FOREWORD

This workshop manual has been prepared to provide information regarding repair procedures on Hino Vehicles.

Applicable for FC6J, FC9J, FD8J, GD8J, FG8J, GH8J, FL8J, FM8J, FM1A, FM2P, SG8J, FT8J, GT8J series, equipped with J05D-TI, J05E-TI, J08E-TI, A09C, P11C engine

When making any repairs on your vehicle, be careful not to be injured through improper procedures.
As for maintenance items, refer to the Owner's Manual.
All information and specifications in this manual are based upon the latest product information available at the time of printing.
Hino Motors reserves the right to make changes at any time without prior notice.
This manual is divided into 11 sections with a thumb index for each section at the edge of the pages.

Please note that the publications below have also been prepared as relevant service manuals for the components and systems in this vehicles.

Manual Name	Pub. No.
Chassis Workshop Manual	S1-YFCE18K 1/3 S1-YFCE18K 2/3 S1-YFCE18K EWD
J05D-TI, J05E-TI Engine Workshop Manual	S5-YJ05E12D
J08E-TI Engine Workshop Manual	S5-YJ08E29E
A09C Engine Workshop Manual	S5-MA09E02A
P11C Engine Workshop Manual	S5-YP11E07B

Hino Motors, Ltd.

CHAPTER REFERENCES REGARDING THIS WORKSHOP MANUAL

Use this chart to the appropriate chapter numbers for servicing your particular vehicle.

CHAPTER	MANUAL No.	S1-YFCE18K 3/3								
	MODELS	FC6J, FC9J, FD8J, GD8J, FG8J, GH8J, FL8J, FM8J, FM1A, FM2P, SG8J, FT8J, GT8J								
FRONT AXLE		AX02-001 (LF366)	AX02-002 (LF458)	AX02-003 (LF45I)	AX02-004 (LF578)	AX02-005 (LF57I)	AX02-006 (MF678)	AX02-007 (MF67I)	AX02-008 (DIFFEREN-TIAL GEAR SERIES: SS12)	AX02-009 (DIFFEREN-TIAL GEAR SERIES: SS15)
REAR AXLE		AX03-001 (DIFFEREN-TIAL GEAR SERIES: SH13)	AX03-002 (DIFFEREN-TIAL GEAR SERIES: SH14)	AX03-003 (DIFFEREN-TIAL GEAR SERIES: SH16)	AX03-004 (DIFFEREN-TIAL GEAR SERIES: SH17)	AX03-005 (DIFFEREN-TIAL GEAR SERIES: SH18)	AX03-006 (DIFFEREN-TIAL GEAR SERIES:THD17)			
WHEEL & TIRE		AX04-001								
SUSPENSION		SU02-001 (MODELS: FC, FD, GD, FG, GH)	SU02-002 (MODELS: FL, FM)	SU02-003 (MODELS: FT, GT)	SU02-004 (MODEL: SG)	SU02-005 (HENDRICKSON HAS 200, HAS 230, HAS 400)				
CHASSIS FRAME		FC02-001								
CAB EQUIPMENT		CA01-001								
CAB		CA02-001								
ELECTRICAL EQUIPMENT		EL01-001								
BRAKE CONTROL		DN03-001 (ABS+ES START: DENSO)	DN03-002 (ABS: WABCO)	DN03-003 (ES START)	DN03-004 (ELECTROMAG-NETIC RETARDER)					
CAB EQUIPMENT CONTROL		DN05-001								
OTHERS		DN06-001 (CAN COMMUNICATION)			DN06-002 (HEADLIGHT AUTOLEVELING)					

HINO

WORKSHOP MANUAL

INDEX: CHASSIS GROUP 1/4

GENERAL INTRODUCTION

CLUTCH EQUIPMENT

CLUTCH MAIN UNIT

CLUTCH CONTROL

TRANSMISSION EQUIPMENT

TRANSMISSION MAIN UNIT

TRANSFER MAIN UNIT

AUTOMATIC TRANSMISSION

P.T.O. (POWER TAKE-OFF)

TRANSMISSION / TRANSFER CONTROL

PROPELLER SHAFT EQUIPMENT

PROPELLER SHAFT

DIFFERENTIAL EQUIPMENT

DIFFERENTIAL CARRIER

BRAKE EQUIPMENT

SERVICE BRAKE

ABS & ASR

ES START (EASY & SMOOTH START SYSTEM)

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This manual does not contain items on half-tone dot meshing.
"GENERAL INTRODUCTION" to "DIFFERENTIAL CARRIER": Refer to "S1-YFCE18K 1/3". "BRAKE EQUIPMENT" to "POWER STEERING": Refer to "S1-YFCE18K 2/3".

INDEX: CHASSIS GROUP 2/4

EXHAUST BRAKE

RETARDER BRAKE

PARKING BRAKE

STEERING EQUIPMENT

STEERING UNIT

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AXLE EQUIPMENT

FRONT AXLE

REAR AXLE

WHEEL & TIRE

SUSPENSION EQUIPMENT

SUSPENSION

CHASSIS EQUIPMENT

CHASSIS FRAME

COUPLER (5TH WHEEL)

PINTLE HOOK

CAB EQUIPMENT

CAB

This manual does not contain items on half-tone dot meshing.
"GENERAL INTRODUCTION" to "DIFFERENTIAL CARRIER": Refer to "S1-YFCE18K 1/3". "BRAKE EQUIPMENT" to "POWER STEERING": Refer to "S1-YFCE18K 2/3".

ELECTRICAL EQUIPMENT

ELECTRIC WIRE

This manual does not contain items on half-tone dot meshing.
"GENERAL INTRODUCTION" to "DIFFERENTIAL CARRIER": Refer to "S1-YFCE18K 1/3". "BRAKE EQUIPMENT" to "POWER STEERING": Refer to "S1-YFCE18K 2/3".

INDEX: CHASSIS GROUP 4/4

ENGINE CONTROL

FUEL CONTROL

BRAKE CONTROL

SUSPENSION CONTROL

CAB EQUIPMENT CONTROL

OTHERS

This manual does not contain items on half-tone dot meshing.
"GENERAL INTRODUCTION" to "DIFFERENTIAL CARRIER": Refer to "S1-YFCE18K 1/3". "BRAKE EQUIPMENT" to "POWER STEEING": Refer to "S1-YFCE18K 2/3".

FRONT AXLE (LF366)

AX02-001

FRONT AXLE (LF366) AX02-2
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INSPECTION AND ADJUSTMENT AX02-15
INSPECTION AND REPAIR AX02-16

FRONT AXLE (LF366)

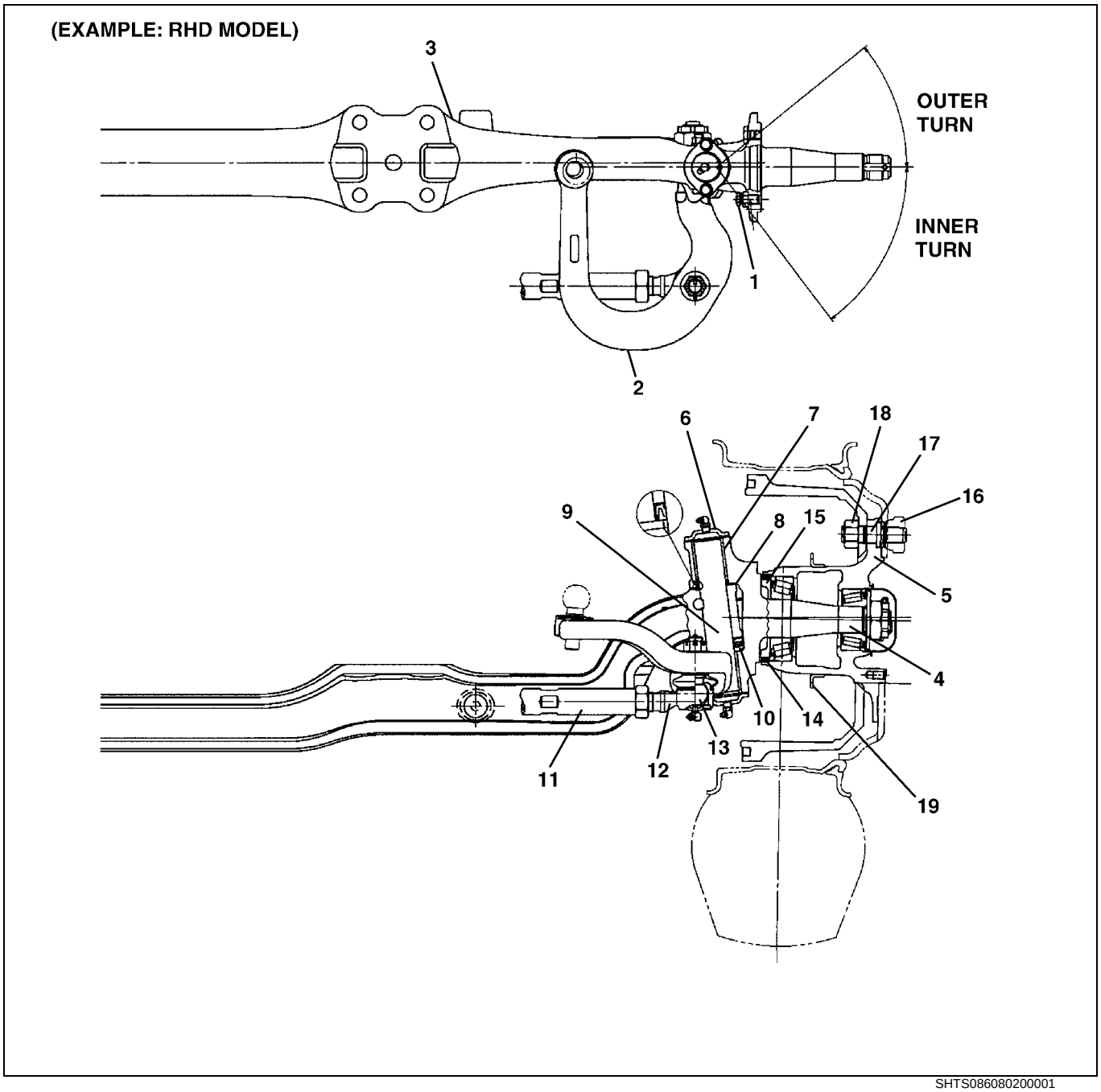
DATA AND SPECIFICATIONS

EN0860802I200001

Front axle series No.			**LF366**
Axle beam type			**Reversed Elliot "I" beam**
Axle beam material			**As rolled normalized steels**
Brake drum location			**Inboard mounted**
Wheel bearing			**Two tapered roller bearings**
Amount of grease in a hub			**430 g {15.1 oz.} at one wheel**
King pin thrust bearing			**Ball bearing**
Wheel alignment	**Camber**		**0°-2°**
	King pin angle		**6°-8°**
	Caster		**2°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**50°-53°**
		Outer turn	**39°**

DESCRIPTION

EN0860802C100001



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1	Stopper bolt	11	Tie rod
2	Knuckle arm	12	Tie-rod end
3	Axle beam	13	Ball stud
4	Knuckle	14	Oil seal
5	Wheel hub	15	Oil seal guide
6	King pin cover	16	Wheel nut
7	Bushing	17	Wheel bolt
8	Thrust washer	18	Wheel bolt fitting nut
9	King pin	19	ABS sensor ring (If so equipped)
10	Thrust bearing		

TROUBLESHOOTING

EN0860802F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheel.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter **"STEERING EQUIPMENT".**
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap is not seated properly	Fit the hub cap properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0860802K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

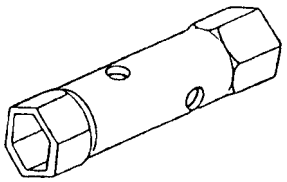
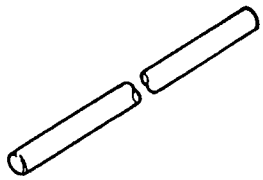
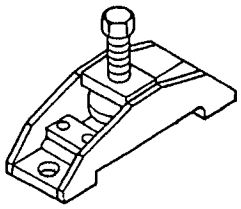
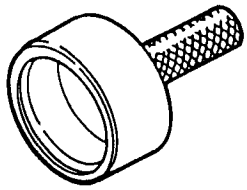
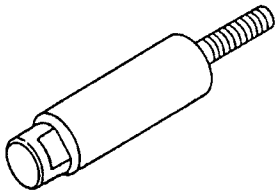
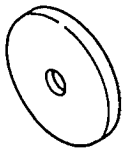
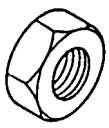
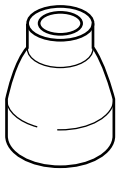
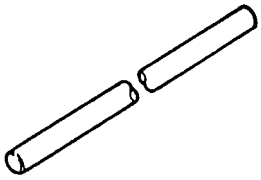
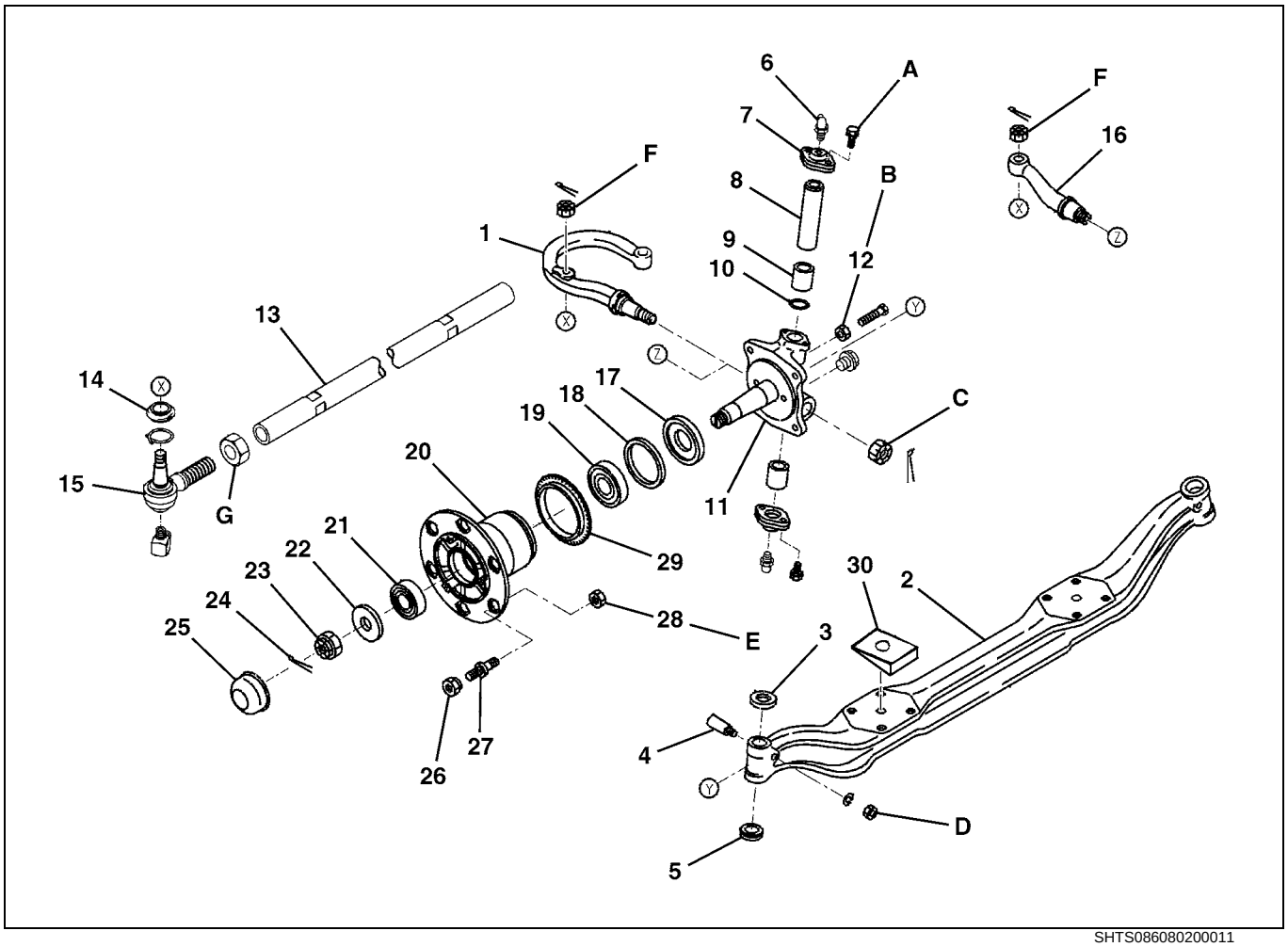
Illustration	Part number	Tool name	Remarks
	S0983-95003	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-02051	WHEEL HUB PULLER	
	S0960-71010	HUB CAP INSTALLER	
	S0965-71131	KING PIN GUIDE	
	S0965-41080	PLATE	
	SL110-01210	NUT	

Illustration	Part number	Tool name	Remarks
	S0965-72050	DUST COVER GUIDE	
	S0971-21080	BAR	

COMPONENT LOCATOR

EN0860802D100001

RIGHT-HAND DRIVE MODEL



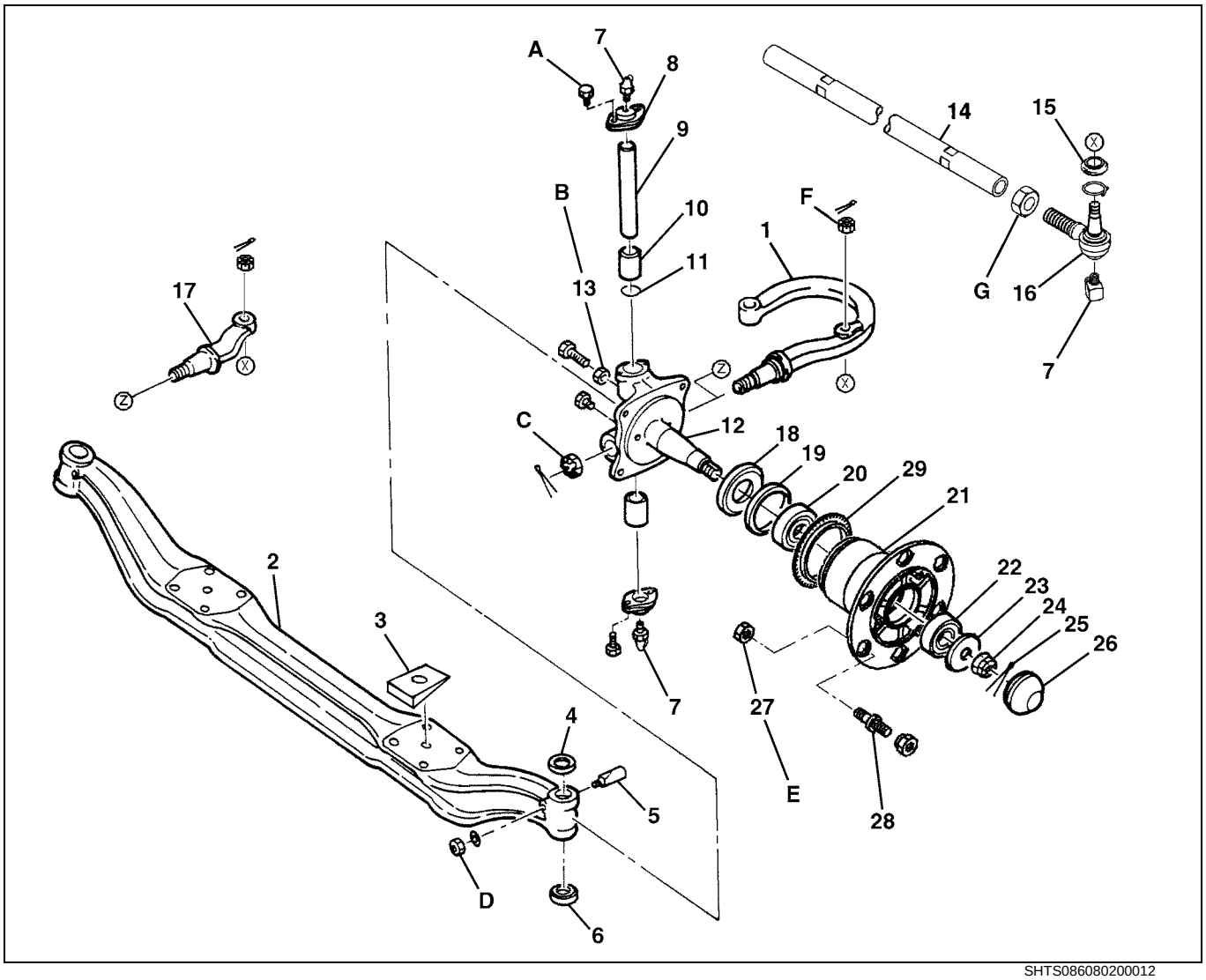
SHTS086080200011

1	Knuckle arm (Drivers side)	16	Tie-rod arm
2	Axle beam	17	Oil seal guide
3	Thrust washer	18	Oil seal
4	Lock pin	19	Inner wheel hub bearing
5	Thrust bearing	20	Wheel hub
6	Lubrication fitting	21	Outer wheel hub bearing
7	King pin cover	22	Washer
8	King pin	23	Hub bearing lock nut
9	Bushing	24	Cotter pin
10	Oil seal	25	Hub cap
11	Knuckle	26	Wheel nut
12	Stopper bolt lock nut	27	Wheel bolt
13	Tie rod	28	Wheel bolt fitting nut
14	Dust cover	29	ABS sensor ring (If so equipped)
15	Tie-rod end assembly	30	Caster shim

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	19-25 {194-254, 14-18}	E	392-470 {4,000-4,800, 290-347}
B	63.5-84.5 {648-861, 47-62}	F	146-244 {1,489-2,488, 108-179}
C	587-783 {5,986-7,984, 433-577}	G	150-200 {1,530-2,039, 111-147}
D	37.5-48.5 {383-494, 28-35}		

LEFT-HAND DRIVE MODEL



SHTS086080200012

1	Knuckle arm	16	Tie-rod end assembly
2	Axle beam	17	Tie-rod arm
3	Caster shim (If so equipped)	18	Oil seal guide
4	Thrust washer	19	Oil seal
5	Lock pin	20	Inner wheel hub bearing
6	Thrust bearing	21	Wheel hub
7	Lubrication fitting	22	Outer wheel hub bearing
8	King pin cover	23	Washer
9	King pin	24	Hub bearing lock nut
10	Bushing	25	Cotter pin
11	Oil seal	26	Hub cap
12	Knuckle	27	Wheel nut
13	Stopper bolt lock nut	28	Wheel bolt
14	Tie rod	29	ABS sensor ring (If so equipped)
15	Dust cover		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	19-25 {194-254, 14-18}	E	392-470 {4,000-4,800, 290-347}
B	63.5-84.5 {648-861, 47-62}	F	146-244 {1,489-2,488, 108-179}
C	587-783 {5,986-7,984, 433-577}	G	150-200 {1,530-2,039, 111-147}
D	37.5-48.5 {383-494, 28-35}		

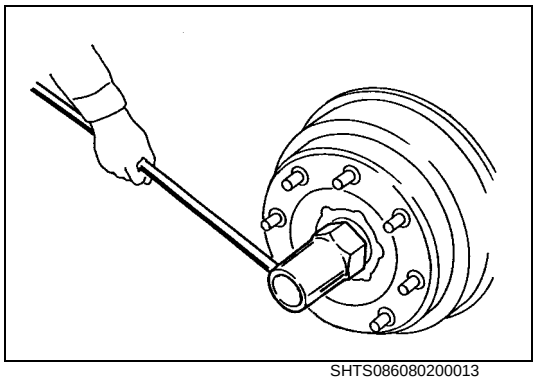
OVERHAUL

EN0860802H200001

IMPORTANT POINTS - DISASSEMBLY

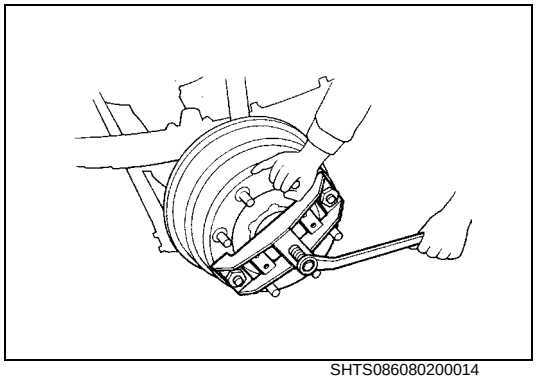
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



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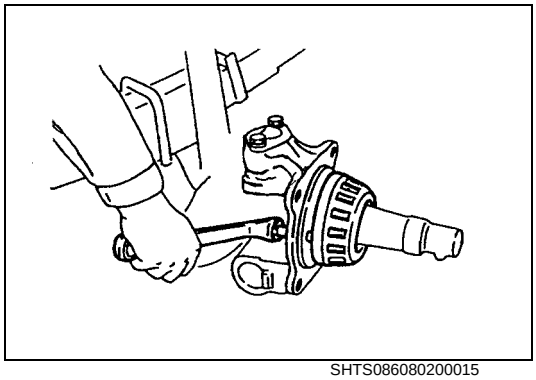
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0983-95003)
Handle (S0984-92001)



SHTS086080200014

3. REMOVAL OF THE WHEEL HUB ASSEMBLY AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-02051)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.



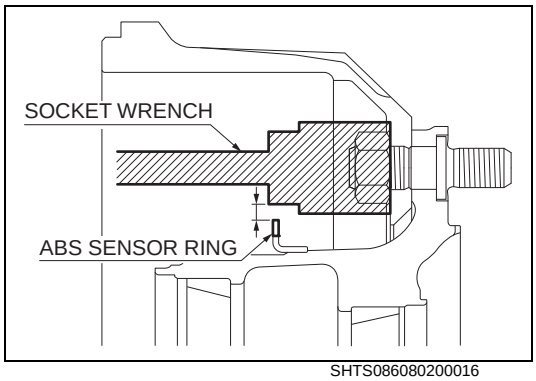
SHTS086080200015

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE

(1) Push out the inner wheel hub bearing and oil seal guide with 2 bolts having same size and thread pitches as of stopper bolt.

5. REMOVAL OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.



SHTS086080200016

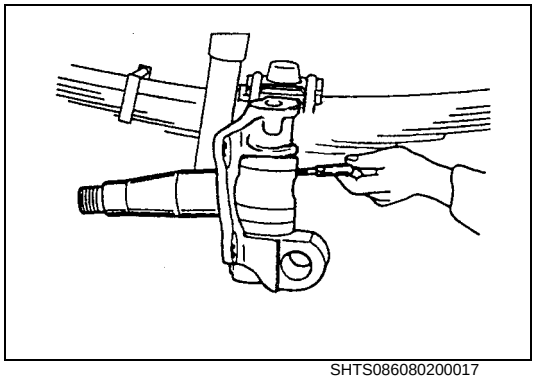
6. DISMOUNTING THE WHEEL BOLT

(1) Remove the nuts.

NOTICE
Removing the nuts without ABS sensor ring (If so equipped), be careful not to damage the ring by tool.

(2) Separate the wheel hub and brake drum. (If necessary)
(3) Knock through the wheel bolt using brass bar and hammer.

NOTICE
Put aligned marks on the wheel hub and brake drum.

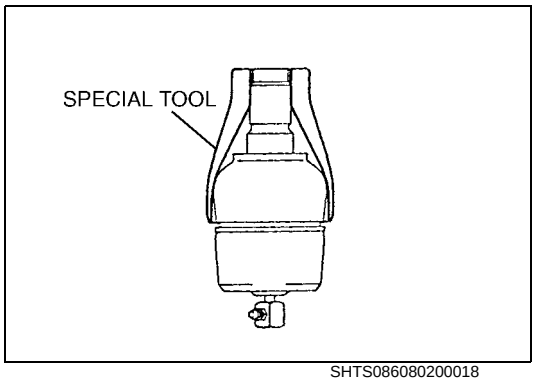


SHTS086080200017

7. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.

IMPORTANT POINTS - ASSEMBLY



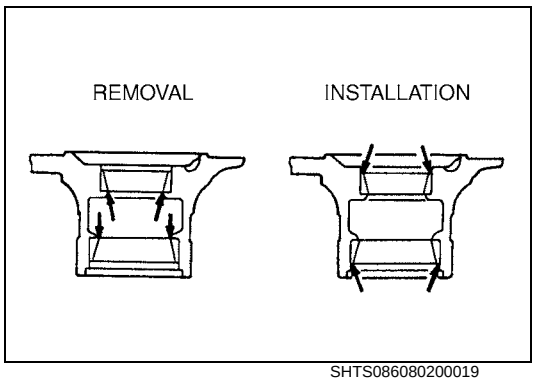
SHTS086080200018

1. REPLACEMENT OF THE DUST COVER.

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST: Dust Cover Guide (S0965-72050)

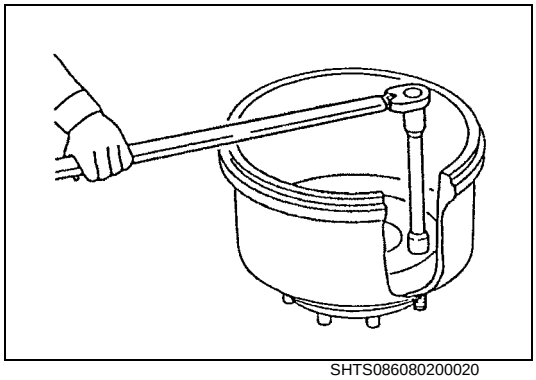


SHTS086080200019

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.


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3. REPLACEMENT OF THE WHEEL BOLTS

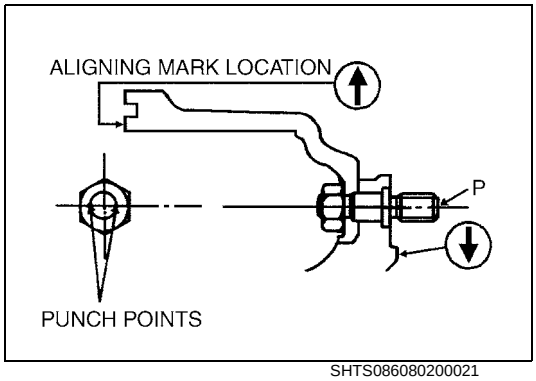
(1) Loosen the wheel bolt fitting nuts and remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

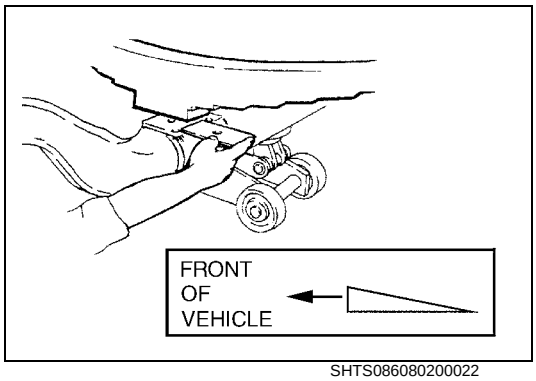
- **The right and left wheel bolts differ, so install them according to the chart below.**

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086080200021

- **After tightening the wheel bolts and nuts, caulk each at 2 points with a punch.**
- **If the wheel hub and brake drum are disassembled to replace the wheel bolts, reassemble them so that their aligning marks are oriented as closely to each other as possible.**



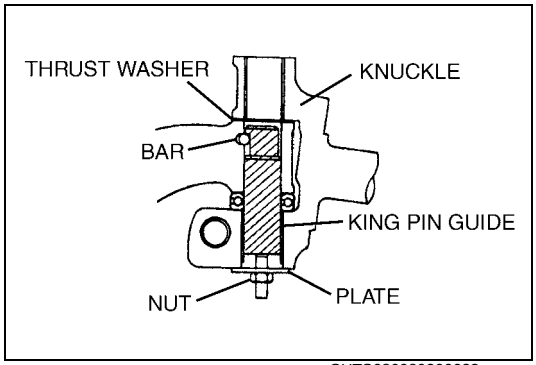
SHTS086080200022

4. INSTALLATION OF THE AXLE BEAM

(1) Secure the axle to the leaf springs with U-bolt.

NOTICE

Confirm the direction of caster shim.



SHTS086080200023

5. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

(1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

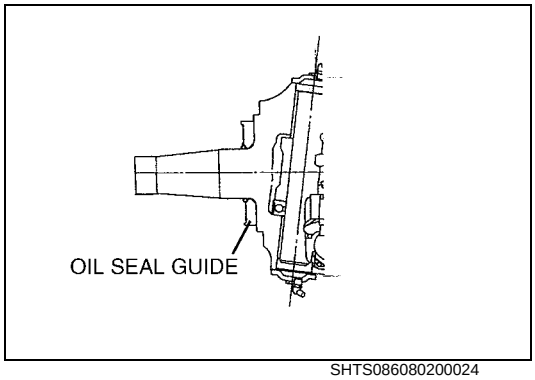
Thickness of Thrust Washer: mm {in.}

1.9 {0.075} 2.0 {0.079} 2.1 {0.083} 2.2 {0.087}
2.3 {0.091} 2.4 {0.094} 2.5 {0.098} 2.6 {0.102}

SST:
King Pin Guide (S0965-71131)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21080)

6. ASSEMBLY OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.

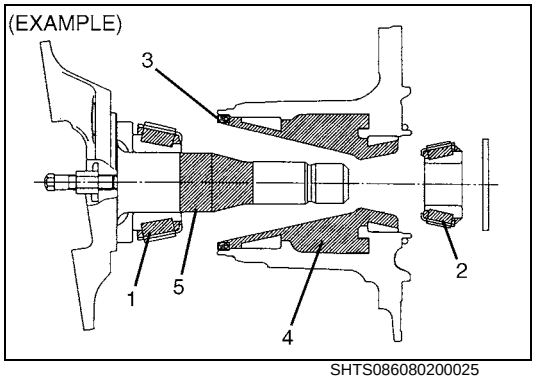


SHTS086080200024

7. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

If the oil seal guide is warmed up with hot water, it can easily be placed.



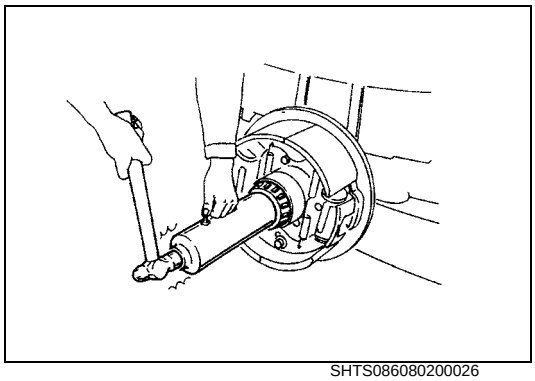
SHTS086080200025

8. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.

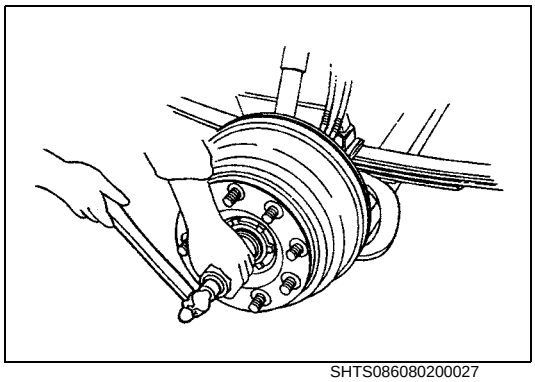

SHTS086080200026

9. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

Using a tool as shown simplifies installation.

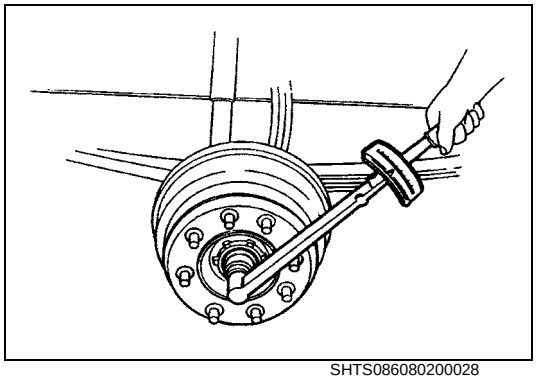

SHTS086080200027

(2) Install the oil seal in the wheel hub.

(3) Install the wheel hub assembly and the outer wheel hub bearing.

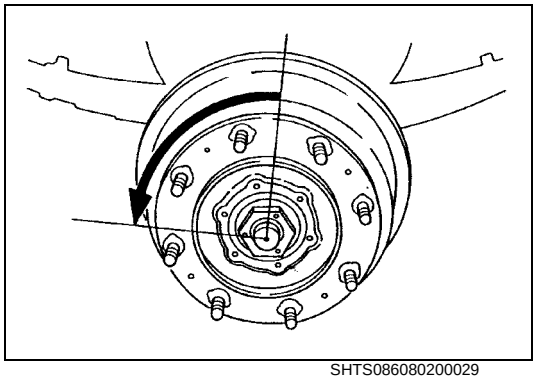
NOTICE

- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086080200028

10. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque: 105 N·m {1,100 kgf·cm, 80 lbf·ft}

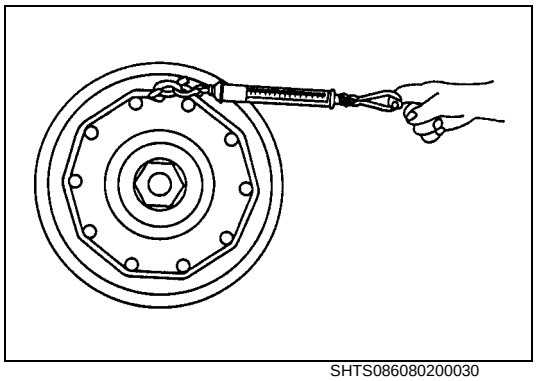

SHTS086080200029

(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)

(3) Measure the wheel bearing preload and adjust the preload with the lock nut, if it exceeds or is less than that specified below.

Assembly standard:

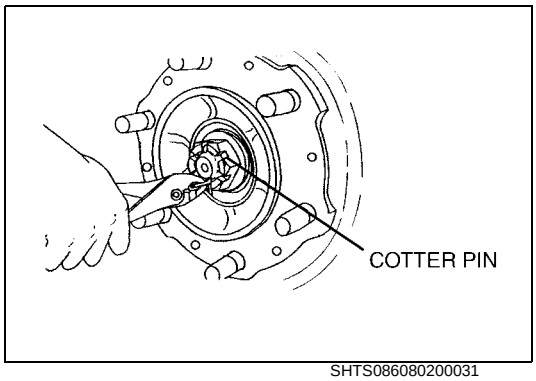
Turning Torque N·m {kgf·cm, lbf·ft}	**1.97-4.90 {20-50, 1.5-3.6}**
Spring balancer reading N {kgf, lbf}	**17.6-43.1 {1.8-4.4, 4.0-9.7}**


SHTS086080200030

11. INSTALLATION OF THE COTTER PIN

NOTICE

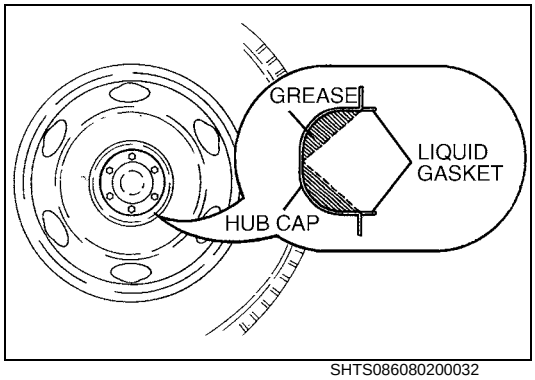
If the holes and the nut groove are not aligned, turn the lock nut within the limits of the wheel hub bearing preload until the hole and groove are aligned.



SHTS086080200031

12. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



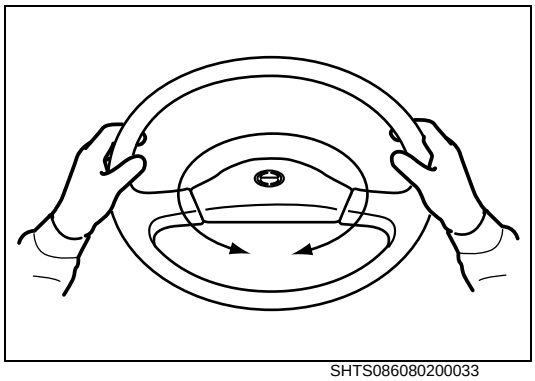
SHTS086080200032

13. INSTALLATION OF THE HUB CAP

NOTICE

- **Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.**
- **Apply silicon based liquid gasket (ThreeBond #1215 or equivalent) to all around the fitting part of the hub cap with the hub, then strike it with special tool.**

SST: Hub Cap Installer (S0960-71010)


SHTS086080200033

14. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

15. ADJUSTMENT OF BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE

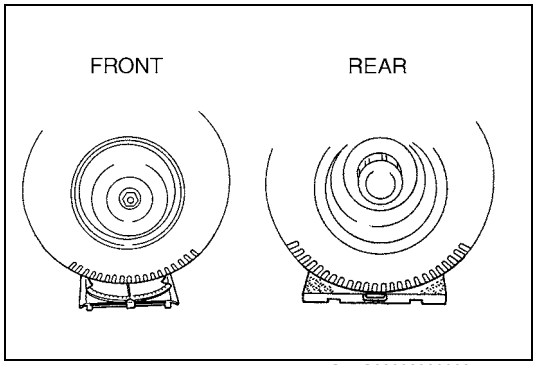
(1) On completion of the front axle overhaul, conduct the followings:

a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.

b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND ADJUSTMENT

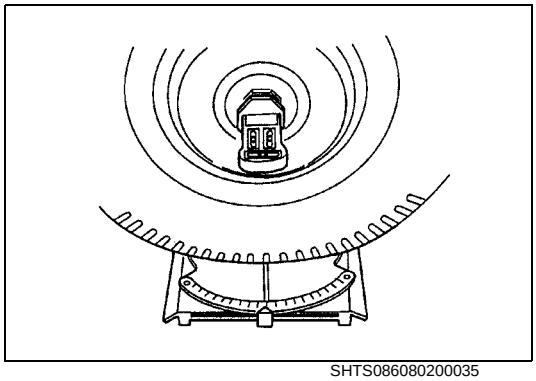
EN0860802H300001



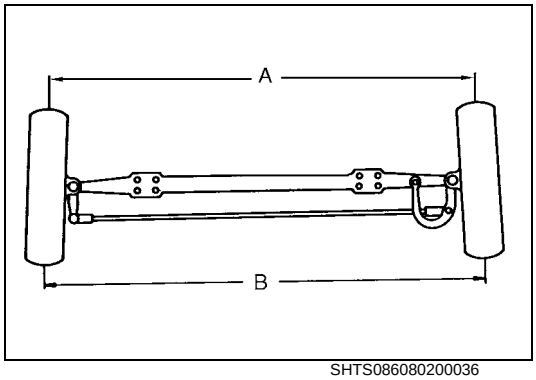
SHTS086080200034

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086080200035

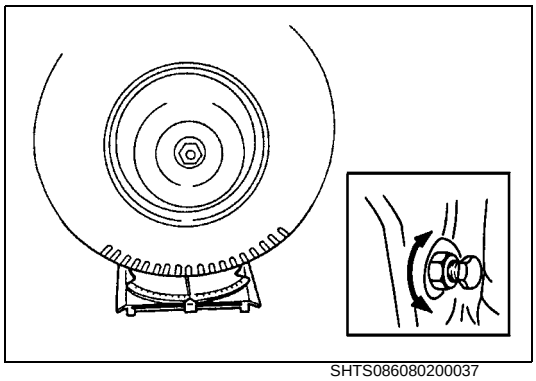
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section **"DATA AND SPECIFICATIONS"**.



SHTS086080200036

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086080200037

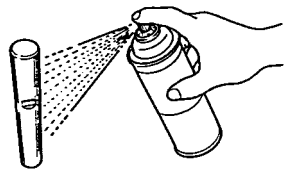
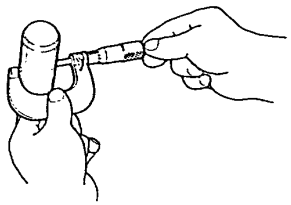
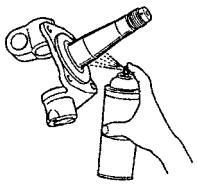
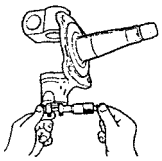
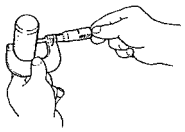
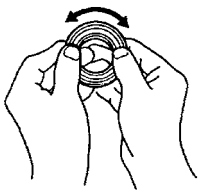
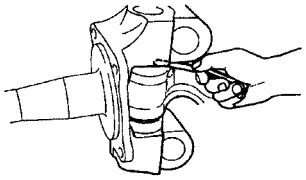
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

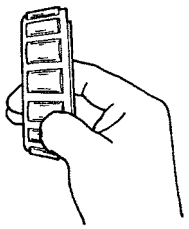
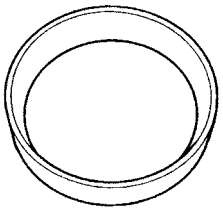
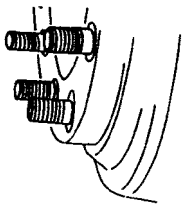
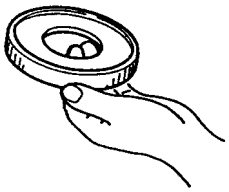
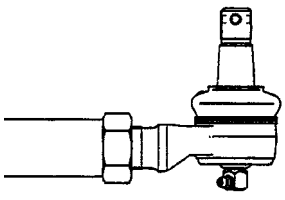
(1) Refer to the section **"DATA AND SPECIFICATIONS"**.

INSPECTION AND REPAIR

EN0860802H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin diameter	**35 {1.378}**	**34.85 {1.373}**	**Replace.**	**Measure** 
Knuckle: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin clearance	**0.020-0.101 {0.0008-0.0039}**	**0.35 {0.0138}**	**Replace.**	**Measure**  
Thrust bearing: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace the thrust washer.**	**Measure** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Dust cover: Crack	**—**	**—**	**Replace.**	**Visual check** 
Muddy water in the cover	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (LF458)

AX02-002

FRONT AXLE (LF458) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-8
INSPECTION AND ADJUSTMENT AX02-14
INSPECTION AND REPAIR AX02-15

FRONT AXLE (LF458)

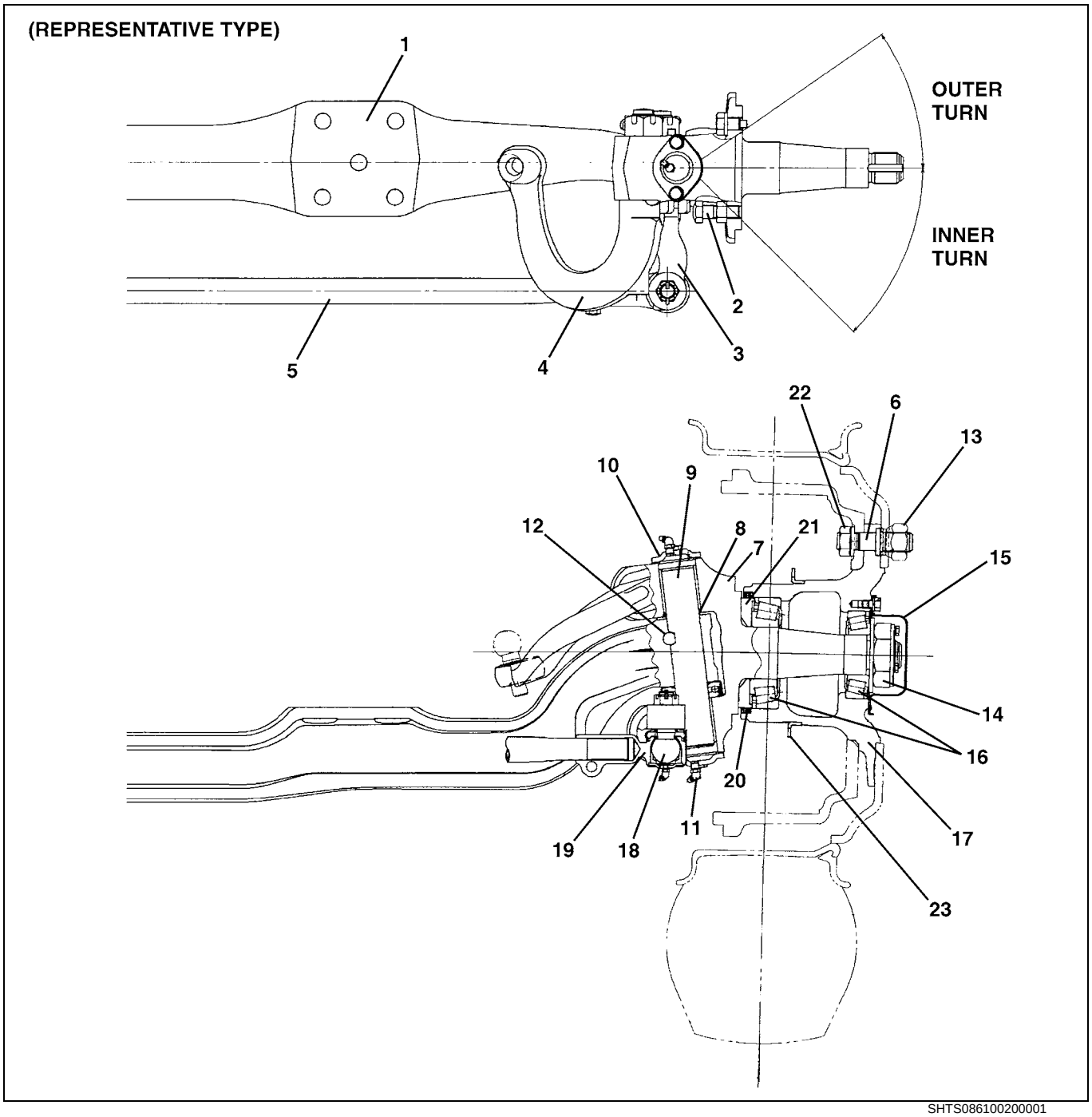
DATA AND SPECIFICATIONS

EN0861002I200001

Front axle series No.			**LF458**
Axle beam type			**Reversed Elliot "I" beam**
Axle beam material			**Heat-treated carbon steel**
Wheel bearing			**Two tapered roller bearings**
King pin thrust bearing			**Ball bearing**
Wheel alignment	**Camber**		**0°-2°**
	King pin angle		**6°-8°**
	Caster		**2°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**42°30'-45°30'**
		Outer turn	**35°**
Amount of grease in a hub			**770 g {27.2 oz.} at one wheel**

DESCRIPTION

EN0861002C100001



SHTS086100200001

1	Axle beam	13	Wheel nut
2	Stopper bolt	14	Lock nut
3	Tie-rod arm	15	Hub cap
4	Knuckle arm	16	Wheel hub bearing
5	Tie rod	17	Wheel hub
6	Wheel bolt	18	Ball stud
7	Knuckle	19	Tie-rod end
8	Thrust washer	20	Oil seal
9	King pin	21	Oil seal guide
10	King pin cover	22	Wheel bolt fitting nut
11	Lubrication fitting	23	ABS sensor ring (If so equipped)
12	Lock pin		

TROUBLESHOOTING

EN0861002F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter **"STEERING EQUIPMENT".**
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861002K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

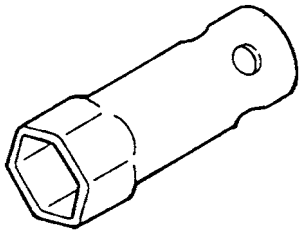
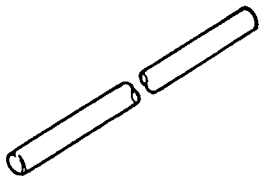
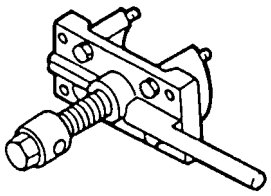
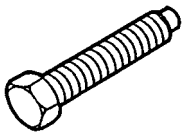
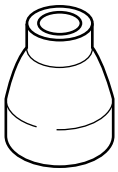
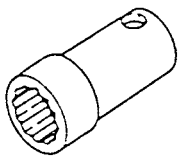
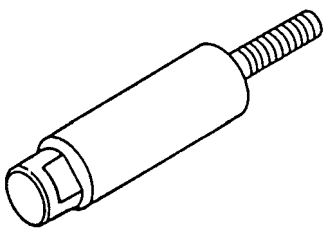
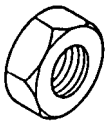
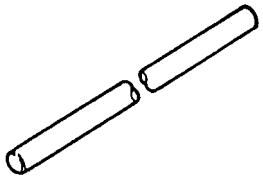
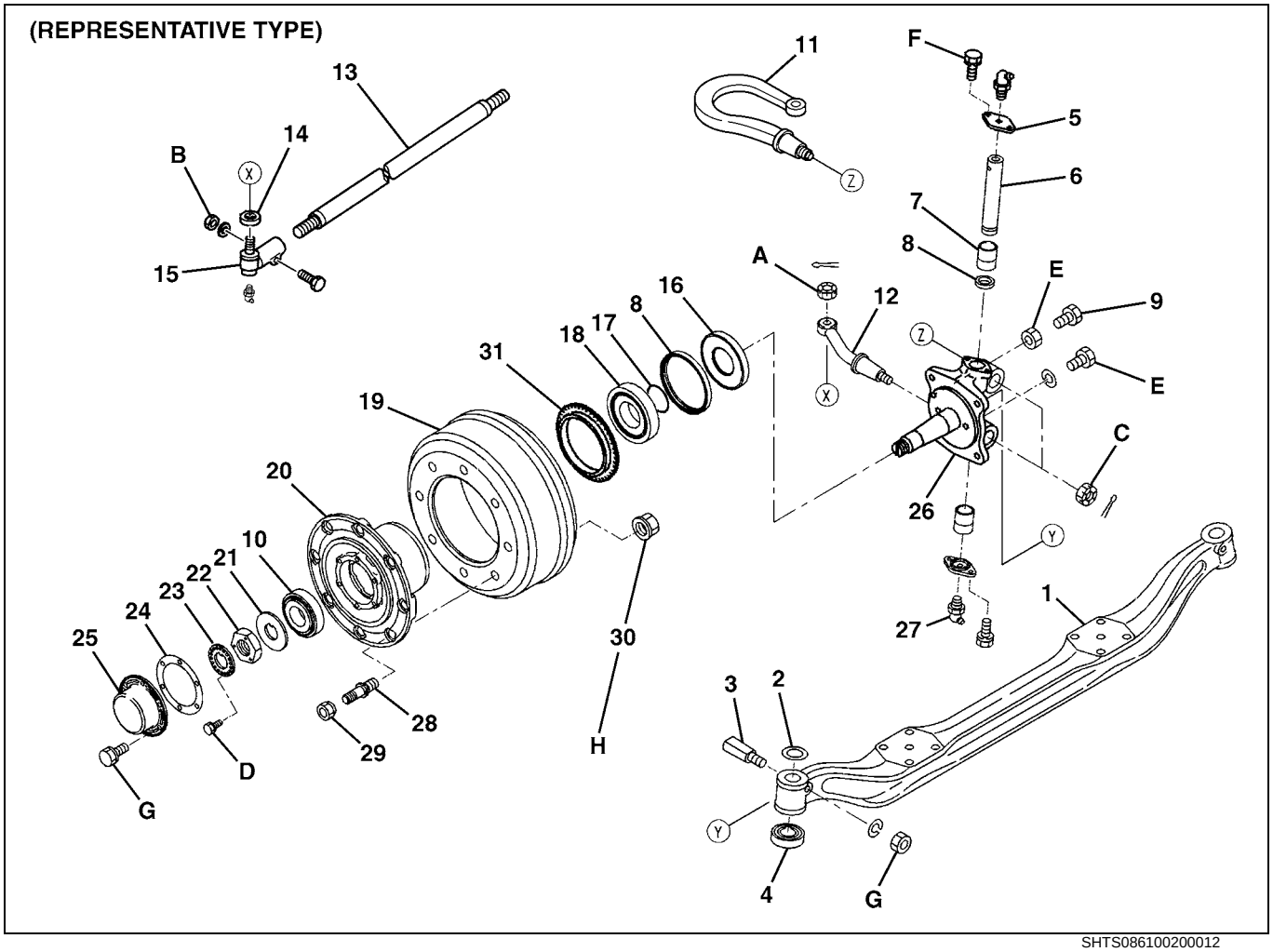
Illustration	Part number	Tool name	Remarks
	S0960-31620	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01790	WHEEL HUB PULLER	
	S0965-21210	PULLER SCREW	2 pieces
	S0965-72050	DUST COVER GUIDE	
	S0960-31190	SOCKET WRENCH	
	S0965-71320	KING PIN GUIDE	

Illustration	Part number	Tool name	Remarks
	S0965-41080	PLATE	
	SL110-01210	NUT	
	S0971-21100	BAR	

COMPONENT LOCATOR

EN0861002D100001



SHTS086100200012

1	Axle beam	17	O-ring
2	Thrust washer	18	Inner wheel hub bearing
3	Lock pin	19	Brake drum
4	Thrust bearing	20	Wheel hub
5	King pin cover	21	Washer
6	King pin	22	Wheel hub bearing lock nut
7	Bushing	23	Lock plate
8	Oil seal	24	Gasket
9	Stopper bolt	25	Wheel hub cap
10	Outer wheel hub bearing	26	Knuckle
11	Knuckle arm	27	Lubrication fitting
12	Tie-rod arm	28	Wheel bolt
13	Tie rod	29	Wheel nut
14	Dust cover	30	Wheel bolt fitting nut
15	Tie-rod end assembly	31	ABS sensor ring (If so equipped)
16	Oil seal guide		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	146-244 {1,500-2,500, 109-326}	E	96-144 {1,000-1,500, 73-108}
B	63.5-84.5 {650-860, 47-62}	F	24.5-33.5 {250-341, 19-24}
C	685-1,175 {7,000-12,000, 507-867}	G	37.5-48.5 {380-500, 28-36}
D	8.5-10.5 {85-110, 6.2-7.9}	H	392-470 {4,000-8,000, 290-347}

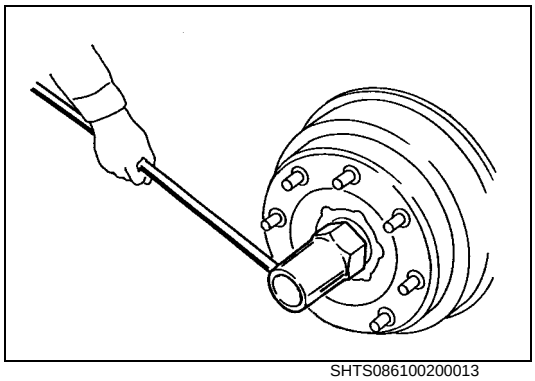
OVERHAUL

EN08610022300001

IMPORTANT POINTS - DISASSEMBLY

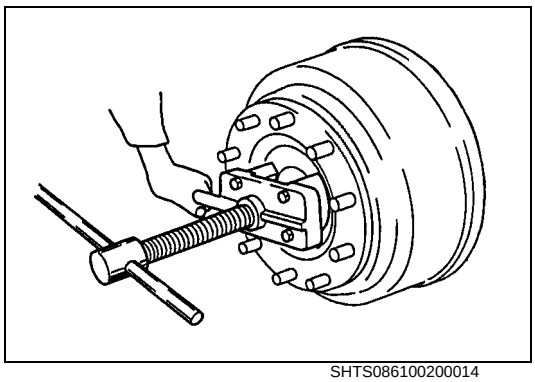
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS086100200013

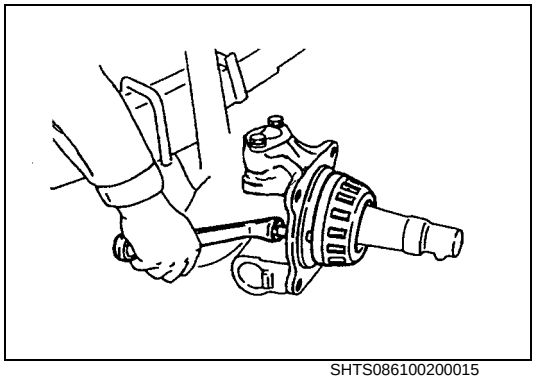
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0960-31620)
Handle (S0984-92001)



SHTS086100200014

3. REMOVAL OF THE WHEEL HUB ASSEMBLY AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.

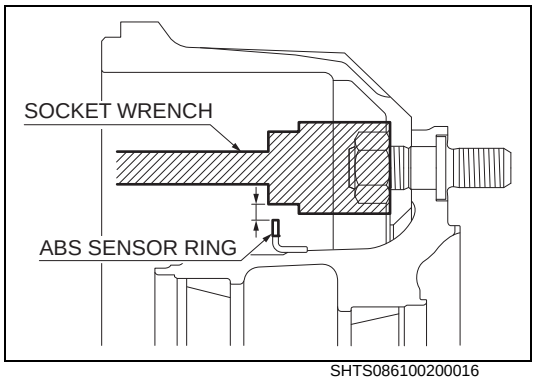


SHTS086100200015

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE
SST: Puller Screw (S0965-21210)

5. REMOVAL OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.



SHTS086100200016

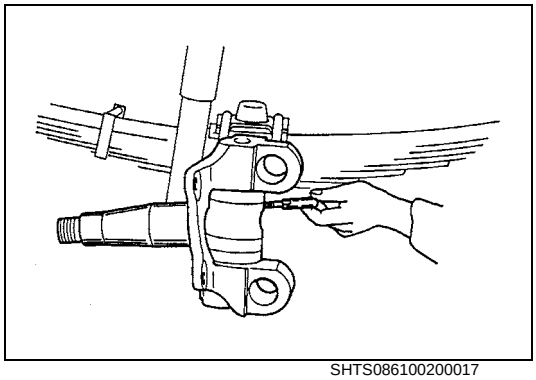
6. DISMOUNTING THE WHEEL BOLT

(1) Remove the nuts.

NOTICE
Removing the nuts without ABS sensor ring, be careful not to damage the ring by tool. (If so equipped)

(2) Separate the wheel hub and brake drum. (If necessary)
(3) Knock through the wheel bolt using brass bar and hammer.

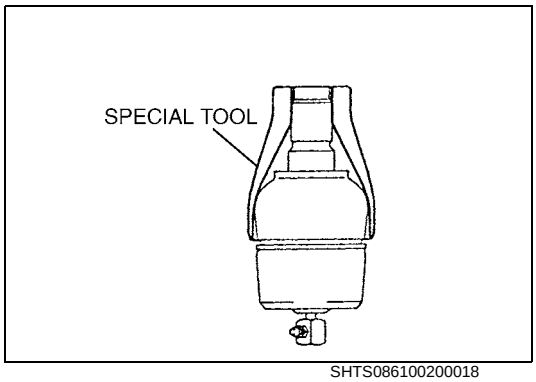
NOTICE
Put aligned marks on the wheel hub and brake drum.


SHTS086100200017

7. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.

IMPORTANT POINTS - ASSEMBLY



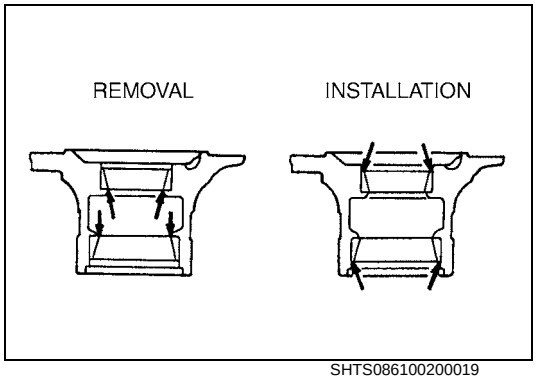
SHTS086100200018

1. REPLACEMENT OF THE DUST COVER

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST: Dust Cover Guide (S0965-72050)

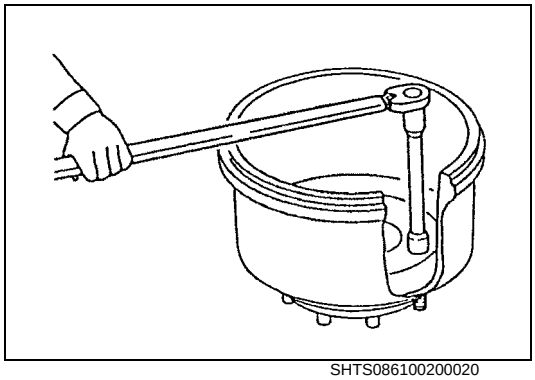


SHTS086100200019

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.


SHTS086100200020

3. REPLACEMENT OF THE WHEEL BOLTS

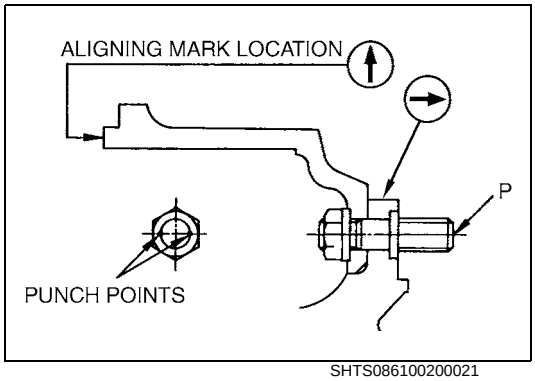
(1) Loosen the wheel bolt fitting nuts and remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

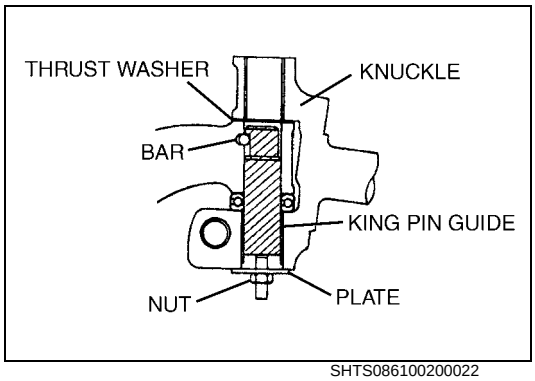
- **The right and left wheel bolts differ, so install them according to the chart below.**

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086100200021

- **After tightening the wheel bolts and nuts, caulk each at 2 points with a punch.**
- **If the wheel hub and brake drum are disassembled to replace the wheel bolts, reassemble them so that their aligning marks are oriented as closely to each other as possible.**



SHTS086100200022

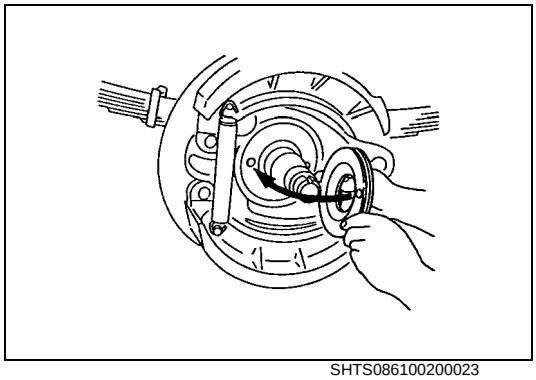
4. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

(1) Adjust the clearance with the correct thickness thrust washer.
Assembly Standard: Less than 0.1 mm {0.004 in.}
Thickness of Thrust Washer: mm {in.}
3.1 {0.122} 3.2 {0.126} 3.3 {0.130} 3.4 {0.134}
3.5 {0.138} 3.6 {0.142} 3.7 {0.146} 3.8 {0.150}

SST:
King Pin Guide (S0965-71320)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21100)

5. ASSEMBLY OF THE WHEEL BRAKE

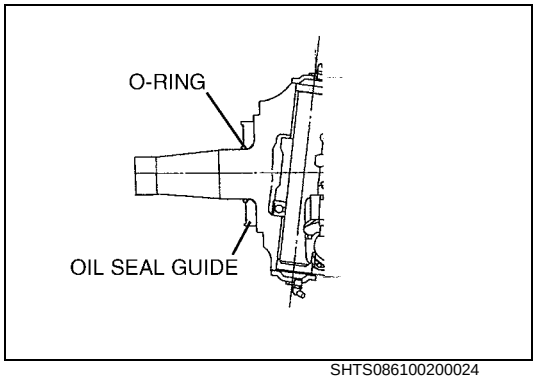
(1) Refer to the chapter **"SERVICE BRAKE"**.


SHTS086100200023

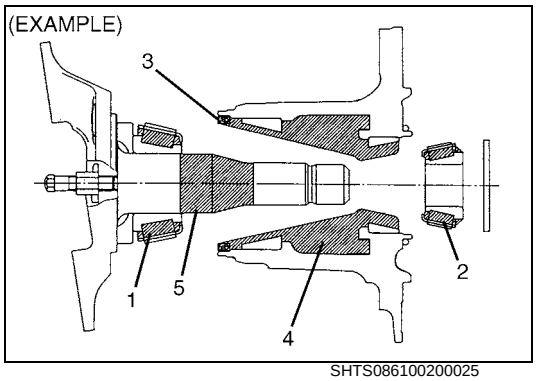
6. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- **Align the stopper bolt hole of the knuckle and oil seal guide hole.**
- **If oil seal guide is warmed up with hot water, it can easily be installed.**
- **Install the O-ring as shown in the figure.**



SHTS086100200024



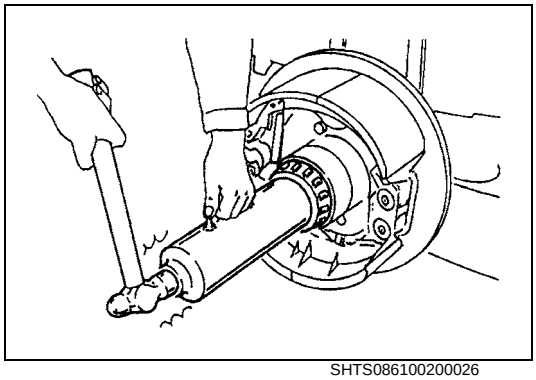
SHTS086100200025

7. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.

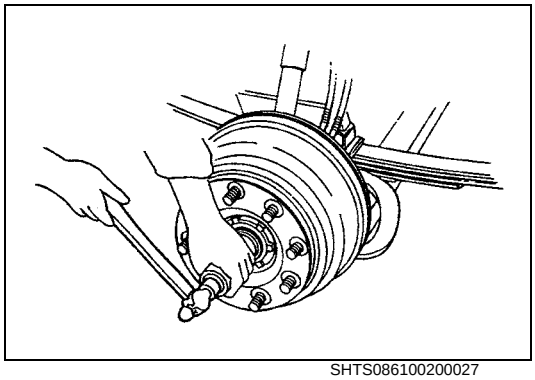

SHTS086100200026

8. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

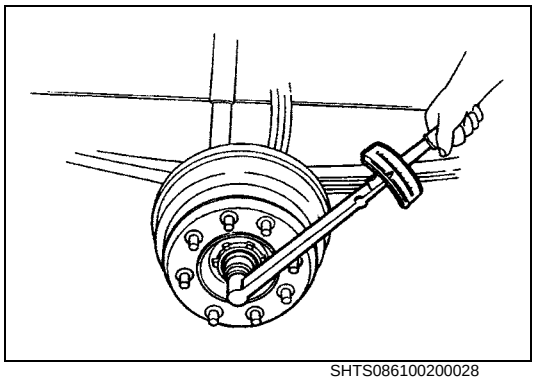
Using a tool as shown, simplifies installation.


SHTS086100200027

(2) Install the oil seal in the wheel hub.
(3) Install the wheel hub assembly and the outer wheel hub bearing.

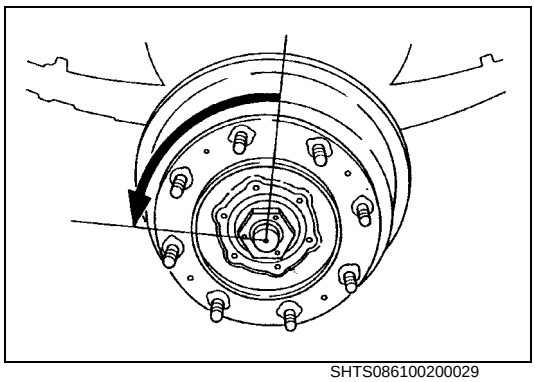
NOTICE

- **Using a tool as shown, simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086100200028

9. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

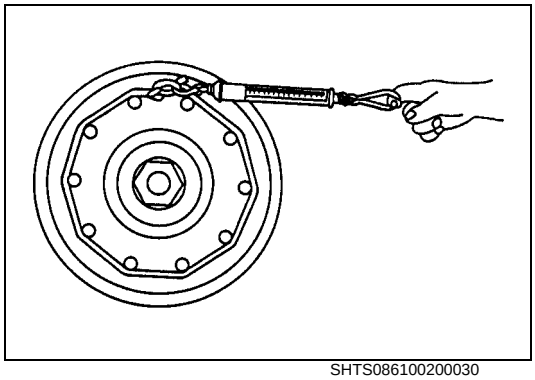
(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque:
340 N·m {3,500 kgf·cm, 253 lbf·ft}

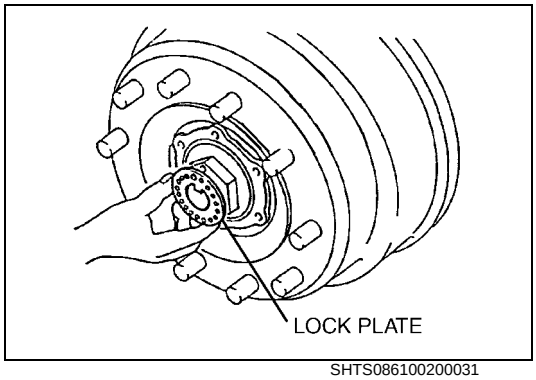

SHTS086100200029

(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)
(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.

Assembly Standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**3.92-6.37 {40-65, 2.9-4.6}**
Spring balancer reading N {kgf, lbf}	**27.5-44.1 {2.8-4.5, 6.2-9.9}**


SHTS086100200030



SHTS086100200031

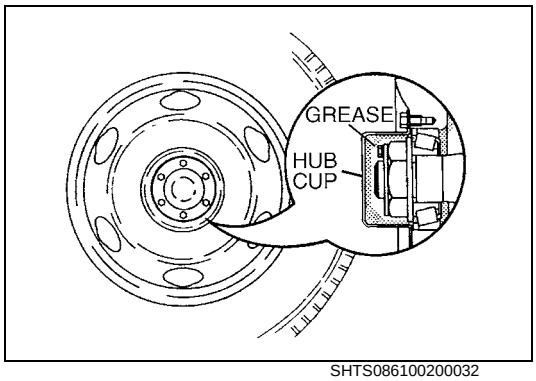
10. INSTALLATION OF THE LOCK PLATE

NOTICE

- **If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

11. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.

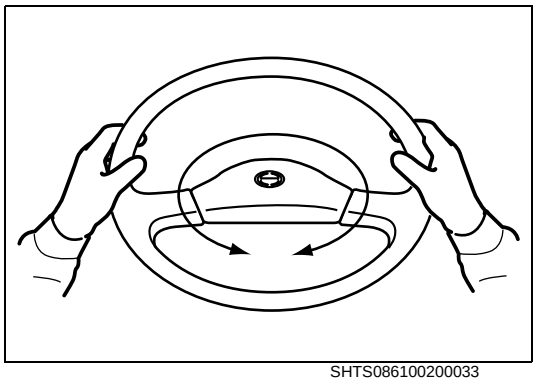


SHTS086100200032

12. INSTALLATION OF THE HUB CAP

NOTICE

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.


SHTS086100200033

13. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

14. ADJUSTMENT OF BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE

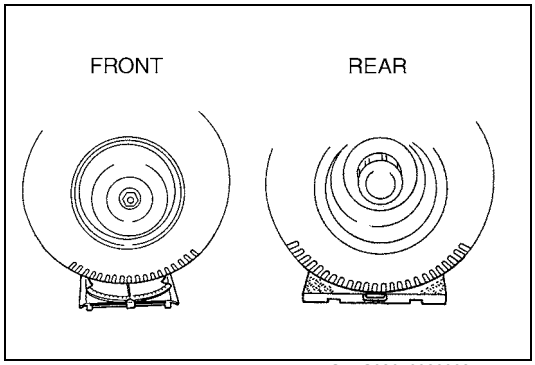
(1) On completion of the front axle overhaul, conduct the followings:

a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.

b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND ADJUSTMENT

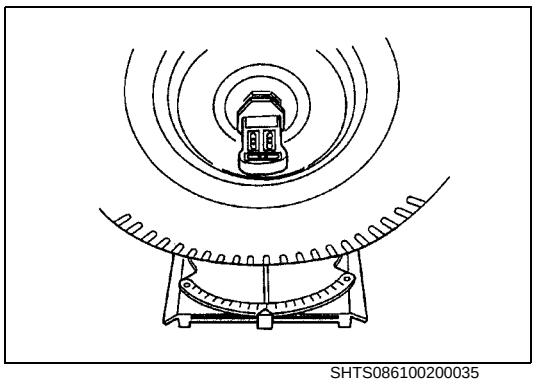
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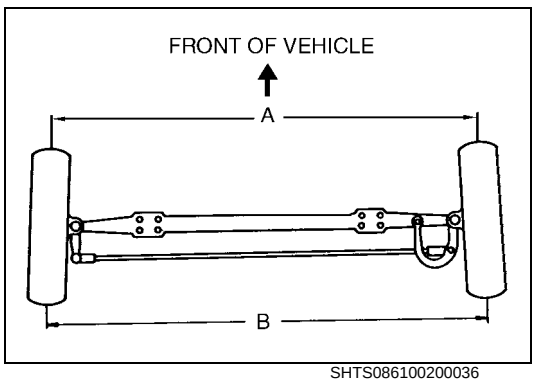
SHTS086100200034

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086100200035

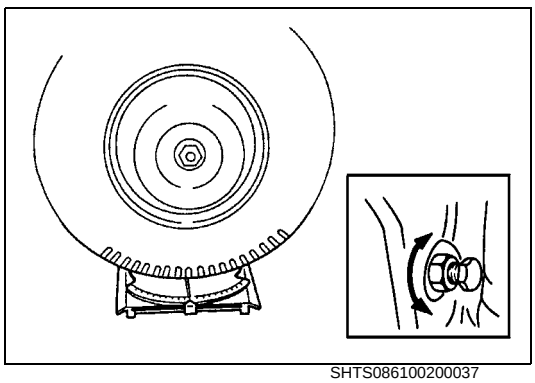
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section **"DATA AND SPECIFICATIONS"**.



SHTS086100200036

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086100200037

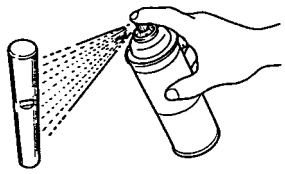
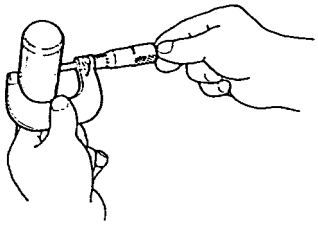
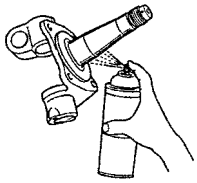
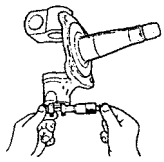
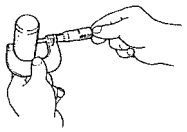
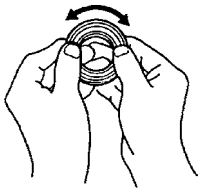
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

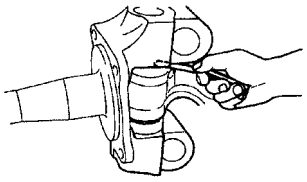
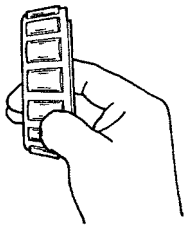
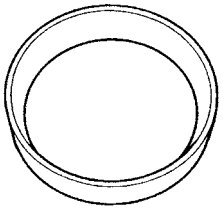
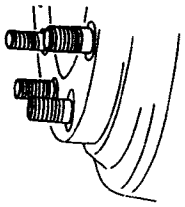
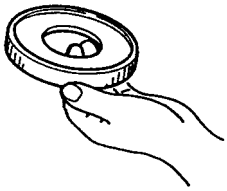
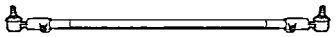
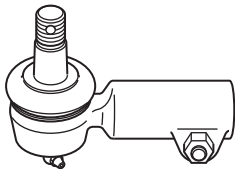
(1) Refer to the section **"DATA AND SPECIFICATIONS"**.

INSPECTION AND REPAIR

EN0861002H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin diameter	**40 {1.575}**	**39.85 {1.569}**	**Replace.**	**Measure** 
Knuckle: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin clearance	**0.060-0.150 {0.0024-0.0059}**	**0.35 {0.0138}**	**Replace.**	**Measure**  
Thrust bearing: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace the thrust washer.**	**Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie-rod end and dust cover: Crack	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Muddy water in the cover (Sealed type ball stud)	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (LF45I)

AX02-003

FRONT AXLE (LF45I) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-9
INSPECTION AND ADJUSTMENT AX02-15
INSPECTION AND REPAIR AX02-16

FRONT AXLE (LF45I)

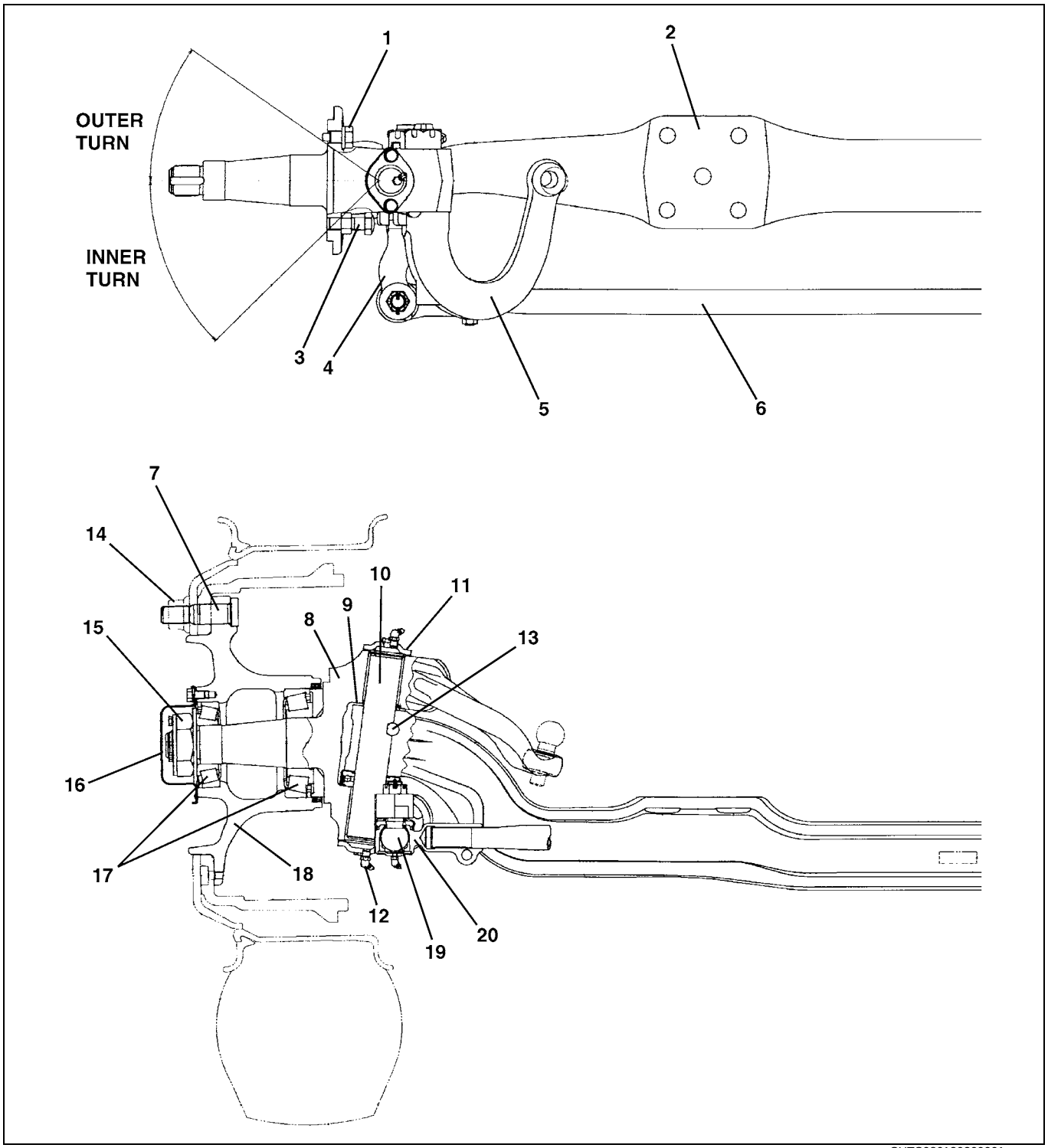
DATA AND SPECIFICATIONS

EN0861302I200001

Front axle series No.			**LF45I**
Axle beam type			**Reversed Elliot "I" beam**
Axle beam material			**Heat-treated carbon steel**
Brake drum location			**Outboard mounted**
Wheel bearing			**Two tapered roller bearings**
King pin thrust bearing			**Ball bearing**
Wheel alignment	**Camber**		**0°-2°**
	King pin angle		**6°-8°**
	Caster		**2°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**42°30'-45°30'**
		Outer turn	**35°**
Amount of grease in a hub			**770 g {27.2 oz.} at one wheel**

DESCRIPTION

EN0861302C100001



SHTS086130200001

1	Lock pin bolt	11	King pin cover
2	Axle beam	12	Lubrication fitting
3	Stopper bolt	13	Lock pin
4	Tie-rod arm	14	Wheel nut
5	Knuckle arm	15	Lock nut
6	Tie rod	16	Hub cap
7	Wheel bolt	17	Wheel hub bearing
8	Knuckle	18	Wheel hub
9	Thrust washer	19	Ball stud
10	King pin	20	Tie-rod end

TROUBLESHOOTING

EN0861302F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter "**STEERING EQUIPMENT**".
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861302K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

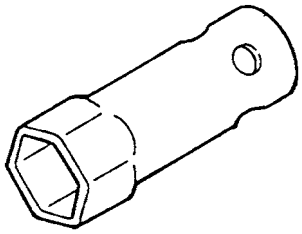
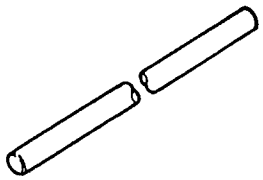
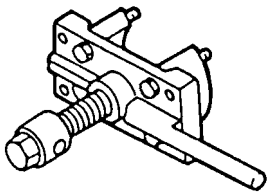
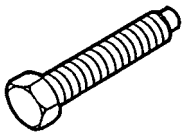
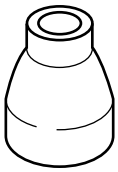
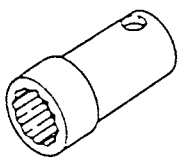
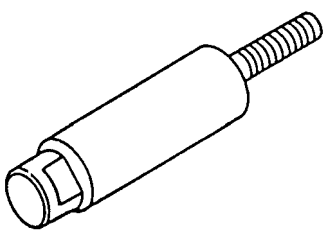
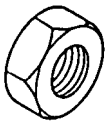
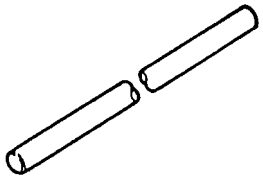
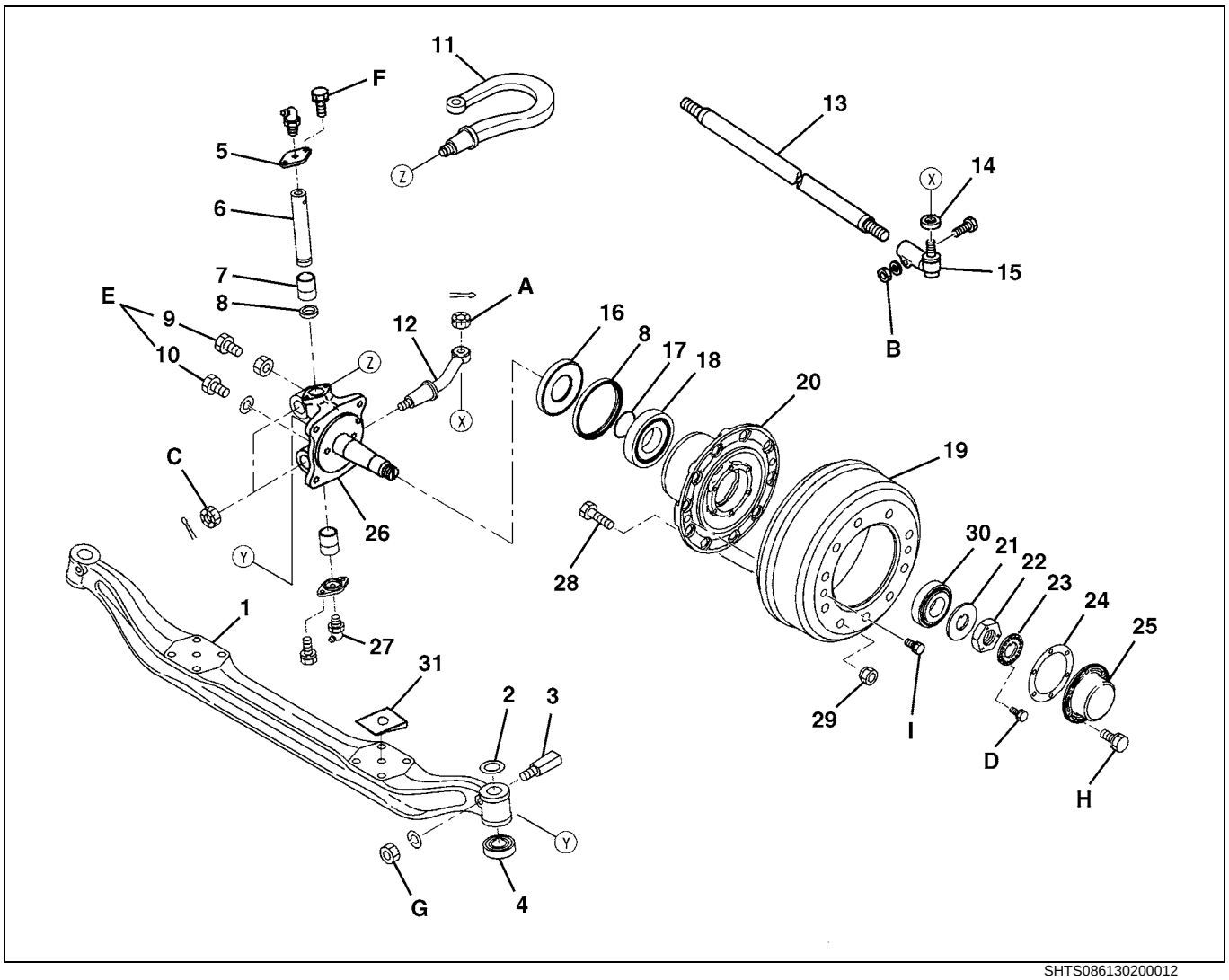
Illustration	Part number	Tool name	Remarks
	S0983-97001	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01790	WHEEL HUB PULLER	
	S0965-21210	PULLER SCREW	2 pieces
	S0965-72050	DUST COVER GUIDE	
	S0960-31190	SOCKET WRENCH	
	S0965-71320	KING PIN GUIDE	

Illustration	Part number	Tool name	Remarks
	S0965-41080	PLATE	
	SL110-01210	NUT	
	S0971-21100	BAR	

COMPONENT LOCATOR

EN0861302D100001



SHTS086130200012

1	Axle beam	17	O-ring
2	Thrust washer	18	Inner wheel hub bearing
3	Lock pin	19	Brake drum
4	Thrust bearing	20	Wheel hub
5	King pin cover	21	Washer
6	King pin	22	Wheel hub bearing lock nut
7	Bushing	23	Lock plate
8	Oil seal	24	Gasket
9	Stopper bolt	25	Wheel hub cap
10	Lock pin bolt	26	Knuckle
11	Knuckle arm	27	Lubrication fitting
12	Tie-rod arm	28	Wheel bolt
13	Tie rod	29	Wheel nut
14	Dust cover	30	Outer wheel hub bearing
15	Tie-rod end assembly	31	Caster shim
16	Oil seal guide		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	146-244 {1,500-2,500, 109-326}	F	24.5-33.5 {250-341, 19-24}
B	85.5-114.5 {870-1,170, 63-84}	G	37.5-48.5 {380-500, 28-36}
C	685-1,175 {7,000-12,000, 507-867}	H	37.5-48.5 {380-500, 28-36}
D	8.5-10.5 {85-110, 6.2-7.9}	I	20.5-39.5 {210-400, 16-28}
E	96-144 {1,000-1,500, 73-108}		

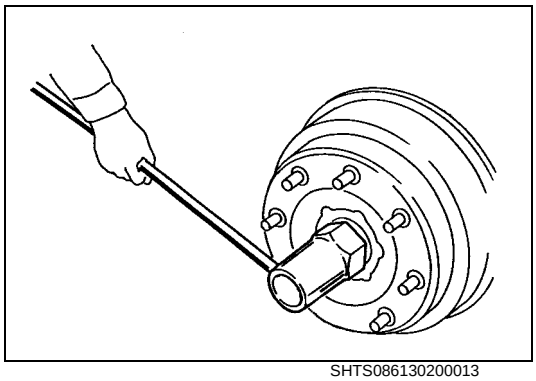
OVERHAUL

EN08613022300001

IMPORTANT POINTS - DISASSEMBLY

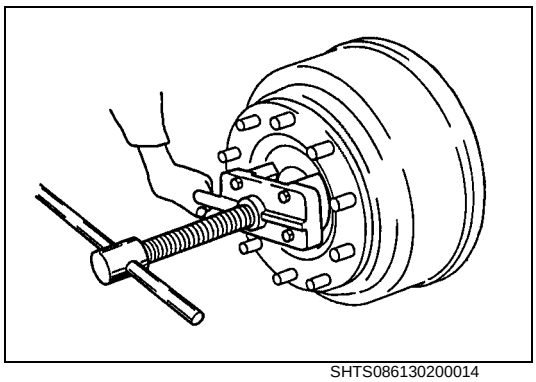
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".



SHTS086130200013

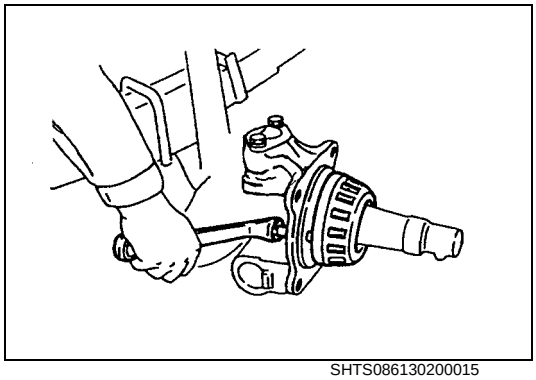
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0983-97001)
Handle (S0984-92001)



SHTS086130200014

3. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.

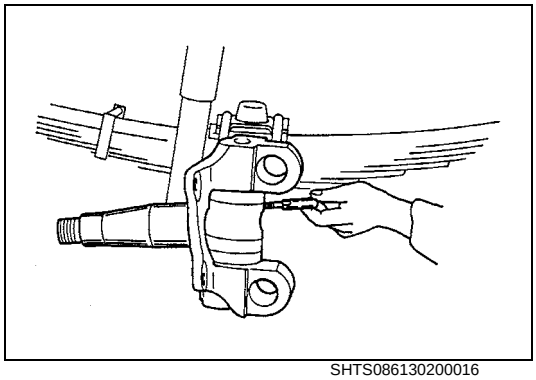


SHTS086130200015

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE
SST: Puller Screw (S0965-21210)

5. REMOVAL OF THE WHEEL BRAKE

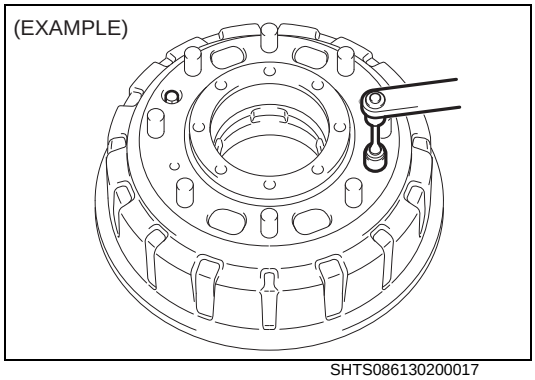
(1) Refer to the chapter "**SERVICE BRAKE**".



SHTS086130200016

6. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.

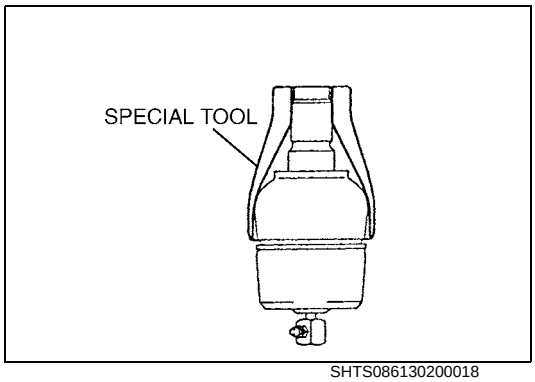


SHTS086130200017

7. SEPARATION OF THE BRAKE DRUM AND WHEEL HUB

(1) Remove the bolts, and separate the brake drum and wheel hub.

IMPORTANT POINTS - ASSEMBLY



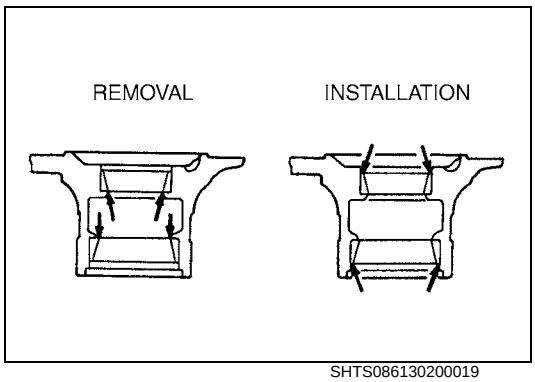
SHTS086130200018

1. REPLACEMENT OF THE DUST COVER

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST: Dust Cover Guide (S0965-72050)

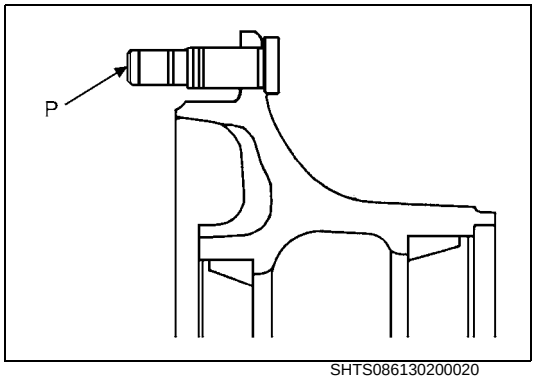


SHTS086130200019

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.



SHTS086130200020

3. REPLACEMENT OF THE WHEEL BOLTS

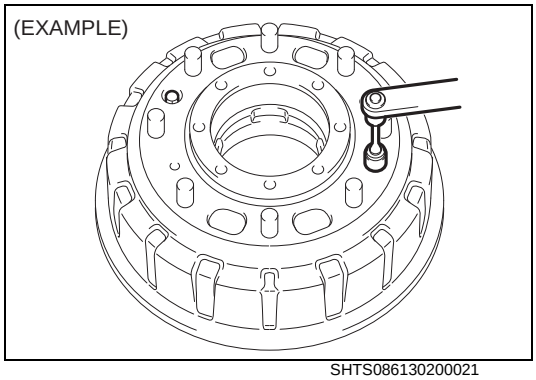
(1) Remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

- **The left and right wheel bolts differ, so install them according to the chart below.**

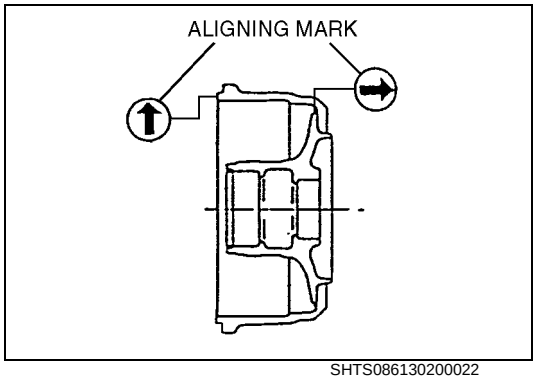
	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086130200021

4. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB

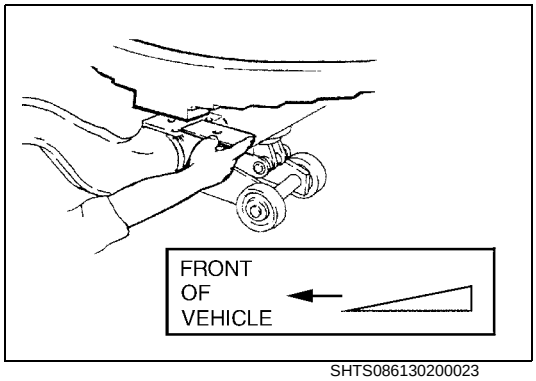
(1) Assemble the brake drum and wheel hub, and tighten the bolts.



SHTS086130200022

NOTICE

When assembling the brake drum and wheel hub, make sure that their aligning marks are oriented as closely to each other as possible.



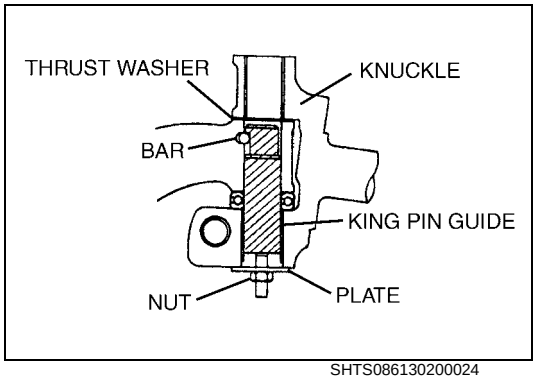
SHTS086130200023

5. INSTALLATION OF THE AXLE BEAM

(1) Secure the axle to the leaf springs with U-bolts.

NOTICE

Confirm the direction of caster shim.



SHTS086130200024

6. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

(1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

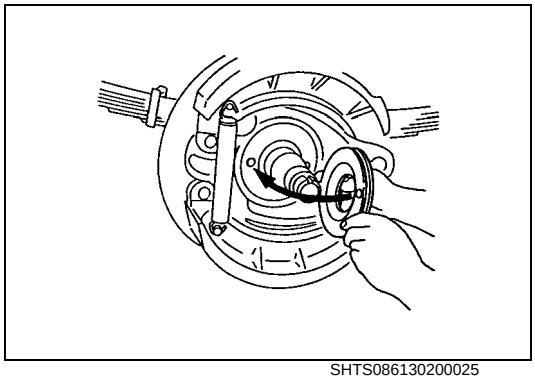
Thickness of Thrust Washer: mm {in.}

3.1 {0.122} 3.2 {0.126} 3.3 {0.130} 3.4 {0.134}
3.5 {0.138} 3.6 {0.142} 3.7 {0.146} 3.8 {0.150}

SST:
King Pin Guide (S0965-71320)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21100)

7. ASSEMBLY OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.

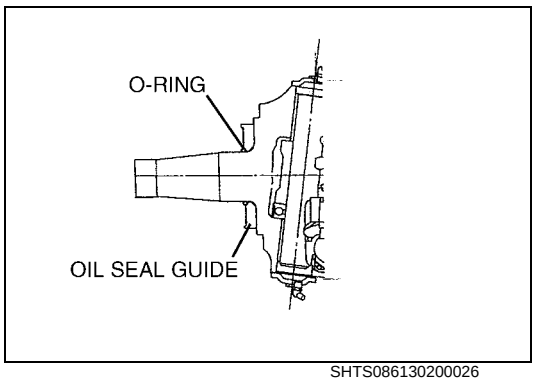


SHTS086130200025

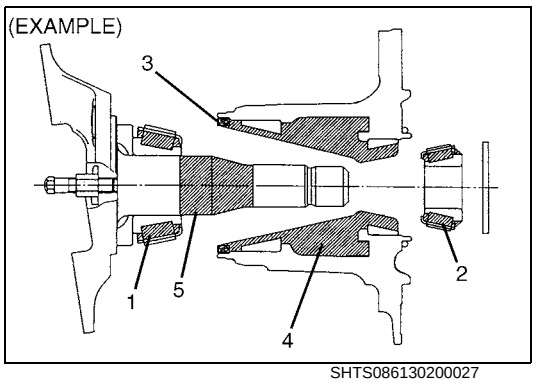
8. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- **Align the stopper bolt hole of the knuckle and oil seal guide hole.**
- **If oil seal guide is warmed up with hot water, it can easily be installed.**
- **Install the O-ring as shown in the figure.**



SHTS086130200026



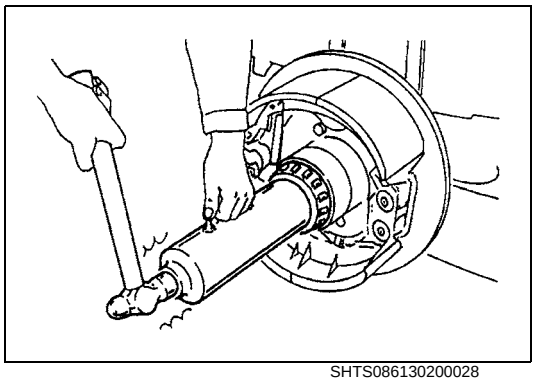
SHTS086130200027

9. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.



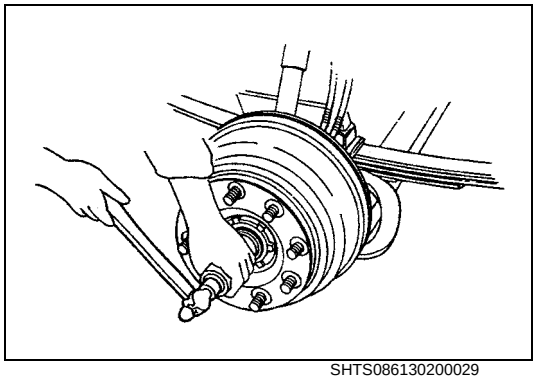
SHTS086130200028

10. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

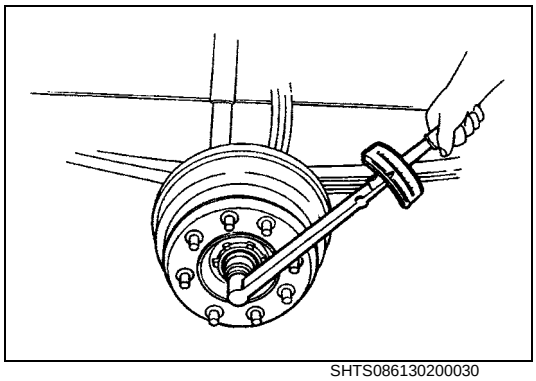
Using a tool as shown, simplifies installation.


SHTS086130200029

(2) Install the oil seal in the wheel hub.
(3) Install the wheel hub assembly and the outer wheel hub bearing.

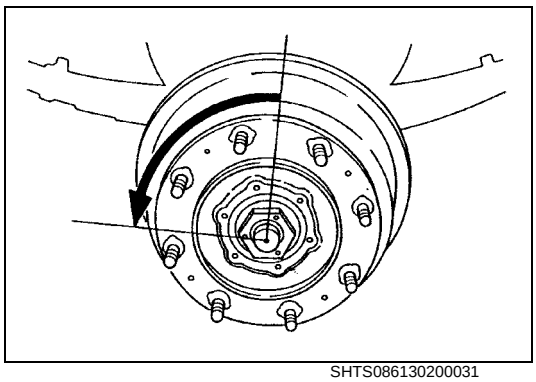
NOTICE

- **Using a tool as shown, simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086130200030

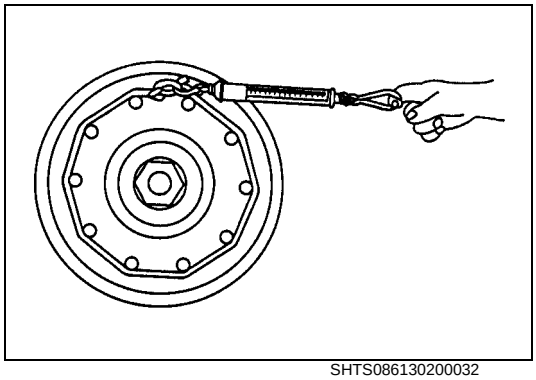
11. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque:
340 N·m {3,500 kgf·cm, 253 lbf·ft}

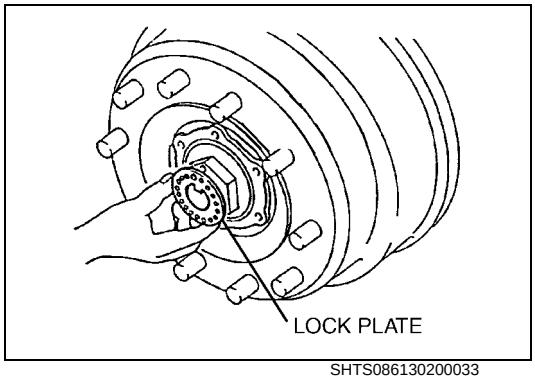

SHTS086130200031

(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)
(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.

Assembly Standard:


SHTS086130200032

Turning Torque N·m {kgf·cm, lbf·ft}	**3.93-6.37 {40-65, 2.9-4.6}**
Spring balancer reading N {kgf, lbf}	**23.5-38.0 {2.4-3.9, 5.3-8.6}**



SHTS086130200033

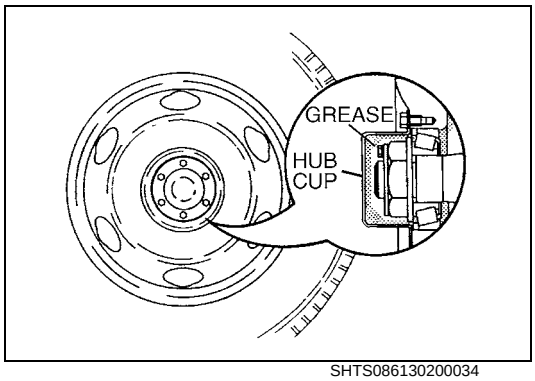
12. INSTALLATION OF THE LOCK PLATE

NOTICE

- **If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

13. INSTALLATION OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".

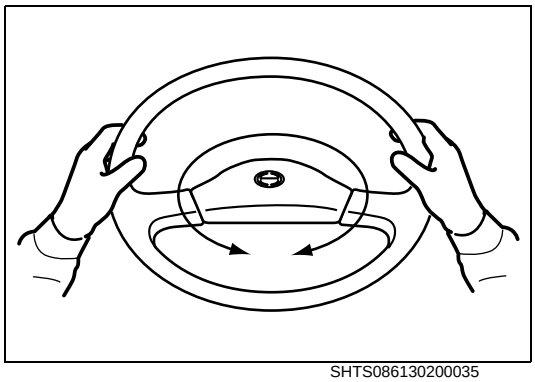


SHTS086130200034

14. INSTALLATION OF THE HUB CAP

NOTICE

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.


SHTS086130200035

15. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

16. ADJUSTMENT OF THE BRAKE SYSTEM AIR BLEEDING AND THE BRAKE SHOE CLEARANCE

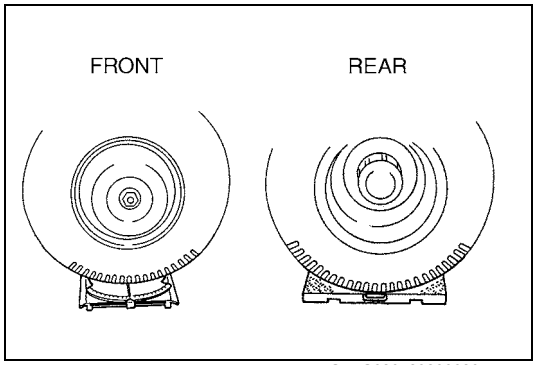
(1) On completion of the wheel hub and related parts reassembly, conduct the followings:

a. Bleed the air from the brake lines according to the section "**SERVICE BRAKE ASSEMBLY**" in the chapter "**BRAKE EQUIPMENT**".

b. Adjust the brake shoe clearance according to the section "**WHEEL BRAKE**" in the chapter "**SERVICE BRAKE**".

INSPECTION AND ADJUSTMENT

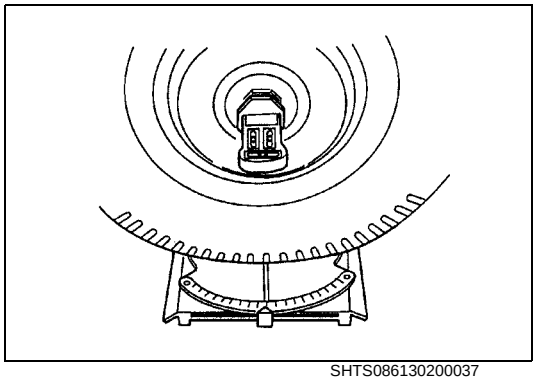
EN0861302H300001



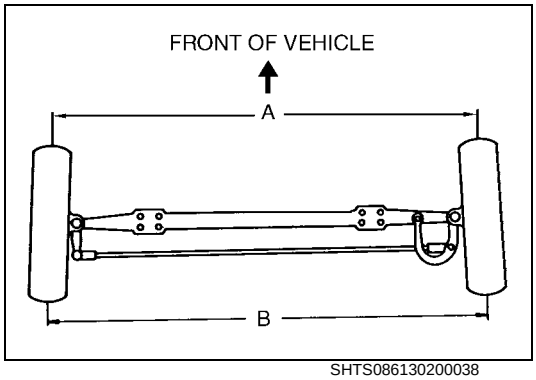
SHTS086130200036

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086130200037

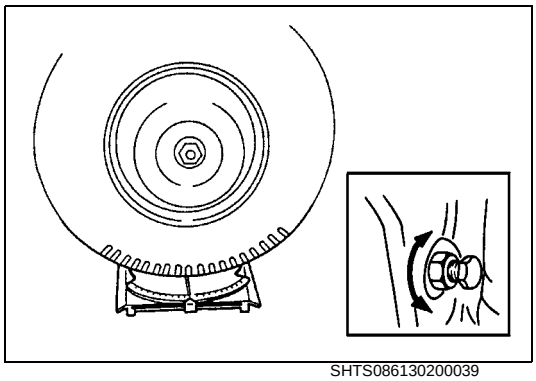
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section "**DATA AND SPECIFICATIONS**".



SHTS086130200038

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086130200039

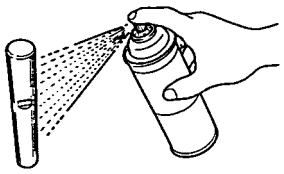
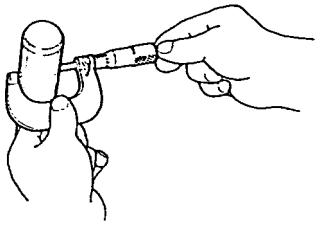
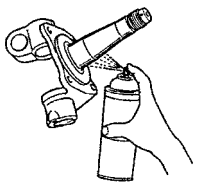
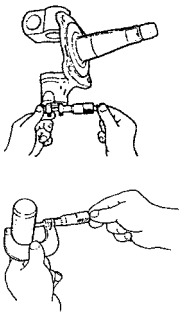
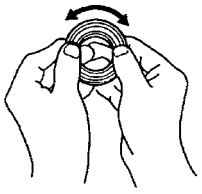
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

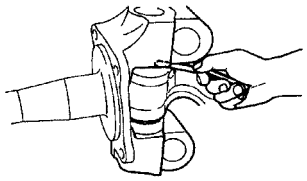
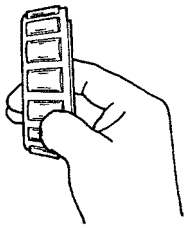
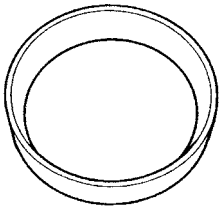
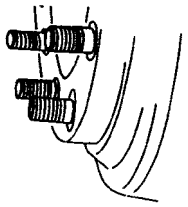
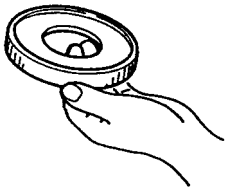
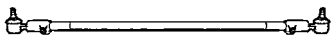
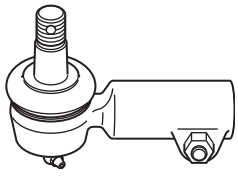
(1) Refer to the section "**DATA AND SPECIFICATIONS**".

INSPECTION AND REPAIR

EN0861302H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	—	—	Replace, if necessary.	Use the magnetic flaw detector or color checking instrument. 
King pin diameter	40 {1.575}	39.85 {1.569}	Replace.	Measure 
Knuckle: Wear and damage	—	—	Replace, if necessary.	Use the magnetic flaw detector or color checking instrument. 
King pin clearance	0.060-0.150 {0.0024-0.0059}	0.35 {0.0138}	Replace.	Measure 
Thrust bearing: Burns and pitting	—	—	Replace, if necessary.	Visual check 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace.**	**Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie-rod end and dust cover: Crack	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Muddy water in the cover (Sealed type ball stud)	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (LF578)

AX02-004

FRONT AXLE (LF578) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-8
INSPECTION AND ADJUSTMENT AX02-14
INSPECTION AND REPAIR AX02-15

FRONT AXLE (LF578)

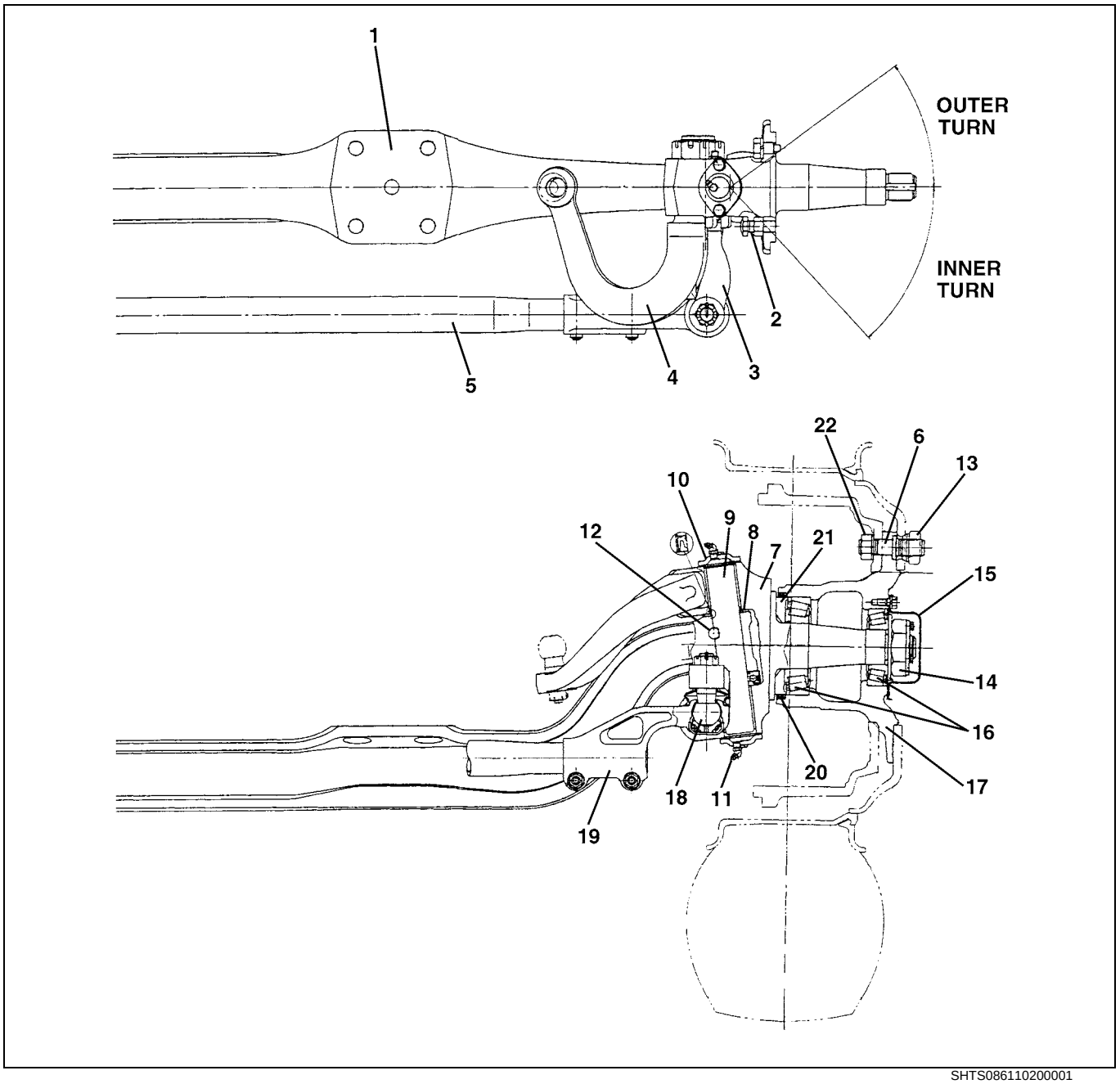
DATA AND SPECIFICATIONS

EN0861102I200001

Front axle series No.			**LF578**
Axle beam type			**Reversed Elliot "I" beam**
Axle beam material			**Heat-treated carbon steel**
Brake drum location			**Inboard mounted**
Wheel bearing			**Two tapered roller bearings**
King pin thrust bearing			**Ball bearing**
Wheel alignment	**Camber**		**0°-2°**
	King pin angle		**6°-8°**
	Caster		**2°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**44°30'-47°30'**
		Outer turn	**36°**
Amount of grease in a hub			**770 g {27.2 oz.} at one wheel**

DESCRIPTION

EN0861102C100001



SHTS086110200001

1	Axle beam	12	Lock pin
2	Stopper bolt	13	Wheel nut
3	Tie-rod arm	14	Lock nut
4	Knuckle arm	15	Hub cap
5	Tie rod	16	Wheel hub bearing
6	Wheel bolt	17	Wheel hub
7	Knuckle	18	Ball stud
8	Thrust washer	19	Tie-rod end
9	King pin	20	Oil seal
10	King pin cover	21	Oil seal guide
11	Lubrication fitting	22	Wheel bolt fitting nut

TROUBLESHOOTING

EN0861102F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter "**STEERING EQUIPMENT**".
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861102K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

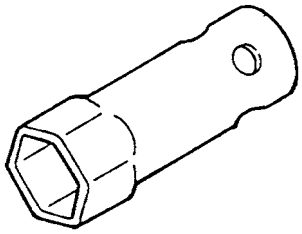
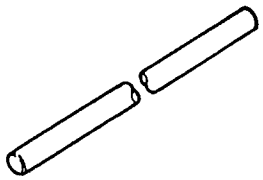
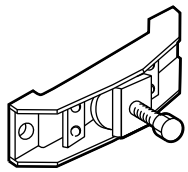
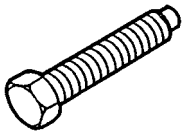
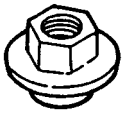
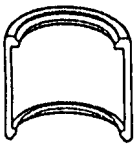
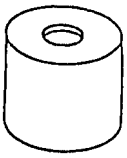
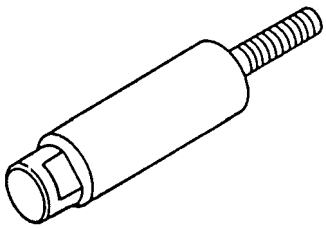
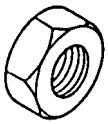
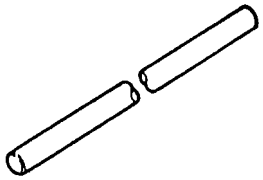
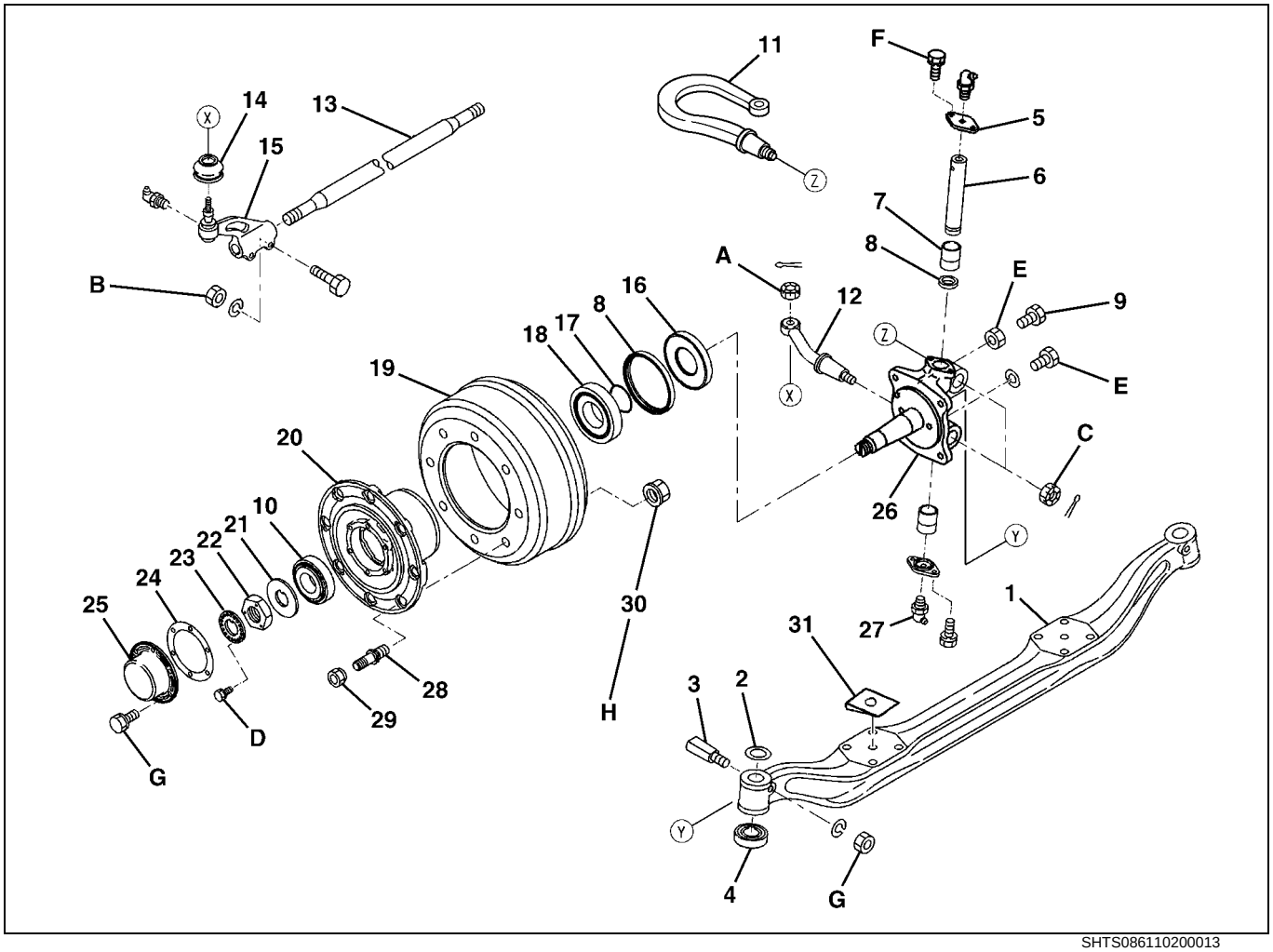
Illustration	Part number	Tool name	Remarks
	S0983-97001	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01292	WHEEL HUB PULLER	
	S0965-21210	PULLER SCREW	2 pieces
	SZ179-20001	DUST COVER GUIDE NUT	
	S0965-71790	DUST COVER GUIDE (INNER)	2 pieces
	S0965-71800	DUST COVER GUIDE (OUTER)	

Illustration	Part number	Tool name	Remarks
	S0965-71320	KING PIN GUIDE	
	S0965-41080	PLATE	
	SL110-01210	NUT	
	S0971-21100	BAR	

COMPONENT LOCATOR

EN0861102D100001



SHTS086110200013

1	Axle beam	17	O-ring
2	Thrust washer	18	Inner wheel hub bearing
3	Lock pin	19	Brake drum
4	Thrust bearing	20	Wheel hub
5	King pin cover	21	Washer
6	King pin	22	Wheel hub bearing lock nut
7	Bushing	23	Lock plate
8	Oil seal	24	Gasket
9	Stopper bolt	25	Wheel hub cap
10	Outer wheel hub bearing	26	Knuckle
11	Knuckle arm	27	Lubrication fitting
12	Tie-rod arm	28	Wheel bolt
13	Tie rod	29	Wheel nut
14	Dust cover	30	Wheel bolt fitting nut
15	Tie-rod end assembly	31	Caster shim
16	Oil seal guide		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,499-3,497, 109-253}	E	96-144 {979-1,468, 71-106}
B	85.5-114.5 {872-1,167, 64-84}	F	24.5-33.5 {250-341, 19-24}
C	685-1,175 {6,986-11,981, 505-866}	G	37.5-48.5 {383-494, 28-35}
D	8.5-10.5 {87-107, 6.3-7.7}	H	392-470 {4,000-4,800, 290-347}

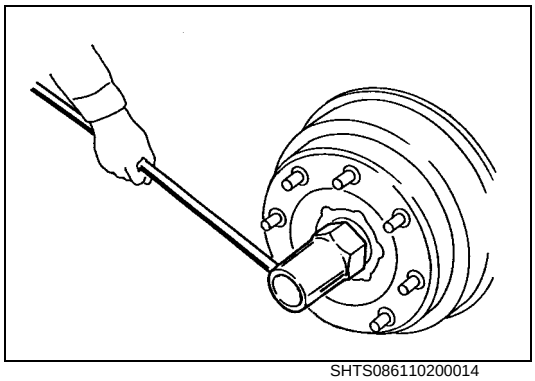
OVERHAUL

EN08611022300001

IMPORTANT POINTS - DISASSEMBLY

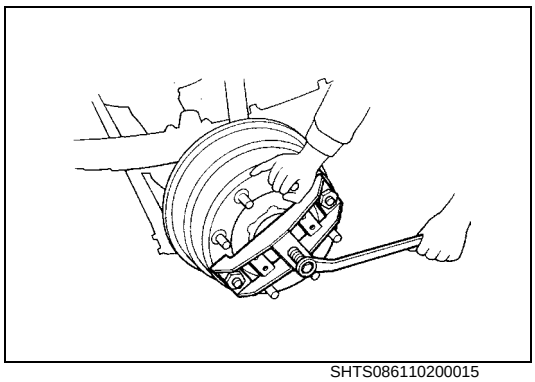
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".



SHTS086110200014

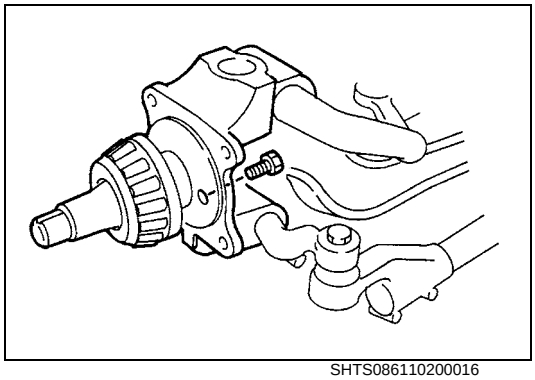
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0983-97001)
Handle (S0984-92001)



SHTS086110200015

3. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01292)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.

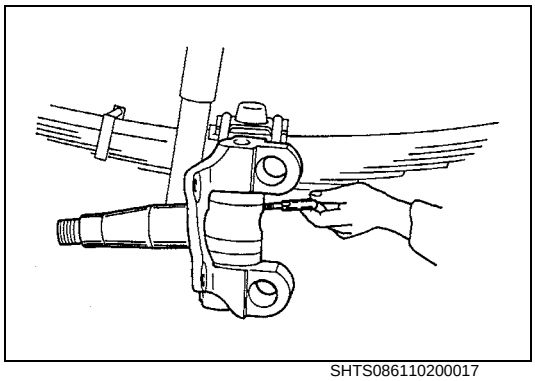


SHTS086110200016

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE
SST: Puller Screw (S0965-21210)

5. REMOVAL OF THE WHEEL BRAKE

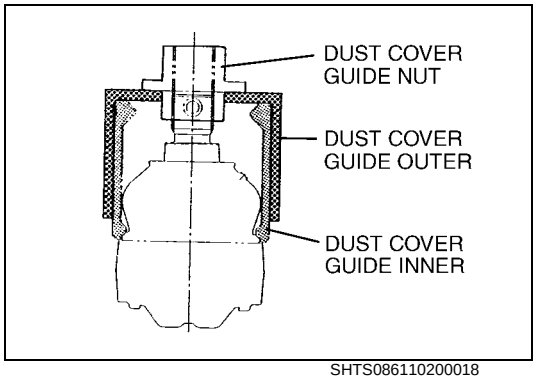
(1) Refer to the chapter "**SERVICE BRAKE**".



SHTS086110200017

6. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.



SHTS086110200018

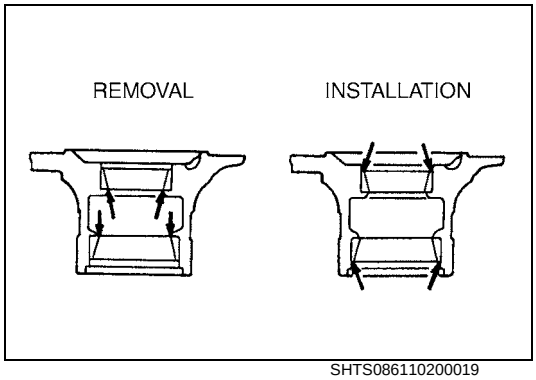
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE DUST COVER

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST:
Dust Cover Guide Nut (SZ179-20001)
Dust Cover Guide Inner (S0965-71790)
Dust Cover Guide Outer (S0965-71800)

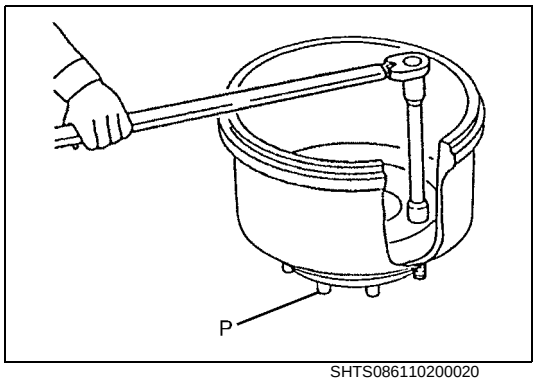


SHTS086110200019

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.



SHTS086110200020

3. REPLACEMENT OF THE WHEEL BOLTS

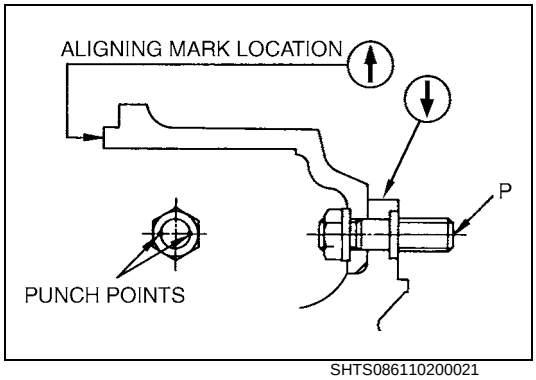
(1) Loosen the wheel bolt fitting nuts and remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

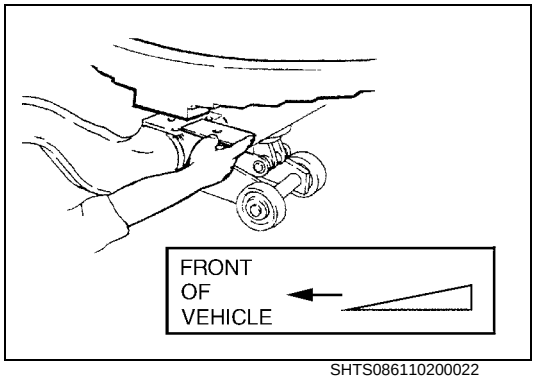
- **The left and right wheel bolts differ, so install them according to the chart below.**

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086110200021

- **After tightening the wheel bolts and nuts, caulk each at 2 points with a punch.**
- **If the wheel hub and brake drum are disassembled to replace the wheel bolts, reassemble them so that their aligning marks are oriented as closely to each other as possible.**



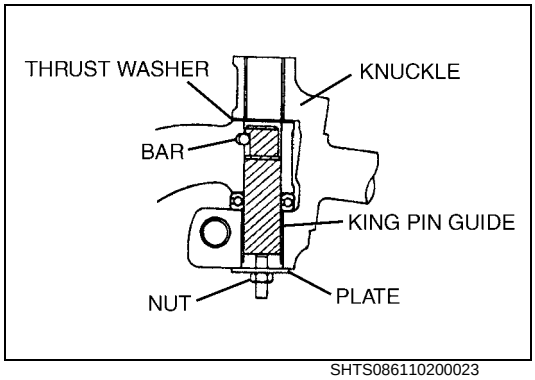
SHTS086110200022

4. INSTALLATION OF THE AXLE BEAM

(1) Secure the axle to the leaf springs with U-bolt.

NOTICE

Confirm the direction of caster shim.



SHTS086110200023

5. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

(1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

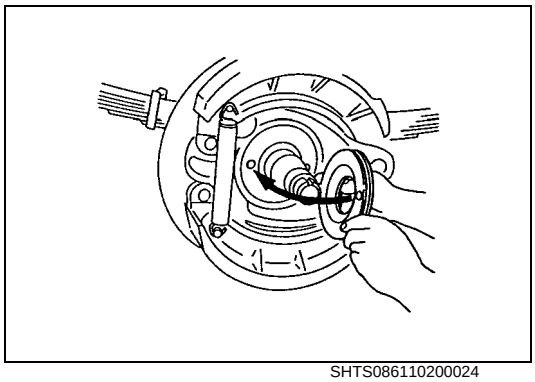
Thickness of Thrust Washer: mm {in.}

3.1 {0.122} 3.2 {0.126} 3.3 {0.130} 3.4 {0.134}
3.5 {0.138} 3.6 {0.142} 3.7 {0.146} 3.8 {0.150}

SST:
King Pin Guide (S0965-71320)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21100)

6. ASSEMBLY OF THE WHEEL BRAKE

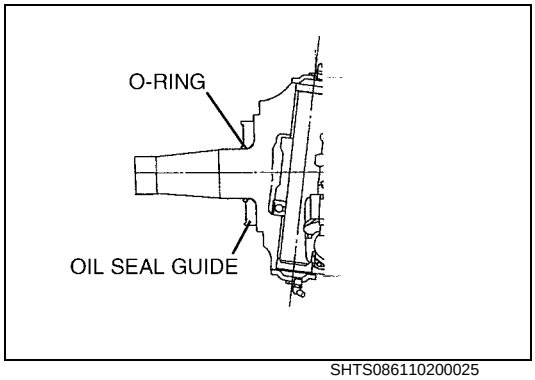
(1) Refer to the chapter "**SERVICE BRAKE**".


SHTS086110200024

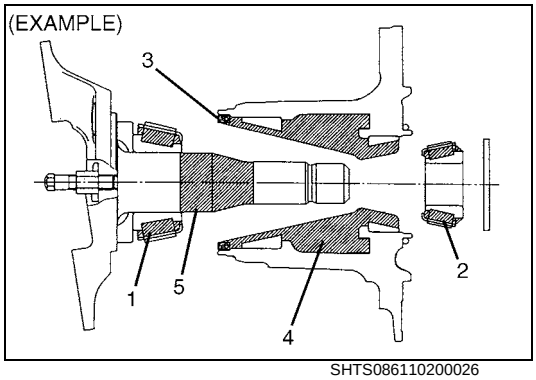
7. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- **Align the stopper bolt hole of the knuckle and oil seal guide hole.**
- **If oil seal guide is warmed up with hot water, it can easily be installed.**
- **Install the O-ring as shown in the figure.**



SHTS086110200025



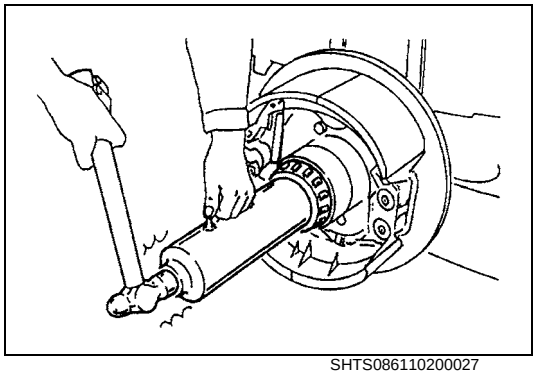
SHTS086110200026

8. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.

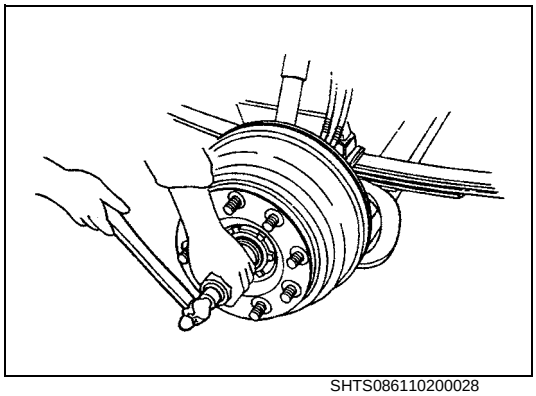

SHTS086110200027

9. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

Using a tool as shown, simplifies installation.

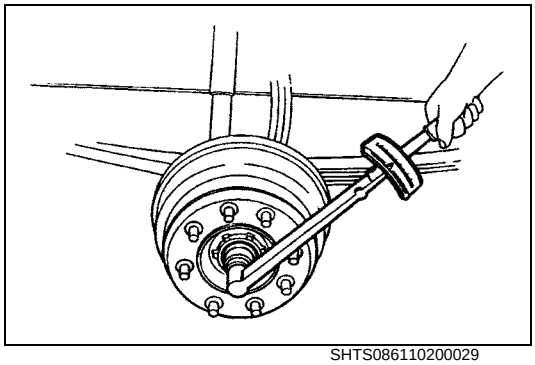

SHTS086110200028

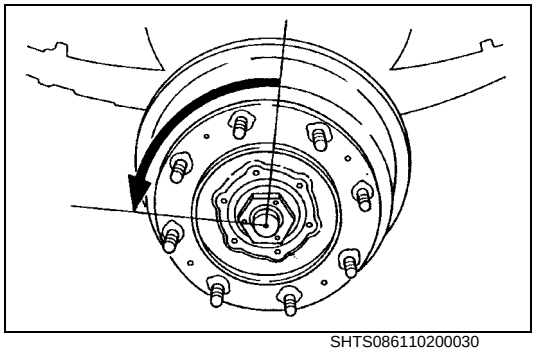
(2) Install the oil seal in the wheel hub.

(3) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

- **Using a tool as shown, simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086110200029

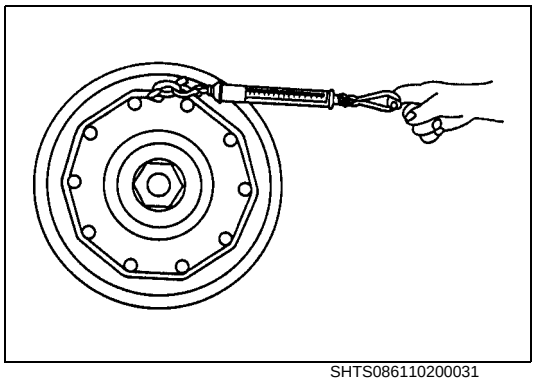

SHTS086110200030

10. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque:
343 N·m {3,500 kgf·cm, 253 lbf·ft}

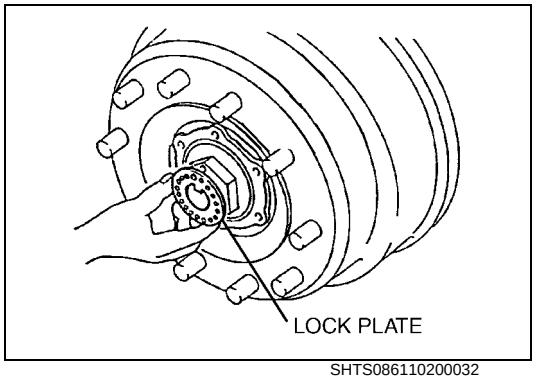
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.


SHTS086110200031

Assembly Standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**3.93-6.37 {40-65, 2.9-4.6}**
Spring balancer reading N {kgf, lbf}	**27.5-44.1 {2.8-4.5, 6.2-9.9}**



SHTS086110200032

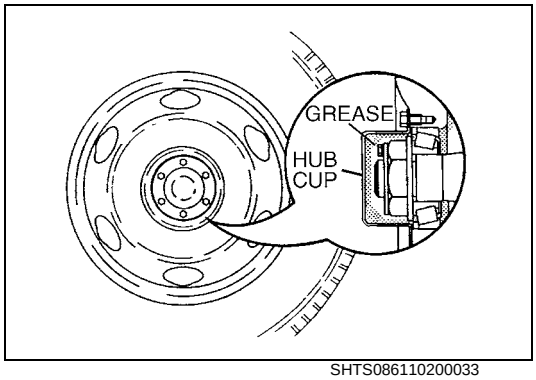
11. INSTALLATION OF THE LOCK PLATE

NOTICE

- **If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

12. INSTALLATION OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".

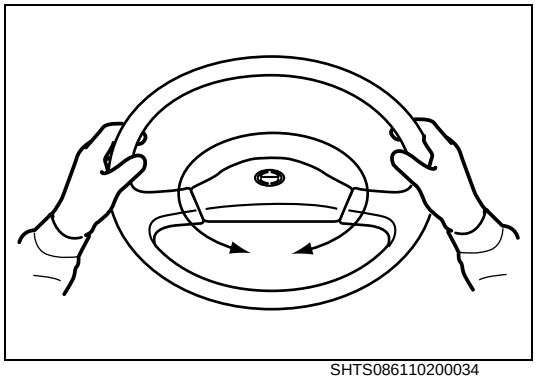


SHTS086110200033

13. INSTALLATION OF THE HUB CAP

NOTICE

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.


SHTS086110200034

14. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

15. BRAKE SYSTEM AIR BLEEDING AND THE BRAKE SHOE CLEARANCE ADJUSTMENT

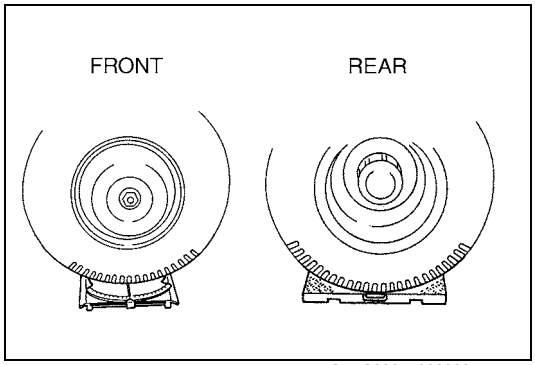
(1) On completion of the wheel hub and related parts reassembly, conduct the followings:

a. Bleed the air from the brake lines according to the section "**SERVICE BRAKE ASSEMBLY**" in the chapter "**BRAKE EQUIPMENT**".

b. Adjust the brake shoe clearance according to the section "**WHEEL BRAKE**" in the chapter "**SERVICE BRAKE**".

INSPECTION AND ADJUSTMENT

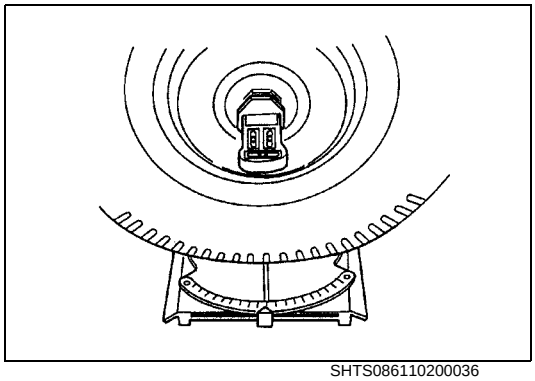
EN0861102H300001



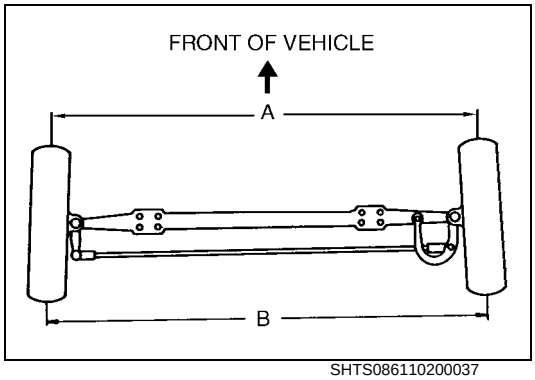
SHTS086110200035

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086110200036

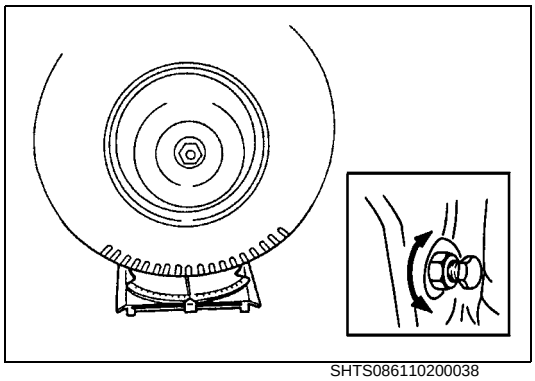
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section "**DATA AND SPECIFICATIONS**".



SHTS086110200037

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086110200038

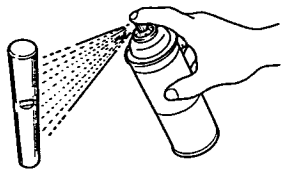
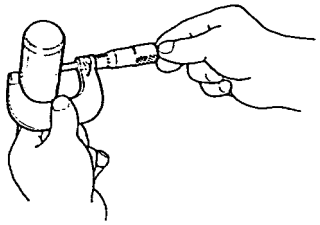
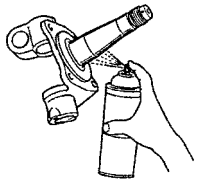
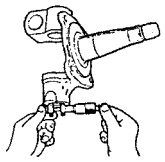
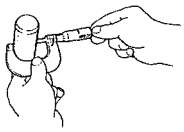
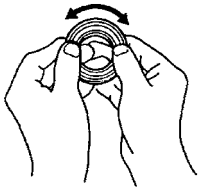
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

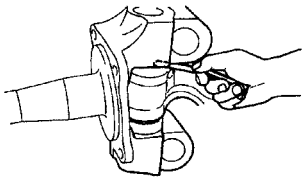
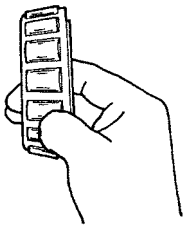
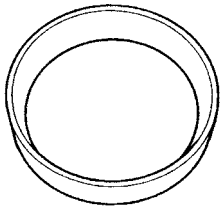
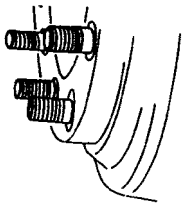
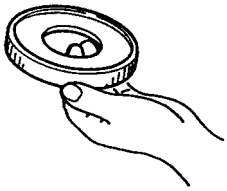
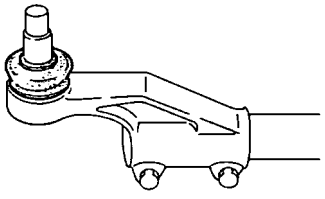
(1) Refer to the section "**DATA AND SPECIFICATIONS**".

INSPECTION AND REPAIR

EN0861102H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin diameter	**40 {1.575}**	**39.85 {1.569}**	**Replace.**	**Measure** 
Knuckle: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin clearance	**0.060-0.150 {0.0024-0.0059}**	**0.35 {0.0138}**	**Replace.**	**Measure**  
Thrust bearing: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace.**	**Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie-rod end and dust cover: Crack	**—**	**—**	**Replace.**	**Visual check** 
Muddy water in the cover (Sealed type ball stud)	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (LF57I)

AX02-005

FRONT AXLE (LF57I) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-8
INSPECTION AND ADJUSTMENT AX02-14
INSPECTION AND REPAIR AX02-15

FRONT AXLE (LF57I)

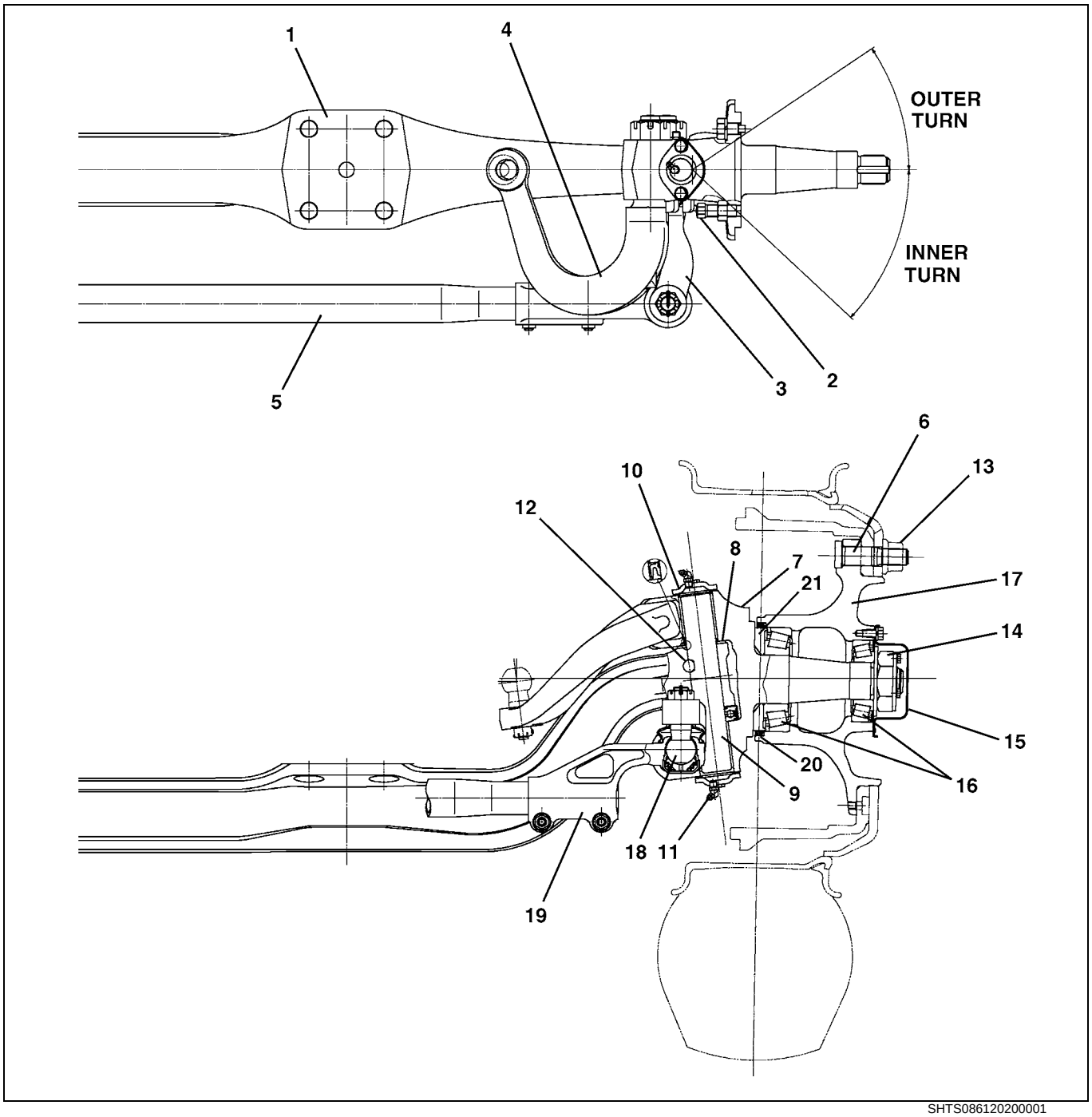
DATA AND SPECIFICATIONS

EN0861202I200001

Front axle series No.			**LF57I**
Axle beam type			**Reversed Elliot "I" beam**
Axle beam material			**Chrome molybdenum steel**
Brake drum location			**Outboard mounted**
Wheel bearing			**Two tapered roller bearings**
King pin thrust bearing			**Ball bearing**
Wheel alignment	**Camber**		**0°-2°**
	King pin angle		**6°-8°**
	Caster		**2°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**40°30'-43°30'**
		Outer turn	**34°**
Amount of grease in a hub			**600 g {21.2 oz} at one wheel**

DESCRIPTION

EN0861202C100001



SHTS086120200001

1	Axle beam	12	Lock pin
2	Stopper bolt	13	Wheel nut
3	Tie-rod arm	14	Lock nut
4	Knuckle arm	15	Hub cap
5	Tie rod	16	Wheel hub bearing
6	Wheel bolt	17	Wheel hub
7	Knuckle	18	Ball stud
8	Thrust washer	19	Tie-rod end
9	King pin	20	Oil seal
10	King pin cover	21	Oil seal guide
11	Lubrication fitting		

TROUBLESHOOTING

EN0861202F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter "**STEERING EQUIPMENT**".
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861202K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

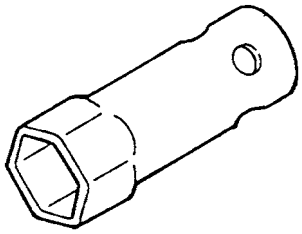
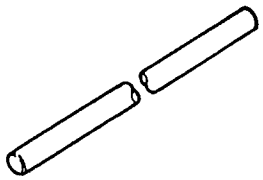
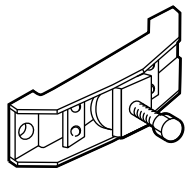
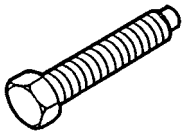
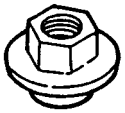
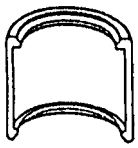
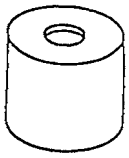
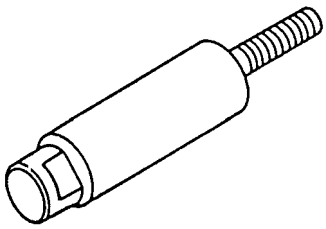
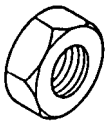
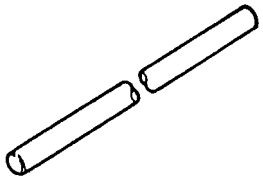
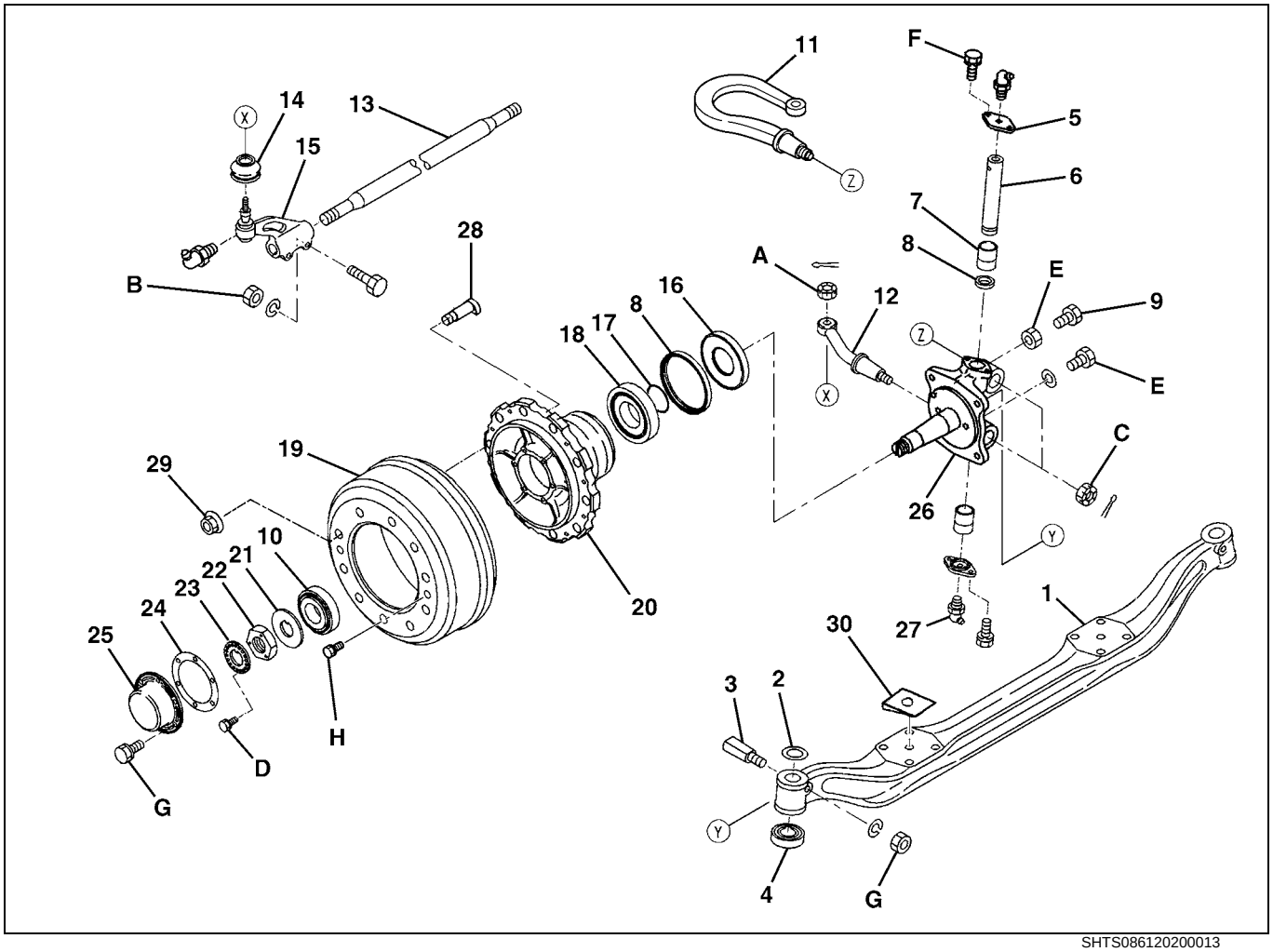
Illustration	Part number	Tool name	Remarks
	S0983-97001	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01292	WHEEL HUB PULLER	
	S0965-21210	PULLER SCREW	2 pieces
	SZ179-20001	DUST COVER GUIDE NUT	
	S0965-71790	DUST COVER GUIDE (INNER)	2 pieces
	S0965-71800	DUST COVER GUIDE (OUTER)	

Illustration	Part number	Tool name	Remarks
	S0965-71320	KING PIN GUIDE	
	S0965-41080	PLATE	
	SL110-01210	NUT	
	S0971-21100	BAR	

COMPONENT LOCATOR

EN0861202D100001



SHTS086120200013

1	Axle beam	16	Oil seal guide
2	Thrust washer	17	O-ring
3	Lock pin	18	Inner wheel hub bearing
4	Thrust bearing	19	Brake drum
5	King pin cover	20	Wheel hub
6	King pin	21	Washer
7	Bushing	22	Wheel hub bearing lock nut
8	Oil seal	23	Lock plate
9	Stopper bolt	24	Gasket
10	Outer wheel hub bearing	25	Wheel hub cap
11	Knuckle arm	26	Knuckle
12	Tie-rod arm	27	Lubrication fitting
13	Tie rod	28	Wheel bolt
14	Dust cover	29	Wheel nut
15	Tie-rod end assembly	30	Caster shim

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,500-3,500, 109-253}	E	96-144 {1,000-1,500, 73-108}
B	85.5-114.5 {900-1,200, 66-86}	F	24.5-33.5 {250-341, 19-24}
C	685-1,175 {7,000-12,000, 507-867}	G	37.5-48.5 {380-500, 28-36}
D	8.5-10.5 {85-110, 6.2-7.9}	H	20.5-39.5 {210-400, 16-28}

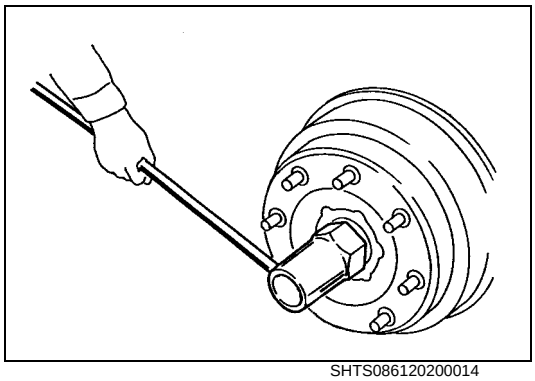
OVERHAUL

EN08612022300001

IMPORTANT POINTS - DISASSEMBLY

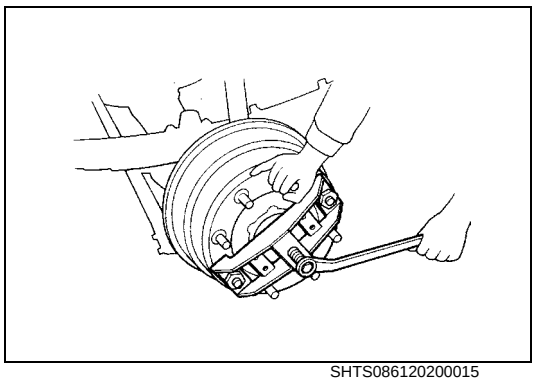
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".



SHTS086120200014

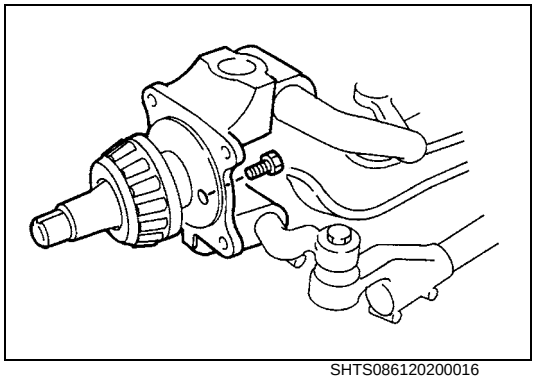
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0983-97001)
Handle (S0984-92001)



SHTS086120200015

3. REMOVAL OF THE WHEEL HUB ASSEMBLY AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01292)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.

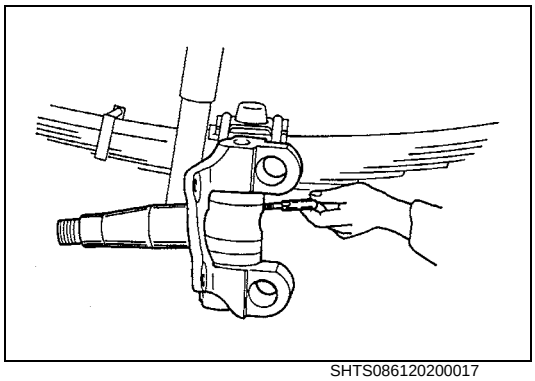


SHTS086120200016

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE
SST: Puller Screw (S0965-21210)

5. REMOVAL OF THE WHEEL BRAKE

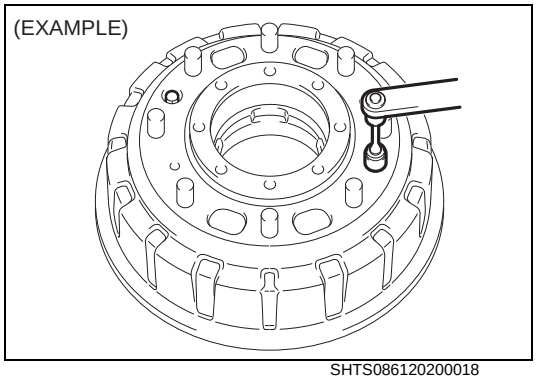
(1) Refer to the chapter "**SERVICE BRAKE**".



SHTS086120200017

6. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.

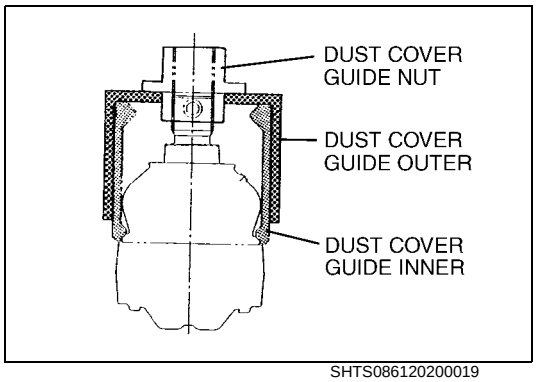


SHTS086120200018

7. SEPARATION OF THE BRAKE DRUM AND WHEEL HUB

(1) Remove the bolts, and separate the brake drum and wheel hub.

IMPORTANT POINTS - ASSEMBLY



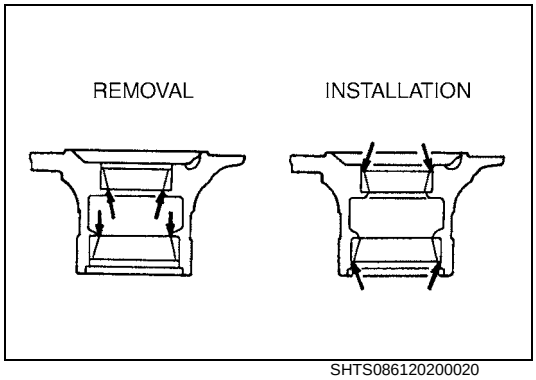
SHTS086120200019

1. REPLACEMENT OF THE DUST COVER

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST:
Dust Cover Guide Nut (SZ179-20001)
Dust Cover Guide Inner (S0965-71790)
Dust Cover Guide Outer (S0965-71800)

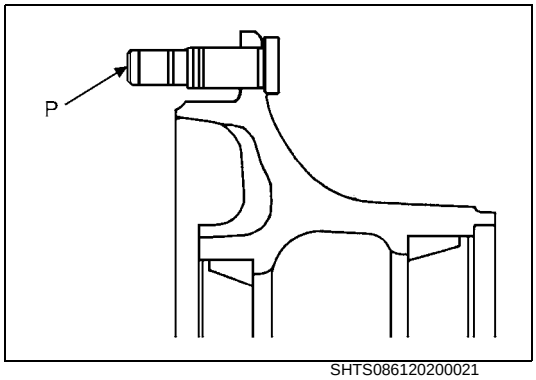


SHTS086120200020

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.



SHTS086120200021

3. REPLACEMENT OF THE WHEEL BOLTS

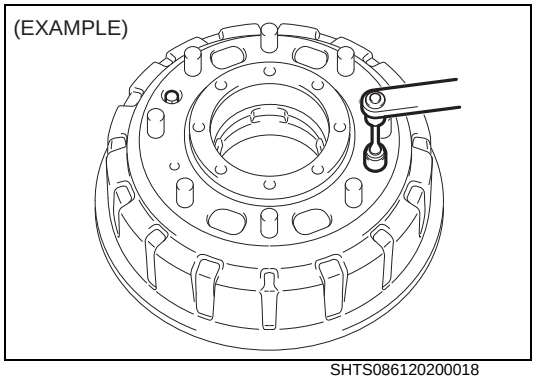
(1) Remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

- **The right and left wheel bolts differ, so install them according to the chart below.**

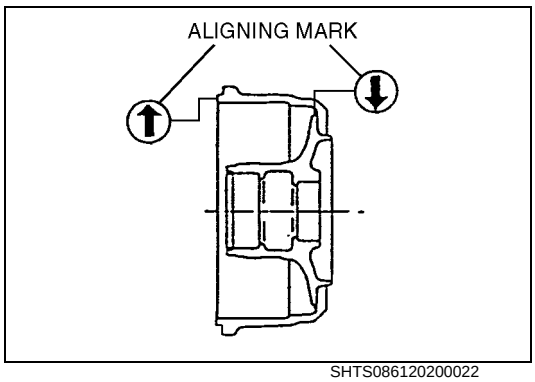
	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086120200018

4. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB

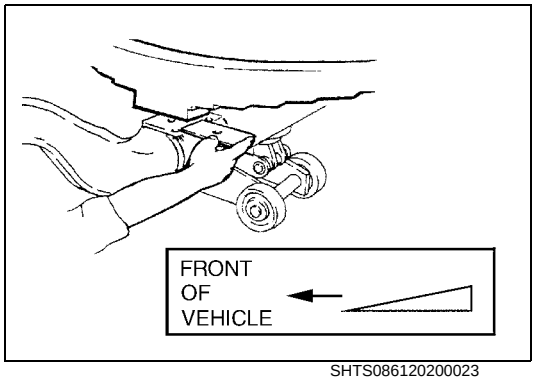
(1) Assemble the brake drum and wheel hub, and tighten the bolts.



SHTS086120200022

NOTICE

When assembling the brake drum and wheel hub, make sure that their aligning marks are oriented as closely to each other as possible.



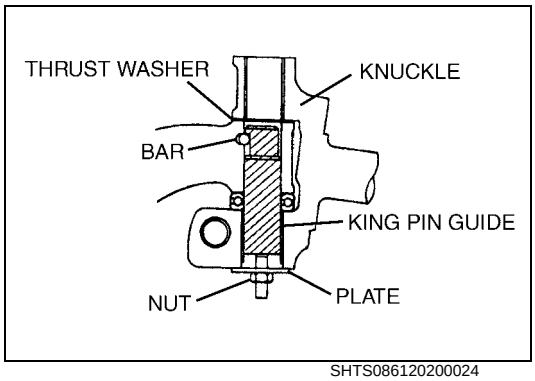
SHTS086120200023

5. INSTALLATION OF THE AXLE BEAM

(1) Secure the axle to the leaf springs with U-bolts.

NOTICE

Confirm the direction of caster shim.



SHTS086120200024

6. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

(1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

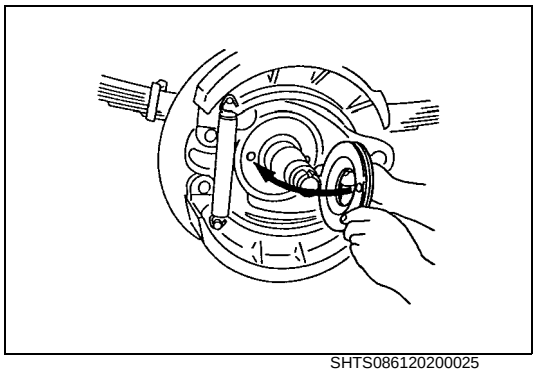
Thickness of Thrust Washer: mm {in.}

3.2 {0.126} 3.3 {0.130} 3.4 {0.134} 3.5 {0.138}
3.6 {0.142} 3.7 {0.146} 3.8 {0.150}

SST:
King Pin Guide (S0965-71320)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21100)

7. ASSEMBLY OF THE WHEEL BRAKE

(1) Refer to the chapter "**SERVICE BRAKE**".

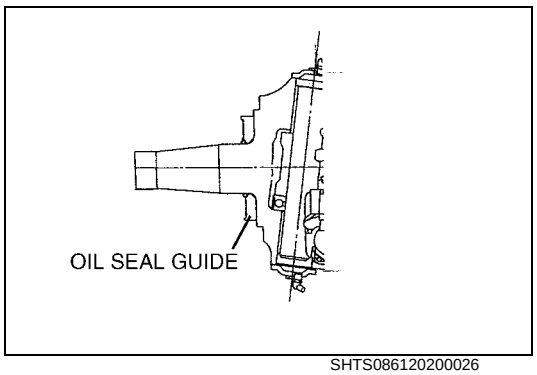


SHTS086120200025

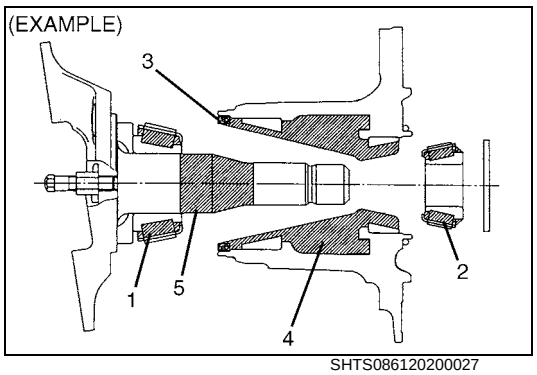
8. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- **Align the stopper bolt hole of the knuckle and oil seal guide hole.**
- **If oil seal guide is warmed up with hot water, it can easily be installed.**
- **Install the O-ring as shown in the figure.**



SHTS086120200026



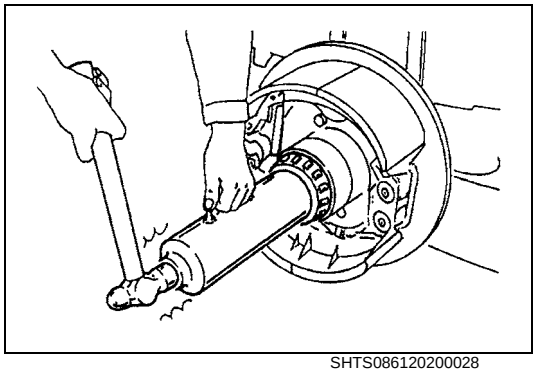
SHTS086120200027

9. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.



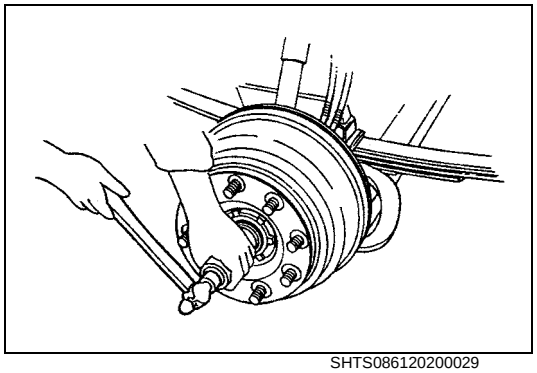
SHTS086120200028

10. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

Using a tool as shown, simplifies installation.

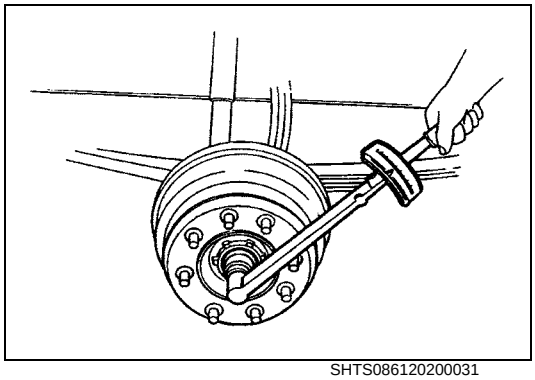


SHTS086120200029

(2) Install the oil seal in the wheel hub.
(3) Install the wheel hub assembly and the outer wheel hub bearing.

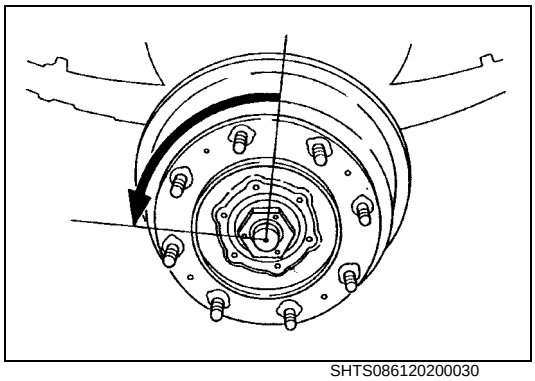
NOTICE

- **Using a tool as shown, simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086120200031

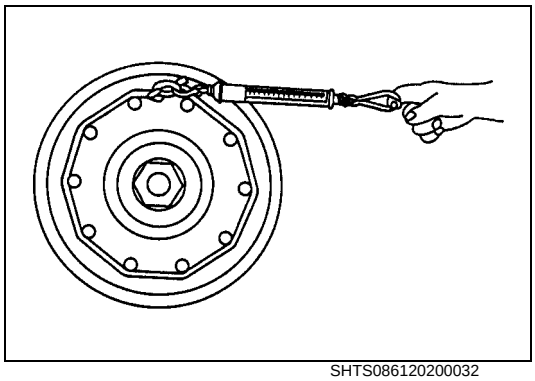
11. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque:
340 N·m {3,500 kgf·cm, 253 lbf·ft}


SHTS086120200030

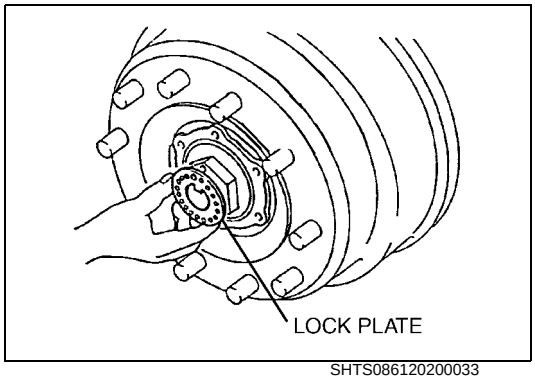
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, and adjust the preload with the lock nut.


SHTS086120200032

Assembly Standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**3.93-6.37 {40-65, 2.9-4.6}**
Spring balancer reading N {kgf, lbf}	**23.5-38.0 {2.4-3.9, 5.3-8.6}**



SHTS086120200033

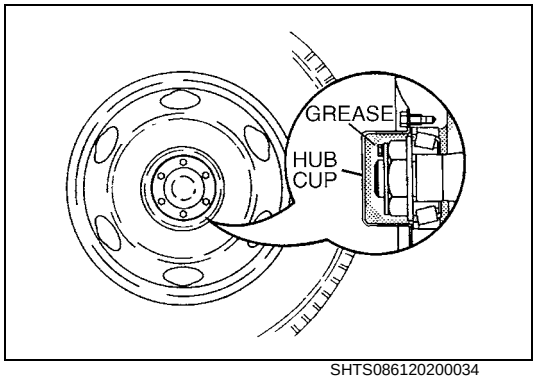
12. INSTALLATION OF THE LOCK PLATE

NOTICE

- **If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

13. INSTALLATION OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".

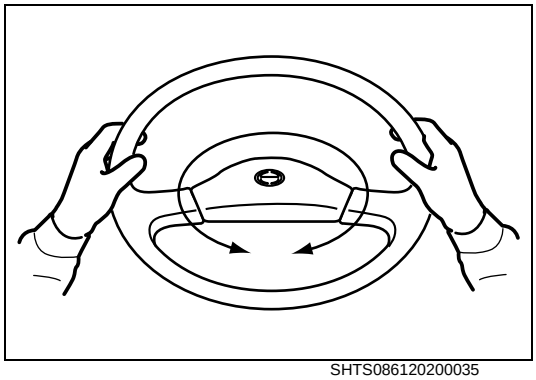


SHTS086120200034

14. INSTALLATION OF THE HUB CAP

NOTICE

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.


SHTS086120200035

15. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

16. BRAKE SYSTEM AIR BLEEDING AND THE BRAKE SHOE CLEARANCE ADJUSTMENT

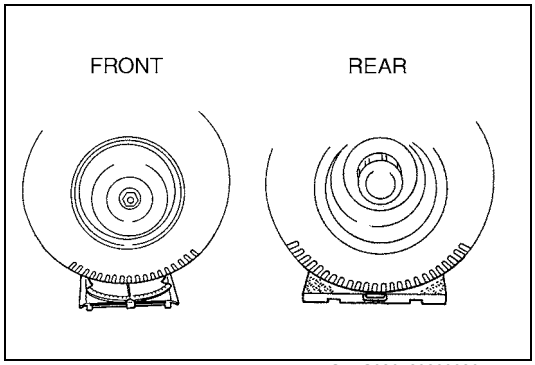
(1) On completion of the wheel hub and related parts reassembly, conduct the followings:

a. Bleed the air from the brake lines according to the section "**SERVICE BRAKE ASSEMBLY**" in the chapter "**BRAKE EQUIPMENT**".

b. Adjust the brake shoe clearance according to the section "**WHEEL BRAKE** " in the chapter "**SERVICE BRAKE**".

INSPECTION AND ADJUSTMENT

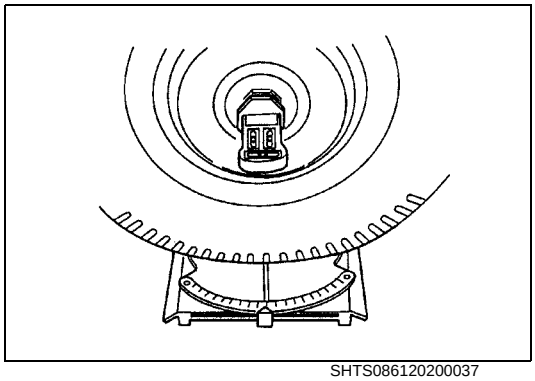
EN0861202H300001



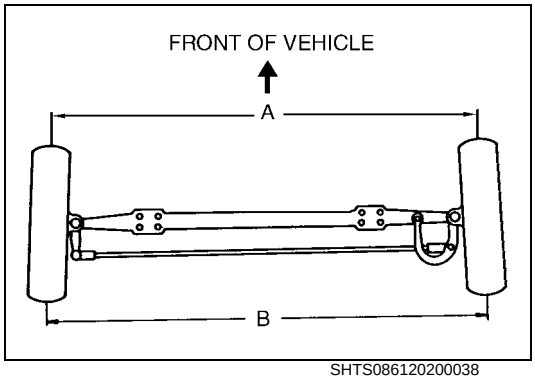
SHTS086120200036

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086120200037

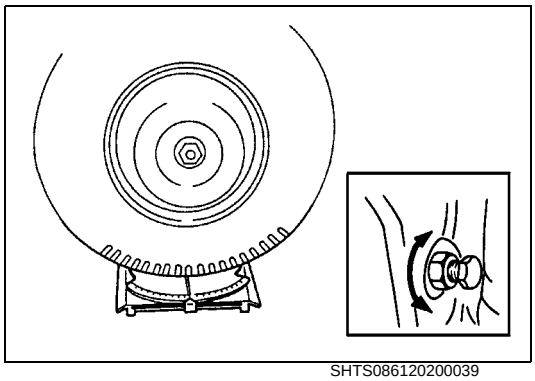
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section "**DATA AND SPECIFICATIONS**".



SHTS086120200038

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086120200039

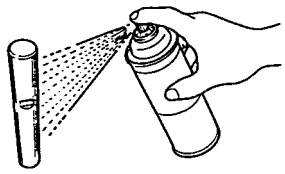
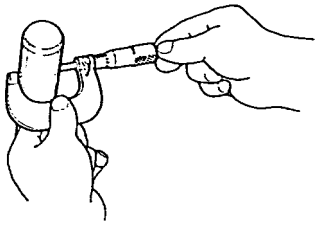
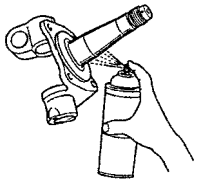
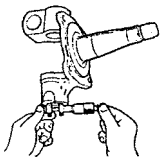
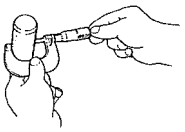
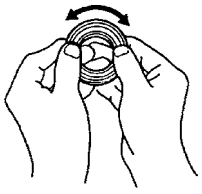
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

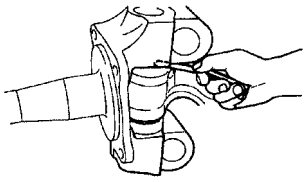
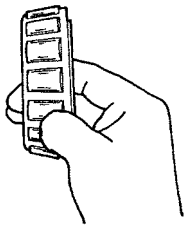
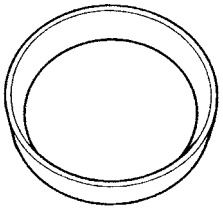
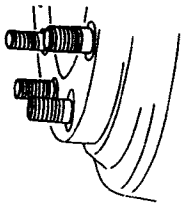
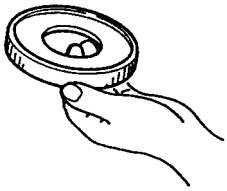
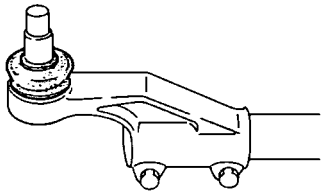
(1) Refer to the section "**DATA AND SPECIFICATIONS**".

INSPECTION AND REPAIR

EN0861202H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin diameter	**45 {1.772}**	**39.85 {1.5689}**	**Replace.**	**Measure** 
Knuckle: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin clearance	**0.060-0.150 {0.0024-0.0059}**	**0.35 {0.0138}**	**Replace.**	**Measure**  
Thrust bearing: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace the thrust washer.**	**Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie-rod end and dust cover: Crack	**—**	**—**	**Replace, if necessary.**	**Visual check**
Muddy water in the cover (Sealed type ball stud)	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (MF678)

AX02-006

FRONT AXLE (MF678) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-10
INSPECTION AND ADJUSTMENT AX02-16
INSPECTION AND REPAIR AX02-17

FRONT AXLE (MF678)

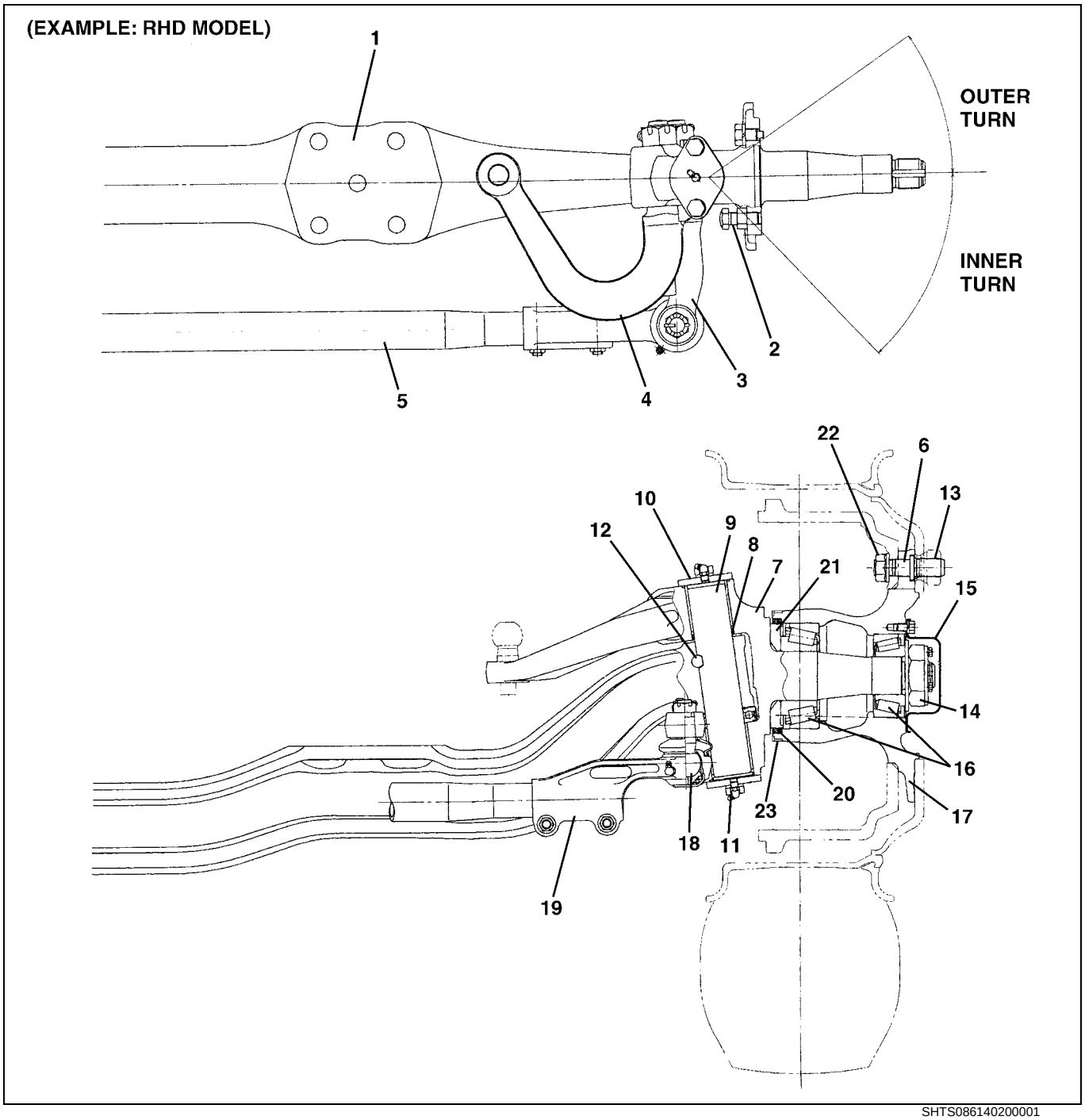
DATA AND SPECIFICATIONS

EN0861402I200001

Front axle series No.			**MF678**
Axle beam type			**Reversed Elliot "I" beam**
Axle beam material			**Chrome molybdenum steel**
Brake drum location			**Inboard mounted**
Wheel bearing			**Two tapered roller bearings**
King pin thrust bearing			**Ball bearing**
Wheel alignment	**Camber**		**0°-2°**
	King pin angle		**6°-8°**
	Caster		**2°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**44°30'-47°30'**
		Outer turn	**34°**
Amount of grease in a hub			**600 g {21.2 oz.} at one wheel**

DESCRIPTION

EN0861402C100001



SHTS086140200001

1	Axle beam	13	Wheel nut
2	Stopper bolt	14	Lock nut
3	Tie-rod arm	15	Hub cap
4	Knuckle arm	16	Wheel hub bearing
5	Tie rod	17	Wheel hub
6	Wheel bolt	18	Ball stud
7	Knuckle	19	Tie-rod end
8	Thrust washer	20	Oil seal
9	King pin	21	Oil seal guide
10	King pin cover	22	Wheel bolt fitting nut
11	Lubrication fitting	23	ABS sensor ring (If so equipped)
12	Lock pin		

TROUBLESHOOTING

EN0861402F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter **"STEERING EQUIPMENT"**.
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861402K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

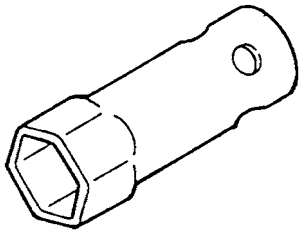
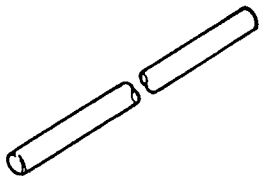
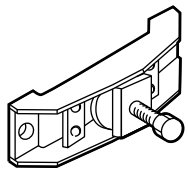
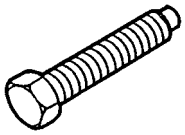
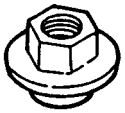
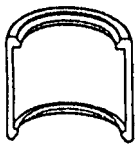
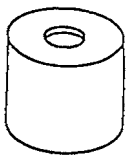
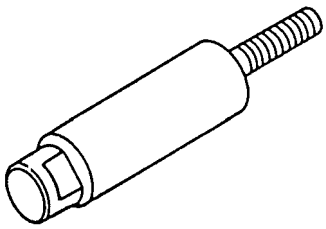
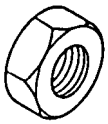
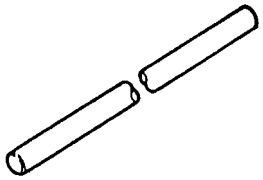
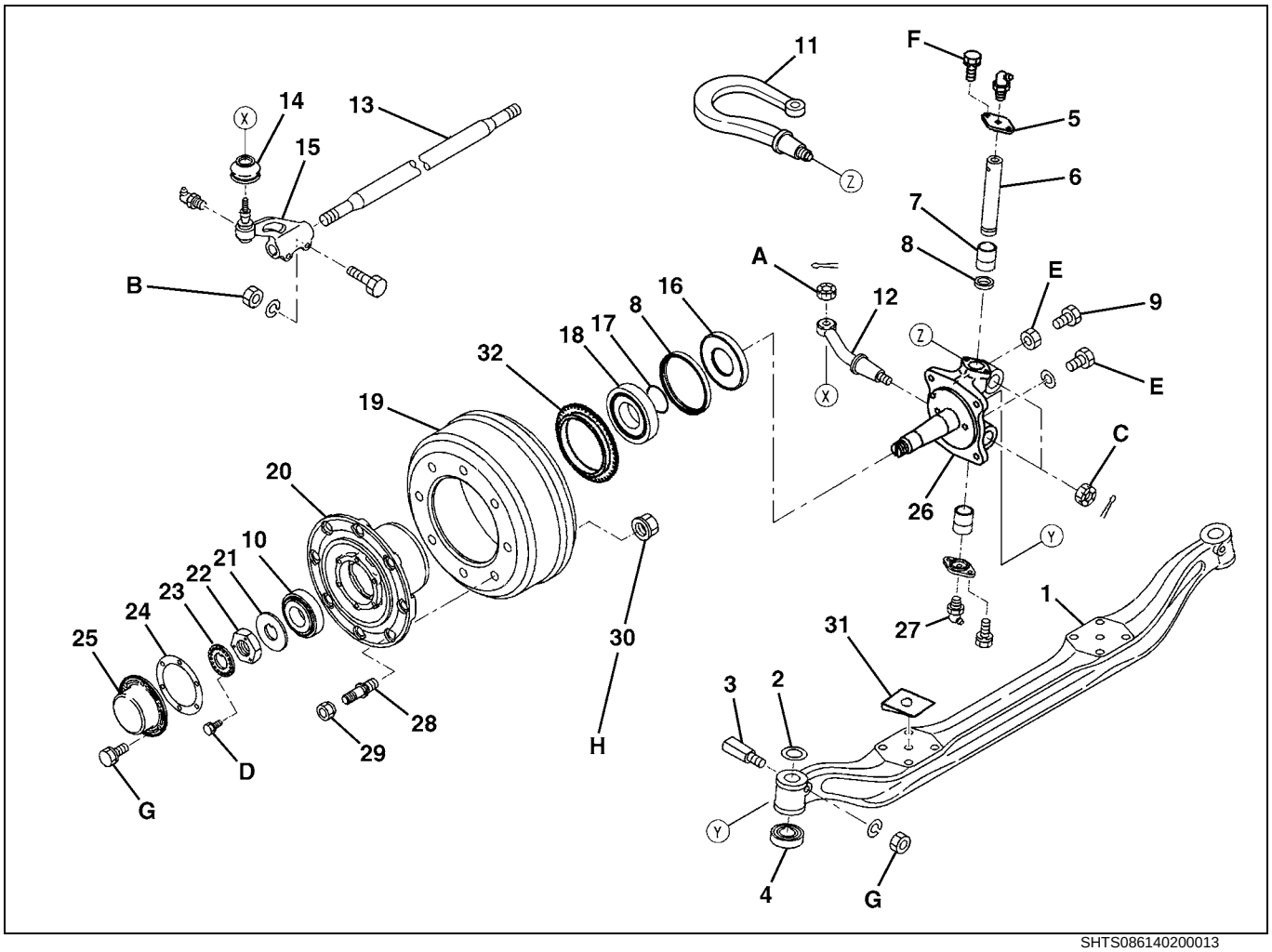
Illustration	Part number	Tool name	Remarks
	S0983-97001	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01292	WHEEL HUB PULLER	
	S0965-21210	PULLER SCREW	2 pieces
	SZ179-20001	DUST COVER GUIDE NUT	
	S0965-71790	DUST COVER GUIDE (INNER)	2 pieces
	S0965-71800	DUST COVER GUIDE (OUTER)	

Illustration	Part number	Tool name	Remarks
	S0965-71320	KING PIN GUIDE	
	S0965-41080	PLATE	
	SL110-01210	NUT	
	S0971-21100	BAR	

COMPONENT LOCATOR

EN0861402D100001

RIGHT-HAND DRIVE MODEL



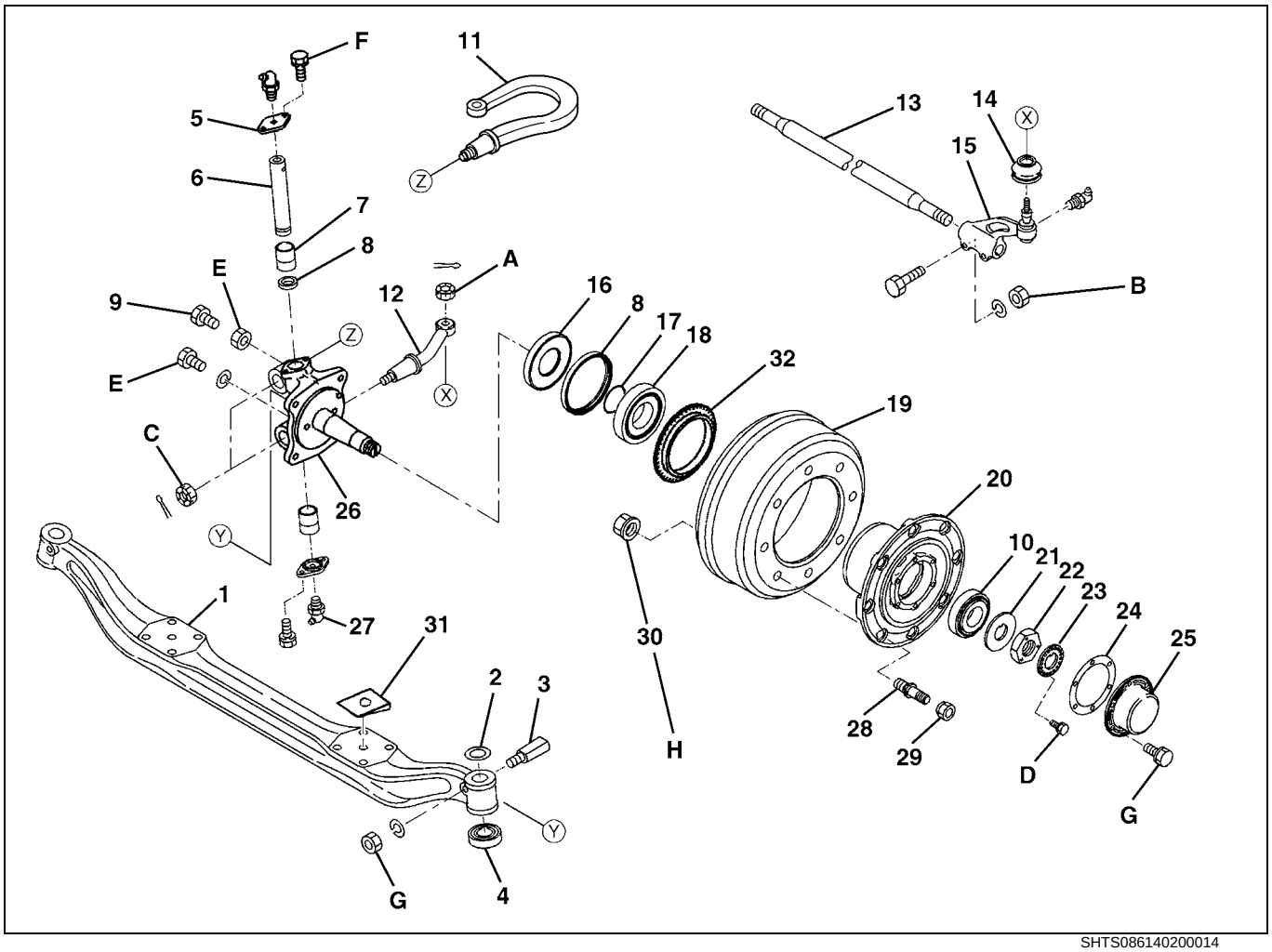
SHTS086140200013

1	Axle beam	17	O-ring
2	Thrust washer	18	Inner wheel hub bearing
3	Lock pin	19	Brake drum
4	Thrust bearing	20	Wheel hub
5	King pin cover	21	Washer
6	King pin	22	Wheel hub bearing lock nut
7	Bushing	23	Lock plate
8	Oil seal	24	Gasket
9	Stopper bolt	25	Wheel hub cap
10	Outer wheel hub bearing	26	Knuckle
11	Knuckle arm	27	Lubrication fitting
12	Tie-rod arm	28	Wheel bolt
13	Tie rod	29	Wheel nut
14	Dust cover	30	Wheel bolt fitting nut
15	Tie-rod end assembly	31	Caster shim
16	Oil seal guide	32	ABS sensor ring (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,499-3,497, 109-253}	E	96-144 {979-1,468, 71-106}
B	85.5-114.5 {872-1,167, 64-84}	F	105.5-144.5 {1,076-1,473, 78-106}
C	685-1,175 {6,986-11,981, 505-866}	G	37.5-48.5 {383-494, 28-35}
D	8.5-10.5 {87-107, 6.3-7.7}	H	392-470 {4,000-4,800, 290-347}

LEFT-HAND DRIVE MODEL



SHTS086140200014

1	Axle beam	17	O-ring
2	Thrust washer	18	Inner wheel hub bearing
3	Lock pin	19	Brake drum
4	Thrust bearing	20	Wheel hub
5	King pin cover	21	Washer
6	King pin	22	Wheel hub bearing lock nut
7	Bushing	23	Lock plate
8	Oil seal	24	Gasket
9	Stopper bolt	25	Wheel hub cap
10	Outer wheel hub bearing	26	Knuckle
11	Knuckle arm	27	Lubrication fitting
12	Tie-rod arm	28	Wheel bolt
13	Tie rod	29	Wheel nut
14	Dust cover	30	Wheel bolt fitting nut
15	Tie-rod end assembly	31	Caster shim
16	Oil seal guide	32	ABS sensor ring (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,499-3,497, 109-253}	E	96-144 {979-1,468, 71-106}
B	85.5-114.5 {872-1,167, 64-84}	F	105.5-144.5 {1,076-1,473, 78-106}
C	685-1,175 {6,986-11,981, 505-866}	G	37.5-48.5 {383-494, 28-35}
D	8.5-10.5 {87-107, 6.3-7.7}	H	392-470 {4,000-4,800, 290-347}

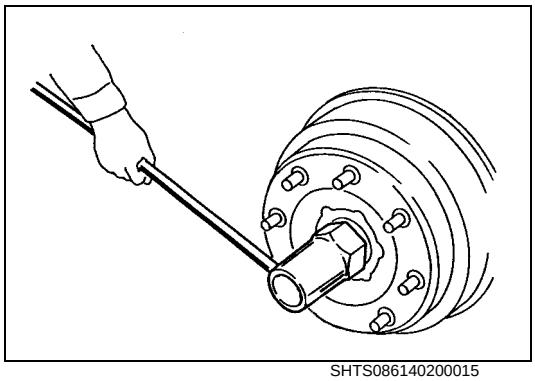
OVERHAUL

EN08614022300001

IMPORTANT POINTS - DISASSEMBLY

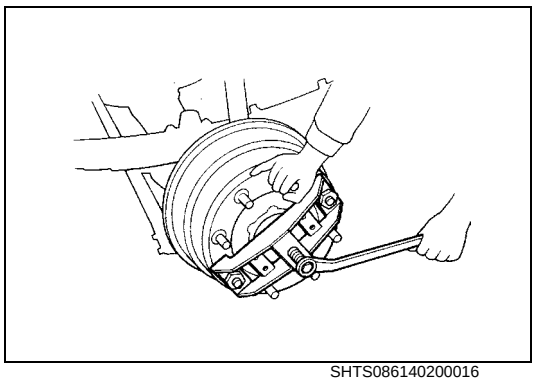
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS086140200015

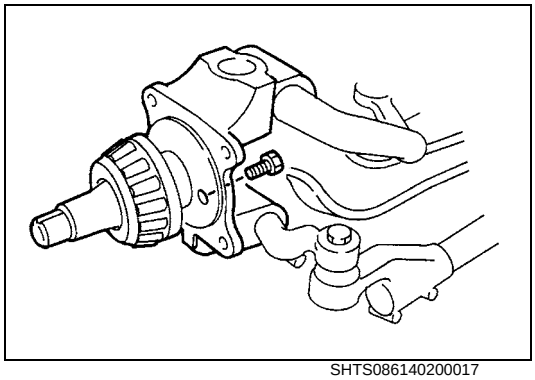
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0983-97001)
Handle (S0984-92001)



SHTS086140200016

3. REMOVAL OF THE WHEEL HUB ASSEMBLY AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01292)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.

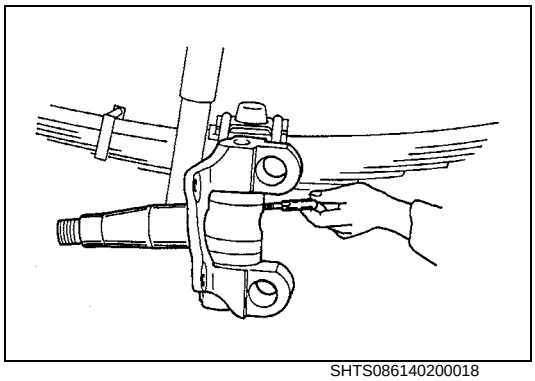


SHTS086140200017

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE
SST: Puller Screw (S0965-21210)

5. REMOVAL OF THE WHEEL BRAKE

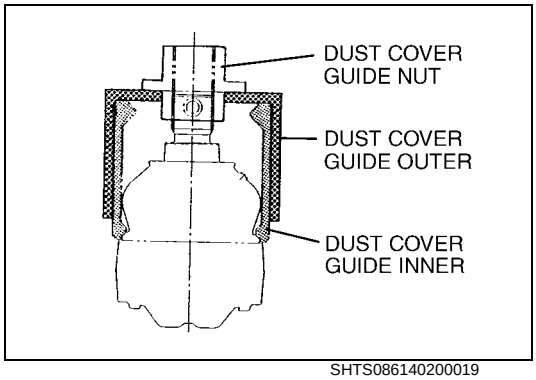
(1) Refer to the chapter **"SERVICE BRAKE"**.



SHTS086140200018

6. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.



SHTS086140200019

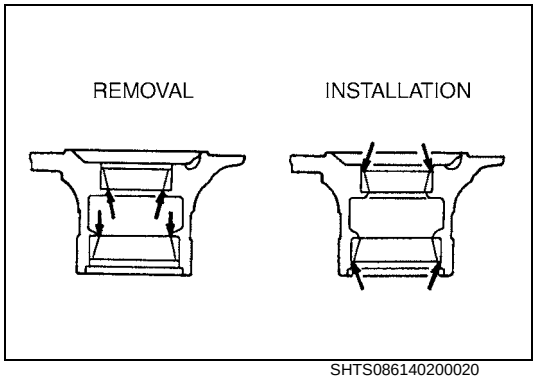
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE DUST COVER

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST:
Dust Cover Guide Nut (SZ179-20001)
Dust Cover Guide Inner (S0965-71790)
Dust Cover Guide Outer (S0965-71800)

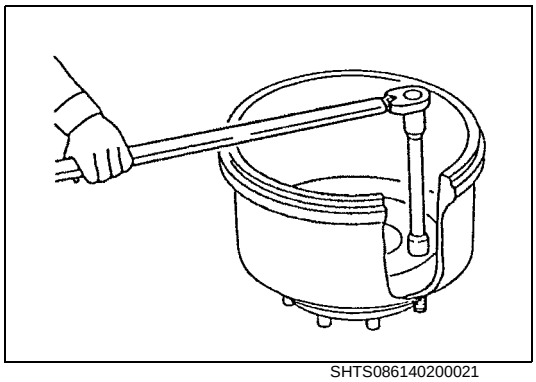


SHTS086140200020

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.


SHTS086140200021

3. REPLACEMENT OF THE WHEEL BOLTS

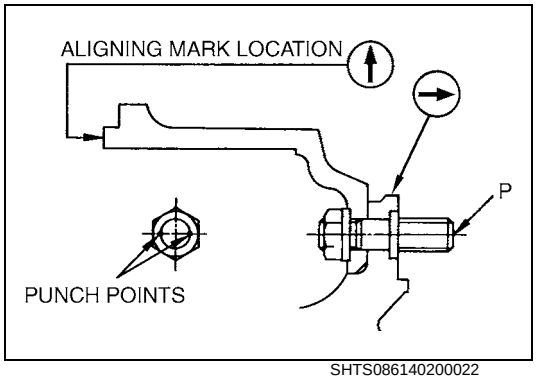
(1) Loosen the wheel bolt fitting nuts and remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

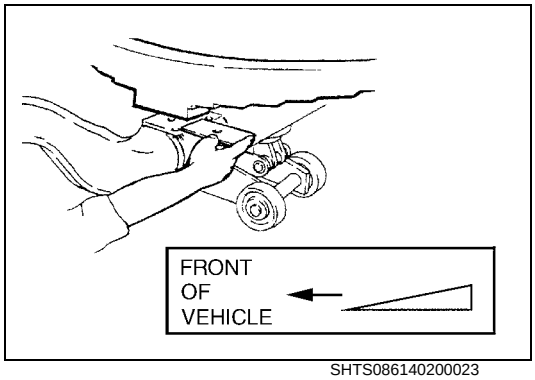
- **The left and right wheel bolts differ, so install them according to the chart below.**

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086140200022

- **After tightening the wheel bolts and nuts, caulk each at 2 points with a punch.**
- **If the wheel hub and brake drum are disassembled to replace the wheel bolts, reassemble them so that their aligning marks are oriented as closely to each other as possible.**



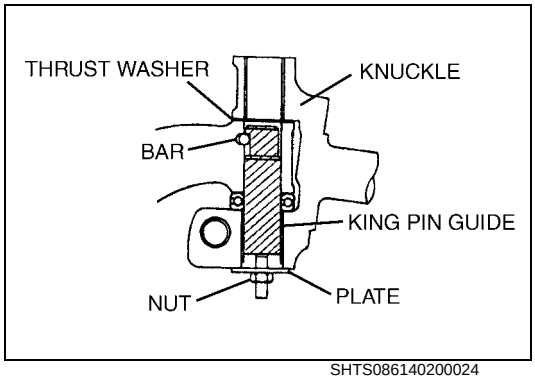
SHTS086140200023

4. INSTALLATION OF THE AXLE BEAM

(1) Secure the axle to the leaf springs with U-bolt.

NOTICE

Confirm the direction of caster shim.



SHTS086140200024

5. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE.

(1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

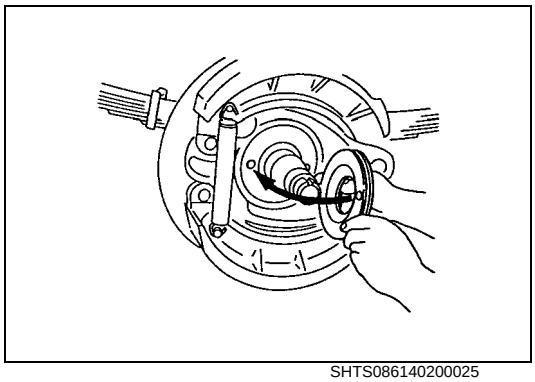
Thickness of Thrust Washer: mm {in.}

3.2 {0.126} 3.3 {0.130} 3.4 {0.134} 3.5 {0.138}
3.6 {0.142} 3.7 {0.146} 3.8 {0.150}

SST:
King Pin Guide (S0965-71320)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21100)

6. ASSEMBLY OF THE WHEEL BRAKE

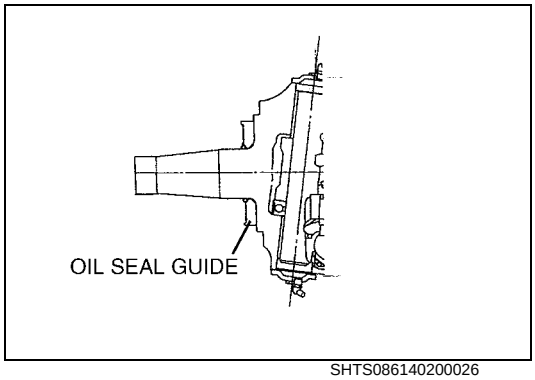
(1) Refer to the chapter **"SERVICE BRAKE"**.


SHTS086140200025

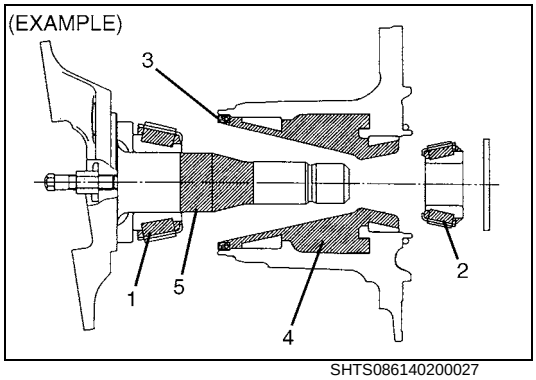
7. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- **Align the stopper bolt hole of the knuckle and oil seal guide hole.**
- **If oil seal guide is warmed up with hot water, it can easily be installed.**
- **Install the O-ring as shown in the figure.**



SHTS086140200026



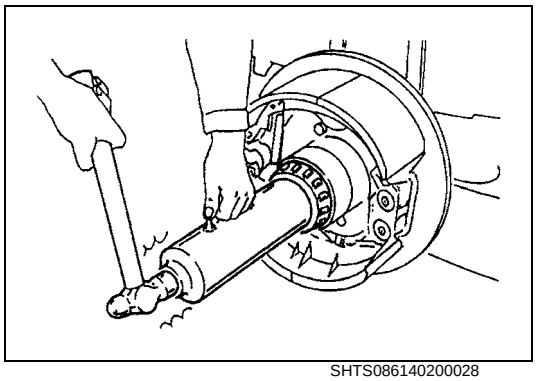
SHTS086140200027

8. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.

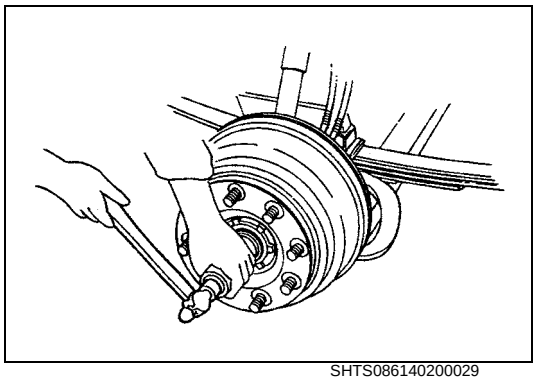

SHTS086140200028

9. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

Using a tool as shown, simplifies installation.

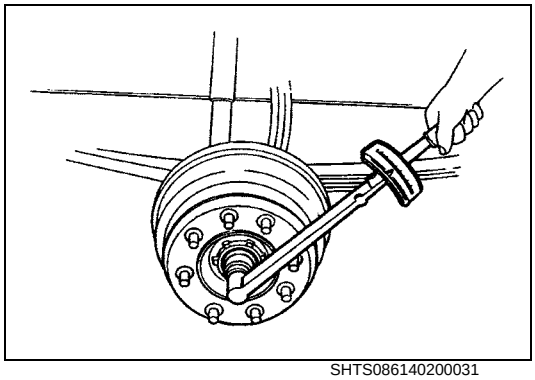

SHTS086140200029

(2) Install the oil seal in the wheel hub.

(3) Install the wheel hub assembly and the outer wheel hub bearing.

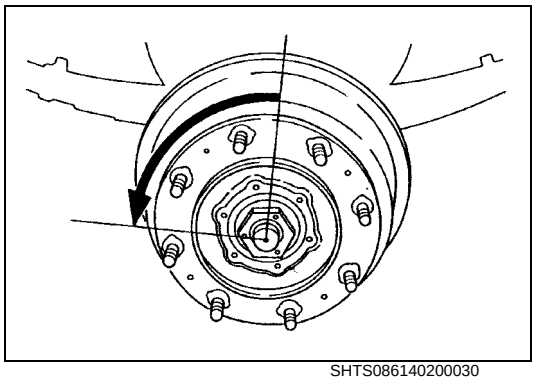
NOTICE

- **Using a tool as shown, simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086140200031

10. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque:
343 N·m {3,500 kgf·cm, 253 lbf·ft}

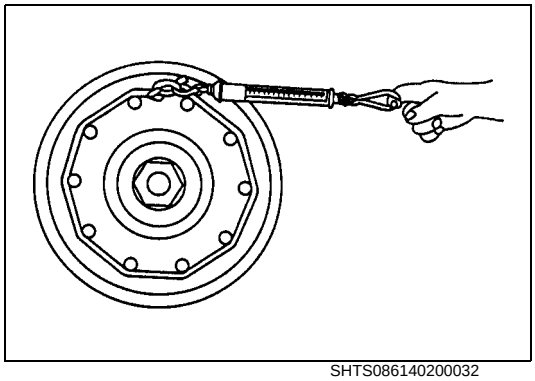

SHTS086140200030

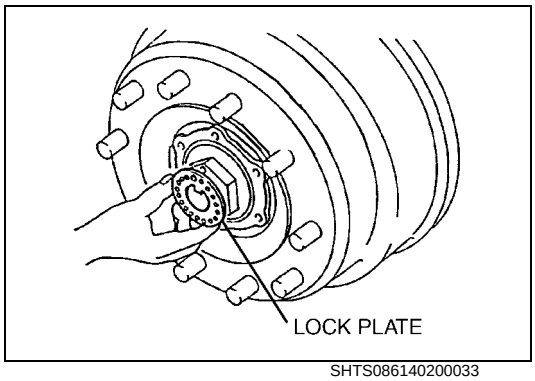
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, and adjust the preload with the lock nut.

Assembly Standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**3.93-6.37 {40-65, 2.9-4.6}**
Spring balancer reading N {kgf, lbf}	**27.5-44.1 {2.8-4.5, 6.2-9.9}**


SHTS086140200032



SHTS086140200033

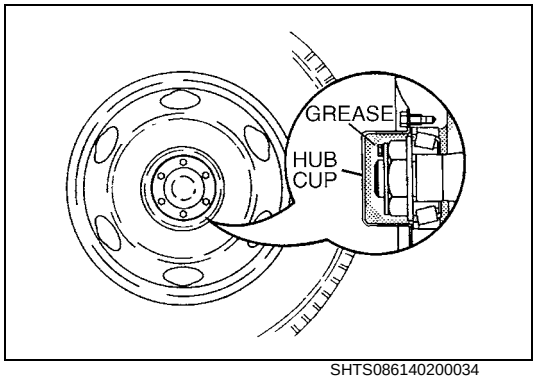
11. INSTALLATION OF THE LOCK PLATE

NOTICE

- **If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

12. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.

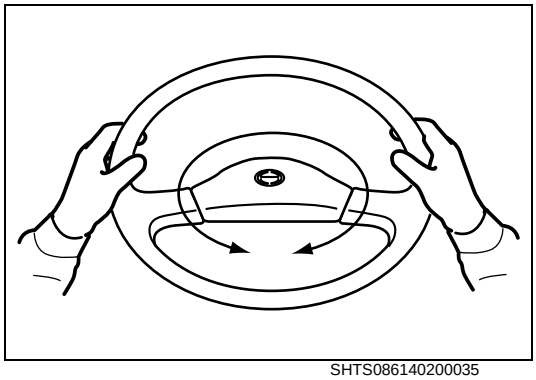


SHTS086140200034

13. INSTALLATION OF THE HUB CAP

NOTICE

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.


SHTS086140200035

14. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

15. ADJUSTMENT OF THE BRAKE SYSTEM AIR BLEEDING AND THE BRAKE SHOE CLEARANCE

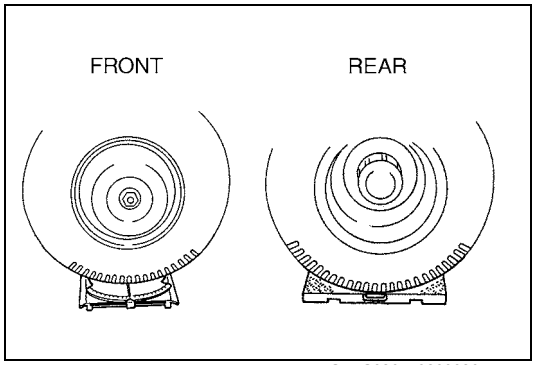
(1) On completion of the wheel hub and related parts reassembly, conduct the followings:

a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.

b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE "** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND ADJUSTMENT

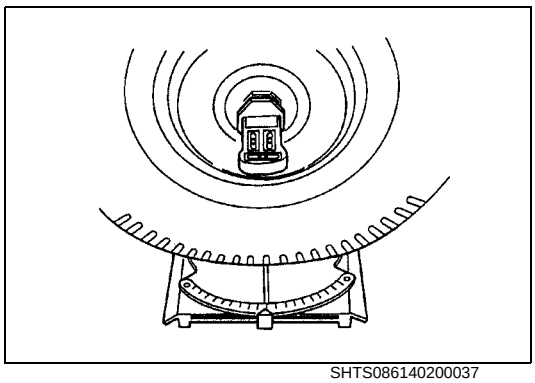
EN0861402H300001



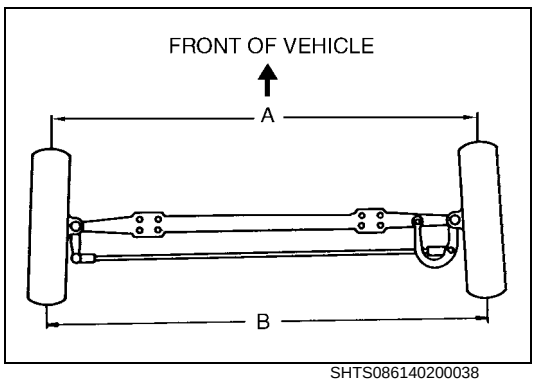
SHTS086140200036

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086140200037

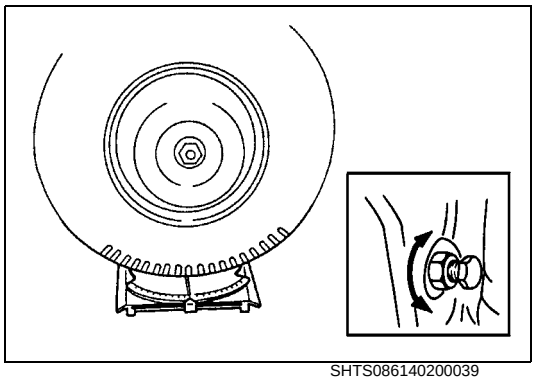
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section **"DATA AND SPECIFICATIONS"**.



SHTS086140200038

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086140200039

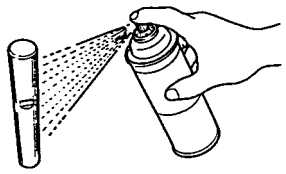
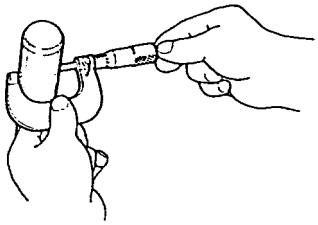
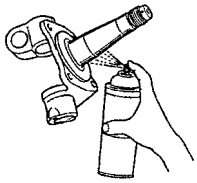
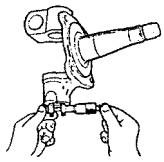
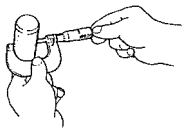
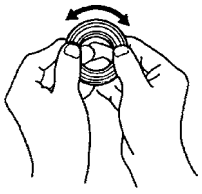
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

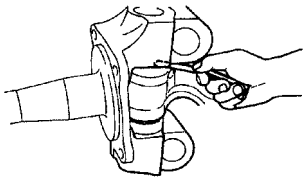
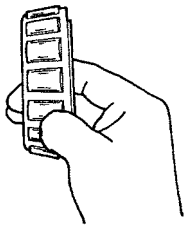
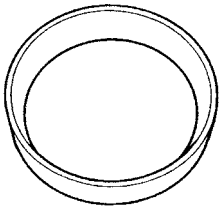
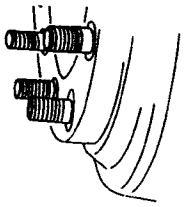
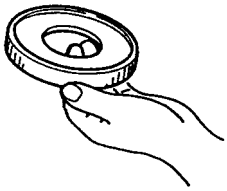
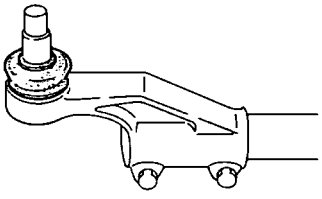
(1) Refer to the section **"DATA AND SPECIFICATIONS"**.

INSPECTION AND REPAIR

EN0861402H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin diameter	**50 {1.969}**	**49.85 {1.9626}**	**Replace.**	**Measure** 
Knuckle: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin clearance	**0.025-0.08 {0.0010-0.0031}**	**0.35 {0.0138}**	**Replace.**	**Measure**  
Thrust bearing: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace the thrust washer.**	**Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie-rod end and dust cover: Crack	**—**	**—**	**Replace.**	**Visual check** 
Muddy water in the cover (Sealed type ball stud)	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (MF67I)

AX02-007

FRONT AXLE (MF67I) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-10
INSPECTION AND ADJUSTMENT AX02-16
INSPECTION AND REPAIR AX02-17

FRONT AXLE (MF67I)

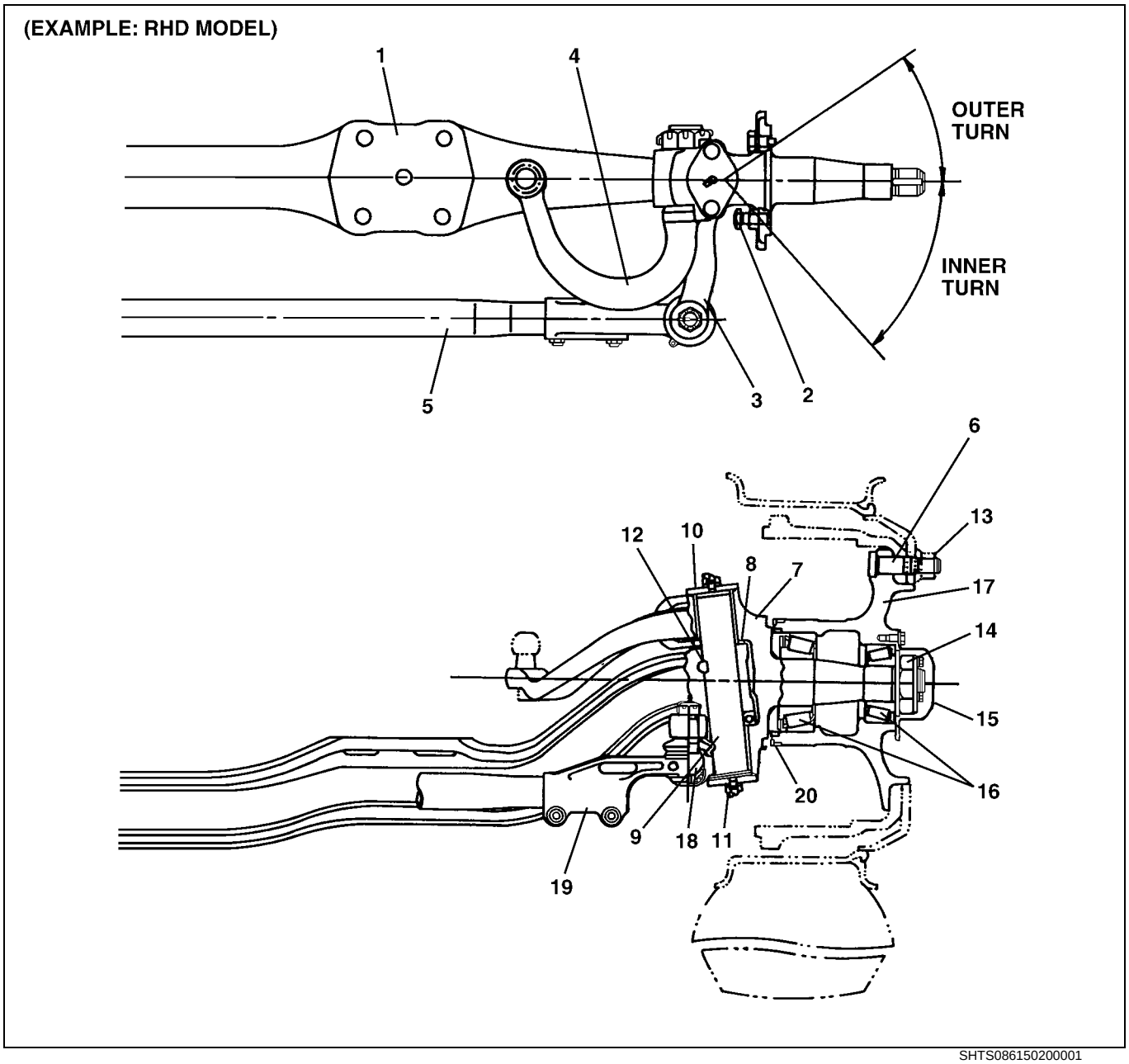
DATA AND SPECIFICATIONS

EN0861502I200001

Chassis model			**FG, GH (EXCEPT FOR IRELAND), SG**		**GH (FOR IRELAND), FL, FM**
Front axle series No.			**MF67I**		
Axle beam type			**Reversed Elliot "I" beam**		
Axle beam material			**Chrome molybdenum steel**		
Brake drum location			**Outboard mounted**		
Wheel bearing			**Two tapered roller bearings**		
King pin thrust bearing			**Ball bearing**		
Wheel alignment	**Camber**		**0°-2°**		
	King pin angle		**6°-8°**		
	Caster		**2°**		
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**		
		Radial tires	**0-2 mm {0-0.0787 in.}**		
Knuckle turning angle		**Tire size**	**10.00-20**	**11.00-20**	**10.00-20**
		Inner turn	**44°30'-47°30'**	**41°30'-44°30'**	**39°30'-42°30'**
		Outer turn	**34°**	**33°**	**32°**
Amount of grease in a hub			**600 g {21.2 oz.} at one wheel**		

DESCRIPTION

EN0861502C100001



SHTS086150200001

1	Axle beam	11	Lubrication fitting
2	Stopper bolt	12	Lock pin
3	Tie-rod arm	13	Wheel nut
4	Knuckle arm	14	Lock nut
5	Tie rod	15	Hub cap
6	Wheel bolt	16	Wheel hub bearing
7	Knuckle	17	Wheel hub
8	Thrust washer	18	Ball stud
9	King pin	19	Tie-rod end
10	King pin cover	20	ABS sensor ring (If so equipped)

TROUBLESHOOTING

EN0861502F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate king pins and ball joints.
	Incorrect front wheel alignment (Toe-in angle is incorrect.)	Correct the toe-in.
	Incorrect front wheel alignment (Camber, caster of king pin angles are not within specifications.)	Inspect king pin bushings for wear or deflection of knuckles axle beam and tie rod, and replace if necessary.
	Worn out or damaged thrust bearing	Replace thrust bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out king pin bushing	Replace king pin bushings.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheels.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter **"STEERING EQUIPMENT"**.
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Hub cap bolts are not tightened properly	Tighten the bolts properly.
	Too much grease	Apply only the specified amount of grease.

SPECIAL TOOL

EN0861502K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

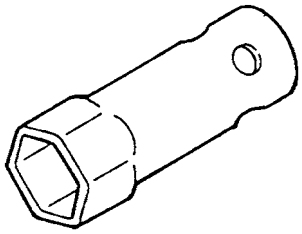
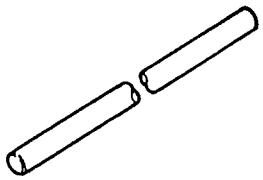
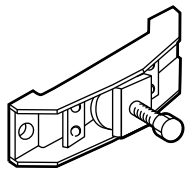
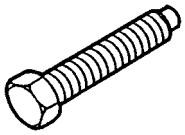
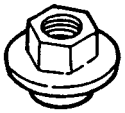
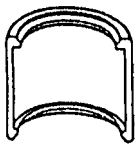
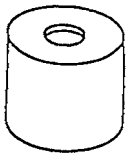
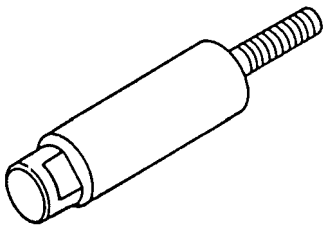
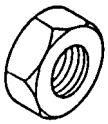
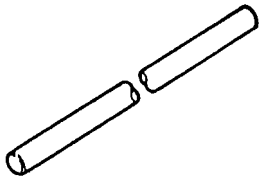
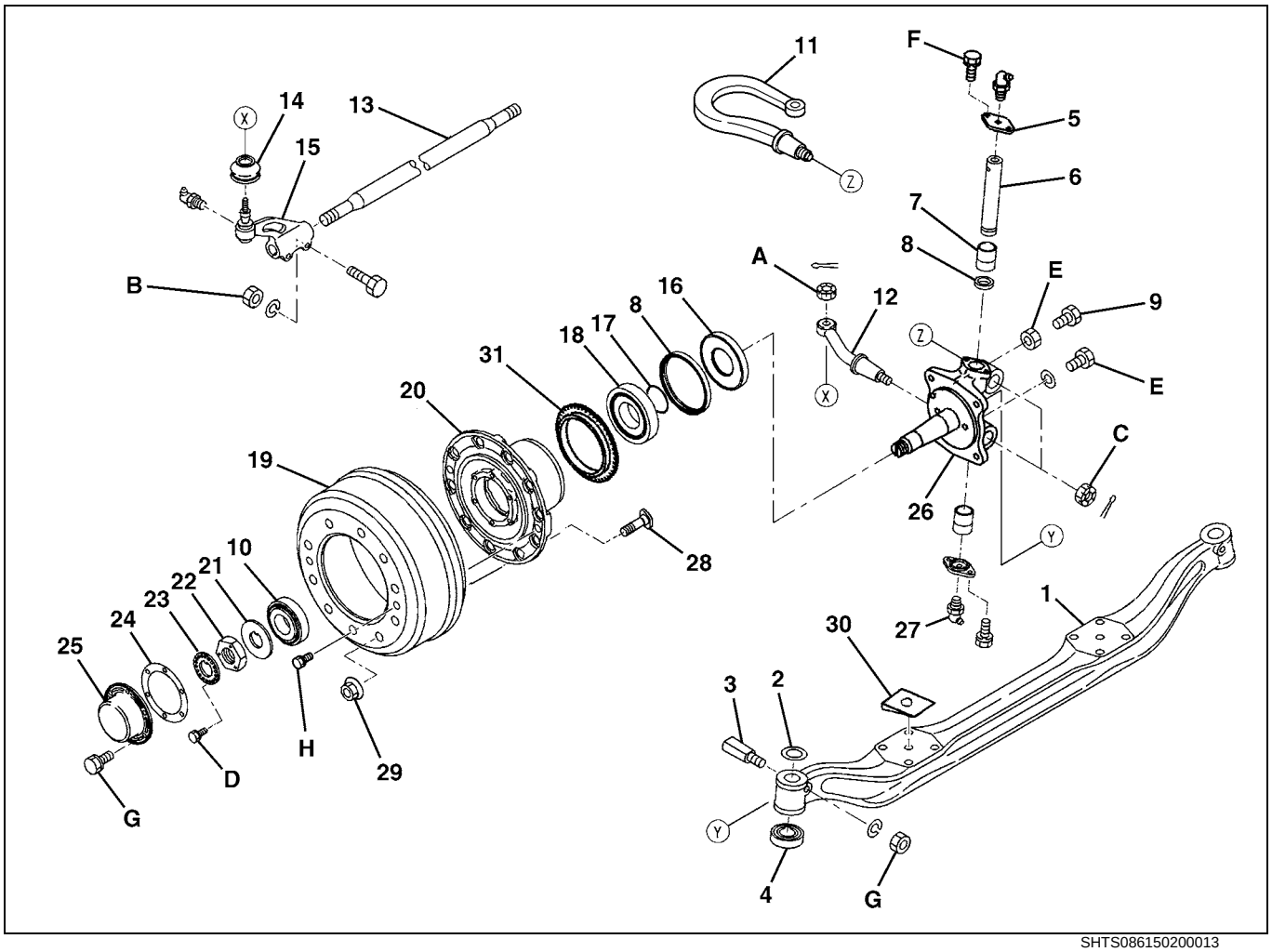
Illustration	Part number	Tool name	Remarks
	S0983-97001	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01790	WHEEL HUB PULLER	
	S0965-21210	PULLER SCREW	2 pieces
	SZ179-20001	DUST COVER GUIDE NUT	
	S0965-71790	DUST COVER GUIDE (INNER)	2 pieces
	S0965-71800	DUST COVER GUIDE (OUTER)	

Illustration	Part number	Tool name	Remarks
	S0965-71320	KING PIN GUIDE	
	S0965-41080	PLATE	
	SL110-01210	NUT	
	S0971-21100	BAR	

COMPONENT LOCATOR

EN0861502D100001

RIGHT-HAND DRIVE MODEL



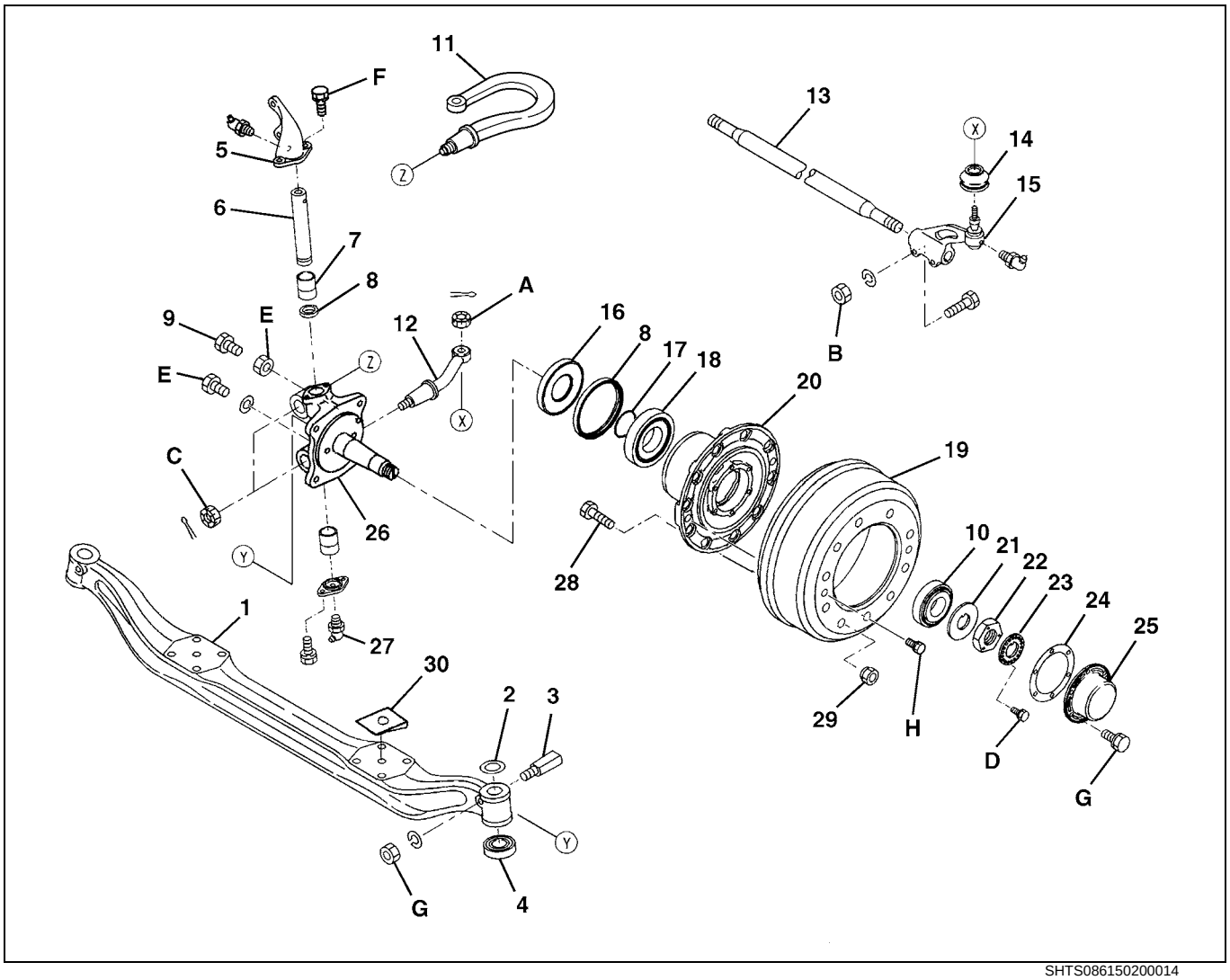
SHTS086150200013

1	Axle beam	17	O-ring
2	Thrust washer	18	Inner wheel hub bearing
3	Lock pin	19	Brake drum
4	Thrust bearing	20	Wheel hub
5	King pin cover	21	Washer
6	King pin	22	Wheel hub bearing lock nut
7	Bushing	23	Lock plate
8	Oil seal	24	Gasket
9	Stopper bolt	25	Wheel hub cap
10	Outer wheel hub bearing	26	Knuckle
11	Knuckle arm	27	Lubrication fitting
12	Tie-rod arm	28	Wheel bolt
13	Tie rod	29	Wheel nut
14	Dust cover	30	Caster shim
15	Tie-rod end assembly	31	ABS sensor ring (If so equipped)
16	Oil seal guide		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,499-3,497, 109-253}	E	96-144 {979-1,468, 71-106}
B	85.5-114.5 {872-1,167, 64-84}	F	105.5-144.5 {1,076-1,473, 78-106}
C	685-1,175 {6,986-11,981, 505-866}	G	37.5-48.5 {383-494, 28-35}
D	8.5-10.5 {87-107, 6.3-7.7}	H	20.5-39.5 {210-403, 16-29}

LEFT-HAND DRIVE MODEL



SHTS086150200014

1	Axle beam	16	Oil seal guide
2	Thrust washer	17	O-ring
3	Lock pin	18	Inner wheel hub bearing
4	Thrust bearing	19	Brake drum
5	Brake chamber bracket	20	Wheel hub
6	King pin	21	Washer
7	Bushing	22	Wheel hub bearing lock nut
8	Oil seal	23	Lock plate
9	Stopper bolt	24	Gasket
10	Outer wheel hub bearing	25	Wheel hub cap
11	Knuckle arm	26	Knuckle
12	Tie-rod arm	27	Lubrication fitting
13	Tie rod	28	Wheel bolt
14	Dust cover	29	Wheel nut
15	Tie-rod end assembly	30	Caster shim

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,499-3,497, 109-253}	E	96-144 {979-1,468, 71-106}
B	85.5-114.5 {872-1,167, 64-84}	F	105.5-144.5 {1,076-1,473, 78-106}
C	685-1,175 {6,986-11,981, 505-866}	G	37.5-48.5 {383-494, 28-35}
D	8.5-10.5 {87-107, 6.3-7.7}	H	20.5-39.5 {210-403, 16-29}

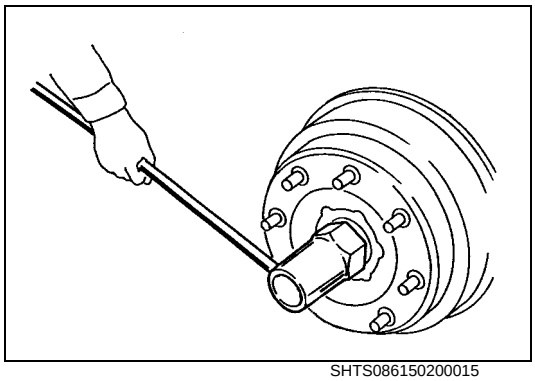
OVERHAUL

EN08615022300001

IMPORTANT POINTS - DISASSEMBLY

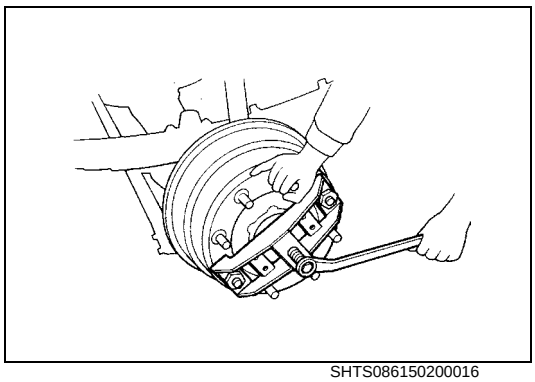
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS086150200015

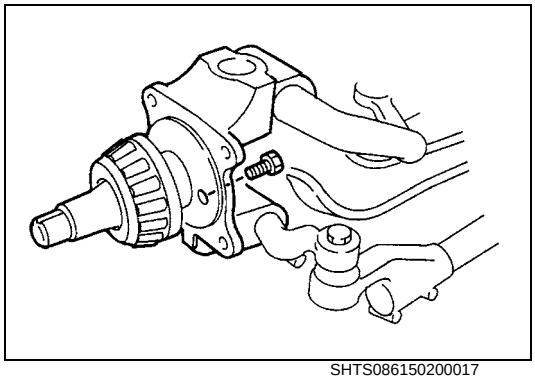
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0983-97001)
Handle (S0984-92001)



SHTS086150200016

3. REMOVAL OF THE WHEEL HUB ASSEMBLY AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-92001)

NOTICE
Wheel hub assembly is heavy, therefore be careful when handling it.

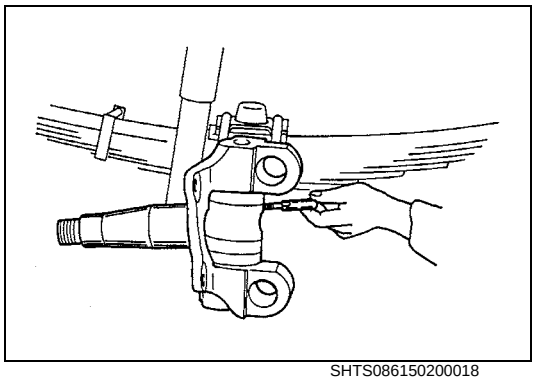


SHTS086150200017

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL GUIDE
SST: Puller Screw (S0965-21210)

5. REMOVAL OF THE WHEEL BRAKE

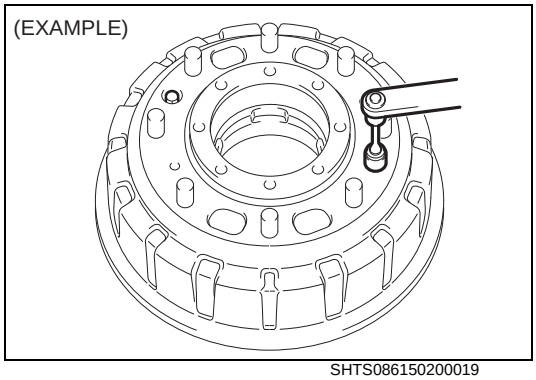
(1) Refer to the chapter **"SERVICE BRAKE"**.



SHTS086150200018

6. REMOVAL OF THE LOCK PIN

(1) To prevent damage to the lock pin threading, loosen the lock pin nut until it is flush with the end of the lock pin, then hammer the nut to loosen the lock pin.

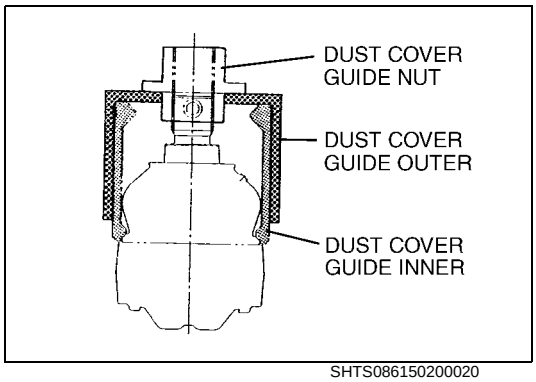


SHTS086150200019

7. SEPARATION OF THE BRAKE DRUM AND WHEEL HUB

(1) Remove the bolts, and separate the brake drum and wheel hub.

IMPORTANT POINTS - ASSEMBLY



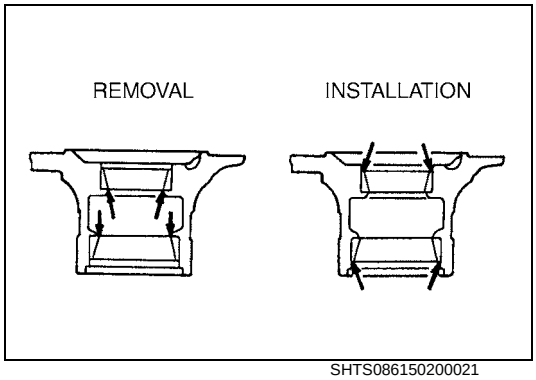
SHTS086150200020

1. REPLACEMENT OF THE DUST COVER

NOTICE

Apply lithium molybdenum sulfide grease to the inside and lip part of the dust cover.

SST:
Dust Cover Guide Nut (SZ179-20001)
Dust Cover Guide Inner (S0965-71790)
Dust Cover Guide Outer (S0965-71800)

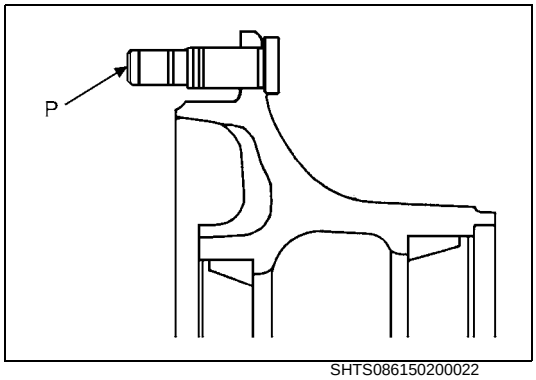


SHTS086150200021

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.



SHTS086150200022

3. REPLACEMENT OF THE WHEEL BOLTS

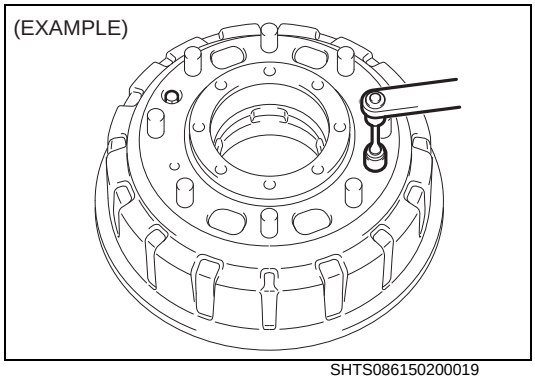
(1) Remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

- **The right and left wheel bolts differ, so install them according to the chart below.**

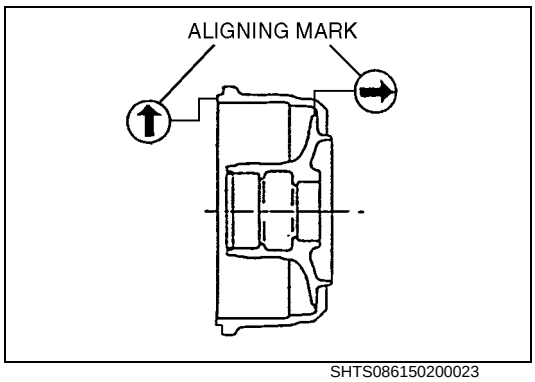
	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS086150200019

4. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB

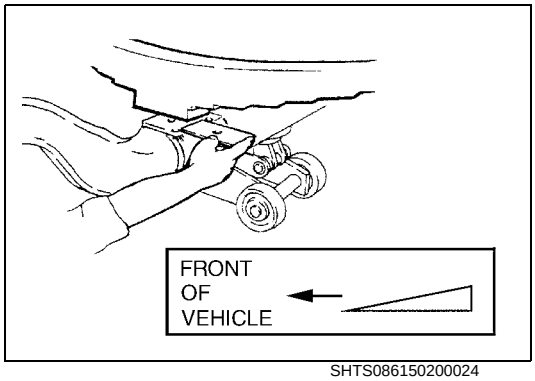
(1) Assemble the brake drum and wheel hub, and tighten the bolts.



SHTS086150200023

NOTICE

When assembling the brake drum and wheel hub, make sure that their aligning marks are oriented as closely to each other as possible.



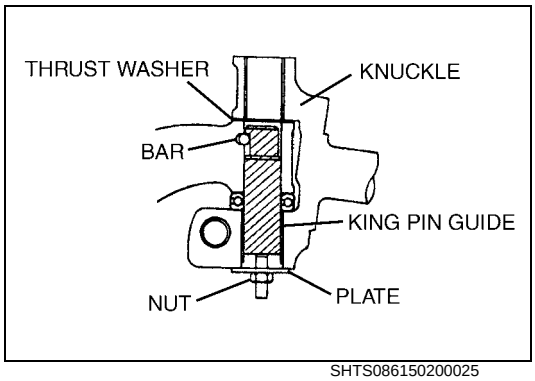
SHTS086150200024

5. INSTALLATION OF THE AXLE BEAM

(1) Secure the axle to the leaf springs with U-bolts.

NOTICE

Confirm the direction of caster shim.



SHTS086150200025

6. ADJUSTMENT OF THE CLEARANCE BETWEEN THE THRUST WASHER AND KNUCKLE

(1) Adjust the clearance with the correct thickness thrust washer.

Assembly Standard: Less than 0.1 mm {0.004 in.}

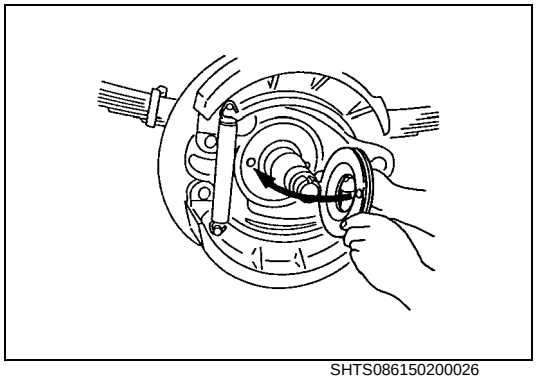
Thickness of Thrust Washer: mm {in.}

3.2 {0.126} 3.3 {0.130} 3.4 {0.134} 3.5 {0.138}
3.6 {0.142} 3.7 {0.146} 3.8 {0.150}

SST:
King Pin Guide (S0965-71320)
Plate (S0965-41080)
Nut (SL110-01210)
Bar (S0971-21100)

7. ASSEMBLY OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.

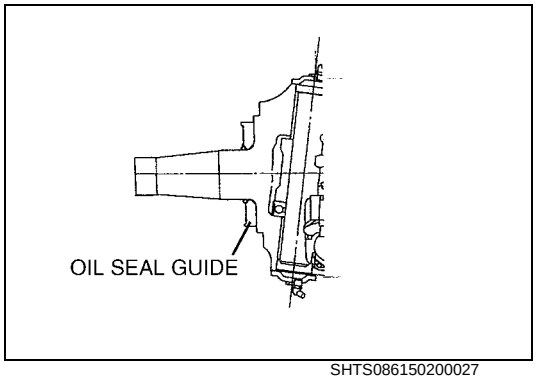


SHTS086150200026

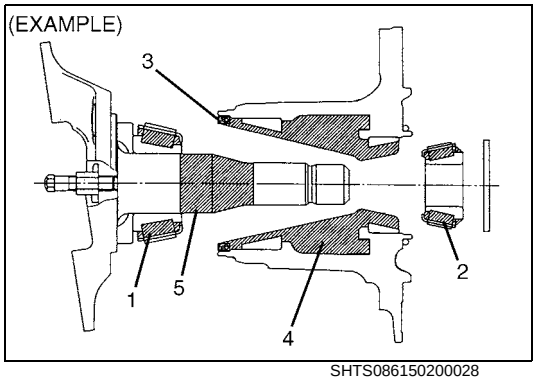
8. INSTALLATION OF THE OIL SEAL GUIDE

NOTICE

- **Align the stopper bolt hole of the knuckle and oil seal guide hole.**
- **If oil seal guide is warmed up with hot water, it can easily be installed.**
- **Install the O-ring as shown in the figure.**



SHTS086150200027



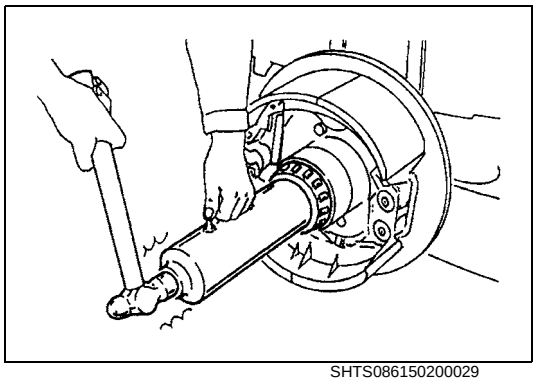
SHTS086150200028

9. GREASING

(1) Before assembling, apply wheel hub bearing grease to the following parts as shown in the figure.

1. Inner wheel hub bearing inner race
2. Outer wheel hub bearing inner race
3. Sealing lip of the oil seal
4. Wheel hub
5. Knuckle spindle

(2) Lubricate the king pin with chassis grease, using the lubrication fittings located on the two king pin covers.



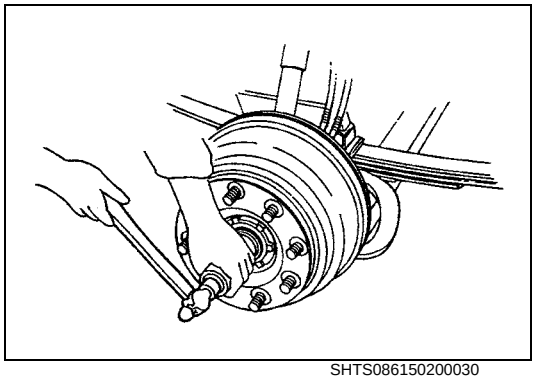
SHTS086150200029

10. INSTALLATION OF THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the inner wheel hub bearing.

NOTICE

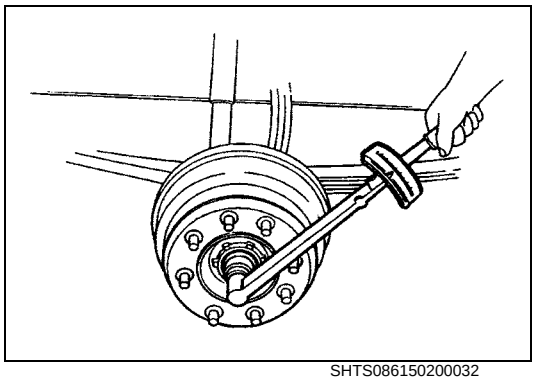
Using a tool as shown, simplifies installation.


SHTS086150200030

(2) Install the oil seal in the wheel hub.
(3) Install the wheel hub assembly and the outer wheel hub bearing.

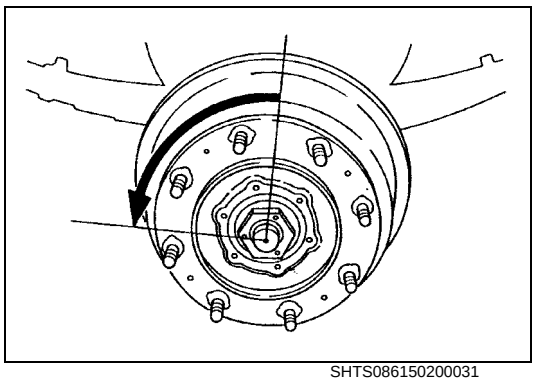
NOTICE

- **Using a tool as shown, simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS086150200032

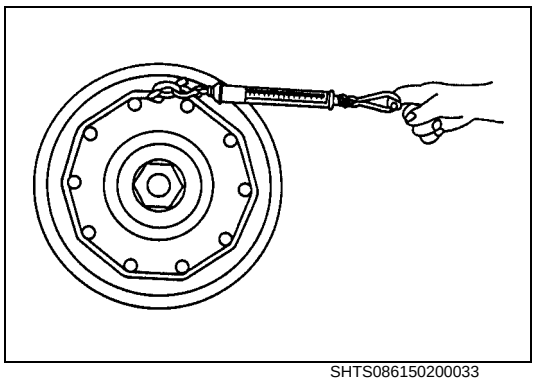
11. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/6 - 1/4 turn.
Tightening Torque:
343 N·m {3,500 kgf·cm, 253 lbf·ft}

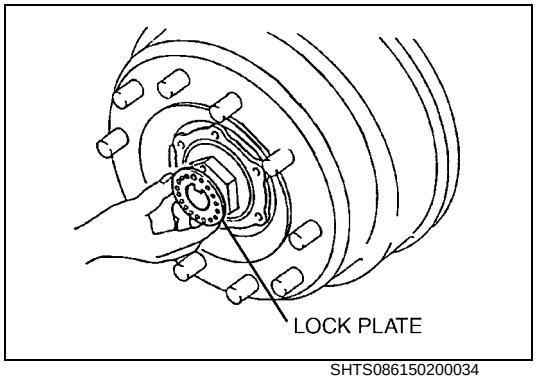

SHTS086150200031

(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)
(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, and adjust the preload with the lock nut.

Assembly Standard:


SHTS086150200033

Turning Torque N·m {kgf·cm, lbf·ft}	**3.93-6.37 {40-65, 2.9-4.6}**
Spring balancer reading N {kgf, lbf}	**23.5-38.0 {2.4-3.9, 5.3-8.6}**



SHTS086150200034

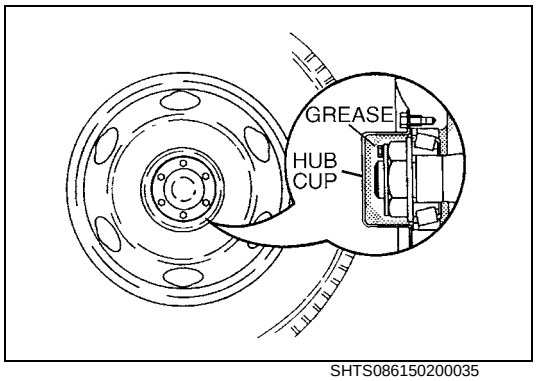
12. INSTALLATION OF THE LOCK PLATE

NOTICE

- **If the holes of the plate are not aligned with the screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

13. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.

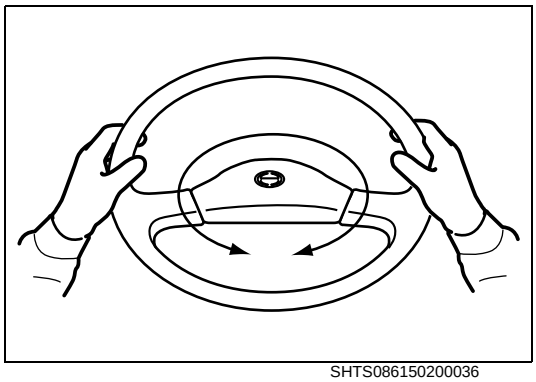


SHTS086150200035

14. INSTALLATION OF THE HUB CAP

NOTICE

Before installing the cap, apply wheel hub bearing grease to the inner surface of the cap.


SHTS086150200036

15. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

16. ADJUSTMENT OF THE BRAKE SYSTEM AIR BLEEDING AND THE BRAKE SHOE CLEARANCE

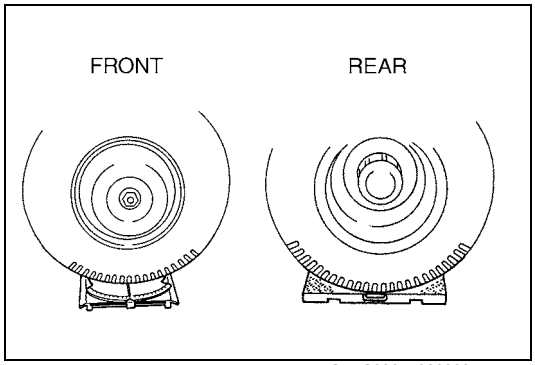
(1) On completion of the wheel hub and related parts reassembly, conduct the followings:

a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.

b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE".**

INSPECTION AND ADJUSTMENT

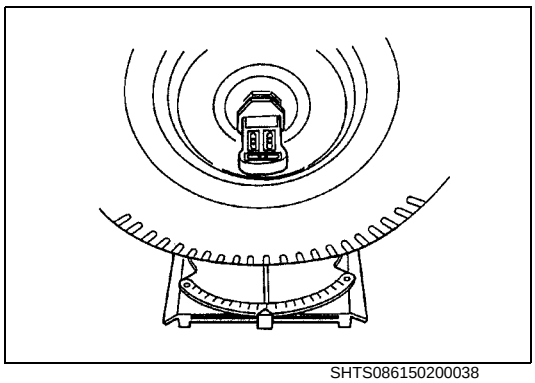
EN0861502H300001



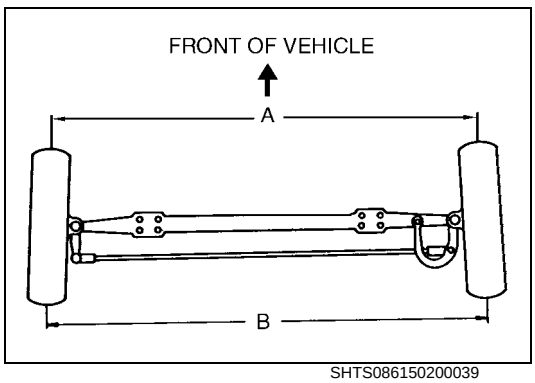
SHTS086150200037

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS086150200038

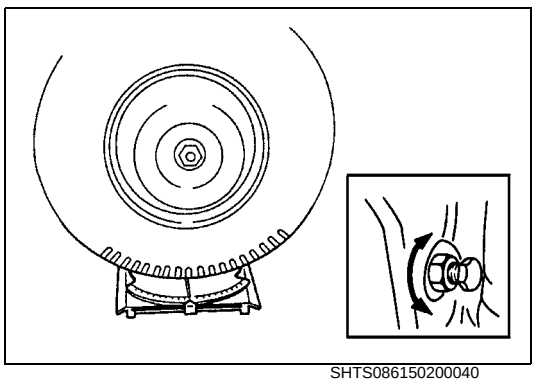
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section **"DATA AND SPECIFICATIONS"**.



SHTS086150200039

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS086150200040

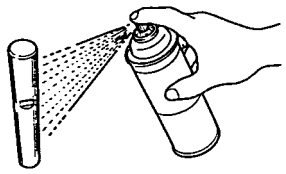
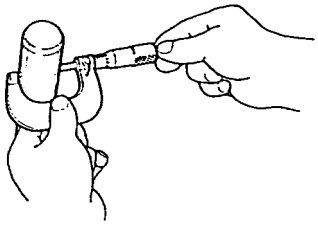
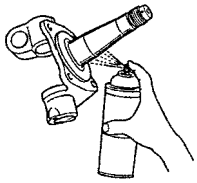
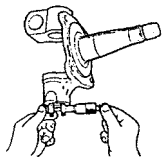
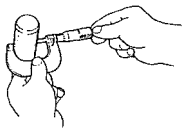
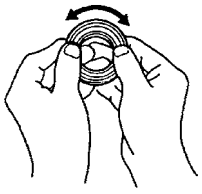
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

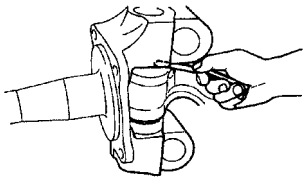
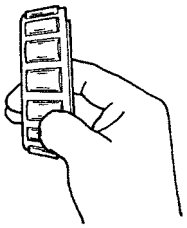
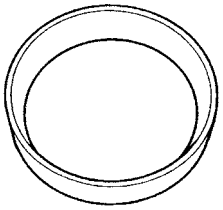
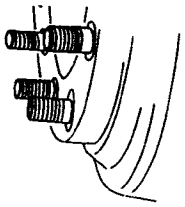
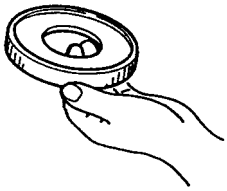
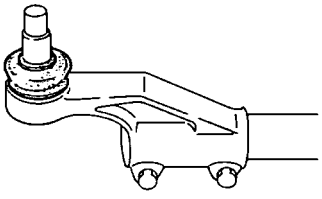
(1) Refer to the section **"DATA AND SPECIFICATIONS"**.

INSPECTION AND REPAIR

EN0861502H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
King pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin diameter	**50 {1.969}**	**49.85 {1.9626}**	**Replace.**	**Measure** 
Knuckle: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
King pin clearance	**0.025-0.08 {0.0010-0.0031}**	**0.35 {0.0138}**	**Replace.**	**Measure**  
Thrust bearing: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washer: Wear (Clearance between knuckle and axle beam)	**—**	**0.5 {0.0197}**	**Replace the thrust washer.**	**Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
			Replace, if necessary.	**Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie rod: Distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tie-rod end and dust cover: Crack	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Muddy water in the cover (Sealed type ball stud)	**—**	**—**	**Replace the tie-rod end assembly.**	

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS12) AX02-008

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS12) .. AX02-2

DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-6
OVERHAUL AX02-8
INSPECTION AND ADJUSTMENT AX02-14
INSPECTION AND REPAIR AX02-15

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS12)

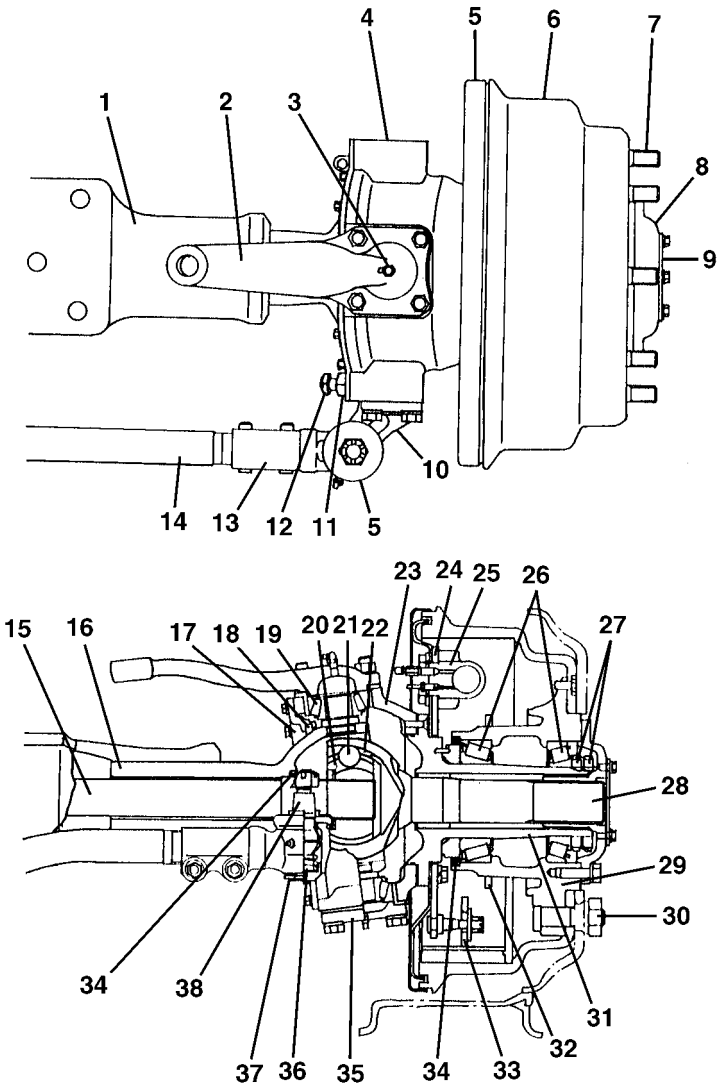
DATA AND SPECIFICATIONS

EN0851002I200001

Front axle series No.			**SS12**
Type			**Full-floating, single-reduction, single-speed by spiral bevel gearings with birfield joints**
Brake drum location			**Outboard mounted**
Wheel hub bearing			**Tapered roller bearing**
Socket pin bearing			
Wheel alignment	**Camber**		**0°**
	King pin angle		**6°-8°**
	Caster		**0°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**32°-35°**
		Outer turn	**28°**
Housing			**Cast steel banjo type with carbon steel tubing**
Amount of grease in a hub			**500 g {18 oz.} at one wheel**
Oil capacity			**Approx. 3.5 L {0.770 Imp gal./ 0.925 U.S. gal.}**

DESCRIPTION

EN0851002C100001



SHTS085100200001

1	Axle housing	14	Tie rod	27	Bearing lock nut
2	Knuckle arm	15	Axle shaft	28	Birfield joint
3	Lubrication fitting	16	Trunnion socket	29	Wheel hub
4	Knuckle housing	17	Trunnion socket cover	30	Wheel nut
5	Dust cover	18	Dust seal	31	Knuckle spindle
6	Brake drum	19	Socket pin bearing	32	ABS sensor ring (If so equipped)
7	Wheel bolt	20	Inner race	33	Brake shoe
8	Drive flange	21	Joint ball	34	Oil seal
9	Drive flange cover	22	Joint ball cage	35	Bearing cover
10	Tie-rod arm	23	Socket pin cage	36	Spring
11	Lock nut	24	Brake assembly	37	Seat
12	Stopper bolt	25	Wheel brake cylinder	38	Ball stud
13	Tie-rod end	26	Wheel hub bearing		

TROUBLESHOOTING

EN0851002F300001

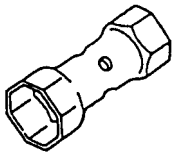
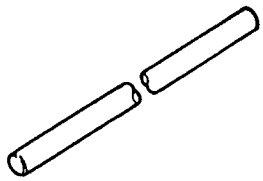
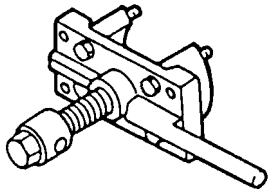
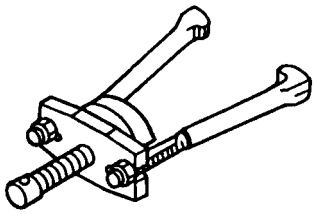
Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate.
	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out or damaged socket pin bearing	Replace socket pin bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheel.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter **"STEERING EQUIPMENT"**.
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Too much grease	Apply only the specified amount of grease.
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearings preload.
	Loose differential side bearings	Adjust bearings preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Front axle system)	Worn front axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
	Loose socket pin bearings	Adjust bearing preload.

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil; check for leakage.
	Insufficient grease	Add grease.
	Poor oil quality	Change oil.
	Poor grease quality	Change grease.
	Abnormal noise of propeller shaft	Refer to the chapter **"PROPELLER SHAFT"**.

SPECIAL TOOL

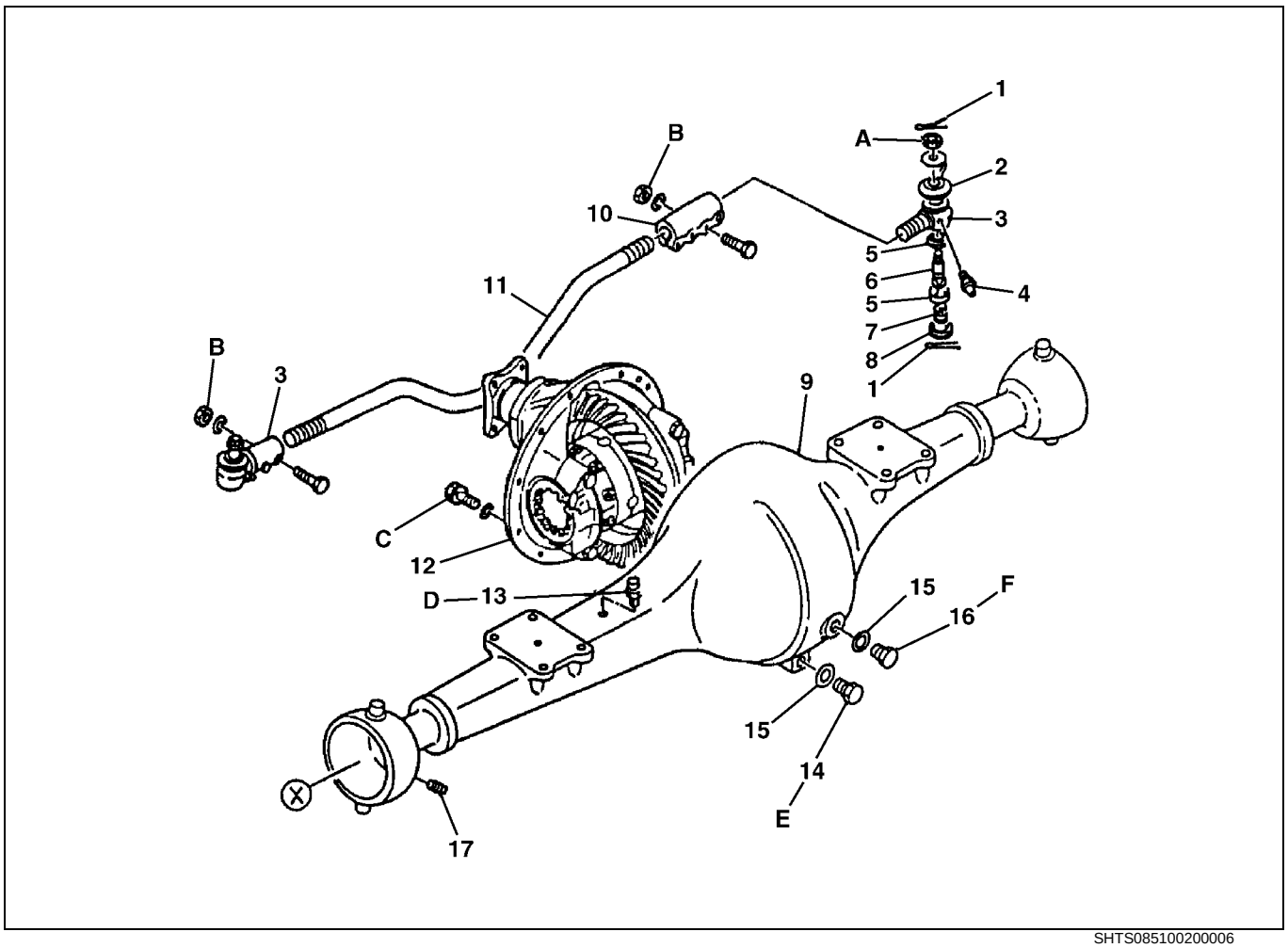
EN0851002K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0983-90101	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01790	WHEEL HUB PULLER	
	S0965-01310	HUB BEARING PULLER	

COMPONENT LOCATOR

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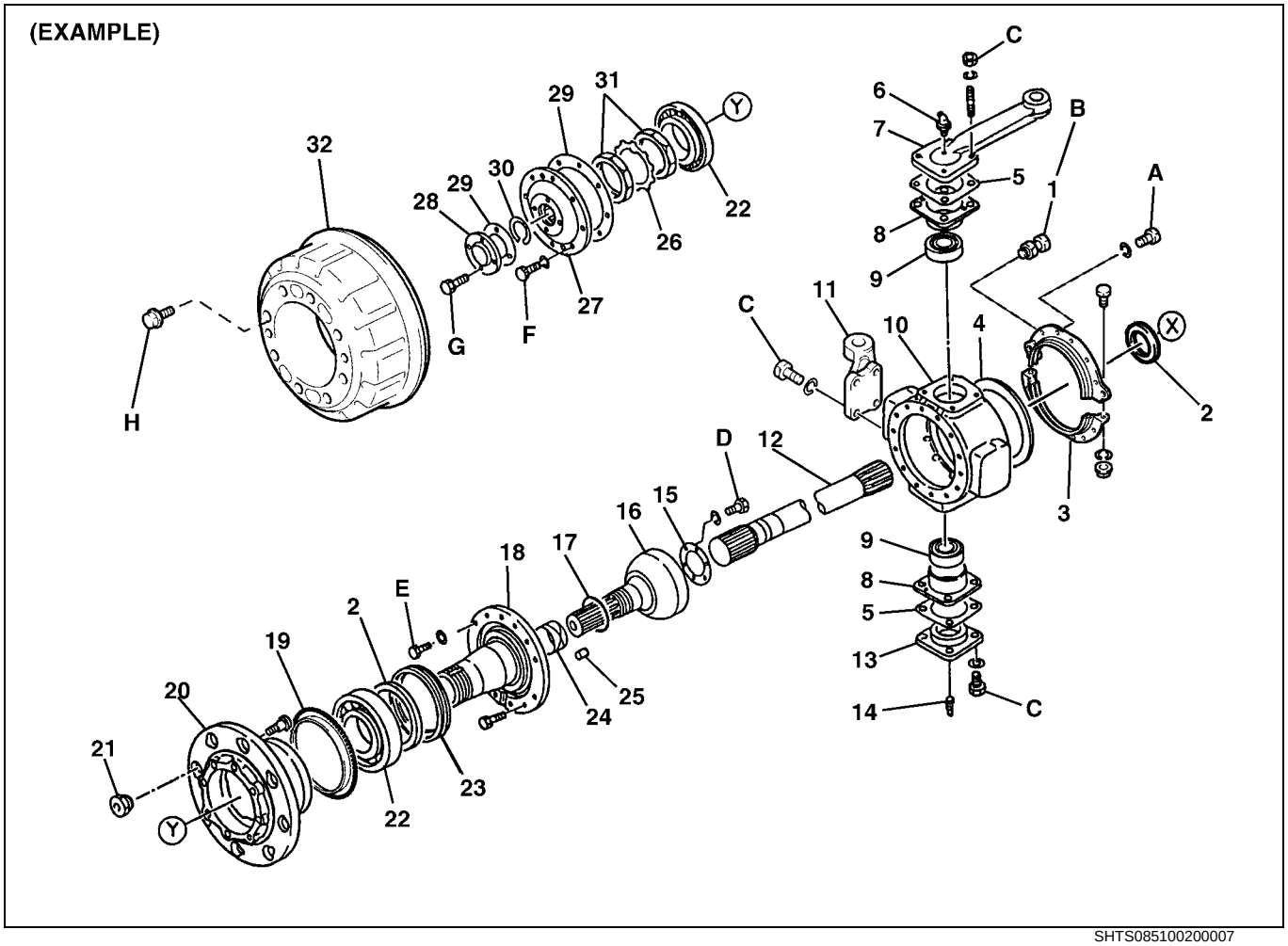


SHTS085100200006

1	Cotter pin	10	Tie-rod turn buckle
2	Dust cover	11	Tie rod
3	Tie-rod end	12	Differential carrier assembly
4	Lubrication fitting	13	Air breather
5	Seat	14	Oil drain plug
6	Ball stud	15	Gasket
7	Spring	16	Oil filler plug
8	Spring seat	17	Plug
9	Axle housing		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,500-3,500, 109-253}	D	9.8-19.6 {100-200, 7.3-14.4}
B	85.5-114.5 {872-1,167, 63-84}	E	39.2-68.6 {400-700, 29-50}
C	109-147 {1,100-1,500, 80-108}	F	78.5-117.5 {800-1,200, 58-86}



SHTS085100200007

1	Stopper bolt	17	O-ring
2	Oil seal	18	Knuckle spindle
3	Trunnion socket cover	19	ABS sensor ring (If so equipped)
4	Dust seal	20	Wheel hub
5	Shim	21	Wheel nut
6	Lubrication fitting	22	Hub bearing
7	Knuckle arm (Driver's side)	23	Oil seal guide
8	Socket pin cage	24	Bushing
9	Socket pin bearing	25	Guide pin
10	knuckle	26	Lock plate
11	Tie-rod arm	27	Drive flange
12	Axle shaft	28	Drive flange cover
13	Bearing cover	29	Gasket
14	Plug	30	Retainer ring
15	Plate	31	Lock nut
16	Birfield joint	32	Brake drum

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	19-25 {193-257, 13.9-18.3}	E	85.5-114.5 {900-1,200, 65-86}
B	95.5-144.5 {974-1,470, 71-106}	F	108.5-147.5 {1,107-1,500, 80-108}
C	105.5-144.5 {1,100-1,500, 80-108}	G	13-18 {130-190, 9-13}
D	5-7 {50-70, 4-5}	H	20.5-39.5 {210-400, 15-29}

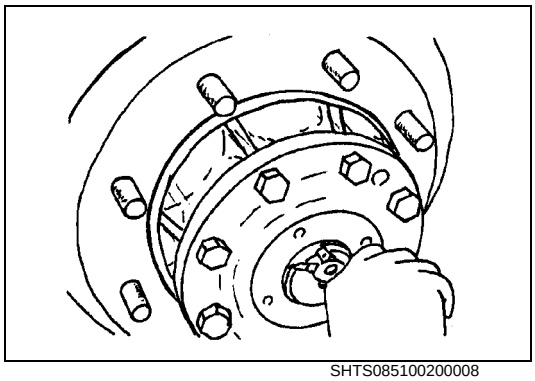
OVERHAUL

EN0851002H200001

IMPORTANT POINTS - DISMOUNTING

1. REMOVAL OF THE WHEELS

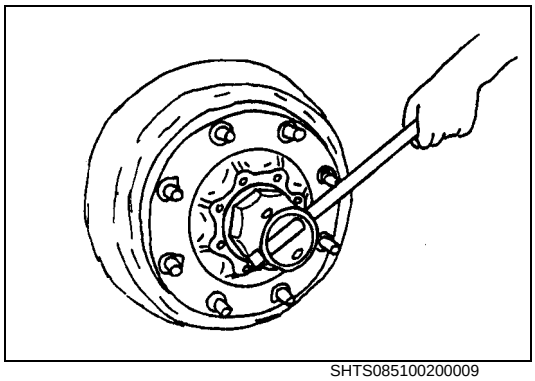
(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS085100200008

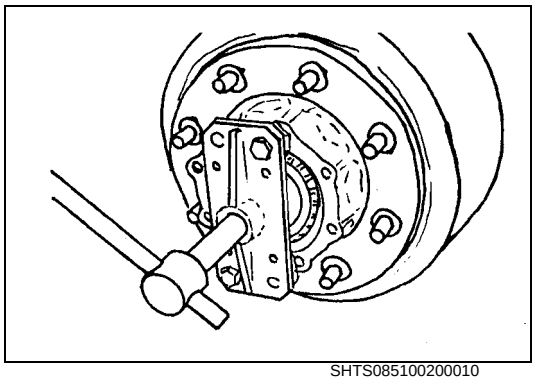
2. DISMOUNTING OF THE WHEEL HUB

(1) Remove the retainer ring which secures the drive flange to shaft of the birfield joint.



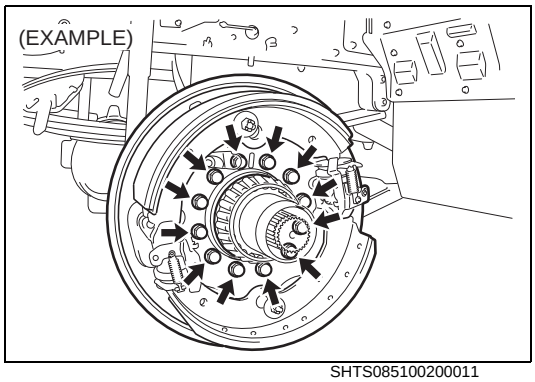
SHTS085100200009

(2) Flatten the pawl of lock washer and remove the two lock nuts.
SST:
Socket Wrench (S0983-90101)
Handle (S0984-92001)



SHTS085100200010

(3) Remove the wheel hub together with the brake drum.
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-92001)

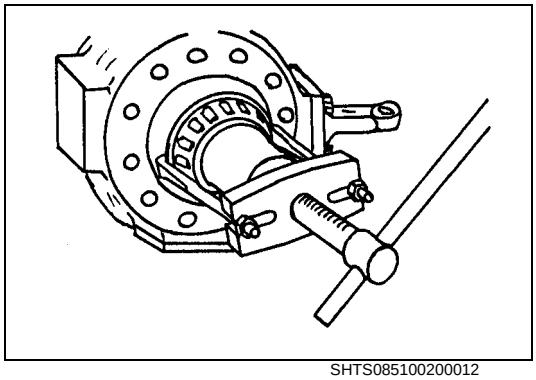


SHTS085100200011

3. DISMOUNTING OF THE WHEEL BRAKE

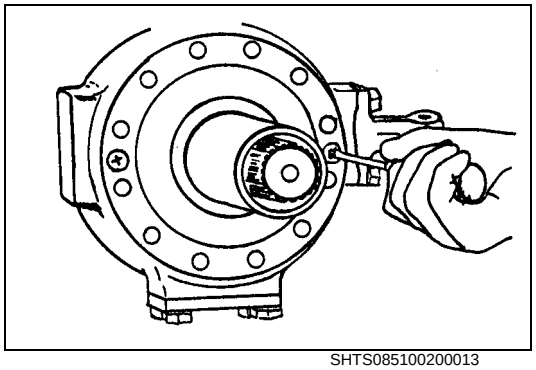
(1) Disconnect the brake hose.
(2) Remove the oil seal.
(3) Remove the bolts and then remove the wheel brake.

NOTICE
If the brake hose is disconnected, bleed air from the brake lines.


SHTS085100200012

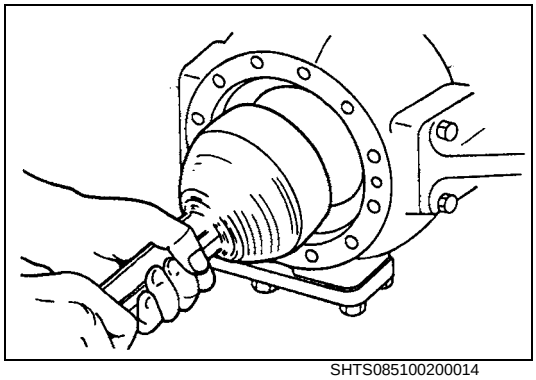
4. DISMOUNTING OF THE KNUCKLE SPINDLE

(1) Remove the inner bearing and oil seal guide from the knuckle spindle.
SST:
Hub Bearing Puller (S0965-01310)
Handle (S0984-92001)


SHTS085100200013

(2) Remove the knuckle spindle.

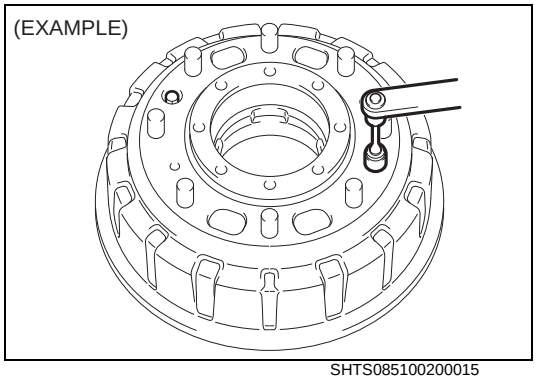
NOTICE
When removing the knuckle spindle, be careful not to damage the bushing fitted in the knuckle spindle.


SHTS085100200014

5. REMOVAL OF THE AXLE SHAFT ASSEMBLY

(1) Remove the birfield joint together with the axle shaft.

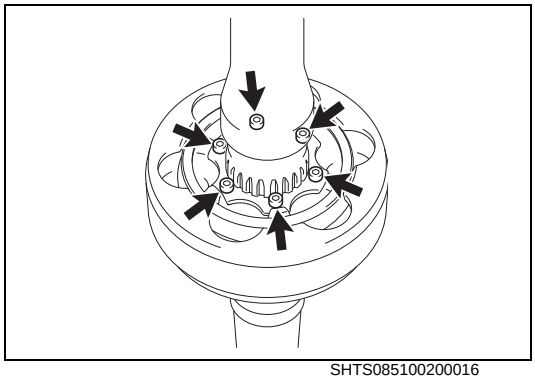
NOTICE
When removing the birfield joint, be careful not to damage the oil seal fitted in the axle housing tube.



SHTS085100200015

6. SEPARATION OF THE BRAKE DRUM AND WHEEL HUB

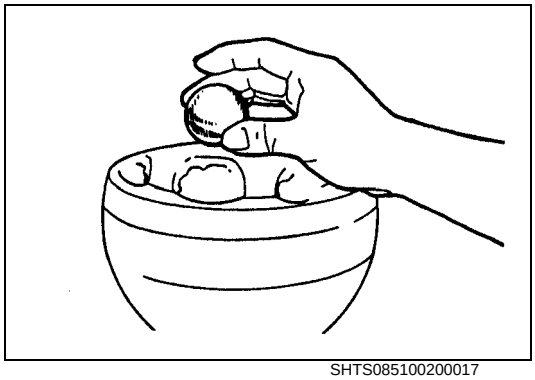
(1) Remove the bolts, and separate the brake drum and wheel hub.


SHTS085100200016

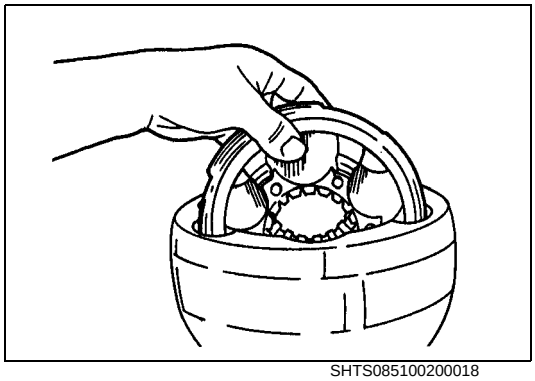
IMPORTANT POINT - DISASSEMBLY

1. DISASSEMBLY OF THE AXLE SHAFT ASSEMBLY

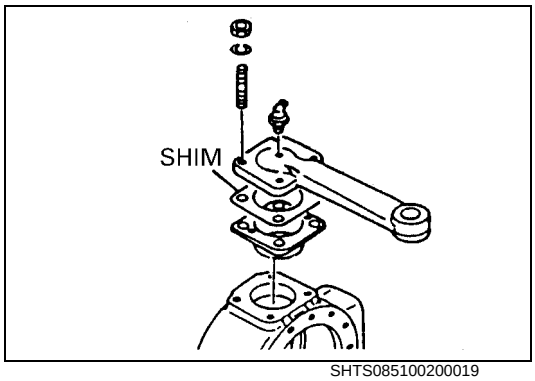
(1) Remove the hexagon bolts which are retaining the lock plate to the inner race, and then disconnect the axle shaft.


SHTS085100200017

(2) Pushing the bearing cage downward and then upward in the bearing housing, take out the ball bearing one by one.


SHTS085100200018

(3) Place the bigger slot on the cage to one of the bosses on the bearing housing, and then pull the cage and inner race from the housing.



SHTS085100200019

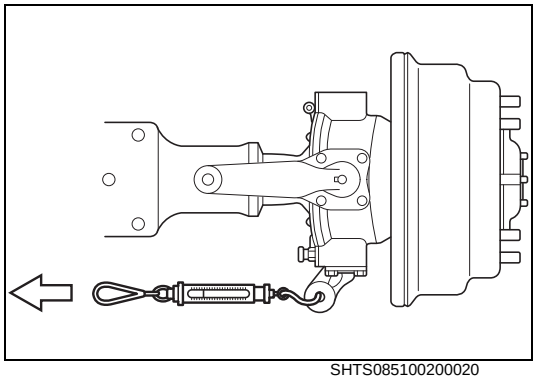
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY AND ADJUSTMENT OF THE KNUCKLE

(1) Adjust the turning force of knuckle body with shims.

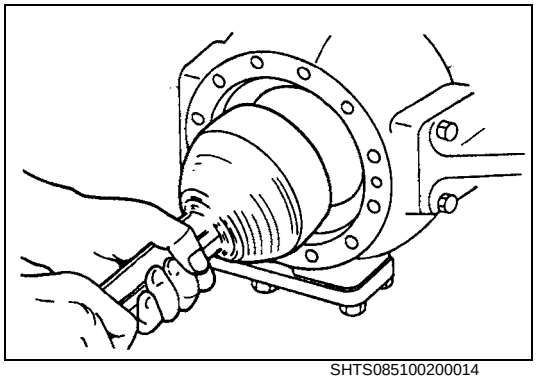
Turning Force: 5.9-10.8 N·m {60-110 kgf·cm, 4.4-7.9 lbf·ft}
Turning Force (with dust seal):
Less than 52.0 N·m {530 kgf·cm, 38.0 lbf·ft}

Adjusting shims Thickness: 0.1 mm {0.0039 in.}
0.2 mm {0.0079 in.}
0.5 mm {0.0020 in.}


SHTS085100200020

NOTICE

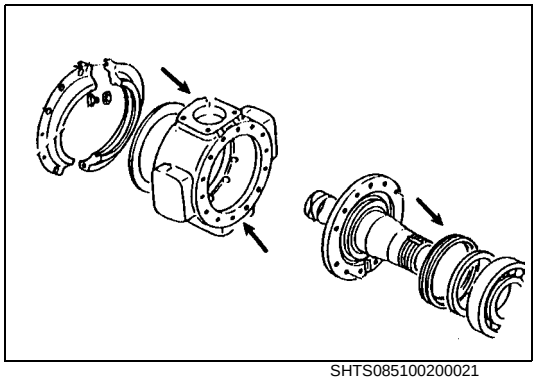
- **In case of reassembling, insert the shim of the same thickness as that used in the previous assembling.**
- **Lubricate the bearings with bearing grease sufficiently.**


SHTS085100200014

(2) Insert the birfield joint with axle shaft.

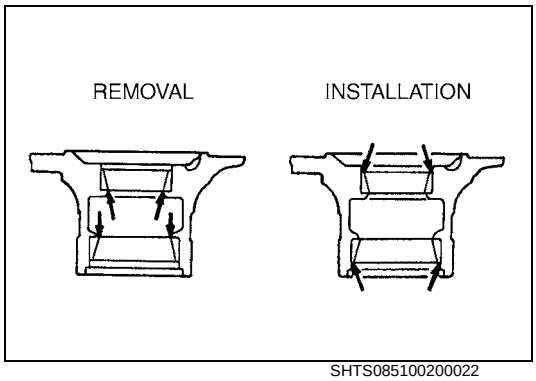
NOTICE

- **Apply grease to the inner surface of oil seal.**
- **Be careful not to damage the oil seal.**
- **Lubricate the inside of birfield joint and knuckle body with bearing grease sufficiently.**


SHTS085100200021

NOTICE

Apply the liquid gasket (ThreeBond #1215 or #1216 or equivalent) to the both faces of knuckle body (spindle side and trunnion socket cover side) and to the spindle side of the oil seal guide.

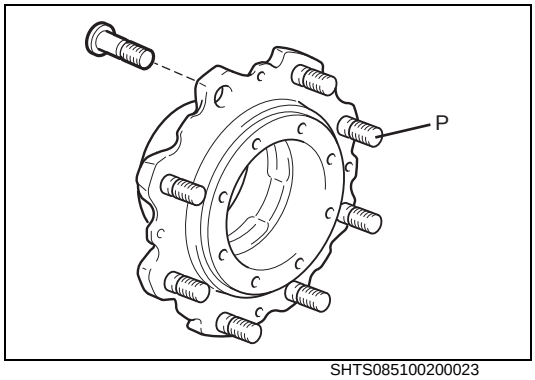


SHTS085100200022

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.



SHTS085100200023

3. REPLACEMENT OF THE WHEEL BOLT

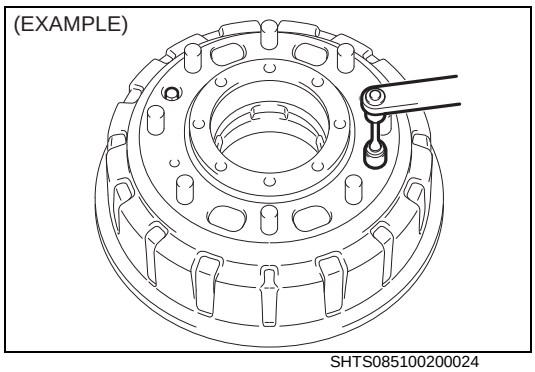
(1) Using a brass bar or a hammer, drive out the wheel bolts from the wheel hub.

(2) Using a copper hammer, drive the new wheel bolts into the wheel hub.

NOTICE

- **The left and right wheel bolts differ, so install them according to the chart below.**

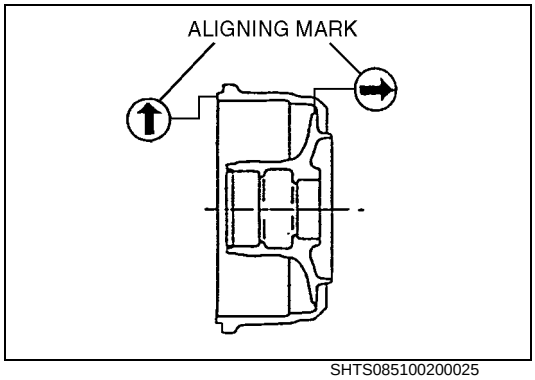
	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS085100200024

4. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB

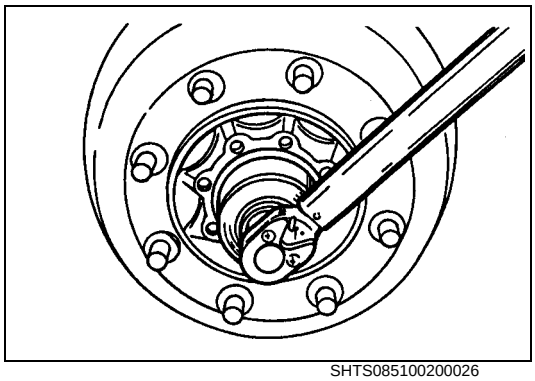
(1) Assemble the brake drum and wheel hub, and tighten the bolts.



SHTS085100200025

NOTICE

When assembling the brake drum and wheel hub, make sure that their aligning marks are oriented as closely to each other as possible.


SHTS085100200026

5. ADJUSTMENT OF THE WHEEL BEARING PRELOAD

NOTICE

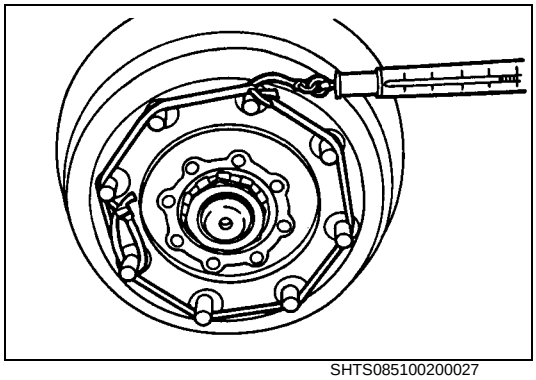
- **Before mounting the wheel hub, lubricate inside of wheel hub with bearing grease sufficiently.**
  Volume of grease: 500 g {18 oz.) / wheel
- **While assembling of the hub bearing, take care not to contaminate the hub inside and grease with chips and dust.**
- **Apply grease to the inner surface of oil seal.**

(1) Tighten the inner nut while turning the wheel hub, and turn it back 1/3-1/4 turn, tap the around of wheel hub with copper hammer.
Tightening Torque:
588.4 N·m {6,000 kgf·cm, 434 lbf·ft}

SST: Socket Wrench (S0983-90101)

(2) Install the lock plate and tighten the outer nut.
Tightening Torque:
588.4 N·m {6,000 kgf·cm, 434 lbf·ft}

SST: Socket Wrench (S0983-90101)

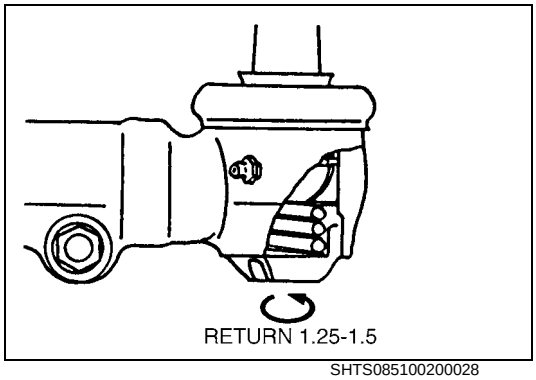


SHTS085100200027

(3) Measure the wheel bearing preload, and bend the lock washer for 2 points.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**4.9-8.9 {50-90, 3.7-6.5}**
Spring balancer reading N {kgf, lbf}	**34.3-60.8 {3.5-6.2, 7.8-13.6}**



SHTS085100200028

6. ASSEMBLY OF THE TIE-ROD END

NOTICE

- **Apply the chassis grease to the ball stud.**
- **Tighten the plug fully, and then turn it back 1.25-1.5 turn.**

7. LUBRICATION FOR KNUCKLE AND BIRFIELD JOINT

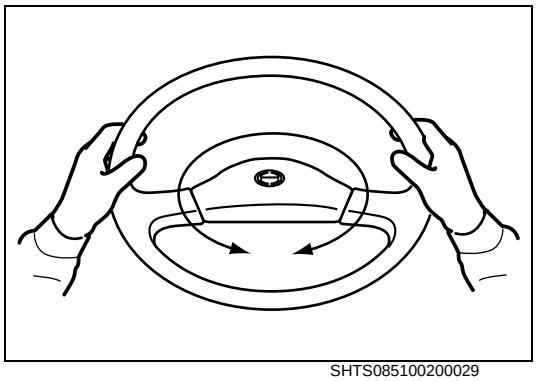
(1) On completion of front axle and related parts reassembly, lubricate the knuckle and birfield joint with bearing grease by inducting from lubrication fitting on the knuckle body until grease comes out from plug holes.

NOTICE

Before greasing, remove the plug on the spherical part at end of the knuckle body.

8. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS085100200029

9. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

10. ADJUSTMENT OF BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE

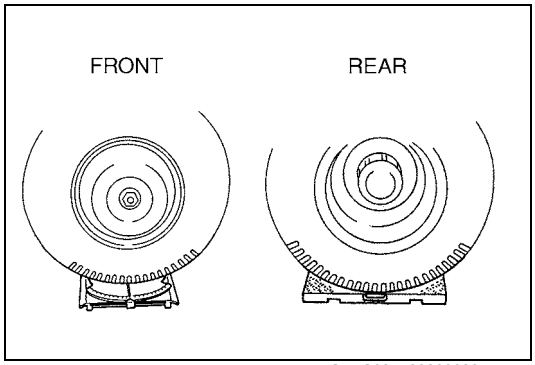
(1) On completion of the front axle overhaul, conduct the followings:

a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.

b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND ADJUSTMENT

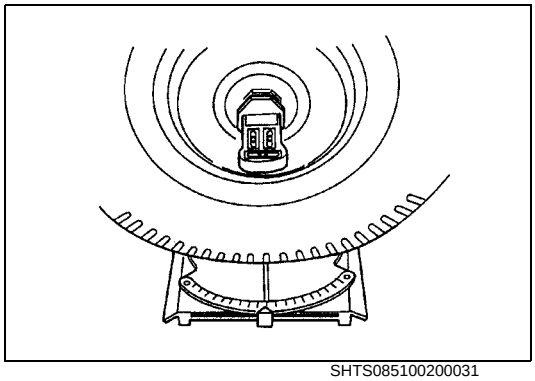
EN0851002H300001



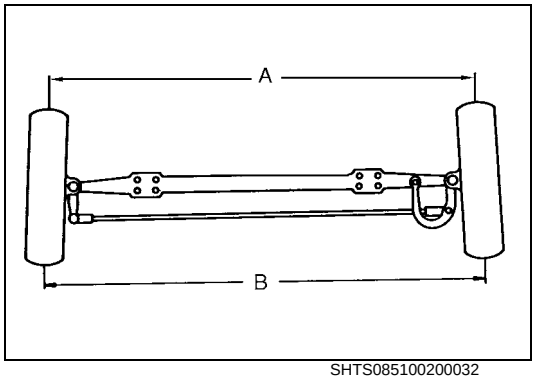
SHTS085100200030

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS085100200031

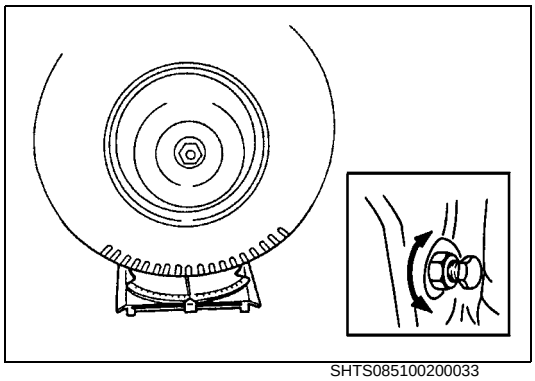
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section **"DATA AND SPECIFICATIONS"**.



SHTS085100200032

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS085100200033

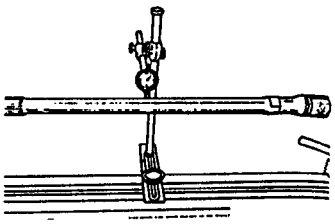
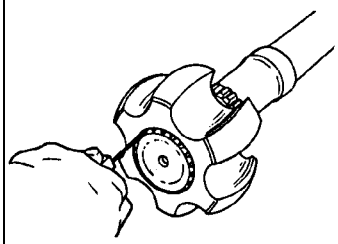
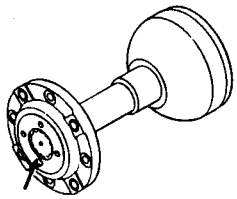
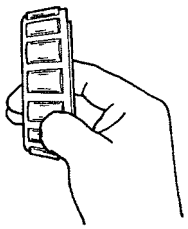
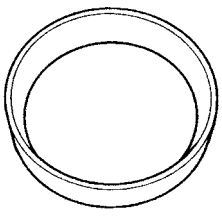
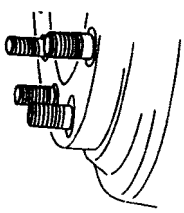
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

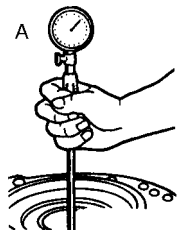
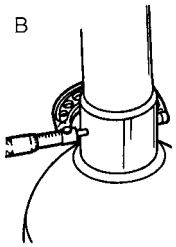
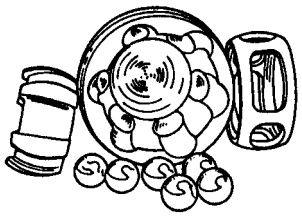
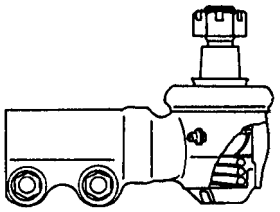
(1) Refer to the section **"DATA AND SPECIFICATIONS"**.

INSPECTION AND REPAIR

EN0851002H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Axle shaft: Bend and damage	**0.8 {0.031}**	**1.5 {0.059}**	**Replace.**	**Measure** 
Axle shaft spline and birfield joint spline: Wear, damage and backlash	**0.08-0.17 {0.0031-0.0066}**	**0.34 {0.013}**	**Replace.**	**Visual check, Measure** 
Birfield joint shaft and drive flange spline: Wear, damage and backlash	**0.05-0.15 {0.006-0.11}**	**0.3 {0.012}**	**Replace.**	**Visual check, Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check**  **Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Knuckle spindle, bushing and birfield joint: Wear, damage and clearance (A-B)	**0.15-0.3 {0.006-0.11}**	**0.6 {0.023}**	**Replace.**	**Visual check, Measure**  **Visual check, Measure** 
Rollers and race: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Ball stud and seat: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS15) AX02-009

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS15) .. AX02-2

DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-6
OVERHAUL AX02-8
INSPECTION AND ADJUSTMENT AX02-14
INSPECTION AND REPAIR AX02-15

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS15)

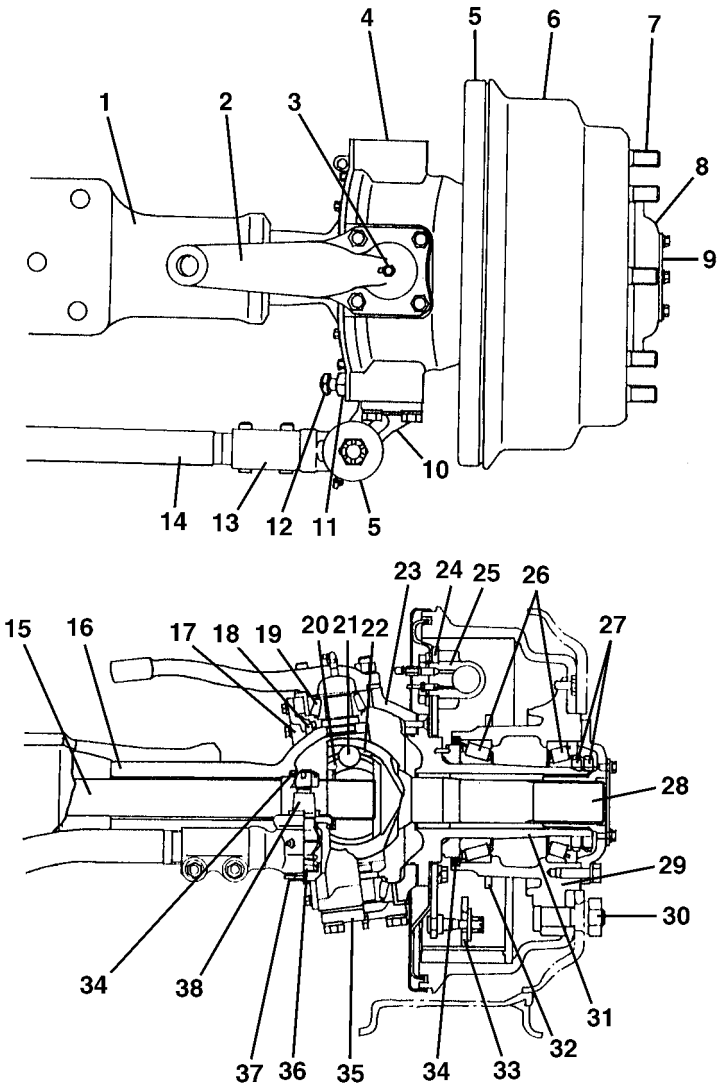
DATA AND SPECIFICATIONS

EN0851102I200001

Front axle series No.			**SS15**
Type			**Full-floating, single-reduction, single-speed by spiral bevel gearings with birfield joints**
Brake drum location			**Outboard mounted**
Wheel hub bearing			**Tapered roller bearing**
Socket pin bearing			
Wheel alignment	**Camber**		**0°**
	King pin angle		**6°-8°**
	Caster		**0°**
	Toe-in	**Diagonal tires**	**1-3 mm {0.0394-0.1181 in.}**
		Radial tires	**0-2 mm {0-0.0787 in.}**
Knuckle turning angle		**Inner turn**	**32°-35°**
		Outer turn	**28°**
Housing			**Cast steel banjo type with carbon steel tubing**
Amount of grease in a hub			**500 g {18 oz.} at one wheel**
Oil capacity			**Approx. 7 L {1.539 lmp gal./ 1.849 U.S. gal.}**

DESCRIPTION

EN0851102C100001



SHTS085110200001

1	Axle housing	14	Tie rod	27	Bearing lock nut
2	Knuckle arm	15	Axle shaft	28	Birfield joint
3	Lubrication fitting	16	Trunnion socket	29	Wheel hub
4	Knuckle housing	17	Trunnion socket cover	30	Wheel nut
5	Dust cover	18	Dust seal	31	Knuckle spindle
6	Brake drum	19	Socket pin bearing	32	ABS sensor ring (If so equipped)
7	Wheel bolt	20	Inner race	33	Brake shoe
8	Drive flange	21	Joint ball	34	Oil seal
9	Drive flange cover	22	Joint ball cage	35	Bearing cover
10	Tie-rod arm	23	Socket pin cage	36	Spring
11	Lock nut	24	Brake assembly	37	Seat
12	Stopper bolt	25	Wheel brake cylinder	38	Ball stud
13	Tie-rod end	26	Wheel hub bearing		

TROUBLESHOOTING

EN0851102F300001

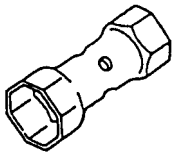
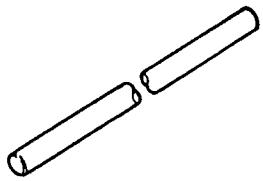
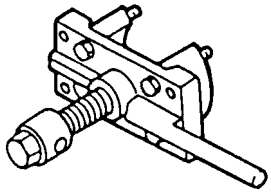
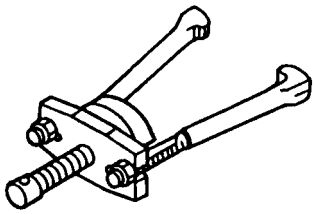
Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate.
	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out or damaged socket pin bearing	Replace socket pin bearings.
	Tire pressure is too low	Inflate to proper pressure.
Vibration or shimmy	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	The preload of the wheel bearing is off	Adjust wheel bearing preload.
	Badly worn hub bearings	Replace hub bearings.
	Loose tie-rod ends ball joints	Replace all the tie-rod ends.
	Loose U-bolt nuts holding the springs to the beams	Tighten the nuts properly.
	Loose hub nuts	Tighten the hub nuts properly.
	Distorted disc wheels	Replace the disc wheel.
	The tires are out of balance	Balance the tires.
	Run-out of the tire and wheel rim	Correct the run-out of the tire and wheel rim.
	Tire and wheel are out of balance	Balance the wheel using a balancing machine.
	Tire pressure is not uniform or sufficient	Adjust the pressure of all tires.
	Other faults in the steering system	Refer to the chapter **"STEERING EQUIPMENT"**.
Abnormal tire wear	Incorrect front wheel alignment	Adjust properly or replace parts, if necessary.
	Improper tire pressure	Adjust to proper pressure.
Grease leakage from wheel hub	Worn out oil seal	Replace oil seal.
	Too much grease	Apply only the specified amount of grease.
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearings preload.
	Loose differential side bearings	Adjust bearings preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Front axle system)	Worn front axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
	Loose socket pin bearings	Adjust bearing preload.

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil; check for leakage.
	Insufficient grease	Add grease.
	Poor oil quality	Change oil.
	Poor grease quality	Change grease.
	Abnormal noise of propeller shaft	Refer to the chapter **"PROPELLER SHAFT"**.

SPECIAL TOOL

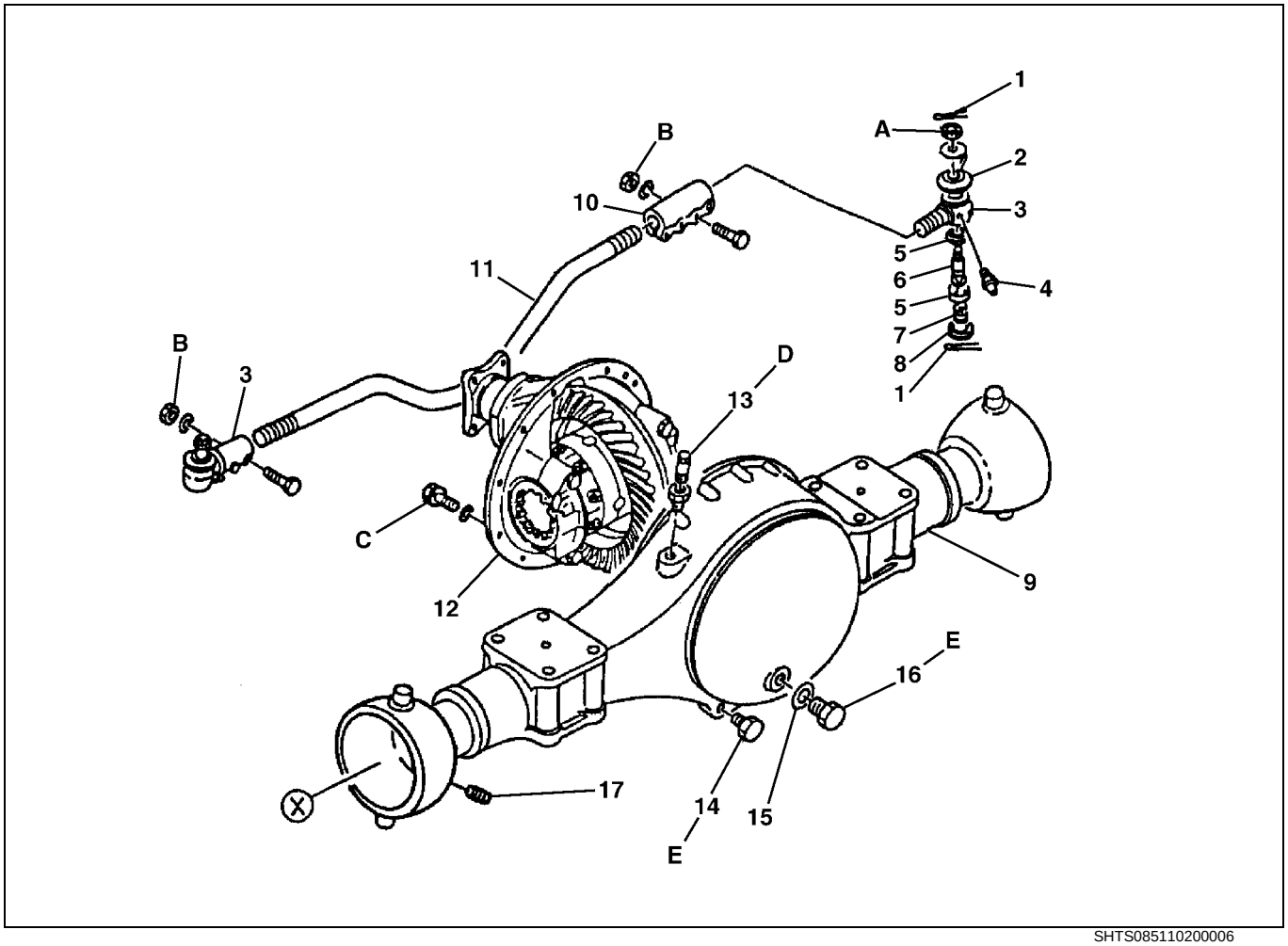
EN0851102K100001

Prior to starting a front axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0983-90101	SOCKET WRENCH	
	S0984-92001	HANDLE	
	S0965-01790	WHEEL HUB PULLER	
	S0965-01310	HUB BEARING PULLER	

COMPONENT LOCATOR

EN0851102D100001

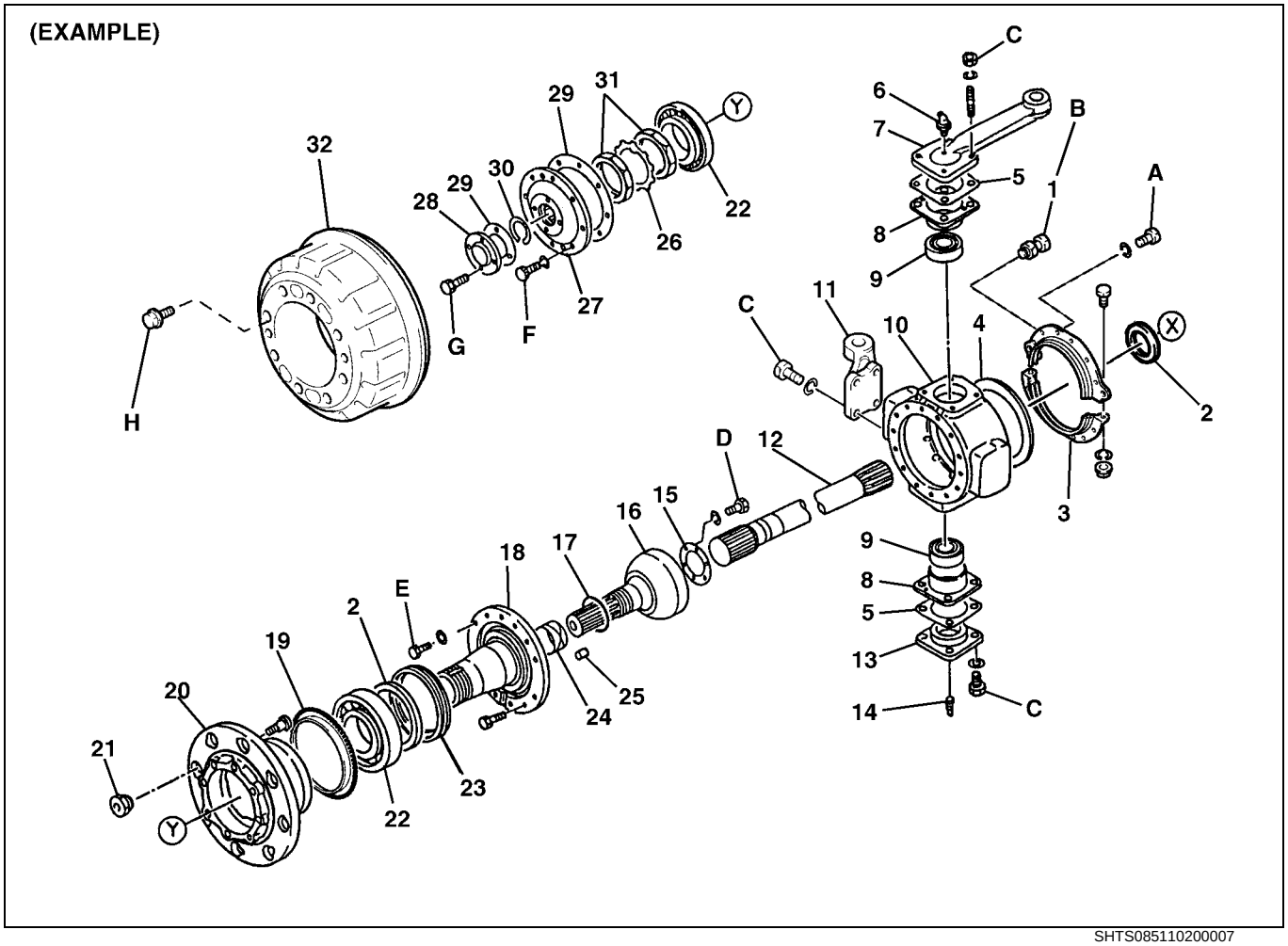


SHTS085110200006

1	Cotter pin	10	Tie-rod turn buckle
2	Dust cover	11	Tie rod
3	Tie-rod end	12	Differential carrier assembly
4	Lubrication fitting	13	Air breather
5	Seat	14	Oil drain plug
6	Ball stud	15	Gasket
7	Spring	16	Oil filler plug
8	Spring seat	17	Plug
9	Axle housing		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	147-343 {1,500-3,500, 109-253}	D	9.8-19.6 {100-200, 7.3-14.4}
B	85.5-114.5 {872-1,167, 63-84}	E	78.5-117.5 {800-1,200, 58-86}
C	109-147 {1,100-1,500, 80-108}		



SHTS085110200007

1	Stopper bolt	17	O-ring
2	Oil seal	18	Knuckle spindle
3	Trunnion socket cover	19	ABS sensor ring (If so equipped)
4	Dust seal	20	Wheel hub
5	Shim	21	Wheel nut
6	Lubrication fitting	22	Hub bearing
7	Knuckle arm (Driver's side)	23	Oil seal guide
8	Socket pin cage	24	Bushing
9	Socket pin bearing	25	Guide pin
10	knuckle	26	Lock plate
11	Tie-rod arm	27	Drive flange
12	Axle shaft	28	Drive flange cover
13	Bearing cover	29	Gasket
14	Plug	30	Retainer ring
15	Plate	31	Lock nut
16	Birfield joint	32	Brake drum

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	19-25 {193-257, 13.9-18.3}	E	85.5-114.5 {900-1,200, 65-86}
B	95.5-144.5 {974-1,470, 71-106}	F	108.5-147.5 {1,107-1,500, 80-108}
C	105.5-144.5 {1,100-1,500, 80-108}	G	13-18 {130-190, 9-13}
D	5-7 {50-70, 4-5}	H	20.5-39.5 {210-400, 15-29}

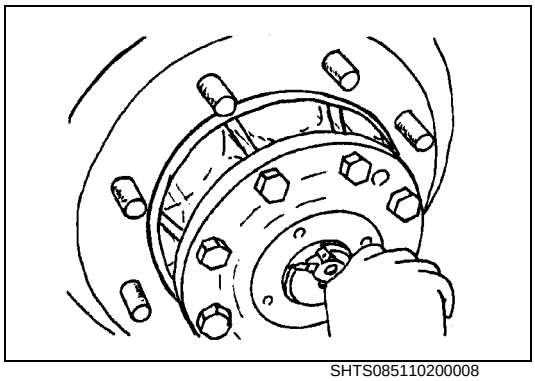
OVERHAUL

EN0851102H200001

IMPORTANT POINTS - DISMOUNTING

1. REMOVAL OF THE WHEELS

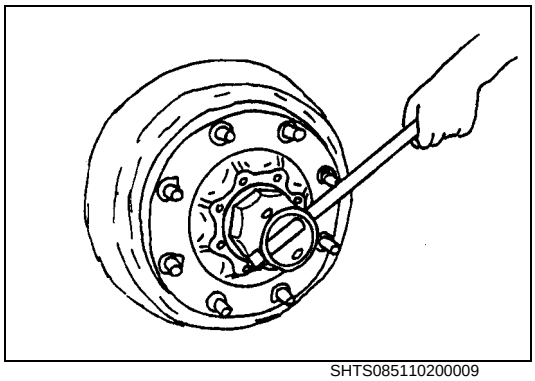
(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS085110200008

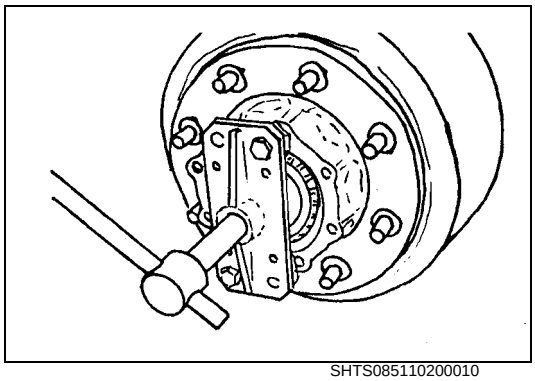
2. DISMOUNTING OF THE WHEEL HUB

(1) Remove the retainer ring which secures the drive flange to shaft of the birfield joint.



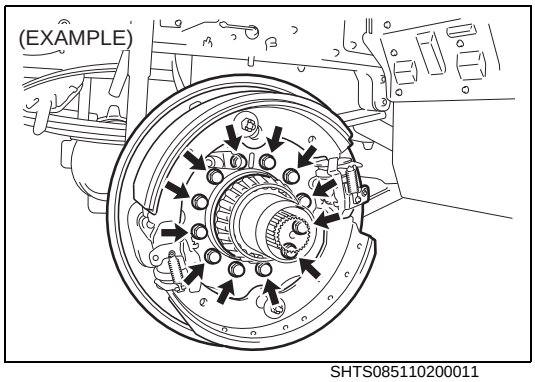
SHTS085110200009

(2) Flatten the pawl of lock washer and remove the two lock nuts.
SST:
Socket Wrench (S0983-90101)
Handle (S0984-92001)



SHTS085110200010

(3) Remove the wheel hub together with the brake drum.
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-92001)

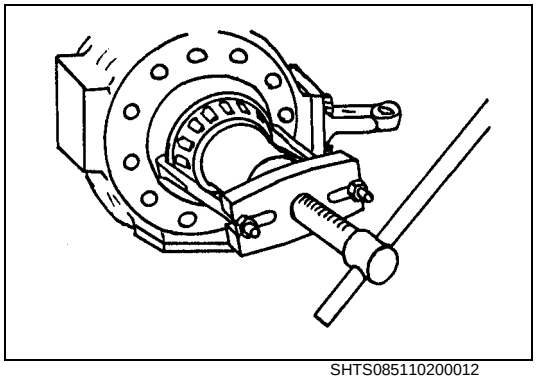


SHTS085110200011

3. DISMOUNTING OF THE WHEEL BRAKE

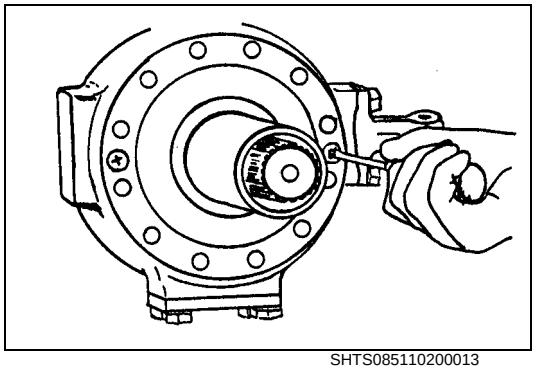
(1) Disconnect the brake hose.
(2) Remove the oil seal.
(3) Remove the bolts and then remove the wheel brake.

NOTICE
If the brake hose is disconnected, bleed air from the brake lines.


SHTS085110200012

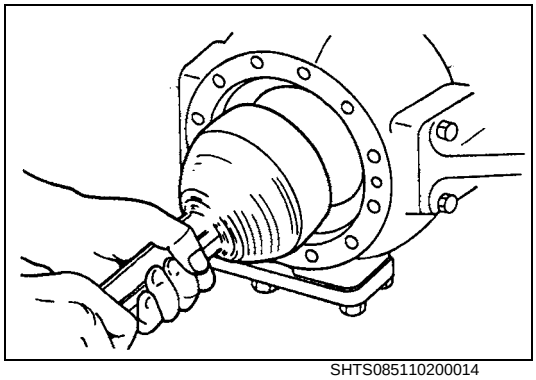
4. DISMOUNTING OF THE KNUCKLE SPINDLE

(1) Remove the inner bearing and oil seal guide from the knuckle spindle.
SST:
Hub Bearing Puller (S0965-01310)
Handle (S0984-92001)


SHTS085110200013

(2) Remove the knuckle spindle.

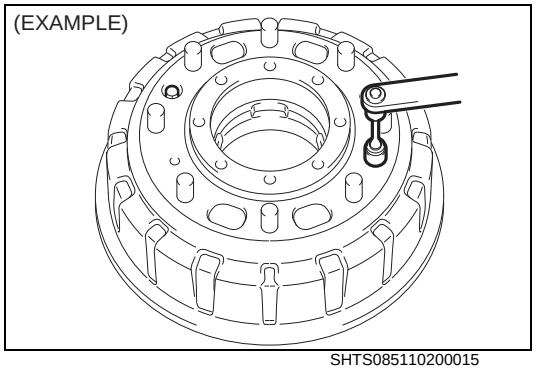
NOTICE
When removing the knuckle spindle, be careful not to damage the bushing fitted in the knuckle spindle.


SHTS085110200014

5. REMOVAL OF THE AXLE SHAFT ASSEMBLY

(1) Remove the birfield joint together with the axle shaft.

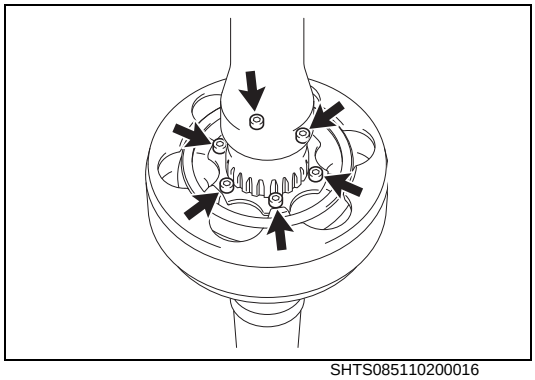
NOTICE
When removing the birfield joint, be careful not to damage the oil seal fitted in the axle housing tube.



SHTS085110200015

6. SEPARATION OF THE BRAKE DRUM AND WHEEL HUB

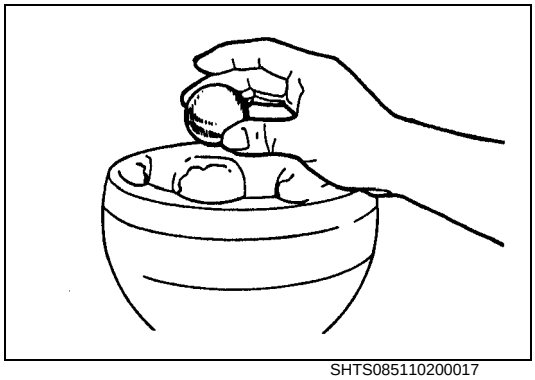
(1) Remove the bolts, and separate the brake drum and wheel hub.


SHTS085110200016

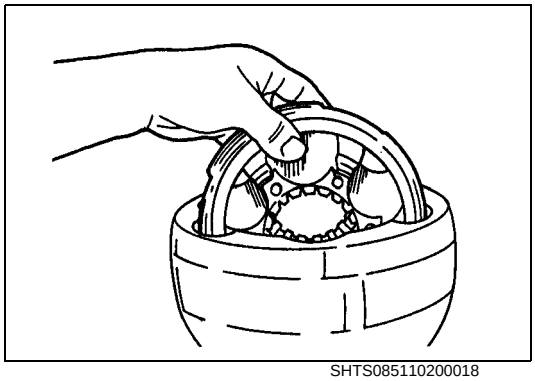
IMPORTANT POINT - DISASSEMBLY

1. DISASSEMBLY OF THE AXLE SHAFT ASSEMBLY

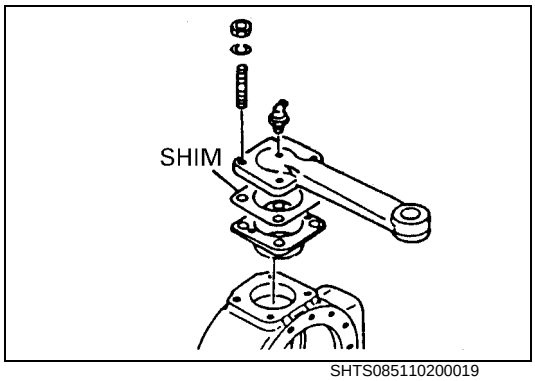
(1) Remove the hexagon bolts which are retaining the lock plate to the inner race, and then disconnect the axle shaft.


SHTS085110200017

(2) Pushing the bearing cage downward and then upward in the bearing housing, take out the ball bearing one by one.


SHTS085110200018

(3) Place the bigger slot on the cage to one of the bosses on the bearing housing, and then pull the cage and inner race from the housing.



SHTS085110200019

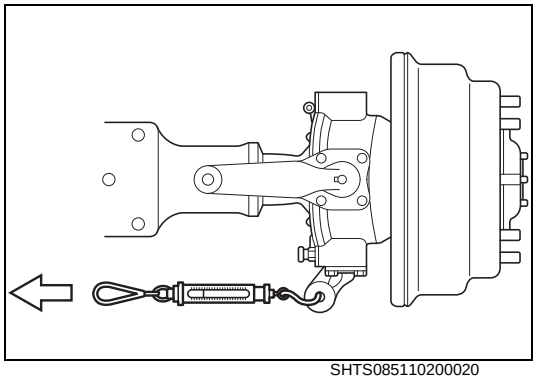
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY AND ADJUSTMENT OF THE KNUCKLE

(1) Adjust the turning force of knuckle body with shims.

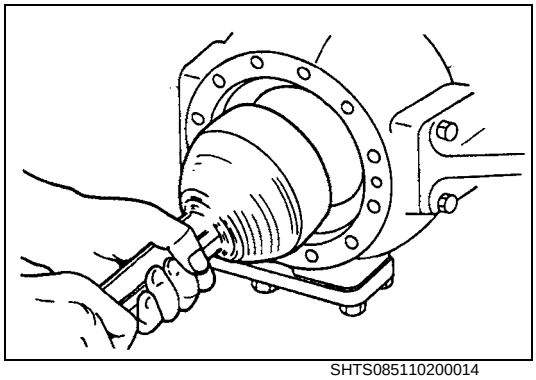
Turning Force: 5.9-10.8 N·m {60-110 kgf·cm, 4.4-7.9 lbf·ft}
Turning Force (with dust seal):
Less than 52.0 N·m {530 kgf·cm, 38.0 lbf·ft}

Adjusting shims Thickness: 0.1 mm {0.0039 in.}
0.2 mm {0.0079 in.}
0.5 mm {0.0020 in.}


SHTS085110200020

NOTICE

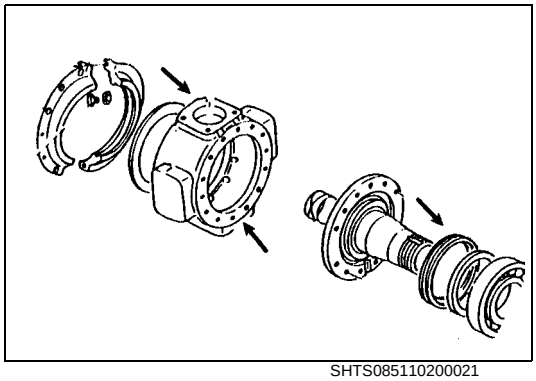
- **In case of reassembling, insert the shim of the same thickness as that used in the previous assembling.**
- **Lubricate the bearings with bearing grease sufficiently.**


SHTS085110200014

(2) Insert the birfield joint with axle shaft.

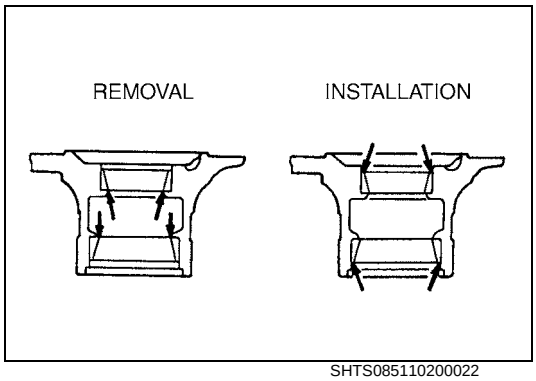
NOTICE

- **Apply grease to the inner surface of oil seal.**
- **Be careful not to damage the oil seal.**
- **Lubricate the inside of birfield joint and knuckle body with bearing grease sufficiently.**


SHTS085110200021

NOTICE

Apply the liquid gasket (ThreeBond #1215 or #1216 or equivalent) to the both faces of knuckle body (spindle side and trunnion socket cover side) and to the spindle side of the oil seal guide.

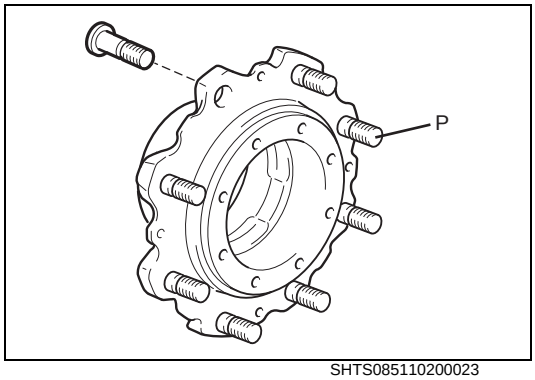


SHTS085110200022

2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.

(2) To install the outer race, use a tapping rod and a hammer, or a press.



SHTS085110200023

3. REPLACEMENT OF THE WHEEL BOLT

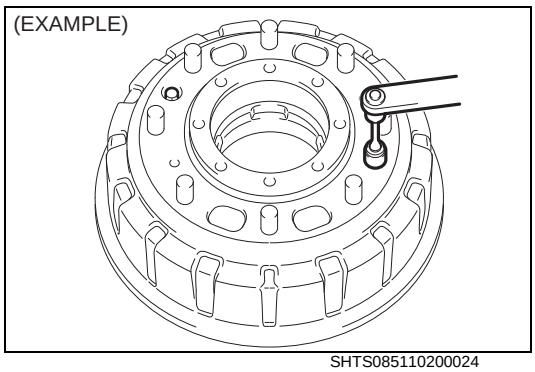
(1) Using a brass bar or a hammer, drive out the wheel bolts from the wheel hub.

(2) Using a copper hammer, drive the new wheel bolts into the wheel hub.

NOTICE

- **The left and right wheel bolts differ, so install them according to the chart below.**

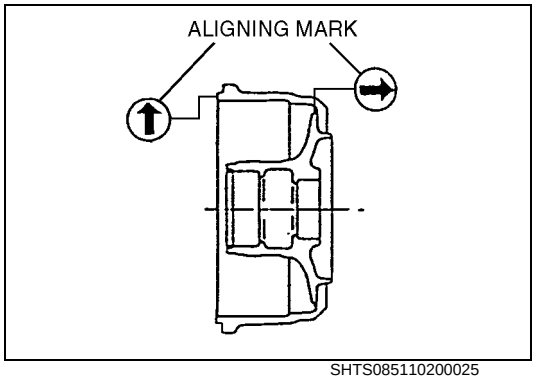
	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



SHTS085110200024

4. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB

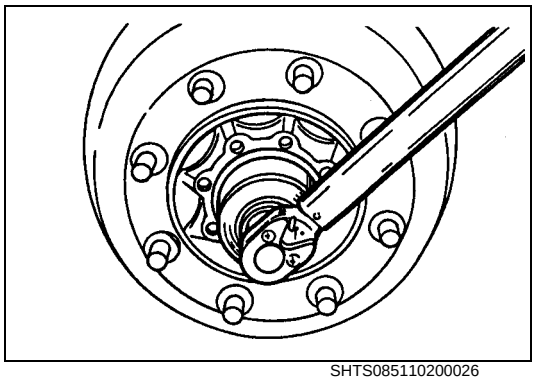
(1) Assemble the brake drum and wheel hub, and tighten the bolts.



SHTS085110200025

NOTICE

When assembling the brake drum and wheel hub, make sure that their aligning marks are oriented as closely to each other as possible.


SHTS085110200026

5. ADJUSTMENT OF THE WHEEL BEARING PRELOAD

NOTICE

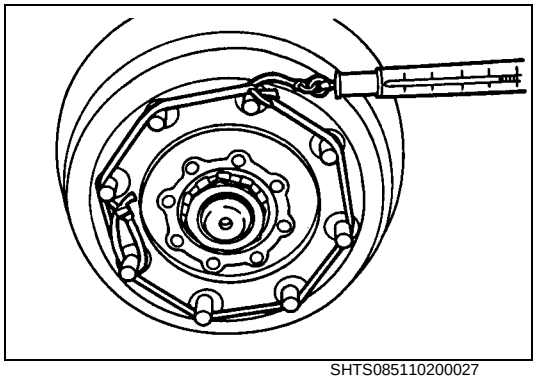
- **Before mounting the wheel hub, lubricate inside of wheel hub with bearing grease sufficiently.**
  Volume of grease: 500 g {18 oz.} / wheel
- **While assembling of the hub bearing, take care not to contaminate the hub inside and grease with chips and dust.**
- **Apply grease to the inner surface of oil seal.**

(1) Tighten the inner nut while turning the wheel hub, and turn it back 1/3-1/4 turn, tap the around of wheel hub with copper hammer.
Tightening Torque:
588.4 N·m {6,000 kgf·cm, 434 lbf·ft}

SST: Socket Wrench (S0983-90101)

(2) Install the lock plate and tighten the outer nut.
Tightening Torque:
588.4 N·m {6,000 kgf·cm, 434 lbf·ft}

SST: Socket Wrench (S0983-90101)

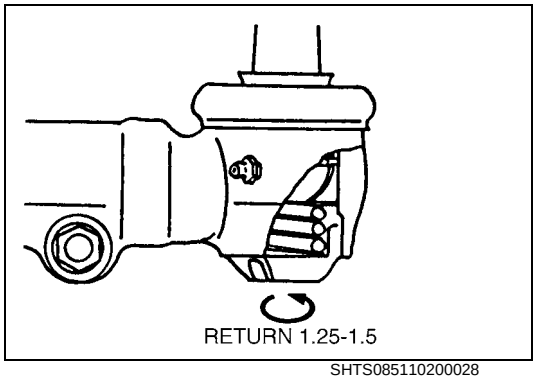


SHTS085110200027

(3) Measure the wheel bearing preload, and bend the lock washer for 2 points.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**4.9-8.9 {50-90, 3.7-6.5}**
Spring balancer reading N {kgf, lbf}	**34.3-60.8 {3.5-6.2, 7.8-13.6}**



SHTS085110200028

6. ASSEMBLY OF THE TIE-ROD END

NOTICE

- **Apply the chassis grease to the ball stud.**
- **Tighten the plug fully, and then turn it back 1.25-1.5 turn.**

7. LUBRICATION FOR KNUCKLE AND BIRFIELD JOINT

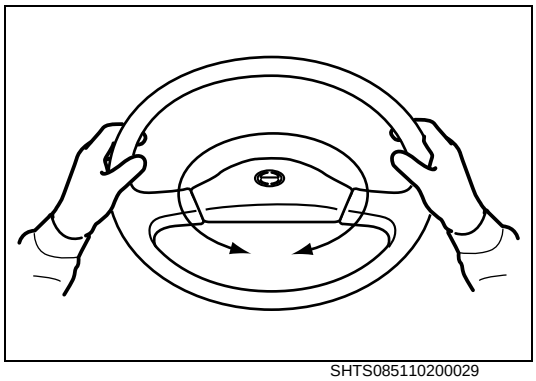
(1) On completion of front axle and related parts reassembly, lubricate the knuckle and birfield joint with bearing grease by inducting from lubrication fitting on the knuckle body until grease comes out from plug holes.

NOTICE

Before greasing, remove the plug on the spherical part at end of the knuckle body.

8. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS085110200029

9. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

10. ADJUSTMENT OF BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE

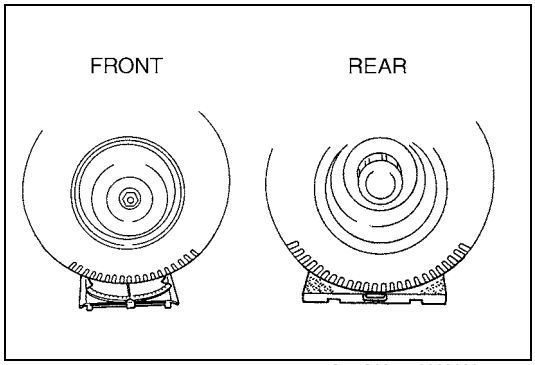
(1) On completion of the front axle overhaul, conduct the followings:

a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.

b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND ADJUSTMENT

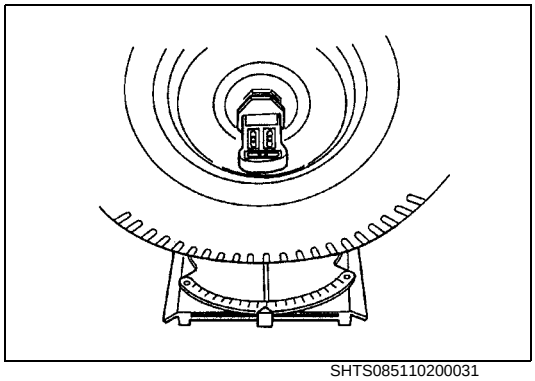
EN0851102H300001



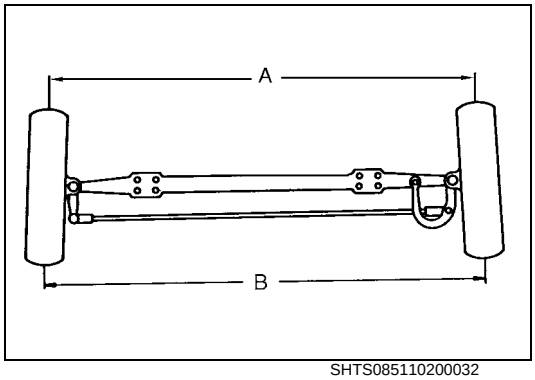
SHTS085110200030

1. INSPECTION OF THE WHEEL ALIGNMENT

(1) Park the vehicle on a level surface and check the tire pressure.


SHTS085110200031

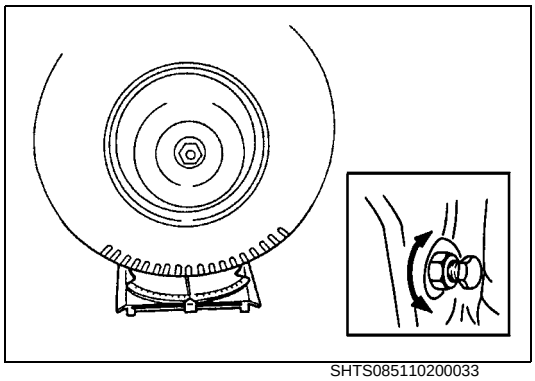
(2) Adjust the king pin inclination, caster, and camber.
Refer to the section **"DATA AND SPECIFICATIONS"**.



SHTS085110200032

(3) Check the toe-in.

- **B - A =Toe-in**


SHTS085110200033

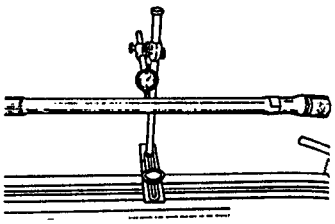
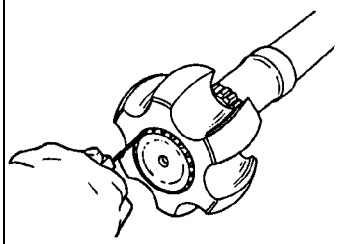
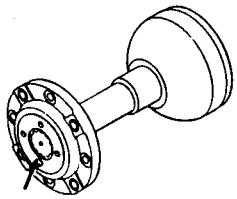
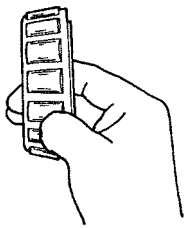
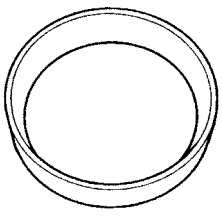
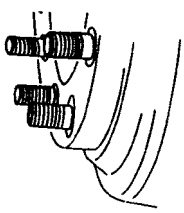
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

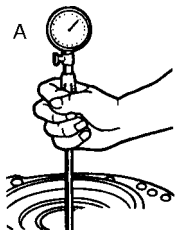
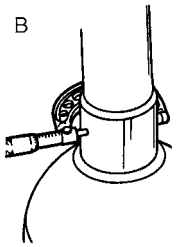
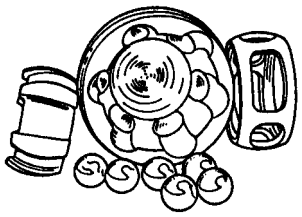
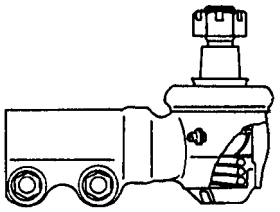
(1) Refer to the section **"DATA AND SPECIFICATIONS"**.

INSPECTION AND REPAIR

EN0851102H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Axle shaft: Bend and damage	**0.8 {0.031}**	**1.5 {0.059}**	**Replace.**	**Measure** 
Axle shaft spline and birfield joint spline: Wear, damage and backlash	**0.08-0.17 {0.0031-0.0066}**	**0.34 {0.013}**	**Replace.**	**Visual check, Measure** 
Birfield joint shaft and drive flange spline: Wear, damage and backlash	**0.05-0.15 {0.006-0.11}**	**0.3 {0.012}**	**Replace.**	**Visual check, Measure** 
Bearing and race: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check**  **Visual check** 
Wheel bolts: Threads wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Knuckle spindle, bushing and birfield joint: Wear, damage and clearance (A-B)	**0.15-0.3 {0.006-0.11}**	**0.6 {0.023}**	**Replace.**	**Visual check, Measure**  **Visual check, Measure** 
Rollers and race: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Ball stud and seat: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH13) AX03-001

REAR AXLE AX03-2
DATA AND SPECIFICATIONS AX03-2
DESCRIPTION AX03-2
TROUBLESHOOTING AX03-3
SPECIAL TOOL AX03-4
COMPONENT LOCATOR AX03-5
OVERHAUL AX03-6
INSPECTION AND REPAIR AX03-10

REAR AXLE

DATA AND SPECIFICATIONS

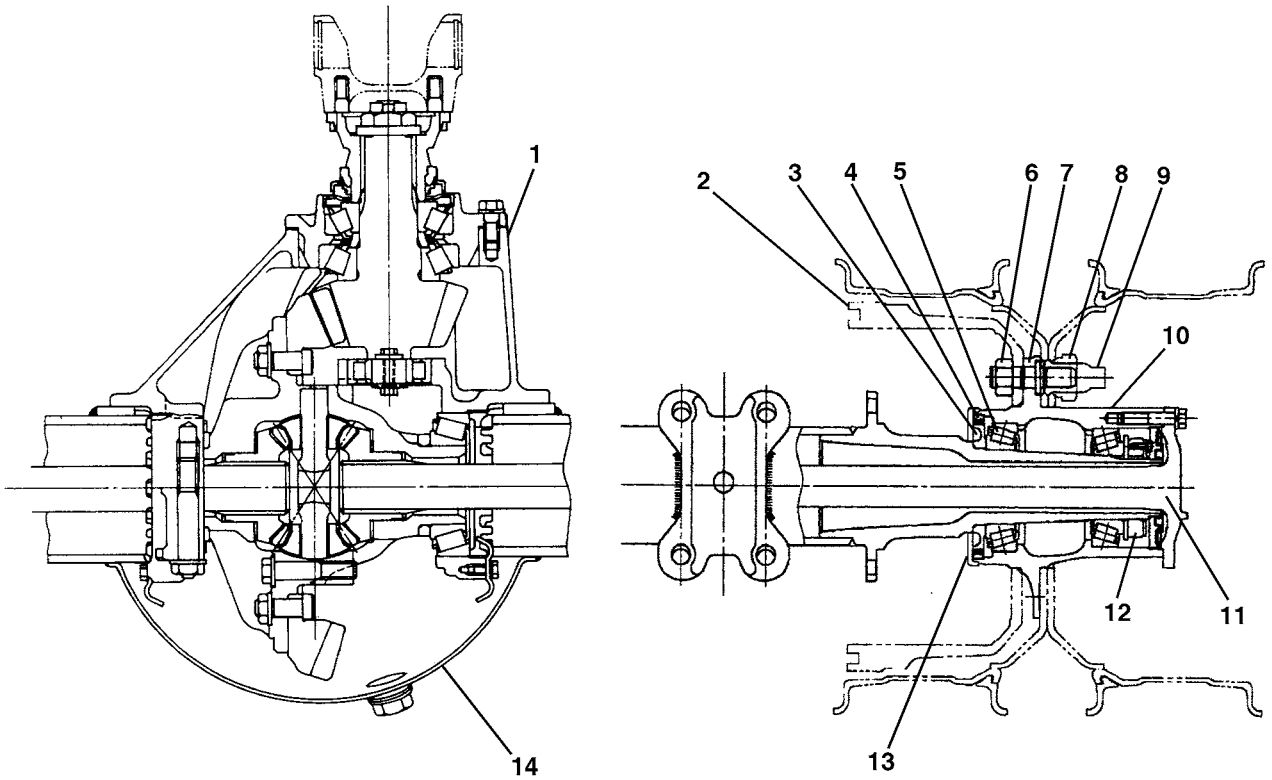
EN0850403I200001

Type	**Full-floating axle shaft**
Housing	**Banjo type, with extension tubes welded on both ends**
Type of drive	**Hotchkiss drive**

DESCRIPTION

EN0850403C100001

(REPRESENTATIVE TYPE)



SHTS085040300001

1	Differential carrier assembly	8	Outer wheel nut
2	Brake drum	9	Inner wheel nut
3	Oil seal collar	10	Wheel hub
4	Oil seal	11	Axle shaft
5	Wheel hub bearing	12	Lock nut
6	Wheel bolt fitting nut	13	ABS sensor ring (If so equipped)
7	Wheel bolt	14	Axle housing

TROUBLESHOOTING

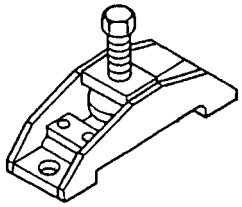
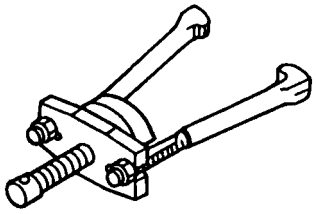
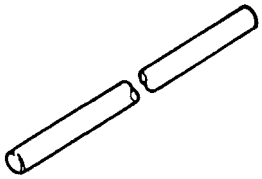
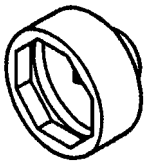
EN0850403F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearings preload.
	Loose differential side bearings	Adjust bearings preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Rear axle system)	Worn rear axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil; check for leakage.
	Poor oil quality	Change oil.
	Abnormal noise of propeller shaft	Refer to the chapter **"PROPELLER SHAFT"**.

SPECIAL TOOL

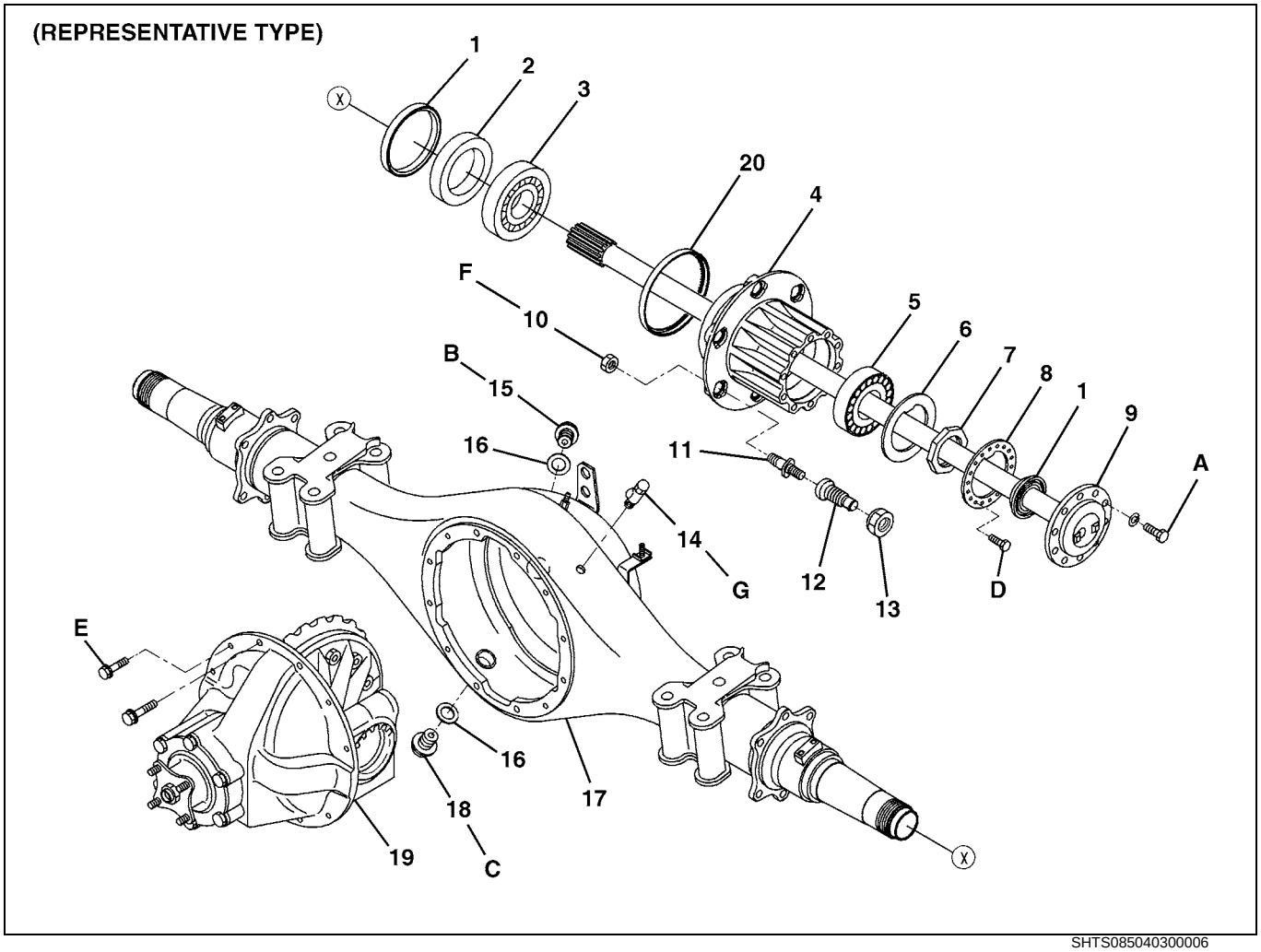
EN0850403K100001

Prior to starting a rear axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-02051	WHEEL HUB PULLER	
	S0965-02090	HUB BEARING PULLER	
	S0984-91601 S0984-92001	HANDLE	
	S0983-99401	SOCKET WRENCH	

COMPONENT LOCATOR

EN0850403D100001



SHTS085040300006

1	Oil seal	11	Wheel bolt
2	Oil seal collar	12	Inner wheel nut
3	Inner wheel hub bearing	13	Outer wheel nut
4	Wheel hub	14	Air breather
5	Outer wheel hub bearing	15	Oil filler plug
6	Lock washer	16	Gasket
7	Lock nut	17	Axle housing assembly
8	Lock plate	18	Oil drain plug
9	Axle shaft	19	Differential carrier assembly
10	Wheel bolt fitting nut	20	ABS sensor ring (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	84.5-107.5 {862-1,097, 63-79}	E	ϕ12: 84.5-107.5 {862-1,097, 63-79}
B	78.4-117.6 {800-1,200, 58-86}		ϕ14: 113-147 {1,152-1,499, 83-108}
C	78.4-117.6 {800-1,200, 58-86}	F	392-470 {4,000-4,800, 290-347}
D	8.33-10.79 {85-110, 6.2-8.0}	G	9.8-19.6 {100-200, 7-14}

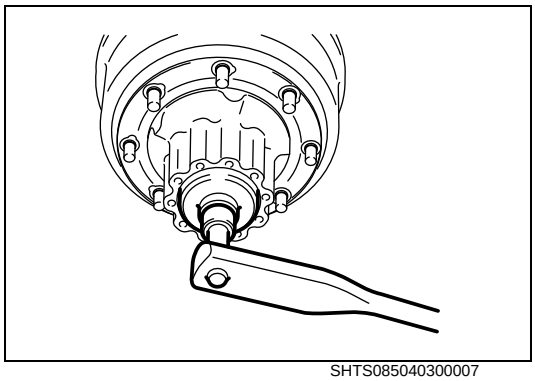
OVERHAUL

EN0850403H200001

IMPORTANT POINTS - DISASSEMBLY

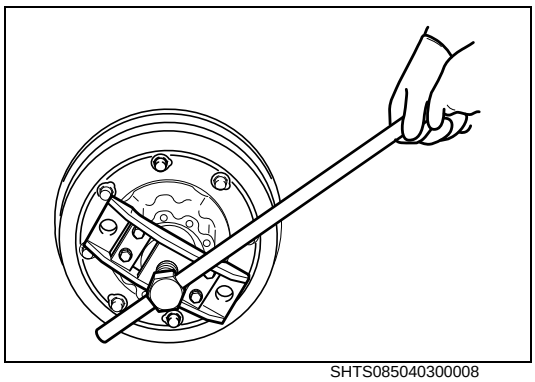
1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



SHTS085040300007

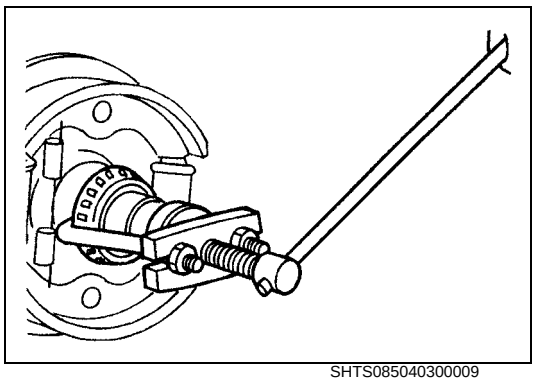
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST: Socket Wrench (S0983-99401)



SHTS085040300008

3. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-02051)
Handle (S0984-91601)
Handle (S0984-92001)

NOTICE
The wheel hub assembly is heavy, therefore be careful when handling it.

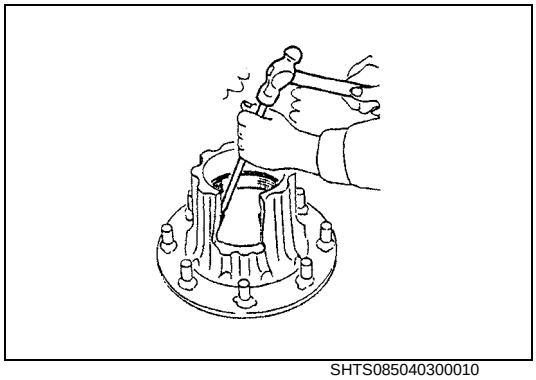


SHTS085040300009

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR
SST:
Hub Bearing Puller (S0965-02090)
Handle (S0984-91601)
Handle (S0984-92001)

5. REMOVAL OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.

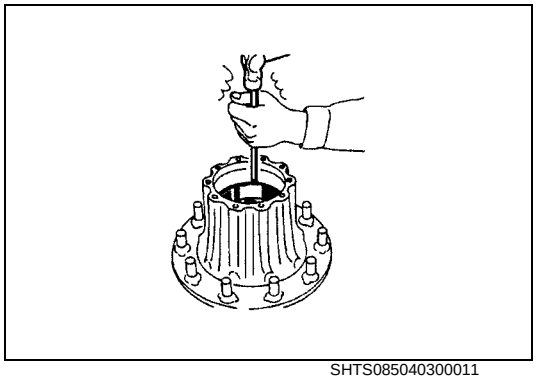


SHTS085040300010

IMPORTANT POINTS - ASSEMBLY

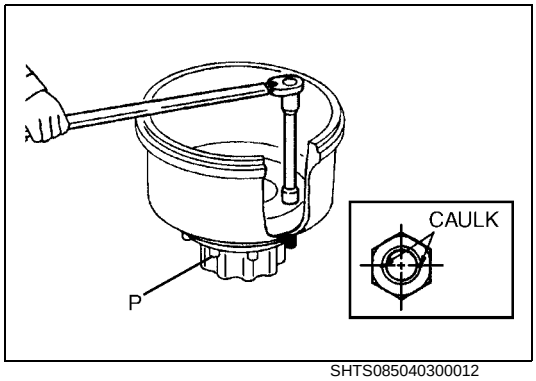
1. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.



SHTS085040300011

(2) Using a tapping rod and a hammer or a press, install the outer race.



SHTS085040300012

2. REPLACEMENT OF THE WHEEL BOLTS

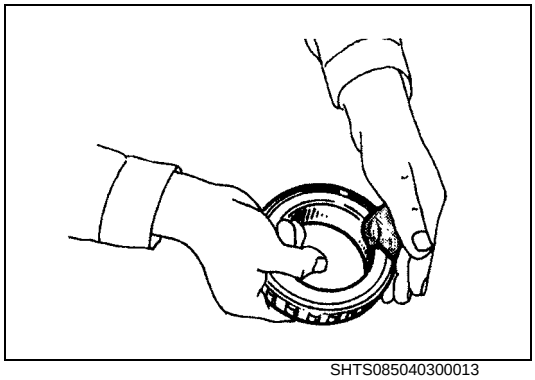
NOTICE

The left and right wheel bolts differ, so install them according to the chart below.

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**

NOTICE

Caulk the lock nuts at two points after tightening to the specified torque.

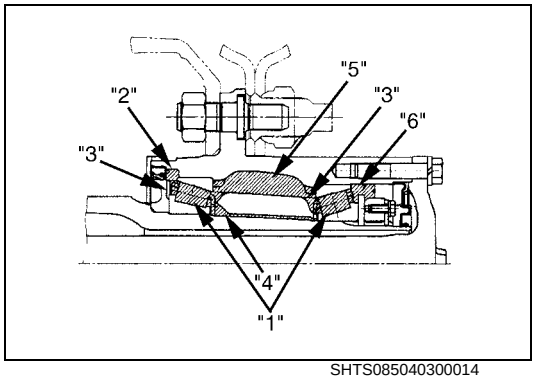

SHTS085040300013

3. GREASING

(1) Pack sufficient amount of wheel hub bearing grease between the bearing rollers.

NOTICE

"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.

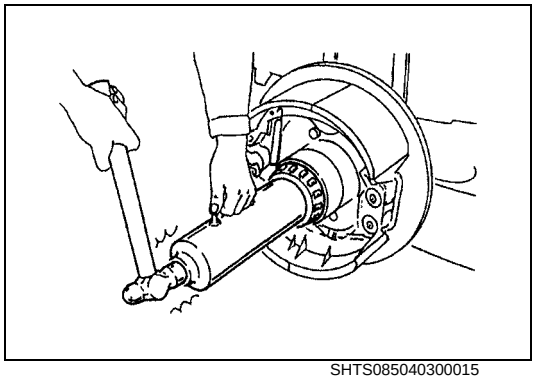


SHTS085040300014

(2) Apply wheel hub bearing grease to wheel hub.

NOTICE

- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the end of race circumferentially with the width of 15 mm {0.591 in.}.**
- **"5": When filling the grease to this space, do it up to the line which connects between the small diameter sides edges of 2 bearings.**
- **"6": Fill the grease up the half depth of the lock nut.**

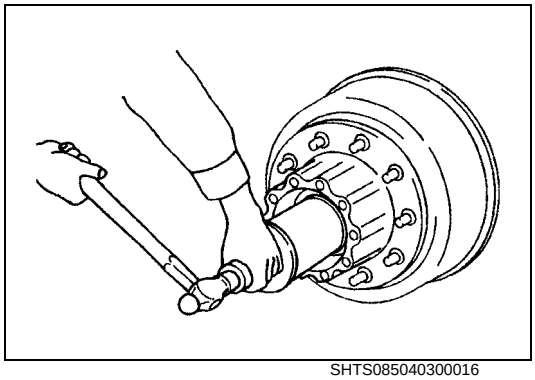

SHTS085040300015

4. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the oil seal and the inner wheel hub bearing.

NOTICE

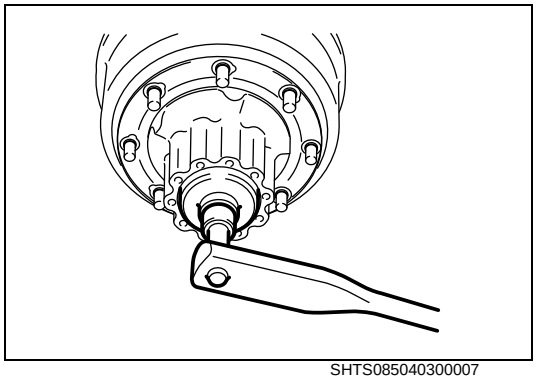
If the collar is warmed up with hot water, it can easily be installed.


SHTS085040300016

(2) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

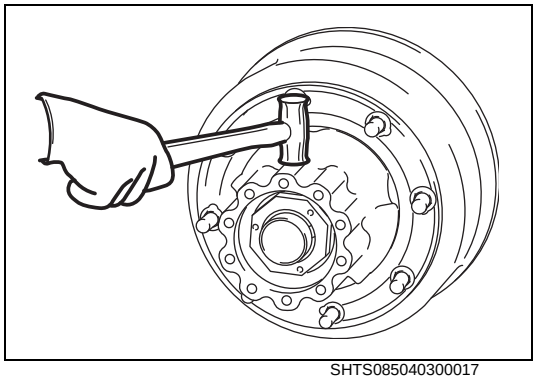
- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS085040300007

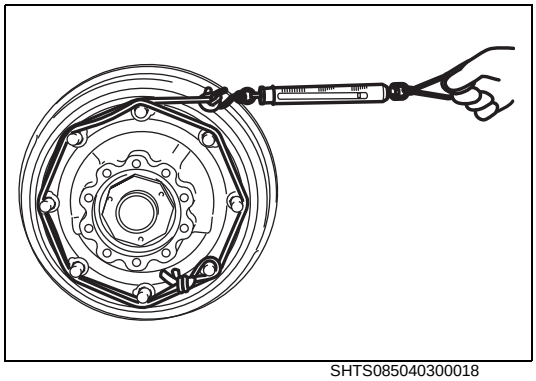
5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.
SST: Socket Wrench (S0983-99401)

Tightening Torque:
588-882 N·m {6,000-9,000 kgf·cm, 433-650 lbf·ft}


SHTS085040300017

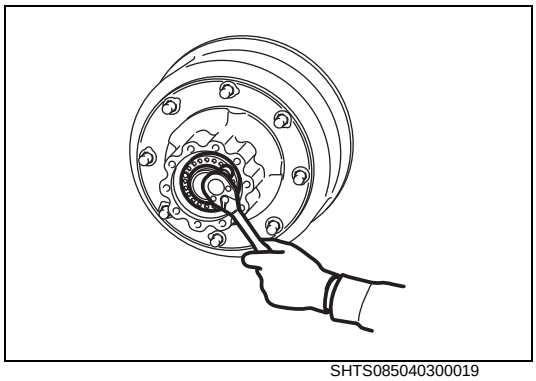
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.


SHTS085040300018

(3) Measure the wheel bearing preload and adjust the preload with the lock nut, if it exceeds or is less than that specified below.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**4.0-5.4 {39-53, 2.9-4.0}**
Spring balancer reading N {kgf, lbf}	**36.0-48.6 {3.6-4.8, 7.9-10.5}**


SHTS085040300019

6. INSTALLATION OF THE LOCK PLATE

(1) Install the lock plate to the lock nut.

NOTICE

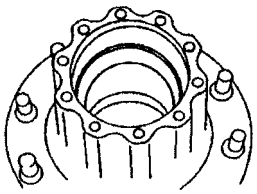
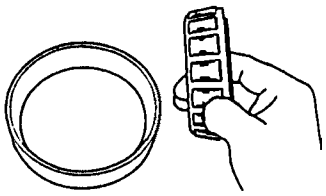
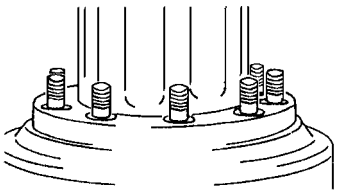
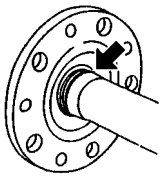
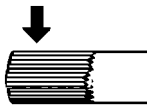
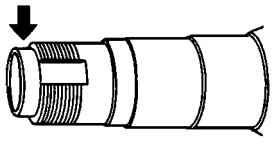
- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

7. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT

(1) On completion of the front axle overhaul, conduct the followings:
   a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.
   b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND REPAIR

EN0850403H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Wheel hub bearing race: Burns, pitting and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel hub bearings: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel bolt: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal collar: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle shaft spline: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check**  
Axle tube: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH14) AX03-002

REAR AXLE AX03-2
DATA AND SPECIFICATIONS AX03-2
DESCRIPTION AX03-2
TROUBLESHOOTING AX03-4
SPECIAL TOOL AX03-5
COMPONENT LOCATOR AX03-6
OVERHAUL AX03-8
INSPECTION AND REPAIR AX03-13

REAR AXLE

DATA AND SPECIFICATIONS

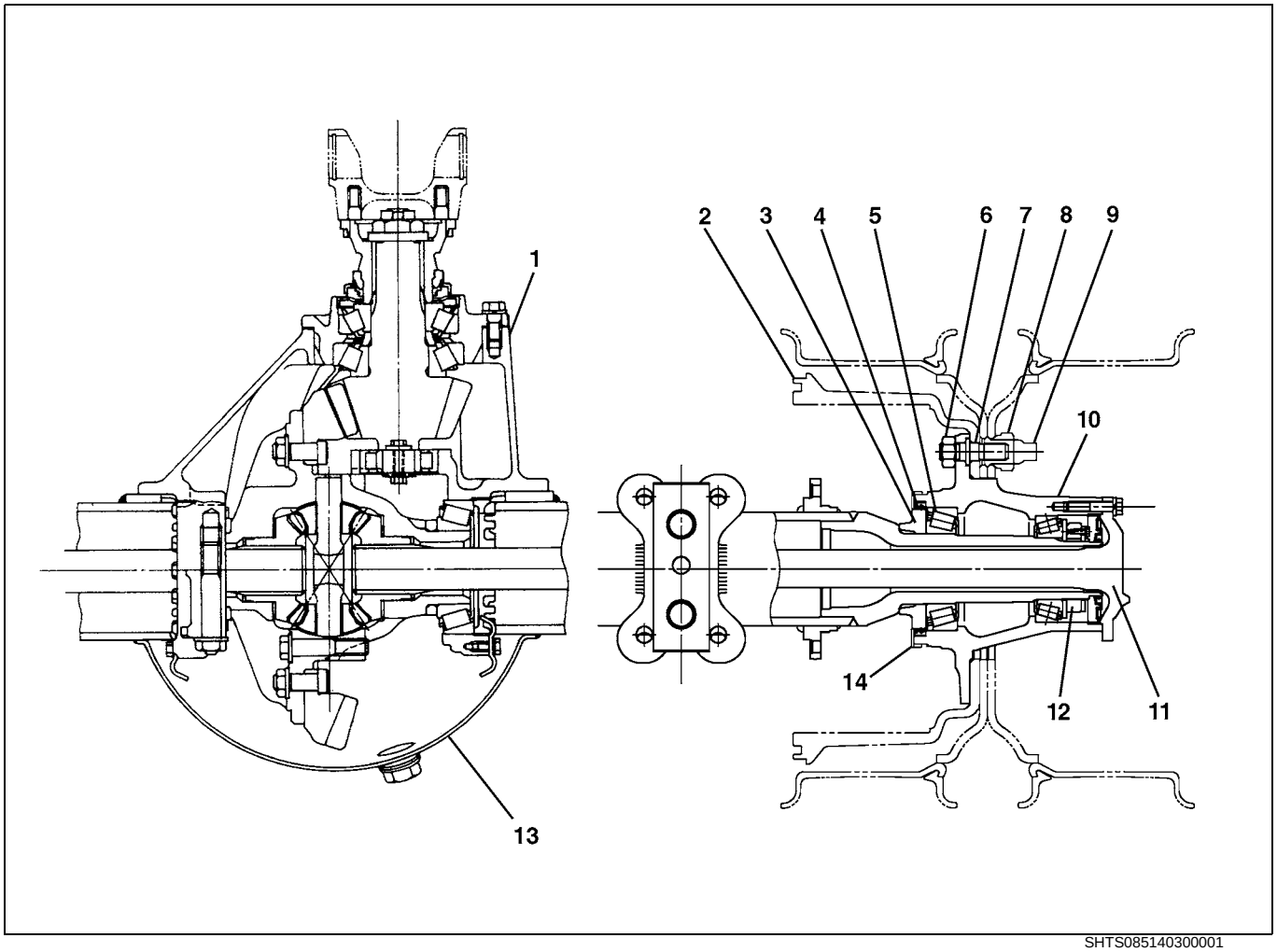
EN0851403I200001

Type	**Full-floating axle shaft**
Housing	**Banjo type, with extension tubes welded on both ends**
Type of drive	**Hotchkiss drive**

DESCRIPTION

EN0851403C100001

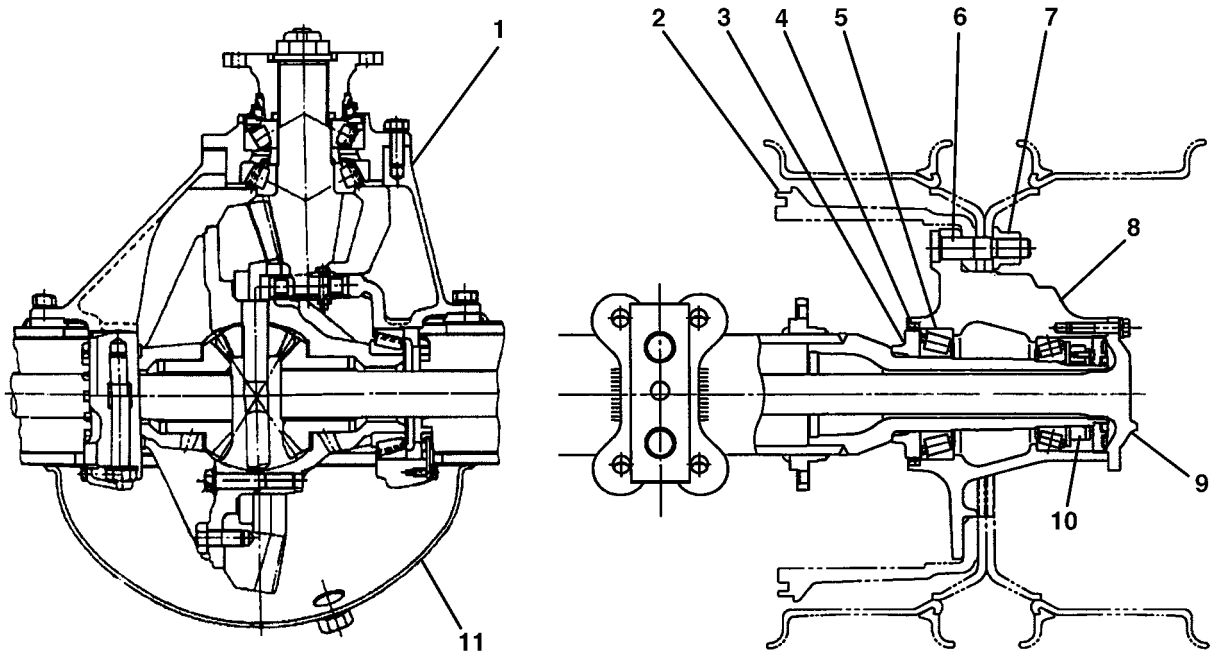
JIS TYPE WHEEL



SHTS085140300001

1	**Differential carrier assembly**	**8**	**Outer wheel nut**
2	**Brake drum**	**9**	**Inner wheel nut**
3	**Oil seal collar**	**10**	**Wheel hub**
4	**Oil seal**	**11**	**Axle shaft**
5	**Wheel hub bearing**	**12**	**Lock nut**
6	**Wheel bolt fitting nut**	**13**	**Axle housing**
7	**Wheel bolt**	**14**	**ABS sensor ring (If so equipped)**

ISO TYPE WHEEL



SHTS085140300002

1	Differential carrier assembly	7	Wheel nut
2	Brake drum	8	Wheel hub
3	Oil seal collar	9	Axle shaft
4	Oil seal	10	Lock nut
5	Wheel hub bearing	11	Axle housing
6	Wheel bolt		

TROUBLESHOOTING

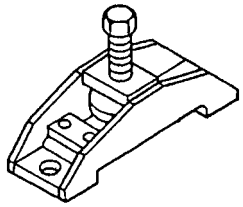
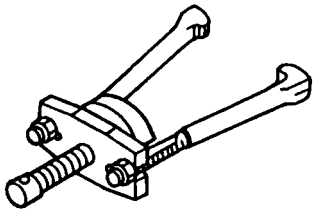
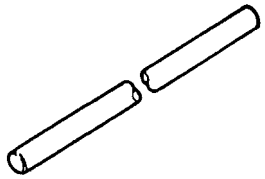
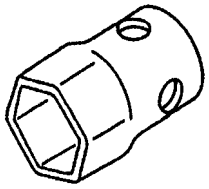
EN0851403F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearings preload.
	Loose differential side bearings	Adjust bearings preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Rear axle system)	Worn rear axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil; check for leakage.
	Poor oil quality	Change oil.
	Abnormal noise of propeller shaft	Refer to the chapter "**PROPELLER SHAFT**".

SPECIAL TOOL

EN0851403K100001

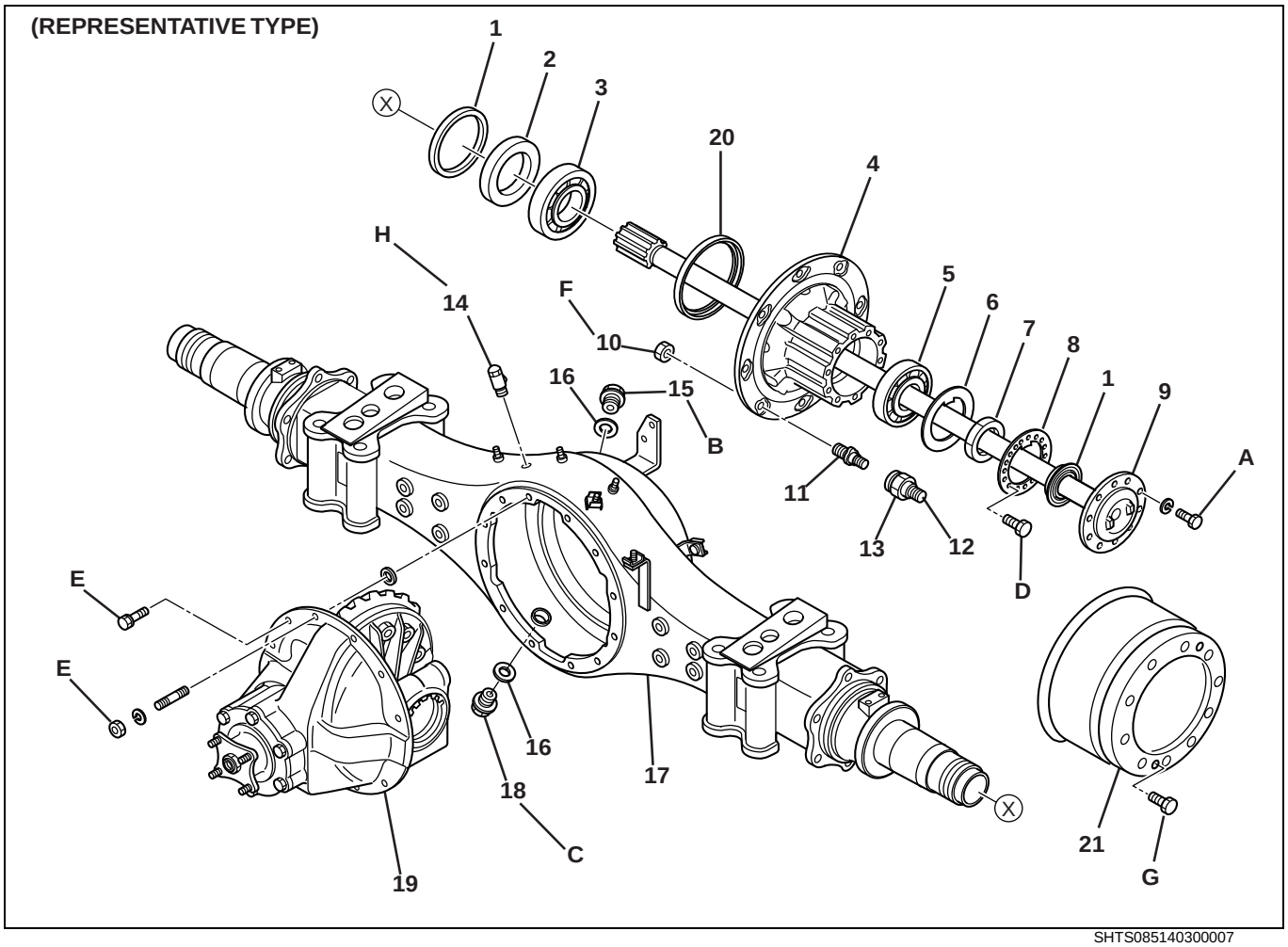
Prior to starting a rear axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-01292	WHEEL HUB PULLER	
	S0965-02090	HUB BEARING PULLER	
	S0984-91601 S0984-92001	HANDLE	
	S0960-31210	SOCKET WRENCH	

COMPONENT LOCATOR

EN0851403D100001

JIS TYPE WHEEL



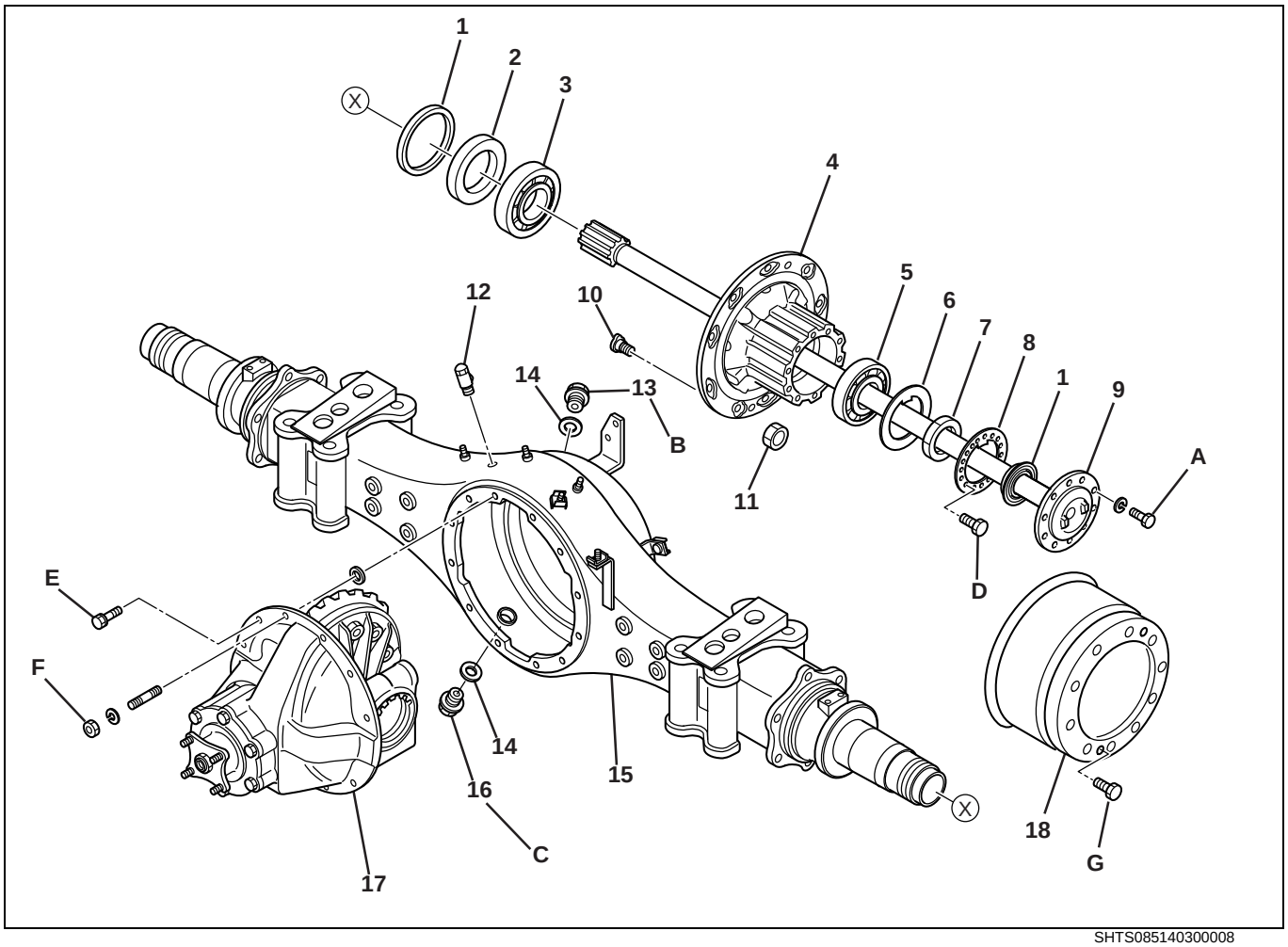
SHTS085140300007

1	Oil seal	12	Inner wheel nut
2	Oil seal collar	13	Outer wheel nut
3	Inner wheel hub bearing	14	Air breather
4	Wheel hub	15	Oil filler plug
5	Outer wheel hub bearing	16	Gasket
6	Lock washer	17	Axle housing assembly
7	Lock nut	18	Oil drain plug
8	Lock plate	19	Differential carrier assembly
9	Axle shaft	20	ABS sensor ring (If so equipped)
10	Wheel bolt fitting nut	21	Brake drum
11	Wheel bolt		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	84.5-107.5 {862-1,097, 63-79}	E	113-147 {1,152-1,499, 83-108}
B	78.4-117.6 {800-1,200, 58-86}	F	392-470 {4,000-4,800, 290-347}
C	39.2-68.6 {400-700, 29-50}	G	20.5-39.5 {210-400, 16-28}
D	8.33-10.79 {85-110, 6.2-8.0}	H	9.8-19.6 {100-200, 7.3-14.4}

ISO TYPE WHEEL



SHTS085140300008

1	Oil seal	10	Wheel bolt
2	Oil seal collar	11	Wheel nut
3	Inner wheel hub bearing	12	Air breather
4	Wheel hub	13	Oil filler plug
5	Outer wheel hub bearing	14	Gasket
6	Lock washer	15	Axle housing assembly
7	Lock nut	16	Oil drain plug
8	Lock plate	17	Differential carrier assembly
9	Axle shaft	18	Brake drum

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

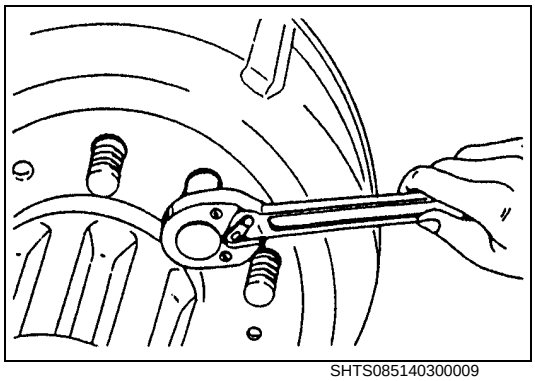
A	84.5-107.5 {862-1,097, 63-79}	E	113-147 {1,152-1,499, 83-108}
B	78.4-117.6 {800-1,200, 58-86}	F	70-78 {713-795, 51-57}
C	39.2-68.6 {400-700, 29-50}	G	19.6-39.2 {200-400, 14-28}
D	8.33-10.79 {85-110, 6.2-8.0}		

OVERHAUL

EN0851403H200001

IMPORTANT POINTS - DISASSEMBLY

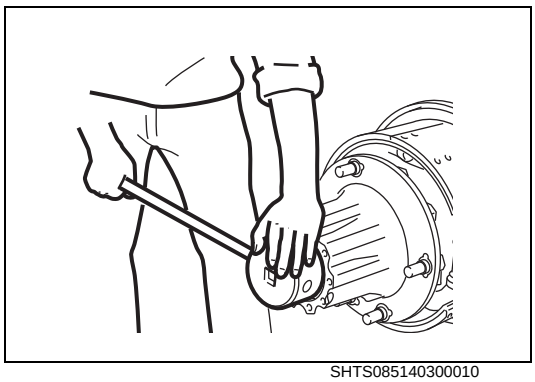
1. REMOVAL OF THE WHEELS.
(1) Refer to the chapter "**WHEEL & TIRE**".


SHTS085140300009

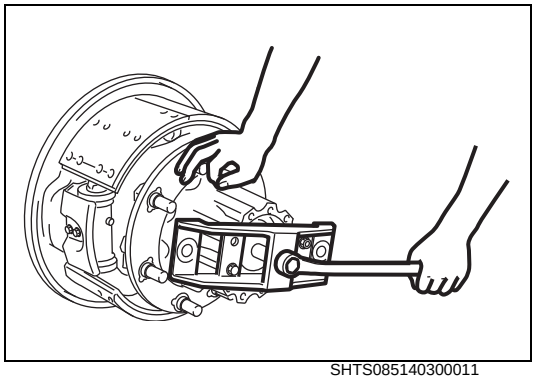
2. REMOVAL OF THE BRAKE DRUMS
(1) Loosen the drum set screws and remove the brake drums.

NOTICE

- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**

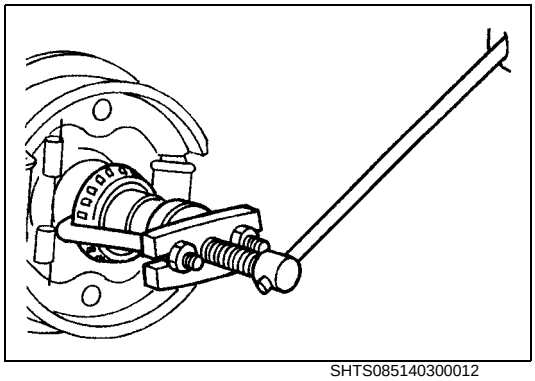

SHTS085140300010

3. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT.
SST: Socket Wrench (S0960-31210)


SHTS085140300011

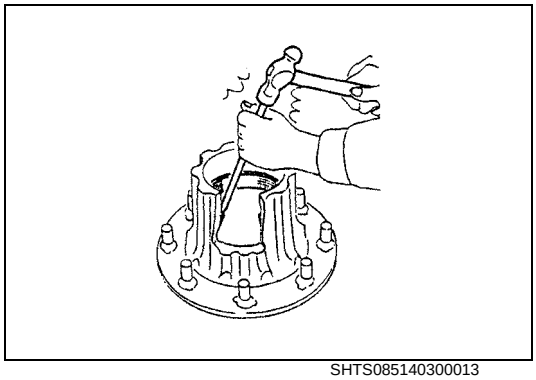
4. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING.
SST:
Wheel Hub Puller (S0965-01292)
Handle (S0984-91601)
Handle (S0984-92001)

NOTICE
The wheel hub assembly is heavy, therefore be careful when handling it.


SHTS085140300012

5. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR.
SST:
Hub Bearing Puller (S0965-02090)
Handle (S0984-91601)
Handle (S0984-92001)

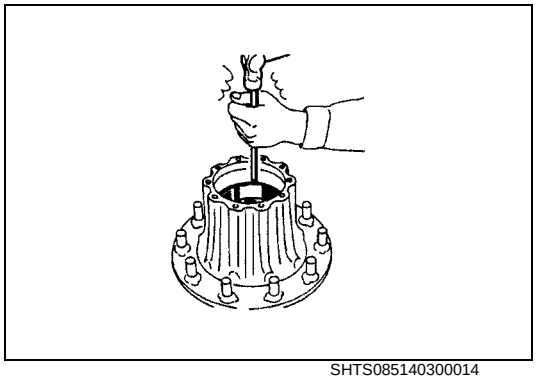
6. REMOVAL OF THE WHEEL BRAKE
(1) Refer to the chapter "**SERVICE BRAKE**".


SHTS085140300013

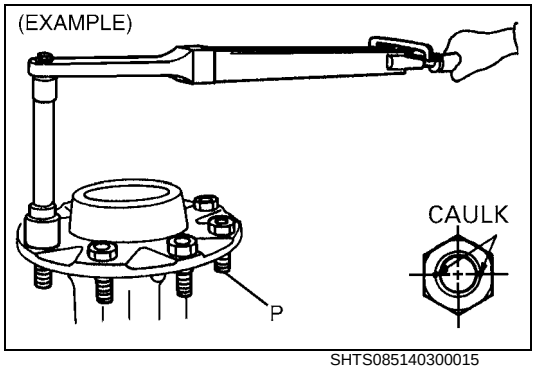
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE WHEEL HUB BEARING RACE.

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.


SHTS085140300014

(2) Using a tapping rod and a hammer or a press, install the outer race.



SHTS085140300015

2. REPLACEMENT OF THE WHEEL BOLTS

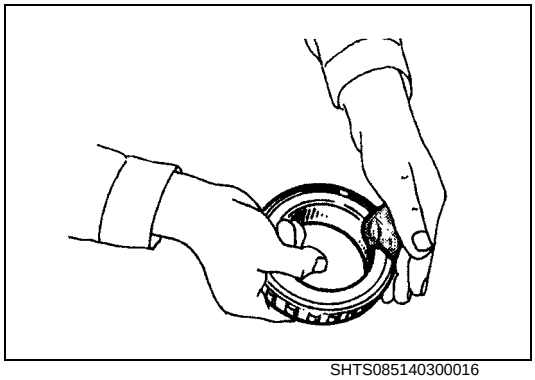
NOTICE

The left and right wheel bolts differ, so install them according to the chart below.

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**

NOTICE

Caulk the lock nuts at two points after tightening to the specified torque. (JIS-8 studs type wheel bolt only)



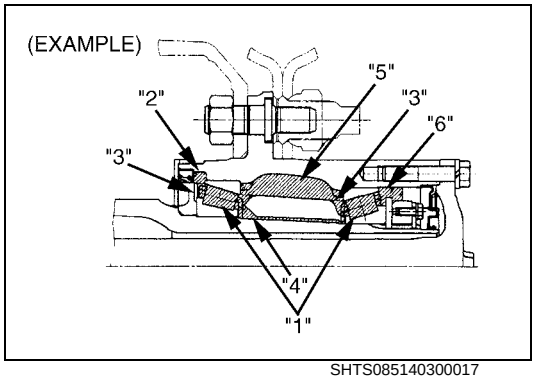
SHTS085140300016

3. GREASING.

(1) Pack sufficient amount of wheel hub bearing grease between the bearing rollers.

NOTICE

"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.

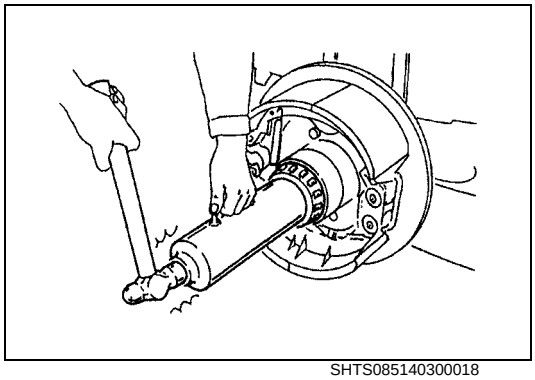


SHTS085140300017

(2) Apply wheel hub bearing grease to wheel hub.

NOTICE

- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the end of race circumferentially with the width of 15 mm {0.591 in.}**
- **"5": When filling the grease to this space, do it up to the line which connects between the small diameter sides edges of 2 bearings.**
- **"6": Fill the grease up the half depth of the lock nut.**



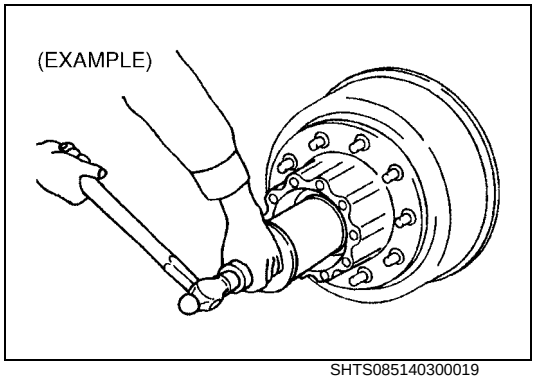
SHTS085140300018

4. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY.

(1) Install the oil seal and the inner wheel hub bearing.

NOTICE

If the collar is warmed up with hot water, it can easily be installed.

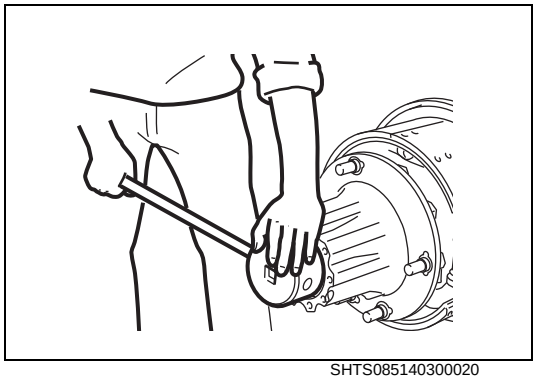


SHTS085140300019

(2) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

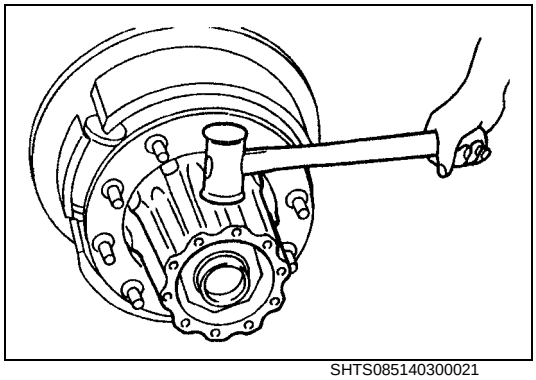
- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


SHTS085140300020

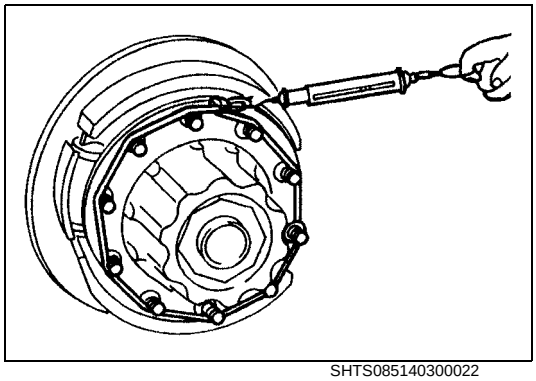
5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD.

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.
SST: Socket Wrench (S0960-31210)

Tightening Torque:
588-882 N·m {6,000-9,000 kgf·cm, 434-650 lbf·ft}


SHTS085140300021

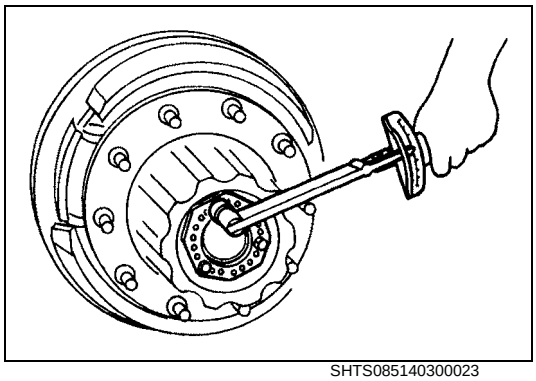
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.


SHTS085140300022

(3) Measure the wheel bearing preload and adjust the preload with the lock nut, if it exceeds or is less than that specified below.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}		**3.9-5.9 {40-60, 2.9-4.4}**
Spring balancer reading N {kgf, lbf}	**ISO type wheel hub**	**23.3-35.2 {2.4-3.5, 5.2-7.9}**
	JIS type wheel hub	**27.4-41.4 {2.8-4.2, 6.2-9.3}**

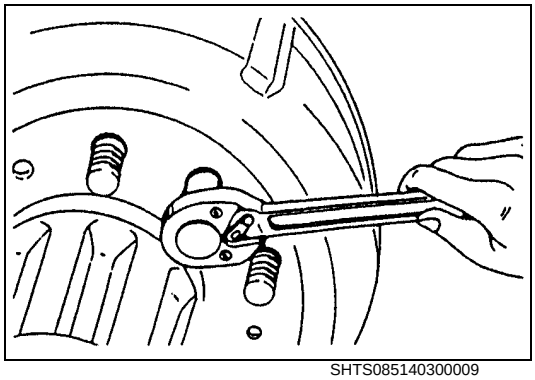

SHTS085140300023

6. INSTALLATION OF THE LOCK PLATE

(1) Install the lock plate to the lock nut.

NOTICE

- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**


SHTS085140300009

7. INSTALLATION OF THE BRAKE DRUMS

(1) Install the brake drums and tighten the drum set screws.

8. INSTALLATION OF THE WHEELS

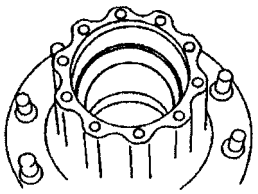
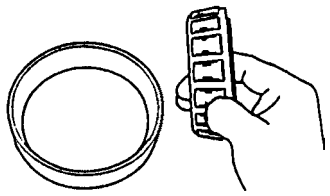
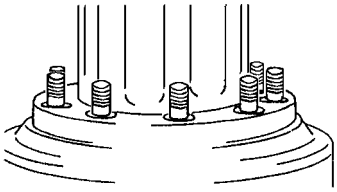
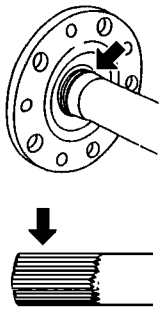
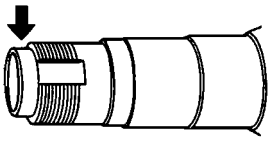
(1) Refer to the chapter "**WHEEL & TIRE**".

9. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT.

(1) On completion of the wheel hub and related parts reassembly, conduct the followings:
   a. Bleed the air from the brake lines according to the section "**SERVICE BRAKE ASSEMBLY**" in the chapter "**BRAKE EQUIPMENT**".
   b. Adjust the brake shoe clearance according to the section "**WHEEL BRAKE**" in the chapter "**SERVICE BRAKE**".

INSPECTION AND REPAIR

EN0851403H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Wheel hub bearing race: Burns, pitting and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel hub bearings: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel bolt: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal collar: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle shaft spline: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle tube: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH16) AX03-003

REAR AXLE AX03-2
DATA AND SPECIFICATIONS AX03-2
DESCRIPTION AX03-2
TROUBLESHOOTING AX03-4
SPECIAL TOOL AX03-5
COMPONENT LOCATOR AX03-6
OVERHAUL AX03-8
INSPECTION AND REPAIR AX03-13

REAR AXLE

DATA AND SPECIFICATIONS

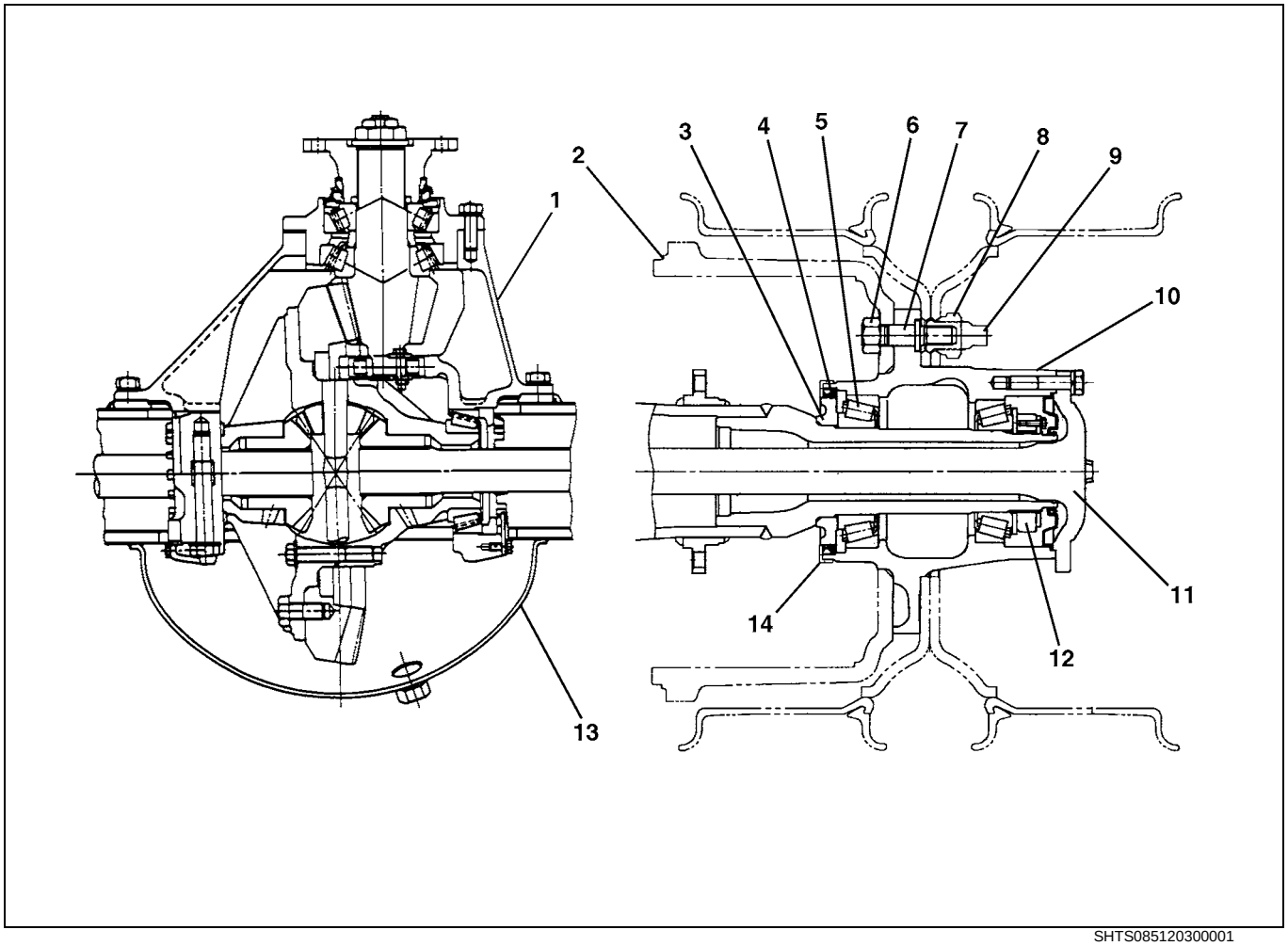
EN0851203I200001

Type	Full-floating axle shaft
Housing	Banjo type, with extension tubes welded on both ends
Type of drive	Hotchkiss drive

DESCRIPTION

EN0851203C100001

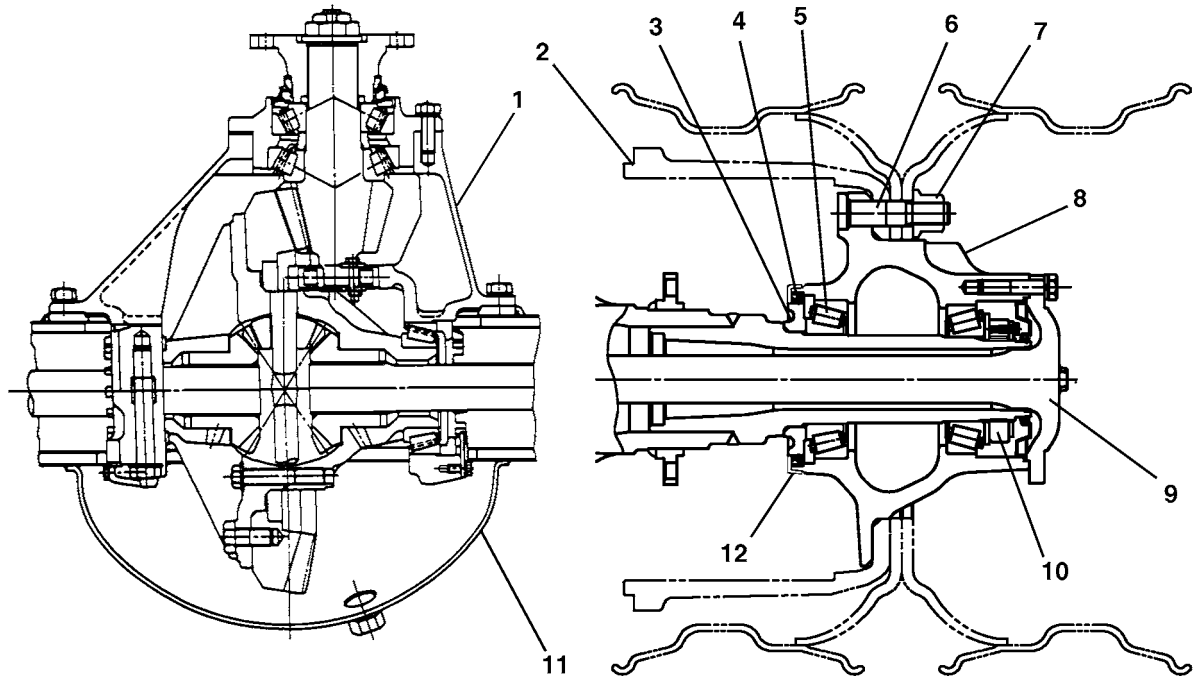
JIS TYPE WHEEL



SHTS085120300001

1	Differential carrier assembly	8	Outer wheel nut
2	Brake drum	9	Inner wheel hub
3	Oil seal collar	10	Wheel hub
4	Oil seal	11	Axle shaft
5	Wheel hub bearing	12	Lock nut
6	Wheel bolt fitting nut	13	Axle housing
7	Wheel bolt	14	ABS sensor ring (If so equipped)

ISO TYPE WHEEL



SHTS085120300002

1	Differential carrier assembly	7	Wheel nut
2	Brake drum	8	Wheel hub
3	Oil seal collar	9	Axle shaft
4	Oil seal	10	Lock nut
5	Wheel hub bearing	11	Axle housing
6	Wheel bolt	12	ABS sensor ring (If so equipped)

TROUBLESHOOTING

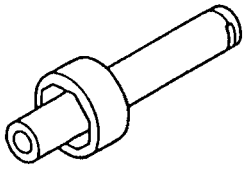
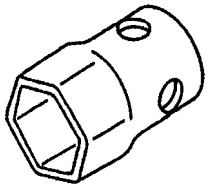
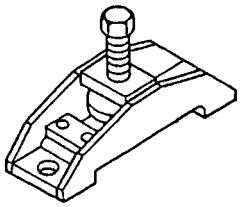
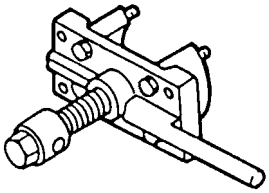
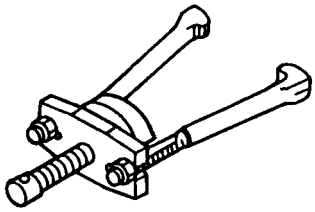
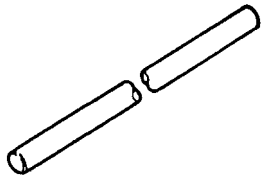
EN0851203F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearing preload.
	Loose differential side bearings	Adjust bearing preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Rear axle system)	Worn rear axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil, check for leakage.
	Poor oil quality	Change oil.
	Abnormal noise of propeller shaft	Refer to the chapter **"PROPELLER SHAFT"**.

SPECIAL TOOL

EN0851203K100001

Prior to starting a rear axle overhaul, it is necessary to have these special tools.

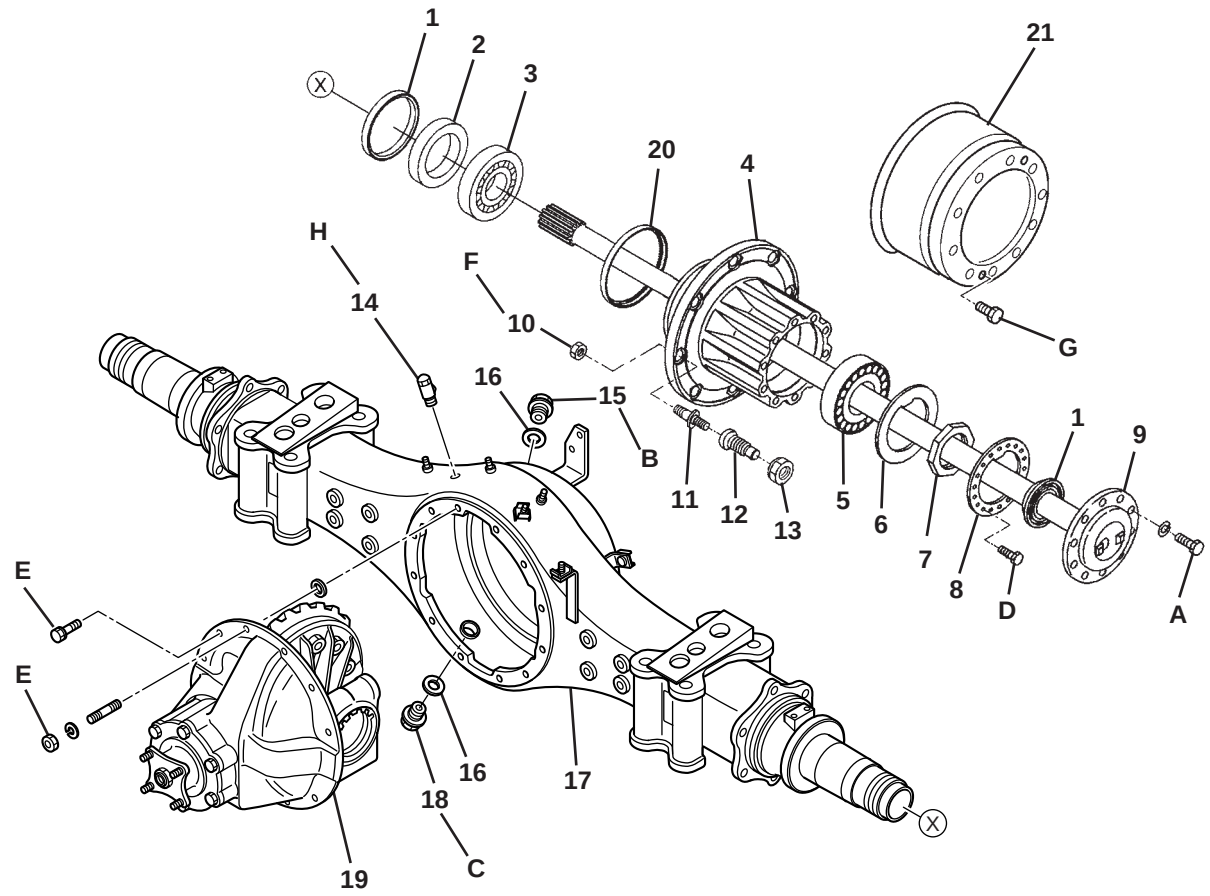
Illustration	Part number	Tool name	Remarks
	S0960-31360	SOCKET WRENCH	For model FG
	S0960-31210	SOCKET WRENCH	For model GT
	S0965-01790	WHEEL HUB PULLER	For model FG
	S0965-01292	WHEEL HUB PULLER	For model GT
	S0965-01310	HUB BEARING PULLER	For model FG
	S0965-02090	HUB BEARING PULLER	For model GT
	S0984-91601 S0984-92001	HANDLE	

COMPONENT LOCATOR

EN0851203D100001

JIS TYPE WHEEL

(REPRESENTATIVE TYPE)



SHTS085120300009

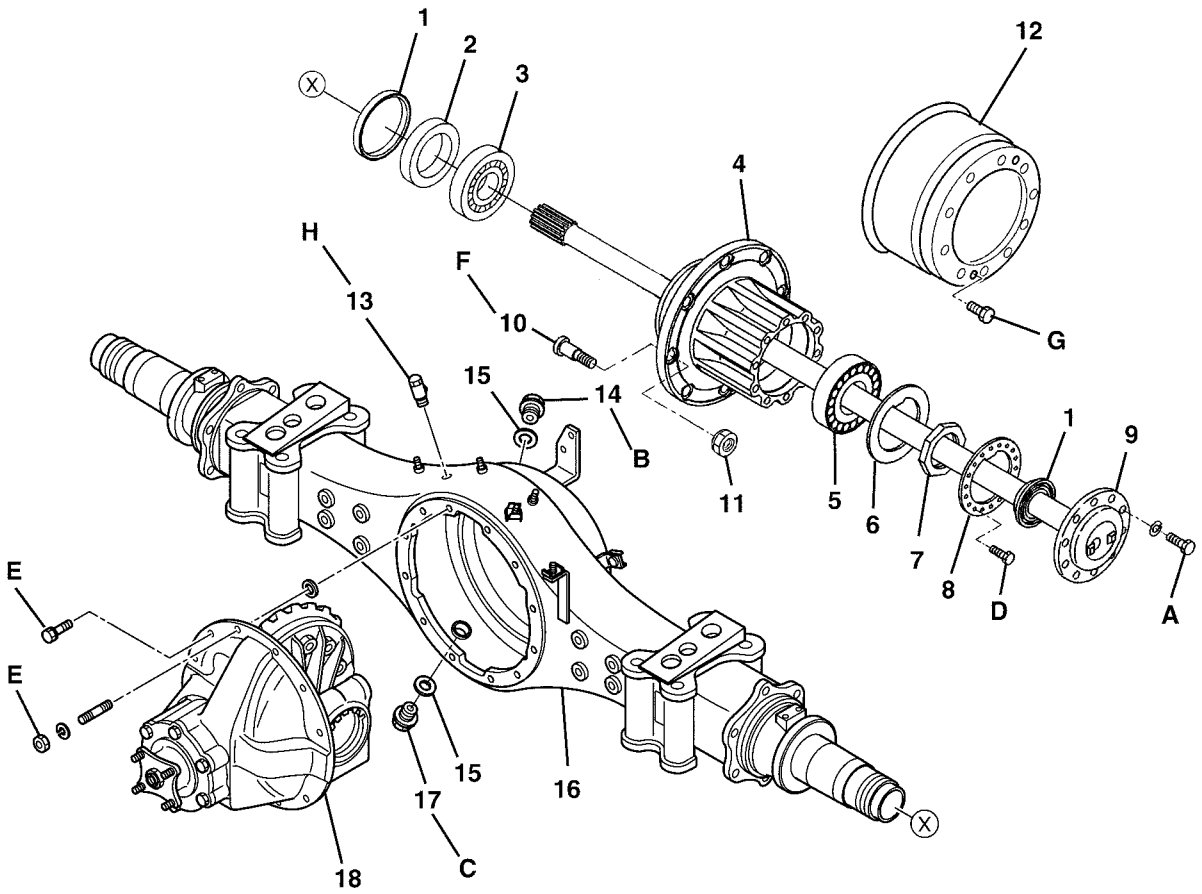
1	Oil seal	12	Inner wheel nut
2	Oil seal collar	13	Outer wheel nut
3	Inner wheel hub bearing	14	Air breather
4	Wheel hub	15	Oil filler plug
5	Outer wheel hub bearing	16	Gasket
6	Lock washer	17	Axle housing assembly
7	Lock nut	18	Oil drain plug
8	Lock plate	19	Differential carrier assembly
9	Axle shaft	20	Sensor ring (If so equipped)
10	Wheel bolt fitting nut	21	Brake drum
11	Wheel bolt		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	84.5-107.5 {862-1,097, 63-79}	E	113-147 {1,150-1,500, 83-108}
B	78.4-117.6 {800-1,200, 58-86}	F	392-470 {4,000-4,800, 290-347}
C	39.2-68.6 {400-700, 29-50}	G	20.5-39.5 {210-400, 16-29}
D	8.33-10.79 {85-110, 6.2-8.0}	H	9.8-19.6 {100-200, 7.3-14.4}

ISO TYPE WHEEL

(REPRESENTATIVE TYPE)



SHTS085120300010

1	Oil seal	10	Wheel bolt
2	Oil seal collar	11	Wheel nut
3	Inner wheel hub bearing	12	Brake drum
4	Wheel hub	13	Air breather
5	Outer wheel hub bearing	14	Oil filler plug
6	Lock washer	15	Gasket
7	Lock nut	16	Axle housing assembly
8	Lock plate	17	Oil drain plug
9	Axle shaft	18	Differential carrier assembly

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	148-192 {1,509-1,957, 109-141}	E	113-147 {1,150-1,500, 83-108}
B	78.4-117.6 {800-1,200, 58-86}	F	392-470 {4,000-4,800, 290-347}
C	39.2-68.6 {400-700, 29-50}	G	20.5-39.5 {210-400, 16-29}
D	8.33-10.79 {85-110, 6.2-8.0}	H	9.8-19.6 {100-200, 7.3-14.4}

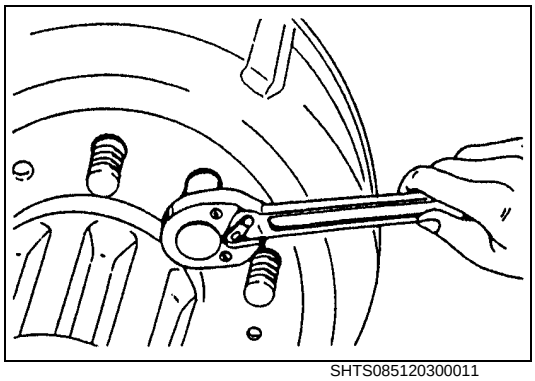
OVERHAUL

EN0851203H200001

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



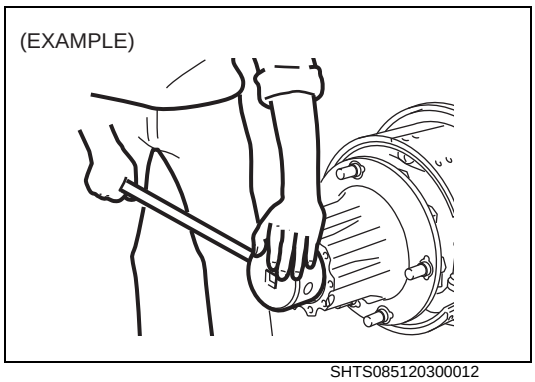
SHTS085120300011

2. REMOVAL OF THE BRAKE DRUMS (DRUM LOCATION TYPE: OUTBOARD MOUNTED)

(1) Loosen the drum set screws and remove the brake drums.

NOTICE

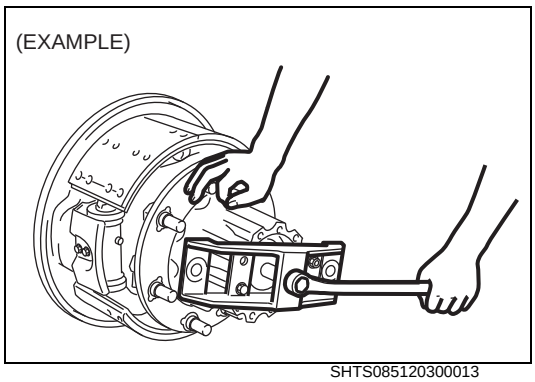
- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**



SHTS085120300012

3. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT

SST:
Socket Wrench for model FG (S0960-31360)
Socket Wrench for model GT (S0960-31210)
Handle (S0984-91601)
Handle (S0984-92001)



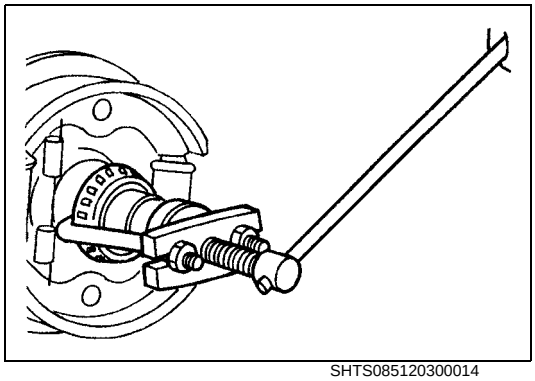
SHTS085120300013

4. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING

SST:
Wheel Hub Puller for model FG (S0965-01790)
Wheel Hub Puller for model GT (S0965-01292)
Handle (S0984-91601)
Handle (S0984-92001)

NOTICE

The wheel hub assembly is heavy, therefore be careful when handling it.



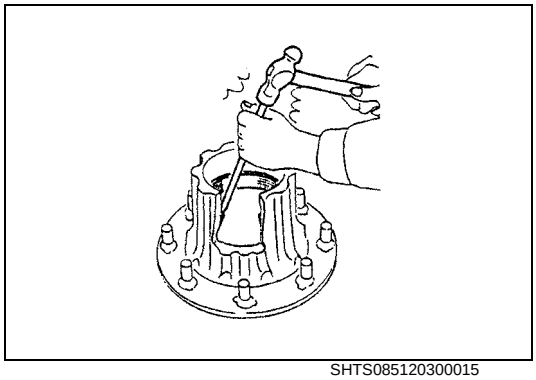
SHTS085120300014

5. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR

SST:
Hub Bearing Puller for model FG (S0965-01310)
Hub Bearing Puller for model GT (S0965-02090)
Handle (S0984-91601)
Handle (S0984-92001)

6. REMOVAL OF THE WHEEL BRAKE

(1) Refer to the chapter **"SERVICE BRAKE"**.

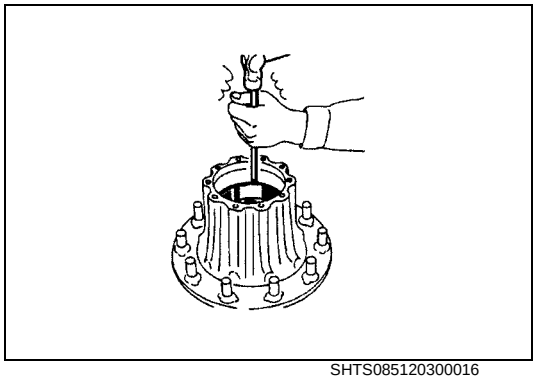


SHTS085120300015

IMPORTANT POINTS - ASSEMBLY

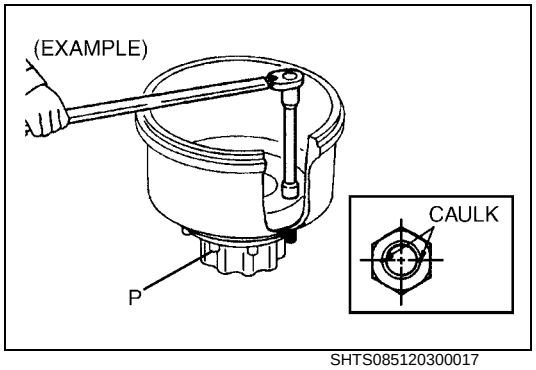
1. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.



SHTS085120300016

(2) Using a tapping rod and a hammer or a press, install the outer race.



SHTS085120300017

2. REPLACEMENT OF THE WHEEL BOLTS

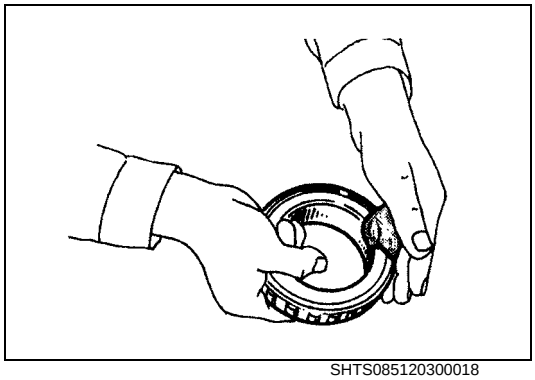
NOTICE

The left and right wheel bolts differ, so install them according to the chart below.

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**

NOTICE

Caulk the lock nuts at two points after tightening to the specified torque. (JIS-8 studs type wheel bolt only)



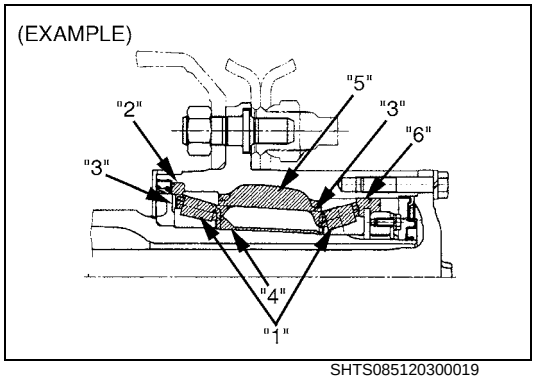
SHTS085120300018

3. GREASING

(1) Pack sufficient amount of wheel hub bearing grease between the bearing rollers.

NOTICE

"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.

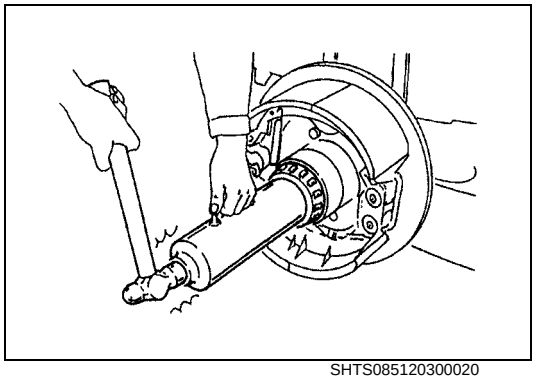


SHTS085120300019

(2) Apply wheel hub bearing grease to wheel hub.

NOTICE

- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the end of race circumferentially with the width of 15 mm {0.591 in}.**
- **"5": When filling the grease to this space, do it up to the line which connects between the small diameter sides edges of 2 bearings.**
- **"6": Fill the grease up the half depth of the lock nut.**



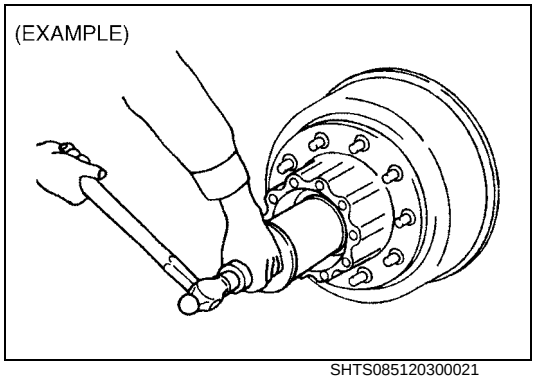
SHTS085120300020

4. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the oil seal and the inner wheel hub bearing.

NOTICE

If the collar is warmed up with hot water, it can easily be installed.

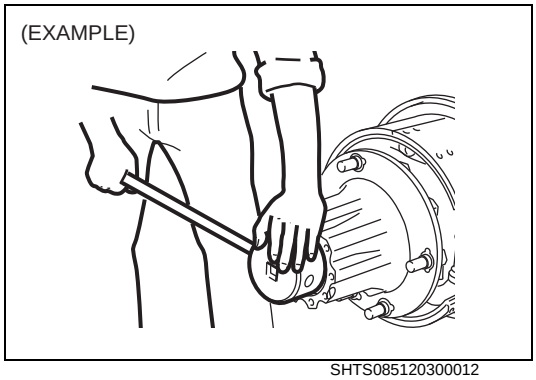


SHTS085120300021

(2) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**

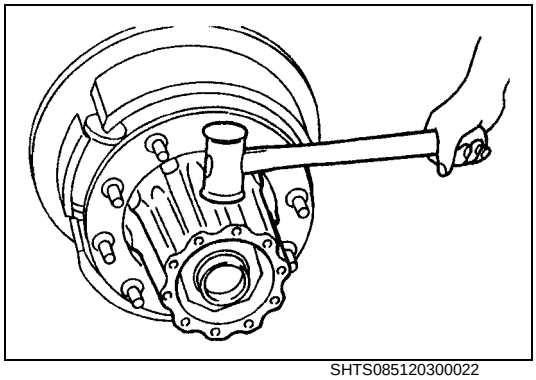


SHTS085120300012

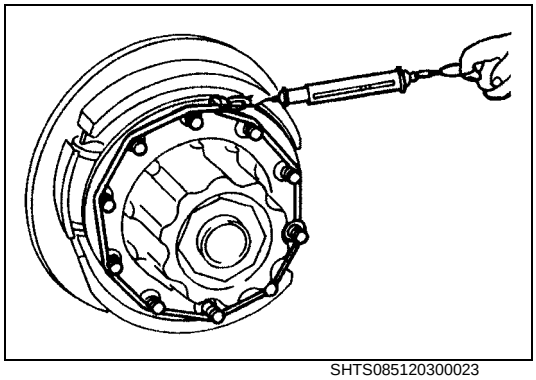
5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.
SST:
Socket Wrench for model FG (S0960-31360)
Socket Wrench for model GT (S0960-31210)
Handle (S0984-91601)
Handle (S0984-92001)

Model	Turning Torque
FG	588-1,176 N·m {6,000-12,000 kgf·cm, 434-868 lbf·ft}
GT	588-882 N·m {6,000-9,000 kgf·cm, 434-650 lbf·ft}


SHTS085120300022

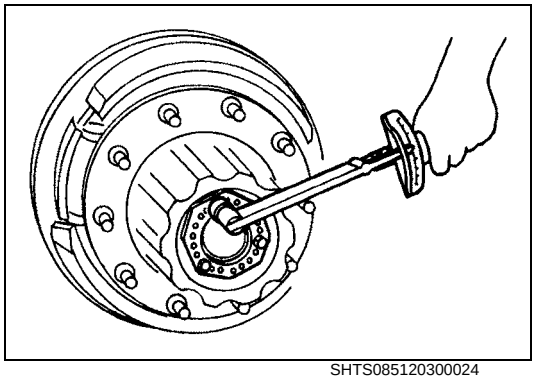
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.


SHTS085120300023

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}		**3.9-5.9 {40-60, 2.9-4.4}**
Spring balancer reading N {kgf, lbf}	**ISO type wheel hub**	**23.3-35.2 {2.4-3.5, 5.2-7.9}**
	JIS type wheel hub	**27.4-41.4 {2.8-4.2, 6.2-9.3}**

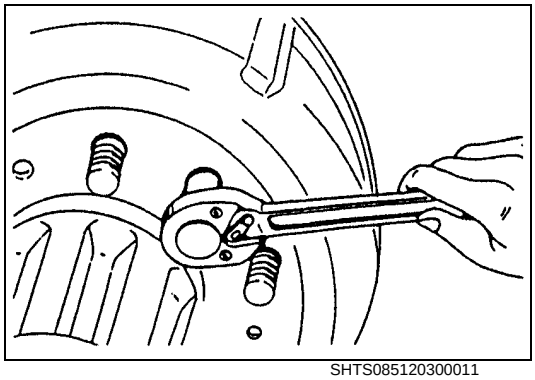

SHTS085120300024

6. INSTALLATION OF THE LOCK PLATE

(1) Install the lock plate to the lock nut.

NOTICE

- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**


SHTS085120300011

7. INSTALLATION OF THE BRAKE DRUMS (DRUM LOCATION TYPE: OUTBOARD MOUNTED)

(1) Install the brake drums and tighten the drum set screws.

8. INSTALLATION OF THE WHEELS

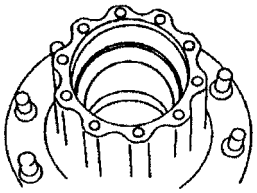
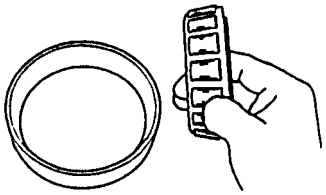
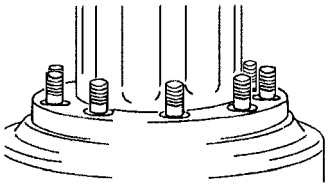
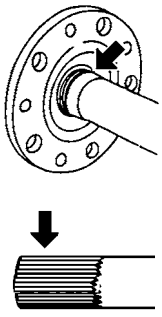
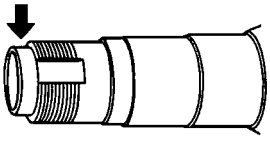
(1) Refer to the chapter **"WHEEL & TIRE".**

9. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT

(1) On completion of the wheel hub and related parts reassembly, conduct the followings.
   a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.
   b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE".**

INSPECTION AND REPAIR

EN0851203H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Wheel hub bearing race: Burns, pitting and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel hub bearings: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel bolt: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal collar: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle shaft spline: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle tube: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH17) AX03-004

REAR AXLE AX03-2
DATA AND SPECIFICATIONS AX03-2
DESCRIPTION AX03-2
TROUBLESHOOTING AX03-4
SPECIAL TOOL AX03-5
COMPONENT LOCATOR AX03-6
OVERHAUL AX03-10
INSPECTION AND REPAIR AX03-15

REAR AXLE

DATA AND SPECIFICATIONS

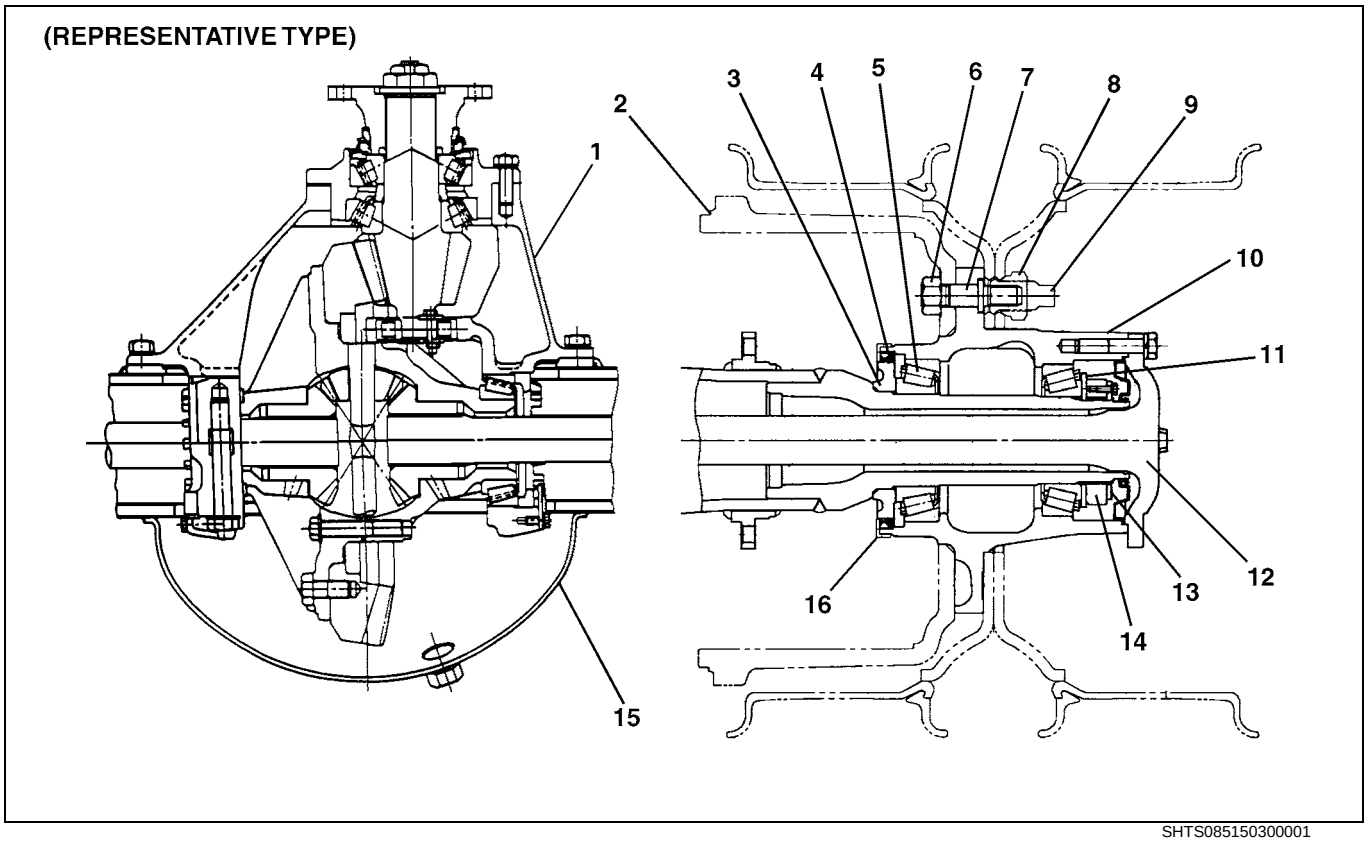
EN0851503I200001

Type	Full-floating axle shaft
Housing	Banjo type, with extension tubes welded on both ends
Type of drive	Hotchkiss drive

DESCRIPTION

EN0851503C100001

JIS TYPE WHEEL

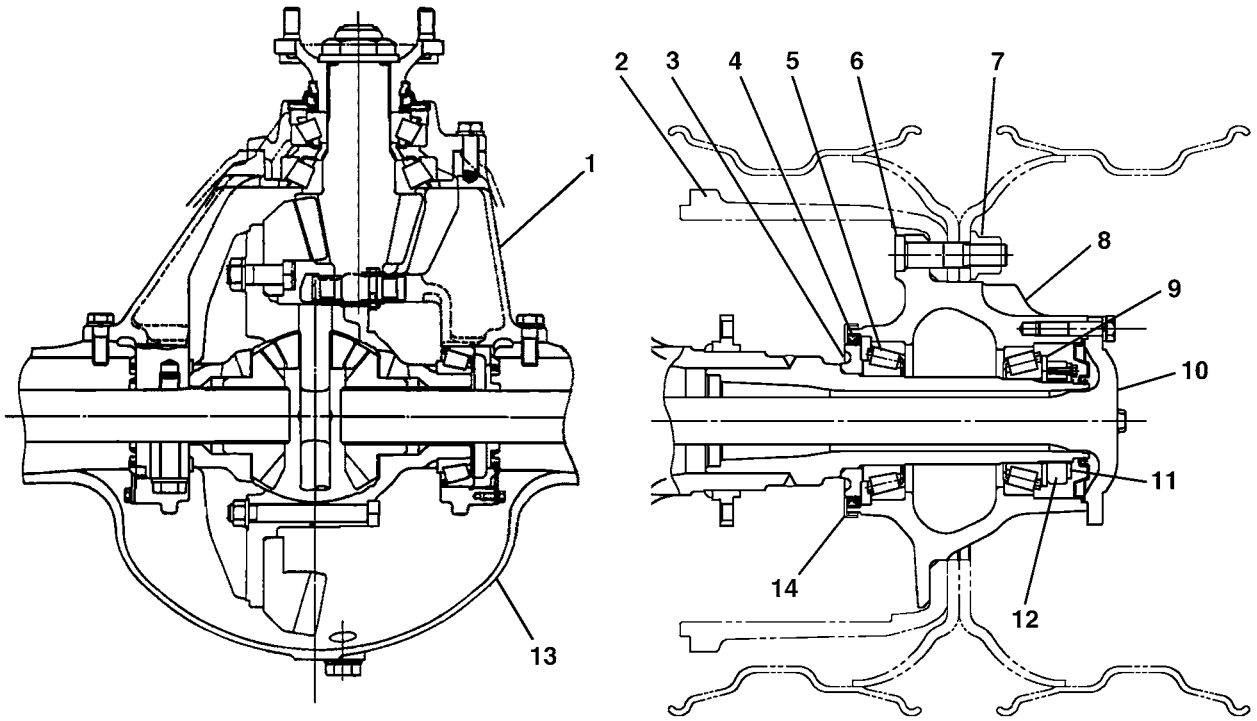


SHTS085150300001

1	Differential carrier assembly	9	Inner wheel nut
2	Brake drum	10	Wheel hub
3	Oil seal collar	11	Lock washer
4	Oil seal	12	Axle shaft
5	Wheel hub bearing	13	Lock plate
6	Wheel bolt fitting nut	14	Lock nut
7	Wheel bolt	15	Axle housing
8	Outer wheel nut	16	ABS sensor ring (If so equipped)

ISO TYPE WHEEL

(REPRESENTATIVE TYPE)



SHTS085150300002

1	Differential carrier assembly	8	Wheel hub
2	Brake drum	9	Lock washer
3	Oil seal collar	10	Axle shaft
4	Oil seal	11	Lock plate
5	Wheel hub bearing	12	Lock nut
6	Wheel bolt	13	Axle housing
7	Wheel nut	14	ABS sensor ring (If so equipped)

TROUBLESHOOTING

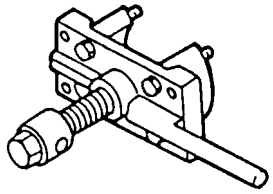
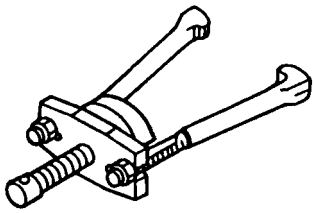
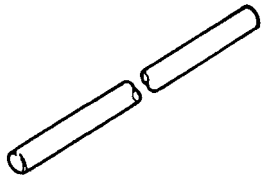
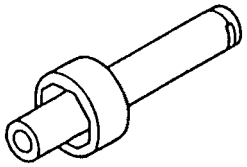
EN0851503F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearing preload.
	Loose differential side bearings	Adjust bearing preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Rear axle system)	Worn rear axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil; check for leakage.
	Poor oil quality	Change oil.
	Abnormal noise of propeller shaft	Refer to the chapter **"PROPELLER SHAFT"**.

SPECIAL TOOL

EN0851503K100001

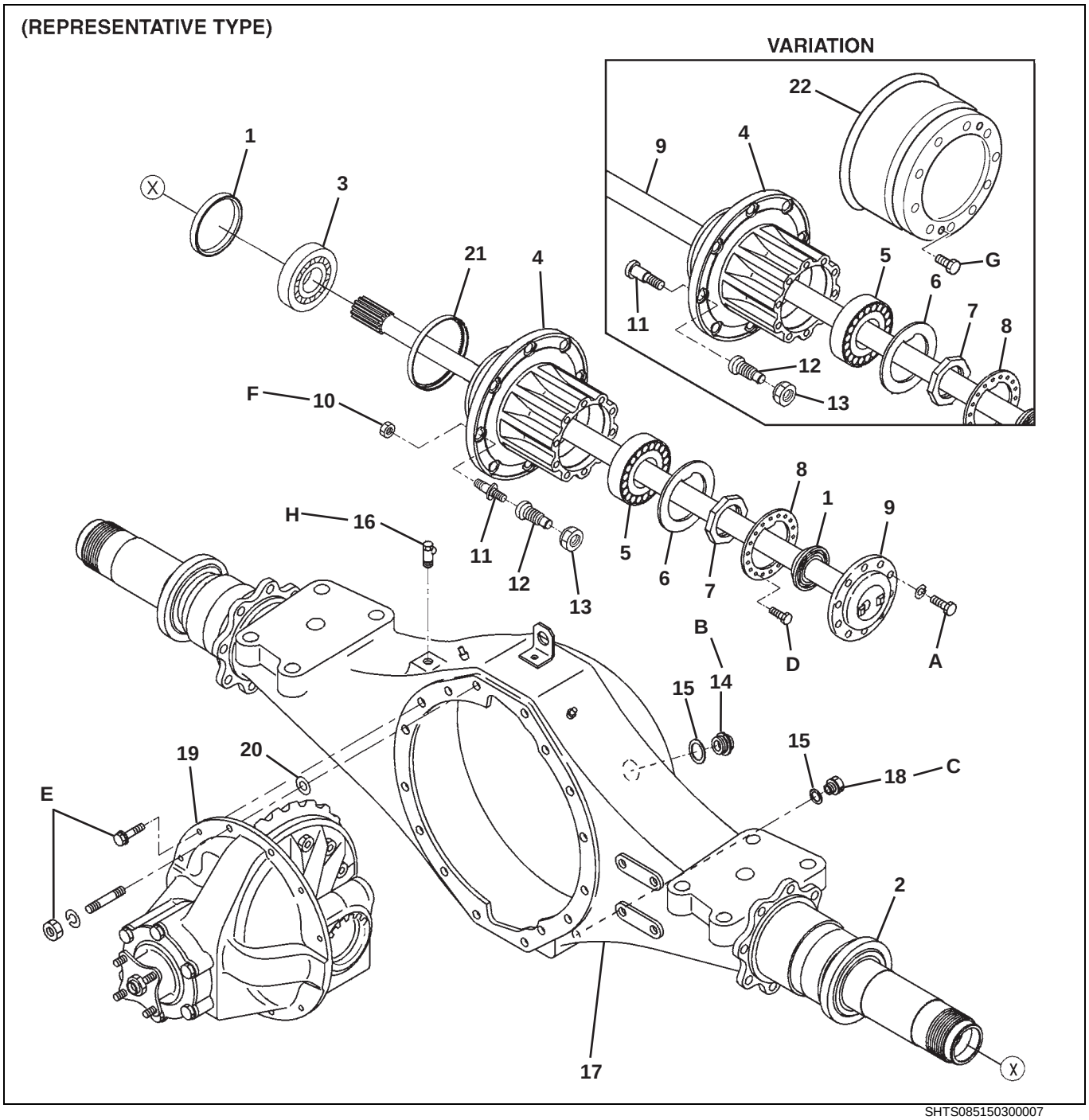
Prior to starting a rear axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-01790	WHEEL HUB PULLER	
	S0965-01310	HUB BEARING PULLER	
	S0984-91601 S0984-92001	HANDLE	
	S0960-31360	SOCKET WRENCH	

COMPONENT LOCATOR

EN0851503D100001

JIS TYPE WHEEL



SHTS085150300007

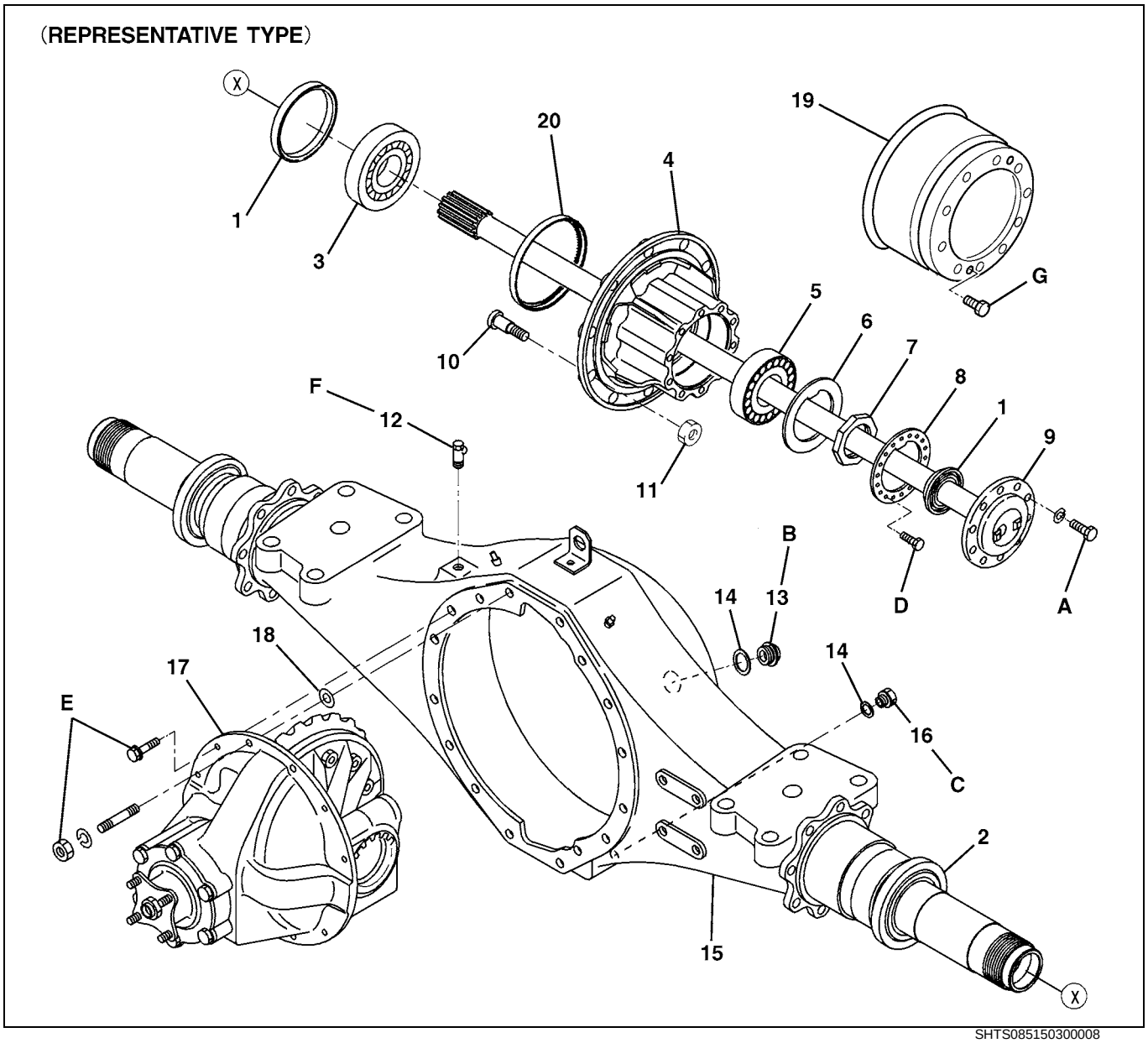
1	Oil seal	12	Inner wheel nut
2	Oil seal collar	13	Outer wheel nut
3	Inner wheel hub bearing	14	Air breather
4	Wheel hub	15	Oil filler plug
5	Outer wheel hub bearing	16	Gasket
6	Lock washer	17	Axle housing assembly
7	Lock nut	18	Oil drain plug
8	Lock plate	19	Differential carrier assembly
9	Axle shaft	20	O-ring
10	Wheel bolt fitting nut	21	Sensor ring (If so equipped)
11	Wheel bolt	22	Brake drum

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	M12: 83.5-106.5 {850-1,080, 62-78}	E	167-213 {1,700-2,200, 123-159}
	M14: 148-192 {1,500-2,000, 114-146}	F	392-470 {4,000-4,800, 290-347}
B	78.4-117.6 {800-1,200, 58-86}	G	20.5-39.5 {210-400, 16-29}
C	39.2-68.6 {400-700, 29-50}	H	9.8-19.6 {100-200, 7.3-14.4}
D	8.33-10.79 {85-110, 6.2-8.0}		

ISO TYPE WHEEL

(REPRESENTATIVE TYPE)



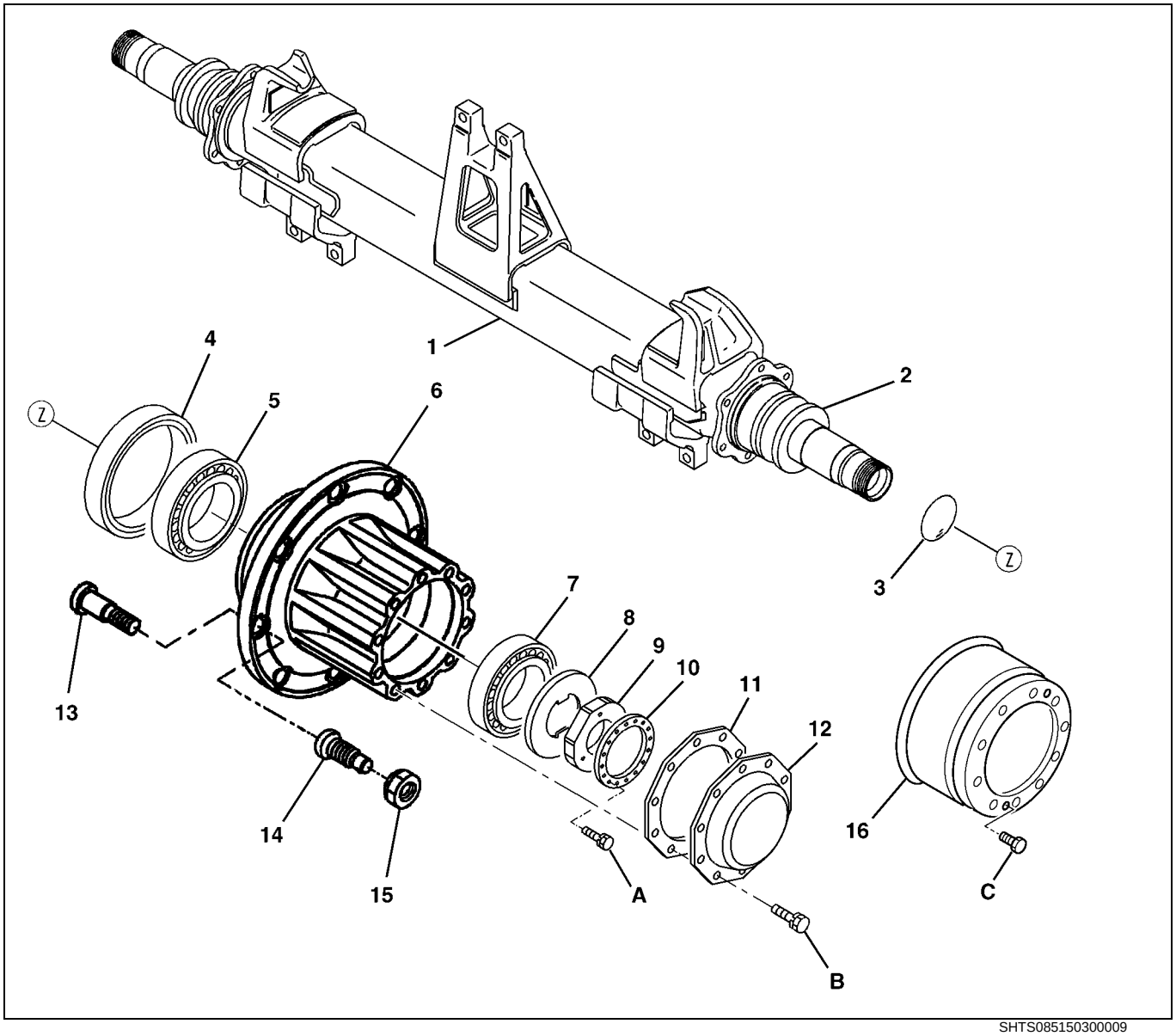
SHTS085150300008

1	Oil seal	11	Wheel nut
2	Oil seal collar	12	Air breather
3	Inner wheel hub bearing	13	Oil filler plug
4	Wheel hub	14	Gasket
5	Outer wheel hub bearing	15	Axle housing assembly
6	Lock washer	16	Oil drain plug
7	Lock nut	17	Differential carrier assembly
8	Lock plate	18	O-ring
9	Axle shaft	19	Brake drum
10	Wheel bolt	20	ABS sensor ring (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	148-192 {1,500-2,000, 109-144}	E	167-213 {1,700-2,200, 123-159}
B	78.4-117.6 {800-1,200, 58-86}	F	9.8-19.6 {100-200, 7.3-14.4}
C	39.2-68.6 {400-700, 29-50}	G	20.5-39.5 {210-400, 16-29}
D	8.33-10.79 {85-110, 6.2-8.0}		

DEAD AXLE



SHTS085150300009

1	Dead axle tube	9	Lock nut
2	Oil seal guide	10	Lock plate
3	Expansion plug	11	Gasket
4	Oil seal	12	Wheel hub cover
5	Inner wheel hub bearing	13	Wheel bolt
6	Wheel hub	14	Inner wheel nut
7	Outer wheel hub bearing	15	Outer wheel nut
8	Lock washer	16	Brake drum

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	8.33-10.79 {85-110, 6.2-8.0}	C	20.5-39.5 {210-400, 16-29}
B	10.7-146.6 {1,100-1,500, 81-110}		

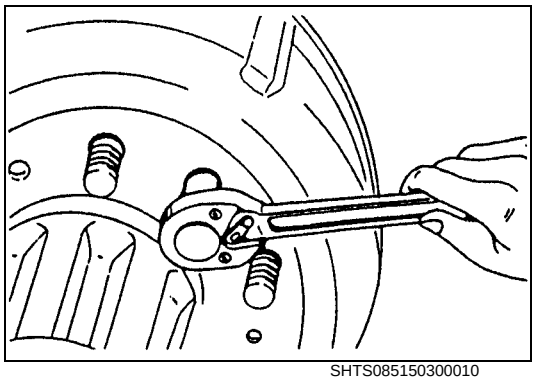
OVERHAUL

EN0851503H200001

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



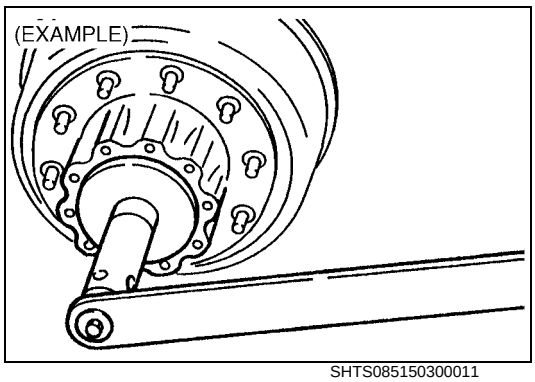
SHTS085150300010

2. REMOVAL OF THE BRAKE DRUMS (DRUM LOCATION TYPE: OUTBOARD MOUNTED)

(1) Loosen the drum set screws and remove the brake drums.

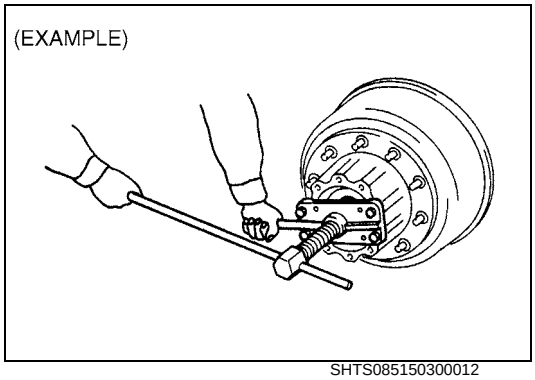
NOTICE

- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**



SHTS085150300011

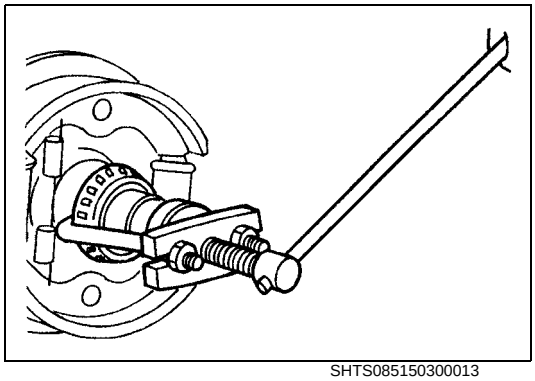
3. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0960-31360)
Handle (S0984-91601)
Handle (S0984-92001)



SHTS085150300012

4. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-91601)
Handle (S0984-92001)

NOTICE
The wheel hub assembly is heavy, therefore be careful when handling it.

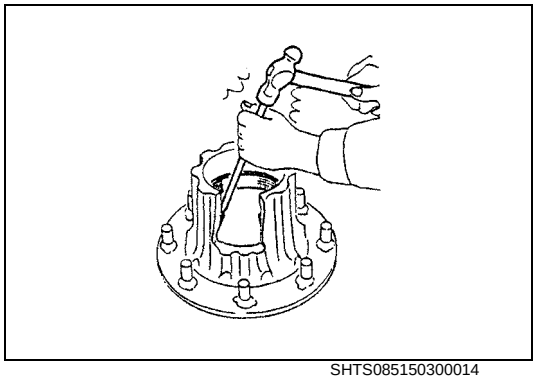


SHTS085150300013

5. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR
SST:
Hub Bearing Puller (S0965-01310)
Handle (S0984-91601)
Handle (S0984-92001)

6. REMOVAL OF THE WHEEL BRAKE

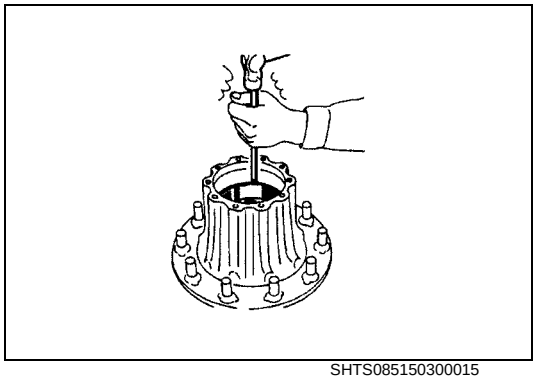
(1) Refer to the chapter **"SERVICE BRAKE"**.


SHTS085150300014

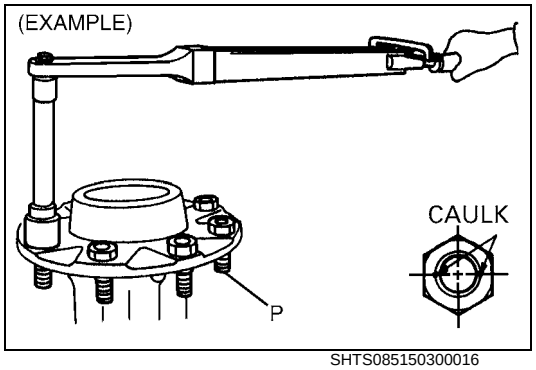
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.


SHTS085150300015

(2) Using a tapping rod and a hammer or a press, install the outer race.



SHTS085150300016

2. REPLACEMENT OF THE WHEEL BOLTS

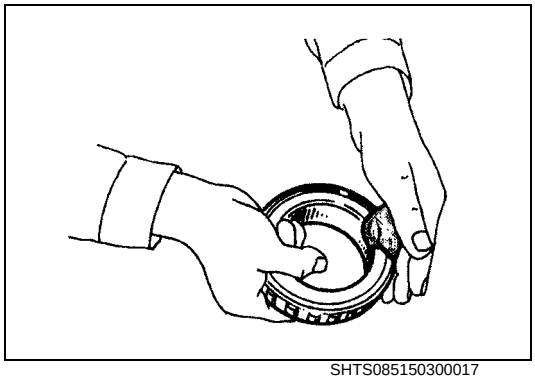
NOTICE

The left and right wheel bolts differ, so install them according to the chart below.

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**

NOTICE

Caulk the lock nuts at two points after tightening to the specified torque. (JIS-8 studs type wheel bolt only)



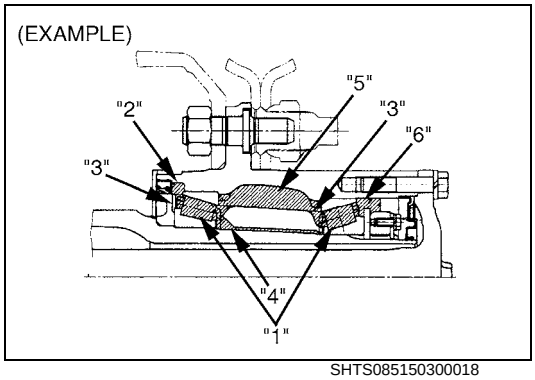
SHTS085150300017

3. GREASING

(1) Pack sufficient amount of wheel hub bearing grease between the bearing rollers.

NOTICE

"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.

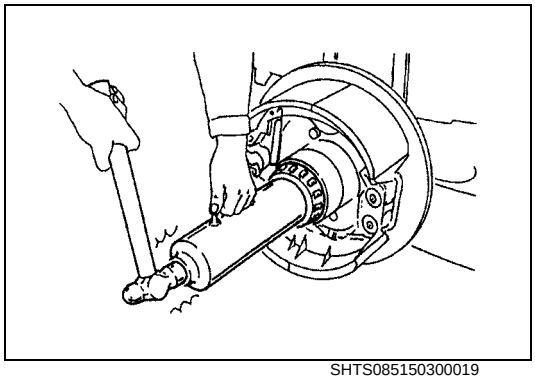


SHTS085150300018

(2) Apply wheel hub bearing grease to wheel hub.

NOTICE

- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the end of race circumferentially with the width of 15 mm {0.591 in}.**
- **"5": When filling the grease to this space, do it up to the line which connects between the small diameter sides edges of 2 bearings.**
- **"6": Fill the grease up the half depth of the lock nut.**



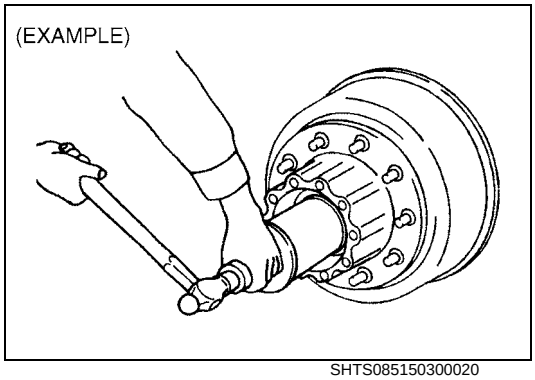
SHTS085150300019

4. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the oil seal and the inner wheel hub bearing.

NOTICE

If the collar is warmed up with hot water, it can easily be installed.

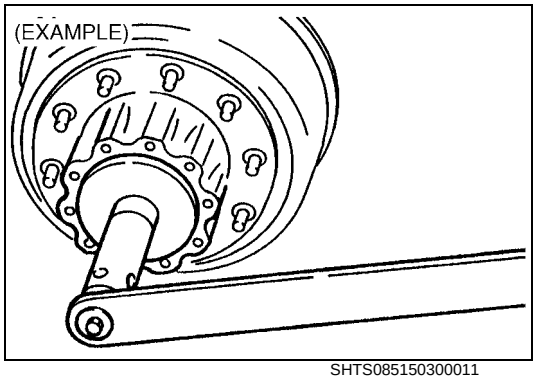


SHTS085150300020

(2) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**



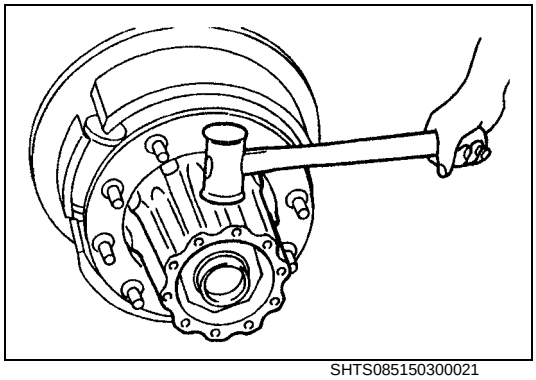
SHTS085150300011

5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

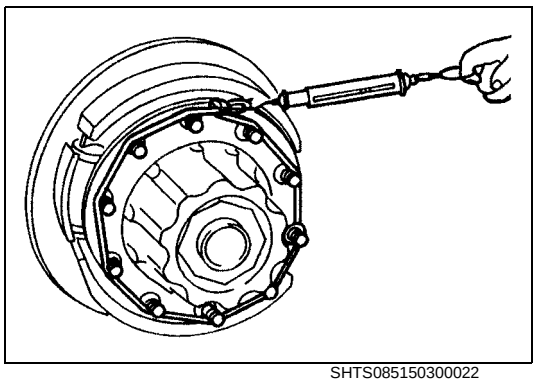
(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.

SST:
Socket Wrench (S0960-31360)
Handle (S0984-91601)
Handle (S0984-92001)

Tightening Torque:
588-1,176 N·m {6,000-12,000 kgf·cm, 434-868 lbf·ft}


SHTS085150300021

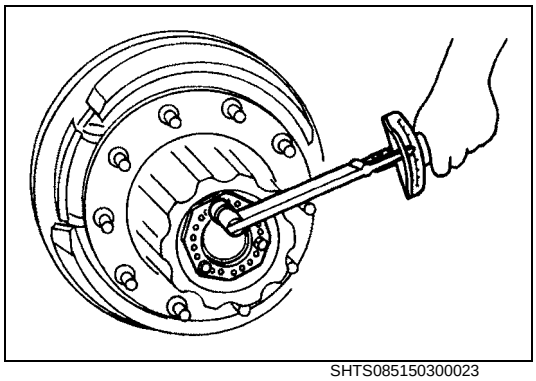
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.


SHTS085150300022

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}		**3.9-5.9 {40-60, 2.9-4.4}**
Spring balancer reading N {kgf, lbf}	**ISO type wheel hub**	**23.3-35.2 {2.4-3.5, 5.2-7.9}**
	JIS type wheel hub	**27.4-41.4 {2.8-4.2, 6.2-9.3}**

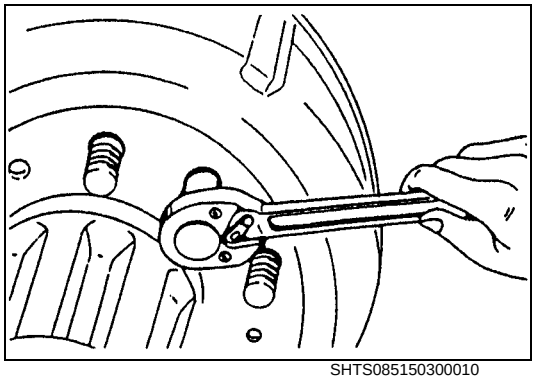

SHTS085150300023

6. INSTALLATION OF THE LOCK PLATE

(1) Install the lock plate to the lock nut.

NOTICE

- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**


SHTS085150300010

7. INSTALLATION OF THE BRAKE DRUMS (DRUM LOCATION TYPE: OUTBOARD MOUNTED)

(1) Install the brake drums and tighten the drum set screws.

8. INSTALLATION OF THE WHEELS

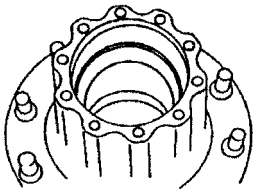
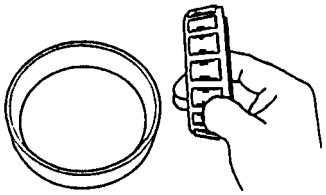
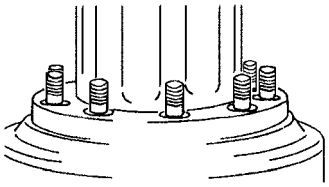
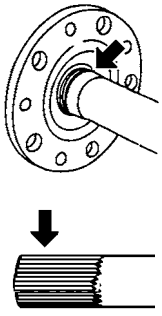
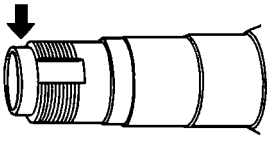
(1) Refer to the chapter **"WHEEL & TIRE"**.

9. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT

(1) On completion of the wheel hub and related parts reassembly, conduct the followings.
   a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.
   b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND REPAIR

EN0851503H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Wheel hub bearing race: Burns, pitting and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel hub bearings: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel bolt: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal collar: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle shaft spline: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle tube: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH18) AX03-005

REAR AXLE AX03-2
DATA AND SPECIFICATIONS AX03-2
DESCRIPTION AX03-2
TROUBLESHOOTING AX03-3
SPECIAL TOOL AX03-4
COMPONENT LOCATOR AX03-5
OVERHAUL AX03-6
INSPECTION AND REPAIR AX03-11

REAR AXLE

DATA AND SPECIFICATIONS

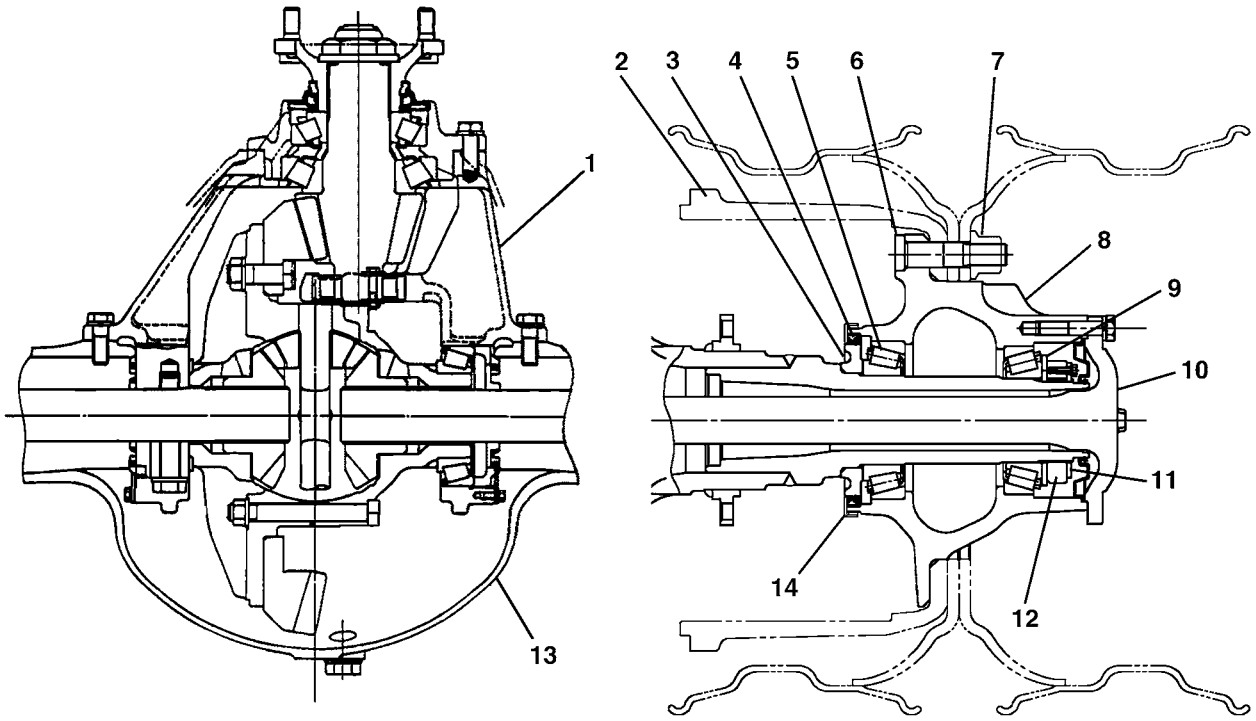
EN0851603I200001

Type	Full-floating axle shaft
Housing	Banjo type, with extension tubes welded on both ends
Type of drive	Hotchkiss drive

DESCRIPTION

EN0851603C100001

(REPRESENTATIVE TYPE)



SHTS085160300001

1	Differential carrier assembly	8	Wheel hub
2	Brake drum	9	Lock washer
3	Oil seal collar	10	Axle shaft
4	Oil seal	11	Lock plate
5	Wheel hub bearing	12	Lock nut
6	Wheel bolt	13	Axle housing
7	Wheel nut	14	ABS sensor ring

TROUBLESHOOTING

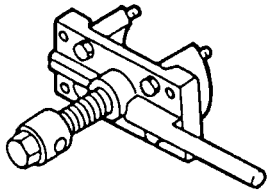
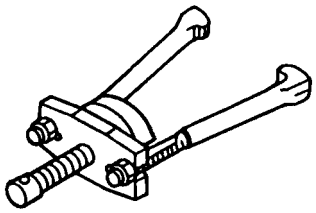
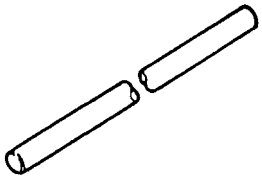
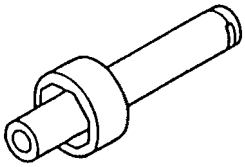
EN0851603F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings	Replace bearings.
	Worn or damaged differential side bearings	Replace bearings.
	Loose pinion bearings	Adjust bearing preload.
	Loose differential side bearings	Adjust bearing preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear	Adjust backlash.
	Worn thrust washers	Replace.
	Worn differential spider	Replace.
	Worn or damaged ring gear and pinion	Replace.
	Worn or damaged differential side gears and pinions	Replace.
	Loose ring gear tightening bolts	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear	Replace or adjust tooth contact.
	Worn pinion spline	Replace.
Abnormal noise (Rear axle system)	Worn rear axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil	Add oil; check for leakage.
	Poor oil quality	Change oil.
	Abnormal noise of propeller shaft	Refer to the chapter **"PROPELLER SHAFT"**.

SPECIAL TOOL

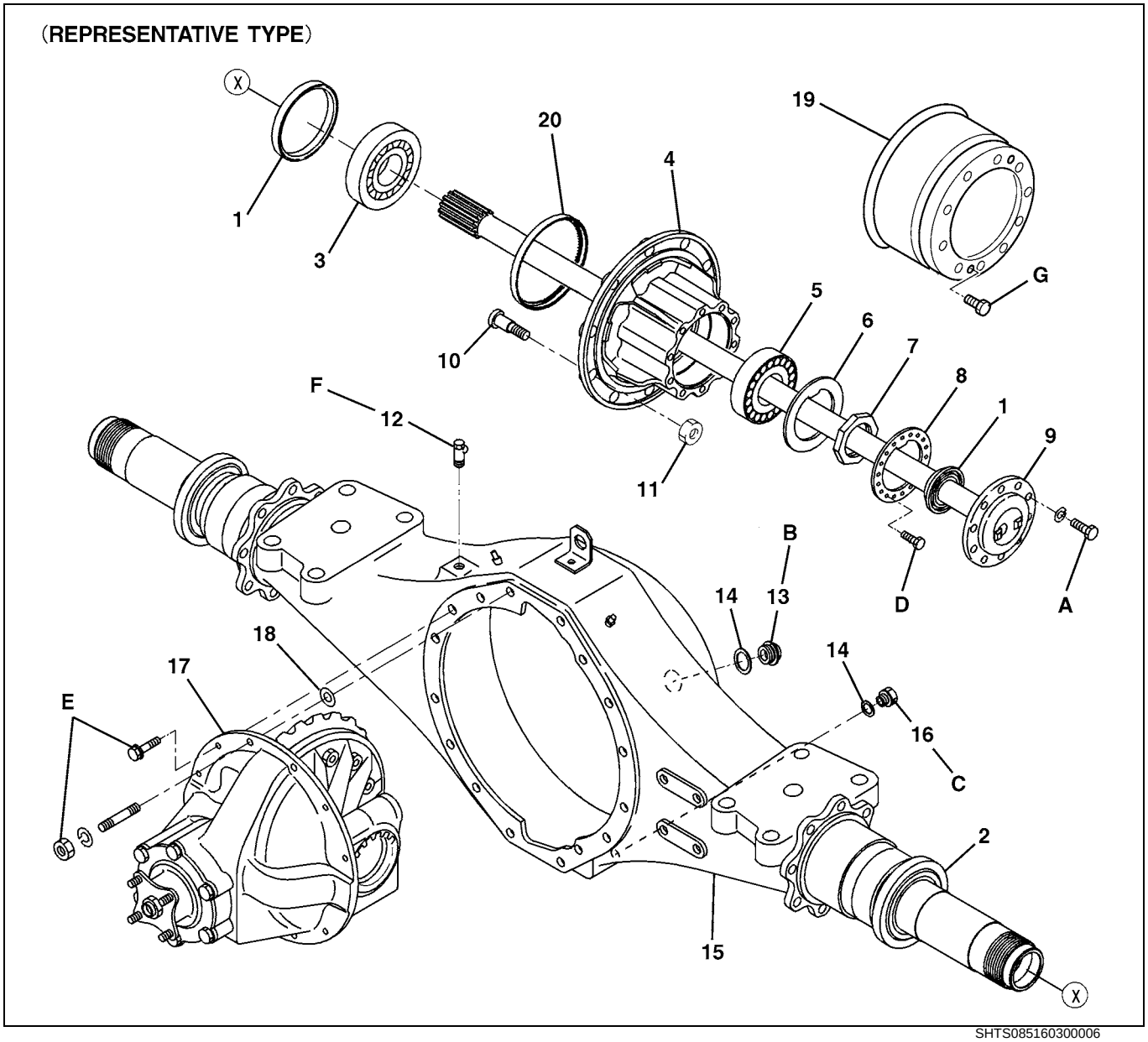
EN0851603K100001

Prior to starting a rear axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-01790	WHEEL HUB PULLER	
	S0965-01310	HUB BEARING PULLER	
	S0984-91601 S0984-92001	HANDLE	
	S0960-31360	SOCKET WRENCH	

COMPONENT LOCATOR

EN0851603D100001



SHTS085160300006

1	Oil seal	11	Wheel nut
2	Oil seal collar	12	Air breather
3	Inner wheel hub bearing	13	Oil filler plug
4	Wheel hub	14	Gasket
5	Outer wheel hub bearing	15	Axle housing assembly
6	Lock washer	16	Oil drain plug
7	Lock nut	17	Differential carrier assembly
8	Lock plate	18	O-ring
9	Axle shaft	19	Brake drum
10	Wheel bolt	20	ABS sensor ring

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	148-192 {1,500-2,000, 109-144}	E	167-213 {1,700-2,200, 123-159}
B	78.4-117.6 {800-1,200, 58-86}	F	9.8-19.6 {100-200, 7.3-14.4}
C	39.2-68.6 {400-700, 29-50}	G	20.5-39.5 {210-400, 16-29}
D	8.33-10.79 {85-110, 6.2-8.0}		

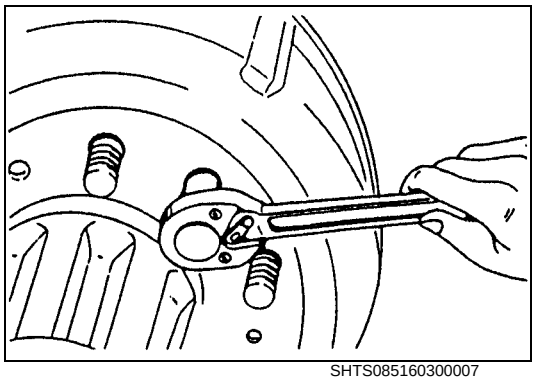
OVERHAUL

EN0851603H200001

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.



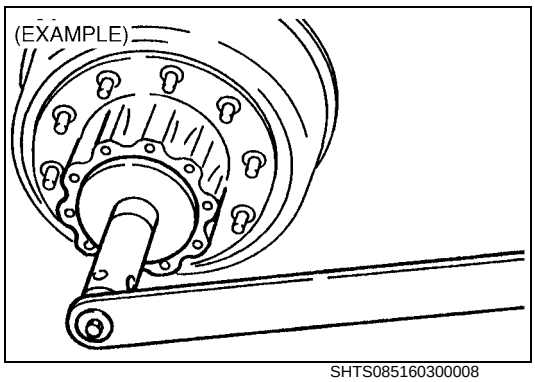
SHTS085160300007

2. REMOVAL OF THE BRAKE DRUMS (DRUM LOCATION TYPE: OUTBOARD MOUNTED)

(1) Loosen the drum set screws and remove the brake drums.

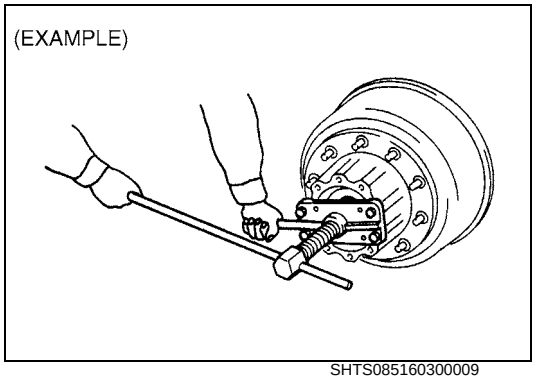
NOTICE

- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**



SHTS085160300008

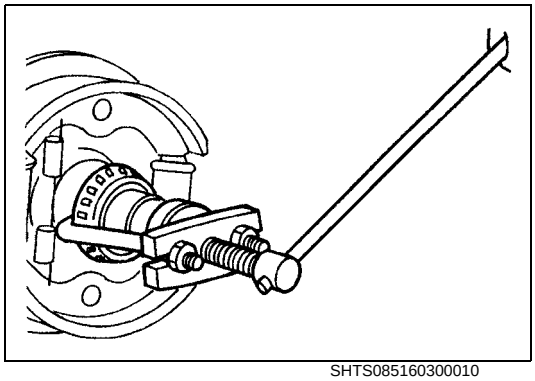
3. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (S0960-31360)
Handle (S0984-91601)
Handle (S0984-92001)



SHTS085160300009

4. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-91601)
Handle (S0984-92001)

NOTICE
The wheel hub assembly is heavy, therefore be careful when handling it.

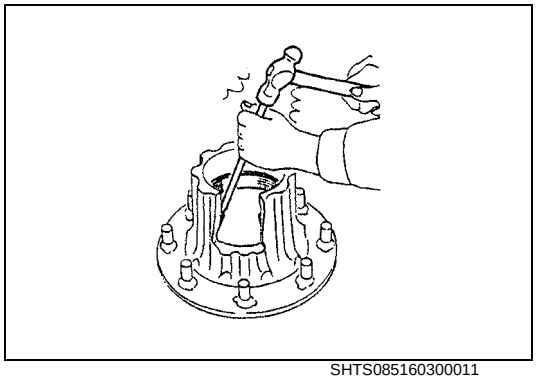


SHTS085160300010

5. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR
SST:
Hub Bearing Puller (S0965-01310)
Handle (S0984-91601)
Handle (S0984-92001)

6. REMOVAL OF THE WHEEL BRAKE

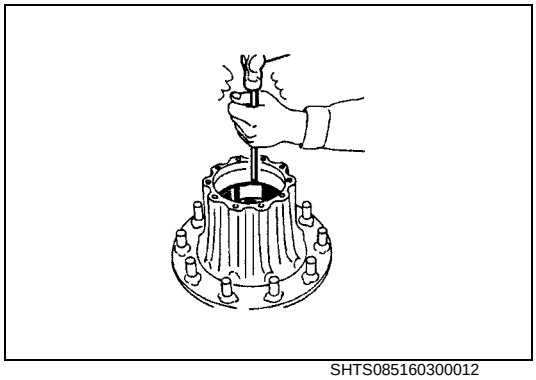
(1) Refer to the chapter **"SERVICE BRAKE"**.


SHTS085160300011

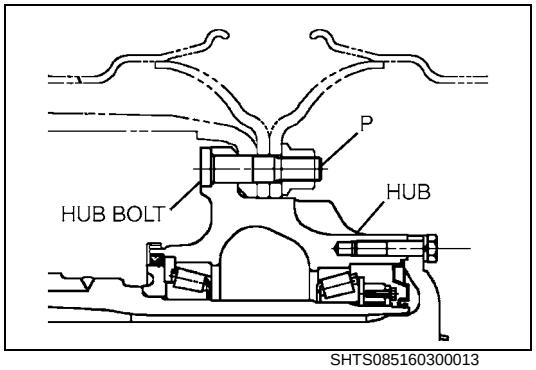
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.


SHTS085160300012

(2) Using a tapping rod and a hammer or a press, install the outer race.



SHTS085160300013

2. REPLACEMENT OF THE WHEEL BOLTS

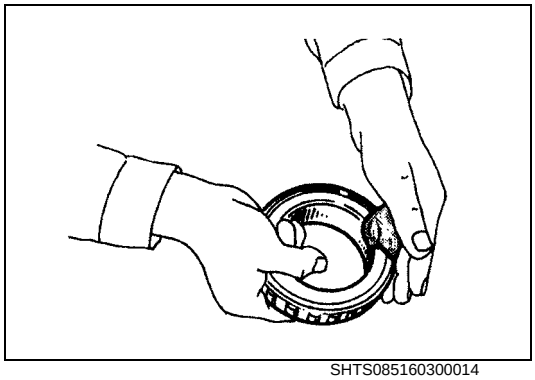
(1) Remove the wheel bolts from the wheel hub.

(2) Install the new wheel bolts.

NOTICE

The left and right wheel bolts differ, so install them according to the chart below.

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**

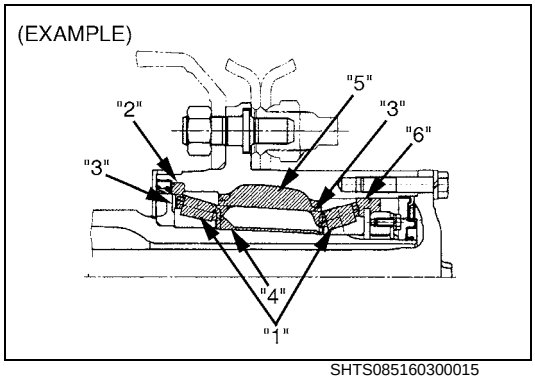

SHTS085160300014

3. GREASING

(1) Pack sufficient amount of wheel hub bearing grease between the bearing rollers.

NOTICE

"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.

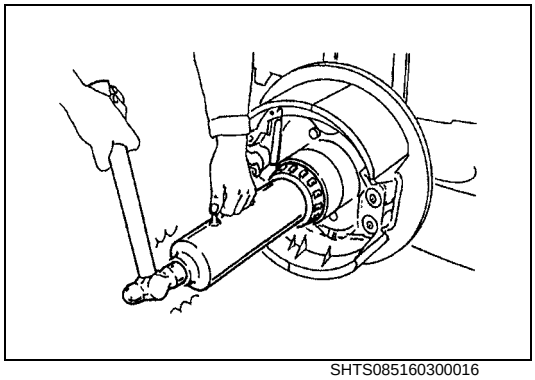


SHTS085160300015

(2) Apply wheel hub bearing grease to wheel hub.

NOTICE

- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the end of race circumferentially with the width of 15 mm {0.591 in}.**
- **"5": When filling the grease to this space, do it up to the line which connects between the small diameter sides edges of 2 bearings.**
- **"6": Fill the grease up the half depth of the lock nut.**

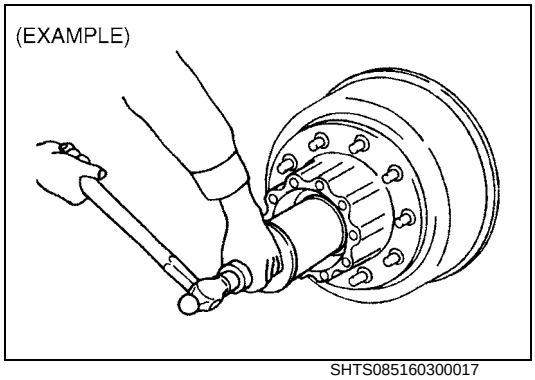

SHTS085160300016

4. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the oil seal and the inner wheel hub bearing.

NOTICE

If the collar is warmed up with hot water, it can easily be installed.

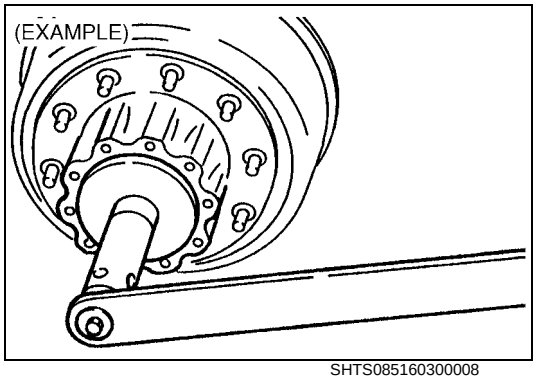


SHTS085160300017

(2) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**



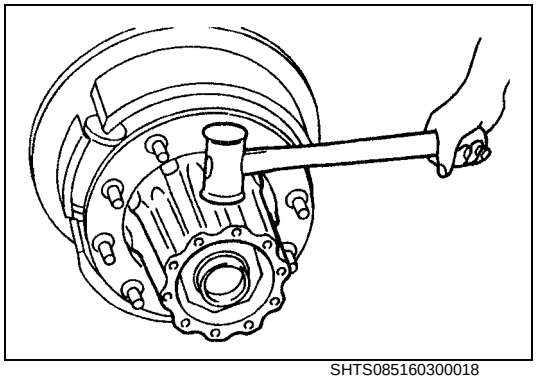
SHTS085160300008

5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

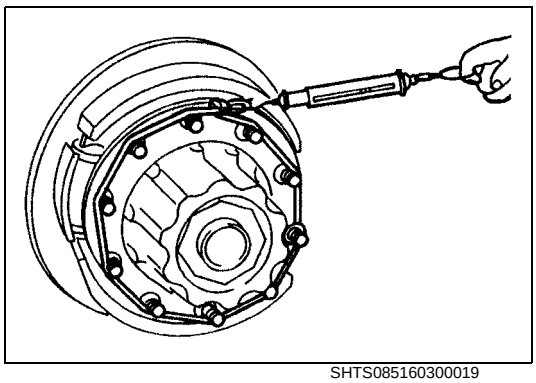
(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.

SST:
Socket Wrench (S0960-31360)
Handle (S0984-91601)
Handle (S0984-92001)

Tightening Torque:
588-1,176 N·m {6,000-12,000 kgf·cm, 434-868 lbf·ft}


SHTS085160300018

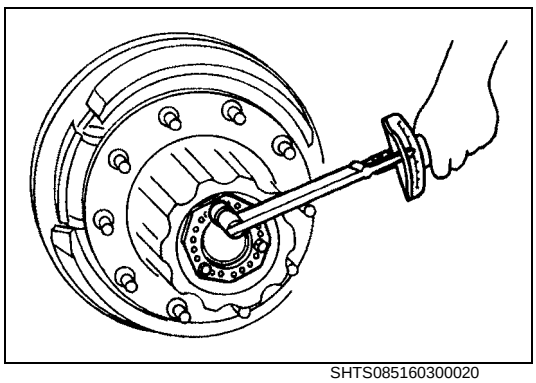
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.


SHTS085160300019

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**3.9-7.9 {40-80, 2.9-5.8}**
Spring balancer reading N {kgf, lbf}	**23.3-47.1 {2.4-4.8, 5.3-10.5}**

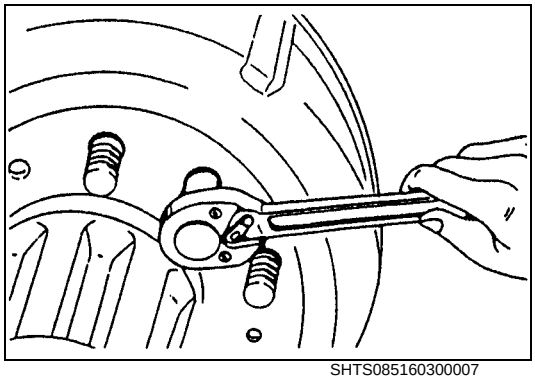

SHTS085160300020

6. INSTALLATION OF THE LOCK PLATE

(1) Install the lock plate to the lock nut.

NOTICE

- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**


SHTS085160300007

7. INSTALLATION OF THE BRAKE DRUMS (DRUM LOCATION TYPE: OUTBOARD MOUNTED)

(1) Install the brake drums and tighten the drum set screws.

8. INSTALLATION OF THE WHEELS

(1) Refer to the chapter **"WHEEL & TIRE"**.

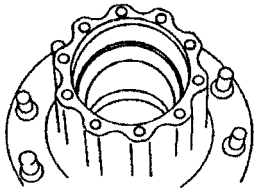
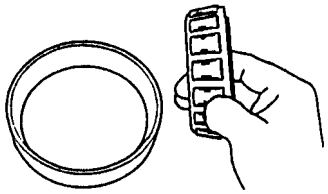
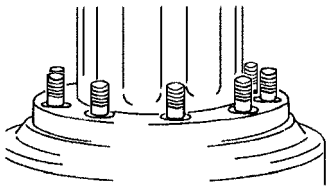
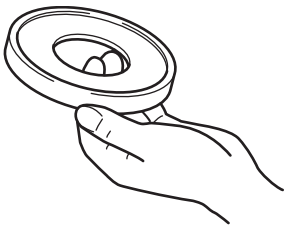
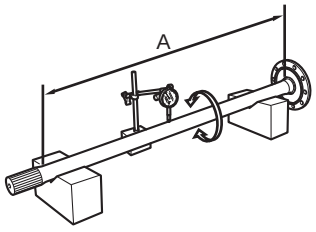
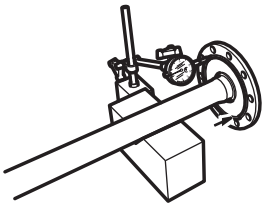
9. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT

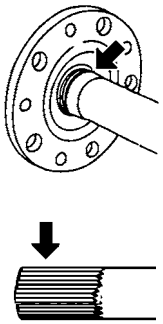
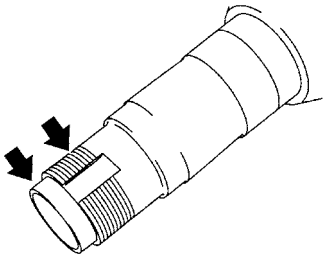
(1) On completion of the wheel hub and related parts reassembly, conduct the followings.
   a. Bleed the air from the brake lines according to the section **"SERVICE BRAKE ASSEMBLY"** in the chapter **"BRAKE EQUIPMENT"**.
   b. Adjust the brake shoe clearance according to the section **"WHEEL BRAKE"** in the chapter **"SERVICE BRAKE"**.

INSPECTION AND REPAIR

EN0851603H300001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Wheel hub bearing race: Burns, pitting and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel hub bearings: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel bolt: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal guide: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle shaft: Bend (Measure the bend at 2 or 3 points of the range "A".)	**0.8 {0.0314} or less**	**—**	**Replace.**	**Measure** 
Axle shaft flange: Bend	**0.3 {0.0118} or less**	**—**	**Replace.**	**Measure** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Axle shaft flange and spline: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Use the magnetic flaw detector or color checking instrument.** 
Axle tube: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: THD17) AX03-006

REAR AXLE AX03-2
DATA AND SPECIFICATIONS AX03-2
DESCRIPTION AX03-2
TROUBLESHOOTING AX03-4
SPECIAL TOOL AX03-5
COMPONENT LOCATOR AX03-6
OVERHAUL AX03-8
INSPECTION AND REPAIR AX03-13

REAR AXLE

DATA AND SPECIFICATIONS

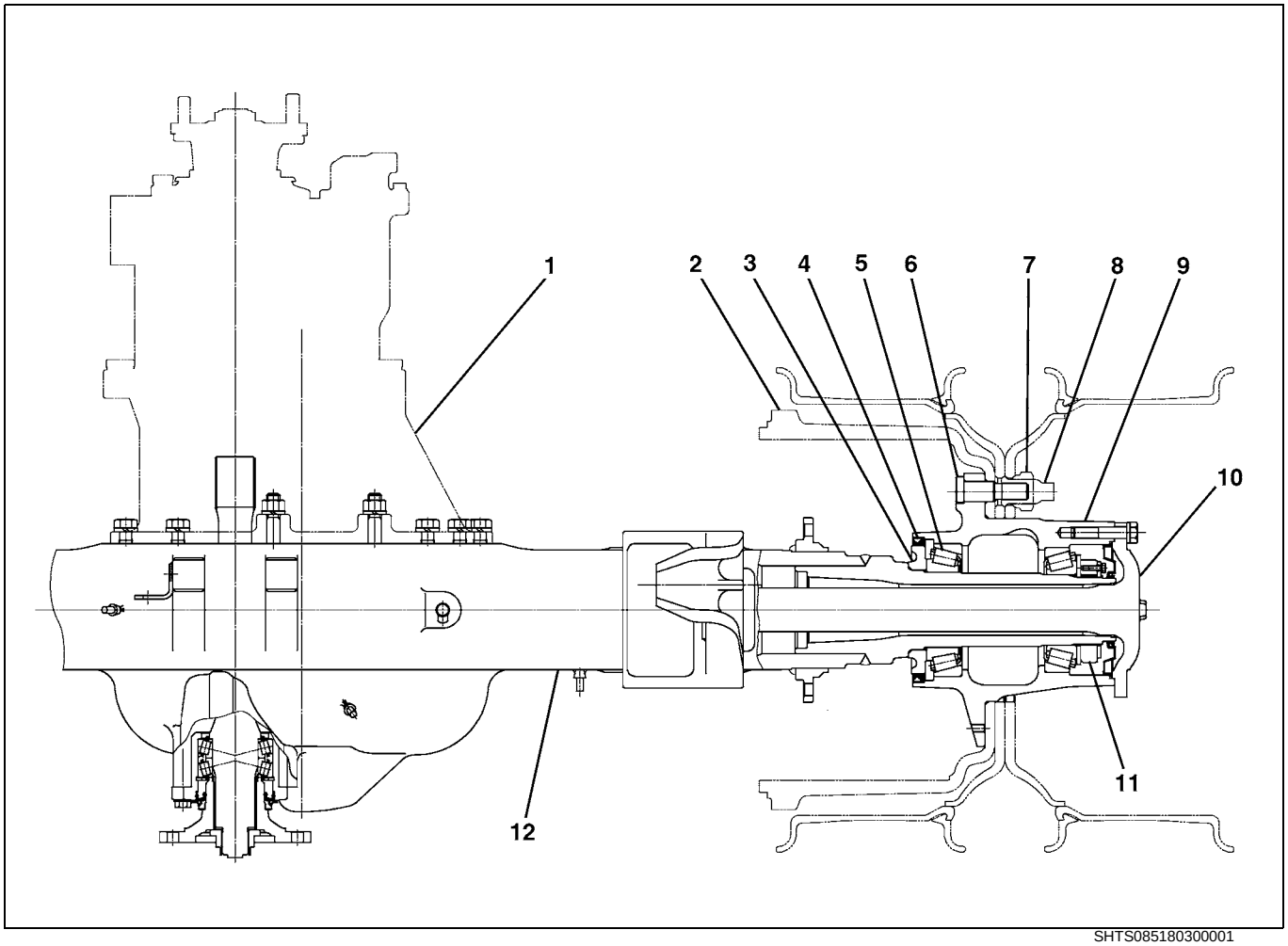
EN0851803I200001

Type	**Full-floating axle shaft**
Housing	**Banjo type, with extension tubes welded on both ends**
Type of drive	**Torque rod drive**

DESCRIPTION

EN0851803C100001

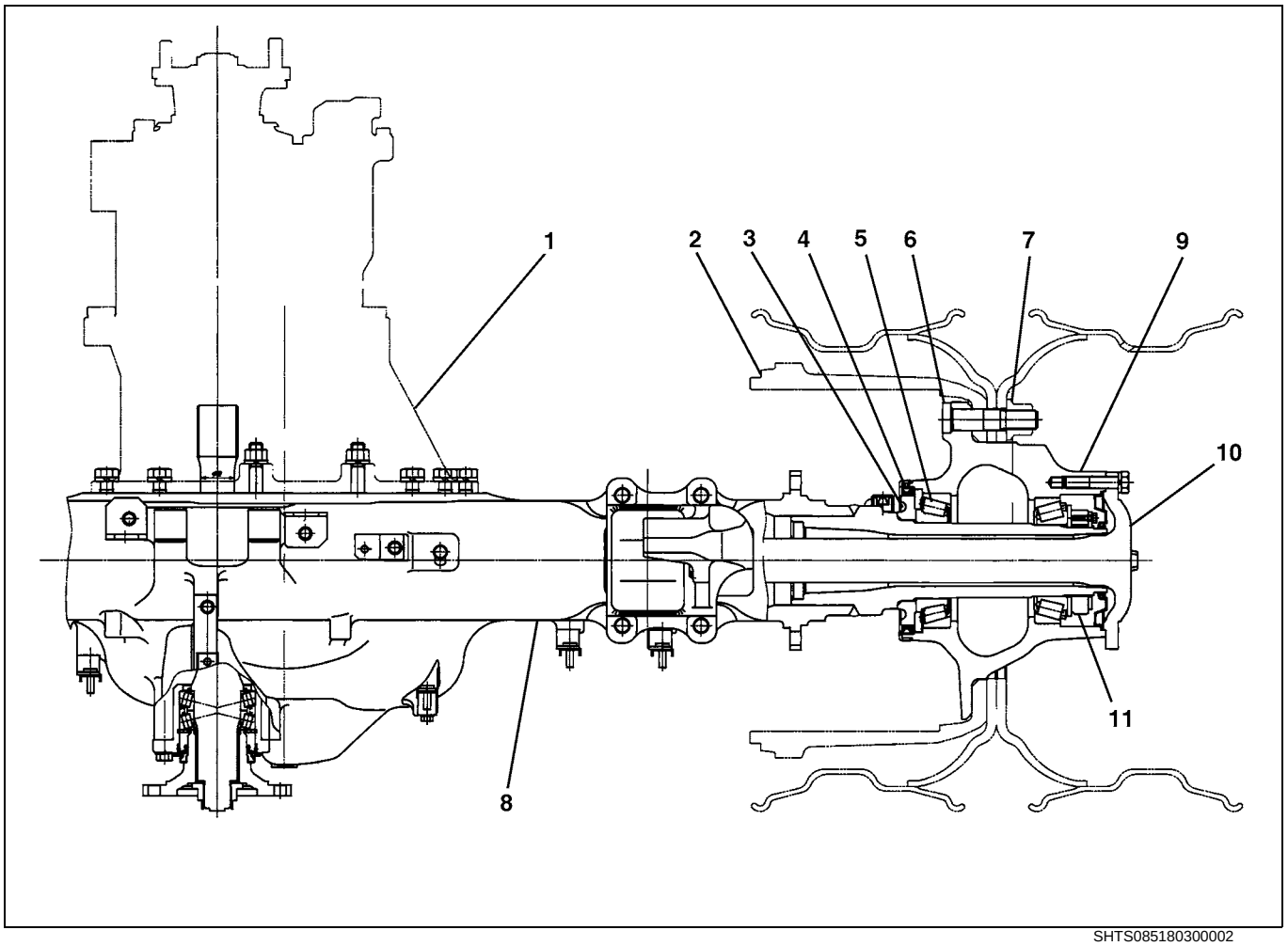
JIS TYPE WHEEL



SHTS085180300001

1	**Differential carrier assembly**	**7**	**Outer wheel nut**
2	**Brake drum**	**8**	**Inner wheel nut**
3	**Oil seal collar**	**9**	**Wheel hub**
4	**Oil seal**	**10**	**Axle shaft**
5	**Wheel hub bearing**	**11**	**Lock nut**
6	**Wheel bolt**	**12**	**Axle housing**

ISO TYPE WHEEL



SHTS085180300002

1	Differential carrier assembly	7	Wheel nut
2	Brake drum	8	Axle housing
3	Oil seal collar	9	Wheel hub
4	Oil seal	10	Axle shaft
5	Wheel hub bearing	11	Lock nut
6	Wheel bolt		

TROUBLESHOOTING

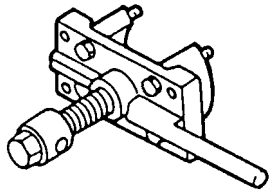
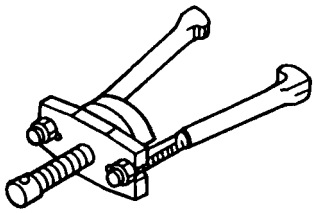
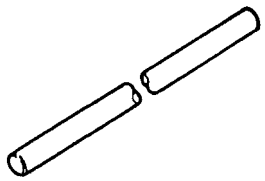
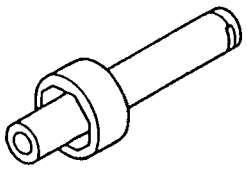
EN0851803F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Bearing system)	Worn or damaged pinion bearings.	Replace bearings.
	Worn or damaged differential side bearings.	Replace bearings.
	Loose pinion bearings.	Adjust bearing preload.
	Loose differential side bearings.	Adjust bearing preload.
Abnormal noise (Gear system)	Inadequate backlash on ring gear and pinion gear.	Adjust backlash.
	Worn thrust washers.	Replace.
	Worn differential spider.	Replace.
	Worn or damaged ring gear and pinion.	Replace.
	Worn or damaged differential side gears and pinions.	Replace.
	Loose ring gear tightening bolts.	Tighten bolts.
	Inadequate tooth contact of ring gear and pinion gear.	Replace or adjust tooth contact.
	Worn pinion spline.	Replace.
Abnormal noise (Rear axle system)	Worn rear axle shaft spline.	Replace.
	Worn hub bearings.	Replace.
	Loose hub bearings.	Adjust bearing preload.
	Loose differential case tightening bolts.	Tighten bolts.
Abnormal noise (Oil system, etc.)	Insufficient oil.	Add oil, check for leakage.
	Poor oil quality.	Change oil.
	Abnormal noise of propeller shaft.	Refer to the chapter "**PROPELLER SHAFT**".

SPECIAL TOOL

EN0851803K100001

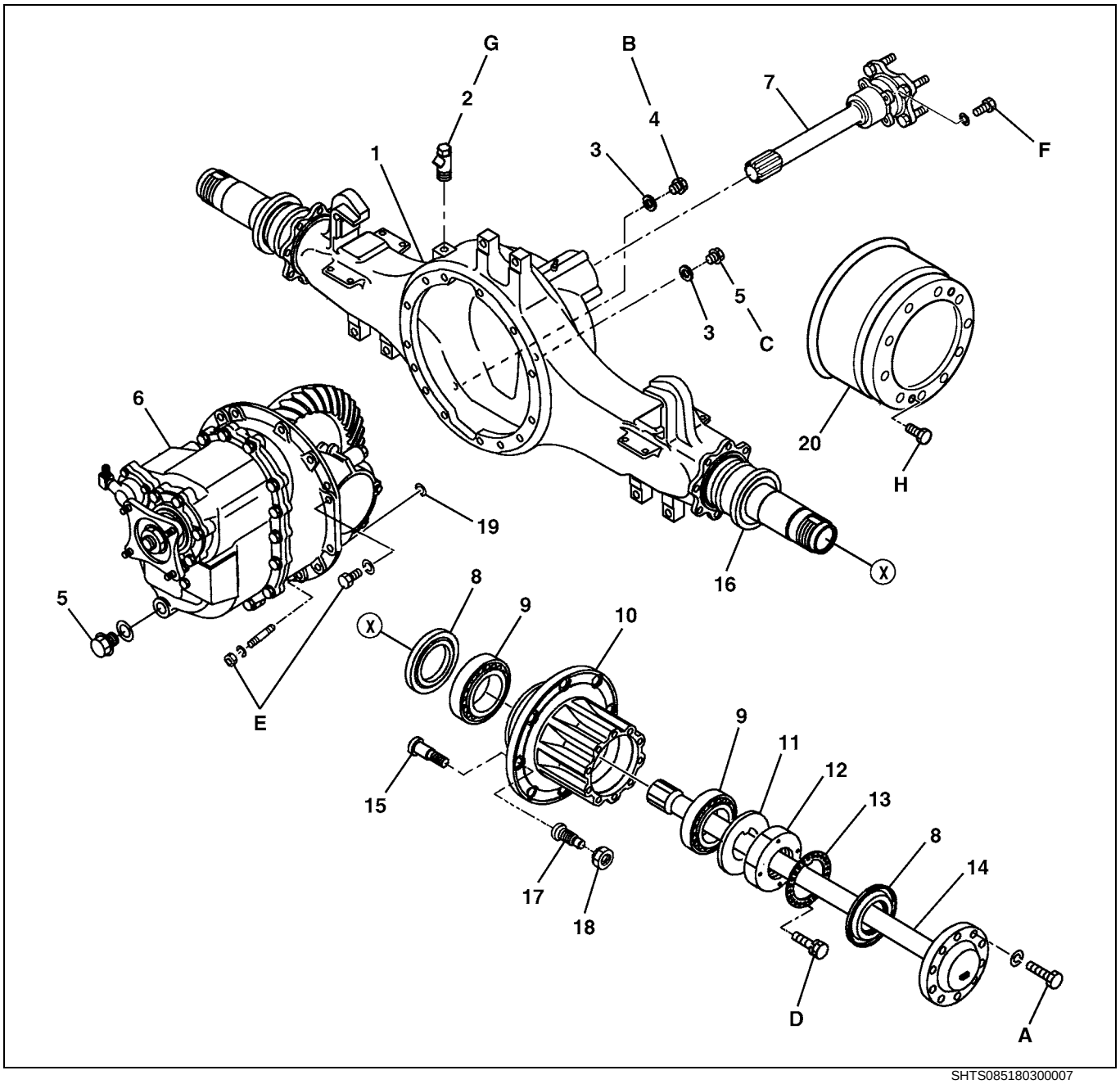
Prior to starting a rear axle overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-01790	WHEEL HUB PULLER	
	S0965-01310	HUB BEARING PULLER	
	S0984-91601 S0984-92001	HANDLE	
	S0960-31360	SOCKET WRENCH	

COMPONENT LOCATOR

EN0851803D100001

JIS TYPE WHEEL



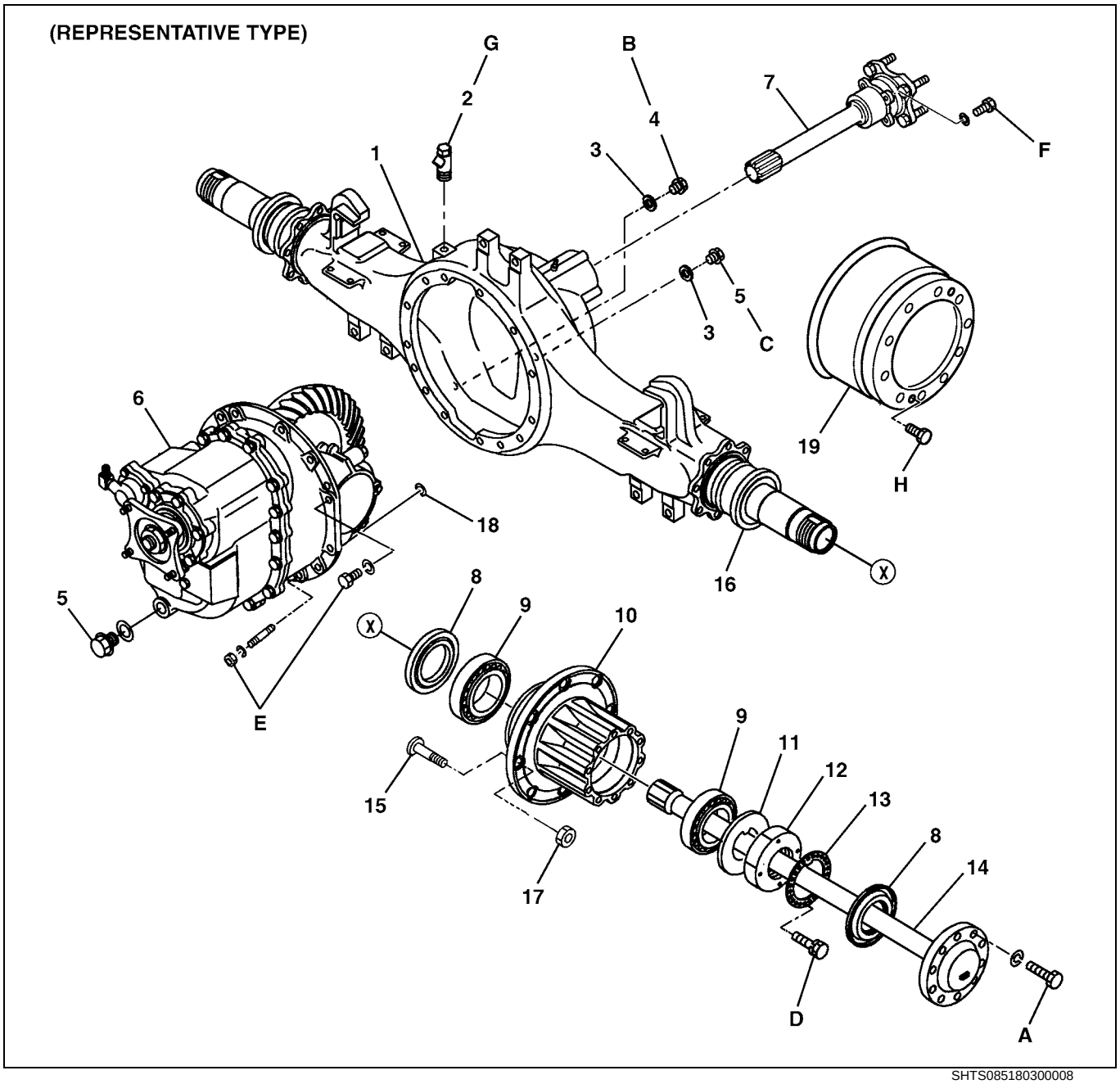
SHTS085180300007

1	Axle housing assembly	8	Oil seal	15	Wheel bolt
2	Air breather	9	Wheel hub bearing	16	Oil seal collar
3	Gasket	10	Wheel hub	17	Inner wheel nut
4	Oil drain plug	11	Lock washer	18	Outer wheel nut
5	Oil filler plug	12	Lock nut	19	O-ring
6	Differential carrier assembly	13	Lock plate	20	Brake drum
7	Through shaft assembly	14	Axle shaft		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	148-192 {1,500-2,000, 109-144}	E	167-213 {1,700-2,200, 123-159}
B	39.2-68.6 {400-700, 29-50}	F	64-84 {650-870, 47-63}
C	78.4-117.6 {800-1,200, 58-86}	G	9.8-19.6 {100-200, 7.3-14.4}
D	8.33-10.79 {85-110, 6.2-8.0}	H	20.5-39.5 {210-400, 16-29}

ISO TYPE WHEEL



SHTS085180300008

1	Axle housing assembly	8	Oil seal	15	Wheel bolt
2	Air breather	9	Wheel hub bearing	16	Oil seal collar
3	Gasket	10	Wheel hub	17	Wheel nut
4	Oil drain plug	11	Lock washer	18	O-ring
5	Oil filler plug	12	Lock nut	19	Brake drum
6	Differential carrier assembly	13	Lock plate		
7	Through shaft assembly	14	Axle shaft		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	148-192 {1,500-2,000, 109-144}	E	167-213 {1,700-2,200, 123-159}
B	78.4-117.6 {800-1,200, 58-86}	F	64-84 {650-870, 47-63}
C	39.2-68.6 {400-700, 29-50}	G	9.8-19.6 {100-200, 7.3-14.4}
D	8.33-10.79 {85-110, 6.2-8.0}	H	20.5-39.5 {210-400, 16-29}

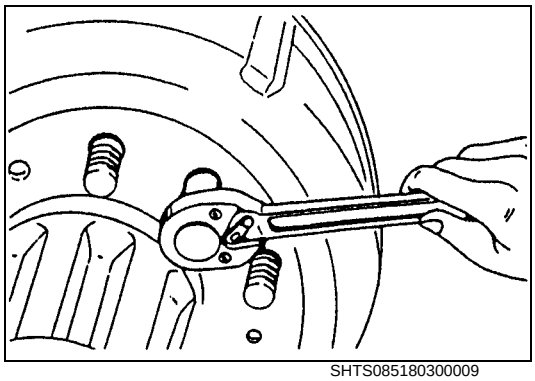
OVERHAUL

EN0851803H200001

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".



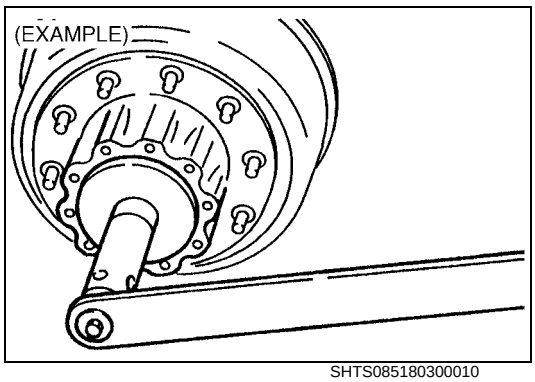
SHTS085180300009

2. REMOVAL OF THE BRAKE DRUMS

(1) Loosen the drum set screws and remove the brake drums.

NOTICE

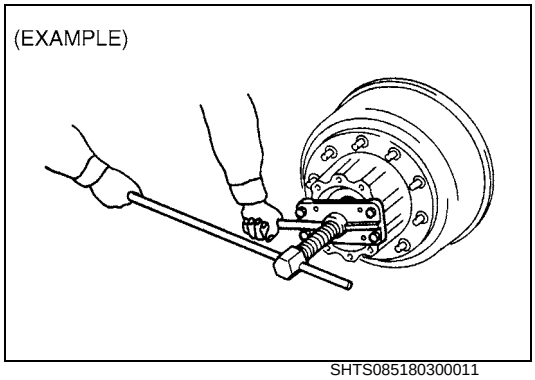
- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**



SHTS085180300010

3. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT

SST:
Socket Wrench (S0960-31360)
Handle (S0984-91601)
Handle (S0984-92001)



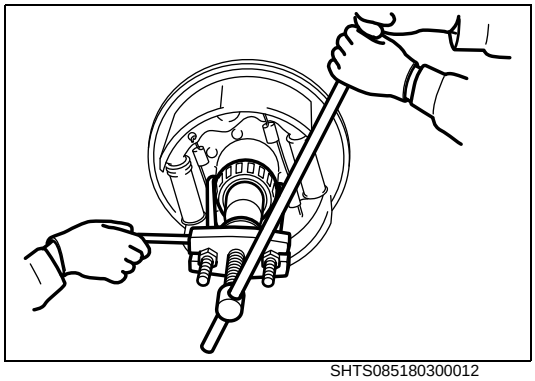
SHTS085180300011

4. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING

SST:
Wheel Hub Puller (S0965-01790)
Handle (S0984-91601)
Handle (S0984-92001)

NOTICE

The wheel hub assembly is heavy, therefore be careful when handling it.



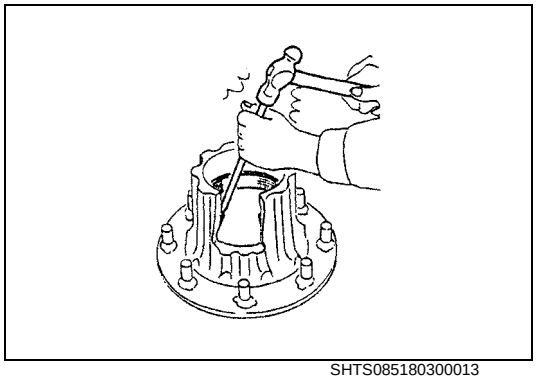
SHTS085180300012

5. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR

SST:
Hub Bearing Puller (S0965-01310)
Handle (S0984-91601)
Handle (S0984-92001)

6. REMOVAL OF THE WHEEL BRAKE

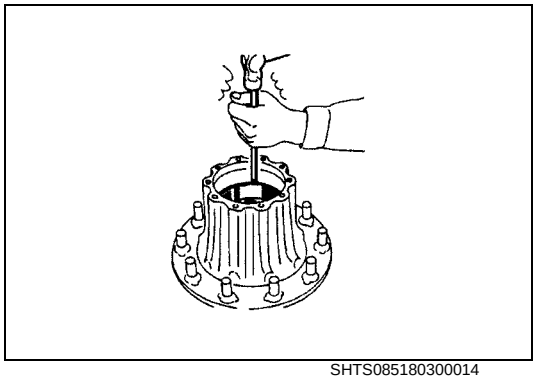
(1) Refer to the chapter "**SERVICE BRAKE**".


SHTS085180300013

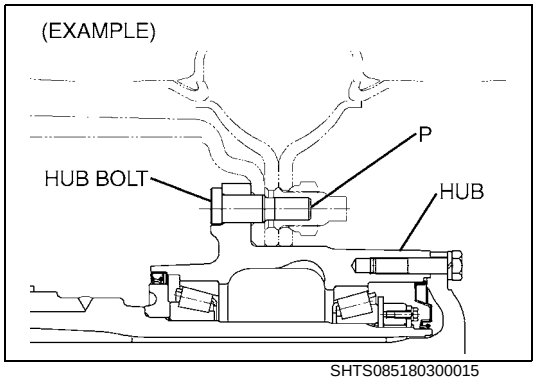
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE WHEEL HUB BEARING RACE

(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.


SHTS085180300014

(2) Using a tapping rod and a hammer or a press, install the outer race.



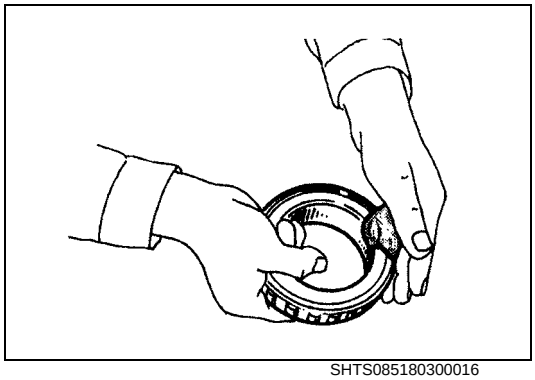
SHTS085180300015

2. REPLACEMENT OF THE WHEEL BOLTS

NOTICE

The left and right wheel bolts differ, so install them according to the chart below.

	Marks at "P"	Color
RIGHT	**R**	**Gold**
LEFT	**L**	**Silver**



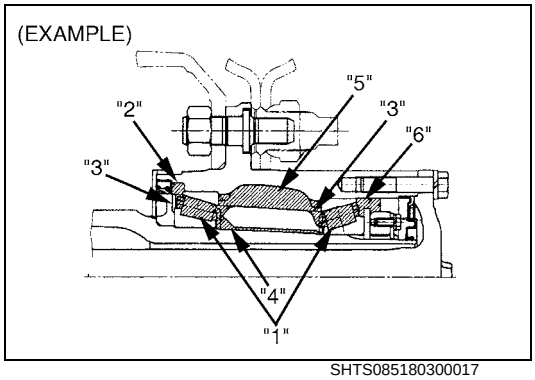
SHTS085180300016

3. GREASING

(1) Pack sufficient amount of wheel hub bearing grease between the bearing rollers.

NOTICE

"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.

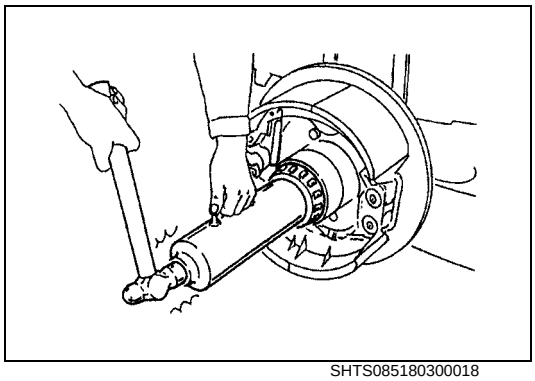


SHTS085180300017

(2) Apply wheel hub bearing grease to wheel hub.

NOTICE

- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the end of race circumferential with the width of 15 mm {0.591 in}.**
- **"5": When filling the grease to this space, do it up to the line which connects between the small diameter sides edges of 2 bearings.**
- **"6": Fill the grease up the half depth of the lock nut.**



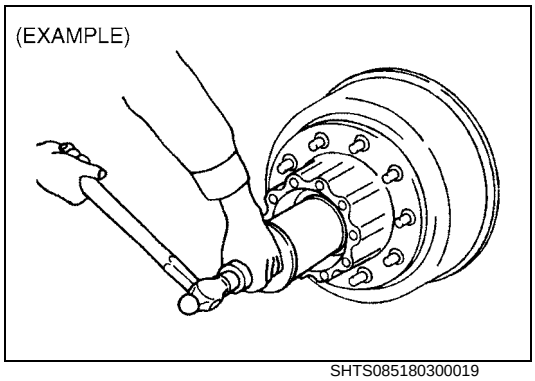
SHTS085180300018

4. INSTALLATION OF THE OIL SEAL, THE WHEEL HUB BEARINGS AND WHEEL HUB ASSEMBLY

(1) Install the oil seal and the inner wheel hub bearing.

NOTICE

If the collar is warmed up with hot water, it can easily be installed.

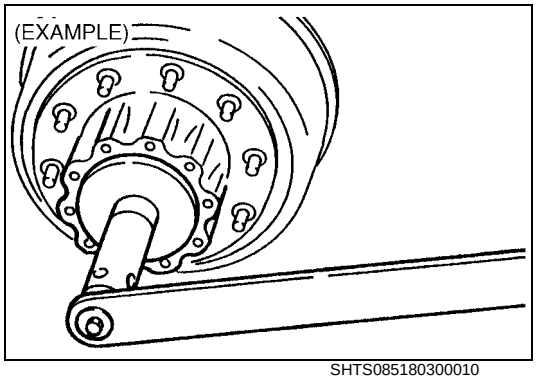


SHTS085180300019

(2) Install the wheel hub assembly and the outer wheel hub bearing.

NOTICE

- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**



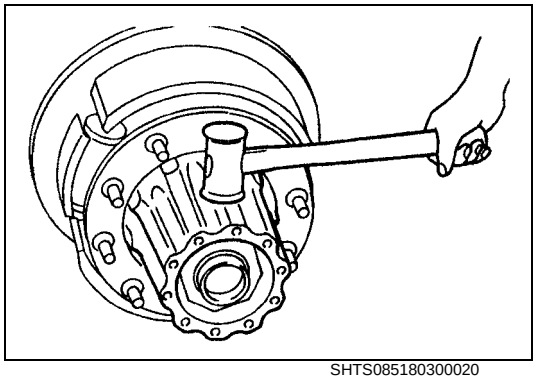
SHTS085180300010

5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

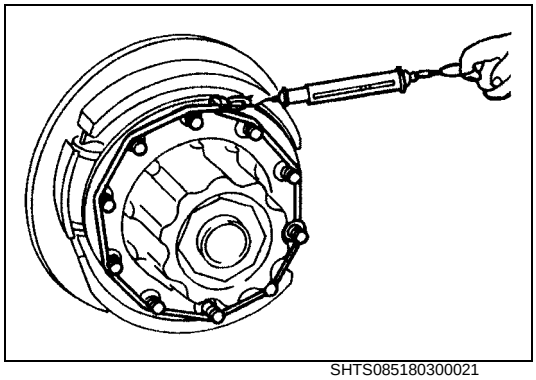
(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.

SST:
Socket Wrench (S0960-31360)
Handle (S0984-91601)
Handle (S0984-92001)

Tightening Torque:
588-1,176 N·m {6,000-12,000 kgf·cm, 434-868 lbf·ft}


SHTS085180300020

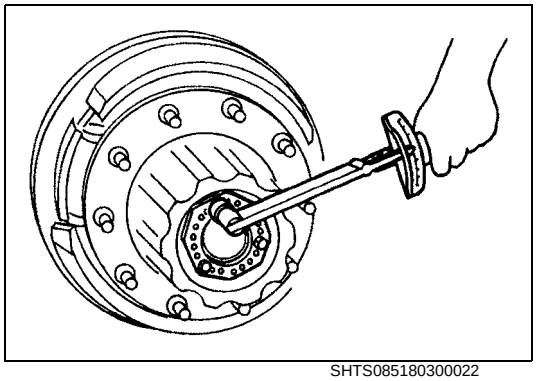
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub, and check the return of the bearing. (Check that the hub can be turned by hands, and the nut cannot be turned by hands.)


SHTS085180300021

(3) Measure the wheel bearing preload. If it exceeds or it is less than the standard value shown below, adjust the preload with the lock nut.

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}		**3.9-5.9 {40-60, 2.9-4.4}**
Spring balancer reading N {kgf, lbf}	**ISO type wheel hub**	**23.3-35.2 {2.4-3.5, 5.2-7.9}**
	JIS type wheel hub	**27.4-41.4 {2.8-4.2, 6.2-9.3}**

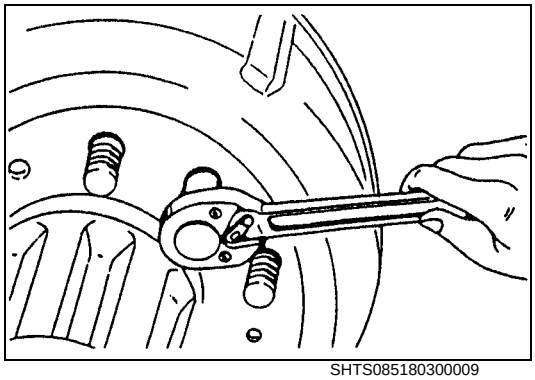

SHTS085180300022

6. INSTALLATION OF THE LOCK PLATE

(1) Install the lock plate to the lock nut.

NOTICE

- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**


SHTS085180300009

7. INSTALLATION OF THE BRAKE DRUMS

(1) Install the brake drums and tighten the drum set screws.

8. INSTALLATION OF THE WHEELS

(1) Refer to the chapter "**WHEEL & TIRE**".

9. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT.

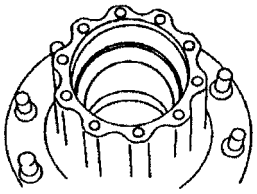
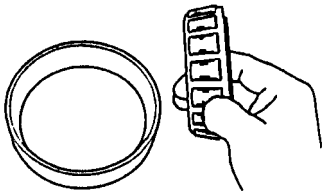
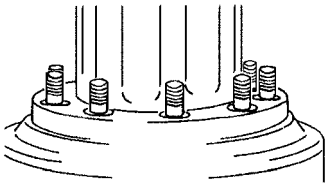
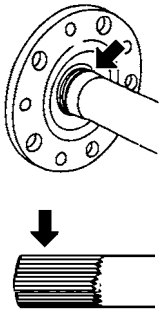
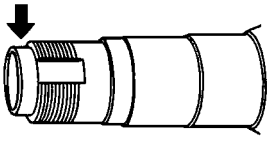
(1) On completion of the wheel hub and related parts reassembly, conduct the followings.

a. Bleed the air from the brake lines according to the section "**SERVICE BRAKE ASSEMBLY**" in the chapter "**BRAKE EQUIPMENT**".

b. Adjust the brake shoe clearance according to the section "**WHEEL BRAKE**" in the chapter "**SERVICE BRAKE**".

INSPECTION AND REPAIR

EN0851803H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Wheel hub bearing race: Burns, pitting and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel hub bearings: Burns and pitting	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel bolt: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil seal collar: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle shaft spline: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Axle tube: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL & TIRE

AX04-001

WHEEL AND TIRE AX04-2
DATA AND SPECIFICATIONS AX04-2
DESCRIPTION AX04-8
TROUBLESHOOTING AX04-13
SPECIAL TOOL AX04-15
PRECAUTIONS AX04-16
INSPECTION AX04-17
INSPECTION AND REPAIR AX04-18

SAE, JIS, DIN AND ISO TYPE WHEEL AX04-19
OVERHAUL AX04-19

SPOKE WHEEL AND ADAPTER TYPE WHEEL AX04-25
OVERHAUL AX04-25

WHEEL AND TIRE

DATA AND SPECIFICATIONS

EN08Z0904I200001

The figures given in the table are based on the recommendation by European Tire and Rim Technical Organization. (E.T.R.T.O.)

***(1). Tire radius given is dynamic effective radius for dual tires, for single tire, deduct 1.0 mm {0.039 in.} from the figure given.**

***(2). The rims with mark (•) are standard and others may be used.**

***(3). The max. air pressure and max. load refer to the recommendation by Japan Automobile Tire Manufacturers' Association. (J.A.T.M.A.)**

***(4). The tire is certified by ECE.**

***(5). Some vehicle specifications are not applicable to the following table. Refer to the Owner's Manual for details.**

***(6). The tire is certified by GB.**

1. Diagonal tires

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb.}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
*(3) 7.00-16-6PR	325 {3.25, 47}	880 {1,940}	840 {1,852}	*(1) 368 {14.49}	• 16 x 5.50F SDC
*(3) 7.00-16-10PR	500 {5.00, 73}	1,130 {2,491}	1,075 {2,370}		• 16 x 5.50F SDC
7.00-16-12PR	600 {6.12, 87}	1,285 {2,833}	1,250 {2,756}	373 {14.69}	• 16 x 5.50F SDC
7.50-16-12PR	650 {6.63, 94}	1,450 {3,197}	1,400 {3,086}	389 {15.31}	• 16 x 6.00GS SDC
*(3) 7.50-16-14PR	650 {6.50, 94}	1,510 {3,329}	1,440 {3,175}	383 {15.08}	
7.50-20-10PR	550 {5.61, 80}	1,550 {3,417}	1,500 {3,307}	451 {17.76}	• 20 x 6.00S
7.50-20-12PR	675 {6.88, 98}	1,800 {3,968}	1,750 {3,858}		
8.25-16-14PR	650 {6.63, 94}	1,800 {3,968}	1,700 {3,747}	404 {15.91}	• 16 x 6.40H 16 x 6.00S SDC 16 X 6.00GS
*(3) 8.25-16-14PR	575 {5.75, 83.4}	1,710 {3,770}	1,630 {3,593}	*(1) 404 {15.91}	• 16 x 6.00GS
8.25-20-12PR	600 {6.12, 87}	1,900 {4,188}	1,800 {3,968}	468 {18.43}	• 20 x 6.50T
8.25-20-14PR	675 {6.88, 98}	2,060 {4,541}	1,950 {4,299}		• 20 x 6.50T 20 x 6.00S
9.00-20-12PR	625 {6.37, 91}	2,240 {4,938}	2,060 {4,541}	488 {19.21}	• 20 x 7.00T 20 x 6.50T
9.00-20-14PR	700 {7.14, 102}	2,500 {5,511}	2,300 {5,071}		20 x 6.50T 20 x 7.00T 20 x 7.50V
*(3) 10.00-20-12PR	575 {5.75, 83}	2,450 {5,401}	2,210 {4,482}	*(1) 506 {19.92}	• 20 x 7.50V

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb.}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
10.00-20-14PR	650 {6.63, 94}	2,650 {5,842}	2,430 {5,357}	507 {19.96}	20 x 7.00T 20 x 7.50T
10.00-20-16PR	750 {7.65, 109}	3,000 {6,614}	2,725 {6,007}		20 x 7.00T 20 x 7.50V 20 x 8.00T
*(3) 11.00-20-12PR	575 {5.75, 83}	2,585 {5,699}	2,435 {5,368}	*(1) 520 {20.47}	• 20 x 8.00V
11.00-20-14PR	675 {6.88, 98}	3,000 {6,614}	2,725 {6,007}	521 {20.51}	20 x 7.50V
11.00-20-16PR	725 {7.39, 105}	3,250 {7,165}	2,900 {6,393}		20 x 7.50V 20 x 8.50V
*(3) 12.00-20-14PR	575 {5.75, 83}	2,900 {6,393}	2,760 {6,085}	*(1) 539 {21.22}	• 20 x 8.50V
12.00-20-16PR	675 {6.88, 98}	3,350 {7,385}	3,000 {6,613}	540 {21.26}	20 x 8.00V
12.00-20-18PR	775 {7.90, 112}	3,750 {8,267}	3,250 {7,165}		20 x 9.00V
12.00-24-16PR	675 {6.88, 98}	3,650 {8,047}	3,250 {7,165}	589 {23.19}	• 24 x 8.50V 24 x 8.00V 24 x 9.00V
12.00-24-18PR	775 {7.90, 112}	4,000 {8,818}	3,650 {8,047}		
*(3) 14.00-24-20PR	675 {6.75, 98}	4,990 {11,001}	4,755 {10,483}	*(1) 642 {25.28}	• 24 x 10.00WI 24 x 9.00V

2. Radial tires (with tube)

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb.}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
*(3) 7.00R-16-8PR	450 {4.5, 65}	1,025 {2,259}	980 {2,160}	*(1) 373 {14.69}	• 16 x 5.50F SDC
*(3) 7.00R-16-10PR	525 {5.25, 76}	1,130 {2,491}	1,075 {2,369}		• 16 x 5.50F SDC
*(3) 7.00R-16-12PR	600 {6.00, 87}	1,230 {2,711}	1,170 {2,579}		• 16 x 5.50F SDC
7.50R-16-12PR	625 {6.37, 91}	1,450 {3,197}	1,400 {3,086}	390 {15.35}	16 x 6.00GS
*(3) 7.50R-16-14PR	700 {7.00, 102}	1,510 {3,328}	1,440 {3,174}	*(1) 387 {15.24}	• 16 x 6.00GS SDC
7.50R-20-12PR	675 {6.88, 98}	1,800 {3,968}	1,750 {3,858}	451 {17.76}	• 20 x 6.00S 20 x 6.50T
8.25R-16-14PR	675 {6.88, 98}	1,800 {3,968}	1,700 {3,748}	418 {16.46}	• 16 x 6.00GS
*(6) 8.25R-16-18PR	775 {7.90, 112}	1,950 {4,299}	1,850 {4,079}	409 {16.10}	16 x 6.50H
8.25R-20-14PR	675 {6.88, 98}	2,060 {4,541}	1,950 {4,299}	467 {18.39}	• 20 x 6.50T 20 x 7.00T
9.00R-20-12PR	725 {7.39, 105}	2,336 {5,150}	2,050 {4,520}	491 {19.29}	20 x 7.00T
9.00R-20-14PR	725 {7.39, 105}	2,500 {5,511}	2,300 {5,071}	494 {19.45}	• 20 x 7.00T 20 x 6.50T 20 x 7.50V
10.00R-20-14PR	725 {7.39, 105}	2,650 {5,842}	2,430 {5,357}	508 {20.00}	• 20 x 7.50V 20 x 6.50T 20 x 7.00T 20 x 8.00V
10.00R-20-16PR	800 {8.16, 116}	3,000 {6,614}	2,725 {6,007}	511 {20.12}	• 20 x 7.50V 20 x 7.00T
11.00R-20-14PR	725 {7.39, 105}	3,000 {6,614}	2,725 {6,007}	523 {20.59}	• 20 x 8.00V 20 x 7.50V 20 x 8.50V
11.00R-20-16PR	800 {8.16, 116}	3,250 {7,165}	2,900 {6,393}	525 {20.67}	• 20 x 8.00V 20 x 7.50V 20 x 8.50V
12.00R-20-16PR	750 {7.65, 109}	3,350 {7,385}	3,000 {6,613}	542 {21.34}	• 20 x 8.50V 20 x 9.00V
12.00R-20-18PR	850 {8.67, 123}	3,750 {8,267}	3,250 {7,165}	545 {21.46}	• 20 x 8.50V 20 x 8.50
14.00R-20-18PR	700 {7.14, 102}	4,500 {9,921}	4,125 {9,094}	601 {23.66}	20 x 10.00V 20 x 10.00W

3. Radial tires (Tubeless)

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb.}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
205/75R17.5 122/120	675 {6.88, 81}	1,500 {3,307}	1,400 {3,086}	366 {14.41}	• 17.5 x 6.00 17.5 x 5.25 17.5 x 6.75
215/75R17.5	817.87 {8.34, 118.6}	2,180 {4,806}	2,060 {4,542}	—	17.5 x 6.00 17.5 x 6.75
*(3) 225/70R19.5 -130/128J	850 {8.50, 123}	1,900 {4,189}	1,800 {3,968}	*(1) 394 {15.51}	• 6.75 x 19.5
*(3) 225/80R17.5-14PR	700 {7.00, 102}	1,550 {3,417}	1,500 {3,307}	*(1) 389 {15.31}	• 17.5 x 6.75 17.5 x 6.00
*(3) 225/90R17.5-14PR	700 {7.00, 102}	1,750 {3,858}	1,650 {3,638}	*(1) 410 {16.14}	• 17.5 x 6.75 17.5 x 6.00
*(4) 225/90R17.5 -128/126	720 {7.34, 104}	1,800 {3,968}	1,700 {3,748}	*(1) 410 {16.14}	• 17.5 x 6.00
255/70R22.5	800 {8.16, 116}	2,500 {5,511}	2,300 {5,071}	452 {17.80}	• 22.5 x 7.50
235/70R22.5	900 {9.18, 131}	2,360 {5,202}	2,180 {4,806}	439 {17.28}	• 22.5 x 6.75
*(3) 235/70R22.5 -138/135	900 {9.18, 131}	2,360 {5,202}	2,180 {4,806}	*(1) 440 {17.32}	22.5 x 6.75
235/70R17.5	725 {7.39, 105}	1,900 {4,189}	1,800 {3,968}	387 {15.24}	17.5 x 6.75
235/75R17.5	725 {7.39, 105}	1,900 {4,189}	1,800 {3,968}	372 {14.65}	17.5 x 6.75
255/70R22.5	900 {9.18, 131}	2,725 {6,007}	2,500 {5,511}	452 {17.80}	• 22.5 x 7.50 22.5 x 6.75 22.5 x 8.25
*(3) 255/70R22.5 -143/140	900 {9.18, 131}	2,725 {6,007}	2,500 {5,511}	*(1) 453 {17.83}	22.5 x 7.50
255/70R22.5 -140/137	800 {8.16, 116}	2,500 {5,511}	2,300 {5,071}	452 {17.80}	22.5 x 7.50
275/70R22.5	900 {9.18, 131}	3,150 {6,944}	2,900 {6,393}	465 {18.31}	• 22.5 x 8.25 22.5 x 7.50
255/70R22.5 -148/145	900 {9.18, 131}	3,150 {6,944}	2,900 {6,393}	*(1) 465 {18.31}	22.5 x 8.25
*(3) 275/70R22.5 -148/145	900 {9.18, 131}	3,150 {6,944}	2,900 {6,393}	465 {18.31}	22.5 x 8.25
275/80R22.5	809.05 {8.25, 117.3}	3,000 {6,613}	2,725 {6,007}	490 {19.29}	• 22.5 x 8.25 22.5 x 7.50

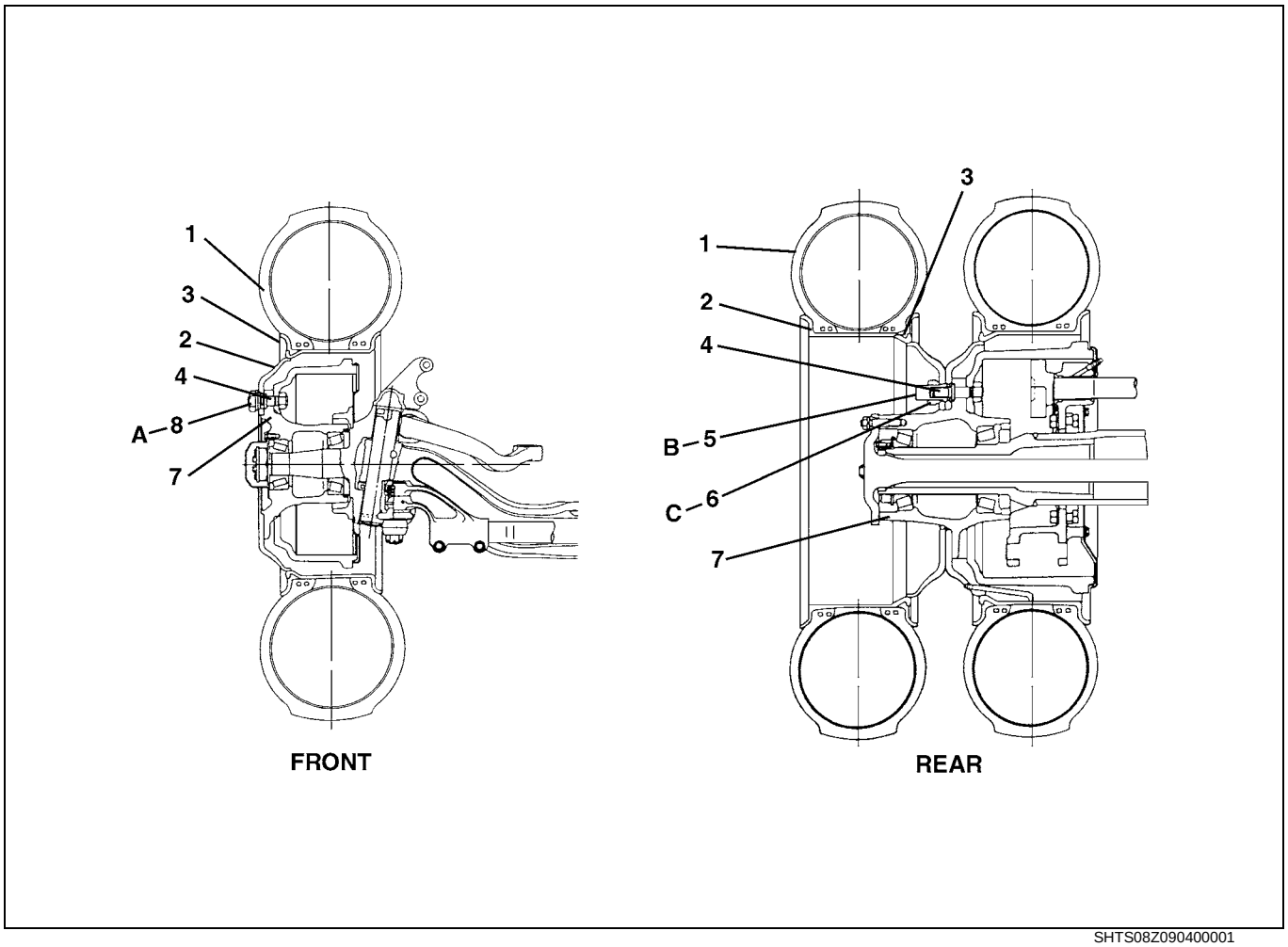
Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb.}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
275/80R22.5 -149/146J	850 {8.67, 123}	3,250 {7,165}	3,000 {6,614}	491 {19.33}	• 22.5 x 7.50
295/70R22.5	882.60 {9.00, 128.0}	3,450 {7,605}	3,150 {6,944}	467 {18.39}	• 22.5 x 9.00 22.5 x 8.25
295/80R22.5	800 {8.16, 116}	3,350 {7,385}	3,000 {6,614}	507 {19.96}	• 22.5 x 8.25
295/80R22.5 -152/148	850 {8.67, 123}	3,550 {7,385}	3,150 {6,945}	507 {19.96}	22.5 x 9.00
315/80R22.5	825 {8.41, 120}	3,750 {8,267}	3,350 {7,385}	523 {20.59}	• 22.5 x 9.00
8R17.5 117/116	600 {6.12, 87}	1,285 {2,833}	1,250 {2,756}	381 {15.00}	• 17.5 x 5.25 • 17.5 x 6.00 17.5 x 6.75
*(3) 8.5R17.5-12PR	625 {6.25, 91}	1,450 {3,196}	1,400 {3,086}	*(1) 389 {15.31}	• 17.5 x 6.00 16 x 6.00GS SDC
*(3) 9R22.5-14PR	725 {7.25, 105}	2,030 {4,475}	1,930 {4,255}	*(1) 470 {18.50}	• 22.5 x 6.75 22.5 x 6.00
9R22.5-133/131	675 {6.88, 98}	2,060 {4,541}	1,950 {4,299}	471 {18.54}	22.5 x 6.75
9.5R-17.5-14PR	671.76 {6.85, 97.4}	1,700 {3,748}	1,600 {3,527}	408 {16.06}	• 17.5 x 6.00 17.5 x 6.75
9.5R-17.5 129/127	671.76 {6.85, 97.4}	1,700 {3,748}	1,600 {3,527}	408 {16.06}	• 17.5 x 6.00 17.5 x 6.75
*(3) 10R22.5-14PR	725 {7.25, 105}	2,415 {5,324}	2,300 {5,071}	*(1) 492 {19.37}	• 22.5 x 7.50 22.5 x 6.75
10R22.5-144/142	850 {8.67, 123}	2,800 {6,173}	2,650 {5,842}	495 {19.49}	22.5 x 7.50
*(3) 11R22.5-14PR	700 {7.00, 102}	2,725 {6,007}	2,500 {5,511}	*(1) 508 {20.0}	• 22.5 x 8.25 22.5 x 7.50
*(3) 11R22.5-16PR	800 {8.00, 116}	3,000 {6,614}	2,725 {6,007}	*(1) 508 {20.0}	• 22.5 x 8.25 22.5 x 7.50
11R22.5-148/145	850 {8.67, 123}	3,150 {6,945}	2,900 {6,393}	510 {20.08}	22.5 x 8.25
*(3) 12R22.5-14PR	725 {7.25, 105}	3,000 {6,614}	2,725 {6,007}	*(1) 523 {20.59}	• 22.5 x 9.00 22.5 x 7.50 22.5 x 8.25
*(3) 12R22.5-16PR	800 {8.00, 116}	3,250 {7,165}	2,900 {6,393}	*(1) 523 {20.59}	• 22.5 x 9.00 22.5 x 8.25
12R22.5-152/148	850 {8.67, 123}	3,550 {7,826}	3,150 {6,944}	526 {20.71}	• 22.5 x 8.25

4. Off the road tires

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb.}	Tire radius mm {in.}	*(2) Applicable rim size
		Single		
*(3) 7.50-20-12PR	525 {5.25, 76}	1,600 {3,527}	*(1) 447 {17.60}	• 6.00S
*(3) 8.25-20-12PR	525 {5.25, 76}	1,890 {4,167}	*(1) 465 {18.31}	• 6.50T 6.00S
*(3) 8.25-20-14PR	600 {6.00, 87}	2,045 {4,508}		
*(3) 9.00-20-12PR	475 {4.75, 69}	2,120 {4,674}	*(1) 485 {19.09}	• 7.00T 6.50T
*(3) 9.00-20-14PR	550 {5.50, 80}	2,310 {5,093}		
*(3) 10.00-20-14PR	500 {5.00, 73}	2,470 {5,445}	*(1) 500 {19.69}	• 7.50V 7.00T 8.00V
*(3) 11.00-20-14PR	475 {4.75, 69}	2,605 {5,743}	*(1) 513 {20.20}	• 8.00V 7.50V 8.50V
*(3) 12.00-20-14PR	425 {4.25, 62}	2,795 {6,162}	*(1) 532 {20.94}	• 8.50V 8.00V 9.00V
*(3) 12.00-20-16PR	500 {5.00, 73}	3,075 {6,779}		
*(3) 12.00-20-18PR	550 {5.50, 80}	3,250 {7,165}		
*(3) 12.00-24-16PR	500 {5.00, 73}	3,460 {7,628}	*(1) 582 {22.91}	• 8.50V 8.00V 9.00V
*(3) 13.00-24-18PR	500 {5.00, 73}	4,000 {8,818}	*(1) 606 {23.86}	• 9.00V 8.50V
*(3) 14.00-20-16PR	425 {4.25, 62}	3,850 {8,488}	*(1) 584 {22.99}	• 10.00WI 9.00V
*(3) 14.00-24-16PR	425 {4.25, 62}	4,295 {9,469}	*(1) 635 {25.00}	• 10.00WI 9.00V
*(3) 14.00-24-20PR	525 {5.25, 76}	4,865 {10,725}		
*(3) 14.00-24-24PR	650 {6.50, 94}	5,510 {12,147}		

DESCRIPTION

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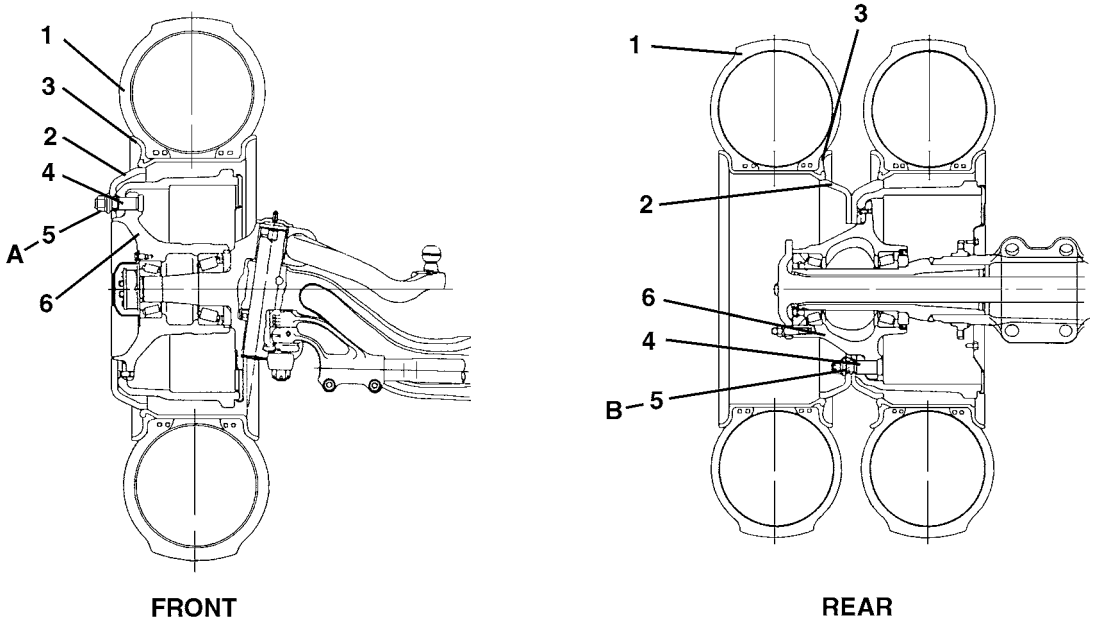


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SAE AND JIS TYPE

1	Tire	5	Inner wheel nut
2	Disc wheel	6	Outer wheel nut
3	Side ring	7	Hub
4	Wheel bolt	8	Wheel nut

	Wheel bolt diameter mm {in.}	Tightening torque N·m {kgf·cm, lbf·ft}
A	20 {0.787}	392.27-470.71 {4,000-4,800, 290-347}
	18 {0.709}	235.36-294.19 {2,400-3,000, 174-216}
B, C	20 {0.787}	392.27-470.71 {4,000-4,800, 290-347}
	18 {0.709}	235.36-294.19 {2,400-3,000, 174-216}

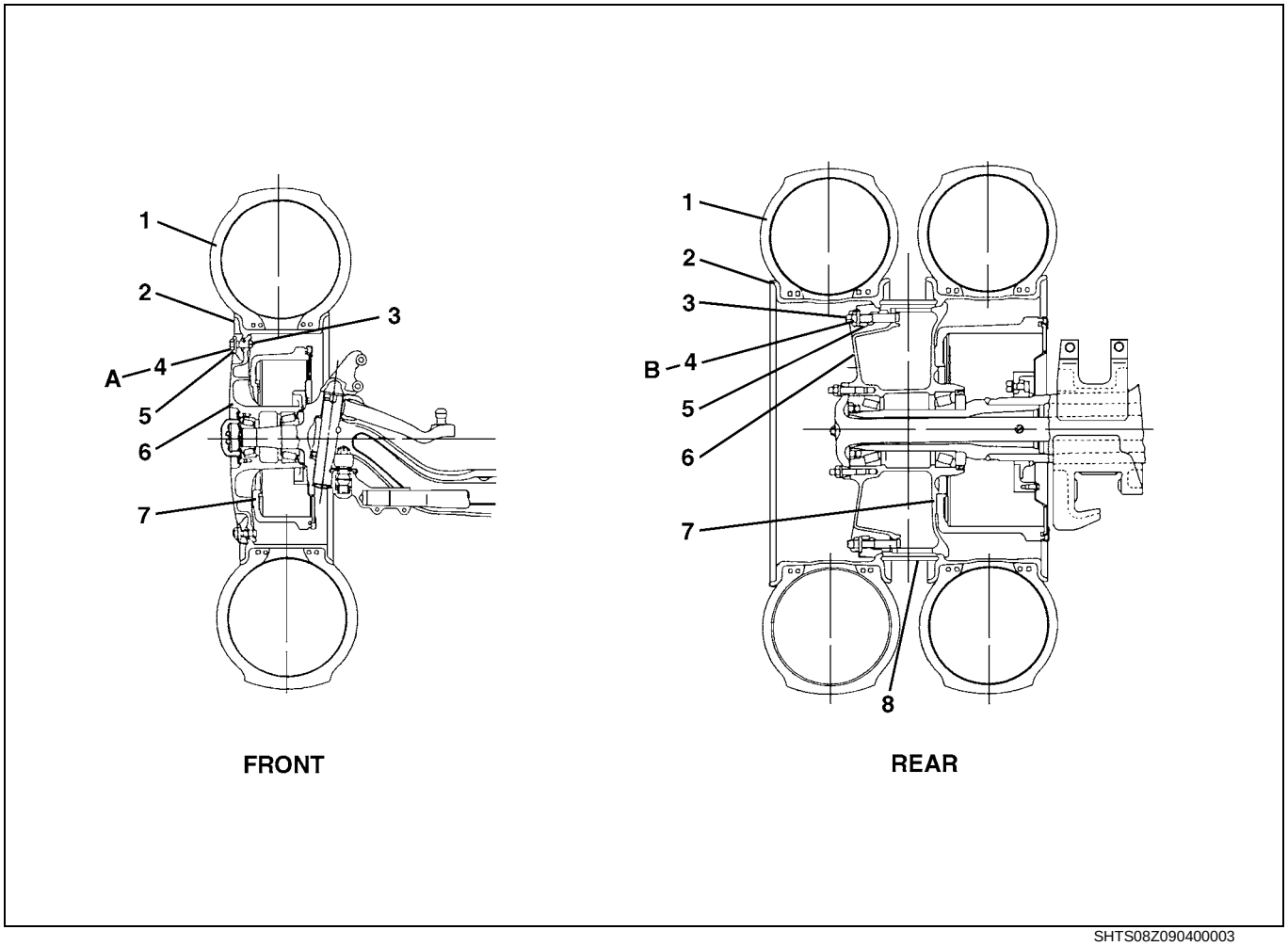


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DIN AND ISO TYPE

1	Tire	4	Wheel bolt
2	Disc wheel	5	Wheel nut
3	Side ring	6	Hub

	Type	Tightening torque N·m {kgf·cm, lbf·ft}
A	DIN	490.34-588.39 {5,000-6,000, 362-433}
	ISO	490-539 {5,000-5,500, 362-397}
B	DIN	490.34-588.39 {5,000-6,000, 362-433}
	ISO	490-539 {5,000-5,500, 362-397}

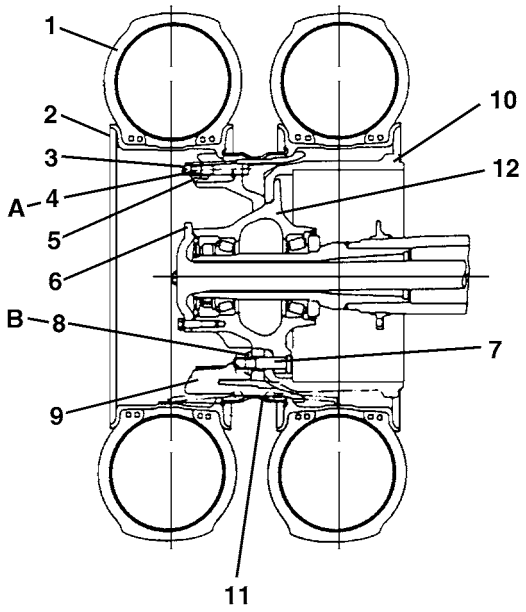


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SPOKE WHEEL TYPE

1	Tire	5	Clamp
2	Rim	6	Spoke wheel
3	Clamp bolt	7	Brake drum
4	Clamp nut	8	Band spacer

	Tightening torque N·m {kgf·cm, lbf·ft}
A	264.78-294.19 {2,700-3,000, 196-216}
B	264.78-294.19 {2,700-3,000, 196-216}

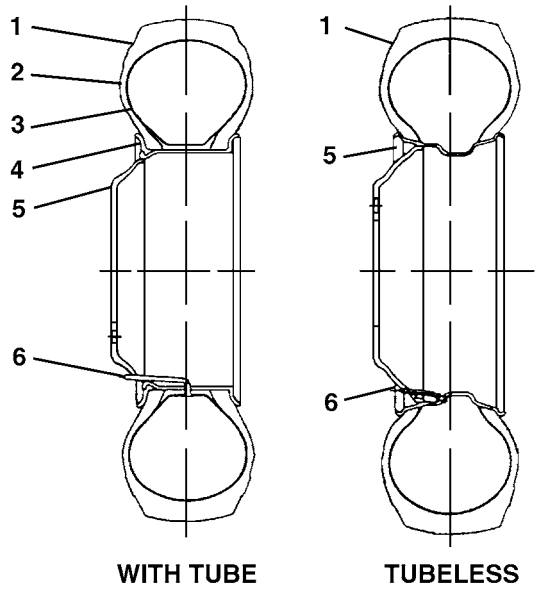


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ADAPTER TYPE SPOKE WHEEL (Only for rear)

1	Tire	7	Wheel bolt
2	Rim	8	Hub nut
3	Clamp bolt	9	Adapter
4	Clamp nut	10	Brake drum
5	Clamp	11	Band spacer
6	Axle shaft	12	Hub

	Tightening torque N·m {kgf·cm, lbf·ft}
A	294.20-323.61 {3,000-3,300, 217-238}
B	490.34-588.39 {5,000-6,000, 362-433}



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WHEEL AND TIRE

1	**Tire**	**4**	**Side ring**
2	**Tube**	**5**	**Disc wheel**
3	**Flap**	**6**	**Valve**

TROUBLESHOOTING

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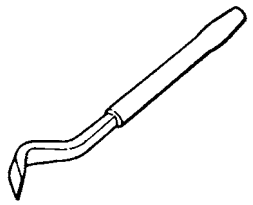
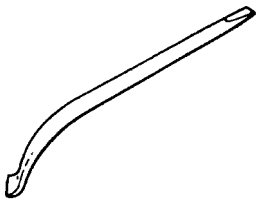
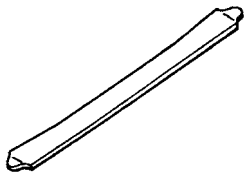
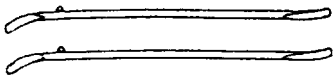
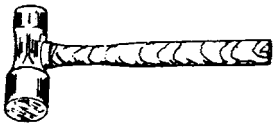
Symptom	Possible cause	Remedy/Prevention
Excessive wear on edges of tread	Under inflated tires	Properly inflate with the recommended pressure.
	Vehicle overloading	Correct as required by Factory spec.
	High speed cornering	Correct as required by Factory spec.
	Incorrect wheel alignment	Set to the correct specifications.
Tires show excessive wear in center of tread	Tires overinflated	Properly inflate with the recommended pressure.
Excessive tire wear	Improper tire pressure	Properly inflate with the recommended pressure.
	Incorrect tire wheel usage	Install the correct tire wheel combination.
	Bent wheel	Repair or replace.
	Front end out of alignment	Align front end.
	Loose, worn or damaged steering linkage, joints, suspension components, bushing or ball joints	Inspect, repair or replace as required
Wheel hopping (vehicle vibration and rough steering) (Disc wheels)	Rocks or debris wedged between dual disc wheels	Remove the rocks and the debris.
	Out-of-balance tire and/or hub and drum	Determine the out-of-balance component and balance or replace.
	Improper positioning of the side ring split	Reassemble with ring split, opposite (180 degrees) to the valve opening to improve the balance.
Wheel hopping (vehicle vibration and rough steering) (Vehicle)	Loose or worn drive line or suspension	Identify the location of vibration carefully. Then repair or replace the loosened or worn parts. (Refer to the chapter **"PROPELLER SHAFT"** for vehicle vibration.)
Wobbling (vehicle vibration and rough steering) (Disc wheels)	Bent or distorted due to the overloading or improper handling	Replace the wheel.
	Loose mountings, damaged studs, wheel nuts, enlarged stud holes, worn or broken hub face, or foreign material on mounting surfaces	Replace worn or damaged parts. Clean mounting surfaces.
Wobbling (vehicle vibration and rough steering) (Vehicle)	Improper alignment	Have vehicle aligned.
	Loose, worn or broken suspension parts	Repair or replace.
Cracked or broken wheel discs (cracks develop in the wheel disc from hand hole to hand hole, from hand hole to rim, or from hand hole to stud hole.)	Metal fatigue resulting from overloading	Replace wheel.

Symptom	Possible cause	Remedy/Prevention
Damaged wheel bolt holes (wheel bolt holes become worn, elongated or deformed, metal builds up around wheel bolt hole edges, cracks develop from wheel bolt hole to wheel bolt hole.)	Loose wheel mounting	• Replace wheel and check the installation of correct wheel bolts and nuts. • Check the cracked or broken wheel bolt-replace. • Check the worn hub face-replace. • Check the broken or cracked hub-replace. • Clean mounting surfaces (Retighten the wheel nuts periodically.) • Rust streaks fanning out from wheel bolt holes: indicates that the wheel nuts are or have been loosen.
Tire slippage on rim (Disc wheels)	Improper storage or operating conditions	Correct as required.
	Poor maintenance	Follow the proper maintenance procedures.
	Rust, corrosion or bead seating	Correct as required.
	Loss of pressure	Follow the proper maintenance procedures.
Tire mounting difficulties (Wheel rims)	Mismatched tire and rim sizes	Correct as required.
	Defective or mismatched rings for the rim	Correct as required.
	Tires overinflated	Properly inflate with the recommended pressure.
	Corrosion and dirt	Correct as required.
Loose inner wheel	Excessive wheel bolt stand out from the mounting face of hub allowing the wheel nut to bottom out	Replace with the proper length wheel bolt.
	Improper torque	Follow the recommended torque procedure.
	Wrong inner nut	Use correct inner nuts.
Broken wheel bolts	Loose wheel nuts	Replace the wheel bolt and follow the proper torque procedures.
	Overloading	Replace the wheel bolt.
Stripped threads	Excessive clamp load	Replace wheel bolt and follow the proper torque procedures.
Rust streaks from wheel bolt holes	Loose wheel nuts	Check complete assembly, replace damaged parts and follow the proper torque procedures.
Damaged inner or outer wheel nuts	Loose wheel assembly	Replace wheel nuts. Check the proper torque procedures.
Frozen inner or outer wheel nuts	Corrosion or damage	Replace wheel nuts and wheel bolts.

SPECIAL TOOL

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Prior to starting a wheel and tire overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0967-21010	LEVER	
	S0967-21020	LEVER	
	S0967-21040	LEVER	
	S0960-91210	LEVER	
	S0960-91220	RUBBER HAMMER	

PRECAUTIONS

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⚠ **CAUTION**
Failure to comply with the following procedures may result in faulty positioning of the tire and/or rim parts, and can cause the assembly to burst with a explosive force sufficient to cause serious physical injury or death.

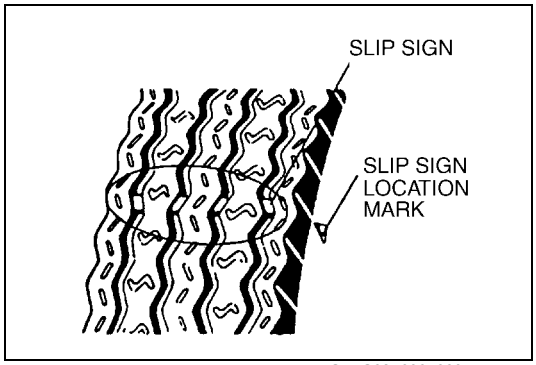
1. DEFLATION AND DISASSEMBLY
(1) Always check the tire/rim assembly for the proper components seating prior to the removal from the vehicle.
(2) Always deflate the tire by removing the valve core prior to removing the wheel from vehicle or disassembling of the components.
(3) Never position your body in front of the rim during deflation.
(4) Always follow the assembly and disassembly procedures outlined in this instruction manual and obtain safety literature from the Authorities.
(5) Never use a steel hammer to assemble or disassemble the rim components. Use a lead, brass, or plastic type mallet.

2. RIM INSPECTION
(1) Always select the proper tire size and construction to match the rim or wheel rating and size.
(2) Never use damaged, worn, or corroded rims, wheels, or mounting hardware.
(3) Always clean and repaint lightly rusted rims.
(4) Never use a rim or wheel component you cannot identify.

3. ASSEMBLY AND INFLATION
(1) Always perform the double check to see that the removable rings are properly seated before inflating.
(2) Always inflate the tire in a safety cage or use a portable lock ring guard. Use a clip-on type air chuck with a remote valve so that you can stand clear during the tire inflation.
(3) Never attempt to seat the rings while the tire is totally or partially inflated.
(4) Never re-inflate or add inflation pressure to a tire that has been run flat or seriously under inflated without removing and checking for ring seating and rim damage.
(5) Tire pressure should be checked while cold. Do not bleed air from tires while hot. This will result in an under inflated condition. Under inflated tires build up excessive heat due to overdeflection that may result in sudden tire deterioration, causing severe handling problems.
(6) Never use an assembly with excessive side ring play, wide gaps between ring ends, or butting ring ends.
(7) Never hammer on the components of an inflated or partially inflated assembly.

INSPECTION

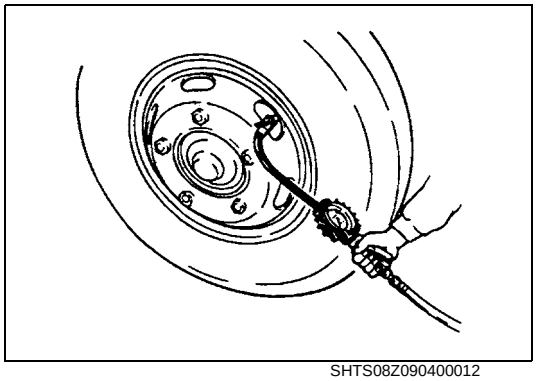
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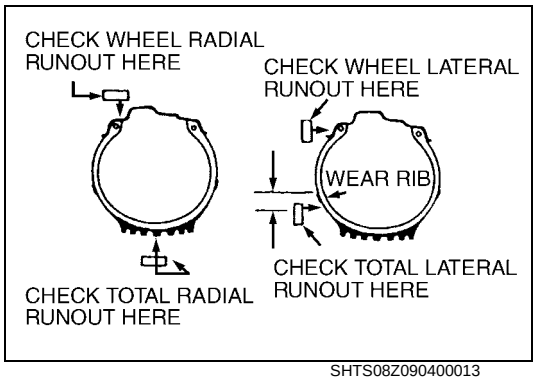
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1. GENERAL INSPECTION

(1) Check the tire tread wear (groove depth) and tire damage. If the slip sign on the tire tread comes out, replace the tire.
Groove depth (Remaining groove)
General running: 1.6 mm {0.063 in.}
High-speed running: 3.2 mm {0.126 in.}


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(2) Check the air pressure.
If improper, inflate the tire to the proper pressure as previously described in this chapter.



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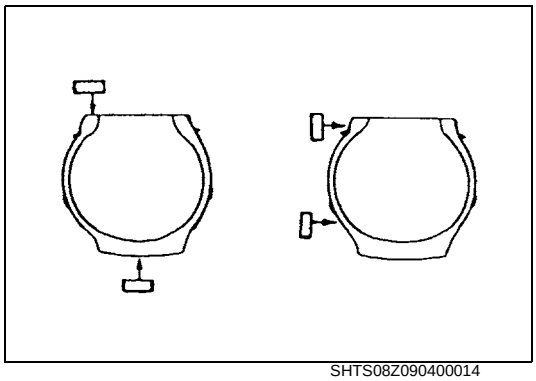
2. CHECK RUNOUT IN THE TIRE AND WHEEL RIM.

NOTICE
Eliminate any flat spots in the tire by driving the vehicle a little.

(1) Jack up the vehicle and the check the runout in the tire and wheel rim.

Unit: mm {in.}

	Tire	Wheel rim
Lateral runout	**Less than 2.5 {0.098}**	**Less than 1.8 {0.071}**
Radial runout	**Less than 2.5 {0.098}**	**Less than 1.8 {0.071}**


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(2) If the wheel rim does not conform to the runout limits, try re-mounting the wheel in a different position.
(3) If the wheel rim is still not within 1.8 mm {0.071 in.} of runout, then replace it with a new rim.
(4) If the tire does not conform to runout standards, reinstall it in different position on the rim.

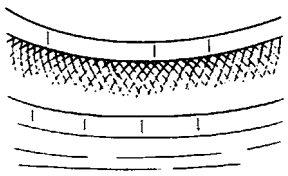
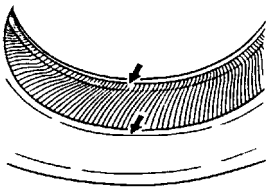
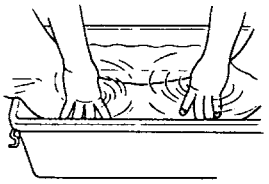
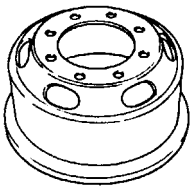
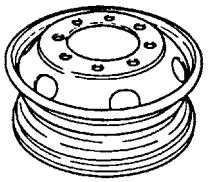
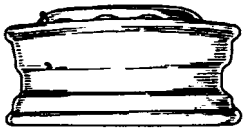
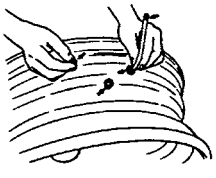
3. WHEEL AND TIRE BALANCING.

(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- Static balancing
  This is relatively effective when operating at low speeds; however, if operating at high speeds, dynamic balancing is recommended.
- Dynamic balancing
  Please balance the wheels, using a balancing machine.

INSPECTION AND REPAIR

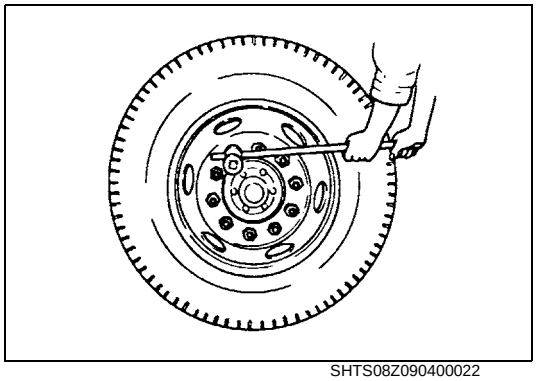
EN08Z0904H300002

Inspection item	Standard	Limit	Remedy	Inspection procedure
Tire: Damage, foreign matter, etc.	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tubeless tire: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Tube: Air leakage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel (With tube): Cracks and deformation	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel (Tubeless tire): Cracks and deformation	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Rim (Tubeless tire): Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Pipe, nut and O-ring of the valve (tubeless tire): Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

SAE, JIS, DIN AND ISO TYPE WHEEL

OVERHAUL

EN08Z0904H200001



SHTS08Z090400022

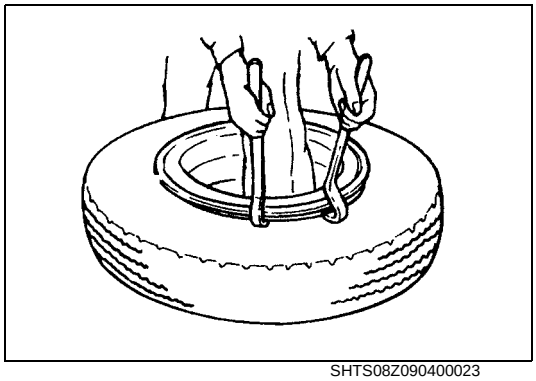
IMPORTANT POINT - REMOVAL

1. REMOVE THE WHEEL AND TIRE.

(1) Loosen the wheel nuts, but do not remove them.
(2) Raise the vehicle until the tire clear the floor.
(3) Remove the wheel nuts and tire from the hub and drum.
On dual tires, the inner wheel nuts will also have to be removed for the inner tire to be removed.

NOTICE

- **Be sure to apply the wheel stoppers in the front or rear tires.**
- **The wheel nuts on the right side of the vehicle have right hand threads, and those on the left side have left hand threads.**

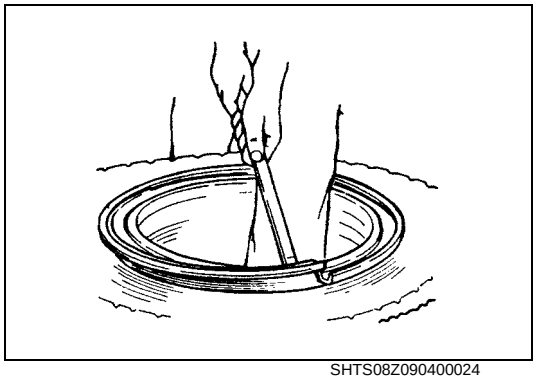


SHTS08Z090400023

IMPORTANT POINTS - DISASSEMBLY

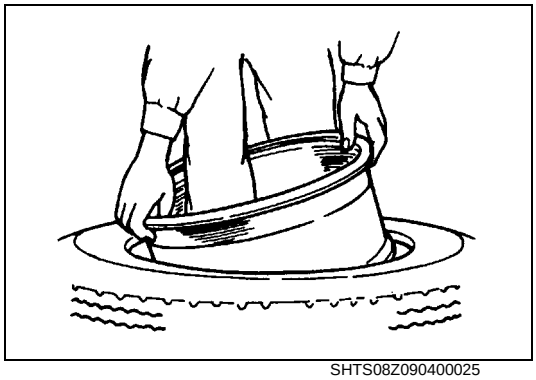
1. DISASSEMBLE THE WHEEL AND TIRE (WITH TUBE).

(1) Place the wheel and tire on the floor with side ring up.
(2) Make certain that the tire is completely deflated with the valve core removed.
(3) With a suitable tools, insert the hook end between the side ring and side wall of the tire and pry the bead loose from the side ring with a downward pressure on the tools.
(4) Continue prying progressively around the tire until the bead is completely freed from side ring.



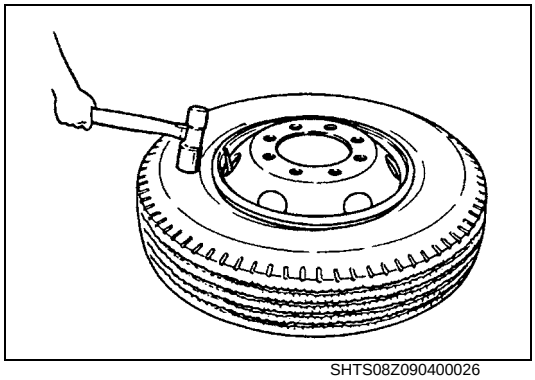
SHTS08Z090400024

(5) With the special tool, pry the side ring from its groove in the rim by prying progressively around the tire until the ring is freed.
SST: Lever (S0967-21040)



SHTS08Z090400025

(6) Turn the assembly over and unseat the second tire bead from the rim. Lift the rim from the tire.
Remove the tube and flap, if any, from the tire.


SHTS08Z090400026

2. DISASSEMBLE THE WHEEL AND TIRE (TUBELESS).

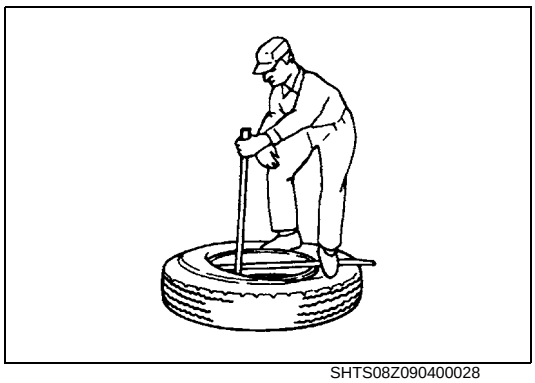
(1) Make certain the tire completely deflated with the valve core removed.

(2) With the tire lying flat, loosen both beads with the special tool or by standing on the tire with your heels close to the rim.
SST: Rubber hammer (S0960-91220)


SHTS08Z090400027

(3) With the wide side of the rim down, lubricate the top bead.

(4) With the stops toward the rim, insert the spoon ends of the special tools about 250 mm {10 in.} apart. Holding the bead in the well with one foot, pull one tool towards the center of the rim.
SST: Lever (S0960-91210)

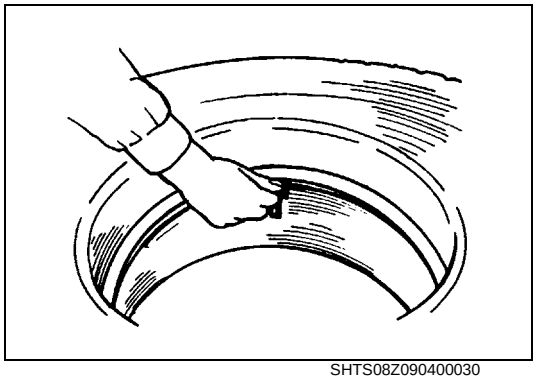

SHTS08Z090400028

(5) Hold the tool in position with one foot and pull the second tool toward the center of the rim. Progressively work the bead off the rim, taking additional bites with the tools as necessary.


SHTS08Z090400029

(6) Stand the assembly in a vertical position.
Lubricate the second bead.

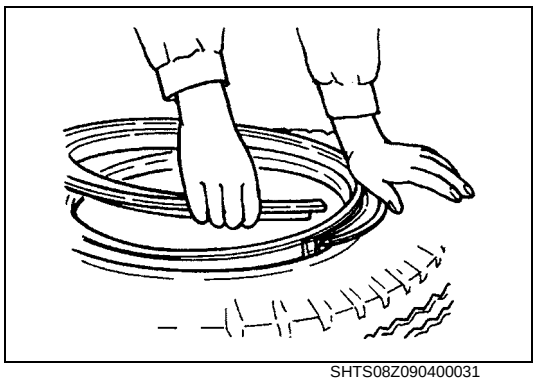
(7) At the top of the assembly, insert the straight end of the tool between the bead and back the flange of the rim at about 45 degrees angle.
Turn the tool so that it is perpendicular to the rim. Pry the second bead off.


SHTS08Z090400030

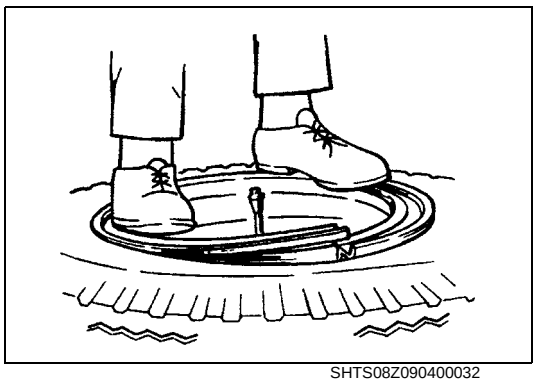
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY THE WHEEL AND TIRE (WITH TUBE).

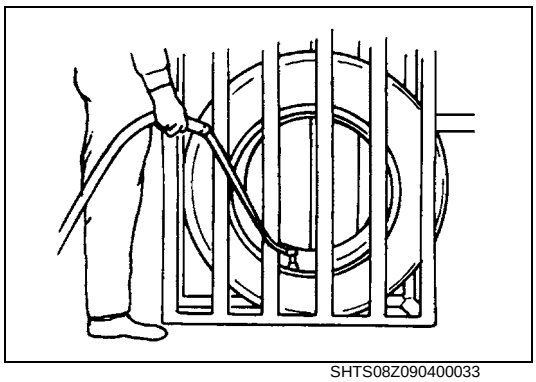
(1) Insert the tube and the flap into the tire and partially inflate to round out the tube. Apply the rubber lubricant to the inside and outside surfaces of both beads and to that portion of the tube and flap that appears between the beads. Lay the rim flat on the floor with the valve slot up. Align the valve with the rim valve slot, and place the tire onto the rim, and insert the valve through the valve slot.


SHTS08Z090400031

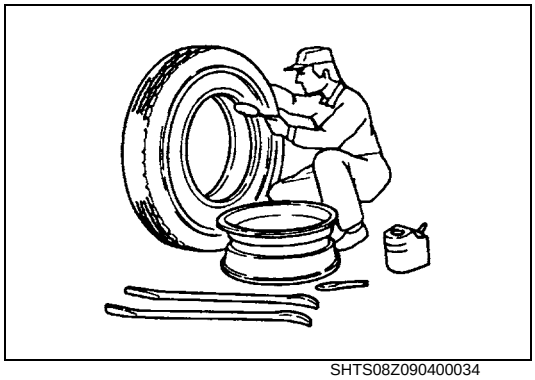
(2) Place the side-ring on the rim base so that the ring split is opposite to the valve stem. Place the leading end of the ring into the groove in the rim as shown.


SHTS08Z090400032

(3) Starting at the valve side progressively walk the side-ring into place. Check to ensure that the ring is fully seated in the groove.


SHTS08Z090400033

(4) Place the tire assembly in a safety cage and inflate the tire as previously described in this chapter. Again check the side-ring, tapping lightly with a mallet to ensure the proper engagement. Check to see that the beads are properly seated. Completely deflate the tire to prevent the tube from the buckling. Reinflate according to the recommended pressure, and check the tire assembly.

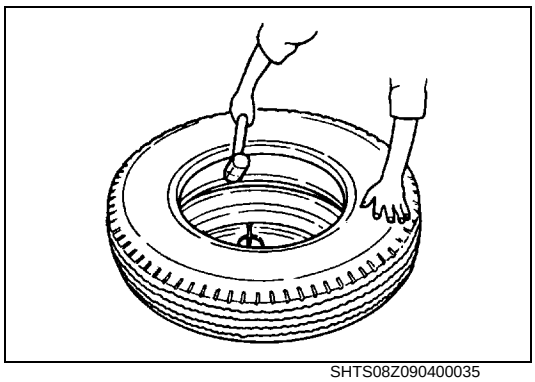

SHTS08Z090400034

2. ASSEMBLY THE WHEEL AND TIRE (TUBELESS).

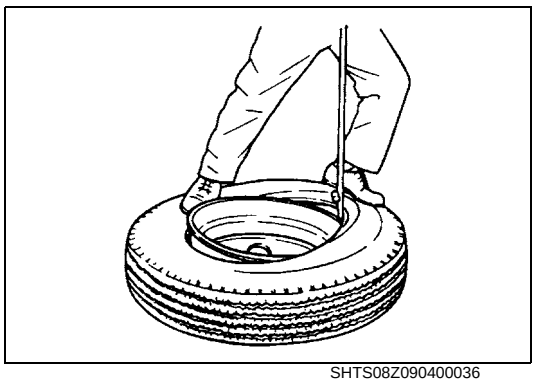
(1) Be sure that the proper valve is used and is properly installed in the rim.
Valve nut tightening torque: 12.7 N·m {130 kgf·cm, 9.4 lbf·ft}

(2) Inspect the rim to ensure that the bead seats are clean and smooth.

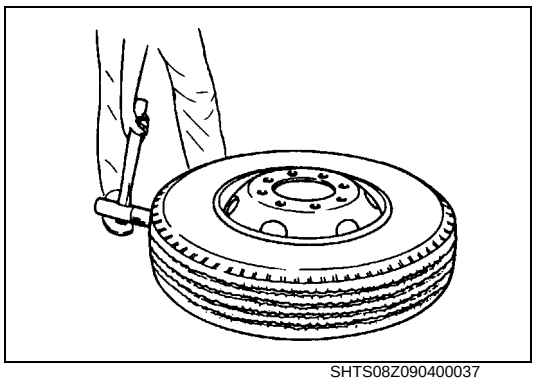
(3) Place the rim on the floor with the wide side down and lubricate the first bead of the tire and upper bead seat of the rim.


SHTS08Z090400035

(4) Push the first bead into the well of the rim and onto the rim as far as possible.
With the special tool, hammer the first bead so that the bead gets over the rim flange.
SST: Rubber hammer (S0960-91220)

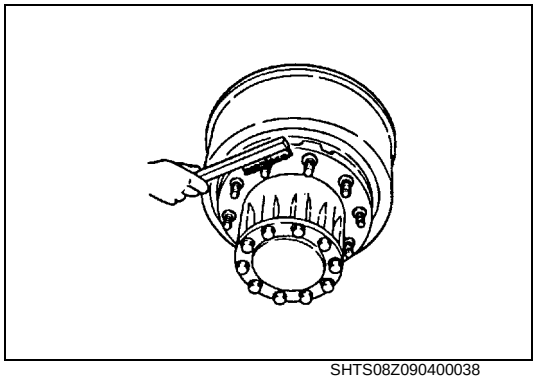

SHTS08Z090400036

(5) Insert the lever between the rim flange and the tire bead and then raise the lever so that the bead gets over the rim flange.
SST: Lever (S0960-91210)


SHTS08Z090400037

(6) With the special tool, hammer the tire tread so that the bead and the rim will be seated.
SST: Rubber hammer (S0960-91220)

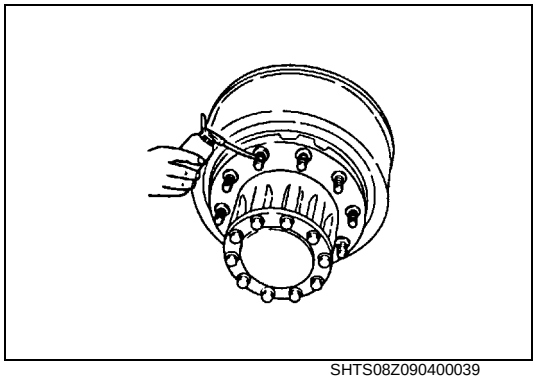
(7) Inflate the tire as described in this chapter, making certain that all the safety precautions are followed. Check for the leakage.


SHTS08Z090400038

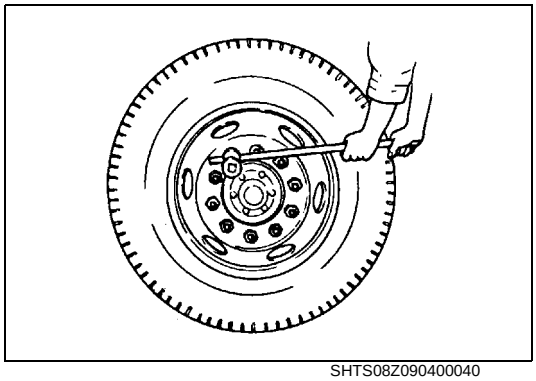
IMPORTANT POINTS - INSTALLATION

1. INSTALL THE WHEEL AND TIRE.

(1) Be sure to check all parts and replace any parts that are overly worn or damaged. Clean and remove any foreign matter from wheel bolts, wheel nuts and wheel side is contacting with the brake drum.


SHTS08Z090400039

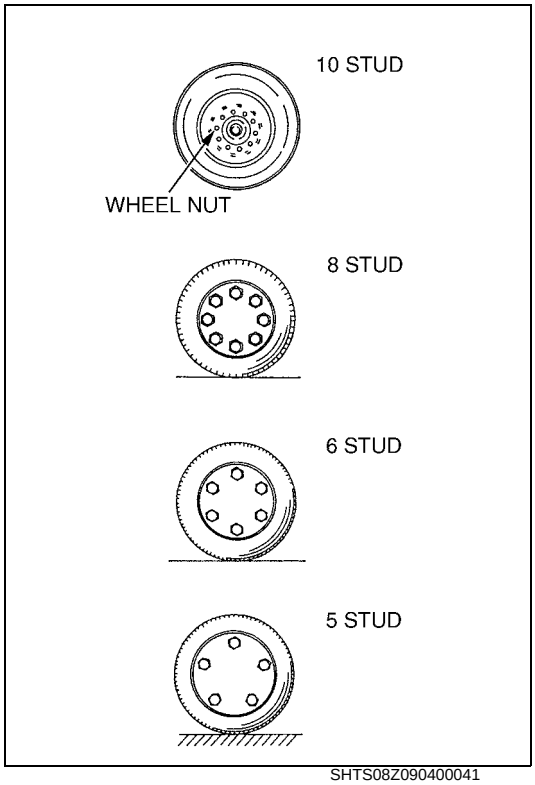
(2) Apply lubricant (engine oil or grease) to the thread part of the wheel bolts and wheel nuts.


SHTS08Z090400040

(3) Rotate the wheel if necessary and check to see that the wheel bolts are in the center of the wheel's wheel bolt holes, then tighten the wheel nuts lightly.

NOTICE

The wheel nuts on the right side of the vehicle have right hand threads, and those on the left side have left hand threads.



SHTS08Z090400041

(4) Using a wheel nut wrench, tighten the wheel nuts in accordance with specified torque using diagonal method.

		Tightening torque N·m {kgf·cm, lbf·ft}
DIN type		**490.34-588.39 {5,000-6,000, 362-434}**
SAE and JIS type	**10 stud**	**392.27-470.71 {4,000-4,800, 290-347}**
	8 stud	
	6 stud	
	5 stud	**235.36-294.19 {2,400-3,000, 174-217}**
ISO type		**490-539 {5,000-5,500, 362-497}**

NOTICE
Tighten the wheel nuts with several repetitions in the tightening order so as to reach the proper torque evenly and gradually.

⚠ CAUTION
The specified torque should be referred to the torque tightening wheel nuts. Tightening it with incorrect can cause the wheel to come off while driving. This can result in physical injury and/or property damage due to the loss of vehicle control.
When the vehicle, wheels, or wheel nuts are new, the wheel nuts should be checked and tightened with specified torque at 50-100 km {30-60 miles} since they may not be well tightened. The tightening torque should be checked with the proper torque wrench.

2. THE FOLLOWING ORDER AND INSTRUCTIONS ARE NECESSARY FOR INSTALLING THE DUAL TIRES.

(1) Installation procedures for the inner wheel nuts are the same as in (1) through (4) above.
(2) Installation procedures for the outer wheel nuts are the same as above.
(3) When only the outer wheel is replaced, first tighten all the inner wheel nuts to the specified torque. Then mount the outer wheel and tighten all the outer wheel nuts to the specified torque.

NOTICE

- **Install the dual rear wheels with their valve stems positioned at 180 degrees apart to facilitate inflation.**
- **Tighten all the inner nuts and outer nuts according to the above-mentioned procedures.**

3. WHEEL AND TIRE BALANCING

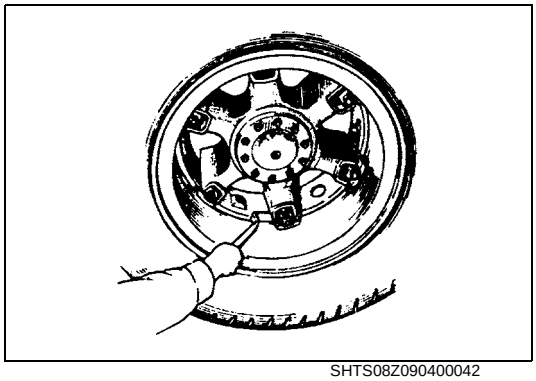
(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- Static balancing
This is relatively effective when operating at low speeds; however, if operating at high speeds, dynamic balancing is recommended.
- Dynamic balancing
Please balance the wheels, using a balancing machine.

SPOKE WHEEL AND ADAPTER TYPE WHEEL

OVERHAUL

EN08Z0904H200002



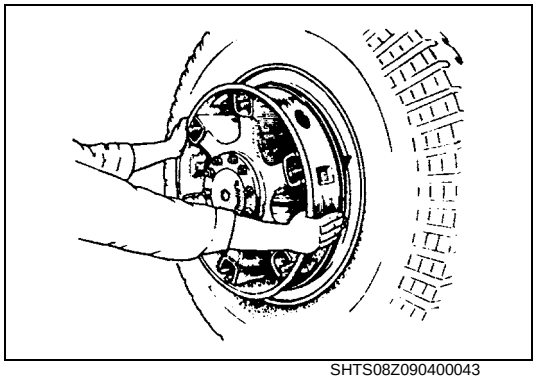
SHTS08Z090400042

IMPORTANT POINT - REMOVAL

1. REMOVAL OF THE RIM AND TIRE.

(1) Loosen the clamp nuts, but do not remove them completely.
(2) Raise the vehicle until the tire clear from floor.
(3) Remove the clamp nuts and then use the special tool to pry off the clamps.
SST: Lever (S0967-21010)

NOTICE
Block the wheels.



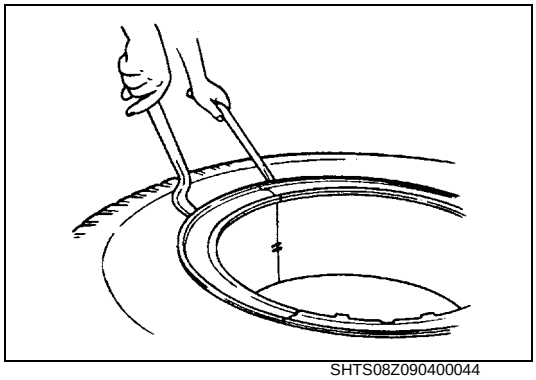
SHTS08Z090400043

(4) On the dual tires, the band spacer will also have to be removed and then remove the inner wheel.

IMPORTANT POINT - DISASSEMBLY

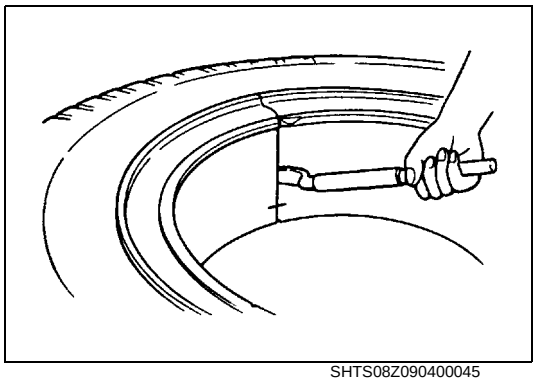
1. DISASSEMBLE THE RIM AND TIRE.

(1) Place the wheel on the floor with valve side up.
(2) Make sure the tire is completely deflated with the valve core removed.
(3) With the special tools, insert the hook end between the rim and side wall of tire and pry the bead loose from the rim with a downward pressure on the tools.
SST: Lever (S0967-21010, S0967-21020)



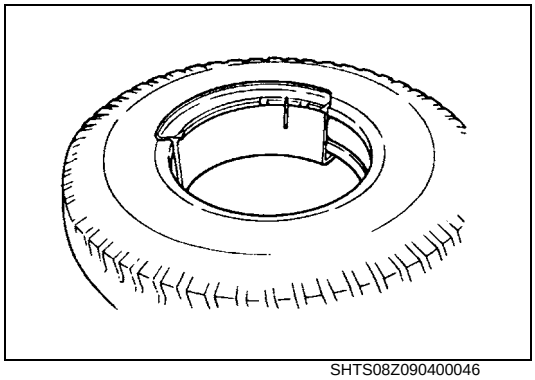
SHTS08Z090400044

(4) Continue prying progressively around the tire until the bead is completely freed from the rim.
(5) Make a matching marks on the segments.
(6) Place the special tool in the rim joint groove and pry the rim segments apart.
SST: Lever (S0967-21010)



SHTS08Z090400045

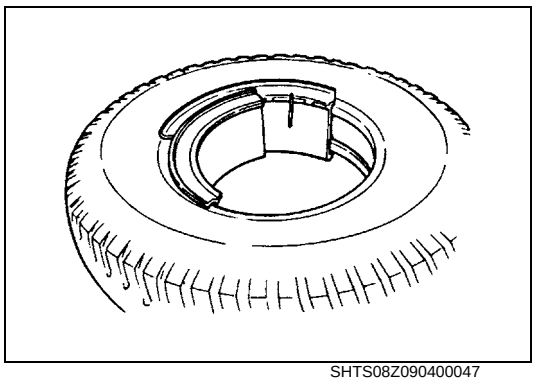
(7) Remove the rim segments.


SHTS08Z090400046

IMPORTANT POINT - ASSEMBLY

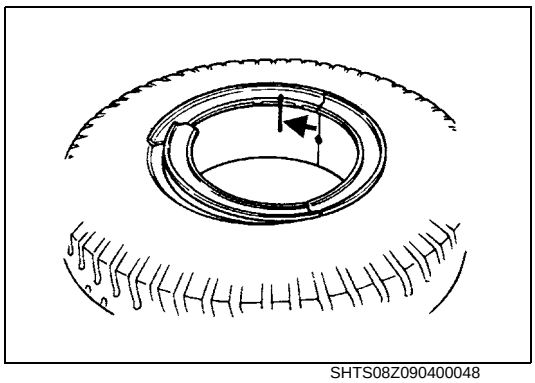
1. ASSEMBLE THE RIM AND TIRE.

(1) Clean the rim segments and check for damages, if there is any damage, repair or replace.
(2) Fit the tube and flap in the tire.
(3) Place the segment with valve hole in the tire.
The valve must point upwards.

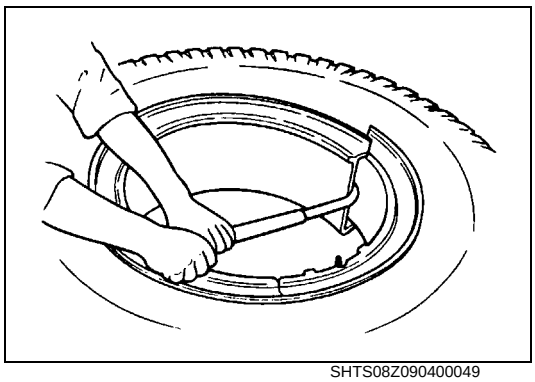

SHTS08Z090400047

(4) Place the other segment on the first one as shown in the figure.

NOTICE
Align the matching marks on the segments.


SHTS08Z090400048

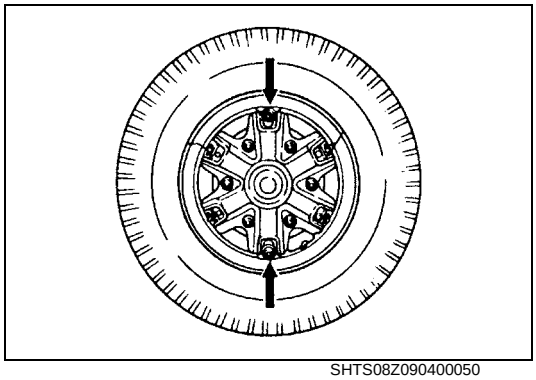
(5) Place the other segment together with the first one.
Fit the segment so that the valve lies against the side of the hole marked with an arrow.


SHTS08Z090400049

(6) With the special tool, pry the segments to fit the last segment in position.
SST: Lever (S0967-21020)

NOTICE
Do not pull upwards.

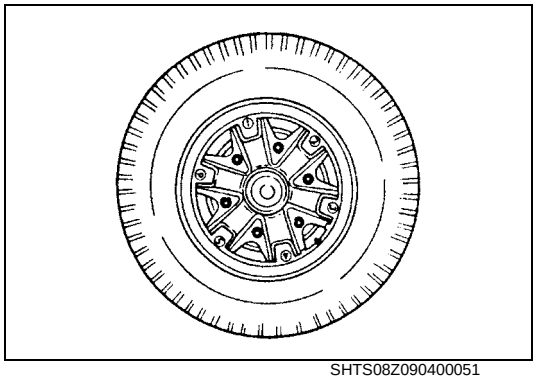
(7) Install the valve core and then inflate the tire as previously described in this chapter, making sure that all the safety precautions are followed. Check for the leakage.


SHTS08Z090400050

IMPORTANT POINTS - INSTALLATION

1. INSTALL THE SINGLE WHEEL.

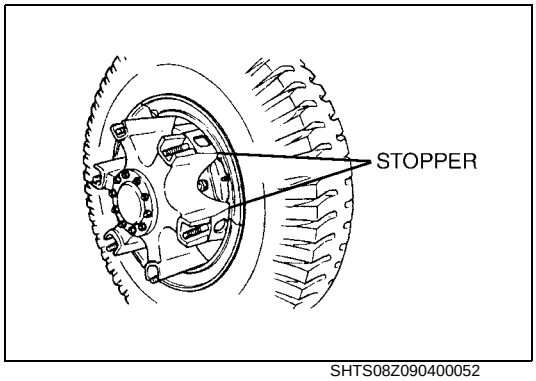
(1) Clean the spoke ends, rim edges, clamps and nuts.
(2) Lubricate the clamp bolts.
(3) Install the wheel over the spoke ends so that the valve and rim stopper are between two spokes.
(4) Install two clamps and nuts on opposite sides of the rim as indicated by arrows on the drawing.
Tighten the nuts lightly.


SHTS08Z090400051

(5) Install the remaining clamps and nuts.
Tighten the nuts in sequence round the rim edge to sufficient torque as described in this chapter.
(6) Check and retighten the nuts after driving the vehicle in a distance.

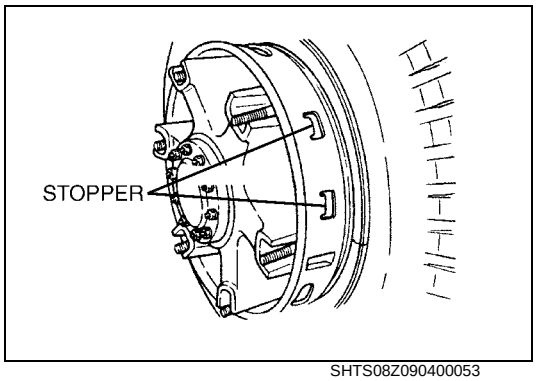
2. INSTALL THE DUAL WHEEL.

(1) Clean the spoke ends, rim edge, band spacer, clamps and nuts.
(2) Lubricate the clamp bolts.
(3) Install the inner wheel so that the valve and rim stopper are between two spokes.

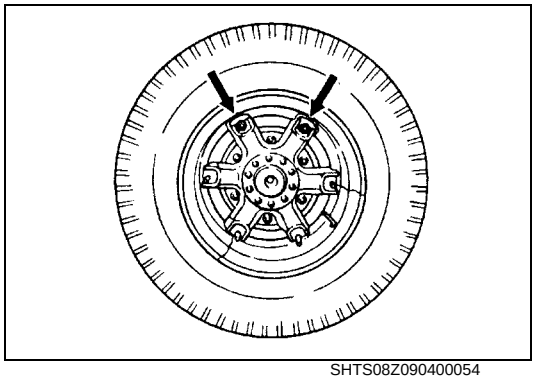


SHTS08Z090400052

(4) Install the band spacer over the spokes so that it may tightened up against the inner wheel rim.
The band spacer stopper must be between two spokes. Make sure that the band spacer stopper does not cover the inner wheel valve.

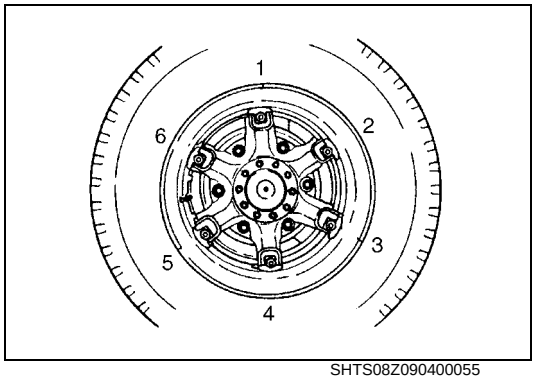


SHTS08Z090400053



SHTS08Z090400054

(5) Install the outer wheel and press it, and then tighten up against the band spacer. Make sure that the rim stopper and valve are between two spokes and diagonally to the inner wheel valve.
Install two top clamps and nuts as indicated by the arrows on the drawing and tighten the nuts lightly.



SHTS08Z090400055

(6) Install the remaining clamps and nuts.
(7) Tighten the nuts in sequence round the rim edge to sufficient torque as previously described in this chapter.
(8) Check and retighten the nuts after driving the vehicle in a distance.

3. WHEEL AND TIRE BALANCING

(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- Static balancing
  This is relatively effective when operating at low speeds; however, if operating at high speeds, dynamic balancing is recommended.
- Dynamic balancing
  Please balance the wheels, using a balancing machine.

SUSPENSION (MODELS: FC, FD, GD, FG, GH)

SU02-001

LEAF SUSPENSION ASSEMBLY SU02-2

DATA AND SPECIFICATIONS SU02-2
DESCRIPTION SU02-5
TROUBLESHOOTING SU02-7
SPECIAL TOOL SU02-7
COMPONENT LOCATOR SU02-8
OVERHAUL SU02-14
INSPECTION AND REPAIR SU02-19

LEAF SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

EN09A0102I200001

MODELS: FC, FD

FRONT SUSPENSION

Type		**Semi-elliptic leaf springs with shock absorber**		
Dimensions of leaf springs:	**Span**	**1,300 mm {51.181 in.}**		
	Width	**70 mm {2.760 in.}**		
	Thickness of leaves	**Multi leaf spring**	**Taper leaf spring**	
		10 mm {0.394 in.}	**18.5 mm {0.728 in.}**	**18.5 mm {0.728 in.}**
		11 mm {0.433 in.}	**19.8 mm {0.780 in.}**	**19.8 mm {0.780 in.}**
			14.0 mm {0.551 in.}	**16.2 mm {0.638 in.}**
Shock absorbers:	**Type**	**Single acting**	**Double acting**	
	Stroke	**255 mm {10.039 in.}**	**255 mm {10.039 in.}**	
	Min. length	**359 mm {14.134 in.}**	**359 mm {14.134 in.}**	
	Max. length	**614 mm {24.173 in.}**	**614 mm {24.173 in.}**	

REAR SUSPENSION

Type		**Semi-elliptic main and auxiliary leaf springs**
Dimensions of main leaf springs:	**Span**	**1,300 mm {51.181 in.}**
	Width	**70 mm {2.760 in.}**
	Thickness of leaves	**11 mm {0.433 in.}**
Dimensions of auxiliary leaf springs:	**Span**	**900 mm {35.433 in.}**
	Width	**70 mm {2.760 in.}**
	Thickness of leaves	**9 mm {0.354 in.}**
		10 mm {0.394 in.}

MODEL: GD

FRONT SUSPENSION

Type		**Semi-elliptic leaf springs with shock absorber**		
Dimensions of leaf springs:	**Span**	**1,300 mm {51.181 in.}**		
	Width	**70 mm {2.760 in.}**		
	Thickness of leaves	**Multi leaf spring**	**Taper leaf spring**	
		10 mm {0.394 in.}	**18.5 mm {0.728 in.}**	**18.5 mm {0.728 in.}**
			19.8 mm {0.780 in.}	**19.8 mm {0.780 in.}**
		11 mm {0.433 in.}	**14.0 mm {0.551 in.}**	**16.2 mm {0.638 in.}**
Shock absorbers:	**Type**	**Single acting**	**Double acting**	
	Stroke	**270 mm {10.630 in.}**	**261 mm {10.276 in.}**	
	Min. length	**365 mm {14.370 in.}**	**360 mm {14.173 in.}**	
	Max. length	**635 mm {25.000 in.}**	**621 mm {24.449 in.}**	
Stabilizer (If so equipped)		**Torsion bar**	**Torsion bar**	

REAR SUSPENSION

Type		**Semi-elliptic main and auxiliary leaf springs**
Dimensions of main leaf springs:	**Span**	**1,300 mm {51.181 in.}**
	Width	**70 mm {2.760 in.}**
	Thickness of leaves	**11 mm {0.433 in.}**
		10 mm {0.394 in.}
Dimensions of auxiliary leaf springs:	**Span**	**900 mm {35.433 in.}**
	Width	**70 mm {2.760 in.}**
	Thickness of leaves	**10 mm {0.394 in.}**

MODELS: FG, GH

FRONT SUSPENSION (MULTI LEAF SPRING)

Type		**Semi-elliptic leaf springs with shock absorber**		
Dimensions of leaf springs:	**Span**	**1,470 mm {57.87 in.}**		
	Width	**80 mm {3.15 in.}**		
	Thickness of leaves	**13 mm {0.512 in.}**	**13 mm {0.512 in.}**	**13 mm {0.512 in.}**
		—	**12 mm {0.472 in.}**	**12 mm {0.472 in.}**
		—	**—**	**10 mm {0.394 in.}**
Shock absorbers:	**Type**	**Single acting**		
	Stroke	**252 mm {9.921 in.}**	**260 mm {10.236 in.}**	
	Min. length	**382 mm {15.039 in.}**	**390 mm {15.354 in.}**	
	Max. length	**634 mm {24.961 in.}**	**650 mm {25.590 in.}**	
Stabilizer (If so equipped)		**Torsion bar**		

FRONT SUSPENSION (TAPER LEAF SPRING)

Type		**Semi-elliptic leaf springs with shock absorber**	
Dimensions of leaf springs:	**Span**	**1,470 mm {57.87 in.}**	
	Width	**80 mm {3.15 in.}**	
	Thickness of leaves	**19.5 mm {0.768 in.}**	**21 mm {0.827 in.}**
Shock absorbers:	**Type**	**Double acting**	
	Stroke	**259 mm {10.197 in.}**	**249 mm {9.803 in.}**
	Min. length	**391 mm {15.394 in.}**	**381 mm {15.000 in.}**
	Max. length	**650 mm {25.591 in.}**	**630 mm {24.803 in.}**
Stabilizer (If so equipped)		**Torsion bar**	

REAR SUSPENSION (EXCEPT THAILAND)

Type		Semi-elliptic main and auxiliary leaf springs
Dimensions of main leaf springs:	Span	1,400 mm {55.12 in.}
	Width	90 mm {3.54 in.}
	Thickness of leaves	12 mm {0.47 in.}
Dimensions of auxiliary leaf springs:	Span	980 mm {39.37 in.}
	Width	90 mm {3.54 in.}
	Thickness of leaves	11 mm {0.43 in.}
		12 mm {0.47 in.}

REAR SUSPENSION (FOR THAILAND)

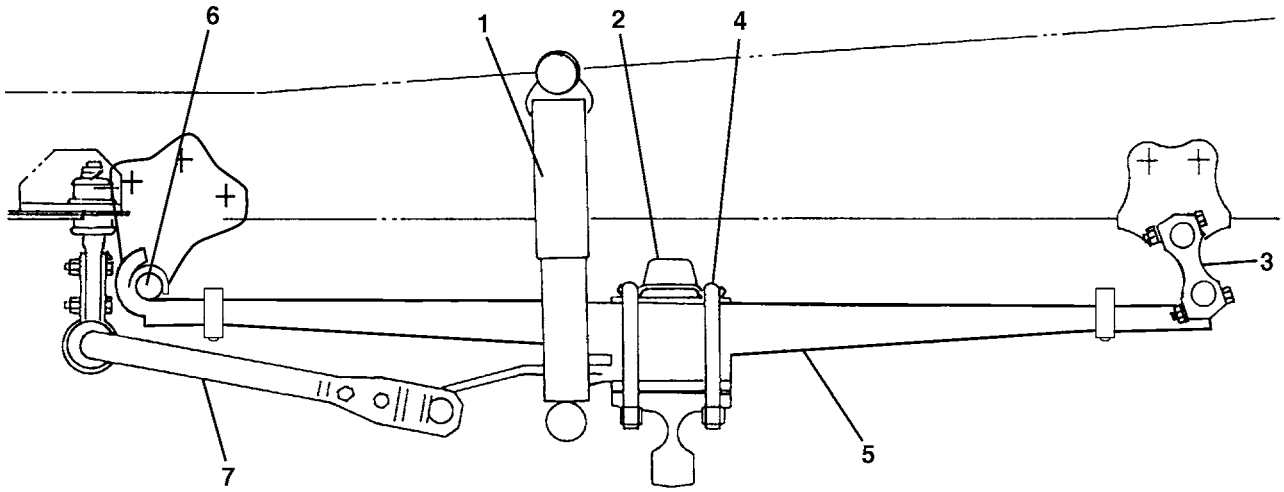
Type		Semi-elliptic main and auxiliary leaf springs	
Dimensions of main leaf springs	Span	1,400 mm {55.12 in.}	
	Width	80 mm {3.15 in.}	
	Thickness of leaves	12 mm {0.47 in.}	
Dimensions of auxiliary leaf springs	Span	1,000 mm {39.37 in.}	
	Width	80 mm {3.15 in.}	
	Thickness of leaves	11 mm {0.43 in.}	11 mm {0.43 in.}
		12 mm {0.47 in.}	10 mm {0.39 in.}

DESCRIPTION

EN09A0102C100001

FRONT SUSPENSION

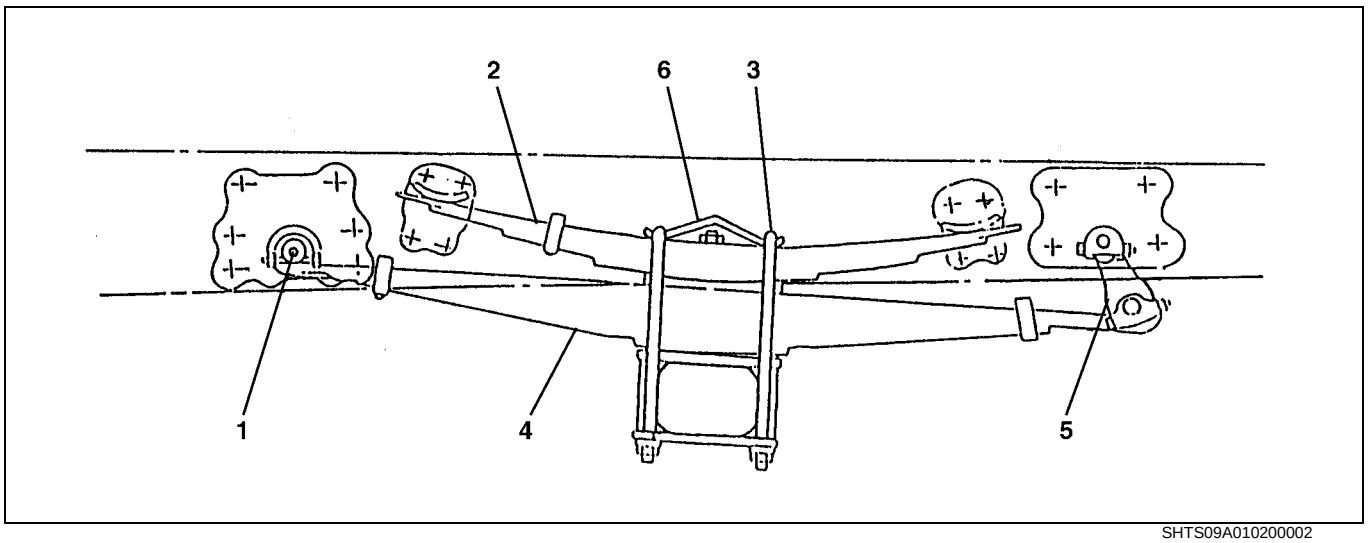
(REPRESENTATIVE TYPE)



SHTS09A010200001

1	Shock absorber	5	Leaf spring assembly
2	Spring bumper	6	Spring pin
3	Shackle	7	Stabilizer (If so equipped)
4	U-bolt		

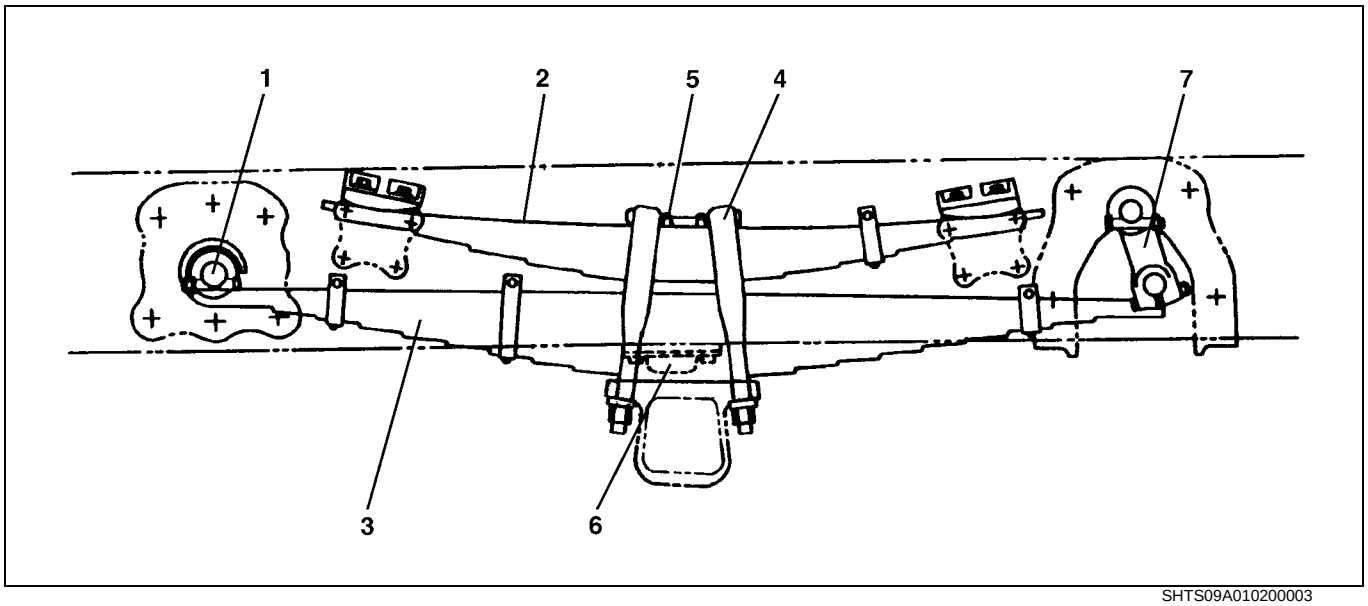
REAR SUSPENSION (MODELS: FC, FD, GD)



SHTS09A010200002

1	Spring pin	4	Main leaf spring assembly
2	Auxiliary leaf spring assembly	5	Shackle
3	U-bolt	6	Spring bumper

REAR SUSPENSION (MODELS: FG, GH)



SHTS09A010200003

1	Spring pin	5	Spring pad
2	Auxiliary leaf spring assembly	6	Spring bumper
3	Main leaf spring assembly	7	Shackle
4	U-bolt		

TROUBLESHOOTING

EN09A0102F300001

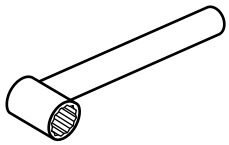
Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Replace the leaves and tighten the U-bolts to specified torque.
Squeaking of the leaves	Friction between the leaves	Replace the silencers and/or apply chassis grease between leaves.

SPECIAL TOOL

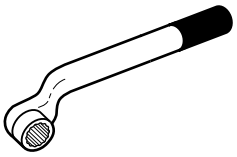
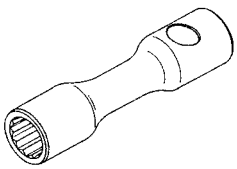
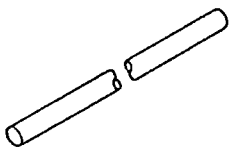
EN09A0102K100001

Prior to starting a suspension overhaul, it is necessary to have these special tools.

MODELS: FC, FD, GD

Illustration	Part number	Tool name	Remarks
	S0983-92204	SOCKET WRENCH	For front U-bolt (Models: FC, FD)
	S0960-31160	SOCKET WRENCH	For front (Model: GD) and rear U-bolt

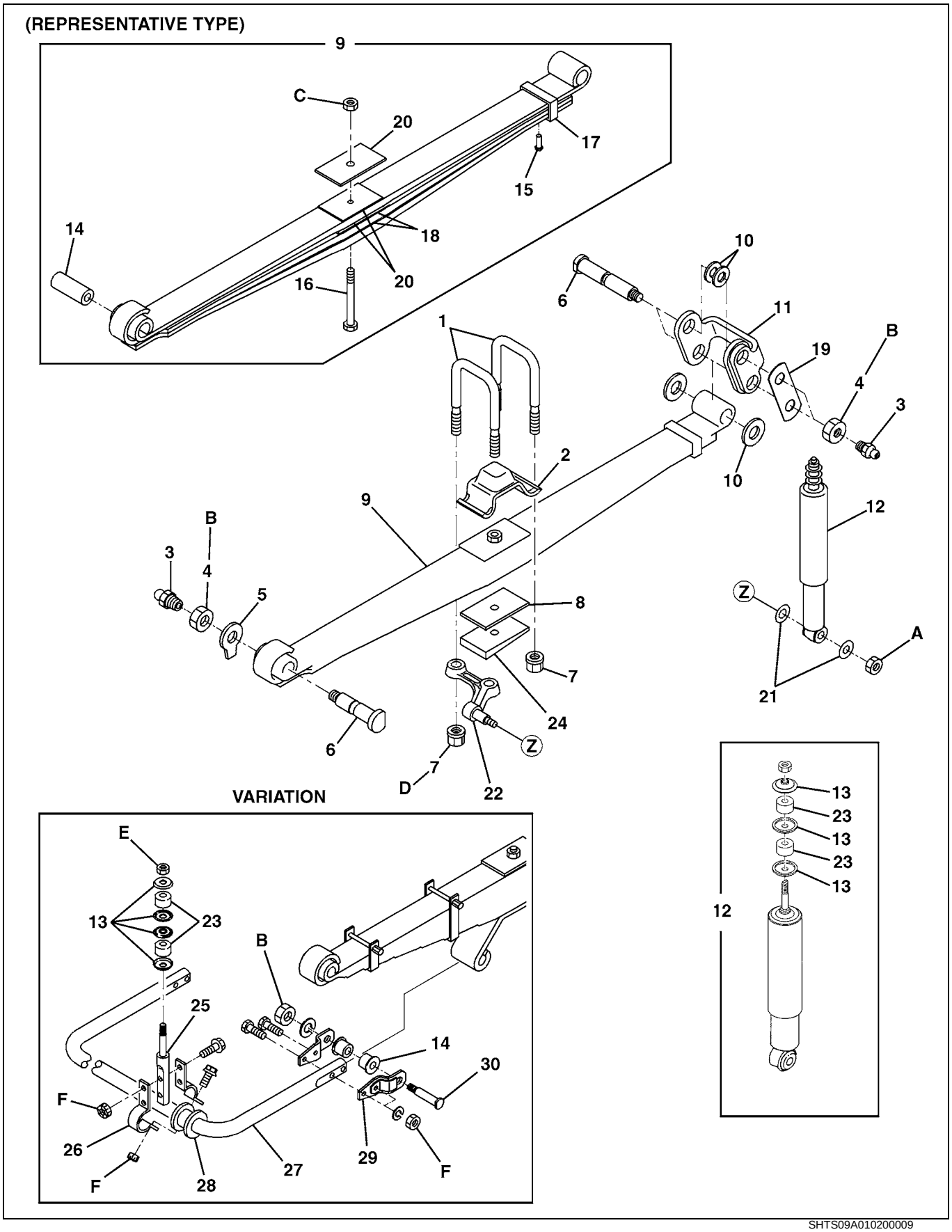
MODELS: FG, GH

Illustration	Part number	Tool name	Remarks
	S0960-31160	SOCKET WRENCH	For front U-bolt
	S0983-93202 S0983-93203	SOCKET WRENCH	For rear U-bolt
	S0984-12560	BAR	For rear U-bolt

COMPONENT LOCATOR

EN09A0102D100001

FRONT SUSPENSION (MODELS: FC, FD, GD)



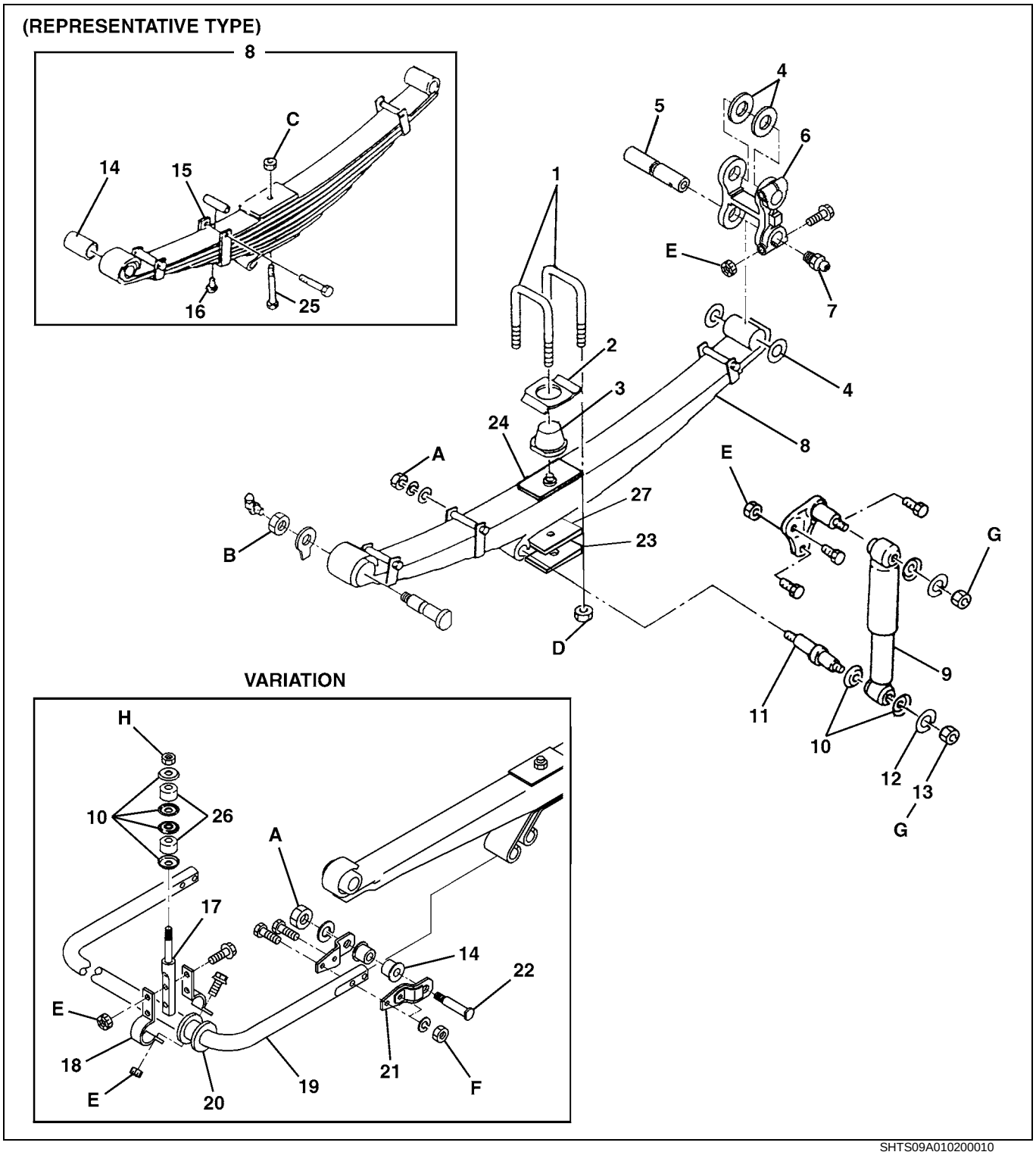
SHTS09A010200009

1	U-bolt	16	Center bolt
2	Spring bumper	17	Clip
3	Lubrication fitting	18	Inter leaf
4	Lock nut	19	Lock plate
5	Lock washer	20	Spacer
6	Spring pin	21	Plain washer
7	U-bolt nut	22	Bracket
8	Spacer (Driver's seat side only)	23	Cushion
9	Leaf spring assembly	24	Caster shim
10	Thrust washer	25	Stabilizer
11	Shackle	26	Holder
12	Shock absorber	27	Stabilizer
13	Cushion washer	28	Rubber bushing
14	Bushing	29	Stabilizer lever
15	Rivet	30	Stabilizer link pin

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	(Models: FC, FD) 76-114 {775-1,162, 57-84} (Model: GD) 73-109 {745-1,110, 55-81}	D	(Models: FC, FD) 200-280 {2,040-2,855, 148-206} (Model: GD) 290-410 {2,960-4,180, 218-307}
B	64-93 {653-948, 48-68}	E	105-145 {1,071-1,478, 78-106}
C	85-108 {870-1,100, 63-79}	F	73-109 {745-1,111, 54-80}

FRONT SUSPENSION (MODELS: FG, GH)



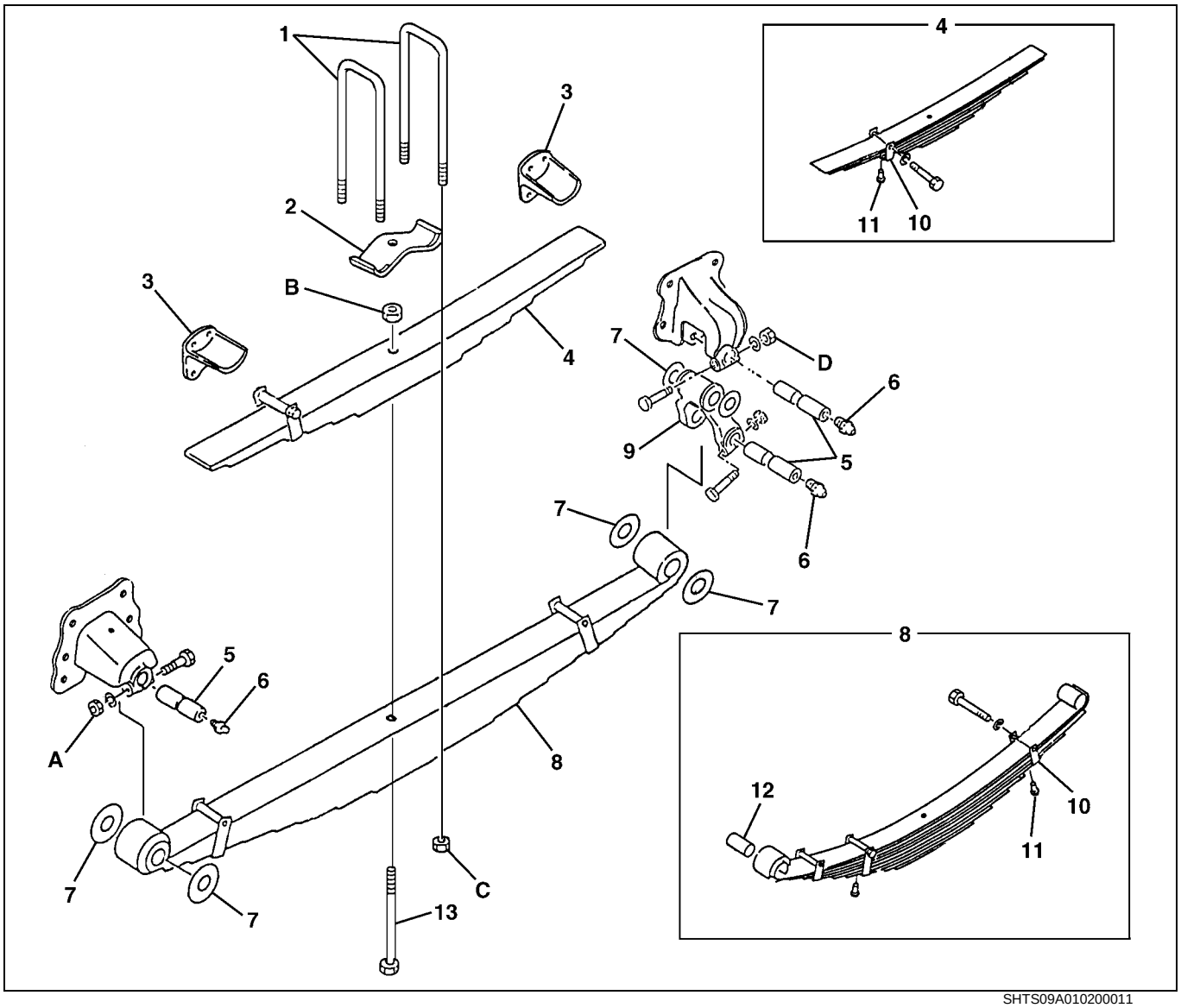
SHTS09A010200010

1	U-bolt	15	Clip
2	Spring pad	16	Rivet
3	Spring bumper	17	Stabilizer link rod
4	Thrust washer	18	Holder
5	Spring pin	19	Stabilizer
6	Shackle	20	Rubber bushing
7	Lubrication fitting	21	Stabilizer lever
8	Leaf spring assembly	22	Stabilizer link pin
9	Shock absorber	23	Caster shim
10	Cushion washer	24	Spacer
11	Shock absorber pin	25	Center bolt
12	Lock washer	26	Cushion
13	Nut	27	Spacer (Driver's seat side only)
14	Bushing		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	236-324 {2,406-3,303, 174-238}	G	167-225 {1,700-2,300, 123-165}
B	64-93 {653-948, 48-68}		(Taper leaf spring)
C	85-108 {870-1,100, 63-79}		236-324 {2,406-3,303, 174-238}
D	390-440 {3,977-4,486, 288-324}		(Multi leaf spring)
E	73-109 {745-1,111, 54-80}	H	105-145 {745-1,111, 54-80}
F	96-144 {979-1,468, 71-106}		

REAR SUSPENSION (MODELS: FC, FD, GD)



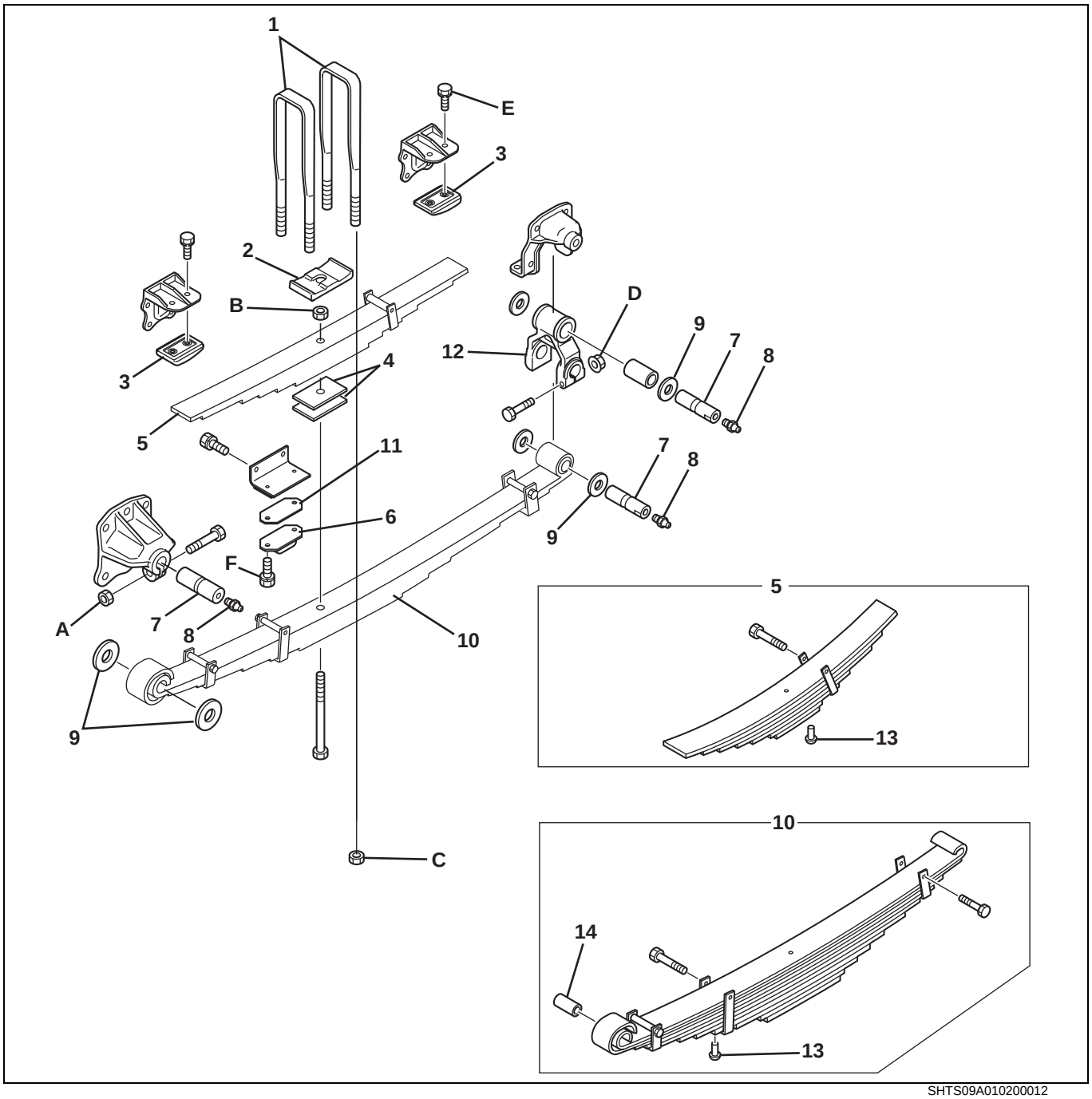
SHTS09A010200011

1	U-bolt	8	Main leaf spring assembly
2	Spring pad	9	Shackle
3	Slide seat	10	Clip
4	Auxiliary leaf spring assembly	11	Rivet
5	Spring pin	12	Bushing
6	Lubrication fitting	13	Center bolt
7	Thrust washer		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	73-109 {745-1,111, 54-80}	C	265-315 {2,703-3,212, 196-232}
B	85-108 {870-1,100, 63-79}	D	73-109 {745-1,111, 54-80}

REAR SUSPENSION (MODELS: FG, GH)



SHTS09A010200012

1	U-bolt	8	Lubrication fitting
2	Spring pad	9	Thrust washer
3	Slide seat	10	Main leaf spring assembly
4	Spacer	11	Spacer
5	Auxiliary leaf spring assembly	12	Shackle
6	Spring bumper	13	Rivet
7	Spring pin	14	Bushing

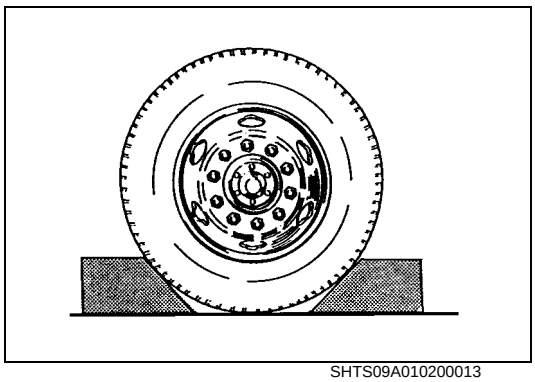
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	73-109 {745-1,110, 54-80}	D	73-109 {745-1,110, 54-80}
B	226-284 {2,300-2,900, 167-209}	E	64-86 {650-870, 47-63}
C	640-740 {6,530-7,540, 472-545}	F	61-91 {620-920, 45-67}

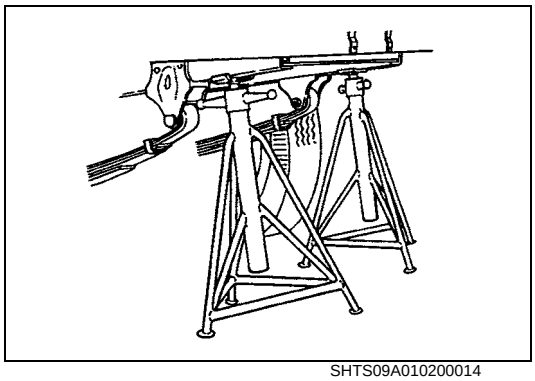
OVERHAUL

EN09A0102H200001

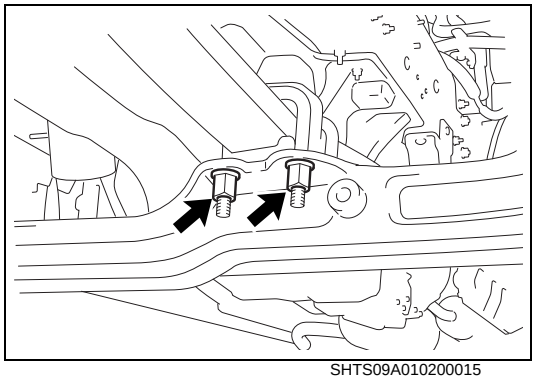
IMPORTANT POINTS - DISMOUNTING


SHTS09A010200013

1. SUPPORT OF THE FRAME WITH STANDS
(1) Park the vehicle on level ground.
(2) Be sure to block the wheels before dismounting.


SHTS09A010200014

(3) Jack up the axle, and support the frame with stands.
(4) Remove the tires.

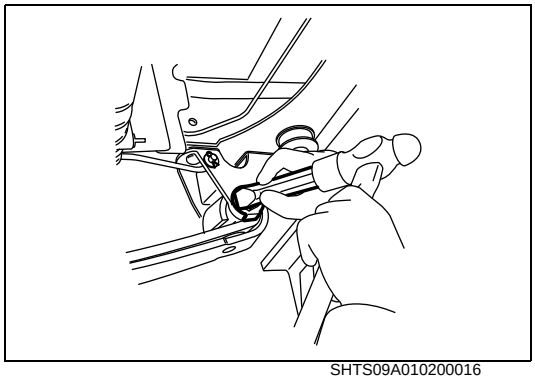

SHTS09A010200015

2. REMOVAL OF THE U-BOLT
(1) Remove the shock absorber. (Front suspension only)
(2) Support the axle with a floor jack.
(3) Remove the U-bolt mounting nuts.

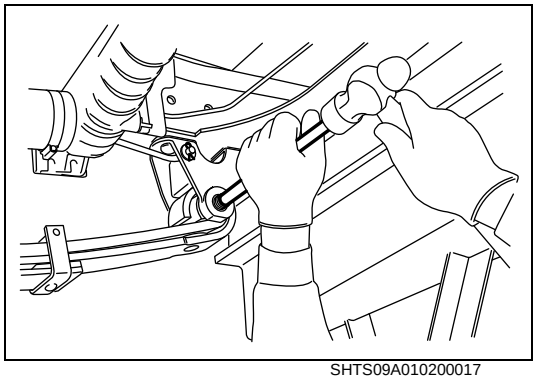
NOTICE
When cutting off the U-bolts (Due to rusted threads) with a torch, never direct the flame toward the leaves or allow sparks to come in contact with the leaves.

SST:

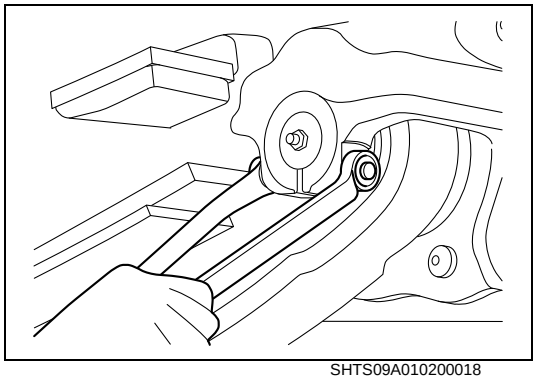
Name	Part No.	Model
Socket Wrench for Front U-bolt	S0983-92204	FC, FD
	S0960-31160	GD, FG, GH
Socket Wrench for Rear U-bolt	S0960-31160	FC, FD, GD
	S0983-93202	FG, GH
	S0983-93203	
Bar	S0984-12560	FG, GH


SHTS09A010200016

3. REMOVAL OF THE SPRING PIN (FRONT SUSPENSION)
(1) Remove the lubrication fitting.
(2) Uncaulk the nut with a chisel, then loosen the nut.

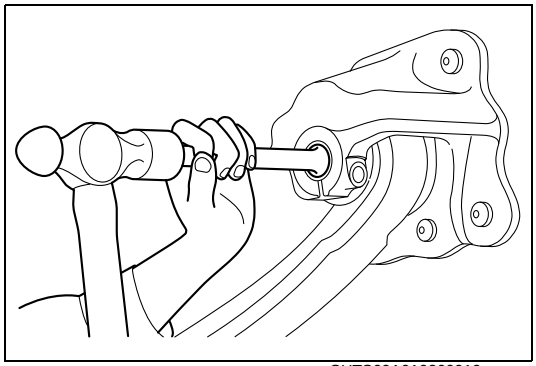

SHTS09A010200017

(3) Use a brass rod to remove the spring pins from the shackle and spring bracket.


SHTS09A010200018

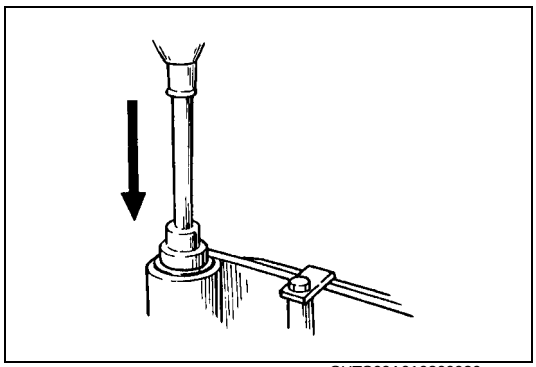
4. REMOVAL OF THE SPRING PIN (REAR SUSPENSION)

(1) Remove the lubrication fitting and spring pin lock bolt.


SHTS09A010200019

(2) Use a brass rod to remove the spring pins from the shackle and spring bracket.

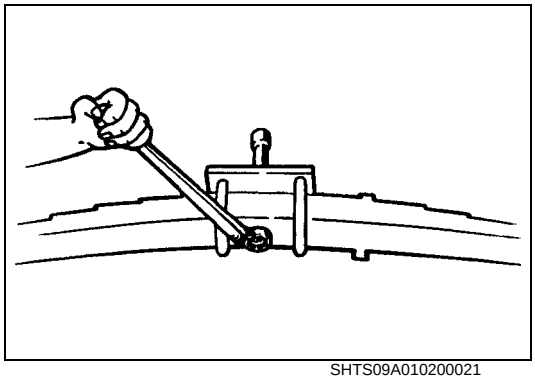
IMPORTANT POINTS - DISASSEMBLY


SHTS09A010200020

1. REPLACEMENT OF THE EYE BUSHING

(1) Use a suitable tool to press out the old eye bushing.

(2) Use a suitable tool to press in the new eye bushing.

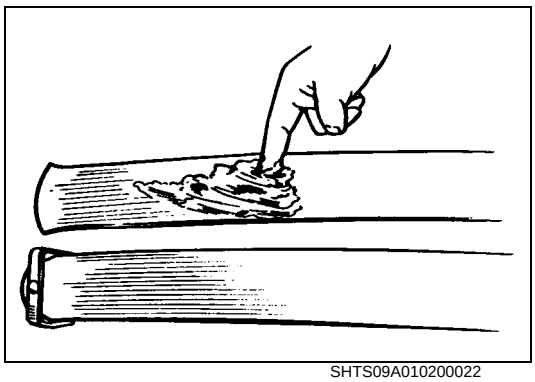

SHTS09A010200021

2. DISASSEMBLY OF THE LEAF SPRING

⚠ CAUTION
When removing the center bolt lock nut, the spring leaves may jump. Care should be taken to avoid possible personal injury.

(1) Remove the clip bolts.
(2) Use a vise or an arbor press to hold the leaf spring near the center bolt.
(3) Remove the center bolt.
(4) Loosen a vise or an arbor press slowly, and separate the leaves.

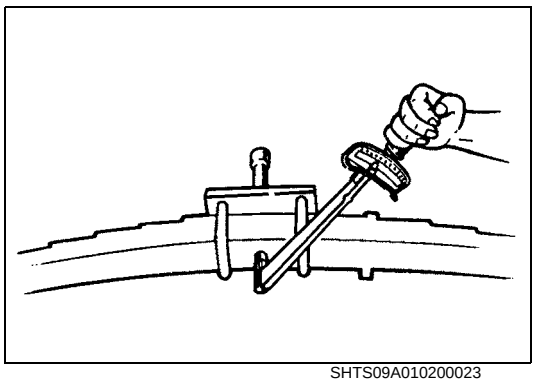
IMPORTANT POINT - ASSEMBLY


SHTS09A010200022

1. ASSEMBLY OF THE LEAF SPRING

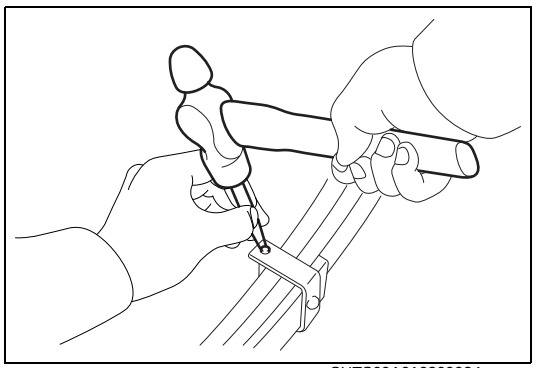
⚠ CAUTION
When clamping the spring leaves, they may jump. Care should be taken to avoid possible personal injury.

(1) Apply coating on the leaf after removing rust, and apply chassis grease on both surfaces at leaves.


SHTS09A010200023

(2) Align the leaf holes and silencers (Front suspension only), then secure the leaves with a vise or an arbor press.
(3) Insert the center bolt and tighten the lock nut.

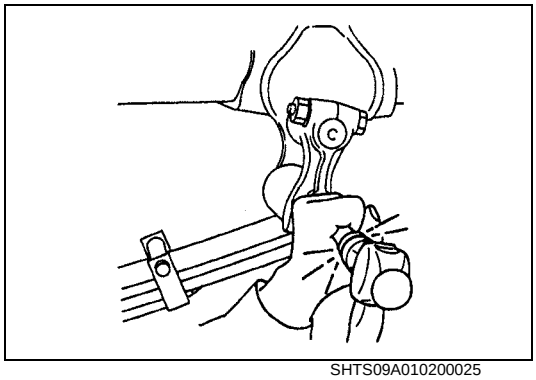
NOTICE
When reassembling the leaf spring, replace the center bolt with a new one.


SHTS09A010200024

(4) Tighten the clip bolts.

NOTICE
When tightening the clip bolts, use a new clip bolts.

(5) Use a punch to peen the thread of the clip bolts.


SHTS09A010200025

IMPORTANT POINTS - MOUNTING

1. INSTALLATION OF THE SPRING PIN

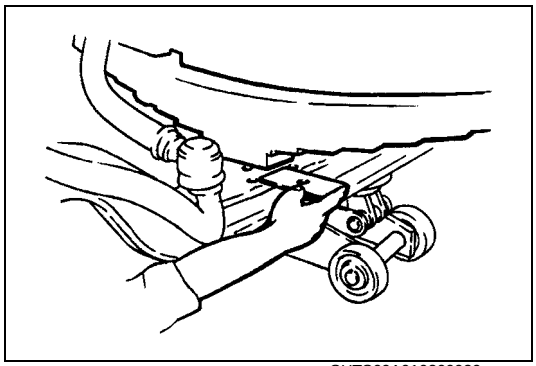
(1) Use a copper hammer to install the spring pin with thrust washers.

NOTICE

Apply chassis grease on the surface of the eye bushing and spring pin before installing.

(2) Install the spring pin lock bolt and nut.

(3) Install and secure the lock nut.

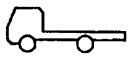
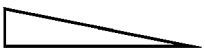
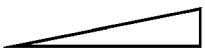

SHTS09A010200029

2. INSTALLATION OF THE U-BOLT

(1) Place the caster shim between the spring seat and leaf spring. (If so equipped)

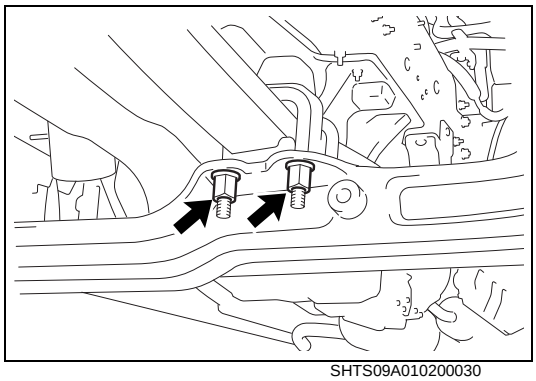
NOTICE

When installing the caster shim, the thick end should face;
front of the vehicle. (Models: FC, FD, GD)
rear of the vehicle. (Models: FG, GH)

Models: FC, FD, GD	Models: FG, GH
← To Front 	
	

(2) Put the spacer between the caster shim and leaf spring of the driver's seat side. (For front suspension)

(3) Lift the axle using a jack and align the hole of the leaf spring center bolt and the hole of the axle I-beam.

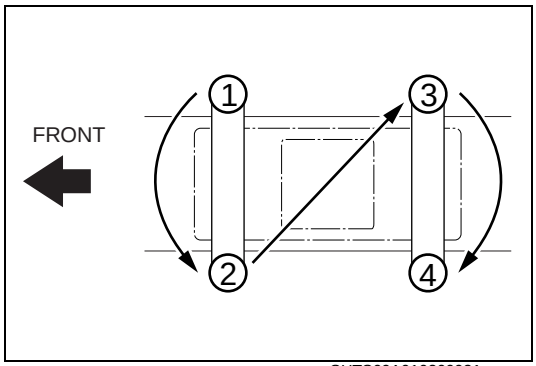

SHTS09A010200030

NOTICE

Axle and suspension assembly are heavy, therefore be careful when handling them.

(4) Put the spring bumper or the spring pad on the leaf spring.

(5) Set the U-bolts so that they catch the spring bumper or the spring pad and tighten the U-bolt nuts temporarily.



SHTS09A010200031

(6) Using the special tool, tighten the U-bolt nuts (4 pieces) alternately right and left and equally.
After repeating this operation 3 to 5 times, tighten the nuts to the specified torque.

SST:

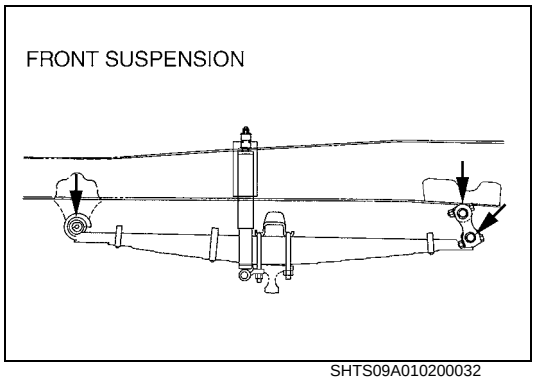
Name	Part No.	Model
Socket Wrench for Front U-bolt	S0983-92204	FC, FD
	S0960-31160	GD, FG, GH
Socket Wrench for Rear U-bolt	S0960-31160	FC, FD, GD
	S0983-93202	FG, GH
	S0983-93203	
Bar	S0984-12560	FG, GH

3. ADJUSTMENT OF THE SUSPENSION AFTER ASSEMBLING

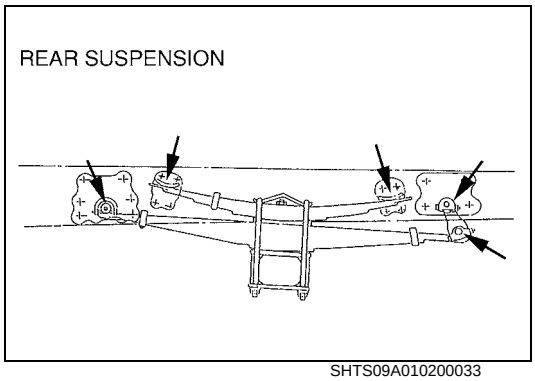
(1) If the vehicle inclination is observed after assembling suspension, correct it by inserting the following spacer between the spring and the axle.

Spacer:

	Model	Part No.	Thickness
Front suspension	**FC, FD, GD**	**SZ940-82568**	**4.5 mm {0.177 in.}**
	FG, GH (Except Hong Kong)	**SZ940-85155**	
	FG, GH (Hong Kong)	**SZ940-85169**	
Rear suspension	**FC, FD**	**SZ940-85053**	**6.0 mm {0.236 in.}**
	GD	**SZ940-85123**	
	FG (Thailand, Taiwan, Indonesia, Philippines, Vietnam)	**SZ940-85018**	
	FG (Chile, Hong Kong, Australia, New Zealand), GH	**SZ940-85086**	**4.5 mm {0.177 in.}**



SHTS09A010200032



SHTS09A010200033

4. LUBRICATION

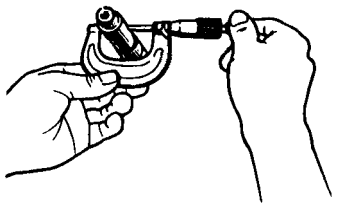
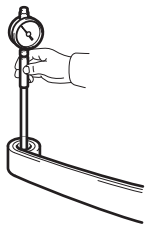
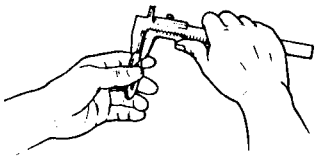
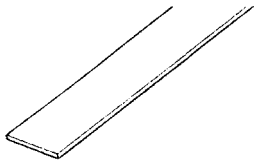
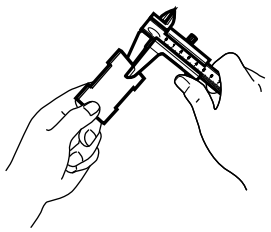
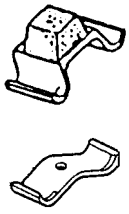
(1) Lubricate the following parts with chassis grease.
   a. Spring pins
   b. Auxiliary spring slide seats

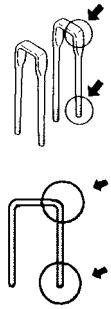
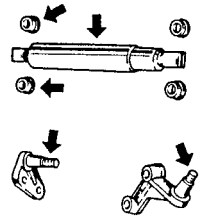
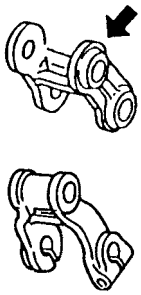
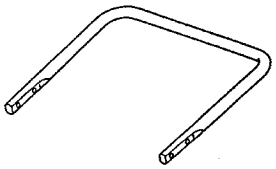
INSPECTION AND REPAIR

EN09A0102H300001

MODELS: FC, FD, GD

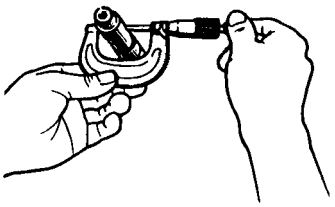
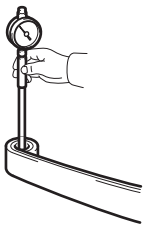
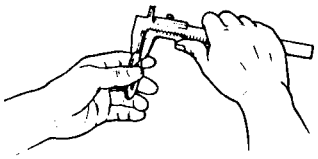
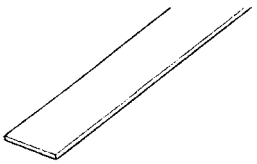
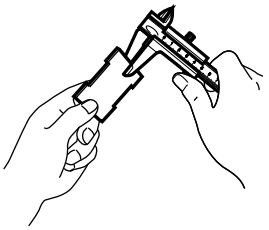
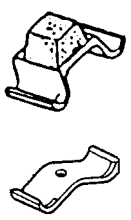
Unit: mm {in.}

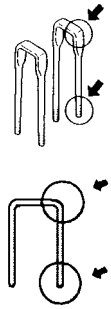
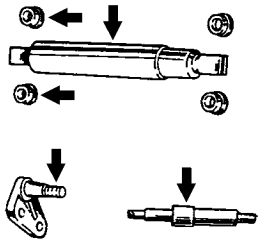
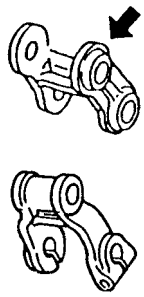
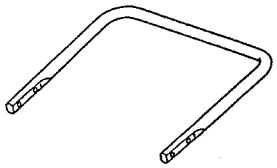
Inspection item		Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	Front	25 {0.984}	24.7 {0.9724}	Replace.	Measure 
	Rear	30 {1.181}	29.7 {1.1693}		
Clearance between spring pin and eye bushing		0.125 {0.0049}	0.5 {0.0197}	Replace the pin and/or bushing.	Measure 
Thrust washer: Wear	Front	2.0 {0.079}	1.5 {0.059}	Replace.	Measure 
	Rear	3.0 {0.118}	2.5 {0.0984}		
Leaf: Damage and wear		—	—	Replace.	Visual check 
Silencer: Wear		3.0 {0.118}	1.0 {0.0394}	Replace.	Measure 
Spring bumper: Damage and wear		—	—	Replace, if necessary.	Visual check 

Inspection item	Standard	Limit	Remedy	Inspection procedure
U-Bolt: **Damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Shock absorber: **Operation, oil leak and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Cushion: **Damage and wear**	**—**	**—**		
Shock absorber pin and bracket: **Damage and wear**	**—**	**—**		
Shackle: **Damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Stabilizer bar: **Damage** **(If so equipped)**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Stabilizer sleeve: **Wear** **(If so equipped)**				
Stabilizer bushing: **Wear** **(If so equipped)**				

MODELS: FG, GH

Unit: mm {in.}

Inspection item		Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	Front	30 {1.181}	29.7 {1.170}	Replace.	Measure 
	Rear	30 {1.181}	29.7 {1.170}		
		38 {1.496}	37.7 {1.484}		
Clearance between spring pin and eye bushing		0.020-0.125 {0.0008-0.0049}	0.5 {0.0196}	Replace the pin and/or bushing.	Measure 
Thrust washer: Wear	Front	Pivot side 2.3 {0.091}	1.8 {0.0709}	Replace.	Measure 
		Shackle side 4.0 {0.157}	3.5 {0.138}		
	Rear	Pivot side 2.0 {0.079}	1.5 {0.059}		
		Pivot side 3.0 {0.118}	2.5 {0.0984}		
		Shackle side 4.0 {0.157}	3.5 {0.138}		
		Shackle side 3.0 {0.118}	2.5 {0.0984}		
Leaf: Damage and wear		—	—	Replace.	Visual check 
Silencer: Wear		3.0 {0.118}	1.0 {0.0394}	Replace.	Measure 
Spring bumper: Damage and wear		—	—	Replace, if necessary.	Visual check 

Inspection item	Standard	Limit	Remedy	Inspection procedure
U-Bolt: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Shock absorber: Operation, oil leak and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cushion: Damage and wear	**—**	**—**		
Shock absorber pin and bracket: Damage and wear	**—**	**—**		
Shackle: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Stabilizer bar: Damage (If so equipped)	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Stabilizer sleeve: Wear (If so equipped)				
Stabilizer bushing: Wear (If so equipped)				

SUSPENSION (MODELS: FL, FM)

SU02-002

LEAF SUSPENSION ASSEMBLY SU02-2
DATA AND SPECIFICATIONS SU02-2
DESCRIPTION SU02-3
TROUBLESHOOTING SU02-4
SPECIAL TOOL SU02-4
COMPONENT LOCATOR SU02-5
OVERHAUL SU02-7
INSPECTION AND REPAIR SU02-13

LEAF SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

EN09A0102I200001

FRONT SUSPENSION

Type		**Semi-elliptic leaf springs with shock absorber**		
Dimensions of leaf springs:	**Span**	**1,470 mm {57.874 in.}**		
	Width	**80 mm {3.15 in.}**		
	Thickness of leaves	**Multi leaf spring**		**Taper leaf spring**
		—	**10 mm {0.394 in.}**	**19.5 mm {0.768 in.}**
		12 mm {0.472 in.}	**12 mm {0.472 in.}**	**—**
		13 mm {0.512 in.}	**13 mm {0.512 in.}**	
Shock absorbers:	**Type**	**Single acting**		**Double acting**
	Stroke	**252 mm {9.921 in.}**	**260 mm {10.236 in.}**	**249 mm {9.803 in.}**
	Min. length	**382 mm {15.039 in.}**	**390 mm {15.354 in.}**	**381 mm {15.000 in.}**
	Max. length	**634 mm {24.961 in.}**	**650 mm {25.590 in.}**	**630 mm {24.803 in.}**

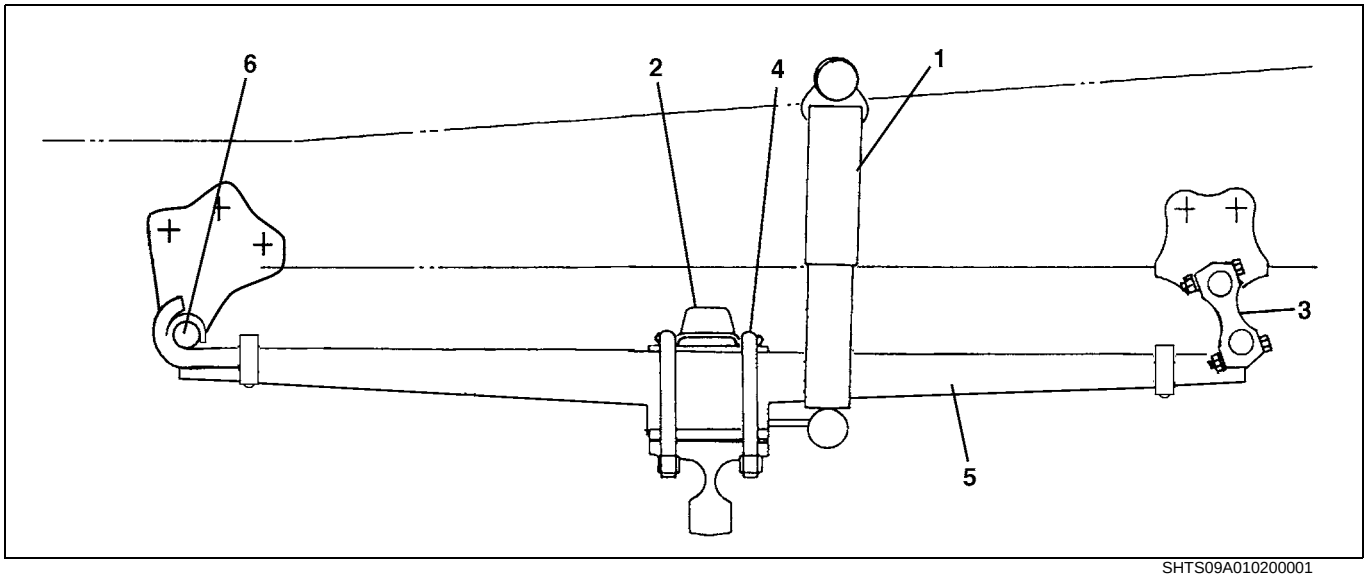
REAR SUSPENSION

Type		**Semi-elliptic leaf springs with torque rods**
Dimensions of main leaf springs:	**Span**	**1,300 mm {51.181 in.}**
	Width	**90 mm {3.543 in.}**
	Thickness of leaves	**16 mm {0.63 in.}**
		18 mm {0.71 in.}

DESCRIPTION

EN09A0102C100001

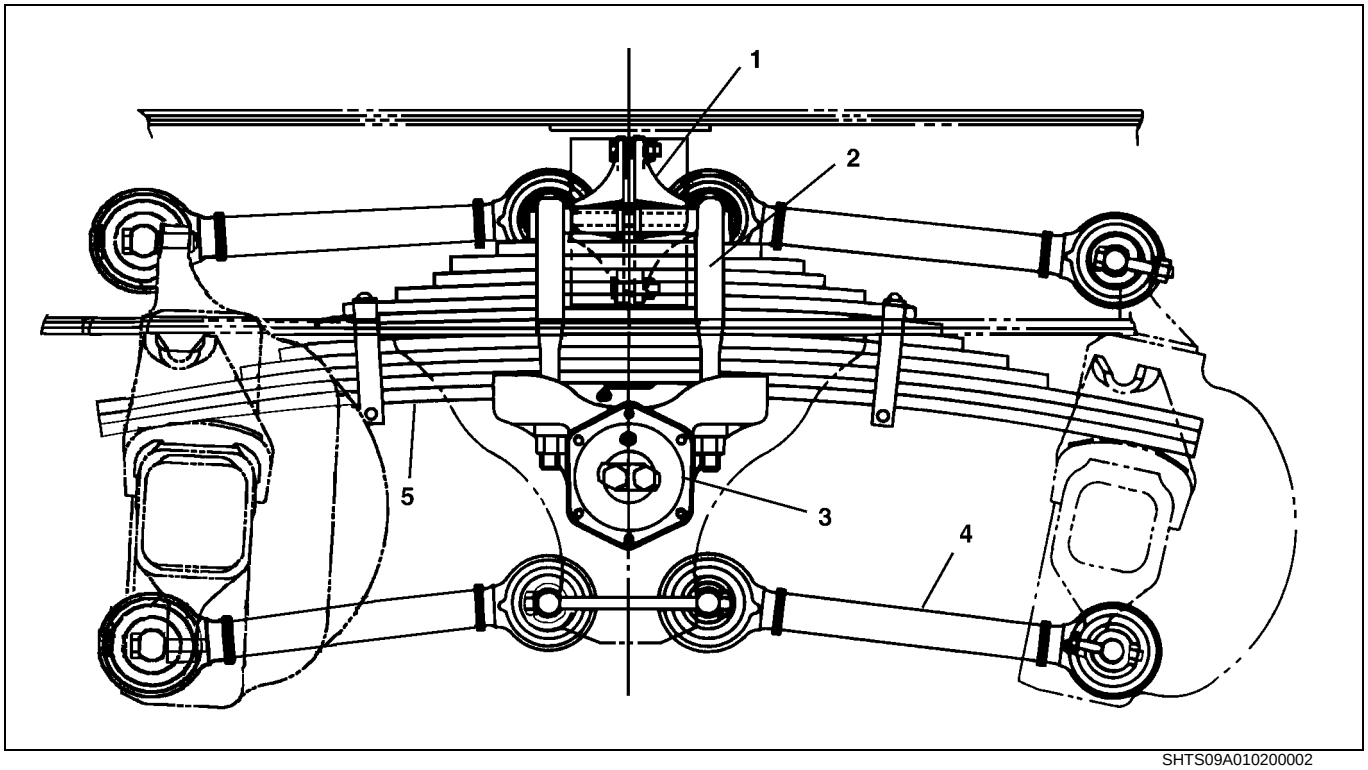
FRONT SUSPENSION



SHTS09A010200001

1	Shock absorber	4	U-bolt
2	Spring bumper	5	Leaf spring assembly
3	Shackle	6	Spring pin

REAR SUSPENSION



SHTS09A010200002

1	Torque rod bracket	4	Torque rod
2	U-bolt	5	Leaf spring assembly
3	Trunnion assembly		

TROUBLESHOOTING

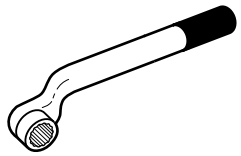
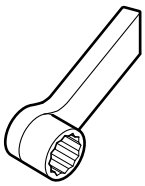
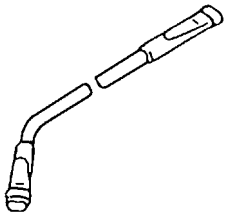
EN09A0102F300001

Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Tighten to specified torque.
Squeaking of the leaves	Friction between the leaves	Replace the silencers and/or apply chassis grease between leaves.

SPECIAL TOOL

EN09A0102K100001

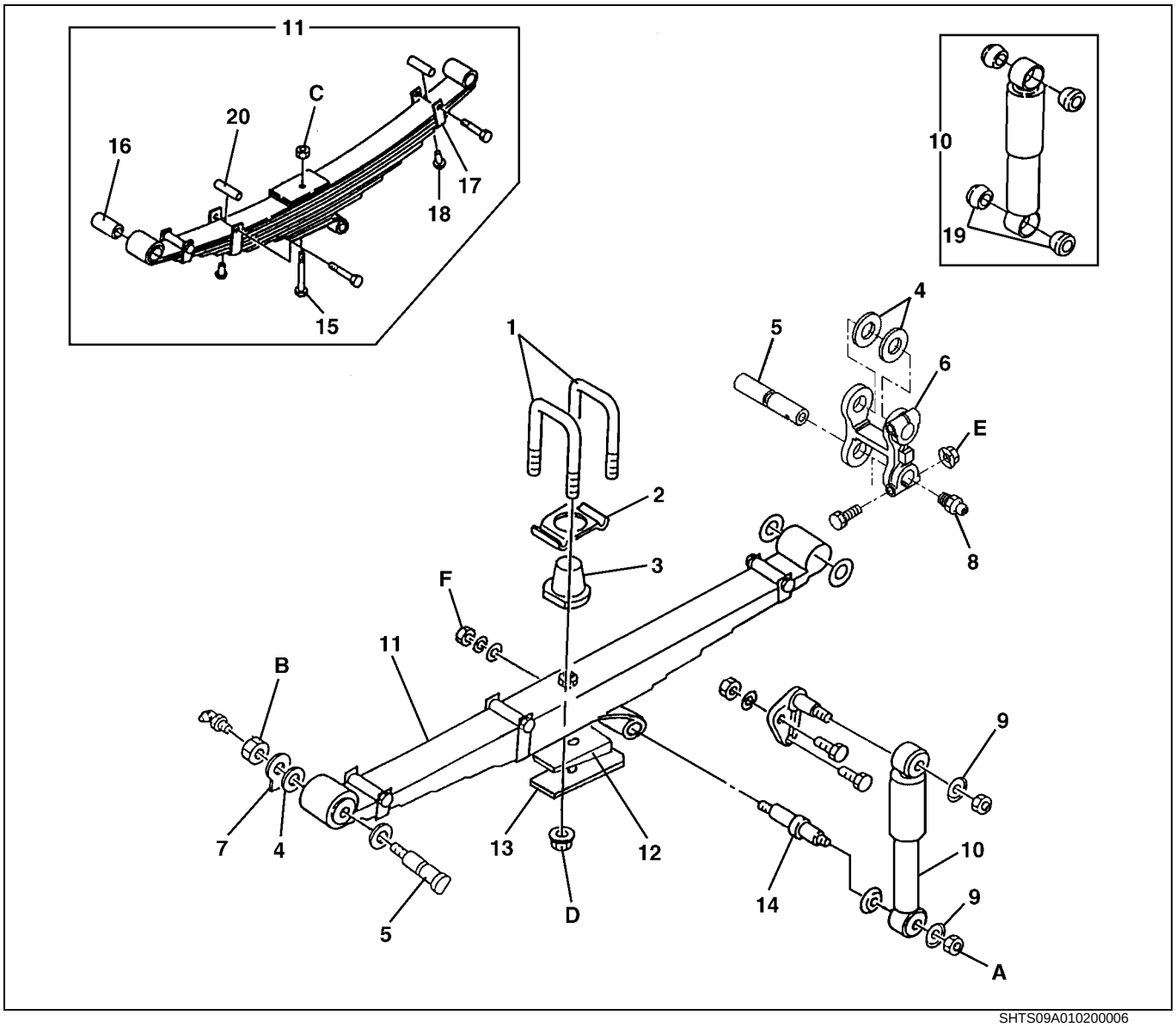
Prior to starting a suspension overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0960-31160	SOCKET WRENCH	For front U-bolt
	S0960-31010	SOCKET WRENCH	For rear U-bolt
	S0940-41060	HANDLE	

COMPONENT LOCATOR

EN09A0102D100001

FRONT SUSPENSION



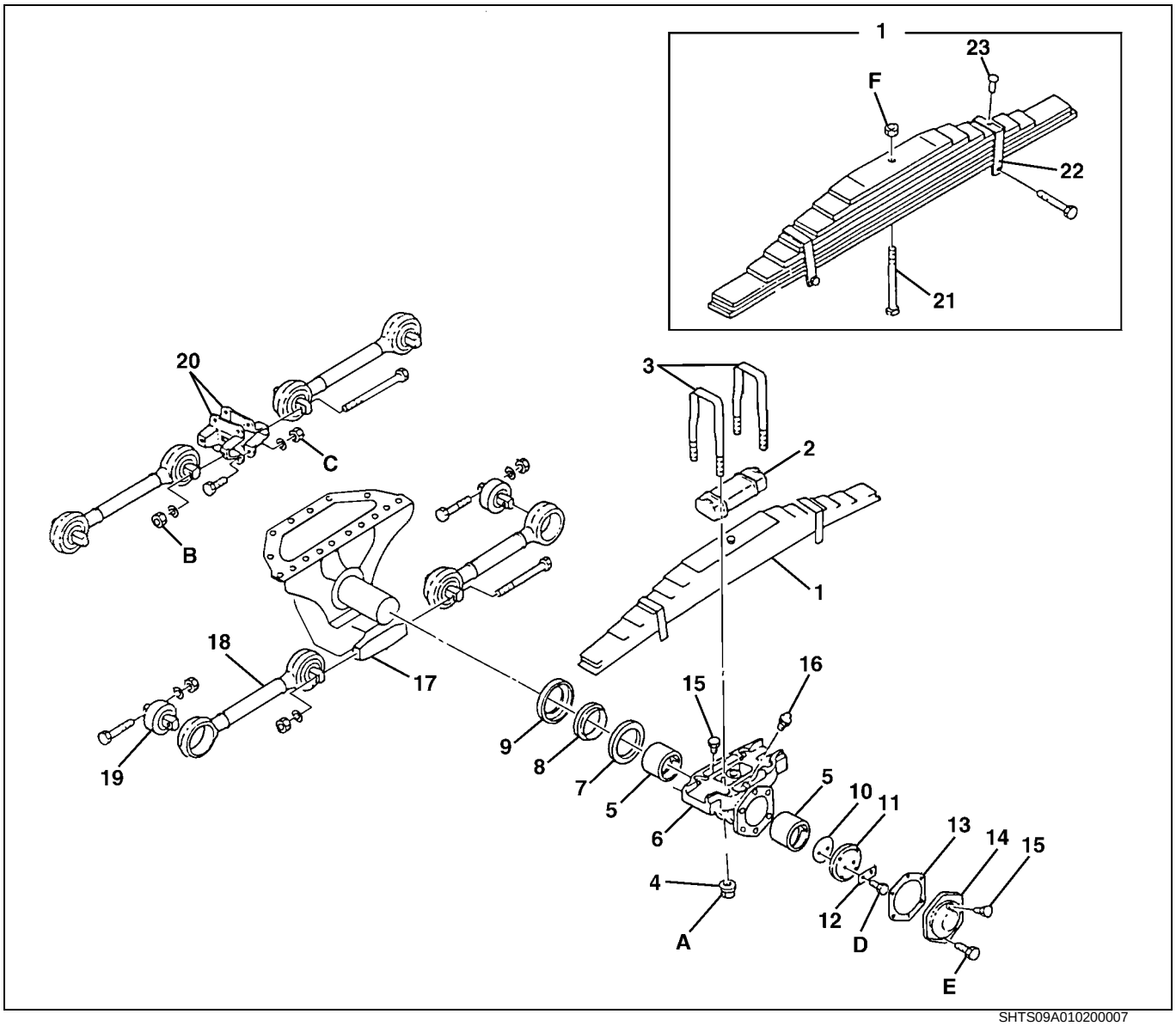
SHTS09A010200006

1	U-bolt	11	Leaf spring assembly
2	Spring pad	12	Caster shim
3	Spring bumper	13	Spacer (Driver's seat side only)
4	Thrust washer	14	Shock absorber pin
5	Spring pin	15	Center bolt
6	Shackle	16	Bushing
7	Lock plate	17	Clip
8	Lubrication fitting	18	Rivet
9	Cushion washer	19	Cushion
10	Shock absorber	20	Collar

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	(Taper leaf spring)	C	85-108 {870-1,100, 63-79}
	167-225 {1,700-2,300, 125-168}	D	390-440 {3,977-4,486, 288-324}
	(Multi leaf spring)	E	73-109 {745-1,111, 54-80}
	236-324 {2,406-3,303, 174-238}	F	236-324 {2,406-3,303, 174-238}
B	64-93 {653-948, 48-68}		

REAR SUSPENSION



SHTS09A010200007

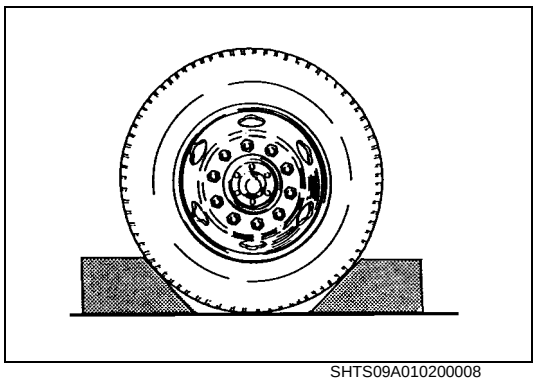
1	Leaf spring assembly	9	Dust shield	17	Trunnion bracket
2	Spring pad	10	Shim	18	Torque rod
3	U-bolt	11	Clamp plate	19	Rubber bushing
4	Nut	12	Lock plate	20	Torque rod bracket
5	Bushing	13	Trunnion gasket	21	Center bolt
6	Trunnion seat	14	Trunnion cover	22	Clip
7	Oil-seal	15	Breather valve	23	Rivet
8	Trunnion collar	16	Lubrication fitting		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	782-978 {7,975-9,972, 577-721}	D	341-459 {3,478-4,680, 254-339}
B	236-324 {2,407-3,303, 174-238}	E	37-49 {378-499, 28-36}
C	170-230 {1,734-2,345, 126-169}	F	226-284 {2,300-2,900, 167-209}

OVERHAUL

EN09A0102H200001



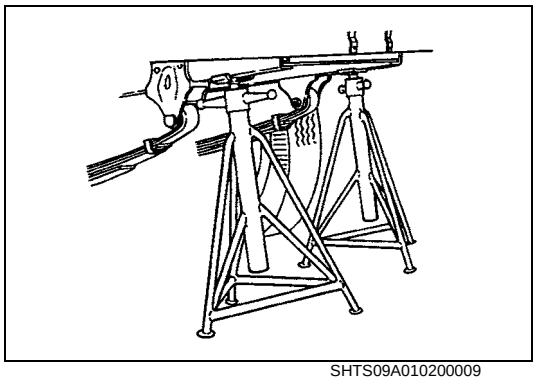
SHTS09A010200008

IMPORTANT POINTS - DISMOUNTING

1. SUPPORT OF THE FRAME WITH STANDS

(1) Park the vehicle on level ground.

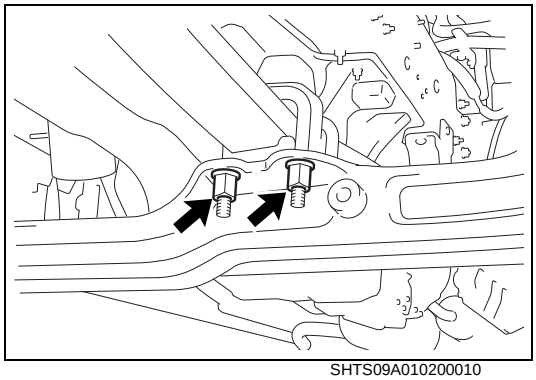
(2) Be sure to block the wheels before dismounting.



SHTS09A010200009

(3) Jack up the axle, and support the frame with stands.

(4) Remove the tires.



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2. REMOVAL OF THE U-BOLT

(1) Remove the shock absorber. (Front suspension only)

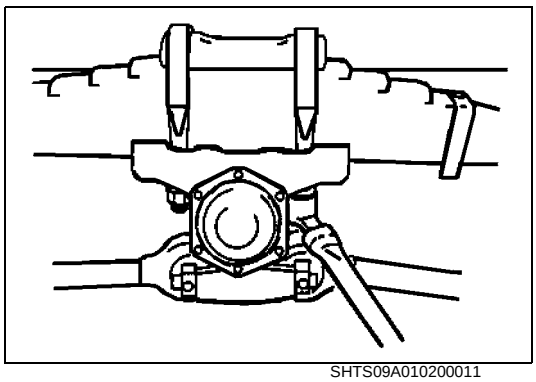
(2) Support the axle with a floor jack.

(3) Remove the U-bolt mounting nuts.

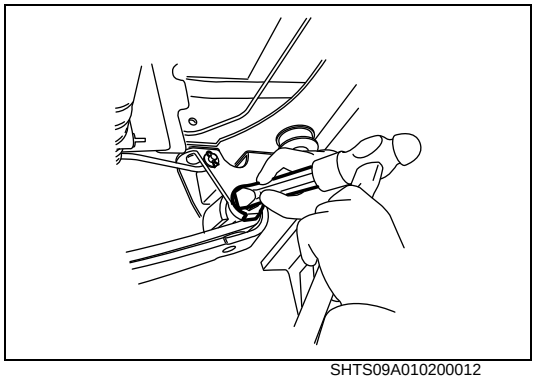
NOTICE

When cutting off the U-bolts (Due to rusted threads) with a torch, never direct the flame toward the leaves or allow sparks to come in contact with the leaves.

SST:
Socket Wrench for Front U-bolt (S0960-31160)
Socket Wrench for Rear U-bolt (S0960-31010)
Handle (S0940-41060)

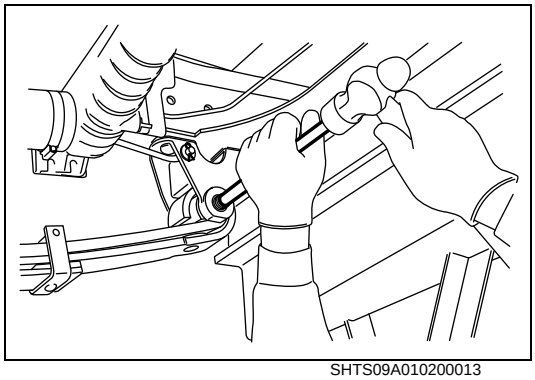


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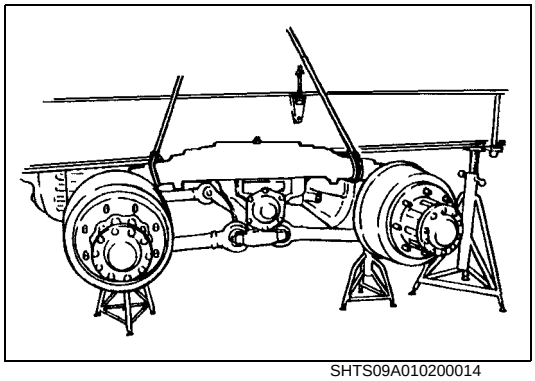

SHTS09A010200012

3. REMOVAL OF THE SPRING PIN (FRONT SUSPENSION)

(1) Remove the lubrication fitting.
(2) Uncaulk the nut with a chisel, then loosen the nut. (Front side of spring)

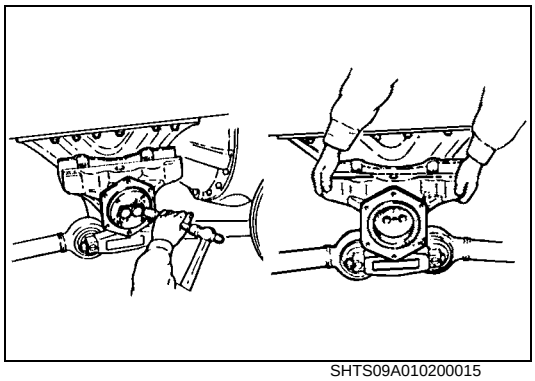

SHTS09A010200013

(3) Remove the spring pin lock bolt. (Rear side of spring)
(4) Use a brass rod to remove the spring pins from the shackle and spring bracket.


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4. REMOVAL OF THE LEAF SPRING FROM THE TRUNNION SEAT.

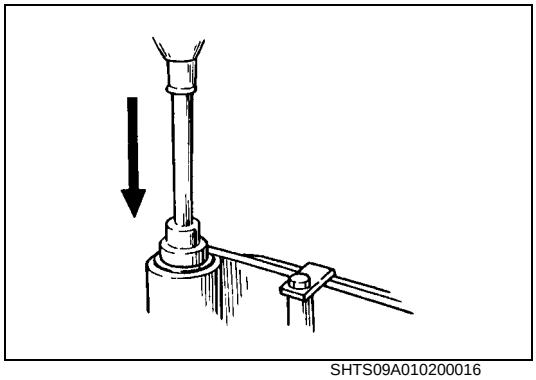
(1) Remove the leaf spring from the trunnion seat.


SHTS09A010200015

5. REMOVAL OF THE TRUNNION SEAT

(1) Remove the trunnion shaft cover.
(2) Uncaulk the lock plate of the clamp plate bolts with a chisel, then remove the bolts, lock plate, clamp plate and shims.
(3) Remove the trunnion seat from trunnion shaft.

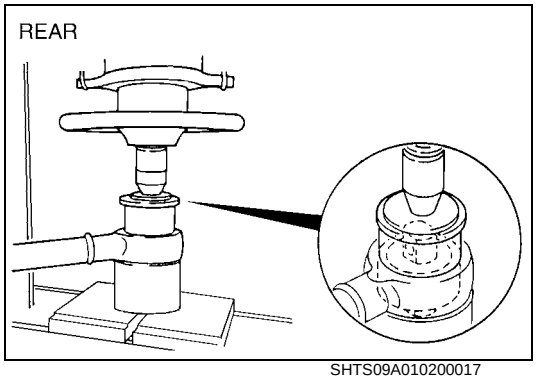
⚠ CAUTION
Since the trunnion seat is too heavy, be careful not to drop it on your feet.


SHTS09A010200016

IMPORTANT POINTS - DISASSEMBLY

1. REPLACEMENT OF THE EYE BUSHING

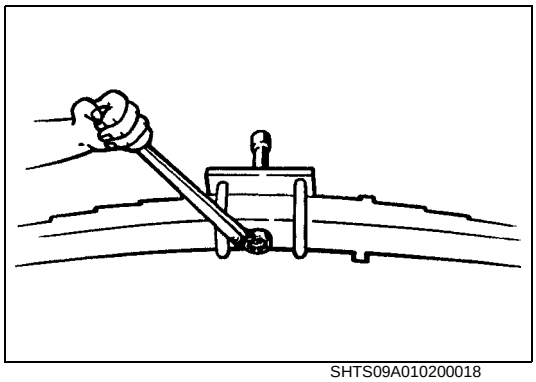
(1) Use a suitable tool to press out the old eye bushing.
(2) Use a suitable tool to press in the new eye bushing.



SHTS09A010200017

2. REPLACEMENT OF THE RUBBER BUSHING

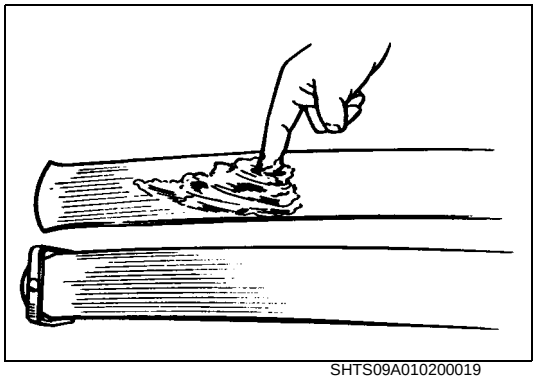
(1) Use a commercial tool to press out the old rubber bushing.
(2) Use a commercial tool to press in the new rubber bushing.


SHTS09A010200018

3. DISASSEMBLY OF THE LEAF SPRING

⚠ CAUTION
When removing the center bolt lock nut, the spring leaves may jump. Care should be taken to avoid possible personal injury.

(1) Remove the clip bolts.
(2) Use a vise or an arbor press to hold the leaf spring near the center bolt.
(3) Remove the center bolt.
(4) Loosen a vise or an arbor press slowly, and separate the leaves.

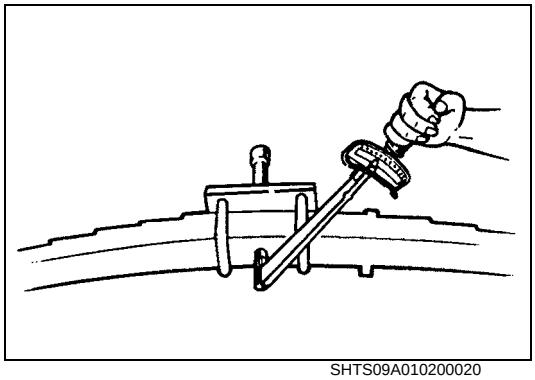

SHTS09A010200019

IMPORTANT POINT - ASSEMBLY

1. ASSEMBLY OF THE LEAF SPRING

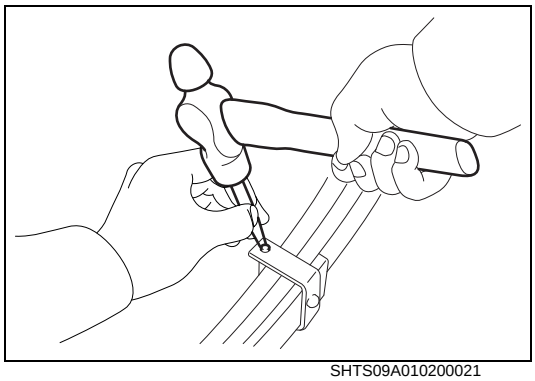
⚠ CAUTION
When clamping the spring leaves, they may jump. Care should be taken to avoid possible personal injury.

(1) Apply coating on the leaf after removing rust, and apply chassis grease on both surfaces at leaves.


SHTS09A010200020

(2) Align the leaf holes and silencers (Front suspension only), then secure the leaves with a vise or an arbor press.
(3) Insert the center bolt and tighten the lock nut.

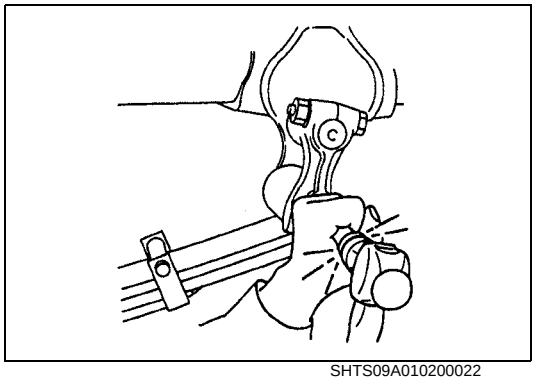
NOTICE
When reassembling the leaf spring, replace the center bolt with a new one.


SHTS09A010200021

(4) Tighten the clip bolts.

NOTICE
When tightening the clip bolts, use a new clip bolts.

(5) Use a punch to peen the thread of the clip bolts.

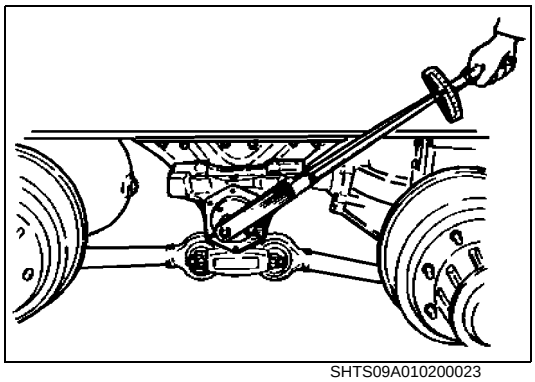

SHTS09A010200022

IMPORTANT POINTS - MOUNTING

1. INSTALLATION OF THE SPRING PIN
(1) Use a copper hammer to install the spring pin with thrust washers.

NOTICE
Apply chassis grease on the surface of the eye bushing and spring pin before installing.

(2) Install the spring pin lock bolt and nut.
(3) Install secure the lock nut.

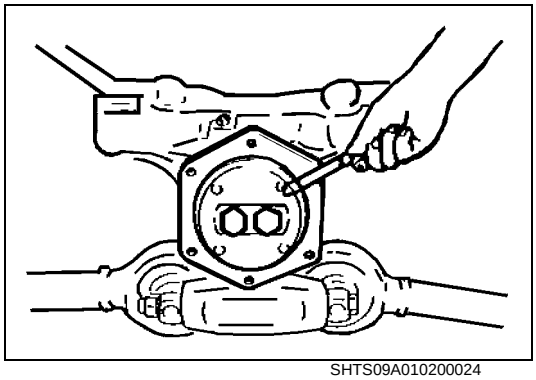

SHTS09A010200023

2. INSPECT THE CLEARANCE BETWEEN THE CLAMP PLATE AND THE TRUNNION SEAT.

NOTICE

- **Replace the oil seal and trunnion gasket with new ones.**
- **Apply chassis grease to lip of the oil seal and the inside of the bushing.**
- **Insert two trunnion seat bolts before installing the trunnion seat on the trunnion shaft.**

(1) Install the trunnion seat to the trunnion shaft.
(2) Set the shim and clamp plate and tighten the bolts with the lock plate.

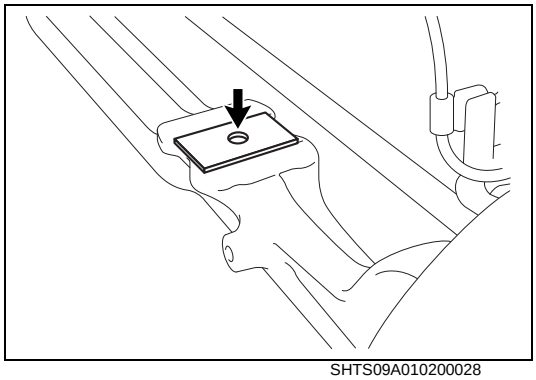

SHTS09A010200024

(3) Inspect the clearance between the clamp plate and trunnion seat.
Standard clearance: 0.05-0.1 mm {0.0020-0.0039 in.}
Service limit: 0.4 mm {0.0157 in.}

NOTICE
If the standard clearance is not correct, adjust the clearance by decreasing or increasing the shim.

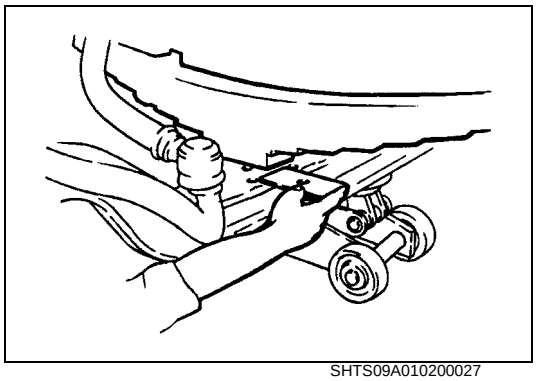
The following shims are available.
0.30 mm {0.0118 in.}, 0.40 mm {0.0157 in.},
0.45 mm {0.0177 in.}, 0.50 mm {0.0197 in.}

(4) Lock the clamp plate bolts with the lock plate.


SHTS09A010200028

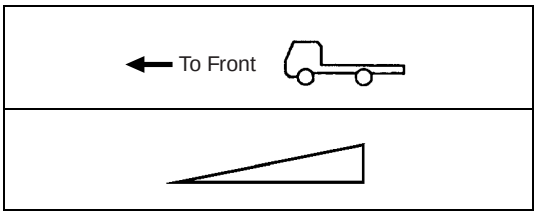
3. INSTALLATION OF THE U-BOLT

(1) Put the spacer on the front axle I-beam part of the driver's seat side. (For front suspension)


SHTS09A010200027

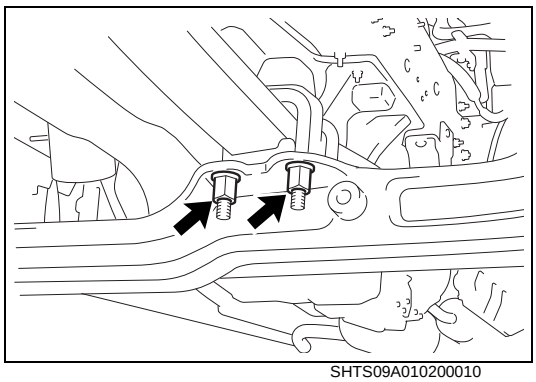
(2) Place the caster shim between the spring seat and leaf spring.

NOTICE
When installing the caster shim, the thick end should face the rear of the vehicle.

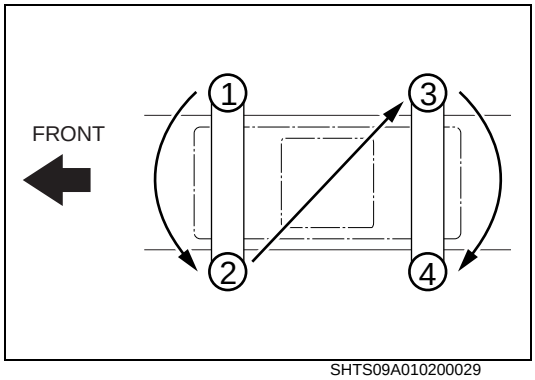


(3) Lift the axle using a jack and align the hole of the leaf spring center bolt and the hole of the axle I-beam.

NOTICE
Axle and suspension assembly are heavy, therefore be careful when handing them.


SHTS09A010200010

(4) Put the spring pads on the leaf springs.
(5) Set the U-bolt so that they catch the spring pads and tighten the U-bolt nuts temporarily.



SHTS09A010200029

(6) Using the special tool, tighten the U-bolt nuts (4 pieces) alternately right and left and equally.
After repeating this operation 3 to 5 times, tighten the nuts to the specified torque.
SST:
Socket Wrench for Front U-bolt (S0960-31160)
Socket Wrench for Rear U-bolt (S0960-31010)
Handle (S0940-41060)

4. ADJUSTMENT OF THE SUSPENSION AFTER ASSEMBLING

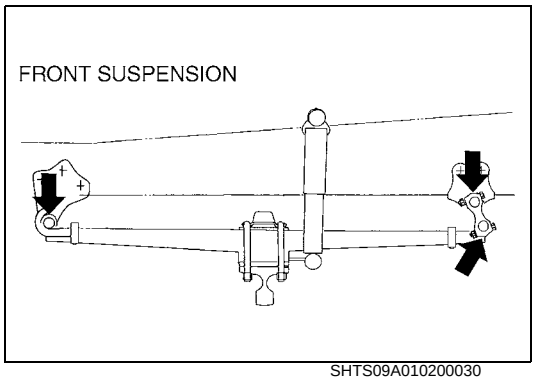
(1) If the vehicle inclination is observed after assembling suspension, correct it by inserting the following spacer between the spring and the axle.

Spacer:

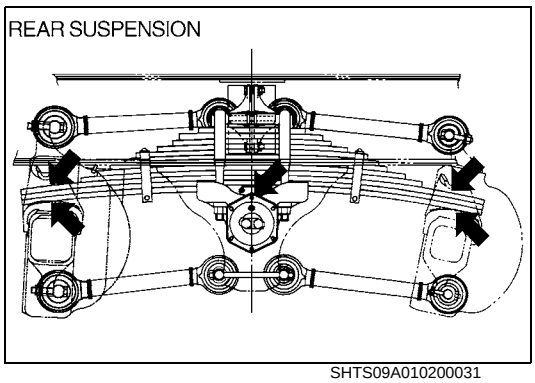
	Part No.	Thickness
Front suspension	**SZ940-85155**	**4.5 mm {0.177 in.}**

5. LUBRICATION

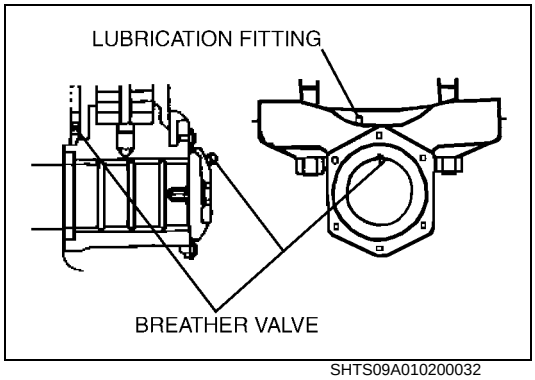
(1) Lubricate the following parts with chassis grease.
a. Spring pins
b. Spring surface of the spring and axle housing
c. Trunnion shaft



SHTS09A010200030



SHTS09A010200031



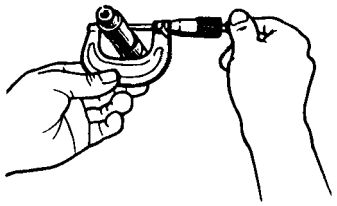
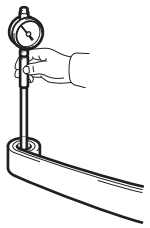
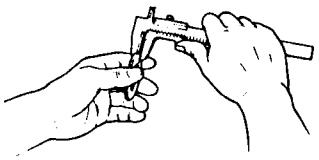
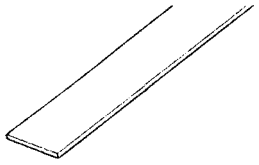
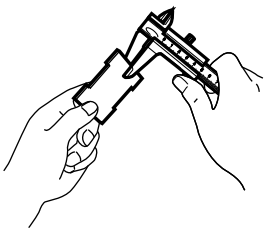
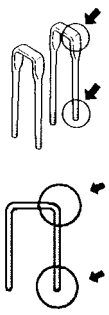
SHTS09A010200032

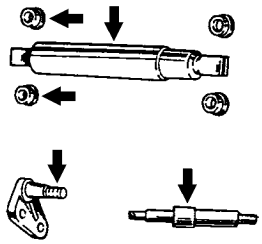
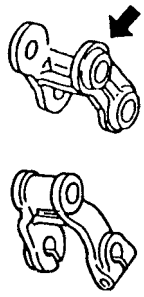
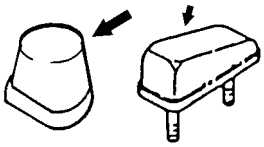
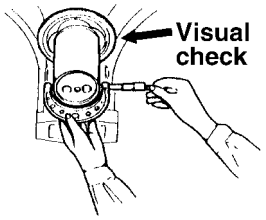
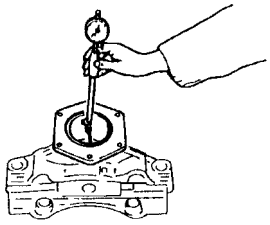
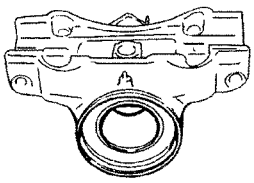
NOTICE
Use the lubrication fitting to chassis grease the trunnion shaft, until the grease flows out from the breather valve of trunnion seat and trunnion cover.

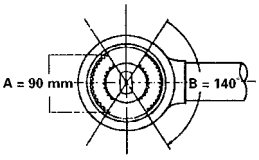
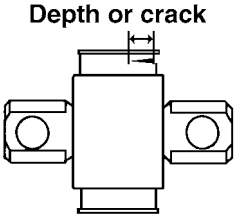
INSPECTION AND REPAIR

EN09A0102H300001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	**30 {1.181}**	**29.7 {1.170}**	**Replace.**	**Measure** 
Clearance between spring pin and eye bushing	**0.02-0.125 {0.0008-0.0049}**	**0.5 {0.0196}**	**Replace the pin and/or bushing.**	**Measure** 
Thrust washer: Wear	**Pivot side 3.0 {0.118}**	**2.5 {0.0984}**	**Replace.**	**Measure** 
	Shackle side 4.0 {0.157}	**3.5 {0.138}**		
Leaf: Damage and wear	**—**	**—**	**Replace.**	**Visual check** 
Silencer: Wear	**3.0 {0.118}**	**1.0 {0.0040}**	**Replace.**	**Measure** 
U-Bolt: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Shock absorber: Operation, oil leak and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cushion: Damage and wear	**—**	**—**		
Shock absorber pin and bracket: Damage and wear	**—**	**—**		
Shackle: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring bumper: Damage and wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Trunnion shaft outside diameter	**100 {3.937}**	**—**	**Replace, if necessary.**	**Measure** 
Clearance between trunnion shaft and bushing	**0.26-0.43 {0.0103-0.0169}**	**0.7 {0.0275}**	**Replace.**	
Dust shield: Damage	**—**	**—**	**Replace, if necessary.**	
Trunnion oil seal: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Rubber bushing: Damage and crack	**—**	**15 {0.59}**	**In case cracks have developed on the rubber circumference in the range (A or B) shown in figure, replace the torque rod bushing.**	**Measure and Visual check**  **Depth or crack** 

SUSPENSION (MODELS: FT, GT)

SU02-003

SUSPENSION ASSEMBLY..... SU02-2
DATA AND SPECIFICATIONS..... SU02-2
DESCRIPTION SU02-3
TROUBLESHOOTING..... SU02-5
SPECIAL TOOL..... SU02-5
COMPONENT LOCATOR SU02-6
OVERHAUL SU02-10
INSPECTION AND REPAIR..... SU02-15

SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

EN09A0102I200001

FRONT SUSPENSION **Unit: mm {in.}**

Model		FT	GT
Type		Semi-elliptic leaf springs with shock absorber	
Dimensions of leaf springs:	Span	1,300 {51.18}	1,400 {55.12}
	Width	70 {2.76}	80 {3.15}
	Thickness of leaves	10 {0.39}	9 {0.35}
			10 {0.39}
			11 {0.43}
Shock absorbers:	Type	Double acting	
	Stroke	253 {9.96}	249 {9.80}
	Min. length	348 {13.70}	381 {15.00}
	Max. length	601 {23.66}	630 {24.80}

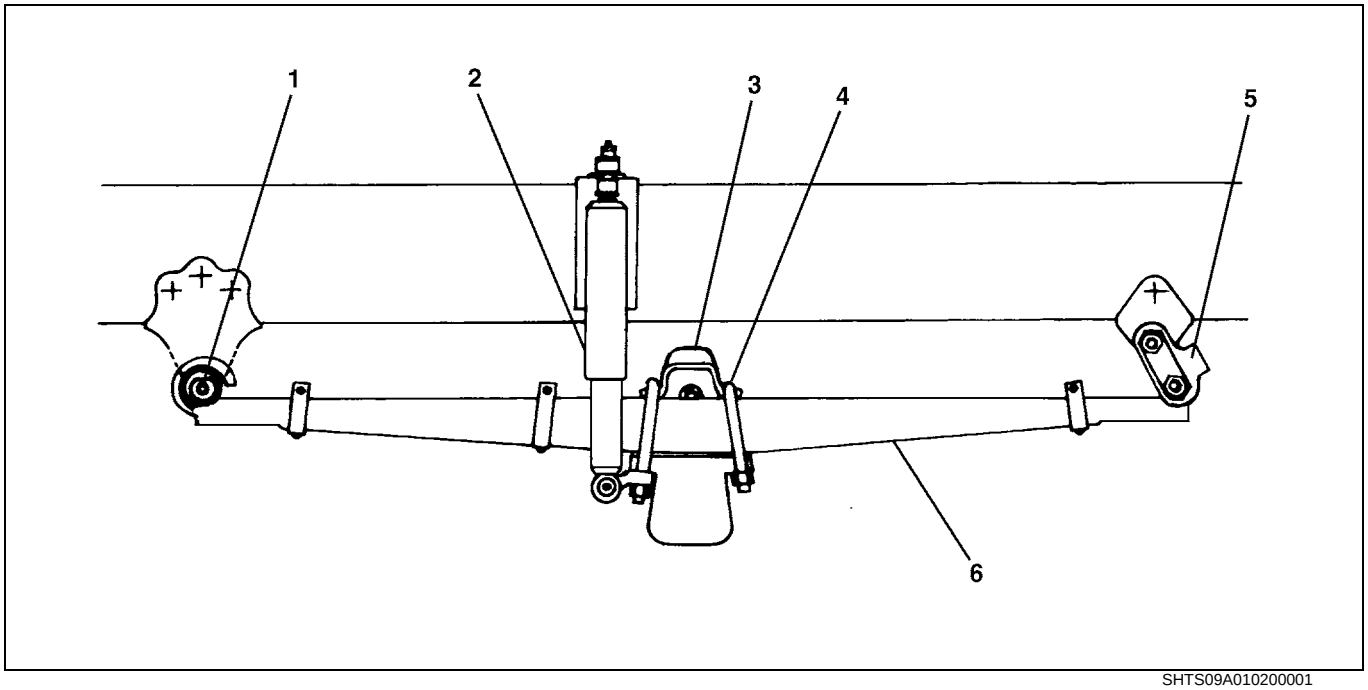
REAR SUSPENSION **Unit: mm {in.}**

Model		FT	GT
Type		Semi-elliptic main and auxiliary leaf springs	
Dimensions of main leaf springs:	Span	1,300 {51.18}	1,600 {62.99}
	Width	70 {2.76}	80 {3.15}
	Thickness of leaves	11 {0.43}	12 {0.47}
			13 {0.51}
Dimensions of auxiliary leaf springs:	Span	900 {35.43}	1,050 {41.34}
	Width	70 {2.76}	80 {3.15}
	Thickness of leaves	10 {0.39}	
		11 {0.43}	

DESCRIPTION

EN09A0102C100001

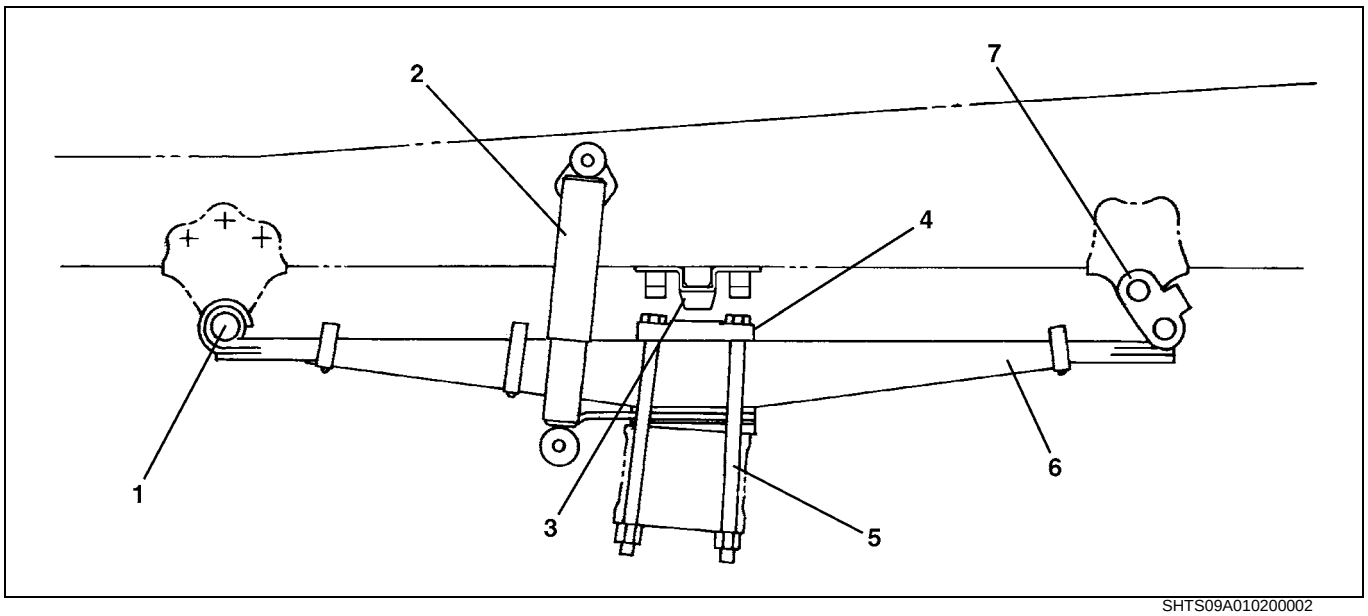
FRONT SUSPENSION (MODEL: FT)



SHTS09A010200001

1	Spring pin	4	U-bolt
2	Shock absorber	5	Shackle
3	Spring bumper	6	Leaf spring assembly

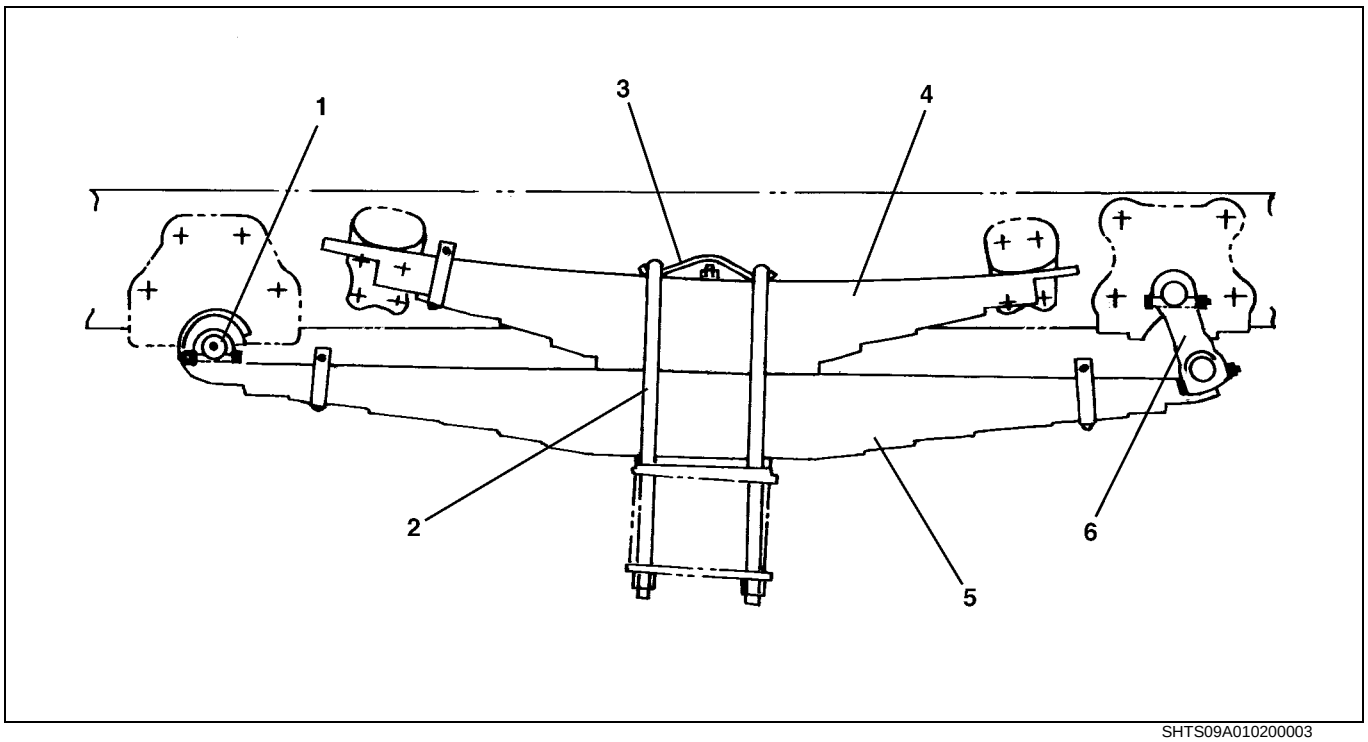
FRONT SUSPENSION (MODEL: GT)



SHTS09A010200002

1	Spring pin	5	Front axle fixing bolt
2	Shock absorber	6	Leaf spring assembly
3	Spring bumper	7	Shackle
4	Spring pad		

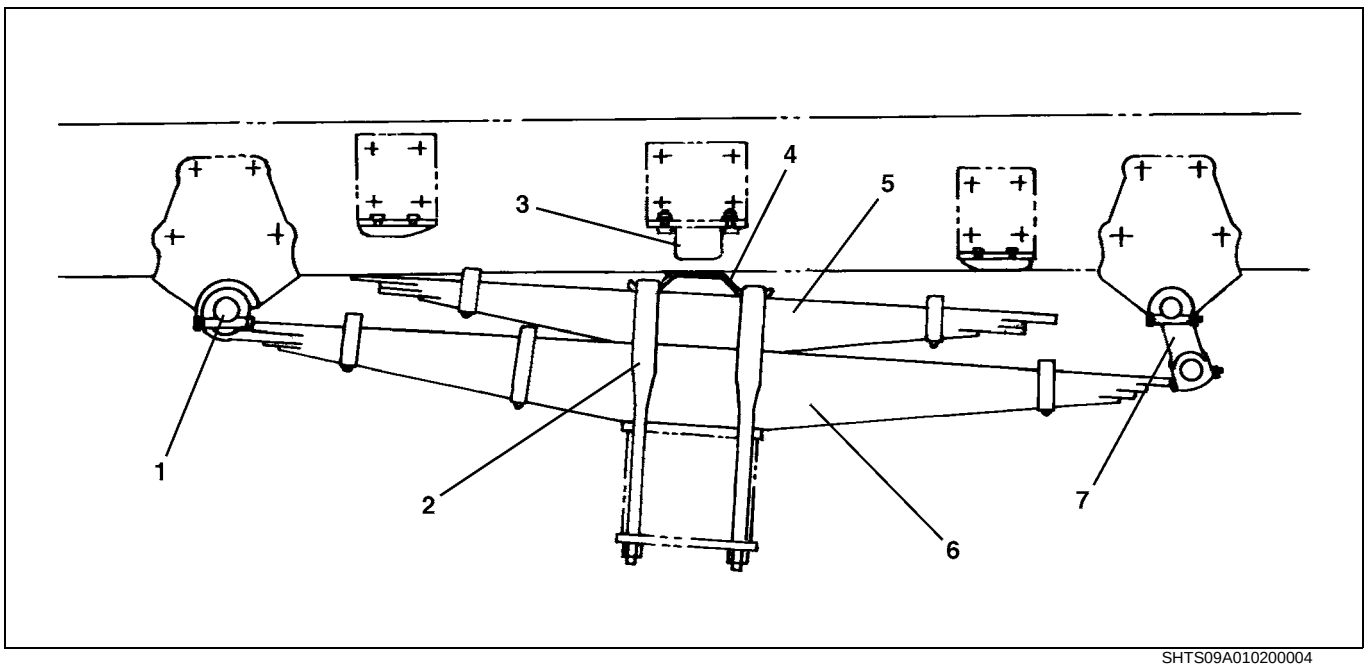
REAR SUSPENSION (MODEL: FT)



SHTS09A010200003

1	Spring pin	4	Auxiliary leaf spring assembly
2	U-bolt	5	Main leaf spring assembly
3	Spring pad	6	Shackle

REAR SUSPENSION (MODEL: GT)



SHTS09A010200004

1	Spring pin	5	Auxiliary leaf spring assembly
2	U-bolt	6	Main leaf spring assembly
3	Spring bumper	7	Shackle
4	Spring pad		

TROUBLESHOOTING

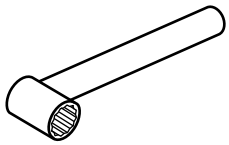
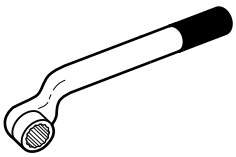
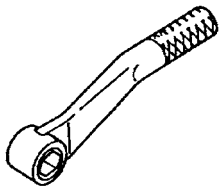
EN09A0102F300001

Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Tighten to specified torque.
Squeaking of the leaves	Friction between the leaves	Replace the silencers and/or apply chassis grease between leaves.

SPECIAL TOOL

EN09A0102K100001

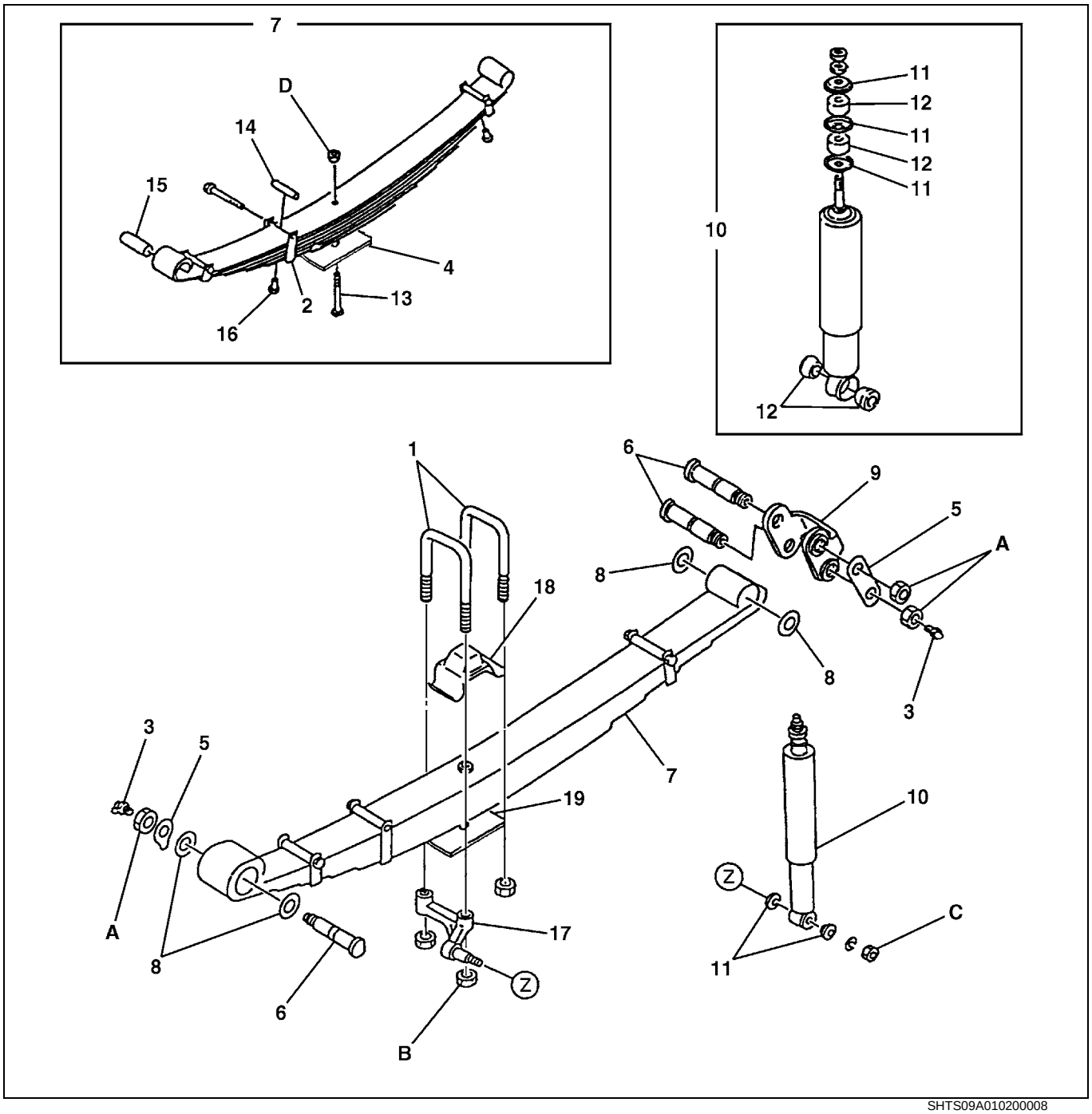
Prior to starting a suspension overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0983-92204	SOCKET WRENCH	For front spring U-bolt (Model: FT)
	S0960-31160	SOCKET WRENCH	For rear spring U-bolt (Model: FT)
	S0960-31140	SOCKET WRENCH	For front and rear spring U-bolt (Model: GT)

COMPONENT LOCATOR

EN09A0102D100001

FRONT SUSPENSION (MODEL: FT)



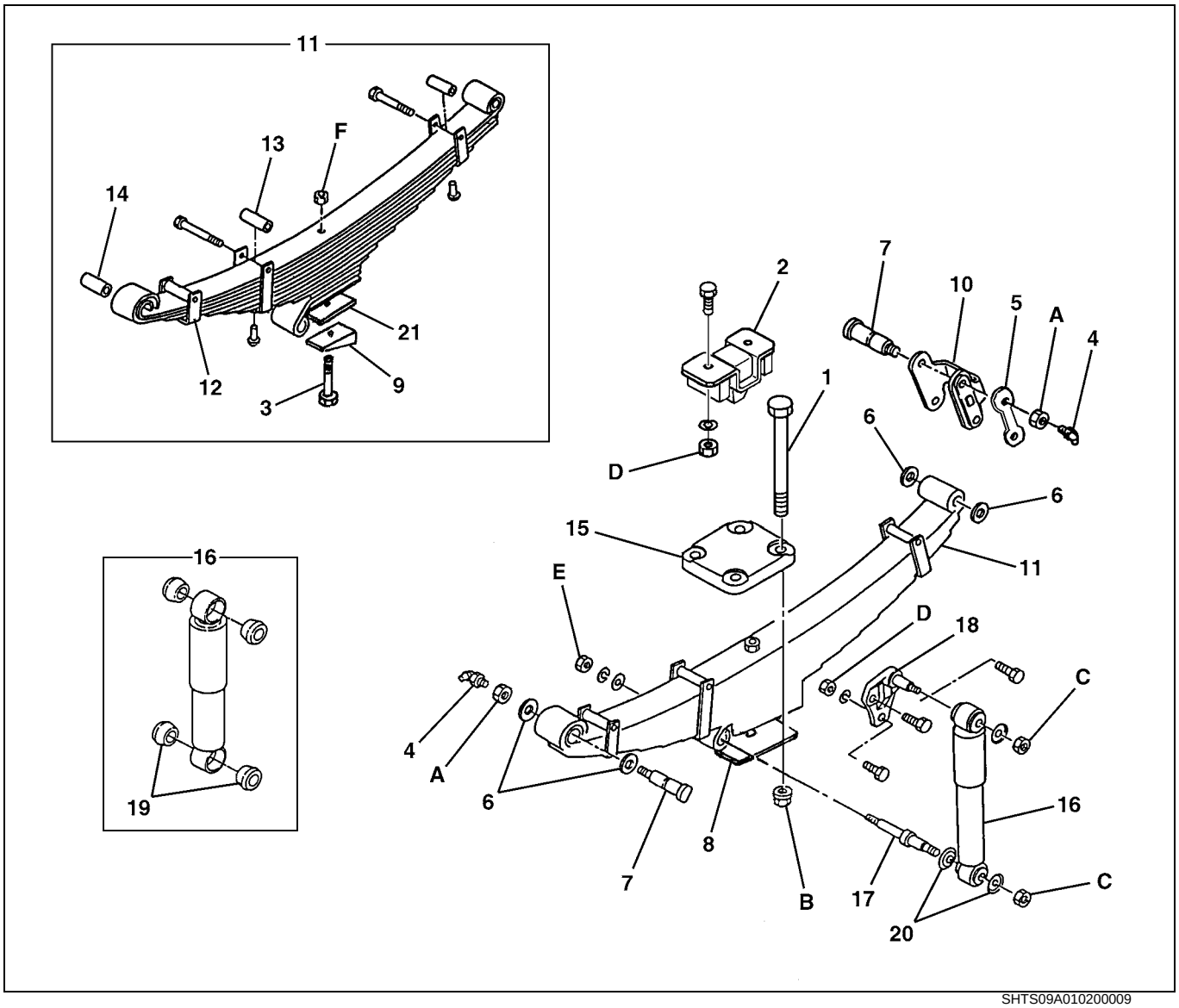
SHTS09A010200008

1	U-bolt	8	Thrust washer	15	Bushing
2	Clip	9	Shackle	16	Rivet
3	Lubrication fitting	10	Shock absorber	17	Shock absorber bracket
4	Spacer	11	Cushion washer	18	Spring bumper
5	Lock plate	12	Cushion	19	Spacer (If so equipped)
6	Spring pin	13	Center bolt		
7	Leaf spring assembly	14	Collar		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	64-93 {653-948, 48-68}	C	73-109 {745-1,111, 54-80}
B	200-280 {2,040-2,855, 148-206}	D	49-62 {500-630, 37-45}

FRONT (MODEL: GT)



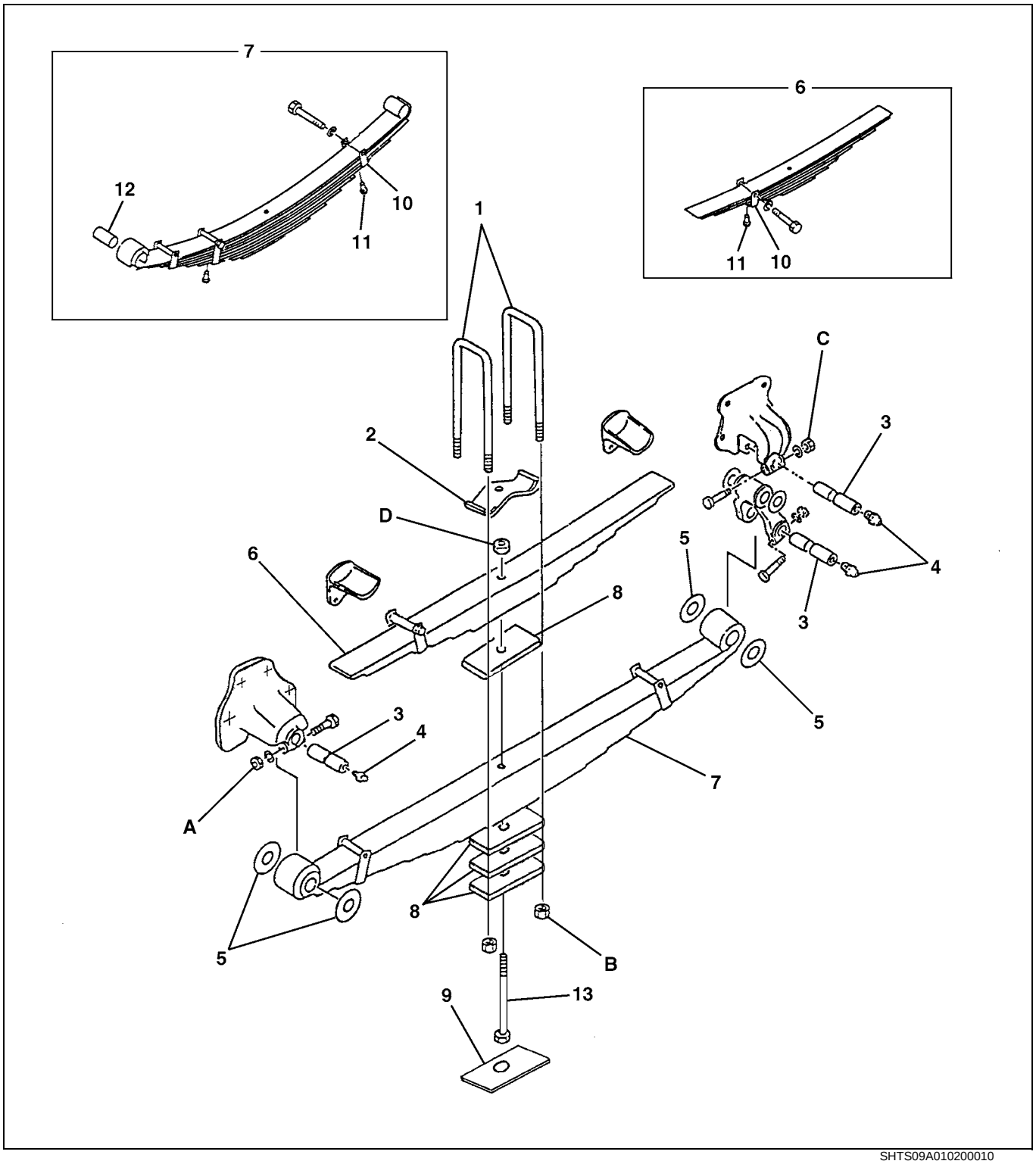
SHTS09A010200009

1	Front axle fixing bolt	12	Clip
2	Spring bumper	13	Collar
3	Center bolt	14	Bushing
4	Lubrication fitting	15	Spring pad
5	Lock plate	16	Shock absorber
6	Thrust washer	17	Shock absorber pin
7	Spring pin	18	Shock absorber bracket
8	Spacer (If so equipped)	19	Cushion
9	Caster shim	20	Cushion washer
10	Shackle	21	Spacer
11	Leaf spring assembly		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	64-93 {653-948, 48-68}	D	73-109 {745-1,111, 54-80}
B	490-590 {5,000-6,000, 361-434}	E	236-324 {2,407-3,303, 174-238}
C	167-225 {1,704-2,294, 123-165}	F	85-108 {870-1,100, 63-79}

REAR (MODEL: FT)



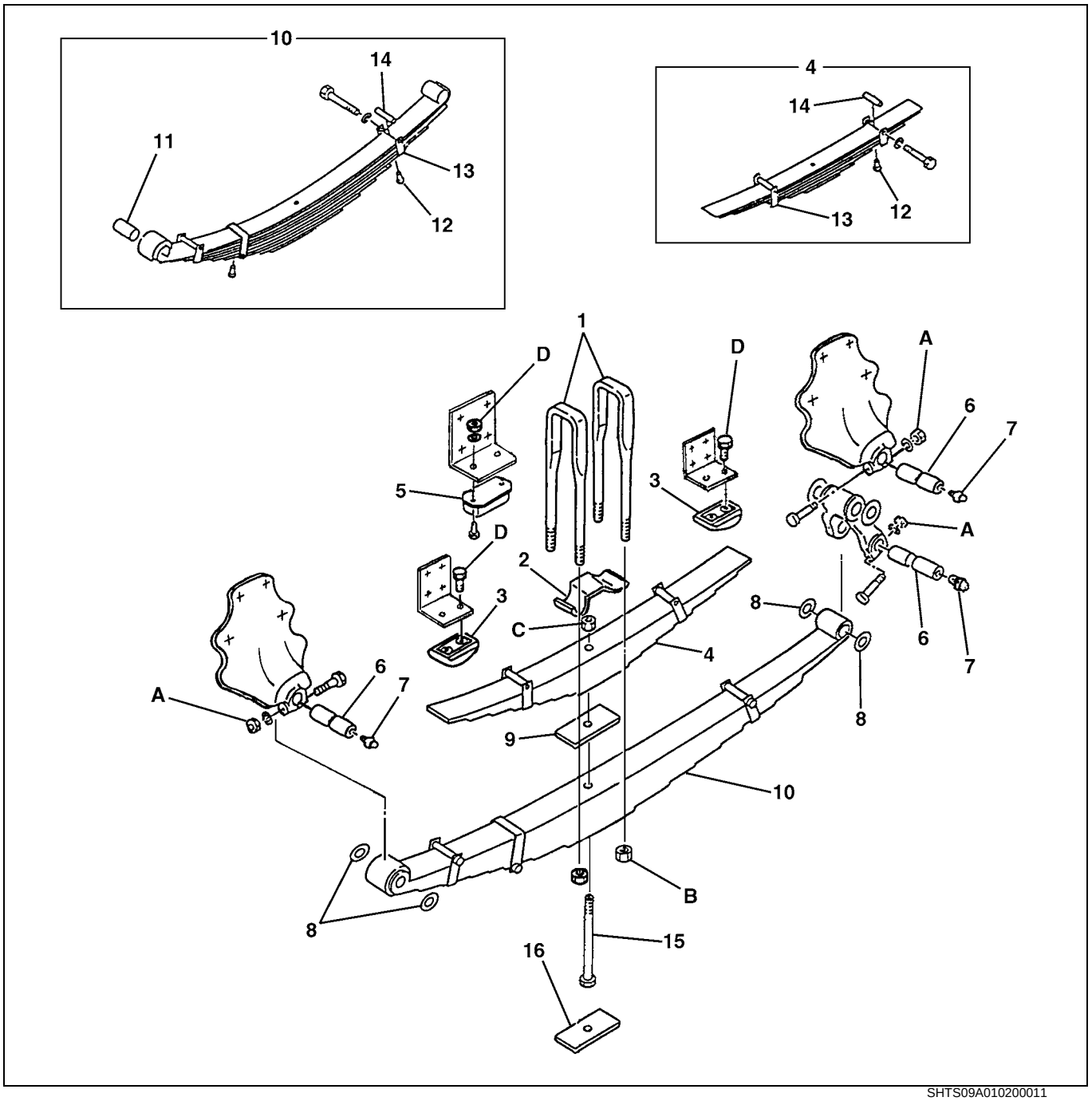
SHTS09A010200010

1	U-bolt	8	Spacer
2	Spring bumper	9	Spacer (If so equipped)
3	Spring pin	10	Clip
4	Lubrication fitting	11	Rivet
5	Thrust washer	12	Bushing
6	Auxiliary leaf spring assembly	13	Center bolt
7	Main leaf spring assembly		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	110-150 {1,122-1,529, 81-110}	C	73-109 {745-1,111, 54-80}
B	265-315 {2,703-3,212, 196-232}	D	85-108 {870-1,100, 63-79}

REAR (MODEL: GT)



SHTS09A010200011

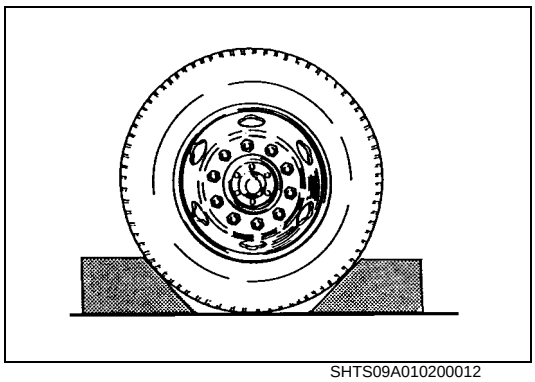
1	U-bolt	9	Spacer
2	Spring pad	10	Main leaf spring assembly
3	Slide seat	11	Bushing
4	Auxiliary leaf spring assembly	12	Rivet
5	Spring bumper	13	Clip
6	Spring pin	14	Collar
7	Lubrication fitting	15	Center bolt
8	Thrust washer	16	Spacer (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	73-109 {745-1,111, 54-80}	C	226-284 {2,300-2,900, 167-209}
B	490-590 {5,000-6,600, 361-434}	D	64-86 {653-876, 47-63}

OVERHAUL

EN09A0102H200001



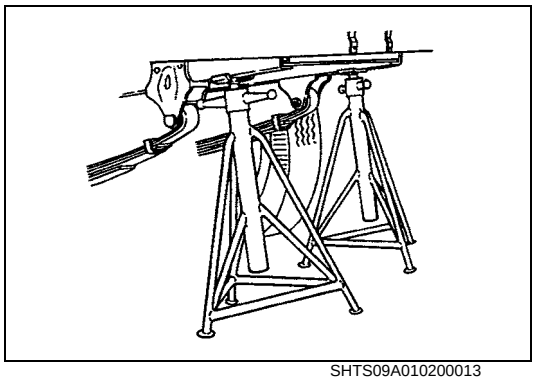
SHTS09A010200012

IMPORTANT POINTS - DISMOUNTING

1. SUPPORT OF THE FRAME WITH STANDS

(1) Park the vehicle on level ground.

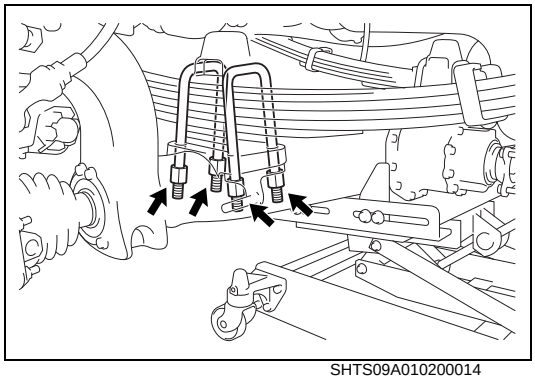
(2) Be sure to block the wheels before dismounting.



SHTS09A010200013

(3) Jack up the axle, and support the frame with stands.

(4) Remove the tires.



SHTS09A010200014

2. REMOVAL OF THE U-BOLT

(1) Remove the shock absorber. (Front suspension only)

(2) Support the axle with a floor jack.

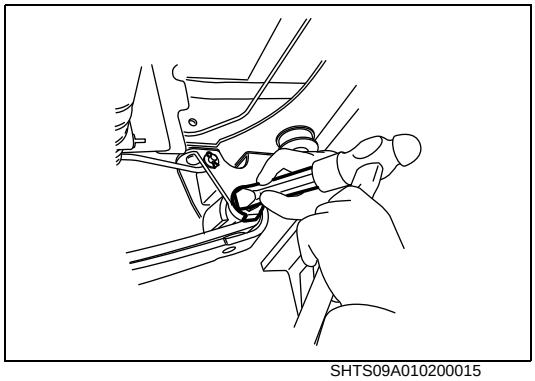
(3) Remove the U-bolt mounting nuts.

NOTICE

When cutting off the U-bolts (Due to rusted threads) with a torch, never direct the flame toward the leaves or allow sparks to come in contact with the leaves.

SST:

Name	Part No.	Model
Socket Wrench for Front spring U-bolt	S0983-92204	FT
Socket Wrench for Rear spring U-bolt	S0960-31160	FT
Socket Wrench for Front and rear spring U-bolt	S0960-31140	GT

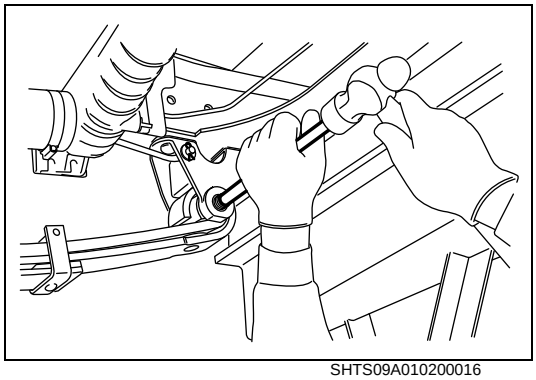


SHTS09A010200015

3. REMOVAL OF THE SPRING PIN (FRONT SUSPENSION)

(1) Remove the lubrication fitting.

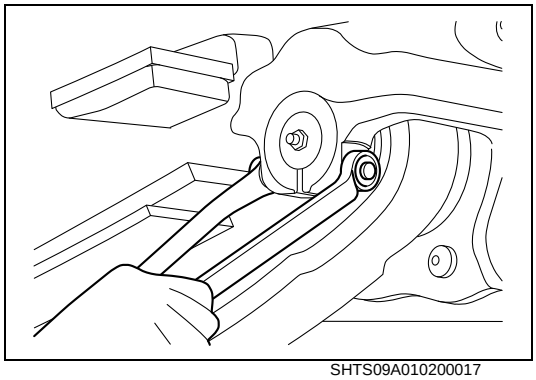
(2) Uncaulk the lock plate with a chisel, then loosen the nut.


SHTS09A010200016

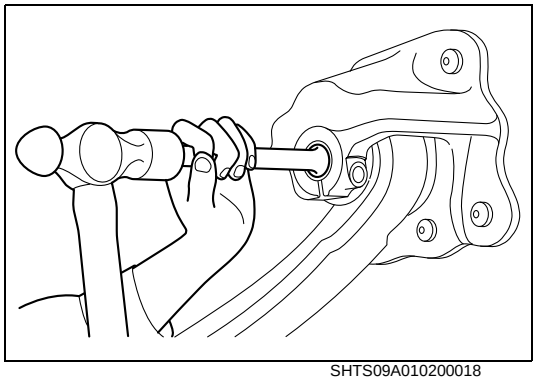
(3) Use a brass rod to remove the spring pins from the shackle and spring bracket.

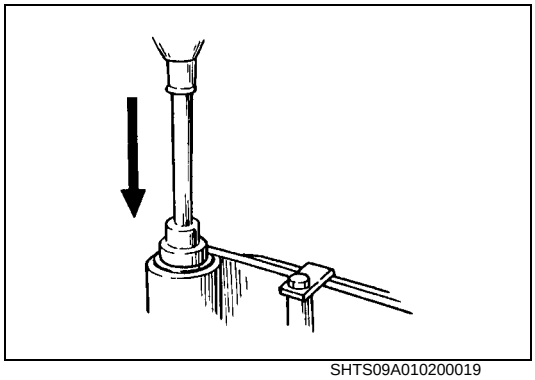
4. REMOVAL OF THE SPRING PIN (REAR SUSPENSION)

(1) Remove the lubrication fitting and spring pin lock bolt.


SHTS09A010200017

(2) Remove the spring pins from the shackle and spring bracket.

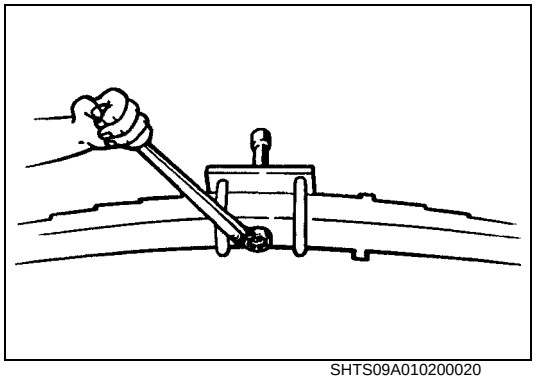

SHTS09A010200018


SHTS09A010200019

IMPORTANT POINTS - DISASSEMBLY

1. REPLACEMENT OF THE EYE BUSHING

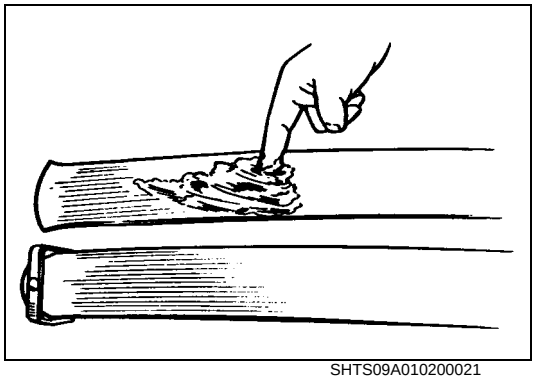
(1) Use a suitable tool to press out the old eye bushing.
(2) Use a suitable tool to press in the new eye bushing.


SHTS09A010200020

2. DISASSEMBLY OF THE LEAF SPRING

⚠ CAUTION
When removing the center bolt lock nut, the spring leaves may jump. Care should be taken to avoid possible personal injury.

(1) Remove the clip bolts.
(2) Use a vise or an arbor press to hold the leaf spring near the center bolt.
(3) Remove the center bolt.
(4) Loosen a vise or an arbor press slowly, and separate the leaves.

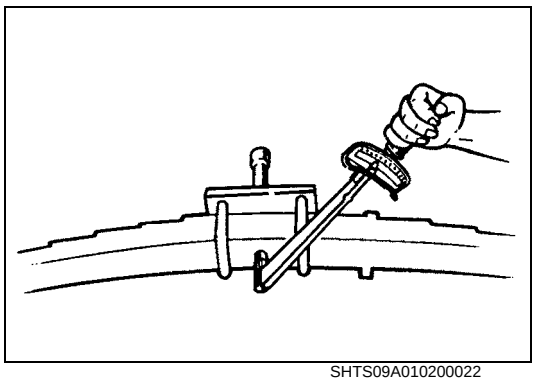

SHTS09A010200021

IMPORTANT POINT - ASSEMBLY

1. ASSEMBLY OF THE LEAF SPRING

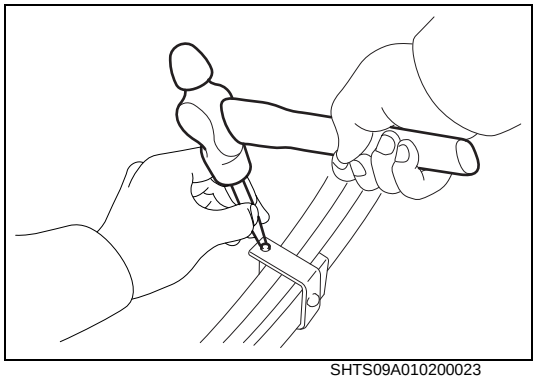
⚠ CAUTION
When clamping the spring leaves, they may jump. Care should be taken to avoid possible personal injury.

(1) Apply coating on the leaf after removing rust, and apply chassis grease on both surface at leaves.


SHTS09A010200022

(2) Align the leaf holes and secure the leaves with a vise or an arbor press.
(3) Insert the center bolt and tighten the lock nut.

NOTICE
When reassembling the leaf spring, replace the center bolt with a new one.

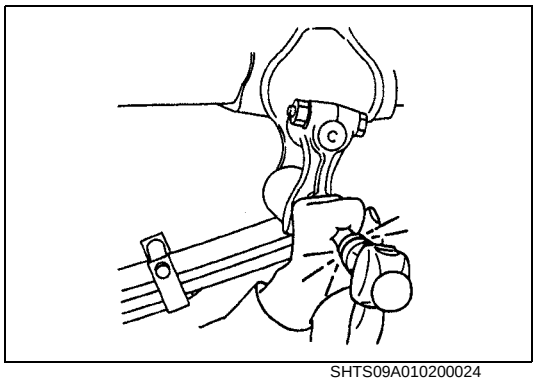

SHTS09A010200023

(4) Tighten the clip bolts.

NOTICE
When tightening the clip bolts, use a new clip bolts.

(5) Use a punch to peen the thread of the clip bolts.

IMPORTANT POINTS - MOUNTING

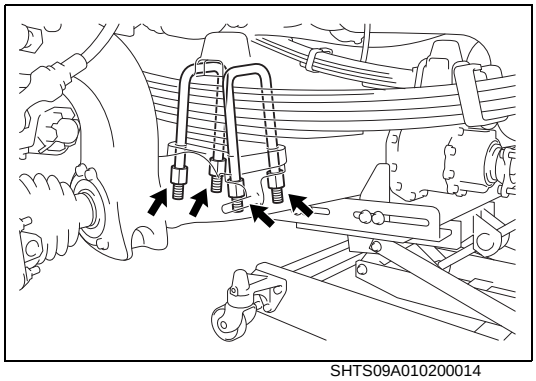

SHTS09A010200024

1. INSTALLATION OF THE SPRING PIN

(1) Use a copper hammer to install the spring pin with thrust washers.

NOTICE
Apply chassis grease on the surface of the eye bushing and spring pin before installing.

(2) Bend the lock plate securely (Front suspension).
(3) Install the spring pin lock bolt (Rear suspension).

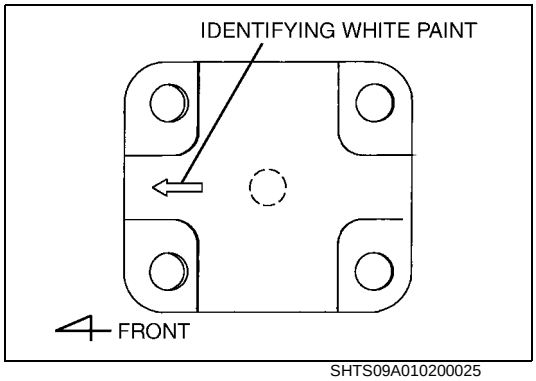

SHTS09A010200014

2. INSTALLATION OF THE U-BOLT

(1) Put the spacer on the front axle of the driver's seat side. (For FT front suspension)
(2) Lift the axle using a jack and align the hole of the leaf spring center bolt and the hole of the axle.

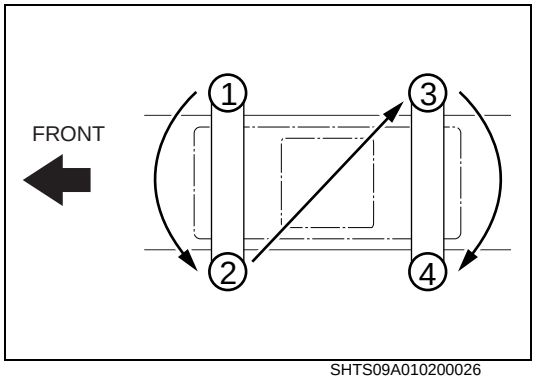
NOTICE
Axle and suspension assembly are heavy, therefore be careful when handling them.

(3) Put the spring pads on the leaf springs.



SHTS09A010200025

(4) Put the spring pad as shown in the figure (For GT front suspension).



SHTS09A010200026

(5) Set the U-bolts so that they catch the spring pads and tighten the U-bolt nuts temporarily.

(6) Using the special tool, tighten the U-bolt nuts (4 pieces) alternately right and left and equally.
After repeating this operation 3 to 5 times, tighten the nuts to the specified torque.

SST:

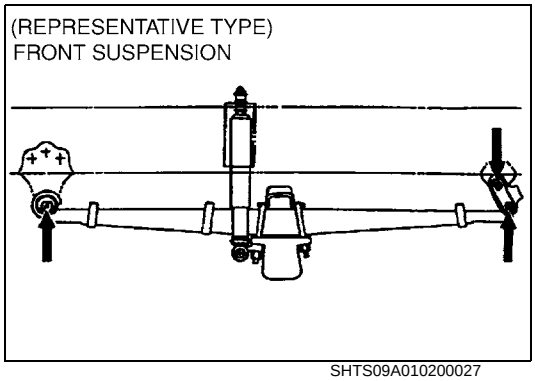
Name	Part No.	Model
Socket Wrench for Front spring U-bolt	**S0983-92204**	**FT**
Socket Wrench for Rear spring U-bolt	**S0960-31160**	**FT**
Socket Wrench for Front and rear spring U-bolt	**S0960-31140**	**GT**

3. ADJUSTMENT OF THE SUSPENSION AFTER ASSEMBLING

(1) If the vehicle inclination is observed after assembling suspension, correct it by inserting the following spacer between the spring and the axle.

Spacer:

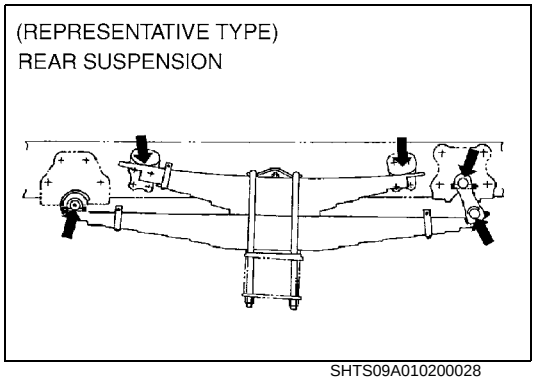
	Model	Part No.	Thickness
Front suspension	**FT**	**SZ940-85065**	**3.2 mm {0.125 in.}**
	GT	**SZ940-85090**	**6.0 mm {0.236 in.}**
Rear suspension	**FT**	**SZ940-85097**	**6.0 mm {0.236 in.}**
	GT	**SZ940-85018**	**6.0 mm {0.236 in.}**



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4. LUBRICATION

(1) Lubricate the following parts with chassis grease.
a. Spring pins
b. Auxiliary spring slide seats

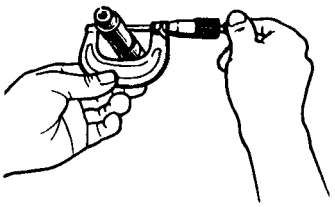
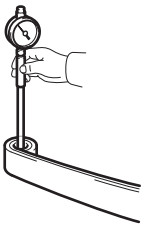
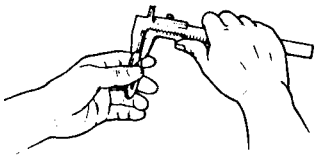


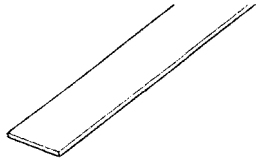
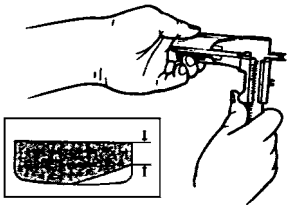
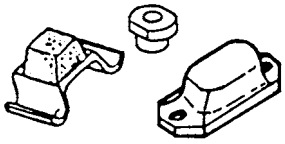
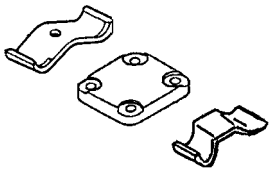
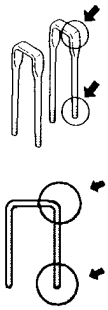
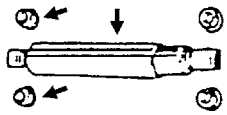
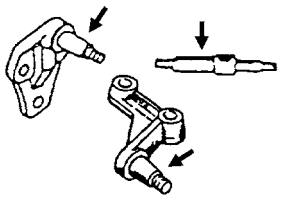
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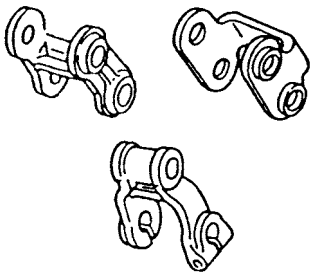
INSPECTION AND REPAIR

EN09A0102H300001

Unit: mm {in.}

Inspection item		Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	Front	MODEL: FT 25 {0.984}	24.7 {0.972}	Replace.	Measure 
		MODEL: GT 30 {1.181}	29.7 {1.170}		
	Rear	MODEL: FT 30 {1.181}	29.7 {1.170}		
		MODEL: GT 38 {1.496}	37.7 {1.485}		
Clearance between spring pin and eye bushing		0.02-0.13 {0.0008-0.0051}	0.5 {0.0296}	Replace the pin and/or bushing.	Measure 
Thrust washer: Wear	Front	3.0 {0.118}	2.5 {0.098}	Replace.	Measure 
	Rear	MODEL: FT Shackle side 3.0 {0.118}	2.5 {0.098}		
		MODEL: FT Pivot side 9.0 {0354}	8.5 {0.334}		
		MODEL:GT Shackle side (Bracket side) 2.0 {0.079}	1.5 {0.059}		
		MODEL:GT Shackle side (Frame side) 6.5 {0.256}	6.0 {0.236}		
		MODEL:GT Shackle side (Opposite side) 11.5 {0.453}	11.0 {0.433}		
		MODEL:GT Pivot side (Frame side) 4.5 {0.177}	4.0 {0.157}		
		MODEL:GT Pivot side (Opposite side) 9.5 {0.374}	9.0 {0.354}		

Inspection item	Standard	Limit	Remedy	Inspection procedure
Leaf: **Damage and wear**	**—**	**—**	**Replace.**	**Visual check** 
Slide seat: **Wear**	**—**	**5.0** **{0.197}**	**Replace.**	**Measure** 
Spring bumper and spring pad: **Damage and wear**	**—**	**—**	**Replace,** **if necessary.**	**Visual check**  
U-Bolt: **Damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Shock absorber: **Operation, oil leak and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Cushion: **Damage and wear**	**—**	**—**		
Shock absorber pin and bracket: **Damage and wear**	**—**	**—**		

Inspection item	Standard	Limit	Remedy	Inspection procedure
Shackle: **Damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 

SUSPENSION (MODEL: SG)

SU02-004

LEAF SUSPENSION ASSEMBLY SU02-2
DATA AND SPECIFICATIONS SU02-2
DESCRIPTION SU02-3
TROUBLESHOOTING SU02-5
SPECIAL TOOL SU02-5
COMPONENT LOCATOR SU02-6
OVERHAUL SU02-9
INSPECTION AND REPAIR SU02-14

LEAF SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

EN09A0102I200001

FRONT SUSPENSION **Unit: mm {in.}**

Type		**Semi-elliptic leaf springs with shock absorber**
Dimensions of leaf springs:	**Span**	**1,470 {57.874}**
	Width	**80 {3.149}**
	Thickness of leaves	**11 {0.433}**
		12 {0.472}
Shock absorbers:	**Type**	**Single acting**
	Stroke	**260 {10.236}**
	Min. length	**390 {15.354}**
	Max. length	**650 {25.591}**
Stabilizer		**Torsion bar**

REAR SUSPENSION **Unit: mm {in.}**

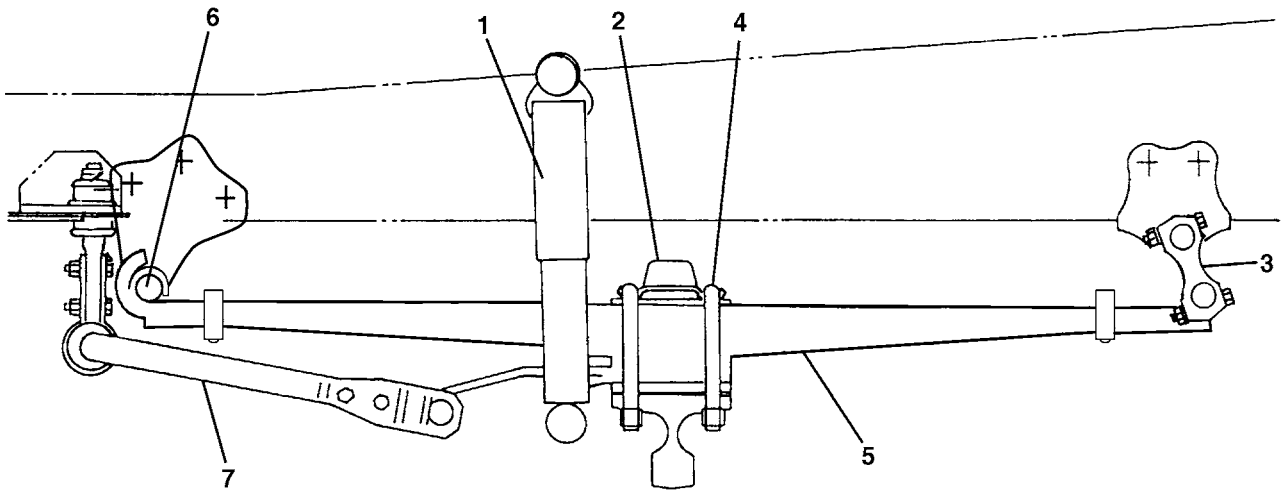
Type		**Semi-elliptic main and auxiliary leaf springs**
Dimensions of main leaf springs:	**Span**	**1,400 {55.118}**
	Width	**90 {3.543}**
	Thickness of leaves	**10 {0.394}**
		12 {0.472}
Dimensions of auxiliary leaf springs:	**Span**	**980 {38.583}**
	Width	**90 {3.543}**
	Thickness of leaves	**10 {0.433}**
Shock absorbers:	**Type**	**Double acting**
	Stroke	**285 {11.220}**
	Min. length	**475 {18.700}**
	Max. length	**760 {29.921}**
Stabilizer		**Torsion bar**

DESCRIPTION

EN09A0102C100001

FRONT SUSPENSION

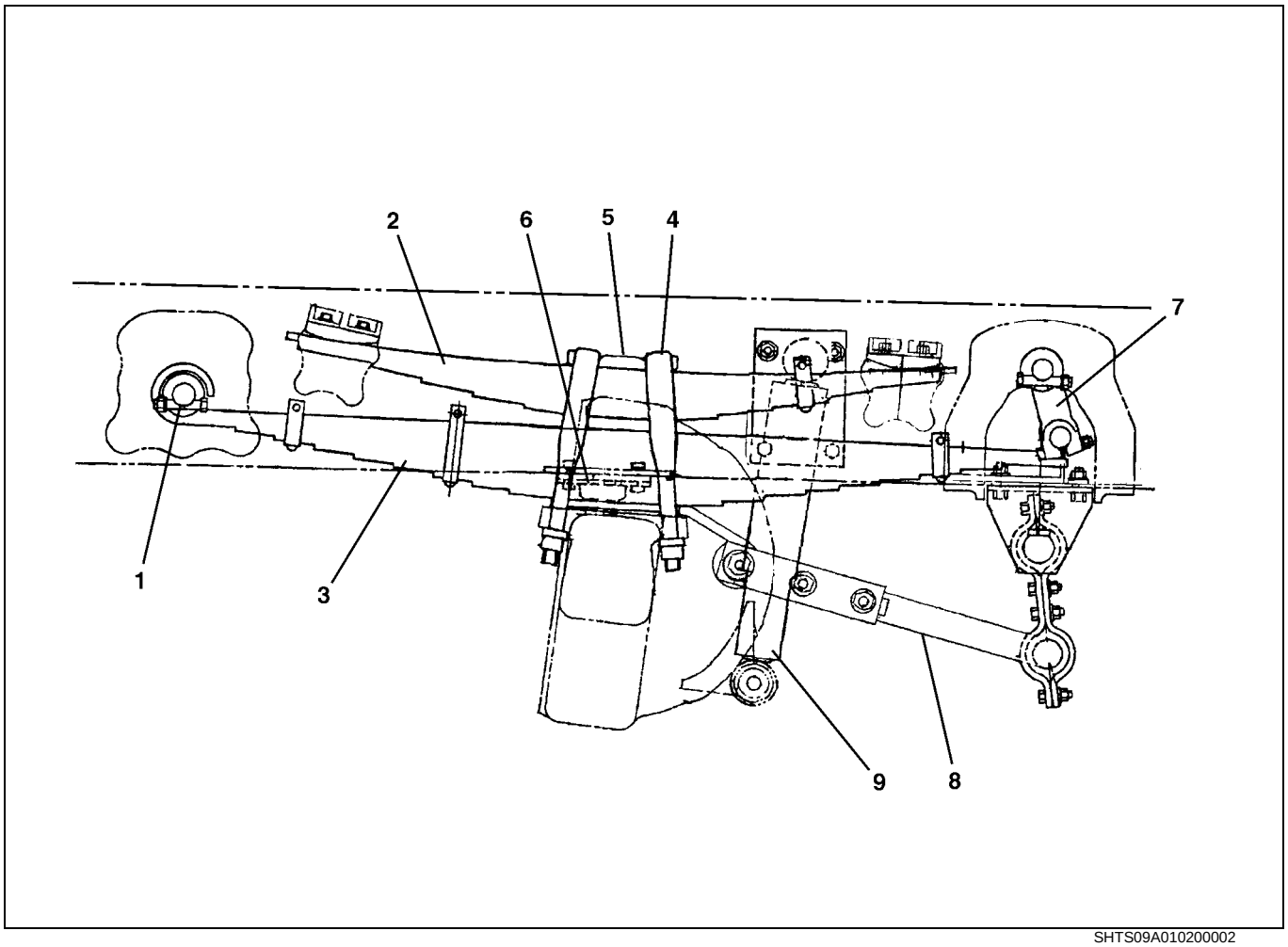
(REPRESENTATIVE TYPE)



SHTS09A010200001

1	Shock absorber	5	Leaf spring assembly
2	Spring bumper	6	Spring pin
3	Shackle	7	Stabilizer (If so equipped)
4	U-bolt		

REAR SUSPENSION



SHTS09A010200002

1	Spring pin	6	Spring bumper
2	Auxiliary leaf spring assembly	7	Shackle
3	Main leaf spring assembly	8	Stabilizer
4	U-bolt	9	Shock absorber
5	Spring pad		

TROUBLESHOOTING

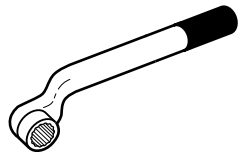
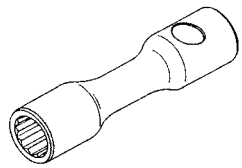
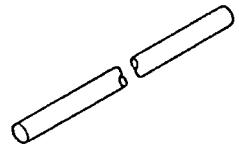
EN09A0102F300001

Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Tighten to specified torque.
Squeaking of the leaves	Friction between the leaves	Replace the silencers and/or apply chassis grease between leaves.

SPECIAL TOOL

EN09A0102K100001

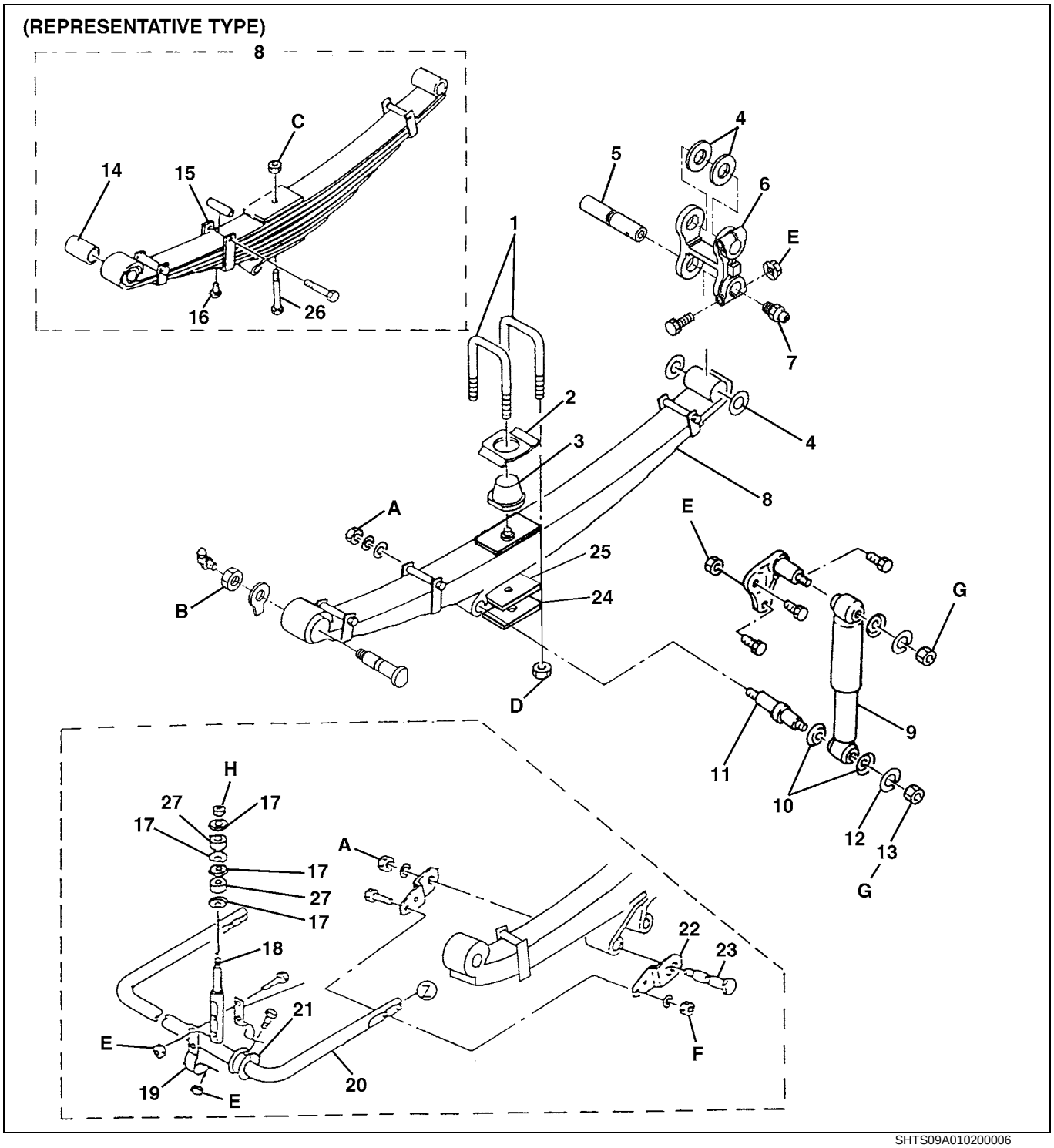
Prior to starting a suspension overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0960-31160	SOCKET WRENCH	For front U-bolt
	S0983-93202 S0983-93203	SOCKET WRENCH	For rear U-bolt
	S0984-12560	BAR	For rear U-bolt

COMPONENT LOCATOR

EN09A0102D100001

FRONT SUSPENSION



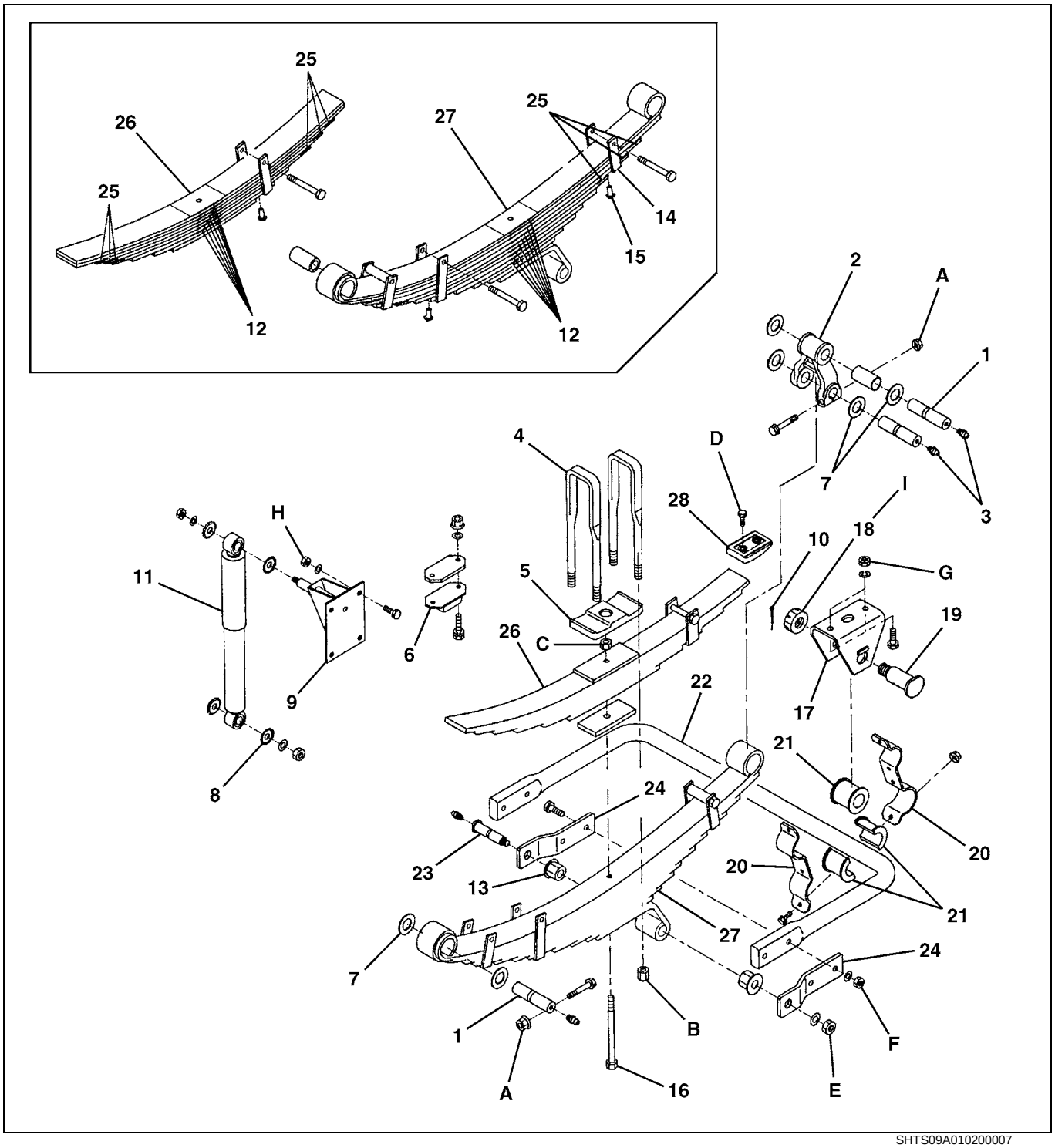
SHTS09A010200006

1	U-bolt	15	Clip
2	Spring pad	16	Rivet
3	Spring bumper	17	Cushion washer (If so equipped)
4	Thrust washer	18	Stabilizer link rod (If so equipped)
5	Spring pin	19	Holder (If so equipped)
6	Shackle	20	Stabilizer (If so equipped)
7	Lubrication fitting	21	Rubber bushing (If so equipped)
8	Leaf spring assembly	22	Stabilizer lever (If so equipped)
9	Shock absorber	23	Stabilizer link pin (If so equipped)
10	Cushion washer	24	Caster shim
11	Shock absorber pin	25	Spacer (Driver's seat side only)
12	Lock washer	26	Center bolt
13	Nut	27	Cushion (If so equipped)
14	Bushing		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	236-324 {2,406-3,303, 174-238}	E	73-109 {745-1,111, 54-80}
B	64-93 {653-948, 48-68}	F	96-144 {979-1,468, 71-106}
C	85-108 {870-1,100, 63-79}	G	236-324 {2,406-3,303, 174-238}
D	390-440 {3,977-4,486, 288-324}	H	105-145 {745-1,111, 54-80}

REAR SUSPENSION



SHTS09A010200007

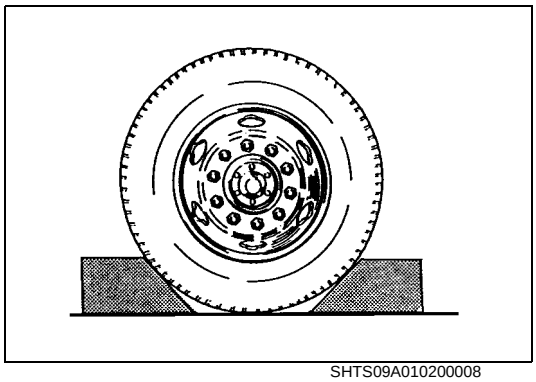
1	Spring pin	11	Shock absorber	21	Stabilizer bar sleeve
2	Shackle	12	Inter leaf	22	Stabilizer bar
3	Lubrication fitting	13	Bushing	23	Link pin
4	U-bolt	14	Clip	24	Stabilizer bar lever
5	Spring pad	15	Rivet	25	Silencer
6	Spring bumper	16	Center bolt	26	Auxiliary leaf spring assembly
7	Thrust washer	17	Stabilizer holder bracket	27	Main leaf spring assembly
8	Cushion	18	Slotted nut	28	Slide seat
9	Shock absorber upper bracket	19	Pin		
10	Cotter pin	20	Stabilizer holder		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

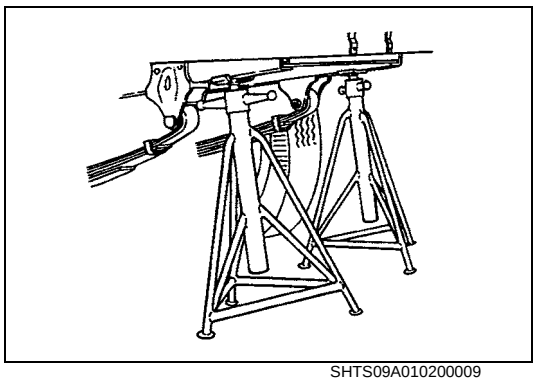
A	73-109 {745-1,111, 54-80}	F	167-225 {1,700-2,290, 123-166}
B	640-740 {6,530-7,540, 472-545}	G	108-225 {1,100-2,290, 80-166}
C	86-107 {870-1,100, 63-79}	H	110-130 {1,122-1,325, 82-95}
D	64-85 {650-870, 47-62}	I	171-229 {1,744-2,335, 127-168}
E	340-460 {3,670-4,690, 265-339}		

OVERHAUL

EN09A0102H200001



SHTS09A010200008



SHTS09A010200009

IMPORTANT POINTS - DISMOUNTING

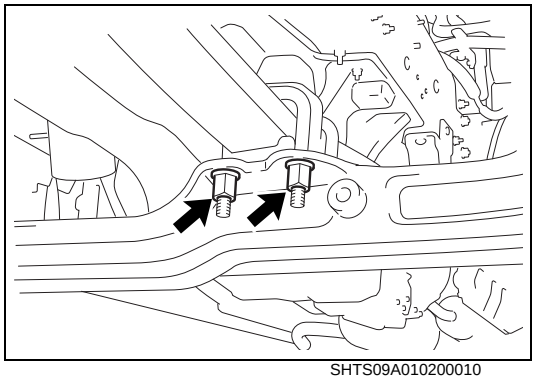
1. SUPPORT OF THE FRAME WITH STANDS

(1) Park the vehicle on level ground.

(2) Be sure to block the wheels before dismounting.

(3) Jack up the axle, and support the frame with stands.

(4) Remove the tires.


SHTS09A010200010

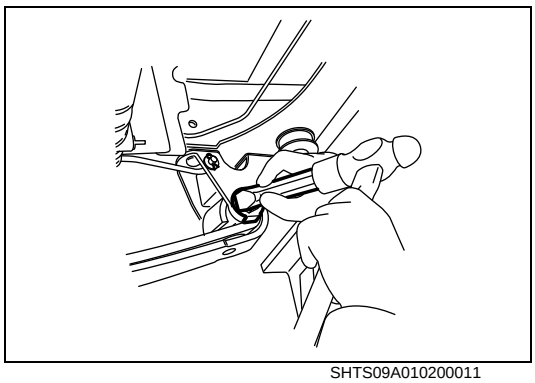
2. REMOVAL OF THE U-BOLT

(1) Remove the stabilizer. (Rear suspension only)
(2) Remove the shock absorber. (Front suspension only)
(3) Support the axle with a floor jack.
(4) Remove the U-bolt mounting nuts.

NOTICE

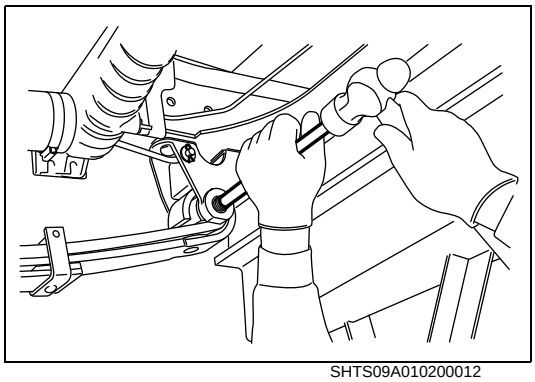
When cutting off the U-bolts (Due to rusted threads) with a torch, never direct the flame toward the leaves or allow sparks to come in contact with the leaves.

SST:
Socket Wrench for Front U-bolt (S0960-31160)
Socket Wrench for Rear U-bolt (S0983-93202)
Socket Wrench for Rear U-bolt (S0983-93203)
Bar (S0984-12560)

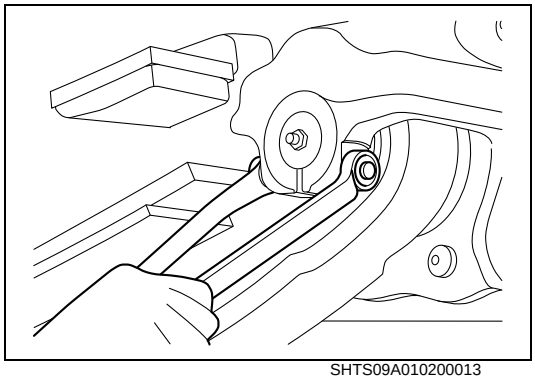

SHTS09A010200011

3. REMOVAL OF THE SPRING PIN (FRONT SIDE SPRING)

(1) Remove the lubrication fitting.
(2) Uncaulk the nut with a chisel, then loosen the nut. (Front side of spring)

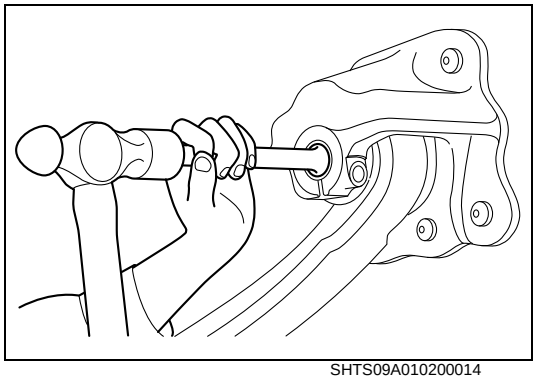

SHTS09A010200012

(3) Remove the spring pin lock bolt. (Rear side of spring)
(4) Use a brass rod to remove the spring pins from the shackle and spring bracket.

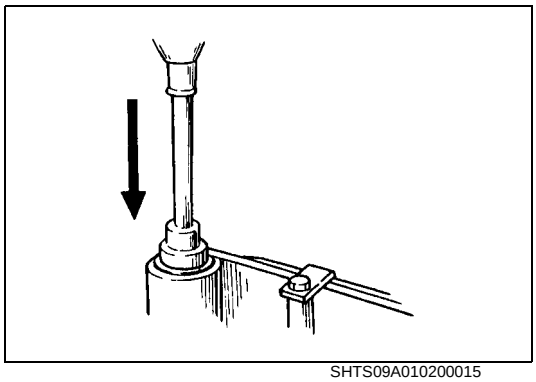

SHTS09A010200013

4. REMOVAL OF THE SPRING PIN (REAR SUSPENSION)

(1) Remove the lubrication fitting and spring pin lock bolt.


SHTS09A010200014

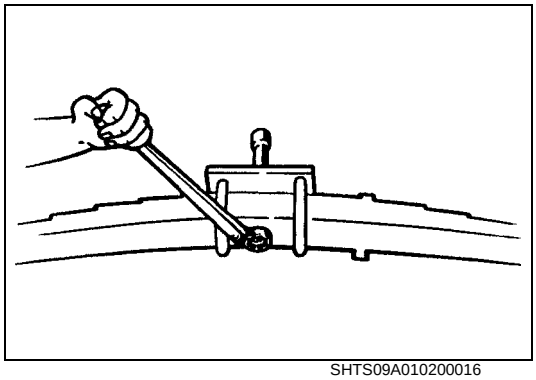
(2) Use a brass rod to remove the spring pins from the shackle and spring bracket.


SHTS09A010200015

IMPORTANT POINTS - DISASSEMBLY

1. REPLACEMENT OF THE EYE BUSHING

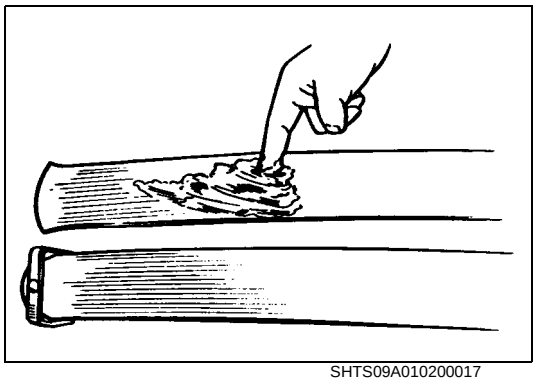
(1) Use a suitable tool to press out the old eye bushing.
(2) Use a suitable tool to press in the new eye bushing.


SHTS09A010200016

2. DISASSEMBLY OF THE LEAF SPRING

⚠ CAUTION
When removing the center bolt lock nut, the spring leaves may jump. Care should be taken to avoid possible personal injury.

(1) Remove the clip bolts.
(2) Use a vise or an arbor press to hold the leaf spring near the center bolt.
(3) Remove the center bolt.
(4) Loosen a vise or an arbor press slowly, and separate the leaves.

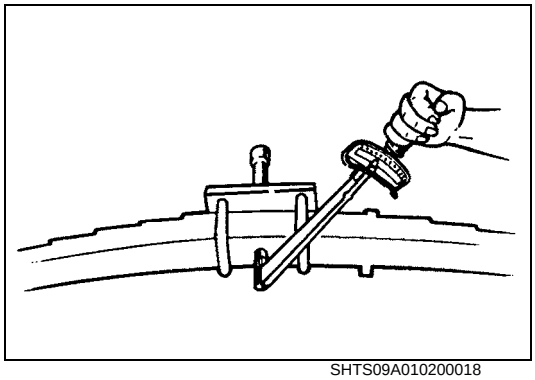

SHTS09A010200017

IMPORTANT POINT - ASSEMBLY

1. ASSEMBLY OF THE LEAF SPRING

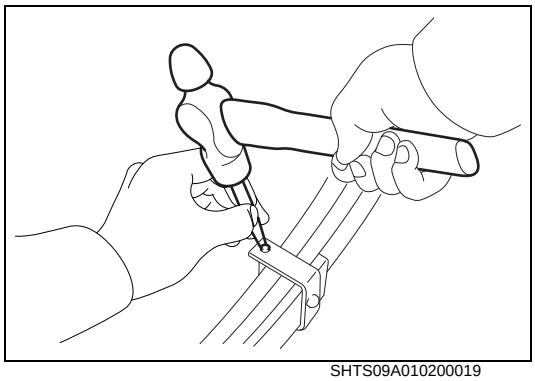
⚠ CAUTION
When clamping the spring leaves, they may jump. Care should be taken to avoid possible personal injury.

(1) Apply coating on the leaf after removing rust, and apply chassis grease on both surface at leaves.


SHTS09A010200018

(2) Align the leaf holes and secure the leaves with a vise or an arbor press.
(3) Insert the center bolt and tighten the lock nut.

NOTICE
When reassembling the leaf spring, replace the center bolt with a new one.

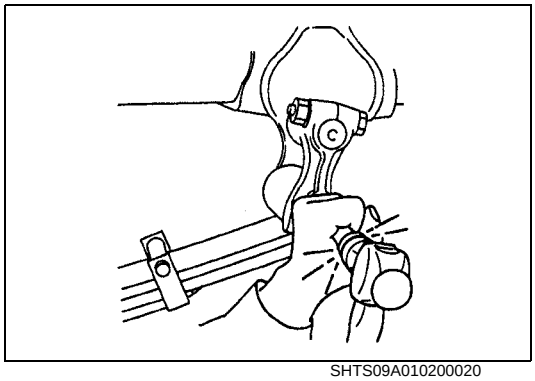

SHTS09A010200019

(4) Tighten the clip bolts.

NOTICE
When tightening the clip bolts, use a new clip bolts.

(5) Use a punch to peen the thread of the clip bolts.

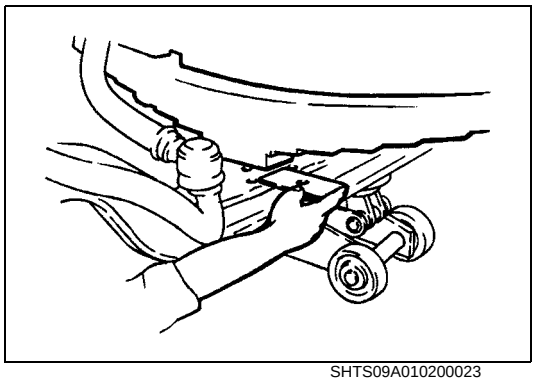
IMPORTANT POINTS - MOUNTING


SHTS09A010200020

1. INSTALLATION OF THE SPRING PIN
(1) Use a copper hammer to install the spring pin with thrust washers.

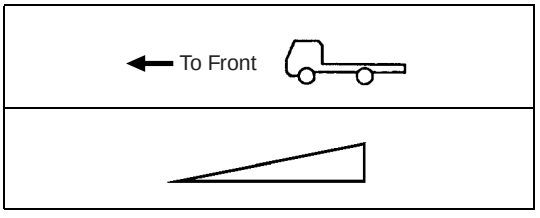
NOTICE
Apply chassis grease on the surface of the eye bushing and spring pin before installing.

(2) Install the spring pin lock bolt and nut.
(3) Install and secure the lock nut.


SHTS09A010200023

2. INSTALLATION OF THE U-BOLT
(1) Place the caster shim between the spring seat and leaf spring.

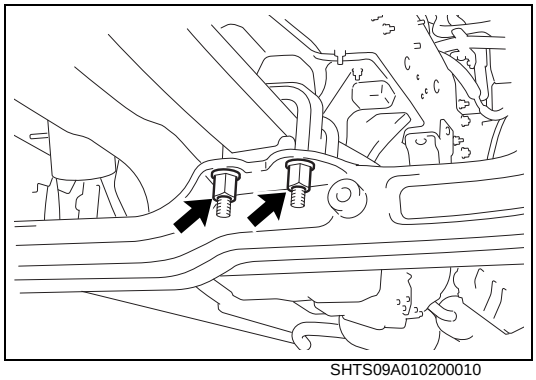
NOTICE
When installing the caster shim, the thick end should face the rear of the vehicle.



(2) Put the spacer between the caster shim and leaf spring of the driver's seat side. (For front suspension)
(3) Lift the axle using a jack and align the hole of the leaf spring center bolt and the hole of the axle I-beam.

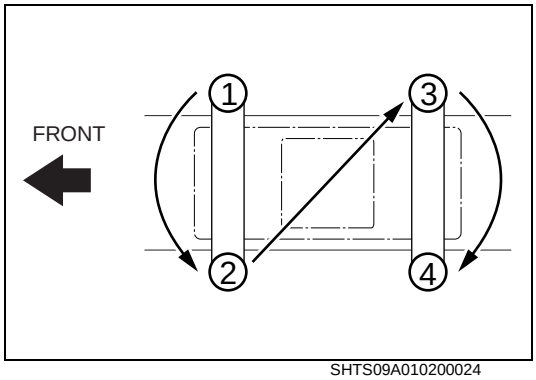
NOTICE
Axle and suspension assembly are heavy, therefore be careful when handling them.

(4) Put the spring bumper and the spring pad on the leaf spring.



SHTS09A010200010

(5) Set the U-bolts so that they catch the spring bumper and the spring pad and tighten the U-bolt nuts temporarily.



SHTS09A010200024

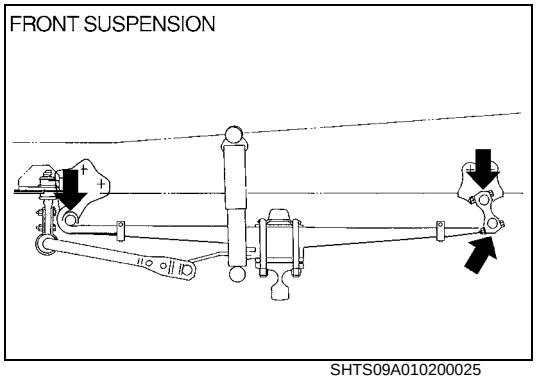
(6) Using the special tool, tighten the U-bolt nuts (4 pieces) alternately right and left and equally.
After repeating this operation 3 to 5 times, tighten the nuts to the specified torque.
SST:
Socket Wrench for Front U-bolt (S0960-31160)
Socket Wrench for Rear U-bolt (S0983-93202)
Socket Wrench for Rear U-bolt (S0983-93203)
Bar (S0984-12560)

3. ADJUSTMENT OF THE SUSPENSION AFTER ASSEMBLING

(1) If the vehicle inclination is observed after assembling suspension, correct it by inserting the following spacer between the spring and the axle.

Spacer:

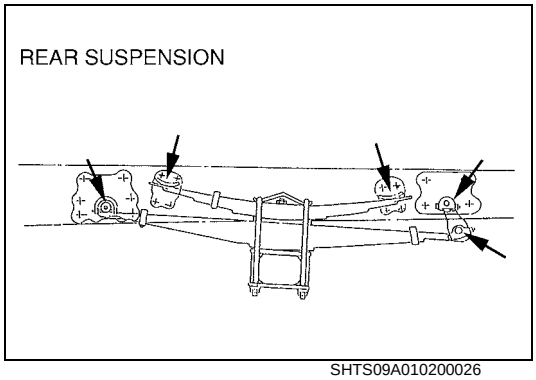
	Part No.	Thickness
Front suspension	**SZ940-85155**	**4.5 mm {0.177 in.}**
Rear suspension	**SZ940-85018**	**6.0 mm {0.236 in.}**



SHTS09A010200025

4. LUBRICATION

(1) Lubricate the following parts with chassis grease.
a. Spring pins
b. Auxiliary spring slide seats

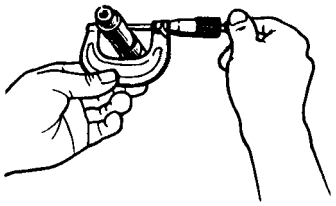
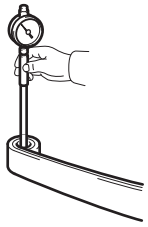
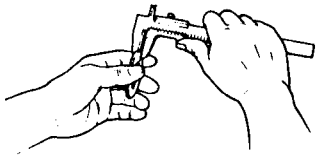
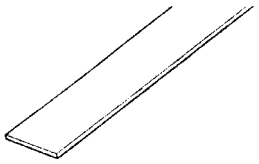
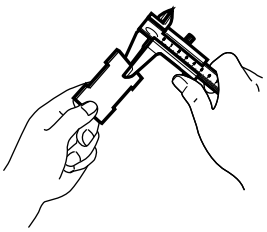
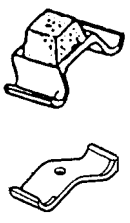


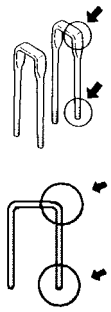
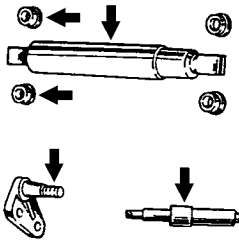
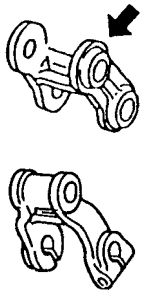
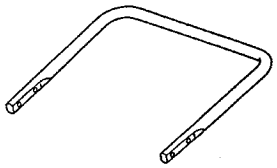
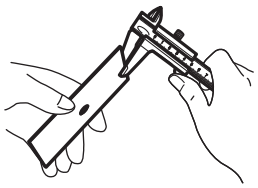
SHTS09A010200026

INSPECTION AND REPAIR

EN09A0102H300001

Unit: mm {in.}

Inspection item		Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	Front	30 {1.181}	29.7 {1.170}	Replace.	Measure 
	Rear	38 {1.496}	37.7 {1.484}		
Clearance between spring pin and eye bushing		0.020-0.125 {0.0008-0.0049}	0.5 {0.0196}	Replace the pin and/or bushing.	Measure 
Thrust washer: Wear	Front	Pivot side 3.0 {0.118}	2.5 {0.0984}	Replace.	Measure 
		Shackle side 4.0 {0.157}	3.5 {0.138}		
	Rear	Pivot side 2.0 {0.079}	1.5 {0.059}		
		Shackle side 4.0 {0.157}	3.5 {0.138}		
Leaf: Damage and wear		—	—	Replace.	Visual check 
Silencer: Wear		3.0 {0.118}	1.0 {0.0394}	Replace.	Measure 
Spring bumper: Damage and wear		—	—	Replace, if necessary.	Visual check 

Inspection item	Standard	Limit	Remedy	Inspection procedure
U-Bolt: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Shock absorber: Operation, oil leak and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cushion: Damage and wear	**—**	**—**		
Shock absorber pin and bracket: Damage and wear	**—**	**—**		
Shackle: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Stabilizer Bar: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Stabilizer Sleeve: Wear				
Stabilizer Bushing: Wear				
Inter leaf: Wear	**1.6 {0.0630}**	**0.8 {0.0315}**	**Replace.**	**Measure** 

SUSPENSION (HENDRICKSON HAS 200, HAS 230, HAS 400)

SU02-005

SUSPENSION ASSEMBLY..... SU02-2
DATA AND SPECIFICATIONS..... SU02-2
DESCRIPTION SU02-2
TROUBLESHOOTING..... SU02-4
SPECIAL TOOL..... SU02-4
COMPONENT LOCATOR SU02-5
OVERHAUL SU02-8
INSPECTION AND REPAIR..... SU02-13

SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

EN09A0202I200001

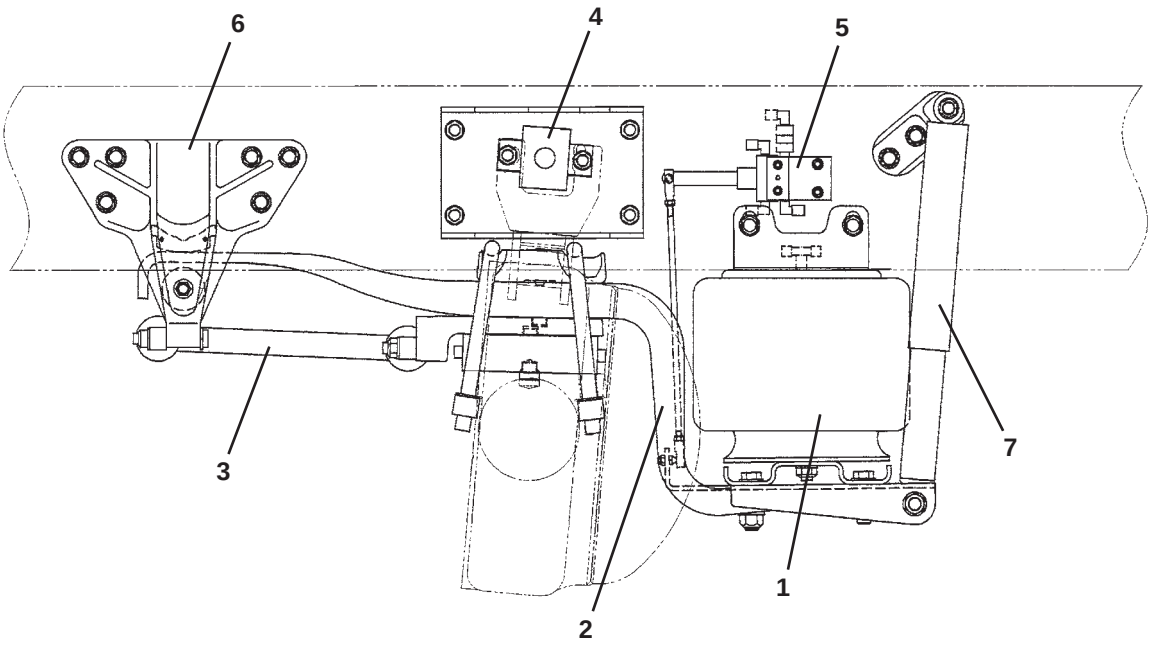
MODEL	FD, GD	FG, GH	FL, FM
TYPE	HENDRICKSON HAS 200	HENDRICKSON HAS 230	HENDRICKSON HAS 400

DESCRIPTION

EN09A0202C100001

MODELS: FD, GD, FG, GH

(REPRESENTATIVE TYPE)

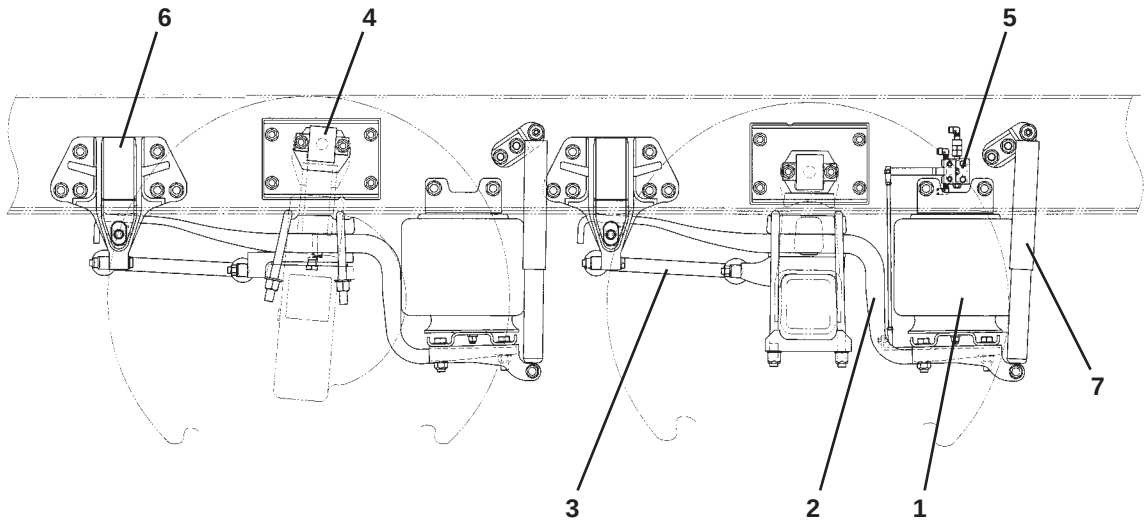


SHTS09A020200001

1	Air spring	5	Height control valve
2	Main support member	6	Frame hanger
3	Torque rod	7	Shock absorber
4	Transverse rod		

MODELS: FL, FM

(REPRESENTATIVE TYPE)



SHTS09A020200002

1	Air spring	5	Height control valve
2	Main support member	6	Frame hanger
3	Torque rod	7	Shock absorber
4	Transverse rod		

TROUBLESHOOTING

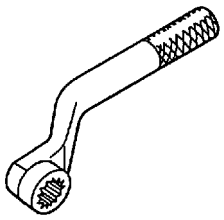
EN09A0202F300001

Symptom	Possible cause	Remedy/Prevention
Abnormal sound occurs from the spring while driving.	Eccentric wear of the shock absorber fitting pin	Replace the pin and/or rubber bushing.
	Wear and deflection of the rebound roller	Remove the rebound roller and/or rebound bolt spacer.
Uncomfortably (Rolling and pitching)	Deflection and damage of the bushings of the torque rod and the transverse rod	Replace the bushings.
	Faulty of the shock absorber	Replace the shock absorber.
	Faulty of the leveling valve	Repair the leveling valve.
Vibration of the steering wheel, and the car shake	Deflection of the bushing in the torque rod and the transverse rod	Replace the bushings.
	Looseness of the torque rod and the transverse rod bracket bolt	Replace the lock nut and tighten with the specified torque.
Vehicle height is not adjusted correctly.	Faulty of the leveling valve	Repair the parts.

SPECIAL TOOL

EN09A0202K100001

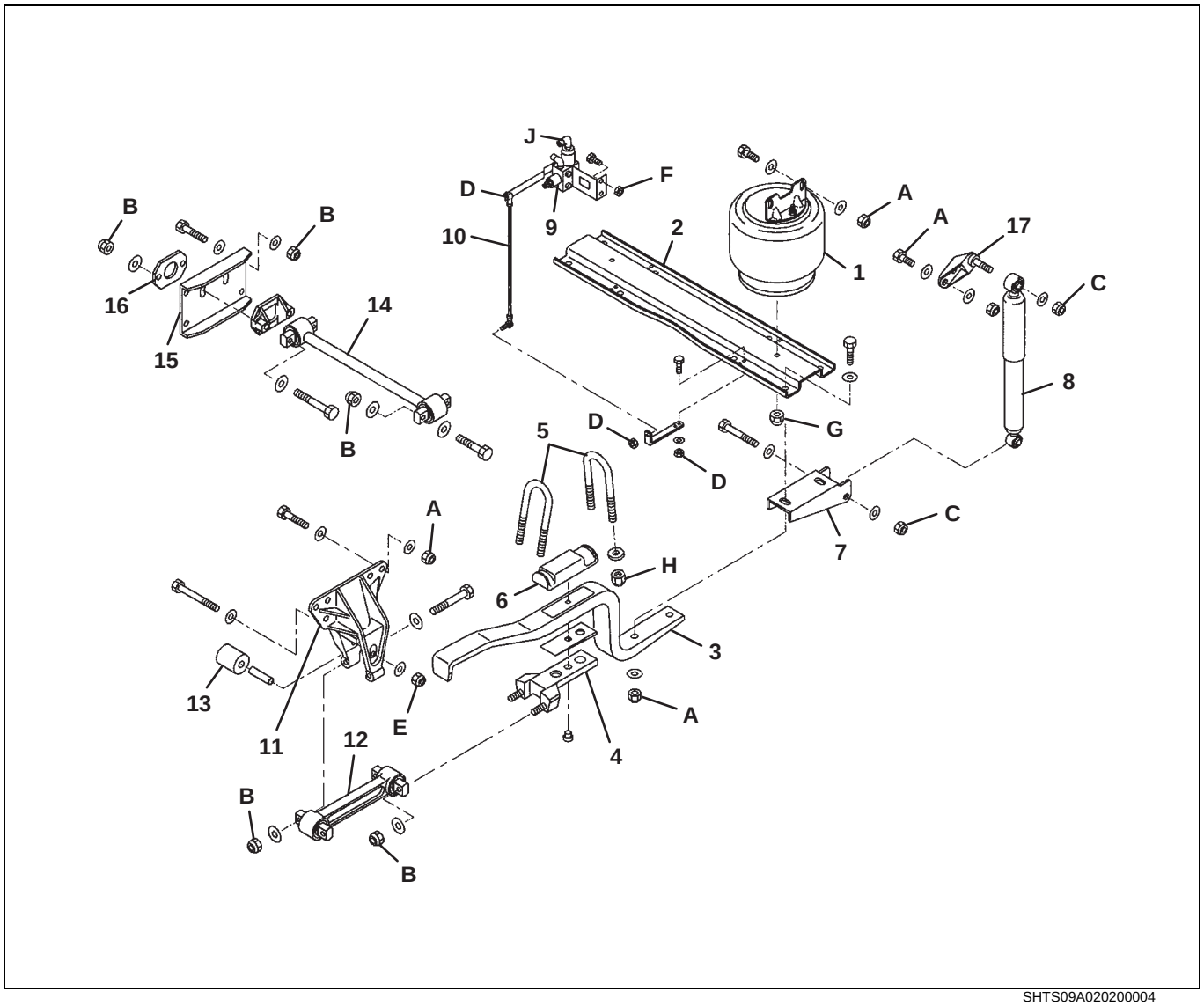
Prior to starting a suspension overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	S0960-31160	SOCKET WRENCH	

COMPONENT LOCATOR

EN09A0202D100001

MODELS: FD, GD



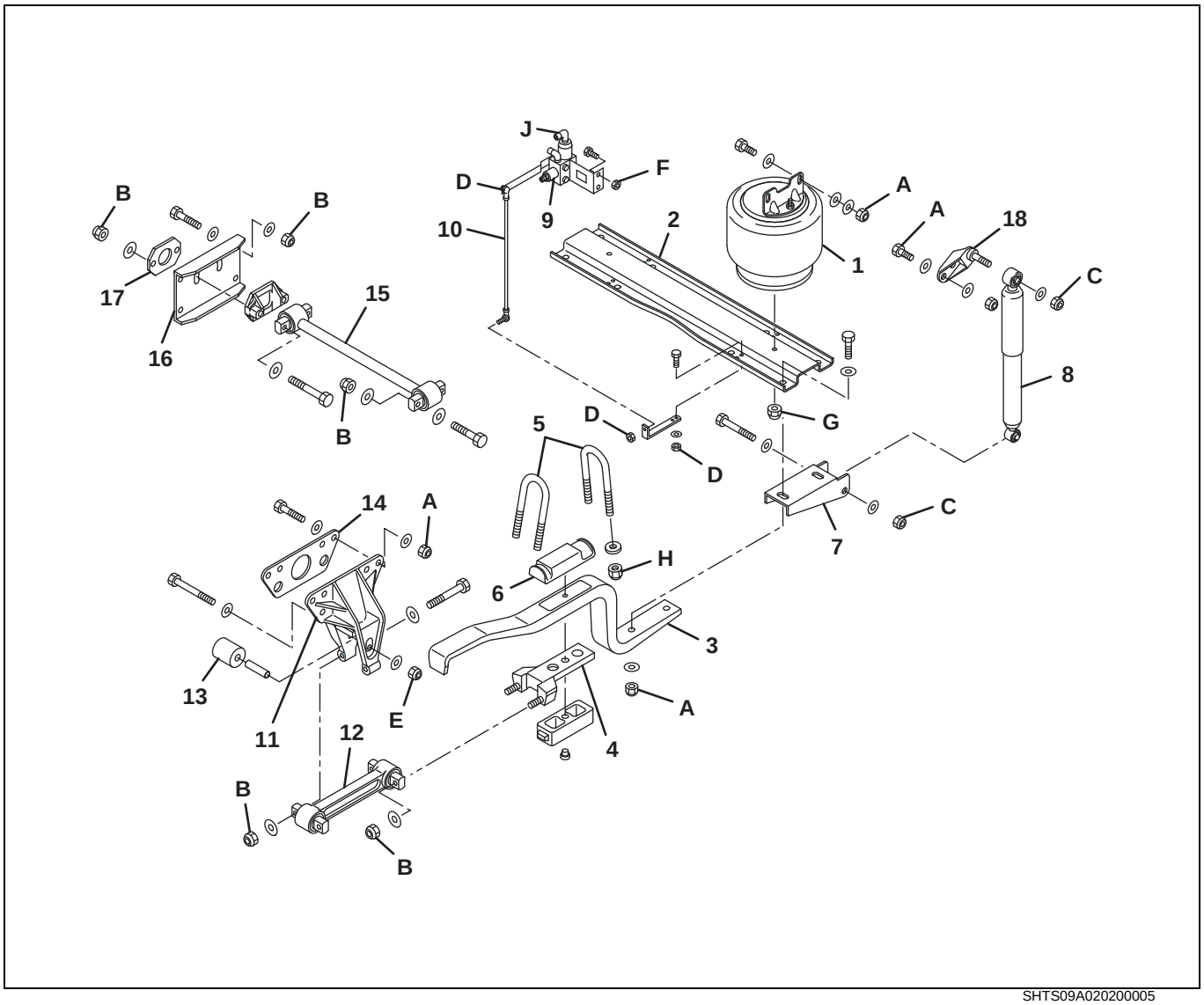
SHTS09A020200004

1	Air spring	10	Threaded extension rod
2	Cross channel	11	Frame hanger
3	Main support member	12	Torque rod
4	Spring seat	13	Rebound roller
5	U-bolt	14	Transverse rod
6	Top pad	15	Channel reinforcement
7	Lower shock absorber bracket	16	Back up plate
8	Shock absorber	17	Upper shock absorber bracket
9	Height control valve		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	352-434 {3,590-4,425, 260-320}	F	41-61 {418-622, 30-45}
B	203-277 {2,070-2,825, 150-204}	G	27-41 {275-418, 20-30}
C	70-98 {714-1,000, 52-72}	H	350-430 {3,569-4,384, 258-317}
D	11-17 {112-173, 8-12}	J	6-7 {61-71, 4.4-5.1}
E	67-95 {683-968, 50-70}		

MODELS: FG, GH



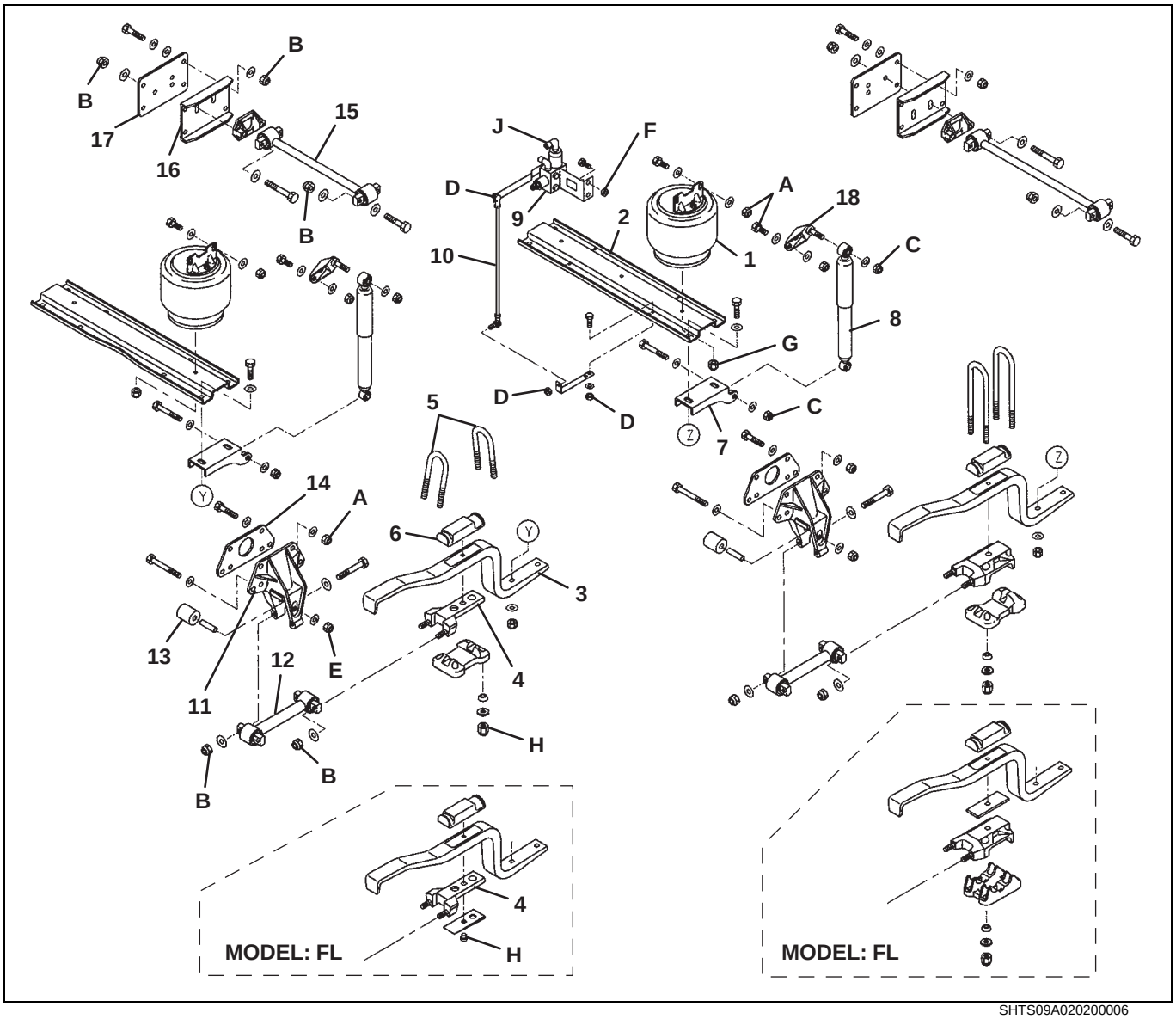
SHTS09A020200005

1	Air spring	10	Threaded extension rod
2	Cross channel	11	Frame hanger
3	Main support member	12	Torque rod
4	Spring seat	13	Rebound roller
5	U-bolt	14	Back plate
6	Top pad	15	Transverse rod
7	Lower shock absorber bracket	16	Channel reinforcement
8	Shock absorber	17	Back up plate
9	Height control valve	18	Upper shock absorber bracket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	352-434 {3,590-4,425, 260-320}	F	41-61 {418-622, 30-45}
B	203-277 {2,070-2,825, 150-204}	G	27-41 {275-418, 20-30}
C	70-98 {714-1,000, 52-72}	H	541-609 {5,517-6,210, 400-450}
D	11-17 {112-173, 8-12}	J	6-7 {61-71, 4.4-5.1}
E	67-95 {683-968, 50-70}		

MODELS: FL, FM



SHTS09A020200006

1	Air spring	10	Threaded extension rod
2	Cross channel	11	Frame hanger
3	Main support member	12	Torque rod
4	Spring seat	13	Rebound roller
5	U-bolt	14	Back plate
6	Top pad	15	Transverse rod
7	Lower shock absorber bracket	16	Channel reinforcement
8	Shock absorber	17	Back up plate
9	Height control valve	18	Upper shock absorber bracket

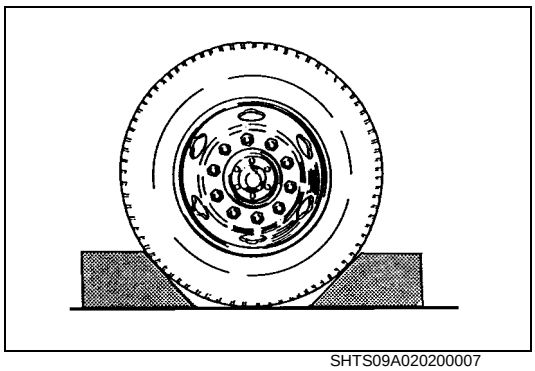
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	352-434 {3,590-4,425, 260-320}	F	41-61 {418-622, 30-45}
B	203-277 {2,070-2,825, 150-204}	G	27-41 {275-418, 20-30}
C	70-98 {714-1,000, 52-72}	H	541-609 {5,517-6,210, 400-450} (FM)
D	11-17 {112-173, 8-12}		460-520 {4,690-5,302, 339-383} (FL)
E	67-95 {683-968, 50-70}	J	6-7 {61-71, 4.4-5.1}

OVERHAUL

EN09A0202H200001

IMPORTANT POINTS - DISASSEMBLY

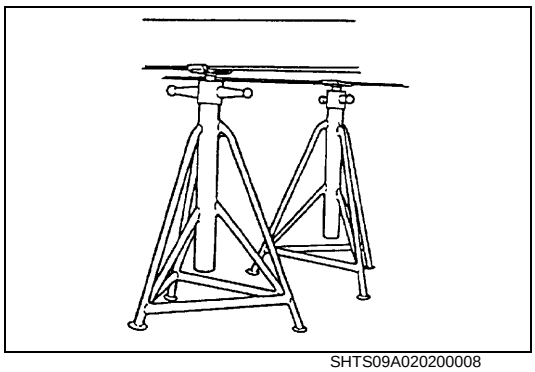


SHTS09A020200007

1. SUPPORT THE FRAME WITH THE STAND.

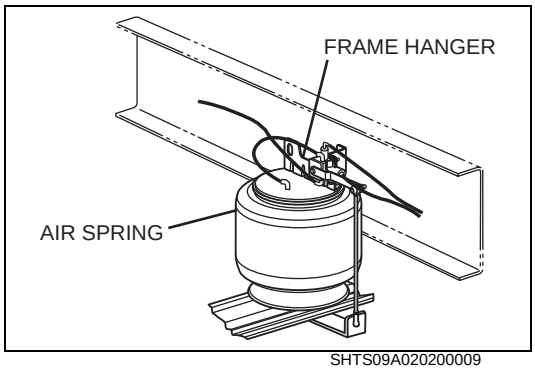
(1) Park the vehicle on the level ground.

(2) Be sure to block the wheels before dismounting.



SHTS09A020200008

(3) Jack up the axle, and support the frame with the stand.

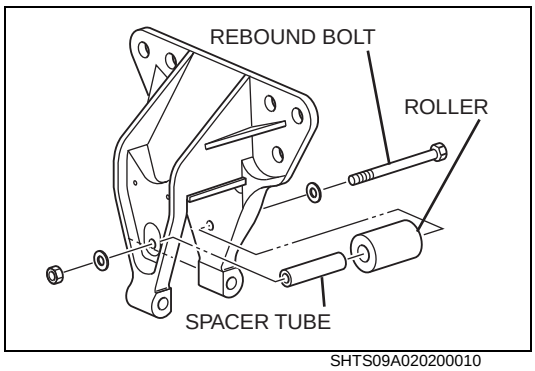


SHTS09A020200009

2. REMOVAL OF MAIN SUPPORT MEMBERS

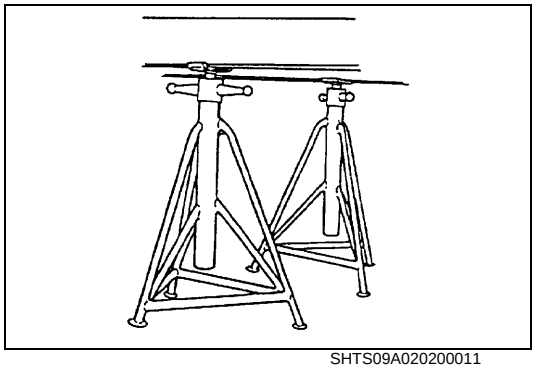
(1) Release air pressure from the air springs.

(2) Remove the height control valve link from the valve by removing the nut and the lock washer.



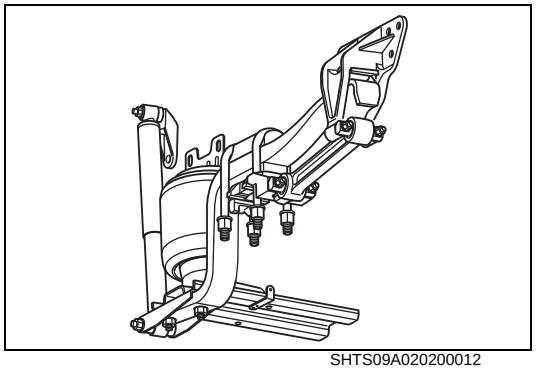
SHTS09A020200010

(3) Remove the rebound bolts, lock nuts, washers, spacer tube, and rebound roller from the frame hanger.



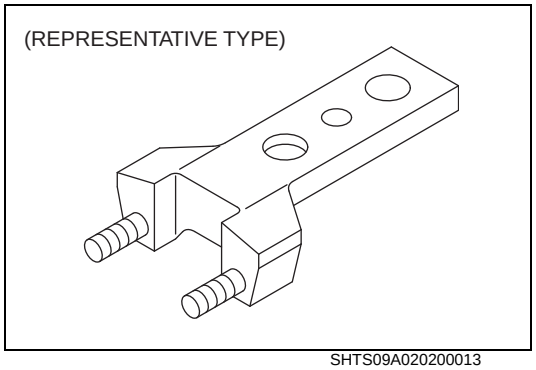
SHTS09A020200011

(4) Raise the rear of frame, high enough to remove the load from main support member.



SHTS09A020200012

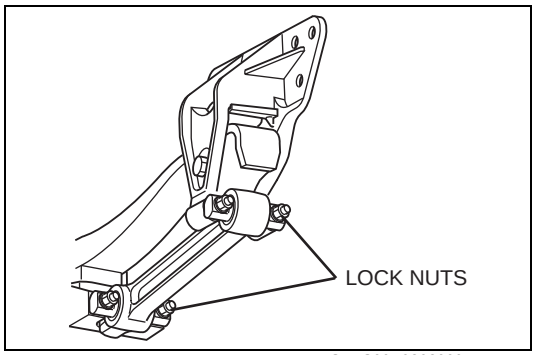
(5) Remove the U-bolt lock nuts and washers.
(6) Remove the U-bolts, bottom cap, and top pad.
(7) Remove both the lock nuts and washers which connect the cross channel to both the main support members.
(8) Lift cross channel off the main support member with jacks.
(9) Remove the main support member assembly.



SHTS09A020200013

3. REPLACEMENT OF THE SPRING SEAT

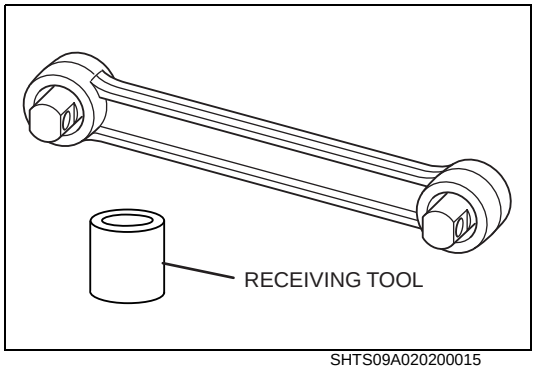
(1) Remove the spring seat.



SHTS09A020200014

4. REPLACEMENT OF THE TORQUE ROD BUSHINGS

(1) Remove the straddle mount bar pin lock nuts and washers at the axle end of the torque rod.
(2) Loosen the rebound bolt lock nut in the frame hanger.
(3) Remove the straddle mount bar pin lock nuts, bolts, and washers at the frame hanger ends of the torque rod.



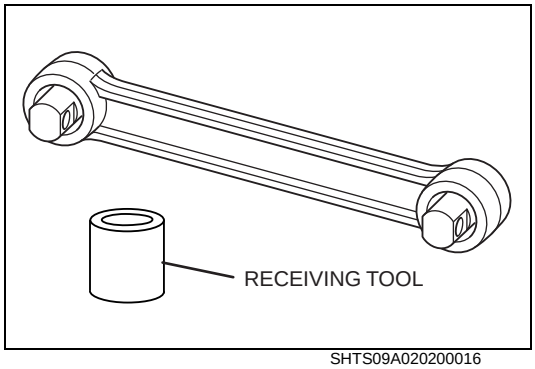
SHTS09A020200015

(4) Push out oil bushings. Use a vertical shop press with a capacity of at least 10 tons. Steel tube receiving tool is required. These bushings are not cartridge type bushings. They do not have outer metals. Support the torque rod end on receiving tool with the end tube of torque rod centered on tool. Push directly on the bushing straddle mount bar pin until the bushing clears the torque rod end tube.

⚠ CAUTION

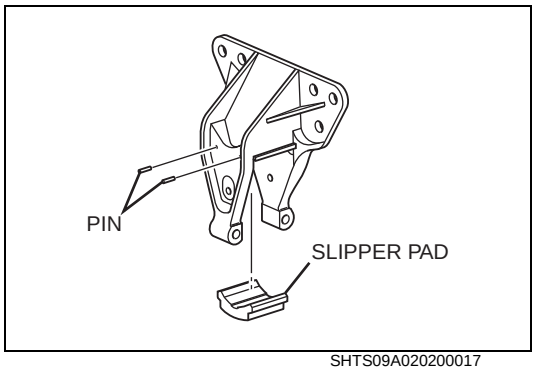
Be sure the torque rod is securely supported on the press bed for safety.

Do not use heat or cutting torch to remove the bushings from the torque rod. The use of heat will adversely affect a strength of the torque rod.



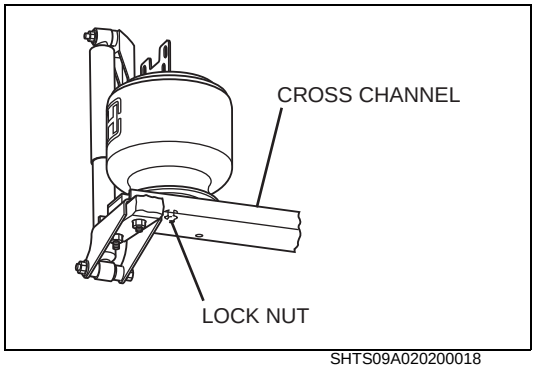
SHTS09A020200016

(5) Clean and inspect the torque rod ends, removing any nick with emery cloth.
(6) Lubricate the torque rod ends and the new rubber bushings with a vegetable base oil (cooking oil or lard). Do not use a petroleum or soap base lubricant.
(7) Press in new bushings. Support the torque rod end on receiving tool with end tube of torque rod centered on receiving tool. Straddle mount bar pin bushing must have mounting flats positioned zero degrees to shank of torque rod as shown in the figure. Press directly straddle mount bar pin of bushing. Bushing must be centered within torque rod end tubes. When pressing in new bushings, overshoot desired final position by approximately 3/16 and press bushing again from opposite side to center bushing within torque rod end.



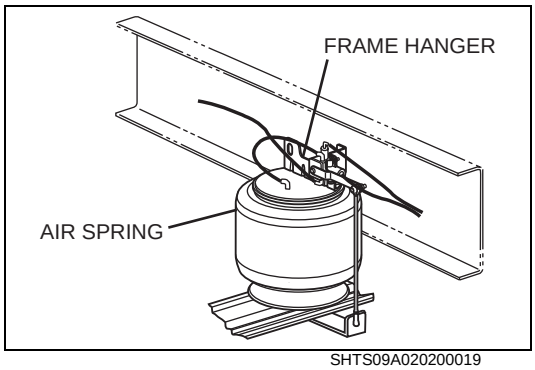
SHTS09A020200017

5. REPLACEMENT OF THE FRAME HANGER SLIPPER PADS
(1) In most cases removal of the rebound roller and spacer may be required to disassemble the slipper pad. Remove the rebound bolt lock nut, washer bolt rebound roller and spacer.
(2) Procure the slipper pad locally from Hendrickson's Agent.



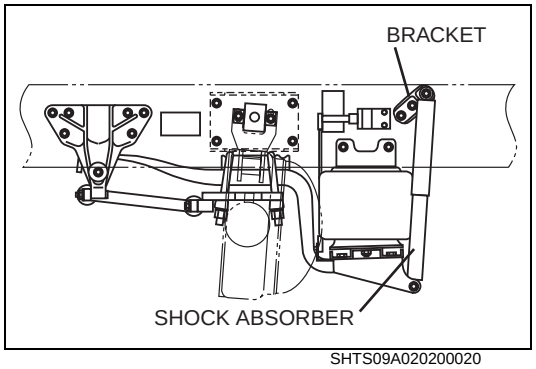
SHTS09A020200018

6. REMOVAL OF CROSS CHANNEL
(1) Remove the lock nuts and washers which connect the air spring to cross channel.
(2) Raise the cross channel by using jack if required.



SHTS09A020200019

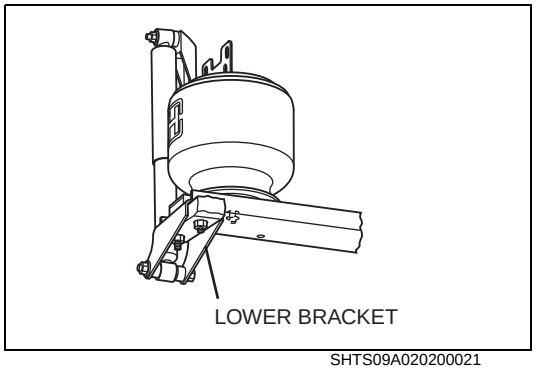
7. REMOVAL OF AIR SPRING
(1) Remove the air line to the air spring seat.
(2) Remove the brass air fittings from the air spring.
(3) Remove the lock nuts and washers which connect the air spring to the upper air spring frame hanger.
(4) Remove the air spring.
(5) Remove the air spring frame hanger.



SHTS09A020200020

8. REMOVAL OF SHOCK ABSORBER FRAME HANGER BRACKET

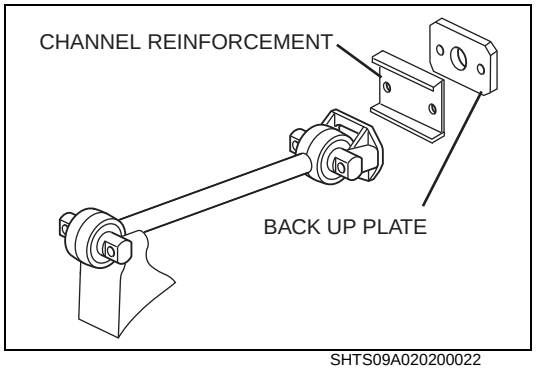
(1) Remove the lock nuts and washers at both ends of the shock absorber.
(2) Remove the shock absorber completely from the chassis.
(3) Remove the lock nuts and washers which connect the shock absorber bracket to the frame.
(4) Remove the shock absorber bracket.



SHTS09A020200021

9. REMOVAL OF SHOCK ABSORBER LOWER BRACKET

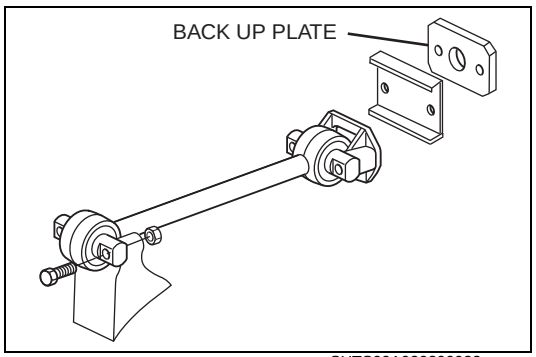
(1) Remove the shock absorber completely from the chassis.
(2) Remove the lock nuts and washers which connect the cross channel to the main support member.
(3) Remove the shock absorber lower bracket by sliding the bracket to rear.



SHTS09A020200022

10. REMOVAL OF TRANSVERSE ROD

(1) Remove the lock nuts and washers which connect the transverse rod to the frame.
(2) Remove the lock nuts and washers which connect to the axle bracket.
(3) Use Owatonna Tool Company's tool set to remove and install the torque rod bushings. Follow their instructions.

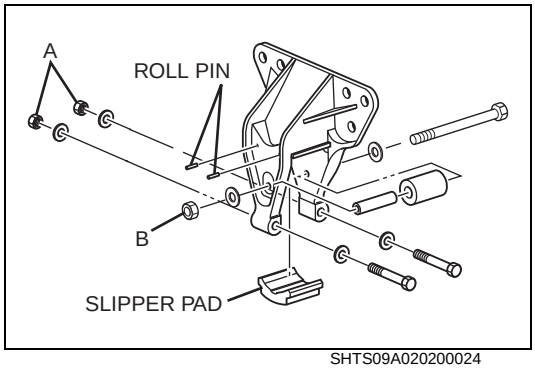


SHTS09A020200023

IMPORTANT POINTS - ASSEMBLY

1. INSTALLATION OF TRANSVERSE ROD

(1) Assemble the washer and lock nut to the bolt. Tighten the lock nut to specified torque.
(2) Install the back up plate.
Thickness: 10 mm {0.394 in.}
(3) Position the straddle mount end of torque rod at the transverse rod to the frame, tighten the lock nuts to specified torque.



SHTS09A020200024

2. INSTALLATION OF FRAME HANGER

(1) Install new slipper pad.
(2) Raise the main support member to secure slipper pad in place.
(3) Drive new roll pin in place with punch until flush with the front of frame hanger.
(4) Tighten fasteners to specified torque.

3. CHECK THE AIR LEAKAGE.

(1) Apply soapy water for each joint of air line and charge the compressed air of 780 kPa {8.0 kgf/cm^2, 110 lbf/in.^{2}} then check the leakage.

4. ADJUSTMENT OF THE VEHICLE HEIGHT

NOTICE

- **Adjustment should be done only after assembling.**
- **Adjustment should be done with the air pressure of 71-86 kPa {7.0-8.5 kgf/cm^2, 99-120 lbf/in.^{2}}, keeping on supplying the air while rotating the engine at the idle speed.**

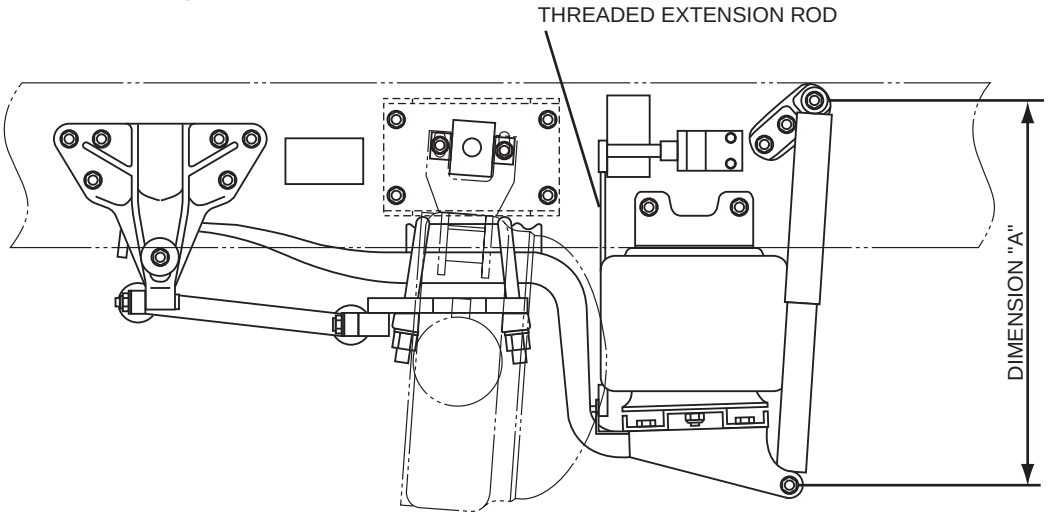
(1) Measure the shock absorber length between upper and lower pins.

Assembly standard: **Unit: mm {in.}**

Model		Dimension "A"
FD		509 {20.03}
GD		598 {23.34}
FG, GH		583 {22.95}
FL	Front	637 {25.07}
	Rear	617 {24.29}
FM	Front	635 {24.99}
	Rear	620 {24.40}

(2) If the shock absorber length is not the assembly standard, adjust the extension rod length, so that the shock absorber length is the assembly standard.

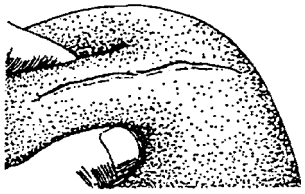
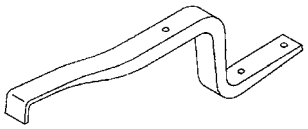
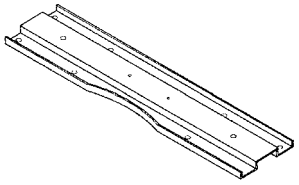
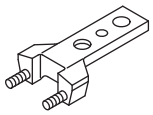
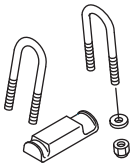
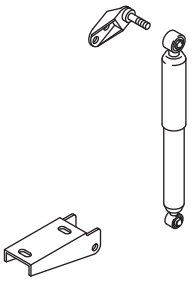
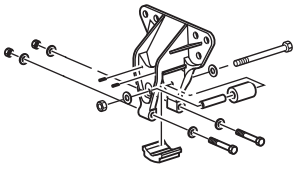
(REPRESENTATIVE TYPE)

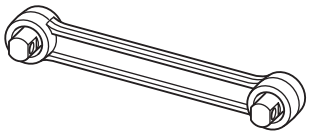
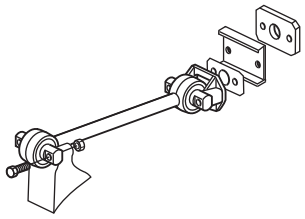


SHTS09A020200025

INSPECTION AND REPAIR

EN09A0202H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Air spring: Wear, damage and crack	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Main support member: Crack and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cross channel: Crack and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring seat: Wear, damage and crack	**—**	**—**	**Replace, if necessary.**	**Visual check** 
U-Bolt: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Pad: Wear, damage and crack	**—**	**—**		
Shock absorber: Operation, oil leak and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Upper and lower brackets: Crack and damage	**—**	**—**		
Rebound roller: Wear, damage and crack	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Slipper pad: Wear, damage and crack	**—**	**—**		

Inspection item	Standard	Limit	Remedy	Inspection procedure
Torque rod: Crack and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Torque rod bushings: Wear, damage and crack	**—**	**—**		
Transverse rod: Crack and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Transverse rod bushings: Wear, damage and crack	**—**	**—**		
Channel reinforcement: Crack and damage	**—**	**—**		
Back up plate: Crack and damage	**—**	**—**		

CHASSIS FRAME

FC02-001

CHASSIS FRAME FC02-2
TROUBLESHOOTING FC02-2
REPAIR FC02-2
INSPECTION AND REPAIR FC02-8

CHASSIS FRAME

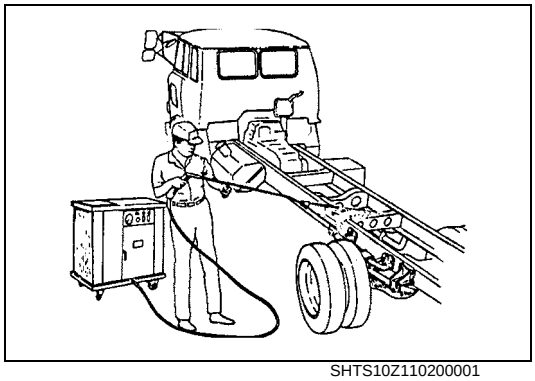
TROUBLESHOOTING

EN10Z1102F300001

Symptom	Possible cause	Remedy/Prevention
Frame distortion (Vehicle inclination)	Flattening or breakage of springs on one side	Replace spring
	Incorrect mounting (Attachment of heavy weight on one side of the vehicle)	Correct mounting
Bent frame	Overloading or concentrated weight on rear end of frame	• Correct load • Correct with frame correction device
Frame cracking or rivets breaking	Wrong body mounting	Correct mounting
	Overloading	• Improvement of the usage • Reinforce with stiffener

REPAIR

EN10Z1102H200001



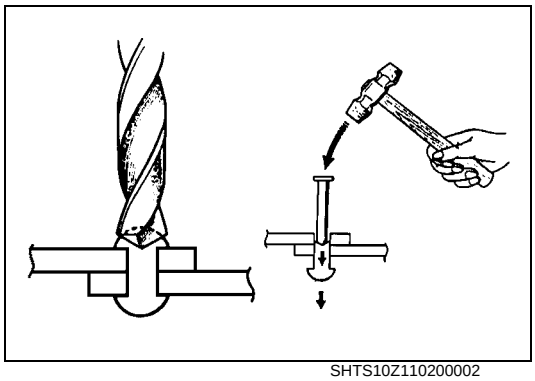
SHTS10Z110200001

1. REPLACEMENT OF LOOSENED RIVETS

(1) Clean the frame.

NOTICE

While inspecting or repairing, stop the vehicle engine and block the wheels. When cleaning with a steam cleaner, use safety goggles.

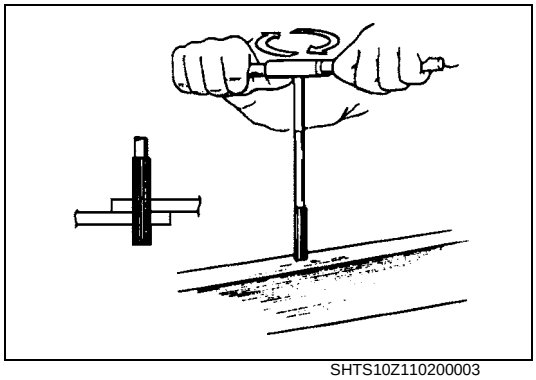


SHTS10Z110200002

(2) Drill out the head of the loosened rivets with a drill or grind.

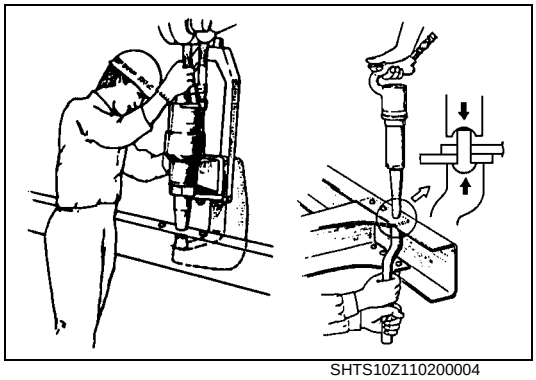
NOTICE

When drilling, do not use the gloves. They can get caught up in the drill.



SHTS10Z110200003

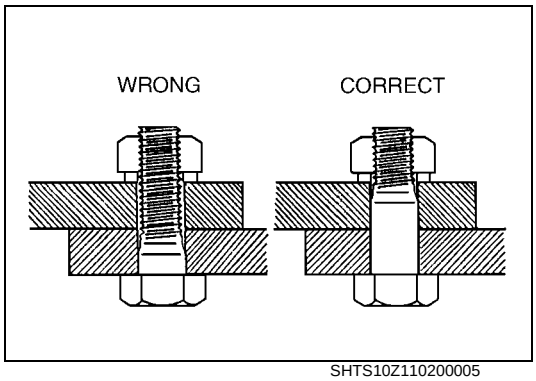
(3) Ream out the hole with a reamer.



SHTS10Z110200004

(4) Rivet with proper force, using a pneumatic riveter.

Rivet	Rivet hole	
ϕ10 mm {ϕ0.39 in.}	**Standard:**	**ϕ11 mm {ϕ0.43 in.}**
	Repair limit:	**ϕ11.5 mm {ϕ0.45 in.}**
ϕ11 mm {ϕ0.43 in.}	**Standard:**	**ϕ12 mm {ϕ0.47 in.}**
	Repair limit:	**ϕ12.5 mm {ϕ0.49 in.}**
ϕ13 mm {ϕ0.51 in.}	**Standard:**	**ϕ14 mm {ϕ0.55 in.}**
	Repair limit:	**ϕ14.5 mm {ϕ0.57 in.}**
ϕ16 mm {ϕ0.63 in.}	**Standard:**	**ϕ17 mm {ϕ0.67 in.}**
	Repair limit:	**ϕ17.5 mm {ϕ0.69 in.}**

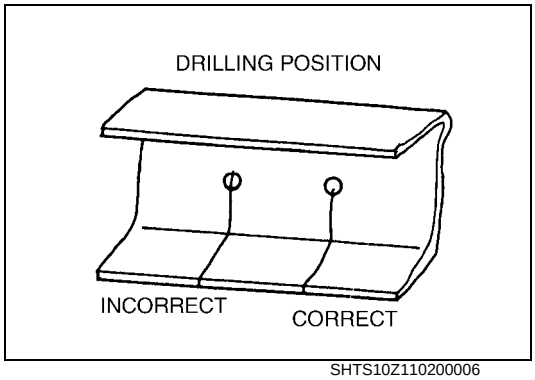


SHTS10Z110200005

(5) If it is impossible to tighten with rivets, finish the rivet hole with a reamer and tighten with reamer bolts.

NOTICE
The tensile strength of the bolts must be above 686 MPa {70 kgf/mm^2, 99,496 lbf/in.^{2}}

Tightening Torque:
10 mm {0.39 in.} Bolt:
37.27-49.03 N·m {380-500 kgf·cm, 28-36 lbf·ft}
12 mm {0.47 in.} Bolt:
63.74-85.32 N·m {650-870 kgf·cm, 47-62 lbf·ft}
14 mm {0.55 in.} Bolt:
107.88-147.09 N·m {1,100-1,500 kgf·cm, 80-108 lbf·ft}
16 mm {0.63 in.} Bolt:
166.72-225.55 N·m {1,700-2,300 kgf·cm, 123-166 lbf·ft}
18 mm {0.71 in.} Bolt:
245.17-323.61 N·m {2,500-3,300 kgf·cm, 181-238 lbf·ft}
20 mm {0.79 in.} Bolt:
343.24-460.91 N·m {3,500-4,700 kgf·cm, 254-339 lbf·ft}
22 mm {0.87 in.} Bolt:
470.72-627.62 N·m {4,800-6,400 kgf·cm, 348-462 lbf·ft}



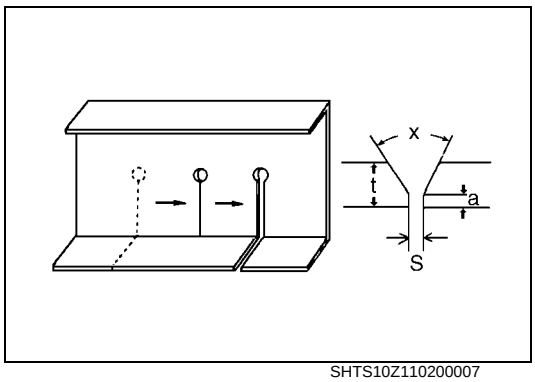
SHTS10Z110200006

2. REPAIRING OF FRAME CRACKS

(1) Perform the procedure for preventing the enlargement of cracks.

NOTICE

Do not make drill holes on the frame flanges except when repairing the cracks.

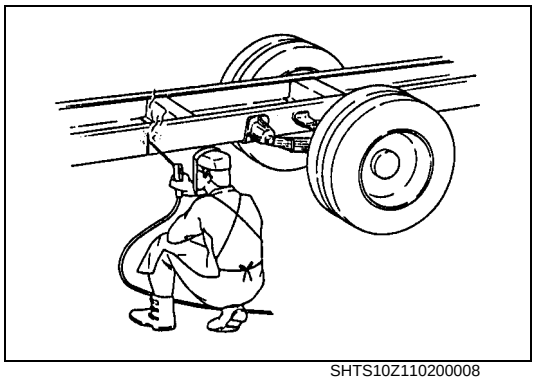


SHTS10Z110200007

(2) Make the V-shape groove with a grinder along the frame crack according the following table.

Unit: mm {in.}

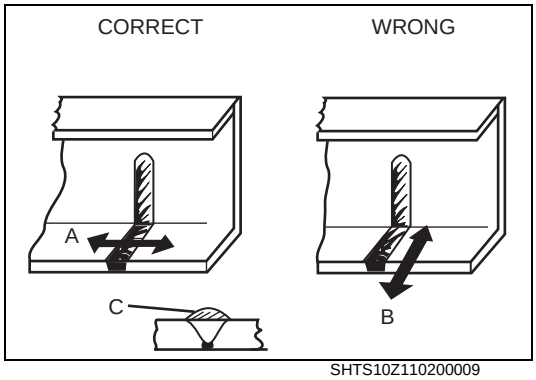
t	x°	s	a
4.5 {0.18}	90	1.0 {0.039}	0
6 {0.24}	70	1.0 {0.039}	0
7 {0.28}	70	1.5 {0.059}	1 {0.039}
8 {0.31}	70	1.5 {0.059}	1 {0.039}
9 {0.35}	70	1.5 {0.059}	1 {0.039}
10 {0.39}	60	1.5 {0.059}	1 {0.039}
12 {0.47}	60	1.5 {0.059}	1 {0.039}
16 {0.63}	60	2.0 {0.079}	1 {0.039}


SHTS10Z110200008

(3) Use an electric welder.
Refer to page FC02-8 for WELDING CONDITION (WHEN WELDING ROD IS USED).

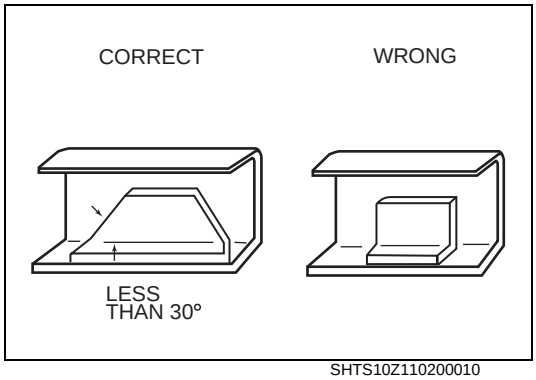
⚠ CAUTION

- **Disconnect the negative battery ground cable before using arc welding equipment.**
- **While welding, make sure that there are no flammable materials such as oil, rags, etc. around. As welded parts becomes extremely hot and sparks are present, make sure that there are no items such as harnesses, tubes, pipes, suspension component, etc. which may be damaged.**
- **If material is allowed to sputter onto the spring leaf during welding its strength will be significantly diminished. It should therefore be covered with a protective sheet. Also, for the same reason, the spring leaf should never be used as a ground for arc welding.**
- **When arc welding, ventilate or wear antitoxic mask for noxious gas.**
- **To prevent burns, electric shock and gas poisoning during arc welding, wear a helmet, apron, antitoxin mask, safety goggles, arm coverings, leg covering, safety boots and gloves.**



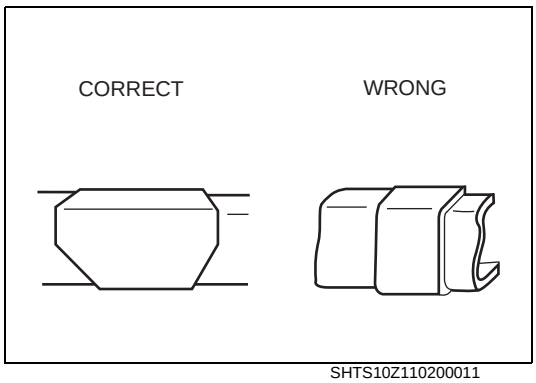
SHTS10Z110200009

(4) After welding, shake the grinder crosswise the bead line "A", along direction "B", to polish the welded area as illustrated in "C". Grind and polish the bead line "A" so that the frame surface becomes even.

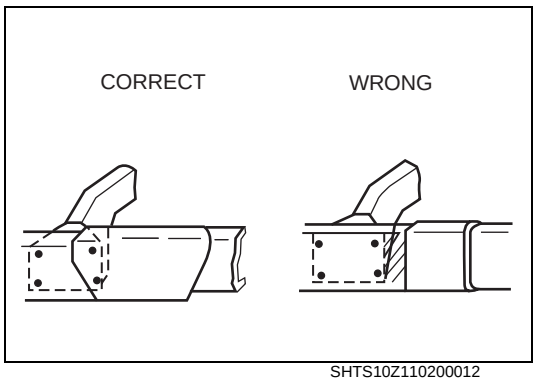


SHTS10Z110200010

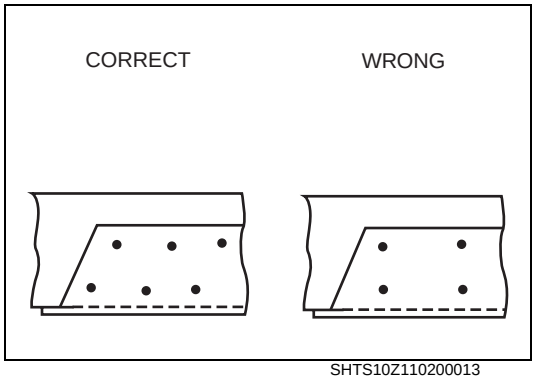
(5) Reinforcement patching method.
Patch-plate with ends squared off rather than tapered can cause damage.
The patching plate thickness should be the same as the frame.



SHTS10Z110200011

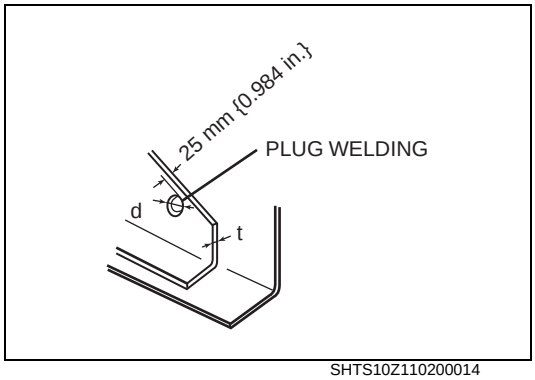


SHTS10Z110200012



SHTS10Z110200013

(6) Be sure to fasten the bolts at the hole locations of ups and downs (use rivets or perform the plug welding).



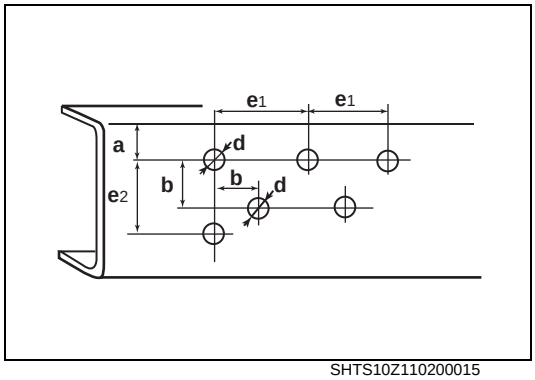
SHTS10Z110200014

(7) Diameter of plug welding hole

NOTICE

Prohibit plug welding on the flange.

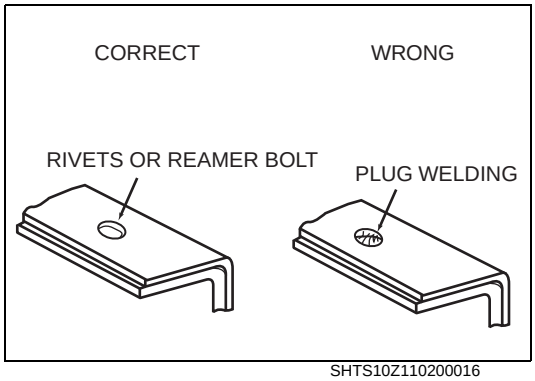
t (Unit: mm {in.})	dϕ
3.2 {0.126}	15
4.5 {0.177}	15
6 {0.236}	18



SHTS10Z110200015

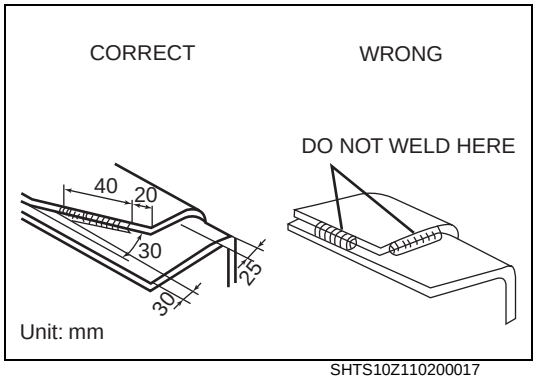
(8) Interval of the holes

a ≥ 50 mm {1.969 in.}+d/2
b ≥ 3d
e1e2 ≥ 701 mm {27.598 in.}+a
dϕ: 20 or less



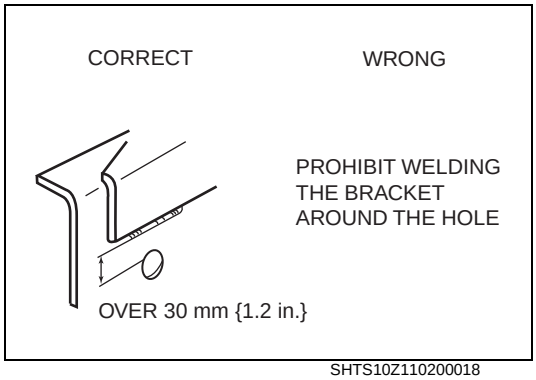
SHTS10Z110200016

(9) Method of fixing on the flange

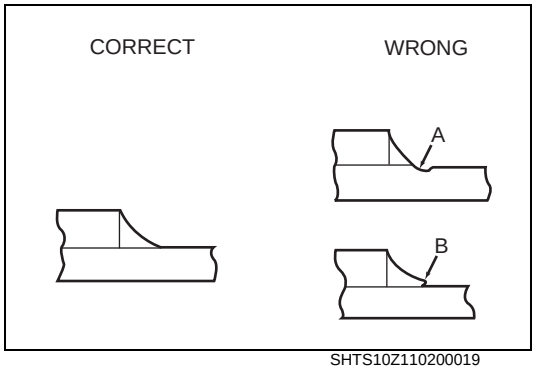


SHTS10Z110200017

(10) Method of welding on the flange



SHTS10Z110200018



SHTS10Z110200019

(11) In welding, be sure that there is no undercut "A" or the overlap "B" of the bead and a pin hole.

NOTICE
An experienced professional welder should always perform the welding since a poor welding job on the frame can cause damage.

WELDING CONDITION (WHEN WELDING ROD IS USED)

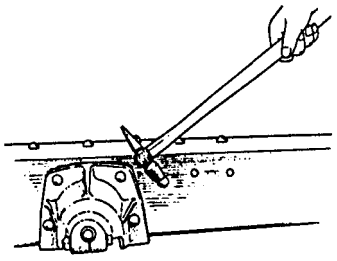
		Electric current (Unit: A)					
	Rod dia ϕ	3.2 mm {0.126 in.}		4 mm {0.157 in.}		5 mm {0.197 in.}	
	Welding position	Flat	Vertical overhead	Flat	Vertical overhead	Flat	Vertical overhead
Mechanical property of weld metal & rod	Weld Metal (Hot roll plate) Tensile strength; 441 MPa {45 kgf/mm^2, 63,962 lbf/in.^{2}} Welding Rod Tensile strength; 422 MPa {43 kgf/mm^2, 61,206 lbf/in.^{2}} Illuminate type (JIS D4301 AWS E6019) Coated electrode	80-130	60-110	120-180	100-150	170-250	130-200
	Weld Metal (Hot roll plate) Tensile strength; 539 MPa {55 kgf/mm^2, 78,175 lbf/in.^{2}} Welding Rod Tensile strength; 490 MPa {50 kgf/mm^2, 71,069 lbf/in.^{2}} Illuminate type (JIS D4301 AWS E6019) Coated electrode	90-140	80-130	141-190	110-160	180-250	—

NOTICE

- **Diameter of welding rod ϕ3.2 mm {0.126 in.} or ϕ4 mm {0.157 in.} - plate thinner than 5 mm {0.197 in.}**
- **Diameter of welding rod ϕ4 mm {0.157 in.} or ϕ5 mm {0.197 in.} - plate thicker than 6 mm {0.236 in.}**

INSPECTION AND REPAIR

EN10Z1102H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Looseness of the rivets	—	—	Replace the rivet, if necessary.	
Frame cracking	—	—	Repair the frame.	

CAB EQUIPMENT

CA01-001

SRS AIRBAG CA01-2
CAUTIONS CA01-2

AIRBAG MODULE CA01-6
REPLACEMENT CA01-6
DISPOSAL PROCEDURE
OF THE SRS AIRBAG..... CA01-8

SPIRAL CABLE CA01-15
SPECIAL TOOL..... CA01-15
REPLACEMENT CA01-15

AIRBAG ECU CA01-20
REPLACEMENT CA01-20

SEAT BELT WITH
ELR PRETENSIONER CA01-21
SPECIAL TOOL..... CA01-21
REPLACEMENT CA01-21
DISPOSAL PROCEDURES OF THE SEAT BELT
PRETENSIONER CA01-25

SEAT BELT CA01-30
COMPONENT LOCATOR CA01-30
REPLACEMENT CA01-31

SRS AIRBAG

CAUTIONS

EN1133401A100001

INTRODUCTION

The SRS airbag components consist of the following components.

a. Horn button assembly (airbag module)
b. Steering wheel
c. ECU for the SRS airbag and seat belt pretensioner
d. SRC (spiral cable)
e. Wire harness, connector, and other related components.

COMMON PRECAUTIONS FOR ALL PARTS OR COMPONENTS OF THE AIRBAG AND SEAT BELT PRETENSIONER

⚠ WARNING

To prevent accidental deployment of the SRS airbag or activation of the seat belt prentensioner, which can cause serious injury or death, and to maintain proper function of the SRS airbag and seat belt prentensioner, always observe the following instructions.

1. **Before any work in relation to the SRS airbag or seat belt pretensioner including mounting and dismounting of the SRS airbag module or seat belt pretensioner, diagnosis of the SRS airbag components or seat belt pretensioner, and any other work such as welding, sheet metal processing and painting the cab, where the airbag module or seat belt pretensioner may be exposed to heat or impact, turn the starter key of the vehicle to "LOCK" position and never start any works within at least 90 seconds after the starter key is turned to "LOCK" position. Otherwise, as electric charge remains in the ECU for the SRS airbag and seat belt pretensioner for 90 seconds even after the starter key is turned to "LOCK" position, the SRS airbag or seat belt pretensioner may be accidentally activated due to heat or impact, which can cause serious injury or death. After the 90 seconds, before welding, sheet metal processing or painting the cab, be sure to remove the 2 pieces of fuses for the SRS airbag before your work.**
2. **Never turn on electricity between the positive and negative terminals of the connector extended from the SRS airbag module with an electrical circuit tester. Otherwise, faint electric current from the tester may cause the SRS airbag to deploy, resulting in death or serious injury. Never turn on electricity between the positive and negative terminals of the connectors extended from the component of seat belt pretensioner with an electrical circuit tester. Otherwise, faint electric current from the tester may cause the seat belt pretensioner to activate, resulting in death or serious injury.**
3. **Never repair any of the SRS airbag components or the component of the seat belt pretensioner but replace it with new one.**
4. **For the replacement of the SRS airbag components or the component of the seat belt pretensioner, be sure to use brand new and unused genuine airbag components.**
5. **To avoid accidental explosion of explosive substance and for your safety, never disassemble or repair any of the SRS airbag components.**
6. **Never drop any of the SRS airbag components or the component of the seat belt pretensioner on the ground. If you drop the airbag components or the component of the seat belt pretensioner, never use it and be sure to use another brand new and unused one.**
7. **Never apply heavy load or impact to the SRS airbag components or the component of the seat belt pretensioner.**
8. **Store the SRS airbag components or the component of the seat belt pretensioner keeping away from dust.**
9. **Never drop or spill grease, detergent, oil, water, or any other liquid on the SRS airbag component or the component of the seat belt pretensioner.**
10. **Never expose the SRS airbag components or the component of the seat belt pretensioner directly to heat or flame.**
11. **Follow the instructions on the caution labels on or around the SRS airbag components. If the caution plate is stained or damaged, replace it with new one.**
12. **Genuine SRS airbag module, the seatbelt pretensioner and the ECU for the SRS airbag and seat belt pretensioner have their own serial number. If the serial number on each parts is stained or damaged, replace them with brand new genuine parts.**
13. **When tightening the bolt or nut to install the SRS airbag components or the component of the seat belt pretensioner on the vehicle, use the specified tool and apply the specified tightening torque in accordance with this chapter "CAB EQUIPMENT".**
14. **After the vehicle was involved in an traffic accident such as a collision, inspect and diagnose malfunction of the SRS airbag and the seat belt pretensioner even if any of them has not been activated.**
15. **Before you turn the starter key to "ON" position for the first time after your work is completed.**

a. **Be sure to get out of the cab and confirm that there is no one in the cab.**

b. **Turn the starter key to "ON" position from outside of the cab.**

c. **Confirm that the SRS airbag does not deploy for at least 10 seconds, and then turn the starter key to "LOCK" position from outside of the cab.**

d. **Sit on the driver's seat, turn the starter key to "ON" position and confirm that the warning light of the SRS airbag on the instrument panel turns on for 6 seconds and then goes off.**

e. **Turn the starter key to "LOCK" position.**

CAUTIONS FOR HANDLING THE HORN BUTTON ASSENBLY (AIRBAG MODULE)

⚠ WARNING

To prevent accidental deployment of the SRS airbag, which can cause serious injury or death, and to maintain proper function of the SRS airbag, be sure to observe the following instructions.

1. **When storing the horn button assembly (airbag module), store it with Hino mark on the horn button assembly facing up regardless of the storage period. Be careful not to damage the connector of the horn button assembly and insulate it with a short harness or insulation tape when storing.**
2. **Never place anything on the horn button assembly.**
3. **Never pile horn button assemblies.**
4. **Store and handle a horn button assembly in a place away from low temperature {below -40°C or -40°F} or high temperature {above 80°C or 176°F}.**
5. **Before disposal of the horn button assembly, deploy the SRS airbag in accordance with procedures provided in CA01-6 of section "AIRBAG MODULE".**

CAUTIONS FOR STORAGE OF ECU FOR THE SRS AIRBAG AND SEAT BELT PRETENSIONER

⚠ WARNING

To maintain proper function of the SRS airbag and seat belt prentensioner, always observe the following instructions.

1. **Store the ECU for the SRS airbag and seat belt pretensioner at the place with the temperature between -40°C {-40°F} and 80°C {176°F}, keep it away from high humidity, static electricity and electric noise.**
2. **Do not store the ECU for the SRS airbag and seat belt pretensioner upside down.**

CAUTIONS FOR HANDLING THE SRC (SPIRAL CABLE)

⚠ WARNING

To prevent accidental deployment of the SRS airbag, which can cause serious injury or death, and to maintain proper function of the SRS airbag, always observe the following instructions;

1. **In the event that you perform the disconnection check of the SRC, detach the SRC from the horn button assembly before conducting any works. Otherwise, the SRS airbag may accidentally deploy, which may cause death or serious injury.**
2. **Keep SRC in a place with the temperature between -30°C {-22°F} and 80°C {176°F}.**
3. **The SRC neutral position shall be aligned with the straight-ahead direction of the vehicle. For detail, refer to CA01-18 of section "SPIRAL CABLE".**

CAUTIONS FOR HANDLING THE WIRE HARNESSES AND CONNECTORS

⚠ WARNING

To prevent accidental deployment of the SRS airbag, which can cause serious injury or death, and to maintain proper function of the SRS airbag, be sure to observe the following instructions.

1. **Never apply an excessive force to the wire harnesses of the SRS airbag components. All wire harnesses related to the SRS airbag components are coloured yellow for distinction.**
2. **When a wire harness of the SRS airbag component is damaged or cut, do not solder it or perform other repairs. Instead, replace it with a brand new one.**
3. **Route a wire harness in a way that it is not jammed with steering shaft, steering column or any other components of the SRS airbag so that the wire harness is not damaged or cut by its interference with those parts or components.**
4. **As connectors of the SRS airbag components are small and unique in design, handle them carefully and be sure not to damage them when mounting and dismounting the SRS airbag components.**
5. **After the connection of each connector of the wire harness of the SRS airbag components, confirm that it is securely locked at designated lock positions.**

COMPONENTS TO BE REPLACED AFTER THE SRS AIRBAG DEPLOYED

⚠ WARNING

Replace all of the following components once the SRS airbag deployed. Otherwise, the SRS airbag may not deploy or may not function properly.

a. Horn button assembly (airbag module)

b. ECU for the SRS airbag and seat belt pretensioner

c. Wire harness

d. Steering wheel body

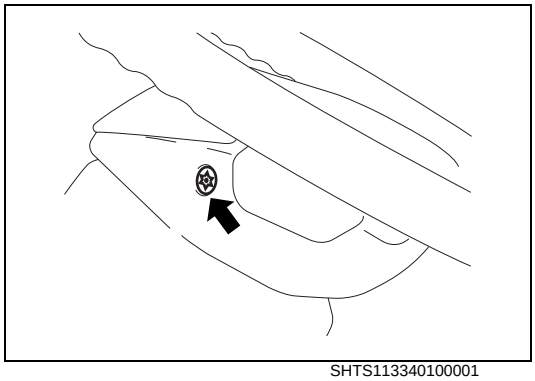
e. SRC (spiral cable)

AIRBAG MODULE

REPLACEMENT

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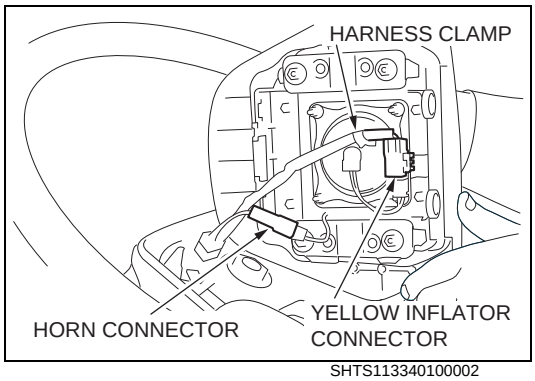
⚠ CAUTION
For your safety, carefully read and observe "CAUTIONS" in "CA01-2", "CA01-3", "CA01-4", "CA01-5" and any cautionary information in this section before conducting any working procedure.



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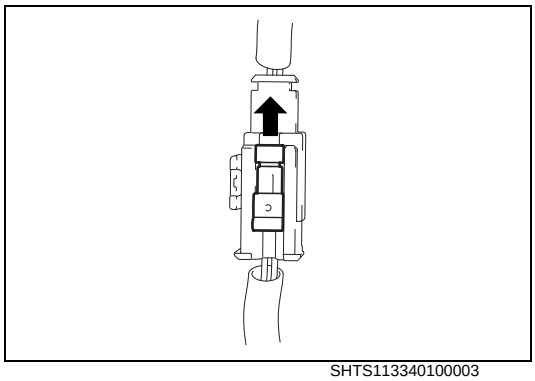
1. REMOVE THE AIRBAG MODULE.
(1) Loosen the two set screws completely using a torx wrench (T30).
HINT
Set screws are designed not to drop from the steering wheel.

(2) Remove the airbag module.



SHTS113340100002

(3) Pull out the harness clamp fixed on the right side of the steering wheel.
HINT
Pull it out while holding the harness clamp.

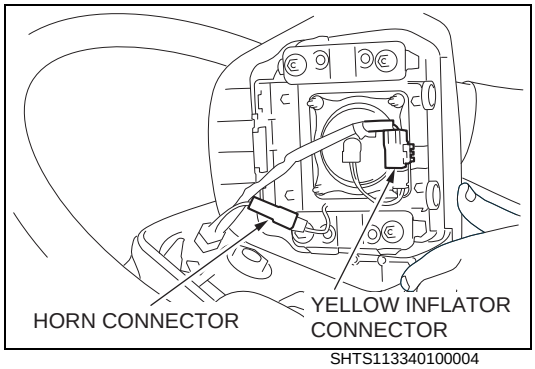


SHTS113340100003

(4) Disconnect the yellow inflator connector.
HINT
Pull the white portion in the direction of the arrow to unlock and disconnect the connector.

(5) Disconnect the horn connector.

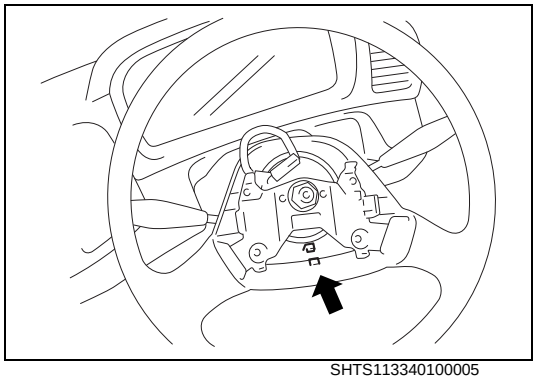
⚠ WARNING
To prevent accidental deployment of the SRS airbag, which can cause serious injury or death, and to maintain proper function of the SRS airbag, when storing the horn button assembly (airbag module), store it with Hino mark on the horn button assembly facing up regardless of the storage period. Be careful not to damage the connector of the horn button assembly and insulate it with a short harness or insulation tape when storing.



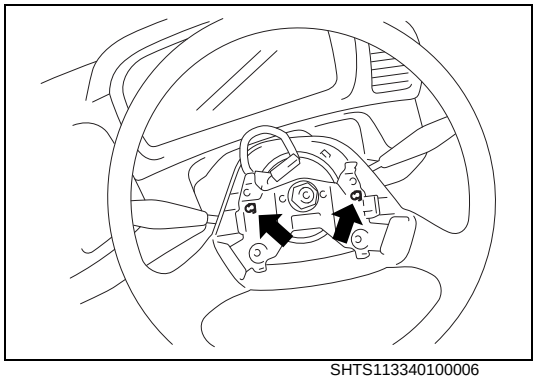
SHTS113340100004

2. MOUNT THE AIRBAG MODULE.
(1) Connect the horn connector.
(2) Connect the yellow inflator connector.

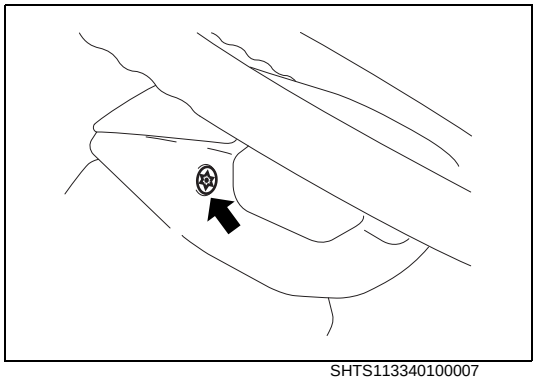
NOTICE
Lock the yellow inflator connector securely.


SHTS113340100005

(3) Fix the horn connector to the fixing hook on the steering wheel side.


SHTS113340100006

(4) Push the airbag module straightly in the direction of the steering shaft. Fix the two temporary fixing pins of the steering wheel body securely to the temporary fixing holes of the airbag module.


SHTS113340100007

(5) Tighten the two set screws using a torx wrench.
Tightening Torque:
6.5-13.5 N·m {66-138 kgf·cm, 4.8-9.9 lbf·ft}

DISPOSAL PROCEDURE OF THE SRS AIRBAG

EN1133401H300001

⚠ WARNING

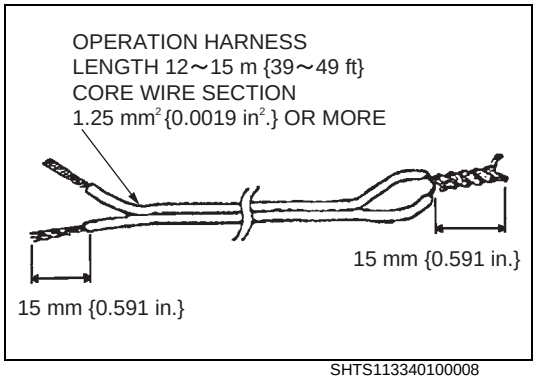
- **When disposing of the vehicle equipped with the SRS airbag or disposing of a horn button assembly (with SRS airbag module), deploy the SRS airbag at first in accordance with the disposal procedures provided in this section. Never dispose of the vehicle or the horn button assembly without deploying the SRS airbag. Otherwise, the SRS airbag may deploy accidentally, causing death or serious injury. In the event that the SRS airbag does not deploy even if you follow the disposal procedures in this section, stop working and immediately contact the service department of Hino authorized distributor in your country.**
- **Before deploying the SRS airbag, confirm that no one is within 5m {16ft.} from the horn button assembly (airbag module) to be deployed. Otherwise, the deployment of the SRS airbag may cause serious injury or death.**

⚠ CAUTION

To avoid serious injury or death resulting the deployment of the SRS airbag, always observe the following instructions;

- **As the SRS airbag makes sizable exploding sound when it deploys, wear (and cause persons nearby to wear) ear plugs and perform the deployment at an outdoor safe place where exploding sound from the deploying airbag will not create a nuisance to nearby residents.**
- **Warn persons around loudly for the exploding sound before the deployment.**
- **As the horn button assembly becomes very hot after the SRS airbag is deployed, never touch the horn button assembly and leave it untouched for at least 30 minutes after deployment until it cools down.**
- **For your safety, wear gloves and safety glasses when handling a horn button assembly before and after the deployment of the airbag. If irritants which may be put on the deployed airbag are put on your skins or eyes, wash and rinse such skins or eyes with sufficient amount of water and consult the doctor.**
- **Always wash your hands with water after completing the disposal procedures.**
- **To prevent irritants which may be adhered to the deployed airbag, from being spilled out of the horn button assembly and coming into contact with your skin, do not apply water, oil or other fluid to a horn button assembly trying to cool it down after the deployment of the airbag.**

DEPLOYMENT PROCEDURES AT DISPOSAL OF AIRBAG SYSTEM-EQUIPPED VEHICLE (IN-VEHICLE DEPLOYMENT)



SHTS113340100008

1. PREPARATION

(1) Turn the starter switch to the "LOCK" position and disconnect the negative battery terminal of the vehicle. Then, make sure to leave it for more than 90 seconds.

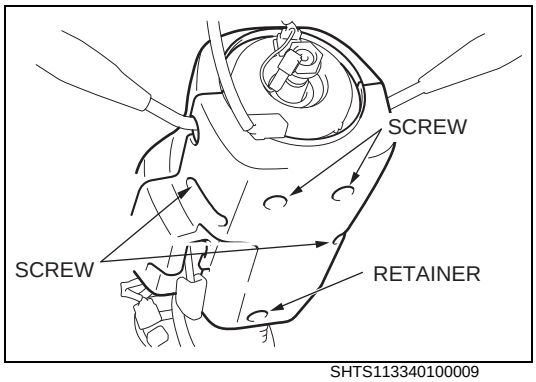
⚠ WARNING

Be sure to peel the covering by 15 mm {0.591 in.} at both ends of the SRS airbag operation harness and twist the harness at one end as shown in left figure. Otherwise, if both ends of the harness are disconnected, the SRS airbag may deploy accidentally by static electricity during the deployment procedure of the SRS airbag, which may cause death or serious injury.

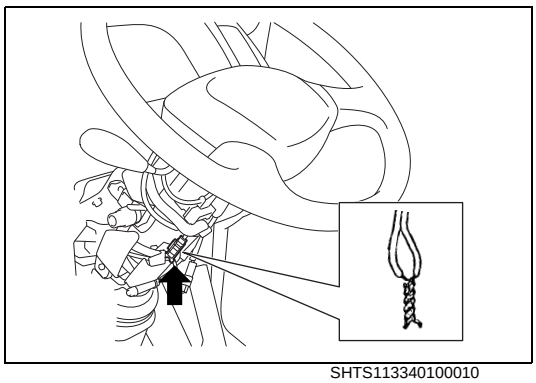
(2) Peel the covering by 15 mm {0.591 in.} at both ends of the SRS airbag operation harnesses. Twist the harnesses at one end.

(3) Remove the screws and retainer, and then remove the column cover.

(4) Touch the vehicle outer panel with bare hands for grounding of operators.



SHTS113340100009



SHTS113340100010

(5) Cut the yellow harness of the airbag on the steering column with nippers.

(6) Peel the covering by 15 mm {0.591 in.} at the cut harness tip on the SRC side.

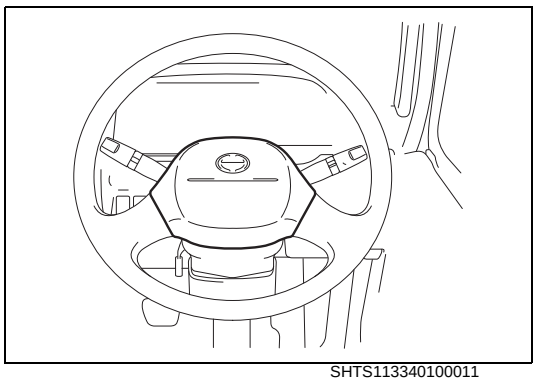
⚠ WARNING

If the subsequent procedure is not performed immediately, twist the both ends of the yellow inflator harness on the horn bottom module side at one end as shown in the left figure to prevent the SRS airbag from deploying accidentally by static electricity, which may cause death or serious injury.

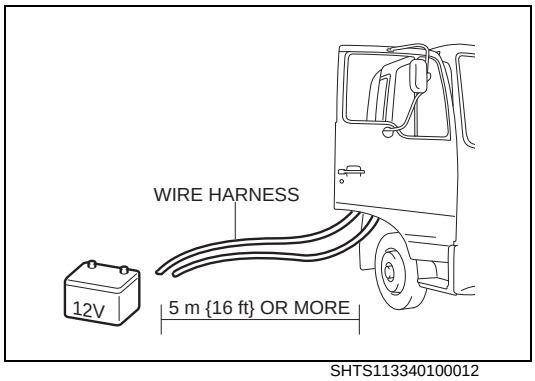
(7) Connect the untwisted side of the prepared airbag operation harness to the cut harness. Cover the portion with an insulation tape.

2. DEPLOYING AIRBAG

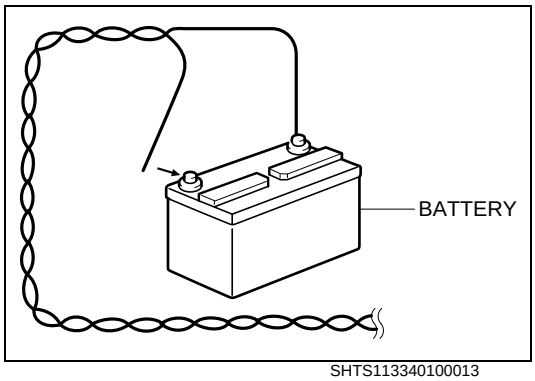
(1) Make sure there is no backlash in the steering wheel and airbag module.



SHTS113340100011



SHTS113340100012



SHTS113340100013

⚠ WARNING

To avoid death or serious injury during the process of deploying the SRS airbag, observe the following instructions.

1. **Make sure there is no backlash in the steering wheel and airbag module.**
2. **Confirm there is no one in and within 5 m {16 ft.} from the cab.**
3. **Close all the doors and windows of the vehicle.**
4. **Place a battery (12V) 5 m {16 ft.} away from the vehicle with the SRS airbag operation harness fully stretched.**
5. **If there is any damage with the glasses of any window of the vehicle, cover all the damaged windows of the vehicle with the sheets such as plastic sheet as they may brake and flaw into pieces by the activation of the SRS airbag.**

(2) Untangle the twisted airbag operation harness and connect one side to the either side of the battery terminals.

HINT

Either terminal can be connected.

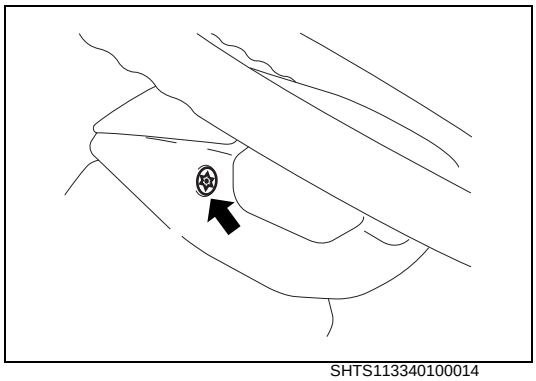
(3) Connect the other side of the airbag operation harness to the battery and deploy the airbag.

⚠ CAUTION

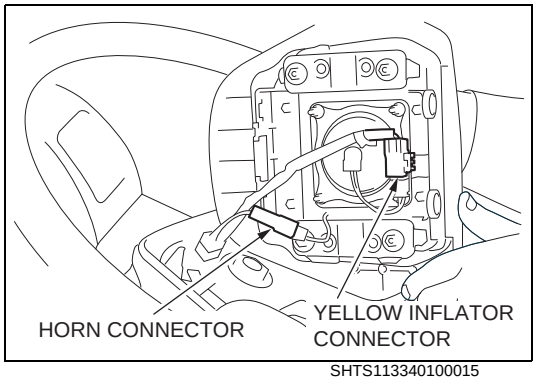
- **Warn persons around loudly for the exploding sound before the deployment.**
- **As the horn button assembly becomes very hot after the SRS airbag is deployed, never touch the horn button assembly and leave it untouched for at least 30 minutes after deployment until it cools down.**
- **For your safety, wear gloves and safety glasses when handling a horn button assembly before and after the deployment of the airbag. If irritants which may be put on the deployed airbag are put on your skins or eyes, wash and rinse such skins or eyes with sufficient amount of water and consult the doctor.**
- **Always wash your hands with water after completing the disposal procedures.**
- **To prevent irritants which may be adhered to the deployed airbag from being spilled out of the horn button assembly and coming into contact with your skin, do not apply water, oil or other fluid to a horn button assembly trying to cool it down after the deployment of the airbag.**

DEPLOYMENT PROCEDURES AT DISPOSAL OF AIRBAG ONLY (DEPLOYMENT OUTSIDE THE VEHICLE)

⚠ CAUTION
For your safety, carefully read and observe "CAUTIONS" in "CA01-2", "CA01-3", "CA01-4", "CA01-5" and "CA01-8" and any cautionary information in this section before conducting any working procedure.

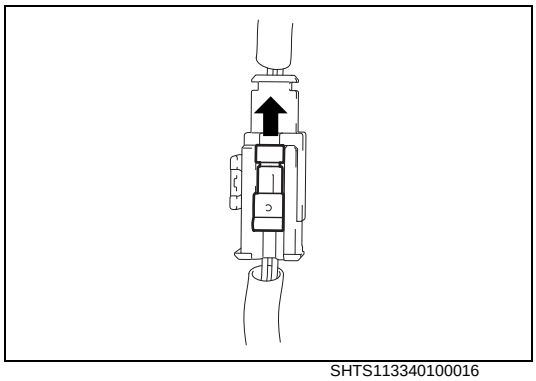

SHTS113340100014

1. REMOVE THE AIRBAG MODULE.
(1) Loosen the two set screws completely using a torx wrench (T30).
HINT
Set screws are designed not to drop from the steering wheel.



SHTS113340100015

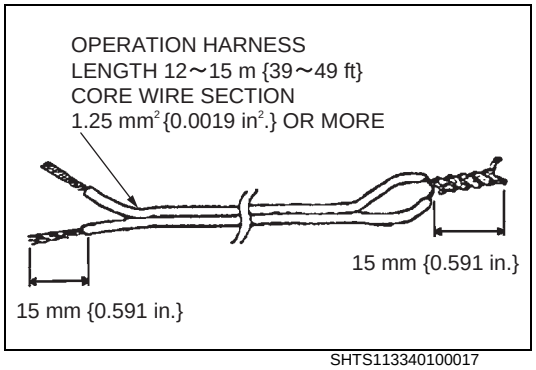
(2) Remove the airbag module.


SHTS113340100016

(3) Disconnect the yellow inflator connector.
HINT
Pull the white portion in the direction of the arrow to unlock and disconnect the connector.

⚠ WARNING
To prevent accidental deployment of the SRS airbag, which can cause serious injury or death, and to maintain proper function of the SRS airbag, when storing the horn button assembly (airbag module), store it with Hino mark on the horn button assembly facing up regardless of the storage period. Be careful not to damage the connector of the horn button assembly and insulate it with a short harness or insulation tape when storing.

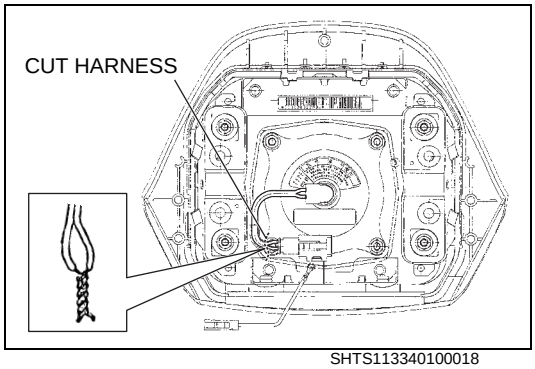
(4) Disconnect the horn connector.



SHTS113340100017

2. DEPLOYING AIRBAG
(1) Peel the covering by 15 mm {0.591 in.} at both sides of the airbag operation harness. Twist the harness on one side.

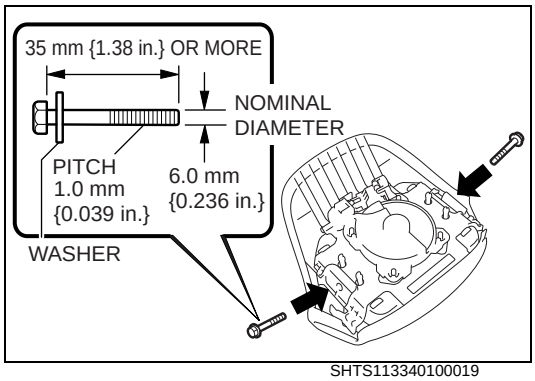
⚠ WARNING
Be sure to peel the covering by 15 mm {0.591 in.} at both ends of the SRS airbag operation harness and twist the harness at one end as shown in left figure. If both ends of the harness are disconnected, the SRS airbag may deploy accidentally by static electricity during the deployment procedure of the SRS airbag, which may cause death or serious injury.



SHTS113340100018

(2) Remove the operators static electricity by touching the vehicle outer panel with bare hands.
(3) Cut the yellow inflator harness of the airbag module with nippers.
(4) Peel the covering by 15 mm {0.591 in.} at the cut harness tip on the inflator side.

⚠ WARNING
If the subsequent procedure is not performed immediately, twist the both ends of the yellow inflator harness on the horn bottom module side at one end as shown in the left figure to prevent the SRS airbag from deploying accidentally by static electricity, which may cause death or serious injury.

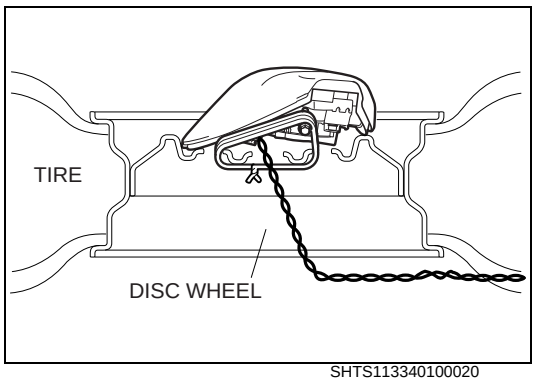


SHTS113340100019

(5) Connect the untwisted side of the prepared airbag operation harness to the cut harness. Cover the portion with an insulation tape.
(6) Fit bolts (lenght 35 mm {1.38 in.} or more, nominal diameter 6.0 mm {0.236 in.}, pitch 1.0 mm {0.039 in.}) with washers to the two bolt holes for mounting the airbag module.

NOTICE

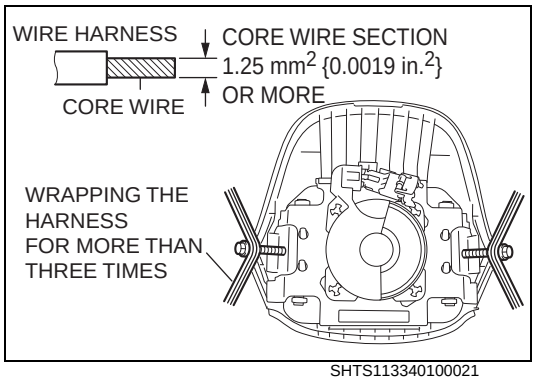
- **Tighten the bolts by hand until the bolts become difficult to turn.**
- **Do not tighten the bolts too much.**



SHTS113340100020

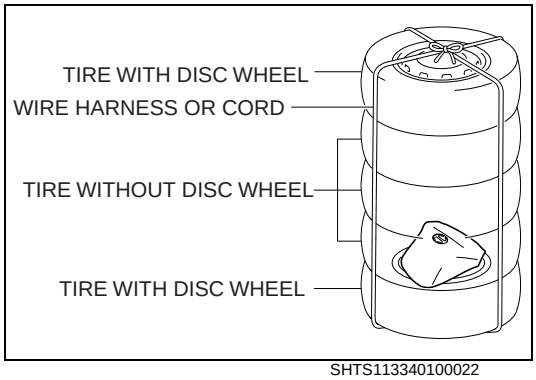
⚠ WARNING
Always secure the horn button assembly in accordance with above working procedure in this section and observe the following instructions in order to prevent serious injury in an accident.

- **Always use an undamaged wire harness with the sectional square measure of at least 1.25 mm^2 {0.0019 $in.^2$} at the core wire to fix the horn button assembly with a tire with a wheel. Otherwise, the shock of the deployment of the SRS airbag may break the wire harness.**
- **Tightly bind the bolts fitted to the SRS airbag module and a hole for wheel bolt with the wire harness at least 3 times and make sure there is no slack in the wire harness. If there is slack in the wire harness, the horn button assembly may come loose due to the shock of the deployment when the SRS airbag deployed and deployed SRS airbag assembly may strike you.**



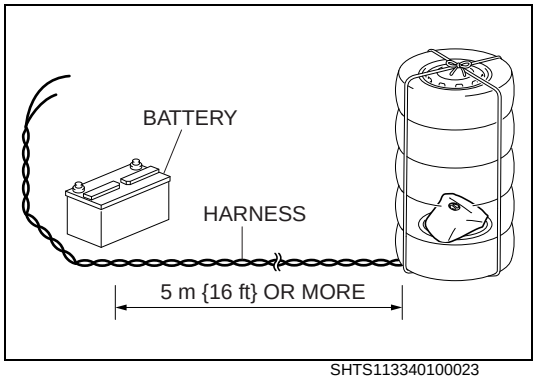
SHTS113340100021

(7) Place a tire with a wheel on the ground and put the horn button assembly on the wheel with the Hino mark on the horn button assembly facing up.
(8) Secure the horn button assembly to the wheel of the tire by tightly binding the bolts fitted to the SRS airbag module and a hole for wheel bolt the wheel with an undamaged wire harness (with a sectional square measure of at least 1.25 mm^2 {0.0019 $in.^2$ } at the core wire) at least 3 times as shown in the left figure.



SHTS113340100022

(9) As in the figure, place at least three tires without disc wheel on top of a tire with disc wheel to which the horn button is fixed. Then, place a tire with disc wheel on the top.
(10) Fix the tires with a wire harness or cord.



SHTS113340100023

(11) Place a battery (12V) where the airbag operation harness is fully stretched.

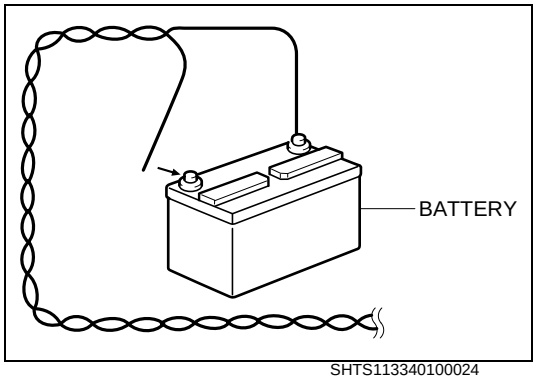
NOTICE

- **Place the battery more than 5 m {16 ft} away from the tires.**
- **Do not use a 24V battery.**

(12) Make sure there is nobody around. Untangle the twisted airbag operation harness and connect one side to the either side of the battery terminals.

HINT

Either terminal can be connected.



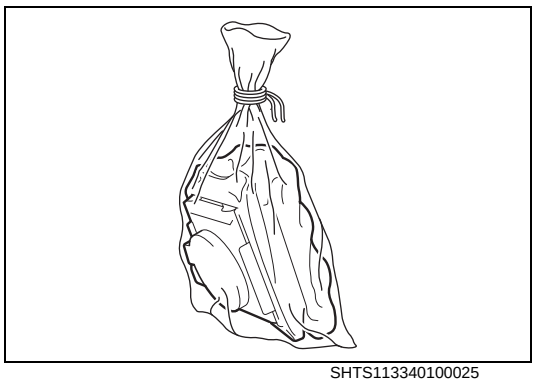
SHTS113340100024

(13) Connect the other side of the airbag operation harness to the battery and deploy the airbag.

⚠ CAUTION

- **Warn persons around loudly for the exploding sound before the deployment.**
- **As the horn button assembly becomes very hot after the SRS airbag is deployed, never touch the horn button assembly and leave it untouched for at least 30 minutes after deployment until it cools down.**
- **For your safety, wear gloves and safety glasses when handling a horn button assembly before and after the deployment of the airbag. If irritants which may be put on the deployed airbag are put on your skins or eyes, wash and rinse such skins or eyes with sufficient amount of water and consult the doctor.**
- **Always wash your hands with water after completing the disposal procedures.**
- **To prevent irritants which may be adhered to the deployed airbag from being spilled out of the horn button assembly and coming into contact with your skin, do not apply water, oil or other fluid to a horn button assembly trying to cool it down after the deployment of the airbag.**

DISPOSAL PROCEDURES OF AIRBAG MODULE



SHTS113340100025

1. DISPOSE OF THE DEPLOYED AIRBAG MODULE AS IN THE PROCEDURES BELOW.

(1) After the smoke ceased, push the activated airbag to its original position and press it with a packing tape.

⚠ CAUTION

- **As the horn button assembly becomes very hot after the SRS airbag is deployed, never touch the horn button assembly and leave it untouched for at least 30 minutes after deployment until it cools down.**
- **For your safety, wear gloves and safety glasses when handling a horn button assembly before and after the deployment of the airbag. If irritants which may be put on the deployed airbag are put on your skins or eyes, wash and rinse such skins or eyes with sufficient amount of water and consult the doctor.**
- **Always wash your hands with water after completing the disposal procedures.**
- **To prevent irritants which may be adhered to the deployed airbag from being spilled out of the horn button assembly and coming into contact with your skin, do not apply water, oil or other fluid to a horn button assembly trying to cool it down after the deployment of the airbag.**

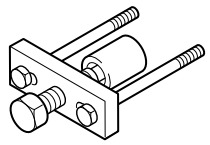
2. DISPOSAL

(1) Make sure the airbag module is completely cooled down.
(2) Put it in a strong plastic bag and seal it.

SPIRAL CABLE

SPECIAL TOOL

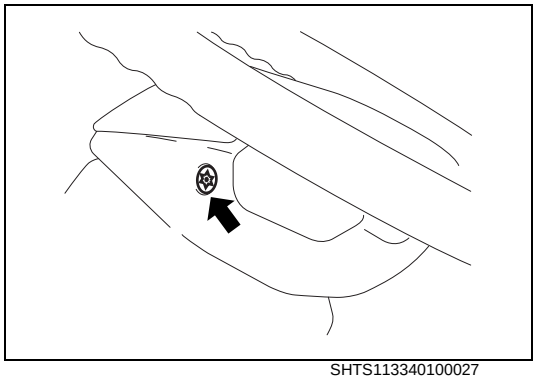
EN1133401K100001

Illustration	Part number	Tool name	Remarks
	S0965-01341	PULLER	

REPLACEMENT

EN1133401H100002

⚠ **CAUTION**
For your safety, carefully read and observe "CAUTIONS" in "CA01-2", "CA01-3", "CA01-4", "CA01-5" and any cautionary information in this section before conducting any working procedure.

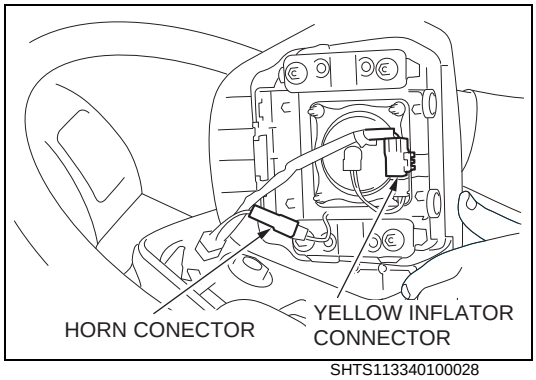


SHTS113340100027

1. REMOVE THE AIRBAG MODULE.

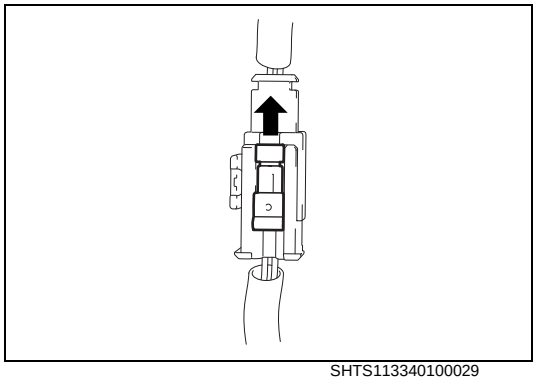
(1) Loosen the two set screws completely using a torx wrench (T30).

HINT
Set screws are designed not to drop from the steering wheel.



SHTS113340100028

(2) Remove the airbag module.

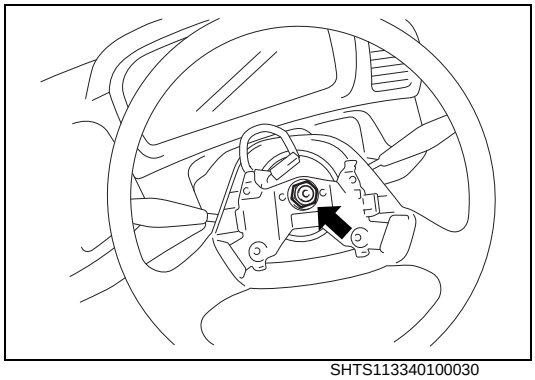


SHTS113340100029

(3) Disconnect the yellow inflator connector.

HINT
Pull the white portion in the direction of the arrow to unlock and disconnect the connector.

(4) Disconnect the horn connector.

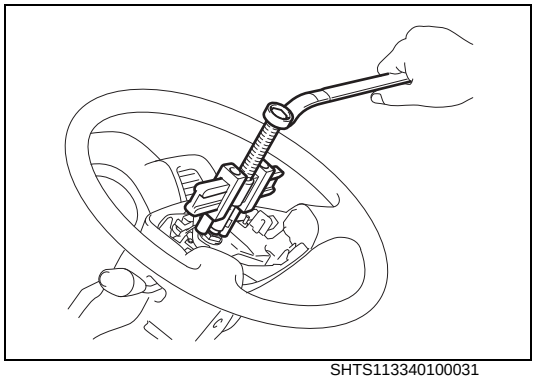

SHTS113340100030

2. REMOVE THE STEERING WHEEL.

(1) Remove the steering wheel mounting nut.

NOTICE

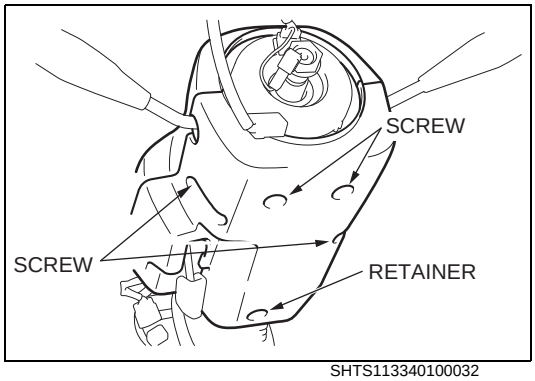
- **To use the spiral cable again, tape it so that the cable does not rotate. Remove the steering wheel after stopping the cable.**
- **Make sure to remove the tape when mounting it again.**


SHTS113340100031

(2) Remove the steering wheel with the special tool.
SST: Puller (S0965-01341)

NOTICE

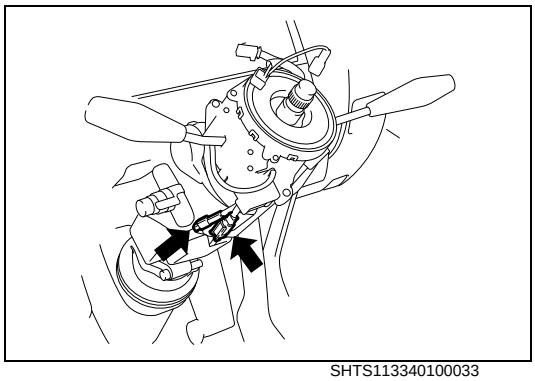
- **Screw the puller sufficiently into the aluminum boss paying attention not to damage the thread.**
- **Make sure to use a puller for removal. Do not apply an excessive load from the prying side. (Do not beat with a hammer.)**



SHTS113340100032

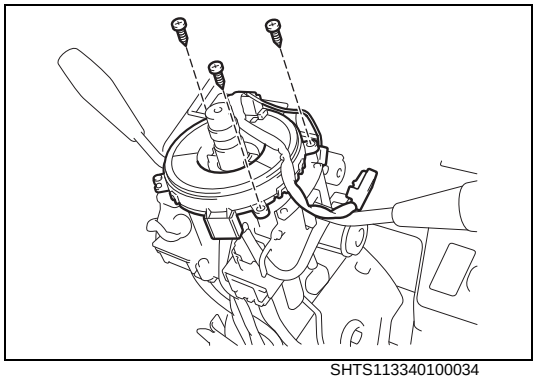
3. REMOVE THE STEERING COLUMN COVER.

(1) Remove the screws and retainer.
(2) Disconnect the connection and remove the steering column cover.

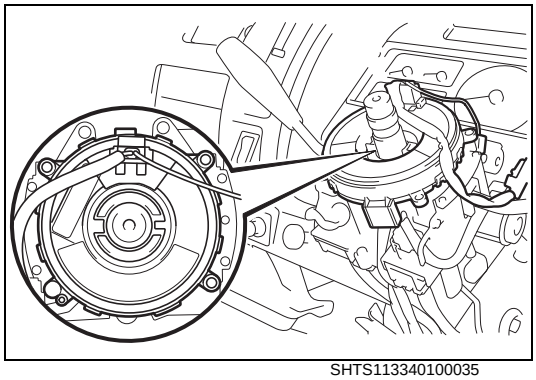

SHTS113340100033

4. REMOVE THE SPIRAL CABLE.

(1) Disconnect the two connectors.

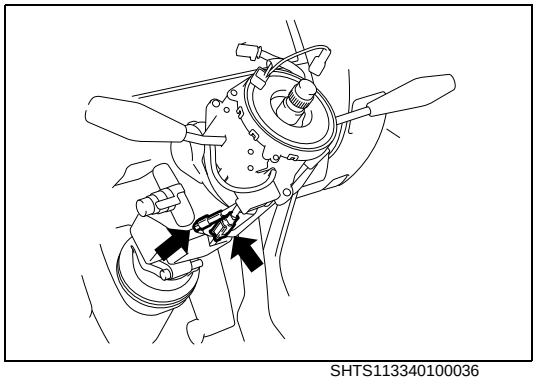

SHTS113340100034

(2) Remove the screws and then the spiral cable.

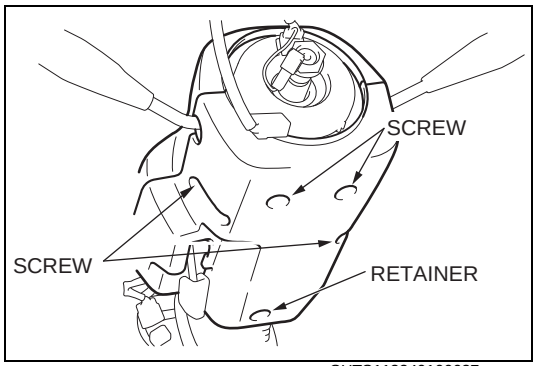

SHTS113340100035

5. MOUNT THE SPIRAL CABLE.

(1) Set the spiral cable in such a manner that it engages with the groove of the combination switch. Tighten and fix it with three screws.
Tightening Torque:
6.9-7.1 N·m {71-72 kgf·cm, 5.1-5.2 lbf·ft}


SHTS113340100036

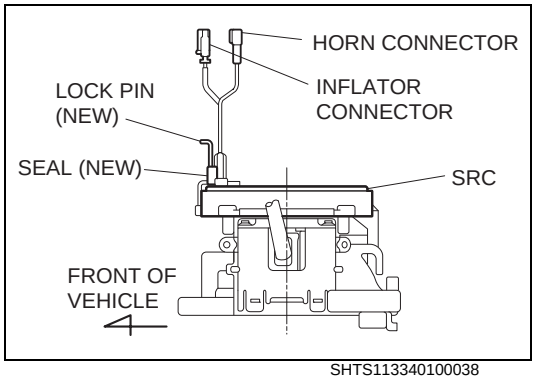
(2) Connect the two connectors.



SHTS113340100037

6. MOUNT THE STEERING COLUMN COVER.

(1) Mount the column cover with screws and a retainer.

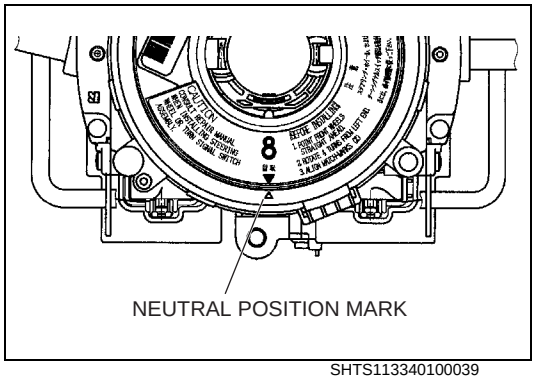


SHTS113340100038

7. MOUNT THE STEERING WHEEL.

(1) Make sure the front wheels are in a straight-ahead condition.

(2) For a new SRC, check if the lock pin and seal of the SRC assembly are not broken. For a recycled SRC, make sure the neutral position is aligned.



SHTS113340100039

NOTICE

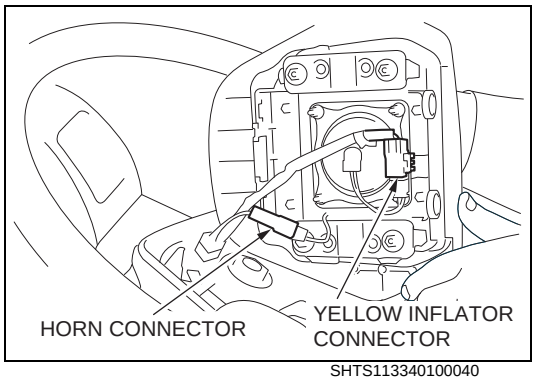
If the lock pin of a new SRC is missing or the seal is cut with the lock pin intact, or if the neutral position of a recycled SRC is not aligned, rotate the SRC lightly counterclockwise. When the movement becomes heavy, turn it four rotations clockwise and align the neutral mark on the SRC assembly.

(3) Put the SRC connector through the steering wheel opening. Mount the steering wheel with a nut aligning to the straight-ahead direction. For a new SRC, remove the lock pin. For a recycled SRC, remove the tape used for stopping the SRC rotation.
Tightening Torque:
48.5-77.5 N·m {500-800 kgf·cm, 36-57 lbf·ft}

(4) Turn the starter switch "ON" before mounting the horn button (airbag module). Delete past malfunctions by the diagnosis monitor or Hino-DX and check if the present malfunction is only "Opening airbag". Turn the starter switch to the "LOCK" position and leave it for more than 90 seconds.
Refer to the section **"SRS AIRBAG AND SEAT BELT WITH PRETENSIONER"** in the chapter **"CAB EQUIPMENT CONTROL"**.

⚠ WARNING

The SRS airbag system has a back-up power source in the ECU for the SRS airbag and seat belt pretensioner and electric charge remains in the ECU for the SRS airbag and seat belt pretensioner for 90 seconds even after the starter key is turned to "Lock" position. To avoid accidental deployment of the SRS airbag, which may cause serious injury or death, never start working with the SRS airbag within at least 90 seconds after the starter key is turned to "Lock" position.



SHTS113340100040

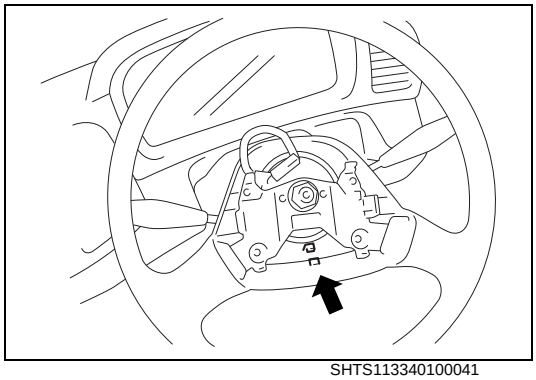
8. MOUNT THE AIRBAG MODULE.

(1) Connect the horn connector.

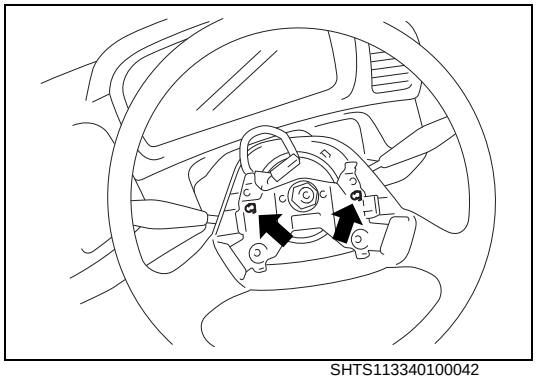
(2) Connect the yellow inflator connector.

NOTICE

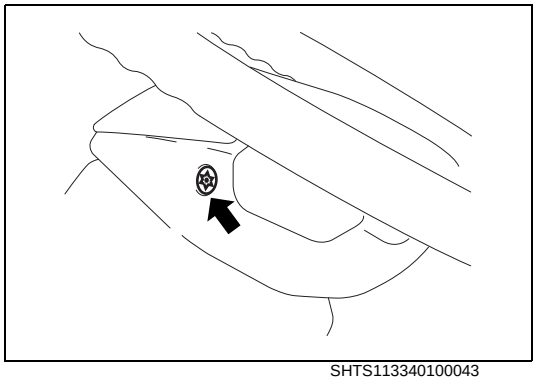
Lock the yellow inflator connector securely.


SHTS113340100041

(3) Fix the horn connector to the fixing hook on the steering wheel side.


SHTS113340100042

(4) Push the airbag module straightly in the direction of the steering shaft. Fix the two temporary fixing pins of the steering wheel body securely to the temporary fixing holes of the airbag module.


SHTS113340100043

(5) Tighten the two set screws using a torx wrench.
Tightening Torque:
6.5-13.5 N·m {66-138 kgf·cm, 4.8-9.9 lbf·ft}

AIRBAG ECU

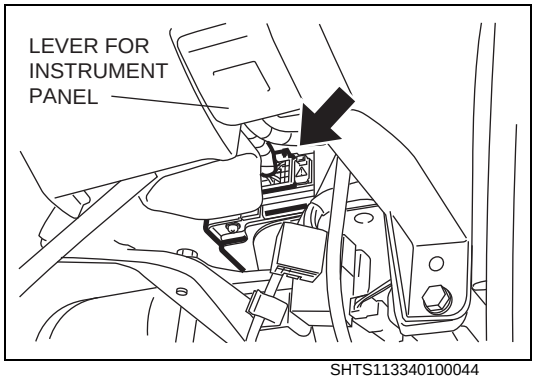
REPLACEMENT

EN1133401H100003

ECU FOR THE SRS AIRBAG AND SEAT BELT PRE-TENSIONER REPLACEMENT

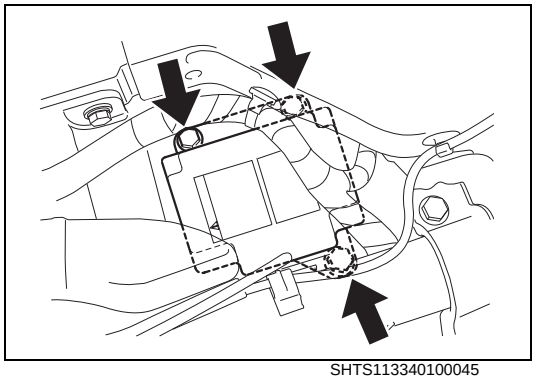
⚠ CAUTION
For your safety, carefully read and observe "CAUTIONS" in "CA01-2", "CA01-3", "CA01-4", "CA01-5" and any cautionary information in this section before conducting any working procedure.

1. REMOVE THE INSTRUMENT PANEL.
(1) Remove the all instrument panel. Refer to the section **"INSTRUMENT PANEL"** in the Chapter **"CAB"**.



SHTS113340100044

2. REMOVE THE ECU FOR SRS AIRBAG AND SEAT BELT PRE-TENSIONER.
(1) Disconnect the yellow connector form ECU.
(2) Remove the ECU tightening bolt.


SHTS113340100045

3. MOUNT THE ECU FOR SRS AIRBAG AND SEAT BELT PRE-TENSIONER.
(1) Mount the ECU with tightening bolt.
Tightening Torque:
4.7-7.1 N·m {48-72 kgf·cm, 3.5-5.2 lbf·ft}

⚠ WARNING
- **Never use an impact wrench for loosening and tightening the ECU for the SRS airbag and seat belt pretensioner mounting bolts and any bolt or nut around the ECU for the SRS airbag and seat belt pretensioner. Using an impact wrench may cause the malfunction of the ECU for the SRS airbag and seat belt pretensioner.**
- **Replace a damaged or deformed ECU with a new one.**

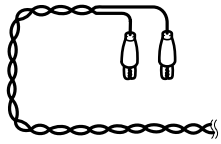
(2) Connect the yellow connector to ECU.

4. MOUNT THE INSTRUMENT PANEL.
(1) Mount the all instrument panel. Refer to the section **"INSTRUMENT PANEL"** in the Chapter **"CAB"**

SEAT BELT WITH ELR PRETENSIONER

SPECIAL TOOL

EN1133401K100002

Illustration	Part number	Tool name	Remarks
	S0963-02210	HARNESS	For seat belt with pretensioner

REPLACEMENT

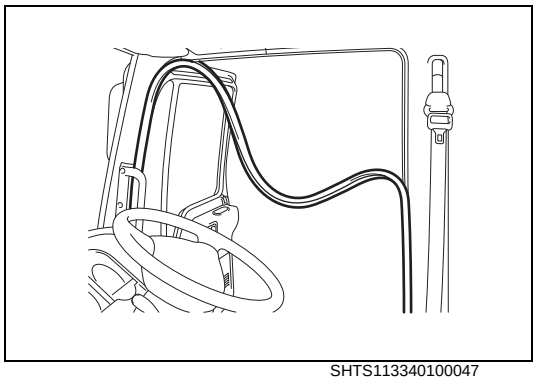
EN1133401H100004

REMOVING OUTER SEAT BELT WITH ELR PRETENSIONER

⚠ CAUTION
For your safety, carefully read and observe "CAUTIONS" in "CA01-2", "CA01-3", "CA01-4", "CA01-5" and any cautionary information in this section before conducting any working procedure.

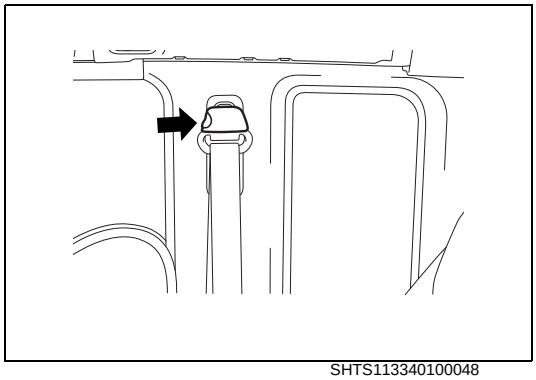
1. REMOVE THE SEAT BELT.

(1) Pull up the weather strip.

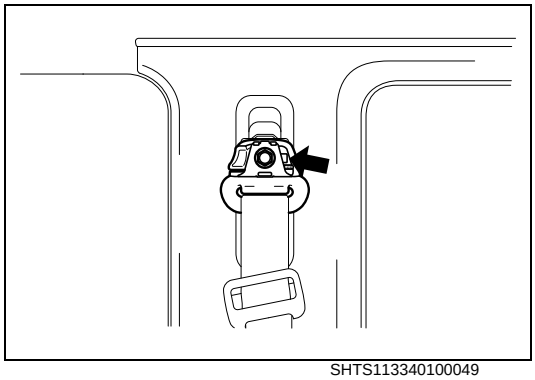


SHTS113340100047

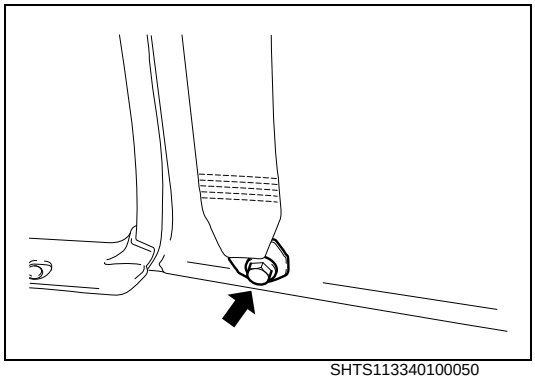
(2) Disconnect the connection of the shoulder anchor cover with a flat blade screwdriver.

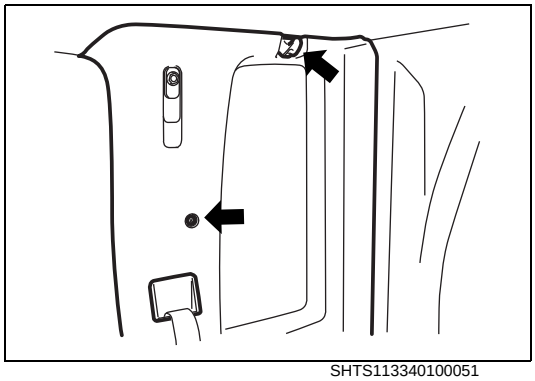


SHTS113340100048

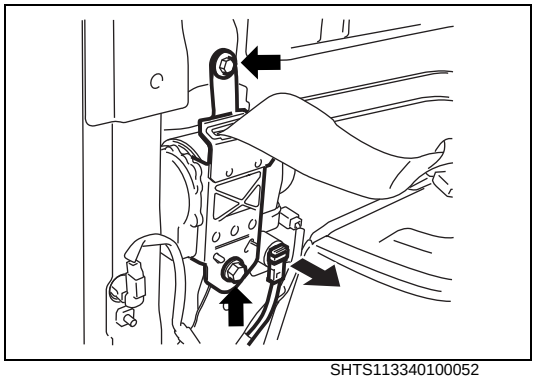

SHTS113340100049

(3) Remove the bolt and then the seat belt anchor.


SHTS113340100050


SHTS113340100051

(4) Open the hook cover and remove the screw and hook.
(5) Remove the retainer and hole cover of the seat belt, and then remove the trim.


SHTS113340100052

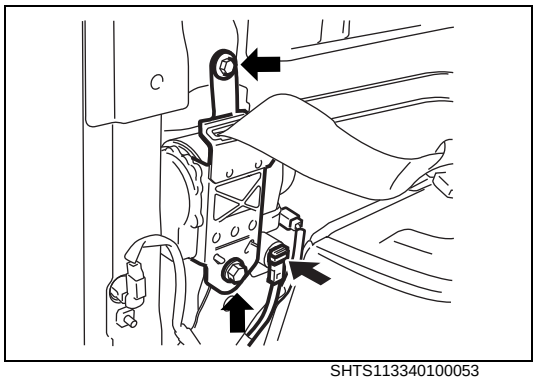
(6) Disconnect the two connectors.

HINT

Disconnect the yellow connector after releasing the lock by pulling up the black portion.

(7) Remove the bolts and then the seat belt with pretensioner.

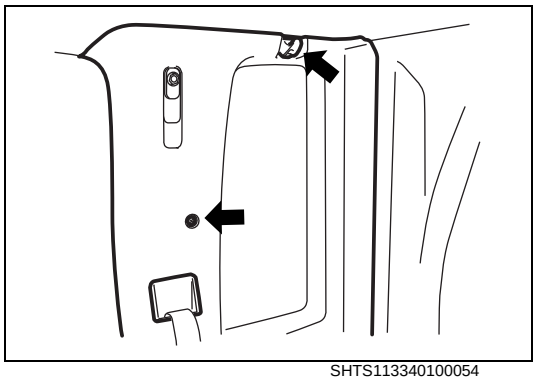
MOUNTING OUTER SEAT BELT WITH ELR PRETENSIONER


SHTS113340100053

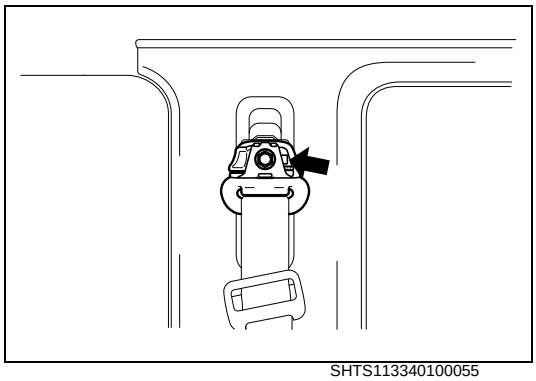
1. MOUNTING SEAT BELT

(1) Mount the seat belt with pretensioner with bolts.
Tightening Torque:
Upper: 4.5-10.5 N·m {46-106 kgf·cm, 3.4-7.7 lbf·ft}
Lower: 29.0-55.0 N·m {296-560 kgf·cm, 22-40 lbf·ft}

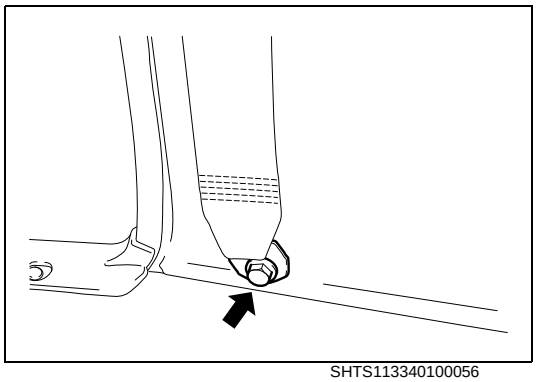
(2) Connect the two connectors.

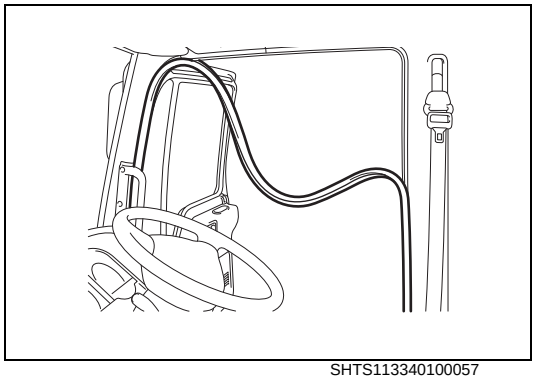

SHTS113340100054

(3) Put the seat belt and hole cover of the seat belt through the trim, and mount the trim.
(4) Mount the hook with a screw.


SHTS113340100055

(5) Mount the seat belt anchor with a bolt.
Tightening Torque:
29.0-55.0 N·m {296-560 kgf·cm, 22-40 lbf·ft}


SHTS113340100056

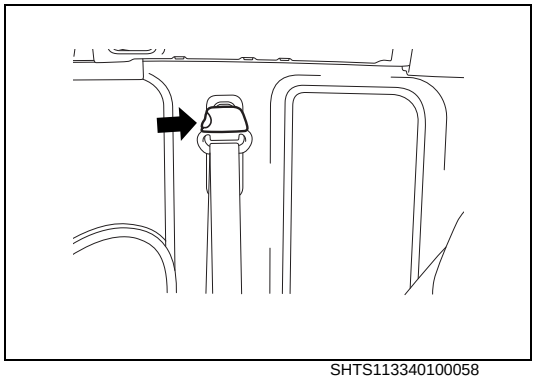


SHTS113340100057

(6) Mount the weather strip.

NOTICE

Align the markings of the weather strip and panel to prevent the weather strip slack.



SHTS113340100058

(7) Mount the shoulder anchor cover.

DISPOSAL PROCEDURES OF THE SEAT BELT PRETENSIONER

EN1133401H300002

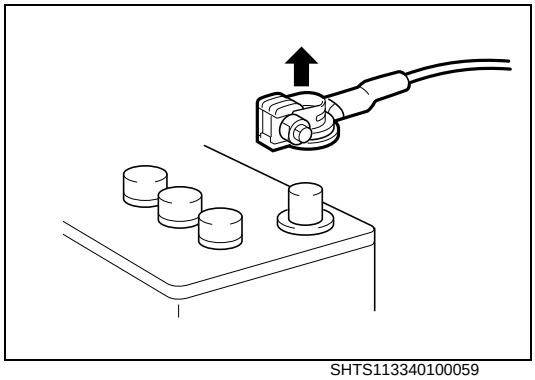
⚠ WARNING

- **When disposing of the vehicle equipped with the seat belt pretensioner, activate the seat belt pretensioner at first in accordance with the disposal procedures provided in this section. Never dispose of the vehicle or the pretensioner without activating the seat belt pretensioner. Otherwise, the seat belt pretensioner may be activated accidentally, which may cause death or serious injury. In the event that the seat belt pretensioner does not activate even if you follow the disposal procedures in this section, stop working and immediately contact the service department of Hino authorized distributor in your country.**
- **Before activating the seat belt pretensioner, confirm that no one is within 5 m {16 ft.} from the pretensioner to be activated. Otherwise, the activating pretensioner may cause serious injury or death.**

⚠ CAUTION

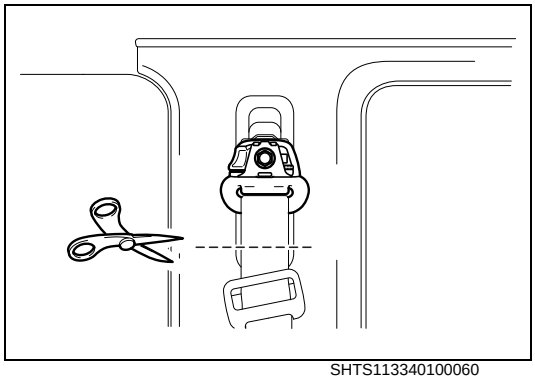
- **As the seat belt pretensioner makes sizable exploding sound when it is activated, wear (and cause persons nearby to wear) ear plugs and perform the activation at an outdoor safe place where the exploding sound will not create a nuisance to nearby residents.**
- **Warn persons around loudly for the exploding sound before the activation of the seat belt pretensioner.**
- **As the seat belt pretensioner becomes very hot after the activation, never touch the pretensioner and leave it untouched for at least 30 minutes after the activation until it cools down.**
- **For your safety, wear gloves and safety glasses when handling the seat belt pretensioner before and after the activation of the pretensioner. If irritants which may be put on the activated pretensioner are put on your skins or eyes, wash and rinse such skins or eyes with sufficient amount of water and consult the doctor.**
- **Always wash your hands with water after completing the disposal procedures.**
- **To prevent irritants which may be adhered to the deployed airbag from being spilled out of the horn button assembly and coming into contact with your skin, do not apply water, oil or other fluid to the seat belt pretensioner trying to cool it down after the activation of the pretensioner.**

OPERATION PROCEDURES AT DISPOSAL OF VEHICLE EQUIPPED WITH SEAT BELT WITH PRETENSIONER (IN-VEHICLE ACTIVATION)

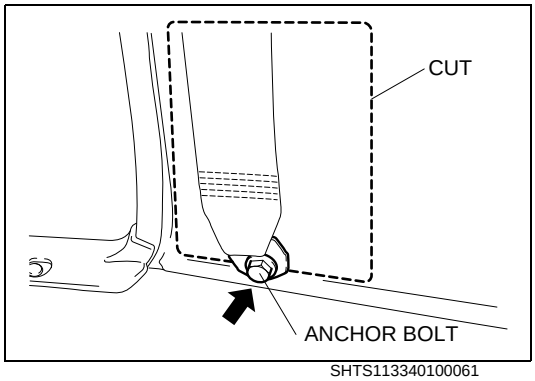

SHTS113340100059

1. OPERATION PROCEDURES

(1) Move the vehicle where safety is secured. Close all windows.
(2) Turn the starter switch to the "LOCK" position and remove the negative battery terminal of the vehicle. Leave it for more than 90 seconds.

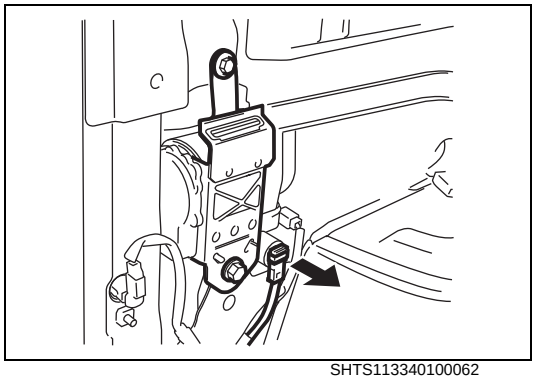

SHTS113340100060

(3) Remove the bed if equipped and then the bar supporting the bottom of the bed.
(4) Cut the seat belt with scissors.



SHTS113340100061

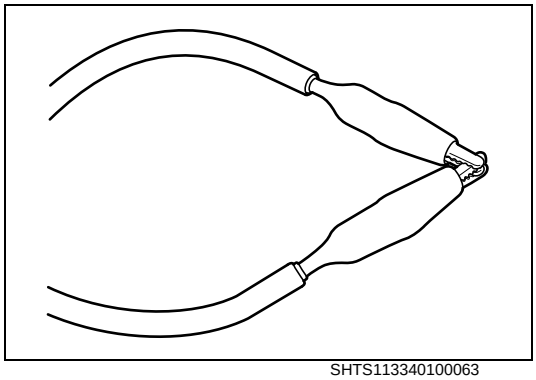
(5) Remove the anchor bolt.
(6) Notch the quarter trim with scissors or a cutter.


SHTS113340100062

(7) Disconnect the yellow connector of the pretensioner harness.

NOTICE

Before the operation, check that more than 90 seconds have passed since disconnecting the negative battery terminal of the vehicle.

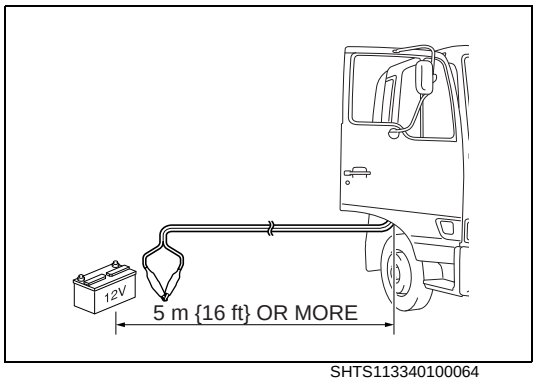

SHTS113340100063

(8) Connect the special tool to the pretensioner harness.
(9) Short-circuit the special tool.
SST: Harness (S0963-02210)

⚠ WARNING

- **Be sure to connect the both ends of the plugs of the special tool as shown in the left figure. If both ends of the plugs are disconnected, the seat belt pretensioner may be accidentally activated by static electricity during the activation procedure of the seat belt pretensioner, which may cause death or serious injury.**
- **To avoid death or serious injury during the process of activating the seat belt pretensioner, observe the following procedure.**

(10) Confirm there is no one in and within 5 m {16 ft.} from the cab.
(11) Close all the doors and windows of the vehicle.
(12) Place a battery (12V) 5 m {16 ft.} away from the vehicle with the special tool of the harness fully stretched.
(13) If there is any damage with the glass of any window of the vehicle, cover all the damaged windows of the vehicle with the sheets such as plastic sheet as they may brake and flaw into pieces by the activation of the seatbelt pretensioner.



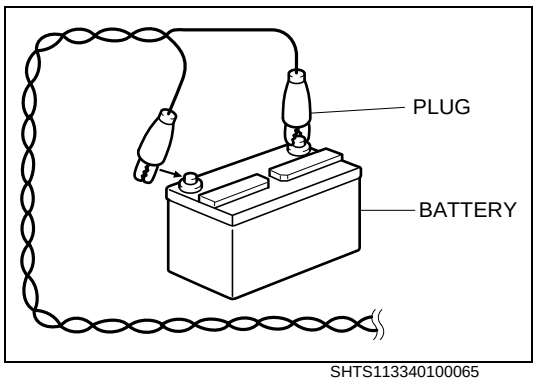
SHTS113340100064

(14) Connect one of the special tool plugs to the battery terminal.

HINT
Either terminal can be connected.

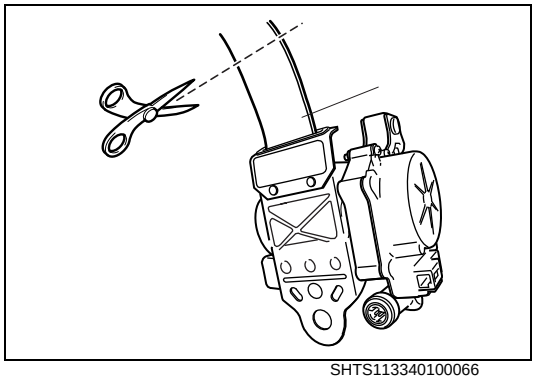
(15) Connect the other side of the plugs to the battery to activate the pretensioner.

NOTICE
Warn the people around loudly before the operation.



SHTS113340100065

ACTIVATION PROCEDURES AT DISPOSAL OF VEHICLE EQUIPPED WITH SEAT BELT WITH PRETENSIONER (ACTIVATION OUTSIDE THE VEHICLE)



SHTS113340100066

1. REMOVING SEAT BELT WITH PRETENSIONER

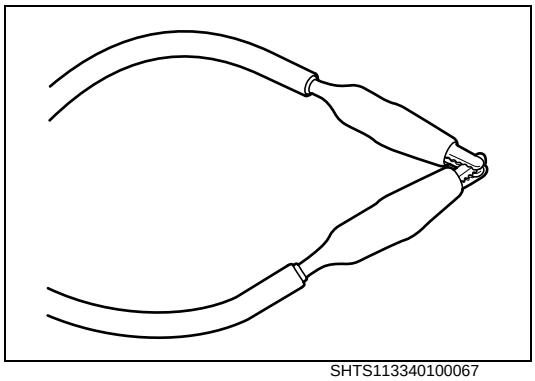
(1) Refer to **"REPLACEMENT"** in the section **"SEAT BELT WITH ELR PRETENSIONER"**.

2. OPERATION PROCEDURES

(1) Pull out the webbing fully and cut it at the base of the retractor frame

⚠ CAUTION

Never place fingers on and around the drum to avoid your fingers being cut by the webbing being rolled. The drum starts to rotate swiftly upon cutting the webbing.

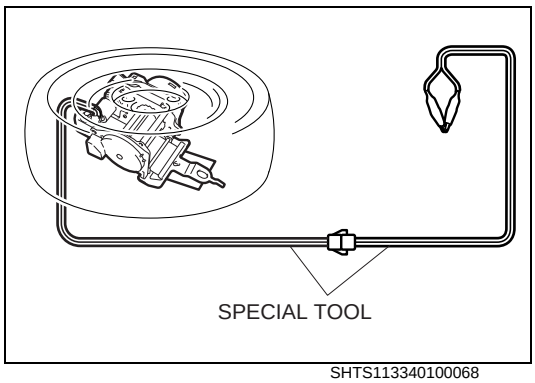


SHTS113340100067

⚠ WARNING

- **Be sure to use the special tool designated in below (2).**
- **Before use of the special tool, check if it does not have a snapping, short-circuit or burns or other damage.**
- **Be sure to connect each end of the special tool at one end as shown in left figure. Otherwise, the seat belt pretensioner may be accidentally activated, resulting in death or serious injury.**

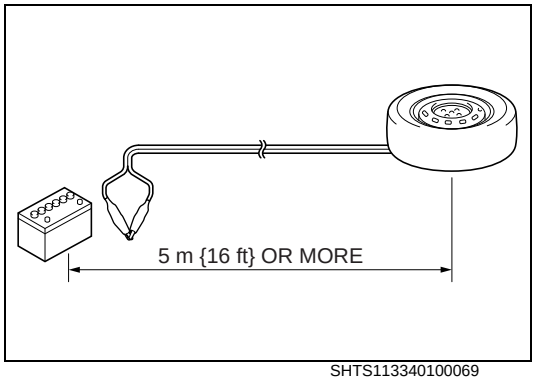
(2) Connect each end of the special tool below at one end as shown in the left figure.
SST: Harness (S0963-02210)



SHTS113340100068

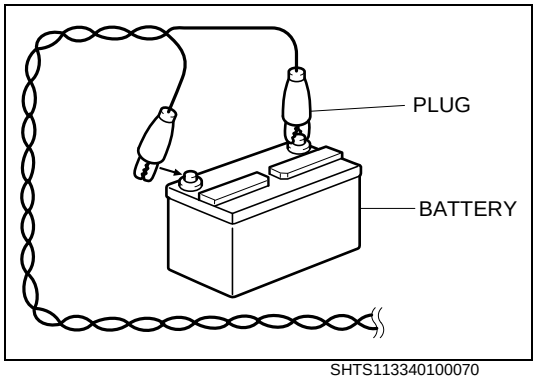
(3) Place the pretensioner on a flat hard surface so that it is balanced. Cover it with a tire with disc wheel.

(4) Make sure there is no inflammable material or object that may be flicked off by the pretensioner operation within 1.8 m {70 in.} from the pretensioner.



SHTS113340100069

(5) Place a battery (12V) where the special tool harness is fully stretched (more than 5 m {16 ft} away from the pretensioner).



SHTS113340100070

(6) Connect one of the special tool plugs to the battery terminal.

HINT

Either terminal can be connected.

(7) Connect the other side of the plugs to the battery to activate the pretensioner.

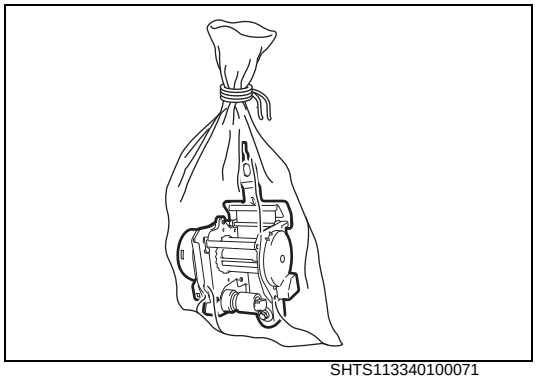
NOTICE

Warn the people around loudly before the operation.

DISPOSAL PROCEDURES OF PRETENSIONER

⚠ CAUTION

- **As the seat belt pretensioner becomes very hot after the activation, never touch the pretensioner and leave it untouched for at least 30 minutes after the activation until it cools down.**
- **For your safety, wear gloves and safety glasses. If irritants which may be put on the activated pretensioner are put on your skins or eyes, wash and rinse such skins or eyes with sufficient amount of water and consult the doctor.**
- **Always wash your hands with water after completing the disposal procedures.**
- **To prevent irritants which may be adhered to the activated seat belt pretensioner from being spilled out of the seat belt pretensioner and coming into contact with your skin, do not apply water, oil or other fluid to the seat belt pretensioner trying to cool it down after the activation of the pretensioner.**


SHTS113340100071

DISPOSE OF THE ACTIVATED PRETENSIONER AS IN THE PROCEDURES BELOW.

1. DISPOSAL

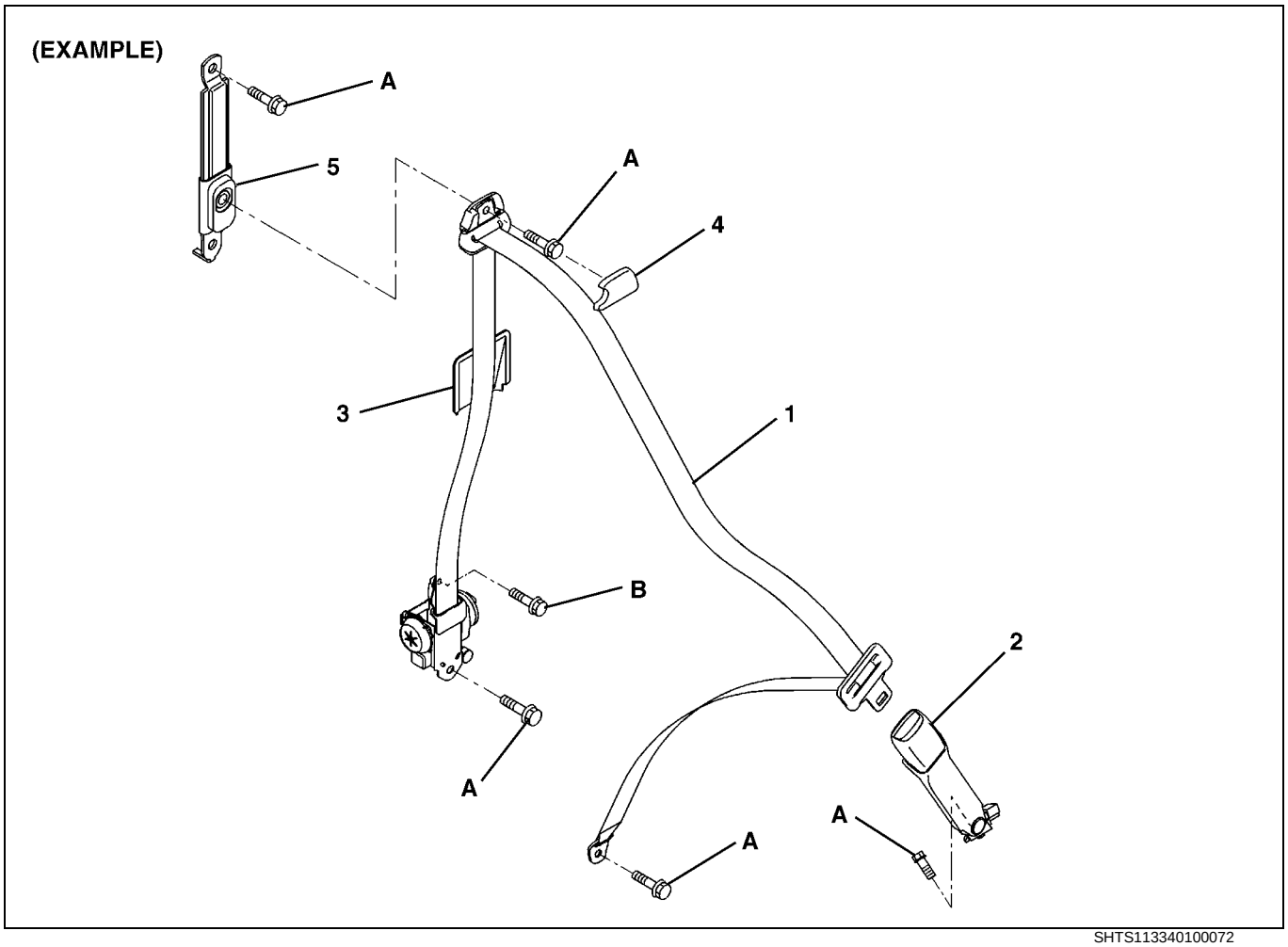
(1) Make sure the pretensioner is completely cooled down.

(2) Put it in a strong plastic bag and seal it.

SEAT BELT

COMPONENT LOCATOR

EN1133401D100001



SHTS113340100072

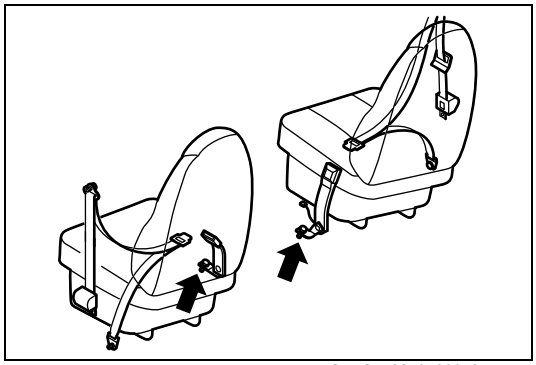
1	Outer seat belt subassembly	4	Outer belt seat belt cover
2	Inner right seat belt subassembly	5	Seat belt adjuster assembly
3	Seat belt guide		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	29.0-55.0 {296-560, 22-40}	B	4.5-10.5 {46-106, 3.4-7.7}

REPLACEMENT

EN1133401H100005



SHTS113340100073

1. REMOVE THE OUTER SEAT BELT WITH ELR PRETENSIONER OF THE DRIVER'S SEAT.

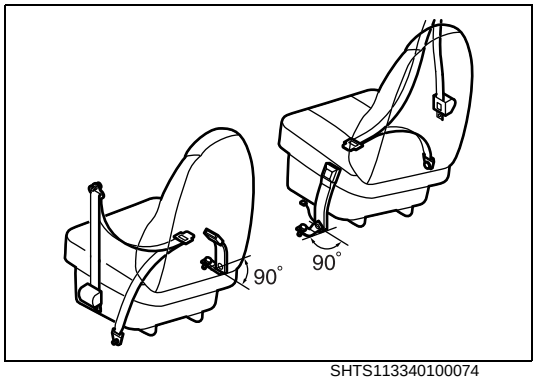
(1) Refer to **"REPLACEMENT"** in the section **"SEAT BELT WITH ELR PRETENSIONER"**.

HINT

Procedures for replacement of the outer seat belt with ELR of the assistant driver's seat are same as those for the seat belt with ELR pretensioner of the driver's seat.

2. REMOVE THE INNER SEAT BELT.

(1) Remove the anchor bolt and then the inner seat belt.



SHTS113340100074

3. MOUNT THE INNER SEAT BELT.

(1) Mount the inner seat belt in such a manner that the anchor plate is set along with the cab floor bead.
Tightening Torque:
29.0-55.0 N·m {296-560 kgf·cm, 22-40 lbf·ft}

4. MOUNT THE OUTER SEAT BELT WITH ELR PRETENSIONER OF THE DRIVER'S SEAT.

(1) Refer to **"REPLACEMENT"** in the section **"SEAT BELT WITH ELR PRETENSIONER"**.

HINT

Procedures for replacement of the outer seat belt with ELR of the assistant driver's seat are same as those for the outer seat belt with ELR pretensioner of the driver's seat.

CAB

CA02-001

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CAB ASSEMBLY

DATA AND SPECIFICATIONS

EN11Z1202I200001

CAB

Models	Except for Double cab, GH (For Ireland), FT, GT single cab	Double cab, FT, GT single cab	GH (For Ireland)
Type	All steel welded construction, safety glass fitted to all windows		
Tilt system	Torsion bar	Oil jack	
Tilt angle	44° ("Over-tilt" position: 50°)	39°	42°

TILT PUMP

Pump	Type		Single plunger type
	Relief valve pressure		34.3-37.2 MPa {350-380 kgf/cm^2, 4,977-5,404 lbf/in.^{2}}
	Discharge pressure and discharge quantity	Rating pressure	19.6 MPa {200 kgf/cm^2, 2,844 lbf/in.^{2}}
		Electric drive	460 cm^3/min.
		Manual operate	19 cm^3/30 stroke or more
Motor	Type		Compound winding type
	Nominal output		0.3kW
	Voltage		24V
	Rotating		Clockwise (seen from output shaft)
	Ground type		Body earth

TILT CYLINDER

Model		Double cab	GH (For Ireland), FT, GT single cab
Type		Double action type	Single action type
Max. length		630.2-633.1 mm {24.82-24.92 in.}	703.7-705.5 mm {27.70-27.77 in.}
Min. length		387.6-389.2 mm {15.26-15.32 in.}	432.4-433.5 mm {17.02-17.06 in.}
Max stroke		241.9-244.4 mm {9.53-9.62 in.}	270.3-272.4 mm {10.64-10.72 in.}
Output	Extension	39,700 N {4,050 kgf, 8,925 lbf} or more	22,600 N {2,306 kgf, 5,085 lbf}
	Retraction	17,000 N {1,730 kgf, 3,822 lbf} or more	12,800 N {1,306 kgf, 2,880 lbf}

TROUBLESHOOTING

EN11Z1202F300001

CAB TILT [EXCEPT FOR DOUBLE CAB, GH (FOR IRELAND), FT, GT SINGLE CAB]

Symptom	Possible cause	Remedy/Prevention
Cab does not tilt up.	Cab mounting hook does not release.	Inspection of cab mounting hook mechanism.
	Safety rod does not release.	Inspection of safety rod mechanism.
	Damaged torsion bar	Replace torsion bar.
Cab tilting is difficult.	Heavy items in or attached to cab	Adjustment of shim for anchor lever or removal of the heavy items.
	Tilt up force is weak.	Adjustment of shim for anchor lever. Replace torsion bar.
Cab does not lock to cab mounting member.	Mounting hook does not operate.	Adjustment of mounting hook mechanism.
	Cab mounting cushion is not correctly installed.	Correct installation of cab mounting.

CAB TILT BY MOTOR DRIVE MECHANISM

Symptom	Possible cause	Remedy/Prevention
Cab not tilting.	Cab lock hook not released	Adjust cab lock.
	Abnormality of tilt pump and/or cylinder.	Replace tilt pump and/or cylinder.
It takes a time for cab tilting.	Too many accessories on cab	Decrease of the accessories.
	Abnormality of tilt pump and/or cylinder.	Replace tilt pump and/or cylinder.
	Drop-off of battery voltage	Inspect and charge battery.
Cab falling down but not correctly locked.	Cab lock hook does not operate.	Adjust cab lock portion. (Adjust RH/LH direction of striker pin)
	Position misalignment of cab mounting rubber.	Adjust cab mounting rubber position.
Cab not tilting (Not raising) → Motor rotates but cab not raising → Cab almost does not move → Motor sound very light (High rotation).	Air suction of pump	Inspect oil level.
	Sealing defect of pump and/or valve	Disassemble and inspect. (Replace O-ring, etc.)
Cab not tilting (Not raising) → Motor rotates but cab not raising → Cab almost does not move → Motor sound very loud (High load).	Crushing or clogging of hose	Replace hose.
	Switching lever is positioned at "DOWN" position.	Operate at "UP" position.
	Clogging of cylinder	Clean.
	Abnormality of pump or cylinder	Inspect pump and cylinder.
	Too heavy load on cab	Inspect.
	Adhesion of snow, ice etc. on cab	Inspect.
	Anchoring of cab tilt hinge pin	Inspect.
Cab not tilting (Not raising) → Motor rotates but cab not raising → Stopped on the way (Stopping at nearby position to unlock cab lock.).	Too heavy load on cab	Inspect.
	Adhesion of snow, ice etc. on cab	Inspect.
	Anchoring of cab tilt hinge pin	Inspect.
	Relief valve pressure of pump is too low.	Check and adjust relief valve pressure.
	Abnormality of pump (not ascending up to relief valve pressure)	Disassemble and inspect.
	Defect of cab lock	Inspect cab lock.
	Big misalignment in lateral direction of cab lock and floating bar	Inspect lateral misalignment amount of cab. Inspect horizontal level of vehicle. Apply grease to pin portion.

Symptom	Possible cause	Remedy/Prevention
Cab not tilting (Not raising) → Motor rotates but cab not raising → Stopped on the way (Half tilted and stopped).	Excessive oil pouring	Inspect oil level.
	Oil shortage (air suction)	Correct cap position or fill oil.
	Cylinder scratching, bending, interference, etc.	Repair.
Cab not tilting (Not raising) → Motor does not rotate → Buzzer does not beep.	Blowout of fuse, defective contact of terminals.	Inspect circuit or replace fuse.
Cab not tilting (Not raising) → Motor does not rotate → Buzzer does not beep → Cab lock switch does not operate.	Defective installation of cab lock switch	Adjust position of switch.
	Defect of cab lock switch	Replace switch.
Cab not tilting (Not raising) → Motor does not rotate → Buzzer does not beep → Cab stopper switch does not operate → Cab position switch does not operate.	Defective installation of cab stopper switch	Adjust position of switch.
	Defect of cab stopper switch	Replace switch.
Cab not tilting (Not raising) → Motor does not rotate.	Battery not charged (starter does not rotate)	Inspect and charge battery.
Cab not tilting (Not raising) → Motor does not rotate → No operating sound by power relay → No voltage on relay excitation circuit when turning on operation switch.	Failure of operation switch	Replace switch.
Cab not tilting (Not raising) → Motor does not rotate → No operating sound by power relay.	Failure of relay	Replace relay.
Cab keeping tilted and not falling down → Motor rotates but cab not falling down → Cab almost does not move. → Motor sound very light.	Air suction of pump	Inspect oil level.
	Sealing defect of pump and/or valve	Disassemble and inspect.
Cab keeping tilted and not falling down → Motor rotates but cab not falling down → Cab almost does not move → Motor sound very loud.	Bad sliding of sliding part between plunger and thrust plate	Apply grease or inspect.
	Faulty installation of pump switching valve	Install valve correctly.
	Cab stopper strongly caught up in stopper lever	Tilt cab with manual pump.
Cab keeping tilted and not falling down → Motor does not rotate → Buzzer does not beep.	Blowout of fuse, defect of terminal contact	Inspect circuit or replace fuse.
Cab keeping tilted and not falling down → Motor does not rotate.→ Buzzer does not beep → Cab lock switch does not operate.	Defective installation of cab lock switch	Adjust position of switch.
	Defect of cab lock switch	Replace switch.
Cab keeping tilted and not falling down → Motor does not rotate → Buzzer does not beep → Cab stopper switch does not operate → Cab position switch does not operate.	Defective installation of cab stopper switch	Adjust position of switch.
	Defect of cab stopper switch	Replace switch.
Cab keeping tilted and not falling down → Motor does not rotate.	Battery not charged (starter does not rotate)	Inspect and charge battery.
Cab keeping tilted and not falling down → Motor does not rotate → No operating sound by power relay → No voltage on relay excitation circuit when turning on operation switch.	Failure of operation switch	Replace switch.
	Failure of relay	Replace relay.

Symptom	Possible cause	Remedy/Prevention
Tilted cab naturally falling down → Cab stopper caught up after tilting cab → Cab quickly falling down when releasing the hand from operation switch.	Cylinder out of order	Disassemble and inspect cylinder
	Check valve seal failure	Disassemble and inspect cylinder
	Pilot piston failure	Disassemble and inspect cylinder
	Piston O-ring failure	Disassemble and inspect cylinder
Tilted cab naturally falling down → Cab stopper caught up after tilting cab → Cab momentarily falling down when operating switching lever (From "UP" to "DOWN").	Faulty operation of cylinder pilot check valve	Disassemble and inspect cylinder.
Tilted cab naturally falling down → Cab stopper caught up after tilting cab → Once cab left tilted for long time, cab falling down and cab stopper locked, which can not be removed.	Cylinder out of order	Disassemble and inspect cylinder
	Check valve seal failure	Disassemble and inspect cylinder
	Pilot O-ring failure	Disassemble and inspect cylinder
	Piston O-ring failure	Disassemble and inspect cylinder
	Faulty operation of cylinder of cylinder pilot check valve	Disassemble and inspect cylinder
Tilting speed is different from usual.	Too heavy load on cab	Inspect.
	Adhesion of snow, ice etc. on cab	Inspect.
	Anchoring of cab tilt hinge pin	Inspect.
	Relief valve pressure of pump is too low.	Check and adjust relief valve pressure.
	Abnormality of pump (not ascending up to relief valve pressure)	Inspect pump.
	Drop-off of battery voltage	Inspect and charge battery.
	Performance deterioration of motor	Inspect and repair motor.
	Resistance increase due to improper oil (low temperature, high viscosity)	Replace all oil to cylinder, pump and piping.
	Performance deterioration of pump	Replace all oil to cylinder, pump and piping.
Oil leaks from pipe hose joint	Faulty of pipe joint	Retighten or replace pipe.
Oil leaks from cylinder	Faulty of O-ring	Replace O-ring
Oil leaks from pump	Damage of O-ring	Replace O-ring
Oil leaks from motor	Damage of oil seal	Replace oil seal
Buzzer does not stop to beep → When cab fulling down.	Defective adjustment of cab lock portion or faulty operation of cab lock switch	Inspect and adjust.
	Cab not locked (faulty operation)	Inspect and replace cab lock.
	Defective adjustment or faulty operation of stroke switch	Inspect and adjust.
Buzzer does not stop to beep → When cab tilting up.	Faulty installation	Adjust position of switch.
	Defect of parts	Replace switch.
Cab tilting but buzzer does not beep.	Defective contact of terminals	Inspect connectors.
	Defect of buzzer	Replace buzzer.
Abnormal sound under frontal part of cab floor.	Looseness of cylinder installing pin portion	Inspect, repair or replace.
	Looseness of shock absorber installing pin portion	Inspect, repair or replace.
	Looseness of tilt hinge pin portion	Inspect, repair or replace.

Symptom	Possible cause	Remedy/Prevention
Abnormal sound from cab back panel.	Damage of protector at cab lock pin portion	Inspect, repair or replace.
	Looseness of shock absorber installing pin portion	Inspect, repair or replace.
	Looseness of lateral rod pin portion.	Inspect, repair or replace.
	Cab lock not operating (cab lock operated under tilted cab condition)	Return of cab lock back to correct condition.
Abnormal sound in tilting cab.	Run out of grease in piston rod	Apply grease to piston rod, inspect or replace.

DOOR

Symptom	Possible cause	Remedy/Prevention
Door does not close properly.	Door is not adjusted	Adjust door installing.
	Striker is not adjusted	Adjustment of shim for door lock striker
	Damaged door lock	Replace door lock.
Door does not lock by inside lock knob.	Deformation of rod	Replace rod.
	Rod is disconnected	Connect rod.
	Damaged door lock	Replace door lock.
Door does not lock by key.	Rod is disconnected	Connect rod.
	Damaged door lock	Replace door lock.
	Damaged lock cylinder	Replace lock cylinder.
Door does not open by outside handle.	Outside handle push rod is not adjusted.	Adjust push rod.
	Damaged door lock	Replace door lock.
Door does not open by inside handle.	Inside handle is not installed properly.	Install inside handle properly.
	Deformation of rod	Replace rod.
	Rod is disconnected.	Connect rod.
	Damaged door lock	Replace door lock.
Inside handle does not return to its normal position.	Interference between rods.	Replace rod.
	Inside handle is not installed properly.	Adjust inside handle.
	Return spring is damaged.	Replace inside handle.
Door window goes down while driving.	Window is not in the glass holder.	Repair.
	Regulator is damaged.	Replace regulator.
Regulator makes abnormal noise while driving.	Window sill weather strip is installed improperly.	Install properly or replace clips.

BLOWER

Symptom	Possible cause	Remedy/Prevention
Malfunction of blower when power is ON.	Blown fuse	Change fuse or check for short circuit.
	Malfunction in heater relay	Inspect relay.
	Malfunction of heater blower switch	Inspect power switch.
	Malfunction of register	Check register.
	Blower motor malfunction	Replace motor.
	Damaged electrical wiring or poor grounding	Repair as necessary.

DISMOUNTING AND MOUNTING [EXCEPT FOR GH (FOR IRELAND)]

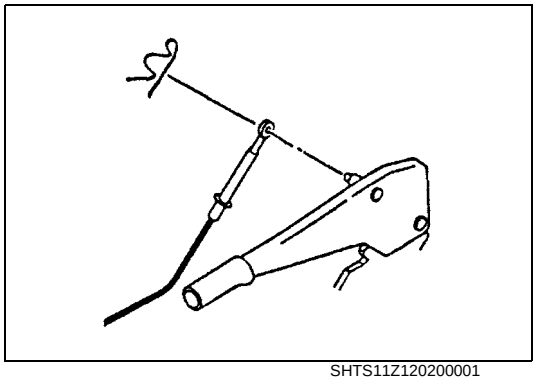
EN11Z1202H100001

1. BEFORE DISMOUNT THE CAB

- Be sure to block the front wheels.
- Disconnect the battery cable from the battery ground terminal.
- Drain engine coolant, clutch fluid and refrigerant of the air conditioner.

2. CAB INSIDE

(1) Remove the parking brake cable retainer spring and pin. (Models with center parking brake)

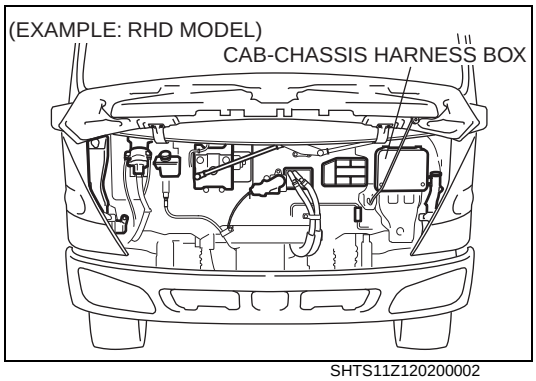


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3. CAB FRONT SIDE

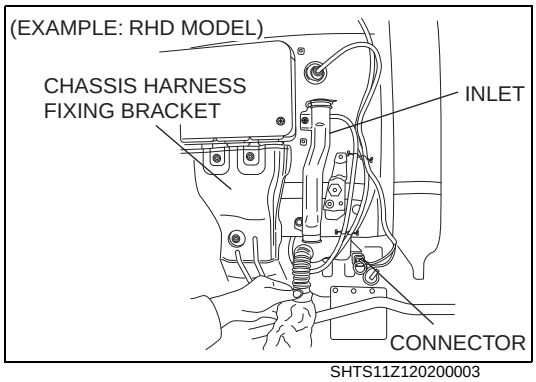
(1) Remove the front bumper and open the front panel.

(2) Remove the cab-chassis harness box lid and disconnect all the connectors of the harness connected to the cab and chassis.

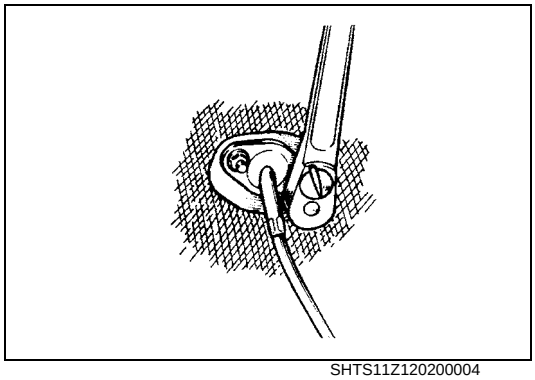


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(3) Disconnect the inlet hose from washer tank.

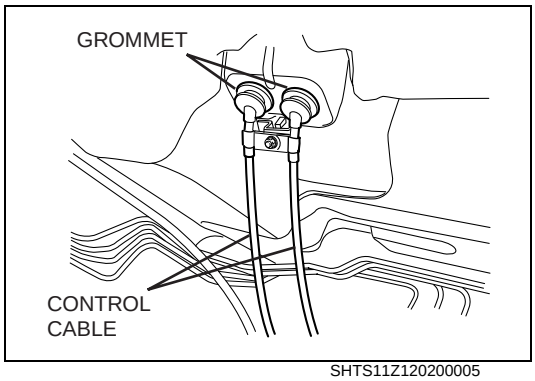


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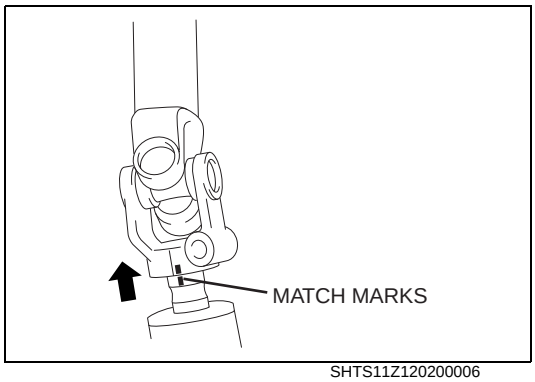
4. AFTER TILTING THE CAB

(1) Disconnect the parking brake cable (only models with center parking brake).



SHTS11Z120200005

(2) Disconnect the transmission control cables.
(3) Remove the harness clips located under the floor of the cab. Disconnect the air brake hoses and clutch hose.
(4) Remove the cab stopper release cable (If so equipped).



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5. STEERING SHAFT YOKE

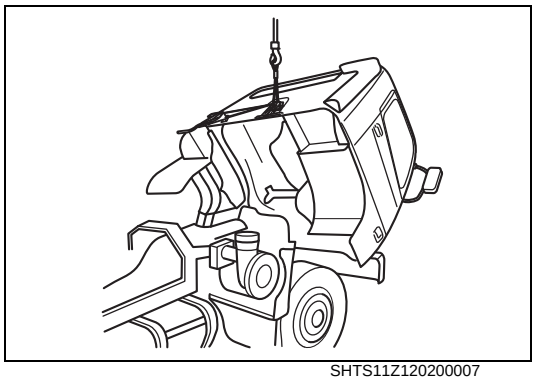
(1) Make match marks on both the steering shaft and shaft yoke.

(2) Separate the steering shaft yoke.

6. HEATER HOSES

NOTICE

Do not remove the heater hoses by pulling or twisting forcibly. If the hoses are not easily removed, cut the hoses horizontally to remove.

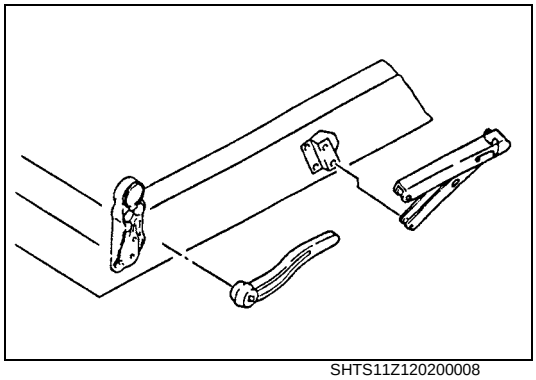

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7. REMOVE ANCHOR LEVER

(1) Raise the cab to OVER-TILT position.
Refer to "**CAB TILT OPERATING TENSION ADJUSTMENT (1) OVER-TILT**".
Suspend the cab with crane or hoist as shown in figure.

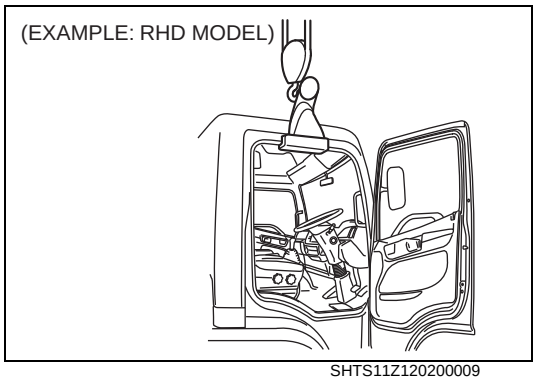
⚠ CAUTION

Do not raise cab excessively, because the cab will fall forward.


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(2) Remove the set screws of the anchor lever, and pull out the anchor levers.
Remove the cab stopper stay.
Slowly lower the cab with crane or hoist.

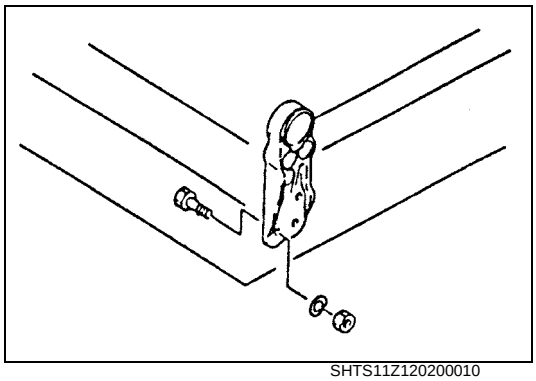
⚠ DANGER
Never go under the cab when lowering the cab. It is very dangerous.



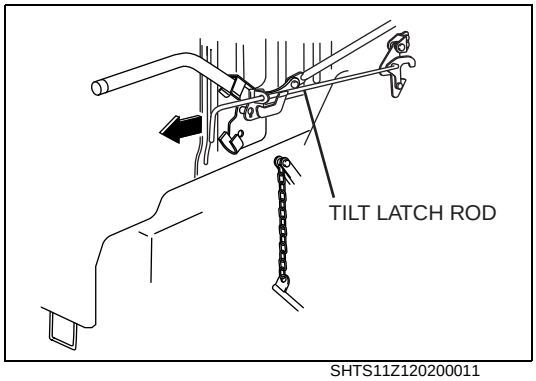
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8. DISMOUNTING CAB ASSEMBLY

(1) Open the doors and hook the hooks of the cab lifting device.


SHTS11Z120200010

(2) Initially raise the cab so that most of its weight is borne by the lifting device, then remove the bolts of the tilt hinge brackets.



SHTS11Z120200011

(3) Pull the cab tilt latch rod and lift the cab slowly.

NOTICE
Make sure that all of connecting parts are disconnected.

(4) Set the cab on a cab stand.

9. CAB MOUNTING

(1) Pay attention to the points below, and mount in the reverse order of dismounting.

1. Steering sliding shaft inserting
2. Anchor lever fitting position
3. Damage or interference of harness wire, cable and hose

DISMOUNTING AND MOUNTING [GH (FOR IRELAND)]

EN11Z1202H100002

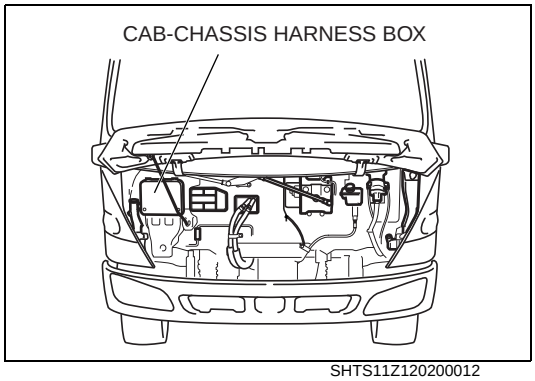
1. BEFORE DISMOUNTING THE CAB

- Be sure to block the front wheels.
- Disconnect the battery cable from the battery ground terminal.
- Drain engine coolant, clutch fluid and refrigerant of the air conditioner.

2. CAB FRONT SIDE

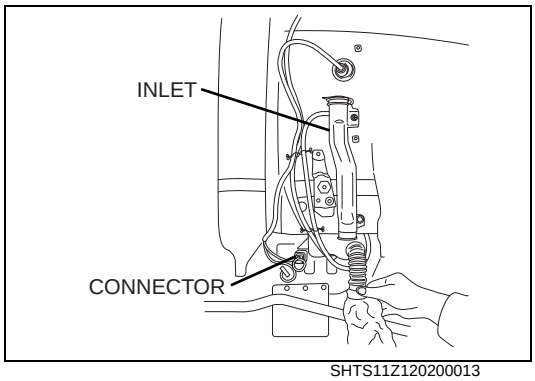
(1) Remove the front bumper and open the front lid.

(2) Remove the cab-chassis harness box lid and disconnect all the connectors of the harness connected to the cab and chassis.



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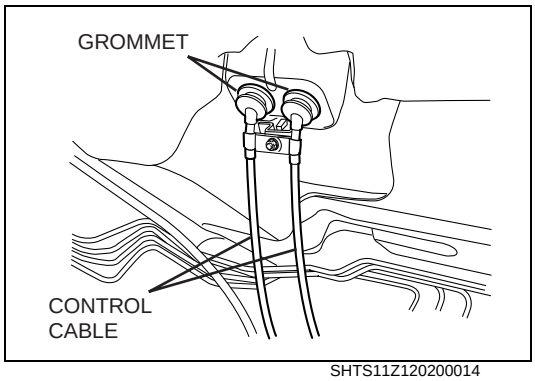
(3) Disconnect the inlet hose from washer tank.



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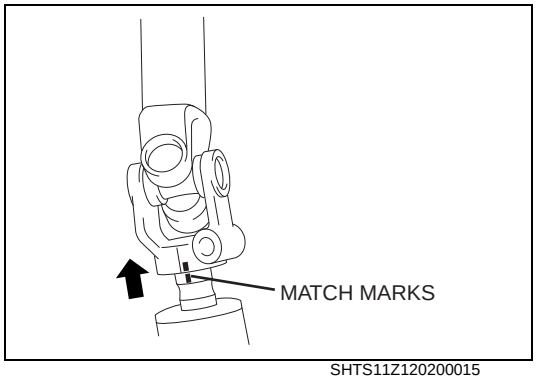
3. AFTER TILTING THE CAB

(1) Disconnect the transmission control cables.



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(2) Remove the harness clips located under the floor of the cab. Disconnect the air brake hoses and clutch hose.



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4. STEERING SHAFT YOKE

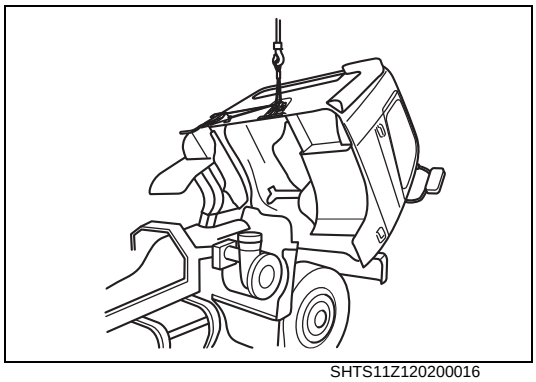
(1) Make match marks on both the steering shaft and shaft yoke.

(2) Separate the steering shaft yoke.

5. HEATER HOSES

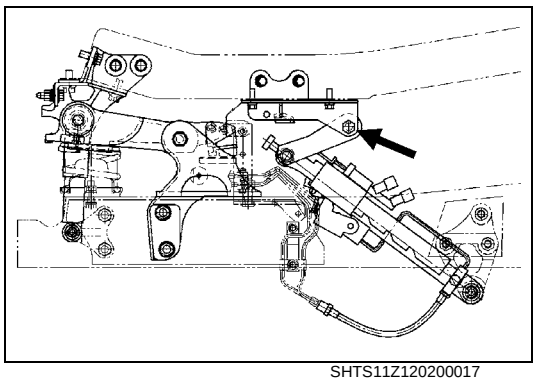
NOTICE

Do not remove the heater hoses by pulling or twisting forcibly. If the hoses are not easily removed, cut the hoses horizontally to remove.

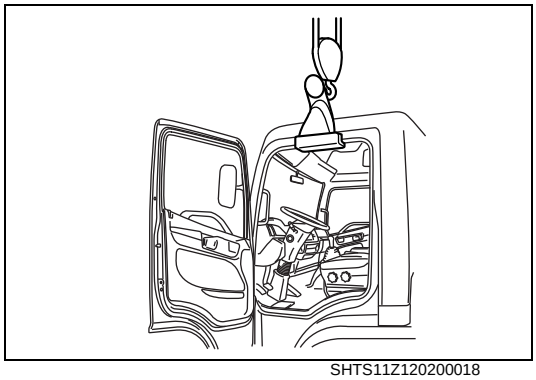

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6. TILT CYLINDER

(1) Suspend the cab with crane or hoist as shown in figure.


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(2) Remove the upper setting pin of the tilt cylinder.

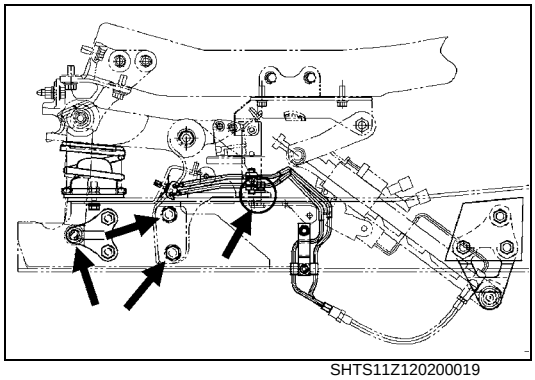

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7. DISMOUNTING CAB ASSEMBLY

(1) Open the doors and hook the hooks of the cab lifting device.

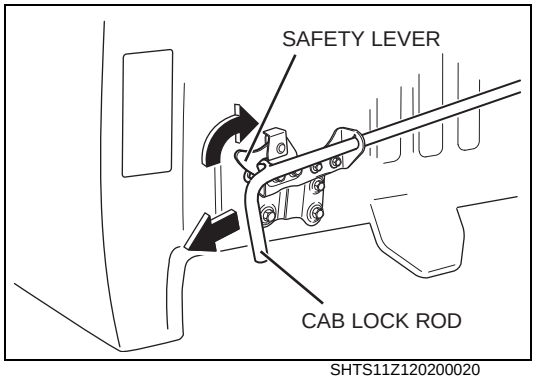
(2) Be sure to block the front wheels.

(3) Bring the cab to slight tension.



SHTS11Z120200019

(4) Remove the bolts of the tilt hinge bracket and the shock absorber.



SHTS11Z120200020

(5) Pull the cab lock rod and lift the cab slowly.

NOTICE
Make sure that all of connecting parts are disconnected.

(6) Set the cab on a cab stand.

8. CAB MOUNTING

(1) Pay attention to the points below, and mount in the reverse order of dismounting.

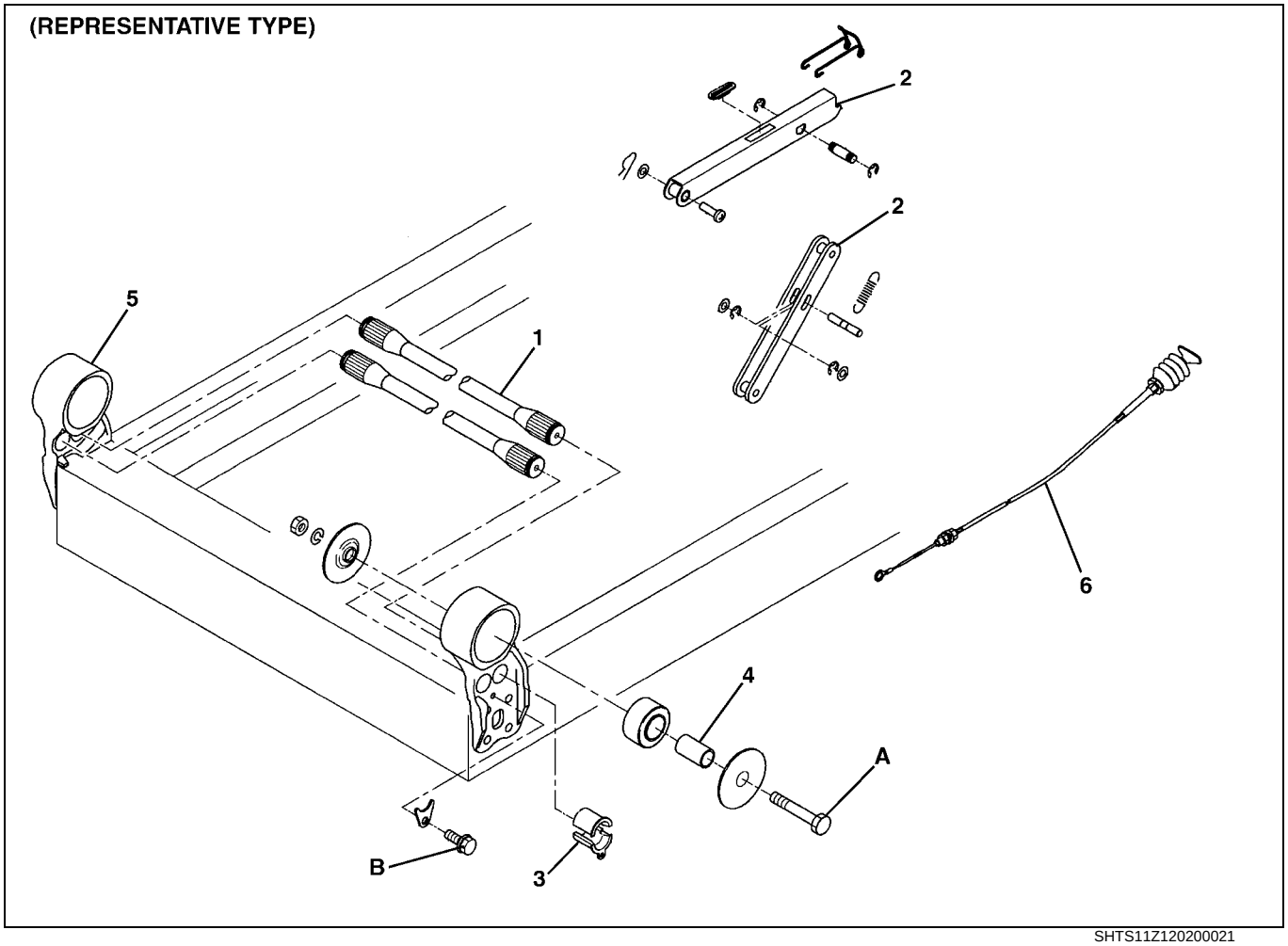
1. Steering sliding shaft inserting
2. Damage or interference of harness wire, cable and hose

CAB MOUNTING PARTS [EXCEPT FOR GH (FOR IRELAND)]

COMPONENT LOCATOR

EN11Z1202D100001

FRONT SIDE



SHTS11Z120200021

1	Torsion bar	4	Collar
2	Cab stopper stay	5	Tilt hinge bracket
3	Fitting collar	6	Cab stopper release cable (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	156-244 {1,591-2,488, 116-179}	B	34.5-51.5 {352-525, 26-37}

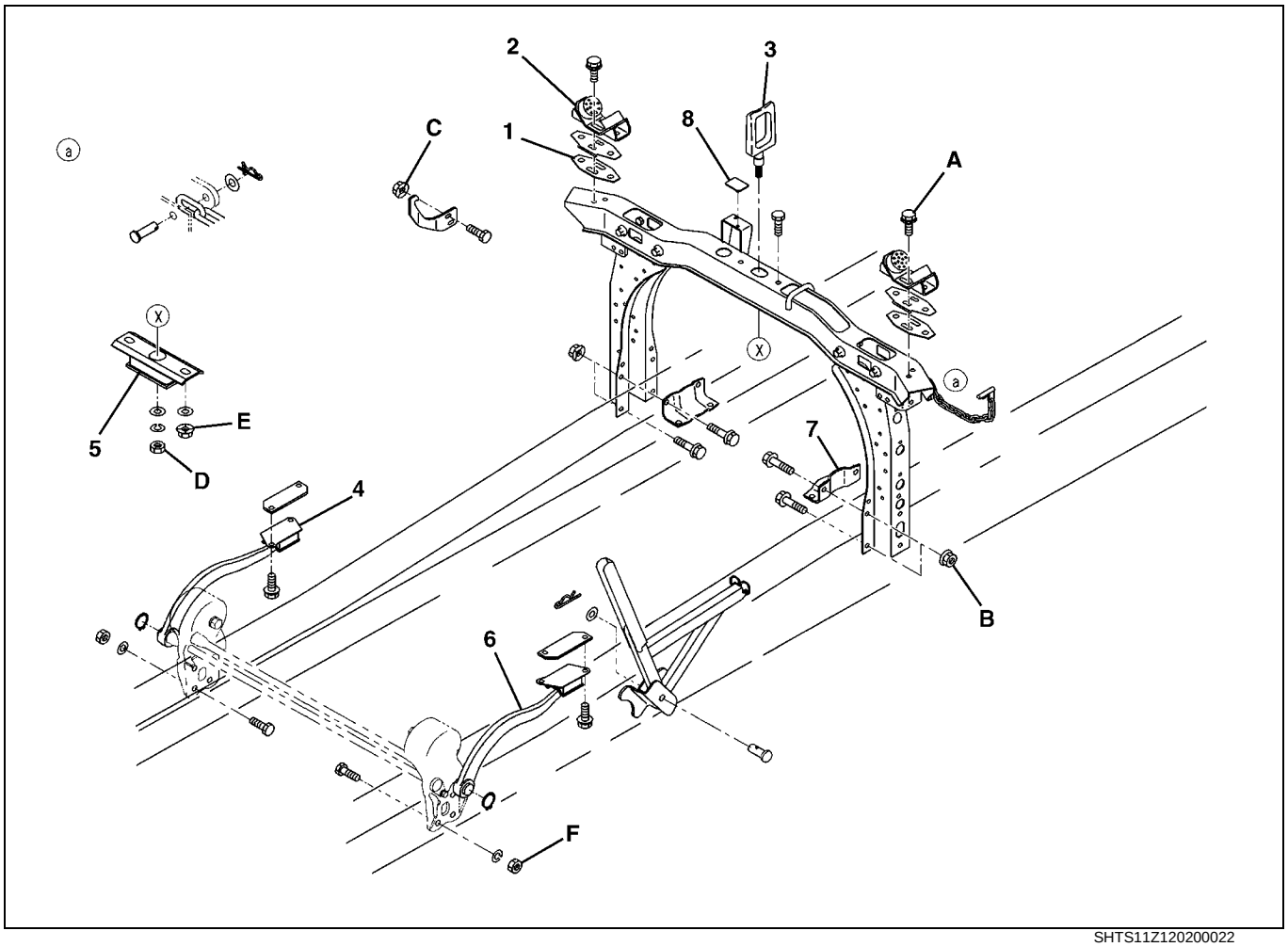
NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

REAR SIDE (EXCEPT FOR DOUBLE CAB, FT, GT SINGLE CAB)



SHTS11Z120200022

1	Adjusting shim	5	Rebound rubber
2	Cab mounting cushion	6	Anchor lever
3	Eye bolt	7	Bracket
4	Stopper	8	Seat

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	34.5-51.5 {352-525, 26-37}	D	110-150 {1,122-1,529, 82-110}
B	Standard cab: 55.0-82.0 {561-836, 41-60}	E	34.5-51.5 {352-525, 26-37}
	Wide cab: 96-144 {979-1,468, 71-106}	F	Standard cab: 150-180 {1,530-1,835, 111-132}
C	55.0-82.0 {561-836, 41-60}		Wide cab: 200-300 {2,040-3,059, 148-221}

NOTICE

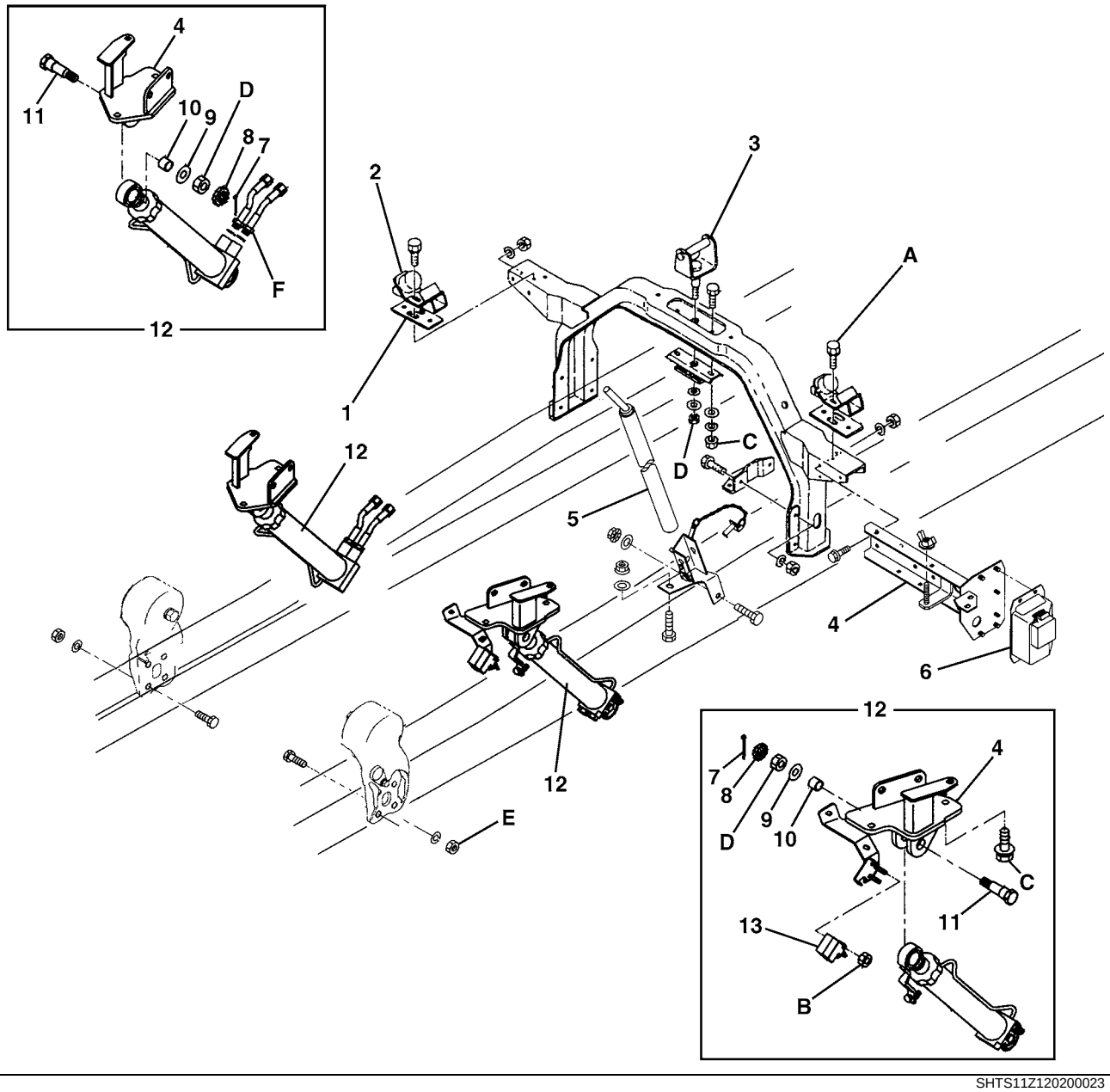
- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

REAR SIDE (DOUBLE CAB)

(REPRESENTATIVE TYPE)



SHTS11Z120200023

1	Adjusting shim	8	Slotted adjusting lock cap
2	Cab mounting cushion	9	Washer
3	Stopper pin	10	Collar
4	Bracket	11	Pin
5	Safety support	12	Tilt cylinder assembly
6	Tilt switch	13	Cab stopper switch
7	Cotter pin		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	34.5-51.5 {352-525, 26-37}	D	110-150 {1,122-1,529, 82-110}
B	5.7-7.7 {58-78, 4.2-5.6}	E	150-180 {1,530-1,835, 111-132}
C	34.5-51.5 {352-525, 26-37}	F	24.5-31.3 {250-319, 18-23}

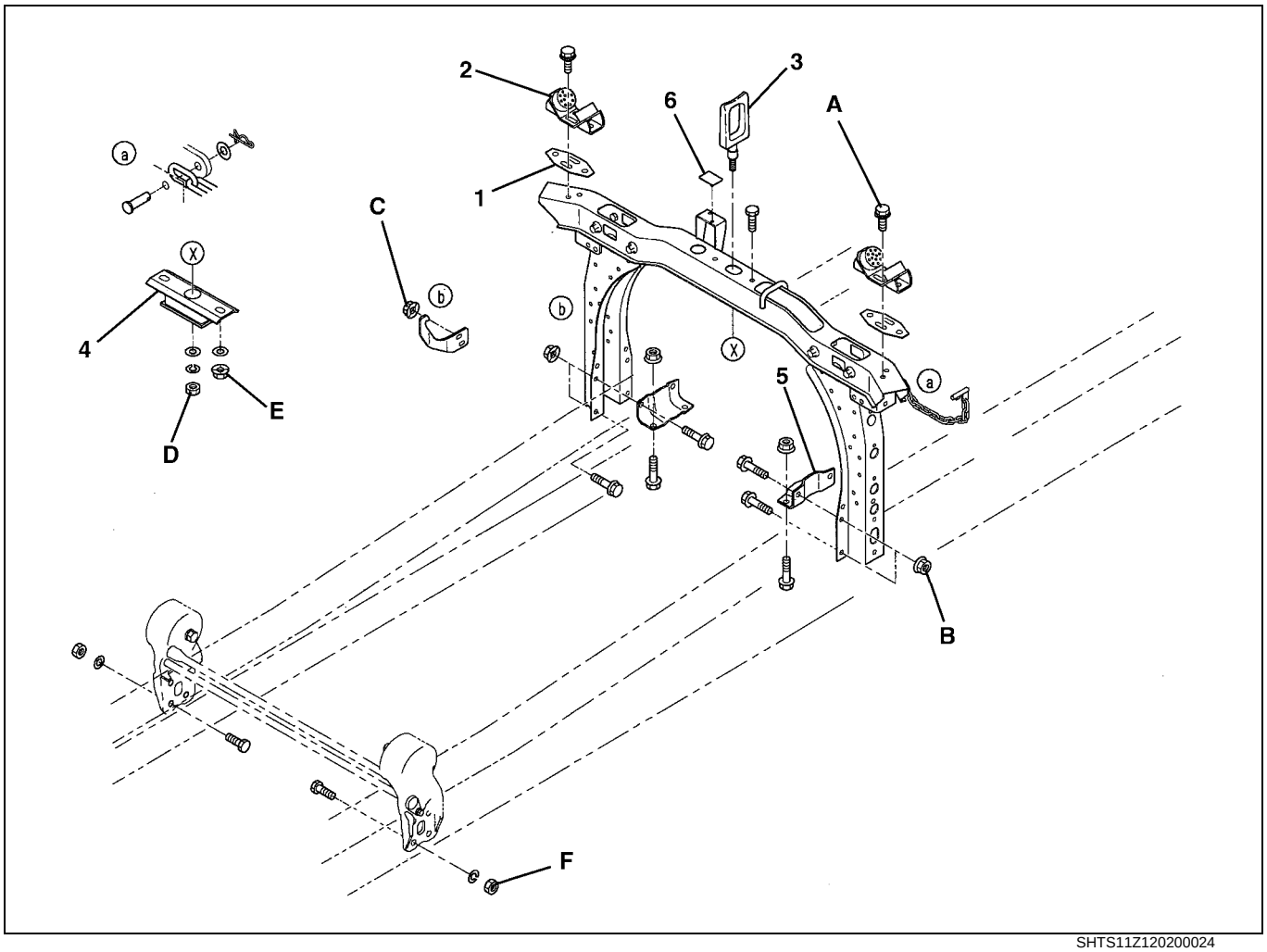
NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

REAR SIDE (FT, GT SINGLE CAB)



SHTS11Z120200024

1	Adjusting shim	4	Rebound rubber
2	Cab mounting cushion	5	Bracket
3	Eye bolt	6	Seat

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	34.5-51.5 {352-525, 26-37}	D	110-150 {1,122-1,529, 82-110}
B	104-144 {1,060-1,468, 76-106}	E	34.5-51.5 {352-525, 26-37}
C	55-72 {560-734, 40-53}	F	150-180 {1,530-1,835, 111-132}

NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

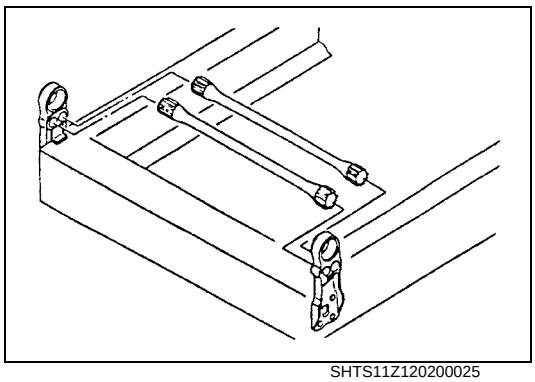
Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

OVERHAUL

EN11Z1202H200001

FRONT CAB MOUNTING PARTS



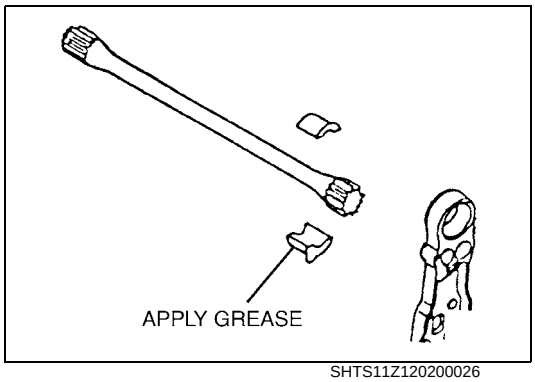
SHTS11Z120200025

1. TORSION BAR INSPECTION

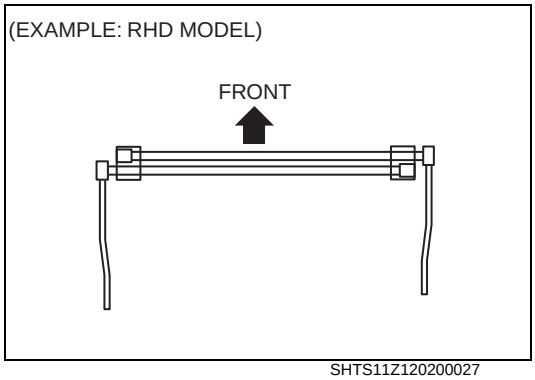
(1) Visually inspect the torsion bars for rust.
If it is severely rusted, replace torsion bars.

NOTICE

- **A rusted torsion bar may be broken while tilting, and it will be very dangerous.**
- **Visually inspect the fitting collars for wear or fatigue.**
- **If it is slight wear or fatigue, replace the collars.**



SHTS11Z120200026



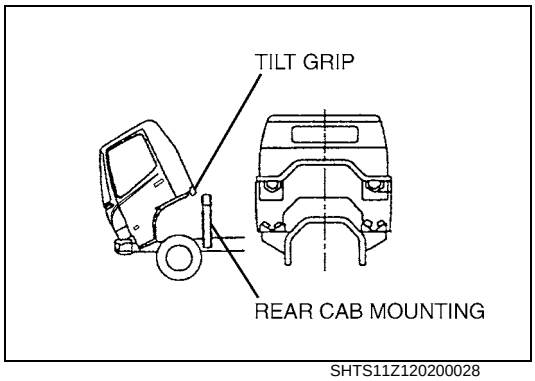
SHTS11Z120200027

2. TORSION BAR INSTALLING

(1) Check the marks on the torsion bars, then install them as shown in figure.

NOTICE

- **Be sure to install the levers in their correct positions.**
- **If the cab is raised with the torsion bars improperly installed, the torsion bars will drastically lose strength, and then it must be replaced with new ones.**

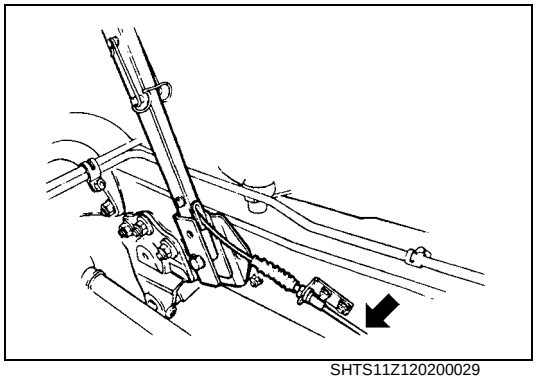


SHTS11Z120200028

3. STANDARD CAB TILT OPERATING TENSION

(1) Tilt the cab several times, without lifting by hand, to determine the average rise of the cab.

UP	DOWN
255 N {26 kgf, 57 lbf} or less	**510 N {52 kgf, 114.6 lbf} or less**

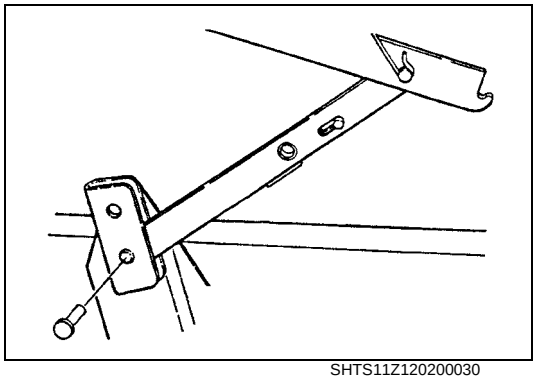

SHTS11Z120200029

4. CAB TILT OPERATING TENSION ADJUSTMENT

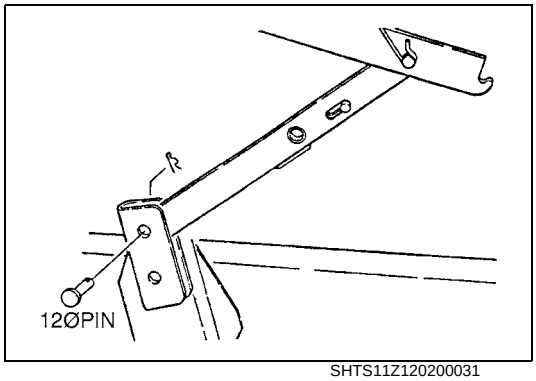
(1) OVER-TILT

a. Remove the radiator grille.

b. Tilt up the cab and remove the cab stopper release cable (If so equipped) from the brackets.


SHTS11Z120200030

c. Pull out the pin at the lower part of cab stopper stay bracket.

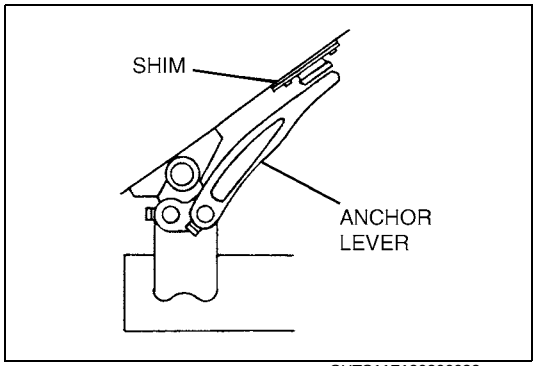


SHTS11Z120200031

d. Align the hole on the cab stopper stay with the hole for OVER-TILT at the upper part of the cab stopper stay bracket and insert **12 mm {0.472 in.}** pin.
Use a cotter pin so that the pin does not come out.

⚠ CAUTION

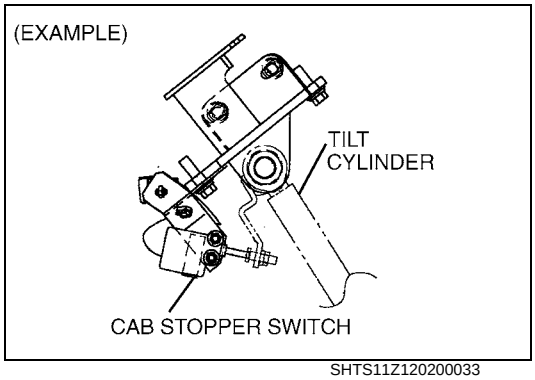
Make sure that the cab stopper pin is locked. If it is not properly locked, the cab may fall.



SHTS11Z120200032

(2) ADJUSTING SHIM INSTALLING

a. Adjust the cab tilt operating tension by increasing or decreasing the number of shims when cab tilt up to OVER-TILT position.
For each **6 mm {0.24 in.}** thick shim added, the cab tilt up effort by hand will be reduced about **49 N {5 kgf, 11 lbf}**.
However, do not add more than **4** shims (Maximum **4** shims).
When more than 5 shims are needed, or the torsion bar sage, replace the torsion bar.
If the clearance between the stopper rubber and the anchor lever is too narrow to insert the spacers, tilt the cab for **3-5** times to obtain the clearance.



SHTS11Z120200033

DOUBLE CAB

1. CAB STOPPER SWITCH ADJUSTMENT

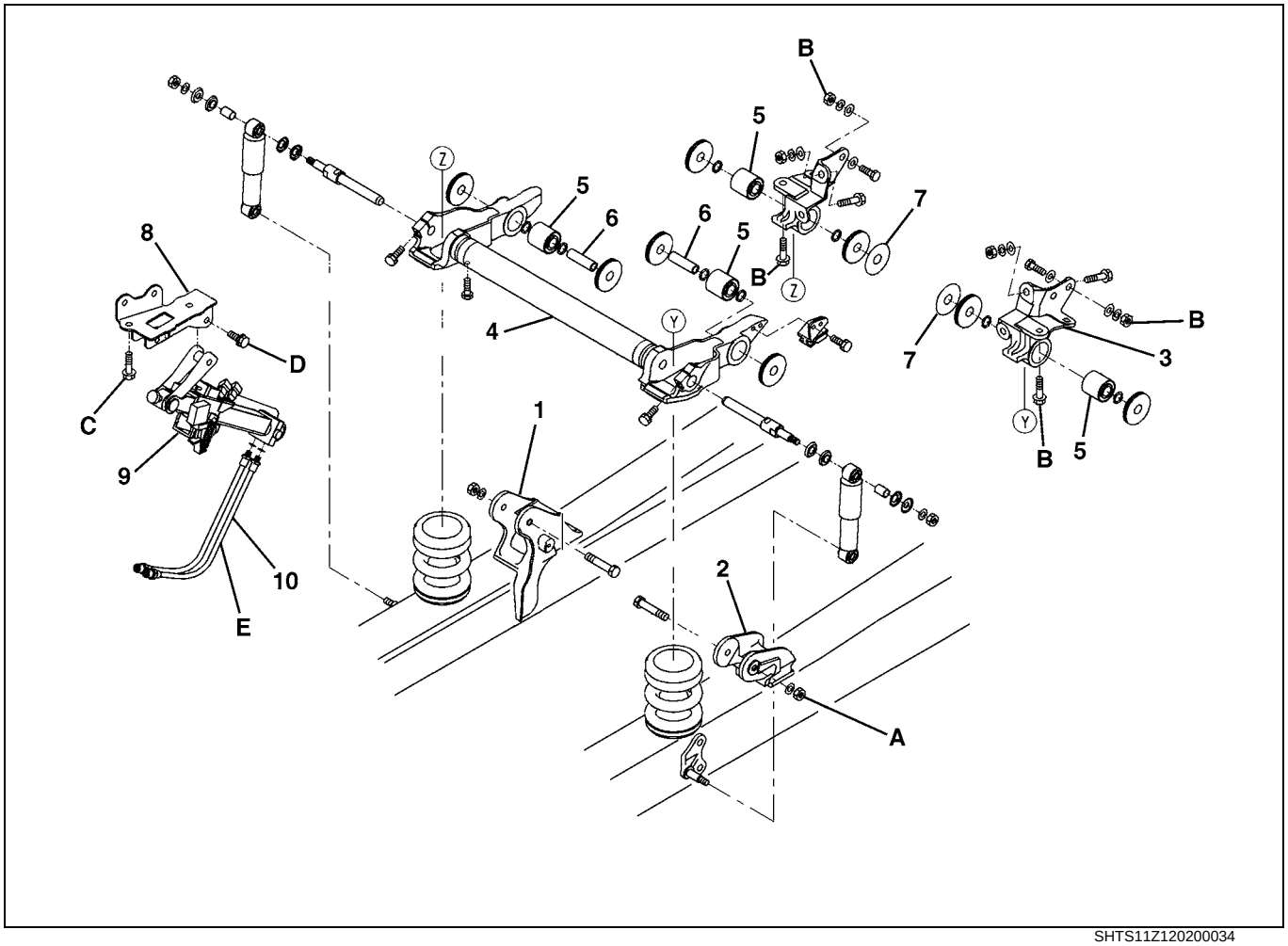
(1) The bolt has to be adjusted so that the limit switch functions, namely cab tilting stops, at the position that the safety support can be completely stood up.

CAB SUSPENSION

COMPONENT LOCATOR

EN11Z1202D100002

FRONT SIDE



SHTS11Z120200034

1	Cab mounting bracket (right)	6	Fitting collar
2	Cab mounting bracket (left)	7	Thrust washer
3	Tilt hinge bracket	8	Stopper bracket
4	Link lever	9	Cab tilt cylinder
5	Bound tilt cushion	10	Oil hose

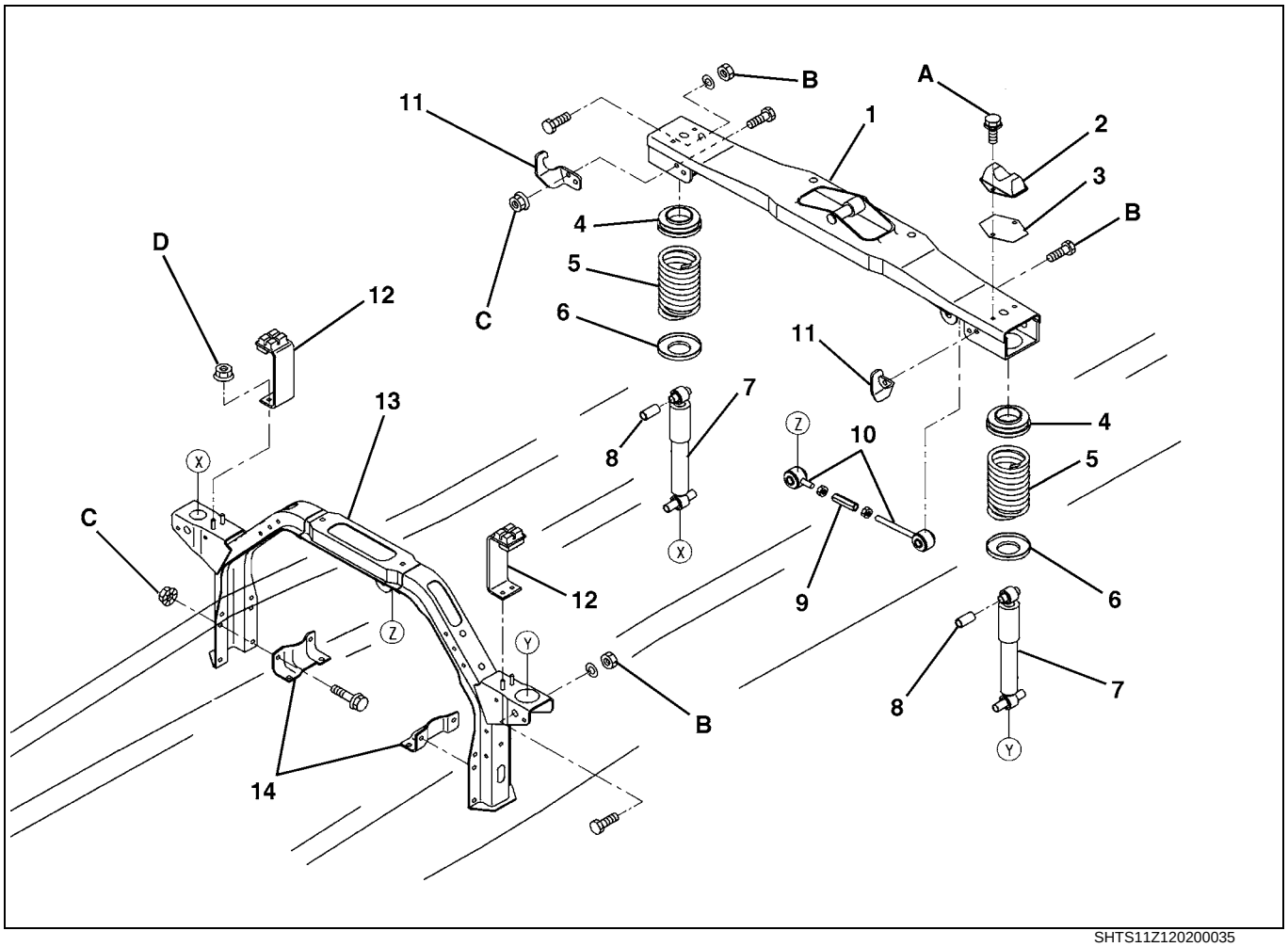
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	110-150 {1,122-1,529, 82-110}	D	50-76 {510-774, 37-56}
B	70-96 {714-978, 52-70}	E	24.5-31.3 {250-319, 19-23}
C	34.5-51.5 {352-525, 26-37}		

NOTICE
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61-91	96-144	152-228
	kgf·cm	184-265	352-525	623-927	979-1,468	1,550-2,324
	lbf·ft	14-19	26-37	45-67	71-106	113-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73-109	144-216	228-342
	kgf·cm	220-321	424-627	745-1,111	1,469-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	107-159	169-252

REAR SIDE



SHTS11Z120200035

1	Floating bar	8	Fitting collar
2	Cab mounting rubber	9	Turnbuckle
3	Spacer	10	Lateral rod
4	Cushion seat	11	Cab mounting stopper
5	Coil spring	12	Upper stopper
6	Lower spring seat	13	Rear arch
7	Shock absorber	14	Cab support fixture

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	18-26 {184-265, 14-19}	C	55-82 {561-836, 41-60}
B	170-230 {1,734-2,345, 126-169}	D	21.5-31.5 {220-321, 16-23}

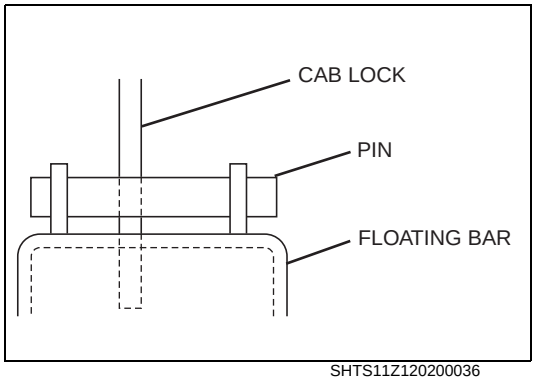
NOTICE
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61-91	96-144	152-228
	kgf·cm	189-213	352-525	623-927	979-1,468	1,550-2,324
	lbf·ft	14-19	26-37	45-67	71-106	113-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73-109	144-216	228-342
	kgf·cm	220-321	424-627	745-1,111	1,469-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	107-159	169-252

INSPECTION AND ADJUSTMENT

EN11Z1202H300001

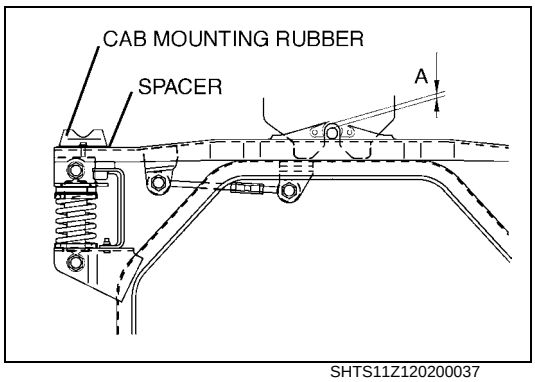
NOTICE
When working to separate the oil pressure circuit, be sure to do it under cab not titled position.



SHTS11Z120200036

1. MISALIGNMENT OF CAB IN THE FRONT AND REAR DIRECTION.

(1) When dropping cab down, do not interfere cab block with floating bar.
(2) When interfering, adjust it, loosening the bolt for mounting member.

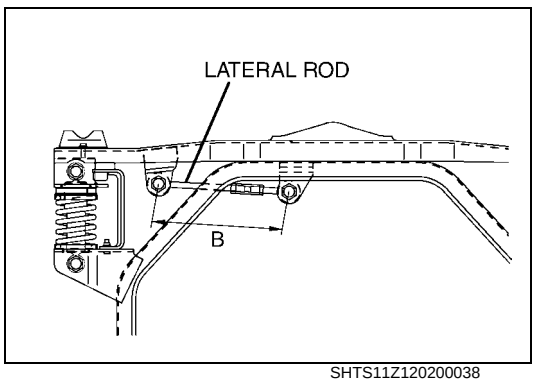


SHTS11Z120200037

2. MISALIGNMENT OF CAB IN THE UP AND DOWN DIRECTION

(1) Measure the dimension of A-portion shown in the figure (Clearance between the pin of floating bar and the back side plate of cab lock bracket). When exceeding the standard value, adjust it with a spacer for cab mounting rubber.

Standard: 3-5 mm {0.12-0.19 in.}
Spacer: S5222-21360 (Thickness: 1 mm {0.04 in.})



SHTS11Z120200038

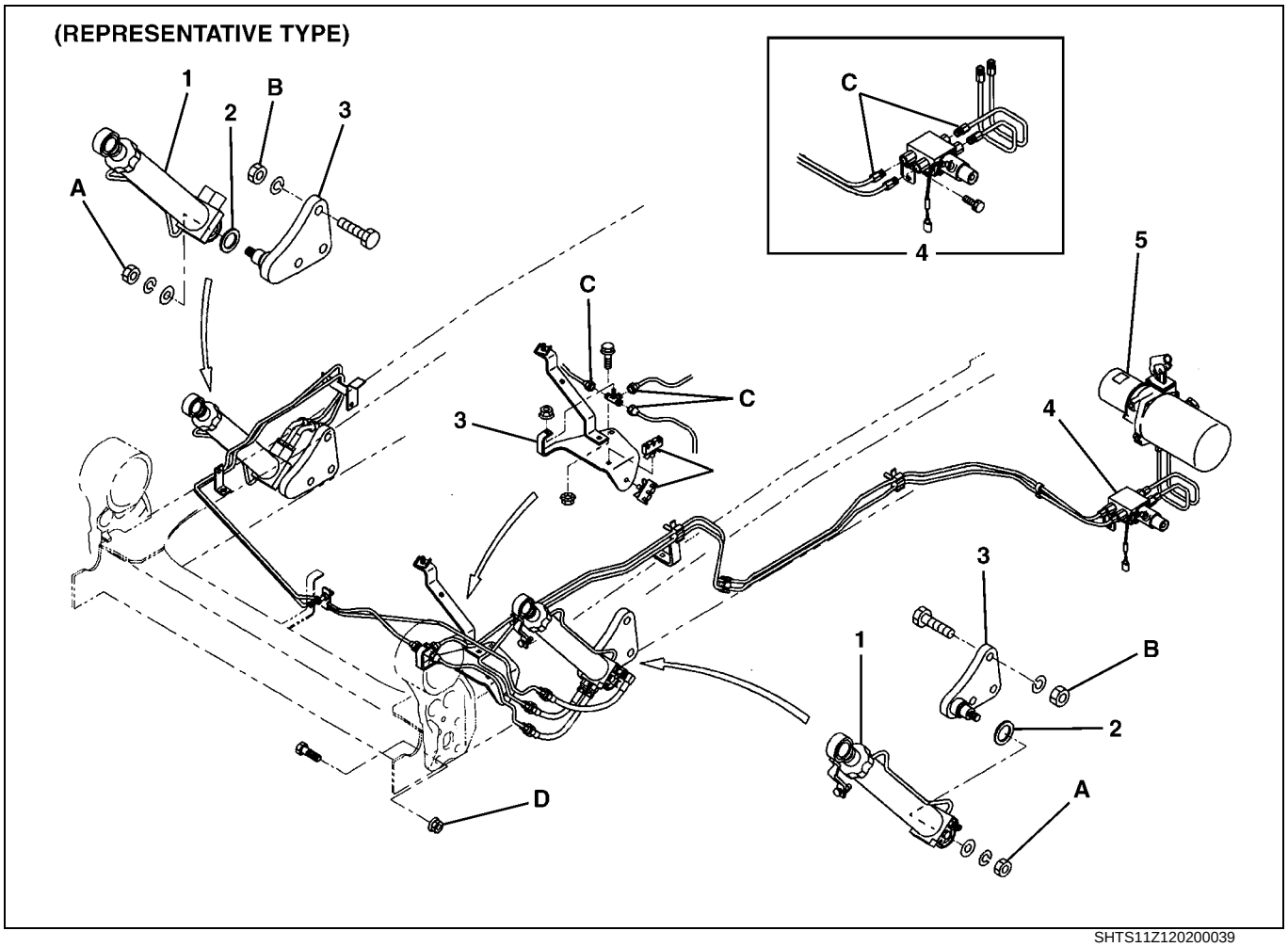
3. ADJUSTMENT IN THE LENGTH OF LATERAL ROD.

(1) Adjust the length (B-portion) of lateral rod.
Standard: 271-281 mm {10.67-11.06 in.}

CAB TILT MECHANISM (MODELS WITH DOUBLE CAB)

COMPONENT LOCATOR

EN11Z1202D100003



SHTS11Z120200039

1	Tilt cylinder	4	Solenoid valve
2	Plain washer	5	Tilt pump
3	Bracket		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	110-150 {1,100-1,500, 80-108}	C	20-30 {204-305, 15-22}
B	170-230 {1,734-2,345, 125-169}	D	150-180 {1,530-1,835, 111-132}

NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

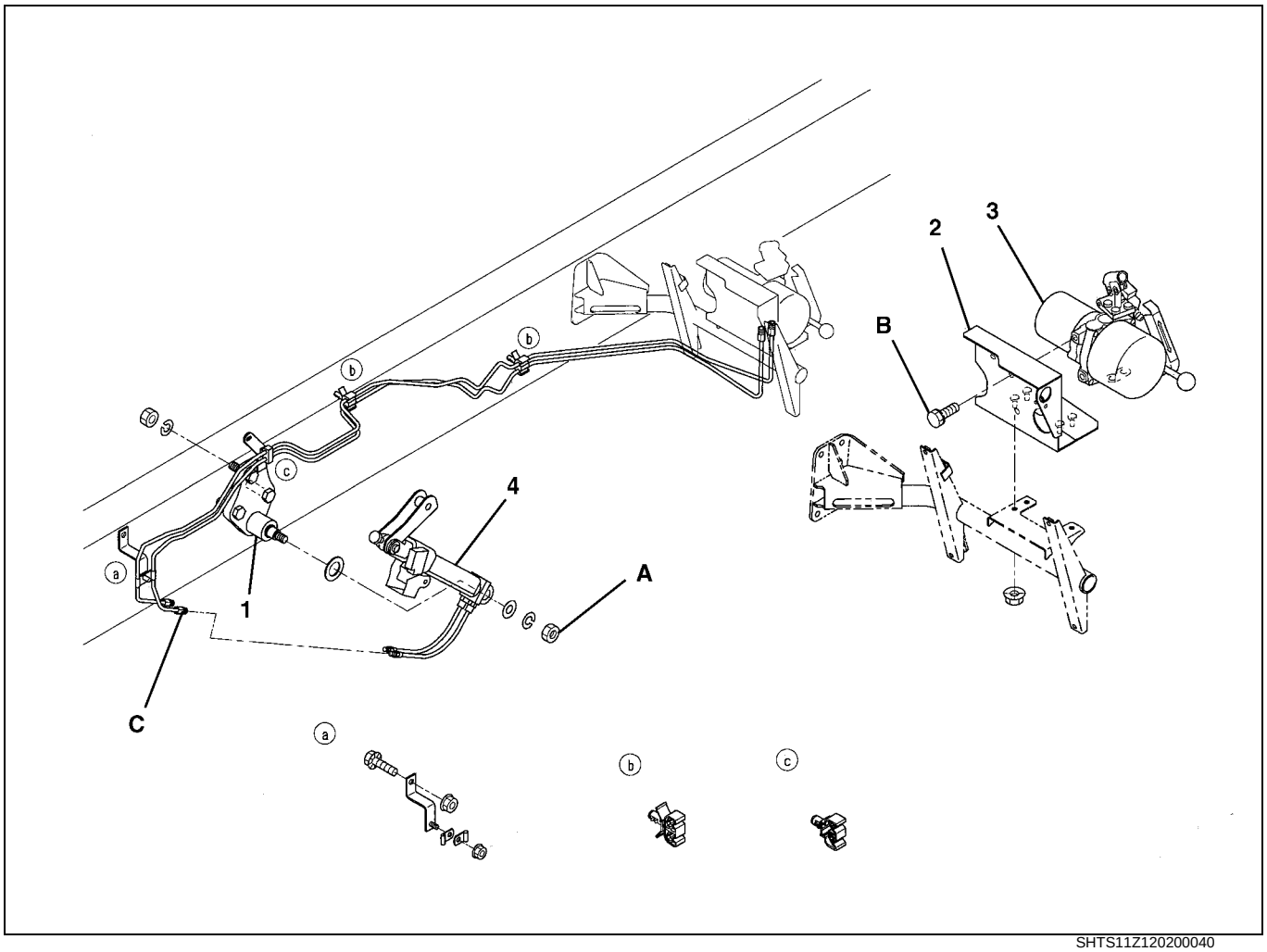
Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

CAB TILT MECHANISM (MODELS: FT, GT SINGLE CAB)

COMPONENT LOCATOR

EN11Z1202D100004



SHTS11Z120200040

1	Bracket	3	Cab tilt pump
2	Bracket	4	Cab tilt cylinder

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	110-150 {1,122-1,529, 82-110}	C	20-30 {204-305, 15-22}
B	34.5-51.5 {352-525, 25-37}		

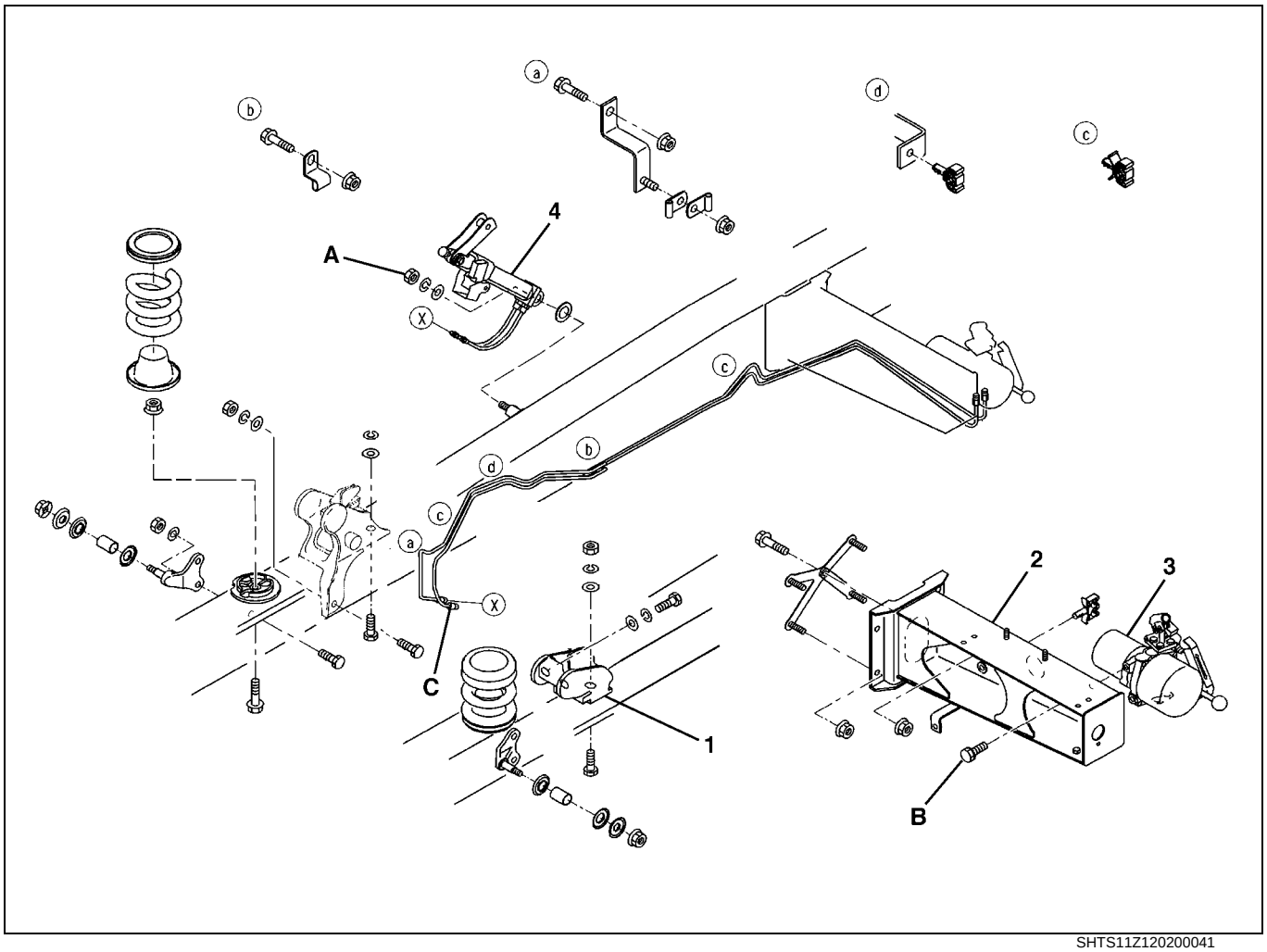
NOTICE
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61-91	96-144	152-228
	kgf·cm	189-213	352-525	623-927	979-1,468	1,550-2,324
	lbf·ft	14-19	26-37	45-67	71-106	113-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73-109	144-216	228-342
	kgf·cm	220-321	424-627	745-1,111	1,469-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	107-159	169-252

CAB TILT MECHANISM [MODEL: GH (FOR IRELAND)]

COMPONENT LOCATOR

EN11Z1202D100005



SHTS11Z120200041

1	Cab mounting bracket	3	Cab tilt pump
2	Tilt pump bracket	4	Cab tilt cylinder

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	110-150 {1,122-1,529, 82-110}	C	20-30 {204-305, 15-22}
B	34.5-51.5 {352-525, 25-37}		

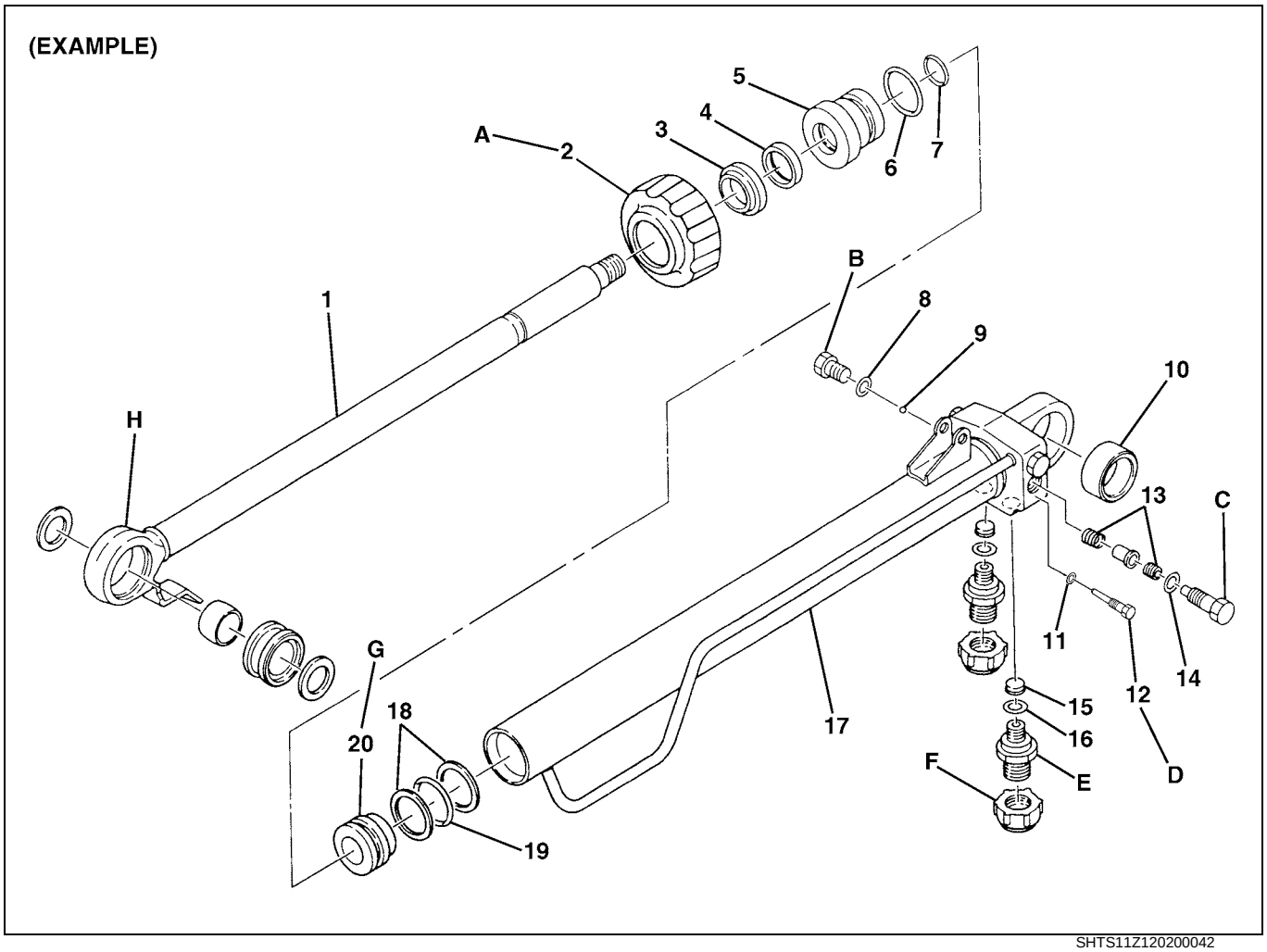
NOTICE
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61-91	96-144	152-228
	kgf·cm	189-213	352-525	623-927	979-1,468	1,550-2,324
	lbf·ft	14-19	26-37	45-67	71-106	113-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73-109	144-216	228-342
	kgf·cm	220-321	424-627	745-1,111	1,469-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	107-159	169-252

TILT CYLINDER (MODELS WITH DOUBLE CAB)

COMPONENT LOCATOR

EN11Z1202D100006



SHTS11Z120200042

1	Piston rod	8	O-ring	15	Filter
2	Stop ring	9	Check valve ball	16	O-ring
3	Dust seal	10	Bearing	17	Cylinder
4	Oil seal ring	11	O-ring	18	Oil seal ring
5	Tube end	12	Plug	19	O-ring
6	O-ring	13	Spring	20	Piston
7	O-ring	14	O-ring		

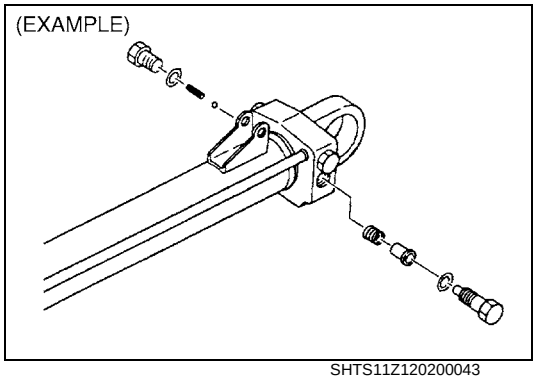
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	176.5-215.7 {1,800-2,199, 130-159}	E	17.7-26.5 {180-270, 14-19}
B	17.7-26.5 {180-270, 14-19}	F	1.0-2.0 {11-20, 0.8-1.4}
C	17.7-26.5 {180-270, 14-19}	G	44.1-58.9 {450-600, 33-43}
D	1.99-2.43 {21-24, 1.6-1.7}	H	44.1-58.9 {450-600, 33-43}

OVERHAUL

EN11Z1202H200002

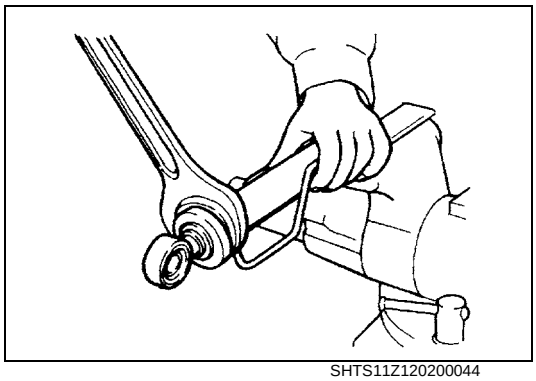
IMPORTANT POINT - DISASSEMBLY



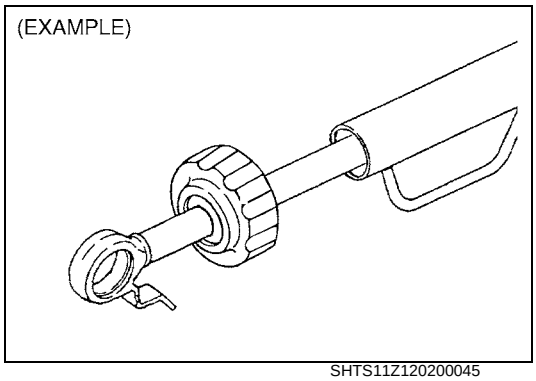
SHTS11Z120200043

1. TILT CYLINDER

(1) Remove the check valve.


SHTS11Z120200044

(2) Loosen the stop ring.



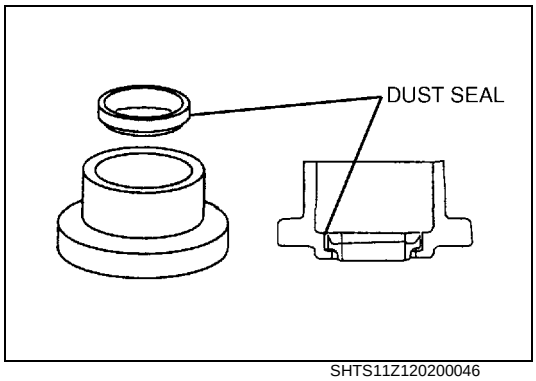
SHTS11Z120200045

(3) Pull out the piston rod assembly.

NOTICE

Take care not to damage the piston rod, and remove the rod over an oil pan, as oil will leak out.

IMPORTANT POINTS - ASSEMBLY



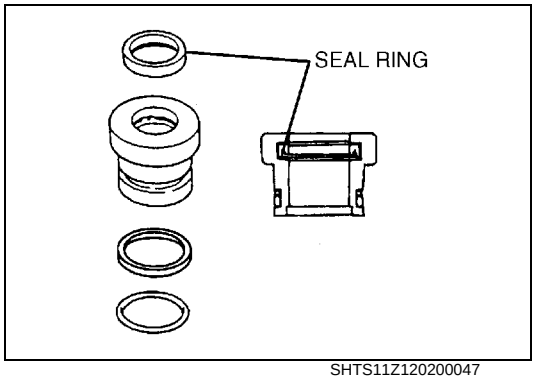
SHTS11Z120200046

1. TILT CYLINDER STOP RING

(1) Use a press to install the dust seal into the stop ring.

NOTICE

Before assembling the dust seal, fill the inside with lithium grease. Afterward, apply lithium grease to O-rings and seal rings.



SHTS11Z120200047

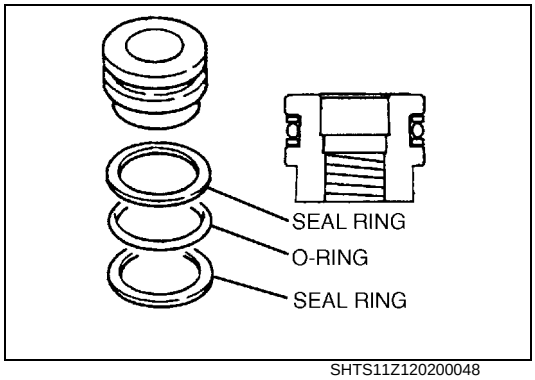
2. TILT CYLINDER TUBE END

(1) Assemble the seal ring and O-rings to the tube end.

NOTICE

Pay attention to the seal ring direction.

When assembling the seal ring, use the new one.



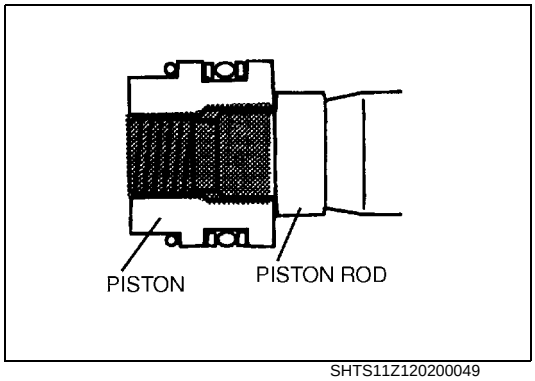
SHTS11Z120200048

3. TILT CYLINDER PISTON

(1) Assemble seal rings and O-ring to piston.

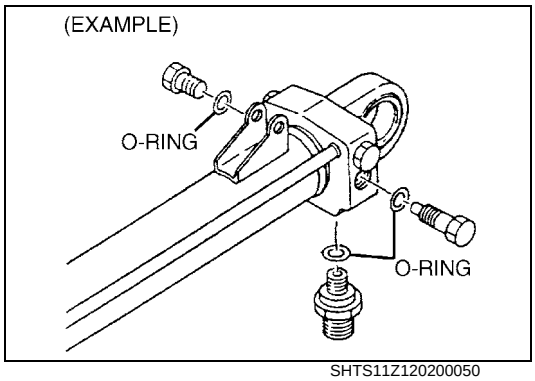
NOTICE

When assembling the seal rings and O-ring, use the new ones.



SHTS11Z120200049

(2) Apply adhesive (ThreeBond No.1374 or equivalent) between the piston and the piston rod.



SHTS11Z120200050

4. CHECK VALVE

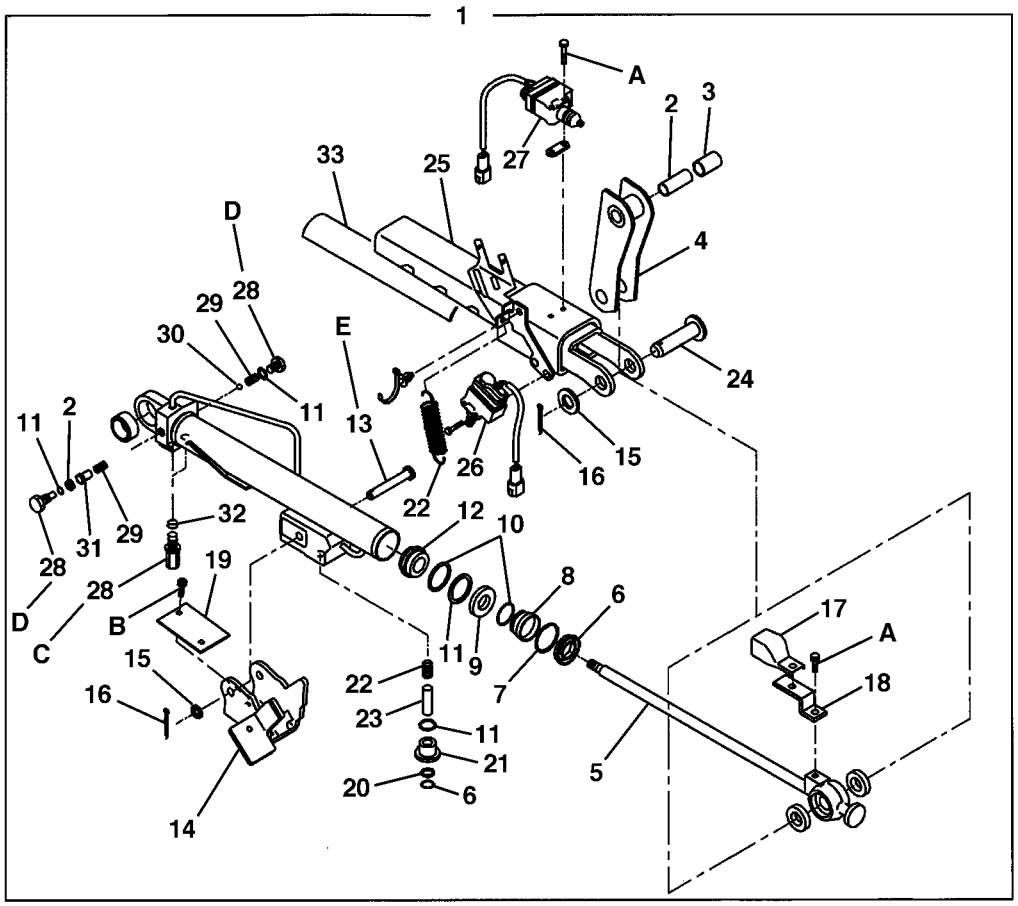
(1) Apply lithium grease to the O-rings.

TILT CYLINDER

[MODELS: GH (FOR IRELAND), FT, GT SINGLE CAB]

COMPONENT LOCATOR

EN11Z1202D100007



SHTS11Z120200051

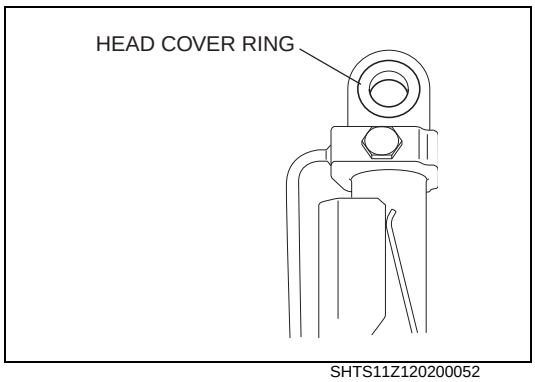
1	Tilt cylinder	12	Piston	23	Plunger
2	Fitting collar	13	Lock lever pin	24	Stopper pin
3	Bushing	14	Lock lever	25	Cylinder tube and stopper
4	Lift arm	15	Plain washer	26	Stroke switch
5	Piston rod	16	Cotter pin	27	Stopper switch
6	Dust seal	17	Dust cover	28	Plug
7	Retainer ring	18	Switch plate	29	Coned disc spring
8	Tube end	19	Thrust washer	30	Steel ball
9	Washer	20	Gasket	31	Piston
10	Back-up ring	21	Lock release cylinder	32	Filter
11	O-ring	22	Spring	33	Pipe cover

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	5.7-7.7 {59-78, 4.3-5.6}	D	17.7-26.5 {181-270, 14-19}
B	2.4-3.4 {25-34, 1.8-2.5}	E	39.2-49.0 {400-499, 29-36}
C	0.98-1.48 {10-15, 0.8-1.0}		

OVERHAUL

EN11Z1202H200003

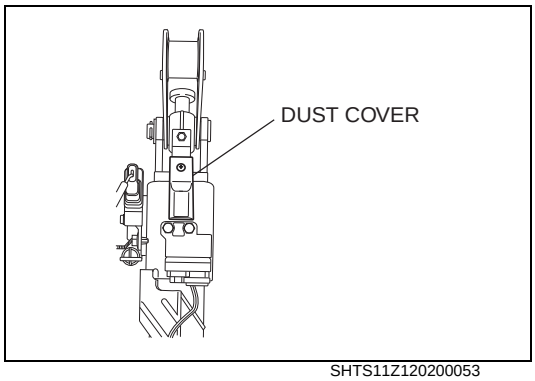


SHTS11Z120200052

IMPORTANT POINTS - DISASSEMBLY

1. DISASSEMBLING OF STOPPER

(1) Remove head cover ring.



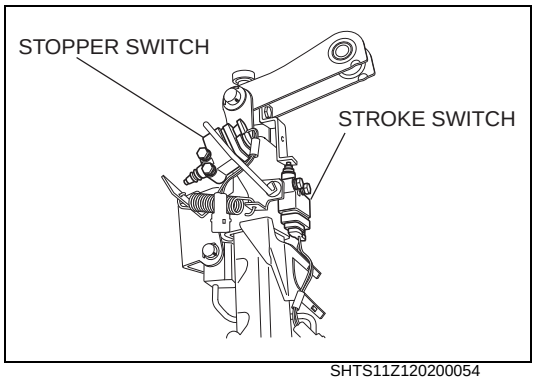
SHTS11Z120200053

(2) Remove screw and then dust cover.

(3) Cut the clamp and raise slightly the hook preventing from coming off of connector, remove connector from cylinder tube.

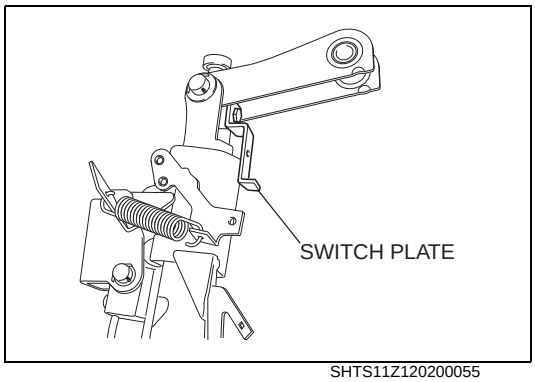
NOTICE

Work carefully not to damage the same hook.



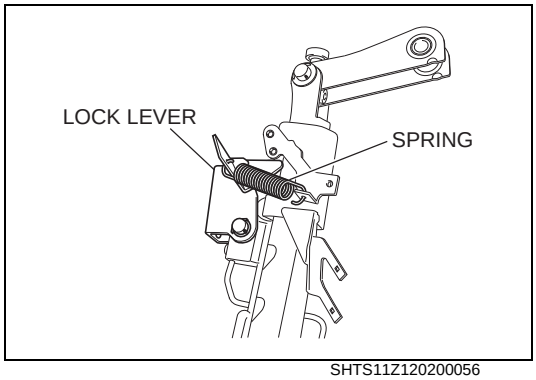
SHTS11Z120200054

(4) Remove stroke switch and stopper switch.



SHTS11Z120200055

(5) Remove switch plate.



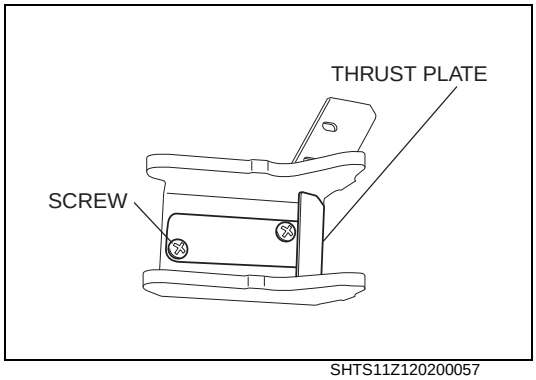
SHTS11Z120200056

(6) Remove spring.

NOTICE

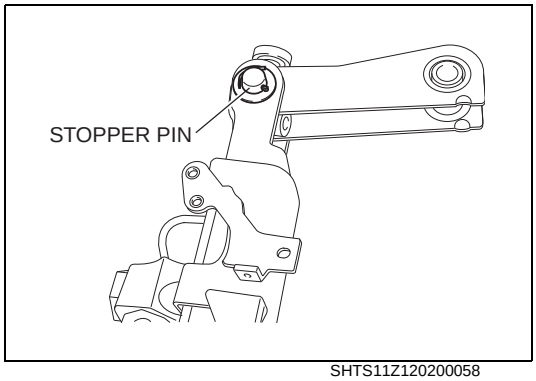
Work not to expand the spring in more than needed.

(7) Remove them in the order of cotter pin, washer, lock lever pin and lock lever.



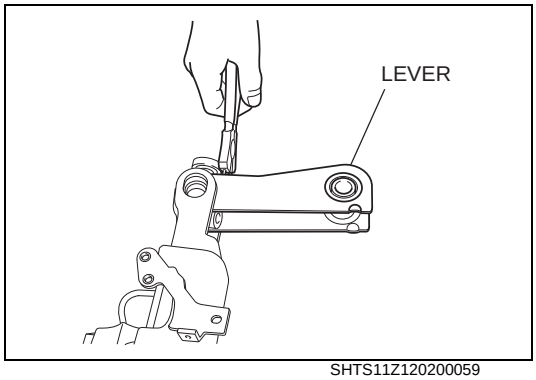
SHTS11Z120200057

(8) Remove screw and then thrust plate.



SHTS11Z120200058

(9) Remove them in the order of cotter pin, washer and stopper pin.

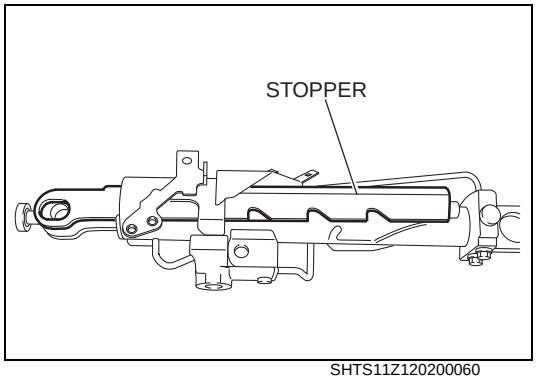


SHTS11Z120200059

(10) Use a snap ring expander or the like, remove lever by expanding slightly 2 plates of lever.

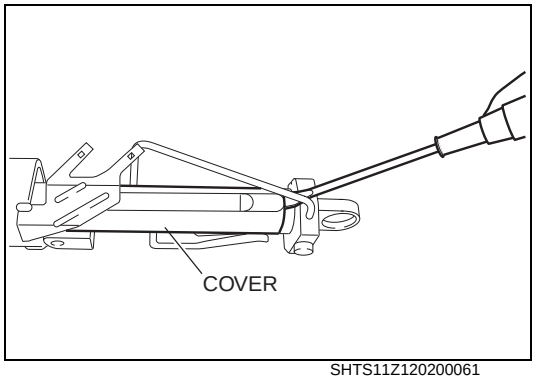
NOTICE

- **To prevent its deformation, work carefully not to expand 2 plates of lever too much.**
- **Work not to damage piston rod ring.**



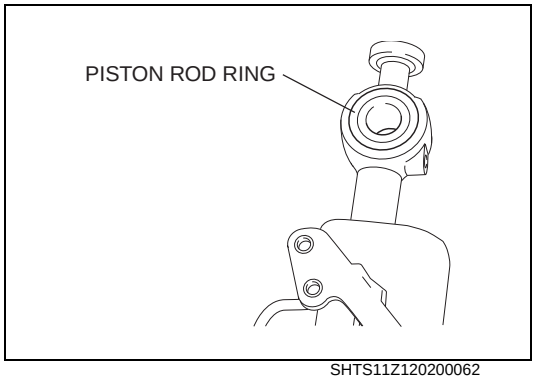
SHTS11Z120200060

(11) Pull out stopper toward rod side.



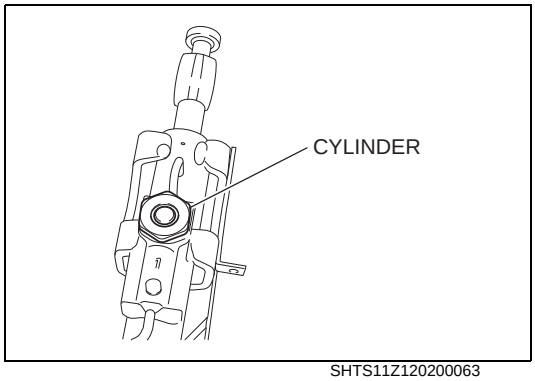
SHTS11Z120200061

(12) Remove cover through the groove for unscrewing driver at head cover side.



SHTS11Z120200062

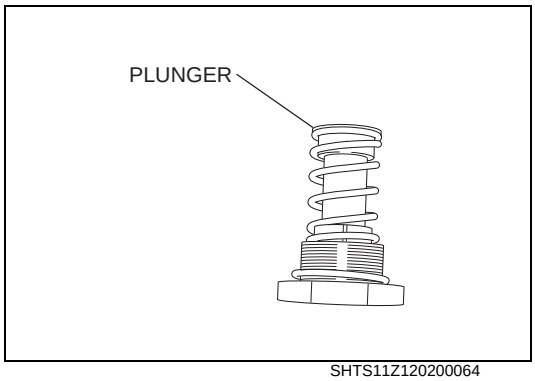
(13) Remove piston rod ring.



SHTS11Z120200063

2. DISASSEMBLING OF LOCK RELEASING CYLINDER

(1) Remove cylinder.

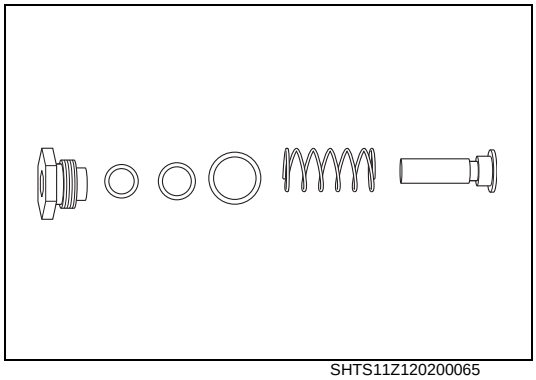


SHTS11Z120200064

(2) Pull out plunger from cylinder.

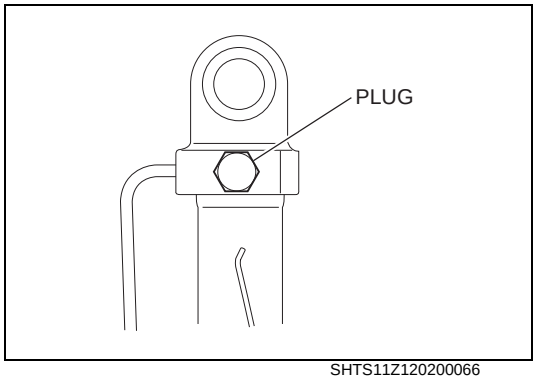
NOTICE

Outer exposing part of plunger has been painted. Pulling it out forcedly may damage the surrounding parts. So, do it after eliminating the paint.



SHTS11Z120200065

(3) Remove spring, O-ring, back-up ring and dust seal.



SHTS11Z120200066

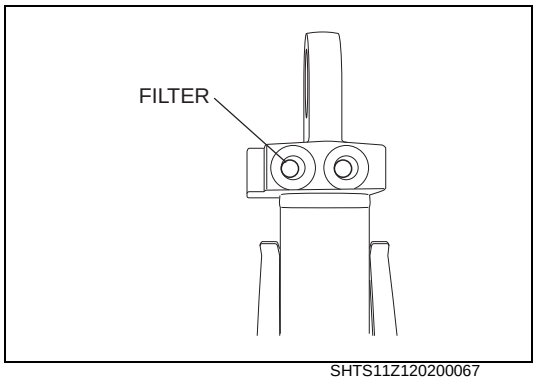
3. DISASSEMBLING OF PILOT CHECK VALVE

(1) Remove plug and O-ring, then pilot piston, spring and sleeve.

NOTICE

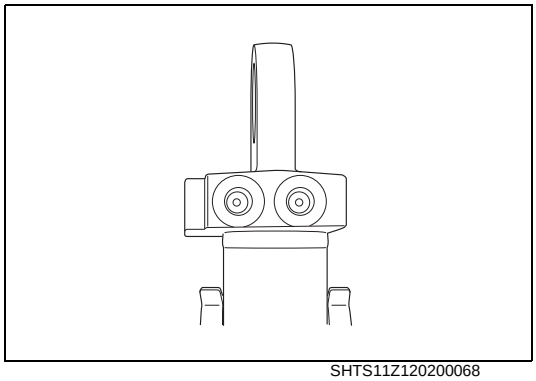
- **Work not to lose spring and steel ball.**
- **When pushing out the sleeve with use of stick or the like, work carefully not to damage the steel ball seat of cylinder tube.**

(2) Remove O-ring of sleeve.



SHTS11Z120200067

(3) Use a hexagon wrench (4 mm {0.157 in.}), remove filter.



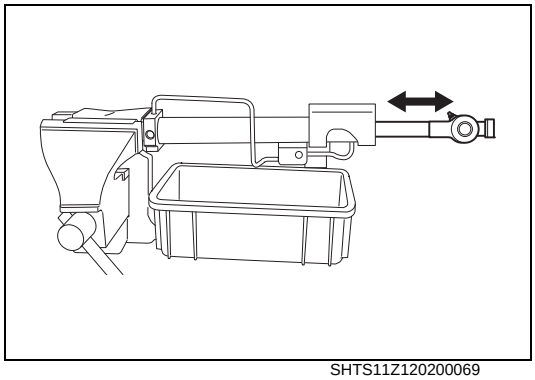
SHTS11Z120200068

(4) Check that there exist minimum through holes at back of screw hole of U, D ports and clean them off with a drill (Direct diameter: 0.3-0.4 mm {0.0118-0.0157 in.}) when holes clogged.

4. OVERHAULING OF CYLINDER

NOTICE

Piston rod is easily bendable and also its sliding part is easily scratched. So, handle them with much care.

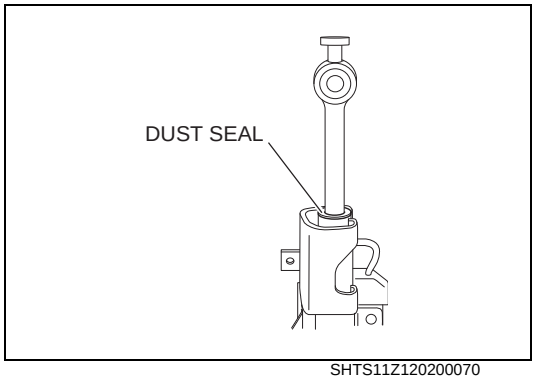


SHTS11Z120200069

(1) With vice, fix the installing portion of head covering for cylinder tube and drain off cab tilt fluid in the cylinder entirely by stretching all stroke of piston rod by hand.

NOTICE

- **As cab tilt fluid will spill over at U, D ports, pilot check valve and lock releasing cylinder, prepare an oil container to keep the cab tilt fluid.**
- **When scrapping cab tilt fluid, it must be done according to specified method (Disposal of industrial waste) or proper method of environmental protection.**

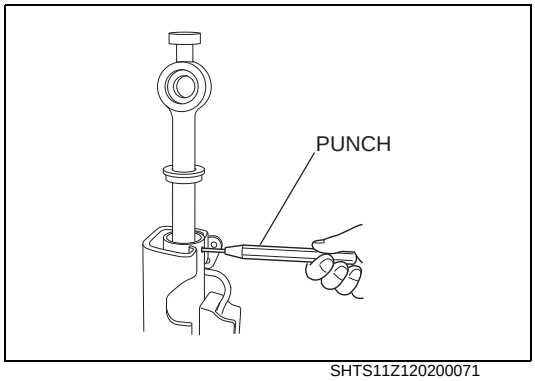


SHTS11Z120200070

(2) Pulling out slightly piston rod, remove dust seal out of cylinder tube with a screw driver.

NOTICE

Check that dust seal lip should not come over the painted or welded part of piston rod.

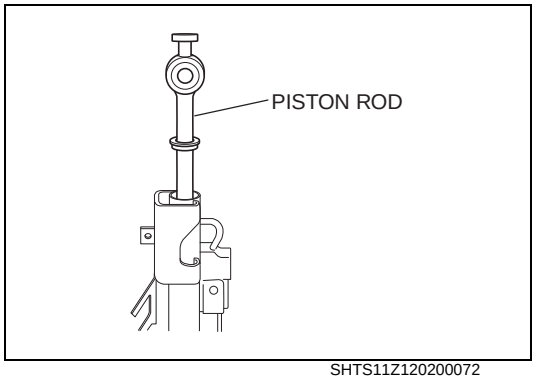


SHTS11Z120200071

(3) With use of punch, remove retainer ring from cylinder tube through side hole drilled on the cylinder tube.

NOTICE

Work not to damage piston rod.

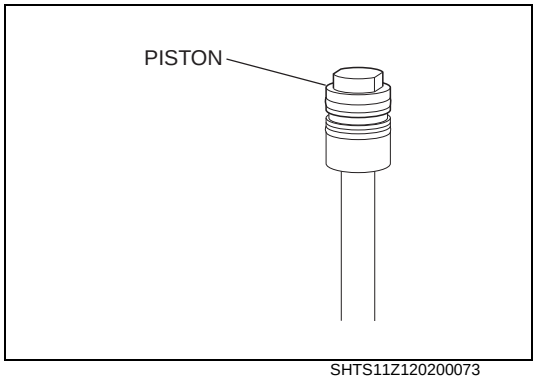


SHTS11Z120200072

(4) Pull out dust seal, retainer ring and bushing together with piston rod from cylinder tube.

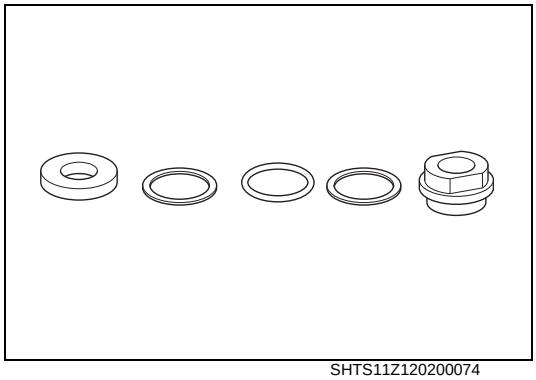
NOTICE

There is a case that cab tilt fluid remaining in the cylinder tube may leak out.

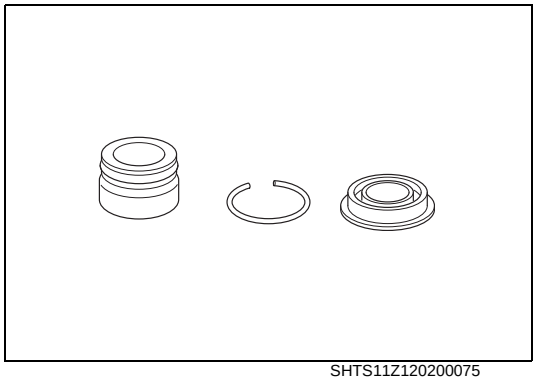


SHTS11Z120200073

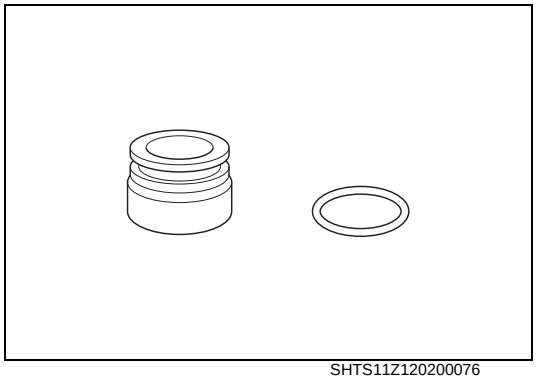
(5) With vice, remove piston by fixing the installing portion of piston rod ring of piston rod.


SHTS11Z120200074

(6) Remove back-up ring, O-ring and washer.


SHTS11Z120200075

(7) Remove bushing, retainer ring and dust seal.


SHTS11Z120200076

(8) Remove O-ring out of bushing.

IMPORTANT POINTS - ASSEMBLY

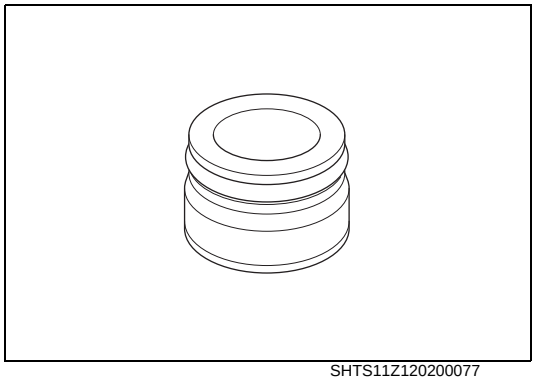
NOTICE

Such dust as sand, dust and a piece of fiber are adhered on the disassembled parts and enter into the cylinder, which may cause a problem. Therefore, be careful on the point.

1. ASSEMBLING THE CYLINDER

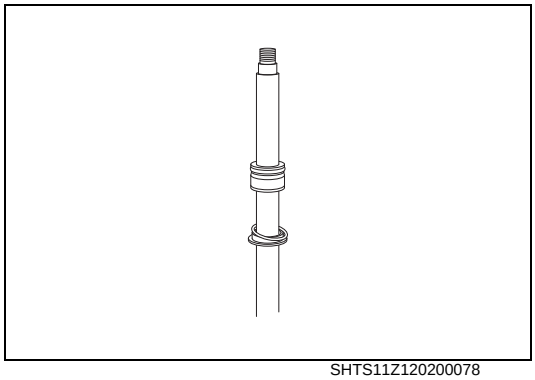
NOTICE

Piston rod is easily bendable and its sliding part is easily scratched. So, handle them with much care.



SHTS11Z120200077

(1) Apply bearing grease to new O-ring and attach on the new bushing.

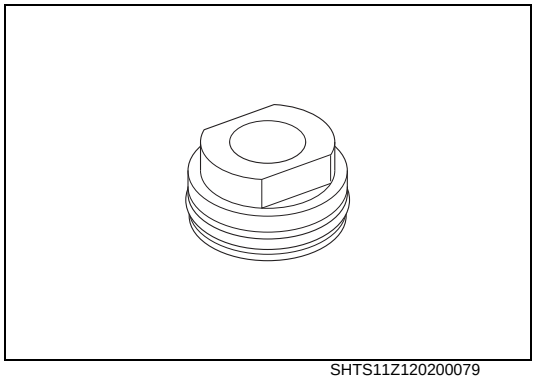


SHTS11Z120200078

(2) Apply lightly molybdenum grease to sliding parts of piston rod and of dust seal with piston rod and install them in the order of dust seal, retainer ring and bushing.

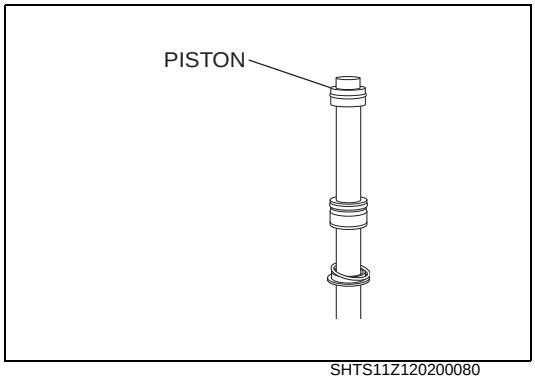
NOTICE

- **When applying amount of grease on piston rod is much, it may cause operational fault. Therefore, apply it lightly.**
- **Check that dust seal lip should not come over the painted or welded parts of piston rod.**



SHTS11Z120200079

(3) Install on piston new back-up ring and new O-ring, on which molybdenum grease was applied.



SHTS11Z120200080

(4) Apply ThreeBond 1374 at the screw for installing piston of piston rod.

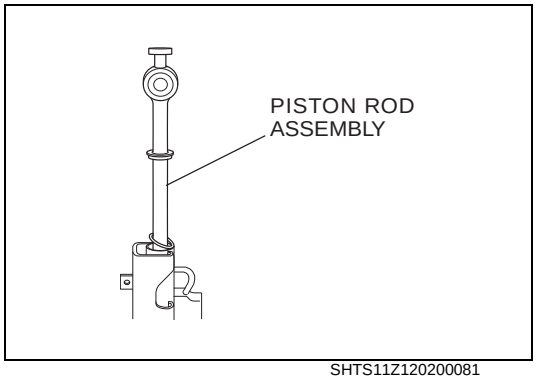
NOTICE

The work should be done after eliminating all grease remaining at the screws of piston rod as well as piston.

(5) With vice, fix the installing portion of piston rod ring of piston rod for installation of new washer and piston assembly.
Tightening Torque:
44.1-58.9 N·m {450-600 kgf·cm, 33-43 lbf·ft}

NOTICE

After installing piston assembly, remove unnecessary portion of ThreeBond 1374.



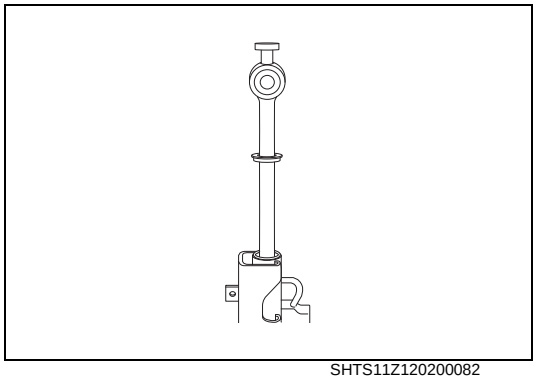
SHTS11Z120200081

(6) Apply lightly molybdenum grease to the sliding part of cylinder tube with piston.

NOTICE
When grease applied in much amount to inside diameter of cylinder tube, it may cause operational fault. So, apply it lightly.

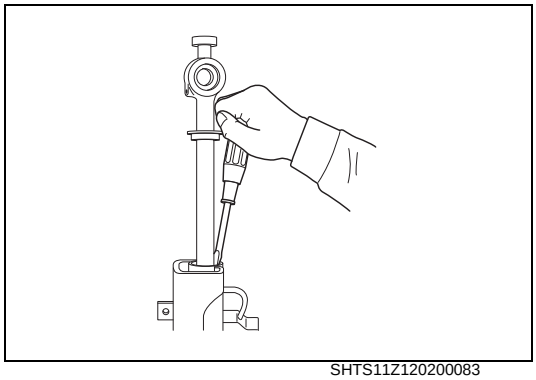
HINT
Grease applying area is good to be within reach by hand.

(7) Fix installing part of head covering of cylinder tube with vice.


SHTS11Z120200082

(8) Apply molybdenum grease to O-ring of piston assembly and back-up ring and install piston rod assembly on cylinder tube.
(9) Build it in the cylinder tube by tapping the bushing.

NOTICE
Work not to damage piston rod.

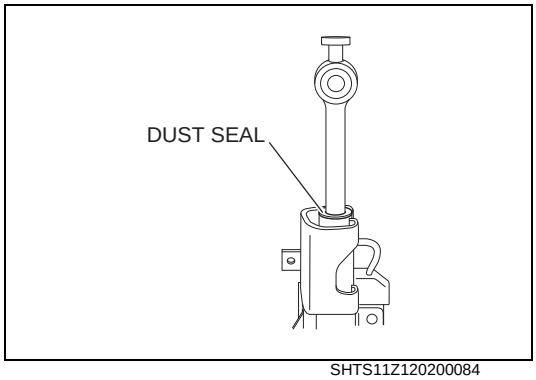

SHTS11Z120200083

(10) With a screw driver or the like, fit retainer ring into the groove in cylinder tube.

NOTICE

- **Work not to damage piston rod.**
- **Adjust its position so that the notch of retainer ring should not come over the side hole drilled on cylinder tube.**

(11) To verify that retainer ring is correctly fit, check that piston rod assembly will not come off by pulling out piston rod in all strokes.

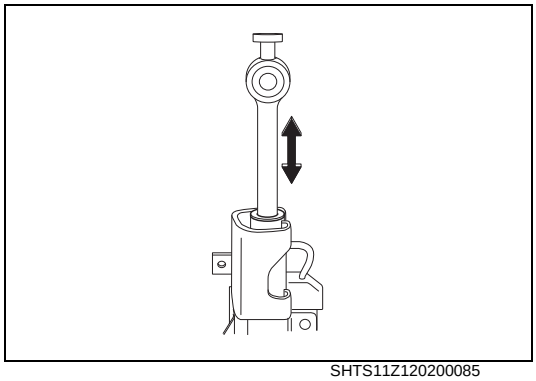


SHTS11Z120200084

(12) Apply molybdenum grease between dust seal and bushing of piston rod and strike the dust seal into cylinder tube by tapping it.

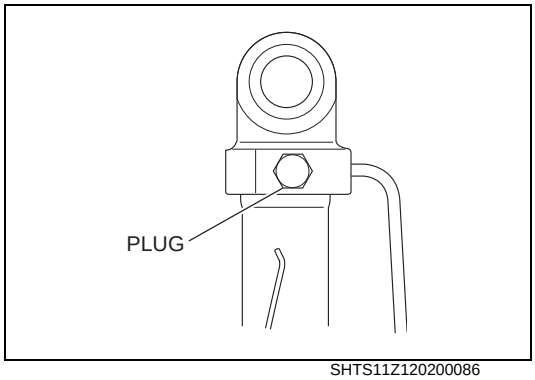
NOTICE

- **Striking the dust seal should be done after eliminating all grease remaining at striking.**
- **Make sure to strike in the dust seal to such extent that it may be faced with the end-face of cylinder tube.**
- **After striking in the dust seal, remove it off when molybdenum grease leaked out through side hole of cylinder tube.**


SHTS11Z120200085

(13) Confirm that piston rod will move smoothly by stretching all strokes by hand.

NOTICE
After the confirmation, push in piston rod up to its shortest stroke. The following assembling work of the components shall be done in condition that piston rod is pushed in up to its shortest stroke to prevent from any scratch to be made on piston rod.

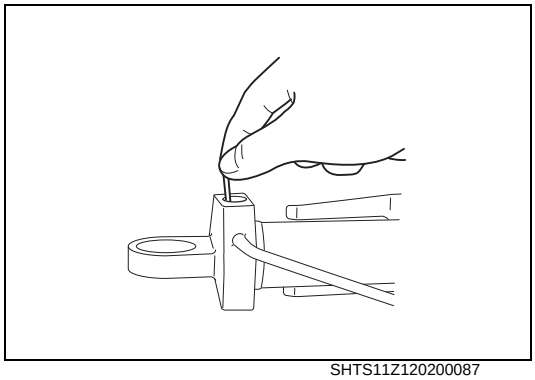


SHTS11Z120200086

2. ASSEMBLING OF PILOT CHECK VALVE

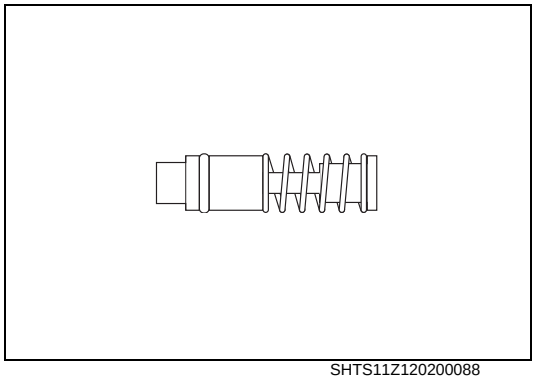
(1) Build in the steel ball, falling down cylinder tube holizontally so that installing part of steel ball should come upside.
(2) On plug, fit new O-ring, on which bearing grease was applied.
(3) Fit plug assembly by fixing temporally spring on plug assembly with bearing grease.
Tightening Torque:
17.7-26.5 N·m {181-270 kgf·cm, 14-19 lbf·ft}

NOTICE
When fitting them, there is a case that spring may come off from steel ball. So, spring shall be fixed straightly on the plug with grease and plug assembly must be fitted vertically.

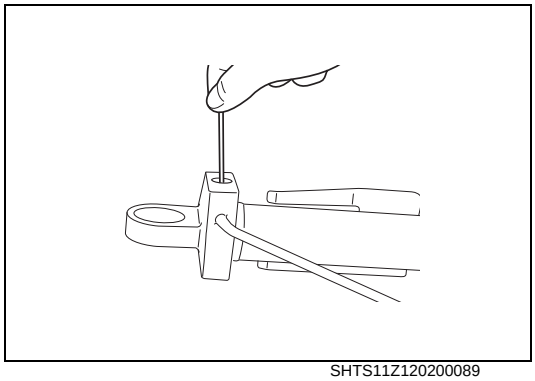

SHTS11Z120200087

(4) Confirm that steel ball will smoothly move and get back to original position by spring force when pushing lightly steel ball inserted therein with small stick (direct diameter: less than 2 mm {0.078 in.}) through hole of opposite side and releasing the stick.

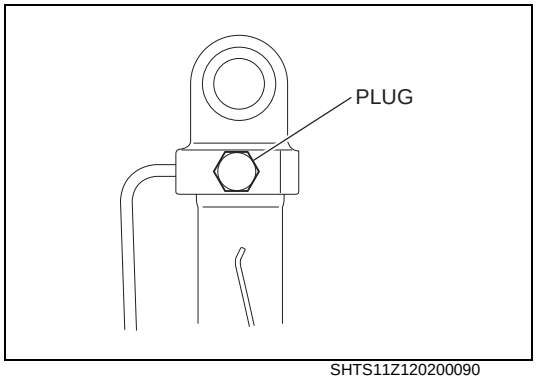
NOTICE
Work not to scratch seat of steel ball of cylinder tube.


SHTS11Z120200088

(5) Fit new O-ring, bearing greased, spring and pilot piston on sleeve.

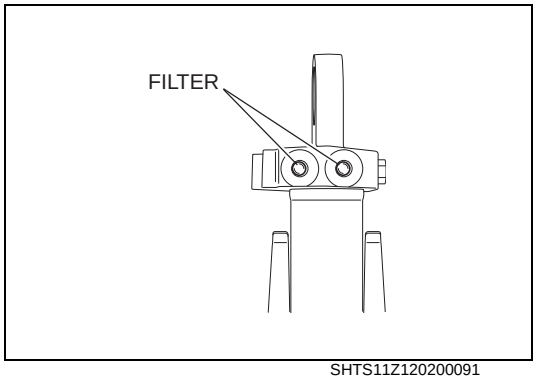

SHTS11Z120200089

(6) Fit pilot piston assembly on cylinder tube.
(7) Confirm that pilot piston will smoothly move by pushing the end-part of pilot piston with a stick.



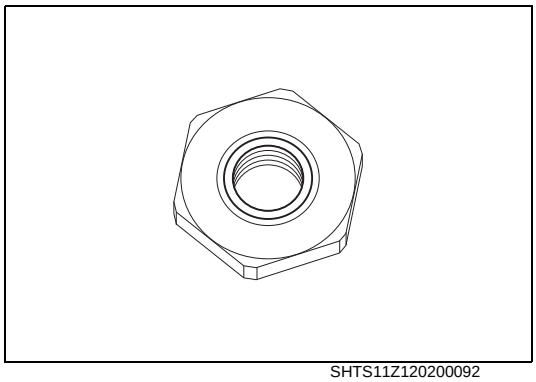
SHTS11Z120200090

(8) Applying bearing grease to new O-ring, fit it on plug and install plug assembly on cylinder tube.
Tightening Torque:
17.7-26.5 N·m {181-270 kgf·cm, 14-19 lbf·ft}



SHTS11Z120200091

(9) With hexagon wrench (4 mm {0.157 in.}), tighten filter so hard that it will be faced with U, D ports.


SHTS11Z120200092

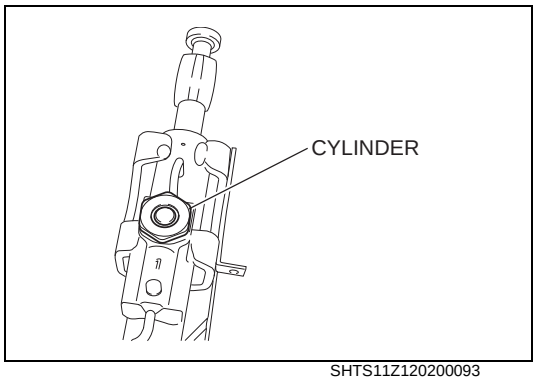
3. ASSEMBLING OF RELEASING CYLINDER

(1) After applying bearing grease to new back-up ring and new O-ring, fit them in the cylinder.

(2) Striking dust seal in the cylinder, apply bearing grease to sliding portion of dust seal with plunger.

NOTICE

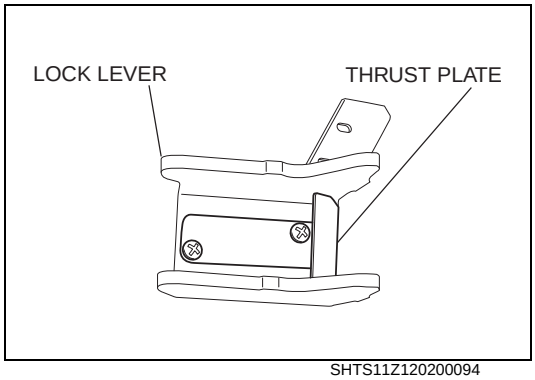
- **Make sure to strike in the dust seal until it will be faced with the groove in cylinder.**
- **The striking must be done with a stick (outer diameter: 16 mm) and be done on metal portion without deforming the rubber portion by hitting it.**
- **Keep dust lip outward and be careful to identify right and wrong sides of the component.**



SHTS11Z120200093

(3) Install them in the order of plunger, spring and cylinder assembly.
Tightening Torque:
39.2-49.0 N·m {400-500 kgf·cm, 29-36 lbf·ft}

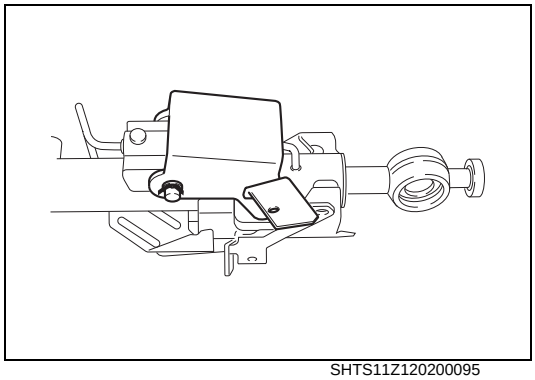
(4) Apply bearing grease to the head of plunger.



SHTS11Z120200094

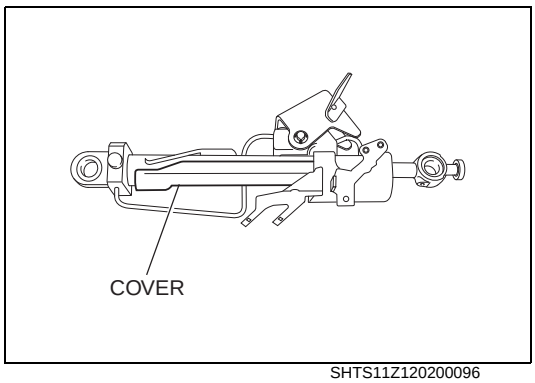
4. ASSEMBLING OF STOPPER

(1) After applying ThreeBond 1323B to the screw, install with the screw the thrust plate on lock lever.
Tightening Torque:
2.4-3.4 N·m {25-34 kgf·cm, 1.8-2.5 lbf·ft}


SHTS11Z120200095

(2) Apply bearing grease to lock lever pin and install lock lever on cylinder tube with the lock lever pin and fit washer and new cotter pin.

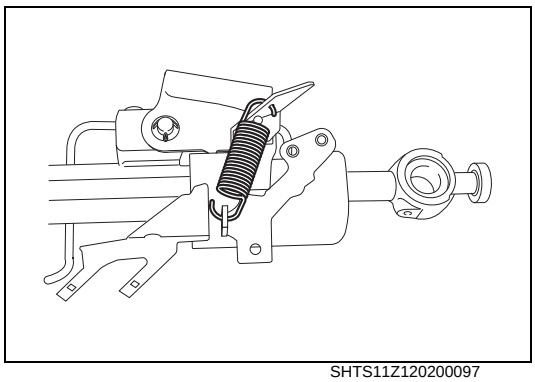
NOTICE
Work not to scratch seat of steel ball of cylinder tube.



SHTS11Z120200096

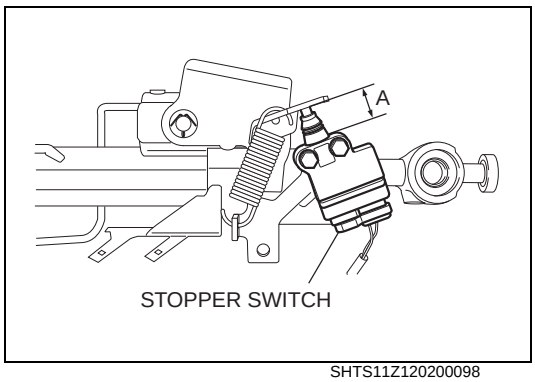
(3) Install the cover on cylinder tube.

NOTICE
Adjust the position not to interfere with weld portion of cylinder tube.


SHTS11Z120200097

(4) Install spring.

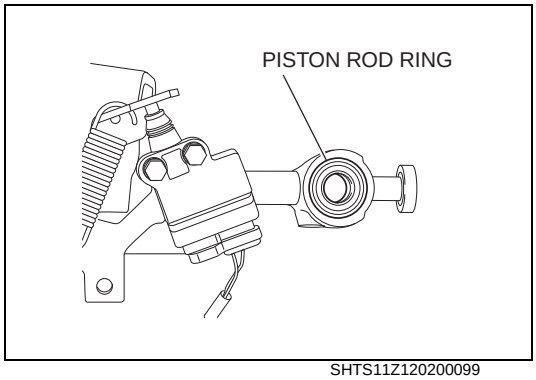
NOTICE
Do not expand spring in more than needed.



SHTS11Z120200098

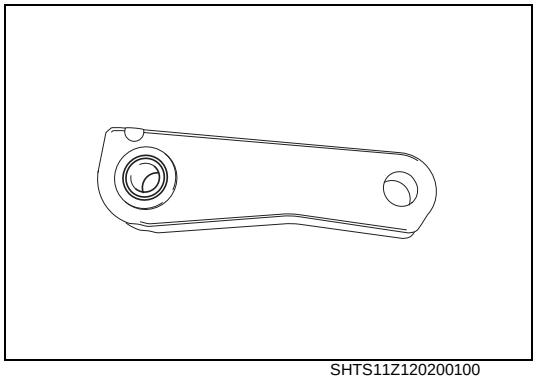
(5) Install stopper switch so that length (Dimension: A) between switch pushing plate of lock lever and rod end-surface of the switch should be of standard value.
Assembly standard:
More than 20.5-24.5 mm {0.807-0.964 in.}
Tightening Torque:
5.7-7.7 N·m {59-78 kgf·cm, 4.3-5.6 lbf·ft}

NOTICE
Be careful to right and wrong sides of switch.

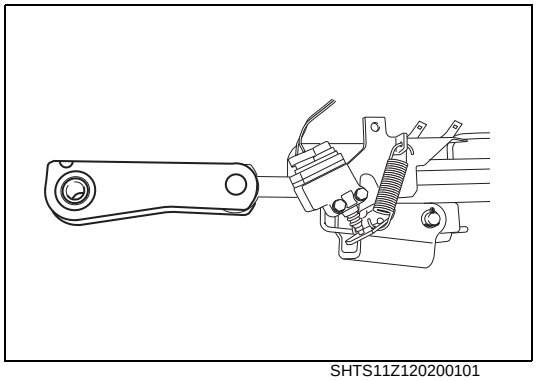


SHTS11Z120200099

(6) Fit piston rod ring on piston rod and fill up the groove in the piston rod ring with molybdenum grease and apply it to sliding surface with lever.


SHTS11Z120200100

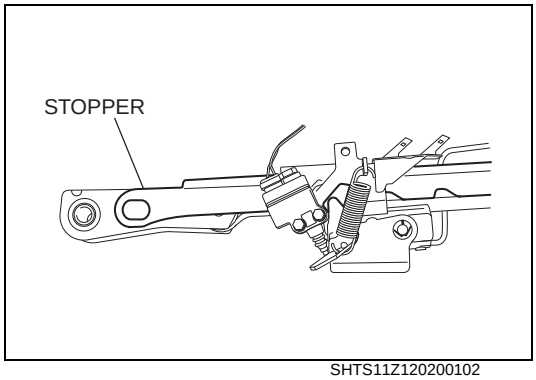
(7) Fitting bushing and new O-ring, greased on lever and filling bearing grease into long hole of the bushing, install the collar therein.


SHTS11Z120200101

(8) With use of snap ring expander or the like, install lever assembly by expanding slightly 2 plates of lever.

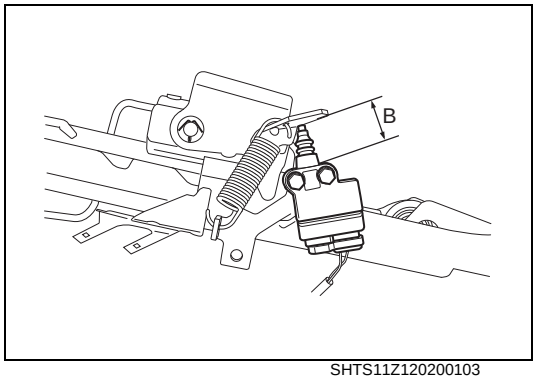
NOTICE

- **To prevent from its deformation, work not to expand too much 2 plates of lever.**
- **Work not to scratch piston rod ring.**



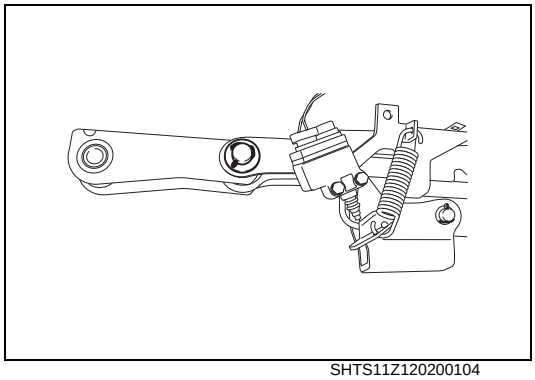
SHTS11Z120200102

(9) Raising lock lever by hand and inserting stopper from rod side, stop the stopper at position where lock lever will be caught in the notch of stopper.



SHTS11Z120200103

(10) Check that length (Dimension: B) between pushing plate of lock lever and rod edge face of switch will be more than standard value. When running out of standard value, adjust again dimension A mentioned in the above (5).
Assembly standard: More than 30 mm {1.181 in.}

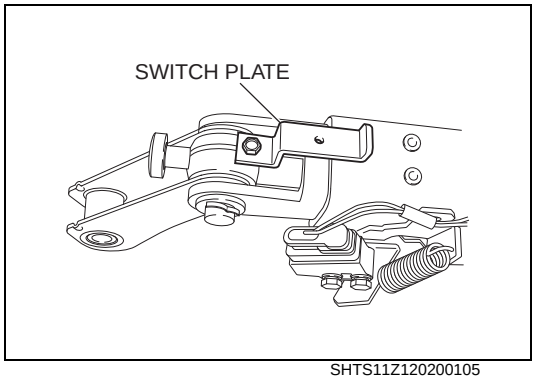


SHTS11Z120200104

(11) After inserting deeply the stopper, fit stopper pin, washer and new cotter pin.

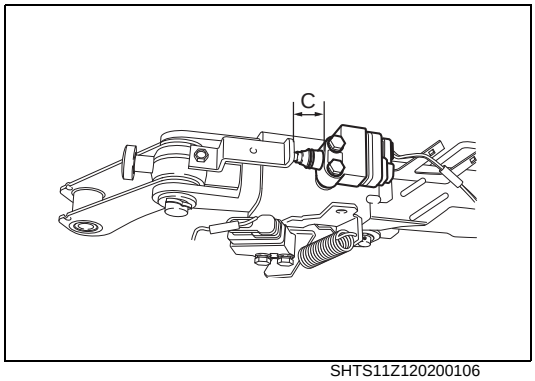
NOTICE

- **Expand cotter pin to both sides not to come off.**
- **After installing, there is a case that molybdenum grease is still adhered on the stopper. So, remove it when noticed.**



SHTS11Z120200105

(12) Install switch plate.
Tightening Torque:
5.7-7.7 N·m {59-78 kgf·cm, 4.3-5.6 lbf·ft}



SHTS11Z120200106

(13) Install stroke switch that length (Dimension: C) between switch plate and rod end-surface of switch will be of standard value.
Tightening Torque:
5.7-7.7 N·m {59-78 kgf·cm, 4.3-5.6 lbf·ft}

Assembly standard: 23.5-24.5 mm {0.925-0.964 in.}

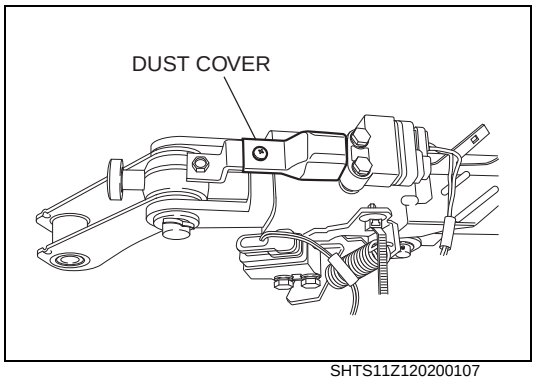
NOTICE
Be careful to right and wrong sides of switch.

(14) Insert connector into cylinder tube.

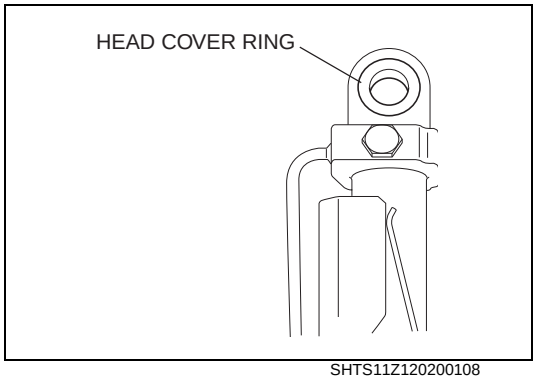
NOTICE
Work not to damage the hook not to come off.

(15) Clamping lead wires of switch, insert fixing portion of clamp into cylinder tube. Leaving 3-6 mm {0.1181-0.2362 in.} from the clamped part, cut off its unnecessary part.

(16) Install dust cover.
Tightening Torque:
2.4-3.4 N·m {25-34 kgf·cm, 1.8-2.5 lbf·ft}



SHTS11Z120200107



SHTS11Z120200108

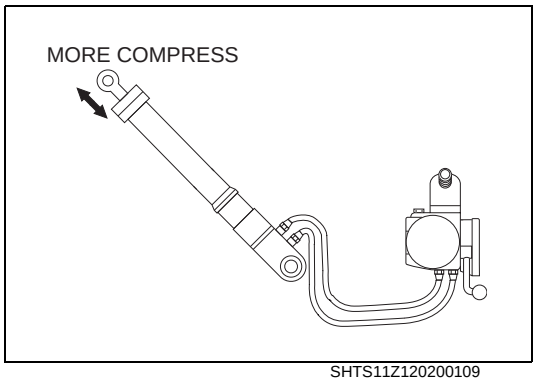
(17) Install head covering onto cylinder tube and fill the groove of head covering with molybdenum grease and also apply it to sliding part of head covering.

IMPORTANT POINTS - CHECK AFTER ASSEMBLING

1. AIR BLEEDING METHOD

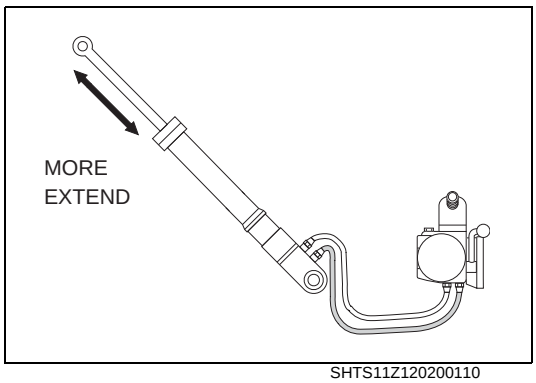
(1) Connect it with pump under condition that cylinder was removed from cab.

(2) Under condition of cylinder extended to the shortest stroke, check cab tilt fluid amount of pump reservoir and replenish it when lacking.



SHTS11Z120200109

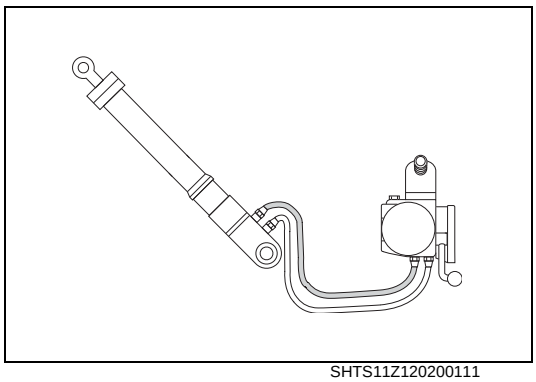
(3) Operating pump with switching lever at "UP" position, stop pump at the moment when cylinder was extended to the most extendible stroke.

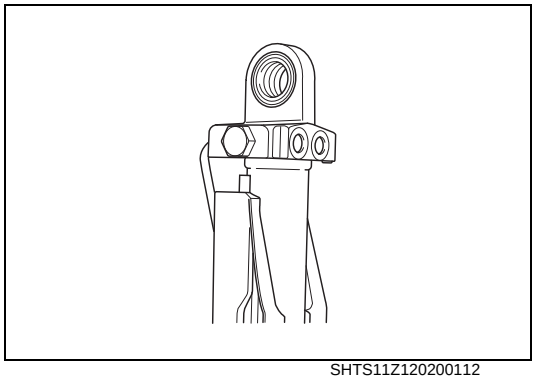


SHTS11Z120200110

(4) Operating pump with switching lever at "DOWN", stop pump at the moment when cylinder was extended to the shortest stroke.

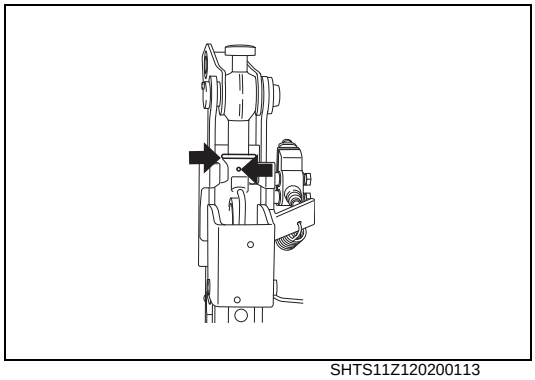
(5) Repeating in 2 to 3 times the operation mentioned in above (2) to (4), check that cab tilt fluid is filled up to filler port of pump under condition that cylinder was extended to the shortest stroke.


SHTS11Z120200111


SHTS11Z120200112

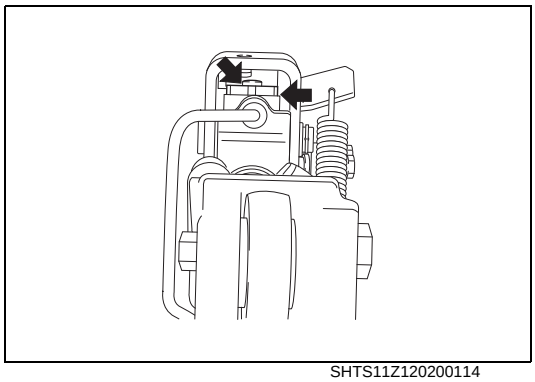
2. INSPECTION OF PILOT CHECK VALVE

(1) Apply hydraulic pressure and check that oil does not leak from the plugs.


SHTS11Z120200113

3. INSPECTION OF CYLINDER

(1) Apply hydraulic pressure and check that oil does not leak from the horizontal hole of the cylinder tube, dust seal and welded sections.


SHTS11Z120200114

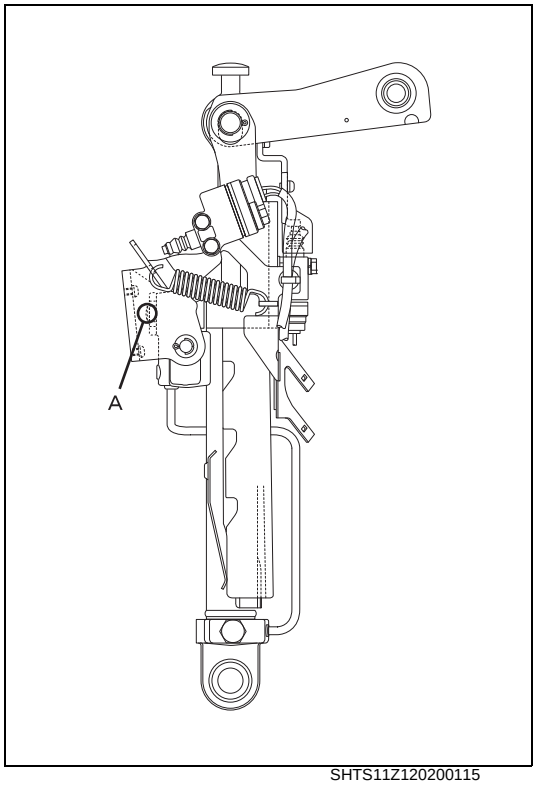
4. INSPECTION OF LOCK RELEASE CYLINDER

(1) Apply hydraulic pressure and check that oil does not leak from the cylinder and sliding section of the plunger.

(2) With the cylinder contracted by 1 to 3 mm {0.0394 to 0.1181 in.} from the fully extended state, operate the manual pump several times with the switching lever at "DOWN" position, and check that the lock lever operates before the cylinder starts to contract.

NOTICE

Inspection should be made with contracted state to obtain the right result.



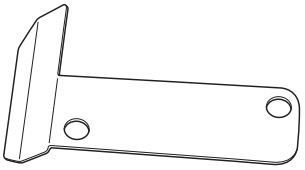
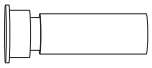
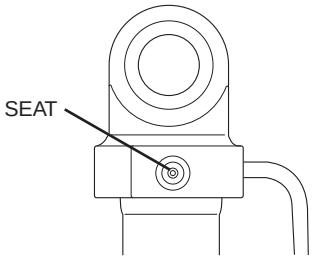
SHTS11Z120200115

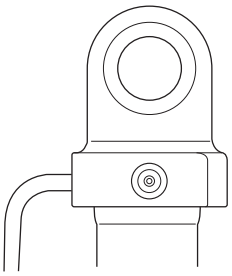
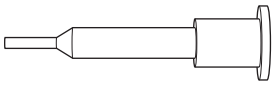
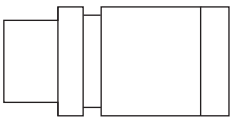
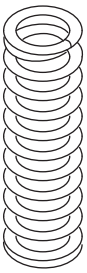
5. LUBRICATION

(1) Apply chassis grease to the part A as shown figure.
A: Sliding part

INSPECTION AND REPAIR

EN11Z1202H300002

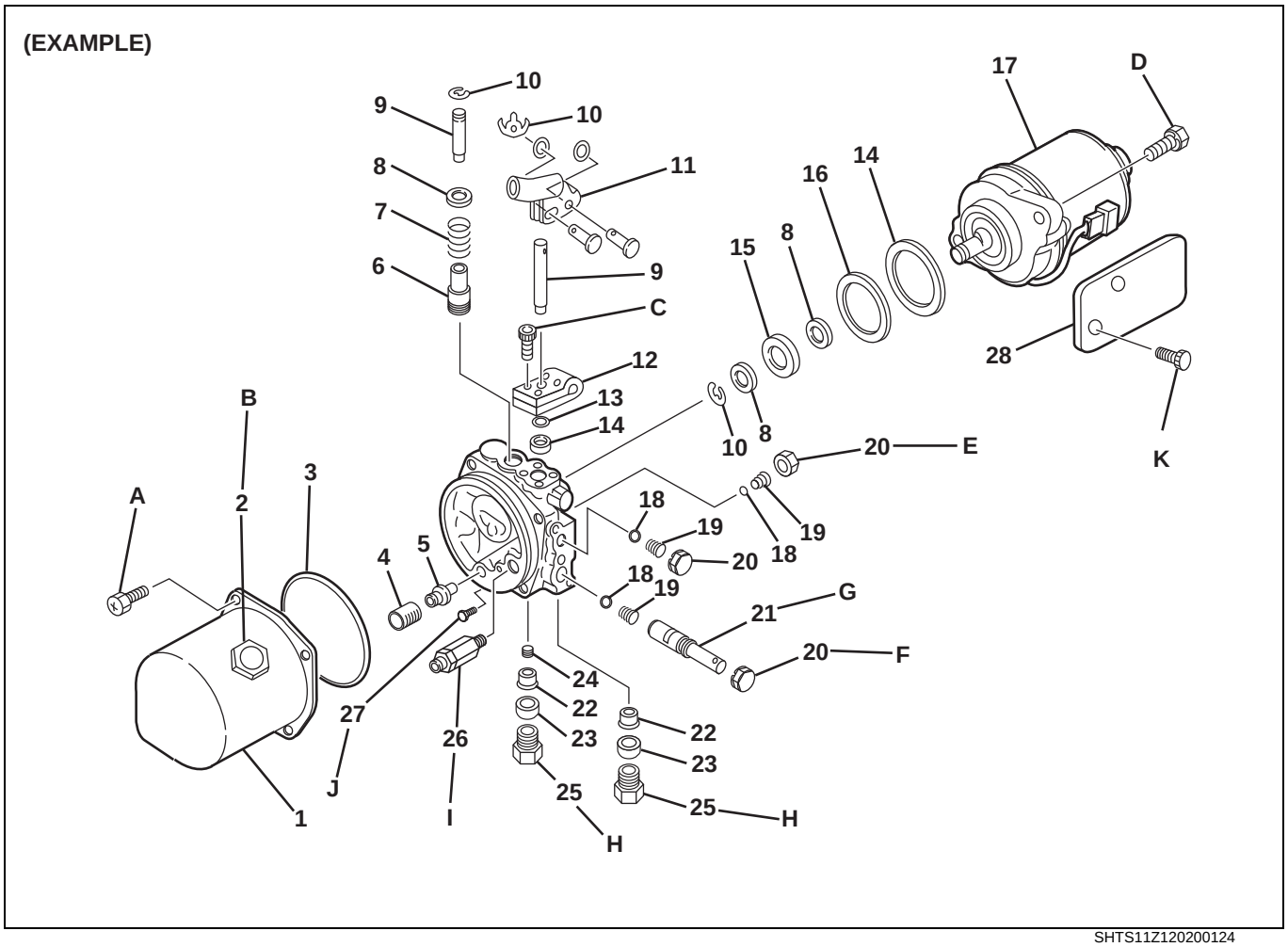
Inspection item	Standard	Limit	Remedy	Inspection procedure
Steel ball: Damage and deformation	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Thrust plate: Wear	**—**	**—**	**Replace the thrust plate and the plunger as a set, if necessary.**	**Visual check** 
Plunger: Wear	**—**	**—**	**Replace the plunger and the thrust plate as a set, if necessary.**	**Visual check** 
Cylinder tube: Wear and damage on the seat of steel ball	**—**	**—**	**Replace the cylinder tube as an assembly, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Cylinder tube: Damage of the inner surface of the fitting collar inserting hole	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Pilot piston: Bend and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Fitting collar: Damage of inner and outer surfaces	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring: Setting and bend	**—**	**—**	**Replace, if necessary.**	**Visual check** 

TILT PUMP (MODELS WITH DOUBLE CAB)

COMPONENT LOCATOR

EN11Z1202D100008



SHTS11Z120200124

1	Reservoir tank	11	Manual pump lever	21	Plug
2	Filler cap	12	Case	22	Filter
3	O-ring	13	Back up ring	23	Seat
4	Filter	14	Gasket	24	Plug
5	Pipe	15	Bearing	25	Plug
6	Pump cylinder	16	Spacer	26	Relief valve
7	Spring	17	Tilt motor	27	Bolt
8	Plain washer	18	Check valve ball	28	Bracket
9	Piston	19	Spring		
10	Retainer	20	Plug		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	2.4-3.4 {25-35, 1.9-2.5}	G	7.8-10.8 {80-110, 5.7-7.9}
B	44.2-54.0 {450-550, 32-39}	H	0.98-1.48 {10-15, 0.72-1.09}
C	4.9-6.9 {50-70, 3.7-5.0}	I	11.8-19.6 {120-200, 8.7-14.4}
D	7.4-9.8 {76-100, 5.5-7.2}	J	4.9-6.9 {50-70, 3.7-5.0}
E	11.7-14.7 {120-150, 9-10}	K	5.0-7.4 {51-75, 3.7-5.4}
F	19.6-29.4 {200-300, 15-21}		

OVERHAUL

EN11Z1202H200004

IMPORTANT POINT - DISMOUNTING

1. TILT PUMP

(1) Disconnect the oil pipes between the pump and the cylinder at the pump side.

NOTICE

- **Before disconnection of the pipes, clean the connection parts.**
- **Seal the removed pump and the pipe connector parts with tape etc.**

IMPORTANT POINTS - DISASSEMBLY

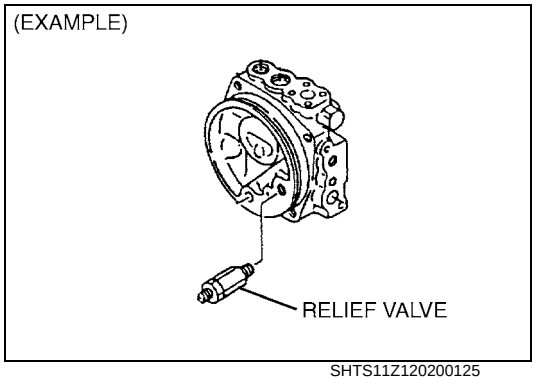
1. RELIEF VALVE

(1) Never disassemble the relief valve when removing it.

NOTICE

Adjust the valve opening pressure of relief valve to the specified value.

VALVE OPENING PRESSURE:
34.3-37.2 MPa {350-379 kgf/cm^2, 4,979-5,390 lbf/in.^{2}}



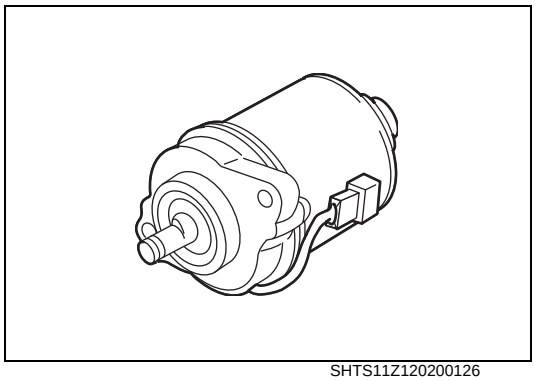
SHTS11Z120200125

2. TILT MOTOR

(1) Never open the tilt motor cover.

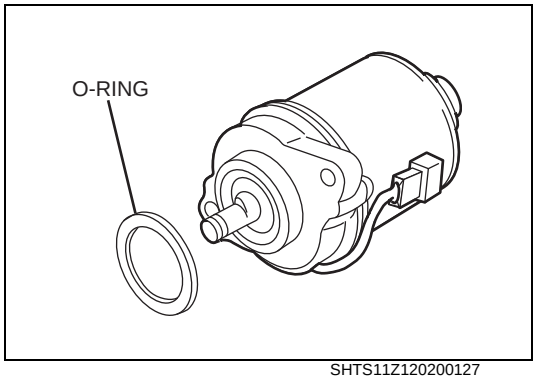
NOTICE

If the motor is faulty, replace the motor assembly.



SHTS11Z120200126

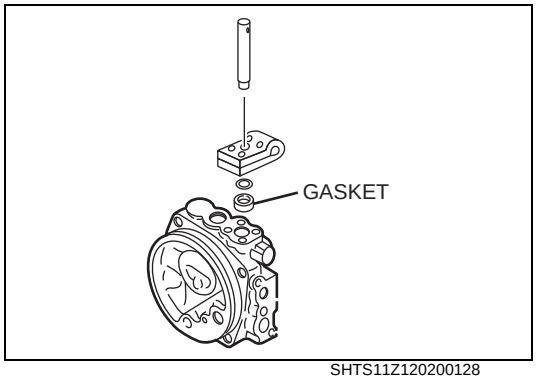
IMOPORTANT POINTS - ASSEMBLY



SHTS11Z120200127

1. TILT MOTOR

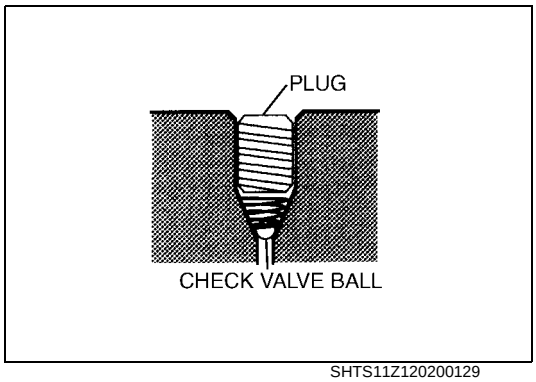
(1) Apply lithium grease to the O-ring.



SHTS11Z120200128

2. MANUAL TILT PUMP

(1) Apply lithium grease to the gasket.



SHTS11Z120200129

3. CHECK VALVES

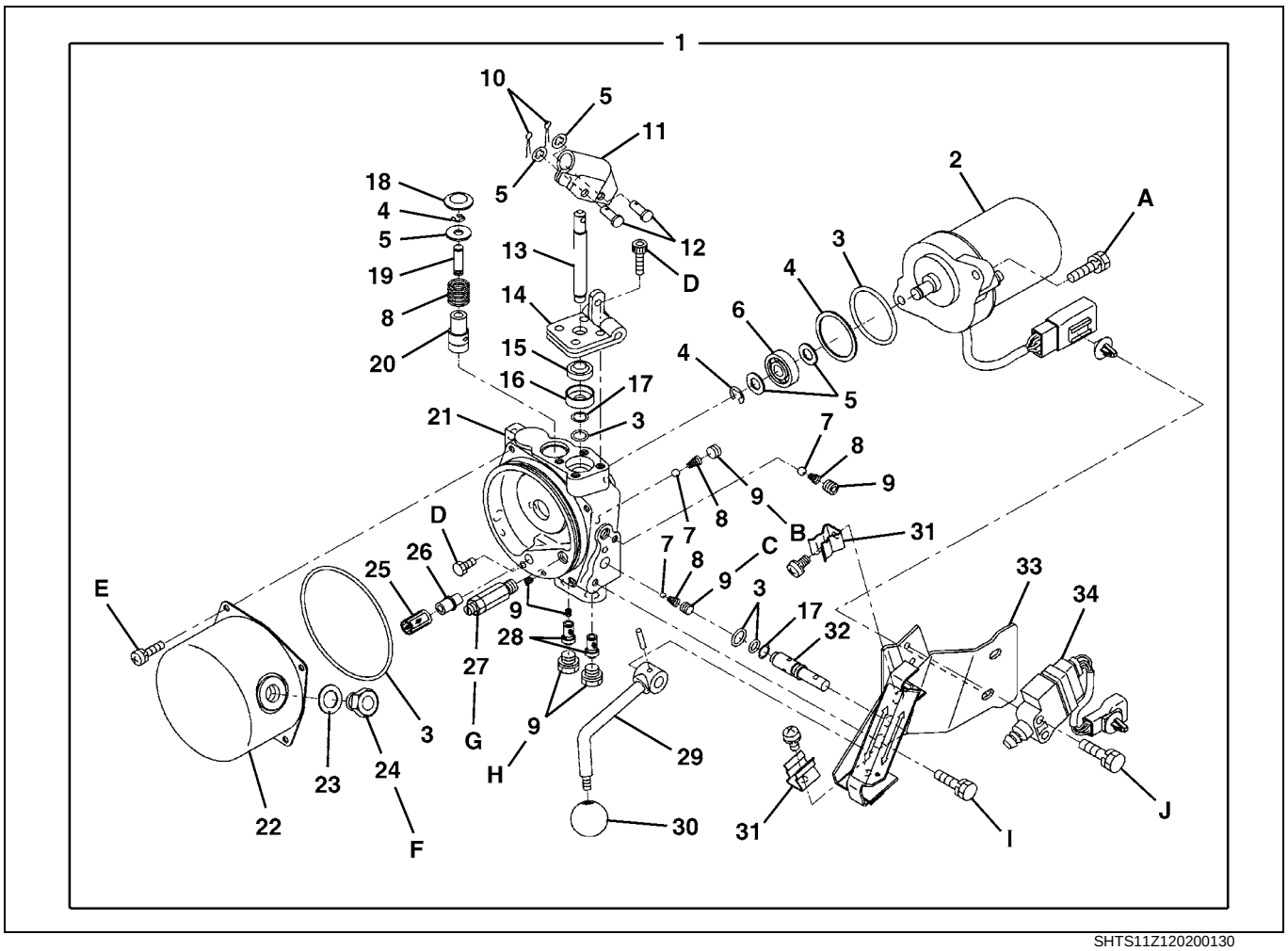
(1) Coat the plug with seal tape when installing the check valves.

ELECTRIC TILT PUMP

[MODELS: GH (FOR IRELAND), FT, GT SINGLE CAB]

COMPONENT LOCATOR

EN11Z1202D100009



SHTS11Z120200130

1	Cab tilt pump	13	Manual pump piston	25	Filter
2	Motor	14	Pump bracket	26	Pipe
3	O-ring	15	Dust seal	27	Relief valve
4	Retainer ring	16	Case	28	Seat
5	Plain washer	17	Back-up ring	29	Switching lever
6	Bearing	18	Expansion plug	30	Lever knob
7	Steel ball	19	Electric pump piston	31	Lever stopper
8	Spring	20	Cylinder	32	Switching valve
9	Plug	21	Body	33	Lever holder
10	Cotter pin	22	Reservoir	34	Tilt position switch
11	Socket	23	Gasket		
12	Pin	24	Filler cap		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	7.4-9.8 {76-99, 5.5-7.2}	F	44.2-54.0 {451-550, 33-39}
B	11.7-14.7 {120-149, 8.7-10.8}	G	11.8-19.6 {121-199, 8.8-14.4}
C	7.8-10.8 {80-110, 5.8-7.9}	H	0.98-1.48 {10-15, 0.73-1.09}
D	4.9-6.9 {50-70, 3.7-5.0}	I	5.0-7.4 {51-75, 3.7-5.4}
E	2.4-3.4 {25-34, 1.8-2.5}	J	5.7-7.7 {59-78, 4.3-5.6}

OVERHAUL

EN11Z1202H200005

IMPORTANT POINTS - ASSEMBLY

1. DRAINAGE OF CAB TILT FLUID

(1) After removing filler cap and gasket, drain cab tilt fluid by turning over pump upside down.

NOTICE

- **When scrapping cab tilt fluid, it must be done according to specified method (disposal of industrial waste) or a method of environmental protection.**
- **With preparation of a oil container, keep cab tilt fluid.**

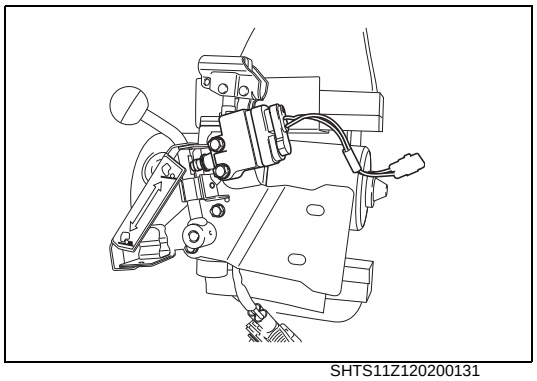
2. DISASSEMBLING OF SWITCHING VALVE

(1) Remove switch and connector of DC motor from lever holder.

NOTICE

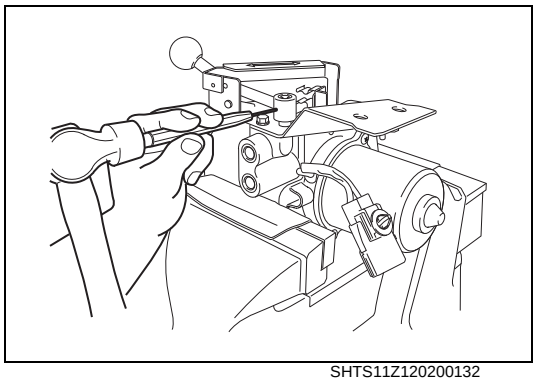
Work not to damage connector clip.

(2) Remove bolt and then switch.



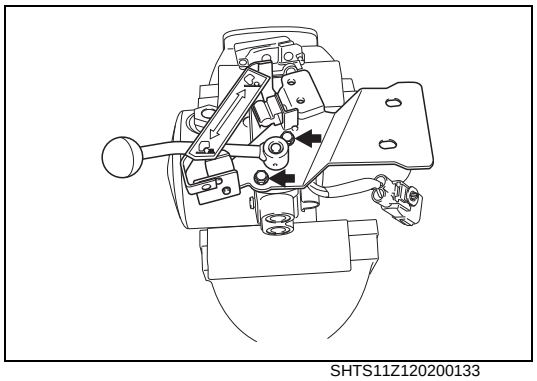
SHTS11Z120200131

(3) With a punch, pull out spring pin from lever.

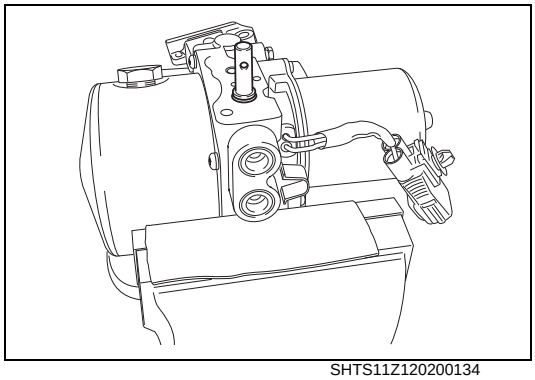


SHTS11Z120200132

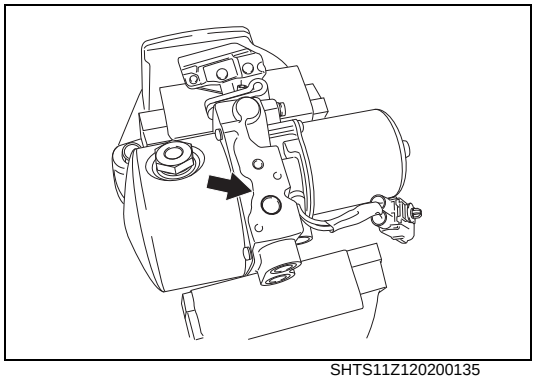
(4) Remove bolt to remove lever and lever holder.



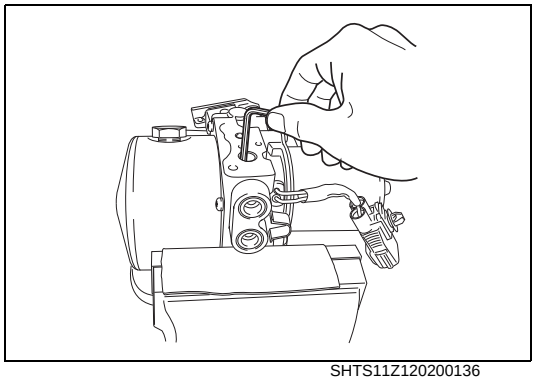
SHTS11Z120200133


SHTS11Z120200134

(5) Pull out switching valve from body.
(6) Remove O-ring and back-up ring from switching valve.


SHTS11Z120200135

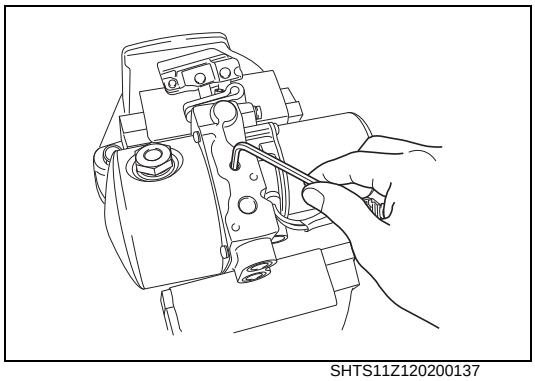
(7) Remove O-ring in the installing hole of switching valve.


SHTS11Z120200136

3. DISASSEMBLING OF ELECTRIC PUMP DELIVERY CHECK VALVE

(1) With hexagon wrench (4 mm {0.157 in.}), remove hole plug for installing switching valve to remove delivery spring and steel ball.

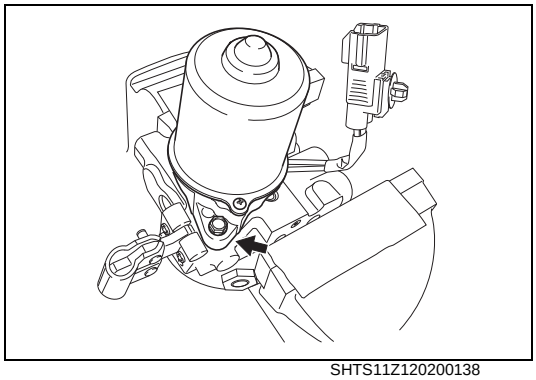
NOTICE
Work not to lose the disassembled parts.


SHTS11Z120200137

4. DISASSEMBLING OF MANUAL PUMP DELIVERY CHECK VALVE

(1) With hexagon wrench (5 mm {0.196 in.}), remove plug and then delivery spring and steel ball.

NOTICE
Work not to lose them.

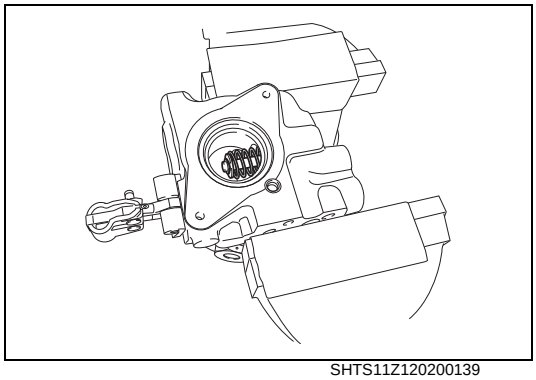

SHTS11Z120200138

5. DISASSEMBLING OF ELECTRIC PUMP PISTON

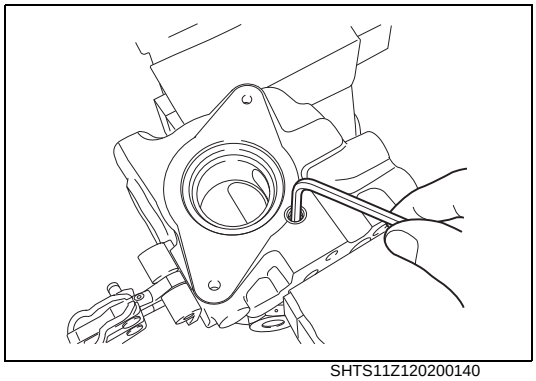
(1) Remove bolt and then DC motor from body is a case that piston may jump out. So, be careful.

NOTICE

There is a case that piston may jump out. So, be careful.


SHTS11Z120200139

(2) Remove piston, piston spring, washer and retainer ring.

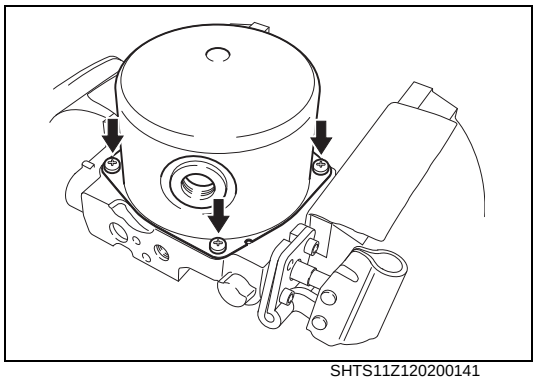

SHTS11Z120200140

6. DISASSEMBLING OF MANUAL PUMP SUCTION CHECK VALVE

(1) With hexagon wrench (5 mm {0.196 in.}), remove plug and then suction spring and steel ball.

NOTICE

Work not to lose them.

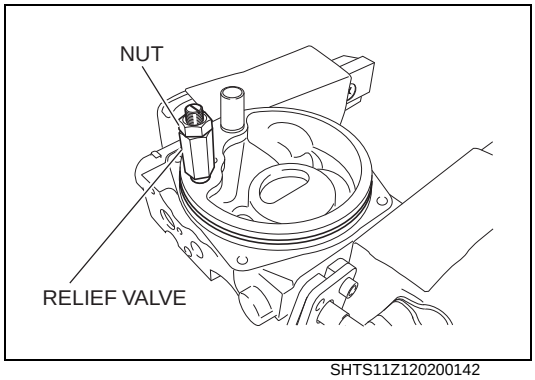

SHTS11Z120200141

7. DISASSEMBLING OF RELIEF VALVE

(1) Removing the screws, remove reservoir with screw driver or the like.

NOTICE

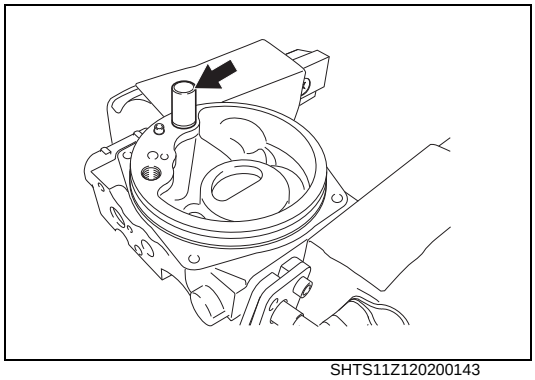
- **As cab tilt fluid remaining in the reservoir may flow out, prepare oil recipient to keep it.**
- **Work not to deform the reservoir.**



SHTS11Z120200142

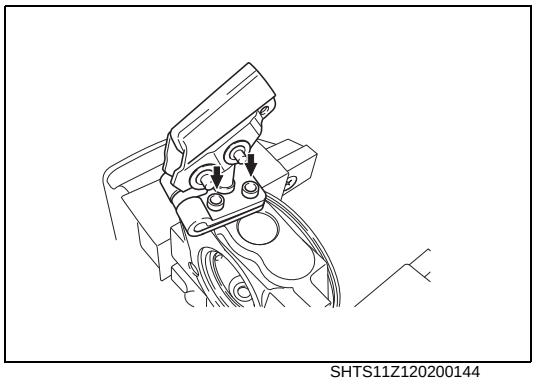
(2) Remove O-ring.
(3) Remove relief valve.

NOTICE
Once the nut loosened, setting pressure for relief valve will be changed. Therefore, remove it by putting a wrench on the body of relief valve.


SHTS11Z120200143

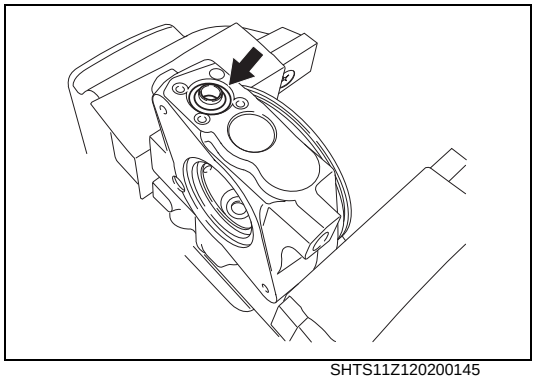
8. DISASSEMBLING OF FILTER
(1) Pull out filter together with the pipe.

NOTICE
Filter and pipe are breakable. So, handle them with much care.


SHTS11Z120200144

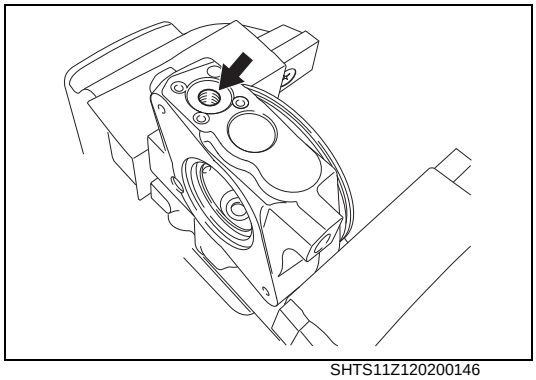
9. DISASSEMBLING OF MANUAL PUMP PISTON
(1) With use of hexagon wrench (4 mm {0.157 in.}), remove bolt and pull out manual piston, together with socket assembly and link cover assembly.

NOTICE
Manual piston is bendable and sliding portion is easily scratched. So, handle them with care.


SHTS11Z120200145

(2) With a screw driver or the like, remove dust seal from body.

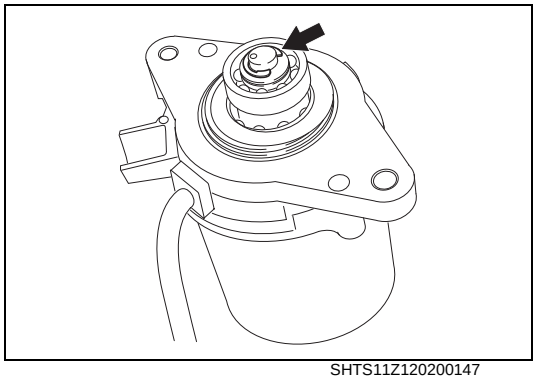
NOTICE
Work not to scratch body.


SHTS11Z120200146

(3) Remove O-ring and back-up ring.

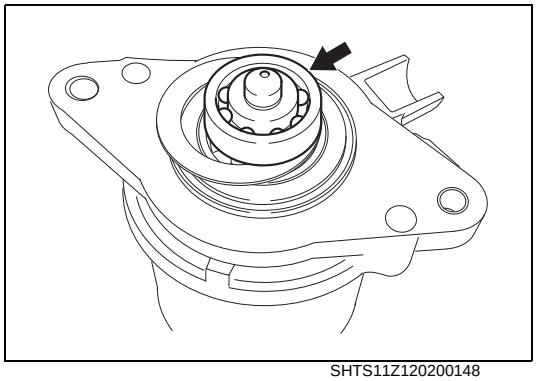
NOTICE

Work not to scratch manual piston inserting hole of body.

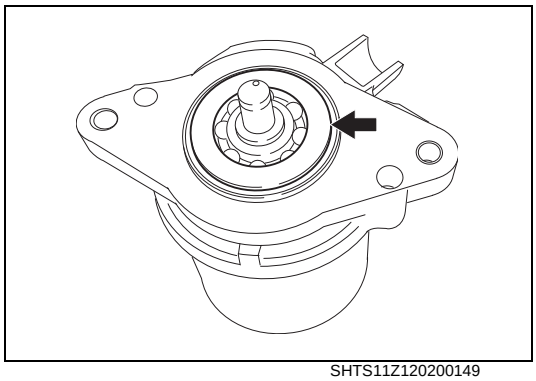

SHTS11Z120200147

10. DISASSEMBLING OF DC MOTOR

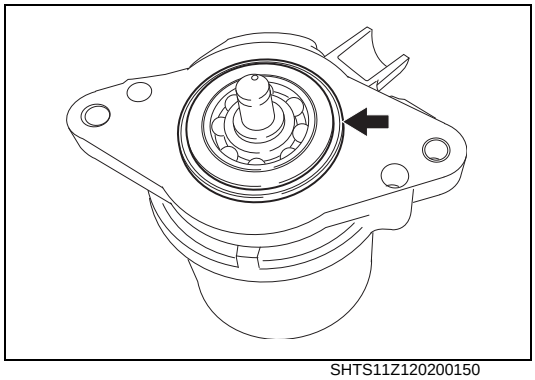
(1) Remove retainer ring.


SHTS11Z120200148

(2) Remove them in the order of washer, bearing and washer.


SHTS11Z120200149

(3) Remove retainer ring.

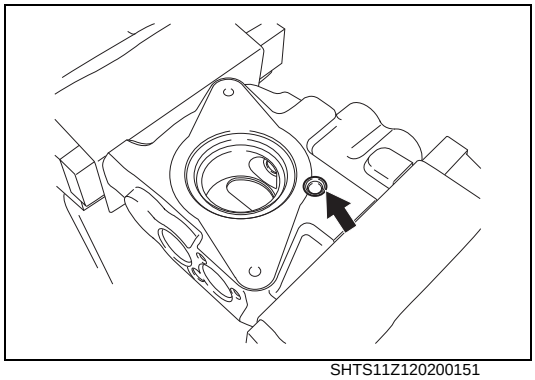

SHTS11Z120200150

(4) Remove O-ring.

IMPORTANT POINTS - ASSEMBLY

NOTICE

- **When such dusts as sand, dust, a piece of fiber and so on are adhered on the components and enter into the cylinder, which may cause operation fault. So, be careful.**
- **Back-up ring, O-ring, retainer ring, spring pin, cotter pin and dust seal, all new ones must be used. And, apply bearing grease to prevent from any damage in fitting each O-ring.**
- **There is a possibility that a piece of vulcanized tape remaining on body screw surface after the plug was removed may enter into the pump when assembling again, which may cause operation fault. So, clean off completely.**

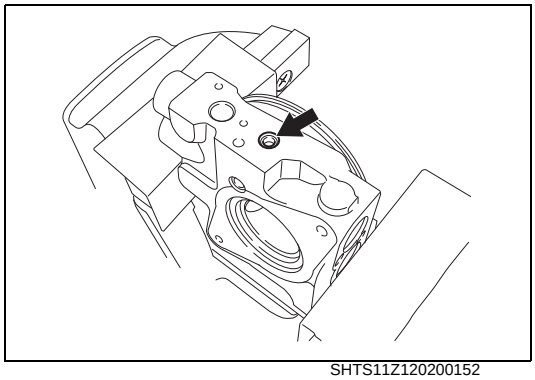

SHTS11Z120200151

1. ASSEMBLING OF MANUAL PUMP SUCTION VALVE

(1) Fit in steel ball and suction spring.

(2) Winding up the plug with vulcanized tape, install it on body with hexagon wrench (5 mm {0.196 in.}).
Tightening Torque:
11.7-14.7 N·m {120-149 kgf·cm, 8.7-10.8 lbf·ft}

NOTICE
Check that it is concaved from end-face of body.

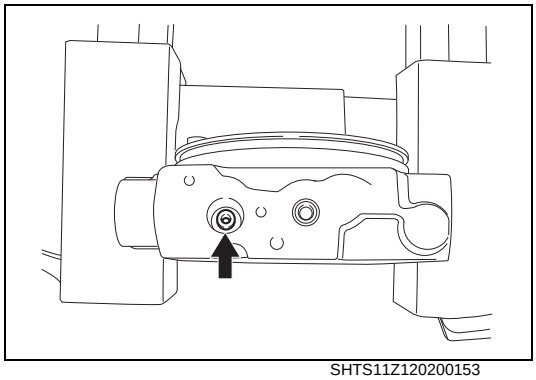

SHTS11Z120200152

2. ASSEMBLING OF MANUAL PUMP SUCTION VALVE

(1) Fit in steel ball and delivery spring.

(2) Winding the plug with vulcanized tape, install it on body with hexagon wrench (5 mm {0.196 in.}).
Tightening Torque:
11.7-14.7 N·m {120-149 kgf·cm, 8.7-10.8 lbf·ft}

NOTICE
Check that it is concaved from end-face of body.


SHTS11Z120200153

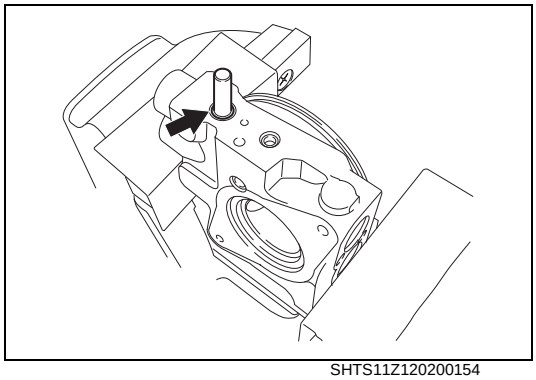
3. ASSEMBLING OF ELECTRIC PUMP DELIVERY CHECK VALVE

(1) Fit steel ball and delivery spring.

(2) With hexagon wrench (4 mm {0.157 in.}), install plug.
Tightening Torque:
7.8-10.8 N·m {80-110 kgf·cm, 5.8-7.9 lbf·ft}

NOTICE

- **Do not wind up the plug with vulcanized tape.**
- **Confirm that it is concaved from edge-face of hole bottom for installing switching valve.**

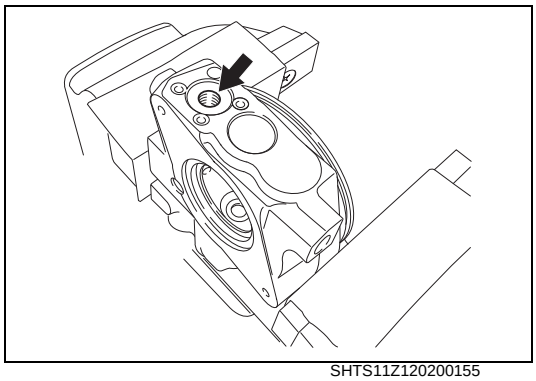

SHTS11Z120200154

4. ASSEMBLING OF SWITCHING VALVE

(1) Applying bearing grease to new O-ring, fit it on the back of hole for installing switching valve.

(2) After fitting new O-ring and new back-up ring, applying bearing grease on switching valve, adjust its direction so that the notch of switching valve should come to manual pump side and insert it into body.

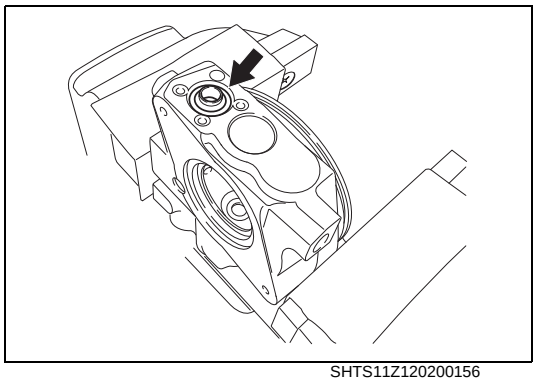
NOTICE
Install so that O-ring of switching valve should come to the back side of hole for body.


SHTS11Z120200155

5. ASSEMBLING OF MANUAL PUMP

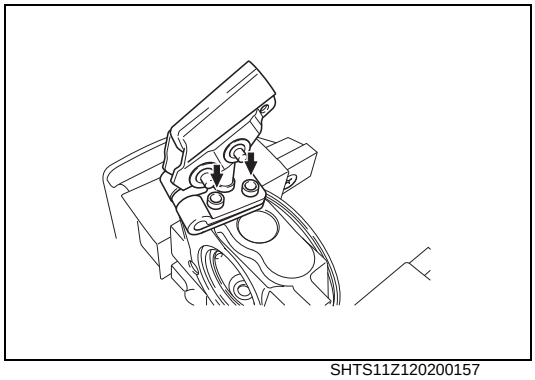
(1) Fit new O-ring and back-up ring applying bearing grease to the back of hole for installing manual piston.

NOTICE
Assemble it so that O-ring should come to the back side of hole for installing manual piston.


SHTS11Z120200156

(2) After applying bearing grease to the sliding part of new dust seal with manual piston, press it in body.

NOTICE
In pressing it in, work not to damage dust seal.

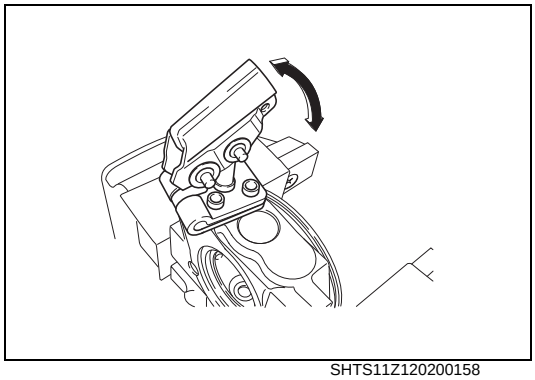

SHTS11Z120200157

(3) Install manual piston, socket assembly and link cover assembly therein.

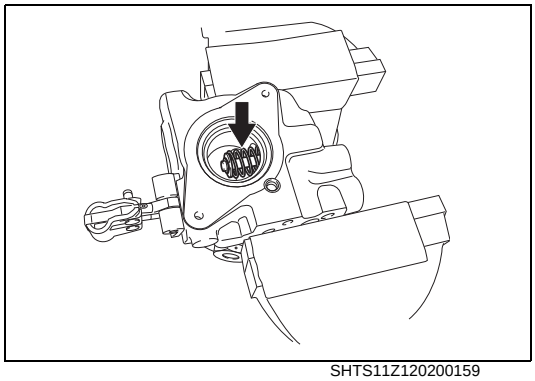
NOTICE

Manual piston is bendable and also, sliding part is easily scratched. So, handle them with much care.

(4) With hexagon wrench (4 mm {0.157 in.}), fix link cover with bolt.
Tightening Torque:
4.9-6.9 N·m {50-70 kgf·cm, 3.7-5.0 lbf·ft}


SHTS11Z120200158

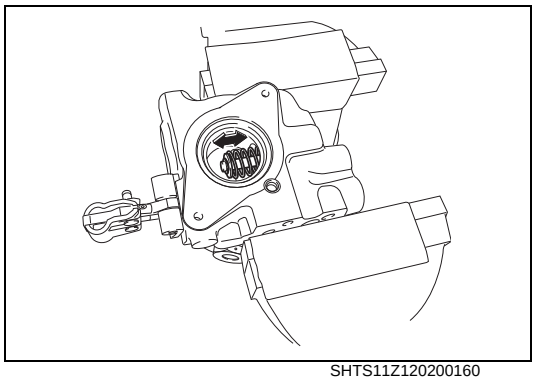
(5) With operation of socket, check smooth movement of manual piston.


SHTS11Z120200159

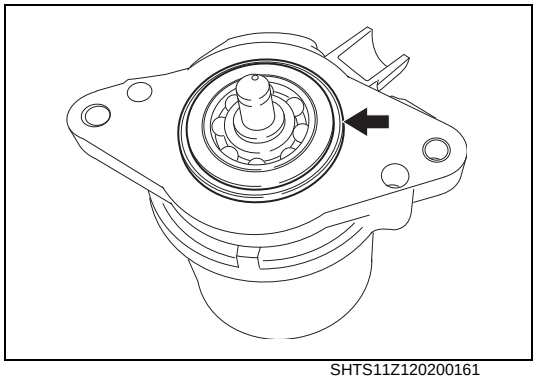
6. ASSEMBLING OF ELECTRIC PUMP PISTON

(1) Fit piston spring into body.

(2) After fitting new retainer ring and washer on piston, build it in body.

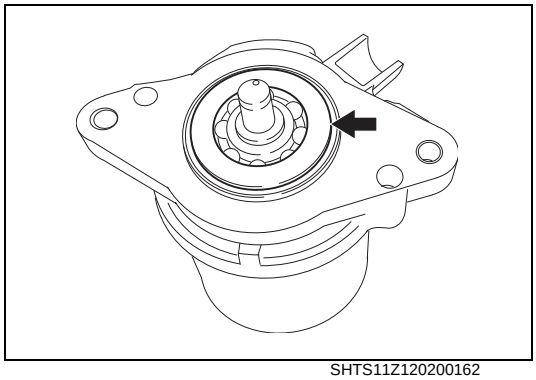

SHTS11Z120200160

(3) Confirm smooth movement of piston.

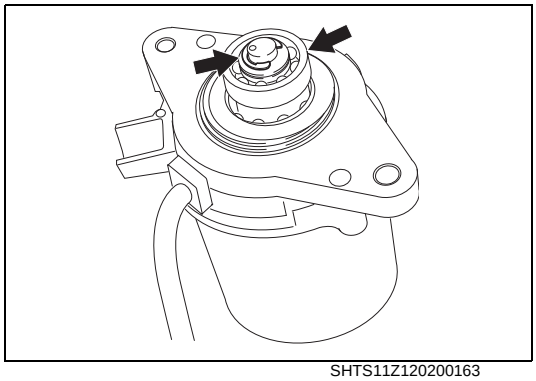

SHTS11Z120200161

7. ASSEMBLING OF DC MOTOR

(1) Fit new O-ring bearing greased on DC motor.


SHTS11Z120200162

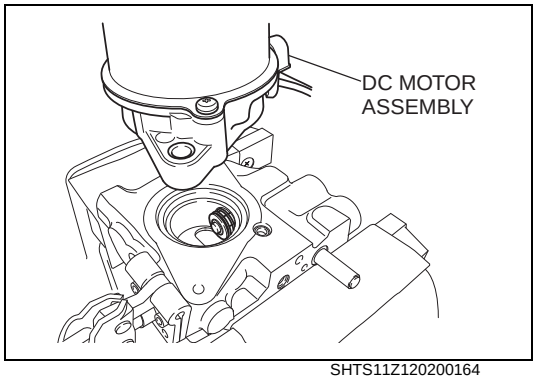
(2) Applying lightly bearing grease to surface of retainer ring at DC motor side, install it on DC motor.


SHTS11Z120200163

(3) Fitting washer, bearing and washer in the order, fix it with new retainer ring.

NOTICE

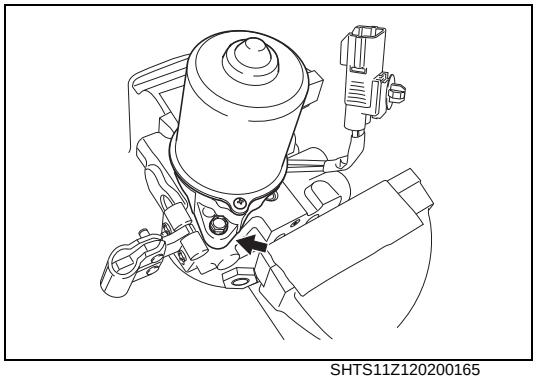
In fitting bearing, there is a case that it tends to be pressed in. In this case, install it therein by pushing slightly inner lace of bearing.



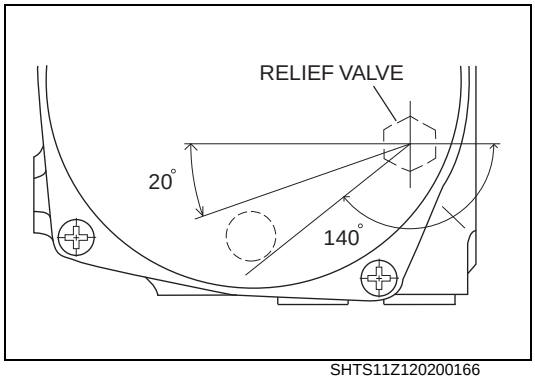
SHTS11Z120200164

(4) Turn it by hand so that eccentric part of DC motor shaft should be faced with opposite side of piston.

(5) Holding piston from reservoir side, build DC motor in body.


SHTS11Z120200165

(6) Fix DC motor assembly with bolt.
Tightening Torque:
7.4-9.8 N·m {76-99 kgf·cm, 5.5-7.2 lbf·ft}



SHTS11Z120200166

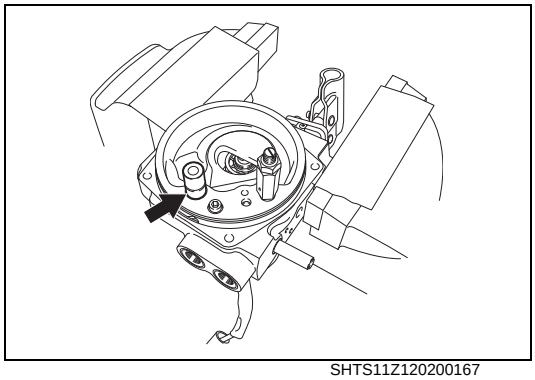
8. ASSEMBLING OF RELIEF VALVE

(1) Install relief valve on body so that its blow hole should be turned within range of the figure.

NOTICE

When tightened at the part of nut, setting pressure of relief valve will be changed. Therefore, install it by putting a wrench on body of relief valve.

Tightening Torque:
11.8-19.6 N·m {121-199 kgf·cm, 8.8-14.4 lbf·ft}

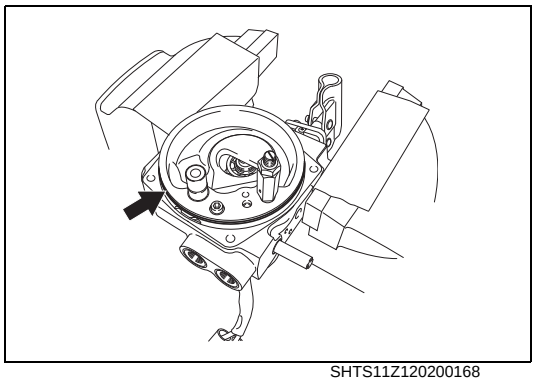

SHTS11Z120200167

9. ASSEMBLING OF FILTER

(1) Install filter by tapping it.

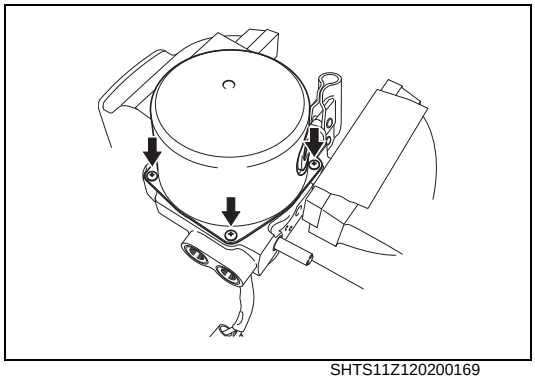
NOTICE

Filter and pipe are breakable. So, handle them with much care.


SHTS11Z120200168

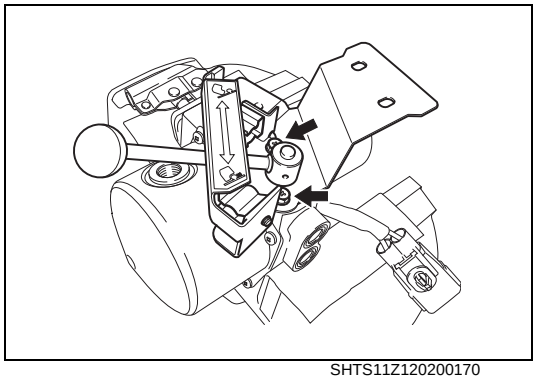
10. ASSEMBLING OF RESERVOIR

(1) Fit new O-ring with bearing grease applied in body.


SHTS11Z120200169

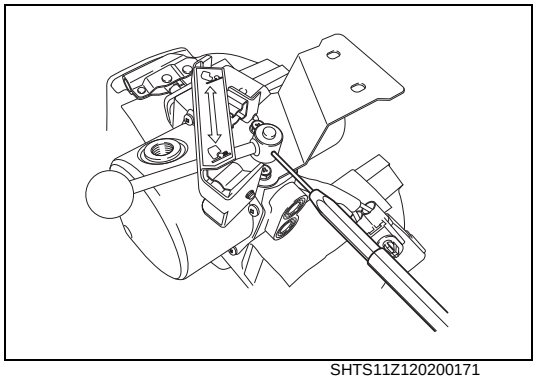
(2) Turning reservoir filler toward installing face side of lever holder, install it on body with care not to cut off its O-ring.

(3) Install reservoir with screw.
Tightening Torque:
2.4-3.4 N·m {25-34 kgf·cm, 1.8-2.5 lbf·ft}

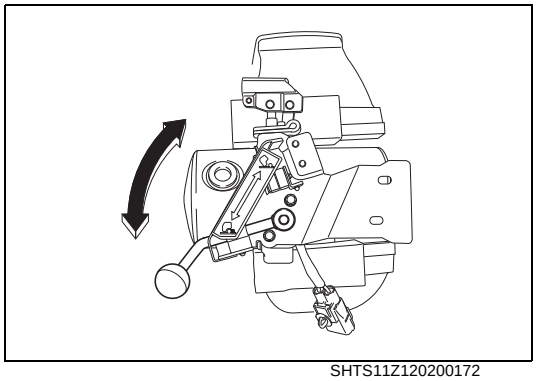

SHTS11Z120200170

11. ASSEMBLING OF LEVER HOLDER

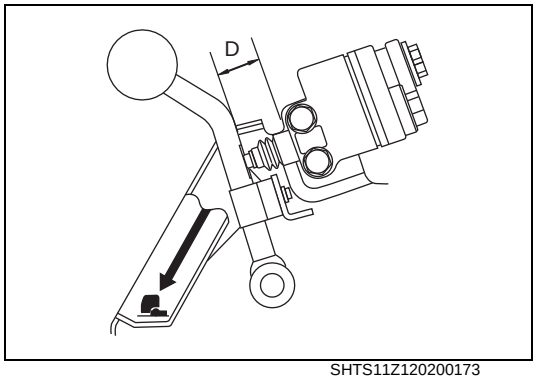
(1) Install it on body and switching body with bolt in condition that lever is inserted in lever holder.
Tightening Torque:
5.0-7.4 N·m {51-75 kgf·cm, 3.7-5.4 lbf·ft}


SHTS11Z120200171

(2) Strike new spring pin therein in condition that lever will be turned from "DOWN" position by approx. 15° to "UP" one (mostly horizontal condition).


SHTS11Z120200172

(3) Operating lever, confirm its smooth movement.

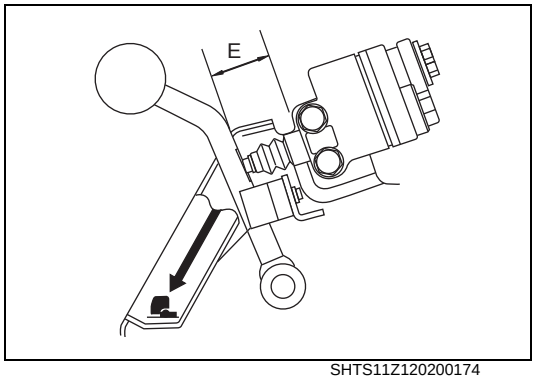


SHTS11Z120200173

(4) Fitting temporally switch on lever holder with bolt, adjust it so that it will become of dimension D in turning lever to "UP" direction.

NOTICE
Be careful not to make a mistake in identifying right and wrong sides of switch.

Assembly standard: More than 18.5 mm {0.728 in.}



SHTS11Z120200174

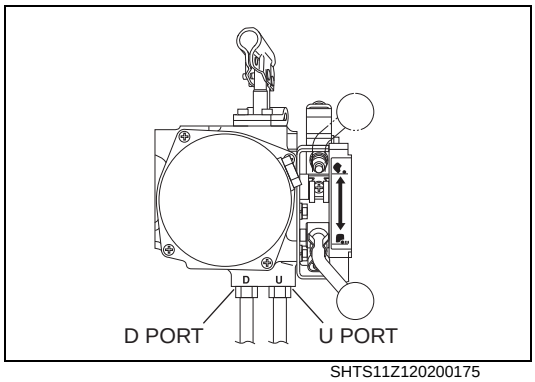
(5) Keep your hand off from lever after adjustment specified in above (4) and adjust for tightening bolt so that it may become of dimension E after lever will be pushed back to "DOWN" side by spring force of switch.
Tightening Torque:
5.7-7.7 N·m {59-78 kgf·cm, 4.3-5.6 lbf·ft}

Assembly standard: Less than 24.5 mm {0.964 in.}

(6) Set switch and connector clip of DC motor in lever holder.

NOTICE
Work not to damage connector clip.

(7) Fit filler cap after supplying cab tilt fluid into the reservoir.
Tightening Torque:
44.2-54.0 N·m {451-550 kgf·cm, 33-39 lbf·ft}



SHTS11Z120200175

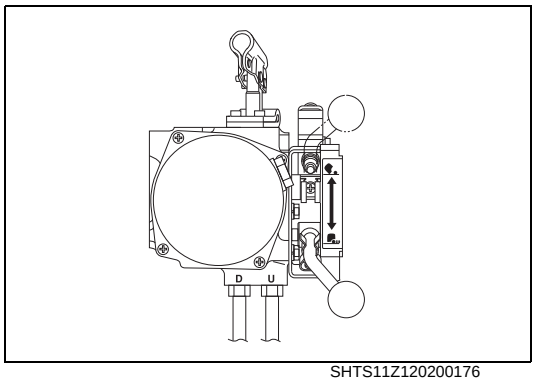
IMPORTANT POINTS - CHECK AFTER ASSEMBLING

1. AIR BLEEDING METHOD

(1) Making connection between U and D ports with piping, fill the reservoir with cab tilt fluid to such extent that oil will spill over the filler of reservoir.

NOTICE

- **Pump should supply oil at holizontal level (While the vehicle with pump installed is stopping at flat level).**
- **When U or D port piping is removed, cab tilt fluid will flow out of the ports. So, be careful.**



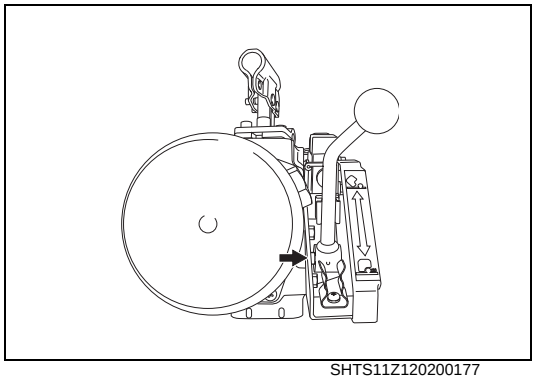
SHTS11Z120200176

(2) For approx. 20 seconds, operate electric pump and manual one at the same time.

NOTICE

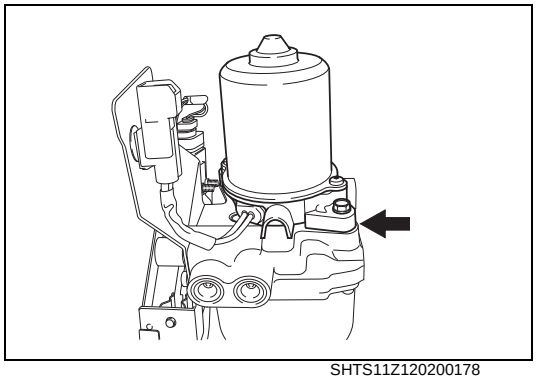
- **It must be executed at either side, "UP" or "DOWN" position of lever.**
- **Electric pump should not be run continuously for more than 3 minutes.**

(3) Performing the operation specified in above (2) in 2-3 times, check that cab tilt fluid is sufficiently filled up to the filler mouth of reservoir.


SHTS11Z120200177

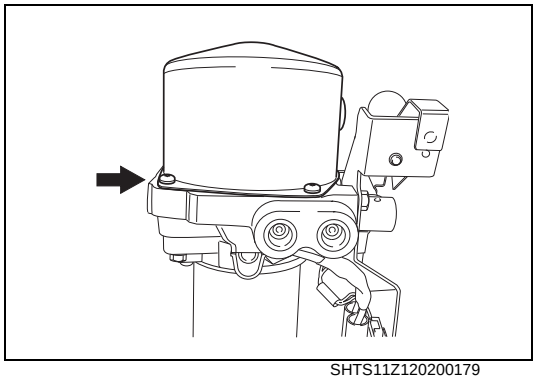
2. CHECK OF SWITCHING VALVE

(1) Confirm that no leaks out of insertion part of switching valve.


SHTS11Z120200178

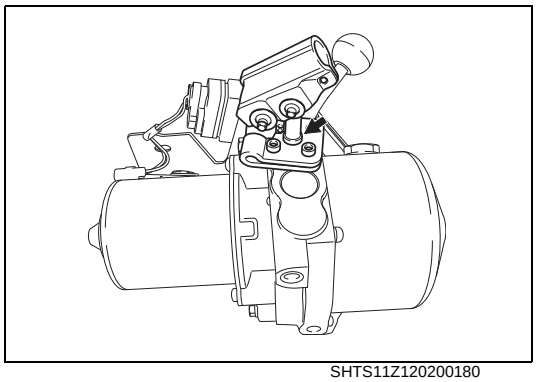
3. CHECK OF SUCTION CHECK VALVE

(1) Confirm that no leaks out of plug and installation surface of DC motor.


SHTS11Z120200179

4. CHECK OF RESERVOIR

(1) Confirm that no leaks out of O-ring seal of reservoir.

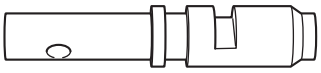
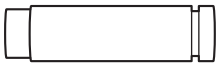
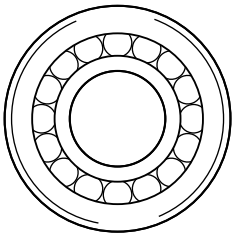
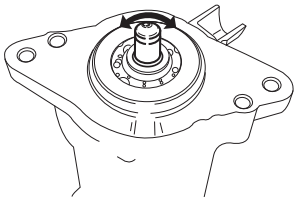
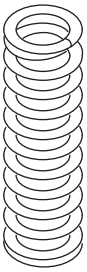

SHTS11Z120200180

5. MANUAL PUMP

(1) Confirm that no leaks out of insertion part of manual piston.

INSPECTION AND REPAIR

EN11Z1202H300003

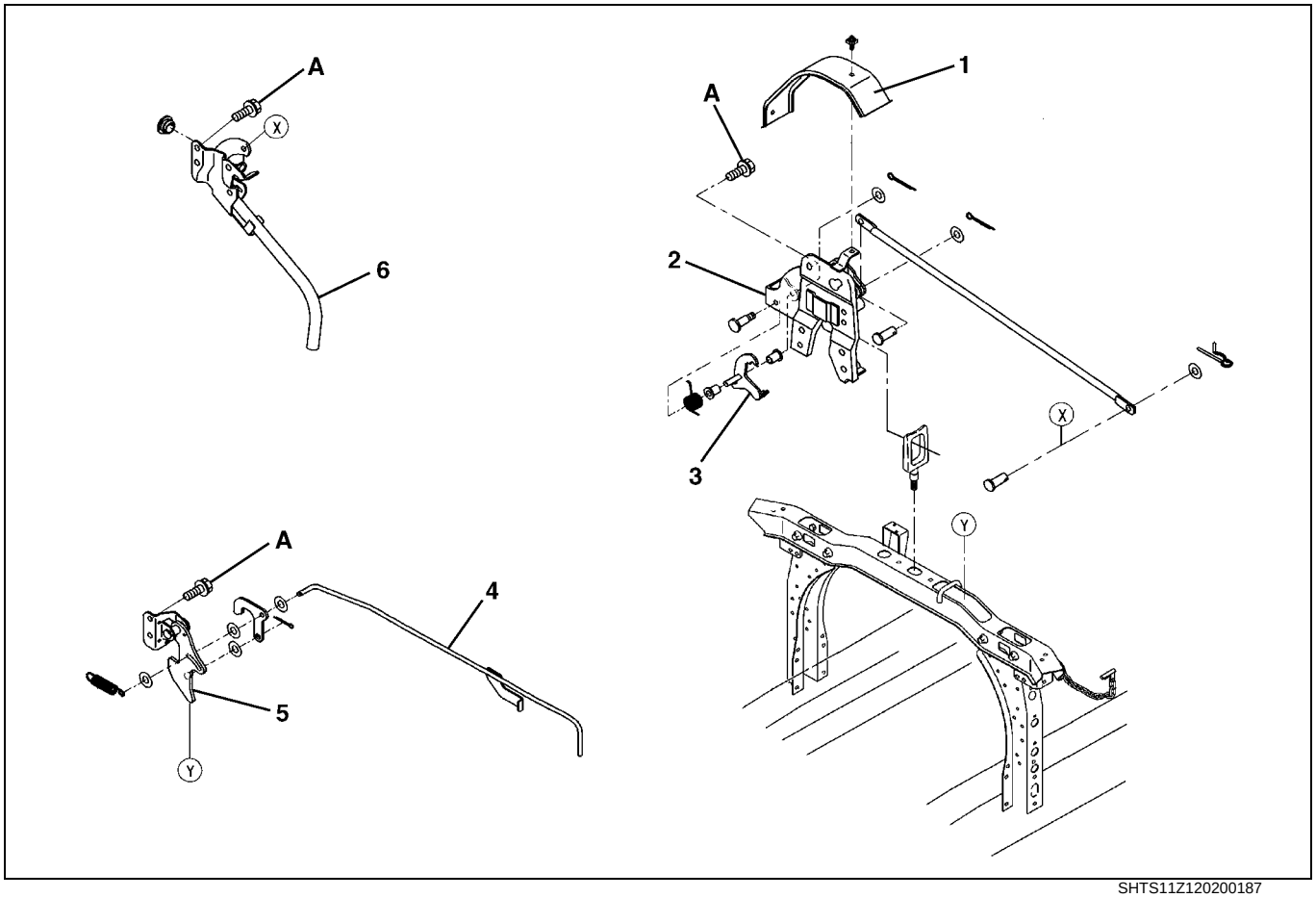
Inspection item	Standard	Limit	Remedy	Inspection procedure
Switching valve: Wear of sliding surface	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Body: Wear and damage on the seat of steel ball	**—**	**—**	**Replace, if necessary.**	**Visual check**
Steel ball: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Electric pump piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Motor: Rotating condition of bearing and shaft	**—**	**—**	**Replace, if necessary.**	**Visual check**  
Spring: Setting and bend	**—**	**—**	**Replace, if necessary.**	**Visual check** 

CAB LOCK MECHANISM

COMPONENT LOCATOR

EN11Z1202D100010

EXCEPT FOR GH (FOR IRELAND) AND DOUBLE CAB



SHTS11Z120200187

1	Dust cover	4	Tilt latch rod
2	Cab lock	5	Tilt latch
3	Release latch	6	Cab lock lever

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	34.5-51.5 {352-525, 26-37}	

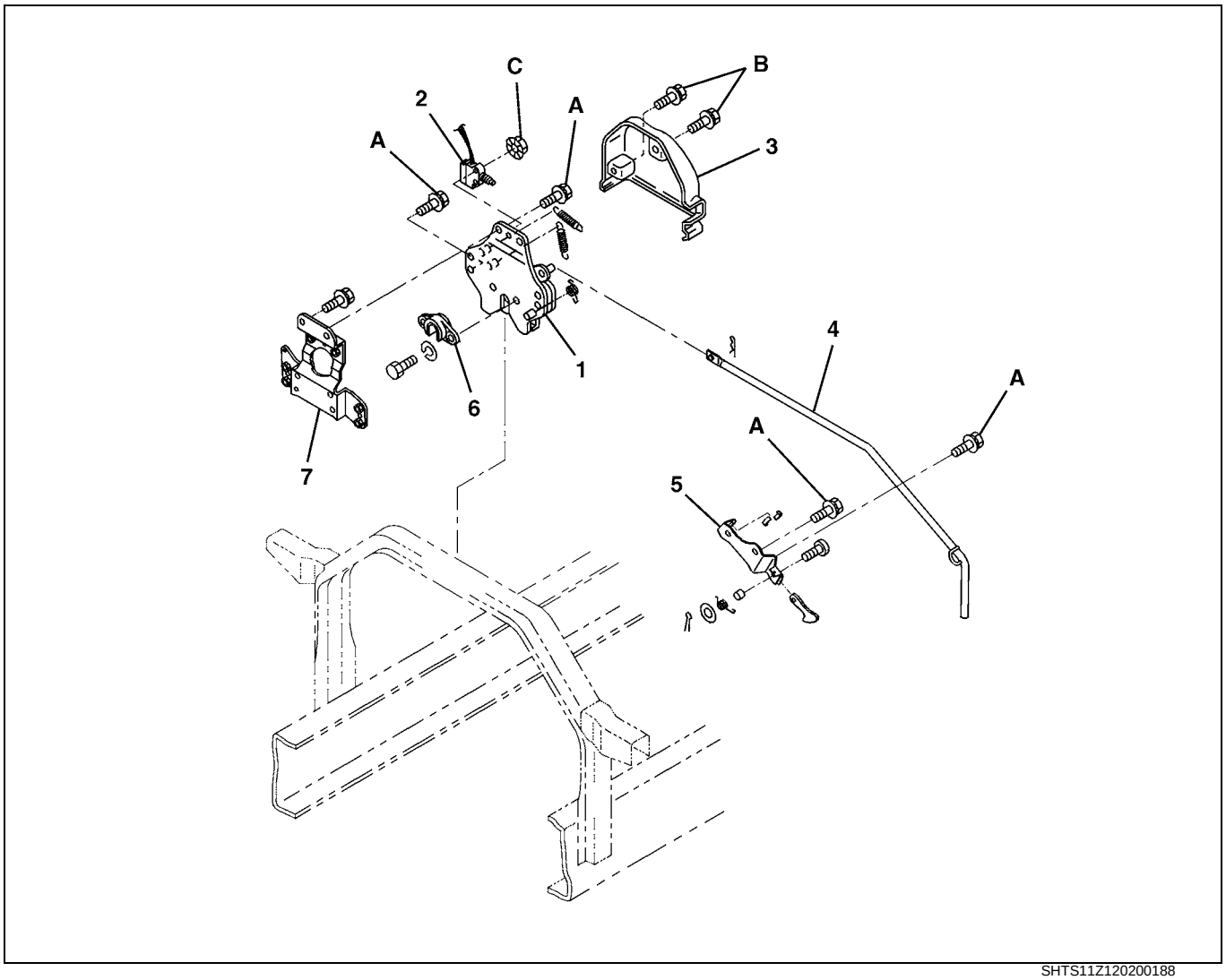
NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

GH (FOR IRELAND)



SHTS11Z120200188

1	Cab lock assembly	5	Safety lever bracket
2	Cab lock switch	6	Stopper
3	Dust cover	7	Cab mounting hook bracket
4	Cab lock rod		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	34.5-51.5 {352-525, 26-37}	C	5.7-7.7 {59-78, 4.3-5.6}
B	5.0-13.0 {51-132, 3.7-9.5}		

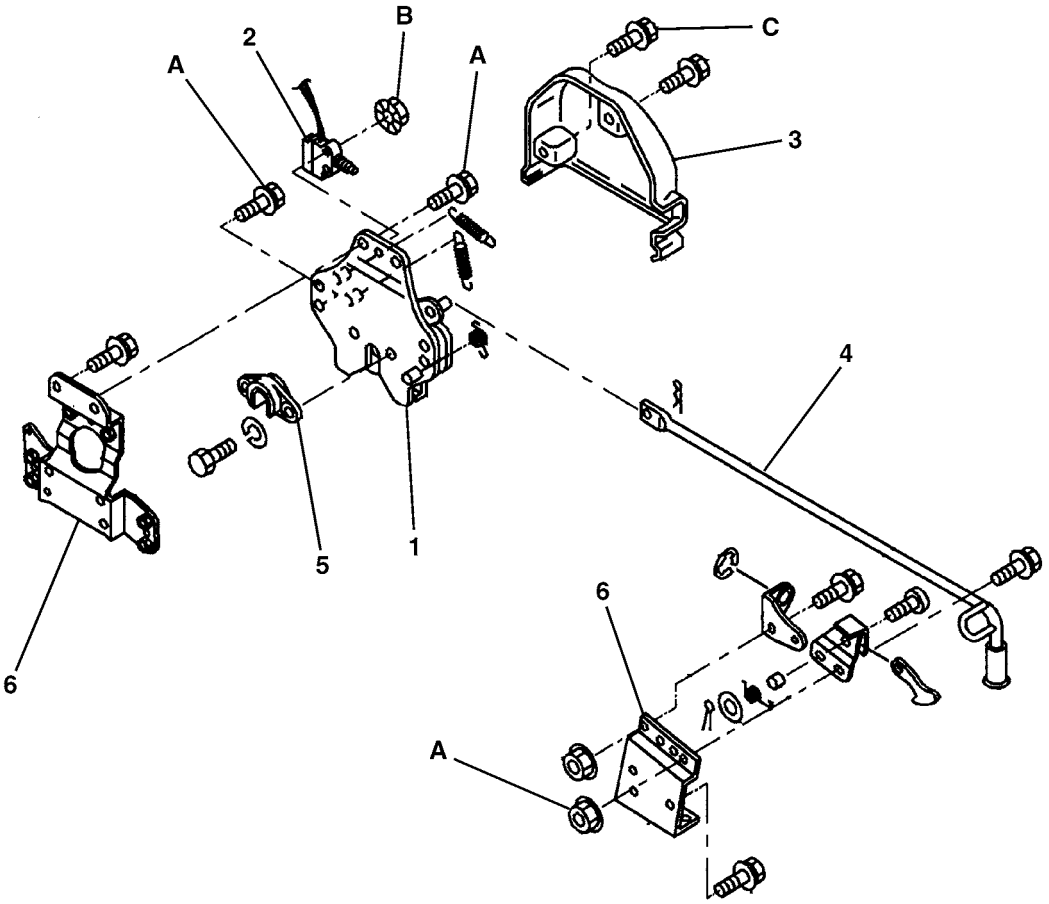
NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

DOUBLE CAB



SHTS11Z120200189

1	Cab lock	4	Cab lock rod
2	Cab lock switch	5	Stopper
3	Dust cover	6	Bracket

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	34.5-51.5 {352-525, 26-37}	C	5.0-13.0 {51-132, 3.7-9.5}
B	5.7-7.7 {58-78, 4.2-5.6}		

NOTICE

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

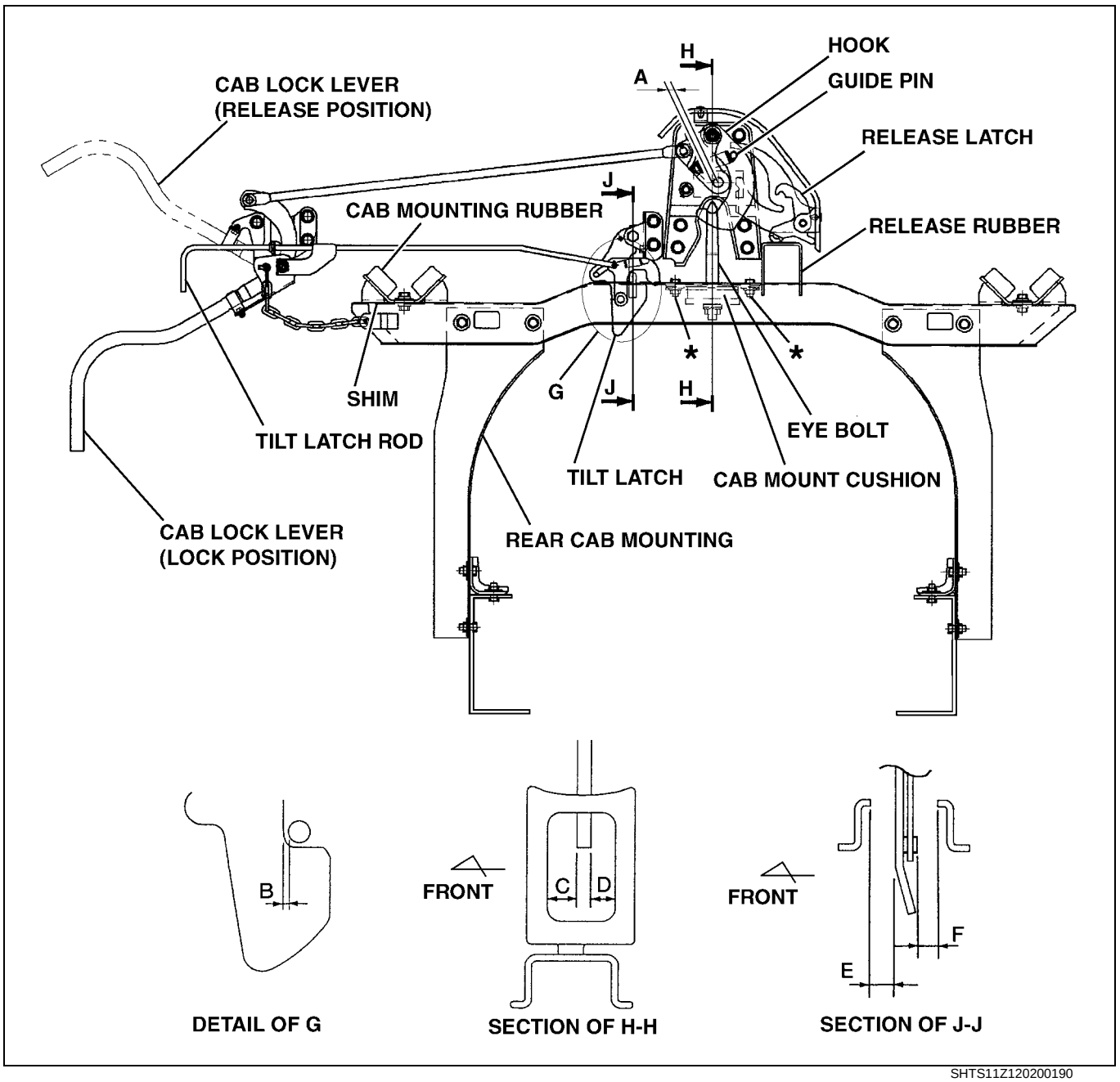
OVERHAUL

EN11Z1202H200006

EXCEPT FOR GH (FOR IRELAND) AND DOUBLE CAB

1. CAB LOCK MECHANISM ADJUSTMENT

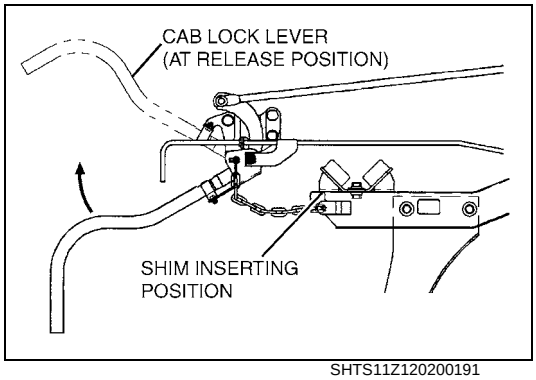
(1) Adjust dimension A, B, C, D, E and F as follows:



SHTS11Z120200190

Unit: mm {in.}

Position	Related parts	Dimensions
A: Eye bolt, crank pin off set	* Mark bolts	9-13 {0.36-0.51}
B: Tilt latch, pin clearance	Tilt latch adjusting bolt	3-6 {0.12-0.23}
C: Hook, eye bolt clearance	Mounting member attaching bolt	12-22 {0.48-0.86}
D: Hook, eye bolt clearance	Mounting member attaching bolt	20-30 {0.79-1.18}
E: Mounting member, tilt latch clearance	Mounting member attaching bolt	20-22 {0.79-0.86}
F: Mounting member, tilt latch clearance	Mounting member attaching bolt	9-11 {0.36-0.43}



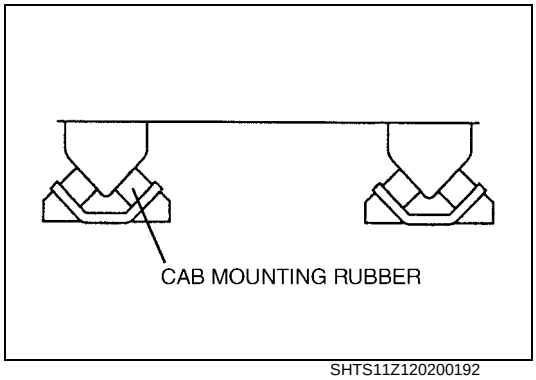
SHTS11Z120200191

2. CAB LOCK LEVER OPERATING RESISTANCE ADJUSTMENT

(1) Adjust the mounting cushion shims to bring the operating tension of the lock lever. If the cab is not directly aligned, the operating resistance of the lock lever increases. In this case, correct the cab mounting cushions.

Assembly standard:

Standard cab	**166-266 N {17-27 kgf, 38-59 lbf}**
Wide cab	**127-207 N {13-21 kgf, 29-46 lbf}**



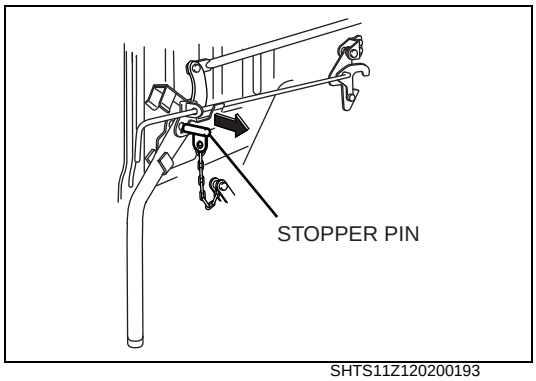
SHTS11Z120200192

3. CAB MOUNTING CUSHION ADJUSTMENT

(1) If the cab shifts sideways, loosen the mounting rubber attaching bolts and adjust the mounting rubbers so that there is no clearance there.

NOTICE

Replace cab mounting rubbers which are hardened or deformed.



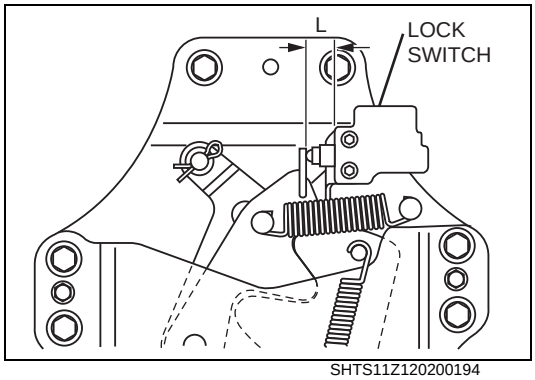
SHTS11Z120200193

4. INSPECTION

(1) Operate the cab lock lever, and confirm that each part operates smoothly, that the hook and eye bolt fit in the lock position, and that the stopper pin is securely inserted.

⚠ CAUTION

If the stopper pin is not inserted securely in place while driving, external shock such as road bumps or collision may cause a tilting of the cab. This can result in personal injury and/or property damage. If the stopper pin is lost, immediately install a new stopper pin. Make sure that the hook engages with the eye bolt securely.

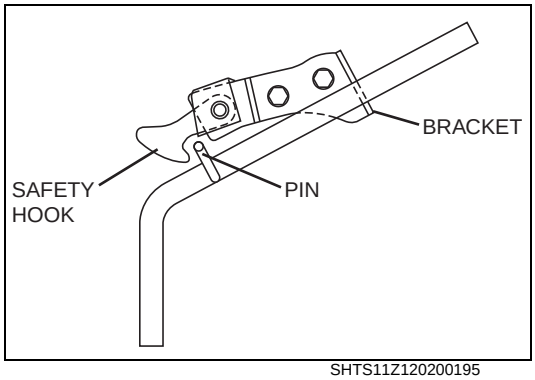


SHTS11Z120200194

GH (FOR IRELAND) AND DOUBLE CAB

1. CAB LOCK SWITCH ADJUSTMENT

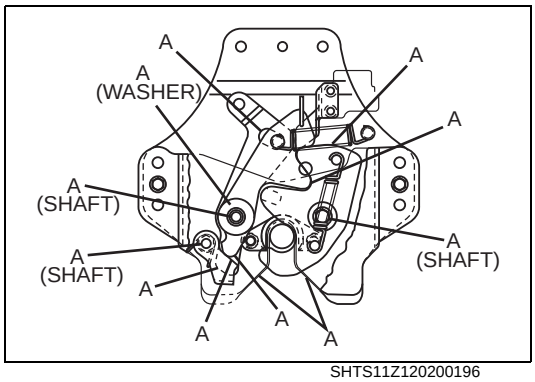
(1) Adjust the dimension L in the elongated hole of the switch, when the cab is locked position.
Tighten the installing nuts to the specified torque.
Dimension L: 19-21 mm {0.748-0.826 in.}



SHTS11Z120200195

2. SAFETY HOOK ADJUSTMENT

(1) The lock position of the safety hook shall be adjusted so that the cab lock switch can not become "ON" with the safety hook and the pin in a free play state.



SHTS11Z120200196

3. LUBRICATION

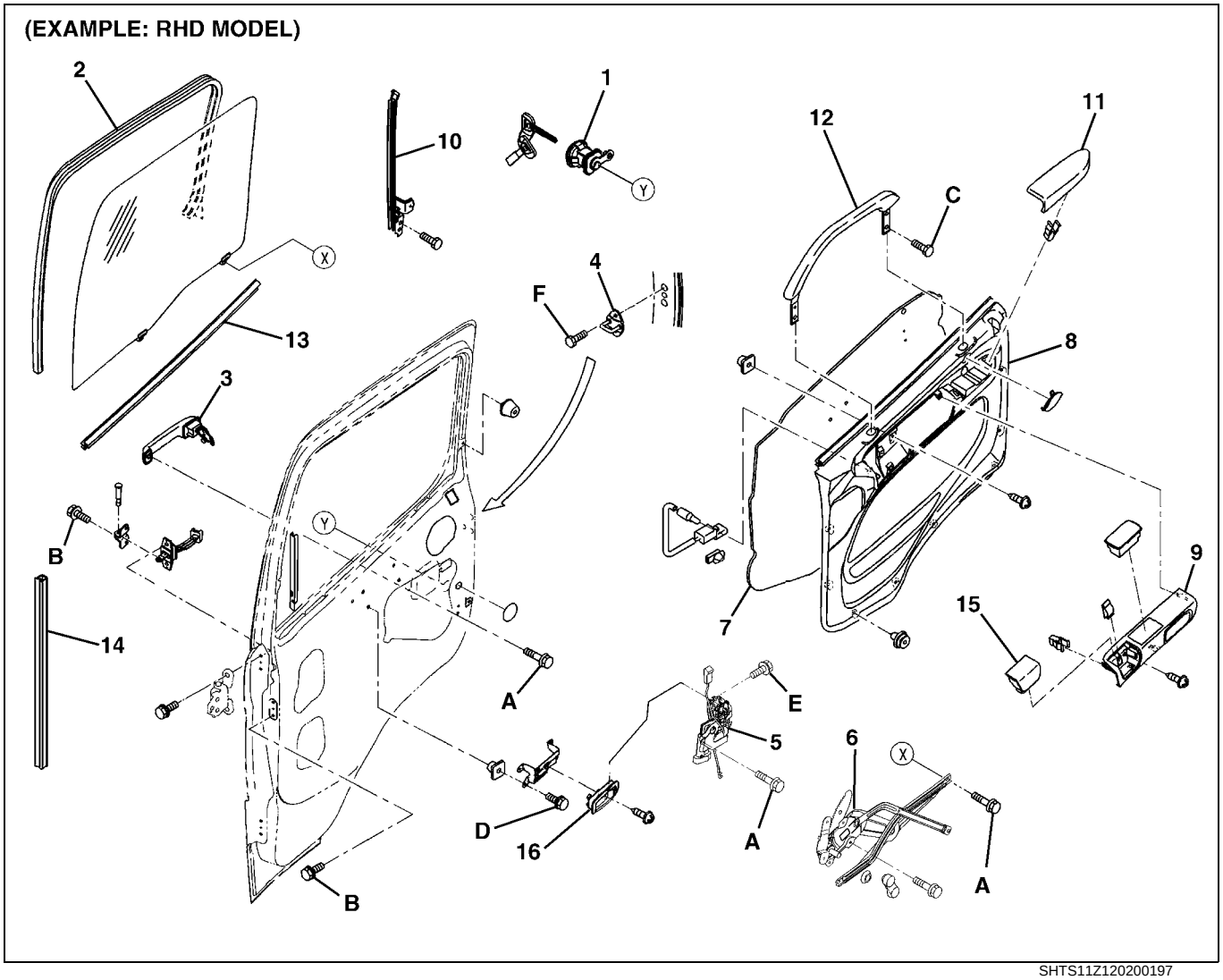
(1) Apply chassis grease to "A" position.

DOOR

COMPONENT LOCATOR

EN11Z1202D100011

FRONT DOOR



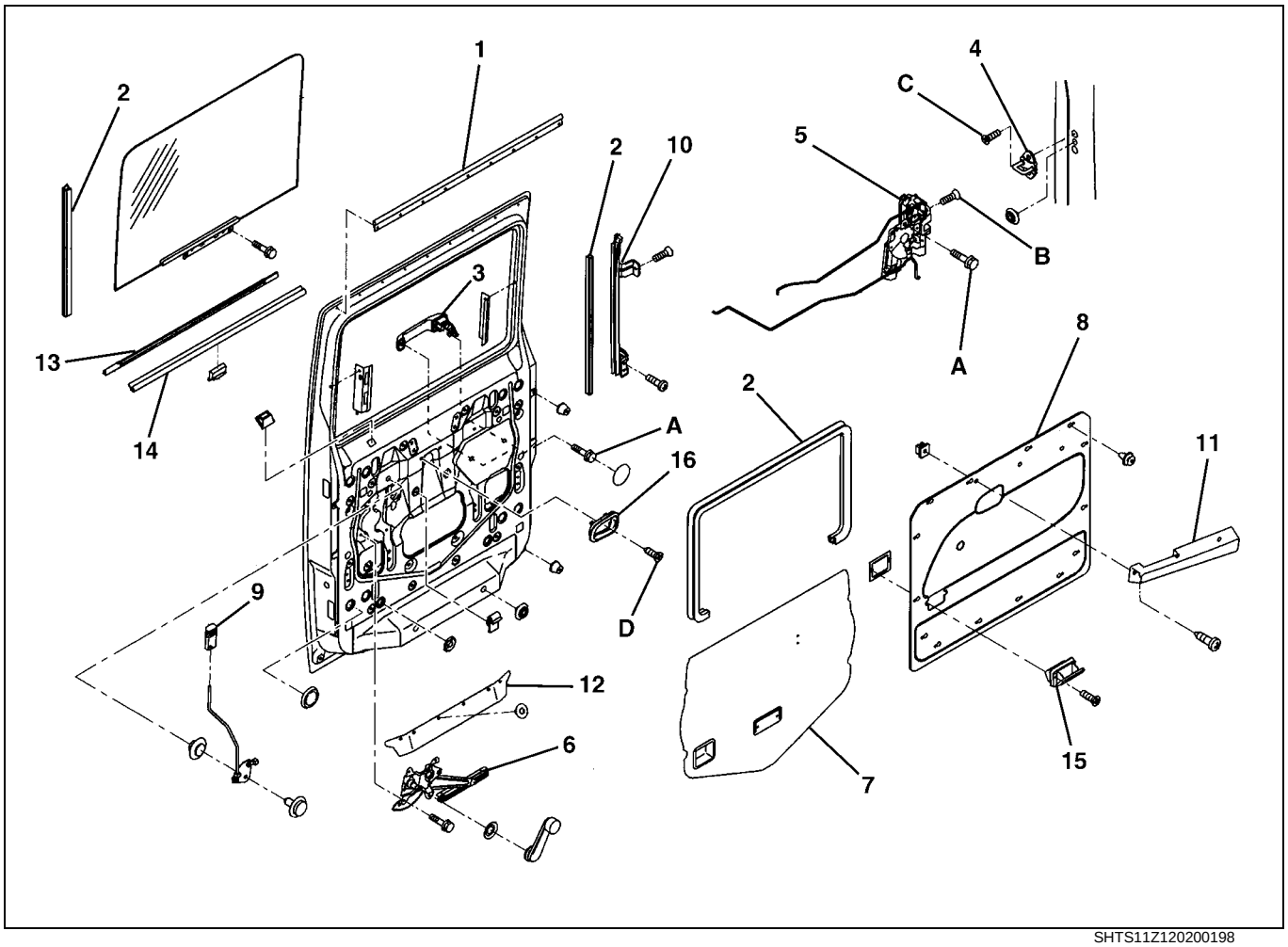
SHTS11Z120200197

1	Lock cylinder	9	Inside upper trim
2	Weather strip	10	Door frame
3	Outside handle	11	Armrest
4	Striker	12	Door assist grip
5	Door lock	13	Outer oscillate-proof
6	Regulator	14	Glass run weather strip
7	Inside hole cover	15	Ashtray
8	Inside trim	16	Inside handle case

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	4.4-6.6 {45-67, 3.3-4.8}	D	2.0-3.0 {20-30, 1.5-2.1}
B	7.2-10.8 {74-110, 5.4-7.9}	E	7.2-10.8 {74-110, 5.4-7.9}
C	10.8-20.2 {110-206, 8.0-14.8}	F	18-26 {184-264, 13.3-19.0}

REAR DOOR



SHTS11Z120200198

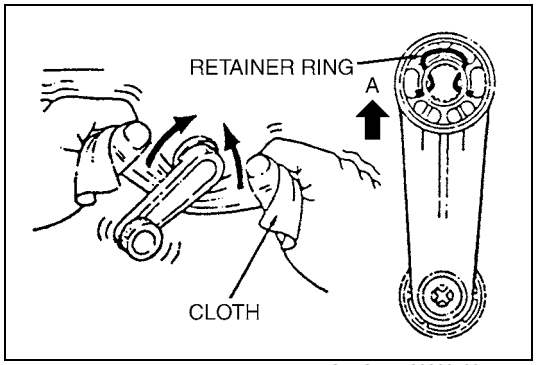
1	Roof side weather strip	9	Knob
2	Grass run weather strip	10	Door frame
3	Outside handle	11	Armrest
4	Striker	12	Splash board
5	Door lock	13	Outer oscillate-proof
6	Regulator	14	Inner oscillate-proof
7	Inside hole cover	15	Ashtray
8	Inside trim	16	Inside handle

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	4.4-6.6 {45-67, 3.3-4.8}	C	18-26 {184-264, 13.3-19.0}
B	7.2-10.8 {74-110, 5.4-7.9}	D	2.0-3.0 {20-30, 1.5-2.1}

OVERHAUL

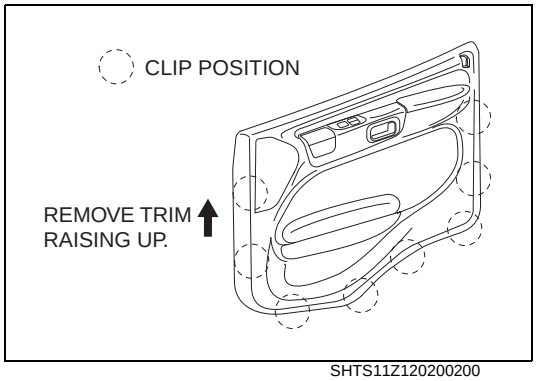
EN11Z1202H200007



SHTS11Z120200199

1. REMOVE REGULATOR HANDLE.

(1) Use a piece of cloth to catch the two ends of the retainer ring and pull the cloth back and forth as shown, to remove the ring.

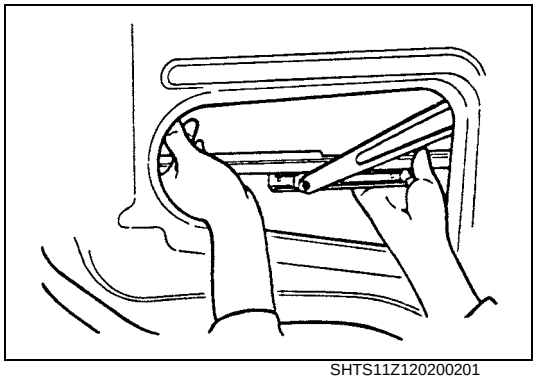


SHTS11Z120200200

2. REMOVE INSIDE TRIM.

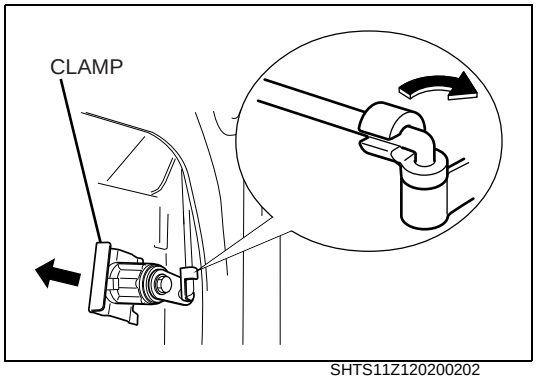
(1) Remove the parts below in the listed.
(Refer to the section "**COMPONENT LOCATOR**" in the component "**DOOR**".)
   a. Ashtray
   b. Armrest
   c. Inside upper trim
   d. Inside handle case

(2) Pull off the inside trim.


SHTS11Z120200201

3. REMOVE WINDOW.

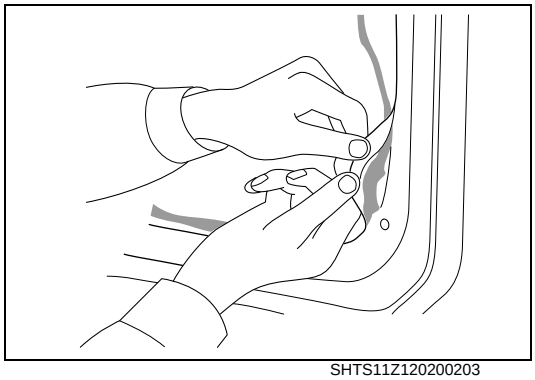
(1) Disconnect regulator from window channel.



SHTS11Z120200202

4. REMOVE DOOR LOCK.

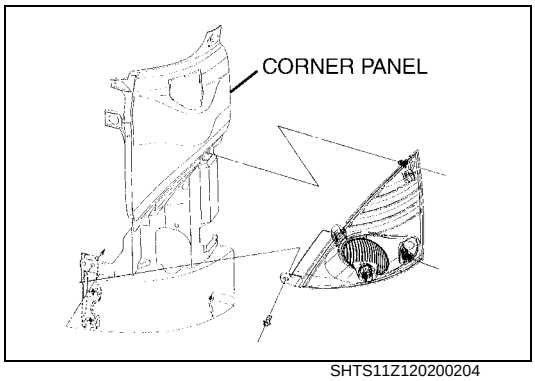
(1) Disconnect the lock cylinder from the door lock.
(2) Remove the lock cylinder.
(3) Remove the door lock with rods.


SHTS11Z120200203

5. SERVICE HOLE COVER AND REGULATOR INSTALLING

(1) Stick butyl rubber tape along lower tangent line of the drain hole of the door.

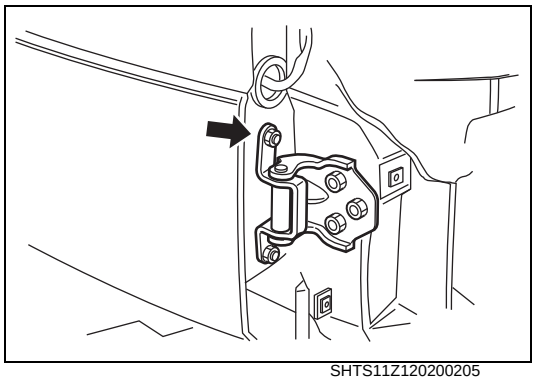
(2) Insert the regulator handle with retainer ring into the regulator.



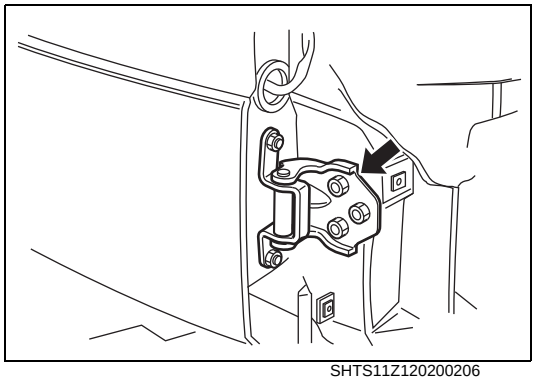
SHTS11Z120200204

6. DOOR HINGE ADJUSTMENT

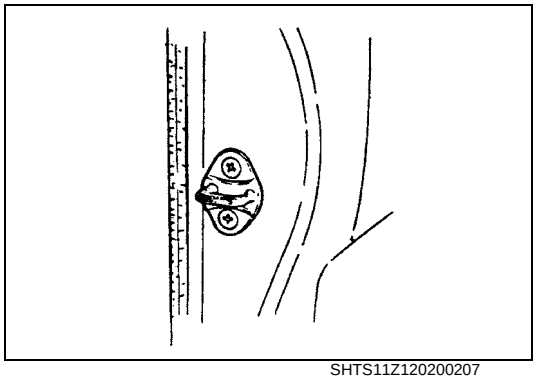
(1) Remove the corner panel.


SHTS11Z120200205

(2) Make vertical and horizontal adjustments by loosening the hinge bolts on the door.


SHTS11Z120200206

(3) Make depth adjustments by loosening the hinge bolts on the body.



SHTS11Z120200207

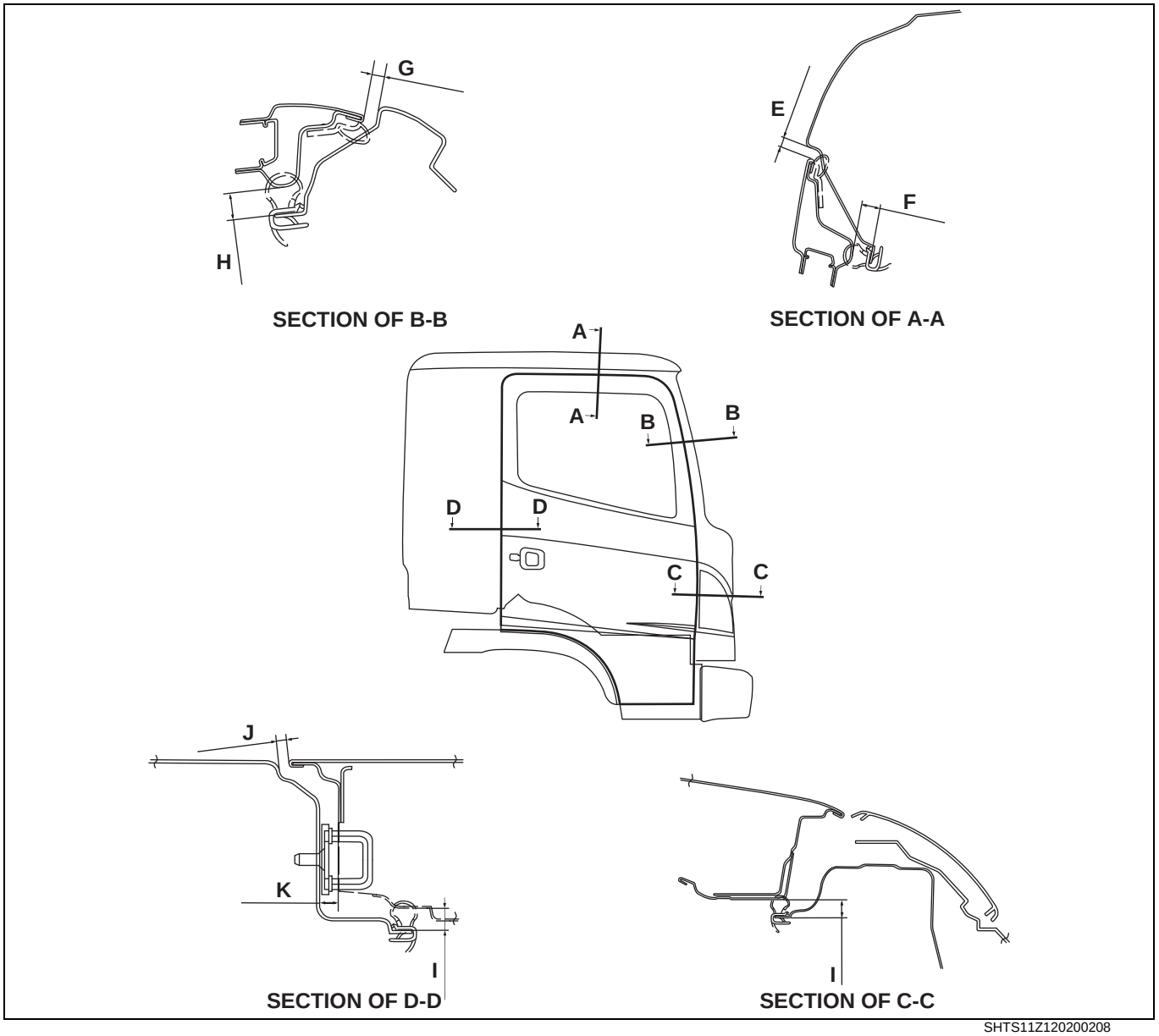
7. STRIKER ADJUSTMENT

(1) Check the engagement between the door lock and the striker. Make the top and bottom contact even.

(2) Perform adjustment so that the outside of the door and the outside of the rear quarter panel are flush with each other. After adjustment, properly tighten the bolts.

NOTICE

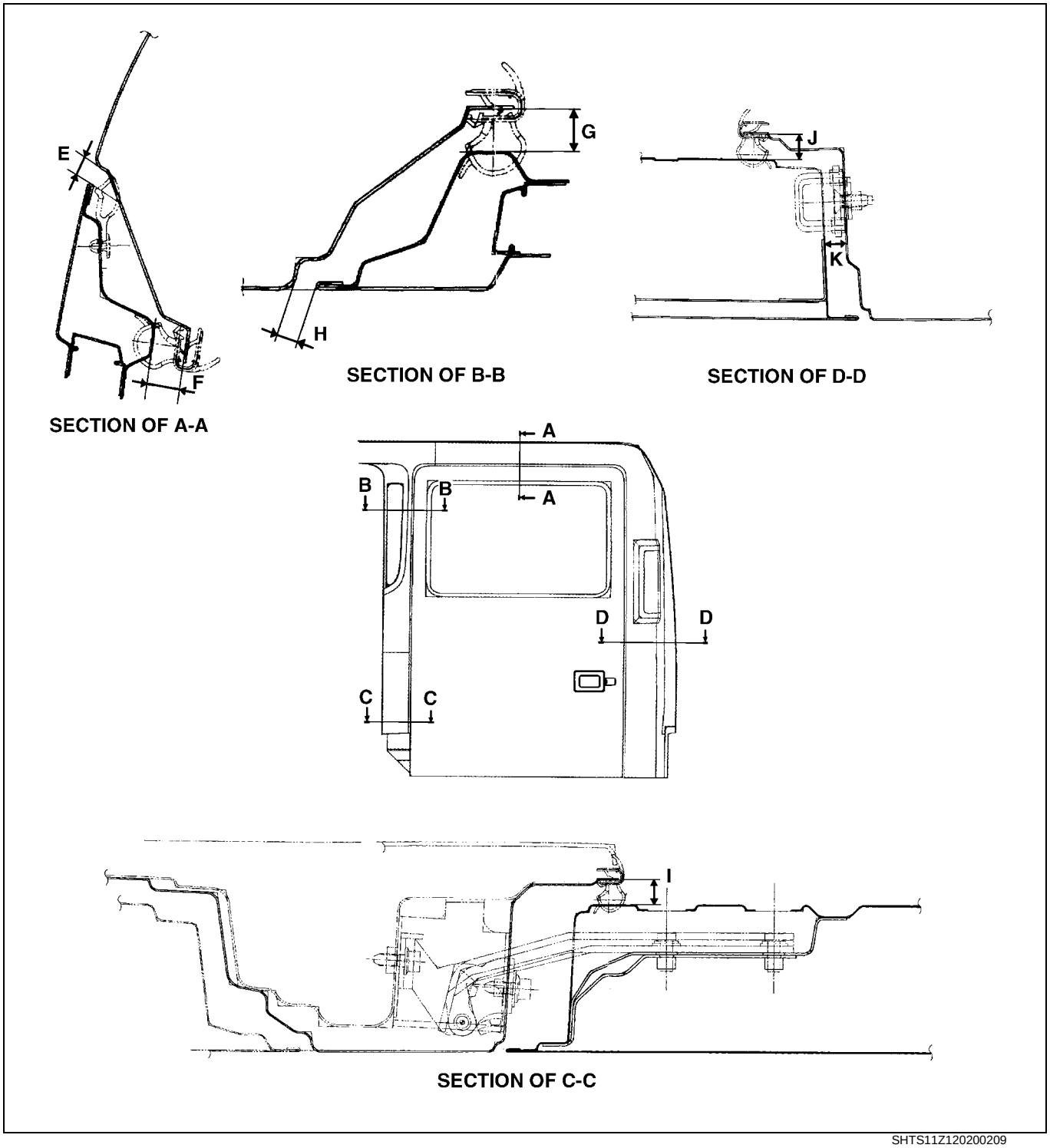
When adjusting the door in the vertical direction, do not force in into alignment by using the door lock striker.



SHTS11Z120200208

CLEARANCES BETWEEN BODY AND DOOR **Unit: mm {in.}**

E	**6.0-9.0 {0.24-0.35}**	**I**	**14.4-18.4 {0.57-0.72}**
F	**12.5-16.5 {0.50-0.64}**	**J**	**6.0-9.0 {0.24-0.35}**
G	**6.0-9.0 {0.24-0.35}**	**K**	**11.3-15.3 {0.45-0.60}**
H	**12.5-16.5 {0.50-0.64}**		



SHTS11Z120200209

CLEARANCES BETWEEN BODY AND REAR DOOR **Unit: mm {in.}**

E	**7.8 {0.31}**	**I**	**14.4-18.4 {0.57-0.72}**
F	**12.5-16.5 {0.50-0.64}**	**J**	**14.5-18.5 {0.58-0.72}**
G	**12.5-16.5 {0.50-0.64}**	**K**	**11.2-15.2 {0.45-0.59}**
H	**7.4 {0.29}**		

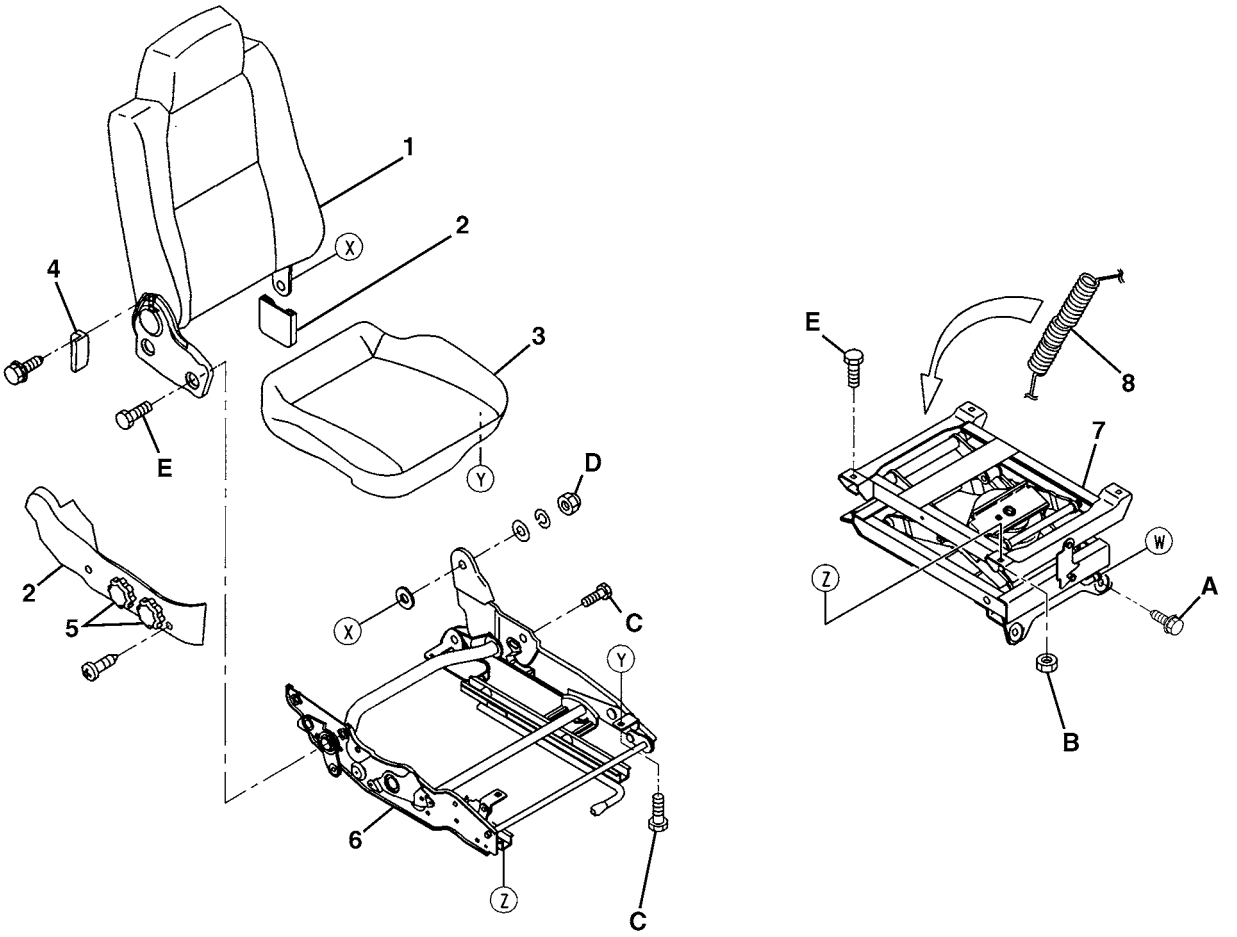
SEAT

COMPONENT LOCATOR

EN11Z1202D100012

DRIVER'S SEAT (RIGHT-HAND DRIVE MODEL)

(REPRESENTATIVE TYPE)



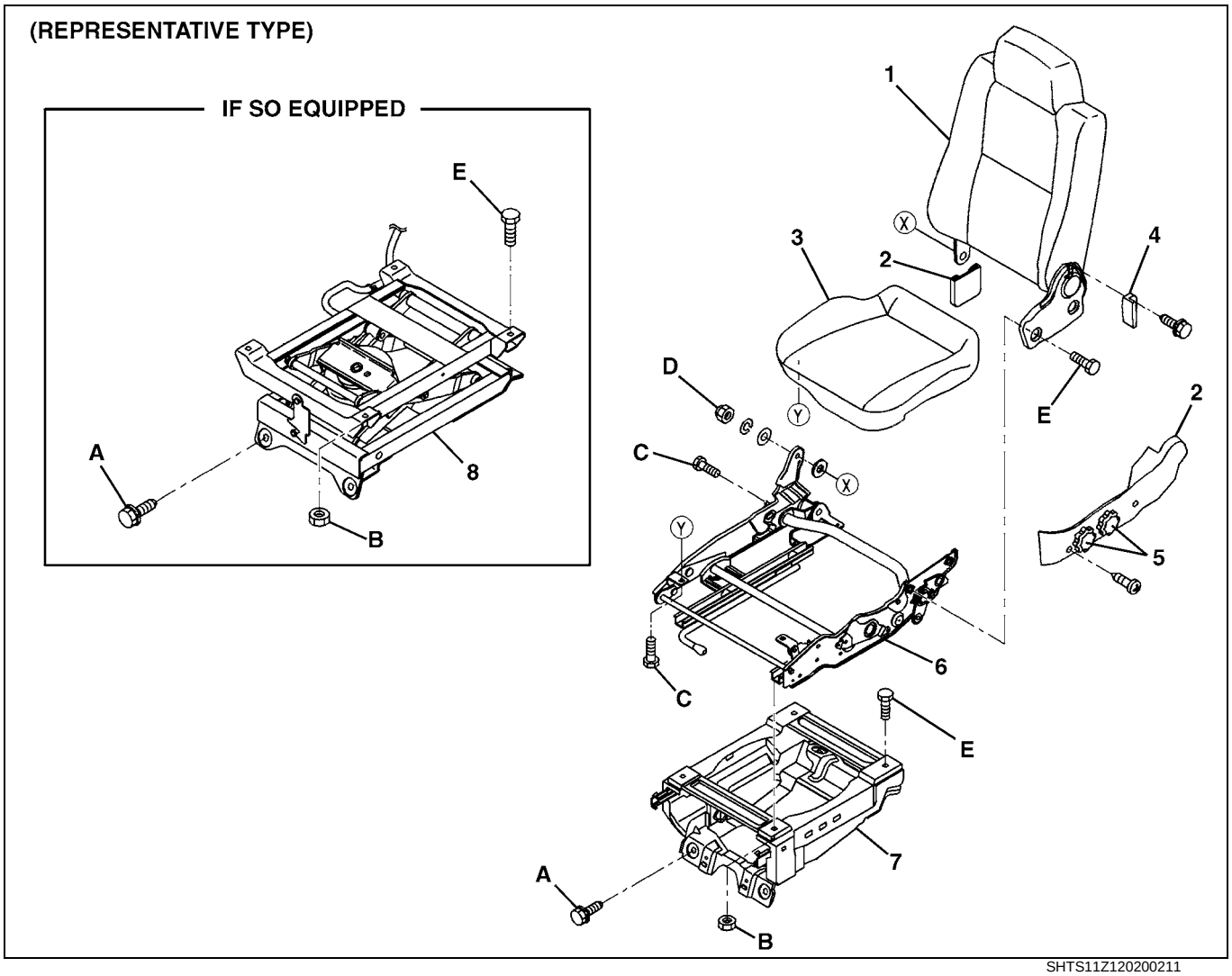
SHTS11Z120200210

1	Seat back	5	Seat tilt adjuster handle
2	Seat back cover	6	Seat adjuster (If so equipped)
3	Seat cushion	7	Seat suspension (If so equipped)
4	Seat reclining lever	8	Wire (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	17.5-32.5 {179-331, 13-23}	D	11.8-14.7 {120-150, 9-11}
B	27.1-41.0 {280-420, 20-30}	E	40.1-53.9 {410-550, 30-40}
C	20.5-34.3 {210-350, 15-25}		

DRIVER'S SEAT (LEFT-HAND DRIVE MODEL)



SHTS11Z120200211

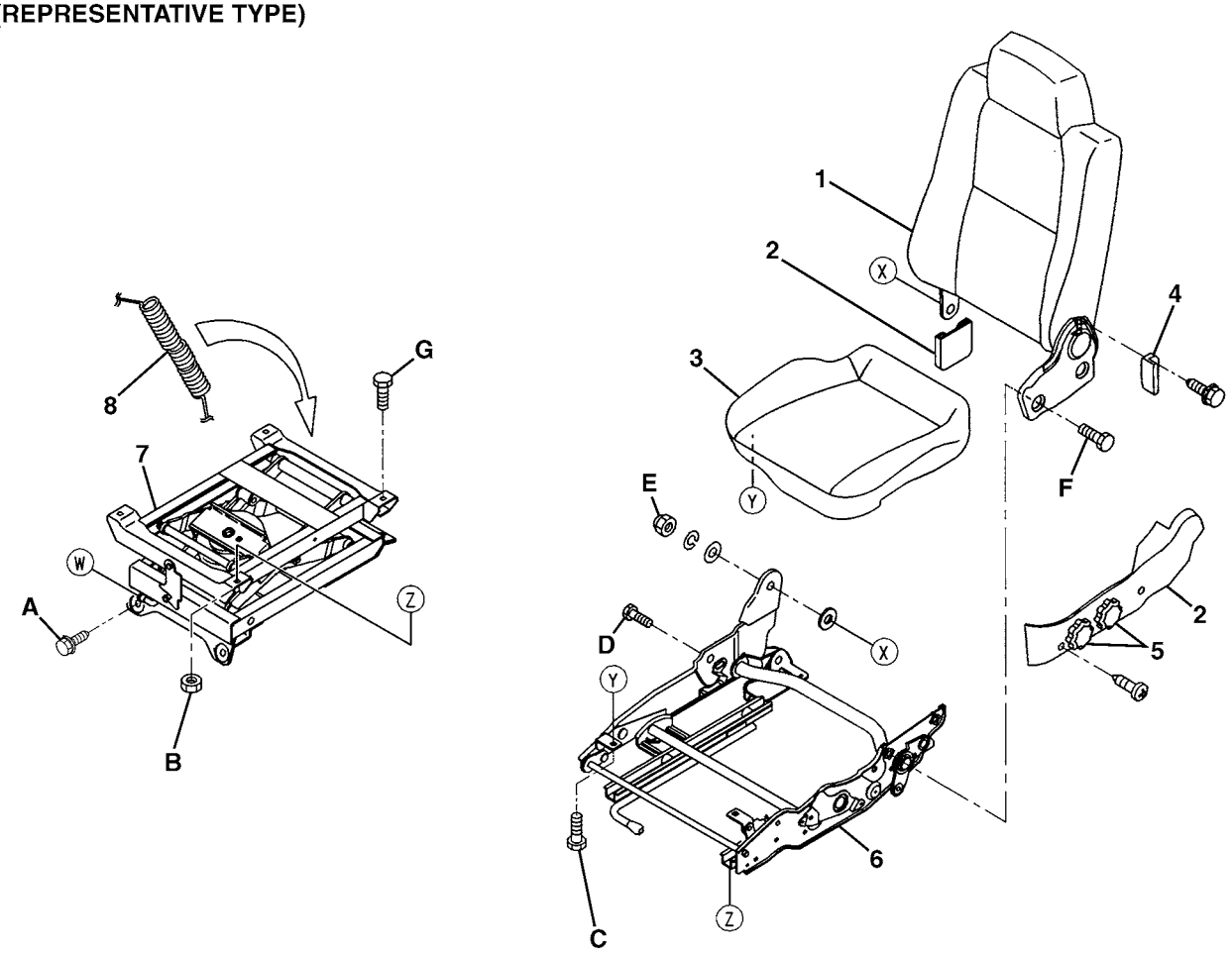
1	Seat back	5	Seat tilt adjuster handle
2	Cover	6	Seat adjuster
3	Seat cushion	7	Seat leg
4	Seat reclining knob	8	Seat suspension

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	17.5-32.5 {179-331, 13-23}	D	11.8-14.7 {120-150, 9-11}
B	27.1-41.0 {280-420, 20-30}	E	40.1-53.9 {410-550, 30-40}
C	20.5-34.3 {210-350, 15-25}		

ASSISTANT'S SEAT

(REPRESENTATIVE TYPE)



SHTS11Z120200212

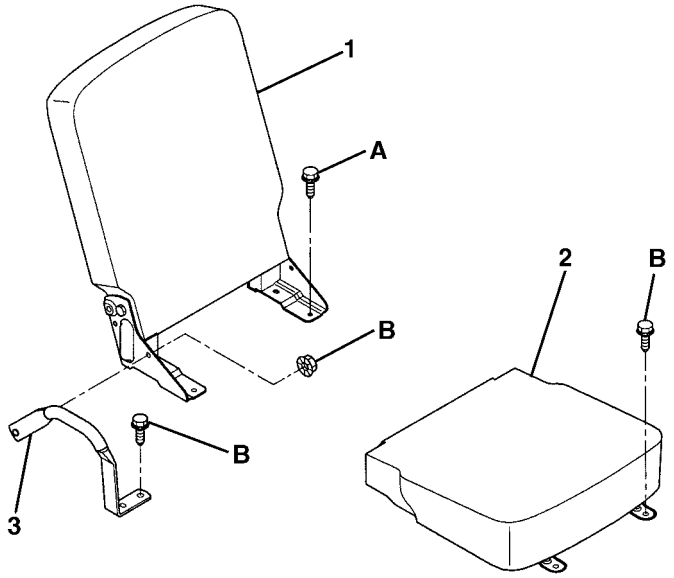
1	Seat back	5	Seat tilt adjuster handle
2	Seat back cover	6	Seat adjuster (If so equipped)
3	Seat cushion	7	Seat suspension (If so equipped)
4	Seat reclining lever	8	Wire (If so equipped)

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	17.5-32.5 {179-331, 13-23}	E	11.8-14.7 {120-150, 9-11}
B	27.1-41.0 {280-420, 20-30}	F	40.1-53.9 {410-550, 30-40}
C	20.5-34.3 {210-350, 15-25}	G	40.1-53.9 {410-550, 30-40}
D	20.5-34.3 {210-350, 15-25}		

CENTER SEAT (IF SO EQUIPPED)

(REPRESENTATIVE TYPE)



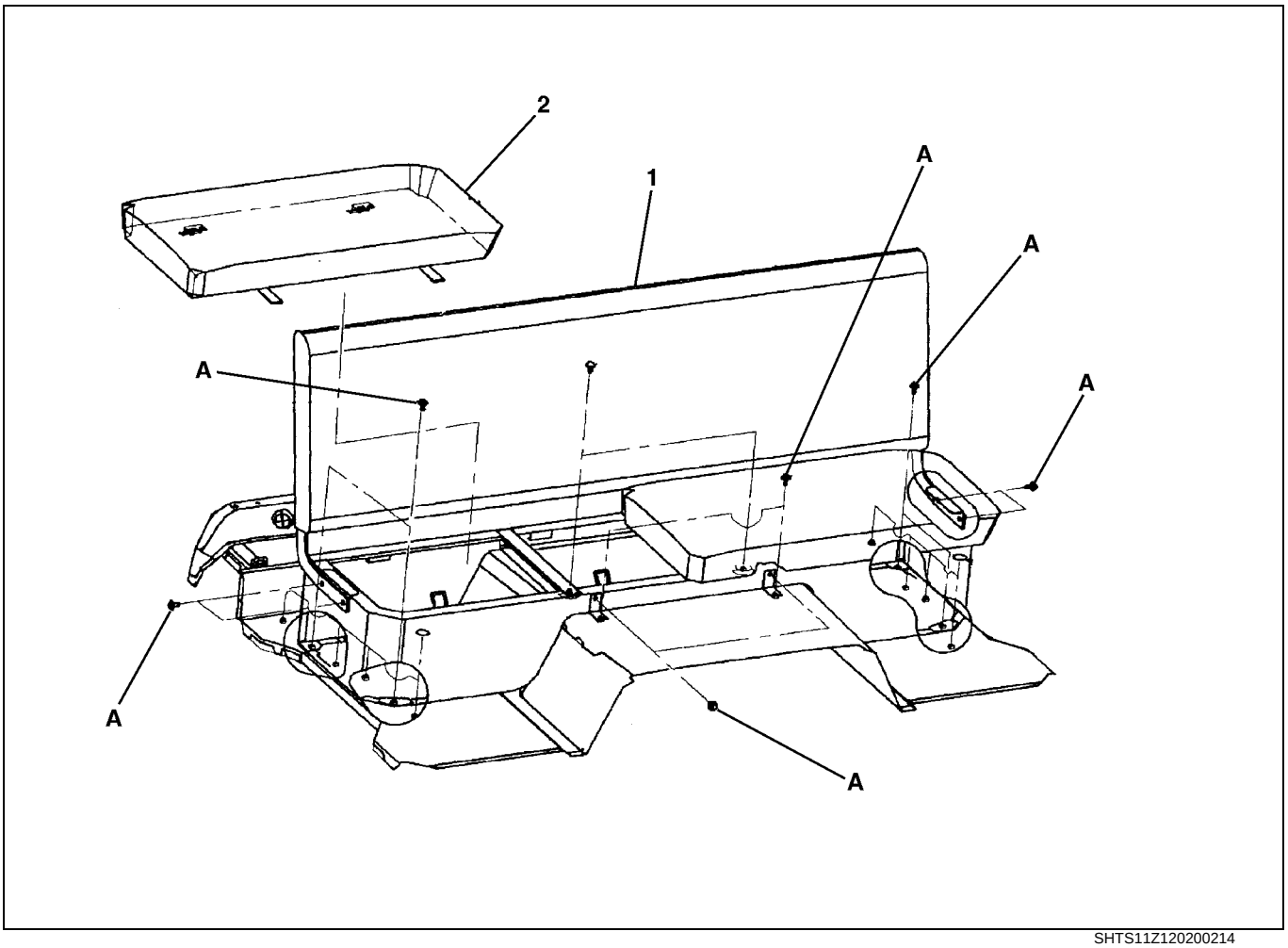
SHTS11Z120200213

1	**Seat back**	**3**	**Center grip**
2	**Cushion**		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	**17.5-32.5 {179-331, 13-23}**	**B**	**14.5-32.5 {148-331, 11-23}**

REAR SEAT (MODELS WITH DOUBLE CAB)



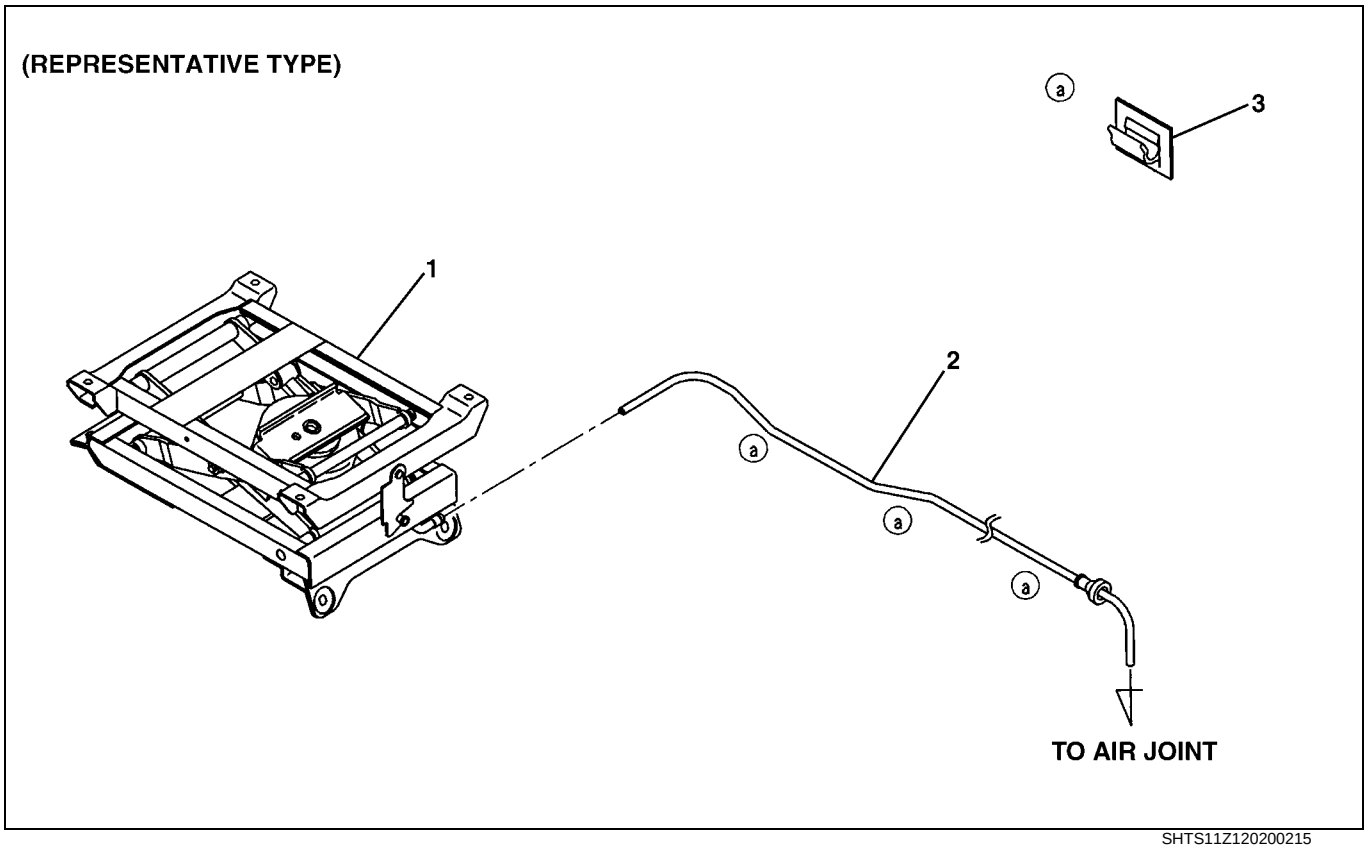
SHTS11Z120200214

1 Seat back	2 Cushion

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A 17.5-32.5 {179-331, 13-23}	

AIR SUSPENSION SEAT

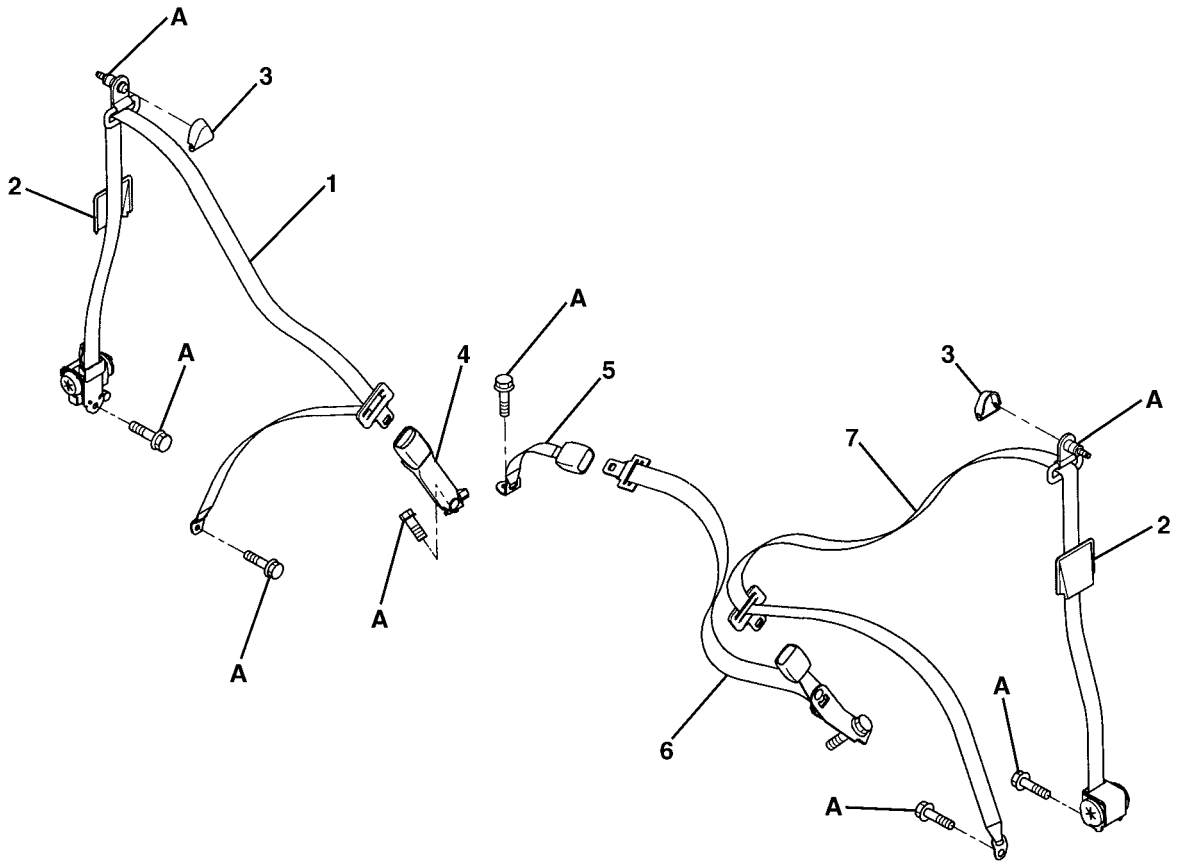


SHTS11Z120200215

1	Seat suspension	3	Clip
2	Air hose		

SEAT BELT (RIGHT-HAND DRIVE MODEL)

(REPRESENTATIVE TYPE)



SHTS11Z120200216

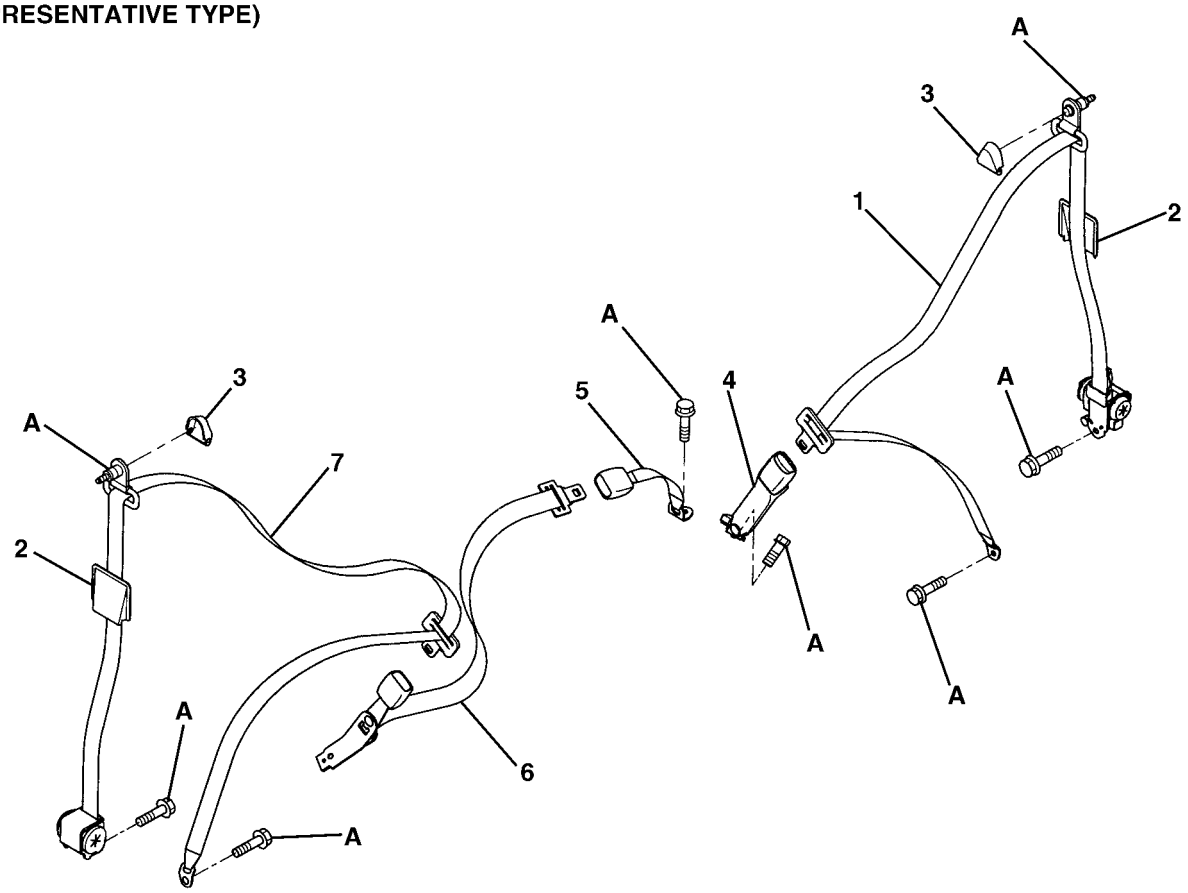
1	Outer seat belt (Driver's seat)	5	Center seat belt
2	Seat belt guide	6	Inner seat belt (Assistant's seat)
3	Seat belt cover	7	Outer seat belt (Assistant's seat)
4	Inner seat belt (Driver's seat)		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	29-55 {296-560, 22-40}		

SEAT BELT (LEFT-HAND DRIVE MODEL)

(REPRESENTATIVE TYPE)



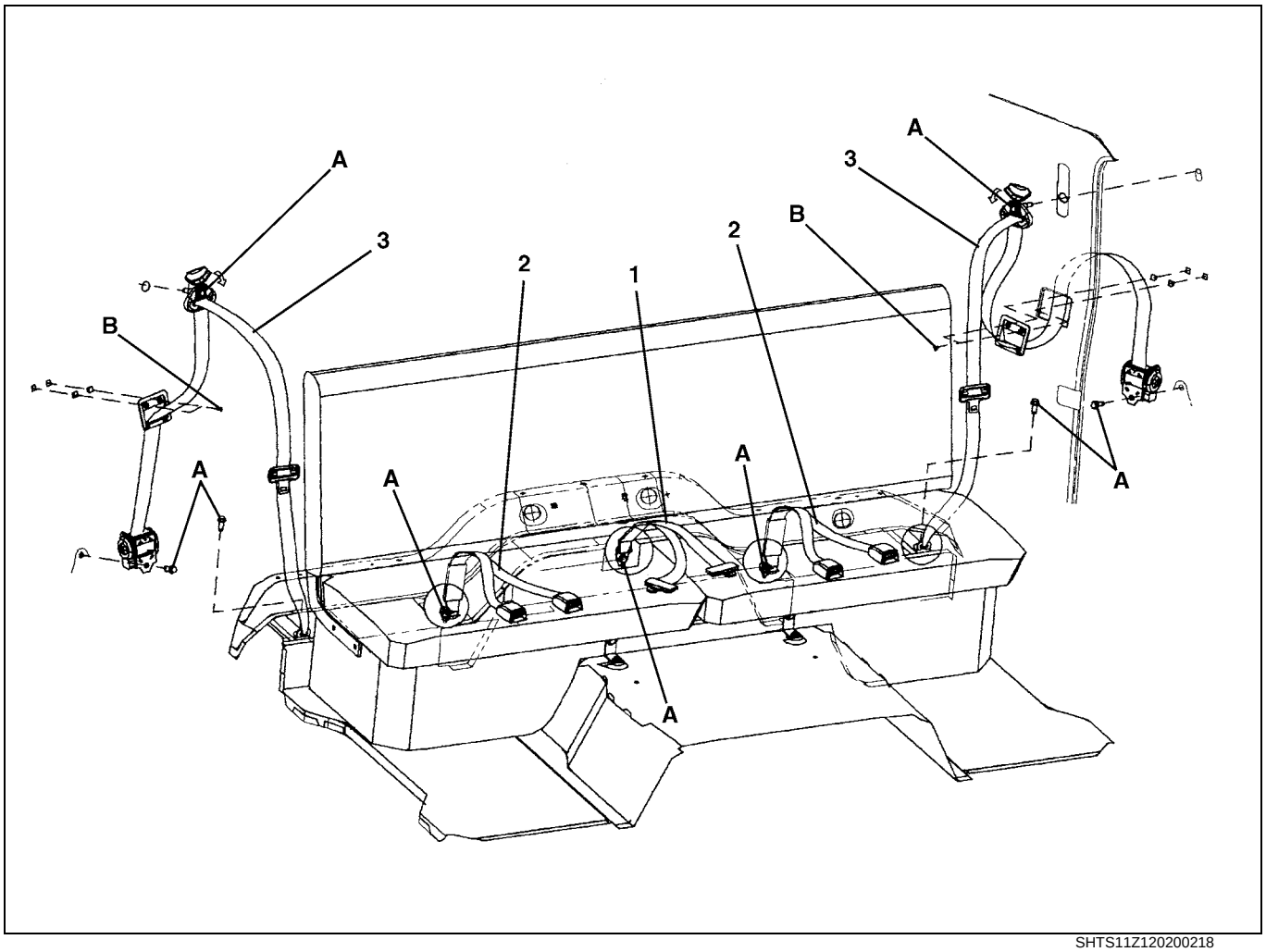
SHTS11Z120200217

1	Outer seat belt (Driver's seat)	5	Center seat belt
2	Seat belt guide	6	Inner seat belt (Assistant's seat)
3	Seat belt cover	7	Outer seat belt (Assistant's seat)
4	Inner seat belt (Driver's seat)		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	29-55 {296-560, 22-40}		

SEAT BELT (REAR)



SHTS11Z120200218

1	Center seat belt	3	Outside seat belt
2	Middle seat belt		

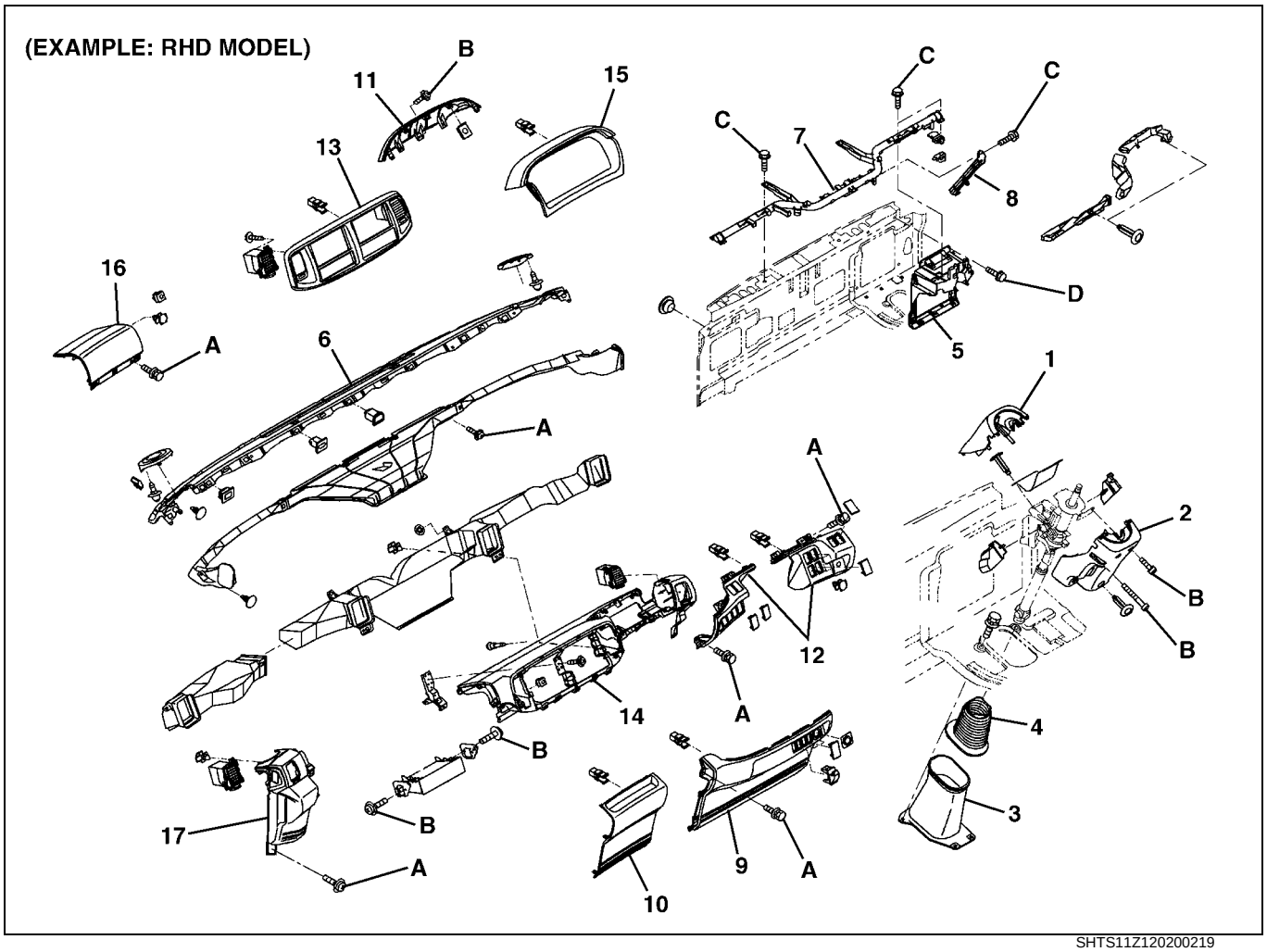
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	29-55 {296-560, 22-40}	B	4.5-10.5 {46-107, 3.3-7.7}

INSTRUMENT PANEL

COMPONENT LOCATOR

EN11Z1202D100013



SHTS11Z120200219

1	Steering column upper cover	10	Lower right cover
2	Steering column lower cover	11	Panel upper cover
3	Steering column lower tube	12	Switch board panel
4	Steering column lower boots	13	Cluster finish panel
5	Pedal bracket support	14	Cluster housing
6	Upper panel	15	Cluster bezel
7	Instrument panel cross member	16	Upper right cover
8	Gusset	17	Side cover
9	Lower center cover		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	2.8-3.2 {29-32, 2.1-2.3}	C	7.5-16.5 {77-168, 5.6-12.1}
B	1.5-2.5 {16-25, 1.2-1.8}	D	9.5-16.5 {96-168, 7.0-12.1}

DISMOUNTING AND MOUNTING

EN11Z1202H100003

1. BEFORE REMOVE THE INSTRUMENT PANEL.

(1) Disconnect the battery cable from the battery ground terminal.

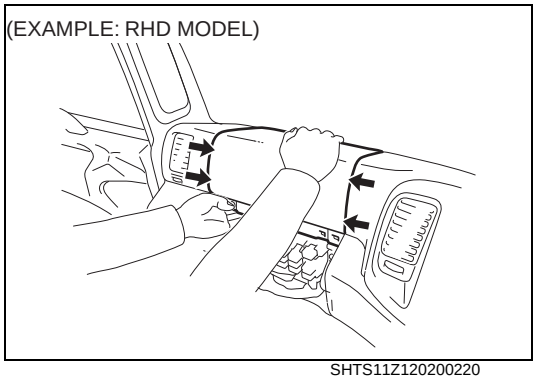
2. REMOVE THE UPPER RIGHT COVER.

(1) Remove the lower bolt on the upper right cover.

(2) Pull the upper right cover toward you, remove the 4 clips of this side.

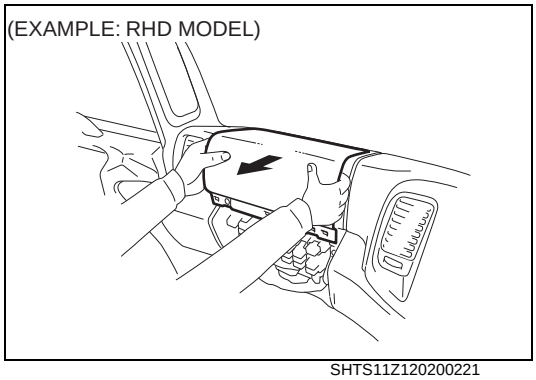
⚠ CAUTION

- **When pulling the upper right cover, be careful not to damage the clips.**
- **Be sure to remove the 4 clips of this side previously because pulling out the upper right cover at one time may damage it.**



SHTS11Z120200220

(3) Pull the upper right cover straight with both hands to remove the inner clip and remove the upper right cover.



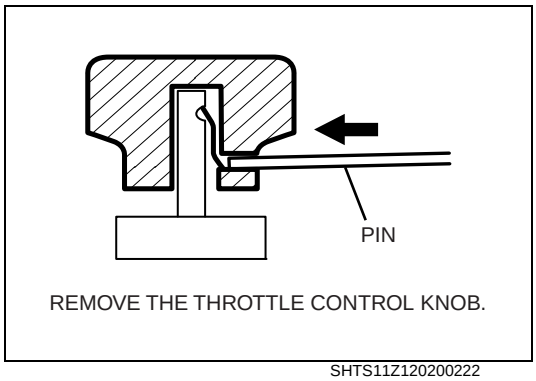
SHTS11Z120200221

3. REMOVE THE SWITCH BOARD PANEL.

(1) Remove the throttle control knob.

(2) Remove the wire of the front lid opener.

(3) Remove the bolt and pull out the switch board panel.

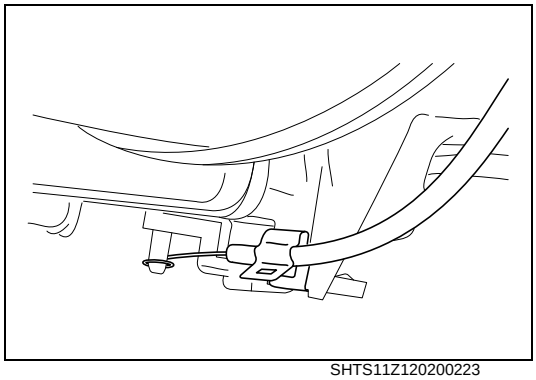


SHTS11Z120200222

4. REMOVE THE INSTRUMENT PANEL CLUSTER.

(1) Remove the cable of the blower part.

(2) Loosen the bolt to remove the instrument panel cluster.

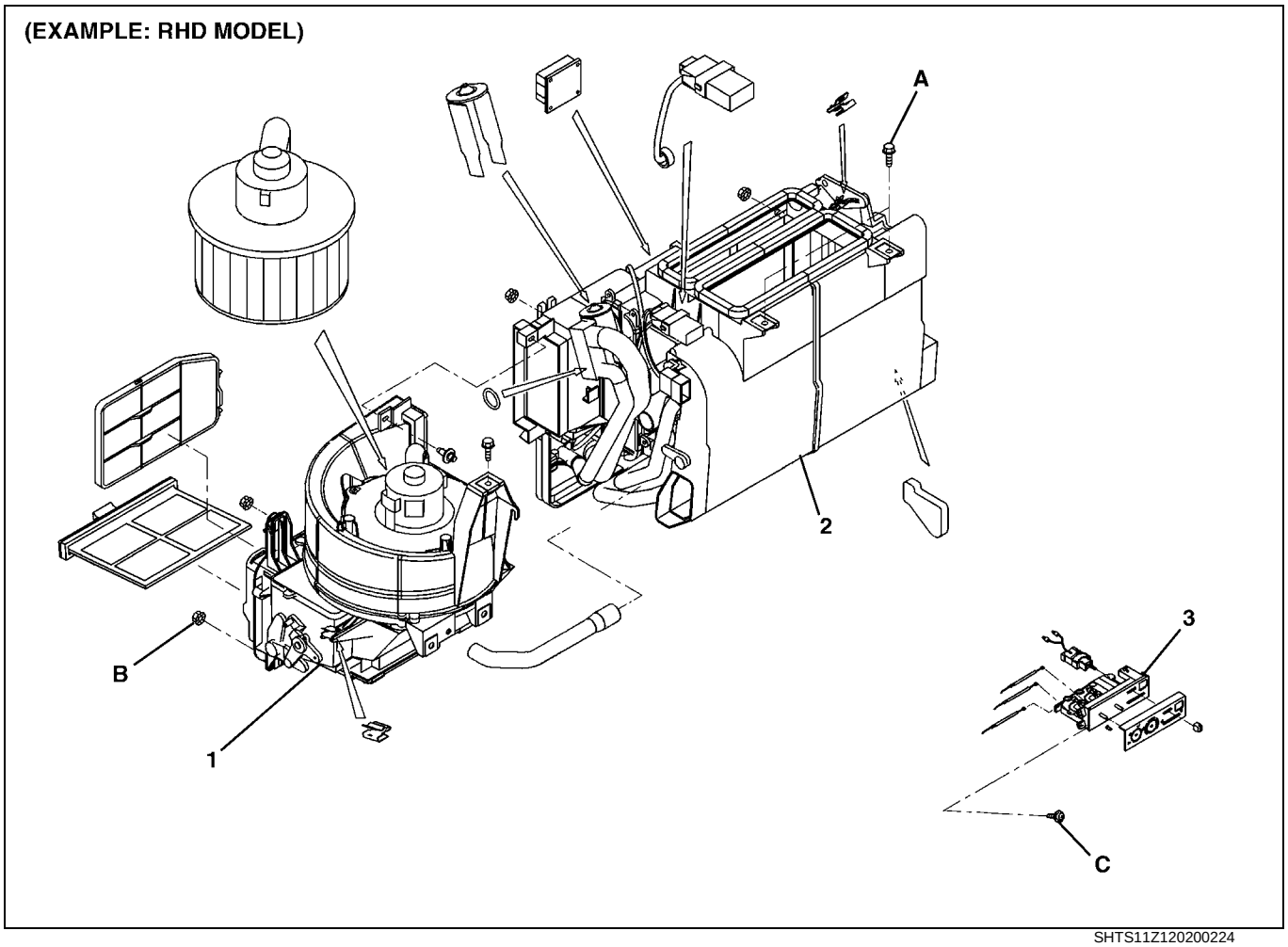


SHTS11Z120200223

HEATER AND AIR CONDITIONER

COMPONENT LOCATOR

EN11Z1202D100014



SHTS11Z120200224

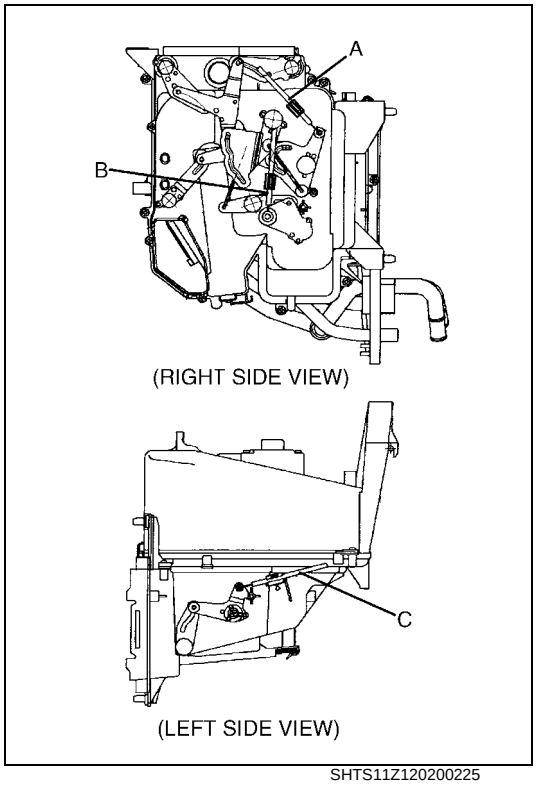
1	Blower assembly	3	Control panel assembly
2	Air conditioner assembly (If so equipped)		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	3.9-4.9 {40-50, 2.9-3.6}	C	1.4-2.4 {14-24, 1.0-1.7}
B	3.9-4.9 {40-50, 2.9-3.6}		

DISMOUNTING AND MOUNTING

EN11Z1202H100004



SHTS11Z120200225

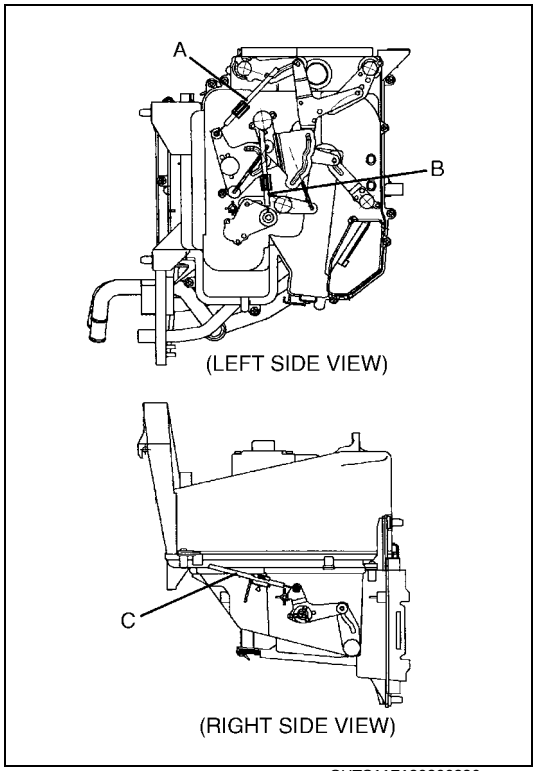
IMPORTANT POINTS - MOUNTING

1. CONNECTING HEATER CONTROL CABLES (RHD MODEL)

NOTICE

- **Do not bend the inner cable when installing the cable**
- **Set the cable at pulled state and make sure the link pressed against the boss. Set position is as follows.**

Cable	Cab width	Color	Position
A: Mode switch (If so equipped)	Standard	GRAY	FACE
	Wide	NATURAL	
B: Temperature control (If so equipped)	Standard	BLACK	MAX COOL
	Wide	BLUE	
C: Inside and outside air switch	Standard	GRAY	OUTSIDE
	Wide	NATURAL	



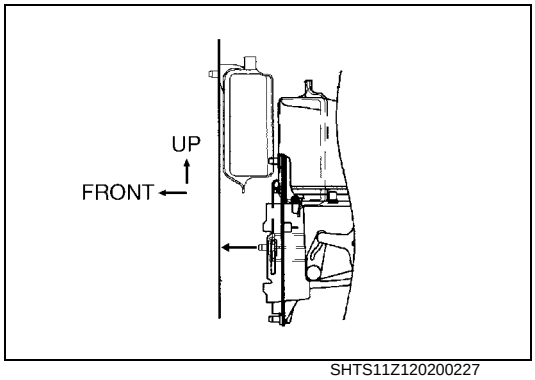
SHTS11Z120200226

2. CONNECTING HEATER CONTROL CABLES (LHD MODEL)

NOTICE

- **Do not bend the inner cable when installing the cable.**
- **Set the cable at pulled state and make sure the link is pressed against the boss. Set position is as follows.**

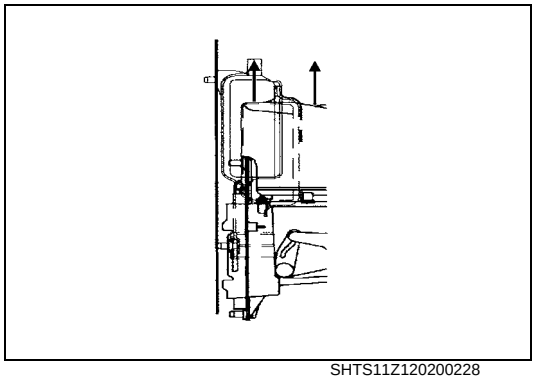
Cable	Cab width	Color	Position
A: Mode switch (If so equipped)	Standard	GLAY	FACE
	Wide	NATURAL	
B: Temperature control (If so equipped)	Standard	BLACK	MAX COOL
	Wide	BLUE	
C: Inside and outside air switch	Standard	BLACK	OUTSIDE
	Wide	BLUE	



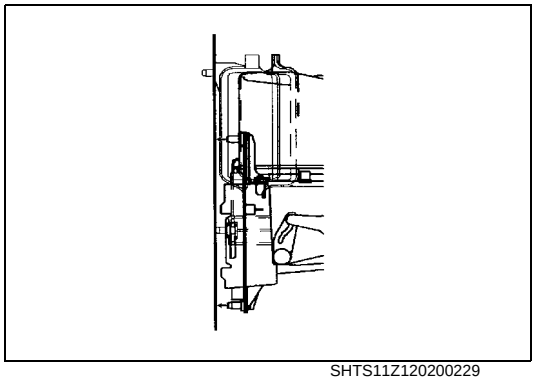
SHTS11Z120200227

3. MOUNTING BLOWER ASSEMBLY.

(1) Press the blower assembly against the dash panel at **15 mm {0.59 in.}** below the installation hole.


SHTS11Z120200228

(2) Hold the blower assembly up **15 mm {0.59 in.}** to align it with the installation hole.

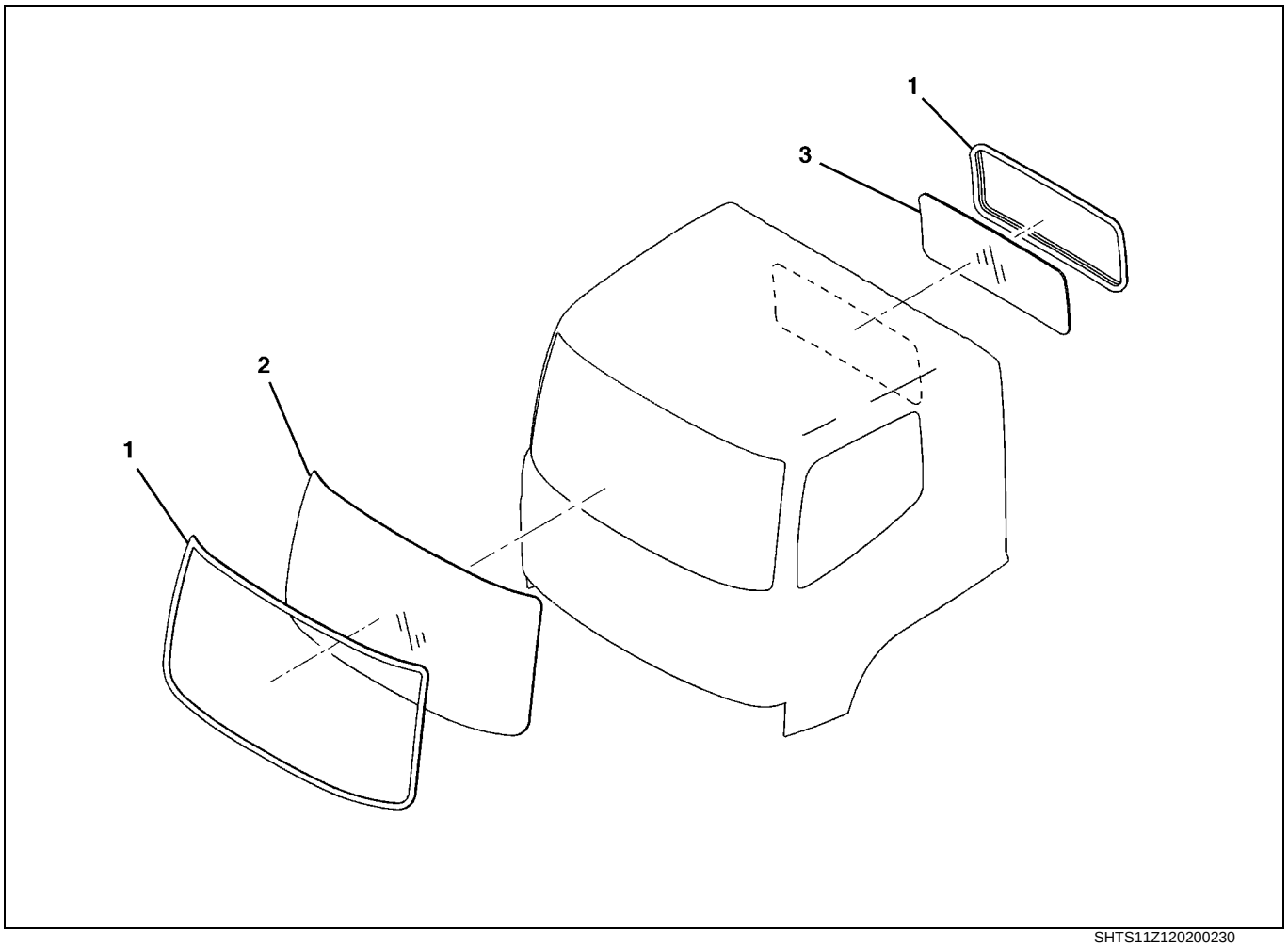

SHTS11Z120200229

(3) Slide the blower assembly to the vehicle front until it is inserted into the installation hole.

WINDSHIELD

COMPONENT LOCATOR

EN11Z1202D100015



SHTS11Z120200230

1	Weather strip	3	Back window
2	Windshield glass		

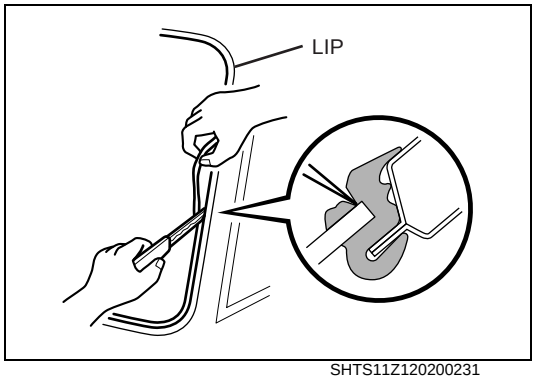
REPLACEMENT

EN11Z1202H100005

1. BEFORE REPLACE THE WINDSHIELD.

(1) Remove the windshield wiper.

2. REMOVE THE WINDSHIELD.

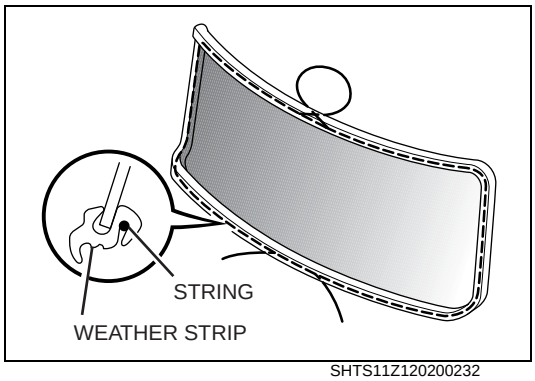


SHTS11Z120200231

(1) Cut the lip of the weather strip with a knife.

(2) The windshield is heavy so remove it using at least two persons.

3. MOUNTING THE WINDSHIELD.

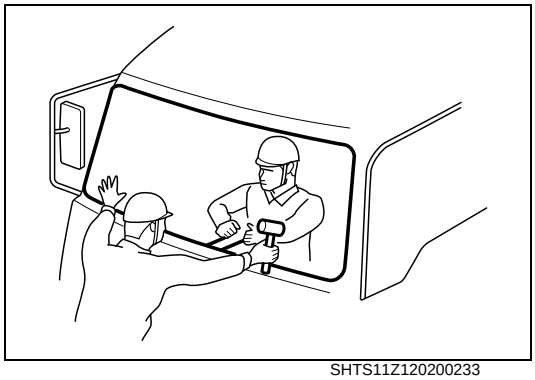


SHTS11Z120200232

(1) Clean the weather strip, mounting flange of cab and contact surface of the window.

(2) Repair any wavy area at the mounting flange as necessary.

(3) Insert the working string as shown in the figure.



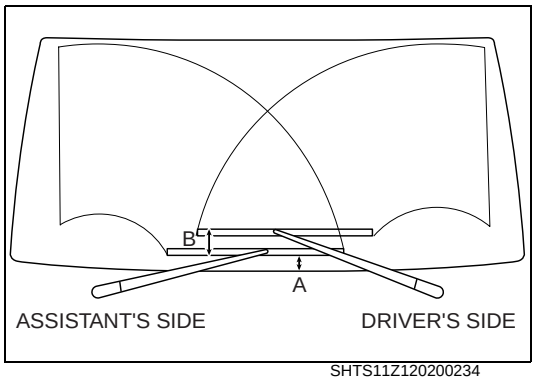
SHTS11Z120200233

(4) Pull the working string from the interior of the cab, and gradually install the lip of the weather strip on the mounting flange.

(5) During this operation, knock the glass from outside. Use soapy water as necessary.

(6) After install the glass properly, knock the glass from inside and outside.

4. INSTALL THE WINDSHIELD WIPER.



SHTS11Z120200234

(1) Install the wiper arm.

Assembly standard: **Unit: mm {in.}**

Clearance (A)	Clearance (B)
30-50 {1.2-1.9}	70-90 {2.8-3.5}

ELECTRICAL EQUIPMENT

EL01-001

ELECTRICAL PARTS EL01-2
DATA AND SPECIFICATIONS.....EL01-2
TROUBLESHOOTING.....EL01-3
GENERAL INSTRUCTION EL01-15
HANDLING PRECAUTION.....EL01-21
INSPECTION.....EL01-22
INSPECTION AND ADJUSTMENT
(EXCEPT INDONESIA, PHILIPPINES
AND VIETNAM) EL01-48
INSPECTION AND ADJUSTMENT
(FOR INDONESIA, PHILIPPINES
AND VIETNAM) EL01-49
SPEEDOMETER CONVERSION
RATE LIST.....EL01-51

ELECTRICAL PARTS

DATA AND SPECIFICATIONS

EN12Z1601I200001

ELECTRICAL SYSTEM

Voltage	Direct current 24 volts
Ground	Negative (-) ground

BULB WATTAGE RATING

Headlight	75/70W	
Fog light (If so equipped)	70W	
Clearance light	5W	
Front turn signal light	21W	
Front side turn signal light	12W	Models for Taiwan, Thailand, Indonesia, Philippines and Vietnam
	21W	Models for Australia, Chile, Hong Kong, India, Ireland, New Zealand, Mexico and Singapore
Front side marker light	5W	Model for India, Indonesia, Ireland and Mexico
Side turn signal light (Only model for Hong Kong)	10W	
Dome light	10W	
Fluorescent light (If so equipped)	100V-18W	
Rear turn signal light	21W	Models for Australia, Chile, Hong Kong, India, Ireland, New Zealand, Mexico, Philippines, Singapore, and Vietnam
	25W	Models for Taiwan, Thailand and Indonesia
Stop/Tail light	21/5W	Models for Australia, Chile, Hong Kong, India, Ireland, New Zealand, Mexico, Philippines, Singapore and Vietnam
	25/10W	Models for Taiwan, Thailand and Indonesia
Back up light	21W	Models for Australia, Chile, Hong Kong, Ireland, New Zealand, Mexico, Philippines, Singapore and Vietnam
	25W	Models for India, Indonesia, Taiwan and Thailand
License plate light	5W	Models for Australia, Chile, Hong Kong, India, New Zealand, Mexico, Philippines, Singapore and Vietnam
	12W	Models for Taiwan, Thailand and Indonesia
Roof marker light (If so equipped)	5W	
Spot light (Tractor only)	35W	

GAUGE TYPE

Fuel	Coil type
Coolant temperature	Coil type
Tachometer	Coil type
Speedometer	Coil type
Air pressure	Coil type

TROUBLESHOOTING

EN12Z1601F300001

STARTING SYSTEM

Symptom	Possible cause	Remedy/Prevention
Engine does not operate (Starter switch)	Poor contact condition	Clean or replace contacts.
Engine does not operate (Battery)	Open circuit in harness	Check and correct.
	Short circuit between electrodes	Replace battery.
	Poor contact condition of battery terminal	Clean or retighten.
Engine does not operate (Engine oil)	Improper viscosity oil	Change oil.
Engine does not operate (Starter relay)	Defective or poor contact of starter relay	Repair or replace.
Engine does not operate (Starter)	Starter does not operate	Repair or replace. Refer to the chapter "**STARTER**".

HEADLIGHT CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Headlight does not turn on (Headlight)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
Headlight does not turn on (Fuse)	Fuse burned out	Replace fuse.
Headlight does not turn on (Headlight relay)	Defective relay	Replace relay.
Headlight does not turn on (Lighting switch)	Broken wire between relay and switch	Repair wire.
	Defective switch	Replace switch.

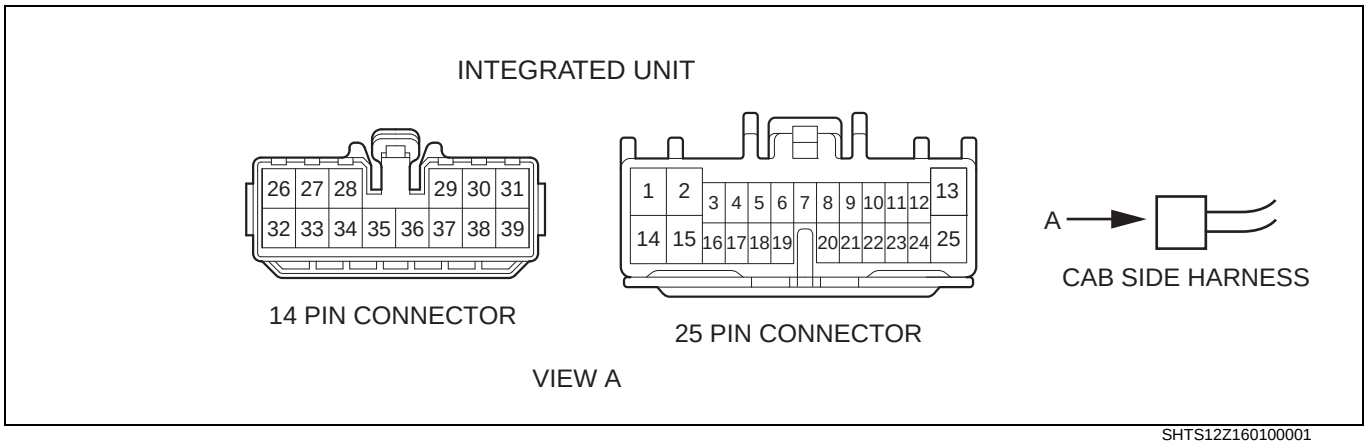
TURN SIGNAL CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Turn signal does not work (Turn signal light)	Bulb burned out	Replace bulb.
	Broken wire	Repair wire.
Turn signal does not work (Fuse)	Fuse burned out	Replace fuse.
Turn signal does not work (Turn signal flasher)	Not grounded	Check the grounding.
	Defective flasher	Replace flasher.
Turn signal does not work (Turn signal switch)	Broken wire between fuse and switch	Repair wire.
	Defective switch	Replace switch.

TAIL AND LICENSE PLATE LIGHT CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Tail and license plate light does not turn on (Light)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
Tail and license plate light does not turn on (Fuse)	Fuse burned out	Replace fuse.
Tail and license plate light does not turn on (Tail light relay)	Defective relay	Replace relay
Tail and license plate light does not turn on (Lighting switch)	Broken wire between fuse and switch	Replace wire.
	Defective switch	Replace switch.

INTEGRATED UNIT
TURN SIGNAL AND HAZARD LIGHT CONTROL



SHTS12Z160100001

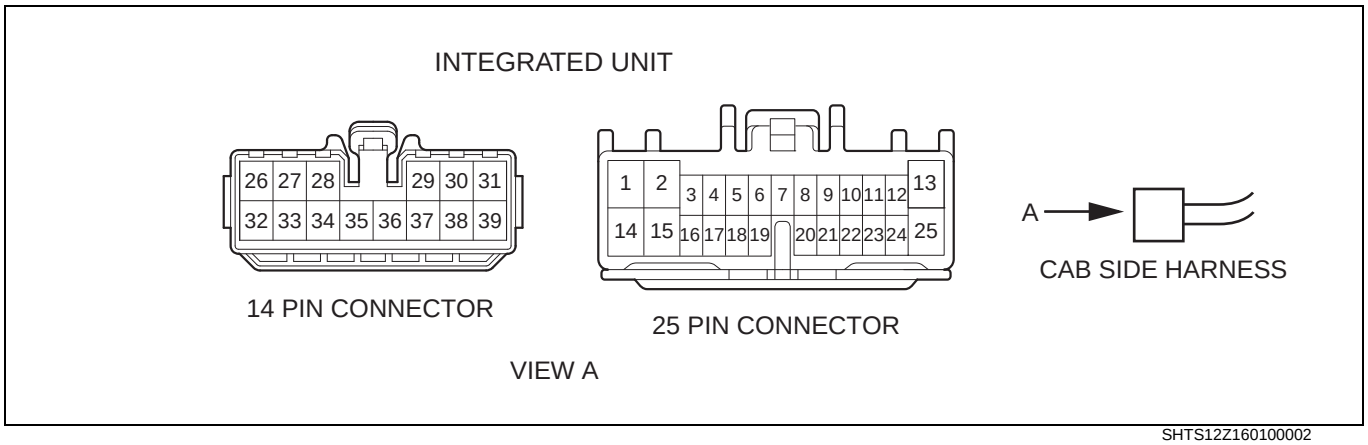
NOTICE

- **Check these items in the order listed below.**
- **Before checking these, verify connectors coupling, blow-out of fuse.**
- **Measure the voltage with No.36 terminal being as the standard.**
- **The above judgement standard is described under normal condition. (If the symptom other than those described in the criteria is found, perform the necessary remedy.)**

Symptom	Possible cause	Remedy/Prevention
Blinking speed is fast.	1. Turn signal light blow-out.	1. Replace turn signal light.
	2. Wrong wattage turn signal light.	2. Replace with correct turn signal light. [Judgement standard] (Refer to the owner's manual.)
	3. Wire harness disconnection between turn signal light and integrated unit.	3. Repair or replace wire harness between turn signal light and integrated unit. [Judgement standard] (Connector disconnect) Between No.33 terminal and left side turn signal light: Less than 1Ω Between No.34 terminal and right side turn signal light: Less than 1Ω
	4. Integrated unit failure.	4. Replace integrated unit. [Judgement standard] When above 1 to 3 are normal.

Symptom	Possible cause	Remedy/Prevention
Light does not blink. (It does not on)	1. Power is not supplied.	1. Replace fuse, repair or replace wire harness. [Judgement standard] (Connector disconnect) No.32 terminal: Always 16-32V
	2. Combination switch or hazard light switch failure.	2. Replace combination switch or hazard light switch. [Judgement standard] (Connector disconnect) No.25 terminal: Less than 1Ω when left turn signal light switch is "ON" No.13 terminal: Less than 1Ω when right turn signal light switch is "ON" No.12 terminal: Less than 1Ω when hazard light switch is "ON"
	3. Wire harness disconnection between combination switch or hazard light switch and integrated unit.	3. Repair or replace wire harness between combination switch and hazard light switch. [Judgement standard] (Connector disconnect) No.25 terminal: Less than 1Ω when left turn signal light switch is "ON" No.13 terminal: Less than 1Ω when right turn signal light switch is "ON" No.12 terminal: Less than 1Ω when hazard light switch is "ON"
	4. Integrated unit failure.	4. Replace integrated unit. [Judgement standard] (Connector connect) No.33 terminal: 0↔16-32V intermittently output when left turn signal light switch is "ON" No.34 terminal: 0↔16-32V intermittently output when right turn signal light switch is "ON"
Light does not blink. (It remain on)	1. Wire harness between the integrated unit and turn signal light is shorted to the power line.	1. Repair or replace wire harness between integrated unit and turn signal light. [Judgement standard] (Connector disconnect) When the combination switch and hazard light switch is "OFF" Between No.34 terminal and No.36 terminal: Approx. 0V Between No.33 terminal and No.36 terminal: Approx. 0V
	2. Integrated unit failure.	2. Replace integrated unit. [Judgement standard] When the above 1 is normal.

STOP LIGHT SYSTEM



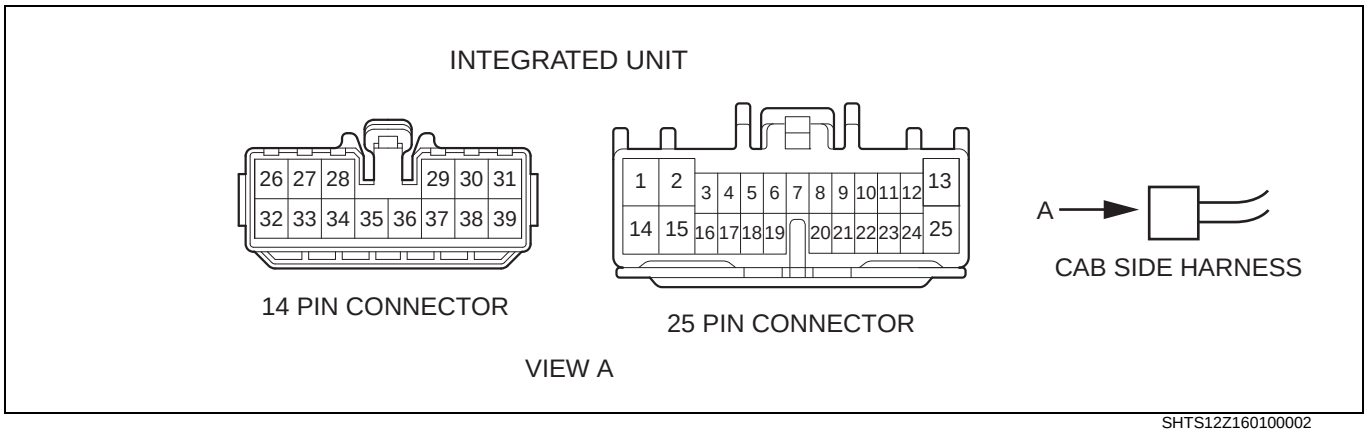
SHTS12Z160100002

NOTICE

- **Check these items in the order listed below.**
- **Before checking these, verify connectors coupling, blow-out of fuse.**
- **Measure the voltage with No.36 terminal being as the standard.**
- **The above judgement standard is described under normal condition. (If the symptom other than those described in the criteria is found, perform the necessary remedy.)**

Symptom	Possible cause	Remedy/Prevention
Light does not turn on.	1. Power source is not supplied.	1. Replace the fuse, repair or replace the harness. [Judgement standard] (Connector disconnect) When the starter switch is "ON" No.39 terminal: 16-32V
	2. Wire harness disconnection between the integrated unit and ground.	2. Repair or replace the wire harness between integrated unit and ground. [Judgement standard] (Connector disconnect) Between No.36 terminal and chassis ground: Continuity
	3. Stop light bulb blow-out.	3. Replace the stop light. [Judgement standard] Check the light.
	4. Wire harness disconnection between the stop light and integrated unit.	4. Repair or replace wire harness between stop light and integrated unit [Judgement standard] (Connector disconnect) Between No.37 terminal and right stop light: Less than 1Ω Between No.38 terminal and left stop light: Less than 1Ω
	5. Stop light switch failure.	5. Replace stop light switch. [Judgement standard] (Connector disconnect) When step on brake pedal Between No.10 terminal and No.36 terminal: Less than 1Ω
	6. Wire harness disconnection between stop light switch and integrated unit.	6. Repair or replace wire harness between stop light switch and integrated unit. [Judgement standard] (Connector disconnect) When step on brake pedal Between No.10 terminal and No.36 terminal: Less than 1Ω
	7. Integrated unit failure.	7. Replace integrated unit [Judgement standard] (Connector connect) When the above 1 to 6 are normal No.37 terminal: 16-32V No.38 terminal: 16-32V (When step on the brake pedal)

WINDSHIELD WIPER CONTROL



SHTS12Z160100002

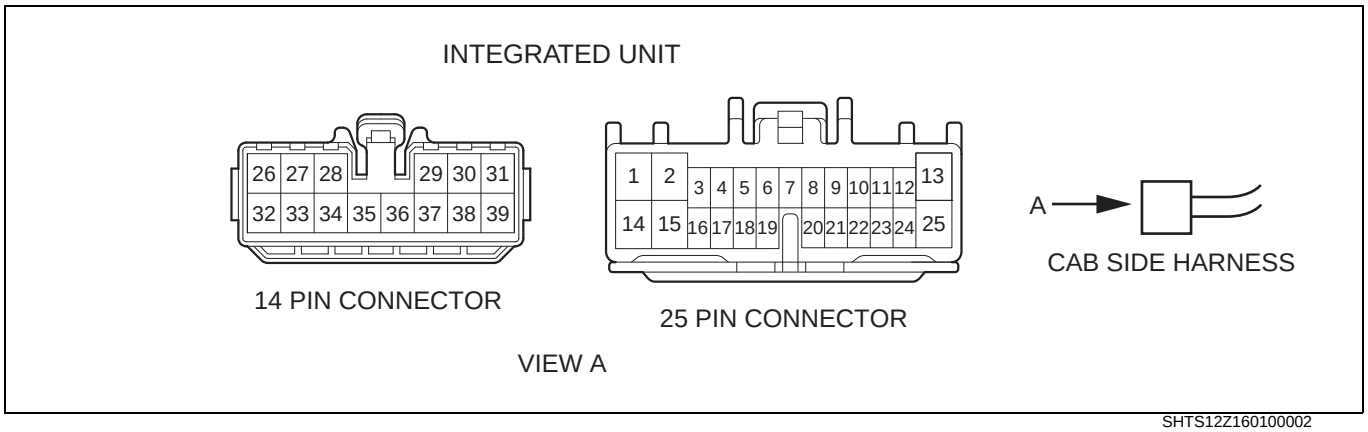
NOTICE

- **Check these items in the order listed below.**
- **Before checking these, verify connectors coupling, blow-out of fuse.**
- **Measure the voltage with No.36 terminal being as the standard.**
- **The above judgement standard is described under normal condition. (If the symptom other than those described in the criteria is found, perform the necessary remedy.)**

Symptom	Possible cause	Remedy/Prevention
Wiper does not function.	1. Power is not supplied.	1. Replace fuse, repair or replace wire harness. [Judgement standard] (Connector disconnect) When starter switch is "ON" No.1 terminal: 16-32V
	2. Ground line disconnection.	2. Repair or replace the wire harness. [Judgement standard] (Connector disconnect) No.36 terminal: Always continuity to the body ground.
	3. Wiper switch signal is off.	3. Repair or replace the wire harness between the combination switch and integrated unit. Replace the combination switch. [Judgement standard] (Connector disconnect) Between terminal No.4 and No.36: Less than 1V Between terminal No.17 and No.36: Less than 1V Between terminal No.3 and No.36: Less than 1V
	4. Wiper motor harness disconnection.	4. Repair or replace the harness between the wiper motor and wiper controller. [Judgement standard] (Connector disconnect) Between No.15 terminal and the wiper motor LO terminal: Less than 1Ω Between No.14 terminal and the wiper motor HI terminal: Less than 1Ω Between No.2 terminal and the wiper motor CAM terminal: Less than 1Ω
	5. Wiper motor failure.	5. Replace the wiper motor. [Judgement standard] (According to failure inspection result of wiper motor.)
	6. Integrated unit failure.	6. Replace the integrated unit. [Judgement standard] (Connector connect) With starter switch "ON" and the wiper switch being at "INT" or "LO" position → No.15 terminal: 16-32V With starter switch "ON" and the wiper switch being at "HI" position → No.14 terminal: 16-32V

Symptom	Possible cause	Remedy/Prevention
Wiper does not stop.	1. Wiper switch signal is not cut off.	1. Repair or replace the wiper signal harness. Replace the combination switch. [Judgement standard] (Connector disconnect) When the position of wiper switch at "OFF" position → Between terminal No.17 and No.36: More than 1kΩ Between terminal No.3 and No.36: More than 1kΩ Between terminal No.4 and No.36: More than 1kΩ
	2. Wiper motor harness is shorted to the power line.	2. Repair or replace the wiper motor harness. [Judgement standard] (Connector disconnect) When the position of wiper switch at "OFF" position No.15 terminal: Less than 1V No.14 terminal: Less than 1V
	3. Integrated unit failure.	3. Replace the integrated unit. [Judgement standard] (Connector connect) When the position of wiper switch at "OFF" position No.15 terminal: Less than 1V No.14 terminal: Less than 1V

DOOR LOCK CONTROL



SHTS12Z160100002

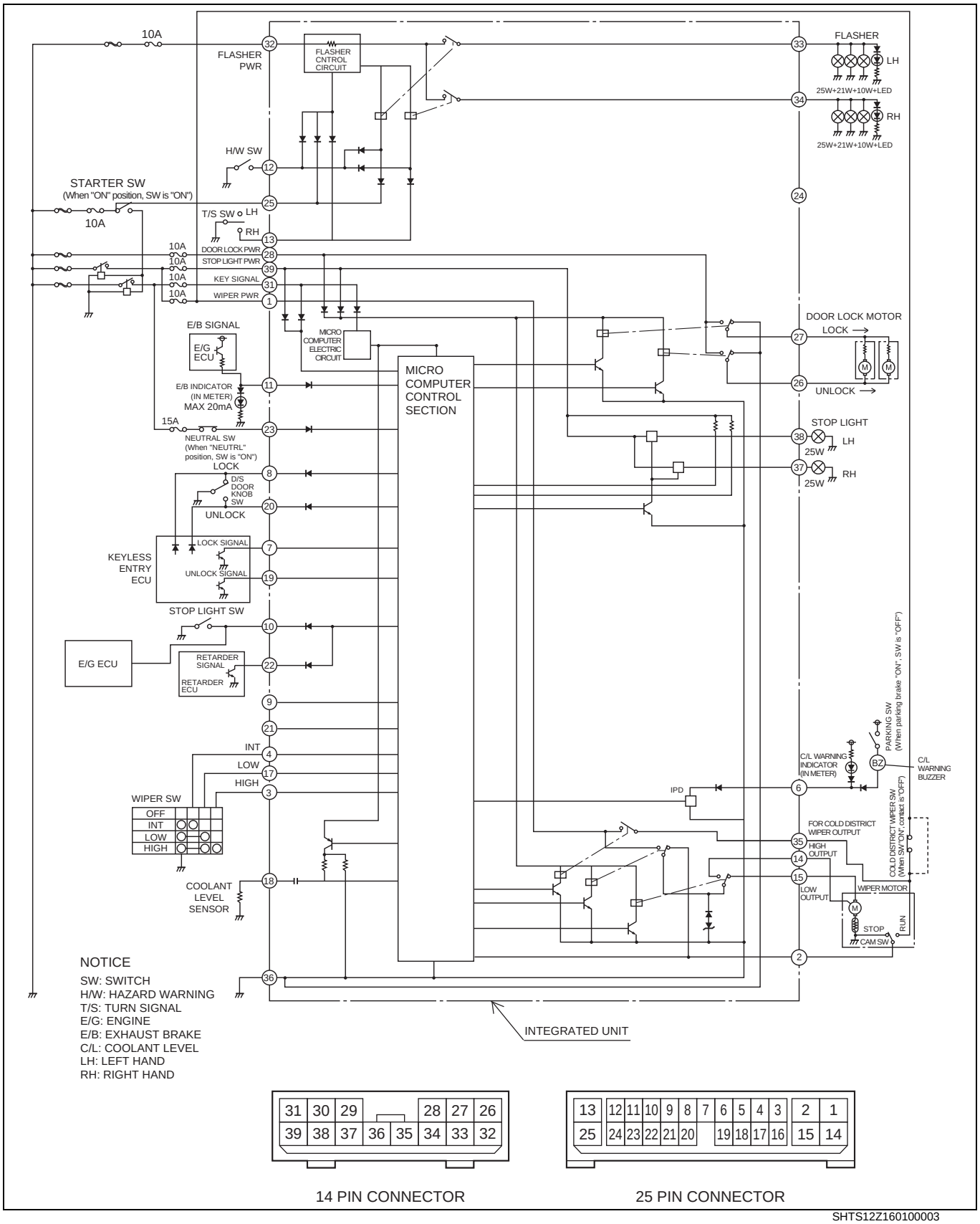
NOTICE

- **Check these items in the order listed below.**
- **Before checking these, verify connectors coupling, blow-out of fuse.**
- **Measure the voltage with terminal No.36 being as the standard.**
- **The above judgement standard is described under normal condition. (If the symptom other than those described in the criteria is found, perform the necessary remedy.)**

Symptom	Possible cause	Remedy/Prevention
The door lock motor on assistant seat side does not function by operating the door lock switch on driver's side.	1. Power source is not supplied.	1. Replace fuse, repair or replace harness. [Judgement standard] (Connector disconnect) No.28 terminal: Always 16-32V
	2. Ground line disconnection.	2. Repair or replace harness. [Judgement standard] (Connector disconnect) No.36 terminal: Always continuity to body ground.
	3. Door lock knob signal harness disconnection.	3. Repair or replace door lock knob signal harness. [Judgement standard] (Connector disconnect) No.8 terminal: Less than 1V when set driver's seat side door lock switch to "LOCK". No.20 terminal: Less than 1V when set driver's seat side door lock switch to "UNLOCK".
	4. Door lock motor harness disconnection.	4. Replace the door lock controller. [Judgement standard] (Connector connect) Between No.27 terminal and door lock motor LOCK terminal: Less than 1Ω Between No.26 terminal and door lock motor UNLOCK terminal: Less than 1Ω
	5. Door lock motor failure.	5. Replace door lock motor. [Judgement standard] (According to inspection results of door lock motor.)
	6. Integrated unit failure.	6. Replace integrated unit. [Judgement standard] (Connector connect) No.27 terminal: For 0.3 second after turning the door lock switch to "LOCK" → 16-32V Turning door lock to "UNLOCK" → Less than 1.5V No.26 terminal: For 0.3 second after turning the door lock switch to "UNLOCK" → 16-32V Turning door lock to "LOCK" → Less than 1.5V

Symptom	Possible cause	Remedy/Prevention
It does not working with keyless entry system.	1. Power source is not supplied.	1. Replace fuse, riper or replace harness. [Judgement standard] (Connector disconnect) No.28 terminal: Always 16-32V
	2. Ground line disconnection.	2. Repair or replace harness. [Judgement standard] (Connector disconnect) No.36 terminal: Always continuity to body ground.
	3. Keyless entry system malfunction.	3. Repair or replace keyless entry system. Replace battery of transmitter.
	4. Keyless signal harness disconnection.	4. Repair or replace keyless signal harness. [Judgement standard] (Connector disconnect) No.7 terminal: Less than 2V when set driver's seat side door lock switch to "LOCK" by keyless entry. No.19 terminal: Less than 2V when set driver's seat side door lock switch to "UNLOCK" by keyless entry.
	5. Door lock knob signal harness disconnection.	5. Repair or replace door lock knob signal harness. [Judgement standard] (Connector disconnect) No.8 terminal: Less than 1Ω when set driver's seat side door lock switch to "LOCK". No.20 terminal: Less than 1Ω when set driver's seat side door lock switch to "UNLOCK".
	6. Door lock motor harness disconnection.	6. Repair or replace door lock motor harness. [Judgement standard] (Connector disconnect) Between No.27 terminal and door lock motor LOCK terminal: Less than 1Ω Between No.26 terminal and door lock motor UNLOCK terminal: Less than 1Ω

INTEGRATED UNIT INTERNAL CIRCUIT



NOTICE

SW: SWITCH
H/W: HAZARD WARNING
T/S: TURN SIGNAL
E/G: ENGINE
E/B: EXHAUST BRAKE
C/L: COOLANT LEVEL
LH: LEFT HAND
RH: RIGHT HAND

14 PIN CONNECTOR

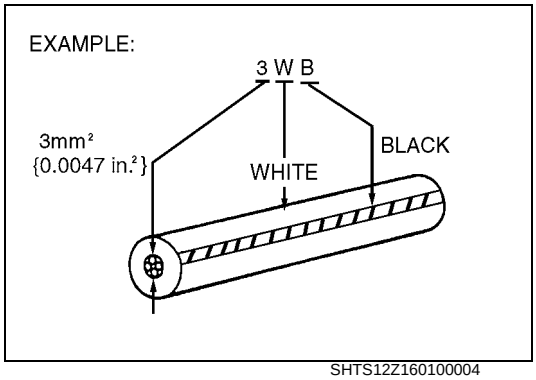
25 PIN CONNECTOR

SHTS12Z160100003

GENERAL INSTRUCTION

EN12Z1601C100001

⚠ **CAUTION**
Be sure to disconnect the ground cable before servicing the electrical circuits except for testing on-vehicle.



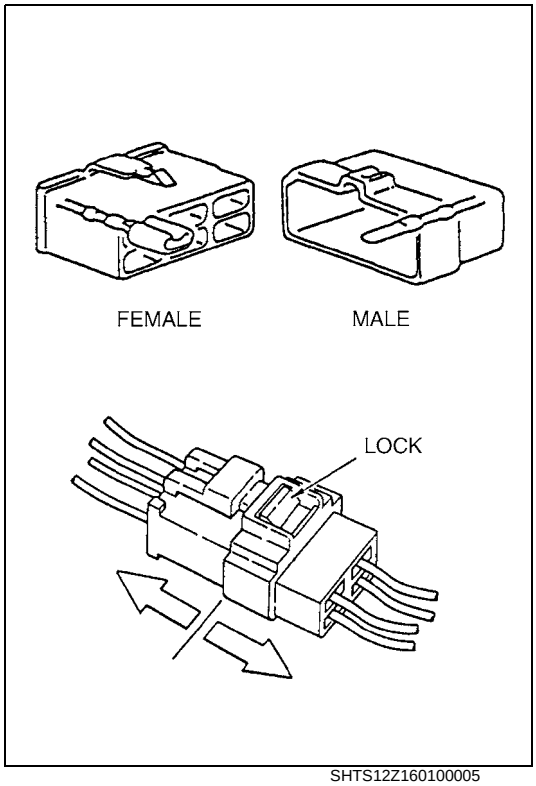
SHTS12Z160100004

1. WIRING CODE

(1) Wiring colors are indicated by a code.

B	: Black	LG	: Light green	V	: Violet
BR	: Brown	R	: Red	O	: Orange
G	: Green	W	: White	GR	: Gray
L	: Blue	Y	: Yellow	P	: Pink

(2) The first letter indicates the ground wire color and second letter indicated the strip color.
(3) Arabic numerals indicates the cross sectional area of wire.
Example: 3 indicates 3 mm^2 {0.0047 $in.^2$}

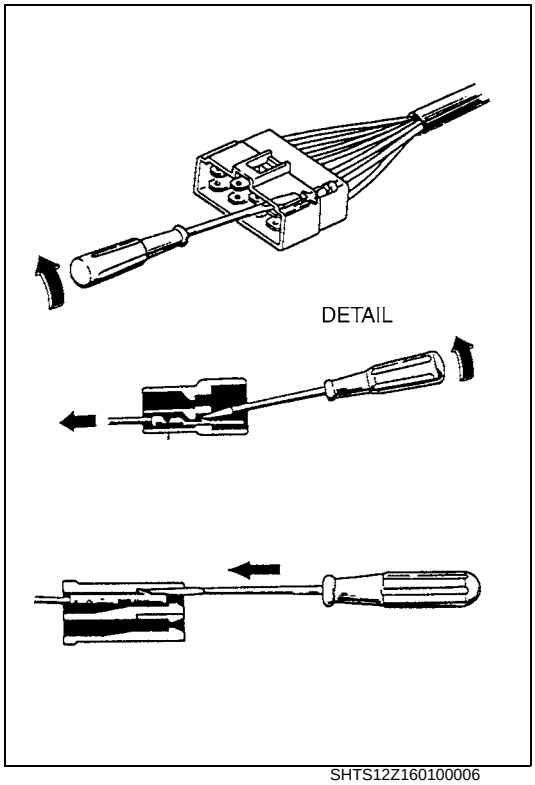


SHTS12Z160100005

2. CONNECTOR

(1) The connector consists of the male and female connectors.
Male and female connectors are classified according to the shape of the terminals in the connector.
Male and female connectors are provided with a lock, so that they can not be separated easily.
To separate the connectors, unlock the lock, then hold one connector with one hand and the other one with the other hand, and pull each other.

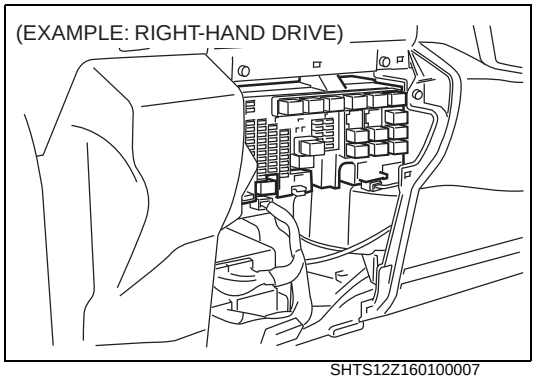
NOTICE
When the connector is disconnected by pulling the wires, the connection between the terminals and the wires will be damaged.



SHTS12Z160100006

(2) Removing the terminal from the connector.
   a. Insert a miniature screwdriver or a terminal puller between terminal and connector, and unlock the lock between terminal and connector.
   b. When the lock has been released, pull the wire to remove the terminal.

(3) Installing the terminal in the connector.
   a. Insert the terminal into the connector until it clicks.
   b. Pull the wire to confirm correct lock engagement.



SHTS12Z160100007

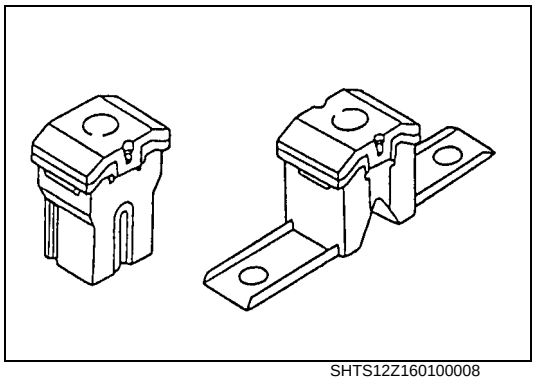
3. FUSE

(1) The power supply must be switched off for fuse replacement.
Use a proper amperage fuse.

NOTICE

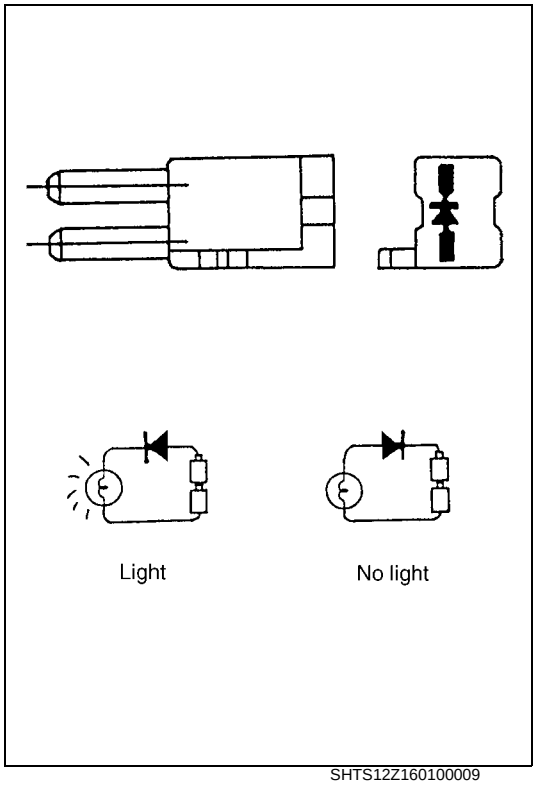
Wire burning may be caused when a fuse with an excessively large current capacity is used.

If the fuse should blow frequently, investigate the cause and correct it.


SHTS12Z160100008

4. FUSIBLE LINK

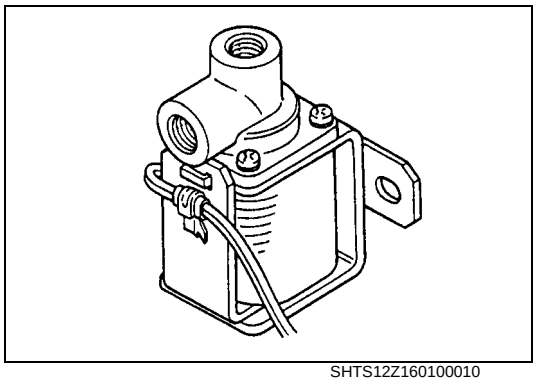
(1) The cause of an overload current should be determined and corrected before a melted fusible link is replaced.
A melted fusible link can be determined swollen or melted insulation of the link.



SHTS12Z160100009

5. DIODE

(1) Diode allows the flow of electric current in only one direction.



SHTS12Z160100010

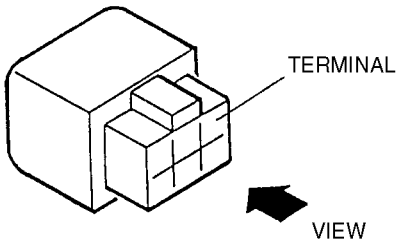
6. SOLENOID VALVE

(1) Solenoid valve controls the current of compressed air by electric. Check the continuity between terminals. If there is no continuity, replace the solenoid valve.

RELAY (TYPE, COLOR, PART No., NAME AND INSPECTION)

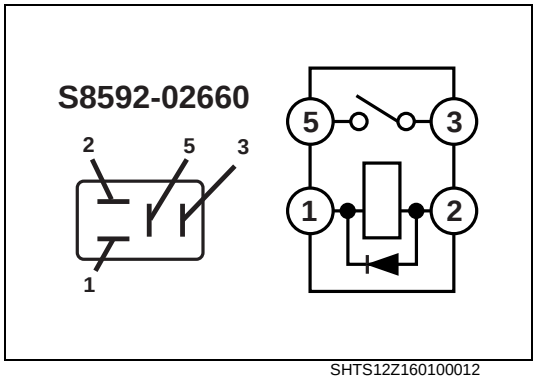
NOTICE

Refer to the section "FUSE AND RELAY BLOCK" in the chapter "ELECTRIC WIRE" for the alignments of relays.



SHTS12Z160100011

	Color	Part No.	Name
TYPE-1	Dark gray	S8592-02660	Headlight relay (Main, dimmer)
			Tail light relay (No.1, 2)
			Horn relay
			Backup light relay (If so equipped)
			Rear fog light relay (If so equipped)
			Automatic transmission back-up light relay (If so equipped)
			Automatic transmission neutral relay (If so equipped)
			Transmission P.T.O. relay (If so equipped)
			ECU main relay
			Cab tilt up relay (If so equipped)
			Cab tilt down relay (If so equipped)
			Rear power window relay (If so equipped)
			Actuator power relay
			Fog light relay (If so equipped)
TYPE-2	Green	S8592-02650	Power relay (No.1, 2, 3, 4)
			Power accessory relay
			Light check relay (If so equipped)
			Heater relay (If so equipped)
			Air conditioner relay (If so equipped)
			Air conditioner condenser relay (If so equipped)
TYPE-3	Light gray	S8292-02570	Stop light relay
TYPE-4	Orange	S8592-02680	Lo-Hi indicator light relay (If so equipped)
			ABS exhaust brake cut relay (If so equipped)
			ABS warning light relay (If so equipped)
			Hour meter relay (If so equipped)
TYPE-5	Yellow	S8592-02700	ABS solenoid relay (If so equipped)
TYPE-6	Purple	S8592-02710	ABS motor relay (If so equipped)
TYPE-7	Light brown	S8592-02510	Engine stop motor relay (If so equipped)
TYPE-8	Blue	S8592-02670	Actuator power relay (If so equipped)

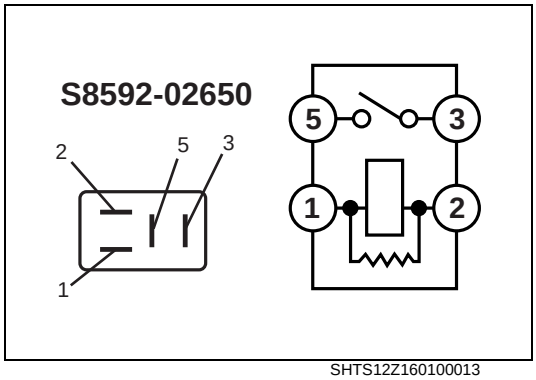


SHTS12Z160100012

1. TYPE-1 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

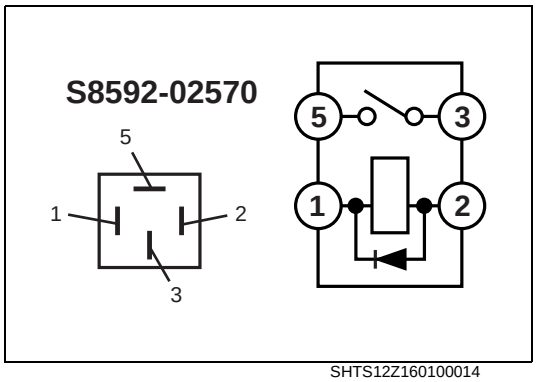


SHTS12Z160100013

2. TYPE-2 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

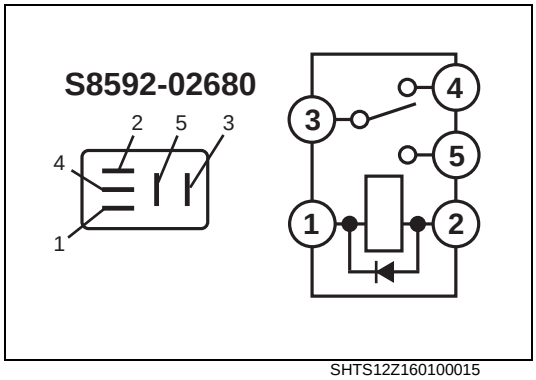


SHTS12Z160100014

3. TYPE-3 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

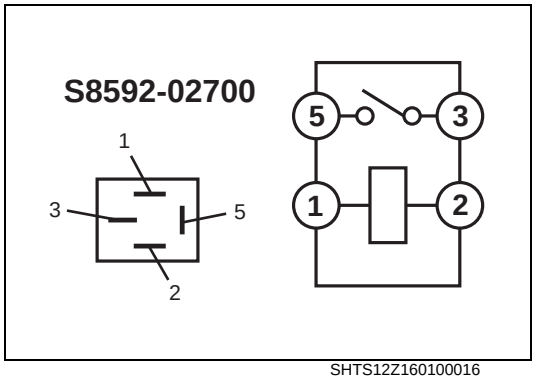


SHTS12Z160100015

4. TYPE-4 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.

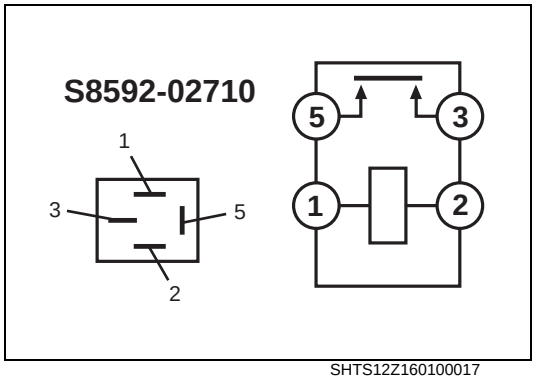


SHTS12Z160100016

5. TYPE-5 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 2,
Ground to terminal 1.

(2) Under normal condition, terminal 3 and 5 switch on.

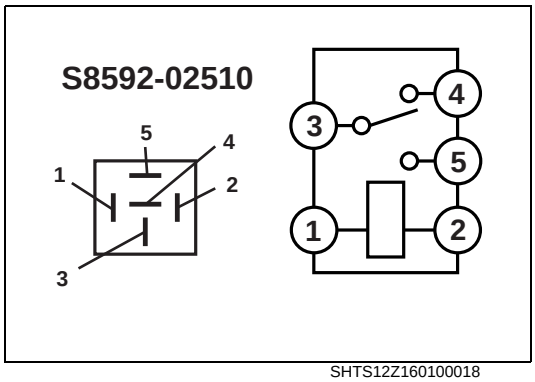


SHTS12Z160100017

6. TYPE-6 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 2,
Ground to terminal 1.

(2) Under normal condition, terminal 3 and 5 switch on.

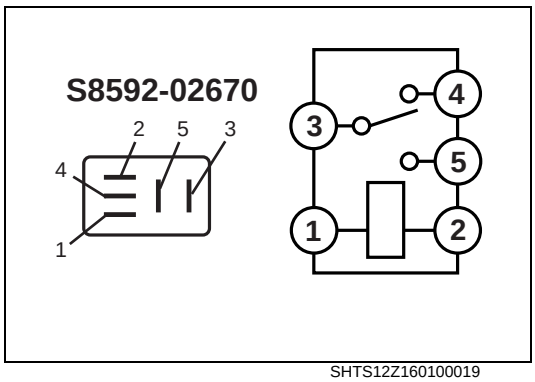


SHTS12Z160100018

7. TYPE-7 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.



SHTS12Z160100019

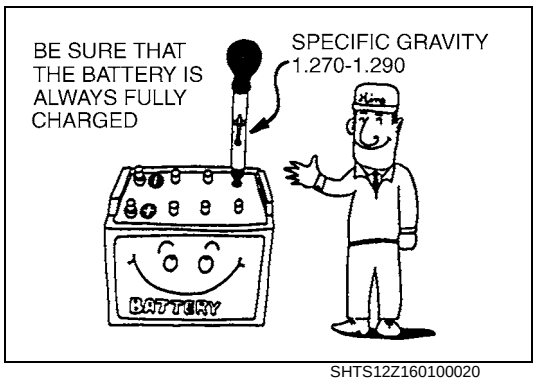
8. TYPE-8 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.

HANDLING PRECAUTION

EN12Z1601C100002



SHTS12Z160100020

BATTERY

1. CONVERSION FORMULA FOR SPECIFIC GRAVITY

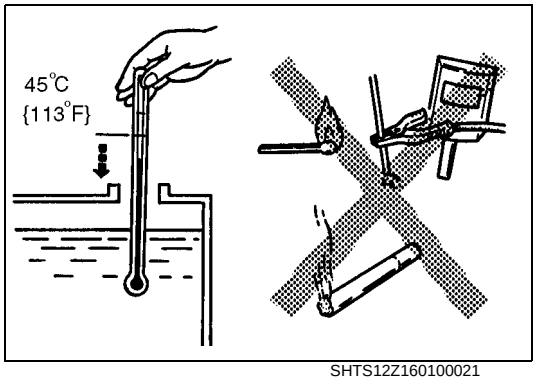
(1) The specific gravity of the electrolyte changes according to the temperature of the electrolyte itself, therefore a temperature of 20°C {68°F} is used as reference temperature.
Consequently, if the temperature is not 20°C when the specific gravity is measured, it is necessary to convent the measured value to value calculated under the following conversion formula at 20°C.
Temperature conversion formula: S20=St+0.0007(t-20)

(2) Where,

- "S20" is the specific gravity at 20°C (Reference temperature)
- "St" is the specific gravity at the measuring temperature
- "t" is the temperature during measurement
- "0.0007" is the temperature coefficient of the electrolyte

NOTICE

As a rough guide, if the temperature of the electrolyte rises or falls by 15°C {59°F}, the specific gravity of the electrolyte will vary by about 0.01.



SHTS12Z160100021

2. BATTERY CHARGING

- Be careful of the following points.

(1) While the battery is being charged, ensure that the temperature of the electrolyte does not rise above 45°C {113°F}.

(2) While the battery is being charged, be particularly careful to keep it away from sources of fire.

(3) The amount of electrolyte must be within the specified level.
Specific gravity when battery is fully charged:
1.270-1.290 at 20°C {68°F}

3. CLEANING THE BATTERY

- If the terminals at the top of the battery are dirty, clean them with cold water or lukewarm water.
- Apply a light coating of grease to the terminals to prevent them from rusting so as to prevent faulty contact.

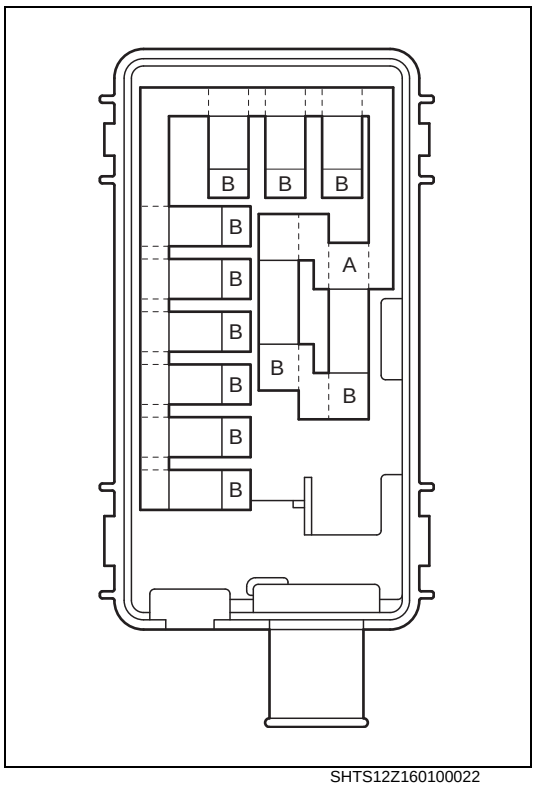
4. CONNECTING THE BATTERY CABLES

- Clamp the cables securely to prevent improper contact between the cables and the battery terminals.
- Be very careful not to connect the (+) and (-) leads in reverse. (Because this may cause damage to the equipment and batteries)

INSPECTION

EN12Z1601H300001

POWER SUPPLY CIRCUIT



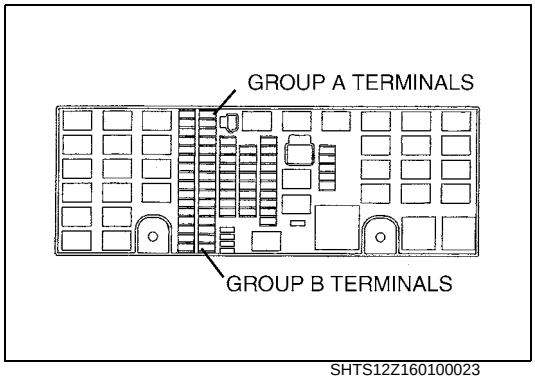
SHTS12Z160100022

1. FUSIBLE LINK BLOCK INSPECTION

(1) Check the voltage between fusible link block terminal A and chassis body ground.
(2) Under normal condition, the voltage is about 24V.
(3) If it is not correct, check the battery cable, wiring harness, etc.

- Battery cable (Open circuit, loosen connection, etc.)
- Wiring harness (Open circuit, etc.)
- Battery (Discharged)

NOTICE
Group "A" terminals: From battery
Group "B" terminals: To each electrical parts



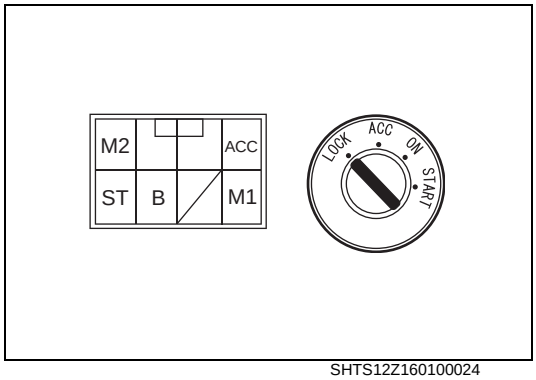
SHTS12Z160100023

2. FUSE BLOCK INSPECTION

(1) Check the voltage between group A terminals of fuse block and cab body ground.
(2) Under normal condition, the voltage is about 24V.
(3) If it is not correct, check the circuit from battery to fuse.

- Coupler connection between cab harness and chassis harness
- Coupler connection of each electrical parts
- Cab harness and chassis harness
  (Open circuit, against short, etc.)
- Fusible link burn out

NOTICE
Group A terminals: From battery
Group B terminals: To each electrical parts



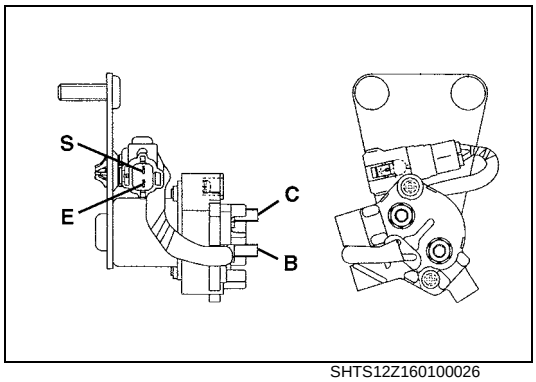
SHTS12Z160100024

ENGINE STARTING CIRCUIT

1. STARTER SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	B	ACC	M2	M1	ST
LOCK					
ACC	○	○			
ON	○	○	○	○	
ST	○		○	○	○

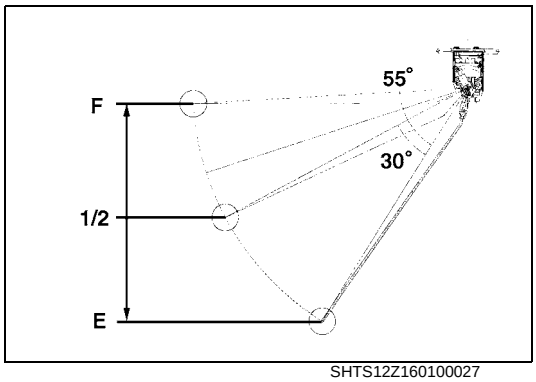


SHTS12Z160100026

2. STARTER RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal S,
Ground to terminal E.

(2) Under normal condition, terminals C and B switch on.



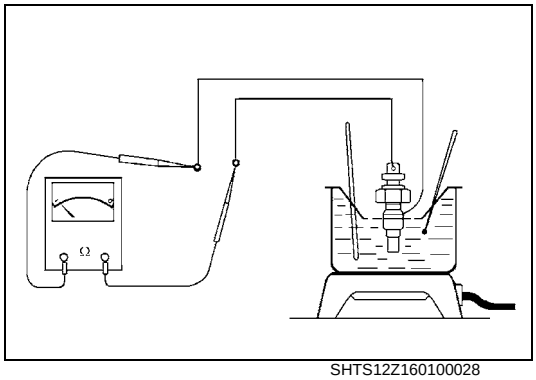
SHTS12Z160100027

GAUGE, METER AND WARNING CIRCUIT

1. FUEL GAUGE SENDER UNIT INSPECTION

(1) Measure resistance between terminals.

Float position	F	1/2	E
Resistance: Ω	0-1.2	29.5-32.5	146.5-153.5

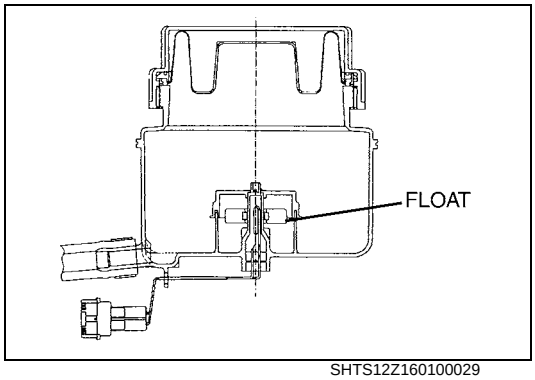


SHTS12Z160100028

2. COOLANT TEMPERATURE GAUGE SENDER UNIT INSPECTION

(1) Warm up the sender gauge and measure the resistance between the terminal and the body ground.

Temperature	75°C {167°F}	100°C {212°F}
Resistance: Ω	79-92	35.5-42.5

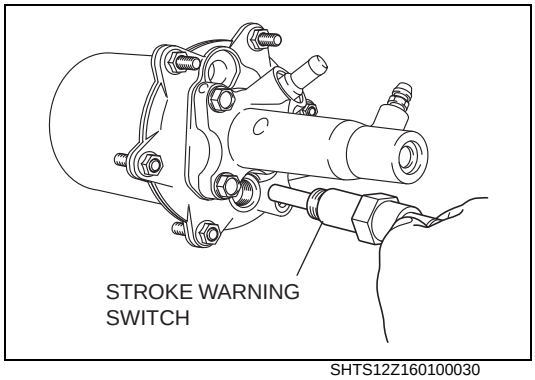


SHTS12Z160100029

3. BRAKE FLUID LEVEL SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
Float position UP	No continuity
Float position DOWN	Continuity



SHTS12Z160100030

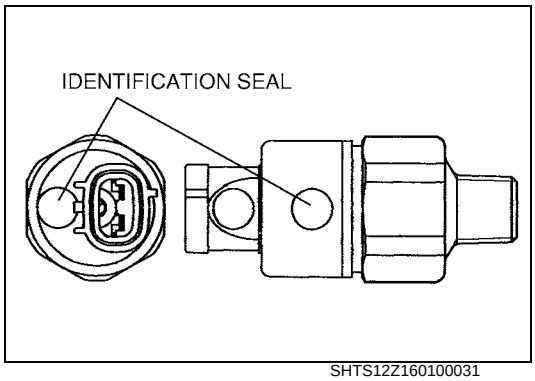
4. BRAKE STROKE WARNING SWITCH (Installed at the service brake air booster) INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

NOTICE

When the head of the detector is depressed, the warning light goes on to indicate brake shoe needs adjustment or lining replacement.



SHTS12Z160100031

5. AIR PRESSURE SWITCH INSPECTION

(1) Apply air pressure.
(2) Check the continuity between terminal and body ground.

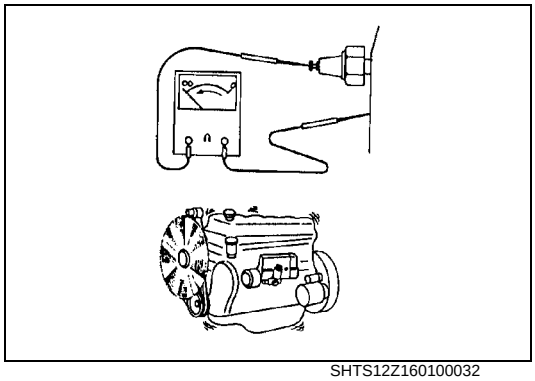
Low pressure switch **Unit: kPa {kgf/cm^2, lbf/in.^{2}}**

Seal color	Operating pressure	Circuit
Yellow	490 {5.0, 71.1}	NC
Blue	274.6 {2.8, 39.8}	
Pink	588.4 {6.0, 85.3}	
None	539.4 {5.5, 78.2}	

Spring brake switch, Buzzer cancel switch and Trailer hand brake switch **Unit: kPa {kgf/cm^2, lbf/in.^{2}}**

Connector color	Operating pressure	Circuit
Black	539.4 {5.5, 78.2}	NC
Light gray	49 {0.5, 7.1}	NO

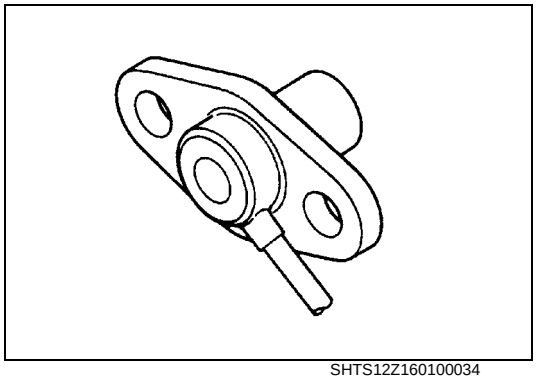
NC (Normal close): Continuity at less than operation pressure.
NO (Normal open): Continuity at more than operation pressure.


SHTS12Z160100032

6. OIL PRESSURE SWITCH INSPECTION

(1) Start engine and disconnect the coupler.
(2) Check the continuity between terminal and engine ground.

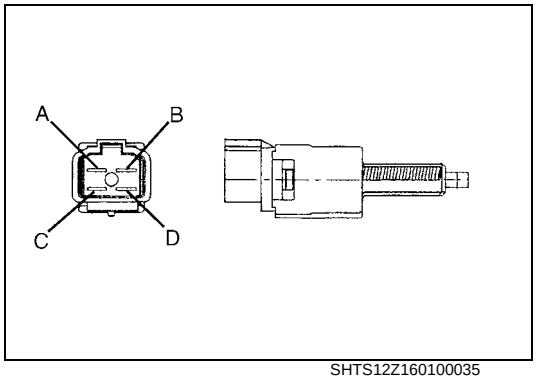
	Terminal	Engine ground
Engine stop	○	○
Engine running		



SHTS12Z160100034

7. REVOLUTION SENSOR INSPECTION

(1) Check the continuity between terminals.
If the revolution sensor is normal, there will be continuity between the terminals.



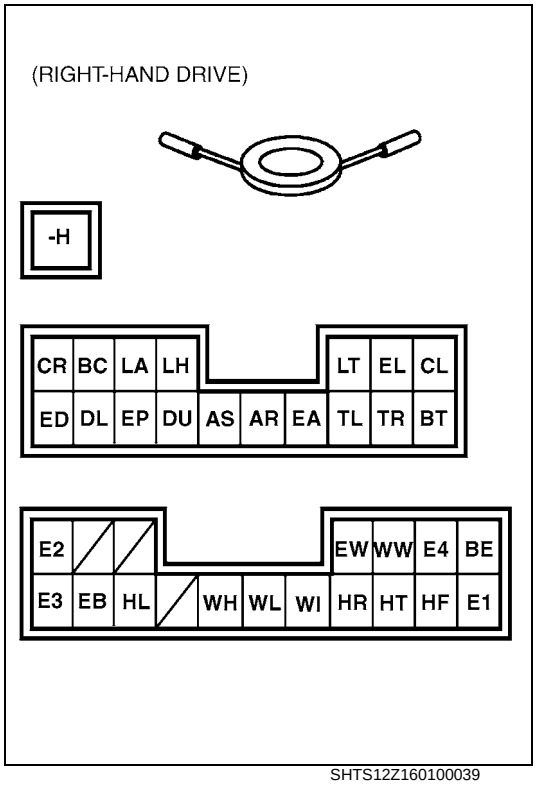
SHTS12Z160100035

8. PARKING BRAKE SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	A	B	C	D
PUSH	○		○	
FREE		○		○

HEADLIGHT CIRCUIT



SHTS12Z160100039

1. COMBINATION SWITCH INSPECTION

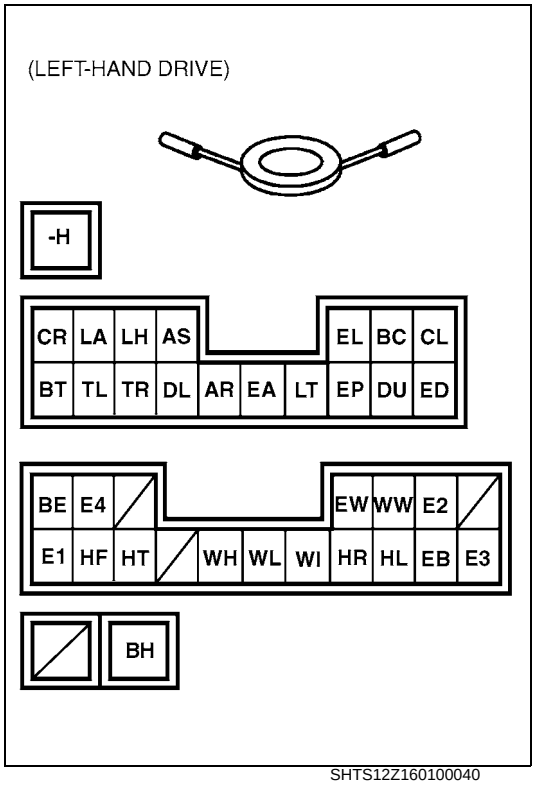
(1) Check the continuity between terminals.

Lighting (ON, OFF):

Terminals / Switch position	EL	LT	LH
OFF			
TAIL	○	○	
TAIL AND HEAD	○	○	○

Lighting (HIGH, LOW):

Terminals / Switch position	ED	DL	DU	EP
PASSING	○	○	○	○
LOW BEAM	○	○		
HIGH BEAM	○		○	



SHTS12Z160100040

Turn signal:

Switch position \ Terminals	BT	TL	TR
LEFT	○——	——○	
OFF			
RIGHT	○——		——○

Hazard warning:

Switch position \ Terminals	HF	HL	HR	HT
OFF				
ON	○——	——○——	——○——	——○

Exhaust brake and electromagnetic retarder:

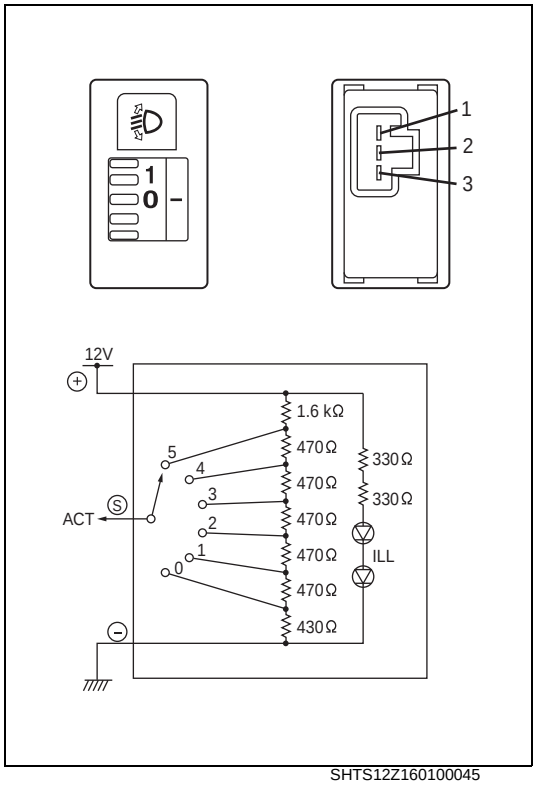
Switch position \ Terminals	EB	E1	E3	BE	E2
OFF					
I	○——	——○			
↕	○——	——○			
II	○——	——○		○——	——○
↕	○——	——○		○——	——○
III	○——	——○——	——○	○——	——○

Windshield wiper and washer:

Switch position \ Terminals	WW	EW	WI	WL	WH
OFF					
WIPER: INT		○——	——○		
MEDIUM		○——	——○——	——○	
HIGH		○——	——○——	——○——	——○
WASHER: ON	○——	——○			

2. HEADLIGHT RELAY INSPECTION

(1) Refer to "**RELAY (TYPE, COLOR, PART No., NAME AND INSPECTION)**" in the section "**GENERAL INSTRUCTION**".



SHTS12Z160100045

HEADLIGHT BEAM CONTROL CIRCUIT (IF SO EQUIPPED)

1. HEADLIGHT BEAM LEVELING CONTROL SWITCH INSPECTION

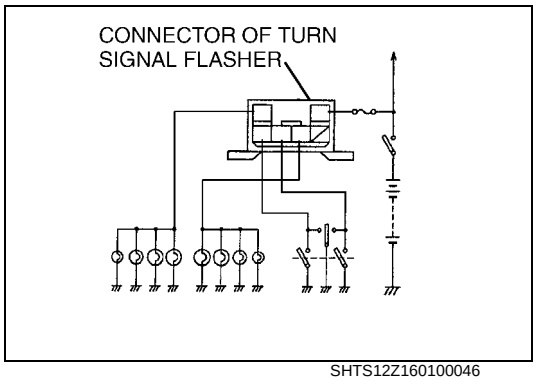
(1) Measure resistance between terminals.

Between No.1 and No.3 terminals

Switch position	Resistance
0	**1.60 kΩ**
1	**2.07 kΩ**
2	**2.54 kΩ**
3	**3.01 kΩ**
4	**3.48 kΩ**
5	**3.95 kΩ**

Between No.1 and No.2 terminals

Resistance
4.38 kΩ



SHTS12Z160100046

TURN SIGNAL, HAZARD, CLEARANCE, TAIL AND LICENSE PLATE LIGHT CIRCUIT

1. TURN SIGNAL FLASHER INSPECTION

(1) Wire the turn signal flasher, bulbs, battery and fuse as shown in figure.

(2) Under normal condition, bulbs turn on and off.

NOTICE

Take care quantity of installing bulbs.

Models for Taiwan and Thailand

TURN SIGNAL:	**21W x 1 pcs, 12W x 1 pcs, 25W x 1 pcs, LED x 1 pcs**
HAZARD WARNING:	**21W x 2 pcs, 12W x 2pcs, 25W x 2 pcs, LED x 1 pcs**

Models for Australia, Chile, Ireland, Singapore and New Zealand

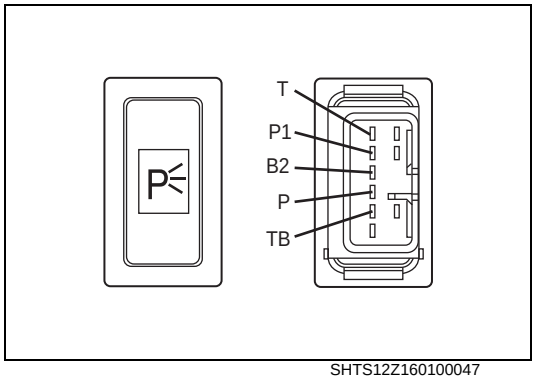
TURN SIGNAL:	**21W x 3 pcs, LED x 1 pcs**
HAZARD WARNING:	**21W x 6 pcs, LED x 2 pcs**

Models for Hong Kong

TURN SIGNAL:	**21W x 2 pcs, 10W x 1 pcs, LED x 1 pcs**
HAZARD WARNING:	**21W x 4 pcs, 10W x 2 pcs, LED x 2 pcs**

Models for Indonesia, Philippines and Vietnam

TURN SIGNAL:	**21W x 2 pcs, 12W x 1 pcs, LED x 1 pcs**
HAZARD WARNING:	**21W x 4 pcs, 12W x 2 pcs, LED x 2 pcs**

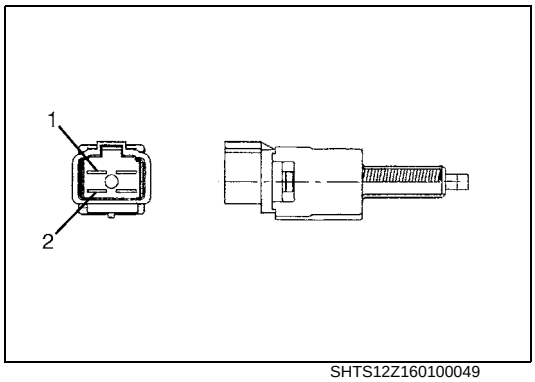


SHTS12Z160100047

2. PARKING LIGHT SWITCH INSPECTION (IF SO EQUIPPED)

(1) Check the continuity between terminals.

Terminals / Switch position	T	P	B2	TB	P1
OFF	○—○				
ON		○—○	○—○	○—○	



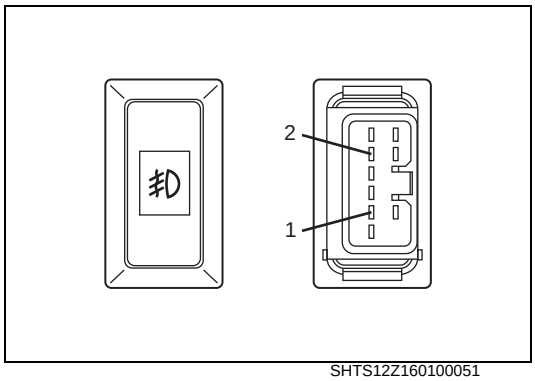
SHTS12Z160100049

STOP LIGHT CIRCUIT

1. STOP LIGHT SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
PUSH		
FREE	○——	——○



SHTS12Z160100051

FOG LIGHT CIRCUIT (IF SO EQUIPPED)

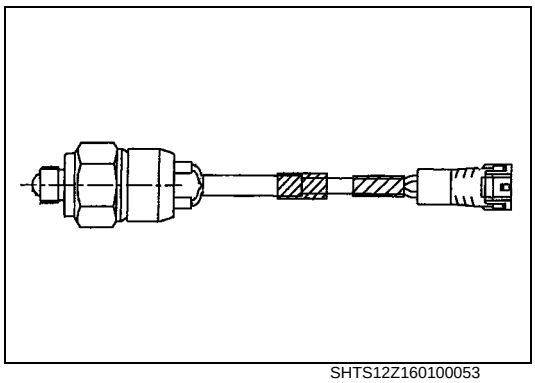
1. FOG LIGHT SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
OFF		
ON	○——	——○

2. FOG LIGHT RELAY INSPECTION

(1) Refer to "**RELAY (TYPE, COLOR, PART No., NAME AND INSPECTION)**" in the section "**GENERAL INSTRUCTION**".

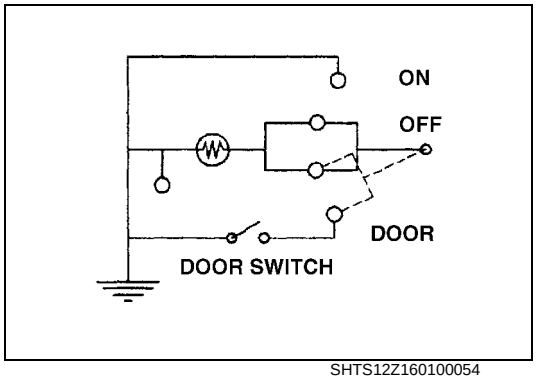

SHTS12Z160100053

BACKUP LIGHT CIRCUIT

1. BACKUP LIGHT SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

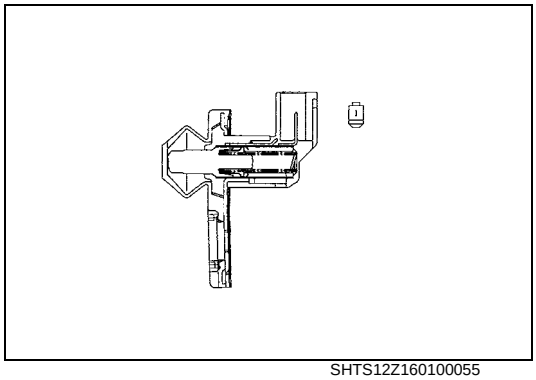


SHTS12Z160100054

DOME LIGHT CIRCUIT

1. DOME LIGHT INSPECTION

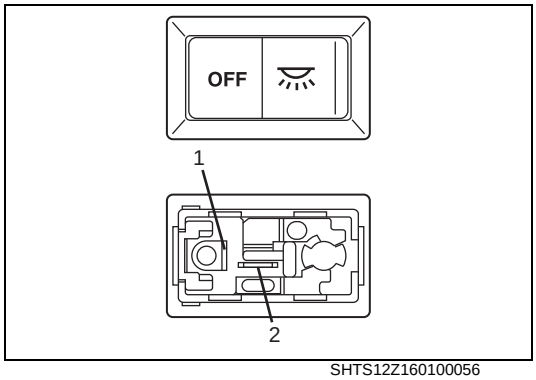
(1) Apply voltage to terminals and check the bulbs lighting.


SHTS12Z160100055

2. COURTESY SWITCH INSPECTION

(1) Check the continuity between terminal and body ground.

	Between terminals
PUSH	No continuity
FREE	Continuity



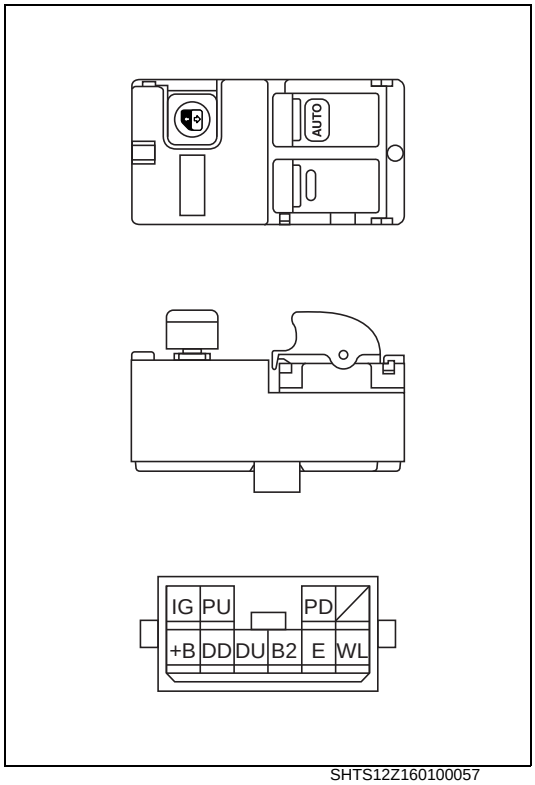
SHTS12Z160100056

FLUORESCENT LIGHT CIRCUIT (IF SO EQUIPPED)

1. FLUORESCENT LIGHT SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
OFF		
ON	○	○



SHTS12Z160100057

POWER WINDOW CIRCUIT (IF SO EQUIPPED)

1. DRIVER'S SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

DRIVER'S SIDE:

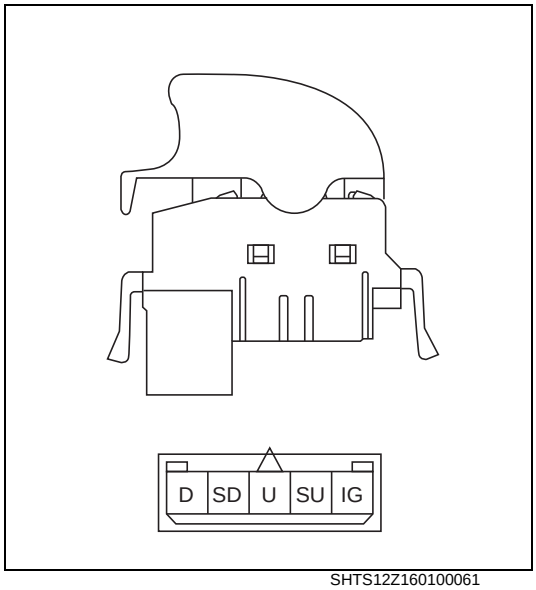
Terminals / Switch position	+B	DU	DD	E
AUTO CLOSE	○—○		○—○	
CLOSE	○—○		○—○	
↕	×——	——	——	×——
OFF		○——	——○	——○
↕	×——	——	——	×——
OPEN	○——	——○	——○	
AUTO OPEN	○——	——○	——○	

ASSISTANT'S SIDE: LOCK SWITCH OFF POSITION

Terminals / Switch position	+B	PU	PD	E	WL
CLOSE	○—○		○	○—○	○—○
↕	×	——	——	×—○	——○
OFF		○——	——○	○—○	○—○
↕	×	——	——	×—○	——○
OPEN	○—○	○——	——○	○—○	○—○

ASSISTANT'S SIDE: LOCK SWITCH ON POSITION

Terminals / Switch position	+B	PU	PD	E	WL
CLOSE	○—○			×—×	×—×
↕	×	——	——	×—×	
OFF		○—○	○—○	×—×	×—×
↕	×	——	——	×—×	
OPEN	○—○	○——	——○	×—×	×—×

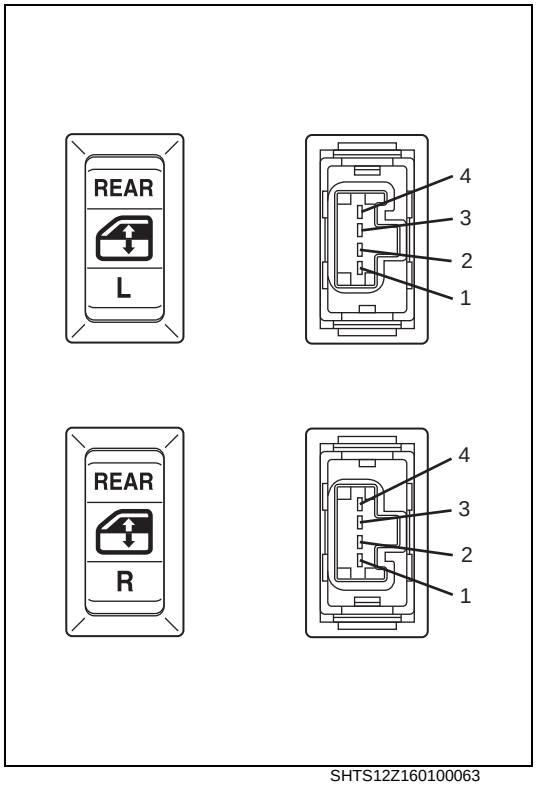


SHTS12Z160100061

2. ASSISTANT'S SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	SU	U	IG	D	SD
CLOSE		○	○	○	○
↕	×		×		
OFF	○	○		○	○
↕			×		×
OPEN	○	○	○	○	

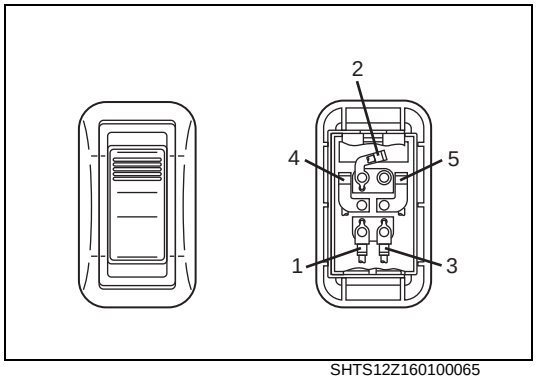


SHTS12Z160100063

3. DRIVER'S SIDE SWITCH INSPECTION (FOR REAR WINDOW)

(1) Check the continuity between terminals.

Terminals / Switch position	1	2	3	4
CLOSE	○	○	○	○
↕	×			×
OFF	○	○	○	
↕	×			×
OPEN	○		○	○

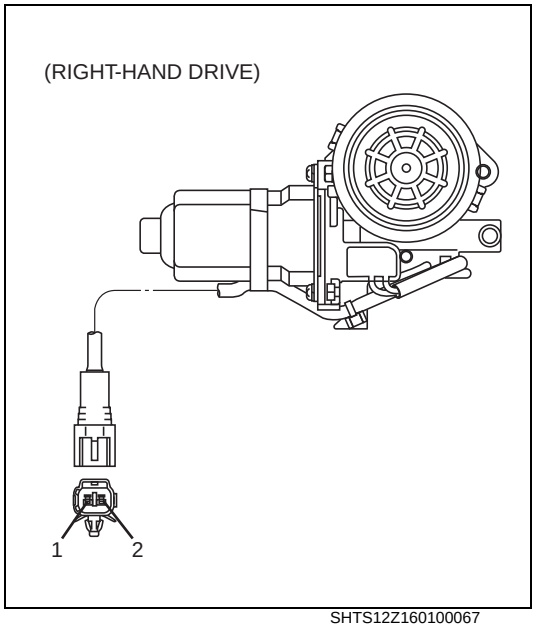


SHTS12Z160100065

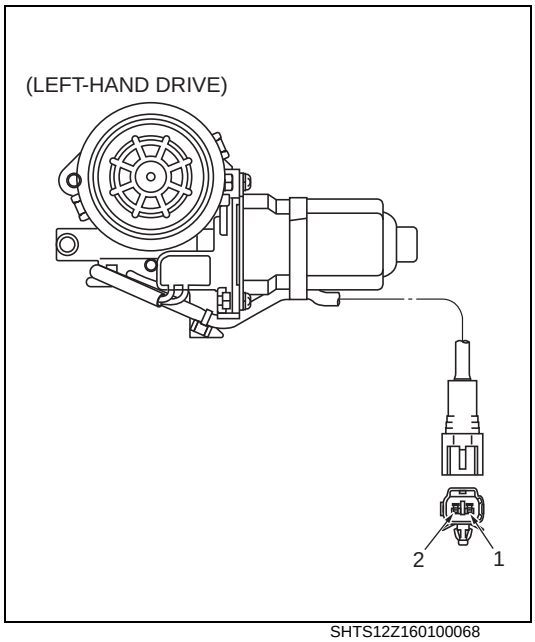
4. REAR SEAT SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2	3	4	5
CLOSE	○			○	
↕	×	×			
OFF		○		○	
↕	×		×		
OPEN	○	○		○	



SHTS12Z160100067



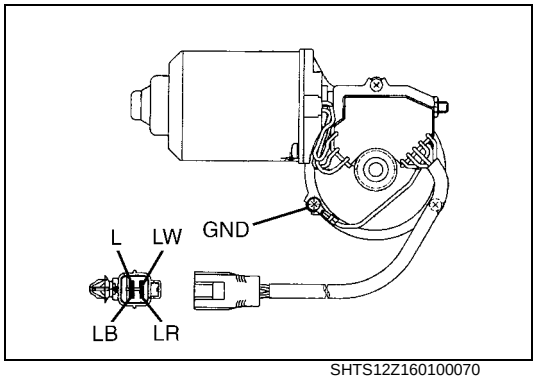
SHTS12Z160100068

5. POWER WINDOW MOTOR INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the motor.

(2) Apply 24V to terminals, inspect the motor operation as below.

Terminals / Direction of rotation (View from out put shaft)	1	2
CLOCKWISE	+	–
COUNTERCLOCKWISE	–	+



SHTS12Z160100070

WINDSHIELD WIPER CIRCUIT

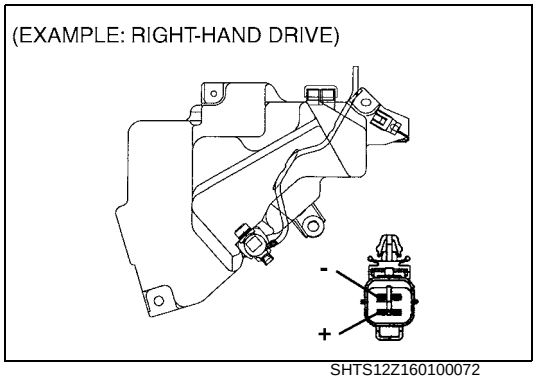
1. WIPER MOTOR INSPECTION

(1) Apply 24V to terminals, the motor operates as below.

NOTICE

Connect a 10A fuse between the terminal and the 24V power source. If the fuse is burned out or the motor does not operate, replace the motor.

Terminals / Switch position	LW	LB	L	LR
OFF	○	○		
LOW	○		○	
HIGH			○	○



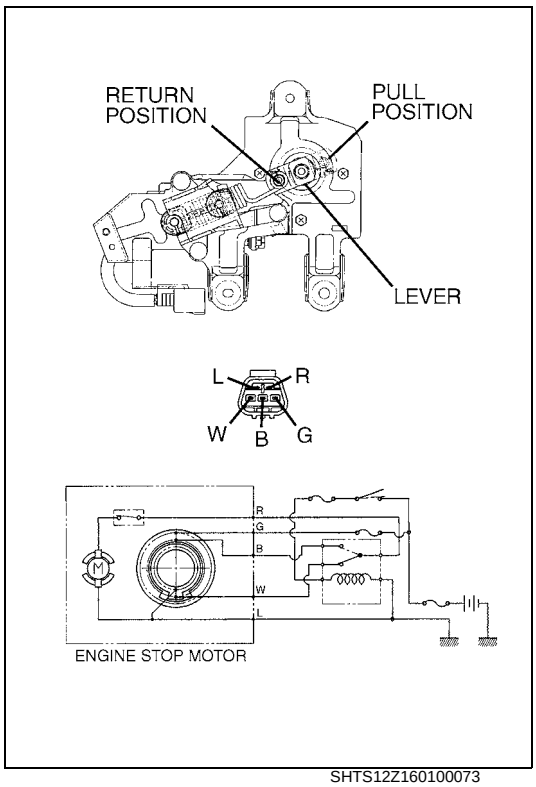
SHTS12Z160100072

2. WASHER PUMP INSPECTION

(1) Check the continuity between terminals of the motor.
If no continuity, replace jar and pump assembly.

NOTICE

Do not apply voltage to the pump motor for operational with an empty jar, or the motor will be damaged.



SHTS12Z160100073

ENGINE STOP CIRCUIT (IF SO EQUIPPED)

1. ENGINE STOP ELECTRIC MOTOR INSPECTION

(1) Wire the engine stop electric motor as shown in the figure.

(2) Under normal condition, it should be operated as below.

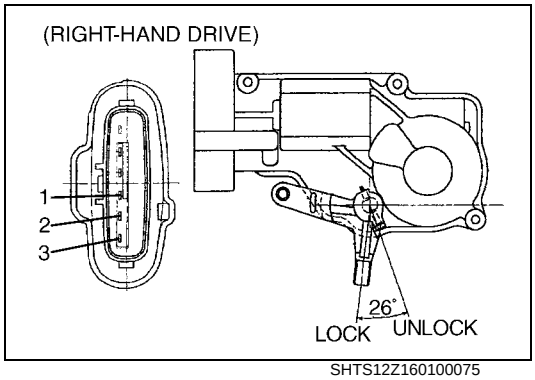
Electric current / Lever position	+	-
PULL	G	W
RETURN	G	B

NOTICE

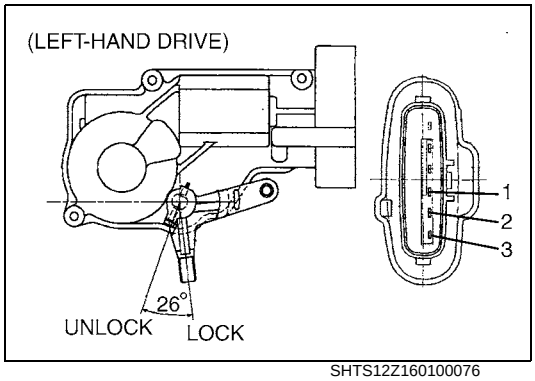
Connect a 10A fuse between the terminal and the 24V power source. If the fuse is burned out or the motor does not operate, replace the motor.

2. ENGINE STOP RELAY

(1) Refer to "**RELAY (TYPE, COLOR, PART No., NAME AND INSPECTION)**" in the section "**GENERAL INSTRUCTION**".



SHTS12Z160100075



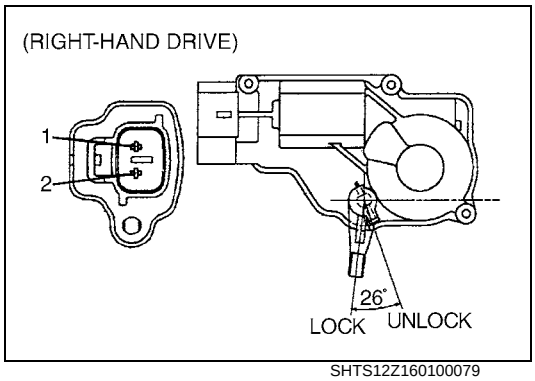
SHTS12Z160100076

POWER DOOR LOCK CIRCUIT (IF SO EQUIPPED)

1. DRIVER'S SIDE DOOR LOCK SWITCH INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the switch.

Terminals / Lever position	1	2	3
LOCK	○		○
UNLOCK		○	○

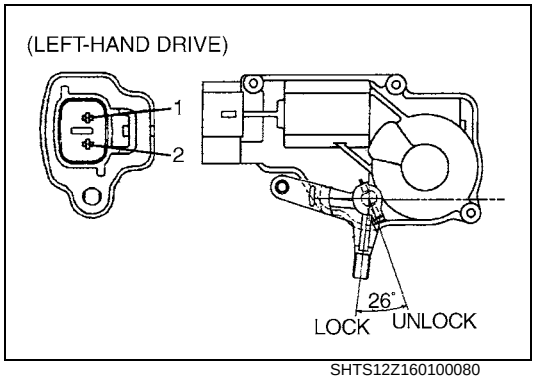


SHTS12Z160100079

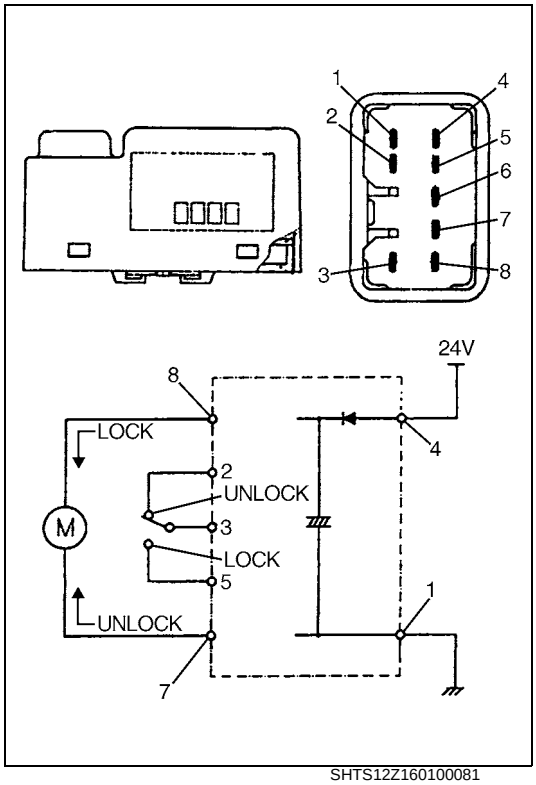
2. ASSISTANT'S SIDE AND REAR LEFT SIDE DOOR LOCK ACTUATOR INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the actuator.

Terminals / Lever position	1	2
LOCK	+	-
UNLOCK	-	+



SHTS12Z160100080

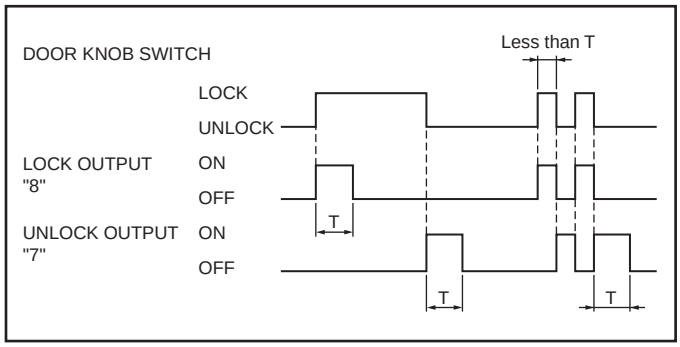


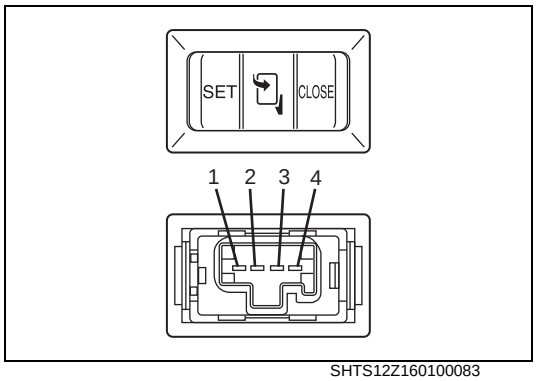
SHTS12Z160100081

3. DOOR LOCK CONTROLLER INSPECTION

(1) Wire the door lock controller as shown in the figure.

(2) Check the function.





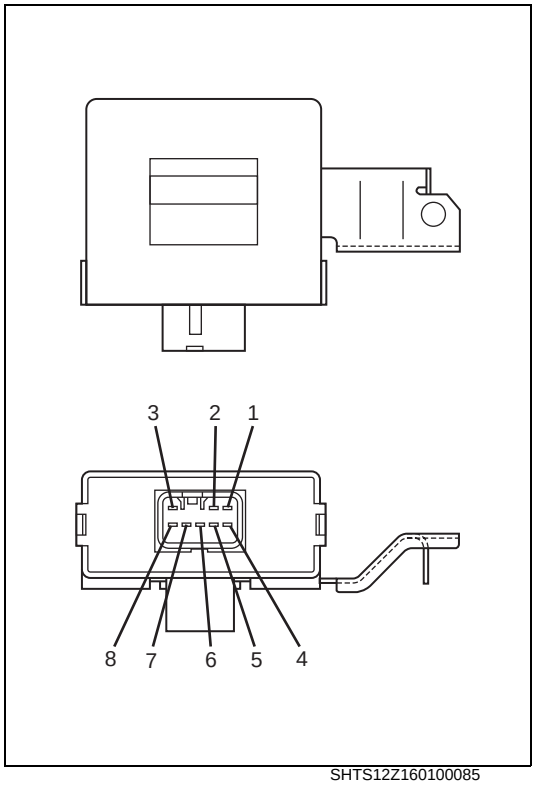
SHTS12Z160100083

POWER MIRROR CIRCUIT (IF SO EQUIPPED)

1. POWER MIRROR SWITCH INSPECTION

(1) Check the continuity between terminals.

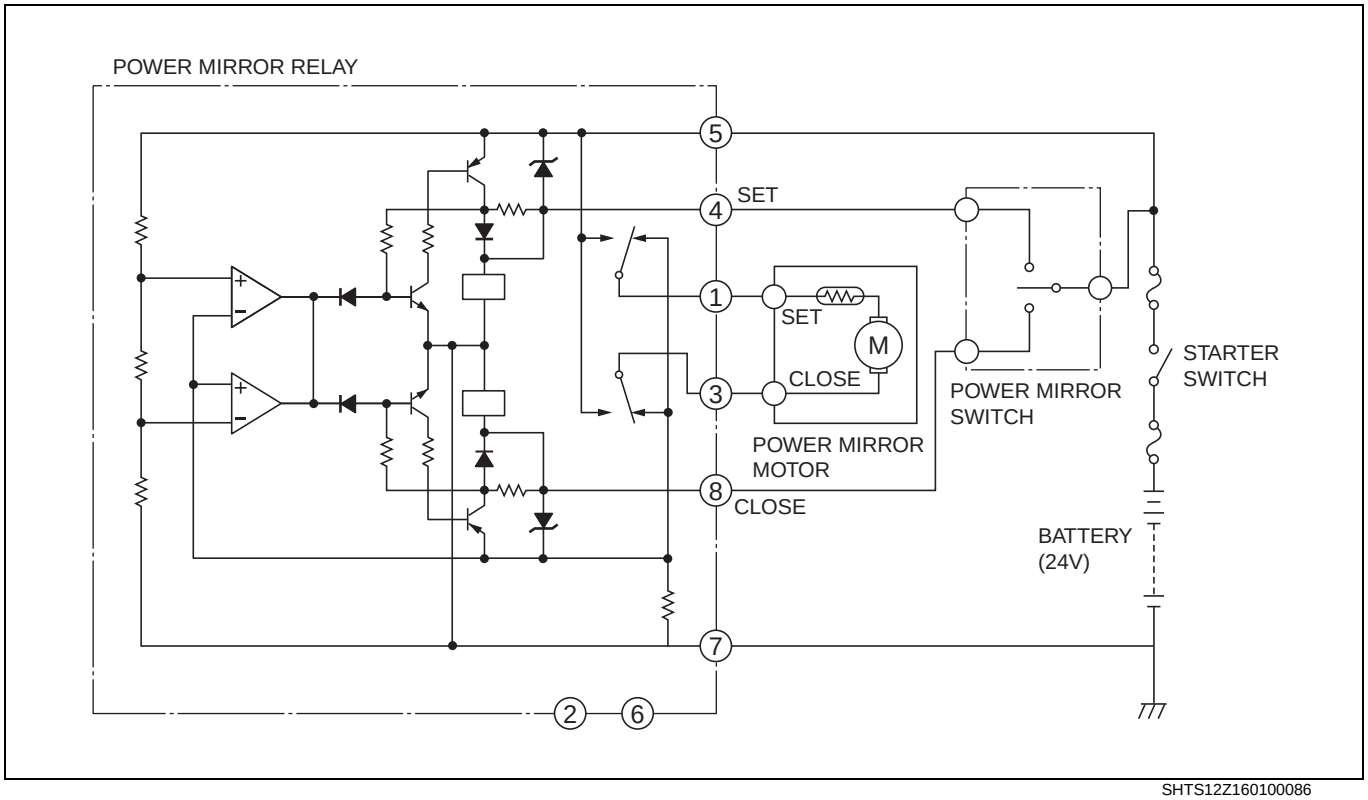
Terminals / Lever position	1	2	3	4
CLOSE	○	○	○	○
↕	×			×
OFF	○	○		
↕	×			×
SET		○		○



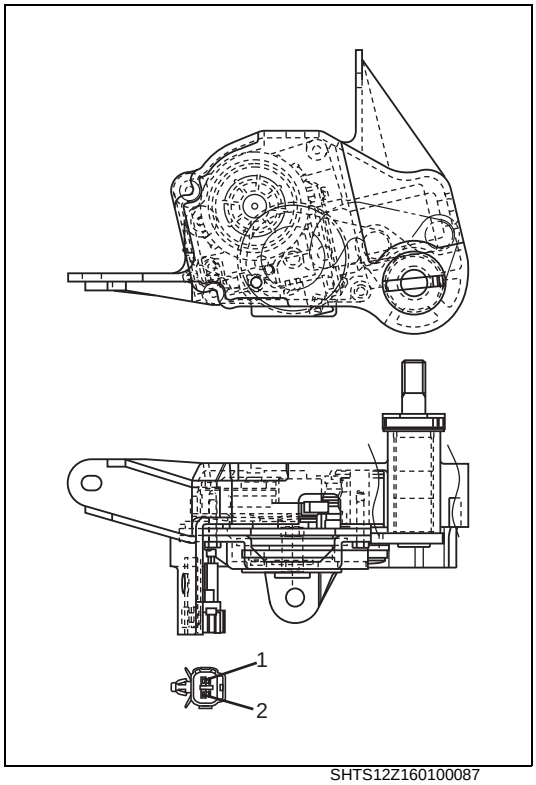
SHTS12Z160100085

2. POWER MIRROR RELAY INSPECTION

(1) Check the function as shown below the wiring diagram.



SHTS12Z160100086



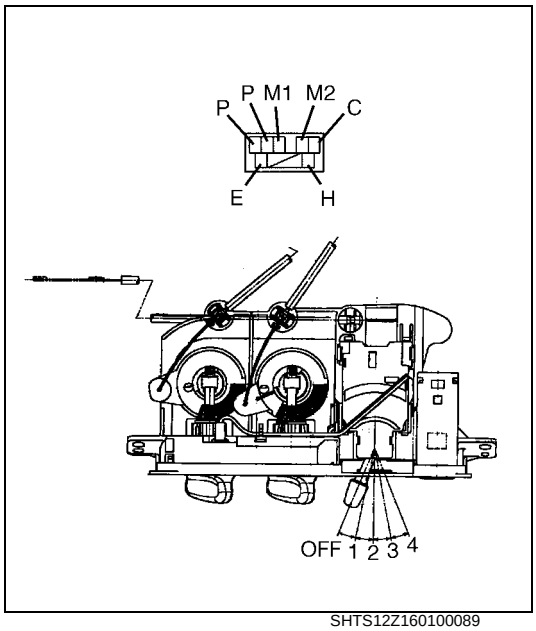
SHTS12Z160100087

3. POWER MIRROR MOTOR INSPECTION

(1) Check the continuity between terminals.

Terminals / Direction of rotation (View from out put shaft)	1	2
COUNTERCLOCKWISE	+	–
CLOCKWISE	–	+

HEATER AND COOLER CIRCUIT (IF SO EQUIPPED)

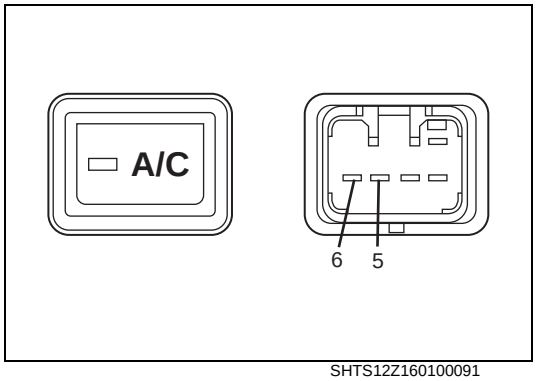


SHTS12Z160100089

1. BLOWER SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	E	C	M1	M2	H	P	P
OFF						LIGHT	
1	○	○					
2	○	○	○				
3	○	○		○			
4	○	○			○		

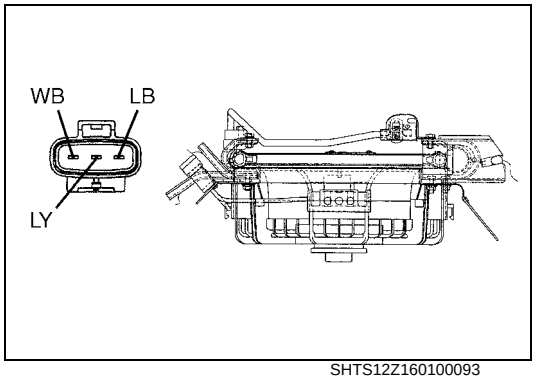


SHTS12Z160100091

2. COOLER CONTROL SWITCH

(1) Check the continuity between terminals.

Terminals / Switch position	5	6
OFF		
ON	○	○



SHTS12Z160100093

3. CONDENSER ASSEMBLY INSPECTION

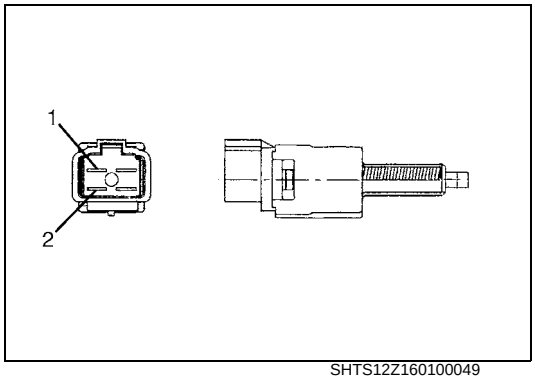
(1) Check continuity between terminals.

Terminal / Switch position	LB	WB	LY
OFF			
LO	○	○	
HIGH	○		○

4. POWER RELAY No.2 INSPECTION

(1) Refer to "**RELAY (TYPE, COLOR, PART No., NAME AND INSPECTION)**" in the section "**GENERAL INSTRUCTION**".

EXHAUST BRAKE CIRCUIT

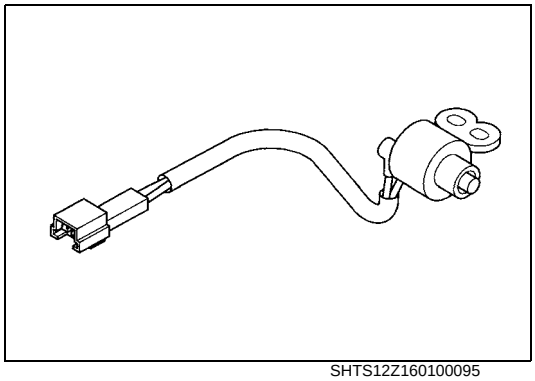


SHTS12Z160100049

1. CLUTCH PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

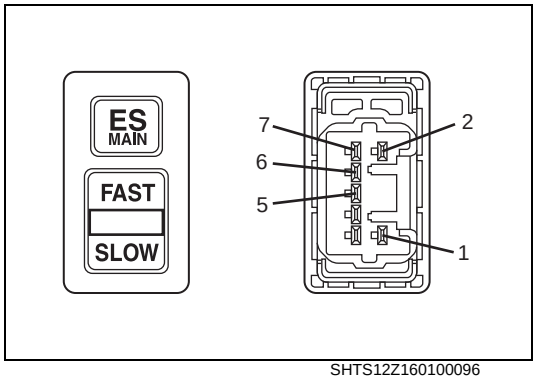
Terminals / Switch position	1	2
PUSH		
FREE	○	○


SHTS12Z160100095

2. ACCELERATOR PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity



SHTS12Z160100096

ES START CIRCUIT (IF SO EQUIPPED)

1. ES MAIN SWITCH INSPECTION

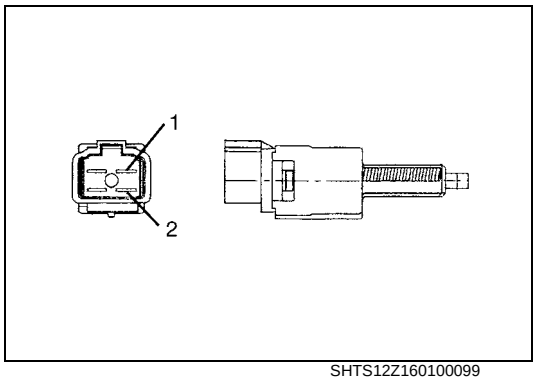
(1) Check the continuity between terminals.

Terminals / Switch position	5	6	7
OFF	○	○	
ON	○		○

2. RELEASE TIMING SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	5	1	2
FAST	○	○	
SLOW	○		○



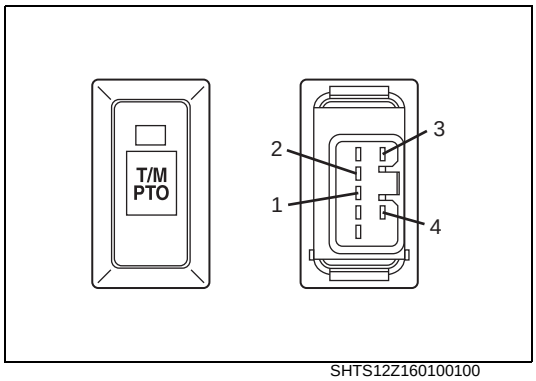
SHTS12Z160100099

POWER TAKE-OFF CIRCUIT (IF SO EQUIPPED)

1. CLUTCH PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
PUSH		
FREE	○	○

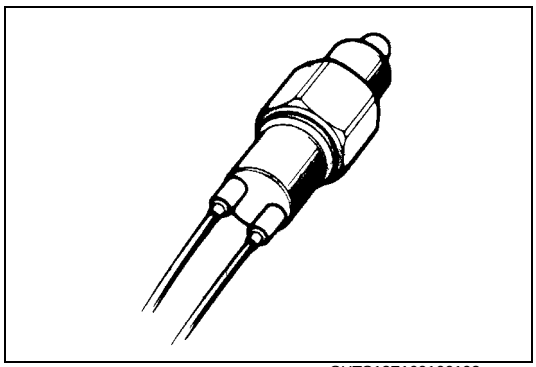


SHTS12Z160100100

2. TRANSMISSION P.T.O. SWITCH INSPECTION

(1) Check the continuity between terminals.

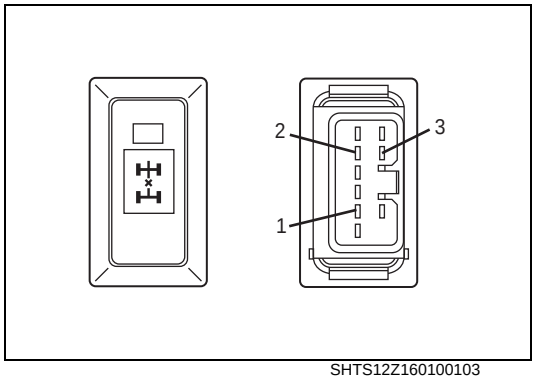
Terminal / Switch position	1	2	3	4
OFF				
ON	○	○		


SHTS12Z160100102

3. P.T.O. POSITION SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity



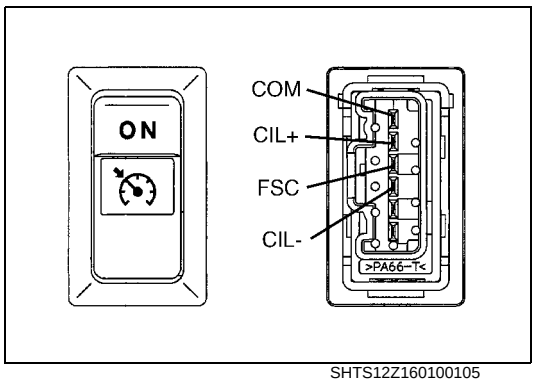
SHTS12Z160100103

INTER-AXLE DIFFERENTIAL LOCK CIRCUIT (IF SO EQUIPPED)

1. INTER-AXLE DIFFERENTIAL LOCK

(1) Check the continuity between terminals.

Switch position \ Terminal	1	2	3
OFF			
ON	○	○	○



SHTS12Z160100105

FS CRUISE CIRCUIT

1. CRUISE MAIN SWITCH INSPECTION

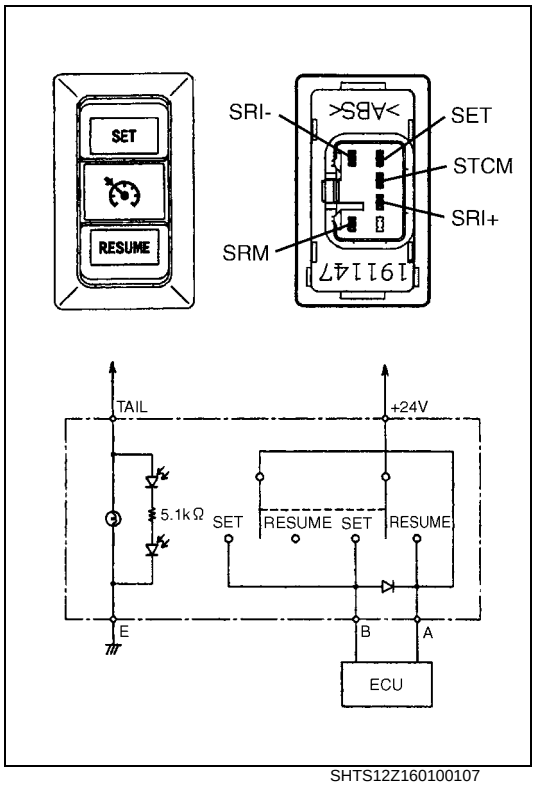
(1) Check the continuity between terminals.

Switch position \ Terminal	FSC	COM	CIL+	CIL-
OFF			○	○
ON	○	○		

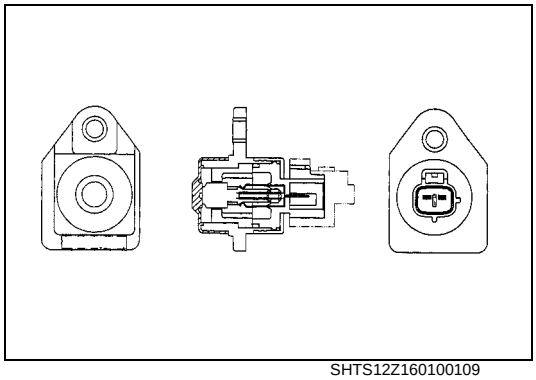
2. CRUISE SET AND RESUME SWITCH INSPECTION

(1) Check the continuity between terminals.

Switch position \ Terminals	SET	STCM	SM	SRI+	SRI-
RESUME	○	○	○	○	○
OFF					
SET	○	○	○	○	○



SHTS12Z160100107



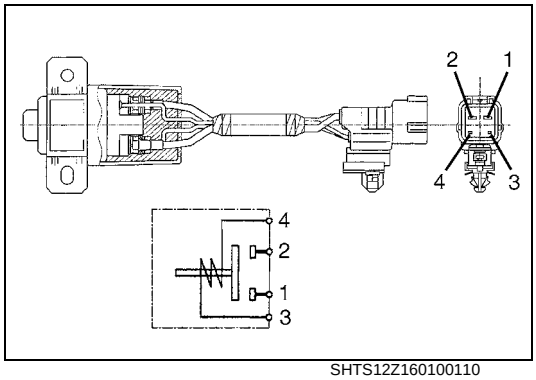
SHTS12Z160100109

CAB TILT CIRCUIT
[MODELS: GH (FOR IRELAND), FT, GT SINGLE CAB]

1. CAB TILT SWITCH INSPECTION

(1) Check the continuity between terminals.

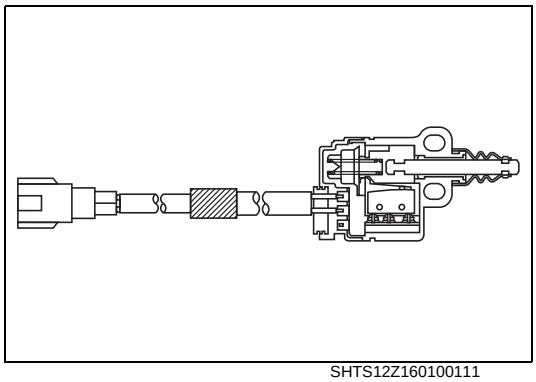
	Between terminals
FREE	No continuity
PUSH	Continuity



SHTS12Z160100110

2. CAB TILT RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal 4,
Ground to terminal 3.
(2) Under normal condition, terminals 1 and 2 switch on.

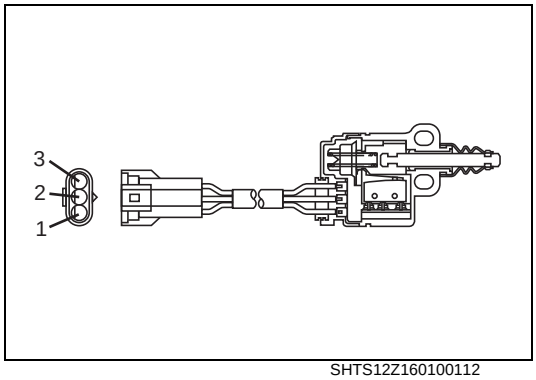


SHTS12Z160100111

3. CAB TILT STOPPER SWITCH AND CAB TILT STROKE SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
FREE	Continuity
PUSH	No continuity

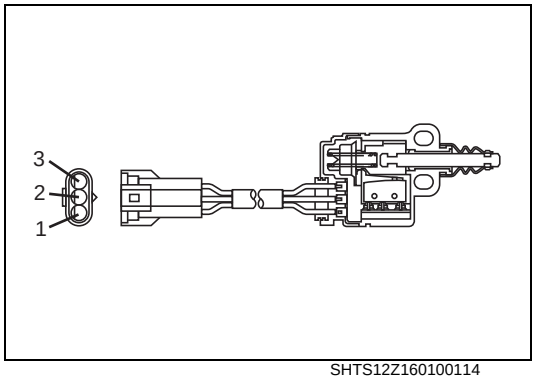


SHTS12Z160100112

4. CAB TILT POSITION SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Lever position	1	2	3
FREE		○	○
PUSH	○	○	



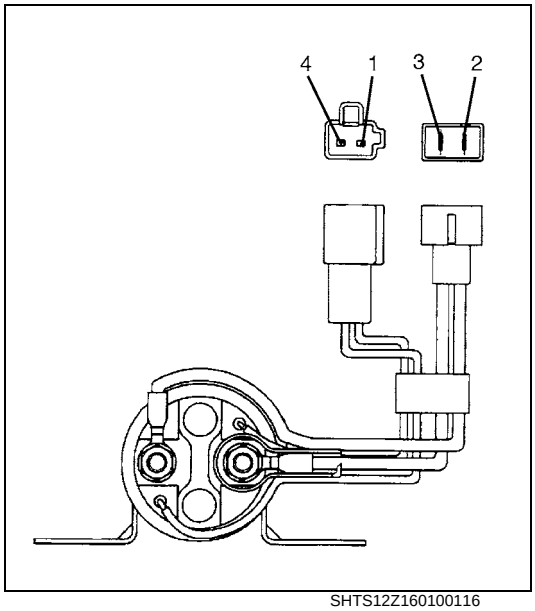
SHTS12Z160100114

5. CAB TILT LOCK SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Lever position	1	2	3
FREE		○	○
PUSH	○		○

CAB TILT CIRCUIT (MODELS WITH DOUBLE CAB)

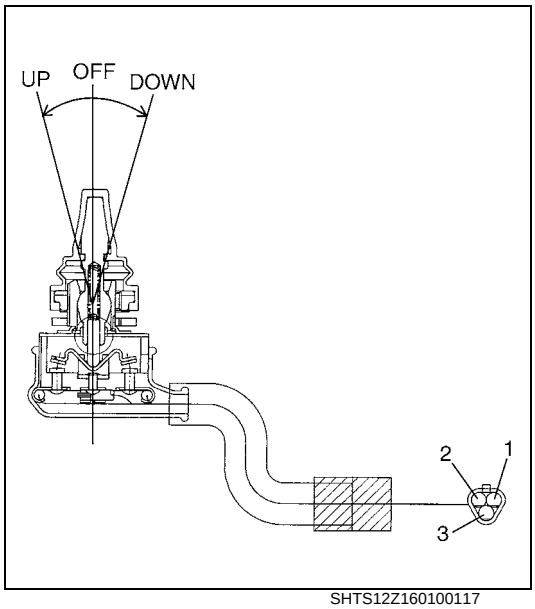


SHTS12Z160100116

1. CAB TILT RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 4.

(2) Under normal condition, terminals 2 and 3 switch on.

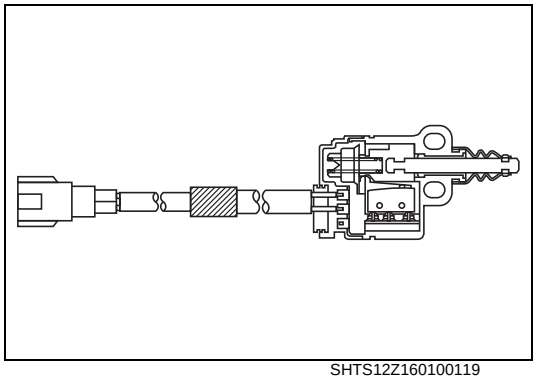


SHTS12Z160100117

2. CAB TILT SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Position	1	2	3
UP	○	○	
OFF			
DOWN		○	○

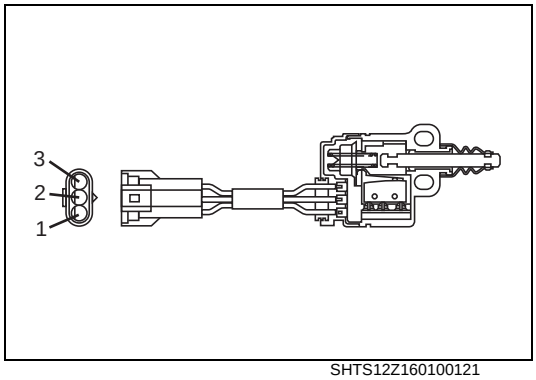


SHTS12Z160100119

3. CAB TILT STOPPER SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	No continuity
FREE	Continuity

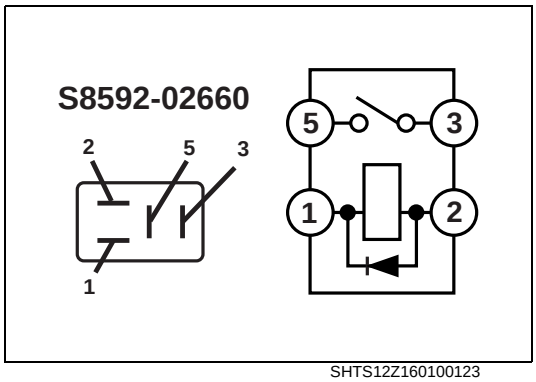


SHTS12Z160100121

4. CAB TILT LOCK SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2	3
PUSH	○		○
FREE		○	○



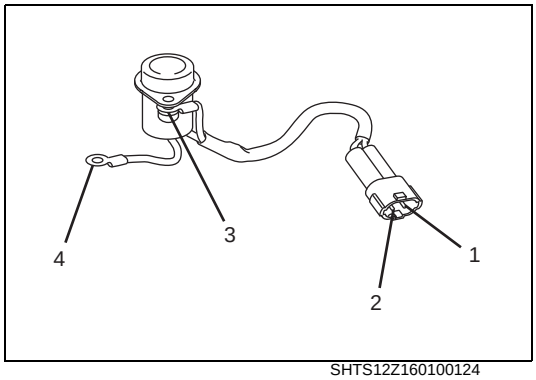
SHTS12Z160100123

5. CAB TILT UP RELAY AND CAB TILT DOWN RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

AIR DRYER CIRCUIT



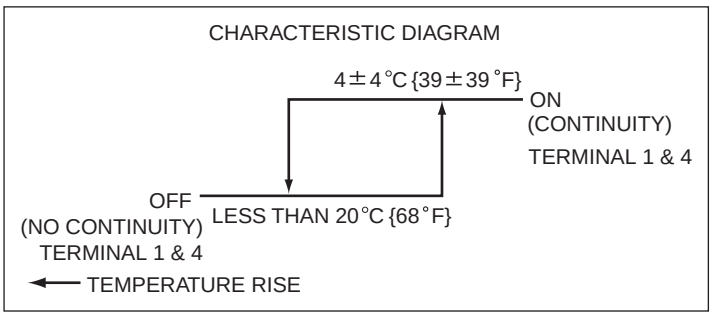
SHTS12Z160100124

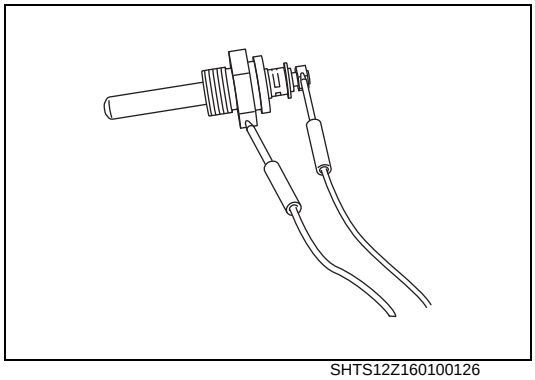
1. THERMOSTAT INSPECTION

(1) Warm up and cool down the thermostat, check the continuity between terminals, and confirm that the continuity the characteristic diagram shown in the figure.

NOTICE

There will be continuity between terminals 2 and 3.



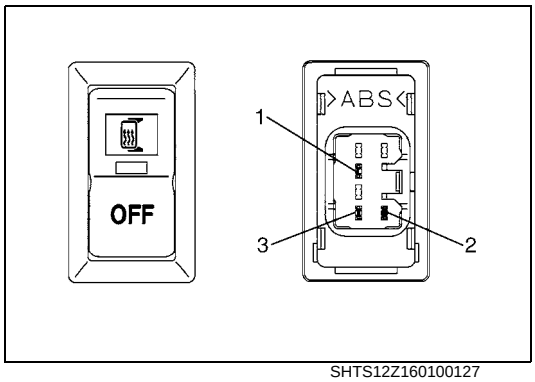


SHTS12Z160100126

2. HEATER INSPECTION

(1) Check the continuity between terminal and switch body. Under normal condition, there will be continuity between terminal and switch body.

MIRROR HEATER CIRCUIT

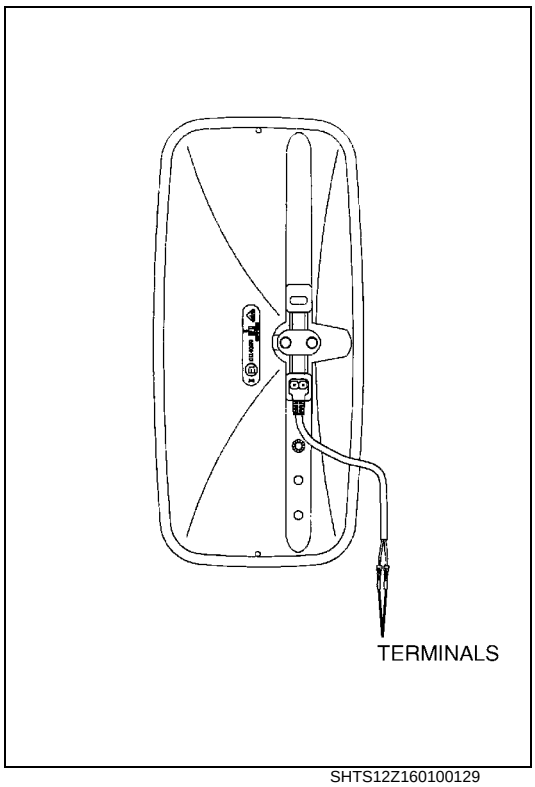


SHTS12Z160100127

1. MIRROR HEATER SWITCH INSPECTION

(1) Check the continuity between terminals.

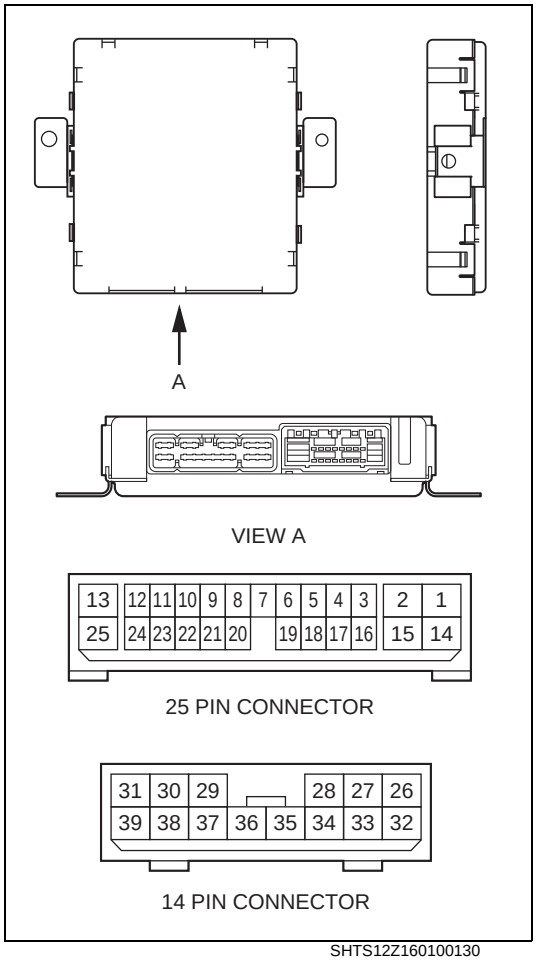
Terminal / Switch position	1	2	3
OFF		○	○
ON	○	○	○



SHTS12Z160100129

2. HEATER INSPECTION

(1) Measure the electric current between terminals.
Standard: 4A



SHTS12Z160100130

INTEGRATED UNIT (FUNCTIONAL CHECK)

1. WHEN OPERATING COMBINATION SWITCH AND HAZARD SWITCH

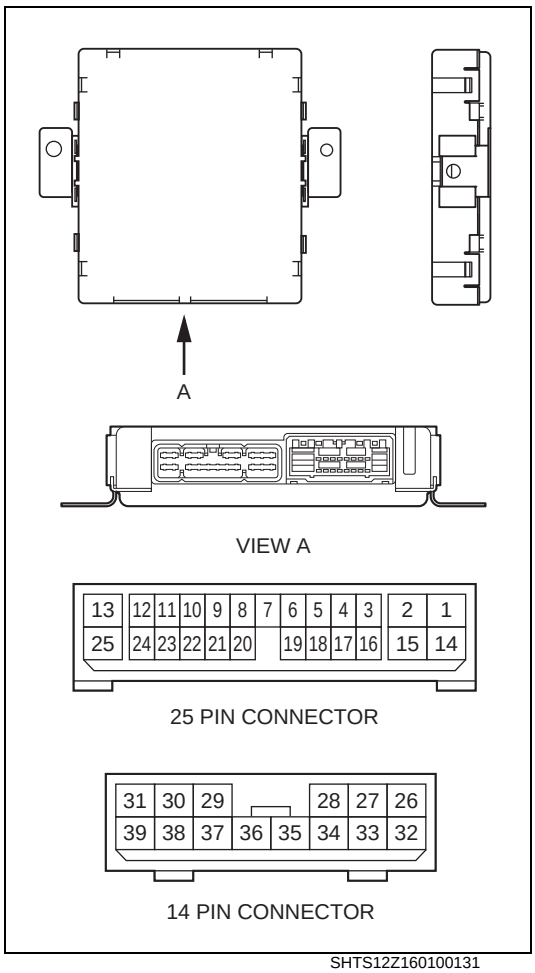
(1) Under condition that integrated unit and the vehicle wiring harness are connected, check the continuity, the voltage between each terminals from back side of connectors of vehicle harness side with use of circuit tester.

When operating combination switch

Switch operation	When being normal
Right	There should be the continuity between terminal 13 and the vehicle ground (Input)
	The voltage between terminal 32 (+) and the vehicle ground be more than 24V (Power supply)
	The voltage between terminal 34 (+) and the vehicle ground should be intermittently more than 24V (Output)
Neutral	There should be the no continuity between terminal 13 and the vehicle ground (Input)
	There should be the no continuity between terminal 25 and the vehicle ground (Input)
Left	There should be the continuity between terminal 25 and the vehicle ground (Input)
	The voltage between terminal 32 (+) and the vehicle ground be more than 24V (Power supply)
	The voltage between terminal 33 (+) and the vehicle ground should be intermittently more than 24V (Output)

When operating hazard switch

Switch operation	When being normal
ON	There should be the continuity between terminal 12 and the vehicle ground (Input)
	The voltage between terminal 32 (+) and the vehicle ground be more than 24V (Power supply)
	The voltage between terminal 34 (+) and the vehicle ground should be intermittently more than 24V (Output)
	The voltage between terminal 33 (+) and the vehicle ground should be intermittently more than 24V (Output)
OFF	There should be the no continuity between terminal 12 and the vehicle ground (Input)



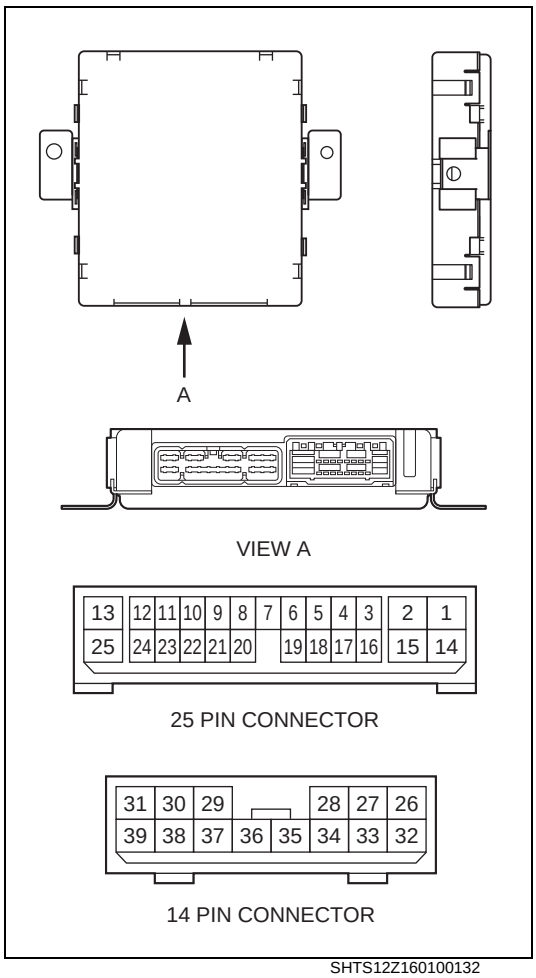
SHTS12Z160100131

2. WHEN OPERATING WIPER SWITCH

(1) Under condition that integrated unit and the vehicle wiring harness are connected, check the continuity, the voltage between each terminals from back side of connectors of vehicle harness side with use of circuit tester.

When operating wiper switch (Starter switch: ON)

Switch operation	When being normal
OFF	The voltage between terminal 1 (+) and the vehicle ground be more than 24V (Power supply)
	There should exist no difference of voltage between terminal 36 and the vehicle ground (Terminal 36 should be grounded surely)
	The voltage between terminal 4 (+) and the vehicle ground should not be 0V (No input)
	The voltage between terminal 17 (+) and the vehicle ground should not be 0V (No input)
	The voltage between terminal 3 (+) and the vehicle ground should not be 0V (No input)
	The voltage between terminal 14 (+) and the vehicle ground should be 0V (No input)
	The voltage between terminal 15 (+) and the vehicle ground should be 0V (No input)
INT	The voltage between terminal 1 (+) and the vehicle ground be more than 24V (Power supply)
	There should exist no difference of voltage between terminal 36 and the vehicle ground (Terminal 36 should be grounded surely)
	There should be the continuity between terminal 4 and the vehicle ground (Input)
	The voltage between terminal 15 (+) and the vehicle ground should be intermittently more than 24V (Output)
LOW	The voltage between terminal 1 (+) and the vehicle ground be more than 24V (Power supply)
	There should exist no difference of voltage between terminal 36 and the vehicle ground (Terminal 36 should be grounded surely)
	There should be the continuity between terminal 17 and the vehicle ground (Input)
	The voltage between terminal 15 (+) and the vehicle ground be more than 24V (Power supply)
HIGH	The voltage between terminal 1 (+) and the vehicle ground be more than 24V (Power supply)
	There should exist no difference of voltage between terminal 36 and the vehicle ground (Terminal 36 should be grounded surely)
	There should be the continuity between terminal 3 and the vehicle ground (Input)
	The voltage between terminal 14 (+) and the vehicle ground be more than 24V (Power supply)



SHTS12Z160100132

3. WHEN OPERATING DRIVER'S SIDE DOOR LOCK SWITCH

(1) Under condition that integrated unit and the vehicle wiring harness are connected, check the continuity, the voltage between each terminals from back side of connectors of vehicle harness side with use of circuit tester.

When operating driver's side door lock switch

Switch operation	When being normal
LOCK	**The voltage between terminal 28 (+) and the vehicle ground be more than 24V (Power supply)**
	There should be the continuity between terminal 8 and the vehicle ground (Input)
	There should exist no difference of voltage between terminal 36 and the vehicle ground (Terminal 36 should be grounded surely)
	The voltage between terminals 27 (+) and 26 (-) be more than 24V (Output 0.4 seconds)
UNLOCK	**The voltage between terminal 28 (+) and the vehicle ground be more than 24V (Power supply)**
	There should be the continuity between terminal 20 and the vehicle ground (Input)
	There should exist no difference of voltage between terminal 36 and the vehicle ground (Terminal 36 should be grounded surely)
	The voltage between terminals 27 (-) and 26 (+) be more than 24V (Output 0.4 seconds)

INSPECTION AND ADJUSTMENT (EXCEPT INDONESIA, PHILIPPINES AND VIETNAM)

EN12Z1601H300002

ADJUSTMENT OF PULSE CONVERSION RATE

NOTICE

Be sure to carry out the adjustment of pulse conversion rate when you replace the combination meter.

HINT

This is a device that enables a fine-tuning of compensating ratio of speedometer without modifying the speedometer driven gear of the transmission.

1. CONNECTING INPUT TOOL

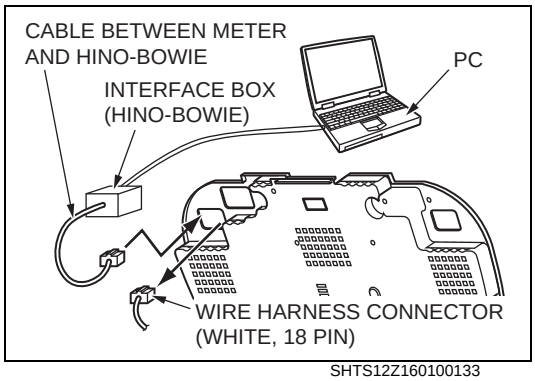
(1) Remove the combination meter.

(2) Disconnect the wire harness connector (White, 18 pin) and connect the interface box (Hino-Bowie) with the PC unit, which is Hino-DX is installed.

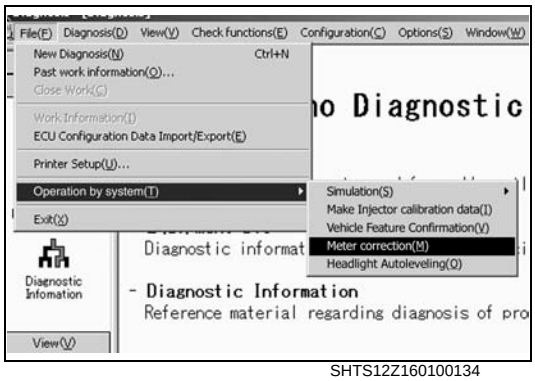
NOTICE

Do not disconnect other connectors.

SST:
Interface Box (Hino-Bowie) (09993-E9070)
Cable between meter & Hino-Bowie (S0904-21180)
Hino Diagnostic eXplorer (Hino-DX)



SHTS12Z160100133



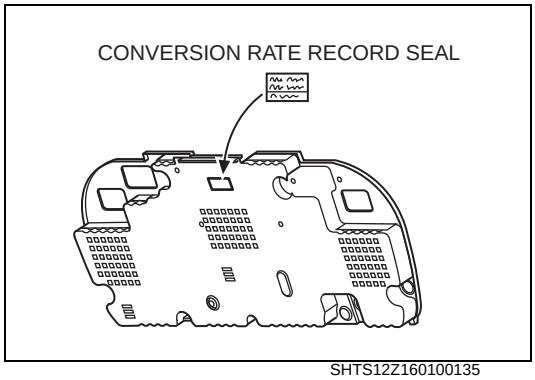
SHTS12Z160100134

2. THE METHOD OF WRITING IN OR READING OUT THE CONVERSION RATE

(1) Set the starter switch to "ON", and then turn on the power of PC to start up the Hino-DX.

(2) Select "File", "Operation by system", then "Meter correction (M)".

(3) Carry out writing in or reading out the conversion rate in accordance with the instructions.



SHTS12Z160100135

3. DISCONNECTING INPUT TOOL

(1) Turn off the power of PC unit, and then turn the starter switch to "LOCK" position.

(2) Disconnect the interface box (Hino-Bowie) from the combination meter, and connect the wire harness connector (White, 18 pin).

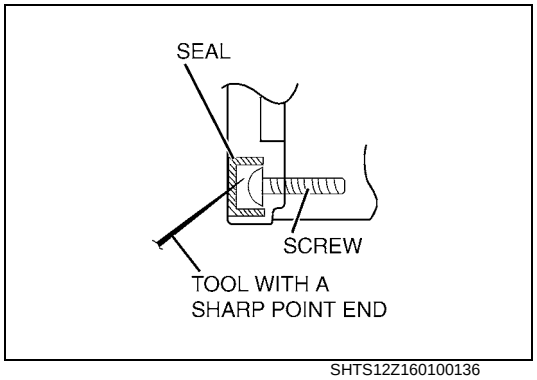
(3) Write conversion rate on a new caution plate (conversion rate record seal and stick it on the back side cover of the combination meter.

New caution plate No.	
Thailand	**S7658-84080**
Except Thailand	**S7658-83800**

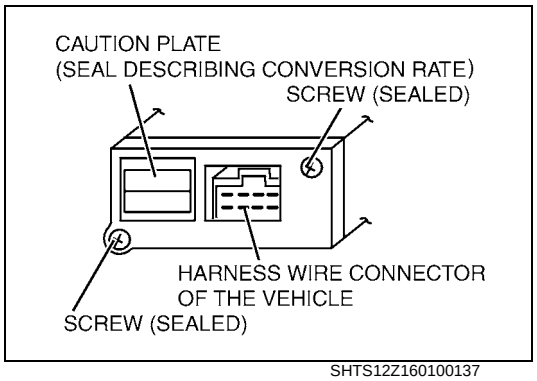
(4) Install the combination meter.

INSPECTION AND ADJUSTMENT (FOR INDONESIA, PHILIPPINES AND VIETNAM)

EN12Z1601H300003



SHTS12Z160100136



SHTS12Z160100137

ADJUSTMENT OF PULSE ADJUST COMPUTER

HINT

This is a device that enables a fine-tuning of compensating ratio of speedometer without modifying the speedometer driven gear of the transmission.

1. CONNECTING INPUT TOOL

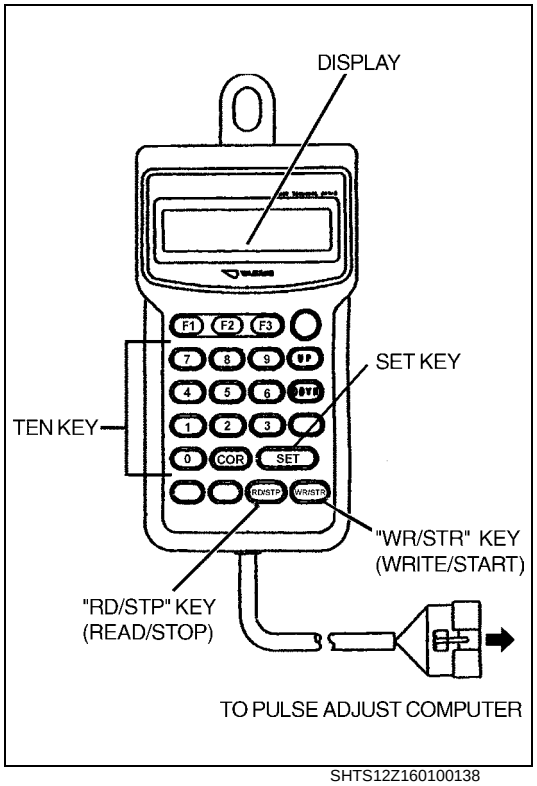
(1) Remove the instrument panel cover of assistant seat side in the cabin.

(2) Remove the seal around the screws by using a tool with a sharp point end.

(3) Remove the screws and then the cover of pulse adjust computer.

(4) If you disconnected the wire harness connector of the vehicle when removing the cover of pulse adjust computer, connect again the wire harness connector.

(5) Connect the input tool connector.
SST: Input tool (S0963-02400)



SHTS12Z160100138

2. THE METHOD OF WRITING IN OR READING OUT THE CONVERSION RATE

NOTICE

The vehicle condition at writing in or reading out: Starter switch is turned on.

(1) Reading out the conversion rate.
   a. The "RD/STP" key is pushed.
   b. Reading out the conversion rate correctly, "GOOD" is indicated and buzzer is rung for three seconds, then the conversion rate which is written in the pulse adjust computer is indicated.
   (Reading out it incorrectly, "bad 0" is indicated and buzzer is rung. In this case, put the connector again.)
   c. It becomes a condition of writing the conversion rate when the set key is pushed after reading out the conversion rate.

HINT

Refer to operation manual which belongs to input tool for details.

(2) Writing in the conversion rate.
   a. While the condition of inputting the conversion rate (" *.****" indication), the conversion rate is inputted to push the ten key or [UP] [DOWN] key.
   If the conversion rate is inputted, omit a decimal point.
   EX.) When you want to input the conversion rate "1.8210", push the ten key as "18210" and the set key.

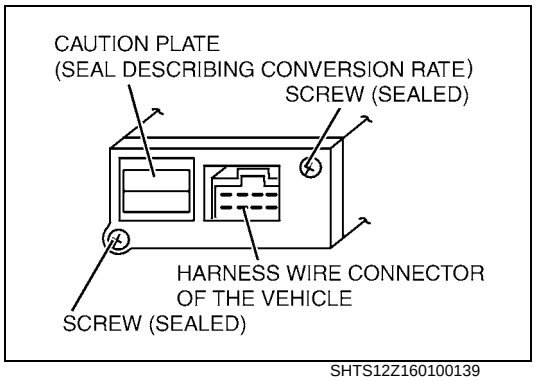
NOTICE

Refer to the following "Pulse conversion rate table".

   b. If the set key is pushed, the input value is decided.

When it is inputted correctly, the buzzer is rung and the display becomes the same condition before inputting with ten key.

c. The "WR/STR" key is pushed.
Writing in the conversion rate correctly, "GOOD" is indicated and buzzer is rung for three seconds, then the conversion rate which is contained an error and which was actually written in the pulse converter is indicated.
Writing in it incorrectly, "bad 0" is indicated and buzzer is rung.
In this case, write in it correctly again.



SHTS12Z160100139

3. DISCONNECTING INPUT TOOL

(1) Turn the starter switch to "LOCK" position.
(2) Disconnect the input tool connector and mount the cover of pulse adjust computer.
(3) Apply new seal (S8317-91140) on the screws to seal them.
(4) Write conversion rate on a new caution plate (conversion rate record seal (S7658-83800) and stick it on the place.
(5) Mount the instrument panel cover of assistant seat side.

SPEEDOMETER CONVERSION RATE LIST

EN12Z1601H300004

LX06 TRANSMISSION SERIES FOR CHILE, NEW ZEALAND, MEXICO, PHILIPPINES, TAIWAN, VIETNAM

PULSE TYPE M3, SPEEDOMETER CORRECTION RATE 0.960

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	3.363	3.636	3.900	4.100	4.300	4.333	4.555	4.625
225/60R17.5	0.349	1.370	1.267	1.181	1.123	1.071	1.063	1.011	0.996
215/70R17.5	0.364	1.428	1.321	1.232	1.172	1.117	1.109	1.055	1.039
195/80R17.5	0.367	1.440	1.332	1.242	1.181	1.126	1.118	1.063	1.047
205/80R17.5	0.374	1.468	1.357	1.266	1.204	1.148	1.139	1.084	1.067
235/70R17.5	0.376	1.476	1.365	1.272	1.210	1.154	1.145	1.089	1.073
7.50-16	0.383	1.503	1.390	1.296	1.233	1.175	1.166	1.110	1.093
7.50R16	0.387	1.519	1.405	1.310	1.246	1.188	1.179	1.121	1.104
235/75R17.5	0.387	1.519	1.405	1.310	1.246	1.188	1.179	1.121	1.104
225/80R17.5	0.389	1.527	1.412	1.316	1.252	1.194	1.185	1.127	1.110
225/70R19.5	0.395	1.550	1.434	1.337	1.271	1.212	1.203	1.144	1.127
8.25-16	0.404	1.586	1.466	1.367	1.300	1.240	1.230	1.170	1.153
245/80R17.5	0.406	1.593	1.474	1.374	1.307	1.246	1.237	1.176	1.158
245/70R19.5	0.407	1.597	1.477	1.377	1.310	1.249	1.240	1.179	1.161
8.25R16	0.409	1.605	1.485	1.384	1.317	1.255	1.246	1.185	1.167
9.5R17.5	0.409	1.605	1.485	1.384	1.317	1.255	1.246	1.185	1.167
225/90R17.5	0.410	1.609	1.488	1.387	1.320	1.258	1.249	1.188	1.170
9.00-16	0.420	1.648	1.525	1.421	1.352	1.289	1.279	1.217	1.198
265/70R19.5	0.421	1.652	1.528	1.425	1.355	1.292	1.282	1.220	1.201
7.50-18	0.423	1.660	1.535	1.431	1.362	1.298	1.288	1.226	1.207
7.50R18	0.426	1.672	1.546	1.442	1.371	1.307	1.297	1.234	1.216
9R19.5	0.433	1.699	1.572	1.465	1.394	1.329	1.319	1.255	1.236
265/60R22.5	0.438	1.719	1.590	1.482	1.410	1.344	1.334	1.269	1.250
235/70R22.5	0.440	1.727	1.597	1.489	1.416	1.350	1.340	1.275	1.256
7.50-20	0.448	1.758	1.626	1.516	1.442	1.375	1.365	1.298	1.278
285/60R22.5	0.450	1.766	1.633	1.523	1.449	1.381	1.371	1.304	1.284
7.50R20	0.452	1.774	1.641	1.530	1.455	1.387	1.377	1.310	1.290
255/70R22.5	0.453	1.778	1.644	1.533	1.458	1.390	1.380	1.312	1.293
275/70R22.5	0.465	1.825	1.688	1.574	1.497	1.427	1.416	1.347	1.327
11/70R22.5	0.468	1.837	1.699	1.584	1.506	1.436	1.425	1.356	1.335
8.25-20	0.468	1.837	1.699	1.584	1.506	1.436	1.425	1.356	1.335
8.25R20	0.470	1.845	1.706	1.591	1.513	1.443	1.432	1.362	1.341
9R22.5	0.470	1.845	1.706	1.591	1.513	1.443	1.432	1.362	1.341
265/75R22.5	0.474	1.860	1.721	1.604	1.526	1.455	1.444	1.373	1.353
295/70R22.5	0.479	1.880	1.739	1.621	1.542	1.470	1.459	1.388	1.367
9.00-20	0.490	1.923	1.779	1.658	1.577	1.504	1.492	1.420	1.398
275/80R22.5	0.491	1.927	1.782	1.662	1.581	1.507	1.496	1.423	1.401
9.00R20	0.492	1.931	1.786	1.665	1.584	1.510	1.499	1.426	1.404
10R22.5	0.492	1.931	1.786	1.665	1.584	1.510	1.499	1.426	1.404
295/75R22.5	0.493	1.935	1.790	1.668	1.587	1.513	1.502	1.428	1.407
295/80R22.5	0.505	1.982	1.833	1.709	1.626	1.550	1.538	1.463	1.441
10.00-20	0.506	1.986	1.837	1.712	1.629	1.553	1.541	1.466	1.444
11.1-20	0.506	1.986	1.837	1.712	1.629	1.553	1.541	1.466	1.444
10.00R20	0.508	1.994	1.844	1.719	1.635	1.559	1.547	1.472	1.450
11.1R20	0.508	1.994	1.844	1.719	1.635	1.559	1.547	1.472	1.450
11R22.5	0.508	1.994	1.844	1.719	1.635	1.559	1.547	1.472	1.450
11.00-20	0.520	2.041	1.888	1.760	1.674	1.596	1.584	1.507	1.484
315/80R22.5	0.520	2.041	1.888	1.760	1.674	1.596	1.584	1.507	1.484
11.00R20	0.523	2.053	1.899	1.770	1.684	1.605	1.593	1.515	1.492
12R22.5	0.523	2.053	1.899	1.770	1.684	1.605	1.593	1.515	1.492
12.00-20	0.539	2.115	1.957	1.824	1.735	1.654	1.642	1.562	1.538
12.00R20	0.542	2.127	1.968	1.834	1.745	1.664	1.651	1.570	1.547

SHTS12Z160100140

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	4.875	5.125	5.142	5.250	5.285	5.428	5.571	5.857
225/60R17.5	0.349	0.945	0.899	0.896	0.877	0.871	0.848	0.827	0.786
215/70R17.5	0.364	0.985	0.937	0.934	0.915	0.909	0.885	0.862	0.820
195/80R17.5	0.367	0.993	0.945	0.942	0.922	0.916	0.892	0.869	0.827
205/80R17.5	0.374	1.012	0.963	0.960	0.940	0.934	0.909	0.886	0.843
235/70R17.5	0.376	1.018	0.968	0.965	0.945	0.939	0.914	0.891	0.847
7.50-16	0.383	1.037	0.986	0.983	0.963	0.956	0.931	0.907	0.863
7.50R16	0.387	1.048	0.996	0.993	0.973	0.966	0.941	0.917	0.872
235/75R17.5	0.387	1.048	0.996	0.993	0.973	0.966	0.941	0.917	0.872
225/80R17.5	0.389	1.053	1.002	0.998	0.978	0.971	0.946	0.921	0.876
225/70R19.5	0.395	1.069	1.017	1.014	0.993	0.986	0.960	0.936	0.890
8.25-16	0.404	1.094	1.040	1.037	1.015	1.009	0.982	0.957	0.910
245/80R17.5	0.406	1.099	1.045	1.042	1.020	1.014	0.987	0.962	0.915
245/70R19.5	0.407	1.102	1.048	1.044	1.023	1.016	0.989	0.964	0.917
8.25R16	0.409	1.107	1.053	1.050	1.028	1.021	0.994	0.969	0.921
9.5R17.5	0.409	1.107	1.053	1.050	1.028	1.021	0.994	0.969	0.921
225/90R17.5	0.410	1.110	1.056	1.052	1.031	1.024	0.997	0.971	0.924
9.00-16	0.420	1.137	1.081	1.078	1.056	1.049	1.021	0.995	0.946
265/70R19.5	0.421	1.140	1.084	1.080	1.058	1.051	1.023	0.997	0.948
7.50-18	0.423	1.145	1.089	1.086	1.063	1.056	1.028	1.002	0.953
7.50R18	0.426	1.153	1.097	1.093	1.071	1.064	1.036	1.009	0.960
9R19.5	0.433	1.172	1.115	1.111	1.088	1.081	1.053	1.026	0.976
265/60R22.5	0.438	1.186	1.128	1.124	1.101	1.094	1.065	1.037	0.987
235/70R22.5	0.440	1.191	1.133	1.129	1.106	1.099	1.070	1.042	0.991
7.50-20	0.448	1.213	1.154	1.150	1.126	1.119	1.089	1.061	1.009
285/60R22.5	0.450	1.218	1.159	1.155	1.131	1.124	1.094	1.066	1.014
7.50R20	0.452	1.224	1.164	1.160	1.136	1.129	1.099	1.071	1.018
255/70R22.5	0.453	1.226	1.166	1.163	1.139	1.131	1.101	1.073	1.021
275/70R22.5	0.465	1.259	1.197	1.193	1.169	1.161	1.131	1.101	1.048
11/70R22.5	0.468	1.267	1.205	1.201	1.176	1.169	1.138	1.109	1.054
8.25-20	0.468	1.267	1.205	1.201	1.176	1.169	1.138	1.109	1.054
8.25R20	0.470	1.272	1.210	1.206	1.181	1.174	1.143	1.113	1.059
9R22.5	0.470	1.272	1.210	1.206	1.181	1.174	1.143	1.113	1.059
265/75R22.5	0.474	1.283	1.221	1.217	1.191	1.184	1.152	1.123	1.068
295/70R22.5	0.479	1.297	1.233	1.229	1.204	1.196	1.165	1.135	1.079
9.00-20	0.490	1.327	1.262	1.258	1.232	1.224	1.191	1.161	1.104
275/80R22.5	0.491	1.329	1.264	1.260	1.234	1.226	1.194	1.163	1.106
9.00R20	0.492	1.332	1.267	1.263	1.237	1.229	1.196	1.165	1.109
10R22.5	0.492	1.332	1.267	1.263	1.237	1.229	1.196	1.165	1.109
295/75R22.5	0.493	1.335	1.269	1.265	1.239	1.231	1.199	1.168	1.111
295/80R22.5	0.505	1.367	1.300	1.296	1.269	1.261	1.228	1.196	1.138
10.00-20	0.506	1.370	1.303	1.299	1.272	1.264	1.230	1.199	1.140
11.1-20	0.506	1.370	1.303	1.299	1.272	1.264	1.230	1.199	1.140
10.00R20	0.508	1.375	1.308	1.304	1.277	1.269	1.235	1.203	1.145
11.1R20	0.508	1.375	1.308	1.304	1.277	1.269	1.235	1.203	1.145
11R22.5	0.508	1.375	1.308	1.304	1.277	1.269	1.235	1.203	1.145
11.00-20	0.520	1.408	1.339	1.335	1.307	1.298	1.264	1.232	1.172
315/80R22.5	0.520	1.408	1.339	1.335	1.307	1.298	1.264	1.232	1.172
11.00R20	0.523	1.416	1.347	1.342	1.315	1.306	1.272	1.239	1.178
12R22.5	0.523	1.416	1.347	1.342	1.315	1.306	1.272	1.239	1.178
12.00-20	0.539	1.459	1.388	1.383	1.355	1.346	1.310	1.277	1.214
12.00R20	0.542	1.467	1.396	1.391	1.362	1.353	1.318	1.284	1.221

SHTS12Z160100141

		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS (m)	6.142	6.285	6.428	6.571	6.833	7.166
225/60R17.5	0.349	0.750	0.733	0.716	0.701	0.674	0.642
215/70R17.5	0.364	0.782	0.764	0.747	0.731	0.703	0.670
195/80R17.5	0.367	0.788	0.770	0.753	0.737	0.709	0.676
205/80R17.5	0.374	0.803	0.785	0.768	0.751	0.722	0.689
235/70R17.5	0.376	0.808	0.789	0.772	0.755	0.726	0.692
7.50-16	0.383	0.823	0.804	0.786	0.769	0.740	0.705
7.50R16	0.387	0.831	0.812	0.794	0.777	0.747	0.712
235/75R17.5	0.387	0.831	0.812	0.794	0.777	0.747	0.712
225/80R17.5	0.389	0.836	0.817	0.798	0.781	0.751	0.716
225/70R19.5	0.395	0.849	0.829	0.811	0.793	0.763	0.727
8.25-16	0.404	0.868	0.848	0.829	0.811	0.780	0.744
245/80R17.5	0.406	0.872	0.852	0.833	0.815	0.784	0.747
245/70R19.5	0.407	0.874	0.854	0.835	0.817	0.786	0.749
8.25R16	0.409	0.879	0.859	0.840	0.821	0.790	0.753
9.5R17.5	0.409	0.879	0.859	0.840	0.821	0.790	0.753
225/90R17.5	0.410	0.881	0.861	0.842	0.823	0.792	0.755
9.00-16	0.420	0.902	0.882	0.862	0.843	0.811	0.773
265/70R19.5	0.421	0.904	0.884	0.864	0.845	0.813	0.775
7.50-18	0.423	0.909	0.888	0.868	0.849	0.817	0.779
7.50R18	0.426	0.915	0.894	0.874	0.855	0.823	0.784
9R19.5	0.433	0.930	0.909	0.889	0.869	0.836	0.797
265/60R22.5	0.438	0.941	0.920	0.899	0.880	0.846	0.806
235/70R22.5	0.440	0.945	0.924	0.903	0.884	0.850	0.810
7.50-20	0.448	0.962	0.941	0.920	0.900	0.865	0.825
285/60R22.5	0.450	0.967	0.945	0.924	0.904	0.869	0.829
7.50R20	0.452	0.971	0.949	0.928	0.908	0.873	0.832
255/70R22.5	0.453	0.973	0.951	0.930	0.910	0.875	0.834
275/70R22.5	0.465	0.999	0.976	0.955	0.934	0.898	0.856
11/70R22.5	0.468	1.005	0.983	0.961	0.940	0.904	0.862
8.25-20	0.468	1.005	0.983	0.961	0.940	0.904	0.862
8.25R20	0.470	1.010	0.987	0.965	0.944	0.908	0.865
9R22.5	0.470	1.010	0.987	0.965	0.944	0.908	0.865
265/75R22.5	0.474	1.018	0.995	0.973	0.952	0.915	0.873
295/70R22.5	0.479	1.029	1.006	0.983	0.962	0.925	0.882
9.00-20	0.490	1.053	1.029	1.006	0.984	0.946	0.902
275/80R22.5	0.491	1.055	1.031	1.008	0.986	0.948	0.904
9.00R20	0.492	1.057	1.033	1.010	0.988	0.950	0.906
10R22.5	0.492	1.057	1.033	1.010	0.988	0.950	0.906
295/75R22.5	0.493	1.059	1.035	1.012	0.990	0.952	0.908
295/80R22.5	0.505	1.085	1.060	1.037	1.014	0.975	0.930
10.00-20	0.506	1.087	1.062	1.039	1.016	0.977	0.932
11.1-20	0.506	1.087	1.062	1.039	1.016	0.977	0.932
10.00R20	0.508	1.091	1.067	1.043	1.020	0.981	0.935
11.1R20	0.508	1.091	1.067	1.043	1.020	0.981	0.935
11R22.5	0.508	1.091	1.067	1.043	1.020	0.981	0.935
11.00-20	0.520	1.117	1.092	1.068	1.044	1.004	0.958
315/80R22.5	0.520	1.117	1.092	1.068	1.044	1.004	0.958
11.00R20	0.523	1.124	1.098	1.074	1.050	1.010	0.963
12R22.5	0.523	1.124	1.098	1.074	1.050	1.010	0.963
12.00-20	0.539	1.158	1.132	1.107	1.082	1.041	0.993
12.00R20	0.542	1.165	1.138	1.113	1.088	1.047	0.998

SHTS12Z160100142

LX06 TRANSMISSION SERIES FOR AUSTRALIA

PULSE TYPE M8, SPEEDOMETER CORRECTION RATE 0.960

(Apply to vehicles produced for after June, 2007)

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	3.363	3.636	3.900	4.100	4.300	4.333	4.555	4.625
225/60R17.5									
215/70R17.5									
195/80R17.5									
215/75R17.5	0.383	1.503	1.390	1.296	1.233	1.175	1.166	1.110	1.093
205/80R17.5									
235/70R17.5									
7.50-16									
7.50R16									
235/75R17.5	0.398	1.562	1.445	1.347	1.281	1.221	1.212	1.153	1.136
225/80R17.5									
225/70R19.5									
8.25-16									
245/80R17.5									
245/70R19.5	0.418	1.640	1.517	1.415	1.345	1.283	1.273	1.211	1.193
9.5R17.5	0.420	1.648	1.525	1.421	1.352	1.289	1.279	1.217	1.198
8.25R16	0.430	1.688	1.561	1.455	1.384	1.320	1.310	1.246	1.227
225/90R17.5									
9.00-16									
265/70R19.5	0.432	1.695	1.568	1.462	1.391	1.326	1.316	1.252	1.233
7.50-18									
7.50R18									
9R19.5									
265/60R22.5									
235/70R22.5									
7.50-20									
285/60R22.5									
7.50R20									
255/70R22.5	0.463	1.817	1.681	1.567	1.490	1.421	1.410	1.341	1.321
275/70R22.5	0.477	1.872	1.731	1.614	1.535	1.464	1.453	1.382	1.361
11/70R22.5									
8.25-20									
8.25R20									
9R22.5									
265/75R22.5									
295/70R22.5									
9.00-20									
9.00R20	0.505	1.982	1.833	1.709	1.626	1.550	1.538	1.463	1.441
275/80R22.5	0.505	1.982	1.833	1.709	1.626	1.550	1.538	1.463	1.441
10R22.5	0.509	1.998	1.848	1.723	1.639	1.562	1.550	1.475	1.452
295/75R22.5									
295/80R22.5	0.521	2.045	1.891	1.763	1.677	1.599	1.587	1.510	1.487
10.00-20	0.524	2.057	1.902	1.773	1.687	1.608	1.596	1.518	1.495
11R22.5	0.525	2.061	1.906	1.777	1.690	1.611	1.599	1.521	1.498
11.1-20									
10.00R20	0.526	2.064	1.909	1.780	1.693	1.614	1.602	1.524	1.501
11.1R20									
11.00-20	0.539	2.115	1.957	1.824	1.735	1.654	1.642	1.562	1.538
315/80R22.5									
11.00R20	0.542	2.127	1.968	1.834	1.745	1.664	1.651	1.570	1.547
12R22.5									
12.00-20									
12.00R20									

SHTS12Z160100143

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	**4.875**	**5.125**	**5.142**	**5.250**	**5.285**	**5.428**	**5.571**	**5.857**
225/60R17.5									
215/70R17.5									
195/80R17.5									
215/75R17.5	0.383	**1.037**	**0.986**	**0.983**	**0.963**	**0.956**	**0.931**	**0.907**	**0.863**
205/80R17.5									
235/70R17.5									
7.50-16									
7.50R16									
235/75R17.5	0.398	**1.077**	**1.025**	**1.021**	**1.000**	**0.994**	**0.968**	**0.943**	**0.897**
225/80R17.5									
225/70R19.5									
8.25-16									
245/80R17.5									
245/70R19.5	0.418	**1.132**	**1.076**	**1.073**	**1.051**	**1.044**	**1.016**	**0.990**	**0.942**
9.5R17.5	0.420	**1.137**	**1.081**	**1.078**	**1.056**	**1.049**	**1.021**	**0.995**	**0.946**
8.25R16	0.430	**1.164**	**1.107**	**1.104**	**1.081**	**1.074**	**1.045**	**1.019**	**0.969**
225/90R17.5									
9.00-16									
265/70R19.5	0.432	**1.169**	**1.112**	**1.109**	**1.086**	**1.079**	**1.050**	**1.023**	**0.973**
7.50-18									
7.50R18									
9R19.5									
265/60R22.5									
235/70R22.5									
7.50-20									
285/60R22.5									
7.50R20									
255/70R22.5	0.463	**1.253**	**1.192**	**1.188**	**1.164**	**1.156**	**1.126**	**1.097**	**1.043**
275/70R22.5	0.477	**1.291**	**1.228**	**1.224**	**1.199**	**1.191**	**1.160**	**1.130**	**1.075**
11/70R22.5									
8.25-20									
8.25R20									
9R22.5									
265/75R22.5									
295/70R22.5									
9.00-20									
9.00R20	0.505	**1.367**	**1.300**	**1.296**	**1.269**	**1.261**	**1.228**	**1.196**	**1.138**
275/80R22.5	0.505	**1.367**	**1.300**	**1.296**	**1.269**	**1.261**	**1.228**	**1.196**	**1.138**
10R22.5	0.509	**1.378**	**1.311**	**1.306**	**1.279**	**1.271**	**1.238**	**1.206**	**1.147**
295/75R22.5									
295/80R22.5	0.521	**1.410**	**1.342**	**1.337**	**1.310**	**1.301**	**1.267**	**1.234**	**1.174**
10.00-20	0.524	**1.419**	**1.349**	**1.345**	**1.317**	**1.308**	**1.274**	**1.241**	**1.181**
11R22.5	0.525	**1.421**	**1.352**	**1.347**	**1.320**	**1.311**	**1.276**	**1.244**	**1.183**
11.1-20									
10.00R20	0.526	**1.424**	**1.355**	**1.350**	**1.322**	**1.313**	**1.279**	**1.246**	**1.185**
11.1R20									
11.00-20	0.539	**1.459**	**1.388**	**1.383**	**1.355**	**1.346**	**1.310**	**1.277**	**1.214**
315/80R22.5									
11.00R20	0.542	**1.467**	**1.396**	**1.391**	**1.362**	**1.353**	**1.318**	**1.284**	**1.221**
12R22.5									
12.00-20									
12.00R20									

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		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS (m)	6.142	6.285	6.428	6.571	6.833	7.166
225/60R17.5							
215/70R17.5							
195/80R17.5							
215/75R17.5	0.383	0.823	0.804	0.786	0.769	0.740	0.705
205/80R17.5							
235/70R17.5							
7.50-16							
7.50R16							
235/75R17.5	0.398	0.855	0.836	0.817	0.799	0.768	0.733
225/80R17.5							
225/70R19.5							
8.25-16							
245/80R17.5							
245/70R19.5	0.418	0.898	0.878	0.858	0.839	0.807	0.770
9.5R17.5	0.420	0.902	0.882	0.862	0.843	0.811	0.773
8.25R16	0.430	0.924	0.903	0.883	0.863	0.830	0.792
225/90R17.5							
9.00-16							
265/70R19.5	0.432	0.928	0.907	0.887	0.867	0.834	0.795
7.50-18							
7.50R18							
9R19.5							
265/60R22.5							
235/70R22.5							
7.50-20							
285/60R22.5							
7.50R20							
255/70R22.5	0.463	0.995	0.972	0.950	0.930	0.894	0.853
275/70R22.5	0.477	1.025	1.001	0.979	0.958	0.921	0.878
11/70R22.5							
8.25-20							
8.25R20							
9R22.5							
265/75R22.5							
295/70R22.5							
9.00-20							
9.00R20	0.505	1.085	1.060	1.037	1.014	0.975	0.930
275/80R22.5	0.505	1.085	1.060	1.037	1.014	0.975	0.930
10R22.5	0.509	1.094	1.069	1.045	1.022	0.983	0.937
295/75R22.5							
295/80R22.5	0.521	1.119	1.094	1.070	1.046	1.006	0.959
10.00-20	0.524	1.126	1.100	1.076	1.052	1.012	0.965
11R22.5	0.525	1.128	1.102	1.078	1.054	1.014	0.967
11.1-20							
10.00R20	0.526	1.130	1.104	1.080	1.056	1.016	0.969
11.1R20							
11.00-20	0.539	1.158	1.132	1.107	1.082	1.041	0.993
315/80R22.5							
11.00R20	0.542	1.165	1.138	1.113	1.088	1.047	0.998
12R22.5							
12.00-20							
12.00R20							

SHTS12Z160100145

LX06 TRANSMISSION SERIES FOR AUSTRALIA

PULSE TYPE M6, SPEEDOMETER CORRECTION RATE 0.980

(Apply to vehicles produced for before May, 2007)

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	3.363	3.636	3.900	4.100	4.300	4.333	4.555	4.625
225/60R17.5	0.349	1.342	1.241	1.157	1.100	1.049	1.041	0.990	0.975
215/70R17.5	0.364	1.399	1.294	1.207	1.148	1.094	1.086	1.033	1.017
195/80R17.5	0.367	1.411	1.305	1.217	1.157	1.103	1.095	1.042	1.026
205/80R17.5	0.374	1.438	1.330	1.240	1.179	1.124	1.116	1.061	1.045
235/70R17.5	0.376	1.445	1.337	1.246	1.186	1.130	1.122	1.067	1.051
7.50-16	0.383	1.472	1.362	1.270	1.208	1.151	1.143	1.087	1.070
7.50R16	0.387	1.488	1.376	1.283	1.220	1.163	1.155	1.098	1.082
235/75R17.5	0.387	1.488	1.376	1.283	1.220	1.163	1.155	1.098	1.082
225/80R17.5	0.389	1.495	1.383	1.289	1.227	1.169	1.161	1.104	1.087
225/70R19.5	0.395	1.519	1.404	1.309	1.245	1.188	1.178	1.121	1.104
8.25-16	0.404	1.553	1.436	1.339	1.274	1.215	1.205	1.147	1.129
245/70R19.5	0.407	1.565	1.447	1.349	1.283	1.224	1.214	1.155	1.138
8.25R16	0.409	1.572	1.454	1.356	1.290	1.230	1.220	1.161	1.143
9.5R17.5	0.409	1.572	1.454	1.356	1.290	1.230	1.220	1.161	1.143
225/90R17.5	0.410	1.576	1.458	1.359	1.293	1.233	1.223	1.164	1.146
9.00-16	0.420	1.615	1.493	1.392	1.324	1.263	1.253	1.192	1.174
265/70R19.5	0.421	1.619	1.497	1.396	1.327	1.266	1.256	1.195	1.177
7.50-18	0.423	1.626	1.504	1.402	1.334	1.272	1.262	1.201	1.182
7.50R18	0.426	1.638	1.515	1.412	1.343	1.281	1.271	1.209	1.191
9R19.5	0.433	1.665	1.540	1.435	1.365	1.302	1.292	1.229	1.210
265/60R22.5	0.438	1.684	1.557	1.452	1.381	1.317	1.307	1.243	1.224
235/70R22.5	0.440	1.692	1.565	1.459	1.387	1.323	1.313	1.249	1.230
7.50-20	0.448	1.722	1.593	1.485	1.413	1.347	1.337	1.271	1.252
285/60R22.5	0.450	1.730	1.600	1.492	1.419	1.353	1.343	1.277	1.258
7.50R20	0.452	1.738	1.607	1.498	1.425	1.359	1.349	1.283	1.263
255/70R22.5	0.453	1.742	1.611	1.502	1.428	1.362	1.352	1.286	1.266
275/70R22.5	0.465	1.788	1.653	1.541	1.466	1.398	1.387	1.320	1.300
11/70R22.5	0.468	1.799	1.664	1.551	1.476	1.407	1.396	1.328	1.308
8.25-20	0.468	1.799	1.664	1.551	1.476	1.407	1.396	1.328	1.308
8.25R20	0.470	1.807	1.671	1.558	1.482	1.413	1.402	1.334	1.314
9R22.5	0.470	1.807	1.671	1.558	1.482	1.413	1.402	1.334	1.314
265/75R22.5	0.474	1.822	1.685	1.571	1.495	1.425	1.414	1.345	1.325
295/70R22.5	0.479	1.842	1.703	1.588	1.510	1.440	1.429	1.360	1.339
9.00-20	0.490	1.884	1.742	1.624	1.545	1.473	1.462	1.391	1.370
275/80R22.5	0.491	1.888	1.746	1.628	1.548	1.476	1.465	1.394	1.372
9.00R20	0.492	1.892	1.749	1.631	1.551	1.479	1.468	1.396	1.375
10R22.5	0.492	1.892	1.749	1.631	1.551	1.479	1.468	1.396	1.375
295/75R22.5	0.493	1.895	1.753	1.634	1.555	1.482	1.471	1.399	1.378
295/80R22.5	0.505	1.942	1.796	1.674	1.592	1.518	1.507	1.433	1.412
10.00-20	0.506	1.945	1.799	1.677	1.596	1.521	1.510	1.436	1.414
11.1-20	0.506	1.945	1.799	1.677	1.596	1.521	1.510	1.436	1.414
10.00R20	0.508	1.953	1.806	1.684	1.602	1.527	1.516	1.442	1.420
11.1R20	0.508	1.953	1.806	1.684	1.602	1.527	1.516	1.442	1.420
11R22.5	0.508	1.953	1.806	1.684	1.602	1.527	1.516	1.442	1.420
11.00-20	0.520	1.999	1.849	1.724	1.640	1.563	1.552	1.476	1.454
315/80R22.5	0.520	1.999	1.849	1.724	1.640	1.563	1.552	1.476	1.454
11.00R20	0.523	2.011	1.860	1.734	1.649	1.573	1.561	1.484	1.462
12R22.5	0.523	2.011	1.860	1.734	1.649	1.573	1.561	1.484	1.462

SHTS12Z160100146

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	4.875	5.125	5.142	5.250	5.285	5.428	5.571	5.857
225/60R17.5	0.349	0.925	0.880	0.877	0.859	0.854	0.831	0.810	0.770
215/70R17.5	0.364	0.965	0.918	0.915	0.896	0.890	0.867	0.845	0.803
195/80R17.5	0.367	0.973	0.926	0.923	0.904	0.898	0.874	0.851	0.810
205/80R17.5	0.374	0.992	0.943	0.940	0.921	0.915	0.891	0.868	0.825
235/70R17.5	0.376	0.997	0.948	0.945	0.926	0.920	0.895	0.872	0.830
7.50-16	0.383	1.016	0.966	0.963	0.943	0.937	0.912	0.889	0.845
7.50R16	0.387	1.026	0.976	0.973	0.953	0.947	0.922	0.898	0.854
235/75R17.5	0.387	1.026	0.976	0.973	0.953	0.947	0.922	0.898	0.854
225/80R17.5	0.389	1.031	0.981	0.978	0.958	0.951	0.926	0.903	0.858
225/70R19.5	0.395	1.047	0.996	0.993	0.973	0.966	0.941	0.916	0.872
8.25-16	0.404	1.071	1.019	1.016	0.995	0.988	0.962	0.937	0.892
245/70R19.5	0.407	1.079	1.027	1.023	1.002	0.995	0.969	0.944	0.898
8.25R16	0.409	1.085	1.032	1.028	1.007	1.000	0.974	0.949	0.903
9.5R17.5	0.409	1.085	1.032	1.028	1.007	1.000	0.974	0.949	0.903
225/90R17.5	0.410	1.087	1.034	1.031	1.009	1.003	0.976	0.951	0.905
9.00-16	0.420	1.114	1.059	1.056	1.034	1.027	1.000	0.975	0.927
265/70R19.5	0.421	1.116	1.062	1.058	1.037	1.030	1.003	0.977	0.929
7.50-18	0.423	1.122	1.067	1.063	1.042	1.035	1.007	0.981	0.934
7.50R18	0.426	1.130	1.075	1.071	1.049	1.042	1.014	0.988	0.940
9R19.5	0.433	1.148	1.092	1.089	1.066	1.059	1.031	1.005	0.956
265/60R22.5	0.438	1.161	1.105	1.101	1.078	1.071	1.043	1.016	0.967
235/70R22.5	0.440	1.167	1.110	1.106	1.083	1.076	1.048	1.021	0.971
7.50-20	0.448	1.188	1.130	1.126	1.103	1.096	1.067	1.040	0.989
285/60R22.5	0.450	1.193	1.135	1.131	1.108	1.101	1.072	1.044	0.993
7.50R20	0.452	1.199	1.140	1.136	1.113	1.106	1.076	1.049	0.998
255/70R22.5	0.453	1.201	1.143	1.139	1.115	1.108	1.079	1.051	1.000
275/70R22.5	0.465	1.233	1.173	1.169	1.145	1.137	1.107	1.079	1.026
11/70R22.5	0.468	1.241	1.180	1.177	1.152	1.145	1.115	1.086	1.033
8.25-20	0.468	1.241	1.180	1.177	1.152	1.145	1.115	1.086	1.033
8.25R20	0.470	1.246	1.186	1.182	1.157	1.150	1.119	1.091	1.037
9R22.5	0.470	1.246	1.186	1.182	1.157	1.150	1.119	1.091	1.037
265/75R22.5	0.474	1.257	1.196	1.192	1.167	1.159	1.129	1.100	1.046
295/70R22.5	0.479	1.270	1.208	1.204	1.179	1.172	1.141	1.111	1.057
9.00-20	0.490	1.299	1.236	1.232	1.207	1.199	1.167	1.137	1.081
275/80R22.5	0.491	1.302	1.239	1.234	1.209	1.201	1.169	1.139	1.084
9.00R20	0.492	1.305	1.241	1.237	1.211	1.203	1.172	1.142	1.086
10R22.5	0.492	1.305	1.241	1.237	1.211	1.203	1.172	1.142	1.086
295/75R22.5	0.493	1.307	1.244	1.239	1.214	1.206	1.174	1.144	1.088
295/80R22.5	0.505	1.339	1.274	1.270	1.244	1.235	1.203	1.172	1.115
10.00-20	0.506	1.342	1.276	1.272	1.246	1.238	1.205	1.174	1.117
11.1-20	0.506	1.342	1.276	1.272	1.246	1.238	1.205	1.174	1.117
10.00R20	0.508	1.347	1.281	1.277	1.251	1.243	1.210	1.179	1.121
11.1R20	0.508	1.347	1.281	1.277	1.251	1.243	1.210	1.179	1.121
11R22.5	0.508	1.347	1.281	1.277	1.251	1.243	1.210	1.179	1.121
11.00-20	0.520	1.379	1.312	1.307	1.280	1.272	1.238	1.207	1.148
315/80R22.5	0.520	1.379	1.312	1.307	1.280	1.272	1.238	1.207	1.148
11.00R20	0.523	1.387	1.319	1.315	1.288	1.279	1.246	1.214	1.154
12R22.5	0.523	1.387	1.319	1.315	1.288	1.279	1.246	1.214	1.154

SHTS12Z160100147

		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS (m)	6.142	6.285	6.428	6.571	6.833	7.166
225/60R17.5	0.349	0.734	0.718	0.702	0.686	0.660	0.629
215/70R17.5	0.364	0.766	0.749	0.732	0.716	0.688	0.656
195/80R17.5	0.367	0.772	0.755	0.738	0.722	0.694	0.662
205/80R17.5	0.374	0.787	0.769	0.752	0.736	0.707	0.674
235/70R17.5	0.376	0.791	0.773	0.756	0.740	0.711	0.678
7.50-16	0.383	0.806	0.788	0.770	0.753	0.724	0.691
7.50R16	0.387	0.814	0.796	0.778	0.761	0.732	0.698
235/75R17.5	0.387	0.814	0.796	0.778	0.761	0.732	0.698
225/80R17.5	0.389	0.819	0.800	0.782	0.765	0.736	0.702
225/70R19.5	0.395	0.831	0.812	0.794	0.777	0.747	0.712
8.25-16	0.404	0.850	0.831	0.812	0.795	0.764	0.729
245/70R19.5	0.407	0.856	0.837	0.818	0.801	0.770	0.734
8.25R16	0.409	0.861	0.841	0.822	0.804	0.774	0.738
9.5R17.5	0.409	0.861	0.841	0.822	0.804	0.774	0.738
225/90R17.5	0.410	0.863	0.843	0.824	0.806	0.776	0.739
9.00-16	0.420	0.884	0.864	0.845	0.826	0.794	0.757
265/70R19.5	0.421	0.886	0.866	0.847	0.828	0.796	0.759
7.50-18	0.423	0.890	0.870	0.851	0.832	0.800	0.763
7.50R18	0.426	0.897	0.876	0.857	0.838	0.806	0.768
9R19.5	0.433	0.911	0.891	0.871	0.852	0.819	0.781
265/60R22.5	0.438	0.922	0.901	0.881	0.862	0.829	0.790
235/70R22.5	0.440	0.926	0.905	0.885	0.865	0.832	0.794
7.50-20	0.448	0.943	0.921	0.901	0.881	0.847	0.808
285/60R22.5	0.450	0.947	0.925	0.905	0.885	0.851	0.812
7.50R20	0.452	0.951	0.930	0.909	0.889	0.855	0.815
255/70R22.5	0.453	0.953	0.932	0.911	0.891	0.857	0.817
275/70R22.5	0.465	0.979	0.956	0.935	0.915	0.880	0.839
11/70R22.5	0.468	0.985	0.963	0.941	0.921	0.885	0.844
8.25-20	0.468	0.985	0.963	0.941	0.921	0.885	0.844
8.25R20	0.470	0.989	0.967	0.945	0.925	0.889	0.848
9R22.5	0.470	0.989	0.967	0.945	0.925	0.889	0.848
265/75R22.5	0.474	0.998	0.975	0.953	0.932	0.897	0.855
295/70R22.5	0.479	1.008	0.985	0.963	0.942	0.906	0.864
9.00-20	0.490	1.031	1.008	0.985	0.964	0.927	0.884
275/80R22.5	0.491	1.033	1.010	0.987	0.966	0.929	0.886
9.00R20	0.492	1.035	1.012	0.989	0.968	0.931	0.887
10R22.5	0.492	1.035	1.012	0.989	0.968	0.931	0.887
295/75R22.5	0.493	1.038	1.014	0.991	0.970	0.933	0.889
295/80R22.5	0.505	1.063	1.039	1.016	0.993	0.955	0.911
10.00-20	0.506	1.065	1.041	1.018	0.995	0.957	0.913
11.1-20	0.506	1.065	1.041	1.018	0.995	0.957	0.913
10.00R20	0.508	1.069	1.045	1.022	0.999	0.961	0.916
11.1R20	0.508	1.069	1.045	1.022	0.999	0.961	0.916
11R22.5	0.508	1.069	1.045	1.022	0.999	0.961	0.916
11.00-20	0.520	1.094	1.070	1.046	1.023	0.984	0.938
315/80R22.5	0.520	1.094	1.070	1.046	1.023	0.984	0.938
11.00R20	0.523	1.101	1.076	1.052	1.029	0.989	0.943
12R22.5	0.523	1.101	1.076	1.052	1.029	0.989	0.943

SHTS12Z160100148

LJ06, MF06 TRANSMISSION SERIES FOR CHILE, INDIA, INDONESIA, NEW ZEALAND, MEXICO, PHILIPPINES, SINGAPORE, TAIWAN, VIETNAM

PULSE TYPE M4, SPEEDOMETER CORRECTION RATE 0.960

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	3.363	3.636	3.900	4.100	4.300	4.333	4.555	4.625
225/60R17.5	0.349	1.112	1.029	0.959	0.912	0.870	0.863	0.821	0.808
215/70R17.5	0.364	1.160	1.073	1.000	0.951	0.907	0.900	0.856	0.843
195/80R17.5	0.367	1.169	1.082	1.008	0.959	0.914	0.908	0.863	0.850
205/80R17.5	0.374	1.192	1.102	1.028	0.977	0.932	0.925	0.880	0.866
235/70R17.5	0.376	1.198	1.108	1.033	0.983	0.937	0.930	0.884	0.871
7.50-16	0.383	1.220	1.129	1.052	1.001	0.954	0.947	0.901	0.887
7.50R16	0.387	1.233	1.141	1.063	1.011	0.964	0.957	0.910	0.897
235/75R17.5	0.387	1.233	1.141	1.063	1.011	0.964	0.957	0.910	0.897
225/80R17.5	0.389	1.240	1.146	1.069	1.017	0.969	0.962	0.915	0.901
225/70R19.5	0.395	1.259	1.164	1.085	1.032	0.984	0.977	0.929	0.915
8.25-16	0.404	1.287	1.191	1.110	1.056	1.007	0.999	0.950	0.936
245/70R19.5	0.407	1.297	1.200	1.118	1.064	1.014	1.006	0.957	0.943
8.25R16	0.409	1.303	1.205	1.124	1.069	1.019	1.011	0.962	0.948
9.5R17.5	0.409	1.303	1.205	1.124	1.069	1.019	1.011	0.962	0.948
225/90R17.5	0.410	1.307	1.208	1.127	1.072	1.022	1.014	0.964	0.950
9.00-16	0.420	1.338	1.238	1.154	1.098	1.047	1.039	0.988	0.973
265/70R19.5	0.421	1.342	1.241	1.157	1.100	1.049	1.041	0.990	0.975
7.50-18	0.423	1.348	1.247	1.162	1.106	1.054	1.046	0.995	0.980
7.50R18	0.426	1.358	1.256	1.171	1.113	1.062	1.054	1.002	0.987
9R19.5	0.433	1.380	1.276	1.190	1.132	1.079	1.071	1.019	1.003
265/60R22.5	0.438	1.396	1.291	1.204	1.145	1.092	1.083	1.030	1.015
235/70R22.5	0.440	1.402	1.297	1.209	1.150	1.097	1.088	1.035	1.019
7.50-20	0.448	1.428	1.320	1.231	1.171	1.116	1.108	1.054	1.038
285/60R22.5	0.450	1.434	1.326	1.237	1.176	1.121	1.113	1.059	1.043
7.50R20	0.452	1.440	1.332	1.242	1.181	1.126	1.118	1.063	1.047
255/70R22.5	0.453	1.444	1.335	1.245	1.184	1.129	1.120	1.066	1.050
275/70R22.5	0.465	1.482	1.371	1.278	1.215	1.159	1.150	1.094	1.077
11/70R22.5	0.468	1.491	1.379	1.286	1.223	1.166	1.157	1.101	1.084
8.25-20	0.468	1.491	1.379	1.286	1.223	1.166	1.157	1.101	1.084
8.25R20	0.470	1.498	1.385	1.291	1.228	1.171	1.162	1.106	1.089
9R22.5	0.470	1.498	1.385	1.291	1.228	1.171	1.162	1.106	1.089
265/75R22.5	0.474	1.511	1.397	1.302	1.239	1.181	1.172	1.115	1.098
295/70R22.5	0.479	1.526	1.412	1.316	1.252	1.194	1.185	1.127	1.110
9.00-20	0.490	1.562	1.444	1.346	1.281	1.221	1.212	1.153	1.135
275/80R22.5	0.491	1.565	1.447	1.349	1.283	1.224	1.214	1.155	1.138
9.00R20	0.492	1.568	1.450	1.352	1.286	1.226	1.217	1.157	1.140
10R22.5	0.492	1.568	1.450	1.352	1.286	1.226	1.217	1.157	1.140
295/75R22.5	0.493	1.571	1.453	1.355	1.289	1.229	1.219	1.160	1.142
295/80R22.5	0.505	1.609	1.488	1.388	1.320	1.259	1.249	1.188	1.170
10.00-20	0.506	1.613	1.491	1.390	1.323	1.261	1.251	1.190	1.172
11.1-20	0.506	1.613	1.491	1.390	1.323	1.261	1.251	1.190	1.172
10.00R20	0.508	1.619	1.497	1.396	1.328	1.266	1.256	1.195	1.177
11.1R20	0.508	1.619	1.497	1.396	1.328	1.266	1.256	1.195	1.177
11R22.5	0.508	1.619	1.497	1.396	1.328	1.266	1.256	1.195	1.177
11.00-20	0.520	1.657	1.533	1.429	1.359	1.296	1.286	1.223	1.205
315/80R22.5	0.520	1.657	1.533	1.429	1.359	1.296	1.286	1.223	1.205
11.00R20	0.523	1.667	1.542	1.437	1.367	1.303	1.294	1.230	1.212
12R22.5	0.523	1.667	1.542	1.437	1.367	1.303	1.294	1.230	1.212

SHTS12Z160100149

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	4.875	5.125	5.142	5.250	5.285	5.428	5.571	5.857
225/60R17.5	0.349	0.767	0.730	0.727	0.712	0.707	0.689	0.671	0.638
215/70R17.5	0.364	0.800	0.761	0.758	0.743	0.738	0.718	0.700	0.666
195/80R17.5	0.367	0.807	0.767	0.765	0.749	0.744	0.724	0.706	0.671
205/80R17.5	0.374	0.822	0.782	0.779	0.763	0.758	0.738	0.719	0.684
235/70R17.5	0.376	0.826	0.786	0.783	0.767	0.762	0.742	0.723	0.688
7.50-16	0.383	0.842	0.801	0.798	0.782	0.776	0.756	0.737	0.701
7.50R16	0.387	0.851	0.809	0.806	0.790	0.785	0.764	0.744	0.708
235/75R17.5	0.387	0.851	0.809	0.806	0.790	0.785	0.764	0.744	0.708
225/80R17.5	0.389	0.855	0.813	0.811	0.794	0.789	0.768	0.748	0.712
225/70R19.5	0.395	0.868	0.826	0.823	0.806	0.801	0.780	0.760	0.723
8.25-16	0.404	0.888	0.845	0.842	0.824	0.819	0.797	0.777	0.739
245/70R19.5	0.407	0.895	0.851	0.848	0.831	0.825	0.803	0.783	0.744
8.25R16	0.409	0.899	0.855	0.852	0.835	0.829	0.807	0.787	0.748
9.5R17.5	0.409	0.899	0.855	0.852	0.835	0.829	0.807	0.787	0.748
225/90R17.5	0.410	0.901	0.857	0.854	0.837	0.831	0.809	0.788	0.750
9.00-16	0.420	0.923	0.878	0.875	0.857	0.851	0.829	0.808	0.768
265/70R19.5	0.421	0.925	0.880	0.877	0.859	0.854	0.831	0.810	0.770
7.50-18	0.423	0.930	0.884	0.881	0.863	0.858	0.835	0.814	0.774
7.50R18	0.426	0.936	0.891	0.888	0.869	0.864	0.841	0.819	0.779
9R19.5	0.433	0.952	0.905	0.902	0.884	0.878	0.855	0.833	0.792
265/60R22.5	0.438	0.963	0.916	0.913	0.894	0.888	0.865	0.842	0.801
235/70R22.5	0.440	0.967	0.920	0.917	0.898	0.892	0.869	0.846	0.805
7.50-20	0.448	0.985	0.937	0.934	0.914	0.908	0.884	0.862	0.820
285/60R22.5	0.450	0.989	0.941	0.938	0.918	0.912	0.888	0.865	0.823
7.50R20	0.452	0.993	0.945	0.942	0.922	0.916	0.892	0.869	0.827
255/70R22.5	0.453	0.996	0.947	0.944	0.925	0.918	0.894	0.871	0.829
275/70R22.5	0.465	1.022	0.972	0.969	0.949	0.943	0.918	0.894	0.851
11/70R22.5	0.468	1.029	0.978	0.975	0.955	0.949	0.924	0.900	0.856
8.25-20	0.468	1.029	0.978	0.975	0.955	0.949	0.924	0.900	0.856
8.25R20	0.470	1.033	0.983	0.979	0.959	0.953	0.928	0.904	0.860
9R22.5	0.470	1.033	0.983	0.979	0.959	0.953	0.928	0.904	0.860
265/75R22.5	0.474	1.042	0.991	0.988	0.967	0.961	0.936	0.912	0.867
295/70R22.5	0.479	1.053	1.001	0.998	0.978	0.971	0.946	0.921	0.876
9.00-20	0.490	1.077	1.025	1.021	1.000	0.993	0.967	0.942	0.896
275/80R22.5	0.491	1.079	1.027	1.023	1.002	0.995	0.969	0.944	0.898
9.00R20	0.492	1.081	1.029	1.025	1.004	0.998	0.971	0.946	0.900
10R22.5	0.492	1.081	1.029	1.025	1.004	0.998	0.971	0.946	0.900
295/75R22.5	0.493	1.084	1.031	1.027	1.006	1.000	0.973	0.948	0.902
295/80R22.5	0.505	1.110	1.056	1.052	1.031	1.024	0.997	0.971	0.924
10.00-20	0.506	1.112	1.058	1.054	1.033	1.026	0.999	0.973	0.926
11.1-20	0.506	1.112	1.058	1.054	1.033	1.026	0.999	0.973	0.926
10.00R20	0.508	1.117	1.062	1.059	1.037	1.030	1.003	0.977	0.929
11.1R20	0.508	1.117	1.062	1.059	1.037	1.030	1.003	0.977	0.929
11R22.5	0.508	1.117	1.062	1.059	1.037	1.030	1.003	0.977	0.929
11.00-20	0.520	1.143	1.087	1.084	1.061	1.054	1.027	1.000	0.951
315/80R22.5	0.520	1.143	1.087	1.084	1.061	1.054	1.027	1.000	0.951
11.00R20	0.523	1.150	1.094	1.090	1.067	1.060	1.032	1.006	0.957
12R22.5	0.523	1.150	1.094	1.090	1.067	1.060	1.032	1.006	0.957

SHTS12Z160100150

		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS (m)	6.142	6.285	6.428	6.571	6.833	7.166
225/60R17.5	0.349	0.609	0.595	0.582	0.569	0.547	0.522
215/70R17.5	0.364	0.635	0.620	0.607	0.593	0.571	0.544
195/80R17.5	0.367	0.640	0.626	0.612	0.598	0.575	0.549
205/80R17.5	0.374	0.652	0.637	0.623	0.610	0.586	0.559
235/70R17.5	0.376	0.656	0.641	0.627	0.613	0.589	0.562
7.50-16	0.383	0.668	0.653	0.638	0.624	0.600	0.572
7.50R16	0.387	0.675	0.660	0.645	0.631	0.607	0.578
235/75R17.5	0.387	0.675	0.660	0.645	0.631	0.607	0.578
225/80R17.5	0.389	0.678	0.663	0.648	0.634	0.610	0.581
225/70R19.5	0.395	0.689	0.673	0.658	0.644	0.619	0.590
8.25-16	0.404	0.705	0.689	0.673	0.659	0.633	0.604
245/70R19.5	0.407	0.710	0.694	0.678	0.664	0.638	0.608
8.25R16	0.409	0.713	0.697	0.682	0.667	0.641	0.611
9.5R17.5	0.409	0.713	0.697	0.682	0.667	0.641	0.611
225/90R17.5	0.410	0.715	0.699	0.683	0.668	0.643	0.613
9.00-16	0.420	0.733	0.716	0.700	0.685	0.658	0.628
265/70R19.5	0.421	0.734	0.718	0.702	0.686	0.660	0.629
7.50-18	0.423	0.738	0.721	0.705	0.690	0.663	0.632
7.50R18	0.426	0.743	0.726	0.710	0.695	0.668	0.637
9R19.5	0.433	0.755	0.738	0.722	0.706	0.679	0.647
265/60R22.5	0.438	0.764	0.747	0.730	0.714	0.687	0.655
235/70R22.5	0.440	0.768	0.750	0.733	0.717	0.690	0.658
7.50-20	0.448	0.781	0.764	0.747	0.730	0.702	0.670
285/60R22.5	0.450	0.785	0.767	0.750	0.734	0.706	0.673
7.50R20	0.452	0.788	0.771	0.753	0.737	0.709	0.676
255/70R22.5	0.453	0.790	0.772	0.755	0.739	0.710	0.677
275/70R22.5	0.465	0.811	0.793	0.775	0.758	0.729	0.695
11/70R22.5	0.468	0.816	0.798	0.780	0.763	0.734	0.700
8.25-20	0.468	0.816	0.798	0.780	0.763	0.734	0.700
8.25R20	0.470	0.820	0.801	0.783	0.766	0.737	0.703
9R22.5	0.470	0.820	0.801	0.783	0.766	0.737	0.703
265/75R22.5	0.474	0.827	0.808	0.790	0.773	0.743	0.709
295/70R22.5	0.479	0.836	0.817	0.798	0.781	0.751	0.716
9.00-20	0.490	0.855	0.835	0.817	0.799	0.768	0.733
275/80R22.5	0.491	0.857	0.837	0.818	0.801	0.770	0.734
9.00R20	0.492	0.858	0.839	0.820	0.802	0.771	0.736
10R22.5	0.492	0.858	0.839	0.820	0.802	0.771	0.736
295/75R22.5	0.493	0.860	0.840	0.822	0.804	0.773	0.737
295/80R22.5	0.505	0.881	0.861	0.842	0.823	0.792	0.755
10.00-20	0.506	0.883	0.863	0.843	0.825	0.793	0.757
11.1-20	0.506	0.883	0.863	0.843	0.825	0.793	0.757
10.00R20	0.508	0.886	0.866	0.847	0.828	0.797	0.759
11.1R20	0.508	0.886	0.866	0.847	0.828	0.797	0.759
11R22.5	0.508	0.886	0.866	0.847	0.828	0.797	0.759
11.00-20	0.520	0.907	0.886	0.867	0.848	0.815	0.777
315/80R22.5	0.520	0.907	0.886	0.867	0.848	0.815	0.777
11.00R20	0.523	0.912	0.892	0.872	0.853	0.820	0.782
12R22.5	0.523	0.912	0.892	0.872	0.853	0.820	0.782

SHTS12Z160100151

LJ06, MF06 TRANSMISSION SERIES FOR AUSTRALIA, HONG KONG, IRELAND

PULSE TYPE M9, SPEEDOMETER CORRECTION RATE 0.960

(Apply to vehicles produced for Australia after June, 2007)

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	3.363	3.636	3.900	4.100	4.300	4.333	4.555	4.625
225/60R17.5									
215/70R17.5									
195/80R17.5									
215/75R17.5	0.383	1.220	1.129	1.052	1.001	0.954	0.947	0.901	0.887
205/80R17.5									
235/70R17.5									
7.50-16									
7.50R16									
235/75R17.5	0.398	1.268	1.173	1.094	1.040	0.992	0.984	0.936	0.922
225/80R17.5									
225/70R19.5									
8.25-16									
245/80R17.5									
245/70R19.5	0.418	1.332	1.232	1.149	1.092	1.042	1.034	0.983	0.968
9.5R17.5	0.420	1.338	1.238	1.154	1.098	1.047	1.039	0.988	0.973
8.25R16	0.430	1.370	1.267	1.182	1.124	1.072	1.063	1.012	0.996
225/90R17.5									
9.00-16									
265/70R19.5	0.432	1.377	1.273	1.187	1.129	1.077	1.068	1.016	1.001
7.50-18									
7.50R18									
9R19.5									
265/60R22.5									
235/70R22.5									
7.50-20									
285/60R22.5									
7.50R20									
255/70R22.5	0.463	1.475	1.365	1.272	1.210	1.154	1.145	1.089	1.073
275/70R22.5	0.477	1.520	1.406	1.311	1.247	1.189	1.180	1.122	1.105
11/70R22.5									
8.25-20									
8.25R20									
9R22.5									
265/75R22.5									
295/70R22.5									
9.00-20									
9.00R20	0.505	1.609	1.488	1.388	1.320	1.259	1.249	1.188	1.170
275/80R22.5	0.505	1.609	1.488	1.388	1.320	1.259	1.249	1.188	1.170
10R22.5	0.509	1.622	1.500	1.399	1.330	1.269	1.259	1.197	1.179
295/75R22.5									
295/80R22.5	0.521	1.660	1.536	1.432	1.362	1.298	1.289	1.226	1.207
10.00-20	0.524	1.670	1.545	1.440	1.370	1.306	1.296	1.233	1.214
11R22.5	0.525	1.673	1.547	1.443	1.372	1.308	1.298	1.235	1.216
11.1-20									
10.00R20	0.526	1.676	1.550	1.445	1.375	1.311	1.301	1.237	1.219
11.1R20									
11.00-20	0.539	1.718	1.589	1.481	1.409	1.343	1.333	1.268	1.249
315/80R22.5									
11.00R20	0.542	1.727	1.598	1.489	1.417	1.351	1.341	1.275	1.256
12R22.5									

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		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	4.875	5.125	5.142	5.250	5.285	5.428	5.571	5.857
225/60R17.5									
215/70R17.5									
195/80R17.5									
215/75R17.5	0.383	0.842	0.801	0.798	0.782	0.776	0.756	0.737	0.701
205/80R17.5									
235/70R17.5									
7.50-16									
7.50R16									
235/75R17.5	0.398	0.875	0.832	0.829	0.812	0.807	0.786	0.765	0.728
225/80R17.5									
225/70R19.5									
8.25-16									
245/80R17.5									
245/70R19.5	0.418	0.919	0.874	0.871	0.853	0.847	0.825	0.804	0.765
9.5R17.5	0.420	0.923	0.878	0.875	0.857	0.851	0.829	0.808	0.768
8.25R16	0.430	0.945	0.899	0.896	0.878	0.872	0.849	0.827	0.787
225/90R17.5									
9.00-16									
265/70R19.5	0.432	0.950	0.903	0.900	0.882	0.876	0.853	0.831	0.790
7.50-18									
7.50R18									
9R19.5									
265/60R22.5									
235/70R22.5									
7.50-20									
285/60R22.5									
7.50R20									
255/70R22.5	0.463	1.018	0.968	0.965	0.945	0.939	0.914	0.890	0.847
275/70R22.5	0.477	1.048	0.997	0.994	0.974	0.967	0.942	0.917	0.873
11/70R22.5									
8.25-20									
8.25R20									
9R22.5									
265/75R22.5									
295/70R22.5									
9.00-20									
9.00R20	0.505	1.110	1.056	1.052	1.031	1.024	0.997	0.971	0.924
275/80R22.5	0.505	1.110	1.056	1.052	1.031	1.024	0.997	0.971	0.924
10R22.5	0.509	1.119	1.064	1.061	1.039	1.032	1.005	0.979	0.931
295/75R22.5									
295/80R22.5	0.521	1.145	1.089	1.086	1.063	1.056	1.029	1.002	0.953
10.00-20	0.524	1.152	1.096	1.092	1.070	1.062	1.034	1.008	0.959
11R22.5	0.525	1.154	1.098	1.094	1.072	1.064	1.036	1.010	0.960
11.1-20									
10.00R20	0.526	1.156	1.100	1.096	1.074	1.066	1.038	1.012	0.962
11.1R20									
11.00-20	0.539	1.185	1.127	1.123	1.100	1.093	1.064	1.037	0.986
315/80R22.5									
11.00R20	0.542	1.191	1.133	1.130	1.106	1.099	1.070	1.043	0.992
12R22.5									

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		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS (m)	**6.142**	**6.285**	**6.428**	**6.571**	**6.833**	**7.166**
225/60R17.5							
215/70R17.5							
195/80R17.5							
215/75R17.5	0.383	**0.668**	**0.653**	**0.638**	**0.624**	**0.600**	**0.572**
205/80R17.5							
235/70R17.5							
7.50-16							
7.50R16							
235/75R17.5	0.398	**0.694**	**0.678**	**0.663**	**0.649**	**0.624**	**0.595**
225/80R17.5							
225/70R19.5							
8.25-16							
245/80R17.5							
245/70R19.5	0.418	**0.729**	**0.713**	**0.697**	**0.681**	**0.655**	**0.625**
9.5R17.5	0.420	**0.733**	**0.716**	**0.700**	**0.685**	**0.658**	**0.628**
8.25R16	0.430	**0.750**	**0.733**	**0.717**	**0.701**	**0.674**	**0.643**
225/90R17.5							
9.00-16							
265/70R19.5	0.432	**0.754**	**0.736**	**0.720**	**0.704**	**0.677**	**0.646**
7.50-18							
7.50R18							
9R19.5							
265/60R22.5							
235/70R22.5							
7.50-20							
285/60R22.5							
7.50R20							
255/70R22.5	0.463	**0.808**	**0.789**	**0.772**	**0.755**	**0.726**	**0.692**
275/70R22.5	0.477	**0.832**	**0.813**	**0.795**	**0.778**	**0.748**	**0.713**
11/70R22.5							
8.25-20							
8.25R20							
9R22.5							
265/75R22.5							
295/70R22.5							
9.00-20							
9.00R20	0.505	**0.881**	**0.861**	**0.842**	**0.823**	**0.792**	**0.755**
275/80R22.5	0.505	**0.881**	**0.861**	**0.842**	**0.823**	**0.792**	**0.755**
10R22.5	0.509	**0.888**	**0.868**	**0.848**	**0.830**	**0.798**	**0.761**
295/75R22.5							
295/80R22.5	0.521	**0.909**	**0.888**	**0.868**	**0.850**	**0.817**	**0.779**
10.00-20	0.524	**0.914**	**0.893**	**0.873**	**0.854**	**0.822**	**0.783**
11R22.5	0.525	**0.916**	**0.895**	**0.875**	**0.856**	**0.823**	**0.785**
11.1-20							
10.00R20	0.526	**0.918**	**0.897**	**0.877**	**0.858**	**0.825**	**0.786**
11.1R20							
11.00-20	0.539	**0.940**	**0.919**	**0.898**	**0.879**	**0.845**	**0.806**
315/80R22.5							
11.00R20	0.542	**0.946**	**0.924**	**0.903**	**0.884**	**0.850**	**0.810**
12R22.5							

SHTS12Z160100154

LJ06, MF06 TRANSMISSION SERIES FOR AUSTRALIA

PULSE TYPE M7, SPEEDOMETER CORRECTION RATE 0.980

(Apply to vehicles produced for before May, 2007)

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	3.363	3.636	3.900	4.100	4.300	4.333	4.555	4.625
225/60R17.5	0.349	1.089	1.008	0.939	0.893	0.852	0.845	0.804	0.792
215/70R17.5	0.364	1.136	1.051	0.980	0.932	0.888	0.882	0.839	0.826
195/80R17.5	0.367	1.146	1.060	0.988	0.940	0.896	0.889	0.846	0.833
205/80R17.5	0.374	1.167	1.080	1.007	0.957	0.913	0.906	0.862	0.849
235/70R17.5	0.376	1.174	1.086	1.012	0.963	0.918	0.911	0.866	0.853
7.50-16	0.383	1.196	1.106	1.031	0.981	0.935	0.928	0.883	0.869
7.50R16	0.387	1.208	1.117	1.042	0.991	0.945	0.937	0.892	0.878
235/75R17.5	0.387	1.208	1.117	1.042	0.991	0.945	0.937	0.892	0.878
225/80R17.5	0.389	1.214	1.123	1.047	0.996	0.950	0.942	0.896	0.883
225/70R19.5	0.395	1.233	1.140	1.063	1.011	0.964	0.957	0.910	0.896
8.25-16	0.404	1.261	1.166	1.087	1.034	0.986	0.979	0.931	0.917
245/70R19.5	0.407	1.270	1.175	1.095	1.042	0.994	0.986	0.938	0.924
8.25R16	0.409	1.277	1.181	1.101	1.047	0.998	0.991	0.942	0.928
9.5R17.5	0.409	1.277	1.181	1.101	1.047	0.998	0.991	0.942	0.928
225/90R17.5	0.410	1.280	1.184	1.104	1.050	1.001	0.993	0.945	0.930
9.00-16	0.420	1.311	1.213	1.130	1.075	1.025	1.017	0.968	0.953
265/70R19.5	0.421	1.314	1.215	1.133	1.078	1.028	1.020	0.970	0.955
7.50-18	0.423	1.320	1.221	1.139	1.083	1.033	1.025	0.975	0.960
7.50R18	0.426	1.330	1.230	1.147	1.091	1.040	1.032	0.982	0.967
9R19.5	0.433	1.352	1.250	1.165	1.109	1.057	1.049	0.998	0.983
265/60R22.5	0.438	1.367	1.265	1.179	1.121	1.069	1.061	1.009	0.994
235/70R22.5	0.440	1.374	1.270	1.184	1.127	1.074	1.066	1.014	0.999
7.50-20	0.448	1.399	1.293	1.206	1.147	1.094	1.085	1.032	1.017
285/60R22.5	0.450	1.405	1.299	1.211	1.152	1.099	1.090	1.037	1.021
7.50R20	0.452	1.411	1.305	1.217	1.157	1.103	1.095	1.042	1.026
255/70R22.5	0.453	1.414	1.308	1.219	1.160	1.106	1.097	1.044	1.028
275/70R22.5	0.465	1.452	1.343	1.252	1.191	1.135	1.127	1.072	1.055
11/70R22.5	0.468	1.461	1.351	1.260	1.198	1.142	1.134	1.079	1.062
8.25-20	0.468	1.461	1.351	1.260	1.198	1.142	1.134	1.079	1.062
8.25R20	0.470	1.467	1.357	1.265	1.203	1.147	1.139	1.083	1.067
9R22.5	0.470	1.467	1.357	1.265	1.203	1.147	1.139	1.083	1.067
265/75R22.5	0.474	1.480	1.369	1.276	1.214	1.157	1.148	1.092	1.076
295/70R22.5	0.479	1.495	1.383	1.289	1.226	1.169	1.160	1.104	1.087
9.00-20	0.490	1.530	1.415	1.319	1.255	1.196	1.187	1.129	1.112
275/80R22.5	0.491	1.533	1.418	1.322	1.257	1.199	1.190	1.132	1.114
9.00R20	0.492	1.536	1.421	1.324	1.260	1.201	1.192	1.134	1.117
10R22.5	0.492	1.536	1.421	1.324	1.260	1.201	1.192	1.134	1.117
295/75R22.5	0.493	1.539	1.423	1.327	1.262	1.204	1.194	1.136	1.119
295/80R22.5	0.505	1.577	1.458	1.359	1.293	1.233	1.223	1.164	1.146
10.00-20	0.506	1.580	1.461	1.362	1.296	1.235	1.226	1.166	1.148
11.1-20	0.506	1.580	1.461	1.362	1.296	1.235	1.226	1.166	1.148
10.00R20	0.508	1.586	1.467	1.367	1.301	1.240	1.231	1.171	1.153
11.1R20	0.508	1.586	1.467	1.367	1.301	1.240	1.231	1.171	1.153
11R22.5	0.508	1.586	1.467	1.367	1.301	1.240	1.231	1.171	1.153
11.00-20	0.520	1.623	1.501	1.400	1.331	1.269	1.260	1.198	1.180
315/80R22.5	0.520	1.623	1.501	1.400	1.331	1.269	1.260	1.198	1.180
11.00R20	0.523	1.633	1.510	1.408	1.339	1.277	1.267	1.205	1.187
12R22.5	0.523	1.633	1.510	1.408	1.339	1.277	1.267	1.205	1.187

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		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	**4.875**	**5.125**	**5.142**	**5.250**	**5.285**	**5.428**	**5.571**	**5.857**
225/60R17.5	0.349	**0.751**	**0.715**	**0.712**	**0.698**	**0.693**	**0.675**	**0.657**	**0.625**
215/70R17.5	0.364	**0.784**	**0.745**	**0.743**	**0.728**	**0.723**	**0.704**	**0.686**	**0.652**
195/80R17.5	0.367	**0.790**	**0.752**	**0.749**	**0.734**	**0.729**	**0.710**	**0.691**	**0.658**
205/80R17.5	0.374	**0.805**	**0.766**	**0.763**	**0.748**	**0.743**	**0.723**	**0.705**	**0.670**
235/70R17.5	0.376	**0.809**	**0.770**	**0.767**	**0.752**	**0.747**	**0.727**	**0.708**	**0.674**
7.50-16	0.383	**0.825**	**0.784**	**0.782**	**0.766**	**0.761**	**0.741**	**0.721**	**0.686**
7.50R16	0.387	**0.833**	**0.793**	**0.790**	**0.774**	**0.769**	**0.748**	**0.729**	**0.693**
235/75R17.5	0.387	**0.833**	**0.793**	**0.790**	**0.774**	**0.769**	**0.748**	**0.729**	**0.693**
225/80R17.5	0.389	**0.837**	**0.797**	**0.794**	**0.778**	**0.772**	**0.752**	**0.733**	**0.697**
225/70R19.5	0.395	**0.850**	**0.809**	**0.806**	**0.790**	**0.784**	**0.764**	**0.744**	**0.708**
8.25-16	0.404	**0.870**	**0.827**	**0.825**	**0.808**	**0.802**	**0.781**	**0.761**	**0.724**
245/70R19.5	0.407	**0.876**	**0.834**	**0.831**	**0.814**	**0.808**	**0.787**	**0.767**	**0.729**
8.25R16	0.409	**0.881**	**0.838**	**0.835**	**0.818**	**0.812**	**0.791**	**0.771**	**0.733**
9.5R17.5	0.409	**0.881**	**0.838**	**0.835**	**0.818**	**0.812**	**0.791**	**0.771**	**0.733**
225/90R17.5	0.410	**0.883**	**0.840**	**0.837**	**0.820**	**0.814**	**0.793**	**0.772**	**0.735**
9.00-16	0.420	**0.904**	**0.860**	**0.857**	**0.840**	**0.834**	**0.812**	**0.791**	**0.753**
265/70R19.5	0.421	**0.906**	**0.862**	**0.859**	**0.842**	**0.836**	**0.814**	**0.793**	**0.754**
7.50-18	0.423	**0.911**	**0.866**	**0.863**	**0.846**	**0.840**	**0.818**	**0.797**	**0.758**
7.50R18	0.426	**0.917**	**0.872**	**0.870**	**0.852**	**0.846**	**0.824**	**0.803**	**0.763**
9R19.5	0.433	**0.932**	**0.887**	**0.884**	**0.866**	**0.860**	**0.837**	**0.816**	**0.776**
265/60R22.5	0.438	**0.943**	**0.897**	**0.894**	**0.876**	**0.870**	**0.847**	**0.825**	**0.785**
235/70R22.5	0.440	**0.947**	**0.901**	**0.898**	**0.880**	**0.874**	**0.851**	**0.829**	**0.788**
7.50-20	0.448	**0.965**	**0.918**	**0.914**	**0.896**	**0.890**	**0.866**	**0.844**	**0.803**
285/60R22.5	0.450	**0.969**	**0.922**	**0.919**	**0.900**	**0.894**	**0.870**	**0.848**	**0.806**
7.50R20	0.452	**0.973**	**0.926**	**0.923**	**0.904**	**0.898**	**0.874**	**0.852**	**0.810**
255/70R22.5	0.453	**0.975**	**0.928**	**0.925**	**0.906**	**0.900**	**0.876**	**0.853**	**0.812**
275/70R22.5	0.465	**1.001**	**0.952**	**0.949**	**0.930**	**0.924**	**0.899**	**0.876**	**0.833**
11/70R22.5	0.468	**1.008**	**0.959**	**0.955**	**0.936**	**0.929**	**0.905**	**0.882**	**0.839**
8.25-20	0.468	**1.008**	**0.959**	**0.955**	**0.936**	**0.929**	**0.905**	**0.882**	**0.839**
8.25R20	0.470	**1.012**	**0.963**	**0.959**	**0.940**	**0.933**	**0.909**	**0.885**	**0.842**
9R22.5	0.470	**1.012**	**0.963**	**0.959**	**0.940**	**0.933**	**0.909**	**0.885**	**0.842**
265/75R22.5	0.474	**1.021**	**0.971**	**0.968**	**0.948**	**0.941**	**0.917**	**0.893**	**0.849**
295/70R22.5	0.479	**1.031**	**0.981**	**0.978**	**0.958**	**0.951**	**0.926**	**0.902**	**0.858**
9.00-20	0.490	**1.055**	**1.004**	**1.000**	**0.980**	**0.973**	**0.948**	**0.923**	**0.878**
275/80R22.5	0.491	**1.057**	**1.006**	**1.002**	**0.982**	**0.975**	**0.949**	**0.925**	**0.880**
9.00R20	0.492	**1.059**	**1.008**	**1.004**	**0.984**	**0.977**	**0.951**	**0.927**	**0.882**
10R22.5	0.492	**1.059**	**1.008**	**1.004**	**0.984**	**0.977**	**0.951**	**0.927**	**0.882**
295/75R22.5	0.493	**1.062**	**1.010**	**1.006**	**0.986**	**0.979**	**0.953**	**0.929**	**0.883**
295/80R22.5	0.505	**1.087**	**1.034**	**1.031**	**1.010**	**1.003**	**0.977**	**0.951**	**0.905**
10.00-20	0.506	**1.090**	**1.036**	**1.033**	**1.012**	**1.005**	**0.978**	**0.953**	**0.907**
11.1-20	0.506	**1.090**	**1.036**	**1.033**	**1.012**	**1.005**	**0.978**	**0.953**	**0.907**
10.00R20	0.508	**1.094**	**1.040**	**1.037**	**1.016**	**1.009**	**0.982**	**0.957**	**0.910**
11.1R20	0.508	**1.094**	**1.040**	**1.037**	**1.016**	**1.009**	**0.982**	**0.957**	**0.910**
11R22.5	0.508	**1.094**	**1.040**	**1.037**	**1.016**	**1.009**	**0.982**	**0.957**	**0.910**
11.00-20	0.520	**1.120**	**1.065**	**1.062**	**1.040**	**1.033**	**1.006**	**0.980**	**0.932**
315/80R22.5	0.520	**1.120**	**1.065**	**1.062**	**1.040**	**1.033**	**1.006**	**0.980**	**0.932**
11.00R20	0.523	**1.126**	**1.071**	**1.068**	**1.046**	**1.039**	**1.011**	**0.985**	**0.937**
12R22.5	0.523	**1.126**	**1.071**	**1.068**	**1.046**	**1.039**	**1.011**	**0.985**	**0.937**

SHTS12Z160100156

		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS (m)	**6.142**	**6.285**	**6.428**	**6.571**	**6.833**	**7.166**
225/60R17.5	0.349	**0.596**	**0.583**	**0.570**	**0.557**	**0.536**	**0.511**
215/70R17.5	0.364	**0.622**	**0.608**	**0.594**	**0.581**	**0.559**	**0.533**
195/80R17.5	0.367	**0.627**	**0.613**	**0.599**	**0.586**	**0.564**	**0.537**
205/80R17.5	0.374	**0.639**	**0.624**	**0.611**	**0.597**	**0.574**	**0.548**
235/70R17.5	0.376	**0.642**	**0.628**	**0.614**	**0.600**	**0.577**	**0.551**
7.50-16	0.383	**0.654**	**0.639**	**0.625**	**0.612**	**0.588**	**0.561**
7.50R16	0.387	**0.661**	**0.646**	**0.632**	**0.618**	**0.594**	**0.567**
235/75R17.5	0.387	**0.661**	**0.646**	**0.632**	**0.618**	**0.594**	**0.567**
225/80R17.5	0.389	**0.665**	**0.649**	**0.635**	**0.621**	**0.597**	**0.570**
225/70R19.5	0.395	**0.675**	**0.660**	**0.645**	**0.631**	**0.607**	**0.578**
8.25-16	0.404	**0.690**	**0.675**	**0.660**	**0.645**	**0.620**	**0.592**
245/70R19.5	0.407	**0.695**	**0.680**	**0.664**	**0.650**	**0.625**	**0.596**
8.25R16	0.409	**0.699**	**0.683**	**0.668**	**0.653**	**0.628**	**0.599**
9.5R17.5	0.409	**0.699**	**0.683**	**0.668**	**0.653**	**0.628**	**0.599**
225/90R17.5	0.410	**0.701**	**0.685**	**0.669**	**0.655**	**0.630**	**0.600**
9.00-16	0.420	**0.718**	**0.701**	**0.686**	**0.671**	**0.645**	**0.615**
265/70R19.5	0.421	**0.719**	**0.703**	**0.687**	**0.672**	**0.647**	**0.616**
7.50-18	0.423	**0.723**	**0.706**	**0.691**	**0.676**	**0.650**	**0.619**
7.50R18	0.426	**0.728**	**0.711**	**0.695**	**0.680**	**0.654**	**0.624**
9R19.5	0.433	**0.740**	**0.723**	**0.707**	**0.692**	**0.665**	**0.634**
265/60R22.5	0.438	**0.748**	**0.731**	**0.715**	**0.700**	**0.673**	**0.641**
235/70R22.5	0.440	**0.752**	**0.735**	**0.718**	**0.703**	**0.676**	**0.644**
7.50-20	0.448	**0.766**	**0.748**	**0.731**	**0.716**	**0.688**	**0.656**
285/60R22.5	0.450	**0.769**	**0.751**	**0.735**	**0.719**	**0.691**	**0.659**
7.50R20	0.452	**0.772**	**0.755**	**0.738**	**0.722**	**0.694**	**0.662**
255/70R22.5	0.453	**0.774**	**0.756**	**0.740**	**0.723**	**0.696**	**0.663**
275/70R22.5	0.465	**0.795**	**0.776**	**0.759**	**0.743**	**0.714**	**0.681**
11/70R22.5	0.468	**0.800**	**0.782**	**0.764**	**0.747**	**0.719**	**0.685**
8.25-20	0.468	**0.800**	**0.782**	**0.764**	**0.747**	**0.719**	**0.685**
8.25R20	0.470	**0.803**	**0.785**	**0.767**	**0.751**	**0.722**	**0.688**
9R22.5	0.470	**0.803**	**0.785**	**0.767**	**0.751**	**0.722**	**0.688**
265/75R22.5	0.474	**0.810**	**0.792**	**0.774**	**0.757**	**0.728**	**0.694**
295/70R22.5	0.479	**0.819**	**0.800**	**0.782**	**0.765**	**0.736**	**0.701**
9.00-20	0.490	**0.837**	**0.818**	**0.800**	**0.783**	**0.753**	**0.718**
275/80R22.5	0.491	**0.839**	**0.820**	**0.802**	**0.784**	**0.754**	**0.719**
9.00R20	0.492	**0.841**	**0.822**	**0.803**	**0.786**	**0.756**	**0.721**
10R22.5	0.492	**0.841**	**0.822**	**0.803**	**0.786**	**0.756**	**0.721**
295/75R22.5	0.493	**0.842**	**0.823**	**0.805**	**0.787**	**0.757**	**0.722**
295/80R22.5	0.505	**0.863**	**0.843**	**0.825**	**0.807**	**0.776**	**0.740**
10.00-20	0.506	**0.865**	**0.845**	**0.826**	**0.808**	**0.777**	**0.741**
11.1-20	0.506	**0.865**	**0.845**	**0.826**	**0.808**	**0.777**	**0.741**
10.00R20	0.508	**0.868**	**0.848**	**0.829**	**0.811**	**0.780**	**0.744**
11.1R20	0.508	**0.868**	**0.848**	**0.829**	**0.811**	**0.780**	**0.744**
11R22.5	0.508	**0.868**	**0.848**	**0.829**	**0.811**	**0.780**	**0.744**
11.00-20	0.520	**0.889**	**0.868**	**0.849**	**0.831**	**0.799**	**0.762**
315/80R22.5	0.520	**0.889**	**0.868**	**0.849**	**0.831**	**0.799**	**0.762**
11.00R20	0.523	**0.894**	**0.873**	**0.854**	**0.835**	**0.803**	**0.766**
12R22.5	0.523	**0.894**	**0.873**	**0.854**	**0.835**	**0.803**	**0.766**

SHTS12Z160100157

HK06 TRANSMISSION SERIES FOR VIETNAM

PULSE TYPE K1, SPEEDOMETER CORRECTION RATE 0.960

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	*3.636*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*	*4.875*
215/70R17.5	0.364	1.073	1.000	0.951	0.907	0.900	0.856	0.843	0.800
195/80R17.5	0.367	1.082	1.008	0.959	0.914	0.908	0.863	0.850	0.807
205/80R17.5	0.374	1.102	1.028	0.977	0.932	0.925	0.880	0.866	0.822
235/70R17.5	0.376	1.108	1.033	0.983	0.937	0.930	0.884	0.871	0.826
7.50-16	0.383	1.129	1.052	1.001	0.954	0.947	0.901	0.887	0.842
7.50R16	0.387	1.141	1.063	1.011	0.964	0.957	0.910	0.897	0.851
225/80R17.5	0.389	1.146	1.069	1.017	0.969	0.962	0.915	0.901	0.855
225/70R19.5	0.395	1.164	1.085	1.032	0.984	0.977	0.929	0.915	0.868
8.25-16	0.404	1.191	1.110	1.056	1.007	0.999	0.950	0.936	0.888
245/70R19.5	0.407	1.200	1.118	1.064	1.014	1.006	0.957	0.943	0.895
8.25R16	0.409	1.205	1.124	1.069	1.019	1.011	0.962	0.948	0.899
225/90R17.5	0.410	1.208	1.127	1.072	1.022	1.014	0.964	0.950	0.901
9.00-16	0.420	1.238	1.154	1.098	1.047	1.039	0.988	0.973	0.923
265/70R19.5	0.421	1.241	1.157	1.100	1.049	1.041	0.990	0.975	0.925
7.50-18	0.423	1.247	1.162	1.106	1.054	1.046	0.995	0.980	0.930
7.50R18	0.426	1.256	1.171	1.113	1.062	1.054	1.002	0.987	0.936
265/60R22.5	0.438	1.291	1.204	1.145	1.092	1.083	1.030	1.015	0.963
235/70R22.5	0.440	1.297	1.209	1.150	1.097	1.088	1.035	1.019	0.967
7.50-20	0.448	1.320	1.231	1.171	1.116	1.108	1.054	1.038	0.985
285/60R22.5	0.450		1.237	1.176	1.121	1.113	1.059	1.043	0.989
7.50R20	0.452		1.242	1.181	1.126	1.118	1.063	1.047	0.993
255/70R22.5	0.453		1.245	1.184	1.129	1.120	1.066	1.050	0.996
275/70R22.5	0.465		1.278	1.215	1.159	1.150	1.094	1.077	1.022
11/70R22.5	0.468		1.286	1.223	1.166	1.157	1.101	1.084	1.029
8.25-20	0.468		1.286	1.223	1.166	1.157	1.101	1.084	1.029
8.25R20	0.470		1.291	1.228	1.171	1.162	1.106	1.089	1.033
9R22.5	0.470		1.291	1.228	1.171	1.162	1.106	1.089	1.033
295/70R22.5	0.479		1.316	1.252	1.194	1.185	1.127	1.110	1.053
9.00-20	0.490			1.281	1.221	1.212	1.153	1.135	1.077
275/80R22.5	0.491			1.283	1.224	1.214	1.155	1.138	1.079
10R22.5	0.492			1.286	1.226	1.217	1.157	1.140	1.081
9.00R20	0.492			1.286	1.226	1.217	1.157	1.140	1.081
295/75R22.5	0.493			1.289	1.229	1.219	1.160	1.142	1.084
295/80R22.5	0.505				1.259	1.249	1.188	1.170	1.110
10.00-20	0.506				1.261	1.251	1.190	1.172	1.112
11.1-20	0.506				1.261	1.251	1.190	1.172	1.112
10.00R20	0.508				1.266	1.256	1.195	1.177	1.117
11.1R20	0.508				1.266	1.256	1.195	1.177	1.117
11R22.5	0.508				1.266	1.256	1.195	1.177	1.117
11.00-20	0.520				1.296	1.286	1.223	1.205	1.143
315/80R22.5	0.520				1.296	1.286	1.223	1.205	1.143
11.00R20	0.523				1.303	1.294	1.230	1.212	1.150
12R22.5	0.523				1.303	1.294	1.230	1.212	1.150
12.00-20	0.539						1.268	1.249	1.185
12.00R20	0.542						1.275	1.256	1.191
12.00-24	0.593								1.304
12.00R24	0.594								1.306

SHTS12Z160100158

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS (m)	5.250	5.285	5.428	5.857	6.142	6.428	6.833	7.166
215/70R17.5	0.364								
195/80R17.5	0.367								
205/80R17.5	0.374	0.763	0.758						
235/70R17.5	0.376	0.767	0.762						
7.50-16	0.383	0.782	0.776	0.756					
7.50R16	0.387	0.790	0.785	0.764					
225/80R17.5	0.389	0.794	0.789	0.768					
225/70R19.5	0.395	0.806	0.801	0.780					
8.25-16	0.404	0.824	0.819	0.797					
245/70R19.5	0.407	0.831	0.825	0.803					
8.25R16	0.409	0.835	0.829	0.807					
225/90R17.5	0.410	0.837	0.831	0.809	0.750				
9.00-16	0.420	0.857	0.851	0.829	0.768				
265/70R19.5	0.421	0.859	0.854	0.831	0.770				
7.50-18	0.423	0.863	0.858	0.835	0.774				
7.50R18	0.426	0.869	0.864	0.841	0.779				
265/60R22.5	0.438	0.894	0.888	0.865	0.801	0.764			
235/70R22.5	0.440	0.898	0.892	0.869	0.805	0.768			
7.50-20	0.448	0.914	0.908	0.884	0.820	0.781			
285/60R22.5	0.450	0.918	0.912	0.888	0.823	0.785	0.750		
7.50R20	0.452	0.922	0.916	0.892	0.827	0.788	0.753		
255/70R22.5	0.453	0.925	0.918	0.894	0.829	0.790	0.755		
275/70R22.5	0.465	0.949	0.943	0.918	0.851	0.811	0.775		
11/70R22.5	0.468	0.955	0.949	0.924	0.856	0.816	0.780		
8.25-20	0.468	0.955	0.949	0.924	0.856	0.816	0.780		
8.25R20	0.470	0.959	0.953	0.928	0.860	0.820	0.783		
9R22.5	0.470	0.959	0.953	0.928	0.860	0.820	0.783		
295/70R22.5	0.479	0.978	0.971	0.946	0.876	0.836	0.798	0.751	
9.00-20	0.490	1.000	0.993	0.967	0.896	0.855	0.817	0.768	
275/80R22.5	0.491	1.002	0.995	0.969	0.898	0.857	0.818	0.770	
10R22.5	0.492	1.004	0.998	0.971	0.900	0.858	0.820	0.771	
9.00R20	0.492	1.004	0.998	0.971	0.900	0.858	0.820	0.771	
295/75R22.5	0.493	1.006	1.000	0.973	0.902	0.860	0.822	0.773	
295/80R22.5	0.505	1.031	1.024	0.997	0.924	0.881	0.842	0.792	0.755
10.00-20	0.506	1.033	1.026	0.999	0.926	0.883	0.843	0.793	0.757
11.1-20	0.506	1.033	1.026	0.999	0.926	0.883	0.843	0.793	0.757
10.00R20	0.508	1.037	1.030	1.003	0.929	0.886	0.847	0.797	0.759
11.1R20	0.508	1.037	1.030	1.003	0.929	0.886	0.847	0.797	0.759
11R22.5	0.508	1.037	1.030	1.003	0.929	0.886	0.847	0.797	0.759
11.00-20	0.520	1.061	1.054	1.027	0.951	0.907	0.867	0.815	0.777
315/80R22.5	0.520	1.061	1.054	1.027	0.951	0.907	0.867	0.815	0.777
11.00R20	0.523	1.067	1.060	1.032	0.957	0.912	0.872	0.820	0.782
12R22.5	0.523	1.067	1.060	1.032	0.957	0.912	0.872	0.820	0.782
12.00-20	0.539	1.100	1.093	1.064	0.986	0.940	0.898	0.845	0.806
12.00R20	0.542	1.106	1.099	1.070	0.992	0.946	0.903	0.850	0.810
12.00-24	0.593	1.210	1.202	1.171	1.085	1.035	0.989	0.930	0.887
12.00R24	0.594	1.212	1.204	1.173	1.087	1.036	0.990	0.931	0.888

SHTS12Z160100159

EATON, FULLER TRANSMISSION SERIES FOR CHILE, INDONESIA, NEW ZEALAND, MEXICO, TAIWAN, VIETNAM

PULSE TYPE E1, SPEEDOMETER CORRECTION RATE 0.960

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	*3.636*	*3.727*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*	*4.875*
7.50-16	0.383	1.024	0.999	0.955	0.908	0.866	0.859	0.817	0.805	0.764
7.50R16	0.387	1.035	1.010	0.965	0.918	0.875	0.868	0.826	0.813	0.772
235/75R17.5	0.387	1.035	1.010	0.965	0.918	0.875	0.868	0.826	0.813	0.772
225/80R17.5	0.389	1.040	1.015	0.970	0.922	0.880	0.873	0.830	0.818	0.776
225/70R19.5	0.395	1.056	1.031	0.985	0.937	0.893	0.886	0.843	0.830	0.788
8.25-16	0.404	1.080	1.054	1.007	0.958	0.913	0.907	0.862	0.849	0.806
245/70R19.5	0.407	1.088	1.062	1.015	0.965	0.920	0.913	0.869	0.856	0.812
8.25R16	0.409	1.094	1.067	1.020	0.970	0.925	0.918	0.873	0.860	0.816
9.5R17.5	0.409	1.094	1.067	1.020	0.970	0.925	0.918	0.873	0.860	0.816
225/90R17.5	0.410	1.096	1.070	1.022	0.972	0.927	0.920	0.875	0.862	0.818
9.00-16	0.420	1.123	1.096	1.047	0.996	0.950	0.942	0.896	0.883	0.838
265/70R19.5	0.421	1.126	1.098	1.050	0.998	0.952	0.945	0.899	0.885	0.840
7.50-18	0.423	1.131	1.104	1.055	1.003	0.956	0.949	0.903	0.889	0.844
7.50R18	0.426	1.139	1.111	1.062	1.010	0.963	0.956	0.909	0.896	0.850
9R19.5	0.433	1.158	1.130	1.080	1.027	0.979	0.972	0.924	0.910	0.864
265/60R22.5	0.438	1.171	1.143	1.092	1.039	0.990	0.983	0.935	0.921	0.874
235/70R22.5	0.440	1.177	1.148	1.097	1.043	0.995	0.987	0.939	0.925	0.878
7.50-20	0.448	1.198	1.169	1.117	1.062	1.013	1.005	0.956	0.942	0.893
285/60R22.5	0.450	1.203	1.174	1.122	1.067	1.018	1.010	0.961	0.946	0.897
7.50R20	0.452	1.209	1.179	1.127	1.072	1.022	1.014	0.965	0.950	0.901
255/70R22.5	0.453	1.211	1.182	1.129	1.074	1.024	1.017	0.967	0.952	0.903
275/70R22.5	0.465	1.244	1.213	1.159	1.103	1.051	1.043	0.993	0.978	0.927
11/70R22.5	0.468	1.252	1.221	1.167	1.110	1.058	1.050	0.999	0.984	0.933
8.25-20	0.468	1.252	1.221	1.167	1.110	1.058	1.050	0.999	0.984	0.933
8.25R20	0.470	1.257	1.226	1.172	1.115	1.063	1.055	1.003	0.988	0.937
9R22.5	0.470	1.257	1.226	1.172	1.115	1.063	1.055	1.003	0.988	0.937
265/75R22.5	0.474	1.268	1.237	1.182	1.124	1.072	1.064	1.012	0.996	0.945
295/70R22.5	0.479	1.281	1.250	1.194	1.136	1.083	1.075	1.022	1.007	0.955
9.00-20	0.490	1.310	1.278	1.222	1.162	1.108	1.100	1.046	1.030	0.977
275/80R22.5	0.491	1.313	1.281	1.224	1.164	1.110	1.102	1.048	1.032	0.979
9.00R20	0.492	1.316	1.284	1.227	1.167	1.113	1.104	1.050	1.034	0.981
10R22.5	0.492	1.316	1.284	1.227	1.167	1.113	1.104	1.050	1.034	0.981
295/75R22.5	0.493	1.319	1.286	1.229	1.169	1.115	1.106	1.052	1.036	0.983
295/80R22.5	0.505	1.351	1.318	1.259	1.198	1.142	1.133	1.078	1.062	1.007
10.00-20	0.506	1.353	1.320	1.262	1.200	1.144	1.136	1.080	1.064	1.009
11.1-20	0.506	1.353	1.320	1.262	1.200	1.144	1.136	1.080	1.064	1.009
10.00R20	0.508	1.359	1.325	1.267	1.205	1.149	1.140	1.084	1.068	1.013
11.1R20	0.508	1.359	1.325	1.267	1.205	1.149	1.140	1.084	1.068	1.013
11R22.5	0.508	1.359	1.325	1.267	1.205	1.149	1.140	1.084	1.068	1.013
11.00-20	0.520	1.391	1.357	1.297	1.233	1.176	1.167	1.110	1.093	1.037
315/80R22.5	0.520	1.391	1.357	1.297	1.233	1.176	1.167	1.110	1.093	1.037
11.00R20	0.523	1.399	1.365	1.304	1.240	1.183	1.174	1.116	1.100	1.043
12R22.5	0.523	1.399	1.365	1.304	1.240	1.183	1.174	1.116	1.100	1.043
12.00-20	0.539	1.442	1.406	1.344	1.278	1.219	1.210	1.151	1.133	1.075
12.00R20	0.542	1.450	1.414	1.351	1.285	1.226	1.216	1.157	1.140	1.081
12.00-24	0.593	1.586	1.547	1.479	1.407	1.341	1.331	1.266	1.247	1.183
12.00R24	0.594	1.589	1.550	1.481	1.409	1.343	1.333	1.268	1.249	1.185

SHTS12Z160100160

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	5.125	5.250	5.285	5.428	5.857	6.142	6.428	6.833	7.166
7.50-16	0.383	0.726	0.709	0.704	0.686	0.636	0.606	0.579	0.545	0.519
7.50R16	0.387	0.734	0.717	0.712	0.693	0.642	0.612	0.585	0.550	0.525
235/75R17.5	0.387	0.734	0.717	0.712	0.693	0.642	0.612	0.585	0.550	0.525
225/80R17.5	0.389	0.738	0.720	0.716	0.697	0.646	0.616	0.588	0.553	0.528
225/70R19.5	0.395	0.749	0.731	0.727	0.707	0.656	0.625	0.597	0.562	0.536
8.25-16	0.404	0.766	0.748	0.743	0.724	0.671	0.639	0.611	0.575	0.548
245/70R19.5	0.407	0.772	0.754	0.749	0.729	0.675	0.644	0.615	0.579	0.552
8.25R16	0.409	0.776	0.757	0.752	0.733	0.679	0.647	0.618	0.582	0.555
9.5R17.5	0.409	0.776	0.757	0.752	0.733	0.679	0.647	0.618	0.582	0.555
225/90R17.5	0.410	0.778	0.759	0.754	0.734	0.680	0.649	0.620	0.583	0.556
9.00-16	0.420	0.797	0.778	0.773	0.752	0.697	0.665	0.635	0.597	0.570
265/70R19.5	0.421	0.799	0.780	0.774	0.754	0.699	0.666	0.637	0.599	0.571
7.50-18	0.423	0.802	0.783	0.778	0.758	0.702	0.669	0.640	0.602	0.574
7.50R18	0.426	0.808	0.789	0.784	0.763	0.707	0.674	0.644	0.606	0.578
9R19.5	0.433	0.821	0.802	0.797	0.776	0.719	0.685	0.655	0.616	0.587
265/60R22.5	0.438	0.831	0.811	0.806	0.784	0.727	0.693	0.662	0.623	0.594
235/70R22.5	0.440	0.835	0.815	0.809	0.788	0.730	0.696	0.665	0.626	0.597
7.50-20	0.448	0.850	0.830	0.824	0.802	0.744	0.709	0.677	0.637	0.608
285/60R22.5	0.450	0.854	0.833	0.828	0.806	0.747	0.712	0.681	0.640	0.610
7.50R20	0.452	0.857	0.837	0.831	0.810	0.750	0.715	0.684	0.643	0.613
255/70R22.5	0.453	0.859	0.839	0.833	0.811	0.752	0.717	0.685	0.644	0.614
275/70R22.5	0.465	0.882	0.861	0.855	0.833	0.772	0.736	0.703	0.662	0.631
11/70R22.5	0.468	0.888	0.867	0.861	0.838	0.777	0.741	0.708	0.666	0.635
8.25-20	0.468	0.888	0.867	0.861	0.838	0.777	0.741	0.708	0.666	0.635
8.25R20	0.470	0.892	0.870	0.865	0.842	0.780	0.744	0.711	0.669	0.638
9R22.5	0.470	0.892	0.870	0.865	0.842	0.780	0.744	0.711	0.669	0.638
265/75R22.5	0.474	0.899	0.878	0.872	0.849	0.787	0.750	0.717	0.674	0.643
295/70R22.5	0.479	0.909	0.887	0.881	0.858	0.795	0.758	0.724	0.681	0.650
9.00-20	0.490	0.930	0.907	0.901	0.878	0.813	0.776	0.741	0.697	0.665
275/80R22.5	0.491	0.931	0.909	0.903	0.879	0.815	0.777	0.743	0.699	0.666
9.00R20	0.492	0.933	0.911	0.905	0.881	0.817	0.779	0.744	0.700	0.667
10R22.5	0.492	0.933	0.911	0.905	0.881	0.817	0.779	0.744	0.700	0.667
295/75R22.5	0.493	0.935	0.913	0.907	0.883	0.818	0.780	0.746	0.701	0.669
295/80R22.5	0.505	0.958	0.935	0.929	0.905	0.838	0.799	0.764	0.718	0.685
10.00-20	0.506	0.960	0.937	0.931	0.906	0.840	0.801	0.765	0.720	0.686
11.1-20	0.506	0.960	0.937	0.931	0.906	0.840	0.801	0.765	0.720	0.686
10.00R20	0.508	0.964	0.941	0.935	0.910	0.843	0.804	0.768	0.723	0.689
11.1R20	0.508	0.964	0.941	0.935	0.910	0.843	0.804	0.768	0.723	0.689
11R22.5	0.508	0.964	0.941	0.935	0.910	0.843	0.804	0.768	0.723	0.689
11.00-20	0.520	0.987	0.963	0.957	0.931	0.863	0.823	0.786	0.740	0.705
315/80R22.5	0.520	0.987	0.963	0.957	0.931	0.863	0.823	0.786	0.740	0.705
11.00R20	0.523	0.992	0.969	0.962	0.937	0.868	0.828	0.791	0.744	0.709
12R22.5	0.523	0.992	0.969	0.962	0.937	0.868	0.828	0.791	0.744	0.709
12.00-20	0.539	1.023	0.998	0.992	0.965	0.895	0.853	0.815	0.767	0.731
12.00R20	0.542	1.028	1.004	0.997	0.971	0.900	0.858	0.820	0.771	0.735
12.00-24	0.593	1.125	1.098	1.091	1.062	0.984	0.939	0.897	0.844	0.805
12.00R24	0.594	1.127	1.100	1.093	1.064	0.986	0.940	0.898	0.845	0.806

SHTS12Z160100161

EATON, FULLER TRANSMISSION SERIES FOR AUSTRALIA, IRELAND

PULSE TYPE E4, SPEEDOMETER CORRECTION RATE 0.960

(Apply to vehicles produced for Australia after June, 2007)

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	3.636	3.727	3.900	4.100	4.300	4.333	4.555	4.625	4.875
7.50-16										
7.50R16										
235/75R17.5	0.398	1.064	1.038	0.992	0.944	0.900	0.893	0.850	0.837	0.794
225/80R17.5										
225/70R19.5										
8.25-16										
245/70R19.5										
8.25R16	0.430	1.150	1.122	1.072	1.020	0.972	0.965	0.918	0.904	0.858
9.5R17.5	0.420	1.123	1.096	1.047	0.996	0.950	0.942	0.896	0.883	0.838
225/90R17.5										
9.00-16										
265/70R19.5										
7.50-18										
7.50R18										
9R19.5										
265/60R22.5										
235/70R22.5										
7.50-20										
285/60R22.5										
7.50R20										
255/70R22.5	0.463	1.238	1.208	1.154	1.098	1.047	1.039	0.988	0.973	0.923
275/70R22.5	0.477	1.276	1.245	1.189	1.131	1.079	1.070	1.018	1.003	0.951
11/70R22.5										
8.25-20										
8.25R20										
9R22.5										
265/75R22.5										
295/70R22.5										
9.00-20										
275/80R22.5	0.505	1.351	1.318	1.259	1.198	1.142	1.133	1.078	1.062	1.007
9.00R20	0.505	1.351	1.318	1.259	1.198	1.142	1.133	1.078	1.062	1.007
10R22.5	0.509	1.361	1.328	1.269	1.207	1.151	1.142	1.087	1.070	1.015
295/75R22.5										
295/80R22.5	0.521	1.393	1.359	1.299	1.236	1.178	1.169	1.112	1.095	1.039
10.00-20	0.524	1.401	1.367	1.307	1.243	1.185	1.176	1.119	1.102	1.045
11.1-20										
10.00R20	0.526	1.407	1.372	1.312	1.248	1.189	1.180	1.123	1.106	1.049
11.1R20										
11R22.5	0.525	1.404	1.370	1.309	1.245	1.187	1.178	1.121	1.104	1.047
11.00-20	0.539	1.442	1.406	1.344	1.278	1.219	1.210	1.151	1.133	1.075
315/80R22.5										
11.00R20	0.541	1.447	1.412	1.349	1.283	1.223	1.214	1.155	1.137	1.079
12R22.5										
12.00-20										
12.00R20										
12.00-24										
12.00R24										

SHTS12Z160100162

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	5.125	5.250	5.285	5.428	5.857	6.142	6.428	6.833	7.166
7.50-16										
7.50R16										
235/75R17.5	0.398	0.755	0.737	0.732	0.713	0.661	0.630	0.602	0.566	0.540
225/80R17.5										
225/70R19.5										
8.25-16										
245/70R19.5										
8.25R16	0.430	0.816	0.796	0.791	0.770	0.714	0.681	0.650	0.612	0.583
9.5R17.5	0.420	0.797	0.778	0.773	0.752	0.697	0.665	0.635	0.597	0.570
225/90R17.5										
9.00-16										
265/70R19.5										
7.50-18										
7.50R18										
9R19.5										
265/60R22.5										
235/70R22.5										
7.50-20										
285/60R22.5										
7.50R20										
255/70R22.5	0.463	0.878	0.857	0.852	0.829	0.769	0.733	0.700	0.659	0.628
275/70R22.5	0.477	0.905	0.883	0.878	0.854	0.792	0.755	0.721	0.679	0.647
11/70R22.5										
8.25-20										
8.25R20										
9R22.5										
265/75R22.5										
295/70R22.5										
9.00-20										
275/80R22.5	0.505	0.958	0.935	0.929	0.905	0.838	0.799	0.764	0.718	0.685
9.00R20	0.505	0.958	0.935	0.929	0.905	0.838	0.799	0.764	0.718	0.685
10R22.5	0.509	0.966	0.943	0.936	0.912	0.845	0.806	0.770	0.724	0.690
295/75R22.5										
295/80R22.5	0.521	0.988	0.965	0.958	0.933	0.865	0.825	0.788	0.741	0.707
10.00-20	0.524	0.994	0.970	0.964	0.939	0.870	0.829	0.793	0.746	0.711
11.1-20										
10.00R20	0.526	0.998	0.974	0.968	0.942	0.873	0.833	0.796	0.748	0.714
11.1R20										
11R22.5	0.525	0.996	0.972	0.966	0.940	0.871	0.831	0.794	0.747	0.712
11.00-20	0.539	1.023	0.998	0.992	0.965	0.895	0.853	0.815	0.767	0.731
315/80R22.5										
11.00R20	0.541	1.026	1.002	0.995	0.969	0.898	0.856	0.818	0.770	0.734
12R22.5										
12.00-20										
12.00R20										
12.00-24										
12.00R24										

SHTS12Z160100163

EATON, FULLER TRANSMISSION SERIES FOR AUSTRALIA

PULSE TYPE E2, SPEEDOMETER CORRECTION RATE 0.980

(Apply to vehicles produced for before May, 2007)

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	*3.636*	*3.727*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*	*4.875*
7.50-16	0.383	1.003	0.979	0.935	0.890	0.848	0.842	0.801	0.789	0.748
7.50R16	0.387	1.014	0.989	0.945	0.899	0.857	0.851	0.809	0.797	0.756
235/75R17.5	0.387	1.014	0.989	0.945	0.899	0.857	0.851	0.809	0.797	0.756
225/80R17.5	0.389	1.019	0.994	0.950	0.904	0.862	0.855	0.813	0.801	0.760
225/70R19.5	0.395	1.035	1.009	0.965	0.918	0.875	0.868	0.826	0.813	0.772
8.25-16	0.404	1.058	1.032	0.987	0.939	0.895	0.888	0.845	0.832	0.789
245/70R19.5	0.407	1.066	1.040	0.994	0.945	0.901	0.895	0.851	0.838	0.795
8.25R16	0.409	1.071	1.045	0.999	0.950	0.906	0.899	0.855	0.842	0.799
9.5R17.5	0.409	1.071	1.045	0.999	0.950	0.906	0.899	0.855	0.842	0.799
225/90R17.5	0.410	1.074	1.048	1.001	0.952	0.908	0.901	0.857	0.844	0.801
9.00-16	0.420	1.100	1.073	1.026	0.976	0.930	0.923	0.878	0.865	0.821
265/70R19.5	0.421	1.103	1.076	1.028	0.978	0.933	0.925	0.880	0.867	0.822
7.50-18	0.423	1.108	1.081	1.033	0.983	0.937	0.930	0.884	0.871	0.826
7.50R18	0.426	1.116	1.089	1.040	0.990	0.944	0.936	0.891	0.877	0.832
9R19.5	0.433	1.134	1.107	1.058	1.006	0.959	0.952	0.905	0.892	0.846
265/60R22.5	0.438	1.147	1.119	1.070	1.018	0.970	0.963	0.916	0.902	0.856
235/70R22.5	0.440	1.153	1.125	1.075	1.022	0.975	0.967	0.920	0.906	0.860
7.50-20	0.448	1.174	1.145	1.094	1.041	0.992	0.985	0.937	0.923	0.875
285/60R22.5	0.450	1.179	1.150	1.099	1.045	0.997	0.989	0.941	0.927	0.879
7.50R20	0.452	1.184	1.155	1.104	1.050	1.001	0.994	0.945	0.931	0.883
255/70R22.5	0.453	1.187	1.158	1.106	1.052	1.003	0.996	0.947	0.933	0.885
275/70R22.5	0.465	1.218	1.188	1.136	1.080	1.030	1.022	0.972	0.958	0.908
11/70R22.5	0.468	1.226	1.196	1.143	1.087	1.037	1.029	0.979	0.964	0.914
8.25-20	0.468	1.226	1.196	1.143	1.087	1.037	1.029	0.979	0.964	0.914
8.25R20	0.470	1.231	1.201	1.148	1.092	1.041	1.033	0.983	0.968	0.918
9R22.5	0.470	1.231	1.201	1.148	1.092	1.041	1.033	0.983	0.968	0.918
265/75R22.5	0.474	1.242	1.211	1.158	1.101	1.050	1.042	0.991	0.976	0.926
295/70R22.5	0.479	1.255	1.224	1.170	1.113	1.061	1.053	1.002	0.986	0.936
9.00-20	0.490	1.284	1.252	1.197	1.138	1.085	1.077	1.025	1.009	0.957
275/80R22.5	0.491	1.286	1.255	1.199	1.141	1.088	1.079	1.027	1.011	0.959
9.00R20	0.492	1.289	1.257	1.202	1.143	1.090	1.082	1.029	1.013	0.961
10R22.5	0.492	1.289	1.257	1.202	1.143	1.090	1.082	1.029	1.013	0.961
295/75R22.5	0.493	1.292	1.260	1.204	1.145	1.092	1.084	1.031	1.015	0.963
295/80R22.5	0.505	1.323	1.291	1.233	1.173	1.119	1.110	1.056	1.040	0.987
10.00-20	0.506	1.326	1.293	1.236	1.176	1.121	1.112	1.058	1.042	0.989
11.1-20	0.506	1.326	1.293	1.236	1.176	1.121	1.112	1.058	1.042	0.989
10.00R20	0.508	1.331	1.298	1.241	1.180	1.125	1.117	1.062	1.046	0.993
11.1R20	0.508	1.331	1.298	1.241	1.180	1.125	1.117	1.062	1.046	0.993
11R22.5	0.508	1.331	1.298	1.241	1.180	1.125	1.117	1.062	1.046	0.993
11.00-20	0.520	1.362	1.329	1.270	1.208	1.152	1.143	1.087	1.071	1.016
315/80R22.5	0.520	1.362	1.329	1.270	1.208	1.152	1.143	1.087	1.071	1.016
11.00R20	0.523	1.370	1.337	1.277	1.215	1.159	1.150	1.094	1.077	1.022
12R22.5	0.523	1.370	1.337	1.277	1.215	1.159	1.150	1.094	1.077	1.022
12.00-20	0.539	1.412	1.378	1.317	1.252	1.194	1.185	1.127	1.110	1.053
12.00R20	0.542	1.420	1.385	1.324	1.259	1.201	1.192	1.133	1.116	1.059
12.00-24	0.593	1.554	1.516	1.448	1.378	1.314	1.304	1.240	1.221	1.159
12.00R24	0.594	1.556	1.518	1.451	1.380	1.316	1.306	1.242	1.223	1.161

SHTS12Z160100164

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	*5.125*	*5.250*	*5.285*	*5.428*	*5.857*	*6.142*	*6.428*	*6.833*	*7.166*
7.50-16	0.383	0.712	0.695	0.690	0.672	0.623	0.594	0.567	0.534	0.509
7.50R16	0.387	0.719	0.702	0.697	0.679	0.629	0.600	0.573	0.539	0.514
235/75R17.5	0.387	0.719	0.702	0.697	0.679	0.629	0.600	0.573	0.539	0.514
225/80R17.5	0.389	0.723	0.706	0.701	0.682	0.632	0.603	0.576	0.542	0.517
225/70R19.5	0.395	0.734	0.716	0.712	0.693	0.642	0.612	0.585	0.550	0.525
8.25-16	0.404	0.751	0.733	0.728	0.709	0.657	0.626	0.598	0.563	0.537
245/70R19.5	0.407	0.756	0.738	0.733	0.714	0.662	0.631	0.603	0.567	0.541
8.25R16	0.409	0.760	0.742	0.737	0.718	0.665	0.634	0.606	0.570	0.543
9.5R17.5	0.409	0.760	0.742	0.737	0.718	0.665	0.634	0.606	0.570	0.543
225/90R17.5	0.410	0.762	0.744	0.739	0.719	0.667	0.636	0.607	0.571	0.545
9.00-16	0.420	0.780	0.762	0.757	0.737	0.683	0.651	0.622	0.585	0.558
265/70R19.5	0.421	0.782	0.764	0.759	0.739	0.684	0.653	0.624	0.587	0.559
7.50-18	0.423	0.786	0.767	0.762	0.742	0.688	0.656	0.627	0.589	0.562
7.50R18	0.426	0.792	0.773	0.768	0.747	0.693	0.660	0.631	0.594	0.566
9R19.5	0.433	0.805	0.785	0.780	0.760	0.704	0.671	0.641	0.603	0.575
265/60R22.5	0.438	0.814	0.795	0.789	0.768	0.712	0.679	0.649	0.610	0.582
235/70R22.5	0.440	0.818	0.798	0.793	0.772	0.715	0.682	0.652	0.613	0.585
7.50-20	0.448	0.833	0.813	0.807	0.786	0.728	0.695	0.664	0.624	0.595
285/60R22.5	0.450	0.836	0.816	0.811	0.790	0.732	0.698	0.667	0.627	0.598
7.50R20	0.452	0.840	0.820	0.815	0.793	0.735	0.701	0.670	0.630	0.601
255/70R22.5	0.453	0.842	0.822	0.816	0.795	0.737	0.702	0.671	0.631	0.602
275/70R22.5	0.465	0.864	0.844	0.838	0.816	0.756	0.721	0.689	0.648	0.618
11/70R22.5	0.468	0.870	0.849	0.843	0.821	0.761	0.726	0.693	0.652	0.622
8.25-20	0.468	0.870	0.849	0.843	0.821	0.761	0.726	0.693	0.652	0.622
8.25R20	0.470	0.873	0.853	0.847	0.825	0.764	0.729	0.696	0.655	0.625
9R22.5	0.470	0.873	0.853	0.847	0.825	0.764	0.729	0.696	0.655	0.625
265/75R22.5	0.474	0.881	0.860	0.854	0.832	0.771	0.735	0.702	0.661	0.630
295/70R22.5	0.479	0.890	0.869	0.863	0.840	0.779	0.743	0.710	0.668	0.636
9.00-20	0.490	0.911	0.889	0.883	0.860	0.797	0.760	0.726	0.683	0.651
275/80R22.5	0.491	0.912	0.891	0.885	0.862	0.798	0.761	0.727	0.684	0.652
9.00R20	0.492	0.914	0.893	0.887	0.863	0.800	0.763	0.729	0.686	0.654
10R22.5	0.492	0.914	0.893	0.887	0.863	0.800	0.763	0.729	0.686	0.654
295/75R22.5	0.493	0.916	0.894	0.888	0.865	0.802	0.764	0.730	0.687	0.655
295/80R22.5	0.505	0.939	0.916	0.910	0.886	0.821	0.783	0.748	0.704	0.671
10.00-20	0.506	0.940	0.918	0.912	0.888	0.823	0.785	0.750	0.705	0.672
11.1-20	0.506	0.940	0.918	0.912	0.888	0.823	0.785	0.750	0.705	0.672
10.00R20	0.508	0.944	0.922	0.915	0.891	0.826	0.788	0.753	0.708	0.675
11.1R20	0.508	0.944	0.922	0.915	0.891	0.826	0.788	0.753	0.708	0.675
11R22.5	0.508	0.944	0.922	0.915	0.891	0.826	0.788	0.753	0.708	0.675
11.00-20	0.520	0.966	0.943	0.937	0.912	0.846	0.806	0.770	0.725	0.691
315/80R22.5	0.520	0.966	0.943	0.937	0.912	0.846	0.806	0.770	0.725	0.691
11.00R20	0.523	0.972	0.949	0.943	0.918	0.850	0.811	0.775	0.729	0.695
12R22.5	0.523	0.972	0.949	0.943	0.918	0.850	0.811	0.775	0.729	0.695
12.00-20	0.539	1.002	0.978	0.971	0.946	0.876	0.836	0.799	0.751	0.716
12.00R20	0.542	1.007	0.983	0.977	0.951	0.881	0.840	0.803	0.755	0.720
12.00-24	0.593	1.102	1.076	1.069	1.041	0.964	0.920	0.879	0.827	0.788
12.00R24	0.594	1.104	1.078	1.071	1.042	0.966	0.921	0.880	0.828	0.789

SHTS12Z160100165

ZF TRANSMISSION SERIES FOR INDIA, INDONESIA

PULSE TYPE Z3, SPEEDOMETER CORRECTION RATE 0.960

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	*3.636*	*3.727*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*	*4.875*
7.50-16	0.383	0.678	0.661	0.632	0.601	0.573	0.569	0.541	0.533	0.506
7.50R16	0.387	0.685	0.668	0.639	0.608	0.579	0.575	0.547	0.538	0.511
235/75R17.5	0.387	0.685	0.668	0.639	0.608	0.579	0.575	0.547	0.538	0.511
225/80R17.5	0.389	0.689	0.672	0.642	0.611	0.582	0.578	0.550	0.541	0.513
225/70R19.5	0.395	0.699	0.682	0.652	0.620	0.591	0.587	0.558	0.550	0.521
8.25-16	0.404	0.715	0.698	0.667	0.634	0.605	0.600	0.571	0.562	0.533
245/70R19.5	0.407	0.721	0.703	0.672	0.639	0.609	0.605	0.575	0.566	0.537
8.25R16	0.409	0.724	0.706	0.675	0.642	0.612	0.608	0.578	0.569	0.540
9.5R17.5	0.409	0.724	0.706	0.675	0.642	0.612	0.608	0.578	0.569	0.540
225/90R17.5	0.410	0.726	0.708	0.677	0.644	0.614	0.609	0.579	0.571	0.541
9.00-16	0.420	0.744	0.725	0.693	0.659	0.629	0.624	0.593	0.584	0.554
265/70R19.5	0.421	0.745	0.727	0.695	0.661	0.630	0.625	0.595	0.586	0.556
7.50-18	0.423	0.749	0.731	0.698	0.664	0.633	0.628	0.598	0.589	0.558
7.50R18	0.426	0.754	0.736	0.703	0.669	0.638	0.633	0.602	0.593	0.562
9R19.5	0.433	0.767	0.748	0.715	0.680	0.648	0.643	0.612	0.603	0.572
265/60R22.5	0.438	0.775	0.756	0.723	0.688	0.656	0.651	0.619	0.610	0.578
235/70R22.5	0.440	0.779	0.760	0.726	0.691	0.659	0.654	0.622	0.612	0.581
7.50-20	0.448	0.793	0.774	0.739	0.703	0.671	0.665	0.633	0.623	0.591
285/60R22.5	0.450	0.797	0.777	0.743	0.706	0.674	0.668	0.636	0.626	0.594
7.50R20	0.452	0.800	0.781	0.746	0.710	0.677	0.671	0.639	0.629	0.597
255/70R22.5	0.453	0.802	0.782	0.748	0.711	0.678	0.673	0.640	0.630	0.598
275/70R22.5	0.465			0.768	0.730	0.696	0.691	0.657	0.647	0.614
11/70R22.5	0.468			0.772	0.735	0.701	0.695	0.661	0.651	0.618
8.25-20	0.468			0.772	0.735	0.701	0.695	0.661	0.651	0.618
8.25R20	0.470			0.776	0.738	0.704	0.698	0.664	0.654	0.621
9R22.5	0.470			0.776	0.738	0.704	0.698	0.664	0.654	0.621
265/75R22.5	0.474				0.744	0.710	0.704	0.670	0.660	0.626
295/70R22.5	0.479				0.752	0.717	0.712	0.677	0.667	0.632
9.00-20	0.490				0.769	0.734	0.728	0.692	0.682	0.647
275/80R22.5	0.491				0.771	0.735	0.729	0.694	0.683	0.648
9.00R20	0.492				0.772	0.737	0.731	0.695	0.685	0.650
10R22.5	0.492				0.772	0.737	0.731	0.695	0.685	0.650
295/75R22.5	0.493				0.774	0.738	0.732	0.697	0.686	0.651
295/80R22.5	0.505					0.756	0.750	0.714	0.703	0.667
10.00-20	0.506					0.757	0.752	0.715	0.704	0.668
11.1-20	0.506					0.757	0.752	0.715	0.704	0.668
10.00R20	0.508					0.760	0.755	0.718	0.707	0.671
11.1R20	0.508					0.760	0.755	0.718	0.707	0.671
11R22.5	0.508					0.760	0.755	0.718	0.707	0.671
11.00-20	0.520					0.778	0.773	0.735	0.724	0.687
315/80R22.5	0.520					0.778	0.773	0.735	0.724	0.687
11.00R20	0.523					0.783	0.777	0.739	0.728	0.691
12R22.5	0.523					0.783	0.777	0.739	0.728	0.691
12.00-20	0.539							0.762	0.750	0.712
12.00R20	0.542							0.766	0.754	0.716
12.00-24	0.593									0.783
12.00R24	0.594									0.784

SHTS12Z160100166

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS (m)	5.125	5.250	5.285	5.428	5.857	6.142	6.428	6.833	7.166
7.50-16	0.383	0.481	0.469	0.466	0.454					
7.50R16	0.387	0.486	0.474	0.471	0.459					
235/75R17.5	0.387	0.486	0.474	0.471	0.459					
225/80R17.5	0.389	0.488	0.477	0.474	0.461					
225/70R19.5	0.395	0.496	0.484	0.481	0.468					
8.25-16	0.404	0.507	0.495	0.492	0.479					
245/70R19.5	0.407	0.511	0.499	0.496	0.482					
8.25R16	0.409	0.514	0.501	0.498	0.485					
9.5R17.5	0.409	0.514	0.501	0.498	0.485					
225/90R17.5	0.410	0.515	0.503	0.499	0.486					
9.00-16	0.420	0.527	0.515	0.511	0.498	0.461				
265/70R19.5	0.421	0.529	0.516	0.513	0.499	0.463				
7.50-18	0.423	0.531	0.518	0.515	0.501	0.465				
7.50R18	0.426	0.535	0.522	0.519	0.505	0.468	0.446			
9R19.5	0.433	0.544	0.531	0.527	0.513	0.476	0.454			
265/60R22.5	0.438	0.550	0.537	0.533	0.519	0.481	0.459			
235/70R22.5	0.440	0.553	0.539	0.536	0.522	0.483	0.461			
7.50-20	0.448	0.563	0.549	0.546	0.531	0.492	0.469			
285/60R22.5	0.450	0.565	0.552	0.548	0.534	0.494	0.471			
7.50R20	0.452	0.568	0.554	0.550	0.536	0.497	0.474			
255/70R22.5	0.453	0.569	0.555	0.552	0.537	0.498	0.475			
275/70R22.5	0.465	0.584	0.570	0.566	0.551	0.511	0.487	0.465		
11/70R22.5	0.468	0.588	0.574	0.570	0.555	0.514	0.490	0.468		
8.25-20	0.468	0.588	0.574	0.570	0.555	0.514	0.490	0.468		
8.25R20	0.470	0.590	0.576	0.572	0.557	0.516	0.492	0.470		
9R22.5	0.470	0.590	0.576	0.572	0.557	0.516	0.492	0.470		
265/75R22.5	0.474	0.595	0.581	0.577	0.562	0.521	0.497	0.474		
295/70R22.5	0.479	0.602	0.587	0.583	0.568	0.526	0.502	0.479		
9.00-20	0.490	0.615	0.601	0.597	0.581	0.538	0.513	0.491	0.461	
275/80R22.5	0.491	0.617	0.602	0.598	0.582	0.539	0.514	0.492	0.462	
9.00R20	0.492	0.618	0.603	0.599	0.583	0.541	0.515	0.493	0.463	
10R22.5	0.492	0.618	0.603	0.599	0.583	0.541	0.515	0.493	0.463	
295/75R22.5	0.493	0.619	0.604	0.600	0.585	0.542	0.517	0.494	0.464	
295/80R22.5	0.505	0.634	0.619	0.615	0.599	0.555	0.529	0.506	0.476	
10.00-20	0.506	0.635	0.620	0.616	0.600	0.556	0.530	0.507	0.476	
11.1-20	0.506	0.635	0.620	0.616	0.600	0.556	0.530	0.507	0.476	
10.00R20	0.508	0.638	0.623	0.619	0.602	0.558	0.532	0.509	0.478	
11.1R20	0.508	0.638	0.623	0.619	0.602	0.558	0.532	0.509	0.478	
11R22.5	0.508	0.638	0.623	0.619	0.602	0.558	0.532	0.509	0.478	
11.00-20	0.520	0.653	0.637	0.633	0.617	0.571	0.545	0.521	0.490	0.467
315/80R22.5	0.520	0.653	0.637	0.633	0.617	0.571	0.545	0.521	0.490	0.467
11.00R20	0.523	0.657	0.641	0.637	0.620	0.575	0.548	0.524	0.493	0.470
12R22.5	0.523	0.657	0.641	0.637	0.620	0.575	0.548	0.524	0.493	0.470
12.00-20	0.539	0.677	0.661	0.656	0.639	0.592	0.565	0.540	0.508	0.484
12.00R20	0.542	0.681	0.664	0.660	0.643	0.596	0.568	0.543	0.510	0.487
12.00-24	0.593	0.745	0.727	0.722	0.703	0.652	0.621	0.594	0.559	0.533
12.00R24	0.594	0.746	0.728	0.723	0.704	0.653	0.622	0.595	0.559	0.533

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ALLISON TRANSMISSION SERIES FOR NEW ZEALAND

PULSE TYPE B3, SPEEDOMETER CORRECTION RATE 0.960
(Apply to vehicles produced for after June, 2007)

		REAR AXLE GEAR RATIO				
TIRE SIZE	RADIUS (m)	5.428	5.857	6.142	6.428	7.166
275/70R22.5	0.465	1.116	1.034	0.986	0.942	0.845
275/80R22.5	0.491	1.179	1.092	1.042	0.995	0.893
295/80R22.5	0.505	1.212	1.123	1.071	1.024	0.918
11R22.5	0.508	1.219	1.130	1.078	1.030	0.924

ALLISON TRANSMISSION SERIES FOR AUSTRALIA

PULSE TYPE B4, SPEEDOMETER CORRECTION RATE 0.960
(Apply to vehicles produced for after June, 2007)

		REAR AXLE GEAR RATIO				
TIRE SIZE	RADIUS (m)	5.428	5.857	6.142	6.428	7.166
275/70R22.5	0.477	1.146	1.062	1.013	0.968	0.868
275/80R22.5	0.505	1.212	1.124	1.071	1.024	0.918
295/80R22.5	0.521	1.251	1.160	1.106	1.057	0.948
11R22.5	0.525	1.259	1.167	1.113	1.063	0.954

ALLISON TRANSMISSION SERIES FOR AUSTRALIA, NEW ZEALAND

PULSE TYPE A8, SPEEDOMETER CORRECTION RATE 0.980
(Apply to vehicles produced for before May, 2007)

		REAR AXLE GEAR RATIO				
TIRE SIZE	RADIUS (m)	5.428	5.857	6.142	6.428	7.166
275/70R22.5	0.465	1.093	1.013	0.966	0.923	0.828
275/80R22.5	0.492	1.157	1.072	1.022	0.977	0.876
295/80R22.5	0.505	1.187	1.100	1.049	1.003	0.899
11R22.5	0.508	1.194	1.107	1.056	1.009	0.905

BRAKE CONTROL (ABS+ES START: DENSO)

DN03-001

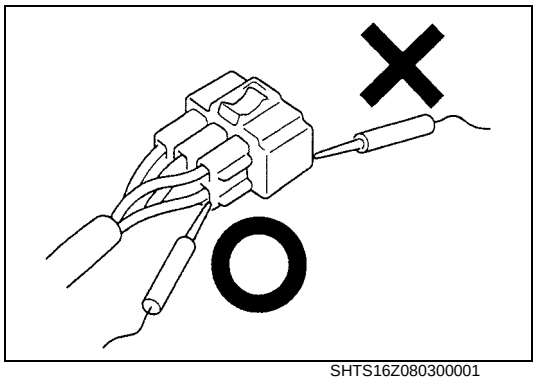
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ANTI-LOCK BRAKE

HANDLING PRECAUTIONS

EN16Z0803F200001



SHTS16Z080300001

1. ABOUT CONNECTORS

(1) When vehicle placed on speed meter tester, or jacked up to rotate the tires, there is a case that ECU memorize failure code. But, this is not abnormal. Clear the failure code on ECU in any case of having done that type of maintenance service.

(2) Before performing an inspection work, check that each connector is surely connected.

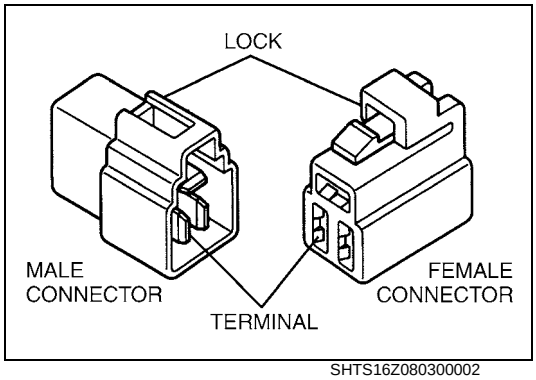
(3) When taking off connector, do it without fail at the "LOCK" position of starter key.

(4) Any parts presumed to be abnormal should not be repaired, but change it.

(5) After clearing the failure memories recorded in the past, perform failure diagnosis again and check the current failure.

(6) After completing the diagnosis analysis, clear the diagnosis memories in the past.

(7) Unless otherwise specified, the drawing of connector is one viewed from connected surface. But, test bar should be inserted from back side for measuring.
However, check the terminals at the connected part of such water proof connectors as ABS actuator, etc. In this case, be careful not to short the terminals.

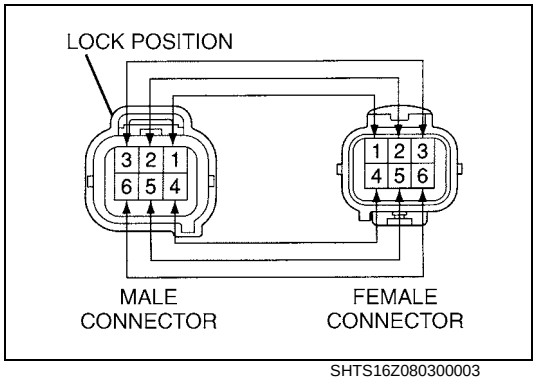


SHTS16Z080300002

(8) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



SHTS16Z080300003

(9) As for the terminal numbers of the connector, the first terminal is located on the top right terminal of the male connector and the top left terminal of the female connector.
Reference:
When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(10) When disconnecting the connectors, be sure to position the starter switch "LOCK".

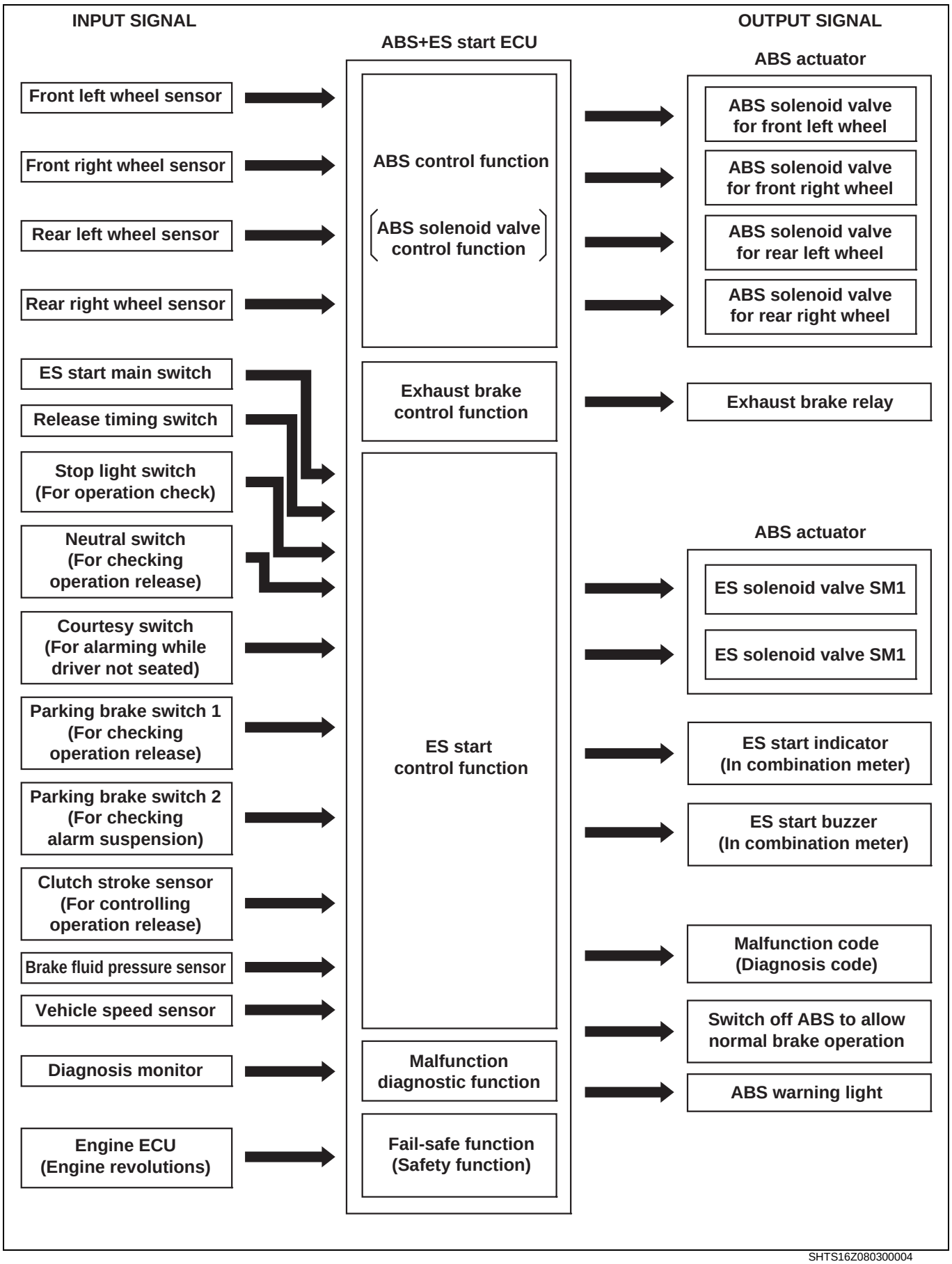
2. ABOUT DIAGNOSIS MONITOR

(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, delete the previous damage data.

SYSTEM DIAGRAM

EN16Z0803J100001

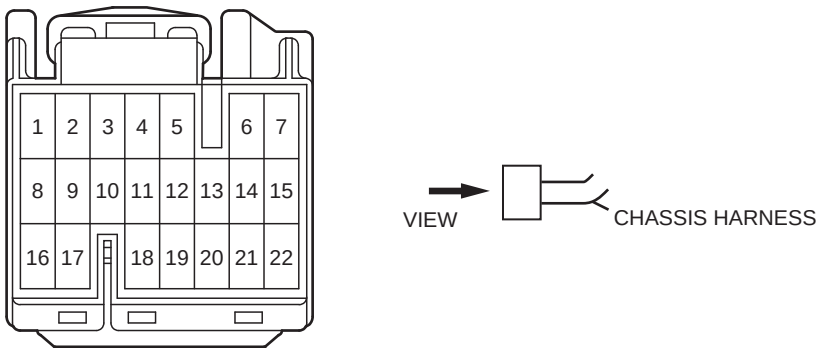


SHTS16Z080300004

CHASSIS SIDE CONNECTOR PIN ASSIGNMENT

EN16Z0803F200002

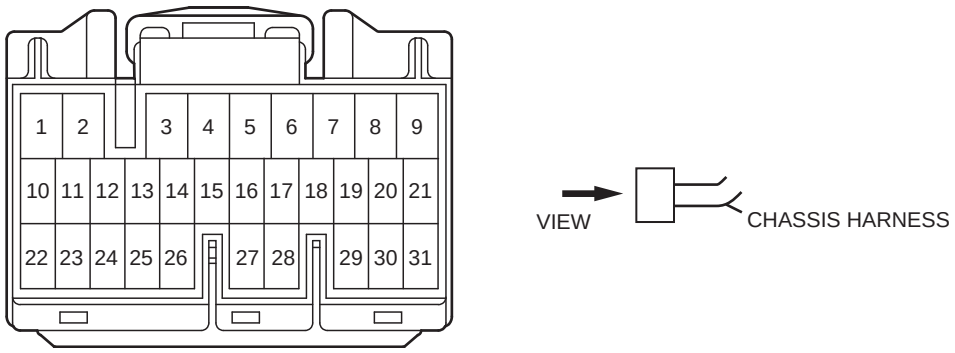
22 PIN CONNECTOR



SHTS16Z080300005

No.	Signal	No.	Signal
1	Rear reducing solenoid valve	12	Neutral switch
2	ES solenoid valve SM1 (Front) -	13	—
3	ES solenoid valve SM1 (Front) +	14	Ground 4
4	ES solenoid valve SM2 (Rear) -	15	Ground 3
5	ES solenoid valve SM2 (Front) +	16	Front retaining solenoid valve
6	Solenoid relay test	17	—
7	Rear retaining solenoid valve	18	—
8	Front reducing solenoid valve	19	—
9	—	20	—
10	—	21	—
11	—	22	—

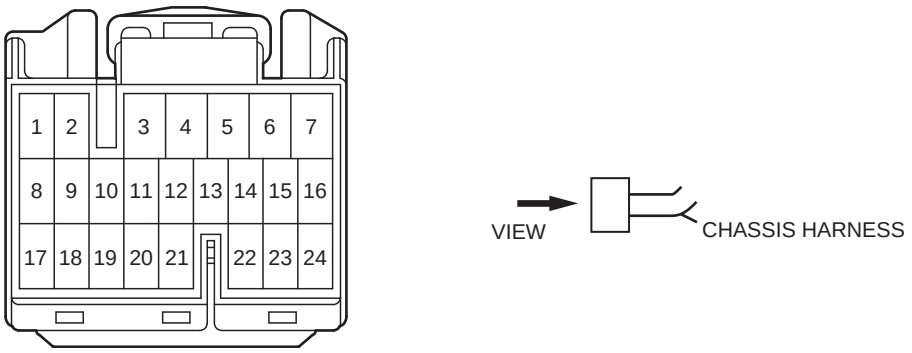
31 PIN CONNECTOR



SHTS16Z080300006

No.	Signal	No.	Signal
1	Relay power supply	17	—
2	Ground 1	18	Motor relay test
3	Ground 2	19	—
4	Clutch pedal stroke sensor power supply	20	Rear retaining solenoid valve
5	—	21	—
6	—	22	—
7	—	23	—
8	Front retaining solenoid valve	24	Solenoid relay
9	Front reducing solenoid valve	25	Front right wheel sensor -
10	—	26	Front right wheel sensor +
11	—	27	Front left wheel sensor +
12	Motor relay	28	Front left wheel sensor -
13	DST-1	29	—
14	—	30	Rear reducing solenoid valve
15	Clutch pedal stroke sensor signal	31	—
16	Clutch pedal stroke sensor ground		

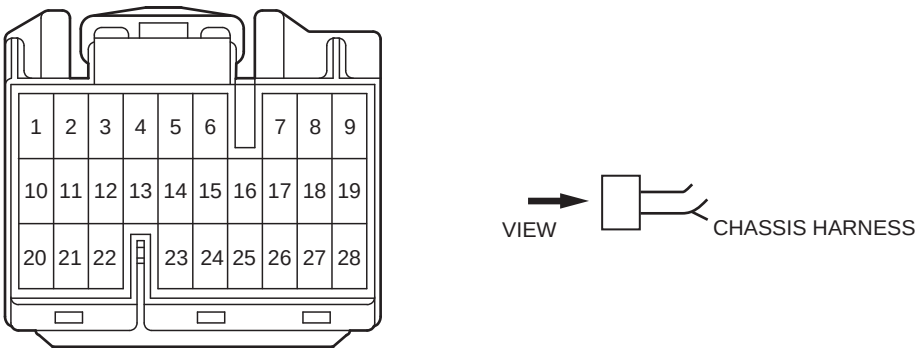
24 PIN CONNECTOR



SHTS16Z080300007

No.	Signal	No.	Signal
1	Stop light switch	13	—
2	ES start indicator light	14	—
3	ECU power supply (Battery)	15	Rear right wheel sensor -
4	—	16	Rear right wheel sensor +
5	Buzzer output	17	—
6	ABS warning light	18	Test mode startup
7	ECU power supply (Ignition)	19	Diagnosis startup
8	—	20	—
9	—	21	Parking brake switch
10	Exhaust brake relay	22	Rear left wheel sensor +
11	Parking brake switch 2	23	Rear left wheel sensor -
12	—	24	—

28 PIN CONNECTOR



SHTS16Z080300008

No.	Signal	No.	Signal
1	—	15	Brake fluid pressure sensor shield ground
2	Courtesy switch	16	G sensor power supply
3	Main switch (OFF)	17	—
4	Main switch (ON)	18	Exhaust brake relay monitor
5	Release timing switch (FAST)	19	—
6	Release timing switch (SLOW)	20	—
7	Engine revolution signal input	21	—
8	Vehicle speed sensor	22	—
9	—	23	—
10	—	24	Brake fluid pressure sensor power supply
11	—	25	Brake fluid pressure sensor signal
12	—	26	G sensor shield ground
13	—	27	G sensor ground
14	Brake fluid pressure sensor shield ground	28	G sensor input

INSPECTION
(ABS SYSTEM OPERATION AND FAILURE DIAGNOSTICS)

EN16Z0803F200003

OPERATION CHECK OF ABS FUNCTION

Perform an operation check every year for ABS function in the following manner:

1. CHECK OF OPERATING CONDITION

(1) Check operating condition of the system, according to the following "CHECK OF ABS OPERATING CONDITION".

2. PREPARATION BEFORE CHECKING OPERATING CONDITION.

(1) Under the vehicle stopping condition, check any fluid leak from ABS actuator by depressing the brake pedal.
When any fluid leak is found at the connection part of pipe connectors, retighten the connectors.
At the same time, when leaking from ABS actuator, replace ABS actuator with the new one.

(2) By releasing the brake pedal, check any leakage from ABS actuator.

3. CHECK OF ABS OPERATING CONDITION UNDER THE VEHICLE RUNNING.

NOTICE

Perform ABS operating condition check under the vehicle running with much attention on the following points.

- **Do it at a spacious and safe place.**
- **Do it with no payload on the vehicle.**
- **Put white tape or the like along the tire side face so that tire rotating condition may be also checked.**

(1) Switch starter key "ON" and check that ABS warning light will go on and go off thereafter.

(2) By driving the vehicle at the speed of 20-30 km/h {12-19 mile/h}, put a sudden brake and check that all wheels with ABS system will not be locked.

MALFUNCTION DIAGNOSIS BY WARNING LIGHT

ILLUMINATING LIGHT	CAUSE OF MALFUNCTION	FAIL-SAFE FUNCTION
ABS warning light is lit under the vehicle running condition.	POWER SUPPLY RELATED • Fuse burned out. • Wire harness connector disconnected. • Bad contact with wire harness. • Wire broken in wire harness. • Low battery voltage.	ABS all system not operating. (As normal braking operation)
	WHEEL SENSOR RELATED • Sensor clearance too wide. • Bad sensor unit. • Broken wire in wire harness. • Wire harness connector disconnected or bad contact.	ABS all system not operating. (As normal braking operation)
	ABS ACTUATOR RELATED • Wire broken or short circuit in solenoid coil. • Broken wire in wire harness of ABS actuator, wire harness connector disconnected, bad contact.	ABS all system not operating. (As normal braking operation)
	ECU • Internal malfunction in ECU.	ABS all system not operating. (As normal braking operation)

NOTICE
ABS warning light will continue to be lit even when any abnormal condition is seen in ABS mechanism for a while and come back to the normal condition.
In this case, it can be reset by stopping the vehicle and turning the starter key on "LOCK".

1. LIGHTING AND FLASHING ON/OFF OF WARNING LIGHT IN CONNECTION WITH DIAGNOSIS MONITOR.

• Lighting and flashing on/off of warning light in connection with diagnosis monitor.

Connectors to connect with diagnosis monitor.	Mode	ABS warning light condition	
		Vehicle stopping	Vehicle running
OPT: ATM	Abnormal	Lights up	Lights up
	Sensor check mode	Flashing (Test mode display)	Flashing (Test mode display)
	ABS mode	Flashing (Test mode display)	Not light up
STD: ABS/ASR	Abnormal	Flashing (Indicates diagnosis code)	Lights up
	Not abnormal	Diagnosis code flashes (Correct code)	Not light up
OPT: ATM AND STD: ABS/ASR	Abnormal	Diagnosis code flashes (Sensor check code also flashes before completing sensor check)	Lights up
	Sensor check mode	Sensor check code flashes (Diagnosis code also flashes when it is available)	Diagnosis code flashes
	ABS mode	Diagnosis code flashes (Correct code flashes when system is normal)	Not light up

ABS TEST MODE

1. START-UP OF TEST MODE

(1) Switching starter key to "LOCK" position, connect a dedicated harness wire with diagnosis connector (white color) and diagnosis monitor with "OPT: ATM" connector.

HINT

Refer to "TROUBLE SHOOTING BY USING DIAGNOSIS MONITOR", concerning the connection of diagnosis monitor.

(2) Switch starter key "ON" position.

2. CHECK OF TEST MODE DISPLAY

(1) Check that after turning the starter key "ON", ABS warning light will be lit for 3 seconds, "initial valve check" to "ECU output" will be shown in the order, and then "test mode" will be displayed. Do not step on the brake pedal until "test mode" will be displayed.

(2) Start engine when ABS warning light does not go off after "ECU output", check that "test mode" will be displayed in a few seconds.
In this case, do not depress the brake pedal before checking "test mode display".

NOTICE

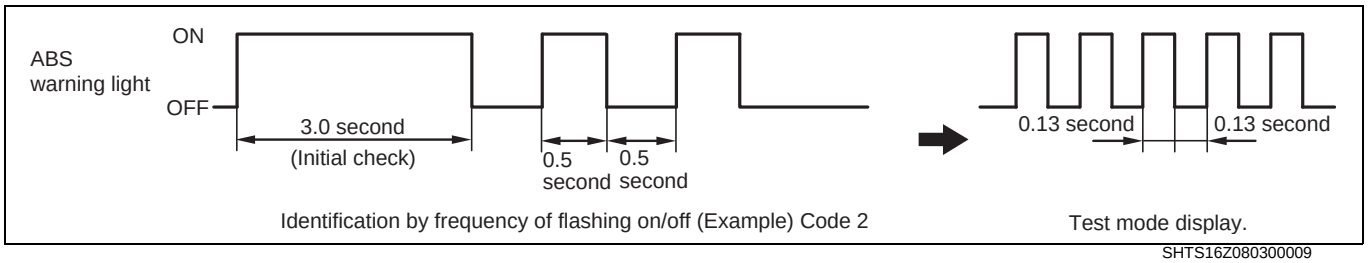
- **ABS warning light will not go off if the relating parts or the wiring are not good and "test mode" will not be displayed. This is a moment when ECU memorizes "malfunction spot" in diagnosis monitor code.**
  At the same time, ABS warning light will not also go off when any abnormality is seen on the fluid pressure sensor. In this case, there is a case that diagnosis monitor code may not be memorized.
- **When ABS warning light remains not lit, there are cases that its bulb or wiring of lighting system are not good.**

HINT

In order to avoid a wrong installation of ABS ECU, output "ECU code" when starting up "test mode".
Since the codes to be installed are different from model to model, check well the proper codes to meet with the model when starting up "Test mode".

Lighting and flashing on/off of warning light in connection with diagnosis monitor.

Specification		ECU code
ABS	Except model FT	1
ABS+ES start	Except model FT	2
ABS	Model FT	6

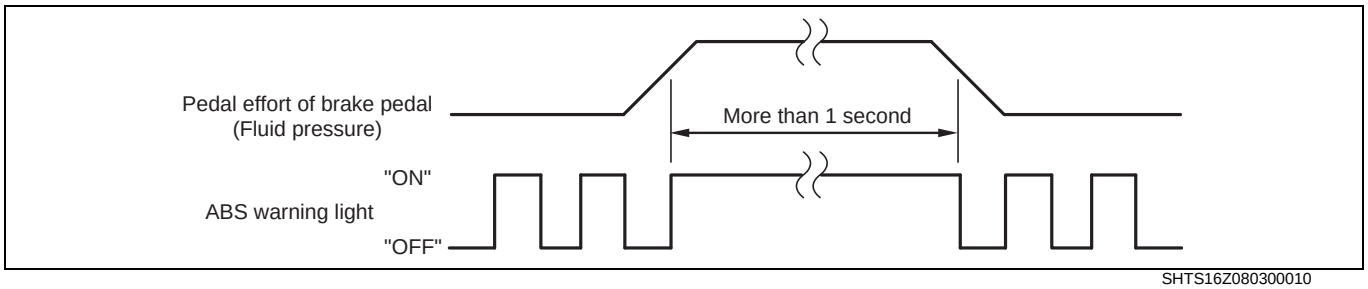


SHTS16Z080300009

3. STARTING THE CHECK

- Confirming that "test mode" will be displayed after "ECU code" displaying in ABS warning light, perform fluid sensor check and speed sensor check.

(1) Fluid sensor check
   a. After releasing the brake pedal for more than 1 sec., check ABS warning light going on by depressing the pedal with pedal effort of more than 147 N {15 kgf, 33 lbf}.
   b. With ABS warning light lit, keep depressing the pedal for 1 second.
   Removing your foot from the brake pedal, check that ABS warning light will be returned to "test mode display".



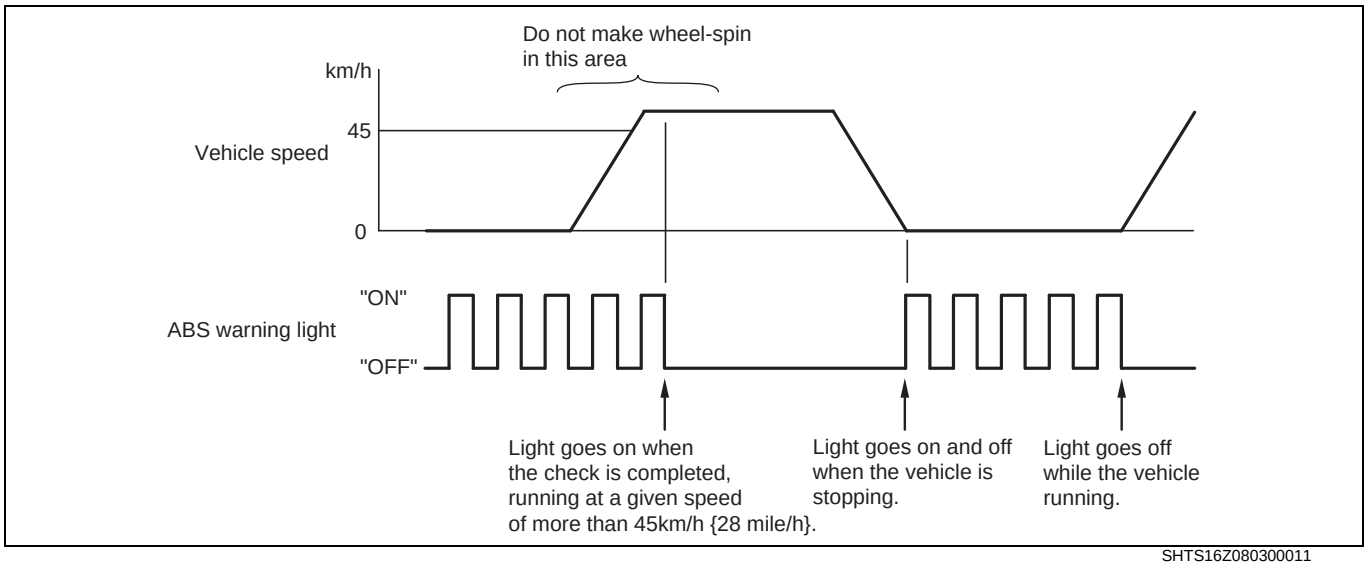
SHTS16Z080300010

NOTICE
When ABS warning light does not go on even with enough pedal effort, malfunction of fluid sensor may be its cause.

(2) Speed sensor check
   a. Starting engine, check that ABS warning light be put into "test mode" flashing on/off.
   b. By taking off the vehicle in straight direction without making wheel-spin and speeding up to more than 45 km/h, keeping it at a given speed for 1 second, check that ABS warning light went off.

NOTICE

- **When making wheel-spin, there is a case that speed sensor check will not be completed.**
- **There is a case that by starting sensor check in steered condition, ABS warning light does not go off after the check.**



SHTS16Z080300011

NOTICE
When the sensor is abnormal and the check is not completed, different from the above mentioned condition, light flashes on and off even under the vehicle running condition.

4. CHECKING COMPLETION

(1) When speed sensor check is correctly completed, ABS warning light goes to the following lighting condition:

- While the vehicle stopping: ABS warning light goes on and off. "Test mode display"
  (It flashes on and off even when it is not correctly completed)
- While the vehicle is running: ABS warning light goes off.

NOTICE

- **When the sensor check is not completed or the sensor is abnormal, it goes on. even under the vehicle running condition.**
- **When the sensor check is correctly completed (light goes off while the vehicle running), ABS will become possible to operate. When it is not completed or it is abnormal, ABS will not operate.**

5. CHECK FOR SENSOR CHECK CODE AND DIAGNOSIS MONITOR CODE.

(1) After the sensor check is completed, check the system condition by "flashing on/off status" of ABS warning light.

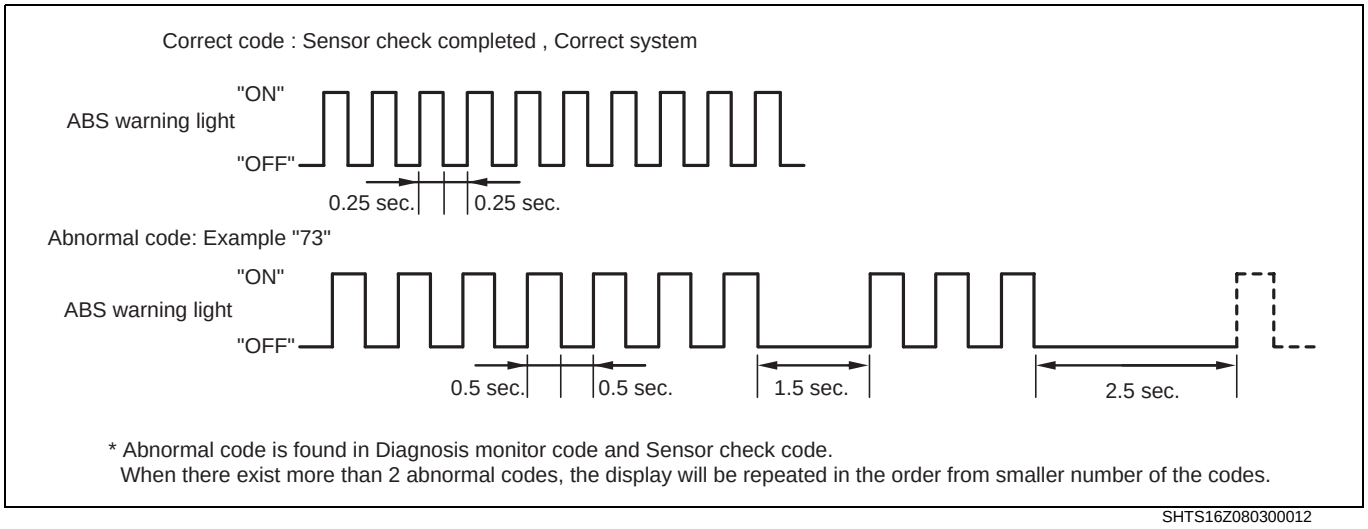
a. Connect dedicated harness wire with diagnosis connector (white color) and diagnosis monitor with "STD: ABS/ ASR" connector.

HINT

Refer to "Malfunction Diagnosis", concerning the connection of diagnosis monitor.

b. Check flashing on/off condition of ABS warning light.

- Correct code display: System is correct.
- Abnormal code display: System is abnormal.
  ABS warning light flashing on/off condition.



SHTS16Z080300012

c. When abnormal code is displayed, repair the defective part.

NOTICE

When only diagnosis monitor code is displayed, repair its defective part and clear off diagnosis monitor code. After clearing off it, check that ABS warning light is correctly operating.

(2) How to clear off diagnosis monitor code and sensor check code.

- Under the vehicle stopping condition, connecting "STD: ABS/ASR" connectors and turning starter key "ON", depress the brake pedal by more than 8 times for 5 sec.

NOTICE

Depress the pedal deeply so that "ON" and "OFF" of stop light switch may be surely recognized.

- Or, under the vehicle stopping condition, connecting "STD: ABS/ASR" connectors and turning starter key on, connect and disconnect the connector for "OPT: ATM" by more than 4 times for 8 sec. (Use 2 diagnosis monitors)
- When correct code is displayed, perform completing operation for test mode.

NOTICE

- **When sensor check code is displayed, repairing the defective part, clear off diagnosis monitor code. After clearing off, start an operation to "1. START-UP OF TEST MODE".**
- **When diagnosis monitor code and sensor check code are displayed, clear off diagnosis monitor code, repairing its defective part. After clearing off, start an operation to start up "1. START-UP OF TEST MODE".**
- **When sensor check code completes "test mode", it will be automatically cleared off.**

6. COMPLETION OF TEST MODE.

(1) Turn starter key to "LOCK" position.
(2) Remove diagnosis monitor. (Connector for "STD: ABS/ASR", connector for "OPT: ATM")
(3) Turn starter key "ON" position.

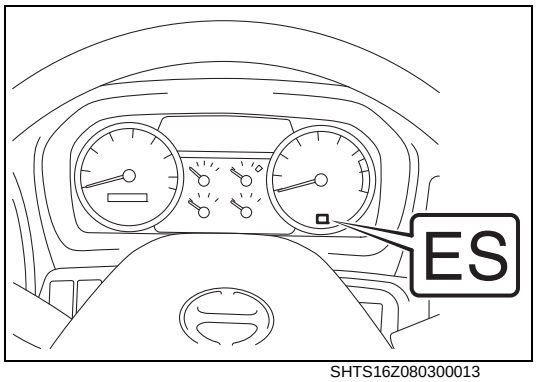
NOTICE

Unless an operation for (1) - (3) is performed, previous test mode will be displayed.

HOW TO TAKE A COUNTER-MEASURE WHEN OUTPUTTING SENSOR CHECK CODE

Sensor check code	Description	Contents	Counter-measure
71	Abnormal voltage output on front RH wheel sensor	The check for voltage output at vehicle speed of less than 5 km/h is not completed.	Check diagnosis monitor code 31.
72	Abnormal voltage output on front LH wheel sensor		Check diagnosis monitor code 32.
73	Abnormal voltage output on rear RH wheel sensor		Check diagnosis monitor code 33.
74	Abnormal voltage output on rear LH wheel sensor		Check diagnosis monitor code 34.
75	Abnormal frequency output on front RH wheel sensor	The check for "noise" or "frequency change" at vehicle speed of more than 45 km/h {28 mile/h} is not completed.	Check diagnosis monitor code 31.
76	Abnormal frequency output on front LH wheel sensor		Check diagnosis monitor code 32.
77	Abnormal frequency output on rear RH wheel sensor		Check diagnosis monitor code 33.
78	Abnormal frequency output on rear LH wheel sensor		Check diagnosis monitor code 34.
79	Abnormal voltage output on G sensor.	The check for sensor output is not completed.	Check diagnosis monitor code 43.
81	Abnormal output on fluid sensor (ABS actuator)	The check for sensor output is not completed.	Check diagnosis monitor code 46.

OPERATION CHECK FOR ES START FUNCTION



SHTS16Z080300013

1. CHECK FOR DISPLAY CODE ON ES START INDICATOR.

(1) When a wrong operation or any malfunction on ABS+ES start ECU is produced, its malfunction will be notified by such warning means as warning buzzer, lighting or flashing on/off of an indicator light as it follows:

NOTICE

When any malfunction is displayed, diagnose it through diagnosis function.

Display and warning item		Indicator light	Warning buzzer	Warning content	Treatment
Under "ON" condition of starter switch, check if the light light up or not		Lighting for 3 second	—	—	—
Operation	ES start is operating (After engine starting)	Lighting	1 short beeping	—	—
	ES start is released	Lighting off	No beeping	—	—
Warning	Failure alarm	Blinking	Beeping continuously	Defects of signal switches or sensors	Perform failure diagnosis by diagnosis function.
	Non-adjustment alarm	Blinking	No beeping	Initialization is not completed.	Initialize.
Caution to mis-operation	Driver not seated alarm	Lighting	Beeping continuously	Door (either driver's side or assistant's side) opens when ES start is operating	Pull parking brake lever.
	Starter switch OFF alarm	Lighting off	Beeping continuously	Starter switch is set to "LOCK" when ES start is operating during neutral position.	Pull parking brake lever or set main switch to "OFF".
	Vehicle moving alarm	Lighting	Beeping continuously	Vehicle moves when ES start is operating.	Pull parking brake lever or step brake pedal
	Operation time information	Lighting	Operation time from 1 to 9 minutes 1 minute has passed: 1 short beeping 2 minutes have passed: 2 short beeping 9 minutes have passed: 9 short beeping Operation time 10 minutes or more: 5 short beeping continuously	Displaying every minute ES start operation time	Release ES start.

SHTS16Z080300014

- Check the battery voltage.
- Standard: more than 20V
- Check that the ES start controller connectors are connected correctly.
- Check the fuse.
- Check that the speed sensor connector is connected correctly.
- Check that the ES start valve connector is connected correctly.
- Check that the clutch hydraulic switch connector is connected correctly.
- Check that the clutch stroke sensor connector is connected correctly.
- Check that the back-up light switch connector is connected correctly.
- Check that the neutral switch connector is connected correctly.

2. OPERATION CHECK

(1) Normal operation check
   a. Turn starter key "ON" position.
   b. ES start indicator light in the meter goes on for 3 second.
   c. Then, when only ES start light flashes on and off, it means that 0-point adjustment of clutch and initial setting of release position are not made. Accordingly, make them. At the same time, when ES start indicator light flashes on and off and the buzzer beeps continuously, it means that the switch or the sensor is not good. Checking those defective parts through diagnosis function, repair them.

(2) 0-point adjustment of clutch and initial setting of release position.
   a. Make 0-point adjustment of clutch and initial setting of release position.

(3) Operation check

NOTICE

This check should be performed on "brake tester" or at place where protective device against the vehicle taking off since vehicle taking off operation is needed.

   a. The followings should be fulfilled.

- Starter key: "ON".
- ES start main switch: "ON".
- Parking switch: "RELEASE".
- Vehicle speed: 0 km/h {0 mile/h}
   b. After depressing the brake pedal for approx. 1 second, check that the buzzer beeps once, ES start indicator light flashes on and off, and ES start will operate.
   c. Check that braking force is retained.
   d. By normal operation for taking off (by shifting gear for clutch connection), check that ES start will be released.

3. WARNING FUNCTION

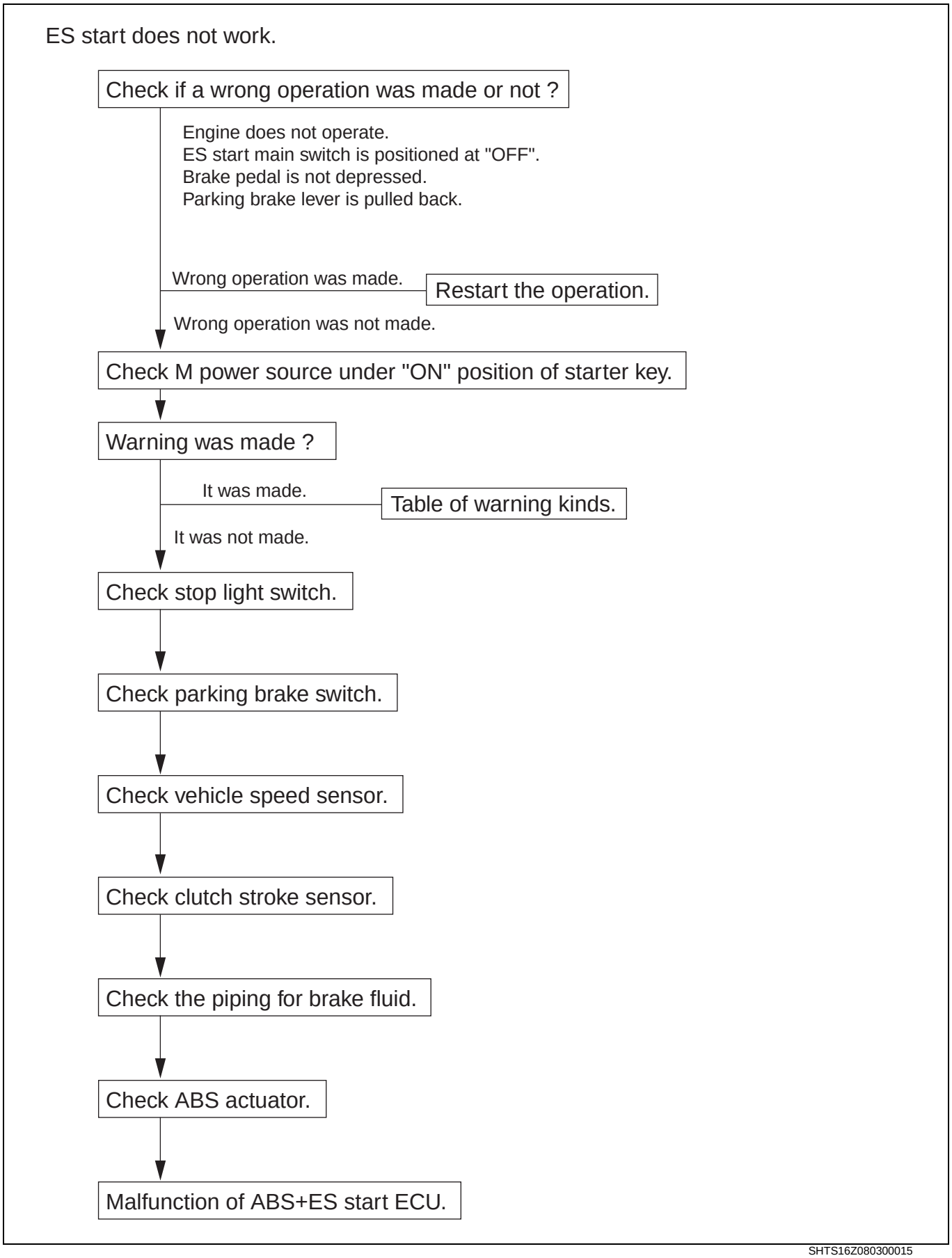
(1) ES start system alerts by beeping the warning buzzer and lighting or blinking the indicator light to classify the alarms when dangerous operations or failures occur.

NOTICE

When a failure alarm is displayed, perform the failure diagnosis by using diagnosis function.

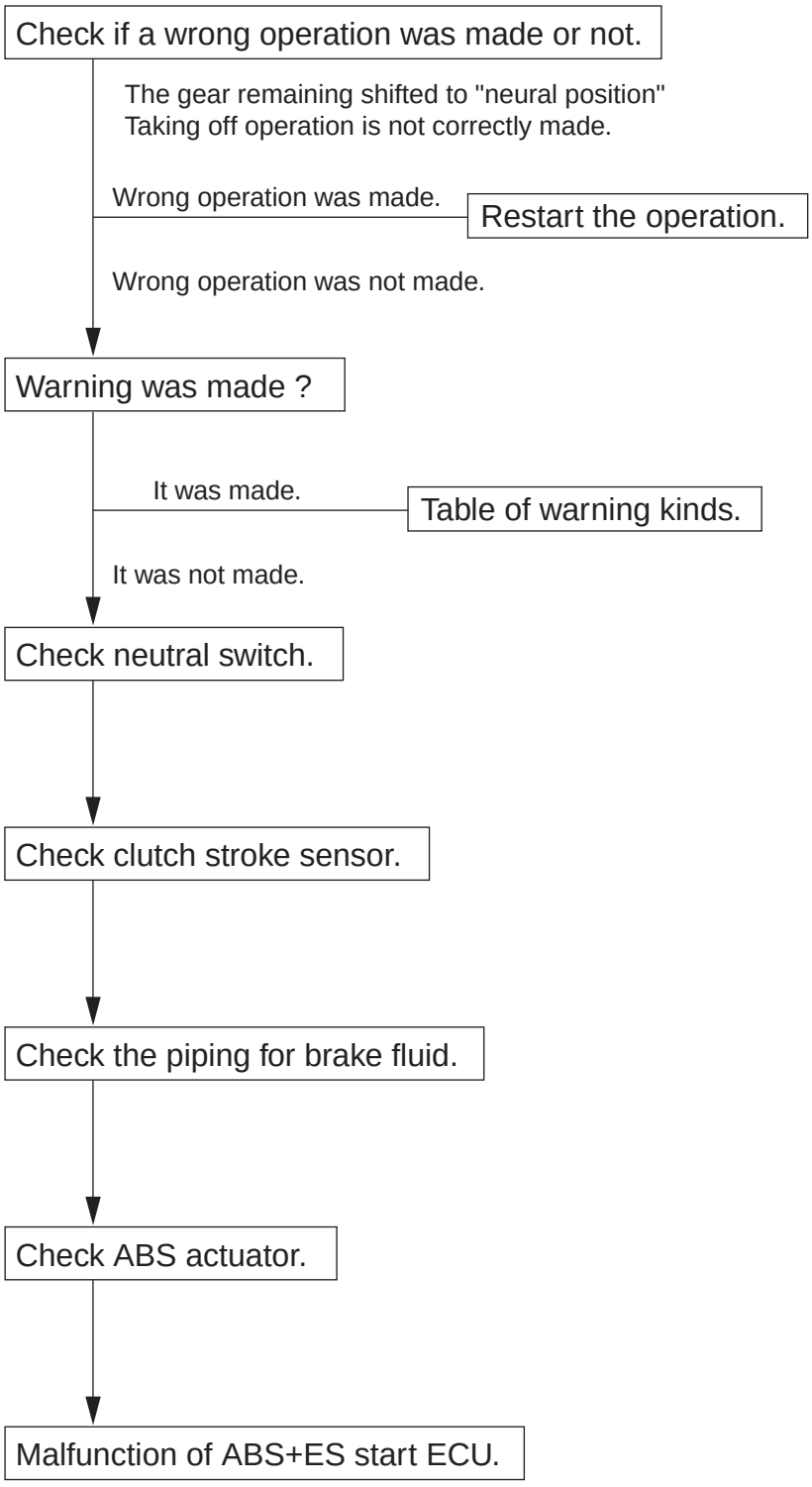
Indicator light	Warning buzzer	Item	Warning content	Treatment
Blinking	No beeping	Non-adjustment alarm	Initialization is not completed.	Initialize.
Blinking	Beeping continuously	Failure alarm	Defects of signal switches or sensors.	Perform failure diagnosis by diagnosis function.
Lighting		Driver not seated alarm	When starter key was cut off during ES start operation under the condition that the door was opened while ES start is operating or parking lever is not pulled at "Neutral" position of shift.	Pull parking brake lever.
Lighting		Vehicle moving alarm	When the vehicle moves while ES start is operating. (Shift: "Neutral" position)	Pull parking brake lever or step brake pedal.
Lighting	Refer to "Warning content"	Operation time information	Operating time of ES start is notified to the driver every 1 min. • During 1 to 9 min. after operating: To beep intermittently every such minutes as time is lapsing. • More than 10 min. after operating: To beep 5 times continuously. • Example: 3 min. after operating. "Beep", "Beep", "Beep".	Stepping deeply on the brake pedal, pull the parking brake lever.

ES START: MALFUNCTION DIAGNOSIS FROM VARIOUS CONDITION



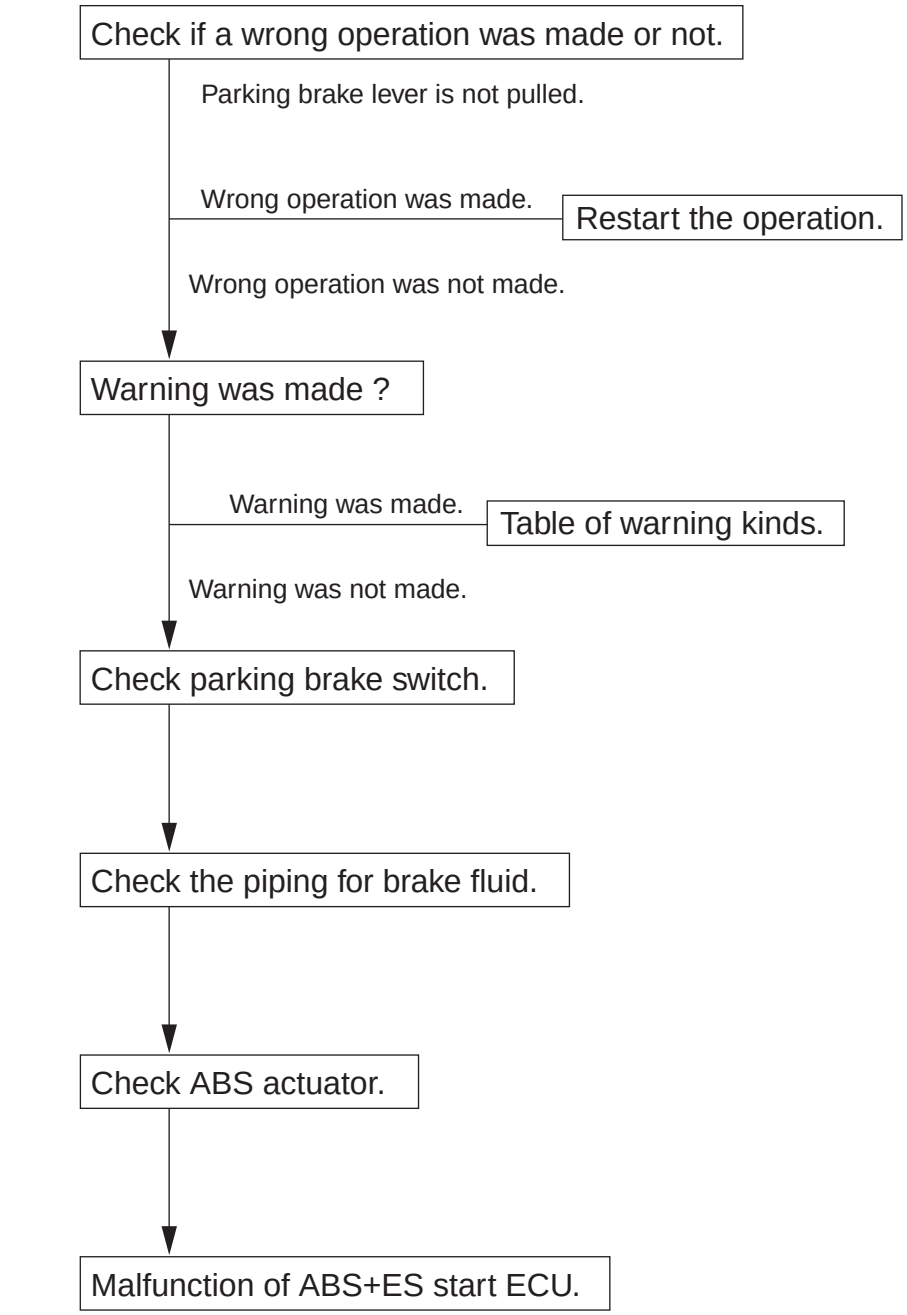
SHTS16Z080300015

ES start is not released. (Release by taking off operation.)



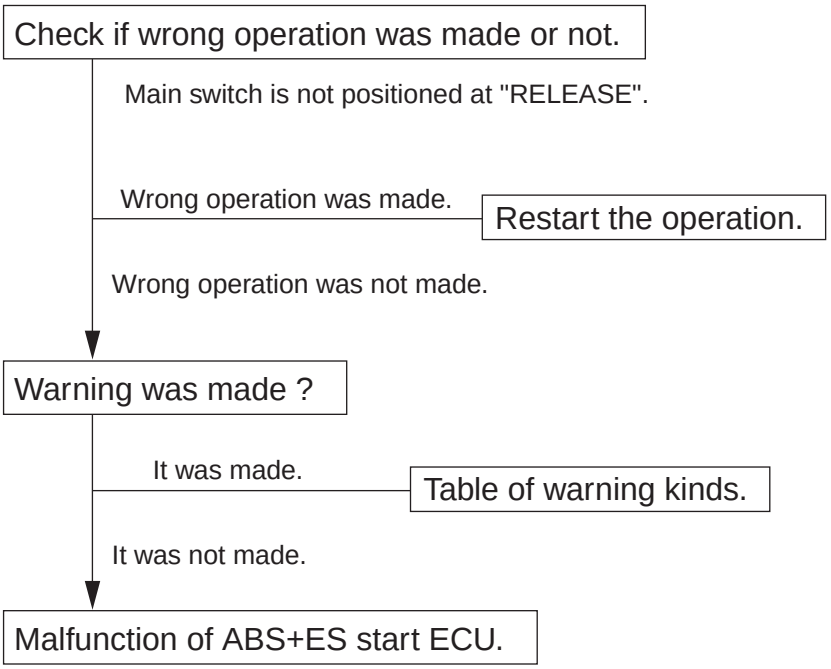
SHTS16Z080300016

ES start is not released. (Release by parking brake.)



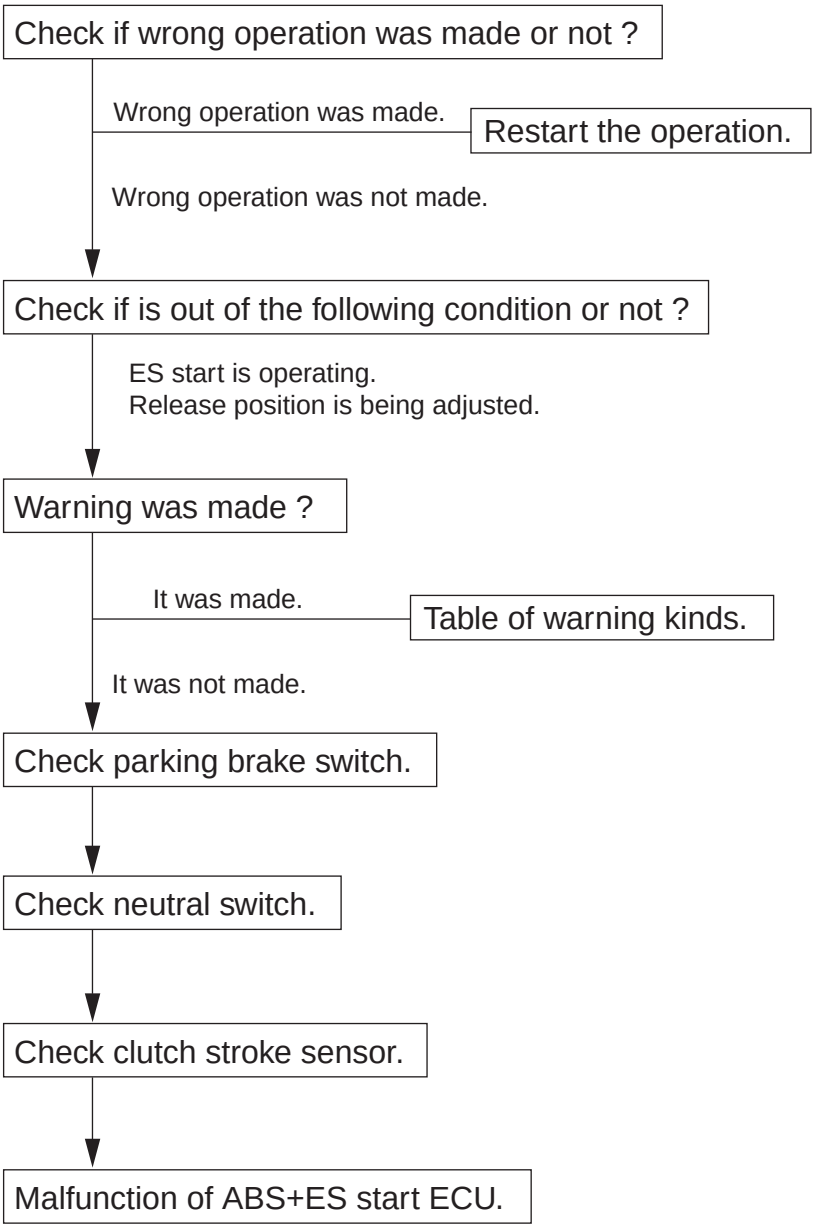
SHTS16Z080300017

ES start is not released. (Release by ES start main switch.)



SHTS16Z080300018

Initial setting for releasing position can not be made.



SHTS16Z080300019

Dragging the brake (Vehicle moving back)

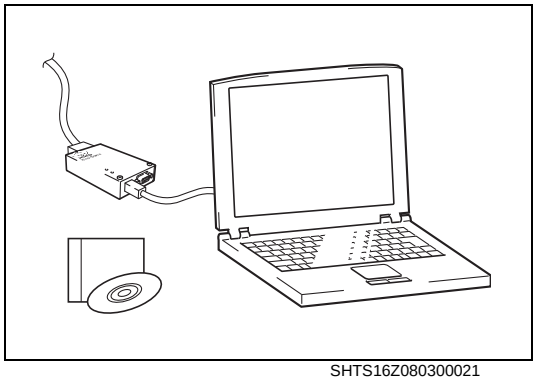


SHTS16Z080300020

DIAGNOSIS USING THE PC (PERSONAL COMPUTER)

DIAGNOSIS TOOL WITH INTERFACE

EN16Z0803F200004



SHTS16Z080300021

1. DIAGNOSIS TOOL

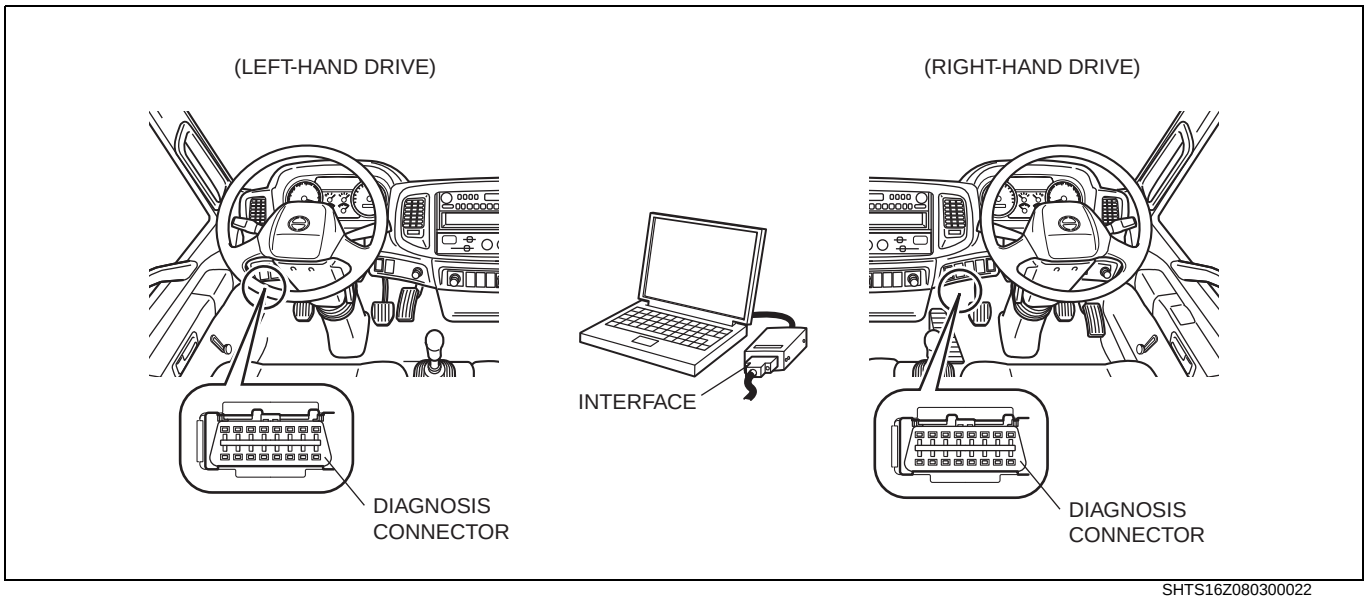
- Trouble diagnosis can be performed using the PC diagnosis tool. By connection to the diagnosis connector, the trouble location is indicated.

SST:
Interface Box (Hino-Bowie) (09993-E9070)
Cable between vehicle & Hino-Bowie (S0904-21220)
Diagnosis software: HINO Diagnostic explorer (DX)
Reprogramming software: HINO Reprog Manager

NOTICE
Only ECU reprogramming can be performed by authorized HINO dealer.

2. CONNECT THE PC DIAGNOSIS TOOL

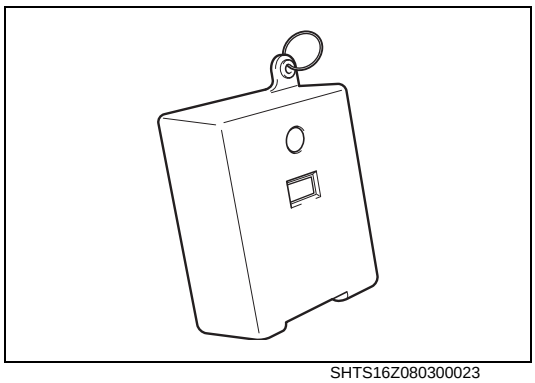
(1) Turn the starter switch to the "LOCK" position.
(2) Connect the diagnosis cable between diagnosis connector and interface.
(3) Connect the interface to the PC.
(4) Turn the starter switch to the "ON" position.
(5) The opening menu will be displayed on the PC screen.



SHTS16Z080300022

TROUBLESHOOTING BY USING DIAGNOSIS MONITOR

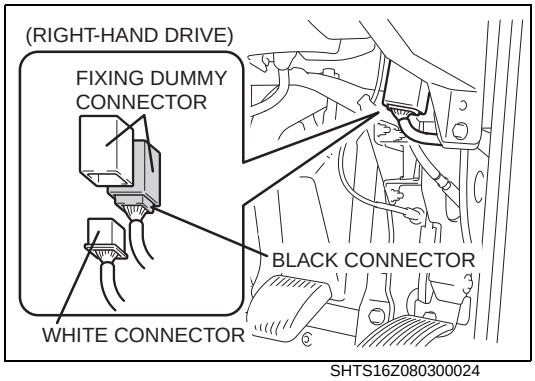
EN16Z0803F200005



SHTS16Z080300023

1. DIAGNOSIS MONITOR

(1) Diagnosis monitor alerts the failure location with sound and light by being connected to the special diagnosis connector of the ABS+ES start system.



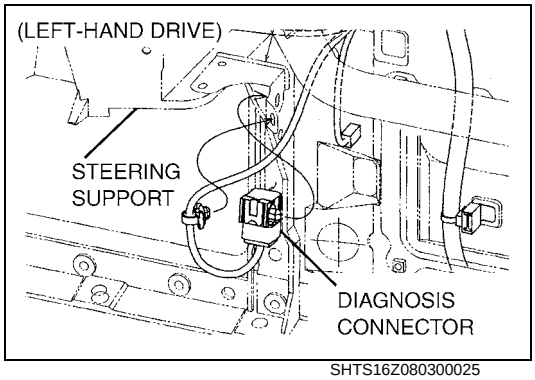
SHTS16Z080300024

2. CONNECT THE DIAGNOSIS MONITOR

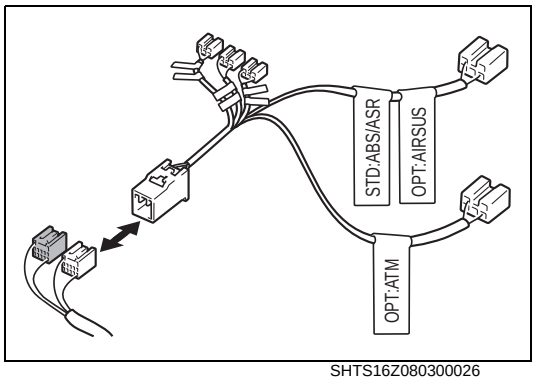
(1) Disconnect the centralized diagnosis connector (upside the accelerator pedal) from the dummy connector.

NOTICE

The centralized diagnosis connector is usually connected to the fixing dummy connector. So, disconnect the connector from the dummy connector and pull it to use. When the connector is not in use, connect it firmly to the fixing dummy connector.



SHTS16Z080300025



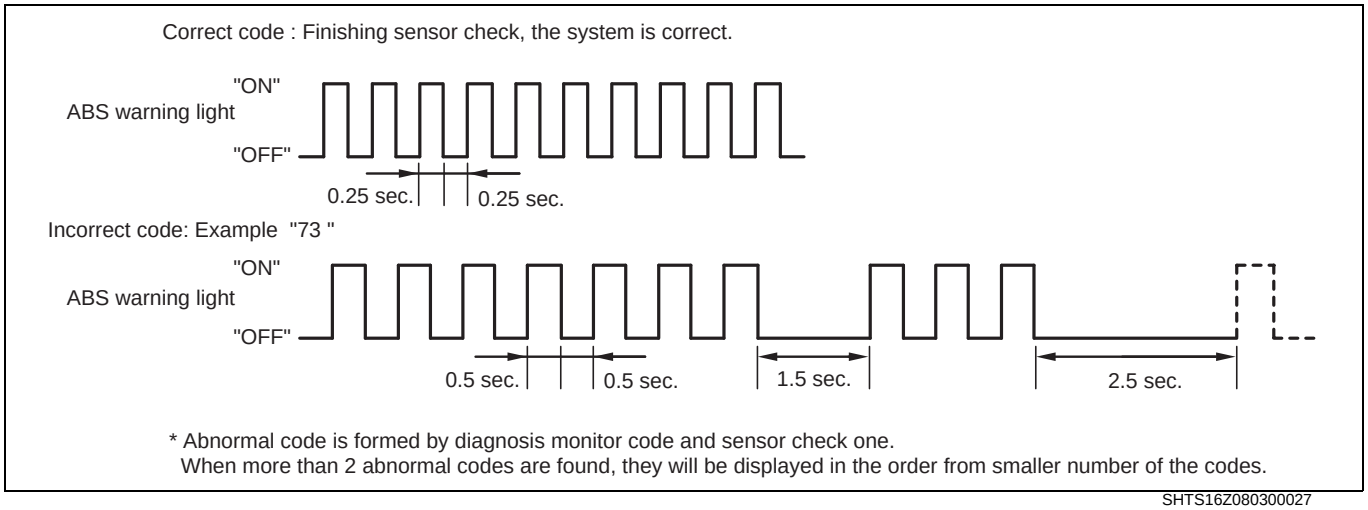
SHTS16Z080300026

(2) Connect the dedicated harness to the centralized diagnosis connector and diagnosis monitor to the connector tagged by "STD: ABS/ASR".
SST:
Dedicated Harness (S0963-02300)
Diagnosis monitor (S0963-01370)

(3) Turn the starter switch to "ON" position.

3. MALFUNCTION CODE DISPLAY

(1) Malfunction codes, regardless of the current or the past ones, will be repeatedly displayed in the order from smaller number of malfunction codes.



SHTS16Z080300027

4. CLEARING OFF OF MALFUNCTIONS IN THE PAST.

(1) How to clear off diagnosis monitor code and sensor check code.

- Stop the vehicle and connect "STD: ABS/ASR" connector and step on the brake pedal by more than 8 times for 5 second by turning starter key "ON".

NOTICE

Depress the brake pedal deeply so that "ON" or "OFF" of stop light switch can be clearly recognized.

- Or, stop the vehicle and connect "STD: ABS" connector, connect and disconnect "OPT: ATM" connector by more than 4 times during 8 second under "ON" position of starter key.

NOTICE

Use 2 diagnosis monitors.

- When correct code is displayed, perform finishing operation of test mode.

HINT

Sensor check code will be automatically deleted when finishing test mode.

TABLE OF TROUBLE CODE

EN16Z0803F200006

NOTICE
DTC No.: Diagnosis Trouble code (Using the PC diagnosis tool)

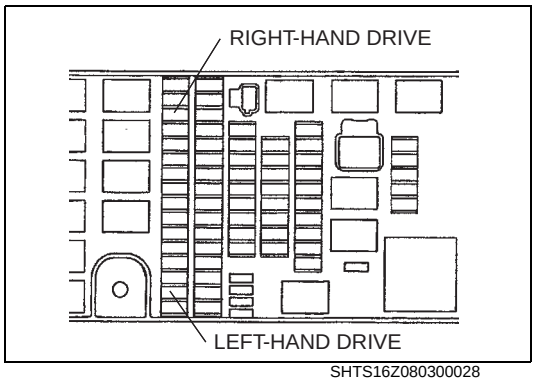
DIAGNOSIS CODE	DTC No.	TROUBLE CONTENTS	REFER PAGE
11	C0278	Disconnection of solenoid relay	DN03-28
12	C0279	Short circuit of solenoid relay	DN03-32
13	C0273	Disconnection of motor relay	DN03-34
14	C0274	Short circuit of motor relay	DN03-39
21	C0226	Abnormality of solenoid for front right wheel	DN03-41
22	C0236	Abnormality of solenoid for front left wheel	DN03-44
23	C0246	Abnormality of solenoid for rear right wheel	DN03-47
24	C0256	Abnormality of solenoid for rear left wheel	DN03-49
25	C1225	Abnormality of ES solenoid	DN03-51
31	C0200	Abnormality of front right wheel sensor	DN03-54
32	C0205	Abnormality of front left wheel sensor	DN03-57
33	C0210	Abnormality of rear right wheel sensor	DN03-60
34	C0215	Abnormality of rear left wheel sensor	DN03-63
35	C1235	Abnormality of front right wheel sensor: Excessive air gap, or adhesion of iron piece	DN03-66
36	C1236	Abnormality of front left wheel sensor: Excessive air gap, or adhesion of iron piece	DN03-66
38	C1238	Abnormality of rear right wheel sensor: Excessive air gap, or adhesion of iron piece	DN03-66
39	C1239	Abnormality of rear left wheel sensor: Excessive air gap, or adhesion of iron piece	DN03-66
41	C1241	Low voltage or overvoltage of power supply	DN03-67
42	C1390	Abnormality of power supply voltage	DN03-67
43	C1243	Fixing of G sensor	DN03-68
44	C1244	Disconnection/short circuit of G sensor	DN03-71
45	C1245	Abnormality of G sensor output	DN03-71
46	C1246	Abnormality of ABS actuator: Brake fluid pressure sensor	DN03-72
49	C1249	Abnormality of stop light switch	DN03-76
51	C1251	Abnormality of motor: No rotation	DN03-77
66	C1266	Abnormality of exhaust brake cut relay	DN03-78
A1	C1393	Abnormality of air pressure signal	DN03-79
B1	C1383	Disconnection/short circuit of vehicle speed sensor	DN03-79
B2	C1384	Abnormality of clutch stroke sensor (only vehicle with ES start)	DN03-80
B3	C1382	Abnormality of neutral switch (only vehicle with ES start)	DN03-82
B5	C1387	Sticking at "ON" position of release timing switch (only vehicle with ES start)	DN03-83

DIAGNOSIS CODE	DTC No.	TROUBLE CONTENTS	REFER PAGE
B6	C1386	Abnormality of ES start main switch (only vehicle with ES start)	DN03-84
B7	C1388	Imperfect initial setting (only vehicle with ES start)	DN03-85
B8	C1389	Abnormality of tachometer signal (only vehicle with ES start)	DN03-85

NOTICE
Diagnosis code "A" means "10", "B" means "11".

DISCONNECTION OF SOLENOID RELAY (DIAGNOSIS CODE 11, DTC No. C0278)

EN16Z0803F200007



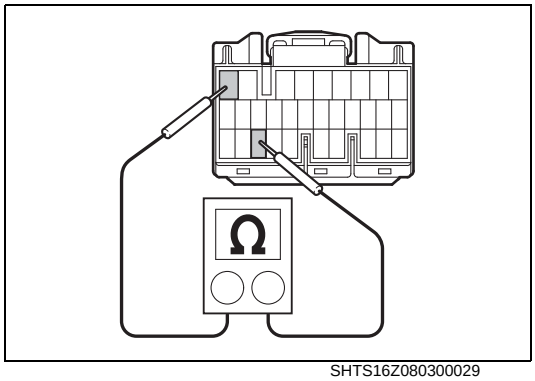
SHTS16Z080300028

1. FUSE CHECK

(1) Set the starter switch to "LOCK", check the ABS solenoid 30A fuse.
Standard: No abnormality

NO → Replace the ABS solenoid fuse.

YES

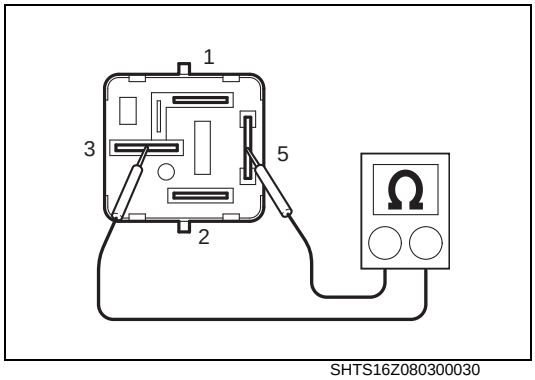

SHTS16Z080300029

2. RELAY CHECK

(1) Disconnect the 31 pin connector of the ECU.
(2) Measure the resistance between 1st and 24th terminals of the 31 pin connector (chassis harness side).
Standard: 160-340 Ω

NO → Go to the item "6".

YES

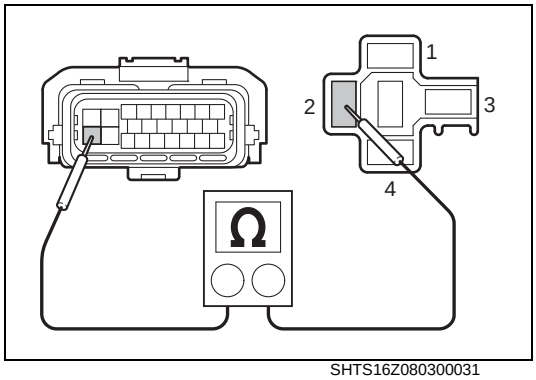


SHTS16Z080300030

(3) Remove the ABS solenoid relay, measure the resistance between 3rd and 5th terminals of the relay.
Standard: More than 500 Ω

NO → Abnormality of the ABS solenoid relay.

YES



SHTS16Z080300031

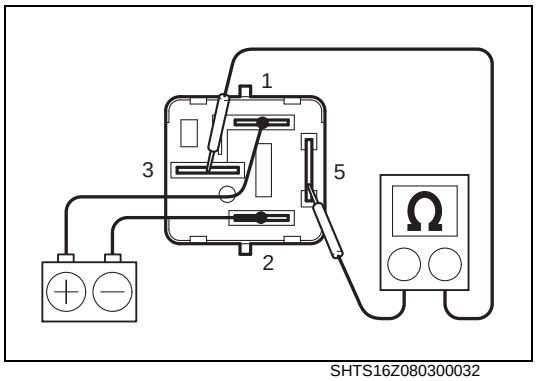
3. WIRE HARNESS CHECK

(1) Disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 16th terminal of the 24 pin connector of ABS actuator (chassis harness side) and 2nd terminal of the ABS solenoid relay (socket side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



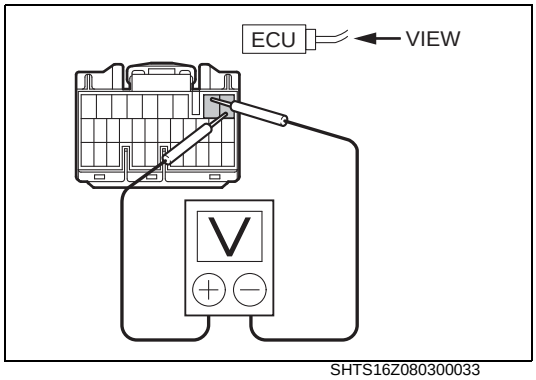
SHTS16Z080300032

4. RELAY CHECK

(1) Remove the ABS solenoid relay, check the continuity between 3rd and 5th terminals of relay when a battery voltage was applied between 1st and 2nd terminals of relay.
Standard:
Turning on electricity between 1st and 2nd terminals:
It is conducted between 3rd and 5th terminals.
Not turning on electricity:
It is not conducted between 3rd and 5th terminals.

NO → Abnormality of the ABS solenoid relay.

YES



SHTS16Z080300033

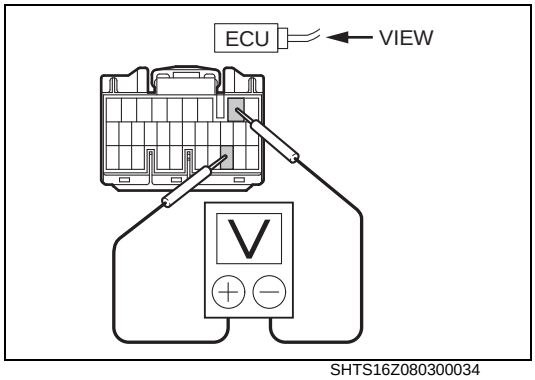
5. ECU CHECK

(1) Connect all the connector and relay, turn the starter switch to "ON".

(2) Measure the voltage between 1st and 2nd terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply circuit.

YES

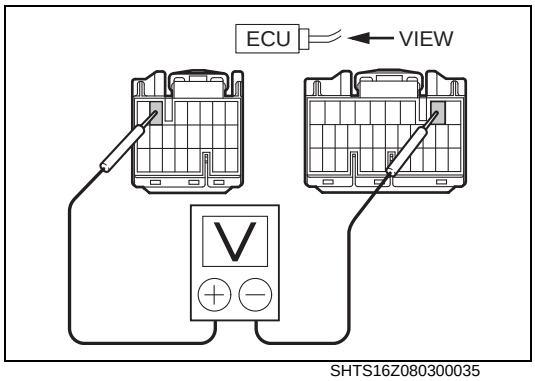


SHTS16Z080300034

(3) Measure the voltage between 24th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 2V

NO → Abnormality of the ECU power supply circuit.

YES



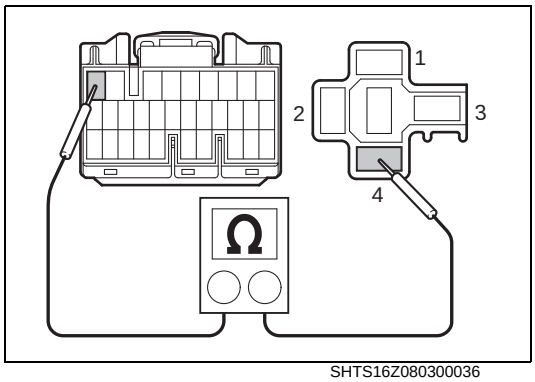
SHTS16Z080300035

(4) Measure the voltage between 6th terminal of the 22 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply circuit.

YES

Normal.



SHTS16Z080300036

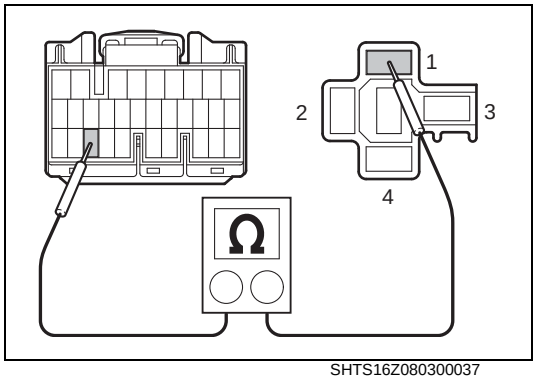
6. WIRE HARNESS CHECK

(1) Turn the starter switch to "LOCK", disconnect the 31 pin connector of ECU.

(2) Measure the resistance between 1st terminal of the 31 pin connector of ECU (chassis harness side) and 4th terminal of the ABS solenoid relay (socket side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



SHTS16Z080300037

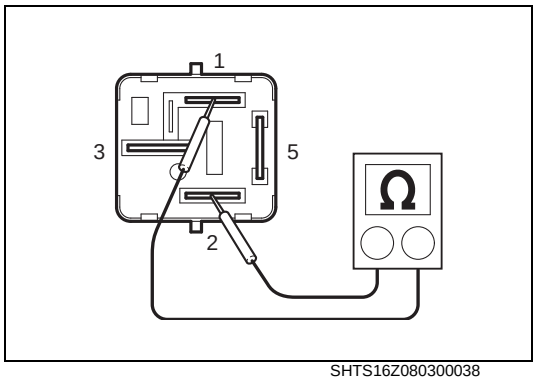
(3) Measure the voltage between 24th terminal of the 31 pin connector of ECU (chassis harness side) and 1st terminal of the ABS solenoid relay (socket side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES

7. RELAY CHECK



SHTS16Z080300038

(1) Remove the ABS solenoid relay, measure the resistance between 1st and 2nd terminals.
Standard: 200-300 Ω

NO

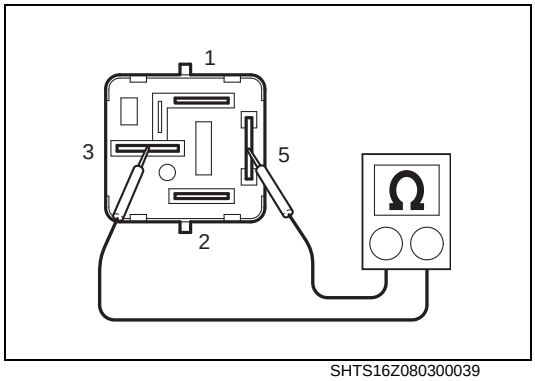
Abnormality of the ABS solenoid relay.

YES

Normal.

SHORT CIRCUIT OF SOLENOID RELAY (DIAGNOSIS CODE 12, DTC No. C0279)

EN16Z0803F200008



SHTS16Z080300039

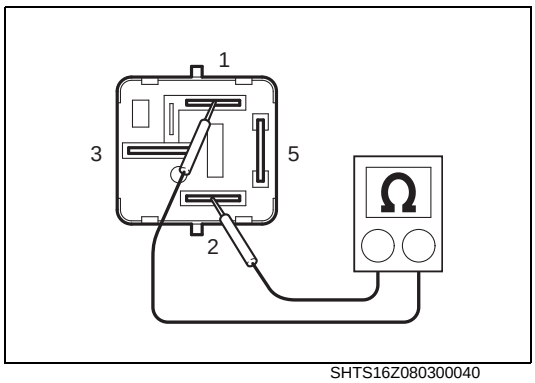
1. RELAY CHECK

(1) Set the starter switch to "LOCK", remove the ABS solenoid relay from the relay block.

(2) Measure the resistance between 3rd and 5th terminals.
Standard: ∞ Ω

NO → Abnormality of the ABS solenoid relay.

YES

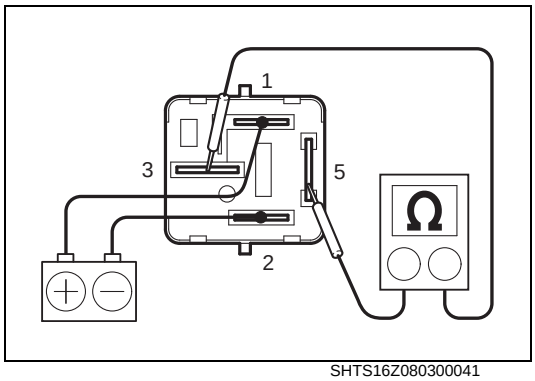


SHTS16Z080300040

(3) Measure the resistance between 1st and 2nd terminals of the ABS solenoid relay.
Standard: 200-300 Ω

NO → Abnormality of the ABS solenoid relay.

YES

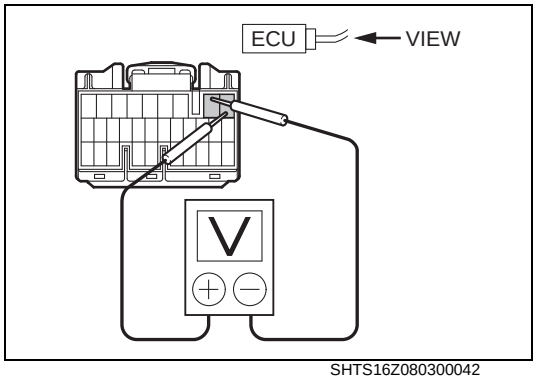


SHTS16Z080300041

(4) Check the continuity between 3rd and 5th terminals ABS solenoid relay when a battery voltage was applied between 1st and 2nd terminals.
Standard:
Turning on electricity between 1st and 2nd terminals:
It is conducted between 3rd and 5th terminals.
Not turning on electricity:
It is not conducted between 3rd and 5th terminals.

NO → Abnormality of the ABS solenoid relay.

YES



SHTS16Z080300042

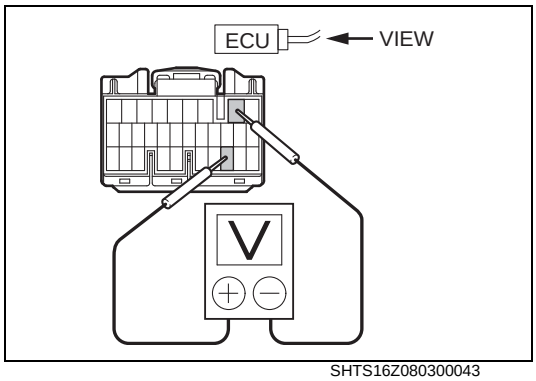
2. ECU CHECK

(1) Install the ABS solenoid relay, turn the starter switch to "ON".

(2) Measure the voltage between 1st and 2nd terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply circuit.

YES



SHTS16Z080300043

(3) Measure the voltage between 24th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 2V

NO → Abnormality of the ECU power supply circuit.

YES

Normal.

DISCONNECTION OF MOTOR RELAY (DIAGNOSIS CODE 13, DTC No. C0273)

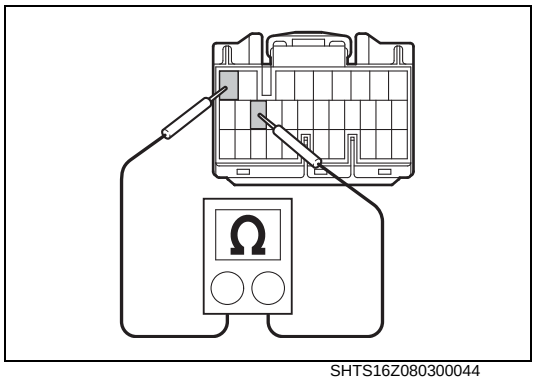
EN16Z0803F200009

1. FUSE CHECK

(1) Set the starter switch to "LOCK", check the ABS 50A fusible link.
Standard: No abnormality

NO → Replace the fusible link.

YES



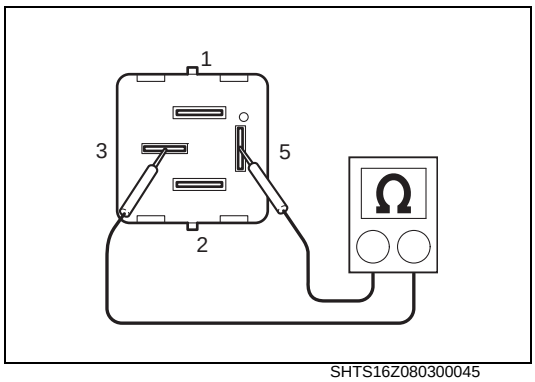
SHTS16Z080300044

2. RELAY CHECK

(1) Disconnect the 31 pin connector of ECU.
(2) Measure the resistance between 1st and 12th terminals of the 31 pin connector.
Standard: 100-210 Ω

NO → Go to the item "6".

YES

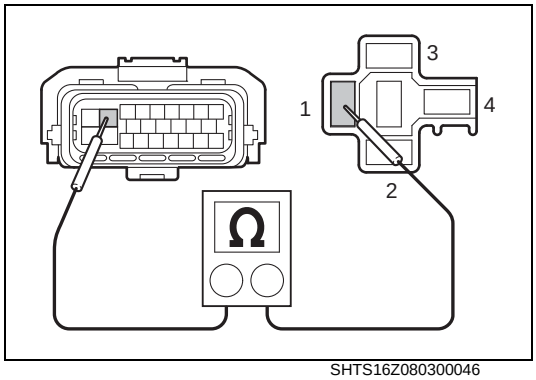


SHTS16Z080300045

(3) Remove the ABS motor relay, measure the resistance between 3rd and 5th terminals.
Standard: ∞ Ω

NO → Abnormality of the ABS motor relay.

YES



SHTS16Z080300046

3. WIRE HARNESS CHECK

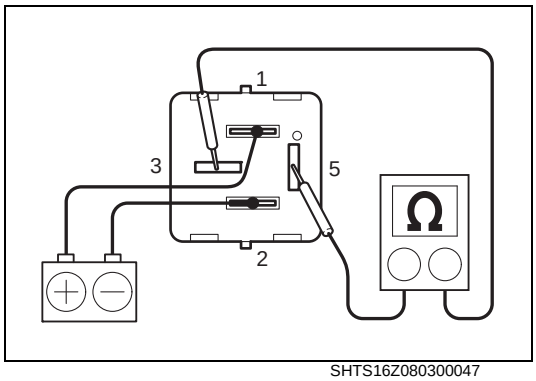
(1) Disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 2nd terminal of the 24 pin connector of ABS actuator (chassis harness side) and 1st terminal of the ABS motor relay (socket side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES



SHTS16Z080300047

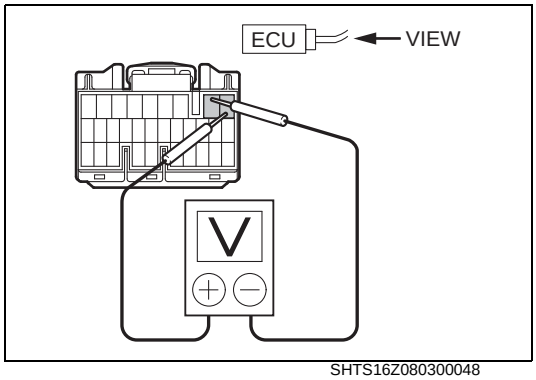
4. RELAY CHECK

(1) Check the continuity between 3rd and 5th terminals of ABS motor relay when a battery voltage was applied between 1st and 2nd terminals.
Standard:
Turning on electricity between 1st and 2nd terminals:
It is conducted between 3rd and 5th terminals.
Not turning on electricity:
It is not conducted between 3rd and 5th terminals.

NO

Abnormality of the ABS motor relay.

YES



SHTS16Z080300048

5. ECU CHECK

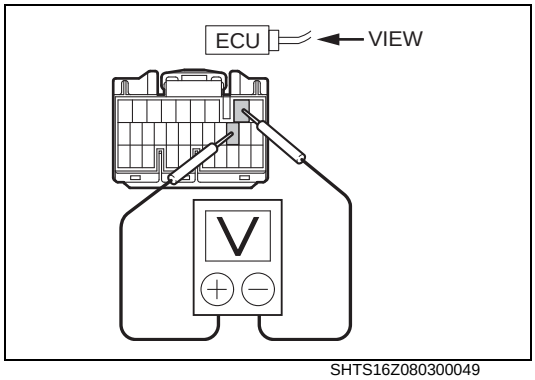
(1) Connect the connector and relay, turn the starter switch to "ON".

(2) Measure the voltage between 1st and 2nd terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO

Abnormality of the ECU power supply circuit.

YES

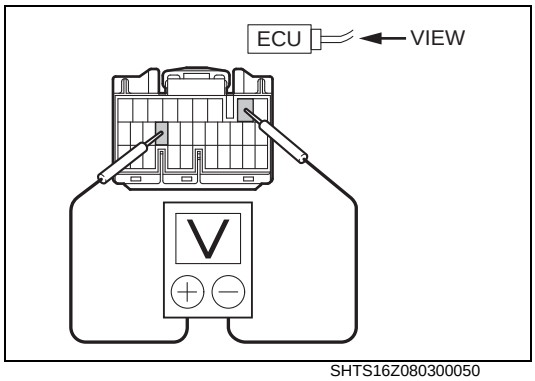


SHTS16Z080300049

(3) Measure the voltage between 12th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply circuit.

YES



SHTS16Z080300050

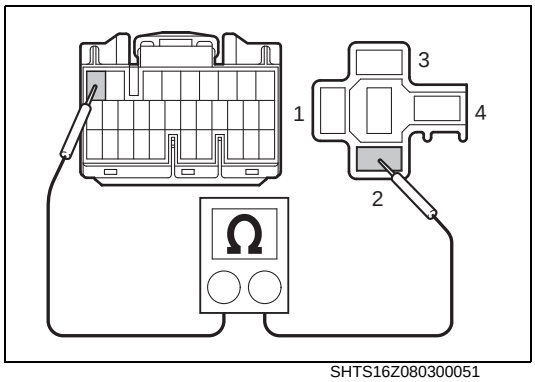
(4) Measure the voltage between 18th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 2V

NO → Abnormality of the ECU power supply circuit.

YES

Normal.

6. WIRE HARNESS CHECK

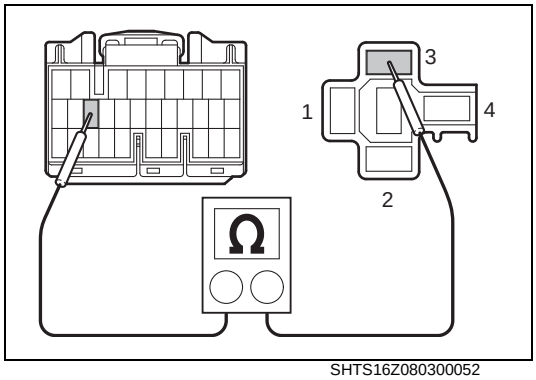


SHTS16Z080300051

(1) Measure the resistance between 1st terminal of the 31 pin connector of ECU (chassis harness side) and 2nd terminal of the ABS motor relay (socket side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



SHTS16Z080300052

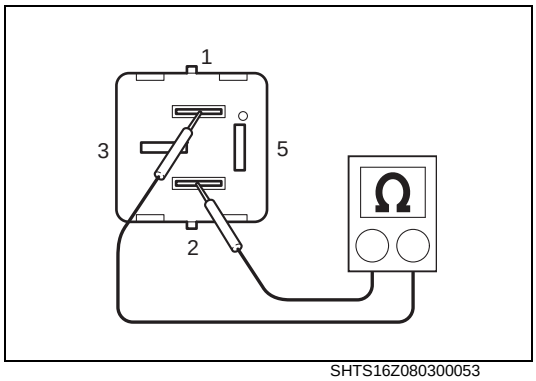
(2) Measure the resistance between 12th terminal of the 31 pin connector of ECU (chassis harness side) and 3rd terminal of the ABS motor relay (socket side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES

7. RELAY CHECK



SHTS16Z080300053

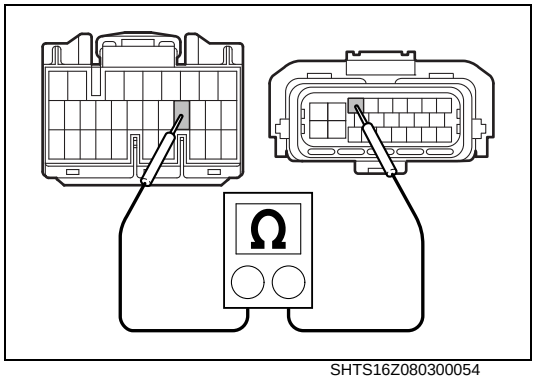
(1) Remove the ABS solenoid relay, measure the resistance between 1st and 2nd terminals.
Standard: 128-187.5 Ω

NO

Abnormality of the ABS solenoid relay.

YES

Normal.



SHTS16Z080300054

8. WIRE HARNESS CHECK

(1) Disconnect 24 pin connector of ABS actuator.

(2) Measure the resistance between 18th terminal of the 31 pin connector of ECU (chassis harness side) and 3rd terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: More than 5 Ω

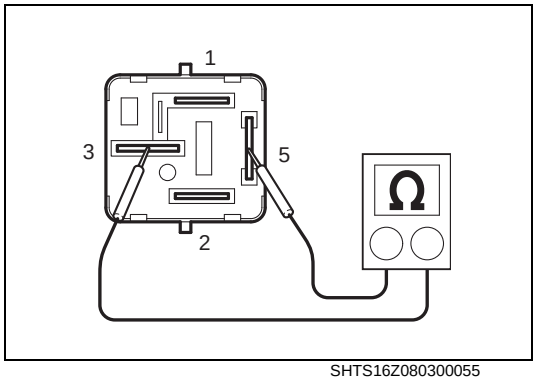
NO → Abnormality of the wire harness.

YES

Normal.

SHORT CIRCUIT OF MOTOR RELAY (DIAGNOSIS CODE 14, DTC No. C0274)

EN16Z0803F200010



SHTS16Z080300055

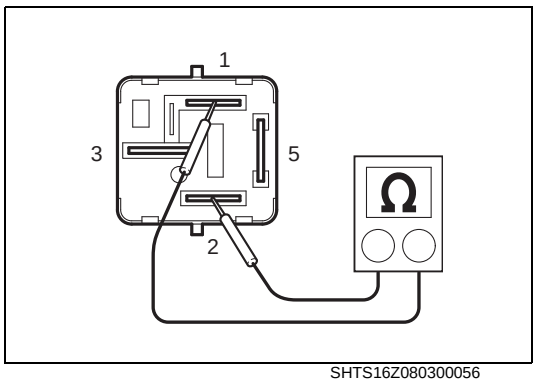
1. RELAY CHECK

(1) Set the starter switch to "LOCK", remove the ABS motor relay from the relay block.

(2) Measure the resistance between 3rd and 5th terminals.
Standard: ∞ Ω

NO → Abnormality of the ABS motor relay.

YES

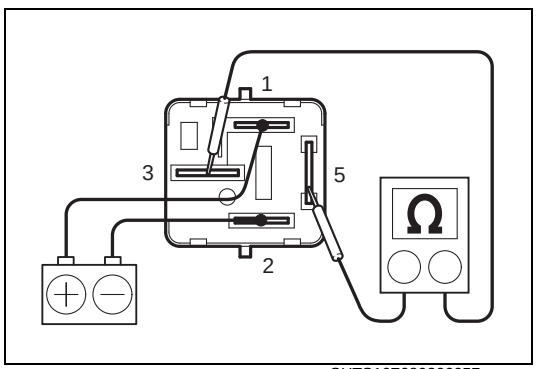


SHTS16Z080300056

(3) Measure the resistance between 1st and 2nd terminals of the ABS motor relay.
Standard: 125-187.5 Ω

NO → Abnormality of the ABS motor relay.

YES

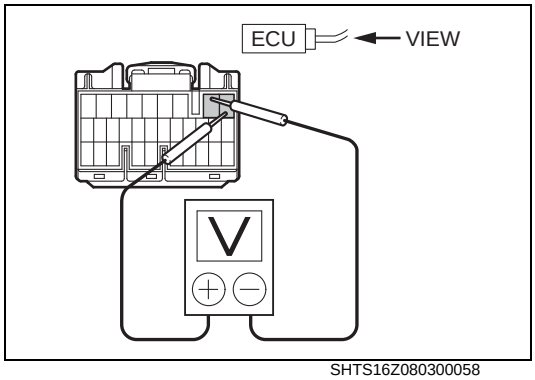


SHTS16Z080300057

(4) Check the continuity between 3rd and 5th terminals of the ABS motor relay when a battery voltage was applied between 1st and 2nd terminals.
Standard:
Turning on electricity between 1st and 2nd terminals:
It is conducted between 3rd and 5th terminals.
Not turning on electricity:
It is not conducted between 3rd and 5th terminals.

NO → Abnormality of the ABS motor relay.

YES



SHTS16Z080300058

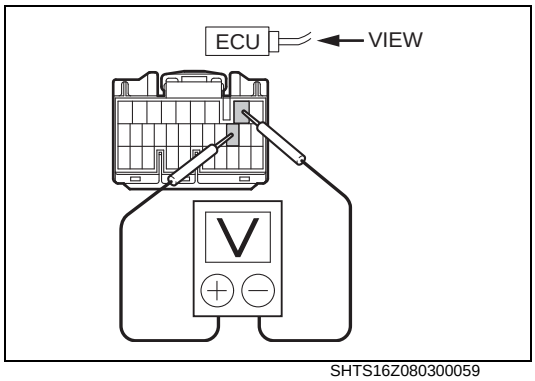
2. ECU CHECK

(1) Install the ABS motor relay, turn the starter switch to "ON".

(2) Measure the voltage between 1st and 2nd terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of ECU power supply circuit.

YES



SHTS16Z080300059

(3) Measure the voltage between 12th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 2V

NO → Abnormality of the ECU power supply circuit.

YES

Normal.

ABNORMALITY OF SOLENOID FOR FRONT RIGHT WHEEL (DIAGNOSIS CODE 21, DTC No. C0226)

EN16Z0803F200011

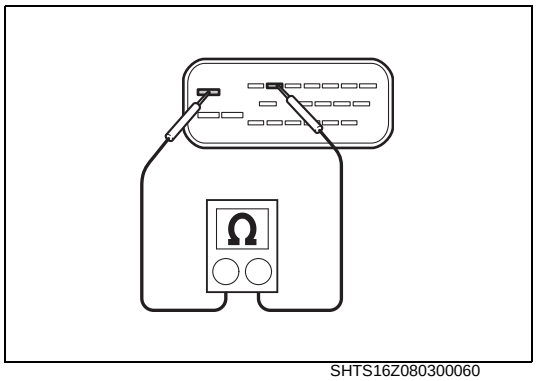
1. CHECK ITEM

(1) Firstly, perform the check of **"DISCONNECTION OF SOLENOID RELAY (DIAGNOSIS CODE 11, DTC No. C0278)"**.

2. ACTUATOR CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 16th and 19th terminals of the 24 pin connector (actuator side).
Standard: 26-40 Ω



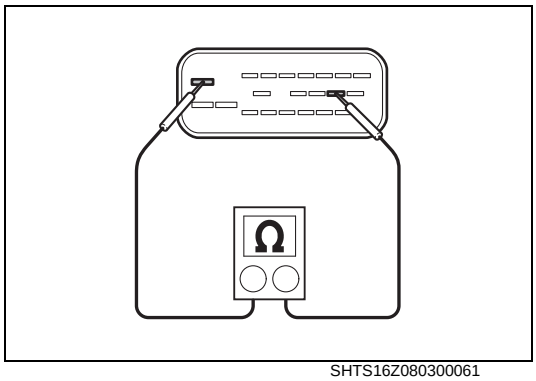
SHTS16Z080300060

NO

YES

Abnormality of the ABS actuator.

(3) Measure the resistance between 14th and 16th terminals of the 24 pin connector (actuator side).
Standard: 13-20 Ω

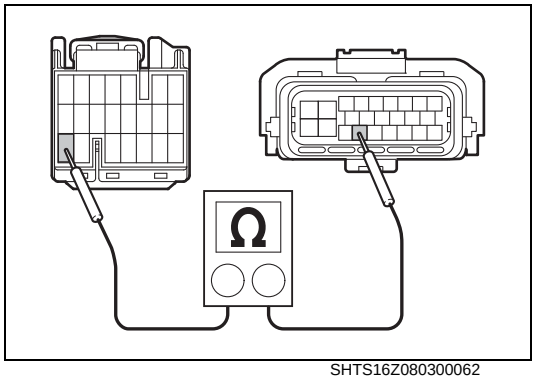


SHTS16Z080300061

NO

YES

Abnormality of the ABS actuator.


SHTS16Z080300062

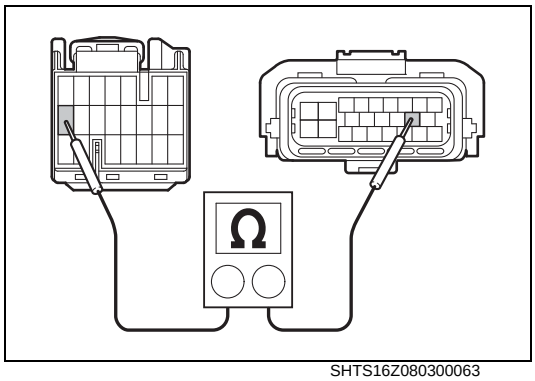
3. WIRE HARNESS CHECK

(1) Disconnect the 22 pin connector of ECU.

(2) Measure the resistance between 16th terminal of the 22 pin connector of ECU (chassis harness side) and 19th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

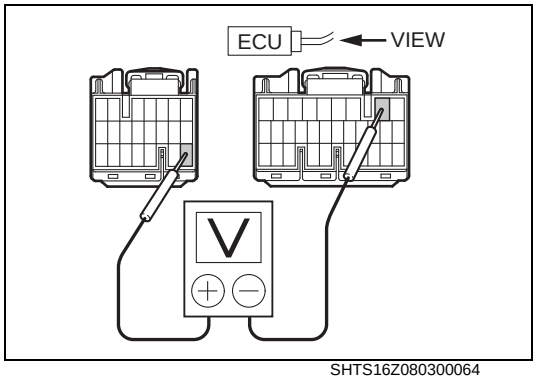
YES


SHTS16Z080300063

(3) Measure the resistance between 8th terminal of the 22 pin connector of ECU (chassis harness side) and 14th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



SHTS16Z080300064

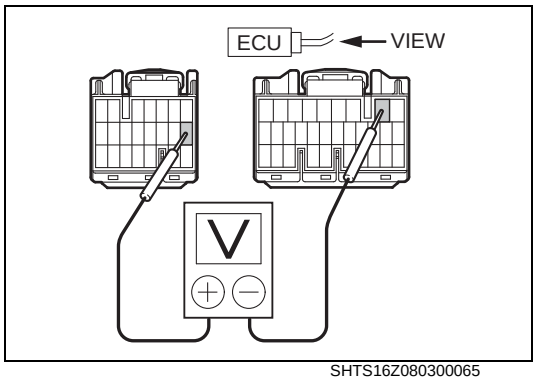
4. ECU CHECK

(1) Connect all the connector, turn the starter switch to "ON".

(2) Measure the voltage between 16th terminal of the 22 pin connector and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES



SHTS16Z080300065

(3) Measure the voltage between 8th terminal of the 22 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES

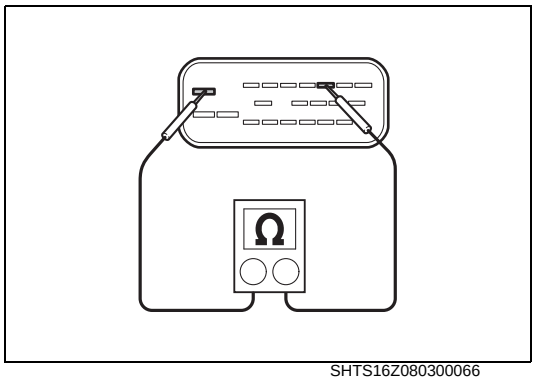
Normal.

ABNORMALITY OF SOLENOID FOR FRONT LEFT WHEEL (DIAGNOSIS CODE 22, DTC No. C0236)

EN16Z0803F200012

1. CHECK ITEM

(1) Firstly, perform the check of **"DISCONNECTION OF SOLENOID RELAY (DIAGNOSIS CODE 11, DTC No. C0278)"**.



SHTS16Z080300066

2. ACTUATOR CHECK

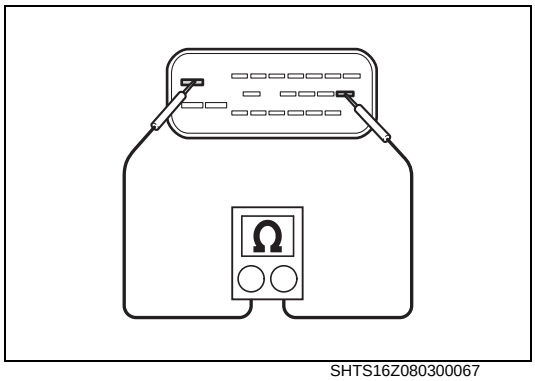
(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 16th and 22th terminals of the 24 pin connector (actuator side).
Standard: 26-40 Ω

NO

Abnormality of the ABS actuator.

YES



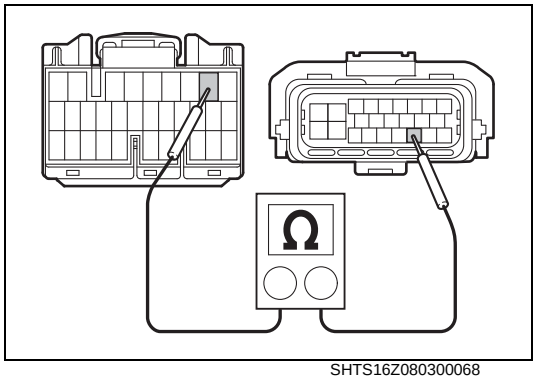
SHTS16Z080300067

(3) Measure the resistance between 15th and 16th terminals of the 24 pin connector (actuator side).
Standard: 13-20 Ω

NO

Abnormality of the ABS actuator.

YES


SHTS16Z080300068

3. WIRE HARNESS CHECK

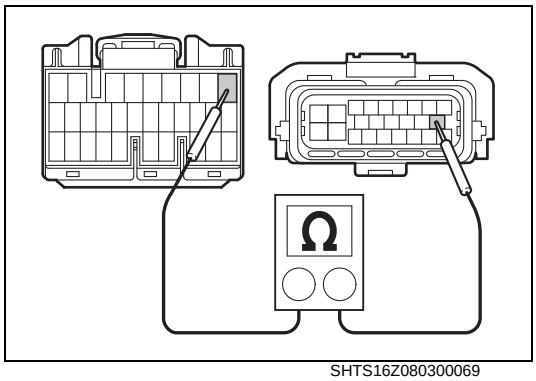
(1) Disconnect the 31 pin connector of ECU.

(2) Measure the resistance between 8th terminal of the 31 pin connector of ECU (chassis harness side) and 22th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES

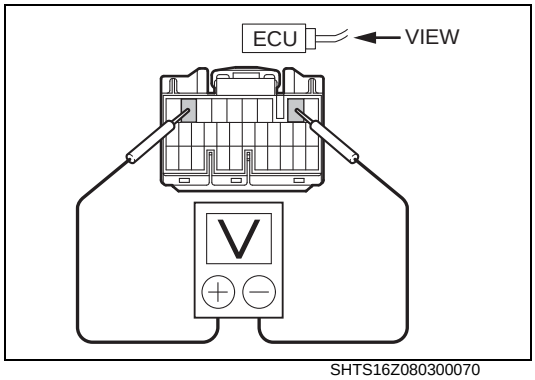

SHTS16Z080300069

(3) Measure the resistance between 9th terminal of the 31 pin connector of ECU (chassis harness side) and 15th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES



SHTS16Z080300070

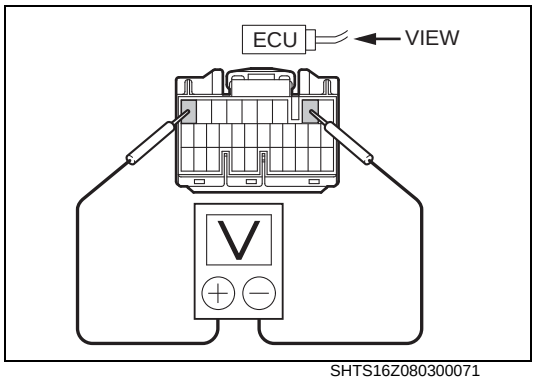
4. ECU CHECK

(1) Connect all the connector, turn the starter switch to "ON".

(2) Measure the voltage between 8th and 2nd terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES



SHTS16Z080300071

(3) Measure the voltage between 9th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES

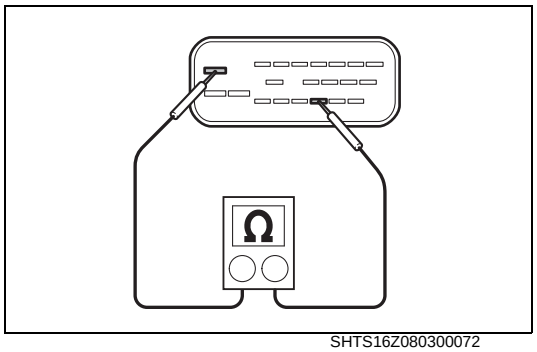
Normal.

ABNORMALITY OF SOLENOID FOR REAR RIGHT WHEEL (DIAGNOSIS CODE 23, DTC No. C0246)

EN16Z0803F200013

1. CHECK ITEM

(1) Firstly, perform the check of **"DISCONNECTION OF SOLENOID RELAY (DIAGNOSIS CODE 11, DTC No. C0278)"**.



SHTS16Z080300072

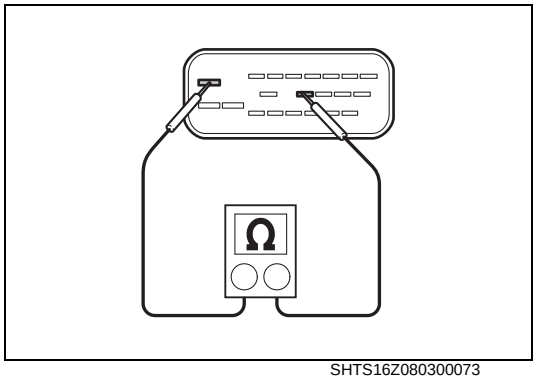
2. ACTUATOR CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 6th and 16th terminals of the 24 pin connector (actuator side).
Standard: 26-40 Ω

NO → Abnormality of the ABS actuator.

YES



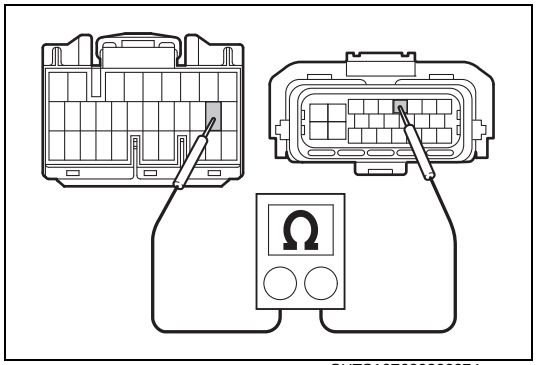
SHTS16Z080300073

(3) Measure the resistance between 12th and 16th terminals of the 24 pin connector (actuator side).
Standard: 13-20 Ω

NO → Abnormality of the ABS actuator.

YES

3. WIRE HARNESS CHECK



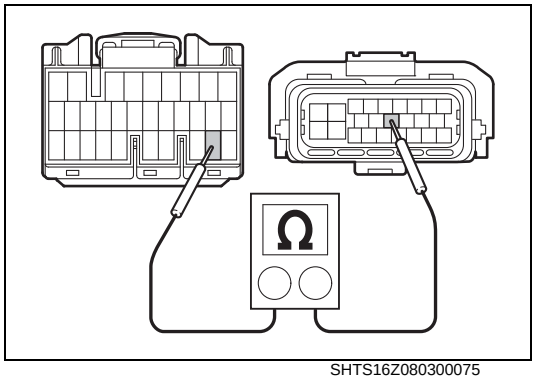
SHTS16Z080300074

(1) Disconnect the 31 pin connector of ECU.

(2) Measure the resistance between 20th terminal of the 31 pin connector of ECU (chassis harness side) and 6th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES

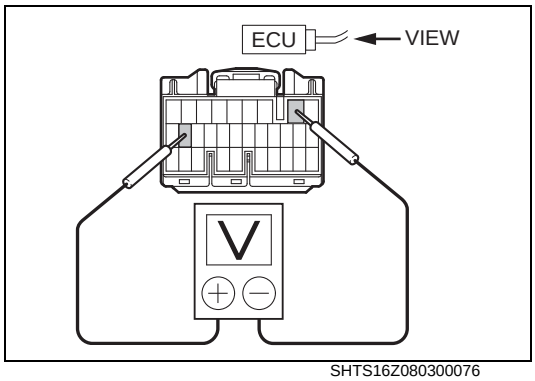


SHTS16Z080300075

(3) Measure the resistance between 30th terminal of the 31 pin connector of ECU (chassis harness side) and 12th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES

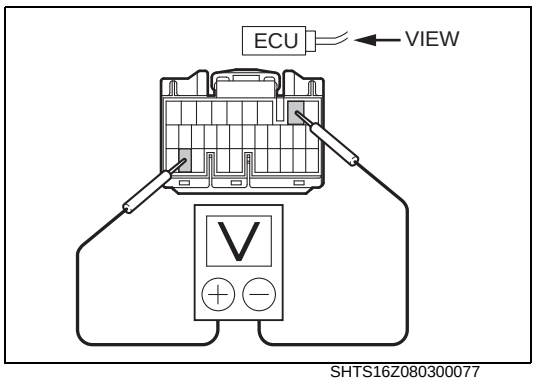


SHTS16Z080300076

4. ECU CHECK
(1) Connect all the connector, turn the starter switch to "ON".
(2) Measure the voltage between 20th and 2nd terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES



SHTS16Z080300077

(3) Measure the voltage between 30th and 2nd terminals of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES

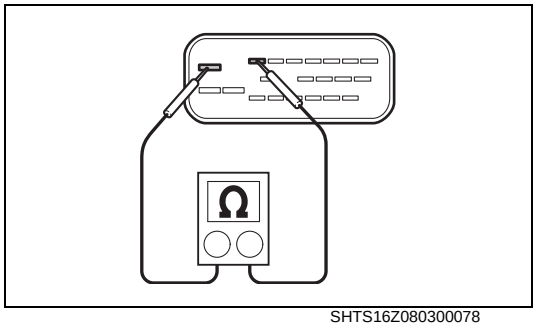
Normal.

ABNORMALITY OF SOLENOID FOR REAR LEFT WHEEL (DIAGNOSIS CODE 24, DTC No. C0256)

EN16Z0803F200014

1. CHECK ITEM

(1) Firstly, perform the check of **"DISCONNECTION OF SOLENOID RELAY (DIAGNOSIS CODE 11, DTC No. C0278)"**.



SHTS16Z080300078

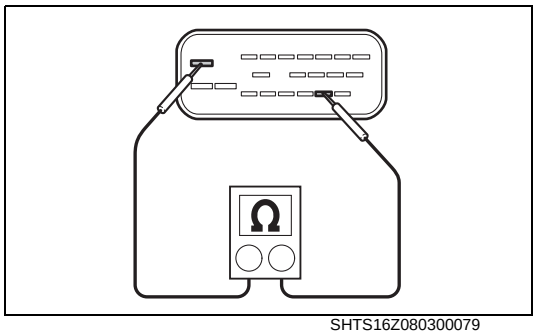
2. ACTUATOR CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 16th and 18th terminals of the 24 pin connector (actuator side).
Standard: 26-40 Ω

NO → Abnormality of the ABS actuator.

YES



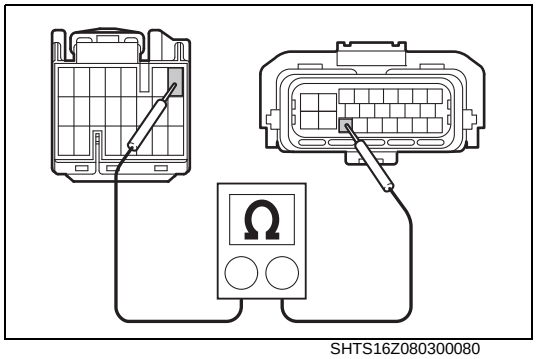
SHTS16Z080300079

(3) Measure the resistance between 7th and 16th terminals of the 24 pin connector (actuator side).
Standard: 13-20 Ω

NO → Abnormality of the ABS actuator.

YES

3. WIRE HARNESS CHECK



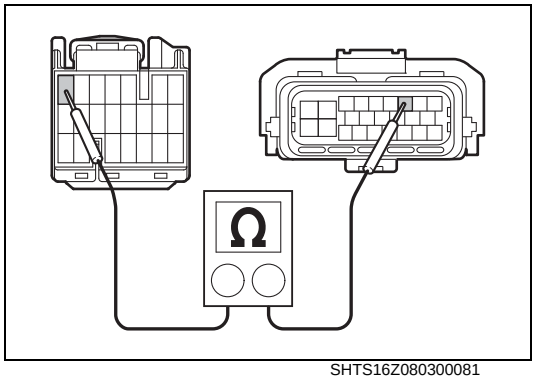
SHTS16Z080300080

(1) Disconnect the 22 pin connector of ECU.

(2) Measure the resistance between 7th terminal of the 22 pin connector of ECU (chassis harness side) and 18th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES

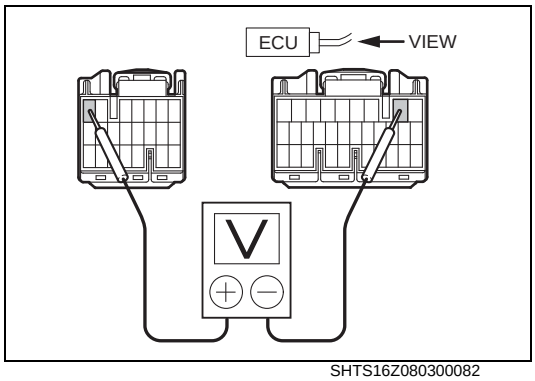


SHTS16Z080300081

(3) Measure the resistance between 1st terminal of the 22 pin connector of ECU (chassis harness side) and 7th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



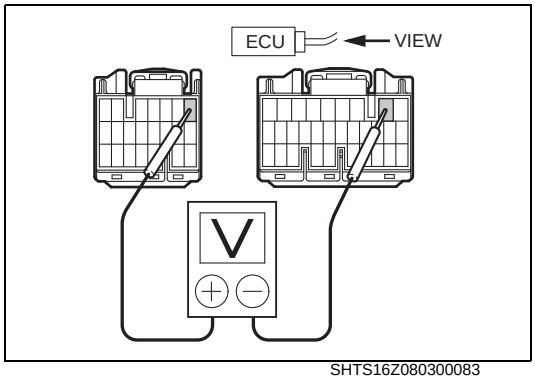
SHTS16Z080300082

4. ECU CHECK

(1) Connect all the connector, turn the starter switch to "ON".
(2) Measure the voltage between 7th terminal of the 22 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES



SHTS16Z080300083

(3) Measure the voltage between 1st terminal of the 22 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES

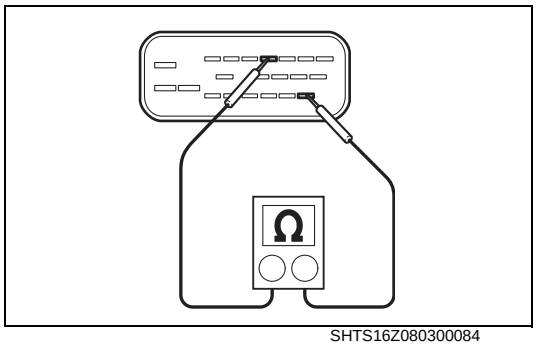
Normal.

ABNORMALITY OF ES SOLENOID (DIAGNOSIS CODE 25, DTC No. C1225)

EN16Z0803F200015

1. CHECK ITEM

(1) Firstly, perform the check of **"DISCONNECTION OF SOLENOID RELAY (DIAGNOSIS CODE 11, DTC No. C0278)"**.



SHTS16Z080300084

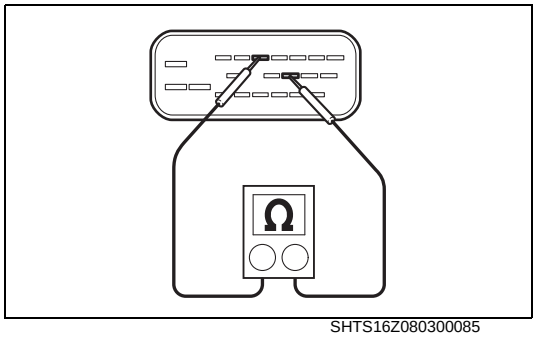
2. ACTUATOR CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ABS actuator.

(2) Measure the resistance between 8th and 21th terminals of the 24 pin connector (actuator side).
Standard: 26-40 Ω

NO → Abnormality of the ABS actuator.

YES

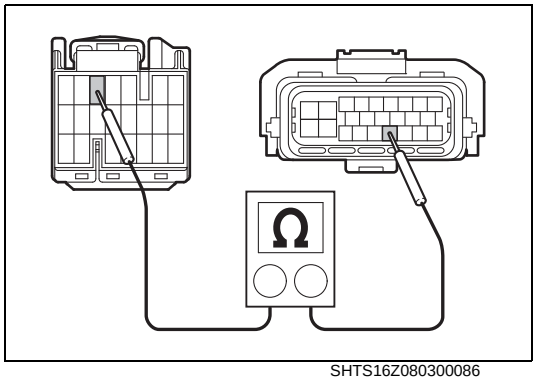


SHTS16Z080300085

(3) Measure the resistance between 13th and 20th terminals of the 24 pin connector (actuator side).
Standard: 26-40 Ω

NO → Abnormality of the ABS actuator.

YES



SHTS16Z080300086

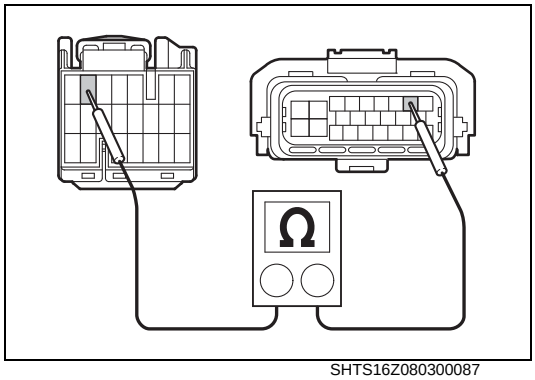
3. WIRE HARNESS CHECK

(1) Disconnect the 22 pin connector of ECU.

(2) Measure the resistance between 3rd terminal of the 22 pin connector of ECU (chassis harness side) and 21th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

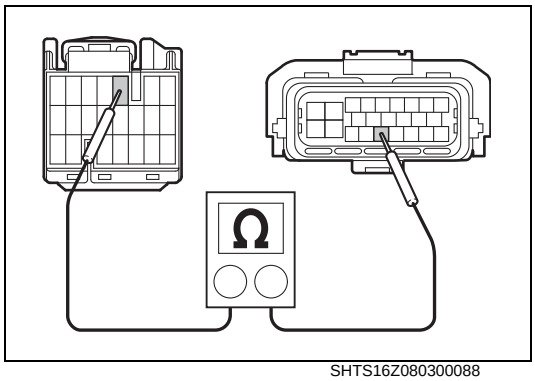
YES


SHTS16Z080300087

(3) Measure the resistance between 2nd terminal of the 22 pin connector of ECU (chassis harness side) and 8th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

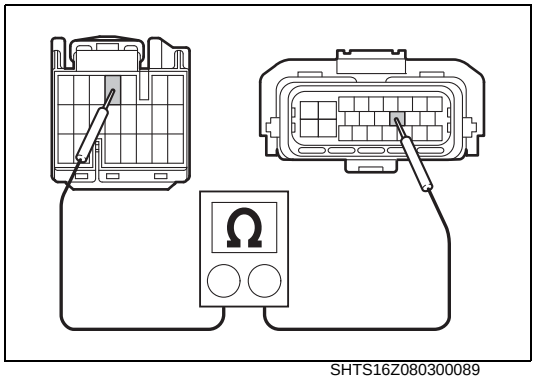
YES


SHTS16Z080300088

(4) Measure the resistance between 5th terminal of the 22 pin connector of ECU (chassis harness side) and 20th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

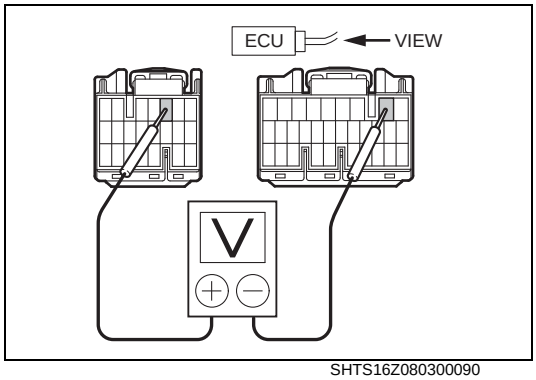
YES


SHTS16Z080300089

(5) Measure the resistance between 4th terminal of the 22 pin connector of ECU (chassis harness side) and 13th terminal of the 24 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



SHTS16Z080300090

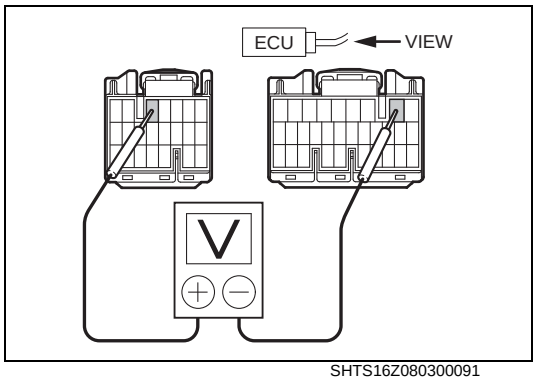
4. ECU CHECK

(1) Connect all the connector, turn the starter switch to "ON".

(2) Measure the voltage between 3rd terminal of the 31 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES



SHTS16Z080300091

(3) Measure the voltage between 5th terminal of the 22 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Abnormality of the ECU power supply voltage.

YES

Normal.

ABNORMALITY OF FRONT RIGHT WHEEL SENSOR (DIAGNOSIS CODE 31, DTC No. C0200)

EN16Z0803F200016

1. SENSOR CHECK

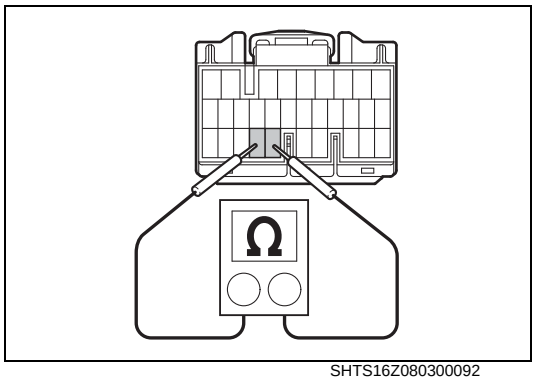
(1) Perform the following checks:

- No damage at the sensor tip.
- No adhesion of foreign material of more than 1 mm^3.
- No clearance between sensor and the face to be installed.
- No air gap expansion between sensor and sensor rotor.

Standard: No abnormality

NO → Repair or replace the sensor installing part.

YES



SHTS16Z080300092

(2) Set the starter switch to "LOCK", disconnect the 31 pin connector of ECU.

(3) Measure the resistance between 25th and 26th terminals of the 31 pin connector (chassis harness side).

Standard: 0.8-2.0 kΩ

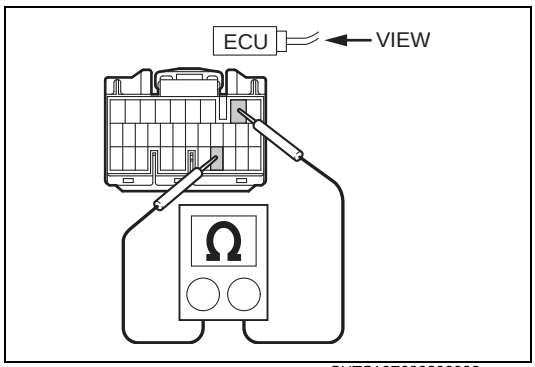
NO → Go to the item "3".

YES

2. ECU CHECK

(1) Connect the connector, check the continuity between 2nd and 25th terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)

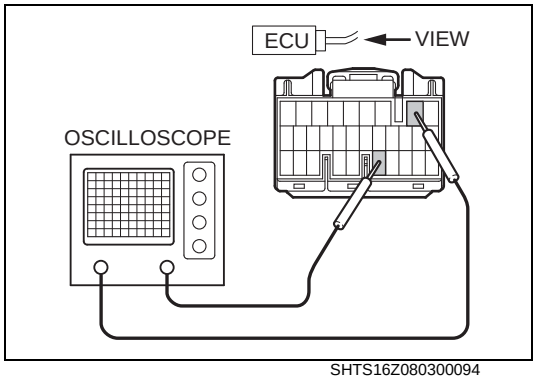
Standard: Continuity



SHTS16Z080300093

NO → Abnormality of the ECU.

YES



SHTS16Z080300094

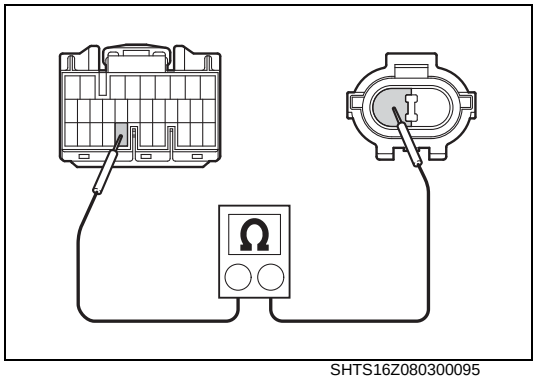
(2) Connect oscilloscope between 2nd and 26th terminals of the 31 pin connector, measure any waveform to be output when running at speed of 30 km/h {19 mile/h}. (Leaving the connector connected with ECU.)
Standard: Waveform output

NO

Abnormality of the ECU.

YES

Normal.

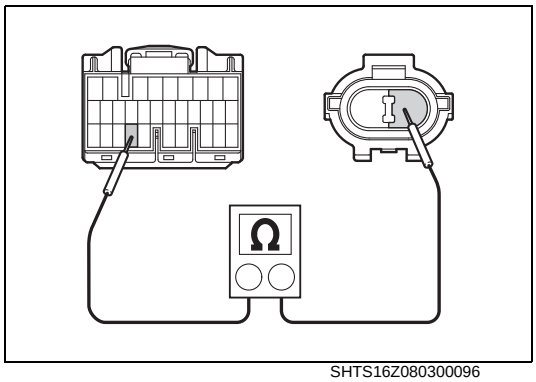

SHTS16Z080300095

3. WIRE HARNESS CHECK
(1) Disconnect the connector of front right wheel sensor.
(2) Measure the resistance between 26th terminal of the 31 pin connector of ECU (chassis harness side) and 1st terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES

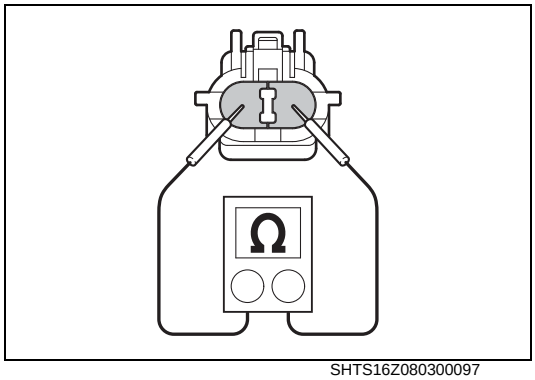

SHTS16Z080300096

(3) Measure the resistance between 25th terminal of the 31 pin connector of ECU (chassis harness side) and 2nd terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES



SHTS16Z080300097

4. SENSOR CHECK

(1) Measure the resistance between 1st and 2nd terminals of the connector of front right wheel sensor (sensor side).
Standard: 0.8-2.0 kΩ

NO

Abnormality of the sensor.

YES

Normal.

ABNORMALITY OF FRONT LEFT WHEEL SENSOR (DIAGNOSIS CODE 32, DTC No. C0205)

EN16Z0803F200017

1. SENSOR CHECK

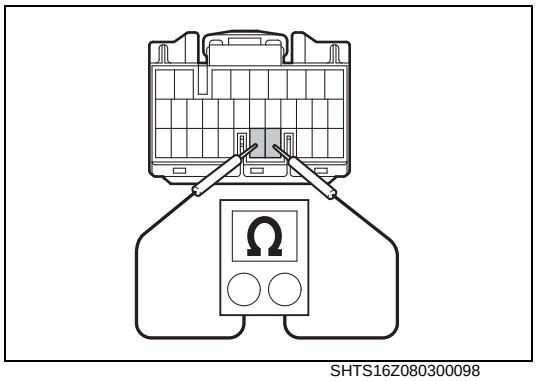
(1) Perform the following checks:

- No damage at the sensor tip.
- No adhesion of foreign material of more than 1 mm^3.
- No clearance between sensor and the face to be installed.
- No air gap expansion between sensor and sensor rotor.

Standard: No abnormality

NO → Repair or replace the sensor installing part.

YES



SHTS16Z080300098

(2) Set the starter switch to "LOCK", disconnect the 31 pin connector of ECU.

(3) Measure the resistance between 27th and 28th terminals of the 31 pin connector (chassis harness side).

Standard: 0.8-2.0 kΩ

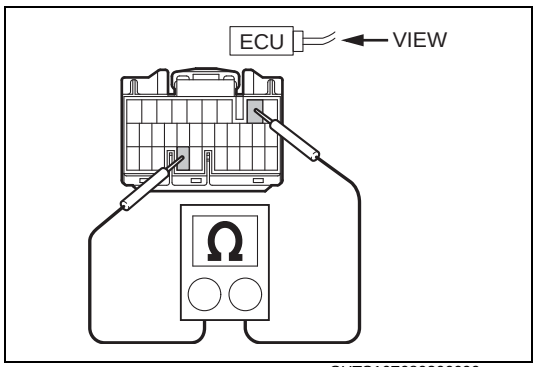
NO → Go to the item "3".

YES

2. ECU CHECK

(1) Connect the connector, check the continuity between 2nd and 28th terminals of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)

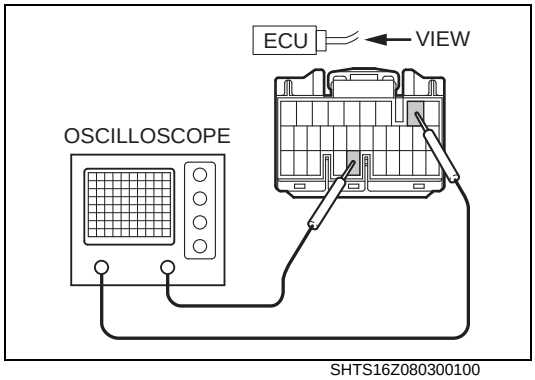
Standard: Continuity



SHTS16Z080300099

NO → Abnormality of the ECU.

YES



SHTS16Z080300100

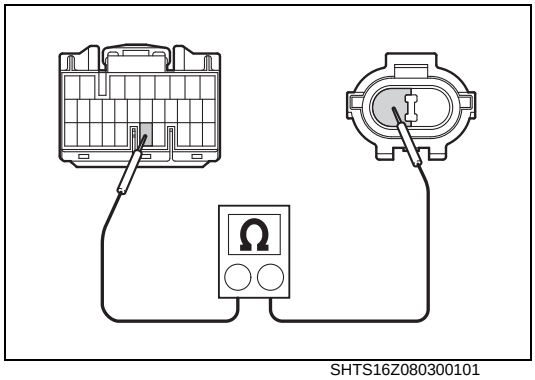
(2) Connect oscilloscope between 2nd and 27th terminals of the 31 pin connector, measure any waveform to be output when running at speed of 30 km/h {19 mile/h}. (Leaving the connector connected with ECU.)
Standard: Waveform output

NO

Abnormality of the ECU.

YES

Normal.

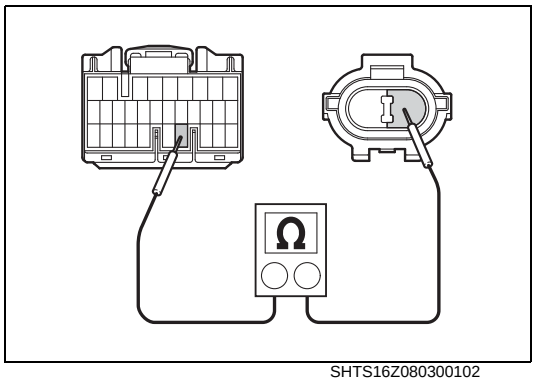

SHTS16Z080300101

3. WIRE HARNESS CHECK
(1) Disconnect the connector of front left wheel sensor.
(2) Measure the resistance between 27th terminal of the 31 pin connector of ECU (chassis harness side) and 1st terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES

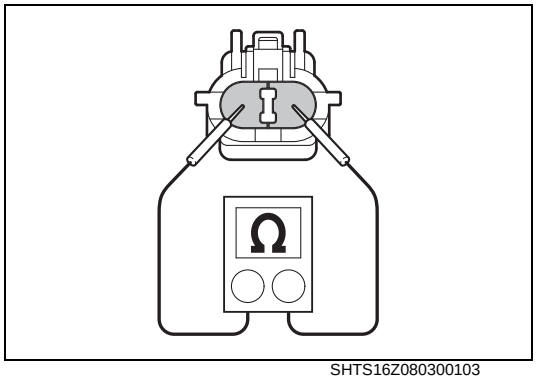

SHTS16Z080300102

(3) Measure the resistance between 28th terminal of the 31 pin connector of ECU (chassis harness side) and 2nd terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES



SHTS16Z080300103

4. SENSOR CHECK

(1) Measure the resistance between 1st and 2nd terminals of the connector of front left wheel sensor (sensor side).
Standard: 0.8-2.0 kΩ

NO

Abnormality of the sensor.

YES

Normal.

ABNORMALITY OF REAR RIGHT WHEEL SENSOR (DIAGNOSIS CODE 33, DTC No. C0210)

EN16Z0803F200018

1. SENSOR CHECK

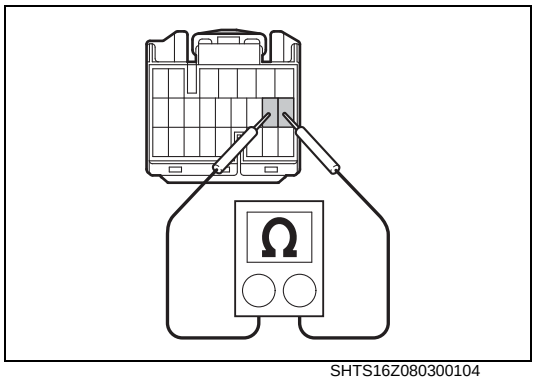
(1) Perform the following checks:

- No damage at the sensor tip.
- No adhesion of foreign material of more than 1 mm^3.
- No clearance between sensor and the face to be installed.
- No air gap expansion between sensor and sensor rotor.

Standard: No abnormality

NO → Repair or replace the sensor installing part.

YES



SHTS16Z080300104

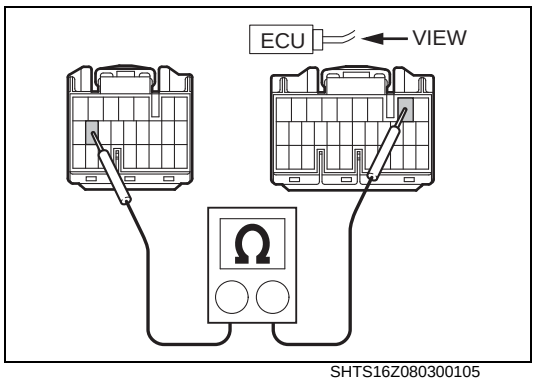
(2) Set the starter switch to "LOCK", disconnect the 24 pin connector of ECU.

(3) Measure the resistance between 15th and 16th terminals of the 24 pin connector (chassis harness side).

Standard: 0.8-2.0 kΩ

NO → Go to the item "3".

YES



SHTS16Z080300105

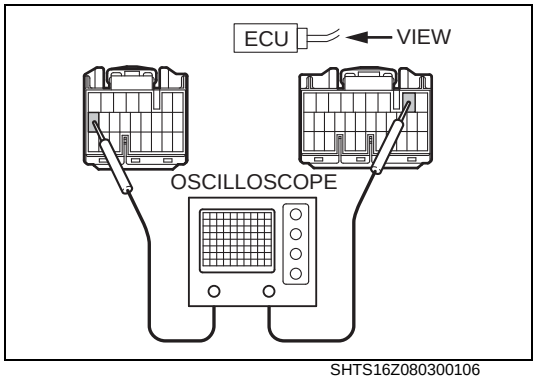
2. ECU CHECK

(1) Connect the connector, check the continuity between 15th terminal of the 24 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)

Standard: Continuity

NO → Abnormality of the ECU.

YES



SHTS16Z080300106

(2) Connect oscilloscope between 16th terminal of the 24 pin connector and 2nd terminal of the 31 pin connector, measure any waveform to be output when running at speed of 30 km/h {19 mile/h}. (Leaving the connector connected with ECU.)

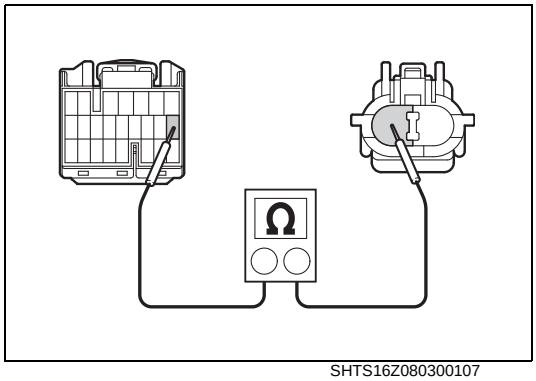
Standard: Waveform output

NO

YES

Abnormality of the ECU.

Normal.



SHTS16Z080300107

3. WIRE HARNESS CHECK

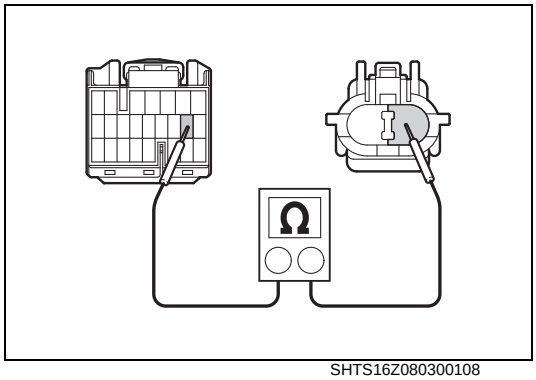
(1) Disconnect the connector of rear right wheel sensor.

(2) Measure the resistance between 16th terminal of the 24 pin connector of ECU (chassis harness side) and 2nd terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

YES

Abnormality of the wire harness.



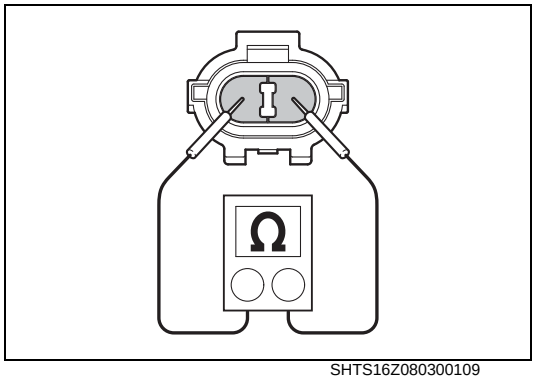
SHTS16Z080300108

(3) Measure the resistance between 15th terminal of the 24 pin connector of ECU (chassis harness side) and 1st terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

YES

Abnormality of the wire harness.



SHTS16Z080300109

4. SENSOR CHECK

(1) Measure the resistance between 1st and 2nd terminals of the connector of rear right wheel sensor.
Standard: 0.8-2.0 kΩ

NO

Abnormality of the sensor.

YES

Normal.

ABNORMALITY OF REAR LEFT WHEEL SENSOR (DIAGNOSIS CODE 34, DTC No. C0215)

EN16Z0803F200019

1. SENSOR CHECK

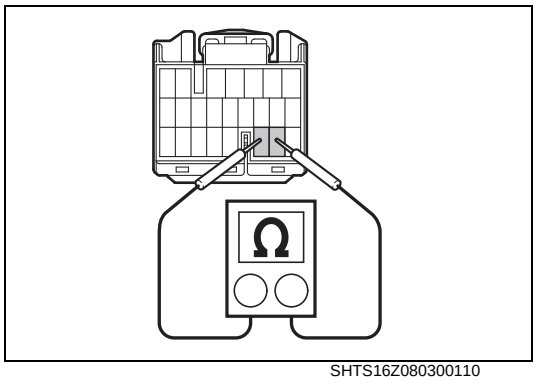
(1) Perform the following checks:

- No damage at the sensor tip.
- No adhesion of foreign material of more than 1 mm^3.
- No clearance between sensor and the face to be installed.
- No air gap expansion between sensor and sensor rotor.

Standard: No abnormality

NO → Repair or replace the sensor installing part.

YES



SHTS16Z080300110

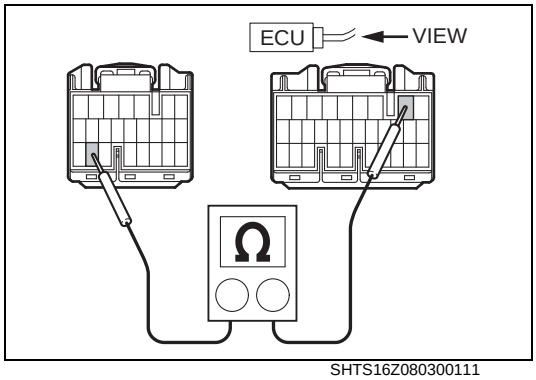
(2) Set the starter switch to "LOCK", disconnect the 24 pin connector of ECU.

(3) Measure the resistance between 22th and 23th terminals of the 24 pin connector (chassis harness side).

Standard: 0.8-2.0 kΩ

NO → Go to the item "3".

YES



SHTS16Z080300111

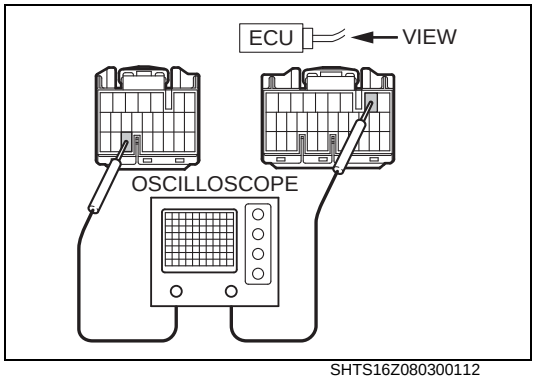
2. ECU CHECK

(1) Connect the connector, check the continuity between 23th terminal of the 24 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)

Standard: Continuity

NO → Abnormality of the ECU.

YES



SHTS16Z080300112

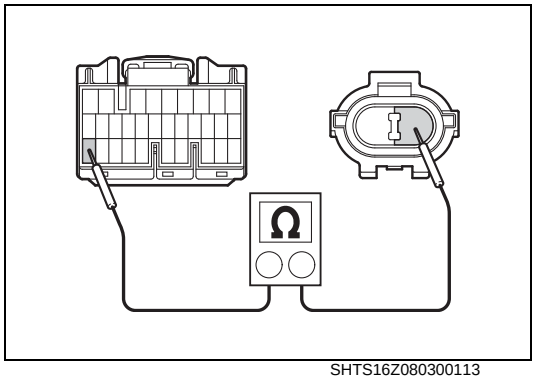
(2) Connect oscilloscope between 22th terminal of the 24 pin connector and 2nd terminal of the 31 pin connector, measure any waveform to be output when running at speed of 30 km/h {19 mile/h}. (Leaving the connector connected with ECU.)
Standard: Waveform output

NO

Abnormality of the ECU.

YES

Normal.



SHTS16Z080300113

3. WIRE HARNESS CHECK

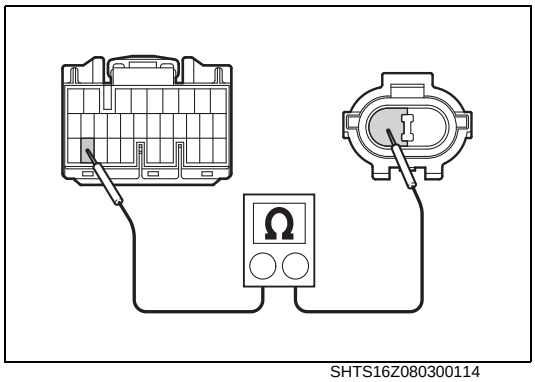
(1) Disconnect the 31 pin connector of ECU and the connector of rear left wheel sensor.

(2) Measure the resistance between 22th terminal of the 31 pin connector of ECU (chassis harness side) and 2nd terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES



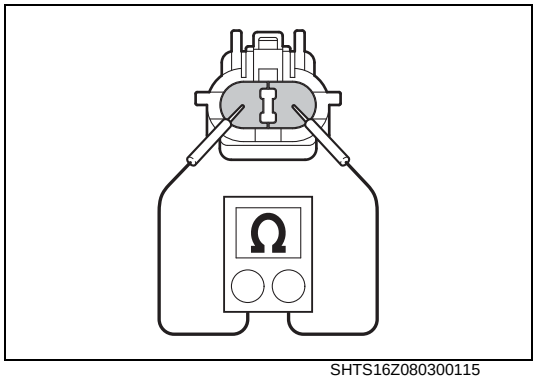
SHTS16Z080300114

(3) Measure the resistance between 23th terminal of the 31 pin connector of ECU (chassis harness side) and 1st terminal of the sensor connector (chassis harness side).
Standard: Less than 5 Ω

NO

Abnormality of the wire harness.

YES



SHTS16Z080300115

4. SENSOR CHECK

(1) Measure the resistance between 1st and 2nd terminals of the connector of rear left wheel sensor (sensor side).
Standard: 0.8-2.0 kΩ

NO

Abnormality of the sensor.

YES

Normal.

ABNORMALITY OF FRONT RIGHT WHEEL SENSOR: EXCESSIVE AIR GAP, OR ADHESION OF IRON PIECE (DIAGNOSIS CODE 35, DTC No. C1235)

EN16Z0803F200020

1. CHECK ITEM
(1) Perform the check of **"ABNORMALITY OF FRONT RIGHT WHEEL SENSOR (DIAGNOSIS CODE 31, DTC No. C0200)"**.

ABNORMALITY OF FRONT LEFT WHEEL SENSOR: EXCESSIVE AIR GAP, OR ADHESION OF IRON PIECE (DIAGNOSIS CODE 36, DTC No. C1236)

EN16Z0803F200021

1. CHECK ITEM
(1) Perform the check of **"ABNORMALITY OF FRONT LEFT WHEEL SENSOR (DIAGNOSIS CODE 32, DTC No. C0205)"**.

ABNORMALITY OF REAR RIGHT WHEEL SENSOR: EXCESSIVE AIR GAP, OR ADHESION OF IRON PIECE (DIAGNOSIS CODE 38, DTC No. C1238)

EN16Z0803F200022

1. CHECK ITEM
(1) Perform the check of **"ABNORMALITY OF REAR RIGHT WHEEL SENSOR (DIAGNOSIS CODE 33, DTC No. C0210)"**.

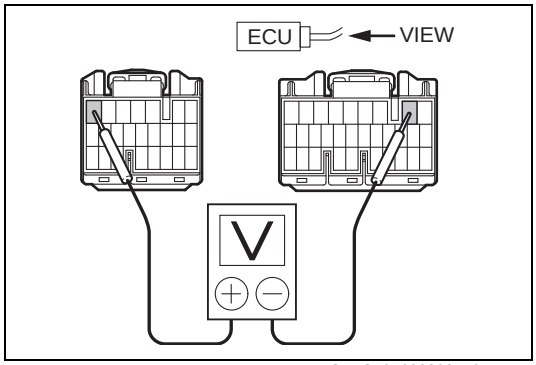
ABNORMALITY OF REAR LEFT WHEEL SENSOR: EXCESSIVE AIR GAP, OR ADHESION OF IRON PIECE (DIAGNOSIS CODE 39, DTC No. C1239)

EN16Z0803F200023

1. CHECK ITEM
(1) Perform the check of **"ABNORMALITY OF REAR LEFT WHEEL SENSOR (DIAGNOSIS CODE 34, DTC No. C0215)"**.

LOW VOLTAGE OR OVERVOLTAGE OF POWER SUPPLY (DIAGNOSIS CODE 41, DTC No. C1241)

EN16Z0803F200024



SHTS16Z080300116

1. POWER SUPPLY VOLTAGE CHECK

(1) Set the starter switch to "ON", measure the voltage between 7th terminal of the 24 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-32V

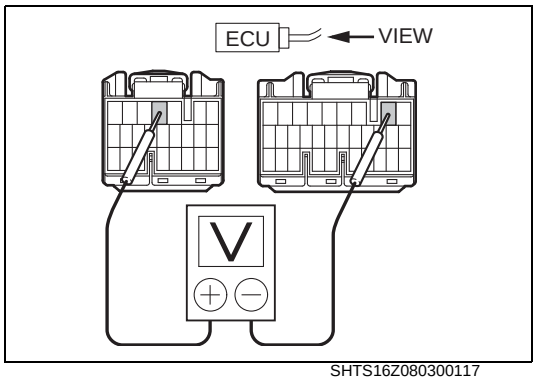
NO → Abnormality of the power supply circuit.

YES

Abnormality of the ECU.

ABNORMALITY OF POWER SUPPLY VOLTAGE (DIAGNOSIS CODE 42, DTC No. C1390)

EN16Z0803F200025



SHTS16Z080300117

1. POWER SUPPLY VOLTAGE CHECK

(1) Set the starter switch to "ON", measure the voltage between 4th terminal of the 24 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-32V

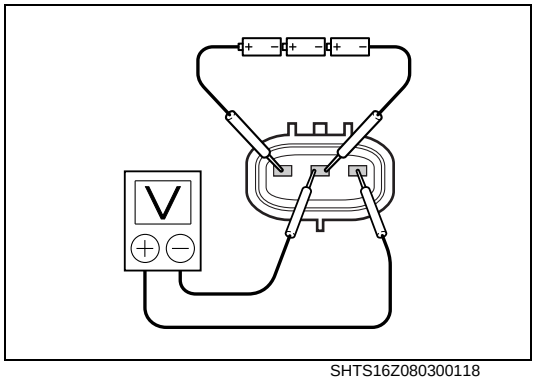
NO → Abnormality of the power supply circuit.

YES

Abnormality of the ECU.

FIXING OF G SENSOR (MODEL: FT) (DIAGNOSIS CODE 43, DTC No. C1243)

EN16Z0803F200026



SHTS16Z080300118

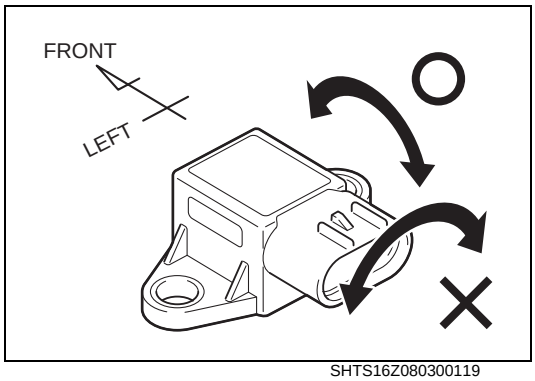
1. SENSOR CHECK

(1) Set the starter switch to "LOCK", disconnect the connector of G sensor.

(2) Connect in series of 3 dry cell and connect (+) terminal of dry cell with 3rd terminal of the G sensor connector (sensor side) (-) terminal of dry cell with 2nd terminal.

NOTICE

Do not add voltage between 3rd and 2nd terminals out of 6V.



SHTS16Z080300119

(3) When measure the output voltage between 1st and 2nd terminals of the G sensor connector (sensor side) when sensor canted horizontal and approximately.

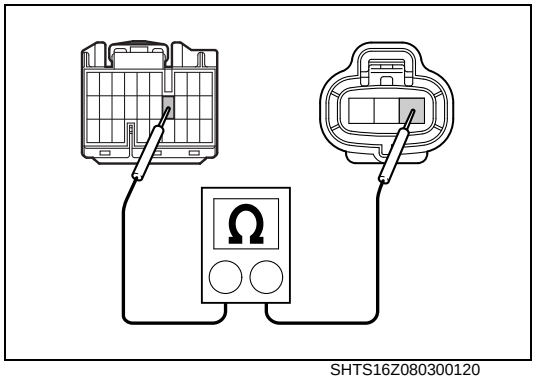
Horizon	about 2.3V
forward slope	0.5-2.3V
lay back	2.3-4.0V

NOTICE

- **Bracket installation respect at the center says that the horizontal is ground with the horizontal center.**
- **Sensor cant over approximately in view of installation.**
- **Different from standard value when sensor canted over.**
- **Change of new sensor when it is dropped.**
- **Do not keep obvert to the sensor.**

NO → Abnormality of the G sensor.

YES



SHTS16Z080300120

2. WIRE HARNESS CHECK

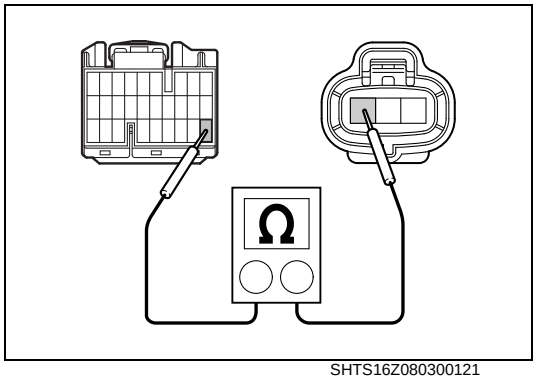
(1) Disconnect the 28 pin connector of ECU.

(2) Measure the resistance between 16th terminal of the 28 pin connector of ECU (chassis harness side) and 3rd terminal of the G sensor (chassis harness side).

Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES

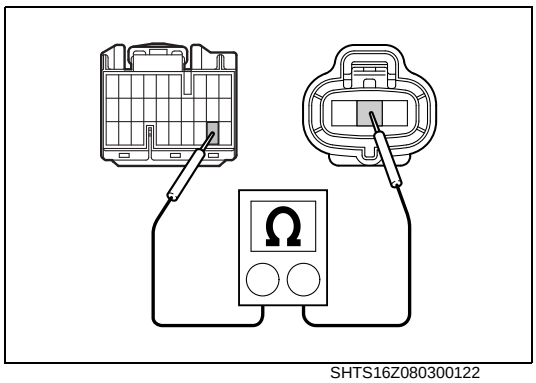

SHTS16Z080300121

(3) Measure the resistance between 28th terminal of the 28 pin connector of ECU (chassis harness side) and 1st terminal of the G sensor (chassis harness side).

Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES

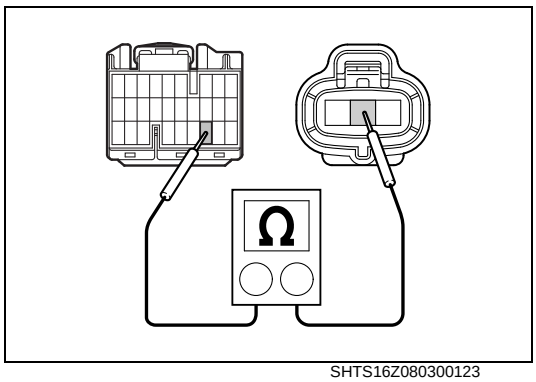

SHTS16Z080300122

(4) Measure the resistance between 27th terminal of the 28 pin connector of ECU (chassis harness side) and 2nd terminal of the G sensor (chassis harness side).

Standard: Continuity

NO → Abnormality of the wire harness.

YES

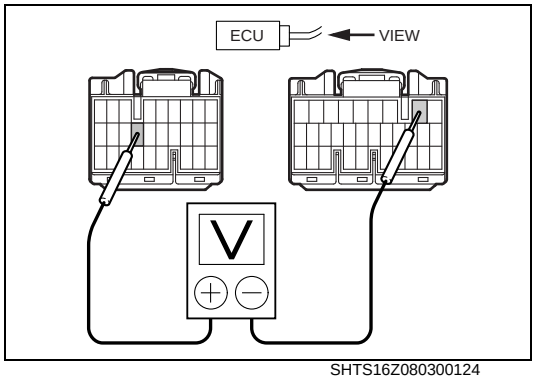

SHTS16Z080300123

(5) Measure the continuity between 26th terminal of the 28 pin connector of ECU (chassis harness side) and 2nd terminal of the G sensor.

Standard: No continuity

NO → Abnormality of the wire harness.

YES



SHTS16Z080300124

3. ECU CHECK

(1) Connect the connector, turn the starter switch to "ON".

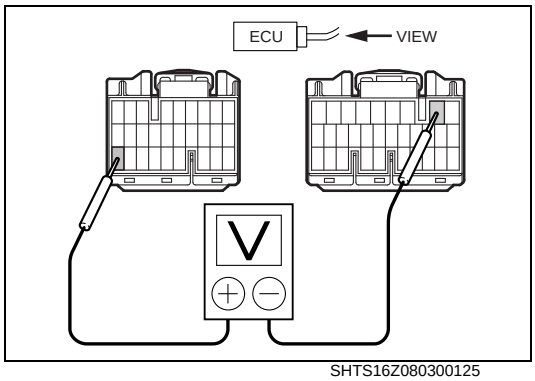
(2) Measure the voltage between 16th terminal of the 28 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)

Standard: 4.85-5.15V

NO

YES

Abnormality of the power supply circuit.
Abnormality of the ECU power supply circuit or output circuit.



SHTS16Z080300125

(3) Measure the voltage between 28th terminal of the 28 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)

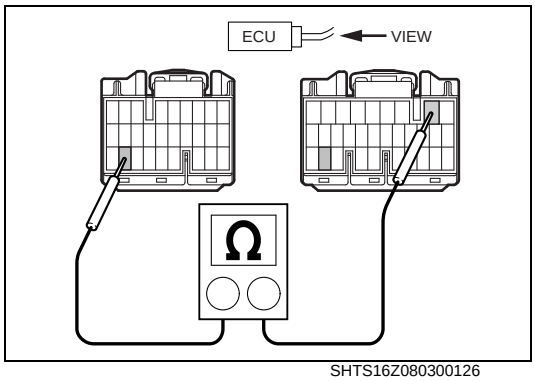
NOTICE
Park the vehicle on level ground.

Standard: 2-3V

NO

YES

Abnormality of the power supply circuit.
Abnormality of the ECU power supply circuit or output circuit.



SHTS16Z080300126

(4) Set the starter switch to "LOCK".

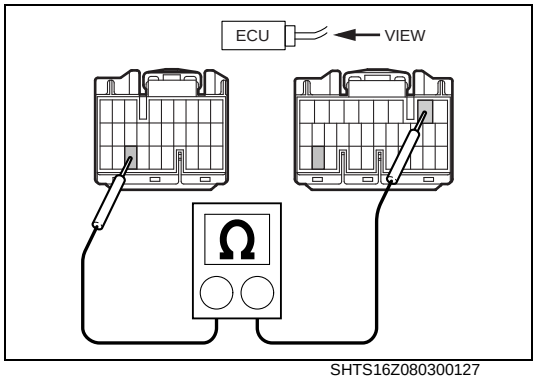
(5) Measure the continuity between 27th terminal of the 28 pin connector of ECU and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)

Standard: Continuity

NO

YES

Abnormality of the power supply circuit.
Abnormality of the ECU power supply circuit or output circuit.



SHTS16Z080300127

(6) Measure the continuity between 26th terminal of the 28 pin connector of ECU and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)

Standard: Continuity

NO

YES

Abnormality of the power supply circuit.
Abnormality of the ECU power supply circuit or output circuit.

Normal.

DISCONNECTION/SHORT CIRCUIT OF G SENSOR (DIAGNOSIS CODE 44, DTC No. C1244)

EN16Z0803F200027

1. CHECK ITEM

(1) Perform the check of **"FIXING OF G SENSOR (DIAGNOSIS CODE 43, DTC No. C1243)"**.

ABNORMALITY OF G SENSOR OUTPUT (DIAGNOSIS CODE 45, DTC No. C1245)

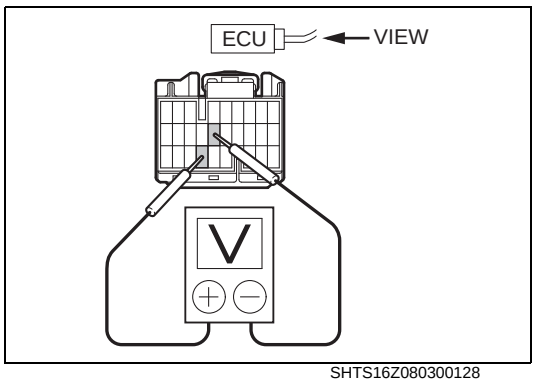
EN16Z0803F200028

1. CHECK ITEM

(1) Perform the check of **"FIXING OF G SENSOR (DIAGNOSIS CODE 43, DTC No. C1243)"**.

ABNORMALITY OF ABS ACTUATOR: BRAKE FLUID PRESSURE SENSOR (DIAGNOSIS CODE 46, DTC No. C1246)

EN16Z0803F200029



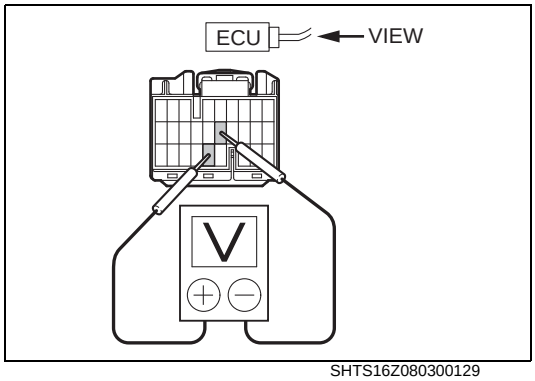
SHTS16Z080300128

1. SENSOR CHECK

(1) Set the starter switch to "ON", measure the voltage between 24th and 15th terminals of the 28 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 4.5-5.5V

NO → Go to the item "5".

YES

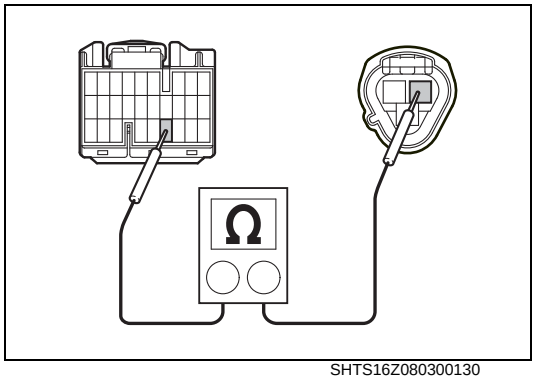


SHTS16Z080300129

(2) Measure the voltage between 24th and 14th terminals of the 28 pin connector. (Leaving the connector connected with ECU.)
Standard: 4.5-5.5V

NO → Go to the item "5".

YES



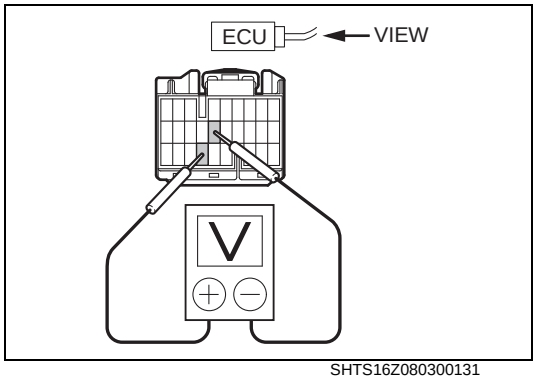
SHTS16Z080300130

2. WIRE HARNESS CHECK

(1) Turn the starter switch to "LOCK", disconnect the 28 pin connector of ECU and the 3 pin connector of ABS actuator.
(2) Measure the resistance between 25th terminal of the 28 pin connector of ECU (chassis harness side) and 2nd terminal of the 3 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES



SHTS16Z080300131

3. ABS ACTUATOR CHECK

(1) Connect all the connector, turn the starter switch to "ON".

(2) Measure the voltage between 25th and 15th terminals of the 28 pin connector of ECU when depressing the brake pedal. (Leaving the connector connected with ECU.)

Standard:

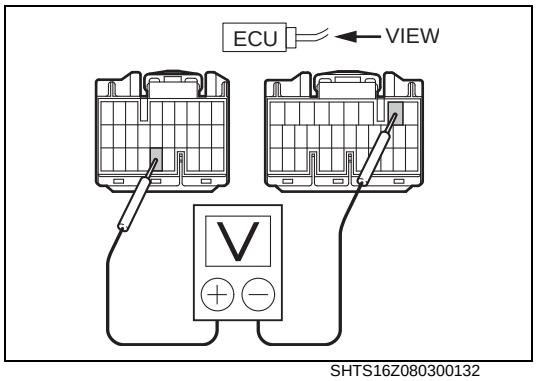
0 MPa {0 kgf/cm^2, 0 lbf/in.^{2}}: Approx. 0.5V

9.8 MPa {100 kgf/cm^2, 1,442 lbf/in.^{2}}: Approx. 2.5V

19.6 MPa {200 kgf/cm^2, 2,845 lbf/in.^{2}}: Approx. 4.5V

NO → Abnormality of the ABS actuator.

YES



SHTS16Z080300132

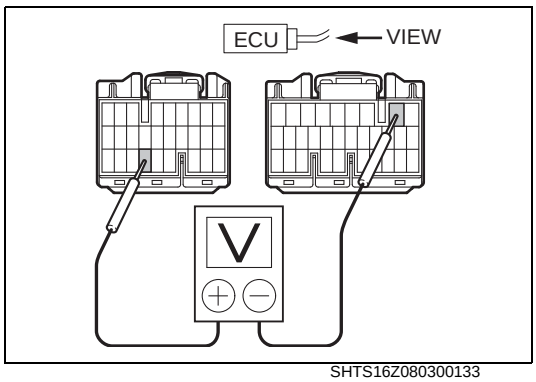
4. ECU CHECK

(1) Measure the voltage between 24th terminal of the 28 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)

Standard: 4.85-5.15V

NO → Abnormality of the ECU.

YES



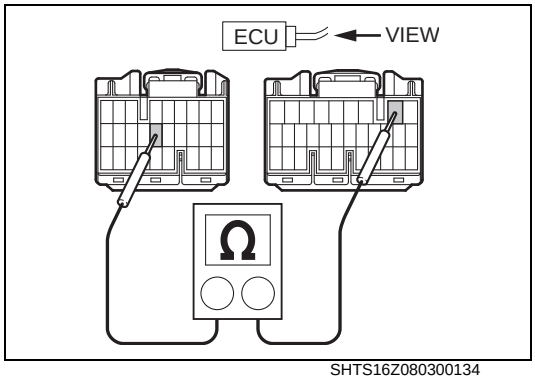
SHTS16Z080300133

(2) Measure the voltage between 25th terminal of the 28 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)

Standard: 0.3-0.7V

NO → Abnormality of the ECU.

YES

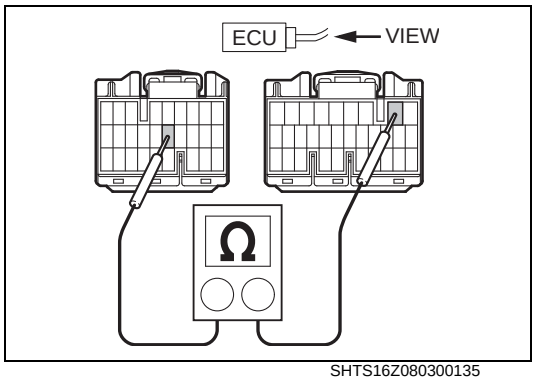


SHTS16Z080300134

(3) Turn the starter switch to "LOCK", check the continuity between 15th terminal of the 28 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: Continuity

NO → Abnormality of the ECU.

YES



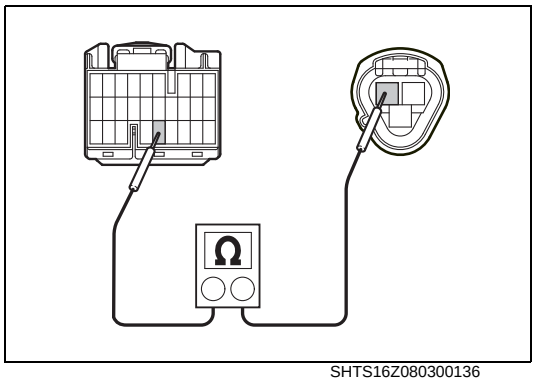
SHTS16Z080300135

(4) Check the continuity between 14th terminal of the 28 pin connector and 2nd terminal of the 31 pin connector. (Leaving the connector connected with ECU.)
Standard: Continuity

NO → Abnormality of the ECU.

YES

Normal.



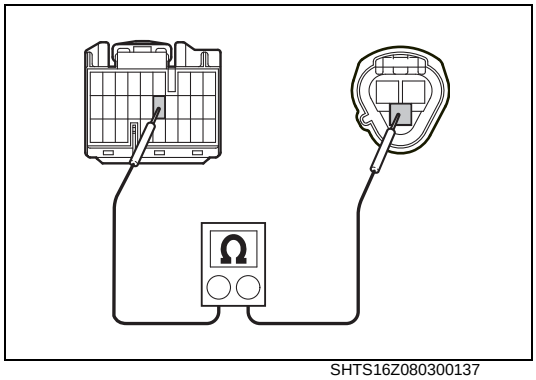
SHTS16Z080300136

5. WIRE HARNESS CHECK

(1) Turn the starter switch to "LOCK", disconnect the 28 pin connector of ECU and the 3 pin connector of ABS actuator.
(2) Measure the resistance between 24th terminal of the 28 pin connector of ECU (chassis harness side) and 1st terminal of the 3 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

NO → Abnormality of the wire harness.

YES


SHTS16Z080300137

(3) Measure the resistance between 15th terminal of the 28 pin connector of ECU (chassis harness side) and 3rd terminal of the 3 pin connector of ABS actuator (chassis harness side).
Standard: Less than 5 Ω

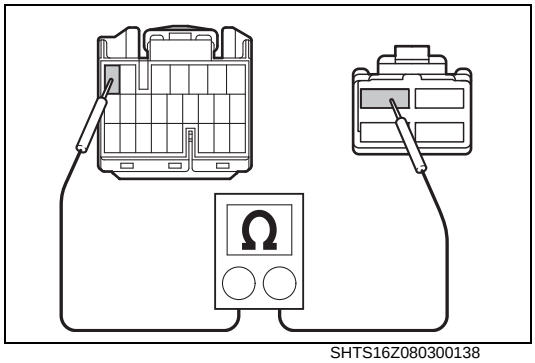
NO → Abnormality of the wire harness.

YES

Normal.

ABNORMALITY OF STOP LIGHT SWITCH (DIAGNOSIS CODE 49, DTC No. C1249)

EN16Z0803F200030



SHTS16Z080300138

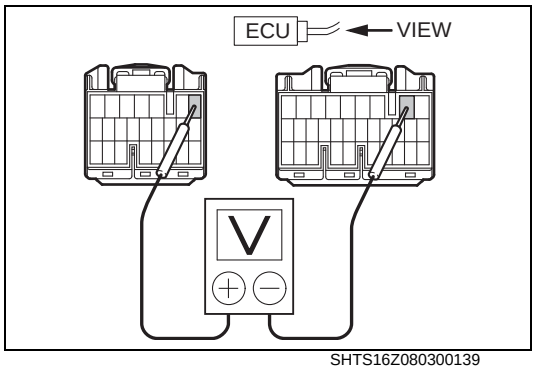
1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ECU and the connector of stop light switch.

(2) Check the continuity between 1st terminal of the 24 pin connector of ECU (chassis harness side) and 1st terminal of the switch connector (chassis harness side).
Standard: Continuity

NO → Disconnection of the wire harness.

YES



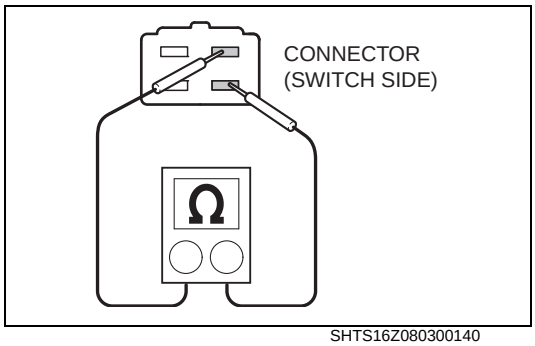
SHTS16Z080300139

(3) Connect all the connector, turn the starter switch to "ON".

(4) Measure the voltage between 1st terminal of the 24 pin connector of ECU and 2nd terminal of the 31 pin connector of ECU. (Leaving the connector connected with ECU.)
Standard: 20-28V

NO → Ground short of the wire harness.

YES



SHTS16Z080300140

2. STOP LIGHT SWITCH CHECK

(1) Turn the starter switch to "LOCK", disconnect the connector of stop light switch.

(2) Measure the resistance between 1st and 3rd terminal of the stop light switch.
Standard:
Pushing in the shaft: Continuity
Not pushing in the shaft: No continuity

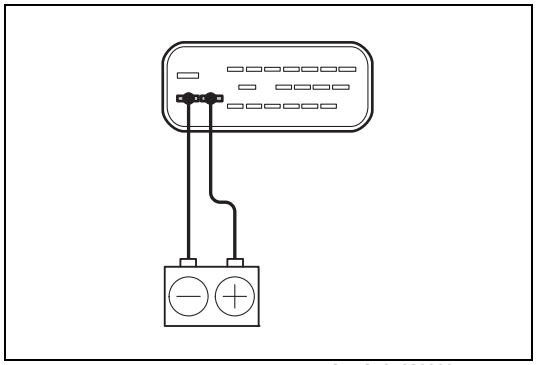
NO → Abnormality of the stop light switch.

YES

Perform the engine ECU check because it is conceivable that abnormality of the signal transmitted from the stop light to engine ECU.

ABNORMALITY OF MOTOR: NO ROTATION (DIAGNOSIS CODE 51, DTC No. C1251)

EN16Z0803F200031



SHTS16Z080300141

1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ABS actuator.

(2) Connecting (+) terminal of battery with 2nd terminal of the 24 pin connector (actuator side), (-) terminal of battery with 1st terminal, and check if motor operates or not.

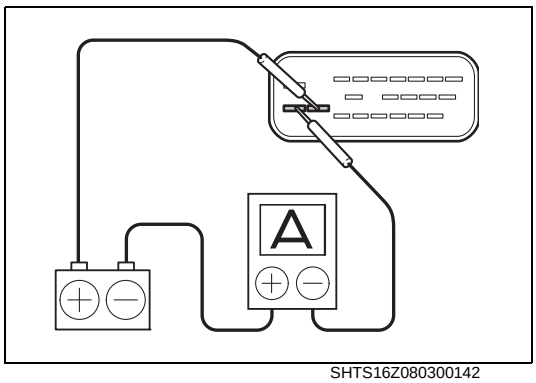
NOTICE

- **Be careful not to short.**
- **Be careful not to make a mistake to (+) against (-).**

Standard: Motor operates

NO → Abnormality of the motor.

YES



SHTS16Z080300142

(3) Connecting ammeter, measure the current while motor operating under no load.
Standard: Less than 4A

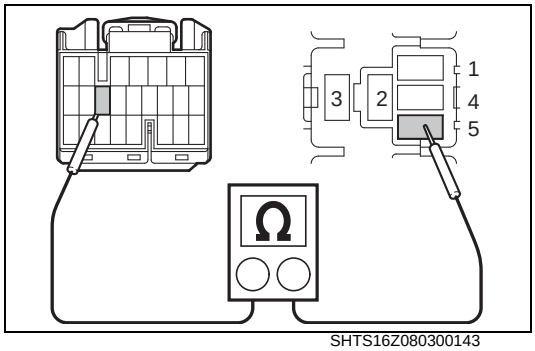
NO → Abnormality of the motor.

YES

Abnormality of the ECU.

ABNORMALITY OF EXHAUST BRAKE CUT RELAY (DIAGNOSIS CODE 66, DTC No. C1266)

EN16Z0803F200032



SHTS16Z080300143

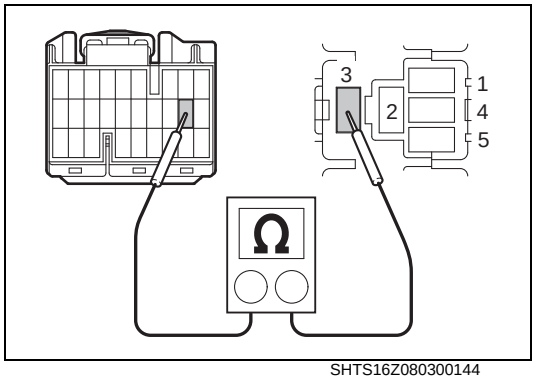
1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 24 pin connector of ECU and exhaust brake cut relay of the relay block.

(2) Check the continuity between 10th terminal of the 24 pin connector of ECU (chassis harness side) and 5th terminal of the relay connector (chassis harness side).
Standard: Continuity

NO → Disconnection of the wire harness.

YES



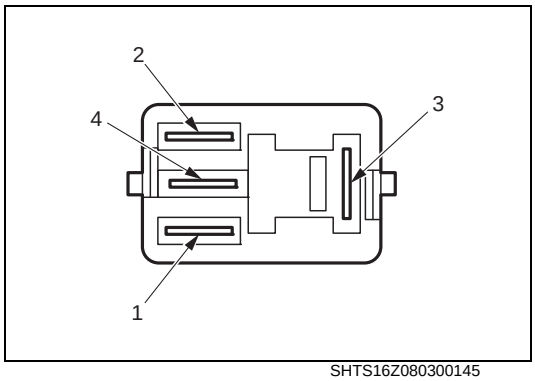
SHTS16Z080300144

(3) Disconnect the 28 pin connector of ECU.

(4) Check the continuity between 18th terminal of the 28 pin connector of ECU (chassis harness side) and 3rd terminal of the relay connector (socket side).
Standard: Continuity

NO → Ground short of the wire harness.

YES



SHTS16Z080300145

2. EXHAUST BRAKE CUT RELAY CHECK

(1) When 24V is applied and is not applied between 2nd and 1st terminals of exhaust brake cut relay, check the continuity between its 4th and 3rd terminals.

NOTICE
Connect (+) side with 1st terminal of relay.

2nd and 1st terminals	4th and 3rd terminals
24V is conducted	No continuity
Not conducted	Continuity

NO → Abnormality of the exhaust brake cut relay.

YES

Normal.

ABNORMALITY OF AIR PRESSURE SIGNAL (DIAGNOSIS CODE A1, DTC No. C1393)

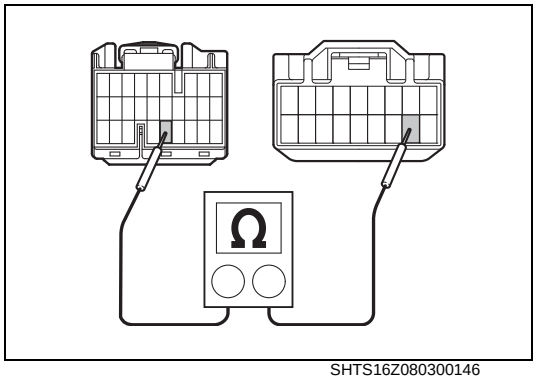
EN16Z0803F200033

1. CHECK ITEM

(1) Check if any abnormality on meter display (Indicator of air pressure) is seen or not. When any abnormality found, check low pressure warning switch and air gauge sensor.

DISCONNECTION / SHORT CIRCUIT OF VEHICLE SPEED SENSOR (DIAGNOSIS CODE B1, DTC No. C1383)

EN16Z0803F200034



SHTS16Z080300146

1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 28 pin connector of ECU and the 18 pin connector (white) of combination meter.

(2) Check the continuity between 8th terminal of the 28 pin connector of ECU (chassis harness side) and 17th terminal of the 18 pin connector of combination meter (chassis harness side).
Standard: Continuity

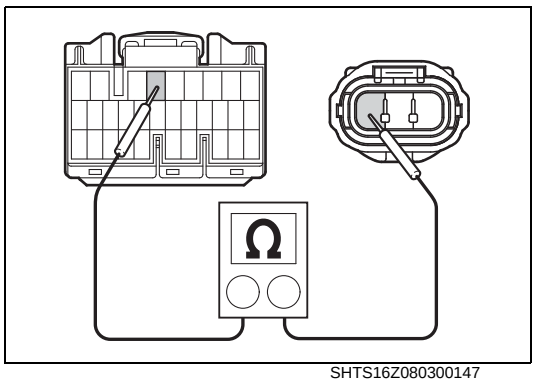
NO → Disconnection of the wire harness.

YES

Abnormality of the combination meter or vehicle speed sensor.

ABNORMALITY OF CLUTCH STROKE SENSOR (DIAGNOSIS CODE B2, DTC No. C1384) (ONLY VEHICLE WITH ES START)

EN16Z0803F200035


SHTS16Z080300147

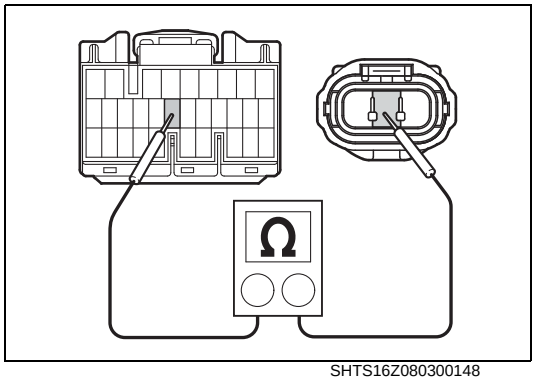
1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 31 pin connector of ECU and the connector of clutch stroke sensor.

(2) Check the continuity between 4th terminal of the 31 pin connector of ECU (chassis harness side) and 1st terminal of the sensor connector (chassis harness side).
Standard: Continuity

NO → Disconnection of the wire harness.

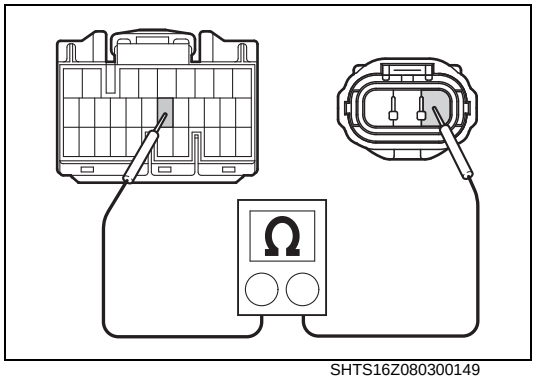
YES


SHTS16Z080300148

(3) Check the continuity between 15th terminal of the 31 pin connector of ECU (chassis harness side) and 2nd terminal of the sensor connector (chassis harness side).
Standard: Continuity

NO → Disconnection of the wire harness.

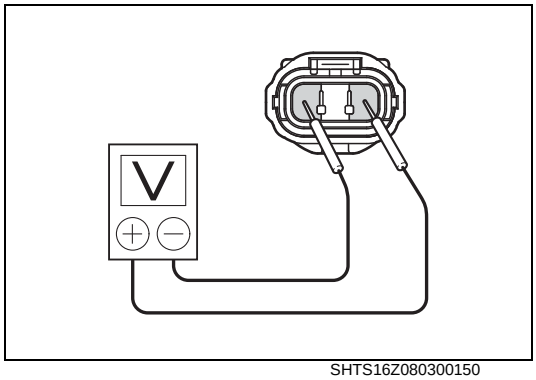
YES


SHTS16Z080300149

(4) Check the continuity between 16th terminal of the 31 pin connector of ECU (chassis harness side) and 3rd terminal of the sensor connector (chassis harness side).
Standard: Continuity

NO → Disconnection of the wire harness.

YES



SHTS16Z080300150

2. CLUTCH STROKE SENSOR CHECK

(1) Connect all the connector, turn the starter switch to "ON".

(2) Measure the voltage between 1st and 3rd terminals of the clutch stroke sensor.

Standard: 3-5V

NO

Abnormality of the clutch stroke sensor.

YES

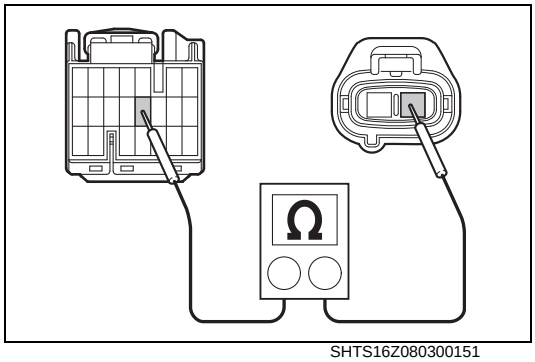
Perform the initial setting of released position for ES start.

NOTICE

When this code is output in spite of performing the initial setting, abnormality of clutch stroke sensor is considered as its cause.

ABNORMALITY OF NEUTRAL SWITCH (DIAGNOSIS CODE B3, DTC No. C1382) (ONLY VEHICLE WITH ES START)

EN16Z0803F200036



SHTS16Z080300151

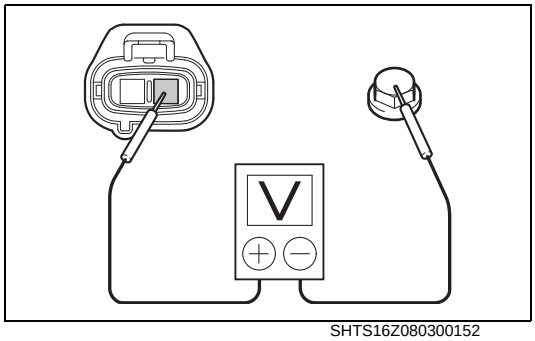
1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 22 pin connector of ECU and the connector of neutral switch.

(2) Check the continuity between 12th terminal of the 22 pin connector of ECU (chassis harness side) and 2nd terminal of the switch connector (chassis harness side).
Standard: Continuity

NO → Disconnection of the wire harness.

YES



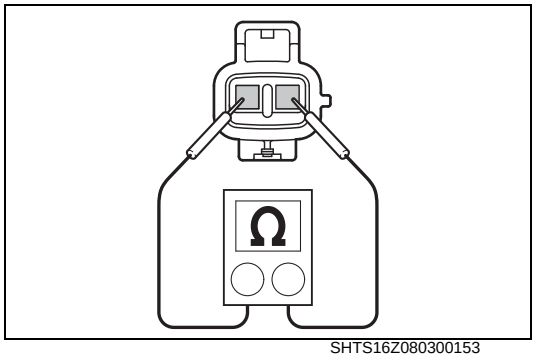
SHTS16Z080300152

(3) Connect the 22 pin connector of ECU, leaving the connector of neutral switch disconnected, turn the starter switch to "ON".

(4) Measure the voltage between 2nd terminal of the switch connector (chassis harness side) and chassis ground.
Standard: More than 20V

NO → Replace the wire harness, or abnormality of the power supply "M".

YES



SHTS16Z080300153

2. NEUTRAL SWITCH CHECK

(1) Check the continuity between 1st and 2nd terminals of the connector of neutral switch (switch side).
Standard:
Putting in gear: No continuity
Putting in neutral: Continuity

NOTICE
Within allowable range for excessive play of shifting lever, check that it can not be shifted.

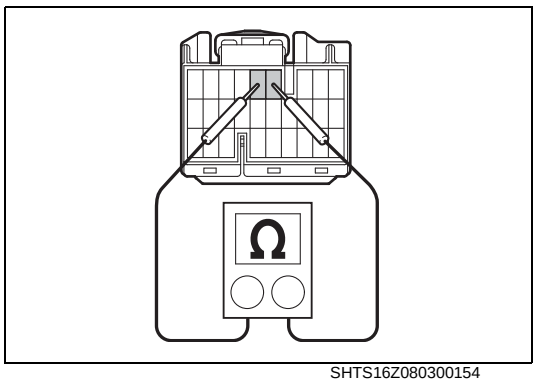
NO → Abnormality of the neutral switch.

YES

Abnormality of the ECU.

STICKING AT "ON" POSITION OF RELEASE TIMING SWITCH (DIAGNOSIS CODE B5, DTC No. C1387) (ONLY VEHICLE WITH ES START)

EN16Z0803F200037



SHTS16Z080300154

1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 28 pin connector of ECU.

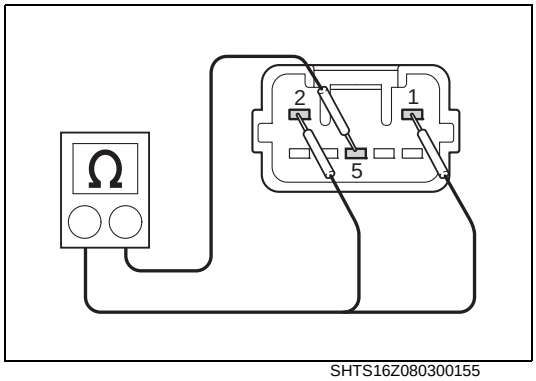
(2) Check the continuity between 5th and 6th terminals of the 28 pin connector (chassis harness side).

Standard: No continuity

NO

Short circuit of the wire harness.

YES



SHTS16Z080300155

2. RELEASE TIMING SWITCH CHECK

(1) Remove the release timing switch, check the continuity between each terminal of switch when putting the switch on "SLOW" or "FAST" sides.

Standard:

"SLOW" side	**Between 5th and 2nd terminals: Continuity** **Between 5th and 1st terminals: No continuity**
"FAST" side	**Between 5th and 2nd terminals: No continuity** **Between 5th and 1st terminals: Continuity**

NO

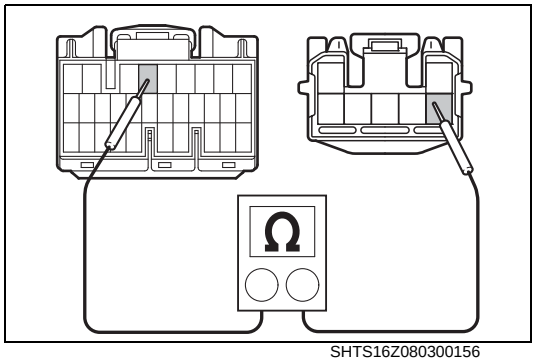
Abnormality of the release timing switch.

YES

Abnormality of the ECU.

ABNORMALITY OF ES START MAIN SWITCH (DIAGNOSIS CODE B6, DTC No. C1386) (ONLY VEHICLE WITH ES START)

EN16Z0803F200038



SHTS16Z080300156

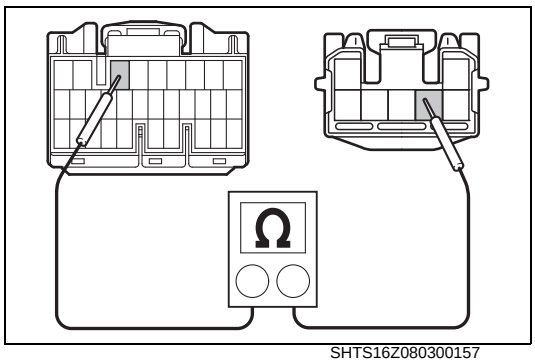
1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 28 pin connector of ECU and the connector of ES start main switch.

(2) Check the continuity between 4th terminal of the 28 pin connector of ECU (chassis harness side) and 7th terminal of the switch connector (chassis harness side).
Standard: Continuity

NO → Disconnection the wire harness.

YES

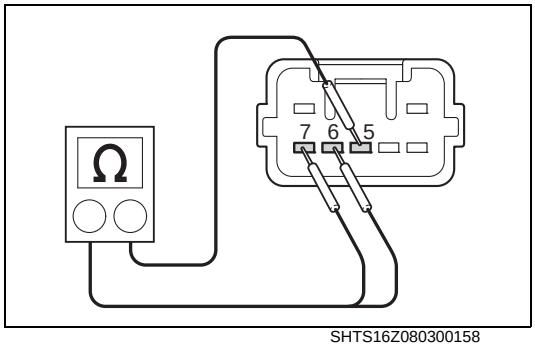


SHTS16Z080300157

(3) Check the continuity between 3rd terminal of the 28 pin connector of ECU (chassis harness side) and 6th terminal of the switch connector (chassis harness side).
Standard: Continuity

NO → Disconnection the wire harness.

YES



SHTS16Z080300158

2. ES START MAIN SWITCH CHECK

(1) Check the continuity between each terminal of ES start main switch when putting the main switch "ON" or "OFF".

Standard:

Main switch "ON"	**Between 5th and 7th terminals: Continuity** **Between 5th and 6th terminals: No continuity**
Main switch "OFF"	**Between 5th and 7th terminals: No continuity** **Between 5th and 6th terminals: Continuity**

NO → Abnormality of the ES start main switch.

YES

Abnormality of the ECU.

IMPERFECT INITIAL SETTING (DIAGNOSIS CODE B7, DTC No. C1388) (ONLY VEHICLE WITH ES START)

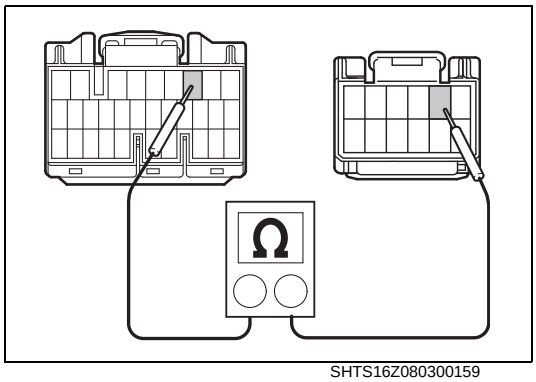
EN16Z0803F200039

1. CHECK ITEM

(1) Perform the initial setting of ES start.
Refer to **"INITIAL SETTING OF ES START"** in the section **"ADJUSTMENT"** in the chapter **"ES START (EASY & SMOOTH START SYSTEM) (MODELS: WITH DENSO ABS)"**.

ABNORMALITY OF TACHOMETER SIGNAL (DIAGNOSIS CODE B8, DTC No. C1389) (ONLY VEHICLE WITH ES START)

EN16Z0803F200040



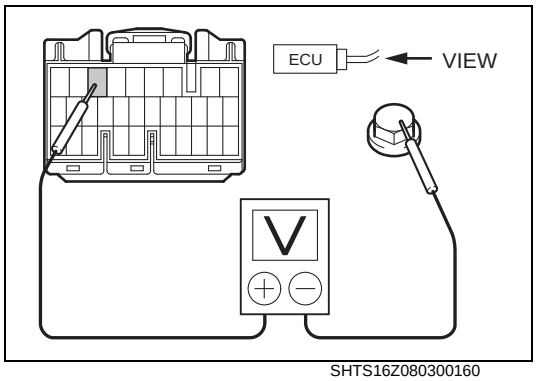
SHTS16Z080300159

1. WIRE HARNESS CHECK

(1) Set the starter switch to "LOCK", disconnect the 28 pin connector of ABS+ES start ECU and the 12 pin connector of engine ECU.
(2) Check the continuity between 7th terminal of the 28 pin connector of ABS+ES start ECU (chassis harness side) and 5th terminal of the connector of engine ECU (chassis harness side).
Standard: Continuity

NO → Disconnection the wire harness.

YES



SHTS16Z080300160

2. ENGINE ECU CHECK

(1) Connect all the connector, turn the starter switch to "ON".
(2) By using a oscilloscope, measure the voltage between 7th terminal of the 28 pin connector of ABS+ES start ECU and chassis ground.

NOTICE

Check the waveform by stepping on the accelerator at "neutral position" of gear while engine is running.

Standard: Under the pulse waveform of less than 25V to more than 6V, pulse interval will be shortened in proportion to engine revolution.

NO → Abnormality of the engine ECU.

YES → Abnormality of the ABS+ES start ECU.

BRAKE CONTROL (ABS: WABCO)

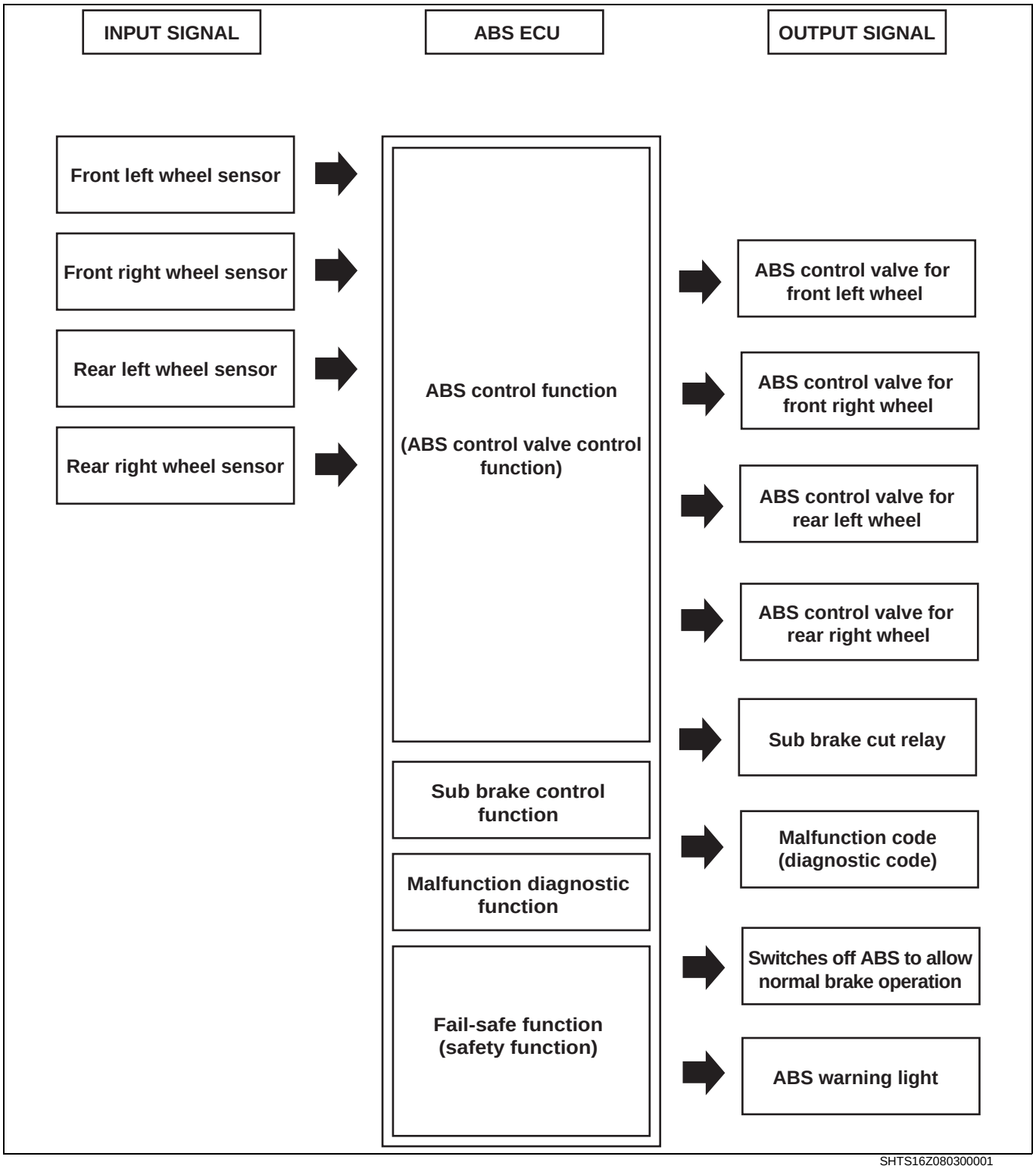
DN03-002

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ANTI-LOCK BRAKE

SYSTEM DIAGRAM

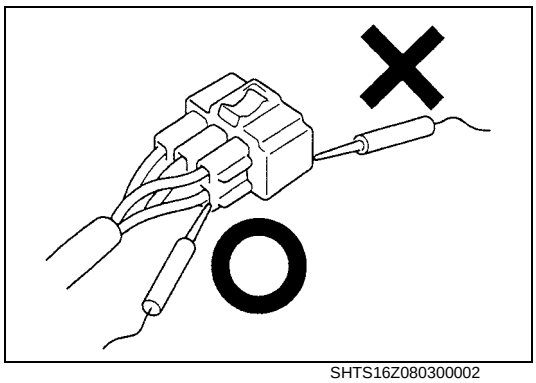
EN16Z0803J100001



SHTS16Z080300001

HANDLING PRECAUTIONS

EN16Z0803F200001



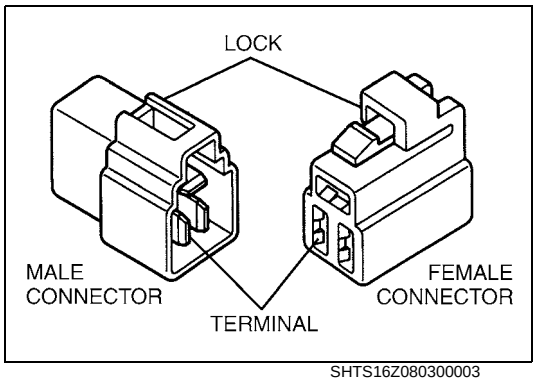
SHTS16Z080300002

1. ABOUT CONNECTORS

(1) Before performing the inspection operation, make sure that all connectors are connected securely.

(2) Do not contact the tester bar to the connection surface of the connector. This may cause terminal damage or a short-circuit.

(3) All connectors in the connector diagram are observed from the contact surfaces. However, the tester bar is put from the rear side.

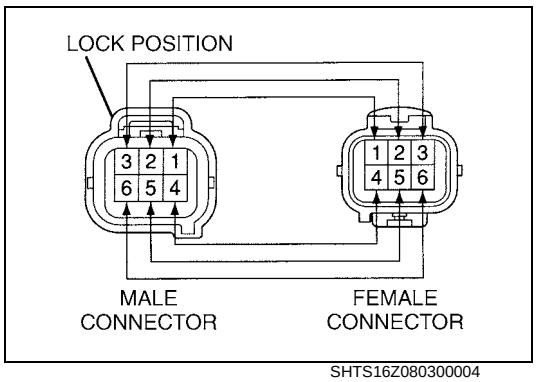


SHTS16Z080300003

(4) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



SHTS16Z080300004

(5) As for the terminal numbers of the connector, the first terminal is located on the top right terminal of the male connector and the top left terminal of the female connector.
Reference:
When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(6) When disconnecting the connectors, be sure to position the starter switch "LOCK".

2. ABOUT DIAGNOSIS MONITOR

(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, delete the previous damage data.

INSPECTION
(ABS SYSTEM OPERATION AND FAILURE DIAGNOSTICS)

EN16Z0803F200002

ABS SYSTEM REGULAR INSPECTION

Inspect the operation of the ABS system once per year in accordance with the procedure below.

OPERATION STATUS INSPECTION

1. PREPARATION BEFORE INSPECTION

(1) With the vehicle stopped, step on the brake pedal and check for air leakage from the ABS control valves. If air leaking from the pipe connectors is found by applying soapy water, or the like, correct the problem by tightening the connectors or take a similar corrective action. Also, if air is leaking from the ABS control valve body, replace the ABS control valve.

(2) Release the brake pedal and inspect the exhaust status of the ABS control valves.
The above inspection should be carried out on all ABS control valves.

2. ABS OPERATION STATUS INSPECTION IN TEST DRIVE

NOTICE

When inspecting the ABS operation status in a test drive, exercise caution with regard to the following points.

- **Use a large, safe area for the test.**
- **Conduct the test with nothing loaded on the vehicle.**
- **Apply white tape, or the like, to the sides of the front and rear wheels to enable you to determine the wheel's rotational status.**
- **Even in case of tractor model, perform a test drive without hauling trailer**

(1) Turn the starter switch "ON". Confirm that the ABS warning light lights and then goes off.

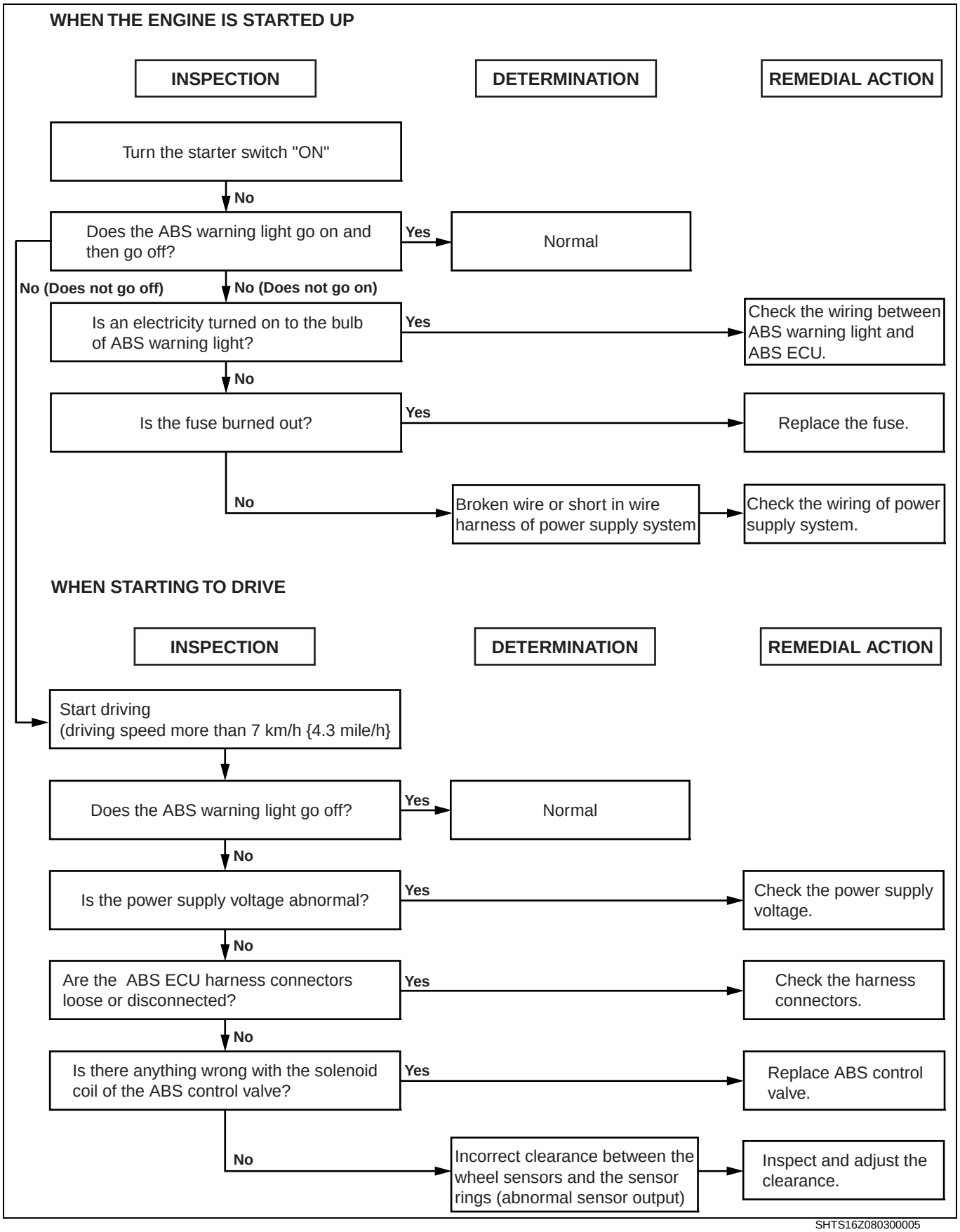
(2) Start driving the vehicle and, accelerate to a speed of vehicle to 20-30 km/h {12.4-18.6 mile/h}, then apply the brakes hard. Confirm that none of the wheels are locked.

FAILURE DIAGNOSTICS BASED ILLUMINATION OF WARNING LIGHT

ABS WARNING LIGHT	CAUSE OF MALFUNCTION	FAIL-SAFE FUNCTION
Lighting (While running)	POWER SUPPLY RELATED • Fuse burned out • Wire harness connector disconnected • Bad contact with wire harness • Wire broken in wire harness • Low battery voltage • Short circuit of ABS valve harness with +24V power supply harness	Entire ABS system becomes non-functional. (Brakes of wheels return to normal breaking operation.)
	WHEEL SENSOR RELATED • Sensor clearance too wide • Bad sensor unit • Broken wire in wire harness • Wire harness connector disconnected or bad contact	ABS becomes non-functional on wheels in the system where sensor malfunctioned, and those wheels return to normal braking operation.
	ABS CONTROL VALVE RELATED • Wire broken or short circuit in solenoid coil • Broken wire in wire harness of ABS control valve, wire harness connector disconnected, bad contact	ABS becomes non-functional on wheel in the system where ABS control valve malfunctioned, and those wheel return to normal braking operation.
	ECU • Internal malfunction in ECU	Entire ABS system becomes non-functional. (Brakes of wheels return to normal breaking operation.)

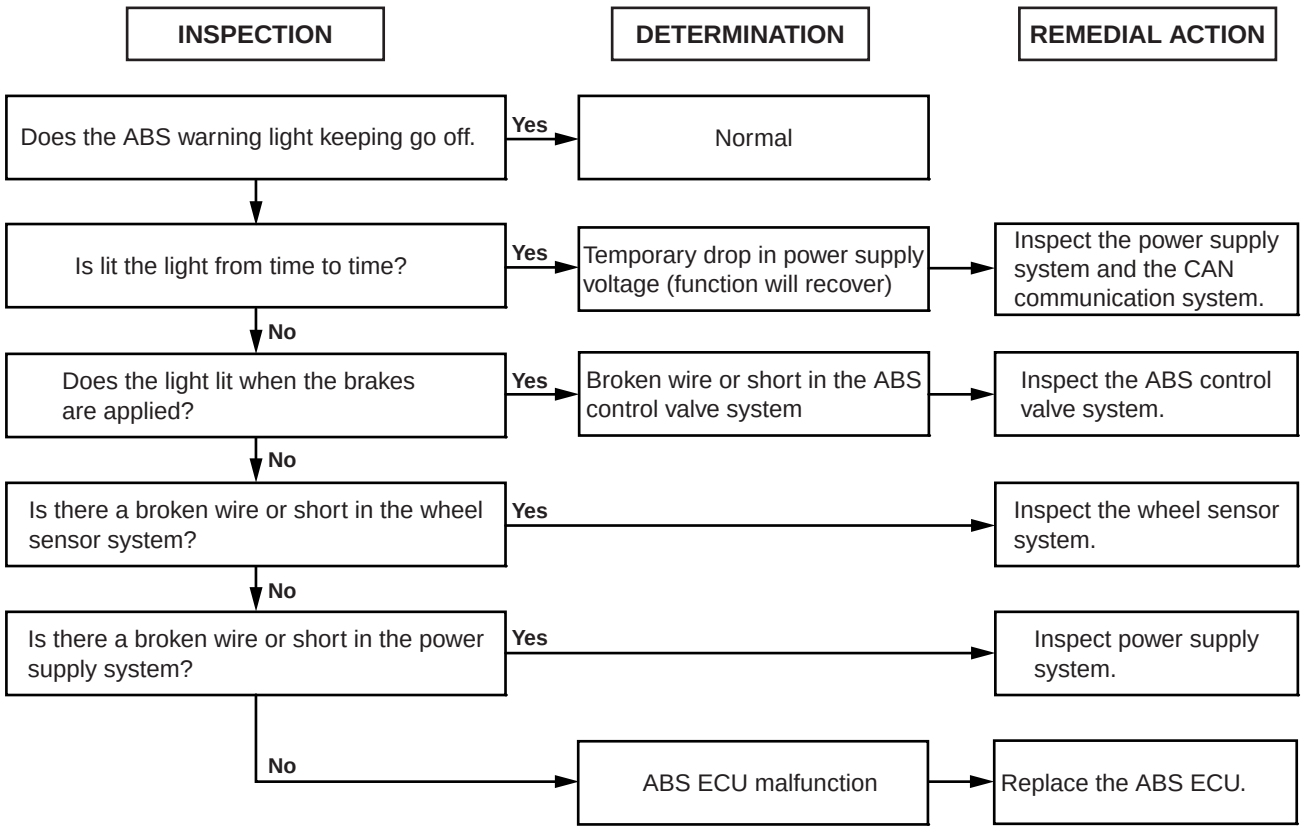
NOTICE
The ABS warning light may remain lit if the ABS system experiences a temporary malfunction and then recovers. Should this occur, reset it by turn "LOCK" the starter switch temporarily while the vehicle is stopped. Then start driving the vehicle. If the light goes off when a speed of vehicle exceeds 7 km/h {4.3 mile/h}, ABS is working normally.

ABS SYSTEM FAILURE DIAGNOSTICS FLOWCHART



SHTS16Z080300005

WHILE DRIVING AND BRAKING



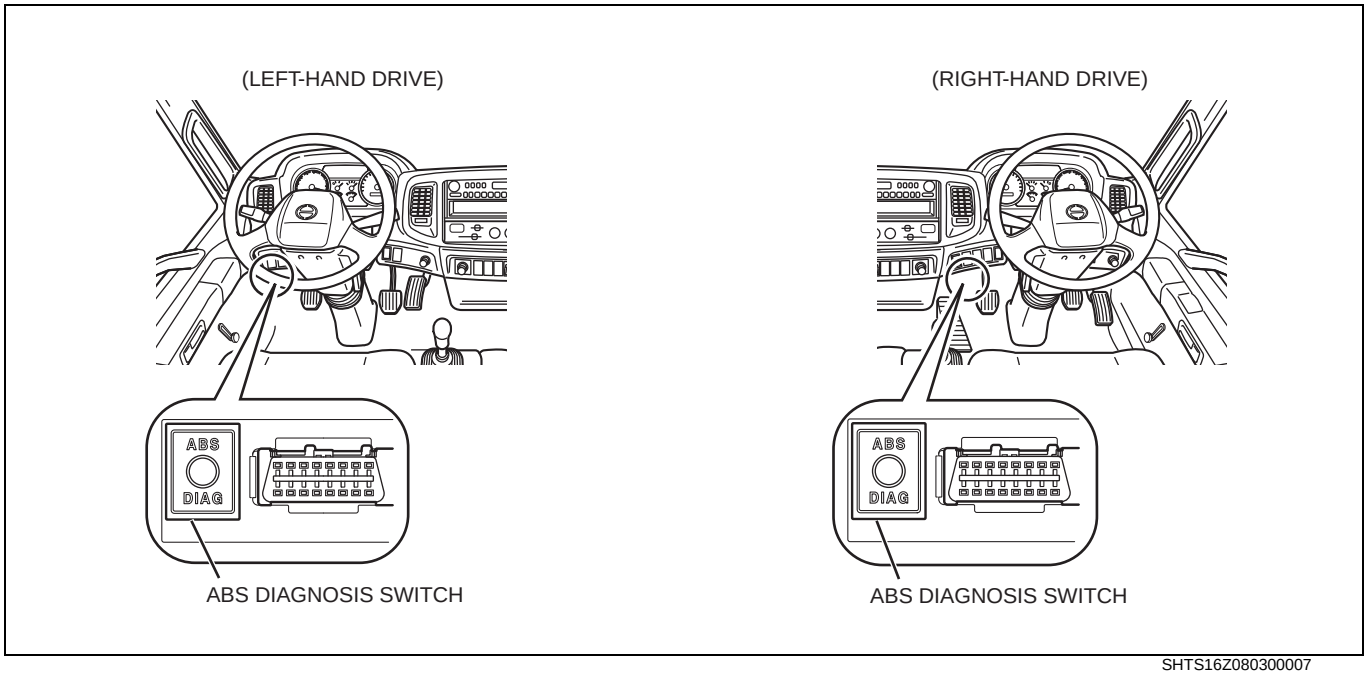
SHTS16Z080300006

TROUBLE DIAGNOSIS BY MALFUNCTION DIAGNOSING FUNCTION OF ABS ECU

ABS system memorizes all malfunction contents occurred so far in the ECU. Push the ABS diagnosis switch, by which is changed to diagnosis mode, ABS warning light flashes on and off to advise the trouble contents.

DIAGNOSIS SWITCH OF ABS SYSTEM

Locate diagnosis switch of ABS system on lower left of driver's side console panel.
Set the starter switch to "ON" and push the ABS diagnosis switch for 0.5-3.0 seconds, which is led to the diagnosis mode, the ABS warning light flashes on and off to inform the trouble codes.

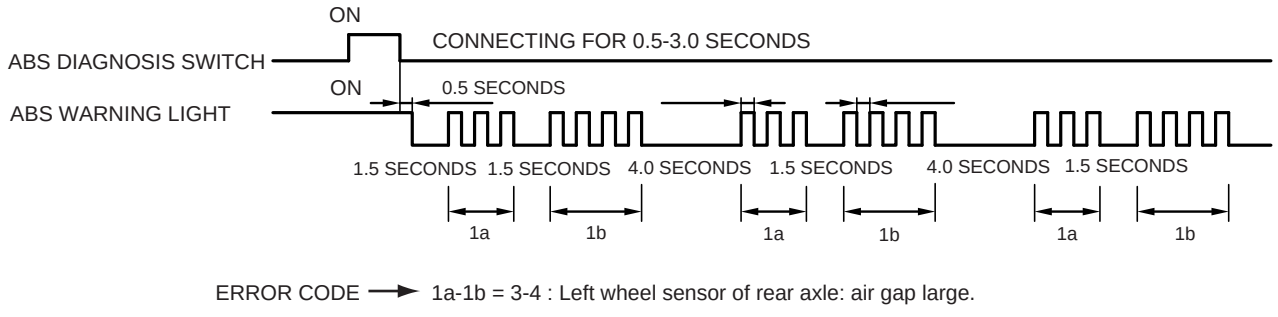


SHTS16Z080300007

NOTICE
ABS diagnosis switch reverts automatically to "OFF" position.

MALFUNCTION DIAGNOSIS WHEN PRESENTLY HAVING TROUBLES

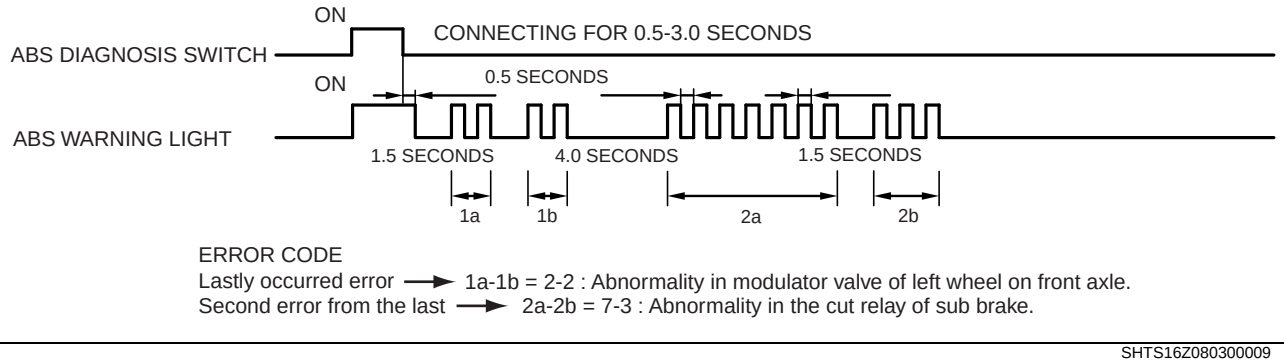
It indicates repeatedly "an current occurring trouble". When having more than two troubles, the latest trouble is displayed. Confirm the trouble contents together with a "TABLE OF TROUBLE CODE", in the page DN03-11.
When set the starter switch to "OFF", or detecting the driving speed with the wheel sensor, trouble indication will be finished.



SHTS16Z080300008

WHEN PRESENTLY NOT HAVING TROUBLE

The last eight troubles occurred will be indicated in the order from the last one.
Even when more than eight troubles are occurred, only latest eight troubles will be indicated without showing other prior one before the latest four ones.
Once the trouble contents are finished to be indicated, it will finish automatically.



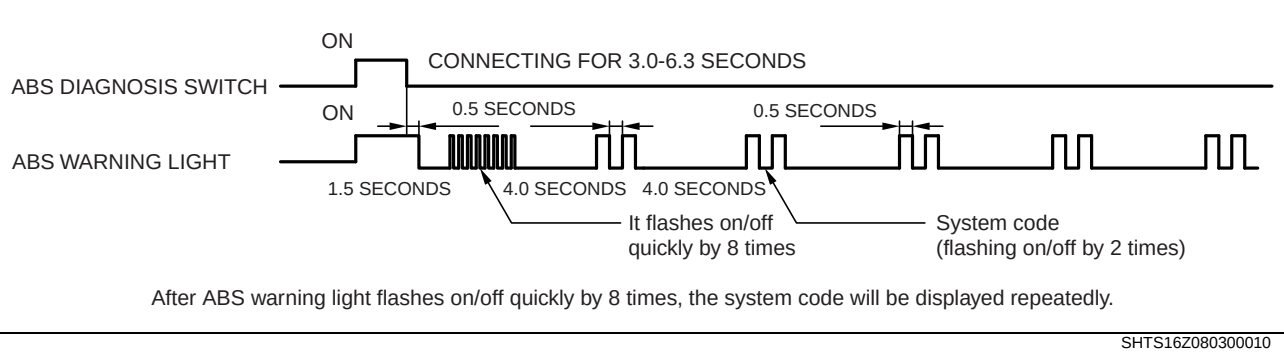
SHTS16Z080300009

ELIMINATION OF PAST TROUBLE HISTORY

Once push the ABS diagnosis switch, by which trouble memories will be eliminated.
And just after ABS warning light flashes on/off by 8 times, the ABS system code will be displayed repeatedly at interval of 4 seconds and will light on/off consecutively.
When set the starter switch to "OFF" once and pushed the ABS warning light will go on and off when the driving speed reaches to 7-10 km/h {4.3-6.2 mile/h}.

NOTICE

Past trouble history can not be eliminated when having trouble.



SHTS16Z080300010

TABLE OF TROUBLE CODE

EN16Z0803F200003

OUTPUT CODE		TROUBLE PORTION	TROUBLE CONTENTS	CORRESPONDING TERMINAL NUMBER OF ABS ECU (CONNECTOR PIN No.)
a	b			
1	1	Normal	—	—
2	1	ABS control valve	Front axle right wheel abnormal	18 pin connector-5th, 6th
	2		Front axle left wheel abnormal	18 pin connector-17th, 18th
	3		Rear axle right wheel abnormal	18 pin connector-10th, 16th
	4		Rear axle left wheel abnormal	18 pin connector-11th, 12th
3	1	ABS wheel sensor air gap	Front axle right wheel abnormal	18 pin connector-2nd, 3rd
	2		Front axle left wheel abnormal	18 pin connector-14th, 15th
	3		Rear axle right wheel abnormal	18 pin connector-7th, 13th
	4		Rear axle left wheel abnormal	18 pin connector-8th, 9th
4	1	ABS wheel sensor disconnection and short-circuit	Front axle right wheel abnormal	18 pin connector-2nd, 3rd
	2		Front axle left wheel abnormal	18 pin connector-14th, 15th
	3		Rear axle right wheel abnormal	18 pin connector-7th, 13th
	4		Rear axle left wheel abnormal	18 pin connector-8th, 9th
5	1	ABS wheel sensor	Front axle right wheel abnormal	18 pin connector-2nd, 3rd
	2		Front axle left wheel abnormal	18 pin connector-14th, 15th
	3		Rear axle right wheel abnormal	18 pin connector-7th, 13th
	4		Rear axle left wheel abnormal	18 pin connector-8th, 9th
6	1	ABS sensor ring	Front axle right wheel abnormal	—
	2		Front axle left wheel abnormal	—
	3		Rear axle right wheel abnormal	—
	4		Rear axle left wheel abnormal	—
7	1	System	CAN communication abnormal	15 pin connector-5th, 15th
	3		Sub brake cut relay abnormal	15 pin connector-6th
	4		Warning light abnormal	15 pin connector-11th
8	1	ECU	Power supply abnormal (Low voltage)	15 pin connector-8th
	2		Power supply abnormal (Over voltage)	15 pin connector-8th
	3		Internal abnormality	—
	4		Internal abnormality	—
	5		Earth abnormal	15 pin connector-4th, 13th

ARRANGEMENT OF CONNECTOR PIN

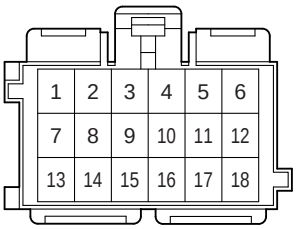
EN16Z0803F200004

NOTICE

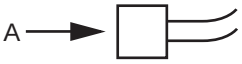
Different terminal numbers from below listed figure are stamped on the connector unit. However, verify it in reference to this figure.

ABS ECU

18 PIN CONNECTOR

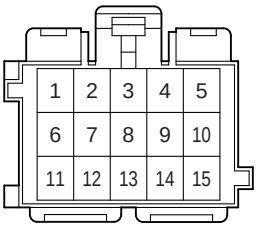


VIEW A

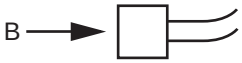


CAB SIDE HARNESS

15 PIN CONNECTOR

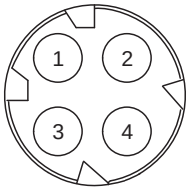


VIEW B



CAB SIDE HARNESS

ABS CONTROL VALVE

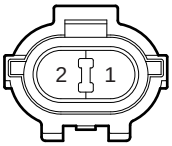


VIEW C

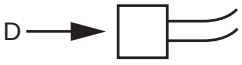


CAB SIDE HARNESS

ABS WHEEL SENSOR



VIEW D

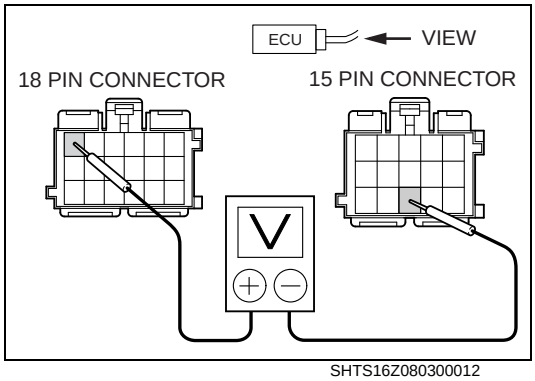


CAB SIDE HARNESS

SHTS16Z080300011

ABNORMALITY OF ABS CONTROL VALVE AND HARNESS WIRE, RH ON FRONT AXLE (DIAGNOSIS CODE 2-1)

EN16Z0803F200005



SHTS16Z080300012

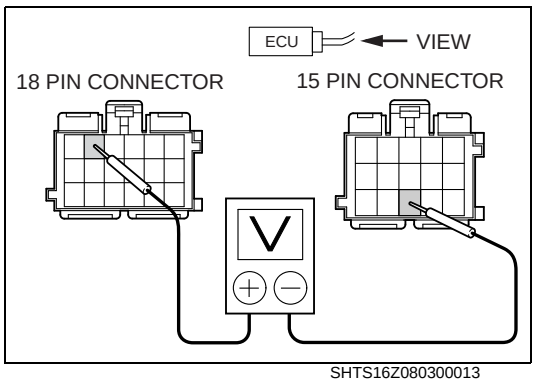
1. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON".

(2) Measure the voltage 6th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES



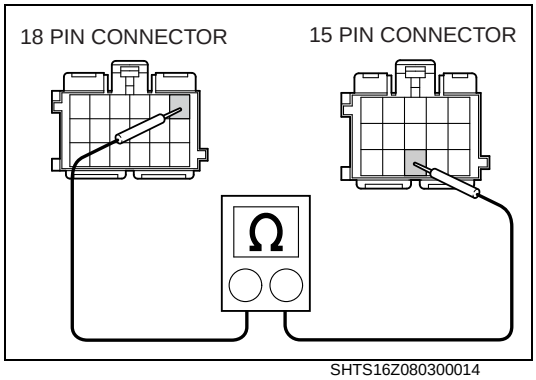
SHTS16Z080300013

(3) Measure the voltage 5th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300014

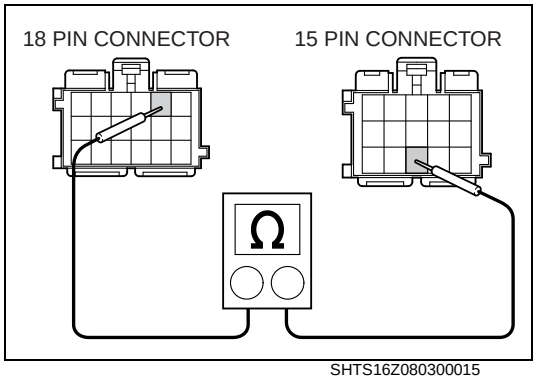
2. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Measure the resistance between 6th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES



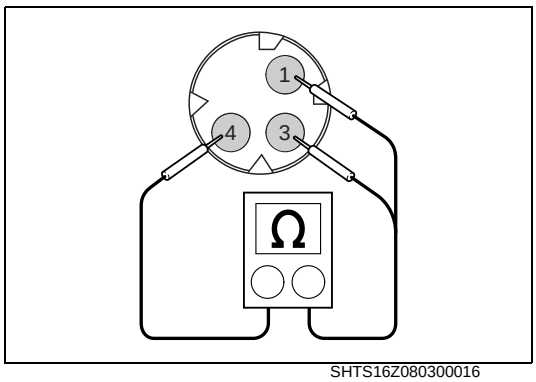
SHTS16Z080300015

(3) Measure the resistance between 5th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES

Temporary malfunction because of abnormality of the harness.



SHTS16Z080300016

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

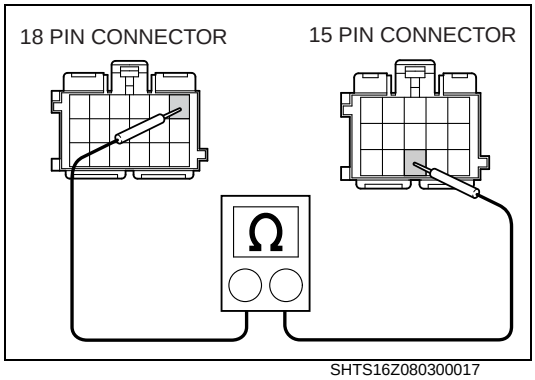
(1) Disconnect the connector of ABS control valve.

(2) Measure the resistance between 1st-4th terminals and 3rd-4th terminals (Control valve side).
Standard: 11.1-19.2 Ω

NO → Abnormality of control valve.

YES

Abnormality of harness.



SHTS16Z080300017

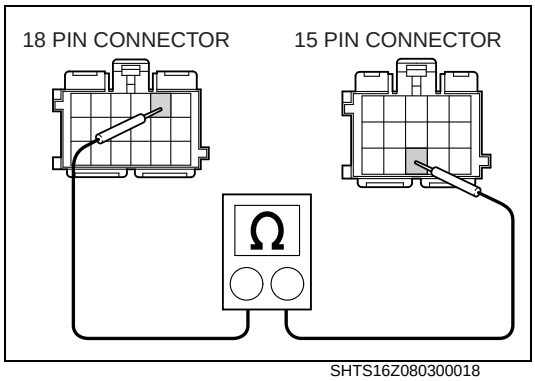
4. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Check the continuity between 6th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES



SHTS16Z080300018

(3) Check the continuity between 5th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

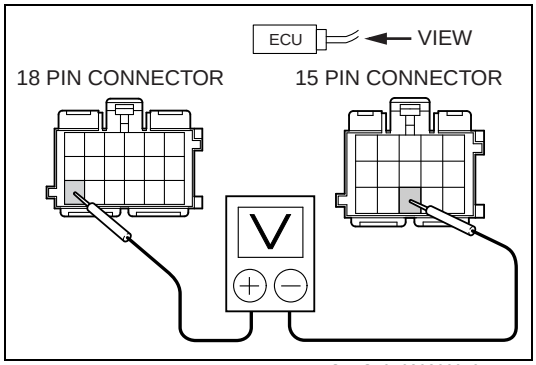
NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.

ABNORMALITY OF ABS CONTROL VALVE AND HARNESS WIRE, LH ON FRONT AXLE (DIAGNOSIS CODE 2-2)

EN16Z0803F200006



SHTS16Z080300019

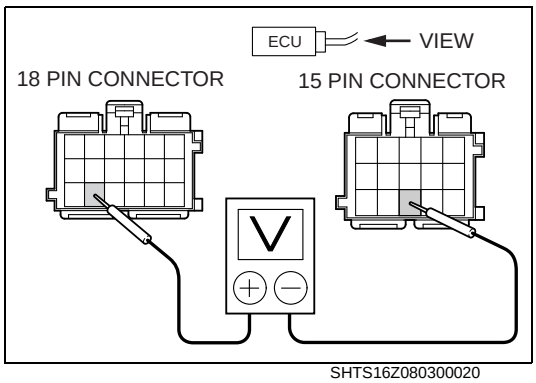
1. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON".

(2) Measure the voltage 18th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES



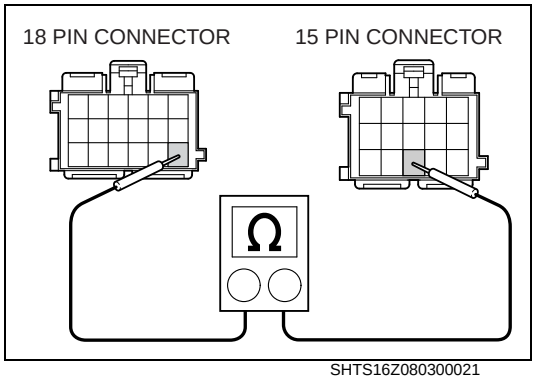
SHTS16Z080300020

(3) Measure the voltage 17th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300021

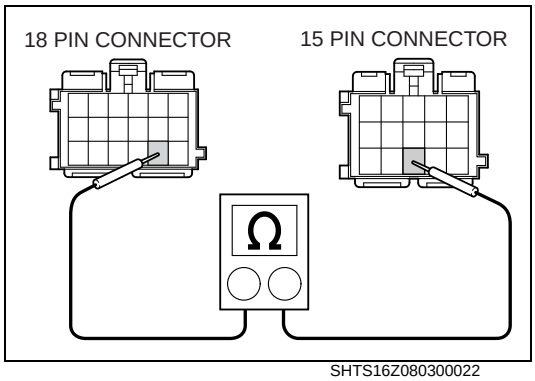
2. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connector of ABS ECU.

(2) Measure the resistance between 18th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES



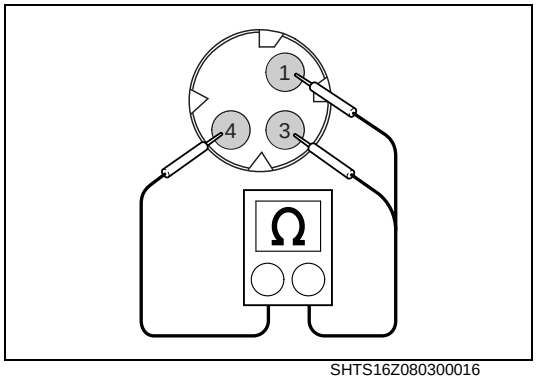
SHTS16Z080300022

(3) Measure the resistance between 17th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300016

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

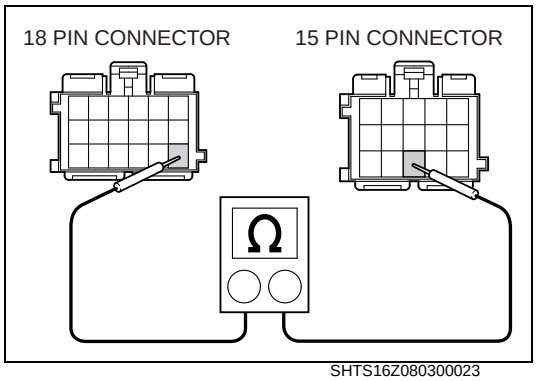
(1) Disconnect the connector of ABS control valve.

(2) Measure the resistance between 1st-4th terminals and 3rd-4th terminals (control valve side).
Standard: 11.1-19.2 Ω

NO → Abnormality of control valve.

YES

Abnormality of harness.



SHTS16Z080300023

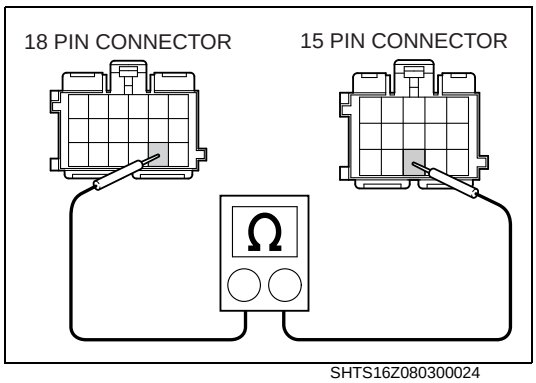
4. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Check the continuity between 18th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES



SHTS16Z080300024

(3) Check the continuity between 17th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

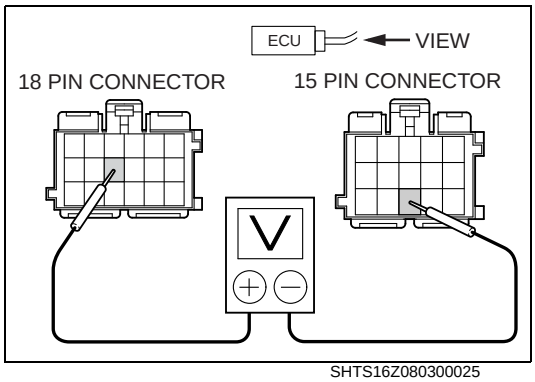
NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.

ABNORMALITY OF ABS CONTROL VALVE AND HARNESS WIRE, RH ON REAR AXLE (DIAGNOSIS CODE 2-3)

EN16Z0803F200007



SHTS16Z080300025

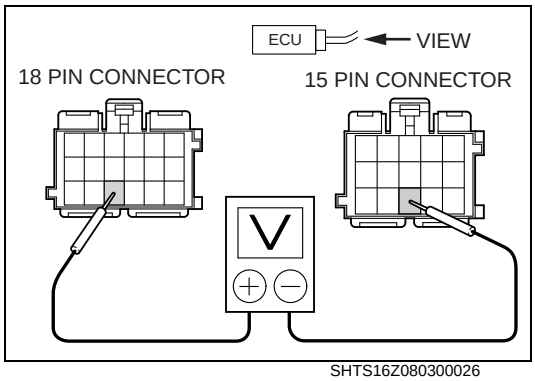
1. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON".

(2) Measure the voltage 10th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES



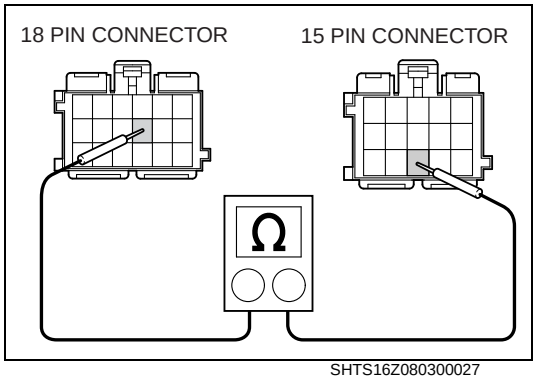
SHTS16Z080300026

(3) Measure the voltage 16th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300027

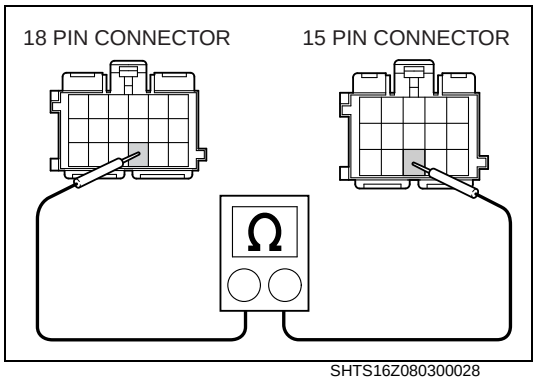
2. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Measure the resistance between 10th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES



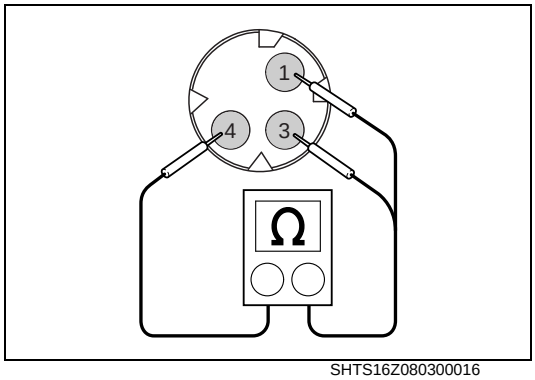
SHTS16Z080300028

(3) Measure the resistance between 16th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300016

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

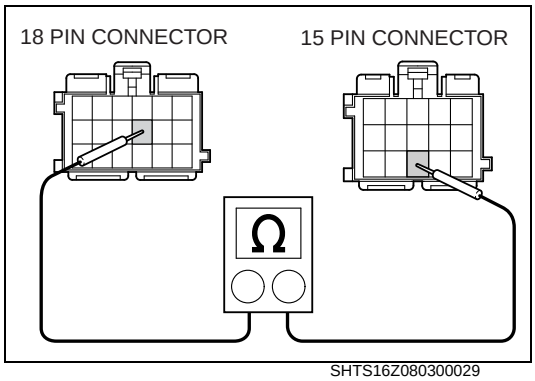
(1) Disconnect the connector of ABS control valve.

(2) Measure the resistance between 1st-4th terminals and 3rd-4th terminals (Control valve side).
Standard: 11.1-19.2 Ω

NO → Abnormality of control valve.

YES

Abnormality of harness.



SHTS16Z080300029

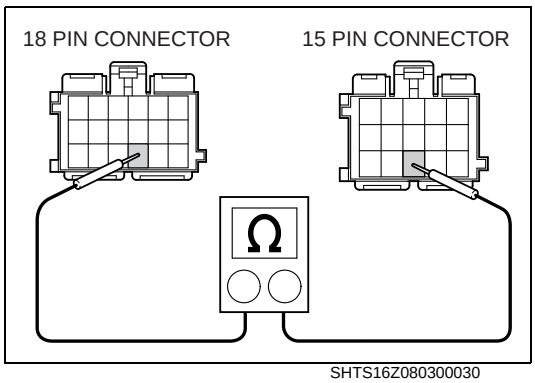
4. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Check the continuity between 10th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES



SHTS16Z080300030

(3) Check the continuity between 16th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

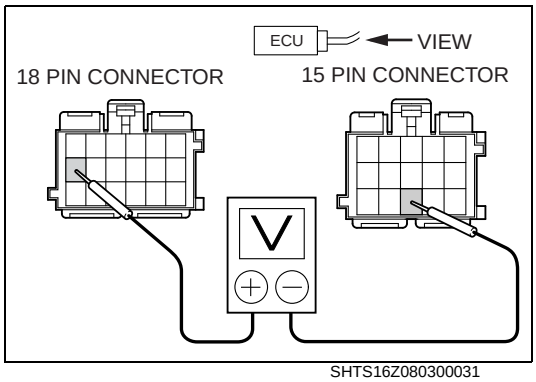
NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.

ABNORMALITY OF ABS CONTROL VALVE AND HARNESS WIRE, LH ON REAR AXLE (DIAGNOSIS CODE 2-4)

EN16Z0803F200008



SHTS16Z080300031

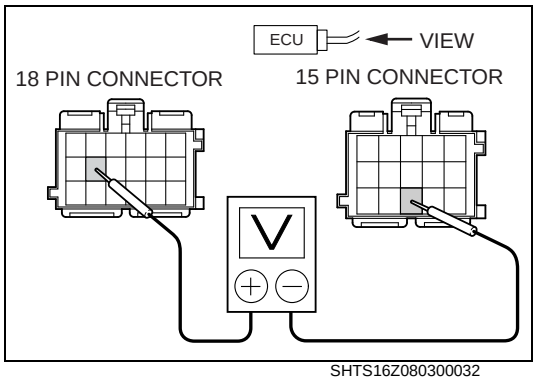
1. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON".

(2) Measure the voltage 12th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES



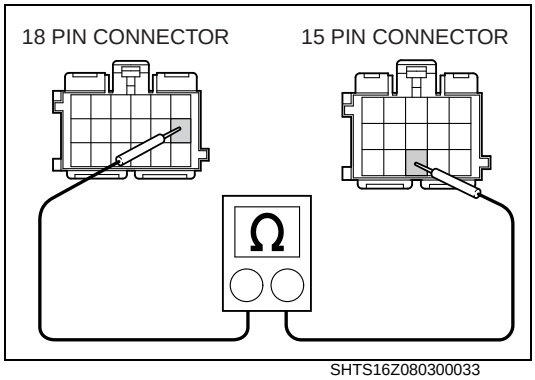
SHTS16Z080300032

(3) Measure the voltage 11th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300033

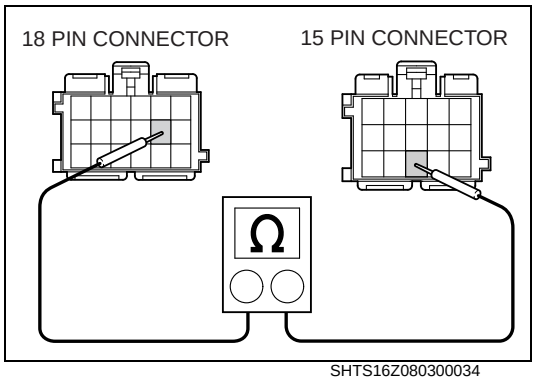
2. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Measure the resistance between 12th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES



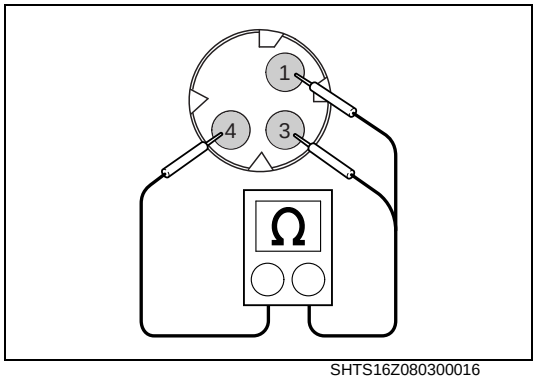
SHTS16Z080300034

(3) Measure the resistance between 11th terminal of 18 pin connector and 13 terminal of 15 pin connector.
Standard: 10-20 Ω

NO → Go to the item 3.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300016

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

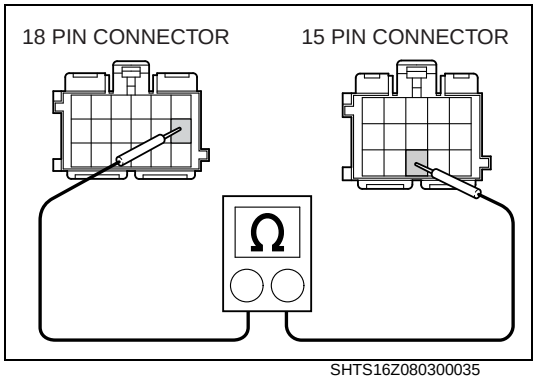
(1) Disconnect the connector of ABS control valve.

(2) Measure the resistance between 1st-4th terminals and 3rd-4th terminals (control valve side).
Standard: 11.1-19.2 Ω

NO → Abnormality of control valve.

YES

Abnormality of harness.



SHTS16Z080300035

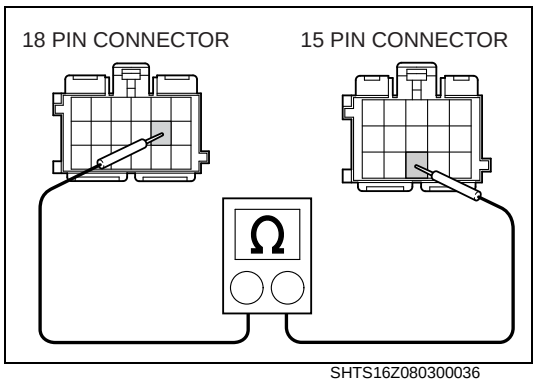
4. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Check the continuity between 12th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES



SHTS16Z080300036

(3) Check the continuity between 11th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

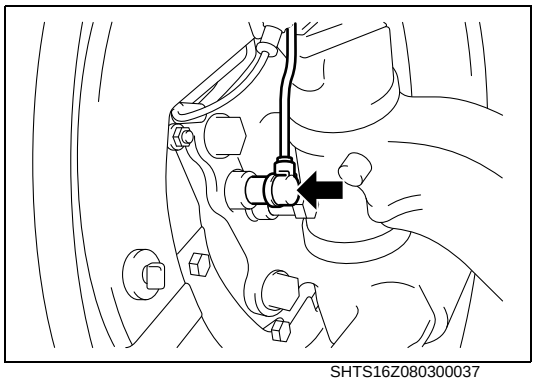
NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.

EXCESSIVE AIR GAP AND SIGNAL DISCONTINUATION OF WHEEL SENSOR, RH ON FRONT AXLE (DIAGNOSIS CODE 3-1)

EN16Z0803F200009

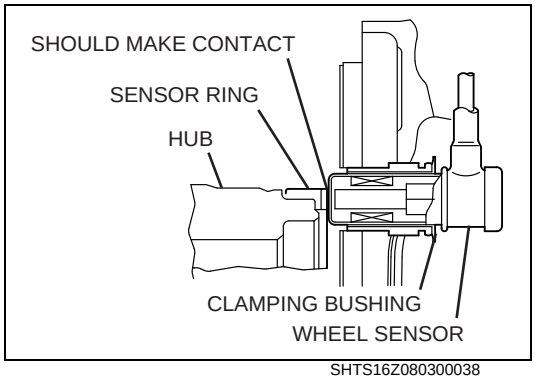

SHTS16Z080300037

1. CHECK THE AIR GAP OF WHEEL SENSOR.

(1) Insert a wheel sensor till it touches to the sensor ring.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place with a screwdriver, or the like. Doing so could damage the wheel sensor.



SHTS16Z080300038

2. CHECK THE CLAMPING BUSHING.

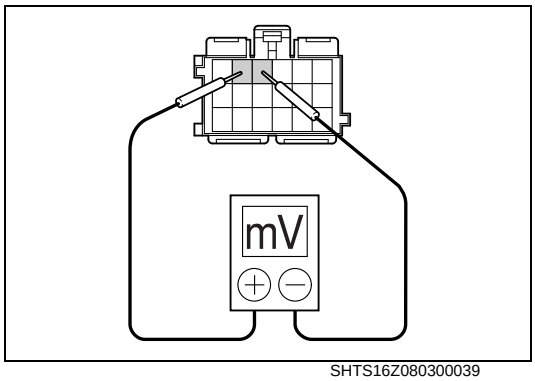
(1) Make sure that wheel sensor is securely fixed.

NOTICE

Change the clamping bushing when it can pulled off or pushed in with a weak force.

3. CHECK THE SENSOR RING.

(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".



SHTS16Z080300039

4. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 18 pin connectors of ABS ECU.

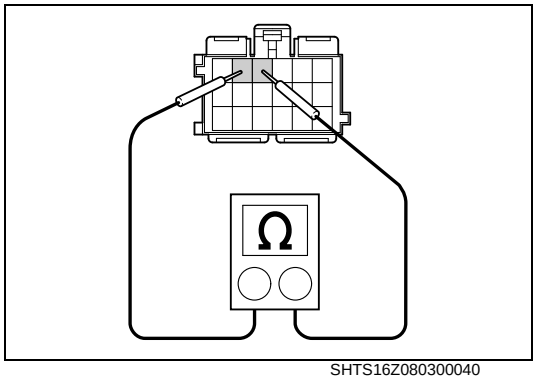
(2) Connecting the tester between 2nd and 3rd terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.

Standard: 150-1,999 mV

NO → Go to the item 5.

YES →

Temporary malfunction because of abnormality of harness.

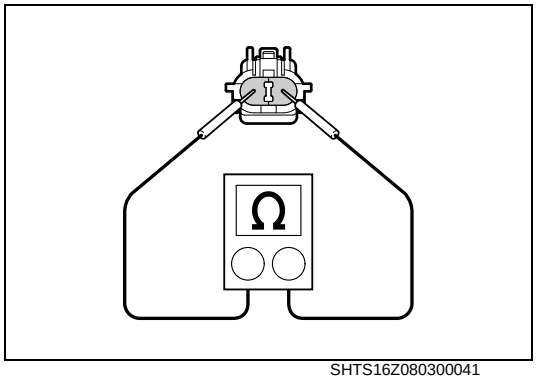

SHTS16Z080300040

5. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 2nd and 3rd terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO → Go to the item 6.

YES → Temporary malfunction because of abnormality of harness.


SHTS16Z080300041

6. CHECK THE RESISTANCE BETWEEN TERMINALS.

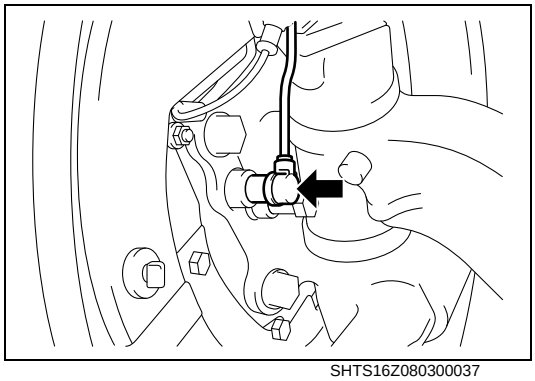
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO → Abnormality wheel sensor.

YES → Temporary malfunction because of abnormality of harness.

EXCESSIVE AIR GAP AND SIGNAL DISCONTINUATION OF WHEEL SENSOR, LH ON FRONT AXLE (DIAGNOSIS CODE 3-2)

EN16Z0803F200010

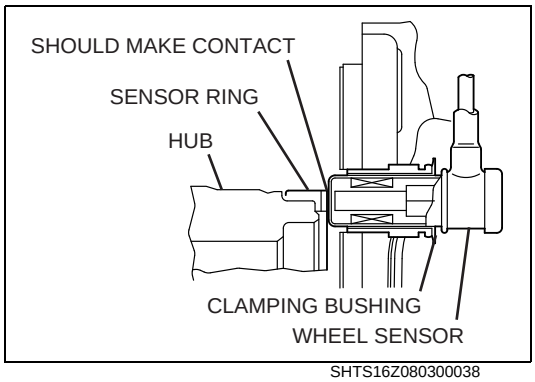

SHTS16Z080300037

1. CHECK THE AIR GAP OF WHEEL SENSOR.

(1) Insert a wheel sensor till it touches to the sensor ring.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place with a screwdriver, or the like. Doing so could damage the wheel sensor.



SHTS16Z080300038

2. CHECK THE CLAMPING BUSHING.

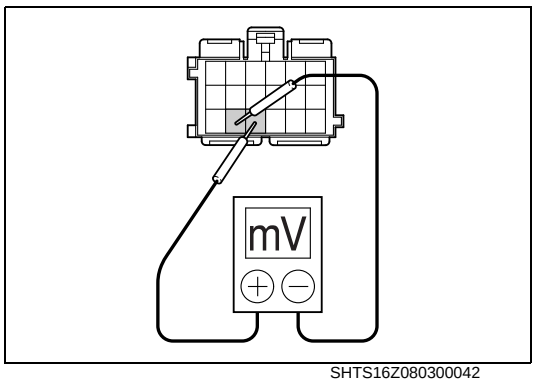
(1) Make sure that wheel sensor is securely fixed.

NOTICE

Change the clamping bushing when it can pulled off or pushed in with a weak force.

3. CHECK THE SENSOR RING.

(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".



SHTS16Z080300042

4. CHECK THE VOLTAGE BETWEEN TERMINALS.

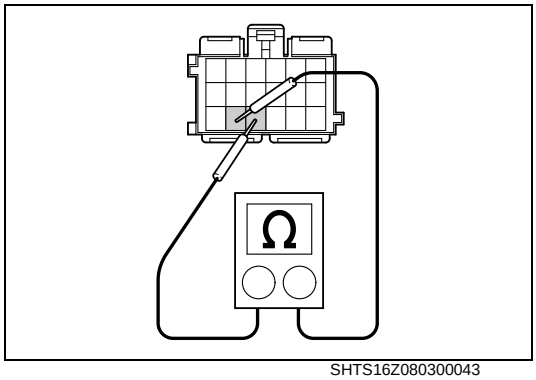
(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

(2) Connecting the tester between 15th and 14th terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.
Standard: 150-1,999 mV

NO → Go to the item 5.

YES

Temporary malfunction because of abnormality of harness.

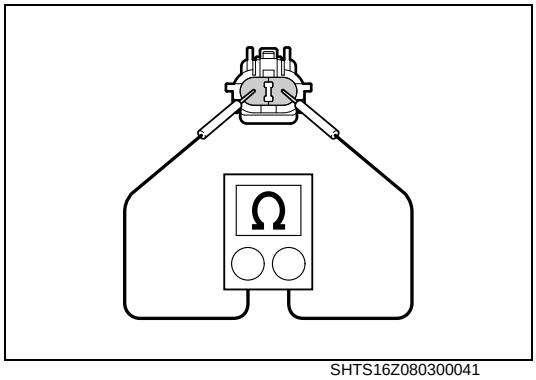

SHTS16Z080300043

5. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 14th and 15th terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO → Go to the item 6.

YES → Temporary malfunction because of abnormality of harness.


SHTS16Z080300041

6. CHECK THE RESISTANCE BETWEEN TERMINALS.

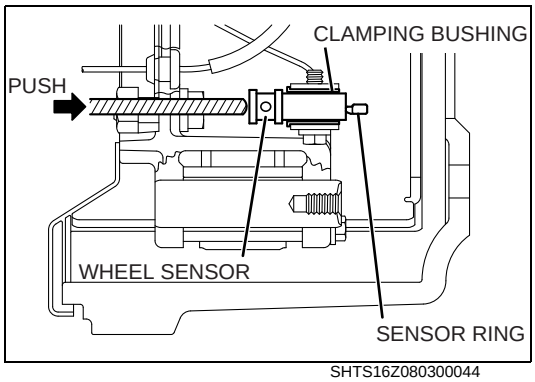
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO → Abnormality wheel sensor.

YES → Temporary malfunction because of abnormality of harness.

EXCESSIVE AIR GAP AND SIGNAL DISCONTINUATION OF WHEEL SENSOR, RH ON REAR AXLE (DIGNOSIS CODE 3-3)

EN16Z0803F200011



SHTS16Z080300044

1. CHECK THE AIR GAP OF WHEEL SENSOR.

(1) Insert a wheel sensor till it touches to the sensor ring.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place with a screwdriver, or the like. Doing so could damage the wheel sensor.

2. CHECK THE CLAMPING BUSHING.

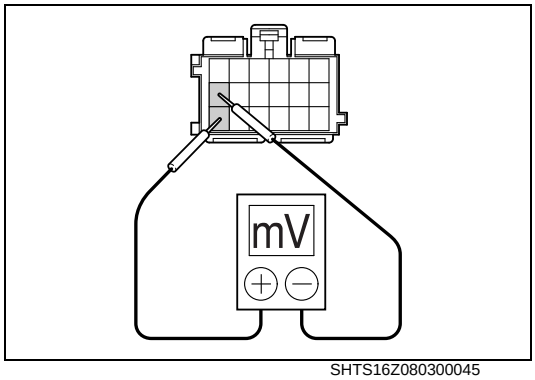
(1) Make sure that wheel sensor is securely fixed.

NOTICE

Change the clamping bushing when it can pulled off or pushed in with a weak force.

3. CHECK THE SENSOR RING.

(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".



SHTS16Z080300045

4. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

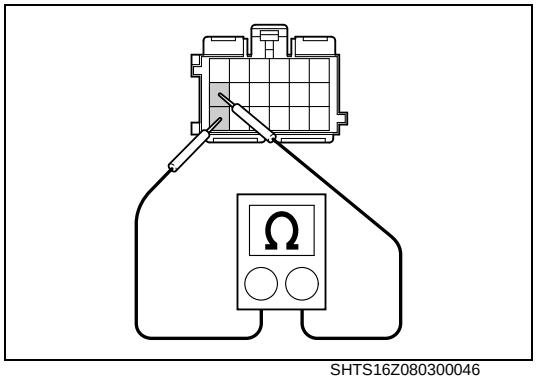
(2) Connecting the tester between 13th and 7th terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.

Standard: 150-1,999 mV

NO → Go to the item 5.

YES

Temporary malfunction because of abnormality of harness.

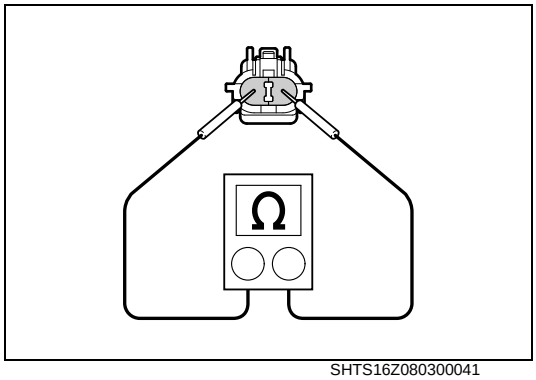

SHTS16Z080300046

5. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 7th and 13th terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO → Go to the item 6.

YES → Temporary malfunction because of abnormality of harness.


SHTS16Z080300041

6. CHECK THE RESISTANCE BETWEEN TERMINALS.

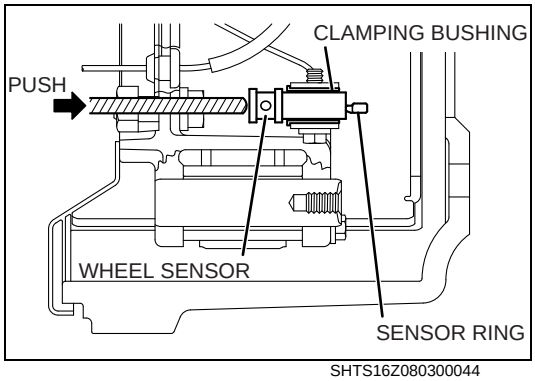
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO → Abnormality wheel sensor.

YES → Temporary malfunction because of abnormality of harness.

EXCESSIVE AIR GAP AND SIGNAL CONTINUATION OF WHEEL SENSOR, LH ON REAR AXLE (DIAGNOSIS CODE 3-4)

EN16Z0803F200012



SHTS16Z080300044

1. CHECK THE AIR GAP OF WHEEL SENSOR.

(1) Insert a wheel sensor till it touches to the sensor ring.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place with a screwdriver, or the like. Doing so could damage the wheel sensor.

2. CHECK THE CLAMPING BUSHING.

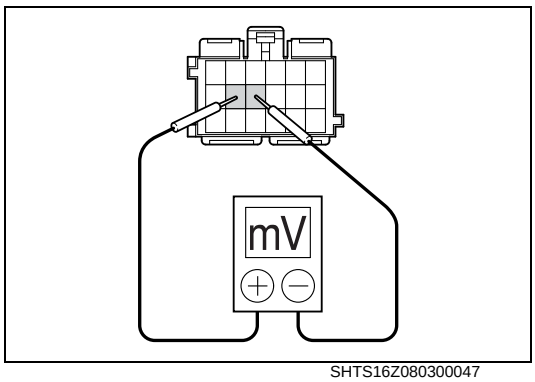
(1) Make sure that wheel sensor is securely fixed.

NOTICE

Change the clamping bushing when it can pulled off or pushed in with a weak force.

3. CHECK THE SENSOR RING.

(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".



SHTS16Z080300047

4. CHECK THE VOLTAGE BETWEEN TERMINALS.

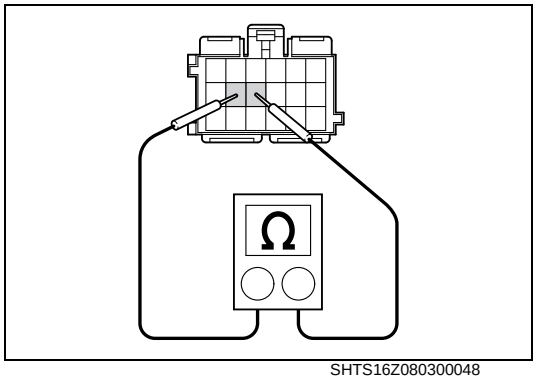
(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

(2) Connecting the tester between 8th and 9th terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.

Standard: 150-1,999 mV

NO → Go to the item 5.

YES → Temporary malfunction because of abnormality of harness.

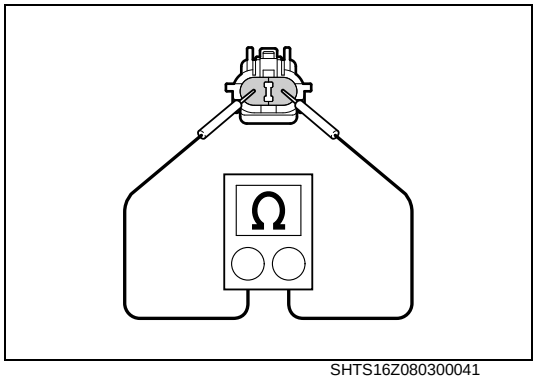

SHTS16Z080300048

5. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 8th and 9th terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO → Go to the item 6.

YES → Temporary malfunction because of abnormality of harness.


SHTS16Z080300041

6. CHECK THE RESISTANCE BETWEEN TERMINALS.

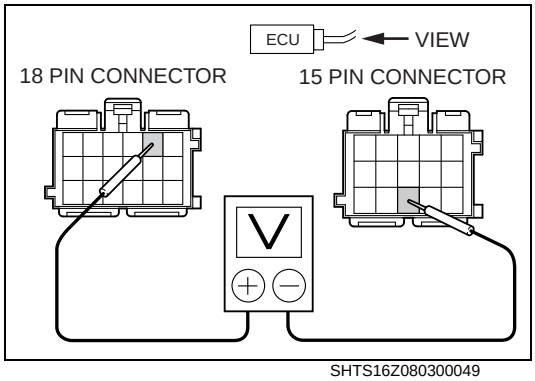
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO → Abnormality of wheel sensor.

YES → Temporary malfunction because of abnormality of harness.

SHORT-CIRCUIT AND WIRING DISCONNECTION OF WHEEL SENSOR, RH ON FRONT AXLE (DIAGNOSIS CODE 4-1)

EN16Z0803F200013



SHTS16Z080300049

1. CHECK THE VOLTAGE BETWEEN TERMINALS.

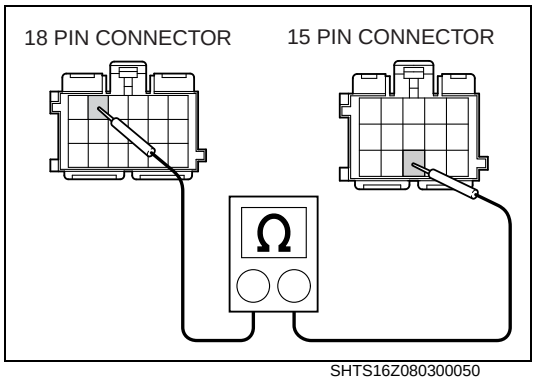
(1) Set the starter switch to "ON".

(2) Measure the voltage 2nd terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300050

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

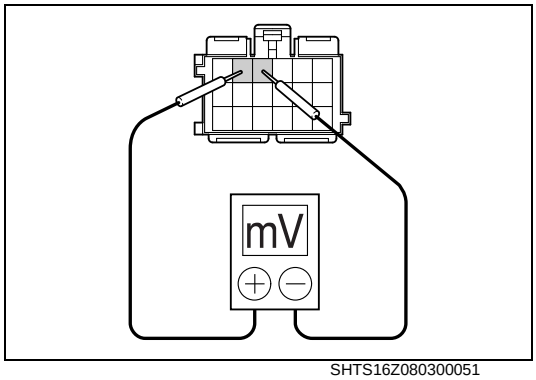
(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Check the continuity between 2nd terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300051

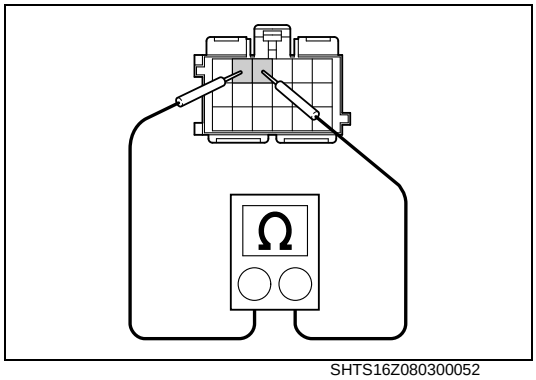
3. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

(2) Connecting the tester between 2nd and 3rd terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.
Standard: 150-1,999 mV

NO → Go to the item 4.

YES → Temporary malfunction because of abnormality of harness.



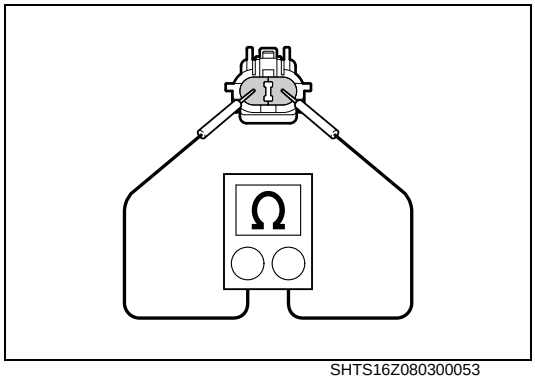
SHTS16Z080300052

4. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 2nd and 3rd terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO → Go to the item 5.

YES → Temporary malfunction because of abnormality of harness.



SHTS16Z080300053

5. CHECK THE RESISTANCE BETWEEN TERMINALS.
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO

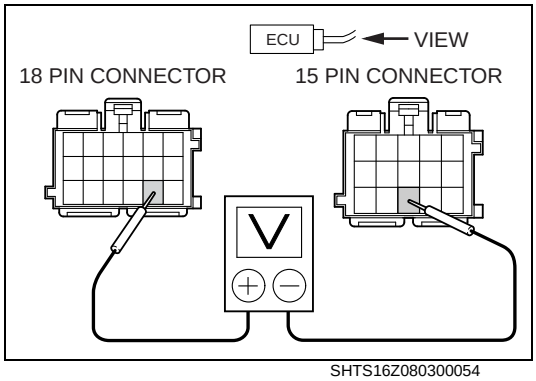
Abnormality of wheel sensor.

YES

Temporary malfunction because of abnormality of harness.

SHORT-CIRCUIT AND WIRING DISCONNECTION OF WHEEL SENSOR, LH ON FRONT AXLE (DIAGNOSIS CODE 4-2)

EN16Z0803F200014



SHTS16Z080300054

1. CHECK THE VOLTAGE BETWEEN TERMINALS.

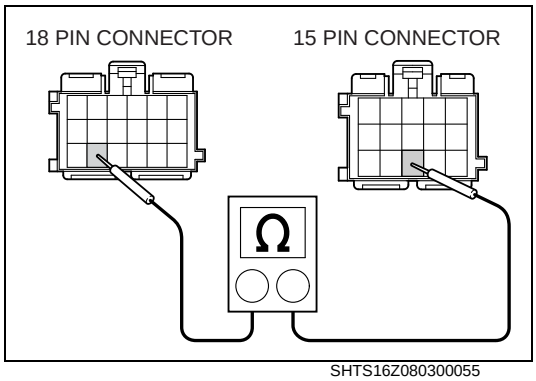
(1) Set the starter switch to "ON".

(2) Measure the voltage 14th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300055

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

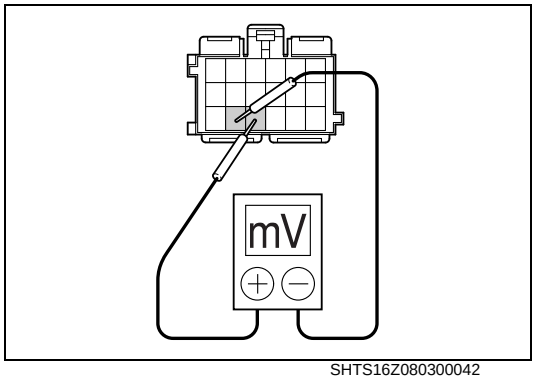
(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

(2) Check the continuity between 14th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300042

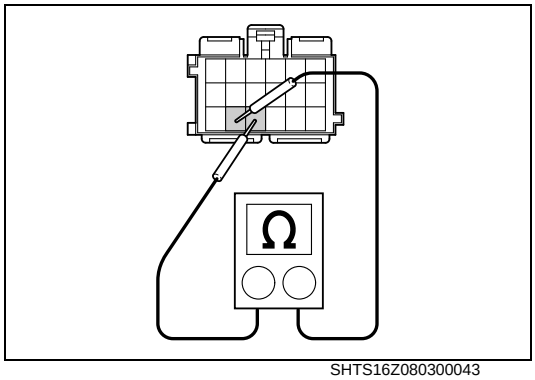
3. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

(2) Connecting the tester between 14th and 15th terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.
Standard: 150-1,999 mV

NO → Go to the item 4.

YES → Temporary malfunction because of abnormality of harness.



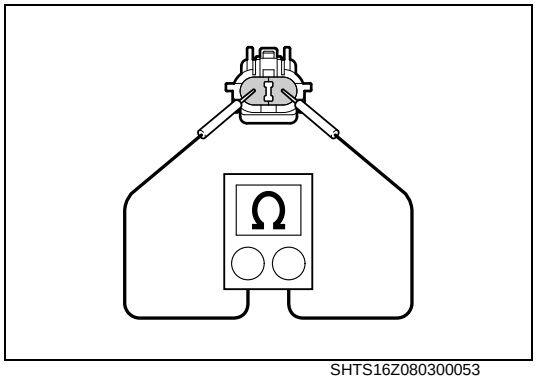
SHTS16Z080300043

4. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 14th and 15th terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO → Go to the item 5.

YES → Temporary malfunction because of abnormality of harness.



SHTS16Z080300053

5. CHECK THE RESISTANCE BETWEEN TERMINALS.
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO

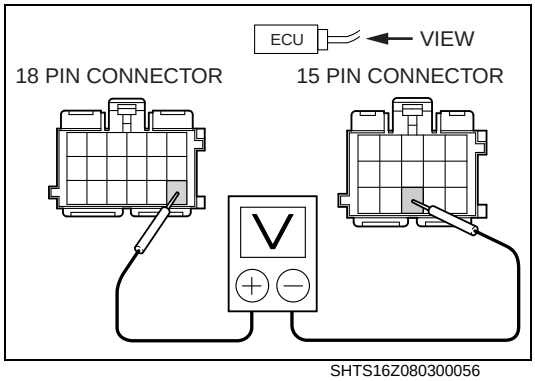
Abnormality of wheel sensor.

YES

Temporary malfunction because of abnormality of harness.

SHORT-CIRCUIT AND WIRING DISCONNECTION OF WHEEL SENSOR, RH ON REAR AXLE (DIAGNOSIS CODE 4-3)

EN16Z0803F200015



SHTS16Z080300056

1. CHECK THE VOLTAGE BETWEEN TERMINALS.

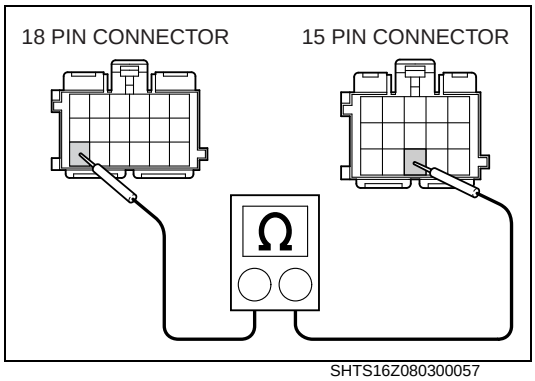
(1) Set the starter switch to "ON".

(2) Measure the voltage 13th terminal of 18 pin connector and 13th terminal of 15 pin connector. (Leaving the connector connected with ECU.)
Standard: Less than 1V

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300057

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

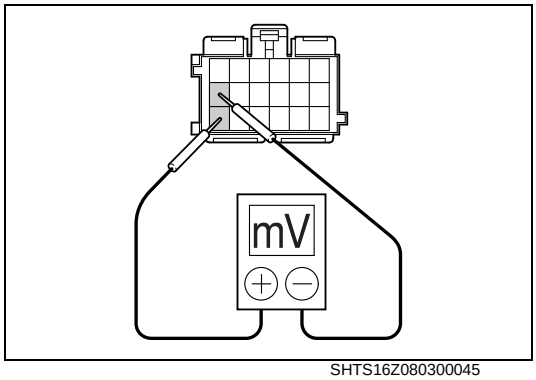
(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU

(2) Check the continuity between 13th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO → Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300045

3. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

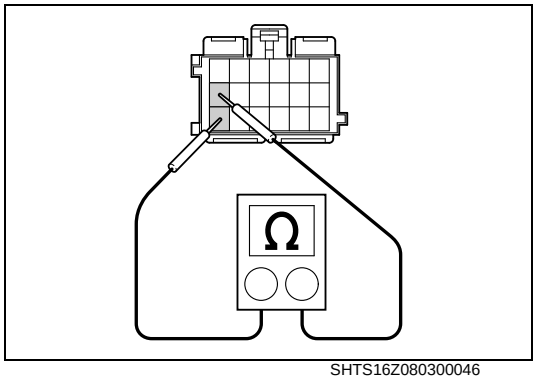
(2) Connecting the tester between 7th and 13th terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.
Standard: 150-1,999 mV

NO

Go to the item 4.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300046

4. CHECK THE RESISTANCE BETWEEN TERMINALS.

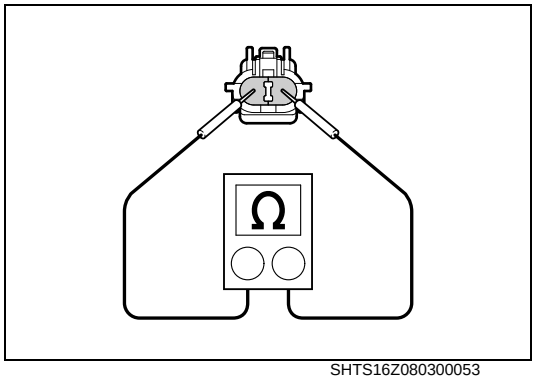
(1) Measure the resistance between 7th and 13th terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO

Go to the item 5.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300053

5. CHECK THE RESISTANCE BETWEEN TERMINALS.
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO

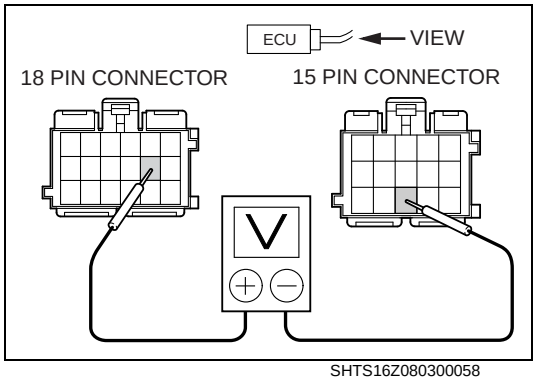
Abnormality of wheel sensor.

YES

Temporary malfunction because of abnormality of harness.

SHORT-CIRCUIT AND WIRING DISCONNECTION OF WHEEL SENSOR, LH ON REAR AXLE (DIAGNOSIS CODE 4-4)

EN16Z0803F200016



SHTS16Z080300058

1. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON".

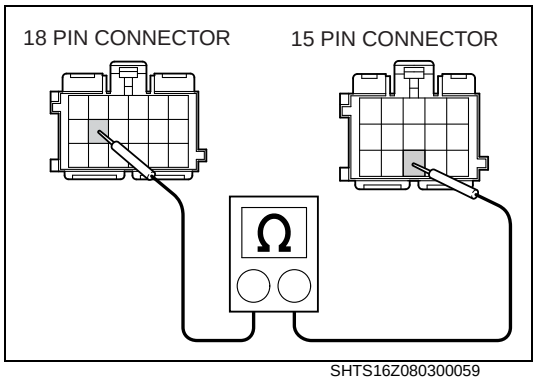
(2) Measure the voltage 8th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: Less than 1V

NO

Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300059

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 15 pin and 18 pin connectors of ABS ECU.

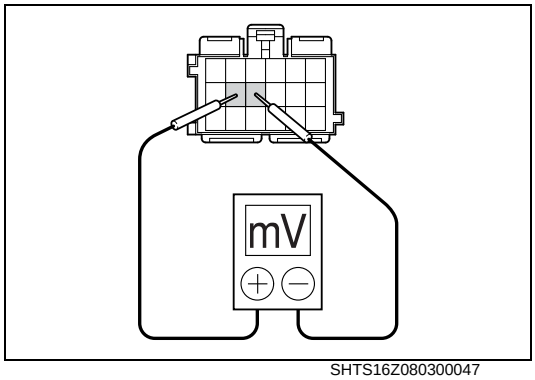
(2) Check the continuity between 8th terminal of 18 pin connector and 13th terminal of 15 pin connector.
Standard: No continuity

NO

Abnormality of harness.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300047

3. CHECK THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", disconnect the 18 pin connector of ABS ECU.

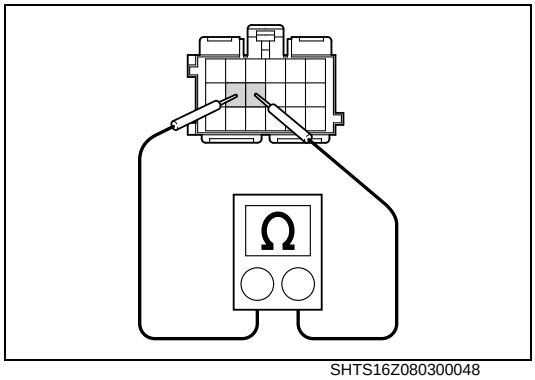
(2) Connecting the tester between 8th and 9th terminals of 18 pin connector, measure its voltage by rotating the tire by one time for 5 seconds.
Standard: 150-1,999 mV

NO

Go to the item 4.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300048

4. CHECK THE RESISTANCE BETWEEN TERMINALS.

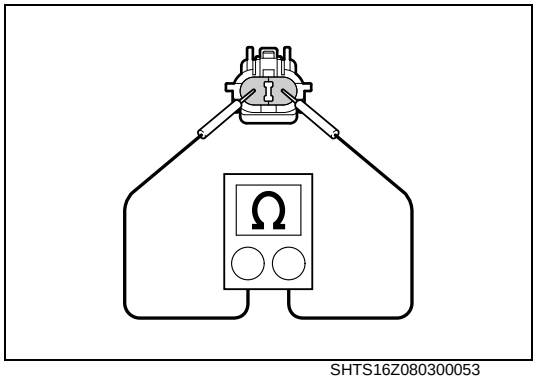
(1) Measure the resistance between 8th and 9th terminals of 18 pin connector.
Standard: 1.0-1.3 kΩ

NO

Go to the item 5.

YES

Temporary malfunction because of abnormality of harness.



SHTS16Z080300053

5. CHECK THE RESISTANCE BETWEEN TERMINALS.
(1) Disconnect the connector of wheel sensor.
(2) Measure the resistance between terminals of wheel sensor.
Standard: 1.0-1.3 kΩ

NO

Abnormality of wheel sensor.

YES

Temporary malfunction because of abnormality of harness.

ABNORMAL SIGNAL OF THE WHEEL SENSOR, RH ON FRONT AXLE (DIAGNOSIS CODE 5-1)

EN16Z0803F200017

1. CHECK THE WHEEL SENSOR.
(1) Inspect the harness and the connectors of wheel sensor.
(2) Inspect the installed status and also damage, breakage of wheel sensor.

2. CHECK THE SENSOR RING.
(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".

3. CHECK THE CLAMPING BUSHING.
(1) Make sure that wheel sensor is securely fixed.

4. CHECK THE WHEEL HUB BEARING.
(1) Check the play of wheel hub bearing.

5. CHECK THE TIRE.
(1) Make sure that the tire size is correct.

ABNORMAL SIGNAL OF THE WHEEL SENSOR, LH ON FRONT AXLE (DIAGNOSIS CODE 5-2)

EN16Z0803F200018

1. CHECK THE WHEEL SENSOR.
(1) Inspect the harness and the connectors of wheel sensor.
(2) Inspect the installed status and also damage, breakage of wheel sensor.

2. CHECK THE SENSOR RING.
(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".

3. CHECK THE CLAMPING BUSHING.
(1) Make sure that wheel sensor is securely fixed.

4. CHECK THE WHEEL HUB BEARING.
(1) Check the play of wheel hub bearing.

5. CHECK THE TIRE.
(1) Make sure that the tire size is correct.

ABNORMAL SIGNAL OF THE WHEEL SENSOR, RH ON REAR AXLE (DIAGNOSIS CODE 5-3)

EN16Z0803F200019

1. CHECK THE WHEEL SENSOR.
(1) Inspect the harness and the connectors of wheel sensor.
(2) Inspect the installed status and also damage, breakage of wheel sensor.

2. CHECK THE SENSOR RING.
(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".

3. CHECK THE CLAMPING BUSHING.
(1) Make sure that wheel sensor is securely fixed.

4. CHECK THE WHEEL HUB BEARING.
(1) Check the play of wheel hub bearing.

5. CHECK THE TIRE.
(1) Make sure that the tire size is correct.

ABNORMAL SIGNAL OF THE WHEEL SENSOR, LH ON REAR AXLE (DIAGNOSIS CODE 5-4)

EN16Z0803F200020

1. CHECK THE WHEEL SENSOR.
(1) Inspect the harness and the connectors of wheel sensor.
(2) Inspect the installed status and also damage, breakage of wheel sensor.

2. CHECK THE SENSOR RING.
(1) Refer to the chapter "**ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)**" or "**ABS & ASR (WABCO, FOR FULL AIR BRAKE)**".

3. CHECK THE CLAMPING BUSHING.
(1) Make sure that wheel sensor is securely fixed.

4. CHECK THE WHEEL HUB BEARING.
(1) Check the play of wheel hub bearing.

5. CHECK THE TIRE.
(1) Make sure that the tire size is correct.

ABNORMALITY IN SENSOR RING, RH ON FRONT AXLE (DIAGNOSIS CODE 6-1)

EN16Z0803F200021

1. CHECK THE SENSOR RING.
(1) Inspect on damage of the sensor ring, installing status of the sensor holder and the play of wheel hub bearing.

ABNORMALITY IN SENSOR RING, LH ON FRONT AXLE (DIAGNOSIS CODE 6-2)

EN16Z0803F200022

1. CHECK THE SENSOR RING.
(1) Inspect on damage of the sensor ring, installing status of the sensor holder and the play of wheel hub bearing.

ABNORMALITY IN SENSOR RING, RH ON REAR AXLE (DIAGNOSIS CODE 6-3)

EN16Z0803F200023

1. CHECK THE SENSOR RING.
(1) Inspect on damage of the sensor ring, installing status of the sensor holder and the play of wheel hub bearing.

ABNORMALITY IN SENSOR RING, LH ON REAR AXLE (DIAGNOSIS CODE 6-4)

EN16Z0803F200024

1. CHECK THE SENSOR RING.
(1) Inspect on damage of the sensor ring, installing status of the sensor holder and the play of wheel hub bearing.

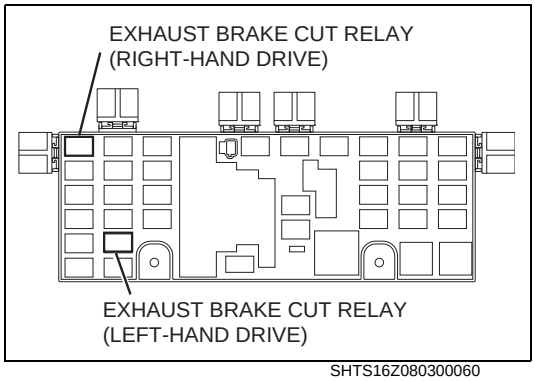
ABNORMALITY OF CAN COMMUNICATION SYSTEM (DIAGNOSIS CODE 7-1)

EN16Z0803F200025

1. CHECK THE CAN COMMUNICATION SYSTEM.
(1) Refer to the chapter **"OTHERS (CAN COMMUNICATION)"**.

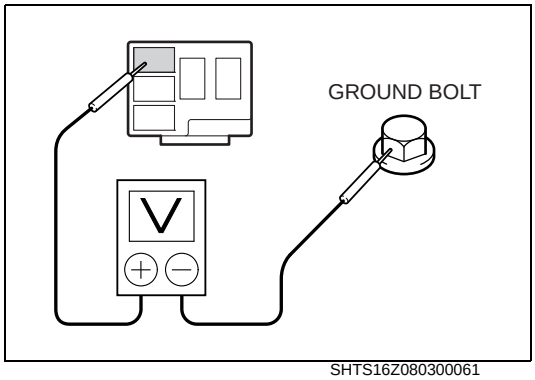
ABNORMALITY ON THE SUB BRAKE CUT RELAY (DIAGNOSIS CODE 7-3)

EN16Z0803F200026



SHTS16Z080300060

1. CHECK THE VOLTAGE BETWEEN TERMINALS.
(1) Set the starter switch to "LOCK", remove the sub brake cut relay.
(2) Set the starter switch to "ON".



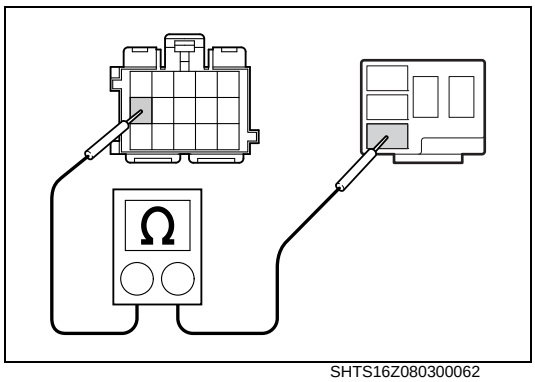
SHTS16Z080300061

(3) Measure the voltage terminal of sub brake cut relay and ground bolt.
Standard: More than 20V

NO → Abnormality of harness.
YES

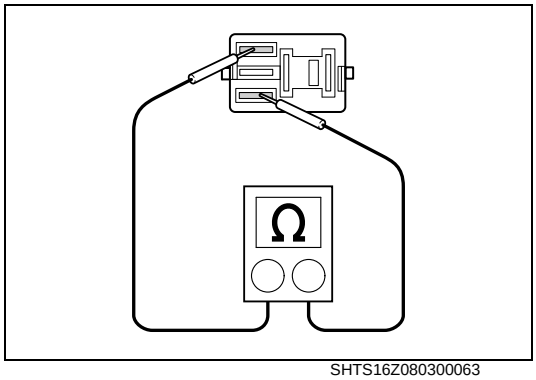
2. CHECK THE CONTINUITY BETWEEN TERMINALS.
(1) Set the starter switch to "LOCK", disconnect the 15 pin connector of ABS ECU.
(2) Check the continuity between 6th terminal of 15 pin connector and terminal of sub brake cut relay.

Standard: Continuity



SHTS16Z080300062

NO → Abnormality of harness.
YES



SHTS16Z080300063

3. CHECK THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between terminals of the sub brake cut relay.
Standard: 370-540 Ω

NO

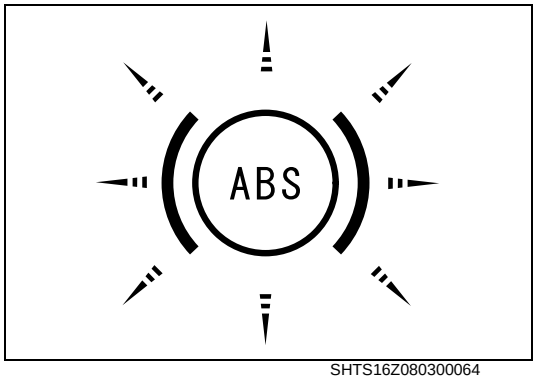
Abnormality of sub brake cut relay.

YES

Temporary malfunction because of abnormality of harness.

ABNORMALITY ON ABS WARNING LIGHT (DIAGNOSIS CODE 7-4)

EN16Z0803F200027



SHTS16Z080300064

1. CHECK THE ABS WARNING LIGHT.

(1) Make sure that it lights when the starter key is turned "ON" and goes off after some moments.
(2) Check the harness when it does not light.

ABNORMALITY OF POWER SUPPLY (LOW VOLTAGE) (DIAGNOSIS CODE 8-1)

EN16Z0803F200028

1. CHECK THE BATTERY.

2. CHECK THE CONTACT OF CONNECTOR AND THE BURNED OUT OF FUSE.

ABNORMALITY OF POWER SUPPLY (OVER VOLTAGE) (DIAGNOSIS CODE 8-2)

EN16Z0803F200029

1. CHECK THE BATTERY AND THE ALTERNATOR.

ABNORMALITY OF ABS ECU (DIAGNOSIS CODE 8-3)

EN16Z0803F200030

1. ERASE THE DIAGNOSIS CODE, AND OUTPUT THE DIAGNOSIS CODE AGAIN.
Standard: Diagnosis code 1-1

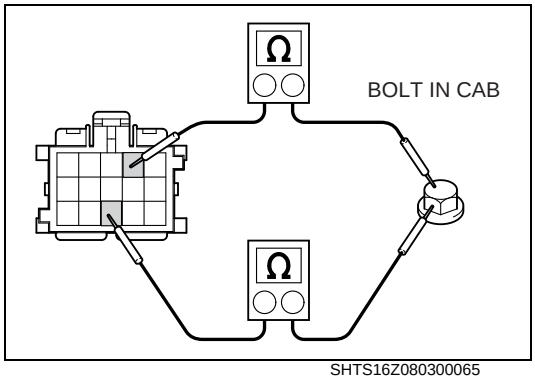
NO → Abnormality of ABS ECU.

YES

Normality.

ABNORMALITY OF GROUND HARNESS (DIAGNOSIS CODE 8-5)

EN16Z0803F200031



SHTS16Z080300065

1. CHECK THE CONTINUITY BETWEEN TERMINALS AND THE BOLT IN THE CAB.
(1) Set the starter switch to "LOCK", disconnect the 15 pin connector of ABS ECU.
(2) Make sure that the continuity exists between 4th, 13th terminals of 15 pin connector and the bolt in the cab.
Standard: Continuity

NO → Abnormality of harness.

YES

- Abnormality of ABS ECU.
- Temporary malfunction because of abnormality of harness.

BRAKE CONTROL (ES START)

DN03-003

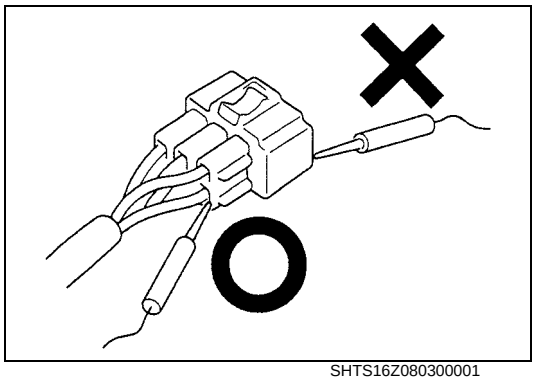
ES START (EASY & SMOOTH START) SYSTEM DN03-2

HANDLING PRECAUTIONS DN03-2
SYSTEM DIAGRAM DN03-3
ARRANGEMENT OF CONNECTOR PIN DN03-4
PRE-INSPECTION DN03-5
TROUBLESHOOTING DN03-6
FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR DN03-10
HOW TO DELETE THE DIAGNOSIS CODE 8 ..... DN03-12
HOW TO DELETE THE DIAGNOSIS CODE 12 ..... DN03-13
HOW TO DELETE THE DIAGNOSIS CODE 13 ..... DN03-14
DAMAGE ANALYSIS BY DIAGNOSIS CODE DN03-16
POWER MALFUNCTION (NO DIAGNOSIS CODE) DN03-16
POWER SUPPLY VOLTAGE MALFUNCTION (DIAGNOSIS CODE 2) DN03-19
CLUTCH STROKE SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 3) DN03-21
SPEED SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 4) DN03-23
ES START CONTROL VALVE DAMAGE (DIAGNOSIS CODE 7) DN03-25
CLUTCH STROKE SENSOR POWER SYSTEM MALFUNCTION (DIAGNOSIS CODE 9) DN03-27
NEUTRAL SWITCH AND BACK-UP LIGHT SWITCH MALFUNCTION (DIAGNOSIS CODE 11) DN03-29
NEUTRAL SWITCH SYSTEM OR SPEED SENSOR SYSTEM MALFUNCTION (DIAGNOSIS CODE 12) DN03-31
STOP LIGHT SWITCH DAMAGE (DIAGNOSIS CODE 13) DN03-34
ES START CONTROLLER MALFUNCTION (DIAGNOSIS CODE 16) DN03-36
ES MAIN SWITCH DAMAGE (DIAGNOSIS CODE 18) DN03-37
ES START RELEASE TIMING SWITCH (DIAGNOSIS CODE 21) DN03-39

ES START (EASY & SMOOTH START) SYSTEM

HANDLING PRECAUTIONS

EN16Z0803F200001



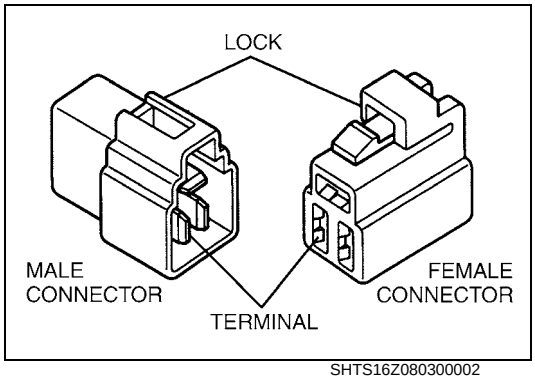
SHTS16Z080300001

1. ABOUT CONNECTORS

(1) Before performing the inspection operation, make sure that all connectors are connected securely.

(2) Do not contact the tester bar to the connection surface of the connector. This may cause terminal damage or a short-circuit.

(3) All connectors in the connector diagram are observed from the contact surfaces. However, the tester bar is put from the rear side.

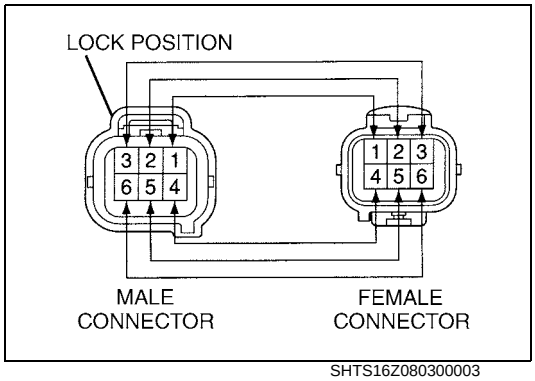


SHTS16Z080300002

(4) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



SHTS16Z080300003

(5) As for the terminal numbers of the connector, the first terminal is located on the top right terminal of the male connector and the top left terminal of the female connector.
Reference:
When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(6) When disconnecting the connectors, be sure to position the starter switch "LOCK".

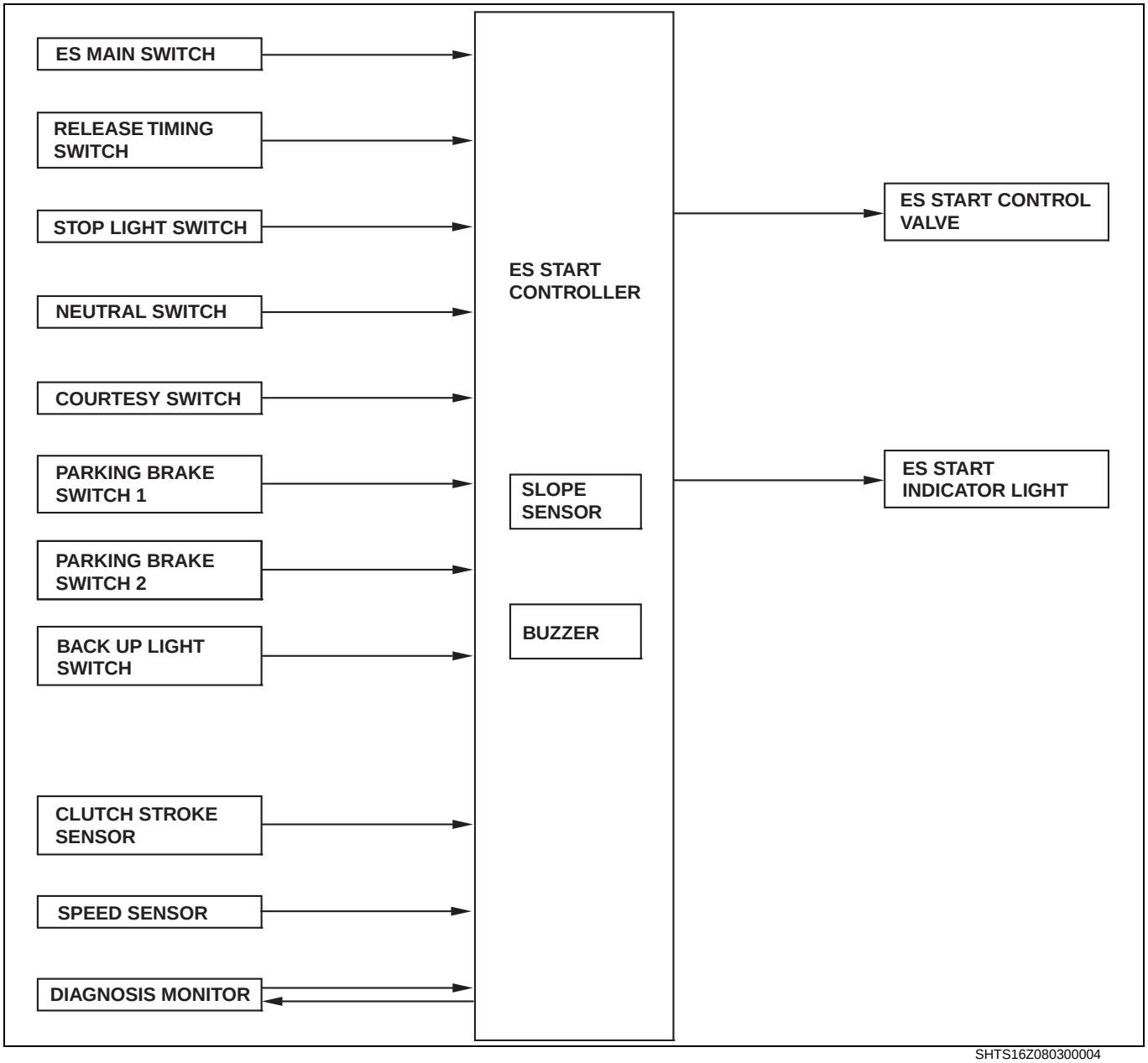
2. ABOUT DIAGNOSIS MONITOR

(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, delete the previous damage data.

SYSTEM DIAGRAM

EN16Z0803F200002



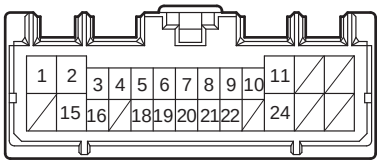
SHTS16Z080300004

ARRANGEMENT OF CONNECTOR PIN

EN16Z0803F200003

ES START CONTROLLER

26 PIN CONNECTOR

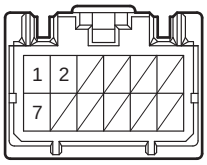


VIEW A



No.	CODE	SIGNAL	No.	CODE	SIGNAL
1	+B	Power	14	–	–
2	KYSW	Starter switch	15	KY2	Starter switch
3	GND	System ground	16	GND2	System ground 2
4	M/V+	ES start control valve output	17	–	–
5	PR	ES start warning light	18	PKB1	Parking brake switch No.2
6	NTL	Neutral switch	19	PKB	Parking brake switch No.1
7	RVS	Back-up light switch	20	DR	Courtesy switch
8	STP	Stop light switch	21	DIC	Diagnosis monitor input
9	ON	ES main switch "ON"	22	OFF	ES main switch "OFF"
10	SSIG	Speed sensor signal	23	–	–
11	FTSW	Release timing switch "FAST"	24	SLSW	Release timing switch "SLOW"
12	–	–	25	–	–
13	–	–	26	–	–

12 PIN CONNECTOR



VIEW B

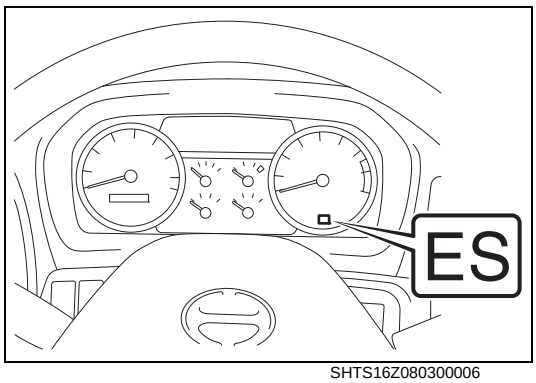


No.	CODE	SIGNAL	No.	CODE	SIGNAL
1	C+B	Clutch stroke sensor power	7	S-S	Clutch stroke sensor ground
2	CSS	Clutch stroke sensor signal	8	–	–
3	–	–	9	–	–
4	–	–	10	–	–
5	–	–	11	–	–
6	–	–	12	–	–

SHTS16Z080300005

PRE-INSPECTION

EN16Z0803F200004



SHTS16Z080300006

1. CHECKING DISPLAY CODES OF ES INDICATOR LIGHT

(1) ES start controller alerts by beeping the warning buzzer and lighting or blinking the indicator light to classify the alarms when malfunctions or failures occur.

NOTICE

When a failure alarm is displayed, perform the failure diagnosis by using diagnosis function.

Display and warning item		Indicator light	Warning buzzer	Warning content	Treatment
Under "ON" condition of starter switch, check if the lamp lights or not		Lighting for one second	Beeping once	—	—
Operation	ES start is operating	Lighting	Beeping once	—	—
	ES start is released	Lighting off	No beeping	—	—
Warning	Failure alarm	Blinking	Beeping continuously	Defects of signal switches or sensors	Perform failure diagnosis by diagnosis function.
	Non-adjustment alarm	Blinking	No beeping	Initialization is not completed.	Initialize.
Caution to mis-operation	Quitting seat alarm	Lighting	Beeping continuously	Door (either driver's side or assistant's side) opens when ES start is operating	Pull parking brake lever.
	Starter switch OFF alarm	Lighting off	Beeping continuously	Starter switch is set to "LOCK" when ES start is operating during neutral position.	Pull parking brake lever or set main switch to "OFF".
	Vehicle moving alarm	Lighting	Beeping continuously	Vehicle moves when ES start is operating.	Pull parking brake lever or step brake pedal
	Operation time information	Lighting	Operation time from 1 to 9 minutes 1 minute has passed: beeping once 2 minutes have passed: beeping two times 9 minutes have passed: beeping nine times Operation time 10 minutes or more: Beeping continuously	Displaying every minute ES start operation time	Release ES start.

SHTS16Z080300007

- Check the battery voltage.
  Reference value: More than 20V
- Check that the ES start controller connectors are connected correctly.
- Check the fuse.
- Check that the speed sensor connector is connected correctly.
- Check that the ES start valve connector is connected correctly.
- Check that the clutch hydraulic switch connector is connected correctly.
- Check that the clutch stroke sensor connector is connected correctly.
- Check that the back-up light switch connector is connected correctly.
- Check that the neutral switch connector is connected correctly.

TROUBLESHOOTING

EN16Z0803F300001

THE ES START OPERATION FAILS.

1 Is there an operation malfunction?
- The starter switch is in either the "LOCK" or "ACC" position.
- The ON/OFF switch is in the "OFF" position.
- The brake pedal is released.
- The parking brake lever is pulled back.
- Going forward downhill.
- Going in reverse uphill.

An operation malfunction occurred. → Correct the operation.

An operation malfunction did not occur.

2 Set the starter key to "ON" and check the main power.

3 Check if a warning is occurred.

A warning occurred. → Refer to table of warning

A warning did not occur.

4 Check the stop light switch.

5 Check the parking brake switch.

6 Check the speed sensor.

7 Check the clutch stroke sensor.

8 Check the air piping.

9 Check the ES start control valve.

10 The ES start controller is damaged.

SHTS16Z080300008

THE ES START IS NOT CANCELED.
(THE CANCEL OPERATION IS PERFORMED BY THE STARTING OPERATION.)

1 **Check if there was an operation malfunction.**
- The gear shift lever is in neutral.
- The start operation is not performed correctly.

An operation malfunction occurred. → Correct the operation.

An operation malfunction did not occur.

2 **Check if a warning is occurred.**

A warning occurred. → Refer to table of warning

A warning did not occur.

3 **Check the neutral switch and the back-up lamp switch.**

4 **Check the clutch stroke sensor.**

5 **Check the air piping.**

6 **Check the ES start control valve.**

7 **The ES start controller is damaged.**

SHTS16Z080300009

THE ES START IS NOT CANCELED.
(THE CANCEL OPERATION IS PERFORMED BY THE PARKING BRAKE.)

1 **Check if there was an operation malfunction.**
- The parking brake must not be pulled back.

An operation malfunction occurred. → Correct the operation.

An operation malfunction did not occur.

2 **Check if a warning is occurred.**

A warning occurred. → Refer to table of warning

A warning did not occur.

3 **Check the parking brake switch.**

4 **Check the air piping.**

5 **Check the ES start control valve.**

6 **The ES start controller is damaged.**

SHTS16Z080300010

THE ES START IS NOT CANCELED.
(THE CANCEL OPERATION IS PERFORMED BY THE ES MAIN SWITCH.)

1 **Check if there was an operation malfunction.**
- The main switch is not set to "OFF" .

An operation malfunction occurred. → Correct the operation.

An operation malfunction did not occur.

2 **Check if a warning is occurred.**

A warning occurred. → Refer to table of warning

A warning did not occur.

3 **The ES start controller is damaged.**

SHTS16Z080300011

THE INITIAL SETTING OF THE CANCEL POSITION CANNOT BE PERFORMED.

1 **Check if an operation malfunction occurred.**

An operation malfunction occurred. → Correct the operation.

An operation malfunction did not occur.

2 **Check if the following conditions are not satisfied.**
- The ES start operation is currently being performed.
- The 0-point adjustment is being performed.
- The cancel position is being adjusted.

3 **Check if a warning is occurred.**

A warning occurred. → Refer to table of warning

A warning did not occur.

4 **Check the parking brake switch.**

5 **Check the neutral switch and the back-up light switch.**

6 **Check the clutch stroke sensor.**

7 **The ES start controller is damaged.**

SHTS16Z080300012

THE 0-POINT ADJUSTMENT OF THE SLOPE SENSOR CANNOT BE PERFORMED.

1 Check if an operation malfunction occurred.

An operation malfunction occurred. → Correct the operation.

An operation malfunction did not occur.

2 Check if the following conditions are not satisfied.

- The ES start operation is currently being performed.
- The initial setting of the cancel position is being performed.
- The cancel position is being adjusted.

3 Check if a warning is occurred.

A warning occurred. → Refer to table of warning

A warning did not occur.

4 Check the parking brake switch.

5 The ES start controller is damaged.

SHTS16Z080300013

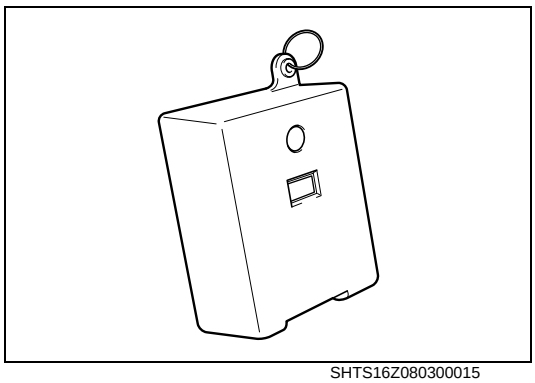
THE BRAKE IS NOT RELEASED WHEN THE CANCELLATION IS PERFORMED. (OR VEHICLE SLIDES DOWN.)

Adjust the release timing.

SHTS16Z080300014

FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR

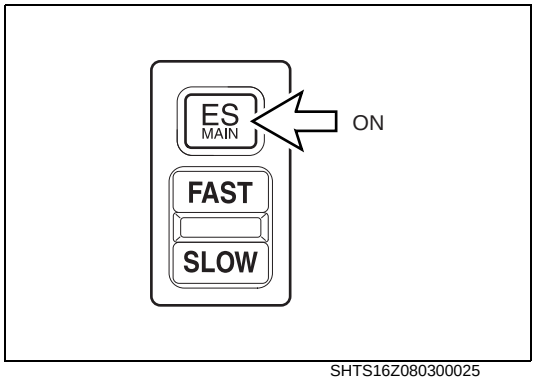
EN16Z0803F200005



SHTS16Z080300015

1. FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR

(1) Diagnosis monitor alerts the failure location with sound and light by being connected to the special diagnosis connector of ES start system.

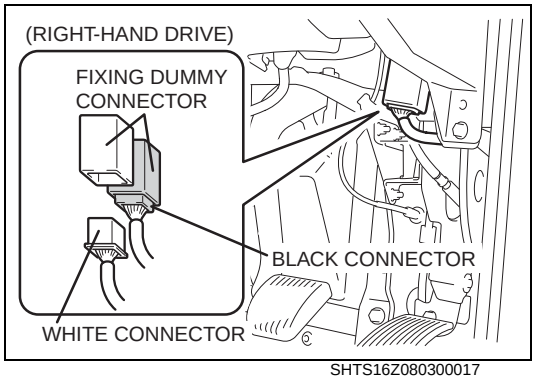


SHTS16Z080300025

2. CONNECTION OF THE DIAGNOSIS MONITOR

(1) Set the ES main switch to "ON".

(2) Set the starter switch to "ON".

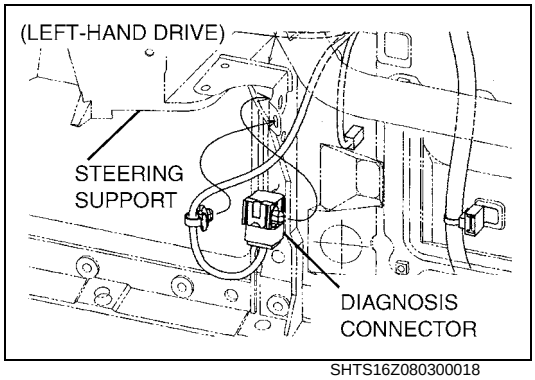


SHTS16Z080300017

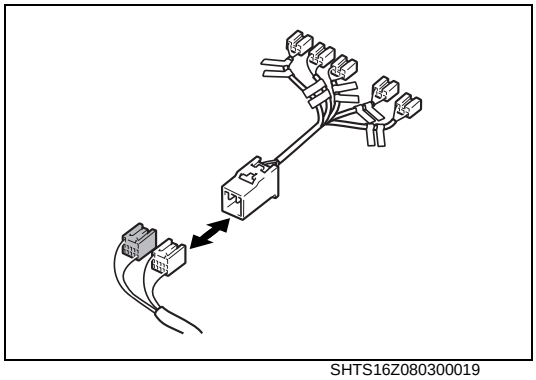
(3) Disconnect the centralized diagnosis connector (upside the accelerator pedal) from the dummy connector.

NOTICE

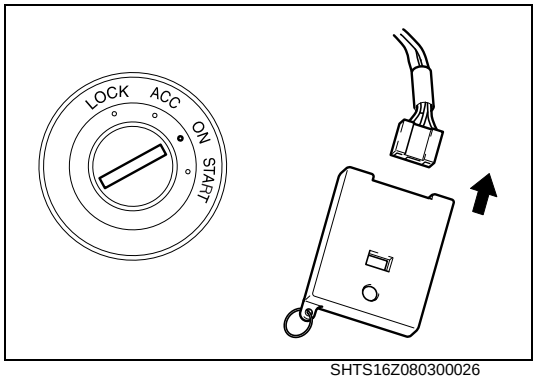
Centralized diagnosis connector is normally coupled with fixed type dummy connector. So, use it by disconnecting from the dummy one and pulling it to this side. When not using it, make sure to leave it connected with fixed type dummy one.



SHTS16Z080300018


SHTS16Z080300019

(4) Connect the dedicated harness to the centralized diagnosis connector and diagnosis monitor to the connector tagged by "ES start".
SST:
Dedicated harness (S0963-02300)
Diagnosis monitor (S0963-01370)



SHTS16Z080300026

3. DISPLAYING THE FAILURE CODE

(1) Because the failure codes are output repeatedly in ascending order of failure codes without distinguishing present and past failures, delete the past failure by referring "4. DELETING THE PAST FAILURES".

HINT

If there are no failure codes, the system outputs "Diagnosis code 1".

4. DELETING THE PAST FAILURES

NOTICE

Regarding the diagnosis codes 8, 12 and 13, the way of deleting the past codes is different. Refer to the individual way of deleting.

(1) Record the first diagnosis code output.
(2) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

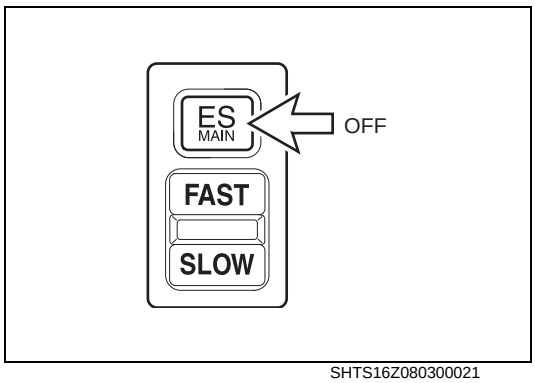
NOTICE

If the starter key is set to "LOCK" position, the past failures cannot be deleted. Make sure to keep the key at "ON" position.

(3) Wait for several seconds. Then connect the diagnosis monitor to output the present failure.

HOW TO DELETE THE DIAGNOSIS CODE 8

EN16Z0803F200006



SHTS16Z080300021

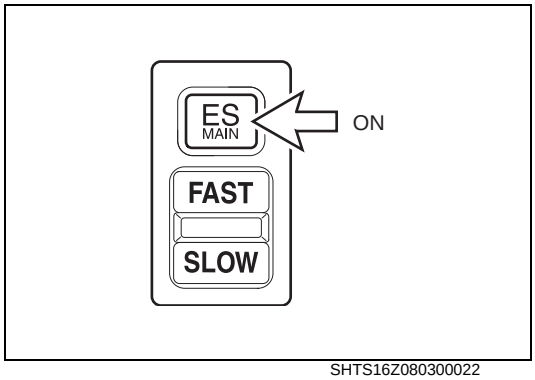
1. DELETING PROCEDURE

(1) Turn the starter switch to "ON" position and ES main switch "OFF".

(2) After having repaired the failure, step and release the clutch pedal for more than three times to make the controller recognize the ON/OFF of hydraulic switch.

HINT

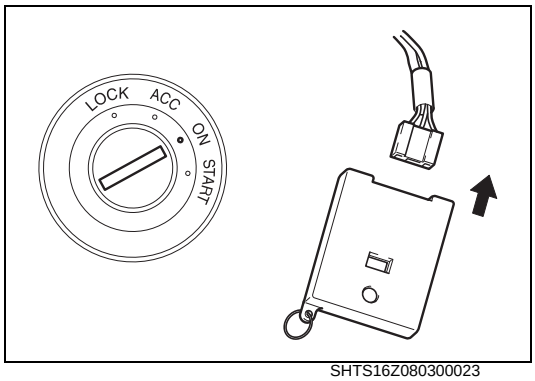
Until the controller recognizes the ON/OFF of hydraulic switch, the diagnosis code cannot be deleted.



SHTS16Z080300022

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 8 is output.



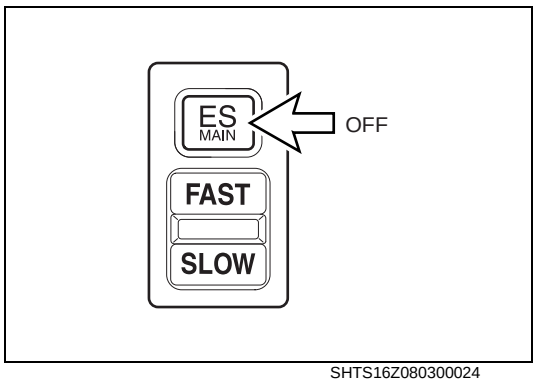
SHTS16Z080300023

(5) Disconnect the diagnosis monitor while keeping the starter switch at "ON" position.

(6) Wait for several seconds. Then connect the diagnosis monitor to check that the diagnosis code 8 has been deleted.

HOW TO DELETE THE DIAGNOSIS CODE 12

EN16Z0803F200007



SHTS16Z080300024

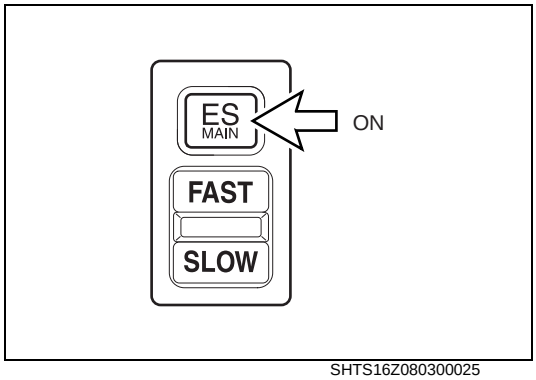
1. DELETING PROCEDURE

(1) Turn the starter switch to "ON" position and ES main switch "OFF".

(2) After having repaired the failure, engage and disengage the transmission for more than three times to make the controller recognize the ON/OFF of neutral switch.

HINT

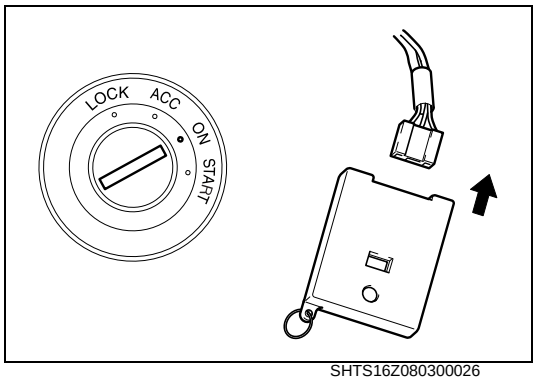
Until the controller recognizes the ON/OFF of neutral switch, the diagnosis code cannot be deleted.



SHTS16Z080300025

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 12 is output.



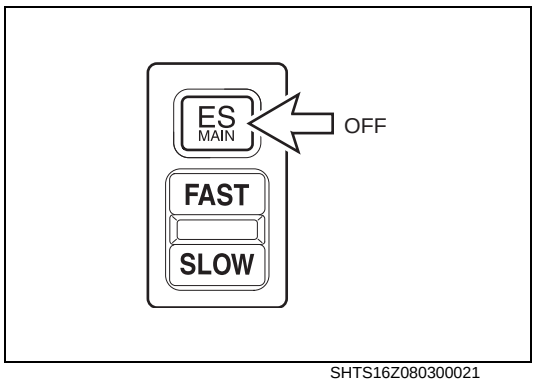
SHTS16Z080300026

(5) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

(6) Wait for several seconds. Then connect the diagnosis monitor to check that the diagnosis code 12 has been deleted.

HOW TO DELETE THE DIAGNOSIS CODE 13

EN16Z0803F200008



SHTS16Z080300021

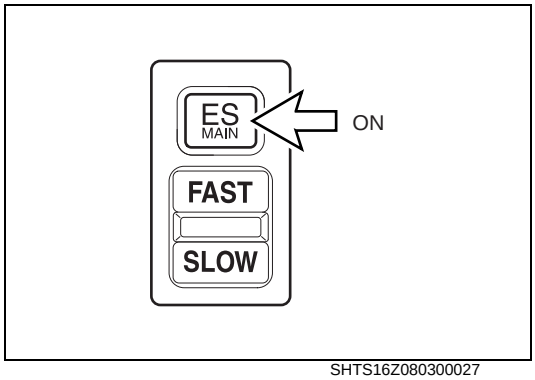
1. DELETING PROCEDURE

(1) Turn the stater switch to "ON" position and ES main switch "OFF".

(2) After having repaired the failure, step and release the brake pedal for more than three times to make the controller recognize the ON/OFF of stop light switch.

HINT

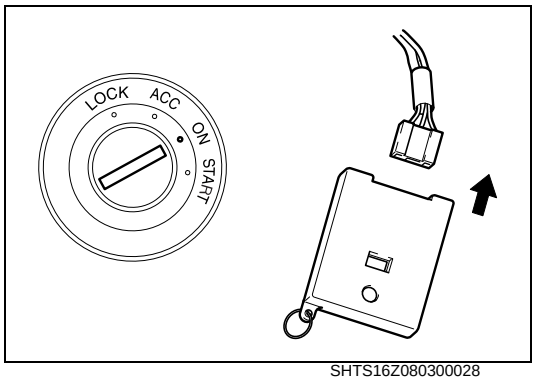
Until the controller recognizes the ON/OFF of stop light switch, the diagnosis code cannot be deleted.



SHTS16Z080300027

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 13 is output.

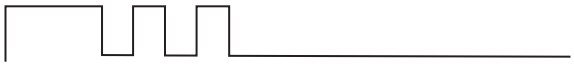
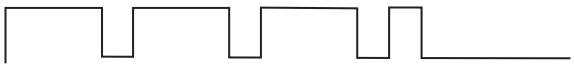
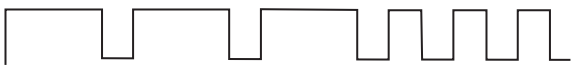
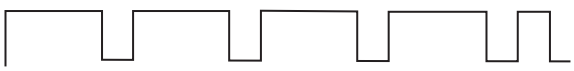


SHTS16Z080300028

(5) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

(6) Wait for several seconds. Then connect the diagnosis monitor to check that the diagnosis code 13 has been deleted.

DIAGNOSIS CODE TABLE

Diagnosis code No.	Inspection item	Diagnosis monitor and indicator light output
1	Normal	
2	Power supply voltage malfunction	
3	Clutch stroke sensor system damage (disconnection, short-circuit)	
4	Speed sensor system damage	
7	ES start control valve damage	
9	Clutch stroke sensor power system malfunction	
11	Neutral switch and back-up light switch malfunction	
12	Neutral switch system or speed sensor system malfunction	
13	Stop light switch damage	
16	ES start controller malfunction	
18	ES main switch damage	
21	ES start release timing switch	

DAMAGE ANALYSIS BY DIAGNOSIS CODE

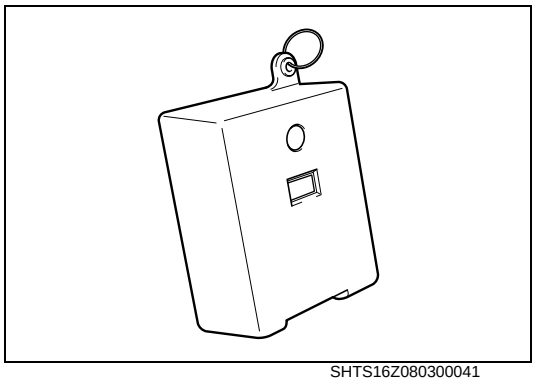
EN16Z0803F200009

NOTICE

1. **When replacing the clutch hydraulic switch, always initialize the brake releasing position.**
2. **When replacing the clutch stroke sensor, always initialize the brake releasing position.**
3. **When replacing ES start controller, always initialize the brake releasing position and perform 0 point adjustment of slope sensor.**

POWER MALFUNCTION (NO DIAGNOSIS CODE)

EN16Z0803F200010



SHTS16Z080300041

1. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK" and remove the 26 pin connector of the ES start controller.

(2) Set the starter switch "ON" and measure the voltage between 2nd -3rd terminals and 15th-16th terminals of 26 pin connector (harness side).
Standard value: More than 20V

NO

- Less than 20 V: Go to the item 3.
- 0 V: Go to the item 4.

YES

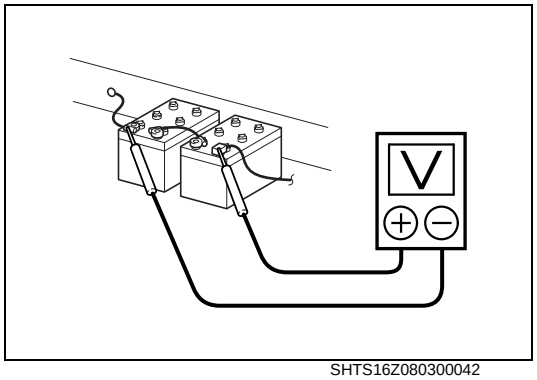
2. CHECK THE OPERATION OF THE ES START SYSTEM.
Standard: Normal operation

NO

ES start controller malfunction.

YES

ES start controller connector contact failure, faulty harness contact failure


SHTS16Z080300042

3. MEASURE THE VOLTAGE OF BATTERY.

(1) Measure the voltage between the (+) terminal and the (-) terminal of the battery.
Standard value: More than 20V

NO → Battery malfunction.

YES

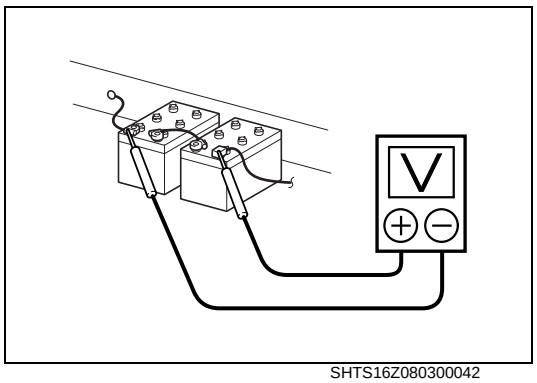
Power supply harness contact failure or disconnection.

4. CHECK THE ES START FUSE.

(1) Check the ES start fuse in the fuse block.
Standard: Not melting

NO → Go to the item 6.

YES


SHTS16Z080300042

5. MEASURE THE VOLTAGE OF BATTERY.

(1) Measure the voltage between the (+) terminal and the (-) terminal of the battery.
Standard value: More than 20V

NO → Battery malfunction.

YES

Power supply harness contact failure or disconnection.

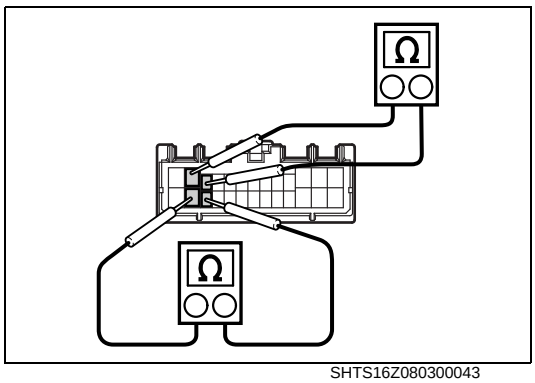
6. RECHECK THE ES START FUSE.

(1) Set the starter switch to "LOCK", replace the fuse and set the starter switch "ON".
Standard: Not melting

NO → Go to the item 7.

YES

Normal.



SHTS16Z080300043

7. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", remove the 26 pin connector of the ES start controller and check the conductivity between 2nd-3rd terminals and 15th-16th terminals of 26 pin connector (harness side).
Standard: No conductivity

NO → Short-circuit in the harness.

YES

8. RECHECK THE OPERATION OF THE ES START SYSTEM.
Standard: Normal operation

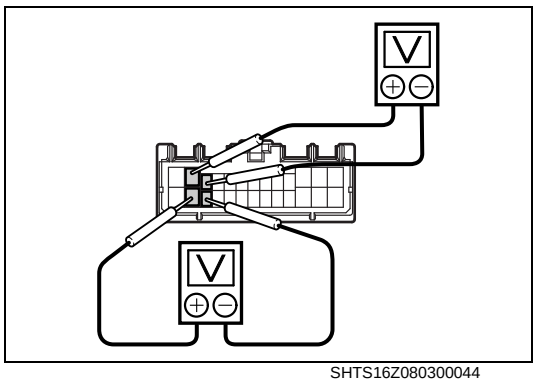
NO → ES start controller malfunction.

YES

ES start controller connector contact failure, faulty harness contact failure.

POWER SUPPLY VOLTAGE MALFUNCTION (DIAGNOSIS CODE 2)

EN16Z0803F200011



SHTS16Z080300044

1. MEASURE THE VOLTAGE BETWEEN TERMINALS.

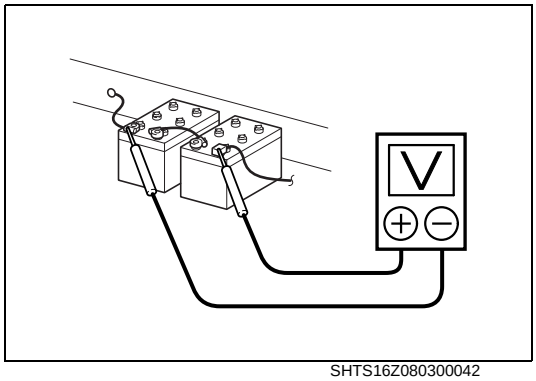
(1) Set the starter switch to "LOCK" and remove the 26 pin connector of the ES start controller.

(2) Measure the voltage between 2nd-3rd terminals and 15th-16th terminals of 26 pin connector (harness side.)
Standard value: More than 20V

NO

Go to the item 3.

YES



SHTS16Z080300042

2. MEASURE THE VOLTAGE OF BATTERY.

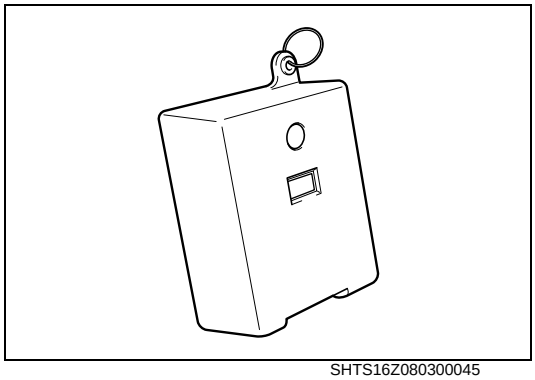
(1) Measure the voltage between the (+) terminal and (-) terminal of the battery.
Standard value: More than 20V

NO

Battery malfunction.

YES

Power supply harness contact failure or disconnection.



SHTS16Z080300045

3. CHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis monitor memory and confirm the diagnosis code by diagnosis functions again.
Standard: Diagnosis code: 1

NO

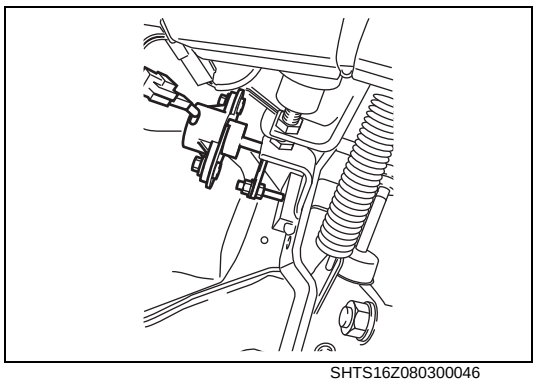
ES start controller malfunction.

YES

- Harness contact failure.
- Charging system malfunction.

CLUTCH STROKE SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 3)

EN16Z0803F200012



SHTS16Z080300046

1. CHECK THE CLUTCH STROKE SENSOR.

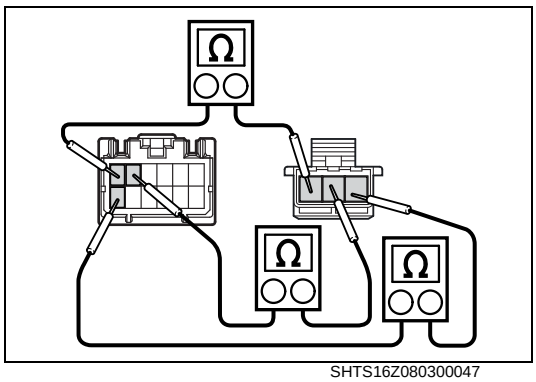
(1) Check the installation location of the clutch stroke sensor.
Standard: Correct installation

NO

Install the sensor correctly.

YES

(2) Measure the voltage of the set position.
Standard voltage: 0.28-0.77V



SHTS16Z080300047

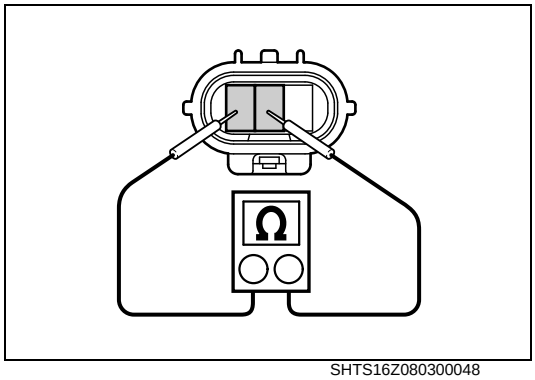
2. CHECK THE CONDUCTIVITY BETWEEN THE TERMINALS.

(1) Remove the 12 pin connector of the ES start controller and clutch stroke sensor connector and check the conductivity between 1st terminal and 1st terminal, 2nd terminal and 2nd terminal, 7th terminal and 3rd terminal both connectors (harness side).
Standard: Conductivity

NO

Harness disconnection.

YES



SHTS16Z080300048

3. MEASURE THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 2nd and 3rd terminals of the connector (sensor side).
Standard value:
When pressing the clutch pedal: Approx. 2 kΩ
When releasing the clutch pedal: Approx. 700 Ω

NO

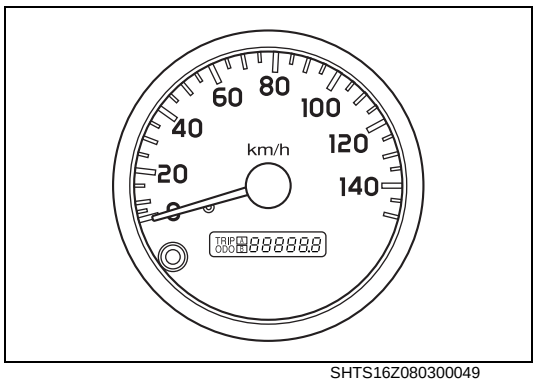
Clutch stroke sensor damage.

YES

Go to diagnosis code 9.

SPEED SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 4)

EN16Z0803F200013



SHTS16Z080300049

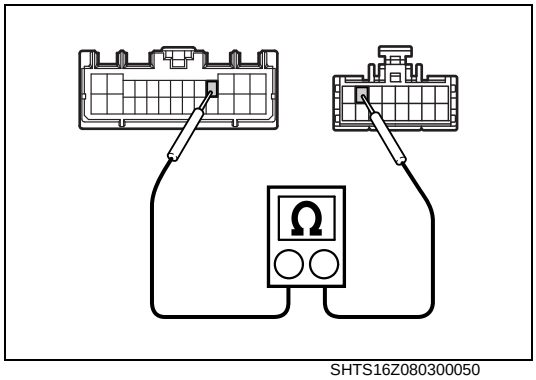
1. CHECK THE SPEEDOMETER OPERATION.

(1) Check if the speedometer operates correctly when driving.
Standard: Normal operation

NO

Speed sensor or pulse adjust computer malfunction

YES



SHTS16Z080300050

2. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

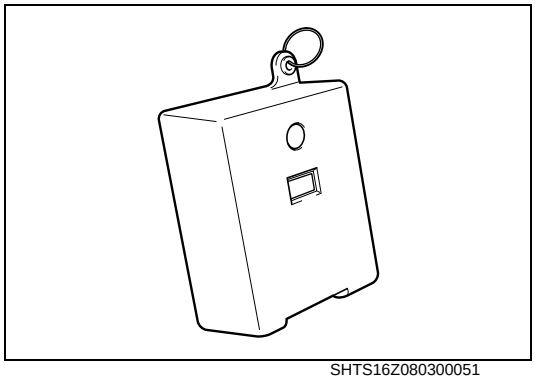
(1) Remove the 26 pin connector of the ES start controller and pulse adjust computer connector and check the conductivity between 10th and 2nd terminals of both connectors (harness side).
Standard: Conductivity

NO

Harness disconnection.

YES

Go to the item 3 after checking the pulse adjust computer.



SHTS16Z080300051

3. CHECKING THE DIAGNOSIS CODE

(1) After having restored the connector and deleted the past failures, drive the vehicle at 30 km/h or above for more than two minutes. Then output again the diagnosis code. (This is because vibrations are necessary for slope sensor output. Inspection by circuit tester has no meaning.)
Standard: Diagnosis code: 4

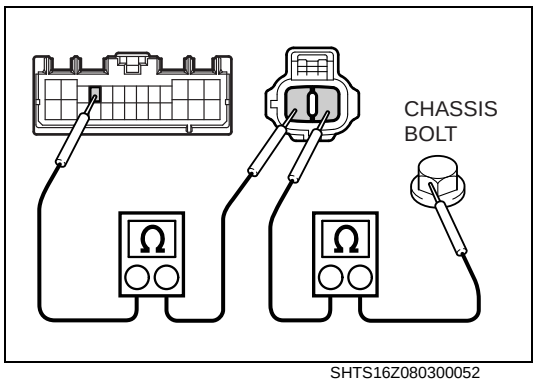
NO → Connector or harness contact failure.

YES

ES start controller malfunction.

ES START CONTROL VALVE DAMAGE (DIAGNOSIS CODE 7)

EN16Z0803F200014



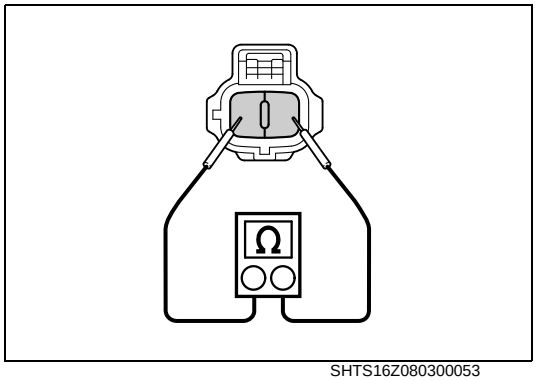
SHTS16Z080300052

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 26 pin connector of the ES start controller and the ES start control valve connector. Check the conductivity between 4th terminal and 1st terminal, the chassis ground and 2nd terminal (harness side).
Standard: Conductivity

NO → Harness disconnection.

YES

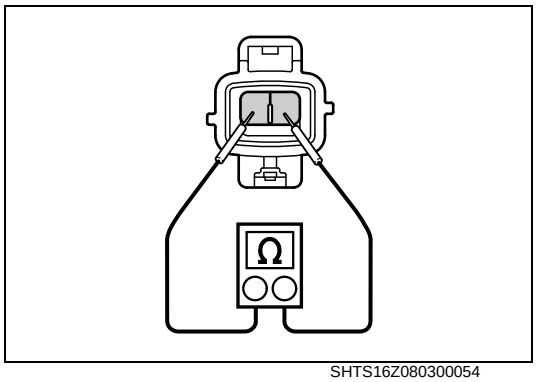

SHTS16Z080300053

2. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Check the conductivity between 1st and 2nd terminals of the ES start valve connector (harness side).
Standard: No conductivity

NO → Short-circuit in the harness.

YES

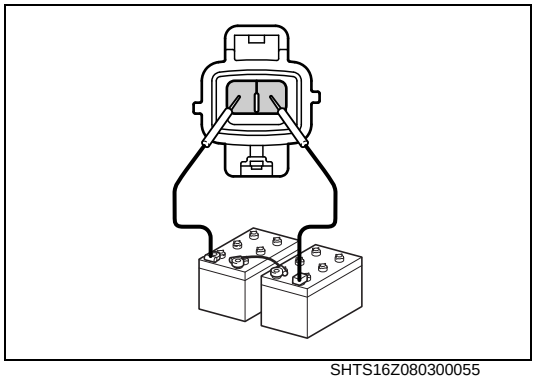

SHTS16Z080300054

3. MEASURE THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between 1st and 2nd terminals of the connector (part side).
Standard value: 30-45 Ω

NO → ES start control valve malfunction.

YES



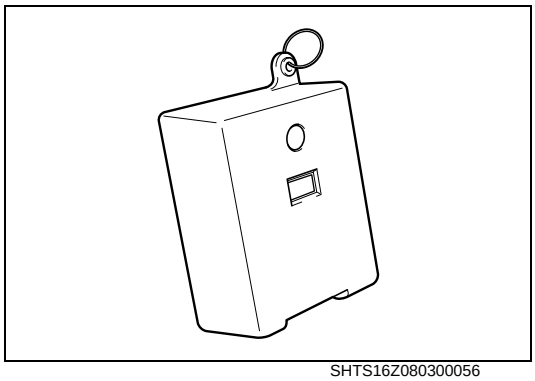
SHTS16Z080300055

4. CHECK THE ES START VALVE OPERATION.

(1) Apply the power voltage and check the ES start control valve operation.
Standard: Normal operation

NO → ES start control valve malfunction.

YES



SHTS16Z080300056

5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code and output the diagnosis code again.
Standard: Diagnosis code: 7

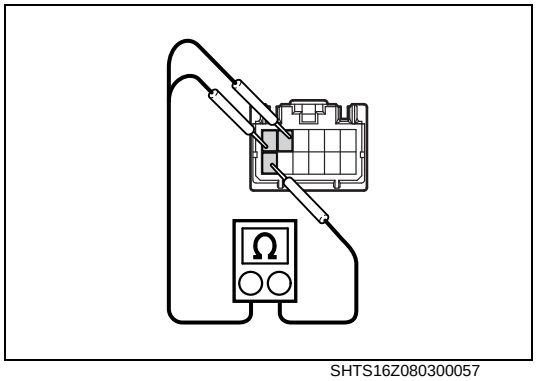
NO → Faulty contact in harness or connector.

YES

ES start controller malfunction.

CLUTCH STROKE SENSOR POWER SYSTEM MALFUNCTION (DIAGNOSIS CODE 9)

EN16Z0803F200015



SHTS16Z080300057

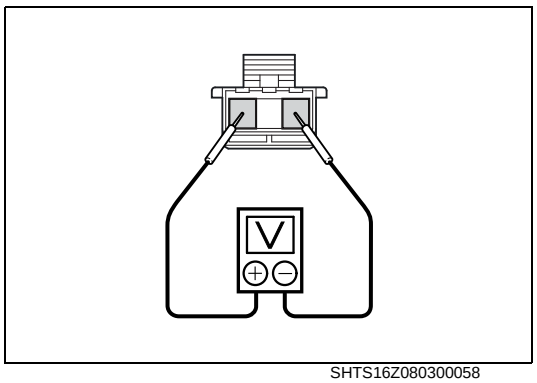
1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 12 pin connector of the ES start controller. Check the conductivity between 1st-7th terminals and 2nd-7th terminals of the ES start controller connector (harness side).

Standard: No conductivity

NO → Short-circuit in the harness.

YES



SHTS16Z080300058

2. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) After having restored the ES start controller connector, remove the clutch stroke sensor connector and set the starter switch "ON". Measure the voltage between 1st and 3rd terminals of the clutch stroke sensor connector (harness side).

NOTICE

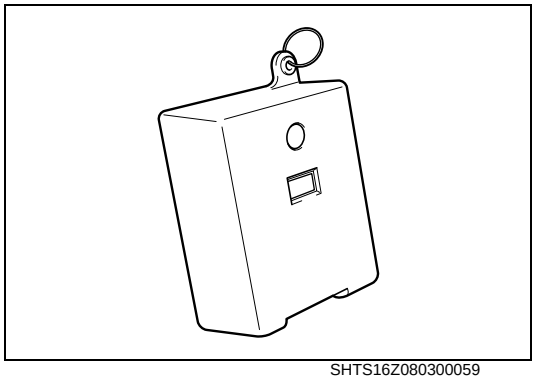
Be careful not to make a short-circuit.

Standard value: 4-6V

NO → Go to the item 3.

YES

Clutch stroke sensor malfunction.



SHTS16Z080300059

3. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Output the diagnosis code again.
Standard: Diagnosis code: 9

NO

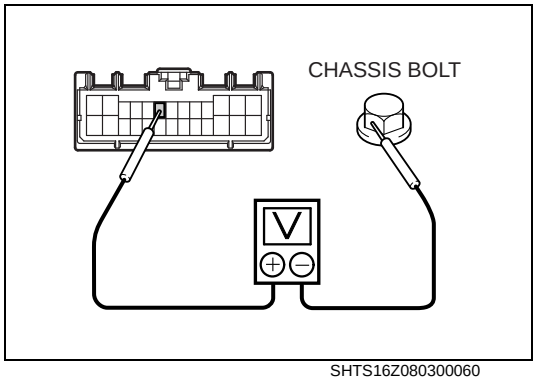
Connector or harness contact failure.

YES

ES start controller malfunction.

NEUTRAL SWITCH AND BACK-UP LIGHT SWITCH MALFUNCTION (DIAGNOSIS CODE 11)

EN16Z0803F200016



SHTS16Z080300060

1. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Remove the 26 pin connector of ES start controller and set the starter switch to "ON". Measure the voltage between the harness connector 6th terminal and the chassis ground.

Standard value:

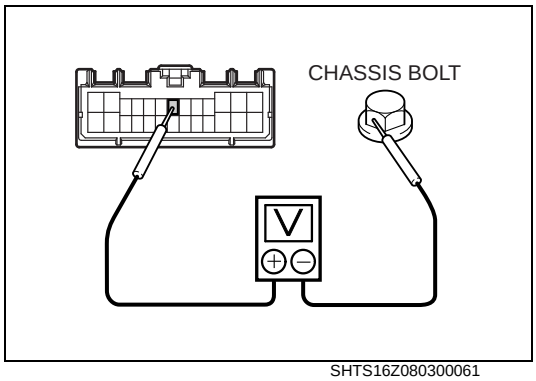
When the transmission is in gear: Less than 1V

When the transmission is in neutral: More than 20V

NO

YES

Neutral switch malfunction, disconnection or installation error.



SHTS16Z080300061

2. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Measure the voltage between the harness connector 7th terminal and the chassis ground.

Standard value:

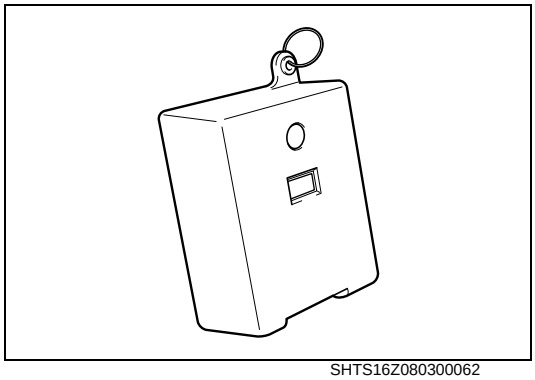
When the transmission is in reverse: More than 20V

When the transmission is in other position: Less than 1V

NO

YES

Back-up light switch malfunction, disconnection or installation error.



SHTS16Z080300062

3. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Shift into reverse and output the diagnosis code again.
Standard: Diagnosis code: 11

NO

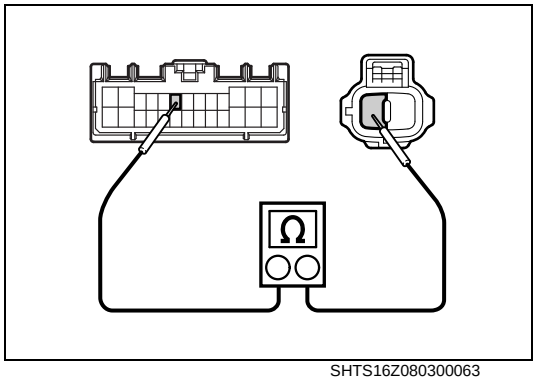
Connector or harness contact failure.

YES

ES start controller malfunction.

NEUTRAL SWITCH SYSTEM OR SPEED SENSOR SYSTEM MALFUNCTION (DIAGNOSIS CODE 12)

EN16Z0803F200017



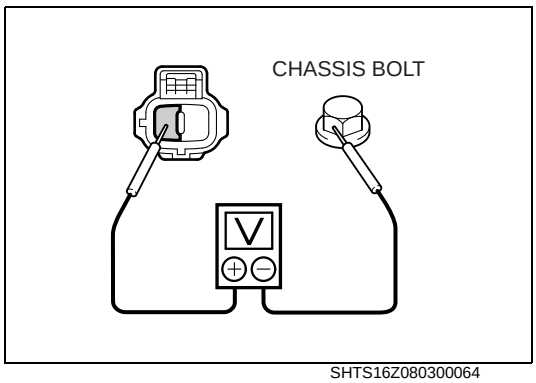
SHTS16Z080300063

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 26 pin connector of the ES start controller and the neutral switch connector. Check the conductivity between 6th terminal and 1st terminal of both connectors (harness side).
Standard: Conductivity

NO → Harness disconnection.

YES



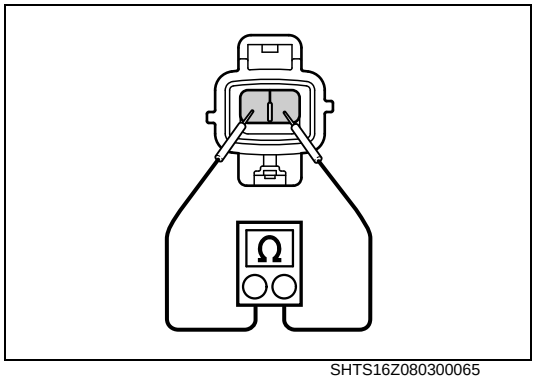
SHTS16Z080300064

2. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Restore the ES start controller connector and set the starter switch to "ON". Measure the voltage between the neutral switch connector 1st terminal and the chassis ground.
Standard value: More than 20V

NO → Harness or power supply malfunction.

YES



SHTS16Z080300065

3. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Check the conductivity between connector 1st and 2nd terminals of the part side.

NOTICE

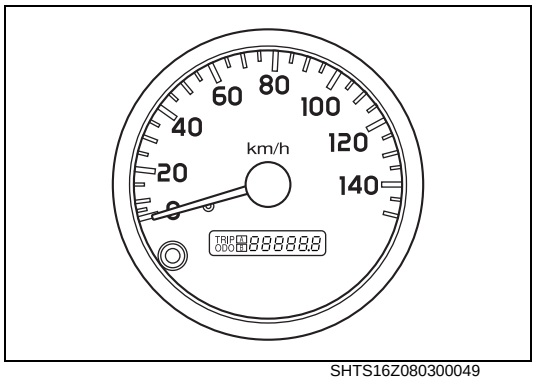
Check that the switch does not change within the motion range of the shift lever.

Standard:
When the transmission is in gear: No conductivity
When the transmission is in neutral: Conductivity

NO

Neutral switch malfunction.

YES



SHTS16Z080300049

4. CHECK THE SPEEDOMETER OPERATION.

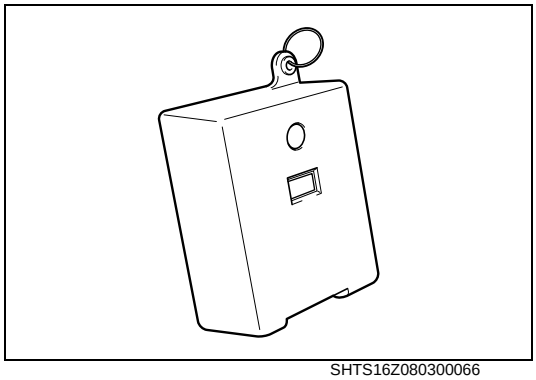
(1) Check if the speedometer operates correctly when driving.
Standard: Normal operation

NO

Go to the item 5 after checking the speed sensor and pulse adjust computer.

YES

Go to the item 5 after checking the pulse adjust computer.



SHTS16Z080300066

5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Accelerate and decelerate from 0 to 50 km/h more than 10 times. Output the diagnosis code again.

NOTICE

The way of deleting the past failure is different to others.

Refer to the section of the "How to delete the diagnosis code 12".

Standard: Diagnosis code: 12

NO

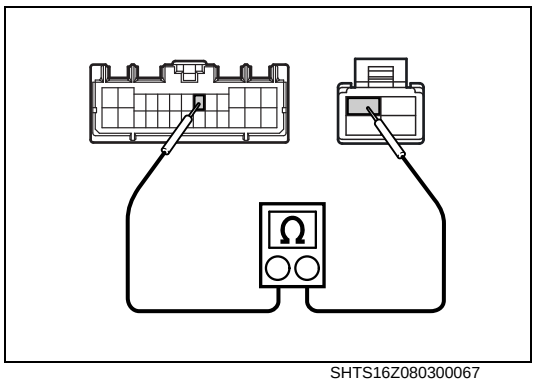
Connector or harness contact failure.

YES

ES start controller malfunction.

STOP LIGHT SWITCH DAMAGE (DIAGNOSIS CODE 13)

EN16Z0803F200018



SHTS16Z080300067

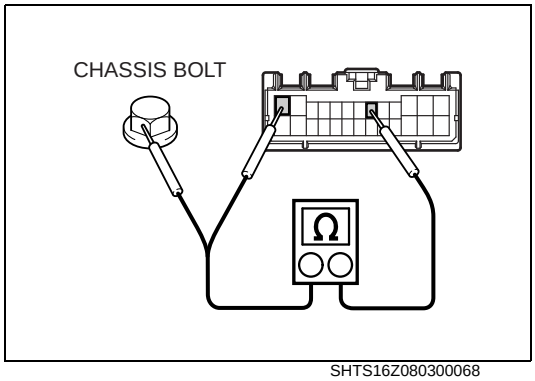
1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK", remove the 26 pin connector of the ES start controller and the connector of the stop light switch.

(2) Check the conductivity between 8th terminal and 1st terminal of both connectors (harness side).
Standard: Conductivity

NO → Harness contact failure or disconnection.

YES



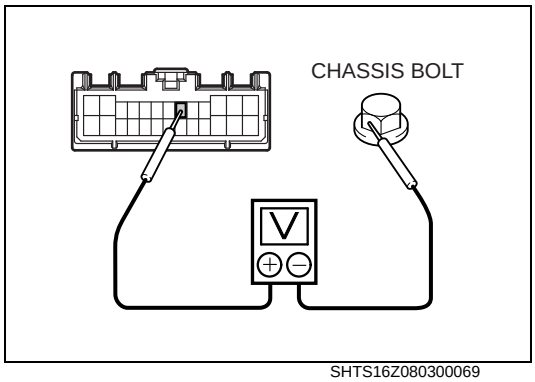
SHTS16Z080300068

2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

(1) Check if the harness connectors between 8th-1st terminals of 26 pin connector (harness side) and between 8th terminal and chassis ground cause a short-circuit.
Standard: No conductivity

NO → Short-circuit in the harness.

YES



SHTS16Z080300069

3. CHECK THE VOLTAGE OF TERMINALS.

(1) Restore the connector and set the starter switch to "ON" and measure the voltage between 8th terminal of 26 pin connector of ES start controller and chassis ground.
Standard value:
When stepping brake pedal: Less than 1V
When releasing brake pedal: More than 18V

NO → Go to the item 4.

YES

Go to the item 5.

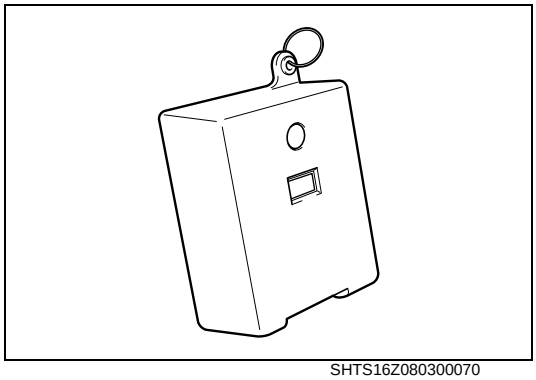
4. CHECK THE STOP LIGHT SWITCH.

(1) Check the stop light switch.

NO

Stop light switch malfunction

YES



SHTS16Z080300070

5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Repeat for more than five times in succession the acceleration from 0 km/h to 50 km/h or above and the deceleration from 50 km/h to 0 km/h. Output the diagnosis code again.

NOTICE

The way of deleting the past failure is different to others.

Refer to the section of the "How to delete the diagnosis code 13".

Standard: Diagnosis code: 13

NO

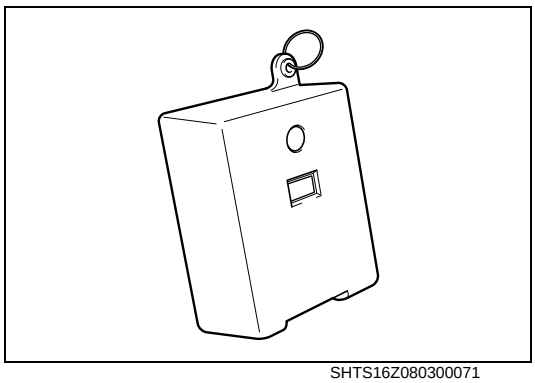
Connector or harness contact failure.

YES

ES start controller malfunction.

ES START CONTROLLER MALFUNCTION (DIAGNOSIS CODE 16)

EN16Z0803F200019



SHTS16Z080300071

1. CHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code and output the diagnosis code again.
Standard: Diagnosis code: 1

NO

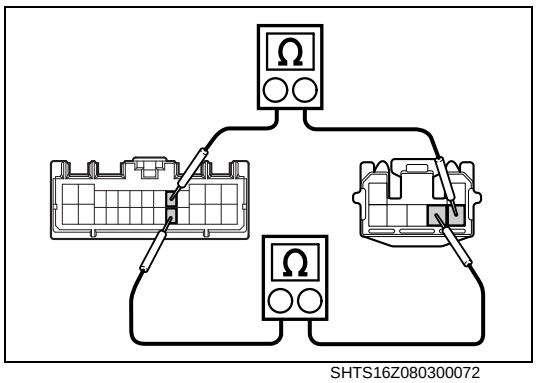
ES start controller malfunction.

YES

Normal.

ES MAIN SWITCH DAMAGE (DIAGNOSIS CODE 18)

EN16Z0803F200020


SHTS16Z080300072

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

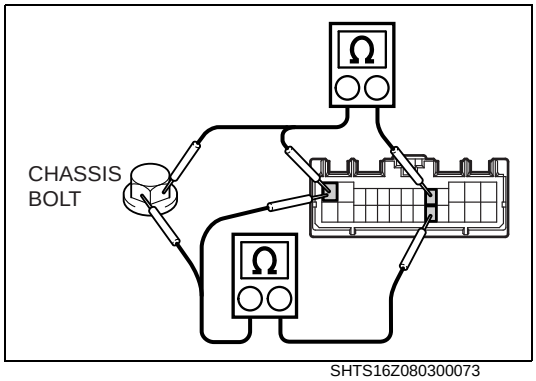
(1) Set the starter switch to "LOCK", and remove the 26 pin connector of ES start controller and the connector of ES main switch.

(2) Check the conductivity between 9th terminal and 7th terminal and between 22th terminal and 6th terminal of both connectors (harness side).

Standard: Conductivity

NO → Harness disconnection.

YES



SHTS16Z080300073

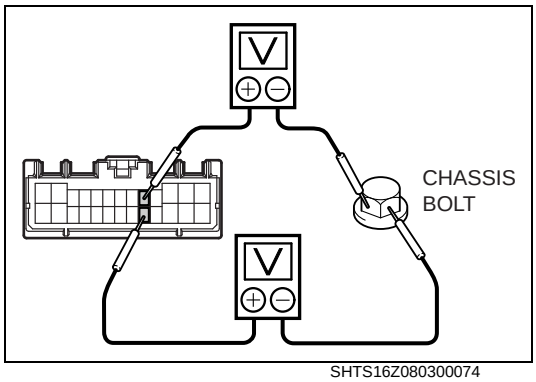
2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

(1) Check a short-circuit of harness connector between 9th terminal and 1st terminal of 26 pin connector, between 9th terminal and chassis ground, between 22th terminal and 1st terminal and between 22th terminal and chassis ground.

Standard: No conductivity

NO → Short-circuit in the harness.

YES



SHTS16Z080300074

3. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON" and measure the voltage between 9th terminal of 26 pin connector and chassis ground and between 22th terminal and chassis ground.

Standard value:
When main switch is "ON":
Between 9th terminal and chassis ground: More than 20V
Between 22th terminal and chassis ground: Less than 1V
When main switch is "OFF":
Between 9th terminal and chassis ground: Less than 1V
Between 22th terminal and chassis ground: More than 20V

NO → Go to the item 4.

YES

Go to the item 5.

4. CHECK THE ES MAIN SWITCH.

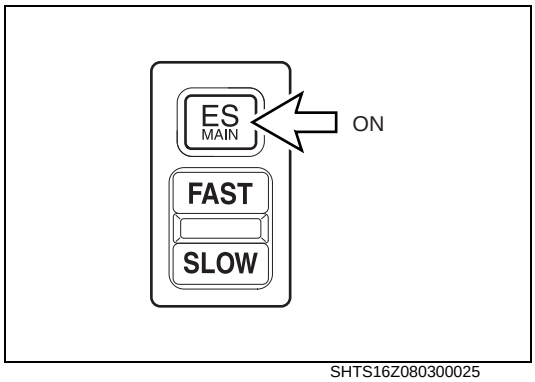
(1) Check the ES main switch.
Standard: Normal

NO → ES main switch malfunction.

YES

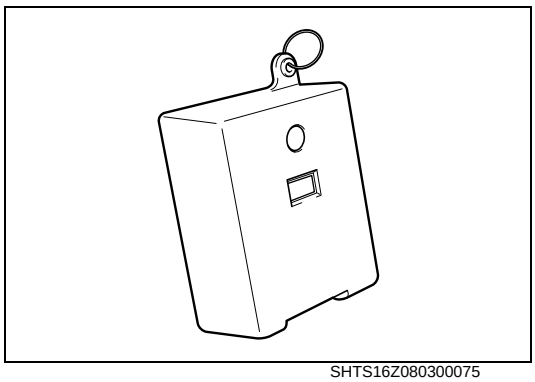
5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code and set the ES main switch to "ON".



SHTS16Z080300025

(2) More than 10 seconds later, output the diagnosis code again.
Standard: Diagnosis code: 18


SHTS16Z080300075

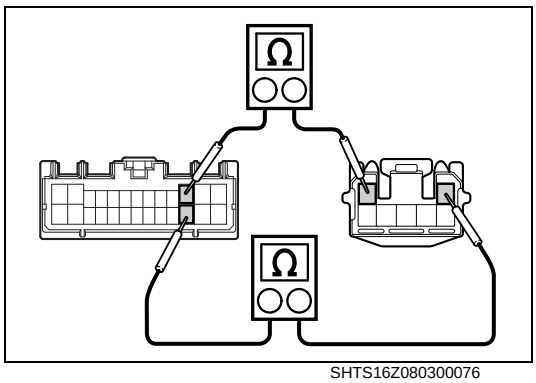
NO → Connector or harness contact failure.

YES

ES start controller malfunction.

ES START RELEASE TIMING SWITCH (DIAGNOSIS CODE 21)

EN16Z0803F200021


SHTS16Z080300076

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

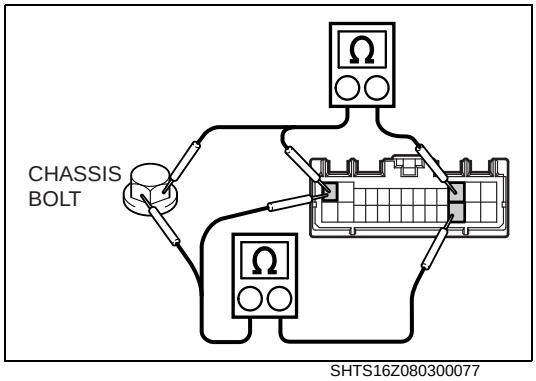
(1) Set the starter switch to "LOCK" and disconnect the connector of 26 pin connector of ES start controller and the connector of release timing switch.

(2) Check the conductivity between the11th terminal and 1st terminal and between 24th terminal and 2nd terminal of both connectors (harness side).

Standard: Conductivity

NO → Harness disconnection.

YES



SHTS16Z080300077

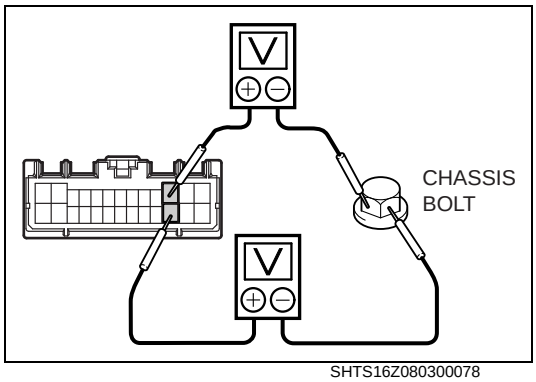
2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

(1) Check a short-circuit of harness connector between 11th terminal and 1st terminal of 26 pin connector, between 11th terminal and chassis ground, between 24th terminal and 1st terminal and between 24th terminal and chassis ground.

Standard: No conductivity

NO → Short-circuit in the harness.

YES



SHTS16Z080300078

3. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to "ON" and measure the voltage between 11th terminal of the 26 pin connector and chassis ground and between 24th terminal and chassis ground.

Standard value:
When release timing switch is "FAST":
Between 11th terminal and chassis ground: More than 20V
Between 24th terminal and chassis ground: Less than 1V
When release timing switch is "SLOW":
Between 11th terminal and chassis ground: Less than 1V
Between 24th terminal and chassis ground: More than 20V

NO → Go to the item 4.

YES

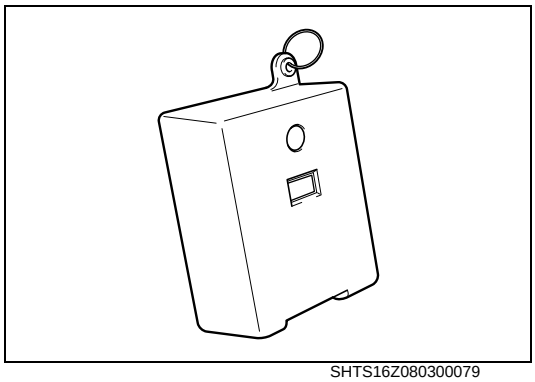
Go to the item 5.

4. CHECK THE RELEASE TIMING SWITCH.

(1) Check the release timing switch.
Standard: Normal

NO → Release timing switch malfunction.

YES



SHTS16Z080300079

5. RECHECKING THE DIAGNOSIS CODE

(1) Delete the past failures. Press for more than three seconds "FAST" and "SLOW" side each of the release timing switch. Then output again the diagnosis code.
Standard: Diagnosis code: 21

NO → Connector or harness contact failure.

YES

ES start controller malfunction.

BRAKE CONTROL (ELECTROMAGNETIC RETARDER)

DN03-004

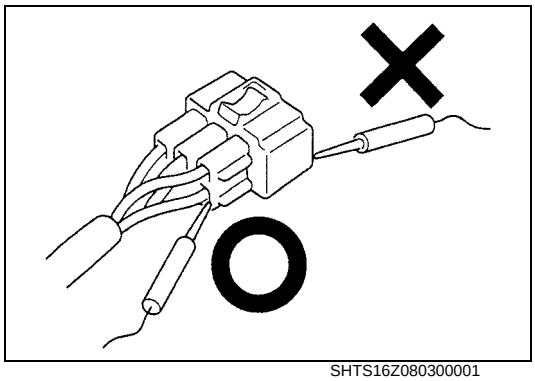
ELECTROMAGNETIC RETARDER DN03-2

HANDLING PRECAUTIONS DN03-2
SYSTEM DIAGRAM DN03-3
ARRANGEMENT OF CONNECTOR PIN IN RETARDER ECU DN03-4
PRE-INSPECTION DN03-6
FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR.....DN03-9
DIAGNOSIS CODE TABLE DN03-10
MALFUNCTION OF THE EXCITER UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 2) DN03-11
MALFUNCTION OF THE FIELD COIL (F COIL) UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 3) DN03-12
MALFUNCTION OF THE TEMPERATURE SENSOR UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 4) DN03-13
FAILURE OF THE DRIVE UNIT (DIAGNOSIS CODE 6) DN03-13
FAILURE OF THE CONTROL UNIT (DIAGNOSIS CODE 7) DN03-13

ELECTROMAGNETIC RETARDER

HANDLING PRECAUTIONS

EN16Z0803F200001



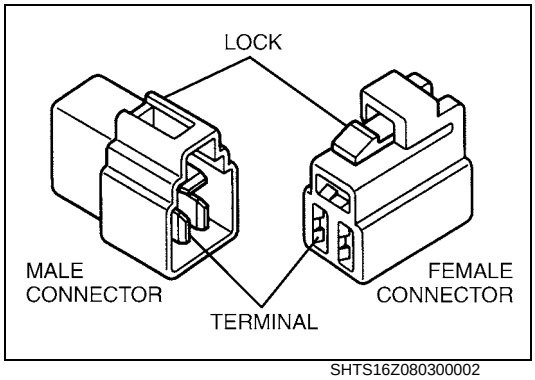
SHTS16Z080300001

1. ABOUT CONNECTORS

(1) Before performing the inspection operation, make sure that all connectors are connected securely.

(2) Do not contact the tester bar to the connection surface of the connector. This may cause terminal damage or a short-circuit.

(3) All connectors in the connector diagram are observed from the contact surfaces. However, the tester bar is put from the rear side.

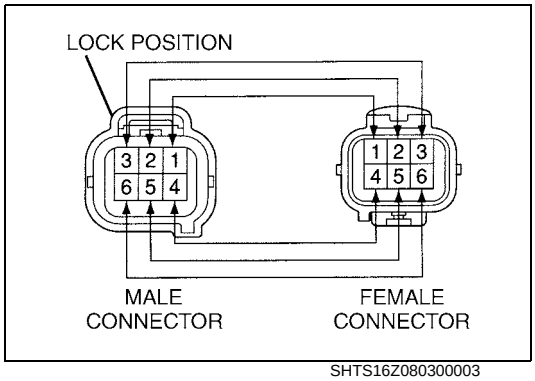


SHTS16Z080300002

(4) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



SHTS16Z080300003

(5) As for the terminal numbers of the connector, the first terminal is located on the top right terminal of the male connector and the top left terminal of the female connector.
Reference:
When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(6) When disconnecting the connector, be sure to set the starter switch to "LOCK".

2. ABOUT DIAGNOSIS MONITOR

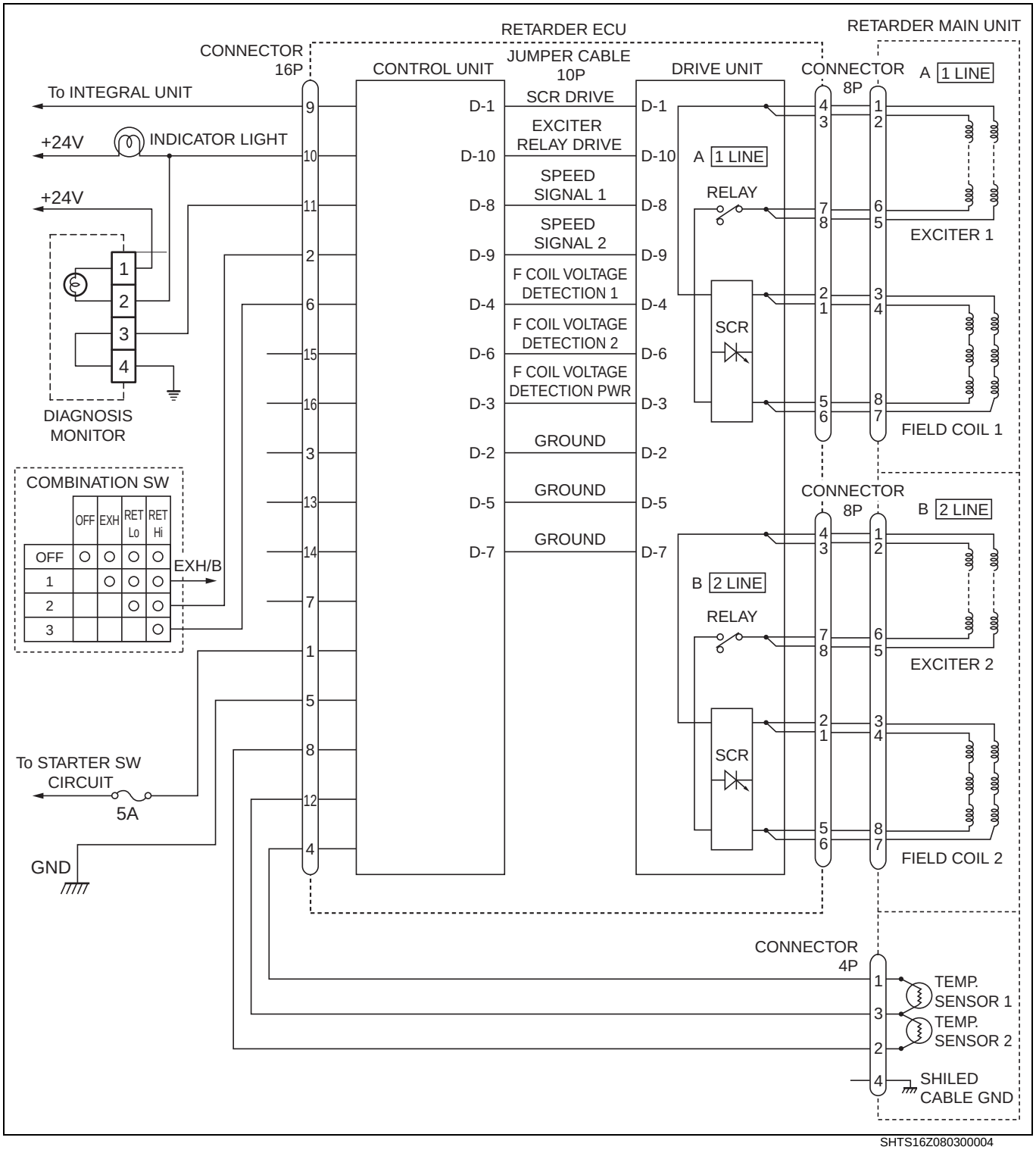
(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, delete the previous damage data.

(3) If a failure that makes the indicator light blink occurs, make sure to delete the past failure after repair has been completed. Otherwise the indicator light does not stop blinking even if the failure does not exist.

SYSTEM DIAGRAM

EN16Z0803F200002

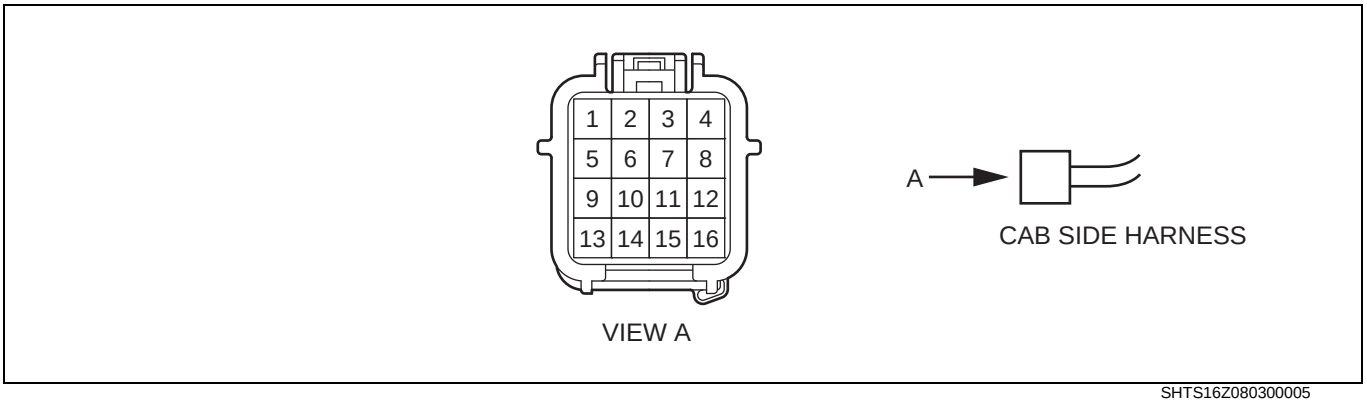


SHTS16Z080300004

ARRANGEMENT OF CONNECTOR PIN IN RETARDER ECU

EN16Z0803F200003

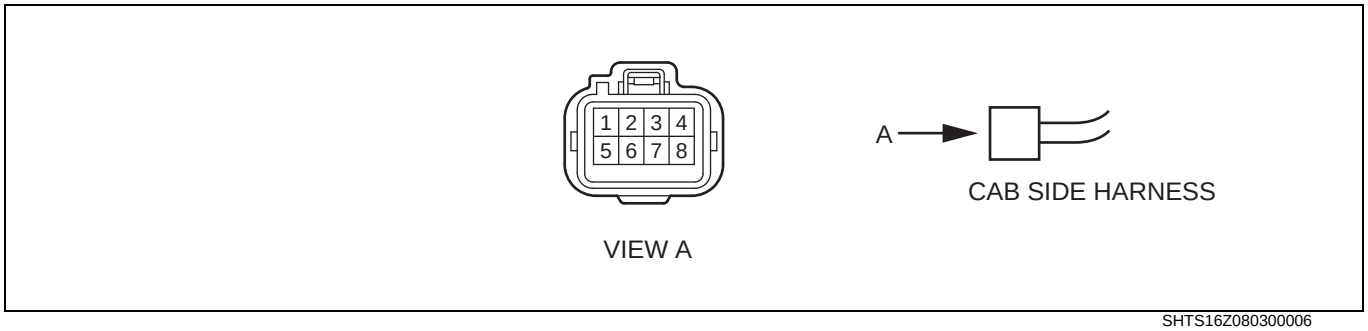
CONTROL UNIT (16 PIN CONNECTOR)



SHTS16Z080300005

No.	Signal	No.	Signal
1	Ignition power	9	Stop light relay output
2	Lever switch Lo	10	Indicator light and Diagnosis output
3	—	11	Diagnosis switch
4	Temperature sensor 1	12	Analogue ground
5	Ground	13	—
6	Lever switch Hi	14	—
7	—	15	—
8	Temperature sensor 2	16	—

DRIVE UNIT (8 PIN CONNECTOR)



SHTS16Z080300006

CIRCUIT A

No.	Signal	No.	Signal
1	Field coil 2	5	Field coil 6
2	Field coil 1	6	Field coil 5
3	Exciter 2	7	Exciter 6
4	Exciter 1	8	Exciter 5

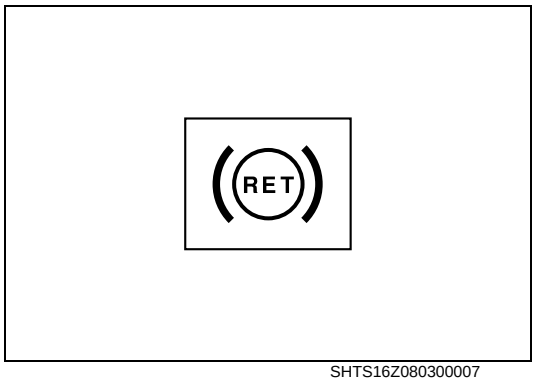
CIRCUIT B

No.	Signal	No.	Signal
1	Field coil 4	5	Field coil 8
2	Field coil 3	6	Field coil 7
3	Exciter 4	7	Exciter 8
4	Exciter 3	8	Exciter 7

PRE-INSPECTION

EN16Z0803F200004

CHECKING SYSTEM STATUS



SHTS16Z080300007

1. Check the indicator light on the instrument panel (When operating the retarder).

INDICATOR LIGHT CONDITION	SYSTEM STATUS
LIGHTING	Normal (But the indicator light does not turn on at the vehicle speed 10 km/h or below because the retarder does not operate then.)
LIGHTING OFF	Failure (Check the operation because faulty operation may turn the indicator light off. The indicator light does not turn on at the vehicle speed 10 km/h or below because the retarder does not operate then.)
BLINKING	Failure (The operation is not cancelled by turning "OFF" the retarder control lever.)

2. Check the battery voltage.
Standard value: More than 20V

3. Check the fuse.

4. Check that the connector of retarder ECU is connected correctly.

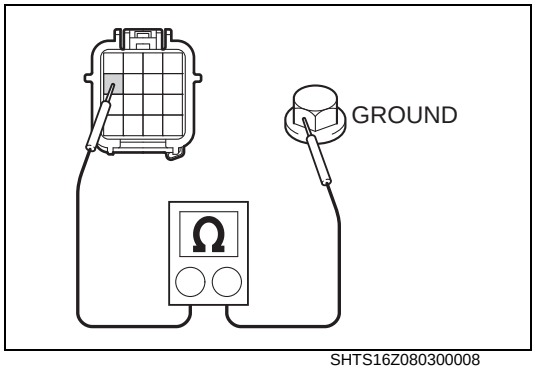
5. Check that the connector of drive unit is connected correctly.

6. Check that the connector of retarder main unit is connected correctly.

7. Check that the connector of clutch switch is connected correctly.

8. Check that the connector of accelerator switch is connected correctly.

INSPECTION OF THE INPUT AND OUTPUT OF THE CONTROL UNIT



SHTS16Z080300008

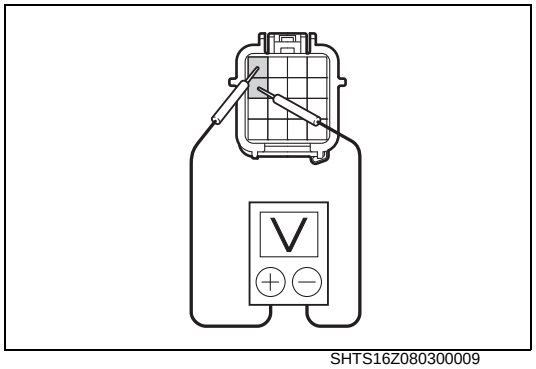
1. CHECK THE CONDUCTIVITY OF HARNESS.

(1) Set the starter switch to "LOCK" position. Disconnect 16 pin connector of the retarder ECU and check the conductivity between 5th terminal of the connector (harness side) and chassis ground.

Standard: Conductivity

NO → Replace the harness.

YES



SHTS16Z080300009

2. INSPECT THE VOLTAGE OF CONTROL UNIT.

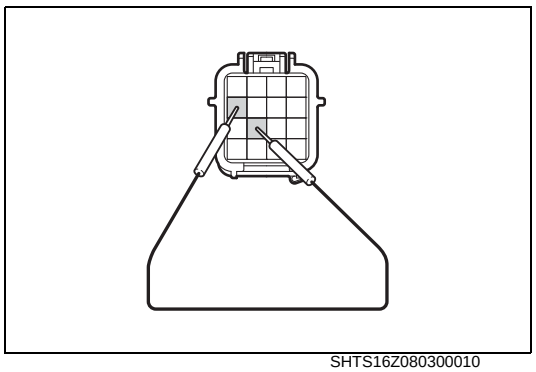
(1) Set the starter switch to "ON" position.

(2) Measure the voltage between 1st and 5th terminals of 16 pin connector (harness side).

Standard value: Approx. 24V

NO → Check the fuse.

YES


SHTS16Z080300010

3. INSPECT THE INDICATOR LIGHT CIRCUIT.

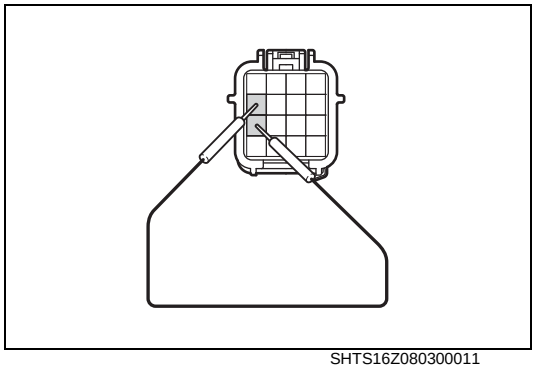
(1) Set the starter switch to "LOCK" position, connect 5th and 10th terminals of 16 pin connector with a harness.

(2) Turn the starter switch to "ON" position, check that the indicator light turns on.

Standard: Lighting

NO → Check the fuse.

YES



SHTS16Z080300011

4. INSPECT THE STOP LIGHT CIRCUIT.

(1) Set the starter switch to "LOCK" position, connect 5th and 9th terminals of 16 pin connector with a harness.

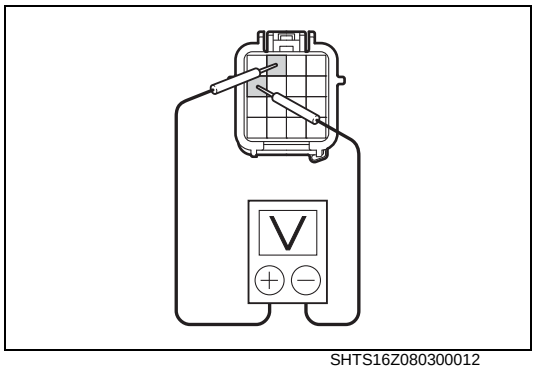
(2) Turn the starter switch to "ON" position, check that the stop light turns on.

Standard: Lighting

NO

Check the fuse.

YES



SHTS16Z080300012

5. INSPECT THE RETARDER CONTROL LEVER CIRCUIT

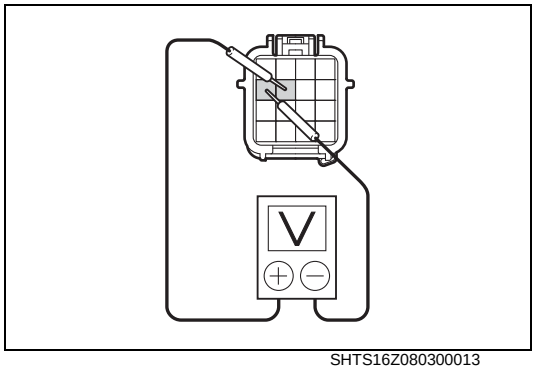
(1) Set the starter switch to "ON" position, set the retarder control lever at the second (LOW) without stepping the clutch pedal. At this moment, measure the voltage between 2nd and 5th terminals of the 16 pin connector (harness side).

Standard value: Approx. 24V

NO

Check the clutch switch, accelerator switch and retarder control lever.

YES



SHTS16Z080300013

6. INSPECT THE RETARDER CONTROL LEVER CIRCUIT.

(1) Set the starter switch to "ON" position, set the retarder control lever at the third (Hi) without stepping the clutch pedal. At this moment, measure the voltage between 6th and 5th terminals of the 16 pin connector (harness side).

Standard value: Approx. 24V

NO

Check the clutch switch, accelerator switch and retarder control lever.

YES

Test OK.

INSPECTION OF FUSE

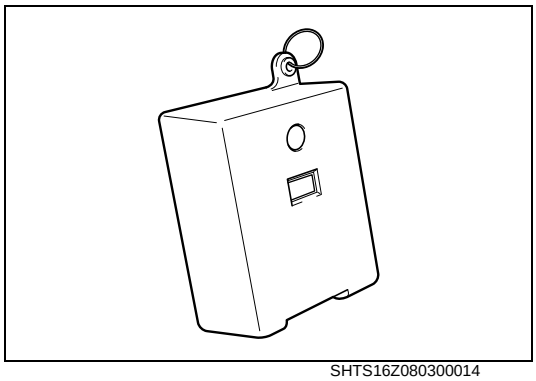
1. Remove the lower cover of the assistant seat side. Check the fuse for electromagnetic retarder. If it is blown out, replace it with new one.

2. Remove the lower cover of the assistant seat side. Check the fuse for power supply. If it is blown out, replace it with new one.

FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR

EN16Z0803F200005

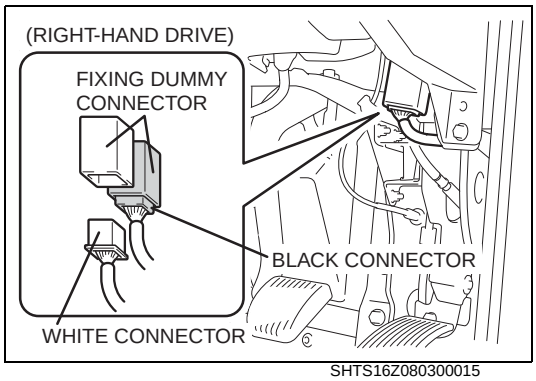
The electromagnetic retarder stores the history of failures and its contents up to the present in its computer. Connecting the diagnosis monitor to the special connector can monitor the failure contents.



SHTS16Z080300014

1. DIAGNOSIS MONITOR

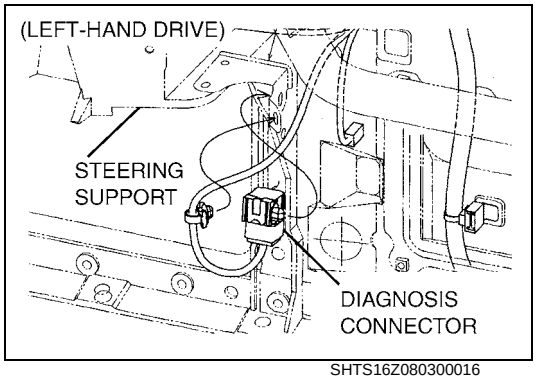
(1) Diagnosis monitor alerts the failure location with sound and light by being connected to the special diagnosis connector of electromagnetic retarder.
SST: Diagnosis monitor (S0963-01370)



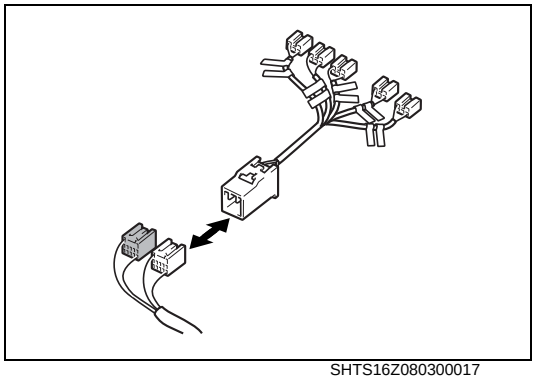
SHTS16Z080300015

2. CONNECT THE DIAGNOSIS MONITOR.

(1) Locate two intensive diagnosis connectors on lower right of the instrument panel. Connect the special wiring harness to the black connector and diagnosis monitor to the connector tagged by "electromagnetic retarder".
SST: Special wiring harness for intensive diagnosis connector (S0963-02300)



SHTS16Z080300016



SHTS16Z080300017

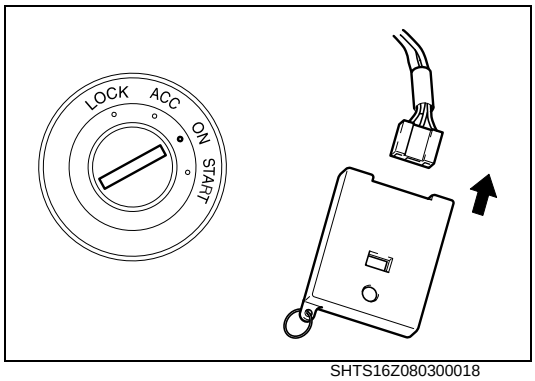
NOTICE

The intensive diagnosis connector is usually connected to the fixing dummy connector. So, disconnect the connector from the dummy connector and pull it to use. When the connector is not in use, connect it firmly to the fixing dummy connector.

(2) Set the starter switch to "ON".

3. DISPLAYING THE FAILURE CODE

(1) The failure codes are output repeatedly in ascending order of failure codes without distinguishing present and past failures.



SHTS16Z080300018

4. DELETE THE PAST FAILURES

(1) Record the first diagnosis code output.

(2) Disconnect the diagnosis monitor while keeping the starter switch at "ON" position.

NOTICE

If the starter switch is set to "LOCK" position, the past failures cannot be deleted. Make sure to keep the switch at "ON" position.

(3) Wait for several seconds. Then connect the diagnosis monitor to output the present failure.

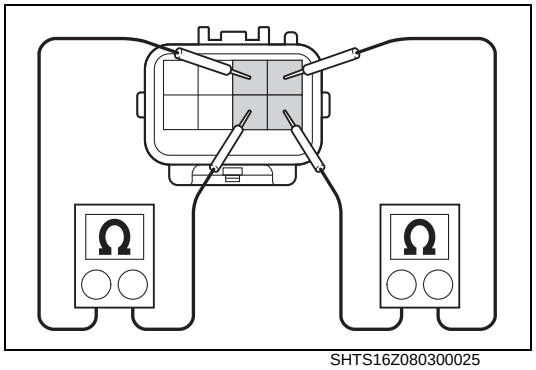
DIAGNOSIS CODE TABLE

EN16Z0803F200006

Diagnosis code No.	Inspection item	Diagnosis monitor and indicator light output
1	Normalcy of the system	
2	Malfunction of the exciter unit in the main unit	
3	Malfunction of the field coil (F coil) unit in the main unit	
4	Malfunction of the temperature sensor unit in the main unit	
6	Failure of the drive unit	
7	Failure of the control unit	

MALFUNCTION OF THE EXCITER UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 2)

EN16Z0803F200007


SHTS16Z080300025

1. MEASURE THE RESISTANCE BETWEEN THE TERMINALS OF THE RETARDER MAIN UNIT.

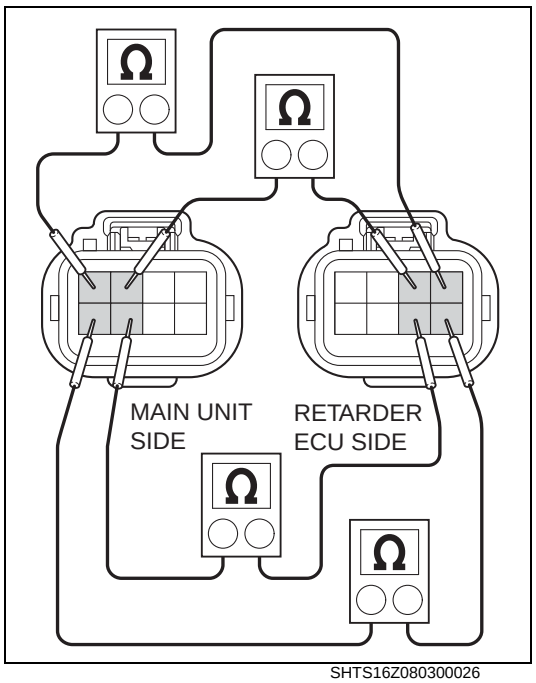
(1) Set the starter switch to "LOCK" position. Disconnect 8 pin connectors of both A line and B line of the retarder main unit.

(2) Measure the resistance between 1st and 5th terminals, 2nd and 6th terminals of each connectors A and B (main unit side).
Standard value: 1.11Ω (At 20°C {68°F})

NO

Replace the retarder main unit (Except for retarder drum).

YES



SHTS16Z080300026

2. CHECK THE CONDUCTIVITY OF HARNESS.

(1) Disconnect 8 pin connectors (black) of A line and B line of the retarder main unit and drive unit and measure the conductivity between each terminals for the exciter of the connector (harness side).

RETARDER MAIN UNIT	RETARDER ECU
5th terminal	8th terminal
6th terminal	7th terminal
1st terminal	4th terminal
2nd terminal	3rd terminal

Standard: Conductivity

NO

Replace the harness.

YES

3. CHECK THE CONNECTORS.

NO

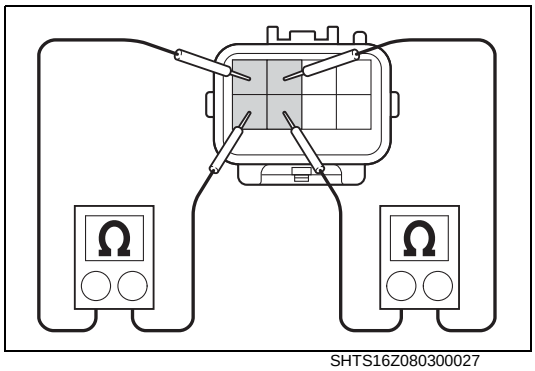
Couple the connector properly.

YES

Replace the retarder ECU.

MALFUNCTION OF THE FIELD COIL (F COIL) UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 3)

EN16Z0803F200008


SHTS16Z080300027

1. MEASURE THE RESISTANCE BETWEEN THE TERMINALS OF THE RETARDER MAIN UNIT.

(1) Set the starter switch to "LOCK" position, disconnect 8 pin connectors of both A line and B line of the retarder main unit.

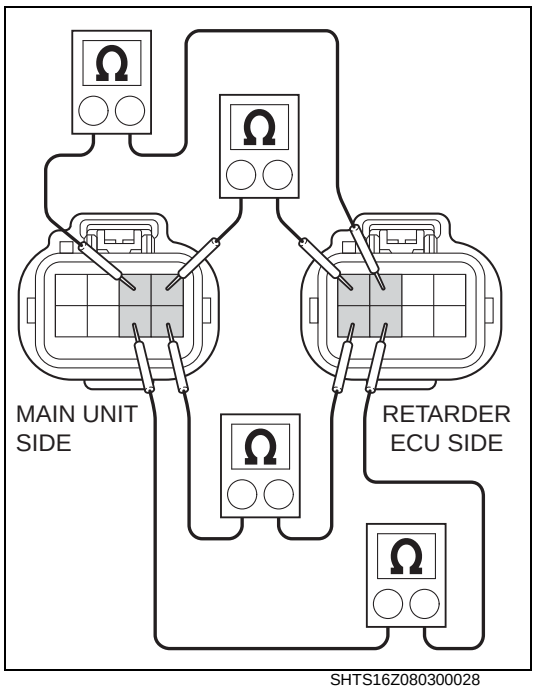
(2) Measure the resistance between 3rd and 7th terminals, 4th and 8th terminals of each connectors A and B (main unit side).

Standard value: 2.8 Ω (At 20°C {68°F})

NO

YES

Replace the retarder main unit (Except for retarder drum).



SHTS16Z080300028

2. CHECK THE CONDUCTIVITY OF HARNESS.

(1) Disconnect 8 pin connectors (black) of A line and B line of the retarder main unit and retarder ECU, measure the conductivity between each terminal for the field coil of the connectors (harness side).

RETARDER MAIN UNIT	RETARDER ECU
7th terminal	6th terminal
8th terminal	5th terminal
3rd terminal	2nd terminal
4th terminal	1st terminal

Standard: Conductivity

NO

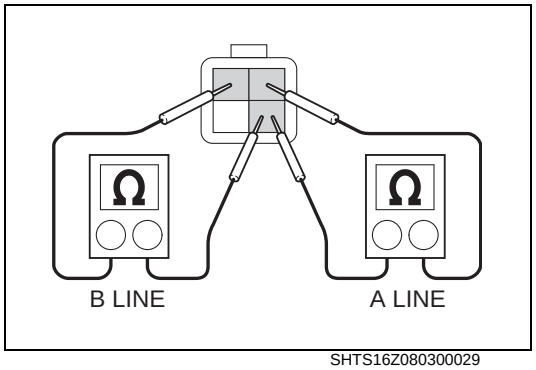
YES

Replace the harness.

Replace the retarder ECU.

MALFUNCTION OF THE TEMPERATURE SENSOR UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 4)

EN16Z0803F200009



SHTS16Z080300029

1. MEASURE THE RESISTANCE BETWEEN THE TERMINALS OF RETARDER MAIN UNIT.

(1) Set the starter switch to "LOCK" position, disconnect each connector of the temperature sensor of the retarder main unit side.

(2) Measure the resistance between terminals of each connector (main unit side).

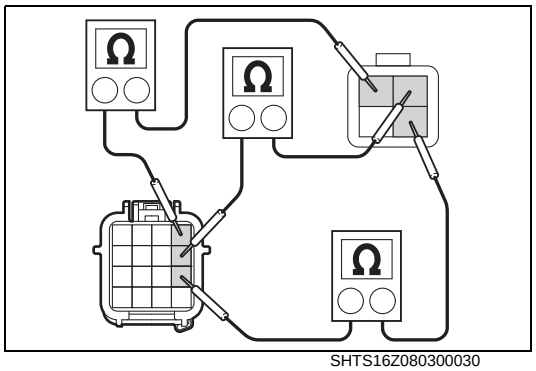
A LINE	1st terminal	3rd terminal
B LINE	2nd terminal	3rd terminal

Standard value: 50-300 kΩ (At 20°C {68°F})

NO

YES

Replace the retarder main unit (Except for retarder drum).


SHTS16Z080300030

2. CHECK THE CONDUCTIVITY OF THE HARNESS.

(1) Disconnect the connectors of temperature sensor of retarder main unit and 16 pin connector of retarder ECU, measure the conductivity between the terminals of connector (harness side).

TEMPERATURE SENSOR	RETARDER ECU
1st terminal	8th terminal
2nd terminal	4th terminal
3rd terminal	12th terminal

Reference: Conductivity

NO

YES

Replace the harness.

Perform the damage analysis of **"MALFUNCTION OF THE EXCITER UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 2)"** and **"MALFUNCTION OF THE FIELD COIL (F COIL) UNIT IN THE MAIN UNIT (DIAGNOSIS CODE 3)"**.

FAILURE OF THE DRIVE UNIT (DIAGNOSIS CODE 6)

EN16Z0803F200010

1. Because internal failure has occurred in the drive unit section of the retarder ECU, replace the retarder ECU.

FAILURE OF THE CONTROL UNIT (DIAGNOSIS CODE 7)

EN16Z0803F200011

1. Because internal failure has occurred in the control unit section of the retarder ECU, replace the control unit.

CAB EQUIPMENT CONTROL

DN05-001

SRS AIRBAG AND SEAT BELT WITH PRETENSIONER DN05-2

TROUBLESHOOTING BY AIRBAG AND SEAT BELT SYMPTOM DN05-2
INSPECTION (PRIOR CHECK)..... DN05-2
CAUTIONS DN05-3
ELECTRIC CIRCUIT DIAGRAM..... DN05-4
TROUBLESHOOTING WITH COMPUTER (HINO-DX) DN05-5
TROUBLESHOOTING USING THE DIAGNOSIS MONITOR..... DN05-7
DIAGNOSIS MONITOR CODE AND DIAGNOSIS TROUBLE CODE TABLE DN05-9
SHORT CIRCUIT OF BAG (DTC CODE B0100/ DIAGNOSIS MONITOR CODE 2) DN05-11
OPENING BAG (DTC CODE B0101/ DIAGNOSIS MONITOR CODE 3) DN05-13
BAG SHORT-CIRCUITED TO GND (DTC CODE B0102/ DIAGNOSIS MONITOR CODE 4) DN05-15
BAG SHORT-CIRCUITED TO BATT (DTC CODE B0103/ DIAGNOSIS MONITOR CODE 6) DN05-17
SHORT-CIRCUITING OF PRETENSIONER (DTC CODE B0130/ DIAGNOSIS MONITOR CODE 7) DN05-19
OPENING PRETENSIONER (DTC CODE B0131/ DIAGNOSIS MONITOR CODE 8) DN05-21
PRETENSIONER SHORT-CIRCUITED TO GND (DTC CODE B0132/ DIAGNOSIS MONITOR CODE 9) DN05-23
PRETENSIONER SHORT-CIRCUITED TO BATT (DTC CODE B0133/ DIAGNOSIS MONITOR CODE 11) DN05-26
POWER SUPPLY VOLTAGE REDUCTION (DTC CODE B2000/ DIAGNOSIS MONITOR CODE 12) DN05-29
WARNING LIGHT CIRCUIT ABNORMALITY (DTC CODE B2002/ DIAGNOSIS MONITOR CODE 13) DN05-30
WITH OR WITHOUT MALFUNCTION (DTC CODE B2003/ DIAGNOSIS MONITOR CODE 14) DN05-30
OPENING SAFING SENSOR (DTC CODE B1103/ DIAGNOSIS MONITOR CODE 16) DN05-31
SHORT CIRCUIT OF SAFING SENSOR (DTC CODE B1101/ DIAGNOSIS MONITOR CODE 16) DN05-31
IGNITION DRIVE CIRCUIT MALFUNCTION (DTC CODE B1112/ DIAGNOSIS MONITOR CODE 16) DN05-31
MALFUNCTION OF G SENSOR (DTC CODE B1115/ DIAGNOSIS MONITOR CODE 16) DN05-31
MALFUNCTION OF G SENSOR HIGH (DTC CODE B1116/ DIAGNOSIS MONITOR CODE 16) DN05-31
MALFUNCTION OF G SENSOR LOW (DTC CODE B1117/ DIAGNOSIS MONITOR CODE 16) DN05-31
VOLTAGE CONVERTER VOLTAGE ABNORMALITY (DTC CODE B1121/ DIAGNOSIS MONITOR CODE 16) DN05-31
BACKUP CAPACITOR'S CAPACITANCE ABNORMALITY (DTC CODE B1122/ DIAGNOSIS MONITOR CODE 16) DN05-32
MONITOR CURRENT LIMIT CIRCUIT MALFUNCTION (DTC CODE B1124/ DIAGNOSIS MONITOR CODE 16) DN05-32
CPU MONITOR FAILURE (DTC CODE B1125/ DIAGNOSIS MONITOR CODE 16) DN05-32
ROM-RAM FAILURE (DTC CODE B1131/ DIAGNOSIS MONITOR CODE 16) DN05-32

SRS AIRBAG AND SEAT BELT WITH PRETENSIONER

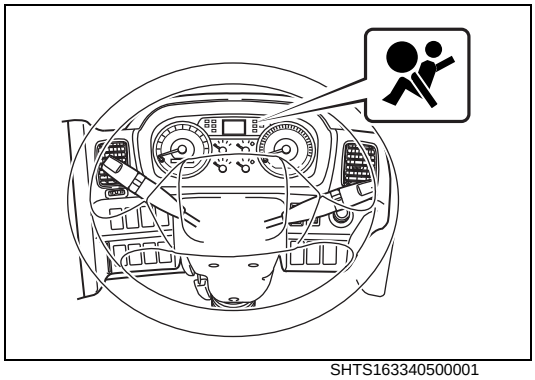
TROUBLESHOOTING BY AIRBAG AND SEAT BELT SYMPTOM

EN1633405F300001

Symptom	Possible cause	Remedy/Prevention
The warning light does not come on, when the starter switch is turned "ON".	The meter fuse has blown or the meter power supply system is abnormal.	Inspection or replacement
	Meter GND system lifted.	Inspection
The warming light does not go off for more than 6 seconds after the starter switch is turned "ON". The warning light comes on when driving.	Circuit malfunction of the SRS airbag system	Correct the problem after malfunction diagnosis.
The warning light blinks.	The SRS airbag ECU has already judged the operation.	Replacement

INSPECTION (PRIOR CHECK)

EN1633405F200001



SHTS163340500001

1. SYSTEM SELF-DIAGNOSTIC

(1) Check that the warning light turns on and turns off in 6 seconds when the starter switch is turned to "ACC" or "ON".

HINT

If the warning light does not go off or come on for more than 6 seconds after the starter switch is turned "ON", the SRS airbag system is abnormal. Inspect following the instruction below.

NO

SRS airbag system abnormality

YES

System normal

CAUTIONS

EN1633405A100001

GENERAL CAUTIONS ON TROUBLE DIAGNOSIS OF THE SRS AIRBAG AND SEAT BELT PRETENSIONER.

⚠ WARNING

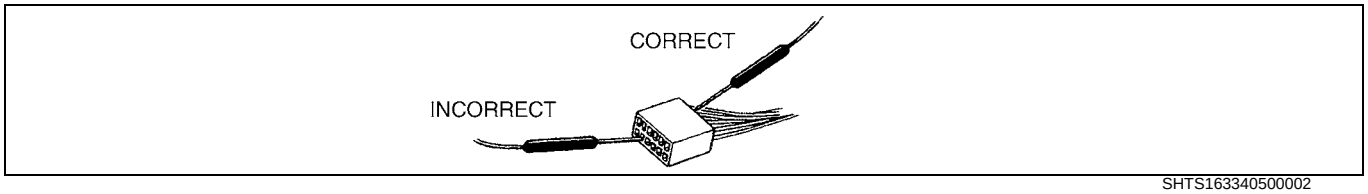
To prevent accidental deployment of the SRS airbag or activation of the seat belt prentensioner, which can cause serious injury or death, be sure to observe the following instructions.

- **Before disassembling any parts or components of the cab, or connecting or disconnecting a harness connector of the SRS airbag or seat belt prentensioner, turn the starter key of the vehicle to "LOCK" position and wait at least 90 seconds without applying any shock or impact to the ECU for the SRS airbag and seat belt pretensioner. Electric charge remains in the ECU for the SRS airbag and seat belt pretensioner for 90 seconds even after the starter key is turned to "LOCK" position, and the SRS airbag may accidentally deploy if any shock or impact is applied to the ECU for the SRS airbag and seat belt pretensioner while the electric charge remains, which can cause death or serious injury.**
- **Never turn on electricity between the positive and negative terminals of the connector extended from the SRS airbag module with an electrical circuit tester. Otherwise, faint electric current from the tester may cause the SRS airbag to deploy, resulting in death or serious injury.**
- **Never turn on electricity between the positive and negative terminals of the connectors extended from the component of seat belt pretensioner with an electrical circuit tester. Otherwise, faint electric current from the tester may cause the seat belt pretensioner to activate, resulting in death or serious injury.**
- **Before you turn the starter key to "ON" position for the first time after your work is completed.**

1. **Be sure to get out of the cab and confirm that there is no one in the cab.**
2. **Turn the starter key to "ON" position from outside of the cab.**
3. **Confirm that the SRS airbag does not deploy for at least 10 seconds, and then turn the starter key to "LOCK" position from outside of the cab.**
4. **Sit on the driver's seat, turn the starter key to "ON" position and confirm that the warning light of the SRS airbag on the instrument panel turns on for 6 seconds and then goes off.**
5. **Turn the starter key to "LOCK" position.**

To prevent accidental deployment of the SRS airbag or activation of the seat belt prentensioner, which can cause serious injury or death, and to maintain proper function of the SRS airbag and seat belt prentensioner, always observe the following instructions.

- **Before conducting the diagnosis, confirm that each connector of wiring harnesses of the SRS airbag components and seat belt prentensioner is securely connected.**
- **Never apply the test lead of the electrical circuit tester to the connection surface of the connector to avoid the damage to or short-circuit of the connector. Apply thin test lead of the tester from the opposite side to the connection surface of the connector. If you cannot apply the test lead of the tester to the connector because the connector is too small, prepare a check pin using a paper clip, safety pin or thin wire and use it as an extension of a test lead.**

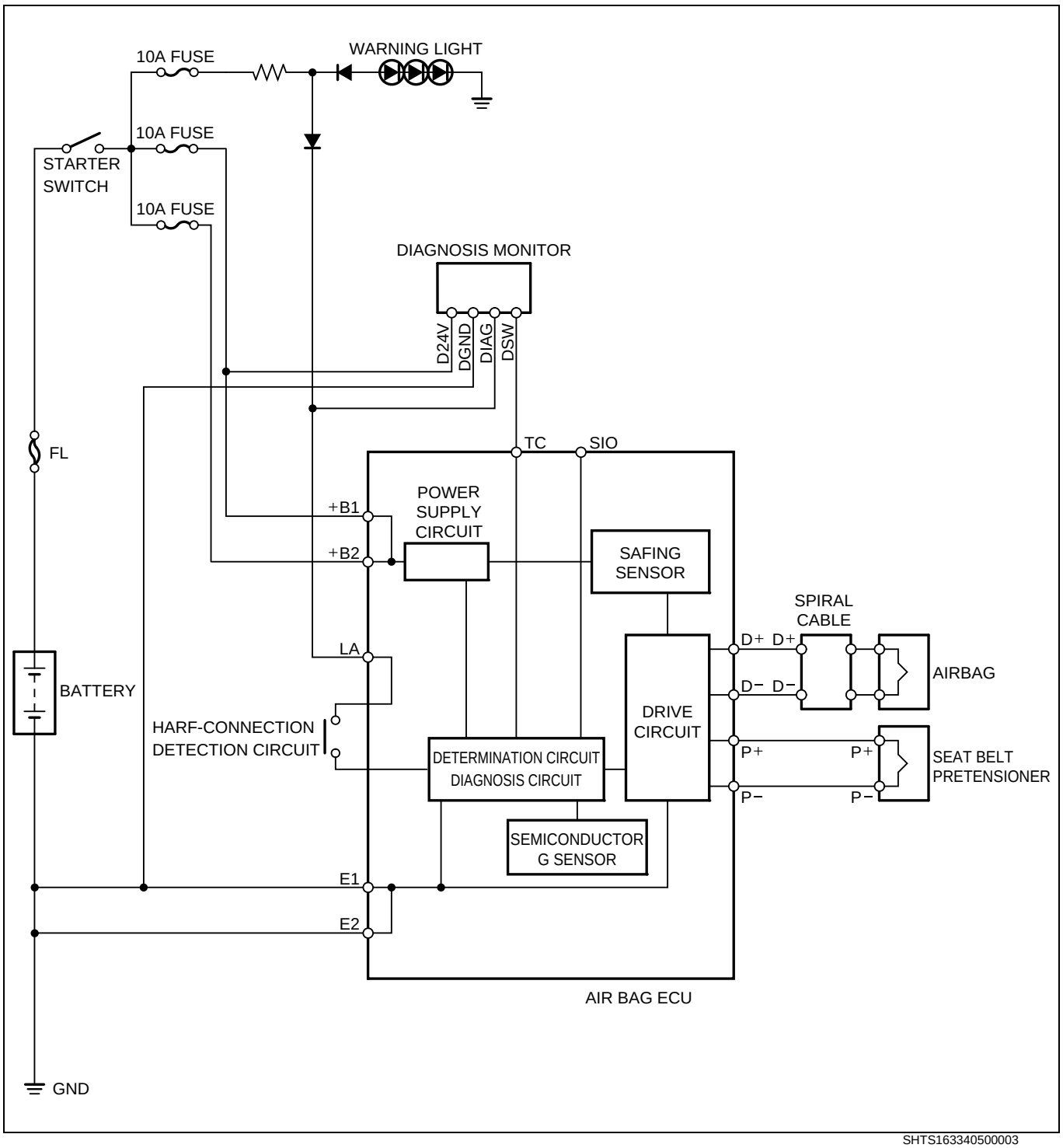


SHTS163340500002

- **The harnesses related to the SRS airbag components and seat belt pretensioner are covered with yellow tubes or gelcoat tubes and connectors are colored with yellow. To avoid malfunction or accidental deployment of the and SRS airbag or acctidental activation of the seat belt pretensioner, if any of these harnesses or connectors (including terminals of the connectors), other components of the SRS airbag module or seat belt pretensioner is diagnosed as malfunctioned, never repair but replace it with new one.**
- **Never use an air impact wrench for loosening and tightening the ECU for the SRS airbag and seat belt pretensioner mounting bolts and any bolt or nut around the ECU for the SRS airbag and seat belt pretensioner. Using an air impact wrench may cause the malfunction of the ECU for the SRS airbag and seat belt pretensioner.**
- **After completion of the diagnosis, for your record, note the diagnosis code on the inspection sheet and delete the diagnosis code from the memory of the ECU for the SRS airbag and seat belt pretensioner. After the deletion of the diagnosis code, perform the diagnosis again and confirm that no malfunction is detected. If the past diagnosis code remains in the memory of the ECU for the SRS airbag and seat belt pretensioner, the warning light on the instrument panel will not go off when the starter key of the vehicle is turned to "ON" position, and the SRS airbag and/or the seat belt pretensioner may not work properly in case of an accident.**

ELECTRIC CIRCUIT DIAGRAM

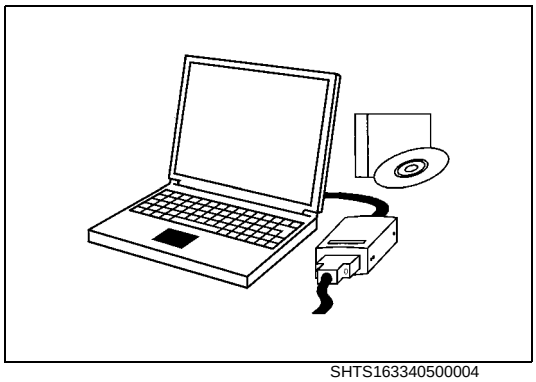
EN1633405J100001



SHTS163340500003

TROUBLESHOOTING WITH COMPUTER (HINO-DX)

EN1633405F200002



SHTS163340500004

1. ABOUT HINO-DX

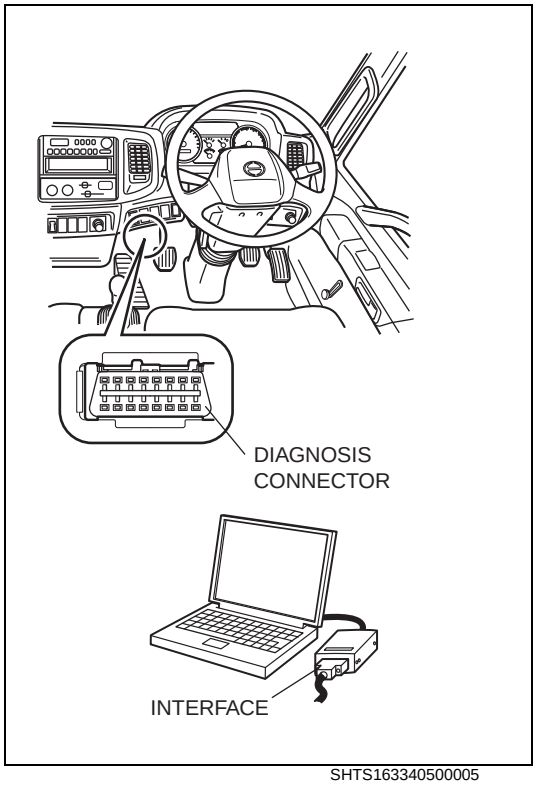
(1) The Hino-DX allows for troubleshooting of the common rail fuel injection system (some chassis system). For connecting to a vehicle, the interface box (Hino-Bowie) will be required.

SST:

	Part name	Part No.
1	**Interface box (Hino-Bowie)**	**09993-E9070**
	Cable between vehicle and Hino-Bowie	**S0904-21220**
2	**Hino Diagnostic eXplorer (Hino-DX)**	

HINT

- **Use "1. Hino-Bowie" listed in the above table as interface.**
- **A cable between the Hino-Bowie and a computer is supplied with Hino-Bowie.**
  Use either RS-232C type or USB type.
- **Also read the user's manuals supplied with Hino-Bowie.**
- **Install the Hino Diagnostic eXplorer (Hino-DX) software in a computer.**
  For installation procedures, refer to the user's manual attached to a CD.



SHTS163340500005

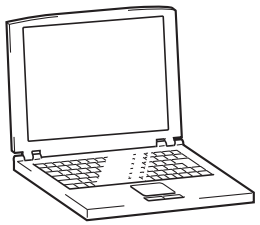
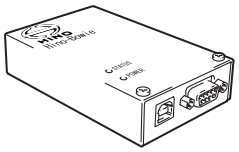
2. CONNECTING HINO-DX

(1) Connect the Hino-Bowie to the dedicated connector located on the back of the console panel.
(2) Connect a computer in which the Hino-DX has been installed, to the Hino-Bowie.
(3) Turn the starter switch "ON".
(4) Turn the computer "ON" to boot the Hino-DX.

HINT

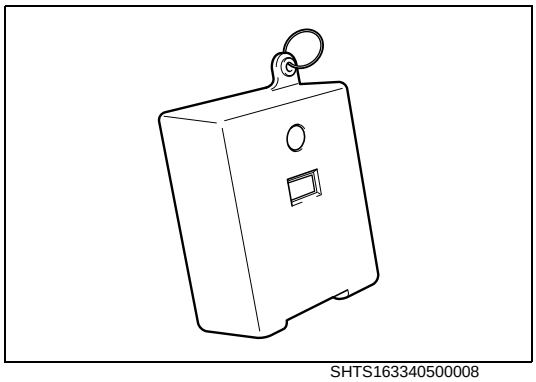
If the Hino-Bowie is used, connection to a vehicle will automatically turn the power supply "ON" and light the POWER light (red) on the Hino-Bowie.

3. APPARATUS FOR TROUBLESHOOTING

Part name	Part No.	Illustration of appearance	Outline/Functions
Computer (DOS/V standard)	—		• Operating system (OS): Windows95, Windows98 (IE5.0 or later), Windows2000 (SP3, IE5.0 or later), WindowsXP (SP1a, IE6.0 or later) • CPU and memory: To guarantee proper operations of the operating systems listed above. • Display: 800 x 600, 256 or more colors
Hino-Bowie (Interface box)	09993-E9070 Main body and cables (for RS-232C and USB) Cable between the vehicle and Hino-Bowie (S0904-21220)		• Computer interface

TROUBLESHOOTING USING THE DIAGNOSIS MONITOR

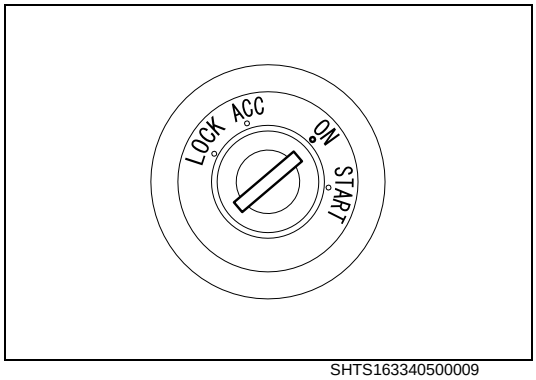
EN1633405F200003



SHTS163340500008

1. DIAGNOSIS MONITOR

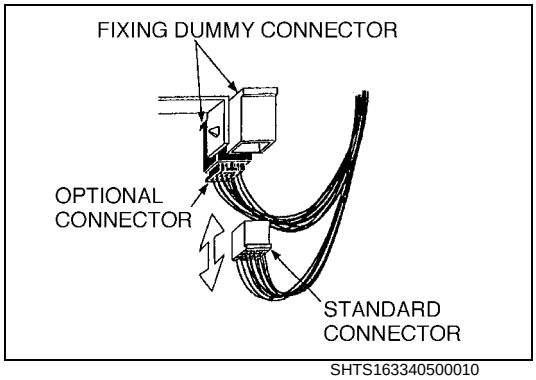
(1) By connecting the diagnosis monitor to the diagnosis connector dedicated for the SRS airbag system, malfunctions are indicated by sound and light.
SST: Diagnosis monitor (S0963-01370)



SHTS163340500009

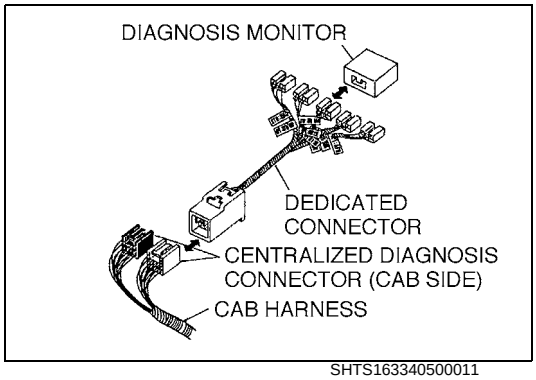
2. CONNECTING DIAGNOSIS MONITOR

(1) Turn the starter switch "ON".



SHTS163340500010

(2) Pull out the centralized diagnosis connector located above the accelerator pedal (standard connector: white) from the dummy connectors for fixing.



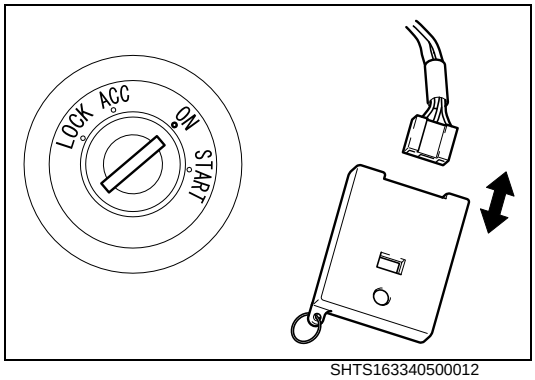
SHTS163340500011

(3) Connect the diagnosis monitor via special tool dedicated connector.
SST: Dedicated connector (S0963-02300)

NOTICE
Connect the diagnosis monitor to a connector with a "STD: AIRBAG" tag.

HINT
The diagnosis monitor connected to a vehicle will indicate detected malfunctions with sound and light.

(4) If no malfunctions are detected, the diagnosis monitor code "1" will be indicated. Past and present malfunctions to be output to the diagnosis monitor will not be sorted in a chronological order. Follow the procedures described below to delete past malfunctions.



SHTS163340500012

3. DELETION OF PAST MALFUNCTION CODE

(1) Record the first output diagnosis monitor code.

(2) With the starter switch kept "ON", remove the diagnosis monitor.

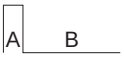
NOTICE

With the starter switch turned to the "LOCK" position, past malfunctions will not be deleted. Make sure to keep the starter key in the "ON" position.

(3) Wait for few seconds and then connect the diagnosis monitor. A present malfunction is output.

DIAGNOSIS MONITOR CODE AND DIAGNOSIS TROUBLE CODE TABLE

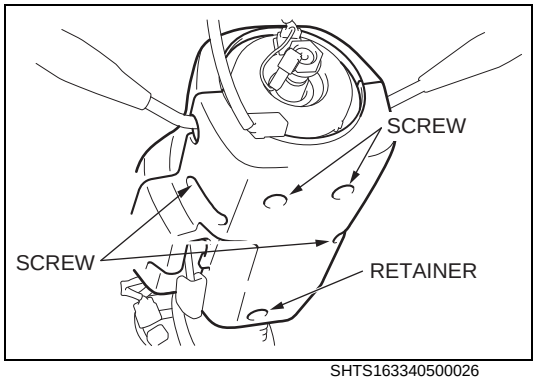
EN1633405F200004

Diagnosis monitor code	DTC CODE	Inspection item	Description of malfunction	Output of diagnosis monitor
1	-	System normal	In case free from system malfunctions	 A: 0.2 sec B: 2 sec
2	B0100	Short-circuiting of bag	Short circuit between airbag ECU and airbag module	 A: 0.2 sec B: 2 sec
3	B0101	Opening bag	Disconnection between airbag ECU and airbag module	 A: 0.2 sec B: 2 sec
4	B0102	Bag short-circuited to GND	Airbag ECU to airbag module short-circuited to GND	 A: 0.2 sec B: 2 sec
6	B0103	Bag short-circuited to BATT	Airbag ECU to airbag module short-circuited to 24V	 A: 0.2 sec B: 2 sec C: 1.5 sec
7	B0130	Short-circuiting of pretensioner	Short circuit between airbag ECU and seat belt tensioner	 A: 0.2 sec B: 2 sec C: 1.5 sec
8	B0131	Opening pretensioner	Disconnection between airbag ECU and seat belt tensioner	 A: 0.2 sec B: 2 sec C: 1.5 sec
9	B0132	Pretensioner short-circuited to GND	Airbag ECU to seat belt tensioner short-circuited to GND	 A: 0.2 sec B: 2 sec C: 1.5 sec
11	B0133	Pretensioner short-circuited to BATT	Airbag ECU to seat belt tensioner short-circuited to 24V	 A: 0.2 sec B: 2 sec C: 1.5 sec
12	B2000	Power supply voltage reduction	Short-circuiting and disconnection of power supply line	 A: 0.2 sec B: 2 sec C: 1.5 sec
13	B2002	Warning light circuit abnormality	GND short circuit or disconnection between airbag ECU to warning light line	 A: 0.2 sec B: 2 sec C: 1.5 sec
14	B2003	With or without malfunction	System found abnormal at the time of impact	 A: 0.2 sec B: 2 sec C: 1.5 sec

Diagnosis monitor code	DTC CODE	Inspection item	Description of malfunction	Output of diagnosis monitor
16	B1103	Opening safing sensor	Airbag ECU inside abnormality	 A: 0.2 sec B: 2 sec C: 1.5 sec
	B1101	Short circuit of safing sensor		
	B1112	Ignition drive circuit malfunction		
	B1115	Malfunction of G sensor		
	B1116	Malfunction of G sensor high		
	B1117	Malfunction of G sensor low		
	B1121	Voltage converter voltage abnormality		
	B1122	Backup capacitor's capacitance abnormality		
	B1124	Monitor current limit circuit malfunction		
	B1125	CPU monitor failure		
	B1131	ROM-RAM failure		

SHORT CIRCUIT OF BAG
(DTC CODE B0100/ DIAGNOSIS MONITOR CODE 2)

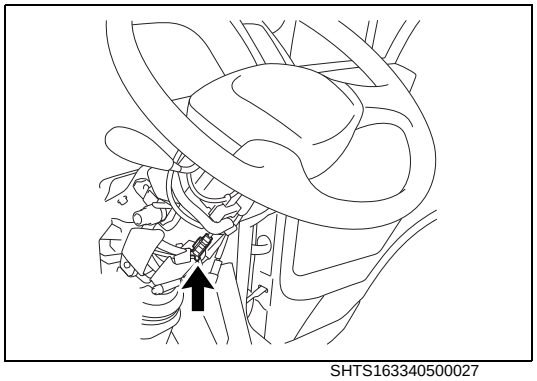
EN1633405F200005



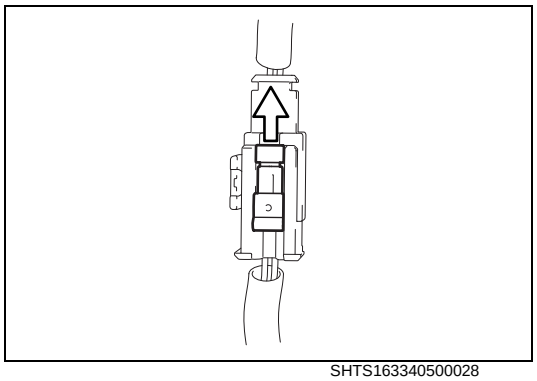
SHTS163340500026

1. STEP 1

(1) Remove the steering column cover.


SHTS163340500027

(2) Pull out the yellow connector.


SHTS163340500028

(3) Turn the starter switch to the "LOCK" position, check that more than 90 seconds have passed, and then disconnect the yellow connector.

HINT

Pull the white portion in the direction of the arrow to unlock and detach the connection of the connector.

(4) Turn the starter switch "ON" and connect the diagnosis monitor to delete past malfunctions. Then, check if the present malfunction is indicated as the diagnosis monitor code 3.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0101.

NO

YES

DTC code B0100/ diagnosis monitor code 2: Abnormality in airbag ECU or cab main harness

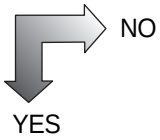
2. STEP 2

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, remove the airbag module.
Refer to the section **"AIRBAG MODULE"** in the chapter **"CAB EQUIPMENT"**.

(2) Connect the yellow connector at the steering column.

(3) Turn the starter switch "ON" and connect the diagnosis monitor to delete past malfunctions. Then, check if the present malfunction is indicated as the diagnosis monitor code 3.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0101.

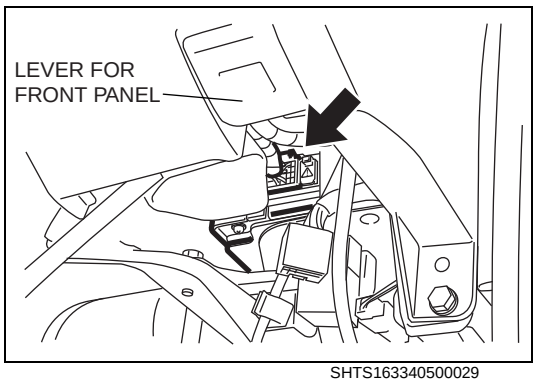


DTC code B0100/ diagnosis monitor code 2: Abnormality in SRC

DTC code B0101/ diagnosis monitor code 3: Abnormality in air-bag inflator

OPENING BAG (DTC CODE B0101/ DIAGNOSIS MONITOR CODE 3)

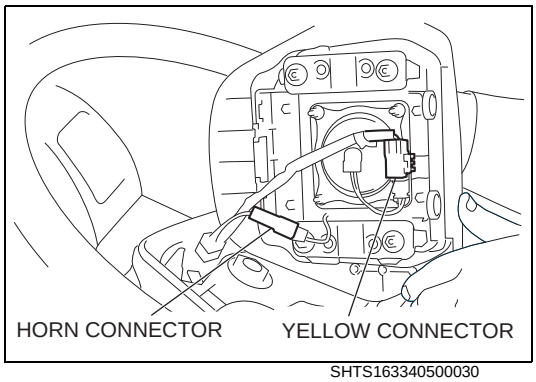
EN1633405F200006



SHTS163340500029

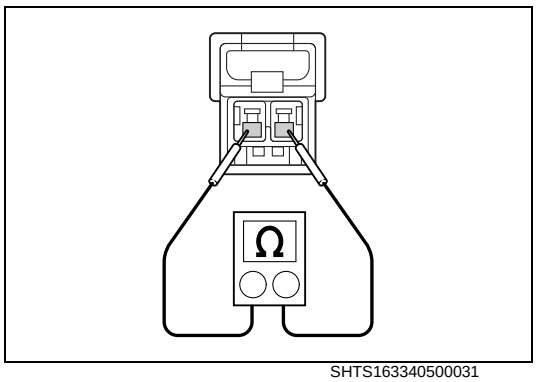
1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.



SHTS163340500030

(2) Remove the airbag module.
Refer to the section **"AIRBAG MODULE"** in the chapter **"CAB EQUIPMENT"**.



SHTS163340500031

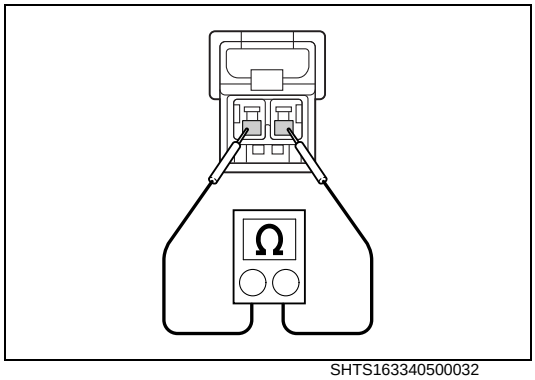
(3) Check the continuity between the yellow connector terminals on the inflator side of the steering column SRC by measuring the resistance.
Standard value: 0-5 Ω

NO

No continuity: Proceed to STEP 2.

YES

With continuity: Airbag ECU abnormality



SHTS163340500032

2. STEP 2

(1) Disconnect the cab harness and SRC at the lower steering column. Check the continuity between the yellow connector terminals on the cab harness side by measuring the resistance.
Standard value: 0-5 Ω

NO

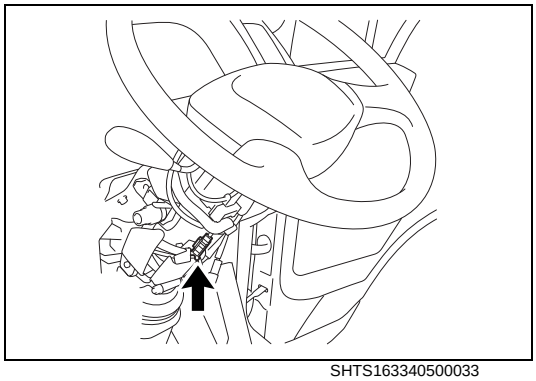
No continuity: Abnormality in cab main harness

YES

With continuity: Abnormality in SRC

BAG SHORT-CIRCUITED TO GND (DTC CODE B0102/ DIAGNOSIS MONITOR CODE 4)

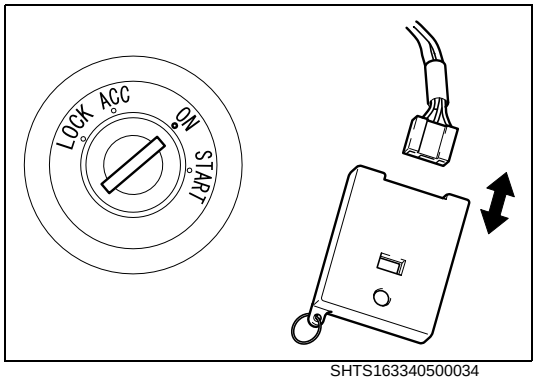
EN1633405F200007



SHTS163340500033

1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, remove the steering column cover and disconnect yellow connector of the spiral cable (SRC) at the lower steering column.



SHTS163340500034

(2) Turn the starter switch "ON" and connect the diagnosis monitor, and remove it once to delete past malfunctions. Connect it again and check if the present malfunction is indicated as the diagnosis monitor code 3.

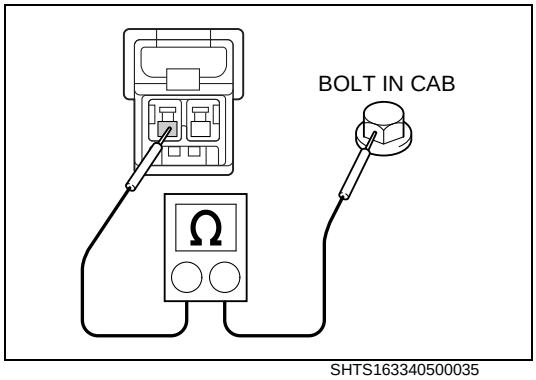
When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0101.

NO

YES

DTC code B0102/ diagnosis monitor code 4: Proceed to STEP 3.

2. STEP 2



SHTS163340500035

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, remove the airbag module.
Refer to the section **"AIRBAG MODULE"** in the chapter **"CAB EQUIPMENT"**.

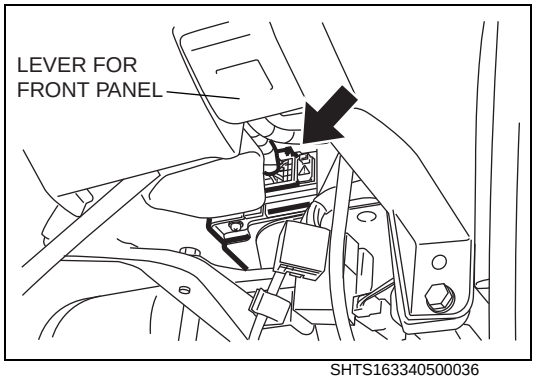
(2) Check if there is no continuity between the GND and the yellow connector terminal on the inflator side of the steering column SRC.
Standard value: No continuity

NO

YES

With continuity: Abnormality in SRC

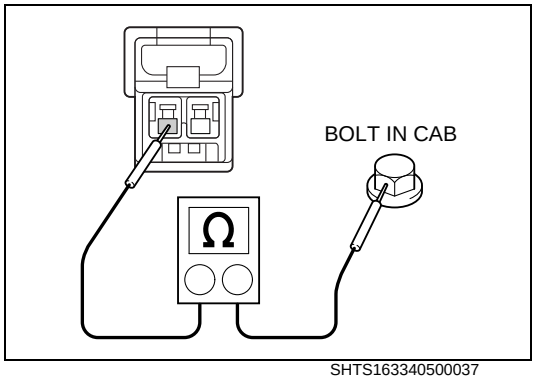
No continuity: Abnormality in airbag inflator



SHTS163340500036

3. STEP 3

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.



SHTS163340500037

(2) Check if there is no continuity between the GND and the yellow connector terminal of the cab main harness at the lower steering column.
Standard value: No continuity

NO

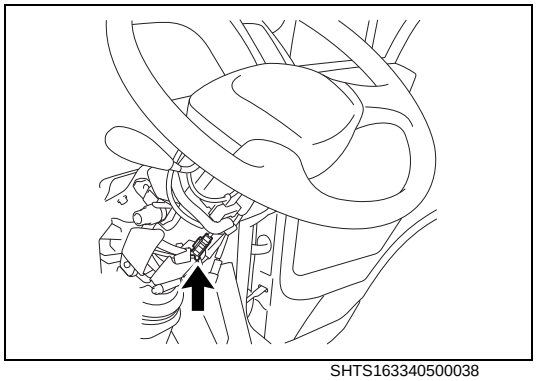
With continuity: Abnormality in cab main harness

YES

No continuity: Abnormality in airbag ECU

BAG SHORT-CIRCUITED TO BATT (DTC CODE B0103/ DIAGNOSIS MONITOR CODE 6)

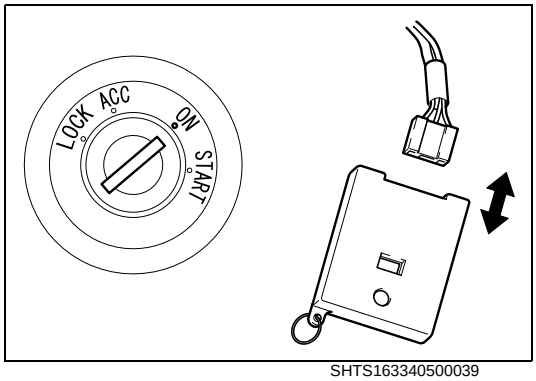
EN1633405F200008



SHTS163340500038

1. STEP 1

(1) Turn the starter switch to the "LOCK" position. After more than 90 seconds, remove the steering column cover and then disconnect the yellow connector of the spiral cable (SRC) at the lower steering column.



SHTS163340500039

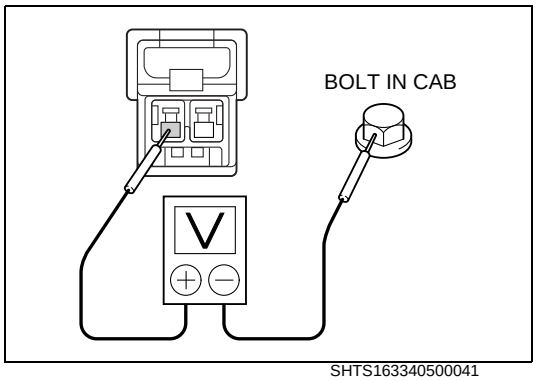
(2) Turn the starter switch "ON" and connect the diagnosis monitor, and remove it once to delete past malfunctions. Connect it again and check if the present malfunction is indicated as the diagnosis monitor code 3.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0101.

NO

YES

DTC code B0103/ diagnosis monitor code 6: Proceed to STEP 3.



SHTS163340500041

2. STEP 2

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the airbag module.
Refer to the section **"AIRBAG MODULE"** in the chapter **"CAB EQUIPMENT"**.

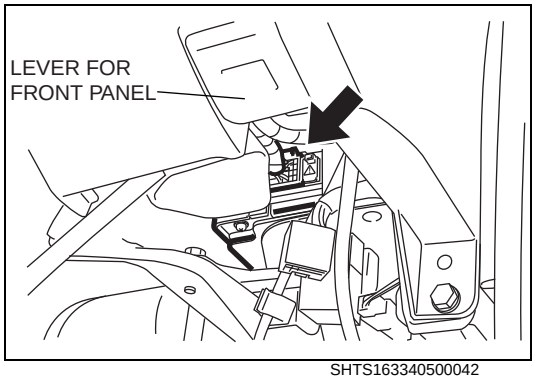
(2) Turn the starter switch "ON" and check if the voltage is 0V between the GND and the yellow connector terminal on the inflator side of the steering column SRC.
Standard value: 0V

NO

YES

With voltage: Abnormality in SRC

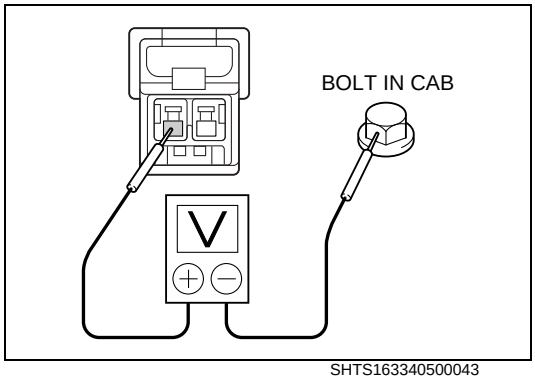
Voltage 0V: Abnormality in airbag module



SHTS163340500042

3. STEP 3

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.



SHTS163340500043

(2) Turn the starter switch "ON" and check if the voltage is 0V between the GND and the yellow connector terminal of the cab main harness at the lower steering column.
Standard value: 0V

NO

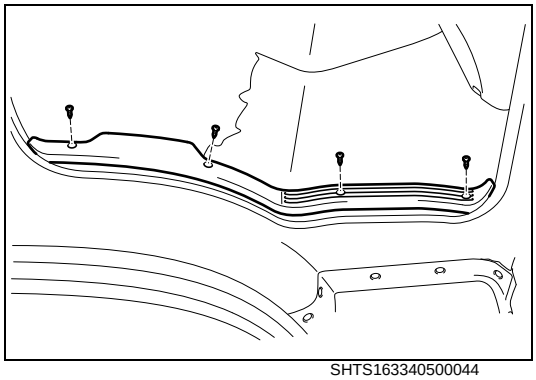
With voltage: Abnormality in cab main harness

YES

Voltage 0V: Abnormality in airbag ECU

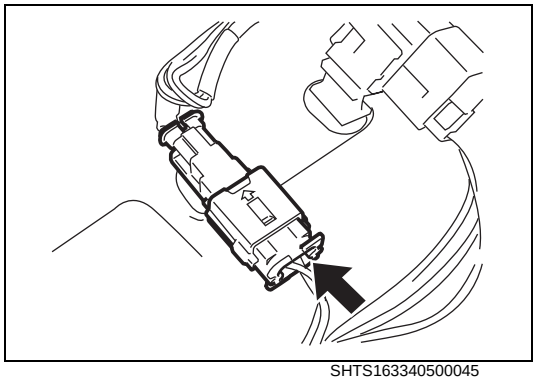
SHORT-CIRCUITING OF PRETENSIONER (DTC CODE B0130/ DIAGNOSIS MONITOR CODE 7)

EN1633405F200009


SHTS163340500044

1. STEP 1

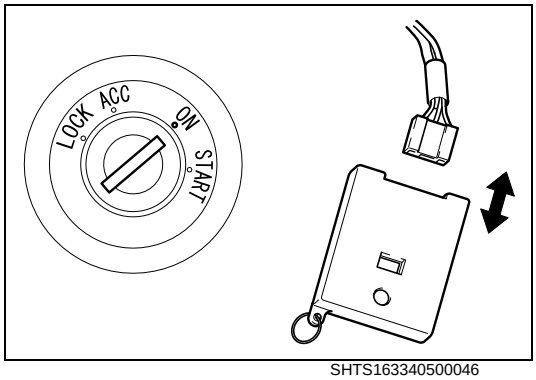
(1) Remove the driver's seat.
(2) Remove the bed if equipped and then the bar supporting the bottom of the bed.
(3) Remove the floor console and parking brake lever console.
(4) Remove the scuff plate.
(5) Pull up the floor carpet.
(6) Remove the seat belt anchor.


SHTS163340500045

(7) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the cab floor.

HINT

Push and separate in the direction of the arrow.



SHTS163340500046

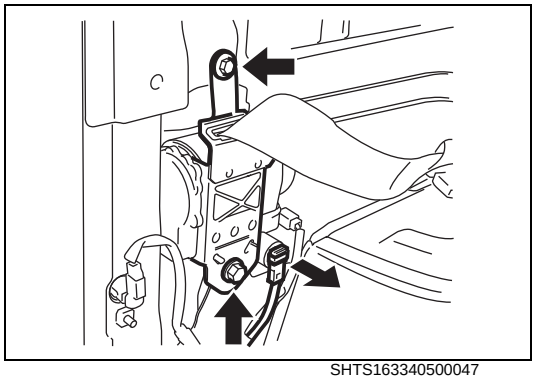
(8) Turn the starter switch "ON" and connect the diagnosis monitor to delete past malfunctions. Then, check if the present malfunction is indicated as the diagnosis monitor code 8.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0131.

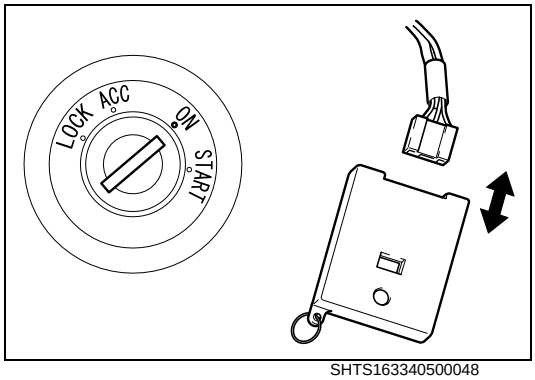
NO

YES

DTC code B0130/ diagnosis monitor code 7: Abnormality in airbag ECU or cab main harness



SHTS163340500047



SHTS163340500048

2. STEP 2

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, securely connect the yellow connector of the cab floor.

(2) Remove the seat belt tensioner.
Refer to the section **"SEAT BELT WITH ELR PRETENSIONER"** in the chapter **"CAB EQUIPMENT"**.

(3) Pull up the black portion to unlock and disconnect the yellow connector.

(4) Turn the starter switch "ON" and connect the diagnosis monitor, and remove it once to delete past malfunctions. Connect it again and check if the present malfunction is indicated as the diagnosis monitor code 8.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0131.

NO

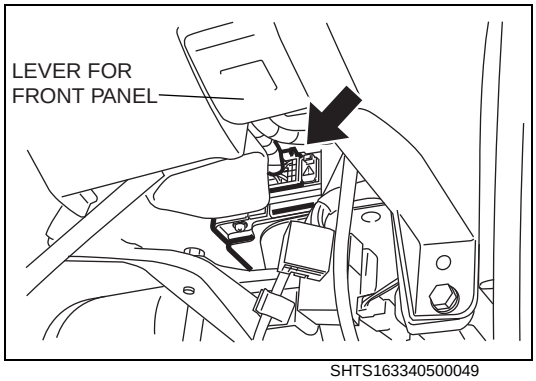
DTC code B0130/ diagnosis monitor code 7: Harness abnormality between the cab floor and seat belt tensioner

YES

DTC code B0131/ diagnosis monitor code 8: Abnormality in seat belt tensioner

OPENING PRETENSIONER
(DTC CODE B0131/ DIAGNOSIS MONITOR CODE 8)

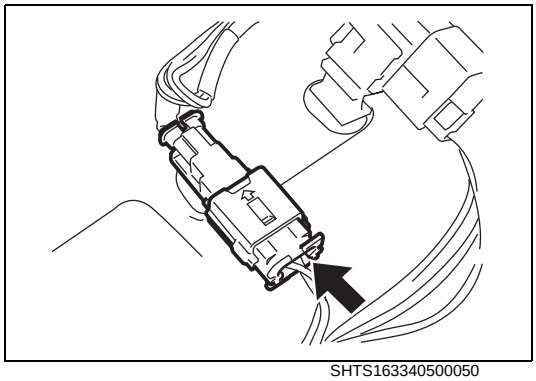
EN1633405F200010



SHTS163340500049

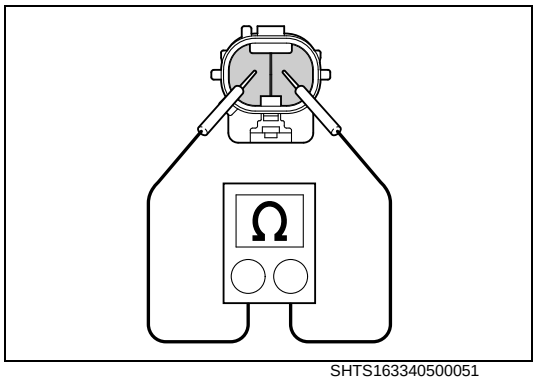
1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.


SHTS163340500050

(2) Disconnect the yellow connector of the cab floor.
Refer to **"SHORT-CIRCUITING OF PRETENSIONER (DTC CODE B0130/ DIAGNOSIS MONITOR CODE 7)"**.

HINT
Push and separate in the direction of the arrow.



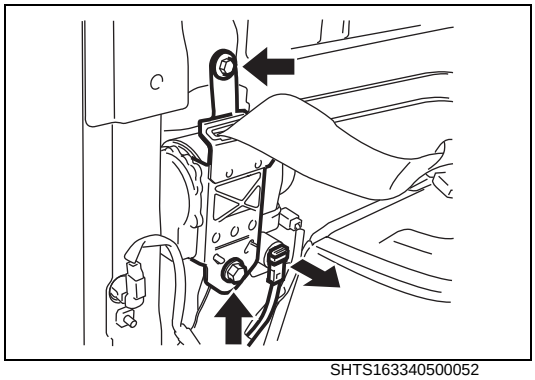
SHTS163340500051

(3) Check the continuity between the yellow connector terminals on the cab main harness side of the cab floor by measuring the resistance.
Standard value: 0-5 Ω

NO

No continuity: Abnormality in cab main harness

YES

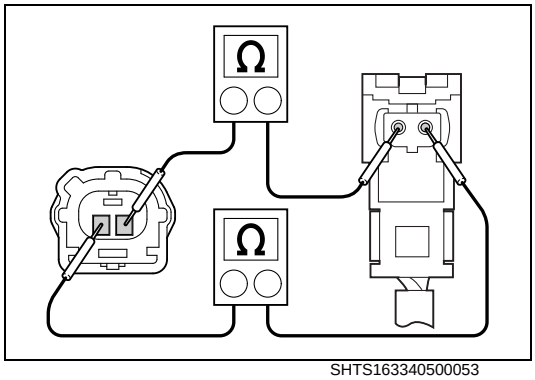


SHTS163340500052

2. STEP 2

(1) Remove the seat belt tensioner.
Refer to the section **"SEAT BELT WITH ELR PRETENSIONER"** in the chapter **"CAB EQUIPMENT"**.

(2) Pull up the black portion to unlock and disconnect the yellow connector.



SHTS163340500053

(3) Check the continuity between the yellow connector terminals of the cab floor and the cab harness on the seat belt tensioner side by measuring the resistance.
Standard value:0-5 Ω

NO

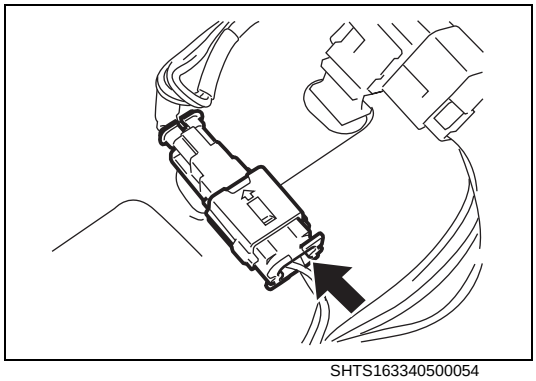
No continuity: Harness abnormality between the cab floor and seat belt tensioner

YES

With continuity: Abnormality in airbag ECU or seat belt tensioner

PRETENSIONER SHORT-CIRCUITED TO GND (DTC CODE B0132/ DIAGNOSIS MONITOR CODE 9)

EN1633405F200011



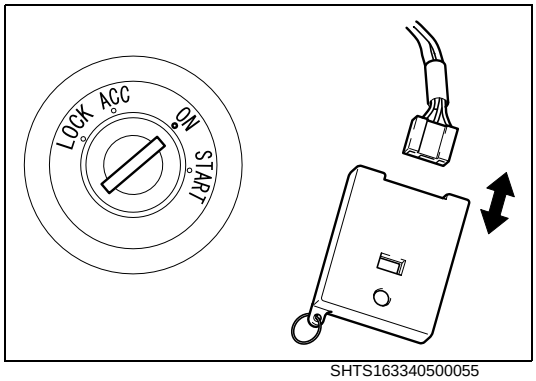
SHTS163340500054

1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the cab floor. Refer to **"SHORT-CIRCUITING OF PRETENSIONER (DTC CODE B0130/ DIAGNOSIS MONITOR CODE 7)"**.

HINT

Push and separate in the direction of the arrow.



SHTS163340500055

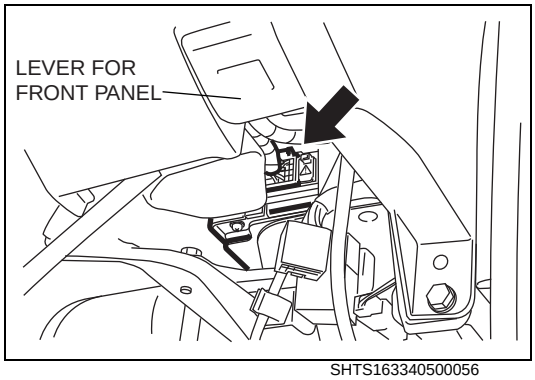
(2) Turn the starter switch "ON" and connect the diagnosis monitor to delete past malfunctions. Then, check if the present malfunction is indicated as the diagnosis monitor code 9.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0132.

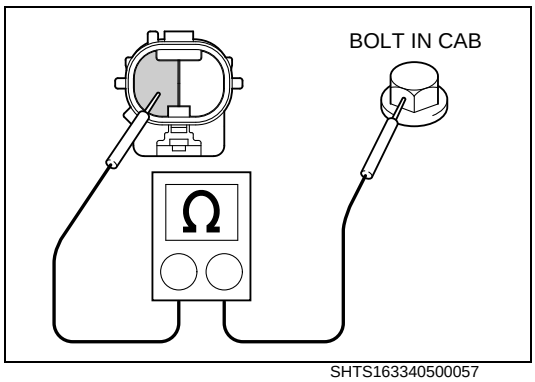
NO

YES

DTC code B0131/ diagnosis monitor code 8: Proceed to STEP 3.



SHTS163340500056



SHTS163340500057

2. STEP 2

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.

(2) Check if there is no continuity between the yellow connector terminal on the cab main harness side of the cab floor and the bolt in the cab.

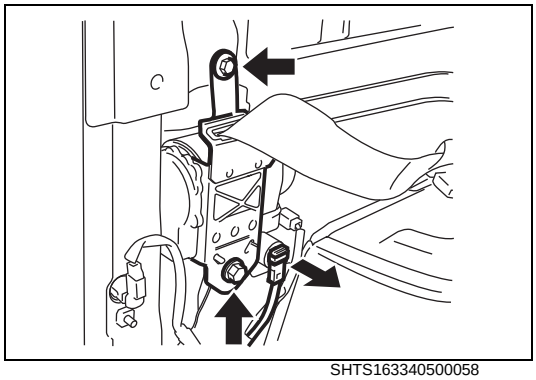
Standard value: No continuity

NO

With continuity: Abnormality in cab main harness

YES

No continuity: Abnormality in airbag ECU

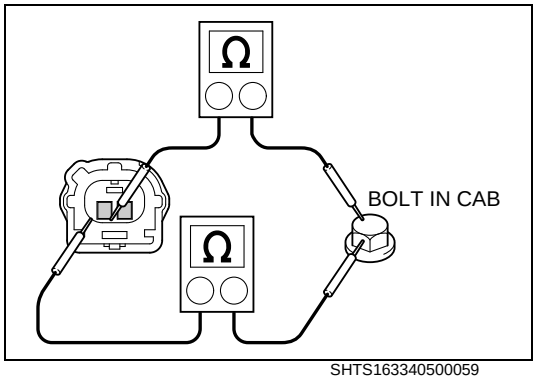


SHTS163340500058

3. STEP 3

(1) Remove the seat belt tensioner.
Refer to the section **"SEAT BELT WITH ELR PRETENSIONER"** in the chapter **"CAB EQUIPMENT"**.

(2) Pull up the black portion to unlock and disconnect the yellow connector.



SHTS163340500059

(3) Check if there is no continuity between the GND and the yellow connector on the pretensioner side of the cab floor.
Standard value: No continuity

NO

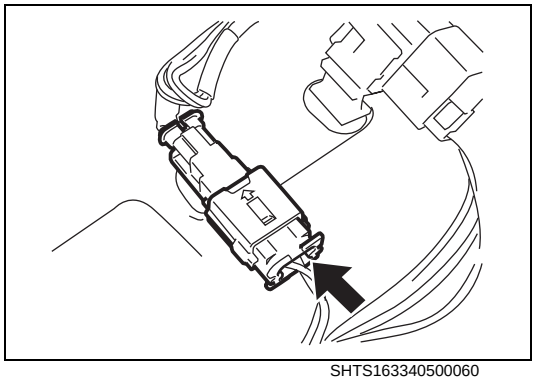
With continuity: Harness abnormality between the cab floor and pretensioner

YES

No continuity: Abnormality in pretensioner

PRETENSIONER SHORT-CIRCUITED TO BATT (DTC CODE B0133/ DIAGNOSIS MONITOR CODE 11)

EN1633405F200012



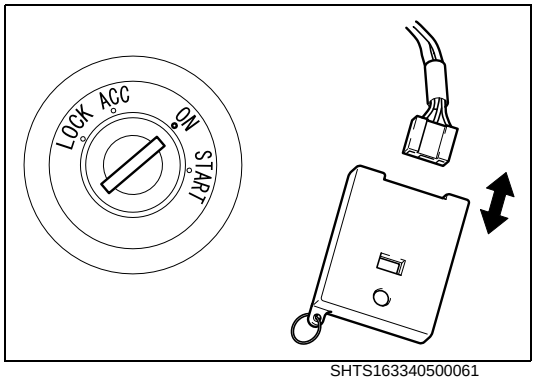
SHTS163340500060

1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the cab floor. Refer to **"SHORT-CIRCUITING OF PRETENSIONER (DTC CODE B0130/ DIAGNOSIS MONITOR CODE 7)"**.

HINT

Push and separate in the direction of the arrow.



SHTS163340500061

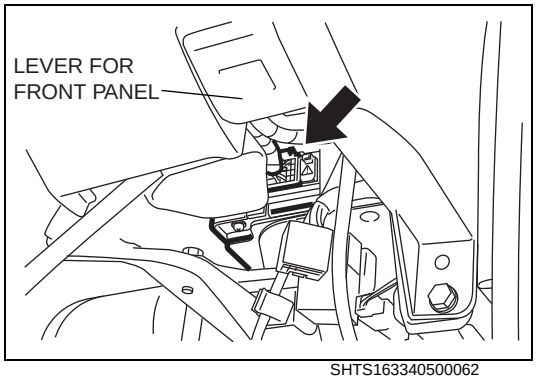
(2) Turn the starter switch "ON" and connect the diagnosis monitor to delete past malfunctions. Then, check if the present malfunction is indicated as the diagnosis monitor code 11.

When using Hino-DX, first delete past malfunctions. Then, check if the present malfunction is displayed as the DTC code B0133.

NO

YES

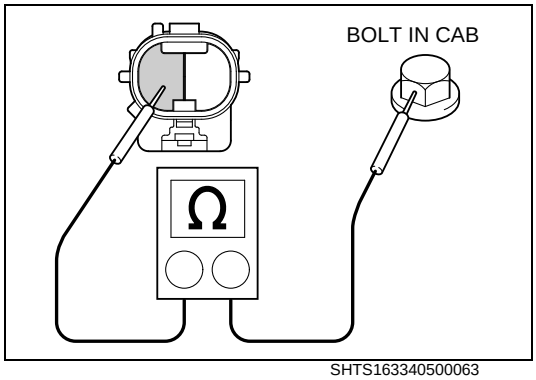
DTC code B0131/ diagnosis monitor code 8: Proceed to STEP 3.



SHTS163340500062

2. STEP 2

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.



SHTS163340500063

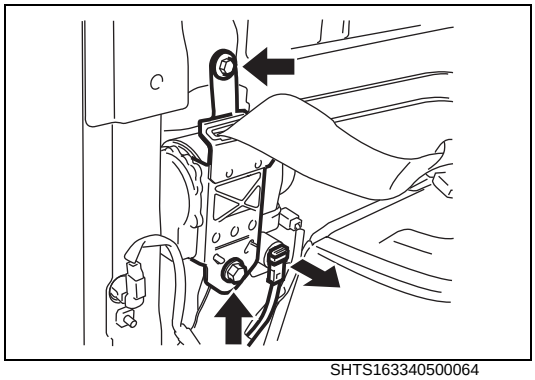
(2) Turn the starter switch "ON" and check if the voltage is 0V between the GND and the yellow connector terminal on the cab main harness side of the cab floor.
Standard value: 0V

NO

With voltage: Abnormality in cab main harness

YES

Voltage 0V: Abnormality in airbag ECU

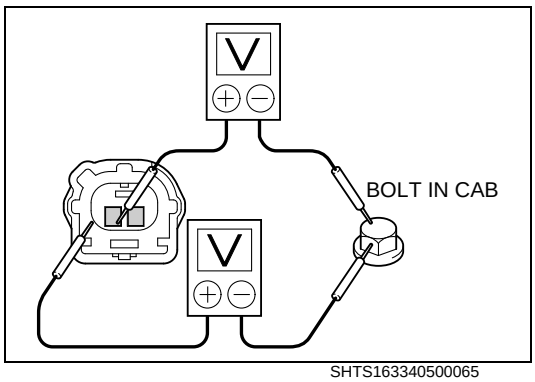


SHTS163340500064

3. STEP 3

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, remove the seat belt tensioner.
Refer to the section **"SEAT BELT WITH ELR PRETENSIONER"** in the chapter **"CAB EQUIPMENT"**.

(2) Pull up the black portion to unlock and disconnect the yellow connector.



SHTS163340500065

(3) Turn the starter switch "ON" and check if the voltage is 0V between the GND and the yellow connector terminal on the pretensioner side of the cab floor.
Standard value: 0V

NO

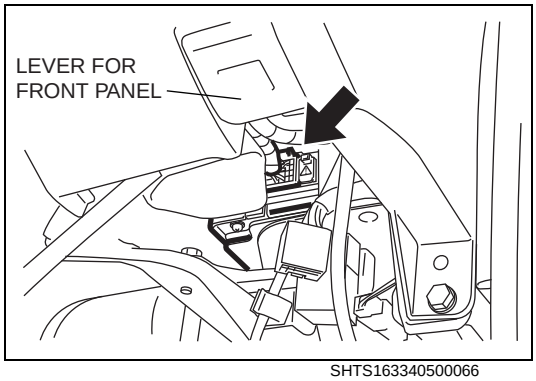
With voltage: Harness abnormality between the cab floor and pretensioner

YES

Voltage 0V: Abnormality in pretensioner

POWER SUPPLY VOLTAGE REDUCTION (DTC CODE B2000/ DIAGNOSIS MONITOR CODE 12)

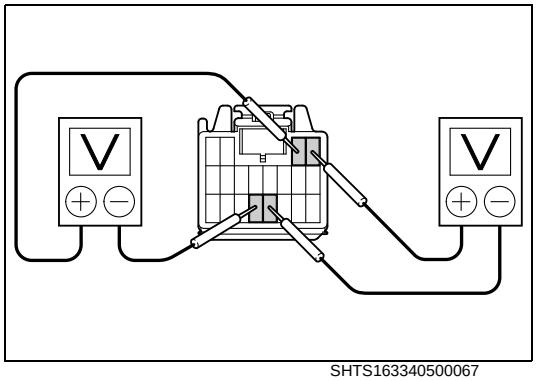
EN1633405F200013



SHTS163340500066

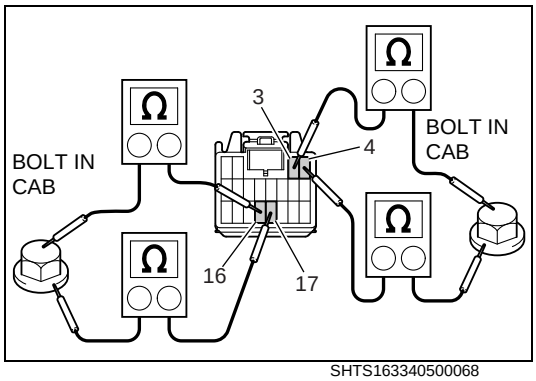
1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.



SHTS163340500067

(2) Turn the starter switch "ON" and measure the voltage between the terminals of the airbag ECU connector of the cab main harness as shown in the figure.
Standard value: 20-28V



SHTS163340500068

(3) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, check if the continuity with the GND is within the standard range.

Terminal No.	Standard value
3	No continuity
4	No continuity
16	With continuity
17	With continuity

NO

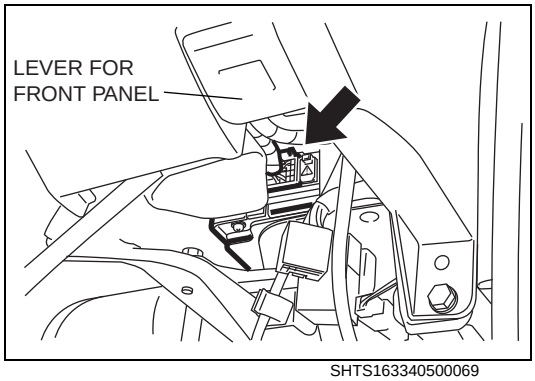
Out of standard range: Abnormality in cab main harness, power supply, or GND system

YES

Within standard range: Abnormality in airbag ECU

WARNING LIGHT CIRCUIT ABNORMALITY (DTC CODE B2002/ DIAGNOSIS MONITOR CODE 13)

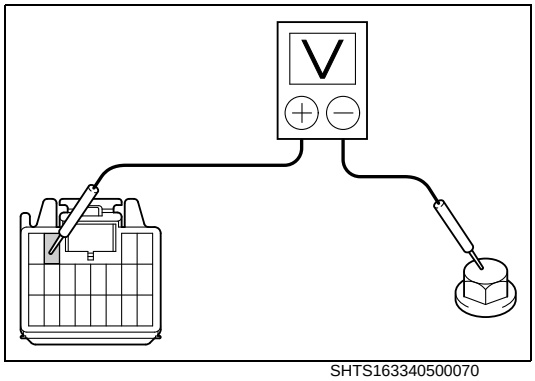
EN1633405F200014



SHTS163340500069

1. STEP 1

(1) Turn the starter switch to the "LOCK" position and, after more than 90 seconds, disconnect the yellow connector of the airbag ECU.



SHTS163340500070

(2) Turn the starter switch "ON" and check if the voltage between the GND and the 2nd terminal of the airbag ECU connector of the cab main harness is within the standard range.
Standard value: 3-7V

NO

YES

Out of standard range: Harness abnormality between airbag ECU and warning light or abnormality in warning light

Within standard range: Abnormality in airbag ECU

WITH OR WITHOUT MALFUNCTION (DTC CODE B2003/ DIAGNOSIS MONITOR CODE 14)

EN1633405F200015

1. This code is indicated if the system is abnormal when the airbag ECU has been impacted and judges the operation of the airbag. The airbag ECU to which this code is indicated cannot be used again. Replace it with a new airbag ECU.

OPENING SAFING SENSOR
(DTC CODE B1103/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200016

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

SHORT CIRCUIT OF SAFING SENSOR
(DTC CODE B1101/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200017

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

IGNITION DRIVE CIRCUIT MALFUNCTION
(DTC CODE B1112/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200018

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

MALFUNCTION OF G SENSOR
(DTC CODE B1115/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200019

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

MALFUNCTION OF G SENSOR HIGH
(DTC CODE B1116/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200020

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

MALFUNCTION OF G SENSOR LOW
(DTC CODE B1117/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200021

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

VOLTAGE CONVERTER VOLTAGE ABNORMALITY
(DTC CODE B1121/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200022

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

BACKUP CAPACITOR'S CAPACITANCE ABNORMALITY (DTC CODE B1122/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200023

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

MONITOR CURRENT LIMIT CIRCUIT MALFUNCTION (DTC CODE B1124/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200024

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

CPU MONITOR FAILURE (DTC CODE B1125/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200025

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

ROM-RAM FAILURE (DTC CODE B1131/ DIAGNOSIS MONITOR CODE 16)

EN1633405F200026

1. This indicates a malfunction inside of the airbag ECU. Replace the airbag ECU. If a deletion of past malfunctions succeeds in recovering a proper state, it is not required to take further actions. Replace the airbag ECU if this code is indicated again.

OTHERS (CAN COMMUNICATION)

DN06-001

CAN COMMUNICATION.....DN06-2

CAN COMMUNICATION LINE DN06-2
HANDLING PRECAUTIONS DN06-2
INSPECTION WHEN CAN COMMUNICATION LINE IS ABNORMAL (MODELS WITH MANUAL TRANSMISSION) DN06-3
INSPECTION WHEN CAN COMMUNICATION LINE IS ABNORMAL (MODELS WITH AUTOMATIC TRANSMISSION) DN06-7

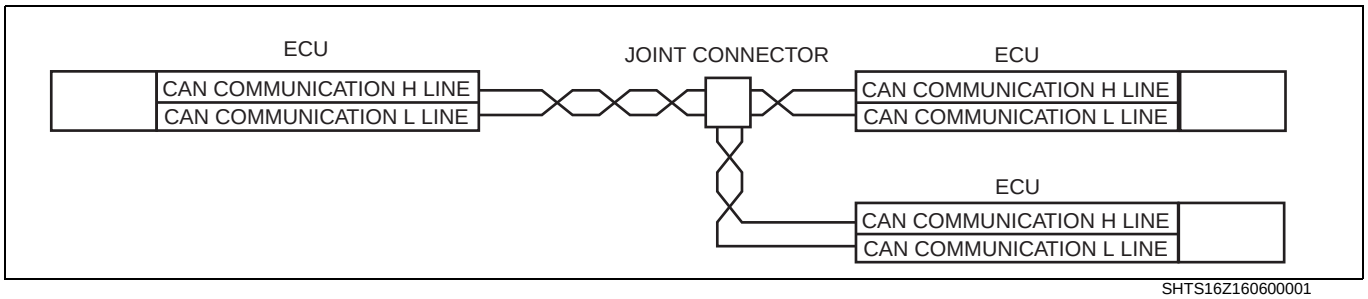
CAN COMMUNICATION

CAN COMMUNICATION LINE

EN16Z1606F200001

1. CAN COMMUNICATION LINE

(1) CAN communication line is composed of 2 harnesses namely the CAN communication H line and L line and a twist pair line is used for the harness.



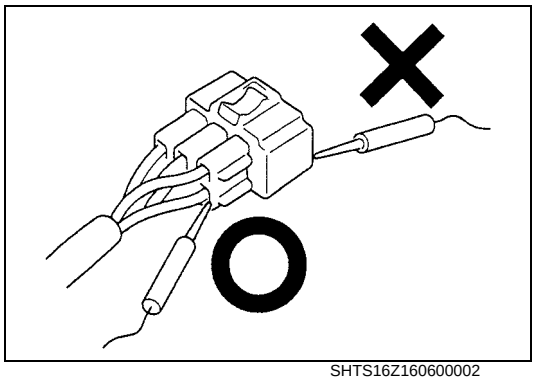
SHTS16Z160600001

NOTICE

Refer to the chapter "ELECTRIC DIAGRAM" for the detail of CAN circuit.

HANDLING PRECAUTIONS

EN16Z1606F200002



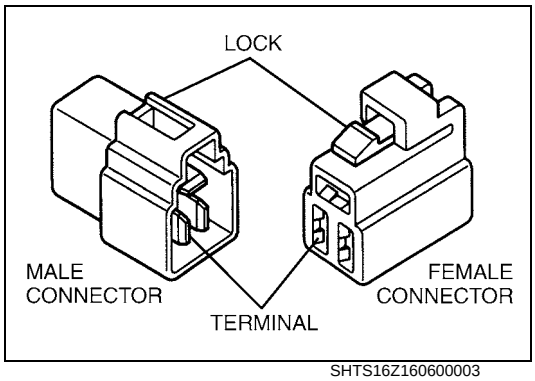
SHTS16Z160600002

1. ABOUT CONNECTORS

(1) Before performing the inspection operation, make sure that all connectors are connected securely.

(2) Do not contact the tester bar to the connection surface of the connector. This may cause terminal damage or a short-circuit.

(3) All connectors in the connector diagram are observed from the contact surfaces. However, the tester bar is put from the rear side.

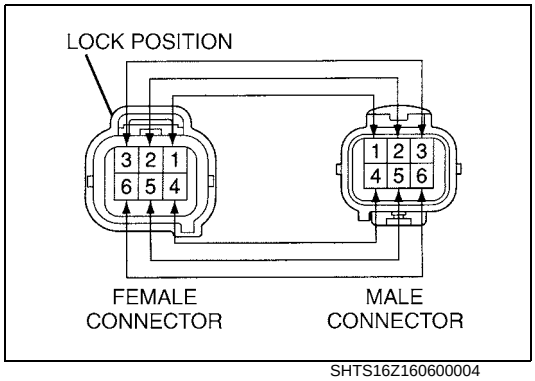


SHTS16Z160600003

(4) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



SHTS16Z160600004

(5) As for the terminal numbers of the connector, the first terminal is located on the top right terminal of the male connector and the top left terminal of the female connector.

Reference:

When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(6) When disconnecting the connector, be sure to set the starter switch to "LOCK".

2. ABOUT DIAGNOSIS MONITOR

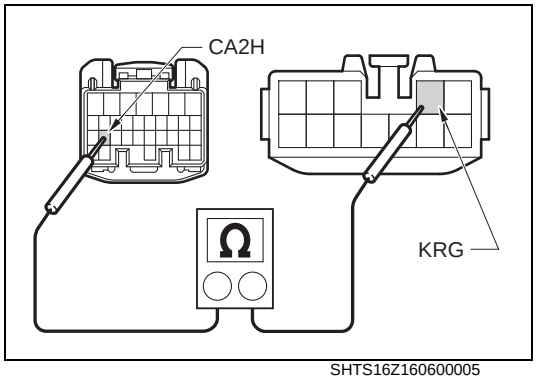
(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, erase the previous damage data.

(3) If a failure that makes the indicator light blink occurs, make sure to erase the past failure after repair has been completed. Otherwise the indicator light does not stop blinking even if the failure does not exist.

INSPECTION WHEN CAN COMMUNICATION LINE IS ABNORMAL (MODELS WITH MANUAL TRANSMISSION)

EN16Z1606F200003



SHTS16Z160600005

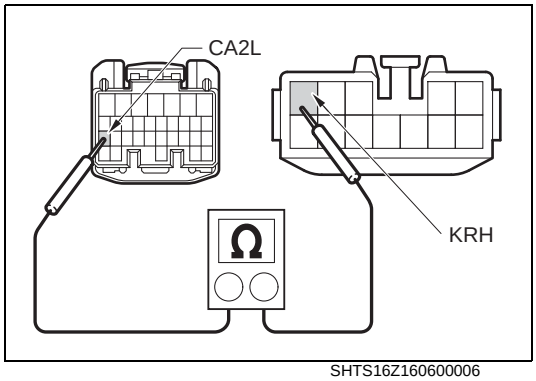
1. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

(1) Check the continuity between "CA2H" terminal of engine ECU connector (32 pin) and 4th (KRG) terminal of joint connector CAN (12 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600006

2. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

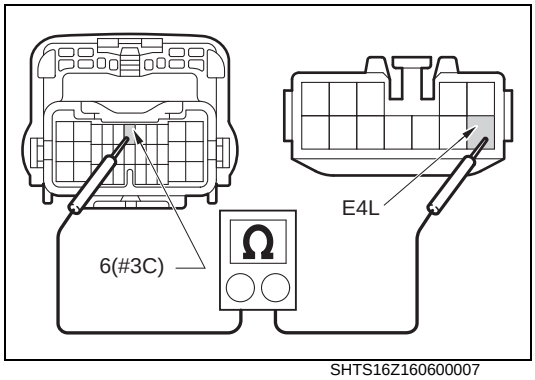
(1) Check the continuity between "CA2L" terminal of engine ECU connector (32 pin) and 1st (KRH) terminal of joint connector CAN (12 pin).

Standard: Continuity

NO → Replace the harness.

YES

Proceed to 3.



SHTS16Z160600007

3. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

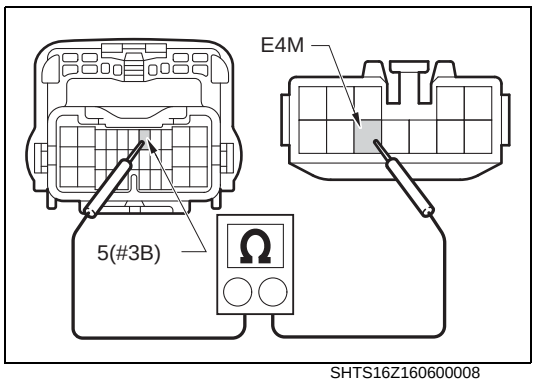
(1) Check the continuity between "MMT+" terminal of meter connector (22 pin) and 12th (E4L) terminal of joint connector CAN (12 pin).

Standard: Continuity

NO

Replace the harness.

YES



SHTS16Z160600008

4. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between "MMT-" terminal of meter connector (22 pin) and 8th (E4M) terminal of joint connector CAN (12 pin).

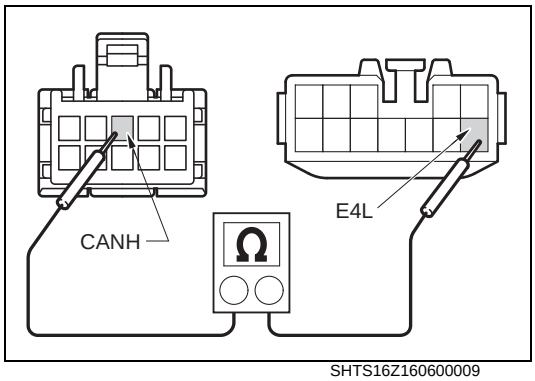
Standard: Continuity

NO

Replace the harness.

YES

Proceed to 7.



SHTS16Z160600009

5. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

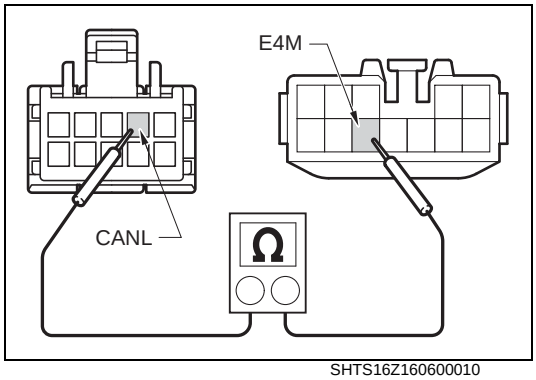
(1) Check the continuity between "CANH" terminal of drive master ECU connector (10 pin) and 12th (E4L) terminal of joint connector CAN (12 pin).

Standard: Continuity

NO

Replace the harness.

YES



SHTS16Z160600010

6. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between "CANL" terminal of drive master ECU connector (10 pin) and 8th (E4M) terminal of joint connector CAN (12 pin).

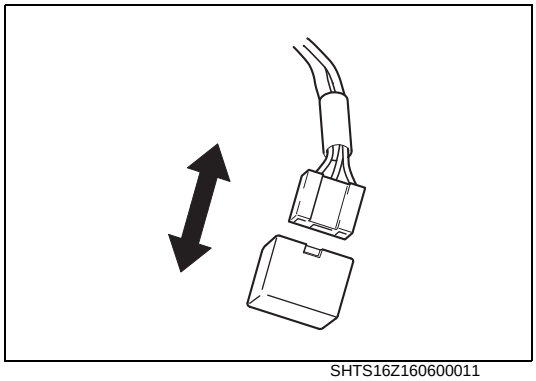
Standard: Continuity

NO

Replace the harness.

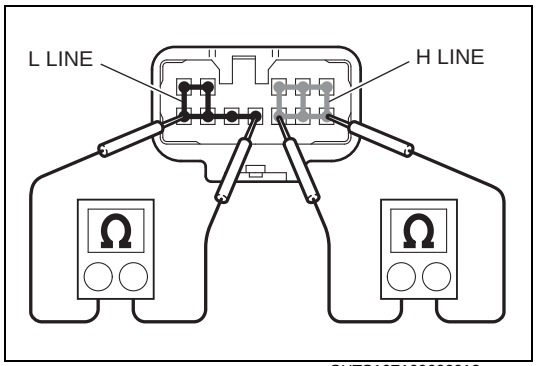
YES

Proceed to 7.


SHTS16Z160600011

7. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN CONNECTOR.

(1) Confirm that the joint connector CAN is plugged completely.



SHTS16Z160600012

(2) With the connector plugged, check the continuity between terminals of joint connector.

- Between terminals of CAN communication L line.
- Between terminals of CAN communication H line.

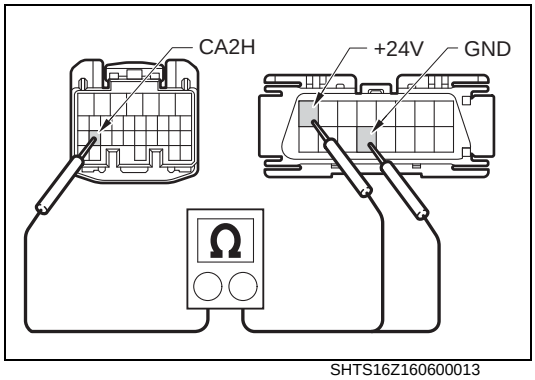
Standard: Continuity

NO

Replace or repair the connector.

YES

Proceed to 8.



SHTS16Z160600013

8. CHECK THE CONTINUITY BETWEEN CAN COMMUNICATION H LINE AND POWER LINE.

(1) Disconnect the connectors of all the ECU.
(2) Check the continuity between "CA2H" terminal of engine ECU connector (32 pin) and "+24V", "GND" terminals of diagnosis connector (16 pin).

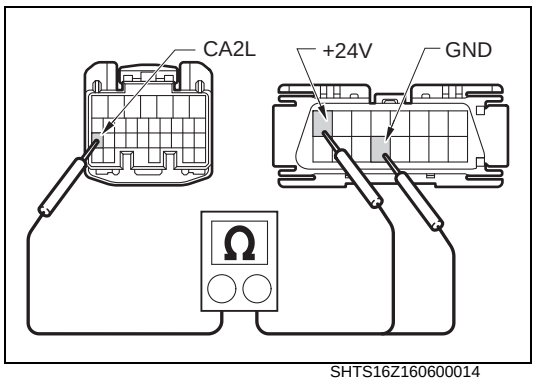
Standard: Continuity

NO

Proceed to 9.

YES

Replace all the CAN harness in case that either or both continuities between terminals "CA2H" and "+24V", "GND".



SHTS16Z160600014

9. CHECK THE CONTINUITY BETWEEN CAN COMMUNICATION L LINE AND POWER LINE.

(1) Check the continuity between "CA2L" terminal of engine ECU connector (32 pin) and "+24V", "GND" terminals of diagnosis connector (16 pin).

Standard: Continuity

NO

Proceed to 10.

YES

Replace all the CAN harness in case that either or both continuities between terminals "CA2L" and "+24V", "GND".

10. CONFIRM THE FAILURE ECU.

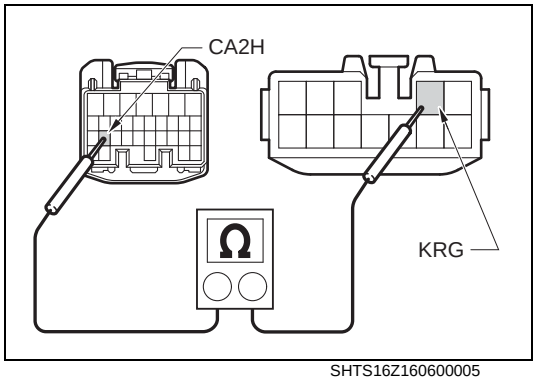
(1) Unplug the connectors of each ECU in turn, when the DTC code about CAN communication goes out, replace the corresponding ECU.

11. INSPECTION AFTER CORRECTION OF CAN COMMUNICATION LINE

(1) After completing repair of CAN communication line, run a test and verify that any failure does not occur.
(2) When any abnormal condition occurs again in the CAN communication line, inspect CAN communication line again.

INSPECTION WHEN CAN COMMUNICATION LINE IS ABNORMAL (MODELS WITH AUTOMATIC TRANSMISSION)

EN16Z1606F200004



SHTS16Z160600005

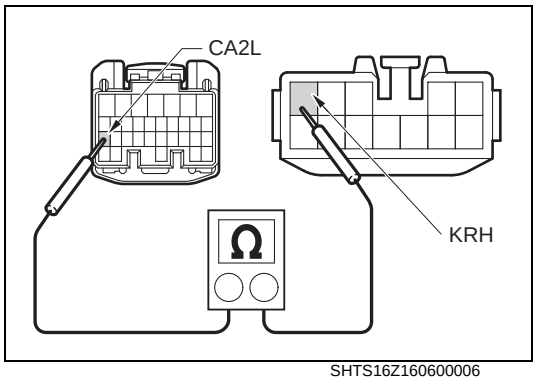
1. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

(1) Check the continuity between "CA2H" terminal of engine ECU connector (32 pin) and 4th (KRG) terminal of joint connector CAN (12 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600006

2. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

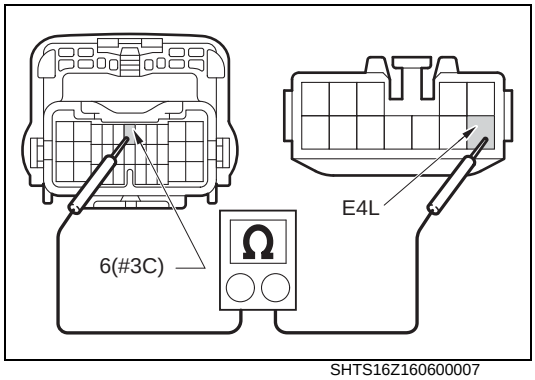
(1) Check the continuity between "CA2L" terminal of engine ECU connector (32 pin) and 1st (KRH) terminal of joint connector CAN (12 pin).

Standard: Continuity

NO → Replace the harness.

YES

Proceed to 3.



SHTS16Z160600007

3. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

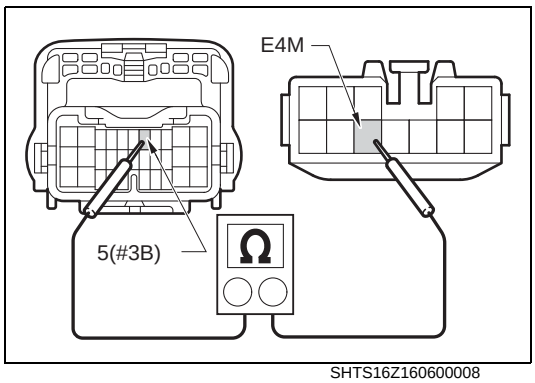
(1) Check the continuity between 12th (E4L) terminal of joint connector (12 pin) and 6th (#3C) terminal of wire to wire connector (34 pin).

Standard: Continuity

NO

Replace the harness.

YES



SHTS16Z160600008

4. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between 8th (E4M) terminal of joint connector (12 pin) and 5th (#3B) terminal of wire to wire connector (34 pin).

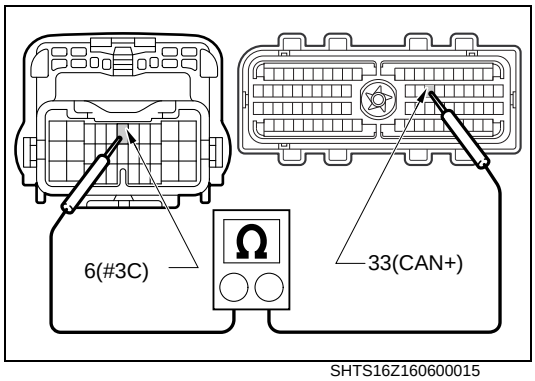
Standard: Continuity

NO

Replace the harness.

YES

Proceed to 7.



SHTS16Z160600015

5. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

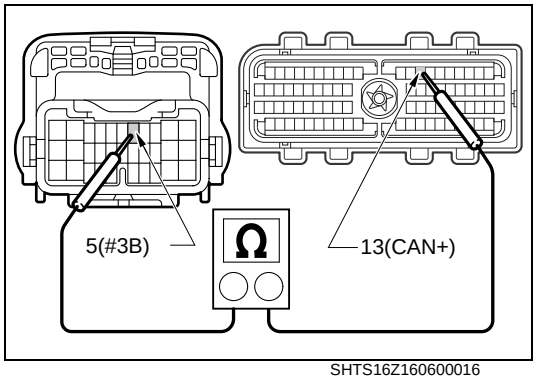
(1) Check the continuity between 6th (#3C) terminal of wire to wire connector (32 pin) and 33th (CAN+) terminal of AT connector (80 pin).

Standard: Continuity

NO

Replace the harness.

YES



SHTS16Z160600016

6. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between 5th (#3B) terminal of wire to wire connector (32 pin) and 13th (CAN-) terminal of AT connector (80 pin).

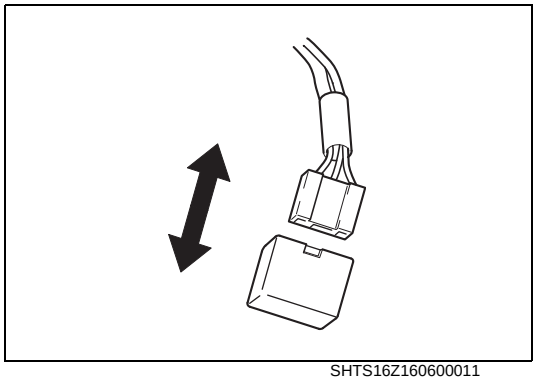
Standard: Continuity

NO

Replace the harness.

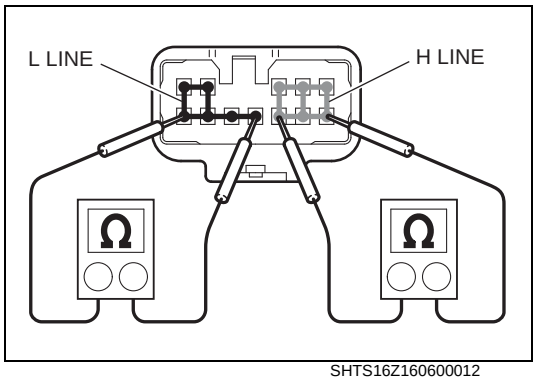
YES

Proceed to 16.


SHTS16Z160600011

7. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN CONNECTOR.

(1) Confirm that the joint connector CAN is plugged completely.



SHTS16Z160600012

(2) With the connector plugged, check the continuity between terminals of joint connector.

- Between terminals of CAN communication L line.
- Between terminals of CAN communication H line.

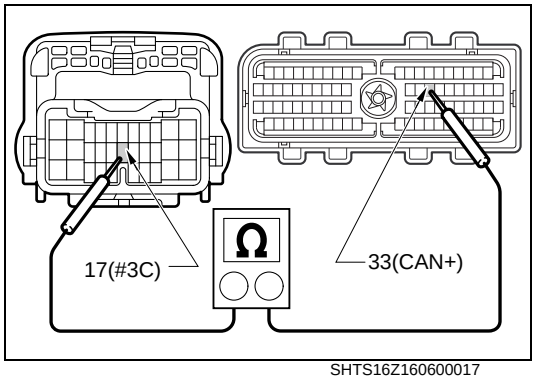
Standard: Continuity

NO

Replace or repair the connector.

YES

Proceed to 17.



SHTS16Z160600017

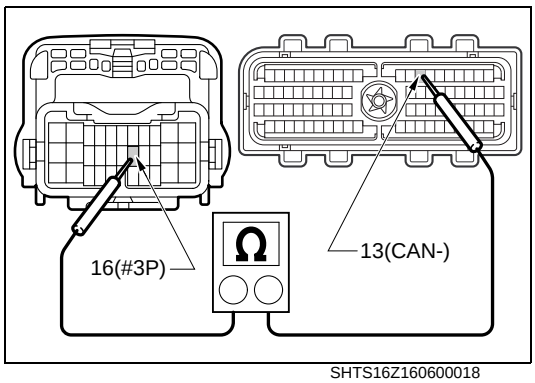
8. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

(1) Check the continuity between 17th (#3Q) terminal of wire to wire connector (34 pin) and 33th (CAN+) terminal of AT connector (80 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600018

9. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

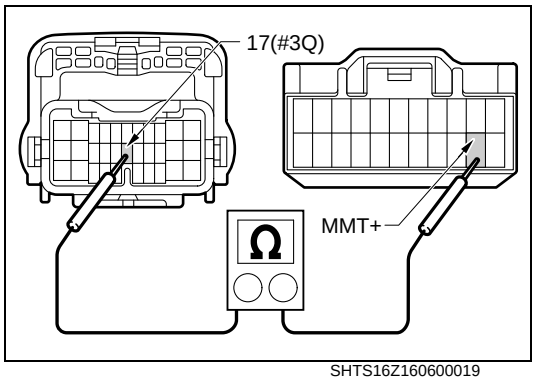
(1) Check the continuity between 16th (#3P) terminal of wire to wire connector (34 pin) and 13th (CAN-) terminal of AT connector (80 pin).

Standard: Continuity

NO → Replace the harness.

YES

Proceed to 17.



SHTS16Z160600019

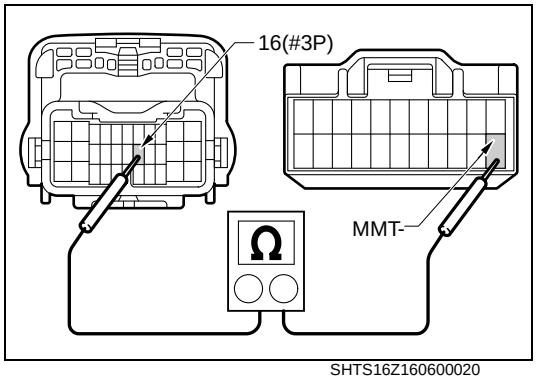
10. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

(1) Check the continuity between 17th (#3Q) terminal of wire to wire connector (32 pin) and "MMT+" terminal of meter connector (22 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600020

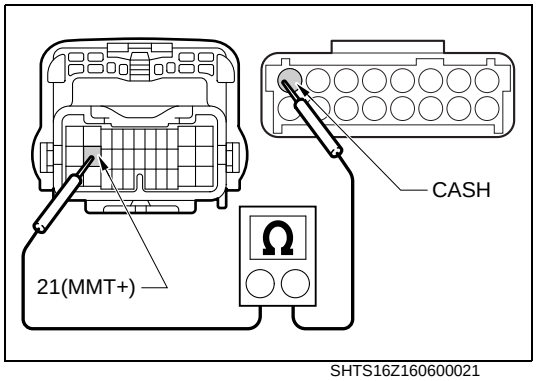
11. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between 16th (#3P) terminal of wire to wire connector (32 pin) and "MMT-" terminal of meter connector (22 pin).

Standard: Continuity

NO → Replace the harness.

YES → Proceed to 17.



SHTS16Z160600021

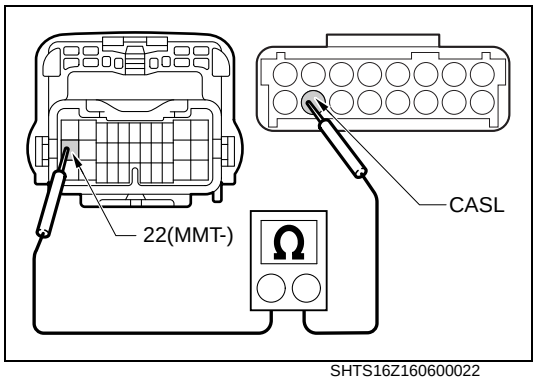
12. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

(1) Check the continuity between "CASH" terminal of AT selector connector (16 pin) and 21th (MMT+) terminal of meter ECU connector (34 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600022

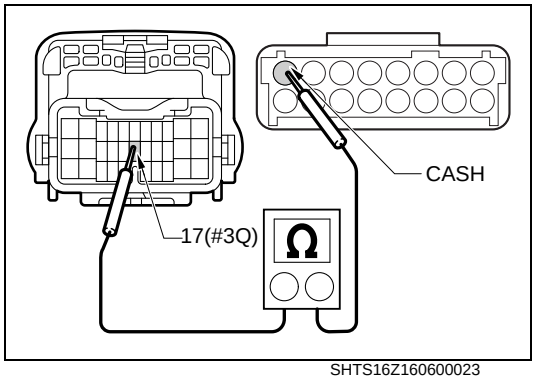
13. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between "CASL" terminal of AT selector connector (16 pin) and 22th (MMT-) terminal of meter ECU connector (34 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600023

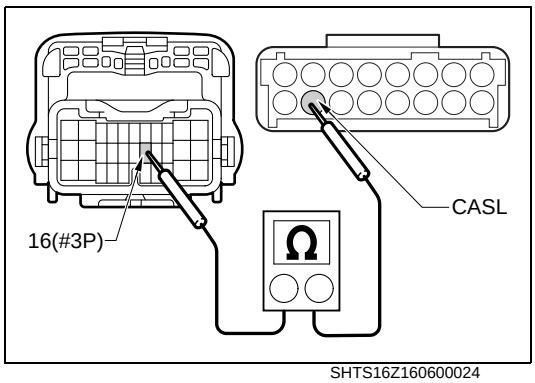
14. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION H LINE.

(1) Check the continuity between "CASH" terminal of AT selector connector (16 pin) and 17th (#3Q) terminal of wire to wire connector (32 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600024

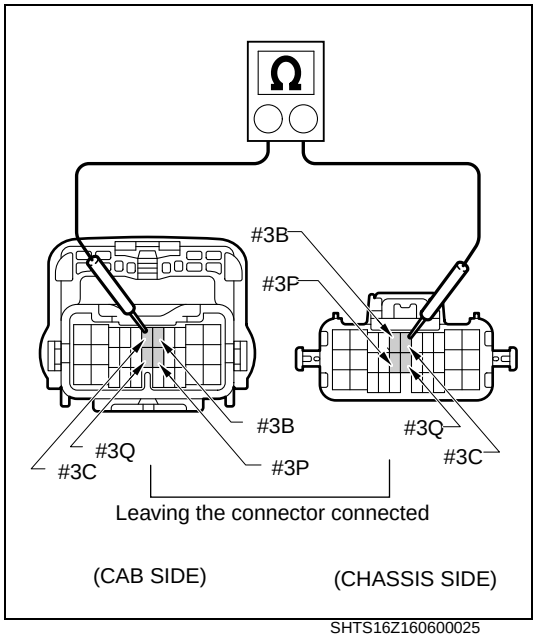
15. CHECK THE CONTINUITY BETWEEN TERMINALS OF CAN COMMUNICATION L LINE.

(1) Check the continuity between "CASL" terminal of AT selector connector (16 pin) and 16th (#3P) terminal of wire to wire connector (32 pin).

Standard: Continuity

NO → Replace the harness.

YES



SHTS16Z160600025

16. CHECK THE CONTINUITY BETWEEN TERMINALS OF WIRE TO WIRE CONNCTOR.

(1) Check the continuity #3C, #3B, #3Q and #3P terminal of wire to wire connector (32 pin).

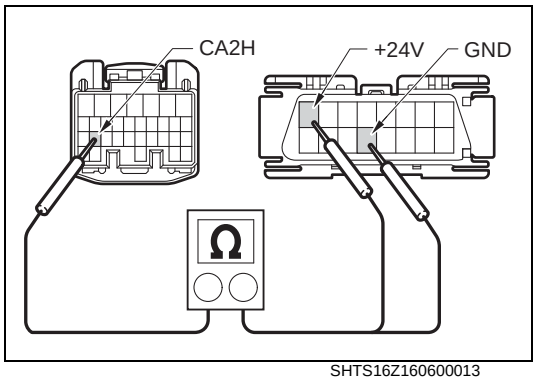
Standard: Continuity

NO

Replace or repair the wire to wire connector.

YES

Proceed to 17.



SHTS16Z160600013

17. CHECK THE CONTINUITY BETWEEN CAN COMMUNICATION H LINE AND POWER LINE.

(1) Disconnect the connectors of all the ECU.

(2) Check the continuity between "CA2H" terminal of engine ECU connector (32 pin) and "+24V", "GND" terminals of diagnosis connector (16 pin).

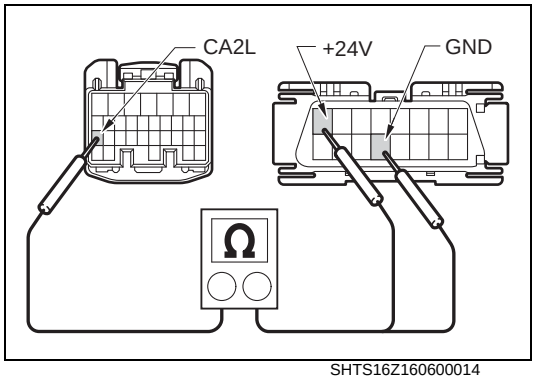
Standard: Continuity

NO

Proceed to 18.

YES

Replace all the CAN harness in case that either or both continuities between terminals "CA2H" and "+24V", "GND".



SHTS16Z160600014

18. CHECK THE CONTINUITY BETWEEN CAN COMMUNICATION L LINE AND POWER LINE.

(1) Check the continuity between "CA2L" terminal of engine ECU connector (32 pin) and "+24V", "GND" terminals of diagnosis connector (16 pin).

Standard: Continuity

NO → Proceed to 19.

YES → Replace all the CAN harness in case that either or both continuities between terminals "CA2L" and "+24V", "GND".

19. CONFIRM THE FAILURE ECU.

(1) Unplug the connectors of each ECU in turn, when the DTC code about CAN communication goes out, replace the corresponding ECU.

20. INSPECTION AFTER CORRECTION OF CAN COMMUNICATION LINE

(1) After completing repair of CAN communication line, run a test and verify that any failure does not occur.

(2) When any abnormal condition occurs again in the CAN communication line, inspect CAN communication line again.

OTHERS (HEADLIGHT AUTOLEVELING)

DN06-002

HEADLIGHT AUTOLEVELING DN06-2
OVERVIEW DN06-2
COMPONENT LOCATOR DN06-4
WRITING-IN OF CONTROLLED CONSTANT FOR AUTOLEVELING ECU DN06-7

FRONT VEHICLE HEIGHT SENSOR DN06-10
COMPONENT LOCATOR DN06-10
OVERHAUL DN06-12
ADJUSTMENT OF LINK ROD DN06-13

REAR VEHICLE HEIGHT SENSOR DN06-14
COMPONENT LOCATOR DN06-14
REPLACEMENT DN06-16
ADJUSTMENT OF LINK ROD DN06-17

FAILURE DIAGNOSIS DN06-18
HANDLING PRECAUTIONS DN06-18
ARRANGEMENT OF CONNECTOR PIN DN06-19
NON-OPERATION (WARNING LIGHT DISPLAY) DN06-20
NON-OPERATION (WARNING LIGHT NOT LIT) DN06-26
OPERATING (OCCASIONALLY WARNING LIGHT LIGHTING) DN06-30
FREQUENTLY OPERATING WHILE DRIVING (WARNING LIGHT GOES OFF) DN06-32
INITIAL SETTING NOT POSSIBLE (NO INITIAL SETTING YET: WARNING LIGHT FLASHING 2 TIMES. INITIAL SETTING DONE ONLY ONE TIME: WARNING LIGHT "OFF".) DN06-33
"CONSTANT" CAN NOT BE WRITTEN IN (WARNING LIGHT TURN OFF) DN06-35

HEADLIGHT AUTOLEVELING

OVERVIEW

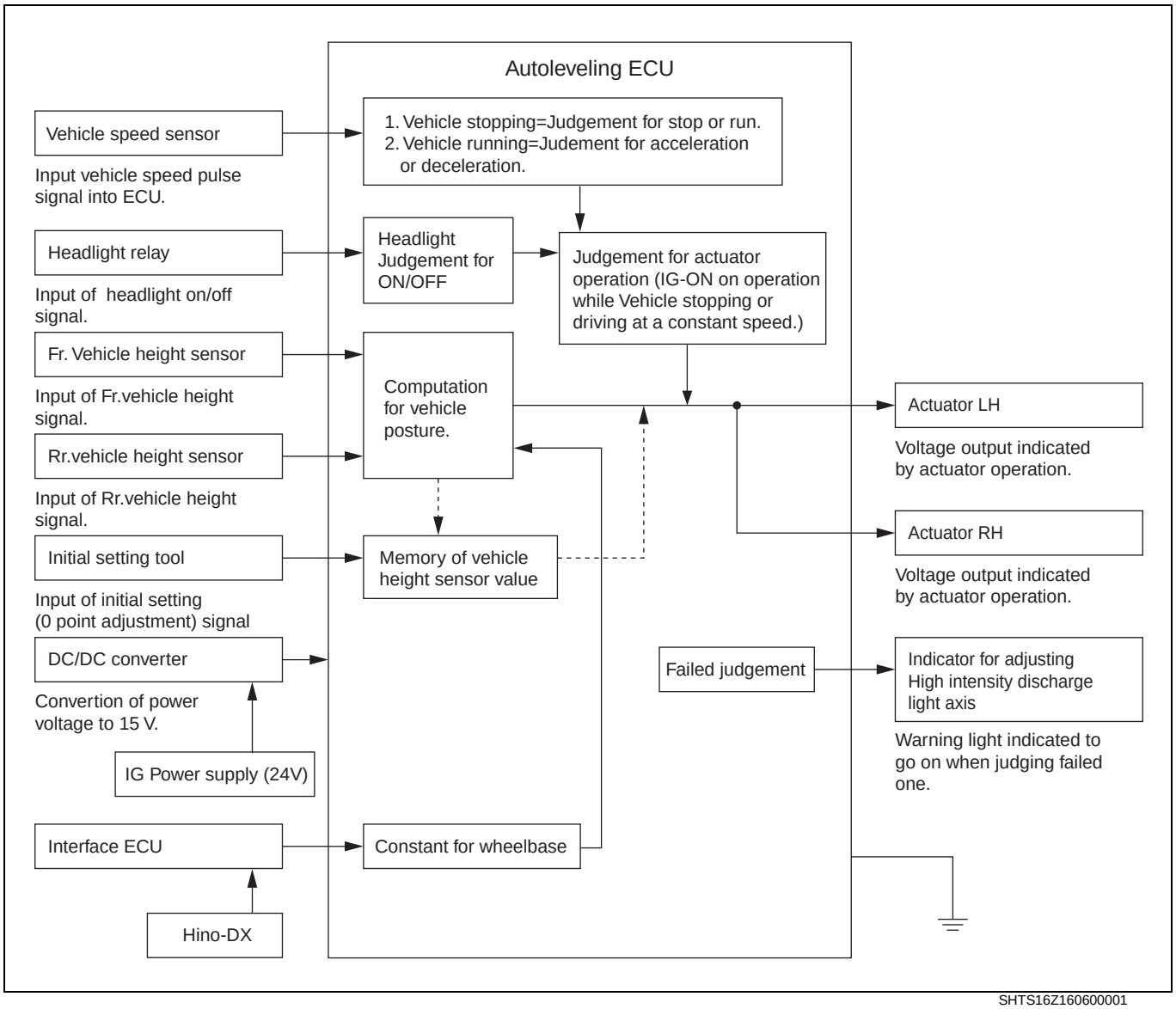
EN16Z1606C100001

FUNCTION

- Headlight autoleveling is a system which will be installed on models with discharge headlights, with which the upper or lower direction of the light axis will be ensured at a given level, regardless of vehicle posture change to be influenced by the loading condition on the rear body.
- The system will not only assure excellent visibility at night time, but will also prevent dazzling ray being shone against vehicle running ahead or oncoming vehicle.

SYSTEM

- Vehicle speed signal to be output by the speed sensor as well as vehicle height signal to be output by the vehicle height sensors installed on the LH front and LH rear wheels of the vehicle are inputted into the autoleveling ECU.
- The ECU will control the light axis of the headlight by computing a change of pitch angle of the vehicle posture with these signals and also wheelbase information memorized in the ECU, and by activating headlight actuator to respond against changing amount of the vehicle posture.



SHTS16Z160600001

COMPUTATION FOR CHANGE AMOUNT OF VEHICLE POSTURE

Basic formula (Vacant vehicle = Vehicle posture 0°)

$$\text{Vehicle posture (deg.)} = \tan^{-1}\left\{\frac{\text{*CA of Fr. Vehicle height (mm)} - \text{CA of Rr. Vehicle height (mm)}}{\text{Wheelbase (mm)}}\right\}$$

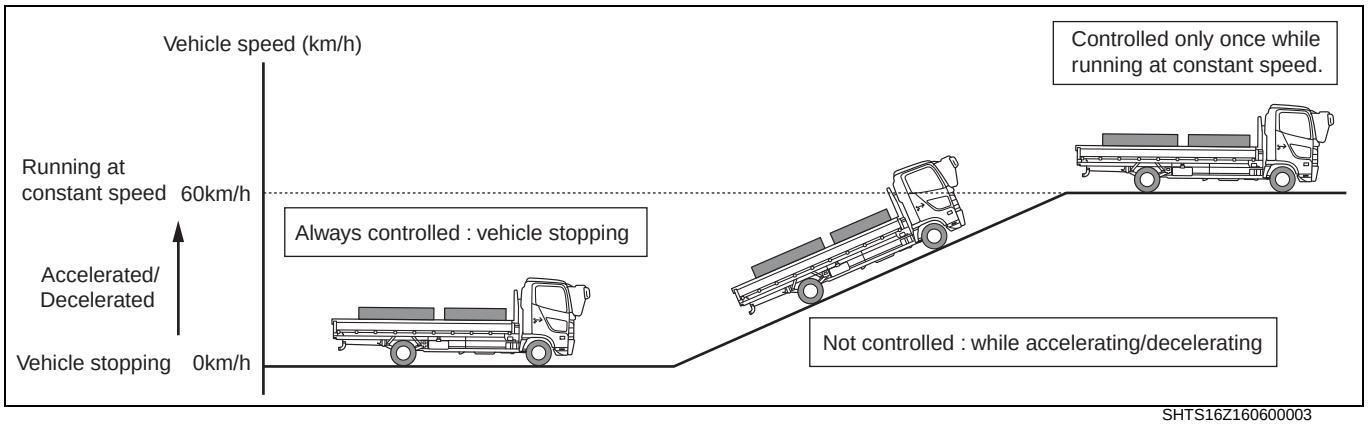
*CA : Change amount

SHTS16Z160600002

PARAMETER FOR LIGHT AXIS ADJUSTMENT

- Light axis control will be done by always reading the vehicle posture change while the vehicle is stopping.
- The light axis control will not be done while the vehicle accelerated or decelerates on road and running on severe roads. But, it will be done only once when the vehicle run at a constant speed between stop-run-stop to correct a wrong recognition of the vehicle posture to be memorized, for example when the vehicle is running over the road curb.

Vehicle status	Starter switch	Headlight	Remarks
Stopping	**ON**	**Lighting**	**Light axis always controlled.**
Running at constant speed	**ON**	**Lighting**	**Controlled only once when running at a given speed after starting out from stopping.**

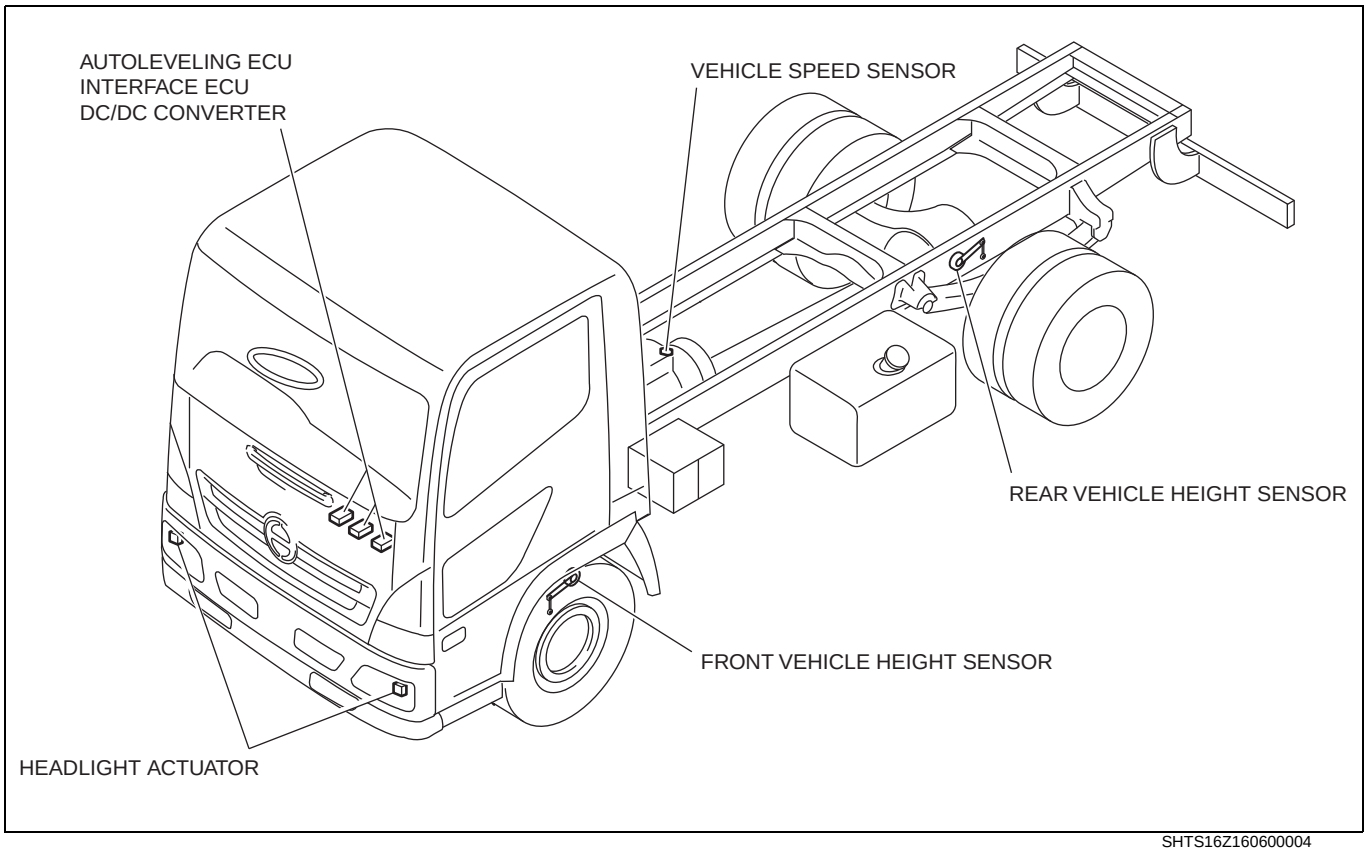


SHTS16Z160600003

COMPONENT LOCATOR

EN16Z1606D100001

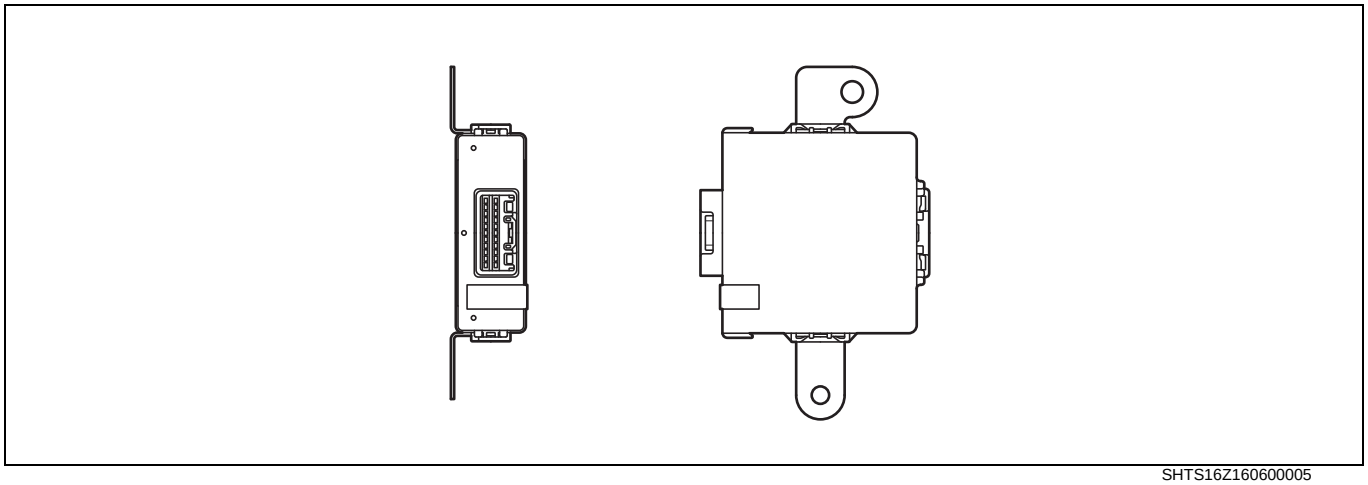
LOCATION OF COMPONENTS



SHTS16Z160600004

AUTOLEVELING ECU

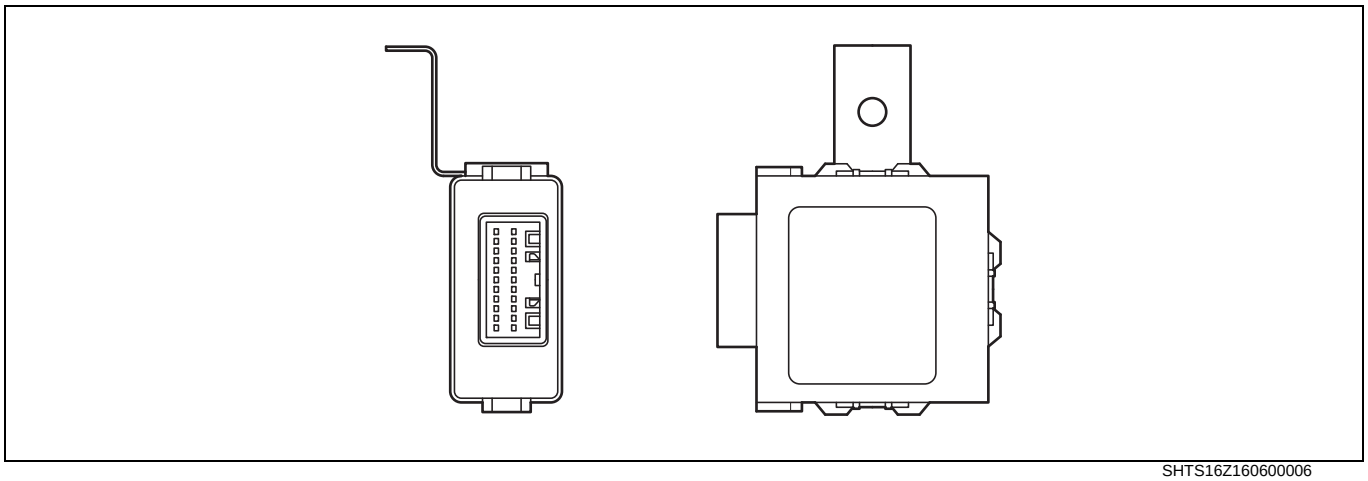
- Controls the autoleveling function.
- Controls the headlight actuator, by judging from the vehicle posture and running status with signals from the vehicle height sensor and the speed sensor.
- Once the system failure is detected, the autoleveling warning light will turn on at the meter-panel.



SHTS16Z160600005

INTERFACE ECU

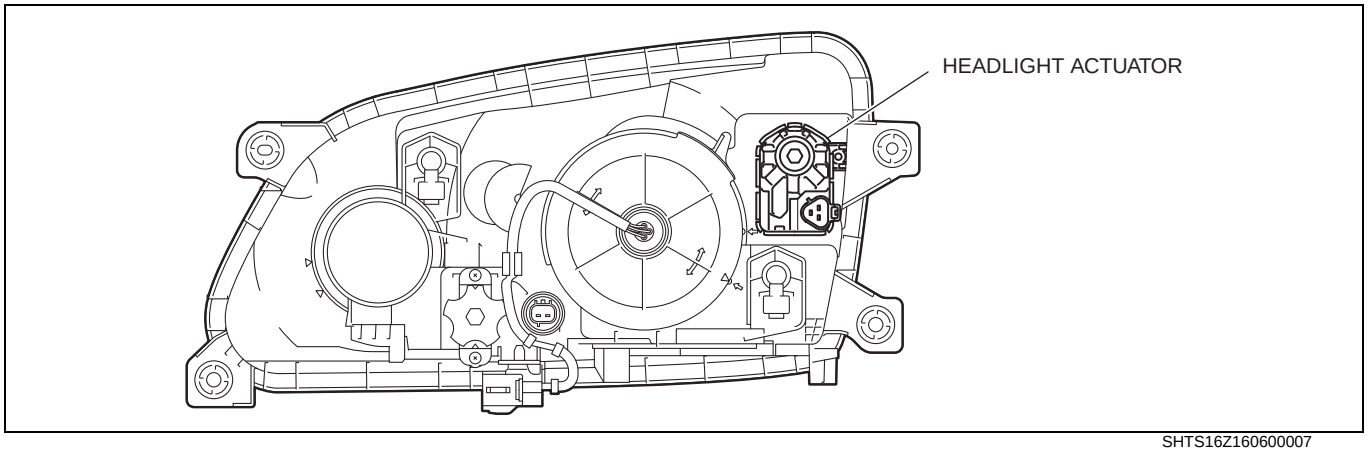
- For the autoleveling ECU, writing-in of the constant per vehicle model will be needed.
- The interface ECU will function between the autoleveling ECU and the writing-in tool (Hino-DX) as an interface when writing the constant.



SHTS16Z160600006

HEADLIGHT ACTUATOR

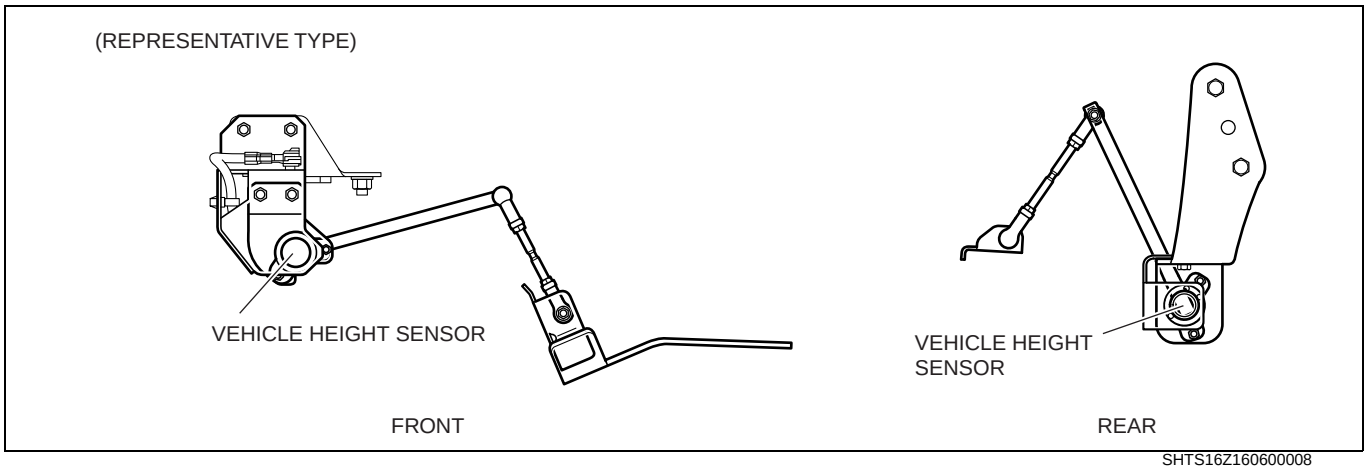
- By activating the low-beam headlights the toward upper/lower directions with control signals from the autoleveling ECU, light axis direction will be controlled.



SHTS16Z160600007

VEHICLE HEIGHT SENSOR (FRONT, REAR)

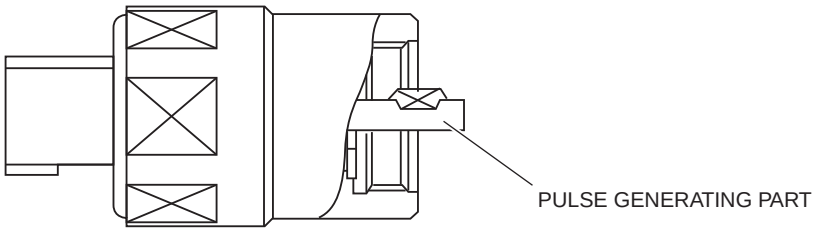
- By detecting the high/low height of the vehicle through the vehicle height sensor, installed at the front/rear part of the vehicle, it will output the vehicle height change signal in the autoleveling ECU.



SHTS16Z160600008

VEHICLE SPEED SENSOR

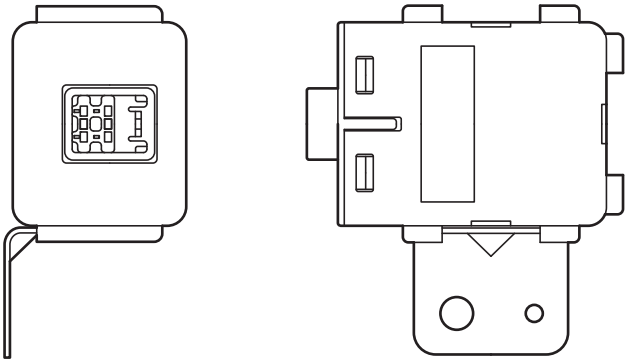
- It is composed of a hole IC and permanent magnet, which is installed at the take-out mouth for speed meter cable of transmission unit.
- It will detect the speed by signaling 8 pulses per one rotation of the drive axle.
- Vehicle speed sensor will be used commonly with the speed meter.



SHTS16Z160600009

DC/DC CONVERTER (24V→15V)

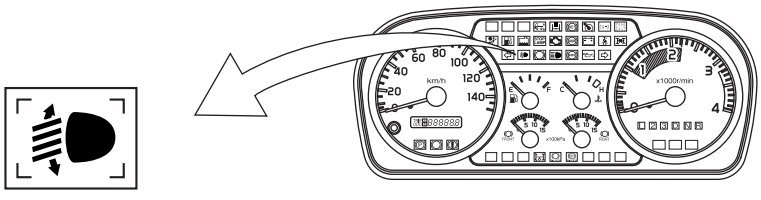
- It will supply the system with conversion of battery voltage of the vehicle.



SHTS16Z160600010

AUTOLEVELING WARNING LIGHT

- By a signal from the autoleveling ECU, the autoleveling warning light will turn on.



AUTOLEVELING WARNING LIGHT

SHTS16Z160600011

WRITING-IN OF CONTROLLED CONSTANT FOR AUTOLEVELING ECU

EN16Z1606H200001

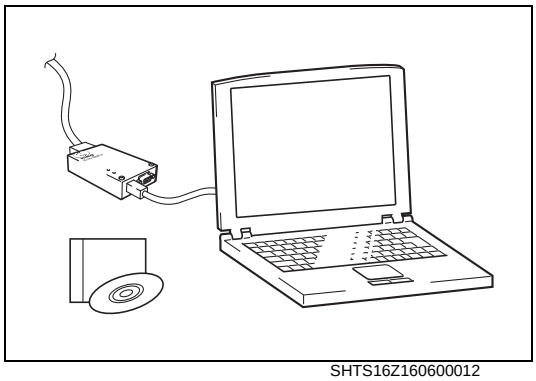
INTRODUCTION

1. INITIAL SETTING OF ECU (WRITING-IN OF CONROLLED CONSTANT)

(1) Due to the fact that the vehicle posture may change by model, a difference of installing rear body, etc., (Due to occurring of vehicular deviation during initial period), autoleveling ECU should be corrected on the basis of the vehicle posture without any load on the rear body, for which initial treatment (Writing-in of controlled constant) will be needed to be performed.

NOTICE

When changing the ECU, writing-in of controlled constant will be needed.



SHTS16Z160600012

2. Hino-DX

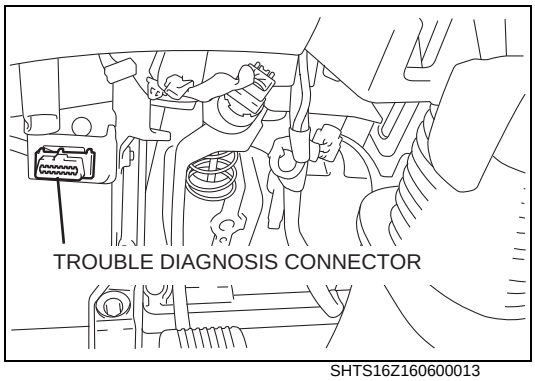
(1) Writing-in of the controlled constant of autoleveling ECU should be performed by Hino-DX.
To connect with the vehicle, an interface box (Hino Bowie) will be needed.

SST: Interface Box (Hino-Bowie) (09993-E9070)
Cable between vehicle & Hino-Bowie (S0904-21220)
Diagnosis software:
Hino Diagnostic eXplorer (Hino-DX)

HINT

- **Cable between Hino-Bowie & PC is packed in a set with the Hino Bowie. Use either for RS-232 or for USB.**
- **Read the manual, attached to the Hino-Bowie.**
- **Install the software of Hino Diagnostic eXplorer (Hino-DX) on the PC unit. Refer to the manual attached to CD for installing procedures.**

CONNECTION OF HINO-DX AND WRITING-IN OF CONTROLLED CONSTANT



SHTS16Z160600013

1. CONNECTION OF HINO-DX.

(1) Connect the Hino-Bowie with the trouble diagnosis connector, located at the lower part of LH under the instrument panel of the driver's seat.

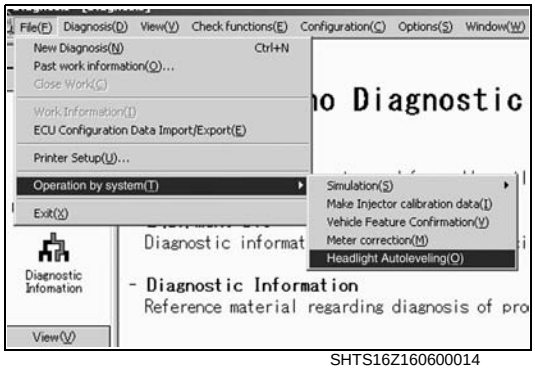
(2) Connect Hino-Bowie with the PC unit, on which the Hino-DX is installed.

(3) Turn the starter switch to "ON" position.

(4) Turn on the power of the PC to start up the Hino-DX.

HINT

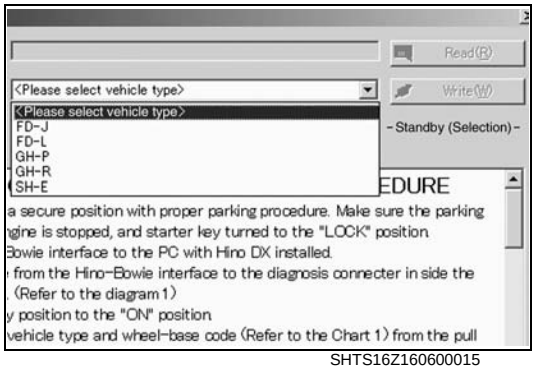
When using the Hino-Bowie, the power will come "ON" the moment it is connected with the vehicle and the power light (Red) on Hino-Bowie unit will turn on.



SHTS16Z160600014

2. PROCEDURE ON HOW TO WRITE-IN THE CONTROLLED CONSTANT

(1) Select "File", "Operation by system", then "Headlight autoleveling".

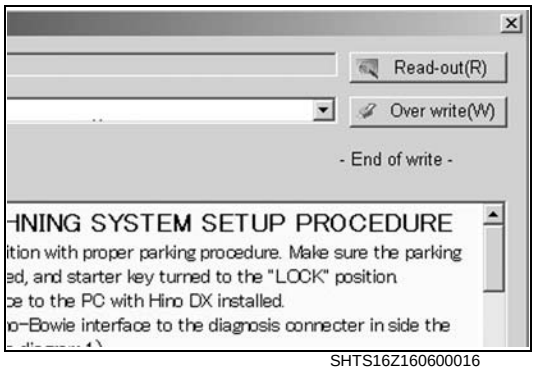


SHTS16Z160600015

(2) Select vehicle specifications with the appropriate vehicle type and wheel-base code from the pull down menu. Refer to the vehicle specification code chart that corresponds to the wheel-base length (The wheel-base code corresponds to the wheel-base on the production code), then click on "Over write" to set the variable headlight projection angle.

NOTICE

- **The correct vehicle specifications must be entered for the system to function properly.**
- **Please note that the variable headlight projection angle also differs by the vehicle grade (with high intensity discharge headlights).**



SHTS16Z160600016

(3) Click on "Read-out" to confirm the setting.

INITIALIZATION

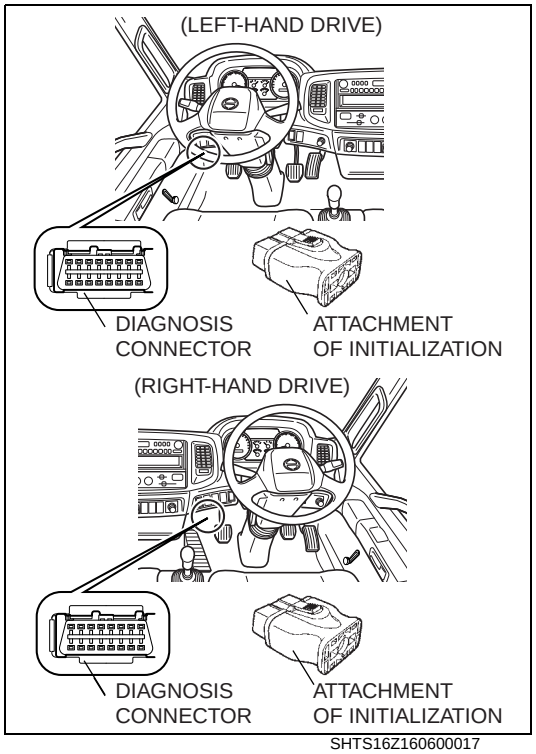
1. INITIALIZATION

(1) Connect the attachment of initialization to the trouble diagnosis Connector.

SST: Attachment of initialization (S0905-01300)

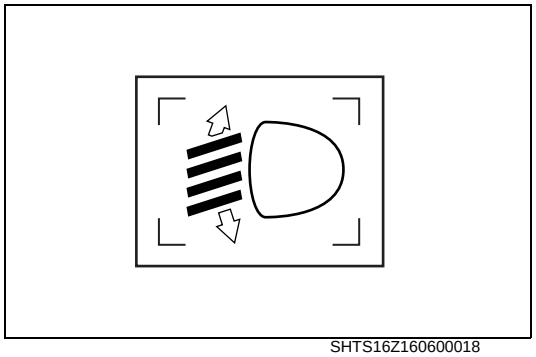
(2) Turn the head lamp switch to the "ON" position.

(3) Turn the starter switch to the "ON" position.



SHTS16Z160600017

(4) Auto leveling warning light is warning.



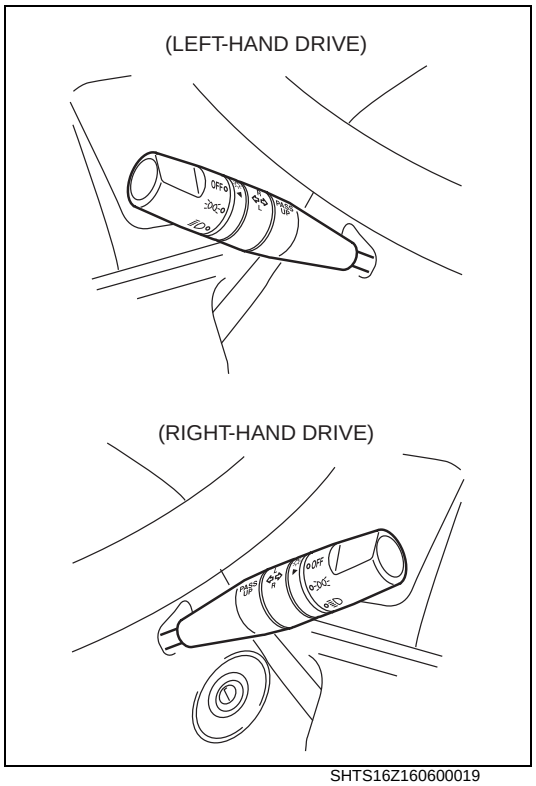
SHTS16Z160600018

(5) The switch operation interval that must keeps of 2 seconds or 1 second more. "ON"→"OFF"→"ON"→"OFF"→"ON"→"OFF"→ "ON", it is after 3 times "OFF" then finish by "ON".

NOTICE

- **Operate the head lamp switch to following process within 30 seconds after ignition switch on.**

(6) During initialization process switch the warning lamp still off, then will be blinking again it is sign of the initialization finished.



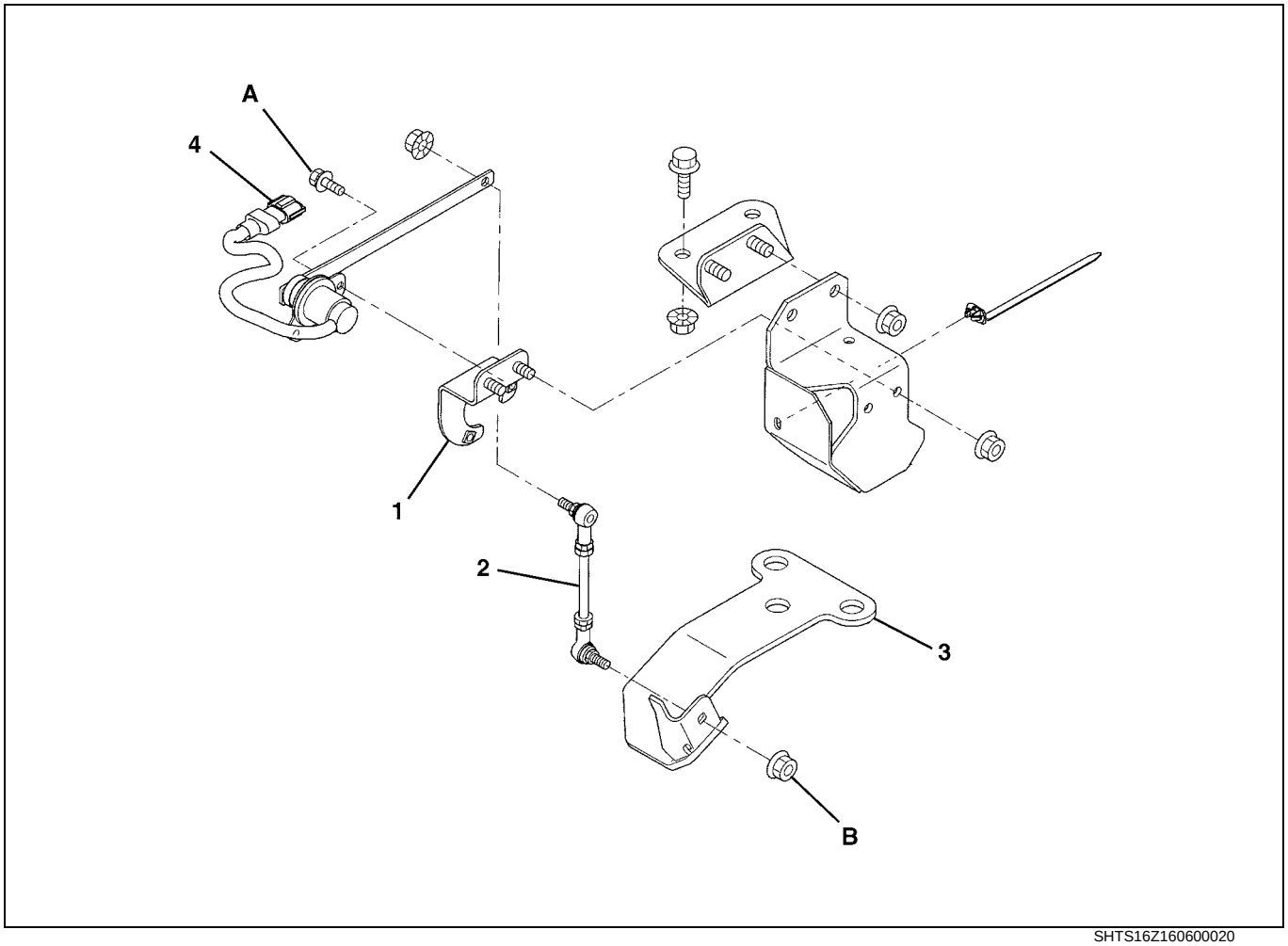
SHTS16Z160600019

FRONT VEHICLE HEIGHT SENSOR

COMPONENT LOCATOR

EN16Z1606D100002

MODEL: FD



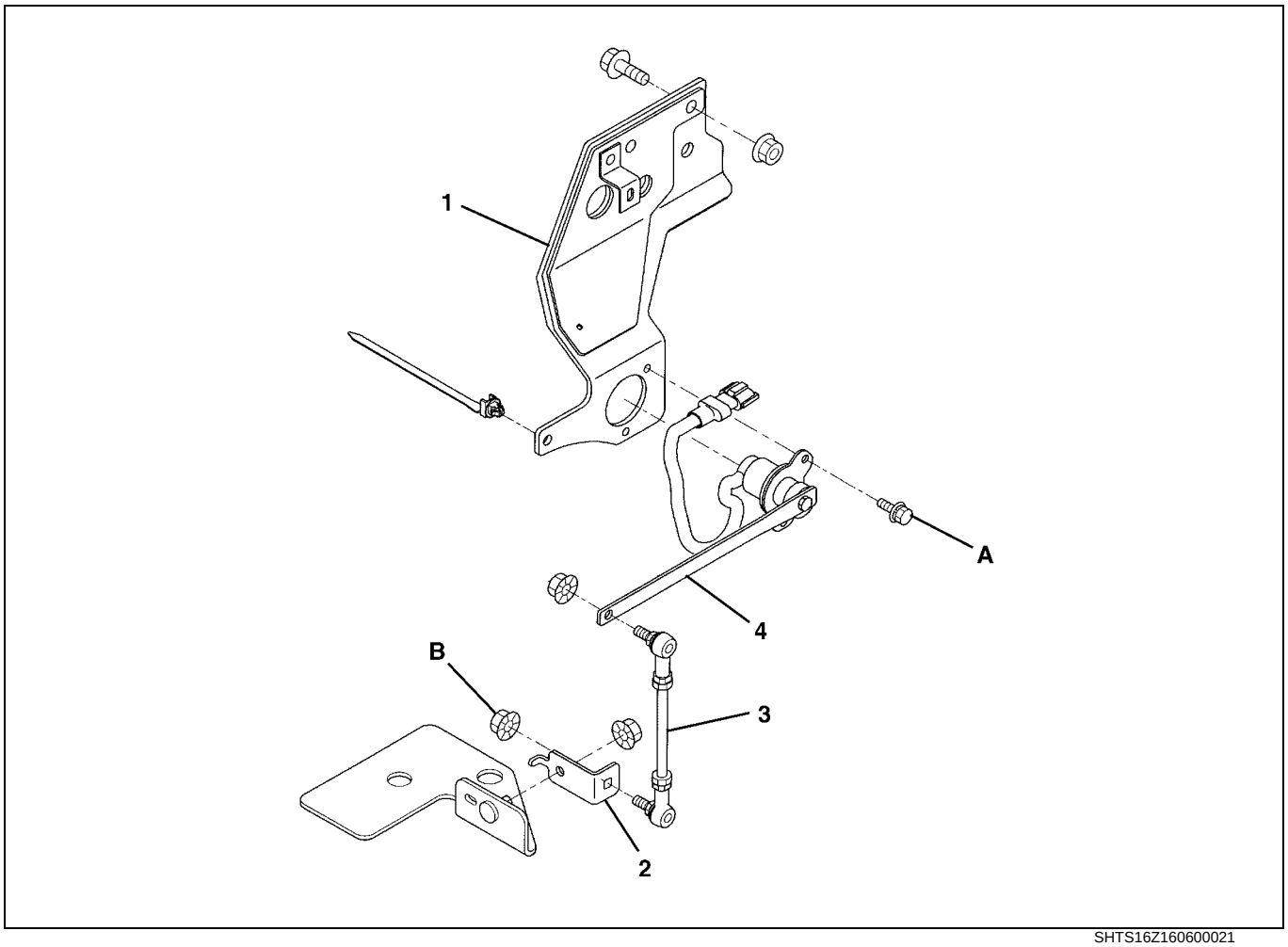
SHTS16Z160600020

1	Link rod bracket	3	Vehicle height sensor bracket
2	Link rod	4	Vehicle height sensor

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	8-11 {82-112, 5.9-8.1}	B	18-26 {184-244, 14-17}

MODELS: FG, GH



SHTS16Z160600021

1	Vehicle height sensor bracket	3	Link rod
2	Link rod bracket	4	Vehicle height sensor

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

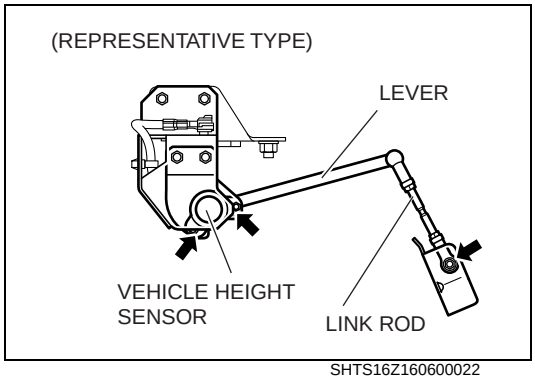
A	8-11 {82-112, 5.9-8.1}	B	18-26 {184-244, 14-17}

OVERHAUL

EN16Z1606H200002

NOTICE
When changing and adjusting a front vehicle height sensor (Sensor itself, Dimension relating to Link Rod), make sure to write in "Controlled constant".
Refer to "WRITING-IN OF CONTROLLED CONSTANT FOR AUTOLEVELING ECU".

REMOVAL OF FRONT VEHICLE HEIGHT SENSOR



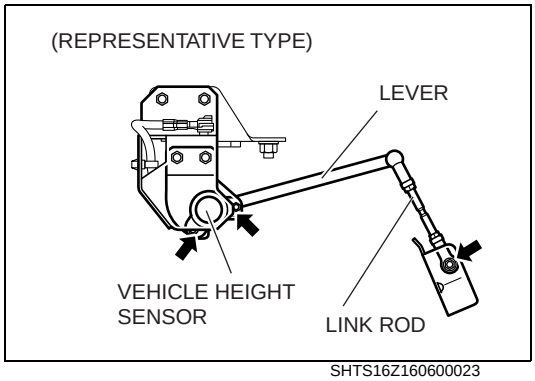
SHTS16Z160600022

1. REMOVAL OF FRONT VEHICLE HEIGHT SENSOR.
(1) Remove off the link rod from link rod bracket by unscrewing the nut.
(2) Separate the connector out of the vehicle height sensor.
(3) Remove the harness clamp from the vehicle height sensor.
(4) With unscrewing the bolt, remove the vehicle height sensor assembly out of the vehicle height sensor bracket.

NOTICE
Do not separate the vehicle height sensor from the lever.

HINT
Replace the vehicle height sensor in every 4 years with a new one.

HOW TO INSTALL FRONT VEHICLE HEIGHT SENSOR



SHTS16Z160600023

1. HOW TO INSTALL THE FRONT VEHICLE HEIGHT SENSOR
(1) Tighten the bolt after installing the vehicle height sensor on the vehicle height sensor bracket.
Tightening Torque:
8-11 N·m {82-112 kgf·cm, 5.9-8.1 lbf·ft}

(2) Connect the connector with the vehicle height sensor.
(3) Install the harness clamp on the vehicle height sensor bracket.
(4) Perform "**LENGTH ADJUSTMENT OF LINK ROD**" described in next page.
(5) Installing the link rod on the link rod bracket, tighten the nut.
Tightening Torque:
18-26 N·m {184-244 kgf·cm, 14-17 lbf·ft}

ADJUSTMENT OF LINK ROD

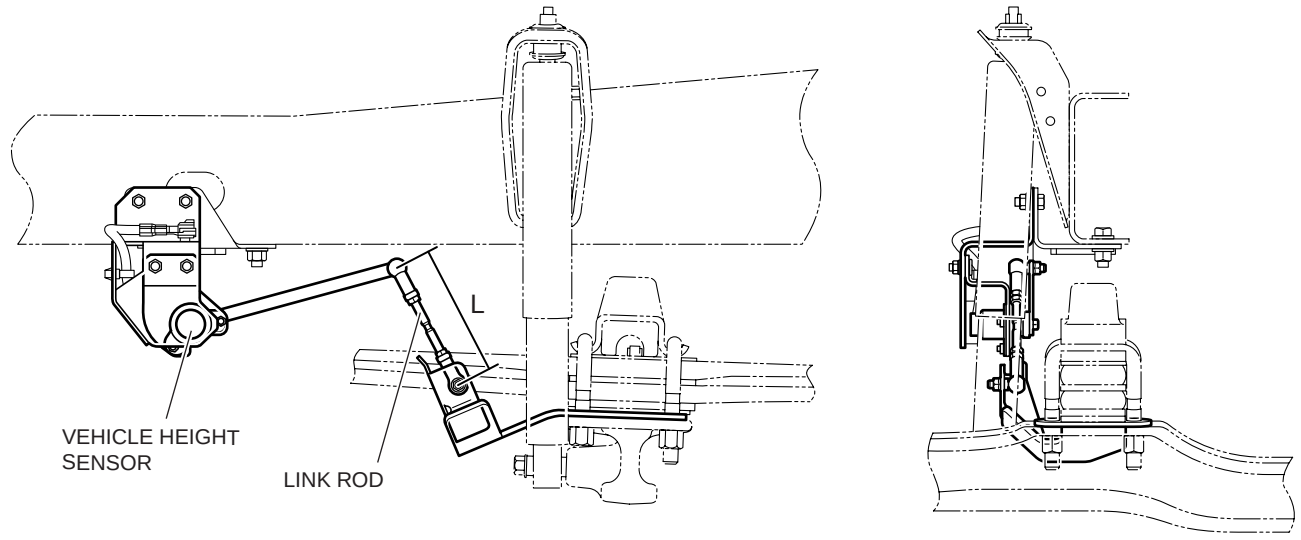
EN16Z1606H200003

1. LENGTH ADJUSTMENT OF LINK ROD.

(1) Adjust Length "L" of link rod to the standard value.

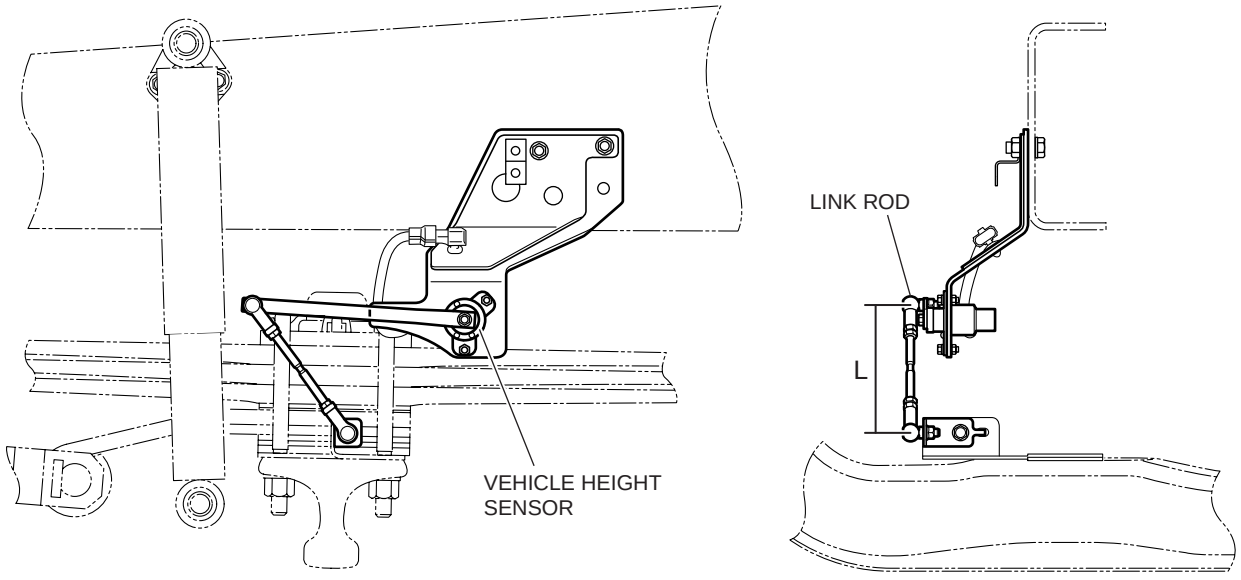
Model	Length "L" of link rod (mm {in.})
FD	140 {5.5}
FG, GH	170 {6.7}

MODEL: FD



SHTS16Z160600024

MODELS: FG, GH



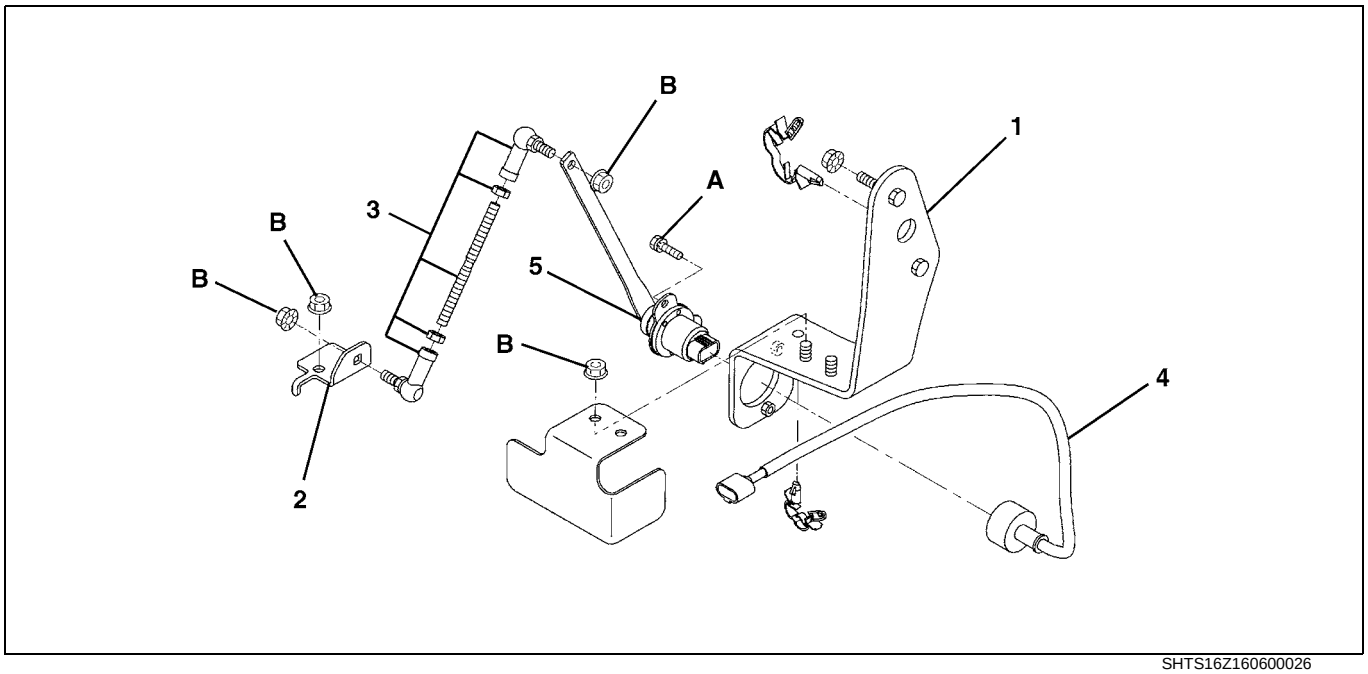
SHTS16Z160600025

REAR VEHICLE HEIGHT SENSOR

COMPONENT LOCATOR

EN16Z1606D100003

MODEL: FD



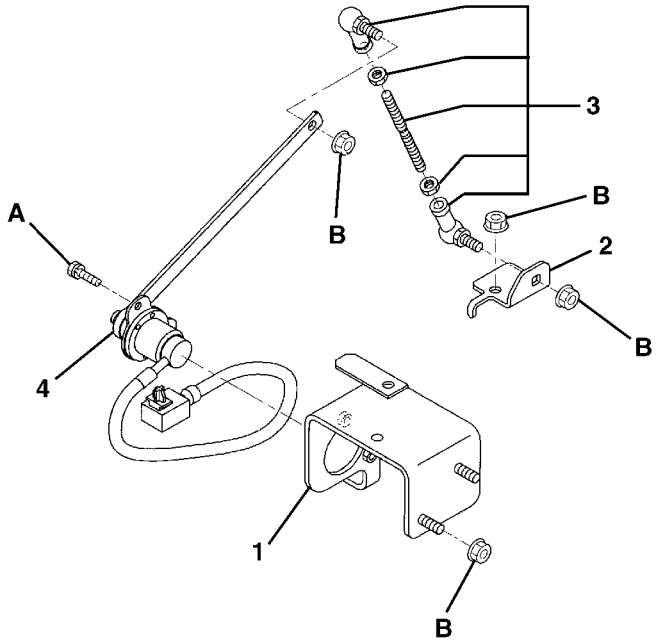
SHTS16Z160600026

1	Vehicle height sensor bracket	4	Vehicle height sensor harness
2	Link rod bracket	5	Vehicle height sensor
3	Link rod		

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	8-11 {82-112, 5.9-8.1}	B	18-26 {184-244, 14-17}

MODELS: FG, GH



SHTS16Z160600027

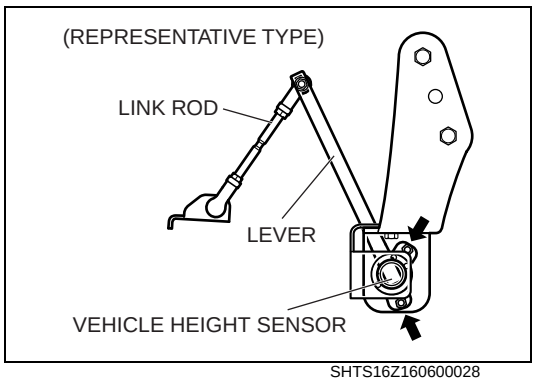
1	Vehicle height sensor bracket	3	Link rod
2	Link rod bracket	4	Vehicle height sensor

Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	8-11 {82-112, 5.9-8.1}	B	18-26 {184-244, 14-17}

REPLACEMENT

EN16Z1606H200004



SHTS16Z160600028

REMOVAL OF REAR VEHICLE HEIGHT SENSOR

1. REMOVAL OF REAR VEHICLE HEIGHT SENSOR

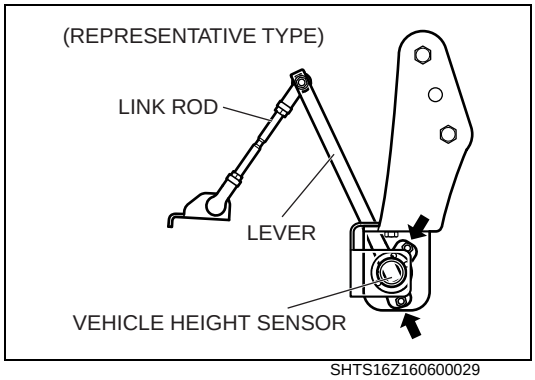
(1) By unscrewing the nut, remove the link rod out of the link rod bracket.
(2) Disconnect the connector from the vehicle sensor
(3) Remove the harness clamp out of the vehicle height sensor.
(4) Unscrewing the bolt, remove off the vehicle height sensor assembly from the vehicle height sensor bracket.

NOTICE

Do not separate the vehicle height sensor from the lever.

HINT

Replace the vehicle sensor in every 4 years with a new one.



SHTS16Z160600029

INSTALLATION OF REAR VEHICLE HEIGHT SENSOR

1. INSTALLATION OF REAR VEHICLE HEIGHT SENSOR

(1) Tighten the bolt after installing the vehicle height sensor assembly on the vehicle height sensor bracket.
Tightening Torque:
8-11 N·m {82-112 kgf·cm, 5.9-8.1 lbf·ft}

(2) Connect the connector with the vehicle height sensor.
(3) Install the harness clamp on the vehicle height sensor bracket.
(4) Perform "**LENGTH ADJUSTMENT OF LINK ROD**" described in the next page.
(5) Tighten the nut after installing the link rod on the link rod bracket.
Tightening Torque:
18-26 N·m {84-244 kgf·cm, 14-17 lbf·ft}

ADJUSTMENT OF LINK ROD

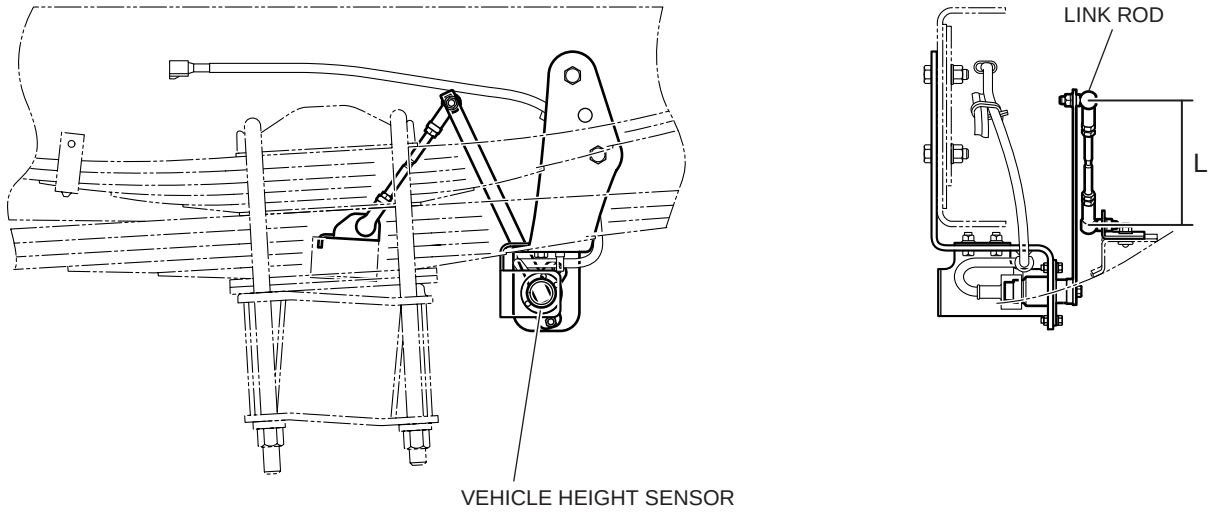
EN16Z1606H200005

1. LENGTH ADJUSTMENT OF LINK ROD.

(1) Length adjustment of link rod to standard value.

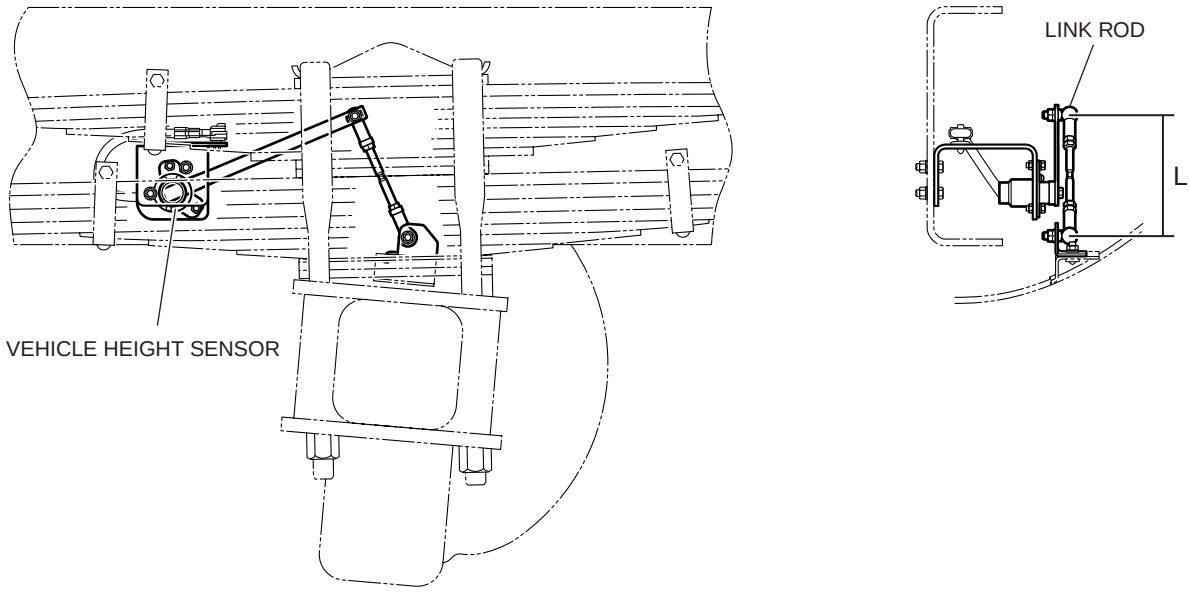
Model	Length "L" of Link Rod (mm {in.})
FD	160 {6.3}
FG, GH	150 {5.9}

MODEL: FD



SHTS16Z160600030

MODELS: FG, GH

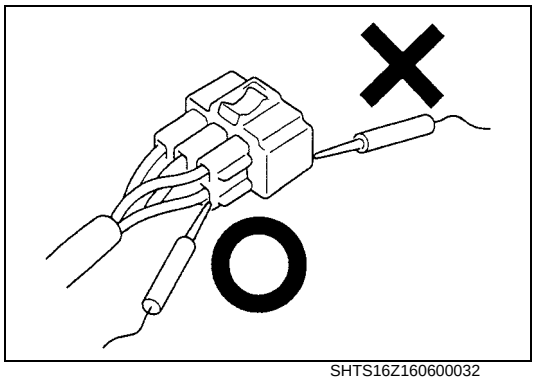


SHTS16Z160600031

FAILURE DIAGNOSIS

HANDLING PRECAUTIONS

EN16Z1606F200001



SHTS16Z160600032

1. ABOUT CONNECTORS

(1) When vehicle placed on speed meter tester, or jacked up to rotate the tires, there is a case that ECU memorize failure code. But, this is not abnormal. Clear the failure code on ECU in any case of having done that type of maintenance service.

(2) Before performing an inspection work, check that each connector is surely connected.

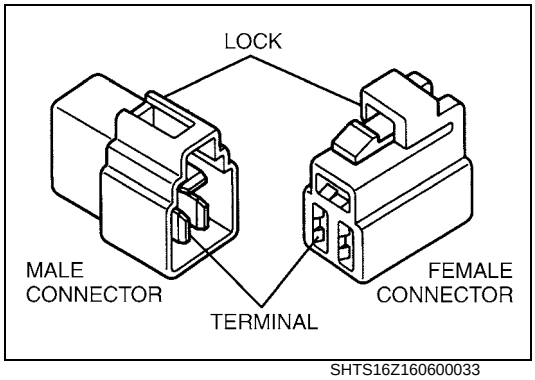
(3) When taking off connector, do it without fail at the "LOCK" position of starter switch.

(4) Any parts presumed to be abnormal should not be repaired, but change it.

(5) After clearing the failure memories recorded in the past, perform failure diagnosis again and check the current failure.

(6) After completing the diagnosis analysis, clear the diagnosis memories in the past.

(7) Unless otherwise specified, the drawing of connector is one viewed from connected surface. But, test bar should be inserted from back side for measuring.
However, check the terminals at the connected part of such water proof connectors as ABS actuator, etc. In this case, be careful not to short the terminals.

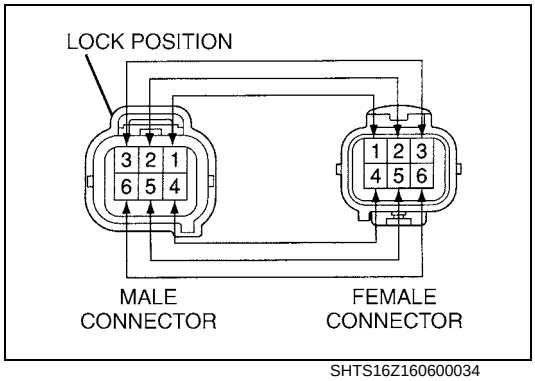


SHTS16Z160600033

(8) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



SHTS16Z160600034

(9) As for the terminal numbers of the connector, the first terminal is located on the top right terminal of the male connector and the top left terminal of the female connector.
Reference:
When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(10) When disconnecting the connectors, be sure to position the starter switch "LOCK".

2. ABOUT DIAGNOSIS MONITOR

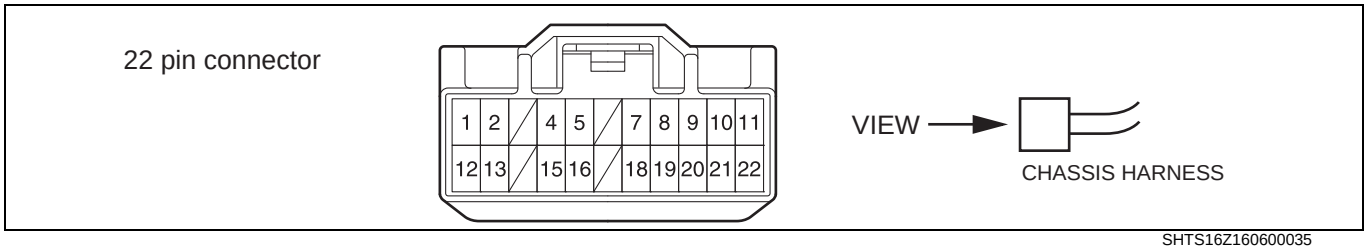
(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, delete the previous damage data.

ARRANGEMENT OF CONNECTOR PIN

EN16Z1606F200002

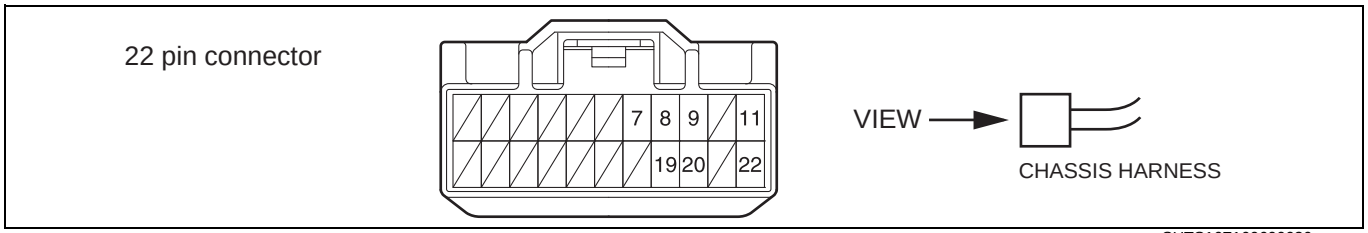
AUTOLEVELING ECU



SHTS16Z160600035

No.	Code	Signal	No.	Code	Signal
1	IG	Power	12	E1	Ground
2	LH1	Left/Right actuator power	13	LH3	Left/Right actuator ground
3	—	—	14	—	—
4	LH2	Left actuator signal	15	RH2	Right actuator signal
5	WNG	Warning light	16	INIT	Diagnostic connector
6	—	—	17	—	—
7	SPDR	Vehicle speed sensor signal	18	HDLP	Headlight signal
8	TX	Serial communication TX	19	RX	Serial communication RX
9	SGR	Rear vehicle height sensor ground	20	SGF	Front vehicle height sensor ground
10	SHR	Rear vehicle height sensor signal	21	SHF	Front vehicle height sensor signal
11	SBR	Rear vehicle height sensor power	22	SBF	Front vehicle height sensor power

INTERFACE ECU

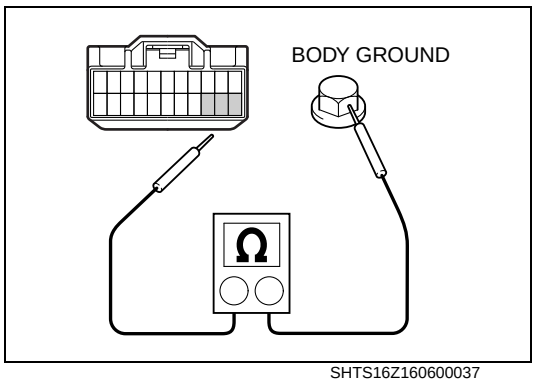


SHTS16Z160600036

No.	Code	Signal	No.	Code	Signal
1	—	—	12	—	—
2	—	—	13	—	—
3	—	—	14	—	—
4	—	—	15	—	—
5	—	—	16	—	—
6	—	—	17	—	—
7	PCGD	PC-ground	18	—	—
8	RX-2	Diagnostic connector RX	19	TX-S	Serial communication TX
9	TX-2	Diagnostic connector TX	20	RX-2	Serial communication RX
10	—	—	21	—	—
11	+12V	Power	22	GND	Ground

NON-OPERATION (WARNING LIGHT DISPLAY)

EN16Z1606F200003



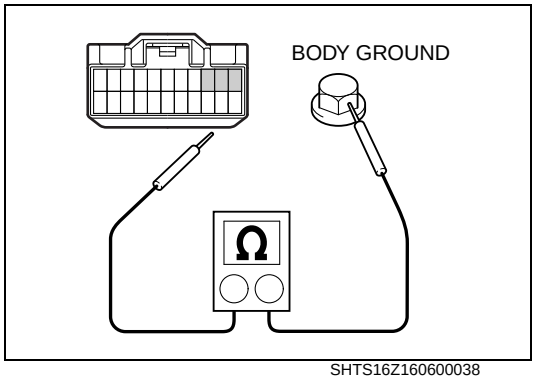
SHTS16Z160600037

1. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Set the starter switch to "LOCK" position, remove 22 pin connector of autoleveling ECU and front/rear vehicle height sensors.

(2) Check electrical continuity between 20th, 21st, 22nd terminals of 22 pin connector (Vehicle harness side) and body ground.

Standard: No electrical continuity.



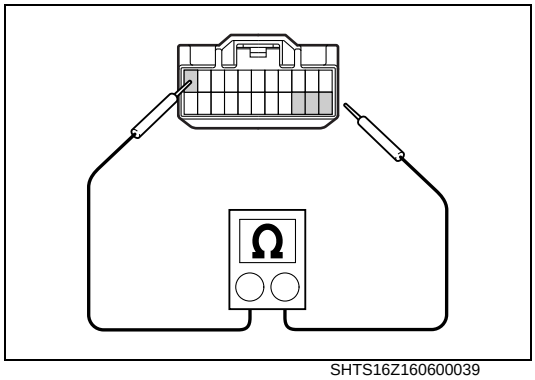
SHTS16Z160600038

(3) Check electrical continuity between 9th, 10th, 11th terminals of 22 pin connector (Vehicle harness side) and body ground.

Standard: No electrical continuity.

NO → Short in the wire.

YES

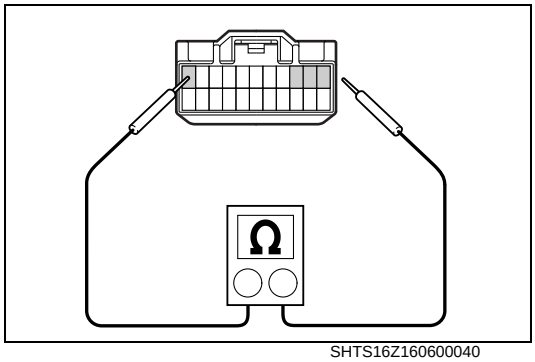


SHTS16Z160600039

2. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 20th, 21st, 22nd and 1st terminals of 22 pin connector (Vehicle harness side).

Standard: No electrical continuity.



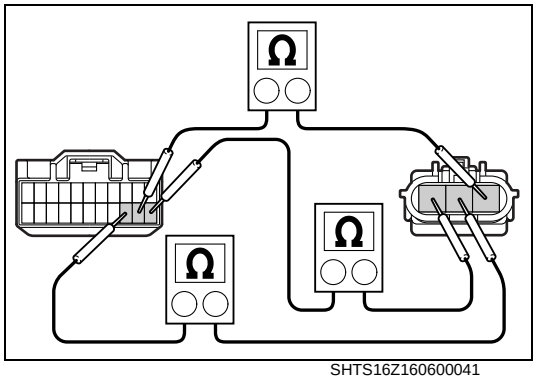
SHTS16Z160600040

(2) Check electrical continuity between 9th, 10th, 11th and 1st terminals of 22 pin connector (Vehicle harness side).

Standard: No electrical continuity

NO → Short in the wire.

YES


SHTS16Z160600041

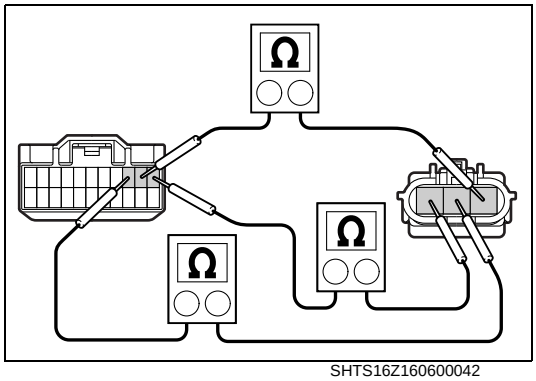
3. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 22 pin connector (Vehicle harness side) and each terminal of front/rear vehicle height sensor connectors (Vehicle harness side).

NOTICE

There are cases that connector shapes are different from model.

ECU	Front vehicle height sensor
20th terminal	2nd terminal
21st terminal	3rd terminal
22nd terminal	1st terminal


SHTS16Z160600042

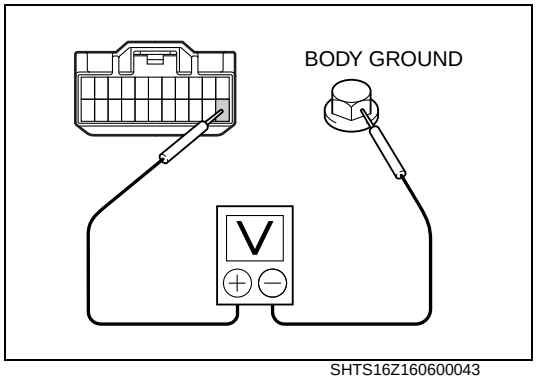
ECU	Rear vehicle height sensor
9th terminal	2nd terminal
10th terminal	3rd terminal
11th terminal	1st terminal

Standard: Electrical continuity

NO

Short in the wire.

YES



SHTS16Z160600043

4. CHECK THE VOLTAGE BETWEEN TERMINALS.

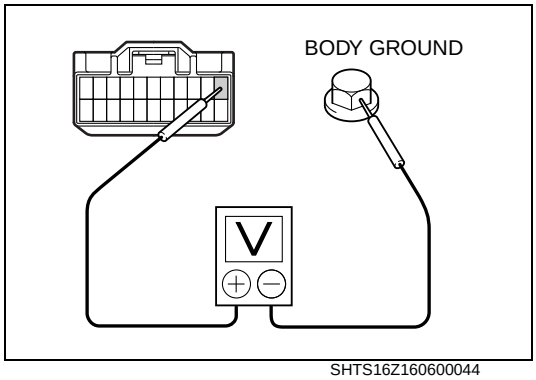
(1) Connecting 22 pin connector with front/rear vehicle height sensor connectors, set the starter switch to "ON" position.

(2) Check voltage between 22nd terminal of 22 pin connector (Vehicle harness side) and body ground.

Standard value: 4.5-5.5V

NOTICE

Connector in the drawing is a view from mating face.



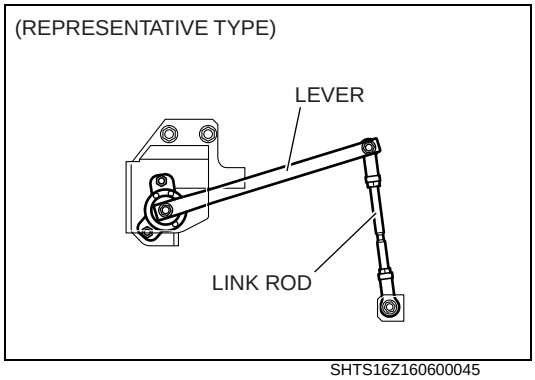
SHTS16Z160600044

(3) Check voltage between 22nd terminal of 11 pin connector (Vehicle harness side) and body ground.

Standard value: 4.5-5.5V

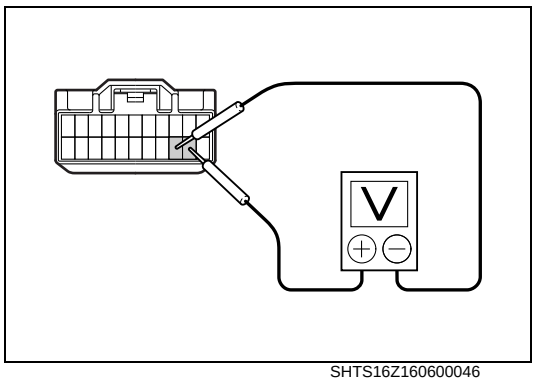
NOTICE

Connector in the drawing is a view from mating face.



SHTS16Z160600045

(4) Remove link rod out of the lever of front/rear vehicle height sensors.



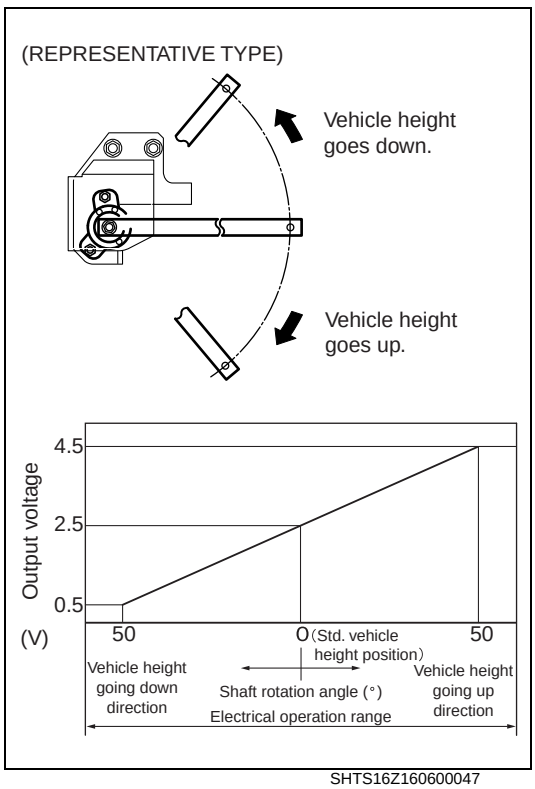
SHTS16Z160600046

(5) Checking voltage between 21st and 20th terminals of 22 pin connector (Vehicle harness side), check voltage change when operating the lever at low/high position.

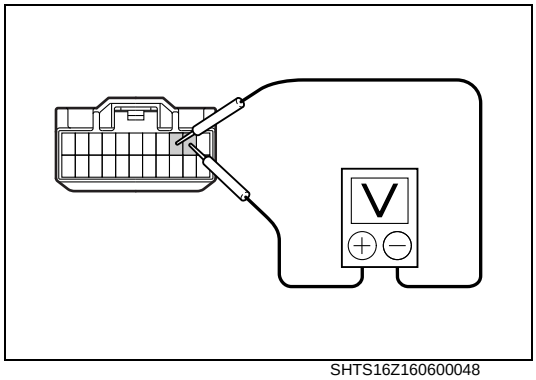
Standard: As shown in the figure, voltage should change.

NOTICE

Connector in the drawing is a view from mating face.



SHTS16Z160600047

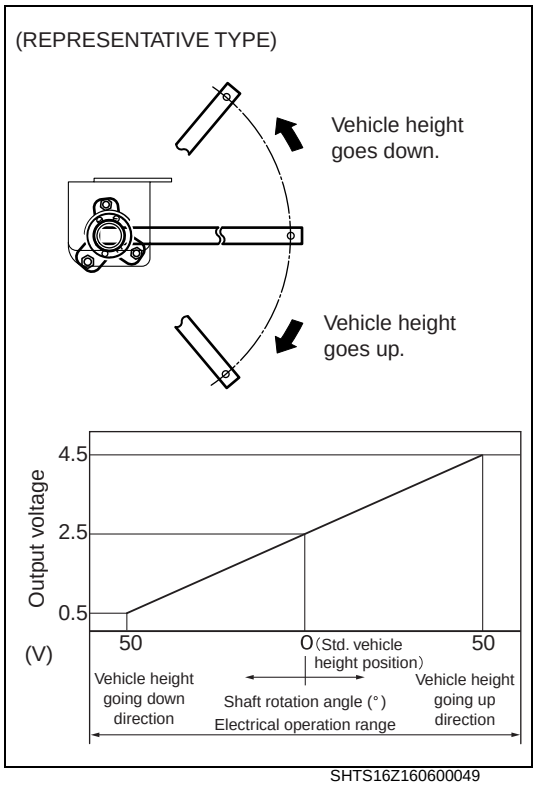


SHTS16Z160600048

(6) Checking voltage between 10th and 9th terminals of 22 pin connector (Vehicle harness side), check voltage change when operating the lever at low/high position.

Standard: As shown in the figure, voltage should change.

NOTICE
Connector in the drawing is a view from mating face.



SHTS16Z160600049

NO

Abnormality of vehicle height sensor.

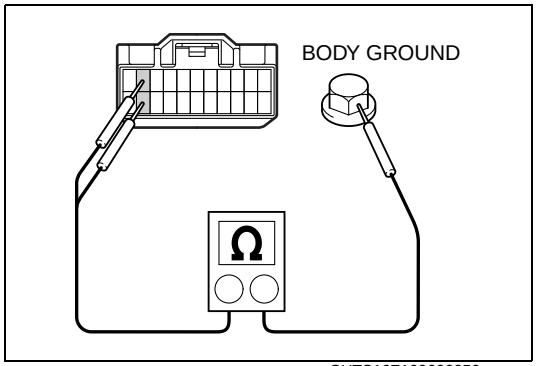
YES

5. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

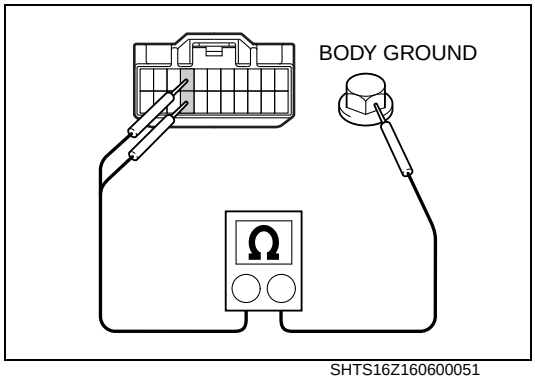
(1) Set the starter switch to "LOCK" position, remove 22 pin connector of autoleveling ECU and right/left headlight leveling actuator.

(2) Check electrical continuity between 2nd, 13th terminals of 22 pin connector (Vehicle harness side) and body ground.

Standard: No electrical continuity.



SHTS16Z160600050



SHTS16Z160600051

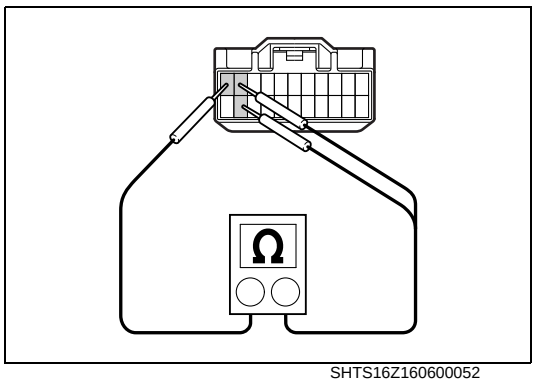
(3) Check electrical continuity between 4th, 15th terminals of 22 pin connector (Vehicle harness side) and body ground.

Standard: No electrical continuity.

NO

Short in the wire.

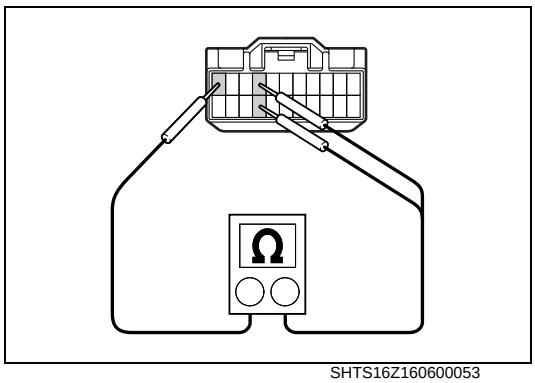
YES


SHTS16Z160600052

6. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 2nd, 13th and 1st terminals of 22 pin connector (Vehicle harness side).

Standard: No electrical continuity.


SHTS16Z160600053

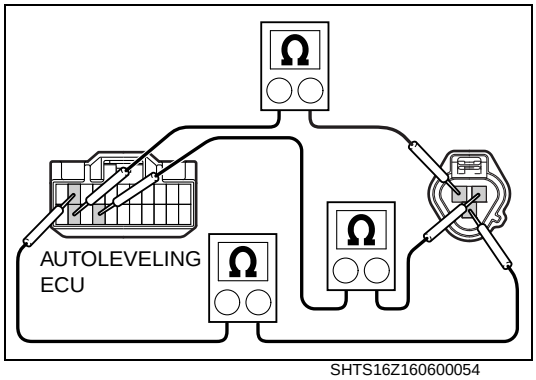
(2) Check electrical continuity between 4th, 15th and 1st terminals of 22 pin connector (Vehicle harness side).

Standard: No electrical continuity.

NO

Short in the wire.

YES

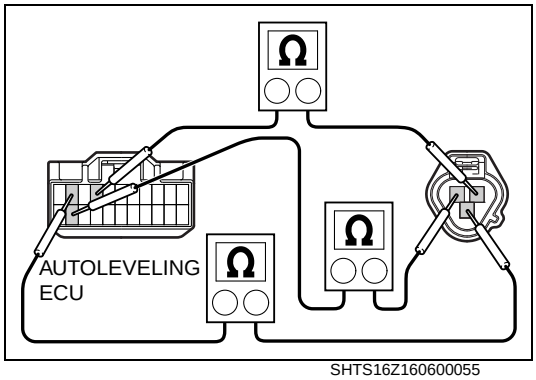


SHTS16Z160600054

7. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 22 pin connector (Vehicle harness side) and each terminal of right/left headlight leveling actuator connectors (Vehicle harness side).

ECU	Right actuator
2nd terminal	3rd terminal
15th terminal	2nd terminal
13th terminal	1st terminal



SHTS16Z160600055

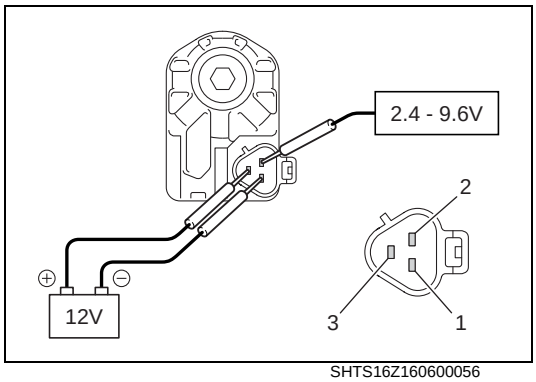
ECU	Left actuator
2nd terminal	3rd terminal
4th terminal	2nd terminal
13th terminal	1st terminal

Standard: Electrical continuity

NO

Short in the wire.

YES



SHTS16Z160600056

8. CHECK FOR ONLY LEVELING ACTUATOR.

(1) Connecting 3rd terminal of leveling actuator connector (Part side) with (+) terminal of 12V power supply, connect 1st terminal with (-) one.

(2) Check the actuator operation when the voltage changing within a range where voltage by 20-80% (2.4-9.6V) of electrical power supply is connected with 2nd terminal.

Standard: Operating correctly

NO

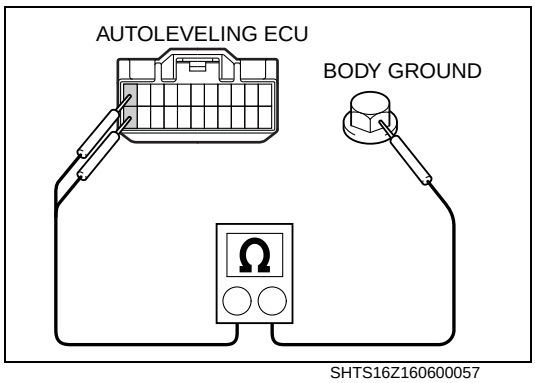
Failure in headlight leveling actuator.

YES

Abnormality of autoleveling ECU.

NON-OPERATION (WARNING LIGHT NOT LIT)

EN16Z1606F200004



SHTS16Z160600057

1. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

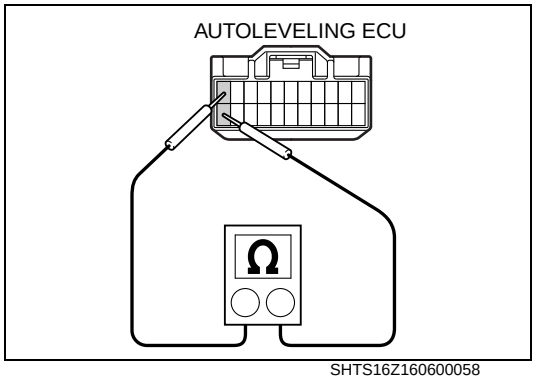
(1) Set the starter switch to "LOCK" position, remove 22 pin connector of autoleveling ECU and DC/DC converter connector (for Headlight leveling).

(2) Check electrical continuity between 1st, 12th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: No electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600058

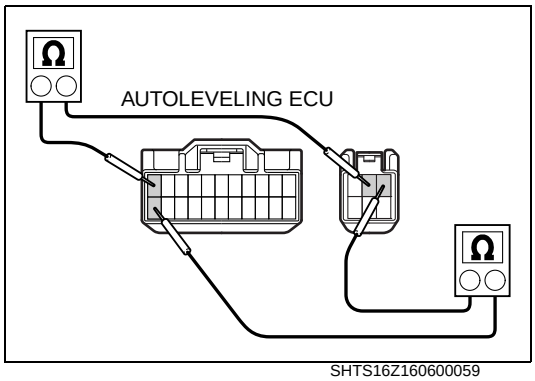
2. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 1st and 12th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU.

Standard: No electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600059

3. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

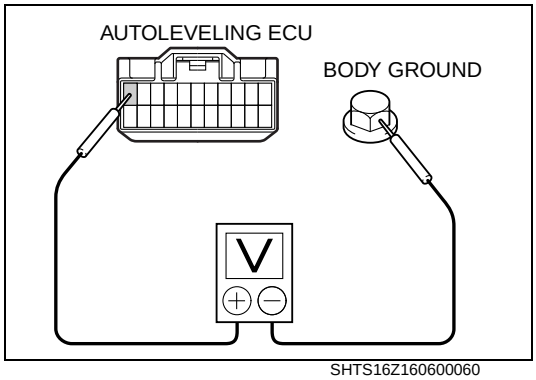
(1) Check electrical continuity between 22 pin connector (Vehicle harness side) of autoleveling ECU and each terminal of DC/DC converter connector (Vehicle harness side).

ECU	DC/DC converter
1st terminal	2nd terminal
12th terminal	3rd terminal

Standard: Electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600060

4. VOLTAGE CHECK BETWEEN THE TERMINALS.

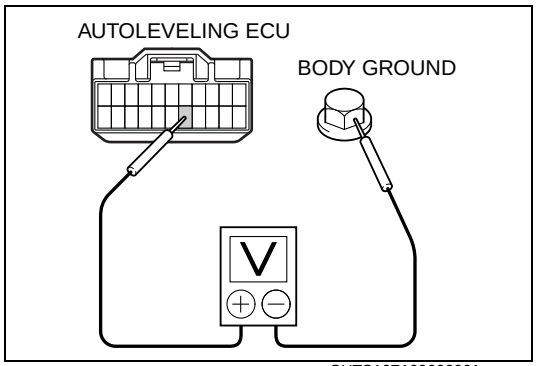
(1) Set the starter switch to "ON" position, check electrical continuity between 1st terminal of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: 14-16V

NO

YES

Abnormality of DC/DC convertor or short in the wire.



SHTS16Z160600061

5. VOLTAGE CHECK BETWEEN THE TERMINALS.

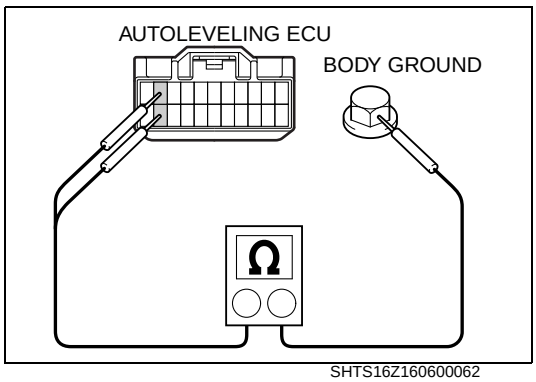
(1) Turning Headlight switch "ON", check input voltage between 18th terminal of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard value: 24V

NO

YES

Failure in signal system of headlight.
(Such as harness disconnected)



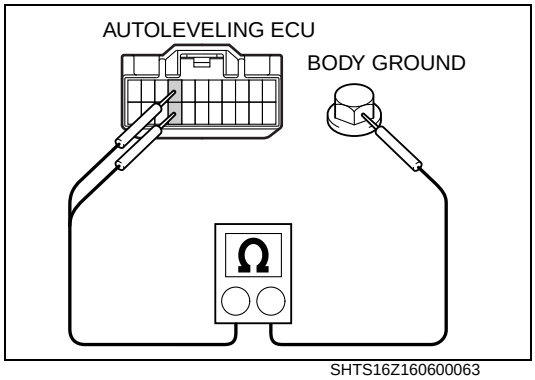
SHTS16Z160600062

6. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Set the starter switch to "LOCK" position, remove right/left headlight leveling actuator connectors.

(2) Check electrical continuity between 2nd, 13th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: No electrical continuity.



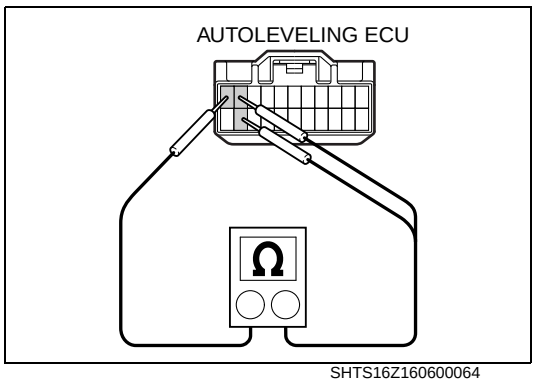
SHTS16Z160600063

(3) Check electrical continuity between 4th, 15th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: No electrical continuity.

NO → Short in the wire.

YES

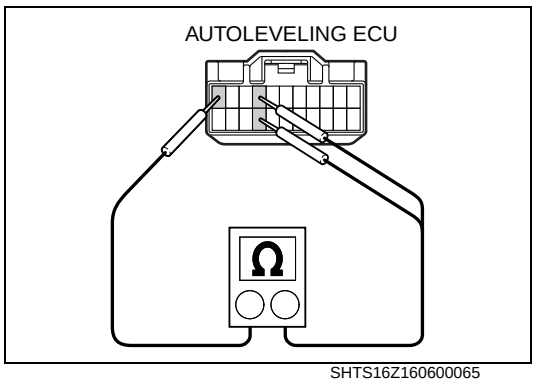


SHTS16Z160600064

7. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 2nd, 13th and 1st terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU.

Standard: No electrical continuity.



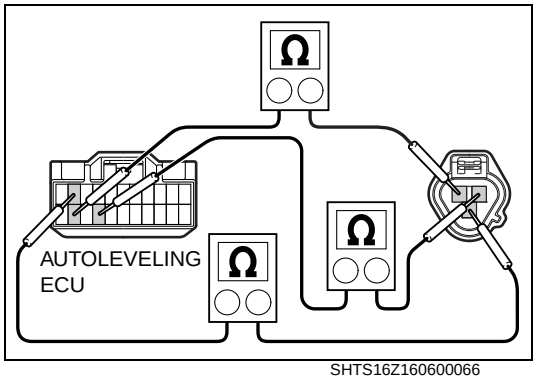
SHTS16Z160600065

(2) Check electrical continuity between 4th, 15th and 1st terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU.

Standard: No electrical continuity.

NO → Short in the wire.

YES

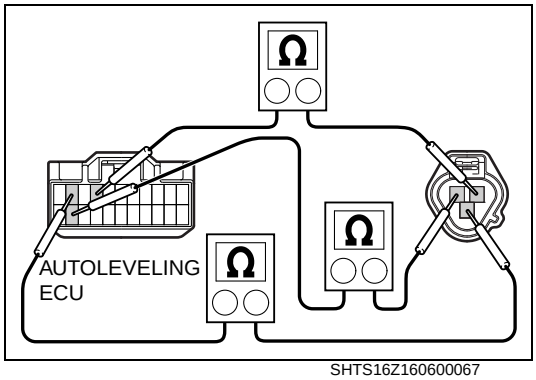


SHTS16Z160600066

8. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 22 pin connector (Vehicle harness side) of autoleveling ECU and each terminal of right/left headlight leveling actuator connectors (Vehicle harness side).

ECU	Right actuator
2nd terminal	3rd terminal
15th terminal	2nd terminal
13th terminal	1st terminal

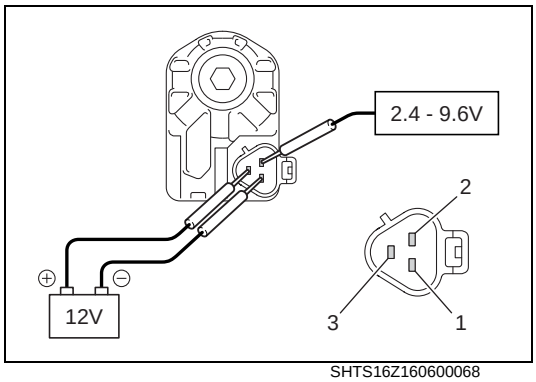


SHTS16Z160600067

ECU	Left actuator
2nd terminal	3rd terminal
4th terminal	2nd terminal
13th terminal	1st terminal

NO → Short in the wire.

YES



SHTS16Z160600068

9. CHECK FOR ONLY LEVELING ACTUATOR.

(1) Connecting 3rd terminal of leveling actuator connector (Part side) with (+) terminal of 12V power supply, connect 1st terminal with (-) one.

(2) Check the actuator operation when the voltage changing within a range where voltage by 20-80% (2.4-9.6V) of electrical power supply is connected with 2nd terminal.

Standard: Operating correctly

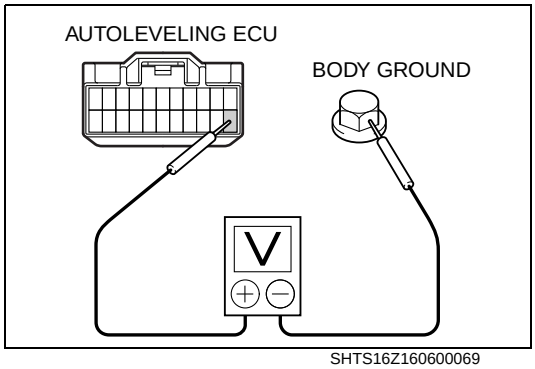
NO → Failure in headlight leveling actuator.

YES

Abnormality of autoleveling ECU.

OPERATING (OCCASIONALLY WARNING LIGHT LIGHTING)

EN16Z1606F200005



SHTS16Z160600069

1. VOLTAGE CHECK OF VEHICLE HEIGHT SENSOR

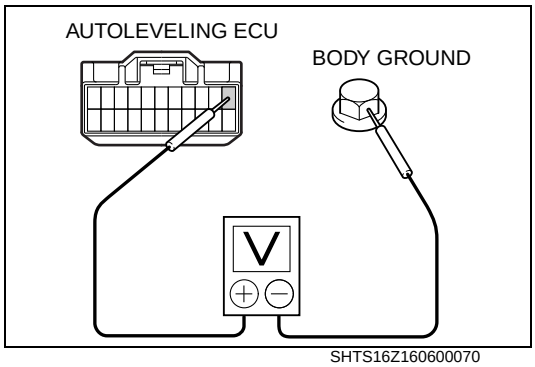
(1) Check any looseness in link rod of vehicle height sensor.

(2) Set the starter switch to "ON" position, measure the voltage between 22th terminal of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: 4.5-5.5V

NOTICE

Connector in the drawing is a view from mating face.



SHTS16Z160600070

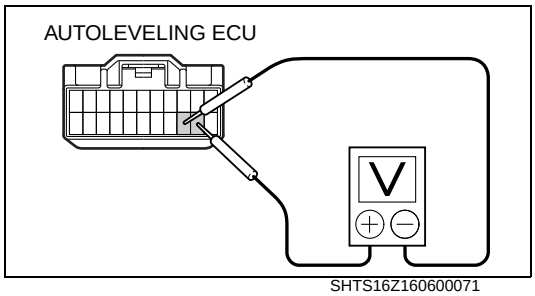
(3) Measure the voltage between 11th terminal of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: 4.5-5.5V

NOTICE

Connector in the drawing is a view from mating face.

(4) Remove link rod out of the lever of front/rear vehicle height sensors.



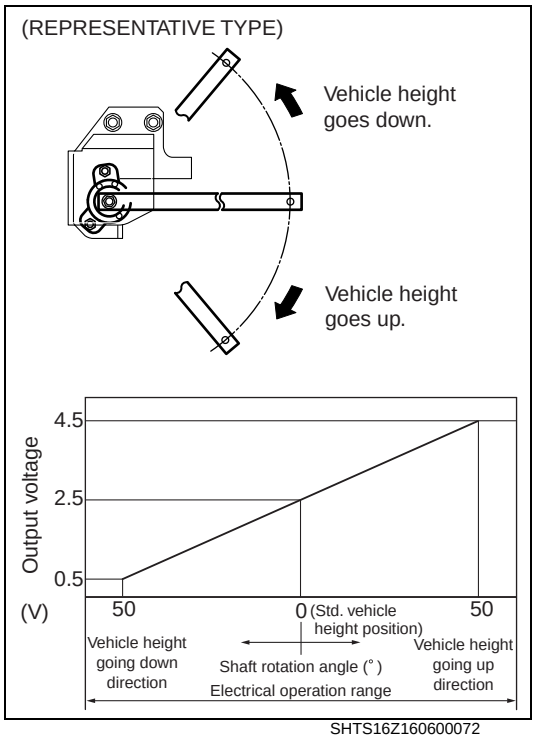
SHTS16Z160600071

(5) Checking voltage between 21st and 20th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU, check voltage change when operating the lever at low/high position.

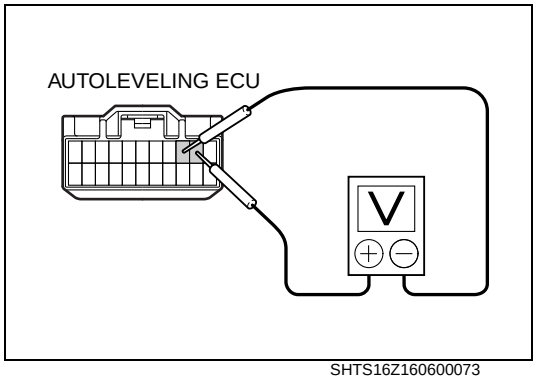
Standard: As shown in the figure, voltage should change.

NOTICE

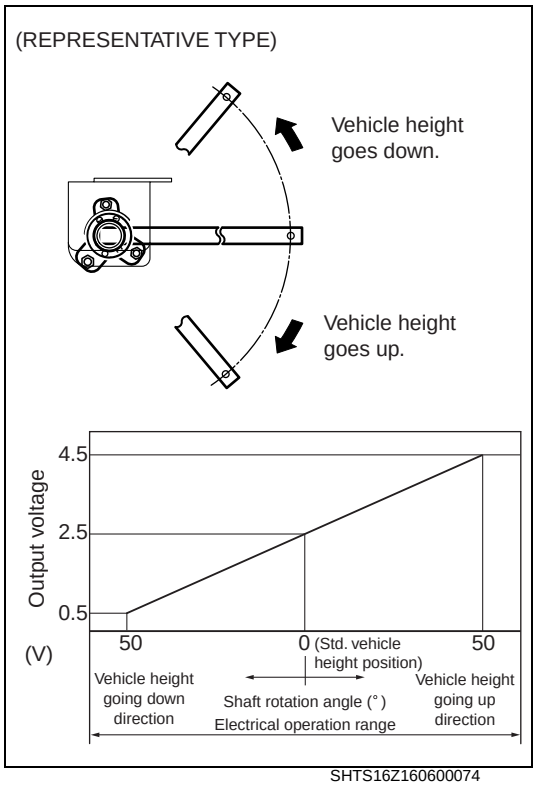
Connector in the drawing is a view from mating face.



SHTS16Z160600072



SHTS16Z160600073



SHTS16Z160600074

(6) Checking voltage between 10th and 9th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU, check voltage change when operating the lever at low/high position.

Standard: As shown in the figure, voltage should change.

NOTICE

Connector in the drawing is a view from mating face.

NO

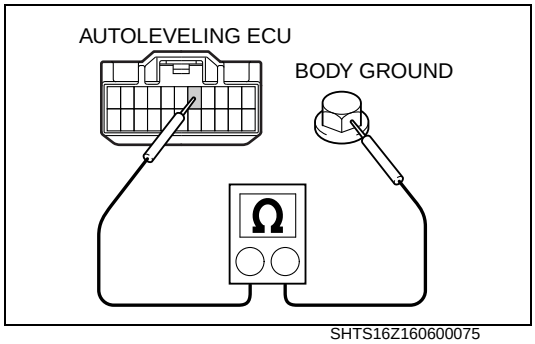
Abnormality of vehicle height sensor.

YES

Abnormality of autoleveling ECU.

FREQUENTLY OPERATING WHILE DRIVING (WARNING LIGHT GOES OFF)

EN16Z1606F200006



SHTS16Z160600075

1. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

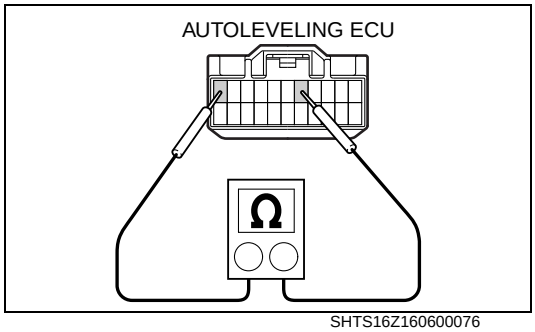
(1) Set the starter switch to "LOCK" position, remove 22 pin connector of autoleveling ECU and vehicle speed sensor connector.

(2) Check electrical continuity between 7th terminal of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: No electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600076

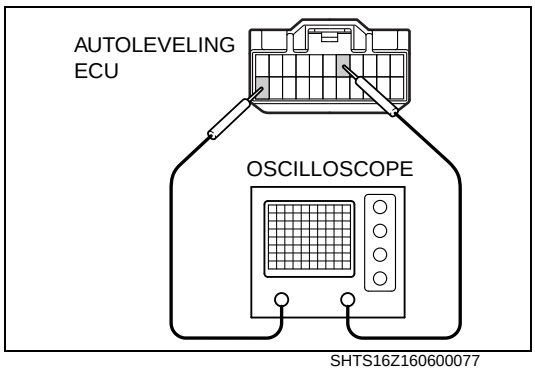
2. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 1st and 7th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU.

Standard: No electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600077

3. WAVE FORM CHECK OF VEHICLE SPEED SENSOR IN AUTOLEVELING ECU.

(1) Connect 22 pin connector of autoleveling ECU and the vehicle speed sensor connector.

(2) Connect 7th and 12th terminals of 22 pin connector with oscilloscope (Voltage axis: 5V-DIV, Time axis: 20msec/DIV).

(3) Starting engine, you drive out the vehicle slowly with a careful attention to around the vehicle and check an output of signal wave form.

Standard: Wave form is output.

NOTICE

Connector in the drawing is a view from mating face.

NO → Failure in vehicle speed sensor system.

YES

Abnormality of autoleveling ECU.

INITIAL SETTING NOT POSSIBLE (NO INITIAL SETTING YET: WARNING LIGHT FLASHING 2 TIMES. INITIAL SETTING DONE ONLY ONE TIME: WARNING LIGHT "OFF".)

EN16Z1606F200007

1. INITITIAL SETTING CONDUCT AGAIN.

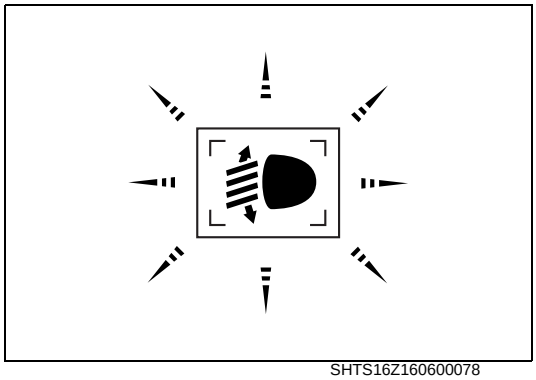
(1) Starting engine, with a much careful attention to around the vehicle, you can slowly move ahead or back the vehicle.

(2) Initial setting operation should be performed again after stopping the vehicle.

Standard: Correct finish of initial setting operation.

NO → Go to the item 2.

YES → Normal.



SHTS16Z160600078

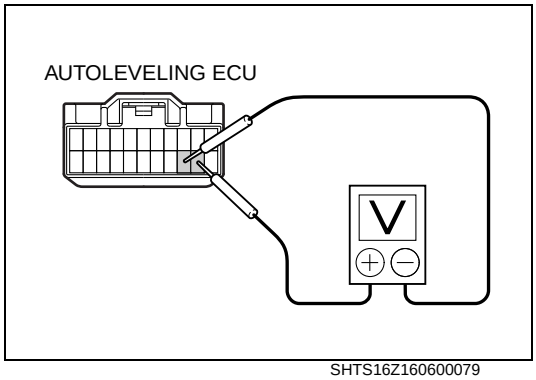
2. OPERATION CHECK

(1) Check all items (Warning light to be on/off) that are not operating.

Standard: No abnormality.

NO → Correction of all abnormal items.

YES



SHTS16Z160600079

3. OUTPUT VOLTAGE CHECK OF VEHICLE HEIGHT SENSOR.

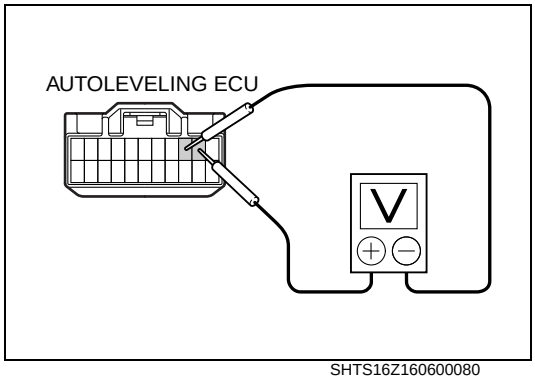
(1) Set the starter switch to "ON" position.

(2) Check the voltage between 21st and 20th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU. (Do it under no load on the body)

Standard: 0.85-4.15V

NOTICE

Connector in the figure is a view from mating face.



SHTS16Z160600080

(3) Check voltage between 10th and 9th terminals of 22 pin connector (Vehicle harness side) of autoleveling ECU. (Do it under no load on the body)

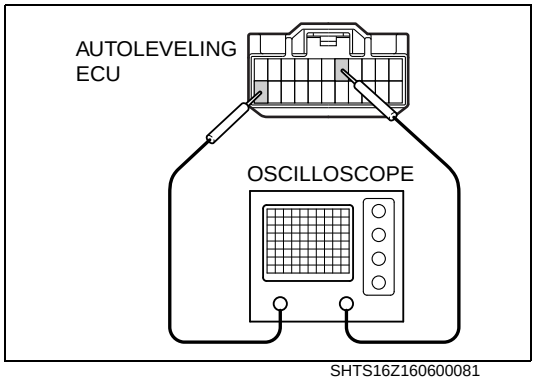
HINT
When initial setting performed while not within the range of voltage, it will flash 2 times even when initial setting performed and warning light turn off.

Standard: 0.85-4.15V

NOTICE
Connector in the drawing is a view from mating face.

NO → Abnormality of vehicle height sensor.

YES



SHTS16Z160600081

4. WAVE FORM CHECK OF VEHICLE SPEED SENSOR OF AUTOLEVELING ECU.

(1) Set the starter switch to "LOCK" position, connect 7th and 12th terminals of 22 pin connector of autoleveling ECU with oscilloscope (Voltage axis: 5V-DIV, Time axis: 20msec/DIV).

(2) Check output of signal wave form under the vehicle stopping condition.

Standard: No wave form.

NO → Failure in vehicle speed sensor system.

YES

Failure in autoleveling ECU or in any initial setting tool.

"CONSTANT" CAN NOT BE WRITTEN IN (WARNING LIGHT TURN OFF)

EN16Z1606F200008

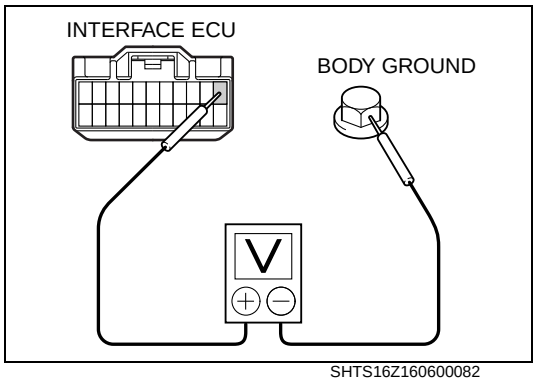
1. LIGHTING CHECK OF WARNING LIGHT.

(1) Check whether warning light turn off or flashes (when initial setting not yet done) just after warning light lighting for 3 sec.
Standard: No abnormality

NO

YES

No power is supplied to autoleveling ECU (Connector is not connected. Harness is disconnected due to broken DC/DC converter or no electrical power) or failure in autoleveling ECU.



SHTS16Z160600082

2. VOLTAGE CHECK BETWEEN THE TERMINALS.

(1) Set the starter switch to "LOCK" position, remove 22 pin connector of interface ECU.

(2) Turn the starter switch to "ON" position, measure the voltage between 11th terminal of 22 pin connector (Vehicle harness side) of interface ECU and body ground.

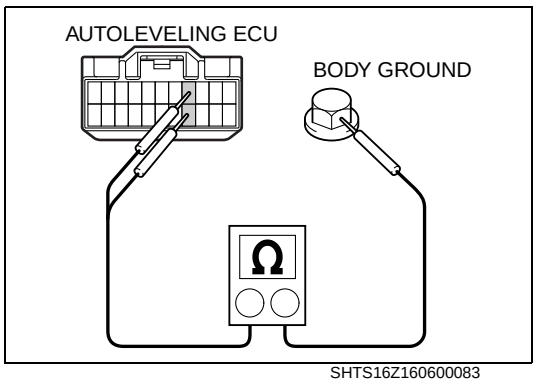
Standard: 14-16V

NOTICE
Connector in the drawing is a view from mating face.

NO

YES

Failure in DC/DC converter for autoleveling or malfunction of harness.



SHTS16Z160600083

3. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Set the starter switch to "LOCK" position, remove 22 pin connector of autoleveling ECU.

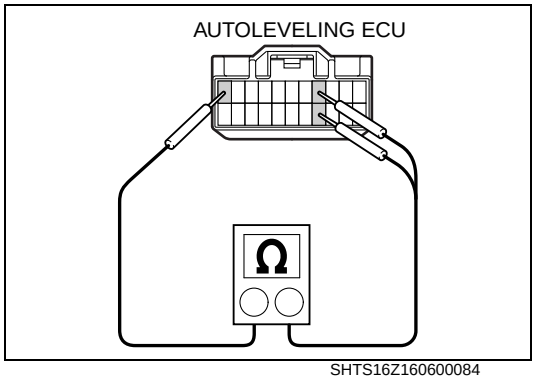
(2) Check electrical continuity between 8th, 19th of 22 pin connector (Vehicle harness side) of autoleveling ECU and body ground.

Standard: No electrical continuity.

NO

YES

Short in the wire.



SHTS16Z160600084

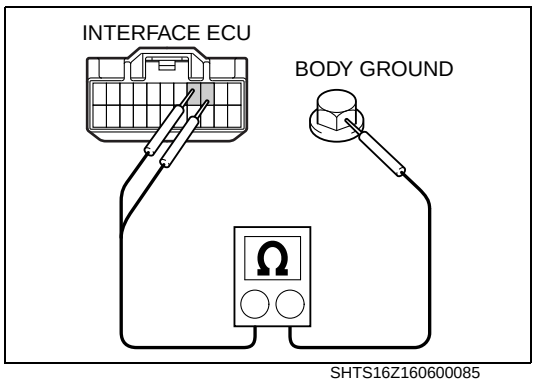
4. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 8th, 19th and 1st of 22 pin connector (Vehicle harness side) of autoleveling ECU.

Standard: No electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600085

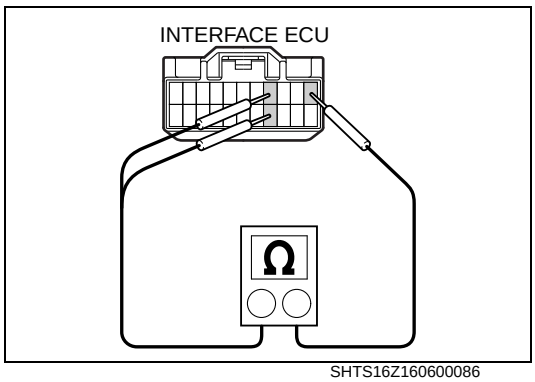
5. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 8th, 9th of 22 pin connector (Vehicle harness side) of interface ECU and body ground.

Standard: No electrical continuity.

NO → Short in the wire.

YES



SHTS16Z160600086

6. ELECTRICAL CONTINUITY CHECK BETWEEN THE TERMINALS.

(1) Check electrical continuity between 8th, 9th and 11th of 22 pin connector (Vehicle harness side) of interface ECU.

Standard: No electrical continuity.

NO → Short in the wire.

YES

Failure in interface ECU. When not improved regardless of changing Interface ECU, replace autoleveling ECU with a new one.

Hino Motors, Ltd.

Pub. No. **S1-YFCE18A ’06-9**
S1-YFCE18B ’06-11
S1-YFCE18C ’07-3
S1-YFCE18D ’07-8
S1-YFCE18E ’07-12
S1-YFCE18F 3/3 ’08-3
S1-YFCE18G 3/3 ’08-5
S1-YFCE18H 3/3 ’08-7
S1-YFCE18I 3/3 ’09-2
S1-YFCE18J 3/3 ’10-2
S1-YFCE18K 3/3 ’10-4