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 10 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 3/3 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.

<table>
<tr><td rowspan="2">CHAPTER</td><td>MANUAL No.</td><td colspan="3">S1-YFCE18K 2/3</td></tr>
<tr><td>MODELS</td><td colspan="3">FC6J, FC9J, FD8J, GD8J, FG8J, GH8J, FL8J, FM8J, FM1A, FM2P, SG8J, FT8J, GT8J</td></tr>
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(MODELS: WITH AIR OVER HYDRAULIC BRAKE)</td><td>BR01-002
(MODELS: WITH FULL AIR BRAKE)</td></tr>
<tr><td colspan="2">SERVICE BRAKE</td><td colspan="2">BR02-001
(MODELS: WITH AIR OVER HYDRAULIC BRAKE)</td><td>BR02-002
(MODELS: WITH FULL AIR BRAKE)</td></tr>
<tr><td colspan="2">ABS & ASR</td><td>BR03-001
(DENSO)</td><td>BR03-002
(WABCO, FOR AIR OVER HYDRAULIC BRAKE)</td><td>BR03-003
(WABCO, FOR FULL AIR BRAKE)</td></tr>
<tr><td colspan="2">ES START
(EASY & SMOOTH START SYSTEM)</td><td>BR04-001
(MODELS: WITH DENSO ABS)</td><td>BR04-002
(WABCO ABS FOR AIR OVER BRAKE)</td><td>BR04-003
(WABCO ABS FOR FULL AIR BRAKE)</td></tr>
<tr><td colspan="2">EXHAUST BRAKE</td><td colspan="3">BR05-001</td></tr>
<tr><td colspan="2">RETARDER BRAKE</td><td colspan="3">BR06-001 (ELECTROMAGNETIC RETARDER)</td></tr>
<tr><td colspan="2">PARKING BRAKE</td><td colspan="2">BR07-001
(MODELS: FC, FD, GD)</td><td>BR07-002
(MODELS: FG, GH, FL, FM, SG)</td></tr>
<tr><td colspan="2">STEERING EQUIPMENT</td><td colspan="3">SR01-001</td></tr>
<tr><td colspan="2">STEERING UNIT</td><td colspan="3">SR02-001</td></tr>
<tr><td colspan="2">POWER STEERING</td><td colspan="3">SR03-001</td></tr>
</table>

HINO

WORKSHOP MANUAL

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CLUTCH MAIN UNIT

CLUTCH CONTROL

TRANSMISSION EQUIPMENT

TRANSMISSION MAIN UNIT

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AUTOMATIC TRANSMISSION

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

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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".
"AXLE EQUIPMENT" to "OTHERS": Refer to "S1-YFCE18K 3/3".

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SUSPENSION

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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".
"AXLE EQUIPMENT" to "OTHERS": Refer to "S1-YFCE18K 3/3".

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".
"AXLE EQUIPMENT" to "OTHERS": Refer to "S1-YFCE18K 3/3".

INDEX: CHASSIS GROUP 4/4

ENGINE CONTROL

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BRAKE CONTROL

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OTHERS

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

BRAKE EQUIPMENT (MODELS: WITH AIR OVER HYDRAULIC BRAKE)

BR01-001

SERVICE BRAKE ASSEMBLY.....BR01-2

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SERVICE BRAKE ASSEMBLY

DESCRIPTION

EN0680101C100001

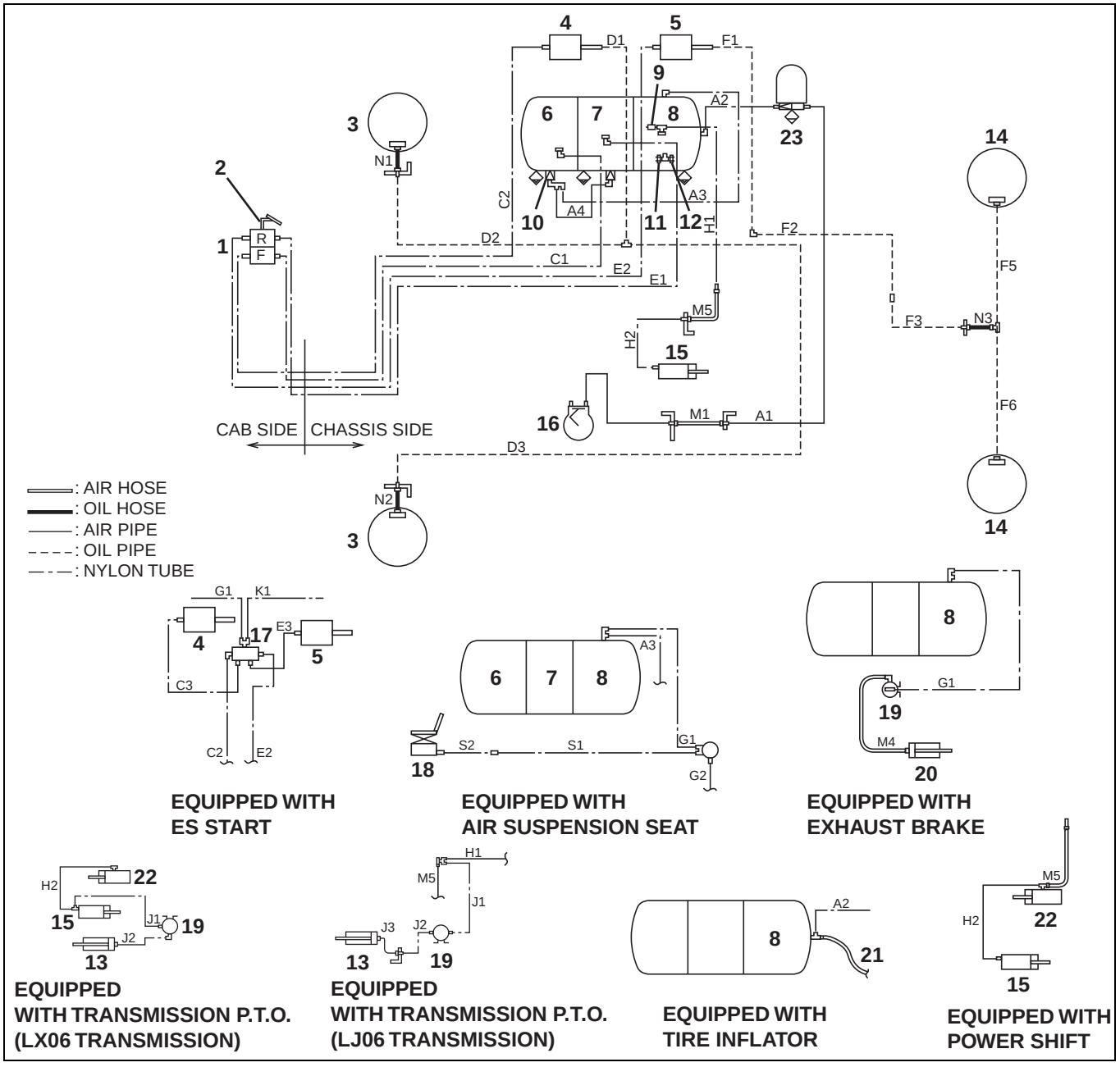
Type of service brake	Air over hydraulic system with drum-shoe type wheel brake.
Air charging system	Air charging is from piston type air compressor and air flow is directed and controlled by a pressure regulator, the necessary valves, and lines as required. Pressure sensor and air pressure warning switch are used for indicating the pressure level in the system.
Service brake control system	Two independent lines for front and rear wheels with air flow controlled by a brake valve, and each line is separated into air line and hydraulic line by a brake air booster. Stop lights switch is used to operate the stop lights.
Wheel brake	Drum brake with hydraulic actuated, internally expending two-leading shoes in front and dual two-leading shoes in rear wheels.

NOTICE
See "DIAGRAM" of the following page the component parts (Valves, Switches, etc.) used in easy system.

DIAGRAM

EN0680101J100001

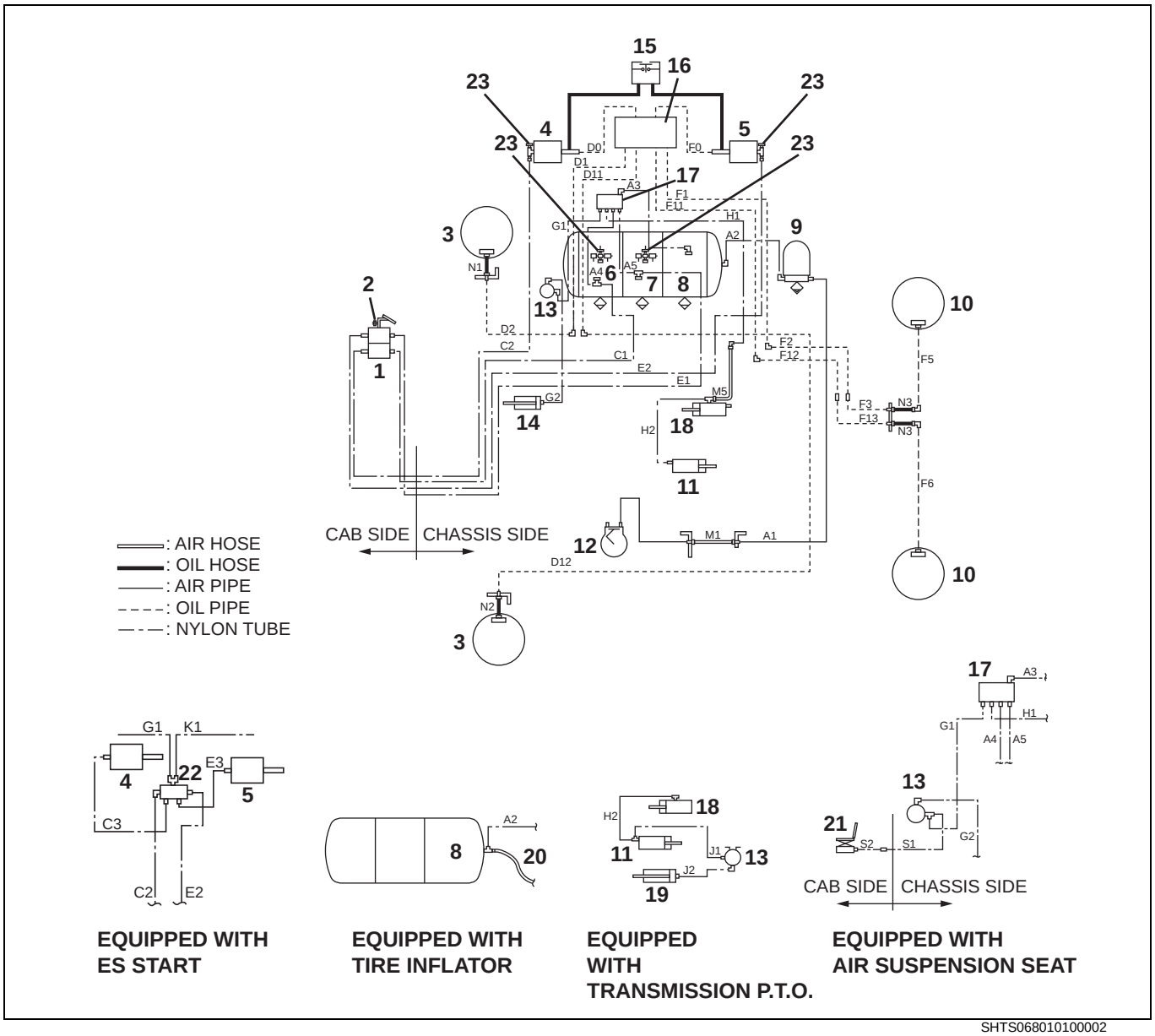
MODELS: FC, FD, GD (FOR CHILE, COLOMBIA, ECUADOR, MEXICO, PHILIPPINES, TAIWAN, THAILAND, AND VIETNAM) (WITHOUT ABS)



SHTS068010100001

1	Brake valve	13	Power take-off (If so equipped)
2	Stop light switch	14	Wheel brake - Rear
3	Wheel brake - Front	15	Clutch booster
4	Brake air booster - Front	16	Air compressor
5	Brake air booster - Rear	17	ES start control valve (If so equipped)
6	Air tank - Front	18	Air suspension seat (If so equipped)
7	Air tank - Rear	19	Magnetic valve
8	Air tank - Water separator	20	Exhaust brake
9	Safety valve	21	Tire inflator (If so equipped)
10	Check valve	22	Power shift (If so equipped)
11	Pressure sensor	23	Air dryer
12	Air pressure warning switch		

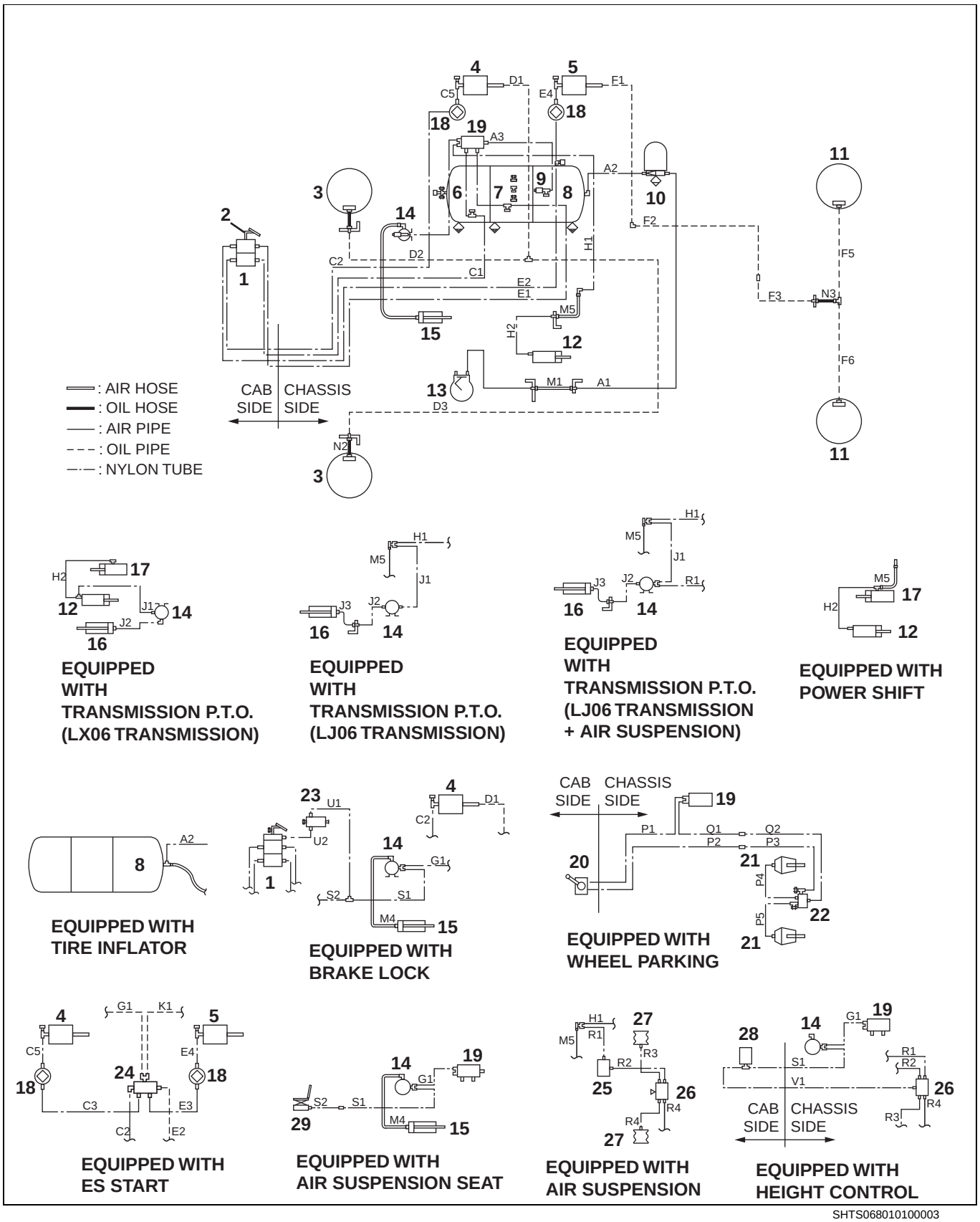
MODELS: FC, FD, GD (FOR COLOMBIA, ECUADOR, MEXICO AND TAIWAN) (EQUIPPED WITH ABS)



SHTS068010100002

1	Brake valve	13	Magnetic valve
2	Stop light switch	14	Exhaust brake
3	Wheel brake - Front	15	Brake fluid reservoir
4	Brake air booster - Front	16	Brake control modulator
5	Brake air booster - Rear	17	4-way protection valve
6	Air tank - Front	18	Power shift (If so equipped)
7	Air tank - Rear	19	Power take-off (If so equipped)
8	Air tank - Water separator	20	Tire inflator (If so equipped)
9	Air dryer	21	Air suspension seat (If so equipped)
10	Wheel brake - Rear	22	ES start control valve (If so equipped)
11	Clutch booster	23	Test connection (For TAIWAN)
12	Air compressor		(Apply to vehicles produced for after Dec, 2009)

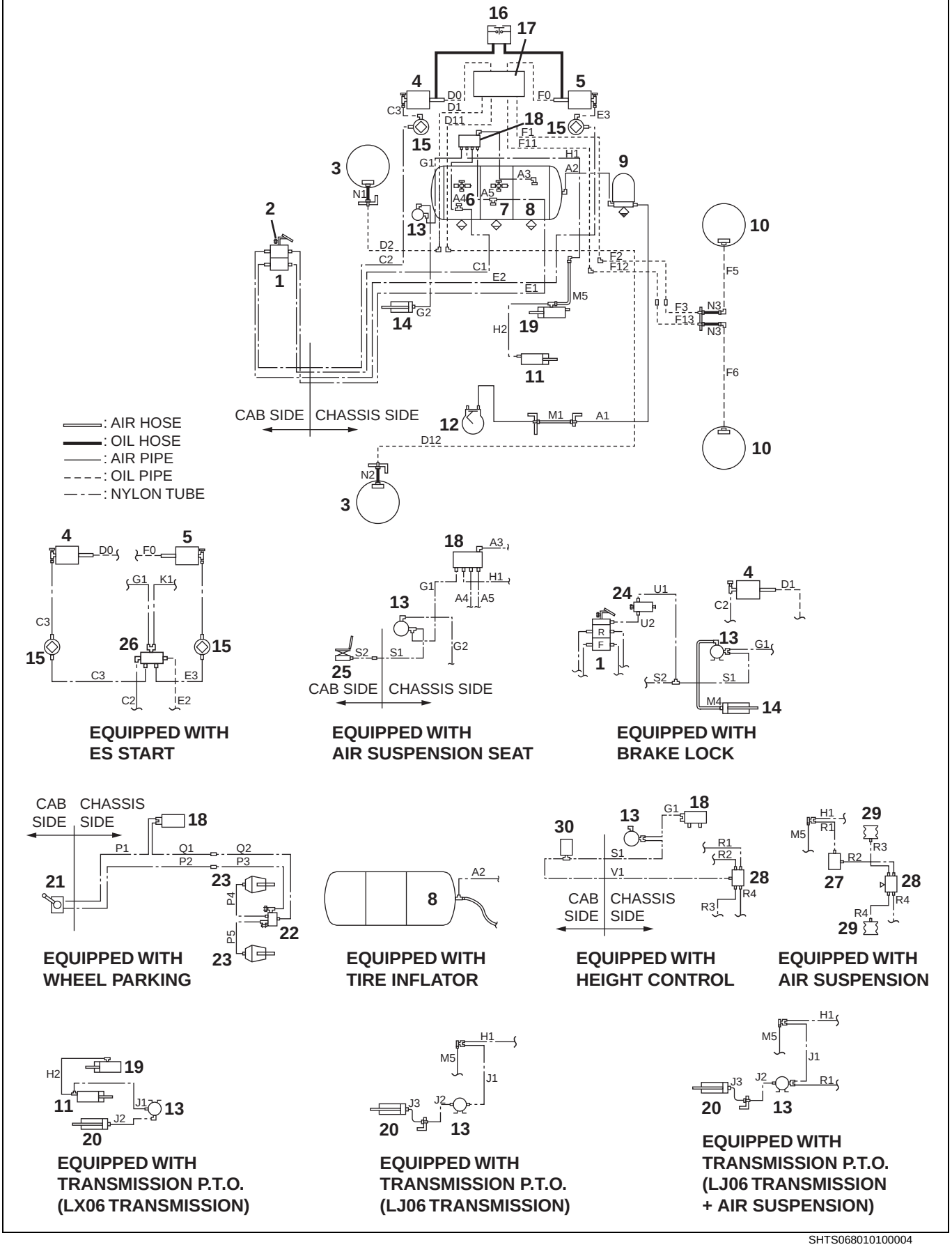
MODELS: FC, FD, GD (FOR AUSTRALIA, NEW ZEALAND AND SINGAPORE) (WITHOUT ABS)



SHTS068010100003

1	**Brake valve**	**16**	**Power take-off (If so equipped)**
2	**Stop light switch**	**17**	**Power shift (If so equipped)**
3	**Wheel brake - Front**	**18**	**Quick release valve**
4	**Brake air booster - Front**	**19**	**4-way protection valve**
5	**Brake air booster - Rear**	**20**	**Parking brake control valve**
6	**Air tank - Front**	**21**	**Parking brake chamber**
7	**Air tank - Rear**	**22**	**Relay valve**
8	**Air tank - Water separator**	**23**	**Brake lock control valve (If so equipped)**
9	**Safety valve**	**24**	**ES start control valve (If so equipped)**
10	**Air dryer**	**25**	**Protection valve**
11	**Wheel brake - Rear**	**26**	**Leveling valve**
12	**Clutch booster**	**27**	**Air spring**
13	**Air compressor**	**28**	**Height control switch (If so equipped)**
14	**Magnetic valve**	**29**	**Air suspension seat (If so equipped)**
15	**Exhaust brake**		

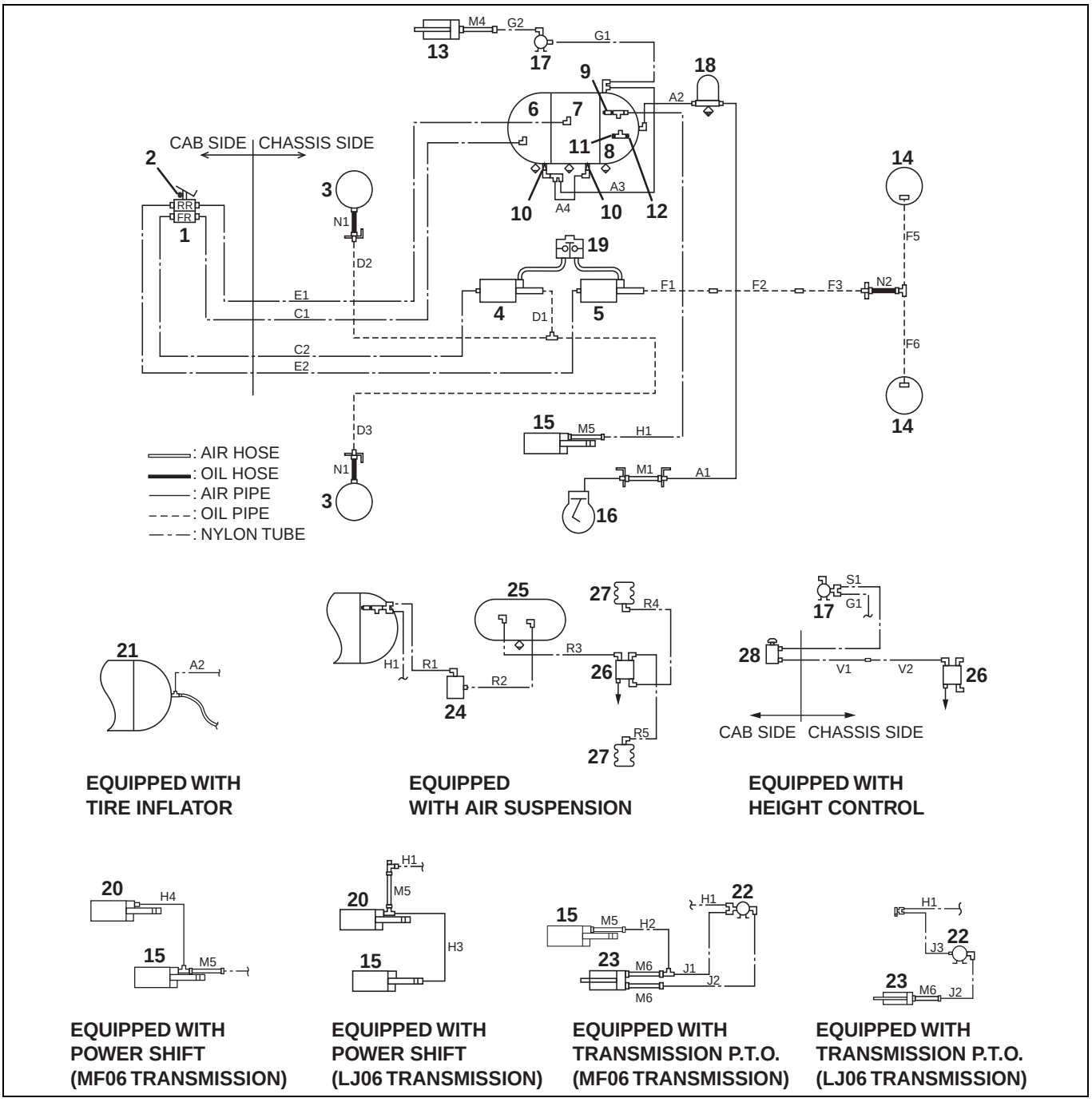
MODELS: FC, FD, GD (FOR AUSTRALIA, HONG KONG AND NEW ZEALAND) (EQUIPPED WITH ABS)



SHTS068010100004

1	**Brake valve**	**16**	**Brake fluid reservoir**
2	**Stop light switch**	**17**	**Brake control modulator**
3	**Wheel brake - Front**	**18**	**4-way protection valve**
4	**Brake air booster - Front**	**19**	**Power shift (If so equipped)**
5	**Brake air booster - Rear**	**20**	**Power take-off (If so equipped)**
6	**Air tank - Front**	**21**	**Parking brake control valve**
7	**Air tank - Rear**	**22**	**Relay valve**
8	**Air tank - Water separator**	**23**	**Parking brake chamber**
9	**Air dryer**	**24**	**Brake lock control valve (If so equipped)**
10	**Wheel brake - Rear**	**25**	**Air suspension seat (If so equipped)**
11	**Clutch booster**	**26**	**ES start control valve (If so equipped)**
12	**Air compressor**	**27**	**Protection valve**
13	**Magnetic valve**	**28**	**Leveling valve**
14	**Exhaust brake**	**29**	**Air spring**
15	**Quick release valve**	**30**	**Height control switch (If so equipped)**

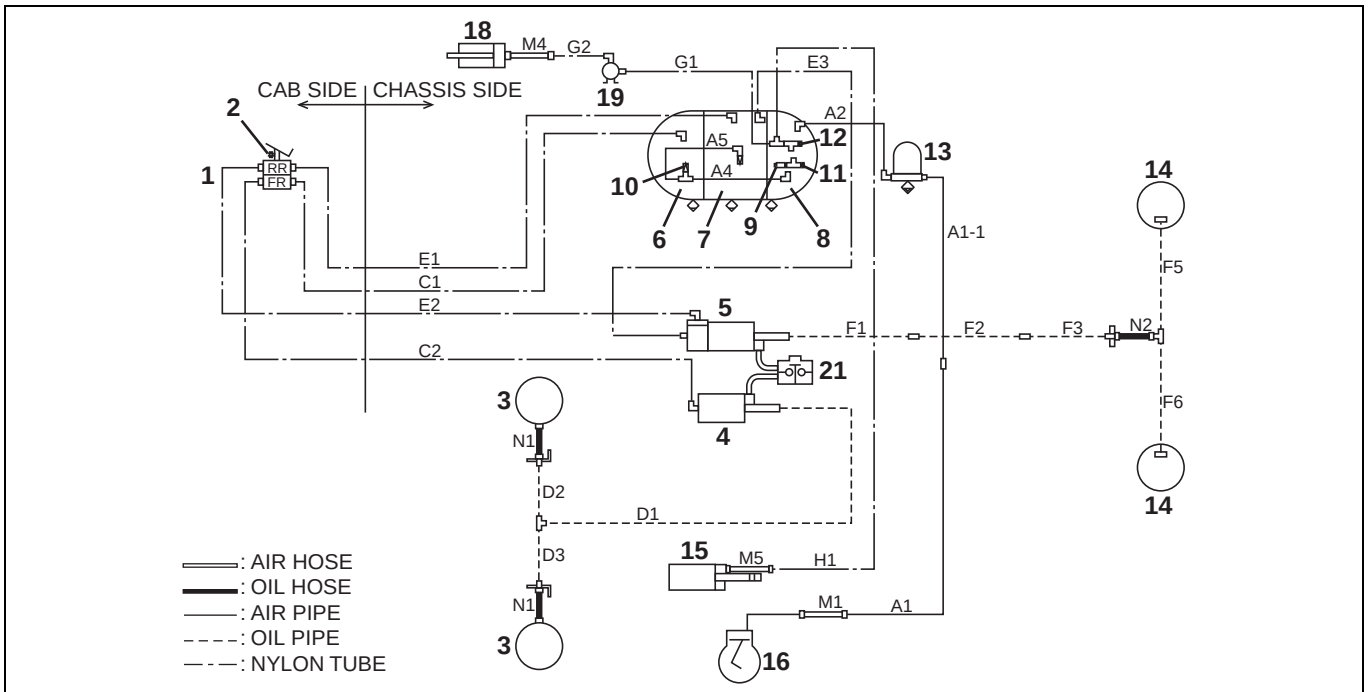
MODEL: FG (FOR INDONESIA, PHILIPPINES, THAILAND AND VIETNAM)



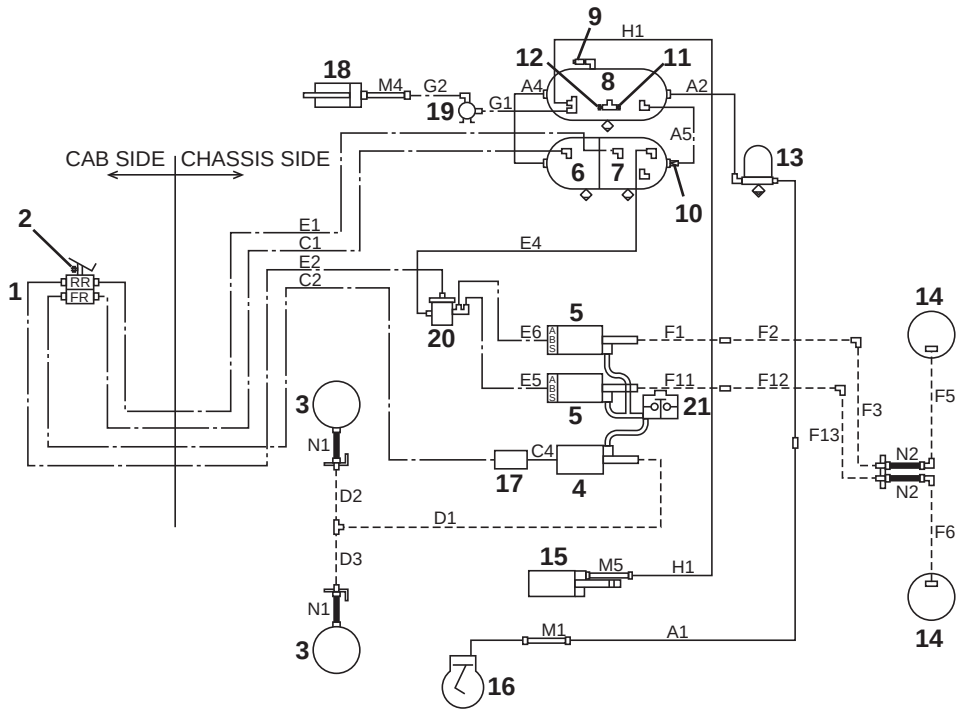
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1	**Brake valve**	**15**	**Clutch booster**
2	**Stop light switch**	**16**	**Air compressor**
3	**Wheel brake - Front**	**17**	**Exhaust brake magnetic valve**
4	**Brake air booster - Front**	**18**	**Air dryer**
5	**Brake air booster - Rear**	**19**	**Brake fluid reservoir**
6	**Air tank - Front**	**20**	**Power shift (If so equipped)**
7	**Air tank - Rear**	**21**	**Tire inflator (If so equipped)**
8	**Air tank - Water separator**	**22**	**Power take-off magnetic valve (If so equipped)**
9	**Safety valve**	**23**	**Power take-off (If so equipped)**
10	**Check valve**	**24**	**Protection valve**
11	**Pressure sensor**	**25**	**Air tank - Air suspension**
12	**Air pressure warning switch**	**26**	**Leveling valve**
13	**Exhaust brake**	**27**	**Air spring**
14	**Wheel brake - Rear**	**28**	**Height control switch (If so equipped)**

MODELS: FG, GH (FOR TAIWAN) (Apply to vehicles produced for befor Nov, 2009)

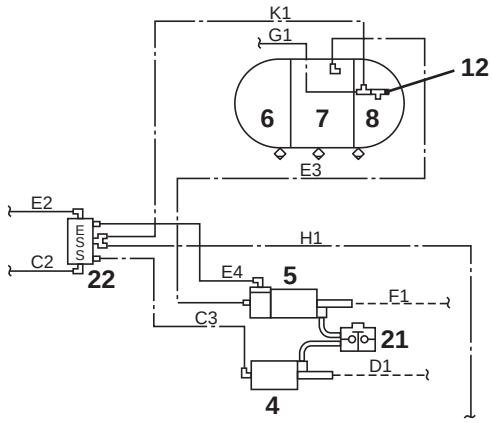


WITHOUT ABS

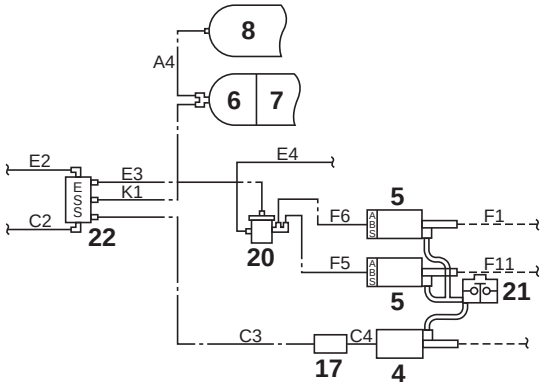


WITH ABS

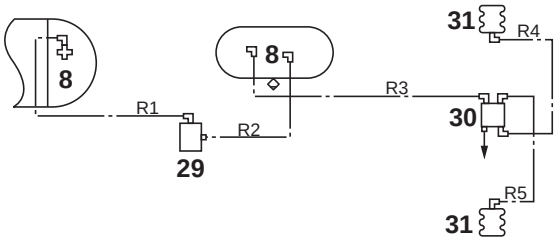
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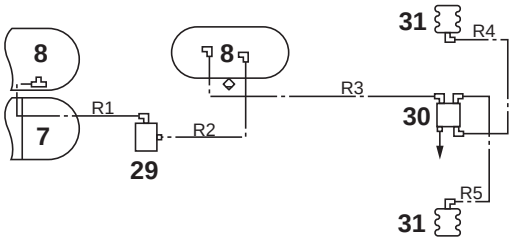
EQUIPPED WITH ES START (WITHOUT ABS)



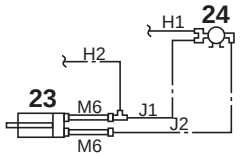
EUIPPED WITH ES START (WITH ABS)



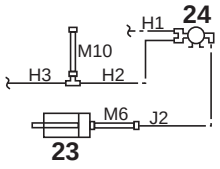
EQUIPPED WITH AIR SUSPENSION (WITHOUT ABS)



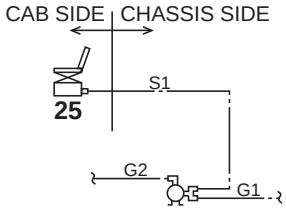
EQUIPPED WITH AIR SUSPENSION (WITH ABS)



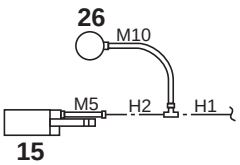
EQUIPPED WITH TRANSMISSION P.T.O. (MF06 TRANSMISSION)



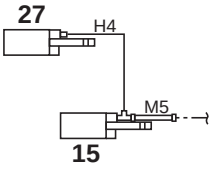
EQUIPPED WITH TRANSMISSION P.T.O. (EATON TRANSMISSION)



EQUIPPED WITH AIR SUSPENSION SEAT



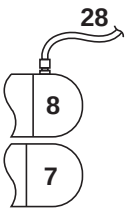
WITH EATON TRANSMISSION



EQUIPPED WITH TRANSMISSION POWER SHIFT (MF06 TRANSMISSION)



EQUIPPED WITH TIRE INFLATOR (WITHOUT ABS)

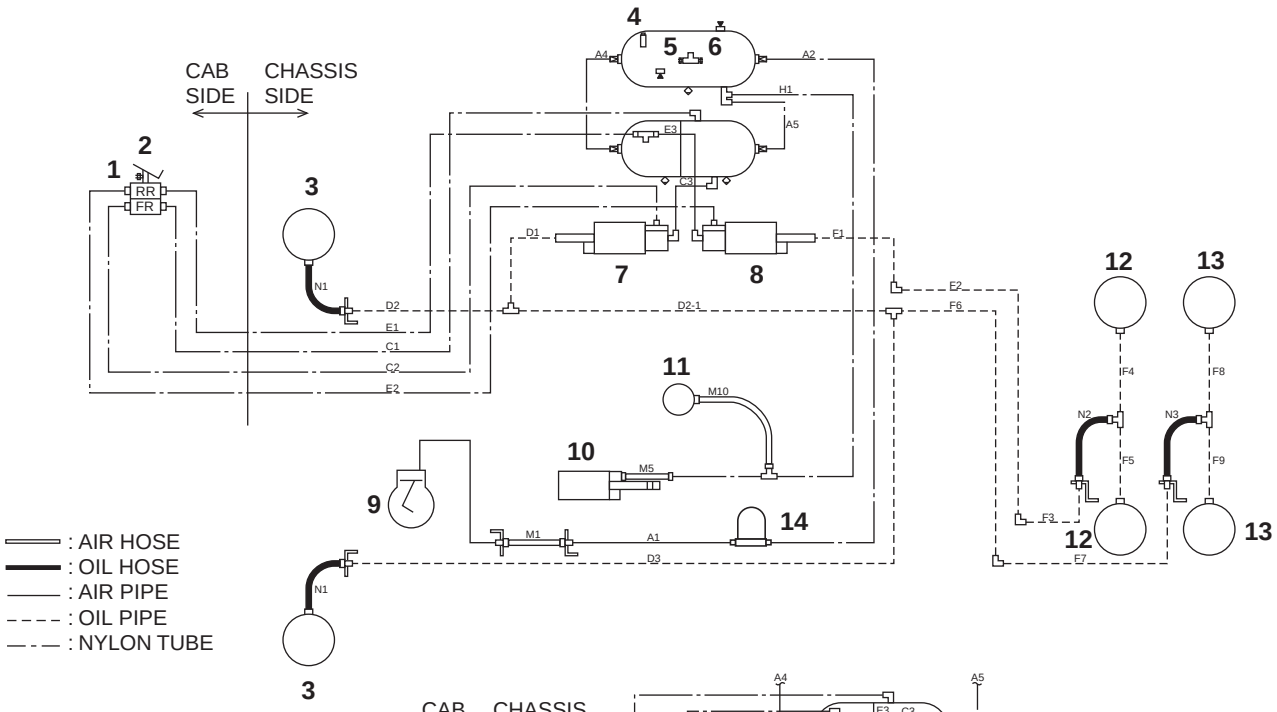


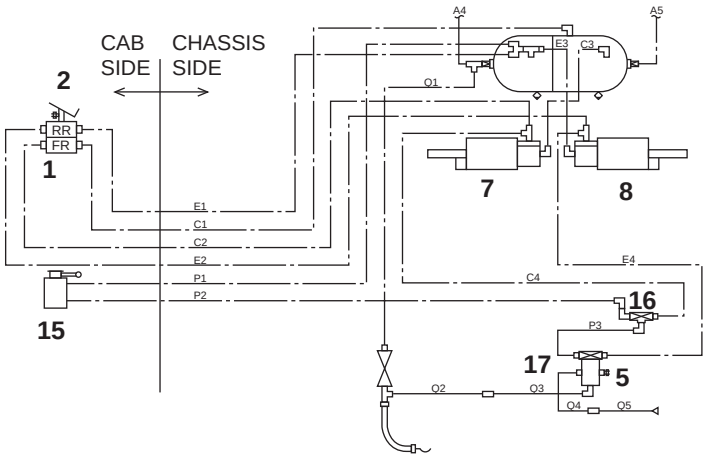
EQUIPPED WITH TIRE INFLATOR (WITH ABS)

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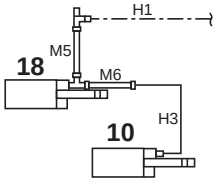
1	Brake valve	17	ABS control valve
2	Stop light switch	18	Exhaust brake
3	Wheel brake - Front	19	Exhaust brake magnetic valve
4	Brake air booster - Front	20	Relay valve
5	Brake air booster - Rear	21	Brake fluid reservoir
6	Air tank - Front	22	ES start control valve
7	Air tank - Rear	23	Power take-off (If so equipped)
8	Air tank - Water separator	24	Power take-off magnetic valve (If so equipped)
9	Safety valve	25	Air suspension seat (If so equipped)
10	Check valve	26	Range preselection magnetic valve
11	Pressure sensor	27	Power shift
12	Air pressure warning switch	28	Tire inflator (If so equipped)
13	Air dryer	29	Protection valve
14	Wheel brake - Rear	30	Leveling valve
15	Clutch booster	31	Air spring
16	Air compressor		

MODELS: FL, FM (FOR PHILIPPINES, THAILAND AND VIETNAM)

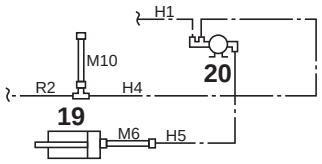




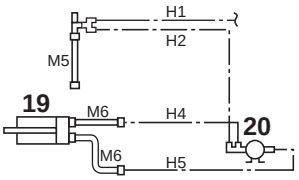
CIRCUIT OF TRAILER



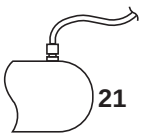
EQUIPPED WITH MF06 TRANSMISSION



EQUIPPED WITH TRANSMISSINO P.T.O. (FS8209 TRANSMISSION)

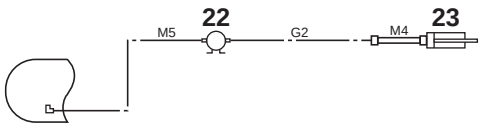


EQUIPPED WITH TRANSMISSION P.T.O. (MF06 TRANSMISSION)

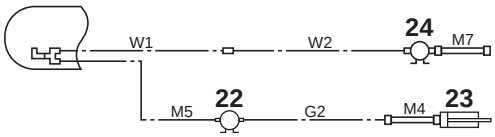


EQUIPPED WITH TIRE INFLATOR

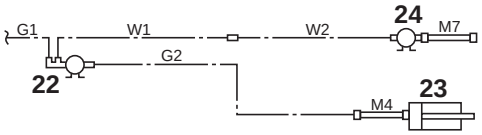
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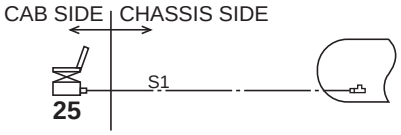
EQUIPPED WITH EXHAUST BRAKE (MODEL: FL)



EQUIPPED WITH DIFFERENTIAL LOCK AND EXHAUST BRAKE (MODEL: EXCEPT FM TRACTOR)



EQUIPPED WITH DIFFERENTIAL LOCK AND EXHAUST BRAKE (MODEL: FM TRACTOR)

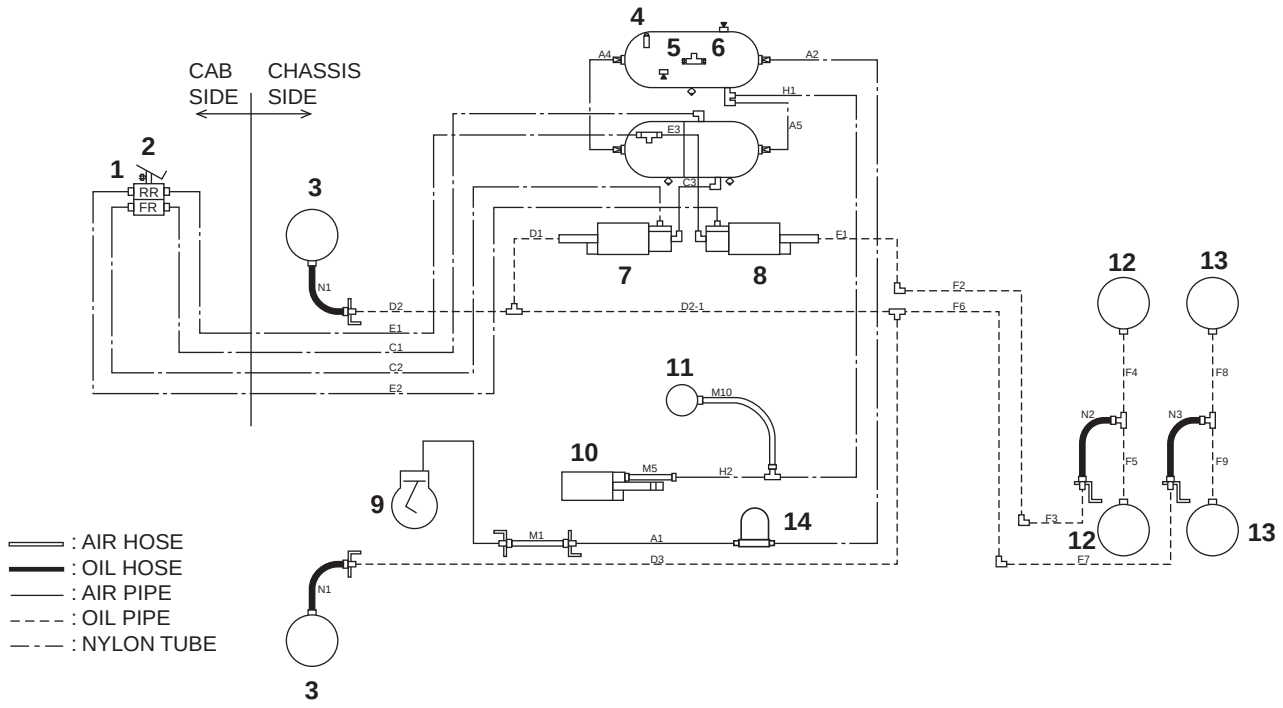


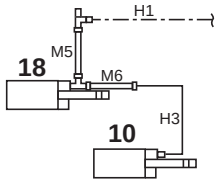
EQUIPPED WITH AIR SUSPENSION SEAT

SHTS068010100009

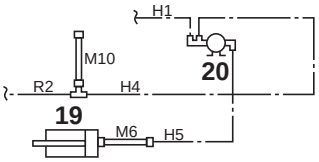
1	Brake valve	14	Air dryer
2	Stop light switch	15	Trailer hand brake
3	Wheel brake - Front	16	Double check valve
4	Safety valve	17	Relay valve
5	Pressure switch	18	Transmission power shift
6	Pressure sensor	19	Power take-off
7	Brake air booster - Front	20	Power take-off magnetic valve
8	Brake air booster - Rear	21	Tire inflator
9	Air compressor	22	Exhaust brake magnetic valve
10	Clutch booster	23	Exhaust brake
11	Transmission high-low change	24	Differential lock magnetic valve
12	Wheel brake - Rear	25	Air suspension seat
13	Wheel brake - Rear		

MODELS: FL, FM8J (FOR INDONESIA)

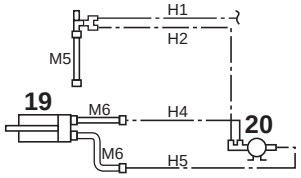




EQUIPPED WITH MF06 TRANSMISSION



EQUIPPED WITH TRANSMISSION P.T.O. (FS8209 TRANSMISSION)

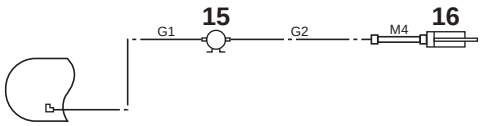


EQUIPPED WITH TRANSMISSION P.T.O. (MF06 TRANSMISSION)

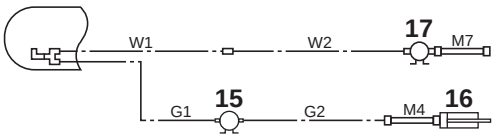


EQUIPPED WITH TIRE INFLATOR

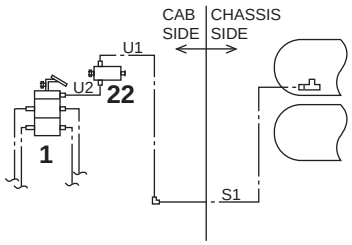
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EQUIPPED WITH EXHAUST BRAKE (MODEL: FL)



EQUIPPED WITH DIFFERENTIAL LOCK AND EXHAUST BRAKE (MODEL: FM)

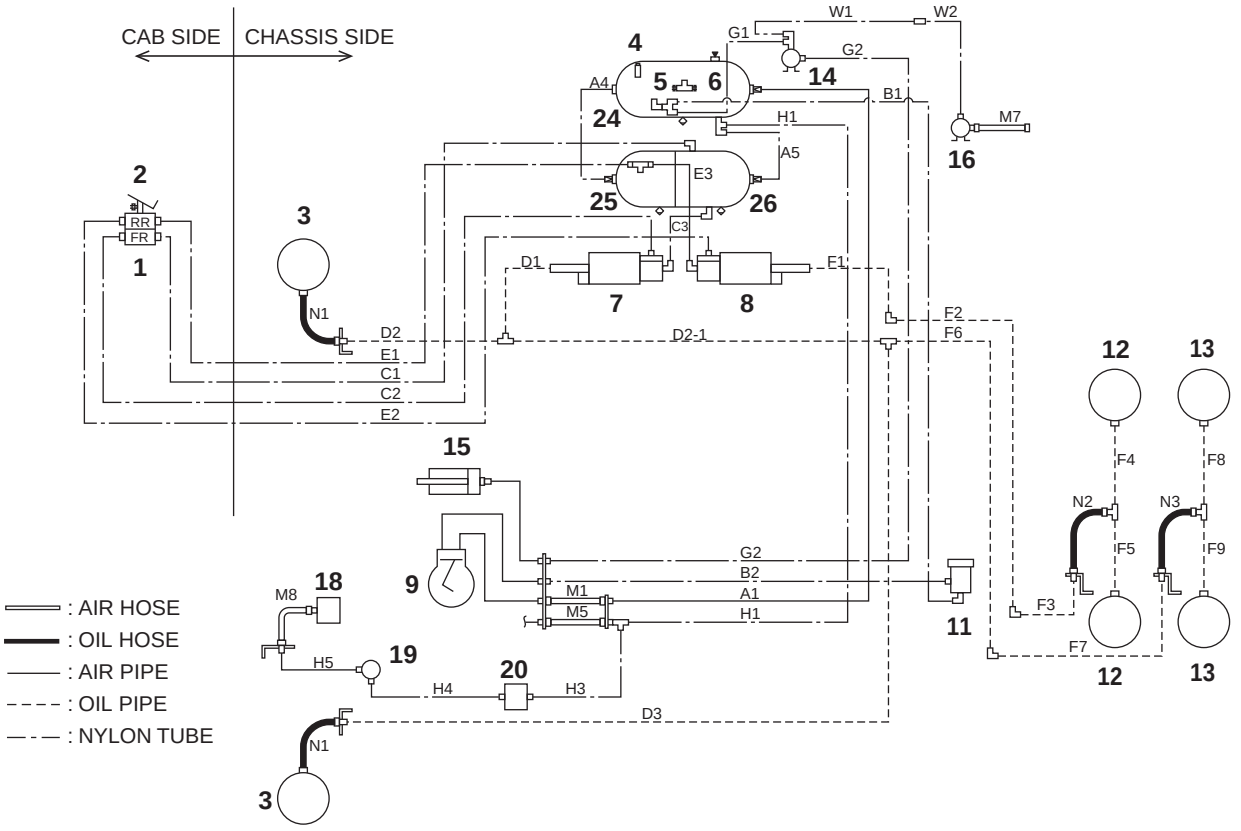


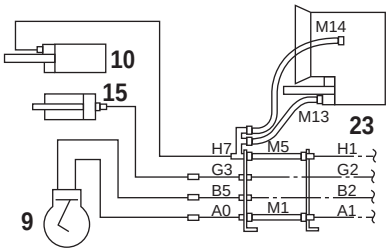
EQUIPPED WITH BRAKE LOCK

SHTS068010100011

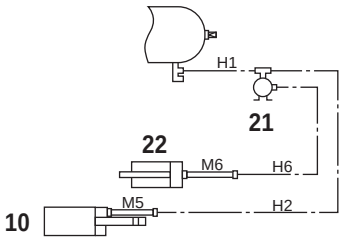
1	Brake valve	12	Wheel brake - Rear
2	Stop light switch	13	Wheel brake - Rear
3	Wheel brake - Front	14	Air dryer
4	Safety valve	15	Exhaust brake magnetic valve
5	Pressure switch	16	Exhaust brake
6	Pressure sensor	17	Differential lock magnetic valve
7	Brake air booster - Front	18	Transmission power shift
8	Brake air booster - Rear	19	Power take-off
9	Air compressor	20	Power take-off magnetic valve
10	Clutch booster	21	Tire inflator
11	Transmission high-low change	22	Brake lock control valve

MODEL: FM2P

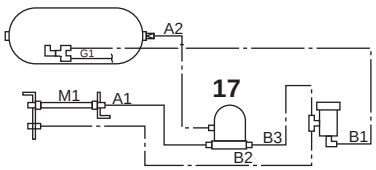




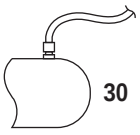
WITH ZF9S109 TRANSMISSION



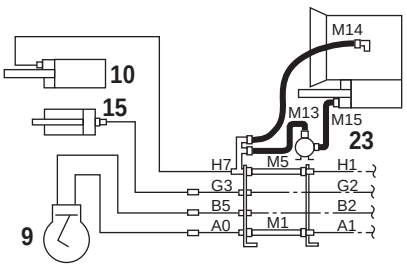
EQUIPPED WITH TRANSMISSION P.T.O.



WITH AIR DRYER

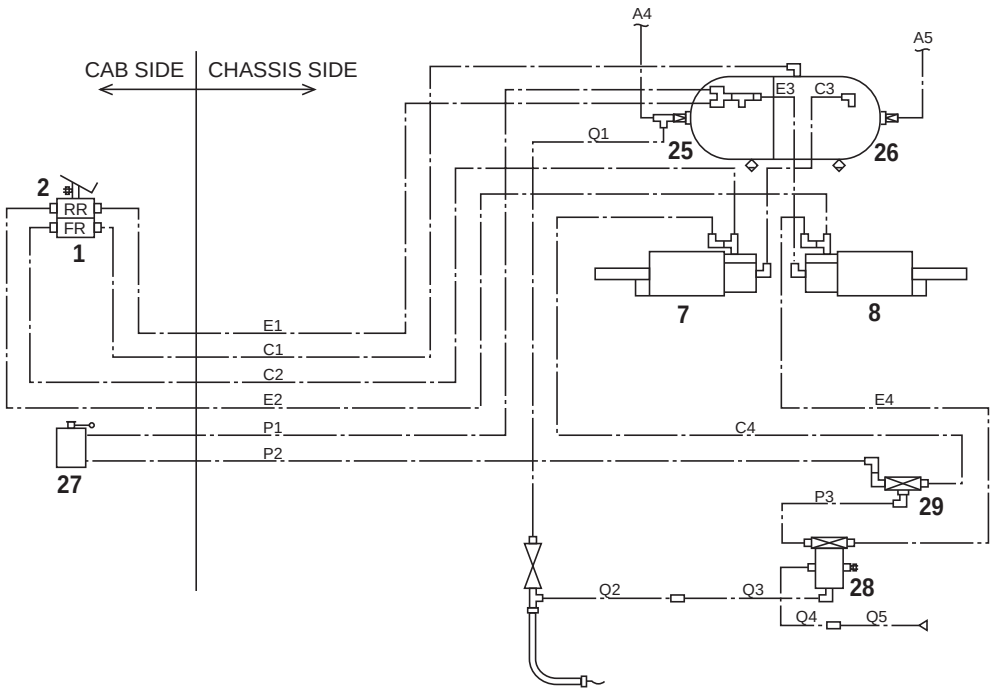


EQUIPPED WITH TIRE INFLATOR



EQUIPPED WITH ZF9S1310 TRANSMISSION

SHTS068010100012

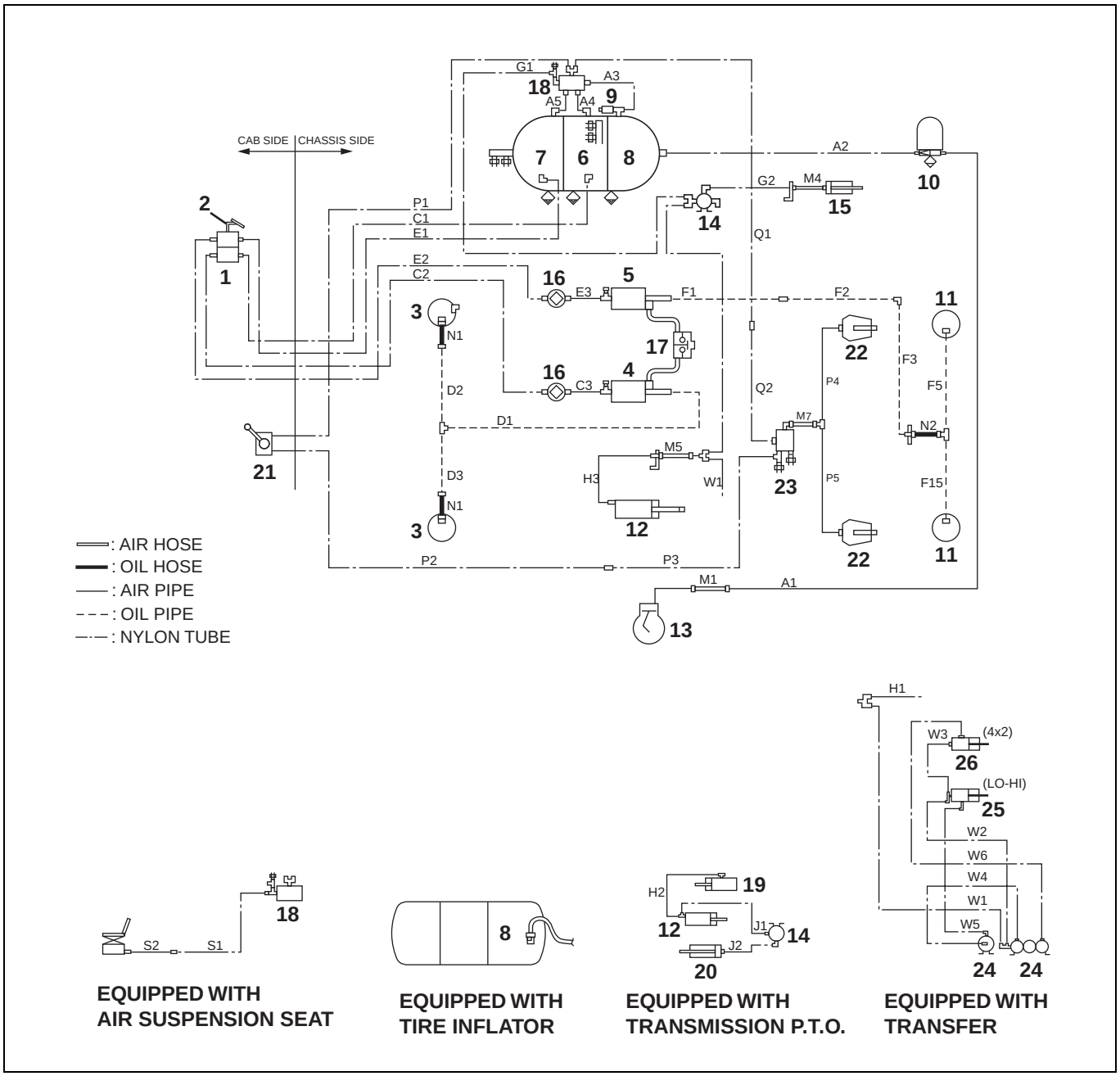


CIRCUIT OF TRAILER

SHTS068010100013

1	**Brake valve**	**16**	**Differential lock magnetic valve**
2	**Stop light switch**	**17**	**Air dryer (If so equipped)**
3	**Wheel brake - Front**	**18**	**Waste gate**
4	**Safety valve**	**19**	**Waste gate magnetic valve**
5	**Pressure switch**	**20**	**Limiting valve**
6	**Pressure sensor**	**21**	**Power take-off magnetic valve (If so equipped)**
7	**Brake air booster - Front**	**22**	**Power take-off (If so equipped)**
8	**Brake air booster - Rear**	**23**	**Transmission power shift**
9	**Air compressor**	**24**	**Air tank - Water separator**
10	**Clutch booster**	**25**	**Air tank - Rear**
11	**Pressure regulator**	**26**	**Air tank - Front**
12	**Wheel brake - Rear**	**27**	**Hand brake valve**
13	**Wheel brake - Rear**	**28**	**Relay valve**
14	**Exhaust brake magnetic valve**	**29**	**Double check valve**
15	**Exhaust brake**	**30**	**Tire inflator**

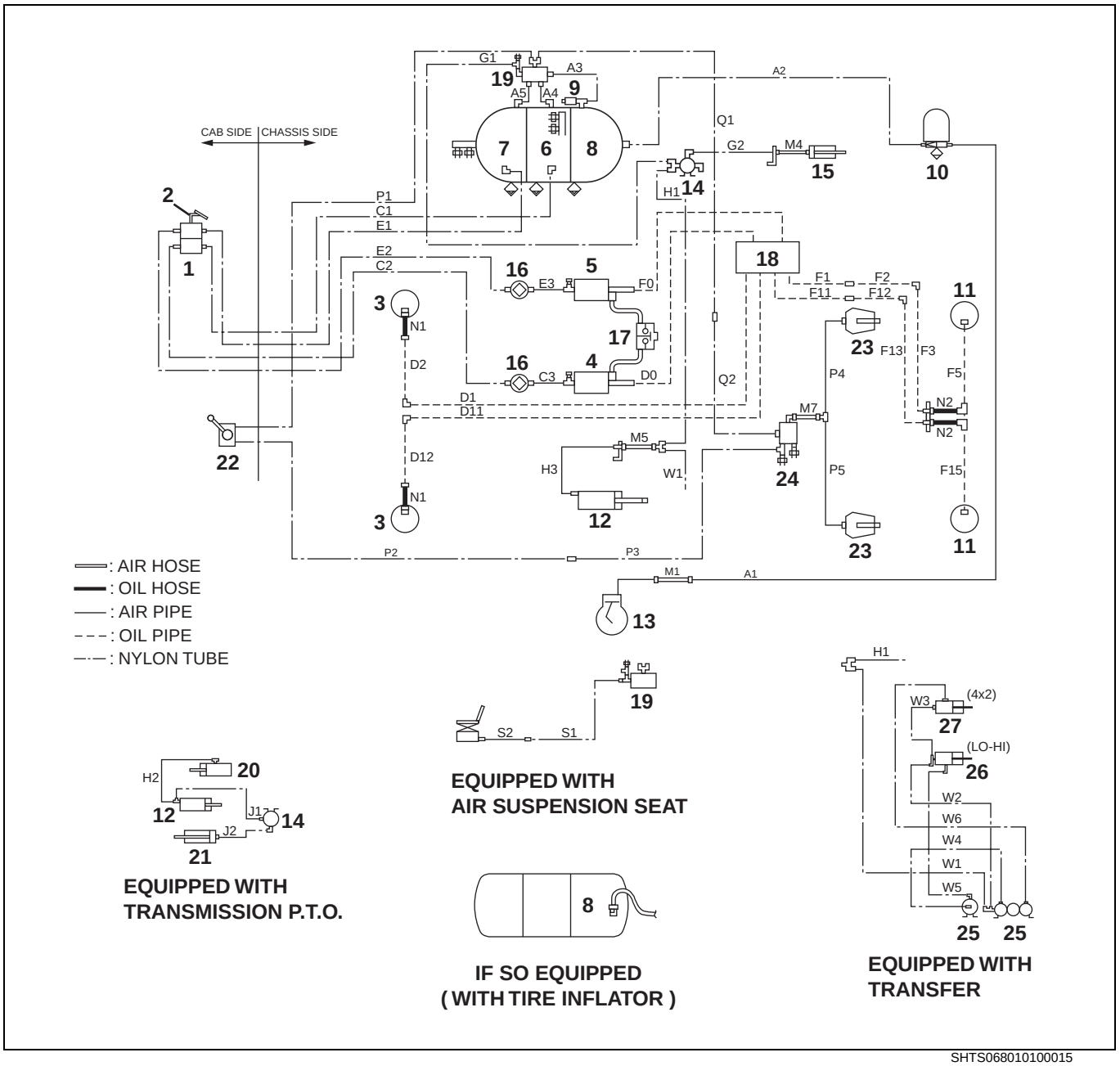
MODELS: FT, GT (WITHOUT ABS)



SHTS068010100014

1	Brake valve	14	Magnetic valve
2	Stop light switch	15	Exhaust brake
3	Wheel brake - Front	16	Quick release valve
4	Brake air booster - Front	17	Brake fluid reservoir
5	Brake air booster - Rear	18	4-way protection valve
6	Air tank - Front	19	Power shift (If so equipped)
7	Air tank - Rear	20	Power take-off (If so equipped)
8	Air tank - Water separator	21	Parking brake control valve
9	Safety valve	22	Parking brake chamber
10	Air dryer	23	Relay valve
11	Wheel brake - Rear	24	Transfer magnetic valve
12	Clutch booster	25	High-Low shift unit
13	Air compressor	26	4WD shift unit

MODELS: FT, GT (EQUIPPED WITH ABS)



SHTS068010100015

1	Brake valve	15	Exhaust brake
2	Stop light switch	16	Quick release valve
3	Wheel brake - Front	17	Brake fluid reservoir
4	Brake air booster - Front	18	Brake control modulator
5	Brake air booster - Rear	19	4-way protection valve
6	Air tank - Front	20	Power shift (If so equipped)
7	Air tank - Rear	21	Power take-off (If so equipped)
8	Air tank - Water separator	22	Parking brake control valve
9	Safety valve	23	Parking brake chamber
10	Air dryer	24	Relay valve
11	Wheel brake - Rear	25	Transfer magnetic valve
12	Clutch booster	26	High-Low shift unit
13	Air compressor	27	4WD shift unit
14	Magnetic valve		

TROUBLESHOOTING

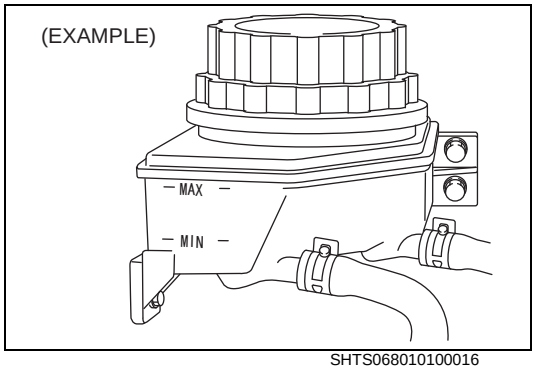
EN0680101F300001

Symptom	Possible cause	Remedy/Prevention
Not enough braking (Wheel brake and drum)	Lining is wet with grease or fluid	Replace the lining.
	Improper contact of drum and lining	Correct.
	Improper lining material or glazed lining	Correct.
	Deformation or hardening of drum	Correct or replace.
	Excessively worn lining	Replace.
	Improper adjustment of shoe	Adjust hold-down nut.
Not enough braking (Control system)	Leakage of brake fluid from brake system	Tighten further or replace gasket.
	Leakage of compressed air from brake system	Tighten further or replace gasket.
	Lack of brake fluid	Supply brake fluid.
	Lack of compressed air pressure due to excessive use.	Use properly.
	Improper operation of air compressor	Repair or replace.
	Improper operation of brake valve	Repair or replace.
	Improper operation of air booster	Repair or replace.
	Clogging of brake system	Replace pipe, hose, etc.
	Vapor lock in brake system	Bleed air from brake line.
Brake fluid decreases	Leakage of brake fluid from brake piping	Tighten further or replace gasket.
	Leakage of brake fluid from cylinder	Replace cup.
	Leakage of brake fluid from push rod oil seal of air booster.	Replace oil seal.
Unequal or unstable braking	Lining is wet with grease or fluid	Replace lining.
	Defective lining material (Improper combination)	Replace lining.
	Non-uniform lining contact	Correct.
	Improper adjustment of brake shoe	Adjust.
	Non-uniform shoe clearance	Adjust the clearance.
	Distorted drums	Correct or replace.
	Excessive abrasion of drums	Correct or replace.
	Loose hub bearing	Adjust or replace bearing.
	Improper or unequal pneumatic pressure of tire	Adjust to proper pneumatic pressure.
	Clogging of brake system	Replace pipe, hose, etc.
Brake drags or does not release (Wheel brake and drum)	Improper adjustment of shoe clearance	Adjust the clearance.
	Improper adjustment of brake shoe	Adjust hold-down nut.
	Defective shoe return spring	Replace.
Brake drags or does not release (Control system)	Lack of pedal play	Adjust.
	Improper return of brake pedal	Repair or replace.
	Improper operation of brake valve	Repair or replace.
	Defective check valve of air booster	Replace.
	Improper operation of air booster	Repair or replace.
	Clogging of brake system	Replace pipe, hose, etc.

Symptom	Possible cause	Remedy/Prevention
Brake squeal	Improper lining material or glazed lining	Replace lining.
	Loose lining rivets	Replace or tighten the rivet further.
	Lining rivet in contact with drum	Replace lining and rivet.
	Deformation or wear of drum	Repair or replace.
	Intrusion of foreign matter between drum and lining	Clean the surface of lining or replace
	Loose hub bearing	Adjust or replace bearing.
Impossible to bleed air completely.	Oil hose between air booster and oil reservoir bends and air trapped	Correct the bend of feed pipe and let air out of the oil reservoir.
	Improper tightness of joint of brake system.	Tighten further or replace gasket.

AIR BLEEDING

EN0680101H100001



SHTS068010100016

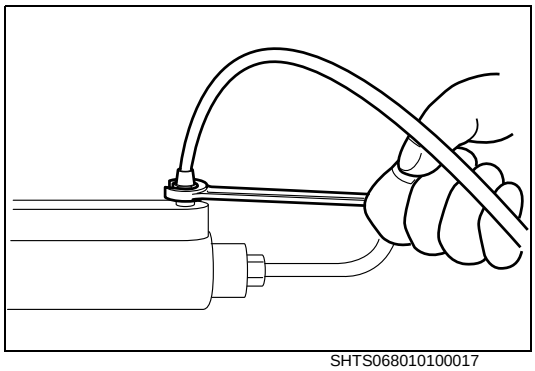
1. PREPARATION

(1) Replenish the reservoir with brake fluid up to MAX line.

(2) Start the engine and keep the engine revolution at idling speed during replacing the brake fluid.

NOTICE

Always first finish the replacement of either front or rear brake line and then start the replacement of the other.

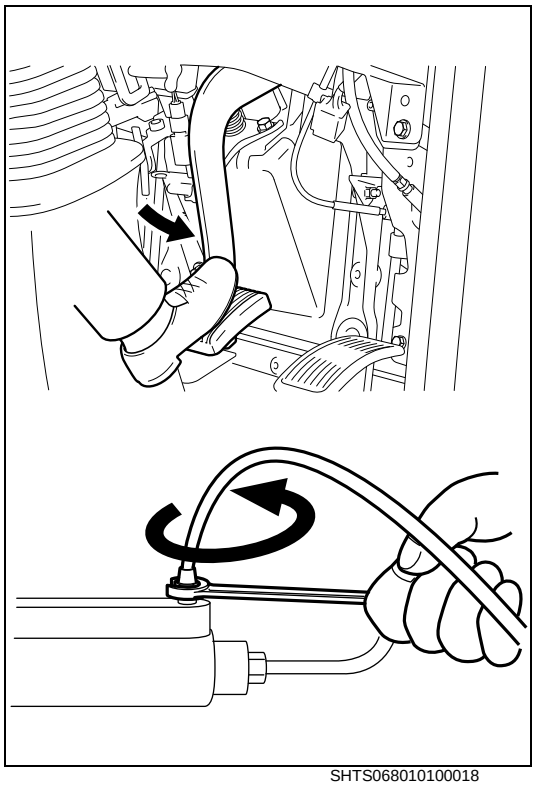

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2. AIR BLEEDING OF THE LINE FROM THE RESERVOIR TO THE BRAKE BOOSTER

(1) Attach a vinyl tube to the bleeder screw of the brake booster.

NOTICE

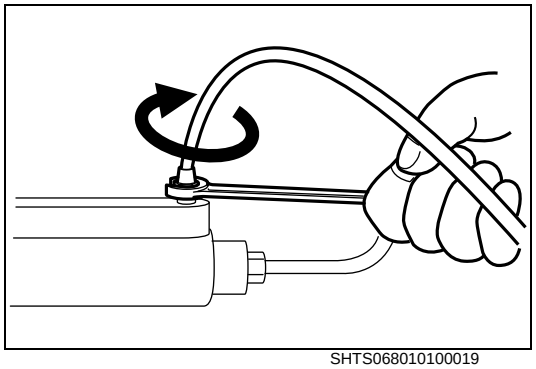
Prepare a container box receiving brake fluid at the end of the vinyl tube.


SHTS068010100018

(2) While depressing slowly the brake pedal, loosen the bleeder screw and discharge the brake fluid with air or old brake fluid.

NOTICE

When replacing the brake fluid, the color of the fluid changes paler. So, observe the color of the fluid passing through the tube.

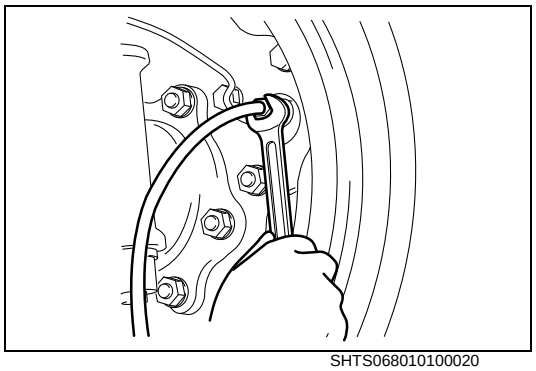


SHTS068010100019

(3) While depressing the brake pedal, tighten the bleeder screw and then release the brake pedal.

(4) Repeat the above procedure until no air is observed in the vinyl tube or the replacement of the brake fluid is finished.
Tightening Torque:
7.0-12.0 N·m {71-122 kgf·cm, 5.2-8.8 lbf·ft}

NOTICE
Because the quantity of brake fluid will decrease, continue to replenish the reservoir with brake fluid to avoid that the reservoir becomes empty.



SHTS068010100020

3. AIR BLEEDING THE LINE FROM THE BRAKE BOOSTER TO THE WHEEL CYLINDER

(1) Attach the vinyl tube to the bleeder screw of wheel cylinder and carry out the air bleeding or replacement in the same manner as that of the brake booster.

Tightening Torque:
7.5-11.5 N·m {76-117 kgf·cm, 5.5-8.4 lbf·ft}

NOTICE
Carry out the air bleeding starting from the wheel cylinder nearest to the brake booster.

(2) After having finished the air bleeding or replacement, replenish the reservoir with brake fluid up to the MAX line.

BRAKE EQUIPMENT (MODELS: WITH FULL AIR BRAKE)

BR01-002

SERVICE BRAKE ASSEMBLY.....BR01-2
DESCRIPTION BR01-2
DIAGRAM BR01-3
TROUBLESHOOTING..... BR01-21

SERVICE BRAKE ASSEMBLY

DESCRIPTION

EN0668001C100001

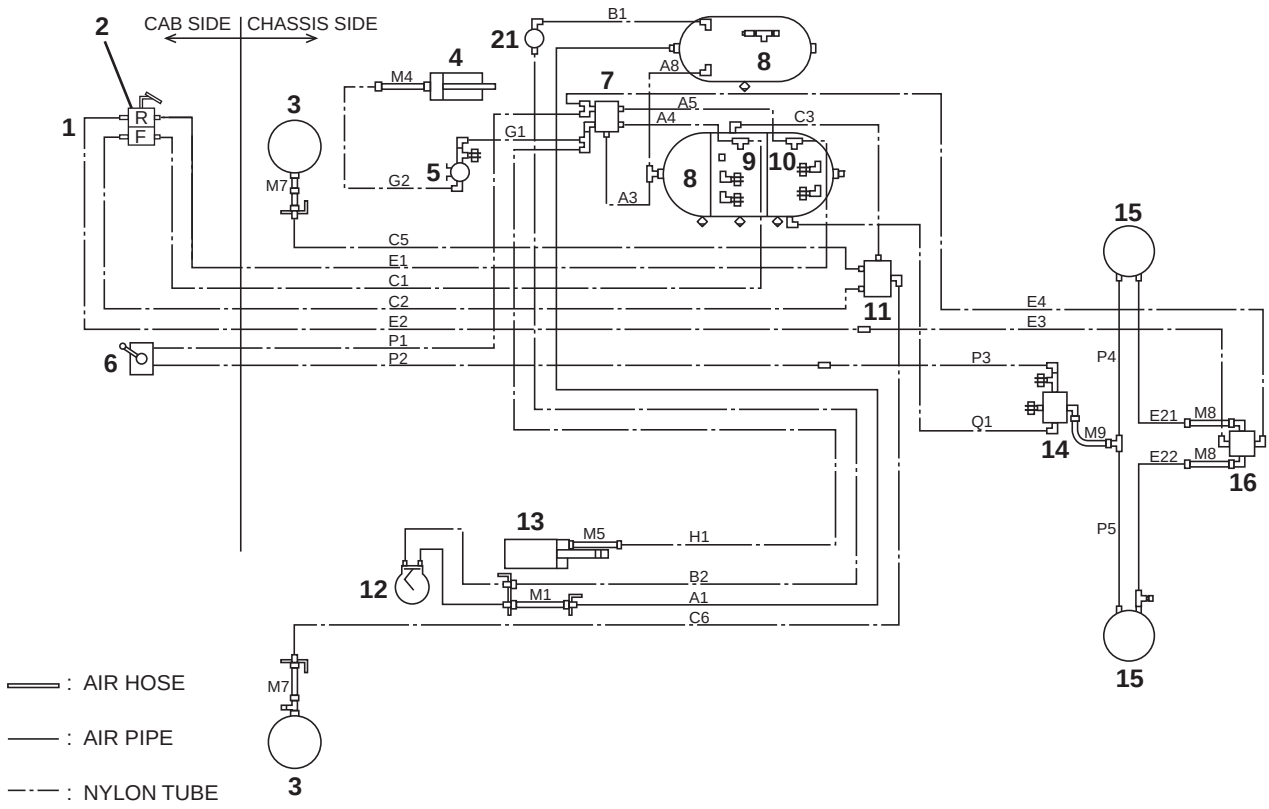
Type of service brake	Drum shoe type wheel brake activated by compressed air.
Air charging system	Air charging is from piston type air compressor and air flow is directed and controlled by a pressure regulator, the necessary valves, and lines as required. Pressure sensor and air pressure warning switch are used for indicating the pressure level in the system.
Service brake control system	Two independent lines for front and rear wheels with air flow controlled by a brake valve, and each line comprises a group of valves and brake chambers (one/wheel). Two stop light switches (one/line) are used to operate the stop lights.
Spring brake control system (If so equipped)	Single line for all spring brake chambers or two lines for all spring brake chambers on tractor and for trailer emergency circuit. The line comprises a control valve which controls air flow, the other necessary valve and spring brake chambers. A stop light switch is used to turn ON the stop lights. A parking brake switch is used to turn OFF the warning buzzer and to turn ON the parking brake warning lights.
Trailer brake control system (If so equipped)	Two lines for service and emergency circuits with a control valve which controls air flow and the other necessary valve. A stop light switch is used to operate the stop lights. A trailer brake switch is used to operate the trailer brake indicator light.
Wheel brake	Drum brake with internally expanding, leading-trailing shoes operation by slack adjuster and cam shaft in all wheels.

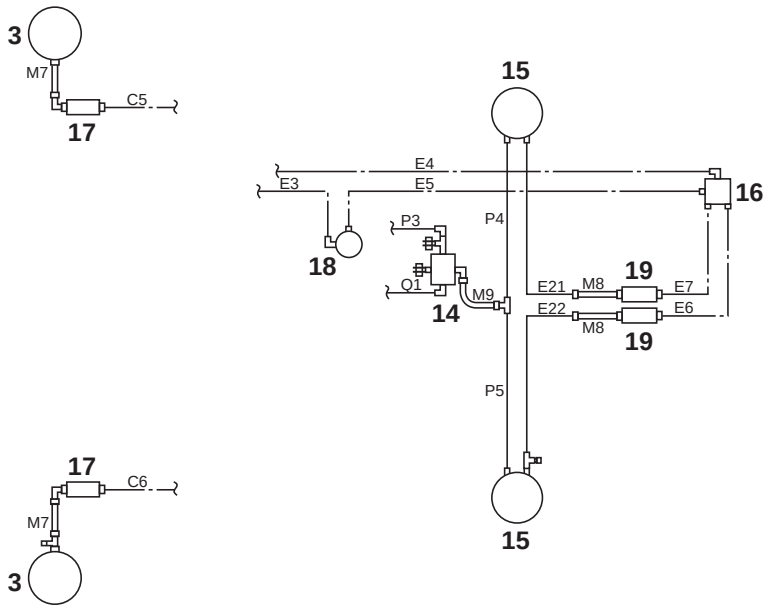
NOTICE
See "DIAGRAM" of the following page the component parts (Valves, Switches, etc.) used in easy system.

DIAGRAM

EN0668001J100001

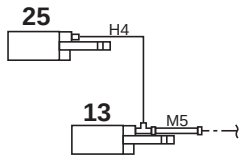
MODELS: FG, GH (EXCEPT FOR IRELAND AND MEXICO)



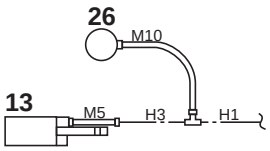


EQUIPPED WITH ABS

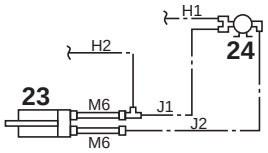
SHTS066800100001



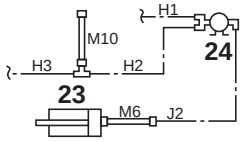
EQUIPPED WITH TRANSMISSION POWER SHIFT



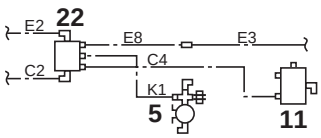
EQUIPPED WITH EATON FS6109 TRANSMISSION



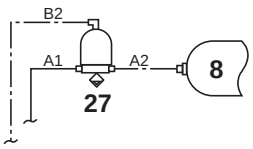
EQUIPPED WITH TRANSMISSION P. T.O. (MF06 TRANSMISSION)



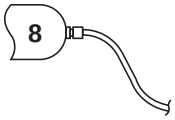
EQUIPPED WITH TRANSMISSION P.T.O. (EATON FS6109 TRANSMISSION)



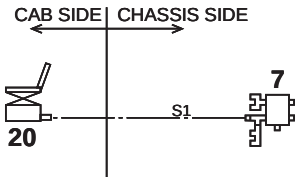
EQUIPPED WITH ES START



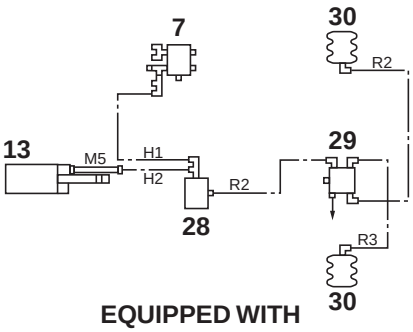
EQUIPPED WITH AIR DRYER



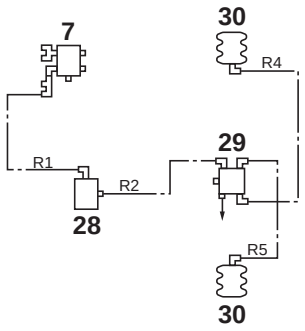
EQUIPPED WITH TIRE INFLATOR



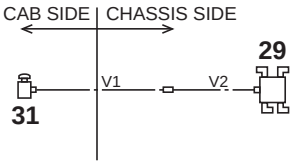
EQUIPPED WITH AIR SUSPENSION SEAT



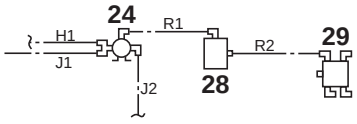
EQUIPPED WITH AIR SUSPENSION



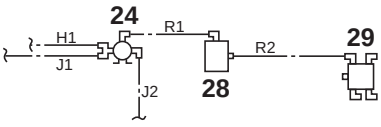
EQUIPPED WITH AIR SUSPENSION AND AUTOMATIC TRANSMISSION



EQUIPPED WITH AIR SUSPENSION HEIGHT CONTROL



EQUIPPED WITH AIR SUSPENSION AND TRANSMISSION P.T.O. (MF06 TRANSMISSION)

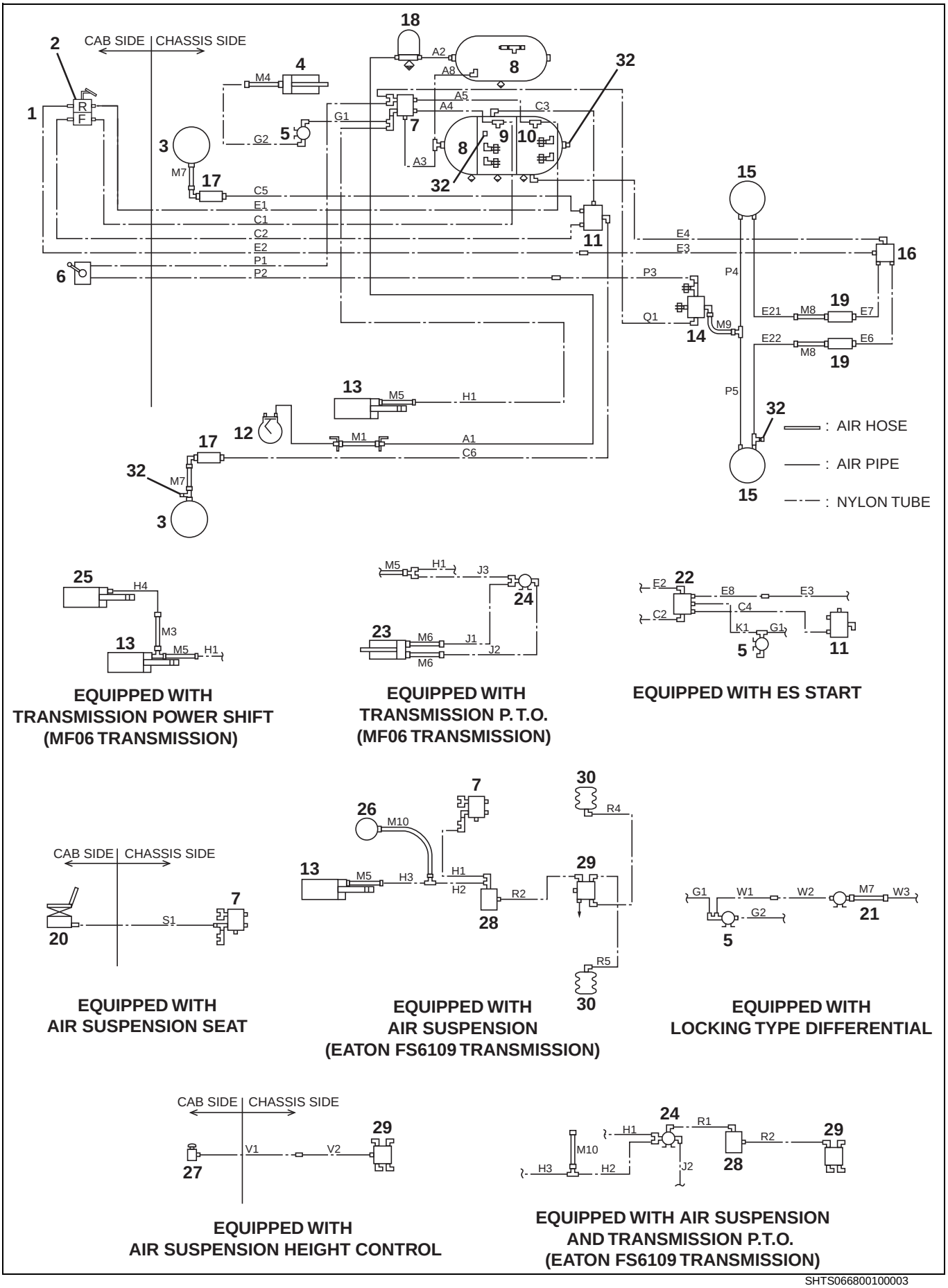


EQUIPPED WITH AIR SUSPENSION AND TRANSMISSION P.T.O. (EATON FS6109 TRANSMISSION)

SHTS066800100002

1	Brake valve	17	ABS control valve - Front
2	Stop light switch	18	Quick release valve
3	Brake chamber - Front	19	ABS control valve - Rear
4	Exhaust brake	20	Air suspension seat
5	Exhaust brake magnetic valve	21	Pressure regulator
6	Parking brake valve	22	ES start control valve
7	4-way protection valve	23	Power take-off
8	Air tank - Water separator	24	Power take-off magnetic valve
9	Air tank - Front	25	Transmission power shift
10	Air tank - Rear	26	Range preselection lever
11	Relay valve - Front	27	Air dryer
12	Air compressor	28	Air suspension protection valve
13	Clutch booster	29	Leveling valve
14	Relay valve - Wheel parking	30	Air spring
15	Brake chamber - Rear	31	Height control valve
16	Relay valve - Rear		

MODEL: FG, GH (FOR COLOMBIA, ECUADOR, IRELAND AND MEXICO) (FOR TAIWAN {Apply to vehicles produced for after Dec, 2009})



EQUIPPED WITH TRANSMISSION POWER SHIFT (MF06 TRANSMISSION)

EQUIPPED WITH TRANSMISSION P. T.O. (MF06 TRANSMISSION)

EQUIPPED WITH ES START

EQUIPPED WITH AIR SUSPENSION SEAT

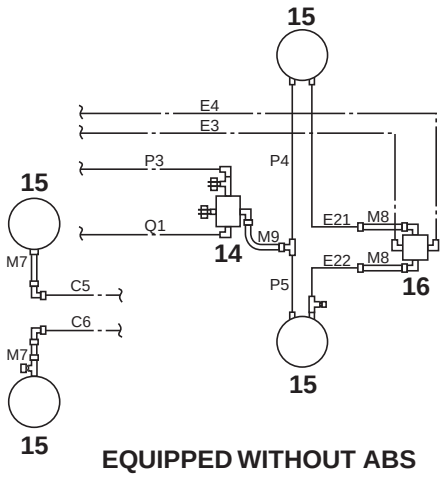
EQUIPPED WITH AIR SUSPENSION (EATON FS6109 TRANSMISSION)

EQUIPPED WITH LOCKING TYPE DIFFERENTIAL

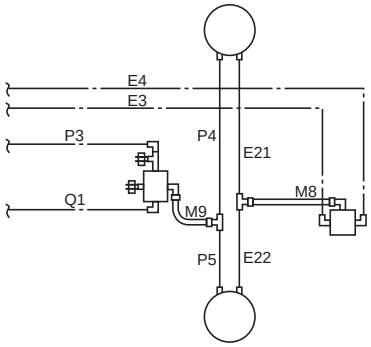
EQUIPPED WITH AIR SUSPENSION HEIGHT CONTROL

EQUIPPED WITH AIR SUSPENSION AND TRANSMISSION P.T.O. (EATON FS6109 TRANSMISSION)

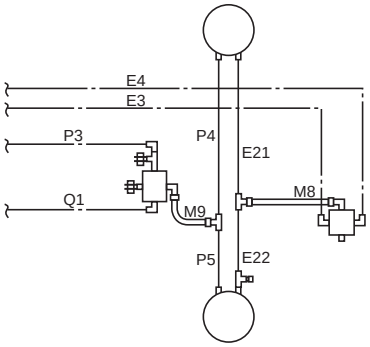
SHTS066800100003



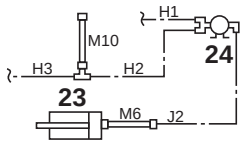
EQUIPPED WITHOUT ABS



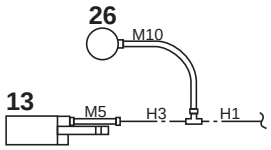
EQUIPPED WITHOUT TEST CONNECTION (RELAY VALVE:44080-E0140)



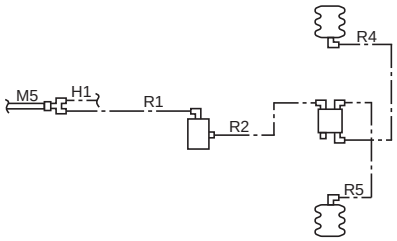
EQUIPPED WITHOUT ABS (RELAY VALVE:44080-E0140)



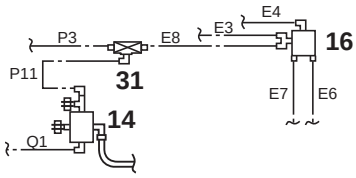
EQUIPPED WITH TRANSMISSION P.T.O. (EATON FS6109 TRANSMISSION)



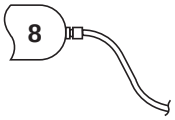
EQUIPPED WITH EATON FS6109 TRANSMISSION



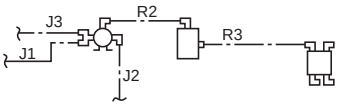
EQUIPPED WITH AIR SUSPENSION



EQUIPPED WITH ANTI COMPOUND



EQUIPPED WITH TIRE INFLATOR

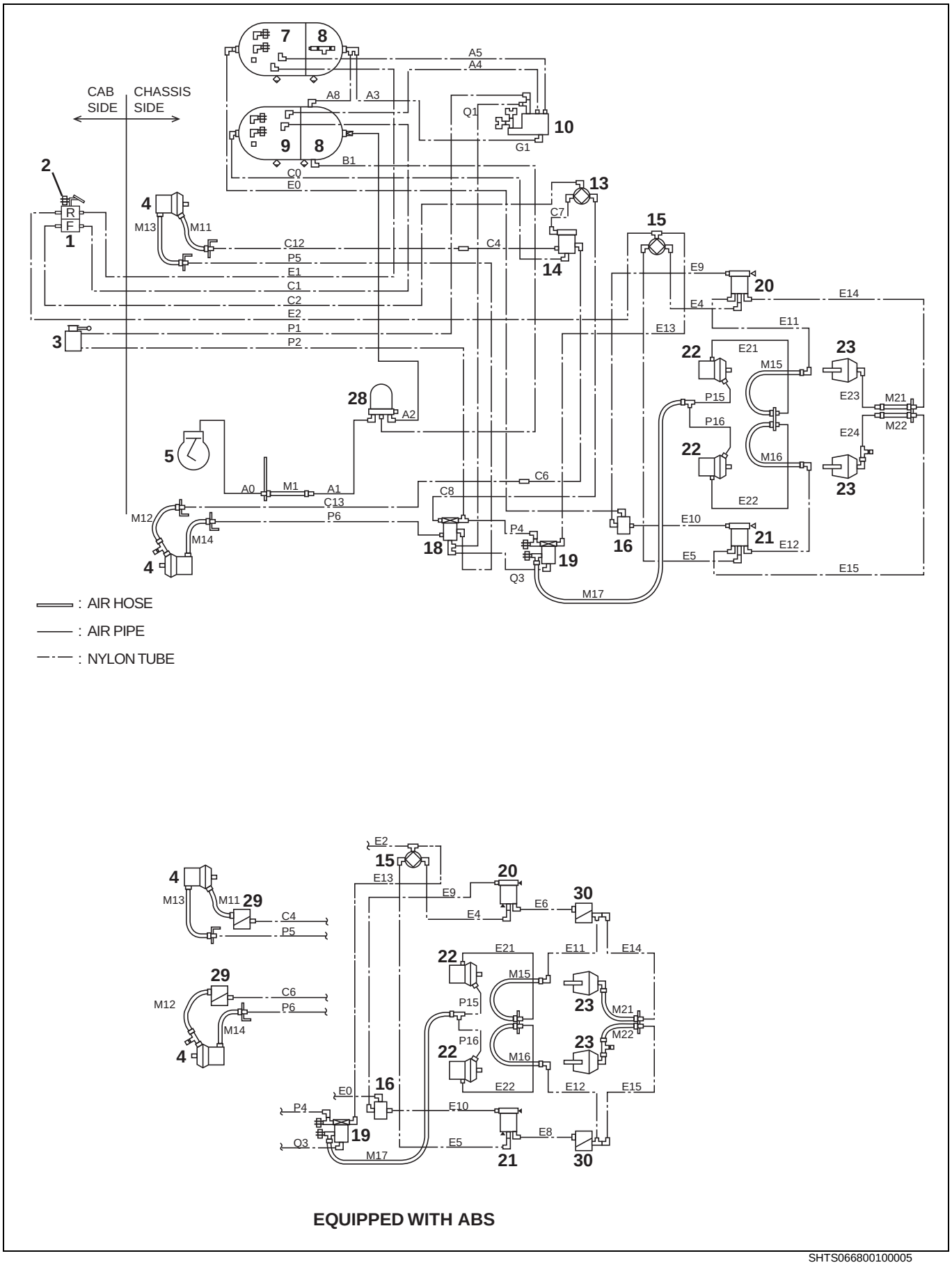


EQUIPPED WITH AIR SUSPENSION AND P.T.O.

SHTS066800100004

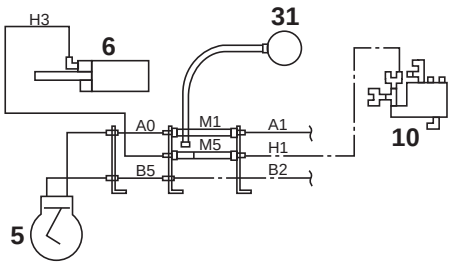
1	Brake valve	17	ABS control valve - Front
2	Stop light switch	18	Air dryer
3	Brake chamber - Front	19	ABS control valve - Rear
4	Exhaust brake	20	Air suspension seat
5	Exhaust brake magnetic valve	21	Differential lock magnetic valve
6	Parking brake valve	22	ES start control valve
7	4-way protection valve	23	Power take-off
8	Air tank - Water separator	24	Power take-off magnetic valve
9	Air tank - Front	25	Transmission power shift
10	Air tank - Rear	26	Range preselection lever
11	Relay valve - Front	27	Height control valve
12	Air compressor	28	Air suspension protection valve
13	Clutch booster	29	Leveling valve
14	Relay valve - Wheel parking	30	Air spring
15	Brake chamber - Rear	31	Double check valve
16	Relay valve - Rear	32	Test connection (If so equipped)

MODELS: FL, FM (FOR AUSTRALIA AND NEW ZEALAND)

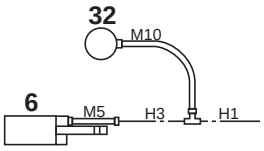


EQUIPPED WITH ABS

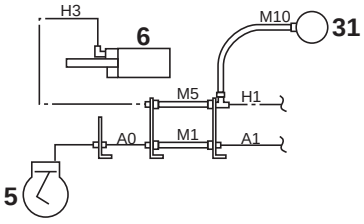
SHTS066800100005



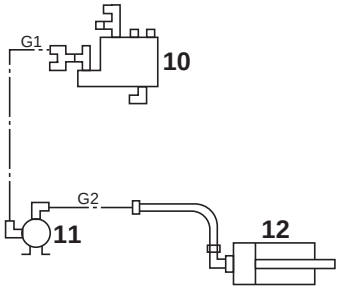
EQUIPPED WITH
FULLER RTO11909 TRANSMISSION



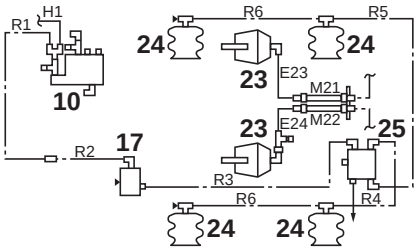
EQUIPPED WITH EATON
FS8209 TRANSMISSION



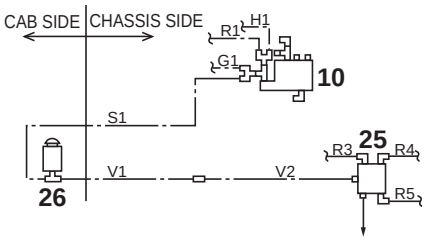
EQUIPPED WITH
FULLER RT8908LL TRANSMISSION



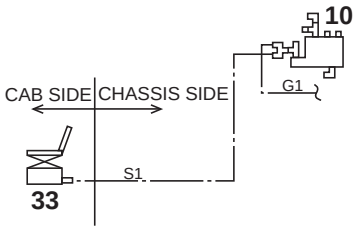
EQUIPPED WITH EXHAUST BRAKE



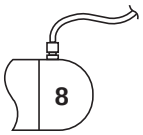
EQUIPPED WITH AIR SUSPENSION



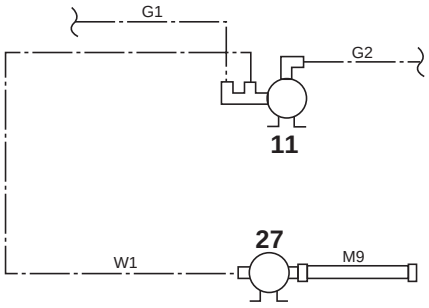
EQUIPPED WITH
AIR SUSPENSION HEIGHT CONTROL



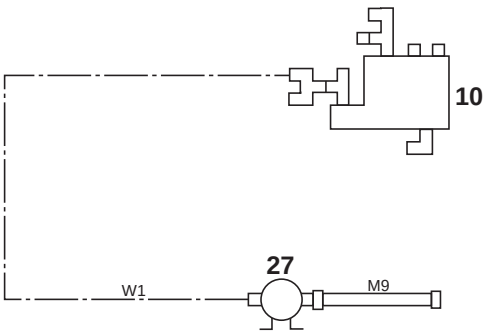
EQUIPPED WITH
AIR SUSPENSION SEAT



EQUIPPED WITH TIRE INFLATOR



EQUIPPED WITH
INTER-AXLE DIFFERENTIAL LOCK
(FL, FM8J)

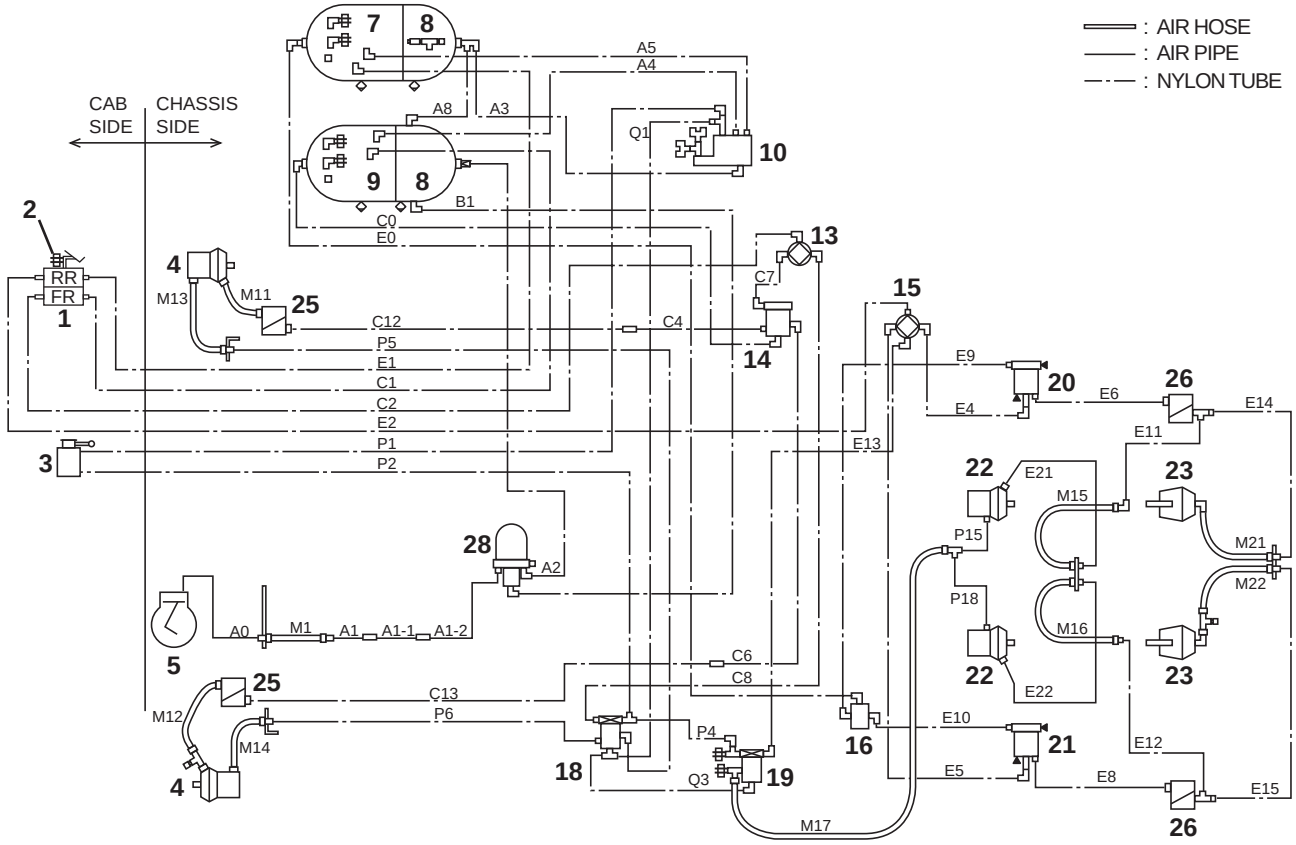


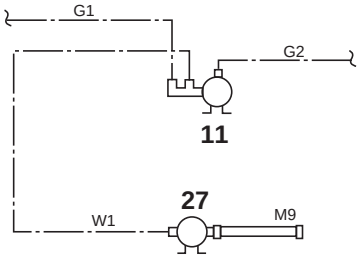
EQUIPPED WITH
INTER-AXLE DIFFERENTIAL LOCK
(FM1A)

SHTS066800100006

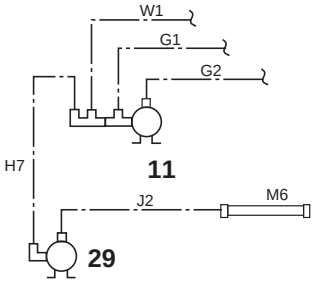
1	**Brake valve**	**18**	**Spring brake valve - Front**
2	**Stop light switch**	**19**	**Spring brake valve - Rear**
3	**Parking brake valve**	**20**	**Relay valve - Rear - Right**
4	**Spring brake chamber - Front**	**21**	**Relay valve - Rear - Left**
5	**Air compressor**	**22**	**Spring brake chamber - Rear**
6	**Clutch booster**	**23**	**Brake chamber - Rear**
7	**Air tank - Rear**	**24**	**Air spring**
8	**Air tank - Water separator**	**25**	**Leveling valve**
9	**Air tank - Front**	**26**	**Height control switch (If so equipped)**
10	**4-way protection valve**	**27**	**Inter-axle differential lock magnetic valve**
11	**Exhaust brake magnetic valve**	**28**	**Air dryer**
12	**Exhaust brake**	**29**	**ABS control valve - Front (If so equipped)**
13	**Quick release valve - Front**	**30**	**ABS control valve - Rear (If so equipped)**
14	**Relay valve - Front**	**31**	**Range selector**
15	**Quick release valve - Rear**	**32**	**Range preselection lever**
16	**Multi joint**	**33**	**Air suspension seat**
17	**Protection valve**		

MODELS: FL, FM (FOR INDIA)

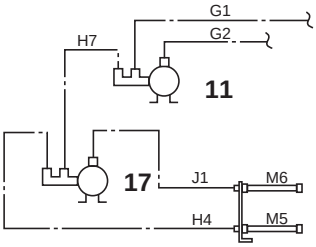




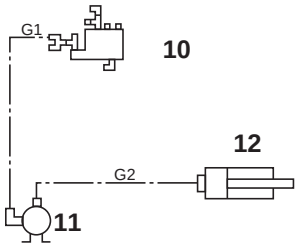
EQUIPPED WITH INTER-AXLE DIFFERENTIAL LOCK (FM)



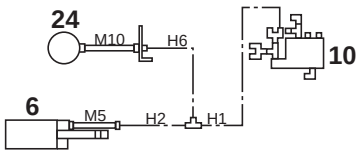
EQUIPPED WITH DIFFERENTIAL LOCK AND P.T.O. (ZF9S1110 TRANSMISSION)



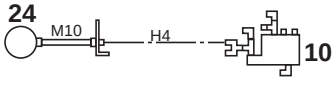
EQUIPPED WITH P.T.O. (MF06 TRANSMISSION)



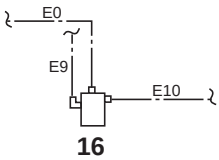
EQUIPPED WITH EXHAUST BRAKE



EQUIPPED WITH ZF9S1110 TRANSMISSION



EQUIPPED WITH MF06 TRANSMISSION

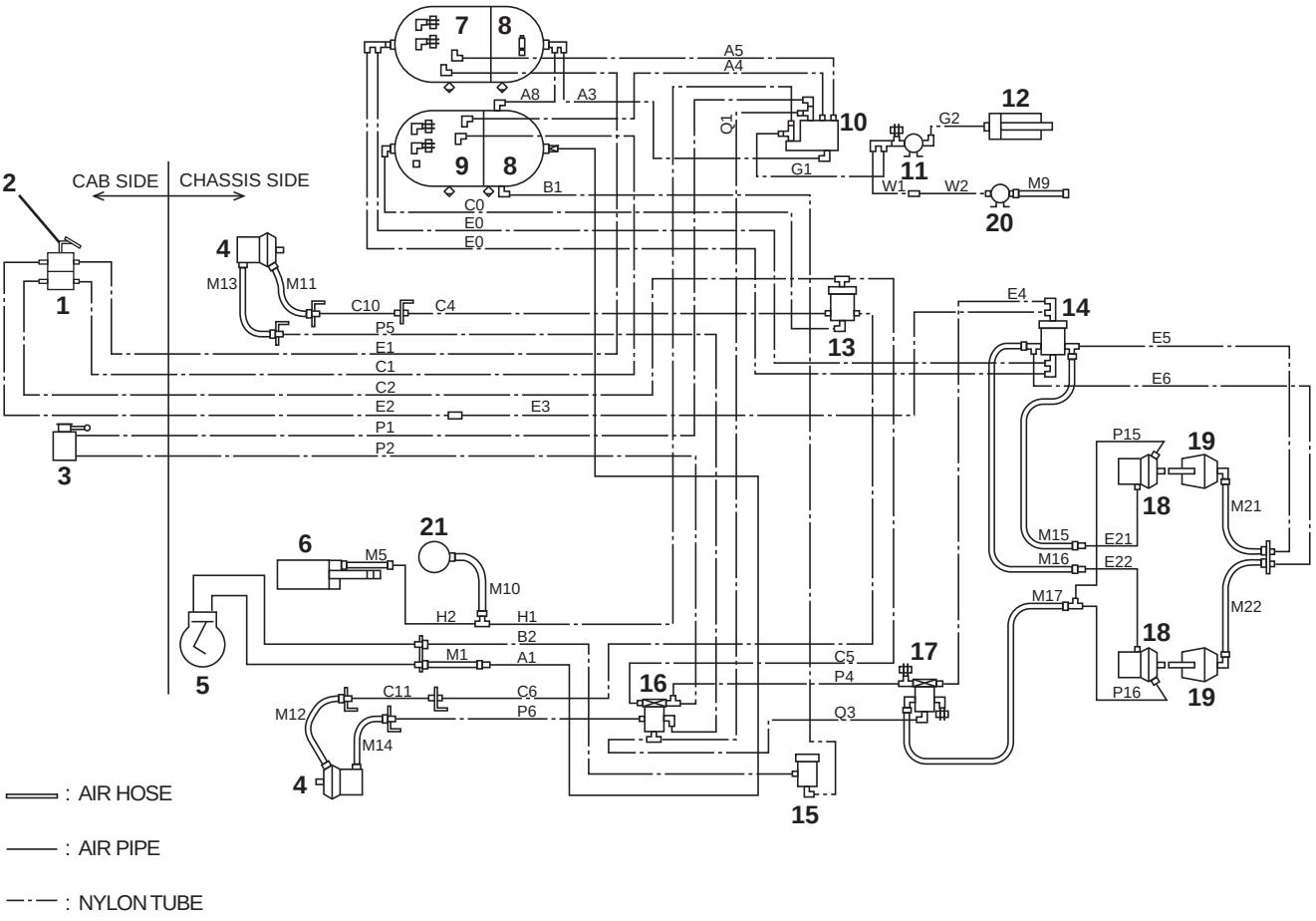


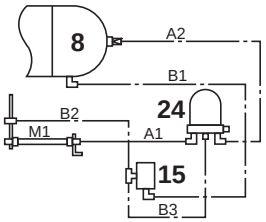
EQUIPPED WITH MULTI-JOINT (FL)

SHTS066800100007

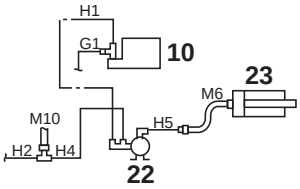
1	**Brake valve**	**16**	**Multi joint**
2	**Stop light switch**	**17**	**Protection valve**
3	**Parking brake valve**	**18**	**Spring brake valve - Front**
4	**Spring brake chamber - Front**	**19**	**Spring brake valve - Rear**
5	**Air compressor**	**20**	**Relay valve - Rear - Right**
6	**Clutch booster**	**21**	**Relay valve - Rear - Left**
7	**Air tank - Rear**	**22**	**Spring brake chamber - Rear**
8	**Air tank - Water separator**	**23**	**Brake chamber - Rear**
9	**Air tank - Front**	**24**	**Transmission High-Low change**
10	**4-way protection valve**	**25**	**ABS control valve - Front**
11	**Exhaust brake magnetic valve**	**26**	**ABS control valve - Rear**
12	**Exhaust brake**	**27**	**Inter-axle differential lock magnetic valve**
13	**Quick release valve - Front**	**28**	**Air dryer**
14	**Relay valve - Front**	**29**	**Power take-off magnetic valve**
15	**Quick release valve - Rear**		

MODEL: FM (FOR CHILE)

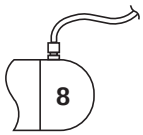




EQUIPPED WITH AIR DRYER



EQUIPPED WITH TRANSMISSION P.T.O.

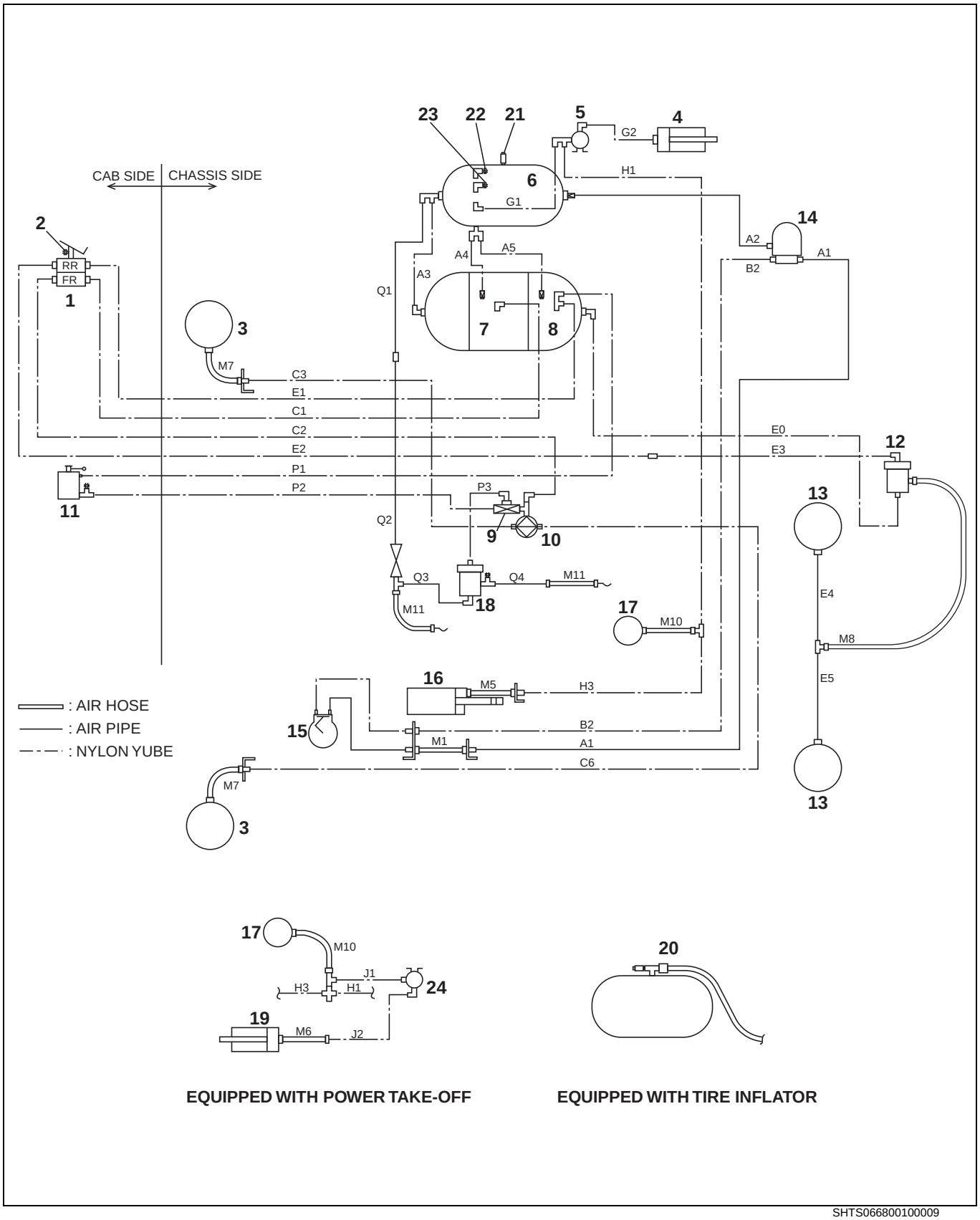


EQUIPPED WITH TIRE INFLATOR

SHTS066800100008

1	**Brake valve**	**13**	**Relay valve - Front**
2	**Stop light switch**	**14**	**Relay valve - Rear**
3	**Parking brake valve**	**15**	**Pressure regulator**
4	**Spring brake chamber - Front**	**16**	**Spring brake valve - Front**
5	**Air compressor**	**17**	**Spring brake valve - Rear**
6	**Clutch booster**	**18**	**Spring brake chamber - Rear**
7	**Air tank - Rear**	**19**	**Brake chamber - Rear**
8	**Air tank - Water separator**	**20**	**Differential lock magnetic valve**
9	**Air tank - Front**	**21**	**Transmission High-Low change**
10	**4-way protection valve**	**22**	**Power take-off magnetic valve**
11	**Exhaust brake magnetic valve**	**23**	**Power take-off**
12	**Exhaust brake**	**24**	**Air dryer**

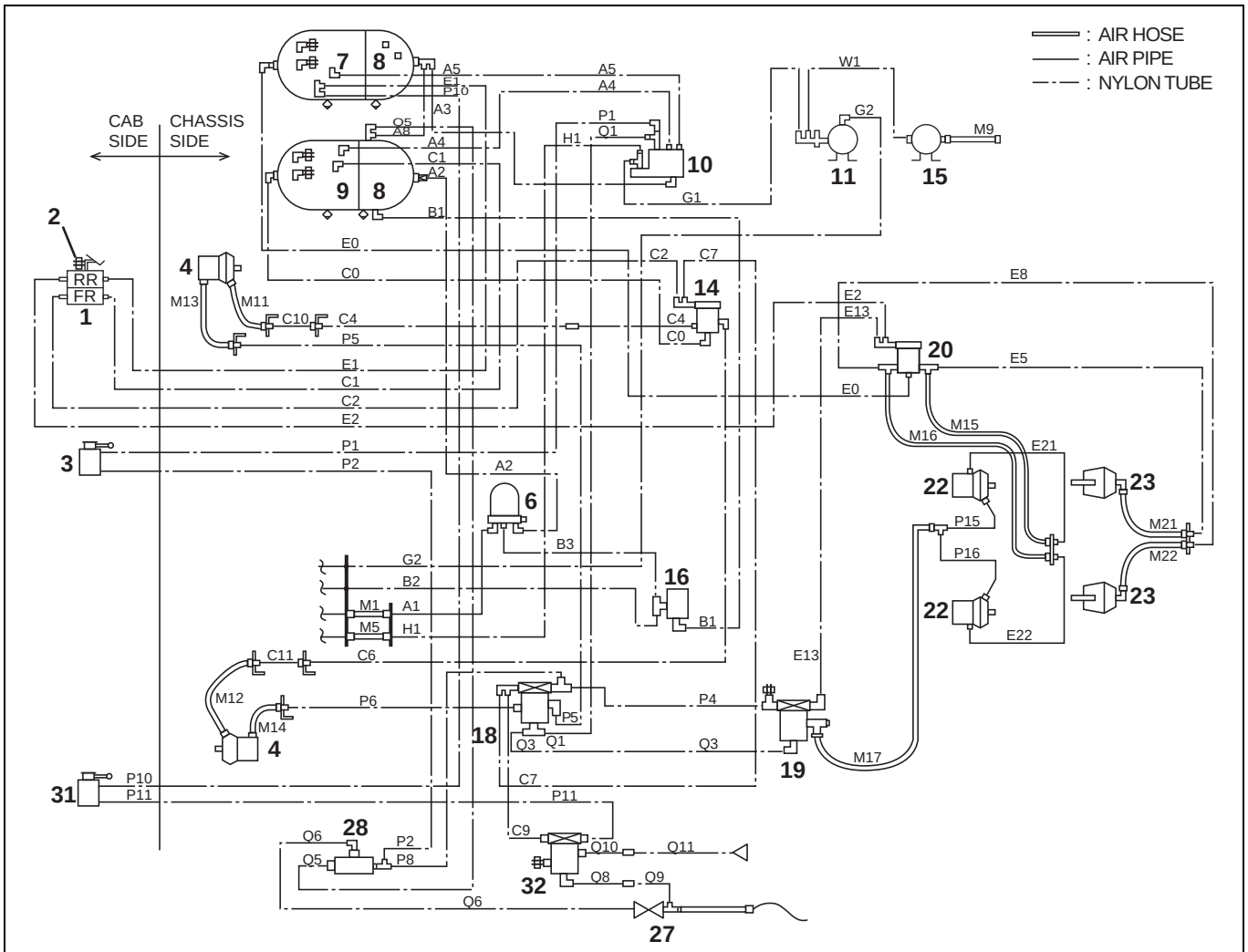
MODEL: SG (FOR INDONESIA)



SHTS066800100009

1	**Brake valve**	**13**	**Wheel brake - Rear**
2	**Stop light switch**	**14**	**Air dryer**
3	**Wheel brake - Front**	**15**	**Air compressor**
4	**Exhaust brake**	**16**	**Clutch booster**
5	**Exhaust brake magnetic valve**	**17**	**Transmission high - low change**
6	**Air tank - Water separator**	**18**	**Relay valve - Trailer**
7	**Air tank - Front**	**19**	**Power take-off**
8	**Air tank - Rear**	**20**	**Tire inflator**
9	**Double check valve**	**21**	**Safety valve**
10	**Quick release valve**	**22**	**Pressure switch**
11	**Trailer hand brake valve**	**23**	**Pressure sensor**
12	**Relay valve - Rear**	**24**	**Power take-off magnetic valve**

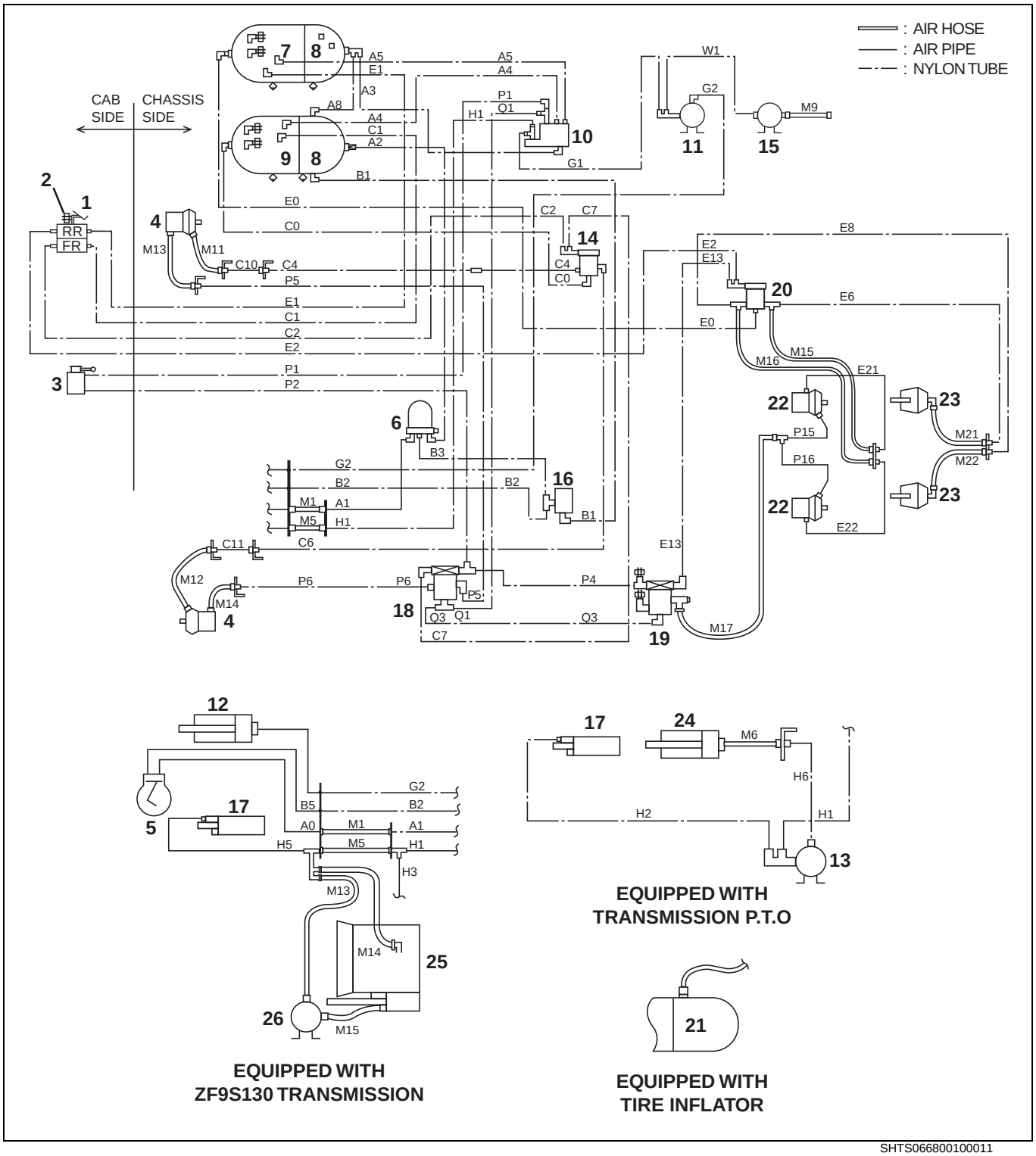
MODEL: FM2P(EXCEPT DUMP) (FOR INDONESIA)



SHTS066800100010

1	**Brake valve**	**17**	**Clutch booster**
2	**Stop light switch**	**18**	**Spring brake valve - Front**
3	**Parking brake valve**	**19**	**Spring brake valve - Rear**
4	**Spring brake chamber - Front**	**20**	**Relay valve - Rear**
5	**Air compressor**	**21**	**Tire inflator (If so equipped)**
6	**Air dryer**	**22**	**Spring brake chamber - Rear**
7	**Air tank - Rear**	**23**	**Brake chamber - Rear**
8	**Air tank - Water separator**	**24**	**Power take-off (If so equipped)**
9	**Air tank - Front**	**25**	**Transmission power shift**
10	**4-way protection valve**	**26**	**Power shift magnetic valve**
11	**Exhaust brake magnetic valve**	**27**	**Trailer cock**
12	**Exhaust brake**	**28**	**Cut valve**
13	**Power take-off magnetic valve (If so equipped)**	**29**	**ABS control valve - Front (If so equipped)**
14	**Relay valve - Front**	**30**	**ABS control valve - Rear (If so equipped)**
15	**Inter-axle differential lock magnetic valve**	**31**	**Trailer hand brake valve**
16	**Pressure regulator**	**32**	**Relay valve - Trailer**

MODEL: FM2P(DUMP) (FOR INDONESIA)



SHTS066800100011

1	**Brake valve**	**14**	**Relay valve - Front**
2	**Stop light switch**	**15**	**Inter-axle differential lock magnetic valve**
3	**Parking brake valve**	**16**	**Pressure regulator**
4	**Spring brake chamber - Front**	**17**	**Clutch booster**
5	**Air compressor**	**18**	**Spring brake valve - Front**
6	**Air dryer**	**19**	**Spring brake valve - Rear**
7	**Air tank - Rear**	**20**	**Relay valve - Rear**
8	**Air tank - Water separator**	**21**	**Tire inflator (If so equipped)**
9	**Air tank - Front**	**22**	**Spring brake chamber - Rear**
10	**4-way protection valve**	**23**	**Brake chamber - Rear**
11	**Exhaust brake magnetic valve**	**24**	**Power take-off (If so equipped)**
12	**Exhaust brake**	**25**	**Transmission power shift**
13	**Power take-off magnetic valve (If so equipped)**	**26**	**Power shift magnetic valve**

TROUBLESHOOTING

EN0668001F300001

Symptom	Possible cause	Remedy/Prevention
Not enough braking (Wheel brake and drum)	Lining is wet with grease or fluid	Replace the lining.
	Improper contact of drum and lining	Correct.
	Improper lining material or glazed lining	Correct.
	Deformation or hardening of drum	Correct or replace.
	Excessively worn lining	Replace.
Not enough braking (Control system)	Leakage of compressed air from brake system	Tighten further or replace gasket.
	Lack of compressed air pressure due to excessive use.	Use properly.
	Improper operation of air compressor	Repair or replace.
	Improper operation of brake valve	Repair or replace.
	Improper operation of relay valve and quick release valve	Repair or replace.
	Clogging of brake system	Replace pipe, hose, etc.
Unequal or unstable braking	Lining is wet with grease or fluid	Replace lining.
	Defective lining material (Improper combination)	Replace lining.
	Non-uniform lining contact	Correct.
	Improper adjustment of brake shoe	Adjust.
	Non-uniform shoe clearance	Adjust the clearance.
	Distorted drums	Correct or replace.
	Excessive abrasion of drums	Correct or replace.
	Loose hub bearing	Adjust or replace bearing.
	Improper or unequal pneumatic pressure of tire	Adjust to proper pneumatic pressure.
	Clogging of brake system	Replace pipe, hose, etc.
Brake drags or does not release (Wheel brake and drum)	Improper adjustment of shoe clearance	Adjust the clearance.
	Defective shoe return spring	Replace.
Brake drags or does not release (Control system)	Lack of pedal play	Adjust.
	Improper return of brake pedal	Repair or replace.
	Improper operation of brake valve	Repair or replace.
	Improper operation of relay valve and quick release valve	Repair or replace.
	Clogging of brake system	Replace pipe, hose, etc.
Brake squeal	Improper lining material or glazed lining	Replace lining.
	Loose lining rivets	Replace or tighten the rivet further.
	Lining rivet in contact with drum	Replace lining and rivet.
	Deformation or wear of drum	Repair or replace.
	Intrusion of foreign matter between drum and lining	Clean the surface of lining or replace.
	Loose hub bearing	Adjust or replace bearing.

SERVICE BRAKE (MODELS: WITH AIR OVER HYDRAULIC BRAKE)

BR02-001

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INSPECTION AND REPAIR BR02-7

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DATA AND SPECIFICATIONS BR02-8
DESCRIPTION BR02-8
COMPONENT LOCATOR BR02-9
OVERHAUL BR02-10
INSPECTION AND REPAIR BR02-12

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DATA AND SPECIFICATIONS BR02-13
DESCRIPTION BR02-13
COMPONENT LOCATOR BR02-14
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DOUBLE CHECK VALVE (MODEL: TRACTOR) BR02-17
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DESCRIPTION BR02-17
COMPONENT LOCATOR BR02-18
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INSPECTION AND REPAIR BR02-19

CHECK VALVE BR02-20
DATA AND SPECIFICATIONS BR02-20
DESCRIPTION BR02-20
COMPONENT LOCATOR BR02-21
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SAFETY VALVE BR02-22
DATA AND SPECIFICATIONS BR02-22
DESCRIPTION BR02-22
INSPECTION AND REPAIR BR02-22

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DESCRIPTION BR02-23
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PROTECTION VALVE BR02-41
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QUICK RELEASE VALVE BR02-44
DATA AND SPECIFICATION BR02-44
DESCRIPTION BR02-44
COMPONENT LOCATOR BR02-46
OVERHAUL BR02-48
INSPECTION AND REPAIR BR02-48

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DATA AND SPECIFICATIONS BR02-49
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COMPONENT LOCATOR BR02-50
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COMPONENT LOCATOR BR02-53
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DESCRIPTION.....BR02-55
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COMPONENT LOCATOR.....BR02-60
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OVERHAUL.....BR02-104
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SPRING BRAKE CHAMBER..... BR02-109
DATA AND SPECIFICATION.....BR02-109
DESCRIPTION.....BR02-109
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DESCRIPTION.....BR02-113
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OVERHAUL.....BR02-115
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SPECIAL TOOL BR02-120
COMPONENT LOCATOR.....BR02-121
OVERHAUL.....BR02-123
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WHEEL BRAKE [AUTO ADJUSTER (MODELS: FC, FD)]..... BR02-130
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SPECIAL TOOL BR02-133
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WHEEL BRAKE
[MODEL: GD (EXCEPT CHILE GD)]....BR02-147
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OVERHAUL BR02-160
ADJUSTMENT..... BR02-165
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DESCRIPTION BR02-170
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(MODELS: TAIWAN FG, GH) BR02-183
DATA AND SPECIFICATIONS..... BR02-183
DESCRIPTION BR02-184
SPECIAL TOOL..... BR02-186
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OVERHAUL BR02-189
ADJUSTMENT..... BR02-195
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(MODELS: FL, FM) BR02-199
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DESCRIPTION BR02-200
SPECIAL TOOL..... BR02-202
COMPONENT LOCATOR BR02-203
OVERHAUL BR02-205
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(MODELS: FT, GT) BR02-213
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DATA AND SPECIFICATION BR02-237
DESCRIPTION BR02-237
COMPONENT LOCATOR BR02-238
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PRESSURE REGULATOR

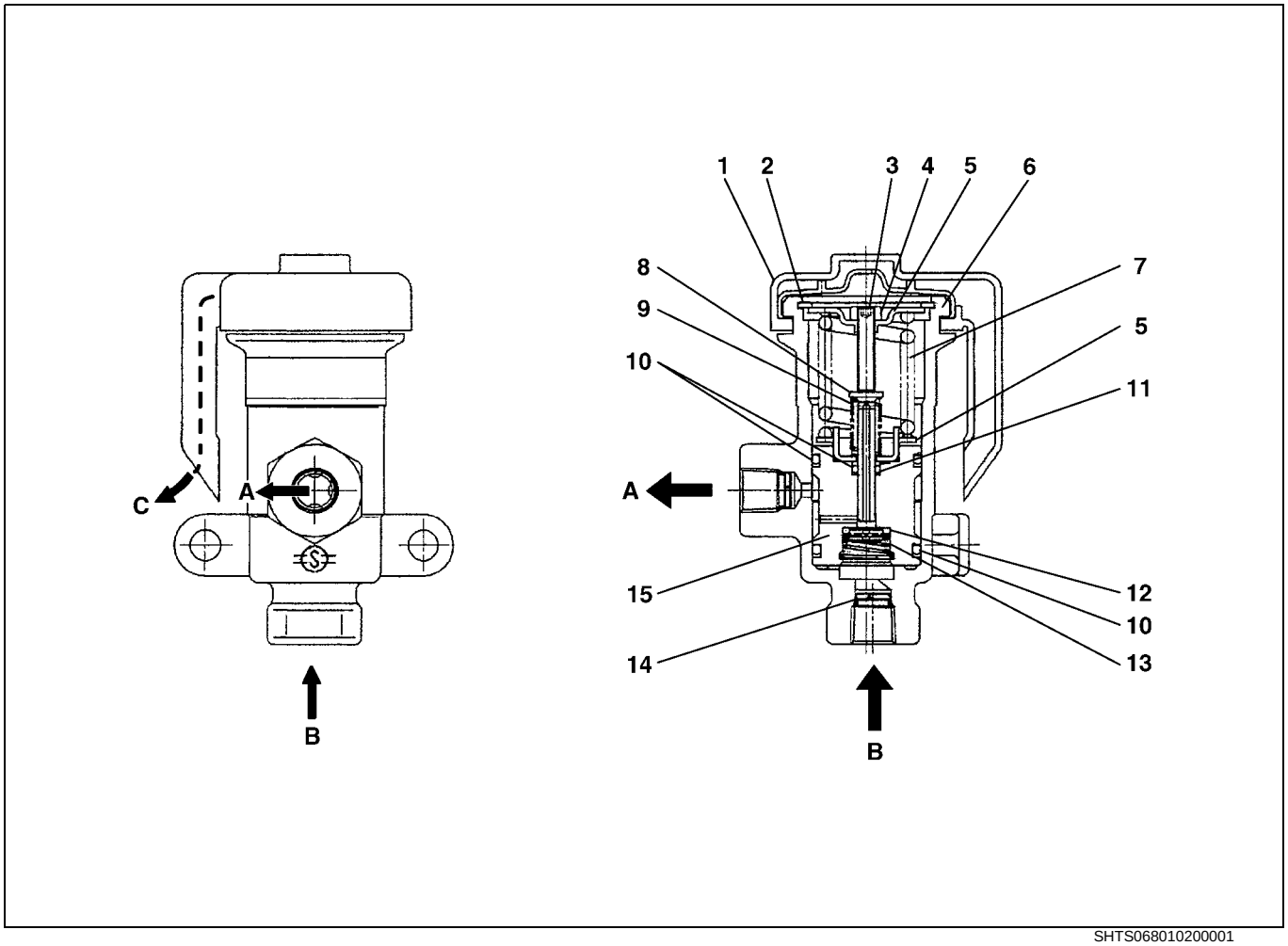
DATA AND SPECIFICATIONS

EN0680102I200001

Type	**Spring type, regulates air pressure together with unloader valve on compressor**
Regulating pressure: Regulator No. S4453-01330	**780-880 kPa {8.0-9.0 kgf/cm^2, 114-128 lbf/in.^{2}}**

DESCRIPTION

EN0680102C100001

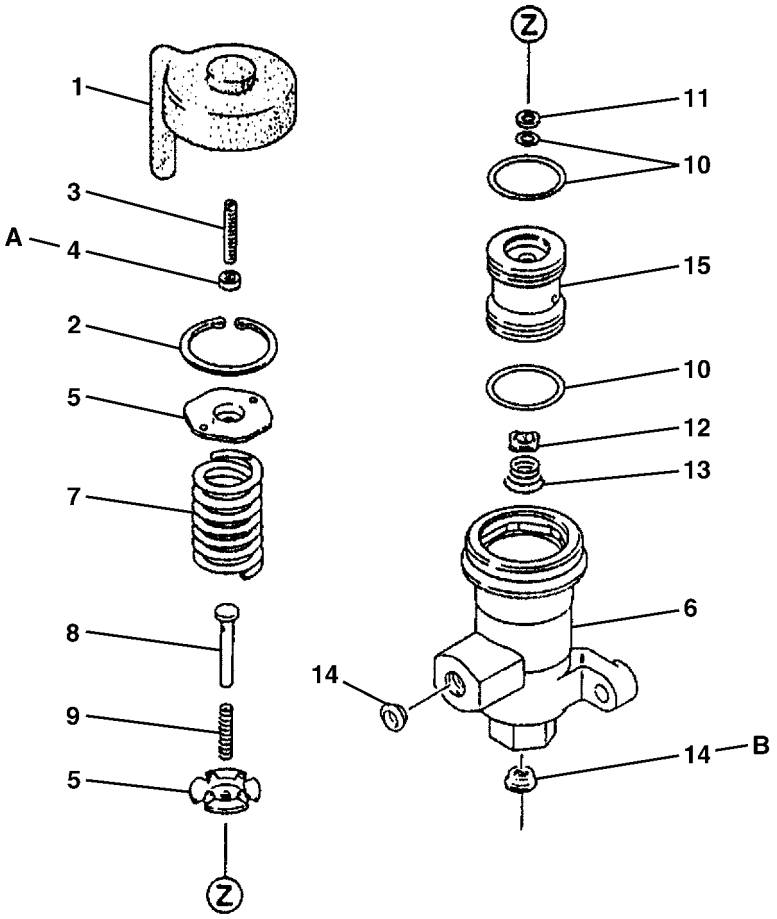


SHTS068010200001

1	Dust cover	7	Main spring	13	Valve spring
2	Retainer ring	8	Push rod	14	Filter
3	Set bolt	9	Rod spring	15	Piston
4	Lock nut	10	O-ring	A	To Unloader valve
5	Spring seat	11	Back up ring	B	From Air tank
6	Valve body	12	Valve	C	Exhaust

COMPONENT LOCATOR

EN0680102D100001



SHTS068010200002

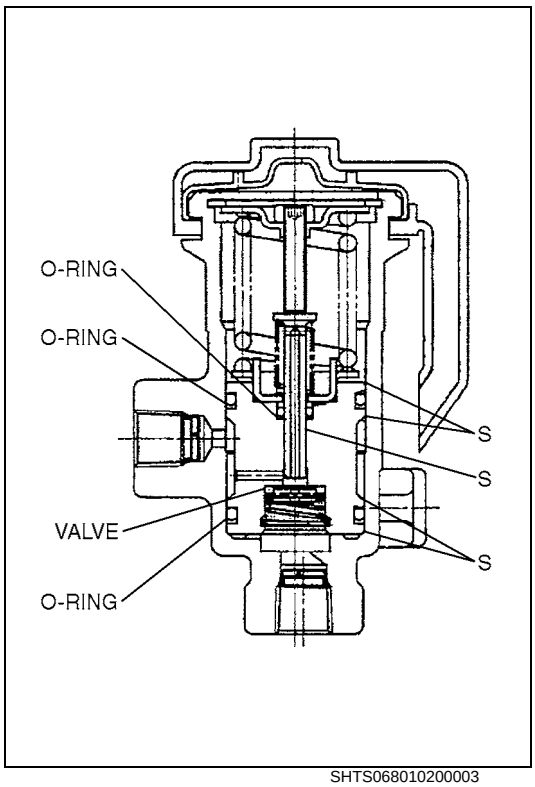
1	Dust cover	6	Valve body	11	Back up ring
2	Retainer ring	7	Main spring	12	Valve
3	Set bolt	8	Push rod	13	Valve spring
4	Lock nut	9	Rod spring	14	Filter
5	Spring seat	10	O-ring	15	Piston

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

A	2.4-3.5 {24-36, 1.8-2.6}	B	0.29-0.49 {3-5, 0.22-0.36}

OVERHAUL

EN0680102H200001



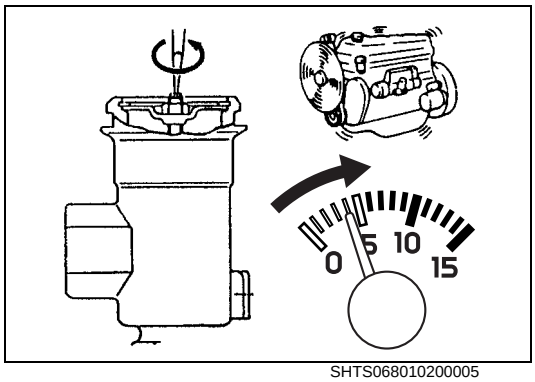
SHTS068010200003

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When reassembling the pressure regulator, replace all rubber parts with new ones.

(2) Apply adequate amount of silicone grease to the O-rings, and sliding surface S of the piston and valve rod.

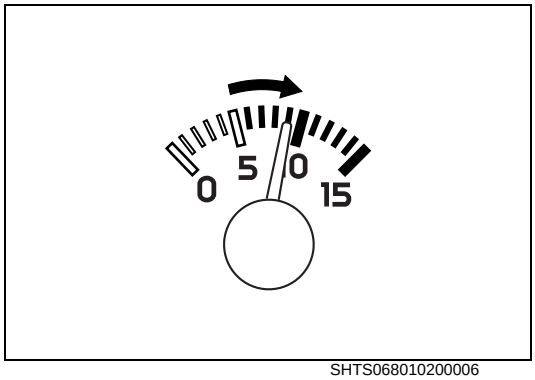


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IMPORTANT POINT - MOUNTING

1. ADJUSTMENT

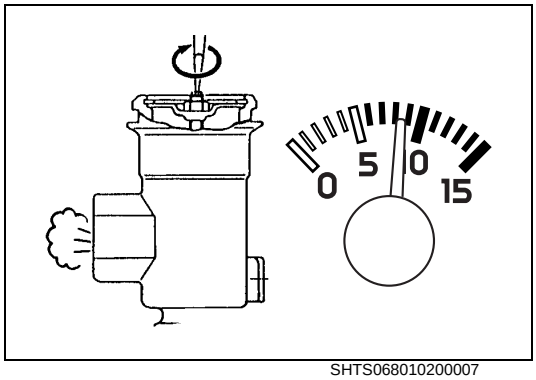
(1) Loosen the adjusting screw until the rod spring tension is released, and start and idle the engine to charge the air for the air tank.



SHTS068010200006

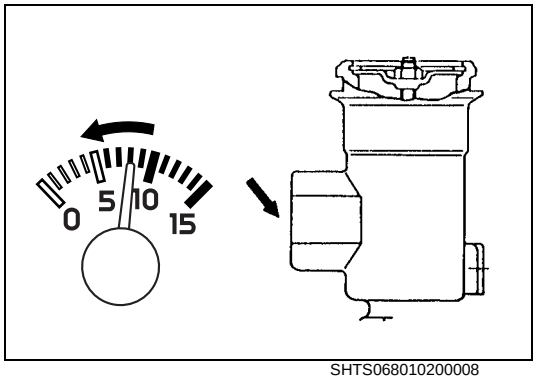
(2) Stop the engine when the gauge indicates valve opening pressure shown below.

Valve opening pressure	Pressure kPa {kgf/cm^2, lbf/in.^{2}}
S4453-01330	860-900 {8.8-9.2, 125-130}



SHTS068010200007

(3) Tighten the adjusting screw gradually till the air starts to leak from the port to the unloader valve side.
(4) Tighten the adjusting screw lock nut.



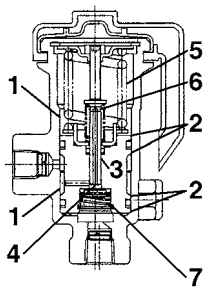
SHTS068010200008

(5) Watch the pressure gauge needle and see that it stops at the valve closing pressure shown below.
(6) Connect the pipe and pressure regulator.

Valve closing pressure	Pressure kPa {kgf/cm^2, lbf/in.^{2}}
S4453-01330	750-790 {7.7-8.1, 109-115}

INSPECTION AND REPAIR

EN0680102H300001

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve body 1, piston 2 and valve rod 3. Sliding surface: Valve rod 4. Valve contact surface: Wear and any other damages	—	—	Replace, if necessary.	Visual check 
Main spring 5. rod spring 6. and valve spring 7: Rust and damage	—	—	Replace, if necessary.	

AIR DRYER (MODELS: EXCEPT FM2P)

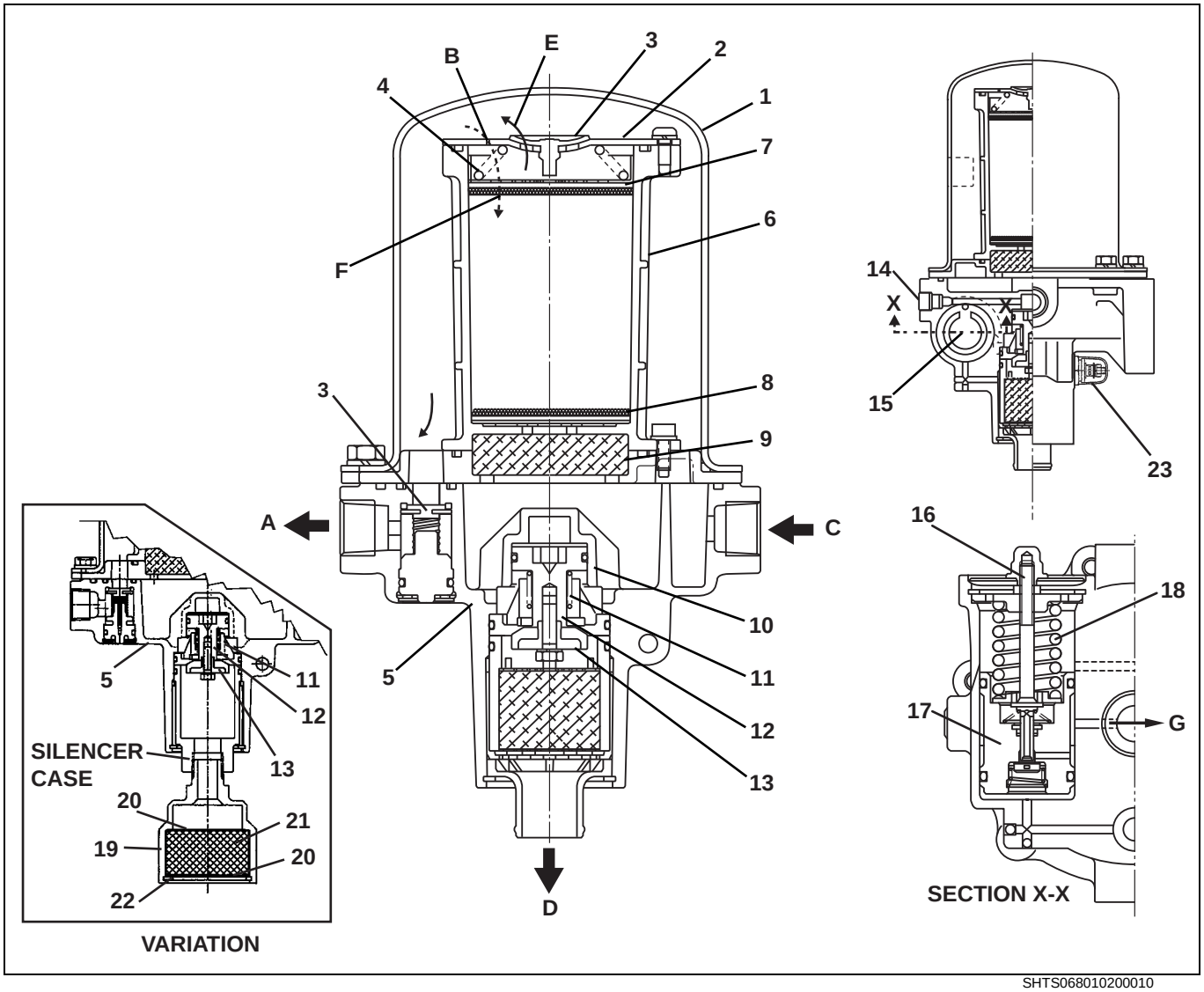
DATA AND SPECIFICATIONS

EN0680102I200002

Type		Purge tank, desiccant, auto-purge valve.
Air and Water discharging time (Reclamation cycle)	Parts No. S4430-E0210	Approx. 30 sec.
	Except Parts No. S4430-E0210	Approx. 50 sec.

DESCRIPTION

EN0680102C100002

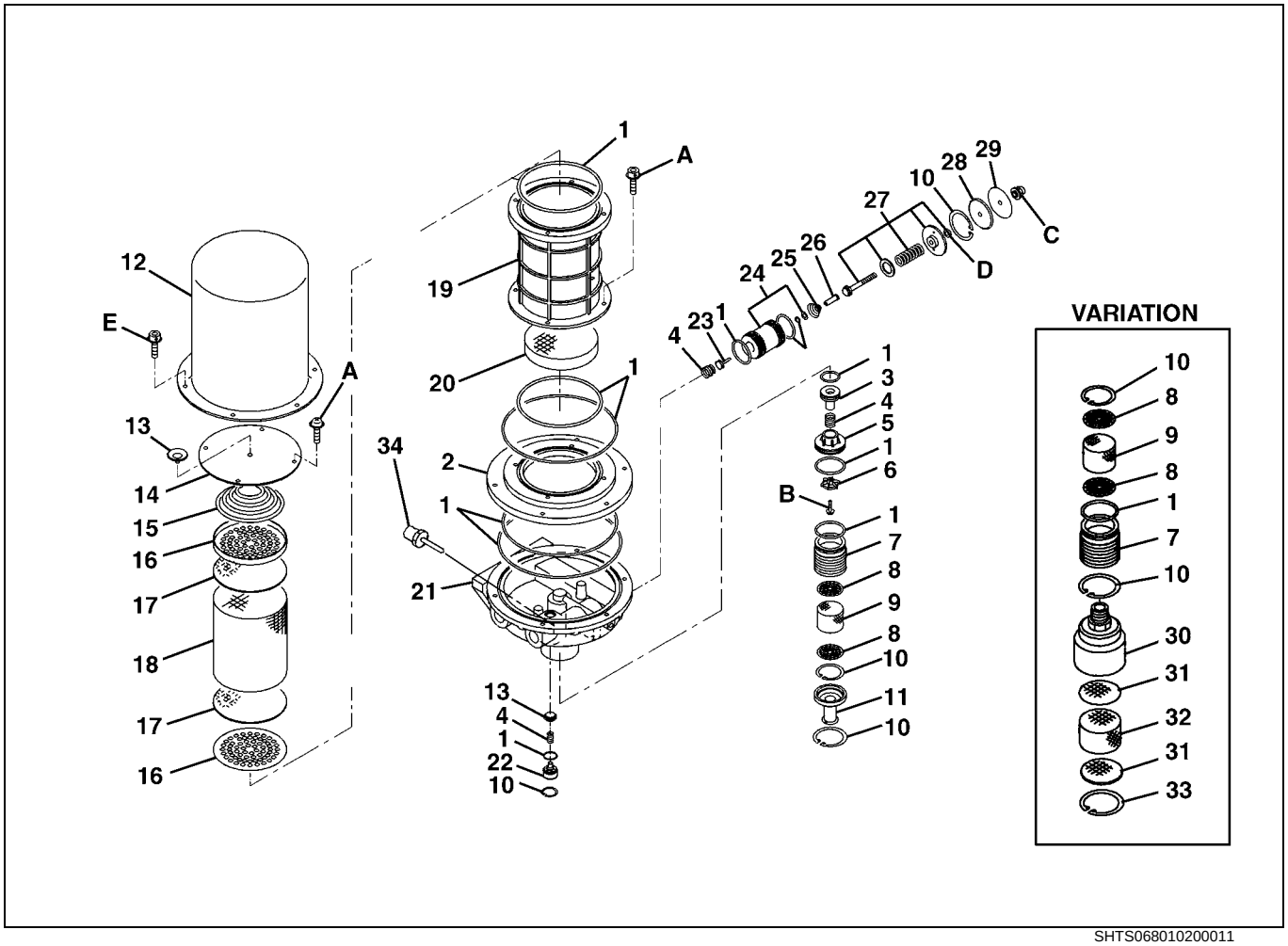


SHTS068010200010

1	Chamber (Purge tank)	11	Valve spring	21	Filter (If so equipped)
2	Case cover	12	Piston	22	Retainer ring (If so equipped)
3	Check valve	13	Purge valve	23	Heater (If so equipped)
4	Spring	14	Plug	A	Outlet (Dried air to air tank)
5	Body	15	Pressure regulator	B	Orifice
6	Desiccant case	16	Adjusting screw	C	Inlet (From air compressor)
7	Filter	17	Piston	D	Purged air
8	Desiccant	18	Piston spring	E	Dehumidification
9	Oil separator filter (If so equipped)	19	Silencer body (If so equipped)	F	Reclamation
10	Valve body	20	Filter plate (If so equipped)	G	To purge valve

COMPONENT LOCATOR

EN0680102D100002



SHTS068010200011

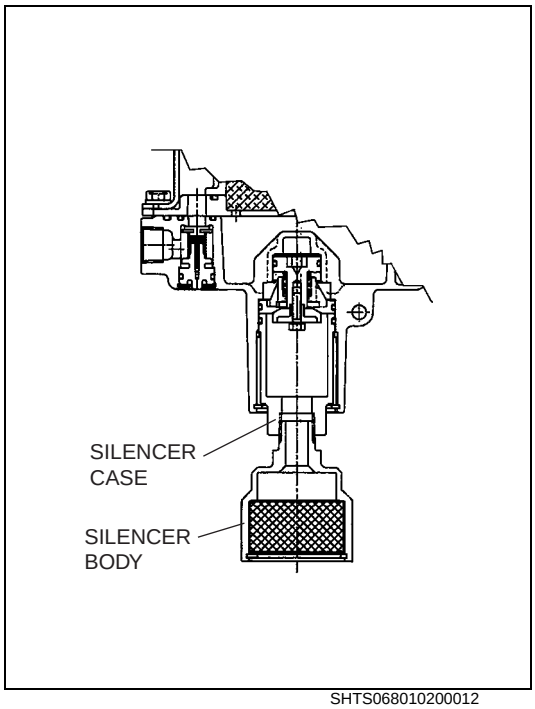
1	O-ring	18	Desiccant
2	Plate	19	Desiccant case
3	Piston	20	Oil separator filter (If so equipped)
4	Valve spring	21	Body
5	Valve body	22	Valve stopper
6	Purge valve	23	Governor valve
7	Silencer case	24	Piston assembly
8	Silencer plate	25	Exhaust stem spring
9	Silencer	26	Exhaust stem
10	Retainer ring	27	Pressure regulator assembly
11	Exhaust cover	28	Valve seat
12	Chamber	29	Plate
13	Check valve	30	Silencer body (If so equipped)
14	Case cover	31	Filter plate (If so equipped)
15	Set spring	32	Filter (If so equipped)
16	Filter plate	33	Retainer ring (If so equipped)
17	Filter	34	Heater (If so equipped)

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

A	2.0-3.9 {20-40, 1.5-2.9}	D	6.9-7.8 {71-79, 5.2-5.7}
B	3.9-6.9 {40-70, 2.9-5.0}	E	17.7-27.5 {180-280, 13-20}
C	4.9-5.9 {50-60, 3.7-4.3}		

OVERHAUL

EN0680102H200002

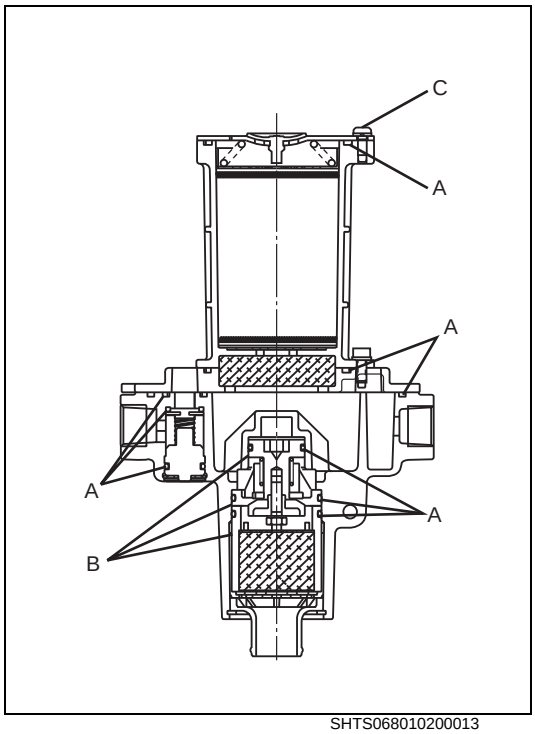


SHTS068010200012

IMPORTANT POINT - DISASSEMBLY

NOTICE

When disassembling the air dryer, never to disassemble the its silencer body because its threaded portion is coated with lock agent (Lock tight).



SHTS068010200013

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the air dryer, use new O-ring, gasket and seal.

(2) Apply grease (lithium base) to each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

2. BEFORE TIGHTEN THE BOLT WITH SPECIFIED TIGHTENING TORQUE, TAP ALL OVER THE OUTER SURFACE OF THE DESICCANT CASE WITH A PLASTIC HAMMER.

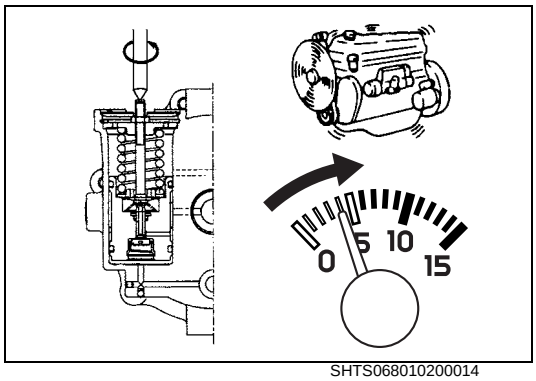
- **C: Bolt**

IMPORTANT POINTS - MOUNTING

1. INSPECTION

(1) Operate the engine and raise the air pressure until the air discharge from the purge valve, then stop the engine.
(The pressure reaches the valve opening pressure of the air pressure regulator).

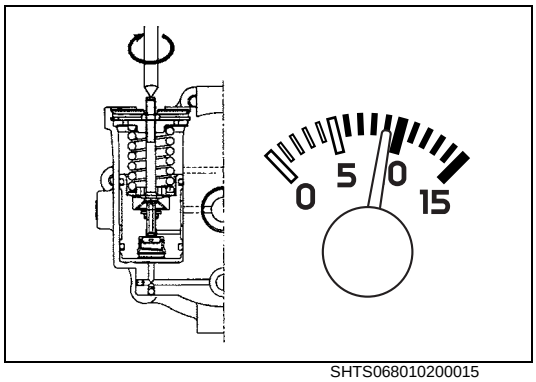
a. Check to see that there is no air leakage from the purge valve.



SHTS068010200014

2. ADJUSTMENT

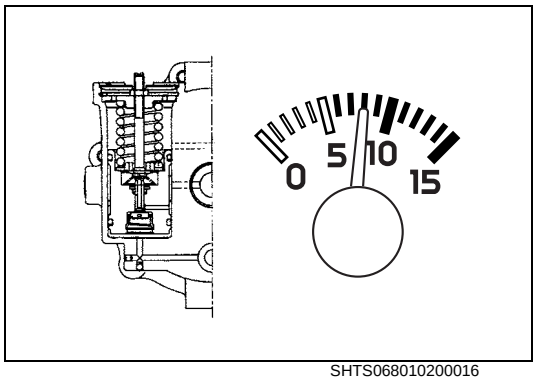
(1) Loosen the adjusting screw until the rod spring tension is released, and start and idle the engine to charge the air for the air tank.



SHTS068010200015

(2) Tighten the adjusting screw gradually till the air pressure gauge indicate valve opening pressure shown below and the air starts to discharge from purge valve.
Governor valve opening pressure: 880 kPa {9.0 kgf/cm^2, 128 lbf/in.^{2}}

(3) Tighten the adjusting screw lock nut.

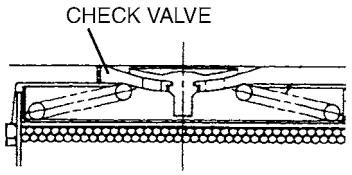
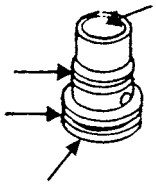
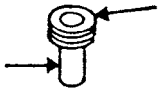
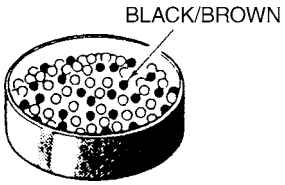


SHTS068010200016

(4) Watch the air pressure gauge needle and see that it stops at the valve closing pressure shown below.
Governor valve closing pressure: 780 kPa {8.0 kgf/cm^2, 114 lbf/in.^{2}}

INSPECTION AND REPAIR

EN0680102H300002

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Check valve and valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body sliding surface and purge valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston sliding surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Purge valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Desiccant: Contamination and deterioration	**—**	**Discolored, more than 1/5 of the quantity.**	**Replace.**	**Visual check** 

AIR DRYER (MODEL: FM2P)

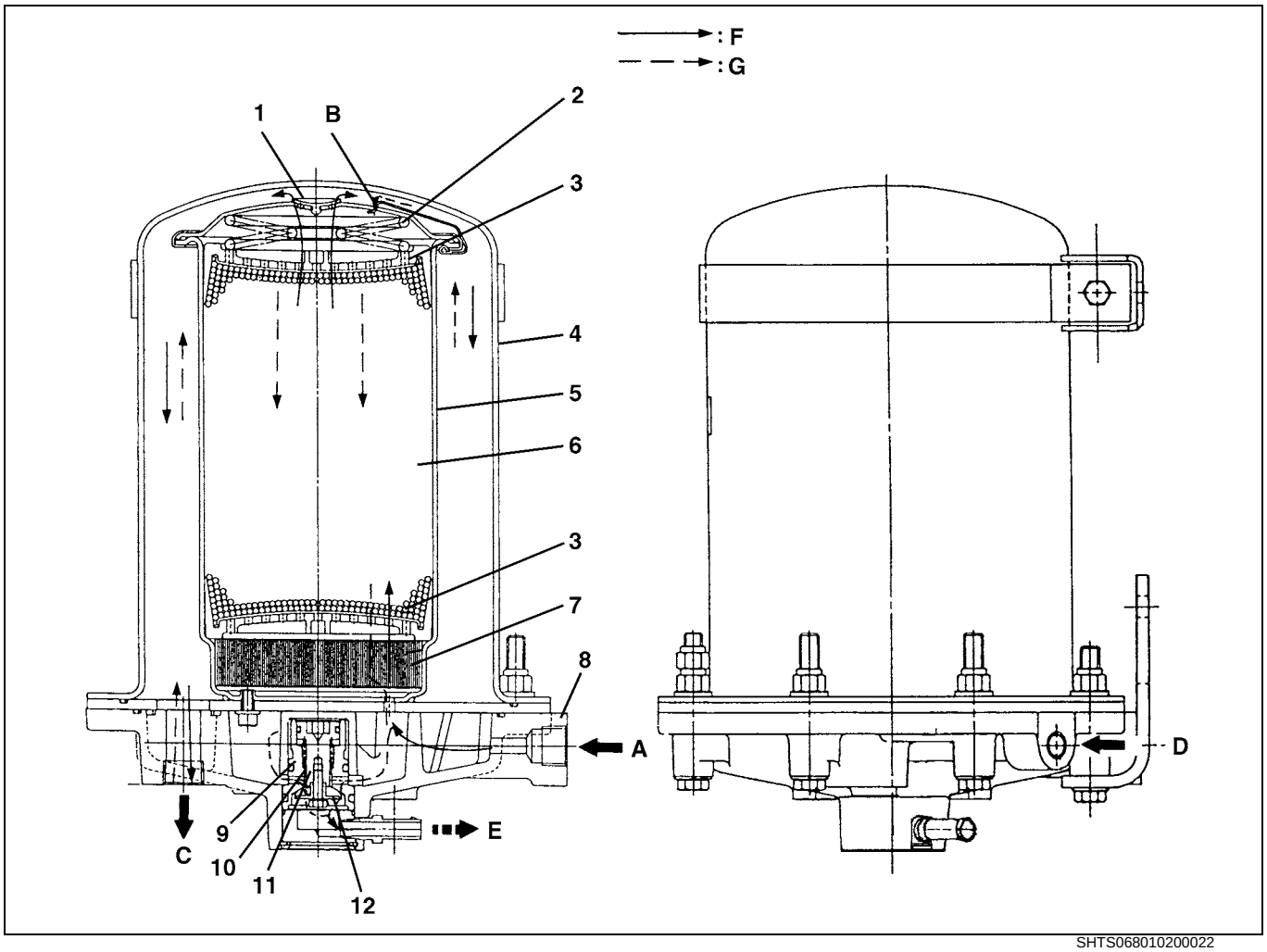
DATA AND SPECIFICATIONS

EN0680102I200003

Type	**Purge tank, desiccant, auto-drain valve.**
Air and Water discharging time (Reclamation cycle)	**Approx. 60 sec.**

DESCRIPTION

EN0680102C100003

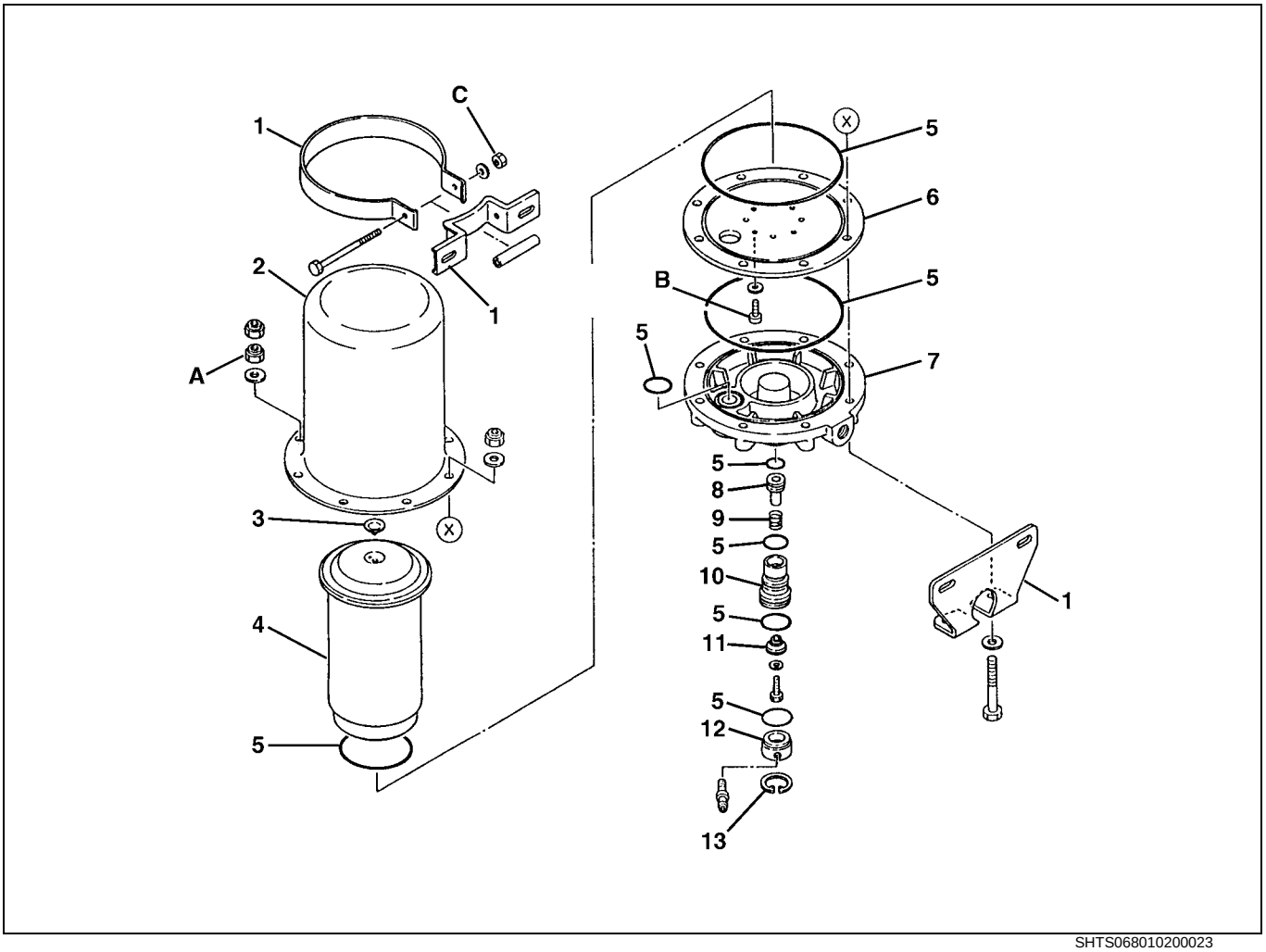


SHTS068010200022

1	**Check valve**	**11**	**Piston**
2	**Spring**	**12**	**Purge valve**
3	**Filter**	**A**	**Inlet (from air compressor)**
4	**Chamber (Purge tank)**	**B**	**Orifice**
5	**Desiccant case**	**C**	**Outlet (dried air to air tank)**
6	**Desiccant**	**D**	**Inlet (from pressure regulator)**
7	**Oil filter**	**E**	**Purged air**
8	**Body**	**F**	**Dehumidification**
9	**Valve body**	**G**	**Reclamation**
10	**Valve spring**		

COMPONENT LOCATOR

EN0680102D100003



SHTS068010200023

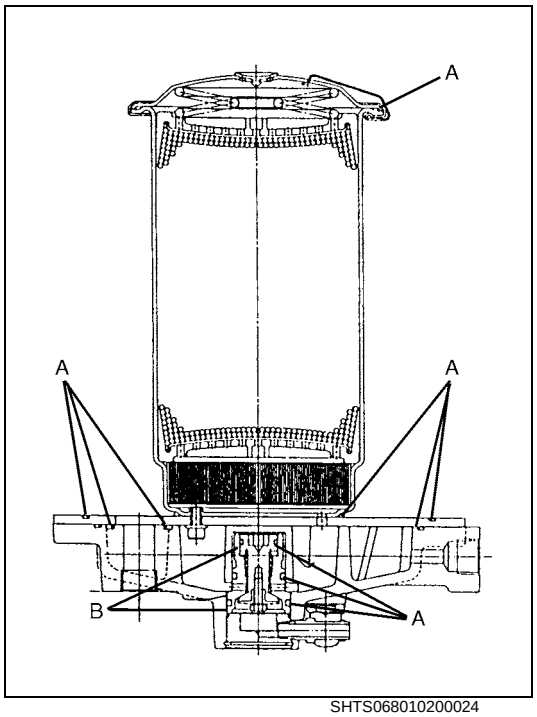
1	Bracket	8	Piston
2	Chamber (purge tank)	9	Valve spring
3	Check valve	10	Valve body
4	Desiccant case	11	Purge valve
5	O-ring	12	Exhaust body
6	Plate	13	Retainer ring
7	Body		

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

A	14.7-22.6 {150-230, 10.9-16.6}	C	6.9-8.8 {70-90, 5.1-6.5}
B	3.9-6.9 {40-70, 2.9-5.0}		

OVERHAUL

EN0680102H200003



SHTS068010200024

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the air dryer, use new O-ring.

(2) Apply grease (lithium base) to each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

2. BEFORE CLOSING THE CHAMBER, TAP ALL OVER THE OUTER SURFACE OF THE DESICCANT CASE WITH A PLASTIC HAMMER.

IMPORTANT POINT - MOUNTING

1. INSPECTION

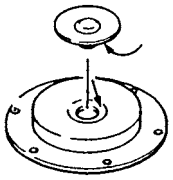
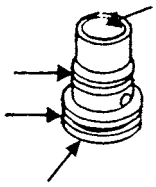
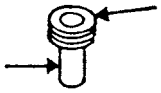
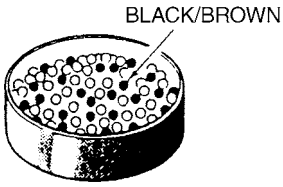
(1) Operate the engine and raise the air pressure until the air compressor stops functioning.
(The pressure reaches the valve opening pressure of the air pressure regulator).

a. Check to see that there is no air leakage from the purge valve while the compressor is functioning.

b. When the compressor stops functioning, check to see that the air is discharged from the purge valve for a period of approx. 60 seconds.

INSPECTION AND REPAIR

EN0680102H300003

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Check valve, Valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body, Sliding surface and purge valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston, Sliding surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Purge valve, Seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Desiccant: Contamination and deterioration	**—**	**Discolored, more than 1/5 of the quantity.**	**Replace.**	**Visual check** 

DOUBLE CHECK VALVE (MODEL: TRACTOR)

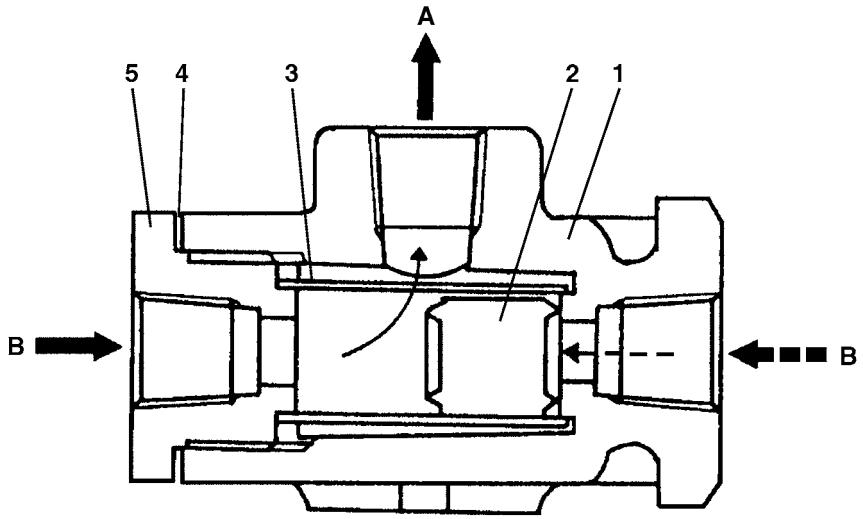
DATA AND SPECIFICATION

EN0680102I200004

Type	**Piston type**

DESCRIPTION

EN0680102C100004

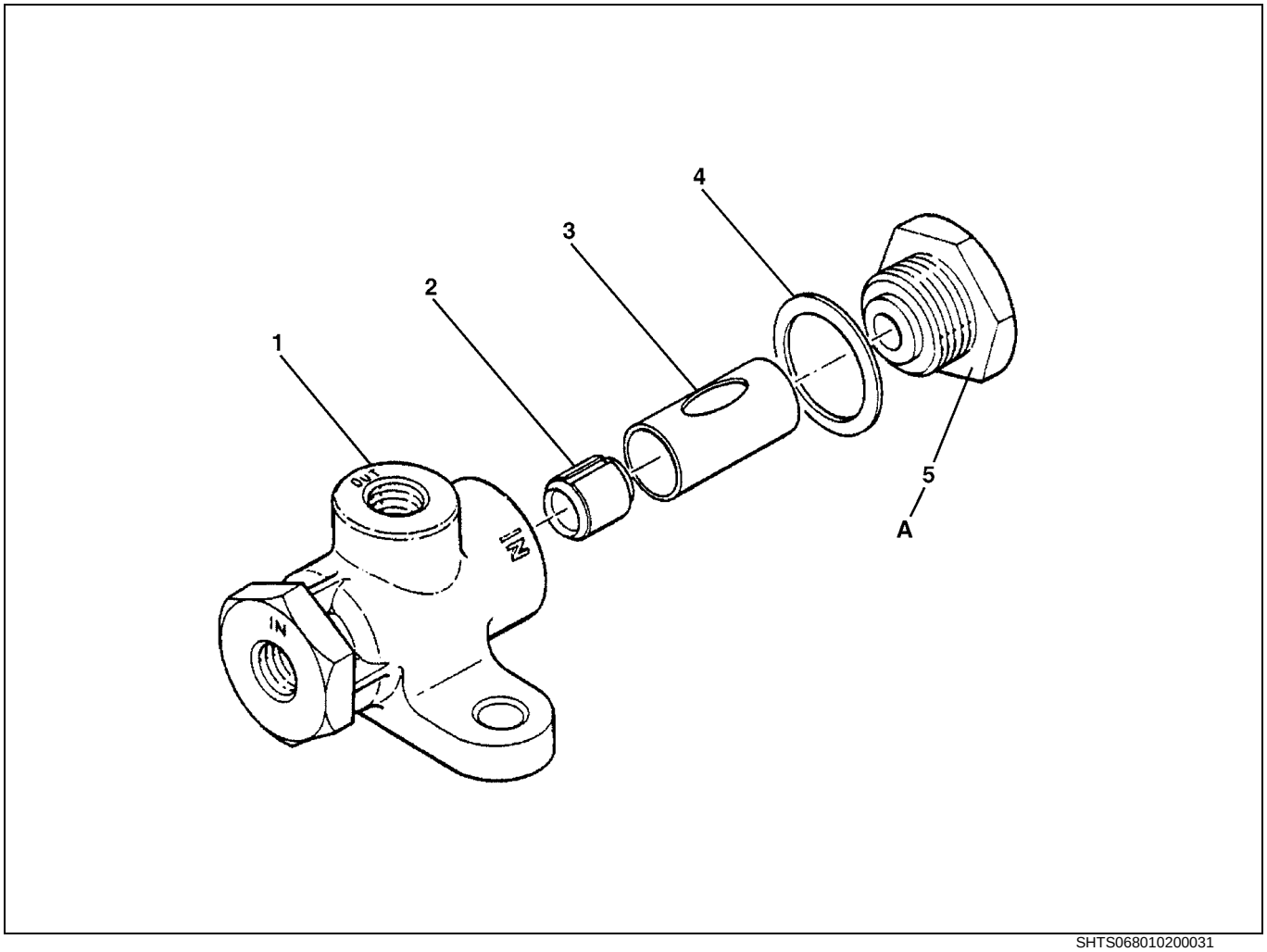


SHTS068010200030

1	**Valve body**	**5**	**Plug**
2	**Valve**	**A**	**Outlet**
3	**Guide**	**B**	**Inlet**
4	**Gasket**		

COMPONENT LOCATOR

EN0680102D100004



SHTS068010200031

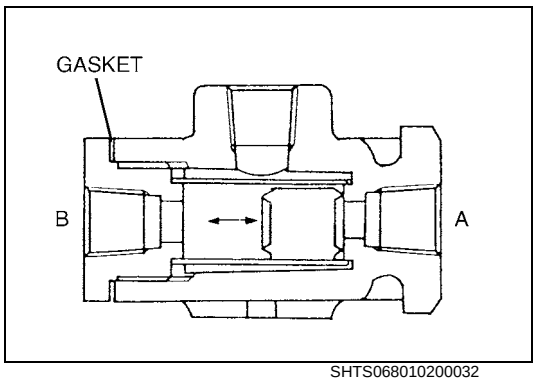
1	Valve body	4	Gasket
2	Valve	5	Plug
3	Guide		

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

A	35-44 {350-450, 25.3-32.5}		

OVERHAUL

EN0680102H200004



SHTS068010200032

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

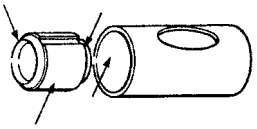
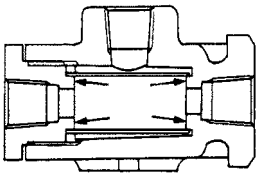
(1) When assembling the double check valve, apply the ThreeBond: TB-1101 or equivalent to the gasket.

NOTICE

Check to see that there is no air leakage from "A", when air is charged from "B", and no air leakage from "B", when air is charged from "A".

INSPECTION AND REPAIR

EN0680102H300004

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve and guide: Rust, wear and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Valve body and plug: Rust, wear and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 

CHECK VALVE

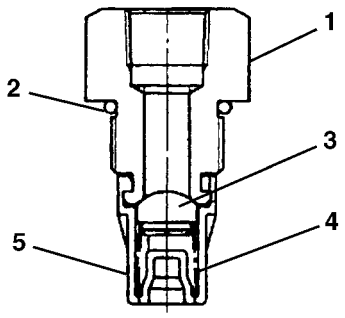
DATA AND SPECIFICATIONS

EN0680102I200005

Type	**Spring type**
Valve opening pressure	**Outlet side pressure 14.7 kPa {0.15 kgf/cm^2, 2.13 lbf/in.^{2}}**

DESCRIPTION

EN0680102C100005

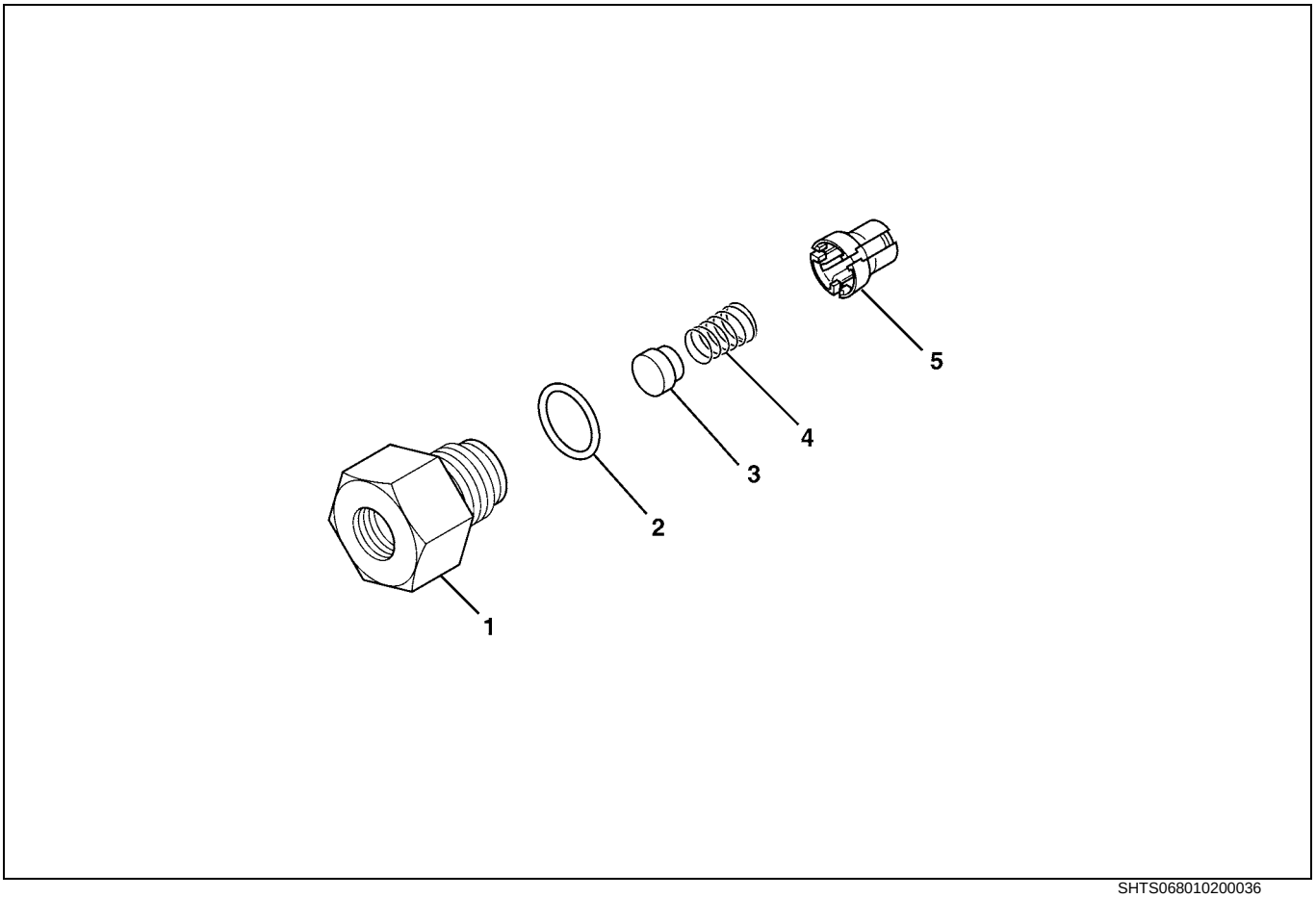


SHTS068010200035

1	**Connector**	**4**	**Valve spring**
2	**O-ring**	**5**	**Valve holder**
3	**Valve**		

COMPONENT LOCATOR

EN0680102D100005

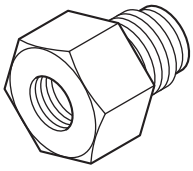
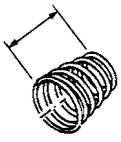


SHTS068010200036

1	Connector	4	Valve spring
2	O-ring	5	Valve holder
3	Valve		

INSPECTION AND REPAIR

EN0680102H300005

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Connector: Wear and damage	—	—	Replace, if necessary.	Visual check 
Valve: Wear and damage	—	—	Replace, if necessary.	Visual check 
Valve spring: Rust, damage and free length	19.8 mm {0.78 in.}	18 mm {0.71 in.}	Replace, if necessary.	Measure and visual check 

SAFETY VALVE

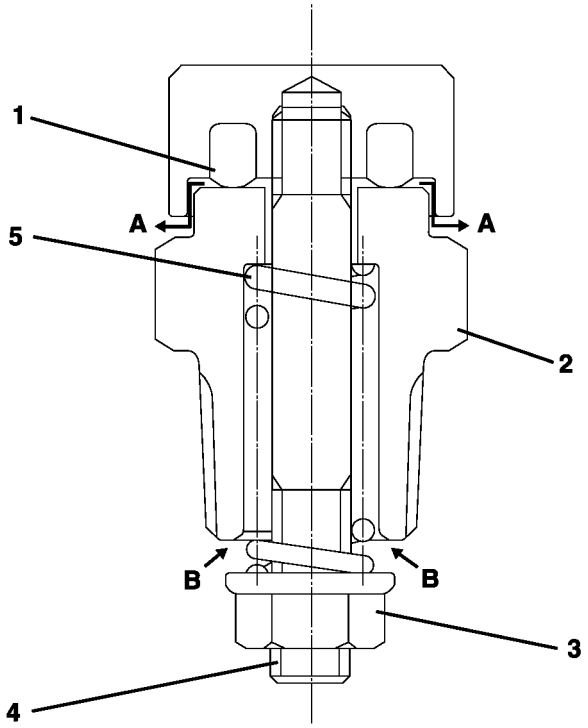
DATA AND SPECIFICATIONS

EN0680102I200006

Type	**Spring type**
Valve opening pressure	**1,029-1,069 kPa {10.5-10.9 kgf/cm^2, 149-155 lbf/in.^{2}}**

DESCRIPTION

EN0680102C100006



SHTS068010200040

1	**Valve**	**5**	**Compression spring**
2	**Body**	**A**	**Exhaust**
3	**Nut**	**B**	**From air tank (Pressure air)**
4	**Bolt**		

INSPECTION AND REPAIR

EN0680102H300006

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve opening pressure	**1,029-1,069 {10.5-10.9, 149-155}**	**—**	**Replace, if necessary**	**Measure**

BRAKE VALVE

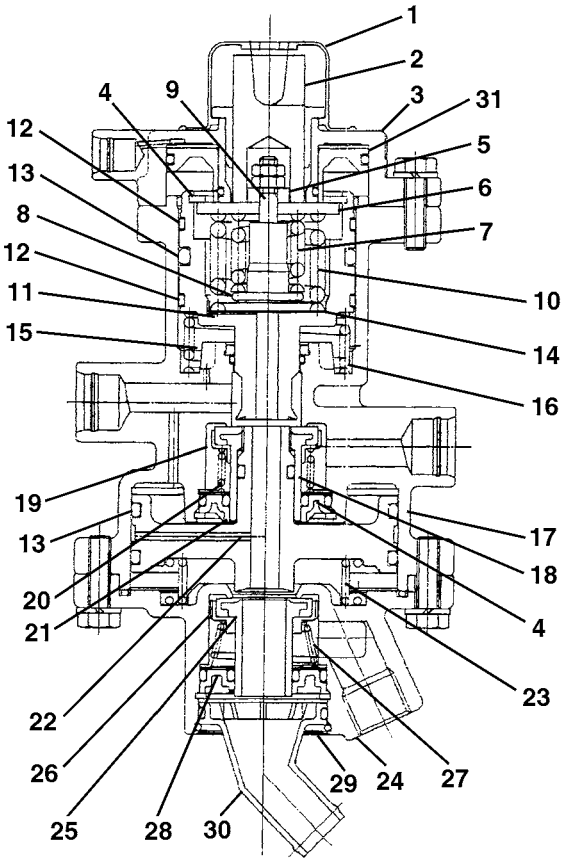
DATA AND SPECIFICATION

EN0680102I200007

Type	**Dual pistons and valves with a plunger type pedal**

DESCRIPTION

EN0680102C100007

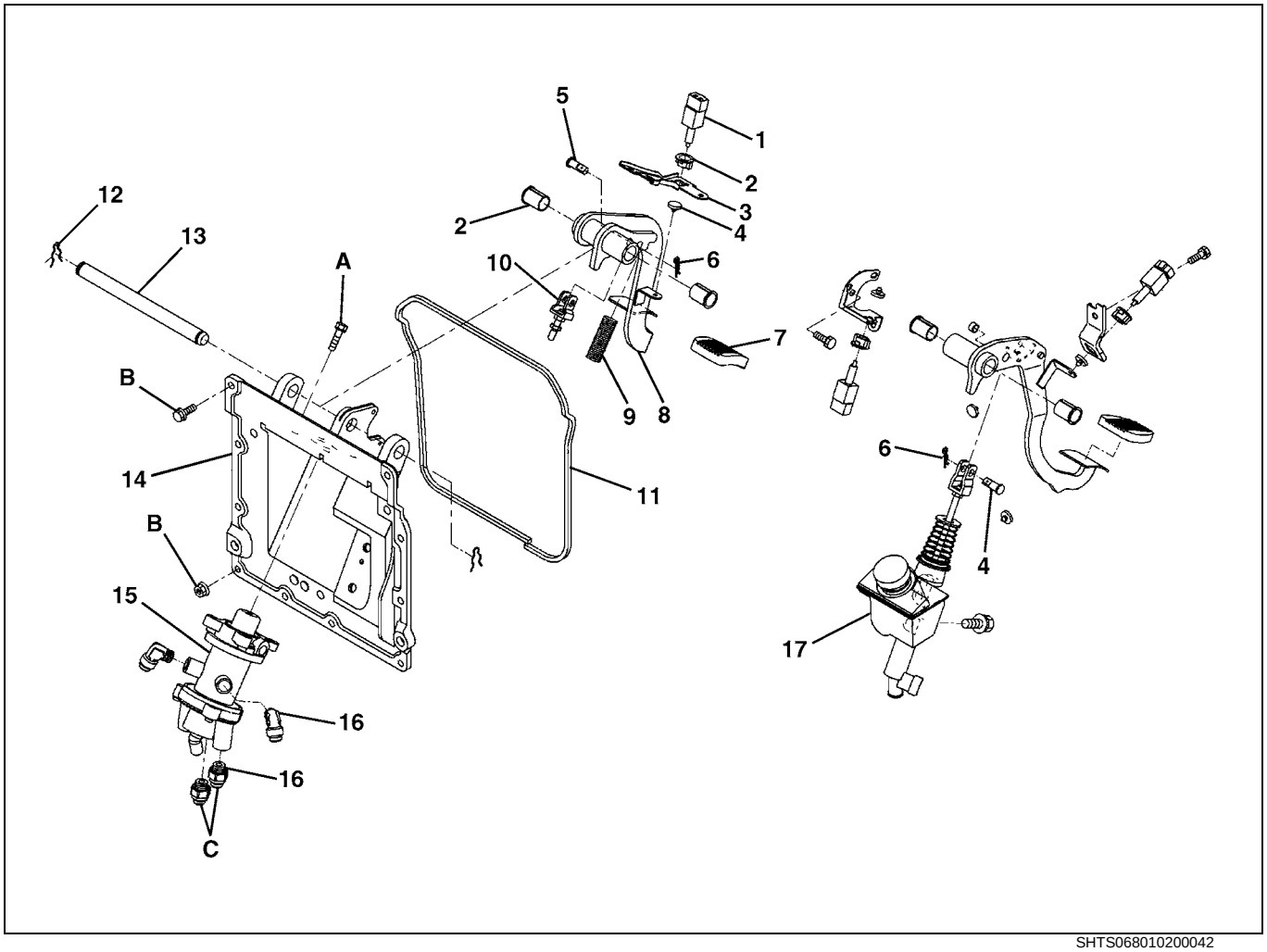


SHTS068010200041

1	Boot	17	Primary valve body
2	Plunger	18	Primary feed valve
3	Brake valve cover	19	Retainer
4	Retainer ring	20	Primary feed valve return spring
5	Guide ring	21	Primary feed valve retainer
6	Spring seat	22	Secondary piston
7	Sub spring	23	Secondary piston return spring
8	Shim	24	Secondary valve body
9	Stem	25	Secondary feed valve
10	Main spring	26	Retainer
11	Shim	27	Secondary feed valve return spring
12	Guide ring	28	Secondary feed valve retainer
13	O-ring	29	C-ring
14	Primary piston	30	Exhaust port
15	Guide	31	Piston (If so equipped)
16	Primary piston return spring		

COMPONENT LOCATOR

EN0680102D100006

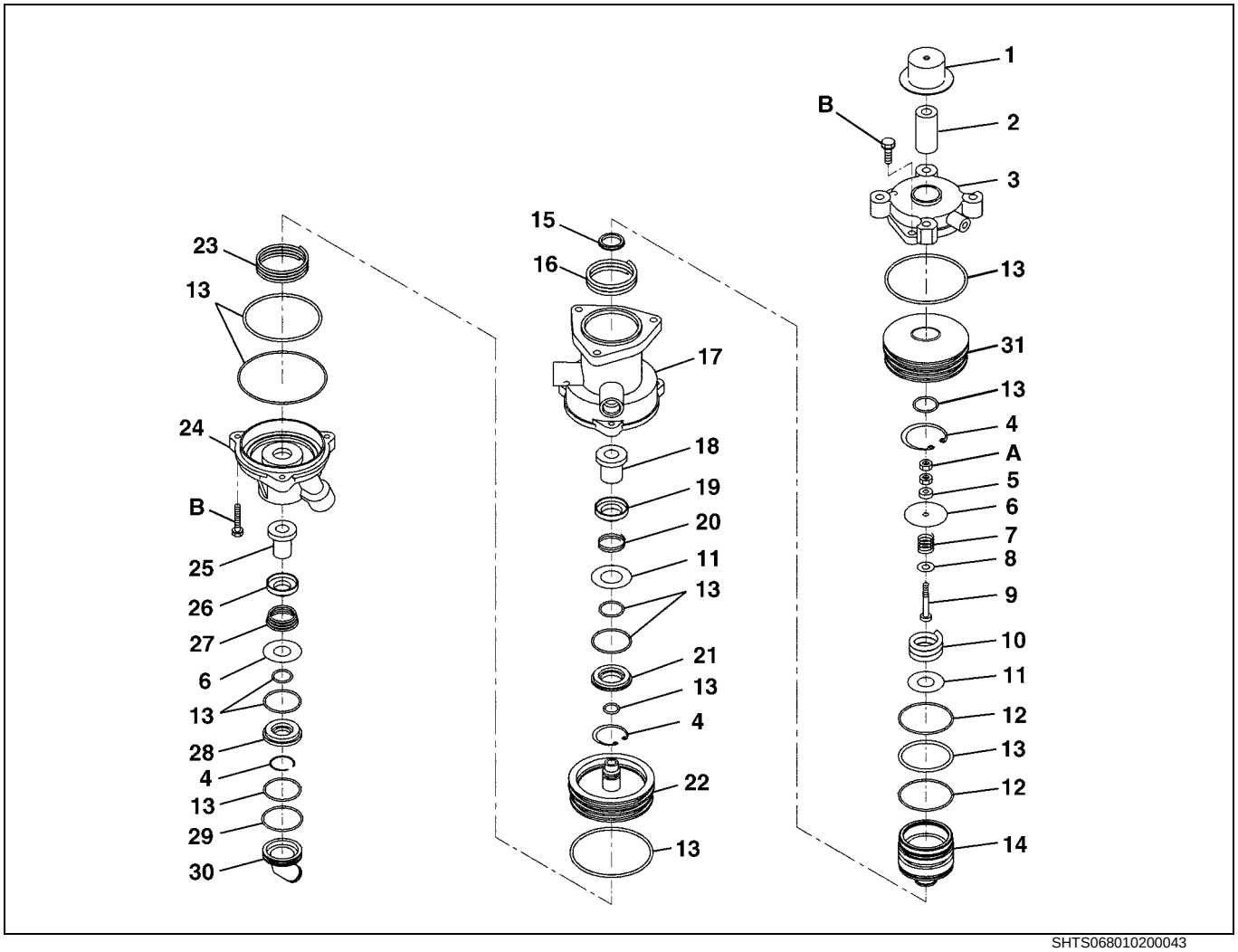


SHTS068010200042

1	Stop light switch	10	Push rod
2	Bushing	11	Seal
3	Bracket	12	Clip
4	Buffer	13	Shaft
5	Pin	14	Pedal bracket
6	R-pin	15	Brake valve
7	Pedal pad	16	Connector
8	Brake pedal	17	Clutch master cylinder
9	Return spring		

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

A	9.5-18.5 {97-188, 7.1-13.5}	C	24.4-34.5 {250-350, 18-25}
B	18-31 {184-316, 14-22}		



SHTS068010200043

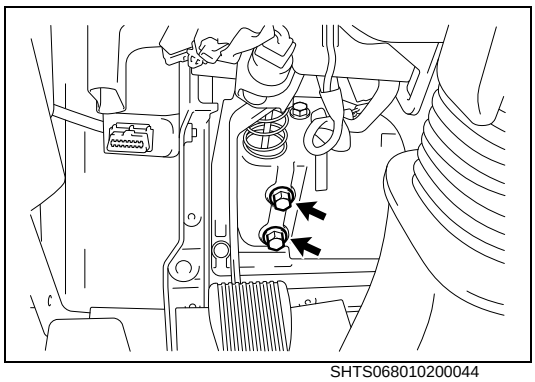
1	Boot	17	Primary valve body
2	Plunger	18	Primary feed valve
3	Brake valve cover	19	Retainer
4	Retainer ring	20	Primary feed valve return spring
5	Guide ring	21	Primary feed valve retainer
6	Spring seat	22	Secondary piston
7	Sub spring	23	Secondary piston return spring
8	Shim	24	Secondary valve body
9	Stem	25	Secondary feed valve
10	Main spring	26	Retainer
11	Shim	27	Secondary feed valve return spring
12	Guide ring	28	Secondary feed valve retainer
13	O-ring	29	C-ring
14	Primary piston	30	Exhaust port
15	Guide	31	Piston (If so equipped)
16	Primary piston return spring		

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

A	2.9-4.9 {30-50, 2.2-3.6}	B	5.9-7.4 {60-75, 4.3-5.4}

OVERHAUL

EN0680102H200005


SHTS068010200044

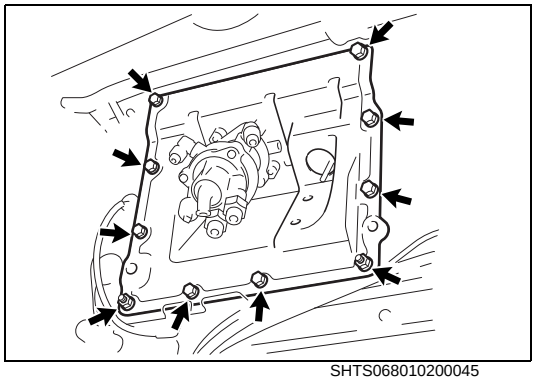
IMPORTANT POINTS - DISMOUNTING

1. REMOVE THE CLUTCH MASTER CYLINDER.

HINT

Even if without removing the clutch master cylinder, pedal bracket can be removed only to the length of the clutch hose.

2. DISCONNECT THE NYLON TUBE.

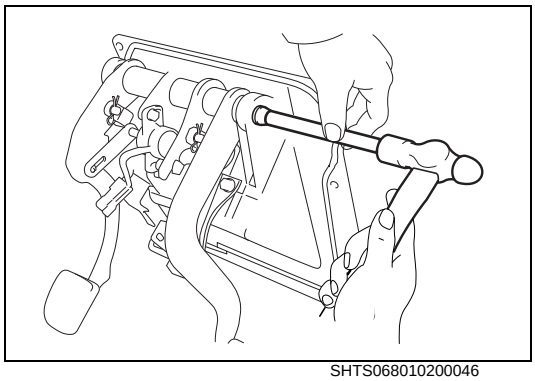

SHTS068010200045

3. REMOVE THE PEDAL BRACKET ASSEMBLY.

(1) Loosen the bolt and nut to remove the pedal bracket assembly.

NOTICE

Before removing the pedal bracket, put the wiper link upward.

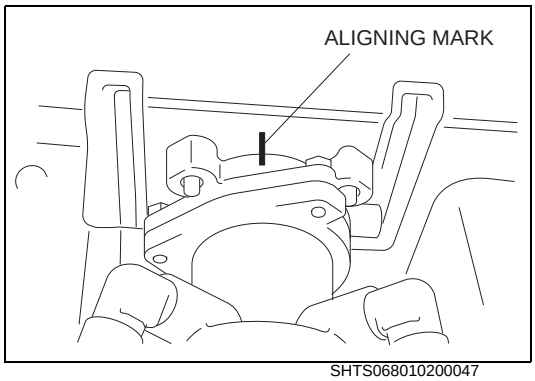

SHTS068010200046

4. REMOVE THE BRAKE PEDAL.

(1) Tap the shaft lightly using a brass rod and a hammer, remove the brake pedal from the pedal bracket assembly.

NOTICE

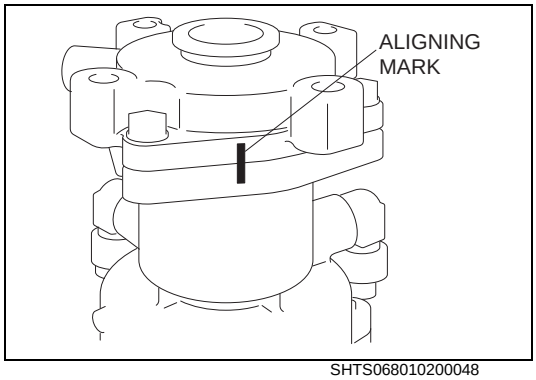
Do not pull out the shaft because the brake pedal and the clutch pedal are installed by one pedal shaft.



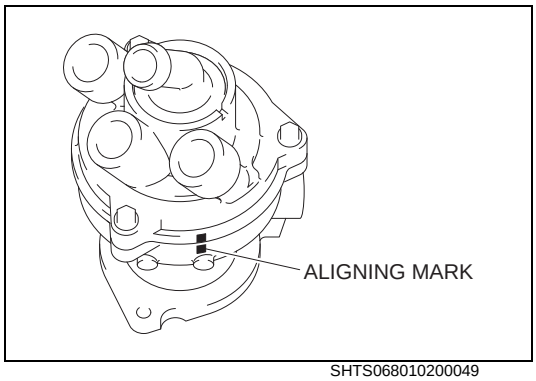
SHTS068010200047

5. REMOVE THE BRAKE VALVE ASSEMBLY.

(1) Apply aligning marks on the brake valve assembly and pedal bracket assembly.



SHTS068010200048

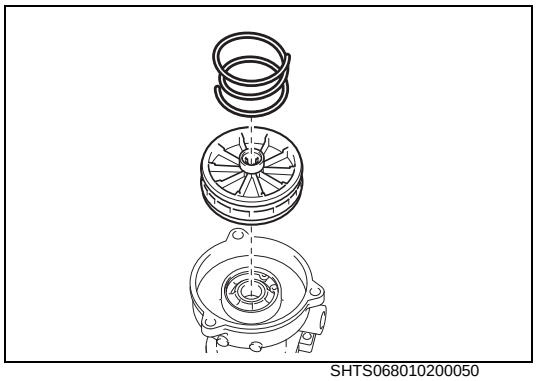


SHTS068010200049

IMPORTANT POINTS - DISASSEMBLY

NOTICE

Before disassembling the brake valve, apply aligning marks on the brake valve cover, primary valve body and secondary valve body.


SHTS068010200050

1. REMOVE THE PRIMARY PISTON ASSEMBLY.

2. REMOVE THE SECONDARY VALVE BODY.

3. REMOVE THE SECONDARY PISTON.

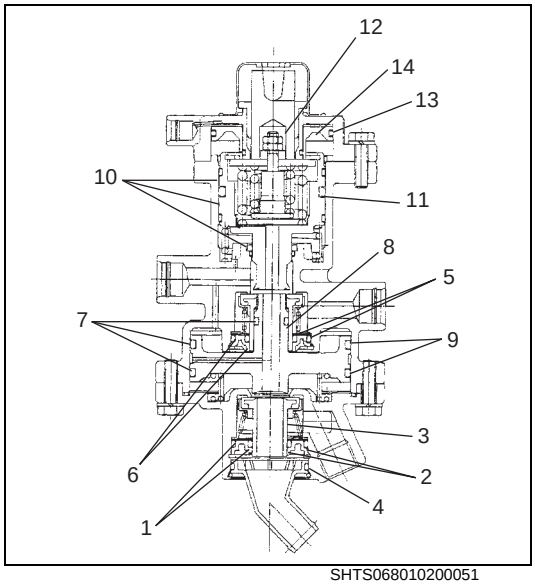
NOTICE

Pull out with hands to prevent the seat part of the secondary piston from being damaged by using a plier etc. If not with hands, secondary piston should not be reused.

4. REMOVE THE PRIMARY FEED VALVE.

5. REMOVE THE EXHAUST PORT.

6. REMOVE THE SECONDARY FEED VALVE



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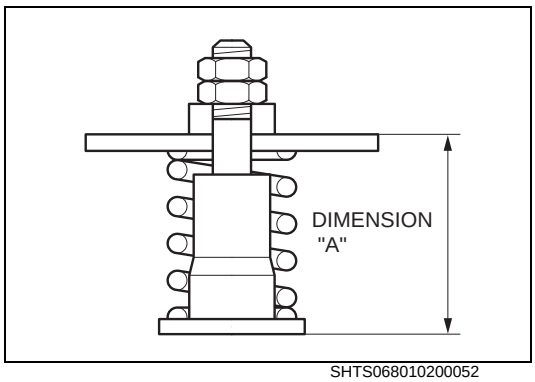
IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When reassembling the brake valve, replace the O-rings and retainer rings with new ones.

(2) Apply adequate amount of silicone grease on the grooves for the O-ring and to the sliding surfaces of the component parts.

1. Secondary feed valve retainer O-ring
2. Secondary feed valve retainer
3. Secondary feed valve
4. Exhaust port O-ring
5. Primary feed valve retainer O-ring
6. Primary feed valve retainer
7. Secondary piston O-ring
8. Secondary piston
9. Primary valve body
10. Primary piston
11. Primary piston O-ring
12. Plunger
13. Piston O-ring
14. Piston



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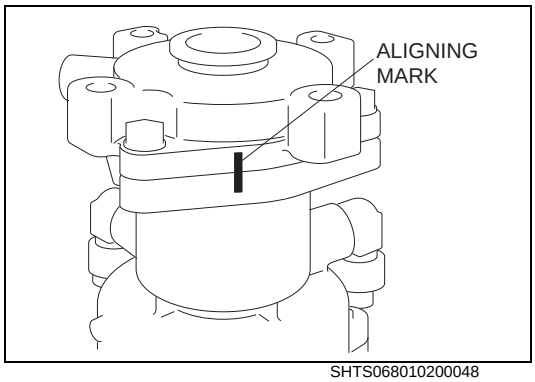
2. ASSEMBLE THE STEM, SPRING, SPRING SEAT AND SHIM.

(1) Assemble the sub spring. At this time, adjust dimension "A" and the spring compression "P" by means of the lock nut and the shim.

NOTICE

In adjusting the spring compression, the axial play of the spring must be removed.

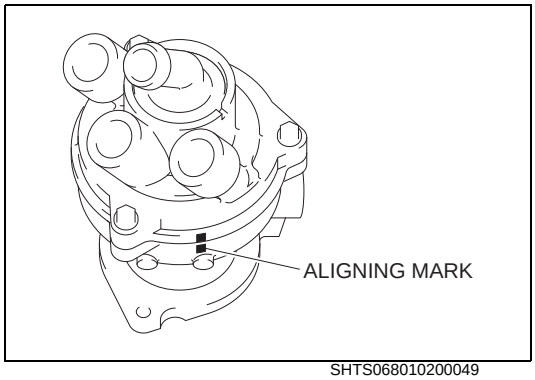
Dimension "A": 27.15-27.55 mm {1.0689-1.0846 in.}
Setting load: 0-9.8 N {0-1 kgf, 0-2.2 lbf}



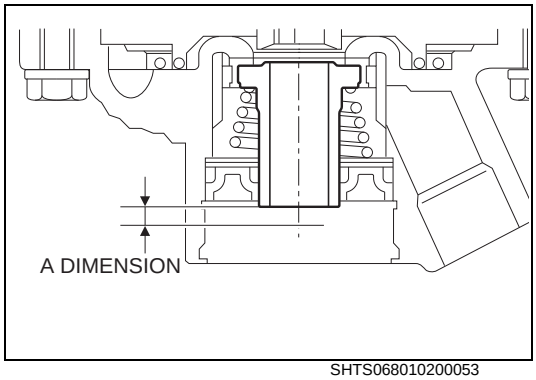
SHTS068010200048

3. ALIGN THE VALVE COVER AND VALVE BODIES.

(1) When assemble the brake valve cover, primary body and secondary body, align the marks which were applied at disassembly.



SHTS068010200049



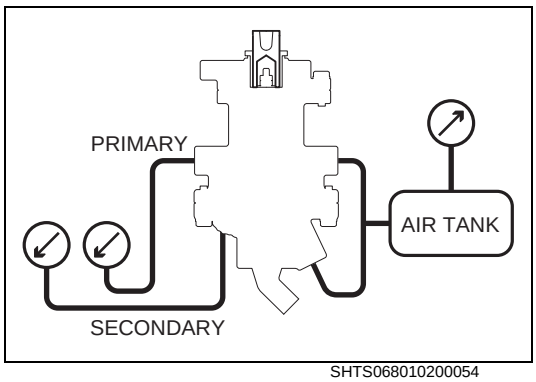
SHTS068010200053

4. INSPECTION AND ADJUSTMENT

(1) Brake valve

a. Measure the secondary feed valve stroke (dimension A from starting to release the plunger to completing to fully release the plunger).

A dimension: 0.6 mm {0.0236 in.} or above

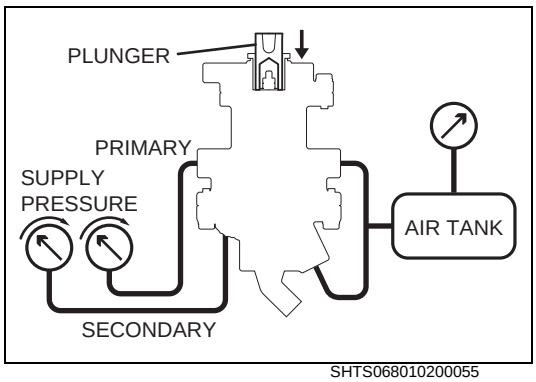


SHTS068010200054

b. Connect the brake valve, nylon tube, air pressure gauge, and air tank as shown in the figure.

c. Set the air tank pressure at 830 kPa {8.5 kgf/cm^2, 120.87 lbf/in.^{2}}.

d. Apply soap water to the exhaust port and check to see there is no air leakage.



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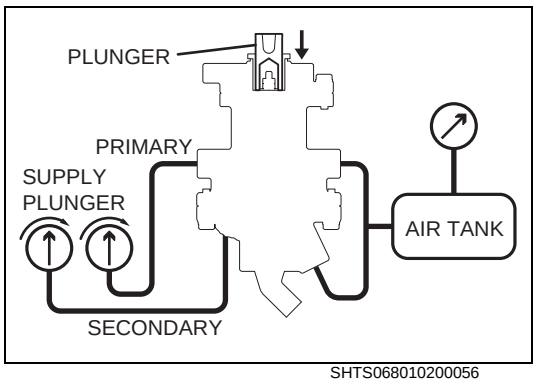
e. Drive in slowly the plunger. Measure the plunger stroke and supply pressure at the point where the primary and secondary air pressure gauges start to rise. If the measurements do not match with the standard values, adjust by the shim of the main spring.

Parts No. S4716-03292, S4716-03302

Measurement item	Standard value
Plunger stroke	0.8-1.6 mm {0.0315-0.0630 in.}
Supply pressure	5-25 kPa {0.1-0.3 kgf/cm^2, 1.43-3.55 lbf/in.^{2}}

Parts No. S4716-03311, S4716-03321

Measurement item	Standard value
Plunger stroke	0.8-1.6 mm {0.0315-0.0630 in.}
Supply pressure	19-41 kPa {0.2-0.4 kgf/cm^2, 2.84-5.60 lbf/in.^{2}}



SHTS068010200056

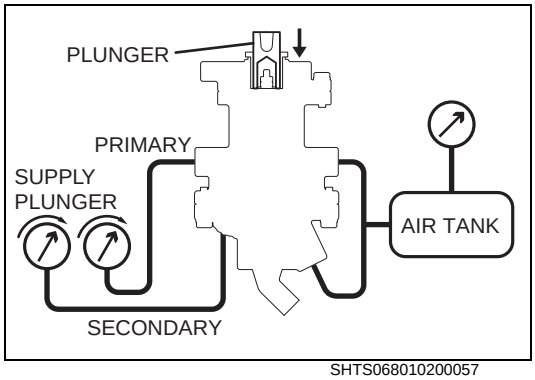
f. Drive in further the plunger. Measure the plunger stroke and supply pressure at the point immediately before that the primary and secondary pressure increases rapidly (bending point). If the measurements do not match with the standard values, replace each spring.

Parts No. S4716-03292, S4716-03302

Measurement item	Standard value
Plunger stroke	4.0-5.1 mm {0.1575-0.2007 in.}
Supply pressure	195 kPa {2.0 kgf/cm^2, 28.28 lbf/in.^{2}}

Parts No. S4716-03311, S4716-03321

Measurement item	Standard value
Plunger stroke	3.6-4.7 mm {0.1418-0.1850 in.}
Supply pressure	196 kPa {2.0 kgf/cm^2, 28.44 lbf/in.^{2}}



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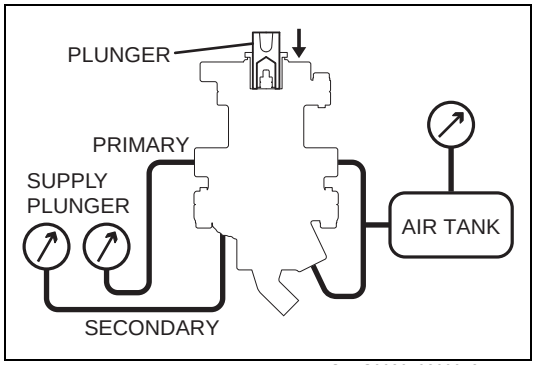
g. Drive in further the plunger. Measure the plunger stroke and supply pressure at the point where the primary and secondary pressures increase rapidly. If the measurements do not match with the standard values, replace each spring.

Parts No. S4716-03292, S4716-03302

Measurement item	Standard value
Plunger stroke	6.34-7.66 mm {0.2497-0.3015 in.}
Supply pressure	614 kPa {6.3 kgf/cm^2, 89.05 lbf/in.^{2}}

Parts No. S4716-03311, S4716-03321

Measurement item	Standard value
Plunger stroke	5.94-7.26 mm {0.2339-0.2858 in.}
Supply pressure	624 kPa {6.4 kgf/cm^2, 90.50 lbf/in.^{2}}



SHTS068010200058

h. Drive in further the plunger. Measure the pedal stepping down angle and supply pressure at the point where the primary and secondary pressure are maximum. If the measurements do not match with the standard values, replace each spring.

Parts No. S4716-03292, S4716-03302

Measurement item	Standard value
Plunger stroke	8.79-10.21 mm {0.3461-0.4019 in.}
Supply pressure	Max. regulating pressure

Parts No. S4716-03311, S4716-03321

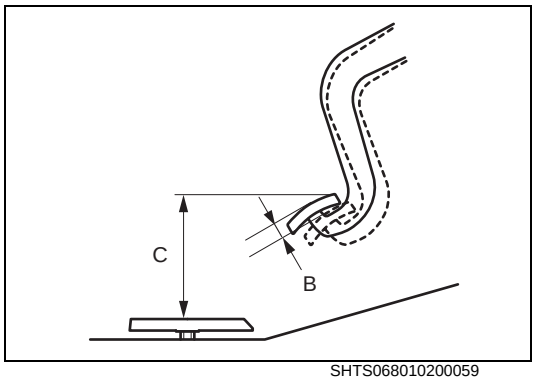
Measurement item	Standard value
Plunger stroke	8.34-9.76 mm {0.3284-0.3842 in.}
Supply pressure	Max. regulating pressure

(2) Brake pedal

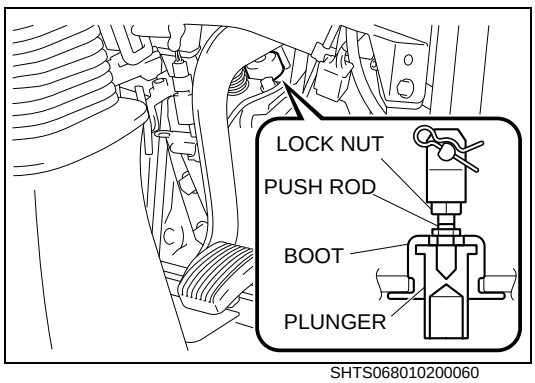
a. Make sure that the installing height of the brake pedal "C" and the pedal play "B".

"B": 2-5 mm {0.0788-0.1968 in.}

"C": 149.6-159.6 mm {5.890-6.283 in.}

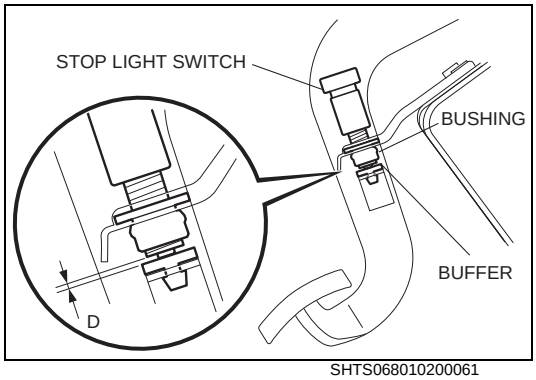


SHTS068010200059



SHTS068010200060

b. If the pedal play is out of the standard value, loosen the lock nut and turn the push rod to adjust the pedal play to the standard value.



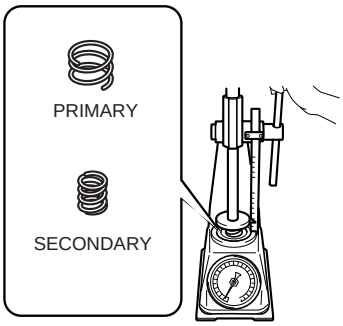
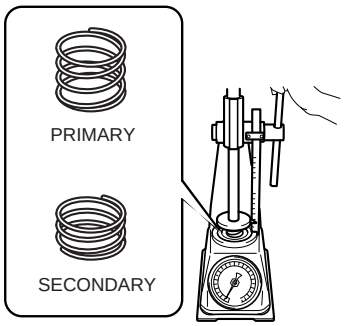
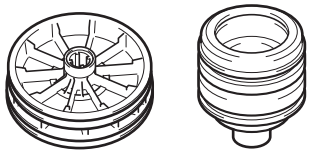
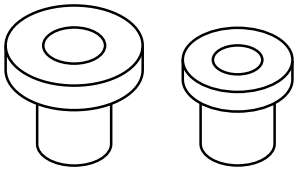
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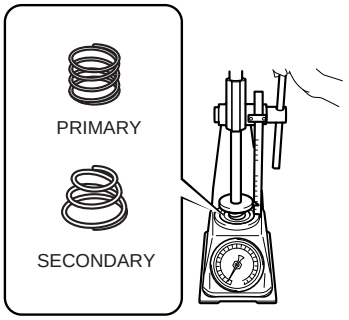
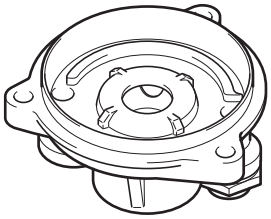
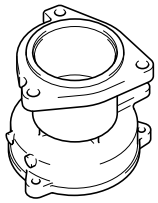
(3) Check the clearance between stop light switch and buffer.
"D": 0.5-1.5 mm {0.0197-0.0590 in.}

INSPECTION AND REPAIR

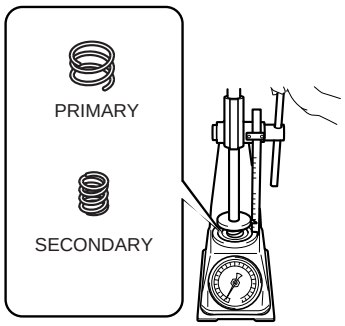
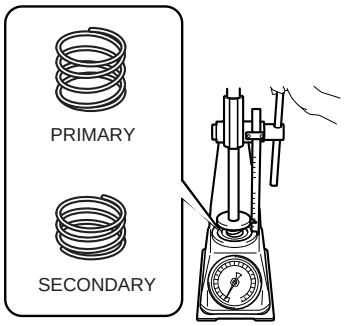
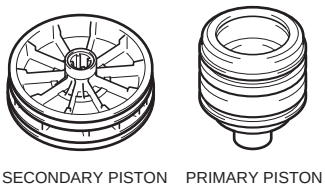
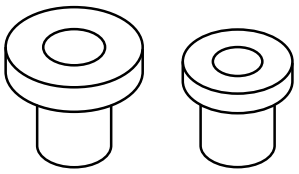
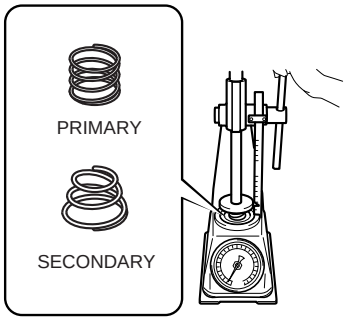
EN0680102H300007

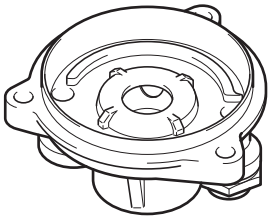
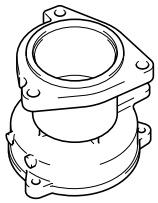
Parts No. S4716-03292, S4716-03302

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Main spring: Free length/ setting length/ setting load	**29.1 mm {1.15 in.}/ 27.5 mm {1.08 in.}/ 147.1 N {15.0 kgf, 35.07 lbf}**	**28.3 mm {1.11 in.}**	**Replace.**	**Visual check and measure** 
Sub spring: Free length/ setting length/ setting load	**21.6 mm {0.85 in.}/ 21.6 mm {0.85 in.}/ 9.8 N {1.0 kgf, 2.20 lbf} or more**	**20.5 mm {0.81 in.}**		
Primary and secondary piston return spring: Free length/ setting length/ setting load	**Primary: 43.2 mm {1.70 in.}/ 16.5 mm {0.65 in.}/ 95.1 N {9.7 kgf, 21.38 lbf}**	**40.5 mm {1.59 in.}**	**Replace.**	**Visual check and measure** 
	Secondary: 45.8 mm {1.80 in.}/ 16.0 mm {0.63 in.}/ 49.0 N {5.0 kgf, 11 lbf}	**43.2 mm {1.70 in.}**		
Primary and secondary piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check**  SECONDARY PISTON PRIMARY PISTON
Primary and secondary feed valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Primary and secondary feed valve return spring: Free length/ setting length/ setting load	**Primary: 21.4 mm {0.84 in.}/ 12.5 mm {0.49 in.}/ 52.0 N {5.3 kgf, 11.68 lbf}**	**20.4 mm {0.80 in.}**	**Replace.**	**Visual check and measure** 
	Secondary: 22.8 mm {0.90 in.}/ 13.0 mm {0.51 in.}/ 49.0 N {5.0 kgf, 11.02 lbf}	**21.8 mm {1.13 in.}**		
Secondary valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Primary valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Parts No. S4716-03311, S4716-03321

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Main spring: Free length/ setting length/ setting load	**29.3 mm {1.15 in.}/ 27.5 mm {1.08 in.}/ 176.5 N {18.0 kgf, 39.68 lbf}**	**28.5 mm {1.12 in.}**	**Replace.**	**Visual check and measure** 
Sub spring: Free length/ setting length/ setting load	**21.6 mm {0.85 in.}/ 19.4 mm {0.76 in.}/ 457 N {46.6 kgf, 102.7 lbf} or more**	**21 mm {0.83 in.}**		
Primary and secondary piston return spring: Free length/ setting length/ setting load	**Primary: 43.2 mm {1.70 in.}/ 16.5 mm {0.65 in.}/ 95.1 N {9.7 kgf, 21.38 lbf}**	**40.5 mm {1.59 in.}**	**Replace.**	**Visual check and measure** 
	Secondary: 24.5 mm {0.96 in.}/ 12.0 mm {0.47 in.}/ 11.8 N {1.2 kgf, 2.6 lbf}	**23.5 mm {0.93 in.}**		
Primary and secondary piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Primary and secondary feed valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Primary and secondary feed valve return spring: Free length/ setting length/ setting load	**Primary: 21.4 mm {0.84 in.}/ 12.5 mm {0.49 in.}/ 52.0 N {5.3 kgf, 11.68 lbf}**	**20.4 mm {0.80 in.}**	**Replace.**	**Visual check and measure** 
	Secondary: 22.8 mm {0.90 in.}/ 13.0 mm {0.51 in.}/ 49.0 N {5.0 kgf, 11.02 lbf}	**21.8 mm {1.13 in.}**		

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Secondary valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Primary valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

PROTECTION VALVE (WITH 4-WAY PROTECTION VALVE)

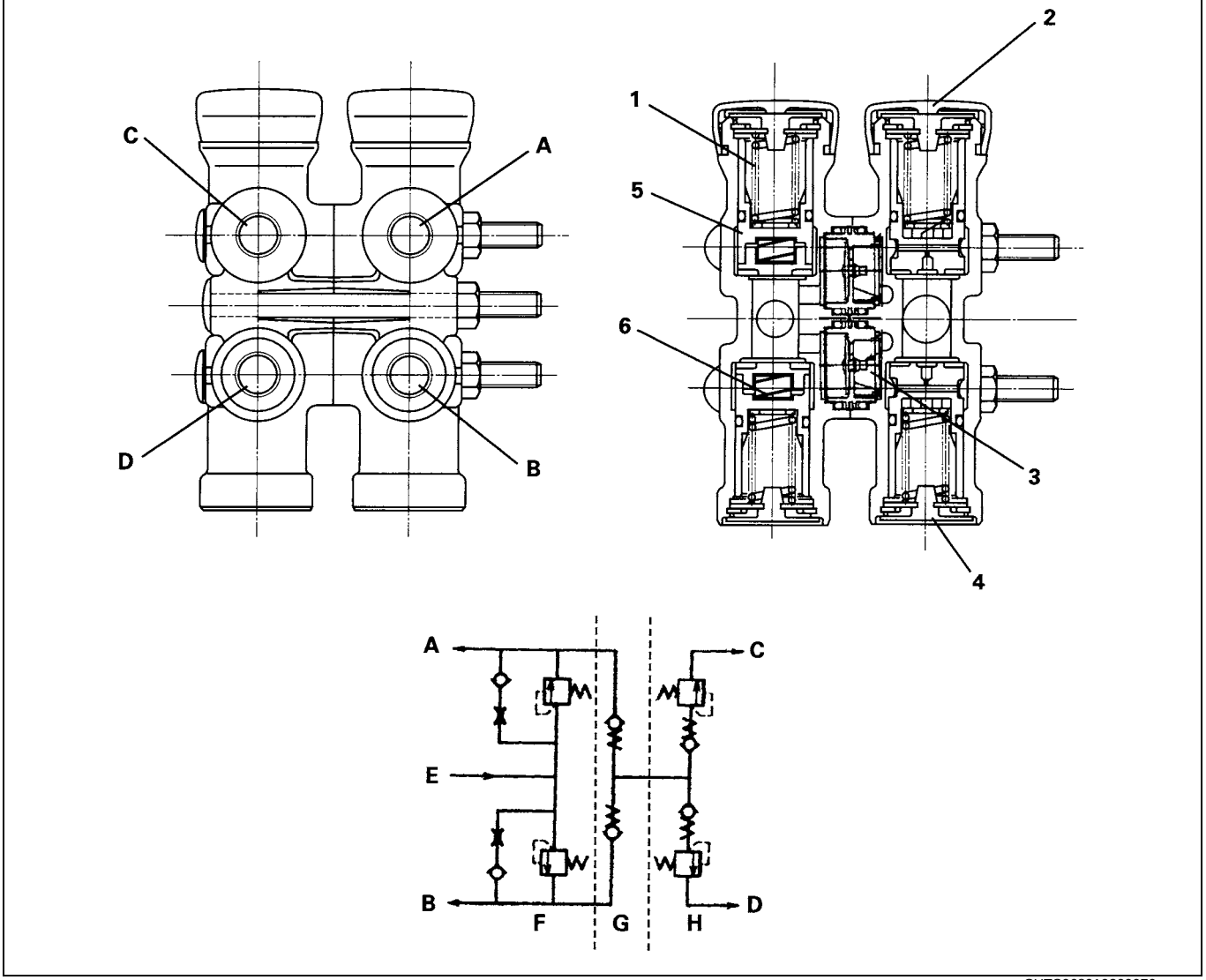
DATA AND SPECIFICATIONS

EN0680102I200008

Type				Spring type (4-way protection)
Opening pressure	Open	Port 21, 22		620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}
		Port 23	Part No. S4457-01290	570-610 kPa {5.8-6.2 kgf/cm^2, 82.49-88.18 lbf/in.^{2}}
			Part No. S4457-01330	620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}
		Port 24		570-610 kPa {5.8-6.2 kgf/cm^2, 82.49-88.18 lbf/in.^{2}}
	Close	Port 21, 22, 24		440-480 kPa {4.5-4.8 kgf/cm^2, 64.01-68.27 lbf/in.^{2}}
		Port 23	Part No. S4457-01290	440-480 kPa {4.5-4.8 kgf/cm^2, 64.01-68.27 lbf/in.^{2}}
			Part No. S4457-01330	490-530 kPa {5.0-5.4 kgf/cm^2, 71.07-76.87 lbf/in.^{2}}

DESCRIPTION

EN0680102C100008

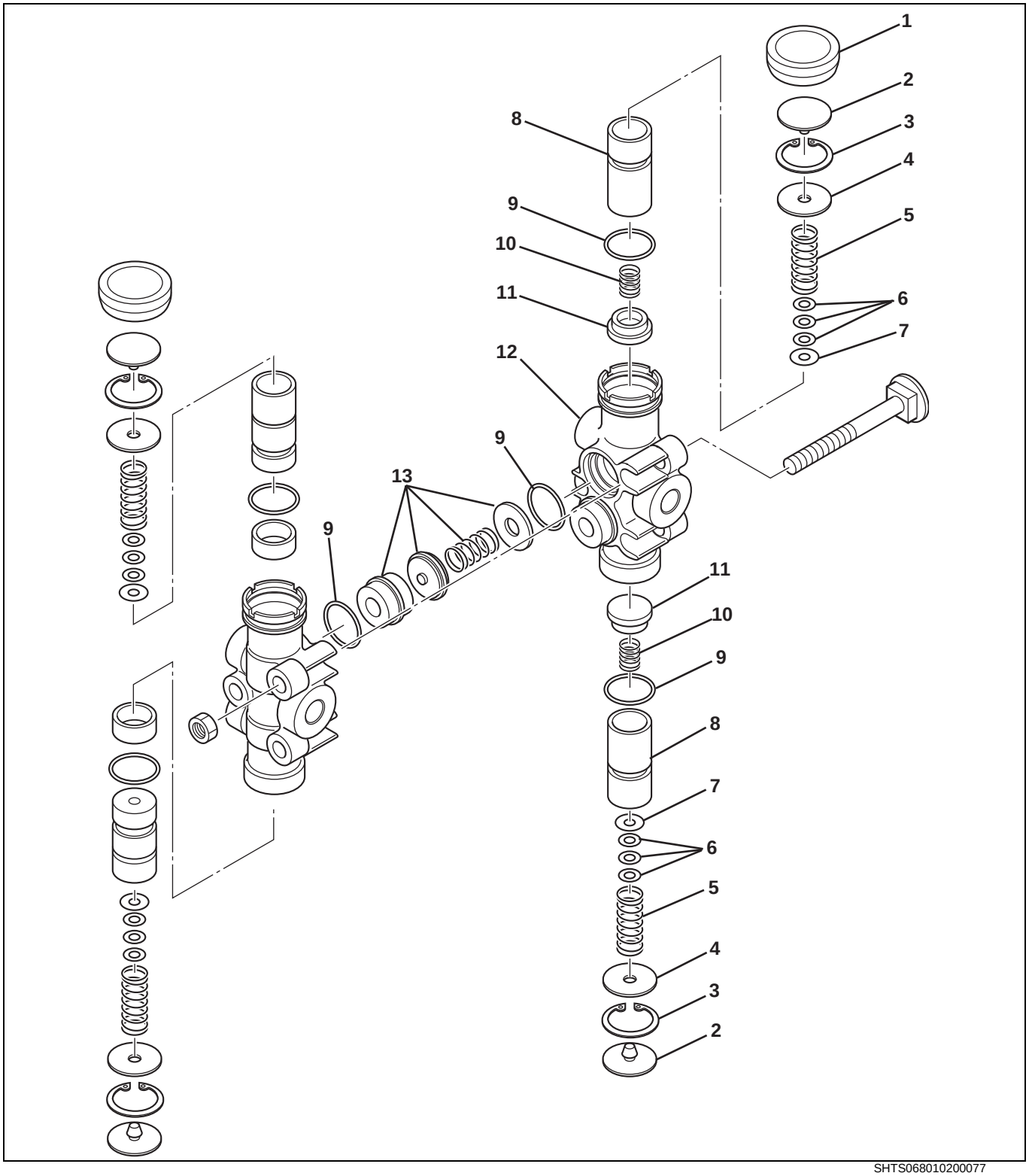


SHTS068010200076

1	Compression spring	A	Port 21 (Outlet)	G	Center check valve
2	Dust cover	B	Port 22 (Outlet)	H	No.2 side
3	Check valve	C	Port 23 (Outlet)		
4	Dust seal rubber	D	Port 24 (Outlet)		
5	Piston	E	Inlet port		
6	Valve spring	F	No.1 side		

COMPONENT LOCATOR

EN0680102D100007

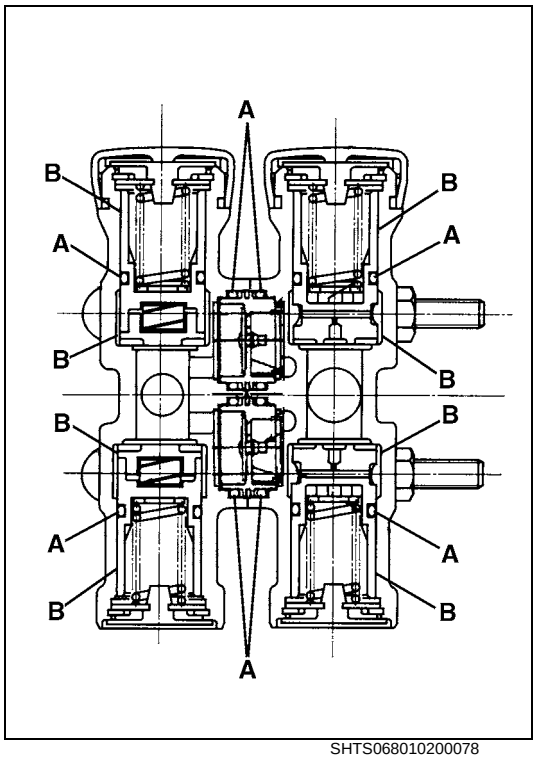


SHTS068010200077

1	Dust cover	6	Shim	11	Valve
2	Dust seal rubber	7	Spacer	12	Body
3	Retainer ring	8	Piston	13	Check valve
4	Dust seal plate	9	O-ring		
5	Compression spring	10	Valve spring		

OVERHAUL

EN0680102H200006



SHTS068010200078

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

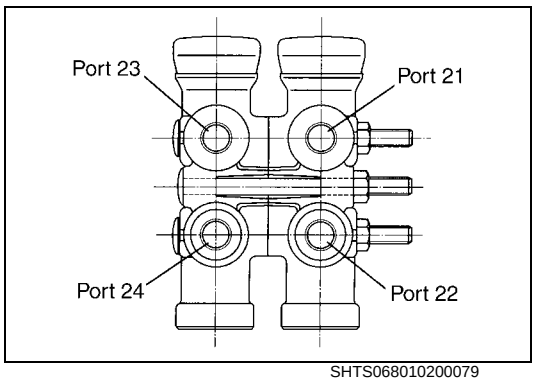
(1) When assembling the protection valve use the new O-rings and valves.

(2) Apply the silicone grease on the each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

ADJUSTMENT

EN0680102H300008



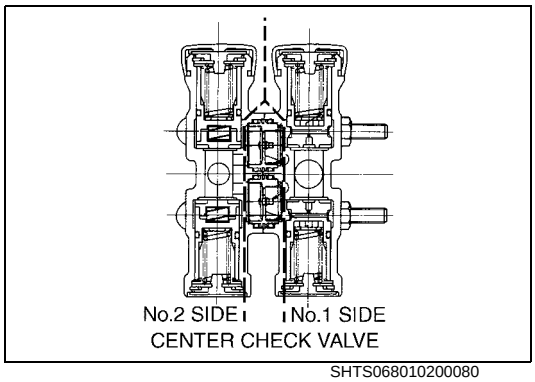
SHTS068010200079

AIR LEAKAGE

1. CHECK VALVE

(1) By-pass check valve at No.1 side.

a. Confirm no leakage of air at inlet, No.1, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}}, 392 kPa {4 kgf/cm^2, 56.89 lbf/in.^{2}} from outlet No.21 and No.22.



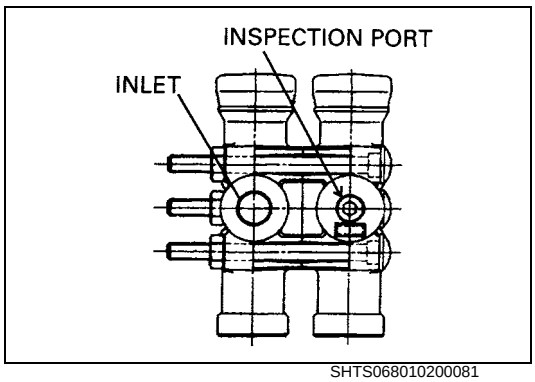
SHTS068010200080

(2) Center check valve

a. Confirm no leakage of air at the outlet No.21 and No.22, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}}, pressure A from the inspection port.

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

Part No.	Pressure A
S4457-01290	880 {9, 122}
S4457-01330	980 {10, 142}



SHTS068010200081

(3) Check valve at No.2 side

a. Confirm no leakage of air at the inspection port, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}}, pressure B at the outlet No.23 and No.24.

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

Part No.	Pressure B
S4457-01290	880 {9, 128}
S4457-01330	980 {10, 142}

2. OTHER AIR TIGHTNESS

(1) When applying pressure to air under pressure C, confirm that any leakage of air should be 0 cm^3/min.

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

Part No.	Pressure C
S4457-01290	0-880 {0-9, 0-128}
S4457-01330	0-980 {0-10, 0-142}

PERFORMANCE CHARACTERISTIC

1. OPENING VALVE PRESSURE

(1) No.1 side

a. Releasing the compressed air at the outlet port No.21 and No.22 to air, when applying the compressed air at the speed specified below, confirm that air pressure of the compressed air, saturated at the inlet should be of opening valve pressure, which should be 620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}.
Charging speed: From 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} to 490 kPa {5.0 kgf/cm^2, 71.10 lbf/in.^{2}} within 3-7 seconds.

(2) No.2 side

a. When applying air at charging speed specified below from the inlet side under air pressure "0" at the outlet port No.23 and No.24, confirm that a pressure at the inspection port when it starting to go up at the outlet should be of opening valve pressure.

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

	Part No.	Opening valve pressure
Port No. 23	**S4457-01290**	**570-610 {5.8-6.2, 82.49-88.18}**
	S4457-01330	**620-660 {6.3-6.7, 82.49-88.18}**
Port No. 24		**570-610 {5.8-6.2, 82.49-88.18}**

Charging speed: From 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} to 490 kPa {5.0 kgf/cm^2, 71.10 lbf/in.^{2}} within 8-22 seconds.

2. CLOSING VALVE PRESSURE

(1) When discharging air through respective No.1 side and No.2 side inlet under a pressure of pressure D at the inlet and the outlet, at discharging speed specified below, confirm that a pressure when the pressures saturated should be of closing valve pressure.

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

Part No.	Pressure D
S4457-01290	**880 {9, 128}**
S4457-01330	**980 {10, 142}**

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

	Part No.	Opening valve pressure
Port No. 21, 22, 24		**440-480 {4.5-4.8, 64.01-68.27}**
Port No. 23	**S4457-01290**	**440-480 {4.5-4.8, 64.01-68.27}**
	S4457-01330	**490-530 {5.0-5.4, 71.07-76.87}**

Discharging speed: From 590 kPa {6.0 kgf/cm^2, 85.32 lbf/in.^{2}} to 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} within less than seconds.

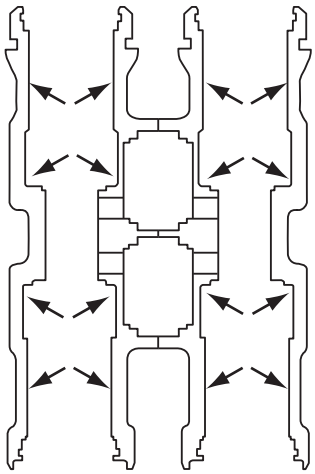
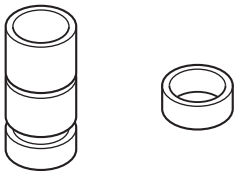
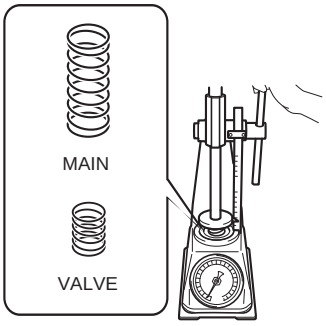
NOTICE

Perform test again by increasing aims, when the respective pressures is low and by decreasing it when high in the above inspection.

INSPECTION AND REPAIR

EN0680102H300009

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface and contact surface of body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Sliding surface and contact surface of valve seat and piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Main spring and valve spring: Free length/ Setting length/ Setting load Crack, rust and damage	**Main spring (Port 21, 22, 24): 42.4 {1.67}/ 27.5 {1.08}/ 158.9 N {16.2 kgf, 35.72 lbf}**	**137.3 N {14.0 kgf, 30.87 lbf} (Setting load)**	**Replace, if necessary.**	**Measure and Visual check** 
	Main spring (Port 23): 35.3 {1.39}/ 27.5 {1.08}/ 169.7 N {17.3 kgf, 38.15 lbf}			
	Valve spring: 20.0 {0.79}/ 9.0 {0.35}/ 0.78 N {0.08 kgf, 0.175 lbf}	**0.69 N {0.07 kgf, 0.155 lbf} (Setting load)**		

PROTECTION VALVE

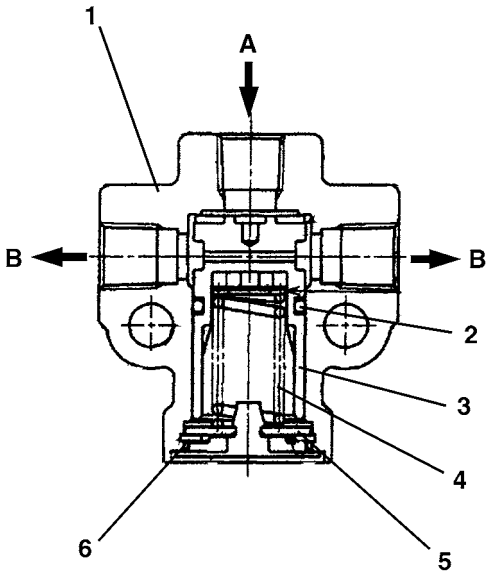
DATA AND SPECIFICATIONS

EN0680102I200009

Type		Spring type
Operating pressure	Open	637 kPa {6.2 kgf/cm^2, 88.16 lbf/in.^{2}}
	Close	510 kPa {5.2 kgf/cm^2, 73.94 lbf/in.^{2}}

DESCRIPTION

EN0680102C100009

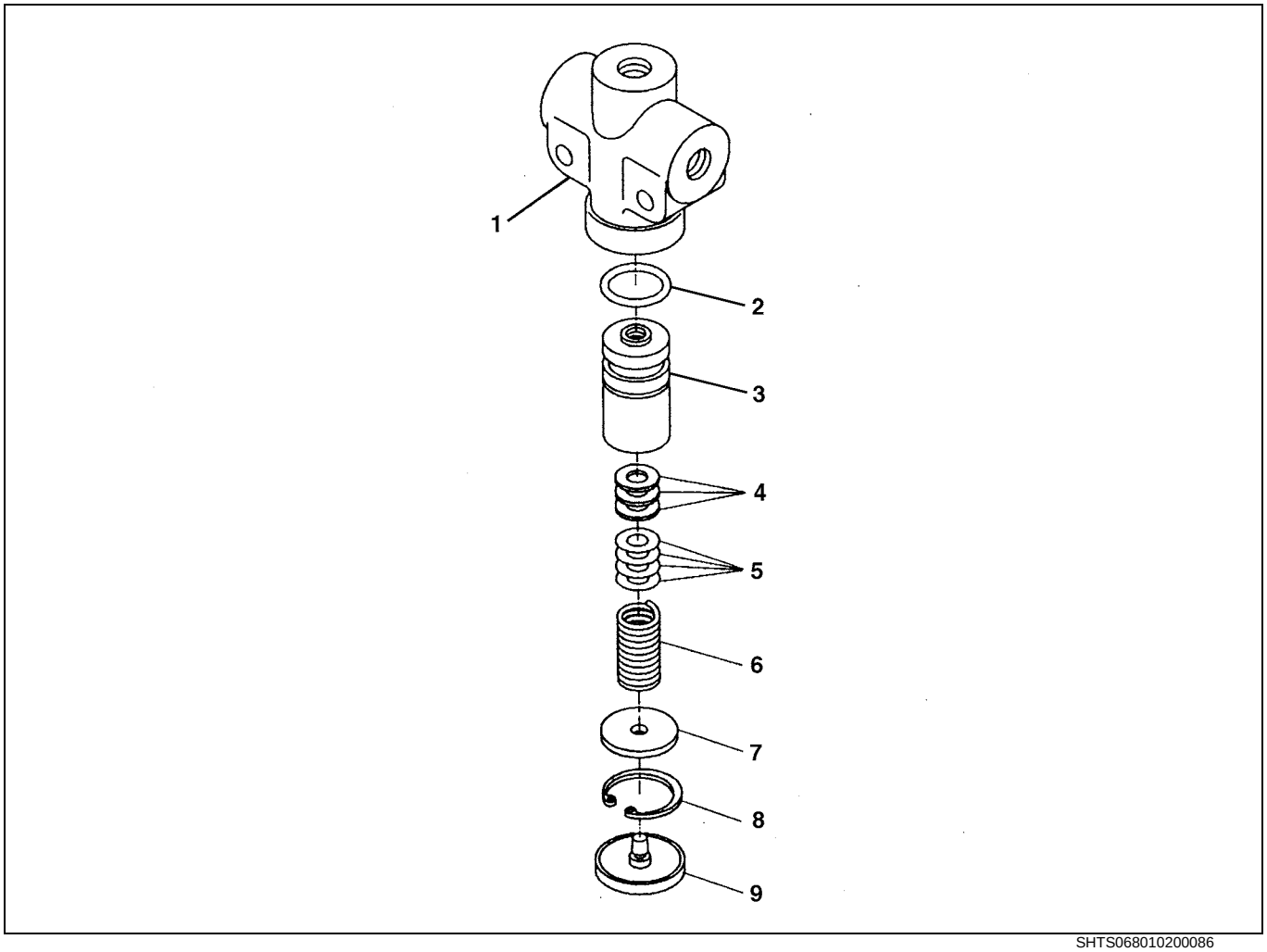


SHTS068010200085

1	Valve body	5	Dust seal plate
2	O-ring	6	Retainer ring
3	Valve	A	Inlet
4	Compression spring	B	Outlet

COMPONENT LOCATOR

EN0680102D100008

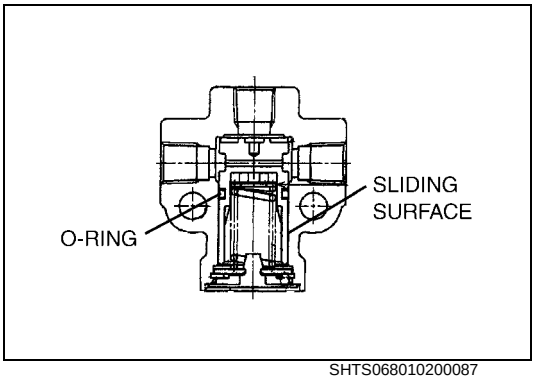


SHTS068010200086

1	Body	4	Spacer	7	Dust seal plate
2	O-ring	5	Shim	8	Retainer ring
3	Piston	6	Spring	9	Dust seal

OVERHAUL

EN0680102H200007



SHTS068010200087

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

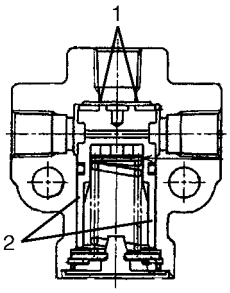
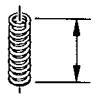
(1) When reassembling the protection valve, replace the O-rings and valve with new ones.

(2) Apply adequate amount of silicone grease to the sliding surface of the component parts.

INSPECTION AND REPAIR

EN0680102H300010

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve contact surface of body cap 1: Rust, wear and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Sliding surface of valve body 2: Rust, wear and damage	**—**	**—**	**Clean or replace, if necessary.**	
Valve spring: Free length	**60.0 {2.36}**	**—**	**Replace.**	**Measure** 

QUICK RELEASE VALVE

DATA AND SPECIFICATION

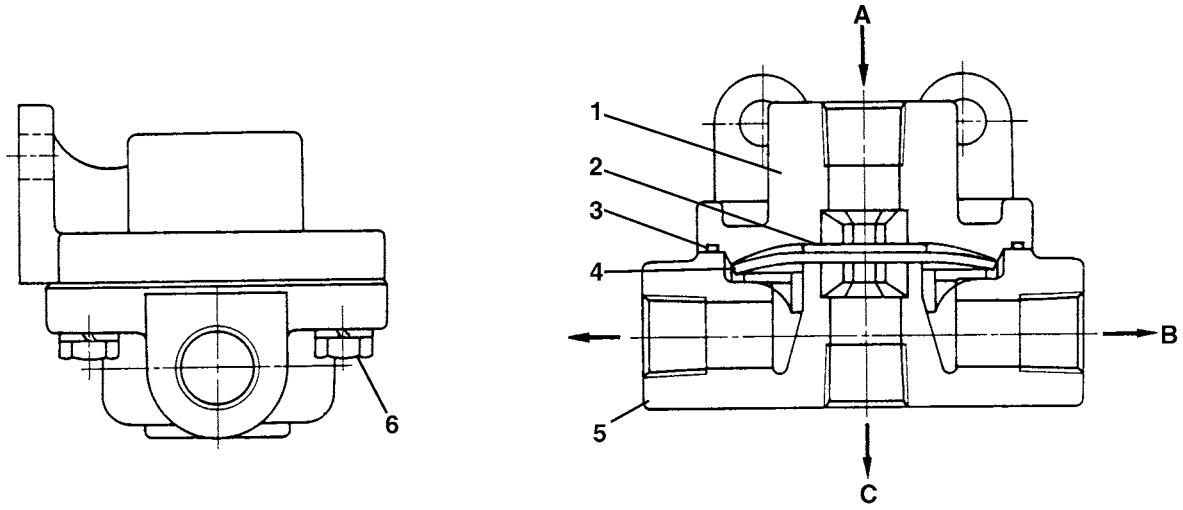
EN0680102I200010

Type	**Diaphragm type**

DESCRIPTION

EN0680102C100010

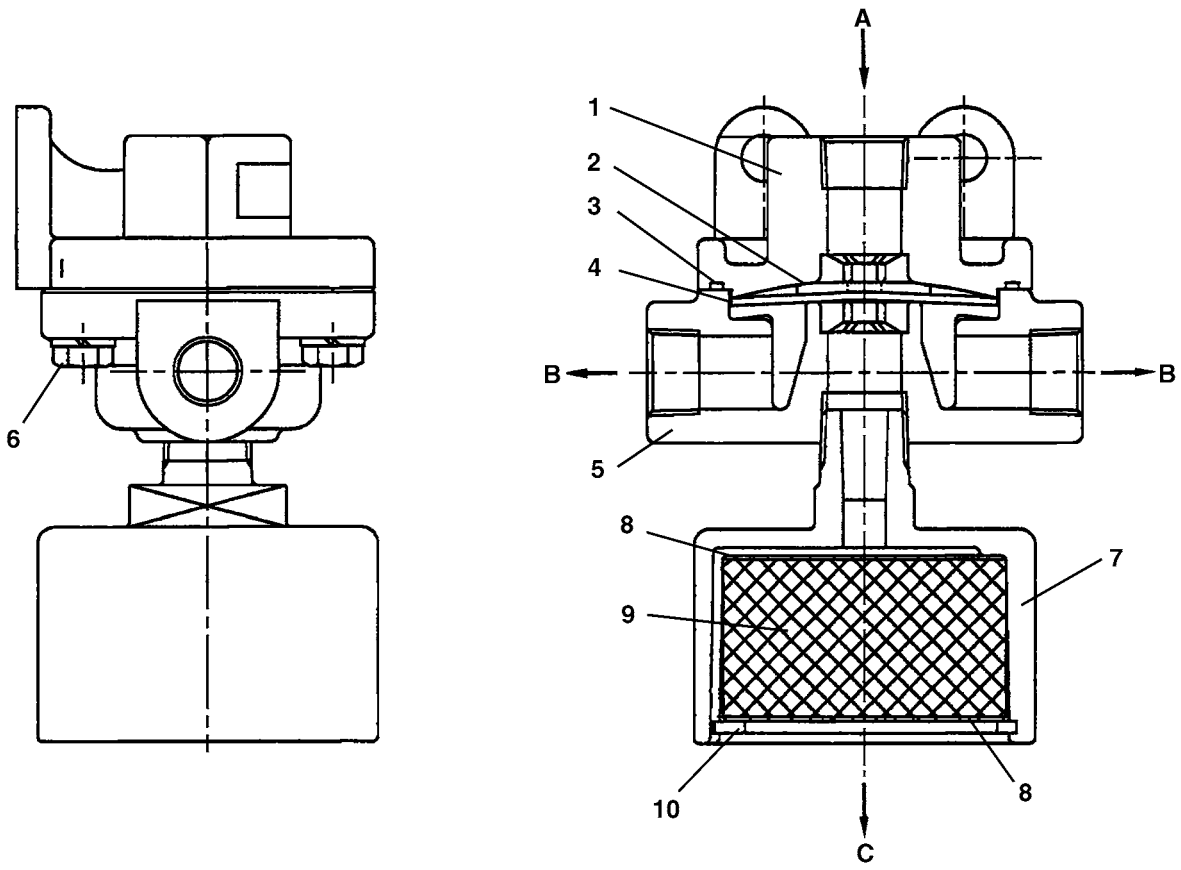
TYPE: A



SHTS068010200090

1	**Cover**	**6**	**Bolt**
2	**Filter**	**A**	**Inlet**
3	**Gasket**	**B**	**Outlet**
4	**Diaphragm**	**C**	**Exhaust**
5	**Valve body**		

TYPE: B



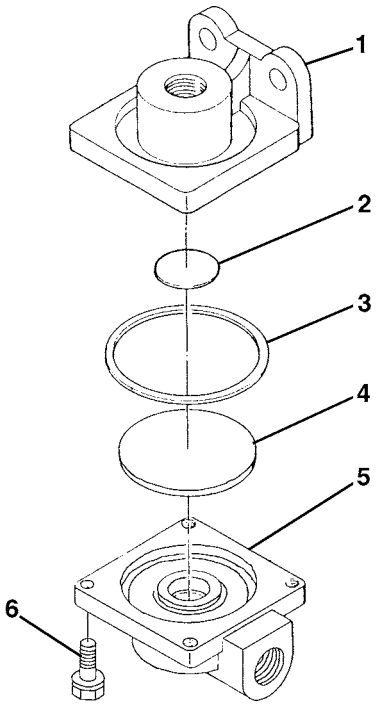
SHTS068010200091

1	Cover	8	Filter plate
2	Filter	9	Filter
3	Gasket	10	Retainer ring
4	Diaphragm	A	Inlet
5	Valve body	B	Outlet
6	Bolt	C	Exhaust
7	Silencer body		

COMPONENT LOCATOR

EN0680102D100009

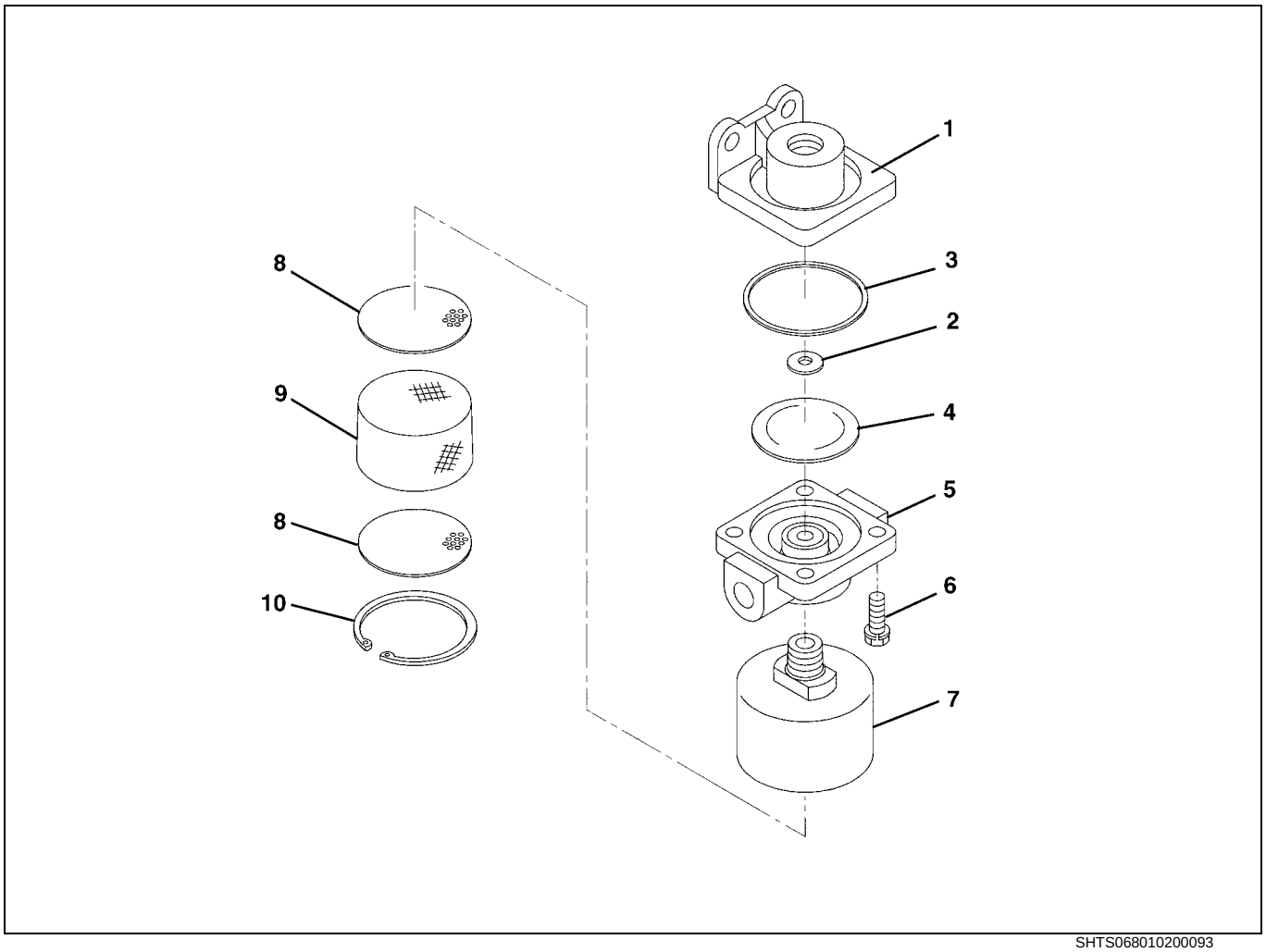
TYPE: A



SHTS068010200092

1	Cover	4	Diaphragm
2	Filter	5	Valve body
3	Gasket	6	Bolt

TYPE: B

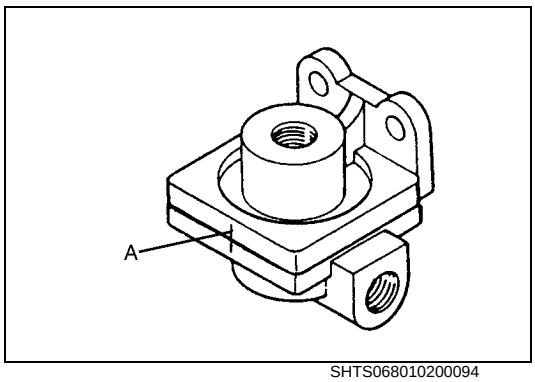


SHTS068010200093

1	Cover	6	Bolt
2	Filter	7	Silencer body (If so equipped)
3	Gasket	8	Filter plate (If so equipped)
4	Diaphragm	9	Filter (If so equipped)
5	Valve body	10	Retainer ring (If so equipped)

OVERHAUL

EN0680102H200008

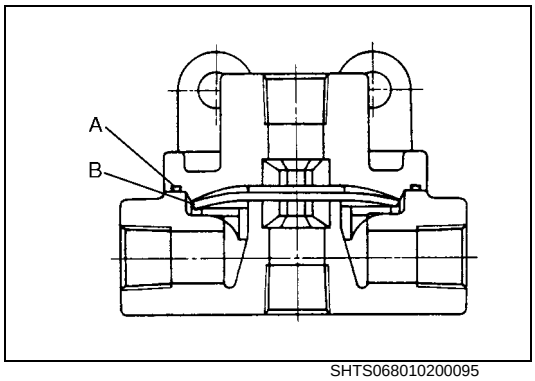


SHTS068010200094

IMPORTANT POINT - DISASSEMBLY

NOTICE

- **Before disassemble the relay valve apply the aligning mark "A" for the cover and valve body.**
- **When disassembling the relay valve, never to disassemble the its silencer body because its threaded portion is coated with lock agent (Lock tight).**



SHTS068010200095

IMPORTANT POINT - ASSEMBLY

1. ASSEMBLE THE RELAY VALVE

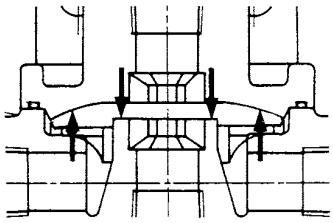
(1) When assembly the relay valve, use the new diaphragm and gasket.

- **A: Gasket**
- **B: Diaphragm**

(2) Coincide the aligning mark "A" which were applied at disassembly.

INSPECTION AND REPAIR

EN0680102H300011

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve body and cover surface: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

BRAKE FLUID RESERVOIR
(MODELS: FC, FD, GD, THAILAND FG)

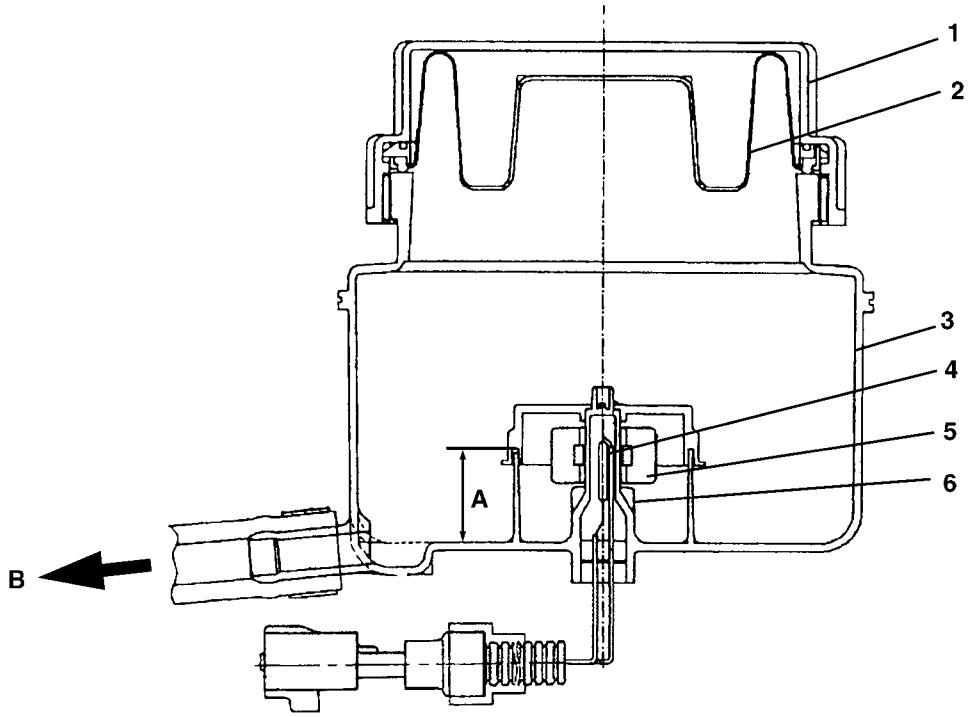
DATA AND SPECIFICATIONS

EN0680102I200011

Type	**Dual chambers for service brake control lines**
Low fluid level warning switch operating range	**Below 18-24 mm {0.709-0.945 in.} (Dimension A)**

DESCRIPTION

EN0680102C100011

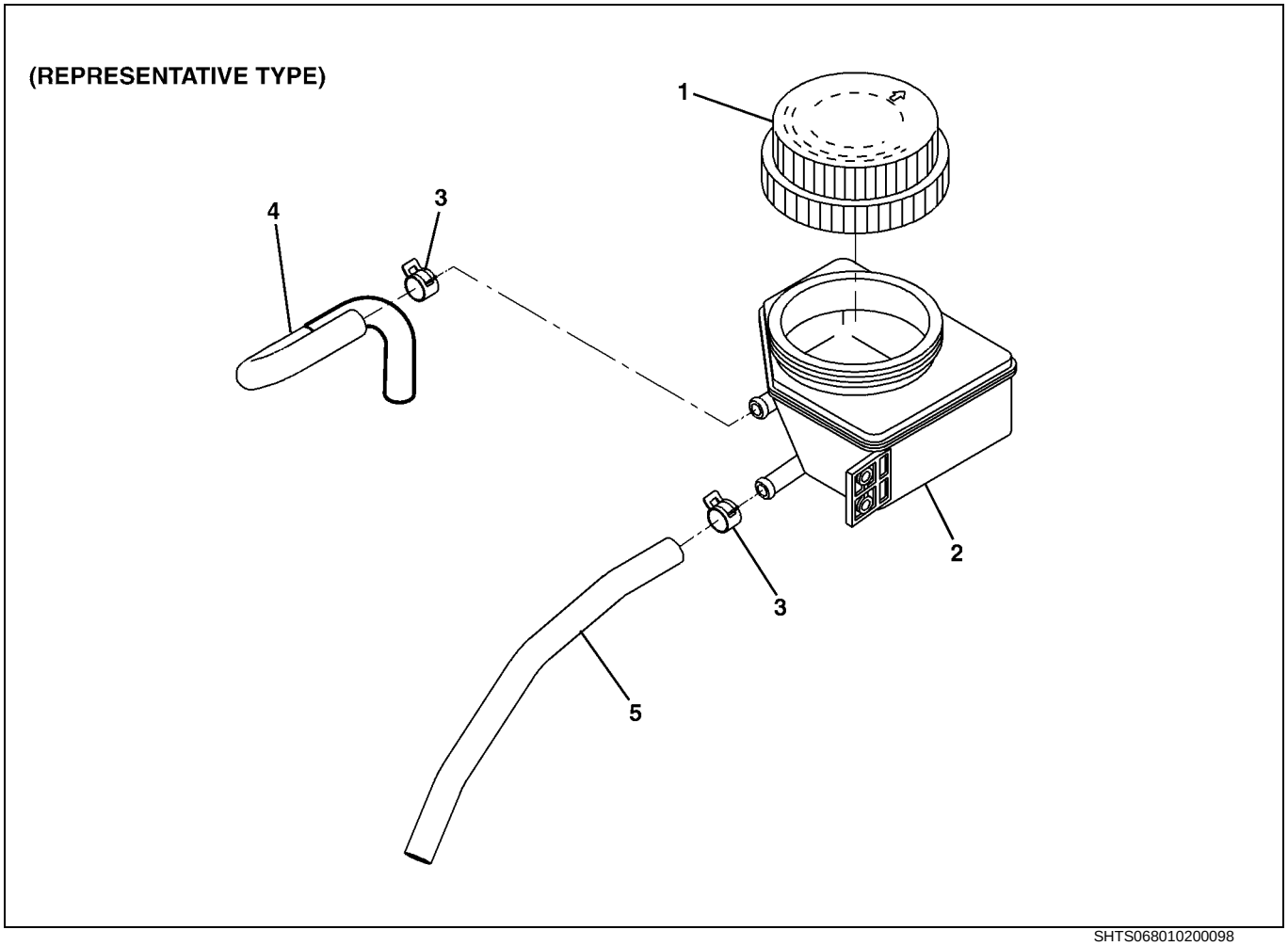


SHTS068010200097

1	**Filler cap**	**5**	**Float**
2	**Diaphragm**	**6**	**Float stopper**
3	**Reservoir**	**B**	**To brake air booster**
4	**Fluid level warning switch**		

COMPONENT LOCATOR

EN0680102D100010



SHTS068010200098

1	Reservoir cap	4	Hose
2	Body	5	Tube
3	Clip		

DISMOUNTING AND MOUNTING

EN0680102H100001

IMPORTANT POINT - DISMOUNTING

1. REMOVAL OF RESERVOIR.

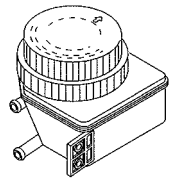
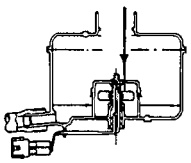
NOTICE

- **Before removing the reservoir, drain the brake fluid from the hydraulic lines.**
- **Place a small pan under the reservoir to receive the brake fluid. Do not let fluid remain on a painted parts. Wash it off immediately.**

INSPECTION AND REPAIR

EN0680102H300012

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the components.

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake fluid reservoir: Cracks, damages and leakage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Operation of fluid level warning switch	**The warning light and buzzer should be turned on, when the float is submerged lower than the MIN. level.**	**—**	**Replace reservoir assembly, if necessary.**	**When the reservoir is filled, submerge the float** 

BRAKE FLUID RESERVOIR (MODELS: FT, GT)

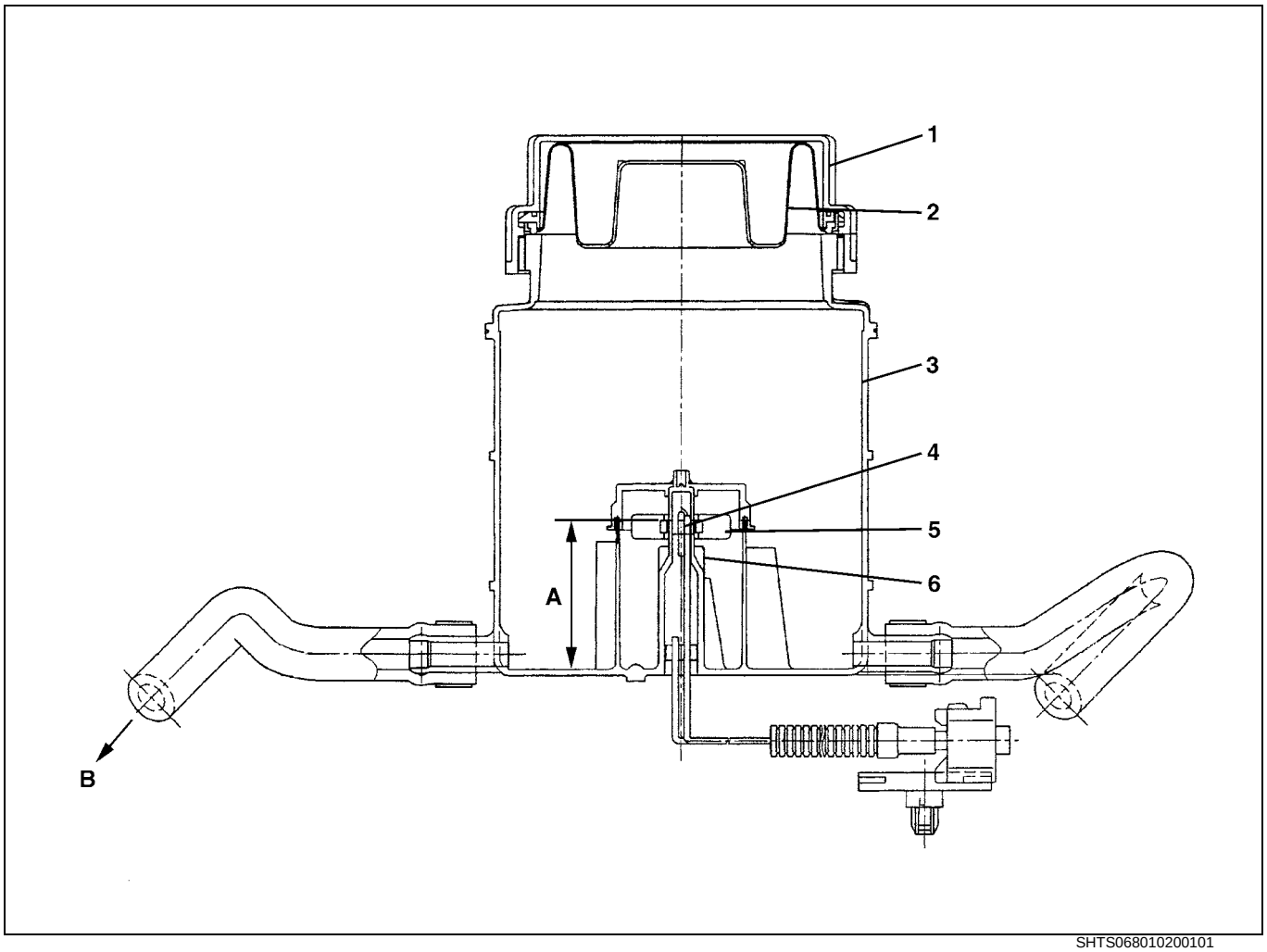
DATA AND SPECIFICATIONS

EN0680102I200012

Type	Dual chambers for service brake control lines
Low fluid level warning switch operating range	Below 48-54 mm {1.890-2.126 in.} (Dimension A)

DESCRIPTION

EN0680102C100012

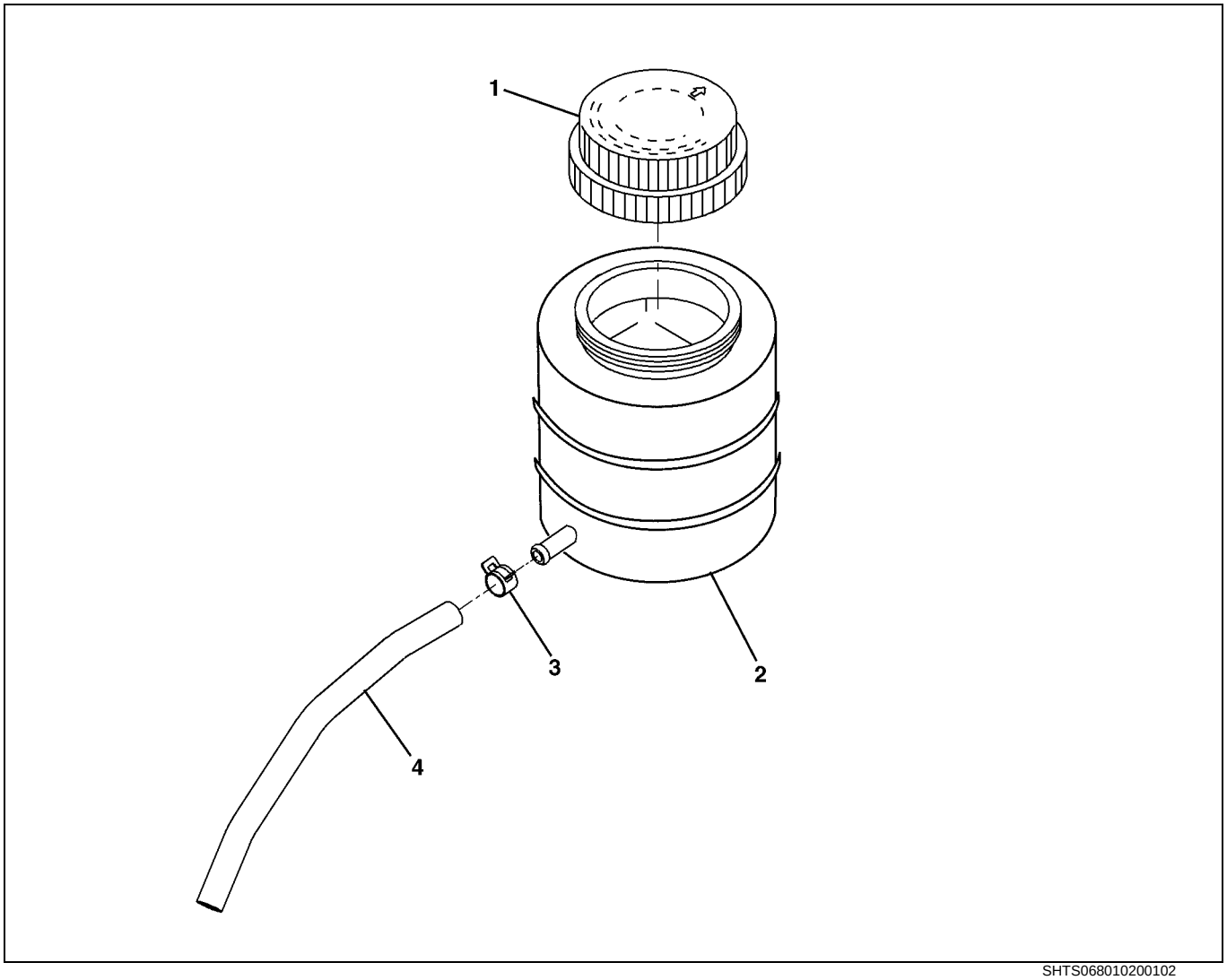


SHTS068010200101

1	Filler cap	5	Float
2	Diaphragm	6	Float stopper
3	Reservoir	B	To brake air booster
4	Fluid level warning switch		

COMPONENT LOCATOR

EN0680102D100011



SHTS068010200102

1	Reservoir cap	3	Clip
2	Body	4	Hose

DISMOUNTING AND MOUNTING

EN0680102H100002

IMPORTANT POINT - DISMOUNTING

1. REMOVAL OF RESERVOIR.

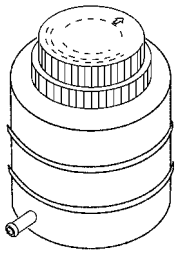
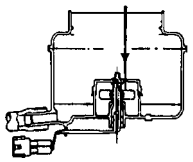
NOTICE

- **Before removing the reservoir, drain the brake fluid from the hydraulic lines.**
- **Place a small pan under the reservoir to receive the brake fluid. Do not let fluid remain on a painted parts. Wash it off immediately.**

INSPECTION AND REPAIR

EN0680102H300013

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the components.

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake fluid reservoir: Cracks, damages and leakage	—	—	Replace, if necessary.	Visual check 
Operation of fluid level warning switch	The warning light and buzzer should be turned on, when the float is submerged lower than the MIN. level.	—	Replace reservoir assembly, if necessary.	When the reservoir is filled, submerge the float 

BRAKE FLUID RESERVOIR

[MODELS: FG (EXCEPT THAILAND FG), GH, FL, FM]

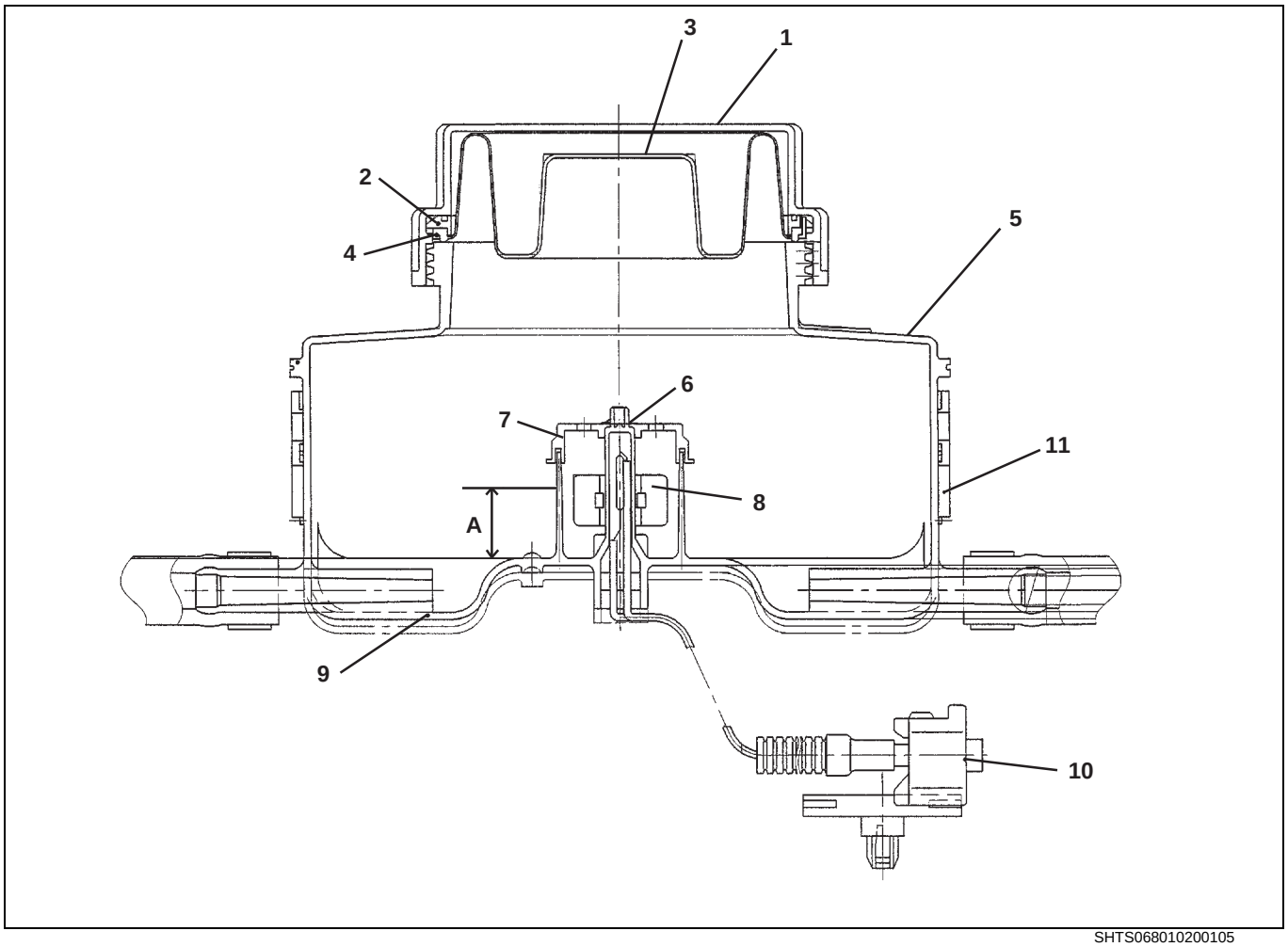
DATA AND SPECIFICATIONS

EN0680102I200013

Type	**Dual chambers for service brake control lines**
Low fluid level warning switch operating range	**Below 19-25 mm {0.748-0.984 in.} (Dimension A)**

DESCRIPTION

EN0680102C100013



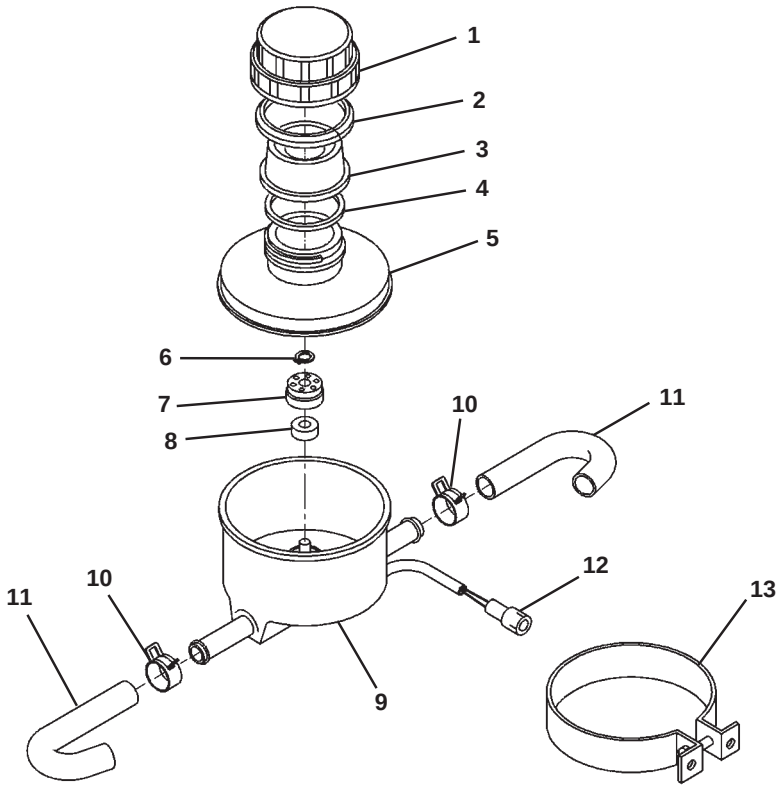
SHTS068010200105

1	**Reservoir cap**	**7**	**Float stopper**
2	**Slide ring**	**8**	**Float**
3	**Diaphragm**	**9**	**Reservoir lower**
4	**Ring cover**	**10**	**Fluid level warning switch**
5	**Reservoir upper**	**11**	**Bracket**
6	**Retainer ring**		

COMPONENT LOCATOR

EN0680102D100012

(REPRESENTATIVE TYPE)



SHTS068010200106

1	Reservoir cap	8	Float
2	Slide ring	9	Reservoir lower
3	Diaphragm	10	Clip
4	Ring cover	11	Tube
5	Reservoir upper	12	Fluid level warning switch
6	Retainer ring	13	Bracket
7	Float stopper		

DISMOUNTING AND MOUNTING

EN0680102H100003

IMPORTANT POINT - DISMOUNTING

1. REMOVAL OF RESERVOIR.

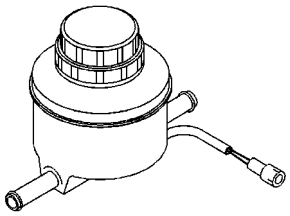
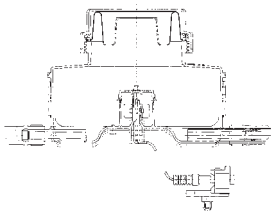
NOTICE

- **Before removing the reservoir, drain the brake fluid from the hydraulic lines.**
- **Place a small pan under the reservoir to receive the brake fluid. Do not let fluid remain on a painted parts. Wash it off immediately.**

INSPECTION AND REPAIR

EN0680102H300014

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the components.

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake fluid reservoir: Cracks, damages and leakage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Operation of fluid level warning switch	**The warning light and buzzer should be turned on, when the float is submerged lower than the MIN. level.**	**—**	**Replace reservoir assembly, if necessary.**	**When the reservoir is filled, submerge the float** 

BRAKE AIR BOOSTER (AIRMASTER) WITHOUT ABS (MODELS: FC, FD, GD, THAILAND FG)

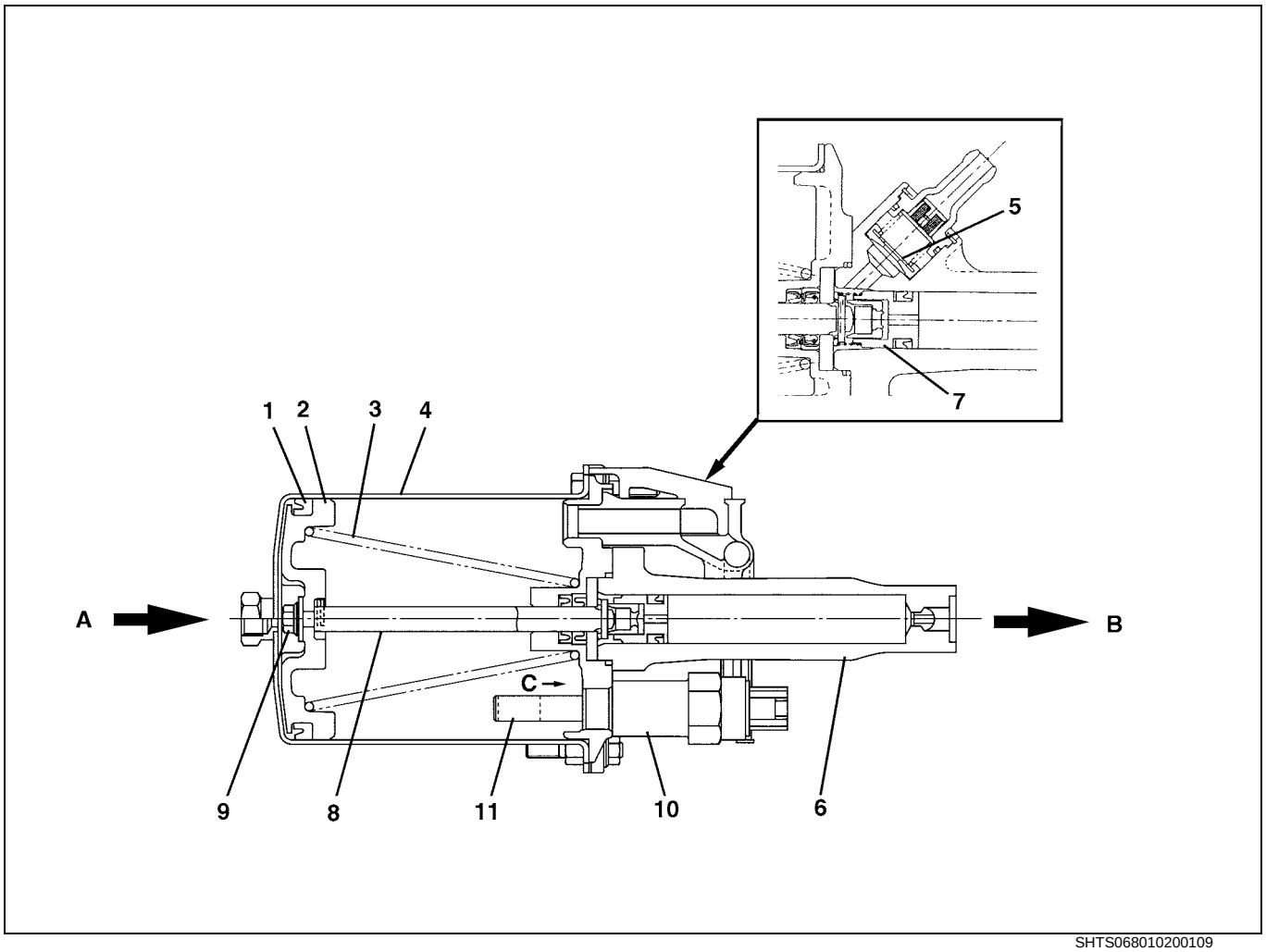
DATA AND SPECIFICATIONS

EN0680102I200014

Type	**AIRMASTER (Boosted air controlled by brake valve)**
Power cylinder diameter	**114.3 mm {4.50 in.}**
Hydraulic cylinder diameter	**22.2 mm {0.87 in.}**

DESCRIPTION

EN0680102C100014



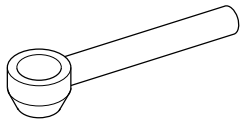
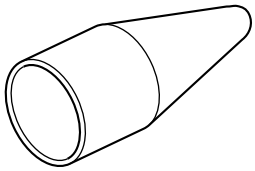
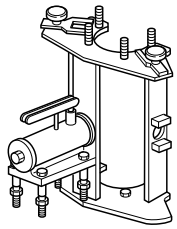
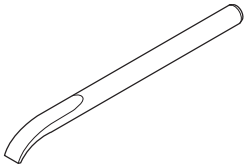
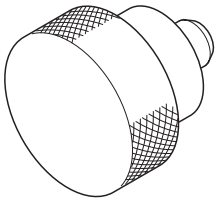
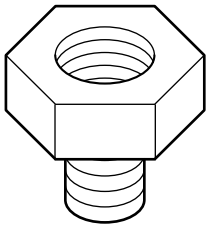
SHTS068010200109

1	**Piston seal**	**8**	**Push rod**
2	**Power piston**	**9**	**Nut**
3	**Return spring**	**10**	**Stroke warning switch**
4	**Power cylinder shell**	**11**	**Piston stroke detector**
5	**Check valve**	**A**	**Boost air (From brake valve)**
6	**Hydraulic cylinder**	**B**	**To wheel cylinder**
7	**Hydraulic piston**	**C**	**At power piston over stroke**

SPECIAL TOOL

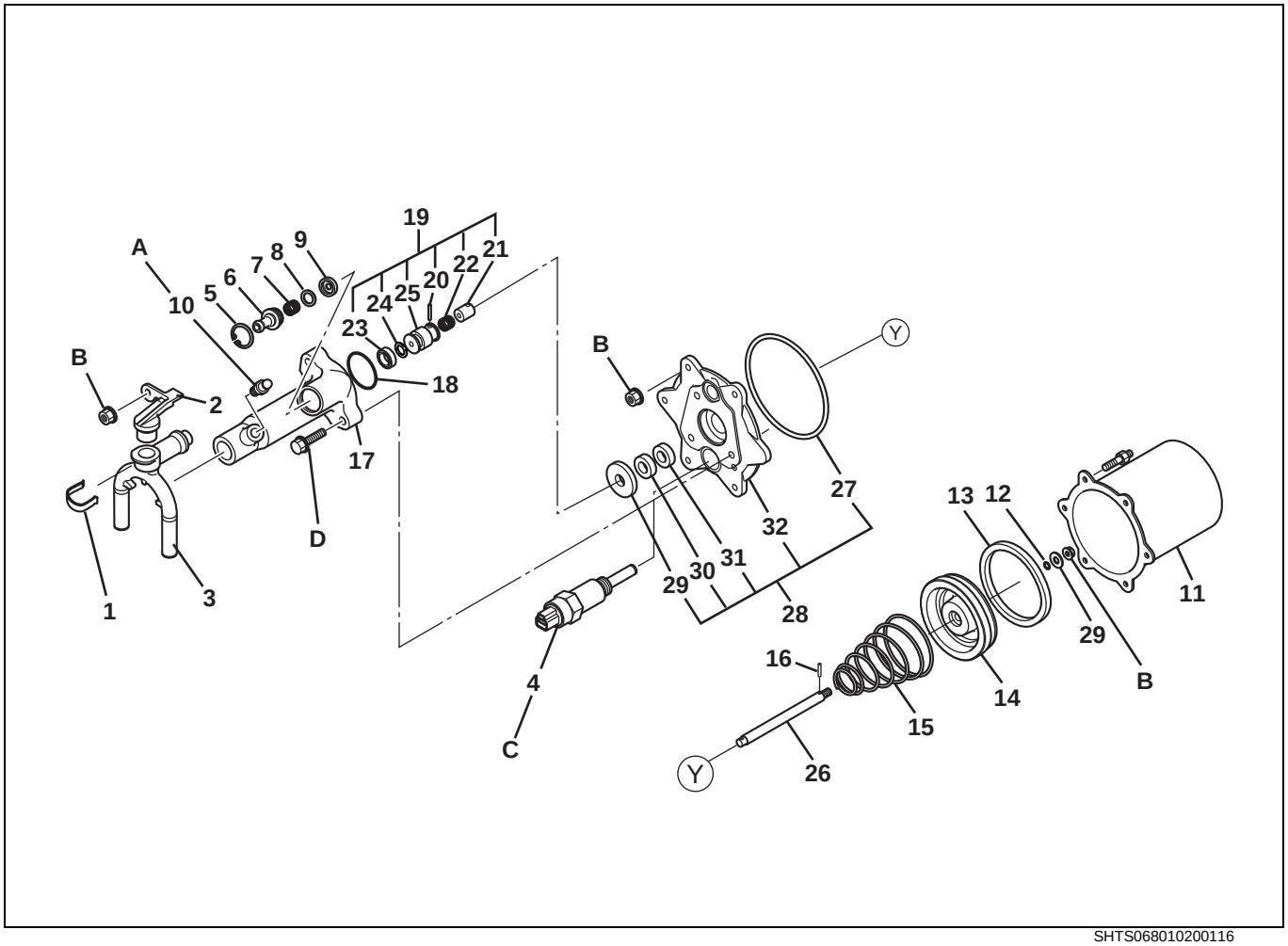
EN0680102K100001

Prior to starting a brake air booster overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0969-91410	POWER PISTON HOLDER	
	S0965-72060	PISTON CUP GUIDE	
	S0963-02340	STAND	
	S0965-11120	PULLER	
	S0960-71160	PRESS FIT BAR	
	S0969-91400	CONNECTOR	

COMPONENT LOCATOR

EN0680102D100013



SHTS068010200116

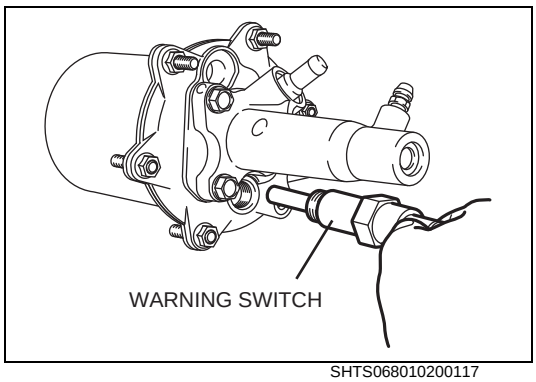
1	Clamp	17	Hydraulic cylinder
2	Holder	18	O-ring
3	Exhaust cover	19	Hydraulic piston assembly
4	Stroke warning switch	20	Pin
5	Retainer ring	21	Valve seal
6	Oil pipe joint	22	Hydraulic piston spring
7	Spring	23	Hydraulic piston cup
8	O-ring	24	Back up ring
9	Check valve	25	Hydraulic piston
10	Air bleeder screw	26	Push rod
11	Power cylinder shell	27	O-ring
12	O-ring	28	End plate assembly
13	Piston seal	29	Washer
14	Power piston	30	Oil seal
15	Return spring	31	Oil seal
16	Push rod pin	32	End plate

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

A	7-12 {70-130, 5.1-9.3}	C	8-12 {80-120, 5.8-8.6}
B	11-15 {110-160, 8-11}	D	20-29 {200-300, 15-21}

OVERHAUL

EN0680102H200009



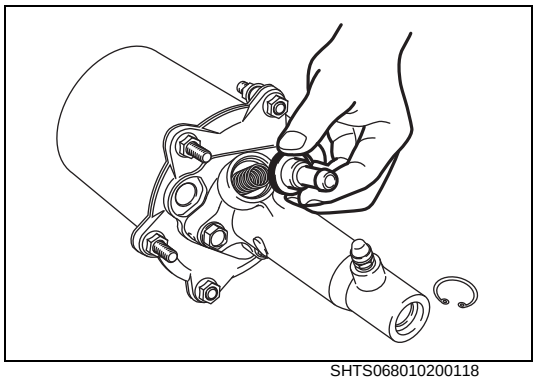
SHTS068010200117

IMPORTANT POINT - DISASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER

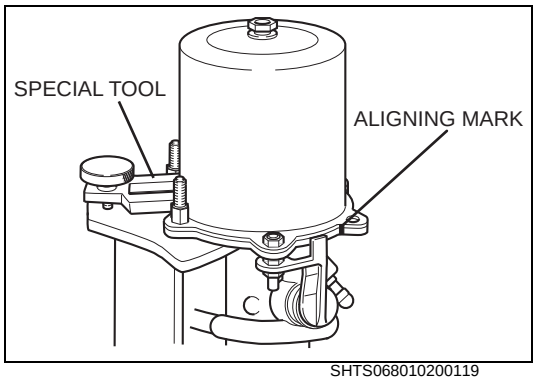
(1) Remove the nut and then remove the clamp, holder, and exhaust cover.

(2) Remove the stroke warning switch.


SHTS068010200118

(3) Remove the retainer ring, oil pipe joint with O-ring, spring and check valve.

(4) Remove the cap and the bleeder screw.

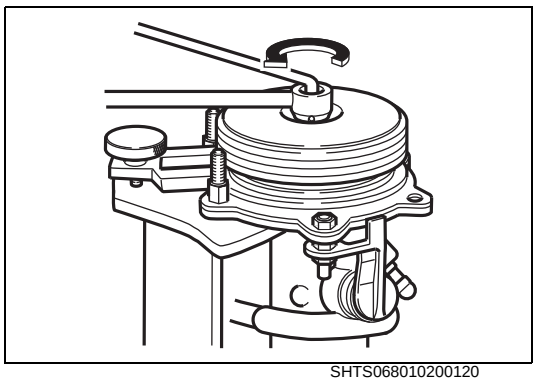


SHTS068010200119

(5) Using the special tool, secure the brake booster.
SST: Stand (S0963-02340)

NOTICE
Before disassembling the brake air booster, apply aligning mark on the power cylinder shell and end plate.

(6) Remove the nuts, then remove the power cylinder shell and O-ring.

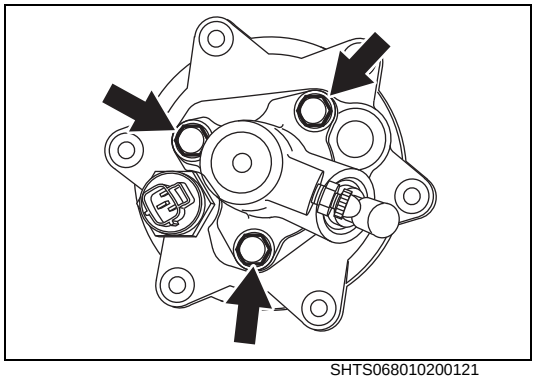

SHTS068010200120

(7) Using the special tool, secure the power piston, then remove the nut.
SST: Power Piston Holder (S0969-91410)

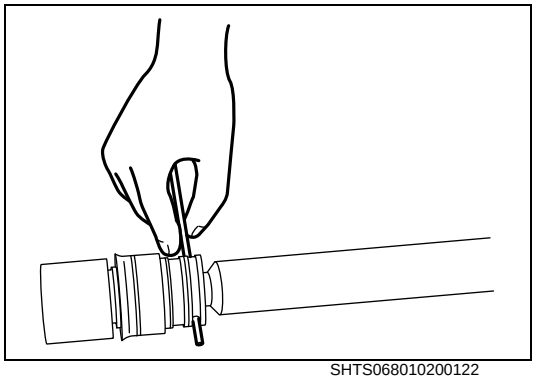
NOTICE

- **Keep the power piston pushed far enough toward the hydraulic cylinder side while removing the nut. If the power piston is not adequately pushed toward the hydraulic cylinder side, the push rod pin will turn together with the nut.**
- **When removing the nut, take precautions, for there is a spring that will jump out when the nut is removed.**

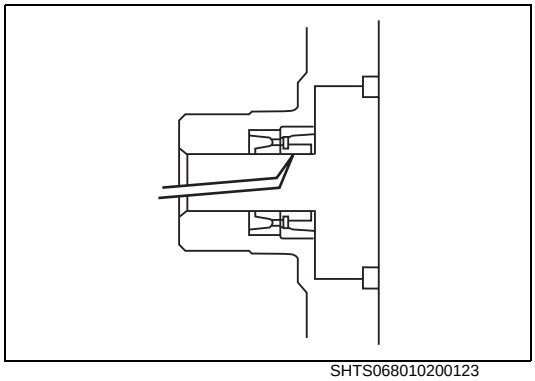
(8) Remove the O-ring, piston seal, power piston and return spring.


SHTS068010200121

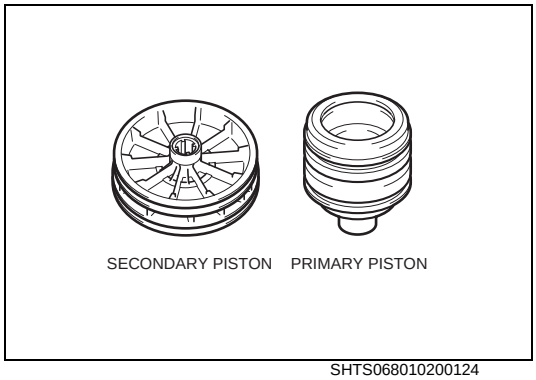
(9) Remove the bolts, then remove the hydraulic cylinder and O-ring.


SHTS068010200122

(10) Press and hold down the hydraulic piston spring and remove the pin, and then remove the hydraulic piston assembly.
(11) Remove the push rod, pulling it in the direction away from the push rod threaded part.


SHTS068010200123

(12) Remove the washer from the end plate.
(13) Using the special tool, remove the oil seal (2 pieces) from the end plate.
SST: Puller (S0965-11120)

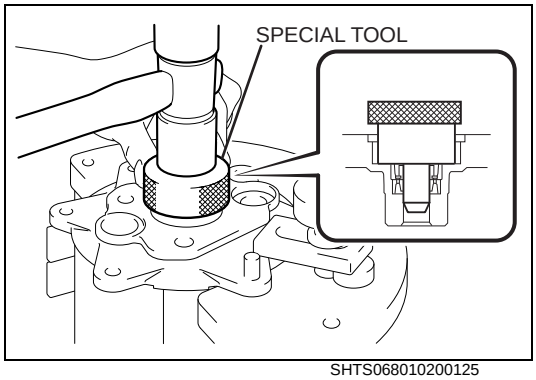


SHTS068010200124

IMPORTANT POINT - ASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER

(1) Using the special tool, secure the end plate.
SST: Stand (S0963-02340)

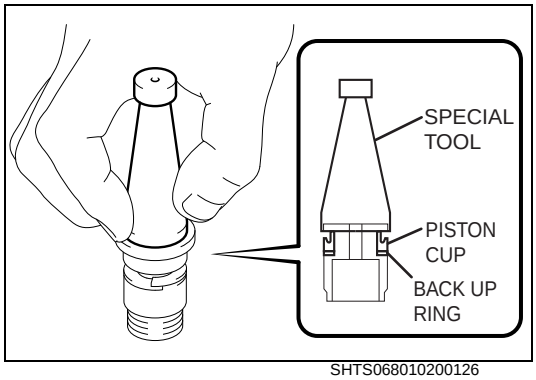


SHTS068010200125

(2) Coat the oil seal and end plate bore with silicone grease. Then using the special tool, press the oil seal on the end plate.
SST: Press Fit Bar (S0960-71160)

NOTICE
Make sure the oil seal is inserted in the proper direction.

(3) Soak the washers in brake fluid and then install the end plate.



SHTS068010200126

(4) Using the special tool, install the back up ring and hydraulic piston cup to the hydraulic piston.
SST: Piston Cup Guide (S0965-72060)

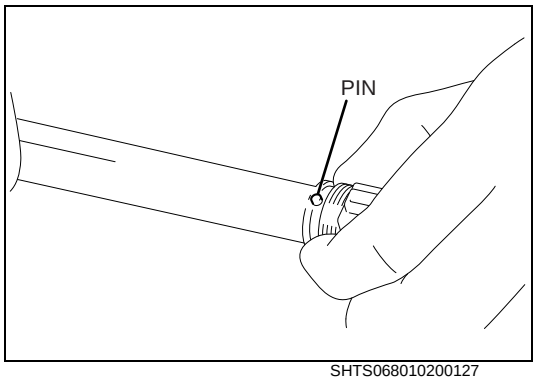
NOTICE

- **Install the back up ring and hydraulic piston cup in the correct order and direction.**
- **Make sure the back up ring is not biting into the piston.**

(5) Coat the push rod surfaces and valve seal with silicone grease, then install the push rod to the end plate, installing it in the direction away from the threaded parts.

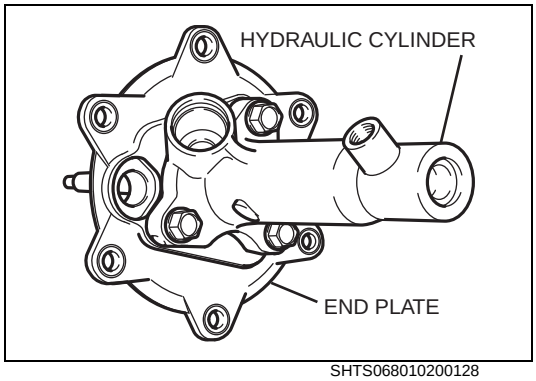
(6) Line up the push rod end pin, the valve seal hole and the hydraulic piston hole, and then insert the pin.

NOTICE
Make sure that the hydraulic piston spring covers the pin, which is not drawn out from the hydraulic piston.

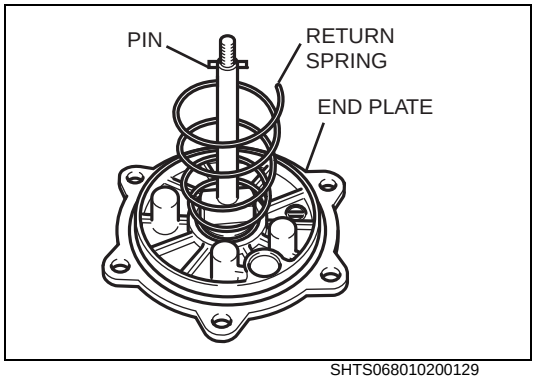


SHTS068010200127

(7) Coat the hydraulic piston assembly exterior surfaces, the hydraulic cylinder inner surfaces and the O-ring with brake fluid.
(8) Install the O-ring on the hydraulic cylinder, then install the hydraulic cylinder on the end plate.
(9) Install the air bleeder screw.

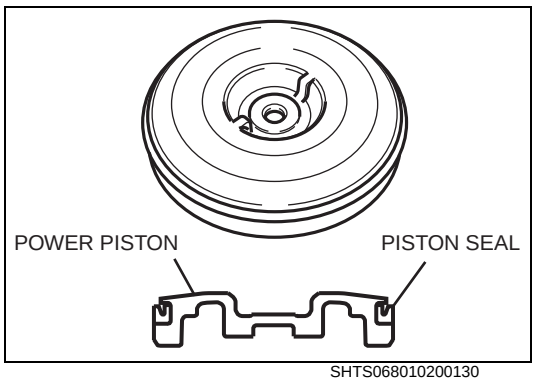


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SHTS068010200129

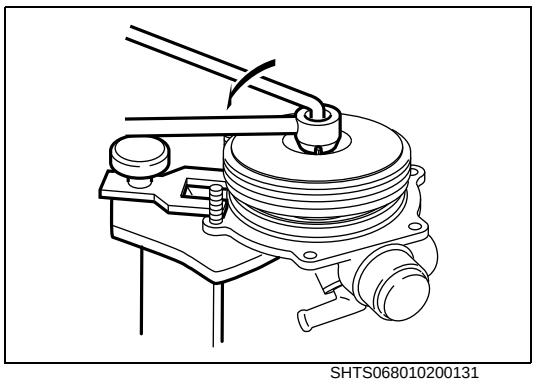
(10) Install the pin in the push rod threaded part hole.
(11) Install the return spring on the end plate.



SHTS068010200130

(12) Coat the piston seal groove of the power piston and piston seal with mineral grease (Air Master Paste or equivalent), and then install the piston seal to the power piston.

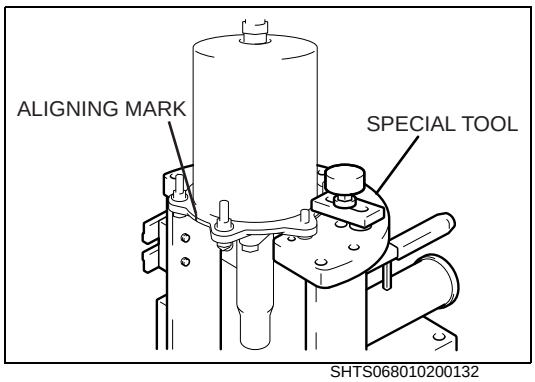
NOTICE
Make sure the piston seal is installed in the proper direction.


SHTS068010200131

(13) While pressing and holding down the compression spring, install the O-ring and washer in that order, and then secure the hydraulic piston and push rod in place with the nut.
SST:
Power Piston Holder (S0969-91410)
Stand (S0963-02340)

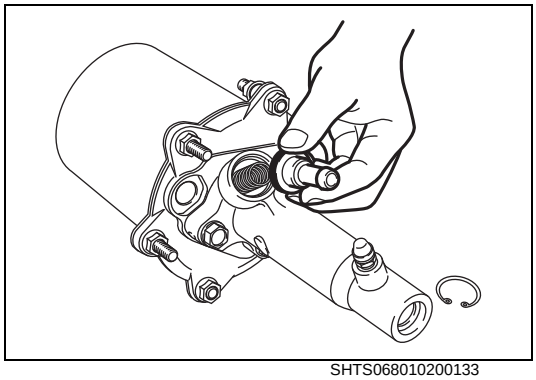
NOTICE

- **Supply compressed air (about 0.1 MPa) through the hydraulic cylinder discharge opening to prevent the push rod from falling down.**
- **After fastening the nut, caulk the nut and the push rod threaded parts with a punch.**



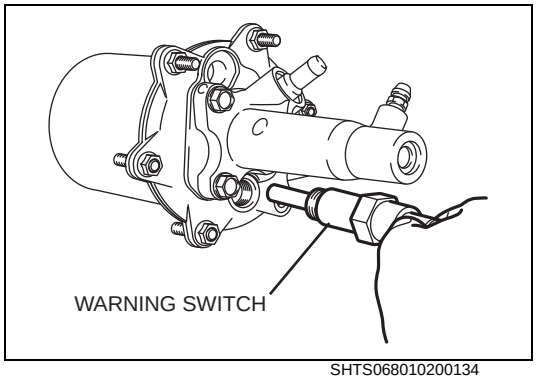
SHTS068010200132

(14) Match the aligning mark, install the power cylinder shell on the end plate.
(15) When assembling the power cylinder shell and end plate, align the mark which were applied at disassembly.



SHTS068010200133

(16) Install the check valve, spring and oil pipe joint with O-ring, then secure the oil pipe joint with the retainer ring.



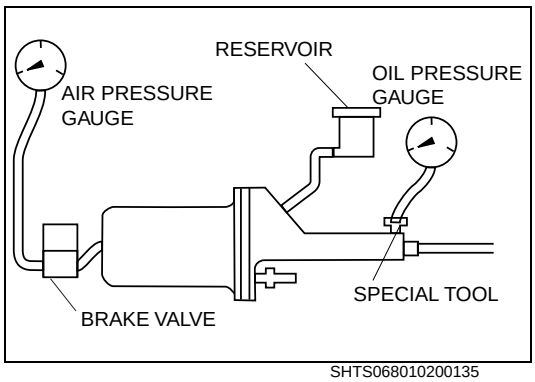
SHTS068010200134

(17) Install the stroke warning switch and tighten it with the specified torque.
(18) Coat the exhaust cover insertion part and the end plate insertion part with silicone grease, and assemble the exhaust cover on the end plate and install the clamp.

INSPECTION

EN0680102H300015

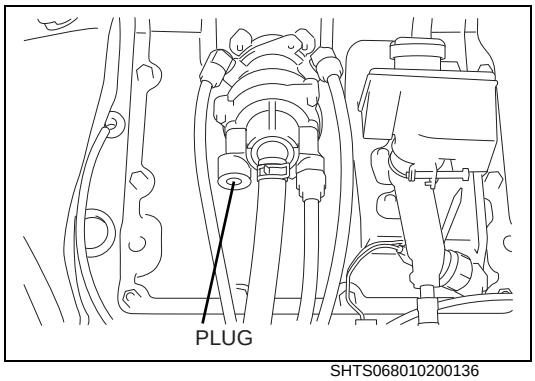
CHECKING OF BRAKE AIR BOOSTER FUNCTION



SHTS068010200135

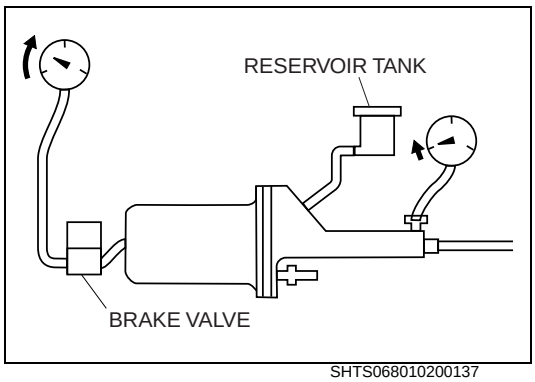
1. OPERATION CHECK OF BRAKE BOOSTER

(1) Remove the bleeder screw of hydraulic cylinder and attach an oil pressure gauge scaling 24.5 MPa {250 kgf/cm^2, 3,553 lbf/in.^{2}} by using a special tool (connecting portion: M12 x 1.5).
SST: Connector (S0969-91400)



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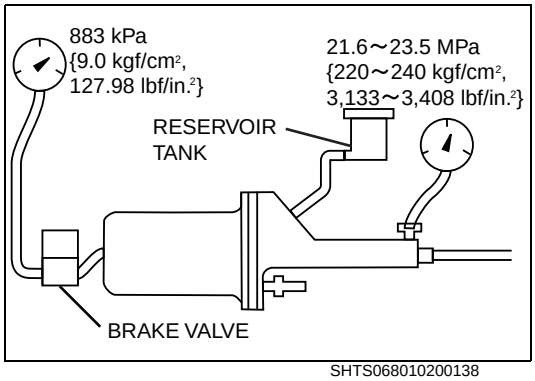
(2) Remove the plug from the brake valve assembly and attach an air pressure gauge to the brake valve assembly.



SHTS068010200137

2. TEST OF OPERATION START PRESSURE

(1) Purge the air within the air tank completely and check to see that the air pressure gauge indicates 0.
(2) Depress the brake pedal completely to the floor and hold it down at that position.
(3) Start the engine and increase the air pressure.
(4) Check to see that the oil pressure increases before the air pressure reaches 69 kPa {0.7 kgf/cm^2, 9.95 lbf/in.^{2}}



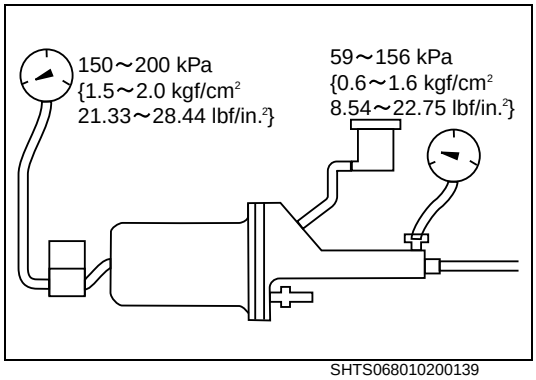
SHTS068010200138

3. OPERATION CHECK AT FULL LOAD

(1) Increase the air pressure after the above test.
(2) Depress the brake pedal completely to the floor.
(3) Stop the engine when the air pressure reaches 883 kPa {9.0 kgf/cm^2, 127.98 lbf/in.^{2}}.
(4) Check to see that the oil pressure at that moment is between 21.6-23.5 MPa {220-240 kgf/cm^2, 3,133-3,408 lbf/in.^{2}}.

4. AIR SEALING TEST AT FULL LOAD

(1) Immediately after the above test, check to see for one minute that the air pressure does not drop down.

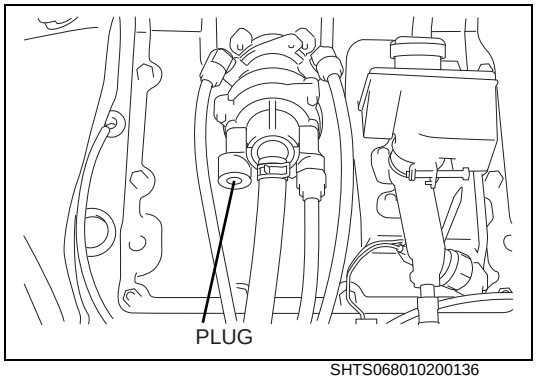


SHTS068010200139

5. RESIDUAL PRESSURE TEST (CHECK VALVE TEST)

(1) Replace an oil pressure gauge with one having the scale of 0-690 kPa {0-7 kgf/cm^2, 0-99.54 lbf/in.^{2}}.

(2) Depress the brake pedal till the air pressure reaches 150-200 kPa {1.5-2.0 kgf/cm^2, 21.33-28.44 lbf/in.^{2}} and then release the pedal. Check to see that the oil pressure at that moment is 59-156 kPa {0.6-1.6 kgf/cm^2, 8.54-22.75 lbf/in.^{2}} in case of the vehicle equipped with drum brake, and 0 in case of the vehicle equipped with disk brake.



SHTS068010200136

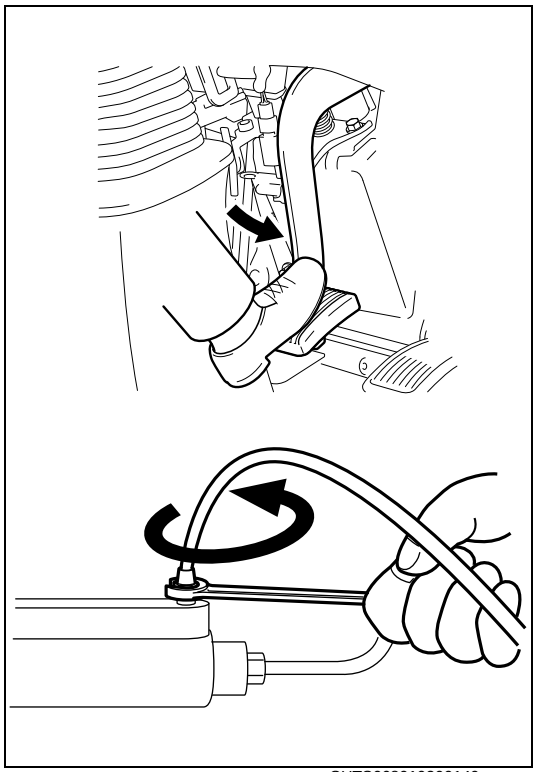
6. OPERATION AFTER CHECK

(1) Remove the air pressure gauge from the brake valve assembly.

(2) Apply lock agent (LOCTITE 575 or equivalent) on the threaded portion of the plug.

(3) Install the plug on the brake valve assembly.

(4) Remove the oil pressure gauge and install the bleeder screw of the hydraulic cylinder.


SHTS068010200140

7. CHECK OF THE STROKE WARNING SWITCH AND WARNING BUZZER

(1) Attach a vinyl tube to the bleeder screw of hydraulic cylinder.

(2) Depress the brake pedal and loosen the bleeder screw of hydraulic cylinder to allow the fluid flow out.

NOTICE

Do not have the fluid scattered.

(3) Check to see if the warning light lights up and the warning buzzer beeps.

NOTICE

Warning buzzer beeps only when the parking brake is released.

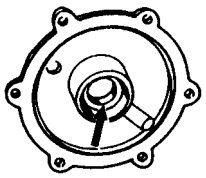
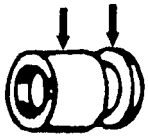
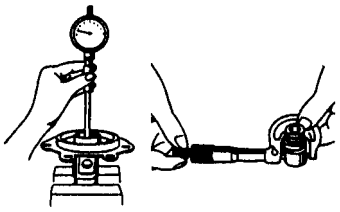
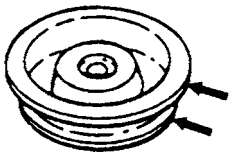
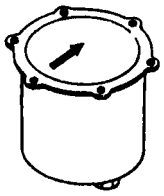
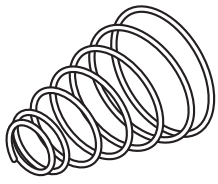
(4) Attach the bleeder screw of hydraulic cylinder.

INSPECTION AND REPAIR

EN0680102H300016

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the components.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Hydraulic cylinder inner surface: Corrosion and wear	—	—	Clean or replace, if necessary.	Visual check 
Hydraulic piston: Corrosion and wear	—	—	Clean or replace, if necessary.	Visual check 
Hydraulic cylinder and piston: Clearance	0.07-0.14 {0.0028-0.0055}	0.16 {0.0063}	Replace, cylinder and/or piston.	Measure 
Power piston: Rust, deformation and wear	—	—	Clean or replace, if necessary.	Visual check 
Power cylinder shell: Rust on inner surface and deformation. **NOTICE** If the cylinder shell has a deformation in 0.45 mm {0.1772 in.} or more depth, be sure to replace it.	—	—	Clean or replace, if necessary.	Visual check 
Return spring: Rust, damage and free length	161 {6.34}	154 {6.06}	Replace, if necessary.	Measure and visual check 

BRAKE AIR BOOSTER (AIRMASTER) WITH ABS (MODELS: FC, FD, GD, FT, GT)

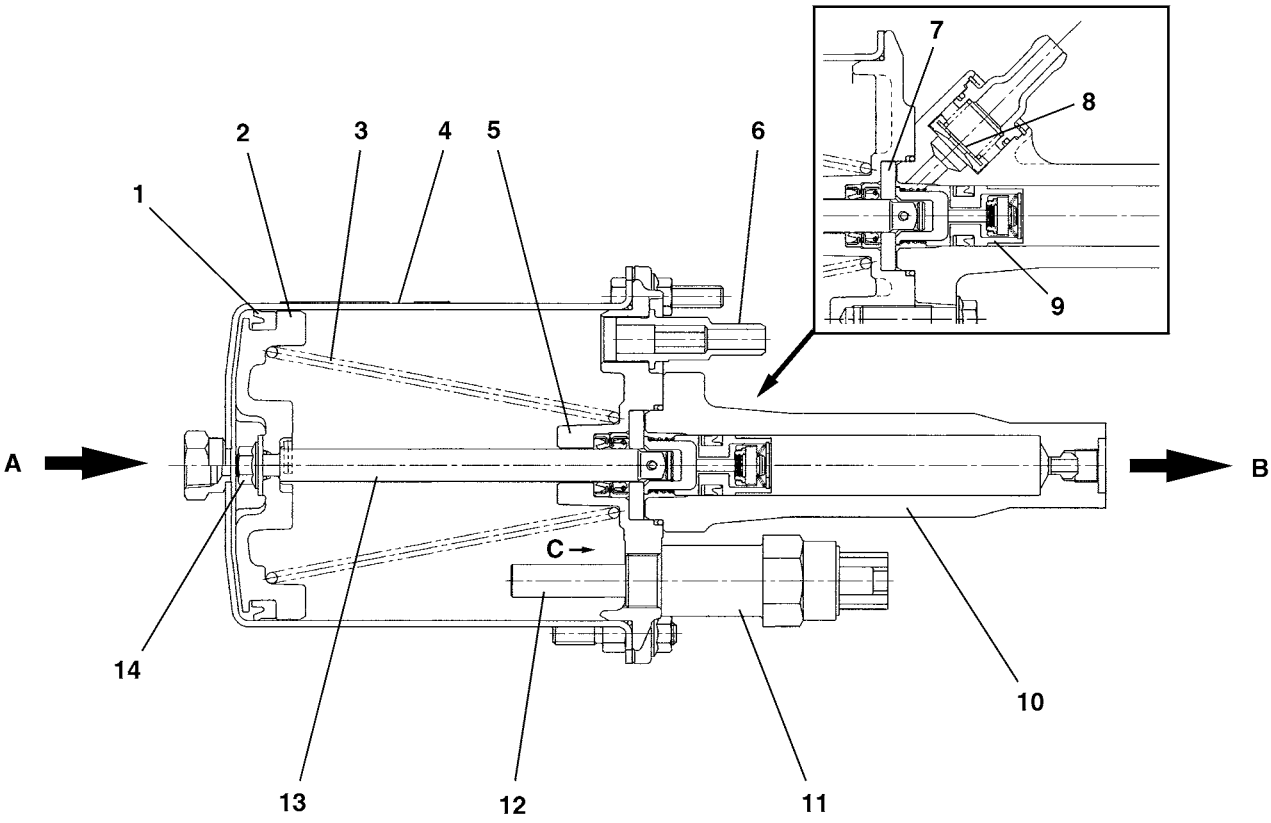
DATA AND SPECIFICATIONS

EN0680102I200015

Type	**AIRMASTER (Boosted air controlled by brake valve)**
Power cylinder diameter	**114.3 mm {4.50 in.}**
Hydraulic cylinder diameter	**22.2 mm {0.87 in.}**

DESCRIPTION

EN0680102C100015



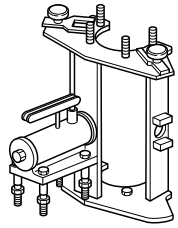
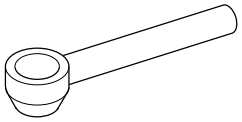
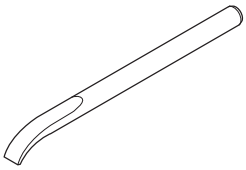
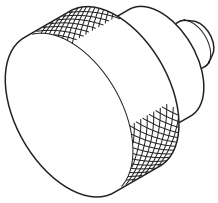
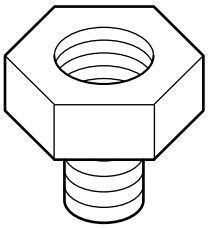
SHTS068010200147

1	**Piston seal**	**10**	**Hydraulic cylinder**
2	**Power piston**	**11**	**Stroke warning switch**
3	**Return spring**	**12**	**Piston stroke detector**
4	**Power cylinder shell**	**13**	**Push rod**
5	**End plate**	**14**	**Nut**
6	**Exhaust connector**		
7	**Spacer**	**A**	**Boost air (From brake valve)**
8	**Check valve**	**B**	**To wheel cylinder**
9	**Hydraulic piston**	**C**	**At power piston over stroke**

SPECIAL TOOL

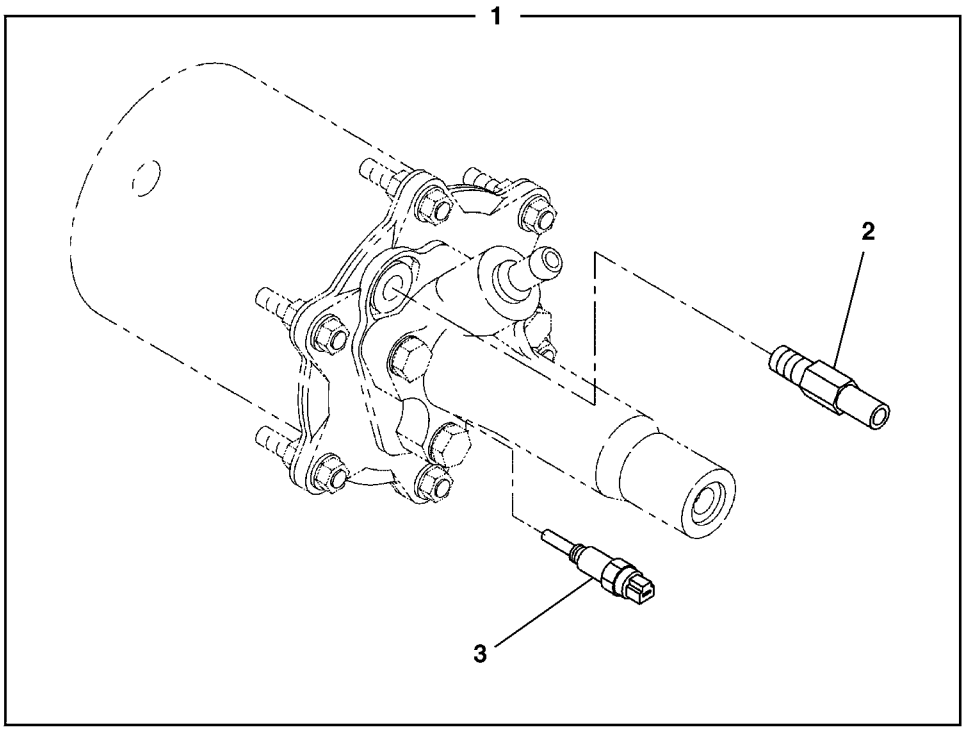
EN0680102K100002

Prior to starting a brake air booster overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0963-02340	STAND	
	S0969-91410	POWER PISTON HOLDER	
	S0965-11120	PULLER	
	S0960-71160	PRESS FIT BAR	
	S0969-91400	CONNECTOR	

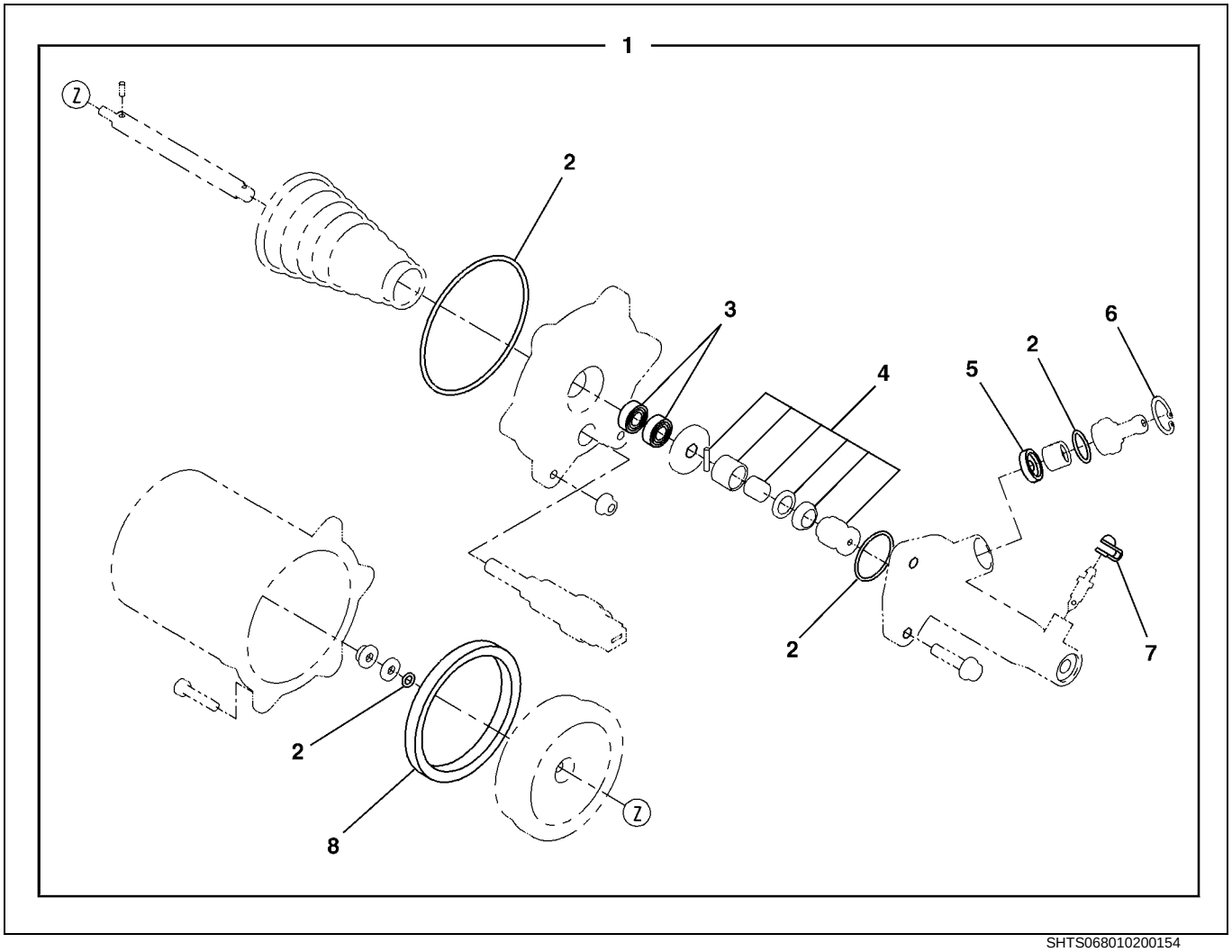
COMPONENT LOCATOR

EN0680102D100014



SHTS068010200153

1	Brake booster assembly	3	Stroke warning switch
2	Exhaust connector		

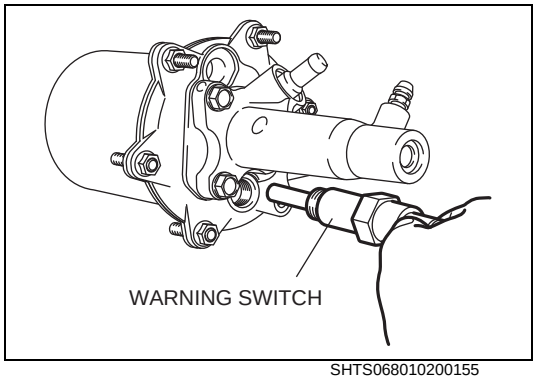


SHTS068010200154

1	Repair kit	5	Check valve assembly
2	O-ring	6	Retainer ring
3	Oil seal	7	Air bleeder screw cap
4	Hydraulic piston assembly	8	Piston seal

OVERHAUL

EN0680102H200010



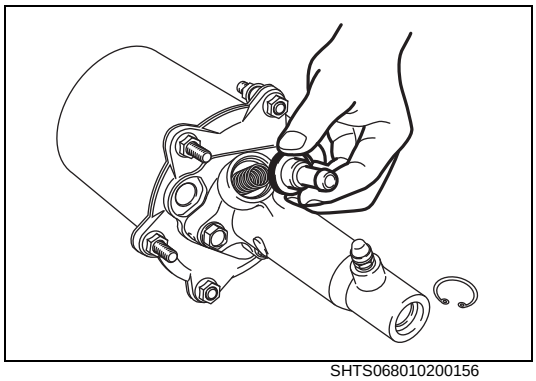
SHTS068010200155

IMPORTANT POINT - DISASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER

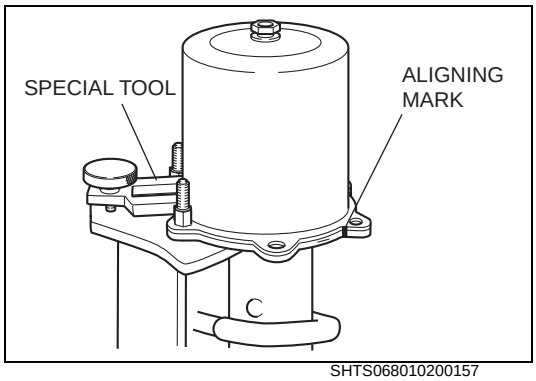
(1) Remove the nut and then remove the clamp, exhaust hose, and exhaust connector.

(2) Remove the stroke warning switch.


SHTS068010200156

(3) Remove the retainer ring, oil pipe joint with O-ring, spring and check valve.

(4) Remove the cap and the air bleeder screw.

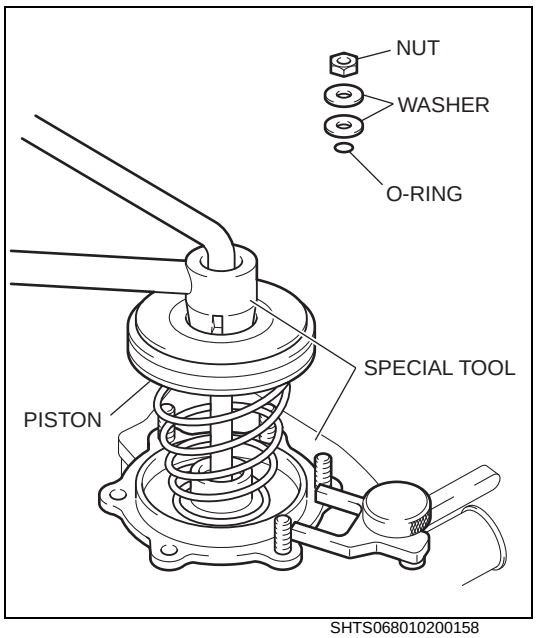


SHTS068010200157

(5) Using the special tool, secure the brake booster.
SST: Stand (S0963-02340)

NOTICE
Before disassembling the brake air booster, apply aligning mark on the power cylinder shell and end plate.

(6) Remove the nuts, then remove the power cylinder shell and O-ring.



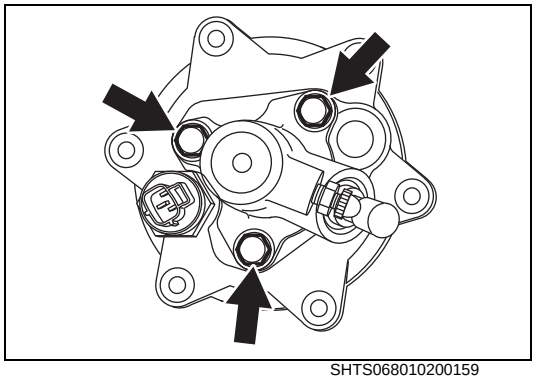
SHTS068010200158

(7) Using the special tool, secure the power piston, then remove the nut.
SST: Power Piston Holder (S0969-91410)

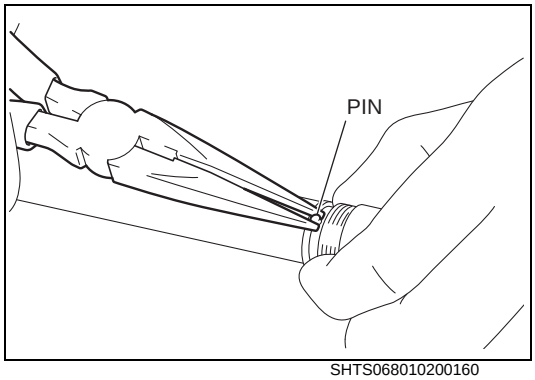
NOTICE

- **Keep the power piston pushed far enough toward the hydraulic cylinder side while removing the nut. If the power piston is not adequately pushed toward the hydraulic cylinder side, the push rod pin will turn together with the nut.**
- **When removing the nut, take precautions, for there is a spring that will jump out when the nut is removed.**

(8) Remove the washers, O-ring, piston seal, power piston and return spring.


SHTS068010200159

(9) Remove the bolts, then remove the hydraulic cylinder and O-ring.

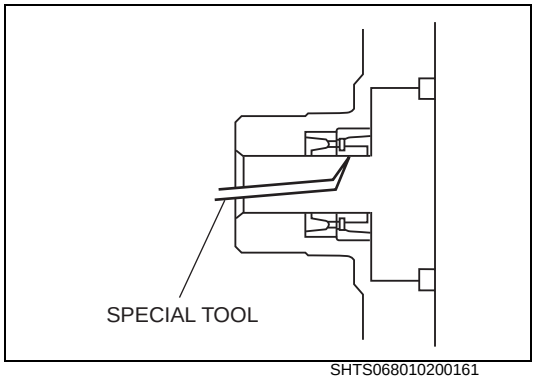


SHTS068010200160

(10) Press and hold down the hydraulic piston spring and remove the pin by using a nose plier, and then remove the hydraulic piston assembly.

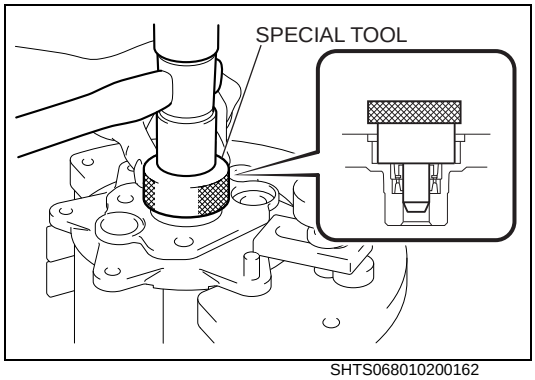
NOTICE
Do not disassemble the hydraulic piston, if it has defects, replace the hydraulic piston assembly.

(11) Remove the push rod, pulling it in the direction away from the push rod threaded part.
(12) Remove the O-ring from the end plate.



SHTS068010200161

(13) Remove the washer from the end plate.
(14) Using the special tool, remove the oil seal (2 pieces) from the end plate.
SST: Puller (S0965-11120)



SHTS068010200162

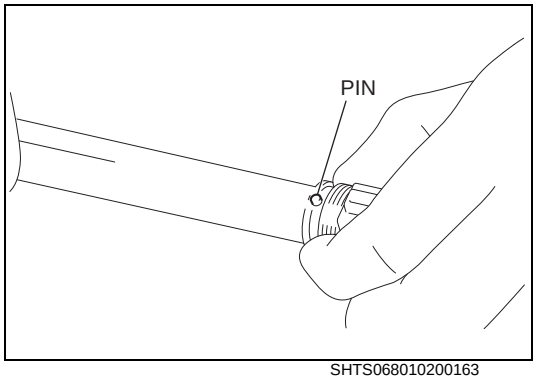
IMPORTANT POINT - ASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER
(1) Using the special tool, secure the end plate.
SST: Stand (S0963-02340)

(2) Coat a new oil seal and the end plate bore with silicone grease. Then using the special tool, press the oil seal on the end plate.
SST: Press Fit Bar (S0960-71160)

NOTICE
Make sure the oil seal is inserted in the proper direction.

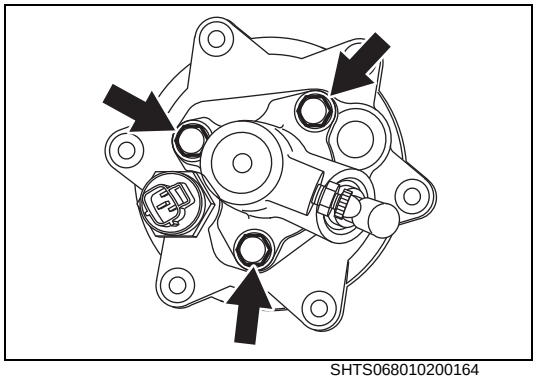
(3) Soak the washers in brake fluid and then install the end plate.



SHTS068010200163

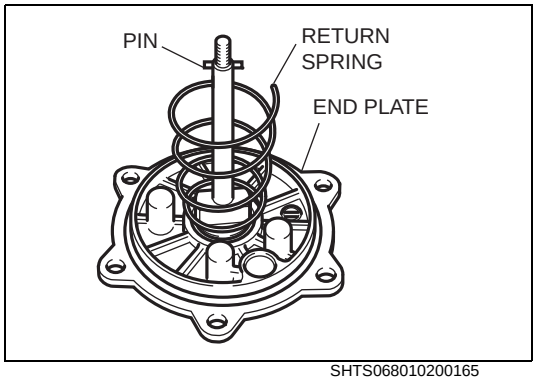
(4) Coat the push rod surfaces and valve seal with silicone grease, then install the push rod to the end plate, installing it in the direction away from the threaded parts.
(5) Line up the push rod end pin, the valve seal hole and the hydraulic piston hole, and then insert the pin.

NOTICE
Make sure that the hydraulic piston spring covers the pin, which is not drawn out from the hydraulic piston.


SHTS068010200164

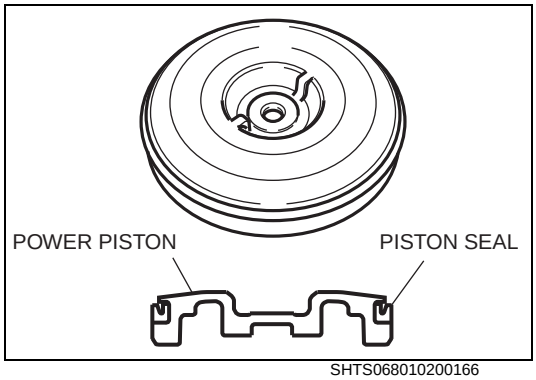
(6) Coat the hydraulic piston assembly exterior surfaces, the hydraulic cylinder inner surfaces and a new O-ring with brake fluid.
(7) Install the O-ring on the hydraulic cylinder, then install the hydraulic cylinder on the end plate.
Tightening Torque:
20-29 N·m {204-295 kgf·cm, 15-21 lbf·ft}

(8) Install the air bleeder screw.
Tightening Torque:
7-12 N·m {72-122 kgf·cm, 5.2-8.8 lbf·ft}



SHTS068010200165

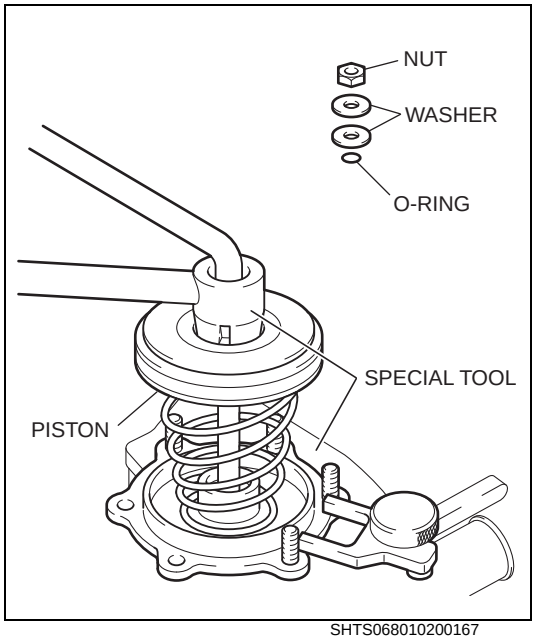
(9) Install the pin in the push rod threaded part side hole.
(10) Install the return spring on the end plate.



SHTS068010200166

(11) Coat the piston seal groove of the power piston and piston seal with mineral grease (Air Master Paste or equivalent), and then install the piston seal to the power piston.

NOTICE
Make sure the piston seal is installed in the proper direction.



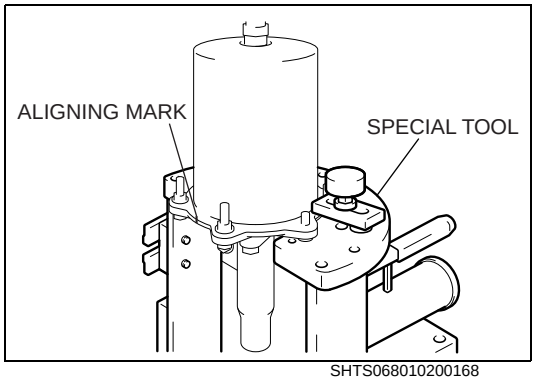
SHTS068010200167

(12) While pressing and holding down the return spring, install a new O-ring and the washer in that order, and then secure the hydraulic piston and push rod in place with the nut.
SST:
Power Piston Holder (S0969-91410)
Stand (S0963-02340)

Tightening Torque:
11-15 N·m {113-153 kgf·cm, 8.2-11 lbf·ft}

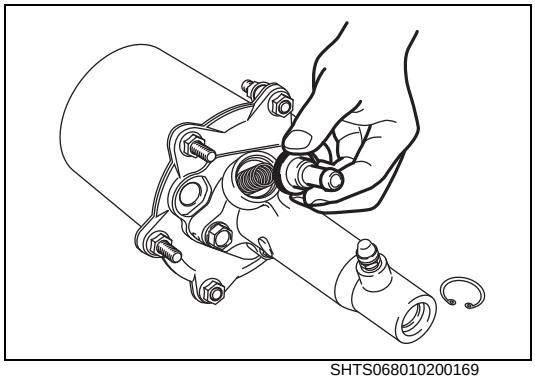
NOTICE

- **Supply compressed air (about 0.1 MPa) through the hydraulic cylinder discharge opening to prevent the push rod from falling down.**
- **Keep the power piston pushed far enough toward the hydraulic cylinder side while tightening the nut. If the power piston is not adequately pushed toward the hydraulic cylinder side, the push rod pin will turn together with the nut.**
- **After fastening the nut, caulk the nut and the push rod threaded parts with a punch.**

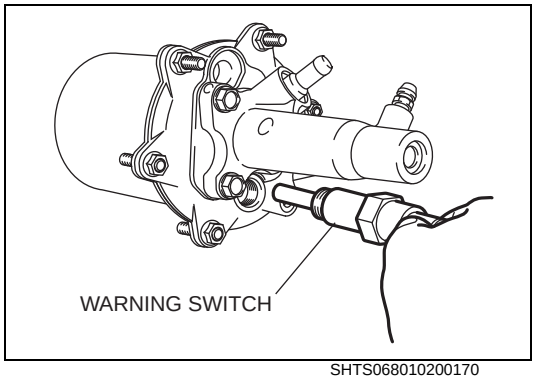


SHTS068010200168

(13) Coat the power cylinder shell inner surface with mineral grease (Air Master Paste or equivalent).
(14) Match the aligning mark, install the power cylinder shell on the end plate.
(15) When assembling the power cylinder shell and end plate, align the mark which were applied at disassembly.
Tightening Torque:
11-15 N·m {113-153 kgf·cm, 8.2-11 lbf·ft}


SHTS068010200169

(16) Install the check valve, spring and oil pipe joint with a new O-ring, then secure the oil pipe joint with a new retainer ring.

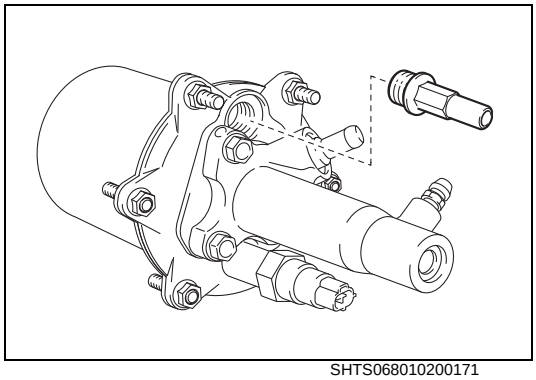


SHTS068010200170

(17) Apply sealant (ThreeBond No.1213) on the threaded part of the stroke warning switch.

NOTICE
Before applying, clean off used sealant completely.

(18) Install the stroke warning switch and tighten it with the specified torque.
Tightening Torque:
8-12 N·m {82-122 kgf·cm, 5.9-8.8 lbf·ft}


SHTS068010200171

(19) Apply sealant (ThreeBond No.1213) on the threaded part of the exhaust connector.

NOTICE

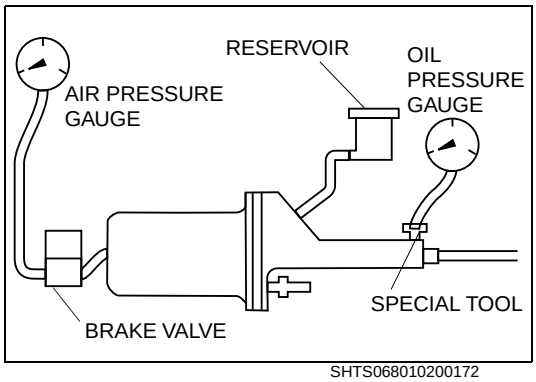
Before applying, clean off used sealant completely.

(20) Install the exhaust connector and tighten it with the specified torque.
Tightening Torque:
5-6 N·m {51-61 kgf·cm, 3.7-4.4 lbf·ft}

INSPECTION

EN0680102H300017

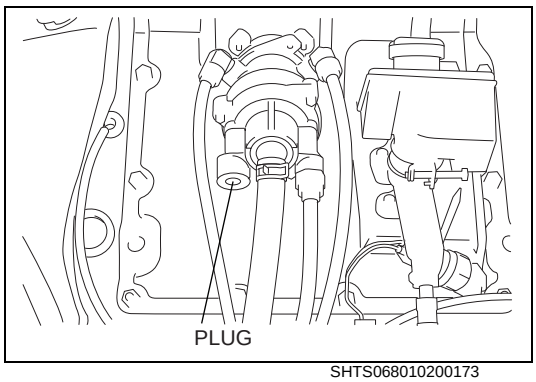
CHECKING OF BRAKE AIR BOOSTER FUNCTION



SHTS068010200172

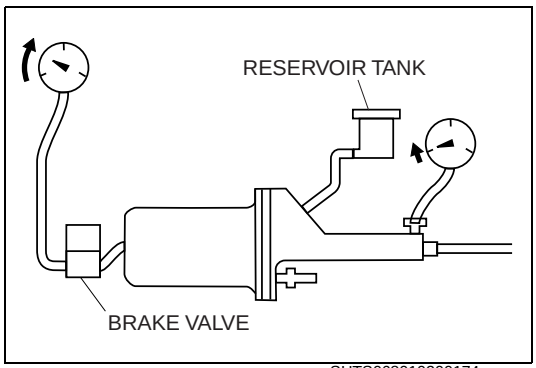
1. OPERATION CHECK OF BRAKE BOOSTER

(1) Remove the bleeder screw of hydraulic cylinder and attach an oil pressure gauge scaling 24.5 MPa {250 kgf/cm^2, 3,553 lbf/in.^{2}} by using a special tool (connecting portion: M12 x 1.5).
SST: Connector (S0969-91400)



SHTS068010200173

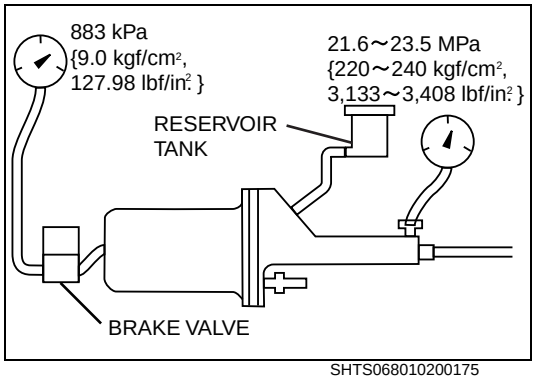
(2) Remove the plug from the brake valve assembly and attach an air pressure gauge to the brake valve assembly.



SHTS068010200174

2. TEST OF OPERATION START PRESSURE

(1) Purge the air within the air tank completely and check to see that the air pressure gauge indicates 0.
(2) Depress the brake pedal completely to the floor and hold it down at that position.
(3) Start the engine and increase the air pressure.
(4) Check to see that the oil pressure increases before the air pressure reaches 69 kPa {0.7 kgf/cm^2, 9.95 lbf/in.^{2}}



SHTS068010200175

3. OPERATION CHECK AT FULL LOAD

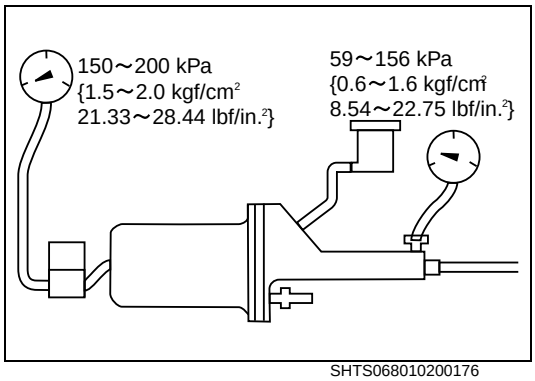
(1) Increase the air pressure after the above test.
(2) Depress the brake pedal completely to the floor.
(3) Stop the engine when the air pressure reaches 883 kPa {9.0 kgf/cm^2, 127.98 lbf/in.^{2}}.
(4) Check to see that the oil pressure at that moment is between 21.6-23.5 MPa {220-240 kgf/cm^2, 3,133-3,408 lbf/in.^{2}}.

Treatment in abnormal condition:
Replace the hydraulic piston assembly (contents of the repair kit).

4. AIR SEALING TEST AT FULL LOAD

(1) Immediately after the above test, check to see for one minute that the air pressure does not drop down.
Treatment in abnormal condition:

- **If the power piston has defects, replace the brake booster assembly.**
- **If the piston seal has defects, replace it with a new one (content of the repair kit).**



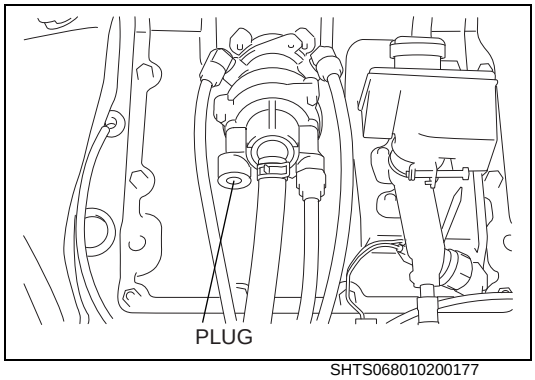
SHTS068010200176

5. RESIDUAL PRESSURE TEST (CHECK VALVE TEST)

(1) Replace an oil pressure gauge with one having the scale of 0-690 kPa {0-7 kgf/cm^2, 0-99.54 lbf/in.^{2}}.
(2) Depress the brake pedal till the air pressure reaches 150-200 kPa {1.5-2.0 kgf/cm^2, 21.33-28.44 lbf/in.^{2}} and then release the pedal. Check to see that the oil pressure at that moment is 59-156 kPa {0.6-1.6 kgf/cm^2, 8.54-22.75 lbf/in.^{2}}.

Treatment in abnormal condition:

- **If the check valve has defects, replace it with a new one (content of the repair kit).**
- **If the spring has defects, replace the brake booster assembly.**

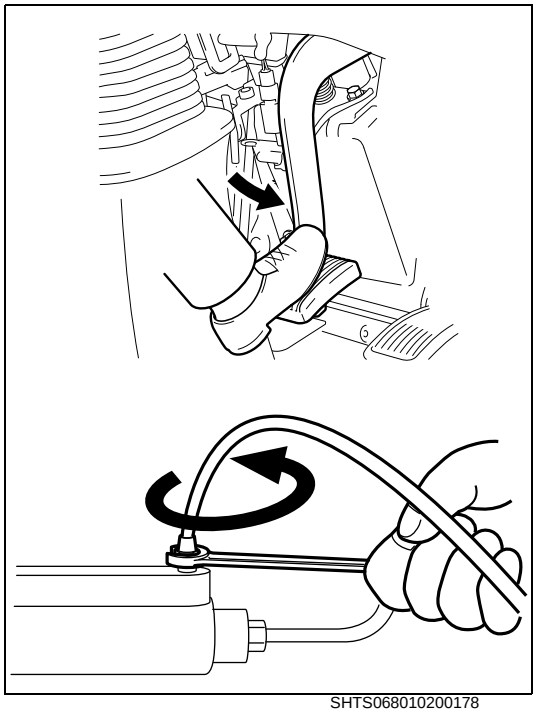


SHTS068010200177

6. OPERATION AFTER CHECK

(1) Remove the air pressure gauge from the brake valve assembly.
(2) Apply lock agent (LOCTITE 575 or equivalent) on the threaded portion of the plug.
(3) Install the plug on the brake valve assembly.
Tightening Torque:
20-30 N·m {204-305 kgf·cm, 15-22 lbf·ft}

(4) Remove the oil pressure gauge and install the bleeder screw of the hydraulic cylinder.
Tightening Torque:
7-12 N·m {72-122 kgf·cm, 5.2-8.8 lbf·ft}



SHTS068010200178

7. CHECK OF THE STROKE WARNING SWITCH AND WARNING BUZZER

(1) Attach a vinyl tube to the bleeder screw of hydraulic cylinder.

(2) Depress the brake pedal and loosen the bleeder screw of hydraulic cylinder to allow the fluid flow out.

NOTICE
Do not have the fluid scattered.

(3) Check to see if the warning light lights up and the warning buzzer beeps.

NOTICE
Warning buzzer beeps only when the parking brake is released.

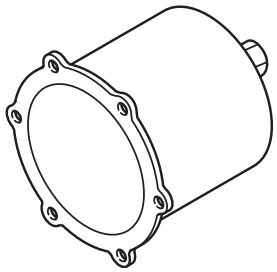
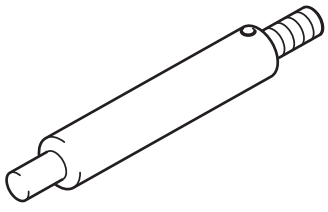
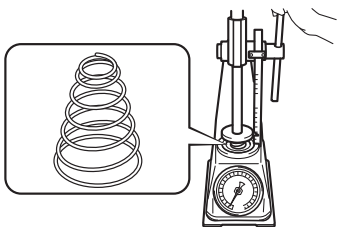
(4) Attach the bleeder screw of hydraulic cylinder.

INSPECTION AND REPAIR

EN0680102H300018

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the components.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Power cylinder shell: Rust on inner surface and deformation. **NOTICE If the cylinder shell has a deformation in 0.45 mm {0.1772 in.} or more depth, be sure to replace it.**	**—**	**—**	**Replace brake booster assembly, if necessary.**	**Visual check** 
Push rod: Damage on sliding surface, and bend	**—**	**—**		**Visual check** 
Return spring: Free length	**161.0 {6.34}**	**154.0 {6.06}**		**Measure**
Return spring: Setting length	**132.0 {5.19}**	**—**		
Return spring: Setting load	**78.5 N {8.0 kgf, 17.54 lbf}**	**58.8 N {6.0 kgf, 13.22 lbf}**		

BRAKE AIR BOOSTER (AIRMASTER) (MODELS: FG, GH, FL, FM)

DATA AND SPECIFICATIONS

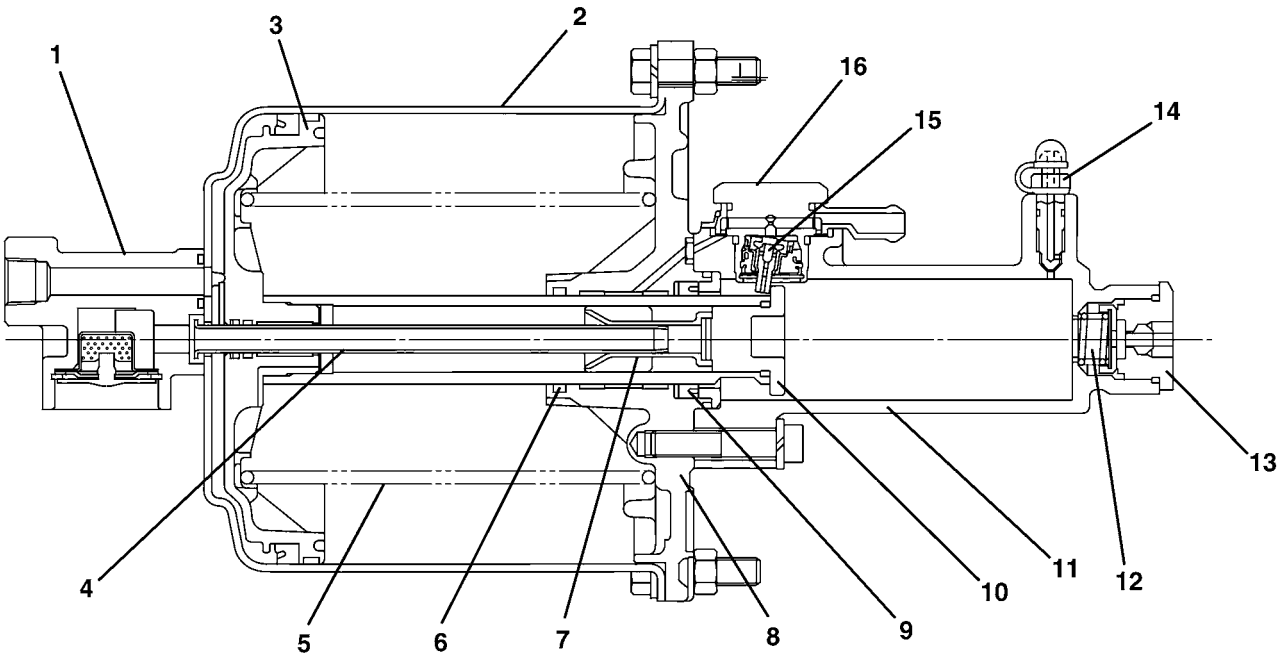
EN06801022600001

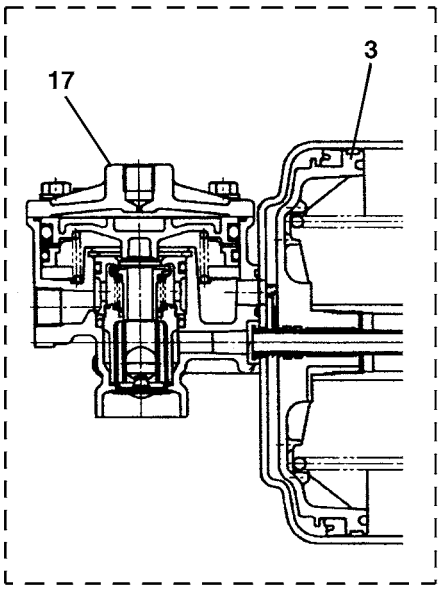
Type	**AIRMASTER (Boosted air controlled by brake valve)**
Power cylinder diameter	**163.6 mm {6.44 in.}**
Hydraulic cylinder diameter	**31.75 mm {1.25 in.}**

DESCRIPTION

EN06801022900001

WITH RELAY VALVE



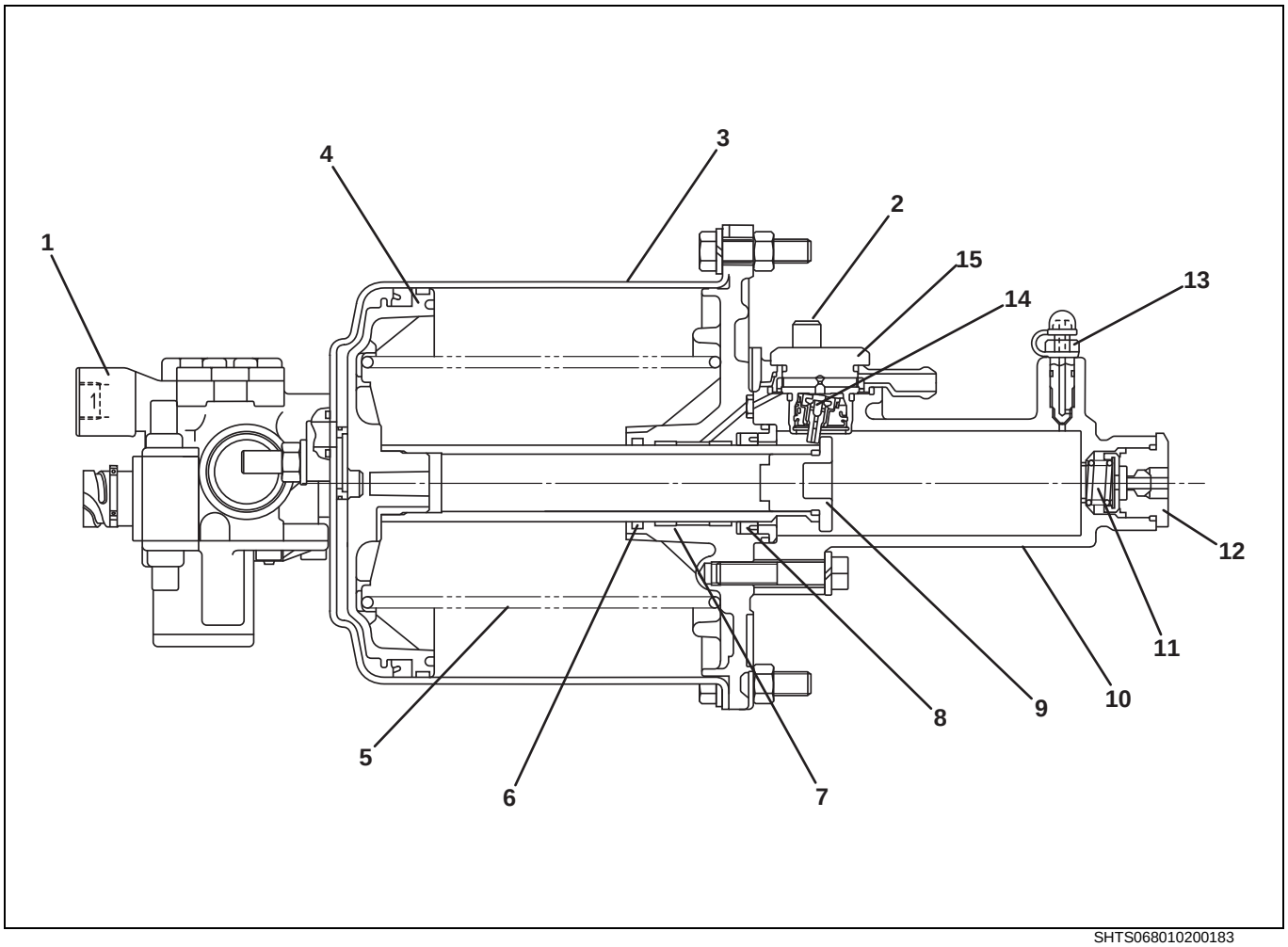


VARIATION

SHTS068010200182

1	Breather	10	Power piston plug
2	Cylinder shell	11	Hydraulic cylinder
3	Power piston	12	Check valve
4	Push rod	13	End plug
5	Return spring	14	Air bleeder screw
6	X-ring	15	Tilt valve
7	Piston guide	16	Valve plug
8	Casing	17	Relay valve
9	Oil seal cup		

WITH ABS CONTROL VALVE



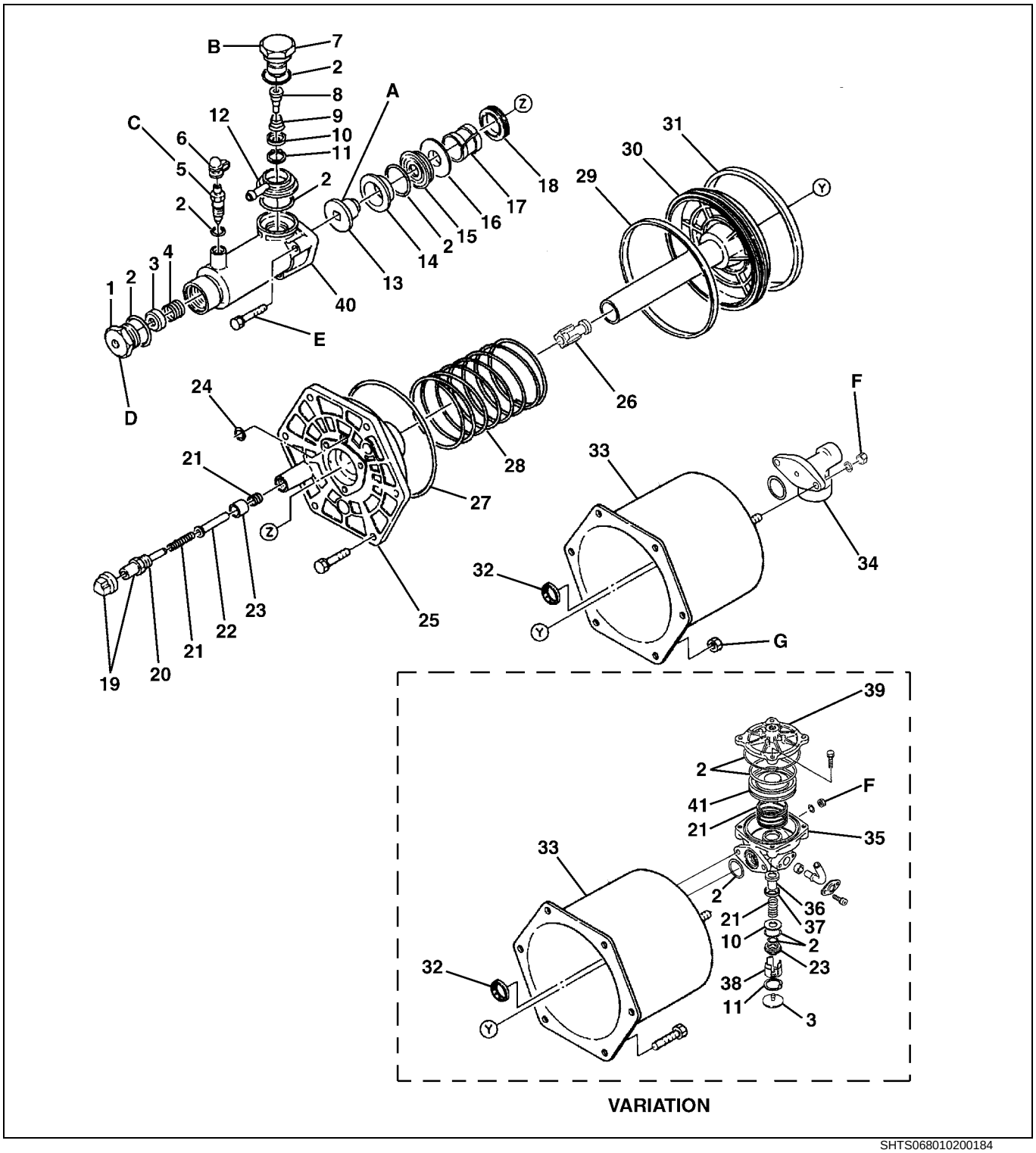
SHTS068010200183

1	ABS control valve	9	Power piston plug
2	Exhaust pipe	10	Hydraulic cylinder
3	Cylinder shell	11	Check valve
4	Power piston	12	End plug
5	Return spring	13	Air bleeder screw
6	X-ring	14	Tilt valve
7	Casing	15	Valve plug
8	Oil seal cup		

COMPONENT LOCATOR

EN06801020600001

WITH RELAY VALVE



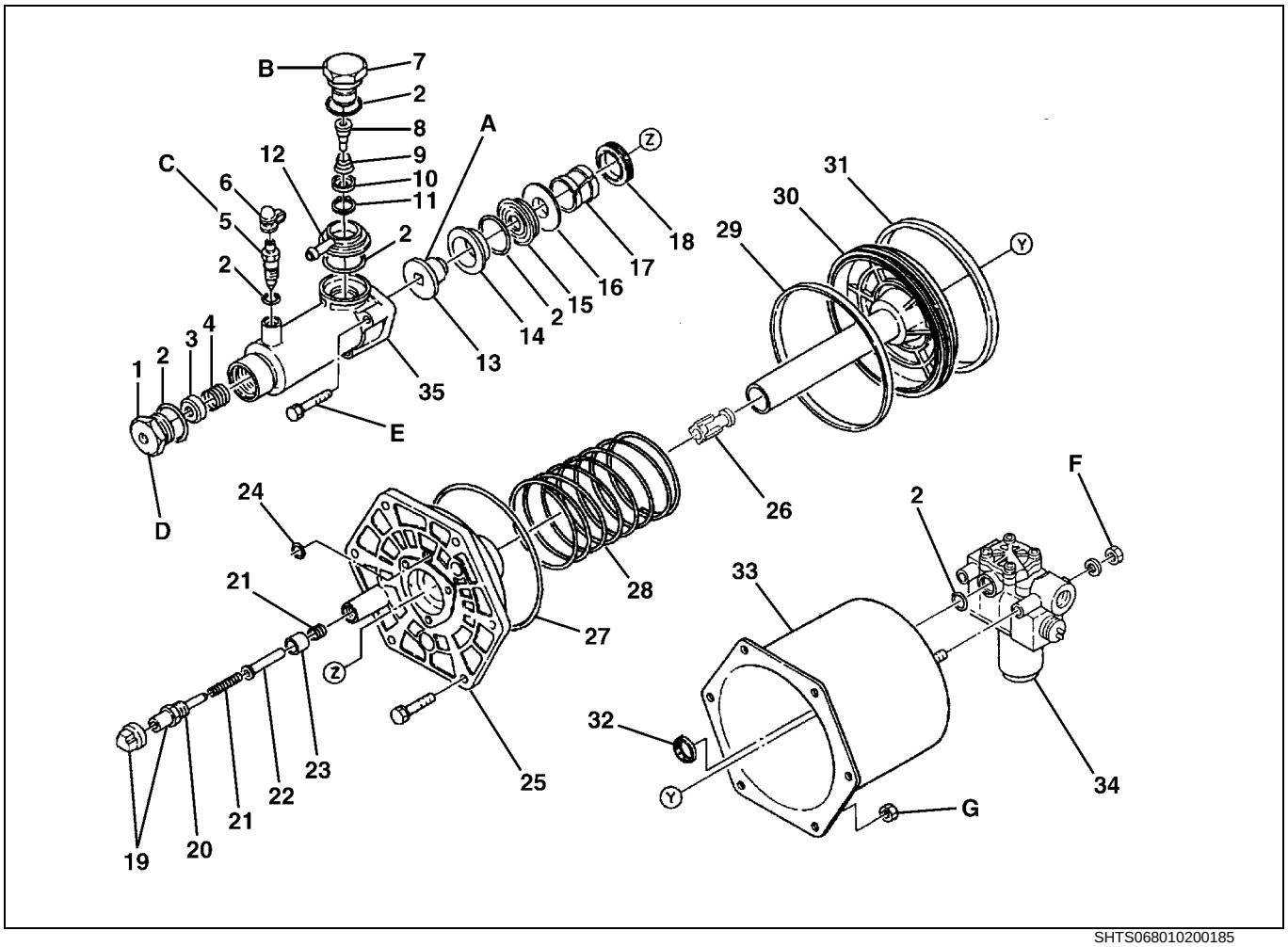
SHTS068010200184

1	End plug	15	Oil seal cup	29	Power piston ring
2	O-ring	16	Back up ring	30	Power piston
3	Check valve	17	Bushing	31	Power piston seal
4	Valve spring	18	X-ring	32	Stopper and clip ring
5	Air bleeder screw	19	Brake booster stroke switch	33	Cylinder shell
6	Cap	20	Lock plate	34	Breather
7	Valve plug	21	Spring	35	Valve body
8	Tilt valve	22	Plunger	36	Valve
9	Valve spring	23	Spring	37	Retainer
10	Spring seat	24	Seal ring	38	Spacer
11	Retainer ring	25	Piston guide	39	Valve cover
12	Oil connector	26	Exhaust pipe	40	Hydraulic cylinder
13	Power piston plug	27	Cylinder seal	41	Piston
14	Stopper ring	28	Return spring		

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

A	78.5-98.1 {800-1,000, 58-72}	E	24.5-29.4 {250-300, 18-21}
B	78.5-98.1 {800-1,000, 58-72}	F	24.5-29.4 {250-300, 18-21}
C	6.9-11.8 {70-120, 5.1-8.6}	G	24.5-29.4 {250-300, 18-21}
D	78.5-98.1 {800-1,000, 58-72}		

WITH ABS CONTROL VALVE



SHTS068010200185

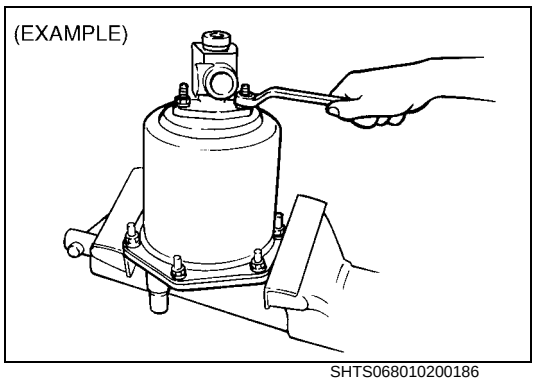
1	End plug	13	Power piston plug	25	Piston guide
2	O-ring	14	Stopper ring	26	Exhaust pipe
3	Check valve	15	Oil seal cup	27	Cylinder seal
4	Valve spring	16	Back up ring	28	Return spring
5	Air bleeder screw	17	Bushing	29	Power piston ring
6	Cap	18	X-ring	30	Power piston
7	Valve plug	19	Brake booster stroke switch	31	Power piston seal
8	Tilt valve	20	Lock plate	32	Stopper and clip ring
9	Valve spring	21	Spring	33	Cylinder shell
10	Spring seat	22	Plunger	34	ABS control valve
11	Retainer ring	23	Spring	35	Hydraulic cylinder
12	Oil connector	24	Seal ring		

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

A	78.5-98.1 {800-1,000, 58-72}	E	24.5-29.4 {250-300, 18-21}
B	78.5-98.1 {800-1,000, 58-72}	F	24.5-29.4 {250-300, 18-21}
C	6.9-11.8 {70-120, 5.1-8.6}	G	24.5-29.4 {250-300, 18-21}
D	78.5-98.1 {800-1,000, 58-72}		

OVERHAUL

EN06801022300001

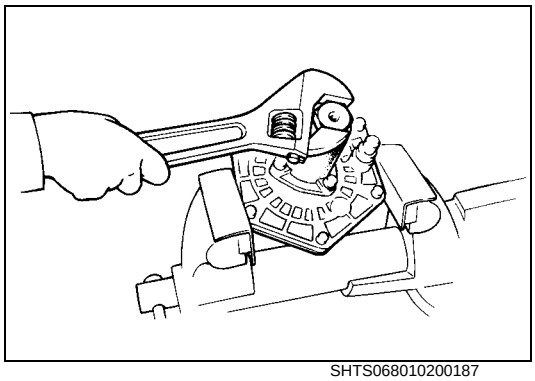


SHTS068010200186

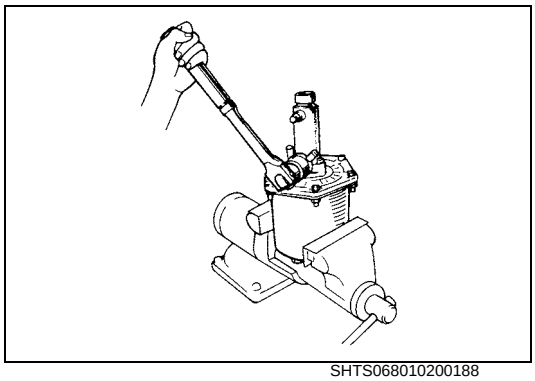
IMPORTANT POINTS - DISASSEMBLY

1. HYDRAULIC CYLINDER AND CYLINDER SHELL

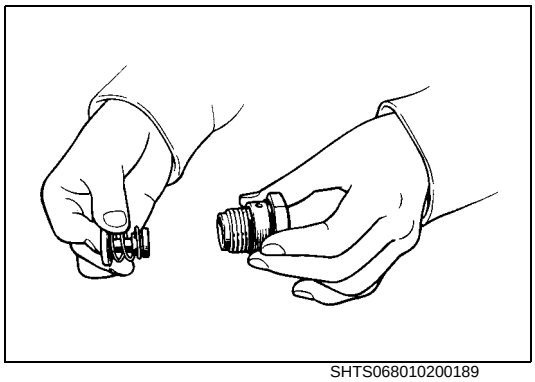
(1) Loosen the nut, and remove the relay valve or ABS control valve and O-ring from the brake booster.


SHTS068010200187

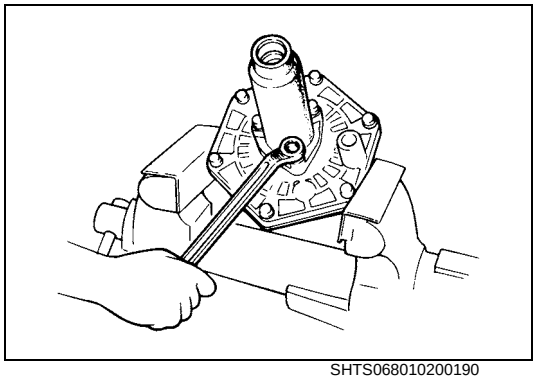
(2) Turn the end plug on the oil cylinder and remove it. Then, remove the check valve and valve spring from inside of the hydraulic cylinder.


SHTS068010200188

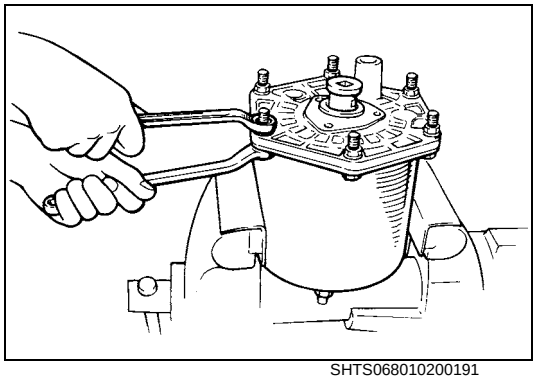
(3) Turn the valve plug and remove the valve plug assembly, oil connector and O-ring from the oil cylinder.


SHTS068010200189

(4) Remove the retainer ring from the valve plug assembly. Remove the tilt valve, valve spring and spring seat from the valve plug.


SHTS068010200190

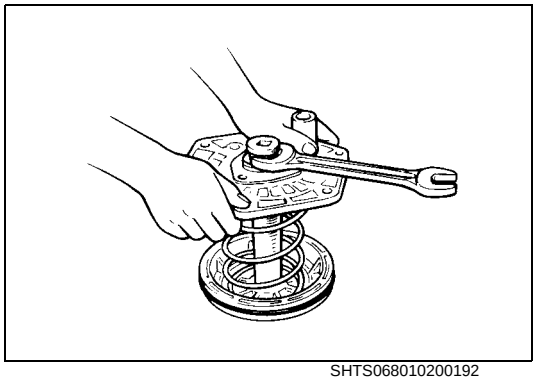
(5) Remove the bolts, and remove the hydraulic cylinder from the casing.


SHTS068010200191

(6) Loosen the mounting bolts and nuts of the casing and cylinder shell, and remove the cylinder shell. Remove the stopper and clip ring from the cylinder shell.

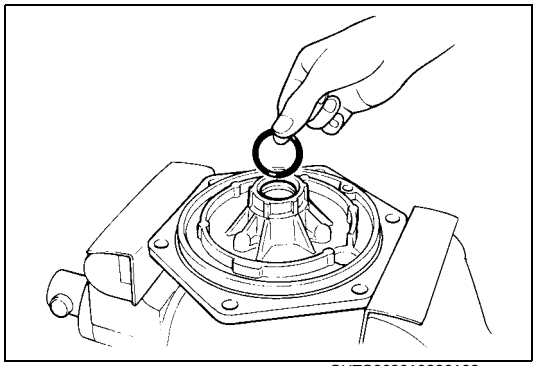
NOTICE

- **Be sure to mark the parts during disassembly so that the parts can be reassembled in the original positions.**
- **Carefully disassemble the unit since it contains a high-tension return spring.**

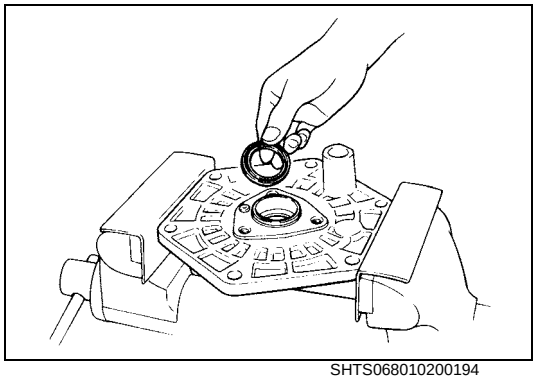

SHTS068010200192

(7) Push down the casing to contract the return spring. After placing a wrench on the hexagonal part of the power piston, lift the casing slowly.

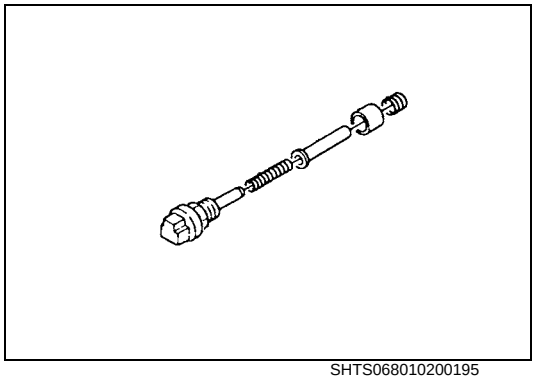
(8) Turn the power piston plug, and remove the power piston plug and O-ring. Push down the casing again, remove the wrench, and lift the casing slowly. Remove the power piston and return spring from the casing.


SHTS068010200193

(9) Remove the X-ring from the casing.


SHTS068010200194

(10) Remove the stopper ring, O-ring, oil seal cup, back up ring and seal ring from the casing.
(11) Remove the exhaust connector and O-ring from the casing. (With ABS control valve only.)
(12) Remove the power piston ring and power piston seal from the power piston.


SHTS068010200195

2. STROKE SWITCH

(1) Straighten the lock washer that is bent towards the casing, then turn the brake booster stroke switch and remove it.

(2) Remove the spring, plunger, holder and spring one by one from inside of the casing.

IMPORTANT POINTS - ASSEMBLY

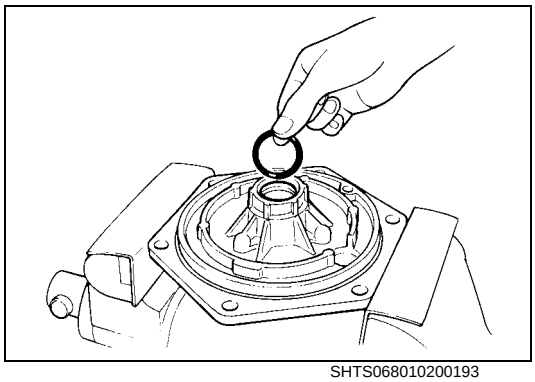
NOTICE

Use Variant Grease S-1 (manufactured by showa shell sekiyu) when grease A is specified. Use Nigroove RX-2 (manufactured by Nippon Grease) when grease B is specified.

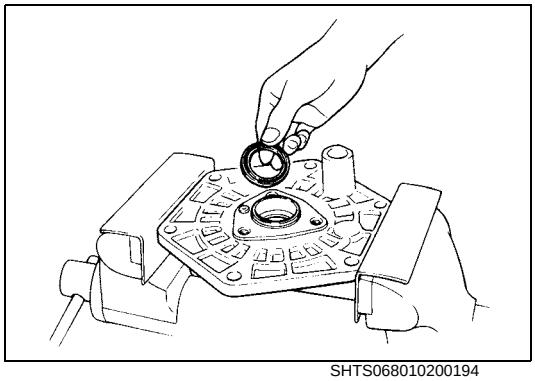
1. HYDRAULIC CYLINDER AND CYLINDER SHELL

(1) Coat the bushing and X-ring of the casing with grease B.

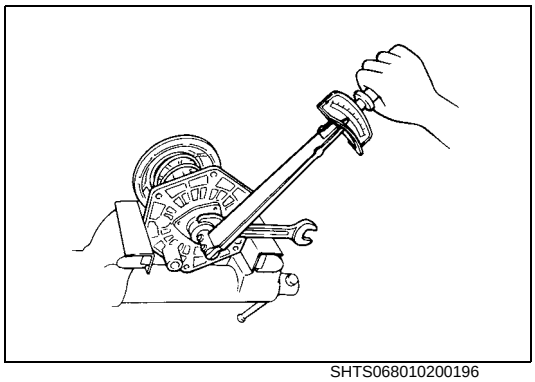
(2) Install the X-ring, bushing and seal ring in the casing.


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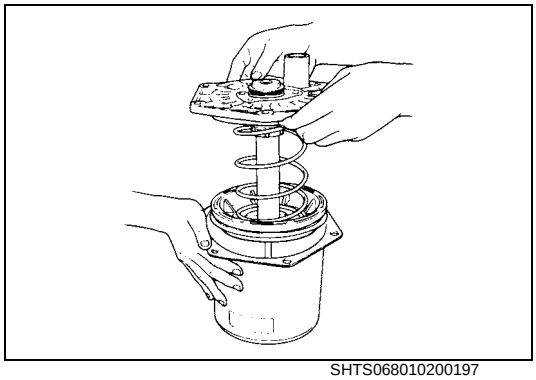
(3) Apply CCI #20 anti-rust oil (manufactured by CCI) on the oil seal cup, and install the oil seal cup and backup ring in the casing. Install the O-ring coated with grease B, then install the stopper ring.


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(4) Install the O-ring and exhaust connector on the casing. (With ABS control valve only.)

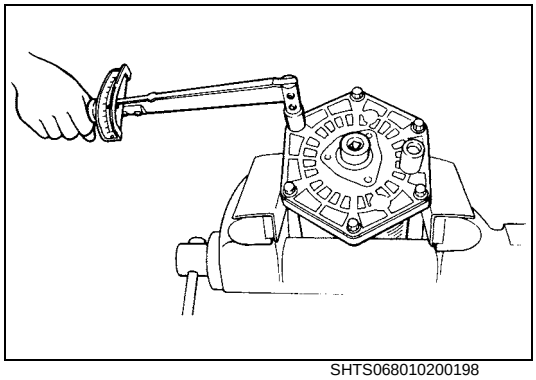

SHTS068010200196

(5) Coat the plunger part of the power piston with grease B. Install the power piston, return spring and casing. Push down the casing to contract the return spring. With the tip of the power piston protruding from the casing, place a wrench on the hexagonal part of the power piston. Then, lift the casing slowly. Install the O-ring coated with grease B on the power piston plug, and tighten the power piston plug.



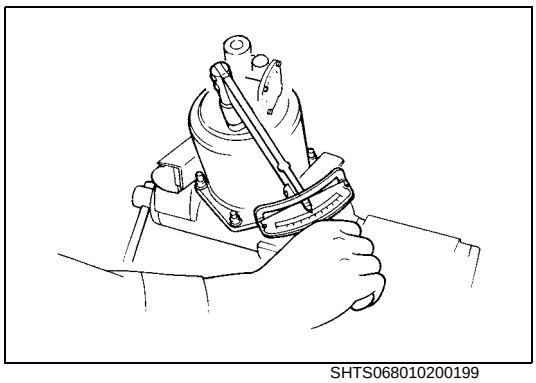
SHTS068010200197

(6) Apply grease A on the groove around the power piston. Install the power piston seal coated with grease A and the power piston ring in the air piston. Coat the periphery of the piston with grease A.



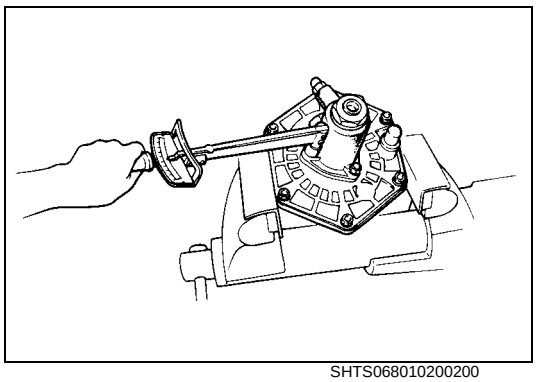
SHTS068010200198

(7) Install the clip ring and stopper on the tip of the stud located on the bottom surface inside the cylinder shell. Apply grease A on the inner wall of the cylinder shell. Install the cylinder shell and cylinder seal in the casing. Tighten the bolts and nut.



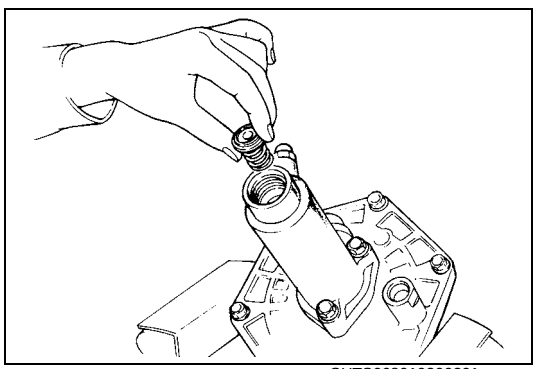
SHTS068010200199

(8) Check to make sure that the O-ring is securely installed. Install the relay valve on the cylinder shell and tighten the nuts with spring washers.



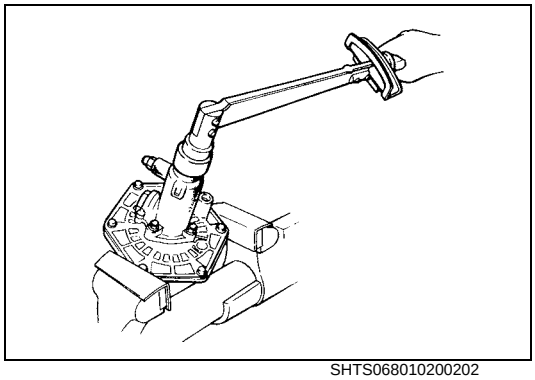
SHTS068010200200

(9) Install the hydraulic cylinder in the casing and tighten the bolts.

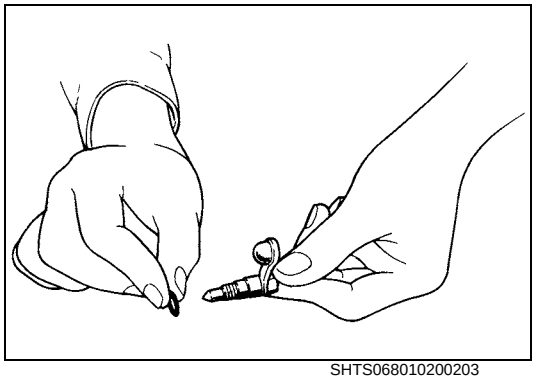


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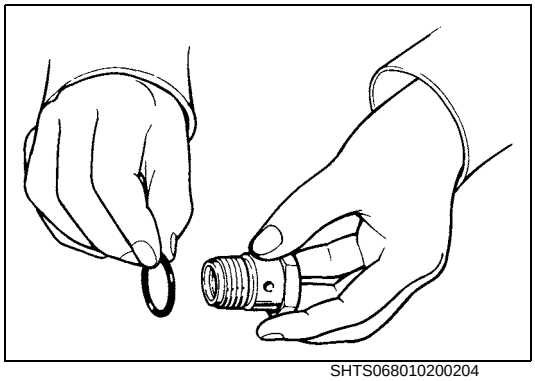
(10) Install the valve spring and check valve in the hydraulic cylinder.


SHTS068010200202

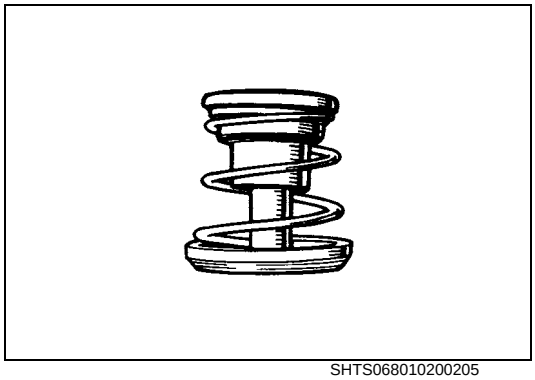
(11) Install the O-ring coated with grease B on the end plug, then install the end plug on the hydraulic cylinder and tighten it.


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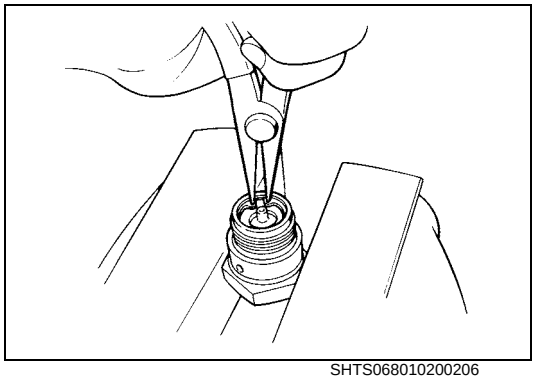
(12) Install the O-ring on the air bleed screw, then install the screw-in cap on the hydraulic cylinder.


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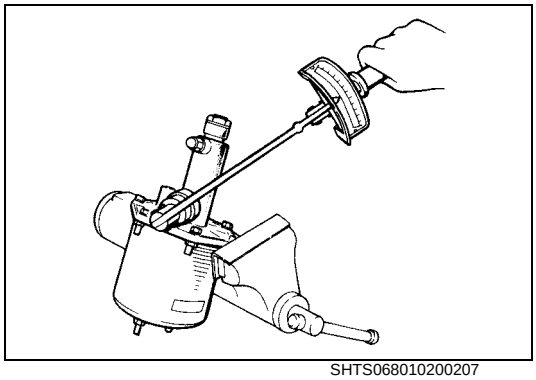
(13) Apply a thin coat of grease B on the O-ring, and install it on the valve plug.


SHTS068010200205

(14) Install the tilt valve, valve spring and spring as shown in figure.


SHTS068010200206

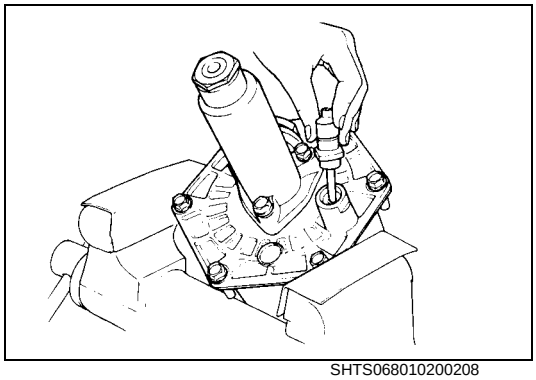
(15) Install the valve plug with the tilt valve, and install the retainer ring to secure it in position.


SHTS068010200207

(16) Install the oil connector on the valve plug. Install it on the hydraulic cylinder and tighten it.

NOTICE

Install the oil cylinder to casing, and then install the oil connector and the plug.


SHTS068010200208

2. STROKE SWITCH

(1) As shown in the stroke switch structural diagram, install the spring, holder, plunger and spring in that order on the boss of the brake booster stroke switch. Hook the bent section of the lock washer on the indentation of the boss, mount and tighten the switch case, then bend the lock washer towards the switch case to look it in position.

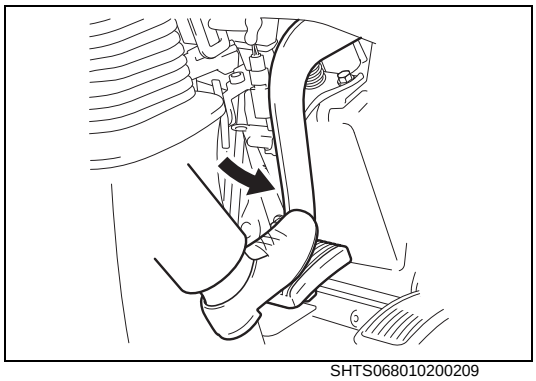
3. OPERATION OF STROKE SWITCH

(1) Remove the stroke detection lever, and mount the stroke switch. Supply air pressure of 196 kPa {2 kgf/cm^2, 28.4 lbf/in.^{2}} to the inlet of the relay valve to discharge oil gradually from the air bleed screw. Move the air piston to make sure that the stroking operation of the stroke switch causes a current flow.

INSPECTION

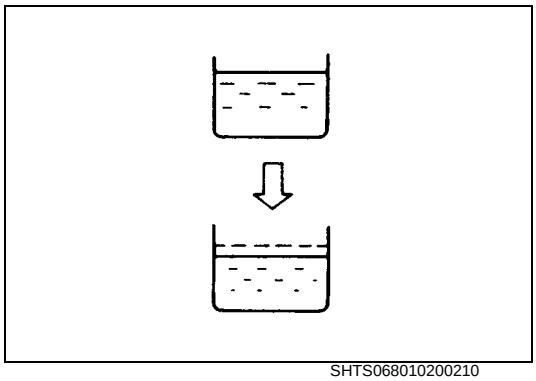
EN06801022300002

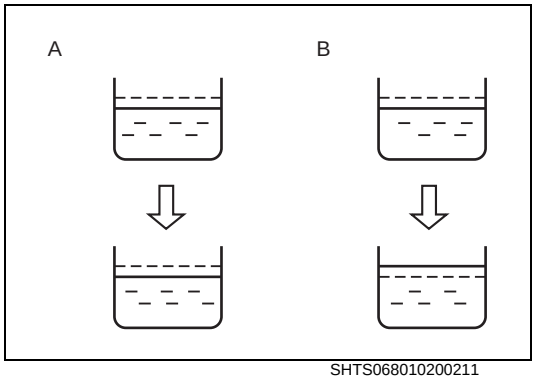
CHECKING OF BRAKE AIR BOOSTER FUNCTION


SHTS068010200209

1. HYDRAULIC PISTON CHECK VALVE AND PISTON CUP.

(1) The fluid level of the reservoir should be fallen, when the brake pedal is depressed.

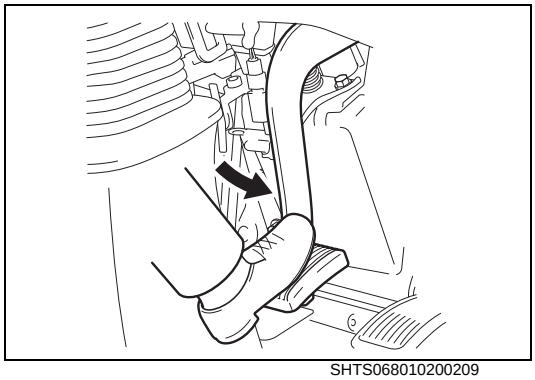

SHTS068010200210



SHTS068010200211

(2) The fluid level of the reservoir should not come up from the fallen state unless the brake pedal is released.

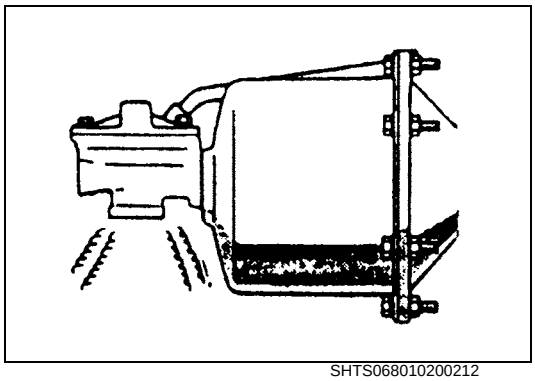
- **A: Normal**
- **B: Defect**

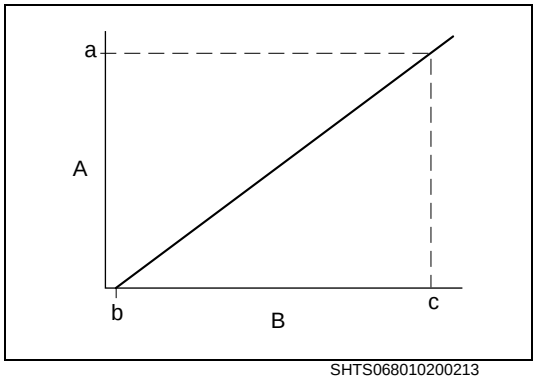

SHTS068010200209

2. POWER PISTON SEALING AND RELAY VALVE.

(1) Depress the brake pedal and remain depressed, then apply soapy water to the exhaust port of the relay valve.

(2) If the soapy water makes bubbles (air leaking), the power piston seals and/or relay valve are defective.


SHTS068010200212



SHTS068010200213

AIR BRAKE BOOSTER PERFORMANCE CHARACTERISTIC

1. THE CHARACTERISTIC IS AS SHOWN FIGURE.

- A: Hydraulic pressure (To Wheel cylinder)
- B: Air pressure (From Brake valve)

Parts No.	a (MPa {kgf/cm^2, lbf/in.^{2}})	b (kPa {kgf/cm^2, lbf/in.^{2}})	c (kPa {kgf/cm^2, lbf/in.^{2}})
S4464-03561	16.7-18.3 {171-186, 2,437-2,654}	13.8-45.7 {0.14-0.46, 1.99-6.63}	690 {7.0, 99.54}
S4464-03571	16.3-18.3 {166-186, 2,378-2,654}	52.7-84.5 {0.54-0.86, 7.68-12.23}	
S4464-03581	16.7-18.3 {171-186, 2,437-2,654}	13.8-45.7 {0.14-0.46, 1.99-6.63}	
S4464-03591	16.7-18.7 {171-190, 2,437-2,728}	32.7-64.7 {0.33-0.66, 4.77-9.43}	

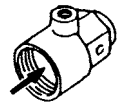
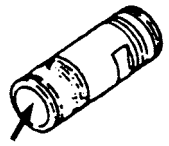
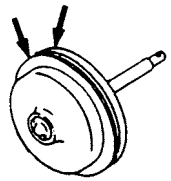
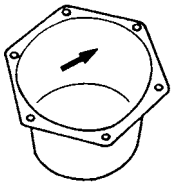
Residual hydraulic pressure:
78-118 kPa {0.8-1.2 kgf/cm^2, 11.38-17.11 lbf/in.^{2}}

HINT
The booster No. is labeled on the cylinder shell.

INSPECTION AND REPAIR

EN0680102H300019

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the components.

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Cylinder plug (Valve contact surface): Corrosion, wear and damage	—	—	Replace, if necessary.	Visual check 
Hydraulic cylinder (Inner surface): Corrosion, wear and damage	—	—	Replace, if necessary.	Visual check 
Hydraulic piston (Outer surface and valve contact surface): Corrosion, wear and damage	—	—	Replace, if necessary.	Measure 
Power piston (Outer circumference): Rust, wear and damage	—	—	Replace, if necessary.	Visual check 
Power cylinder (Inner surface): Rust, wear and damage	—	—	Replace, if necessary.	Visual check 

SPRING BRAKE CONTROL VALVE

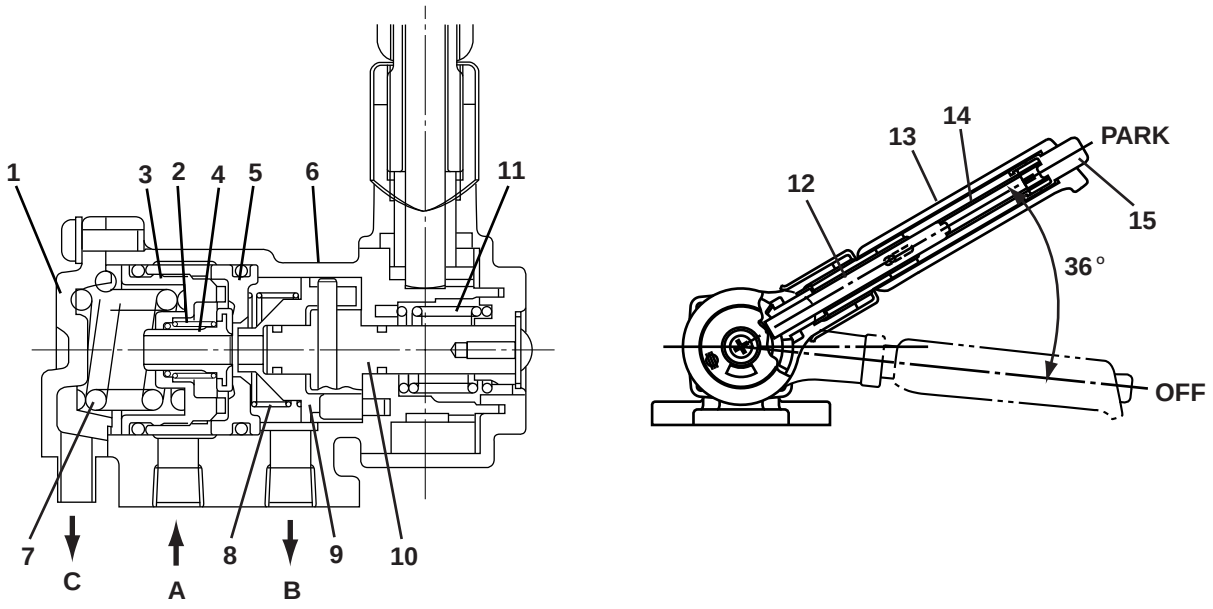
DATA AND SPECIFICATIONS

EN0680102I200016

Type	**Variable pressure control type**
Outlet pressure difference between parking and releasing stroke at a specified lever angle	**Within 147 kPa {1.5 kgf/cm^2, 21.33 lbf/in.^{2}}**

DESCRIPTION

EN0680102C100016

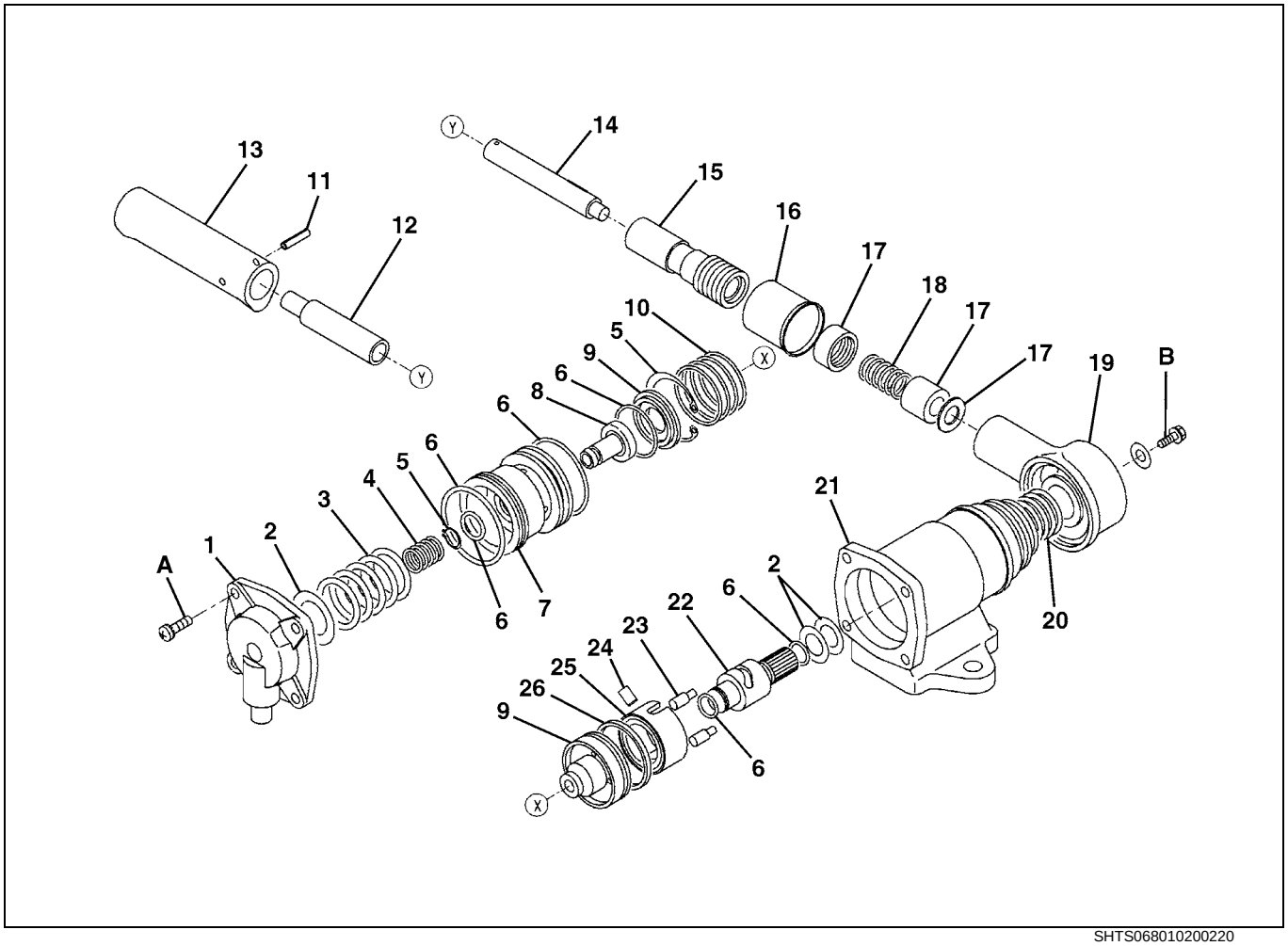


SHTS068010200219

1	Body cover	7	Piston spring	13	Grip
2	Feed valve spring	8	Valve seat spring	14	Compression spring
3	Piston	9	Cam	15	Release rod
4	Feed valve	10	Cam holder	A	Inlet
5	Valve seat	11	Return spring (If so equipped)	B	Outlet
6	Valve body	12	Pull rod	C	Exhaust (PARK)

COMPONENT LOCATOR

EN0680102D100015



SHTS068010200220

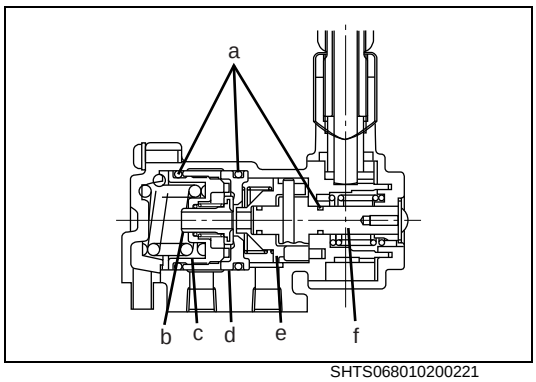
1	Body cover	10	Valve seat spring	19	Body cap
2	Shim	11	Lock pin	20	Return spring (If so equipped)
3	Piston spring	12	Release rod knob	21	Valve body
4	Feed valve spring	13	Grip	22	Cam holder
5	Retainer ring	14	Pull rod	23	Body pin
6	O-ring	15	Supporter	24	Cam holder pin
7	Piston	16	Cover	25	Cam
8	Feed valve	17	Stopper	26	Piston guide
9	Valve seat	18	Compression spring		

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

A	5.4-7.4 {55-75, 4.0-5.4}	B	3.4-4.9 {35-50, 2.6-3.6}

OVERHAUL

EN0680102H200011



SHTS068010200221

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the spring brake control valve, replace the feed valve, valve seats and O-rings.

(2) Apply silicone grease to each sliding surface of the assembly parts, O-rings and O-ring grooves.

a. O-ring

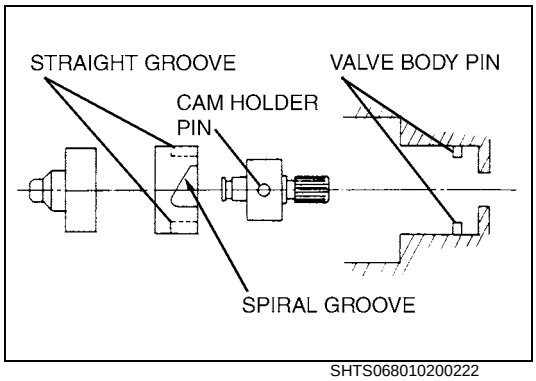
b. Feed valve

c. Piston

d. Valve seat

e. Cam

f. Cam holder

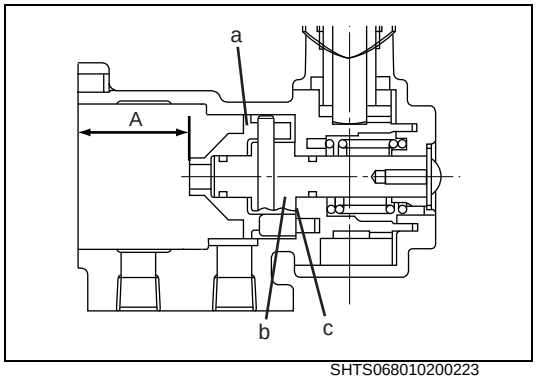


SHTS068010200222

2. ASSEMBLE THE CAM ASSEMBLY.

(1) When assembling the cam and cam holder, make sure that the cam holder pin and spiral groove of the cam are aligned.

(2) When installing the cam assembly to the valve body, the valve body pin and straight groove of the cam must be aligned.



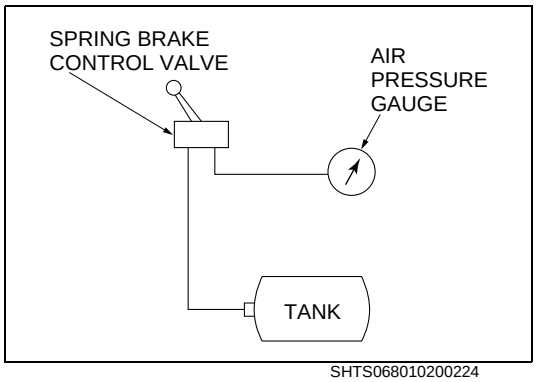
SHTS068010200223

(3) Adjust dimension "A" with the shim.
Assembly standard: 33.8-34.2 mm {1.331-1.346 in.}

a. Cam

b. Cam holder

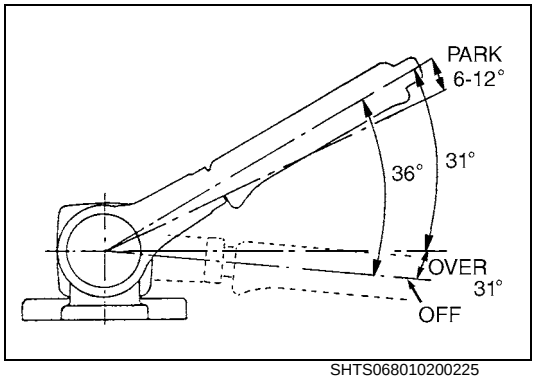
c. Shim



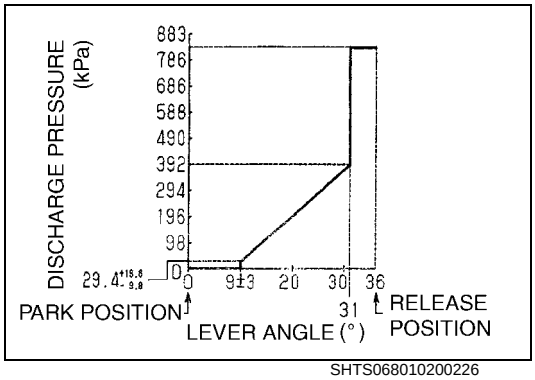
SHTS068010200224

3. SPRING BRAKE CONTROL VALVE PERFORMANCE TEST

(1) First, connect the pressure gauge to the outlet line and apply an air pressure of 834 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} to the inlet line.



SHTS068010200225



SHTS068010200226

(2) Move the spring brake control lever towards the OFF position, gradually and confirm that the air pressure in the outlet line meets the characteristic shown in figure.
Standard:

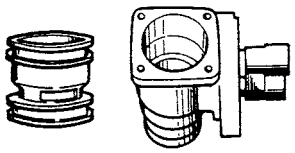
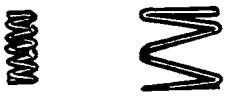
Lever angle:	Outlet pressure: kPa {kgf/cm^2, lbf/in.^{2}}
6-12°	19.6-49 {0.2-0.5, 2.85-7.11}
Over 31°	686 {7.0, 99.54}

NOTICE
The characteristic shown is under the inlet pressure of 834 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}}

INSPECTION AND REPAIR

EN0680102H300020

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Piston and valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam, pin and cam holder: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston spring: Rust, damage and measure the spring free length	**Free length 27.9 {1.098}**	**25.0 {0.984}**	**Replace, if necessary.**	**Measure and visual check** 
Feed valve spring and valve seat spring: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

RELAY VALVE (FOR SPRING BRAKE CHAMBER)

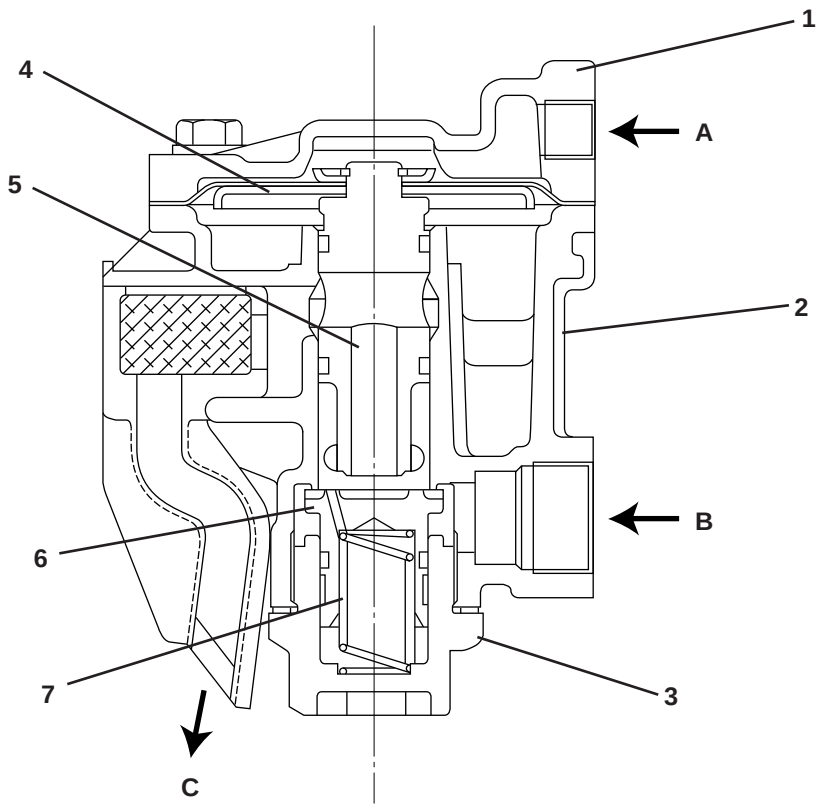
DATA AND SPECIFICATIONS

EN0680102I200017

Type	**Diaphragm type**
Pressure difference between signal and outlet pressure	**Less than 29 kPa {0.3 kgf/cm^2, 4.26 lbf/in.^{2}}**

DESCRIPTION

EN0680102C100017

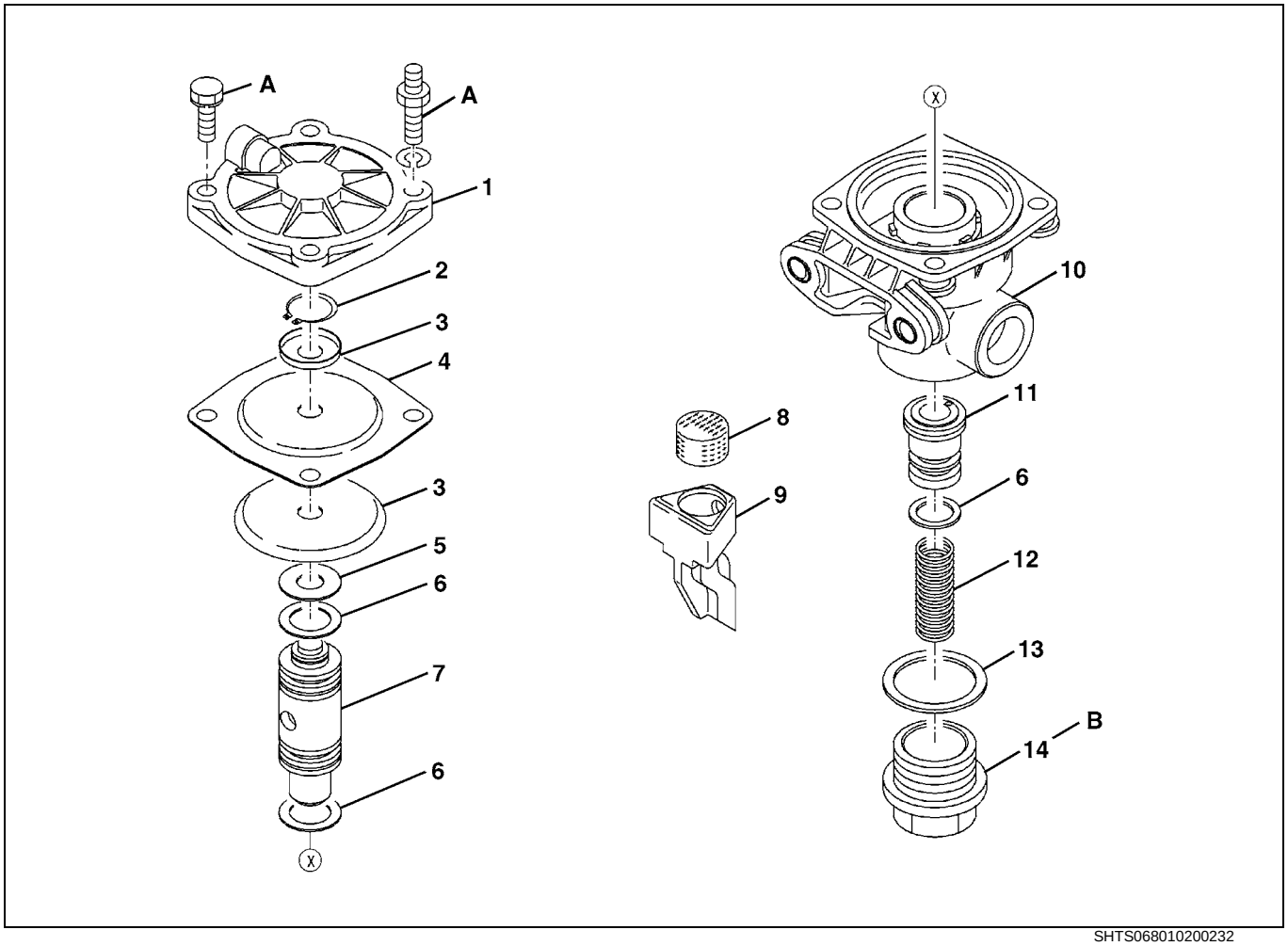


SHTS068010200231

1	**Cover**	**6**	**Feed valve**
2	**Body**	**7**	**Return spring**
3	**Cap**	**A**	**Signal air**
4	**Diaphragm**	**B**	**Inlet air**
5	**Exhaust valve**	**C**	**Exhaust**

COMPONENT LOCATOR

EN0680102D100016



SHTS068010200232

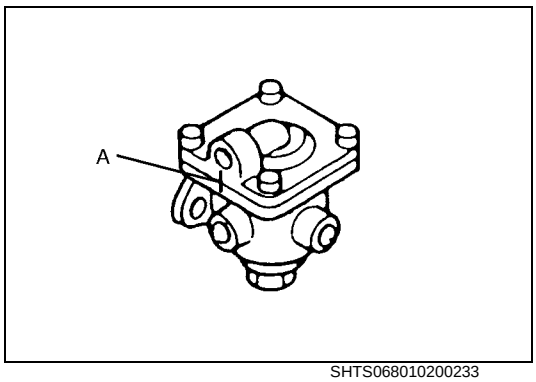
1	Cover	8	Filter
2	Retainer ring	9	Dust cover
3	Washer	10	Body
4	Diaphragm	11	Feed valve
5	Shim	12	Return spring
6	O-ring	13	Gasket
7	Exhaust valve	14	Cap

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

A	11.8-14.7 {120-150, 9-10}	B	58.8-78.4 {600-799, 44-57}

OVERHAUL

EN0680102H200012

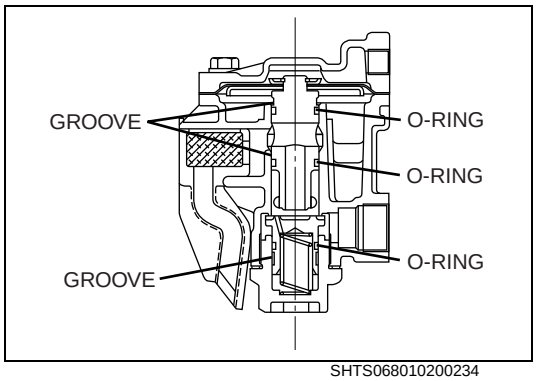


SHTS068010200233

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark A to the cover and body.



SHTS068010200234

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

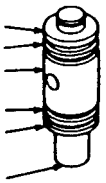
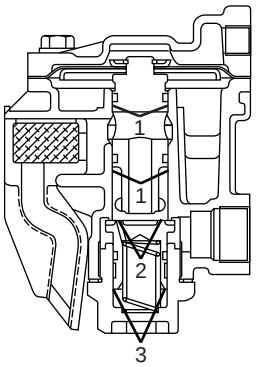
(1) When reassembling the relay valve, replace the O-rings, diaphragm, gasket and feed valve with new ones.

(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680102H300021

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surfaces and valve contact surfaces of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve Body, Sliding surfaces 1 and valve contact surfaces 2: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cap, Sliding surfaces 3: Wear and damage	**—**	**—**	**Replace, if necessary.**	

RELAY VALVE (FOR WABCO ABS)

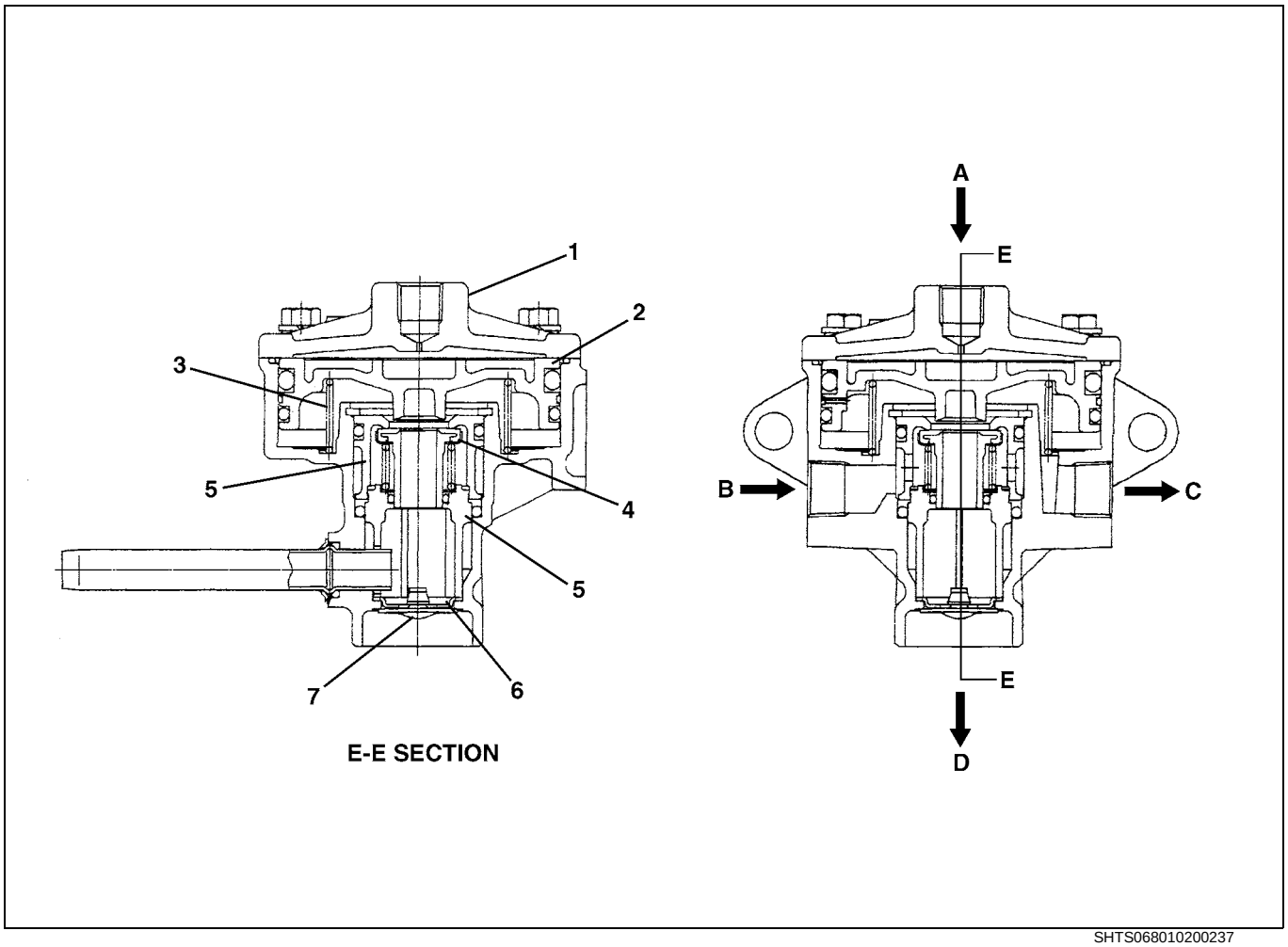
DATA AND SPECIFICATION

EN0680102I200018

Type	Piston type

DESCRIPTION

EN0680102C100018

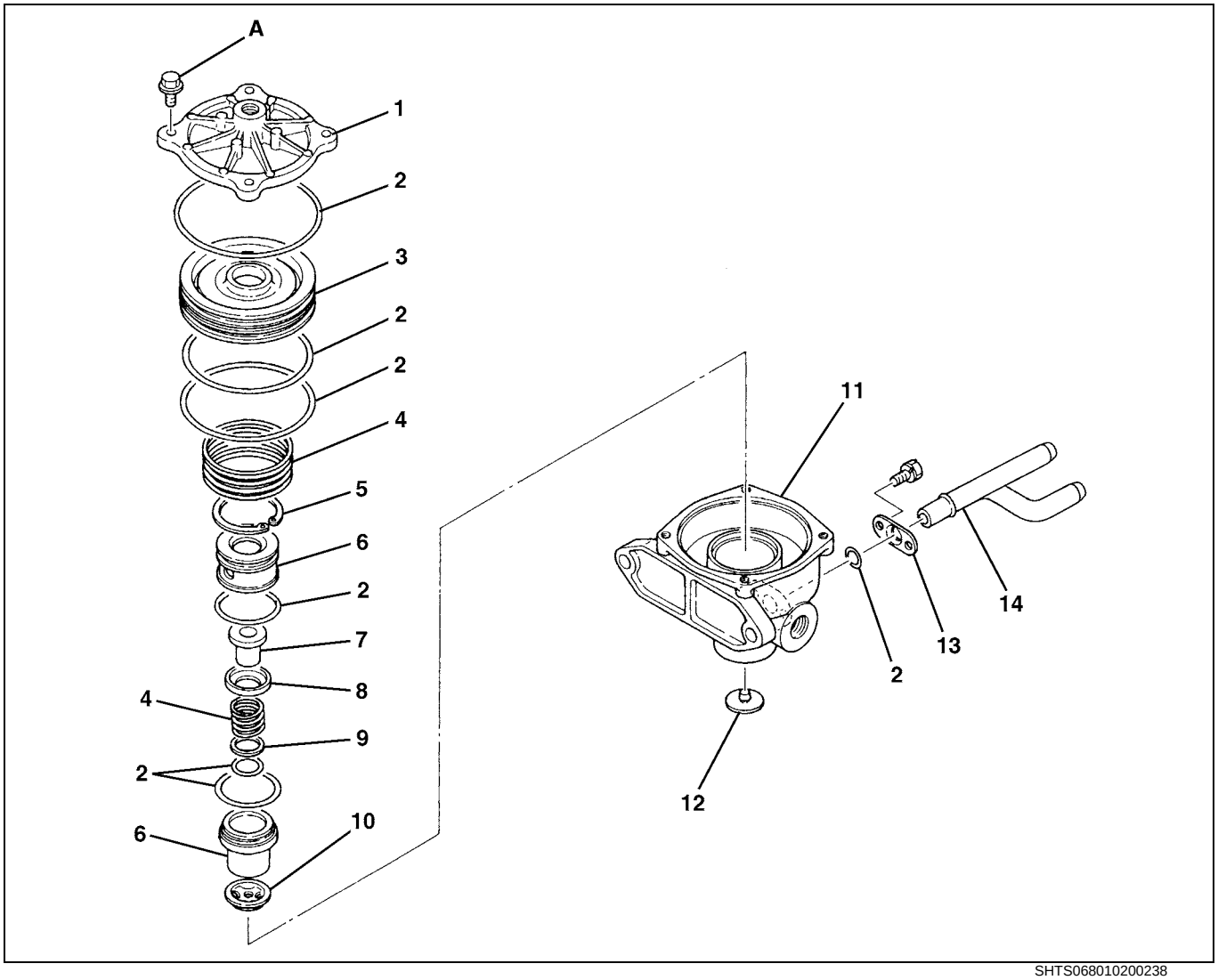


SHTS068010200237

1	Cover	7	Check valve
2	Piston	A	Signal (From brake valve)
3	Spring	B	Inlet (From air tank)
4	Feed valve	C	Outlet (To ABS control valve)
5	Body valve	D	Exhaust
6	Dust seal		

COMPONENT LOCATOR

EN0680102D100017



SHTS068010200238

1	Cover	8	Ring
2	O-ring	9	Washer
3	Piston	10	Dust seal
4	Spring	11	Valve body
5	Retainer ring	12	Check valve
6	Body valve	13	Connector
7	Feed valve	14	Pipe

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

A	5.9-7.4 {60-75, 4.4-5.4}		

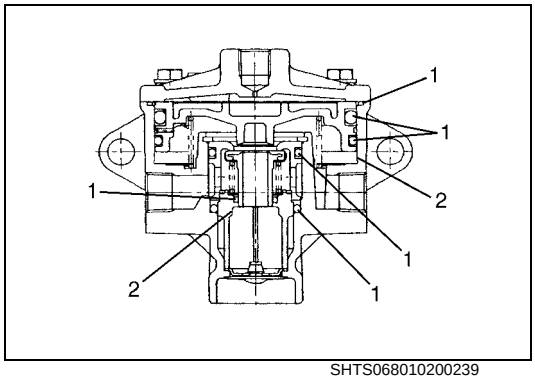
OVERHAUL

EN0680102H200013

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark to the cover and valve body.



SHTS068010200239

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When reassembling the relay valve, replace the O-rings and feed valve with new ones

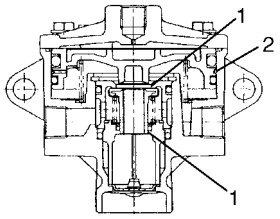
(2) Apply adequate amount of the valiant grease S-1 (manufactured by Showa Shell Sekiyu) or equivalent to the O-rings, grease groove and sliding surfaces of the component parts.

1. O-ring
2. Sliding surface

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680102H300022

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surfaces and valve contact surfaces of feed valve 1: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston, valve body, sliding surfaces 2: Wear and damage				

RELAY VALVE (FOR TRAILER BRAKE)

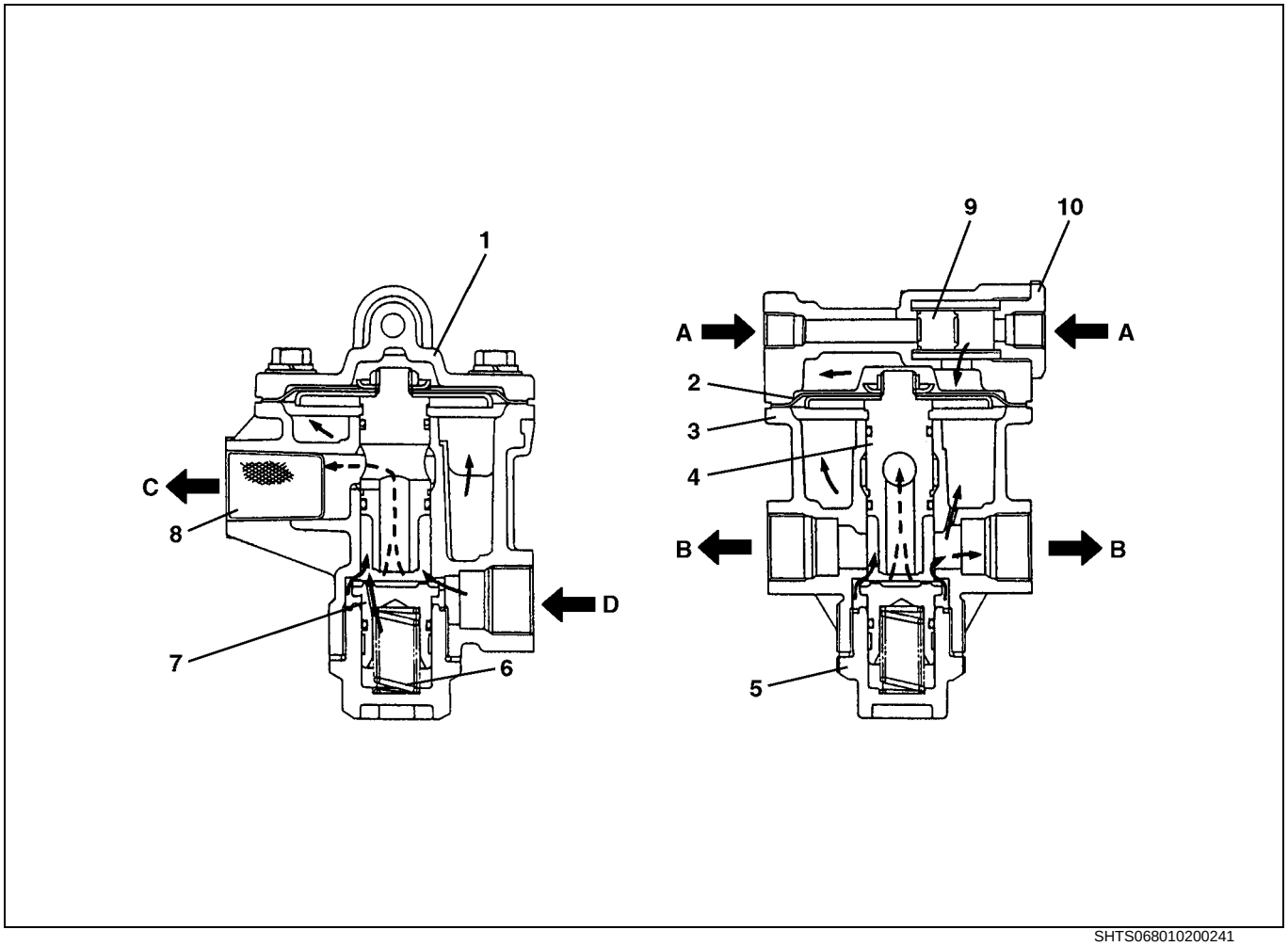
DATA AND SPECIFICATIONS

EN0680102I200019

Type	**Diaphragm type with double check valve combined**
Pressure difference between signal and outlet pressure	**29.4 kPa {0.3 kgf/cm^2, 4.26 lbf/in.^{2}}**

DESCRIPTION

EN0680102C100019

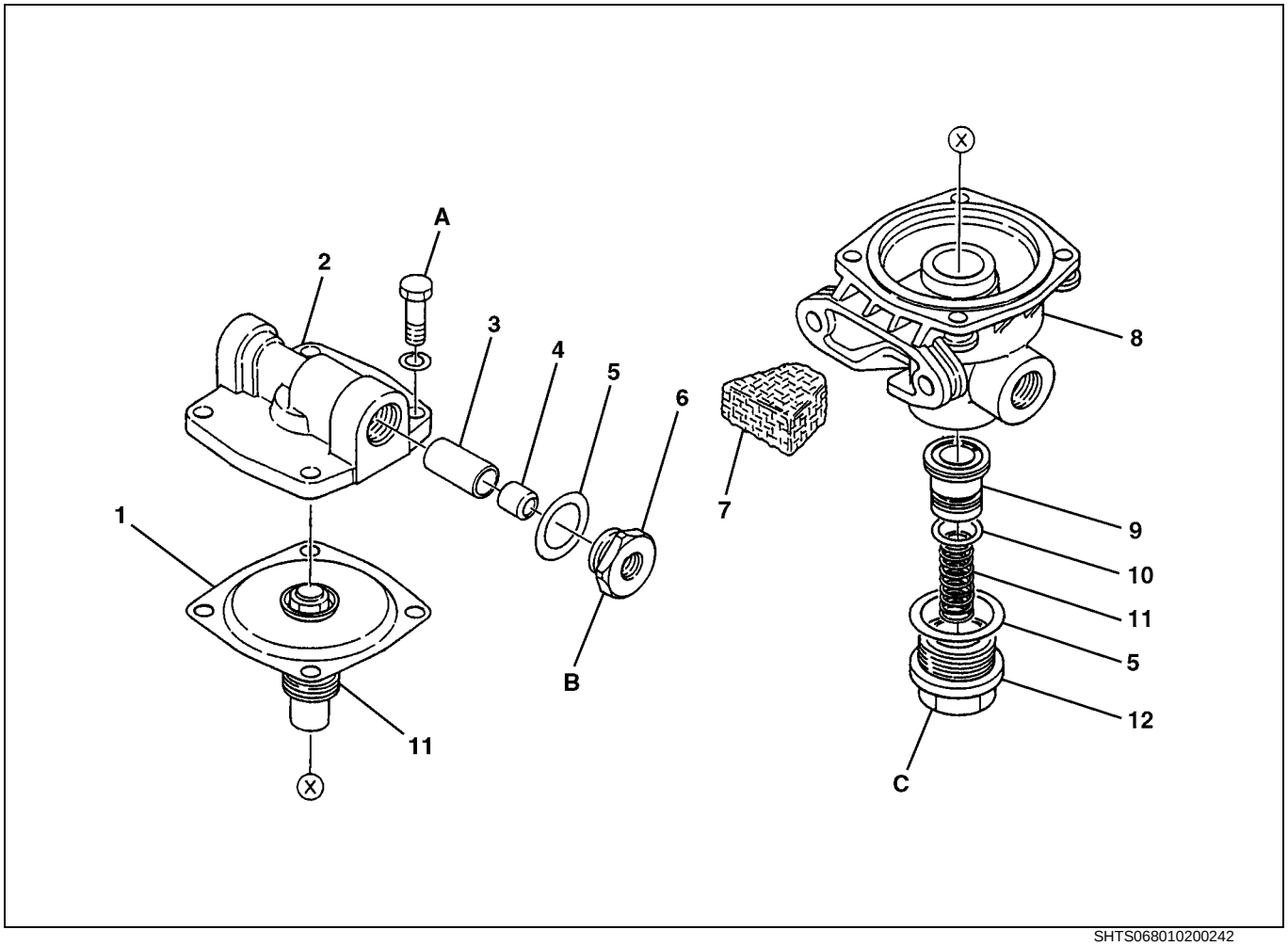


SHTS068010200241

1	**Cover**	**8**	**Filter**
2	**Diaphragm**	**9**	**Valve**
3	**Valve body**	**10**	**Plug**
4	**Valve sub assembly**	**A**	**Signal**
5	**Valve cap**	**B**	**Outlet**
6	**Spring**	**C**	**Exhaust**
7	**Valve**	**D**	**Inlet**

COMPONENT LOCATOR

EN0680102D100018



SHTS068010200242

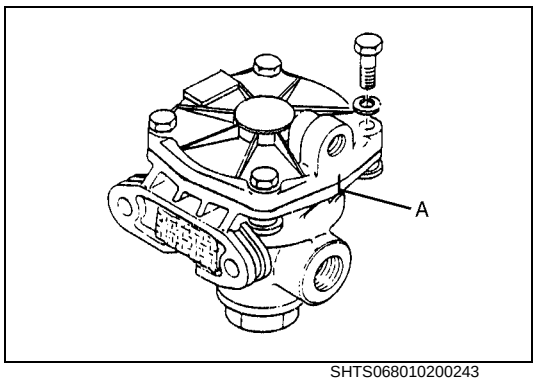
1	Valve sub assembly	7	Filter
2	Cover	8	Valve body
3	Guide	9	Valve
4	Valve	10	O-ring
5	Gasket	11	Spring
6	Plug	12	Valve cap

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

A	11.8-14.7 {120-150, 9-10}	C	58.8-78.4 {600-800, 44-57}
B	34.3-44.1 {350-450, 26-32}		

OVERHAUL

EN0680102H200014

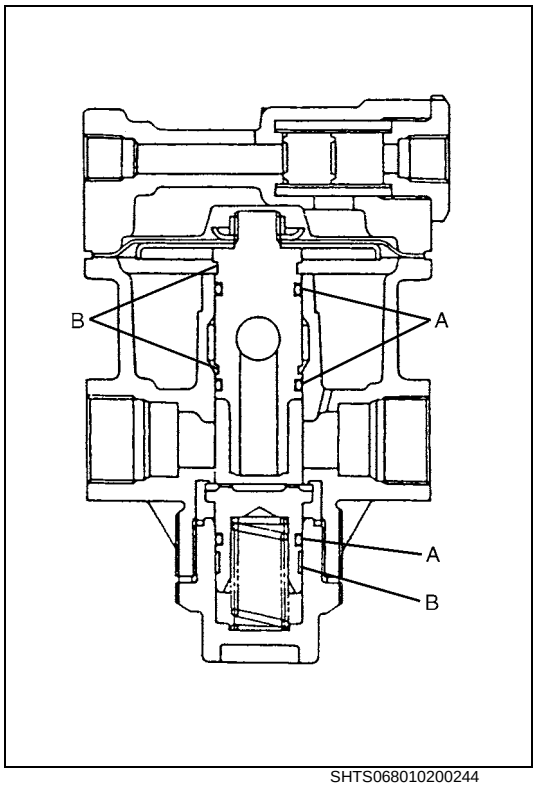


SHTS068010200243

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, mark the aligning marks "A" on the cover and valve body.



SHTS068010200244

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

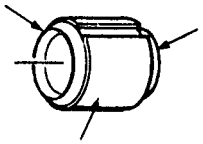
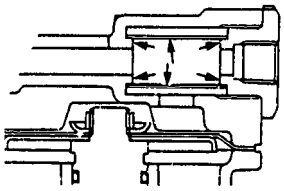
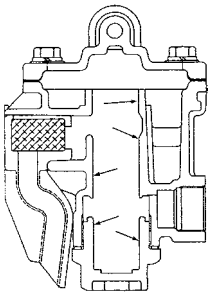
(1) When assembling the relay valve, use new O-rings and valves.

(2) Apply the silicone grease to each sliding surface of the component parts and O-ring groove.
A: O-ring
B: Apply the silicone grease

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680102H300023

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Check valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cover, guide and plug: Damage, wear and rust	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Spring: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Relay valve body and cap sliding surface: Damage, wear and rust	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 

SPRING BRAKE CHAMBER

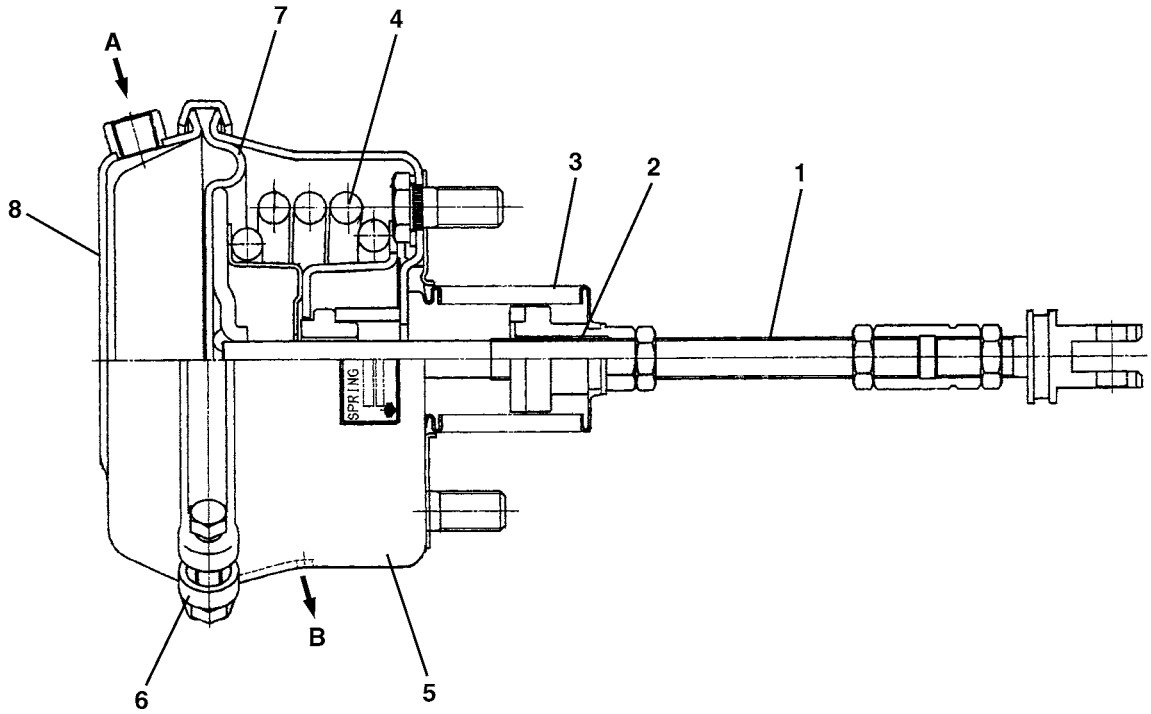
DATA AND SPECIFICATION

EN0680102I200020

Type	**Diaphragm type**

DESCRIPTION

EN0680102C100020

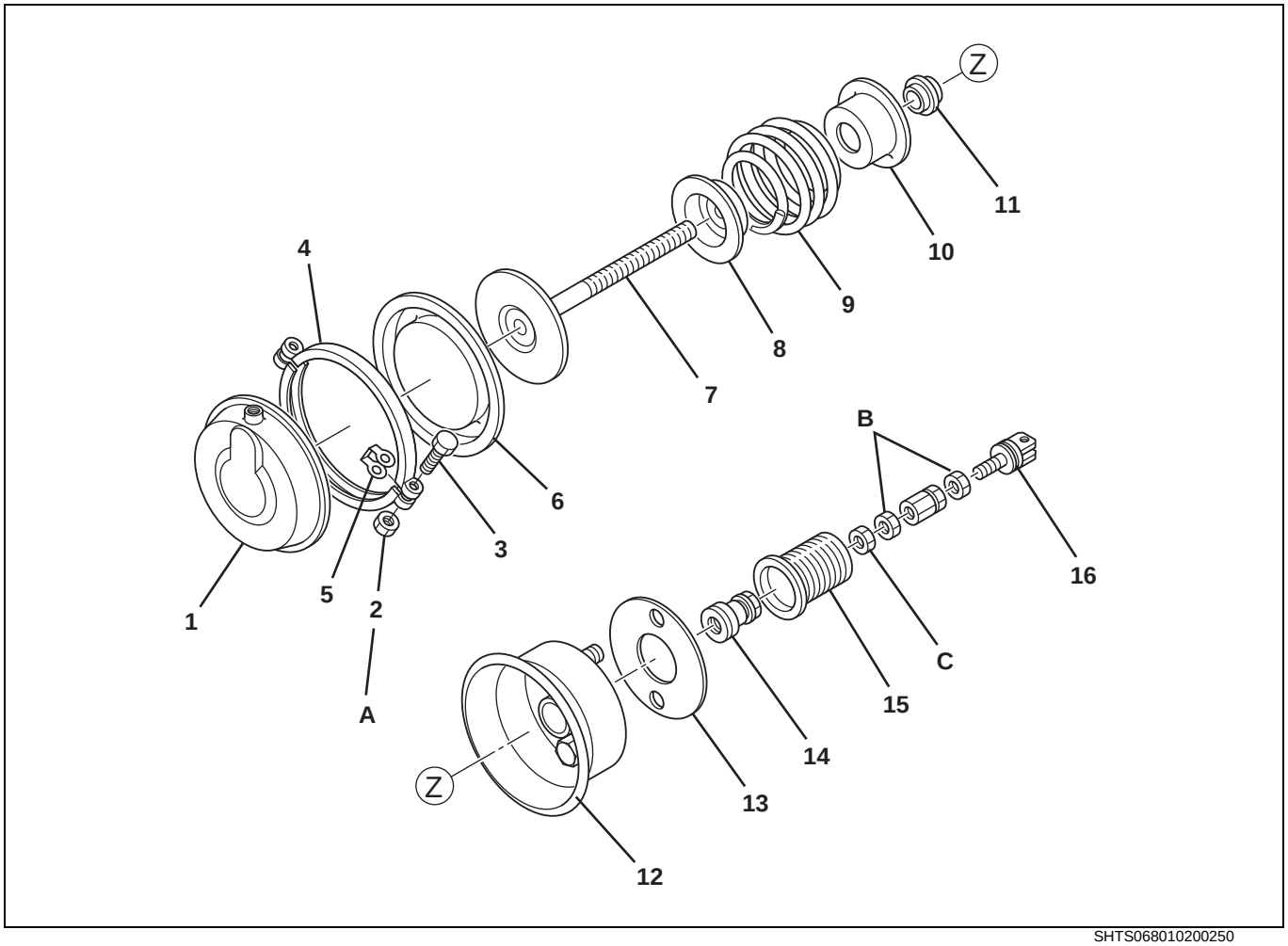


SHTS068010200249

1	**Push rod**	**6**	**Clamp**
2	**Guide**	**7**	**Diaphragm**
3	**Dust boot**	**8**	**Pressure plate**
4	**Return spring**	**A**	**Inlet**
5	**Chamber**	**B**	**Drain hole**

COMPONENT LOCATOR

EN0680102D100019



SHTS068010200250

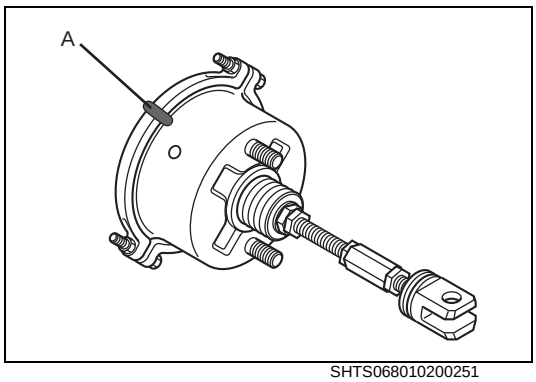
1	Pressure plate	9	Return spring
2	Clamp nut	10	Spring seat
3	Clamp bolt	11	Guide
4	Clamp	12	Chamber
5	Spacer	13	Boot retainer
6	Diaphragm	14	Rod holder
7	Push rod	15	Dust boot
8	Spring holder	16	Clevis

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

A	26.5-32.3 {270-330, 20-23}	C	50-68 {510-693, 37-50}
B	50-68 {510-693, 37-50}		

OVERHAUL

EN0680102H200015



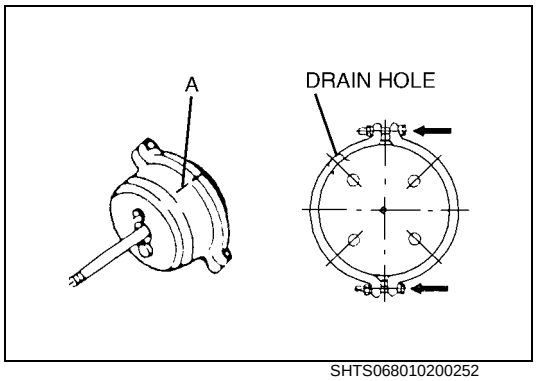
SHTS068010200251

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING OF THE SPRING BRAKE CHAMBER

(1) Before dismounting, apply an aligning mark A to chamber, clamp and chamber cover.

(2) Apply a position mark R or L to make clear the side where the chamber was installed.



SHTS068010200252

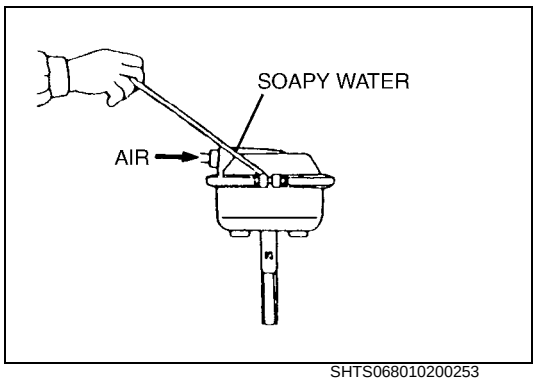
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLING THE SPRING BRAKE CHAMBER

(1) Replace the diaphragm with new one.

(2) Coincide the aligning mark A of the chamber, clamp and chamber cover.

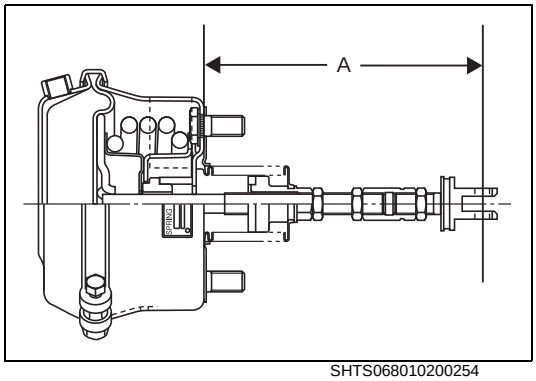
(3) Insert the bolt from opposite side of drain hole and tighten the bolts evenly with nut within specified torque.



SHTS068010200253

2. CHECKING FOR AIR LEAKAGE

(1) Apply soapy water for joint part of chamber and charge the compressed air of 835 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} from the inlet port then check the leakage.



SHTS068010200254

3. INSTALLATION OF CLEVIS.

(1) Install the clevis to the push rod and adjust the dimension A for specified value.
Assembly standard: A = 273.5 mm {10.768 in.}

IMPORTANT POINT - MOUNTING

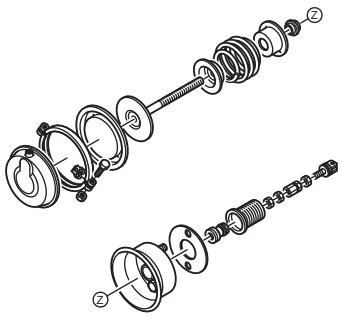
The chamber should be installed for former side.

NOTICE

See the position mark (R or L) which was applied at dismounting.

INSPECTION AND REPAIR

EN0680102H300024

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Cover, clamp, push rod, compression spring, retainer, dust seal, holder and chamber: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

TRAILER HAND BRAKE CONTROL VALVE (MODEL: FM2P)

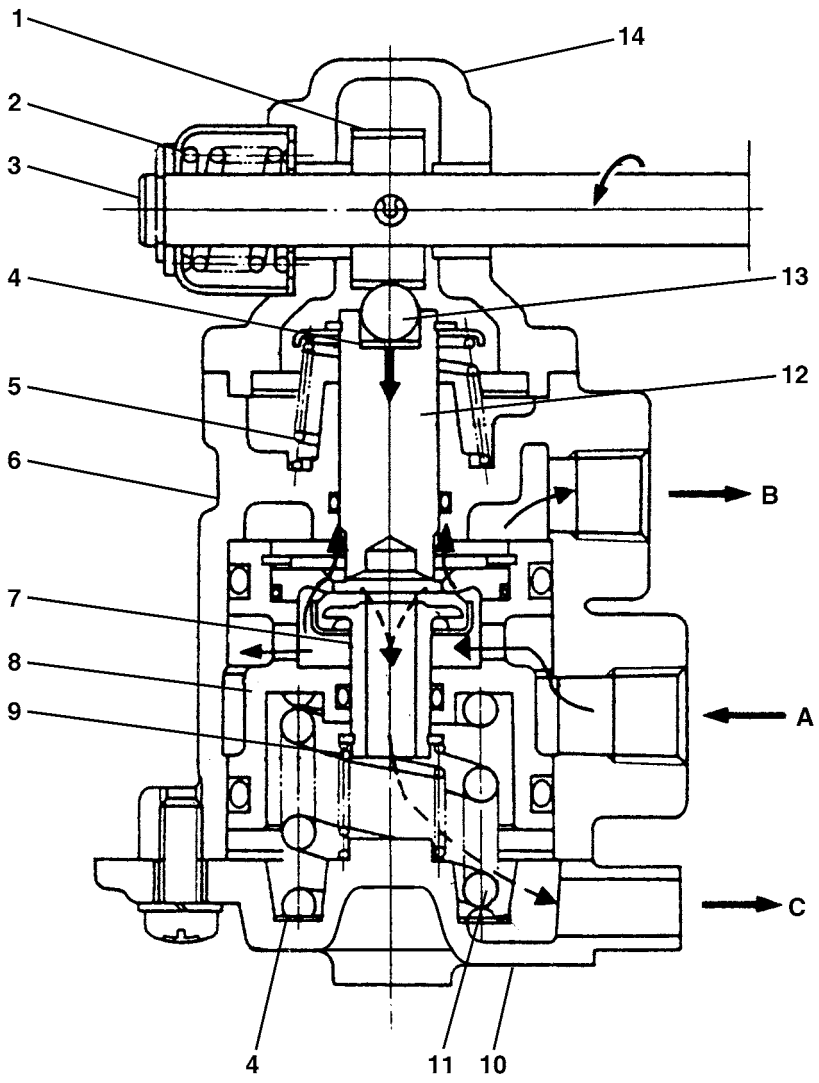
DATA AND SPECIFICATION

EN0680102I200021

Type	**Variable pressure control type**

DESCRIPTION

EN0680102C100021

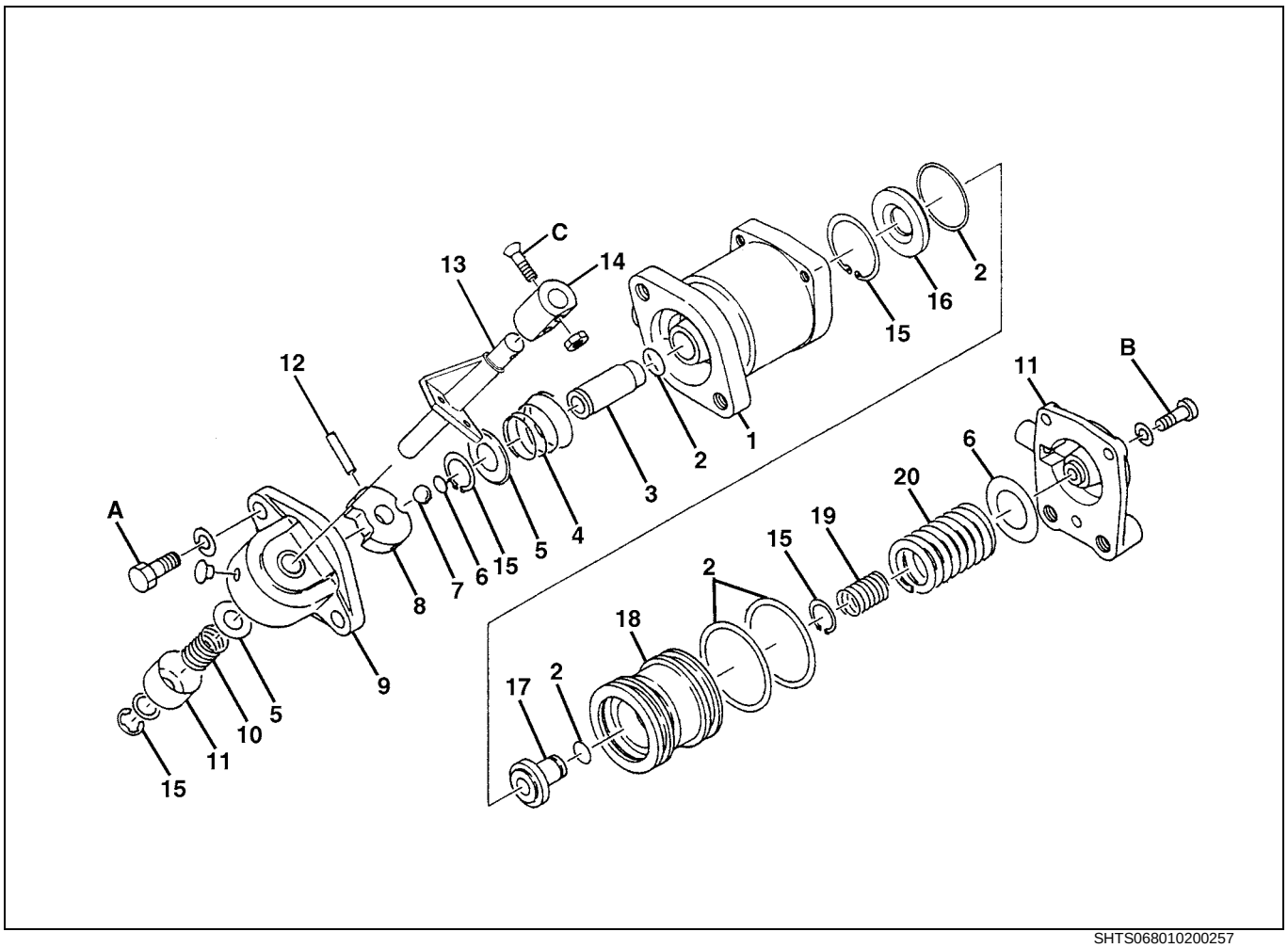


SHTS068010200256

1	Cam	7	Feed valve	13	Steel ball
2	Spring	8	Piston	14	Holder
3	Handle	9	Inner spring	A	Inlet
4	Shim	10	Cover	B	Outlet
5	Conical spring	11	Outlet spring	C	Exhaust
6	Valve body	12	Exhaust valve		

COMPONENT LOCATOR

EN0680102D100020



SHTS068010200257

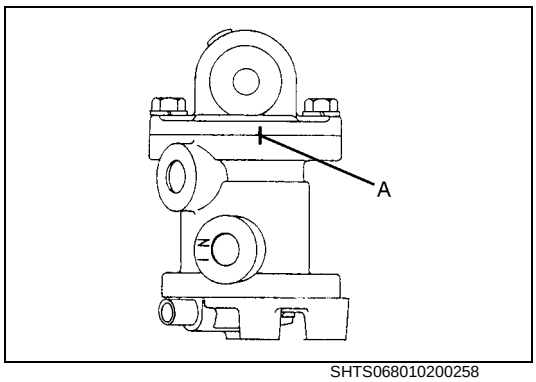
1	Valve body	8	Cam	15	Retainer ring
2	O-ring	9	Holder	16	Valve seat
3	Exhaust valve	10	Spring	17	Feed valve
4	Conical spring	11	Cover	18	Piston
5	Spring seat	12	Pin	19	Inner spring
6	Shim	13	Handle	20	Outer spring
7	Steel ball	14	Connector		

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

A	9.9-19.6 {100-200, 8-14}	C	2.5-3.9 {25-40, 1.9-2.8}
B	5.4-7.3 {55-75, 4.0-5.4}		

OVERHAUL

EN0680102H200016

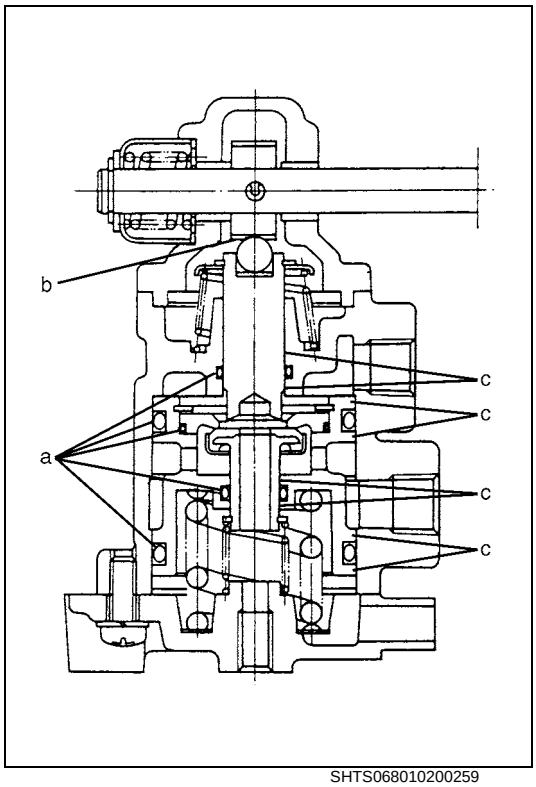


SHTS068010200258

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the hand brake valve, mark the aligning mark "A" on the holder and valve body.



SHTS068010200259

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When assembling the hand brake valve, use new O-ring and feed valve.

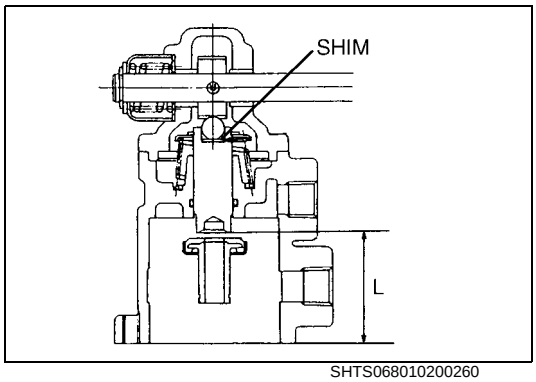
(2) Apply silicone grease to each sliding surface of the component parts and O-ring groove.

a. **O-ring**

b. **Contact of steel ball**

c. **Sliding surface**

(3) Align the aligning mark of the holder and valve body.



SHTS068010200260

IMPORTANT POINTS - ADJUSTMENT

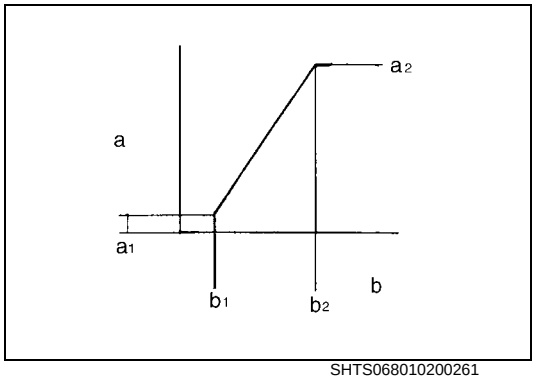
1. EXHAUST VALVE FITTING HEIGHT

(1) Measure the exhaust valve fitting height "L" and adjust it.

NOTICE

Adjust this dimension with shims.

L: 38.3-38.7 mm {1.508-1.523 in.}



SHTS068010200261

2. HAND BRAKE VALVE PERFORMANCE CHARACTERISTIC

a. **Air pressure at outlet port (kPa {kgf/cm^2, lbf/in.^{2}})**

b. **Handle turning angle (°)**

a	**(a_1) 19.6-68.6 {0.2-0.7, 2.8-9.9}**	**(a_2) 460.6-558.6 {4.7-5.7, 66.8-81.0}**
b	**(b_1) 7-13**	**(b_2) 37-43**

NOTICE

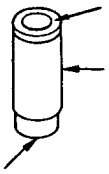
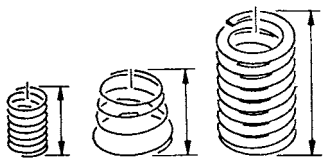
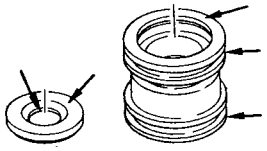
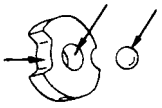
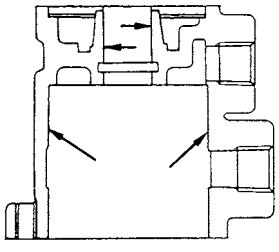
The characteristic shown in both diagrams are for inlet air pressure of 690 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}

The characteristic can be adjusted by changing the shim thickness of the steel ball and of the outer spring.

INSPECTION AND REPAIR

EN0680102H300025

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring: Rust and damage Measure the spring dimension.	**1. 28.5 {1.122} 2. 38 {1.496} 3. 31 {1.220}**	**27 {1.063} 35 {1.377} 29 {1.142}**	**Replace, if necessary.**	**Measure and visual check** 
Piston and valve seat: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam and steel ball: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body: Rust, wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE [MANUAL ADJUSTER (MODELS: FC, FD)]

DATA AND SPECIFICATIONS

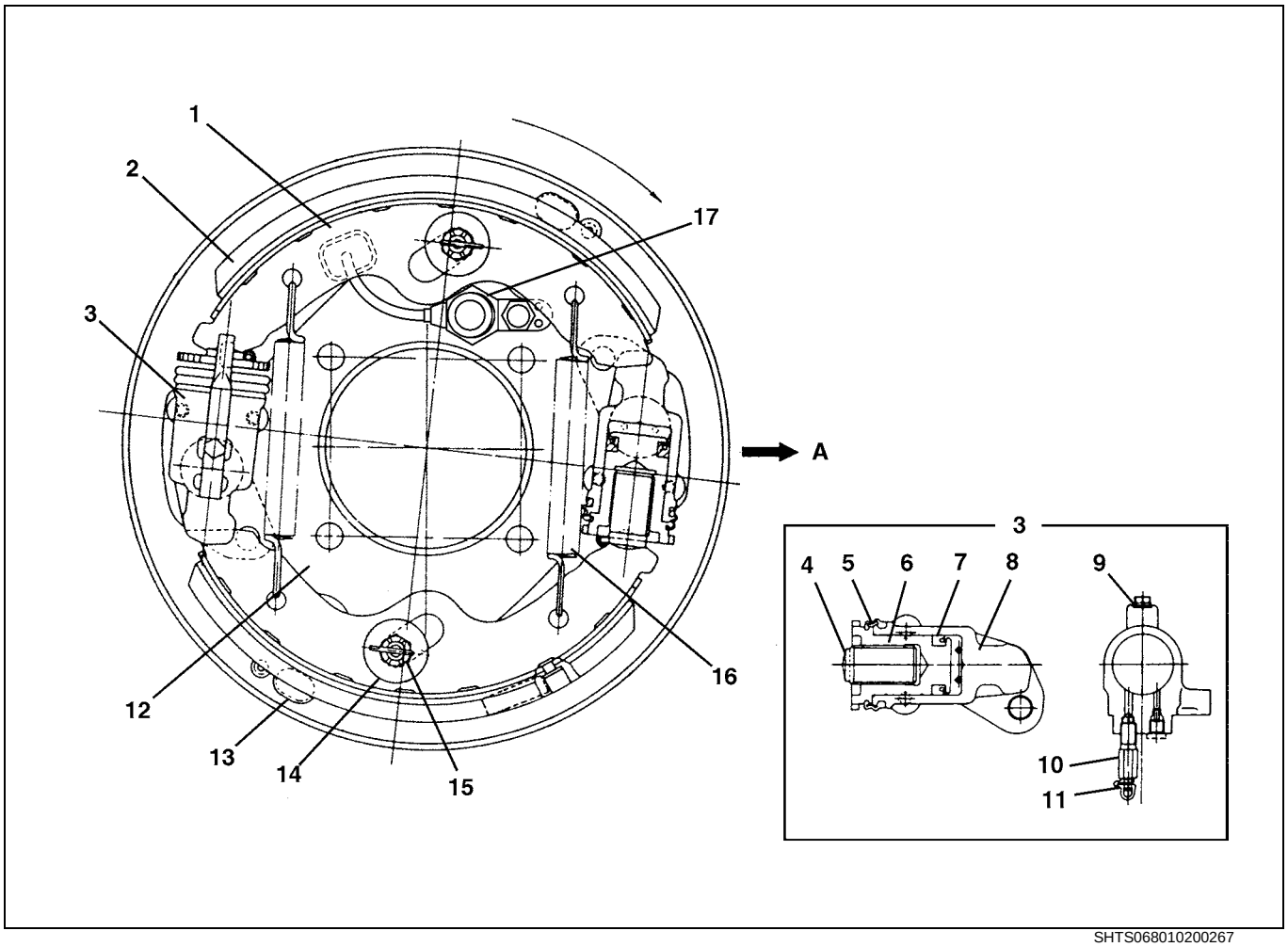
EN0680102I200022

Type		**Drum brake with hydraulically actuated, internally expanding, two-leading shoes in front wheels and dual two-leading shoes in rear wheels.**
Brake drum inside diameter		**320.0 mm {12.59 in.} for both front and rear.**
Brake lining (Width x Thickness)	**Front**	**110 x 13 mm {4.33 x 0.51 in.}**
	Rear	**145 x 13 mm {5.71 x 0.51 in.}**
Wheel cylinder bore diameter	**Front**	**36.51 mm {1.437 in.}**
	Rear	**38.10 mm {1.50 in.}**

DESCRIPTION

EN0680102C100022

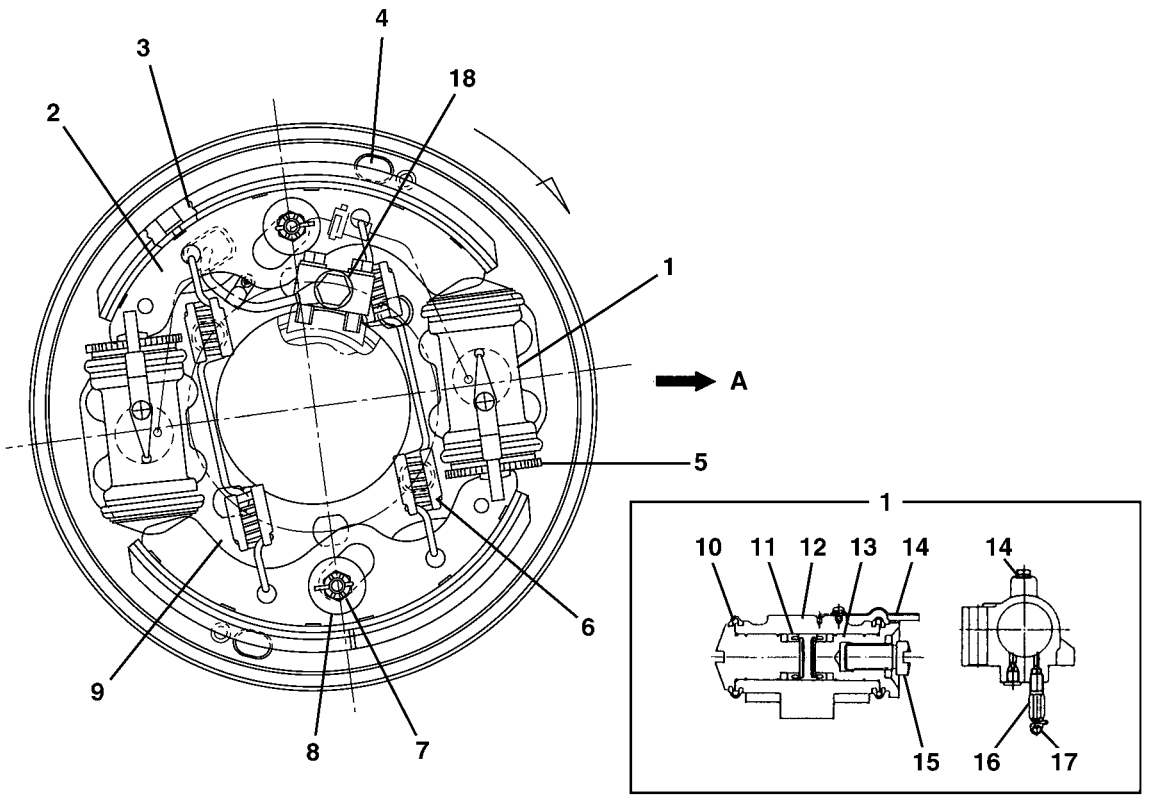
FRONT



SHTS068010200267

1	Brake shoe	10	Air bleeder screw
2	Brake lining	11	Bleeder cap
3	Wheel cylinder assembly	12	Backing plate
4	Shoe adjusting bolt	13	Hole plug
5	Boot	14	Shoe hold down washer
6	Piston	15	Shoe hold down nut
7	Piston cup	16	Retracting spring
8	Cylinder	17	Wheel sensor (If so equipped)
9	Adjuster lock spring	A	Front

REAR



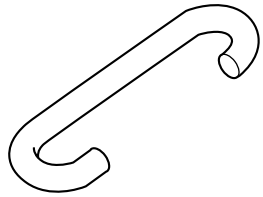
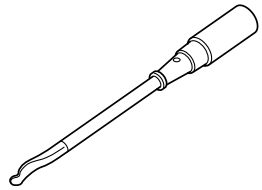
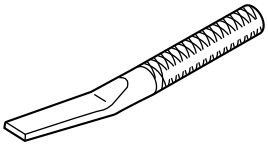
SHTS068010200268

1	Wheel cylinder assembly	11	Piston cup
2	Brake shoe	12	Cylinder
3	Brake lining	13	Piston
4	Hole plug	14	Adjuster lock spring
5	Shoe adjusting screw	15	Adjusting bolt
6	Shoe retracting spring	16	Air bleeder screw
7	Shoe hold down nut	17	Bleeder cap
8	Shoe hold down washer	18	Wheel sensor (If so equipped)
9	Backing plate	A	Front
10	Boot		

SPECIAL TOOL

EN0680102K100003

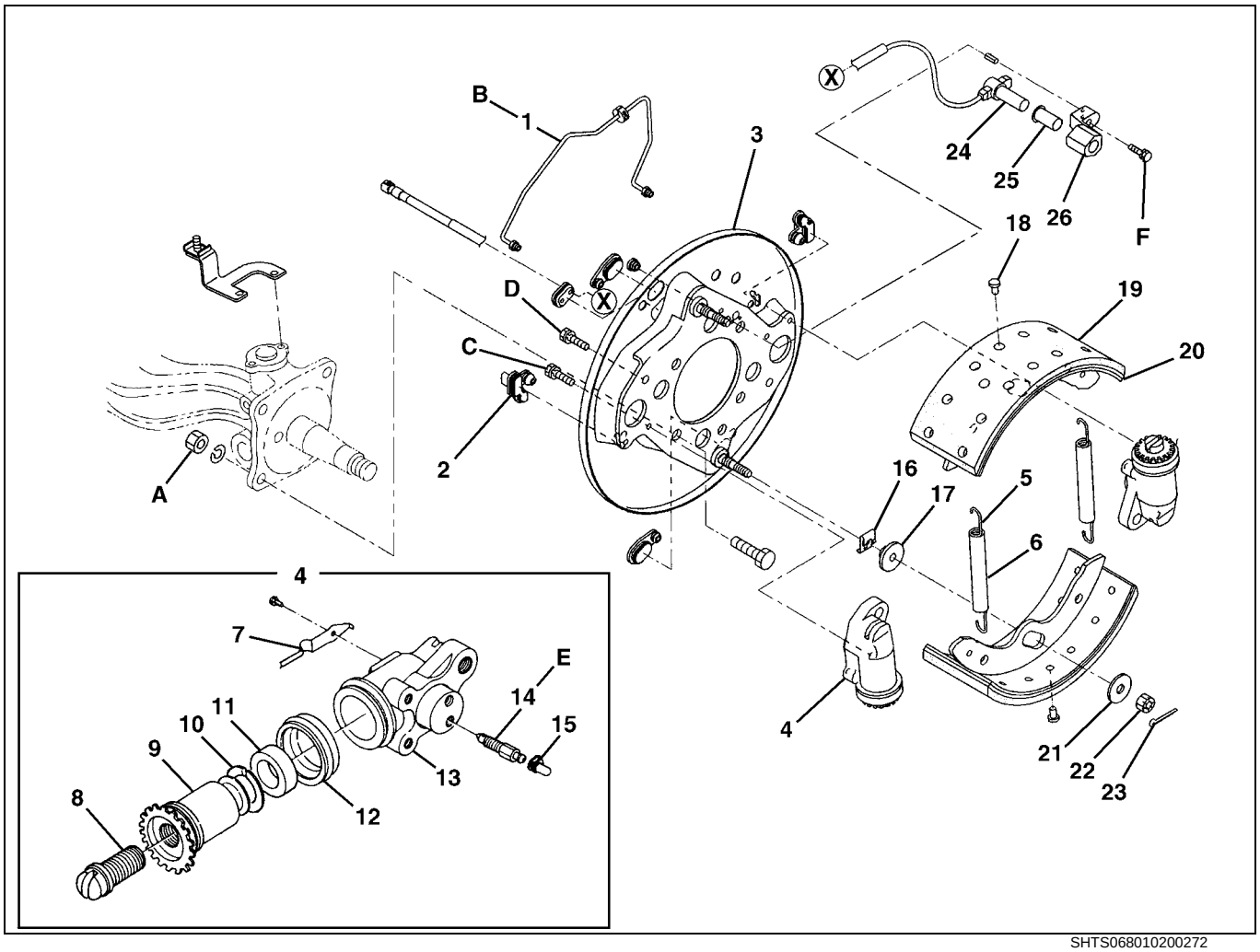
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-31100	HOOK	Use with S0968-31010
	S0968-31010	RETRACTING SPRING PULL BACK TOOL	
	S0965-51250	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN0680102D100021

FRONT



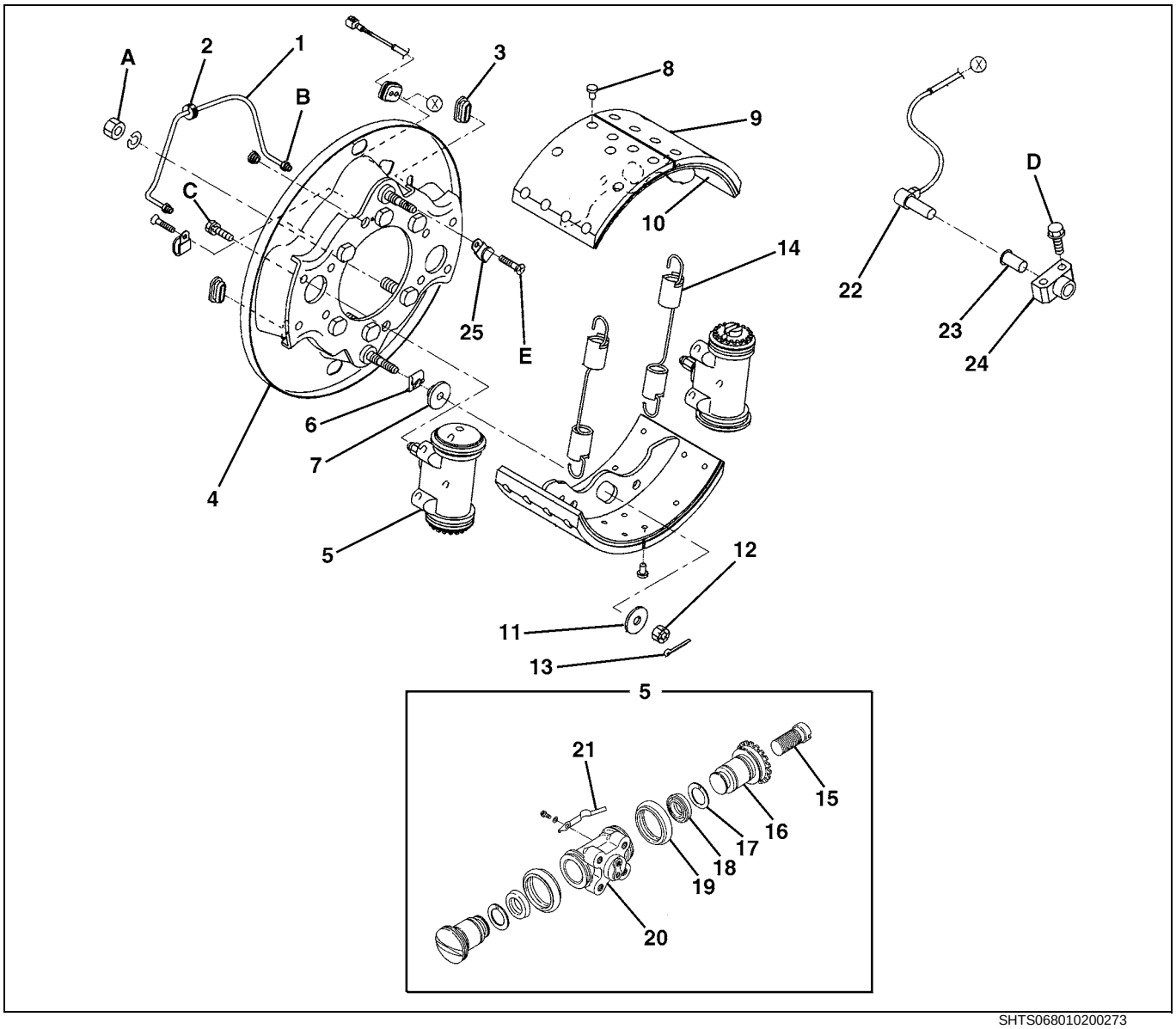
SHTS068010200272

1	Oil pipe	14	Air bleeder screw
2	Hole plug	15	Bleeder cap
3	Backing plate	16	Adjust spring
4	Wheel cylinder assembly	17	Adjusting nut
5	Shoe retracting spring	18	Rivet
6	Spring cover	19	Brake lining
7	Adjuster lock spring	20	Brake shoe
8	Shoe adjusting bolt	21	Shoe hold down washer
9	Piston	22	Shoe hold down nut
10	Back-up ring	23	Cotter pin
11	Piston cup	24	Wheel sensor (If so equipped)
12	Boot	25	Clamping bushing (If so equipped)
13	Cylinder	26	Wheel sensor holder (If so equipped)

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

A	148-196 {1,500-2,000, 109-144}	D	88.8-120.1 {905-1,225, 66-88}
B	12.7-17.7 {130-180, 10-13}	E	7.5-11.5 {70-120, 5.1-8.6}
C	16.7-24.5 {170-250, 13-18}	F	33.8-50.0 {350-510, 25-37}

REAR



SHTS068010200273

1	Oil pipe	14	Shoe retracting spring
2	Grommet	15	Shoe adjusting bolt
3	Hole plug	16	Piston
4	Backing plate	17	Back-up ring
5	Wheel cylinder assembly	18	Piston cup
6	Adjust spring	19	Boot
7	Adjusting nut	20	Cylinder
8	Rivet	21	Adjusting lock spring
9	Brake lining	22	Wheel sensor (If so equipped)
10	Brake shoe	23	Clamping busing (If so equipped)
11	Shoe hold down washer	24	Wheel sensor holder (If so equipped)
12	Shoe hold down nut	25	Clip
13	Cotter pin		

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

A	148-196 {1,500-2,000, 109-144}	D	34.5-51.5 {350-520, 25-38}
B	12.7-17.7 {130-180, 9.4-13}	E	1.3-1.9 {13-19, 1.0-1.4}
C	98.1-137.3 {1,000-1,400, 73-101}		

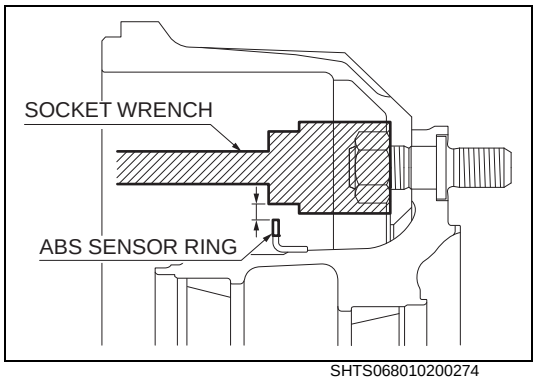
OVERHAUL

EN0680102H200017

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE TIRE.

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



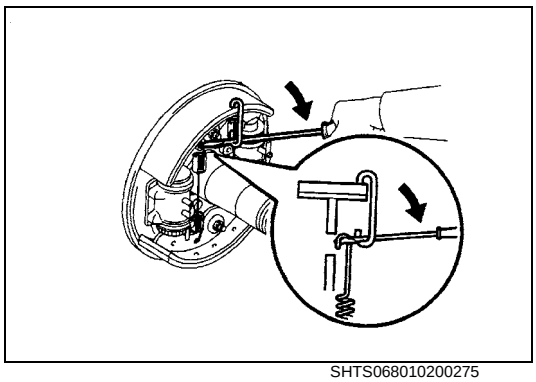
SHTS068010200274

2. REMOVE THE BRAKE DRUM.

NOTICE

(In case of models equipped with ABS;)

When mounting or dismounting the brake drum without removing the sensor ring, be careful not to damage the sensor ring by tools. If tools hit the sensor ring and damage it, ABS operation may be deteriorated.



SHTS068010200275

3. REMOVE THE BRAKE SHOE RETRACTING SPRING.

(1) Remove the retracting spring by using the special tools.
SST:
Hook (S0965-31100)
Retracting spring pull back tool (S0968-31010)

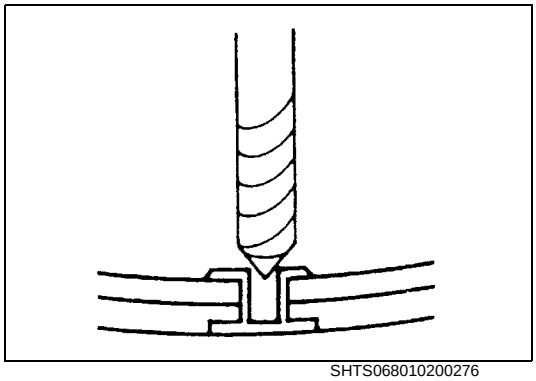
IMPORTANT POINTS - ASSEMBLY

1. REPLACE THE BRAKE LINING.

(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

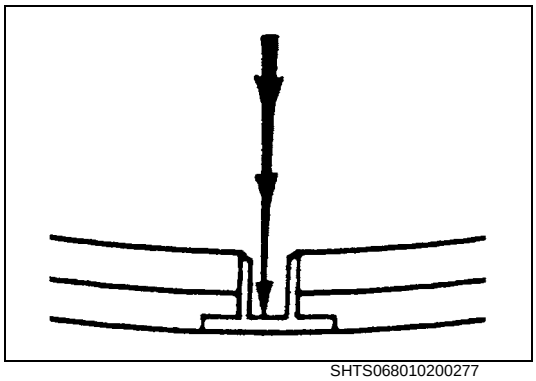
NOTICE

At this time, be careful not to scratch the brake shoe.

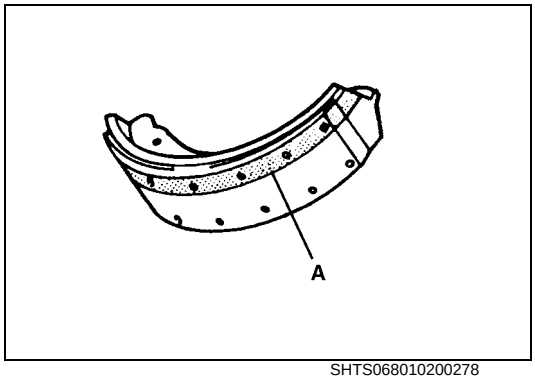


SHTS068010200276

(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.

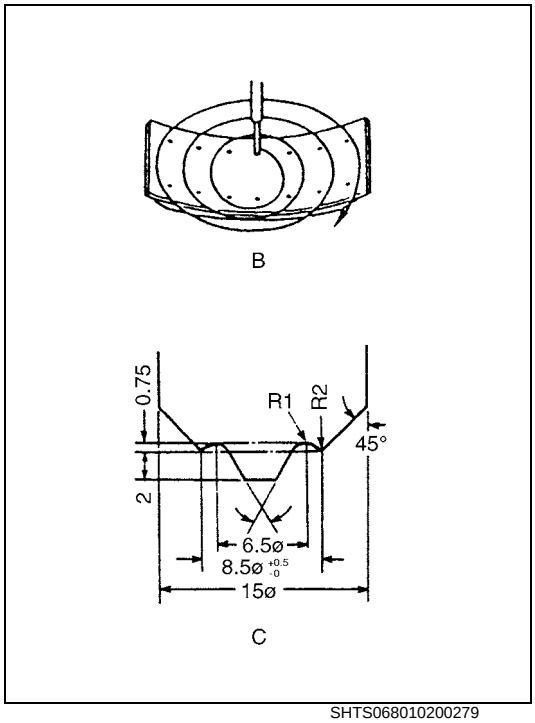


SHTS068010200277



SHTS068010200278

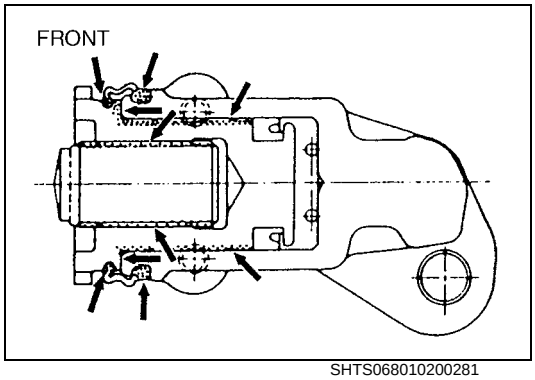
(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



SHTS068010200279

(4) Caulk the rivets lightly in a circular pattern as shown B; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in C.
Recommended force of staking the rivet: 2.4 tons

(5) Remove adhesive tape.



SHTS068010200281

2. ASSEMBLE THE WHEEL CYLINDER.

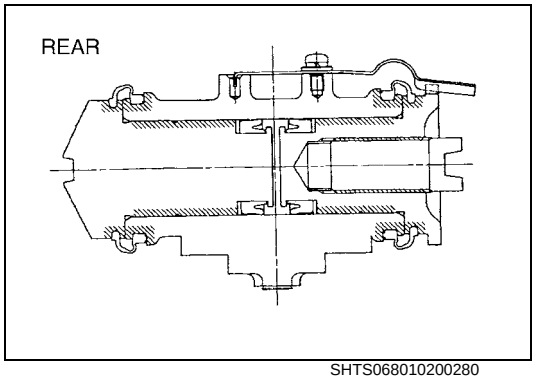
(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI No.20): S0415-61010

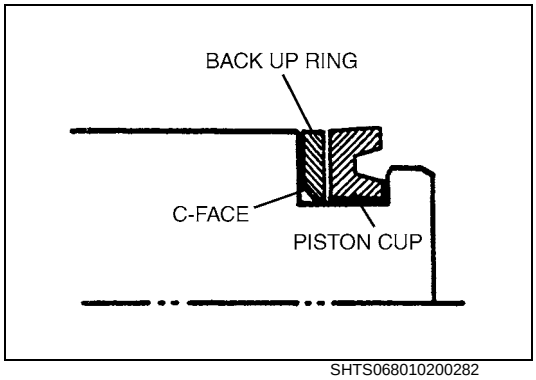
(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2): S0413-31080

NOTICE
The parts where the rubber grease shall be applied are shown in figure with arrows and oblique lines.

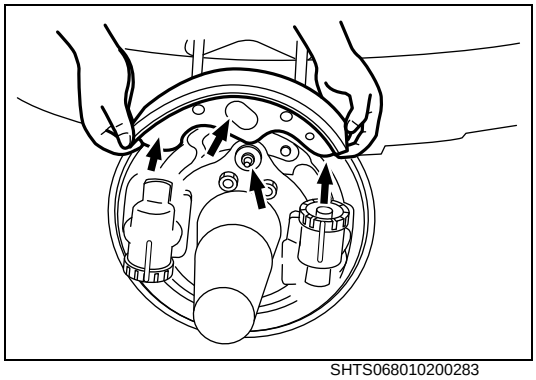


SHTS068010200280



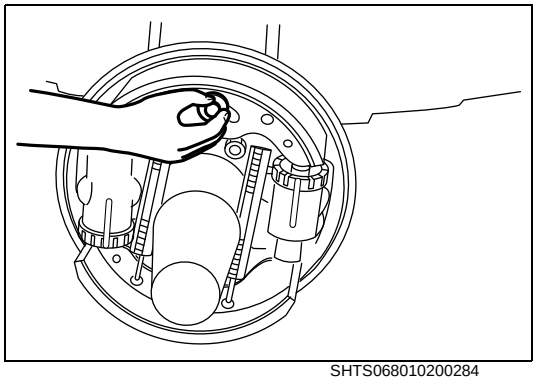
SHTS068010200282

(3) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.


SHTS068010200283

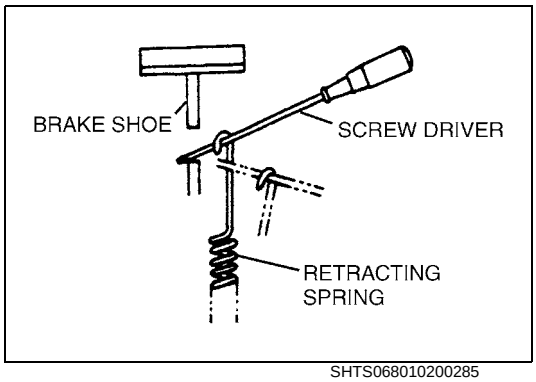
3. INSTALL THE BRAKE SHOE ASSEMBLY.

(1) Apply heat-resistant grease to both ends of the shoe web contacting with the piston, and to the top surface of the shoe web contacting the shoe hold washer.


SHTS068010200284

(2) Adjust the clearance between the hold down washer and the shoe.

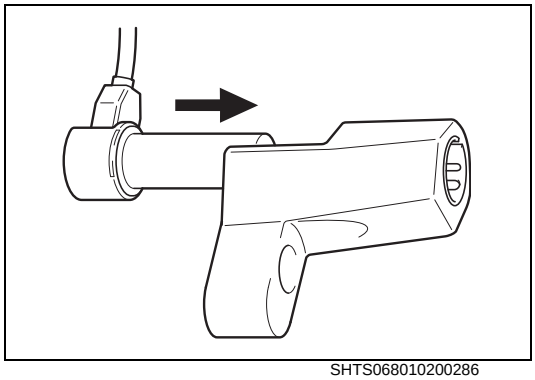
(3) Tighten the slotted nut and back off the nut by 1/3 turn, then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



SHTS068010200285

4. INSTALL THE BRAKE SHOE RETRACTING SPRING.

(1) Install the retracting spring using a screwdriver. After installing the spring, check that the end of the shoe web is securely set in the groove of the wheel cylinder piston. Also check that the hook of the spring is securely hooked in the hole of the shoe.



SHTS068010200286

5. INSTALL THE WHEEL SENSOR. (IF SO EQUIPPED)

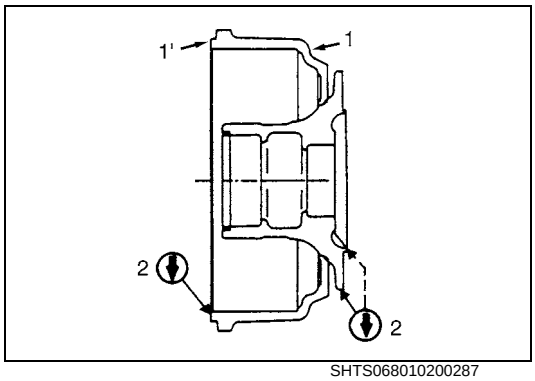
(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

(2) Push the wheel sensor forcefully into the clamping bussing until you feel that the wheel sensor has contact with the sensor ring.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place using a screwdriver, or the like. Doing so could damage the wheel sensor.

(3) Arrange the wire harness.



SHTS068010200287

6. ASSEMBLE THE BRAKE DRUM AND WHEEL HUB. (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in Figure. Install the drum according to NOTICE.

NOTICE

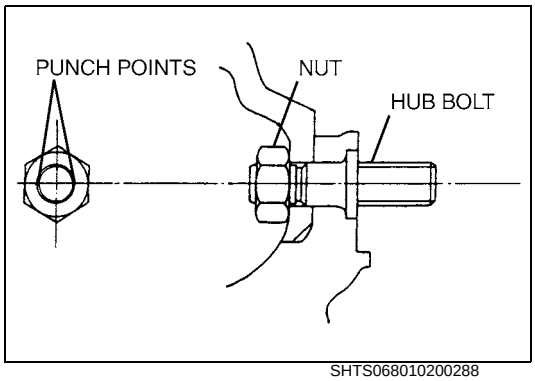
1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drums: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).



SHTS068010200288

(3) Caulk the hub and nuts as shown in figure, after tightening the brake drum and wheel hub.
Tightening Torque:
393-470 N·m {4,000-4,800 kgf·cm, 290-347 lbf·ft}

7. MOUNT THE WHEEL HUB WITH BRAKE DRUM.

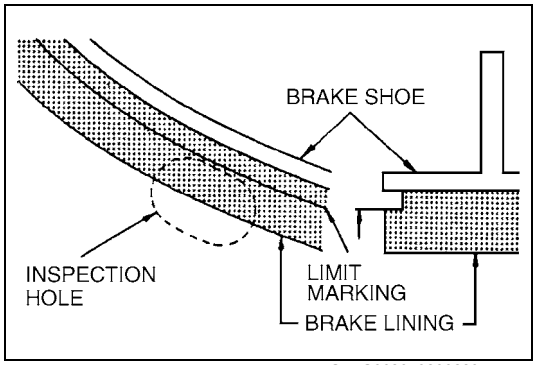
(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

8. MOUNT THE TIRE.

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

ADJUSTMENT

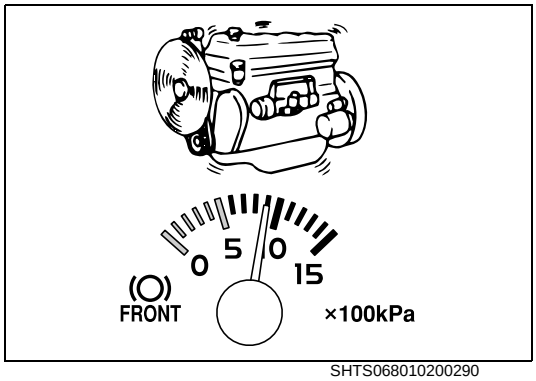
EN0680102H300026



SHTS068010200289

1. REMAINING THICKNESS OF THE BRAKE LINING

(1) Check remaining thickness of lining through the inspection hole of the backing plate. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made replace the lining.



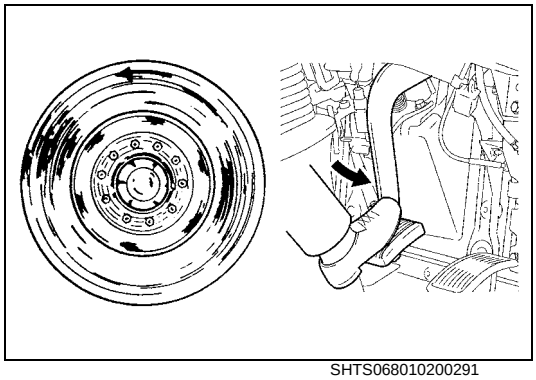
SHTS068010200290

2. AIR PRESSURE IN THE AIR TANK

(1) Operate the engine and obtain an air pressure of the 780-880 kPa {8.0-9.0 kgf/cm^2, 113-127 lbf/in.^{2}}

NOTICE

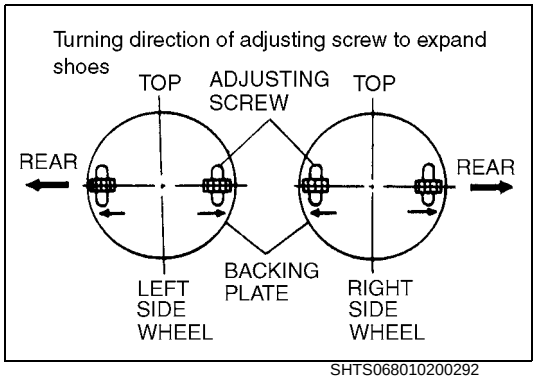
The specified air pressure in the air tank should be maintained when making the adjustment.


SHTS068010200291

3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM

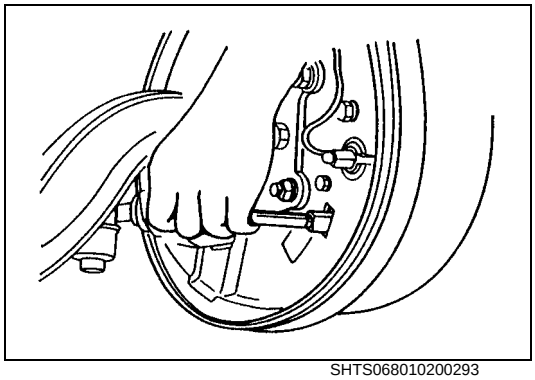
(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.



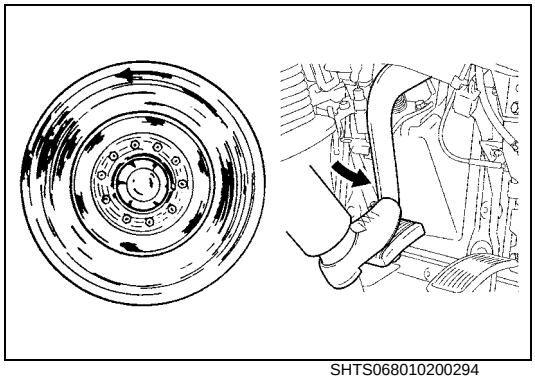
SHTS068010200292

(3) Turn the adjusting screw with an adjusting tool in the arrow direction, (The arrows are marked near the holes on the backing plate), and put the drum into a position as to turn slowly by hand.
SST: Brake shoe adjusting tool (S0966-51250)



SHTS068010200293

(4) Return the adjusting screw 5-7 notches in the reverse arrow direction.



SHTS068010200294

(5) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from (2).

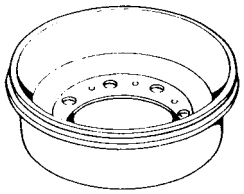
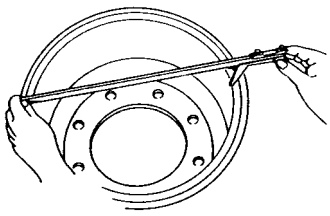
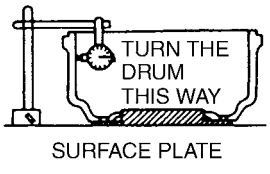
NOTICE
Using the same procedure as above, adjust the clearance for all wheels.

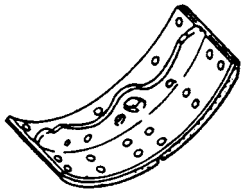
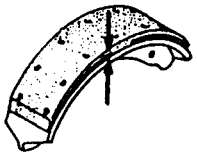
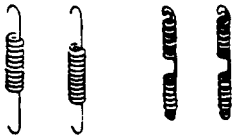
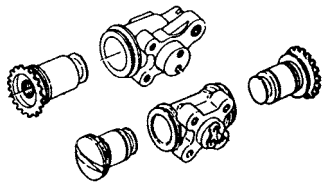
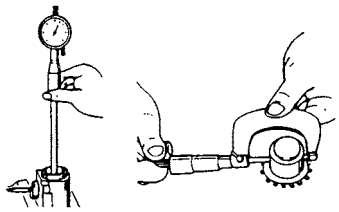
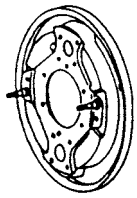
INSPECTION AND REPAIR

EN0680102H300027

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**320.0 {12.600}**	**322.0 {12.677}**	**Replace.**	**Measure** 
Brake drum runout	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure**  SURFACE PLATE

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**13.0 {0.512}**	**4.0 {0.1575}**	**Re-lining.**	**Measure** 
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**Front 0.03-0.13 {0.0012-0.0051} Rear 0.08-0.18 {0.0032-0.0070}**	**0.25 {0.0098}**	**Replace.**	**Measure** 
Backing plate and stud pins: Deformation, damage and any other abnormality	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE [AUTO ADJUSTER (MODELS: FC, FD)]

DATA AND SPECIFICATIONS

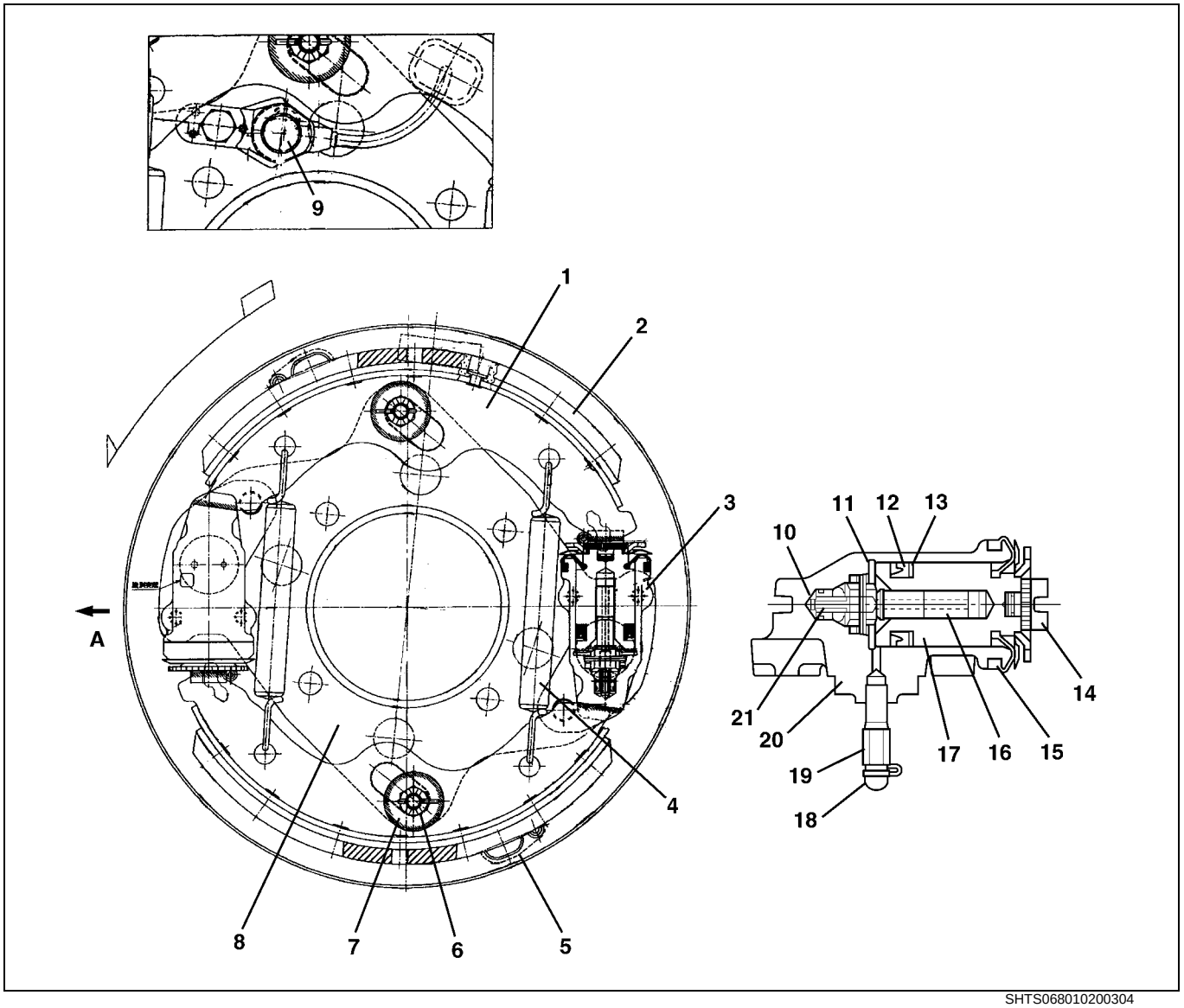
EN0680102I200023

Type			**Drum brake with hydraulically actuated, internally expanding, two-leading shoes in front wheels and dual two-leading shoes in rear wheels.**
Brake drum inside diameter			**320.0 mm {12.59 in.} for both front and rear.**
Brake lining (Width x Thickness)	**Front**		**110 x 13 mm {4.33 x 0.51 in.}**
	Rear		**145 x 13 mm {5.71 x 0.51 in.}**
Wheel cylinder bore diameter	**Front**	**Except TAIWAN**	**36.51 mm {1.437 in.}**
		TAIWAN	**38.10 mm {1.50 in.}**
	Rear	**Except TAIWAN**	**38.10 mm {1.50 in.}**
		TAIWAN	**41.30 mm {1.63 in.}**

DESCRIPTION

EN0680102C100023

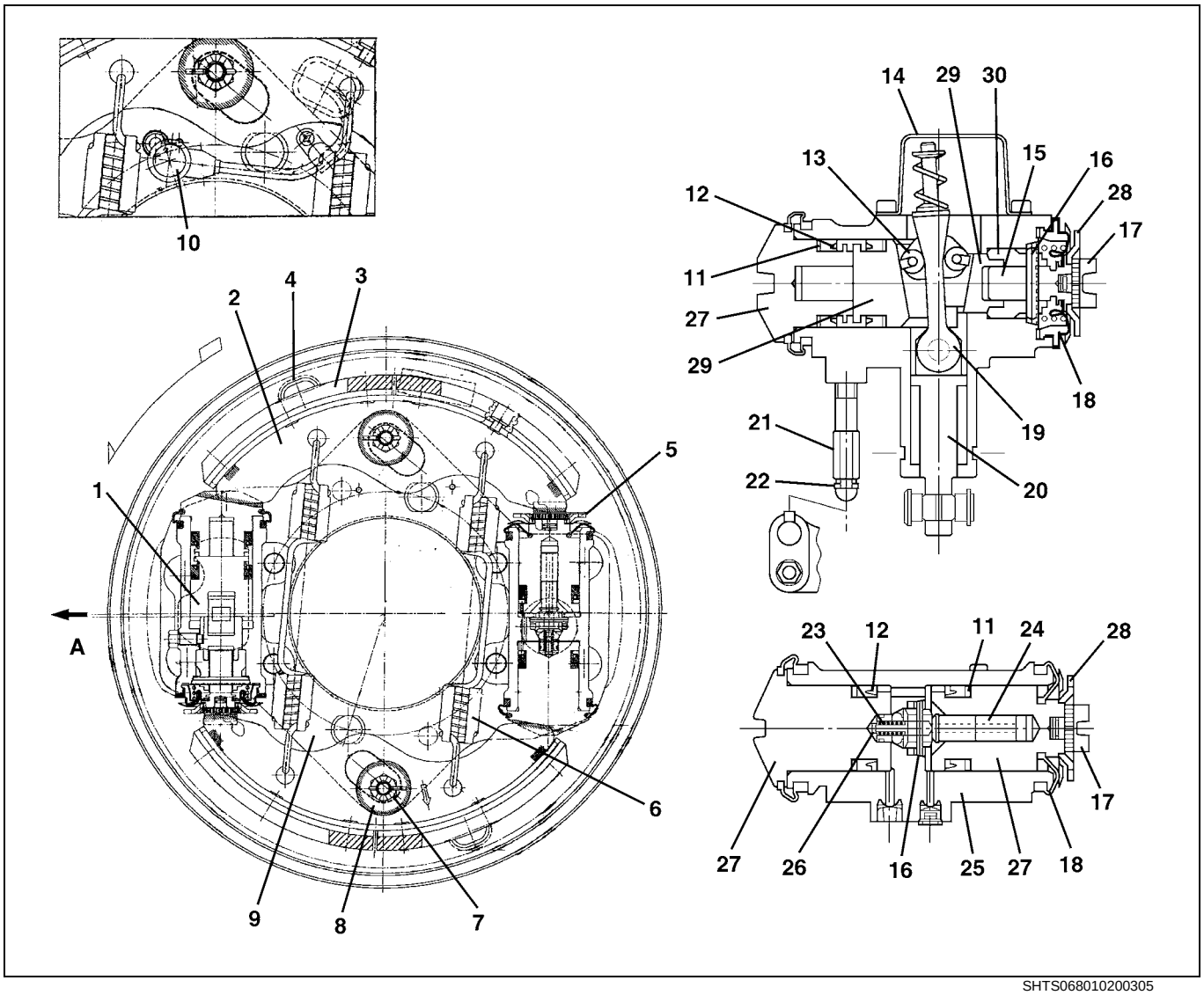
FRONT



SHTS068010200304

1	Brake shoe	12	Piston cup
2	Brake lining	13	Back up ring
3	Wheel cylinder assembly	14	Piston head
4	Retracting spring	15	Boot
5	Hole plug	16	Adjuster shaft
6	Shoe hold down nut	17	Piston
7	Shoe hold down washer	18	Bleeder cap
8	Backing plate	19	Air bleeder screw
9	Wheel sensor (If so equipped)	20	Wheel cylinder body
10	Locator	21	Locator spring
11	Drive ring	A	Front

REAR



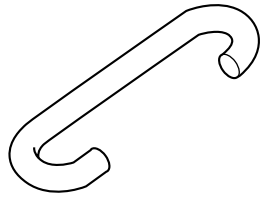
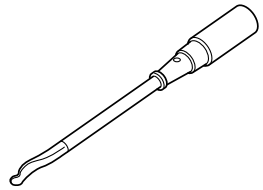
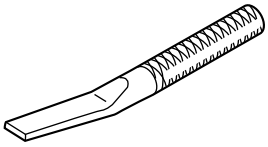
SHTS068010200305

1	Wheel cylinder assembly	17	Piston head
2	Brake shoe	18	Boot
3	Brake lining	19	Wedge
4	Hole plug	20	Rod
5	Shoe adjusting screw	21	Air bleeder screw
6	Shoe retracting spring	22	Bleeder cap
7	Shoe hold down nut	23	Locator spring
8	Shoe hold down washer	24	Adjuster shaft
9	Backing plate	25	Wheel cylinder body
10	Wheel sensor (If so equipped)	26	Locator
11	Back up ring	27	Piston
12	Piston cup	28	Adjuster wheel
13	Roller	29	Plunger
14	Wedge cover	30	Adjusting sleeve
15	Adjusting bolt	A	Front
16	Drive ring		

SPECIAL TOOL

EN0680102K100004

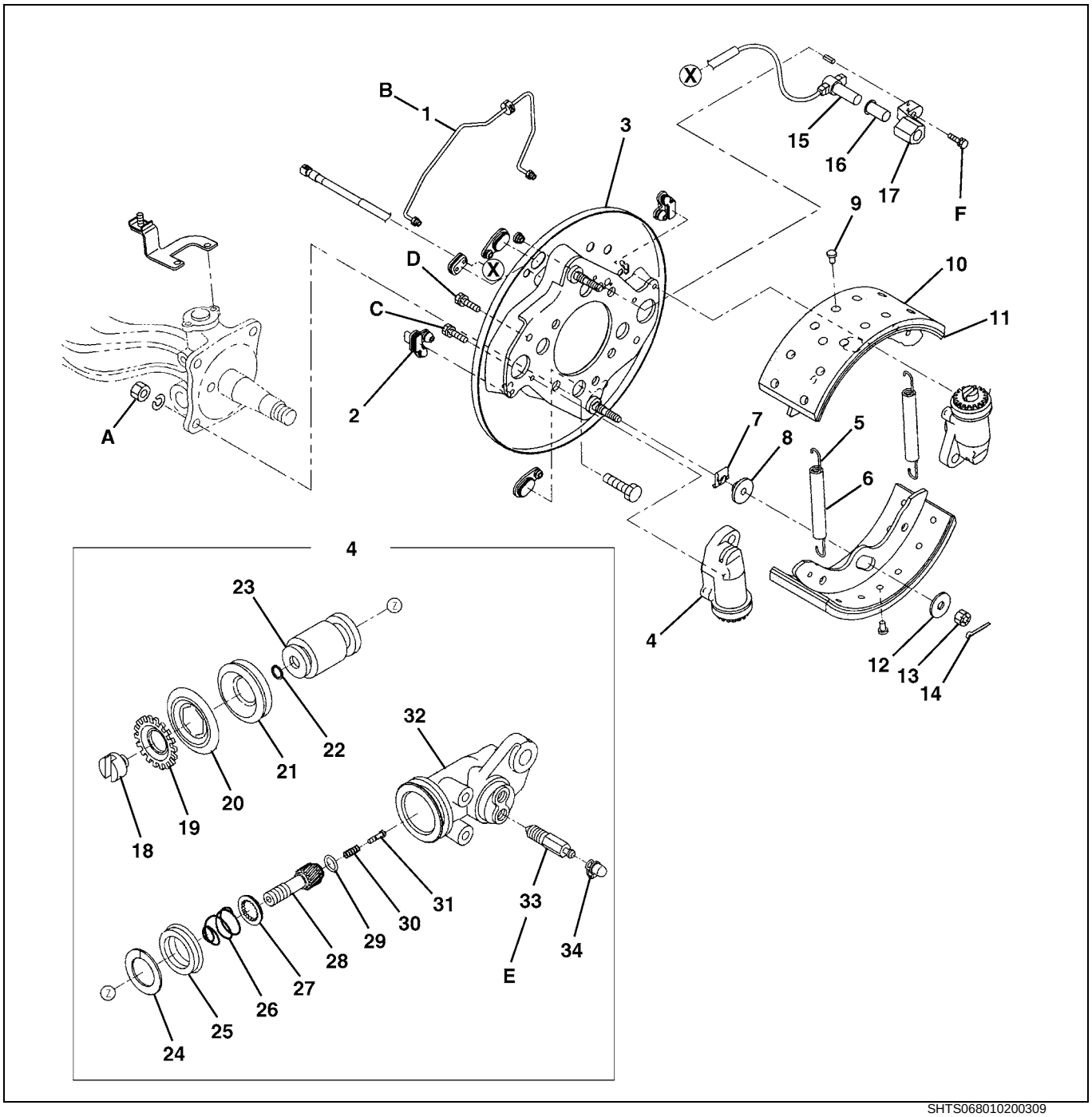
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0965-31100	HOOK	Use With S0968-31010
	S0968-31010	RETRACTING SPRING PULL BACK TOOL	
	S0966-51250	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN0680102D100022

FRONT



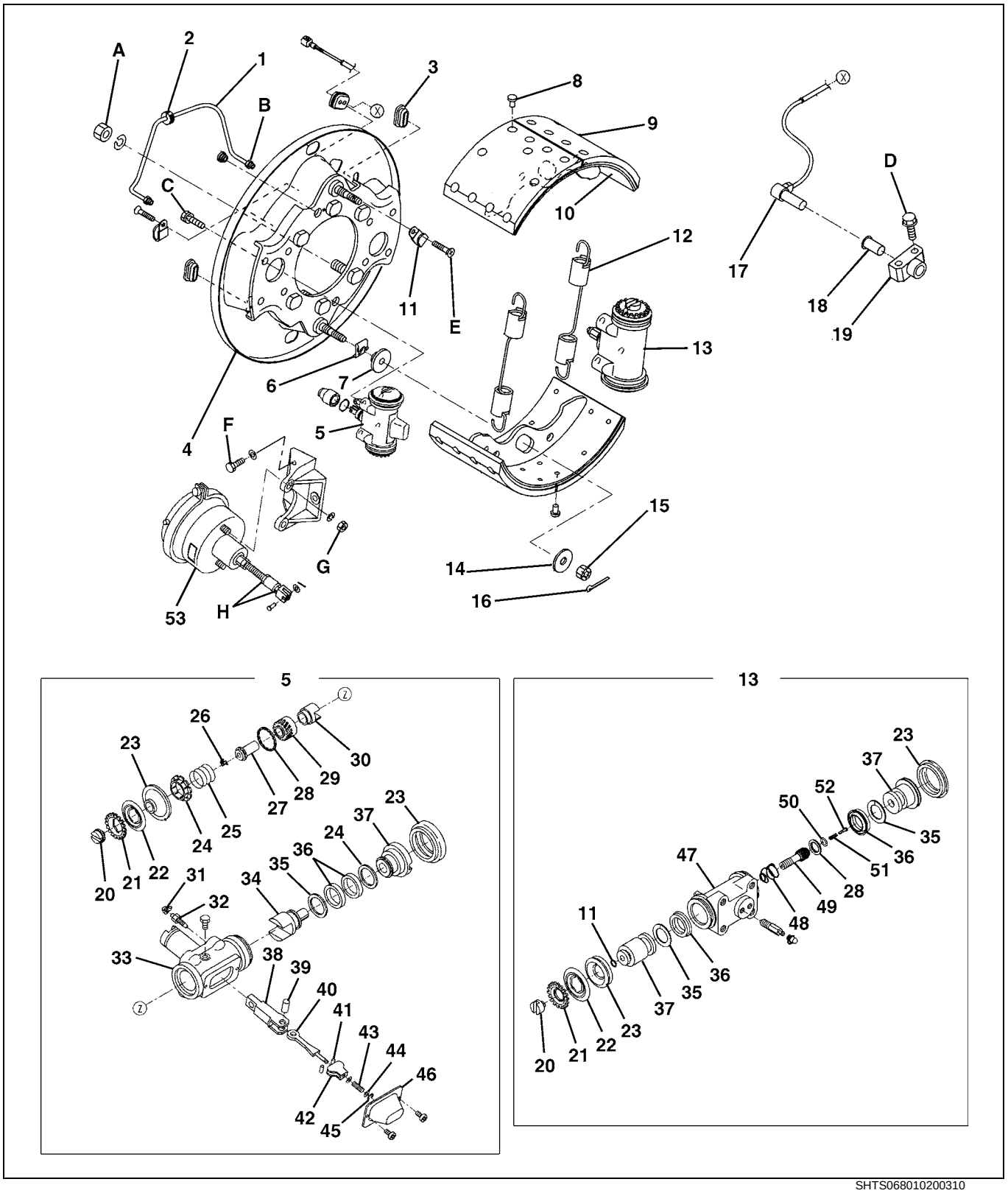
SHTS068010200309

1	Oil pipe	18	Piston head
2	Hole plug	19	Adjuster wheel
3	Backing plate	20	Boot protector
4	Wheel cylinder assembly	21	Boot
5	Shoe retracting spring	22	Clip
6	Spring cover	23	Piston
7	Adjust spring	24	Back up ring
8	Adjusting nut	25	Piston cup
9	Rivet	26	Cone spring
10	Brake lining	27	Drive ring
11	Brake shoe	28	Adjuster shaft
12	Shoe hold down washer	29	O-ring
13	Shoe hold down nut	30	Locator spring
14	Cotter pin	31	Locator
15	Wheel sensor (If so equipped)	32	Wheel cylinder body
16	Clamping bushing (If so equipped)	33	Air bleeder screw
17	Wheel sensor holder (If so equipped)	34	Bleeder cap

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

A	148-196 {1,500-2,000, 109-144}	D	88.8-120.1 {905-1,225, 66-88}
B	12.7-17.7 {130-180, 10-13}	E	7.5-11.5 {70-120, 5.1-8.6}
C	16.7-24.5 {170-250, 13-18}	F	33.8-50.0 {350-510, 25-37}

REAR



SHTS068010200310

1	Oil pipe	28	Drive ring
2	Grommet	29	Adjuster sleeve
3	Hole plug	30	Plunger
4	Backing plate	31	Bleeder cap
5	Wheel cylinder assembly (Wheel parking side)	32	Air bleeder screw
6	Adjust spring	33	Wedge actuator body
7	Adjusting nut	34	Plunger
8	Rivet	35	Back up ring
9	Brake lining	36	Piston cup
10	Brake shoe	37	Piston
11	Clip	38	Rod
12	Shoe retracting spring	39	Pin
13	Wheel cylinder assembly	40	Wedge
14	Shoe hold down washer	41	Roller
15	Shoe hold down nut	42	Cage
16	Cotter pin	43	Cage hold spring
17	Wheel sensor (If so equipped)	44	Spring seat
18	Clamping busing (If so equipped)	45	Retainer
19	Wheel sensor holder (If so equipped)	46	Wedge cover
20	Piston head	47	Wheel cylinder body
21	Adjuster wheel	48	Cone spring
22	Boot protector	49	Adjuster shaft
23	Boot	50	O-ring
24	Guide plate	51	Locator spring
25	Compression spring	52	Locator
26	Snap ring	53	Spring brake chamber
27	Adjuster screw		

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

A	148-196 {1,500-2,000, 109-144}	E	1.3-1.9 {13-19, 1.0-1.4}
B	12.7-17.7 {130-180, 9.4-13}	F	109-147 {1,112-1,498, 81-108}
C	98.1-137.3 {1,000-1,400, 73-101}	G	148-196 {1,500-2,000, 109-144}
D	34.5-51.5 {350-520, 25-38}	H	50-68 {510-693, 37-50}

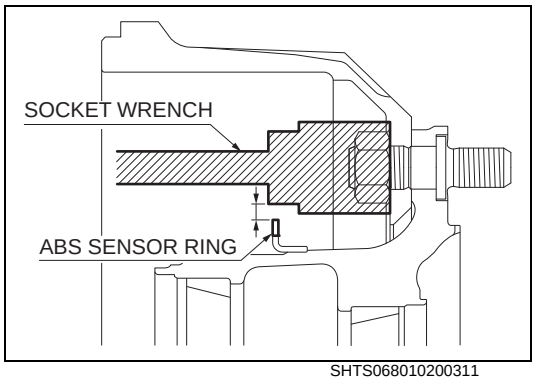
OVERHAUL

EN0680102H200018

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE TIRE.

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



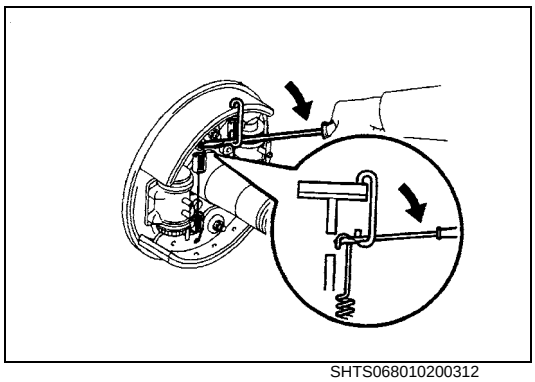
SHTS068010200311

2. REMOVE THE BRAKE DRUM.

NOTICE

(In case of models equipped with ABS;)

When mounting or dismounting the brake drum without removing the sensor ring, be careful not to damage the sensor ring by tools. If tools hit the sensor ring and damage it, ABS operation may be deteriorated.



SHTS068010200312

3. REMOVE THE BRAKE SHOE RETRACTING SPRING.

(1) Remove the retracting spring by using the special tools.
SST:
Hook (S0965-31100)
Retracting spring pull back tool (S0968-31010)

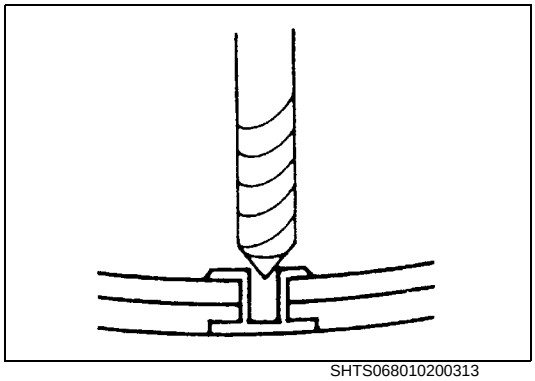
IMPORTANT POINTS - ASSEMBLY

1. REPLACE THE BRAKE LINING.

(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

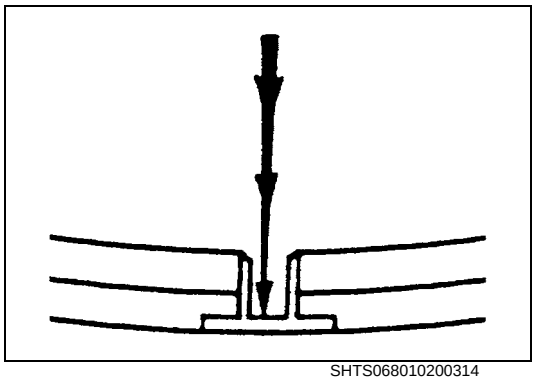
NOTICE

At this time, be careful not to scratch the brake shoe.

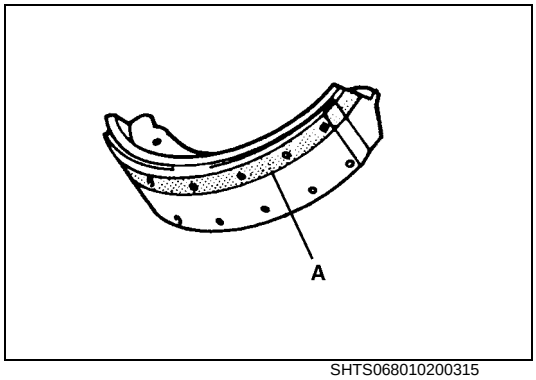


SHTS068010200313

(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.

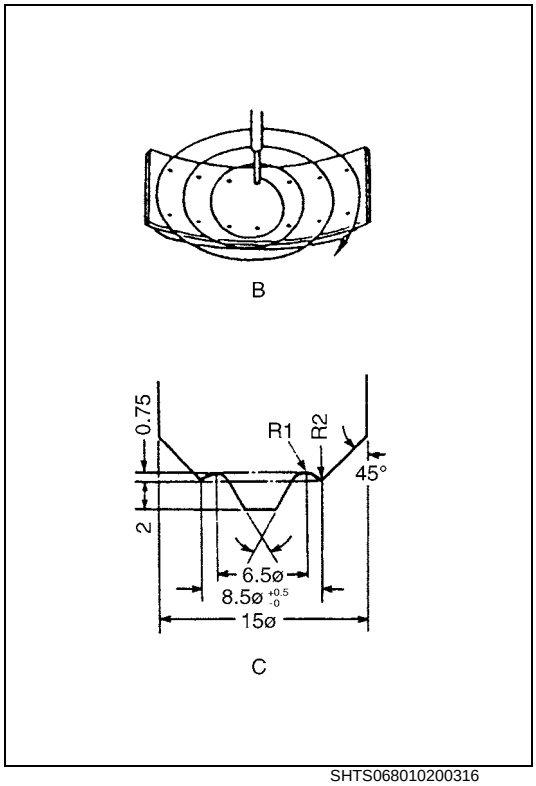


SHTS068010200314



SHTS068010200315

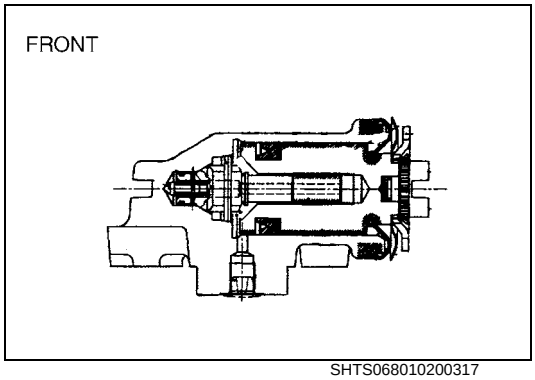
(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



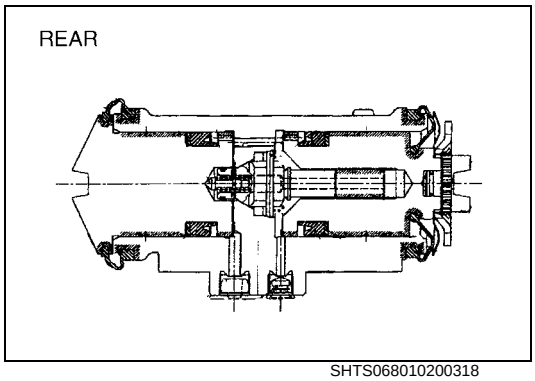
SHTS068010200316

(4) Caulk the rivets lightly in a circular pattern as shown B; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in C.
Recommended force of staking the rivet: 2.4 tons

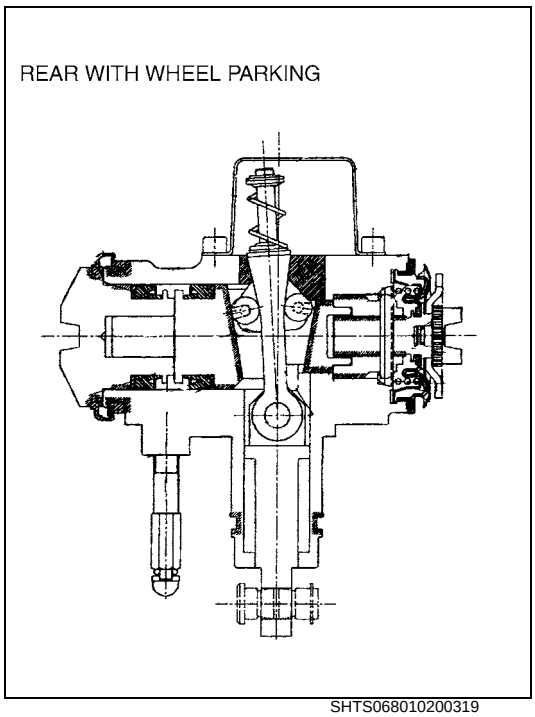
(5) Remove adhesive tape.



SHTS068010200317



SHTS068010200318



SHTS068010200319

2. ASSEMBLE THE WHEEL CYLINDER.

(1) Apply rustproof oil to the internal surface of the cylinder.

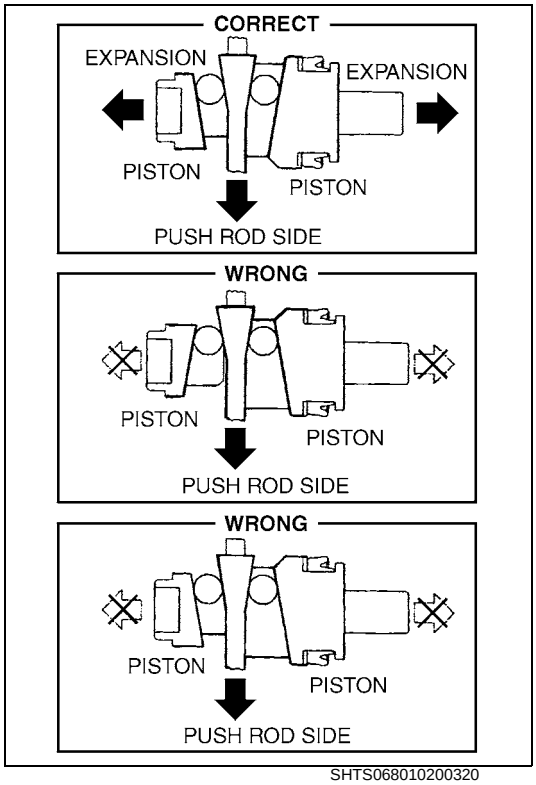
Rustproof oil (CCI No.20): S0415-61010

(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2): S0413-31080

NOTICE

The parts where the rubber grease shall be applied are shown in figure with arrows and oblique lines.

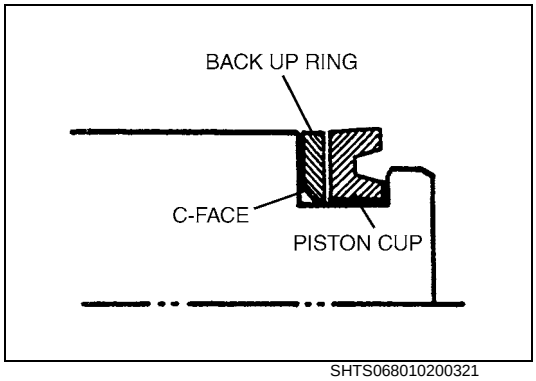


SHTS068010200320

NOTICE

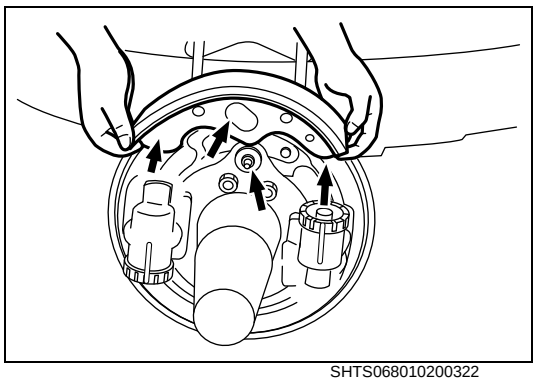
When assembling the rear wheel cylinder with wedge, pay attention to following items.

- **Install the piston so that the taper of the groove of the sliding part of the roller is positioned to expand the piston when the push rod operates (is pulled).**
- **At this time, confirm that the notch comes to the side of the push rod at the time of piston installation.**
- **In case of wrong installation, it is feared that in the worst case the parking brake will not be effective.**



SHTS068010200321

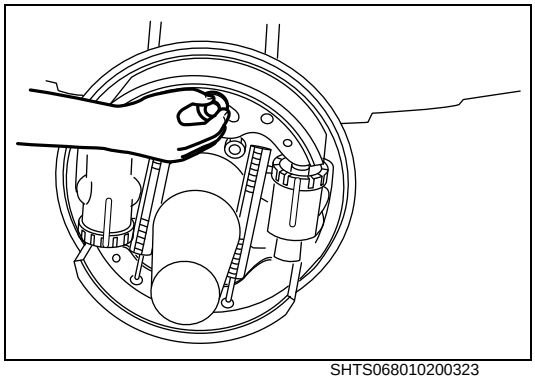
(3) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.



SHTS068010200322

3. INSTALL THE BRAKE SHOE ASSEMBLY.

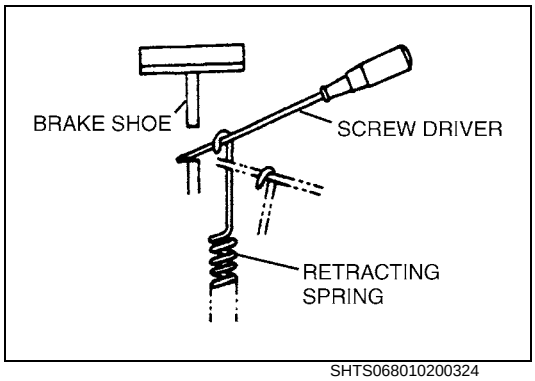
(1) Apply heat-resistant grease to both ends of the shoe web contacting with the piston, and to the top surface of the shoe web contacting the shoe hold washer.



SHTS068010200323

(2) Adjust the clearance between the hold down washer and the shoe.

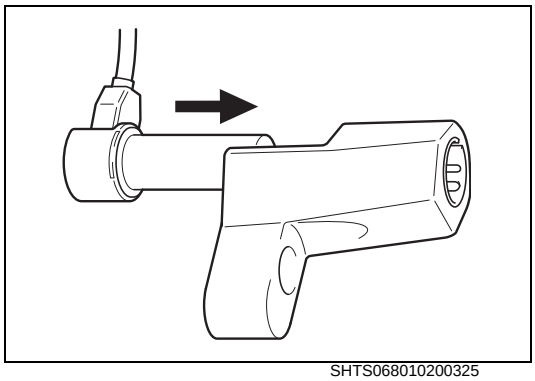
(3) Tighten the slotted nut and back off the nut by 1/3 turn, then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



SHTS068010200324

4. INSTALL THE BRAKE SHOE RETRACTING SPRING.

(1) Install the retracting spring using a screwdriver. After installing the spring, check that the end of the shoe web is securely set in the groove of the wheel cylinder piston. Also check that the hook of the spring is securely hooked in the hole of the shoe.



SHTS068010200325

5. INSTALL THE WHEEL SENSOR. (IF SO EQUIPPED)

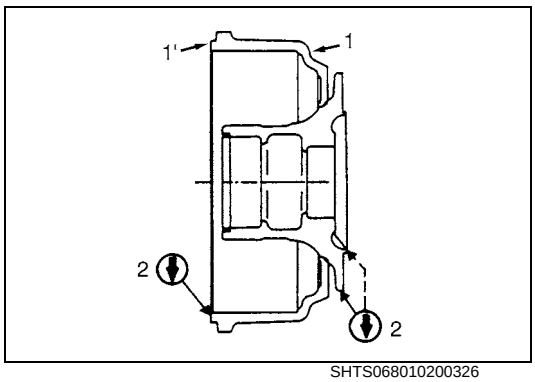
(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

(2) Push the wheel sensor forcefully into the clamping bussing until you feel that the wheel sensor has contact with the sensor ring.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place using a screwdriver, or the like. Doing so could damage the wheel sensor.

(3) Arrange the wire harness.



SHTS068010200326

6. ASSEMBLE THE BRAKE DRUM AND WHEEL HUB. (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in Figure. Install the drum according to NOTICE.

NOTICE

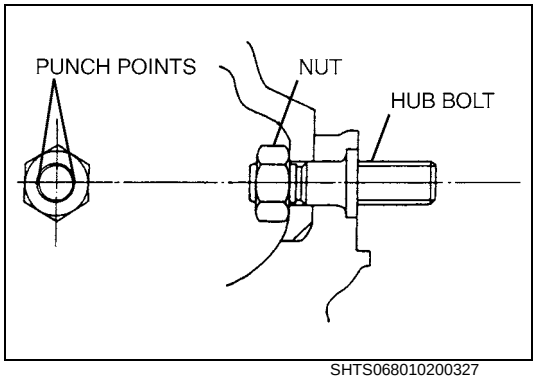
1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drums: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).



SHTS068010200327

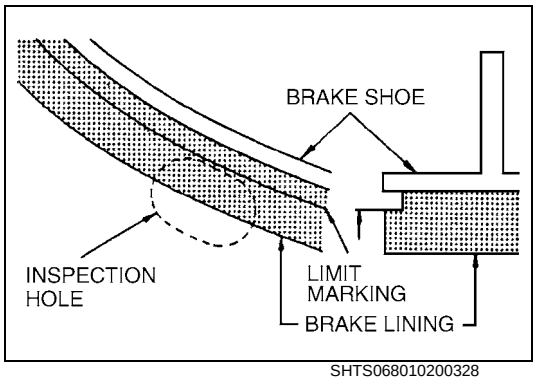
(3) Caulk the hub and nuts as shown in figure, after tightening the brake drum and wheel hub.
Tightening Torque:
393-470 N·m {4,000-4,800 kgf·cm, 290-347 lbf·ft}

7. MOUNT THE WHEEL HUB WITH BRAKE DRUM.
(1) Refer to the chapter "**FRONT AXLE** " and "**REAR AXLE**".

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

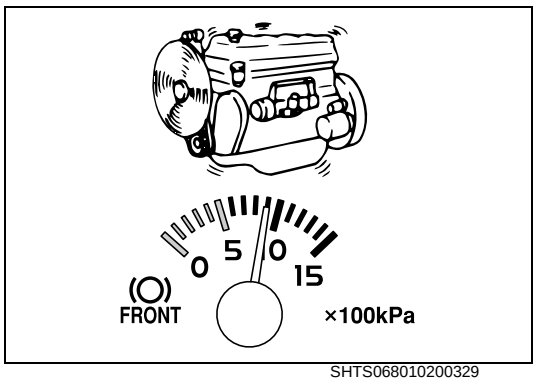
ADJUSTMENT

EN0680102H300028



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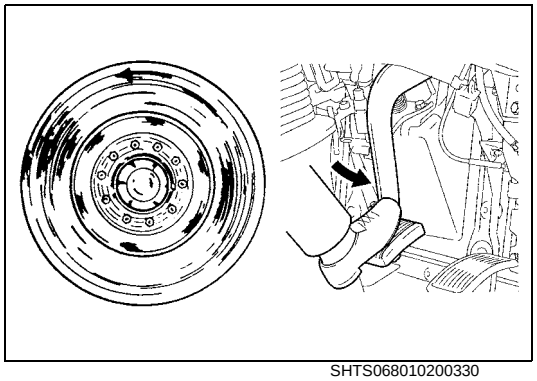
1. REMAINING THICKNESS OF THE BRAKE LINING
(1) Check remaining thickness of lining through the inspection hole of the backing plate. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made replace the lining.



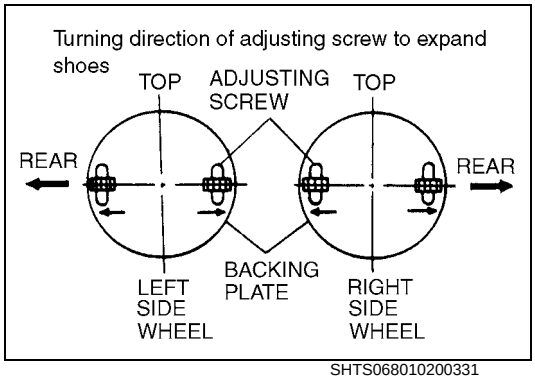
SHTS068010200329

2. AIR PRESSURE IN THE AIR TANK
(1) Operate the engine and obtain an air pressure of the 780-880 kPa {8.0-9.0 kgf/cm^2, 113-127 lbf/in.^{2}}

NOTICE
The specified air pressure in the air tank should be maintained when making the adjustment.

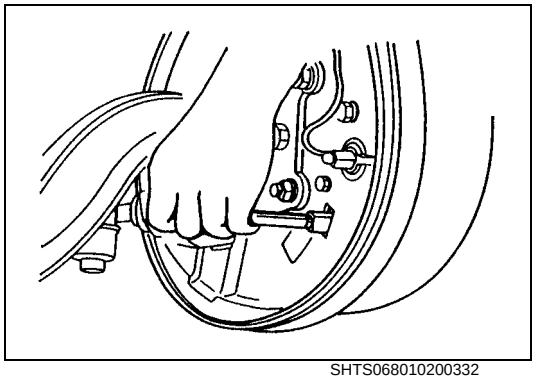

SHTS068010200330

3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM
(1) Lift the wheel to be adjusted off the ground.
(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

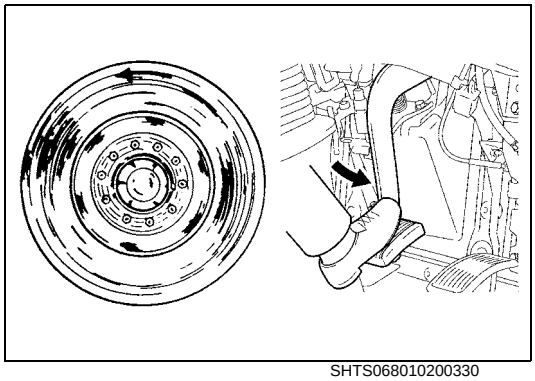


SHTS068010200331

(3) Turn the adjusting screw with an adjusting tool in the arrow direction, (The arrows are marked near the holes on the backing plate), and put the drum into a position as to turn slowly by hand.
SST: Brake shoe adjusting tool (S0966-51250)


SHTS068010200332

(4) Return the adjusting screw 10-14 notches in the reverse arrow direction.


SHTS068010200330

(5) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from (2).

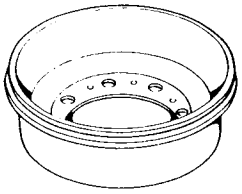
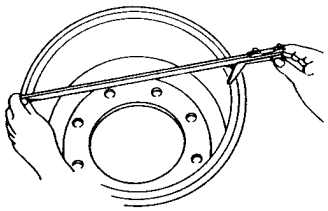
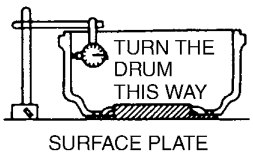
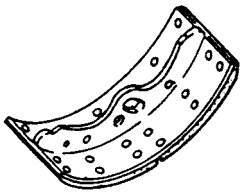
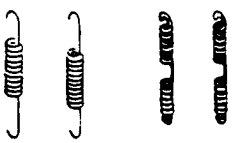
NOTICE
Using the same procedure as above, adjust the clearance for all wheels.

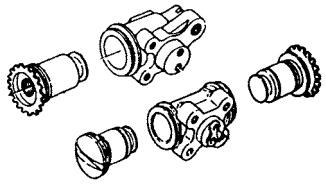
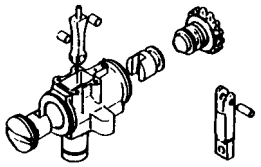
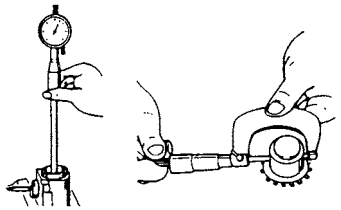
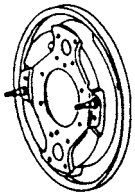
INSPECTION AND REPAIR

EN0680102H300029

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**320.0 {12.600}**	**322.0 {12.677}**	**Replace.**	**Measure** 
Brake drum runout	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure** 
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**13.0 {0.512}**	**4.0 {0.1575}**	**Re-lining.**	**Measure** 
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Wheel cylinder (For spring brake), cylinder, piston, plunger, roller, wedge, pin and rod. Corrosion and/or any damage.	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**Front 0.03-0.13 {0.0012-0.0051} Rear 0.08-0.18 {0.0032-0.0070}**	**0.25 {0.0098}**	**Replace.**	**Measure** 
Backing plate and stud pins: Deformation, damage and any other abnormality	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE [MODEL: GD (EXCEPT CHILE GD)]

DATA AND SPECIFICATIONS

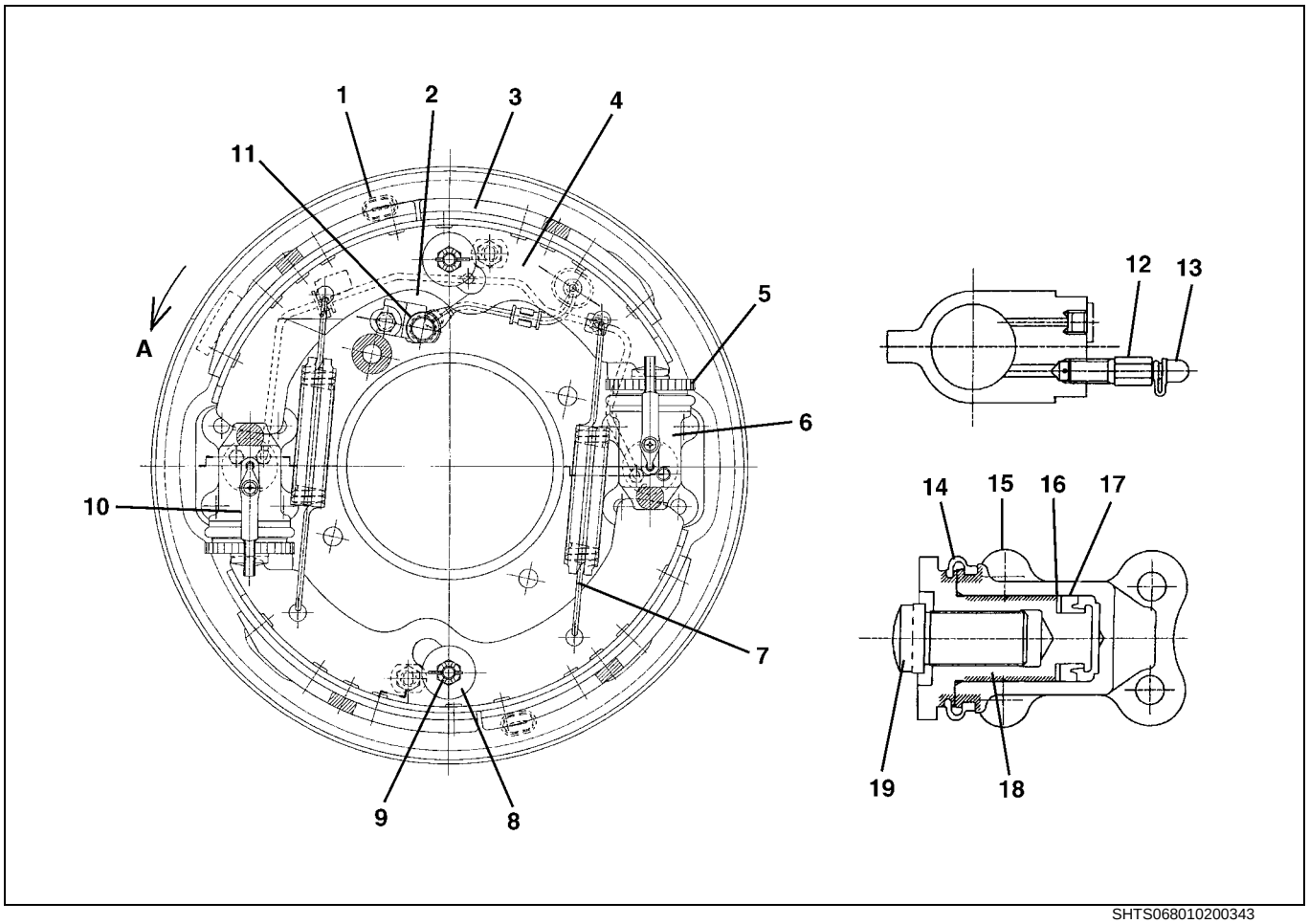
EN0680102I200024

Type		**Drum brake with hydraulically actuated, internally expanding, two-leading shoes in front wheels and dual two-leading shoes in rear wheels.**
Brake drum inside diameter		**400 mm {15.75 in.} for both front and rear.**
Brake lining (Width x Thickness)	**Front**	**120 x 15 mm {4.72 x 0.59 in.}**
	Rear	**155 x 15 mm {6.10 x 0.59 in.}**
Wheel cylinder bore diameter	**Front**	**34.93 mm {1.375 in.}**
	Rear	**38.10 mm {1.50 in.}**

DESCRIPTION

EN0680102C100024

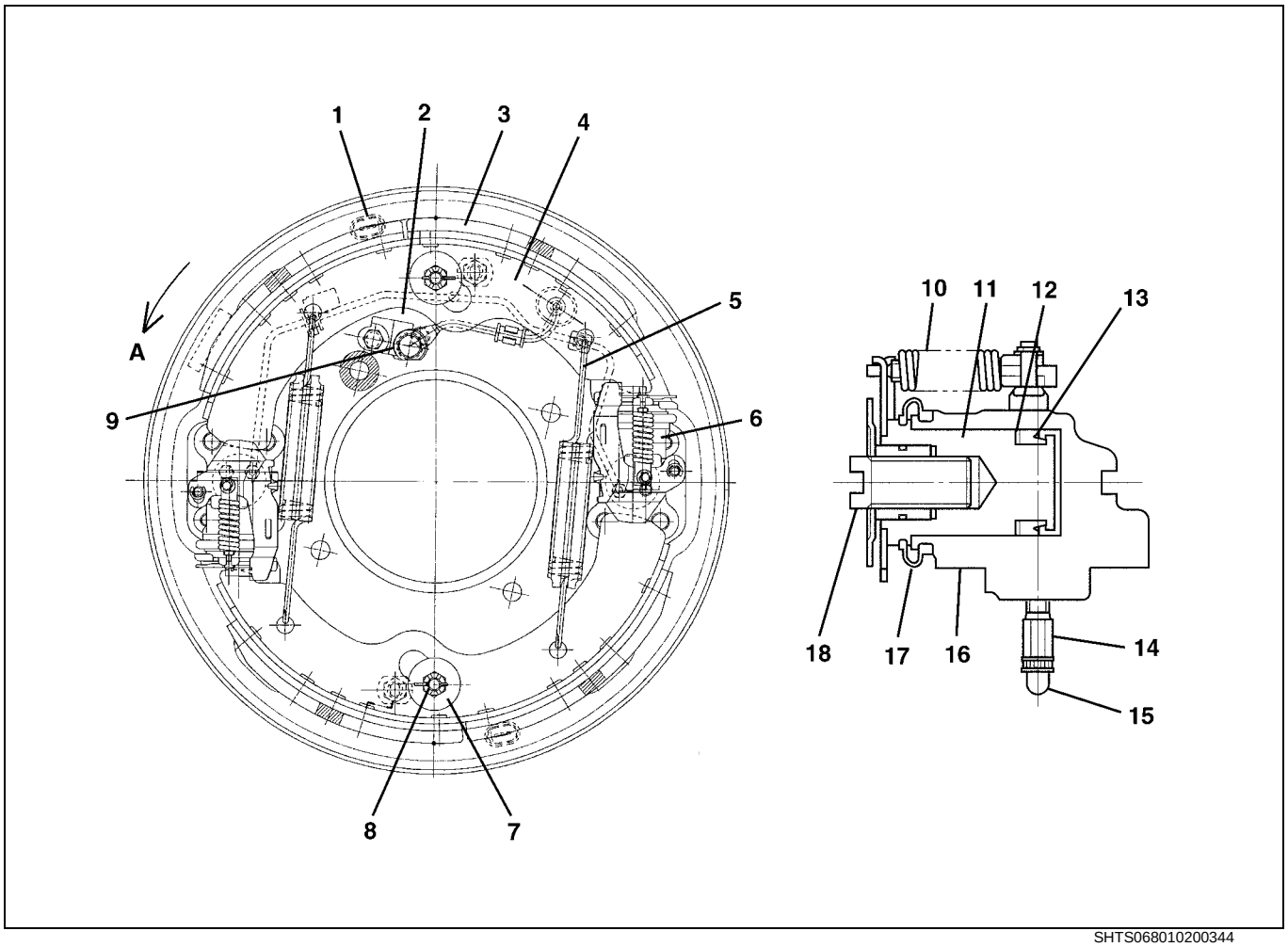
FRONT



SHTS068010200343

1	**Hole plug**	**11**	**Wheel sensor (If so equipped)**
2	**Backing plate**	**12**	**Air bleeder screw**
3	**Brake lining**	**13**	**Bleeder cap**
4	**Brake shoe**	**14**	**Boot**
5	**Shoe adjusting screw**	**15**	**Wheel cylinder**
6	**Wheel cylinder assembly**	**16**	**Back up ring**
7	**Shoe retracting spring**	**17**	**Piston cup**
8	**Shoe hold down washer**	**18**	**Piston**
9	**Shoe hold down nut**	**19**	**Adjusting bolt**
10	**Adjuster lock spring**	**A**	**Forward turning**

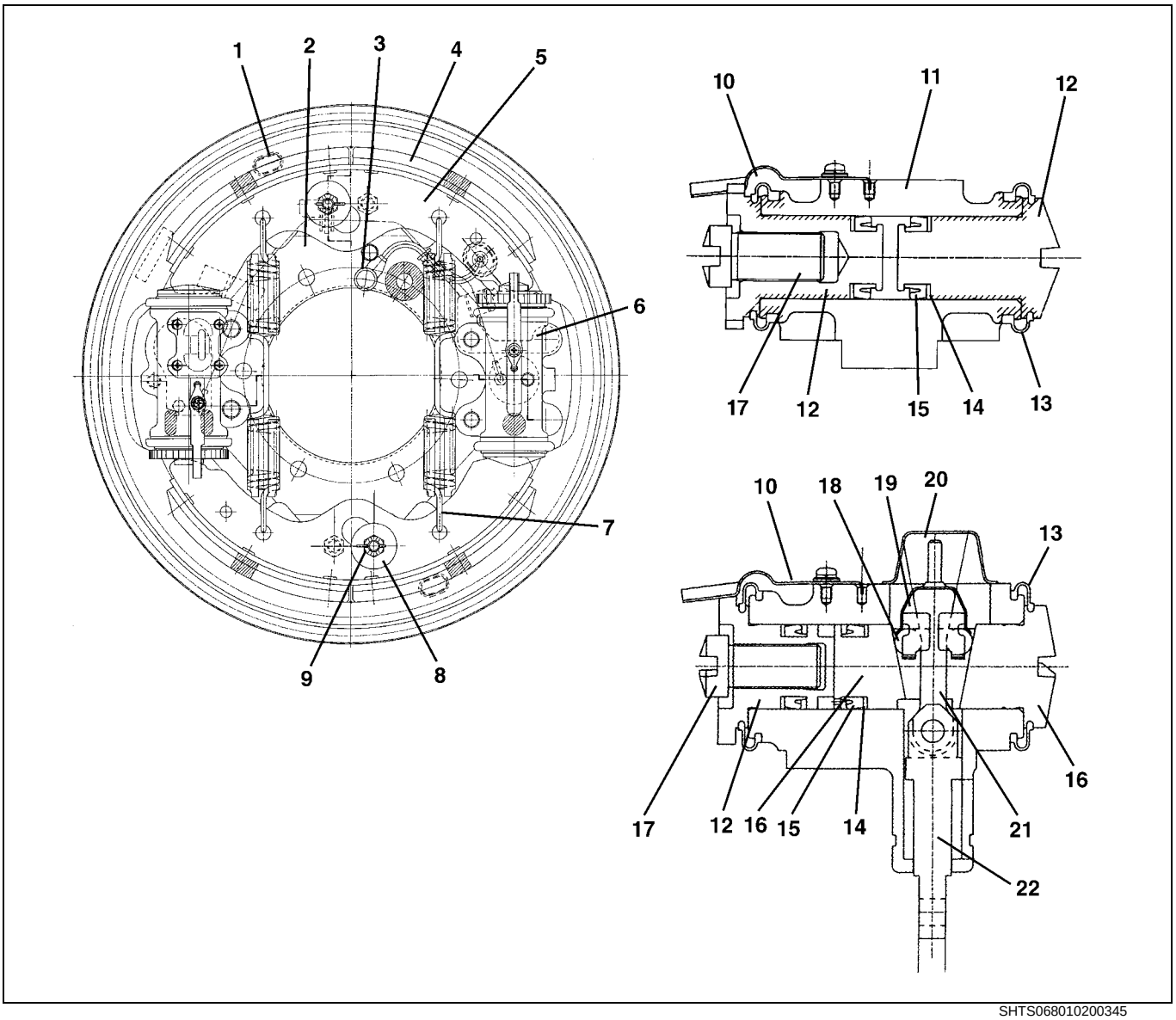
FRONT (WITH AUTO-ADJUSTER)



SHTS068010200344

1	Hole plug	11	Piston
2	Backing plate	12	Back up ring
3	Brake lining	13	Piston cup
4	Brake shoe	14	Air bleeder screw
5	Shoe retracting spring	15	Bleeder cap
6	Wheel cylinder assembly	16	Wheel cylinder
7	Shoe hold down washer	17	Boot
8	Shoe hold down nut	18	Adjusting bolt
9	Wheel sensor (If so equipped)	A	Forward turning
10	Spring		

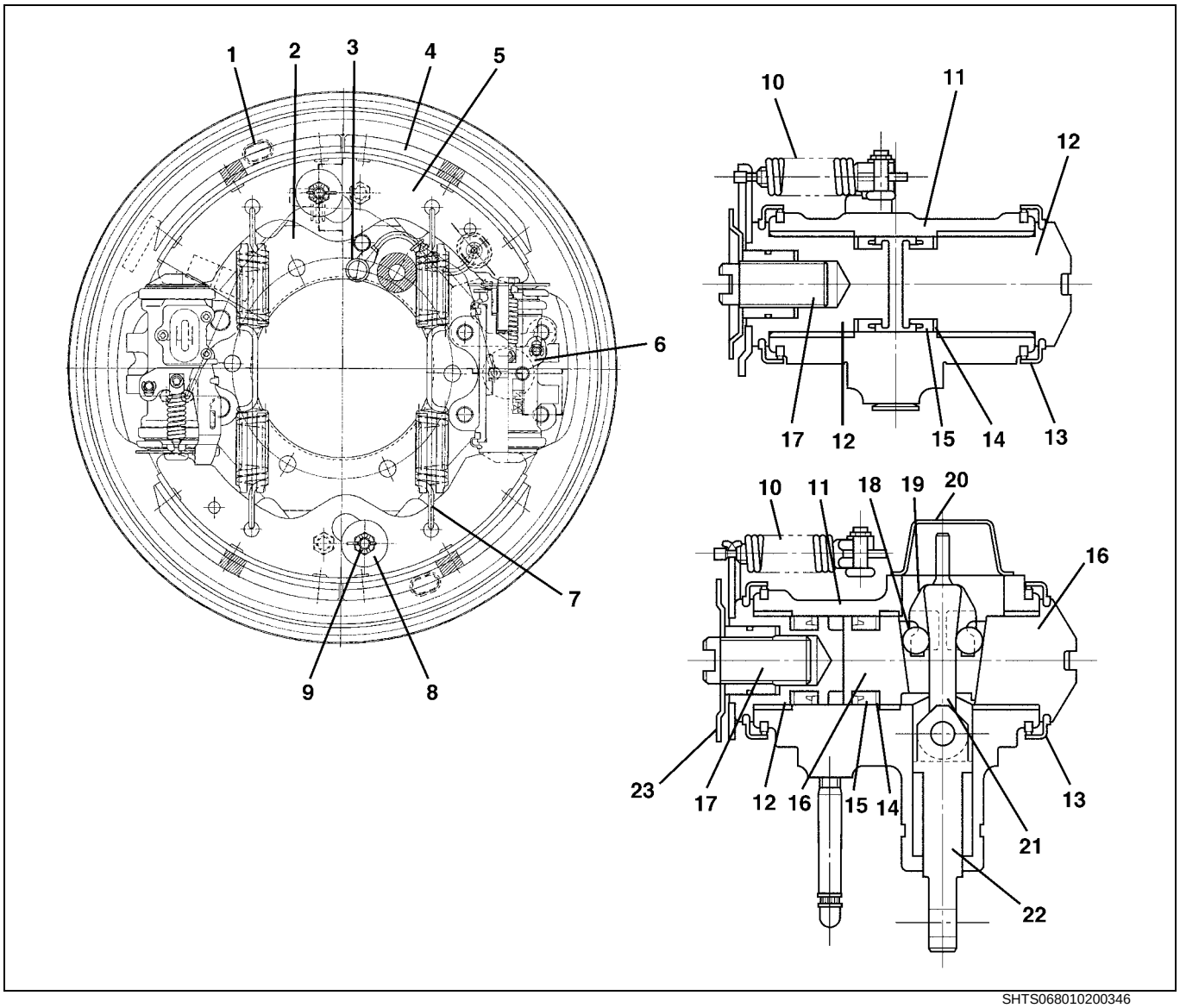
REAR



SHTS068010200345

1	Hole plug	12	Piston
2	Backing plate	13	Boot
3	Wheel sensor (If so equipped)	14	Back up ring
4	Brake lining	15	Piston cup
5	Brake shoe	16	Plunger
6	Wheel cylinder assembly	17	Adjusting bolt
7	Shoe retracting spring	18	Roller
8	Shoe hold down washer	19	Cage
9	Shoe hold down nut	20	Wedge cover
10	Adjuster lock spring	21	Wedge
11	Wheel cylinder	22	Rod

REAR (WITH AUTO-ADJUSTER)



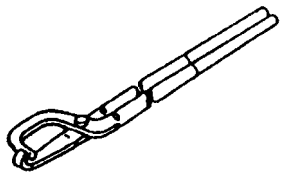
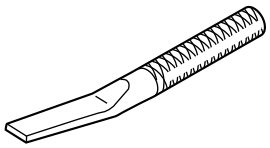
SHTS068010200346

1	Hole plug	13	Boot
2	Backing plate	14	Back up ring
3	Wheel sensor (If so equipped)	15	Piston cup
4	Brake lining	16	Plunger
5	Brake shoe	17	Adjusting bolt
6	Wheel cylinder assembly	18	Roller
7	Shoe retracting spring	19	Cage
8	Shoe hold down washer	20	Wedge cover
9	Shoe hold down nut	21	Wedge
10	Spring	22	Rod
11	Wheel cylinder	23	Adjuster
12	Piston		

SPECIAL TOOL

EN0680102K100005

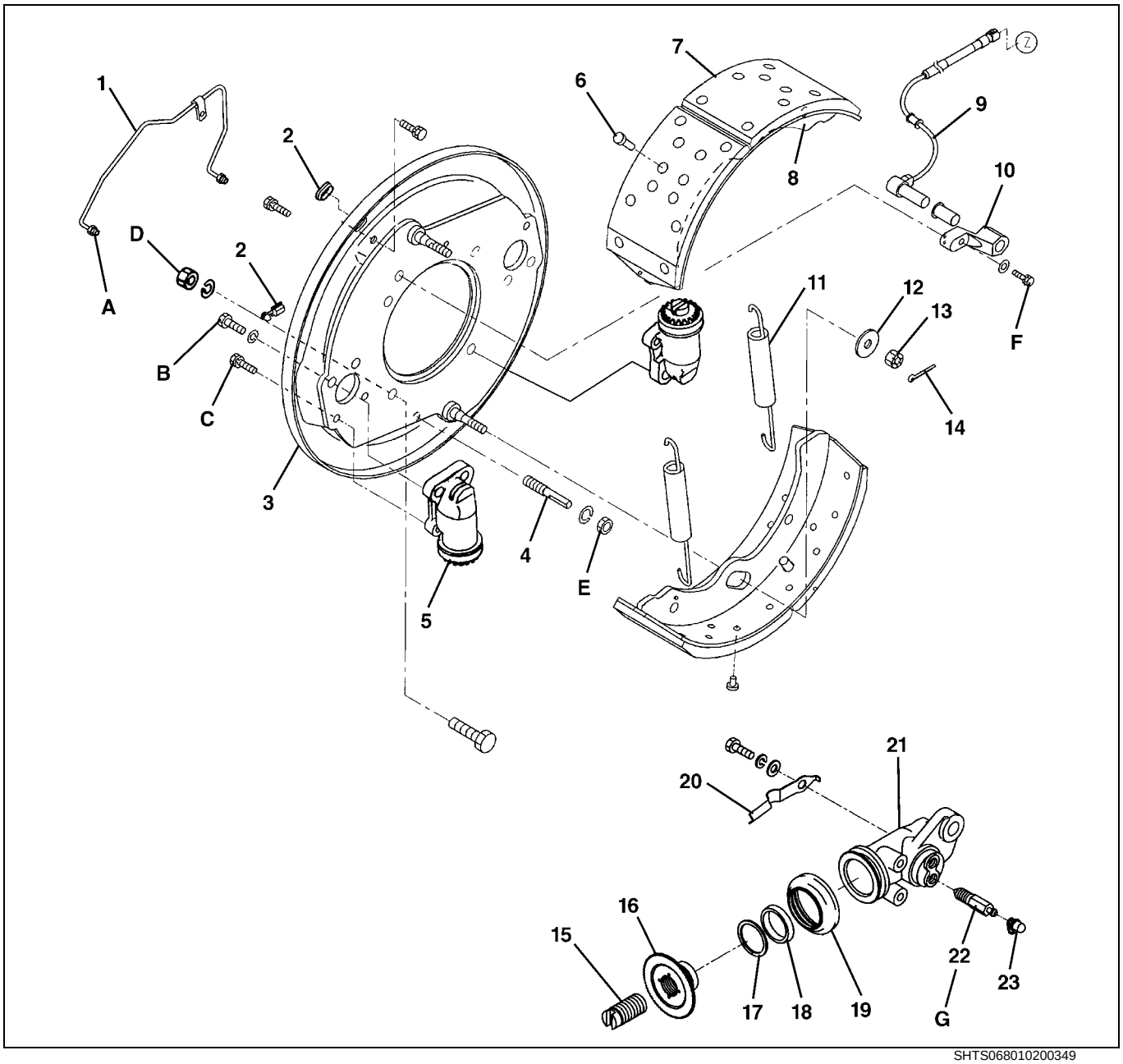
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0960-61040	RETRACTING SPRING PULL BACK TOOL	
	S0966-51130	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN0680102D100023

FRONT



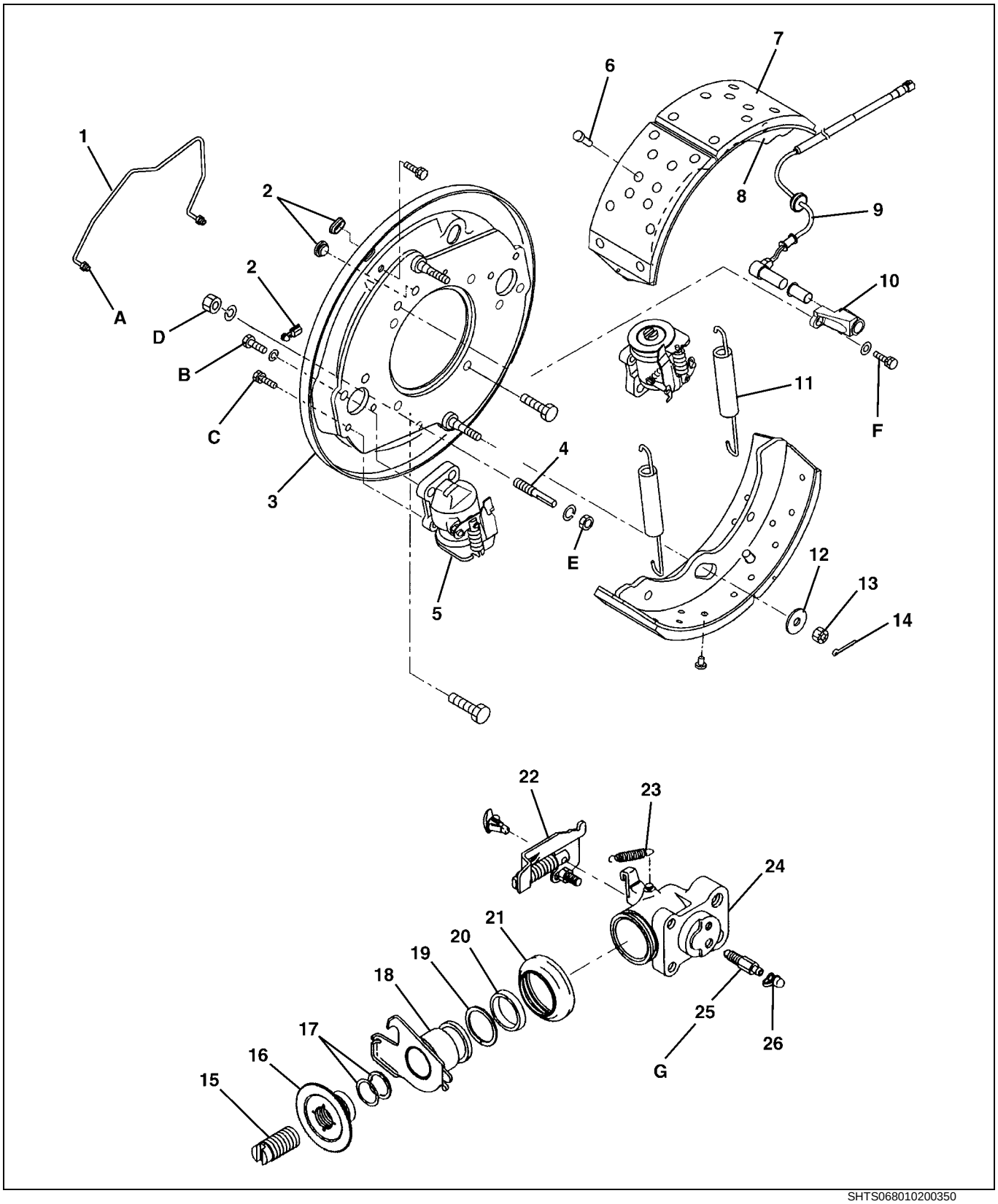
SHTS068010200349

1	Oil pipe	13	Shoe hold down nut
2	Hole plug	14	Cotter pin
3	Backing plate	15	Adjusting bolt
4	Adjusting bolt	16	Wheel cylinder adjuster
5	Wheel cylinder assembly	17	Back up ring
6	Rivet	18	Piston cup
7	Brake lining	19	Boot
8	Brake shoe	20	Shoe adjusting lever
9	Wheel sensor (If so equipped)	21	Wheel cylinder
10	Wheel sensor holder (If so equipped)	22	Air bleeder screw
11	Shoe retracting spring	23	Bleeder cap
12	Shoe hold down washer		

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

A	12.75-17.65 {130-180, 10-13}	E	25.50-36.28 {260-370, 19-26}
B	ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122}	F	13.73-22.56 {141-229, 11-16}
C	ϕ10 bolt: 37.27-49.03 {380-500, 28-36}	G	7.5-11.5 {76-117, 5.5-8.4}
D	148-196 {1,500-2,000, 109-144]		

FRONT (WITH AUTO-ADJUSTER)



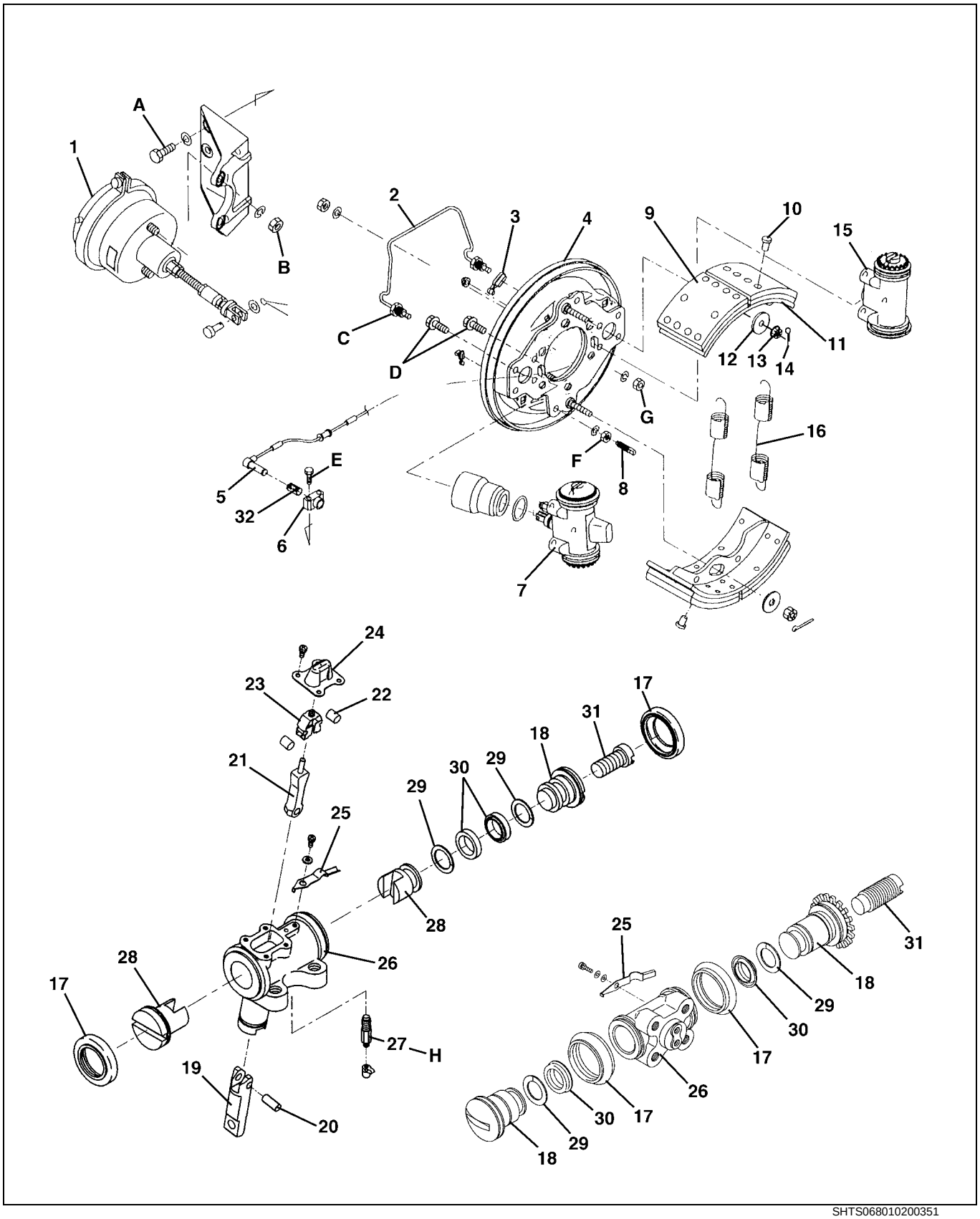
SHTS068010200350

1	Oil pipe	14	Cotter pin
2	Hole plug	15	Adjusting bolt
3	Backing plate	16	Wheel cylinder adjuster
4	Adjusting bolt	17	Spacer
5	Wheel cylinder assembly	18	Piston
6	Rivet	19	Back up ring
7	Brake lining	20	Piston cup
8	Brake shoe	21	Boot
9	Wheel sensor (If so equipped)	22	Shoe adjusting lever
10	Wheel sensor holder (If so equipped)	23	Spring
11	Shoe retracting spring	24	Wheel cylinder
12	Shoe hold down washer	25	Air bleeder screw
13	Shoe hold down nut	26	Bleeder cap

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

A	12.75-17.65 {130-180, 10-13}	E	25.50-36.28 {260-370, 19-26}
B	ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122}	F	13.73-22.56 {141-229, 11-16}
C	ϕ10 bolt: 37.27-49.03 {380-500, 28-36}	G	7.5-11.5 {76-117, 5.5-8.4}
D	148-196 {1,500-2,000, 109-144]		

REAR



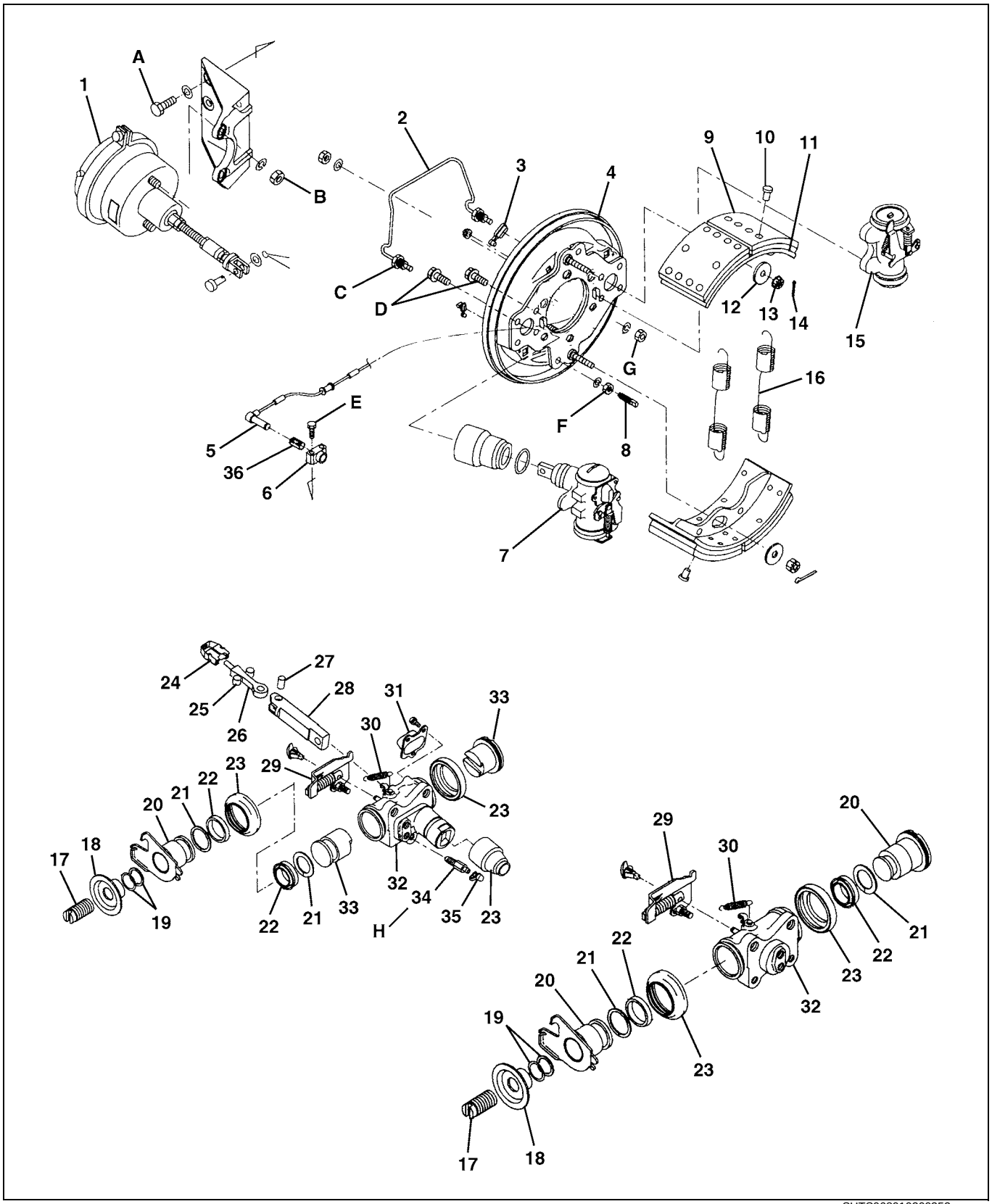
SHTS068010200351

1	Spring brake chamber	17	Boot
2	Oil pipe	18	Piston
3	Hole plug	19	Rod
4	Backing plate	20	Pin
5	Wheel sensor (If so equipped)	21	Wedge
6	Wheel sensor holder (If so equipped)	22	Roller
7	Wheel cylinder assembly	23	Cage
8	Adjusting bolt	24	Wedge cover
9	Brake lining	25	Spring
10	Rivet	26	Cylinder
11	Brake shoe	27	Air bleeder screw
12	Shoe hold down washer	28	Plunger
13	Shoe hold down nut	29	Back up ring
14	Cotter pin	30	Piston cup
15	Wheel cylinder assembly	31	Adjusting bolt
16	Shoe retracting spring	32	Clamping bushing

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

A	109-147 {1,110-1,500, 81-108}	E	34.5-51.5 {350-525, 25-37}
B	148-196 {1,500-2,000, 109-144}	F	25.50-36.28 {260-370, 19-26}
C	12.75-17.65 {130-180, 10-13}	G	148-196 {1,500-2,000, 109-144}
D	ϕ16 bolt: 186.33-254.97 {1,900-2,600, 137-188} ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122} ϕ12 bolt: 79.43-107.87 {810-1,100, 58-79}	H	7.5-11.5 {76-117, 5.5-8.4}

REAR (WITH AUTO-ADJUSTER)



SHTS068010200352

1	Spring brake chamber	19	Spacer
2	Oil pipe	20	Piston
3	Hole plug	21	Back up ring
4	Backing plate	22	Piston cup
5	Wheel sensor (If so equipped)	23	Boot
6	Wheel sensor holder (If so equipped)	24	Cage
7	Wheel cylinder assembly	25	Roller
8	Adjusting bolt	26	Wedge
9	Brake lining	27	Pin
10	Rivet	28	Rod
11	Brake shoe	29	Shoe adjusting lever
12	Shoe hold down washer	30	Spring
13	Shoe hold down nut	31	Wedge cover
14	Cotter pin	32	Cylinder
15	Wheel cylinder assembly	33	Plunger
16	Shoe retracting spring	34	Air bleeder screw
17	Adjusting bolt	35	Bleeder cap
18	Wheel cylinder adjuster	36	Clamping bushing

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

A	109-147 {1,110-1,500, 81-108}	E	34.5-51.5 {350-525, 25-37}
B	148-196 {1,500-2,000, 109-144}	F	25.50-36.28 {260-370, 19-26}
C	12.75-17.65 {130-180, 10-13}	G	148-196 {1,500-2,000, 109-144}
D	ϕ18 bolt: 186.33-254.97 {1,900-2,600, 137-188} ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122} ϕ12 bolt: 79.43-107.87 {810-1,100, 58-79}	H	7.5-11.5 {76-117, 5.5-8.4}

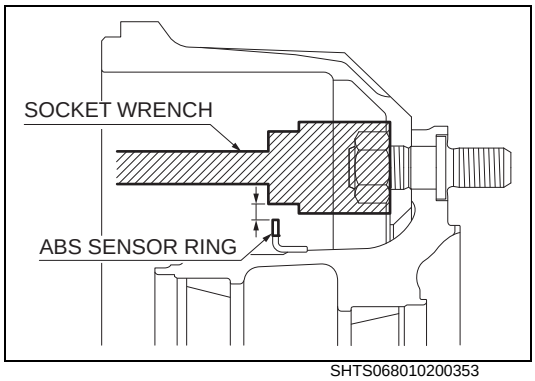
OVERHAUL

EN0680102H200019

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF TIRE.

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



SHTS068010200353

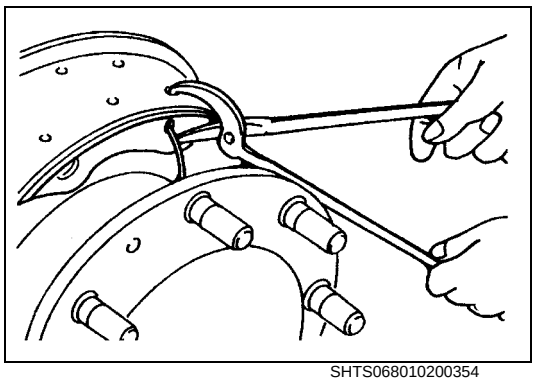
2. REMOVAL OF BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS.

(1) Refer to the chapter "**FRONT AXLE**" and "**REAR AXLE**".

NOTICE

(In case of models equipped with ABS;)

When mounting or dismounting the brake drum without removing the sensor ring, be careful not to damage the sensor ring by tools. If tools hit the sensor ring and damage it, ABS operation may be deteriorated.



SHTS068010200354

3. REMOVAL OF BRAKE SHOE RETRACTING SPRING.

(1) Remove the retracting spring by using the special tools.
SST: Retracting spring pull back tool (S0960-61040)

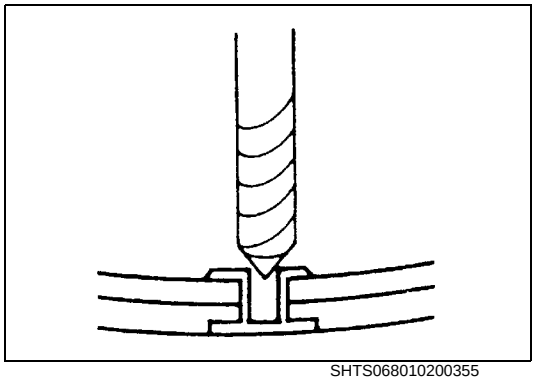
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE BRAKE LINING.

(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

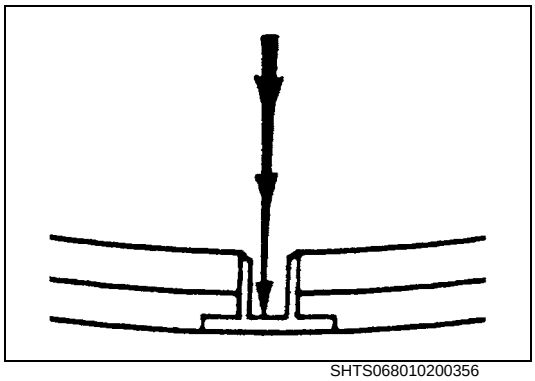
NOTICE

At this time, be careful not to scratch the brake shoe.

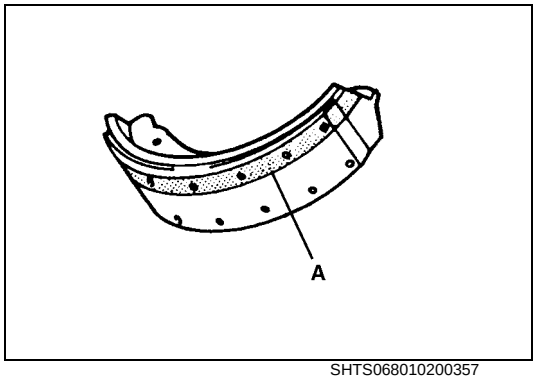


SHTS068010200355

(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.

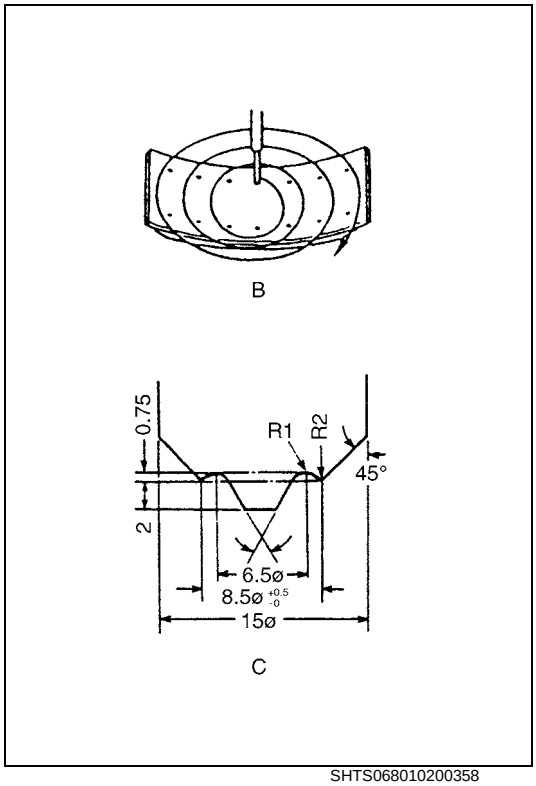


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SHTS068010200357

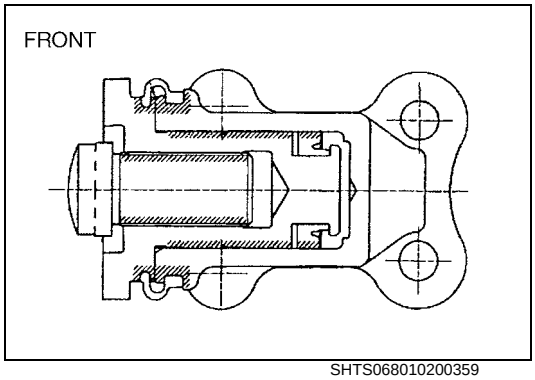
(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



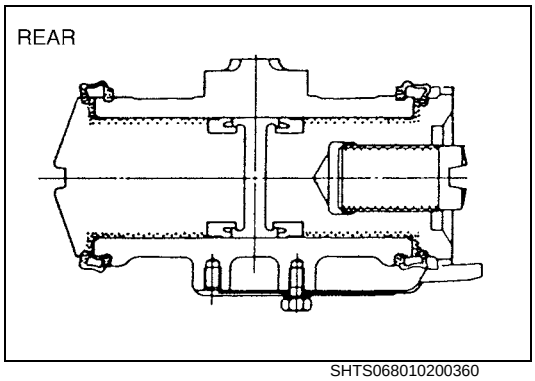
SHTS068010200358

(4) Caulk the rivets lightly in a circular pattern as shown B; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in C.
Recommended force of staking the rivet: 2.4 tons

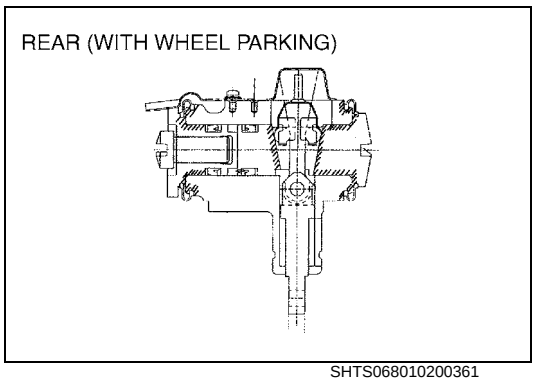
(5) Remove adhesive tape.



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SHTS068010200360



SHTS068010200361

2. ASSEMBLY OF THE WHEEL CYLINDER.

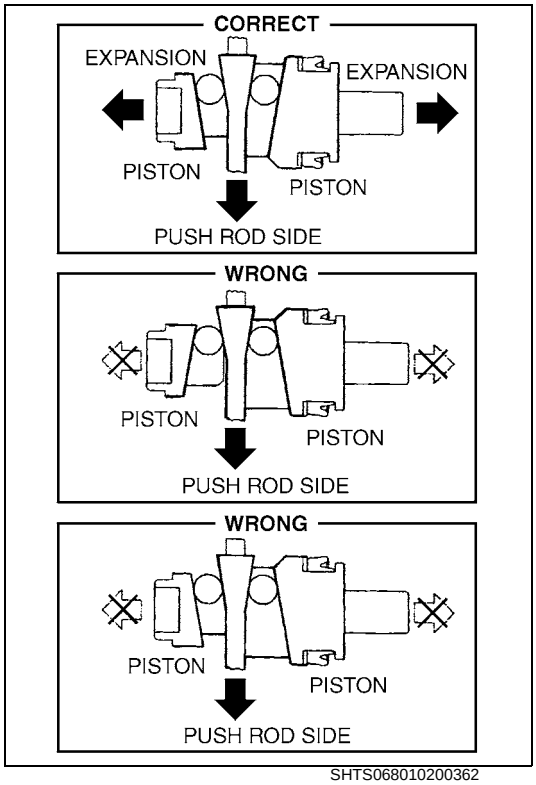
(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI No.20):
S0415-61010

(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2):
S0413-31060

NOTICE
The parts where the rubber grease shall be applied are shown in figure with oblique lines.

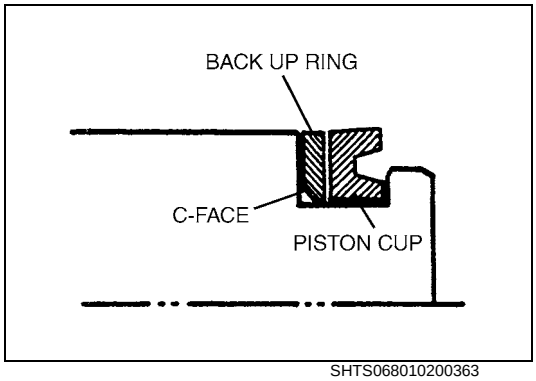


SHTS068010200362

NOTICE

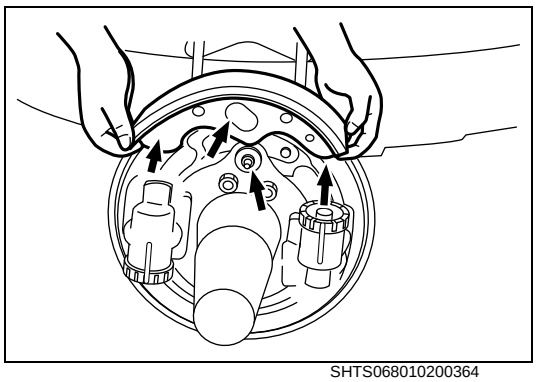
When assembling the rear wheel cylinder with wedge, pay attention to following items.

- **Install the piston so that the taper of the groove of the sliding part of the roller is positioned to expand the piston when the push rod operates (is pulled).**
- **At this time, confirm that the notch comes to the side of the push rod at the time of piston installation.**
- **In case of wrong installation, it is feared that in the worst case the parking brake will not be effective.**



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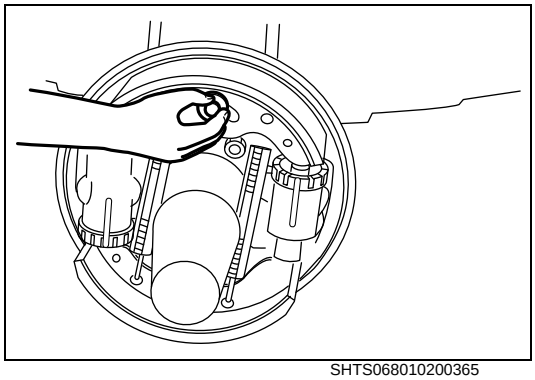
(3) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.



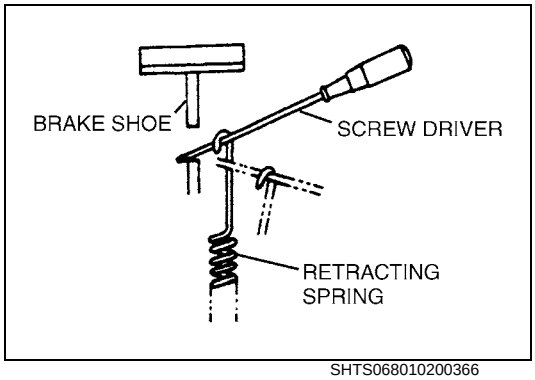
SHTS068010200364

3. INSTALLATION OF BRAKE SHOE ASSEMBLY.

(1) Apply heat-resistant grease to both ends of the shoe web contacting with the piston, and to the top surface of the shoe web contacting the shoe hold washer.


SHTS068010200365

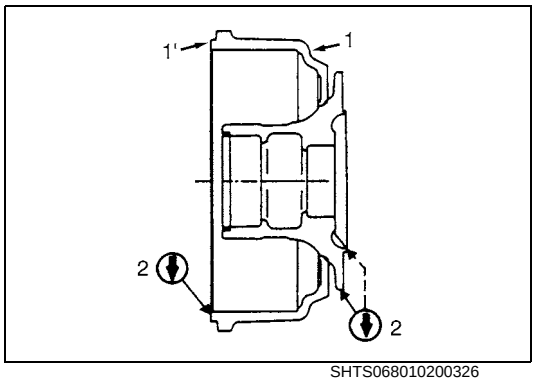
(2) Adjust the clearance between the hold down washer and the shoe.
Tighten the slotted nut and back off the nut by 1/3 turn.
Then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



SHTS068010200366

4. INSTALLATION OF BRAKE SHOE RETRACTING SPRING.

(1) Install the retracting spring using a screwdriver. After installing the spring, check that the end of the shoe web is securely set in the groove of the wheel cylinder piston. Also check that the hook of the spring is securely hooked in the hole of the shoe.



SHTS068010200326

5. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB. (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in figure. Install the drum according to NOTICE.

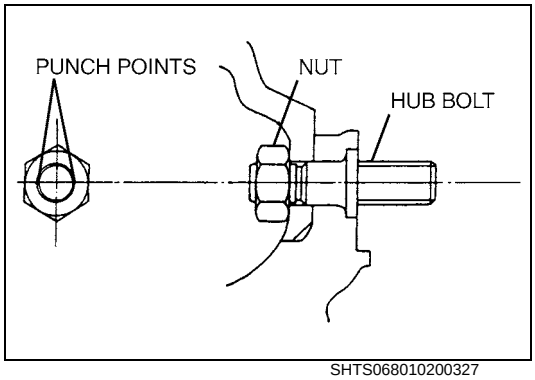
NOTICE

1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drums: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE
Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).



SHTS068010200327

(3) Caulk the hub and nuts as shown in figure, after tightening the brake drum and wheel hub.
Tightening Torque:
393-470 N·m {4,000-4,800 kgf·cm, 290-347 lbf·ft}

6. MOUNTING OF WHEEL HUB WITH BRAKE DRUM.

(1) Refer to the chapter "**FRONT AXLE**" and "**REAR AXLE"**.

7. MOUNTING OF TIRE.

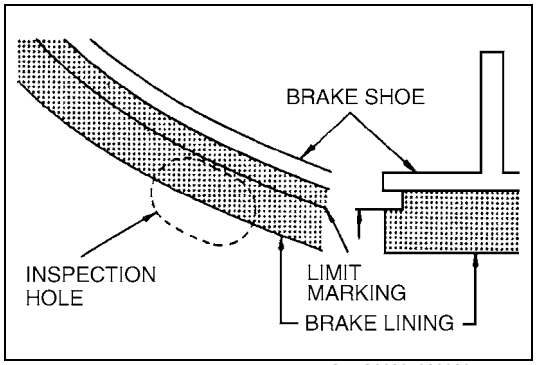
(1) Refer to the chapter **"WHEEL & TIRE**".

8. ADJUSTMENT.

(1) Finally, adjust the clearance between the brake lining and the brake drum as explained in section **"ADJUSTMENT"**.

ADJUSTMENT

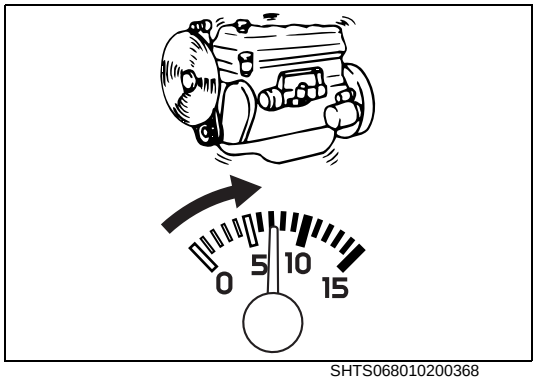
EN0680102H300030



SHTS068010200367

1. REMAINING THICKNESS OF THE BRAKE LINING.

(1) Check remaining thickness of lining through the inspection hole of the backing plate. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made replace the lining.



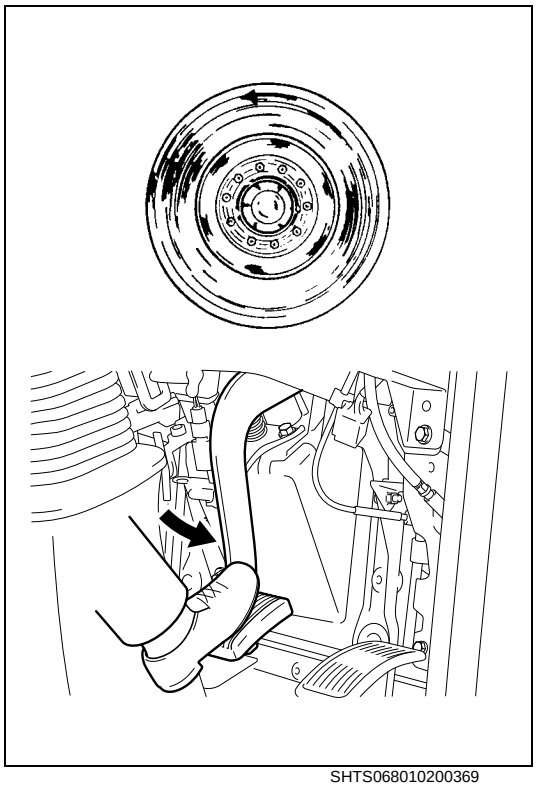
SHTS068010200368

2. AIR PRESSURE IN THE AIR TANK.

(1) Operate the engine and obtain an air pressure of the 785-880 kPa {8.0-9.0 kgf/cm^2, 114-128 lbf/in.^{2}}

NOTICE

The specified air pressure in the air tank should be maintained when making the adjustment.


SHTS068010200369

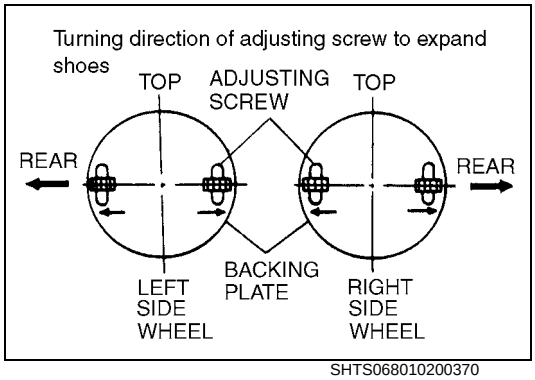
3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM.

(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

NOTICE

When adjusting the clearance between brake lining and brake drum, set spring brake control valve to the OFF position.

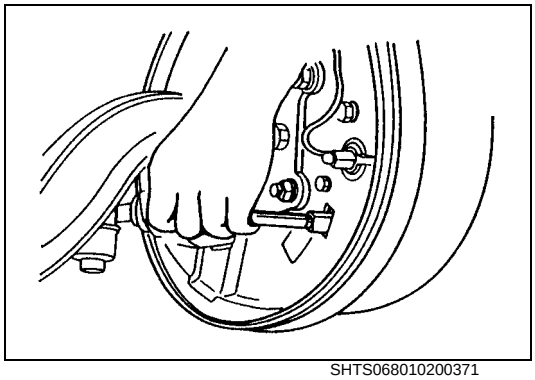


SHTS068010200370

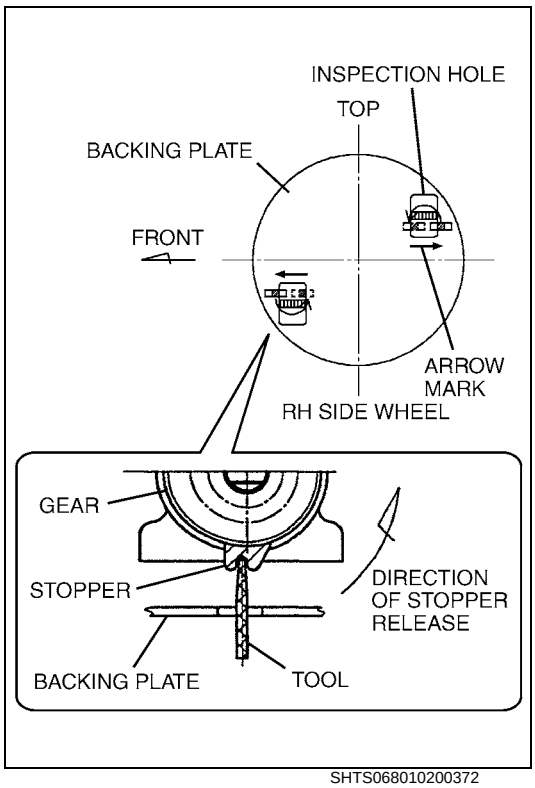
(3) Adjust the clearance between brake lining and brake drum.

(Without auto-adjuster)

1. Turn the adjusting screw with an adjusting tool in the arrow direction (The arrows are marked near the holes on the backing plate), and put the drum into a position as to turn slowly by hand.
   SST: Brake shoe adjusting tool (S0966-51130)


SHTS068010200371

2. Return the adjusting screw 5-7 notches in the reverse arrow direction.



SHTS068010200372

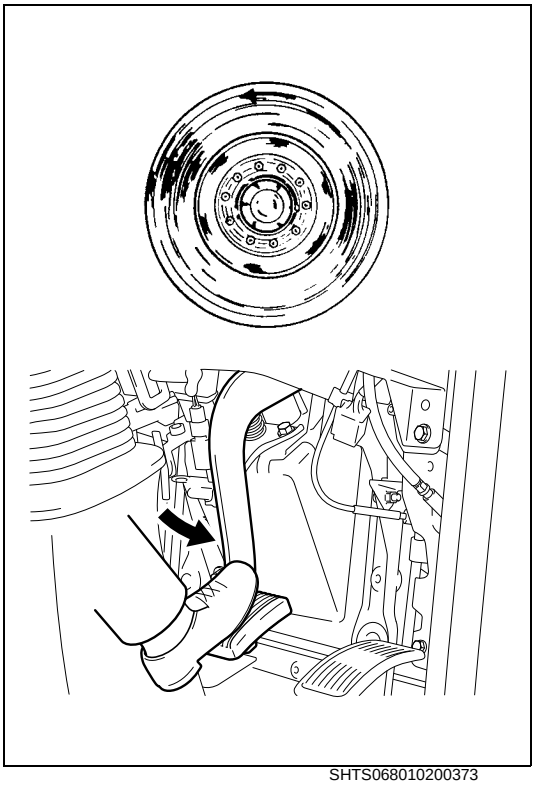
(With auto-adjuster)

1. Insert the thickness gauge of **0.4 mm {0.0157 in.}** through the inspection hole. And turn the adjusting screw with an adjusting tool in the arrow direction (The arrows are marked near the inspection holes.). That is a direction to expand the shoe. So that the shoe gap can become **0.4 mm {0.0157 in.}**.
   SST: Brake shoe adjusting tool (S0966-51130)

NOTICE
If the thickness gauge can not be inserted due to narrow gap (Less than 0.4 mm {0.0157 in.}), release the stopper by moving the adjusting stopper to the position shown in the figure.

2. Turn the adjusting screw to the direction to shrink the shoe. That is the reverse direction of the arrow mark. And then adjust the shoe gap to **0.4 mm {0.0157 in.}**.

NOTICE
Do not forget to return the adjusting stopper to the original position.



SHTS068010200373

(4) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(5) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from (2).

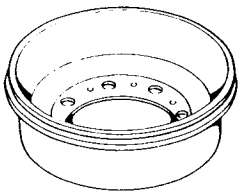
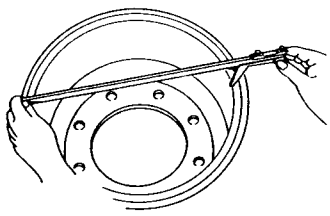
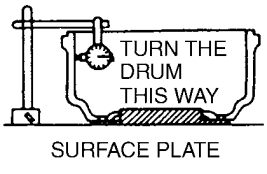
NOTICE
Using the same procedure as above, adjust the clearance for all wheels.

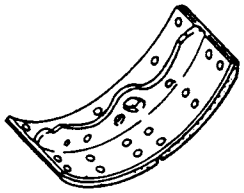
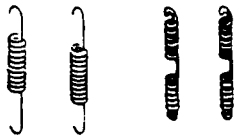
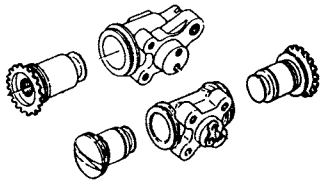
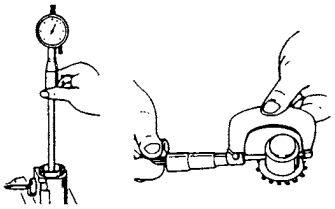
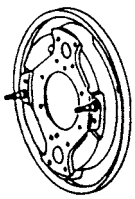
INSPECTION AND REPAIR

EN0680102H300031

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**400 {15.748}**	**403 {15.866}**	**Replace.**	**Measure** 
Brake drum runout	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure**  SURFACE PLATE

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**15.0 {0.590}**	**5.0 {0.197}**	**Re-lining.**	**Measure** 
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**0.03-0.13 {0.0012-0.0051}**	**0.25 {0.0098}**	**Replace.**	**Measure** 
Backing plate and stud pins: Deformation, damage and any other abnormality	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE

(MODELS: CHILI GD, THAILAND FG, INDONESIA FG)

DATA AND SPECIFICATIONS

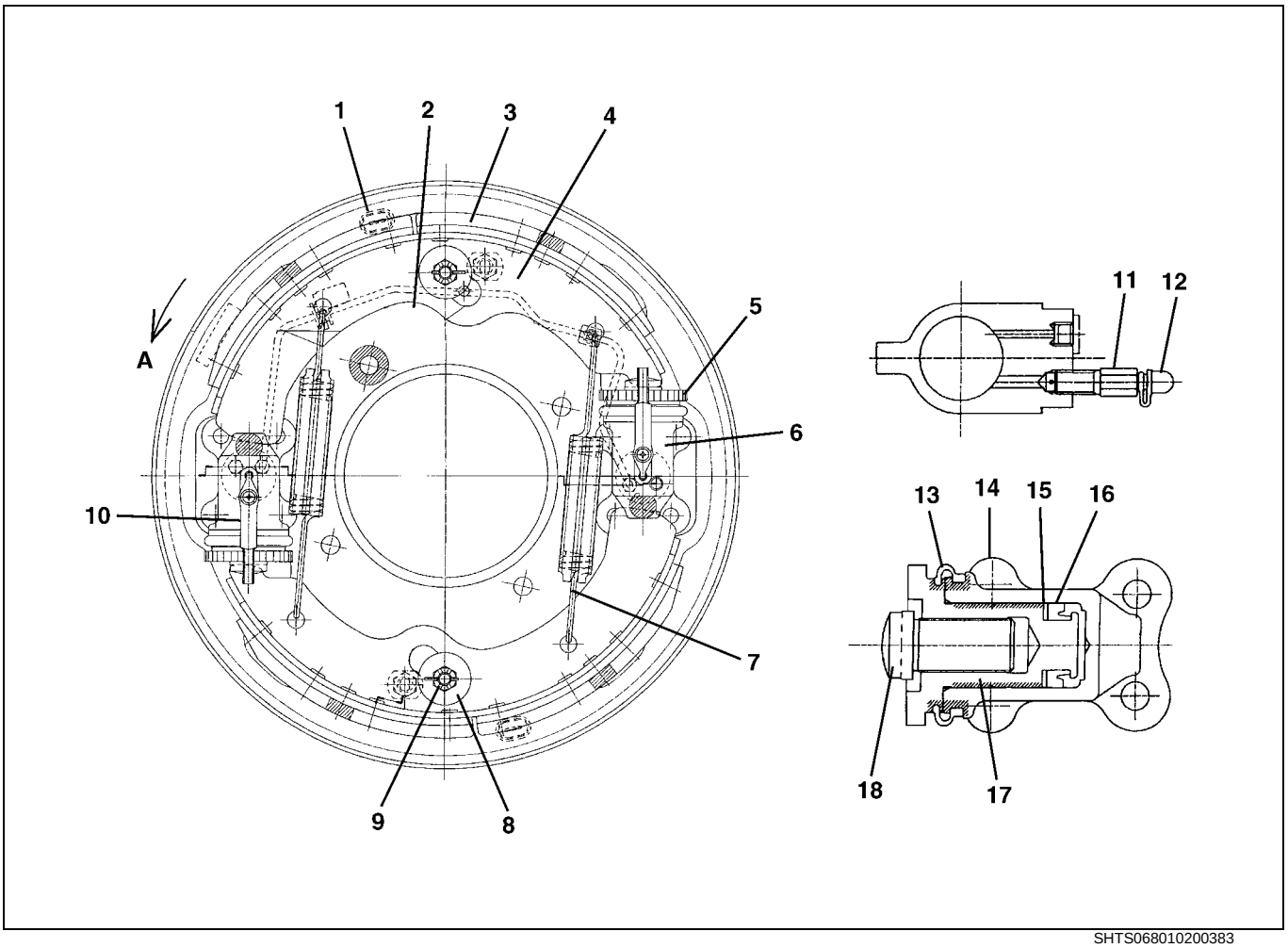
EN0680102I200025

Type		**Drum brake with hydraulically actuated, internally expanding, two-leading shoes in front wheels and dual two-leading shoes in rear wheels.**
Brake drum inside diameter		**400 mm {15.75 in.} for both front and rear.**
Brake lining (Width x Thickness)	**Front**	**120 x 15 mm {4.72 x 0.59 in.}**
	Rear	**155 x 15 mm {6.10 x 0.59 in.}**
Wheel cylinder bore diameter	**Front**	**34.93 mm {1.375 in.}**
	Rear	**38.10 mm {1.50 in.}**

DESCRIPTION

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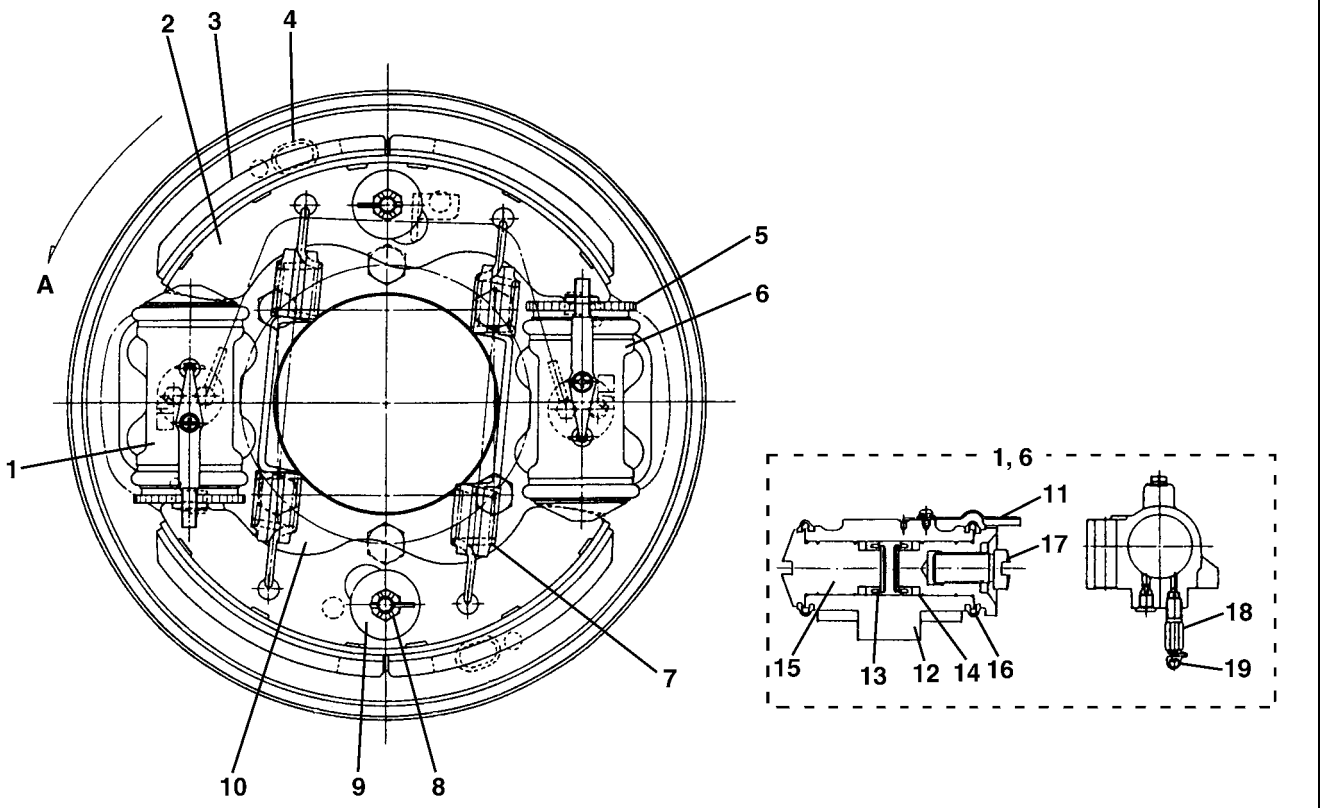
FRONT



SHTS068010200383

1	Hole plug	11	Air bleeder screw
2	Backing plate	12	Bleeder cap
3	Brake lining	13	Boot
4	Brake shoe	14	Wheel cylinder
5	Shoe adjusting screw	15	Back up ring
6	Wheel cylinder assembly	16	Piston cup
7	Shoe retracting spring	17	Piston
8	Shoe hold down washer	18	Adjusting bolt
9	Shoe hold down nut	A	Forward turning
10	Adjuster lock spring		

REAR



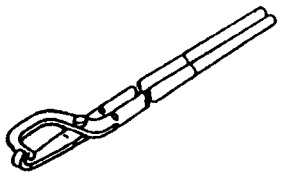
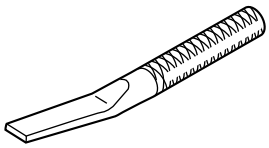
SHTS068010200384

1	Wheel cylinder assembly (Forward)	11	Adjuster lock spring
2	Brake shoe	12	Cylinder
3	Brake lining	13	Piston cup
4	Hole plug	14	Back up ring
5	Shoe adjusting screw	15	Piston
6	Wheel cylinder assembly (Rearward)	16	Boot
7	Shoe retracting spring	17	Adjusting bolt
8	Shoe hold down nut	18	Air bleeder screw
9	Shoe hold down washer	19	Bleeder cap
10	Backing plate	A	Forward turning

SPECIAL TOOL

EN0680102K100006

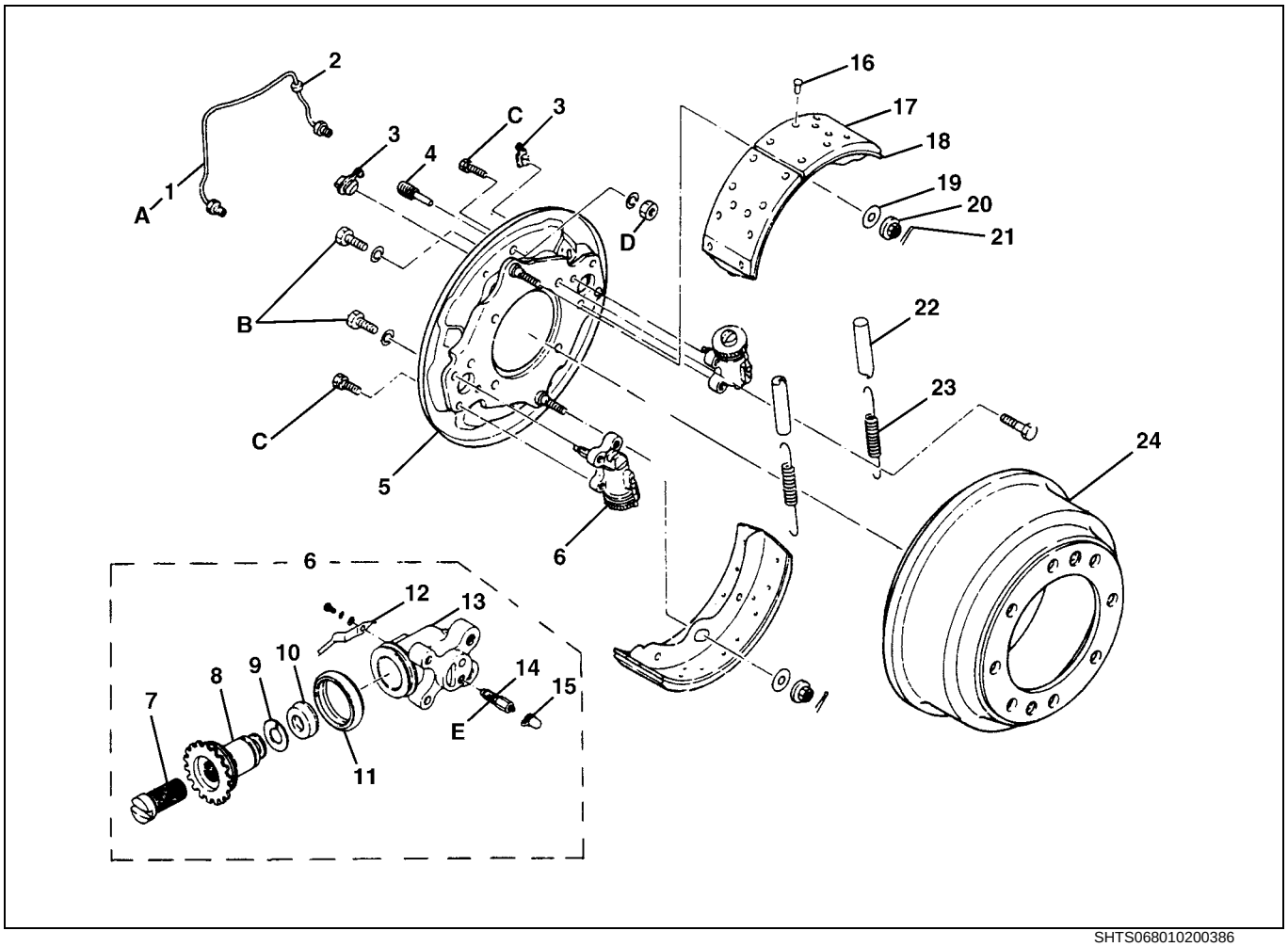
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0960-61040	RETRACTING SPRING PULL BACK TOOL	
	S0966-51130	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN0680102D100024

FRONT



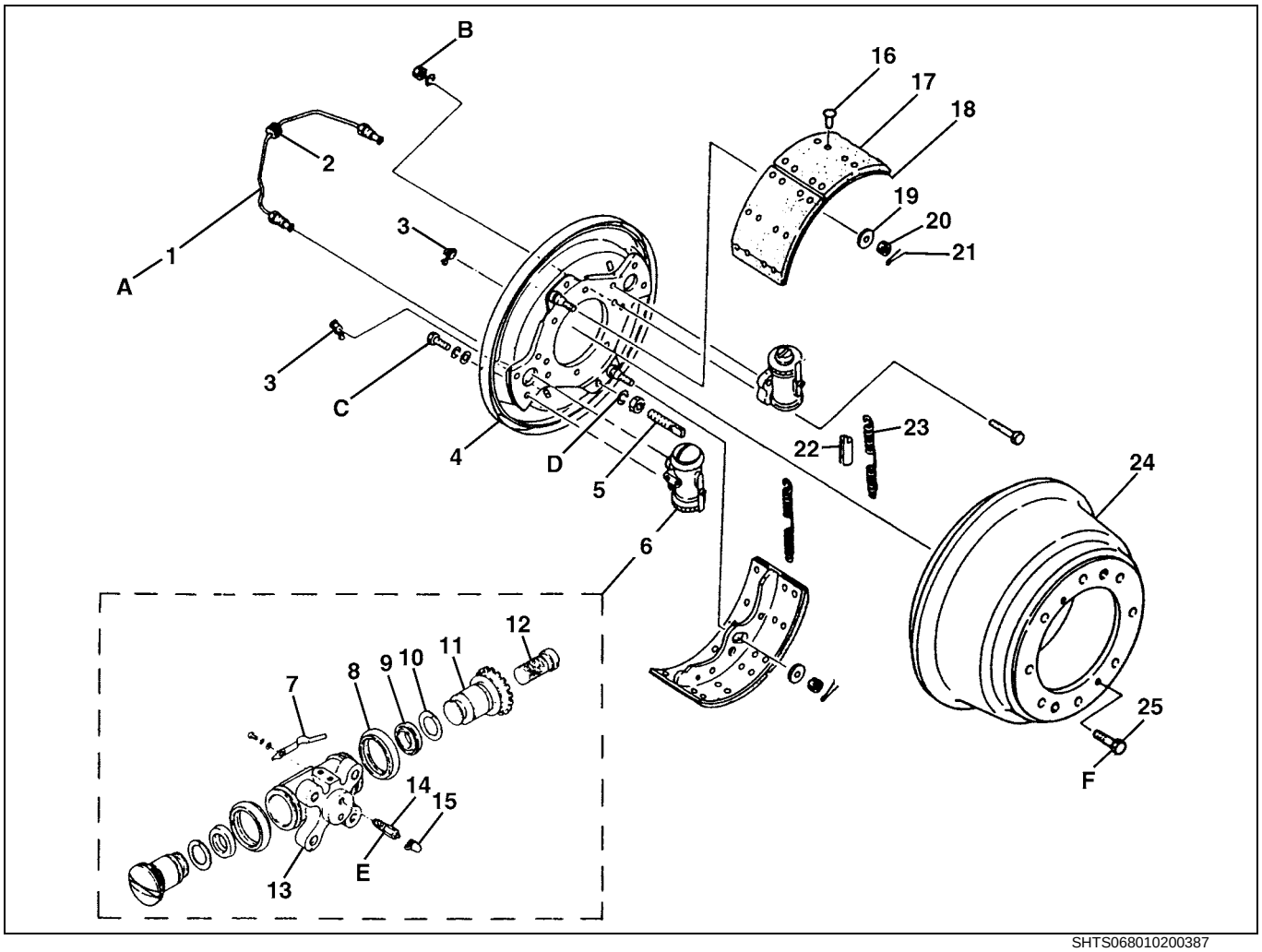
SHTS068010200386

1	Oil pipe	13	Wheel cylinder
2	Grommet	14	Air bleeder screw
3	Hole plug	15	Bleeder cap
4	Adjusting bolt	16	Rivet
5	Backing plate	17	Brake lining
6	Wheel cylinder assembly	18	Brake shoe
7	Shoe adjusting bolt	19	Shoe hold down washer
8	Piston	20	Shoe hold down nut
9	Back up ring	21	Cotter pin
10	Piston cup	22	Spring cover
11	Boot	23	Shoe retracting spring
12	Adjuster lock spring	24	Brake drum

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

A	12.8-17.6 {130-180, 10-13}	D	25.5-36.2 {260-370, 19-26}
B	148-196 {1,500-2,000, 109-144}	E	7.5-11.5 {75-120, 5.5-8.6}
C	37.3-49.0 {380-500, 28-36}		

REAR



SHTS068010200387

1	Oil pipe	14	Air bleeder screw
2	Grommet	15	Bleeder cap
3	Hole plug	16	Rivet
4	Backing plate	17	Brake lining
5	Adjusting bolt	18	Brake shoe
6	Wheel cylinder assembly	19	Shoe hold down washer
7	Adjuster lock spring	20	Shoe hold down nut
8	Boot	21	Cotter pin
9	Piston cup	22	Spring cover
10	Back up ring	23	Shoe retracting spring
11	Piston	24	Brake drum
12	Shoe adjusting bolt	25	Bolt (for out-board mounted brake drum)
13	Wheel cylinder		

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

A	12.8-17.6 {130-180, 10-13}	D	25.5-36.2 {260-370, 19-26}
B	148-196 {1,500-2,000, 109-144}	E	7.5-11.5 {75-120, 5.5-8.6}
C	122.6-166.7 {1,250-1,700, 91-122}	F	20.5-39.5 {205-400, 15-28}

OVERHAUL

EN0680102H200020

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF TIRE

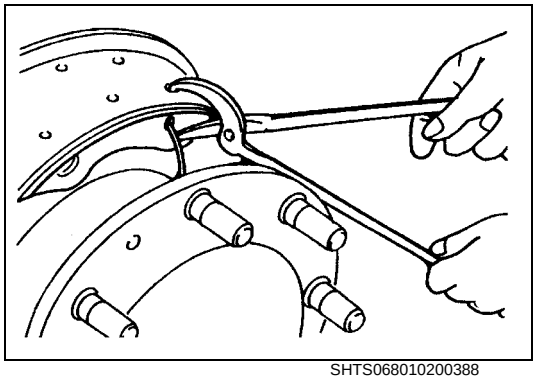
(1) Refer to the chapter "**WHEEL & TIRE"**.

2. REMOVAL OF BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS

(1) Refer to the chapter "**FRONT AXLE**" and "**REAR AXLE"**.

3. REMOVAL OF BRAKE SHOE RETRACTING SPRING

(1) Remove the retracting spring by using the special tools.
SST: Retracting spring pull back tool (S0960-61040)



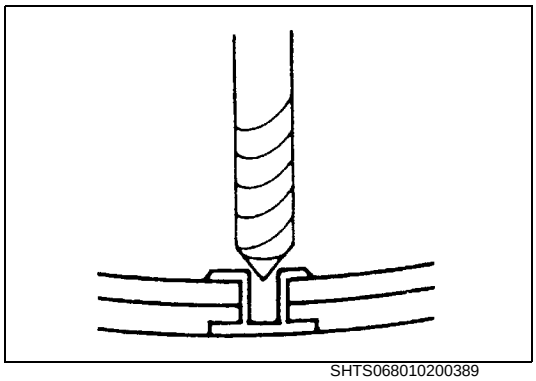
SHTS068010200388

IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE BRAKE LINING

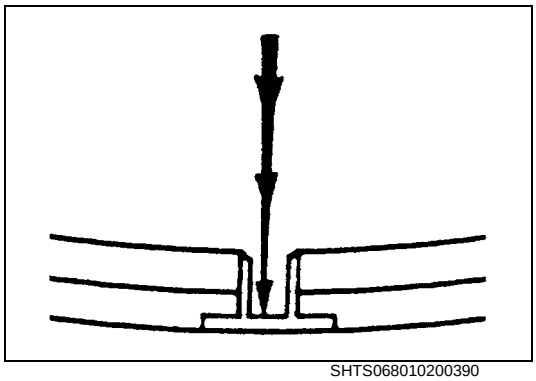
(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

NOTICE
At this time, be careful not to scratch the brake shoe.



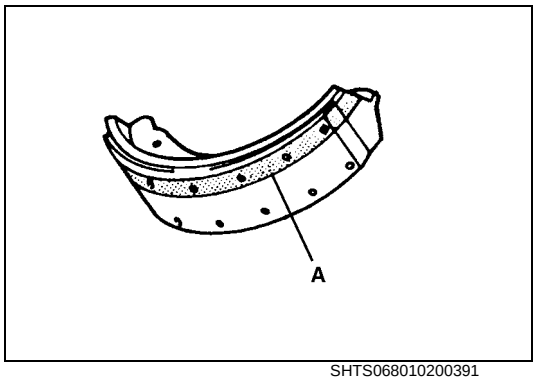
SHTS068010200389

(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.

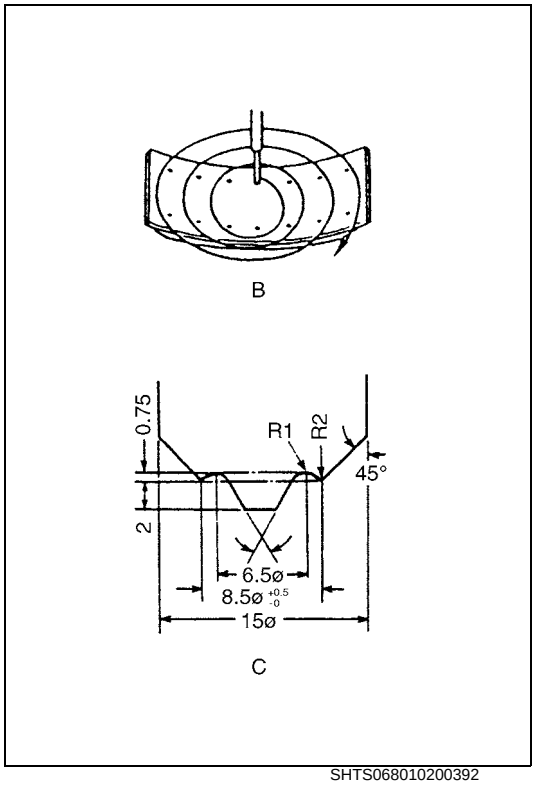


SHTS068010200390

(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape "A".



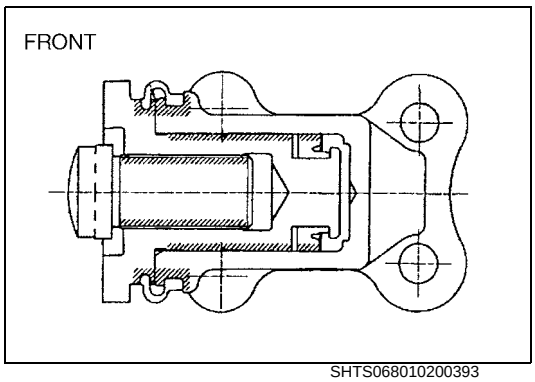
SHTS068010200391



SHTS068010200392

(4) Caulk the rivets lightly in a circular pattern as shown "B"; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in "C".
Recommended force of staking the rivet: 2.4 tons

(5) Remove adhesive tape.



SHTS068010200393

2. ASSEMBLY OF THE WHEEL CYLINDER

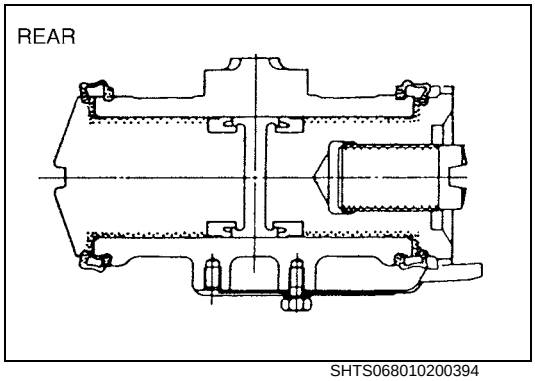
(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI No.20):
S0415-61010

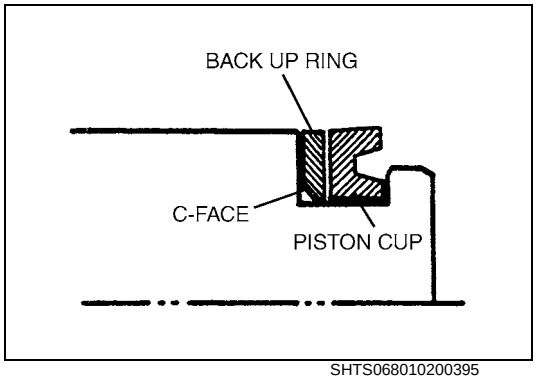
(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2):
S0413-31080

NOTICE
The parts where the rubber grease shall be applied are shown in figure with oblique lines.

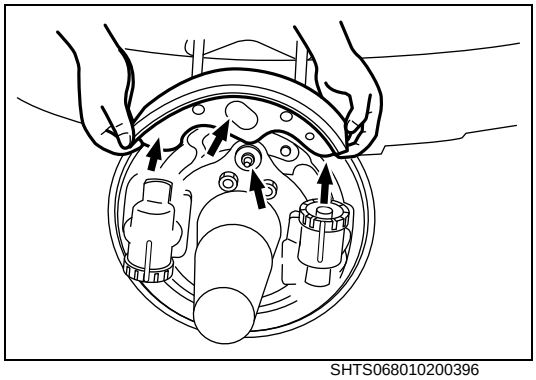


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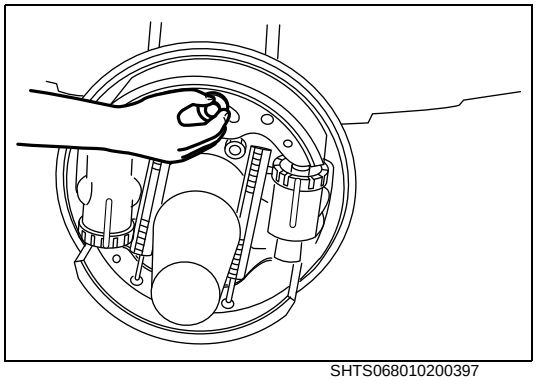
SHTS068010200395

(3) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.

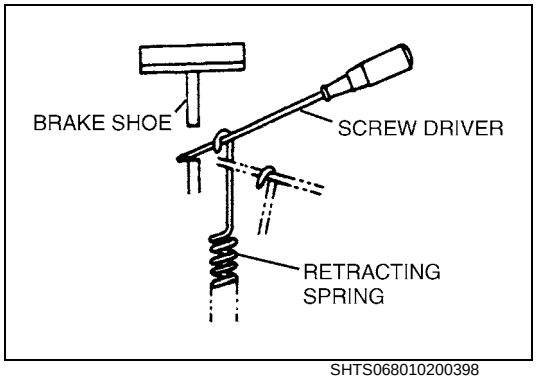

SHTS068010200396

3. INSTALLATION OF BRAKE SHOE ASSEMBLY

(1) Apply heat-resistant grease to both ends of the shoe web contacting with the piston, and to the top surface of the shoe web contacting the shoe hold washer.


SHTS068010200397

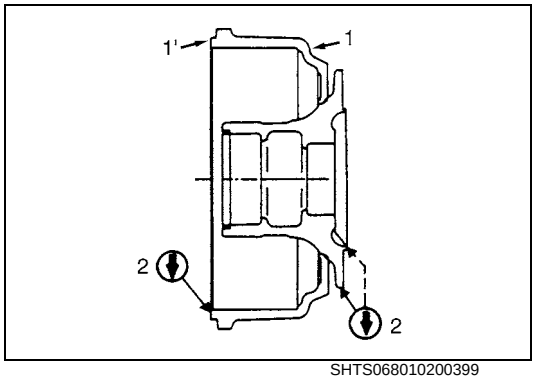
(2) Adjust the clearance between the hold down washer and the shoe.
Tighten the slotted nut and back off the nut by 1/3 turn.
Then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



SHTS068010200398

4. INSTALLATION OF BRAKE SHOE RETRACTING SPRING

(1) Install the retracting spring using a screwdriver. After installing the spring, check that the end of the shoe web is securely set in the groove of the wheel cylinder piston. Also check that the hook of the spring is securely hooked in the hole of the shoe.



SHTS068010200399

5. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in Figure. Install the drum according to NOTICE.

NOTICE

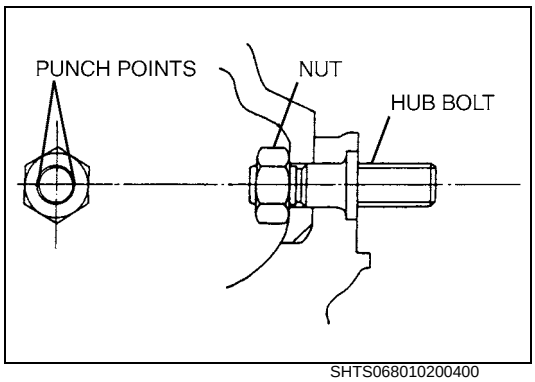
1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drums: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).



SHTS068010200400

(3) Caulk the hub and nuts as shown in figure, after tightening the brake drum and wheel hub.
Tightening Torque:
393-470 N·m {4,000-4,800 kgf·cm, 290-347 lbf·ft}

6. MOUNTING OF WHEEL HUB WITH BRAKE DRUM

(1) Refer to the chapter "**FRONT AXLE**" and "**REAR AXLE**".

7. MOUNTING OF TIRE

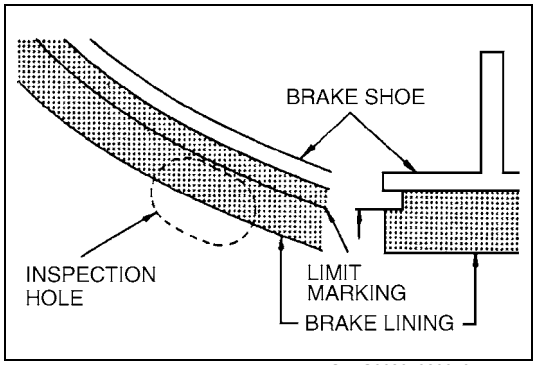
(1) Refer to the chapter "**WHEEL & TIRE**".

8. ADJUSTMENT

(1) Finally, adjust the clearance between the brake lining and the brake drum as explained in section "**ADJUSTMENT**".

ADJUSTMENT

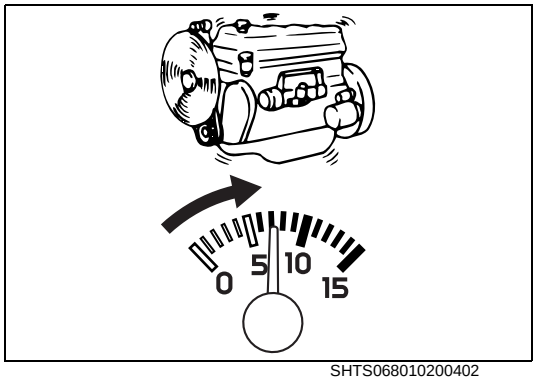
EN0680102H300032



SHTS068010200401

1. REMAINING THICKNESS OF THE BRAKE LINING

(1) Check remaining thickness of lining through the inspection hole of the backing plate. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection, the lining should be made replacement the lining.



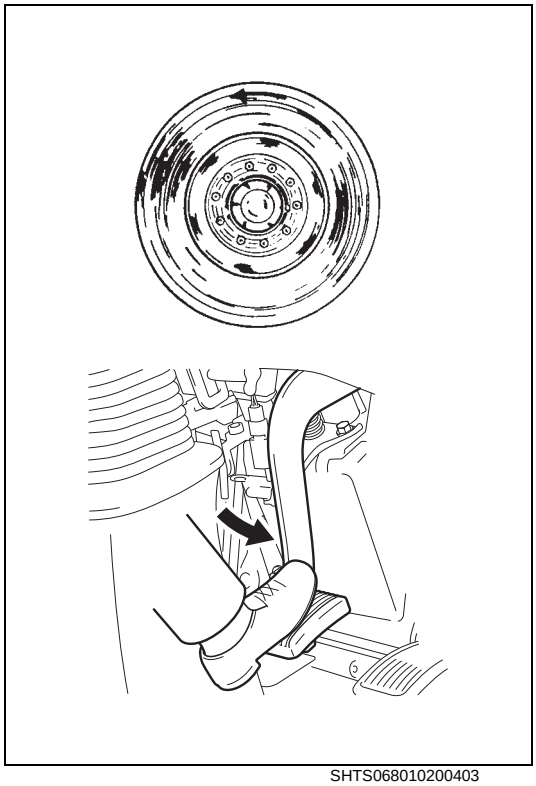
SHTS068010200402

2. AIR PRESSURE IN THE AIR TANK

(1) Operate the engine and obtain an air pressure of the 785-880 kPa {8.0-9.0 kgf/cm^2, 114-128 lbf/in.^{2}}

NOTICE

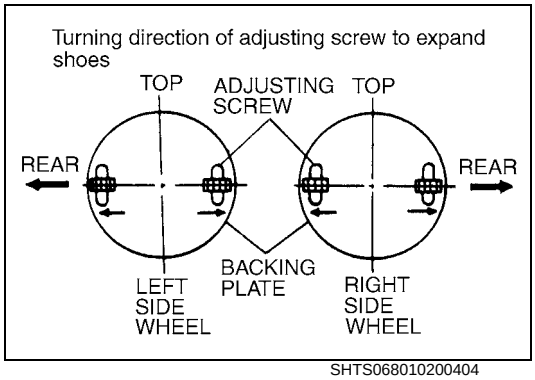
The specified air pressure in the air tank should be maintained when making the adjustment.


SHTS068010200403

3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM

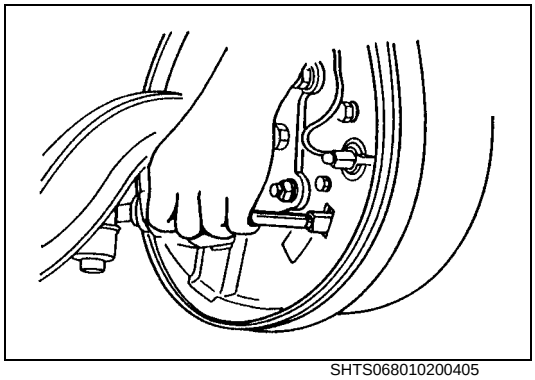
(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

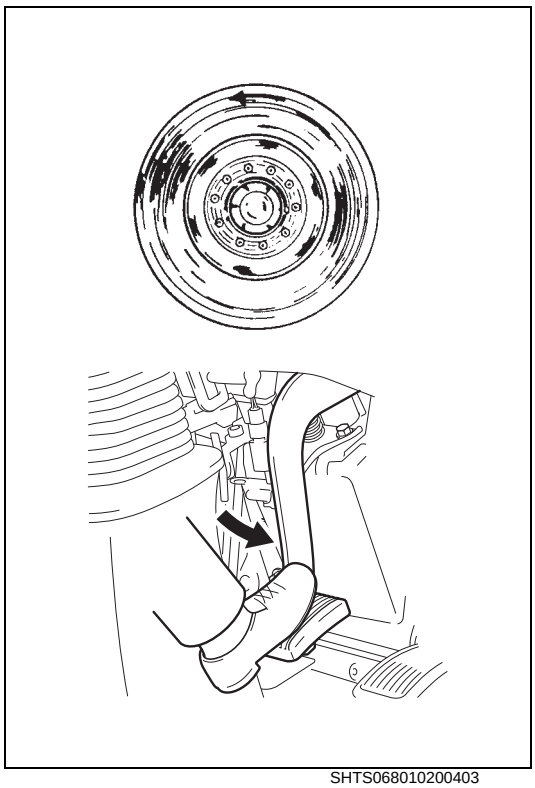


SHTS068010200404

(3) Turn the adjusting screw with an adjusting tool in the arrow direction (The arrows are marked near the holes on the backing plate), and put the drum into a position as to turn slowly by hand.
SST: Brake shoe adjusting tool (S0966-51130)


SHTS068010200405

(4) Return the adjusting screw 5-7 notches in the reverse arrow direction.


SHTS068010200403

(5) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

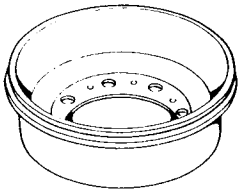
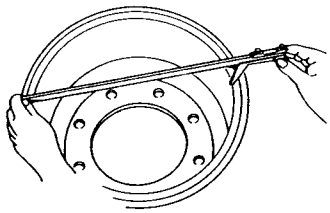
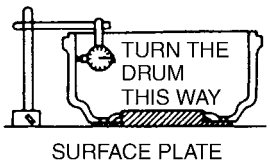
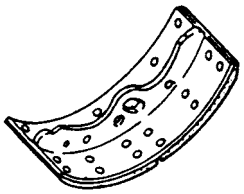
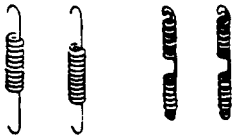
(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from (2).

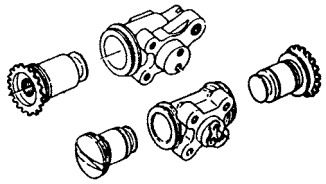
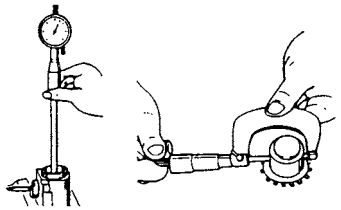
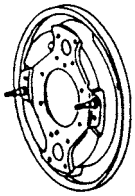
NOTICE
Using the same procedure as above, adjust the clearance for all wheels.

INSPECTION AND REPAIR

EN0680102H300033

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**400 mm {15.748 in.}**	**403 mm {15.866 in.}**	**Replace.**	**Measure** 
Brake drum runout	**0-0.1 mm {0-0.0039 in.}**	**0.2 mm {0.0079 in.}**	**Regrind or replace.**	**Measure** 
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**15.0 mm {0.590 in.}**	**5.0 mm {0.197 in.}**	**Re-lining.**	**Measure** 
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**0.03-0.13 mm {0.0012-0.0051 in.}**	**0.25 mm {0.0098 in.}**	**Replace.**	**Measure** 
Backing plate and stud pins: Deformation, damage and any other abnormality	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE (MODELS: TAIWAN FG, GH)

DATA AND SPECIFICATIONS

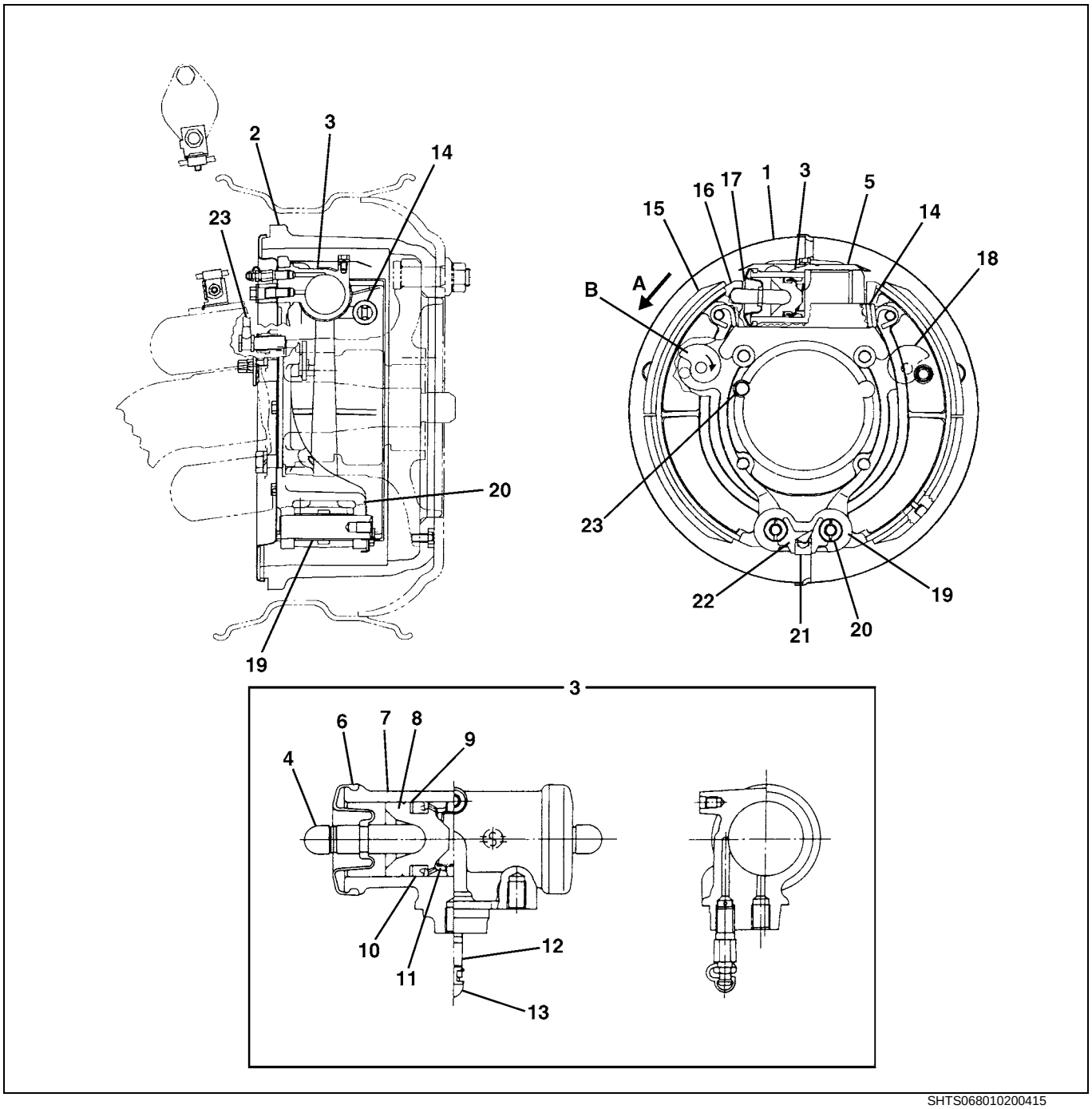
EN0680102I200026

Type		**Drum brake with hydraulically actuated, internally expanding, leading-trailing shoes in all wheels.**
Brake drum inside diameter		**406.4 mm {16.00 in.} for both front and rear.**
Brake lining (Width x Thickness)	**Front**	**127 x 15.5 mm {5 x 0.61 in.}**
	Rear	**203 x 15.5 mm {8 x 0.61 in.}**
Wheel cylinder bore diameter	**Front**	**50.8 mm {2.000 in.}**
	Rear	**58.7 mm {2.311 in.}**

DESCRIPTION

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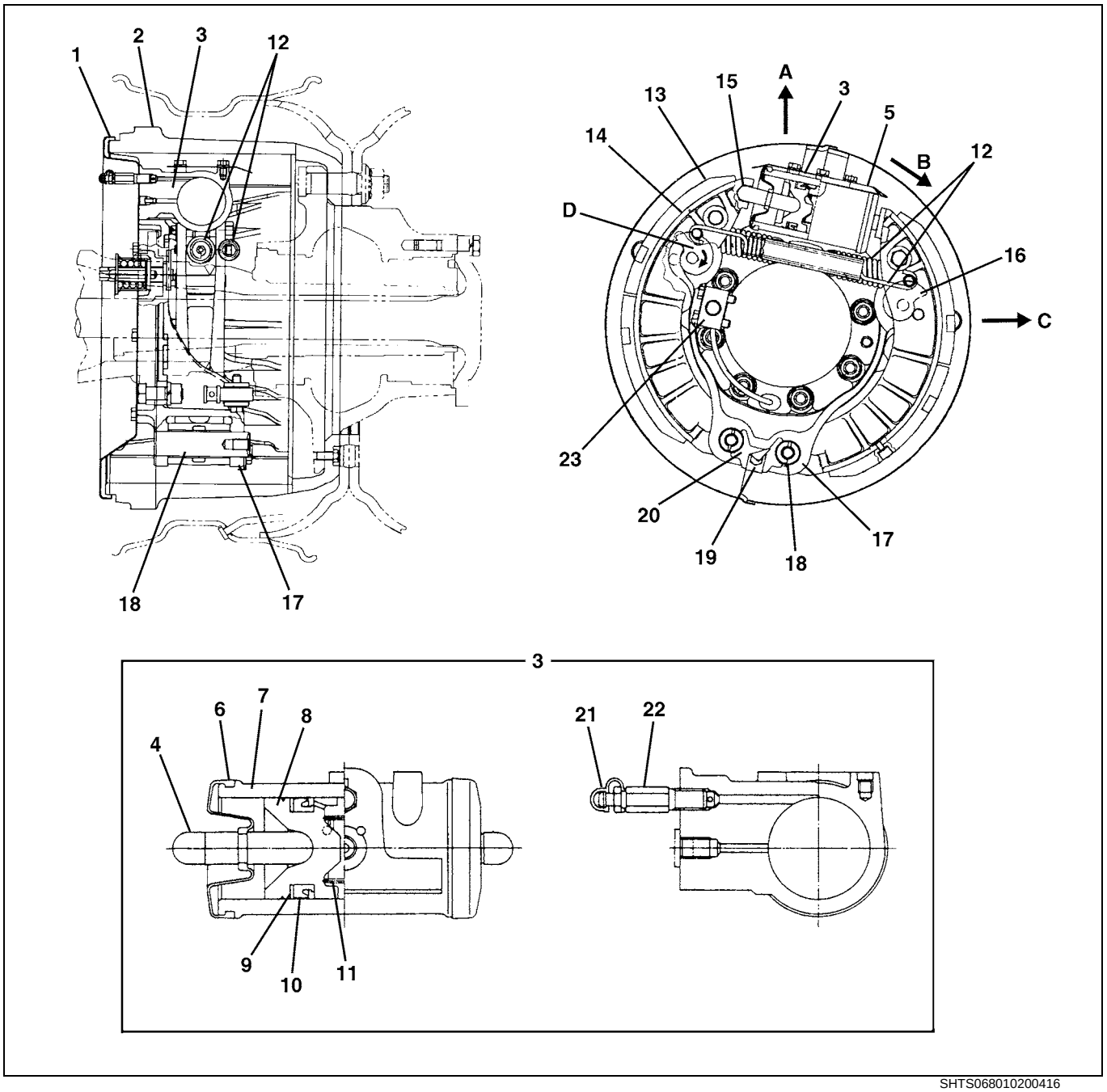
FRONT



SHTS068010200415

1	Drum cover	10	Piston cup	19	Brake spider
2	Brake drum	11	Spring	20	Anchor pin
3	Wheel cylinder assembly	12	Air bleeder screw	21	Lock plate
4	Push rod	13	Cap	22	Retainer
5	Cylinder cover	14	Retracting spring	23	Wheel sensor (If so equipped)
6	Boot	15	Brake lining	A	Forward turning of the drum
7	Cylinder	16	Brake shoe	B	To move the shoe outward
8	Piston	17	Holder		
9	Back up ring	18	Adjusting cam		

REAR



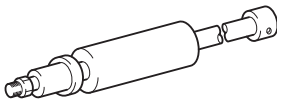
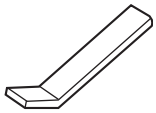
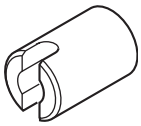
SHTS068010200416

1	Drum cover	10	Piston cup	19	Lock plate
2	Brake drum	11	Spring	20	Retainer
3	Wheel cylinder assembly	12	Retracting spring	21	Bleeder cap
4	Push rod	13	Brake lining	22	Air bleeder
5	Cylinder cover	14	Brake shoe	23	Wheel sensor (If so equipped)
6	Boot	15	Holder	A	Top
7	Cylinder	16	Adjusting cam	B	Forward turning of the drum
8	Piston	17	Brake spider	C	Front (Forward)
9	Back up ring	18	Anchor pin	D	To move the shoe outward

SPECIAL TOOL

EN0680102K100007

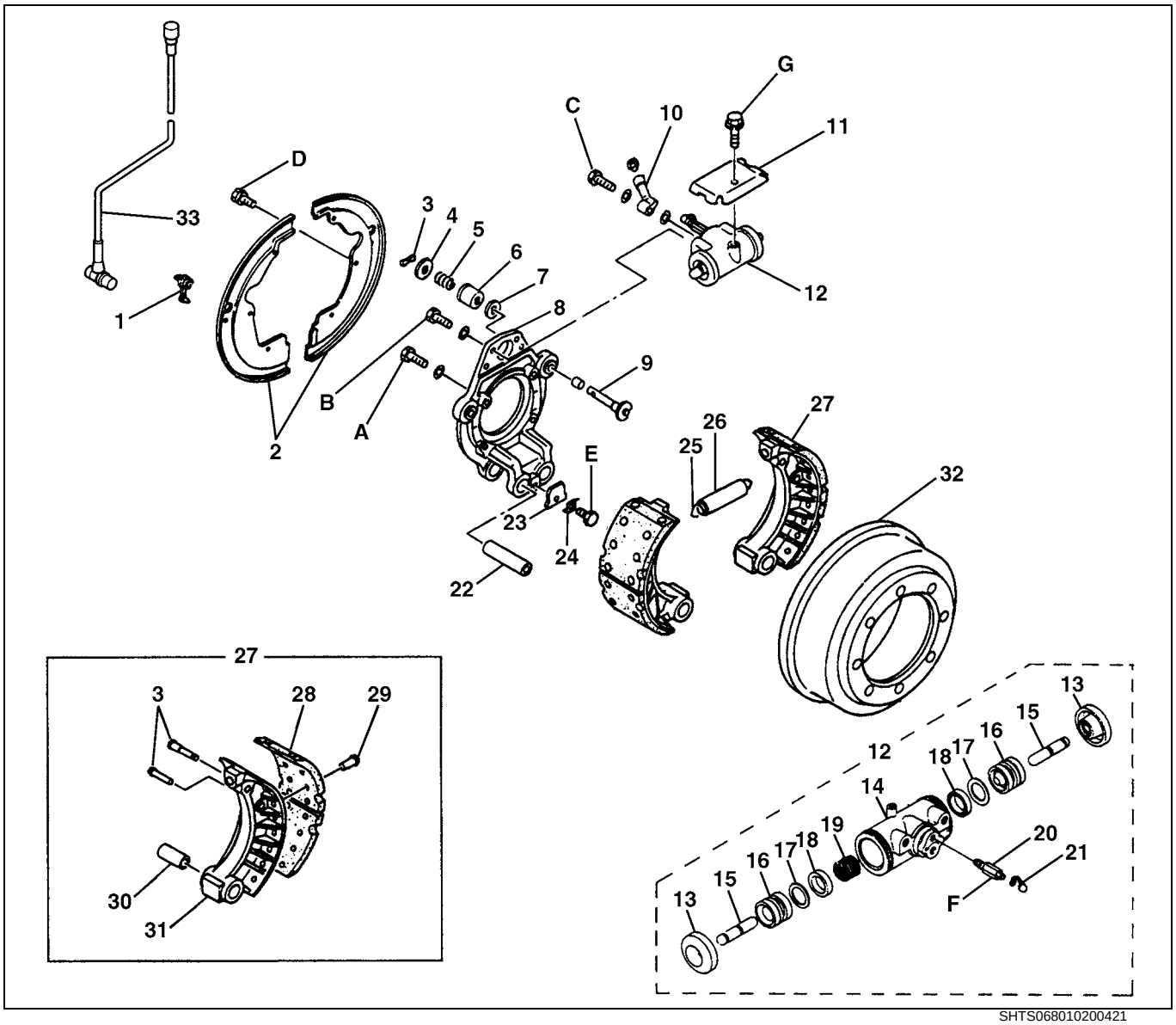
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0968-31070	SPRING PULL BACK TOOL	
	S0942-01510	ANCHOR PIN PULLER	
	S0968-41010	ANCHOR PIN TOOL	
	S0965-71330	GUIDE	

COMPONENT LOCATOR

EN0680102D100025

FRONT



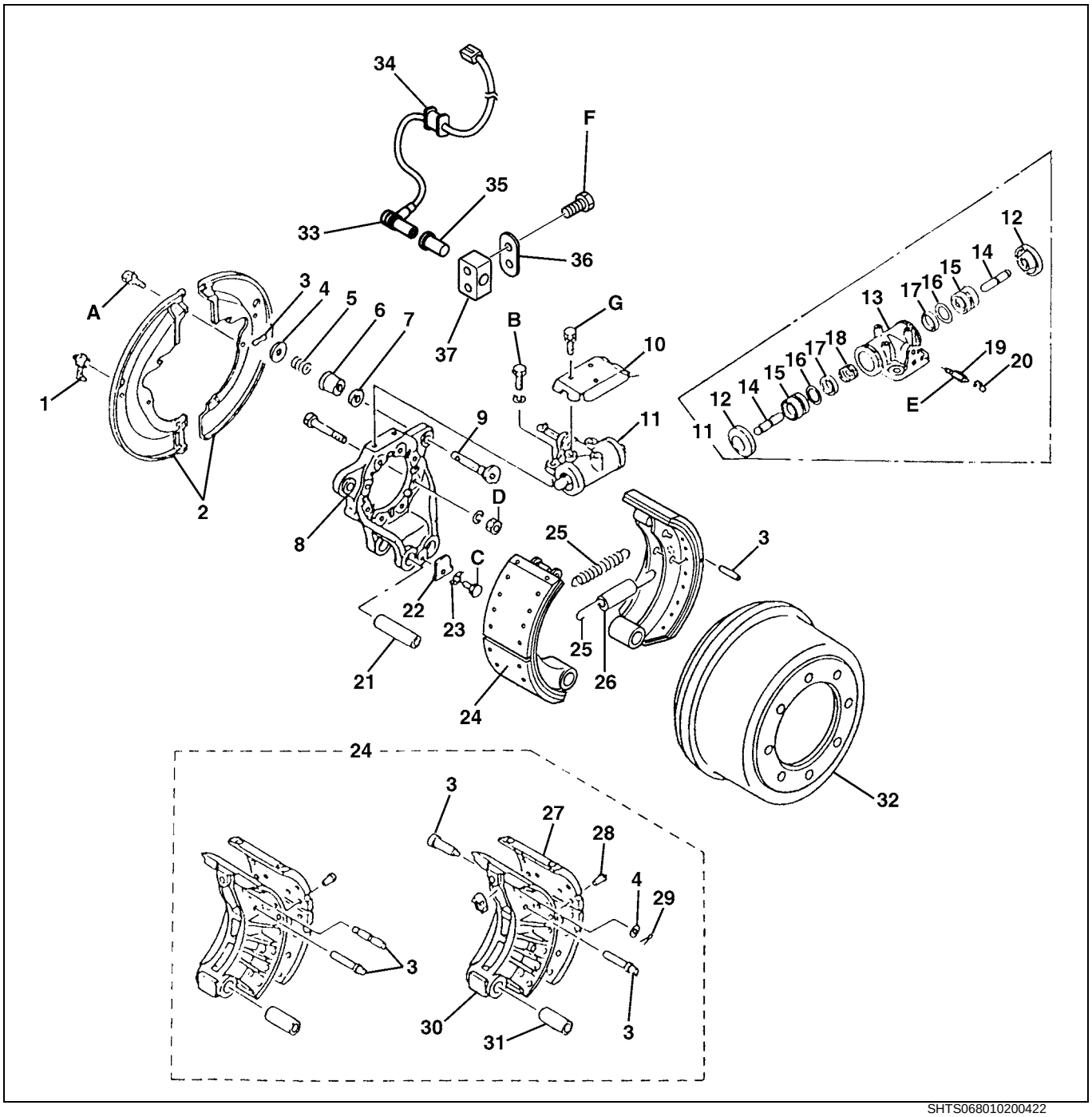
SHTS068010200421

1	Hole plug	12	Wheel cylinder assembly	23	Retainer
2	Drum cover	13	Boot	24	Lock plate
3	Pin	14	Cylinder	25	Retracting spring
4	Collar	15	Push rod	26	Cover
5	Spring	16	Piston	27	Brake shoe assembly
6	Boot	17	Back up ring	28	Brake lining
7	Washer	18	Piston cup	29	Rivet
8	Brake spider	19	Spring	30	Bushing
9	Adjusting cam	20	Air bleeder screw	31	Brake shoe
10	Joint bolt	21	Cap	32	Brake drum
11	Cylinder cover	22	Anchor pin	33	Wheel sensor (If so equipped)

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

A	168-226 {1,700-2,300, 123-166}	E	34.5-51.5 {350-527, 26-38}
B	61-91 {621-930, 45-67}	F	13-19 {120-200, 9-14}
C	44-60 {450-610, 33-45}	G	18-26 {180-270, 13-19}
D	34.5-51.5 {350-527, 26-38}		

REAR



SHTS068010200422

1	Hole plug	14	Push rod	27	Brake lining
2	Drum cover	15	Piston	28	Rivet
3	Pin	16	Back up ring	29	Cotter pin
4	Collar	17	Piston cup	30	Brake shoe
5	Spring	18	Spring	31	Bushing
6	Boot	19	Air bleeder screw	32	Brake drum
7	Washer	20	Cap	33	Wheel sensor (If so equipped)
8	Brake spider	21	Anchor pin	34	Bushing (If so equipped)
9	Adjusting cam	22	Retainer	35	Clamping bushing (If so equipped)
10	Cylinder cover	23	Lock plate	36	Lock plate (If so equipped)
11	Wheel cylinder assembly	24	Brake shoe assembly	37	Wheel sensor holder (If so equipped)
12	Boot	25	Retracting spring		
13	Cylinder	26	Spring cover		

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

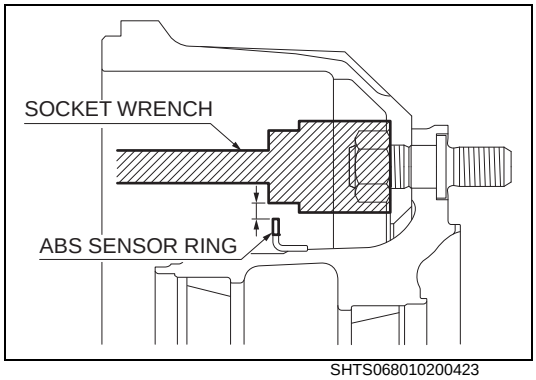
A	34.5-51.5 {350-527, 26-38}	E	13-19 {120-200, 9-14}
B	99-147 {1,000-1,500, 73-108}	F	34.5-51.5 {350-527, 26-38}
C	34.5-51.5 {350-527, 26-38}	G	18-26 {180-270, 13-19}
D	168-226 {1,700-2,300, 123-166}		

OVERHAUL

EN0680102H200021

IMPORTANT POINTS - DISASSEMBLY

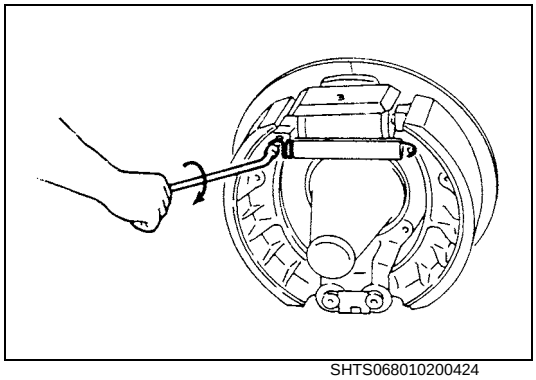
1. REMOVE THE TIRE.
(1) Refer to the chapter **"WHEEL & TIRE"**.



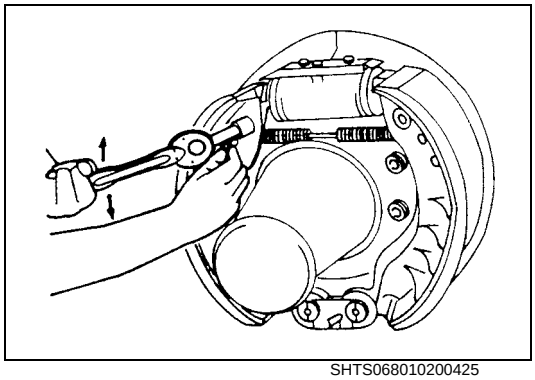
SHTS068010200423

2. REMOVE THE BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS.
(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

NOTICE
(If so equipped)
When mounting or dismounting the brake drum without removing the sensor ring, pay attention not to damage the sensor ring by tools.
If tools hit the sensor ring and damage it, ABS operation may be deteriorated.

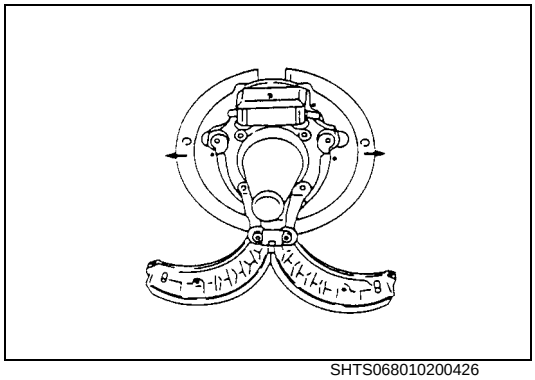

SHTS068010200424

3. RETRACTING SPRING.
(1) Using the special tool, remove the brake shoe retracting spring. (Front wheel and rear wheel)
SST: Spring pull back tool (S0968-31070)



SHTS068010200425

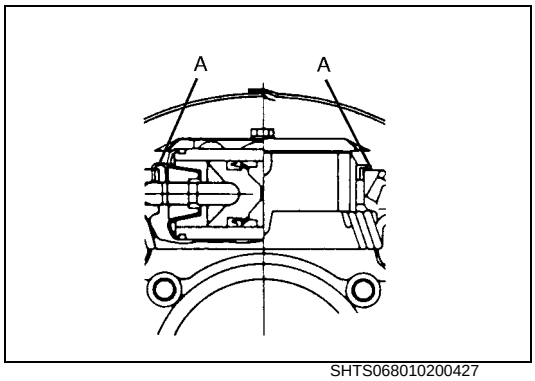
(2) Pull out the pin, and then remove the brake shoe inner retracting spring. (Rear drive wheel)



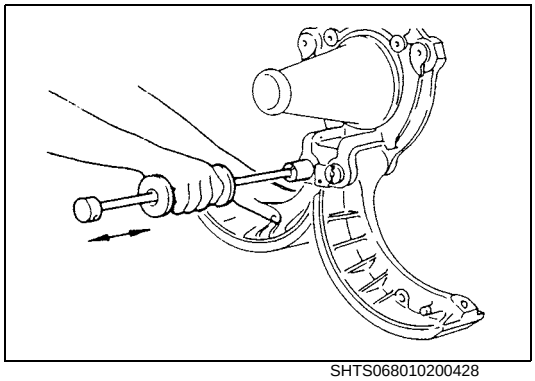
SHTS068010200426

4. BRAKE SHOE

(1) Remove the holder A of wheel cylinder push rod from the brake shoe, then keep holding the brake shoe and remove the drum cover.



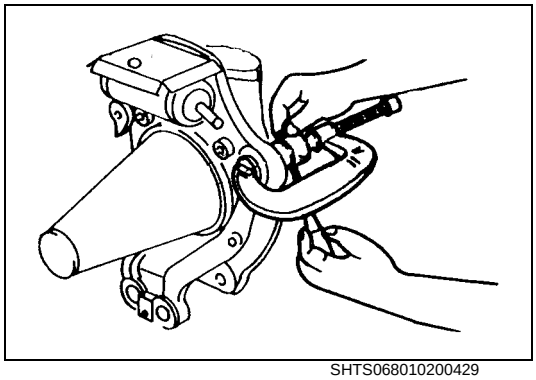
SHTS068010200427



SHTS068010200428

(2) Using the special tool, remove the anchor pin then take the brake shoe out.

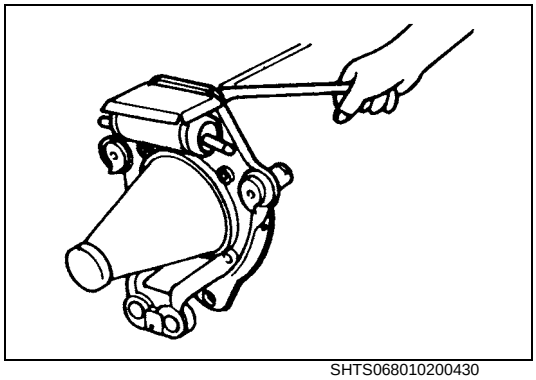
SST: Anchor pin puller (S0942-01510)


SHTS068010200429

5. OPERATING INSPECTION OF ADJUSTING CAM

(1) The cam should rotate smoothly but with enough resistance, if it is defective disassemble it.

(2) When disassemble and assemble the adjusting cam, using a special tool and hand vise.
SST: Guide (S0965-71330)

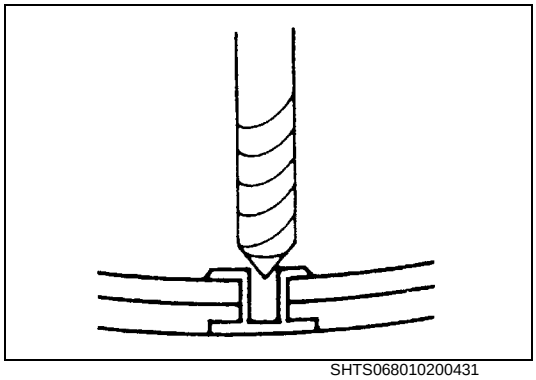

SHTS068010200430

6. REMOVAL WHEEL CYLINDER

(1) Disconnect the oil pipe and remove the wheel cylinder.

NOTICE
Place the drain pan under the wheel cylinder to catch the hydraulic fluid.

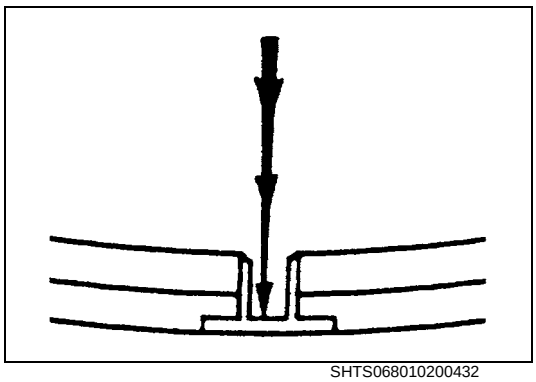
IMPORTANT POINTS - ASSEMBLY


SHTS068010200431

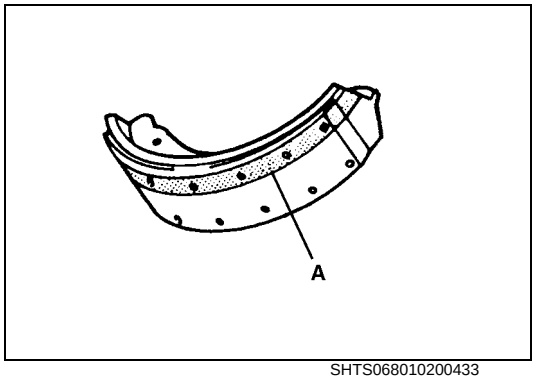
1. REPLACE THE BRAKE LINING.

(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

NOTICE
At this time, be careful not to scratch the brake shoe.

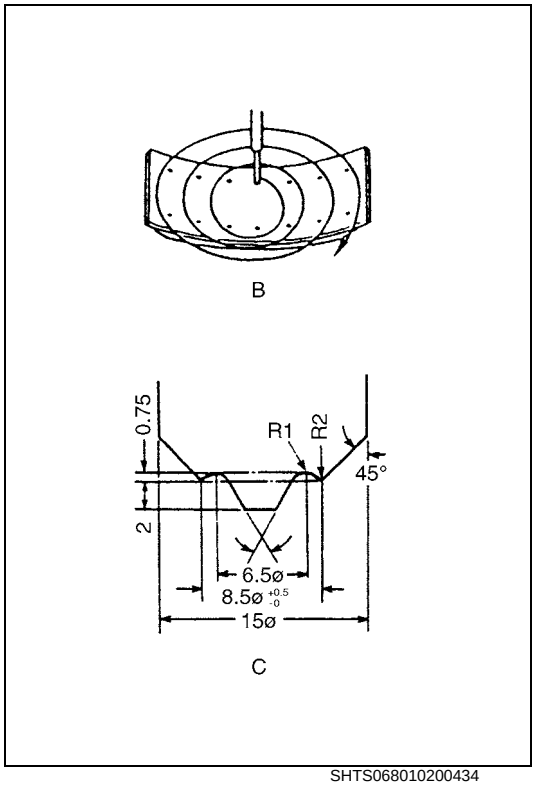

SHTS068010200432

(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.



SHTS068010200433

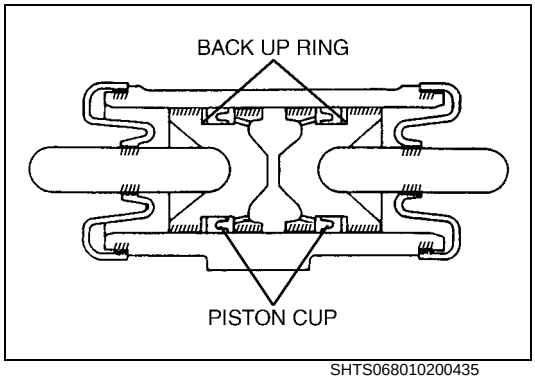
(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



SHTS068010200434

(4) Caulk the rivets lightly in a circular pattern as shown B; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in C.
Recommended force of staking the rivet: 2.4 tons

(5) Remove adhesive tape.



SHTS068010200435

2. ASSEMBLY OF THE WHEEL CYLINDER

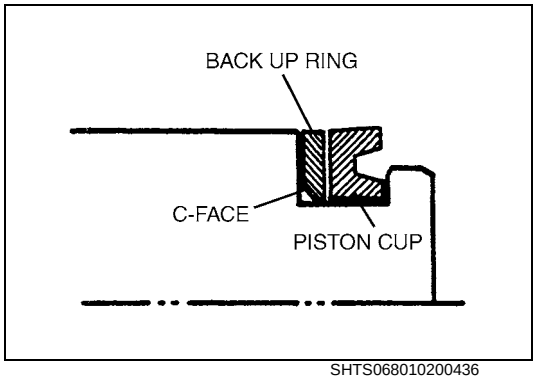
(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI No.20):
S0415-61010

(2) Apply rubber grease to the inside of boot, groove for boot, sliding surface of piston.

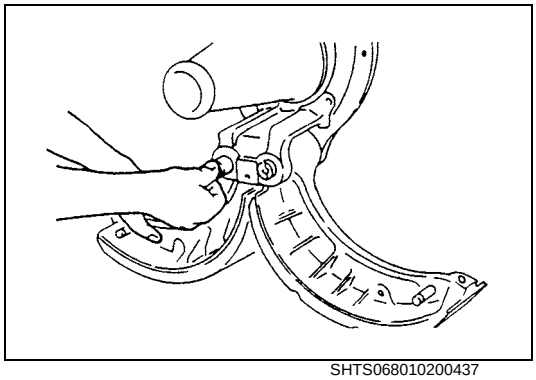
Rubber grease (RX-2):
S0413-31080

NOTICE
The parts where the rubber grease shall be applied are shown in figure with oblique lines.



SHTS068010200436

(3) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.


SHTS068010200437

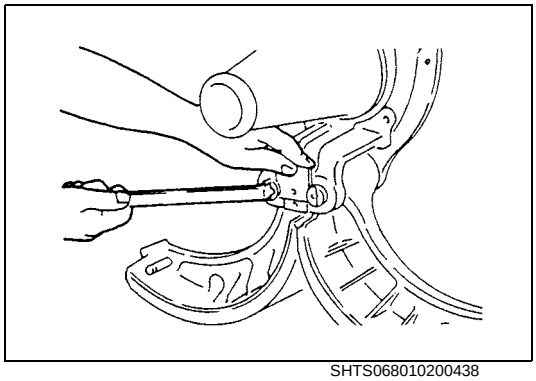
3. INSTALLATION OF BRAKE SHOE ASSEMBLY

(1) Install the wheel cylinder, and then connect the oil pipe.

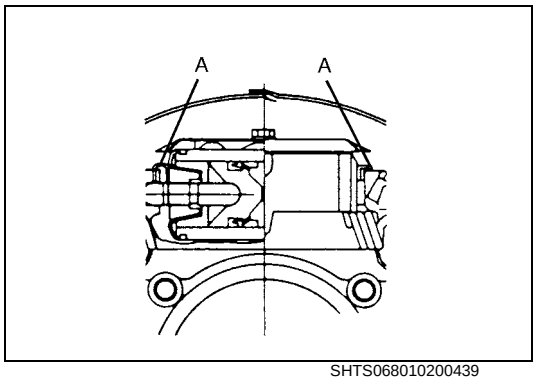
(2) Set the brake shoe assembly in place, then insert the anchor pins.

NOTICE

Apply the heat resistant grease for the shoe bushing.

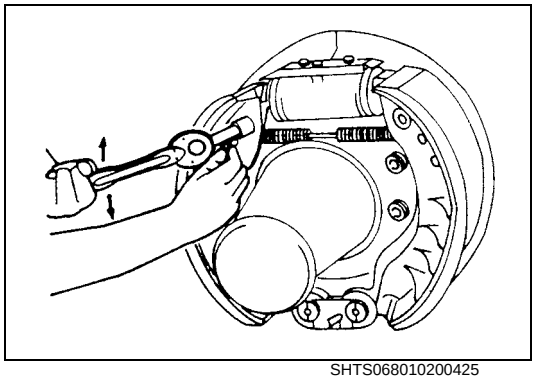

SHTS068010200438

(3) Using the special tool, set the grooves of the two anchor pin, parallel and then insert the retainer in the grooves so that the retainer hole and brake spider hole are aligned.
SST: Anchor Pin Tool (S0968-41010)



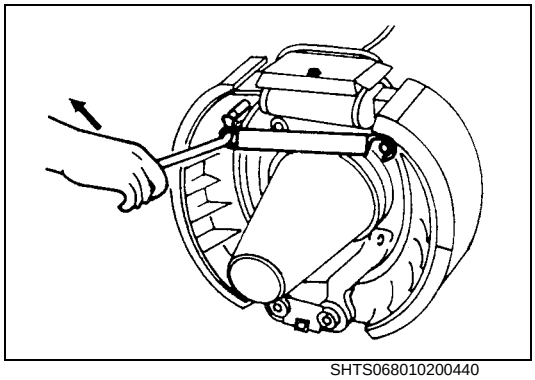
SHTS068010200439

(4) Hook the holder A of the wheel cylinder push rod to the brake shoe.

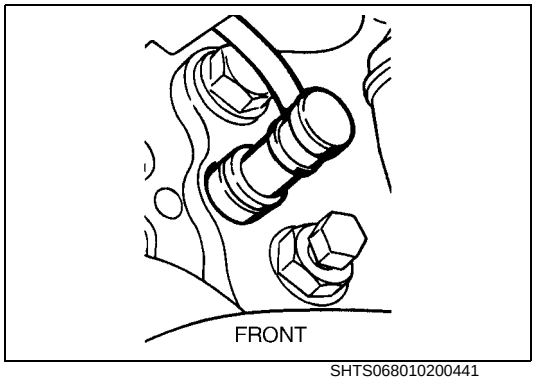

SHTS068010200425

4. INSTALL THE BRAKE SHOE RETRACTING SPRING.

(1) Install the rear side drum cover and brake shoe retracting inner spring, then insert the pin. (Rear drive wheel)


SHTS068010200440

(2) Use the special tool to install the retracting spring. (Front and Rear wheel)
SST: Spring Pull Back Tool (S0968-31070)



SHTS068010200441

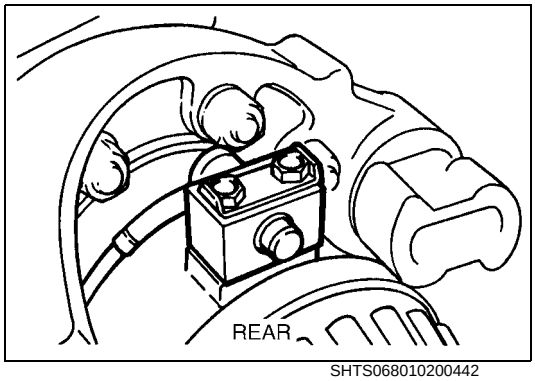
5. INSTALL THE WHEEL SENSOR. (IF SO EQUIPPED)

(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

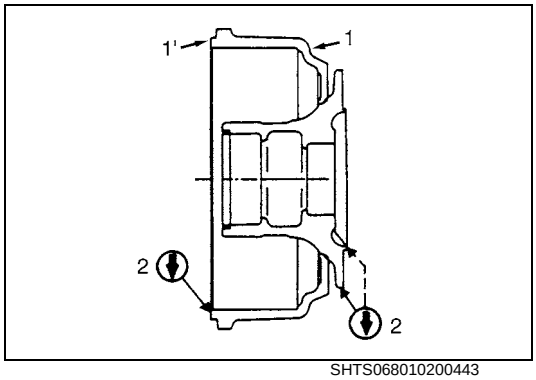
(2) Push the wheel sensor forcefully into the clamping bussing until you feel that the wheel sensor has contact with the sensor ring.

NOTICE
When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place using a screwdriver, or the like. Doing so could damage the wheel sensor.

(3) Arrange the wire harness.



SHTS068010200442



SHTS068010200443

6. ASSEMBLE THE BRAKE DRUM AND WHEEL HUB. (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in figure. Install the drum according to NOTICE.

NOTICE

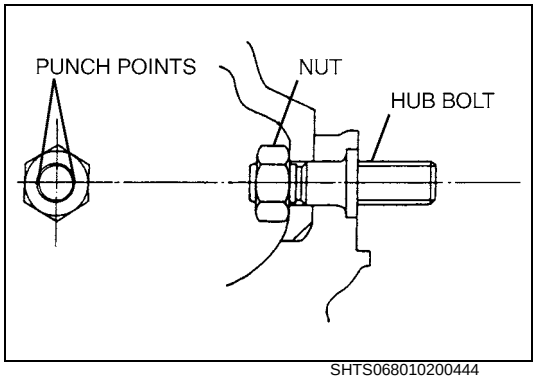
1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drums: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).



SHTS068010200444

(3) Caulk the hub and nuts as shown in figure, after tightening the brake drum and wheel hub.
Tightening Torque:
393-508 N·m {4,000-5,180 kgf·cm, 289-374 lbf·ft}

7. MOUNT THE WHEEL HUB WITH BRAKE DRUM.

(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

8. MOUNT THE TIRE.

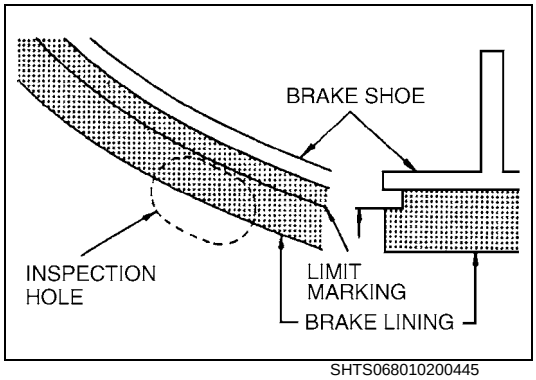
(1) Refer to the chapter **"WHEEL & TIRE"**.

9. ADJUSTMENT

(1) Finally adjust the clearance between the brake lining and the brake drum as explained in the section **"ADJUSTMENT"**.

ADJUSTMENT

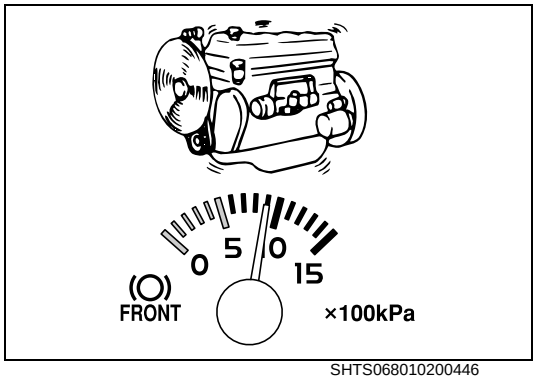
EN0680102H300034



SHTS068010200445

1. REMAINING THICKNESS OF THE BRAKE LINING

(1) Check remaining thickness of lining through the inspection hole of the backing plate. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection, the lining should be made replacement the lining.



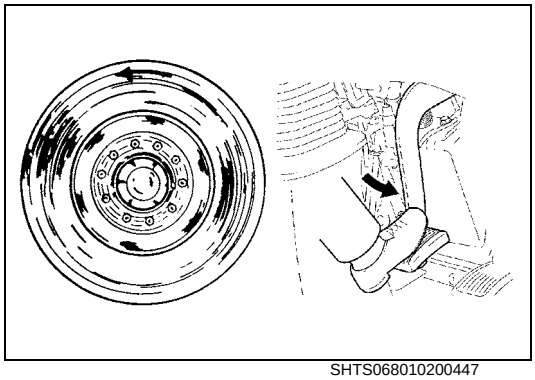
SHTS068010200446

2. AIR PRESSURE IN THE AIR TANK

(1) Operate the engine and obtain an air pressure of the 780-880 kPa {8.0-9.0 kgf/cm^2, 113-127 lbf/in.^{2}}

NOTICE

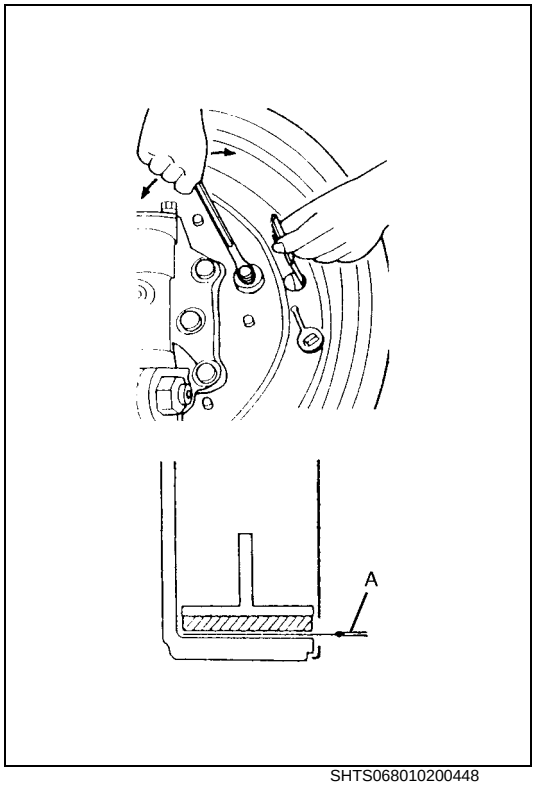
The specified air pressure in the air tank should be maintained when making the adjustment.


SHTS068010200447

3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM

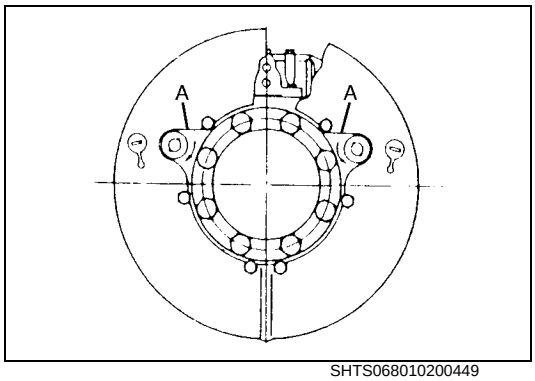
(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.



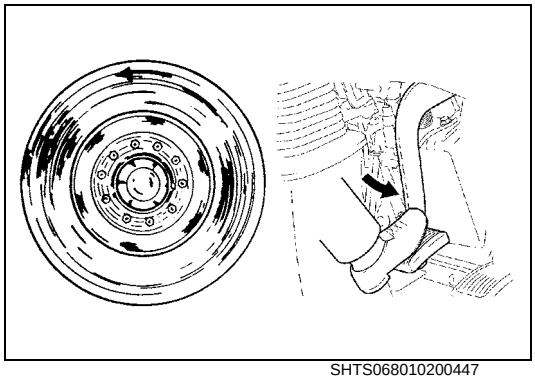
SHTS068010200448

(3) Insert a 0.45 mm {0.018 in.} thick of the gauge A between the brake drum and the brake lining.



SHTS068010200449

(4) Turn the adjusting cam to obtain the correct clearance.
Arrow mark A show the cam turning direction to reduce the clearance. (The arrow are marked on the brake drum cover near the adjusting cam.)
The figure shows for front wheel as a sample.


SHTS068010200447

(5) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from 2.

NOTICE

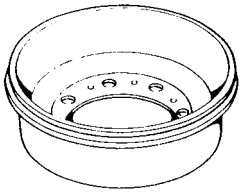
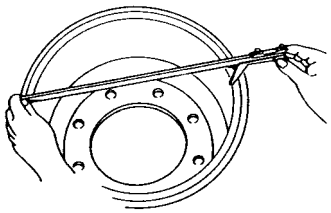
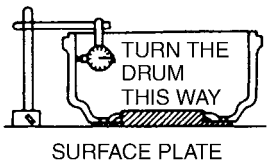
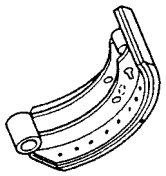
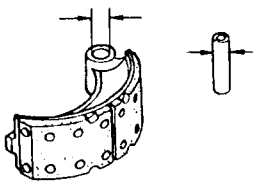
Using the same procedure as above, adjust the clearance for all wheels.

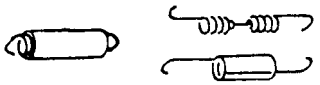
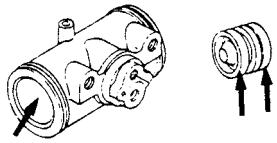
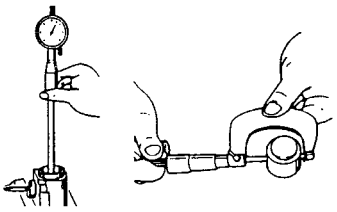
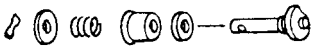
INSPECTION AND REPAIR

EN06801022600002

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**406.4 {16.00}**	**410.4 {16.16}**	**Replace.**	**Measure** 
Brake drum runout	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure** 
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**15.5 {0.61}**	**5.5 {0.215}**	**Re-lining.**	**Measure** 
Clearance between bushing and anchor pin	**0.02-0.07 {0.0008-0.0027}**	**0.25 {0.00984}**	**Replace the bushing and/or anchor pin.**	**Measure** 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**0.03-0.112 {0.0012-0.0047}**	**0.25 {0.0098}**	**Replace.**	**Measure** 
Adjusting cam and related parts: Wear and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE (MODELS: FL, FM)

DATA AND SPECIFICATIONS

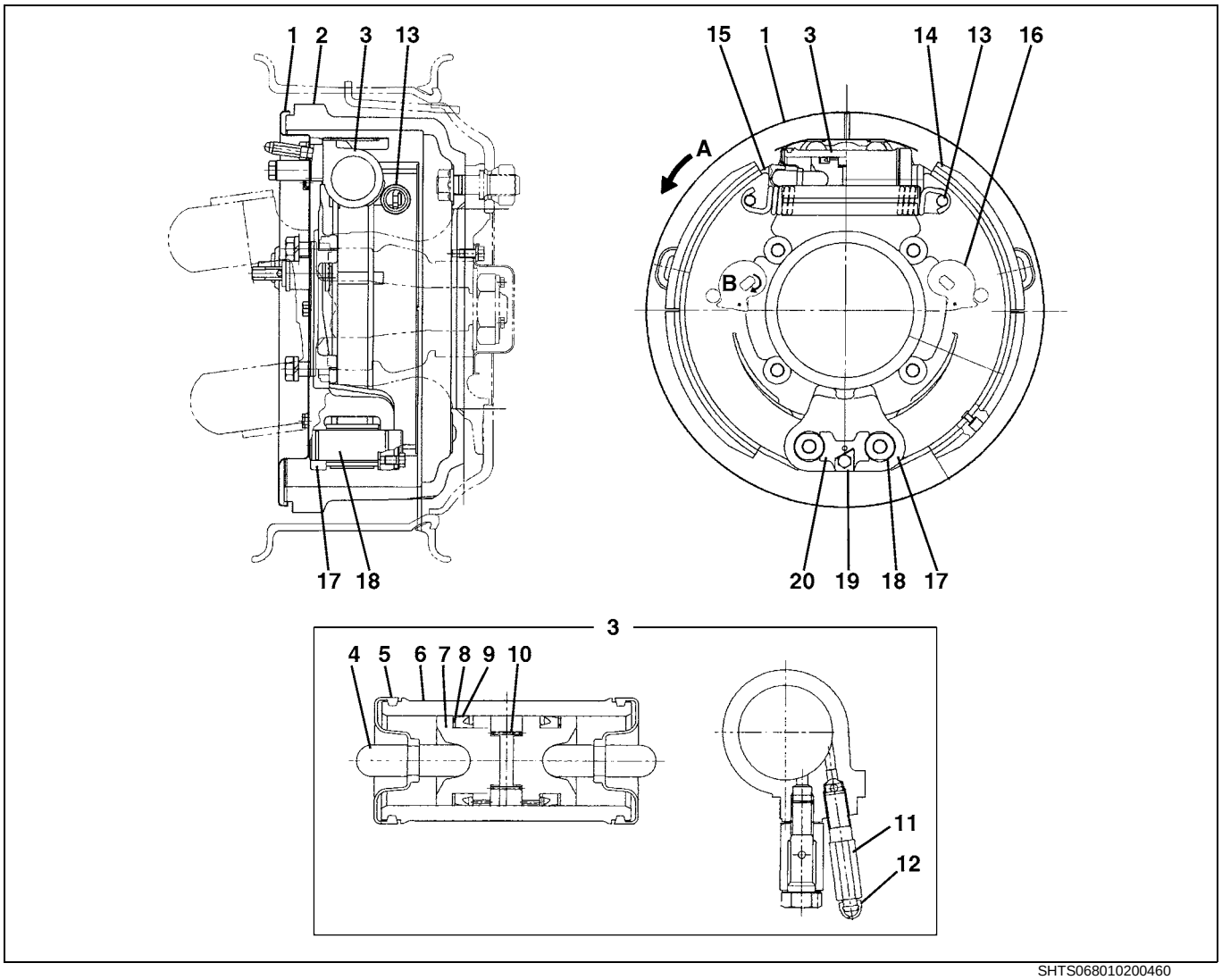
EN0680102I200027

Type		**Drum brake with hydraulically actuated, internally expanding, leading-trailing shoes in all wheels.**
Brake drum inside diameter		**410 mm {16.14 in.} for both front and rear.**
Brake lining (Width x Thickness)	**Front**	**150 x 16 mm {5.91 x 0.63 in.}**
	Rear	**220 x 16 mm {8.66 x 0.63 in.}**
Wheel cylinder bore diameter	**Front**	**50.8 mm {2.0 in.}**
	Rear, Front	**55.56 mm {2.19 in.}**
	Rear, Rear	**53.50 mm {2.11 in.}**

DESCRIPTION

EN0680102C100027

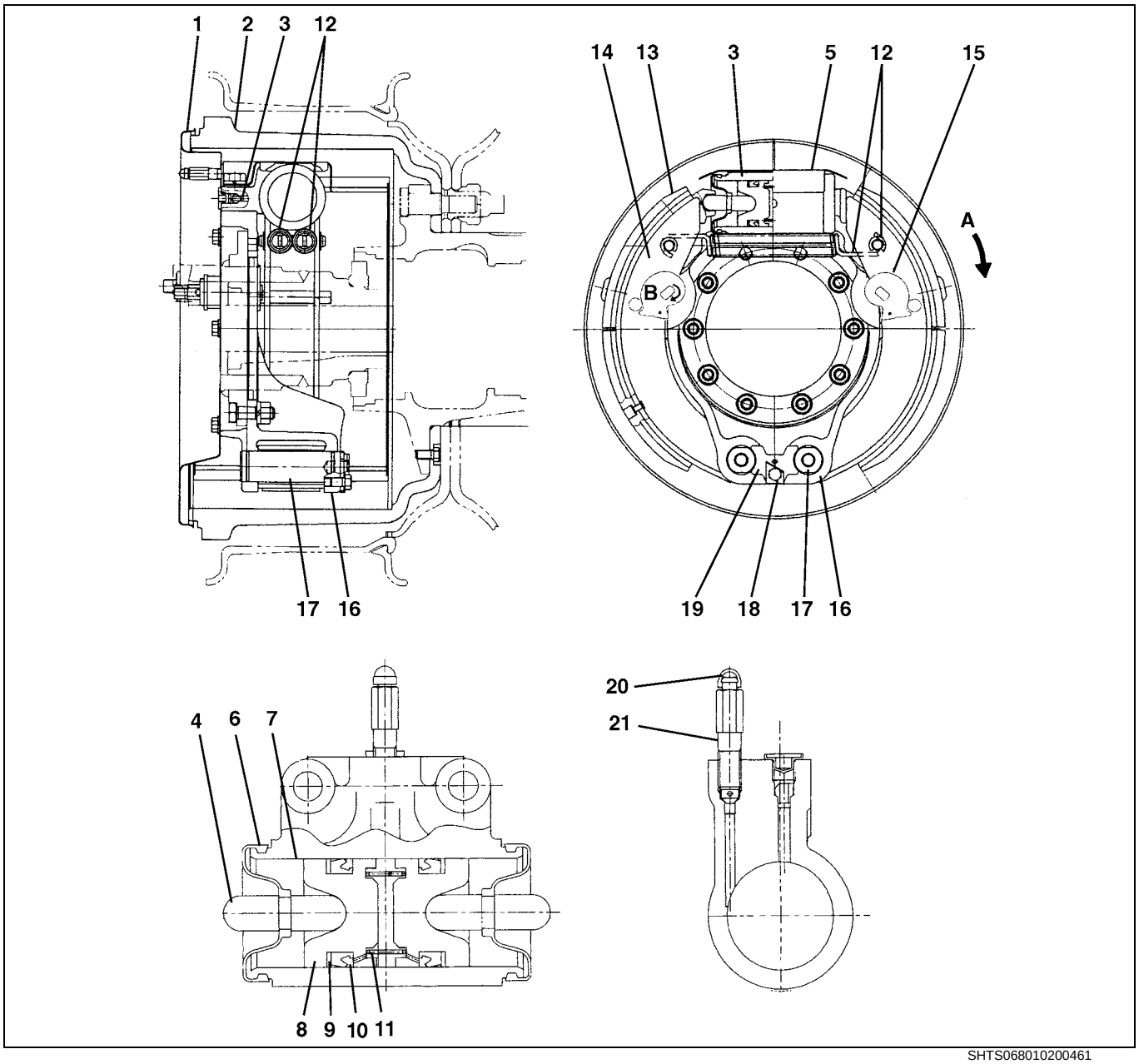
FRONT



SHTS068010200460

1	Drum cover	12	Cap
2	Brake drum	13	Retracting spring
3	Wheel cylinder assembly	14	Brake lining
4	Push rod	15	Brake shoe
5	Boot	16	Adjusting cam
6	Cylinder	17	Brake spider
7	Piston	18	Anchor pin
8	Back up ring	19	Lock plate
9	Piston cup	20	Retainer
10	Spring	A	Forward turning
11	Air bleeder screw	B	To move the shoe outward

REAR



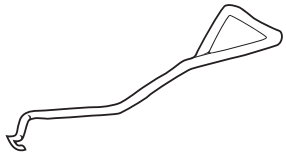
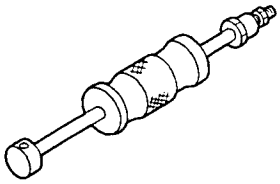
SHTS068010200461

1	Drum cover	13	Brake lining
2	Brake drum	14	Brake shoe
3	Wheel cylinder assembly	15	Adjusting cam
4	Push rod	16	Brake spider
5	Cylinder cover	17	Anchor pin
6	Boot	18	Lock plate
7	Cylinder	19	Retainer
8	Piston	20	Bleeder cap
9	Back up ring	21	Air bleeder
10	Piston cup	A	Forward turning
11	Spring	B	To move the shoe outward
12	Retracting spring		

SPECIAL TOOL

EN0680102K100008

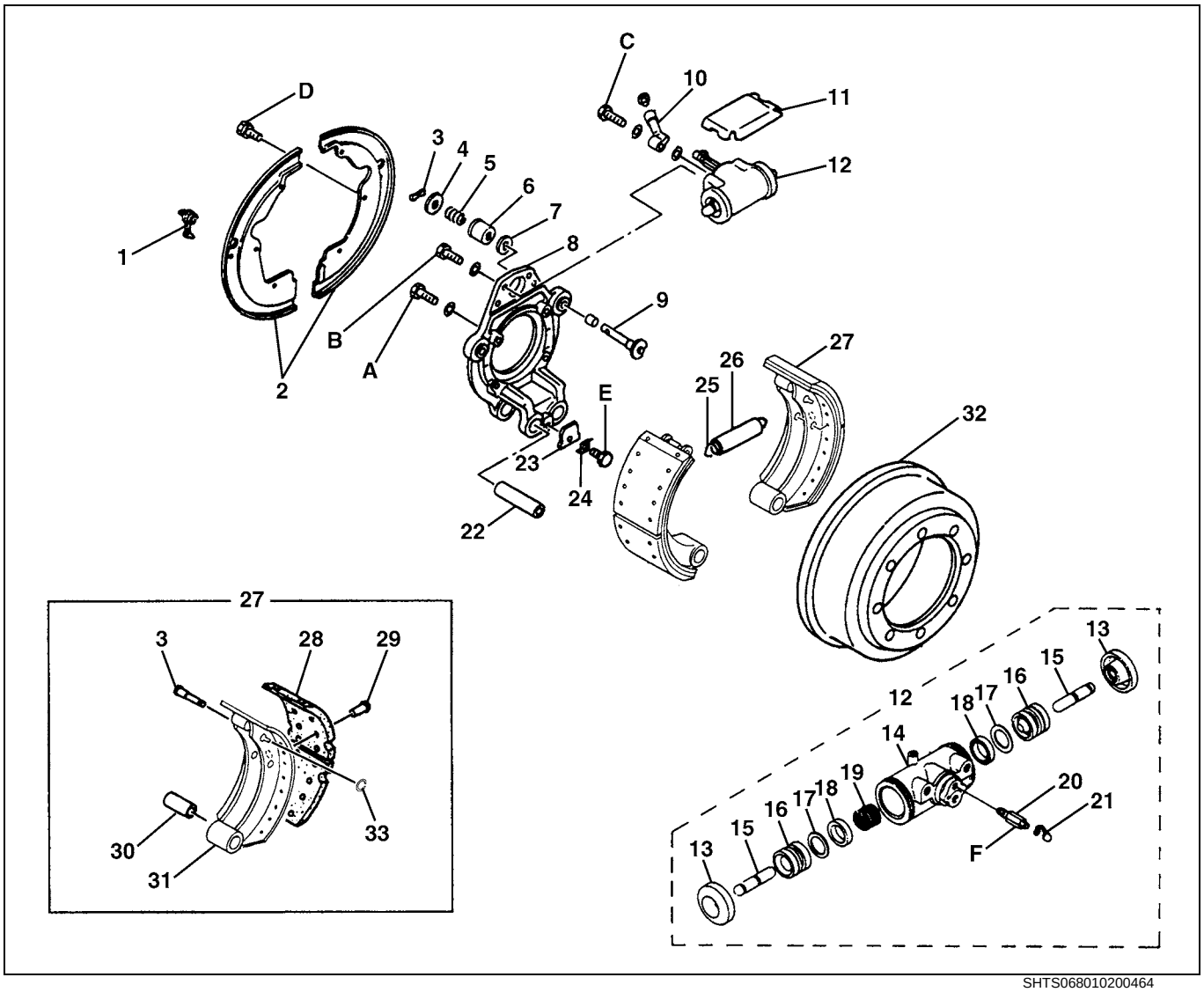
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0968-31090	RETRACTING SPRING PULL BACK TOOL	
	S0942-02000	ANCHOR PIN PULLER	

COMPONENT LOCATOR

EN0680102D100026

FRONT



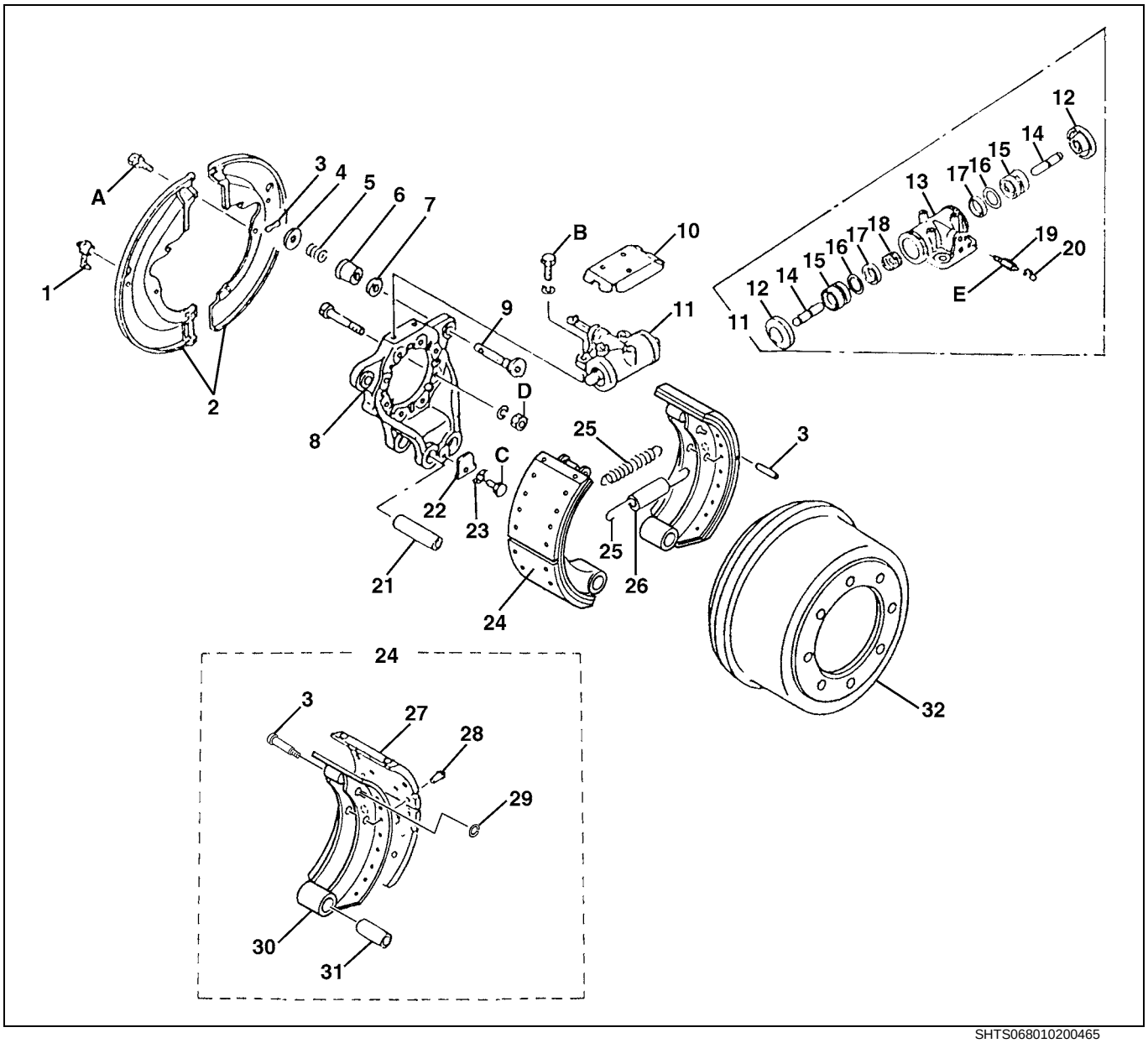
SHTS068010200464

1	Hole plug	12	Wheel cylinder assembly	23	Retainer
2	Drum cover	13	Boot	24	Lock plate
3	Pin	14	Cylinder	25	Retracting spring
4	Cover	15	Push rod	26	Cover
5	Spring	16	Piston	27	Brake shoe assembly
6	Boot	17	Back up ring	28	Brake lining
7	Washer	18	Piston cup	29	Rivet
8	Brake spider	19	Spring	30	Bushing
9	Adjusting cam	20	Air bleeder screw	31	Brake shoe
10	Joint bolt	21	Cap	32	Brake drum
11	Cylinder cover	22	Anchor pin	33	Snap ring

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

A	168-226 {1,700-2,300, 123-166}	D	20-34 {205-347, 15-25}
B	75-91 {765-930, 56-67}	E	20-34 {205-347, 15-25}
C	44-60 {450-610, 33-45}	F	18.7-25.5 {190-260, 14-19}

REAR



SHTS068010200465

1	Hole plug	12	Boot	23	Lock plate
2	Drum cover	13	Cylinder	24	Brake shoe assembly
3	Pin	14	Push rod	25	Retracting spring
4	Cover	15	Piston	26	Spring cover
5	Spring	16	Back up ring	27	Brake lining
6	Boot	17	Piston cup	28	Rivet
7	Washer	18	Spring	29	Snap ring
8	Brake spider	19	Air bleeder screw	30	Brake shoe
9	Adjusting cam	20	Cap	31	Bushing
10	Cylinder cover	21	Anchor pin	32	Brake drum
11	Wheel cylinder assembly	22	Retainer		

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

A	20-34 {205-347, 15-25}	D	148-196 {1,500-2,000, 111-147}
B	113-157 {1,150-1,600, 85-118}	E	18.7-25.5 {190-260, 14-19}
C	20-34 {205-347, 15-25}		

OVERHAUL

EN0680102H200022

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF TIRE.

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

2. REMOVAL OF BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS.

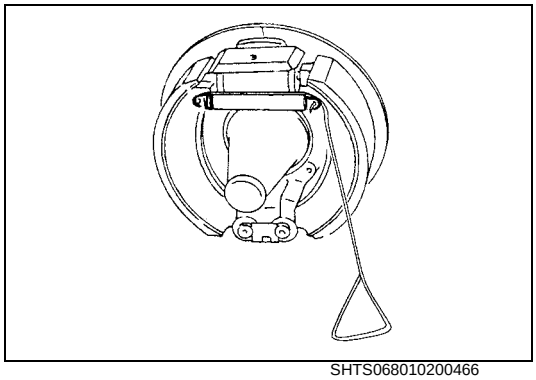
(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

NOTICE

The brake drums for front axle are specified for left and right, therefore put an identification mark on disassembling.

3. REMOVAL OF BRAKE SHOE RETRACTING SPRING.

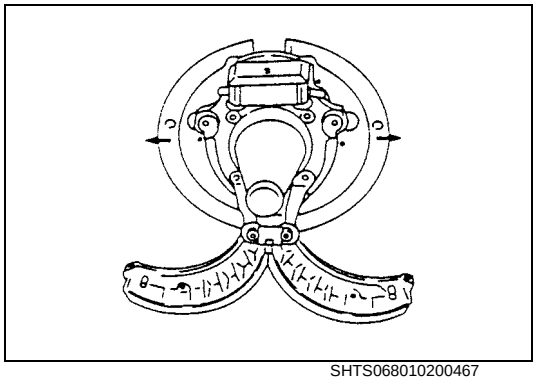
(1) Remove the retracting spring by using the special tools.
SST: Retracting spring pull back tool (S0968-31090)



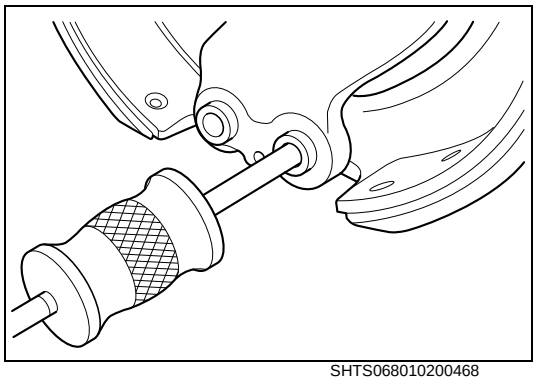
SHTS068010200466

4. REMOVAL OF BRAKE SHOE

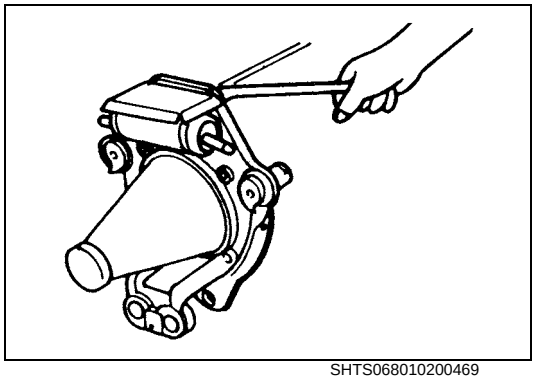
(1) Using the special tool, remove the anchor pin then take the brake shoe out.
SST: Anchor pin puller (S0942-02000)



SHTS068010200467



SHTS068010200468


SHTS068010200469

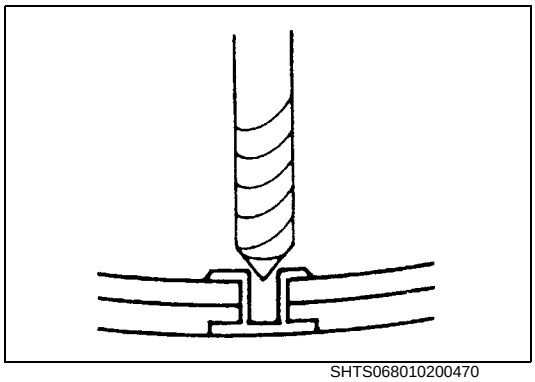
5. REMOVAL WHEEL CYLINDER

(1) Disconnect the oil pipe and remove the wheel cylinder.

NOTICE

Place the drain pan under the wheel cylinder to catch the hydraulic fluid.

IMPORTANT POINTS - ASSEMBLY

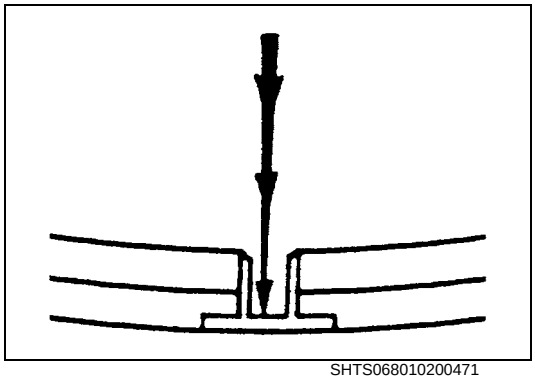

SHTS068010200470

1. REPLACEMENT OF THE BRAKE LINING.

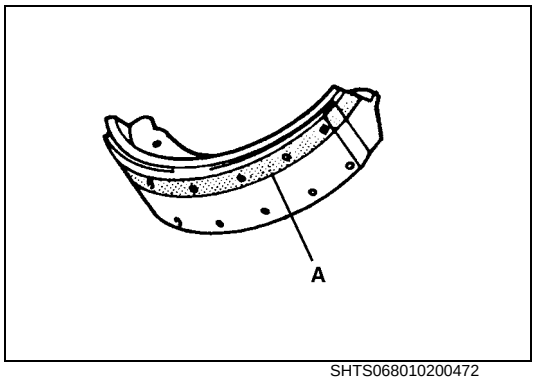
(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

NOTICE

At this time, be careful not to scratch the brake shoe.

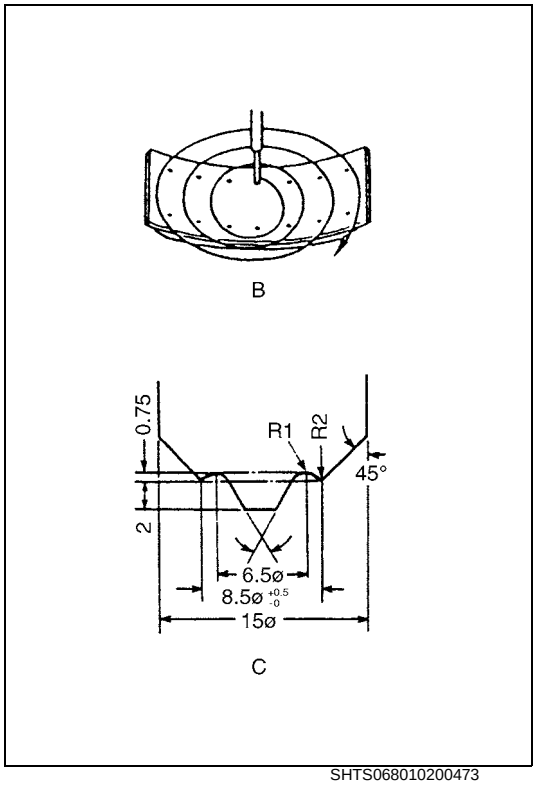

SHTS068010200471

(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.



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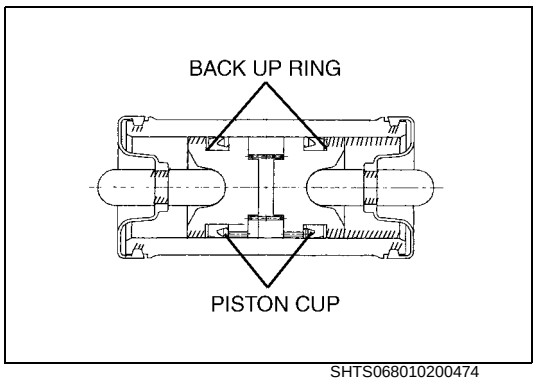
(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



SHTS068010200473

(4) Caulk the rivets lightly in a circular pattern as shown B; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in C.
Recommended force of staking the rivet: 2.4 tons

(5) Remove adhesive tape.



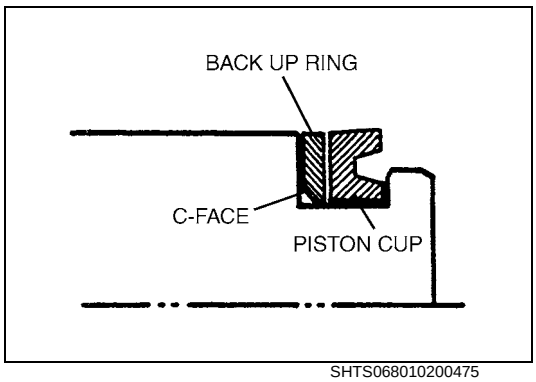
SHTS068010200474

2. ASSEMBLY OF THE WHEEL CYLINDER

(1) Apply rubber grease to the inside of boot, groove for boot, sliding surface of piston.

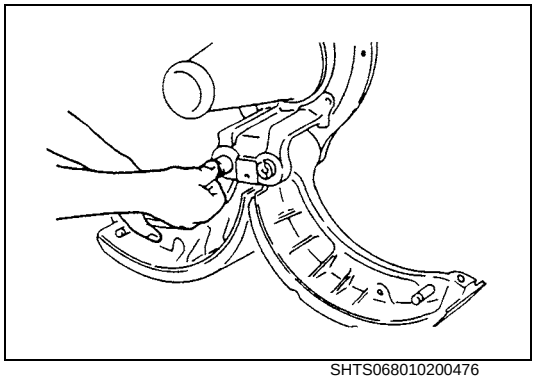
Rubber grease (RG-4)

NOTICE
The parts where the rubber grease shall be applied are shown in figure with oblique lines.



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(2) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.


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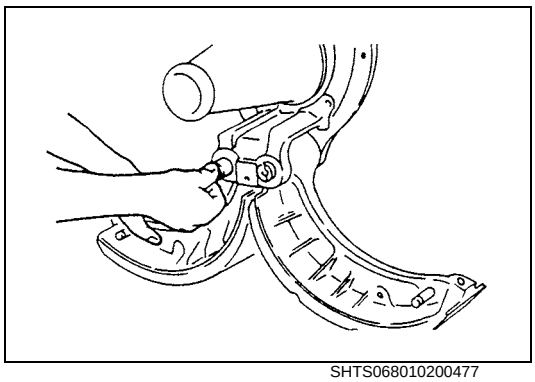
3. INSTALLATION OF BRAKE SHOE ASSEMBLY

(1) Install the wheel cylinder, and then connect the oil pipe.

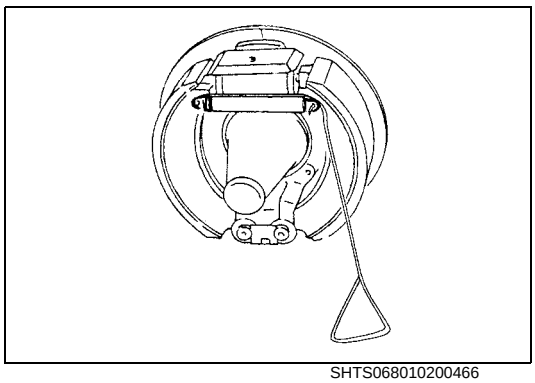
(2) Set the brake shoe assembly in place, then insert the anchor pins.

NOTICE

Apply the heat resistant grease for the shoe bushing.


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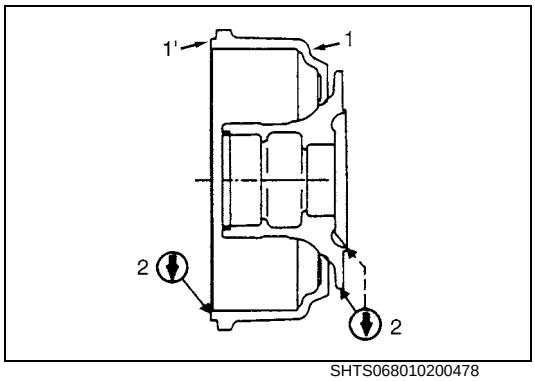
(3) Set the grooves of the two anchor pin, parallel and then insert the retainer in the grooves so that the retainer hole and brake spider hole are aligned.


SHTS068010200466

4. INSTALLATION OF BRAKE SHOE RETRACTING SPRING.

(1) Use the special tool to install the retracting spring. (Front and Rear wheel)

SST: Retracting Spring Pull Back Tool (S0968-31090)



SHTS068010200478

5. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB. (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in figure. Install the drum according to NOTICE.

NOTICE

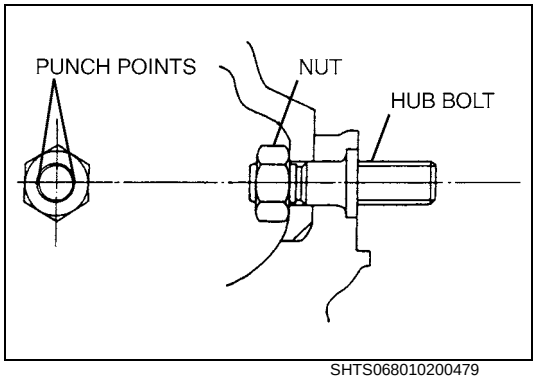
1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drum: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).



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(3) Caulk the hub and nuts as shown in figure, after tightening the brake drum and wheel hub.
Tightening Torque:
393-470 N·m {4,000-4,800 kgf·cm, 290-347 lbf·ft}

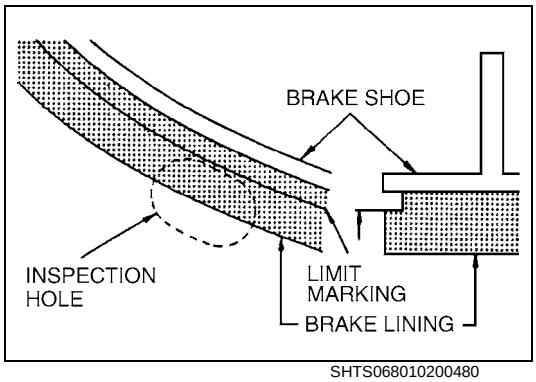
6. MOUNTING OF WHEEL HUB WITH BRAKE DRUM.
(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

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

8. ADJUSTMENT.
(1) Finally, adjust the clearance between the brake lining and the brake drum as explained in the section **"ADJUSTMENT"**.

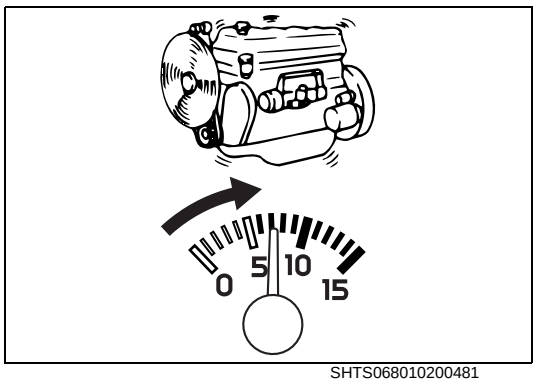
ADJUSTMENT

EN0680102H300035



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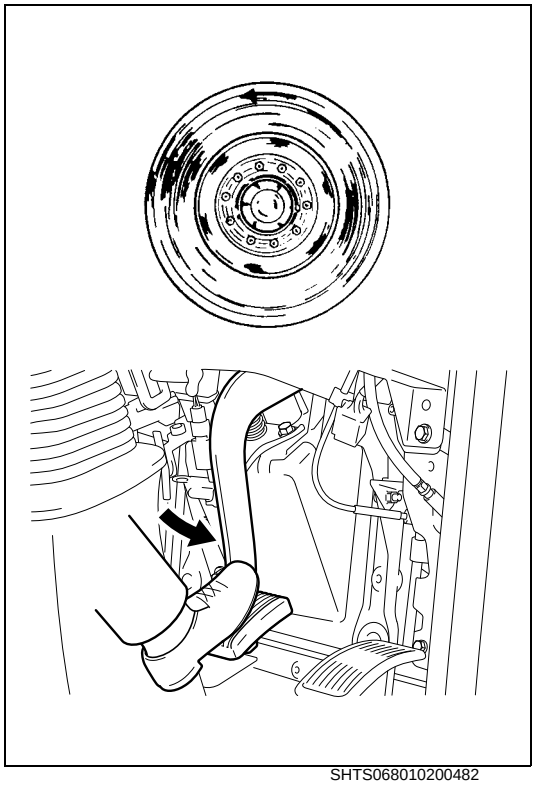
1. REMAINING THICKNESS OF THE BRAKE LINING.
(1) Check remaining thickness of lining through the inspection hole of the brake drum cover. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made replace the lining.



SHTS068010200481

2. AIR PRESSURE IN THE AIR TANK.
(1) Operate the engine and obtain an air pressure of the 785-880 kPa {8.0-9.0 kgf/cm^2, 114-128 lbf/in.^{2}}

NOTICE
The specified air pressure in the air tank should be maintained when making the adjustment.

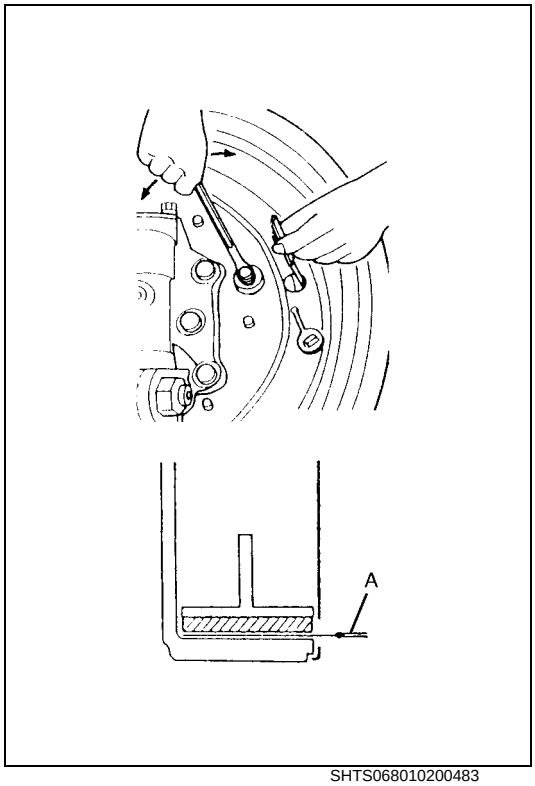


SHTS068010200482

3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM.

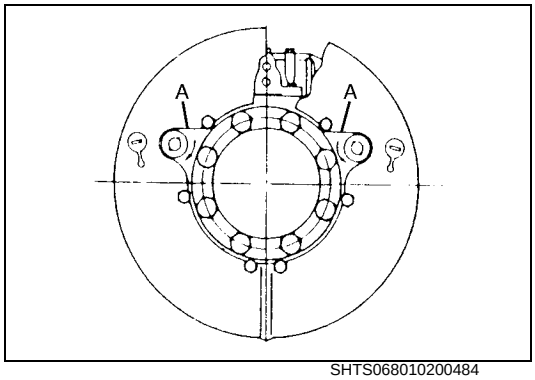
(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.



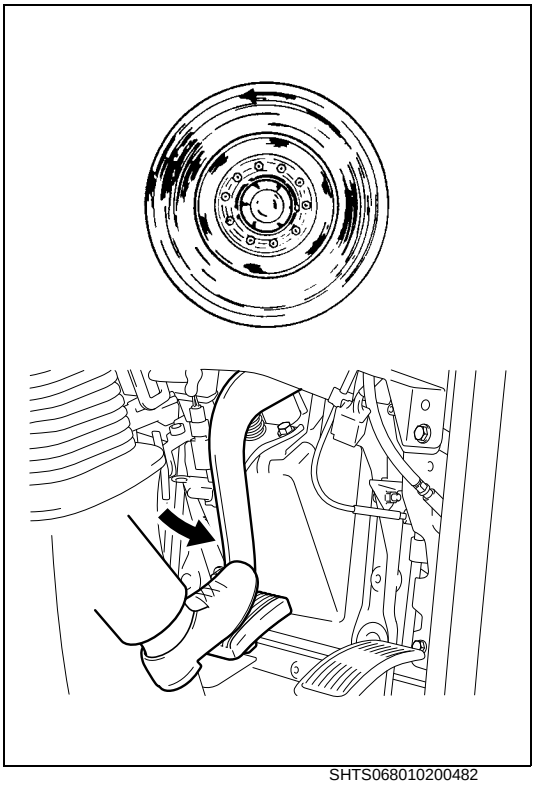
SHTS068010200483

(3) Insert a 0.3 mm {0.012 in.} thick of the gauge A between the brake drum and the brake lining.



SHTS068010200484

(4) Turn the adjusting cam to obtain the correct clearance.
Arrow mark A show the cam turning direction to reduce the clearance. (The arrow are marked on the brake drum cover near the adjusting cam.)
The figure shows for rear wheel as a sample.



SHTS068010200482

(5) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from 2.

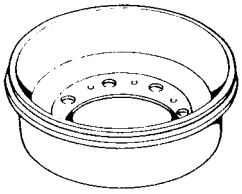
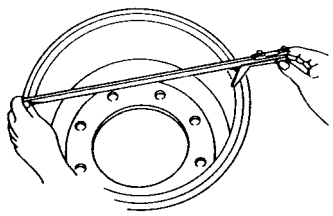
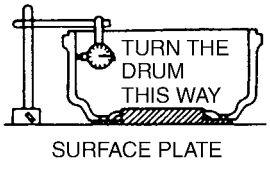
NOTICE
Using the same procedure as above, adjust the clearance for all wheels.

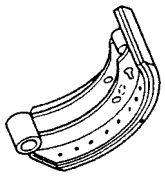
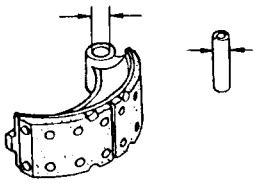
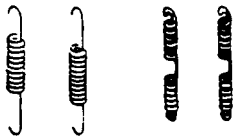
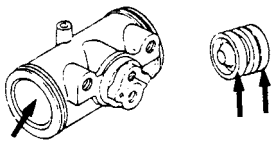
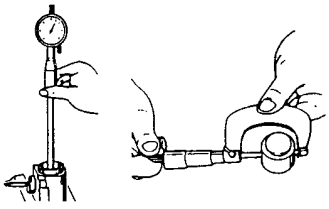
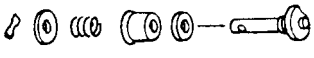
INSPECTION AND REPAIR

EN0680102H300036

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**410.0 {16.142}**	**414.0 {16.299}**	**Replace.**	**Measure** 
Brake drum run out	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure**  SURFACE PLATE

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**16.0 {0.630}**	**6.0 {0.236}**	**Re-lining.**	**Measure** 
Clearance between bushing and anchor pin	**0.06-0.14 {0.0024-0.0055}**	**0.3 {0.0118}**	**Replace the bushing and/or anchor pin.**	**Measure** 
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**0.03-0.122 {0.0012-0.0048}**	**0.15 {0.0059}**	**Replace.**	**Measure** 
Adjusting cam and related parts: Wear and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE (MODELS: FT, GT)

DATA AND SPECIFICATIONS

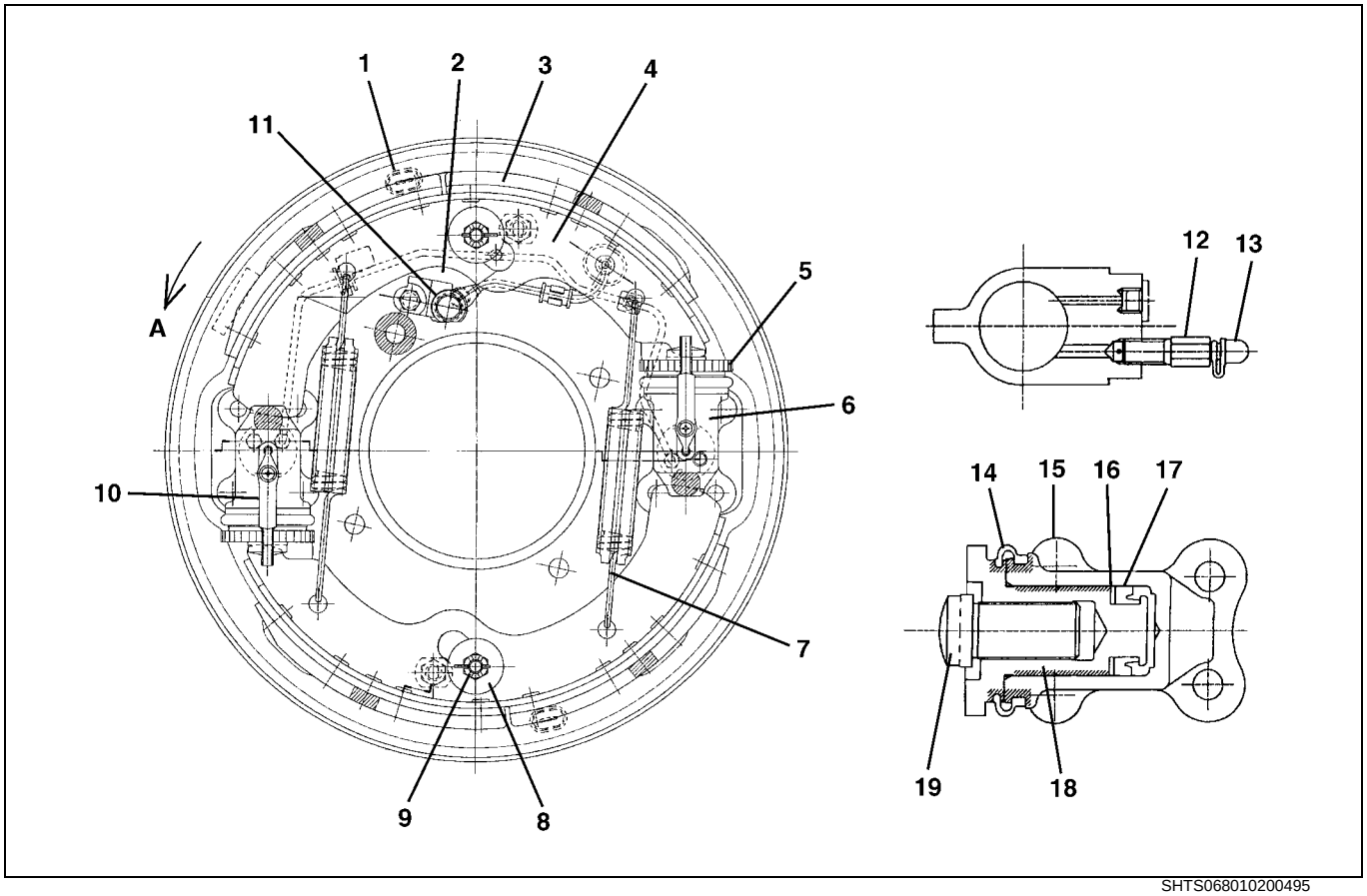
EN0680102I200028

Model		FT	GT
Type		Drum brake with hydraulically actuated, internally expanding, two-leading shoes in front wheels and dual two-leading shoes in rear wheels.	
Brake drum inside diameter		400 mm {15.75 in.} for both front and rear.	
Brake lining (Width x Thickness)	Front	120 x 15 mm {4.72 x 0.59 in.}	
	Rear	130 x 15 mm {5.12 x 0.59 in.}	155 x 15 mm {6.10 x 0.59 in.}
Wheel cylinder bore diameter	Front	38.10 mm {1.50 in.}	
	Rear	38.10 mm {1.50 in.}	

DESCRIPTION

EN0680102C100028

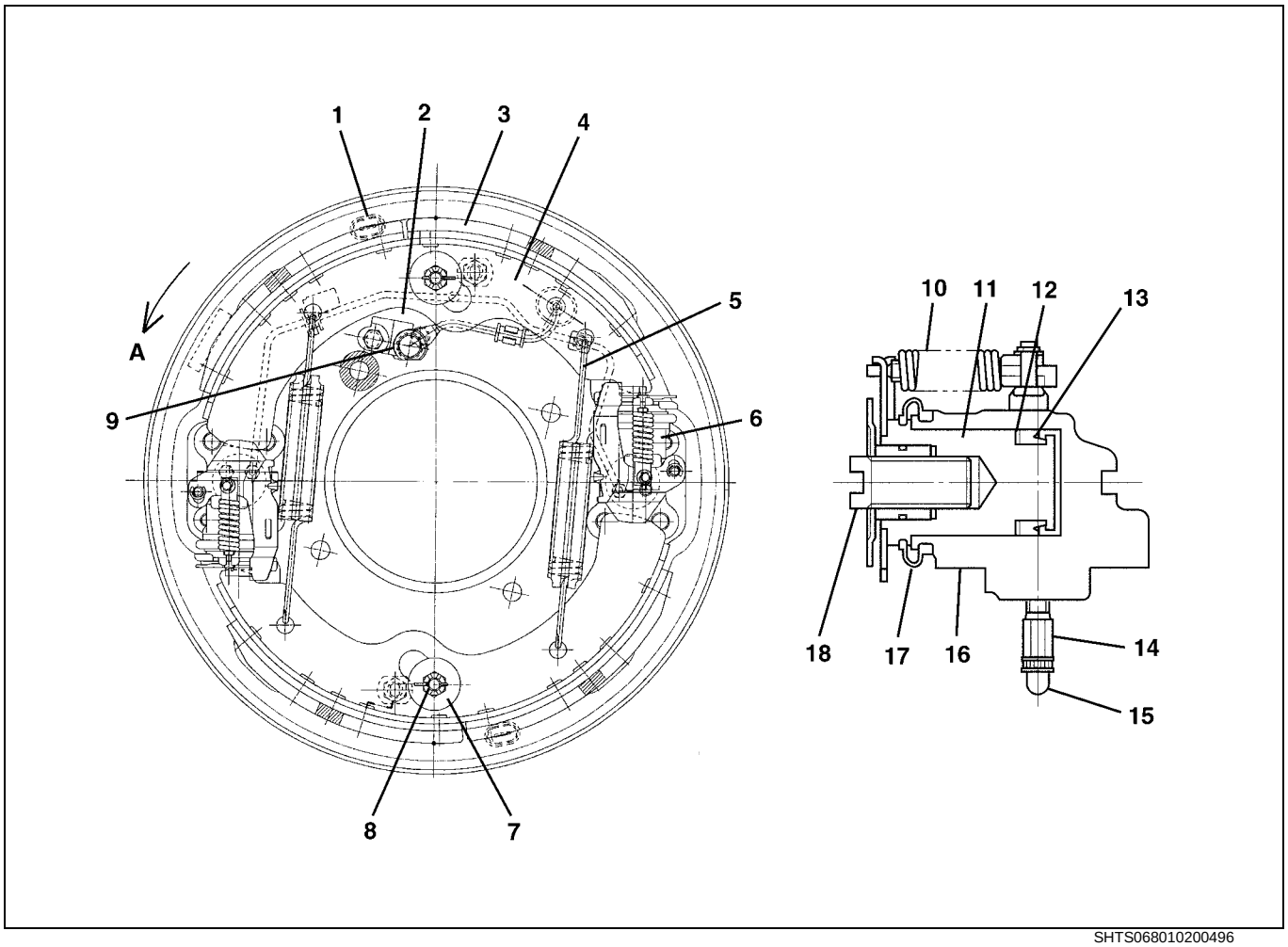
FRONT



SHTS068010200495

1	Hole plug	11	Wheel sensor (If so equipped)
2	Backing plate	12	Air bleeder screw
3	Brake lining	13	Bleeder cap
4	Brake shoe	14	Boot
5	Shoe adjusting screw	15	Wheel cylinder
6	Wheel cylinder assembly	16	Back up ring
7	Shoe retracting spring	17	Piston cup
8	Shoe hold down washer	18	Piston
9	Shoe hold down nut	19	Adjusting bolt
10	Adjuster lock spring	A	Forward turning

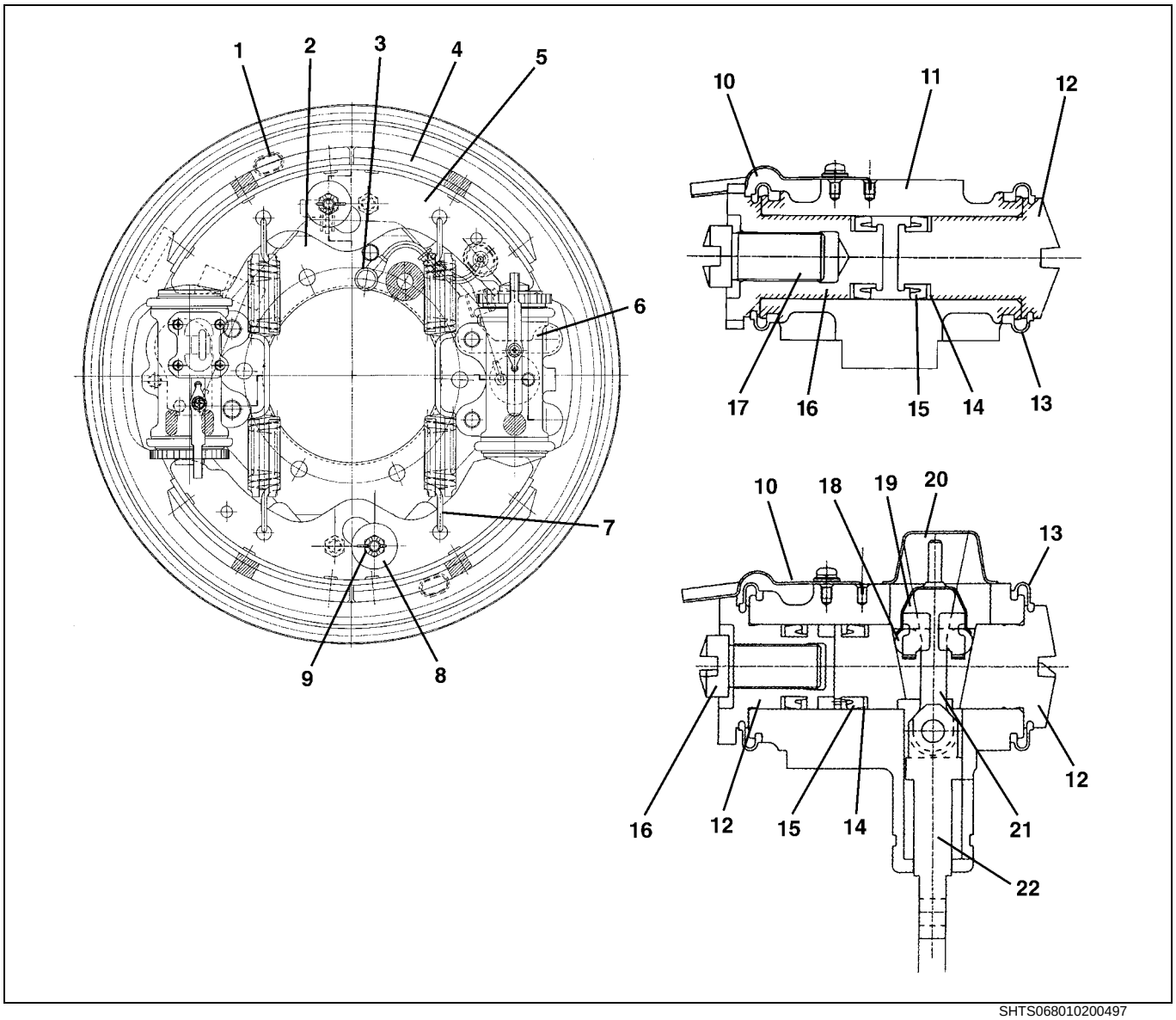
FRONT (WITH AUTO-ADJUSTER)



SHTS068010200496

1	Hole plug	11	Piston
2	Backing plate	12	Back up ring
3	Brake lining	13	Piston cup
4	Brake shoe	14	Air bleeder screw
5	Shoe retracting spring	15	Bleeder cap
6	Wheel cylinder assembly	16	Wheel cylinder
7	Shoe hold down washer	17	Boot
8	Shoe hold down nut	18	Adjusting bolt
9	Wheel sensor (If so equipped)	A	Forward turning
10	Spring		

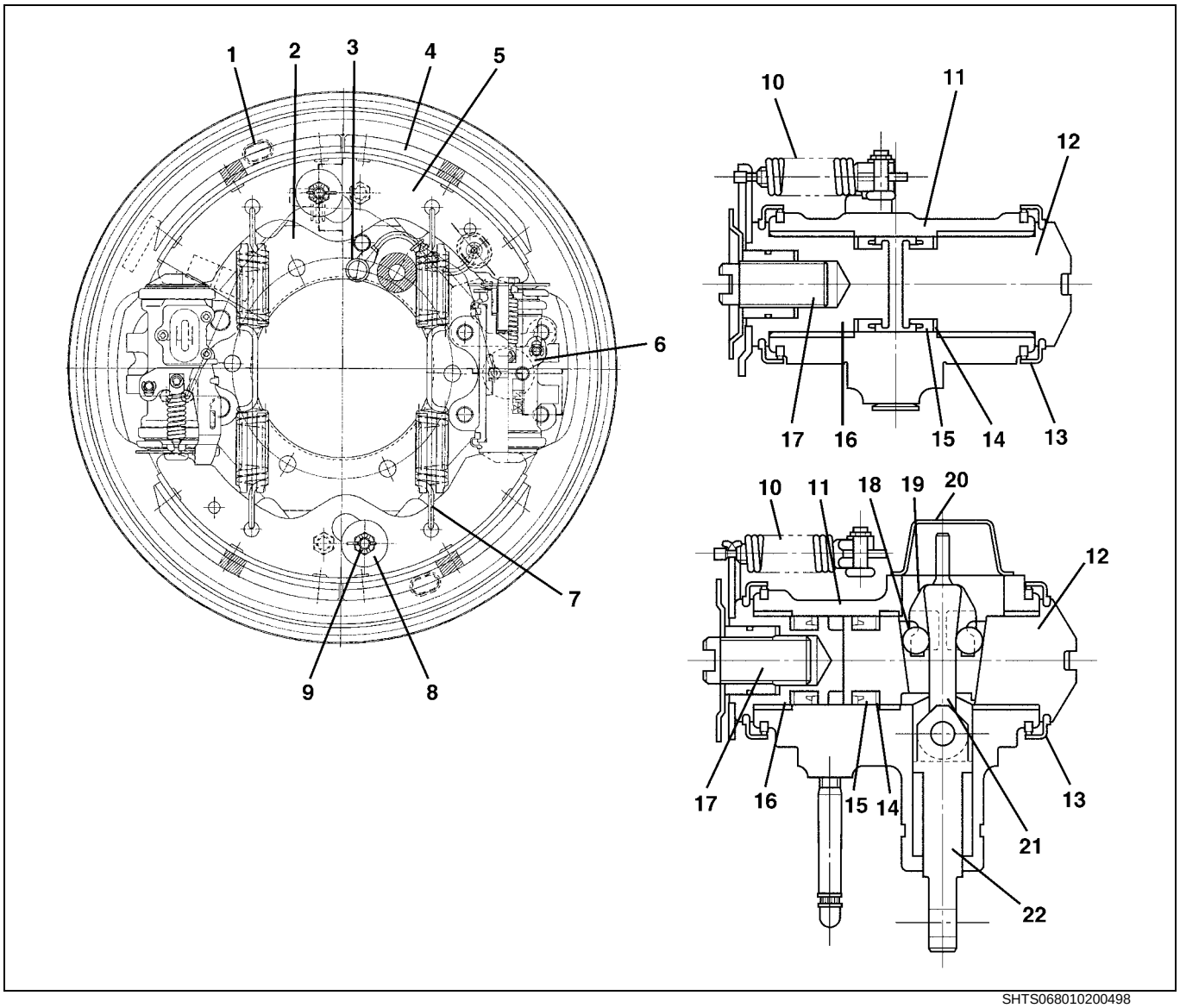
REAR



SHTS068010200497

1	Hole plug	12	Anchor piston
2	Backing plate	13	Boot
3	Wheel sensor (If so equipped)	14	Back up ring
4	Brake lining	15	Piston cup
5	Brake shoe	16	Piston
6	Wheel cylinder assembly	17	Adjusting bolt
7	Shoe retracting spring	18	Roller
8	Shoe hold down washer	19	Cage
9	Shoe hold down nut	20	Wedge cover
10	Adjuster lock spring	21	Wedge
11	Wheel cylinder	22	Rod

REAR (WITH AUTO-ADJUSTER)



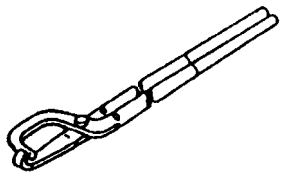
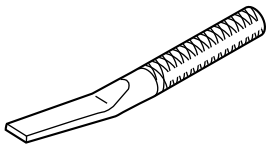
SHTS068010200498

1	Hole plug	12	Anchor piston
2	Backing plate	13	Boot
3	Wheel sensor (If so equipped)	14	Back up ring
4	Brake lining	15	Piston cup
5	Brake shoe	16	Piston
6	Wheel cylinder assembly	17	Adjusting bolt
7	Shoe retracting spring	18	Roller
8	Shoe hold down washer	19	Cage
9	Shoe hold down nut	20	Wedge cover
10	Spring	21	Wedge
11	Wheel cylinder	22	Rod

SPECIAL TOOL

EN0680102K100009

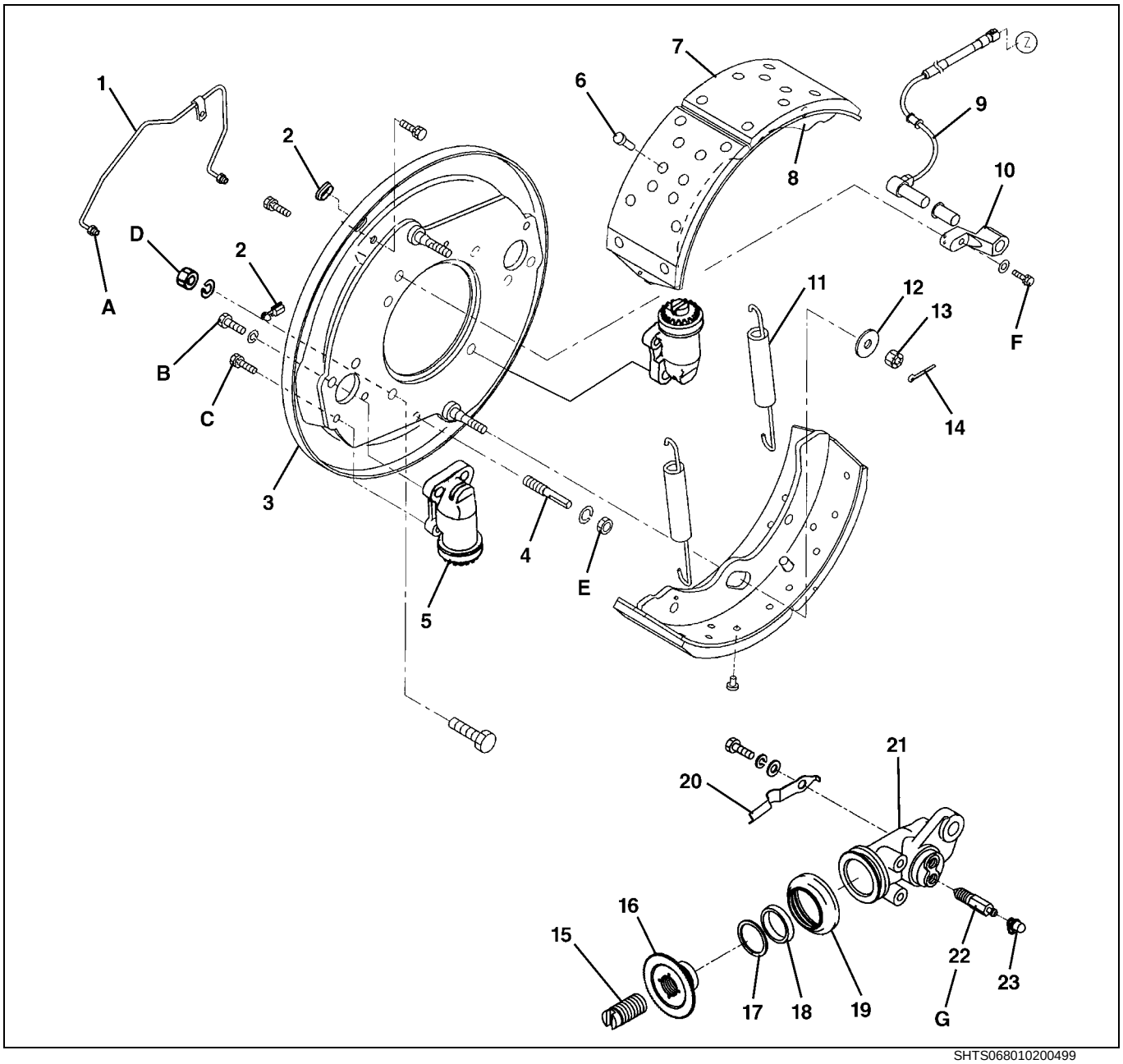
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0960-61040	RETRACTING SPRING PULL BACK TOOL	
	S0966-51130	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN0680102D100027

FRONT



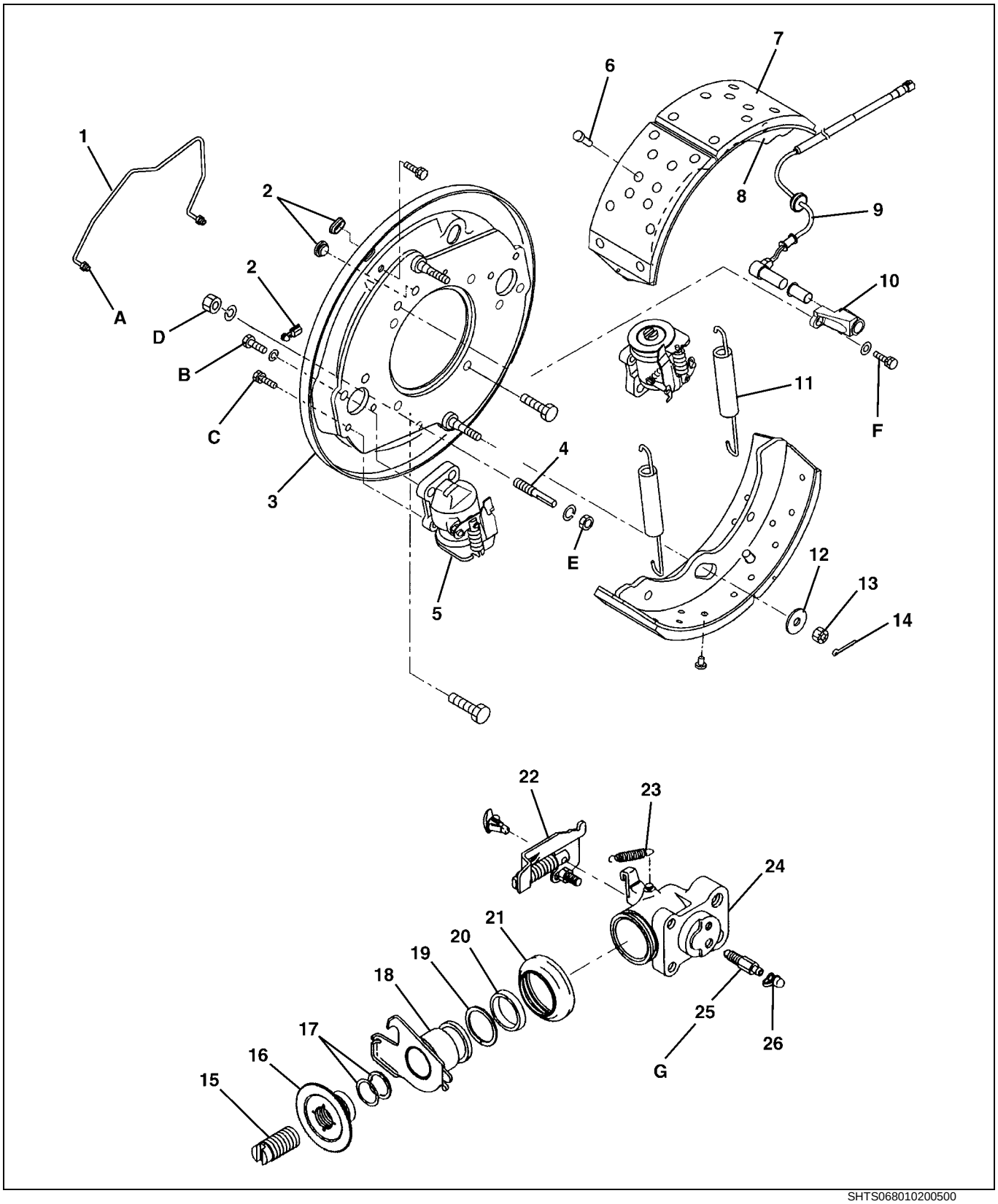
SHTS068010200499

1	Oil pipe	13	Shoe hold down nut
2	Hole plug	14	Cotter pin
3	Backing plate	15	Adjusting bolt
4	Adjusting bolt	16	Wheel cylinder adjuster
5	Wheel cylinder assembly	17	Back up ring
6	Rivet	18	Piston cup
7	Brake lining	19	Boot
8	Brake shoe	20	Shoe adjusting lever
9	Wheel sensor (If so equipped)	21	Wheel cylinder
10	Wheel sensor holder (If so equipped)	22	Air bleeder screw
11	Shoe retracting spring	23	Bleeder cap
12	Shoe hold down washer		

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

A	12.75-17.65 {130-180, 10-13}	E	25.50-36.28 {260-370, 19-26}
B	ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122}	F	13.73-22.56 {141-229, 11-16}
C	ϕ10 bolt: 37.27-49.03 {380-500, 28-36}	G	7.5-11.5 {76-117, 5.5-8.4}
D	148-196 {1,500-2,000, 109-144]		

FRONT (WITH AUTO-ADJUSTER)



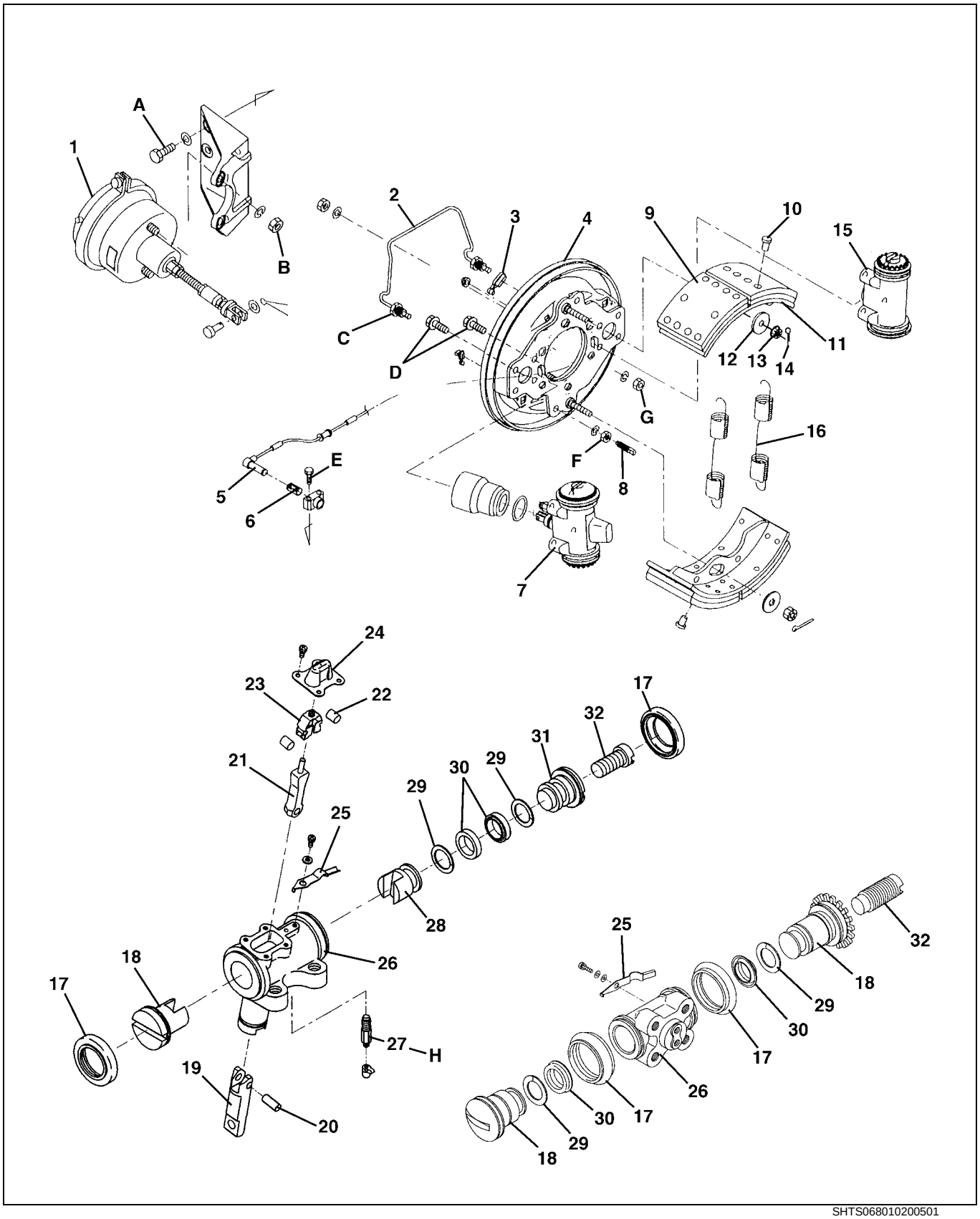
SHTS068010200500

1	Oil pipe	14	Cotter pin
2	Hole plug	15	Adjusting bolt
3	Backing plate	16	Wheel cylinder adjuster
4	Adjusting bolt	17	Spacer
5	Wheel cylinder assembly	18	Piston
6	Rivet	19	Back up ring
7	Brake lining	20	Piston cup
8	Brake shoe	21	Boot
9	Wheel sensor (If so equipped)	22	Shoe adjusting lever
10	Wheel sensor holder (If so equipped)	23	Spring
11	Shoe retracting spring	24	Wheel cylinder
12	Shoe hold down washer	25	Air bleeder screw
13	Shoe hold down nut	26	Bleeder cap

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

A	12.75-17.65 {130-180, 10-13}	E	25.50-36.28 {260-370, 19-26}
B	ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122}	F	13.73-22.56 {141-229, 11-16}
C	ϕ10 bolt: 37.27-49.03 {380-500, 28-36}	G	7.5-11.5 {76-117, 5.5-8.4}
D	148-196 {1,500-2,000, 109-144]		

REAR



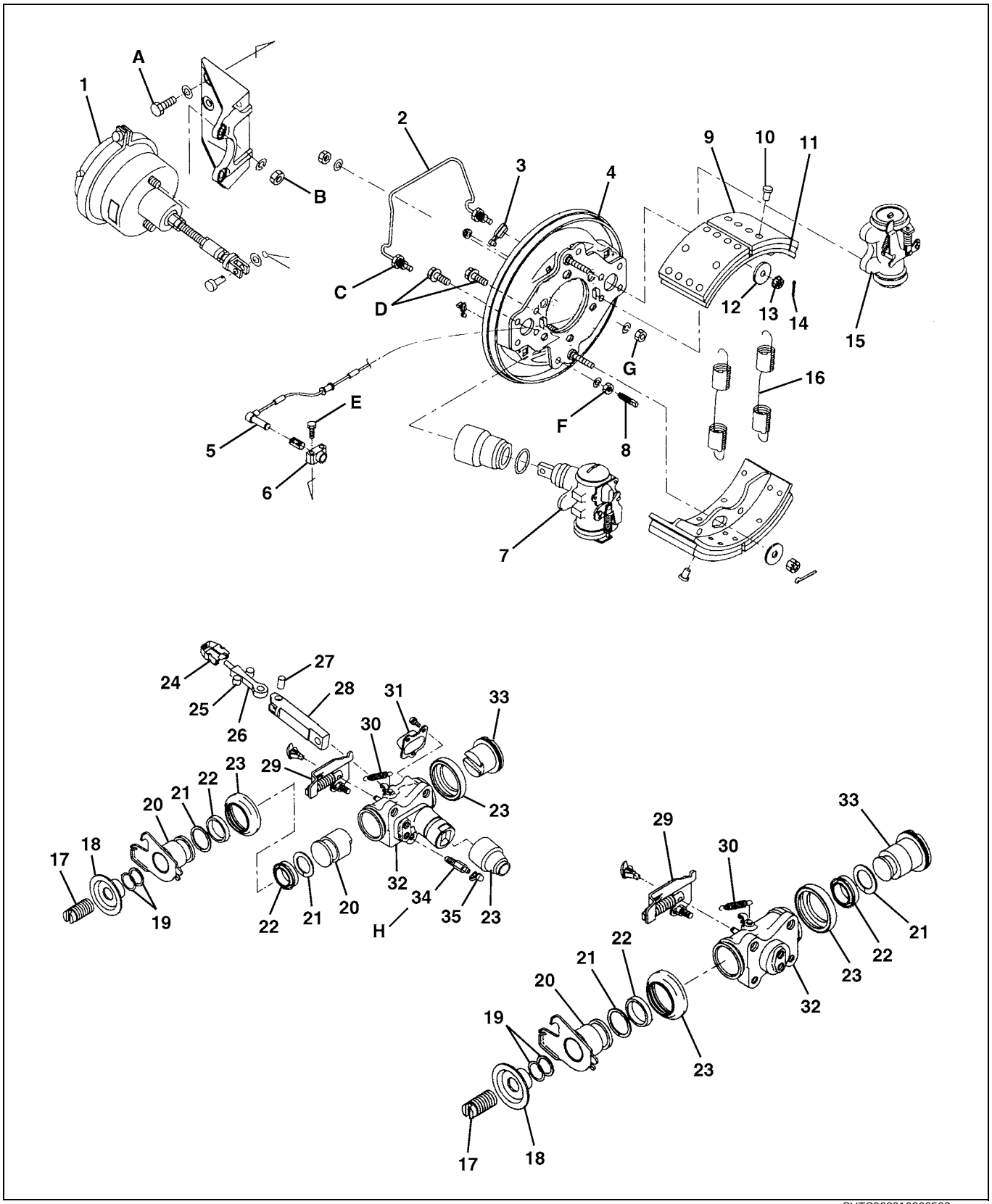
SHTS068010200501

1	Spring brake chamber	17	Boot
2	Oil pipe	18	Piston
3	Hole plug	19	Rod
4	Backing plate	20	Pin
5	Wheel sensor (If so equipped)	21	Wedge
6	Wheel sensor holder (If so equipped)	22	Roller
7	Wheel cylinder assembly	23	Cage
8	Adjusting bolt	24	Wedge cover
9	Brake lining	25	Spring
10	Rivet	26	Cylinder
11	Brake shoe	27	Air bleeder screw
12	Shoe hold down washer	28	Piston
13	Shoe hold down nut	29	Back up ring
14	Cotter pin	30	Piston cup
15	Wheel cylinder assembly	31	Anchor piston
16	Shoe retracting spring	32	Adjusting bolt

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

A	109-147 {1,110-1,500, 81-108}	E	34.5-51.5 {350-525, 25-37}
B	148-196 {1,500-2,000, 109-144}	F	25.50-36.28 {260-370, 19-26}
C	12.75-17.65 {130-180, 10-13}	G	148-196 {1,500-2,000, 109-144}
D	ϕ16 bolt: 186.33-254.97 {1,900-2,600, 137-188} ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122} ϕ12 bolt: 79.43-107.87 {810-1,100, 58-79}	H	7.5-11.5 {76-117, 5.5-8.4}

REAR (WITH AUTO-ADJUSTER)



SHTS068010200502

1	Spring brake chamber	19	Spacer
2	Oil pipe	20	Piston
3	Hole plug	21	Back up ring
4	Backing plate	22	Piston cup
5	Wheel sensor (If so equipped)	23	Boot
6	Wheel sensor holder (If so equipped)	24	Cage
7	Wheel cylinder assembly	25	Roller
8	Adjusting bolt	26	Wedge
9	Brake lining	27	Pin
10	Rivet	28	Rod
11	Brake shoe	29	Shoe adjusting lever
12	Shoe hold down washer	30	Spring
13	Shoe hold down nut	31	Wedge cover
14	Cotter pin	32	Cylinder
15	Wheel cylinder assembly	33	Anchor cylinder
16	Shoe retracting spring	34	Air bleeder screw
17	Adjusting bolt	35	Bleeder cap
18	Wheel cylinder adjuster		

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

A	109-147 {1,110-1,500, 81-108}	E	34.5-51.5 {350-525, 25-37}
B	148-196 {1,500-2,000, 109-144}	F	25.50-36.28 {260-370, 19-26}
C	12.75-17.65 {130-180, 10-13}	G	148-196 {1,500-2,000, 109-144}
D	ϕ18 bolt: 186.33-254.97 {1,900-2,600, 137-188}	H	7.5-11.5 {76-117, 5.5-8.4}
	ϕ14 bolt: 122.58-166.71 {1,250-1,700, 91-122}		
	ϕ12 bolt: 79.43-107.87 {810-1,100, 58-79}		

OVERHAUL

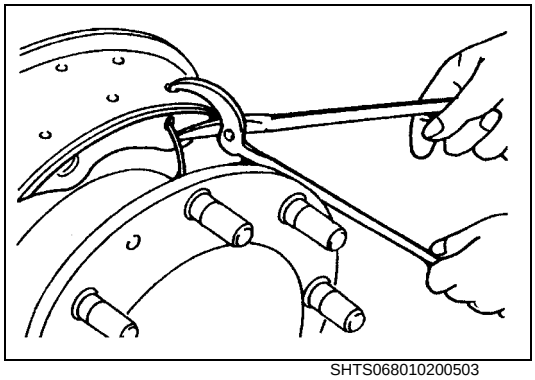
EN0680102H200023

IMPORTANT POINTS - DISASSEMBLY

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

2. REMOVAL OF BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS.
(1) Refer to the chapter "**FRONT AXLE**" and "**REAR AXLE**".

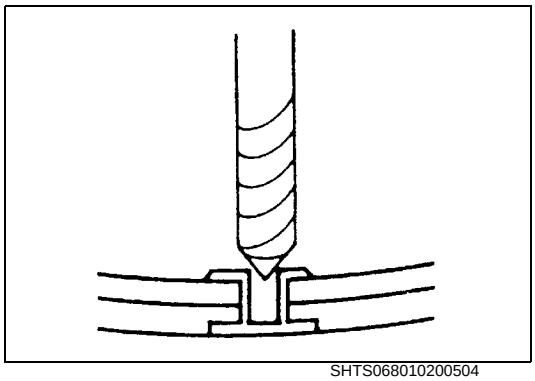
3. REMOVAL OF BRAKE SHOE RETRACTING SPRING.
(1) Remove the retracting spring by using the special tools.
SST: Retracting spring pull back tool (S0960-61040)


SHTS068010200503

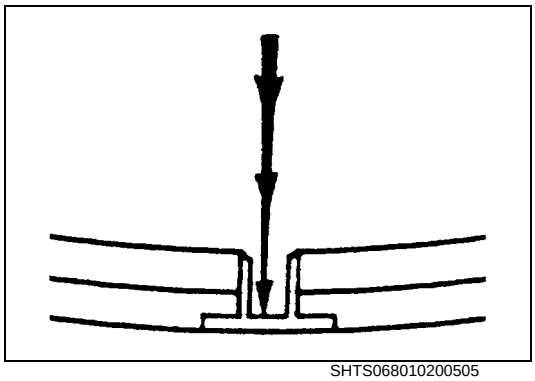
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE BRAKE LINING.
(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

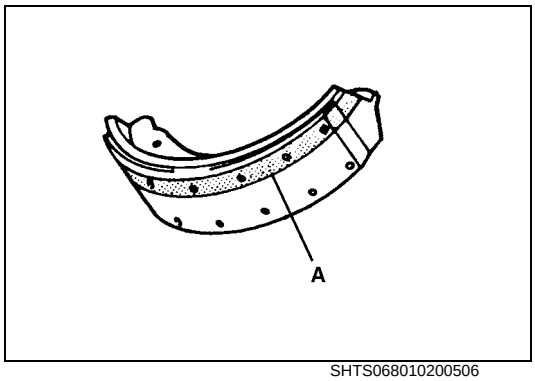
NOTICE
At this time, be careful not to scratch the brake shoe.


SHTS068010200504

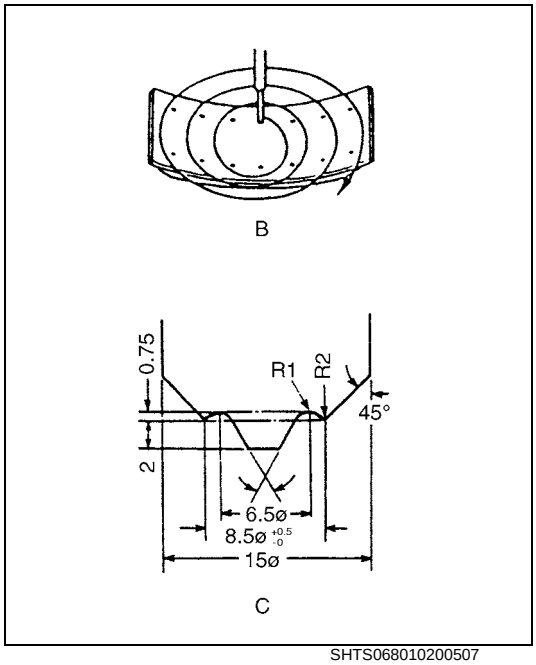
(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.


SHTS068010200505

(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



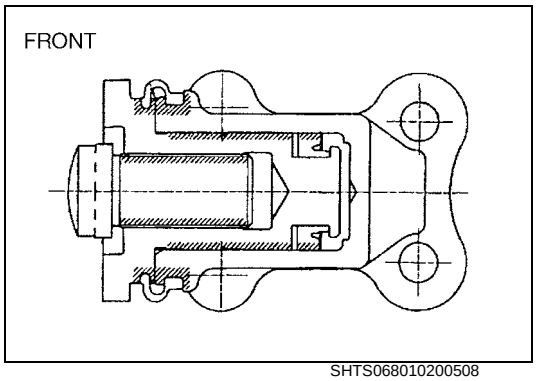
SHTS068010200506



SHTS068010200507

(4) Caulk the rivets lightly in a circular pattern as shown B; repeat several times to assure proper seating of the lining.
Recommended configuration of punch: Shown in C.
Recommended force of staking the rivet: 2.4 tons

(5) Remove adhesive tape.



SHTS068010200508

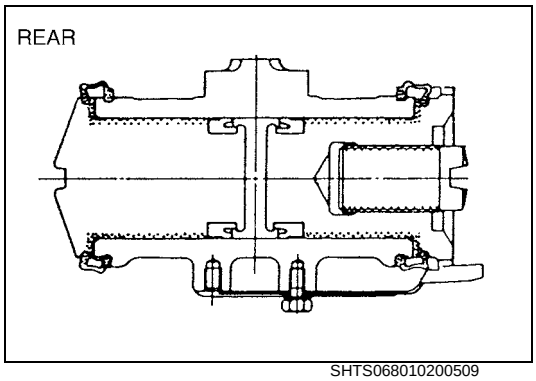
2. ASSEMBLY OF THE WHEEL CYLINDER.

(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI No.20):
S0415-61010

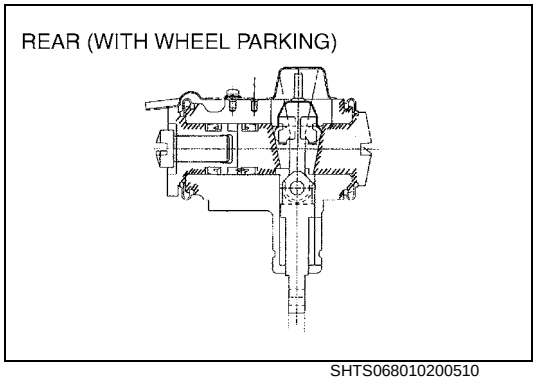
(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2):
S0413-31080

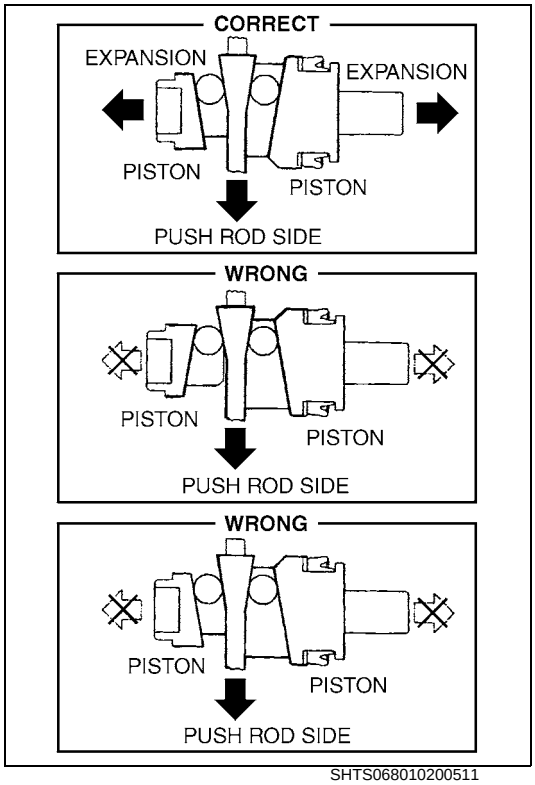


SHTS068010200509

NOTICE
The parts where the rubber grease shall be applied are shown in figure with oblique lines.



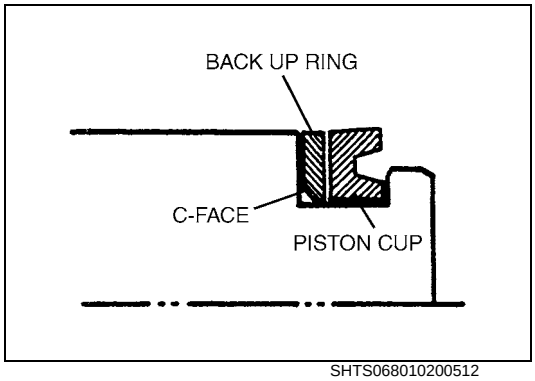
SHTS068010200510



SHTS068010200511

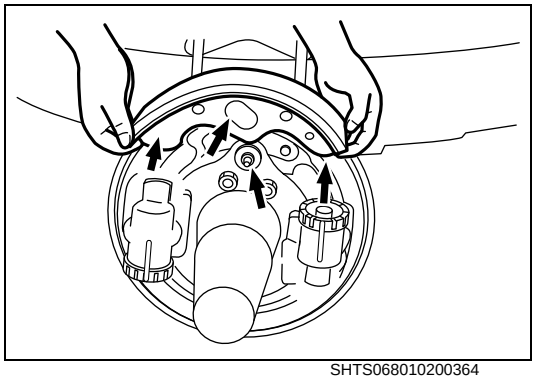
NOTICE
When assembling the rear wheel cylinder with wedge, pay attention to following items.

- **Install the piston so that the taper of the groove of the sliding part of the roller is positioned to expand the piston when the push rod operates (is pulled).**
- **At this time, confirm that the notch comes to the side of the push rod at the time of piston installation.**
- **In case of wrong installation, it is feared that in the worst case the parking brake will not be effective.**



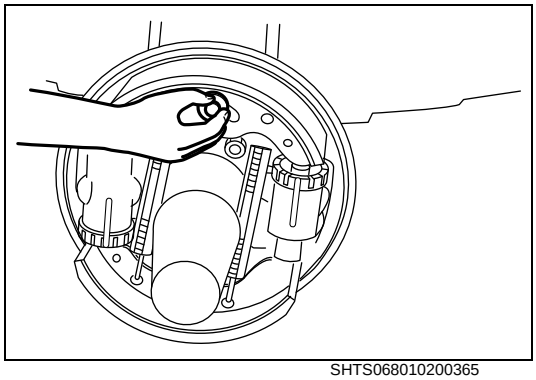
SHTS068010200512

(3) Be sure to install the back up ring with the chamfered face of the ring a way of the cup.


SHTS068010200364

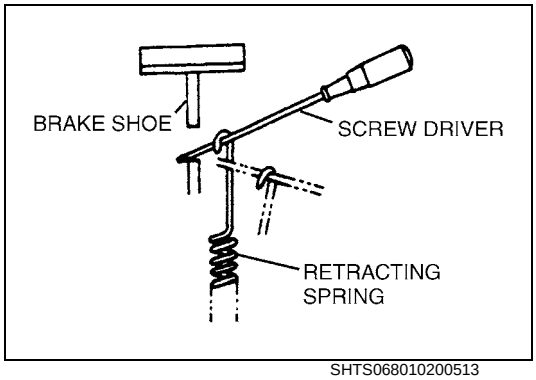
3. INSTALLATION OF BRAKE SHOE ASSEMBLY.

(1) Apply heat-resistant grease to both ends of the shoe web contacting with the piston, and to the top surface of the shoe web contacting the shoe hold washer.



SHTS068010200365

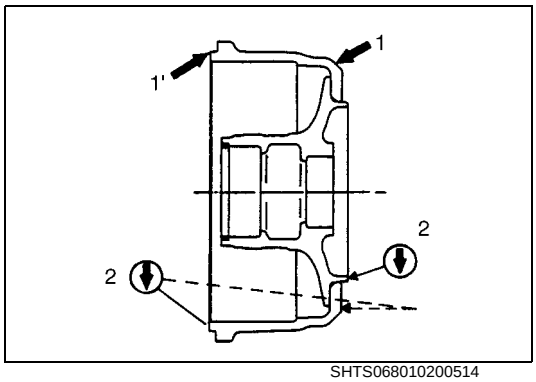
(2) Adjust the clearance between the hold down washer and the shoe.
Tighten the slotted nut and back off the nut by 1/3 turn.
Then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



SHTS068010200513

4. INSTALLATION OF BRAKE SHOE RETRACTING SPRING.

(1) Install the retracting spring using a screwdriver. After installing the spring, check that the end of the shoe web is securely set in the groove of the wheel cylinder piston. Also check that the hook of the spring is securely hooked in the hole of the shoe.



SHTS068010200514

5. ASSEMBLY OF THE BRAKE DRUM AND WHEEL HUB. (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in Figure. Install the drum according to NOTICE.

NOTICE

1. The drums. Number with R or L.
With R: Install in right side.
With L: Install in left side.

2. The drums, with no R or L.
New drums: Install in any side.
Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2. as shown in the figure. (Broken line shows alternative position).

6. MOUNTING OF WHEEL HUB WITH BRAKE DRUM.

(1) Refer to the chapter "**FRONT AXLE**" and "**REAR AXLE**".

7. MOUNTING OF TIRE.

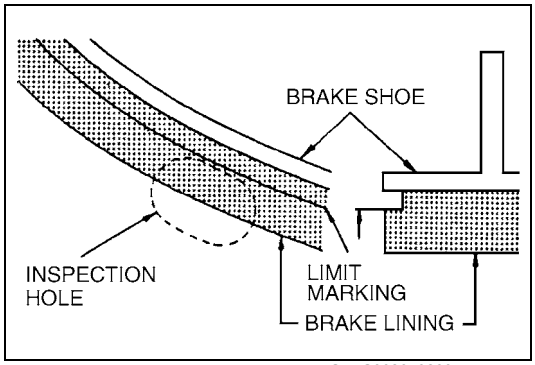
(1) Refer to the chapter "**WHEEL & TIRE**".

8. ADJUSTMENT.

(1) Finally, adjust the clearance between the brake lining and the brake drum as explained in section **"ADJUSTMENT"**.

ADJUSTMENT

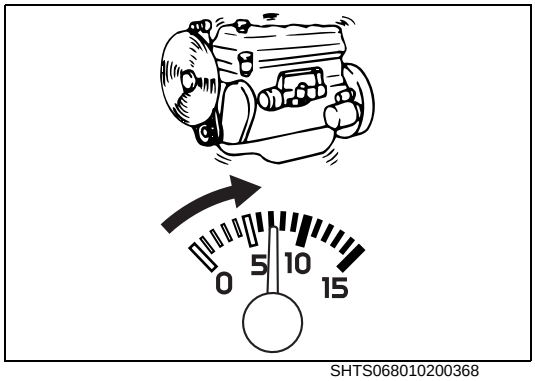
EN0680102H300037



SHTS068010200515

1. REMAINING THICKNESS OF THE BRAKE LINING.

(1) Check remaining thickness of lining through the inspection hole of the backing plate. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made replace the lining.



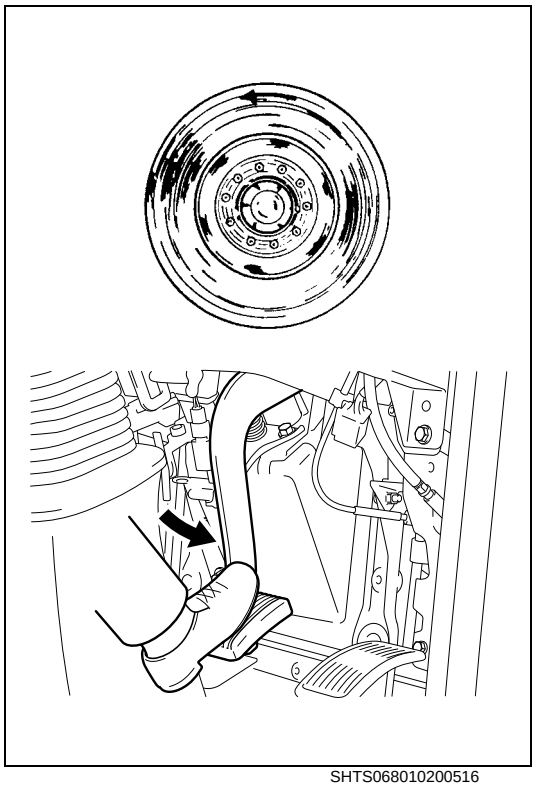
SHTS068010200368

2. AIR PRESSURE IN THE AIR TANK.

(1) Operate the engine and obtain an air pressure of the 785-880 kPa {8.0-9.0 kgf/cm^2, 114-128 lbf/in.^{2}}

NOTICE

The specified air pressure in the air tank should be maintained when making the adjustment.


SHTS068010200516

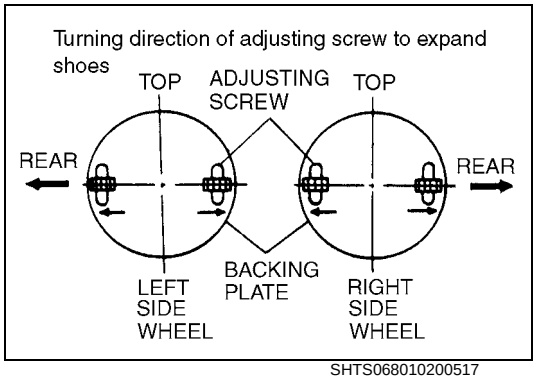
3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM.

(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

NOTICE

When adjusting the clearance between brake lining and brake drum, set spring brake control valve to the OFF position.

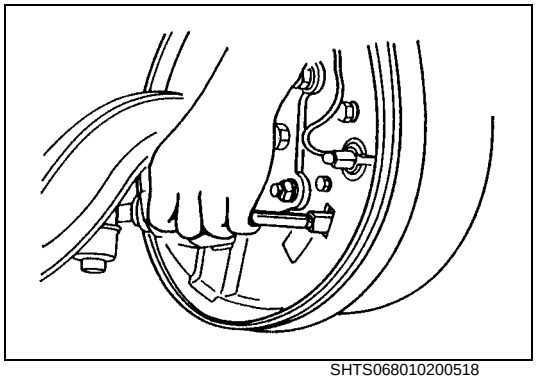


SHTS068010200517

(3) Adjust the clearance between brake lining and brake drum.

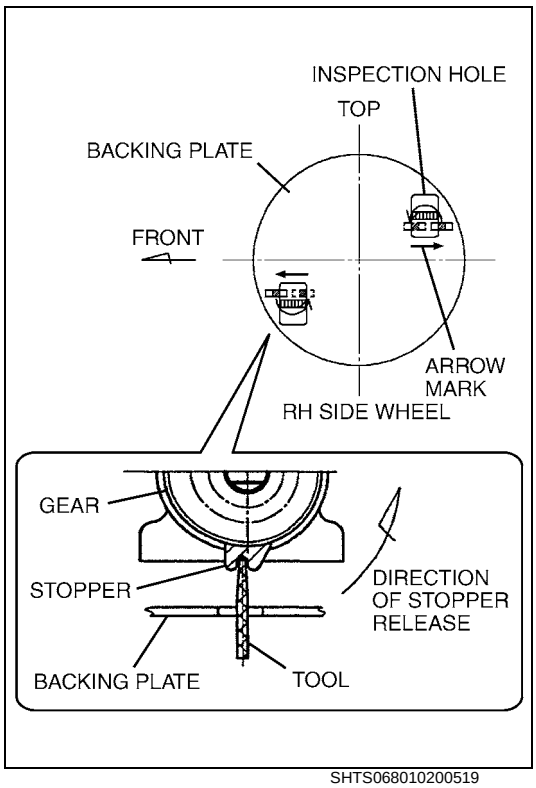
(Without auto-adjuster)

1. Turn the adjusting screw with an adjusting tool in the arrow direction (The arrows are marked near the holes on the backing plate), and put the drum into a position as to turn slowly by hand.
   SST: Brake shoe adjusting tool (S0966-51130)



SHTS068010200518

2. Return the adjusting screw 5-7 notches in the reverse arrow direction.



SHTS068010200519

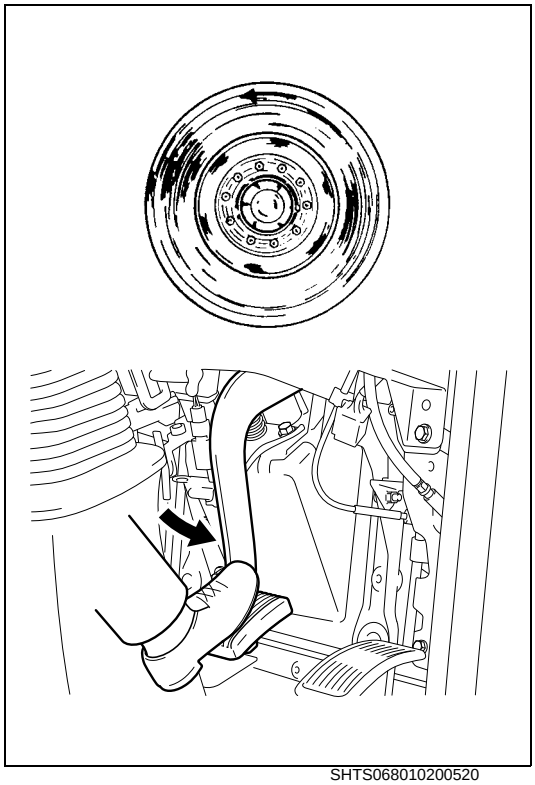
(With auto-adjuster)

1. Insert the thickness gauge of **0.4 mm {0.0157 in.}** through the inspection hole. And turn the adjusting screw with an adjusting tool in the arrow direction (The arrows are marked near the inspection holes.). That is a direction to expand the shoe. So that the shoe gap can become **0.4 mm {0.0157 in.}**.
   SST: Brake shoe adjusting tool (S0966-51130)

NOTICE
If the thickness gauge can not be inserted due to narrow gap (Less than 0.4 mm {0.0157 in.}), release the stopper by moving the adjusting stopper to the position shown in the figure.

2. Turn the adjusting screw to the direction to shrink the shoe. That is the reverse direction of the arrow mark. And then adjust the shoe gap to **0.4 mm {0.0157 in.}**.

NOTICE
Do not forget to return the adjusting stopper to the original position.



SHTS068010200520

(4) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(5) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from (2).

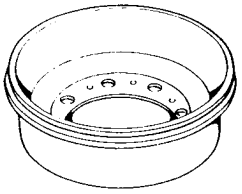
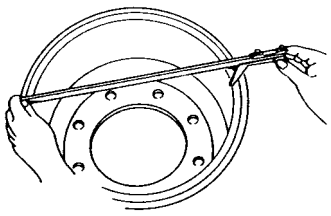
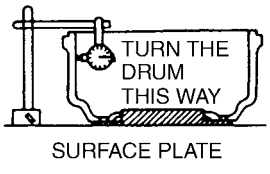
NOTICE
Using the same procedure as above, adjust the clearance for all wheels.

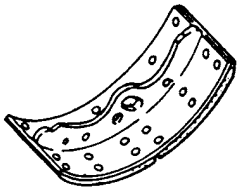
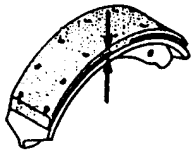
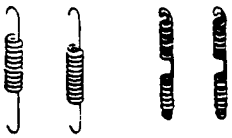
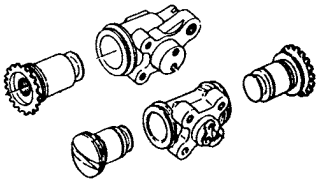
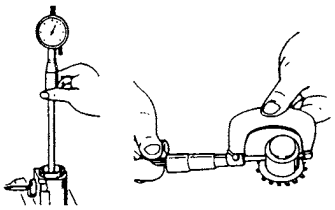
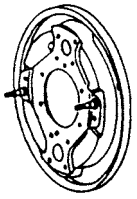
INSPECTION AND REPAIR

EN0680102H300038

NOTICE
Brake fluid or isopropyl alcohol should only be used to wash the wheel cylinder component.

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum inner surface: Crack, scoring and/or any other damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum inner diameter	**400 {15.748}**	**403 {15.866}**	**Replace.**	**Measure** 
Brake drum runout	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure**  SURFACE PLATE

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake shoe with lining: Crack, wear deformation and/or any other damages	**—**	**—**	**Re-lining or replace, if necessary.**	**Visual check** 
Remaining thickness of brake lining	**15.0 {0.590}**	**5.0 {0.197}**	**Re-lining.**	**Measure** 
Brake shoe retracting spring: Elastic strength distortion and/or any damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Wheel cylinder and piston: Corrosion and/or any damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Clearance between piston and wheel cylinder	**0.03-0.13 {0.0012-0.0051}**	**0.25 {0.0098}**	**Replace.**	**Measure** 
Backing plate and stud pins: Deformation, damage and any other abnormality	**—**	**—**	**Replace, if necessary.**	**Visual check** 

LIMITING VALVE (MODEL: FM2P)

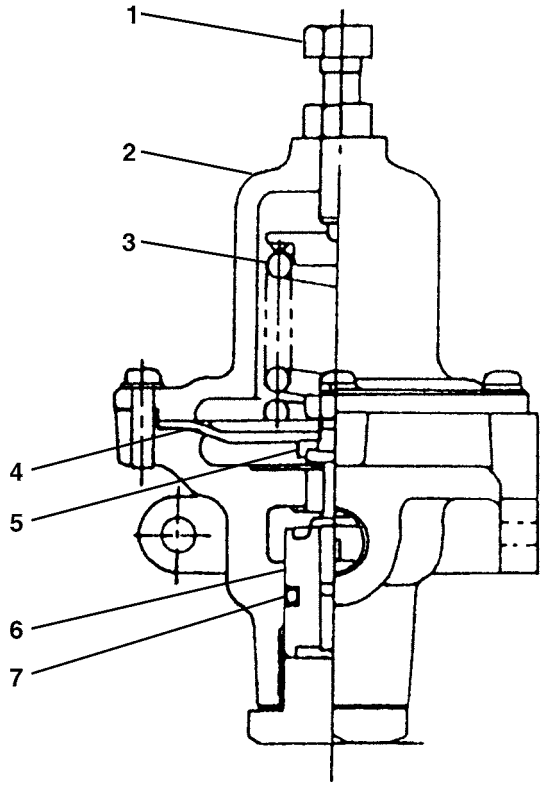
DATA AND SPECIFICATIONS

EN0680102I200029

Type	**Diaphragm and piston type**	
Inlet side pressure	**686 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}**	
Outlet side pressure	**ID mark**	**kPa {kgf/cm^2, lbf/in.^{2}}**
	216	**196.4-235.6 {2.0-2.4, 28.49-34.09}**
	235	**205.6-264.4 {2.1-2.7, 29.87-38.39}**
	363	**343.4-382.6 {3.5-3.9, 49.77-55.45}**
	373	**343.6-402.4 {3.5-4.1, 49.77-58.30}**
	392	**362.6-421.4 {3.7-4.3, 52.62-61.14}**

DESCRIPTION

EN0680102C100029

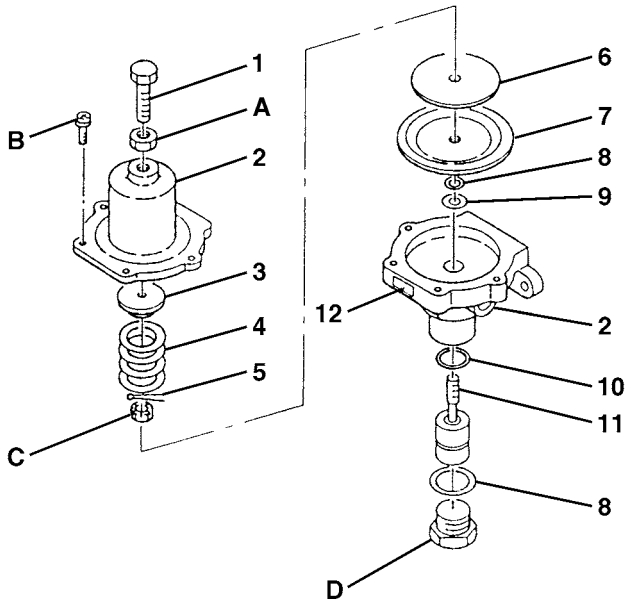


SHTS068010200530

1	**Adjusting bolt**	**5**	**Retainer**
2	**Valve body**	**6**	**Valve**
3	**Spring**	**7**	**O-ring**
4	**Diaphragm**		

COMPONENT LOCATOR

EN0680102D100028



SHTS068010200531

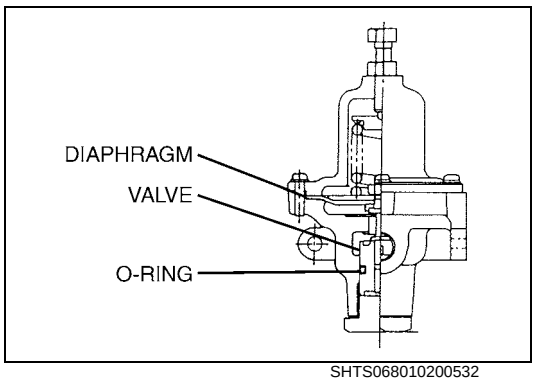
1	Adjusting bolt	7	Diaphragm
2	Valve body	8	O-ring
3	Spring seat	9	Retainer
4	Spring	10	O-ring
5	Cotter pin	11	Valve
6	Plate	12	ID mark

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

A	9.8-19.6 {100-200, 8-14}	C	0.40-0.58 {4-6, 0.29-0.43}
B	0.99-1.47 {10-15, 0.73-1.08}	D	40-59 {400-600, 29-43}

OVERHAUL

EN0680102H200024



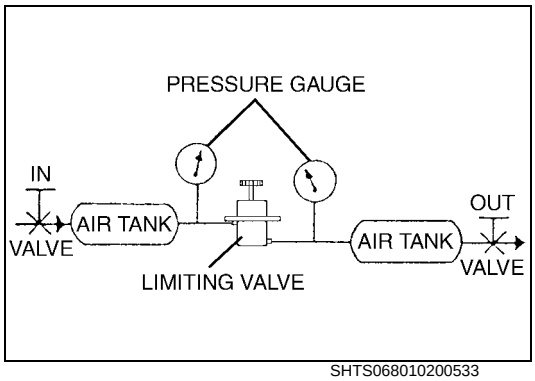
SHTS068010200532

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When assembling the limiting valve, replace the O-rings diaphragm and valve with new one.

(2) Apply adequate amount of silicone grease for the sliding surface of the component parts and O-rings.



SHTS068010200533

IMPORTANT POINT - MOUNTING

1. ADJUSTMENT

(1) Turn the adjusting screw counterclockwise fully, then placed and piped the limiting valve as shown in figure.

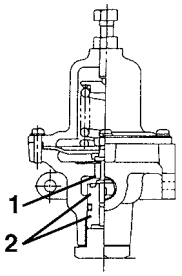
(2) Charge the inlet side air tank with compressed air for 686 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}.

(3) Turn the adjusting screw clockwise gradually till outlet side air pressure for specified below.
Then tighten the lock nut.

ID mark	Outlet side pressure: kPa {kgf/cm^2, lbf/in.^{2}}
216	196.4-235.6 {2.0-2.4, 28.49-34.09}
235	205.6-264.4 {2.1-2.7, 29.87-38.39}
363	343.4-382.6 {3.5-3.9, 49.77-55.45}
373	343.6-402.4 {3.5-4.1, 49.77-58.30}
392	362.6-421.4 {3.7-4.3, 52.62-61.14}

INSPECTION AND REPAIR

EN0680102H300039

Inspection Item		Standard	Limit	Remedy	Inspection Procedure
Valve contact surface 1. and friction surface 2. of valve body: Rust, wear and damage		—	—	Clean or replace.	Visual check and measure 
Load at setting length: Valve ID mark	216 235	270.7 N/35.5 mm {27.6 kgf/35.5 mm, 60.85 lbf/1.39 in.}	243.2-298.2 N {24.8-30.4 kgf, 54.67-67.00 lbf}	Replace, if necessary.	
	363 373 392	1,176.8 N/132.0 mm {120 kgf/32.0 mm, 264.6 lbf/1.26 in.}	1,059.1-1,294.5 N {108-132 kgf, 238.06-290.95 lbf}		

TWO-WAY VALVE (BRAKE LOCK CONTROL VALVE)

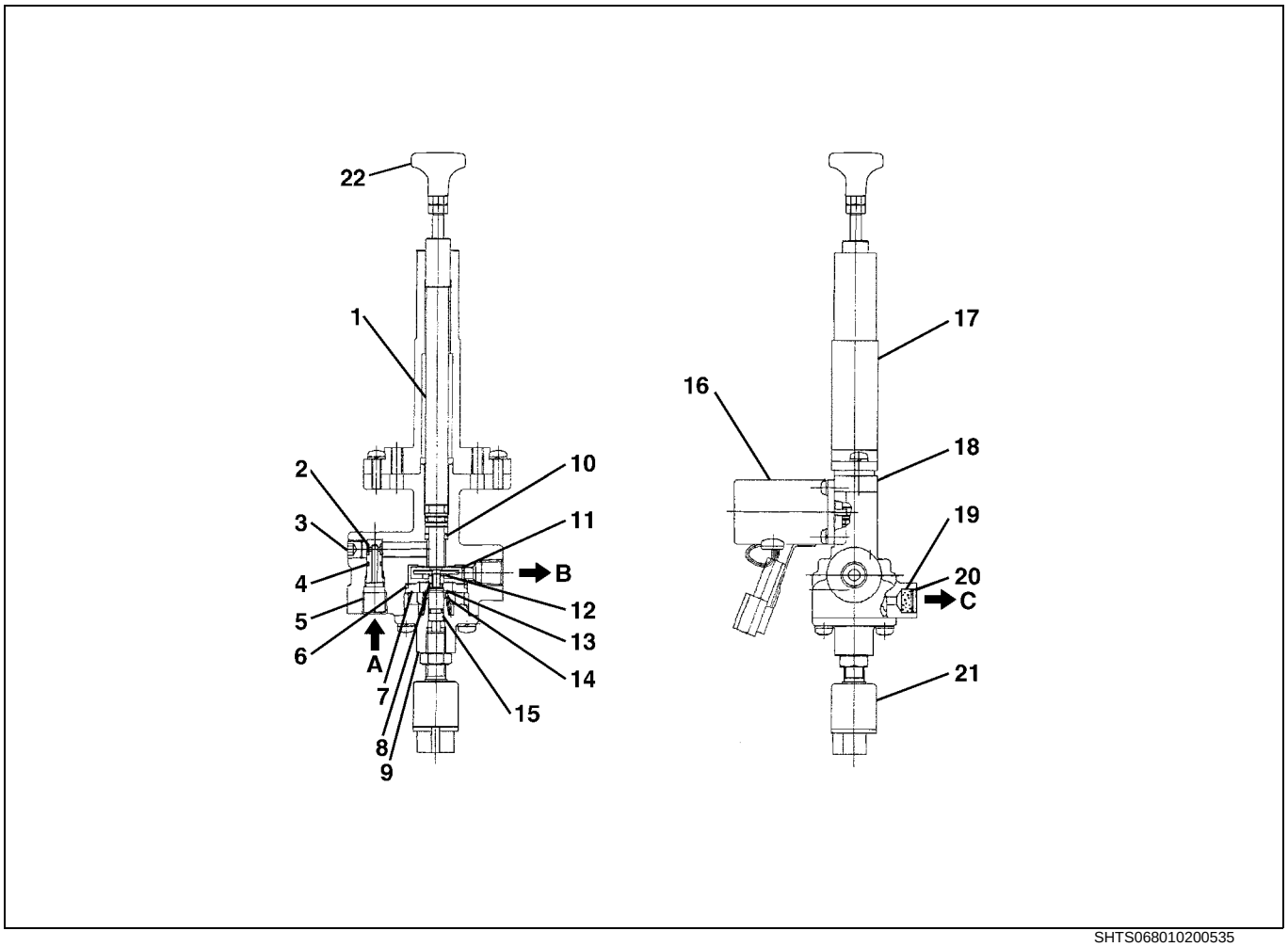
DATA AND SPECIFICATION

EN0680102I200030

Type	**Push-Pull type, with locking mechanism**

DESCRIPTION

EN0680102C100030

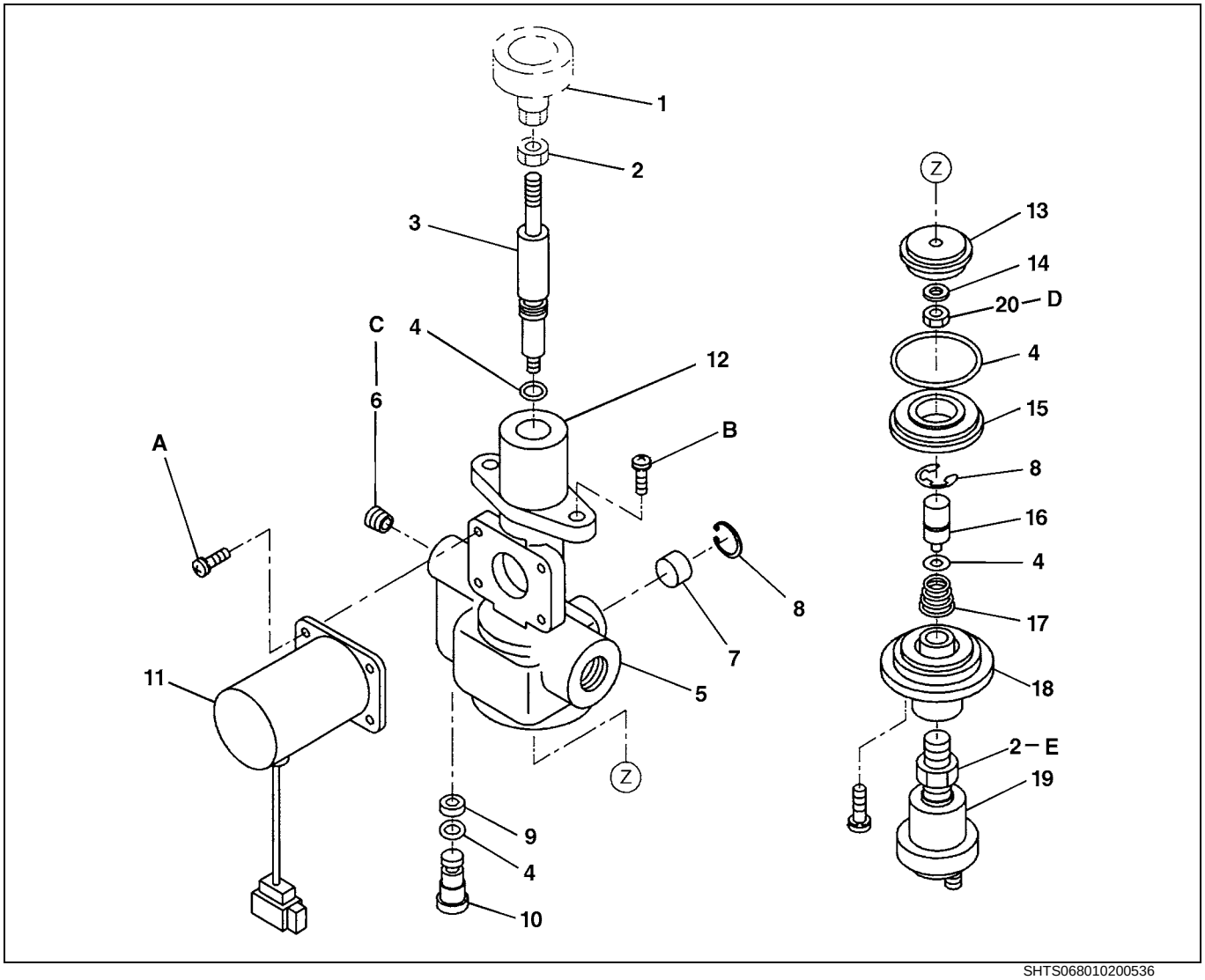


SHTS068010200535

1	Piston	10	O-ring	19	Filter
2	Valve	11	Valve sub assembly	20	Retainer
3	Plug	12	Plain washer	21	Switch assembly
4	O-ring	13	Retainer	22	Knob
5	Valve guide	14	Conical spring	A	From reducing valve
6	O-ring	15	Plunger	B	To double check valve
7	Valve seat	16	Solenoid assembly	C	Exhaust
8	Check bolt nut	17	Guide		
9	Cover	18	Brake valve body		

COMPONENT LOCATOR

EN0680102D100029



SHTS068010200536

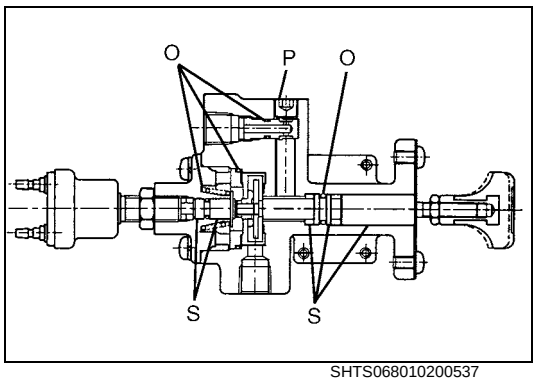
1	Knob	11	Solenoid assembly
2	Lock nut	12	Guide
3	Piston	13	Valve
4	O-ring	14	Washer
5	Valve body	15	Valve seat
6	Plug	16	Plunger
7	Filter	17	Spring
8	Retainer ring	18	Cover
9	Check valve	19	Switch assembly
10	Valve guide	20	Check bolt nut

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

A	1.5-2.4 {15-25, 1.1-1.8}	D	1.96-2.06 {20-21, 1.45-1.51}
B	3.4-4.9 {30-50, 2.6-3.6}	E	19.6-29.4 {200-300, 14.5-21.6}
C	6.9-9.8 {70-100, 5.1-7.2}		

OVERHAUL

EN0680102H200025



SHTS068010200537

IMPORTANT POINTS - ASSEMBLY

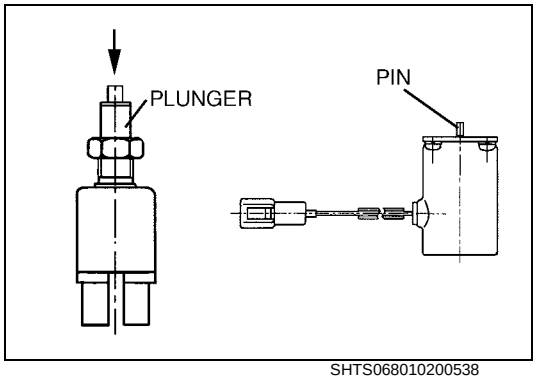
1. LUBRICATION

(1) When assembling the two-way valve, replace the O-rings. Check valve and valve with new ones.

(2) Apply adequate amount of silicone grease to the sliding surfaces, O-ring grooves of the components and O-rings.

(3) Apply sealing compound (LOCTITE 572 or equivalent) to thread of the plug but no to first 1-2 pitch.

O: O-ring
P: Plug
S: Sliding surface



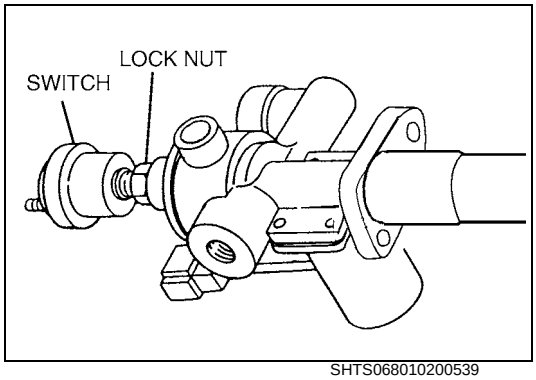
SHTS068010200538

2. SWITCH AND SOLENOID

(1) Check the followings.

- Switch: When the switch is free; OFF.
  When the plunger of the switch is pushed in; ON.
- Solenoid: When electric power is applied, the pin moves in.

Refer to the chapter "**ELECTRICAL EQUIPMENT**" for details.



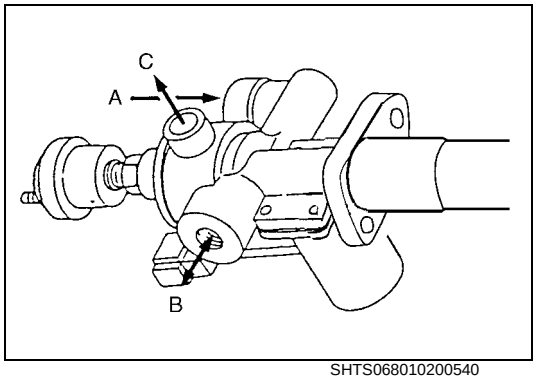
SHTS068010200539

3. SWITCH INSTALLATION

(1) Screw the switch into the cover, so that the switch is turned ON when the knob is pushed in and vice versa.

(2) Lock the switch with the lock nut.

NOTICE
Use a circuit tester.



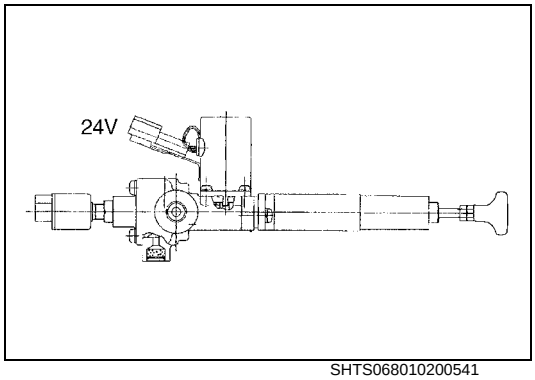
SHTS068010200540

IMPORTANT POINT - INSPECTION

1. FUNCTION CHECK

(1) Air shall be flow from B to C when the knob is pulled out.

(2) Air shall be flow from A to B when the knob is pushed in.

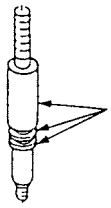
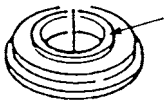
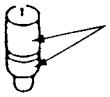
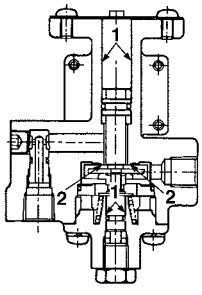


SHTS068010200541

(3) The knob shall be locked at pulled when the solenoid is free from electric power.
(4) The knob shall be released when electric power is applied for solenoid.

INSPECTION AND REPAIR

EN0680102H300040

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Piston sliding surface: Wear, corrosion and any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve guide: Wear, corrosion and any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve seat and valve contact surface: Wear, corrosion and any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Plunger sliding surface Wear, corrosion and any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring: Rust and damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body sliding surface 1 and valve contact surface 2: Wear, corrosion and any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cover sliding surface 1: Wear, corrosion and any other damages	**—**	**—**	**Replace, if necessary.**	

SERVICE BRAKE (MODELS: WITH FULL AIR BRAKE)

BR02-002

PRESSURE REGULATOR.....BR02-4
DATA AND SPECIFICATIONS..... BR02-4
DESCRIPTION BR02-4
COMPONENT LOCATOR BR02-5
OVERHAUL BR02-6
INSPECTION AND REPAIR BR02-7

AIR DRYER (MODELS: FG, GH, SG).....BR02-8
DATA AND SPECIFICATIONS..... BR02-8
DESCRIPTION BR02-8
COMPONENT LOCATOR BR02-9
OVERHAUL BR02-10
INSPECTION AND REPAIR BR02-12

AIR DRYER (MODEL: FM) BR02-13
DATA AND SPECIFICATIONS..... BR02-13
DESCRIPTION BR02-14
COMPONENT LOCATOR BR02-15
OVERHAUL BR02-16
INSPECTION AND REPAIR BR02-17

CHECK VALVE.....BR02-18
DATA AND SPECIFICATIONS..... BR02-18
DESCRIPTION BR02-18
COMPONENT LOCATOR BR02-18
INSPECTION AND REPAIR BR02-19

SAFETY VALVE BR02-20
DATA AND SPECIFICATIONS..... BR02-20
DESCRIPTION BR02-20
INSPECTION AND REPAIR BR02-20

BRAKE VALVE.....BR02-21
DATA AND SPECIFICATION BR02-21
DESCRIPTION BR02-21
COMPONENT LOCATOR BR02-22
OVERHAUL BR02-24
INSPECTION AND REPAIR BR02-29

PROTECTION VALVE (FOR AIR SUSPENSION).....BR02-31
DATA AND SPECIFICATIONS..... BR02-31
DESCRIPTION BR02-31
COMPONENT LOCATOR BR02-32
OVERHAUL BR02-33
INSPECTION AND REPAIR BR02-33

PROTECTION VALVE (WITH 4-WAY PROTECTION VALVE) [EXCEPT GH8J (FOR IRELAND), FM1A].....BR02-34
DATA AND SPECIFICATIONS..... BR02-34
DESCRIPTION BR02-34
COMPONENT LOCATOR BR02-35
OVERHAUL BR02-36
ADJUSTMENT..... BR02-36
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PROTECTION VALVE (WITH 4-WAY PROTECTION VALVE) [MODELS: GH8J (FOR IRELAND), FM1A].....BR02-39
DATA AND SPECIFICATIONS..... BR02-39
DESCRIPTION BR02-39
COMPONENT LOCATOR BR02-40
OVERHAUL BR02-41
ADJUSTMENT..... BR02-41
INSPECTION AND REPAIR BR02-43

QUICK RELEASE VALVE BR02-44
DATA AND SPECIFICATION BR02-44
DESCRIPTION BR02-44
COMPONENT LOCATOR BR02-46
OVERHAUL BR02-48
INSPECTION AND REPAIR BR02-48

SPRING BRAKE CONTROL VALVE BR02-49
DATA AND SPECIFICATIONS..... BR02-49
DESCRIPTION BR02-49
COMPONENT LOCATOR BR02-50
OVERHAUL BR02-51
INSPECTION AND REPAIR BR02-52

RELAY VALVE (FOR FRONT BRAKE AND TRAILER BRAKE) BR02-53
DATA AND SPECIFICATIONS..... BR02-53
DESCRIPTION BR02-53
COMPONENT LOCATOR BR02-54
OVERHAUL BR02-55
INSPECTION AND REPAIR BR02-55

RELAY VALVE (FOR FRONT SPRING BRAKE CHAMBER) BR02-56
DATA AND SPECIFICATIONS BR02-56
DESCRIPTION.....BR02-56
COMPONENT LOCATOR.....BR02-57
OVERHAUL.....BR02-57
INSPECTION AND REPAIR BR02-58

RELAY VALVE (WITH CHECK VALVE, FOR REAR BRAKE)..... BR02-59
DATA AND SPECIFICATIONS BR02-59
DESCRIPTION.....BR02-59
COMPONENT LOCATOR.....BR02-60
OVERHAUL.....BR02-60
INSPECTION AND REPAIR BR02-61

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DATA AND SPECIFICATIONS BR02-62
DESCRIPTION.....BR02-62
COMPONENT LOCATOR.....BR02-63
OVERHAUL.....BR02-64
INSPECTION AND REPAIR BR02-64

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DESCRIPTION.....BR02-65
COMPONENT LOCATOR.....BR02-66
OVERHAUL.....BR02-67
INSPECTION AND REPAIR BR02-67

RELAY VALVE (FOR REAR BRAKE) BR02-68
DATA AND SPECIFICATIONS BR02-68
DESCRIPTION.....BR02-68
COMPONENT LOCATOR.....BR02-69
OVERHAUL.....BR02-70
INSPECTION AND REPAIR BR02-70

RELAY VALVE (FOR REAR BRAKE) (FOR IRELAND) BR02-71
DATA AND SPECIFICATIONS BR02-71
DESCRIPTION.....BR02-71
COMPONENT LOCATOR.....BR02-72
OVERHAUL.....BR02-73
INSPECTION AND REPAIR BR02-74

CUT VALVE BR02-75
DATA AND SPECIFICATION.....BR02-75
DESCRIPTION.....BR02-75
COMPONENT LOCATOR.....BR02-76
OVERHAUL.....BR02-77
INSPECTION AND REPAIR BR02-77

SPRING BRAKE CHAMBER [FOR REAR BRAKE (WEDGE TYPE)] BR02-78
DATA AND SPECIFICATION.....BR02-78
DESCRIPTION.....BR02-78
COMPONENT LOCATOR.....BR02-79
OVERHAUL.....BR02-80
INSPECTION AND REPAIR BR02-81

SPRING BRAKE CHAMBER [FOR FRONT BRAKE (S-CAM TYPE)]..... BR02-82
DATA AND SPECIFICATION.....BR02-82
DESCRIPTION.....BR02-82
SPECIAL TOOL BR02-83
COMPONENT LOCATOR.....BR02-83
OVERHAUL.....BR02-84
INSPECTION AND REPAIR BR02-88

SPRING BRAKE CHAMBER [FOR REAR BRAKE (S-CAM TYPE)] BR02-89
DATA AND SPECIFICATION.....BR02-89
DESCRIPTION.....BR02-89
SPECIAL TOOL BR02-90
COMPONENT LOCATOR.....BR02-91
OVERHAUL.....BR02-92
INSPECTION AND REPAIR BR02-96

BRAKE CHAMBER (MODELS: FG, GH, SG) [FOR FRONT BRAKE (WEDGE TYPE)] BR02-97
DATA AND SPECIFICATIONS BR02-97
DESCRIPTION.....BR02-97
COMPONENT LOCATOR.....BR02-98
OVERHAUL.....BR02-99
INSPECTION AND REPAIR BR02-100

BRAKE CHAMBER (MODELS: FG, GH, SG) [FOR FRONT BRAKE (S-CAM TYPE)]..... BR02-101
DATA AND SPECIFICATION.....BR02-101
DESCRIPTION.....BR02-101
COMPONENT LOCATOR.....BR02-102
OVERHAUL.....BR02-102
INSPECTION AND REPAIR BR02-103

BRAKE CHAMBER
[FOR REAR (REARWARD) BRAKE] ...BR02-104
DATA AND SPECIFICATION BR02-104
DESCRIPTION BR02-104
COMPONENT LOCATOR BR02-105
OVERHAUL BR02-105
INSPECTION AND REPAIR BR02-106

BRAKE CHAMBER (MODEL: SG)
[FOR REAR BRAKE
(S-CAM TYPE)].....BR02-107
DATA AND SPECIFICATION BR02-107
DESCRIPTION BR02-107
COMPONENT LOCATOR BR02-108
OVERHAUL BR02-109
INSPECTION AND REPAIR BR02-110

TRAILER HAND BRAKE
CONTROL VALVE.....BR02-111
DATA AND SPECIFICATION BR02-111
DESCRIPTION BR02-111
COMPONENT LOCATOR BR02-112
OVERHAUL BR02-113
INSPECTION AND REPAIR BR02-114

WHEEL BRAKE (WEDGE TYPE).....BR02-115
DATA AND SPECIFICATIONS..... BR02-115
DESCRIPTION BR02-115
SPECIAL TOOL BR02-119
COMPONENT LOCATOR BR02-120
OVERHAUL BR02-124
ADJUSTMENT..... BR02-129
INSPECTION AND REPAIR BR02-131

WHEEL BRAKE (S-CAM TYPE) BR02-132
DATA AND SPECIFICATIONS..... BR02-132
DESCRIPTION BR02-133
SPECIAL TOOL BR02-141
COMPONENT LOCATOR BR02-142
OVERHAUL BR02-154
ADJUSTMENT..... BR02-163
INSPECTION AND REPAIR BR02-165

LIMITING VALVE (MODEL: FM2P) BR02-167
DATA AND SPECIFICATIONS..... BR02-167
DESCRIPTION BR02-167
COMPONENT LOCATOR BR02-168
OVERHAUL BR02-169
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EXPANDER
(MODELS WITH
WEDGE TYPE BRAKE).....BR02-170
DESCRIPTION BR02-170
SPECIAL TOOL BR02-171
COMPONENT LOCATOR BR02-172
OVERHAUL BR02-173
INSPECTION AND REPAIR BR02-177

WHEEL BRAKE SLACK ADJUSTER
(AUTO ADJUSTER) (MODELS WITH
S-CAM TYPE BRAKE).....BR02-178
DESCRIPTION BR02-178
SPECIAL TOOL BR02-179
COMPONENT LOCATOR BR02-181
OVERHAUL BR02-182
INSPECTION AND REPAIR BR02-189

PRESSURE REGULATOR

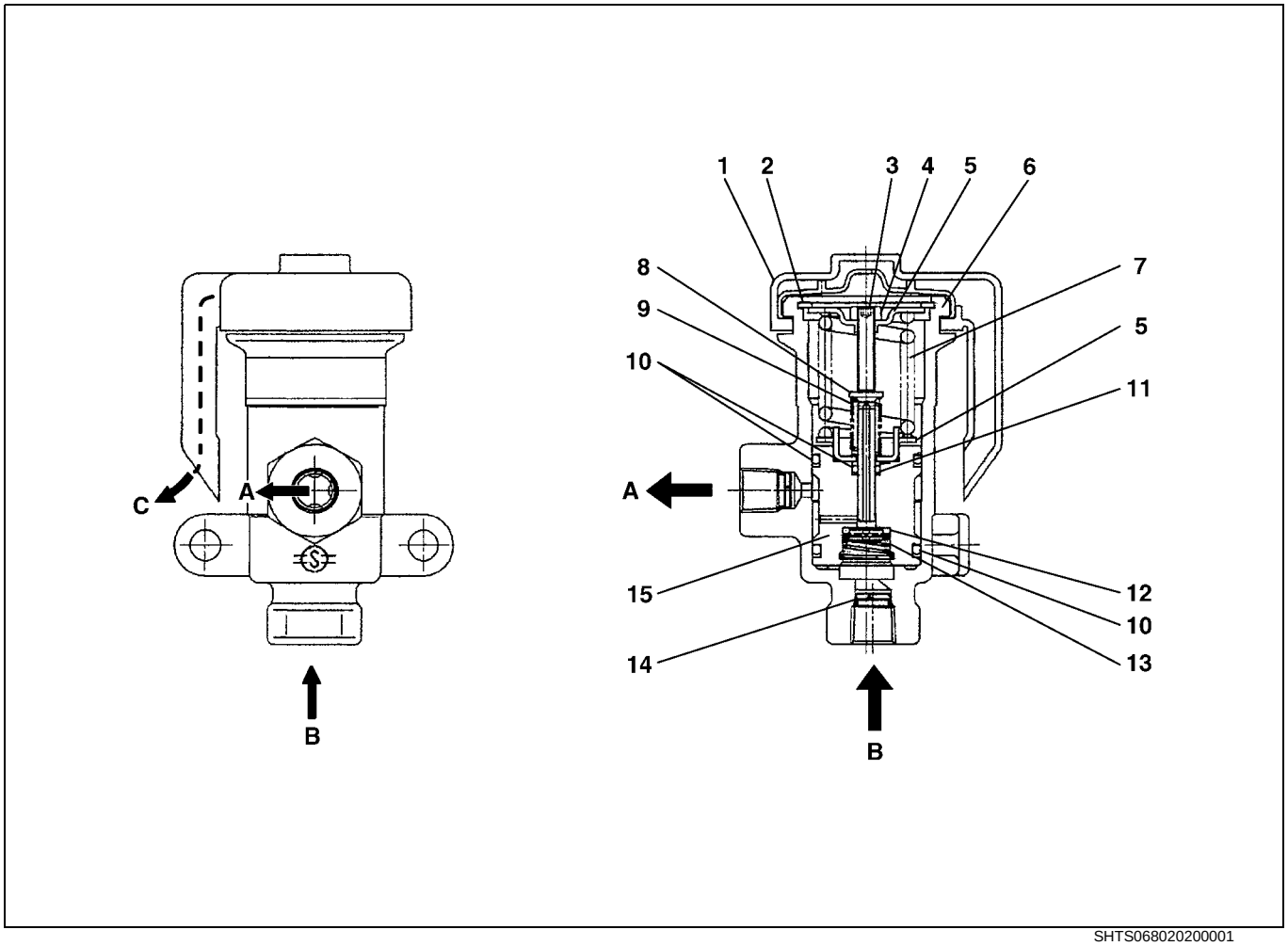
DATA AND SPECIFICATIONS

EN0680202I200001

Type	**Spring type, regulates air pressure together with unloader valve on compressor**
Regulating pressure: Regulator No. S4453-01330	**780-880 kPa {8.0-9.0 kgf/cm^2, 114-128 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100001

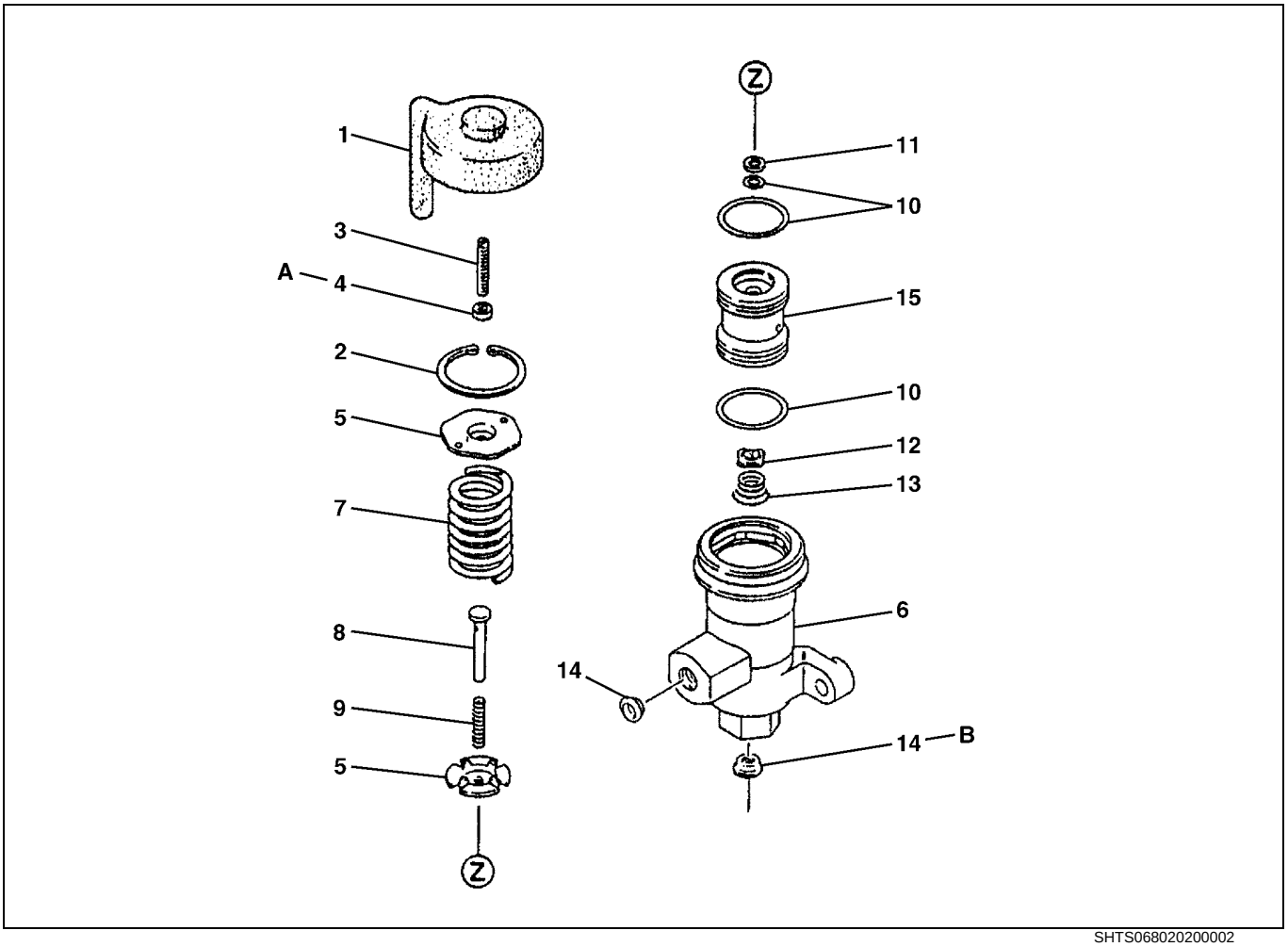


SHTS068020200001

1	Dust cover	7	Main spring	13	Valve spring
2	Retainer ring	8	Push rod	14	Filter
3	Set bolt	9	Rod spring	15	Piston
4	Lock nut	10	O-ring	A	To Unloader valve
5	Spring seat	11	Back up ring	B	From Air tank
6	Valve body	12	Valve seat	C	Exhaust

COMPONENT LOCATOR

EN0680202D100001



SHTS068020200002

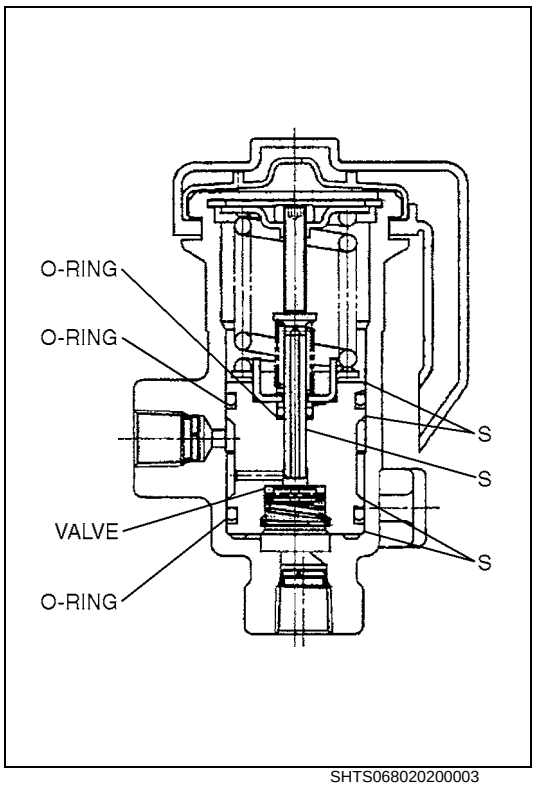
1	Dust cover	6	Valve body	11	Back up ring
2	Retainer ring	7	Main spring	12	Valve
3	Set bolt	8	Push rod	13	Valve spring
4	Lock nut	9	Rod spring	14	Filter
5	Spring seat	10	O-ring	15	Piston

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

A	2.4-3.5 {24-36, 1.8-2.6}	B	0.29-0.49 {3-5, 0.22-0.36}

OVERHAUL

EN0680202H200001



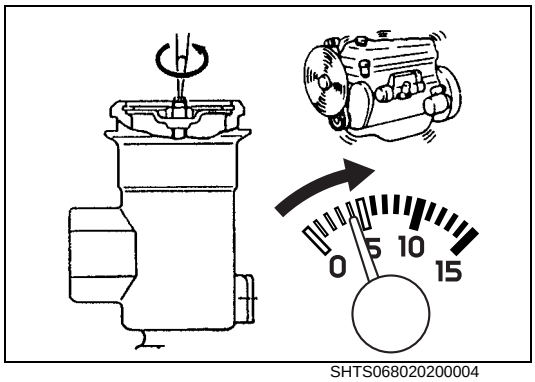
SHTS068020200003

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When reassembling the pressure regulator, replace all rubber parts with new ones.

(2) Apply adequate amount of silicone grease to the O-rings, and sliding surface S of the piston and valve rod.

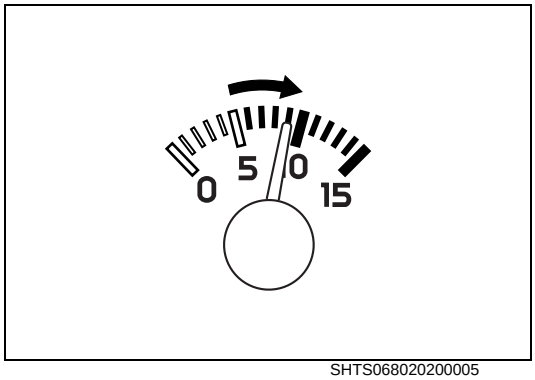


SHTS068020200004

IMPORTANT POINT - MOUNTING

1. ADJUSTMENT

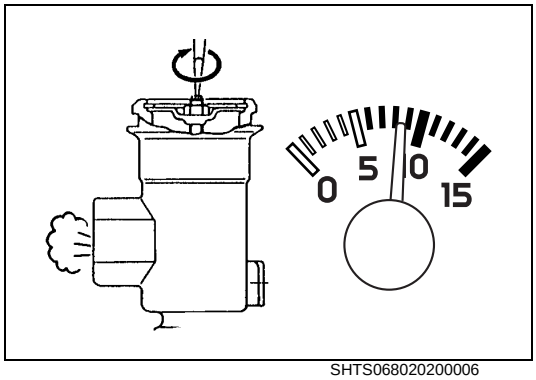
(1) Loosen the adjusting screw until the rod spring tension is released, and start and idle the engine to charge the air for the air tank.



SHTS068020200005

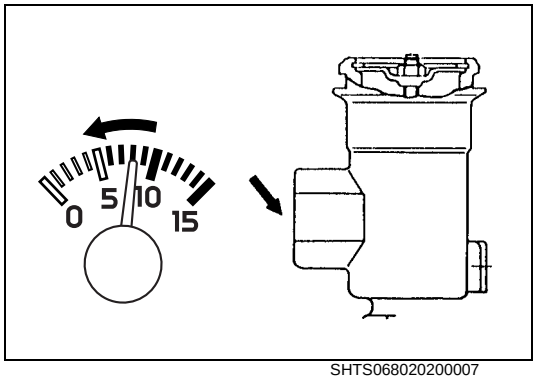
(2) Stop the engine when the gauge indicates valve opening pressure shown below.

Valve opening pressure	Pressure kPa {kgf/cm^2, lbf/in.^{2}}
S4453-01330	860-900 {8.8-9.2, 125-130}



SHTS068020200006

(3) Tighten the adjusting screw gradually till the air starts to leak from the port to the unloader valve side.
(4) Tighten the adjusting screw lock nut.



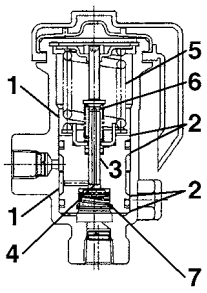
SHTS068020200007

(5) Watch the pressure gauge needle and see that it stops at the valve closing pressure shown below.
(6) Connect the pipe and pressure regulator.

Valve closing pressure	Pressure kPa {kgf/cm^2, lbf/in.^{2}}
S4453-01330	750-790 {7.7-8.1, 109-115}

INSPECTION AND REPAIR

EN0680202H300001

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve body 1, piston 2 and valve rod 3. Sliding surface: Valve rod 4. Valve contact surface: Wear and any other damages	—	—	Replace, if necessary.	Visual check 
Main spring 5. rod spring 6. and valve spring 7: Rust and damage	—	—	Replace, if necessary.	

AIR DRYER (MODELS: FG, GH, SG)

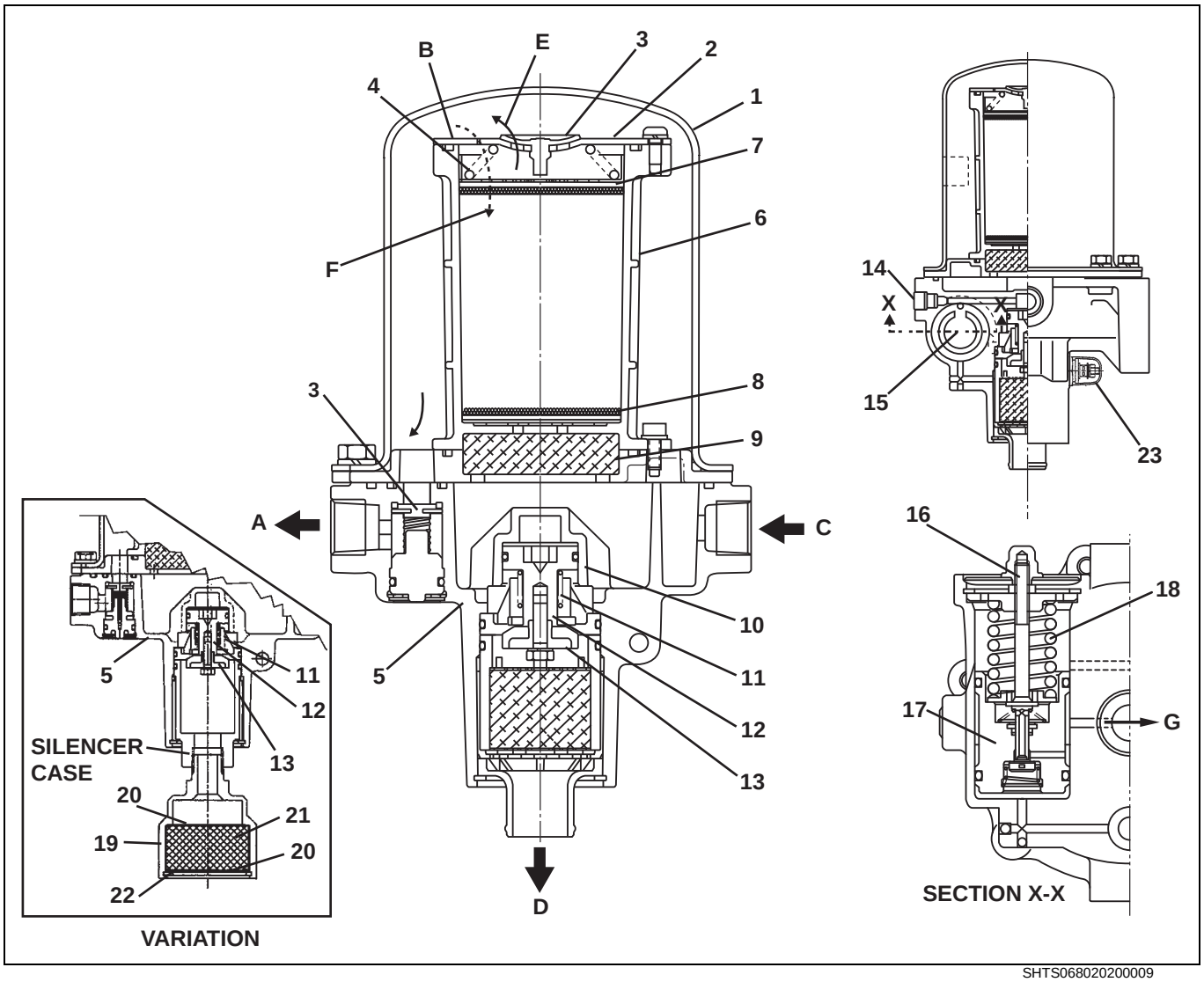
DATA AND SPECIFICATIONS

EN0680202I200002

Type	**Purge tank, desiccant, auto-purge valve.**
Air and Water discharging time (Reclamation cycle)	**Approx. 50 sec.**

DESCRIPTION

EN0680202C100002

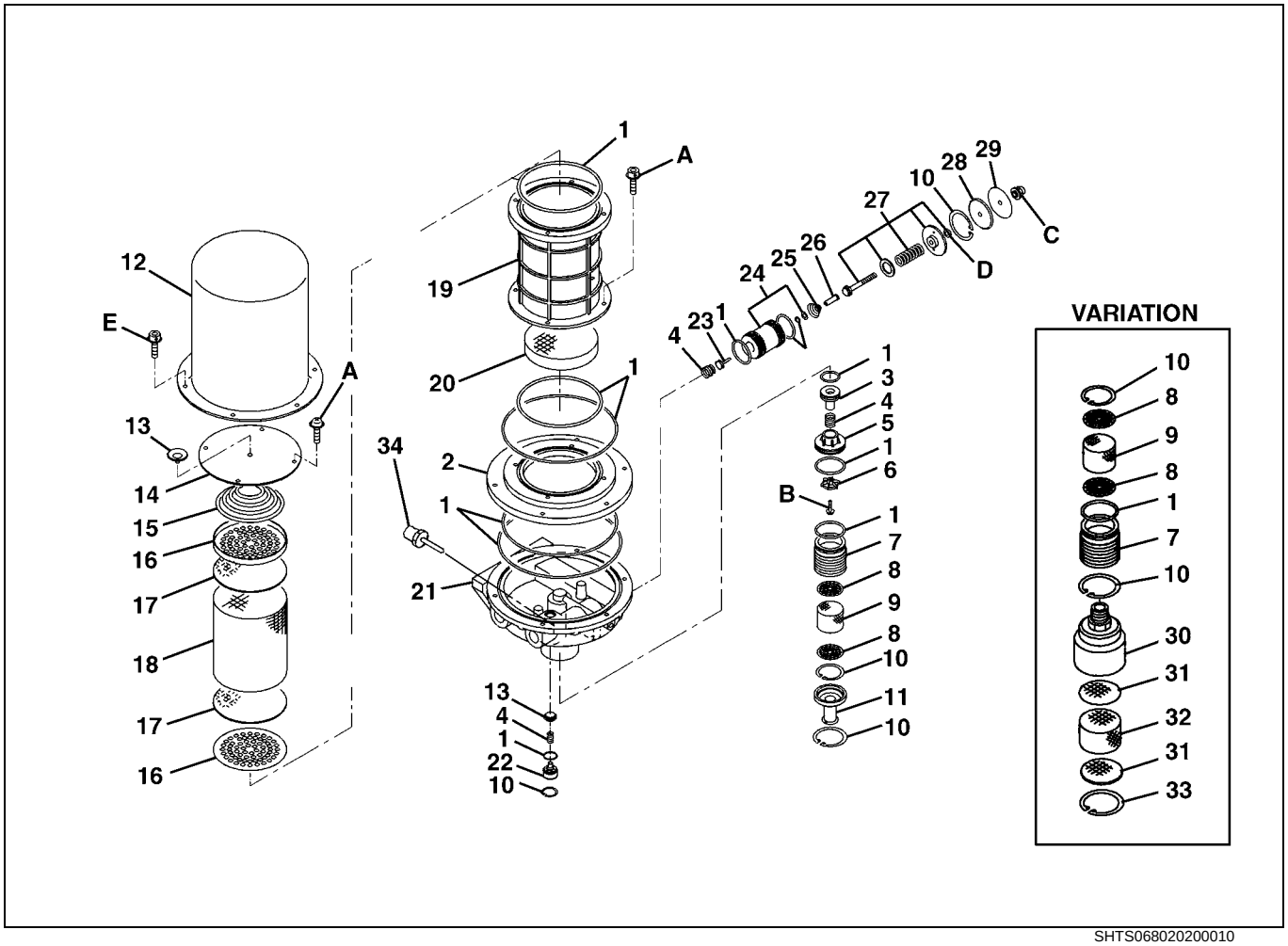


SHTS068020200009

1	Chamber (Purge tank)	11	Valve spring	21	Filter (If so equipped)
2	Case cover	12	Piston	22	Retainer ring (If so equipped)
3	Check valve	13	Purge valve	23	Heater (If so equipped)
4	Spring	14	Plug	A	Outlet (Dried air to air tank)
5	Body	15	Pressure regulator	B	Orifice
6	Desiccant case	16	Adjusting screw	C	Inlet (From air compressor)
7	Filter	17	Piston	D	Purged air
8	Desiccant	18	Piston spring	E	Dehumidification
9	Oil separator filter (If so equipped)	19	Silencer body (If so equipped)	F	Reclamation
10	Valve body	20	Filter plate (If so equipped)	G	To purge valve

COMPONENT LOCATOR

EN0680202D100002



SHTS068020200010

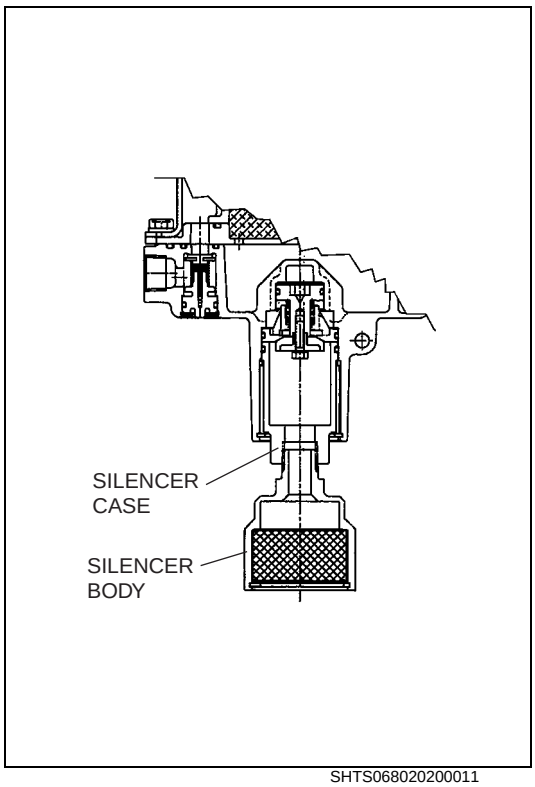
1	O-ring	18	Desiccant
2	Plate	19	Desiccant case
3	Piston	20	Oil separator filter (If so equipped)
4	Valve spring	21	Body
5	Valve body	22	Valve stopper
6	Purge valve	23	Governor valve
7	Silencer case	24	Piston assembly
8	Silencer plate	25	Exhaust stem spring
9	Silencer	26	Exhaust stem
10	Retainer ring	27	Pressure regulator assembly
11	Exhaust cover	28	Valve seat
12	Chamber	29	Plate
13	Check valve	30	Silencer body (If so equipped)
14	Case cover	31	Filter plate (If so equipped)
15	Set spring	32	Filter (If so equipped)
16	Filter plate	33	Retainer ring (If so equipped)
17	Filter	34	Heater (If so equipped)

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

A	2.0-3.9 {20-40, 1.5-2.9}	D	6.9-7.8 {71-79, 5.2-5.7}
B	3.9-6.9 {40-70, 2.9-5.0}	E	17.7-27.5 {180-280, 13-20}
C	4.9-5.9 {50-60, 3.7-4.3}		

OVERHAUL

EN0680202H200002

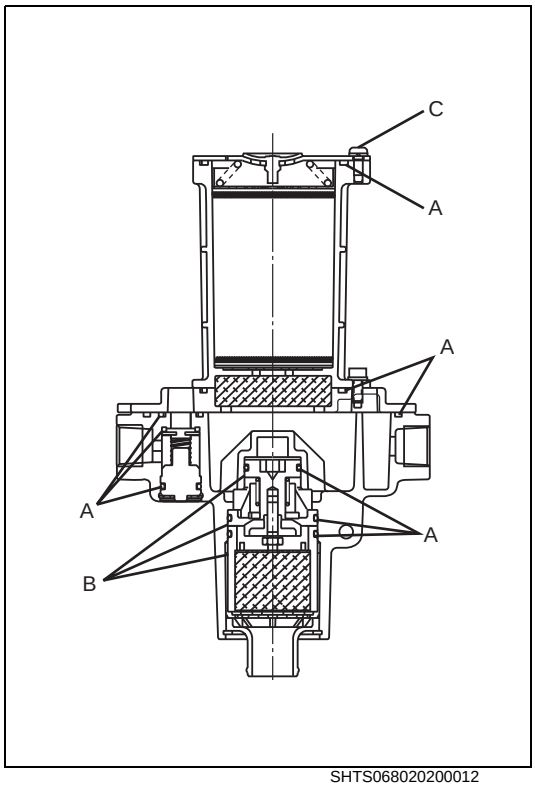


SHTS068020200011

IMPORTANT POINT - DISASSEMBLY

NOTICE

When disassembling the relay valve, never to disassemble the its silencer body because its threaded portion is coated with lock agent (Lock tight).



SHTS068020200012

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the air dryer, use new O-ring, gasket and seal.

(2) Apply grease (lithium base) to each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

2. BEFORE TIGHTEN THE BOLT WITH SPECIFIED TIGHTENING TORQUE, TAP ALL OVER THE OUTER SURFACE OF THE DESICCANT CASE WITH A PLASTIC HAMMER.

- **C: Bolt**

IMPORTANT POINTS - MOUNTING

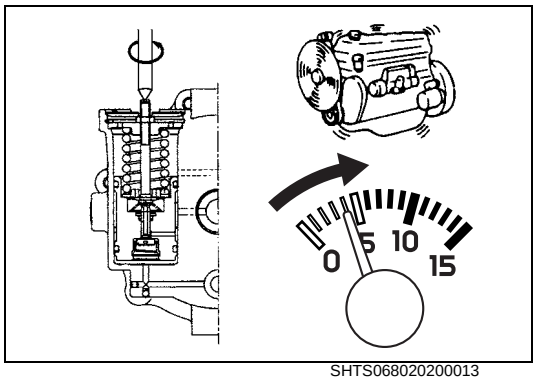
1. INSPECTION

(1) Operate the engine and raise the air pressure until the air discharge from the purge valve, then stop the engine.
(The pressure reaches the valve opening pressure of the air pressure regulator).

a. Check to see that there is no air leakage from the purge valve.

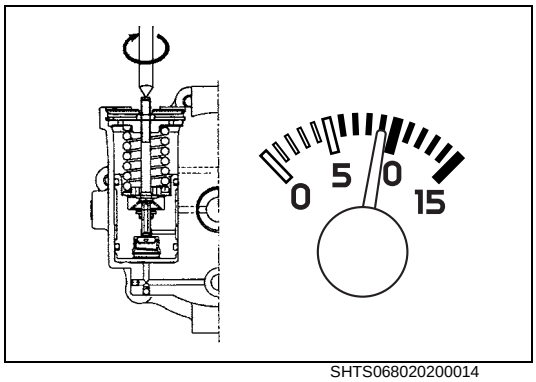
2. ADJUSTMENT

(1) Loosen the adjusting screw until the rod spring tension is released, and start and idle the engine to charge the air for the air tank.



SHTS068020200013

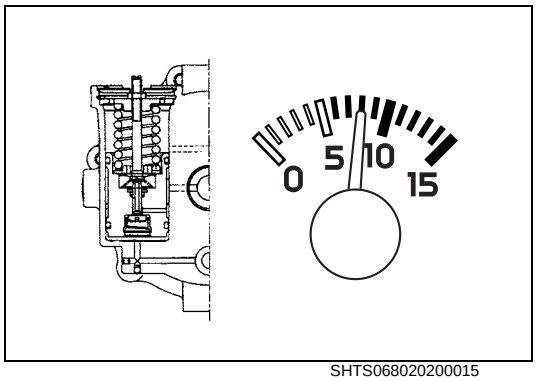
(2) Tighten the adjusting screw gradually till the air pressure gauge indicate valve opening pressure shown below and the air starts to discharge from purge valve.
Governor valve opening pressure: 880 kPa {9.0 kgf/cm^2, 128 lbf/in.^{2}}



SHTS068020200014

(3) Tighten the adjusting screw lock nut.

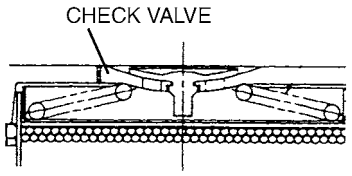
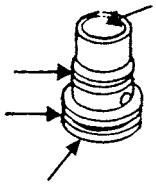
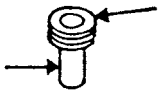
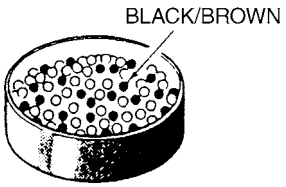
(4) Watch the air pressure gauge needle and see that it stops at the valve closing pressure shown below.
Governor valve closing pressure: 780 kPa {8.0 kgf/cm^2, 114 lbf/in.^{2}}



SHTS068020200015

INSPECTION AND REPAIR

EN0680202H300002

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Check valve and valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body sliding surface and purge valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston sliding surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Purge valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Desiccant: Contamination and deterioration	**—**	**Discolored, more than 1/5 of the quantity.**	**Replace.**	**Visual check** 

AIR DRYER (MODEL: FM)

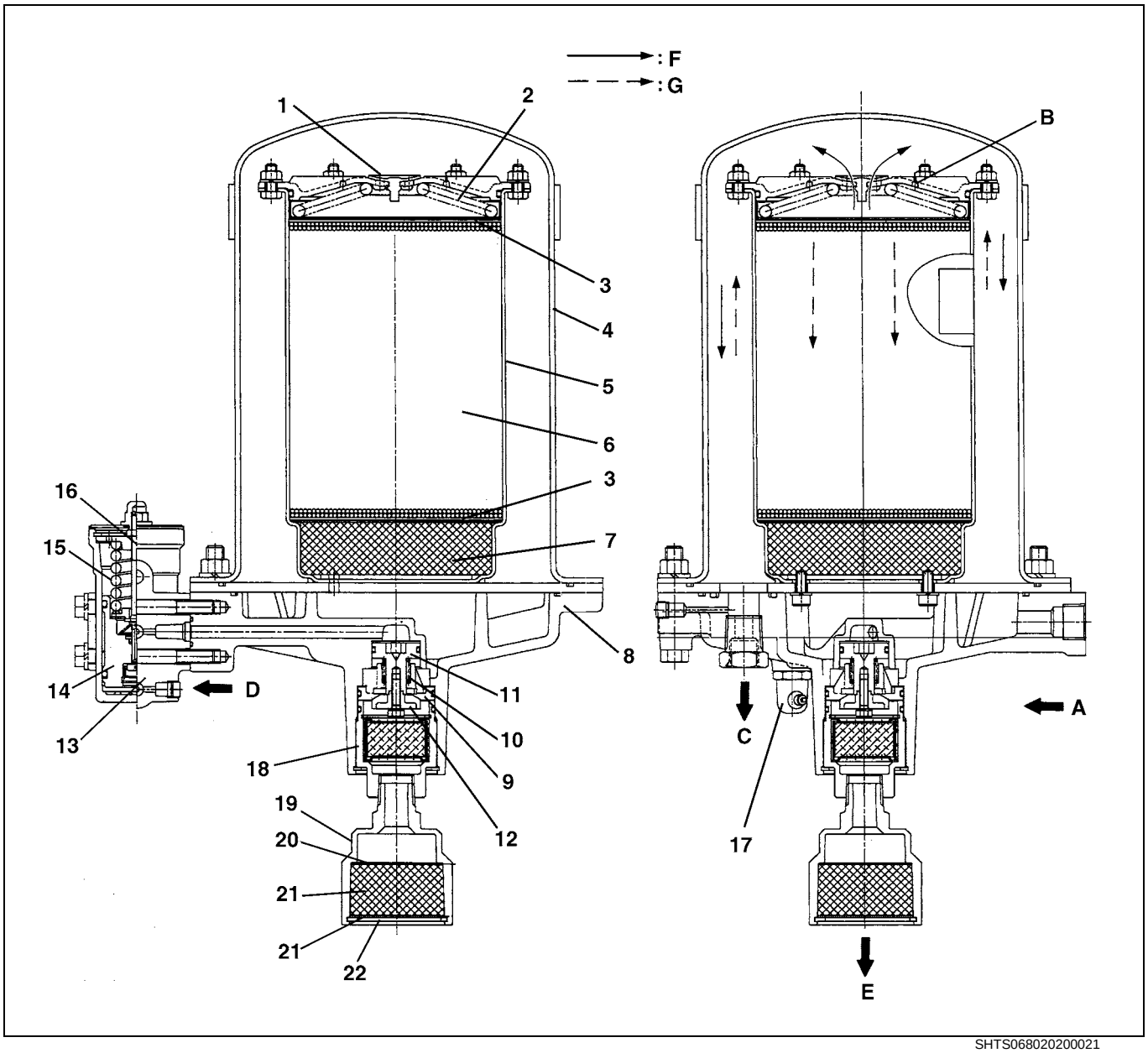
DATA AND SPECIFICATIONS

EN0680202I200003

Type	**Purge tank, desiccant, auto-drain valve.**
Air and Water discharging time (Reclamation cycle)	**Approx. 60 sec.**

DESCRIPTION

EN0680202C100003

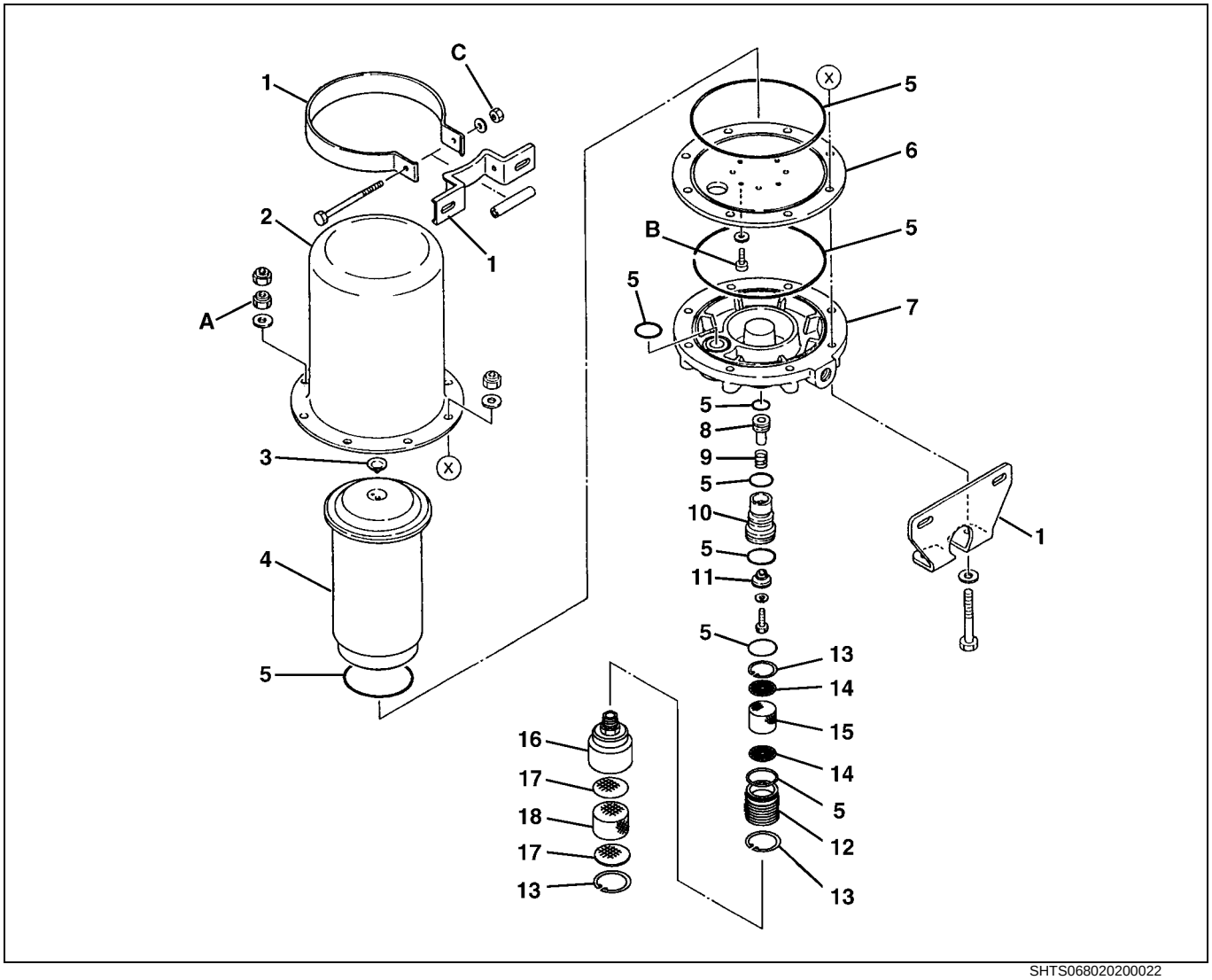


SHTS068020200021

1	Check valve	16	Adjuster screw
2	Spring	17	Heater (If so equipped)
3	Filter	18	Silencer case
4	Chamber (Purge tank)	19	Silencer body (If so equipped)
5	Desiccant case	20	Filter plate (If so equipped)
6	Desiccant	21	Filter (If so equipped)
7	Oil filter	22	Retainer ring (If so equipped)
8	Body	A	Inlet (from air compressor)
9	Valve body	B	Orifice
10	Valve spring	C	Outlet (dried air to air tank)
11	Piston	D	Inlet (from air tank)
12	Purge valve	E	Purged air
13	Pressure regulator	F	Dehumidification
14	Piston	G	Reclamation
15	Piston ring		

COMPONENT LOCATOR

EN0680202D100003



SHTS068020200022

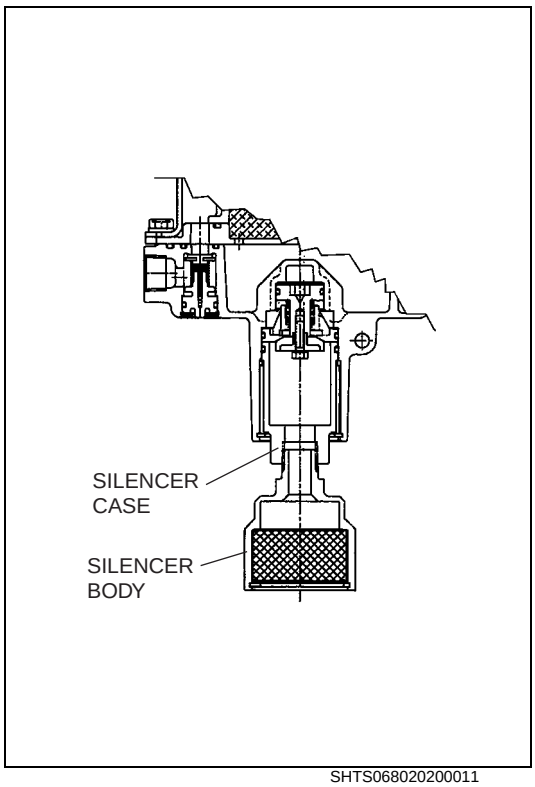
1	Bracket	10	Valve body
2	Chamber (purge tank)	11	Purge valve
3	Check valve	12	Silencer case
4	Desiccant case	13	Retainer ring
5	O-ring	14	Filter plate
6	Plate	15	Filter
7	Body	16	Silencer body (If so equipped)
8	Piston	17	Filter plate (If so equipped)
9	Valve spring	18	Filter (If so equipped)

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

A	14.7-22.6 {150-230, 10.9-16.6}	C	6.9-8.8 {70-90, 5.1-6.5}
B	3.9-6.9 {40-70, 2.9-5.0}		

OVERHAUL

EN0680202H200003

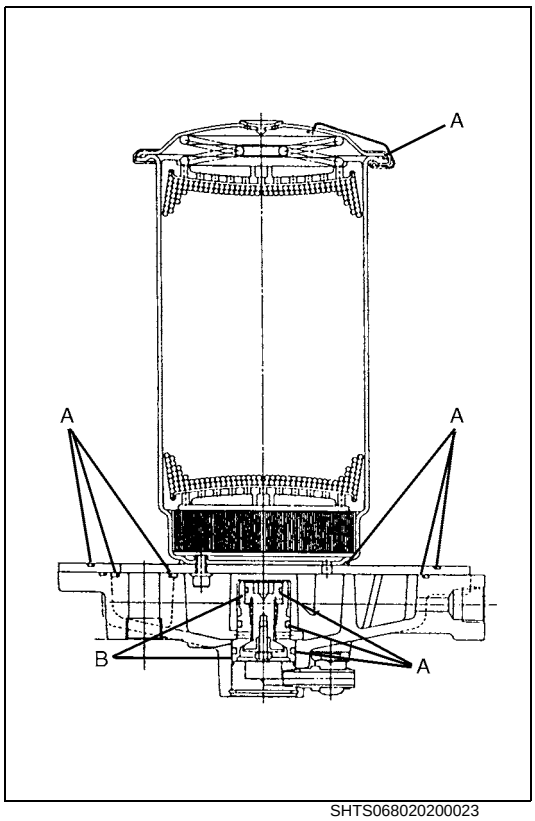


SHTS068020200011

IMPORTANT POINT - DISASSEMBLY

NOTICE

When disassembling the air dryer, never to disassemble the its silencer body because its threaded portion is coated with lock agent (Lock tight).



SHTS068020200023

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the air dryer, use new O-ring.

(2) Apply grease (lithium base) to each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

2. BEFORE CLOSING THE CHAMBER, TAP ALL OVER THE OUTER SURFACE OF THE DESICCANT CASE WITH A PLASTIC HAMMER.

IMPORTANT POINT - MOUNTING

1. INSPECTION

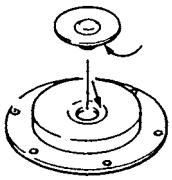
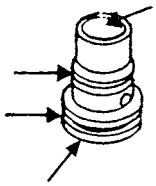
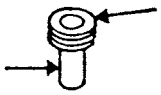
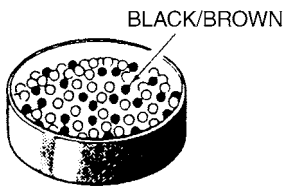
(1) Operate the engine and raise the air pressure until the air compressor stops functioning.
(The pressure reaches the valve opening pressure of the air pressure regulator).

a. Check to see that there is no air leakage from the purge valve while the compressor is functioning.

b. When the compressor stops functioning, check to see that the air is discharged from the purge valve for a period of approx. 60 seconds.

INSPECTION AND REPAIR

EN0680202H300003

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Check valve, Valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body, Sliding surface and purge valve seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston, Sliding surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Purge valve, Seat surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Desiccant: Contamination and deterioration	**—**	**Discolored, more than 1/5 of the quantity.**	**Replace.**	**Visual check** 

CHECK VALVE

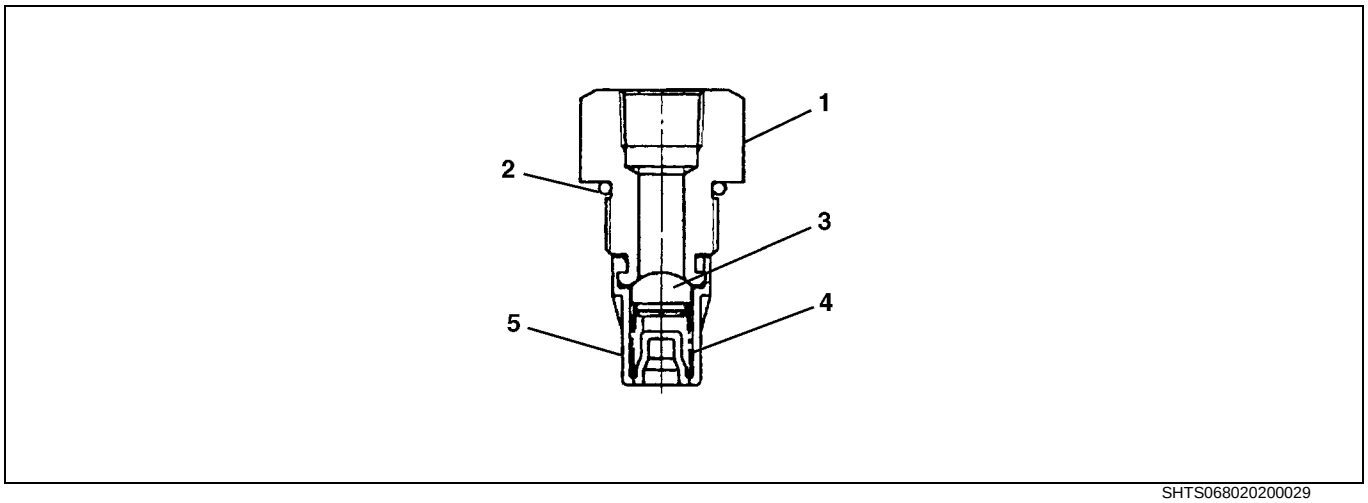
DATA AND SPECIFICATIONS

EN0680202I200004

Type	Spring type
Valve opening pressure	Outlet side pressure 14.7 kPa {0.15 kgf/cm^2, 2.13 lbf/in.^{2}}

DESCRIPTION

EN0680202C100004

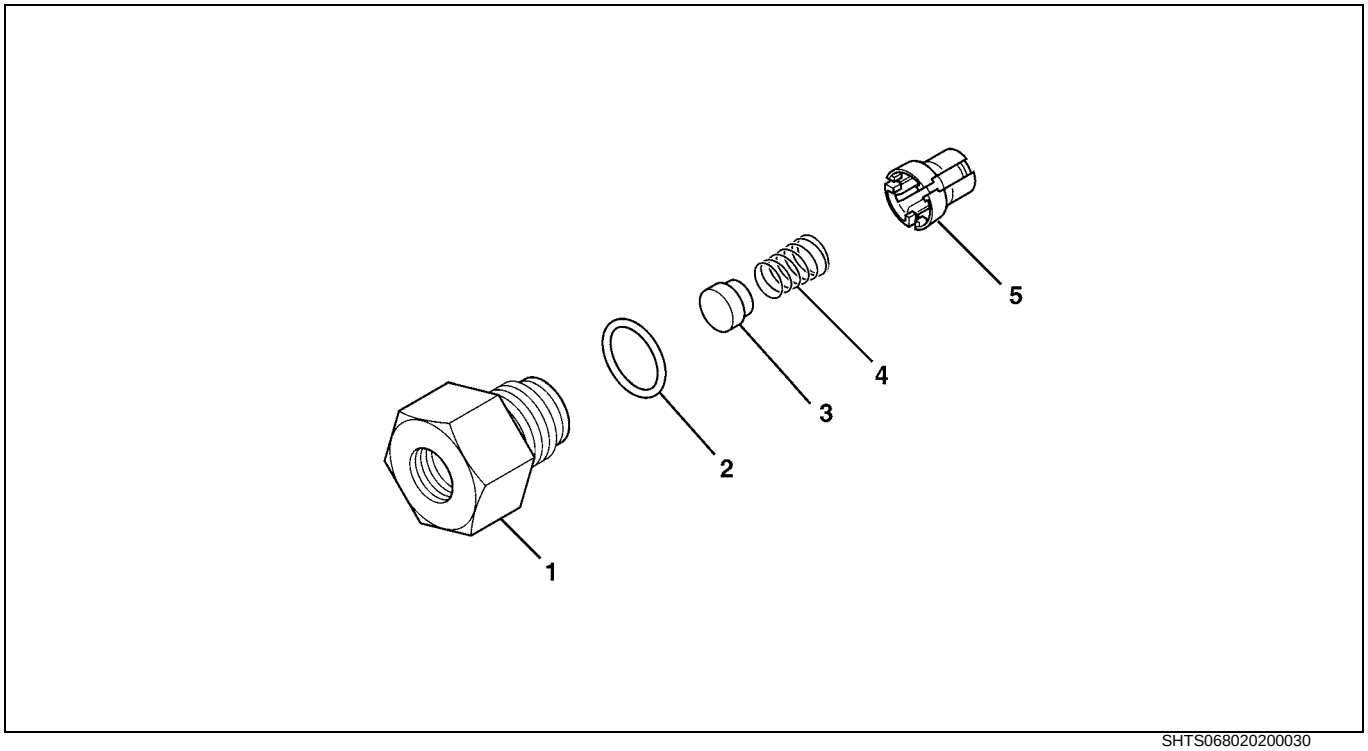


SHTS068020200029

1	Connector	4	Valve spring
2	O-ring	5	Valve holder
3	Valve		

COMPONENT LOCATOR

EN0680202D100004



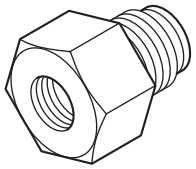
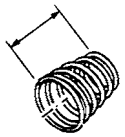
SHTS068020200030

1	Connector	4	Valve spring
2	O-ring	5	Valve holder
3	Valve		

INSPECTION AND REPAIR

EN0680202H300004

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Connector: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve spring: Rust, damage and free length	**19.8 {0.78}**	**18 {0.71}**	**Replace, if necessary.**	**Measure and visual check** 

SAFETY VALVE

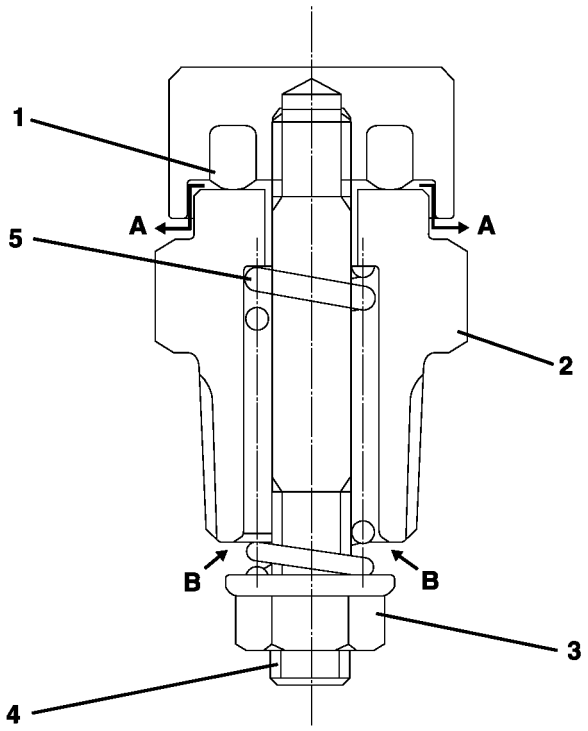
DATA AND SPECIFICATIONS

EN06802022600001

Type	**Spring type**
Valve opening pressure	**1,029-1,069 kPa {10.5-10.9 kgf/cm^2, 150-155 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100005



SHTS068020200034

1	**Valve**	**5**	**Compression spring**
2	**Body**	**A**	**Exhaust**
3	**Nut**	**B**	**From air tank (Pressure air)**
4	**Bolt**		

INSPECTION AND REPAIR

EN0680202H300005

Unit: kPa {kgf/cm^2, lbf/in.^{2}}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve opening pressure	**1,029-1,069 {10.5-10.9, 150-155}**	**—**	**Replace, if necessary.**	**Measure**

BRAKE VALVE

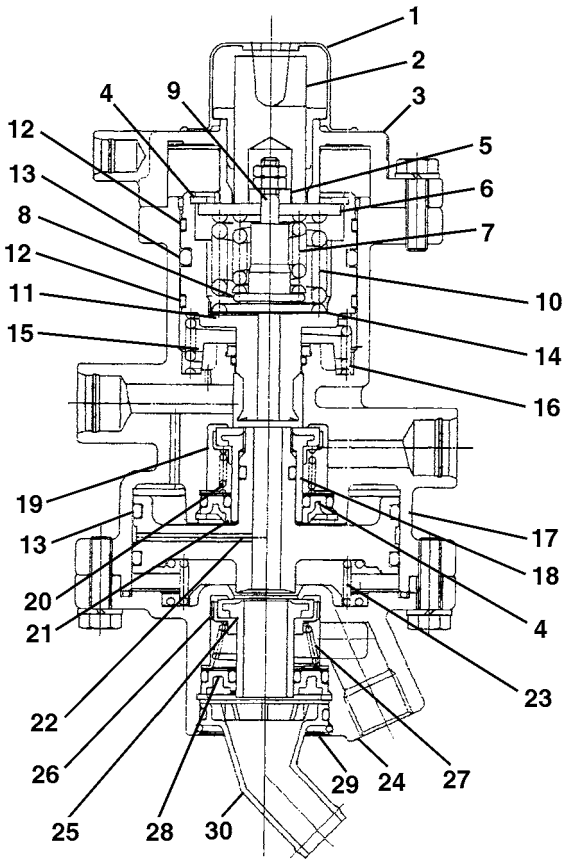
DATA AND SPECIFICATION

EN0680202I200005

Type	**Dual pistons and valves with a plunger type pedal**

DESCRIPTION

EN0680202C100006

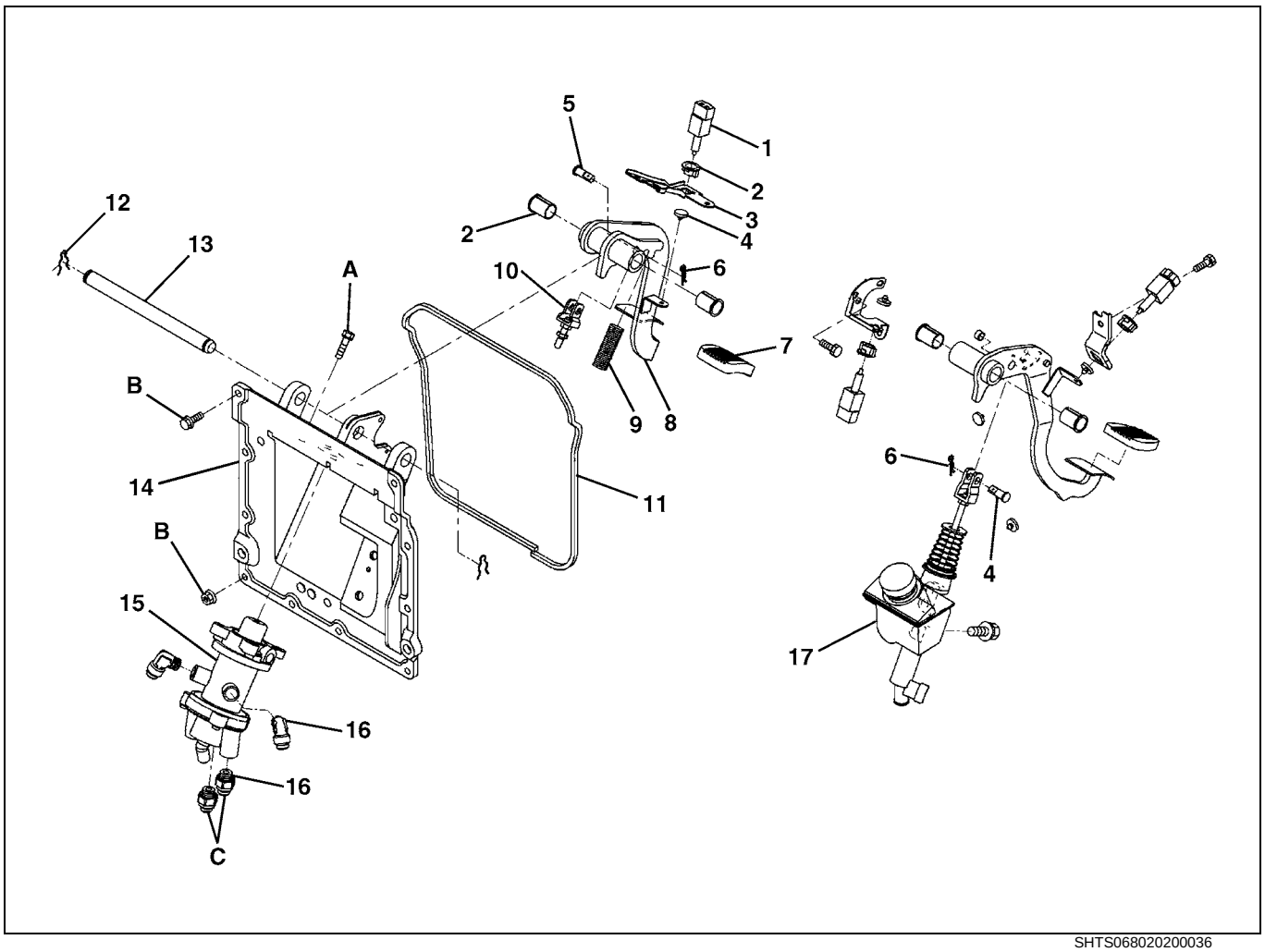


SHTS068020200035

1	Boot	16	Primary piston return spring
2	Plunger	17	Primary valve body
3	Brake valve cover	18	Primary feed valve
4	Retainer ring	19	Retainer
5	Guide ring	20	Primary feed valve return spring
6	Spring seat	21	Primary feed valve retainer
7	Sub spring	22	Secondary piston
8	Shim	23	Secondary piston return spring
9	Stem	24	Secondary valve body
10	Main spring	25	Secondary feed valve
11	Shim	26	Retainer
12	Guide ring	27	Secondary feed valve return spring
13	O-ring	28	Secondary feed valve retainer
14	Primary piston	29	C-ring
15	Guide	30	Exhaust port

COMPONENT LOCATOR

EN0680202D100005

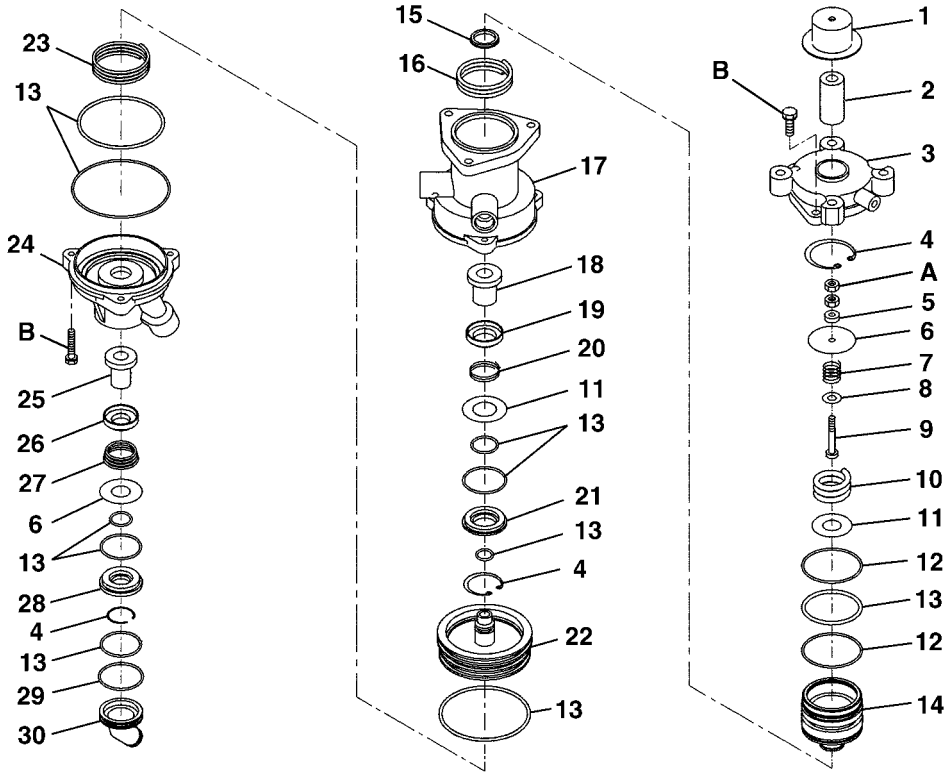


SHTS068020200036

1	Stop light switch	10	Push rod
2	Bushing	11	Seal
3	Bracket	12	Clip
4	Buffer	13	Shaft
5	Pin	14	Pedal bracket
6	R-pin	15	Brake valve
7	Pedal pad	16	Connector
8	Brake pedal	17	Clutch master cylinder
9	Return spring		

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

A	9.5-18.5 {97-188, 7.1-13.5}	C	24.4-34.5 {250-350, 18-25}
B	18-31 {184-316, 14-22}		



SHTS068020200037

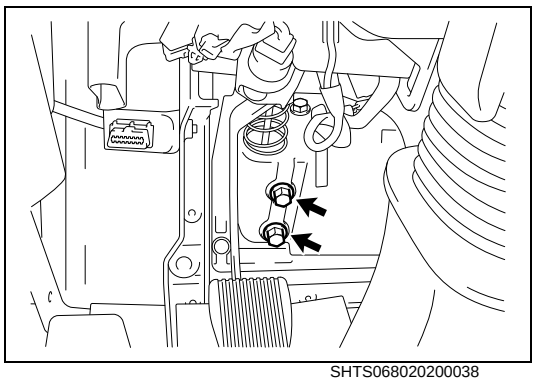
1	Boot	16	Primary piston return spring
2	Plunger	17	Primary valve body
3	Brake valve cover	18	Primary feed valve
4	Retainer ring	19	Retainer
5	Guide ring	20	Primary feed valve return spring
6	Spring seat	21	Primary feed valve retainer
7	Sub spring	22	Secondary piston
8	Shim	23	Secondary piston return spring
9	Stem	24	Secondary valve body
10	Main spring	25	Secondary feed valve
11	Shim	26	Retainer
12	Guide ring	27	Secondary feed valve return spring
13	O-ring	28	Secondary feed valve retainer
14	Primary piston	29	C-ring
15	Guide	30	Exhaust port

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

A	2.9-4.9 {30-50, 2.2-3.6}	B	5.9-7.4 {60-75, 4.3-5.4}

OVERHAUL

EN0680202H200004


SHTS068020200038

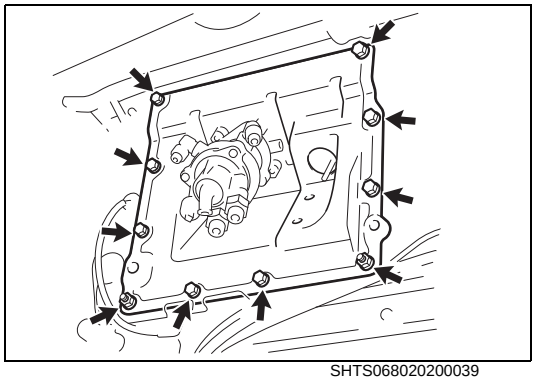
IMPORTANT POINTS - DISMOUNTING

1. REMOVE THE CLUTCH MASTER CYLINDER.

HINT

Even if without removing the clutch master cylinder, pedal bracket can be removed only to the length of the clutch hose.

2. DISCONNECT THE NYLON TUBE.

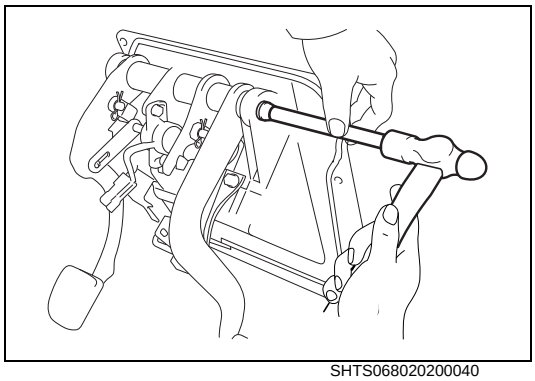

SHTS068020200039

3. REMOVE THE PEDAL BRACKET ASSEMBLY.

(1) Loosen the bolt and nut to remove the pedal bracket assembly.

NOTICE

Before removing the pedal bracket, put the wiper link upward.

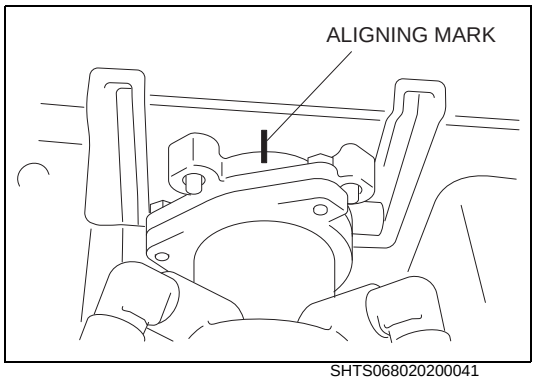

SHTS068020200040

4. REMOVE THE BRAKE PEDAL.

(1) Tap the shaft lightly using a brass rod and a hammer, remove the brake pedal from the pedal bracket assembly.

NOTICE

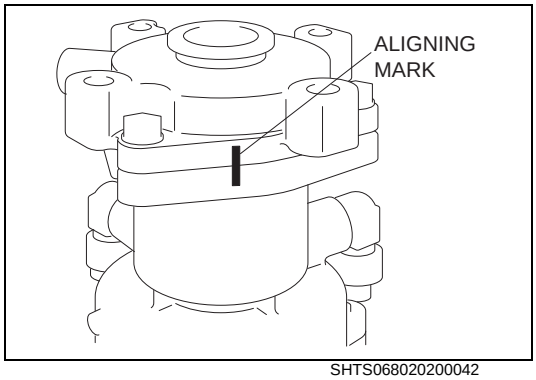
Do not pull out the shaft because the brake pedal and the clutch pedal are installed by one shaft.



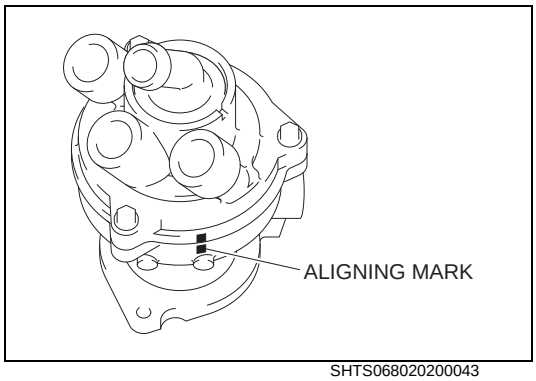
SHTS068020200041

5. REMOVE THE BRAKE VALVE ASSEMBLY.

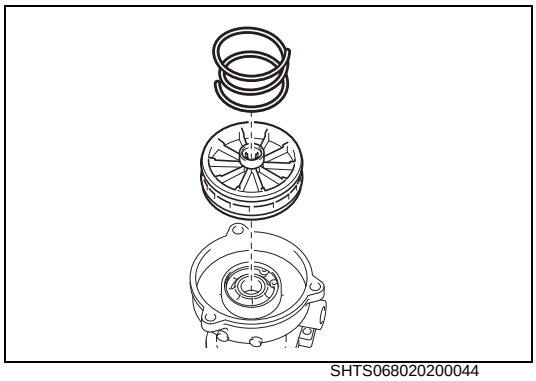
(1) Apply aligning marks on the brake valve assembly and pedal bracket assembly.



SHTS068020200042



SHTS068020200043


SHTS068020200044

IMPORTANT POINTS - DISASSEMBLY

NOTICE

Before disassembling the brake valve, apply aligning marks on the brake valve cover, primary valve body and secondary valve body.

1. REMOVE THE PRIMARY PISTON ASSEMBLY.

2. REMOVE THE SECONDARY VALVE BODY.

3. REMOVE THE SECONDARY PISTON.

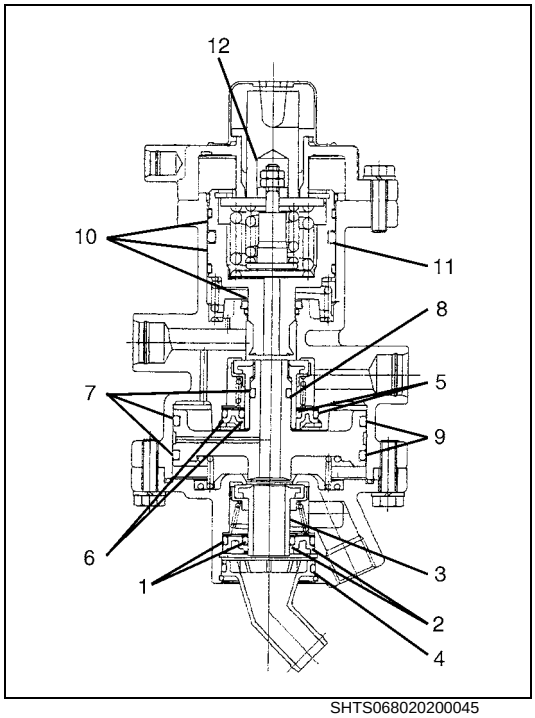
NOTICE

Pull out with hands to prevent the seat part of the secondary piston from being damaged by using a pryer etc. If not with hands, secondary piston should not be reused.

4. REMOVE THE PRIMARY FEED VALVE.

5. REMOVE THE EXHAUST PORT.

6. REMOVE THE SECONDARY FEED VALVE.



SHTS068020200045

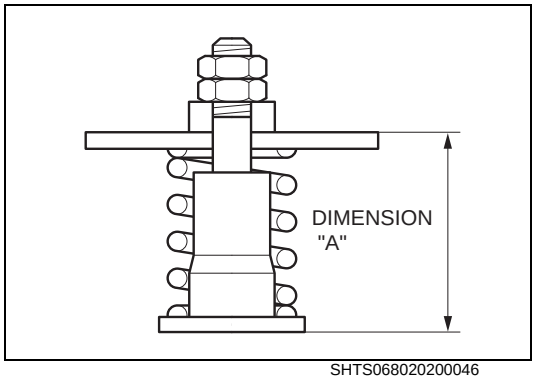
IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When reassembling the brake valve, replace the O-rings and retainer rings with new ones.

(2) Apply adequate amount of silicone grease on the grooves for the O-ring and to the sliding surfaces of the component parts.

1. Secondary feed valve retainer O-ring
2. Secondary feed valve retainer
3. Secondary feed valve
4. Exhaust port O-ring
5. Primary feed valve retainer O-ring
6. Primary feed valve retainer
7. Secondary piston O-ring
8. Secondary piston
9. Primary valve body
10. Primary piston
11. Primary piston O-ring
12. Plunger



SHTS068020200046

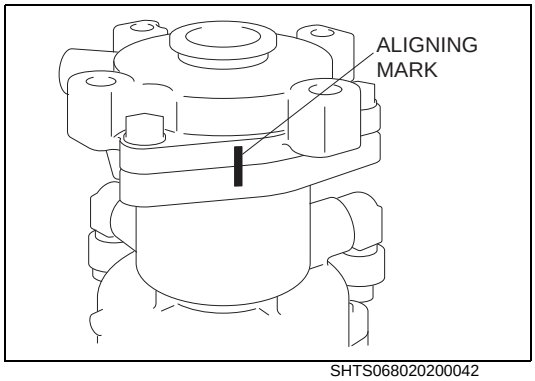
2. ASSEMBLE THE STEM, SPRING, SPRING SEAT AND SHIM.

(1) Assemble the sub spring. At this time, adjust dimension "A" and the spring compression "P" by means of the lock nut and the shim.

NOTICE

In adjusting the spring compression, the axial play of the spring must be removed.

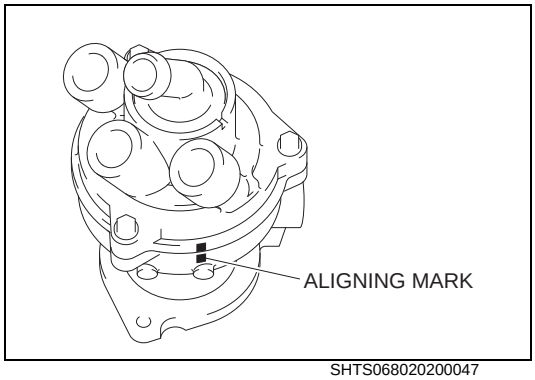
Dimension "A": 27.15-27.55 mm {1.0689-1.0846 in.}
Setting load: 0-9.8 N {0-1 kgf, 0-2.2 lbf}



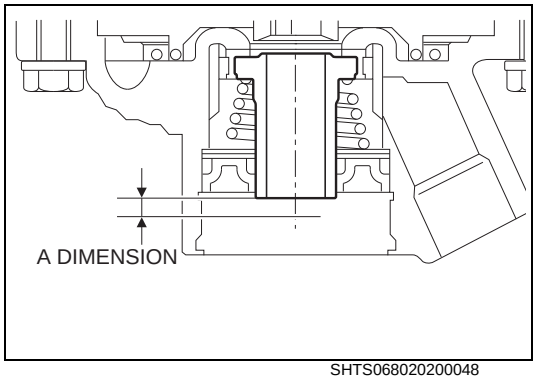
SHTS068020200042

3. ALIGN THE VALVE COVER AND VALVE BODIES.

(1) When assemble the brake valve cover, primary body and secondary body, align the marks which were applied at disassembly.



SHTS068020200047



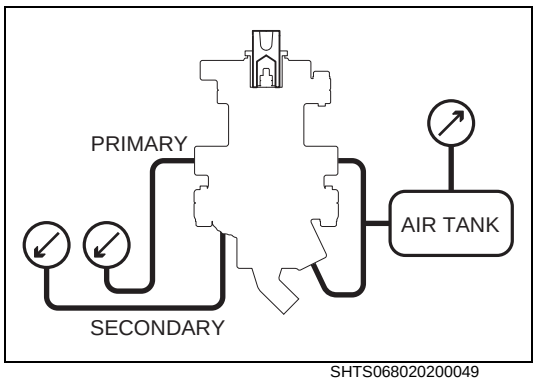
SHTS068020200048

4. INSPECTION AND ADJUSTMENT

(1) Brake valve

a. Measure the secondary feed valve stroke (dimension A from starting to release the plunger to completing to fully release the plunger).

A dimension: 0.6 mm {0.0236 in.} or above

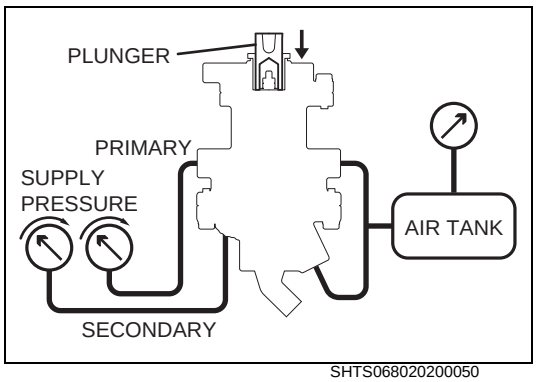


SHTS068020200049

b. Connect the brake valve, nylon tube, air pressure gauge, and air tank as shown in the figure.

c. Set the air tank pressure at 830 kPa {8.5 kgf/cm^2, 120.87 lbf/in.^{2}}.

d. Apply soap water to the exhaust port and check to see there is no air leakage.

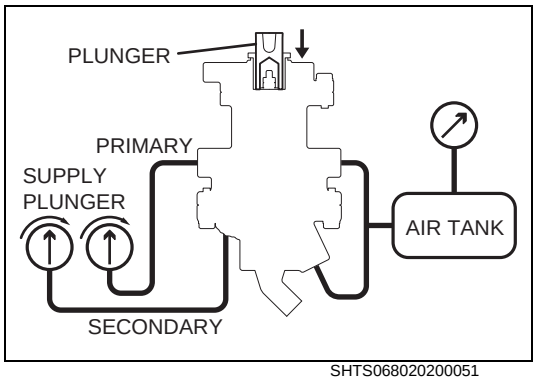


SHTS068020200050

e. Drive in slowly the plunger. Measure the plunger stroke and supply pressure at the point where the primary and secondary air pressure gauges start to rise. If the measurements do not match with the standard values, adjust by the shim of the main spring.

Parts No. S4716-03311

Measurement item	Standard value
Plunger stroke	0.8-1.6 mm {0.0315-0.0629 in.}
Supply pressure	19-41 kPa {0.2-0.4 kgf/cm^2, 2.76-5.94 lbf/in.^{2}}

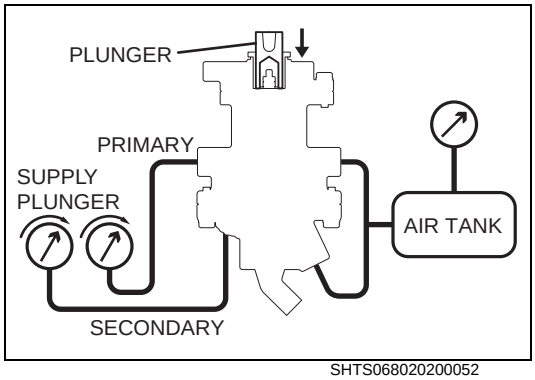


SHTS068020200051

f. Drive in further the plunger. Measure the plunger stroke and supply pressure at the point immediately before that the primary and secondary pressure increases rapidly (bending point). If the measurements do not match with the standard values, replace each spring.

Parts No. S4716-03311

Measurement item	Standard value
Plunger stroke	3.6-4.7 mm {0.1418-0.1850 in.}
Supply pressure	196 kPa {2.0 kgf/cm^2, 28.4 lbf/in.^{2}}

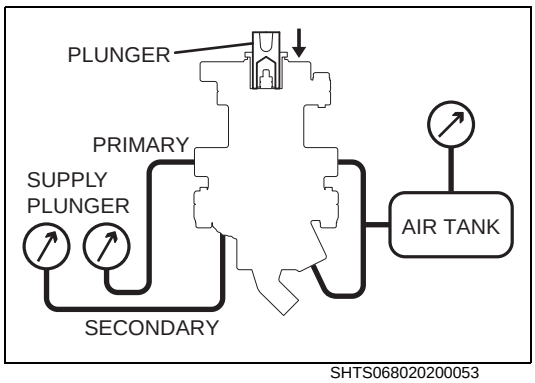


SHTS068020200052

g. Drive in further the plunger. Measure the plunger stroke and supply pressure at the point where the primary and secondary pressures increase rapidly. If the measurements do not match with the standard values, replace each spring.

Parts No. S4716-03311

Measurement item	Standard value
Plunger stroke	5.94-7.26 mm {0.2339-0.2858 in.}
Supply pressure	624 kPa {6.4 kgf/cm^2, 90.5 lbf/in.^{2}}

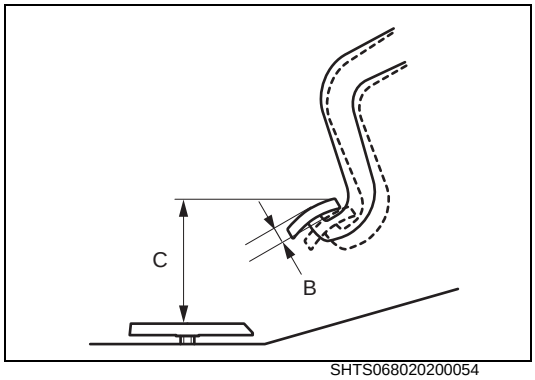


SHTS068020200053

h. Drive in further the plunger. Measure the pedal stepping down angle and supply pressure at the point where the primary and secondary pressure are maximum. If the measurements do not match with the standard values, replace each spring.

Parts No. S4716-03311

Measurement item	Standard value
Plunger stroke	8.34-9.76 mm {0.3284-0.3842 in.}
Supply pressure	980 kPa {10.0 kgf/cm^2, 142.1 lbf/in.^{2}}



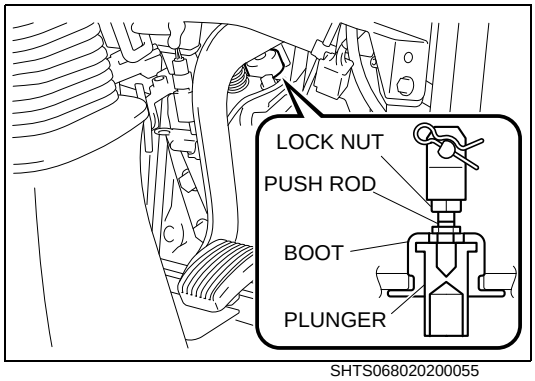
SHTS068020200054

(2) Brake pedal

a. Make sure that the installing height of the brake pedal "C" and the pedal play "B".

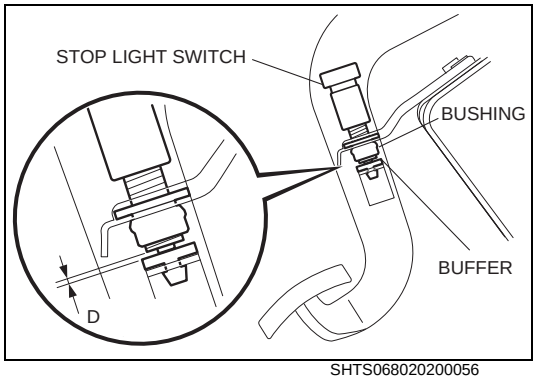
"B": 2-5 mm {0.0788-0.1968 in.}

"C": 149.6-159.6 mm {5.890-6.283 in.}



SHTS068020200055

b. If the pedal play is out of the standard value, loosen the lock nut and turn the push rod to adjust the pedal play to the standard value.

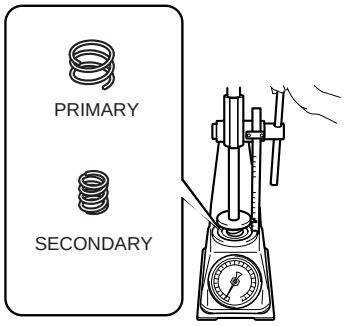
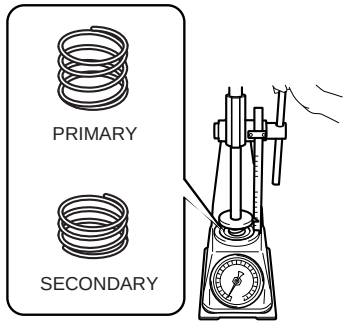
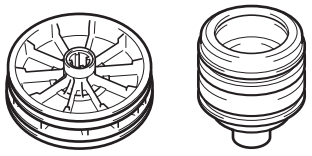
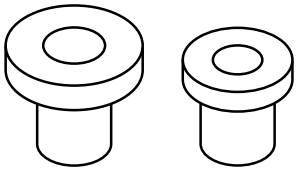


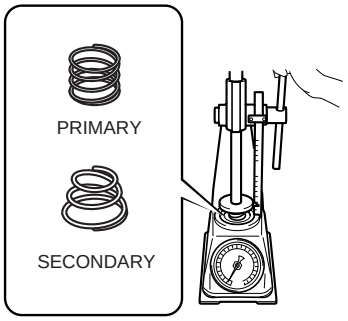
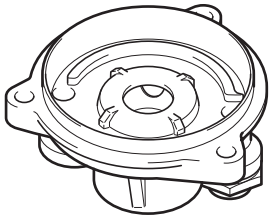
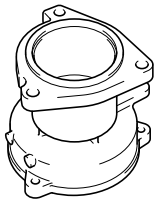
SHTS068020200056

(3) Check the clearance between stop light switch and buffer.
"D": 0.5-1.5 mm {0.0197-0.0590 in.}

INSPECTION AND REPAIR

EN0680202H300006

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Main spring: Free length/ setting length/ setting load	**29.3 mm {1.15 in.}/ 27.5 mm {1.09 in.}/ 176.5 N {18 kgf, 39.68 lbf}**	**28.5 mm {1.12 in.}**	**Replace, if necessary.**	**Visual check and measure** 
Sub spring: Free length/ setting length/ setting load	**21.6 mm {0.85 in.}/ 19.4 mm {0.76 in.}/ 457 N {46.6 kgf, 102.7 lbf} or more**	**21 mm {0.83 in.}**		
Primary and secondary piston return spring: Free length/ setting length/ setting load	**Primary: 43.2 mm {1.70 in.}/ 16.5 mm {0.65 in.}/ 95.1 N {9.7 kgf, 21.38 lbf}**	**40.5 mm {1.59 in.}**	**Replace, if necessary.**	**Visual check and measure** 
	Secondary: 24.5 mm {0.96 in.}/ 12.0 mm {0.47 in.}/ 11.8 N {1.2 kgf, 2.6 lbf}	**23.5 mm {0.93 in.}**		
Primary and secondary piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check**  SECONDARY PISTON PRIMARY PISTON
Primary and secondary feed valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Primary and secondary feed valve return spring: Free length/ setting length/ setting load	**Primary: 21.4 mm {0.84 in.}/ 12.5 mm {0.49 in.}/ 52.0 N {5.3 kgf, 11.68 lbf}**	**20.4 mm {0.80 in.}**	**Replace, if necessary.**	**Visual check and measure** 
	Secondary: 22.8 mm {0.90 in.}/ 13.0 mm {0.51 in.}/ 49.0 N {5.0 kgf, 11.02 lbf}	**21.8 mm {1.13 in.}**		
Secondary valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Primary valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

PROTECTION VALVE (FOR AIR SUSPENSION)

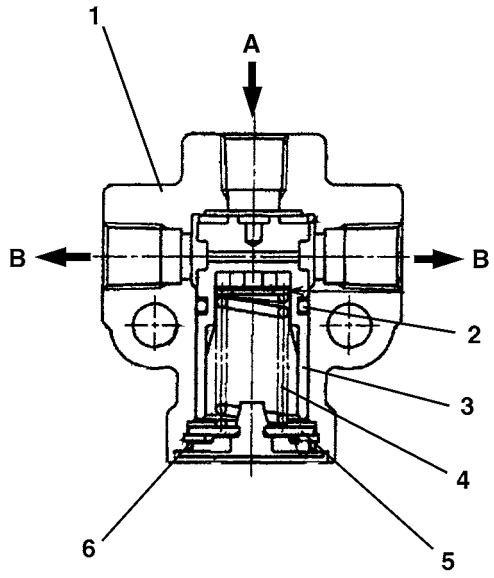
DATA AND SPECIFICATIONS

EN0680202I200006

Type		Spring type
Operating pressure	Open	637 kPa {6.5 kgf/cm^2, 92.4 lbf/in.^{2}}
	Close	510 kPa {5.2 kgf/cm^2, 74.0 lbf/in.^{2}}

DESCRIPTION

EN0680202C100007

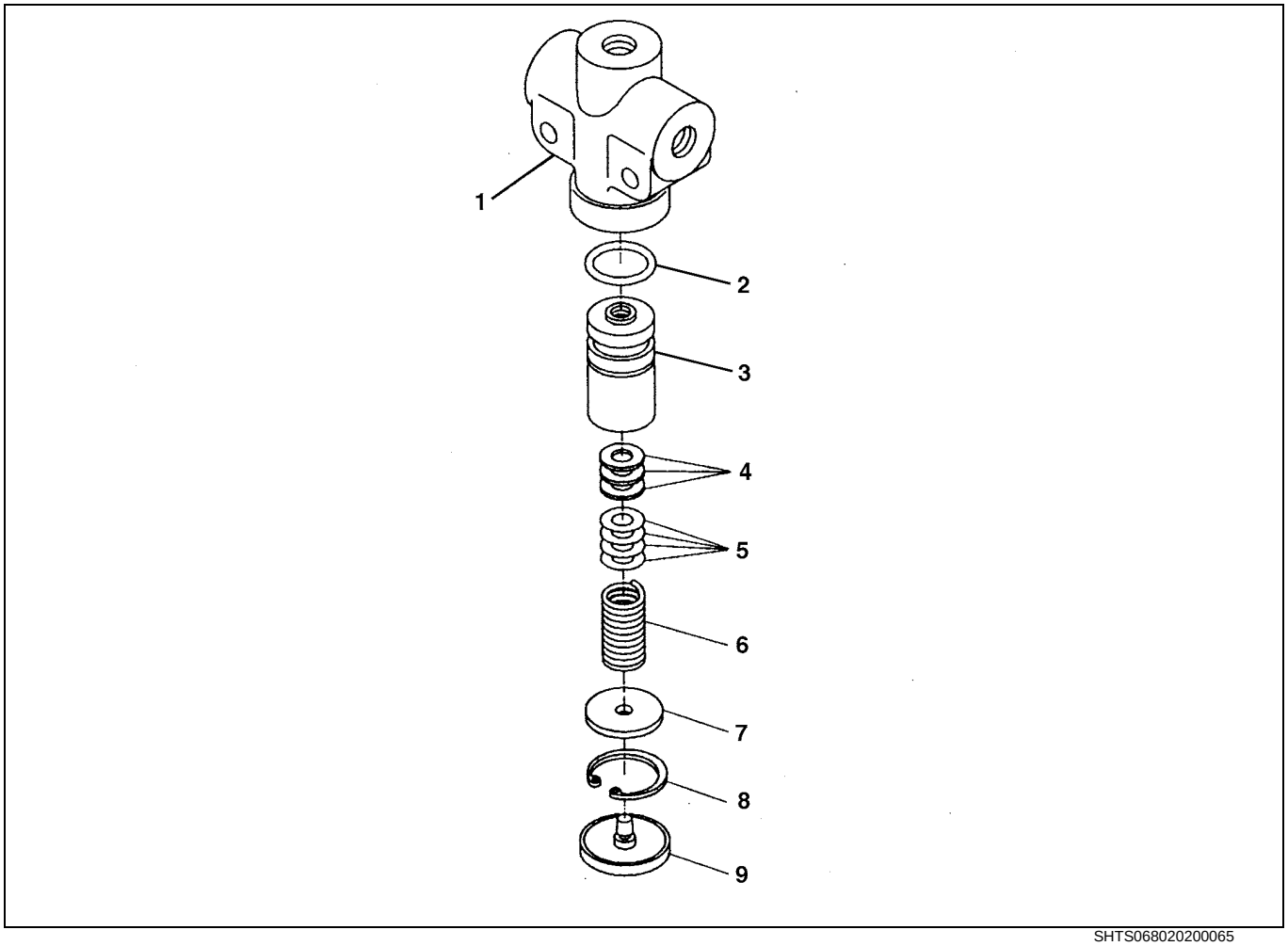


SHTS068020200064

1	Valve body	5	Dust seal plate
2	O-ring	6	Retainer ring
3	Valve	A	Inlet
4	Compression spring	B	Outlet

COMPONENT LOCATOR

EN0680202D100006

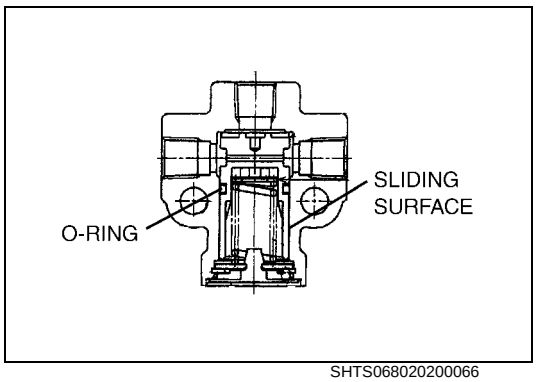


SHTS068020200065

1	Body	4	Spacer	7	Dust seal plate
2	O-ring	5	Shim	8	Retainer ring
3	Piston	6	Spring	9	Dust seal

OVERHAUL

EN0680202H200005



SHTS068020200066

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

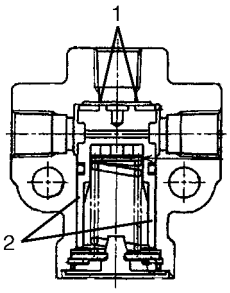
(1) When reassembling the protection valve, replace the O-rings and valve with new ones.

(2) Apply adequate amount of silicone grease to the sliding surface of the component parts.

INSPECTION AND REPAIR

EN0680202H300007

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve contact surface of body cap 1: Rust, wear and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Sliding surface of valve body 2: Rust, wear and damage	**—**	**—**	**Clean or replace, if necessary.**	
Valve spring: Free length	**60.0 {2.36}**	**—**	**Replace, if necessary.**	**Measure** 

PROTECTION VALVE (WITH 4-WAY PROTECTION VALVE) [EXCEPT GH8J (FOR IRELAND), FM1A]

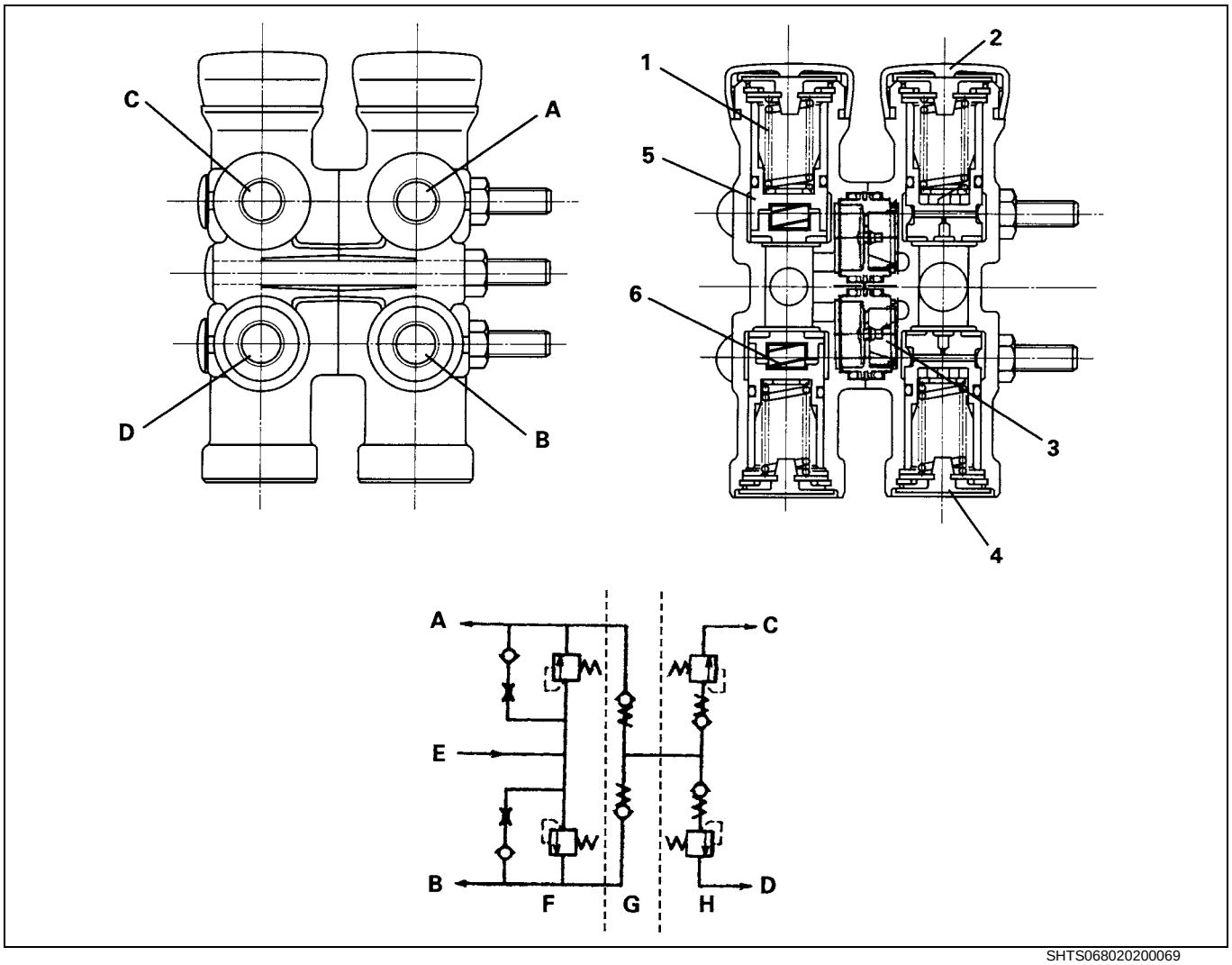
DATA AND SPECIFICATIONS

EN0680202I200007

Type			Spring type (4-way protection)
Opening pressure	Open	Port 21, 22	620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}
		Port 23, 24	570-610 kPa {5.8-6.2 kgf/cm^2, 82.49-88.18 lbf/in.^{2}}
	Close	Port 21, 22	440-480 kPa {4.5-4.8 kgf/cm^2, 64.01-68.27 lbf/in.^{2}}
		Port 23, 24	440-480 kPa {4.5-4.8 kgf/cm^2, 64.01-68.27 lbf/in.^{2}}

DESCRIPTION

EN0680202C100008

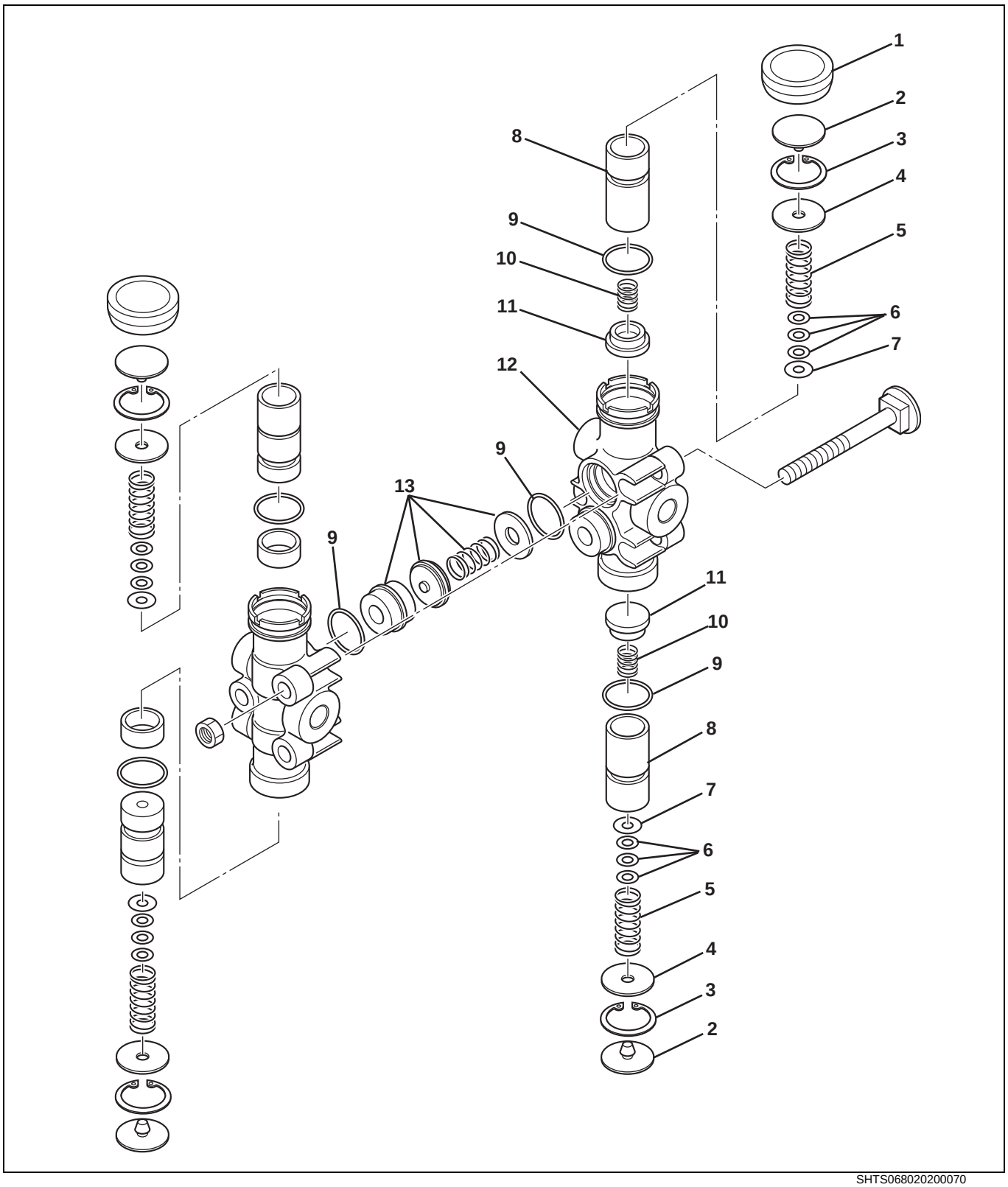


SHTS068020200069

1	Compression spring	A	Port 21 (Outlet)
2	Dust cover	B	Port 22 (Outlet)
3	Check valve	C	Port 23 (Outlet)
4	Dust seal rubber	D	Port 24 (Outlet)
5	Piston	E	Inlet port
6	Valve spring	F	No.1 side
		G	Center check valve
		H	No.2 side

COMPONENT LOCATOR

EN0680202D100007

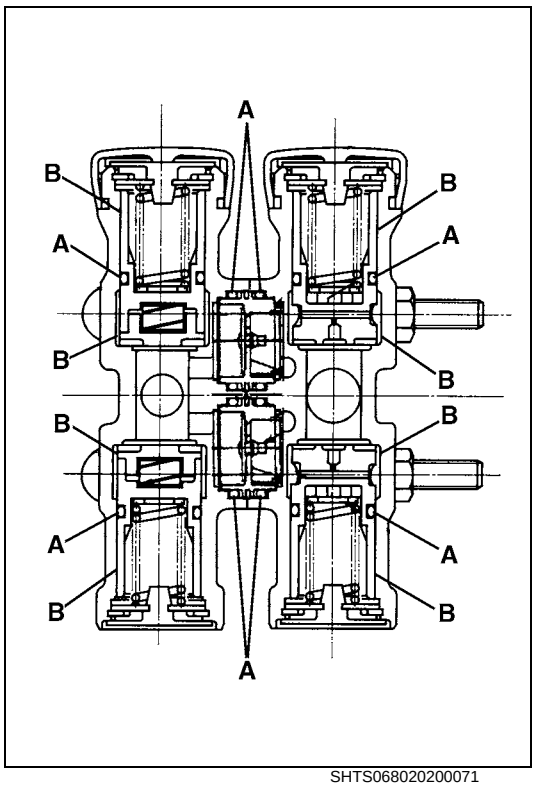


SHTS068020200070

1	Dust cover	6	Shim	11	Valve
2	Dust seal rubber	7	Spacer	12	Body
3	Retainer ring	8	Piston	13	Check valve
4	Dust seal plate	9	O-ring		
5	Compression spring	10	Valve spring		

OVERHAUL

EN0680202H200006



SHTS068020200071

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

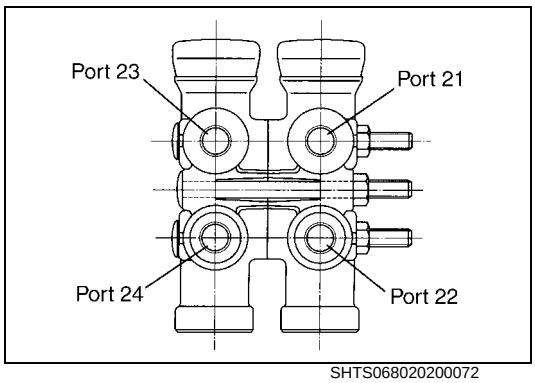
(1) When assembling the protection valve use the new O-rings and valves.

(2) Apply the silicone grease on the each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

ADJUSTMENT

EN0680202H300008



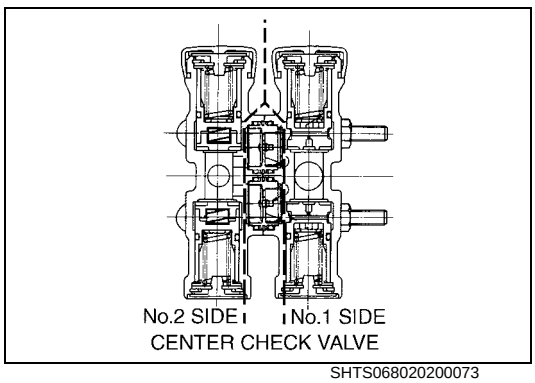
SHTS068020200072

AIR LEAKAGE

1. CHECK VALVE

(1) By-pass check valve at No.1 side

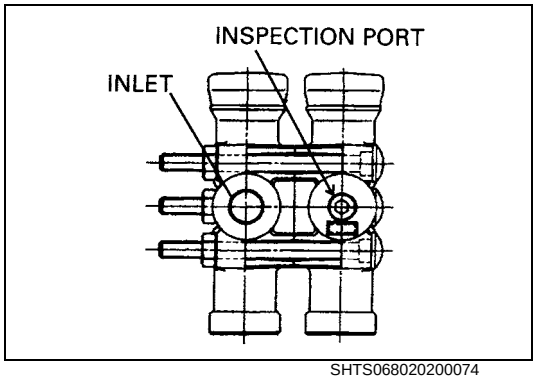
a. Confirm no leakage of air at inlet port, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}}, 392 kPa {4 kgf/cm^2, 56.89 lbf/in.^{2}} from outlet No.21 and No.22.



SHTS068020200073

(2) Center check valve

a. Confirm no leakage of air at the outlet port No.21 and No.22, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}}, 880 kPa {9 kgf/cm^2, 128 lbf/in.^{2}} from the inspection port.



SHTS068020200074

(3) Check valve at No.2 side
   a. Confirm no leakage of air at the inspection port, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}}, 880 kPa {9 kgf/cm^2, 128 lbf/in.^{2}} at the outlet port No.23 and No.24.

2. OTHER AIR TIGHTNESS

(1) When applying pressure to air under 0-880 kPa {0-9.0 kgf/cm^2, 0-128 lbf/in.^{2}}, confirm that any leakage of air should be 0 cm^3/min.

PERFORMANCE CHARACTERISTIC

1. OPENING VALVE PRESSURE

(1) No.1 side
   a. Releasing the compressed air at the outlet port No.21 and No.22 to air, when applying the compressed air at the speed specified below, confirm that air pressure of the compressed air, saturated at the inlet should be of opening valve pressure, which should be 620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}.
   Charging speed: From 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} to 490 kPa {5.0 kgf/cm^2, 71.10 lbf/in.^{2}} within 3-7 seconds.

(2) No.2 side
   a. When applying air at charging speed specified below from the inlet side under air pressure "0" at the outlet port No.23 and No.24, confirm that a pressure at the inspection port when it starting to go up at the outlet should be of opening valve pressure, which should be 570-610 kPa {5.8-6.2 kgf/cm^2, 82.49-88.18 lbf/in.^{2}}.
   Charging speed: From 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} to 490 kPa {5.0 kgf/cm^2, 71.10 lbf/in.^{2}} within 8-22 seconds.

2. CLOSING VALVE PRESSURE

(1) When discharging air through respective No.1 side and No.2 side inlet under a pressure of 880 kPa {9 kgf/cm^2, 128 lbf/in.^{2}} at the inlet and the outlet, at discharging speed specified below, confirm that a pressure when the pressures saturated should be of closing valve pressure, which should be 440-480 kPa {4.5-4.8 kgf/cm^2, 64.01-68.27 lbf/in.^{2}}.
   Discharging speed: From 590 kPa {6.0 kgf/cm^2, 85.32 lbf/in.^{2}} to 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} within less than seconds.

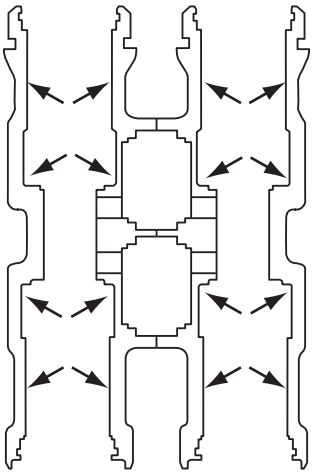
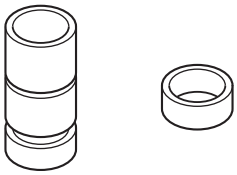
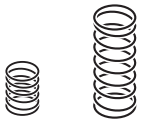
NOTICE

Perform test again by increasing aims, when the respective pressures is low and by decreasing it when high in the above inspection.

INSPECTION AND REPAIR

EN0680202H300009

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface and contact surface of body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Sliding surface and contact surface of valve seat and piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Conical spring and compression spring: Rust, wear and damage Free length	**1. 0.78 {0.08} 2. 158.9 {16.2}**	**1. 0.69 {0.07} 2. 137.3 {14.0}**	**Replace.**	**Visual check** 

PROTECTION VALVE (WITH 4-WAY PROTECTION VALVE) [MODELS: GH8J (FOR IRELAND), FM1A]

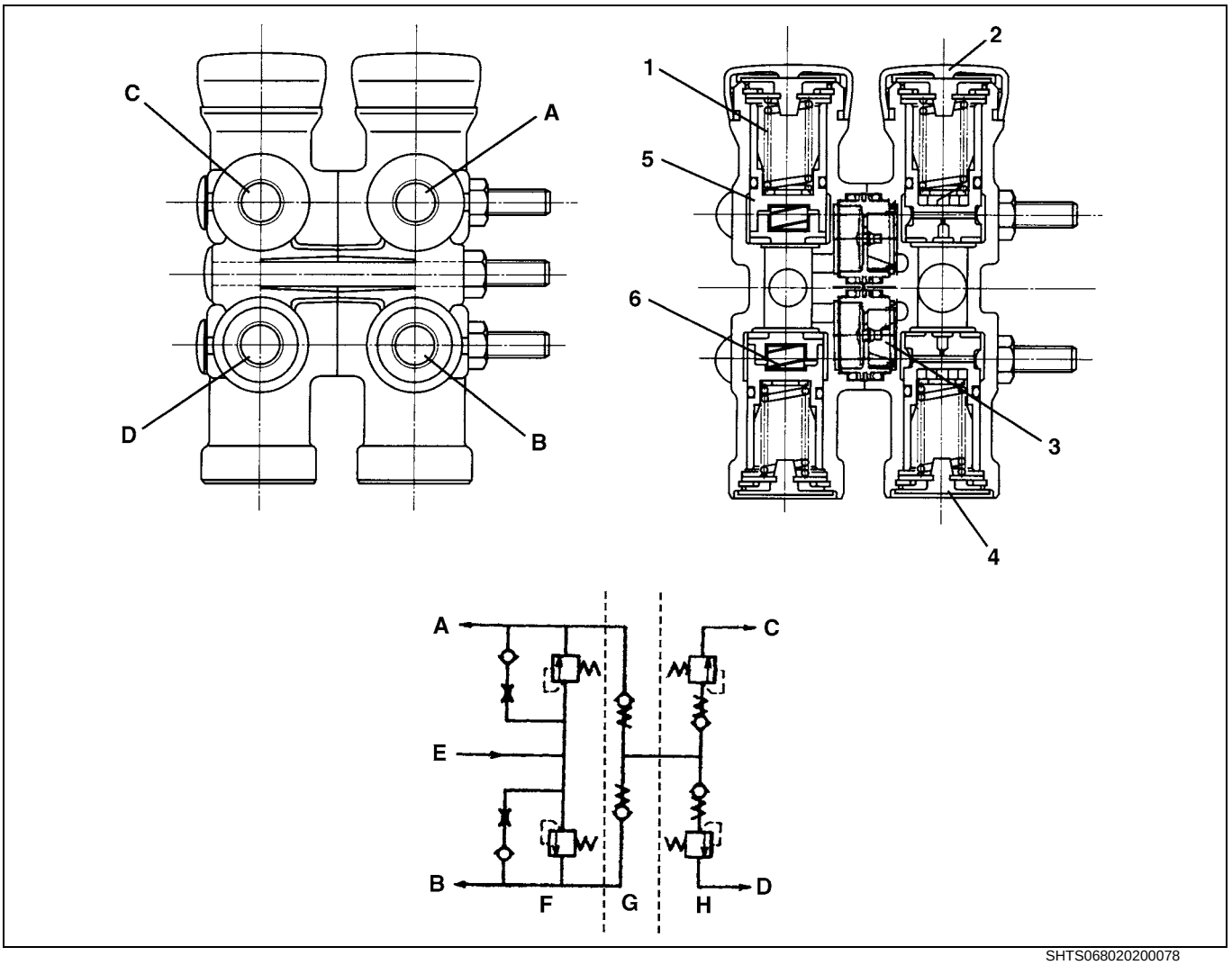
DATA AND SPECIFICATIONS

EN0680202I200008

Type			Spring type (4-way protection)
Opening pressure	Open	Port 21, 22, 23	620-660 kPa {6.4-6.7 kgf/cm^2, 89.93-95.72 lbf/in.^{2}}
		Port 24	570-610 kPa {5.9-6.2 kgf/cm^2, 82.67-88.47 lbf/in.^{2}}
	Close	Port 21, 22, 24	440-480 kPa {4.5-4.8 kgf/cm^2, 63.82-69.61 lbf/in.^{2}}
		Port 23	490-530 kPa {5.0-5.4 kgf/cm^2, 71.07-76.87 lbf/in.^{2}}

DESCRIPTION

EN0680202C100009

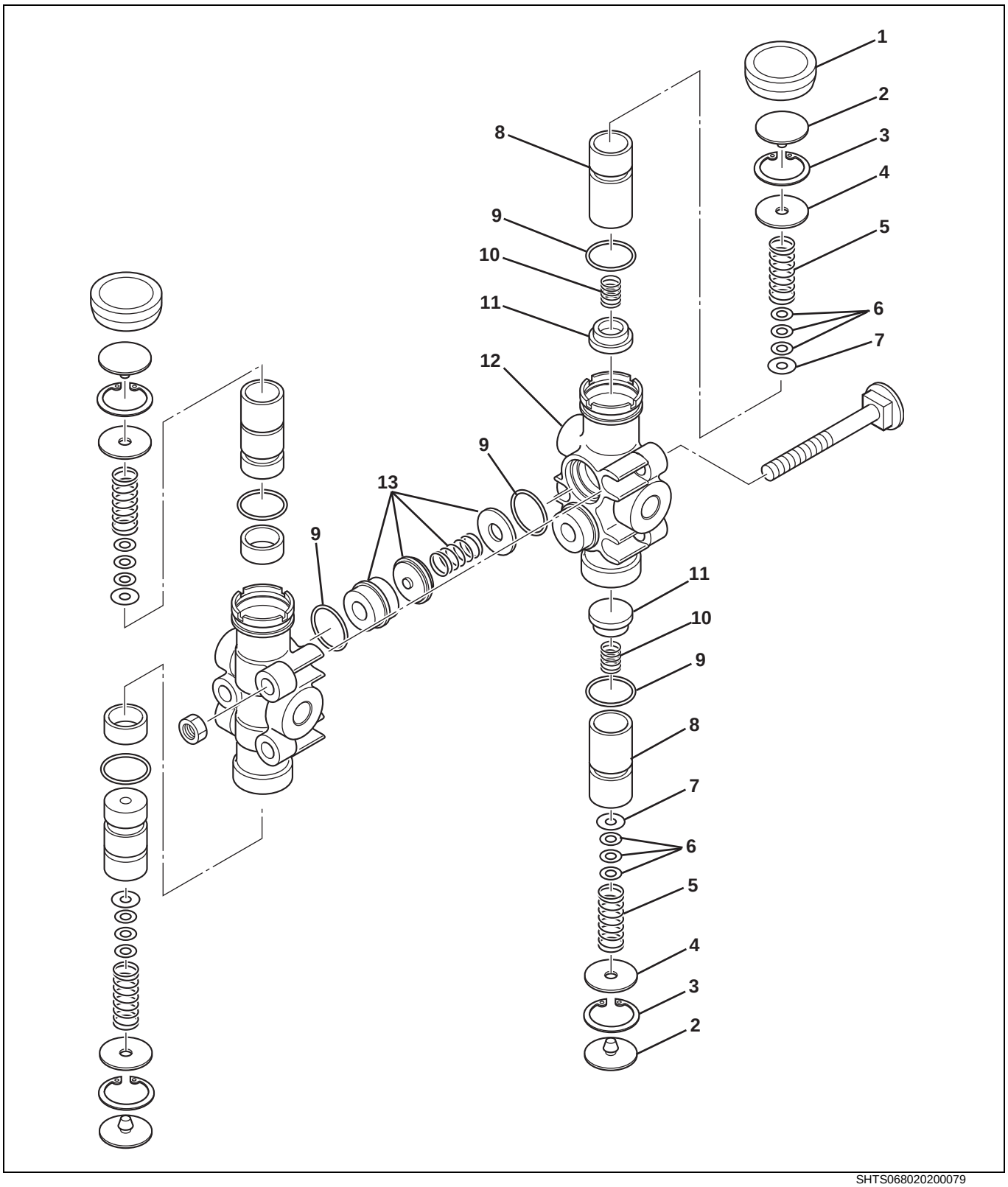


SHTS068020200078

1	Main spring	A	Port 21 (Outlet)
2	Dust cover	B	Port 22 (Outlet)
3	Check valve	C	Port 23 (Outlet)
4	Dust seal rubber	D	Port 24 (Outlet)
5	Piston	E	Inlet port
6	Valve spring	F	No.1 side
		G	Center check valve
		H	No.2 side

COMPONENT LOCATOR

EN0680202D100008



SHTS068020200079

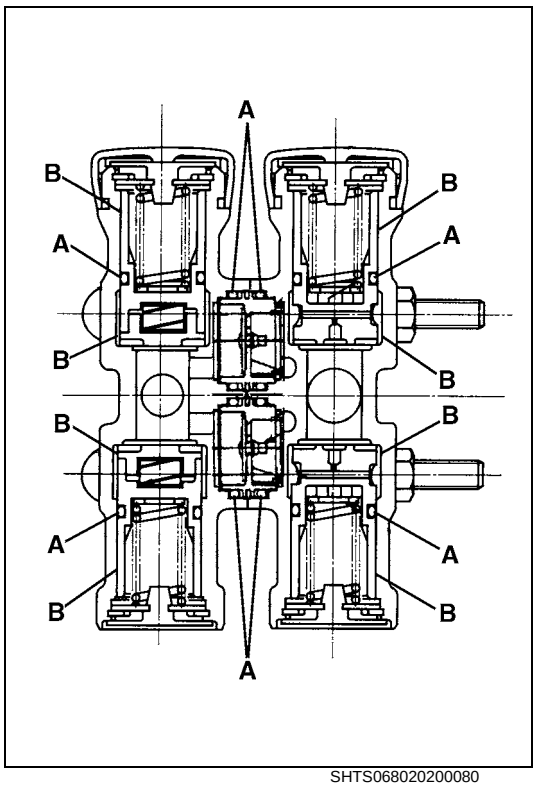
1	Dust cover	6	Shim	11	Valve
2	Dust seal rubber	7	Spacer	12	Body
3	Retainer ring	8	Piston	13	Check valve
4	Dust seal plate	9	O-ring		
5	Main spring	10	Valve spring		

NOTICE

The parts in 3, 9 and 11 are not the ones to be reusable.

OVERHAUL

EN0680202H200007



SHTS068020200080

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

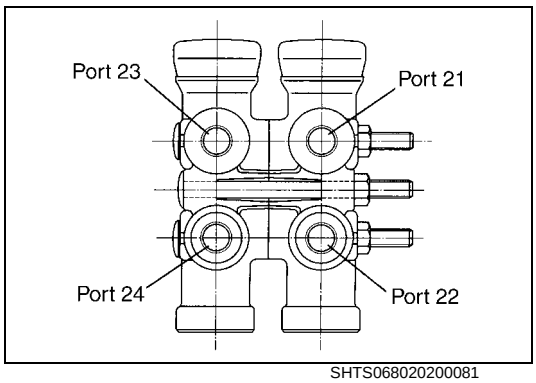
(1) When assembling the protection valve use the new O-rings and valves.

(2) Apply the silicone grease on the each sliding surface of the component parts and O-ring groove.

- **A: O-ring**
- **B: Sliding surface**

ADJUSTMENT

EN0680202H300010



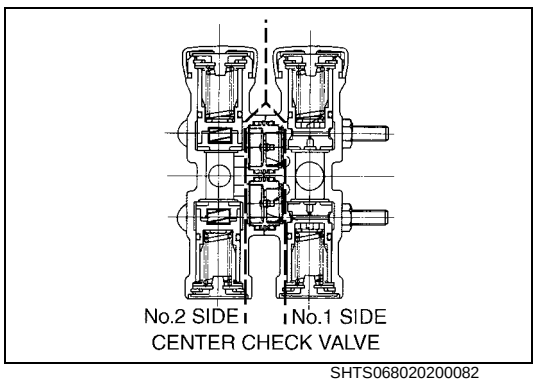
SHTS068020200081

AIR LEAKAGE

1. CHECK VALVE

(1) By-pass check valve at No.1 side.

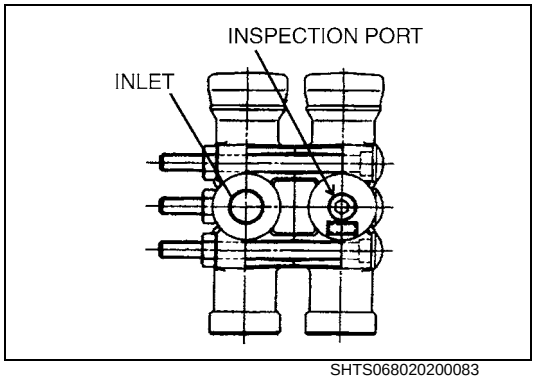
a. Confirm no leakage of air at inlet port, when applying air pressure 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}} and 392 kPa {4 kgf/cm^2, 56.89 lbf/in.^{2}} from outlet port No.21 and No.22.



SHTS068020200082

(2) Center check valve

a. Confirm no leakage of air at the outlet port No.21 and No.22, when applying air pressure 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}} and 980 kPa {10 kgf/cm^2, 142 lbf/in.^{2}} from the inspection port.



SHTS068020200083

(3) Check valve at No.2 side
a. Confirm no leakage of air at the inspection port, when applying air pressure 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in.^{2}} and 980 kPa {10 kgf/cm^2, 142 lbf/in.^{2}} from the outlet port No.23 and No.24.

2. OTHER AIR TIGHTNESS

(1) When applying air pressure 0-980 kPa {0-10 kgf/cm^2, 0-142 lbf/in.^{2}}, confirm that any leakage of air should be 0 cm^3/min.

PERFORMANCE CHARACTERISTIC

1. OPENING VALVE PRESSURE

(1) No.1 side
a. Releasing the compressed air at the outlet port No.21 and No.22 to air, when applying the compressed air at the speed specified below, confirm that air pressure of the compressed air, saturated at the inlet should be of opening valve pressure, which should be 620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}.
Charging speed: From 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} to 490 kPa {5.0 kgf/cm^2, 71.10 lbf/in.^{2}} within 3-7 seconds.

(2) No.2 side
a. When applying air at charging speed specified below from the inlet side under air pressure "0" at the outlet port No.23 and No.24, confirm that a pressure at the inspection port when it starting to go up at the outlet should be of opening valve pressure, which should be 570-610 kPa {5.8-6.2 kgf/cm^2, 82.49-88.18 lbf/in.^{2}}.

	Opening valve pressure
Port No.23	**620-660 kPa {6.3-6.7 kgf/cm^2, 89.61-95.29 lbf/in.^{2}}**
Port No.24	**570-610 kPa {5.8-6.2 kgf/cm^2, 82.67-88.47 lbf/in.^{2}}**

Charging speed: From 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} to 490 kPa {5.0 kgf/cm^2, 71.10 lbf/in.^{2}} within 8-22 seconds.

2. CLOSING VALVE PRESSURE

(1) When discharging air through respective No.1 side and No.2 side inlet under a pressure of 980 kPa {10 kgf/cm^2, 142 lbf/in.^{2}} at the inlet and the outlet, at discharging speed specified below, confirm that a pressure when the pressures saturated should be of closing valve pressure, which should be 440-480 kPa {4.5-4.8 kgf/cm^2, 64.01-68.27 lbf/in.^{2}} (Port No.21, 22 and 24), and 490-530 kPa {5.0-5.4 kgf/cm^2, 71.07-76.87 lbf/in.^{2}} (Port No.23).
Discharging speed: From 590 kPa {6.0 kgf/cm^2, 85.32 lbf/in.^{2}} to 295 kPa {3.0 kgf/cm^2, 42.66 lbf/in.^{2}} within less than 3 seconds.

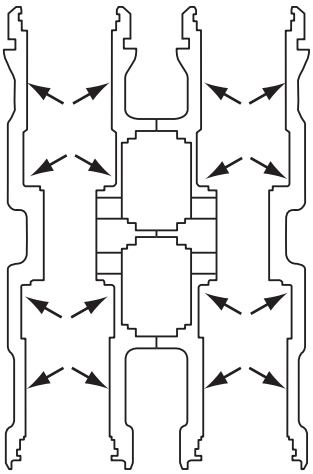
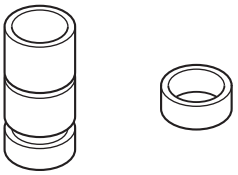
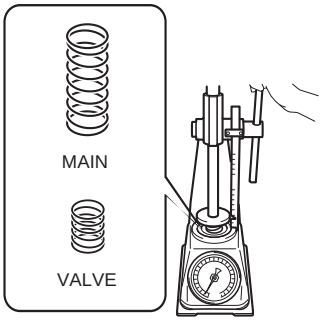
NOTICE

- **Perform test again by increasing aims, when the respective pressures is low and by decreasing it when high in the above inspection.**
- **After inspecting, make sure to tighten the inspection port securely.**

INSPECTION AND REPAIR

EN0680202H300011

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface and contact surface of body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Sliding surface and contact surface of valve seat and piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Main spring and valve spring: Free length/ Setting length/ Setting load Crack, rust and damage	**Main spring (Port 21, 22, 24): 42.4 {1.67}/ 27.5 {1.08}/ 158.9 N {16.2 kgf, 35.72 lbf}**	**137.3 N {14.0 kgf, 30.87 lbf} (Setting load)**	**Replace, if necessary.**	**Measure and Visual check** 
	Main spring (Port 23): 35.3 {1.39}/ 27.5 {1.08}/ 169.7 N {17.3 kgf, 38.15 lbf}			
	Valve spring: 20.0 {0.79}/ 9.0 {0.35}/ 0.78 N {0.08 kgf, 0.175 lbf}	**0.69 N {0.07 kgf, 0.155 lbf} (Setting load)**		

QUICK RELEASE VALVE

DATA AND SPECIFICATION

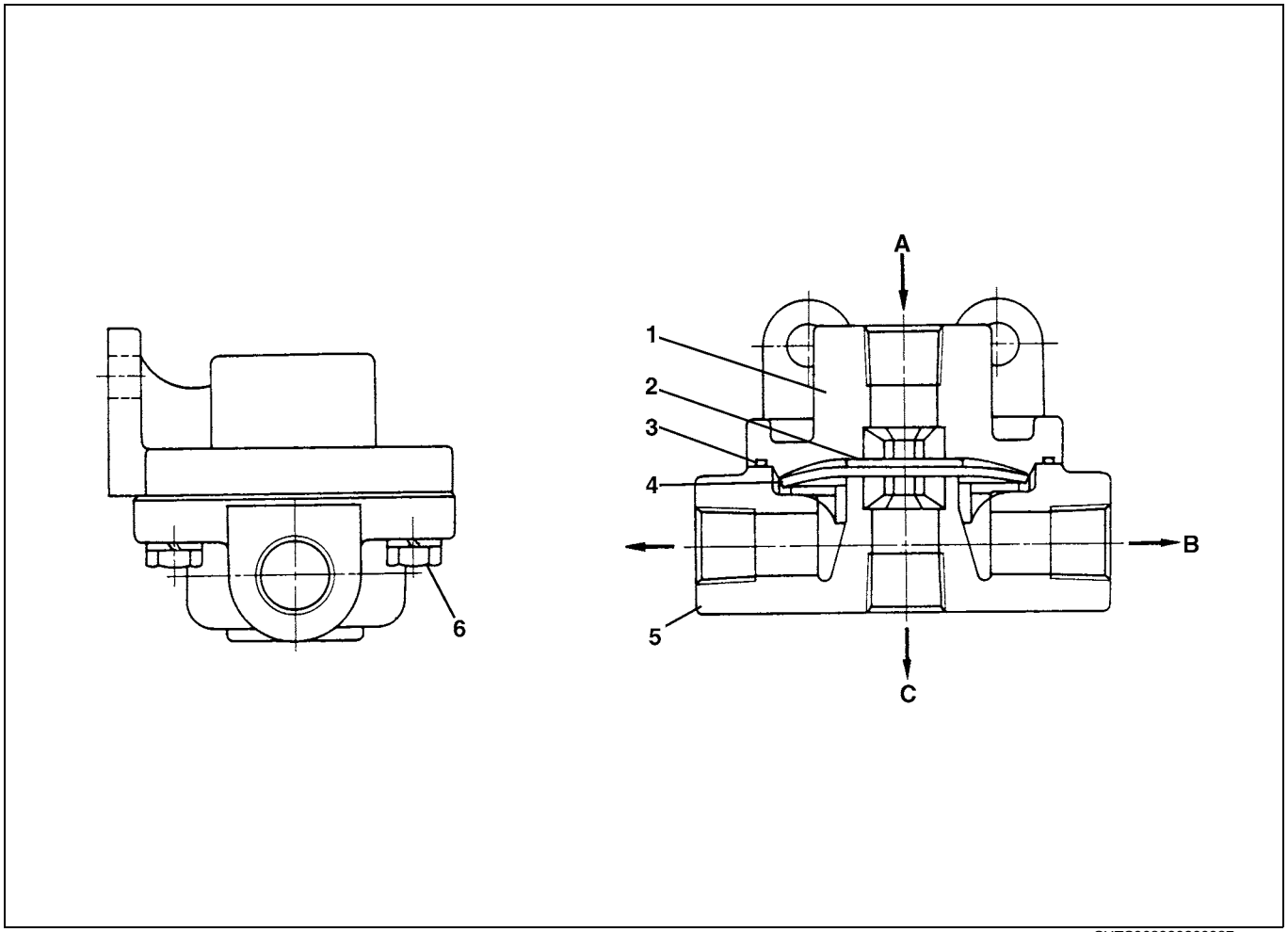
EN0680202I200009

Type	**Diaphragm type**

DESCRIPTION

EN0680202C100010

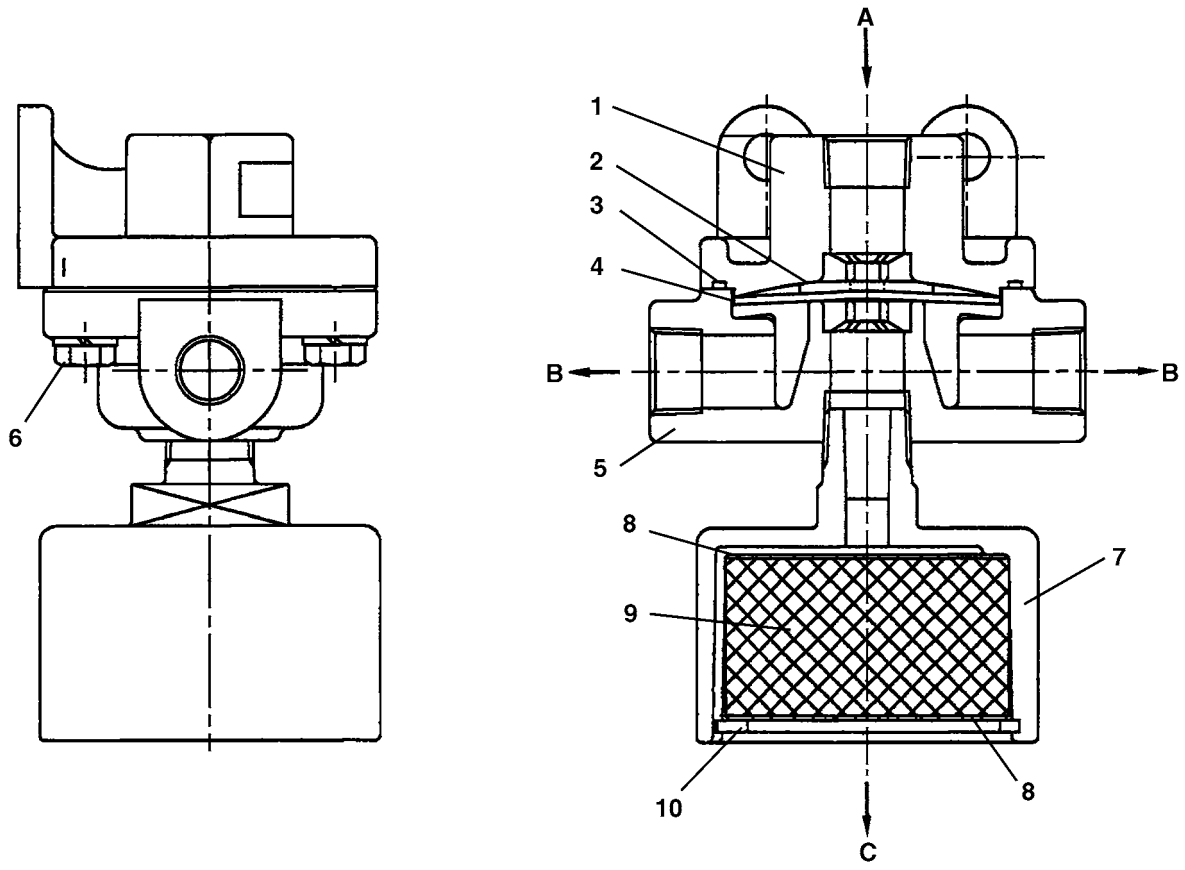
TYPE: A



SHTS068020200087

1	**Cover**	**6**	**Bolt**
2	**Filter**	**A**	**Inlet**
3	**Gasket**	**B**	**Outlet**
4	**Diaphragm**	**C**	**Exhaust**
5	**Valve body**		

TYPE: B



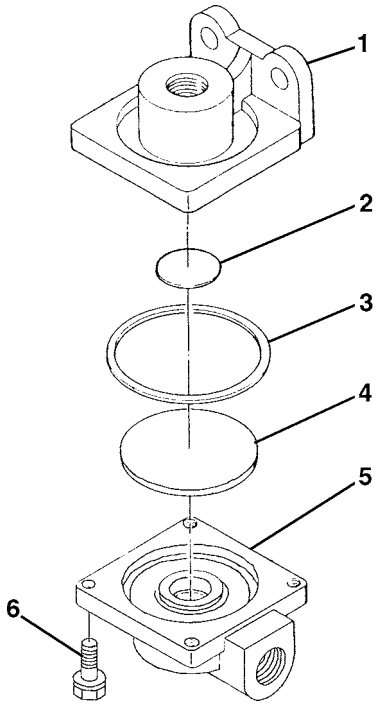
SHTS068020200088

1	Cover	8	Filter plate
2	Filter	9	Filter
3	Gasket	10	Retainer ring
4	Diaphragm	A	Inlet
5	Valve body	B	Outlet
6	Bolt	C	Exhaust
7	Silencer body		

COMPONENT LOCATOR

EN0680202D100009

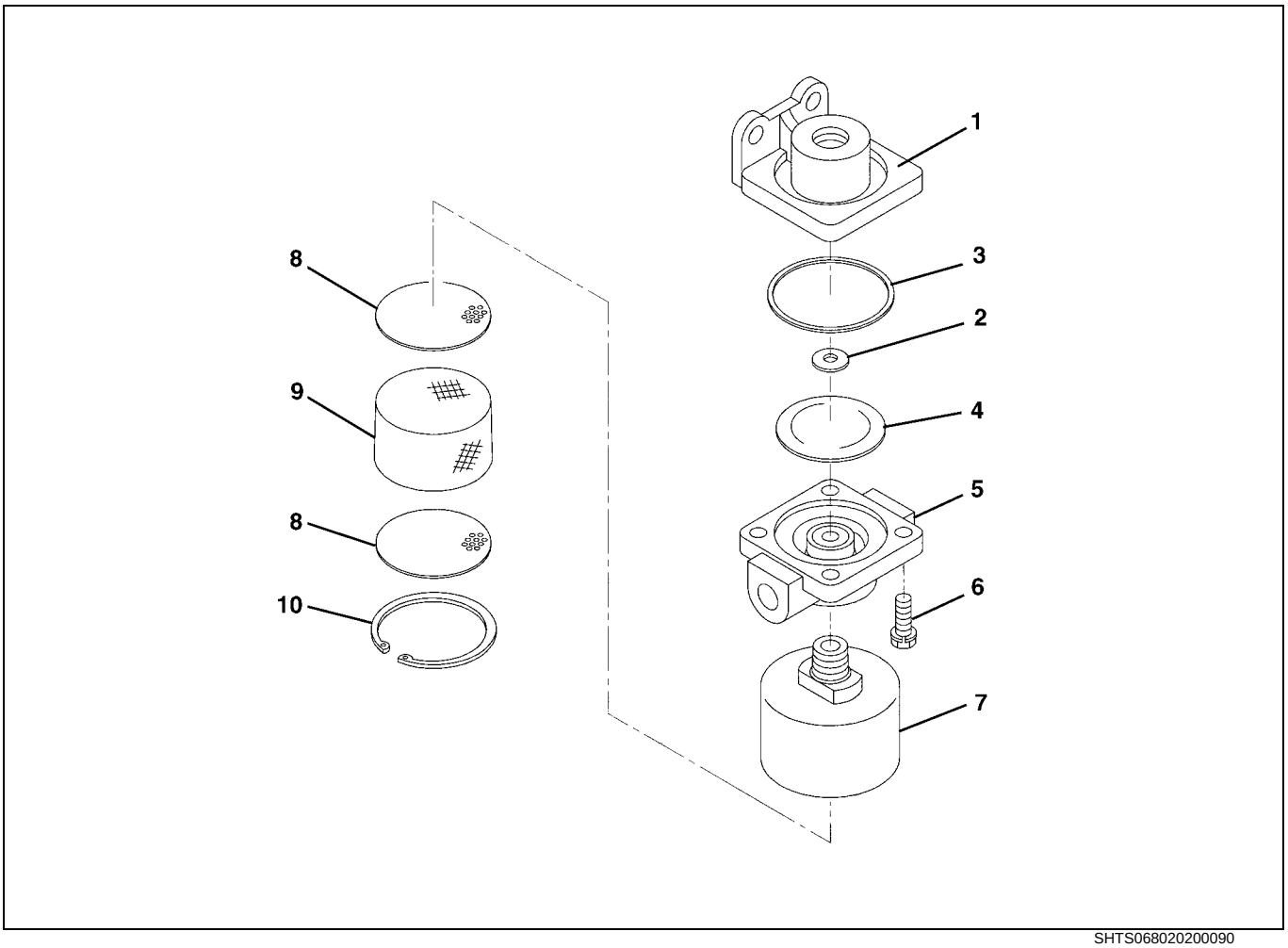
TYPE: A



SHTS068020200089

1	Cover	4	Diaphragm
2	Filter	5	Valve body
3	Gasket	6	Bolt

TYPE: B

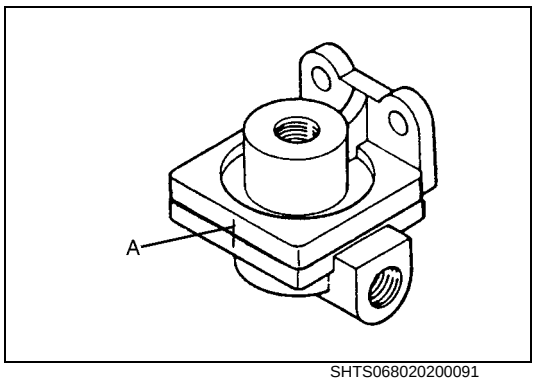


SHTS068020200090

1	Cover	6	Bolt
2	Filter	7	Silencer body (If so equipped)
3	Gasket	8	Filter plate (If so equipped)
4	Diaphragm	9	Filter (If so equipped)
5	Valve body	10	Retainer ring (If so equipped)

OVERHAUL

EN0680202H200008

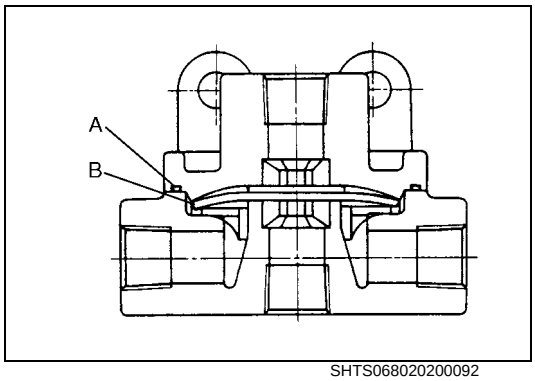


SHTS068020200091

IMPORTANT POINT - DISASSEMBLY

NOTICE

- **Before disassemble the relay valve apply the aligning mark "A" for the cover and valve body.**
- **When disassembling the relay valve, never to disassemble the its silencer body because its threaded portion is coated with lock agent (Lock tight).**



SHTS068020200092

IMPORTANT POINT - ASSEMBLY

1. ASSEMBLE THE RELAY VALVE

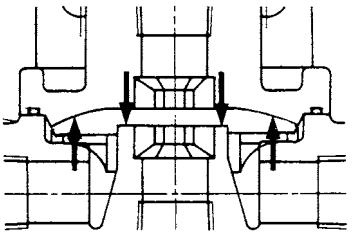
(1) When assembly the relay valve, use the new diaphragm and gasket.

- **A: Gasket**
- **B: Diaphragm**

(2) Coincide the aligning mark "A" which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300012

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve body and cover surface: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

SPRING BRAKE CONTROL VALVE

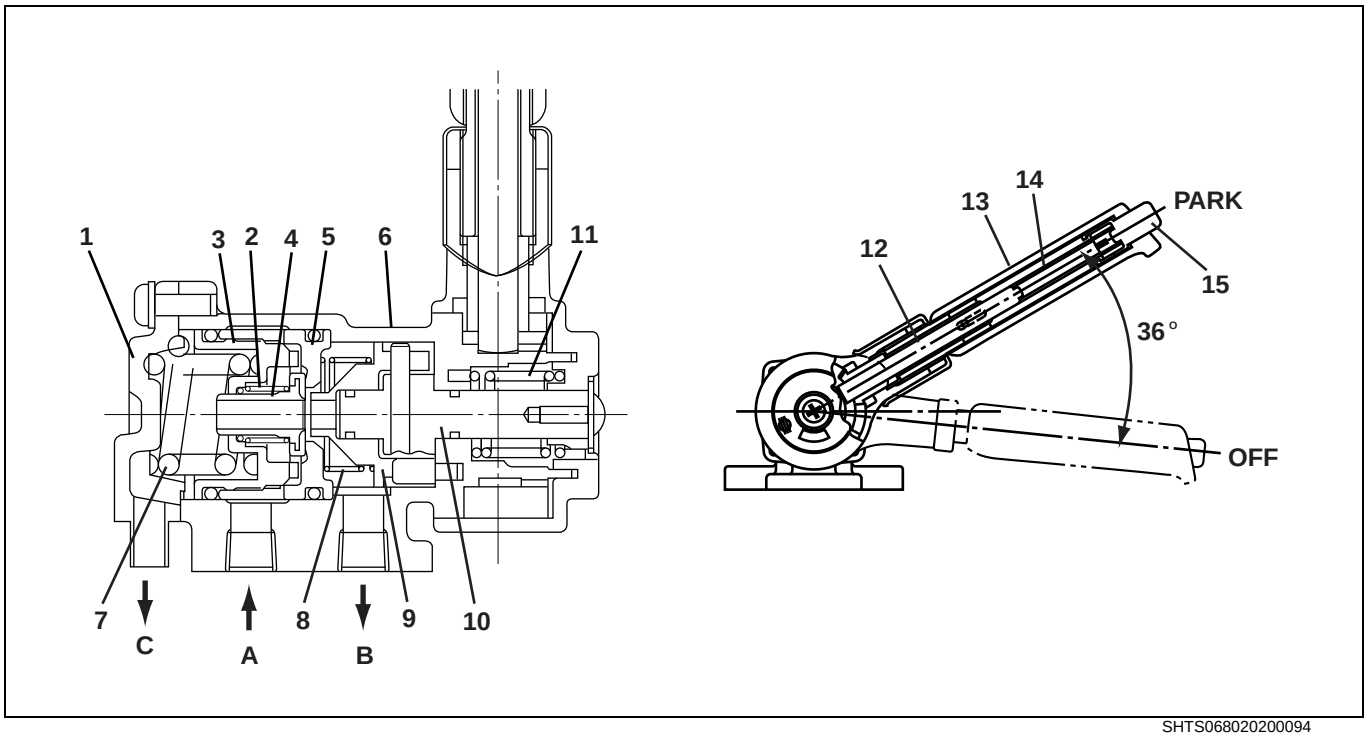
DATA AND SPECIFICATIONS

EN0680202I200010

Type	**Variable pressure control type**
Outlet pressure difference between parking and releasing stroke at a specified lever angle	**Within 147 kPa {1.5 kgf/cm^2, 21.33 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100011

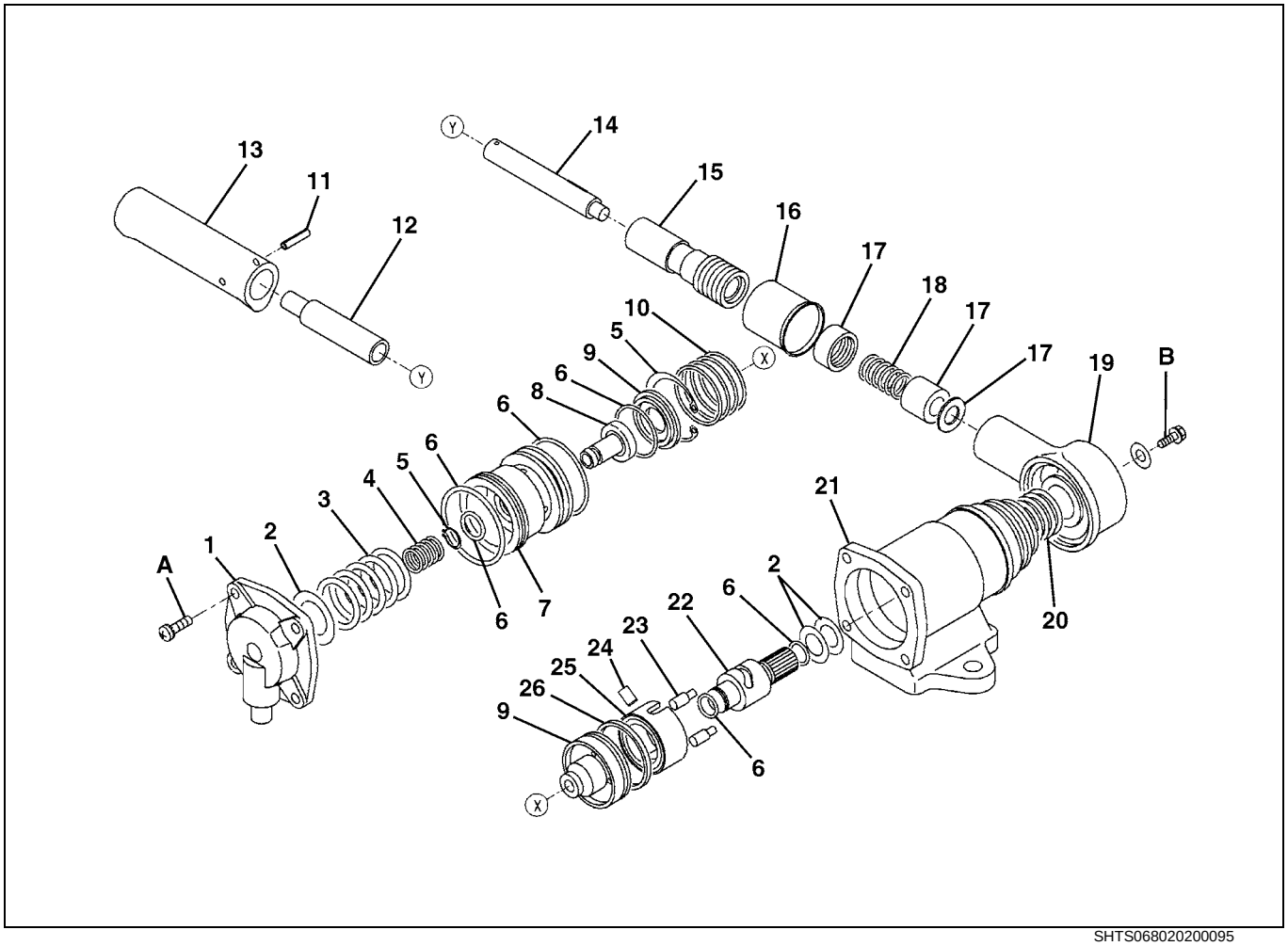


SHTS068020200094

1	Body cover	7	Piston spring	13	Grip
2	Feed valve spring	8	Valve seat spring	14	Compression spring
3	Piston	9	Cam	15	Release rod
4	Feed valve	10	Cam holder	A	Inlet
5	Valve seat	11	Return spring (If so equipped)	B	Outlet
6	Valve body	12	Pull rod	C	Exhaust (PARK)

COMPONENT LOCATOR

EN0680202D100010



SHTS068020200095

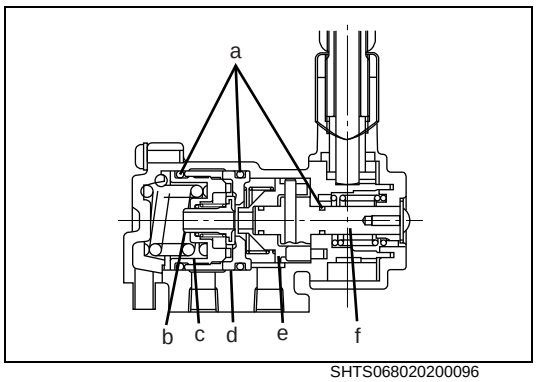
1	Body cover	10	Valve seat spring	19	Body cap
2	Shim	11	Lock pin	20	Return spring (If so equipped)
3	Piston spring	12	Release rod knob	21	Valve body
4	Feed valve spring	13	Grip	22	Cam holder
5	Retainer ring	14	Pull rod	23	Body pin
6	O-ring	15	Supporter	24	Cam holder pin
7	Piston	16	Cover	25	Cam
8	Feed valve	17	Stopper	26	Piston guide
9	Valve seat	18	Compression spring		

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

A	5.4-7.4 {55-75, 4.0-5.4}	B	3.4-4.9 {35-50, 2.6-3.6}

OVERHAUL

EN0680202H200009



SHTS068020200096

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the spring brake control valve, replace the feed valve, valve seats and O-rings.

(2) Apply silicone grease to each sliding surface of the assembly parts, O-rings and O-ring grooves.

a. O-ring

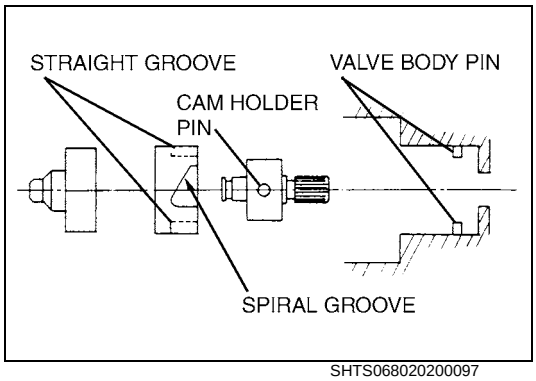
b. Feed valve

c. Piston

d. Valve seat

e. Cam

f. Cam holder

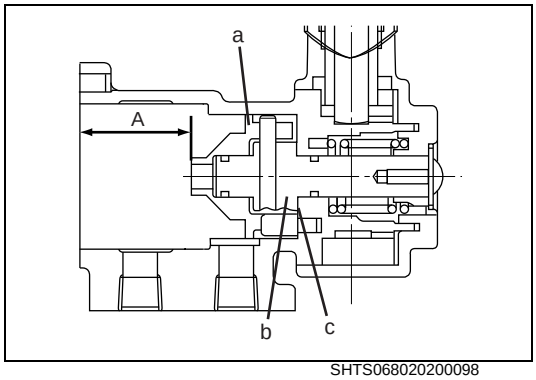


SHTS068020200097

2. ASSEMBLE THE CAM ASSEMBLY.

(1) When assembling the cam and cam holder, make sure that the cam holder pin and spiral groove of the cam are aligned.

(2) When installing the cam assembly to the valve body, the valve body pin and straight groove of the cam must be aligned.



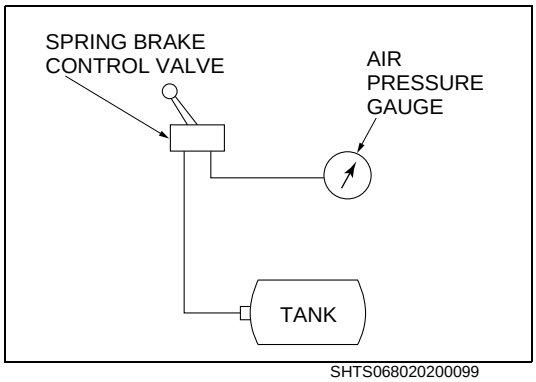
SHTS068020200098

(3) Adjust dimension "A" with the shim.
Assembly standard: 33.8-34.2 mm {1.331-1.346 in.}

a. Cam

b. Cam holder

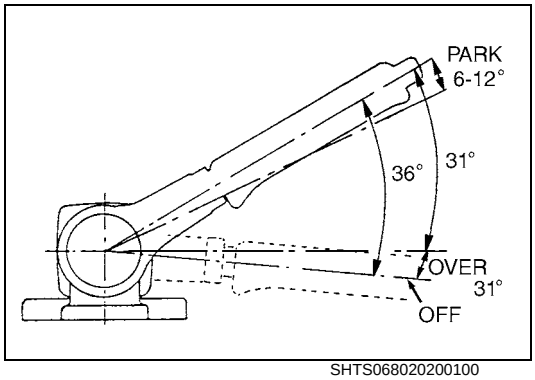
c. Shim



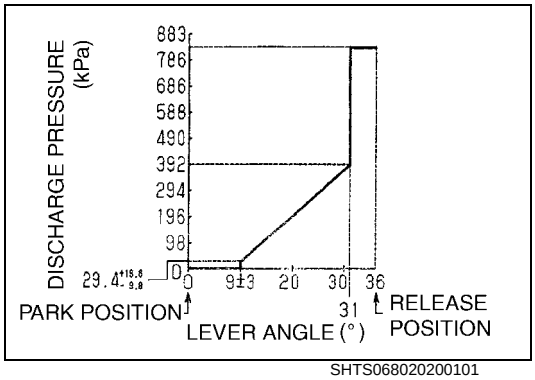
SHTS068020200099

3. SPRING BRAKE CONTROL VALVE PERFORMANCE TEST

(1) First, connect the pressure gauge to the outlet line and apply an air pressure of 834 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} to the inlet line.



SHTS068020200100



SHTS068020200101

(2) Move the spring brake control lever towards the OFF position, gradually and confirm that the air pressure in the outlet line meets the characteristic shown in figure.
Standard:

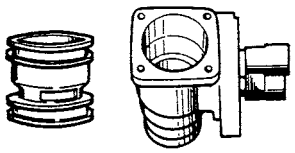
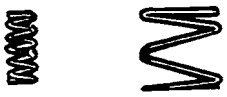
Lever angle:	Outlet pressure: kPa {kgf/cm^2, lbf/in.^{2}}
6-12°	19.6-49 {0.2-0.5, 2.85-7.11}
Over 31°	686 {7.0, 99.54}

NOTICE
The characteristic shown is under the inlet pressure of 834 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}}

INSPECTION AND REPAIR

EN0680202H300013

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Piston and valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam, pin and cam holder: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston spring: Rust, damage and measure the spring free length	**Free length 27.9 {1.098}**	**25.0 {0.984}**	**Replace, if necessary.**	**Measure and visual check** 
Feed valve spring and valve seat spring: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

RELAY VALVE (FOR FRONT BRAKE AND TRAILER BRAKE)

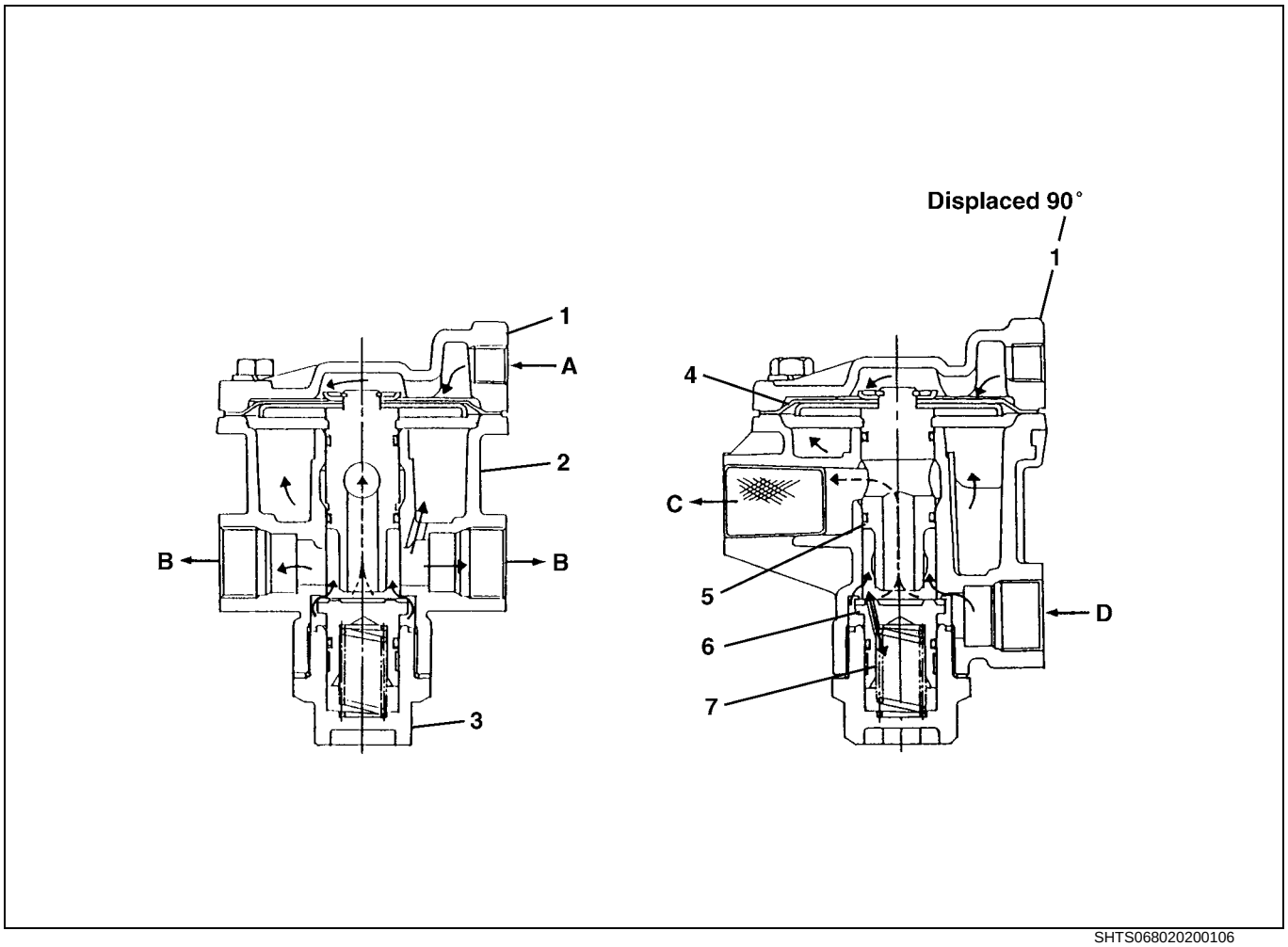
DATA AND SPECIFICATIONS

EN0680202I200011

Type	**Diaphragm type**
Pressure difference between signal and outlet pressure	**10-29 kPa {0.1-0.3 kgf/cm^2, 1.43-4.26 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100012



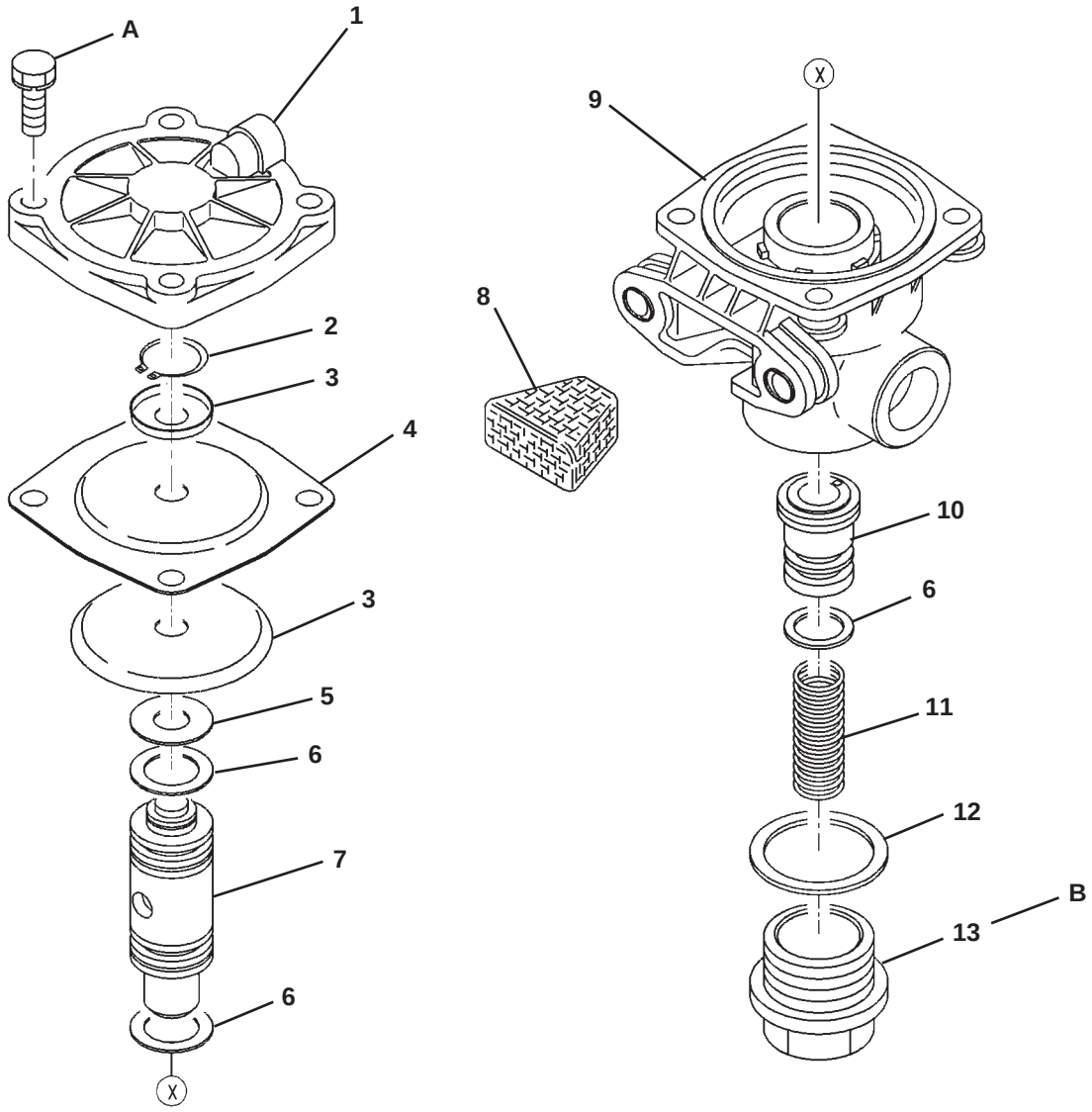
SHTS068020200106

1	**Cover**	**7**	**Return spring**
2	**Body**	**A**	**Signal air**
3	**Cap**	**B**	**Outlet air**
4	**Diaphragm**	**C**	**Exhaust**
5	**Exhaust valve**	**D**	**Inlet air**
6	**Feed valve**		

COMPONENT LOCATOR

EN0680202D100011

(REPRESENTATIVE TYPE)



SHTS068020200107

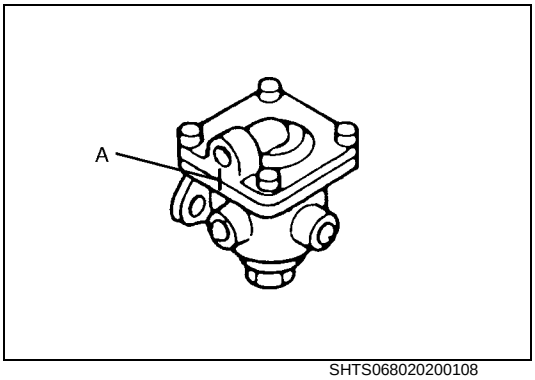
1	Cover	8	Filter
2	Retainer ring	9	Body
3	Washer	10	Feed valve
4	Diaphragm	11	Return spring
5	Shim	12	Gasket
6	O-ring	13	Cap
7	Exhaust valve		

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

A	11.8-14.7 {120-150, 9-10}	B	59-78 {600-800, 44-57}

OVERHAUL

EN0680202H200010

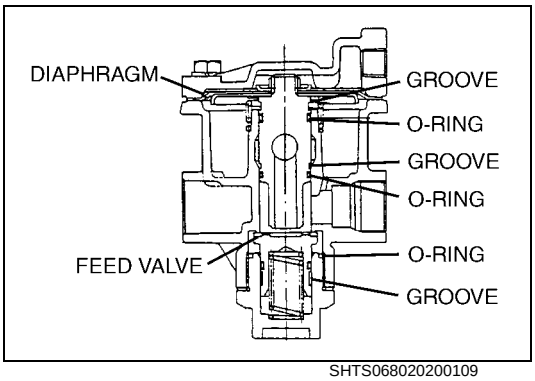


SHTS068020200108

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark A to the cover and body.



SHTS068020200109

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

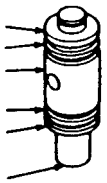
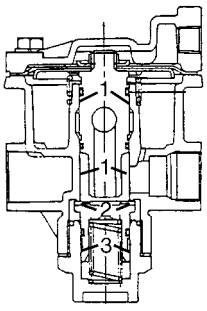
(1) When reassembling the relay valve, replace the O-rings, diaphragm, gasket and feed valve with new ones.

(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300014

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surfaces and valve contact surfaces of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve Body, Sliding surfaces 1 and valve contact surfaces 2: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cap, Sliding surfaces 3: Wear and damage	**—**	**—**	**Replace, if necessary.**	

RELAY VALVE (FOR FRONT SPRING BRAKE CHAMBER)

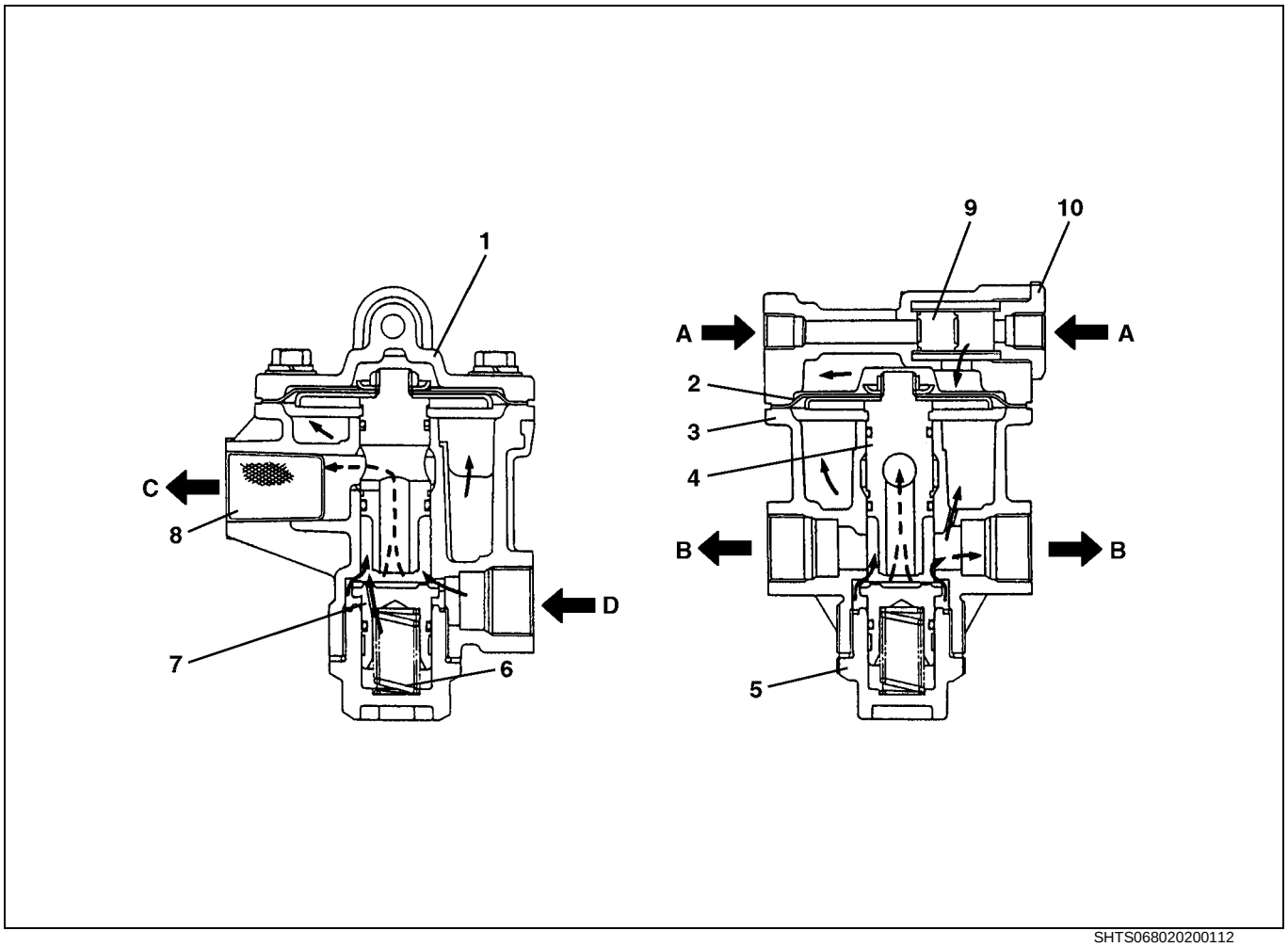
DATA AND SPECIFICATIONS

EN0680202I200012

Type	Diaphragm type with double check valve combined
Pressure difference between signal and outlet pressure	29.4 kPa {0.3 kgf/cm^2, 4.26 lbf/in.^{2}}

DESCRIPTION

EN0680202C100013

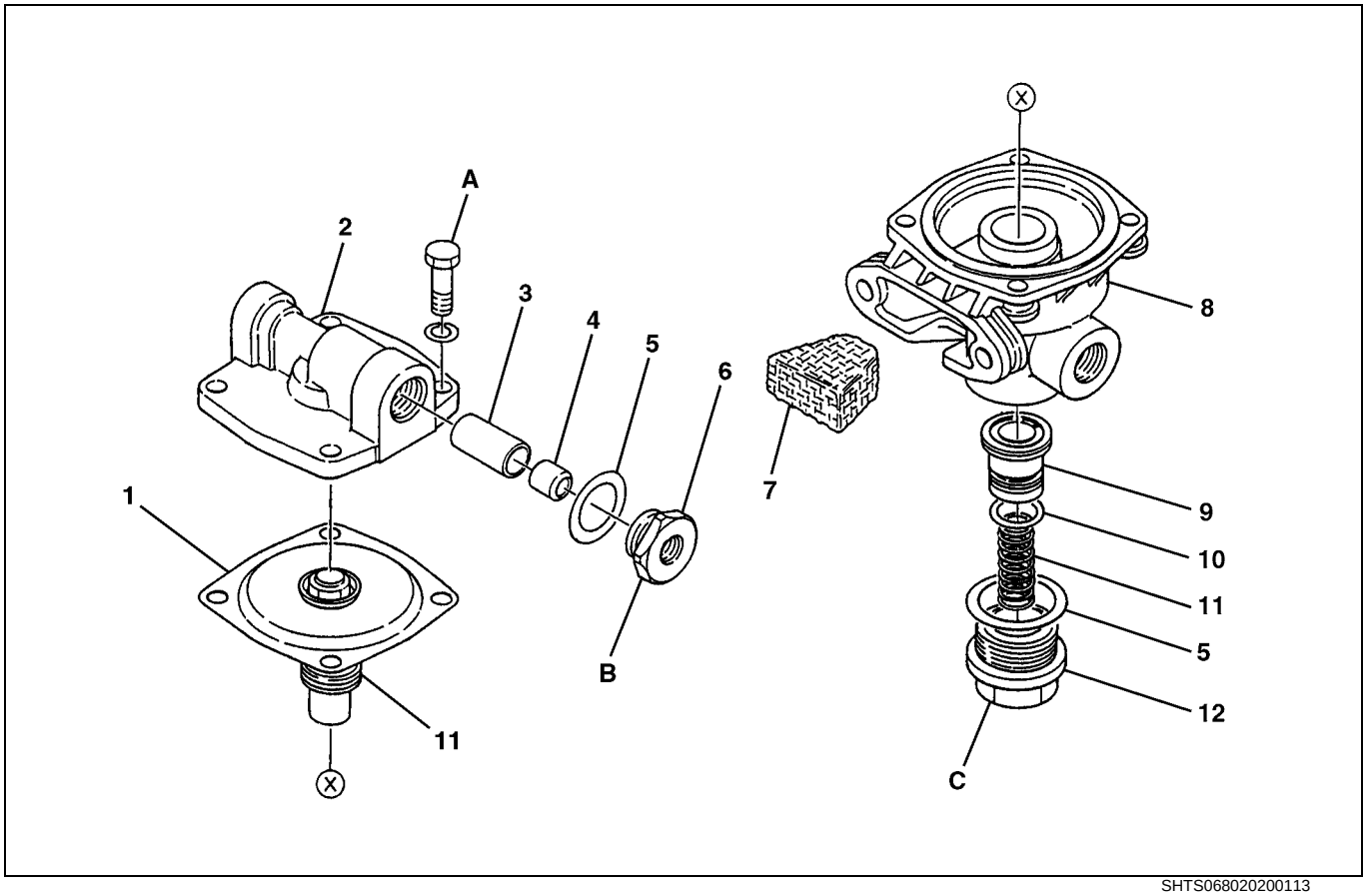


SHTS068020200112

1	Cover	8	Filter
2	Diaphragm	9	Valve
3	Valve body	10	Plug
4	Valve sub assembly	A	Signal
5	Valve cap	B	Outlet
6	Spring	C	Exhaust
7	Valve	D	Inlet

COMPONENT LOCATOR

EN0680202D100012



SHTS068020200113

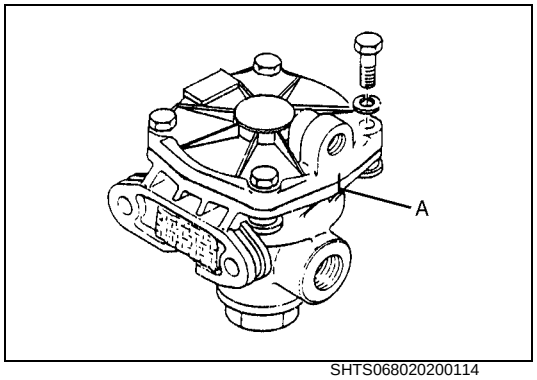
1	Valve sub assembly	7	Filter
2	Cover	8	Valve body
3	Guide	9	Valve
4	Valve	10	O-ring
5	Gasket	11	Spring
6	Plug	12	Valve cap

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

A	11.8-14.7 {120-150, 9-10}	C	58.8-78.4 {600-800, 44-57}
B	34.3-44.1 {350-450, 26-32}		

OVERHAUL

EN0680202H200011

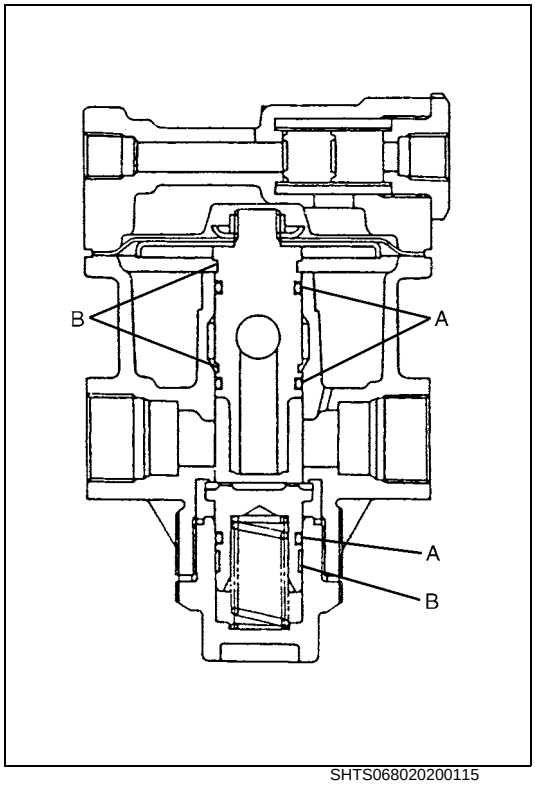


SHTS068020200114

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, mark the aligning marks "A" on the cover and valve body.



SHTS068020200115

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

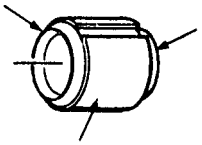
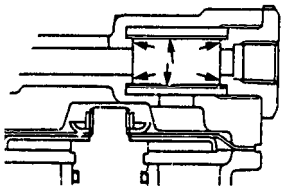
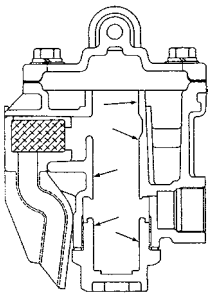
(1) When assembling the relay valve, use new O-rings and valves.

(2) Apply the silicone grease to each sliding surface of the component parts and O-ring groove.
A: O-ring
B: Apply the silicone grease

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300015

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Check valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cover, guide and plug: Damage, wear and rust	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Spring: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Relay valve body and cap sliding surface: Damage, wear and rust	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 

RELAY VALVE (WITH CHECK VALVE, FOR REAR BRAKE)

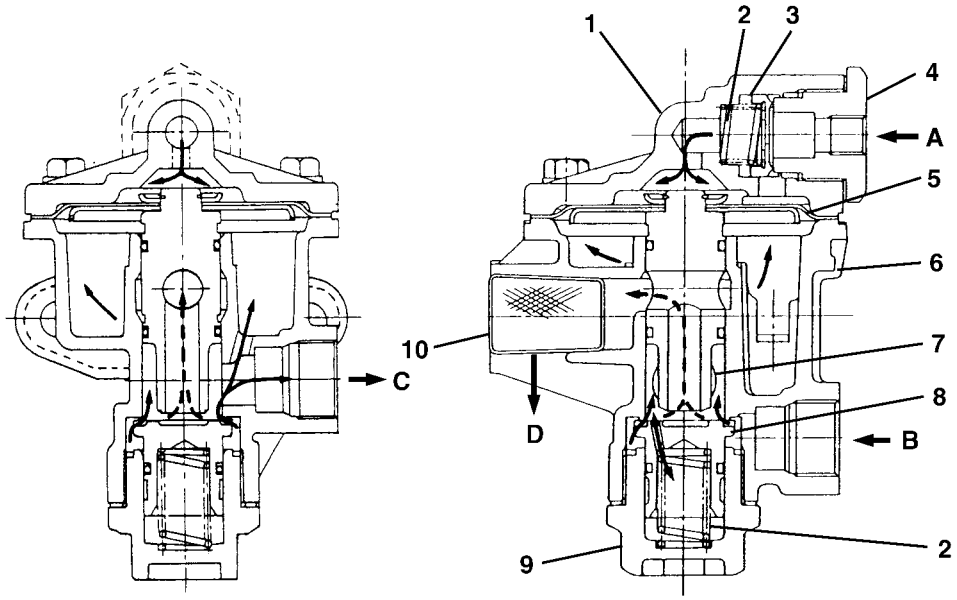
DATA AND SPECIFICATIONS

EN0680202I200013

Type	**Diaphragm type (With a check valve combined)**
Pressure difference between signal and outlet pressure	**24.5-53.9 kPa {0.25-0.55 kgf/cm^2, 3.56-7.82 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100014

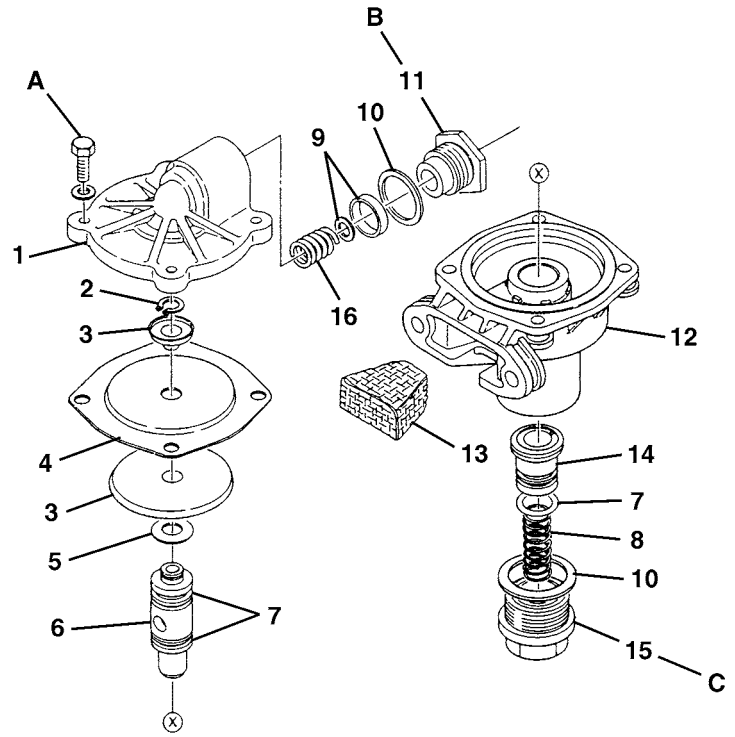


SHTS068020200120

1	**Cover**	**8**	**Feed valve**
2	**Spring**	**9**	**Cap**
3	**Check valve**	**10**	**Filter**
4	**Plug**	**A**	**Signal (From brake valve)**
5	**Diaphragm**	**B**	**Inlet (From air tank)**
6	**Valve body**	**C**	**Outlet (To brake chamber)**
7	**Exhaust valve**	**D**	**Exhaust**

COMPONENT LOCATOR

EN0680202D100013



SHTS068020200121

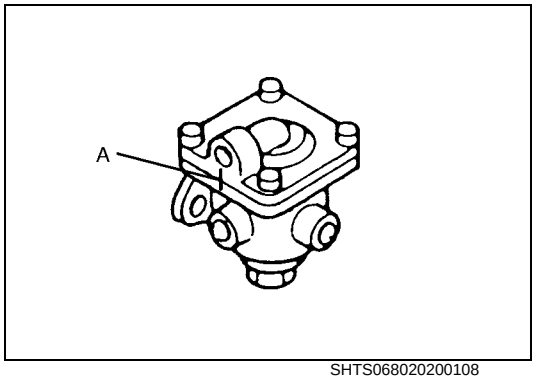
1	Cover	9	Check valve
2	Retainer ring	10	Gasket
3	Diaphragm washer	11	Plug
4	Diaphragm	12	Valve body
5	Shim	13	Filter
6	Exhaust valve	14	Feed valve
7	O-ring	15	Cap
8	Spring	16	Valve spring

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

A	11.8-14.7 {120-150, 9-10}	C	59-78 {600-800, 44-57}
B	50-58 {500-600, 37-43}		

OVERHAUL

EN0680202H200012

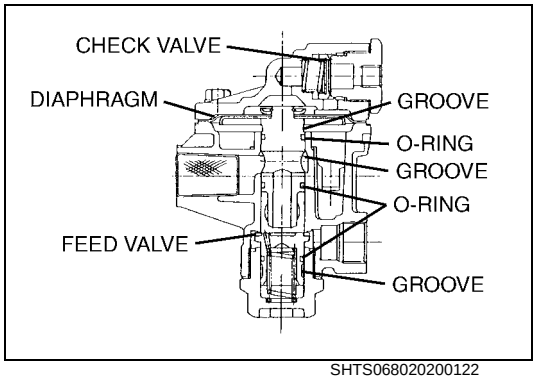


SHTS068020200108

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark A to the cover and body.



SHTS068020200122

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When reassembling the relay valve, replace the check valve, O-rings, diaphragm, gasket and feed valve with new ones.

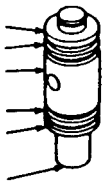
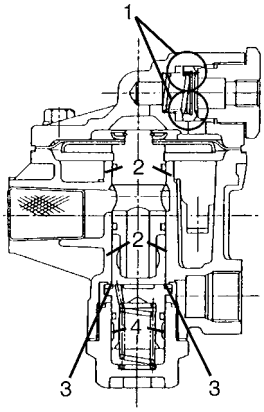
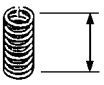
(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300016

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surfaces and valve contact surfaces of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve contact surface of plug 1: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body, Sliding surfaces 2, valve contact surfaces 3: Wear and damage	**—**	**—**	**Replace, if necessary.**	
Cap, Sliding surfaces 4: Wear and damage	**—**	**—**	**Replace, if necessary.**	
Compression spring: Rust, damage, free length.	**46.0 {1.81}**	**—**	**Replace, if necessary.**	**Measure and visual check** 
Valve spring: Rust, damage, free length.	**31.8 {1.25}**	**—**	**Replace, if necessary.**	

RELAY VALVE (FOR REAR SPRING BRAKE CHAMBER) (EXCEPT FOR IRELAND)

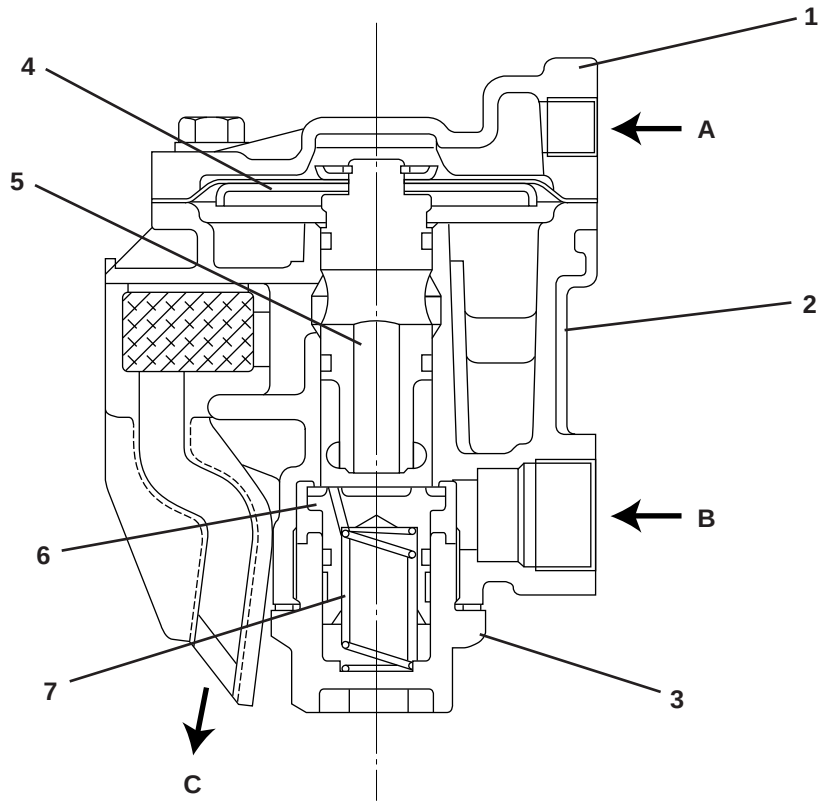
DATA AND SPECIFICATIONS

EN0680202I200014

Type	**Diaphragm type**
Pressure difference between signal and outlet pressure	**Less than 29 kPa {0.3 kgf/cm^2, 4.26 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100015

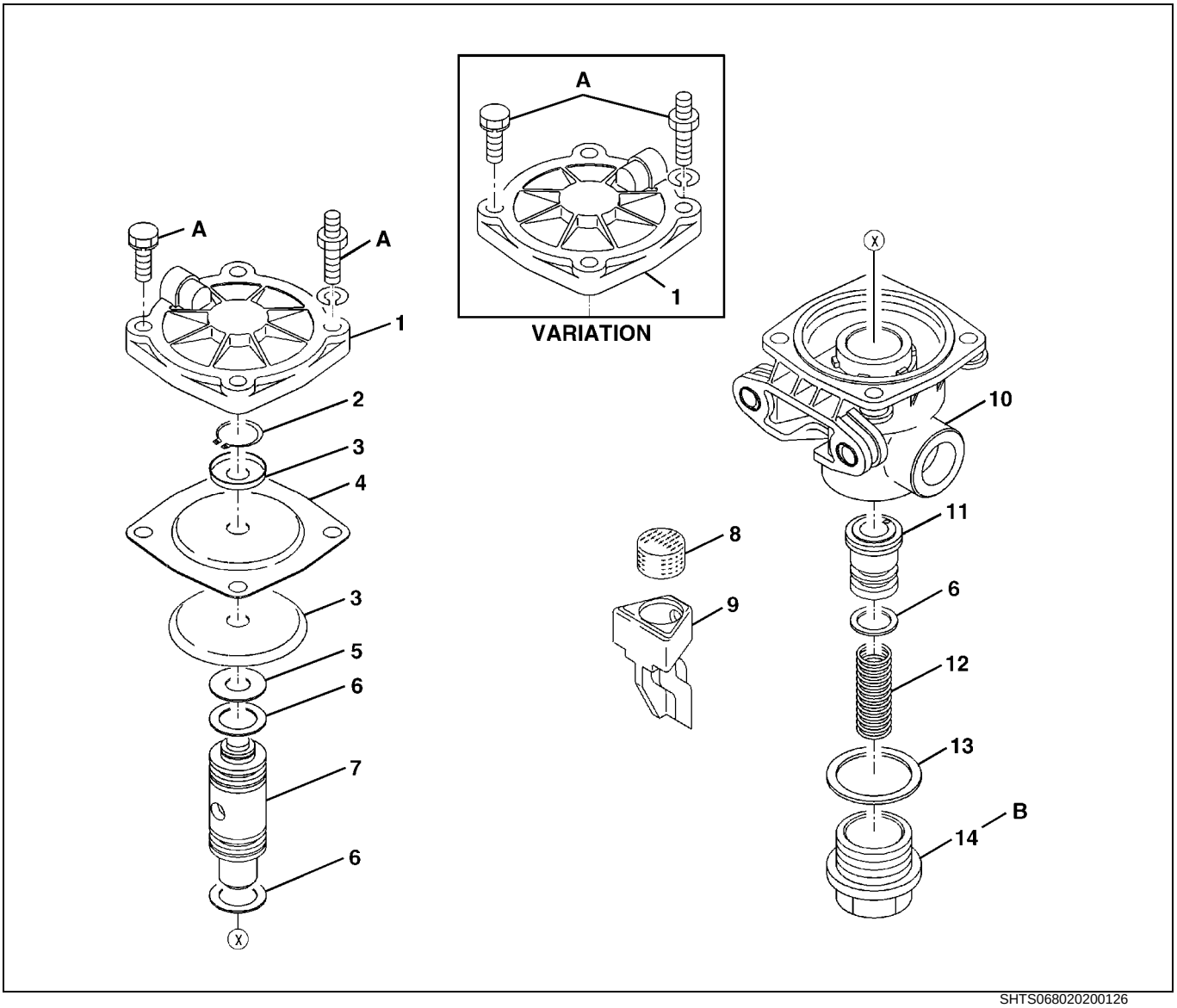


SHTS068020200125

1	**Cover**	**6**	**Feed valve**
2	**Body**	**7**	**Return spring**
3	**Cap**	**A**	**Signal air**
4	**Diaphragm**	**B**	**Inlet air**
5	**Exhaust valve**	**C**	**Exhaust**

COMPONENT LOCATOR

EN0680202D100014



SHTS068020200126

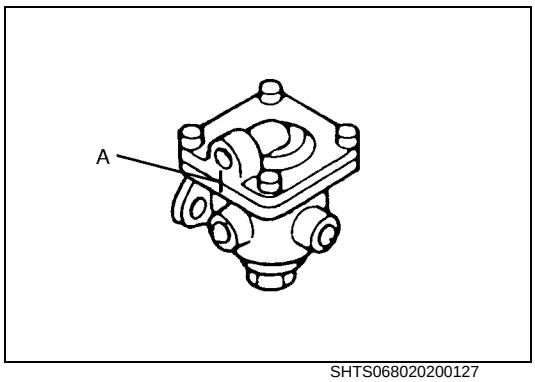
1	Cover	8	Filter
2	Retainer ring	9	Dust cover
3	Washer	10	Body
4	Diaphragm	11	Feed valve
5	Shim	12	Return spring
6	O-ring	13	Gasket
7	Exhaust valve	14	Cap

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

A	11.8-14.7 {120-150, 9-10}	B	58.8-78.4 {600-799, 44-57}

OVERHAUL

EN0680202H200013

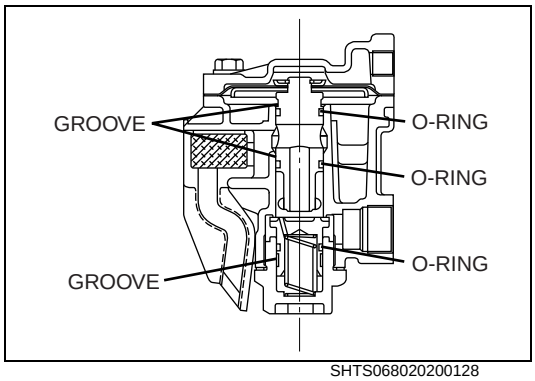


SHTS068020200127

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark A to the cover and body.



SHTS068020200128

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

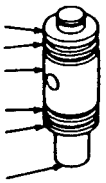
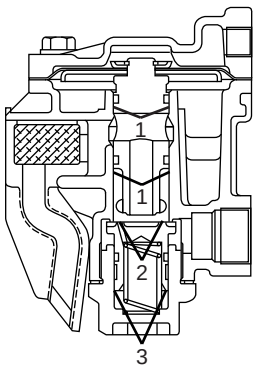
(1) When reassembling the relay valve, replace the O-rings, diaphragm, gasket and feed valve with new ones.

(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300017

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surfaces and valve contact surfaces of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve Body, Sliding surfaces 1 and valve contact surfaces 2: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cap, Sliding surfaces 3: Wear and damage	**—**	**—**	**Replace, if necessary.**	

RELAY VALVE (FOR REAR SPRING BRAKE CHAMBER) [MODELS: GH8J (FOR IRELAND), FM1A)]

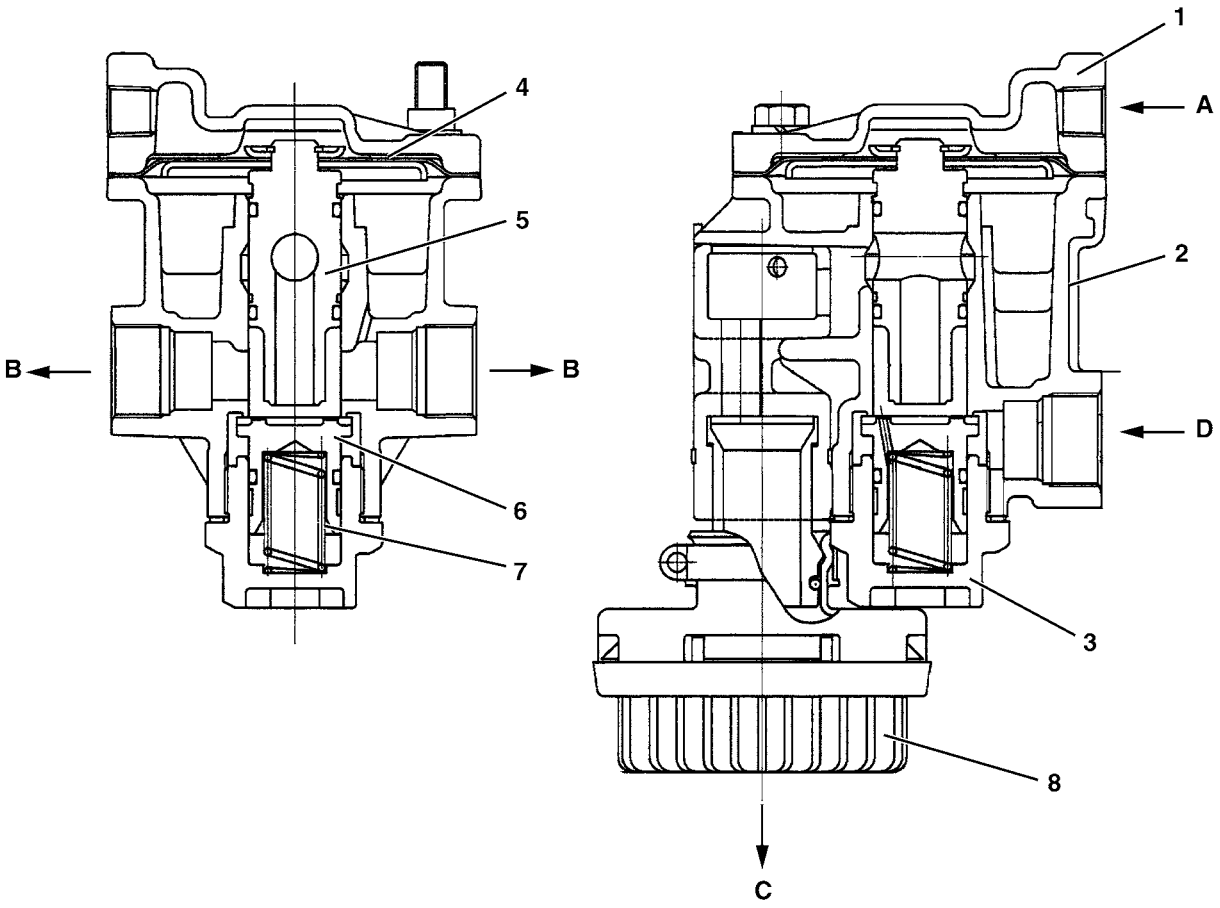
DATA AND SPECIFICATIONS

EN0680202I200015

Type	**Diaphragm type**
Pressure difference between signal and outlet pressure	**10-29 kPa {0.1-0.3 kgf/cm^2, 1.43-4.26 lbf/in.^{2}}**

DESCRIPTION

EN0680202C100016



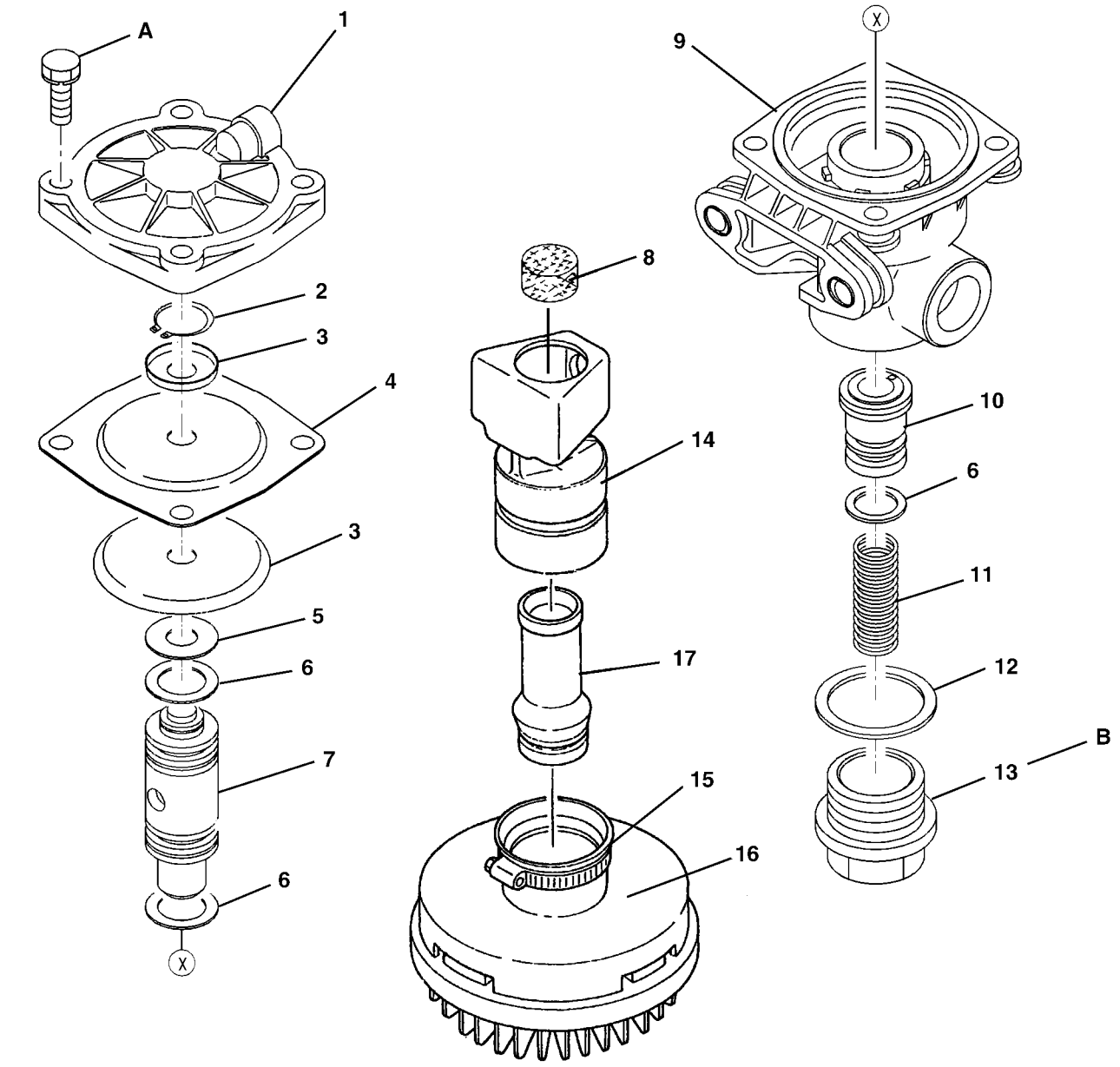
SHTS068020200131

1	Cover	7	Return spring
2	Body	8	Silencer
3	Cap	A	Signal air
4	Diaphragm	B	Outlet air
5	Exhaust valve	C	Exhaust
6	Feed valve	D	Inlet air

COMPONENT LOCATOR

EN0680202D100015

(REPRESENTATIVE TYPE)



SHTS068020200132

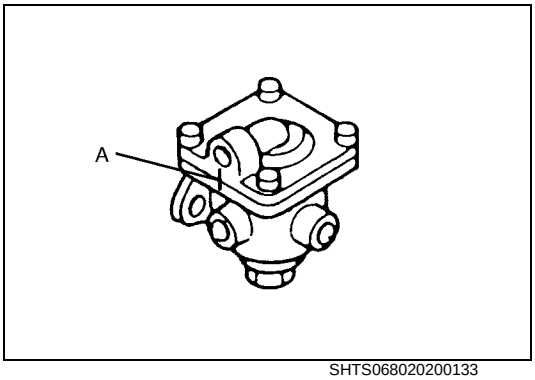
1	Cover	10	Feed valve
2	Retainer ring	11	Return spring
3	Washer	12	Gasket
4	Diaphragm	13	Cap
5	Shim	14	Dust cover
6	O-ring	15	Clip
7	Exhaust valve	16	Silencer
8	Filter	17	Pipe
9	Body		

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

A	11.8-14.7 {120-150, 9-10}	B	59-78 {600-800, 44-57}

OVERHAUL

EN0680202H200014

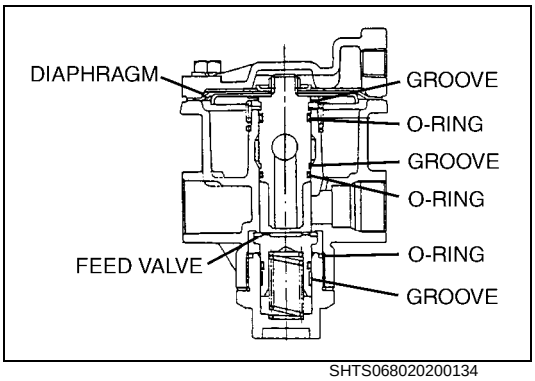


SHTS068020200133

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark A to the cover and body.



SHTS068020200134

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

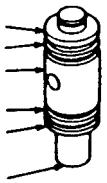
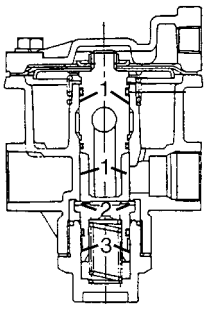
(1) When reassembling the relay valve, replace the O-rings, diaphragm, gasket and feed valve with new ones.

(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300018

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surfaces and valve contact surfaces of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve Body, Sliding surfaces 1 and valve contact surfaces 2: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cap, Sliding surfaces 3: Wear and damage	**—**	**—**	**Replace, if necessary.**	

RELAY VALVE (FOR REAR BRAKE)

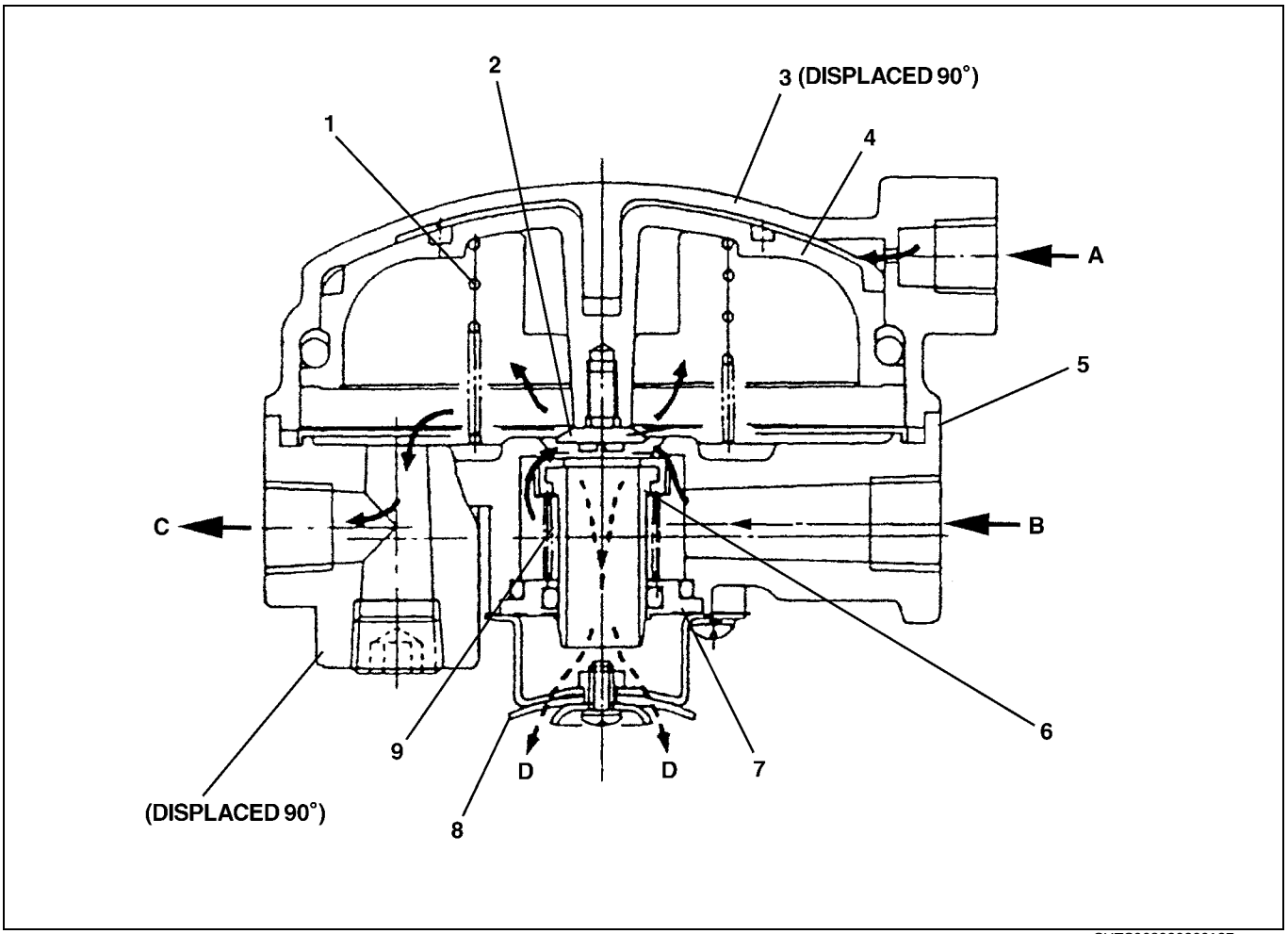
DATA AND SPECIFICATIONS

EN0680202I200016

Type	Piston type
Pressure difference between signal and outlet pressure	Less than 29 kPa {0.3 kgf/cm^2, 4.26 lbf/in.^{2}}

DESCRIPTION

EN0680202C100017

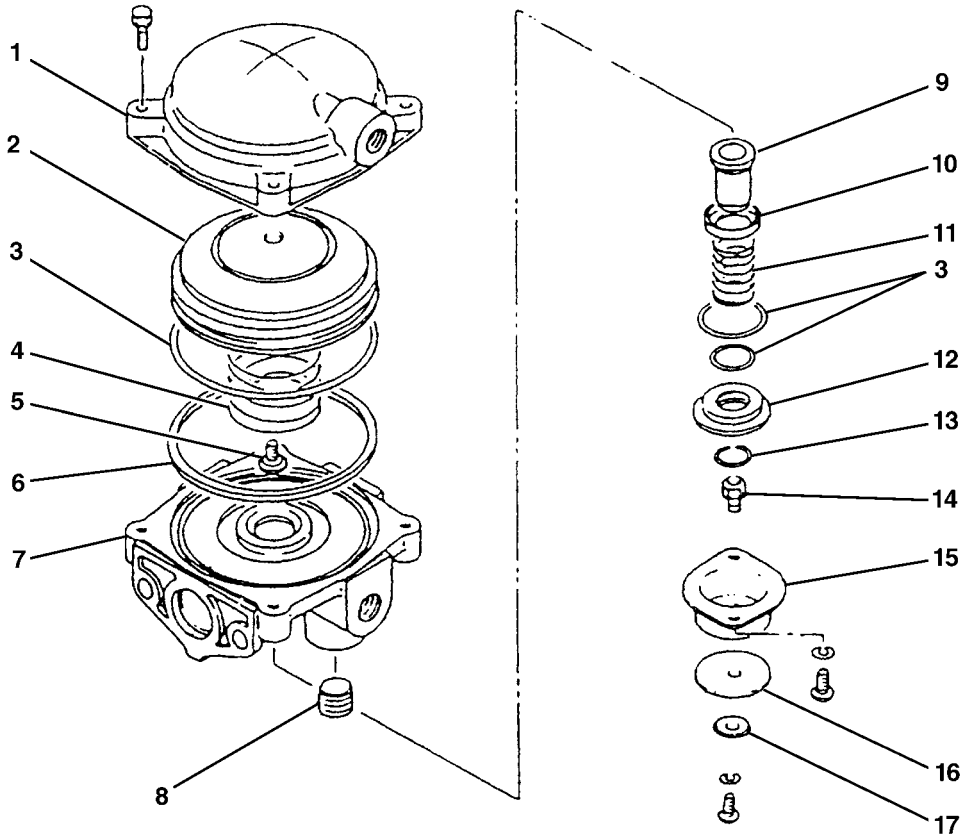


SHTS068020200137

1	Return spring	8	Check valve
2	Exhaust valve	9	Feed valve return spring
3	Cover	A	Signal air
4	Piston	B	Inlet air
5	Valve body	C	Outlet air
6	Feed valve	D	Exhaust
7	Valve retainer		

COMPONENT LOCATOR

EN0680202D100016

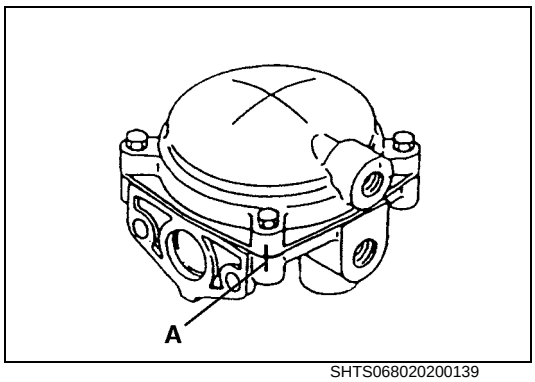


SHTS068020200138

1	Cover	10	Spring seat
2	Piston	11	Feed valve return spring
3	O-ring	12	Valve retainer
4	Piston return spring	13	Retainer ring
5	Exhaust valve	14	Nut
6	Dust seal	15	Dust cover
7	Exhaust valve	16	Check valve
8	Plug	17	Plate
9	Feed valve		

OVERHAUL

EN0680202H200015

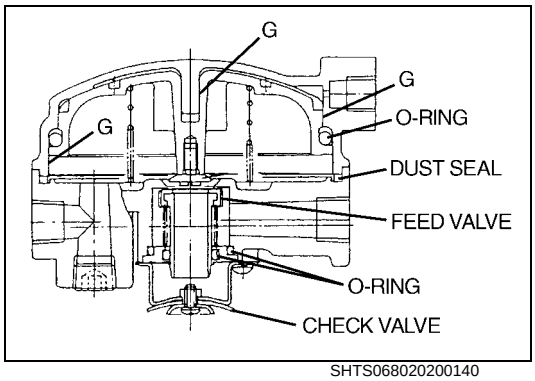


SHTS068020200139

IMPORTANT POINT - ASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark "A" to the cover and body.



SHTS068020200140

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

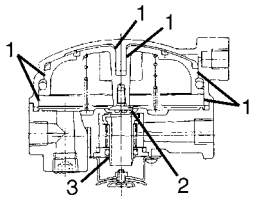
(1) When reassembling the relay valve, replace the O-rings, diaphragm, gasket and feed valve with new ones.

(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.

(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

EN0680202H300019

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve cover, sliding surface 1: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Piston assembly, sliding surface 1, valve contact surface 2: Wear and damage	**—**	**—**	**Replace, if necessary.**	
Valve body, valve contact surface 3: Wear and damage	**—**	**—**	**Replace, if necessary.**	

RELAY VALVE (FOR REAR BRAKE) (FOR IRELAND)

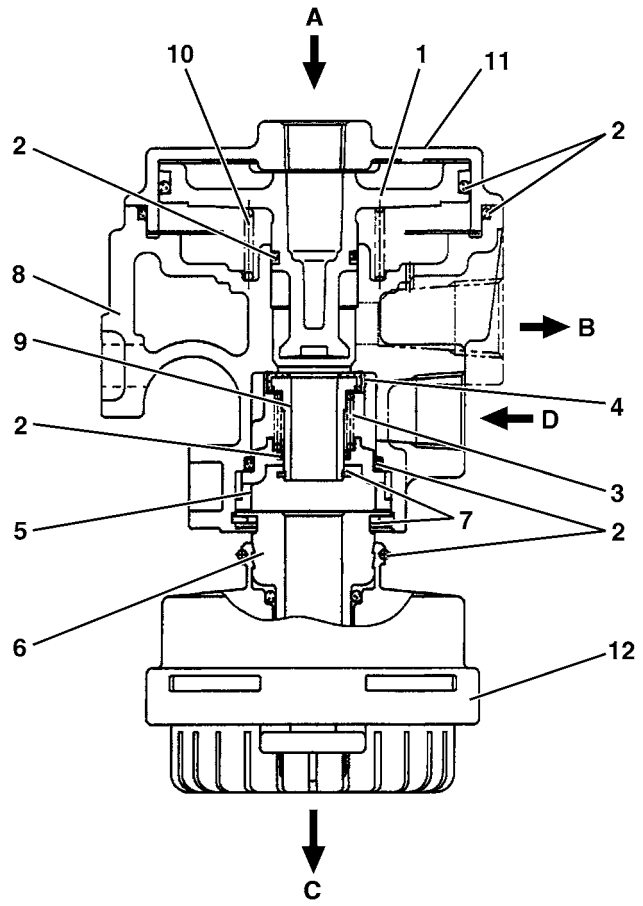
DATA AND SPECIFICATIONS

EN0680202I200017

Type	**Diaphragm type with double check valve combined**
Pressure difference between signal and outlet pressure	**34 kPa {0.34 kgf/cm^2, 4.93 lbf/in.^{2}} or less (At output pressure is 50 kPa {0.51 kgf/cm^2, 7.25 lbf/in.^{2}} or more)**

DESCRIPTION

EN0680202C100018

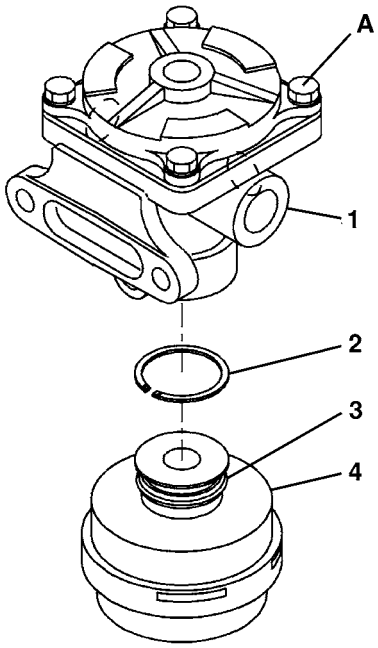


SHTS068020200142

1	Piston	9	Inlet valve
2	O-ring	10	Piston spring
3	Valve spring	11	Cover
4	Valve retainer	12	Silencer
5	Valve guide	A	Signal
6	Valve seat	B	Outlet
7	Retainer ring	C	Exhaust
8	Body	D	Inlet

COMPONENT LOCATOR

EN0680202D100017



SHTS068020200143

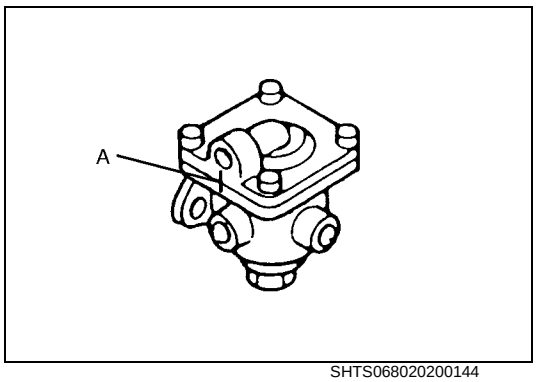
1	Relay valve	3	O-ring
2	Retainer ring	4	Silencer

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

A	12-19 {123-193, 8.9-14}		

OVERHAUL

EN0680202H200016

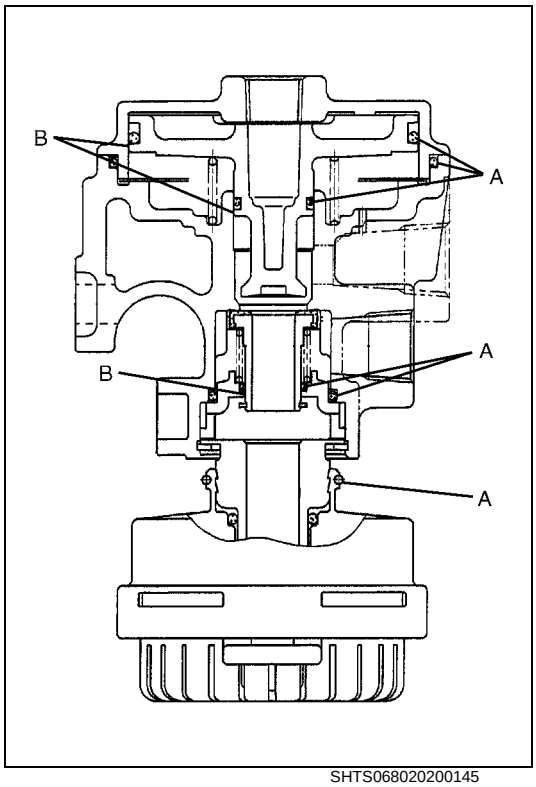


SHTS068020200144

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the relay valve, apply the aligning mark A to the cover and body.



SHTS068020200145

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When assembling the relay valve, use new O-rings and valves.

(2) Apply the silicone grease to each sliding surface of the component parts and O-ring groove.

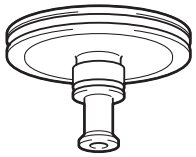
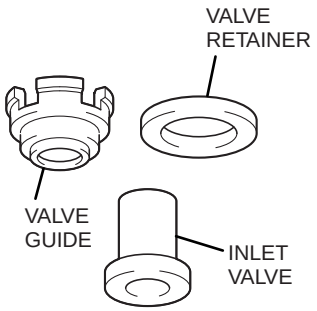
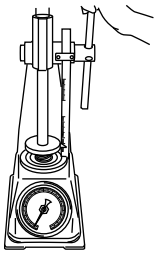
A: O-ring

B: Apply the silicone grease

INSPECTION AND REPAIR

EN0680202H300020

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Piston and sliding surface of cover and valve body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Inlet valve, valve guide, valve retainer and valve body sliding surface: Wear and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Valve spring and piston spring: Free length/ Setting length/ Setting load Crack, rust and damage	**Valve spring 23.5 {0.93}/ 15.7 {0.62}/ 29.0 N {2.96 kgf, 6.52 lbf}**	**21.8 N {2.22 kgf, 4.90 lbf} (Setting load)**	**Replace, if necessary.**	**Measure and visual check** 
	Piston spring 34.5 {1.36}/ 18.8 {0.74}/ 54.6 N {5.57 kgf, 12.27 lbf}	**41.0 N {4.18 kgf, 9.22 lbf} (Setting load)**		

CUT VALVE

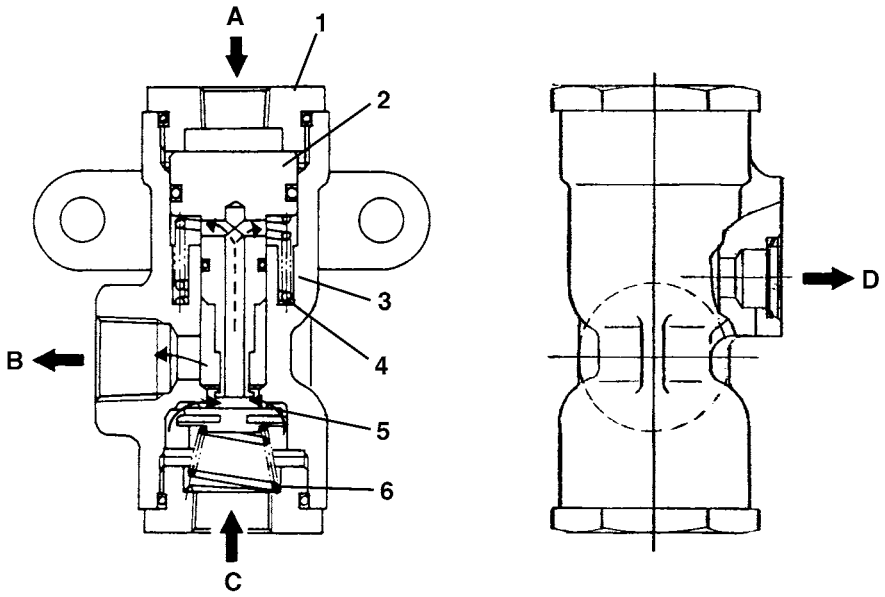
DATA AND SPECIFICATION

EN0680202I200018

Type	Spring type

DESCRIPTION

EN0680202C100019

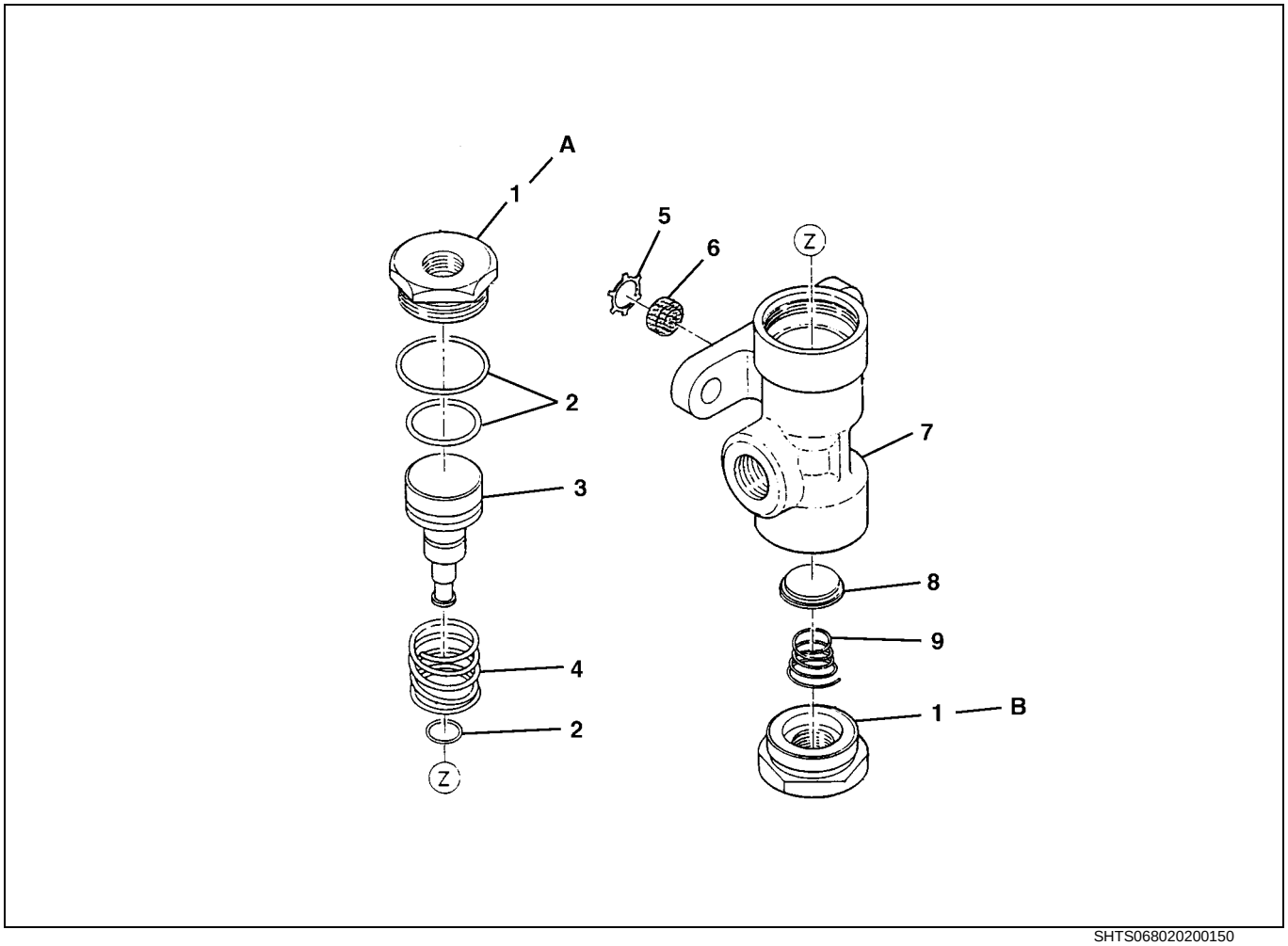


SHTS068020200149

1	Valve cap	6	Conical spring
2	Piston	A	Signal
3	Valve body	B	Outlet
4	Spring	C	Inlet
5	Valve sub assembly	D	Exhaust

COMPONENT LOCATOR

EN0680202D100018



SHTS068020200150

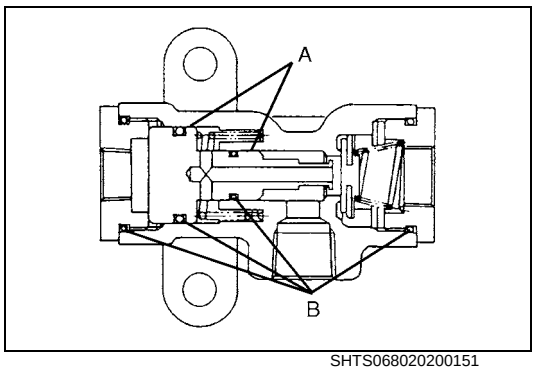
1	Valve cap	4	Spring	7	Valve body
2	O-ring	5	Ring retainer	8	Valve sub assembly
3	Piston	6	Filter	9	Conical spring

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

A	49.04-58.83 {500-600, 36.2-43.3}	B	49.04-58.83 {500-600, 36.2-43.3}

OVERHAUL

EN0680202H200017



SHTS068020200151

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION
(1) When assembling the cut valve, use the new O-ring and valve.
(2) Apply the silicone grease to the each sliding surface of the component parts and O-ring groove.

NOTICE
Check the air leakage from exhaust port, with the piston at the released position.
A: Sliding surface
B: O-ring

PERFORMANCE CHARACTERISTIC

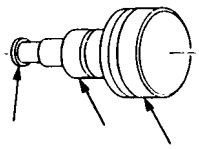
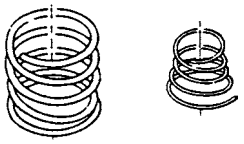
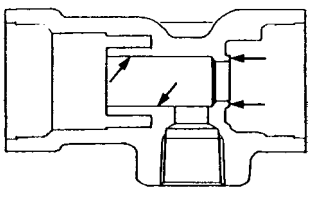
1. When the inlet pressure is 686 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}, the valve should be opened with the signal pressure of below 343 kPa {3.5 kgf/cm^2, 49.77 lbf/in.^{2}} and the valve should be closed with the signal pressure of 147-245 kPa {1.5-2.4 kgf/cm^2, 21.32-35.53 lbf/in.^{2}}.

2. When the inlet and signal pressure are decreasing at same time, the valve should be closed at pressure of 99-196 kPa {1.0-2.0 kgf/cm^2, 14.22-28.44 lbf/in.^{2}}.

3. When the inlet and signal pressure are increasing at same time, the valve should be opened with the pressure of 148-245 kPa {1.5-2.5 kgf/cm^2, 21.33-35.55 lbf/in.^{2}}.

INSPECTION AND REPAIR

EN0680202H300021

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface and valve contact surface of piston: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring: Rust and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body: Sliding surface and contact surface: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

SPRING BRAKE CHAMBER
[FOR REAR BRAKE (WEDGE TYPE)]

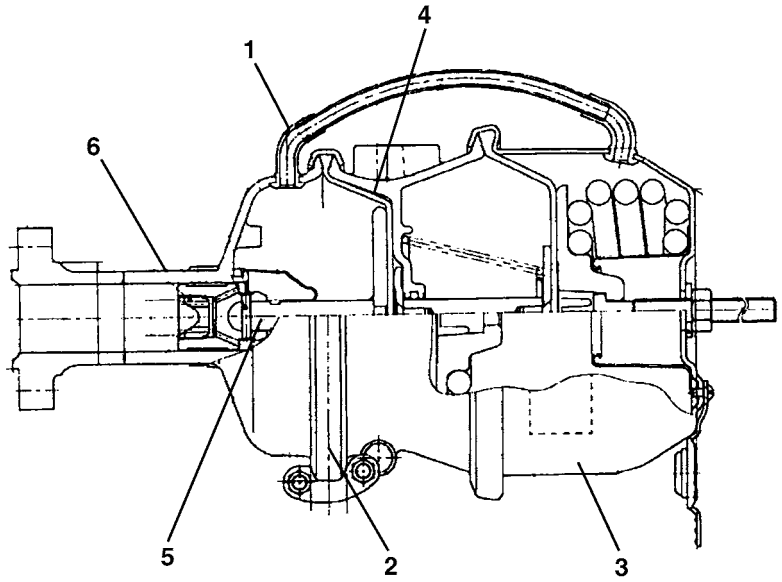
DATA AND SPECIFICATION

EN0680202I200019

Type	**Spring and piston type brake chamber combined with diaphragm type chamber**

DESCRIPTION

EN0680202C100020

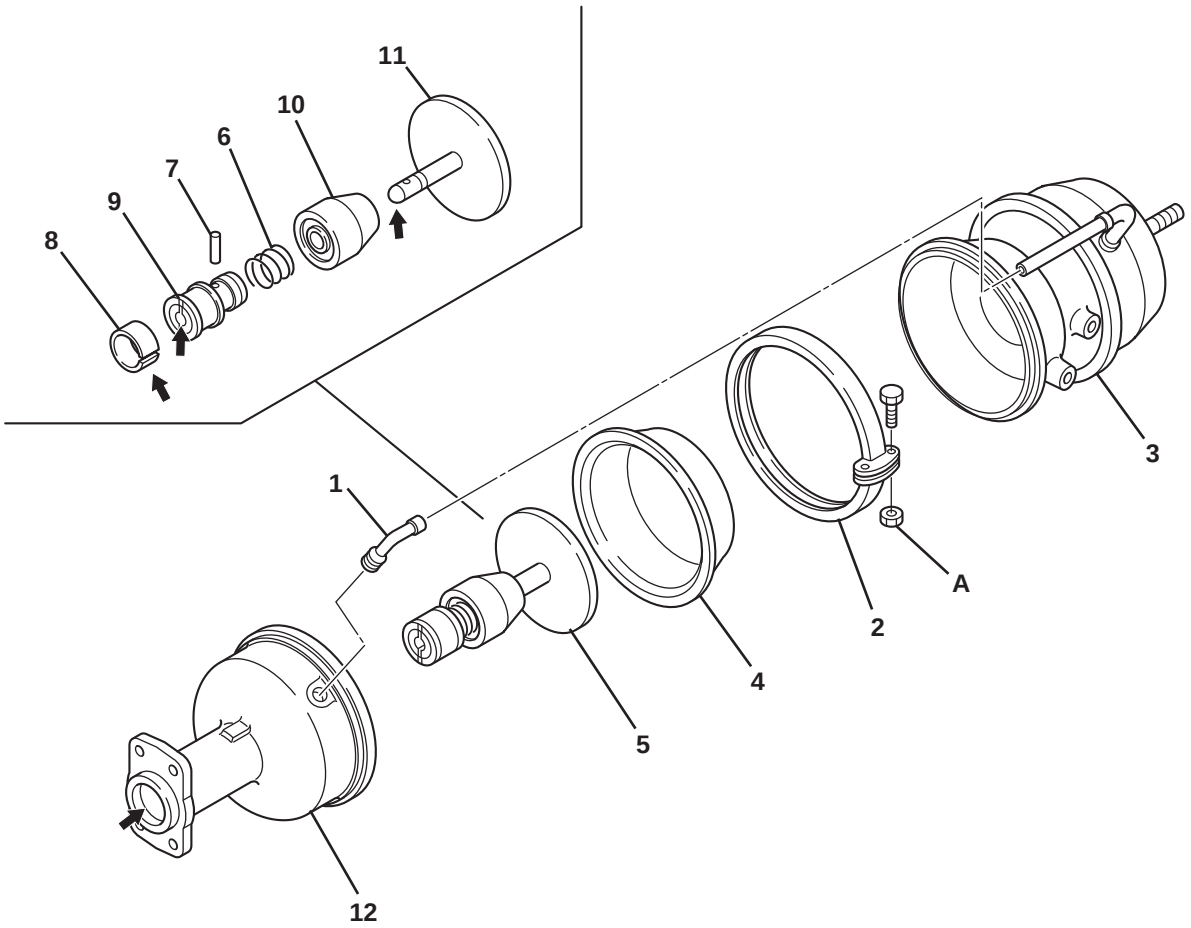


SHTS068020200155

1	**Elbow**	**4**	**Diaphragm**
2	**Clamp**	**5**	**Push rod assembly**
3	**Piggyback**	**6**	**Bracket**

COMPONENT LOCATOR

EN0680202D100019



: Apply grease (Dynamax No.2: COSMO OIL CO., LTD product or equivalent).

SHTS068020200156

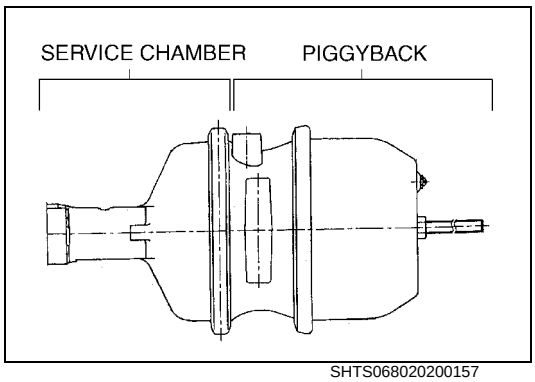
1	Elbow	7	Pin
2	Clamp	8	Bushing
3	Piggyback	9	Push rod guide
4	Diaphragm	10	Push rod boot
5	Push rod assembly	11	Push rod
6	Ring	12	Bracket

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

A	14.7-20.0 {150-204, 11.0-14.8}	

OVERHAUL

EN0680202H200018

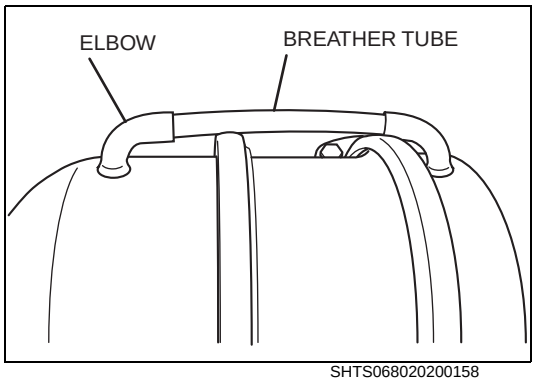


SHTS068020200157

IMPORTANT POINT - DISASSEMBLY

1. DISASSEMBLY OF SPRING BRAKE CHAMBER

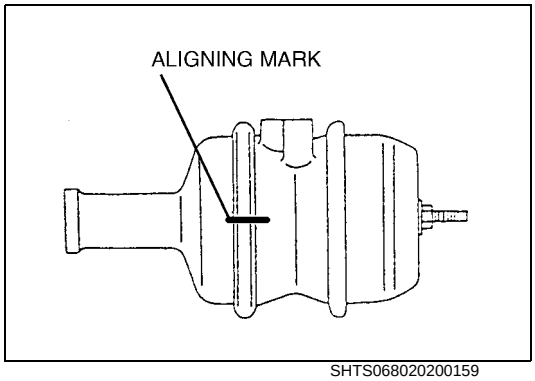
NOTICE
Piggyback is very dangerous because there is very strong spring inside it. Never disassemble the piggyback.



SHTS068020200158

(1) Disconnect the breather tube from the service chamber side elbow.

NOTICE
- **Do not disconnect the breather tube from the piggyback side.**
- **Pulling the center of the elbow obliquely can easily disconnect the breather tube from the elbow.**



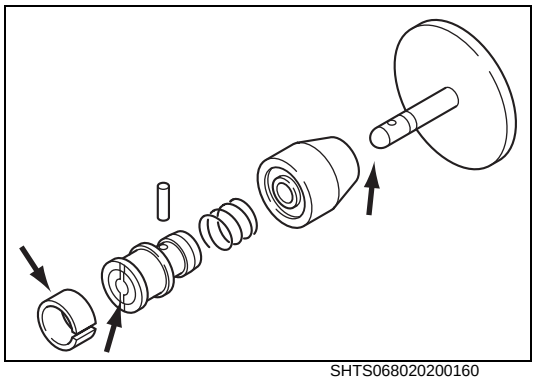
SHTS068020200159

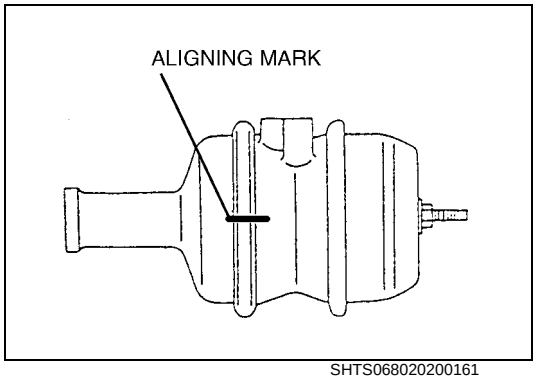
(2) Apply the aligning mark on the clamp, piggyback and bracket.
(3) Remove the clamp, the piggyback and diaphragm from the bracket.
(4) Remove the ring and pin, then disassemble the push rod assembly.

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY OF THE PUSH ROD ASSEMBLY

(1) Before assembling, apply grease (Dynamax No.2: COSMO OIL., LTD. product or equivalent) to each component parts.


SHTS068020200160



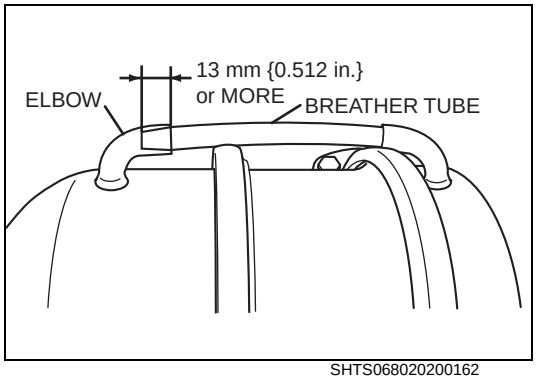
SHTS068020200161

2. ASSEMBLY OF THE SPRING BRAKE CHAMBER

(1) Apply grease to inside of the bracket, and install the push rod assembly, new diaphragm, piggyback and clamp.

NOTICE

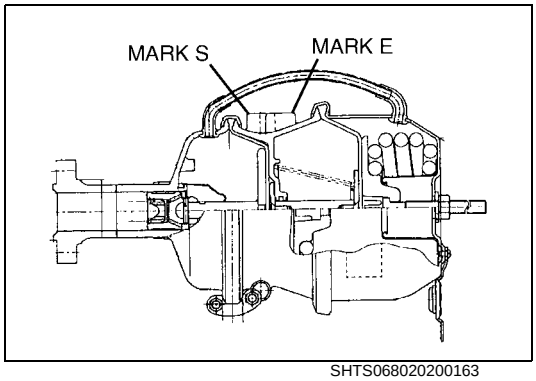
- **Do not adhere grease to the diaphragm.**
- **Before assembling, align the aligning marks on the clamp, piggyback and bracket.**



SHTS068020200162

(2) After wiping the breather tube, apply lock agent (LOCTITE 414 or equivalent) on the tube open end.

(3) Insert the breather tube in the elbow as shown in the figure.



SHTS068020200163

3. INSPECTION FOR AIR LEAKAGE

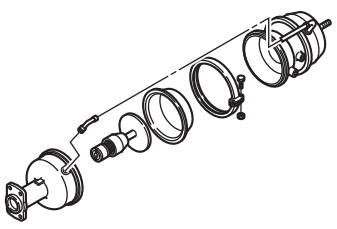
(1) Apply compressed air of 690-880 kPa {7.0-9.0 kgf/cm^2, 100-128 lbf/in.^{2}} to both inlet ports marked E and S, and make sure that there is no air leakage from the joints of the assembly.

4. INSPECTION FOR PISTON MOVEMENT

(1) Apply compressed air of 690-880 kPa {7.0-9.0 kgf/cm^2, 100-128 lbf/in.^{2}} to the inlet port marked E gradually and measure the service chamber stroke.
Piston stroke: 58-61 mm {2.28-2.40 in.}

INSPECTION AND REPAIR

EN0680202H300022

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Bracket, push rod, diaphragm and piggyback: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

SPRING BRAKE CHAMBER
[FOR FRONT BRAKE (S-CAM TYPE)]

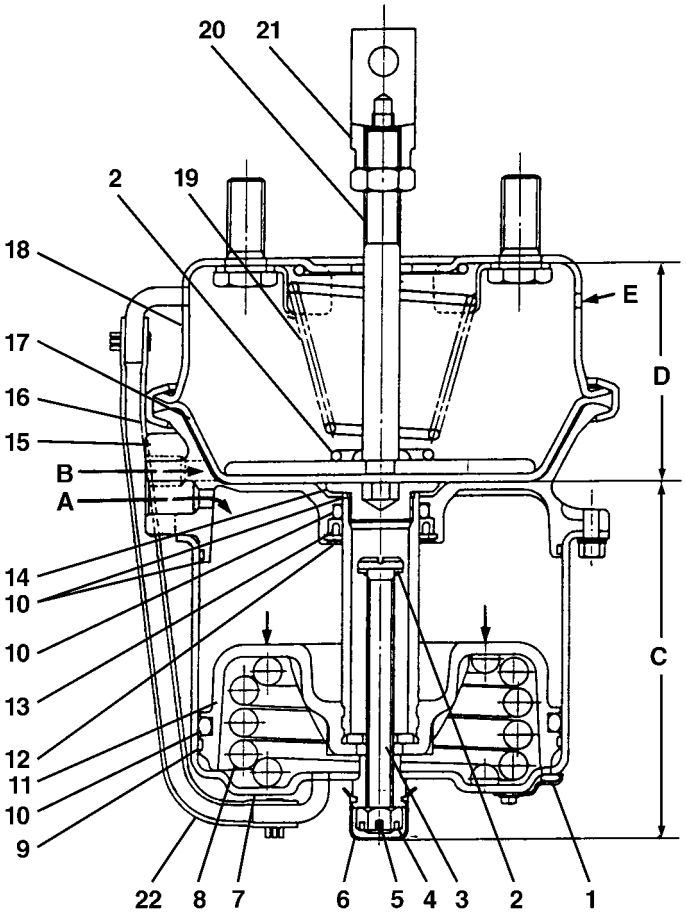
DATA AND SPECIFICATION

EN0680202I200020

Type	**Spring and piston type brake chamber combined with diaphragm type chamber with breather tube**

DESCRIPTION

EN0680202C100021



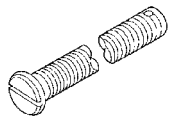
SHTS068020200165

1	Filter	11	Piston	21	Clevis
2	Retainer	12	Retainer ring	22	Breather tube
3	Release bolt	13	Bushing	A	Spring brake air port
4	Slotted nut	14	Piston follower		(Emergency and parking) - for releasing air
5	Spring pin	15	Bulkhead	B	Service brake air port (Service) - for braking air
6	Dust cover	16	Clamp band	C	Spring brake portion
7	Spring brake chamber	17	Diaphragm	D	Service brake portion
8	Spring	18	Service brake chamber	E	Drain hole
9	Piston ring	19	Compression spring		
10	O-ring	20	Push rod		

SPECIAL TOOL

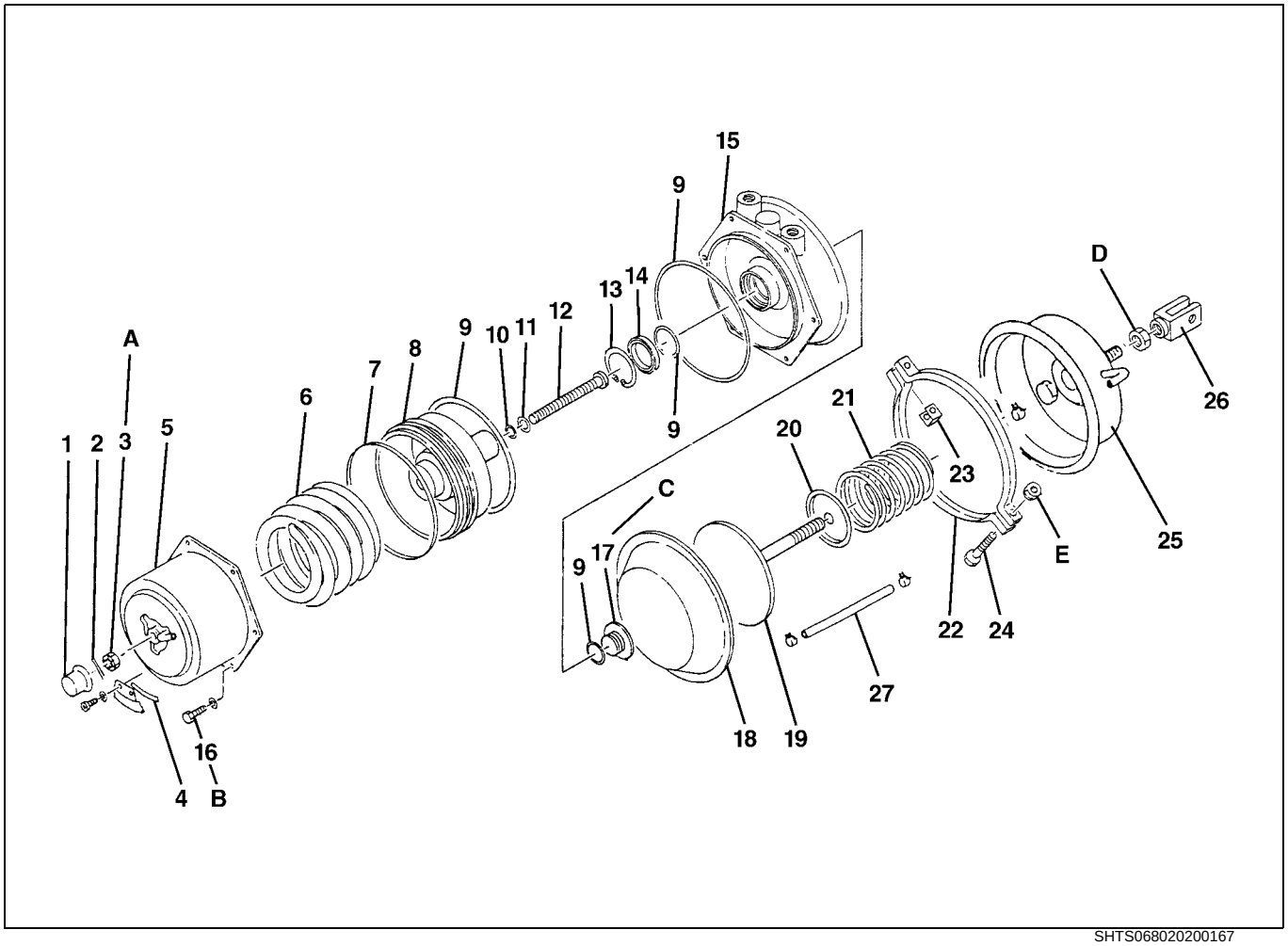
EN0680202K100001

Prior to starting a spring brake chamber overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	S0968-31051	SPRING BRAKE PISTON RELEASE BOLT	

COMPONENT LOCATOR

EN0680202D100020



SHTS068020200167

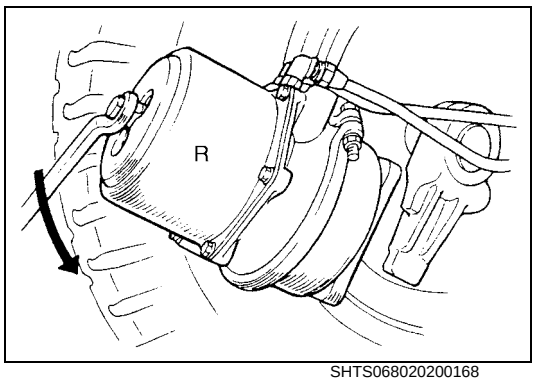
1	Dust cover	10	Retainer	19	Push rod
2	Spring pin	11	Plain washer	20	Spring retainer
3	Slotted nut	12	Release bolt	21	Compression spring
4	Filter	13	Retainer ring	22	Clamp band
5	Spring brake chamber	14	Bushing	23	Spacer
6	Spring	15	Bulkhead	24	Clamp band bolt
7	Piston ring	16	Chamber cover bolt	25	Service brake chamber
8	Piston	17	Piston follower	26	Clevis
9	O-ring	18	Diaphragm	27	Breather tube

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

A	39.2-44.2 {400-450, 29-32}	D	39.0-49.0 {400-500, 29-36}
B	9.8-17.6 {100-180, 7.3-13.0}	E	26.5-32.3 {270-330, 20-23}
C	39.0-49.0 {400-500, 29-36}		

OVERHAUL

EN0680202H200019



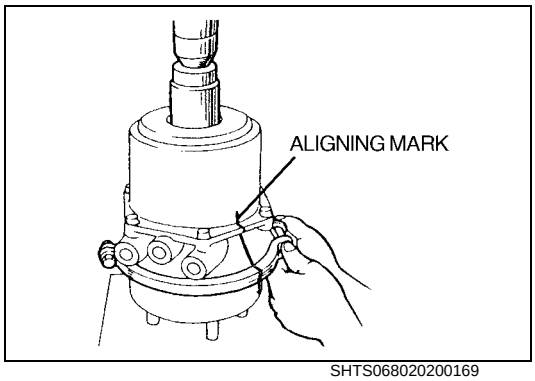
SHTS068020200168

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING THE CHAMBER ASSEMBLY

(1) Before dismounting the chamber, turn the release bolt counter-clockwise to release the spring brake.

(2) Apply a position mark R or L to make clear the side where the chamber was installed.

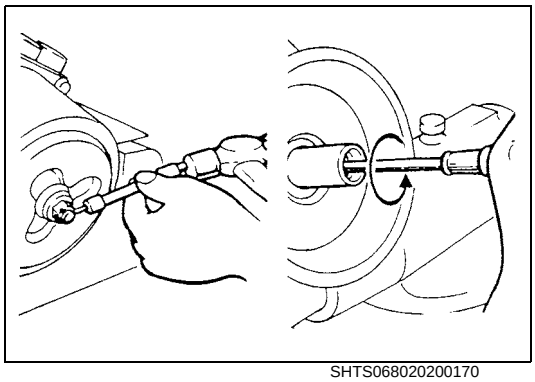


SHTS068020200169

IMPORTANT POINT - DISASSEMBLY

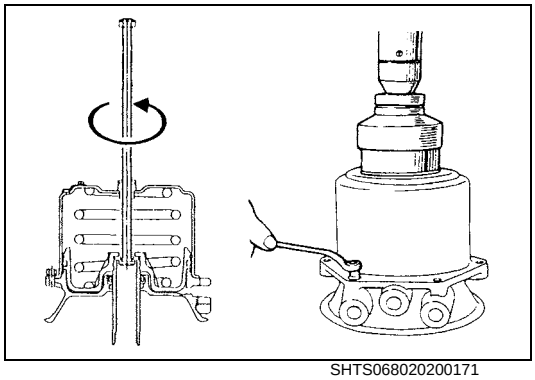
NOTICE

Before disassembling, put aligning marks to the clamp band, service brake chamber, bulkhead and spring brake chamber.

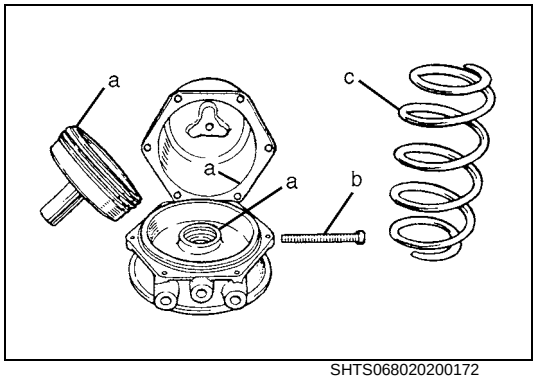

SHTS068020200170

1. DISASSEMBLING THE SPRING BRAKE CHAMBER

(1) Remove the piston follower and then remove the dust cover, spring pin and release bolt.


SHTS068020200171

(2) Use a press or special tool to hold the spring in compression then remove the chamber cover bolt.
SST: Spring brake piston release bolt (S0968-31051)



SHTS068020200172

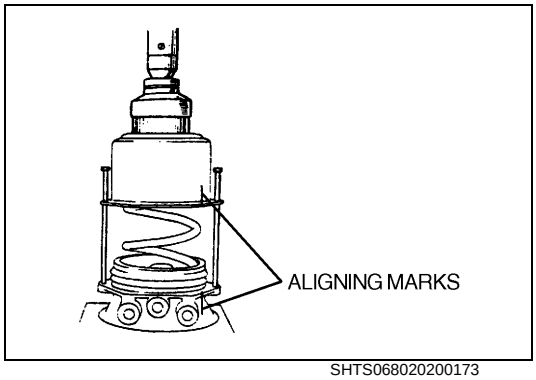
IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the spring brake chamber, replace the piston ring, bushing and O-ring with new ones.

(2) Apply grease or oil to each point.

- a Silicone grease: O-ring, Bushing, Piston ring and Spring brake chamber inner side.
- b Bearing grease: Release bolt
- c Rust preventive oil: Spring



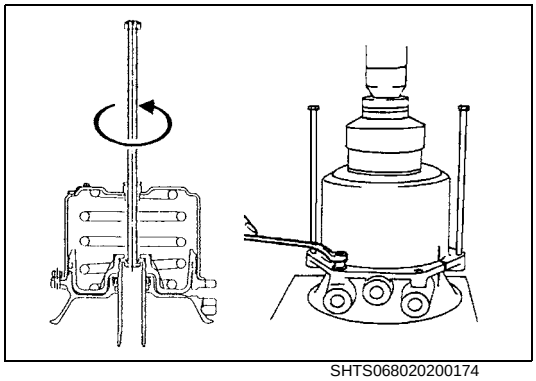
SHTS068020200173

2. ASSEMBLING THE SPRING BRAKE CHAMBER

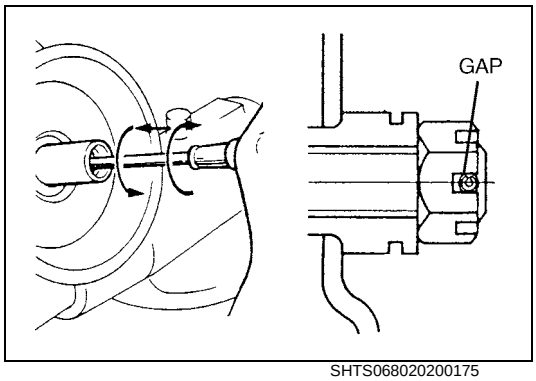
(1) Attach guide bolts to align the holes.

NOTICE

Align the aligning marks of the spring brake chamber and bulkhead.


SHTS068020200174

(2) Use a press or special tool to compress the spring then tighten the chamber cover with the bolts.
SST: Spring brake piston release bolt (S0968-31051)

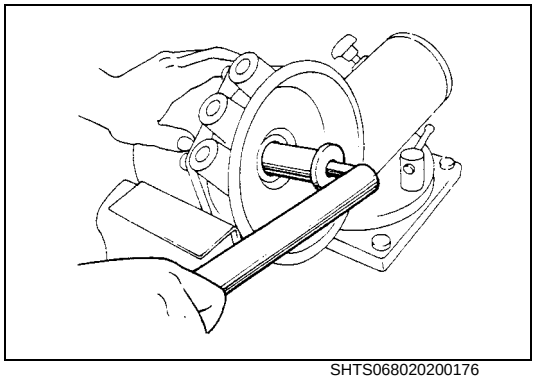


SHTS068020200175

(3) Screw in the release bolt until its head contacts the piston flange, then return the release bolt one or two turns, then install the slotted nut and spring pin.

NOTICE

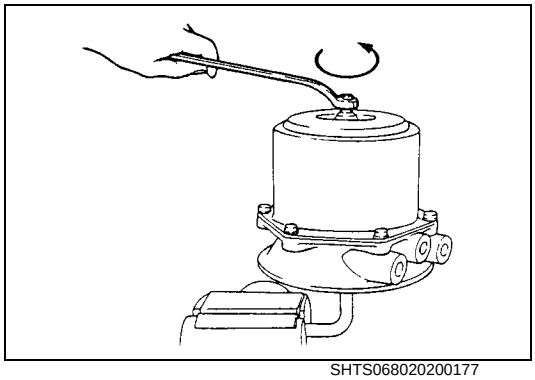
The spring pin should be installed as shown in the figure.


SHTS068020200176

(4) Install the piston follower on the piston.

NOTICE

Apply locking adhesive (LOCTITE 242 or equivalent) to the thread of the piston follower.

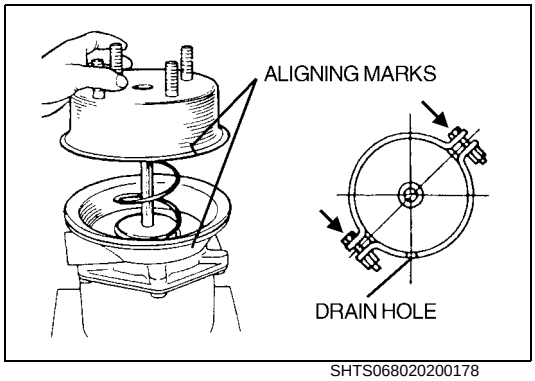

SHTS068020200177

3. ASSEMBLING THE SERVICE BRAKE CHAMBER

(1) Turn the release bolt counterclockwise to compress the spring of the spring brake chamber.

NOTICE

To make turning easy, apply compressed air to the spring brake chamber.



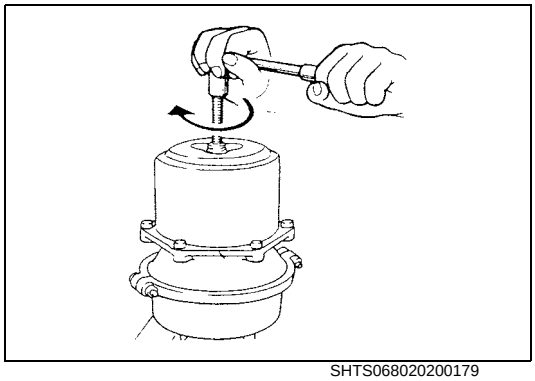
SHTS068020200178

(2) When reassembling the chamber, replace the diaphragm with new one.

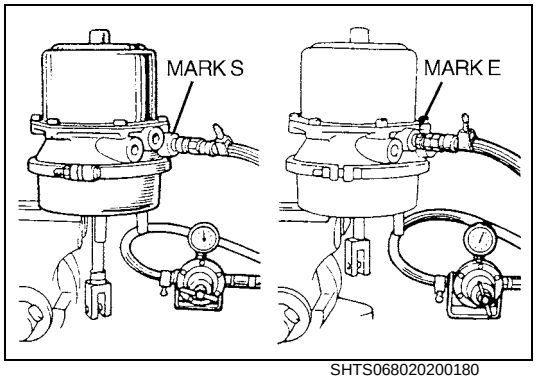
NOTICE

Align the aligning marks of the chamber, clamp band and bulkhead.

(3) Insert the clamp band bolts from opposite side of drain hole and tighten the bolts evenly with nuts within specified torque.


SHTS068020200179

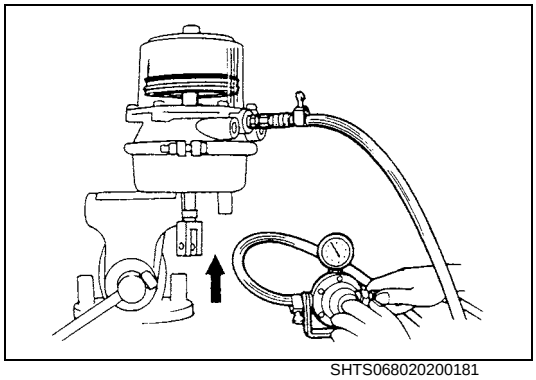
(4) Turn the release bolt clockwise to release the spring of the spring brake chamber.



SHTS068020200180

4. INSPECTION FOR AIR LEAKAGE

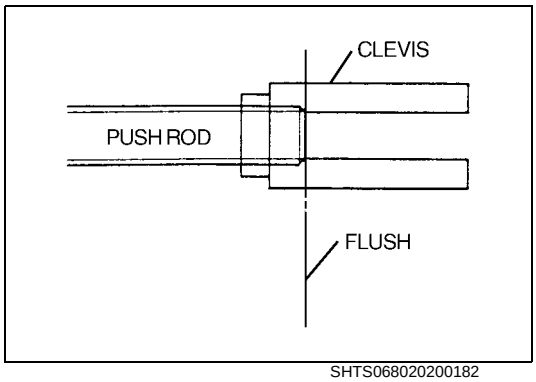
(1) Apply compressed air of 834 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} to both inlet ports marked E and S, and make sure that there is no air leakage from the joints of the assembly.


SHTS068020200181

5. INSPECTION FOR PISTON MOVEMENT

(1) Apply compressed air of 490 kPa {5.0 kgf/cm^2, 71 lbf/in.^{2}} to the inlet port with mark E gradually and make sure that the push rod is completely returned.

Piston stroke: 52 mm {2.05 in.}
for spring brake chamber parts No.
S4785-02920/ -02930/ -02940/ -02950/
-03030/ -03040/ -04370/ -04380

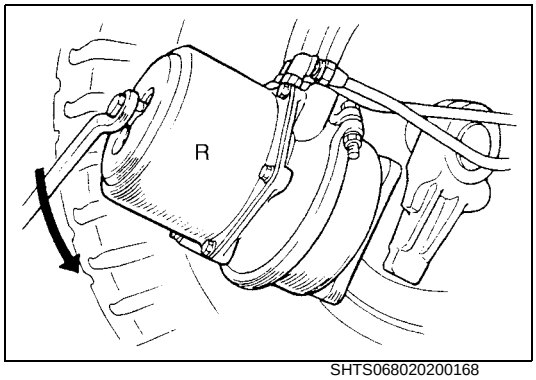


SHTS068020200182

6. SETTING THE CLEVIS TO PUSH ROD

(1) Screw the clevis into the push rod until the screw ends of both clevis and push rod are flush.

IMPORTANT POINT - MOUNTING



SHTS068020200168

1. INSTALLING THE CHAMBER ASSEMBLY

(1) Before mounting, turn the release bolt counterclockwise to release the spring brake.

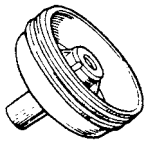
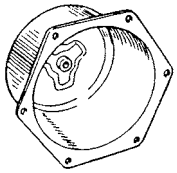
NOTICE

- **Note the position mark R or L on the chamber which mark was applied when dismounting and install it to its former side.**
- **When connecting the clevis with slack adjuster, lubricate clevis pin-hole and clevis pin with sufficient chassis grease.**

(2) After mounting, the release bolt must be set at the specified torque.

INSPECTION AND REPAIR

EN0680202H300023

Inspection item	Standard	Limit	Remedy	Inspection procedure
Piston: **Wear and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Chamber: **Wear and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Spring and compression spring: **Rust and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 

SPRING BRAKE CHAMBER
[FOR REAR BRAKE (S-CAM TYPE)]

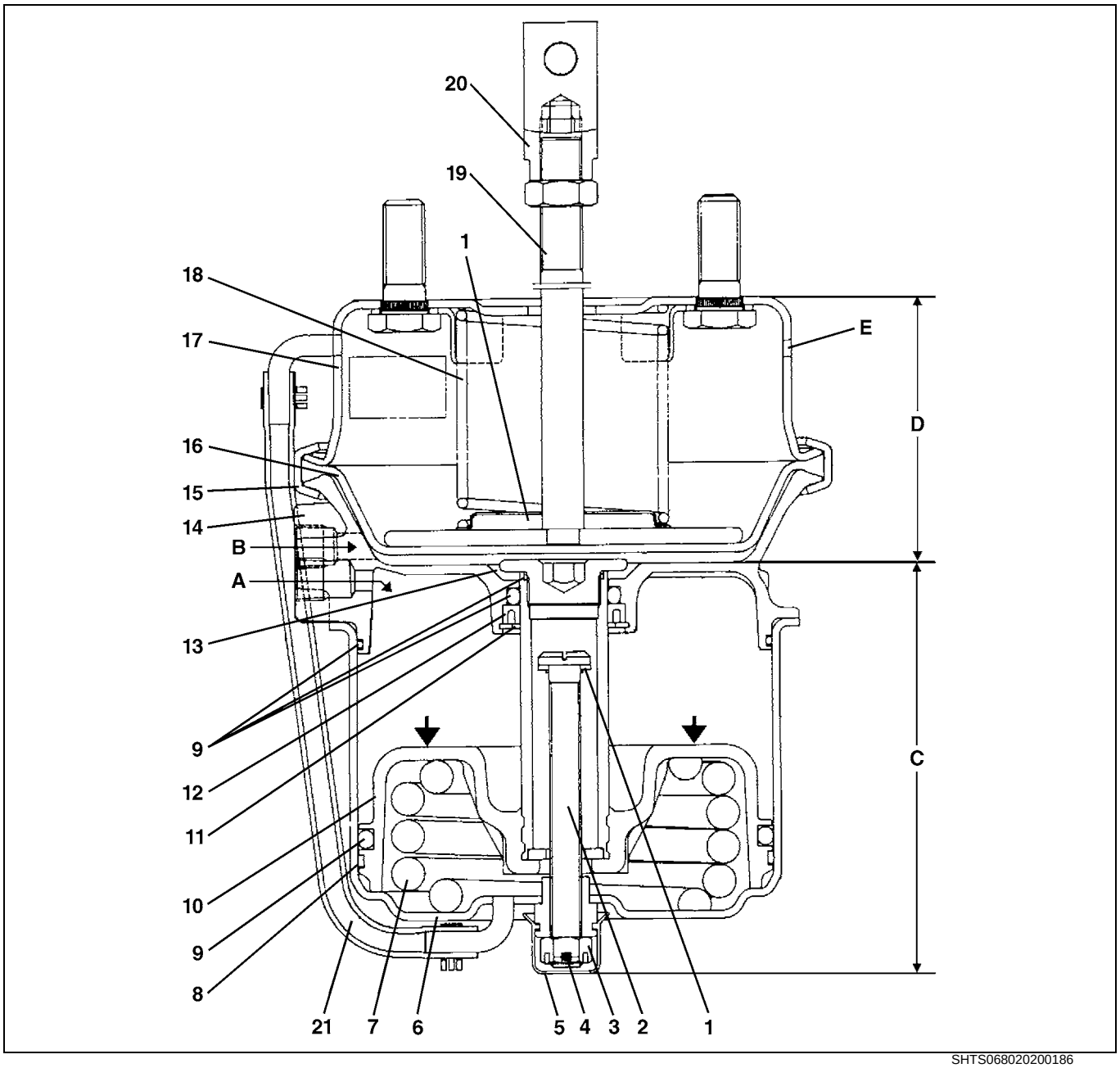
DATA AND SPECIFICATION

EN0680202I200021

Type	**Spring and piston type brake chamber combined with diaphragm type chamber with breather tube**

DESCRIPTION

EN0680202C100022



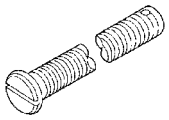
SHTS068020200186

1	**Retainer**	**15**	**Clamp band**
2	**Release bolt**	**16**	**Diaphragm**
3	**Slotted nut**	**17**	**Service brake chamber**
4	**Spring pin**	**18**	**Compression spring**
5	**Dust cover**	**19**	**Push rod**
6	**Spring brake chamber**	**20**	**Clevis**
7	**Spring**	**21**	**Breather tube**
8	**Piston ring**	**A**	**Spring brake air port**
9	**O-ring**		**(Emergency and parking) - for releasing air**
10	**Piston**	**B**	**Service brake air port (Service) - for braking air**
11	**Retainer ring**	**C**	**Spring brake portion**
12	**Bushing**	**D**	**Service brake portion**
13	**Piston follower**	**E**	**Drain hole**
14	**Bulkhead**		

SPECIAL TOOL

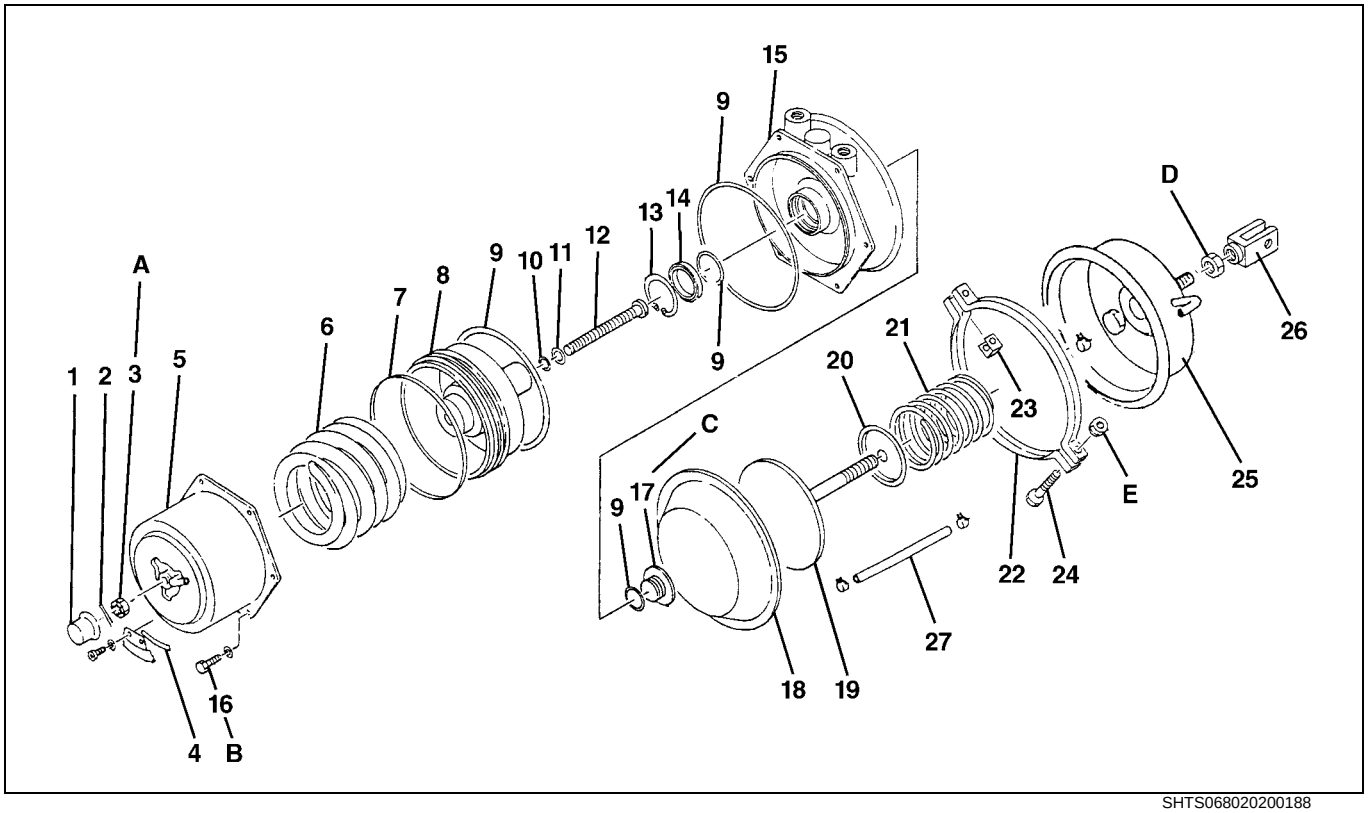
EN0680202K100002

Prior to starting a spring brake chamber overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	S0968-31051	SPRING BRAKE PISTON RELEASE BOLT	

COMPONENT LOCATOR

EN0680202D100021



SHTS068020200188

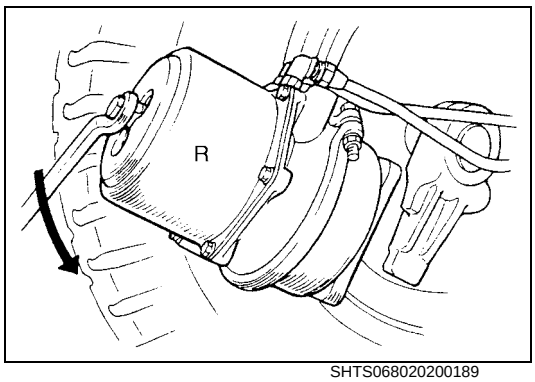
1	Dust cover	10	Retainer	19	Push rod
2	Spring pin	11	Plain washer	20	Spring retainer
3	Slotted nut	12	Release bolt	21	Compression spring
4	Caution plate	13	Retainer ring	22	Clamp band
5	Spring brake chamber	14	Bushing	23	Spacer
6	Spring	15	Bulkhead	24	Clamp band bolt
7	Piston ring	16	Chamber cover bolt	25	Service brake chamber
8	Piston	17	Piston follower	26	Clevis
9	O-ring	18	Diaphragm	27	Breather tube

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

A	39.0-44.0 {400-450, 29-32}	D	39.0-49.0 {400-500, 29-36}
B	9.8-17.6 {100-180, 7.3-13.0}	E	26.5-32.3 {270-330, 20-23}
C	39.0-49.0 {400-500, 29-36}		

OVERHAUL

EN0680202H200020



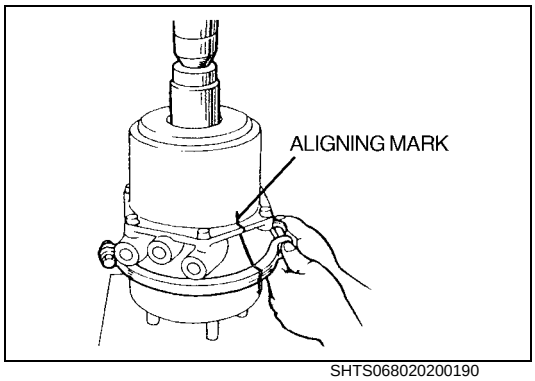
SHTS068020200189

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING THE CHAMBER ASSEMBLY

(1) Before dismounting the chamber, turn the release bolt counter-clockwise to release the spring brake.

(2) Apply a position mark R or L to make clear the side where the chamber was installed.

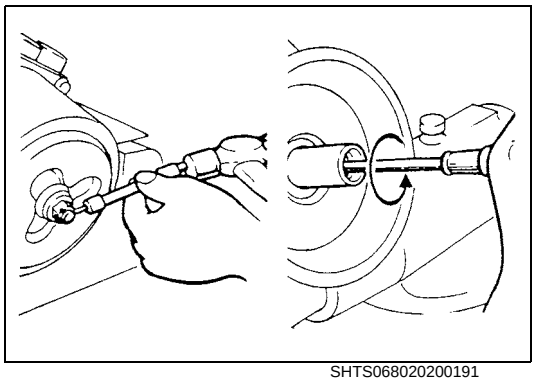


SHTS068020200190

IMPORTANT POINT - DISASSEMBLY

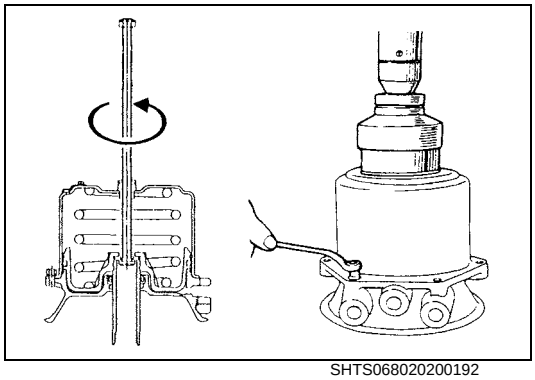
NOTICE

Before disassembling, put aligning marks to the clamp band, service brake chamber, bulkhead and spring brake chamber.

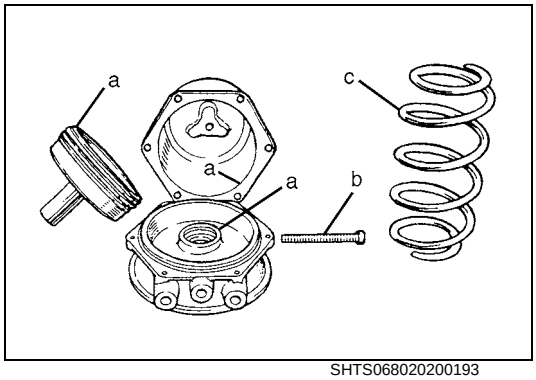

SHTS068020200191

1. DISASSEMBLING THE SPRING BRAKE CHAMBER

(1) Remove the piston follower and then remove the dust cover, spring pin and release bolt.


SHTS068020200192

(2) Use a press or special tool to hold the spring in compression then remove the chamber cover bolt.
SST: Spring brake piston release bolt (S0968-31051)



SHTS068020200193

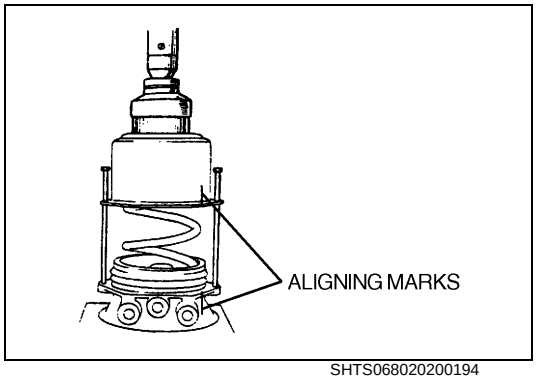
IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

(1) When assembling the spring brake chamber, replace the piston ring, bushing and O-ring with new ones.

(2) Apply grease or oil to each point.

- a Silicone grease: O-ring, Bushing, Piston ring and Spring brake chamber inner side.
- b Bearing grease: Release bolt
- c Rust preventive oil: Spring



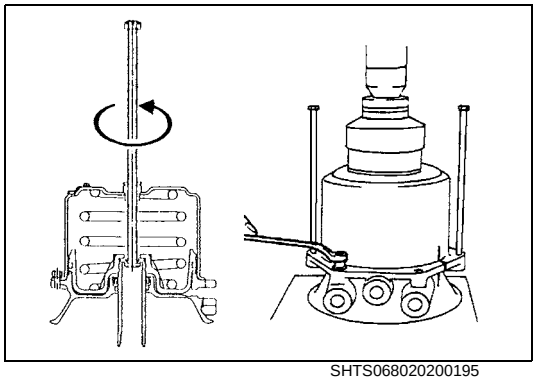
SHTS068020200194

2. ASSEMBLING THE SPRING BRAKE CHAMBER

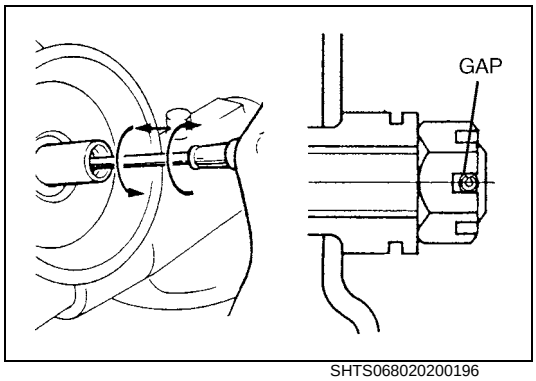
(1) Attach guide bolts to align the holes.

NOTICE

Align the aligning marks of the spring brake chamber and bulkhead.


SHTS068020200195

(2) Use a press or special tool to compress the spring then tighten the chamber cover with the bolts.
SST: Spring brake piston release bolt (S0968-31051)

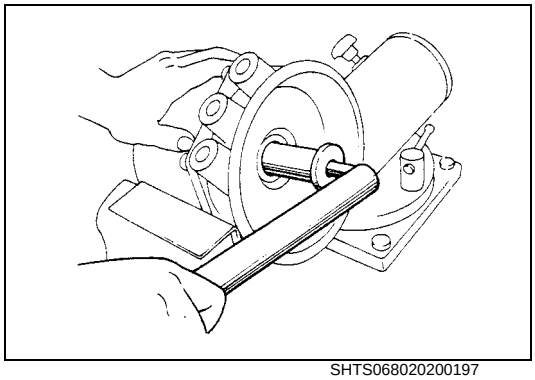


SHTS068020200196

(3) Screw in the release bolt until its head contacts the piston flange, then return the release bolt one or two turns, then install the slotted nut and spring pin.

NOTICE

The spring pin should be installed as shown in the figure.

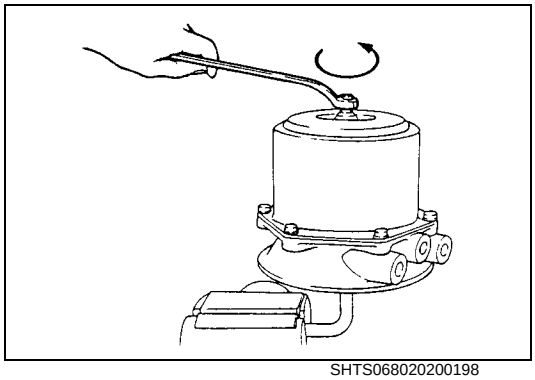


SHTS068020200197

(4) Install the piston follower on the piston.

NOTICE

Apply locking adhesive (LOCTITE 242 or equivalent) to the thread of the piston follower.



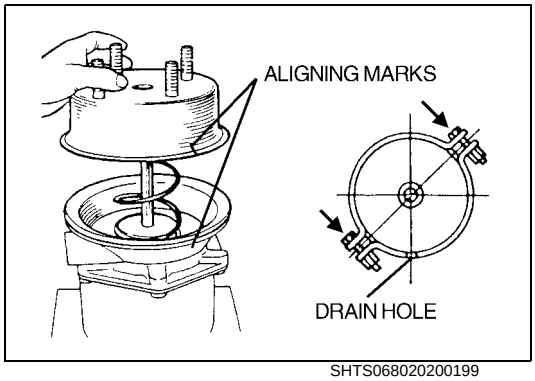
SHTS068020200198

3. ASSEMBLING THE SERVICE BRAKE CHAMBER

(1) Turn the release bolt counterclockwise to compress the spring of the spring brake chamber.

NOTICE

To make turning easy, apply compressed air to the spring brake chamber.



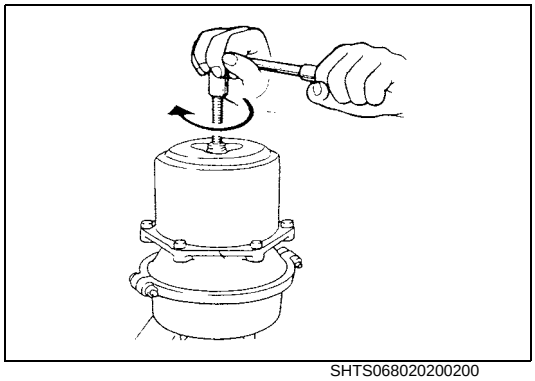
SHTS068020200199

(2) When reassembling the chamber, replace the diaphragm with new one.

NOTICE

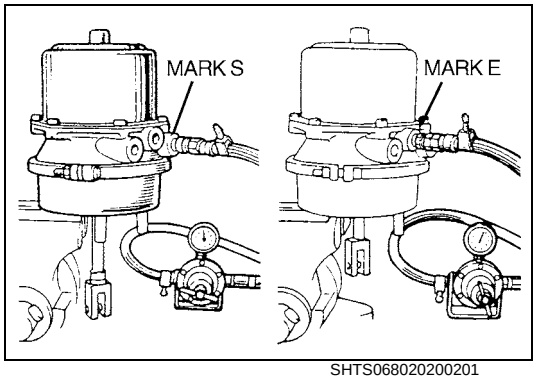
Align the aligning marks of the chamber, clamp band and bulkhead.

(3) Insert the clamp band bolts from opposite side of drain hole and tighten the bolts evenly with nuts within specified torque.



SHTS068020200200

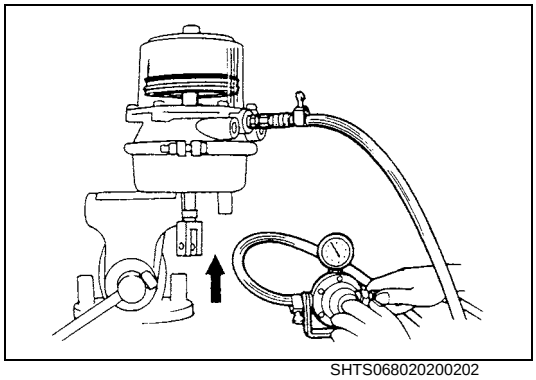
(4) Turn the release bolt clockwise to release the spring of the spring brake chamber.



SHTS068020200201

4. INSPECTION FOR AIR LEAKAGE

(1) Apply compressed air of 834 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} to both inlet ports marked E and S, and make sure that there is no air leakage from the joints of the assembly.

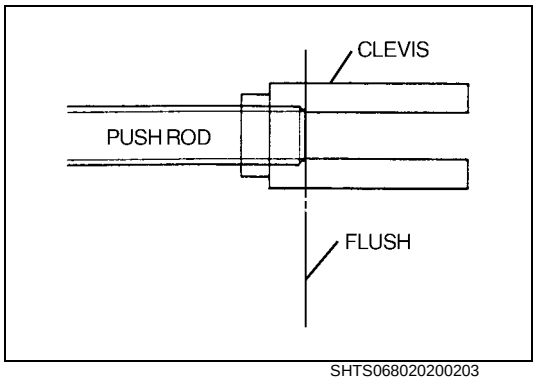

SHTS068020200202

5. INSPECTION FOR PISTON MOVEMENT

(1) Apply compressed air of 640-830 kPa {6.5-8.5 kgf/cm^2, 93-120 lbf/in.^{2}} to the inlet port with mark E gradually and make sure that the push rod is completely returned.

Piston stroke: 62 mm {2.44 in.}
for spring brake chamber parts No.
S4785 -01890/ -01900/ -01971/ -01981/ -02530/ -02540/ -02551/ -02561/ -02570/ -02580/ -02590/ -02600/ -02650/ -02660/ -02670/ -02680/ -02720/ -02730/ -02810/ -02820/ -02830/ -02840/ -02850/ -02860/ -02870/ -02880/ -02890/ -02900/ -02990/ -03000/ -03230/ -03240/ -04410/ -04420

: 52 mm {2.05 in.}
for spring brake chamber parts No.
S4785 -02920/ -02930/ -02940 -02950/ -03030/ -03040

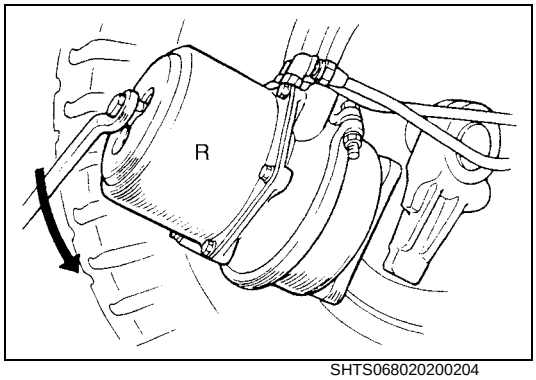


SHTS068020200203

6. SETTING THE CLEVIS TO PUSH ROD

(1) Screw the clevis into the push rod until the screw ends of both clevis and push rod are flush.

IMPORTANT POINT - MOUNTING



SHTS068020200204

1. INSTALLING THE CHAMBER ASSEMBLY

(1) Before mounting, turn the release bolt counterclockwise to release the spring brake.

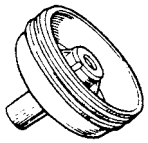
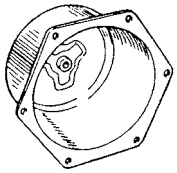
NOTICE

- **Note the position mark R or L on the chamber which mark was applied when dismounting and install it to its former side.**
- **When connecting the clevis with slack adjuster, lubricate clevis pin-hole and clevis pin with sufficient chassis grease.**

(2) After mounting, the release bolt must be set at the specified torque.

INSPECTION AND REPAIR

EN0680202H300024

Inspection item	Standard	Limit	Remedy	Inspection procedure
Piston: **Wear and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Chamber: **Wear and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Spring and compression spring: **Rust and damage**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 

BRAKE CHAMBER (MODELS: FG, GH, SG) [FOR FRONT BRAKE (WEDGE TYPE)]

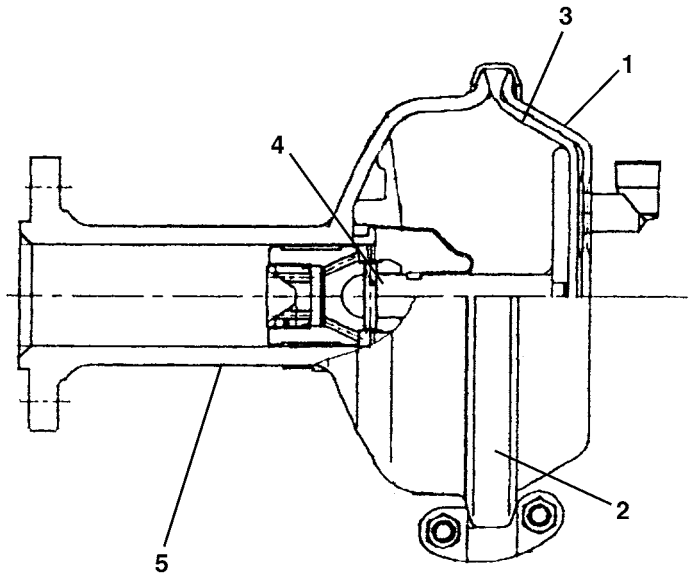
DATA AND SPECIFICATIONS

EN0680202I200022

Type	**Diaphragm type**
Chamber inside diameter	**124 mm {4.88 in.}**

DESCRIPTION

EN0680202C100023

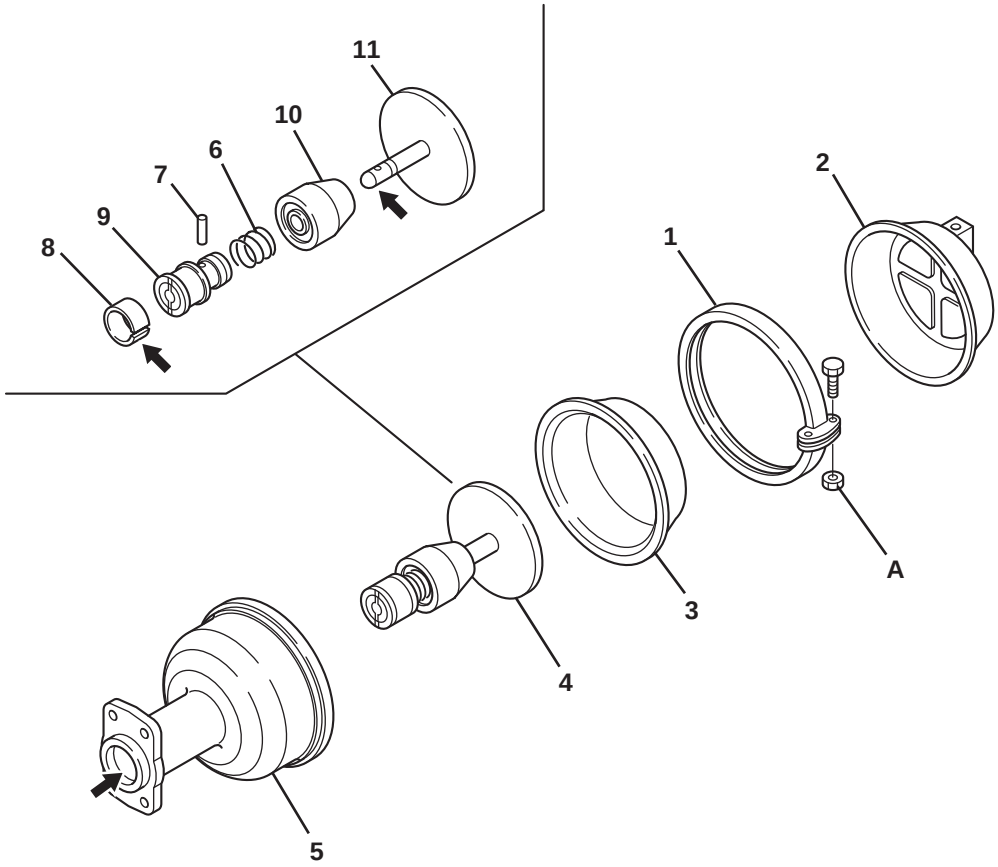


SHTS068020200208

1	**Chamber cover**	**4**	**Push rod assembly**
2	**Clamp**	**5**	**Bracket**
3	**Diaphragm**		

COMPONENT LOCATOR

EN0680202D100022



: Apply grease (Dynamax No.2: COSMO OIL CO., LTD. product or equivalent).

SHTS068020200209

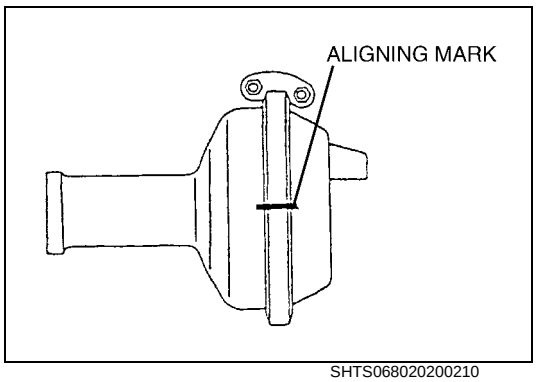
1	Clamp	7	Pin
2	Chamber cover	8	Bushing
3	Diaphragm	9	Push rod guide
4	Push rod assembly	10	Push rod boot
5	Bracket	11	Push rod
6	Ring		

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

A	14.7-20.0 {150-204, 11.0-14.8}	

OVERHAUL

EN0680202H200021



SHTS068020200210

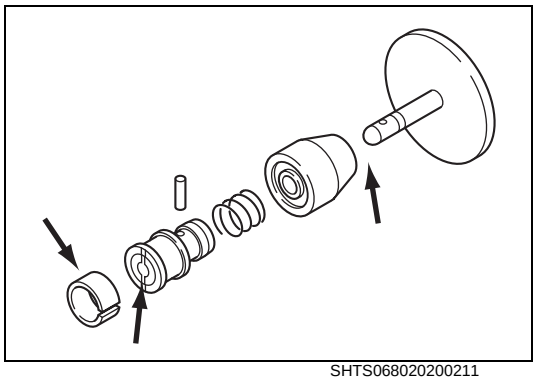
IMPORTANT POINT - DISASSEMBLY

1. DISASSEMBLY OF THE BRAKE CHAMBER

(1) Before dismounting, apply aligning mark to the clamp, chamber cover and bracket.

(2) Remove the clamp, diaphragm and chamber cover from the bracket.

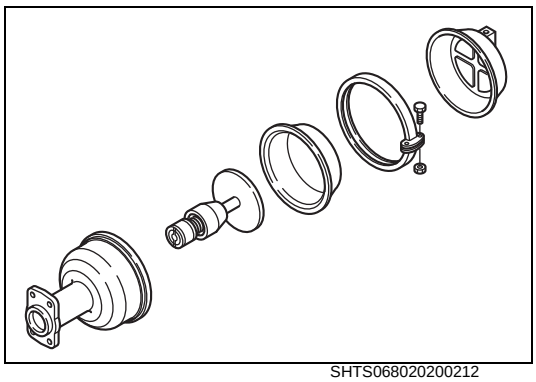
(3) Disassemble the push rod assembly.


SHTS068020200211

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY OF PUSH ROD ASSEMBLY

(1) Before assembling, apply grease (Dynamax No.2: COSMO OIL CO., LTD. product or equivalent) to each component parts.

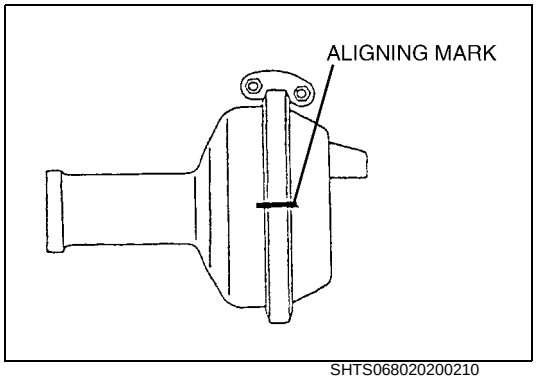

SHTS068020200212

2. ASSEMBLY OF BRACKET ASSEMBLY

(1) Apply grease to inside of the bracket and install the push rod assembly, new diaphragm, chamber cover and clamp.

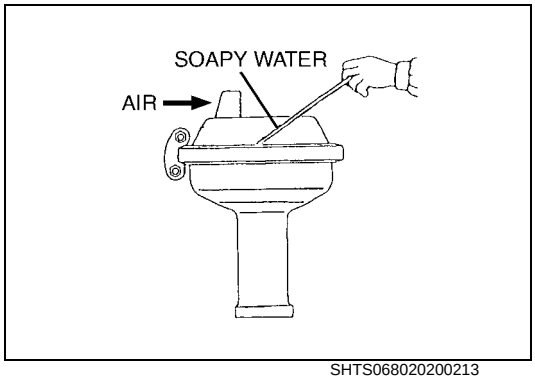
NOTICE

- **Do not adhere grease to the diaphragm.**



SHTS068020200210

- **Before assembling, align the aligning marks on the clamp, chamber cover and bracket.**



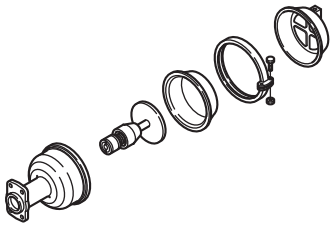
SHTS068020200213

3. CHECK OF AIR LEAKAGE

(1) Apply soapy water to the chamber as shown and charge with compressed air of 690-880 kPa {7.0-9.0 kgf/cm^2, 100-128 lbf/in.^{2}} from the inlet port A then check for leakage.

INSPECTION AND REPAIR

EN0680202H300025

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Chamber cover, clamp, push rod, diaphragm and bracket: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

BRAKE CHAMBER (MODELS: FG, GH, SG) [FOR FRONT BRAKE (S-CAM TYPE)]

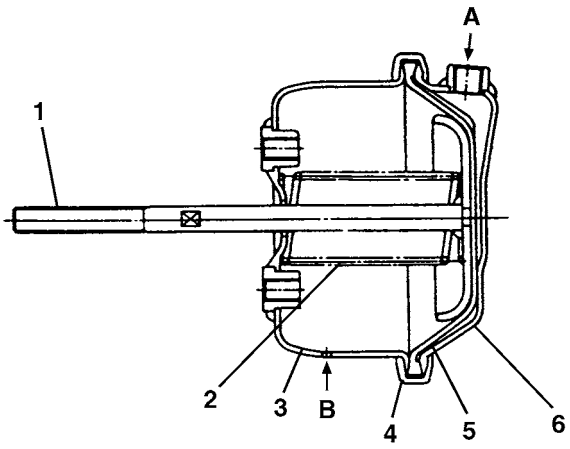
DATA AND SPECIFICATION

EN0680202I200023

Type	**Diaphragm type**

DESCRIPTION

EN0680202C100024

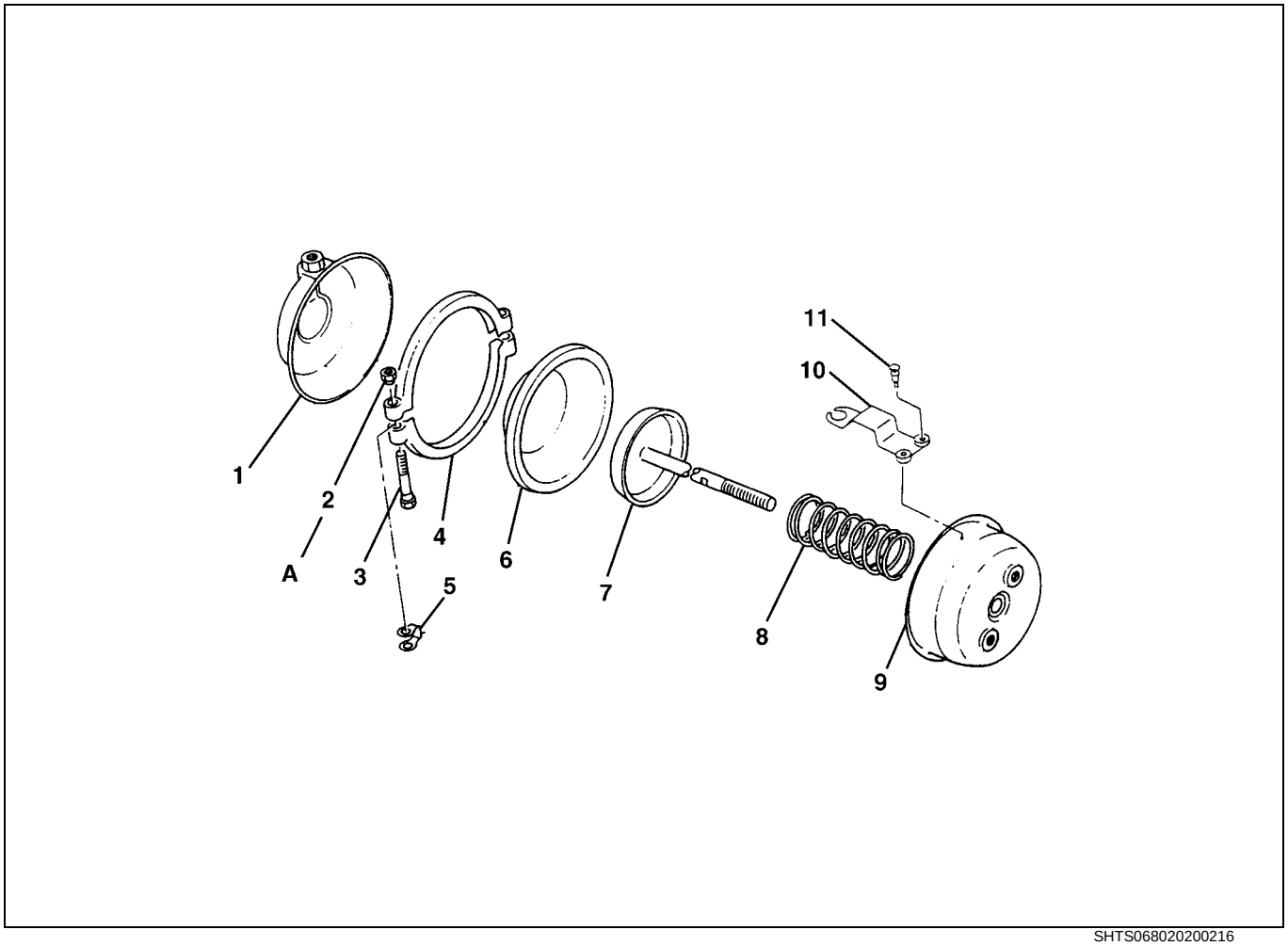


SHTS068020200215

1	**Push rod**	**5**	**Diaphragm**
2	**Return spring**	**6**	**Chamber cover**
3	**Chamber**	**A**	**Inlet**
4	**Clamp**	**B**	**Drain hole**

COMPONENT LOCATOR

EN0680202D100023



SHTS068020200216

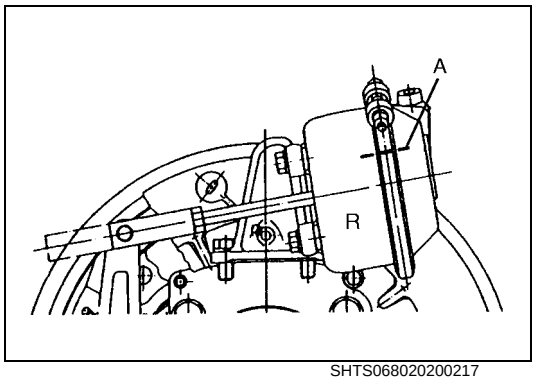
1	Chamber cover	7	Push rod
2	Clamp nut	8	Return spring
3	Clamp bolt	9	Chamber
4	Clamp	10	Holder
5	Spacer	11	Retainer
6	Diaphragm		

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

A	17.7-19.6 {180-200, 13.1-14.4}	

OVERHAUL

EN0680202H200022



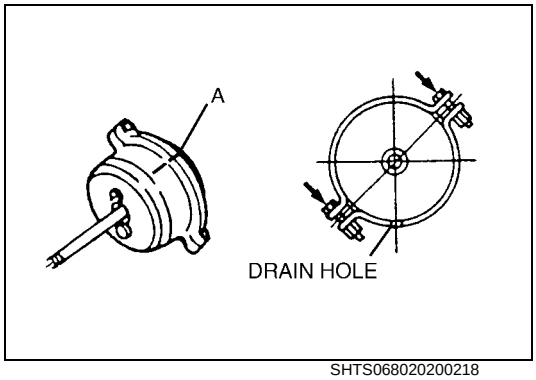
SHTS068020200217

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING OF THE BRAKE CHAMBER

(1) Before dismounting, apply aligning mark A to the chamber, clamp and chamber cover.

(2) Apply a position mark R or L to identify the side where the chamber was installed.



SHTS068020200218

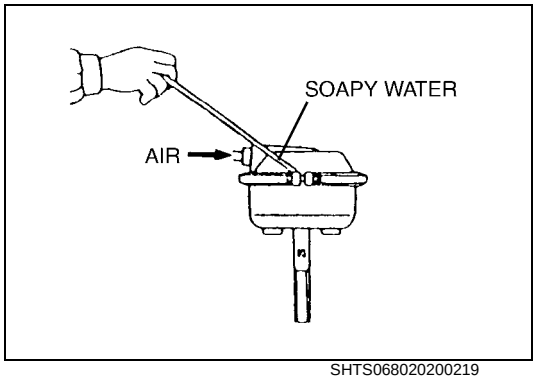
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLING THE BRAKE CHAMBER

(1) Replace the diaphragm with new one.

(2) Align the aligning mark A of the chamber, clamp and chamber cover.

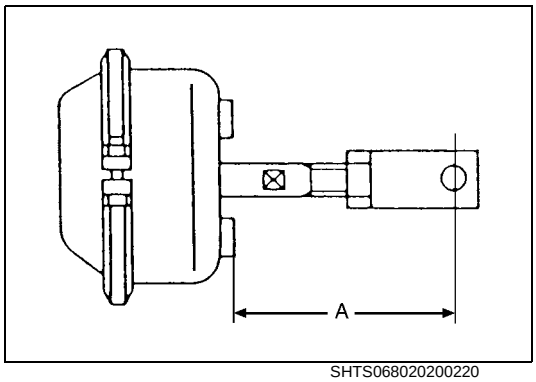
(3) Insert the bolt from opposite side of drain hole and tighten the bolts evenly with nut within the specified torque.



SHTS068020200219

2. CHECKING FOR AIR LEAKAGE

(1) Apply soapy water to the chamber as shown and charge with compressed air of 830 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} from the inlet port A then check for leakage.



SHTS068020200220

3. INSTALLING CLEVIS

(1) Install the clevis to the push rod and adjust dimension A to the specified value.
Assembly Standard: 183 mm {7.205 in.}

IMPORTANT POINT - MOUNTING

1. INSTALLING THE BRAKE CHAMBER

(1) The chamber must be mounted on the side as marked when dismounting.

NOTICE

- **See the position mark (R or L) which was applied when dismounting.**
- **When connecting the clevis with the slack adjuster, lubricate the clevis pin hole and clevis pin with sufficient chassis grease.**

INSPECTION AND REPAIR

EN0680202H300026

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Cover, clamp, push rod, return spring and chamber: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

BRAKE CHAMBER [FOR REAR (REARWARD) BRAKE]

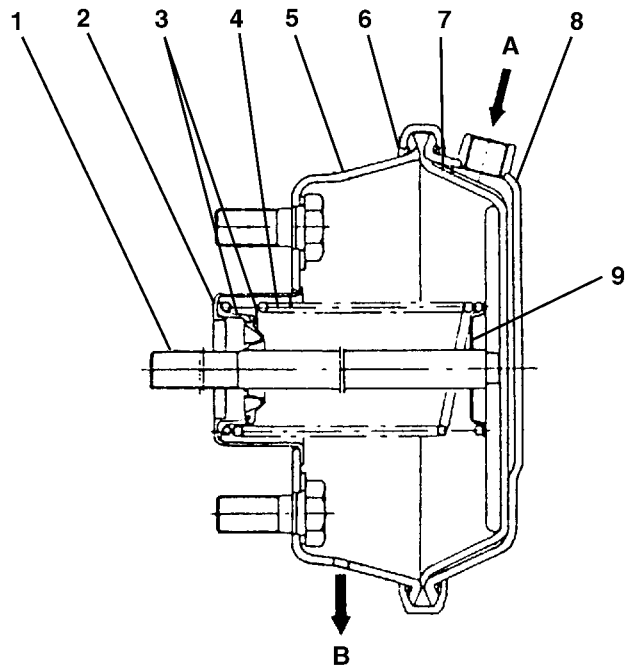
DATA AND SPECIFICATION

EN0680202I200024

Type	**Diaphragm type**

DESCRIPTION

EN0680202C100025

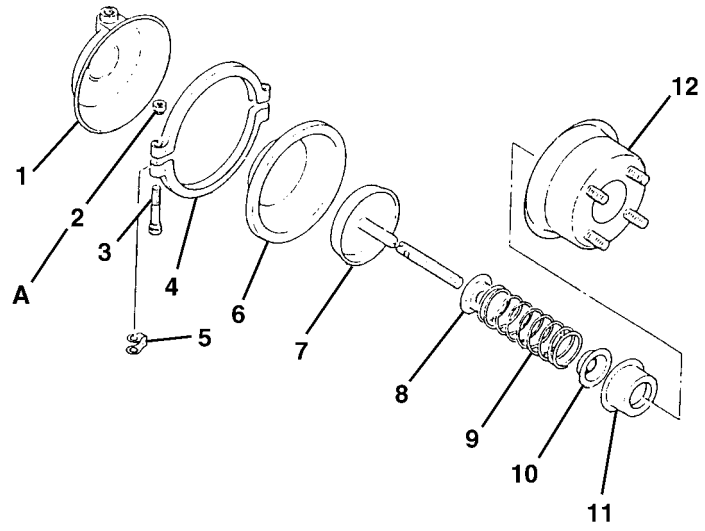


SHTS068020200222

1	**Push rod**	**7**	**Diaphragm**
2	**Holder**	**8**	**Chamber cover**
3	**Dust seal**	**9**	**Retainer**
4	**Return spring**	**A**	**Inlet**
5	**Chamber**	**B**	**Drain hole**
6	**Clamp**		

COMPONENT LOCATOR

EN0680202D100024



SHTS068020200223

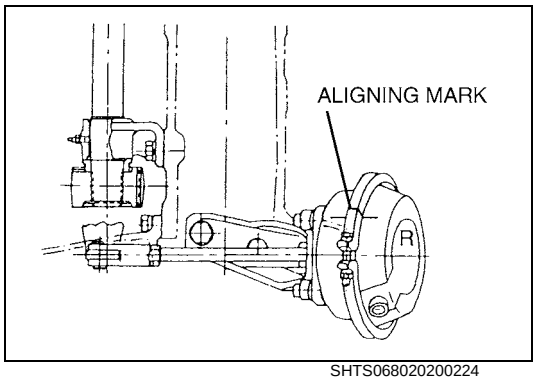
1	Chamber cover	7	Push rod
2	Clamp nut	8	Retainer
3	Clamp bolt	9	Return spring
4	Clamp	10	Dust seal
5	Spacer	11	Holder
6	Diaphragm	12	Chamber

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

A	26.5-32.3 {270-330, 20-23}	

OVERHAUL

EN0680202H200023



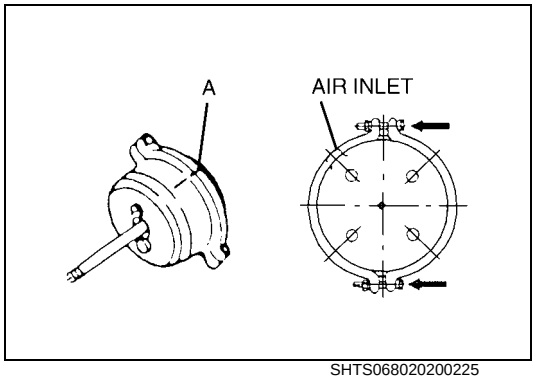
SHTS068020200224

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING OF THE BRAKE CHAMBER

(1) Before dismounting, apply aligning mark to the chamber, clamp and chamber cover.

(2) Apply a position mark R or L to identify the side where the chamber was installed.



SHTS068020200225

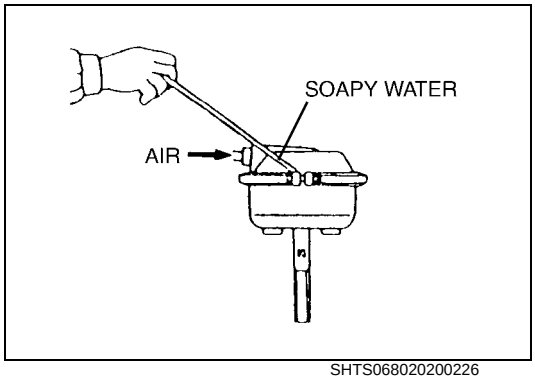
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLING THE BRAKE CHAMBER

(1) Replace the diaphragm with new one.

(2) Align the aligning mark A of the chamber, clamp and chamber cover.

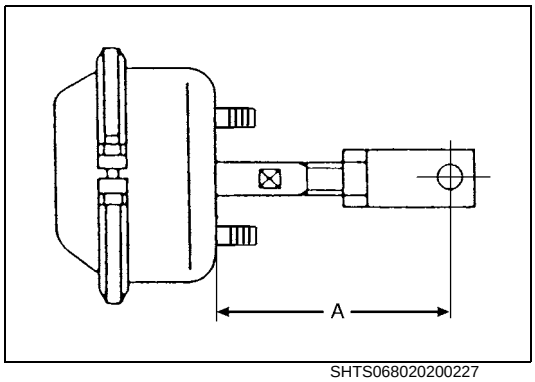
(3) Insert the bolt from opposite side of drain hole and tighten the bolts evenly with nut within the specified torque.



SHTS068020200226

2. CHECKING FOR AIR LEAKAGE

(1) Apply soapy water to the chamber as shown and charge with compressed air of 830 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} from the inlet port A then check for leakage.



SHTS068020200227

3. INSTALLING CLEVIS

(1) Install the clevis to the push rod and adjust dimension A to the specified value.

		ID MARK
Assembly Standard:	**85 mm {3.35 in.}**	**-3100/ -3110**
	318 mm {12.52 in.}	**-3080/ -3090**
	330 mm {12.99 in.}	**-2910/ -2920**

IMPORTANT POINT - MOUNTING

1. INSTALLING THE BRAKE CHAMBER

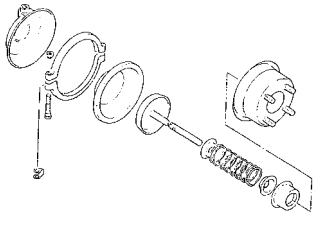
(1) The chamber must be mounted on the side as marked when dismounting.

NOTICE

- **See the position mark (R or L) which was applied when dismounting.**
- **When connecting the clevis with the slack adjuster, lubricate the clevis pin hole and clevis pin with sufficient chassis grease.**

INSPECTION AND REPAIR

EN0680202H300027

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Cover, clamp, push rod, return spring, retainer, dust seal, holder and chamber: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

BRAKE CHAMBER (MODEL: SG)
[FOR REAR BRAKE (S-CAM TYPE)]

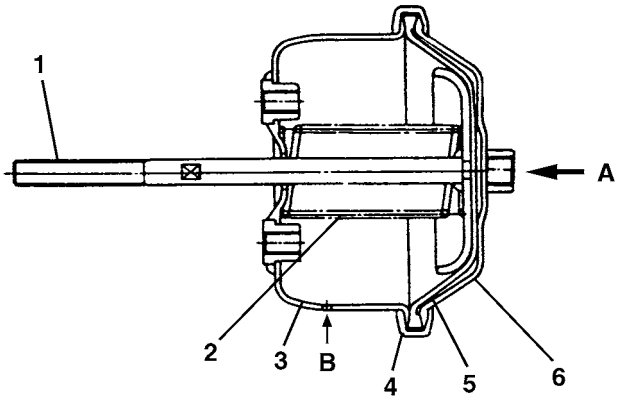
DATA AND SPECIFICATION

EN0680202I200025

Type	**Diaphragm type**

DESCRIPTION

EN0680202C100026

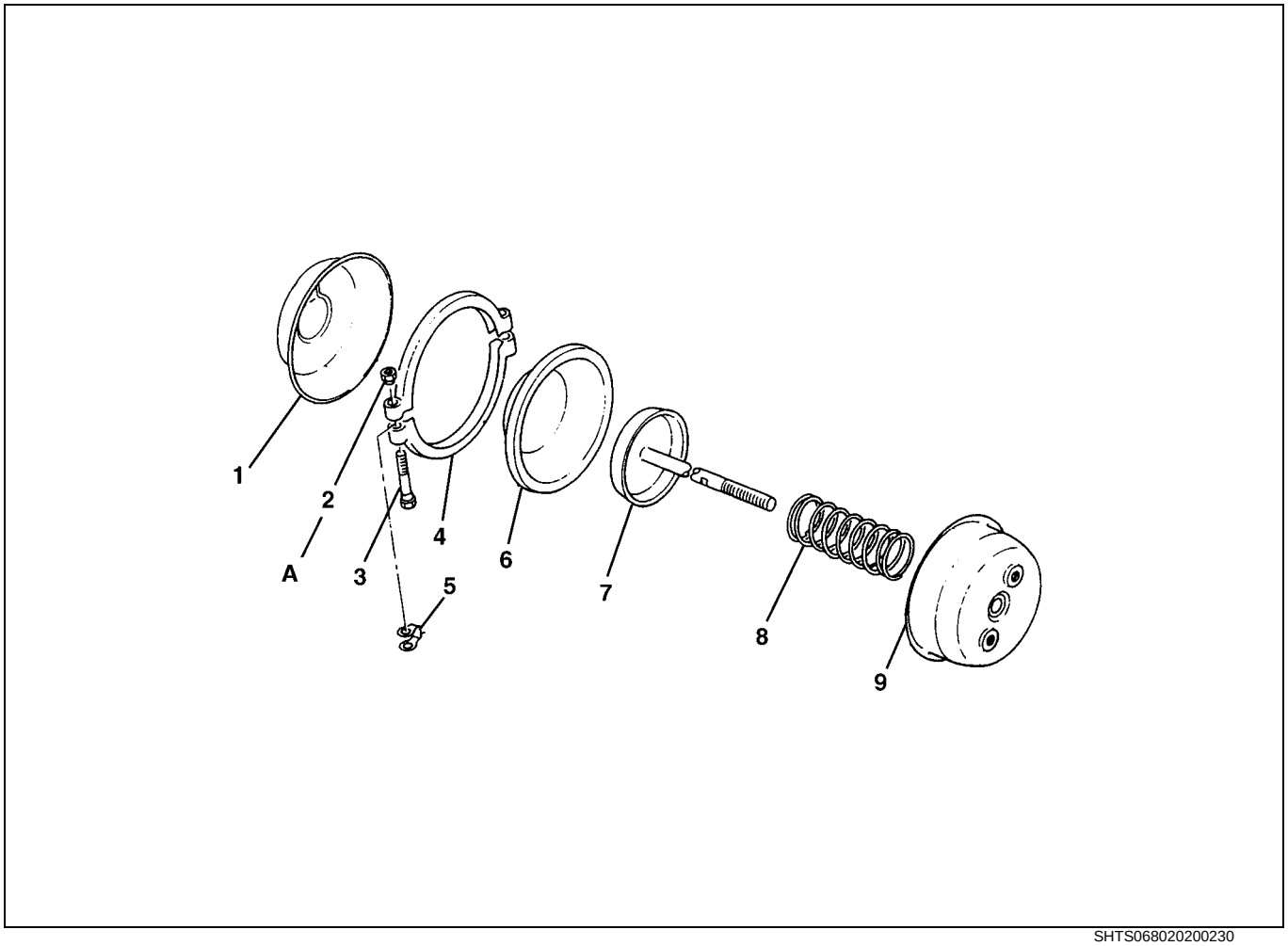


SHTS068020200229

1	**Push rod**	**5**	**Diaphragm**
2	**Return spring**	**6**	**Chamber cover**
3	**Chamber**	**A**	**Inlet**
4	**Clamp**	**B**	**Drain hole**

COMPONENT LOCATOR

EN0680202D100025



SHTS068020200230

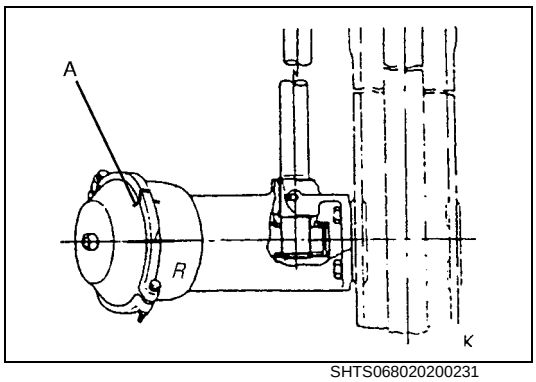
1	Chamber cover	6	Diaphragm
2	Clamp nut	7	Push rod
3	Clamp bolt	8	Return spring
4	Clamp	9	Chamber
5	Spacer		

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

A	17.7-19.6 {180-200, 13.1-14.4}	

OVERHAUL

EN0680202H200024



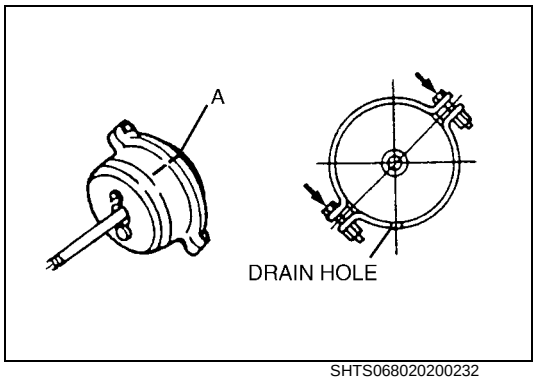
SHTS068020200231

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING OF THE BRAKE CHAMBER

(1) Before dismounting, apply aligning mark "A" to the chamber, clamp and chamber cover.

(2) Apply a position mark "R" or "L" to identify the side where the chamber was installed.



SHTS068020200232

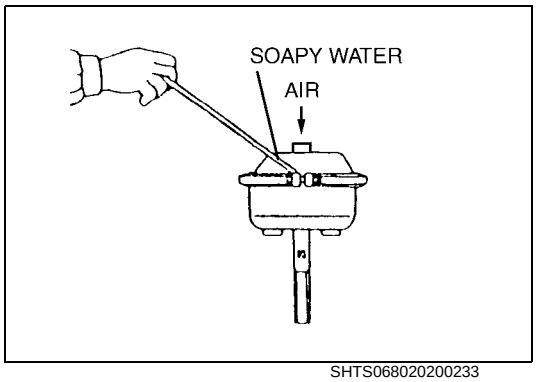
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLING THE BRAKE CHAMBER

(1) Replace the diaphragm with new one.

(2) Align the aligning mark "A" of the chamber, clamp and chamber cover.

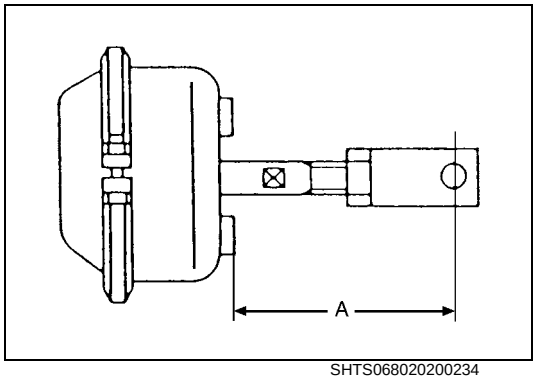
(3) Insert the bolt from opposite side of drain hole and tighten the bolts evenly with nut within the specified torque.



SHTS068020200233

2. CHECKING FOR AIR LEAKAGE

(1) Apply soapy water to the chamber as shown and charge with compressed air of 830 kPa {8.5 kgf/cm^2, 121 lbf/in.^{2}} from the inlet port "A" then check for leakage.



SHTS068020200234

3. INSTALLING CLEVIS

(1) Install the clevis to the push rod and adjust dimension "A" to the specified value.
Assembly Standard: 65 mm {2.559 in.}

IMPORTANT POINT - MOUNTING

1. INSTALLING THE BRAKE CHAMBER

(1) The chamber must be mounted on the side as marked when dismounting.

NOTICE

- **See the position mark ("R" or "L") which was applied when dismounting.**
- **When connecting the clevis with the slack adjuster, lubricate the clevis pin hole and clevis pin with sufficient chassis grease.**

INSPECTION AND REPAIR

EN0680202H300028

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Cover, clamp, push rod, return spring and chamber: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

TRAILER HAND BRAKE CONTROL VALVE

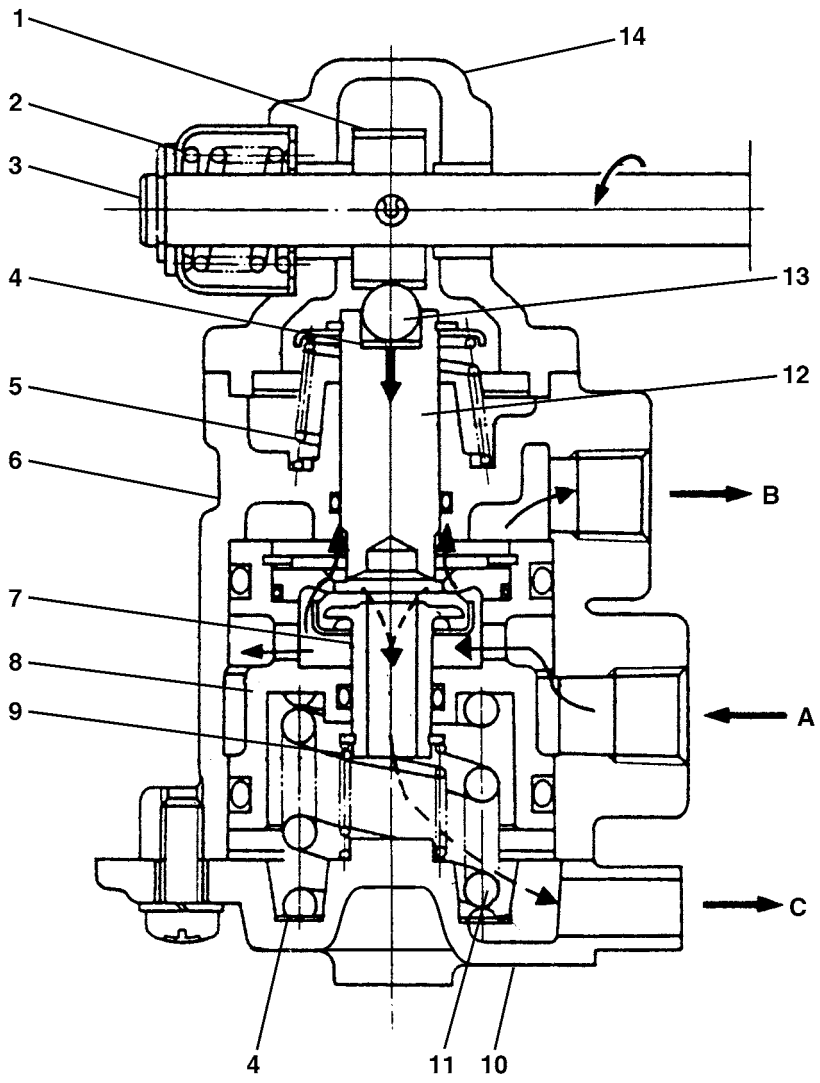
DATA AND SPECIFICATION

EN0680202I200026

Type	**Variable pressure control type**

DESCRIPTION

EN0680202C100027

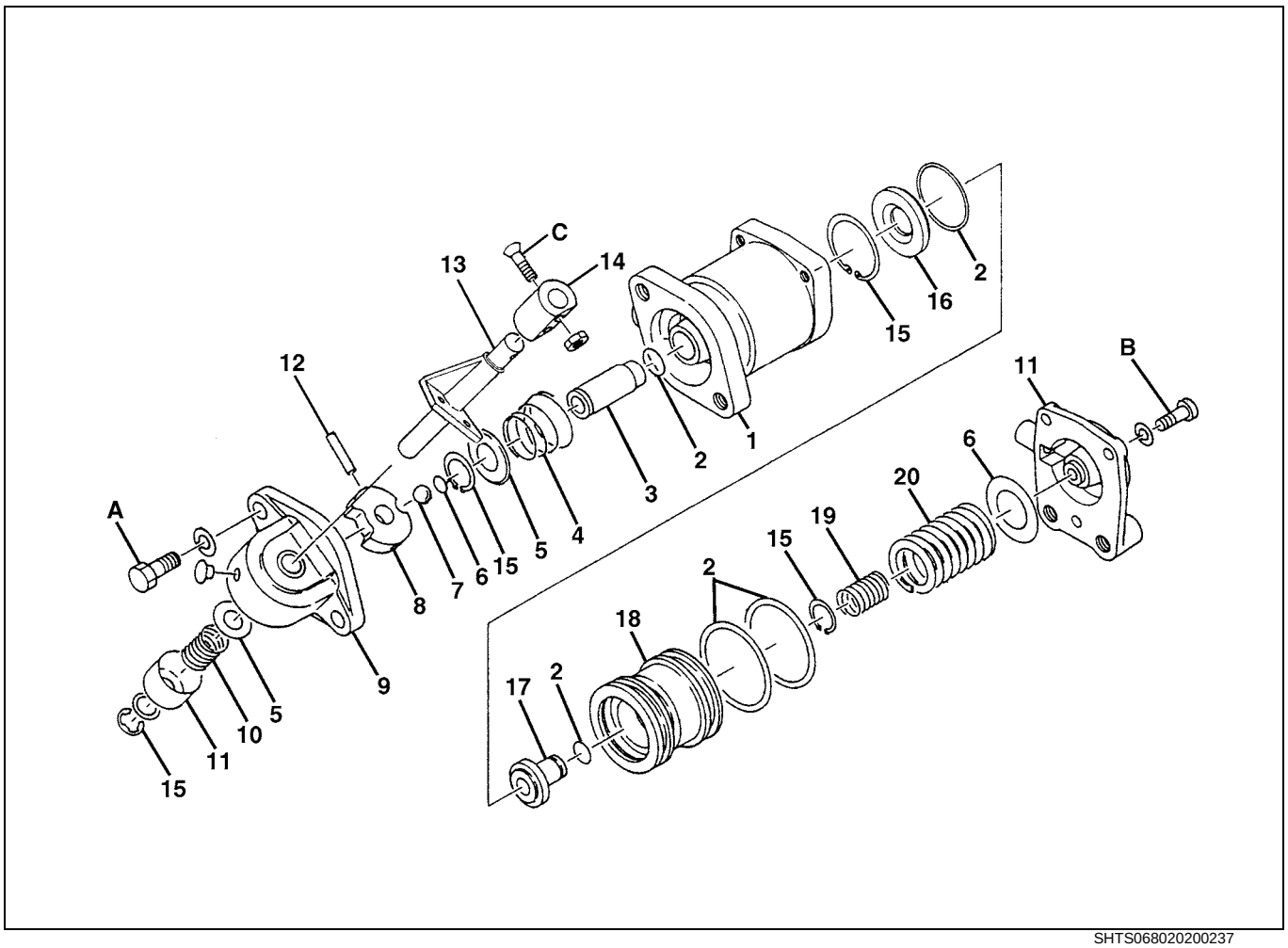


SHTS068020200236

1	Cam	7	Feed valve	13	Steel ball
2	Spring	8	Piston	14	Holder
3	Handle	9	Inner spring	A	Inlet
4	Shim	10	Cover	B	Outlet
5	Conical spring	11	Outlet spring	C	Exhaust
6	Valve body	12	Exhaust valve		

COMPONENT LOCATOR

EN0680202D100026



SHTS068020200237

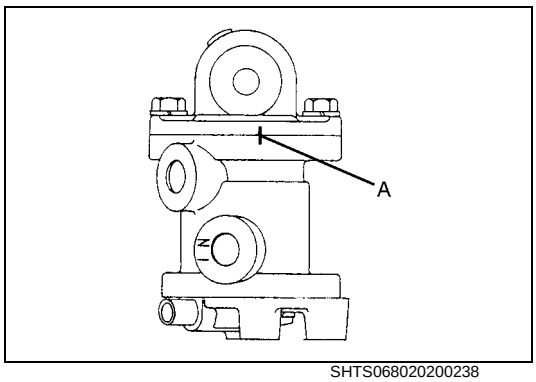
1	Valve body	8	Cam	15	Retainer ring
2	O-ring	9	Holder	16	Valve seat
3	Exhaust valve	10	Spring	17	Feed valve
4	Conical spring	11	Cover	18	Piston
5	Spring seat	12	Pin	19	Inner spring
6	Shim	13	Handle	20	Outer spring
7	Steel ball	14	Connector		

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

A	9.9-19.6 {100-200, 8-14}	C	2.5-3.9 {25-40, 1.9-2.8}
B	5.4-7.3 {55-75, 4.0-5.4}		

OVERHAUL

EN0680202H200025

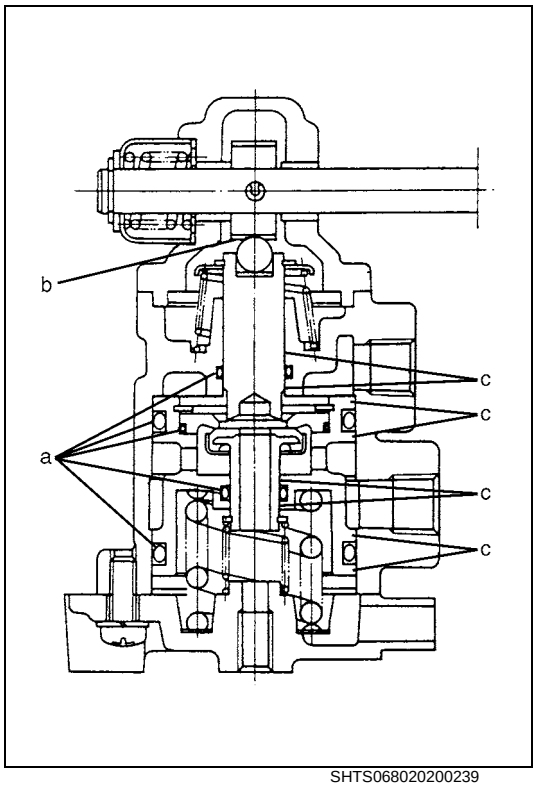


SHTS068020200238

IMPORTANT POINT - DISASSEMBLY

NOTICE

Before disassembling the hand brake valve, mark the aligning mark "A" on the holder and valve body.



SHTS068020200239

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When assembling the hand brake valve, use new O-ring and feed valve.

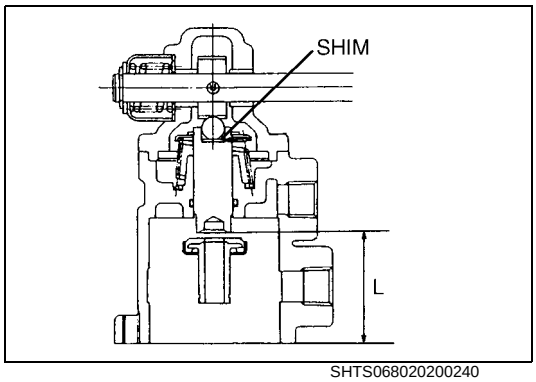
(2) Apply silicone grease to each sliding surface of the component parts and O-ring groove.

a. **O-ring**

b. **Contact of steel ball**

c. **Sliding surface**

(3) Align the aligning mark of the holder and valve body.



SHTS068020200240

IMPORTANT POINTS - ADJUSTMENT

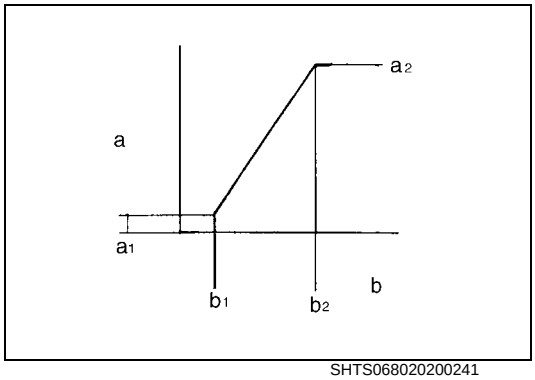
1. EXHAUST VALVE FITTING HEIGHT

(1) Measure the exhaust valve fitting height "L" and adjust it.

NOTICE

Adjust this dimension with shims.

L: 38.3-38.7 mm {1.508-1.523 in.}



SHTS068020200241

2. HAND BRAKE VALVE PERFORMANCE CHARACTERISTIC

a. **Air pressure at outlet port (kPa {kgf/cm^2, lbf/in.^{2}})**

b. **Handle turning angle (°)**

a	**(a_1) 19.6-68.6 {0.2-0.7, 2.8-9.9}**	**(a_2) 460.6-558.6 {4.7-5.7, 66.8-81.0}**
b	**(b_1) 7-13**	**(b_2) 37-43**

NOTICE

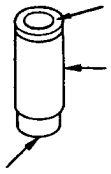
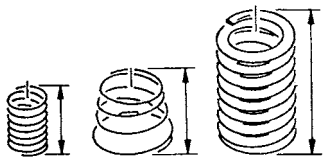
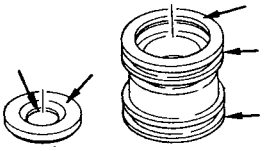
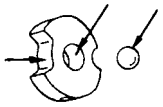
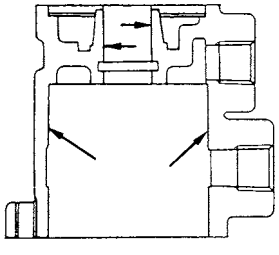
The characteristic shown in both diagrams are for inlet air pressure of 690 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}

The characteristic can be adjusted by changing the shim thickness of the steel ball and of the outer spring.

INSPECTION AND REPAIR

EN0680202H300029

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface of exhaust valve: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spring: Rust and damage Measure the spring dimension.	**1. 28.5 {1.122} 2. 38 {1.496} 3. 31 {1.220}**	**27 {1.063} 35 {1.377} 29 {1.142}**	**Replace, if necessary.**	**Measure and visual check** 
Piston and valve seat: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam and steel ball: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Valve body: Rust, wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE (WEDGE TYPE)

DATA AND SPECIFICATIONS

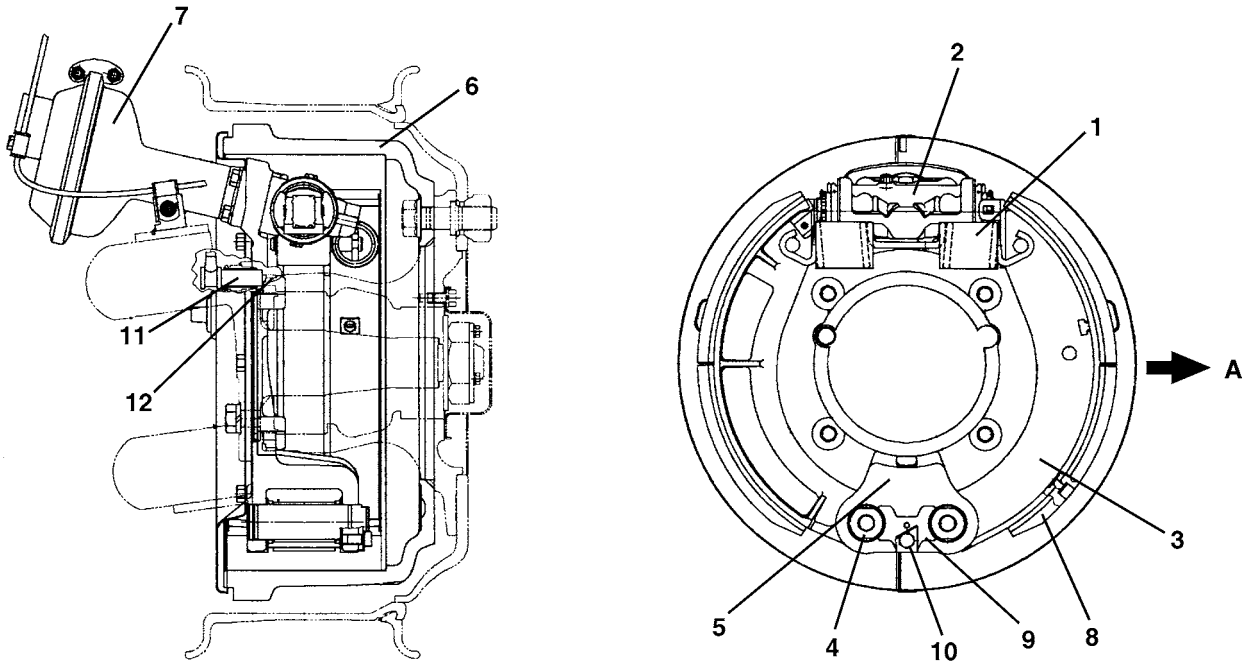
EN0680202I200027

Model		Except TAIWAN	TAIWAN
Type		Drum brake with internally expanding, leading-trailing shoes operating by expander in all wheels.	
Brake drum inside diameter		410 mm {16.14 in.} for both front and rear.	406.4 mm {16.00 in.} for both front and rear.
Brake lining Width x Thickness	Front	150 x 16 mm {5.9 x 0.63 in.}	152 x 15.5 mm {6.0 x 0.61 in.}
	Rear	200 x 16 mm {7.9 x 0.63 in.}	203 x 15.5 mm {8.0 x 0.61 in.}

DESCRIPTION

EN0680202C100028

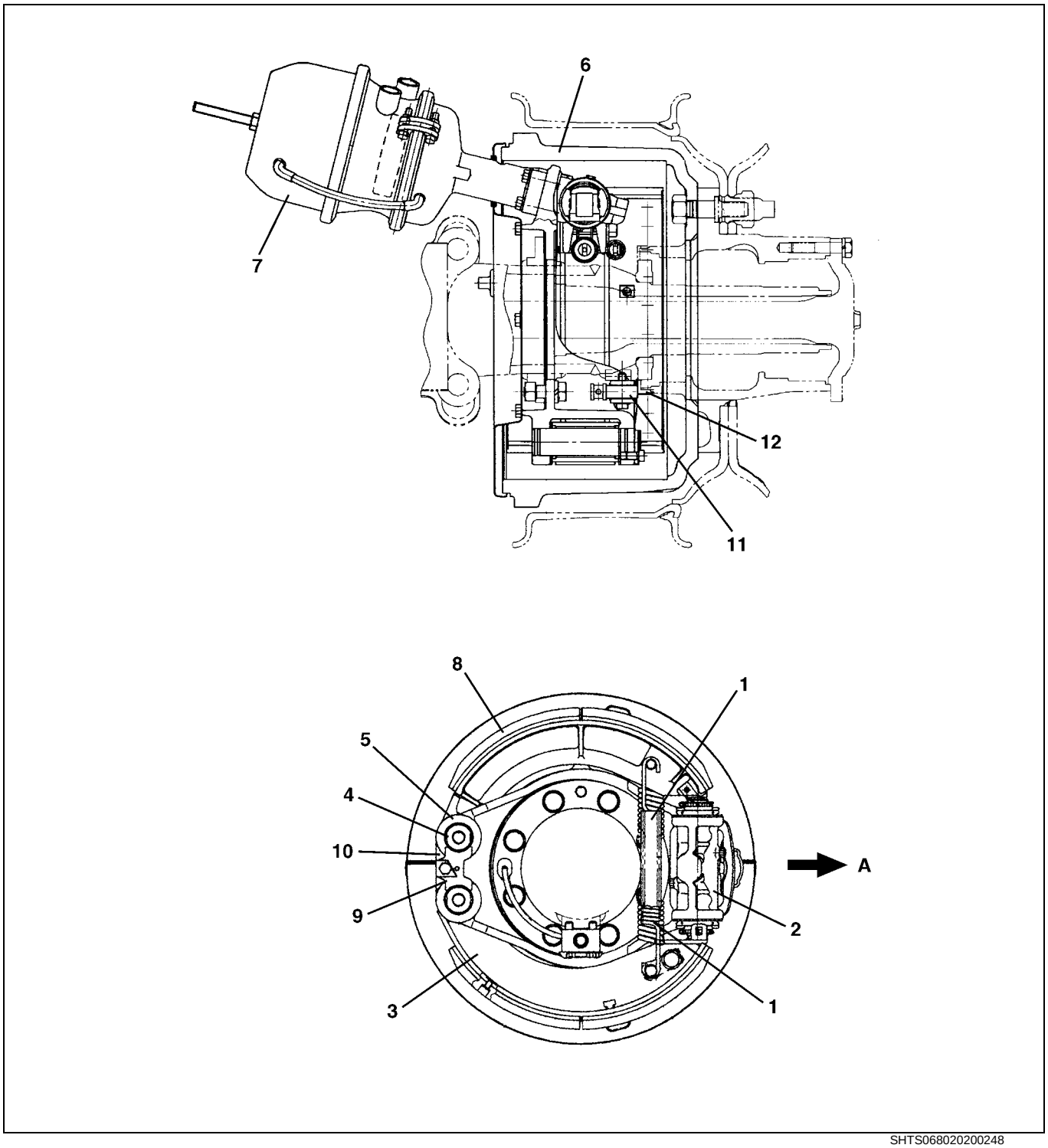
FRONT (MODEL: FG)



SHTS068020200247

1	Brake shoe return spring	8	Brake lining
2	Expander	9	Anchor pin retainer
3	Brake shoe	10	Lock plate
4	Anchor pin	11	Wheel sensor (If so equipped)
5	Brake spider	12	Sensor ring (If so equipped)
6	Brake drum	A	Front
7	Brake chamber		

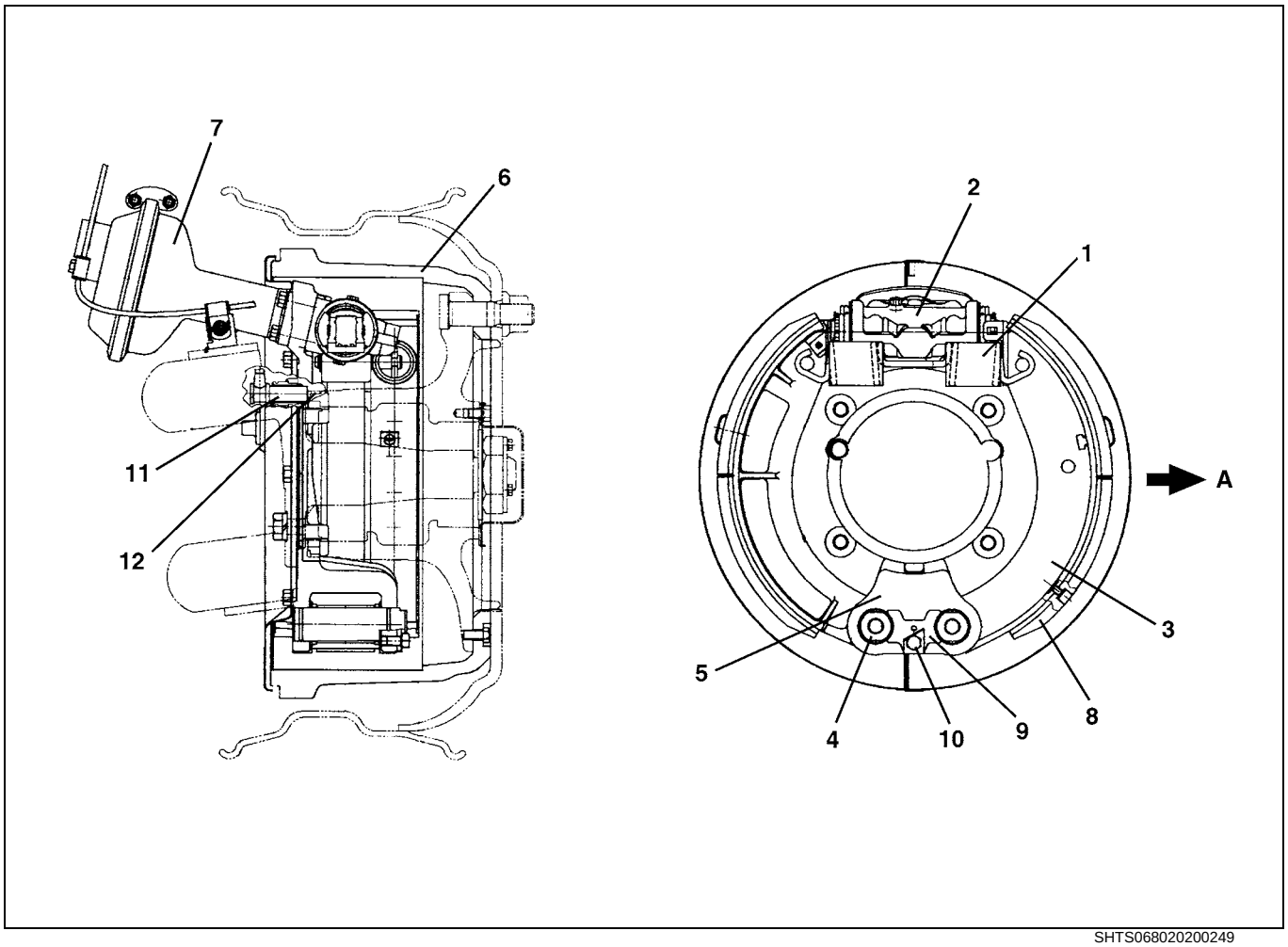
REAR (MODEL: FG)



SHTS068020200248

1	Brake shoe return spring	8	Brake lining
2	Expander	9	Anchor pin retainer
3	Brake shoe	10	Lock plate
4	Anchor pin	11	Wheel sensor (If so equipped)
5	Brake spider	12	Sensor ring (If so equipped)
6	Brake drum	A	Front
7	Spring brake chamber		

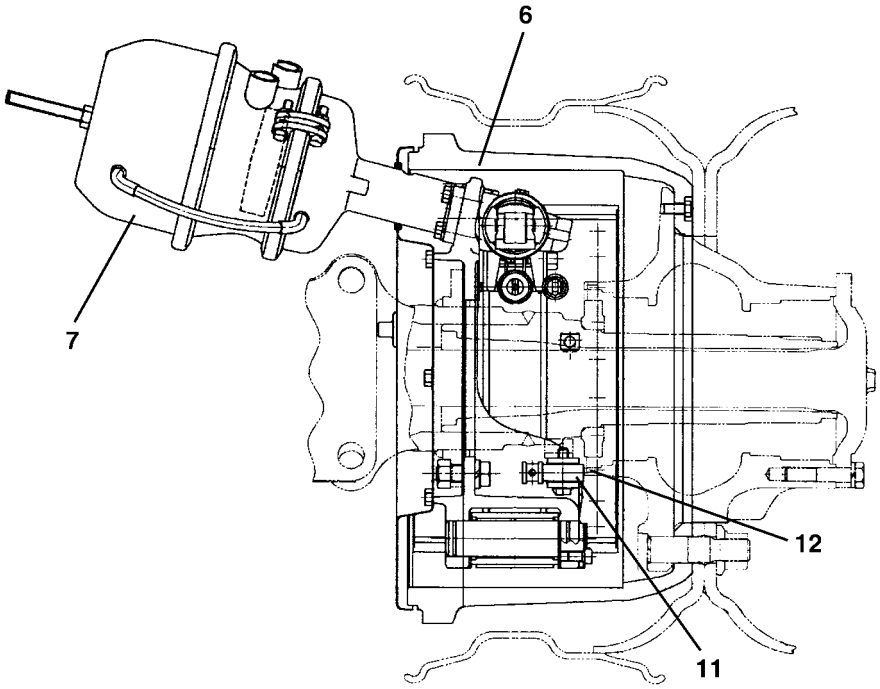
FRONT (MODEL: GH)

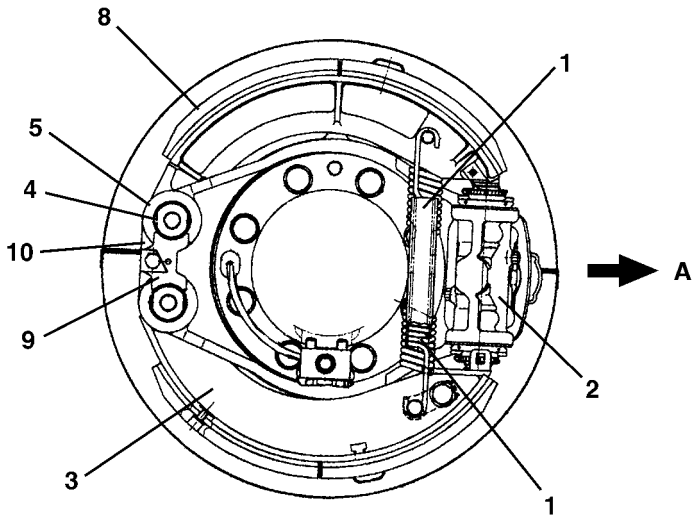


SHTS068020200249

1	Brake shoe return spring	8	Brake lining
2	Expander	9	Anchor pin retainer
3	Brake shoe	10	Lock plate
4	Anchor pin	11	Wheel sensor (If so equipped)
5	Brake spider	12	Sensor ring (If so equipped)
6	Brake drum	A	Front
7	Brake chamber		

REAR (MODEL: GH)





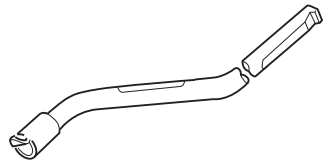
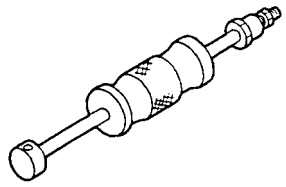
SHTS068020200250

1	Brake shoe return spring	8	Brake lining
2	Expander	9	Anchor pin retainer
3	Brake shoe	10	Lock plate
4	Anchor pin	11	Wheel sensor (If so equipped)
5	Brake spider	12	Sensor ring (If so equipped)
6	Brake drum	A	Front
7	Spring brake chamber		

SPECIAL TOOL

EN0680202K100003

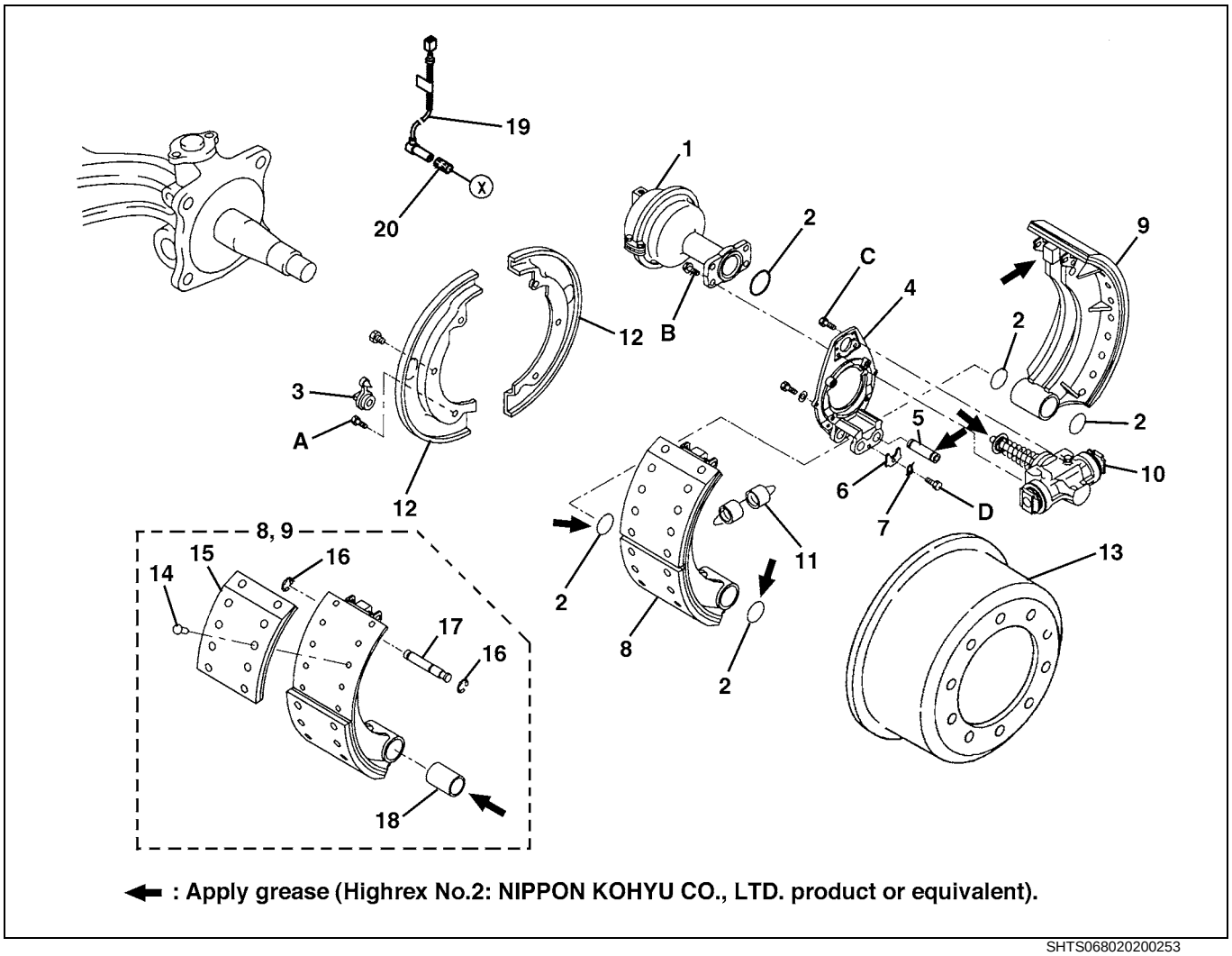
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0968-31070	SPRING PULL BACK TOOL	
	S0942-02000	ANCHOR PIN PULLER	

COMPONENT LOCATOR

EN0680202D100027

FRONT (MODEL: FG)



SHTS068020200253

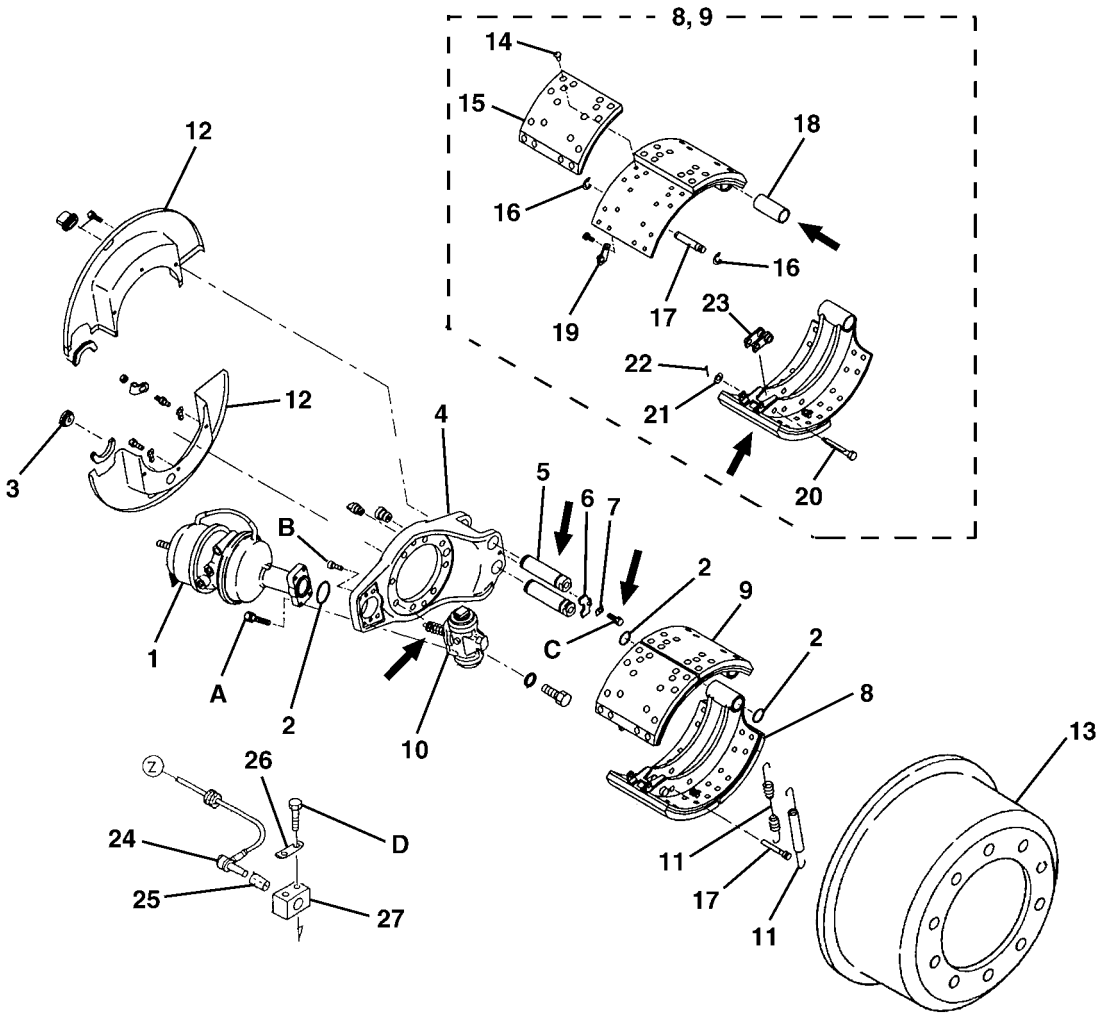
1	Brake chamber	11	Brake shoe return spring
2	O-ring	12	Brake drum cover
3	Hole plug	13	Brake drum
4	Brake spider	14	Rivet
5	Anchor pin	15	Brake lining
6	Anchor pin retainer	16	Retainer spring
7	Lock plate	17	Return spring pin
8	Brake shoe assembly (Leading)	18	Bushing
9	Brake shoe assembly (Trailing)	19	Wheel sensor (If so equipped)
10	Expander	20	Clamping bushing

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

A	20.1-33.9 {205-345, 14.9-24.9}	C	13.7-23.5 {140-240, 10.1-17.4}
B	36.3-51.9 {371-529, 26.9-38.2}	D	20.1-33.9 {205-345, 14.9-24.9}

REAR (MODEL: FG)

(REPRESENTATIVE TYPE)



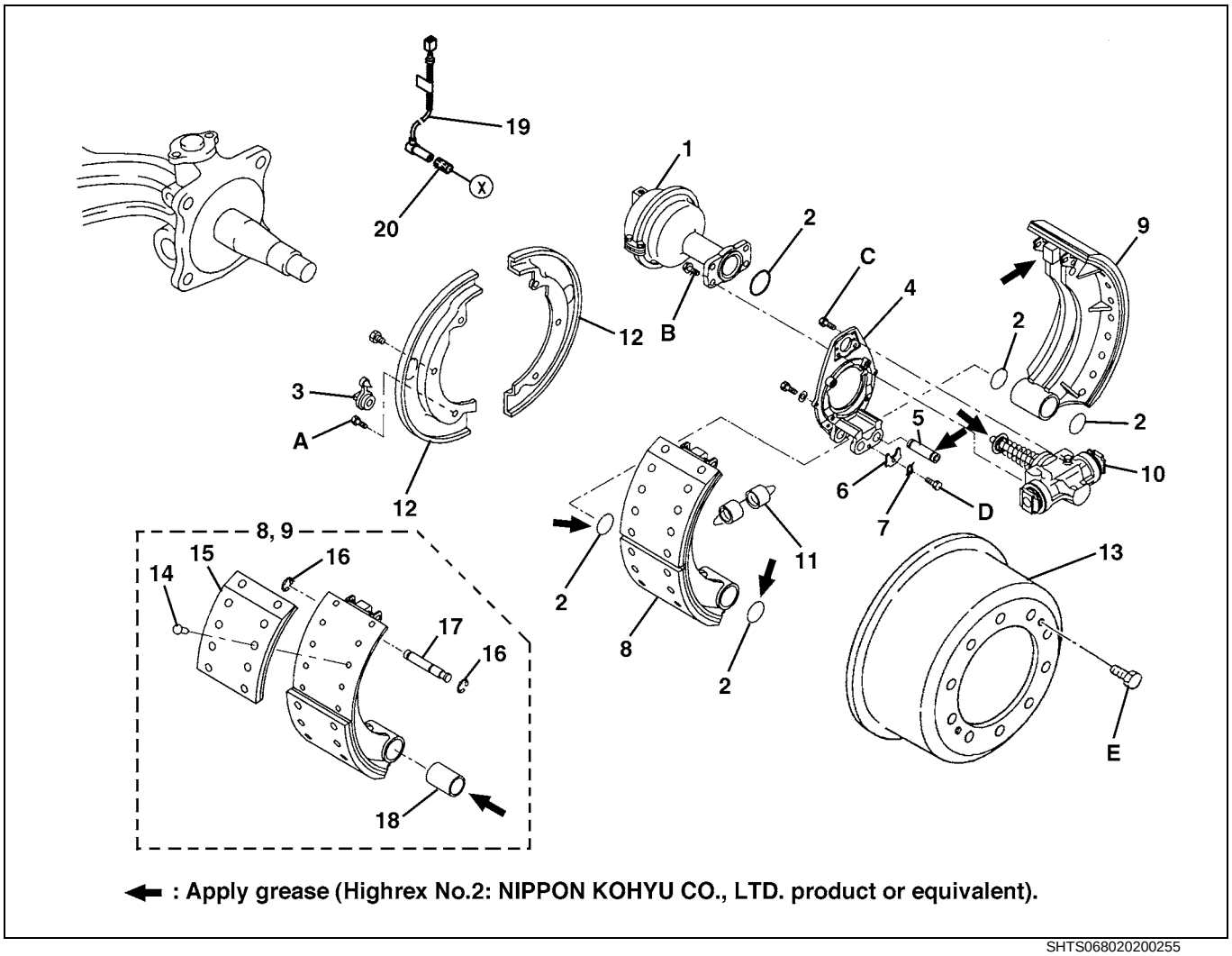
SHTS068020200254

1	Brake chamber	10	Expander	19	Plate
2	O-ring	11	Brake shoe return spring	20	Pivot pin
3	Hole plug	12	Brake drum cover	21	Washer
4	Brake spider	13	Brake drum	22	Cotter pin
5	Anchor pin	14	Rivet	23	Return spring hanger
6	Anchor pin retainer	15	Brake lining	24	Wheel sensor (If so equipped)
7	Lock plate	16	Retainer spring	25	Sleeve (If so equipped)
8	Brake shoe assembly (Leading)	17	Return spring pin	26	Lock washer (If so equipped)
9	Brake shoe assembly (Trailing)	18	Bushing	27	Holder (If so equipped)

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

A	36.3-51.9 {371-529, 26.9-38.2}	C	20.1-33.9 {205-345, 14.9-24.9}
B	13.7-23.5 {140-240, 10.1-17.4}	D	34.5-51.5 {351-527, 26-38}

FRONT (MODEL: GH)



SHTS068020200255

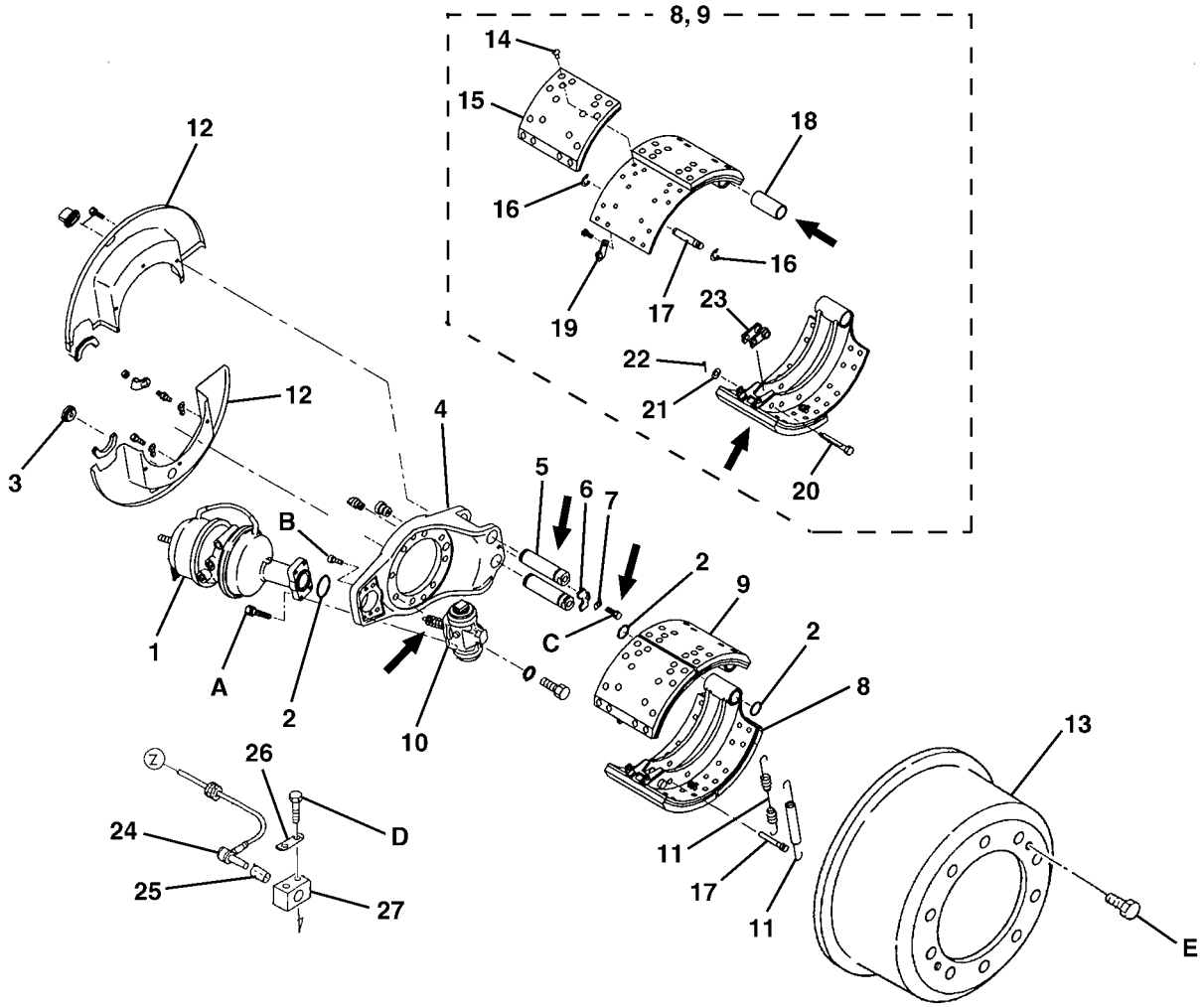
1	Brake chamber	11	Brake shoe return spring
2	O-ring	12	Brake drum cover
3	Hole plug	13	Brake drum
4	Brake spider	14	Rivet
5	Anchor pin	15	Brake lining
6	Anchor pin retainer	16	Retainer spring
7	Lock plate	17	Return spring pin
8	Brake shoe assembly (Leading)	18	Bushing
9	Brake shoe assembly (Trailing)	19	Wheel sensor (If so equipped)
10	Expander	20	Clamping bushing

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

A	20.1-33.9 {205-345, 14.9-24.9}	D	20.1-33.9 {205-345, 14.9-24.9}
B	36.3-51.9 {371-529, 26.9-38.2}	E	21-30 {214-398, 15.5-28.8}
C	13.7-23.5 {140-240, 10.1-17.4}		

REAR (MODEL: GH)

(REPRESENTATIVE TYPE)



: Apply grease (Highrex No.2: NIPPON KOHYU CO., LTD. product or equivalent).

SHTS068020200256

1	Brake chamber	10	Expander	19	Plate
2	O-ring	11	Brake shoe return spring	20	Pivot pin
3	Hole plug	12	Brake drum cover	21	Washer
4	Brake spider	13	Brake drum	22	Cotter pin
5	Anchor pin	14	Rivet	23	Return spring hanger
6	Anchor pin retainer	15	Brake lining	24	Wheel sensor (If so equipped)
7	Lock plate	16	Retainer spring	25	Sleeve (If so equipped)
8	Brake shoe assembly (Leading)	17	Return spring pin	26	Lock washer (If so equipped)
9	Brake shoe assembly (Trailing)	18	Bushing	27	Holder (If so equipped)

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

A	36.3-51.9 {371-529, 26.9-38.2}	D	34.5-51.5 {351-527, 26-38}
B	13.7-23.5 {140-240, 10.1-17.4}	E	21-30 {214-398, 15.5-28.8}
C	20.1-33.9 {205-345, 14.9-24.9}		

OVERHAUL

EN0680202H200026

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF TIRE

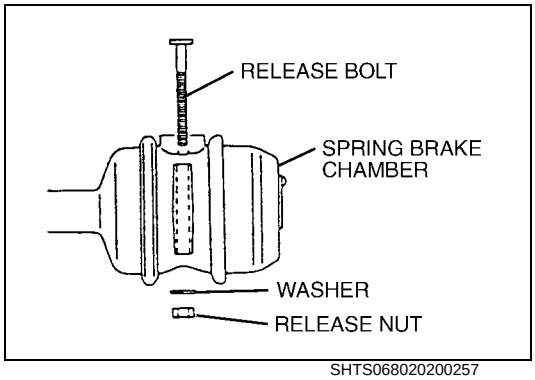
(1) Refer to the chapter **"WHEEL & TIRE"**.

2. REMOVAL OF BRAKE DRUM, WHEEL HUB AND WHEEL HUB BEARINGS

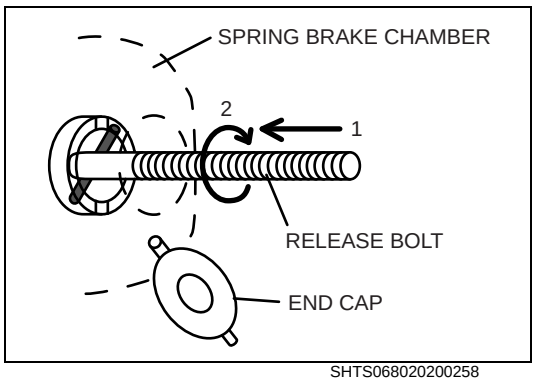
(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

3. COMPRESSION OF SPRING IN SPRING BRAKE CHAMBER BY RELEASE BOLT

(1) Remove the release bolt, washer and release nut from the chamber.



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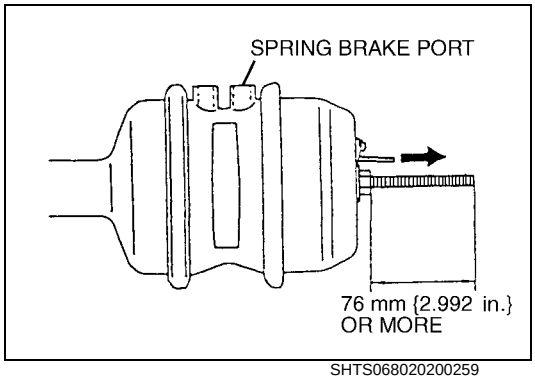


SHTS068020200258

(2) Remove the end cap. Insert the release bolt to the brake chamber, then turn the release bolt by 1/4.

NOTICE

- **Make sure that the release bolt can not be pulled out.**
- **When the release bolt is pulled out, insert the release bolt again and turn it by 1/4 similarly.**



SHTS068020200259

(3) Apply compressed air of 640 kPa {6.5 kgf/cm^2, 92.5 lbf/in.^{2}} to the spring brake port.

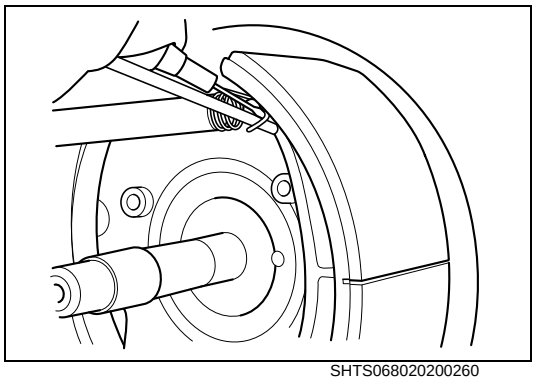
NOTICE

When compressed air cannot be applying, coat grease to the release bolt.

(4) Install the washer and release nut to the release bolt and pull out the release bolt by 76 mm {2.992 in.}.

NOTICE

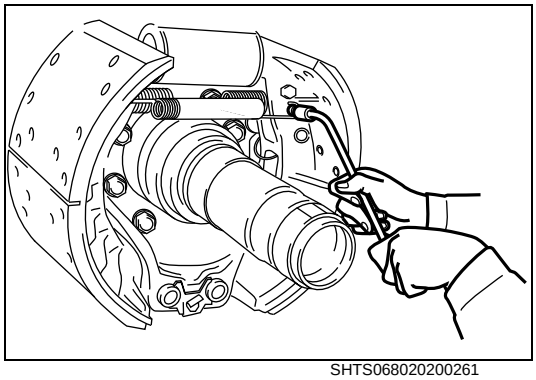
Do not turn the release nut at the strong torque (68.7 N·m {700 kgf·cm, 51 lbf·ft} or more).



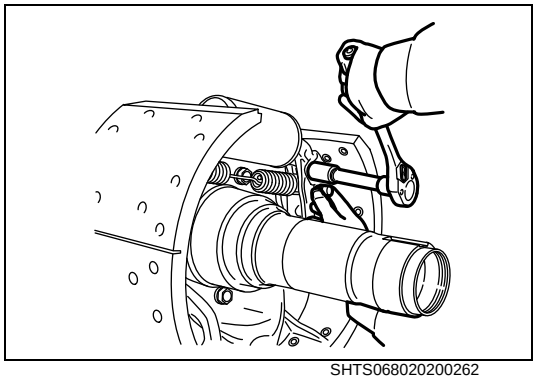
SHTS068020200260

4. REMOVAL OF BRAKE SHOE RETURN SPRING

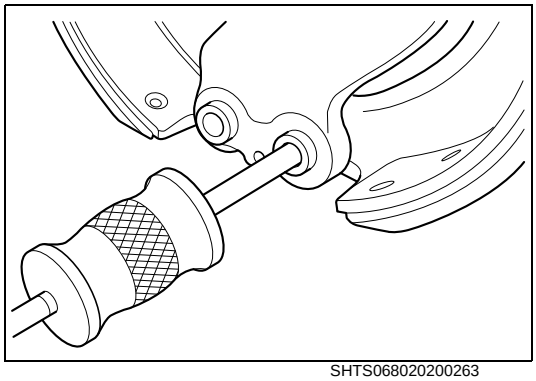
(1) Using the special tool, remove the return spring.
(FRONT WHEEL)
SST: Spring pull back tool (S0968-31070)


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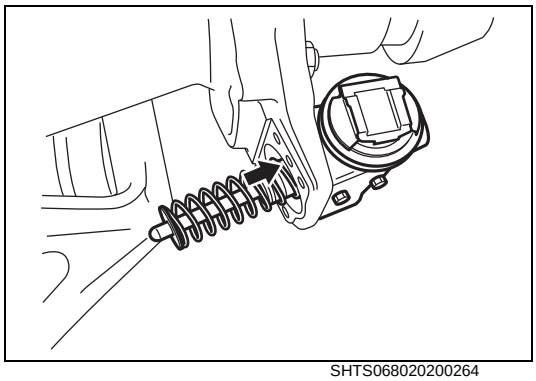
(2) Using the special tool, remove the outer return spring. (REAR WHEEL)
SST: Spring pull back tool (S0968-31070)


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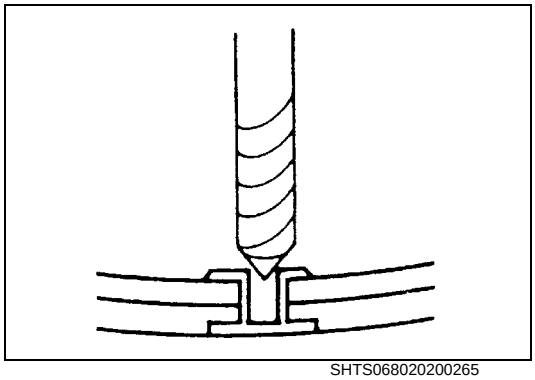
(3) Turn the pivot pin and pull out the return spring pin then remove the inner return spring (REAR WHEEL).


SHTS068020200263

5. REMOVAL OF ANCHOR PIN
(1) Remove the lock plate and anchor pin retainer.
(2) Using the special tool, remove the pin and brake shoe assembly.
SST: Anchor pin puller (S0942-02000)


SHTS068020200264

6. REMOVAL OF BRAKE CHAMBER AND EXPANDER
(1) Remove the air hose.
(2) Remove the brake chamber and O-ring from the brake spider.
(3) Using a hexagon wrench, remove the expander from the brake spider.


SHTS068020200265

IMPORTANT POINTS - ASSEMBLY

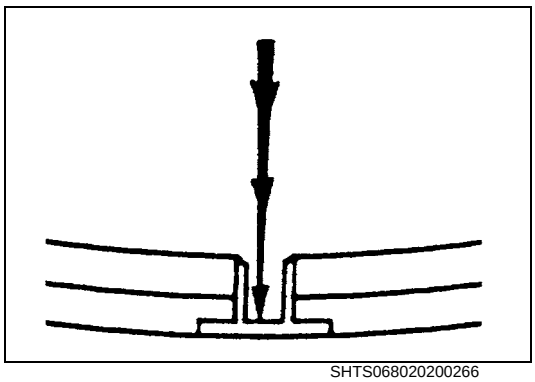
1. REPLACEMENT OF BRAKE LINING

(1) Remove the brake lining from the brake shoe.

a. Drill the rivet caulking section with a drill smaller than the rivet diameter.

NOTICE

At this time, be careful not to scratch the brake shoe.

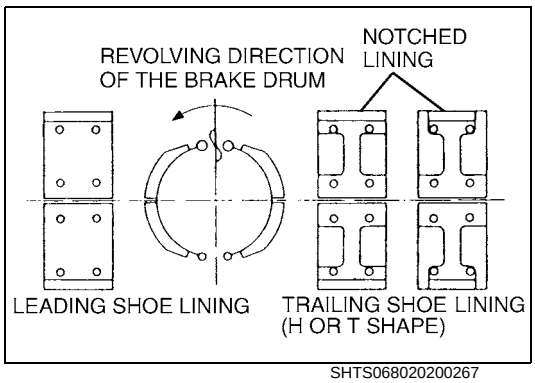

SHTS068020200266

b. After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.

(2) Install the brake lining to the brake shoe.

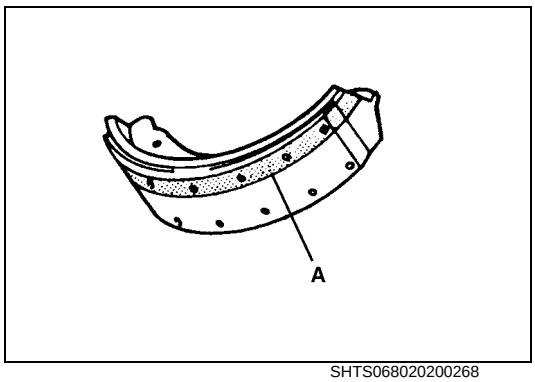
NOTICE

If a notched lining is used, the brake shoe and brake lining should be installed as shown in figure.

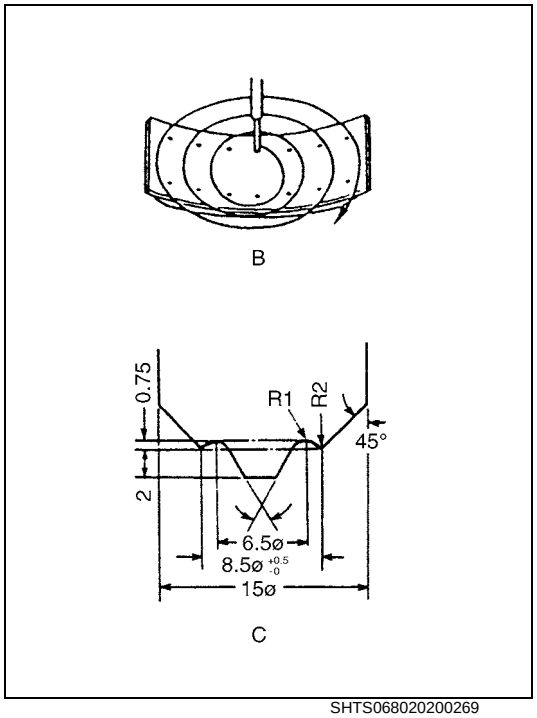


SHTS068020200267

a. Set the lining on the shoe and insert the rivets into all holes, then hold them in place with adhesive tape "A".

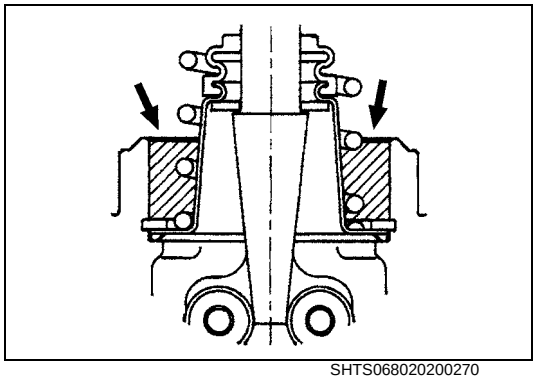


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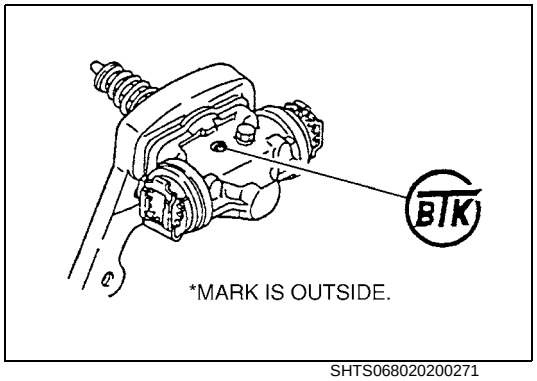


SHTS068020200269

b. Caulk the rivets lightly in a circular pattern as shown in figure "B", repeat several times assure proper seating of the lining.
Recommended configuration of punch: shown in "C".
Recommended force of staking the rivet: 2.4 tons.
c. Remove adhesive tape.

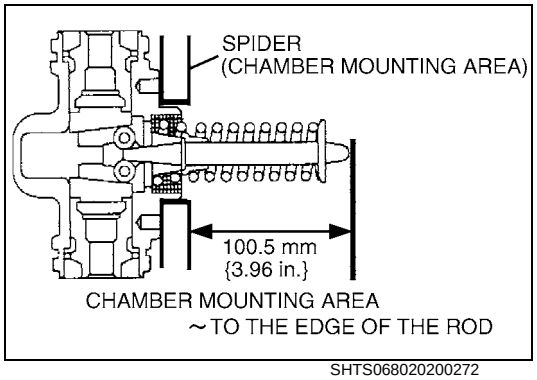

SHTS068020200270

2. INSTALLATION OF EXPANDER AND BRAKE CHAMBER
(1) Apply grease (Darina Grease: Showa Shell Sekiyu K.K. product or equivalent) to the expander as shown in the figure.



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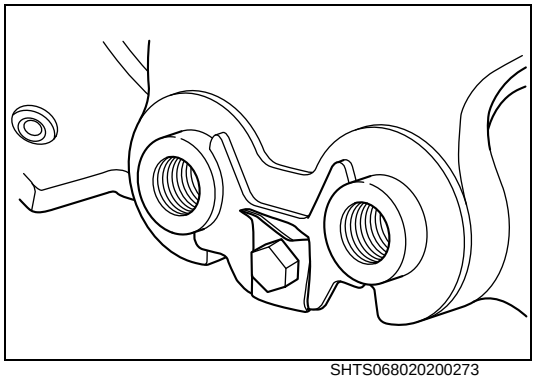
(2) Using a hexagon wrench, install the expander to the brake spider.
NOTICE
Pay attention to assembling way.



SHTS068020200272

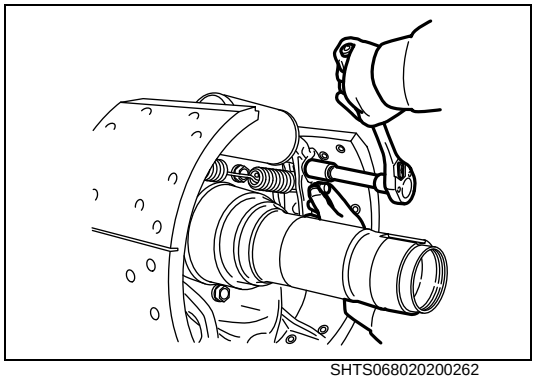
(3) Confirm the length of the expander rod.
NOTICE
Length from the chamber mounting area of spider to the edge of the rod should be 100.5 mm {3.96 in.} as shown in the figure left. Confirm it as that there is a possibility of a defective return of the rod if it is shorter than the standard length.

(4) Install the new O-ring and brake chamber to the brake spider.


SHTS068020200273

3. INSTALLATION OF BRAKE SHOE ASSEMBLY

(1) Apply adequate amount of heat resistance grease on the brake shoe bushing, O-ring and anchor pin.
(2) Set the brake shoe assembly in place, then insert the anchor pins.
(3) Insert the anchor pin retainer in the grooves of the two anchor pins.
(4) Place the lock plate on the anchor pin retainer so that its hole is aligned with the lock plate hole, then insert the bolt and tighten it.

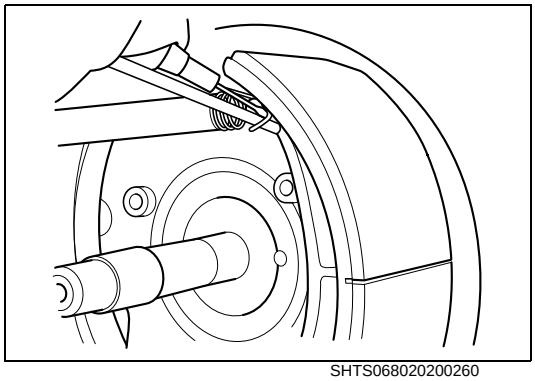

SHTS068020200262

4. INSTALLATION OF BRAKE SHOE RETURN SPRING

(1) Hook the inner spring to the clamp and turn the pivot pin to align the holes, then insert the spring hanger.
(REAR WHEEL)

NOTICE

Painted part of the spring must be placed in the upper side.

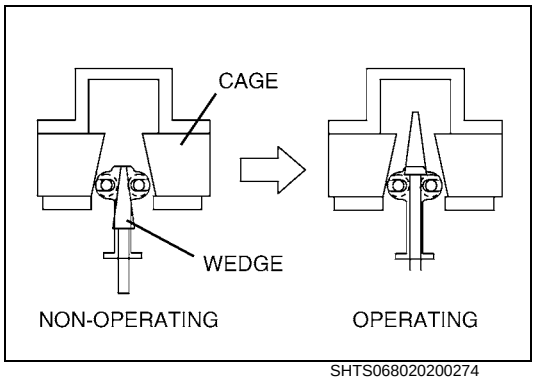

SHTS068020200260

(2) Use the special tool to install the return spring.
(FRONT WHEEL, REAR WHEEL OUTER SPRING)

NOTICE

The folded part of the spring cover must be placed in the upper side.

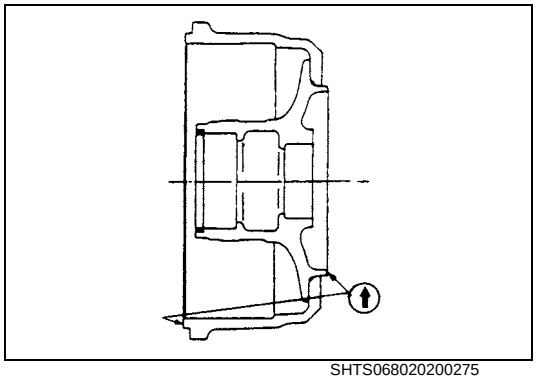
SST: Spring pull back tool (S0968-31070)



SHTS068020200274

NOTICE

- **Do not operate the brake with the brake drum removed.**
- **The wedge type showed a returning failure because the brake was applied the without the drum and shoe return spring when brake maintenance was performed.**
- **The wedge becomes caught when the brake is operated and return becomes defective due to the wedge exceeding the cage.**



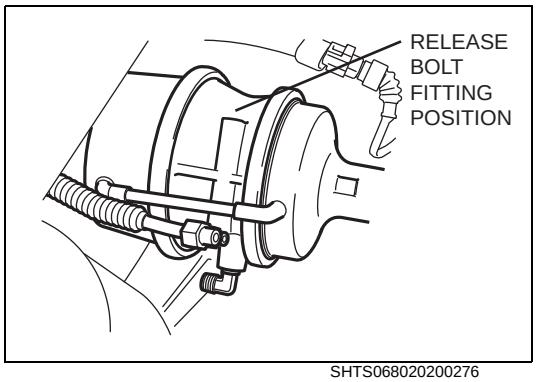
SHTS068020200275

5. BRAKE DRUM AND WHEEL HUB

(1) When assembling the front brake drum and front wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks is shown in the figure.



SHTS068020200276

IMPORTANT POINTS - MOUNTING

1. REMOVAL OF THE RELEASE BOLT

(1) After mounting, turn the release bolt counterclockwise to release the spring brake.

NOTICE

Note the position mark R or L on the chamber which mark was applied when dismounting and install it to its former side.

(2) After mounting, the release bolt must be set at the specified torque.
Tightening Torque:
13.7-15.7 N·m {140-160 kgf·cm, 10.2-11.5 lbf·ft}

2. MOUNTING OF WHEEL HUB AND BRAKE DRUM.

(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

3. MOUNTING OF TIRE

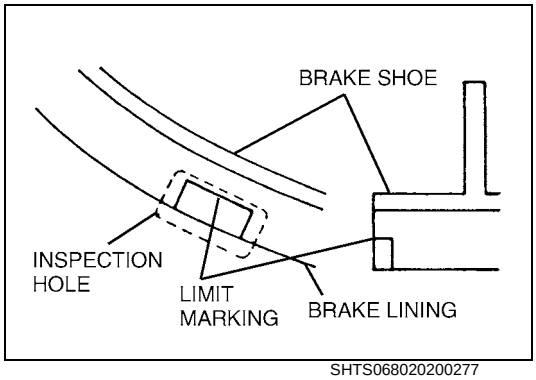
(1) Refer to the chapter **"WHEEL & TIRE"**.

4. ADJUSTMENT

(1) Finally, adjust the brake shoe clearance as explained in the section **"ADJUSTMENT"**.

ADJUSTMENT

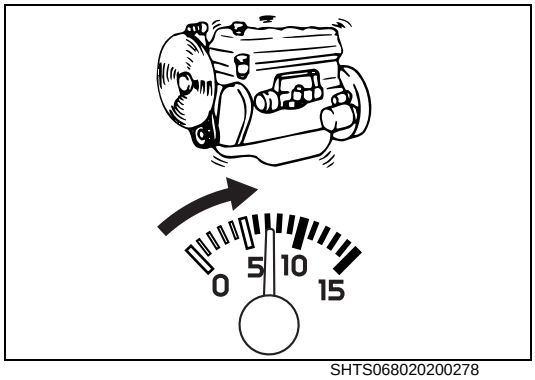
EN0680202H300030



SHTS068020200277

1. REMAINING THICKNESS OF THE BRAKE LINING

(1) Check remaining thickness of lining through the inspection hole of the brake drum cover. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made replace the lining.



SHTS068020200278

2. AIR PRESSURE IN THE AIR TANK

(1) Operate the engine and obtain an air pressure of the 740-840 kPa {7.5-8.5 kgf/cm^2, 107-121 lbf/in.^{2}}

NOTICE

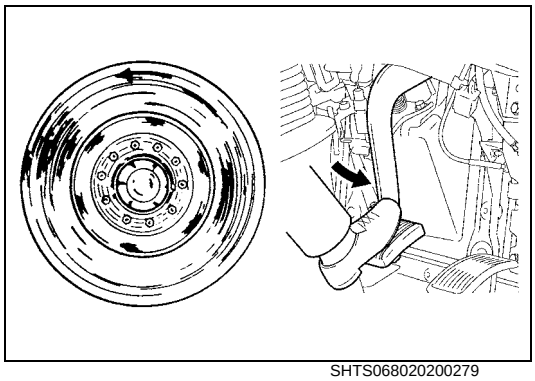
The specified air pressure in the air tank should be maintained while making the adjustment.

3. INSPECTION OF THE CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM

(1) Step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(2) Insert a thickness gauge from the inspection hole to inspect the clearance between brake lining and brake drum. If the clearance exceeds standard value, disassemble auto adjuster and perform maintenance service because auto adjuster possibly may be out of order.

	STANDARD (mm {in.})
FRONT	0.2-1.0 {0.0079-0.0393}
REAR	0.2-1.0 {0.0079-0.0393}


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4. ADJUSTMENT OF THE CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM

NOTICE

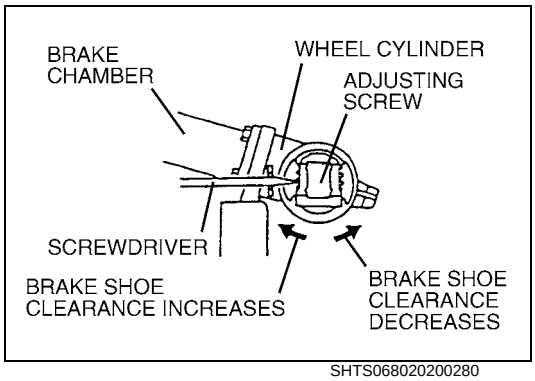
As this brake has auto adjuster function, it is not necessary to adjust the clearance between brake lining and brake drum. Adjust the clearance in accordance with the following method, if the brake lining is replaced and maintenance service is performed.

(1) Lift the wheel to be adjusted off the ground.

(2) While turning the wheel in the forward direction and step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

NOTICE

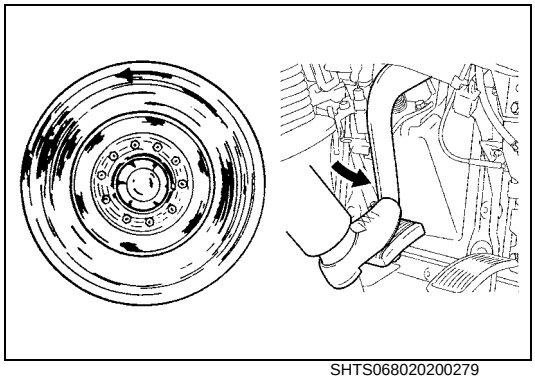
When adjusting the clearance between brake lining and brake drum, set spring brake control valve to the OFF position.



SHTS068020200280

(3) Remove the brake drum cover.

(4) Insert the thickness gauge and turn the adjusting screw with screwdriver so that brake shoe clearance come to the standard value.


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(5) While turning the wheel by hand in the forward direction, step on the brake pedal several times to make sure that the brake shoes are correctly positioned.

(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from 2.

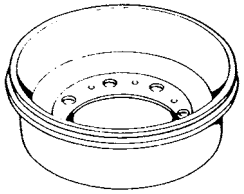
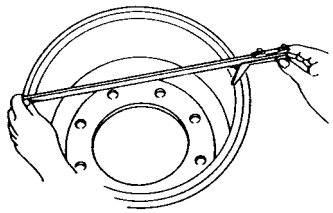
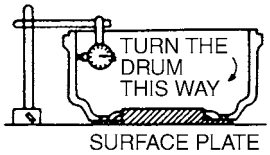
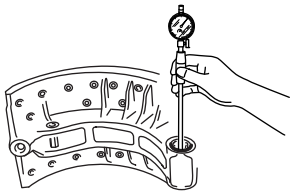
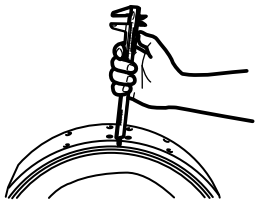
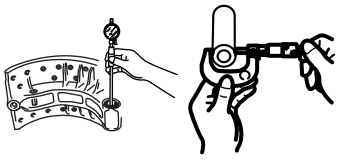
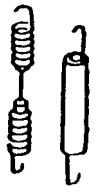
NOTICE

Using the same procedure as above, adjust the clearance for all wheels.

INSPECTION AND REPAIR

EN0680202H300031

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum: Cracks and damage	**—**	**—**	**Regrind or replace, if necessary.**	**Visual check** 
Brake drum: Inside diameter	**410 {16.142}**	**414 {16.299}**	**Replace.**	**Measure** 
Brake drum: Runout	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure** 
Brake shoe assembly: Cracks and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Brake lining: Thickness	**16 {0.630}**	**5.0 {0.197}**	**Replace.**	**Measure** 
Clearance between brake shoe bushing and anchor pin	**0.05-0.14 {0.0020-0.0055}**	**0.30 {0.0118}**	**Replace the brake shoe bushing and/ or anchor pin.**	**Measure** 
Brake shoe return spring and spring cover: Damage, lacking elastic strength distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE (S-CAM TYPE)

DATA AND SPECIFICATIONS

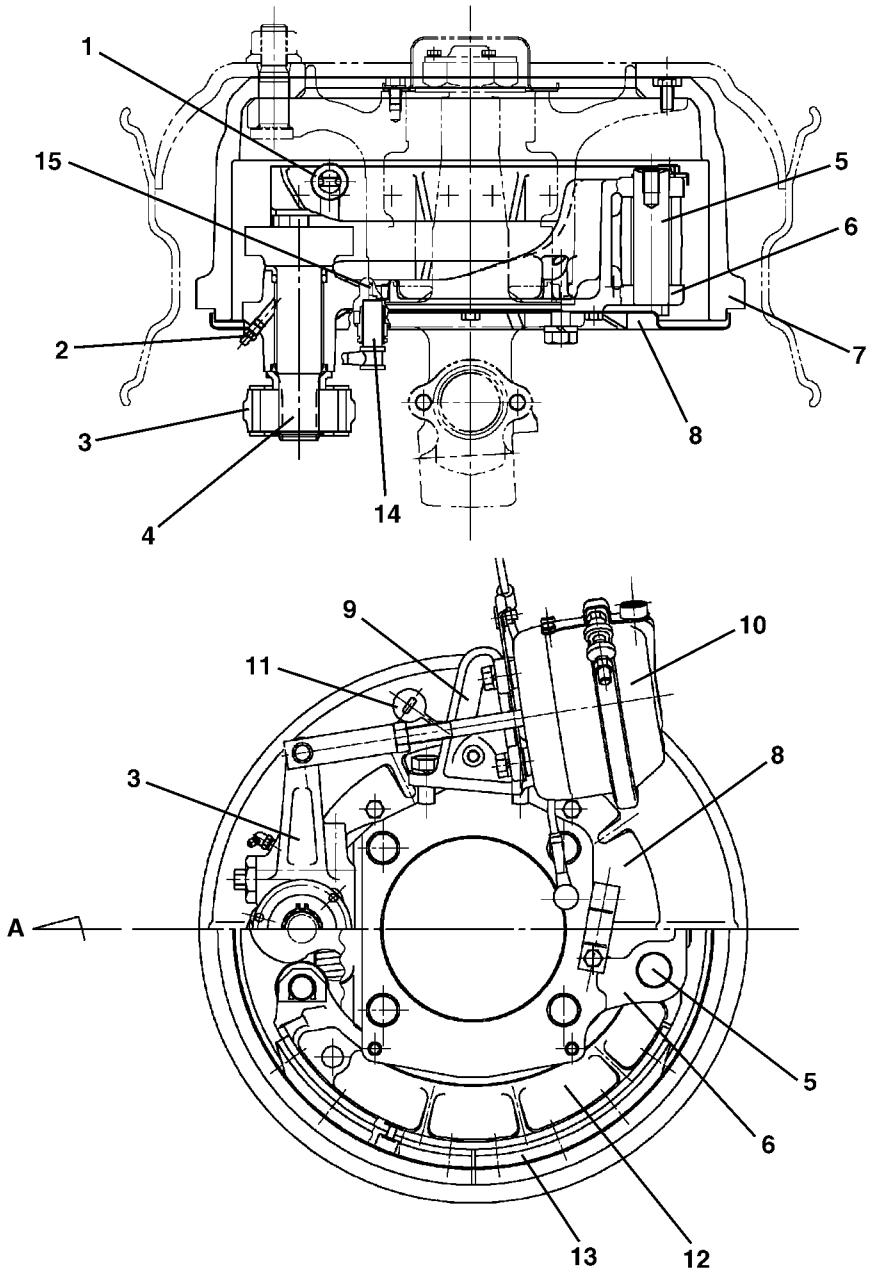
EN0680202I200028

Type			**Drum brake with internally expanding, leading-trailing shoes operating by cam shaft and slack adjuster in all wheels.**
Brake drum inside diameter			**406.4 mm {16.0 in.} for both front and rear.**
Brake lining Width x Thickness	**Models: FG, GH, SG**	**Front**	**127 x 15.5 mm {5.0 x 0.61 in.}**
		Rear	**203 x 15.5 mm {8.0 x 0.61 in.}**
	Models: FL, FM	**Front**	**152 x 15.5 mm {6.0 x 0.61 in.}**
		Rear	**216 x 15.5 mm {8.5 x 0.61 in.}**

DESCRIPTION

EN0680202C100029

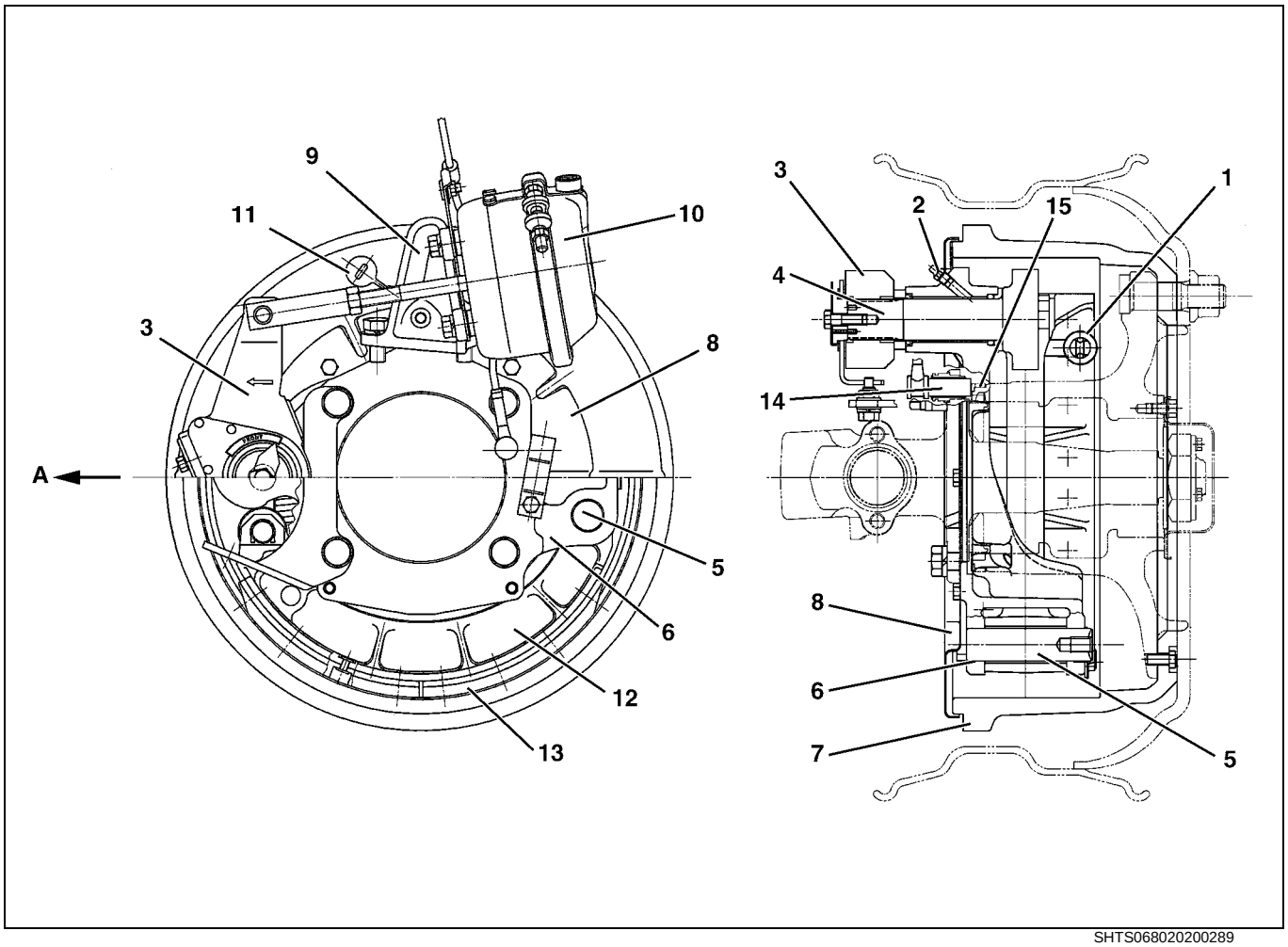
FRONT
[MODELS: FG, GH (EXCEPT FOR IRELAND), SG]



SHTS068020200288

1	Brake shoe return spring	9	Brake chamber bracket
2	Lubrication fitting	10	Brake chamber
3	Slack adjuster	11	Hole plug
4	Cam shaft	12	Brake shoe
5	Anchor pin	13	Brake lining
6	Brake spider	14	Wheel sensor (If so equipped)
7	Brake drum	15	Sensor ring (If so equipped)
8	Brake drum cover	A	Front

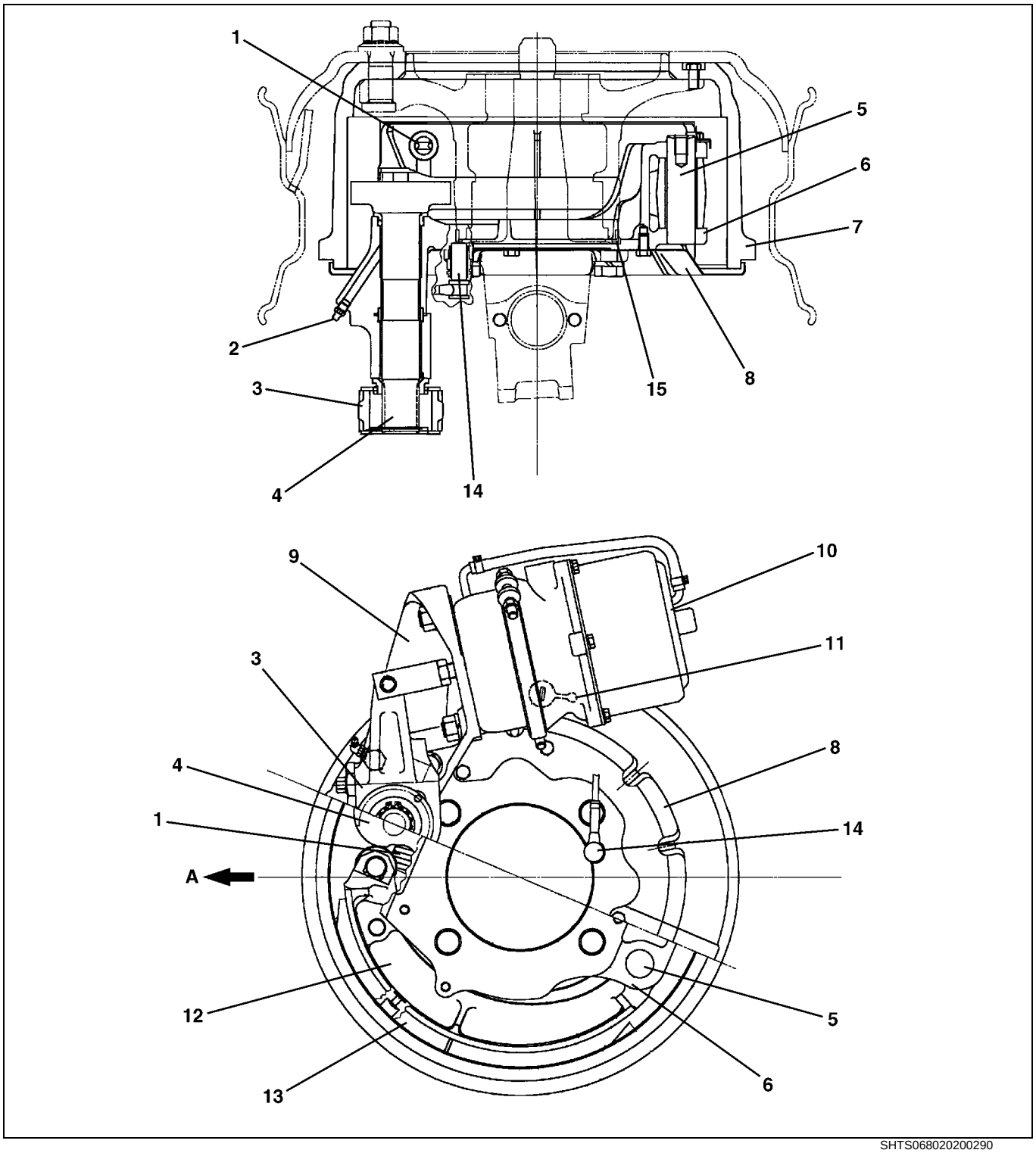
FRONT [MODEL: GH (FOR IRELAND)]



SHTS068020200289

1	Brake shoe return spring	9	Brake chamber bracket
2	Lubrication fitting	10	Brake chamber
3	Auto slack adjuster	11	Hole plug
4	Cam shaft	12	Brake shoe
5	Anchor pin	13	Brake lining
6	Brake spider	14	Wheel sensor (If so equipped)
7	Brake drum	15	Sensor ring (If so equipped)
8	Brake drum cover	A	Front

FRONT (MODELS: FL, FM)

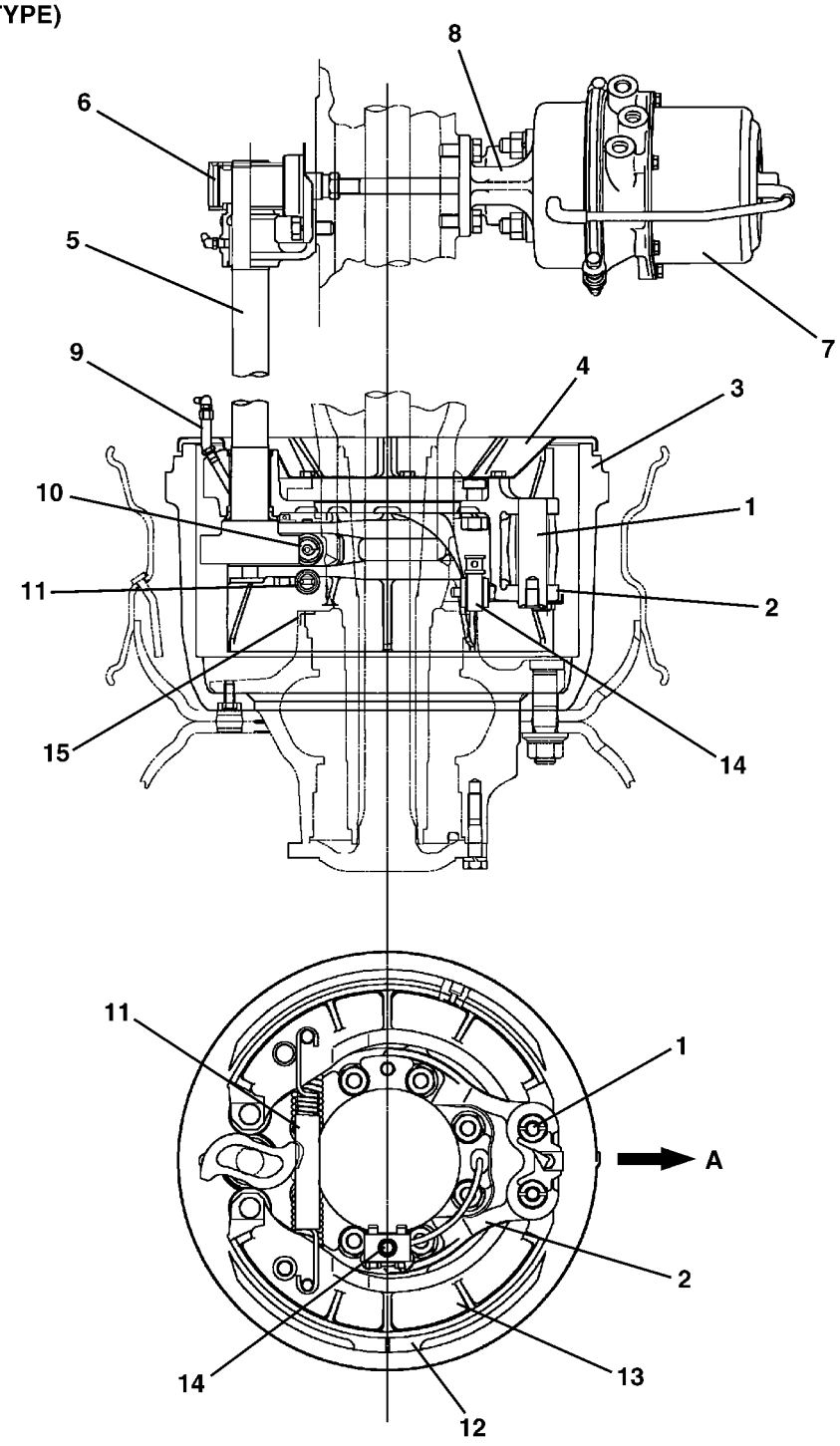


SHTS068020200290

1	Brake shoe return spring	9	Brake chamber bracket
2	Lubrication fitting	10	Spring brake chamber
3	Slack adjuster	11	Hole plug
4	Cam shaft	12	Brake shoe
5	Anchor pin	13	Brake lining
6	Brake spider	14	Wheel sensor (If so equipped)
7	Brake drum	15	Sensor ring (If so equipped)
8	Brake drum cover	A	Front

REAR [MODELS: FG, GH (EXCEPT FOR IRELAND), FL (Frontward)]

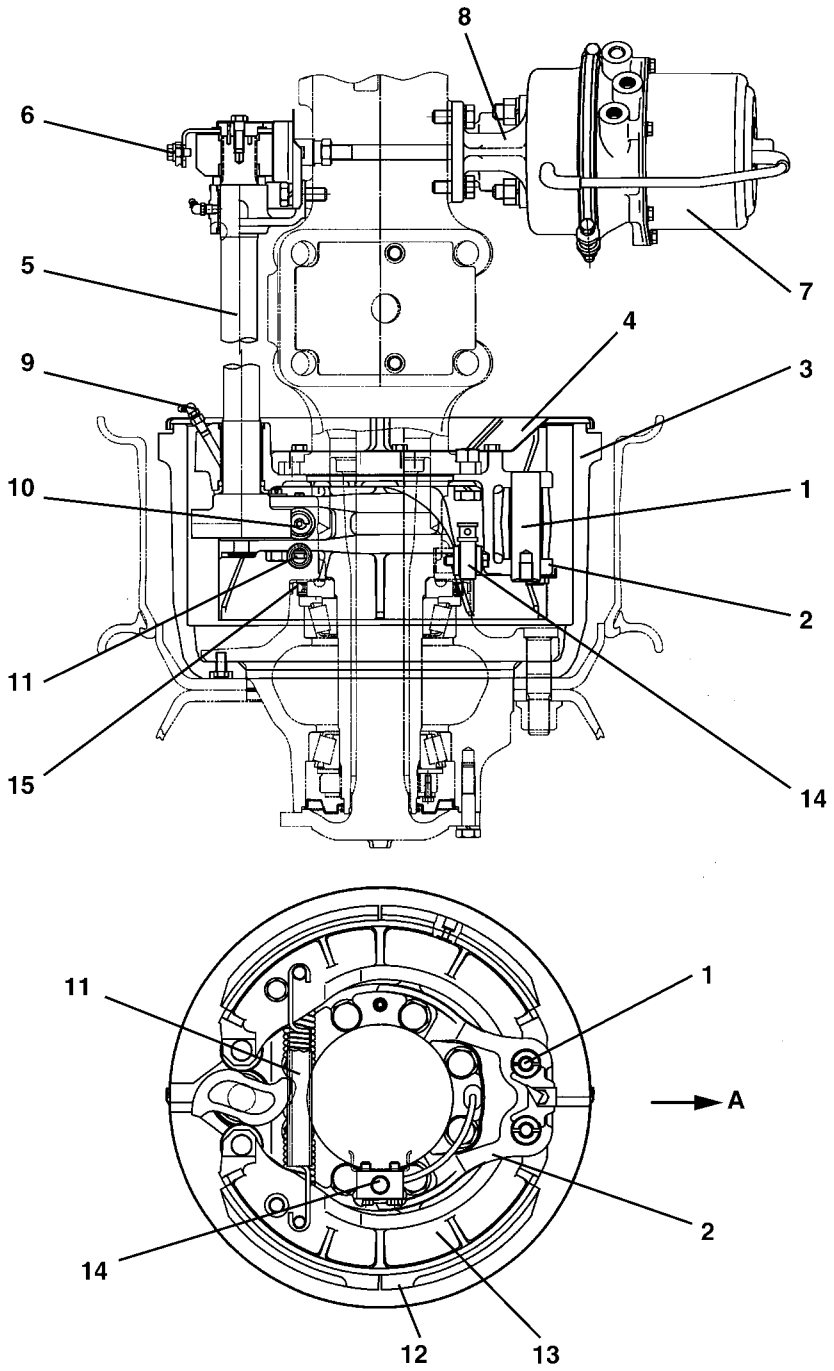
(REPRESENTATIVE TYPE)



SHTS068020200291

1	Anchor pin	9	Lubrication fitting
2	Brake spider	10	Brake shoe return spring (Inner)
3	Brake drum	11	Brake shoe return spring (Outer)
4	Brake drum cover	12	Brake lining
5	Cam shaft	13	Brake shoe
6	Slack adjuster	14	Wheel sensor (If so equipped)
7	Spring brake chamber	15	Sensor ring (If so equipped)
8	Brake chamber bracket	A	Front

REAR [MODEL: GH (FOR IRELAND)]

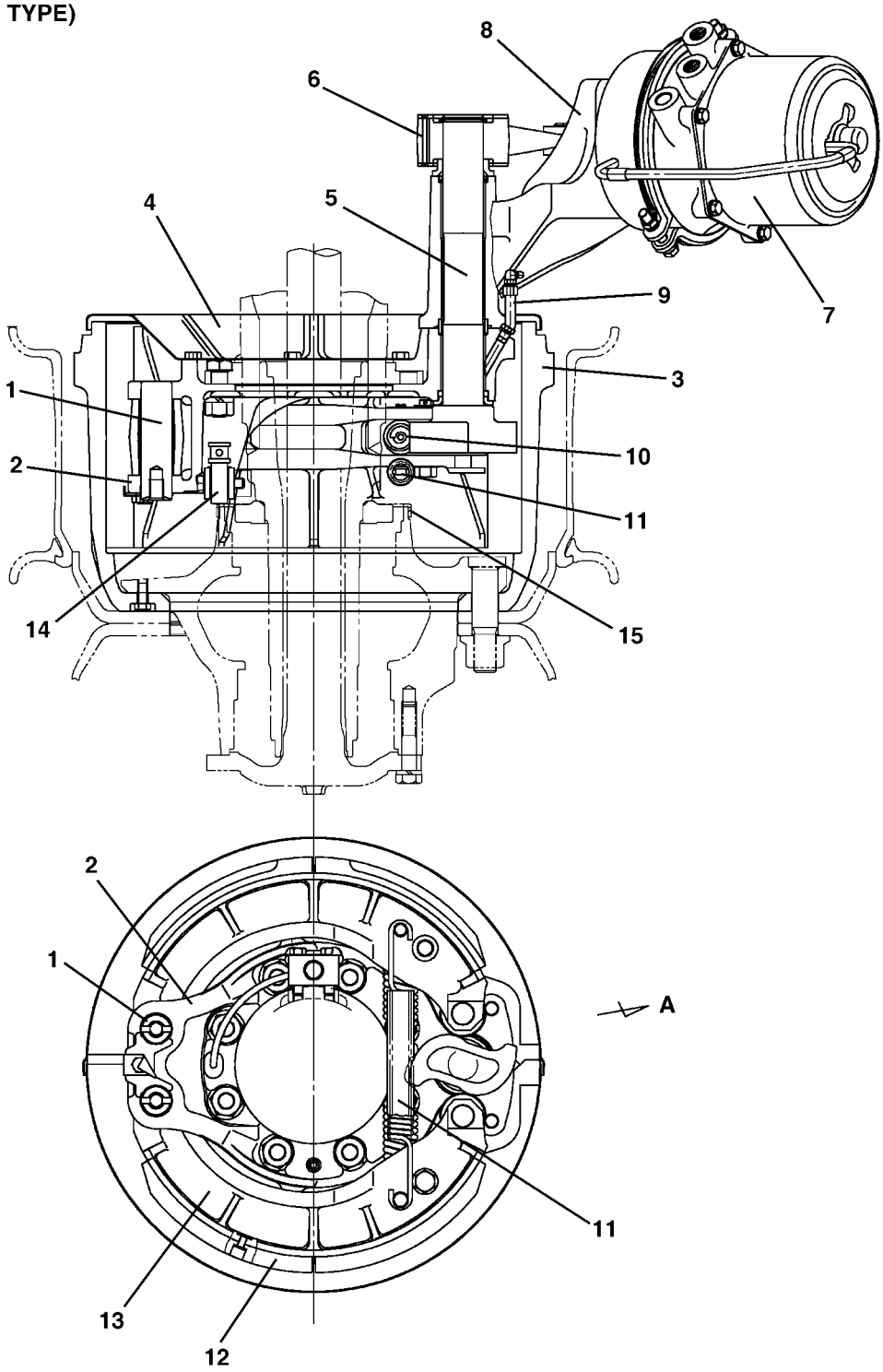


SHTS068020200292

1	Anchor pin	9	Lubrication fitting
2	Brake spider	10	Brake shoe return spring (Inner)
3	Brake drum	11	Brake shoe return spring (Outer)
4	Brake drum cover	12	Brake lining
5	Cam shaft	13	Brake shoe
6	Slack adjuster	14	Wheel sensor
7	Spring brake chamber	15	Sensor ring
8	Brake chamber bracket	A	Front

REAR (Frontward) (MODEL: FM)

(REPRESENTATIVE TYPE)

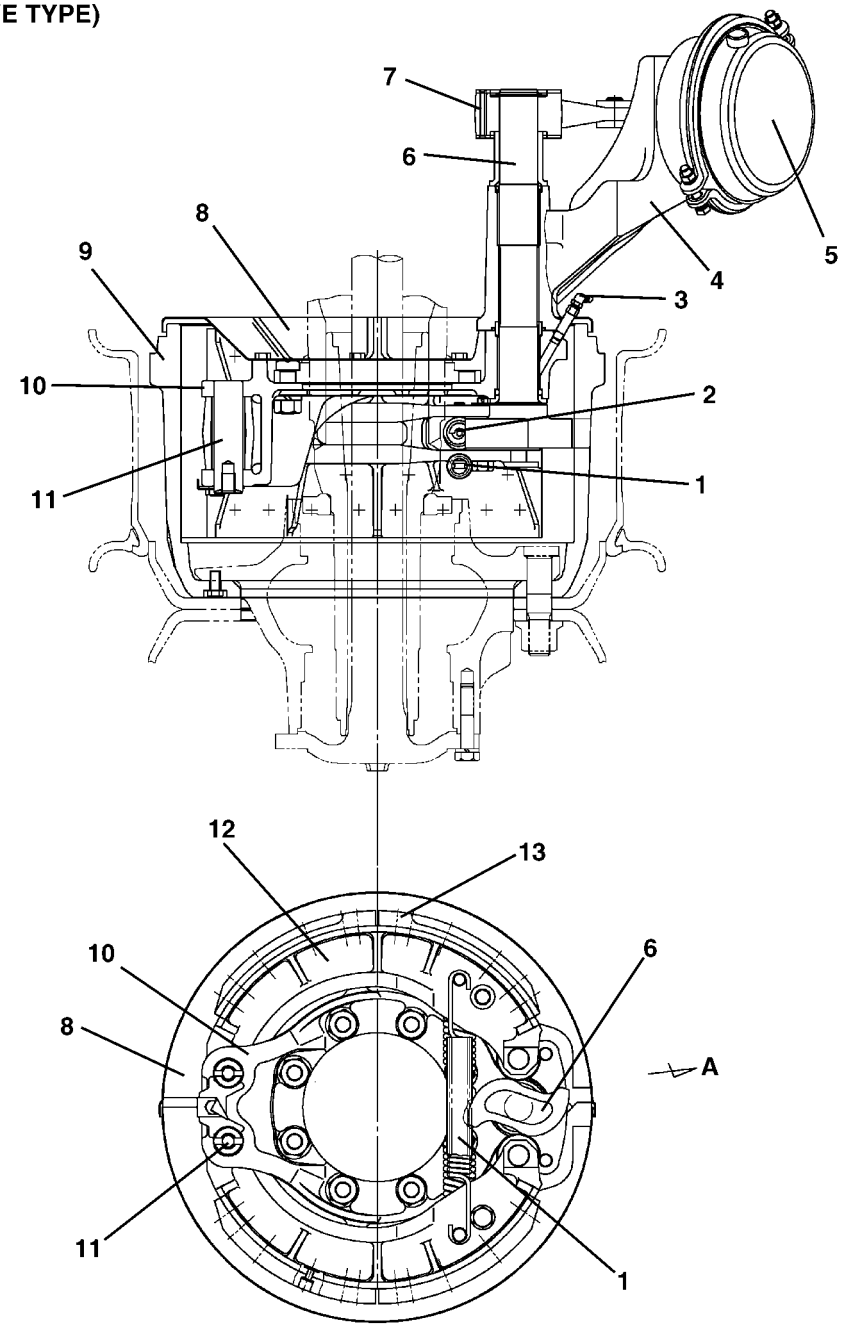


SHTS068020200293

1	Anchor pin	9	Lubrication fitting
2	Brake spider	10	Brake shoe return spring (Inner)
3	Brake drum	11	Brake shoe return spring (Outer)
4	Brake drum cover	12	Brake lining
5	Cam shaft	13	Brake shoe
6	Slack adjuster	14	Wheel sensor (If so equipped)
7	Spring brake chamber	15	Sensor ring (If so equipped)
8	Brake chamber bracket	A	Front

REAR (Rearward) (MODEL: FM)

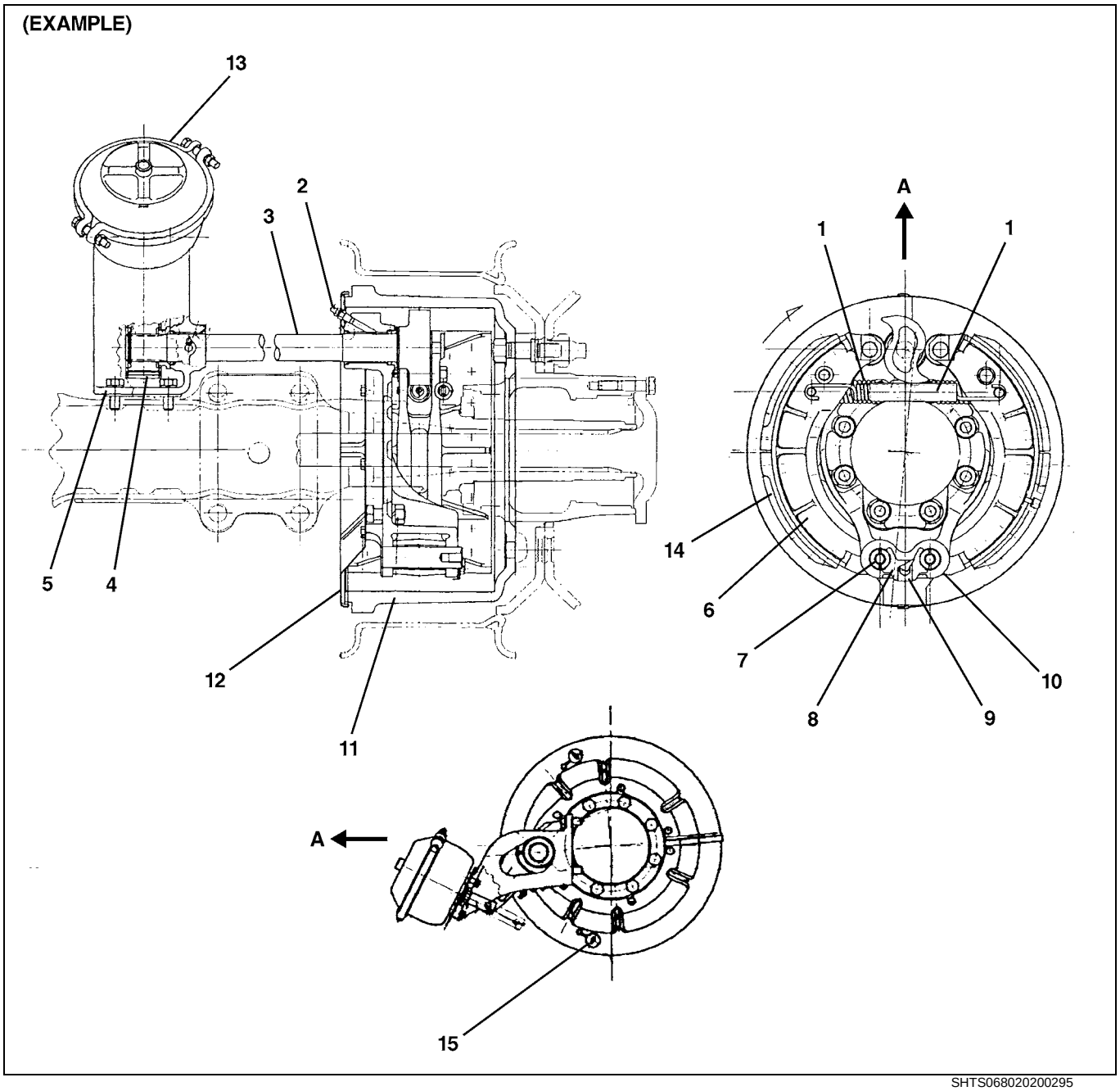
(REPRESENTATIVE TYPE)



SHTS068020200294

1	Brake shoe return spring (Outer)	8	Brake drum cover
2	Brake shoe return spring (Inner)	9	Brake drum
3	Lubrication fitting	10	Brake spider
4	Brake chamber bracket	11	Anchor pin
5	Brake chamber	12	Brake shoe
6	Cam shaft	13	Brake lining
7	Slack adjuster	A	Front

REAR (MODEL: SG)



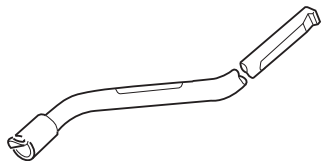
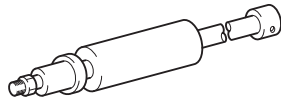
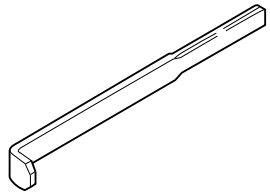
SHTS068020200295

1	Brake shoe return spring	9	Lock plate
2	Lubrication fitting	10	Brake spider
3	Cam shaft	11	Brake drum
4	Slack adjuster	12	Brake drum cover
5	Brake chamber bracket	13	Brake chamber
6	Brake shoe	14	Brake lining
7	Anchor pin	15	Hole plug
8	Anchor pin retainer	A	Front

SPECIAL TOOL

EN0680202K100004

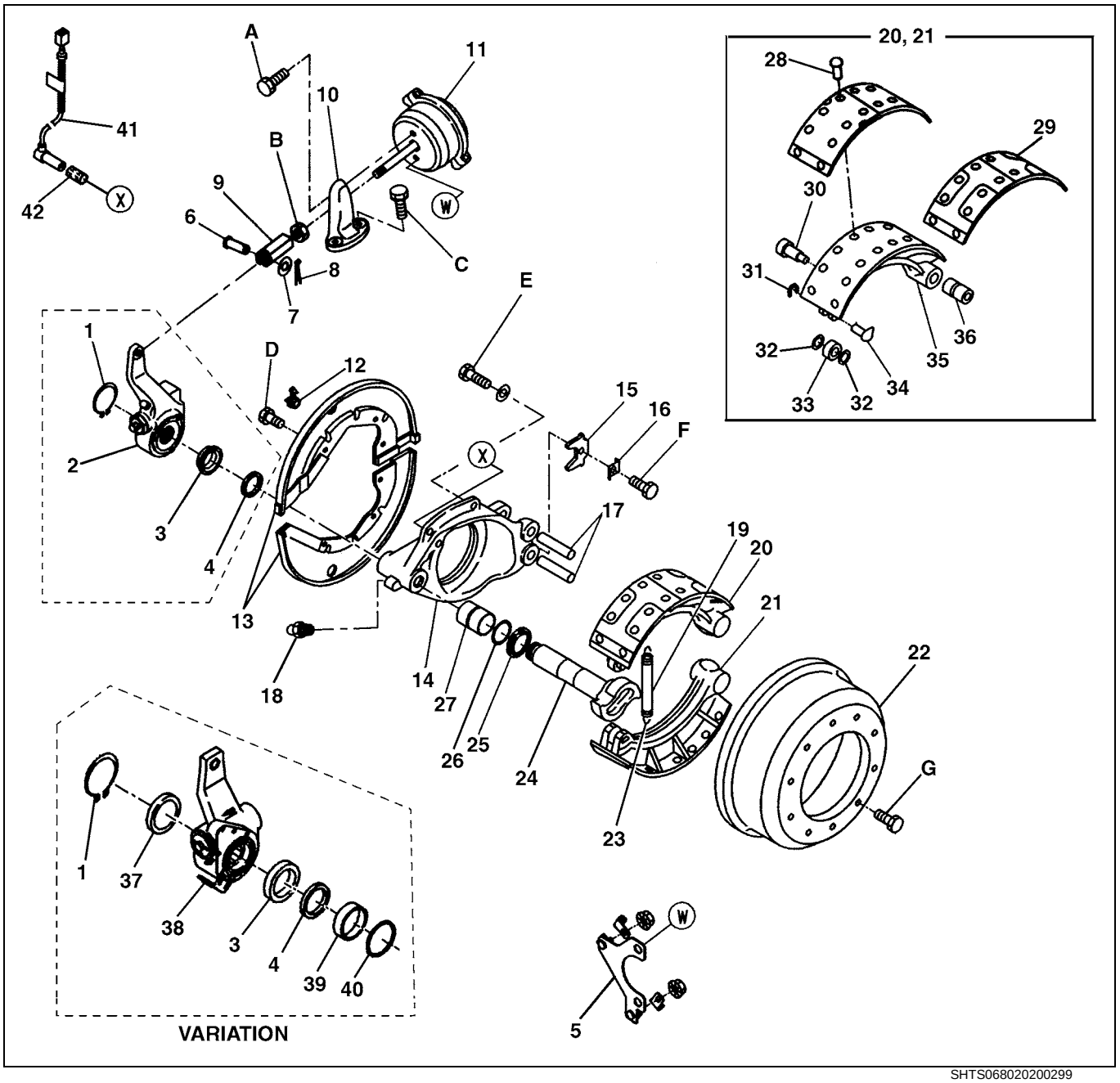
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0968-31070	SPRING PULL BACK TOOL	
	S0942-01510	ANCHOR PIN PULLER	
	S0968-41010	ANCHOR PIN TOOL	

COMPONENT LOCATOR

EN0680202D100028

FRONT (MODELS: FG, GH, SG)



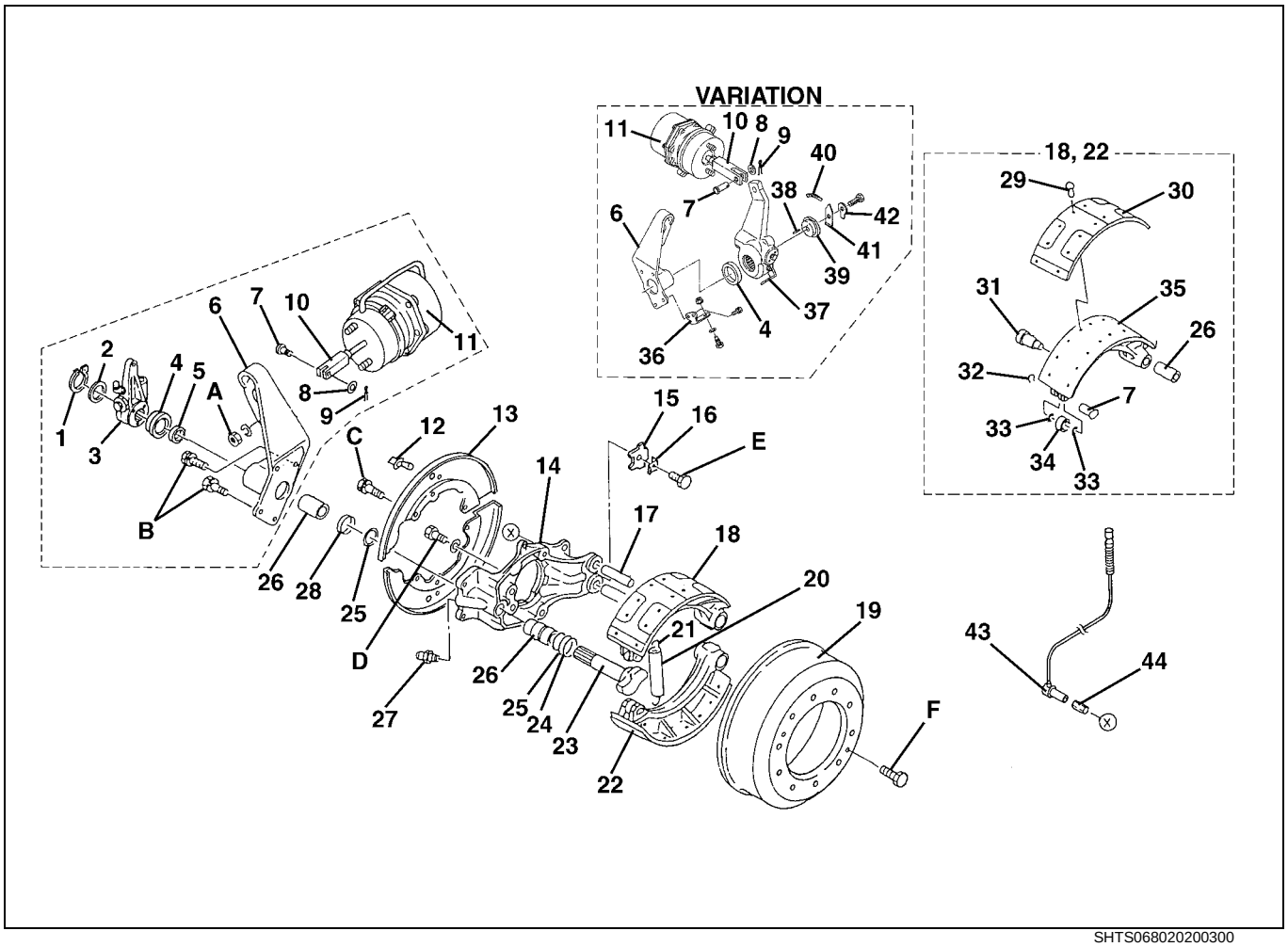
SHTS068020200299

1	Retainer ring	15	Retainer	29	Brake lining
2	Slack adjuster	16	Lock plate	30	Spring hanger
3	Collar	17	Anchor pin	31	Retainer ring
4	Oil seal	18	Lubrication fitting	32	Seal
5	Bracket	19	Spring cover	33	Roller
6	Pin	20	Brake shoe assembly (Trailing)	34	Pin
7	Washer	21	Brake shoe assembly (Leading)	35	Brake shoe
8	Cotter pin	22	Brake drum	36	Bushing
9	Clevis	23	Brake shoe return spring	37	Thrust washer (If so equipped)
10	Brake chamber bracket	24	Cam shaft	38	Auto slack adjuster (If so equipped)
11	Brake chamber	25	Collar	39	Spacer (If so equipped)
12	Hole plug	26	O-ring	40	O-ring (If so equipped)
13	Brake drum cover	27	Bushing	41	Wheel sensor (If so equipped)
14	Brake spider	28	Rivet	42	Sleeve (If so equipped)

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

A	64-86 {650-870, 47-63}	E	168-226 {1,710-2,300, 124-166}
B	50-68 {510-690, 36-50}	F	34.5-51.5 {351-527, 26-38}
C	109-147 {1,100-1,500, 80-108}	G	20.5-31.5 {200-400, 15-28}
D	34.5-51.5 {351-527, 26-38}		

FRONT (MODELS: FL, FM)



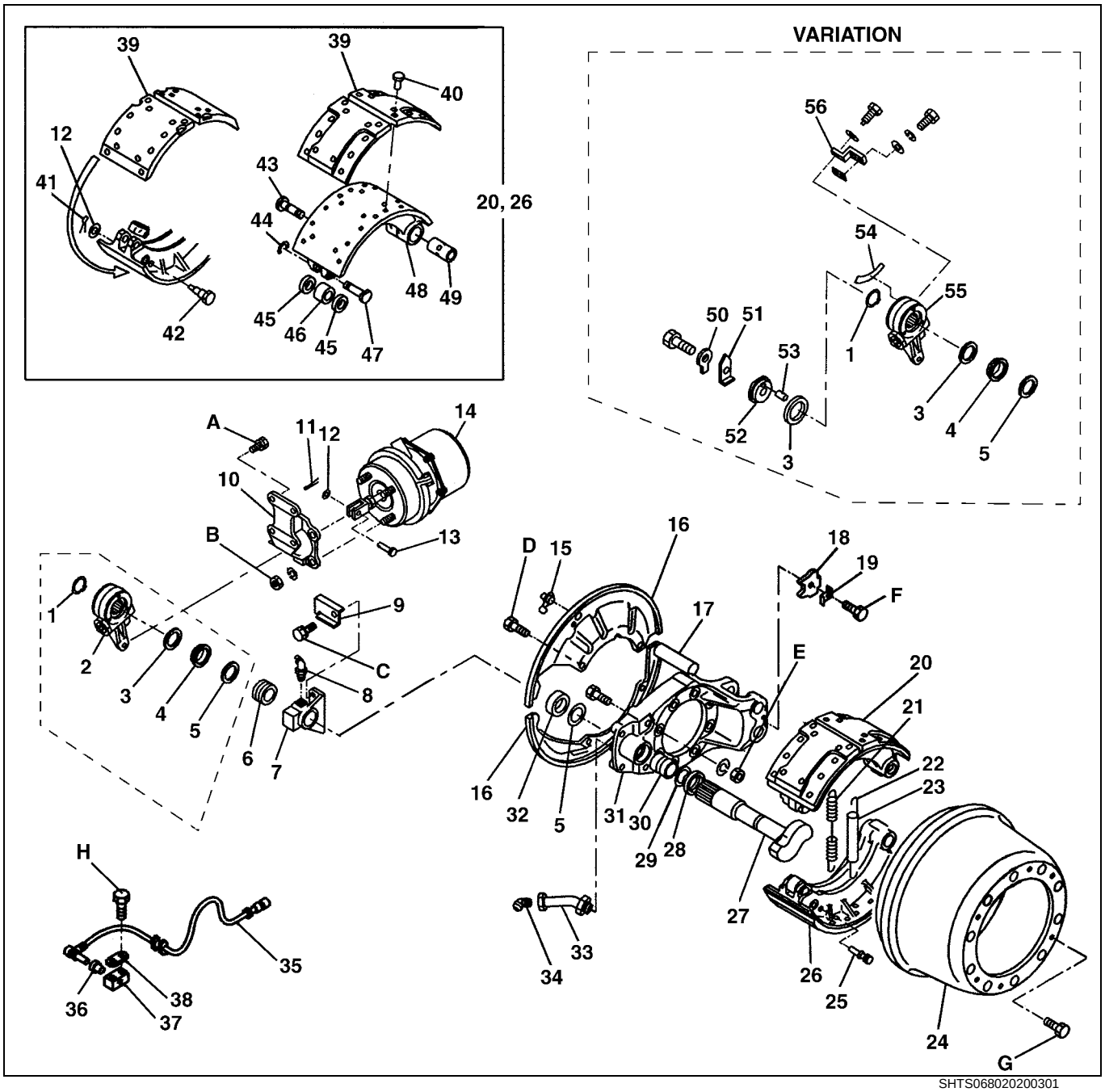
SHTS068020200300

1	Retainer ring	16	Lock plate	31	Spring hanger
2	Thrust washer	17	Anchor pin	32	Retainer ring
3	Slack adjuster	18	Brake shoe assembly (Trailing)	33	Seal
4	Collar	19	Brake drum	34	Roller
5	Oil seal	20	Spring cover	35	Brake shoe
6	Brake chamber bracket	21	Brake shoe return spring	36	Bracket (If so equipped)
7	Pin	22	Brake shoe assembly (Leading)	37	Auto slack adjuster (If so equipped)
8	Washer	23	Cam shaft	38	Pin (If so equipped)
9	Cotter pin	24	Collar	39	Spacer (If so equipped)
10	Clevis	25	O-ring	40	Plate (If so equipped)
11	Spring brake chamber	26	Bushing	41	Indicator (If so equipped)
12	Hole plug	27	Lubrication fitting	42	Lock washer (If so equipped)
13	Brake drum cover	28	Spacer	43	Wheel sensor (If so equipped)
14	Brake spider	29	Rivet	44	Sleeve (If so equipped)
15	Retainer	30	Brake lining		

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

A	119-225 {1,200-2,300, 87-166}	D	246-324 {2,500-3,300, 181-238}
B	109-147 {1,100-1,500, 80-108}	E	34.5-51.5 {351-527, 26-38}
C	34.5-51.5 {351-527, 26-38}	F	20.5-39.5 {200-400, 15-28}

REAR [MODELS: FG, GH (EXCEPT FOR IRELAND), FL (Frontward)]

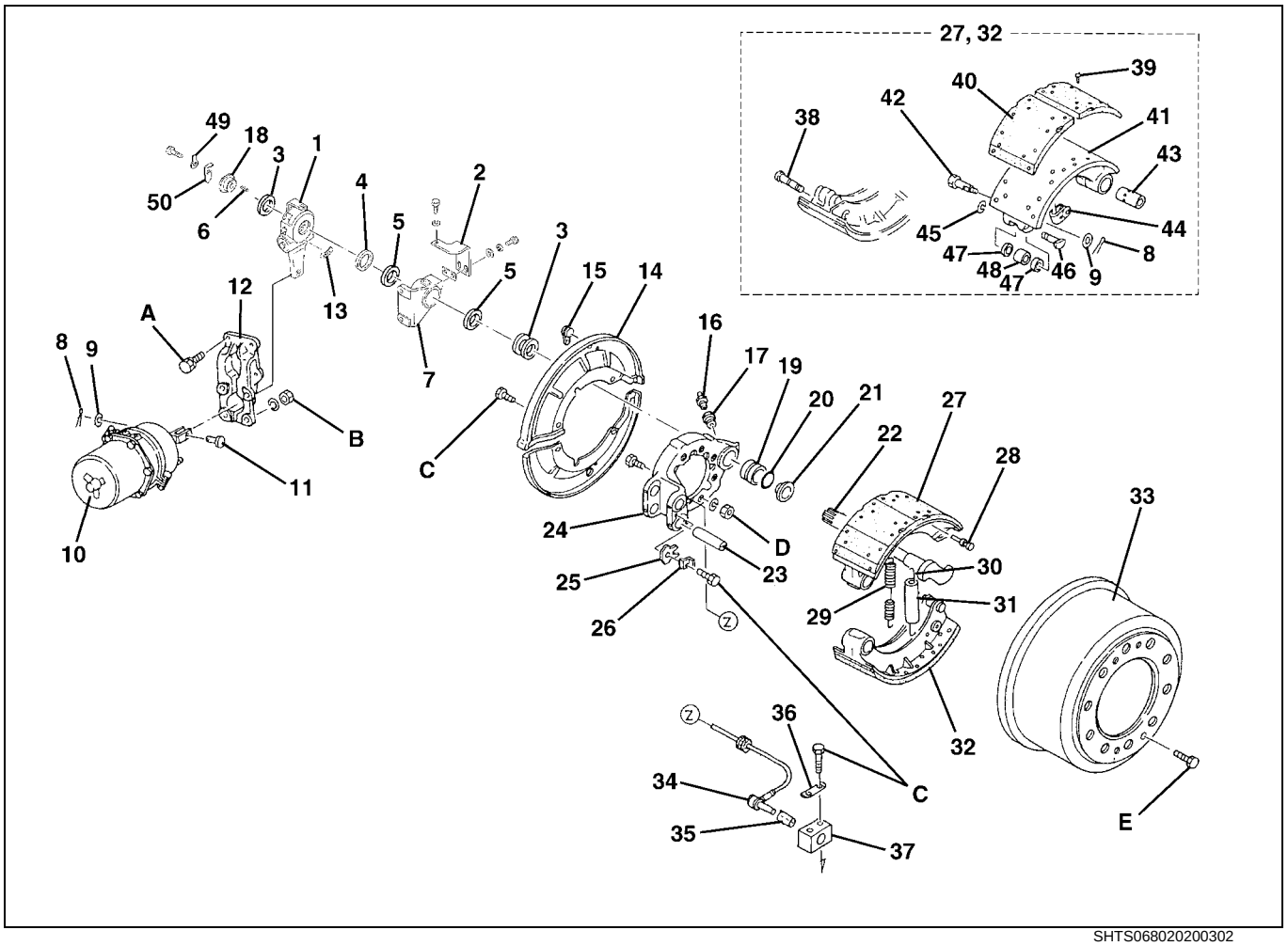


1	Retainer ring	20	Brake shoe assembly (Trailing)	39	Brake lining
2	Slack adjuster	21	Brake shoe return spring (Inner)	40	O-ring
3	Thrust washer	22	Brake shoe return spring (Outer)	41	Cotter pin
4	Collar	23	Spring cover	42	Pivot pin
5	Oil seal	24	Brake drum	43	Spring hanger
6	Bushing	25	Spring hanger	44	Retainer ring
7	Bracket	26	Brake shoe assembly (Leading)	45	Seal
8	Lubrication fitting	27	Cam shaft	46	Roller
9	Protector	28	Washer	47	Pin
10	Brake chamber bracket	29	O-ring	48	Brake shoe
11	Cotter pin	30	Bushing	49	Bushing
12	Washer	31	Brake spider	50	Lock washer (If so equipped)
13	Pin	32	Spacer	51	Indicator (If so equipped)
14	Spring brake chamber	33	Connector	52	Spacer (If so equipped)
15	Hole plug	34	Lubrication fitting	53	Pin (If so equipped)
16	Brake drum cover	35	Wheel sensor (If so equipped)	54	Plate (If so equipped)
17	Anchor pin	36	Sleeve (If so equipped)	55	Auto slack adjuster (If so equipped)
18	Retainer	37	Holder (If so equipped)	56	Bracket (If so equipped)
19	Lock plate	38	Lock washer (If so equipped)		

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

A	109-147 {1,100-1,500, 80-108}	E	168-226 {1,710-2,300, 124-166}
B	119-225 {1,200-2,300, 81-166}	F	34.5-51.5 {351-527, 26-38}
C	109-147 {1,100-1,500, 80-108}	G	21-39 {200-400, 15-28}
D	34.5-51.5 {351-527, 26-38}	H	21.5-31.5 {220-320, 15-23}

REAR [MODEL: GH (FOR IRELAND)]



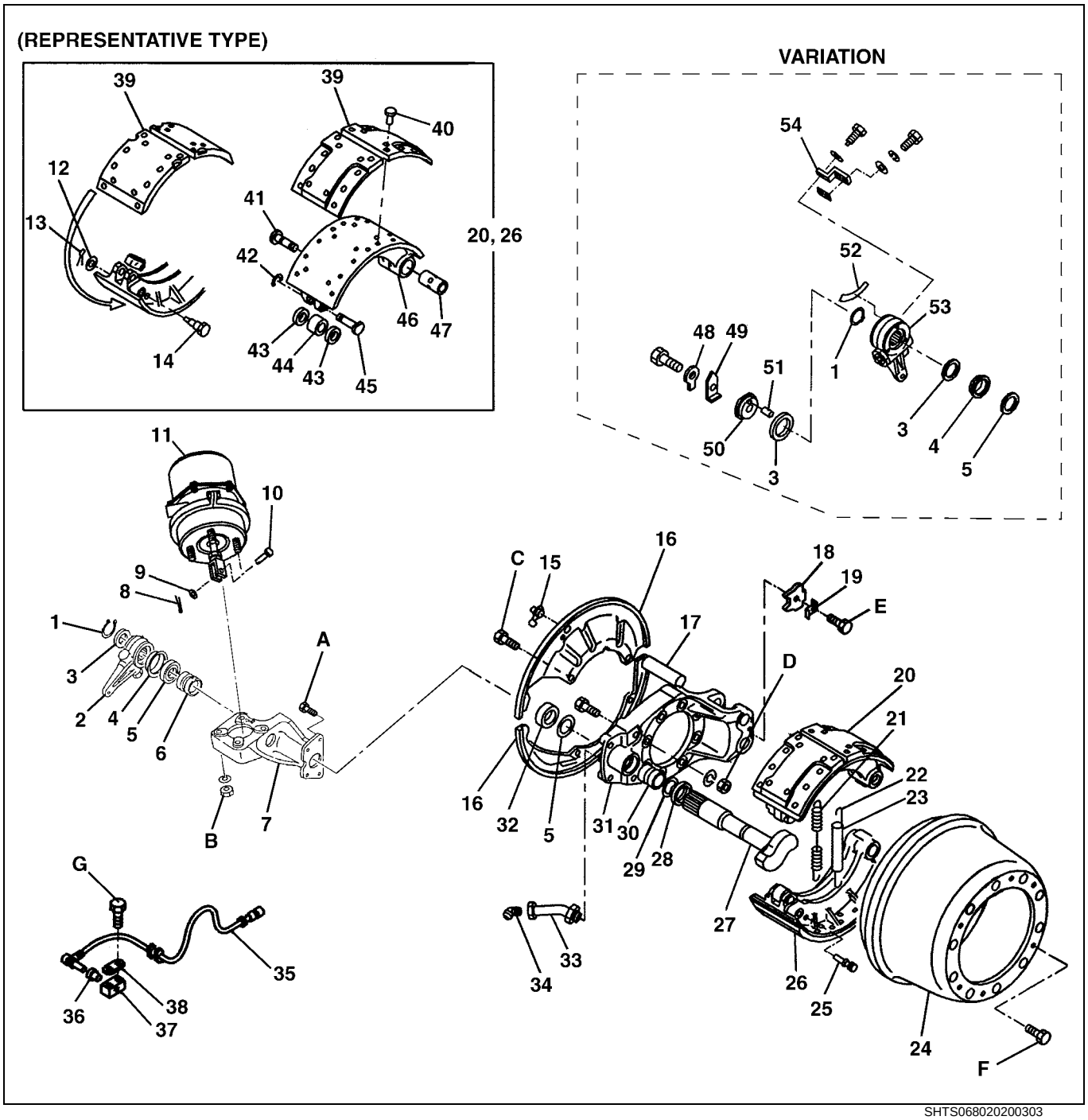
SHTS068020200302

1	Auto slack adjuster	18	Spacer	35	Sleeve
2	Bracket	19	Bushing	36	Lock washer
3	Thrust washer	20	O-ring	37	Holder
4	Collar	21	Collar	38	Spring hanger
5	Oil seal	22	Cam shaft	39	Rivet
6	Pin	23	Anchor pin	40	Brake lining
7	Bracket	24	Brake spider	41	Brake shoe
8	Cotter pin	25	Retainer	42	Rivet pin
9	Washer	26	Lock plate	43	Bushing
10	Spring brake chamber	27	Brake shoe assembly (Trailing)	44	Clamp
11	Pin	28	Spring hanger	45	Retainer ring
12	Brake chamber bracket	29	Brake shoe return spring (Inner)	46	Pin
13	Plate	30	Brake shoe return spring (Outer)	47	Seal
14	Brake drum cover	31	Spring cover	48	Roller
15	Hole plug	32	Brake shoe assembly (Leading)	49	Lock washer
16	Lubrication fitting	33	Brake drum	50	Indicator
17	Joint	34	Wheel sensor		

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

A	109-147 {1,100-1,500, 80-108}	D	168-226 {1,710-2,300, 124-166}
B	119-225 {1,200-2,300, 81-166}	E	21-39 {200-400, 15-28}
C	34.5-51.5 {351-527, 26-38}		

REAR (Frontward) (MODEL: FM)



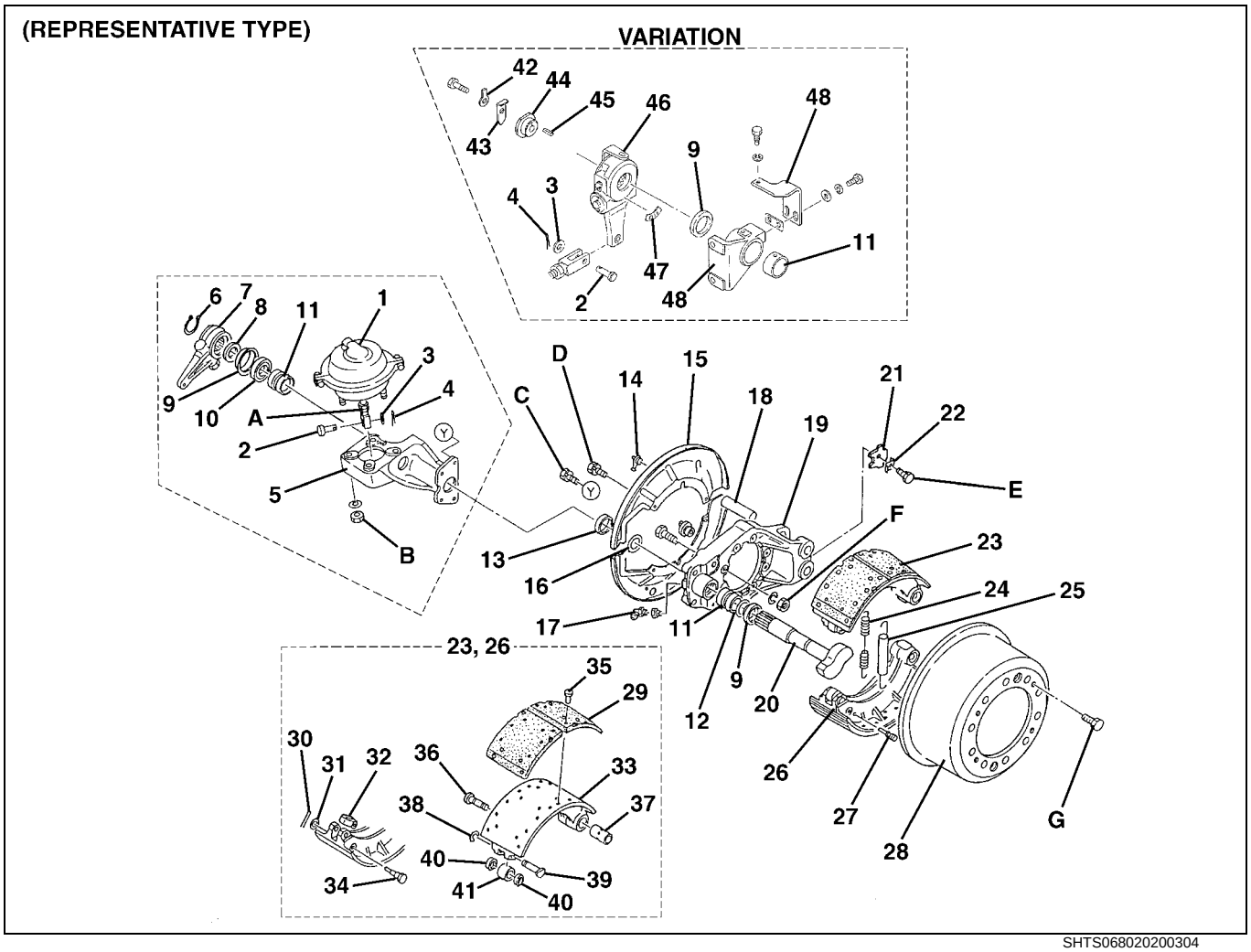
SHTS068020200303

1	Retainer ring	19	Lock plate	37	Holder (If so equipped)
2	Slack adjuster	20	Brake shoe assembly (Trailing)	38	Lock washer (If so equipped)
3	Thrust washer	21	Brake shoe return spring (Inner)	39	Brake lining
4	Collar	22	Brake shoe return spring (Outer)	40	Rivet
5	Oil seal	23	Spring cover	41	Spring hanger
6	Bushing	24	Brake drum	42	Retainer ring
7	Bracket	25	Spring hanger	43	Seal
8	Cotter pin	26	Brake shoe assembly (Leading)	44	Roller
9	Washer	27	Cam shaft	45	Pin
10	Pin	28	Washer	46	Brake shoe
11	Spring brake chamber	29	O-ring	47	Bushing
12	Washer	30	Bushing	48	Lock washer (If so equipped)
13	Cotter pin	31	Brake spider	49	Indicator (If so equipped)
14	Pivot pin	32	Spacer	50	Spacer (If so equipped)
15	Hole plug	33	Connector	51	Pin (If so equipped)
16	Brake drum cover	34	Lubrication fitting	52	Plate (If so equipped)
17	Anchor pin	35	Wheel sensor (If so equipped)	53	Auto slack adjuster (If so equipped)
18	Retainer	36	Sleeve (If so equipped)	54	Bracket (If so equipped)

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

A	109-147 {1,100-1,500, 80-108}	E	34.5-51.5 {351-527, 26-38}
B	119-225 {1,200-2,300, 81-166}	F	21-39 {200-400, 15-28}
C	34.5-51.5 {351-527, 26-38}	G	21.5-31.5 {220-320, 15-23}
D	168-226 {1,710-2,300, 124-166}		

REAR (Rearward) (MODELS: FL, FM)



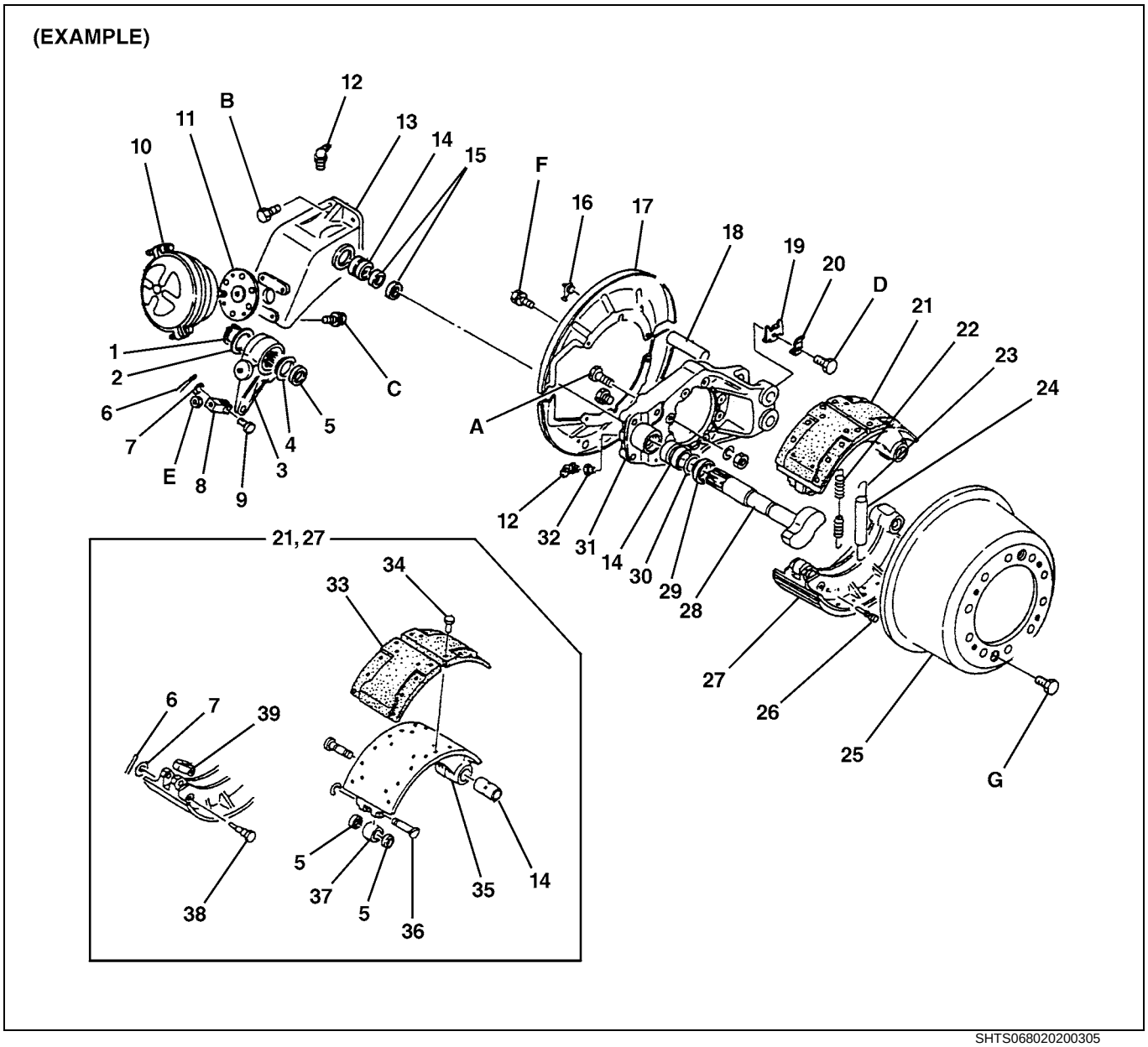
SHTS068020200304

1	Brake chamber	17	Lubrication fitting	33	Brake shoe
2	Pin	18	Anchor pin	34	Pivot pin
3	Washer	19	Brake spider	35	Rivet
4	Cotter pin	20	Cam shaft	36	Spring hanger
5	Brake chamber bracket	21	Retainer	37	Bushing
6	Retainer ring	22	Lock plate	38	Retainer ring
7	Slack adjuster	23	Brake shoe assembly (Leading)	39	Pin
8	Thrust washer	24	Brake shoe return spring (Inner)	40	Seal
9	Collar	25	Brake shoe return spring (Outer)	41	Roller
10	Oil seal	26	Brake shoe assembly (Trailing)	42	Lock washer (If so equipped)
11	Bushing	27	Spring hanger	43	Indicator (If so equipped)
12	O-ring	28	Brake drum	44	Spacer (If so equipped)
13	Spacer	29	Brake lining	45	Pin (If so equipped)
14	Hole plug	30	Cotter pin	46	Auto slack adjuster (If so equipped)
15	Brake drum cover	31	Washer	47	Plate (If so equipped)
16	O-ring	32	Clamp	48	Bracket (If so equipped)

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

A	50-68 {510-690, 36-50}	E	34.5-51.5 {351-527, 26-38}
B	119-225 {1,200-2,300, 81-166}	F	168-226 {1,710-2,300, 124-166}
C	109-147 {1,100-1,500, 80-108}	G	20.5-39.5 {200-400, 15-28}
D	34.5-51.5 {351-527, 26-38}		

REAR (MODEL: SG)



SHTS068020200305

1	Retainer ring	14	Bushing	27	Brake shoe assembly (Leading)
2	Thrust washer	15	Oil seal	28	Cam shaft
3	Slack adjuster assembly	16	Plug hole	29	Cam shaft collar
4	Collar	17	Brake drum cover	30	O-ring
5	Seal	18	Anchor pin	31	Brake spider
6	Cotter pin	19	Anchor pin retainer	32	Connector
7	Washer	20	Lock plate	33	Brake lining
8	Clevis	21	Brake shoe assembly (Trailing)	34	Rivet
9	Clevis pin	22	Brake shoe return spring (Inner)	35	Brake shoe
10	Brake chamber	23	Brake shoe return spring (Outer)	36	Roller pin
11	Brake dust seal	24	Spring cover	37	Roller
12	Lubrication fitting	25	Brake drum	38	Pivot pin
13	Brake chamber bracket	26	Spring hanger	39	Brake shoe return spring

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

A	168-226 {1,700-2,300, 123-166}	E	50-68 {500-700, 37-50}
B	109-147 {1,100-1,500, 80-108}	F	34.5-51.5 {351-527, 26-38}
C	39-49 {380-500, 28-36}	G	20.5-39.5 {210-400, 15-29} (With ISO wheel bolt)
D	34.5-51.5 {351-527, 26-38}		

OVERHAUL

EN0680202H200027

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF TIRE

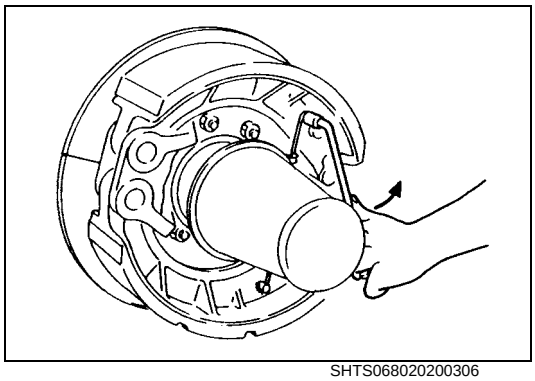
(1) Refer to the chapter **"WHEEL & TIRE"**.

2. REMOVAL OF BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS.

(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE"**.

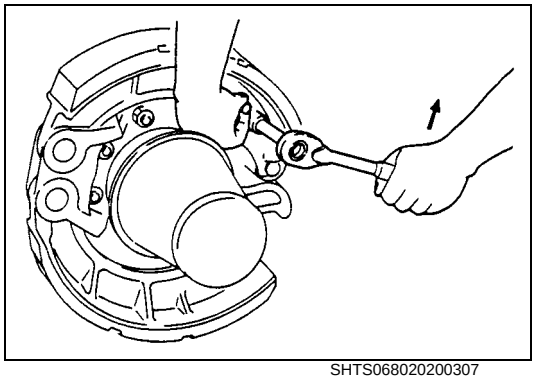
3. REMOVAL OF BRAKE SHOE RETURN SPRING

(1) Using the special tool, remove the return spring.
(FRONT WHEEL AND REAR WHEEL - OUTER SPRING).
SST: Spring pull back tool (S0968-31070)

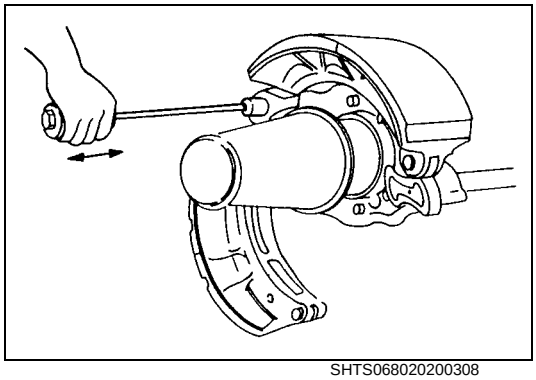


SHTS068020200306

(2) Turn the pivot pin and pull out the spring hanger then remove the return spring, inner (REAR WHEEL).

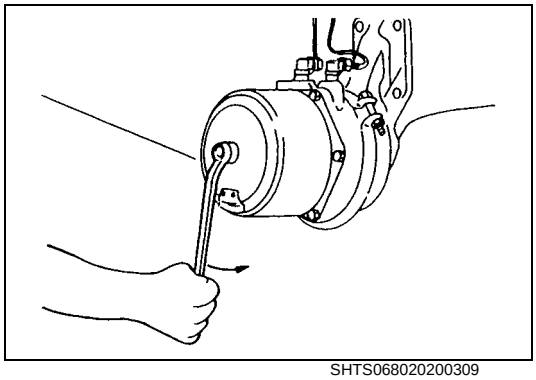


SHTS068020200307


SHTS068020200308

4. REMOVAL OF ANCHOR PIN

(1) Using the special tool, remove the pin and the brake shoe assembly.
SST: Anchor pin puller (S0942-01510)

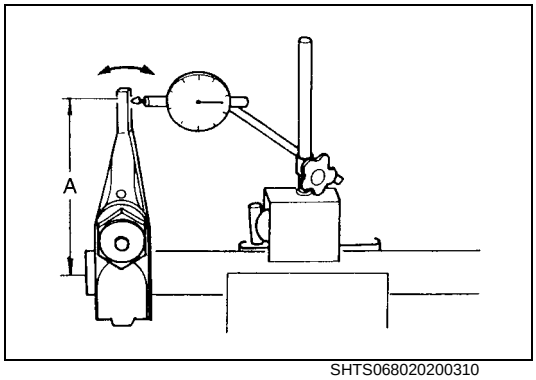

SHTS068020200309

5. REMOVAL OF CAM SHAFT AND SLACK ADJUSTER

(1) If the vehicle is equipped with spring brake chamber, before removing the cam shaft and slack adjuster, release the spring brake.

NOTICE
Before removing the slack adjuster and cam shaft, apply a mark to them to make clear the side (Left or Right) where they were installed.

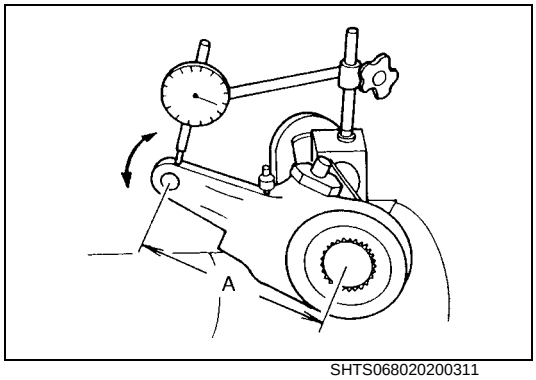
IMPORTANT POINTS - ASSEMBLY



SHTS068020200310

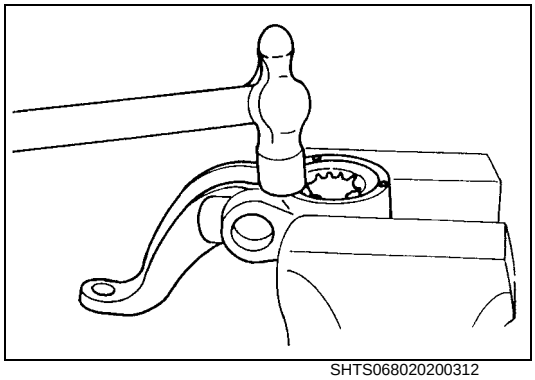
1. INSPECTION OF SLACK ADJUSTER

(1) Measure the axial play and if the play exceed the limit, inspect the spline of cam shaft and disassemble the adjuster.
Dimension A: 150 mm {5.9 in.}
Assembly Standard: 1.5 mm {0.06 in.}
Service Limit: 3.0 mm {0.12 in.}



SHTS068020200311

(2) Measure the circumference play and if the play exceed the limit, inspect the spline of cam shaft and disassemble the adjuster.
Dimension A: 150 mm {5.9 in.}
Assembly Standard: 3.0 mm {0.12 in.}
Service Limit: 10.0 mm {0.39 in.}


SHTS068020200312

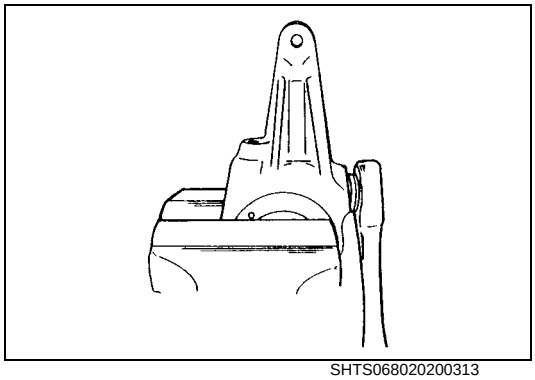
2. ASSEMBLY OF SLACK ADJUSTER

(1) Install the body cover.

(2) Use new rivets and caulk the rivet ends.

NOTICE

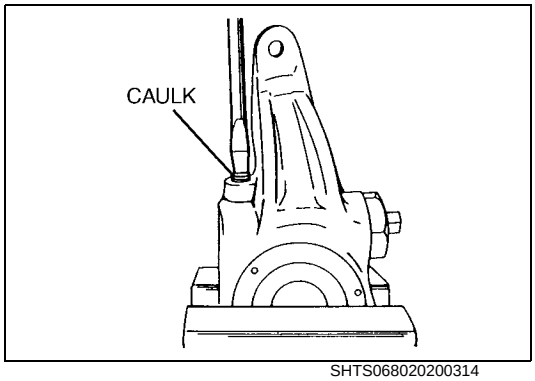
Apply enough chassis grease on the worm gear shaft before installing the cover.


SHTS068020200313

(3) Tighten the worm gear shaft stopper fully then loose it by 1/12-1/6 turn.

NOTICE

- **Replace the O-ring with new one.**
- **Apply enough chassis grease on the worm gear shaft before installing the worm gear shaft.**



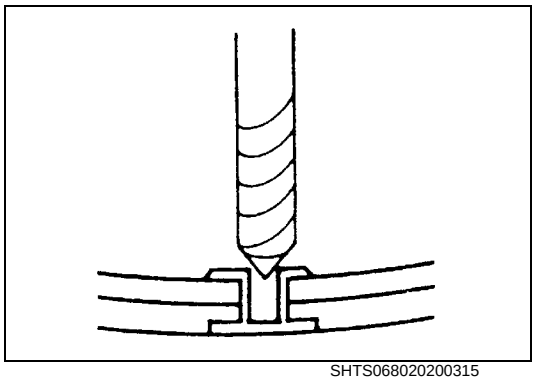
SHTS068020200314

(4) Install the lock ball, spring and plug.

(5) After tighten the plug, caulk it to the body by a punch.

NOTICE

Apply enough chassis grease on the lock ball and spring.


SHTS068020200315

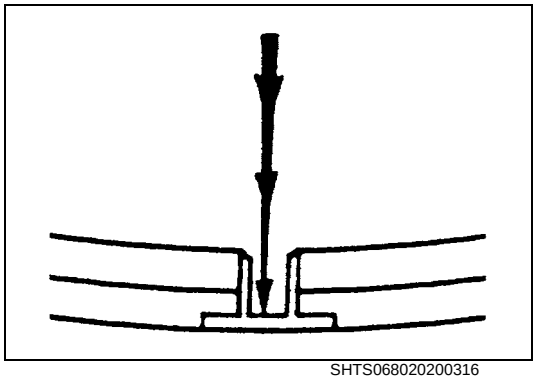
3. REPLACEMENT OF BRAKE LINING

(1) Remove the brake lining from the brake shoe.

a. Drill the rivet caulking section with a drill smaller than the rivet diameter.

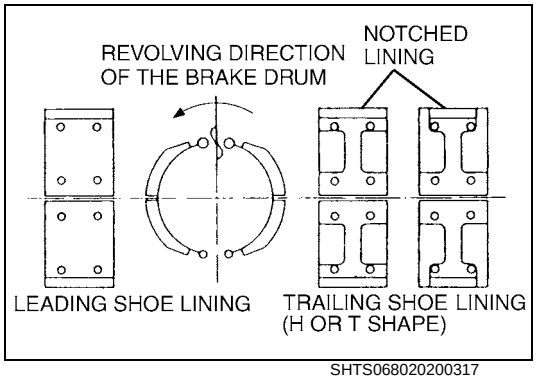
NOTICE

At this time, be careful not to scratch the brake shoe.



SHTS068020200316

b. After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.

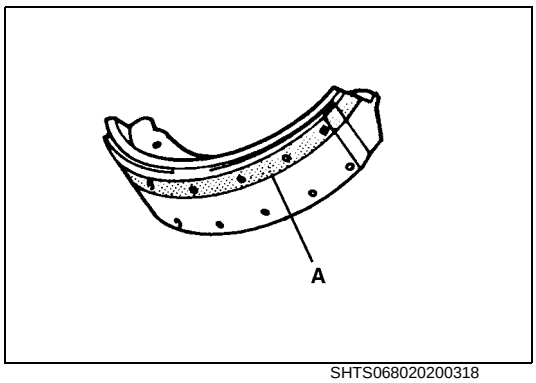


SHTS068020200317

(2) Install the brake lining to the brake shoe.

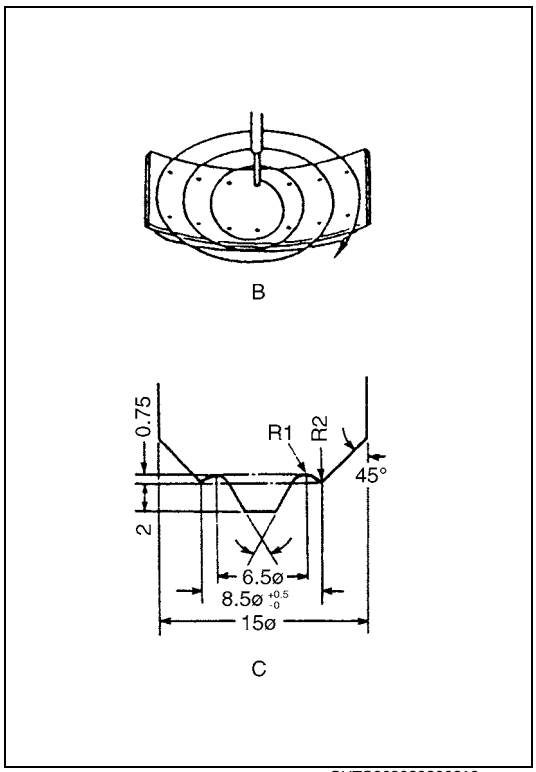
NOTICE

If a notched lining is used, the brake shoe and brake lining should be installed as shown in figure.



SHTS068020200318

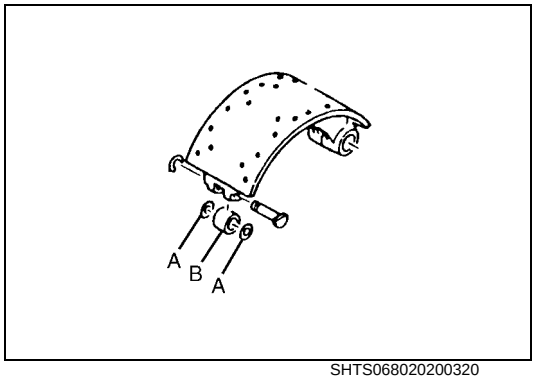
a. Set the lining on the shoe and insert the rivets into all holes, then hold them in place with adhesive tape "A".



SHTS068020200319

b. Caulk the rivets lightly in a circular pattern as shown in figure "B", repeat several times assure proper seating of the lining.
Recommended configuration of punch: shown in "C".
Recommended force of staking the rivet: 2.4 tons.

c. Remove adhesive tape.

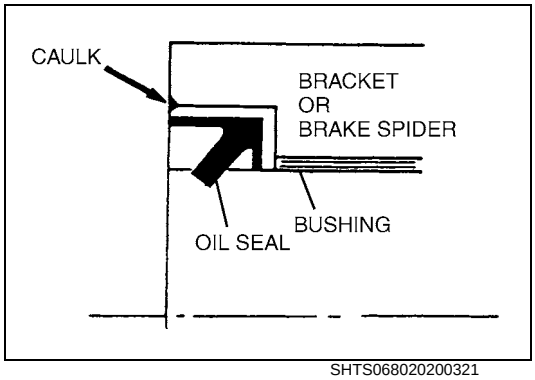


SHTS068020200320

4. ASSEMBLY OF BRAKE SHOE

(1) Seals "A" for roller "B" should be replaced with new ones.

(2) Apply adequate amount of heat resistance grease on the roller and seals.



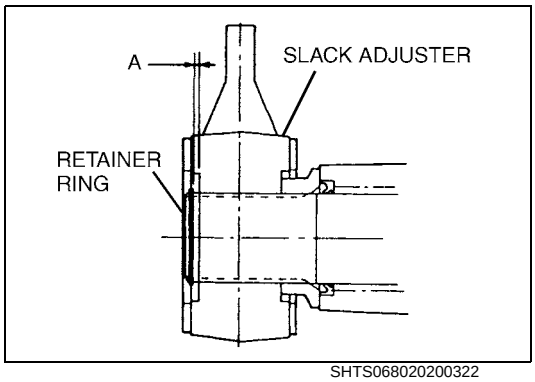
SHTS068020200321

5. INSTALLATION OF O-RING AND OIL SEAL

(1) When assembling the wheel brake, replace the O-rings and oil seals with new ones.

NOTICE

- **The lip parts of the seal should always be facing outside.**
- **The seal should be caulked to the bracket (or bracket spider) with a punch.**



SHTS068020200322

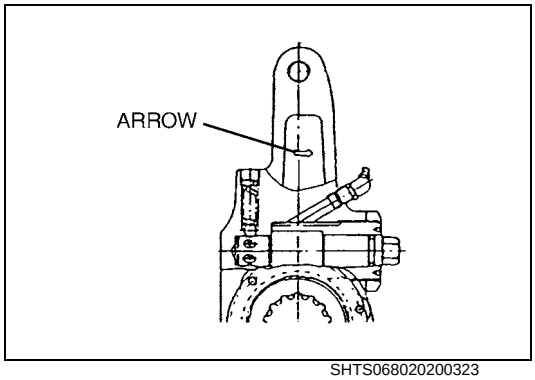
6. INSTALLATION OF CAM SHAFT AND SLACK ADJUSTER

(1) Apply adequate amount of chassis grease on the O-ring, oil seal and bushing before installing the cam shaft.

(2) If the clearance "A" between the retainer ring and slack adjuster exceed 2.0 mm {0.078 in.}, install the washer between them.

NOTICE

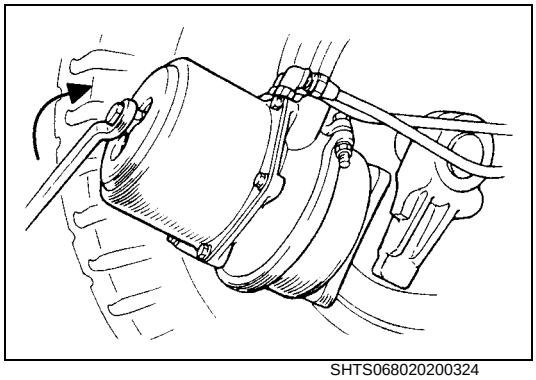
Install the cam shaft and slack adjuster on the correct side (Left or Right) according to the mark on them which were applied when disassembling.



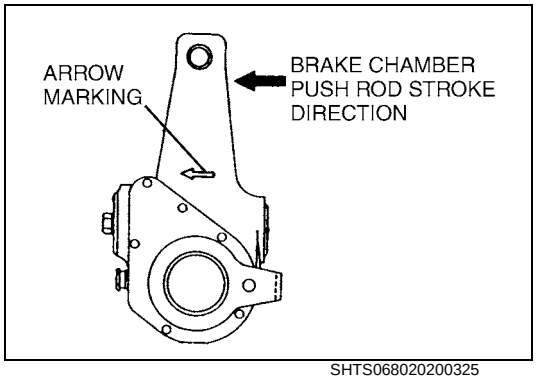
SHTS068020200323

NOTICE

- **Make sure that the slack adjuster is installed, so that the arrow on the adjuster points to the direction of the brake chamber rod stroke as shown in figure.**
- **When connecting the slack adjuster with the brake chamber and/or spring brake chamber, lubricate the clevis pin-hole and the pin with sufficient chassis grease.**


SHTS068020200324

(3) If the vehicle is equipped with a spring brake chamber, after connecting the slack adjuster with the brake chamber push rod, turn the spring brake release bolt clockwise and securely tighten (with mechanical released device).



SHTS068020200325

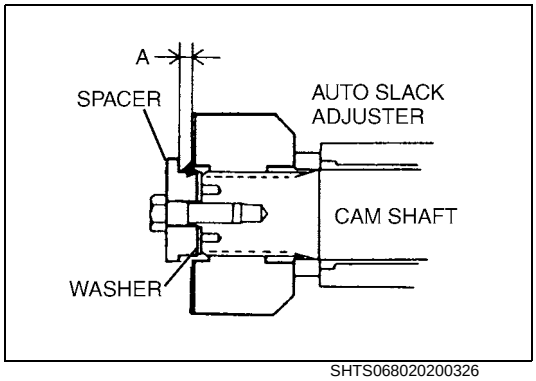
7. INSTALLATION OF CAM SHAFT AND AUTO SLACK ADJUSTER (IF SO EQUIPPED)

(1) Apply adequate amount of chassis grease on the O-ring, oil seal and bushing before installing the cam shaft.

(2) Make sure that the auto slack adjuster is installed so that the arrow on the adjuster points in the direction of the brake chamber rod stroke, as shown in figure.

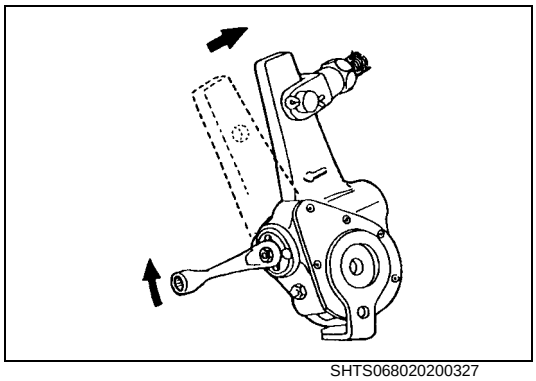
NOTICE

Install the cam shaft and auto slack adjuster on the correct side (Left or Right) according to the mark which was applied when disassembly.



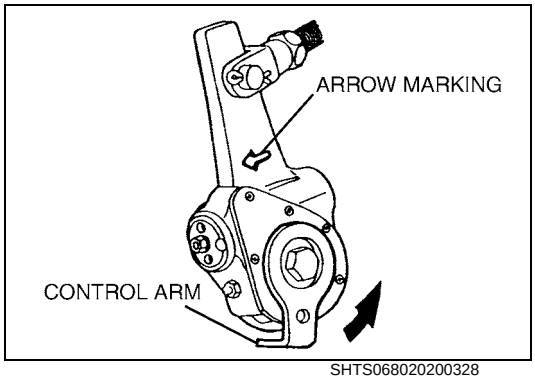
SHTS068020200326

(3) Make sure that clearance "A" between the spacer and auto slack adjuster is 0.5-2.0 mm {0.020-0.078 in.}. Install or remove the washer to maintain the required clearance.


SHTS068020200327

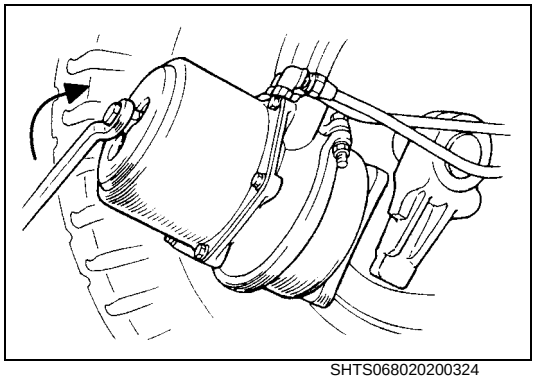
(4) When connection the auto slack adjuster with the brake chamber and/or spring brake chamber, lubricate the clevis pin-hole and pin with sufficient chassis grease.

(5) If the clevis pin-hole and auto slack adjuster pin-hole are misaligned, turn the set screw of auto slack adjuster for clockwise.



SHTS068020200328

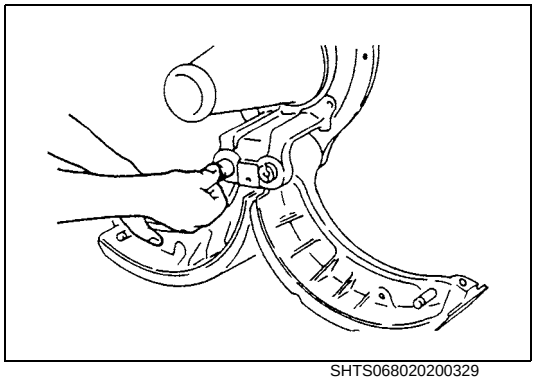
(6) Rotate by hand, the control arm as for as possible in the direction of the arrow on the adjuster point.
(7) Make sure that clearance between set bolt and control arm is correct, and tighten the nut.


SHTS068020200324

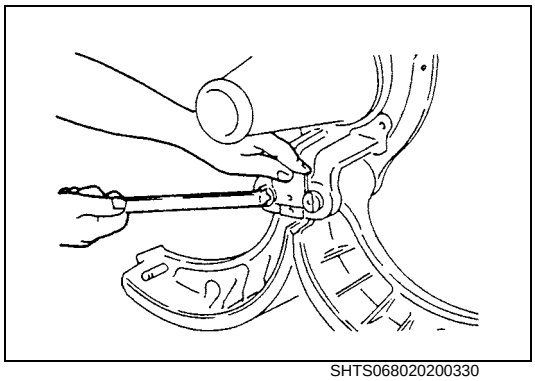
(8) If the spring brake chamber is the equipped, after connecting the auto slack adjuster with the brake chamber push rod, turn the spring brake release bolt for clockwise fully (with mechanical released device).

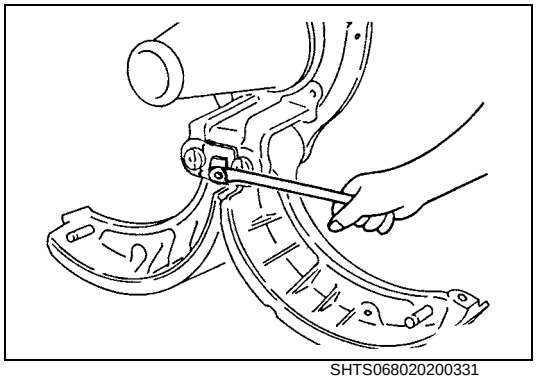
8. INSTALLATION OF BRAKE SHOE ASSEMBLY

(1) Apply adequate amount of heat resistance grease on the bushing of the brake shoe.
(2) Set the brake shoe assembly in place, then insert the anchor pins.

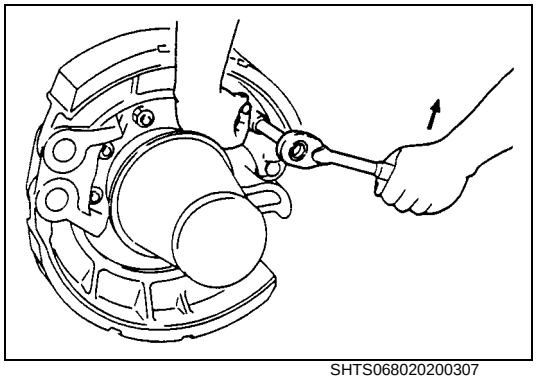

SHTS068020200329

(3) Using the special tool, set the grooves of the two anchor pin parallel and then insert the retainer in the grooves so that the retainer hole and brake spider hole are aligned.
SST: Anchor pin tool (S0968-41010)


SHTS068020200330


SHTS068020200331

(4) Place the lock plate on the retainer so that its hole is aligned with the lock plate hole, then insert the bolt and tighten it.

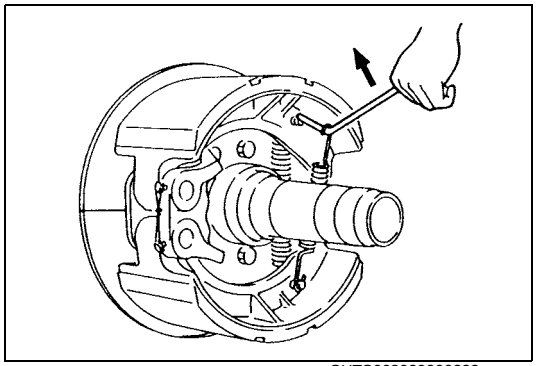

SHTS068020200307

9. INSTALLATION OF BRAKE SHOE RETURN SPRING

(1) Hook the inner spring to the clamp and turn the pivot pin to align the holes, then insert the spring hanger. (REAR WHEEL)

NOTICE

Painted part of the spring must be placed in the upper side.

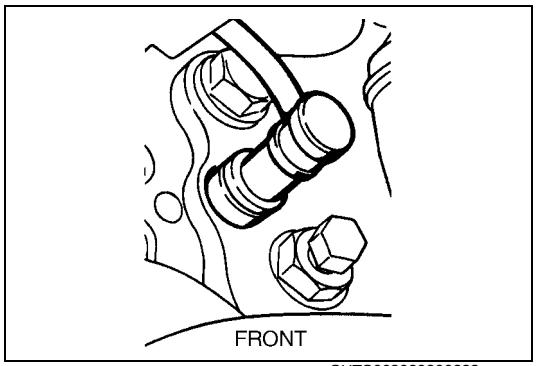

SHTS068020200332

(2) Use the special tool to install the return spring. (FRONT WHEEL, REAR WHEEL - OUTER SPRING).

NOTICE

The folded part of the spring cover must be placed in the upper side.

SST: Spring pull back tool (S0968-31070)



SHTS068020200333

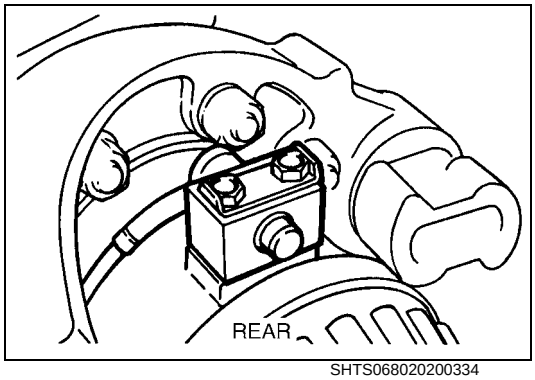
10. INSTALL THE WHEEL SENSOR (IF SO EQUIPPED)

(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

(2) Push the wheel sensor forcefully into the clamping bushing until you feel that the wheel sensor has contact with the sensor ring.

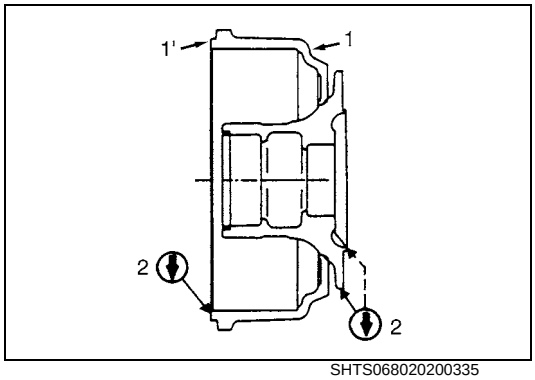
NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place using a screwdriver, or the like. Doing so could damage the wheel sensor.



SHTS068020200334

(3) Arrange the wire harness.



SHTS068020200335

11. ASSEMBLE THE BRAKE DRUM AND WHEEL HUB (FRONT WHEEL)

(1) See the mark located at 1 or 1' on the brake drum as shown in figure. Install the drum according to NOTICE.

NOTICE

- **The drums, number with R or L.**
  With R: Install in right side.
  With L: Install in left side.
- **The drums, with no R or L.**
  New drums: Install in any side.
  Reused drums: Install in the side originally installed.

(2) When assembling the brake drum and wheel hub, make sure that their aligning marks are aligned as close to each other as possible.

NOTICE

Position of marks are located at 2 as shown in the figure. (Broken line shows alternative position).

12. MOUNTING OF WHEEL HUB WITH BRAKE DRUM

(1) Refer to the chapter **"FRONT AXLE"** and **"REAR AXLE**".

NOTICE

1. **Be careful not to push back the wheel sensor too far when mounting the wheel hub and brake drum. Also, make sure they are straight so that you do not bump the tip of the wheel sensor.**
2. **When inserting the outer hub bearing, avoid tapping on it with a hammer as this will expose the wheel sensor to bumps. Insert the outer hub bearing carefully using a lock nut.**

(2) Slowly turn the wheel hub and brake drum and confirm that they move smoothly.

13. MOUNTING OF TIRE

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

14. GREASING

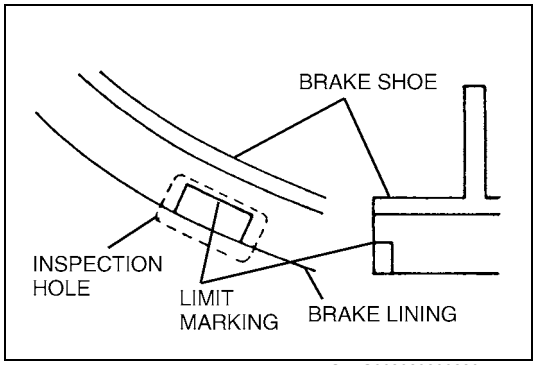
(1) After completion of assembly, lubricate the bushings of the brake spider, cam shaft bracket (REAR WHEEL) and slack adjuster wire with chassis grease from the lubrication fittings.

15. ADJUSTMENT

(1) Finally, adjust the brake chamber rod stroke as explained in the section **"ADJUSTMENT"**.

ADJUSTMENT

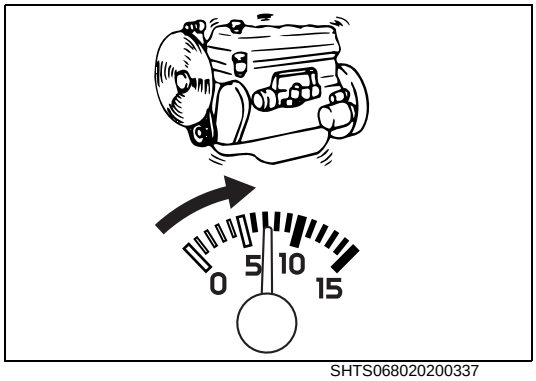
EN0680202H300032



SHTS068020200336

1. REMAINING THICKNESS OF THE BRAKE LINING

(1) Check remaining thickness of lining through the inspection hole of the brake drum cover. If the lining has been worn to the limit marking or if it is foreseen that the lining will be worn to the limit by the time the next inspection is made, replace the lining.



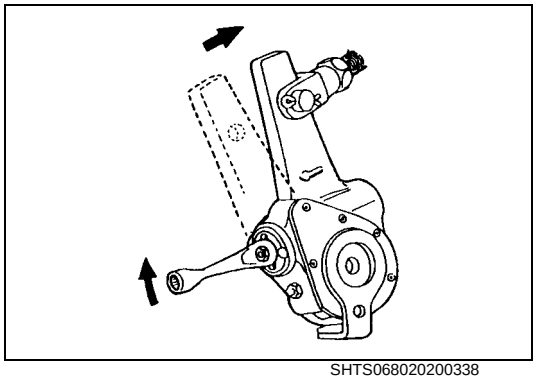
SHTS068020200337

2. AIR PRESSURE IN THE AIR TANK

(1) Operate the engine and obtain an air pressure of the 690 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}

NOTICE

The specified air pressure in the air tank should be maintained when making the adjustment.


SHTS068020200338

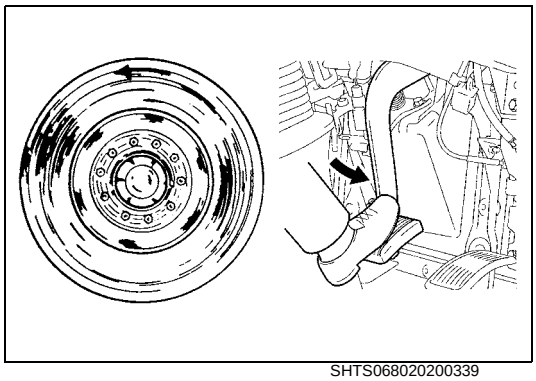
3. ADJUST THE BRAKE CHAMBER STROKE

(1) Lift the wheel to be adjusted off the ground.

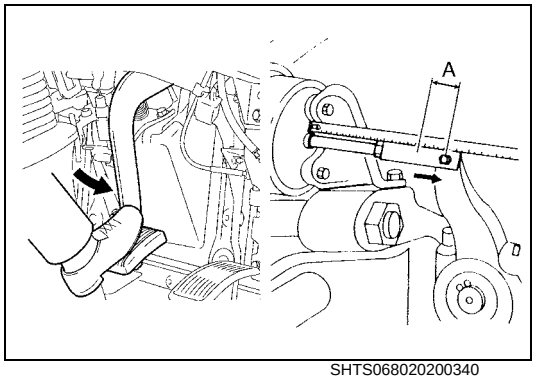
(2) Turn the set screw clockwise until the brake lining slightly contacts the drum, and then turn back the screw by 1. With this, the brake chamber stroke will become approx. 55 to 60 mm {2.166 to 2.362 in.} under the air pressure of 690 kPa {7.0 kgf/cm, 99.54 lbf/in.^{2}}.

NOTICE

In the case of spring brake chamber, set the spring brake control valve to the "OFF" position.


SHTS068020200339

(3) Final adjustment after completion of vehicle building up start the engine, and push in the brake pedal repeatedly. That is, first push in the pedal lightly and rapidly with rather long interval, and later do it deeply and slowly in proportion to decreasing of the chamber stroke amount. The set screw and the indicator automatically rotate at the initial pushing-in actions. By repetition of pushing-in, however, the chamber stroke gets close to a steady value, the set screw and the indicator coming to stop rotating. In case that the set screw has been adjusted by 1 back turn as the above (2), the chamber stroke will become certain steady value after repetitive pushing of approx. 50 times.



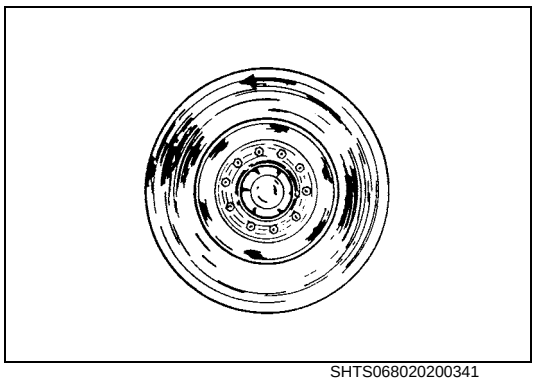
SHTS068020200340

(4) Depress the brake pedal fully and measure the brake chamber push rod stroke "A".

Assembly standard: 22-30 mm {0.87-1.18 in.}

Repair limit: Brake chamber: 40 mm {1.57 in.}

Spring brake chamber: 45 mm {1.77 in.}



SHTS068020200341

(5) Make sure that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from (2).

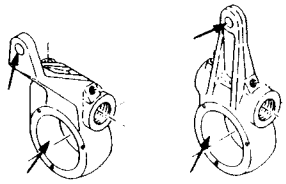
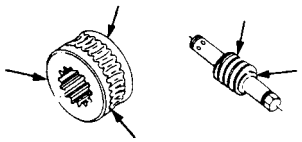
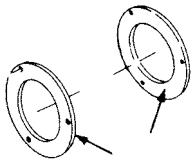
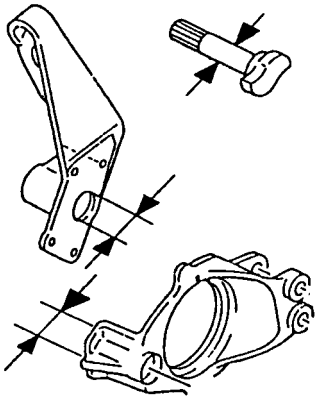
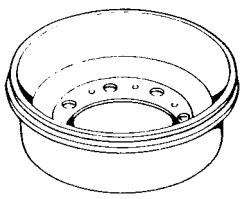
NOTICE

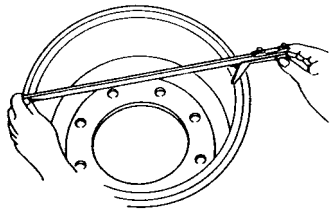
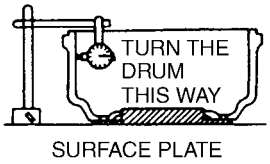
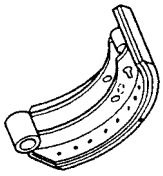
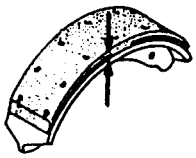
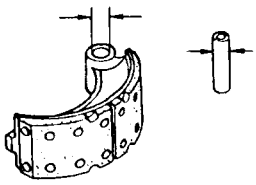
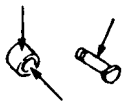
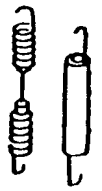
In accordance with the same procedure as above, adjust the stroke for all wheels.

INSPECTION AND REPAIR

EN0680202H300033

Unit: mm {in.}

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Slack adjuster body: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Slack adjuster, worm gears: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Slack adjuster, body cover: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam shaft: Diameter	**39.8 {1.57}**	**39.5 {1.56)**	**Replace.**	**Measure** 
Clearance between cam shaft and bushing of brake spider, chamber bracket, cam shaft bracket	**0.23-0.30 {0.0091-0.0110}**	**0.6 {0.024}**	**Replace bushing and/ or cam shaft.**	
Cam shaft collar and spacer: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Brake drum: Cracks and damage	**—**	**—**	**Regrind or replace.**	**Visual check** 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Brake drum: Inside diameter	**406.4 {16.0}**	**Regrind 409.4 {16.12} Service 410.4 {16.16}**	**Regrind or replace.**	**Visual check** 
Brake drum: Run out	**0-0.1 {0-0.0039}**	**0.2 {0.0079}**	**Regrind or replace.**	**Measure** 
Brake shoe assembly: Cracks and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Brake lining: Thickness	**15.5 {0.61}**	**5.5 {0.217}**	**Replace.**	**Visual check** 
Clearance between brake shoe bushing and anchor pin	**0.02-0.07 {0.0008-0.0027}**	**0.25 {0.0098}**	**Replace the brake shoe bushing and/ or anchor pin.**	**Visual check** 
Brake shoe roller and pin: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Brake shoe return spring and spring cover: Damage, lacking elastic strength distortion	**—**	**—**	**Replace, if necessary.**	**Visual check** 

LIMITING VALVE (MODEL: FM2P)

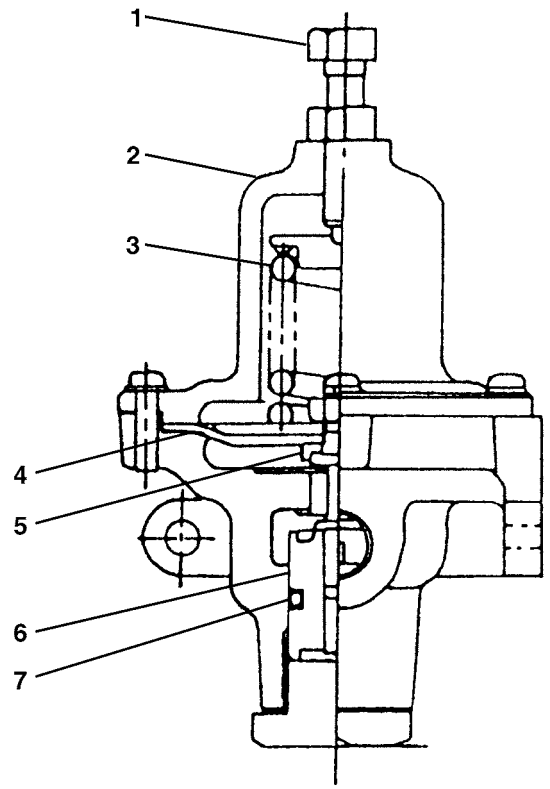
DATA AND SPECIFICATIONS

EN0680202I200029

Type	**Diaphragm and piston type**	
Inlet side pressure	**686 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}**	
Outlet side pressure	**ID mark**	**kPa {kgf/cm^2, lbf/in.^{2}}**
	216	**196.4-235.6 {2.0-2.4, 28.49-34.09}**
	235	**205.6-264.4 {2.1-2.7, 29.87-38.39}**
	363	**343.4-382.6 {3.5-3.9, 49.77-55.45}**
	373	**343.6-402.4 {3.5-4.1, 49.77-58.30}**
	392	**362.6-421.4 {3.7-4.3, 52.62-61.14}**

DESCRIPTION

EN0680202C100030

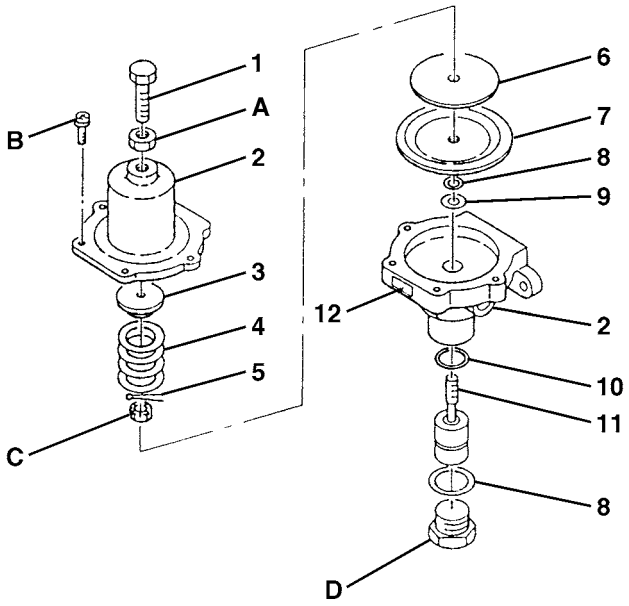


SHTS068020200355

1	**Adjusting bolt**	**5**	**Retainer**
2	**Valve body**	**6**	**Valve**
3	**Spring**	**7**	**O-ring**
4	**Diaphragm**		

COMPONENT LOCATOR

EN0680202D100029



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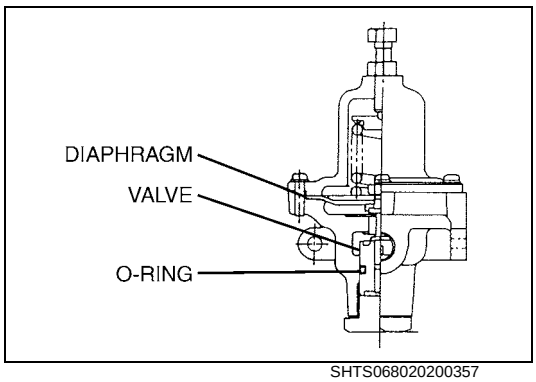
1	Adjusting bolt	7	Diaphragm
2	Valve body	8	O-ring
3	Spring seat	9	Retainer
4	Spring	10	O-ring
5	Cotter pin	11	Valve
6	Plate	12	ID mark

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

A	9.8-19.6 {100-200, 8-14}	C	0.40-0.58 {4-6, 0.29-0.43}
B	0.99-1.47 {10-15, 0.73-1.08}	D	40-59 {400-600, 29-43}

OVERHAUL

EN0680202H200028



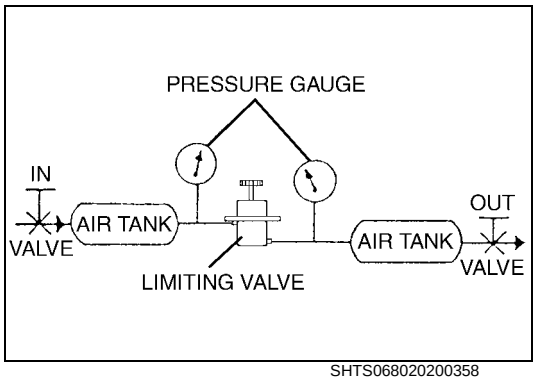
SHTS068020200357

IMPORTANT POINT - ASSEMBLY

1. LUBRICATION

(1) When assembling the limiting valve, replace the O-rings diaphragm and valve with new one.

(2) Apply adequate amount of silicone grease for the sliding surface of the component parts and O-rings.



SHTS068020200358

IMPORTANT POINT - MOUNTING

1. ADJUSTMENT

(1) Turn the adjusting screw counterclockwise fully, then placed and piped the limiting valve as shown in figure.

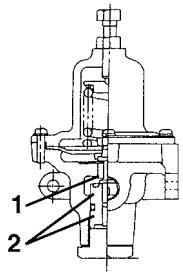
(2) Charge the inlet side air tank with compressed air for 686 kPa {7.0 kgf/cm^2, 99.54 lbf/in.^{2}}.

(3) Turn the adjusting screw clockwise gradually till outlet side air pressure for specified below.
Then tighten the lock nut.

ID mark	Outlet side pressure: kPa {kgf/cm^2, lbf/in.^{2}}
216	196.4-235.6 {2.0-2.4, 28.49-34.09}
235	205.6-264.4 {2.1-2.7, 29.87-38.39}
363	343.4-382.6 {3.5-3.9, 49.77-55.45}
373	343.6-402.4 {3.5-4.1, 49.77-58.30}
392	362.6-421.4 {3.7-4.3, 52.62-61.14}

INSPECTION AND REPAIR

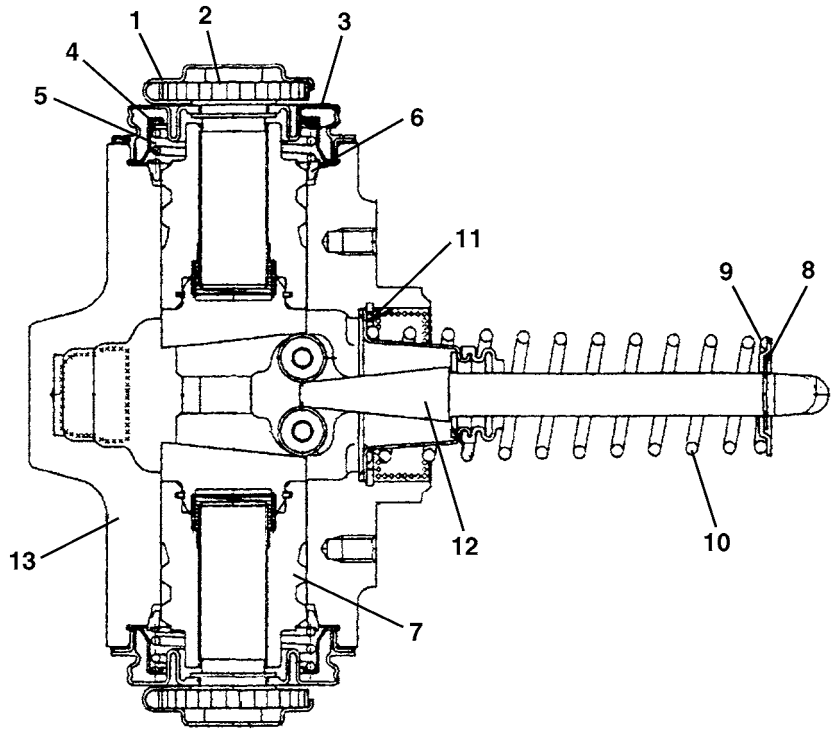
EN0680202H300034

Inspection Item		Standard	Limit	Remedy	Inspection Procedure
Valve contact surface 1. and friction surface 2. of valve body: Rust, wear and damage		—	—	Clean or replace.	Visual check and measure 
Load at setting length: Valve ID mark	216 235	270.7 N/35.5 mm {27.6 kgf/35.5 mm, 60.85 lbf/1.39 in.}	243.2-298.2 N {24.8-30.4 kgf, 54.67-67.00 lbf}	Replace, if necessary.	
	363 373 392	1,176.8 N/132.0 mm {120 kgf/32.0 mm, 264.6 lbf/1.26 in.}	1,059.1-1,294.5 N {108-132 kgf, 238.06-290.95 lbf}		

EXPANDER (MODELS WITH WEDGE TYPE BRAKE)

DESCRIPTION

EN0680202C100031



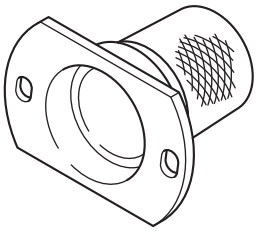
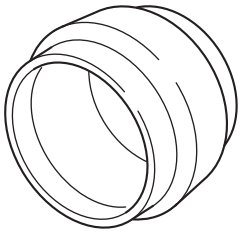
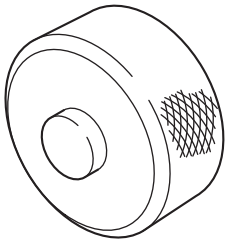
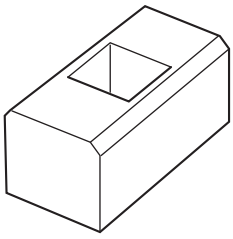
SHTS068020200360

1	Retainer	8	E-ring
2	Adjusting bolt	9	Retainer
3	Boot	10	Return spring
4	Cover	11	Retainer ring
5	Adjust lock spring	12	Wedge assembly
6	Adjust ring	13	Body
7	Sleeve assembly		

SPECIAL TOOL

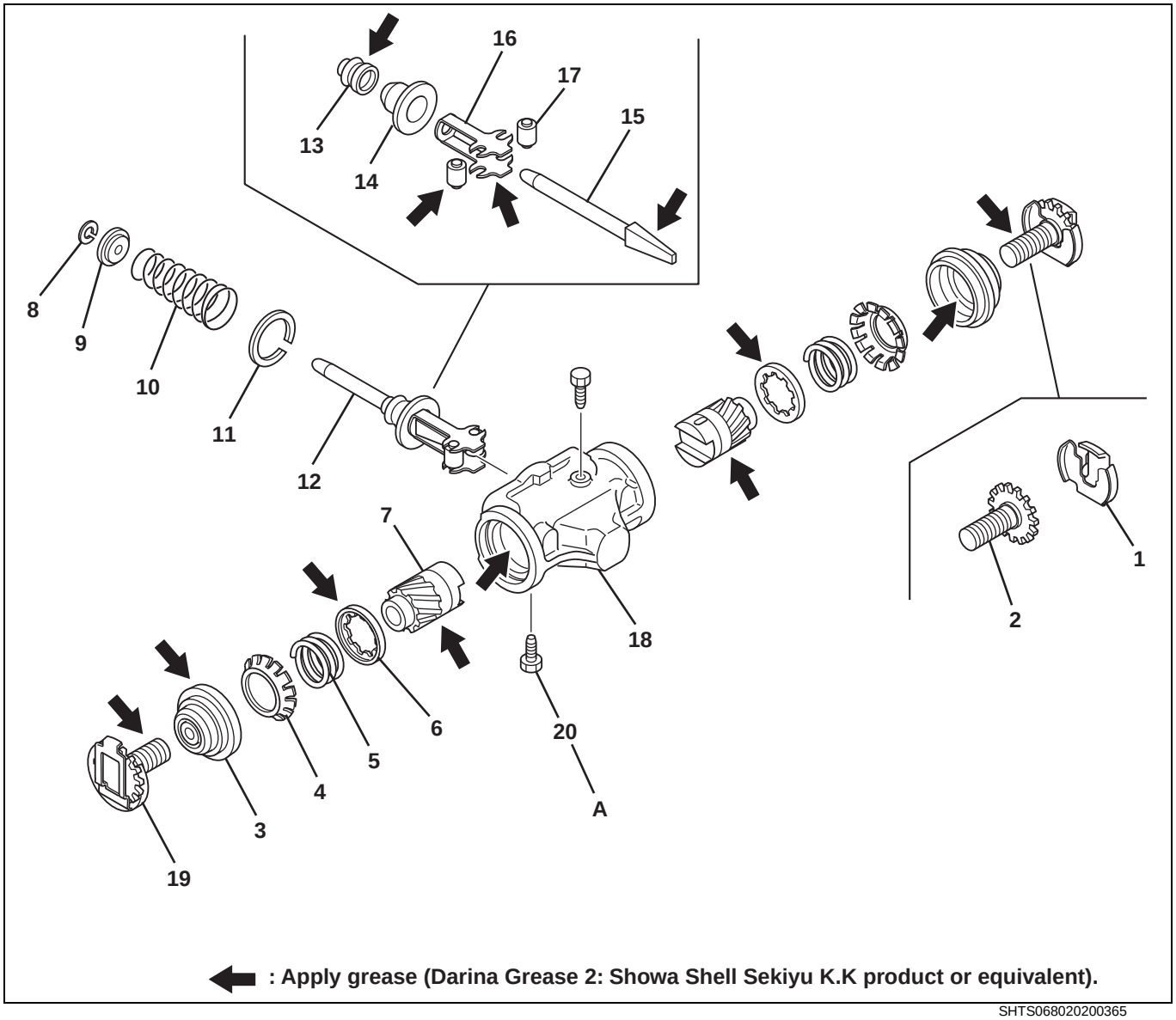
EN0680202K100005

Prior to starting an expander overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	S0968-31080	SPRING PULL BACK TOOL	
	S0965-71930	GUIDE	
	S0968-51020	BOOT SETTING TOOL	
	S0965-91540	ADAPTER	

COMPONENT LOCATOR

EN0680202D100030



SHTS068020200365

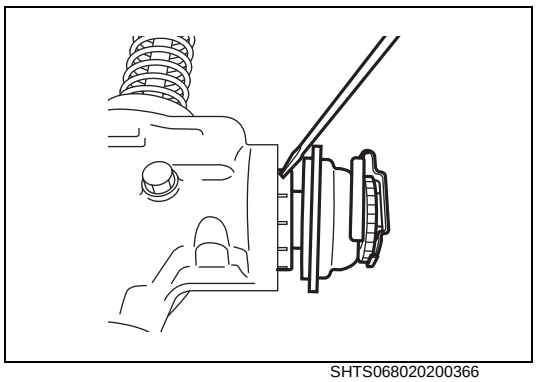
1	Retainer	11	Retainer ring
2	Adjusting bolt	12	Wedge assembly
3	Boot	13	Boot
4	Cover	14	Retainer
5	Adjust lock spring	15	Wedge
6	Adjust ring	16	Holder
7	Sleeve assembly	17	Roller
8	E-ring	18	Body
9	Retainer	19	Adjusting bolt assembly
10	Return spring	20	Screw

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

A	12-18 {120-180, 9-13}		

OVERHAUL

EN0680202H200029

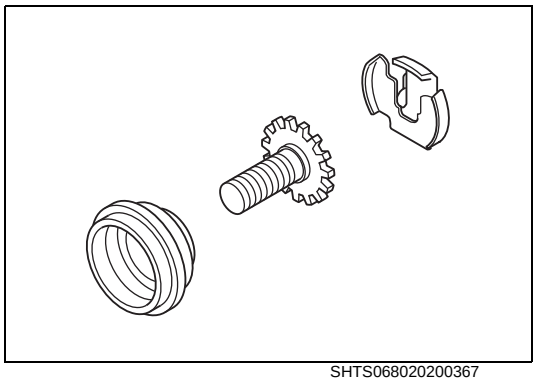

SHTS068020200366

IMPORTANT POINTS - DISASSEMBLY

1. DISASSEMBLY OF THE EXPANDER

(1) Using the screwdriver, remove the boot from the body.

(2) Turn the adjusting bolt counterclockwise and remove the boot with adjusting bolt.


SHTS068020200367

(3) Remove the boot and retainer from the adjusting bolt.

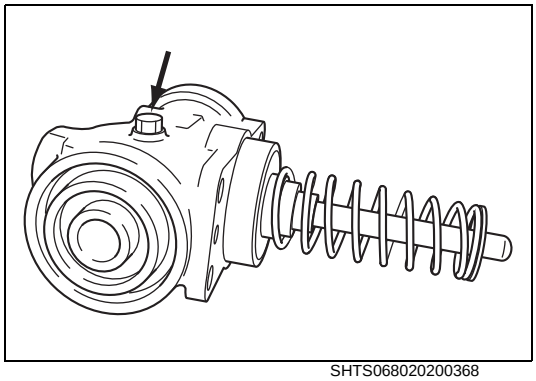
NOTICE

When removing the retainer, take care not to damage it.

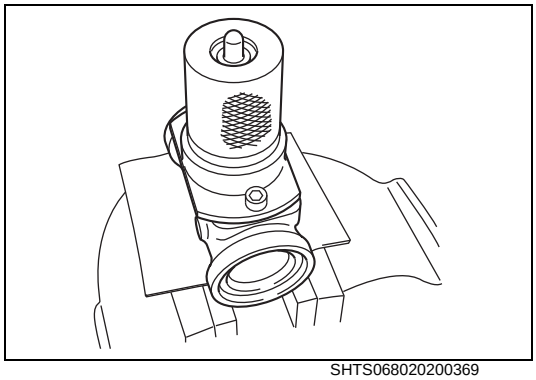
(4) Using the screwdriver, remove the cover and then remove the adjust lock spring and adjust ring.

NOTICE

Pay attention to adjusting lock spring jump-out.


SHTS068020200368

(5) Remove the screw and then remove the sleeve assembly.


SHTS068020200369

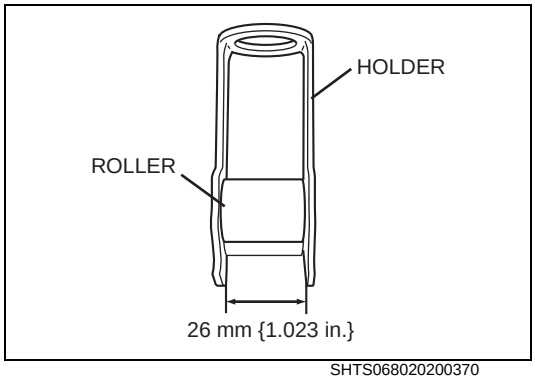
(6) Install the special tool to the body and tighten the bolt.
SST: Spring pull back tool (S0968-31080)

(7) Remove the E-ring.

(8) Remove the special tool and then remove the retainer, return spring and wedge assembly.

NOTICE

Pay attention to return spring jump-out when removing the special tool.



SHTS068020200370

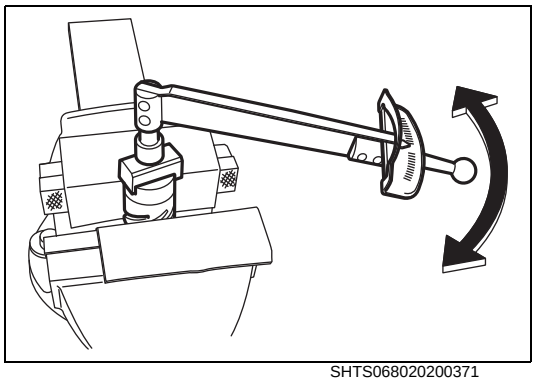
2. DISASSEMBLY OF THE WEDGE ASSEMBLY

(1) Remove the retainer ring and then remove the boot, retainer and wedge assembly.

(2) Remove the holder and the roller from the wedge.

NOTICE

Do not expand open end of holder 26 mm {1.023 in.} or more.


SHTS068020200371

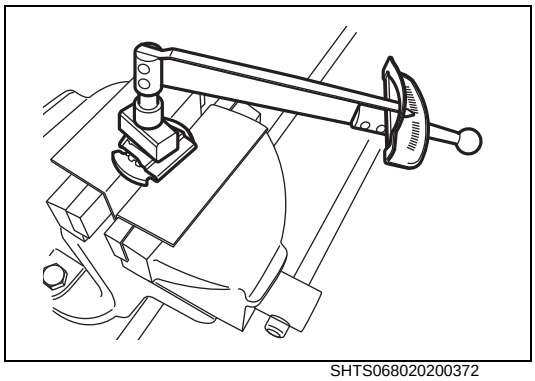
IMPORTANT POINTS - INSPECTION

1. INSPECTION FOR SLEEVE ASSEMBLY

(1) Fix the sleeve assembly in a vise and install the special tool to the tappet part.
SST: Adapter (S0965-91540)

(2) Install the torque wrench to the special tool to measure the starting torque of the tappet part. Replace the sleeve assembly if the torque exceeds the standard value.

	Standard (N·m {kgf·cm, lbf·ft})
Clockwise (Right turn)	**0.6 {6.0, 0.433} or less**
Counterclockwise (Left turn)	**2.0 {20.0, 1.447} or more**


SHTS068020200372

2. INSPECTION FOR RETAINER KEEP TORQUE OF ADJUSTING BOLT ASSEMBLY

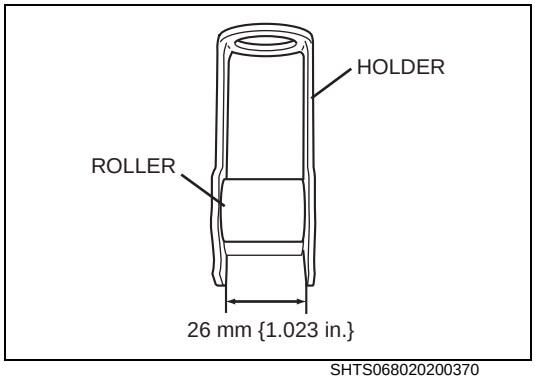
(1) Fix the adjusting bolt fitted retainer in a vise and install the special tool to clip.

NOTICE

Take care not to damage thread of the adjusting bolt when fixing adjusting bolt in a vise.

SST: Adapter (S0965-91540)

(2) Install the torque wrench to the special tool to measure the starting torque of the retainer. Replace the adjusting bolt if the torque exceeds the standard value.
Standard: 1.5-5.0 N·m {15-50 kgf·cm, 1.09-3.61 lbf·ft}



SHTS068020200370

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY OF THE WEDGE ASSEMBLY

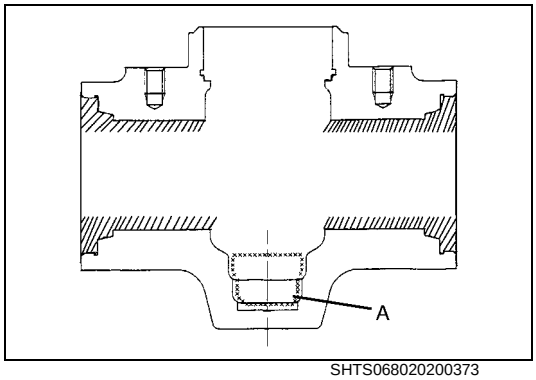
(1) Assemble the roller to the holder and assemble them to the wedge.

NOTICE

Do not expand open end of holder 26 mm {1.023 in.} or more.

(2) Apply grease (Darina Grease 2: Showa Shell Sekiyu K.K. product or equivalent) to engaged part and contact part of the roller, holder and wedge.

(3) Assemble the boot and retainer to the wedge, applying grease to wedge axle part and boot contact surface.



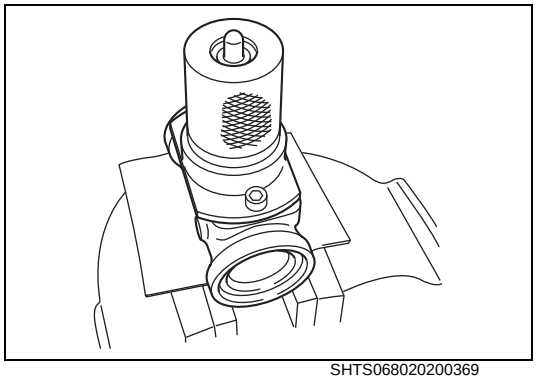
SHTS068020200373

2. ASSEMBLY OF THE EXPANDER

(1) Fill up grease (Darina Grease 2: Showa Shell Sekiyu K.K. product or equivalent) to the A part of body.

(2) Apply grease (Darina Grease 2: Showa Shell Sekiyu K.K. product or equivalent) to the following part.

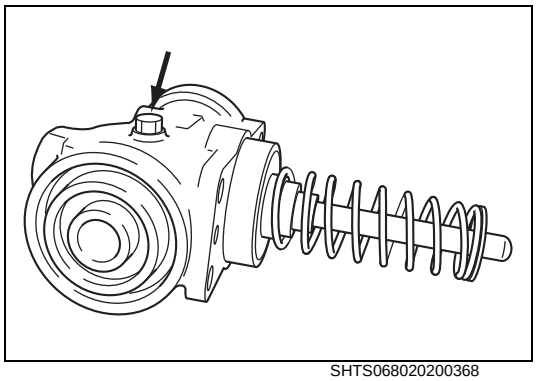
1. Adjust ring seat surface of body
2. Sleeve sliding part of body and tappet part stabbing part
3. Roller contact surface of tappet part and outer periphery
4. Sleeve assembly outer periphery and gear part
5. Sleeve assembly thread part.


SHTS068020200369

(3) Assemble wedge assembly to body, and install the new retainer ring using the snap ring pliers.

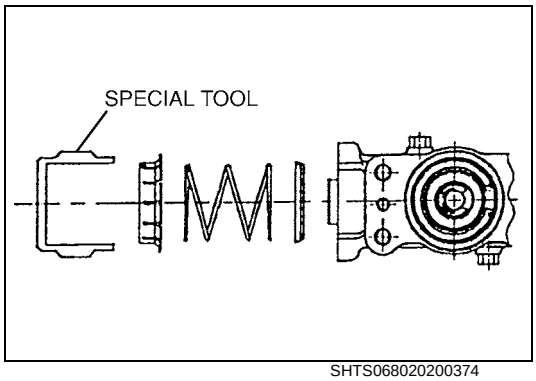
(4) Install the return spring and then install the special tool.
SST: Spring pull back tool (S0968-31080)

(5) Install the new E-ring and remove the special tool.


SHTS068020200368

(6) After assembling the sleeve assembly to the body, tighten the screw applied the LOCTITE 202 or ThreeBond 2415 or equivalent.

NOTICE
Align the screw setting hole of body with the groove of tappet part.



SHTS068020200374

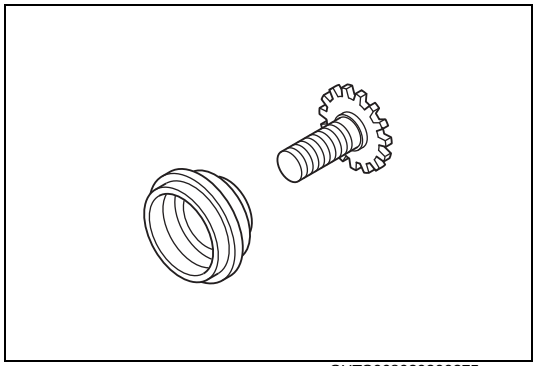
(7) Install the adjust ring and adjust lock spring.

(8) Using the special tool, install the cover.

NOTICE

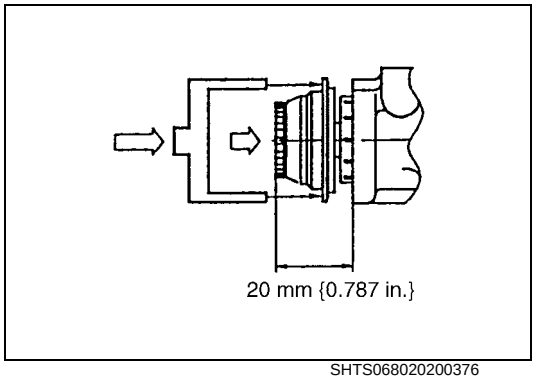
- **Be sure to install by hand using such as hammer.**
- **Before driving cover into sleeve assembly, assemble the cover to the body groove.**
- **After assembling the cover, turn the cover while pushing it and make sure that the cover turns smoothly in order to confirm the cover fits securely to the groove of the body.**

SST: Guide (S0965-71930)


SHTS068020200375

(9) Assemble the new boot to the adjusting bolt. Apply grease (Darina Grease 2: Showa Shell Sekiyu K.K. product or equivalent) to contact part of boot and adjusting bolt, and thread part of adjusting bolt.

NOTICE
Be sure to assemble the boot to the groove of the adjusting bolt securely.



SHTS068020200376

(10) Screw adjusting bolt into the sleeve assembly until the dimension of end surfaces from adjusting bolt to body is about 20 mm {0.787 in.}.

(11) Pull the adjusting bolt lightly to confirm the sleeve slides.

(12) Using the plastic hammer and special tool, press a new boot in.
SST: Boot setting tool (S0968-51020)

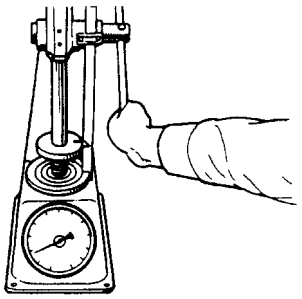
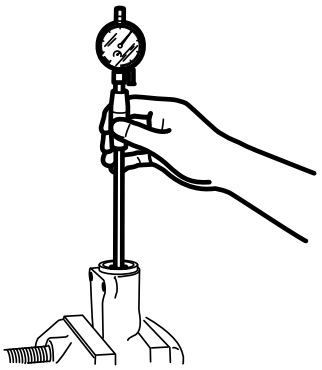
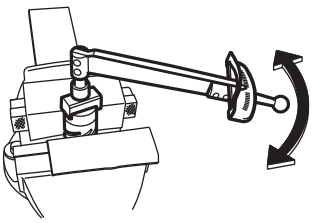
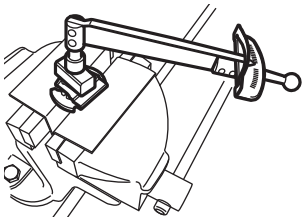
(13) Install the retainer to the adjusting bolt.

NOTICE

- **Do not cut the boot.**
- **Pay attention to installing direction of the retainer.**

INSPECTION AND REPAIR

EN0680202H300035

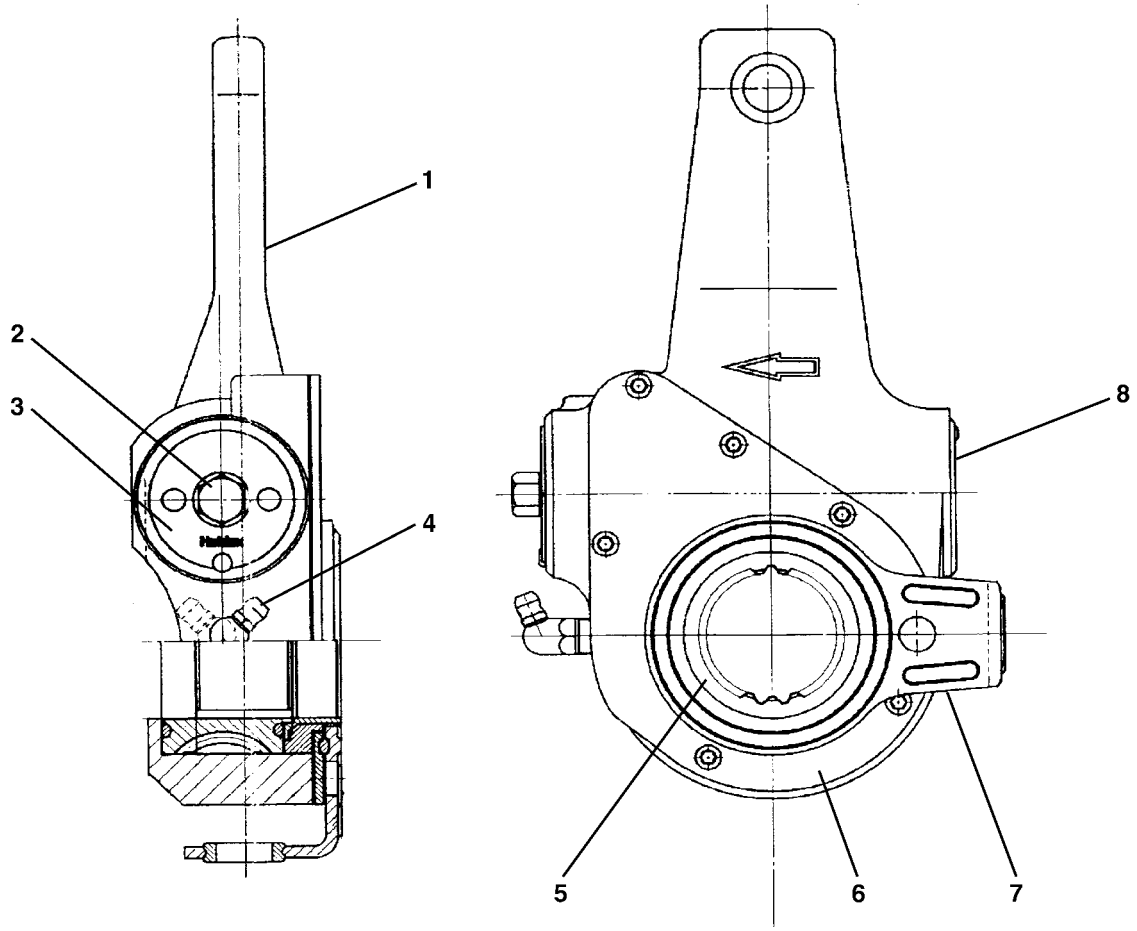
Inspection Item		Standard	Limit	Remedy	Inspection Procedure
Adjust lock spring: Setting load at the specified setting length		78.5 N {8.0 kgf, 17.6 lbf} at 11.3 mm {0.45 in.}	73.6 N {7.5 kgf, 16.5 lbf}	Replace.	Measure 
Return spring: Setting load at the specified setting length		147 N {15 kgf, 33.1 lbf} at 105.8 mm {4.17 in.}	132 N {13.5 kgf, 29.8 lbf}		
Sliding parts of sleeve assembly and roller: Wear and damage		—	—	Replace, if necessary.	Visual check
Axle dent of sleeve assembly and roller: Wear and damage		—	0.010 mm {0.0004 in.} or less	Replace, sleeve assembly or roller.	Visual check
Sliding parts of wedge and roller: Wear and damage		—	—	Replace, if necessary.	Visual check
Body inside diameter		38.1-38.2 mm {1.500-1.504 in.}	38.07 mm {1.499 in.}	Replace.	Measure 
Sleeve assembly turning torque	Clockwise	0.6 N·m {6.0 kgf·cm, 0.433 lbf·ft} or less	—	Replace.	Measure 
	Counter-clockwise	2.0 N·m {20.0 kgf·cm, 1.447 lbf·ft} or less			
Retainer keep torque of adjusting bolt assembly		1.5-5.0 N·m {15-50 kgf·cm, 1.09-3.61 lbf·ft}	—	Replace.	Measure 

WHEEL BRAKE SLACK ADJUSTER (AUTO ADJUSTER) (MODELS WITH S-CAM TYPE BRAKE)

DESCRIPTION

EN0680202C100032

REPRESENTATIVE TYPE



SHTS068020200381

1	Body	5	Worm gear
2	Worm shaft	6	Holder
3	Front retainer	7	Control arm
4	Lubrication fitting	8	Rear retainer

SPECIAL TOOL

EN0680202K100006

Prior to starting an auto slack adjuster overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	S0963-02350	SPECIAL PARTS ASSEMBLY	

COMPONENTS IN THE SPECIAL PARTS ASSEMBLY

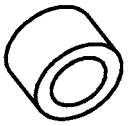
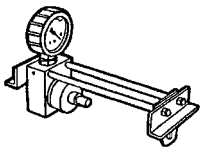
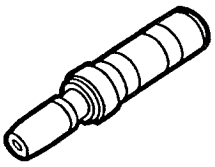
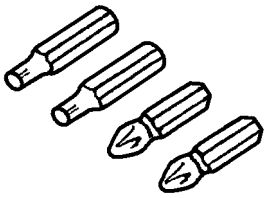
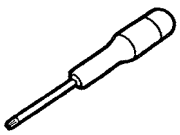
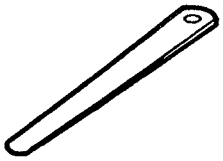
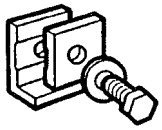
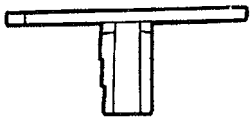
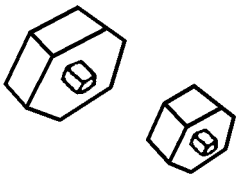
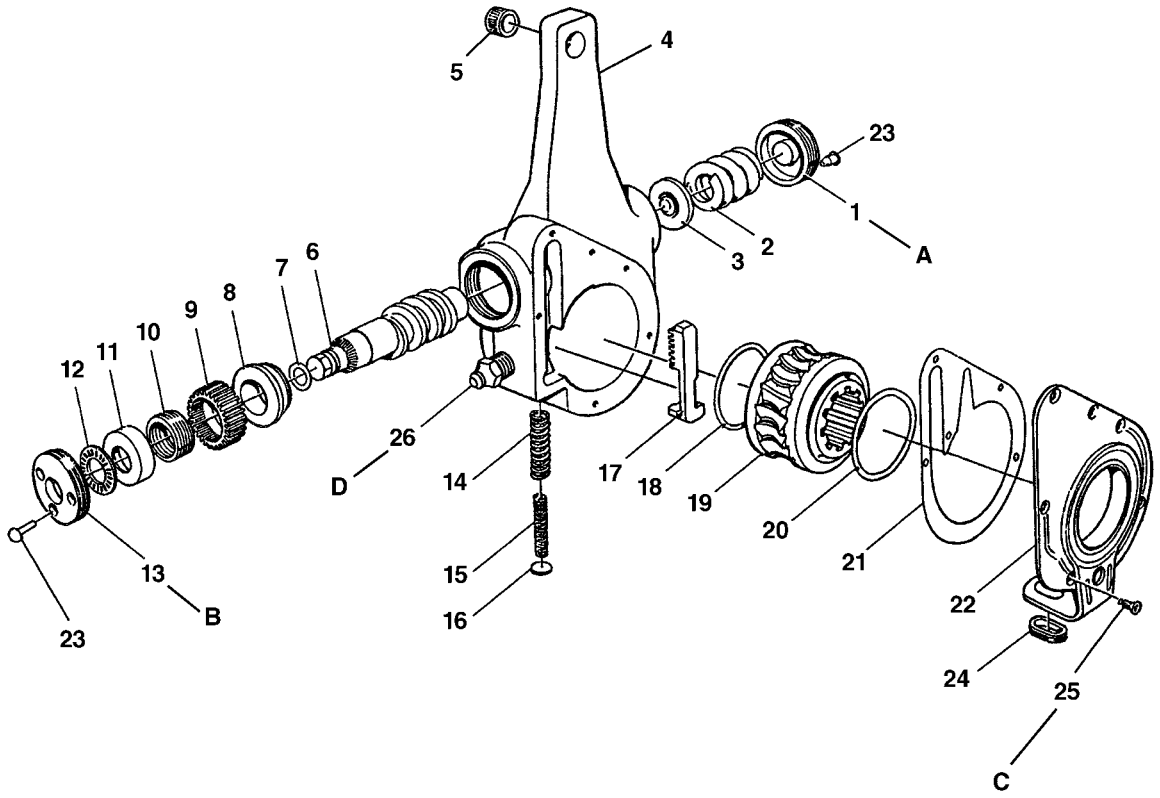
Illustration	Tool name	Remarks
	PEG SPANNER	
	SPACER	
	END LOAD TESTER	
	GREASE TOOL	
	IMPACT SCREWDRIVER	
	DRIVER TIP	
	TORX SCREWDRIVER	
	MANDREL	

Illustration	Tool name	Remarks
	THICKNESS GAUGE	
	CONTROL ARM BUSHING INSTALLATION TOOL	
	UNIVERSAL SPLINE KEY	
	DIAL GAUGE	
	HEXAGONAL WRENCH	

COMPONENT LOCATOR

EN0680202D100031

REPRESENTATIVE TYPE



SHTS068020200396

1	Rear retainer	10	Spring	19	Worm gear
2	Spring	11	Inner cap	20	O-ring
3	Thrust washer	12	Thrust bearing	21	Gasket
4	Body	13	Front retainer	22	Holder
5	Bushing	14	Spring	23	Rivet
6	Worm shaft	15	Spring	24	Plug
7	O-ring	16	Plug	25	Torx screw
8	Bearing	17	Rack	26	Lubrication fitting
9	Drive gear	18	O-ring		

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

A	50 {510, 37}	D	TYPE-A: S4748-01471/ -01791, S4749-01031/ -01181:
B	50 {510, 37}		3.92-9.81 {40-100, 2.90-7.23}
C	4 {41, 2.96}		TYPE-B: S4748-01631/ -01641/ -01801/ -01811
			9.81-29.4 {100-300, 7.24-21.69}

OVERHAUL

EN0680202H200030

IMPORTANT POINTS - DISASSEMBLY

1. REMOVING THE AUTO SLACK ADJUSTER

(1) Remove the auto slack adjuster from the wheel brake.

2. DISASSEMBLING OF RACK AND SPRING SECTION

(1) Remove the six torx screws with the special tool.

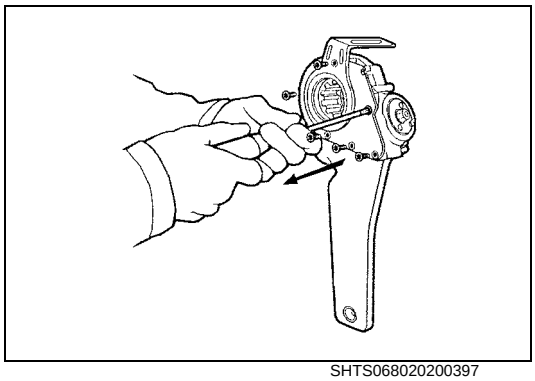
NOTICE

When the torx screws have been tightened strongly, use the special impact screwdriver and a hammer.

SST: Special parts assembly (S0963-02350)

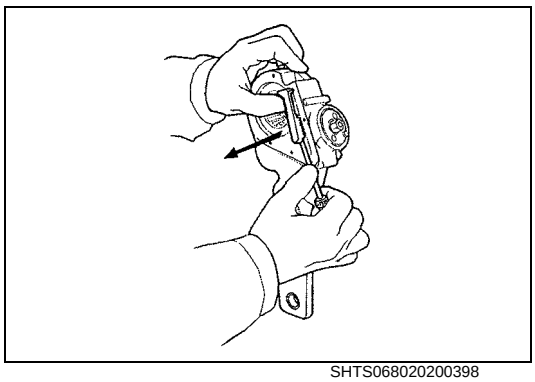
- **Torx screwdriver**
- **Impact screwdriver**

(2) Remove the holder and the gasket.



SHTS068020200397

(3) Remove the rack using a screwdriver.

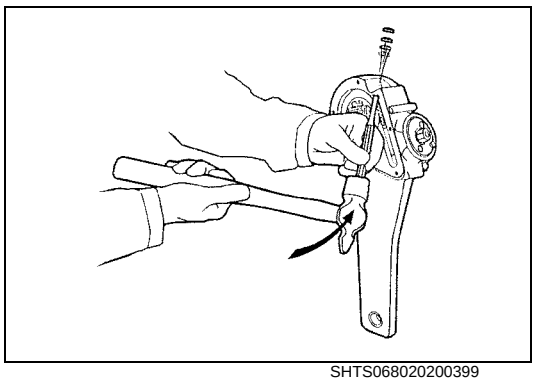


SHTS068020200398

(4) Push and shrink the spring with a screwdriver and bring a tapping rod into contact with the plug.

(5) Remove the plug using a tapping rod and hammer.

(6) Remove the spring.

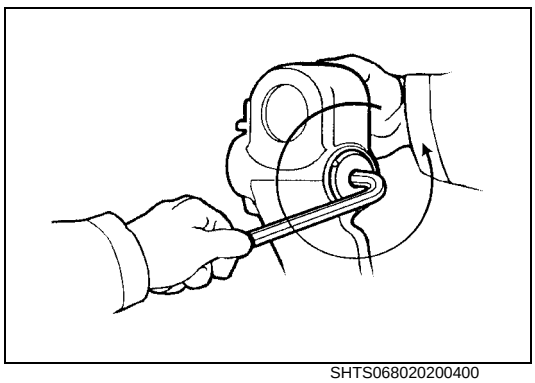


SHTS068020200399

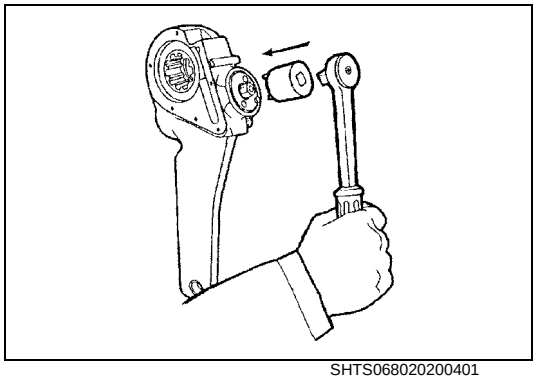
3. DISASSEMBLING OF WORM SHAFT AND WORM GEAR SECTION

(1) Loosen the rear retainer in counterclockwise direction with a hexagonal wrench to remove it.

(2) Remove the spring and the thrust washer.



SHTS068020200400


SHTS068020200401

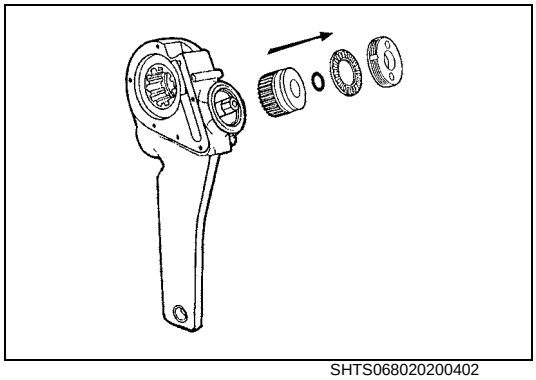
(3) Turn the front retainer in counterclockwise direction using the special tool to remove it.

NOTICE

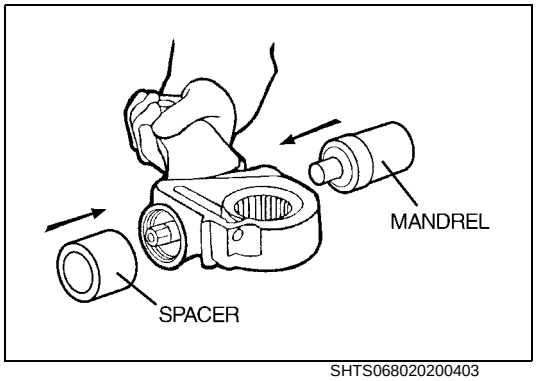
When the retainer has been tightened strongly, use the special impact screwdriver and a hammer.

SST: Special parts assembly (S0963-02350)

- **Peg spanner**
- **Impact screwdriver**


SHTS068020200402

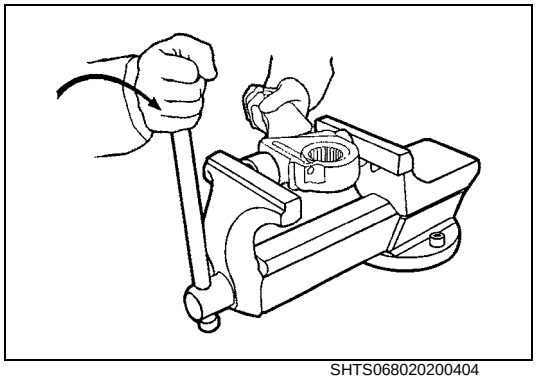
(4) Remove the thrust bearing, the O-ring, the inner cap, the spring and the drive gear.



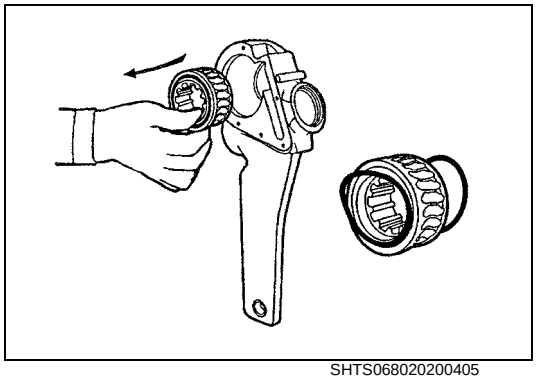
SHTS068020200403

(5) Install the special tool mandrel and the special tool spacer.
SST: Special parts assembly (S0963-02350)

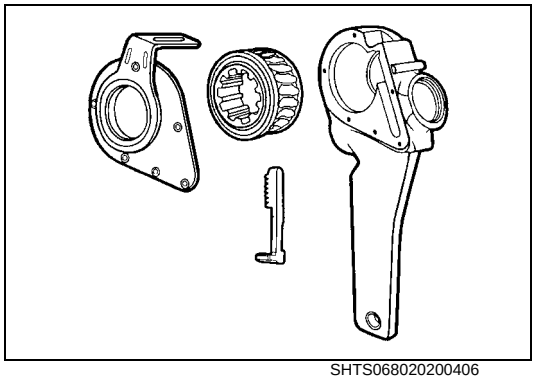
- **Mandrel**
- **Spacer**


SHTS068020200404

(6) Using a vice, turn it slowly until the bearing and the worm shaft are removed.
(7) Remove the bearing and the worm shaft.


SHTS068020200405

(8) Remove the worm gear.
(9) Remove the O-ring from the outer surface of the worm gear.


SHTS068020200406

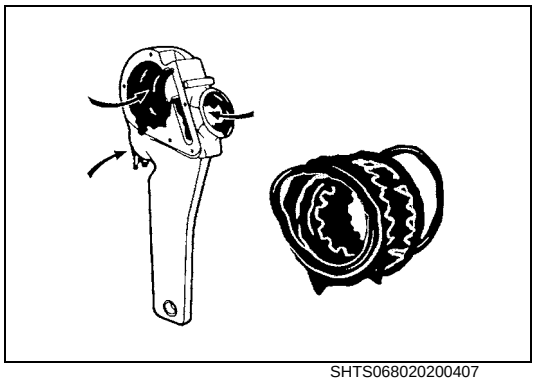
4. CLEANING OF EACH PART

(1) Clean each part shown in the figure.

IMPORTANT POINTS - ASSEMBLY

NOTICE

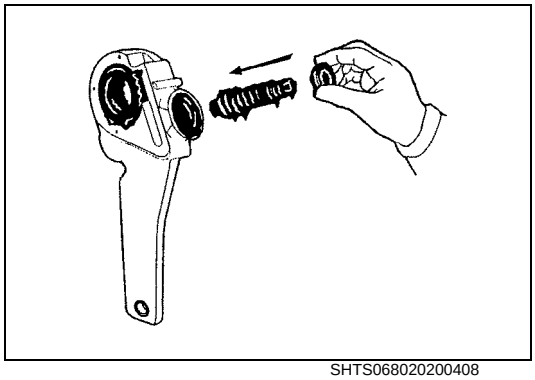
At the time of assembly, apply a sufficient amount of grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to each part.


SHTS068020200407

1. ASSEMBLING OF WORM SHAFT AND WORM GEAR SECTION

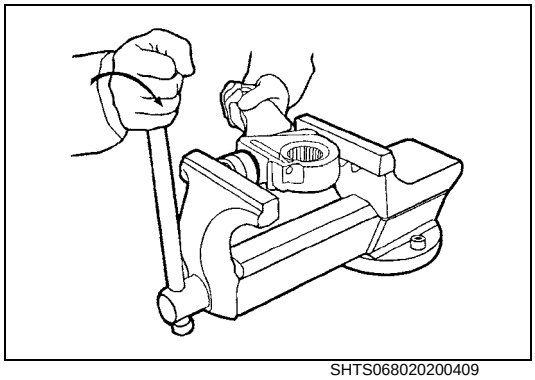
(1) Apply grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to the inside of the body and to the entire worm gear.

(2) Install O-rings on both sides of the worm gear and insert the worm gear with the projecting part to the front into the body.


SHTS068020200408

(3) Apply grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to the worm shaft and the bearing.

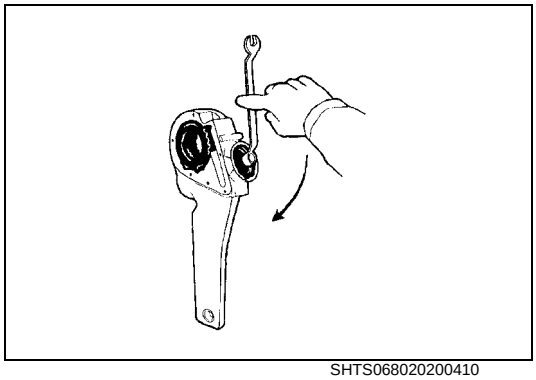
(4) Install them with the hexagonal adjustment part to the front from the front retainer direction all the way to the inside.


SHTS068020200409

(5) Insert the special tool until it comes into contact with the bearing.
SST: Special parts assembly (S0963-02350)

- **Mandrel**

(6) Install the worm shaft and bearing by using a vice to press-fit them completely.

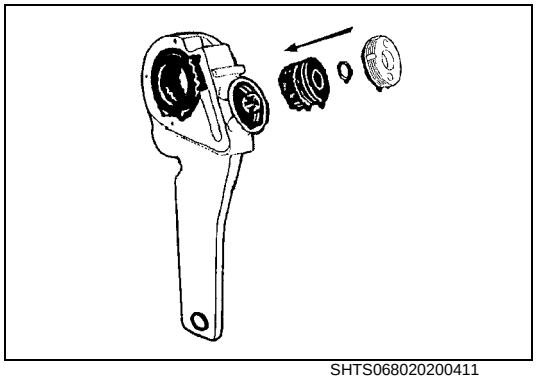


SHTS068020200410

(7) Use a wrench to turn the worm shaft about 22 times, and confirm smooth rotation of the worm shaft and the worm gear.

NOTICE

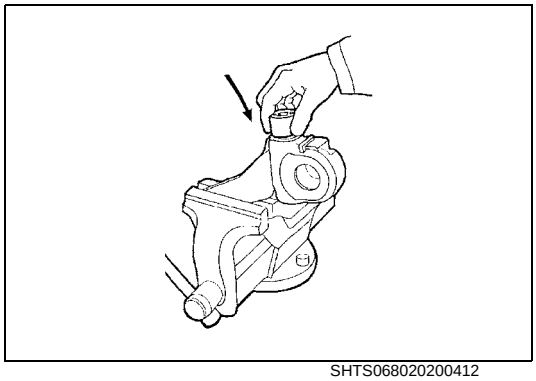
The worm gear performs approximately one revolution when the worm shaft is turned 22 times.



SHTS068020200411

(8) Assemble the inner cap, the spring and the drive gear.

(9) Apply grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to the parts assembled in step (7) and to the O-ring, the thrust bearing, and the front retainer. Then install them in sequence from the front retainer direction.



SHTS068020200412

(10) Install the body in a vice and tighten the front retainer using the special tool and a torque wrench.

NOTICE

Do not use an impact wrench.

SST: Special parts assembly (S0963-02350)

- **Peg spanner**

  Tightening Torque:
  50 N·m {510 kgf·cm, 37 lbf·ft}

(11) Use a wrench to confirm smooth rotation of worm shaft and worm gear.

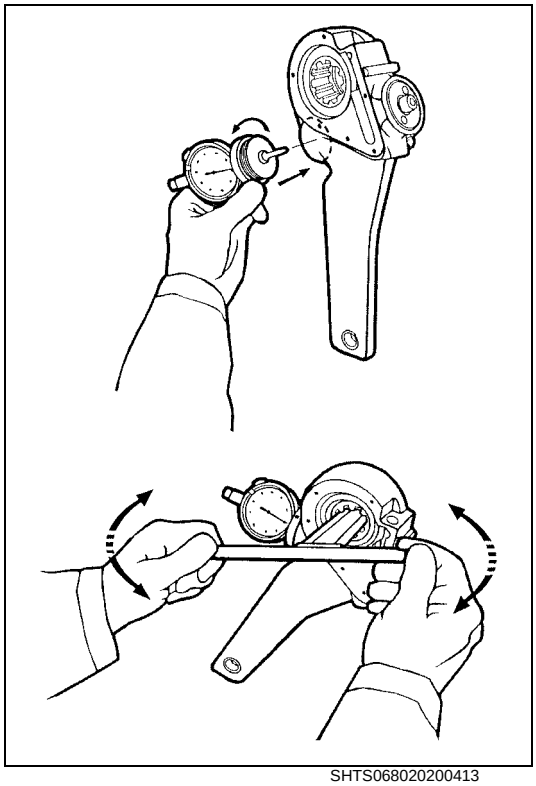
(12) Insert the special tool dial gauge into the rear retainer and insert the special tool universal spline key into the worm gear spline section.

SST: Special parts assembly (S0963-02350)

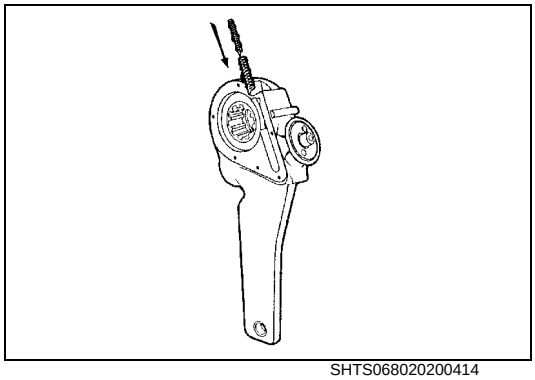
- **Dial gauge**
- **Universal spline key**

(13) Turn the special tool universal spline key to the left and right and measure the play of the worm shaft indicated by the dial gauge.
Play: 0.15-0.60 mm {0.0060-0.0236 in.}

(14) Replace the body if the play is outside the standard range.

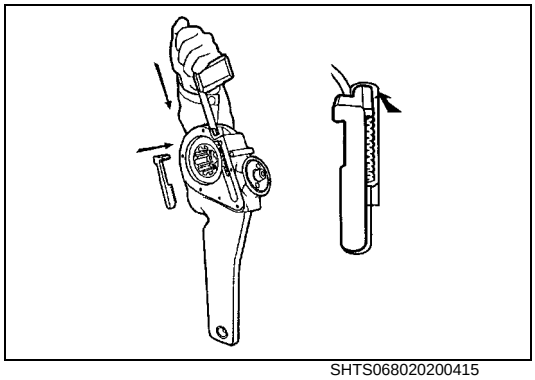


SHTS068020200413


SHTS068020200414

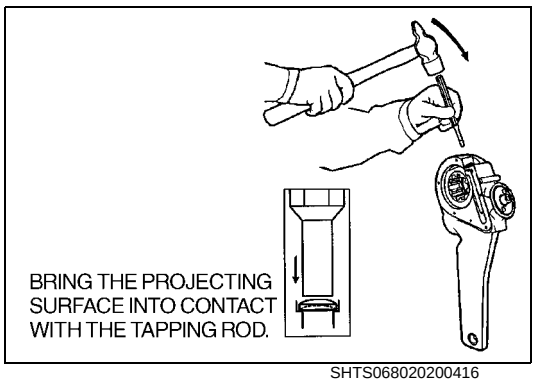
2. ASSEMBLING OF THE RACK AND SPRING SECTION

(1) Apply grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to the spring and the rack and install them to the body.


SHTS068020200415

(2) Install the rack using the special tool while pushing the spring. Visually confirm that the rack and the spring are fitted as shown in the figure.
SST: Special parts assembly (S0963-02350)

- **Universal spline key**



SHTS068020200416

(3) Use a tapping rod and hammer to close the opening with a new plug.

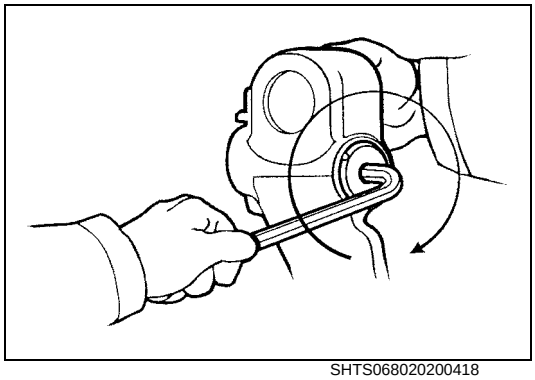
NOTICE
Pay attention to the direction of the plug.



SHTS068020200417

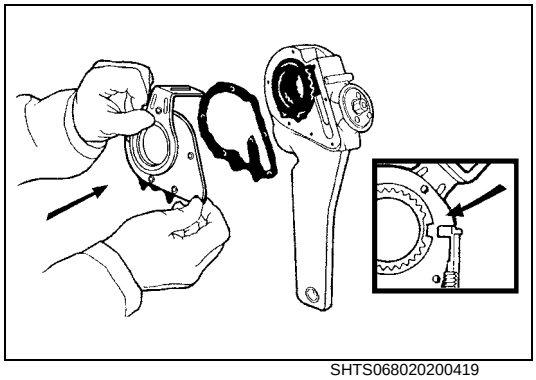
(4) Apply grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to the thrust washer, the spring, and the rear retainer and install them.

NOTICE
Pay attention to the direction of the thrust washer.


SHTS068020200418

(5) Using an hexagonal wrench, tighten the rear retainer about four turns in the clockwise direction.

NOTICE
Do not use an impact wrench.


SHTS068020200419

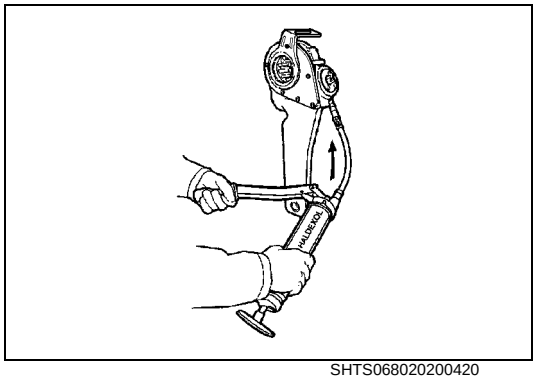
(6) Apply grease (Alexol RCF2, made by AB Axel Christiernsson or equivalent or LITHIUM/CALCIUM-basis with EP additives viscosity NLG12) to the gasket, and then install it together with the holder in the body.

NOTICE

Confirm that the notch of the holder matches the claw of the rack.

(7) Tighten the torx screws.
Tightening Torque:
4 N·m {41 kgf·cm, 3 lbf·ft}

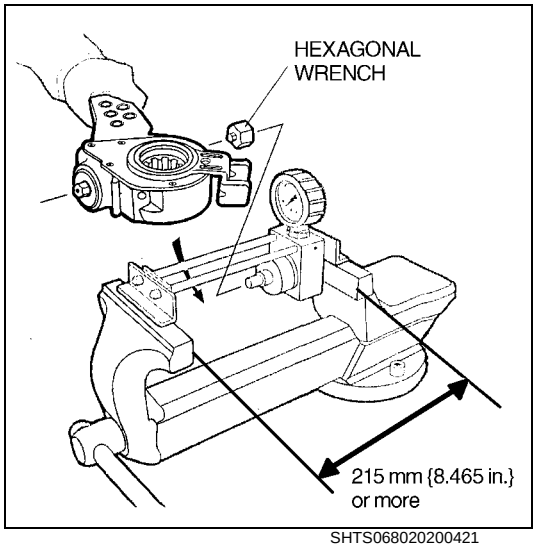
(8) Install the lubrication fitting.


SHTS068020200420

3. GREASE FILLING

(1) Use a grease gun to apply grease until it escapes through the holder gap.

IMPORTANT POINTS - INSPECTION



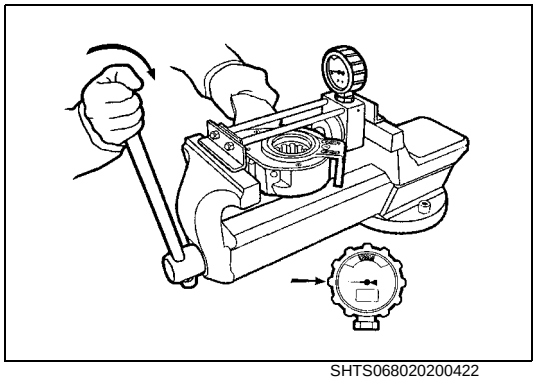
SHTS068020200421

1. INSPECTION OF THE SLACK ADJUSTER ASSEMBLY

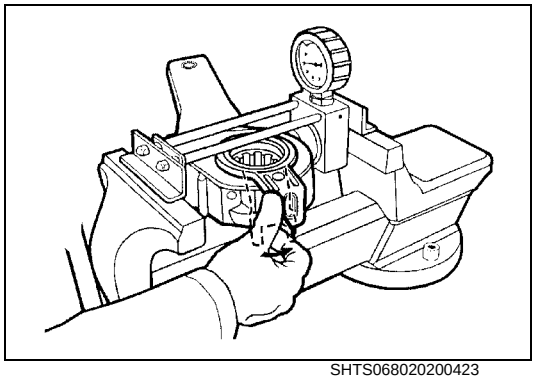
(1) Fix the special tool end load tester to a vice with a width of at least 215 mm {8.465 in.}

(2) Apply the special tool hexagonal wrench to the rear retainer and fix it to the special tool end load tester.
SST: Special parts assembly (S0963-02350)

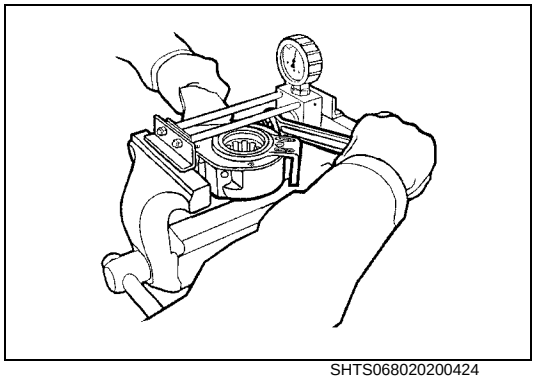
- **End load tester**
- **Hexagonal wrench**


SHTS068020200422

(3) Secure the body, and confirm at this time that the gauge indicator is in the condition shown in the figure.

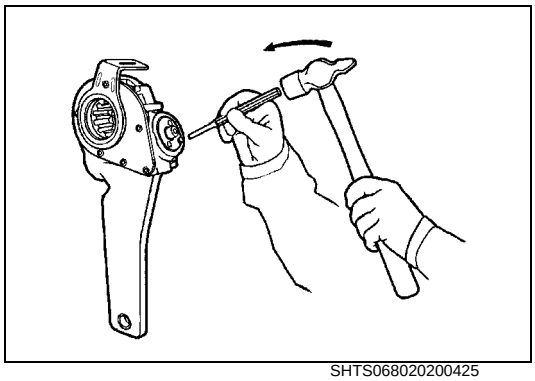

SHTS068020200423

(4) Confirm that the control arm part of the holder can be moved forward and back by hand.
(5) Push the control arm part of the holder with your thumb lightly in the direction of the rear retainer. Turn the vice in clockwise direction and confirm that the control arm part of the holder moves in the direction of the rear retainer within the specified range of the gauge indicator. Or confirm that the control arm of the holder moves lightly.
Specified value: 3,530-3,730 N {360-380 kgf, 794-837 lbf}


SHTS068020200424

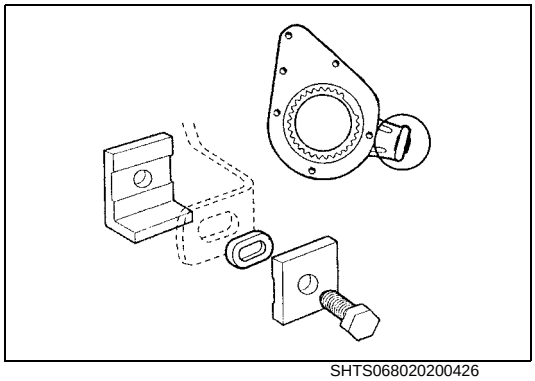
(6) If the control arm part of the holder moves outside the range of 3,530-3,730 N {360-380 kgf, 794-837 lbf} of the gauge indicator, adjust assembly by tightening or loosening the special tool hexagonal wrench with a spanner.
Under 3,530 N {360 kgf, 794 lbf}: Turn in clockwise direction
Over 3,730 N {380 kgf, 837 lbf}: Turn in counterclockwise direction

(7) For confirmation of correct assembly, again perform the inspection after assembly.


SHTS068020200425

2. FINISHING THE INSPECTION
(1) Use a punch and a hammer to drive the rivet into the retainer.
(2) Confirm the inner diameter of the bushing and use a vice to press-fit it into the body.

NOTICE
Confirm the inner diameter of the bushing as the repair kit contains several types of bushings.


SHTS068020200426

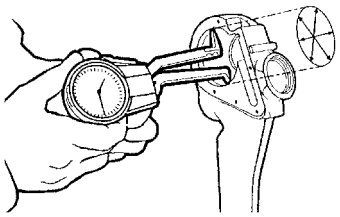
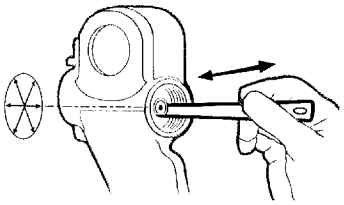
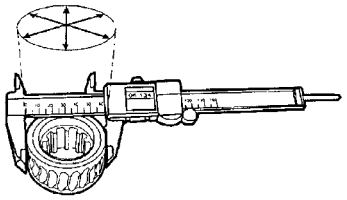
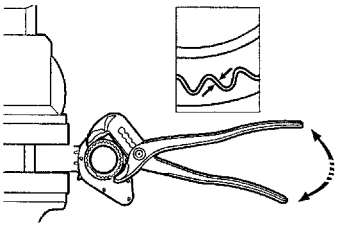
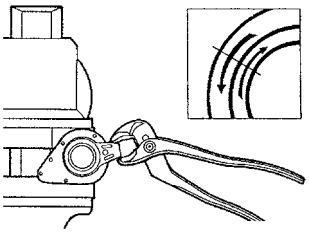
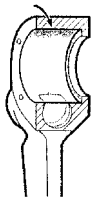
(3) Remove the used plug and use the special tool to install a new plug.
SST: Special parts assembly (S0963-02350)

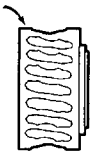
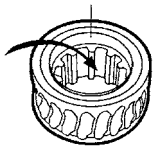
- **Control arm bushing installation tool**

INSPECTION AND REPAIR

EN0680202H300036

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Inner diameter of the body	**—**	**62.20 {2.4488}**	**Replace.**	**Measure.** 
Gap between worm shaft and body (at the time of inspection, a new worm shaft should be used) using special thickness gauge	**—**	**0.25 {0.0098}**	**Replace the body.**	**Measure.** 
Outer diameter of the worm gear	**—**	**61.87 {2.4358}**	**Replace.**	**Measure.** 
Holder gear part	**—**	**0.40 {0.0157}**	**Replace.**	**Measure.** 
Holder gear part: No play	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Body: No traces of scuffing on the inside	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Worm gear: **No uneven wear on the outside**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 
Worm gear: **No damage to the spline part**	**—**	**—**	**Replace,** **if necessary.**	**Visual check** 

ABS & ASR (DENSO)

BR03-001

ABS BR03-2
OVERVIEW BR03-2
COMPOSITION AND OPERATION..... BR03-3
OVERVIEW AND FUNCTION BR03-5

FRONT WHEEL BRAKE.....BR03-6
COMPONENT LOCATOR BR03-6
OVERHAUL BR03-7

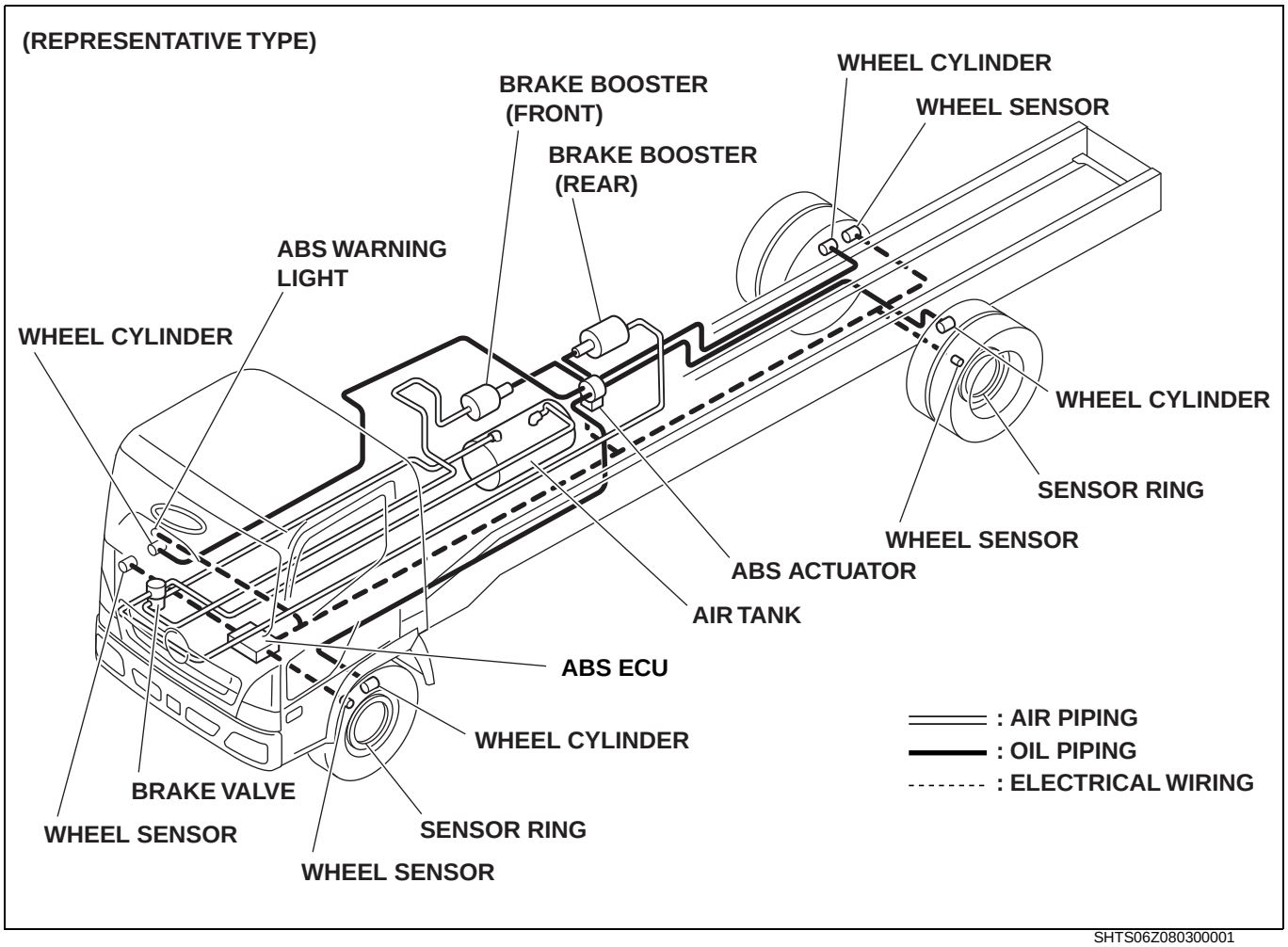
REAR WHEEL BRAKE.....BR03-10
COMPONENT LOCATOR BR03-10
OVERHAUL BR03-11

ABS

OVERVIEW

EN06Z0803C100001

- ABS is a system that makes effective use of the friction between the tires and the road surface to maintain vehicle stability while the brakes are being applied and for stopping the vehicle.
- Applying the brakes forcefully on a slippery road surface can cause the wheels to be locked, due to excessive braking force. This causes the vehicle to lose a stability because the locked wheels lose resistance in the lateral direction. More specifically, if the front wheels are locked, it becomes impossible to steer the vehicle, and if the rear wheels are locked, the rear of the vehicle may fishtail from side to side.
- Also, when wheel-locking occurs, it is not possible to make effective use of friction between the tires and the road surface. This may cause the braking distance to be increased.
- ABS uses wheel sensors mounted on the axles to constantly monitor the rotation of the wheels. If any of the wheels is starting to lock up, the ABS ECU sends signals to the ABS control valve and immediately adjusts the brake pressure to prevent wheel-locking.
- In this way, ABS maintains the stability of the vehicle while stopping by making effective use of the friction between the tires and the road surface.



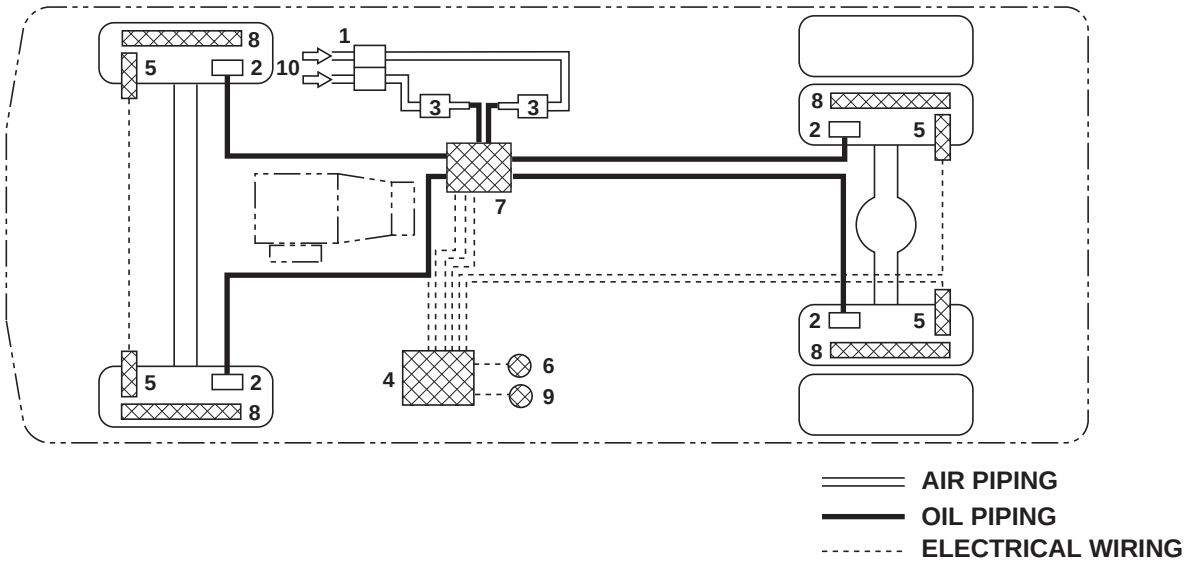
SHTS06Z080300001

COMPOSITION AND OPERATION

EN06Z0803C100002

- The ABS system is comprised of the sensor rings mounted on the wheels, the ABS ECU, which receives signals from the wheel sensors that monitor the rotational speed of the wheels and outputs control signals to maintain the appropriate braking force; ABS control valves, which increase or decrease the braking force, based on the control signals; the warning light, which gives an alarm if the system malfunctions; the piping, wire harnesses, etc., that link together the various units that compose the system.
- Pulse signals transmitted by the sensor rings mounted on the wheel hubs, rotated together with the wheels, and the wheel sensors mounted near sensor ring on the axles are sent to the ABS ECU. The ABS ECU then calculates the wheels' rotational speed, acceleration, deceleration, and amount of slippage, based on these signals.
- If the limit values for the wheel's deceleration, or slippage ratio are exceeded, the ABS ECU immediately transmits signals to the ABS control valves to adjust any excess braking force.
- This ABS system controls the four wheels, front, rear, right, and left, independently.

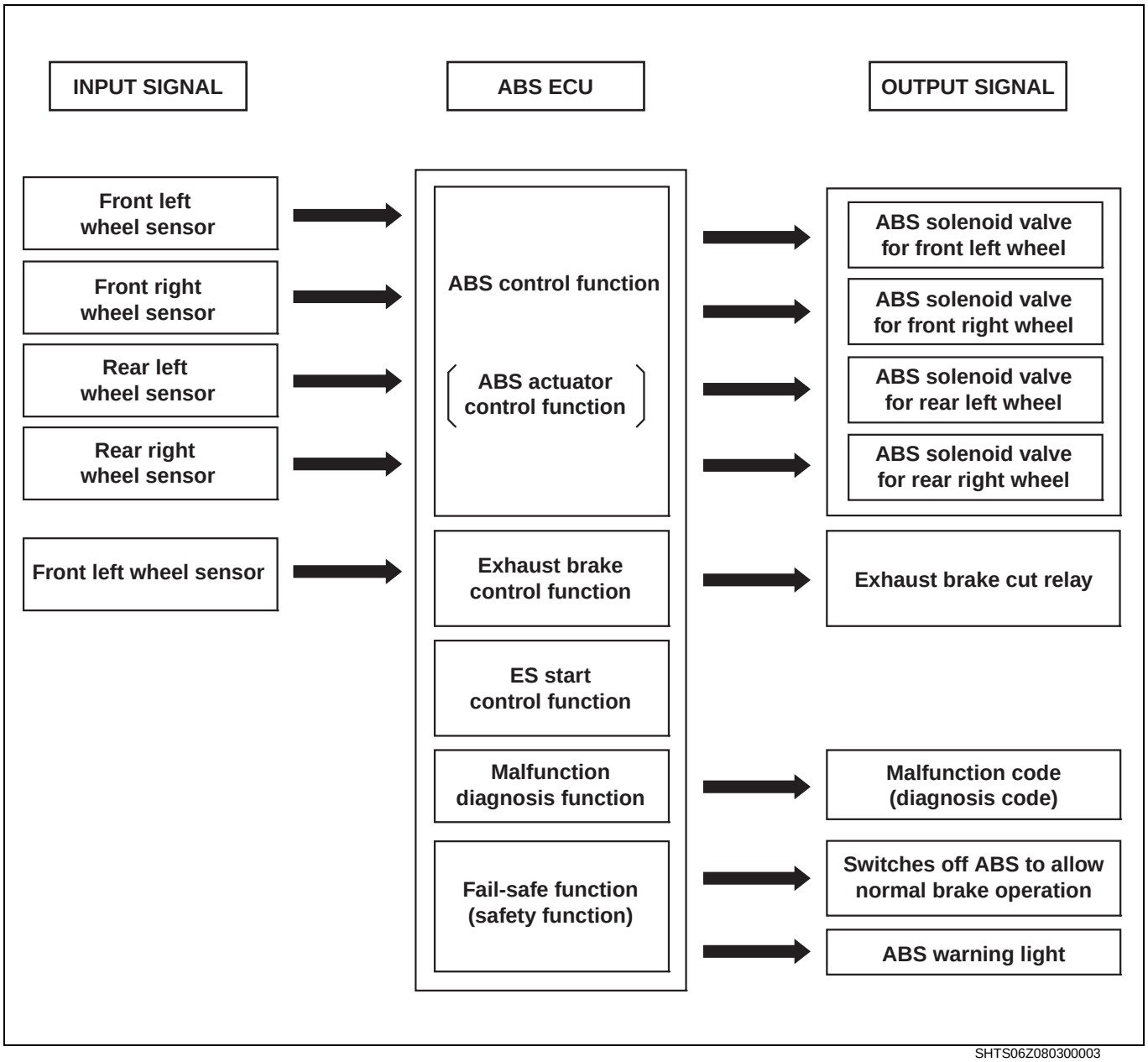
SYSTEM COMPOSITION DIAGRAM



SHTS06Z080300002

1	Brake valve	6	ABS warning light
2	Wheel cylinder	7	ABS actuator
3	Brake booster	8	Sensor ring
4	ABS + ES start ECU	9	Stop light switch
5	Wheel sensor	10	From air tank

ABS CONTROL FLOWCHART



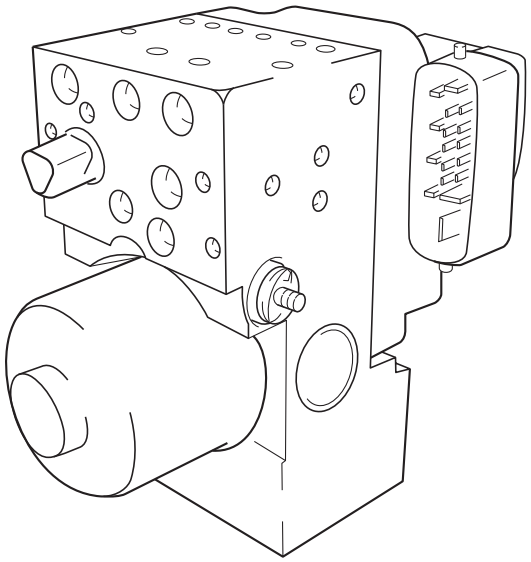
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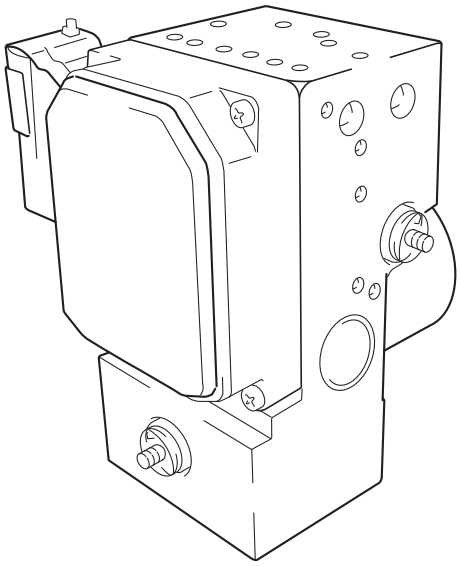
OVERVIEW AND FUNCTION

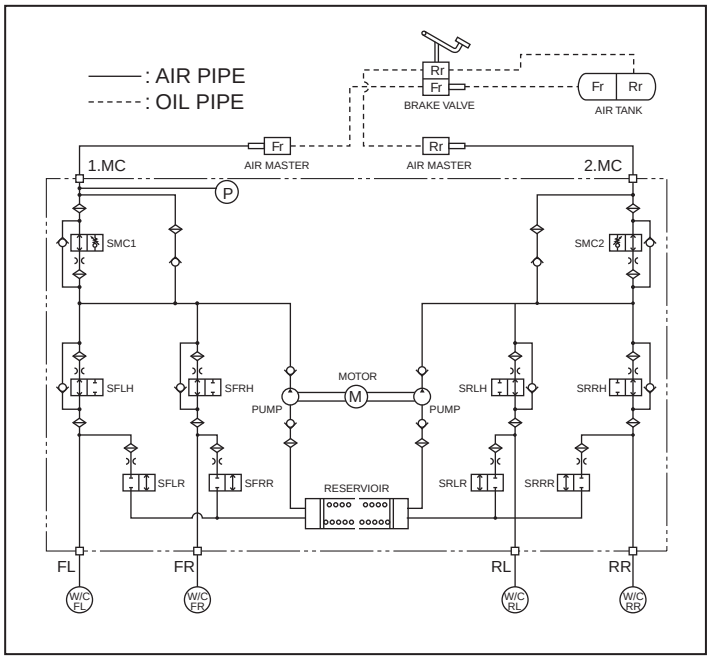
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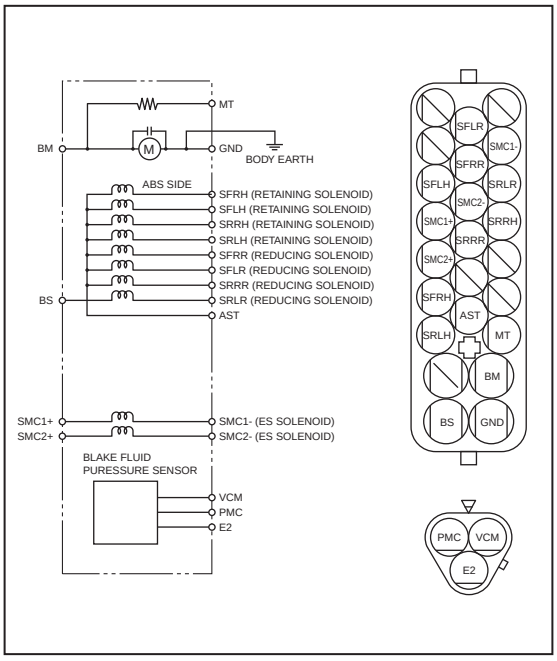
1. ABS ACTUATOR

- ABS actuator is composed of 2 pcs of ES solenoid valve, 4 pcs of retaining solenoid valve, 4 pcs of reducing valve, pump and reservoir.
- Control signal from ABS + ES start ECU control the oil pressure of wheel cylinder.









HYDRAULIC CIRCUIT DIAGRAM **ELECTRIC CIRCUIT DIAGRAM**

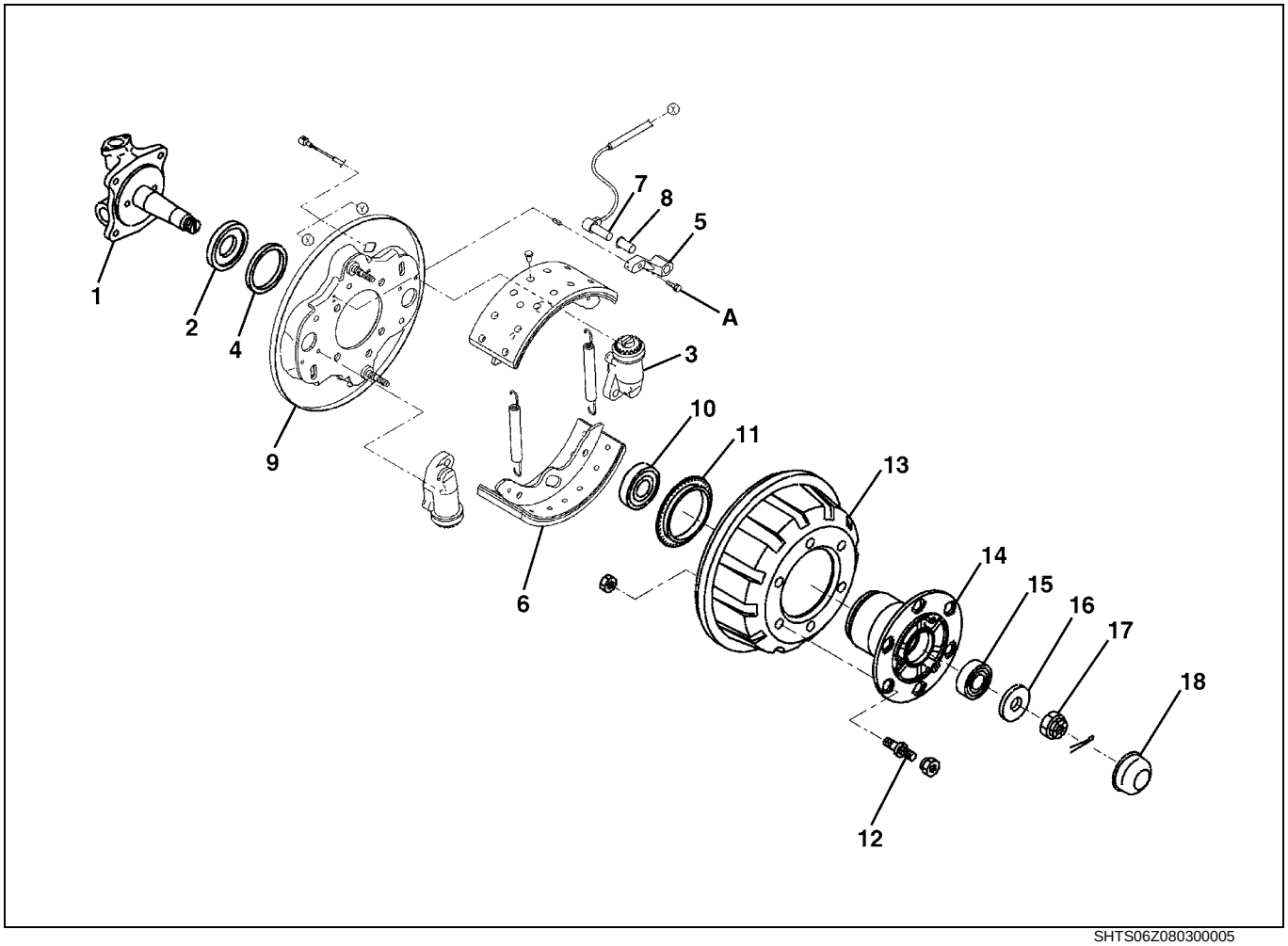
SHTS06Z080300004

FRONT WHEEL BRAKE

COMPONENT LOCATOR

EN06Z0803D100001

FRONT AXLE



SHTS06Z080300005

1	Knuckle	10	Inner wheel hub bearing
2	Oil seal guide	11	Sensor ring
3	Wheel cylinder	12	Wheel bolt
4	Oil seal	13	Brake drum
5	Holder	14	Wheel hub
6	Brake shoe	15	Outer wheel hub bearing
7	Wheel sensor	16	Washer
8	Clamping bushing	17	Wheel hub bearing lock nut
9	Back plate	18	Wheel hub cap

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

A	34.0-50 {345-510, 25-36}		

OVERHAUL

EN06Z0803H200001

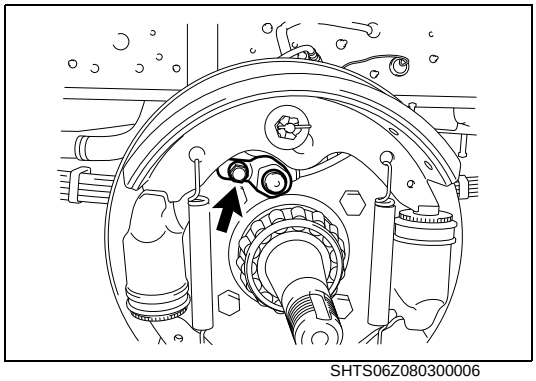
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL SENSOR.

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

(2) Remove the wheel hub, hub bearing and brake drum.
Refer to the chapter **"FRONT AXLE"**.

(3) Loosen the bolt to remove the sensor holder and wheel sensor together from the back plate.



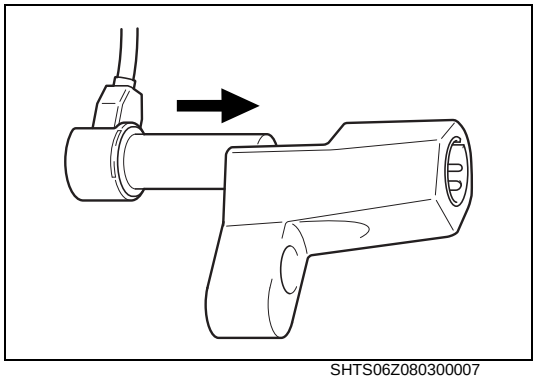
SHTS06Z080300006

(4) Remove the wheel sensor from the wheel sensor holder.

(5) Remove the clamping bushing from the wheel sensor holder.

NOTICE

Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.



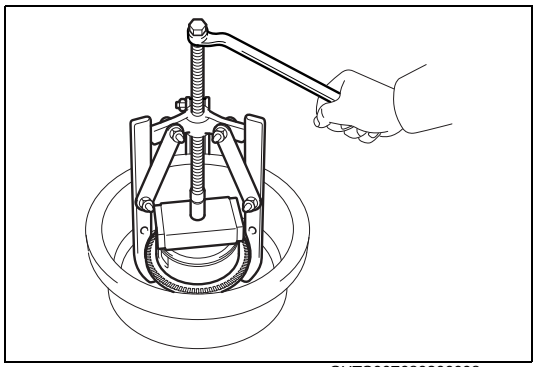
SHTS06Z080300007

2. REMOVE THE SENSOR RING.

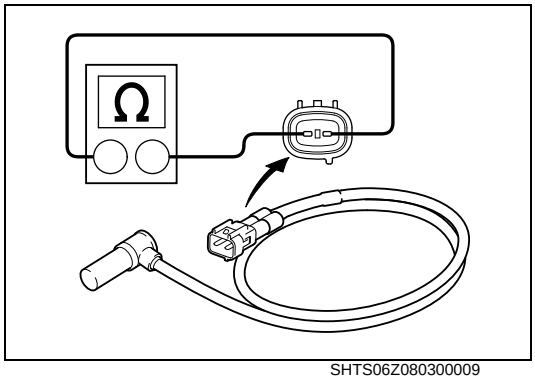
(1) Remove the sensor ring from the hub by using 3-point puller.

NOTICE

- **Do not remove the sensor ring unless it is required.**
- **When removing the sensor ring, be careful not to damage the wheel hub.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**



SHTS06Z080300008

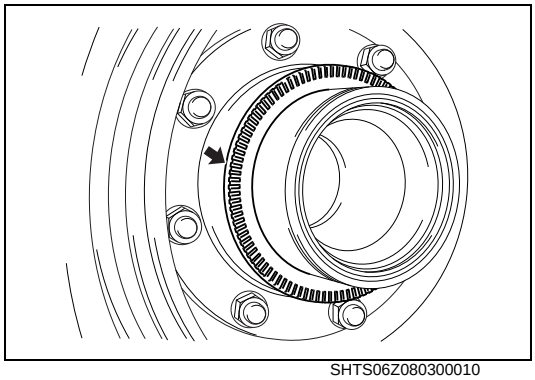

SHTS06Z080300009

IMPORTANT POINTS - INSPECTION

1. INSPECT THE ONLY WHEEL SENSOR.

(1) With a tester, measure the resistance of wheel sensor.
Standard: 1.0-3.0 kΩ

(2) When the measured value is out of the standard, change the wheel sensor as it might be considered presumably to be abnormal.

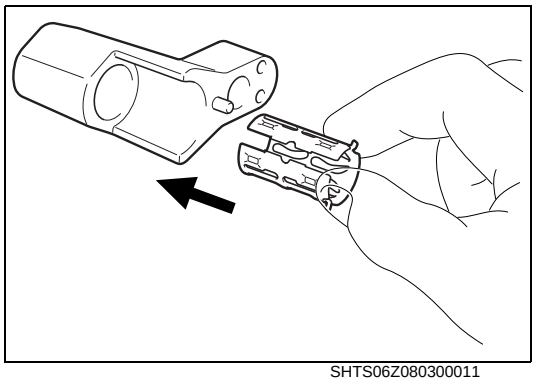

SHTS06Z080300010

2. INSPECT THE SENSOR RING.

(1) Make a visual inspection to check for damage or deformation of the sensor ring, and also to make sure it is not coming loose from the wheel hub.

(2) If any damage or malformation is discovered, replace the sensor ring.

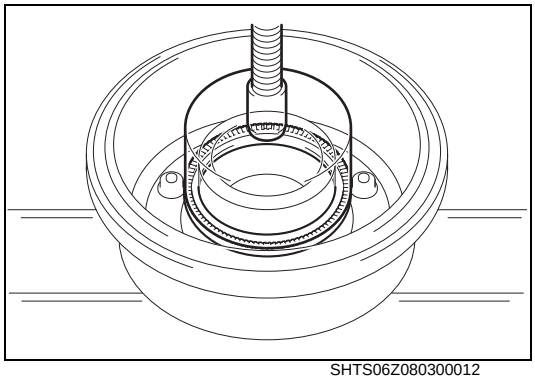
(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and press in it with a press again.


SHTS06Z080300011

3. INSPECT THE CLAMPING BUSHING.

(1) Make sure that wheel sensor is securely fixed.

(2) Change the clamping bushing when it can be pulled off or pushed in with a weak force.


SHTS06Z080300012

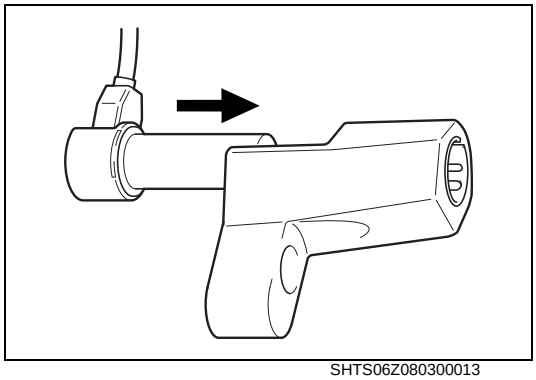
4. MOUNT THE SENSOR RING.

(1) Place the sensor ring on the wheel hub and use the dolly block and a press to evenly pressure mount it.

NOTICE

Warming up the sensor ring with hot water will make it easier to pressure mount it. Do not use a gas burner or the like to warm the sensor ring. Doing so could cause malformation of the sensor ring.

(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}


SHTS06Z080300013

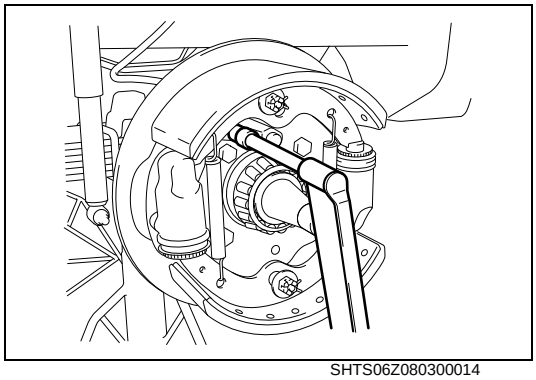
5. MOUNT THE WHEEL SENSOR.

(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

(2) Push the wheel sensor fully in the wheel sensor holder with hands until the wheel sensor makes contact with the clamping bushing.

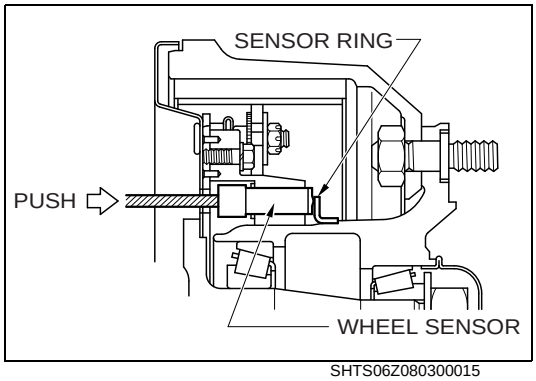
NOTICE

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.


SHTS06Z080300014

(3) Install the wheel sensor holder and wheel sensor together to the back plate with bolts.

(4) Mount the wheel hub, hub bearing and brake drum.
Refer to the chapter **"FRONT AXLE"**.



SHTS06Z080300015

6. INSPECT THE WHEEL SENSOR.

(1) Arrange the wire harness.

(2) With a circuit tester, confirm the output voltage of the wheel sensor (By rotating the tire by one time for 5 seconds)

Standard: 170-1,999 mV

(Range of Alternating Current Voltage)

(3) In case of out of the standard range at (2), remove the dust cover located on the back plate unit. Then push the wheel sensor by using round end bar until the sensor contacts with the sensor ring.

NOTICE

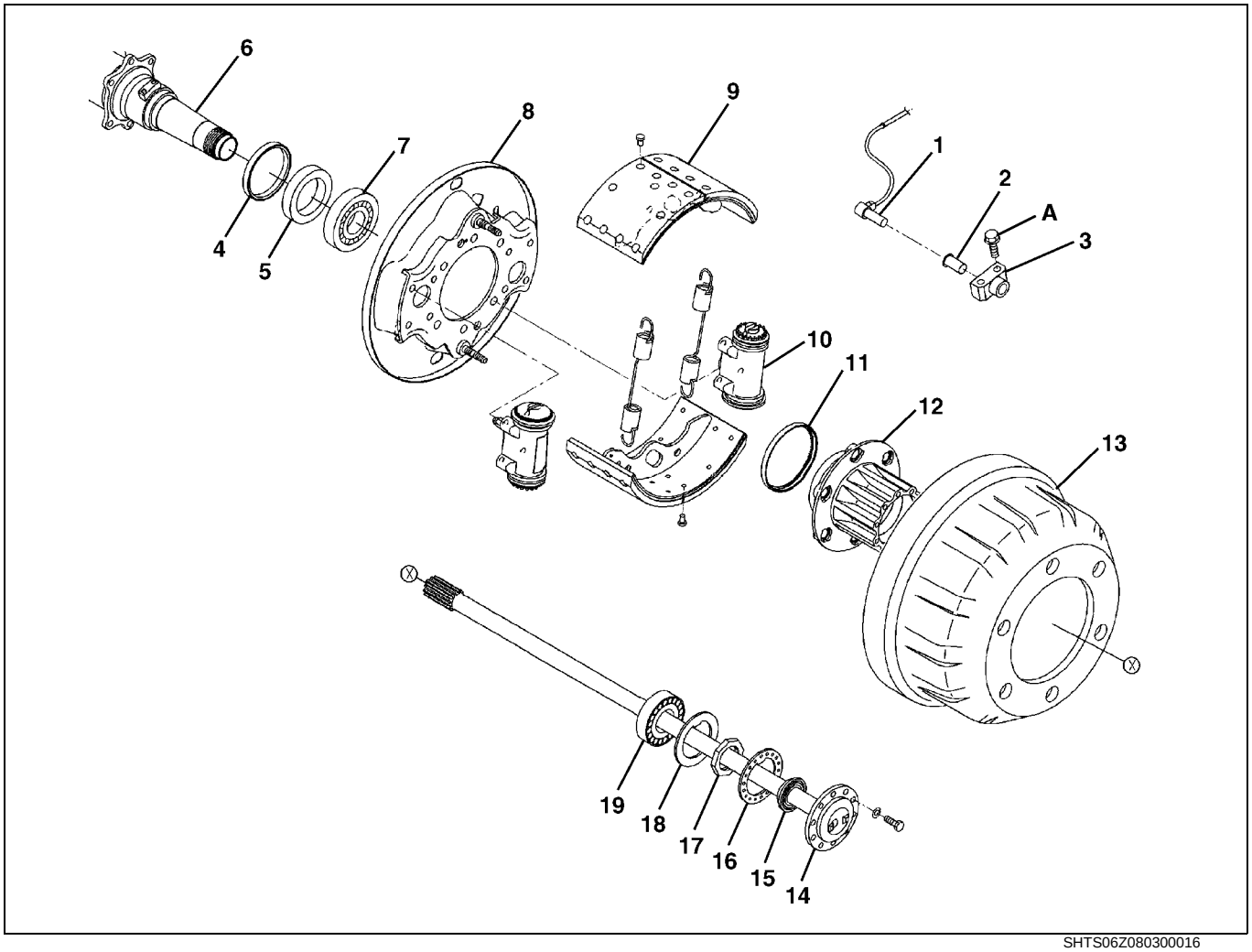
Do not tap by hammer or turn when pushing the wheel sensor. This may damage the wheel sensor.

REAR WHEEL BRAKE

COMPONENT LOCATOR

EN06Z0803D100002

REAR AXLE



SHTS06Z080300016

1	Wheel sensor	11	Sensor ring
2	Clamping bushing	12	Wheel hub
3	Wheel sensor holder	13	Brake drum
4	Oil seal collar	14	Axle shaft
5	Oil seal	15	Oil seal
6	Axle housing assembly	16	Lock plate
7	Inner wheel hub bearing	17	Lock nut
8	Back plate	18	Washer
9	Brake shoe	19	Outer wheel hub bearing
10	Wheel cylinder		

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

A	35-51 {352-525, 26-37}		

OVERHAUL

EN06Z0803H200002

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL SENSOR.

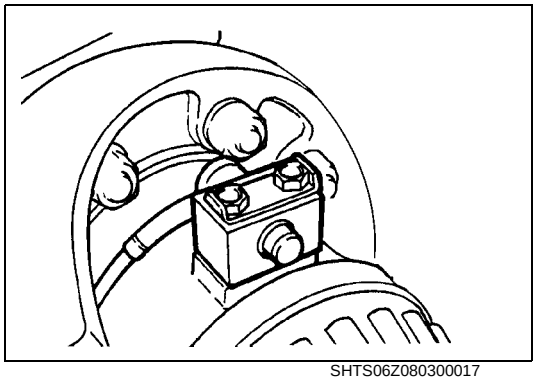
(1) Remove the wheels.
Refer to the chapter **"WHEEL & TIRE"**.

(2) Remove the wheel hub, hub bearing and brake drum.
Refer to the chapter **"REAR AXLE"**.

(3) Remove the wheel sensor.

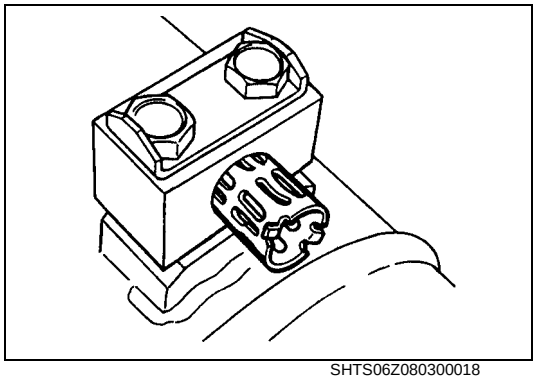
NOTICE

- **Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.**
- **Pull out the wheel sensor from the sensor holder by hand.**



SHTS06Z080300017

(4) Remove the clamping bushing.
Remove the clamping bushing out of the wheel sensor holder.



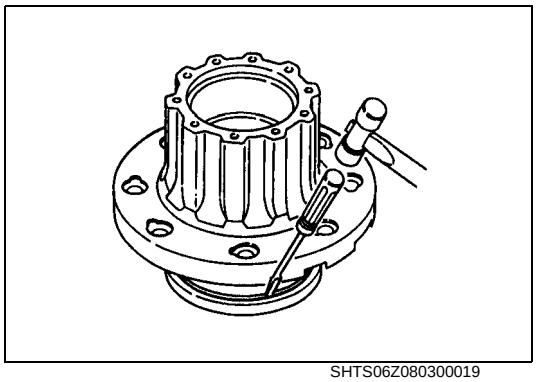
SHTS06Z080300018

2. REMOVE THE SENSOR RING.

(1) Use a screwdriver or the like to gradually remove the sensor ring by tapping evenly on its outer ring.

NOTICE

- **Do not remove the sensor ring unless it is required.**
- **When tapping on the sensor ring to remove it, be careful not to scratch the wheel hub.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**



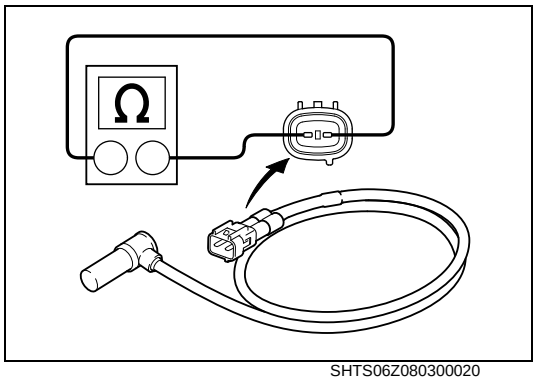
SHTS06Z080300019

IMPORTANT POINTS - INSPECTION

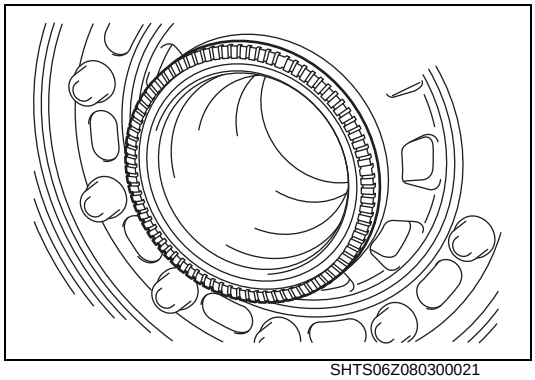
1. INSPECT THE ONLY WHEEL SENSOR.

(1) With a tester, measure the resistance of wheel sensor.
Standard: 1.0-3.0 kΩ

(2) When the measured value is out of the standard, change the wheel sensor as it might be considered presumably to be abnormal.



SHTS06Z080300020

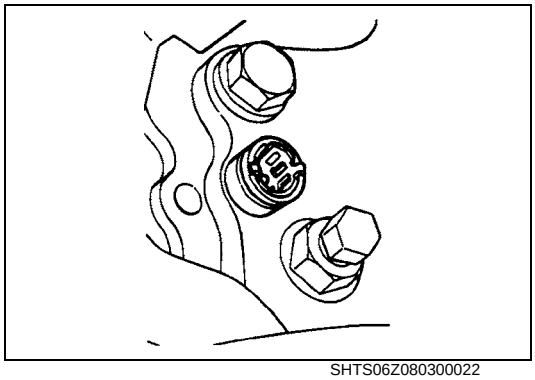

SHTS06Z080300021

2. INSPECT THE SENSOR RING.

(1) Make a visual inspection to check for damage or deformation of the sensor ring, and also to make sure it is not coming loose from the wheel hub.

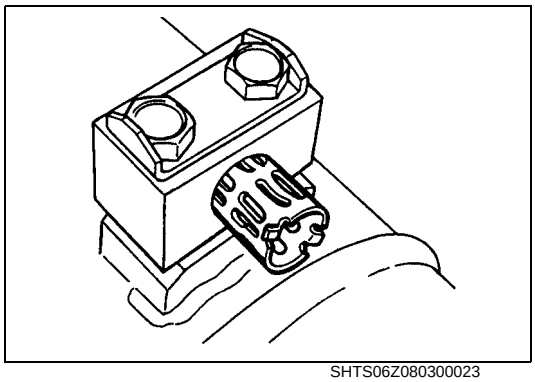
(2) If any damage or malformation is discovered, replace the sensor ring.

(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and a press to pressure mount it again.


SHTS06Z080300022

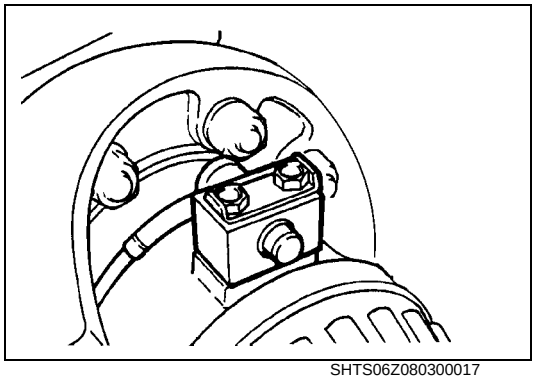
3. INSPECT THE CLAMPING BUSHING.

(1) Make sure that wheel sensor is securely fixed.
Change the clamping bushing when it can be pulled off or pushed in with a weak force.


SHTS06Z080300023

4. MOUNT THE WHEEL SENSOR

(1) Push in the clamping bushing until the stopper makes contact with the rear axle wheel sensor holder.

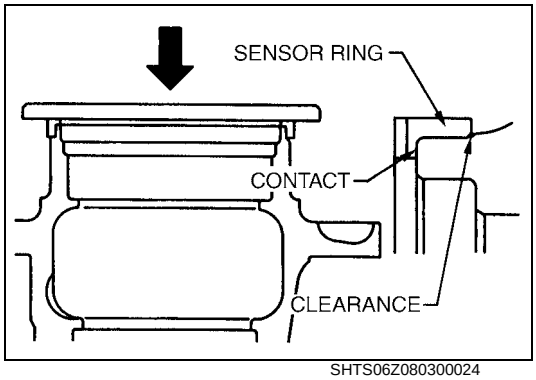

SHTS06Z080300017

(2) Push the wheel sensor fully in the wheel sensor holder with hands until the wheel sensor makes contact with the clamping bushing.

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.

(3) Arrange the wire harness.



SHTS06Z080300024

5. MOUNT THE SENSOR RING.

(1) Place the sensor ring on the wheel hub and use a dolly block and a press to evenly pressure mount it.

NOTICE

Warming up the sensor ring with hot water will make it easier to pressure mount it. Do not use a gas burner or the like to warm the sensor ring. Doing so could cause malformation of the sensor ring.

(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}

(3) If the value is still out of the service limit after having performed the above (2), remove the dust cover on the back plate, and push the wheel sensor by using a round end bar until the sensor gets in contact with the sensor ring.

NOTICE

Do not hammer or twist when pushing the wheel sensor. Otherwise it may damage the wheel sensor.

6. MOUNT THE WHEEL HUB, HUB BEARING AND BRAKE DRUM.

(1) Refer to the chapter **"REAR AXLE"**.

NOTICE

- **Be careful not to push back the wheel sensor too far when mounting the wheel hub and brake drum. Also, make sure they are straight so that you do not bump the tip of the wheel sensor.**
- **When inserting the outer hub bearing, avoid tapping on it with a hammer as this will expose the wheel sensor to bumps. Insert the outer hub bearing carefully with a lock nut.**

7. INSPECT THE WHEEL SENSOR.

(1) Arrange the wire harness.

(2) With a circuit tester, confirm the output voltage of the wheel sensor (By rotating the tire by one time for 5 seconds)
Basic standard valve: 170-1,999 mV
(Range of Alternating Current Voltage)

(3) In case of out of the standard range at (2), remove the dust cover located on the back plate unit. Then push the wheel sensor by using round end bar until the sensor contacts with the sensor ring.

NOTICE

Do not tap by hammer or turn when pushing the wheel sensor. This may damage the wheel sensor.

(4) Mount the axle shaft to the wheel hub and tighten the bolt on the axle shaft.
Refer to the chapter **"REAR AXLE"**.

ABS & ASR (WABCO, FOR AIR OVER HYDRAULIC BRAKE)

BR03-002

ABS BR03-2
OVERVIEW BR03-2
COMPOSITION AND OPERATION..... BR03-3
FUNCTION BR03-6
OVERVIEW AND FUNCTION BR03-6

FRONT WHEEL BRAKE.....BR03-11
COMPONENT LOCATOR BR03-11
OVERHAUL BR03-12

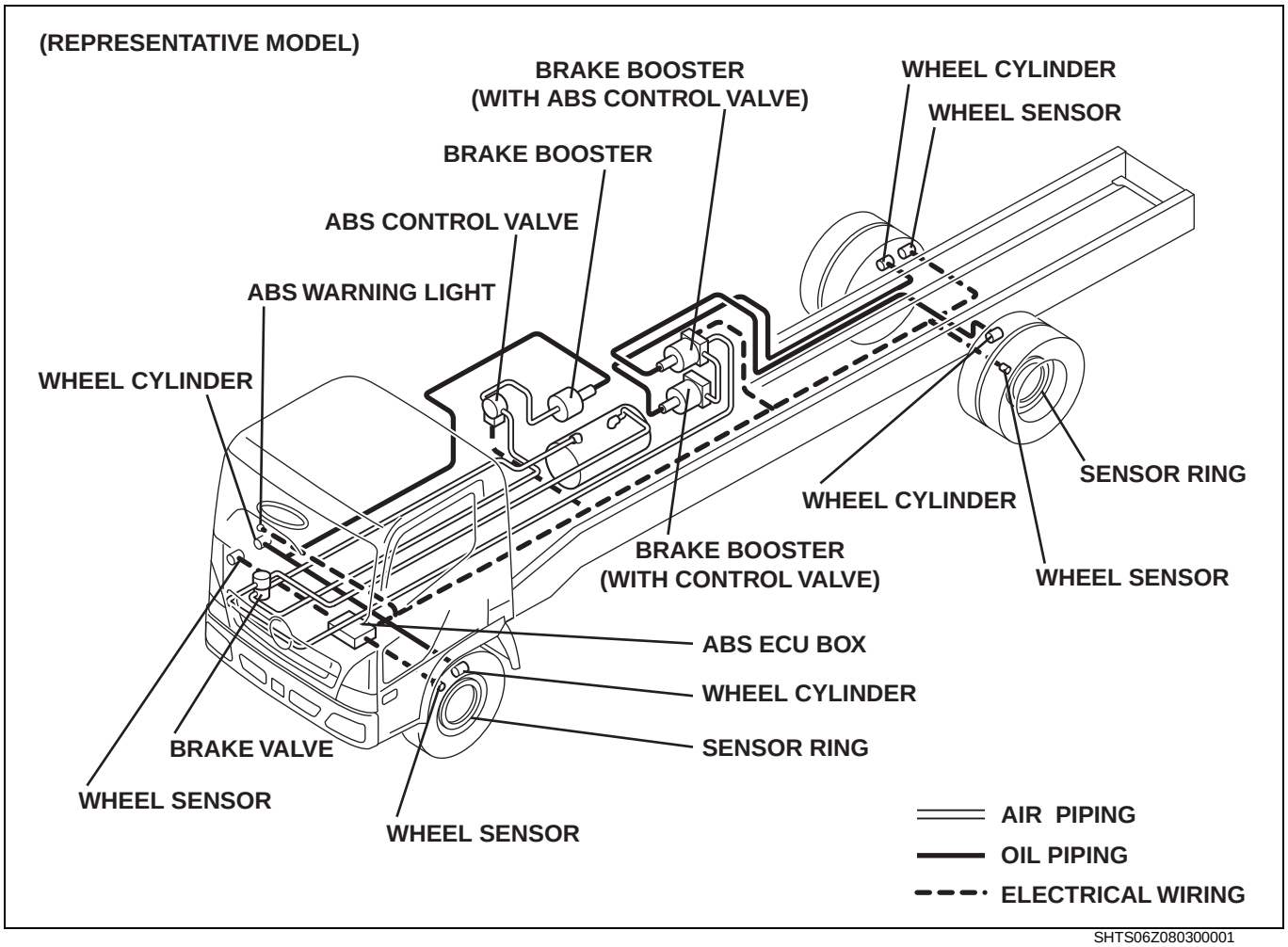
REAR WHEEL BRAKE.....BR03-15
COMPONENT LOCATOR BR03-15
OVERHAUL BR03-16

ABS

OVERVIEW

EN06Z0803C100001

- ABS is a system that makes effective use of the friction between the tires and the road surface to maintain vehicle stability while the brakes are being applied and for stopping the vehicle.
- Applying the brakes forcefully on a slippery road surface can cause the wheels to be locked, due to excessive braking force. This causes the vehicle to lose a stability because the locked wheels lose resistance in the lateral direction. More specifically, if the front wheels are locked, it becomes impossible to steer the vehicle, and if the rear wheels are locked, the rear of the vehicle may fishtail from side to side.
- Also, when wheel-locking occurs, it is not possible to make effective use of friction between the tires and the road surface. This may cause the braking distance to be increased.
- ABS uses wheel sensors mounted on the axles to constantly monitor the rotation of the wheels. If any of the wheels is starting to lock up, the ABS ECU sends signals to the ABS control valve and immediately adjusts the brake pressure to prevent wheel-locking.
- In this way, ABS maintains the stability of the vehicle while stopping by making effective use of the friction between the tires and the road surface.



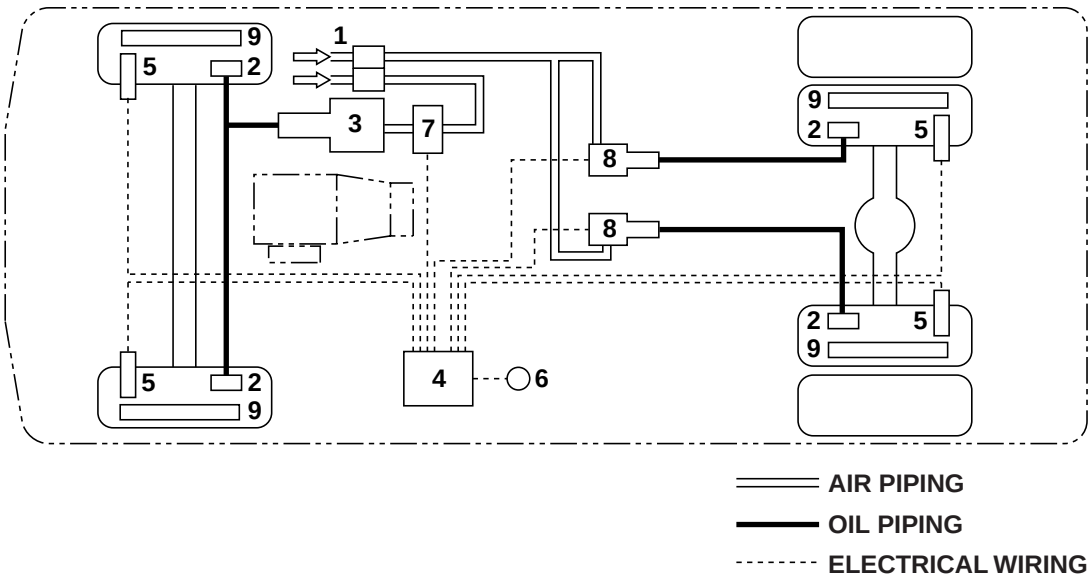
SHTS06Z080300001

COMPOSITION AND OPERATION

EN06Z0803C100002

- The ABS system is comprised of the sensor rings mounted on the wheels, the ABS ECU, which receives signals from the wheel sensors that monitor the rotational speed of the wheels and outputs control signals to maintain the appropriate braking force; ABS control valves, which increase or decrease the braking force, based on the control signals; the warning light, which gives an alarm if the system malfunctions; the piping, wire harnesses, etc., that link together the various units that compose the system.
- Pulse signals transmitted by the sensor rings mounted on the wheel hubs, rotated together with the wheels, and the wheel sensors mounted near sensor ring on the axles are sent to the ABS ECU. The ABS ECU then calculates the wheels' rotational speed, acceleration, deceleration, and amount of slippage, based on these signals.
- If the limit values for the wheel's deceleration, or slippage ratio are exceeded, the ABS ECU immediately transmits signals to the ABS control valves to adjust any excess braking force.
- This ABS system controls the four wheels, front, rear, right, and left, independently.

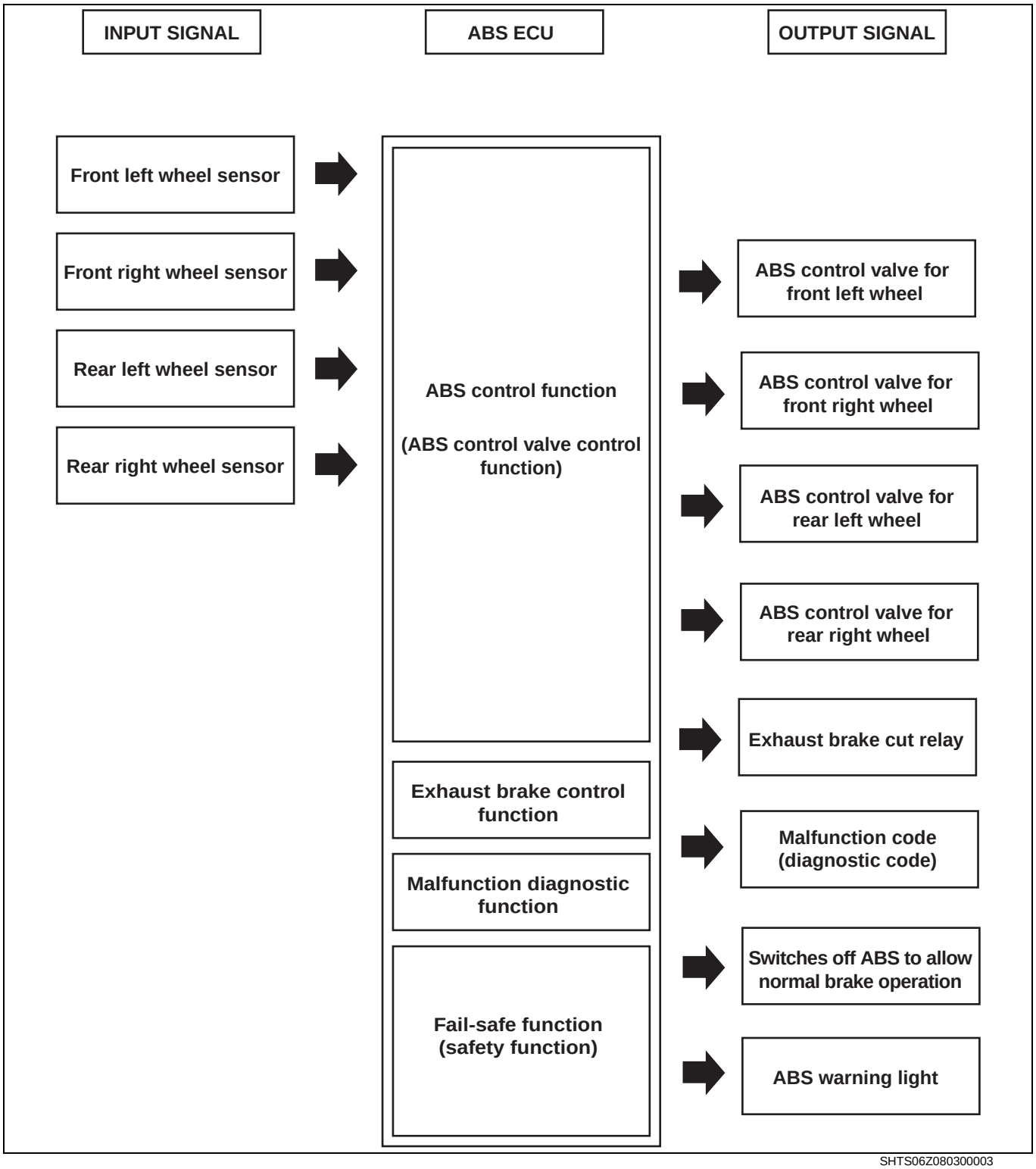
SYSTEM COMPOSITION DIAGRAM



SHTS06Z080300002

1	Brake valve	6	ABS warning light
2	Wheel cylinder	7	ABS control valve
3	Brake booster	8	Brake booster (with ABS control valve)
4	ABS ECU	9	Sensor ring
5	Wheel sensor		

ABS CONTROL FLOWCHART



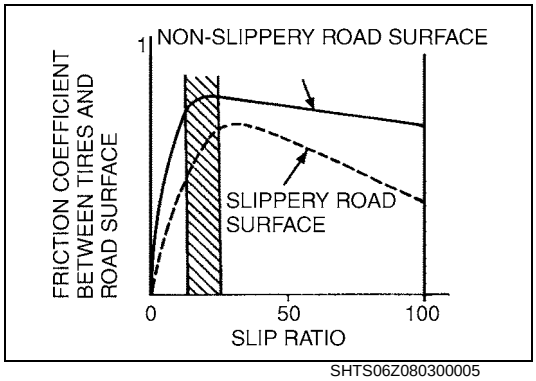
SHTS06Z080300003

BASIC PRINCIPLE

- Based on its relationship with the slip ratio, which is determined from the wheels' rotational speed and the vehicle's speed, ABS controls the brake force so that it will be most effective.
- When the driver applies the brakes, the rotation of the wheels is controlled and the vehicle speed drops. However, the momentum of the vehicle attempts to push it forward further even though the rotation of the wheels is being braked. At this point, slipping will occur if there is a gap between the wheels' rotational speed and the vehicle's speed. The slip ratio is a value that indicates the rate of slippage.

$$\text{Slip ratio} = \frac{\text{Vehicle's speed} - \text{Wheel's rotational speed}}{\text{Vehicle's speed}} \times 100\ \%$$

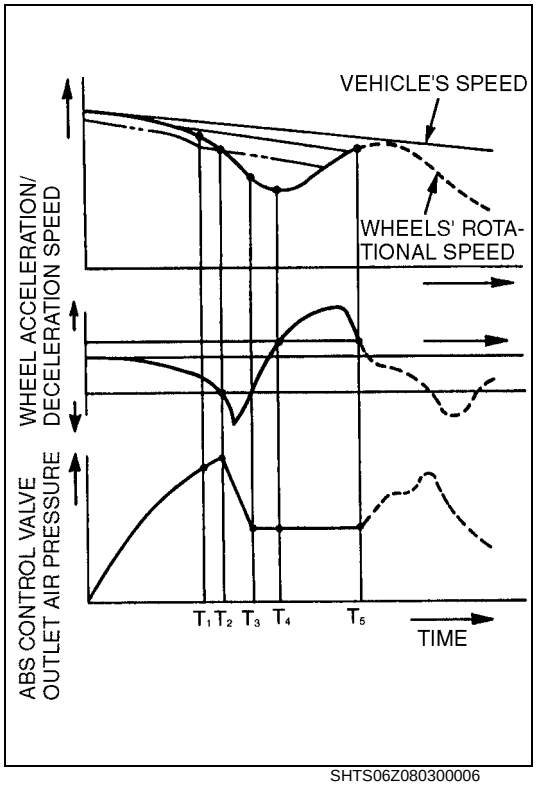
Slip ratio 0 % : No slipping between the wheels and the road surface
100 % : Wheels locked



SHTS06Z080300005

- The graph shown at left shows the relationship between the friction coefficient of the tires and of the road surface and the slip ratio.
- In an ABS-equipped vehicle, the brake force is controlled to ensure that it is within the range where the friction coefficient is high (shaded portion of the graph) without locking the wheels. This ensures efficient braking performance.

OPERATION



SHTS06Z080300006

1. The ABS control characteristics line graph at left illustrates how the vehicle's speed, the wheels' rotational speed, the wheel acceleration/deceleration, and the air pressure at the ABS control valve outlet change over time after the brakes are applied.
2. When the brakes are applied, the vehicle's speed and the wheels' rotational speed drop and at the same time, the wheel acceleration/deceleration speed also drops. At point T1, a gap begins to open between the wheels' rotational speed and the vehicle's speed. Passing on point T2, the ABS ECU detects that the wheels are beginning to lock and is lowering the outlet air pressure of the ABS control valve to prevent wheel locking from occurring.
3. At point T3, the wheel acceleration/deceleration speed is starting to return to normal one, and the ABS ECU stops lowering the air pressure at the ABS control valve outlet and maintains it at a constant level.
4. At point T5, the wheels' rotational speed and the vehicle's speed are about the same. The ABS ECU detects that the wheels are no longer likely to be locked and increases the air pressure at the ABS control valve outlet.
5. The above processes is repeated over and over until the vehicle comes to a complete stop.

FUNCTION

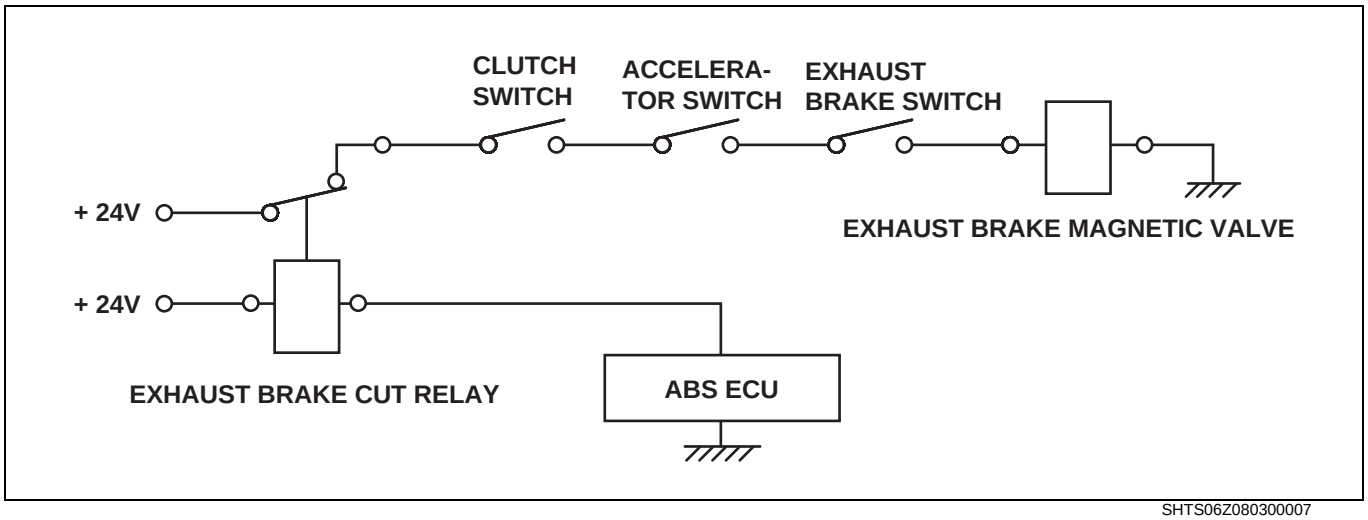
EN06Z0803C100003

FAIL-SAFE FUNCTION

- This ABS system is equipped with a fail-safe function that causes the ABS warning light on the instrument panel to light and to restore the normal (non-ABS) brake system, should an ABS malfunction occur.
- Note that the ABS system consists of two independent circuits. Should a malfunction occur for whatever reason in the electrical circuits, that system's ABS is switched off and the normal brake system is restored while ABS control continued for the other system. This configuration is designed to minimize the effects of any malfunction on ABS function.

EXHAUST BRAKE CONTROL FUNCTION

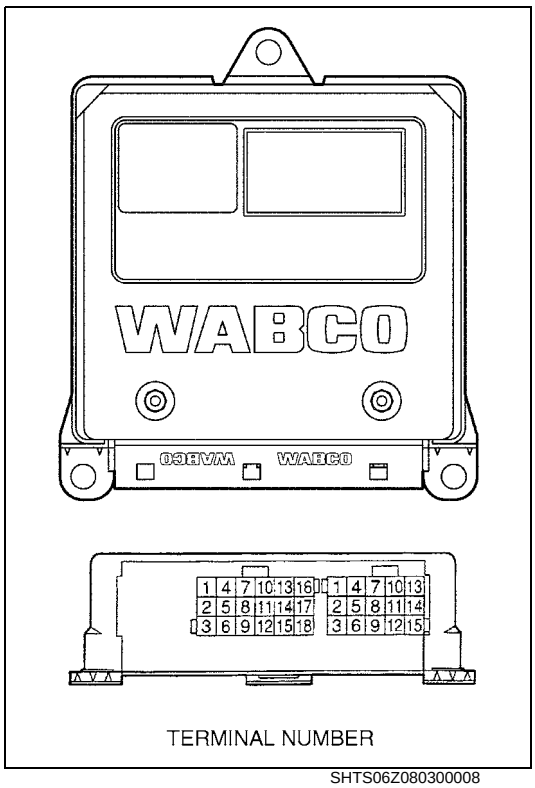
- The ABS system of this vehicle is equipped with a function that controls the exhaust brake while ABS is operating.
- If the exhaust brake is applied independently or together with the service brake on a road surface with very low friction coefficient, the driving wheels may lock. This ABS system prevents the driven wheels from locking in such cases by automatically releasing the exhaust brake, if necessary, during ABS operation.



SHTS06Z080300007

OVERVIEW AND FUNCTION

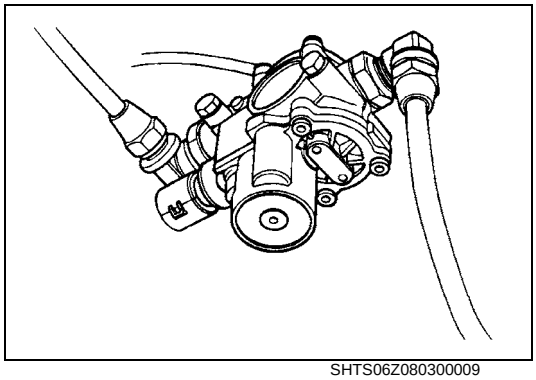
EN06Z0803C100004



SHTS06Z080300008

1. ABS ECU

- Based on pulse signals from the wheel sensors, the ABS ECU mounted in the vehicle calculates and evaluates the slip ratio and the acceleration/deceleration speed of the wheels. Based on the results, it sends signals to the various control valves as necessary, causing them to operate and apply the brakes to maintain the slippage of the wheels within the optimal range.
- During braking, the air pressure applied to the brake chambers is regulated to prevent the wheels from locking. The brakes are applied so as to maintain the slippage of the wheels within the optimal range.
- Regardless of whether the vehicle is stopped or being driven, and whether or not the brakes are being applied, the circuit consisting of the wheel sensors, control valves, ABS ECU, and wire harnesses are constantly being checked by the ABS ECU's fail-safe circuit. If some sort of malfunction occurs, the fail-safe circuit warns the driver by lighting the ABS warning light. At the same time, the ABS system that is experiencing the malfunction is shut off and braking is restored to normal (non-ABS) operation.

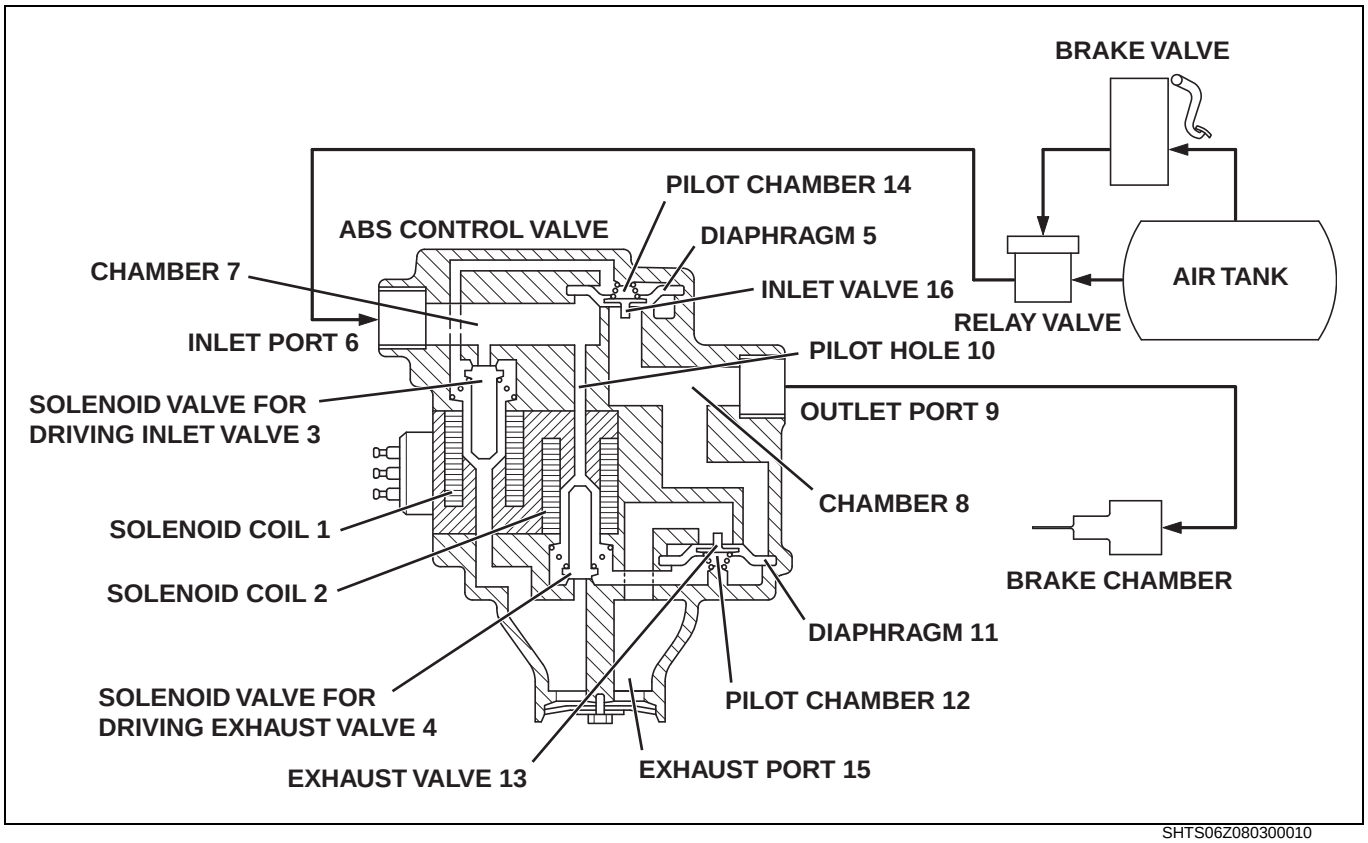


SHTS06Z080300009

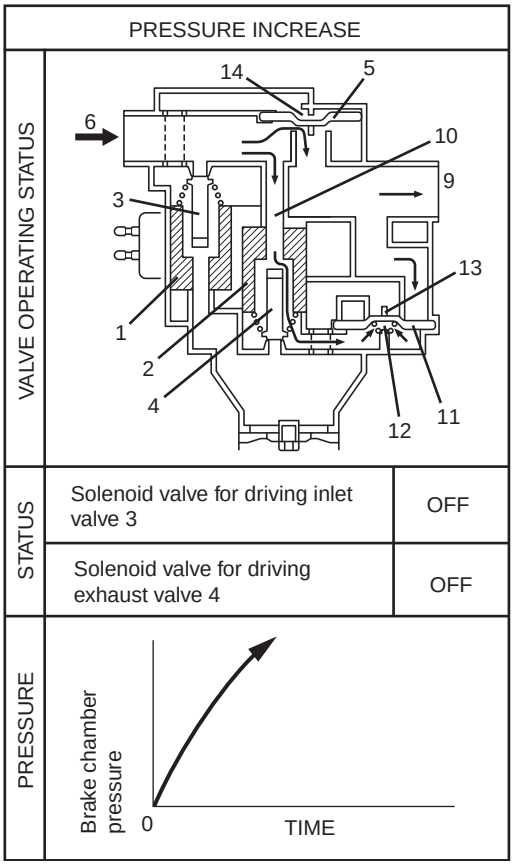
2. ABS CONTROL VALVES

1. OVERVIEW

- The ABS control valves are positioned in the brake air circuit between the relay valves and brake chambers. Based on signals from the ABS ECU, they adjust the air pressure sent to the brake chambers in one of three modes: pressure increase, pressure reduction, or pressure maintenance.



SHTS06Z080300010

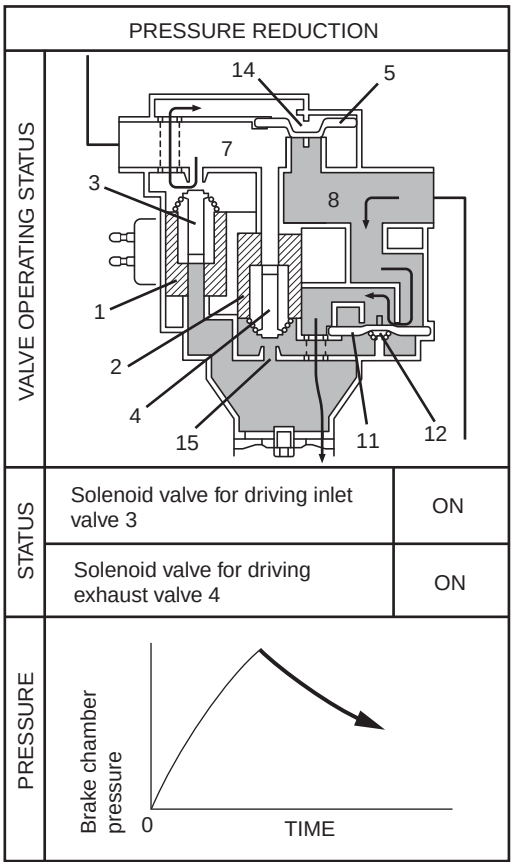


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2. OPERATION

a. PRESSURE INCREASE MODE

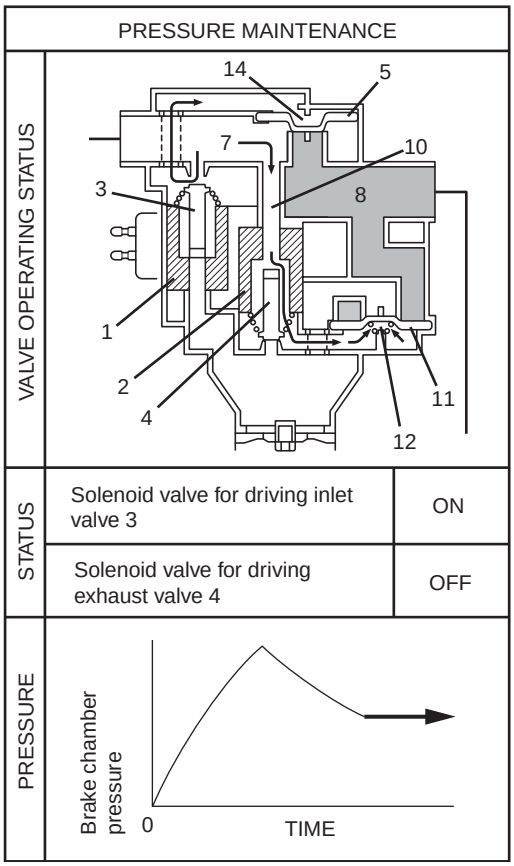
- When the driver steps on the brake pedal, air from the relay valve enters through inlet port (6), pushes open diaphragm (5), passes through outlet port (9), and flows into the brake chamber. At this point, solenoid coil (1) is not energized, so solenoid valve (3) is closed and pilot chamber (14) is open to the atmosphere. Also, solenoid coil (2) is also not energized, so solenoid valve (4) is closed. As a result, air passes through pilot hole (10) and enters pilot chamber (12). It then pushes up diaphragm (11) and closes exhaust valve (13).



SHTS06Z080300012

b. PRESSURE REDUCTION MODE

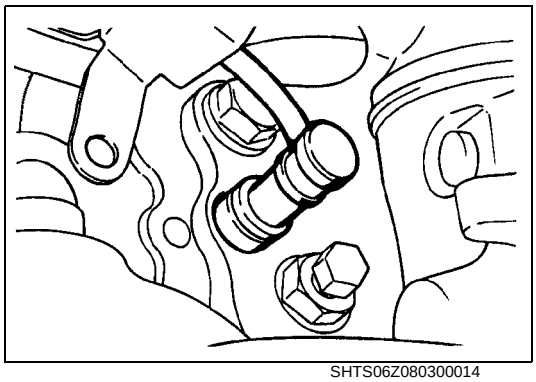
- When solenoid coil (1) is energized, solenoid valve (3) opens and air also flows into pilot chamber (14). It pushes down on diaphragm (5), shutting off chambers (7) and (8). At the same time, solenoid coil (2) is also energized. This causes solenoid valve (4) to open and the operating air from pilot chamber (12) passes through exhaust port (15) and is released into the atmosphere. Consequently, the air from the outlet port (9) side (brake chamber) pushes down on diaphragm (11) and air is released into the atmosphere. This causes the air pressure of the brake chamber to decrease.



SHTS06Z080300013

c. PRESSURE MAINTENANCE MODE

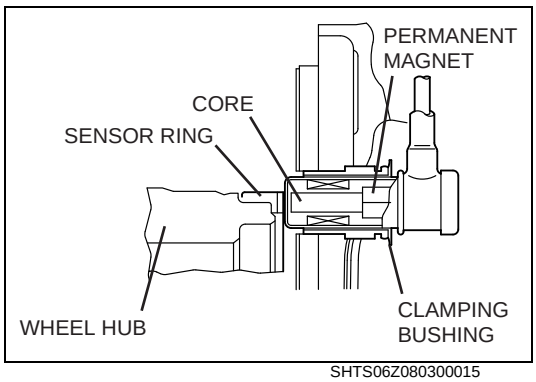
- When solenoid coil (1) is energized, solenoid valve (3) opens and air flows through chamber (7) and acts on pilot chamber (14). On the other hand, since solenoid coil (2) is not energized, solenoid valve (4) is closed and air flows through pilot hole (10) and acts on pilot chamber (12). This causes diaphragms (5) and (11) to shut off their air passages, and the chamber (8) pressure, that is to say the air acting on the brake chamber, is maintained at the pressure that was current when the switch from the pressure reduction mode to the pressure maintenance mode took place.



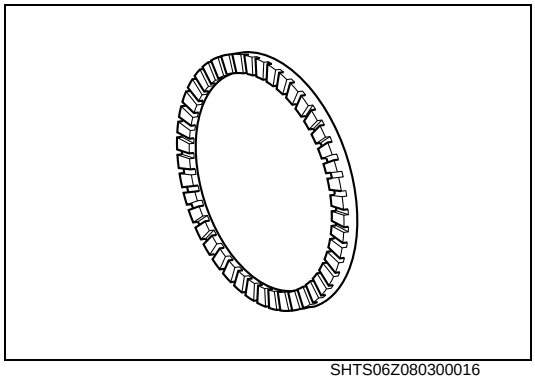
SHTS06Z080300014

3. WHEEL SENSORS

- These sensors are mounted, facing the sensor rings on each wheel on the front and rear axles.
- The wheel sensors are electromagnet sensors consisting of a permanent magnet core with a coil of wire wrapped around it.
- The frequency of the pulse signals generated by magnetic inductance between the sensors and the sensor rings they face is proportional to the rotational speed of the wheels. These pulse signals are sent to the ABS ECU and are used to determine the wheels, rotational status.



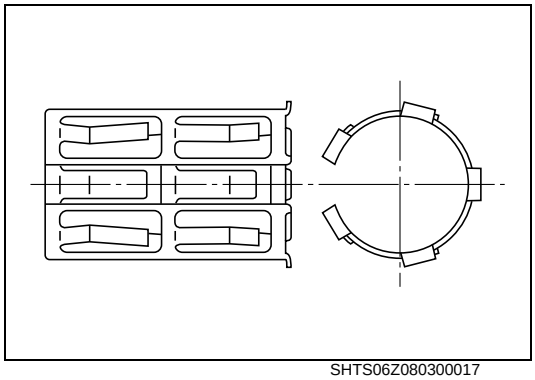
SHTS06Z080300015



SHTS06Z080300016

4. SENSOR RINGS

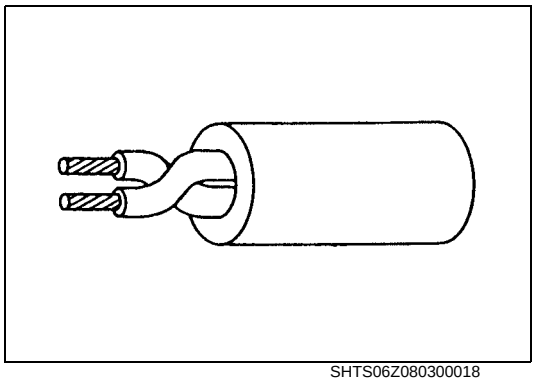
- The sensor rings are press-fitted into the insides of the wheel hubs of each wheel on the front and rear axles, and they face the wheel sensors described in the preceding section. The sensor rings are made of a magnetic material, and teeth are cut into the surface which faces the wheel sensor at regular intervals. Also, when the sensor ring performs one complete rotation, the sensor generates pulse signals corresponding to the number of teeth.



SHTS06Z080300017

5. CLAMPING BUSHINGS

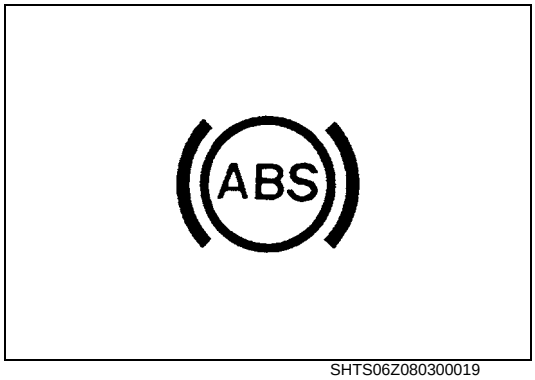
- The wheel sensors are held in place through friction by clamping bushings that are inserted into the mounting brackets. If they are assembled properly, the clamping bushings serve to eliminate the need to adjust the clearance between the wheel sensors and sensor rings.



SHTS06Z080300018

6. WHEEL SENSOR HARNESSES

- Each wheel sensor wire harness employs a two-conductor twisted wire cable. Its function is to protect the wheel sensor signals, which are vital to the proper operation of the ABS system, from electromagnetic interference. Under no circumstances should any part of the wheel sensor wire harnesses be cut or connected to any other wire.



SHTS06Z080300019

7. ABS WARNING LIGHT

- The status of the ABS system is indicated.
- It lights when the starter switch is turned "ON" and automatically goes off when the system functions correctly.
- If malfunction occurs in the ABS system while the vehicle is being driven, the light turns on to alert the driver.
- However, when a defects code is eliminated after repairing it and the starter switch is turned "ON", the light will remain lit until the vehicle speed reaches 7-10 km/h {11.2 - 16 mile/h}.
- Then, note that even when the warning light is lit, the ABS system, unaffected by the malfunction, continues to operate. Also, the brake whose ABS system experiences the malfunction is reverted to normal braking operation without ABS.
- When a Diagnosis switch is turned "ON", this light will goes on and off, which indicates defect code.

8. EXHAUST BRAKE CUT RELAY

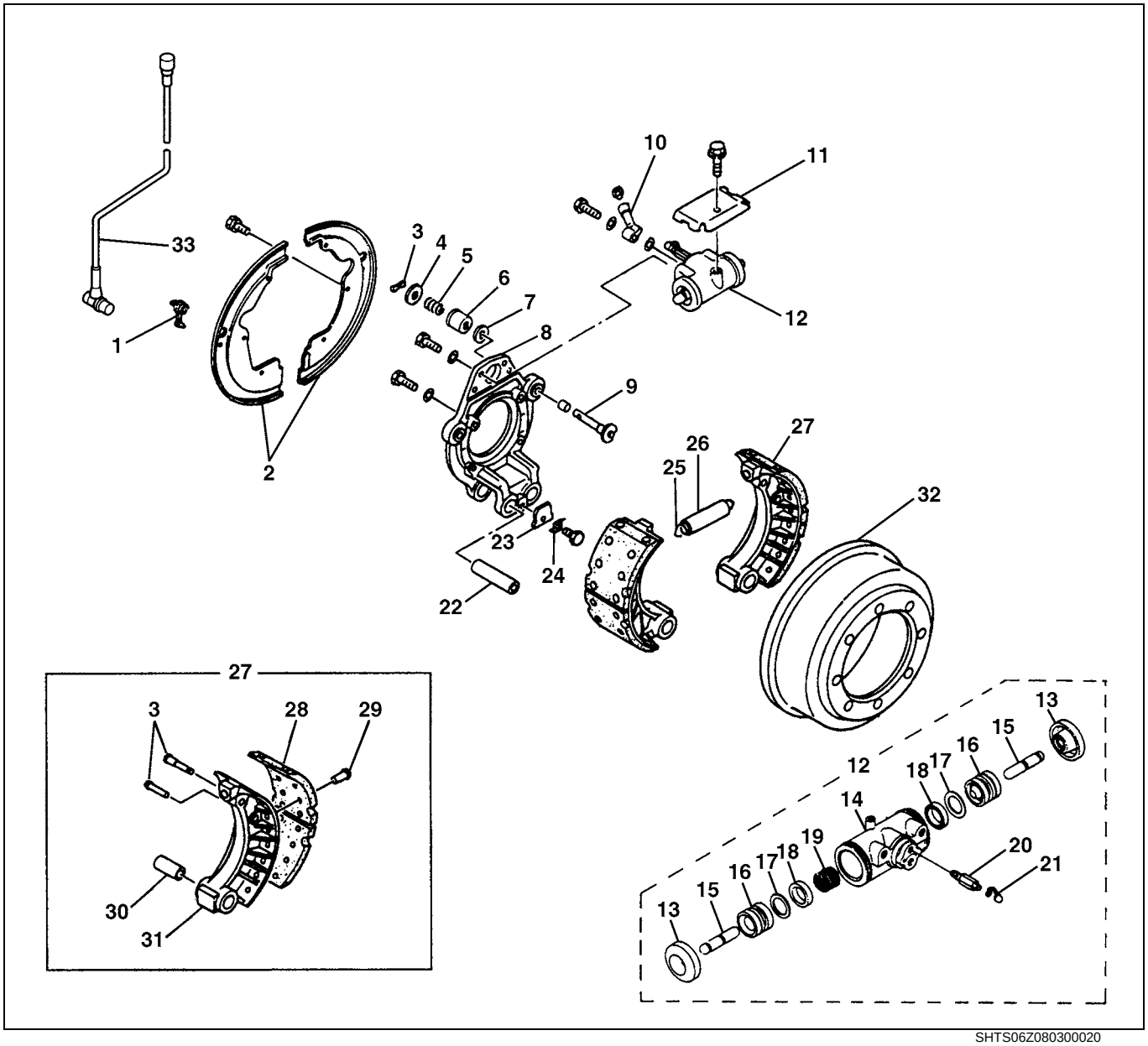
- When this relay is energized during ABS operation, the relay contact opens, the current to the solenoid valve for the exhaust brake is shut down, and the exhaust brake is released.

FRONT WHEEL BRAKE

COMPONENT LOCATOR

EN06Z0803D100001

FRONT AXLE

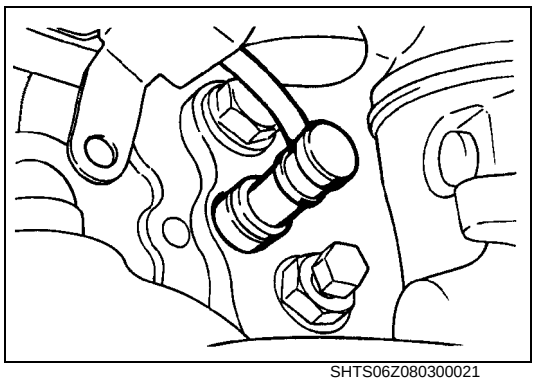


SHTS06Z080300020

1	Hole plug	12	Wheel cylinder assembly	23	Retainer
2	Drum cover	13	Boot	24	Lock plate
3	Pin	14	Cylinder	25	Retracting spring
4	Collar	15	Push rod	26	Cover
5	Spring	16	Piston	27	Brake shoe assembly
6	Boot	17	Back up ring	28	Brake lining
7	Washer	18	Piston cup	29	Rivet
8	Brake spider	19	Spring	30	Bushing
9	Adjusting cam	20	Air bleeder screw	31	Brake shoe
10	Joint bolt	21	Cap	32	Brake drum
11	Cylinder cover	22	Anchor pin	33	Wheel sensor

OVERHAUL

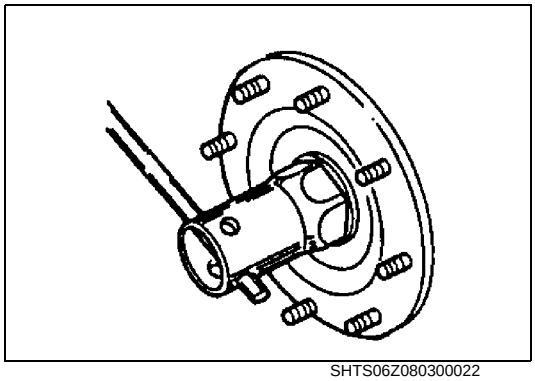
EN06Z0803H200001


SHTS06Z080300021

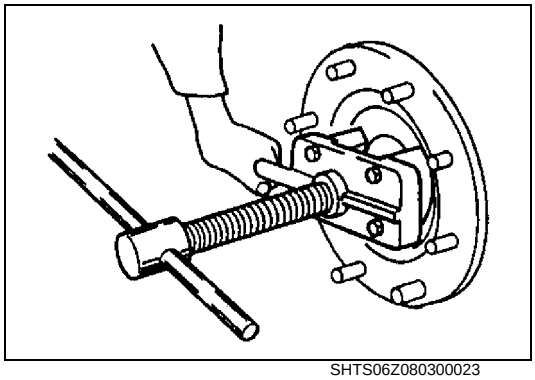
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL SENSOR.
(1) Remove the brake drum cover.
(2) Pull off the wheel sensor.

NOTICE
Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.

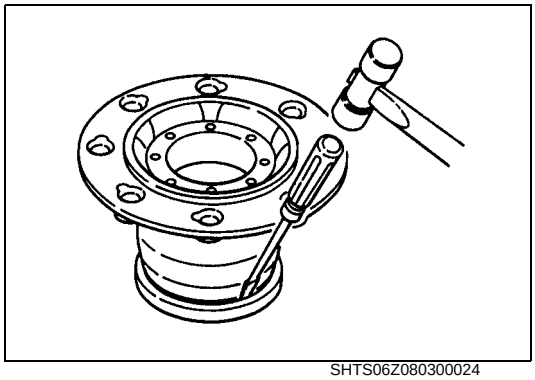

SHTS06Z080300022

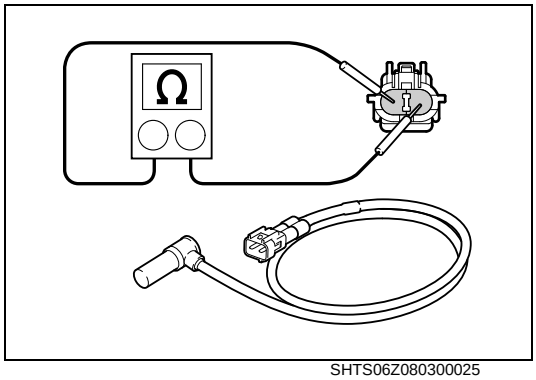
2. REMOVE THE WHEEL HUB, WHEEL HUB BEARINGS AND BRAKE DRUM.
(1) Refer to the chapter **"FRONT AXLE"**.


SHTS06Z080300023

3. REMOVE THE SENSOR RING.
(1) Use a screwdriver or the like to gradually remove the sensor ring by tapping evenly on its outer ring.

NOTICE
- **When tapping on the sensor ring to remove it, be careful not to scratch the wheel hub.**
- **Do not remove the sensor ring unless it is required.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**


SHTS06Z080300024



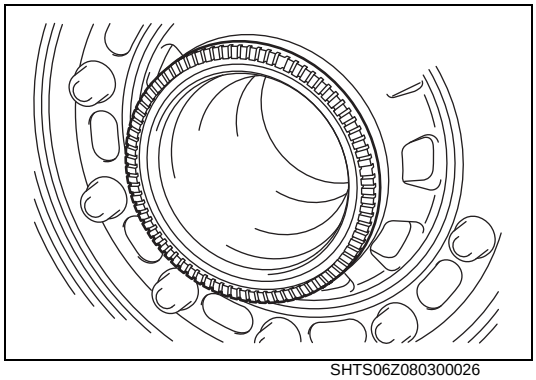
SHTS06Z080300025

IMPORTANT POINTS - INSPECTION

1. INSPECTION OF ONLY WHEEL SENSOR

(1) With a tester, measure the resistance of wheel sensor.
Standard: 1.0-1.3 kΩ

(2) When the measured value is out of the basic standard, change the wheel sensor as it might be considered presumably to be abnormal.

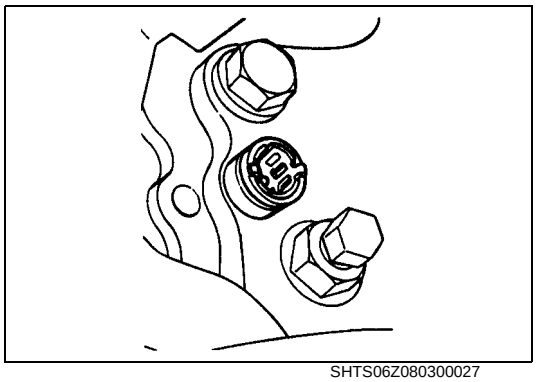

SHTS06Z080300026

2. INSPECTION OF THE SENSOR RING

(1) Make a visual inspection to check for damage or deformation of the sensor ring, and also to make sure it is not coming loose from the wheel hub.

(2) If any damage or malformation is discovered, replace the sensor ring.

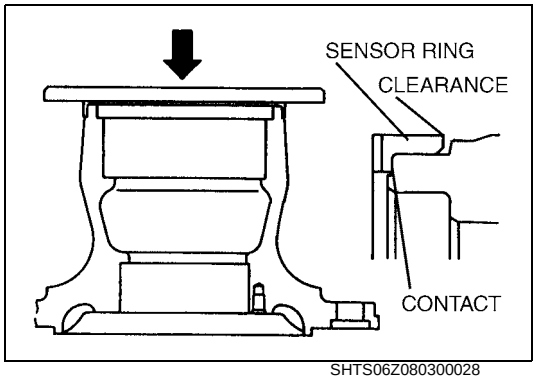
(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and press in it with a press again.


SHTS06Z080300027

3. INSPECTION OF THE CLAMPING BUSHING

(1) Make sure that wheel sensor is securely fixed.

(2) Change the clamping bushing when it can be pulled off or pushed in with a weak force.



SHTS06Z080300028

IMPORTANT POINTS - ASSEMBLY

1. MOUNT THE SENSOR RING.

(1) Place the sensor ring on the wheel hub and use the dolly block and a press to evenly pressure mount it.

NOTICE

Warming up the sensor ring with hot water will make it easier to pressure mount it. Do not use a gas burner or the like to warm the sensor ring. Doing so could cause malformation of the sensor ring.

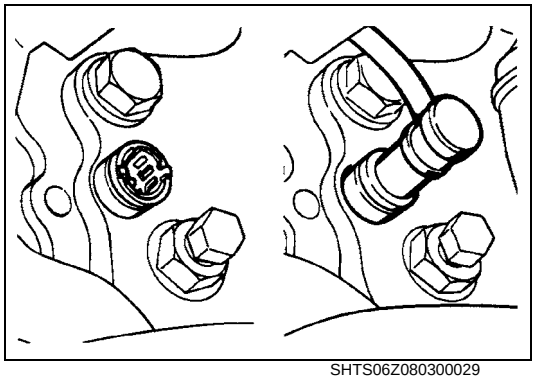
(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}

2. MOUNT THE WHEEL HUB AND BRAKE DRUM.

(1) Refer to the chapter **"FRONT AXLE"**.

NOTICE

If the wheel sensors are mounted, hammering on the wheel hubs and the like on that axle could cause internal damage to the wheel sensors. Either mount the tire and then tap on the tire or tap on the wheel hub after removing the right and left wheel sensors.



SHTS06Z080300029

3. MOUNT THE WHEEL SENSOR.

(1) Push in the clamping bushing until the stopper makes contact with the knuckle's wheel sensor holder.

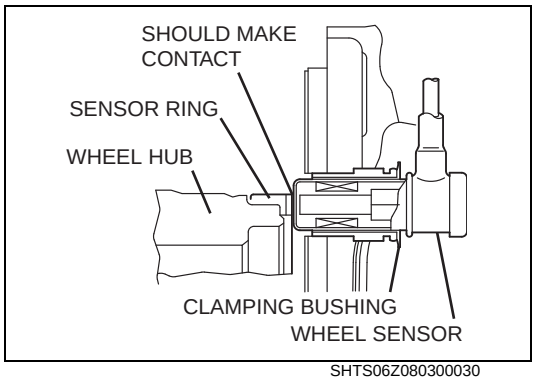
(2) Apply a light coating of chassis grease to the hub of the wheel sensor. Then push it forcefully into the clamping bushing until you feel that the wheel sensor has made contact with the sensor ring.

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.

(3) Slowly turn the wheel hub and brake drum and confirm that they move smoothly.

(4) Mount the drum dust cover.



SHTS06Z080300030

4. ADJUST THE WHEEL SENSOR.

(1) Arrange the wire harness.

(2) With a circuit tester, confirm the output voltage of the wheel sensor (By rotating the tire by one time for 5 seconds)

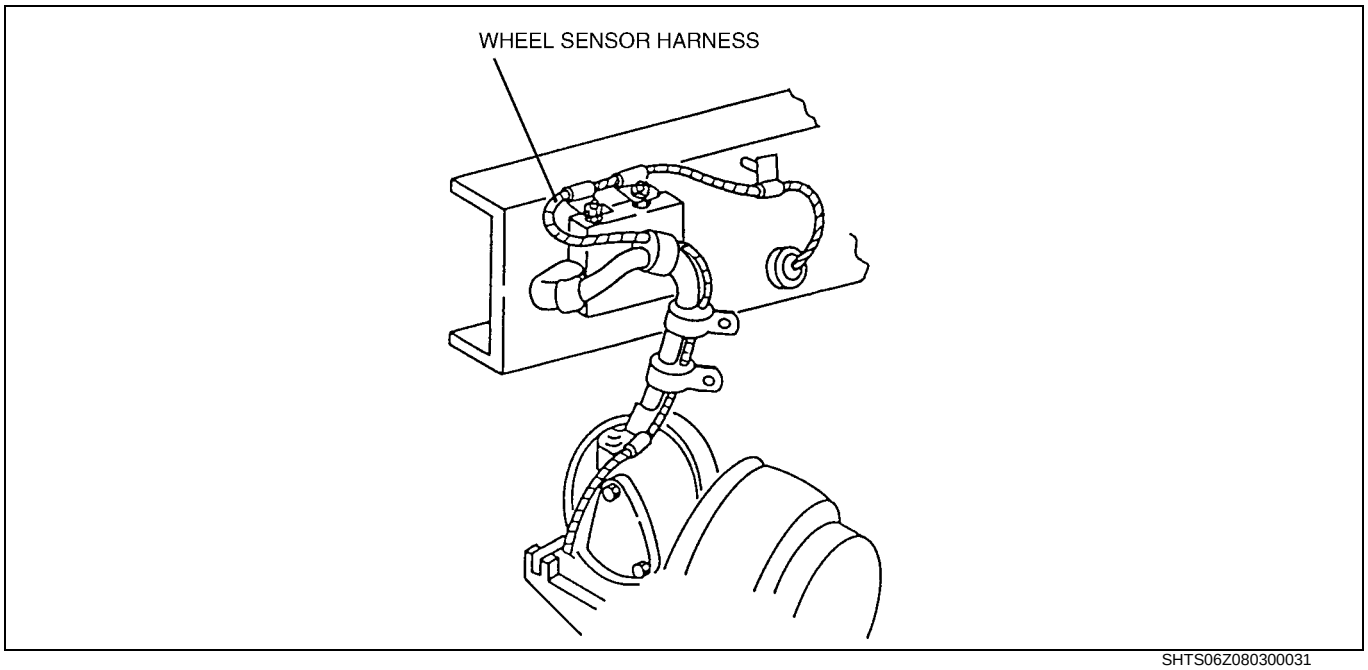
Standard: 150-1,999 mV
(Range of Alternating Current Voltage)

(3) In case of out of the standard range at (2), push the wheel sensor softly by fingers until the sensor contacts with the sensor ring, then inspect again from (1).

5. ABS WIRE HARNESSES

NOTICE

- **The front axle chassis harnesses, particularly the ones that pass over the front axle and extend as far as the wheel sensors, must absorb the movement when the wheels are turned and when the springs move. It is therefore necessary to always maintain an optimal spacing between the clips.**
- **In addition, if there is a large amount of variation in the spacing between the clips, the wheel sensor harnesses can come into contact with tire chains and sustain damage.**
- **The wire harness for the front axle wheel sensor extends directly from the clip on top of the king pin cover to the frame. In particular, make sure that the distance between the clip on top of the king pin cover and the clip on the frame side is as indicated in the diagram below. There are markings on the wheel sensors in cases where the wheel sensor harness clips are in locations where the relative movement is particularly great. These places should be inspected regularly to ensure that the clip positions are still meeting with the same marking.**



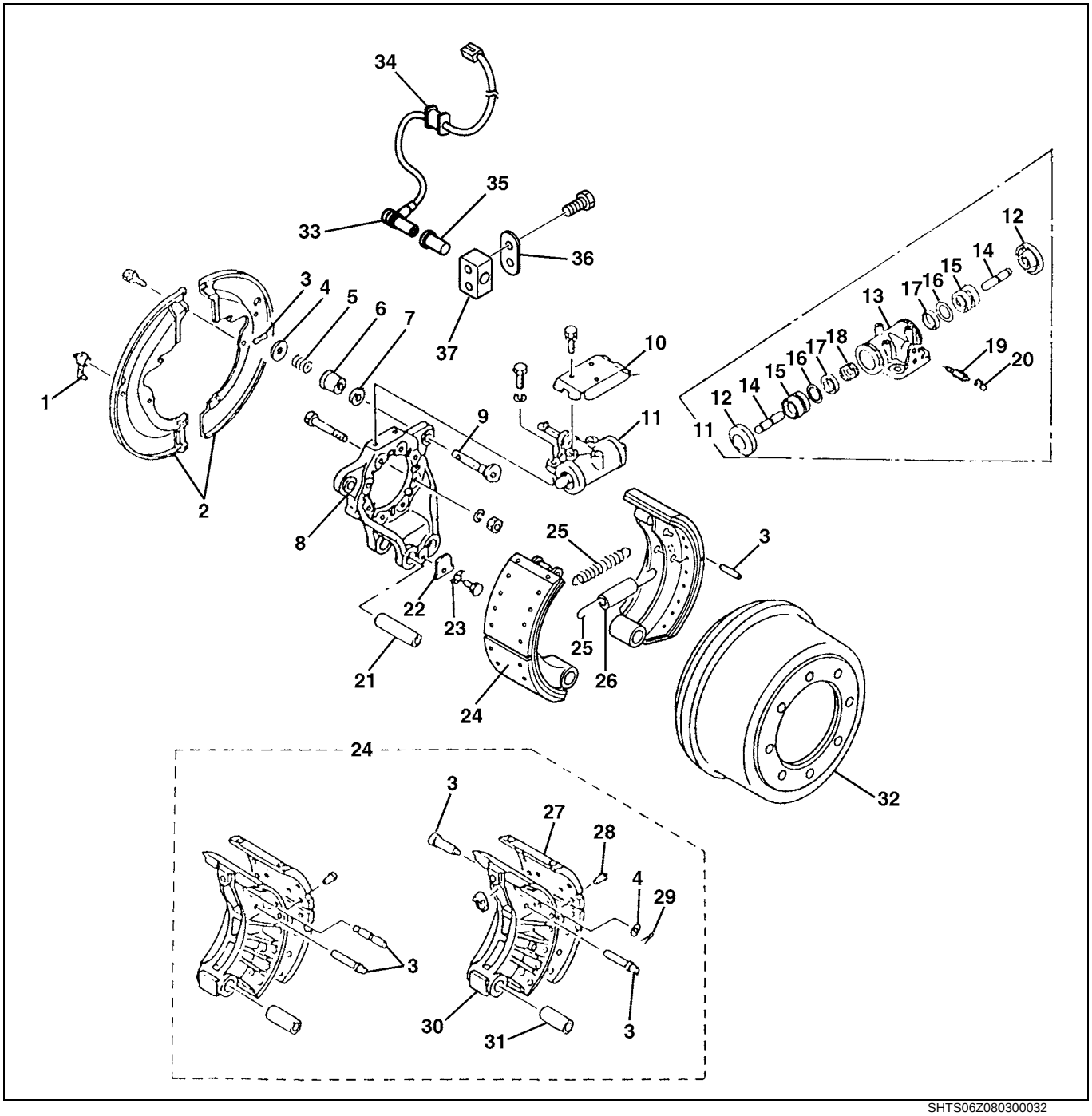
SHTS06Z080300031

REAR WHEEL BRAKE

COMPONENT LOCATOR

EN06Z0803D100002

REAR AXLE



SHTS06Z080300032

1	Hole plug	14	Push rod	27	Brake lining
2	Drum cover	15	Piston	28	Rivet
3	Pin	16	Back up ring	29	Cotter pin
4	Collar	17	Piston cup	30	Brake shoe
5	Spring	18	Spring	31	Bushing
6	Boot	19	Air bleeder screw	32	Brake drum
7	Washer	20	Cap	33	Wheel sensor
8	Brake spider	21	Anchor pin	34	Bushing
9	Adjusting cam	22	Retainer	35	Clamping bushing
10	Cylinder cover	23	Lock plate	36	Lock plate (If so equipped)
11	Wheel cylinder assembly	24	Brake shoe assembly	37	Wheel sensor holder
12	Boot	25	Retracting spring		
13	Cylinder	26	Spring cover		

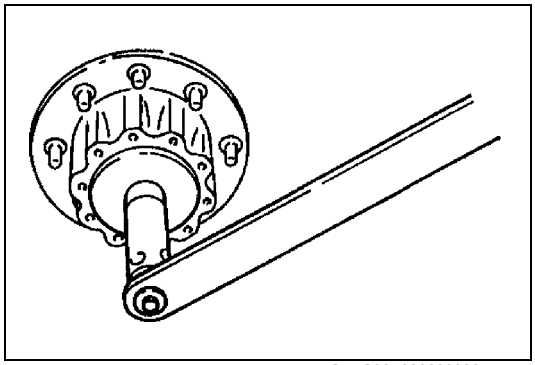
OVERHAUL

EN06Z0803H200002

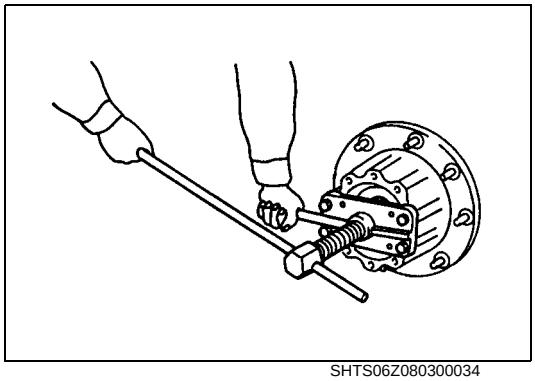
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL HUB, WHEEL HUB BEARINGS AND BRAKE DRUM.

(1) Refer to the chapter **"REAR AXLE"**.



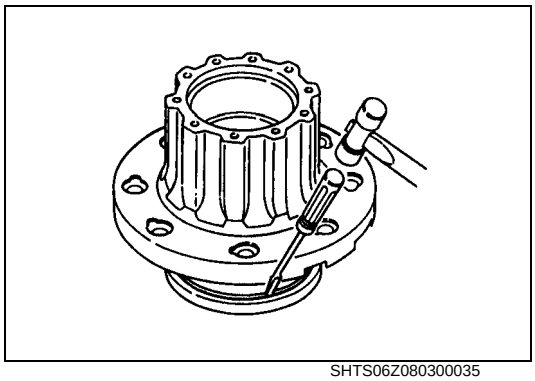
SHTS06Z080300033



SHTS06Z080300034

2. REMOVE THE SENSOR RING.

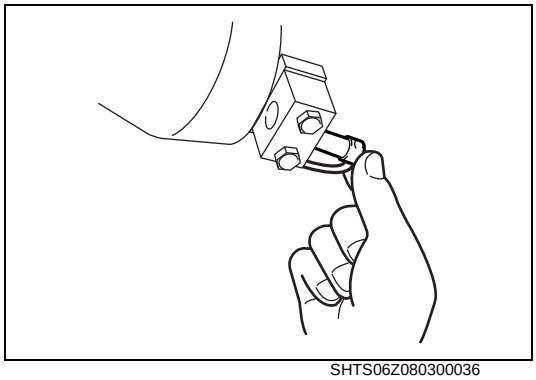
(1) Use a screwdriver or the like to gradually remove the sensor ring by tapping evenly on its outer ring.



SHTS06Z080300035

NOTICE

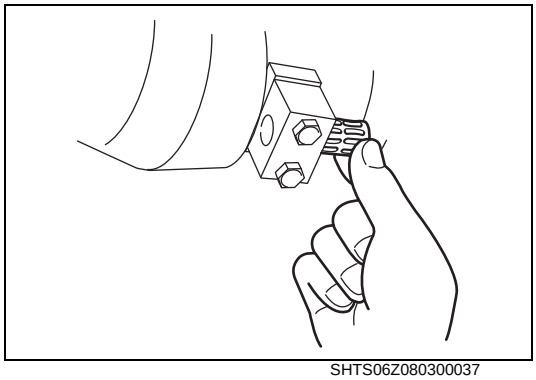
- **When tapping on the sensor ring to remove it, be careful not to scratch the wheel hub.**
- **Do not remove the sensor ring unless it is required.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**


SHTS06Z080300036

3. REMOVE THE WHEEL SENSOR.

NOTICE

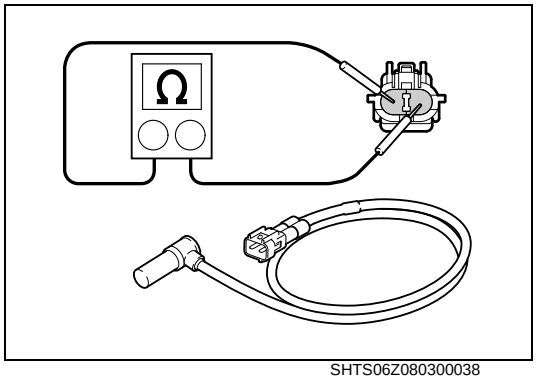
- **Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.**
- **Pull out the wheel sensor from the sensor holder by hand.**


SHTS06Z080300037

4. REMOVE THE CLAMPING BUSHING.

(1) Remove the clamping bushing out of the wheel sensor holder.

IMPORTANT POINTS - INSPECTION

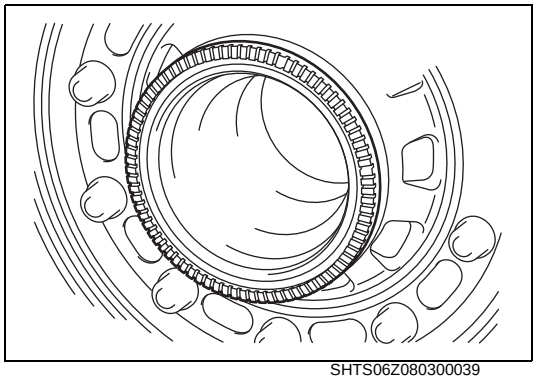


SHTS06Z080300038

1. INSPECTION OF ONLY WHEEL SENSOR

(1) With a tester, measure the resistance of wheel sensor.
Standard: 1.0-1.3 kΩ

(2) When the measured value is out of the basic standard, change the wheel sensor as it might be considered presumably to be abnormal.

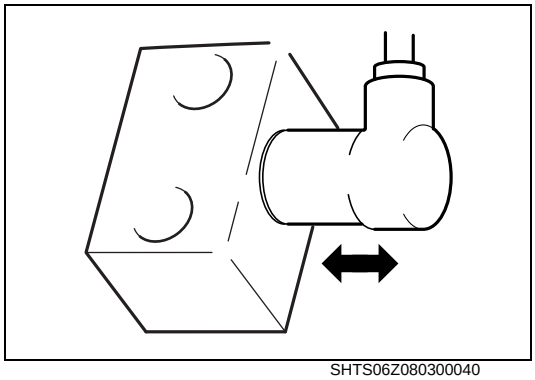

SHTS06Z080300039

2. INSPECTION OF THE SENSOR RING

(1) Make a visual inspection to check for damage or deformation of the sensor ring, and also to make sure it is not coming loose from the wheel hub.

(2) If any damage or malformation is discovered, replace the sensor ring.

(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and a press to pressure mount it again.

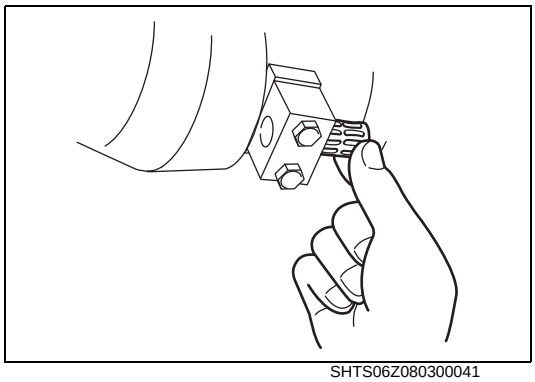

SHTS06Z080300040

3. INSPECTION OF THE CLAMPING BUSHING

(1) Make sure that the wheel sensor is securely fixed.

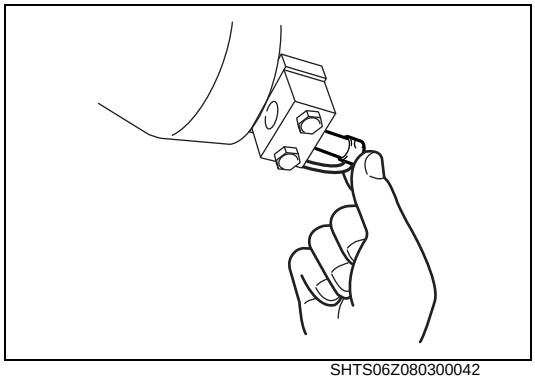
(2) Change the clamping bushing when it can be pulled off or pushed in with a weak force.

IMPORTANT POINTS - ASSEMBLY


SHTS06Z080300041

1. MOUNT THE WHEEL SENSOR.

(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

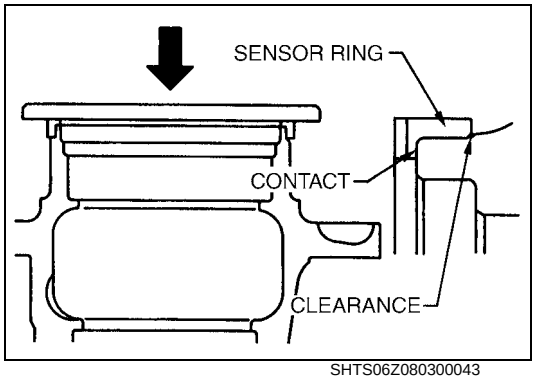

SHTS06Z080300042

(2) Push the wheel sensor fully in the wheel sensor holder with hands until the wheel sensor makes contact with the clamping bushing.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place using a screwdriver, or the like. Doing so could damage the wheel sensor.

(3) Arrange the wire harness.



SHTS06Z080300043

2. MOUNT THE SENSOR RING.

(1) Place the sensor ring on the wheel hub and use the dolly block and a press to evenly pressure mount it.

NOTICE

Warming up the sensor ring with hot water will make it easier to pressure mount it. Do not use a gas burner or the like to warm the sensor ring. Doing so could cause malformation of the sensor ring.

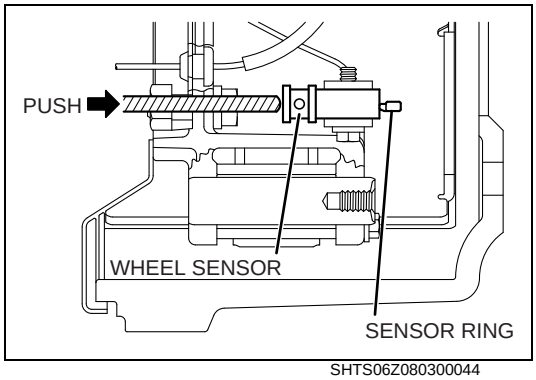
(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}

3. MOUNT THE WHEEL HUB AND BRAKE DRUM.

(1) Refer to the chapter **"REAR AXLE"**.

NOTICE

- **Be careful not to push back the wheel sensor too far when mounting the wheel hub and brake drum. Also, make sure they are straight so that you do not bump the tip of the wheel sensor.**
- **When inserting the outer hub bearing, avoid tapping on it with a hammer as this will expose the wheel sensor to bumps. Insert the outer hub bearing carefully with a lock nut.**



SHTS06Z080300044

4. ADJUST THE WHEEL SENSOR.

(1) Arrange the wire harness.

(2) With a circuit tester, confirm the output voltage of the wheel sensor (By rotating the tire by one time for 5 seconds)

Standard: 150-1,999 mV
(Range of Alternating Current Voltage)

(3) In case of out of the standard range at (2), remove the dust cover located on the back plate unit. Then push the wheel sensor by using round end bar until the sensor contacts with the sensor ring.

NOTICE

Do not tap by hammer or turn when pushing the wheel sensor. This may damage the wheel sensor.

(4) Mount the axle shaft to the wheel hub and tighten the bolt on the axle shaft.
Refer to the chapter **"REAR AXLE"**.

5. ABS WIRE HARNESSES

NOTICE

- **The rear axle chassis harnesses is arranged so that the left and right wheel sensor harnesses are near each other. Therefore, special care should be taken not to make incorrect connections if the harnesses have been removed for inspection or repairs.**
- **If incorrect connections are made, it will interfere with the functioning of the ABS system. For this reason, caution plates indicating "LEFT" and "RIGHT" are affixed to the harnesses. Be sure to check when connecting the harnesses. (The left harness is on the left side of the vehicle when viewed from the behind and facing toward the front, and the right harness is on the right side of the vehicle.)**
- **The wheel sensor harnesses are arranged along the top of the rear axle housing. Therefore, make sure to allow sufficient harness length between the chassis and the rear axle so that the harnesses can absorb the up-and-down motion of the rear axle.**

ABS & ASR (WABCO, FOR FULL AIR BRAKE)

BR03-003

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COMPOSITION AND OPERATION..... BR03-3
FUNCTION BR03-6
OVERVIEW AND FUNCTION BR03-6

FRONT WHEEL BRAKE.....BR03-11
COMPONENT LOCATOR BR03-11
OVERHAUL BR03-12

REAR WHEEL BRAKE.....BR03-15
COMPONENT LOCATOR BR03-15
OVERHAUL BR03-16

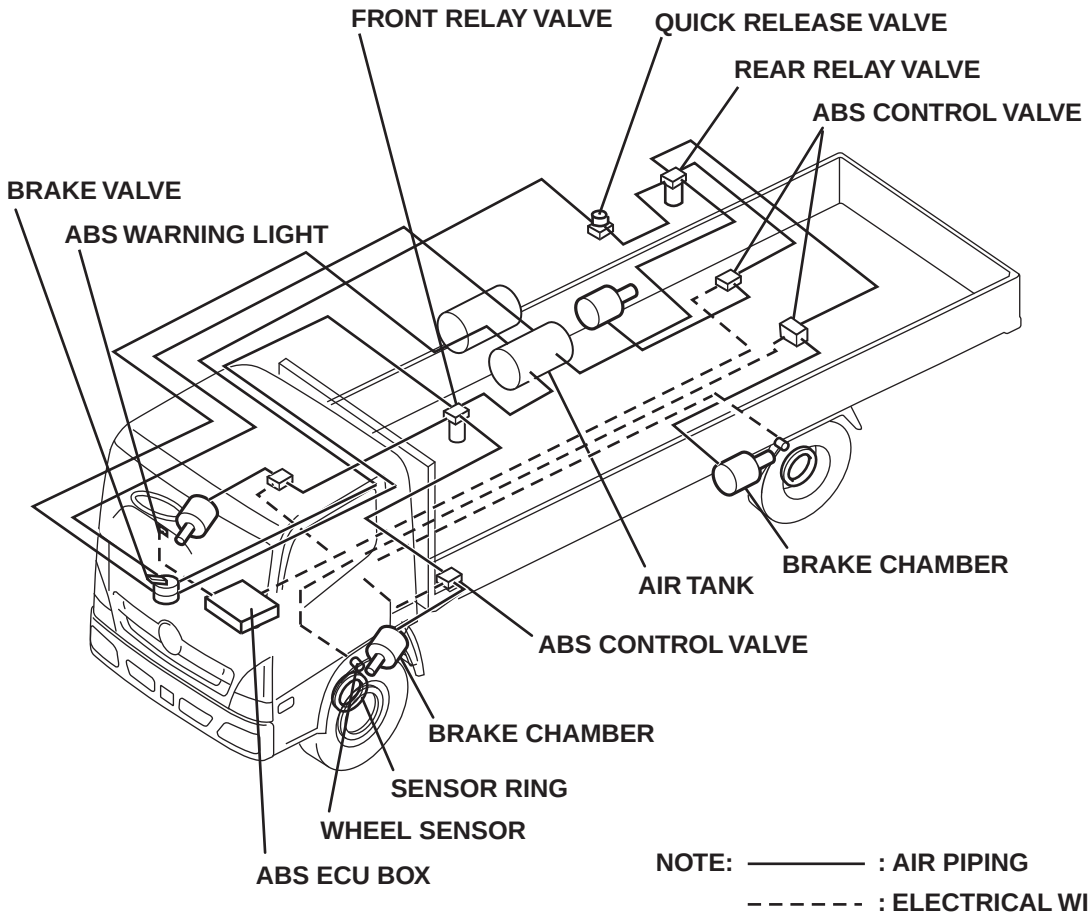
ABS

OVERVIEW

EN06Z0803C100001

- ABS is a system that makes effective use of the friction between the tires and the road surface to maintain vehicle stability while the brakes are being applied and for stopping the vehicle.
- Applying the brakes forcefully on a slippery road surface can cause the wheels to be locked, due to excessive braking force. This causes the vehicle to lose a stability because the locked wheels lose resistance in the lateral direction. More specifically, if the front wheels are locked, it becomes impossible to steer the vehicle, and if the rear wheels are locked, the rear of the vehicle may fishtail from side to side.
- Also, when wheel-locking occurs, it is not possible to make effective use of friction between the tires and the road surface. This may cause the braking distance to be increased.
- ABS uses wheel sensors mounted on the axles to constantly monitor the rotation of the wheels. If any of the wheels is starting to lock up, the ABS ECU sends signals to the ABS control valve and immediately adjusts the brake pressure to prevent wheel-locking.
- In this way, ABS maintains the stability of the vehicle while stopping by making effective use of the friction between the tires and the road surface.

(REPRESENTATIVE MODEL)



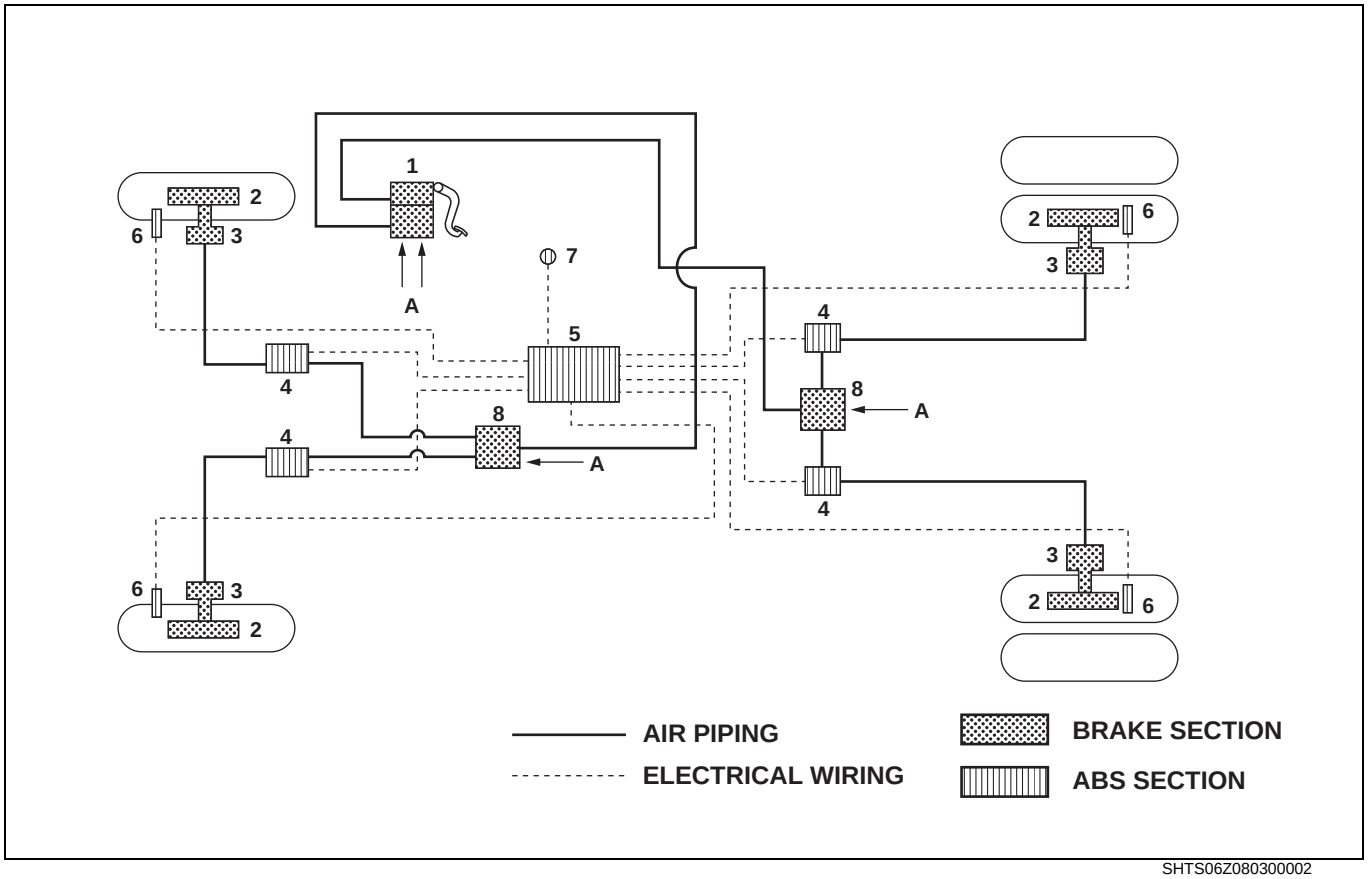
SHTS06Z080300001

COMPOSITION AND OPERATION

EN06Z0803C100002

- The ABS system is comprised of the sensor rings mounted on the wheels, the ABS ECU, which receives signals from the wheel sensors that monitor the rotational speed of the wheels and outputs control signals to maintain the appropriate braking force; ABS control valves, which increase or decrease the braking force, based on the control signals; the warning light, which gives an alarm if the system malfunctions; the piping, wire harnesses, etc., that link together the various units that compose the system.
- Pulse signals transmitted by the sensor rings mounted on the wheel hubs, rotated together with the wheels, and the wheel sensors mounted near sensor ring on the axles are sent to the ABS ECU. The ABS ECU then calculates the wheels' rotational speed, acceleration, deceleration, and amount of slippage, based on these signals.
- If the limit values for the wheel's deceleration, or slippage ratio are exceeded, the ABS ECU immediately transmits signals to the ABS control valves to adjust any excess braking force.
- This ABS system controls the four wheels, front, rear, right, and left, independently.

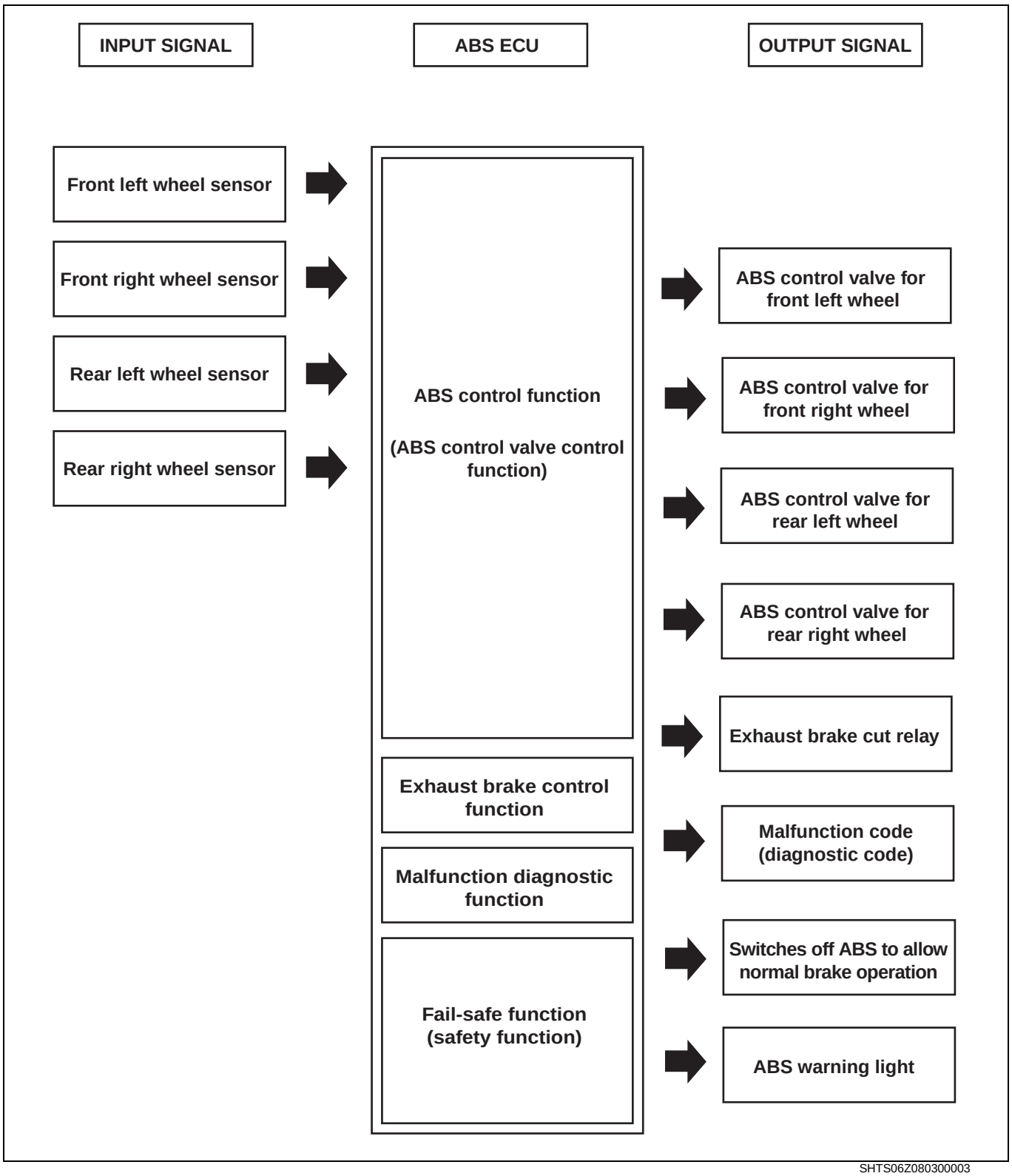
SYSTEM COMPOSITION DIAGRAM



SHTS06Z080300002

1	Brake valve	6	Wheel sensor
2	Wheel brake	7	ABS warning light
3	Brake chamber	8	Relay valve
4	ABS control valve	A	From air tank
5	ABS ECU		

ABS CONTROL FLOWCHART



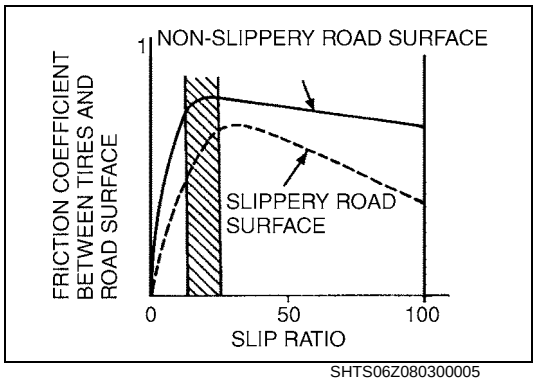
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BASIC PRINCIPLE

- Based on its relationship with the slip ratio, which is determined from the wheels' rotational speed and the vehicle's speed, ABS controls the brake force so that it will be most effective.
- When the driver applies the brakes, the rotation of the wheels is controlled and the vehicle speed drops. However, the momentum of the vehicle attempts to push it forward further even though the rotation of the wheels is being braked. At this point, slipping will occur if there is a gap between the wheels' rotational speed and the vehicle's speed. The slip ratio is a value that indicates the rate of slippage.

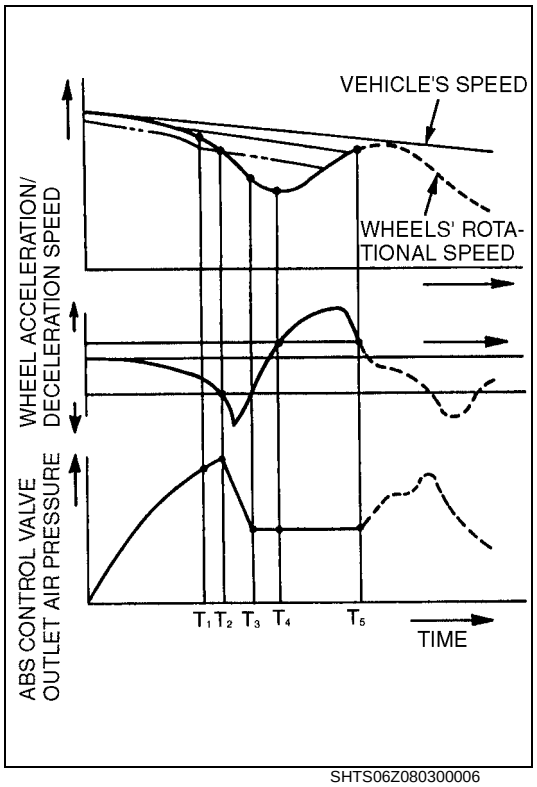
$$\text{Slip ratio} = \frac{\text{Vehicle's speed - Wheel's rotational speed}}{\text{Vehicle's speed}} \times 100\ \%$$

Slip ratio 0 % : No slipping between the wheels and the road surface
100 % : Wheels locked



SHTS06Z080300005

- The graph shown at left shows the relationship between the friction coefficient of the tires and of the road surface and the slip ratio.
- In an ABS-equipped vehicle, the brake force is controlled to ensure that it is within the range where the friction coefficient is high (shaded portion of the graph) without locking the wheels. This ensures efficient braking performance.



SHTS06Z080300006

OPERATION

1. The ABS control characteristics line graph at left illustrates how the vehicle's speed, the wheels' rotational speed, the wheel acceleration/deceleration, and the air pressure at the ABS control valve outlet change over time after the brakes are applied.
2. When the brakes are applied, the vehicle's speed and the wheels' rotational speed drop and at the same time, the wheel acceleration/deceleration speed also drops. At point T1, a gap begins to open between the wheels' rotational speed and the vehicle's speed. Passing on point T2, the ABS ECU detects that the wheels are beginning to lock and is lowering the outlet air pressure of the ABS control valve to prevent wheel locking from occurring.
3. At point T3, the wheel acceleration/deceleration speed is starting to return to normal one, and the ABS ECU stops lowering the air pressure at the ABS control valve outlet and maintains it at a constant level.
4. At point T5, the wheels' rotational speed and the vehicle's speed are about the same. The ABS ECU detects that the wheels are no longer likely to be locked and increases the air pressure at the ABS control valve outlet.
5. The above processes is repeated over and over until the vehicle comes to a complete stop.

FUNCTION

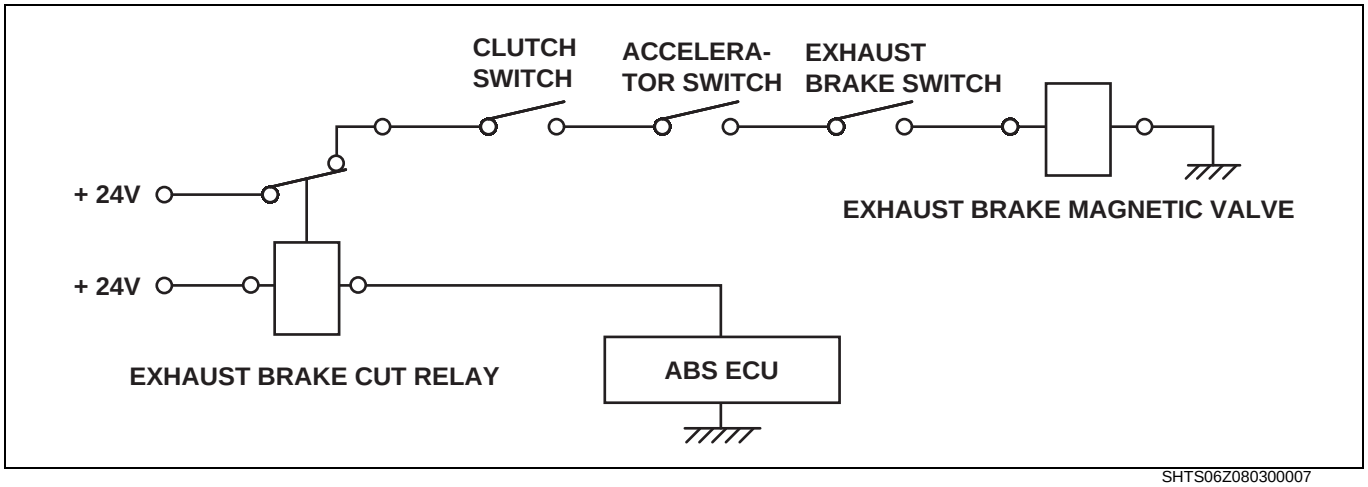
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FAIL-SAFE FUNCTION

- This ABS system is equipped with a fail-safe function that causes the ABS warning light on the instrument panel to light and to restore the normal (non-ABS) brake system, should an ABS malfunction occur.
- Note that the ABS system consists of two independent circuits. Should a malfunction occur for whatever reason in the electrical circuits, that system's ABS is switched off and the normal brake system is restored while ABS control continued for the other system. This configuration is designed to minimize the effects of any malfunction on ABS function.

EXHAUST BRAKE CONTROL FUNCTION

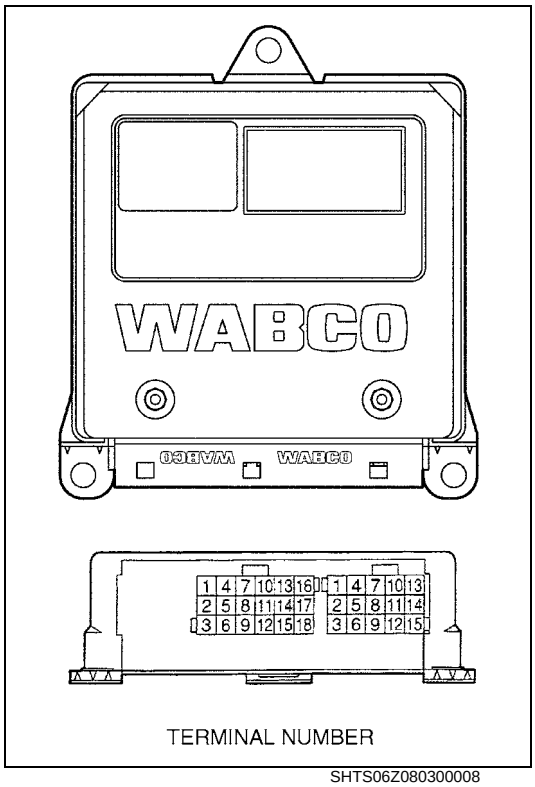
- The ABS system of this vehicle is equipped with a function that controls the exhaust brake while ABS is operating.
- If the exhaust brake is applied independently or together with the service brake on a road surface with very low friction coefficient, the driving wheels may lock. This ABS system prevents the driven wheels from locking in such cases by automatically releasing the exhaust brake, if necessary, during ABS operation.



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OVERVIEW AND FUNCTION

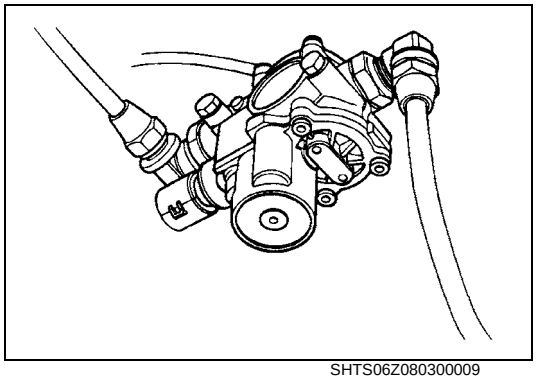
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SHTS06Z080300008

1. ABS ECU

- Based on pulse signals from the wheel sensors, the ABS ECU mounted in the vehicle calculates and evaluates the slip ratio and the acceleration/deceleration speed of the wheels. Based on the results, it sends signals to the various control valves as necessary, causing them to operate and apply the brakes to maintain the slippage of the wheels within the optimal range.
- During braking, the air pressure applied to the brake chambers is regulated to prevent the wheels from locking. The brakes are applied so as to maintain the slippage of the wheels within the optimal range.
- Regardless of whether the vehicle is stopped or being driven, and whether or not the brakes are being applied, the circuit consisting of the wheel sensors, control valves, ABS ECU, and wire harnesses are constantly being checked by the ABS ECU's fail-safe circuit. If some sort of malfunction occurs, the fail-safe circuit warns the driver by lighting the ABS warning light. At the same time, the ABS system that is experiencing the malfunction is shut off and braking is restored to normal (non-ABS) operation.

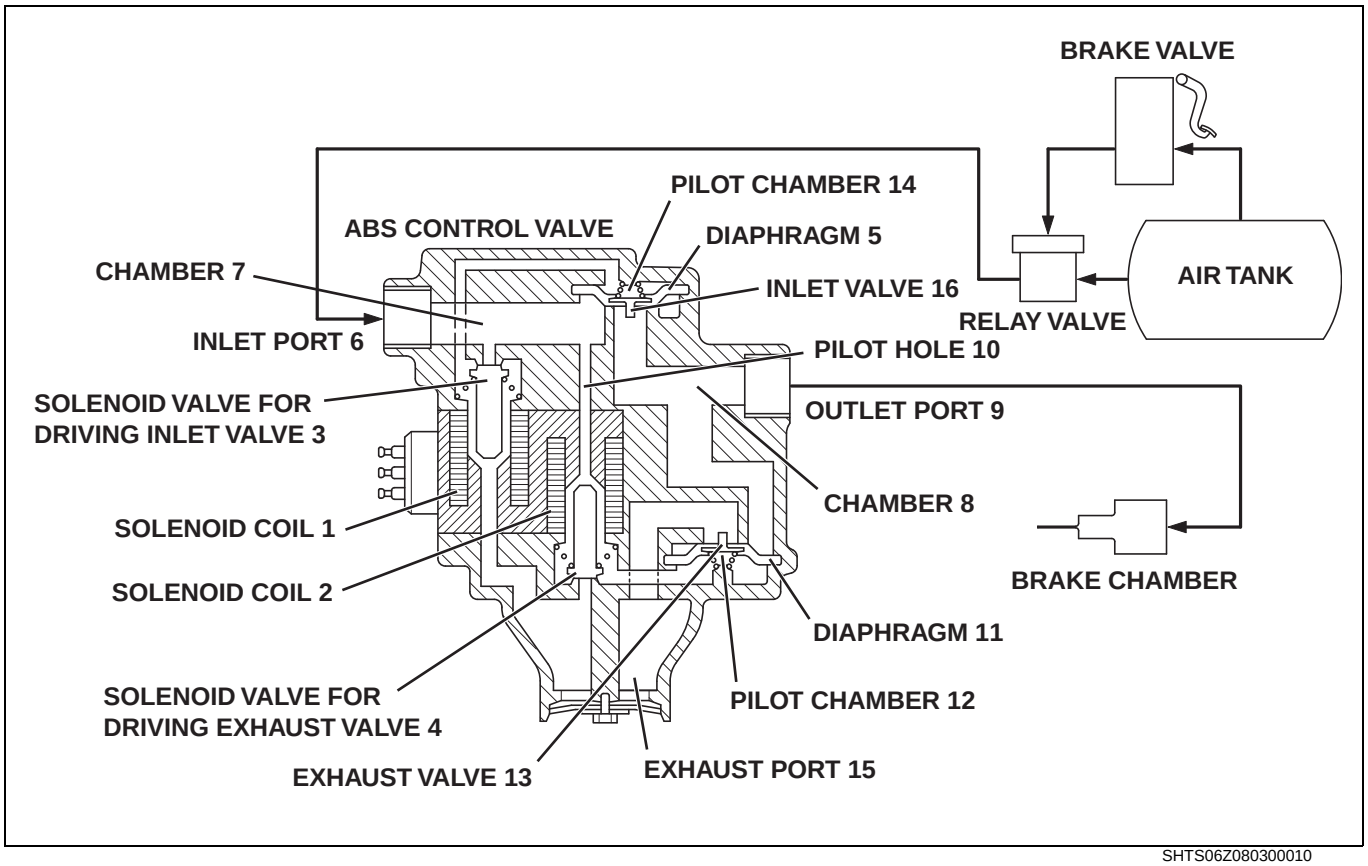


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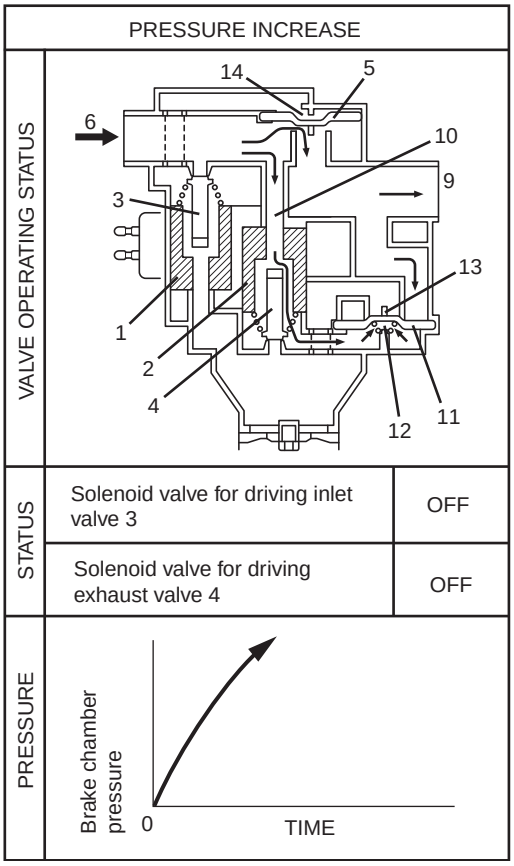
2. ABS CONTROL VALVES

1. OVERVIEW

- The ABS control valves are positioned in the brake air circuit between the relay valves and brake chambers. Based on signals from the ABS ECU, they adjust the air pressure sent to the brake chambers in one of three modes: pressure increase, pressure reduction, or pressure maintenance.



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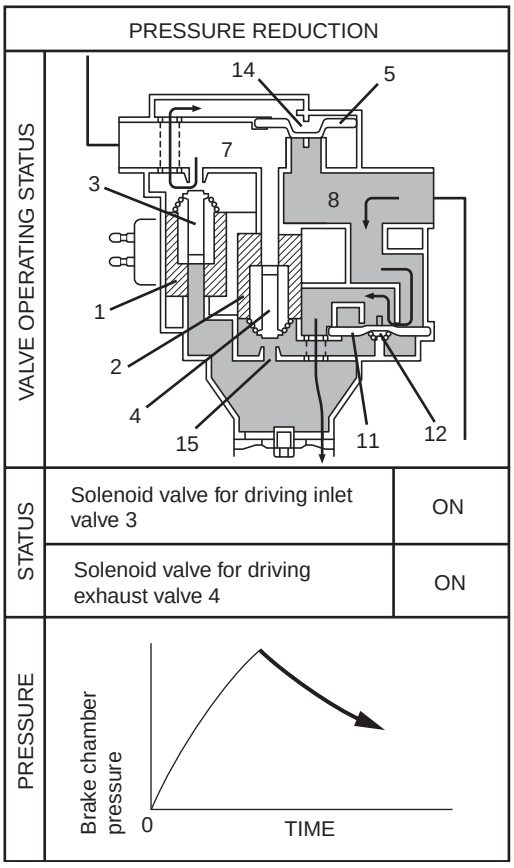


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2. OPERATION

a. PRESSURE INCREASE MODE

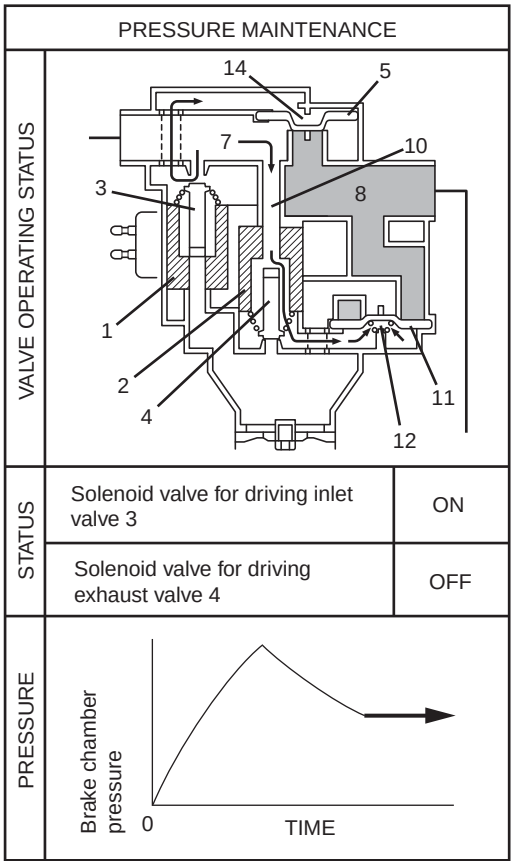
- When the driver steps on the brake pedal, air from the relay valve enters through inlet port (6), pushes open diaphragm (5), passes through outlet port (9), and flows into the brake chamber. At this point, solenoid coil (1) is not energized, so solenoid valve (3) is closed and pilot chamber (14) is open to the atmosphere. Also, solenoid coil (2) is also not energized, so solenoid valve (4) is closed. As a result, air passes through pilot hole (10) and enters pilot chamber (12). It then pushes up diaphragm (11) and closes exhaust valve (13).



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b. PRESSURE REDUCTION MODE

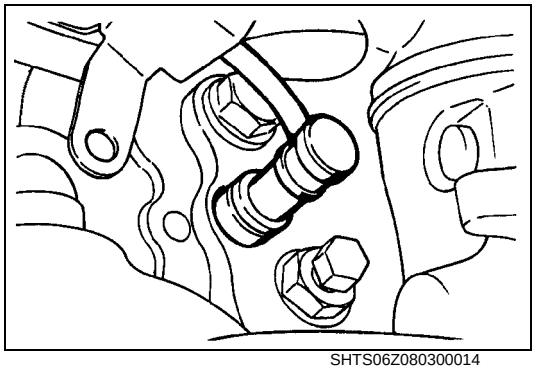
- When solenoid coil (1) is energized, solenoid valve (3) opens and air also flows into pilot chamber (14). It pushes down on diaphragm (5), shutting off chambers (7) and (8). At the same time, solenoid coil (2) is also energized. This causes solenoid valve (4) to open and the operating air from pilot chamber (12) passes through exhaust port (15) and is released into the atmosphere. Consequently, the air from the outlet port (9) side (brake chamber) pushes down on diaphragm (11) and air is released into the atmosphere. This causes the air pressure of the brake chamber to decrease.



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c. PRESSURE MAINTENANCE MODE

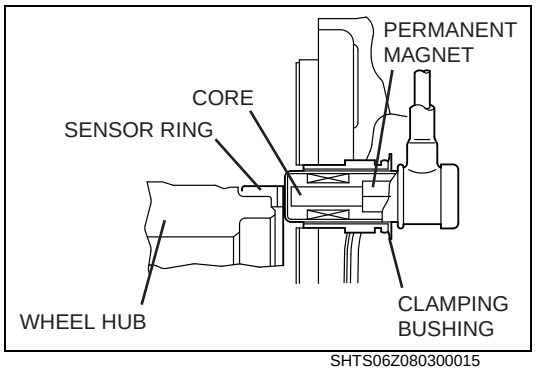
- When solenoid coil (1) is energized, solenoid valve (3) opens and air flows through chamber (7) and acts on pilot chamber (14). On the other hand, since solenoid coil (2) is not energized, solenoid valve (4) is closed and air flows through pilot hole (10) and acts on pilot chamber (12). This causes diaphragms (5) and (11) to shut off their air passages, and the chamber (8) pressure, that is to say the air acting on the brake chamber, is maintained at the pressure that was current when the switch from the pressure reduction mode to the pressure maintenance mode took place.



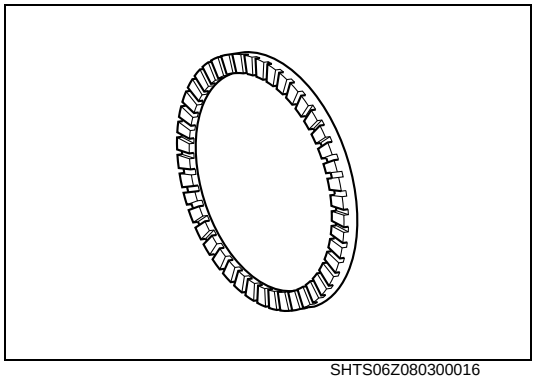
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3. WHEEL SENSORS

- These sensors are mounted, facing the sensor rings on each wheel on the front and rear axles.
- The wheel sensors are electromagnet sensors consisting of a permanent magnet core with a coil of wire wrapped around it.
- The frequency of the pulse signals generated by magnetic inductance between the sensors and the sensor rings they face is proportional to the rotational speed of the wheels. These pulse signals are sent to the ABS ECU and are used to determine the wheels, rotational status.



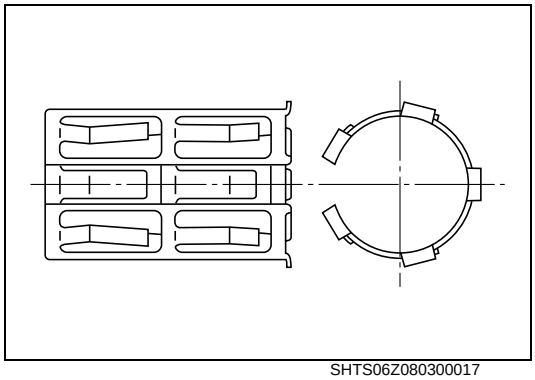
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4. SENSOR RINGS

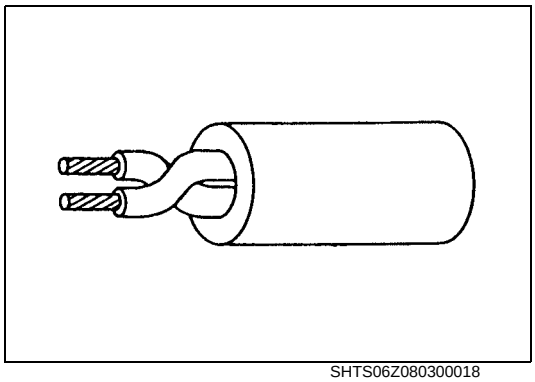
- The sensor rings are press-fitted into the insides of the wheel hubs of each wheel on the front and rear axles, and they face the wheel sensors described in the preceding section. The sensor rings are made of a magnetic material, and teeth are cut into the surface which faces the wheel sensor at regular intervals. Also, when the sensor ring performs one complete rotation, the sensor generates pulse signals corresponding to the number of teeth.



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5. CLAMPING BUSHINGS

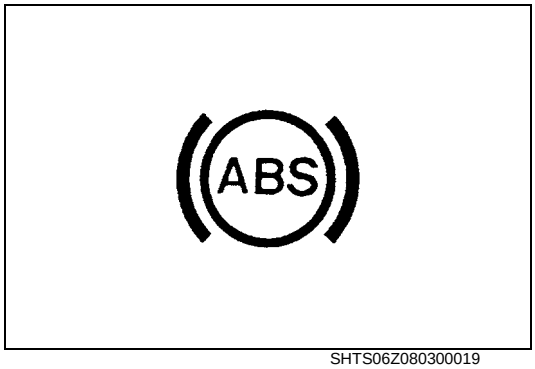
- The wheel sensors are held in place through friction by clamping bushings that are inserted into the mounting brackets. If they are assembled properly, the clamping bushings serve to eliminate the need to adjust the clearance between the wheel sensors and sensor rings.



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6. WHEEL SENSOR HARNESSES

- Each wheel sensor wire harness employs a two-conductor twisted wire cable. Its function is to protect the wheel sensor signals, which are vital to the proper operation of the ABS system, from electromagnetic interference. Under no circumstances should any part of the wheel sensor wire harnesses be cut or connected to any other wire.



SHTS06Z080300019

7. ABS WARNING LIGHT

- The status of the ABS system is indicated.
- It lights when the starter switch is turned "ON" and automatically goes off when the system functions correctly.
- If malfunction occurs in the ABS system while the vehicle is being driven, the light turns on to alert the driver.
- However, when a defects code is eliminated after repairing it and the starter switch is turned "ON", the light will remain lit until the vehicle speed reaches 7-10 km/h {11.2-16 mile/h}.
- Then, note that even when the warning light is lit, the ABS system, unaffected by the malfunction, continues to operate. Also, the brake whose ABS system experiences the malfunction is reverted to normal braking operation without ABS.
- When a Diagnosis switch is turned "ON", this light will goes on and off, which indicates defect code.

8. EXHAUST BRAKE CUT RELAY

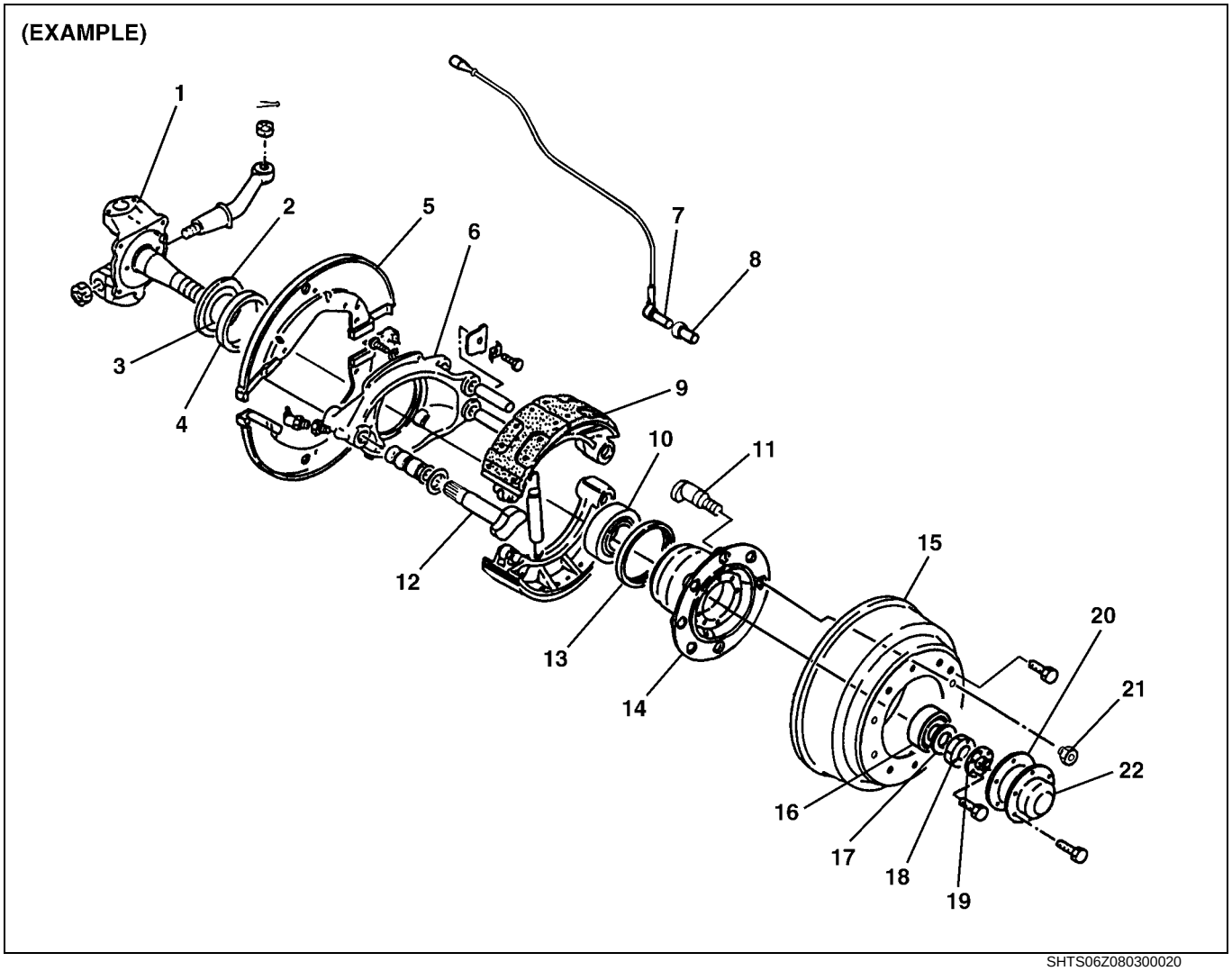
- When this relay is energized during ABS operation, the relay contact opens, the current to the solenoid valve for the exhaust brake is shut down, and the exhaust brake is released.

FRONT WHEEL BRAKE

COMPONENT LOCATOR

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FRONT AXLE

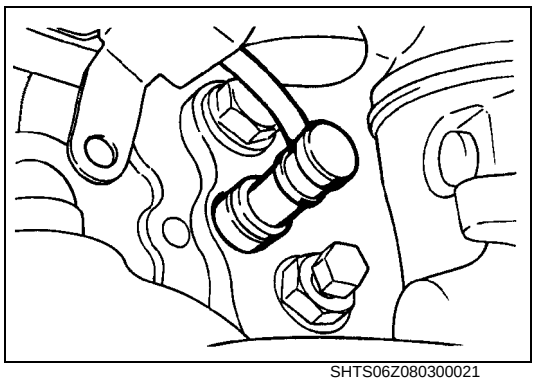


SHTS06Z080300020

1	Knuckle	12	Cam shaft
2	Oil seal guide	13	Sensor ring
3	O-ring	14	Wheel hub
4	Oil seal	15	Brake drum
5	Brake drum cover	16	Outer wheel hub bearing
6	Brake spider	17	Washer
7	Wheel sensor	18	Wheel hub bearing lock nut
8	Clamping bushing	19	Lock plate
9	Brake shoe	20	Gasket
10	Inner wheel hub bearing	21	Wheel nut
11	Wheel bolt	22	Wheel hub cap

OVERHAUL

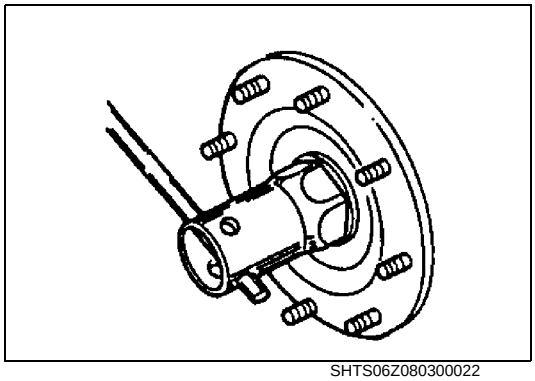
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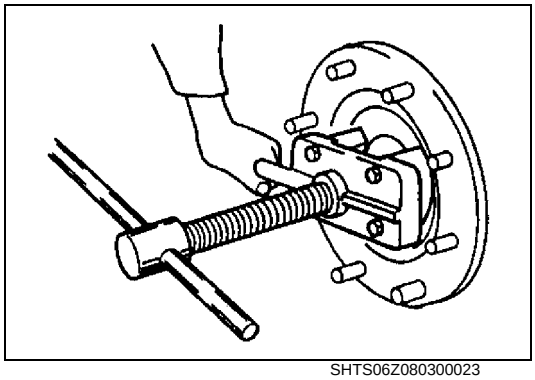
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL SENSOR.
(1) Remove the brake drum cover.
(2) Pull off the wheel sensor.

NOTICE
Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.

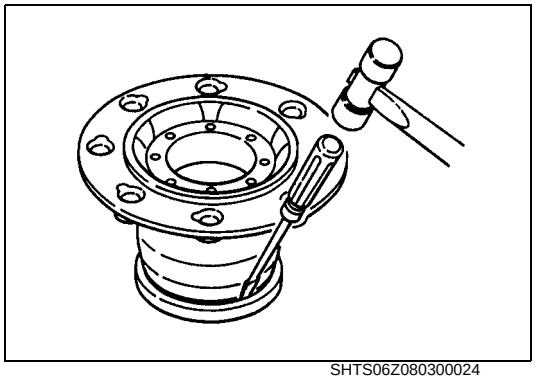

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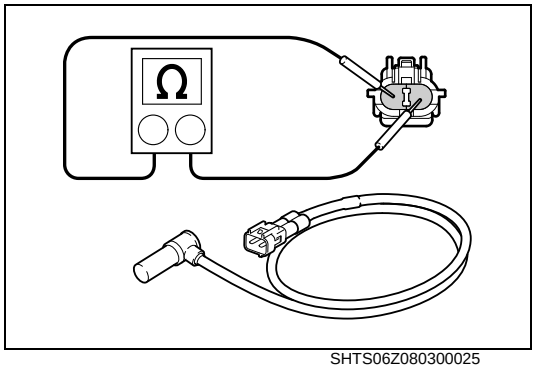
2. REMOVE THE WHEEL HUB, WHEEL HUB BEARINGS AND BRAKE DRUM.
(1) Refer to the chapter **"FRONT AXLE"**.


SHTS06Z080300023

3. REMOVE THE SENSOR RING.
(1) Use a screwdriver or the like to gradually remove the sensor ring by tapping evenly on its outer ring.

NOTICE
- **When tapping on the sensor ring to remove it, be careful not to scratch the wheel hub.**
- **Do not remove the sensor ring unless it is required.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**


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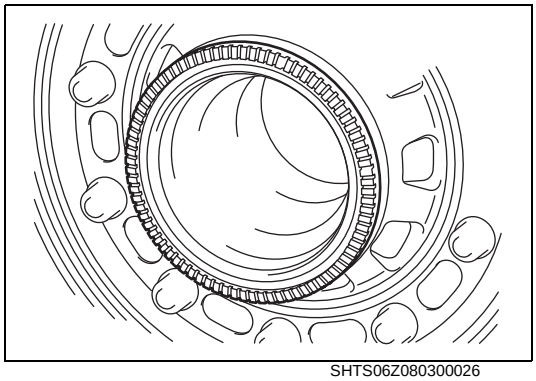
SHTS06Z080300025

IMPORTANT POINTS - INSPECTION

1. INSPECTION OF ONLY WHEEL SENSOR

(1) With a tester, measure the resistance of wheel sensor.
Standard: 1.0-1.3 kΩ

(2) When the measured value is out of the basic standard, change the wheel sensor as it might be considered presumably to be abnormal.

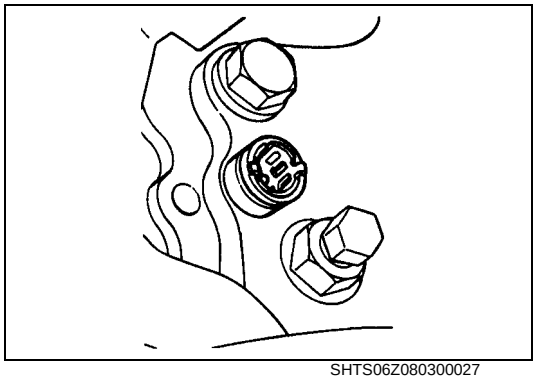

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2. INSPECTION OF THE SENSOR RING

(1) Make a visual inspection to check for damage or deformation of the sensor ring, and also to make sure it is not coming loose from the wheel hub.

(2) If any damage or malformation is discovered, replace the sensor ring.

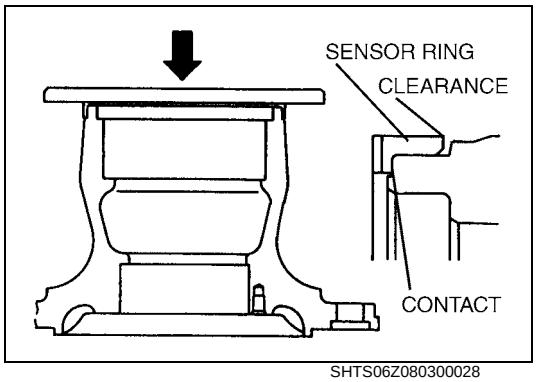
(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and press in it with a press again.


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3. INSPECTION OF THE CLAMPING BUSHING

(1) Make sure that wheel sensor is securely fixed.

(2) Change the clamping bushing when it can be pulled off or pushed in with a weak force.



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IMPORTANT POINTS - ASSEMBLY

1. MOUNT THE SENSOR RING.

(1) Place the sensor ring on the wheel hub and use the dolly block and a press to evenly pressure mount it.

NOTICE

Warming up the sensor ring with hot water will make it easier to pressure mount it. Do not use a gas burner or the like to warm the sensor ring. Doing so could cause malformation of the sensor ring.

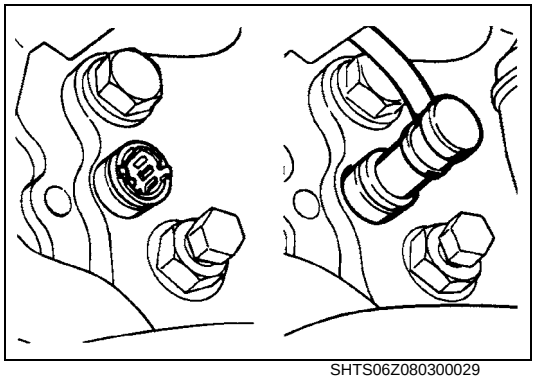
(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}

2. MOUNT THE WHEEL HUB AND BRAKE DRUM.

(1) Refer to the chapter **"FRONT AXLE"**.

NOTICE

If the wheel sensors are mounted, hammering on the wheel hubs and the like on that axle could cause internal damage to the wheel sensors. Either mount the tire and then tap on the tire or tap on the wheel hub after removing the right and left wheel sensors.


SHTS06Z080300029

3. MOUNT THE WHEEL SENSOR.

(1) Push in the clamping bushing until the stopper makes contact with the knuckle's wheel sensor holder.

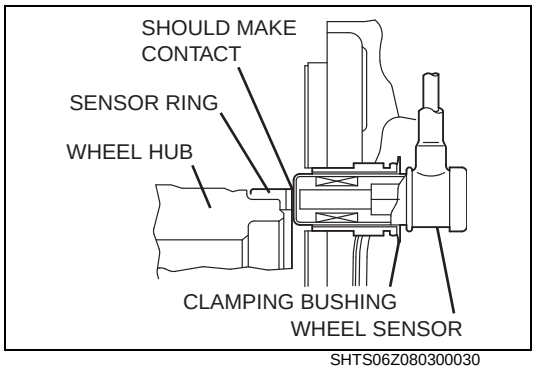
(2) Apply a light coating of chassis grease to the hub of the wheel sensor. Then push it forcefully into the clamping bushing until you feel that the wheel sensor has made contact with the sensor ring.

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.

(3) Slowly turn the wheel hub and brake drum and confirm that they move smoothly.

(4) Mount the drum dust cover.



SHTS06Z080300030

4. ADJUST THE WHEEL SENSOR.

(1) Arrange the wire harness.

(2) With a circuit tester, confirm the output voltage of the wheel sensor (By rotating the tire by one time for 5 seconds)

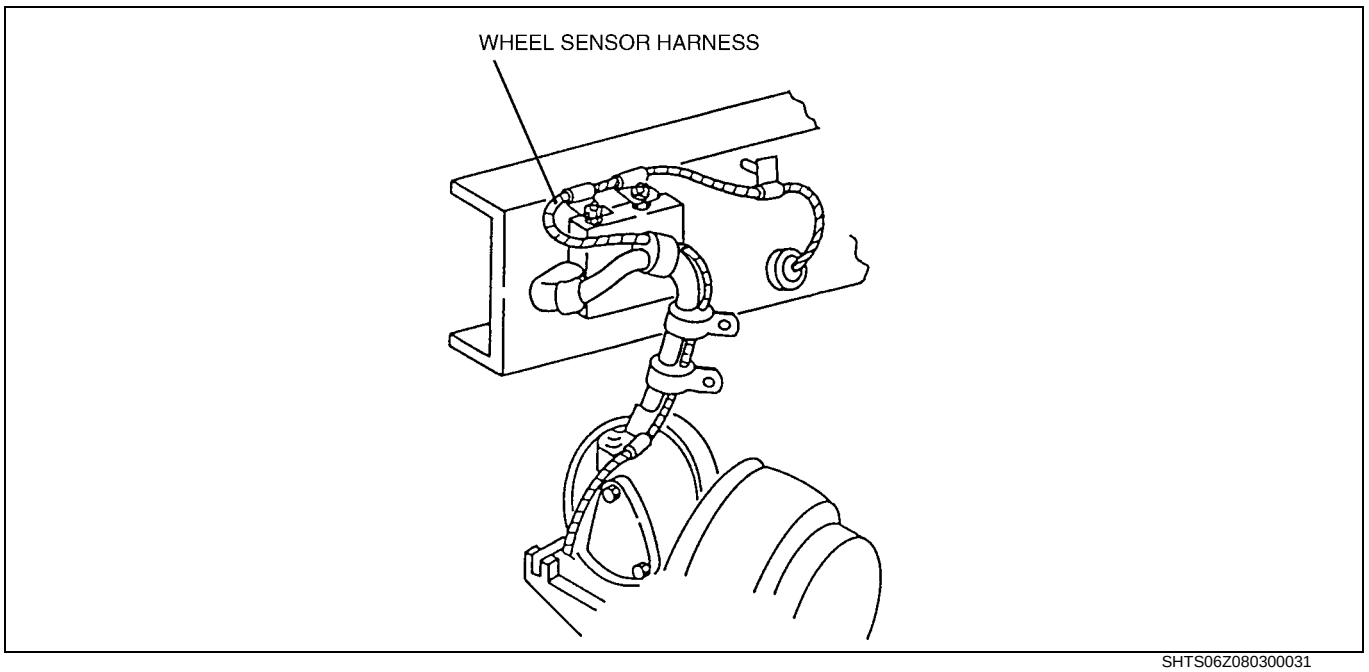
Standard: 150-1,999 mV
(Range of Alternating Current Voltage)

(3) In case of out of the standard range at (2), push the wheel sensor softly by fingers until the sensor contacts with the sensor ring, then inspect again from (1).

5. ABS WIRE HARNESSES

NOTICE

- **The front axle chassis harnesses, particularly the ones that pass over the front axle and extend as far as the wheel sensors, must absorb the movement when the wheels are turned and when the springs move. It is therefore necessary to always maintain an optimal spacing between the clips.**
- **In addition, if there is a large amount of variation in the spacing between the clips, the wheel sensor harnesses can come into contact with tire chains and sustain damage.**
- **The wire harness for the front axle wheel sensor extends directly from the clip on top of the king pin cover to the frame. In particular, make sure that the distance between the clip on top of the king pin cover and the clip on the frame side is as indicated in the diagram below. There are markings on the wheel sensors in cases where the wheel sensor harness clips are in locations where the relative movement is particularly great. These places should be inspected regularly to ensure that the clip positions are still meeting with the same marking.**



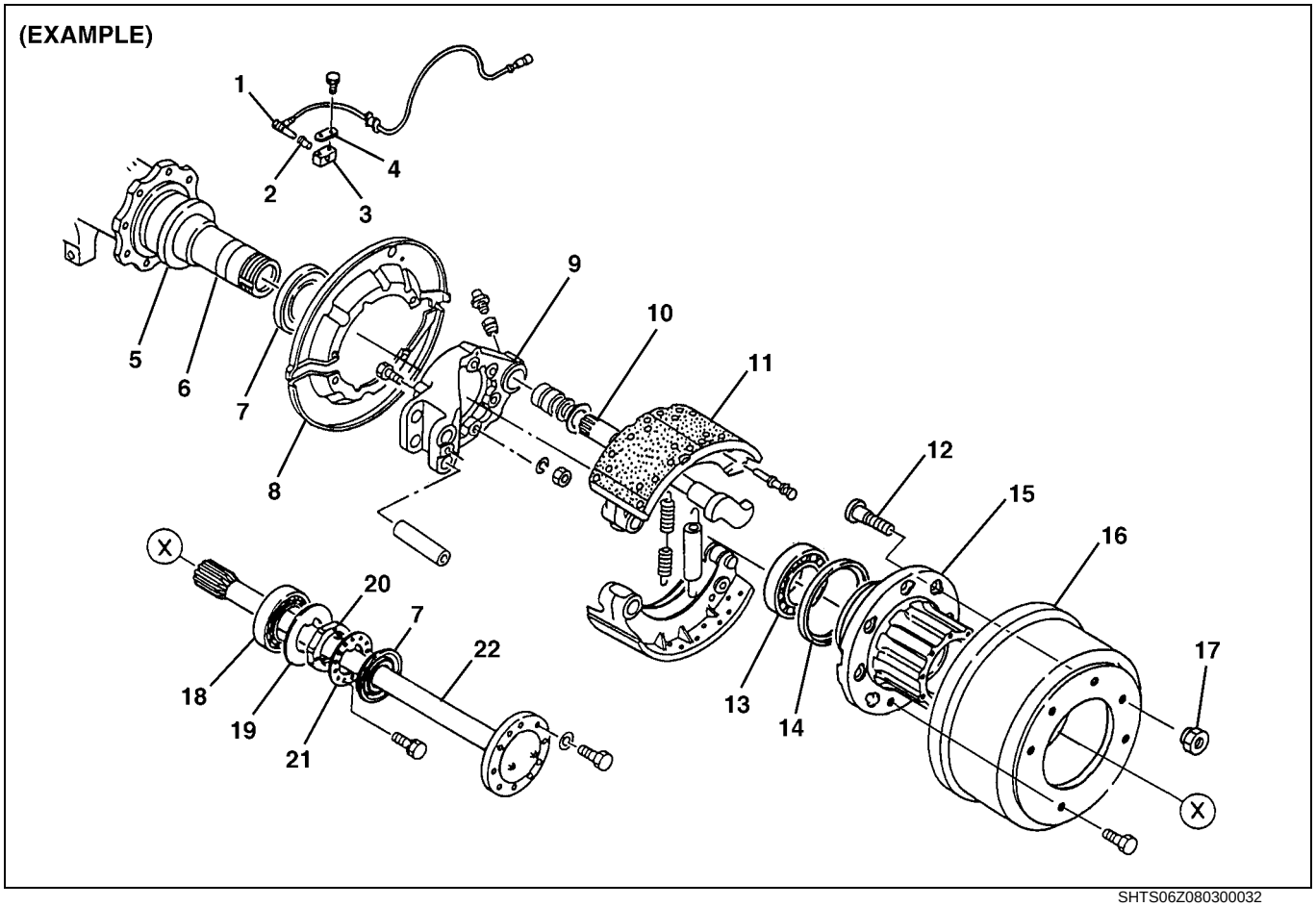
SHTS06Z080300031

REAR WHEEL BRAKE

COMPONENT LOCATOR

EN06Z0803D100002

REAR AXLE



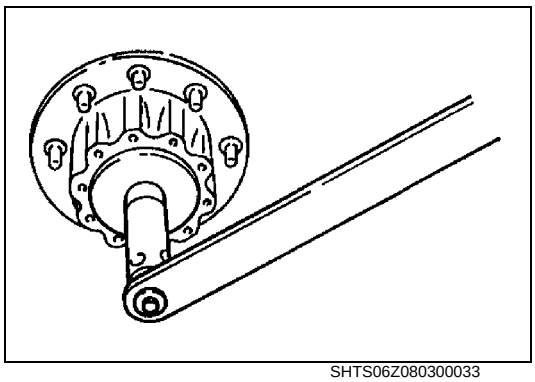
SHTS06Z080300032

1	Wheel sensor	12	Wheel bolt
2	Clamping bushing	13	Inner wheel hub bearing
3	Wheel sensor holder	14	Sensor ring
4	Lock plate	15	Wheel hub
5	Oil seal collar	16	Brake drum
6	Axle housing assembly	17	Wheel nut
7	Oil seal	18	Outer wheel hub bearing
8	Brake drum cover	19	Washer
9	Brake spider	20	Lock nut
10	Cam shaft	21	Lock plate
11	Brake shoe	22	Axle shaft

OVERHAUL

EN06Z0803H200002

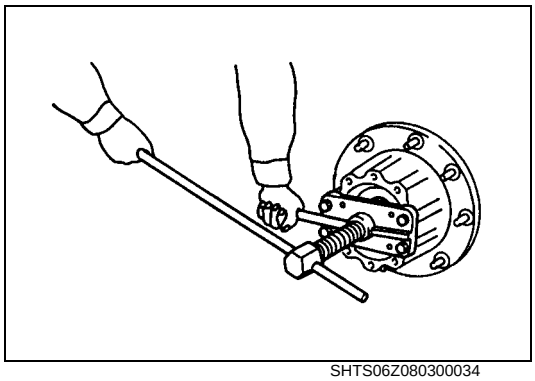
IMPORTANT POINTS - DISASSEMBLY



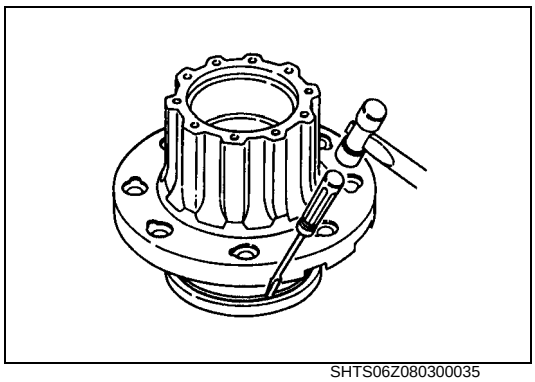
SHTS06Z080300033

1. REMOVE THE WHEEL HUB, WHEEL HUB BEARINGS AND BRAKE DRUM.

(1) Refer to the chapter **"REAR AXLE"**.



SHTS06Z080300034



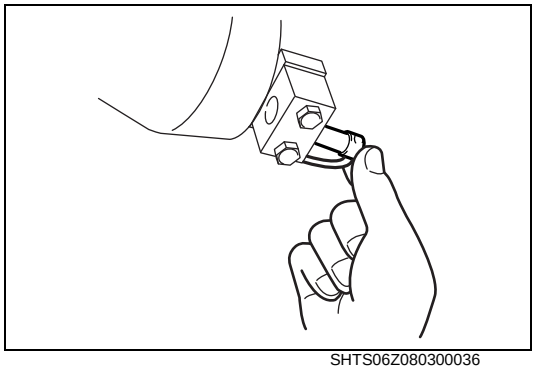
SHTS06Z080300035

2. REMOVE THE SENSOR RING.

(1) Use a screwdriver or the like to gradually remove the sensor ring by tapping evenly on its outer ring.

NOTICE

- **When tapping on the sensor ring to remove it, be careful not to scratch the wheel hub.**
- **Do not remove the sensor ring unless it is required.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**

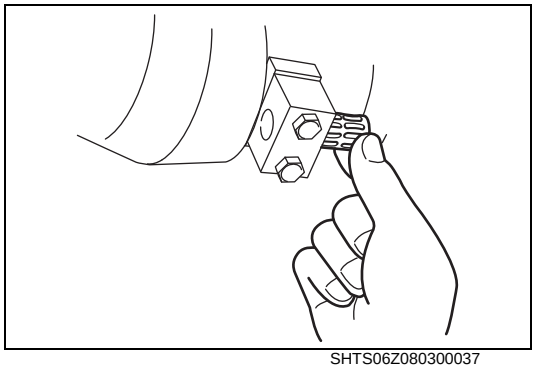


SHTS06Z080300036

3. REMOVE THE WHEEL SENSOR.

NOTICE

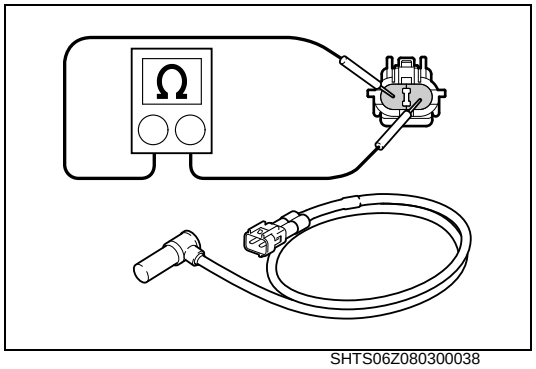
- **Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.**
- **Pull out the wheel sensor from the sensor holder by hand.**


SHTS06Z080300037

4. REMOVE THE CLAMPING BUSHING.

(1) Remove the clamping bushing out of the wheel sensor holder.

IMPORTANT POINTS - INSPECTION

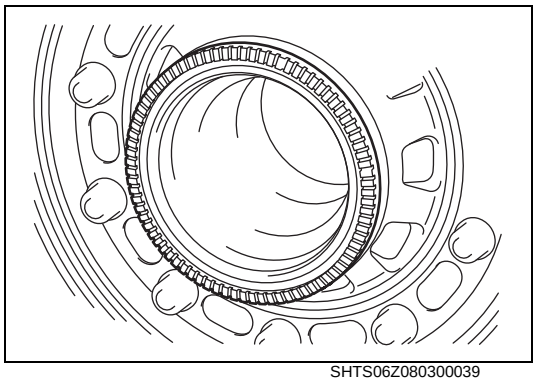


SHTS06Z080300038

1. INSPECTION OF ONLY WHEEL SENSOR

(1) With a tester, measure the resistance of wheel sensor.
Standard: 1.0-1.3 kΩ

(2) When the measured value is out of the basic standard, change the wheel sensor as it might be considered presumably to be abnormal.

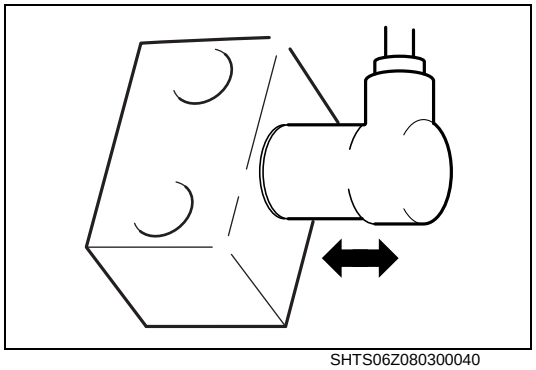

SHTS06Z080300039

2. INSPECTION OF THE SENSOR RING

(1) Make a visual inspection to check for damage or deformation of the sensor ring, and also to make sure it is not coming loose from the wheel hub.

(2) If any damage or malformation is discovered, replace the sensor ring.

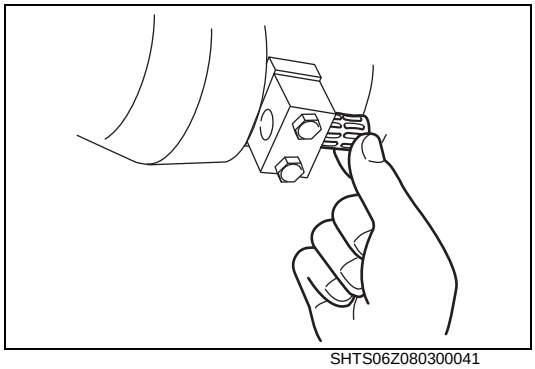
(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and a press to pressure mount it again.


SHTS06Z080300040

3. INSPECTION OF THE CLAMPING BUSHING

(1) Make sure that the wheel sensor is securely fixed.

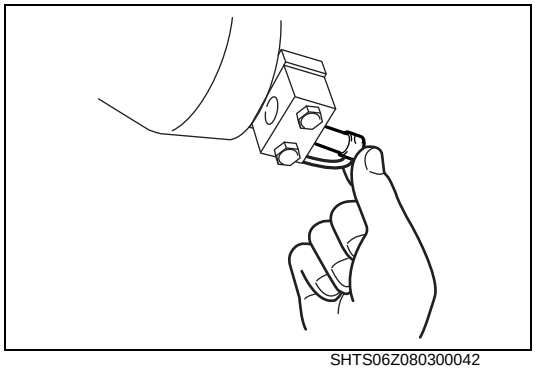
(2) Change the clamping bushing when it can be pulled off or pushed in with a weak force.


SHTS06Z080300041

IMPORTANT POINTS - ASSEMBLY

1. MOUNT THE WHEEL SENSOR.

(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.

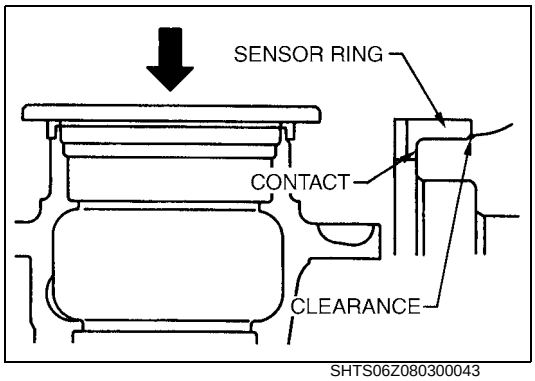

SHTS06Z080300042

(2) Push the wheel sensor fully in the wheel sensor holder with hands until the wheel sensor makes contact with the clamping bushing.

NOTICE

When inserting the wheel sensor, do not tap on it with a hammer or attempt to pry it into place using a screwdriver, or the like. Doing so could damage the wheel sensor.

(3) Arrange the wire harness.



SHTS06Z080300043

2. MOUNT THE SENSOR RING.

(1) Place the sensor ring on the wheel hub and use the dolly block and a press to evenly pressure mount it.

NOTICE

Warming up the sensor ring with hot water will make it easier to pressure mount it. Do not use a gas burner or the like to warm the sensor ring. Doing so could cause malformation of the sensor ring.

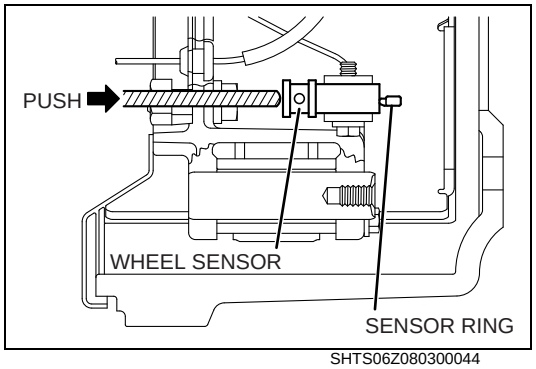
(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}

3. MOUNT THE WHEEL HUB AND BRAKE DRUM.

(1) Refer to the chapter **"REAR AXLE"**.

NOTICE

- **Be careful not to push back the wheel sensor too far when mounting the wheel hub and brake drum. Also, make sure they are straight so that you do not bump the tip of the wheel sensor.**
- **When inserting the outer hub bearing, avoid tapping on it with a hammer as this will expose the wheel sensor to bumps. Insert the outer hub bearing carefully with a lock nut.**



SHTS06Z080300044

4. ADJUST THE WHEEL SENSOR.

(1) Arrange the wire harness.

(2) With a circuit tester, confirm the output voltage of the wheel sensor (By rotating the tire by one time for 5 seconds)

Standard: 150-1,999 mV
(Range of Alternating Current Voltage)

(3) In case of out of the standard range at (2), remove the dust cover located on the back plate unit. Then push the wheel sensor by using round end bar until the sensor contacts with the sensor ring.

NOTICE

Do not tap by hammer or turn when pushing the wheel sensor. This may damage the wheel sensor.

(4) Mount the axle shaft to the wheel hub and tighten the bolt on the axle shaft.
Refer to the chapter **"REAR AXLE"**.

5. ABS WIRE HARNESSES

NOTICE

- **The rear axle chassis harnesses is arranged so that the left and right wheel sensor harnesses are near each other. Therefore, special care should be taken not to make incorrect connections if the harnesses have been removed for inspection or repairs.**
- **If incorrect connections are made, it will interfere with the functioning of the ABS system. For this reason, caution plates indicating "LEFT" and "RIGHT" are affixed to the harnesses. Be sure to check when connecting the harnesses. (The left harness is on the left side of the vehicle when viewed from the behind and facing toward the front, and the right harness is on the right side of the vehicle.)**
- **The wheel sensor harnesses are arranged along the top of the rear axle housing. Therefore, make sure to allow sufficient harness length between the chassis and the rear axle so that the harnesses can absorb the up-and-down motion of the rear axle.**

ES START (EASY & SMOOTH START SYSTEM) (MODELS: WITH DENSO ABS)

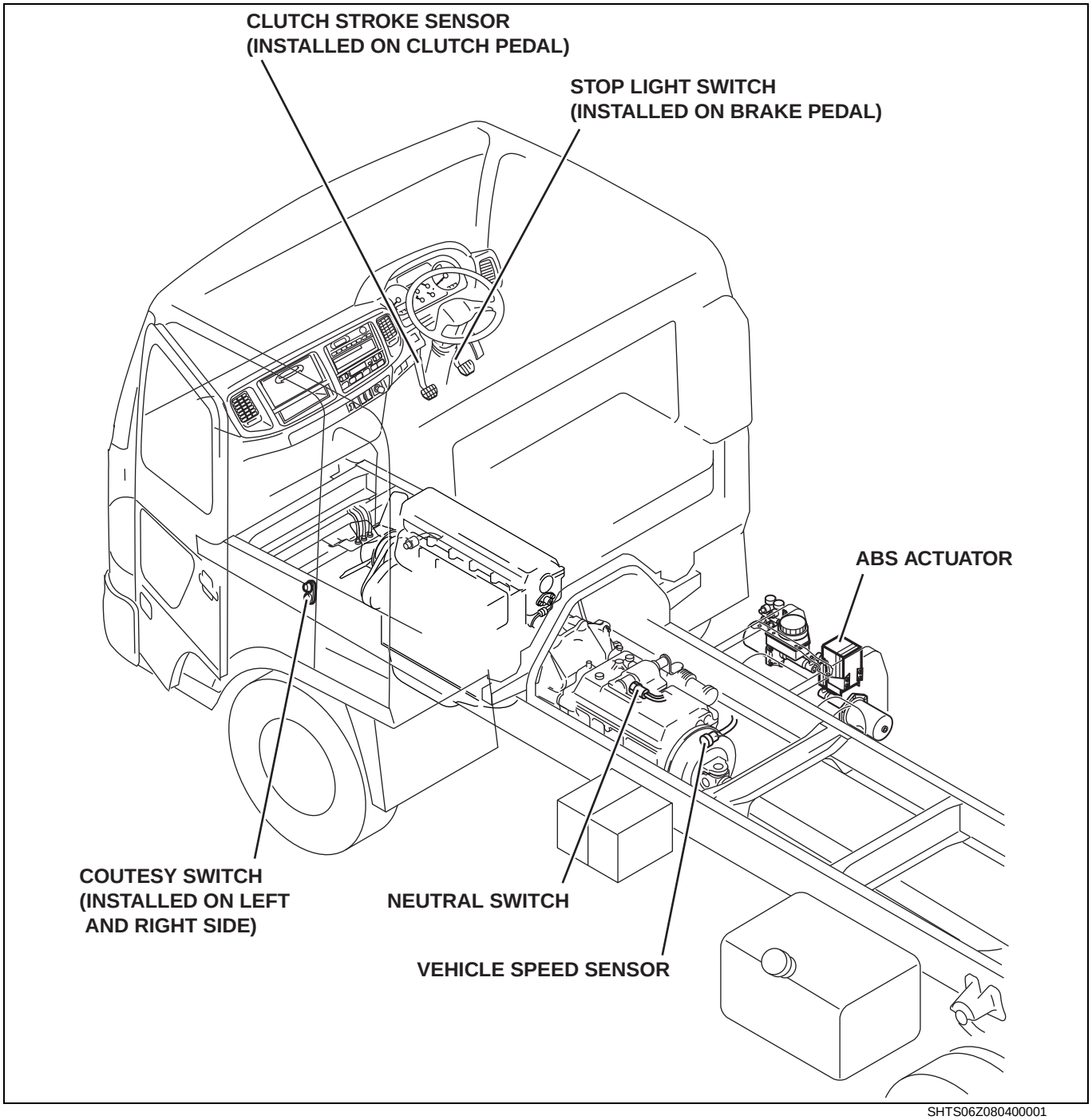
BR04-001

ES START BR04-2
DESCRIPTION BR04-2
DIAGRAM BR04-3
SPECIAL TOOL BR04-4
ADJUSTMENT BR04-5

ES START

DESCRIPTION

EN06Z0804C100001

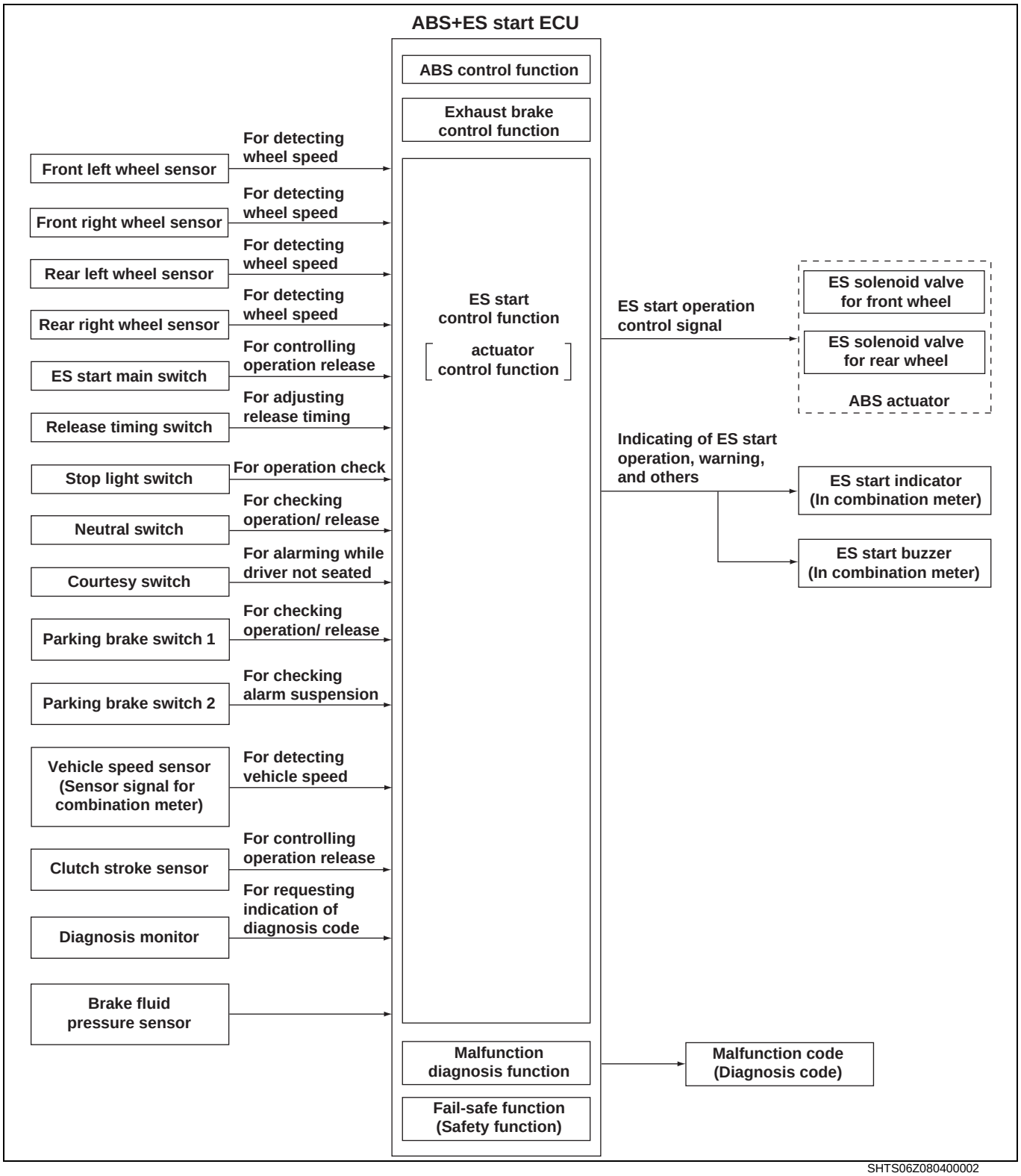


SHTS06Z080400001

DIAGRAM

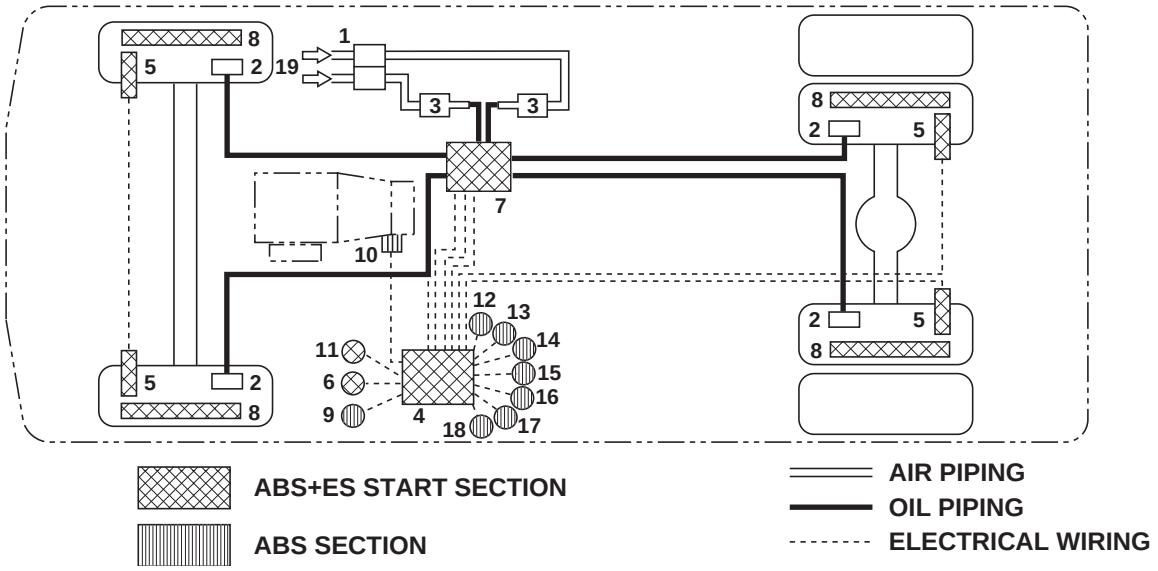
EN06Z0804J100001

SYSTEM DIAGRAM



SHTS06Z080400002

PIPING DIAGRAM

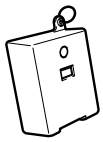
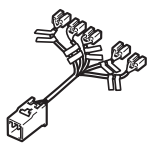


SHTS06Z080400003

1	Brake valve	11	Stop light switch
2	Wheel cylinder	12	Clutch stroke sensor
3	Brake booster	13	Operation/ release switch
4	ABS + ES start ECU	14	Release timing switch
5	Wheel sensor	15	Neutral switch
6	ABS warning light	16	Courtesy switch
7	ABS actuator	17	Parking switch 1
8	Sensor ring	18	Parking switch 2
9	ES start indicator light	19	From air tank
10	Vehicle speed sensor		

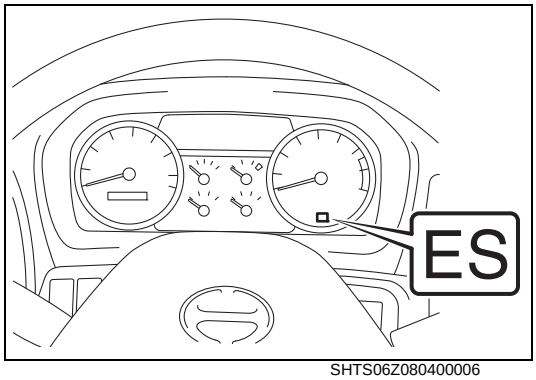
SPECIAL TOOL

EN06Z0804K100001

Illustration	Part number	Tool name	Remarks
	S0963-01370	DIAGNOSIS MONITOR	For diagnosing and setup of ES start
	S0963-02300	DEDICATED HARNESS FOR CENTRALIZED DIAGNOSIS CONNECTOR	For connecting diagnosis monitor

ADJUSTMENT

EN06Z0804H300001



SHTS06Z080400006

OPERATION CHECK.

1. NORMAL OPERATION CHECK

(1) Turn starter switch "ON" position.

(2) Make sure that ES start indicator in the combination meter will go on.

(3) Then, when only ES start light flashes on/off, it means that 0-point adjustment of clutch and initial setting of release position are not made. Accordingly, make them.

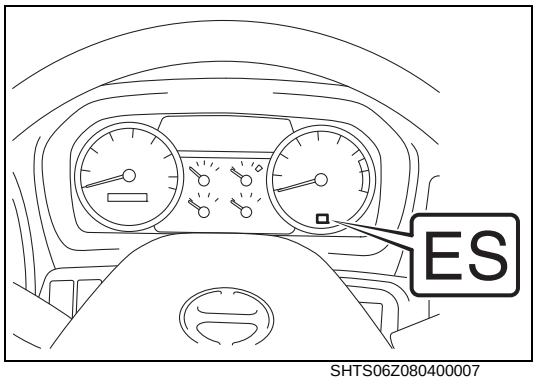
NOTICE

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. OPERATION CHECK

NOTICE

This check should be performed on "Brake Tester" or at place where protective device against the vehicle taking off is installed since taking off operation is needed.



SHTS06Z080400007

(1) The followings should be fulfilled.

- Starter switch: "ON"
- ES start main switch: "ON"
- Parking brake: "RELEASE"
- Vehicle speed: 0 km/h {0 mile/h}.

(2) After stepping on the brake pedal for approx. 1 second, check that the buzzer beeps once, ES start indicator light goes on and ES start will operate.

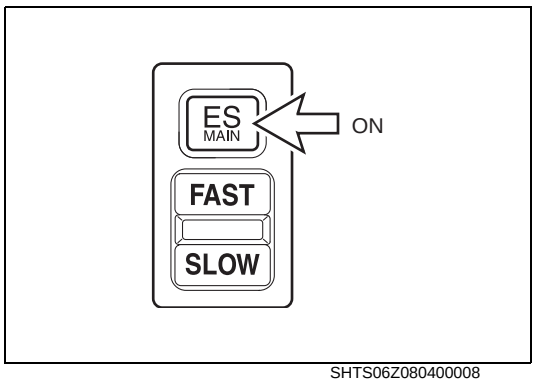
(3) Check that braking force is retained.

(4) By normal operation for taking off (By shifting gear for clutch connection), check that ES start will be released.

ADJUSTMENT FOR RELEASE TIMING

HINT

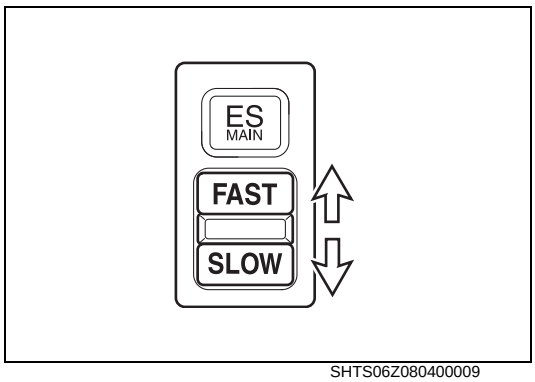
When any discrepancy (Brake dragging or vehicle moving back is produced on release timing of ES start, the release timing can be adjusted at option of driver's taste.



SHTS06Z080400008

1. HOW TO SET

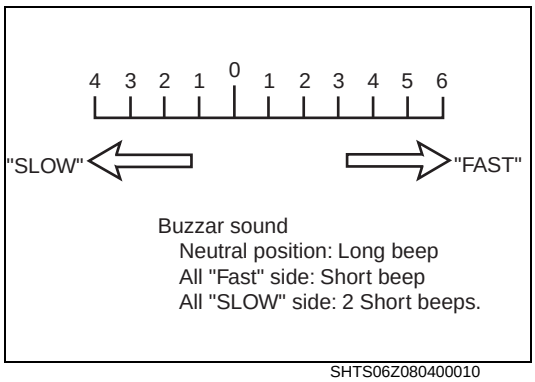
(1) Turn starter switch "ON" and also, put ES start main switch "ON".



SHTS06Z080400009

(2) Push the release timing switch to "FAST" or "SLOW" side for 0.5 sec.

(3) When you want to adjust it to "FAST" side, push the switch to "FAST" side. And when adjusting it to "SLOW" side, push it to "SLOW" side.
Accordingly, the release timing will be adjusted by a direction of the switch to be pushed and its adjusting position will be indicated by buzzer.
When you want to keep adjusting it, release the switch once and push it again.



SHTS06Z080400010

(4) Adjustable range is up to 6 to "FAST" and up to 4 to "SLOW" side and adjusting position will be indicated by buzzer sound.

NOTICE

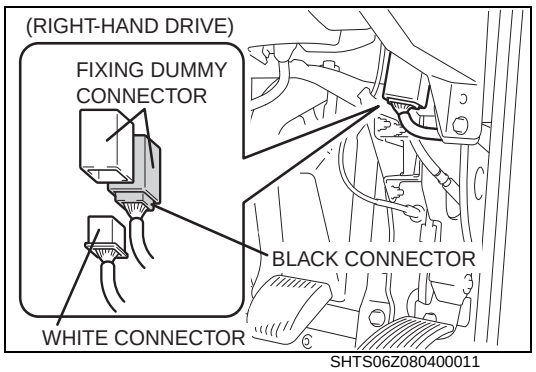
However, release timing adjustment can not be made in the following cases:

1. **When any malfunction is found through diagnosis function.**
2. **When the vehicle running at speed of more than 5 km/h {2.7 mile/h}.**
3. **When ES start main switch is pushed to "RELEASE" side.**
4. **When diagnosis monitor connected.**

INITIAL SETTING OF ES START

HINT

This should be done to memorize Initial value of ES start releasing position (Contacting point of clutch) and 0-point of clutch control sensor in the computer.



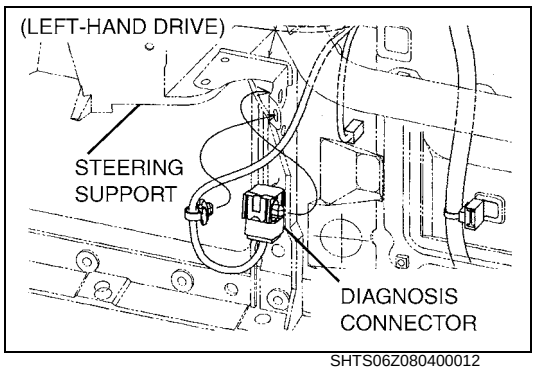
SHTS06Z080400011

1. HOW TO SET

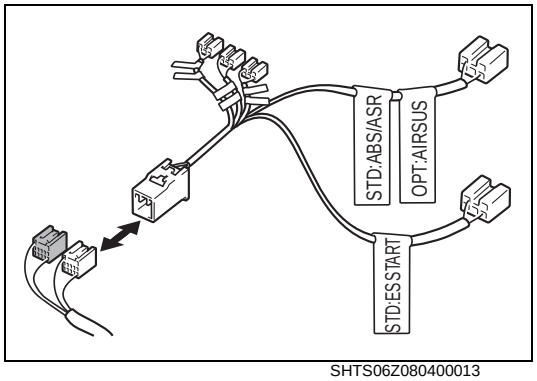
(1) Disconnect the centralized diagnosis connector (On lower right of the driver's side instrument panel) from the dummy connector.

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.



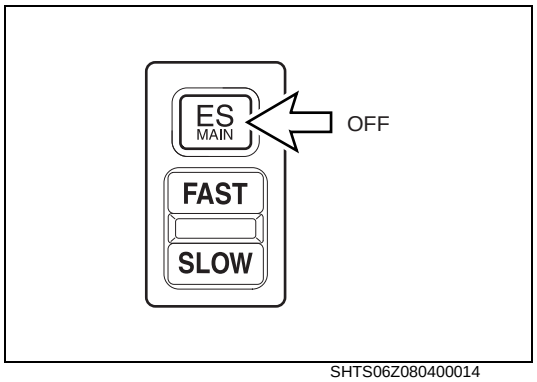
SHTS06Z080400012



SHTS06Z080400013

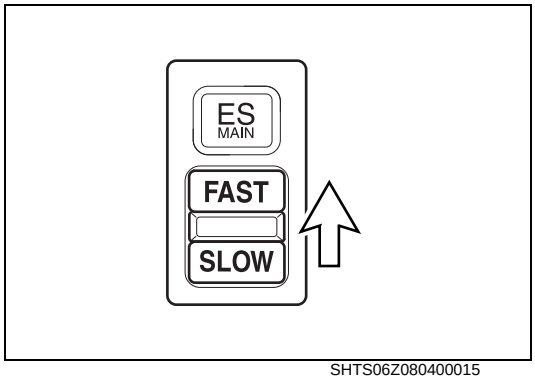
(2) Connect the dedicated harness to the centralized diagnosis connector and diagnosis monitor to the connector tagged by "STD: ABS/ASR".
SST:
Dedicated harness (S0963-02300)
Diagnosis monitor (S0963-01370)

(3) Checking installing condition of clutch stroke sensor, step off the clutch pedal.



SHTS06Z080400014

(4) By turning starter switch "ON", ES start main switch "OFF" and pulling parking brake lever, start engine.



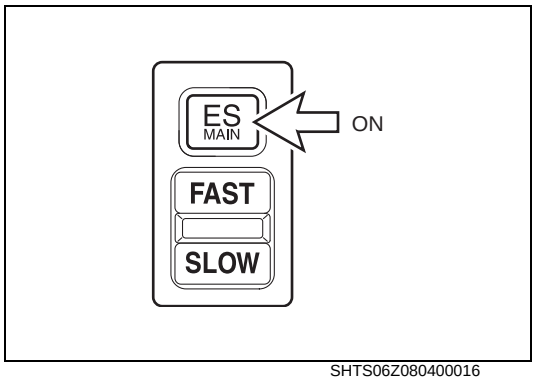
SHTS06Z080400015

(5) Put release timing switch on "FAST".

NOTICE
Do not step on clutch pedal deeply.

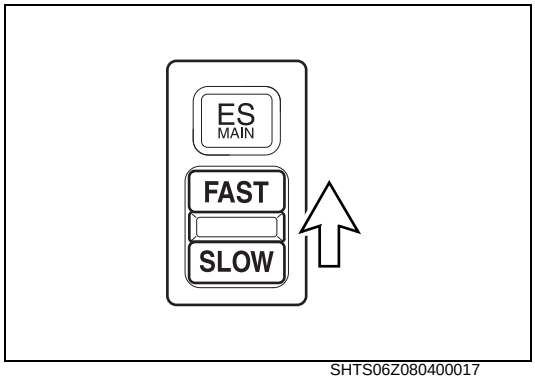
(6) Check that the buzzer will "beep", "beep", "beep".
(0-point setting of clutch stroke sensor will be completed)

NOTICE
When the buzzer beeps, check clutch stroke sensor and its relating circuit.



SHTS06Z080400016

(7) Turning ES start main switch "ON" and stepping on clutch, shift to 3rd gear.

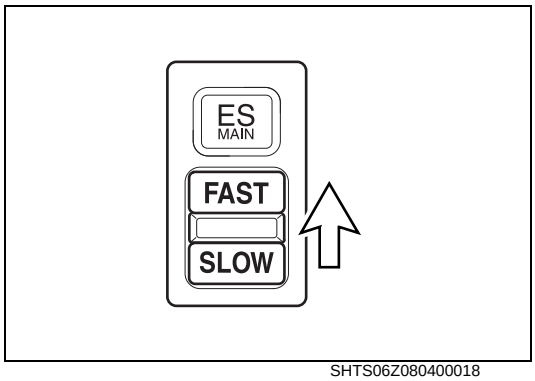


SHTS06Z080400017

(8) Under this condition, push release timing switch to "FAST" side for 3 sec.

HINT
The above mentioned operation will make the buzzer to be beeped 2 times and lead to initial setting of release position.
In spite of releasing the switch, the condition will be kept.

(9) Connect clutch gradually.



SHTS06Z080400018

(10) When engine revolution falling and then coming back, push release timing switch to "FAST" side again.

(11) Check that the buzzer will beep, beep and beep.
(Initial setting of release position is completed)

(12) After removing diagnosis monitor, turn starter switch to "LOCK" position to complete the initial setting.

NOTICE

- **When you want to complete the initial setting on the way, remove off diagnosis monitor.**
- **In case of the following cases, the initial setting can not be made.**

1. **Malfunction alarm is operating.**
2. **Parking brake lever is not pulled back.**
3. **Diagnosis monitor is not connected.**
4. **Wrong clutch operation was made.**

ES START (EASY & SMOOTH START SYSTEM) (WABCO ABS FOR AIR OVER BRAKE) BR04-002

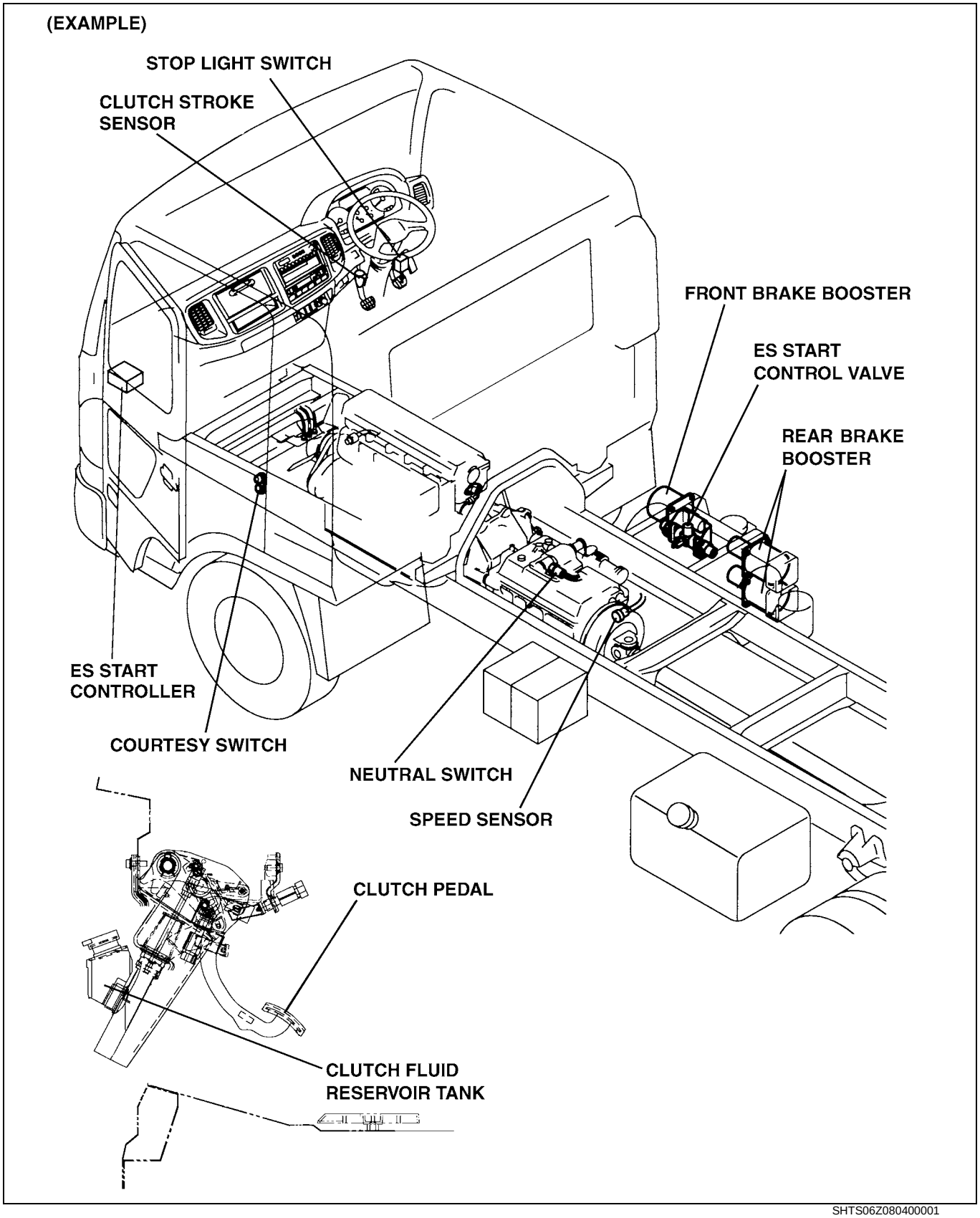
ES START BR04-2
DESCRIPTION BR04-2
DIAGRAM BR04-3
SPECIAL TOOL BR04-4
ADJUSTMENT BR04-5

ES START CONTROL VALVE BR04-9
COMPONENT LOCATOR BR04-9
OVERHAUL BR04-10
INSPECTION AND REPAIR BR04-12

ES START

DESCRIPTION

EN06Z0804C100001

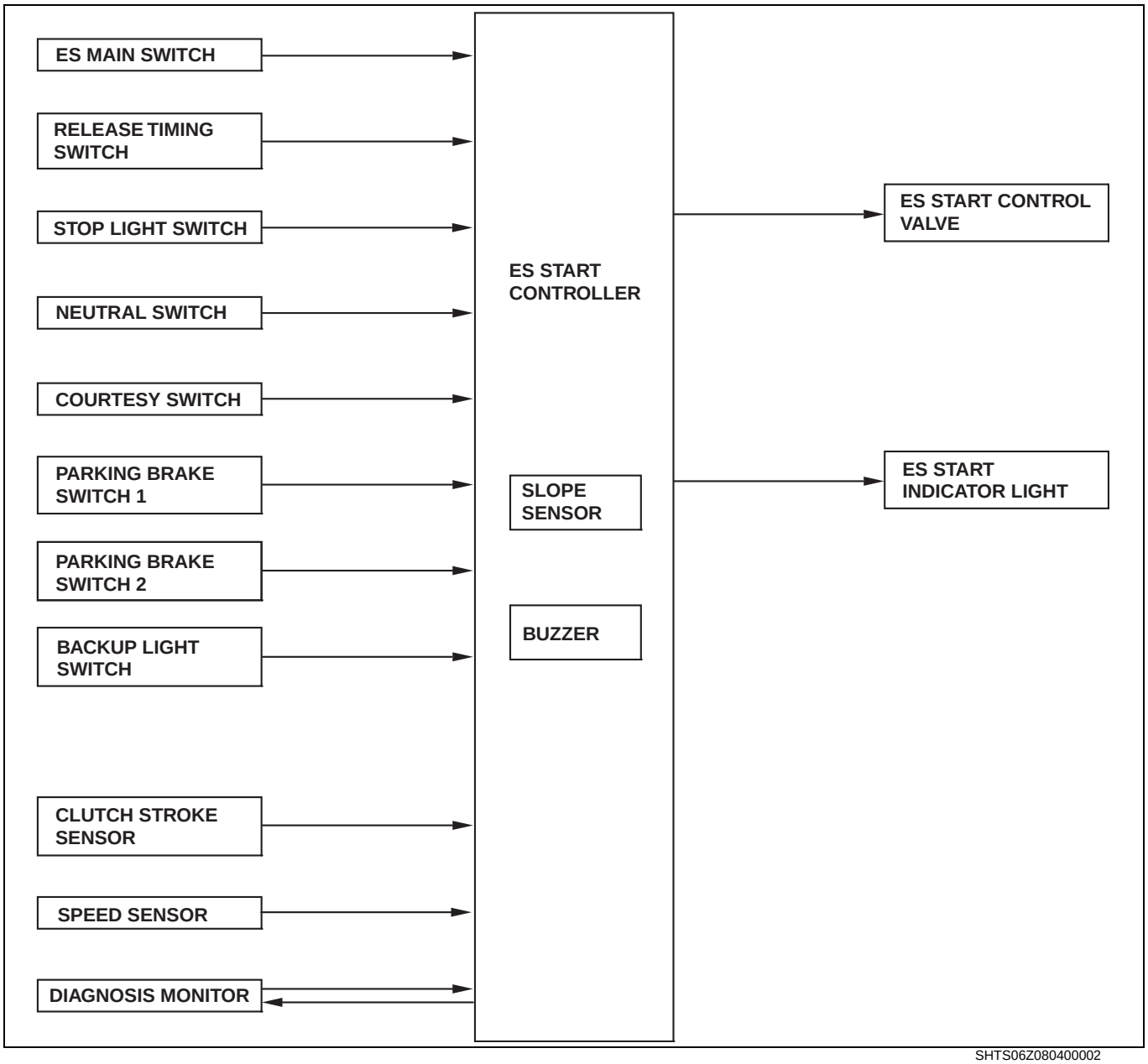


SHTS06Z080400001

DIAGRAM

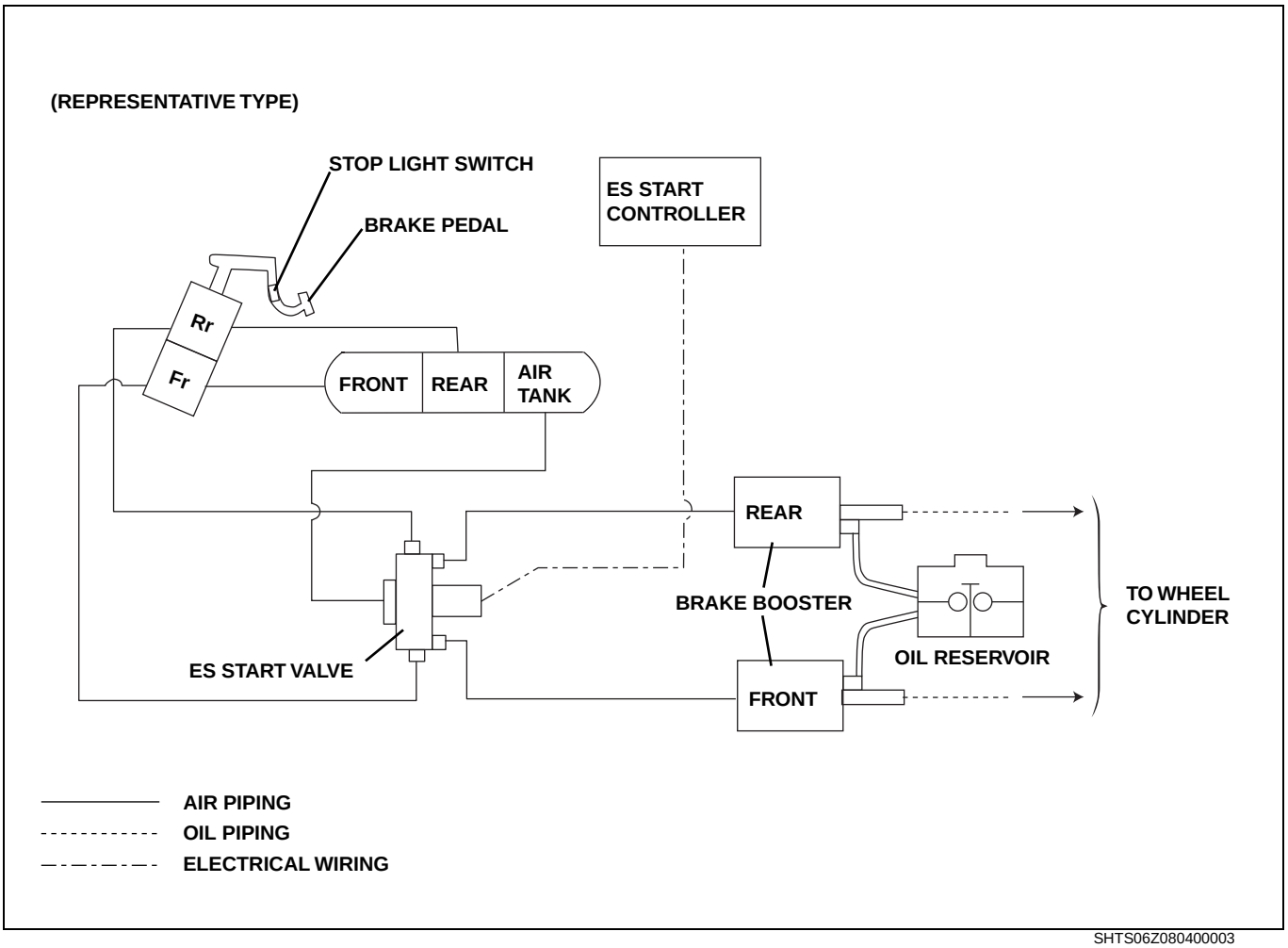
EN06Z0804J100001

SYSTEM DIAGRAM



SHTS06Z080400002

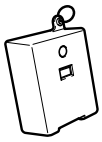
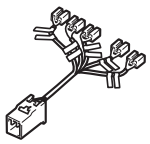
PIPING DIAGRAM



SHTS06Z080400003

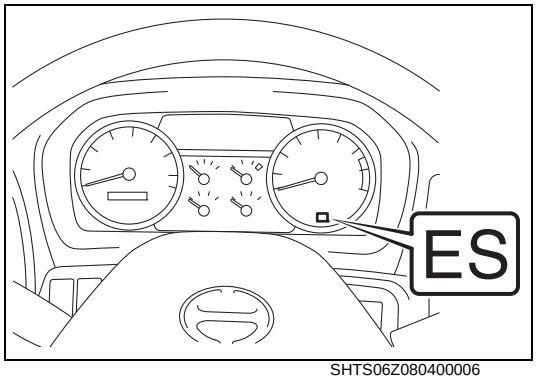
SPECIAL TOOL

EN06Z0804K100001

Illustration	Part number	Tool name	Remarks
	S0963-01370	DIAGNOSIS MONITOR	For diagnosing and setup of ES start
	S0963-02300	DEDICATED HARNESS FOR CENTRALIZED DIAGNOSIS CONNECTOR	For connecting diagnosis monitor

ADJUSTMENT

EN06Z0804H300001



SHTS06Z080400006

OPERATION CHECK.

1. NORMAL OPERATION CHECK

(1) Turn starter switch "ON" position.

(2) Make sure that ES start indicator in the combination meter will go on.

(3) Then, when only ES start light flashes on/off, it means that 0-point adjustment of clutch and initial setting of release position are not made. Accordingly, make them.

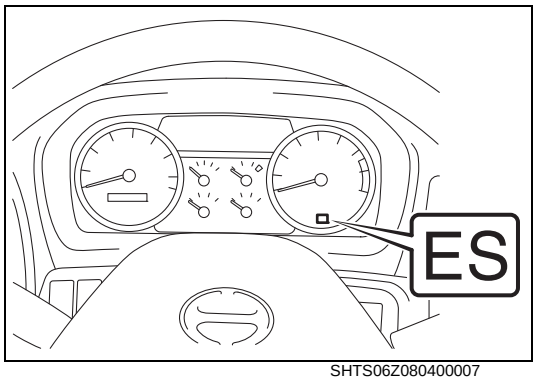
NOTICE

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. OPERATION CHECK

NOTICE

This check should be performed on "Brake Tester" or at place where protective device against the vehicle taking off is installed since taking off operation is needed.



SHTS06Z080400007

(1) The followings should be fulfilled.

- Starter switch: "ON"
- ES start main switch: "ON"
- Parking brake: "RELEASE"
- Vehicle speed: 0 km/h {0 mile/h}.

(2) After stepping on the brake pedal for approx. 1 second, check that the buzzer beeps once, ES start indicator light goes on and ES start will operate.

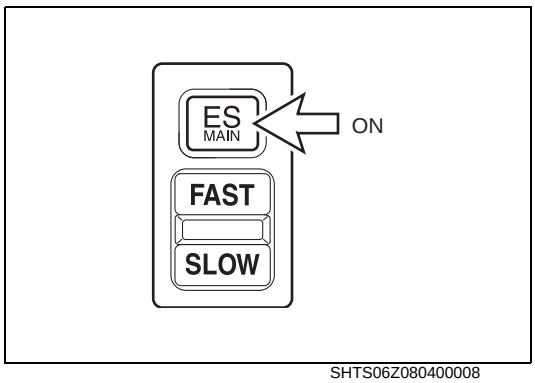
(3) Check that braking force is retained.

(4) By normal operation for taking off (By shifting gear for clutch connection), check that ES start will be released.

ADJUSTMENT FOR RELEASE TIMING

HINT

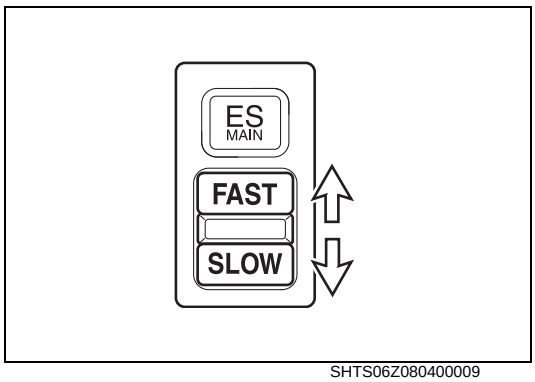
When any discrepancy (Brake dragging or vehicle moving back is produced on release timing of ES start, the release timing can be adjusted at option of driver's taste.



SHTS06Z080400008

1. HOW TO SET

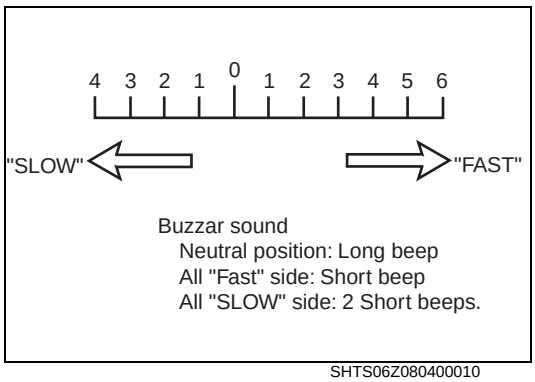
(1) Turn starter switch "ON" and also, put ES start main switch "ON".



SHTS06Z080400009

(2) Push the release timing switch to "FAST" or "SLOW" side for 0.5 sec.

(3) When you want to adjust it to "FAST" side, push the switch to "FAST" side. And when adjusting it to "SLOW" side, push it to "SLOW" side.
Accordingly, the release timing will be adjusted by a direction of the switch to be pushed and its adjusting position will be indicated by buzzer.
When you want to keep adjusting it, release the switch once and push it again.



SHTS06Z080400010

(4) Adjustable range is up to 6 to "FAST" and up to 4 to "SLOW" side and adjusting position will be indicated by buzzer sound.

NOTICE

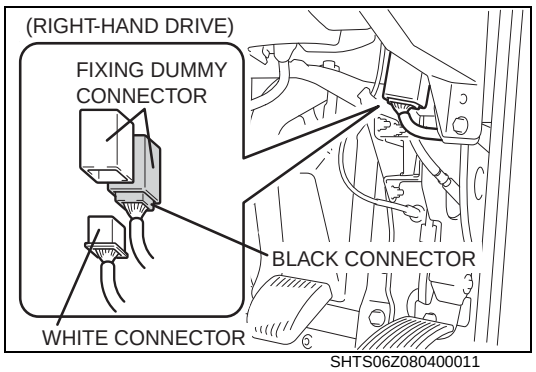
However, release timing adjustment can not be made in the following cases:

1. **When any malfunction is found through diagnosis function.**
2. **When the vehicle running at speed of more than 5 km/h {2.7 mile/h}.**
3. **When ES start main switch is pushed to "RELEASE" side.**
4. **When diagnosis monitor connected.**

INITIAL SETTING OF ES START

HINT

This should be done to memorize Initial value of ES start releasing position (Contacting point of clutch) and 0-point of clutch control sensor in the computer.



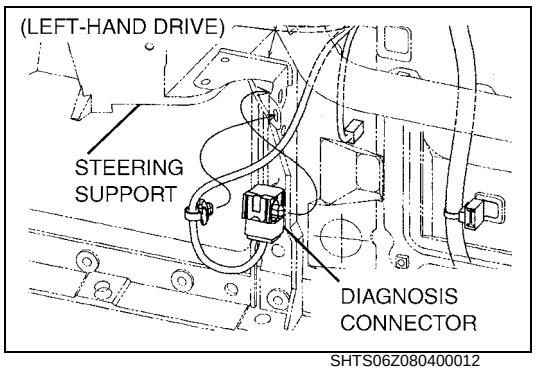
SHTS06Z080400011

1. HOW TO SET

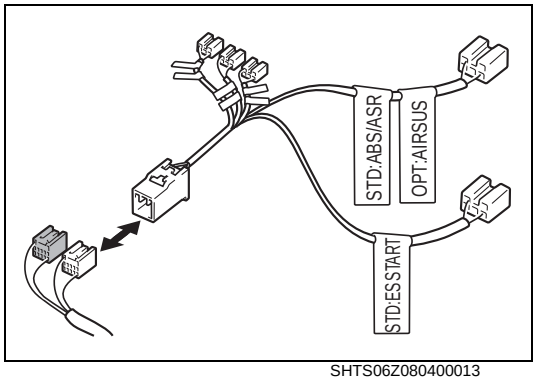
(1) Disconnect the centralized diagnosis connector (On lower right of the driver's side instrument panel) from the dummy connector.

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.



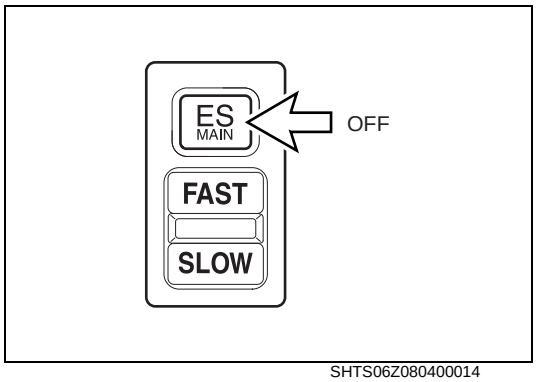
SHTS06Z080400012



SHTS06Z080400013

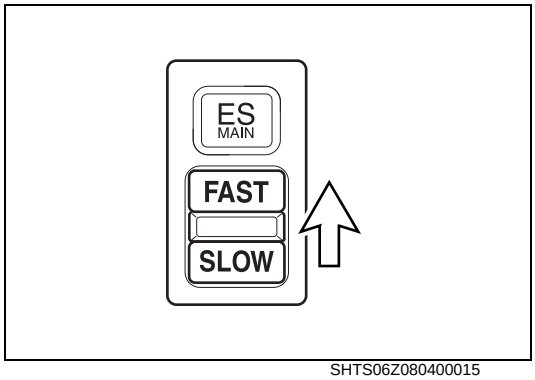
(2) Connect the dedicated harness to the centralized diagnosis connector and diagnosis monitor to the connector tagged by "STD: ABS/ASR".
SST:
Dedicated harness (S0963-02300)
Diagnosis monitor (S0963-01370)

(3) Checking installing condition of clutch stroke sensor, step off the clutch pedal.



SHTS06Z080400014

(4) By turning starter switch "ON", ES start main switch "OFF" and pulling parking brake lever, start engine.



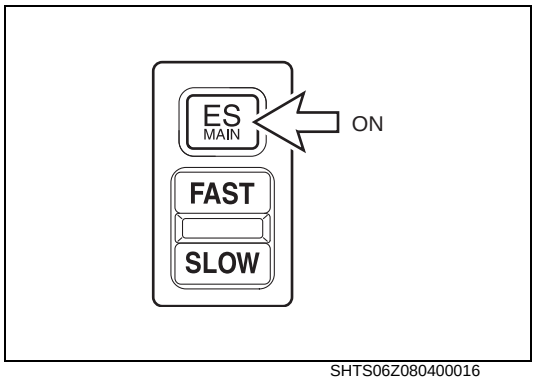
SHTS06Z080400015

(5) Put release timing switch on "FAST".

NOTICE
Do not step on clutch pedal deeply.

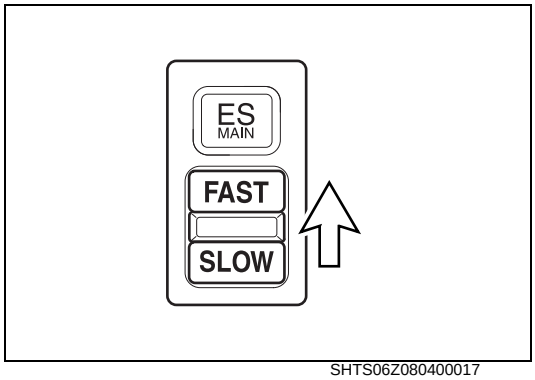
(6) Check that the buzzer will "beep", "beep", "beep".
(0-point setting of clutch stroke sensor will be completed)

NOTICE
When the buzzer beeps, check clutch stroke sensor and its relating circuit.



SHTS06Z080400016

(7) Turning ES start main switch "ON" and stepping on clutch, shift to 3rd gear.

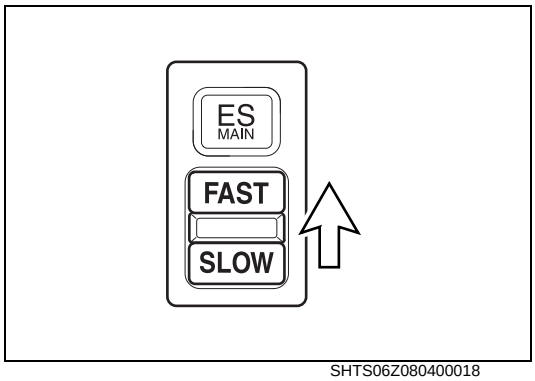


SHTS06Z080400017

(8) Under this condition, push release timing switch to "FAST" side for 3 sec.

HINT
The above mentioned operation will make the buzzer to be beeped 2 times and lead to initial setting of release position.
In spite of releasing the switch, the condition will be kept.

(9) Connect clutch gradually.



SHTS06Z080400018

(10) When engine revolution falling and then coming back, push release timing switch to "FAST" side again.

(11) Check that the buzzer will beep, beep and beep.
(Initial setting of release position is completed)

(12) After removing diagnosis monitor, turn starter switch to "LOCK" position to complete the initial setting.

NOTICE

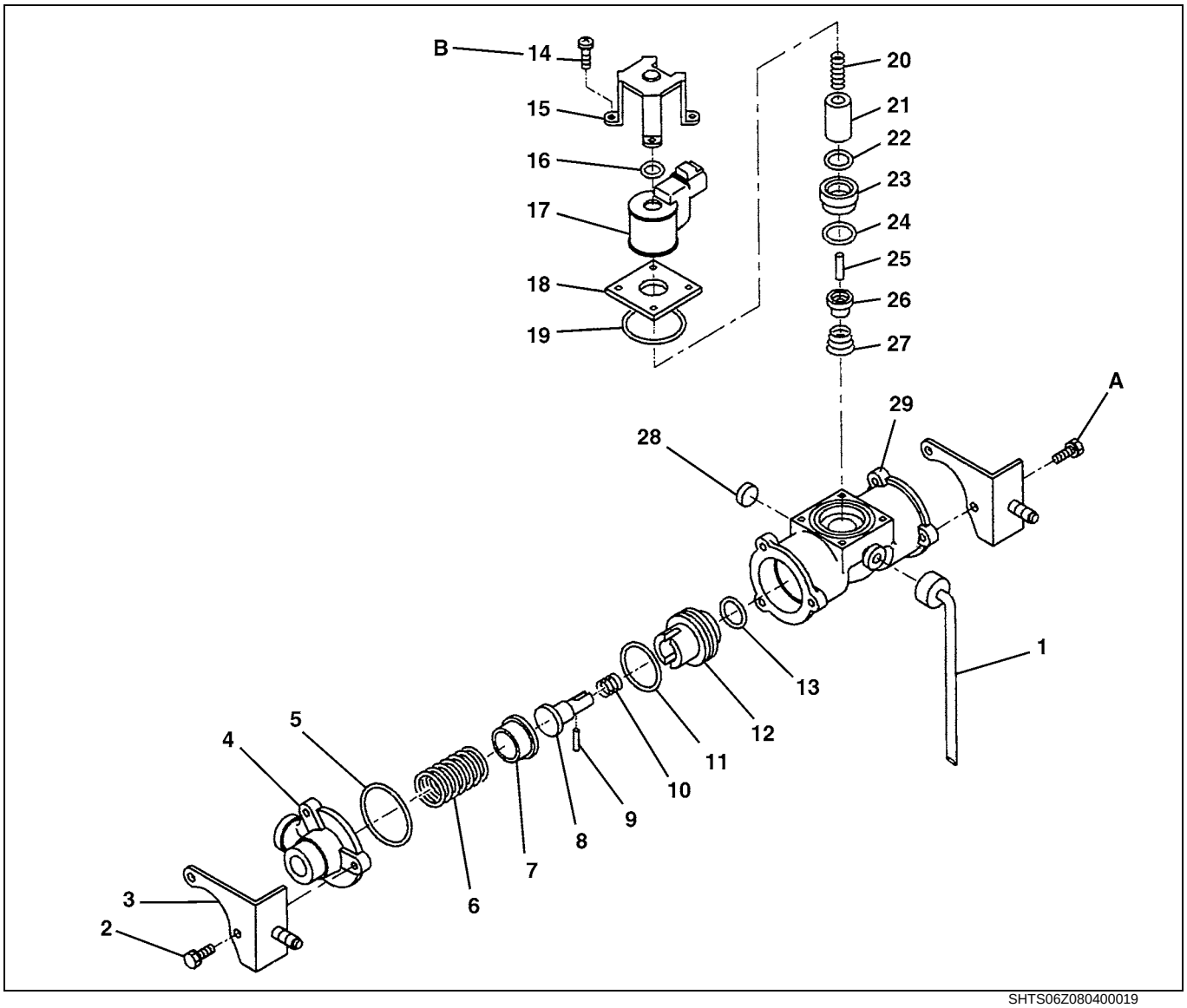
- **When you want to complete the initial setting on the way, remove off diagnosis monitor.**
- **In case of the following cases, the initial setting can not be made.**

1. **Malfunction alarm is operating.**
2. **Parking brake lever is not pulled back.**
3. **Diagnosis monitor is not connected.**
4. **Wrong clutch operation was made.**

ES START CONTROL VALVE

COMPONENT LOCATOR

EN06Z0804D100001



SHTS06Z080400019

1	Hose	11	O-ring	21	Plunger
2	Bolt	12	Piston	22	O-ring
3	Bracket	13	O-ring	23	Valve seat
4	Cover	14	Screw	24	O-ring
5	Seal	15	Solenoid cover	25	Rod
6	Spring	16	O-ring	26	Valve
7	Spring seat	17	Solenoid assembly	27	Spring
8	Inlet valve	18	Coil cover	28	Filter
9	Straight pin	19	O-ring	29	Body
10	Spring	20	Spring		

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

A	3.9-5.9 {40-60, 2.9-4.3}	B	1.2-1.7 {13-17, 0.49-1.22}

OVERHAUL

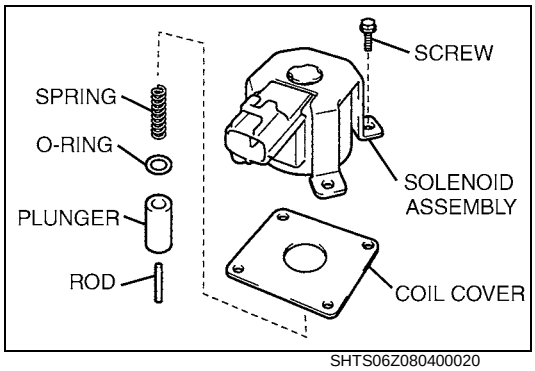
EN06Z0804H200001

IMPORTANT POINT - DISMOUNTING

NOTICE

- **When dismounting and storing parts, place a cap on all ports so not dirt or dust enters.**
- **Be careful so water, dirt, or dust does not enter inside the harness connector to prevent solenoid short circuits or faulty connections.**

IMPORTANT POINT - DISASSEMBLY



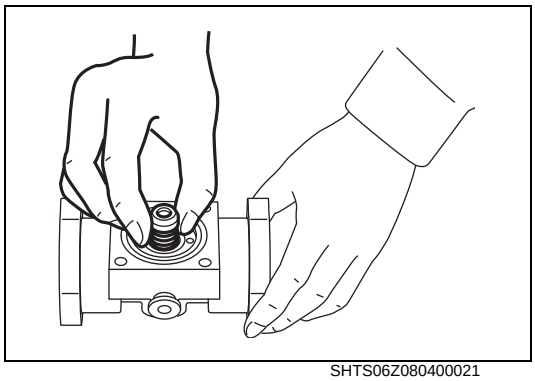
SHTS06Z080400020

NOTICE

Never loosen the screws in the solenoid assembly. Replace the solenoid assembly if the screws have been loosened.

IMPORTANT POINT - ASSEMBLY

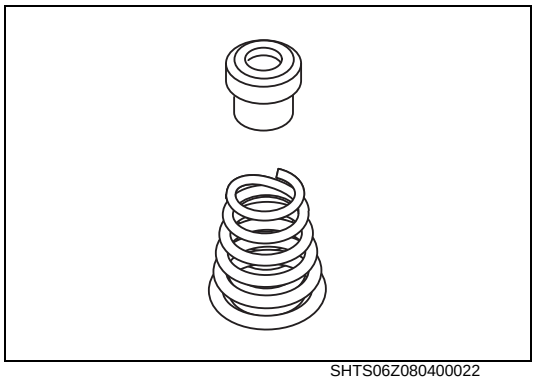
1. ASSEMBLE THE ES START CONTROL VALVE.


SHTS06Z080400021

NOTICE

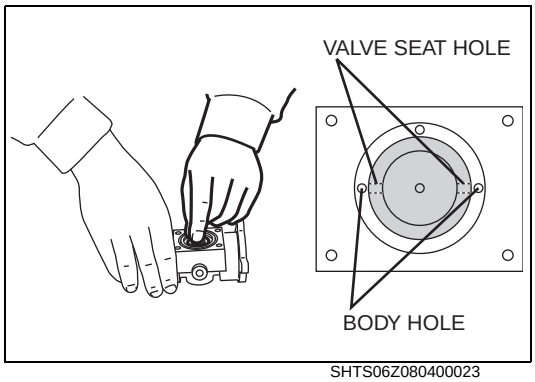
Apply an adequate amount of grease to each O-ring before assembly.

(1) Insert the spring in the valve and assemble it in the body.


SHTS06Z080400022

NOTICE

Assemble the valve and the spring as shown in the figure.

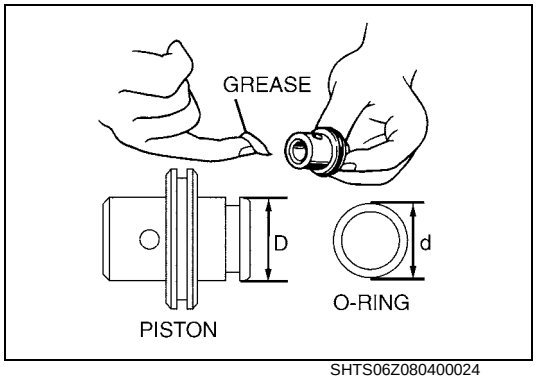


SHTS06Z080400023

(2) Align and attach the O-ring in the small diameter space in the valve seat correctly and install it in the body.

NOTICE

Align the valve seat holes and body holes to perform the assembly.



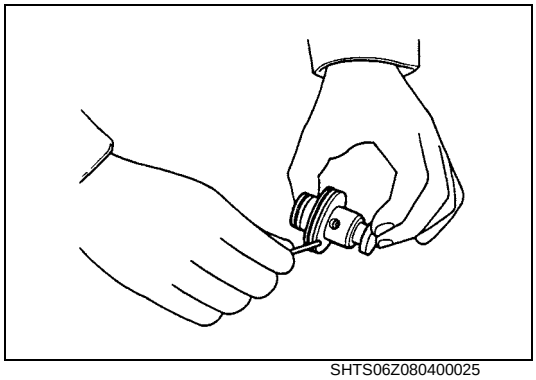
SHTS06Z080400024

(3) Assemble the O-rings (2 units) in the piston and lubricate the inside diameter of the piston with grease.

NOTICE

Verify the diameter of the O-ring (small diameter) because there are multiple settings and then assemble the unit.

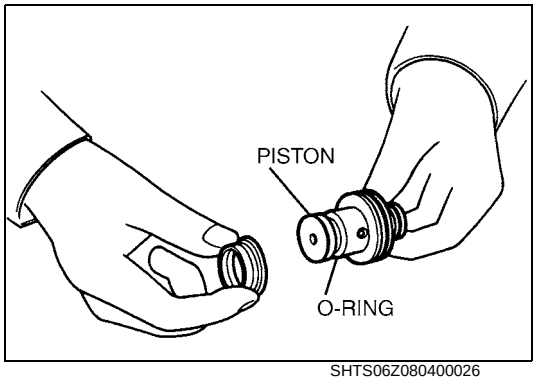
D dimension = 22 mm {0.87 in.}
d dimension = 22 mm {0.87 in.}


SHTS06Z080400025

(4) Assemble the spring, piston and inlet valve. Press in the inlet valve and install the straight pin.

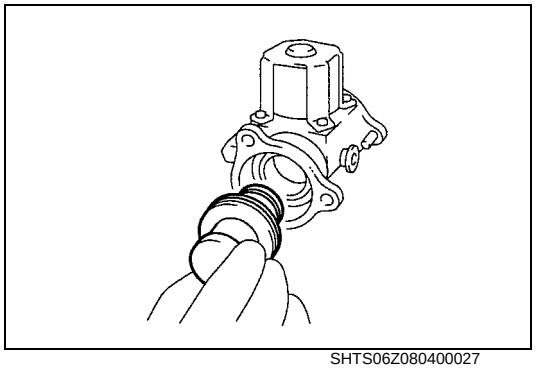
NOTICE

Align the inlet valve pin hole and piston pin hole and assemble the parts. After the assembly is completed, do not rotate the inlet valve to align the pin holes.



SHTS06Z080400026

(5) Position the spring seat collar so it faces the rear side and install the unit.
(6) Apply grease to the outer surface of the O-ring installed in the piston.


SHTS06Z080400027

(7) Apply grease to the inner surface of the body.
(8) Insert the piston inlet valve assembly in the body.

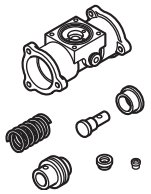
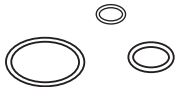
NOTICE

Do not turn the piston when inserting it.

INSPECTION AND REPAIR

EN06Z0804H300002

NOTICE
Isopropyl alcohol should only be used to wash the ES start control valve components.

Inspection item	Standard	Limit	Remedy	Inspection procedure
Valve body inside, piston, valve, valve seat, spring and inlet valve: Wear and damage	**—**	**—**	**Replace.**	**Visual check** 
O-ring: Crack and damage	**—**	**—**	**Replace.**	**Visual check** 

ES START (EASY & SMOOTH START SYSTEM) (WABCO ABS FOR FULL AIR BRAKE) BR04-003

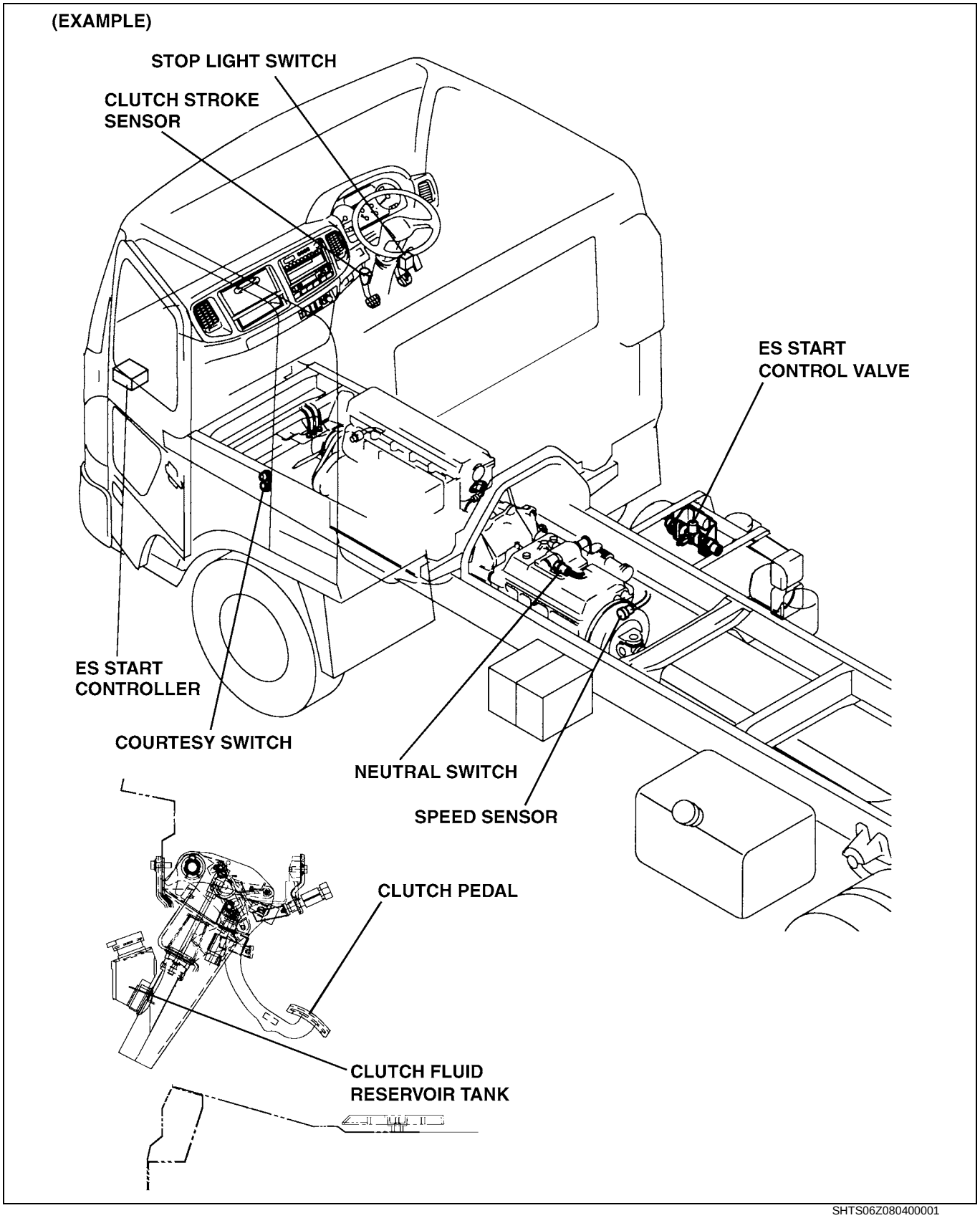
ES START BR04-2
DESCRIPTION BR04-2
DIAGRAM BR04-3
SPECIAL TOOL BR04-4
ADJUSTMENT BR04-5

ES START CONTROL VALVE BR04-13
COMPONENT LOCATOR BR04-13
OVERHAUL BR04-14
INSPECTION AND REPAIR BR04-16

ES START

DESCRIPTION

EN06Z0804C100001

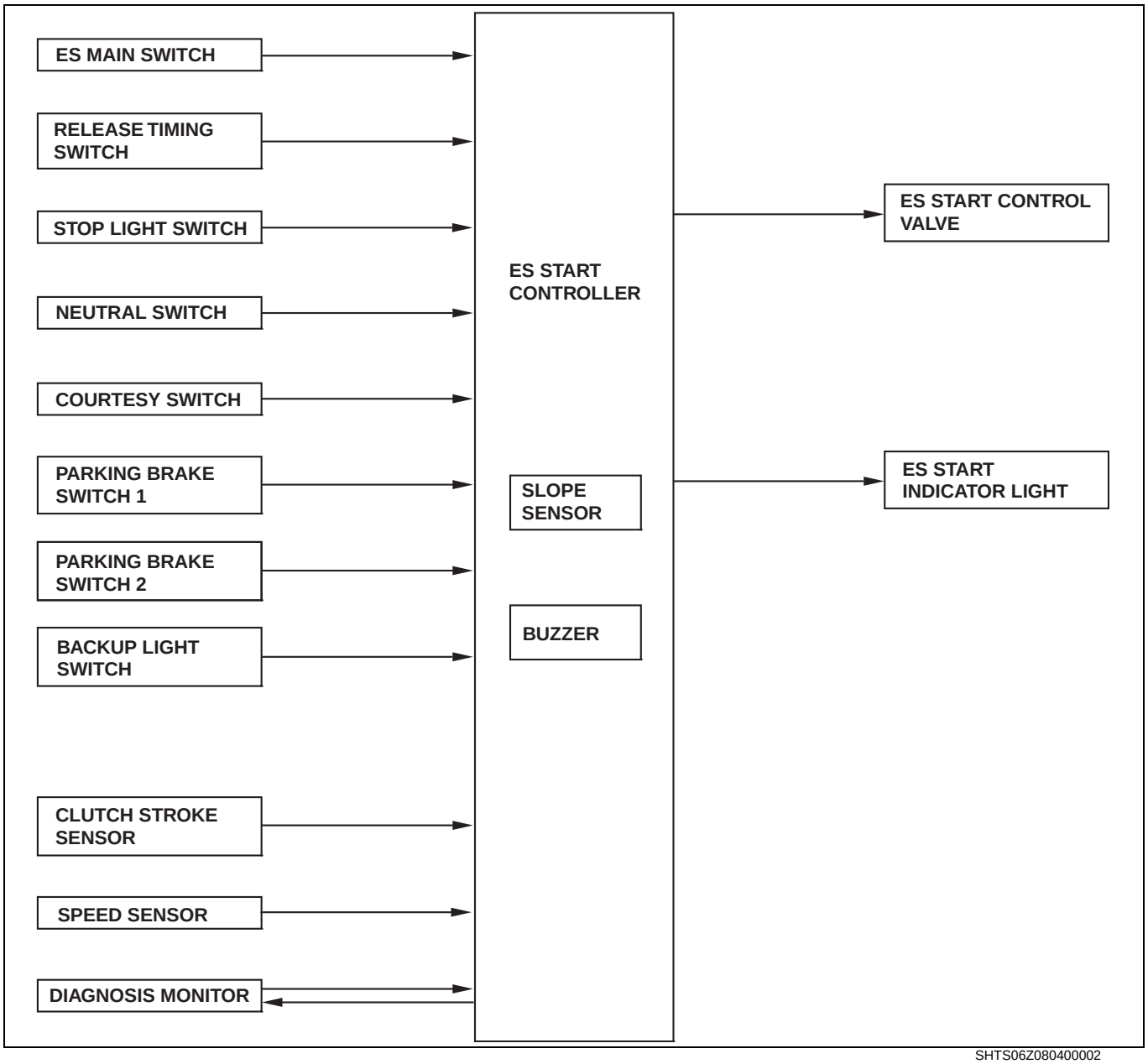


SHTS06Z080400001

DIAGRAM

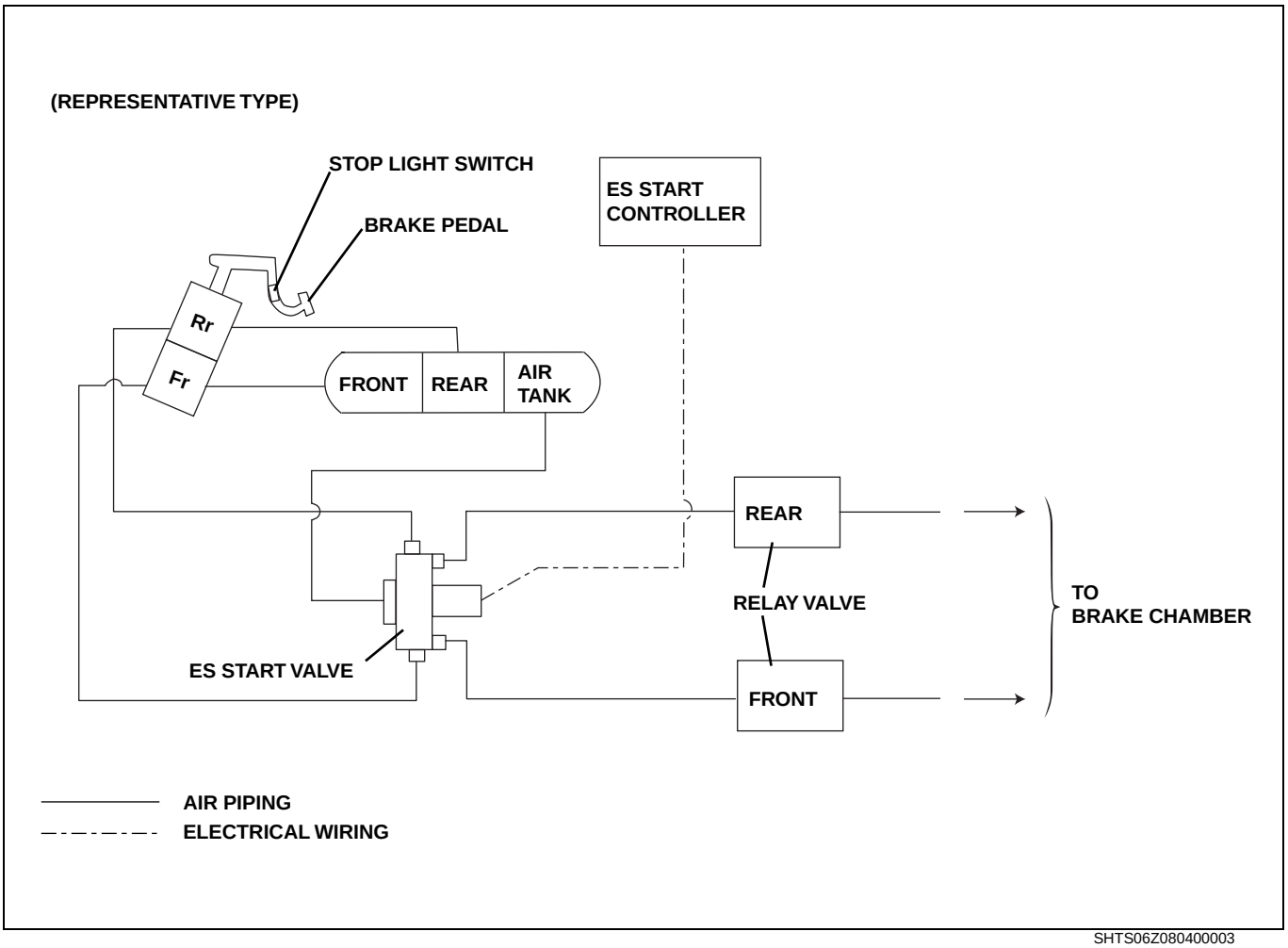
EN06Z0804J100001

SYSTEM DIAGRAM



SHTS06Z080400002

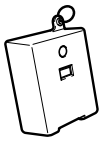
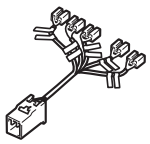
PIPING DIAGRAM



SHTS06Z080400003

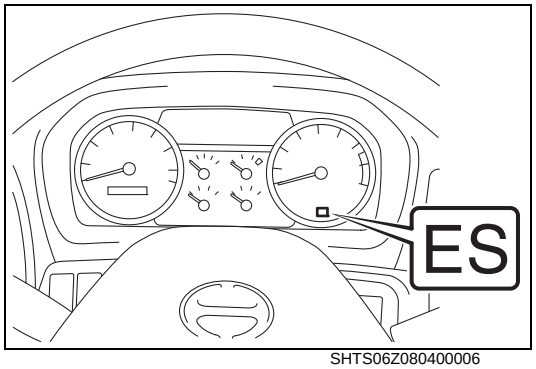
SPECIAL TOOL

EN06Z0804K100001

Illustration	Part number	Tool name	Remarks
	S0963-01370	DIAGNOSIS MONITOR	For diagnosing and setup of ES start
	S0963-02300	DEDICATED HARNESS FOR CENTRALIZED DIAGNOSIS CONNECTOR	For connecting diagnosis monitor

ADJUSTMENT

EN06Z0804H300001



SHTS06Z080400006

OPERATION CHECK.

1. NORMAL OPERATION CHECK

(1) Turn starter switch "ON" position.

(2) Make sure that ES start indicator in the combination meter will go on.

(3) Then, when only ES start light flashes on/off, it means that 0-point adjustment of clutch and initial setting of release position are not made. Accordingly, make them.

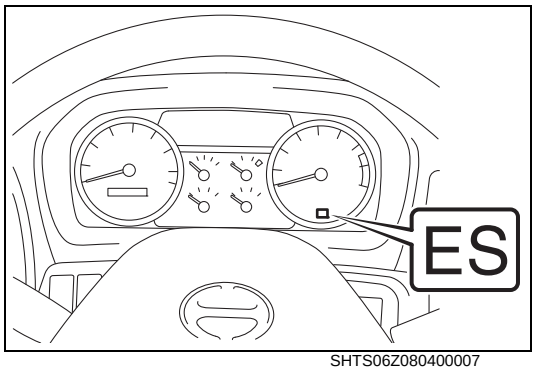
NOTICE

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. OPERATION CHECK

NOTICE

This check should be performed on "Brake Tester" or at place where protective device against the vehicle taking off is installed since taking off operation is needed.



SHTS06Z080400007

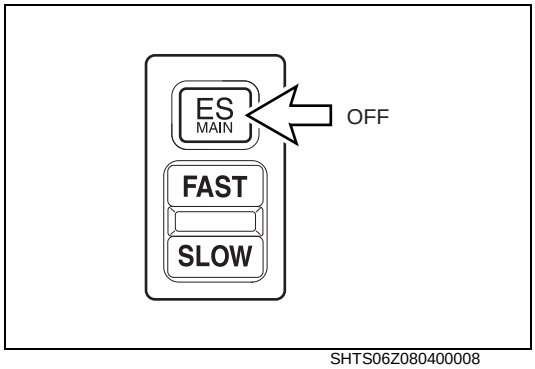
(1) The followings should be fulfilled.

- Starter switch: "ON"
- ES start main switch: "ON"
- Parking brake: "RELEASE"
- Vehicle speed: 0 km/h {0 mile/h}.

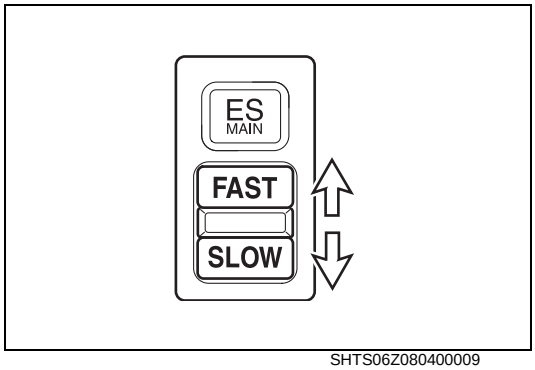
(2) After stepping on the brake pedal for approx. 1 second, check that the buzzer beeps once, ES start indicator light goes on and ES start will operate.

(3) Check that braking force is retained.

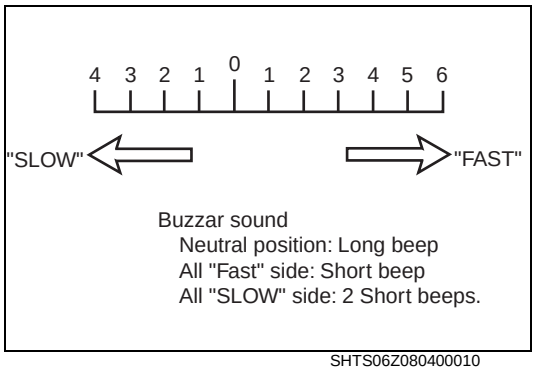
(4) By normal operation for taking off (By shifting gear for clutch connection), check that ES start will be released.



SHTS06Z080400008



SHTS06Z080400009



SHTS06Z080400010

ADJUSTMENT FOR RELEASE TIMING

HINT

When any discrepancy (Brake dragging or vehicle moving back is produced on release timing of ES start, the release timing can be adjusted at option of driver's taste.

1. HOW TO SET

(1) Turn starter switch "ON" and also, put ES start main switch "ON".

(2) Push the release timing switch to "FAST" or "SLOW" side for 0.5 sec.

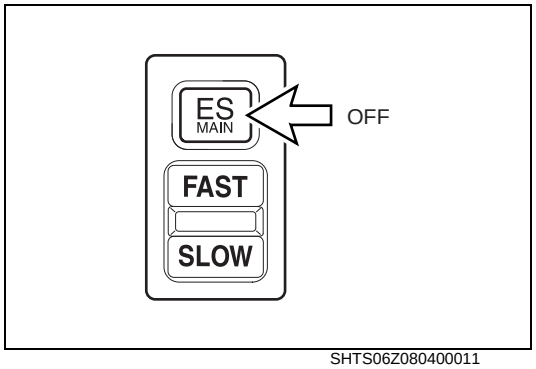
(3) When you want to adjust it to "FAST" side, push the switch to "FAST" side. And when adjusting it to "SLOW" side, push it to "SLOW" side.
Accordingly, the release timing will be adjusted by a direction of the switch to be pushed and its adjusting position will be indicated by buzzer.
When you want to keep adjusting it, release the switch once and push it again.

(4) Adjustable range is up to 6 to "FAST" and up to 4 to "SLOW" side and adjusting position will be indicated by buzzer sound.

NOTICE

However, release timing adjustment can not be made in the following cases:

1. **When any malfunction is found through diagnosis function.**
2. **When the vehicle running at speed of more than 5 km/h {2.7 mile/h}.**
3. **When ES start main switch is pushed to "RELEASE" side.**
4. **When diagnosis monitor connected.**



SHTS06Z080400011

ADJUSTMENT OF THE CLUTCH STROKE SENSOR.

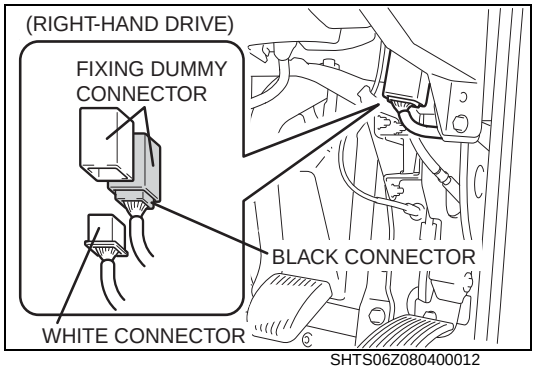
NOTICE

When replacing the clutch disc, clutch stroke sensor or ES start controller, do the following adjustment.

1. ADJUSTMENT PROCEDURE BY USING FUNCTION FOR CONFIRMATION OF THE SENSOR CONDITION.

(1) Set the starter switch "ON".

(2) Set the ES main switch "OFF".

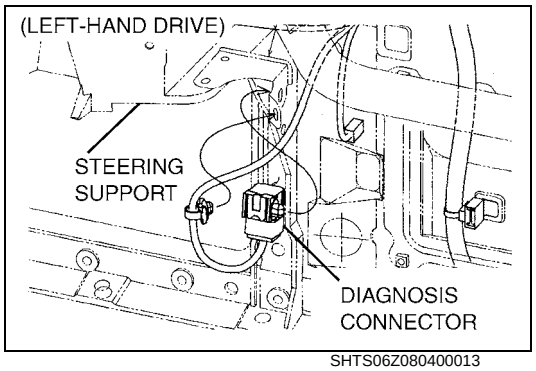


SHTS06Z080400012

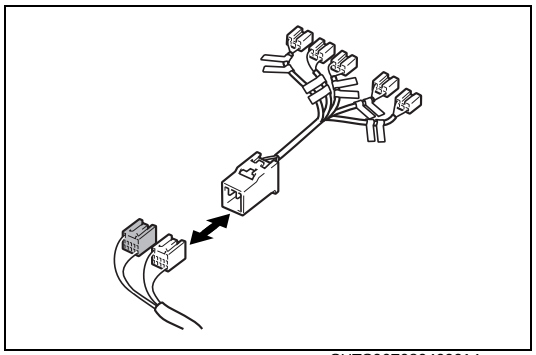
(3) Disconnect the centralized diagnosis connector (On lower right of the driver's side instrument panel) from the dummy connector.

NOTICE

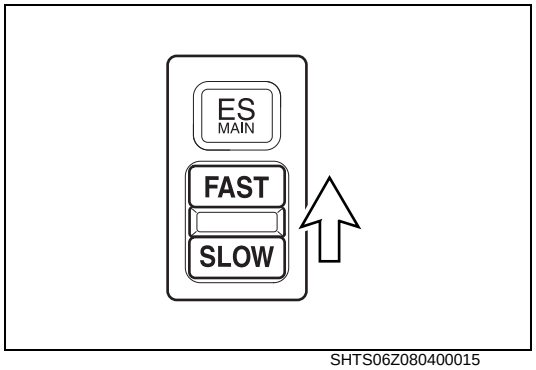
Centralized diagnosis connector is normally coupled with fixed type dummy connector. So, use it by disconnecting from the dummy one and pulling it to this side. When not using it, make sure to leave it connected with fixed type dummy one.



SHTS06Z080400013

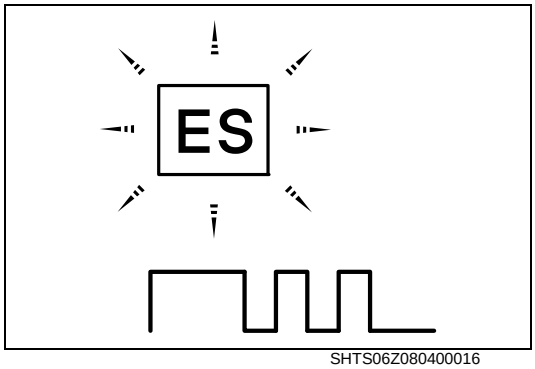

SHTS06Z080400014

(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)



SHTS06Z080400015

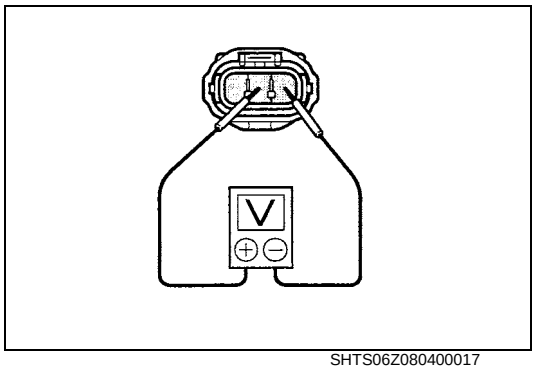
(5) Push "FAST" side of the release timing switch three times.



SHTS06Z080400016

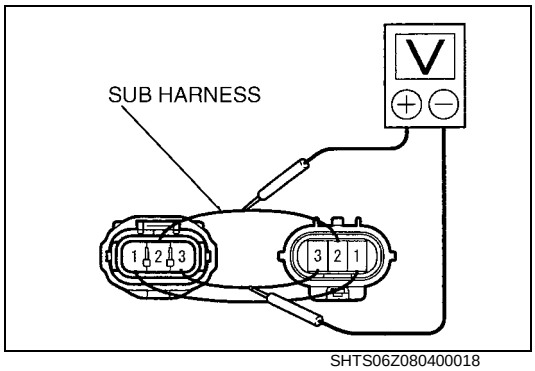
HINT
When the sensor status checking function starts by the above-mentioned operation, ES start indicator lamp on the meter panel lights up and buzzer beeps once according to the patterns shown in the figure.

(6) Diagnose if the adjustment is required or not by the condition of buzzer beeping when the clutch pedal is free.
The buzzer beeps continuously:
Within the range of service limit (adjustment not required)→Go to 4. HOW TO COMPLETE.
The buzzer does not beep or beeps intermittently:
Out of the range of service limit (adjustment required) →Go to 3. ADJUSTMENT PROCEDURE.



SHTS06Z080400017

2. CHECK THE VOLTAGE.
(1) Set the starter switch to "LOCK", remove the connector of the clutch stroke sensor and connect the sub wiring harness between clutch stroke sensor and clutch stroke sensor connector as shown in the figure.



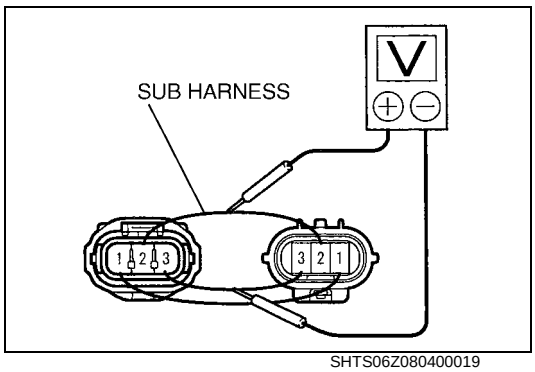
SHTS06Z080400018

(2) Set the starter switch to "ON", measure the voltage between 2nd and 3rd terminals.

NOTICE
Be careful to short.

HINT
Make sub wiring harness ready.

0.28V-0.77V
Within the range of service limit (adjustment not required)
Less than 0.28V or More than 0.77V
Out of the range of service limit (adjustment required)
→Go to 3. ADJUSTMENT PROCEDURE.



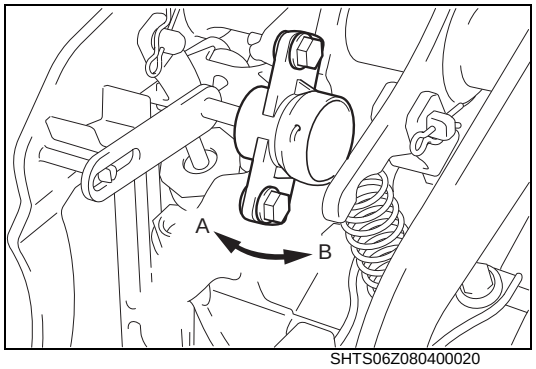
SHTS06Z080400019

(3) Set the starter switch to "LOCK", remove the connector of the clutch stroke sensor and connect the sub wiring harness between clutch stroke sensor and clutch stroke sensor connector as shown in the figure.
(4) Set the starter switch to "ON", measure the voltage between 2nd and 3rd terminals while release the clutch pedal and depress the clutch pedal.

NOTICE
Be careful to short.

HINT
Make sub wiring harness ready.

Standard: Difference valve is more than 3V.



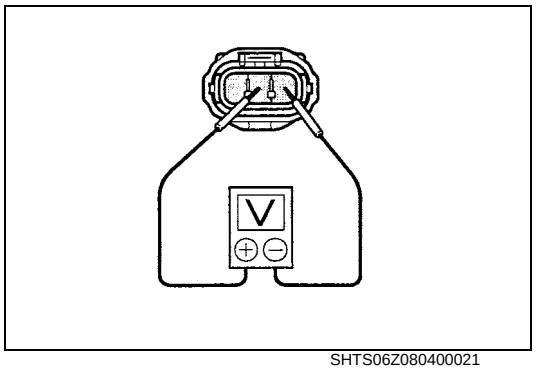
SHTS06Z080400020

3. ADJUSTMENT PROCEDURE

(1) Loosen the clutch stroke sensor fitting bolt to adjust the sensor as shown in the figure.

Buzzer	Voltage	Adjusting procedure
Beeping intermittently	More than 0.77V	Turn the sensor to A direction
Beeping continuously	0.28-0.77V	Normal condition
No beeping	Less than 0.28V	Turn the sensor to B direction

(2) After completing the adjustment, proceed to step 4.

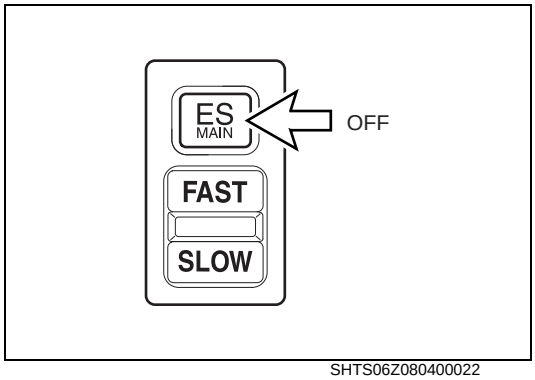


SHTS06Z080400021

4. HOW TO COMPLETE

(1) Tighten the clutch stroke sensor fitting bolt. (Make sure there is no misalignment.)
Tightening Torque:
2.7-6.3 N·m {27.5-64.2 kgf·cm, 2.0-4.6 lbf·in.}

(2) After using the status checking function, turn the release timing switch to "FAST" side, or ES main switch "ON" before detaching the diagnosis monitor.



SHTS06Z080400022

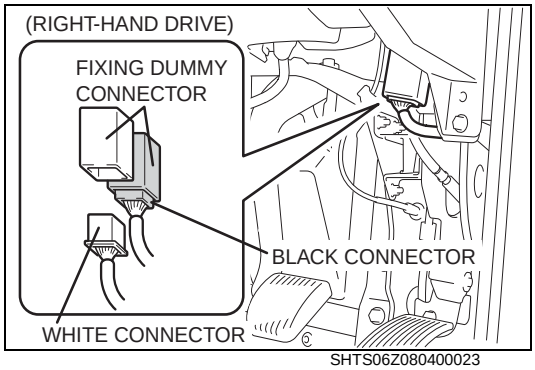
INITIALIZATION OF RELEASE POSITION

HINT

This is for memorizing the default value of ES start release position (engaging point of clutch) to ES start controller.

1. HOW TO SETUP

(1) Turn the starter switch "ON" and ES main switch "OFF". Then pull the parking brake lever.

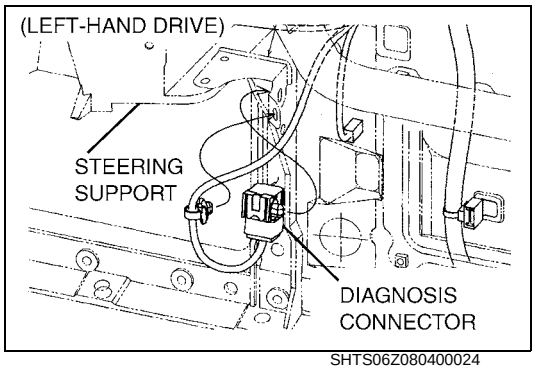


SHTS06Z080400023

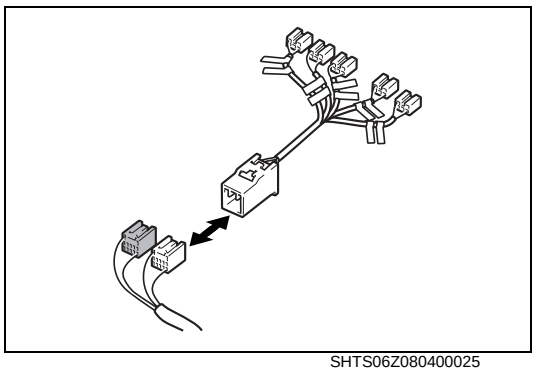
(2) Disconnect the centralized diagnosis connector (On lower right of the driver's side instrument panel) from the dummy connector.

NOTICE

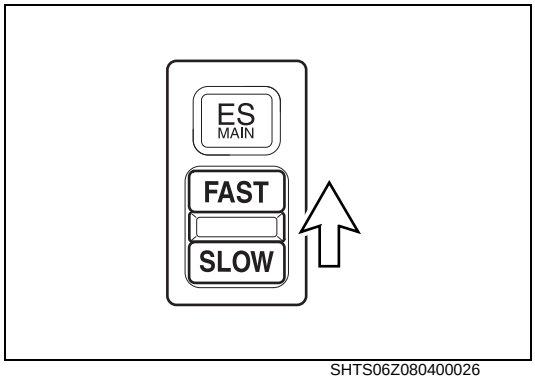
Centralized diagnosis connector is normally coupled with fixed type dummy connector. So, use it by disconnecting from the dummy one and pulling it to this side. When not using it, make sure to leave it connected with fixed type dummy one.



SHTS06Z080400024


SHTS06Z080400025

(3) 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)



SHTS06Z080400026

(4) Make sure that the clutch pedal has returned completely and press "FAST" side of the release timing switch for 3 seconds.

HINT

When the above operation has been completed, the buzzer beeps and the indicator lamp also blinks in exact timing with the buzzer to confirm the startup of the initialization.

(5) Step the clutch pedal and shift the gear to the second and gradually engage the clutch.

(6) When the engine revolution comes into the condition below, press once more "FAST" side of the release timing switch.
Models equipped with mechanical governor:
Tachometer reading goes down by 50 r/min. below the idling revolution.
Models equipped with electronic governor or
Tachometer reading goes down and then returns.

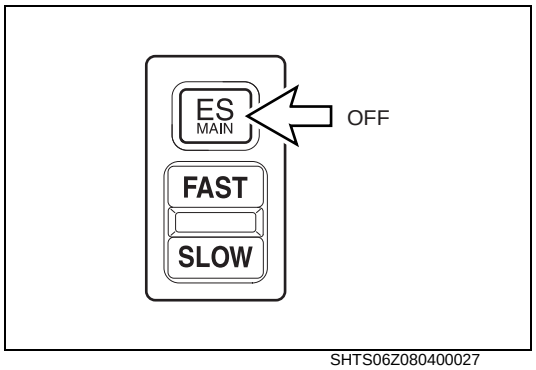
(7) The buzzer beeps once and ES start indicator lamp turns off and then the release position is memorized.

(8) After disconnecting the diagnosis monitor, turn the starter switch to "LOCK" position to complete the initialization.

NOTICE

- **To abort the initialization, disconnect the diagnosis monitor.**
- **On the following conditions, the initialization is impossible.**

1. **Failure alarm is alerting.**
2. **ES start is operating.**
3. **Vehicle speed is 0.5 km/h {0.14 mile/s} or above.**
4. **Parking brake lever has not been pulled.**
5. **Diagnosis monitor is not connected.**



SHTS06Z080400027

0 POINT ADJUSTMENT OF SLOPE SENSOR

HINT

This is for memorizing the slope sensor signal when the vehicle is on the level to ES start controller. (For equipped with air suspension models, perform this adjustment at the normal vehicle height position.)

1. HOW TO SETUP

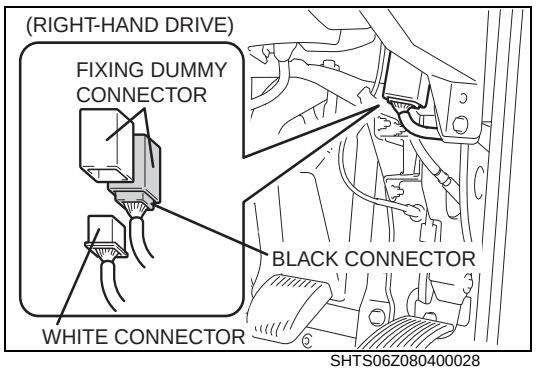
(1) Make sure the conditions below.
Vehicle load: no load
Road condition: on the level

(2) Turn the starter switch "ON" and ES main switch "OFF". Then pull the parking brake lever.

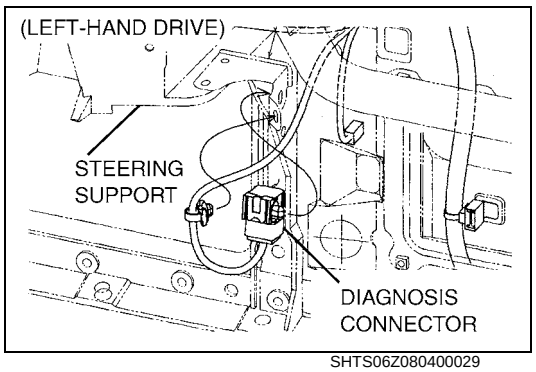
(3) Disconnect the centralized diagnosis connector (On lower right of the driver's side instrument panel) from the dummy connector.

NOTICE

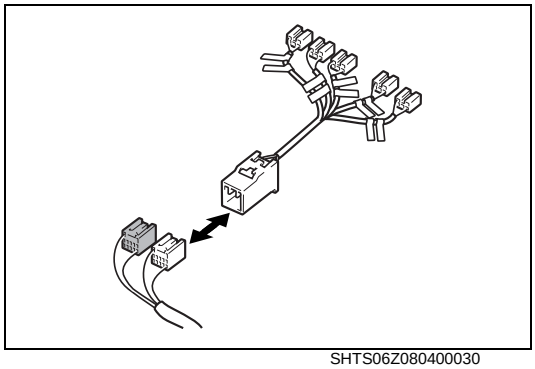
Centralized diagnosis connector is normally coupled with fixed type dummy connector. So, use it by disconnecting from the dummy one and pulling it to this side. When not using it, make sure to leave it connected with fixed type dummy one.



SHTS06Z080400028

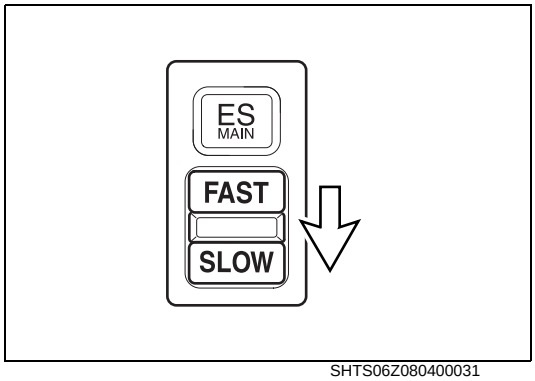


SHTS06Z080400029



SHTS06Z080400030

(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)



SHTS06Z080400031

(5) Press "SLOW" side of the release timing switch for 3 seconds.

HINT
When the above operation has been completed, the buzzer beeps and the indicator lamp also blinks in exact timing with the buzzer to confirm the setup starts. (This condition continues after the switch is released.)

(6) Press "SLOW" side of the release timing switch again.
(7) The buzzer beeps once and ES start indicator lamp turns off and then the slope sensor output value is memorized.
(8) After disconnecting the diagnosis monitor, turn the starter key to "LOCK" position to complete 0 point adjustment.

NOTICE

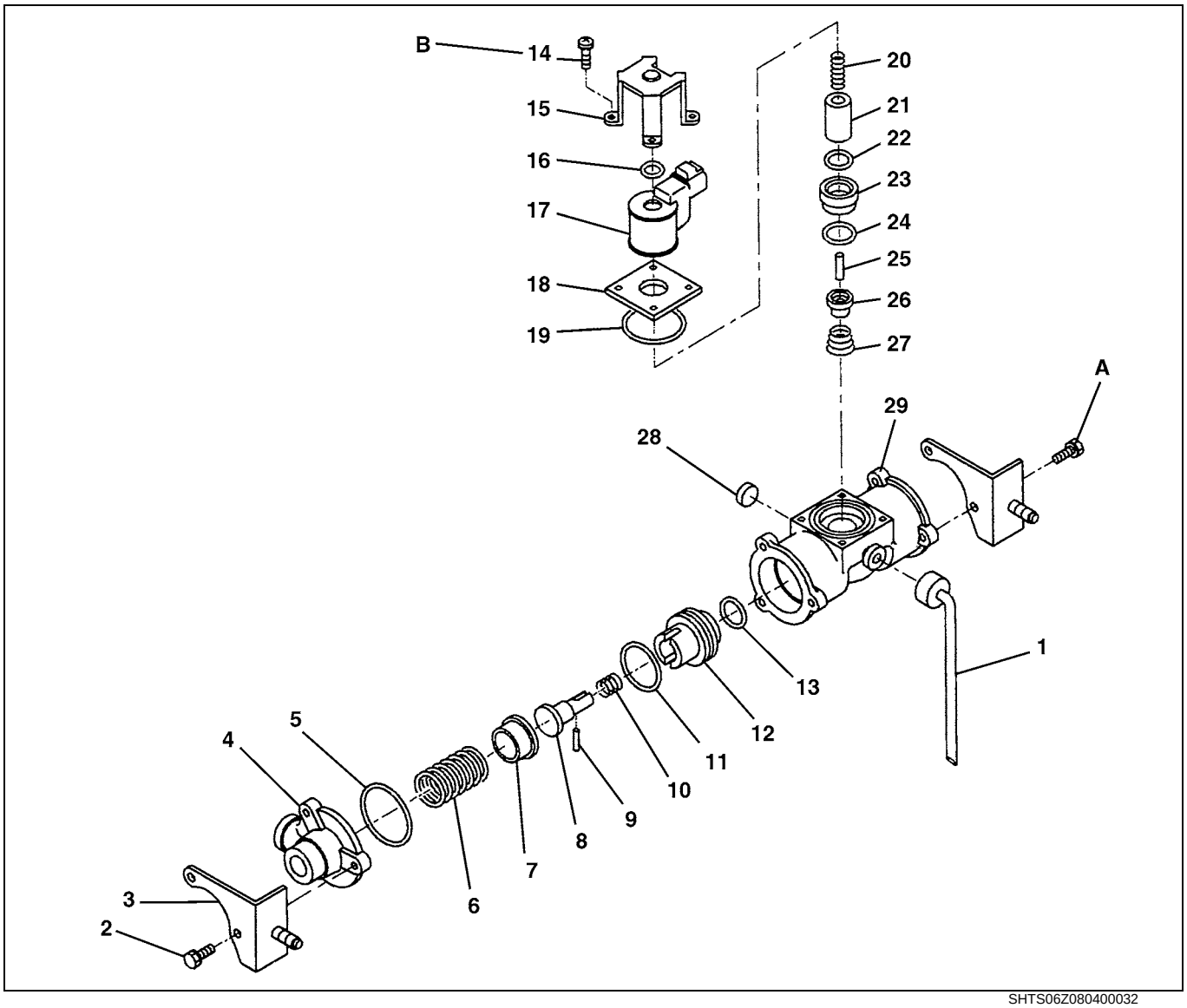
- **0 point adjustment of slope sensor must be done on the level road. (If the adjustment is done on slope road, the sensor does not function properly.)**
- **If startup of 0 point adjustment is impossible, the road condition is not on the level. Move the vehicle to a place on the level.**
- **On the following conditions, 0 point adjustment is impossible.**

1. **Failure alarm is alerting.**
2. **ES start is operating.**
3. **Vehicle speed is 0.5 km/h {0.14 mile/s} or above.**
4. **Parking brake lever has not been pulled.**
5. **Diagnosis monitor is not connected.**

ES START CONTROL VALVE

COMPONENT LOCATOR

EN06Z0804D100001



SHTS06Z080400032

1	Hose	11	O-ring	21	Plunger
2	Bolt	12	Piston	22	O-ring
3	Bracket	13	O-ring	23	Valve seat
4	Cover	14	Screw	24	O-ring
5	Seal	15	Solenoid cover	25	Rod
6	Spring	16	O-ring	26	Valve
7	Spring seat	17	Solenoid assembly	27	Spring
8	Inlet valve	18	Coil cover	28	Filter
9	Straight pin	19	O-ring	29	Body
10	Spring	20	Spring		

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

A	3.9-5.9 {40-60, 2.9-4.3}	B	1.2-1.7 {13-17, 0.49-1.22}

OVERHAUL

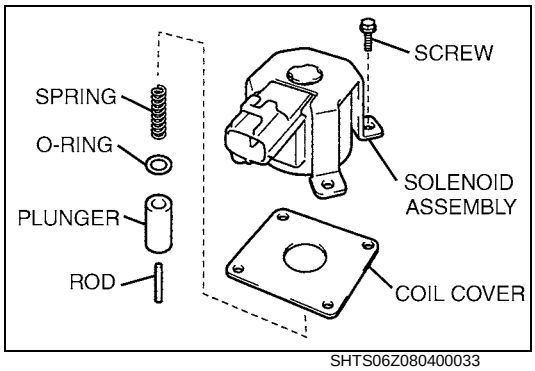
EN06Z0804H200001

IMPORTANT POINT - DISMOUNTING

NOTICE

- **When dismounting and storing parts, place a cap on all ports so not dirt or dust enters.**
- **Be careful so water, dirt, or dust does not enter inside the harness connector to prevent solenoid short circuits or faulty connections.**

IMPORTANT POINT - DISASSEMBLY



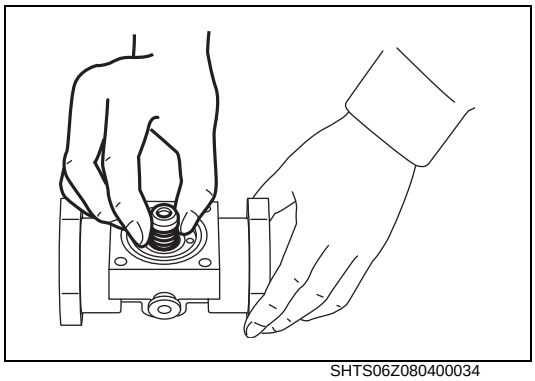
SHTS06Z080400033

NOTICE

Never loosen the screws in the solenoid assembly. Replace the solenoid assembly if the screws have been loosened.

IMPORTANT POINT - ASSEMBLY

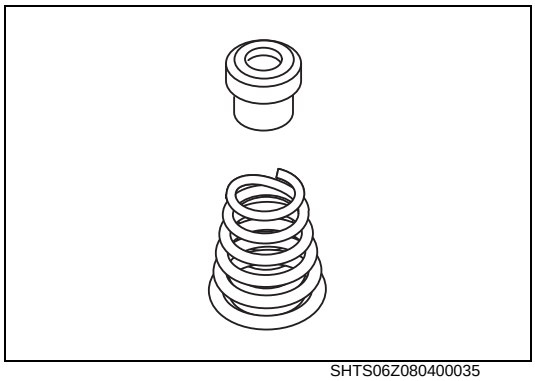
1. ASSEMBLE THE ES START CONTROL VALVE.


SHTS06Z080400034

NOTICE

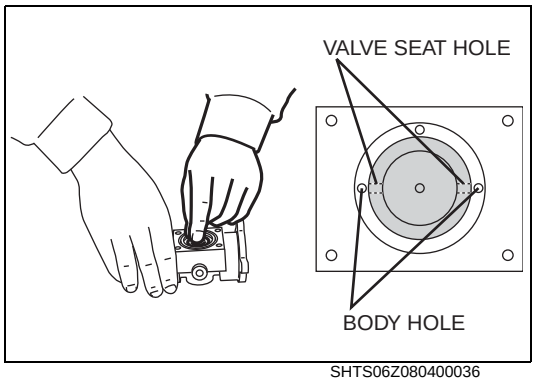
Apply an adequate amount of grease to each O-ring before assembly.

(1) Insert the spring in the valve and assemble it in the body.


SHTS06Z080400035

NOTICE

Assemble the valve and the spring as shown in the figure.

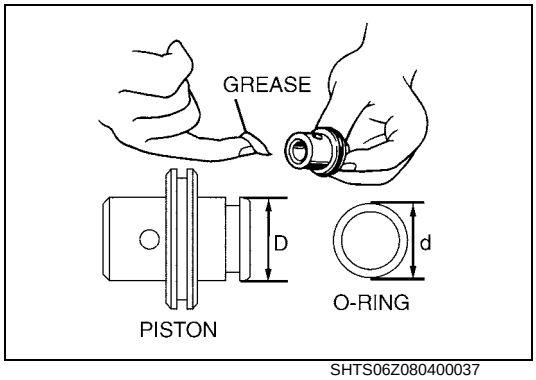


SHTS06Z080400036

(2) Align and attach the O-ring in the small diameter space in the valve seat correctly and install it in the body.

NOTICE

Align the valve seat holes and body holes to perform the assembly.



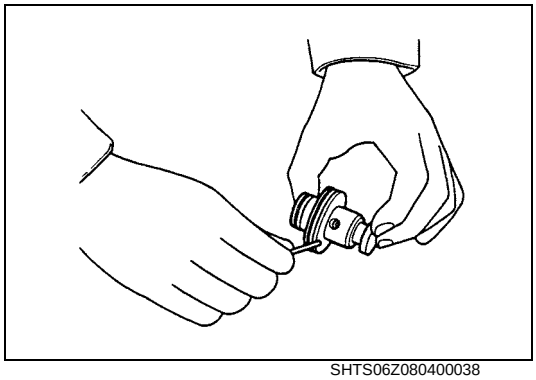
SHTS06Z080400037

(3) Assemble the O-rings (2 units) in the piston and lubricate the inside diameter of the piston with grease.

NOTICE

Verify the diameter of the O-ring (small diameter) because there are multiple settings and then assemble the unit.

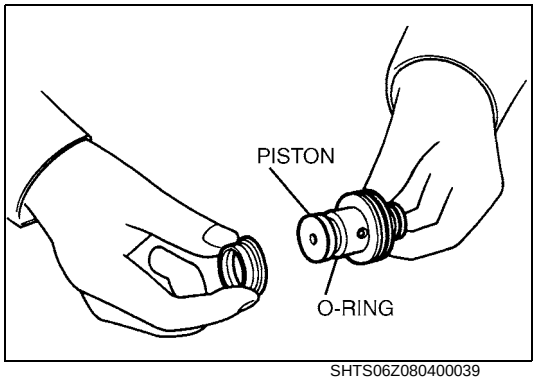
D dimension = 22 mm {0.87 in.}
d dimension = 22 mm {0.87 in.}


SHTS06Z080400038

(4) Assemble the spring, piston and inlet valve. Press in the inlet valve and install the straight pin.

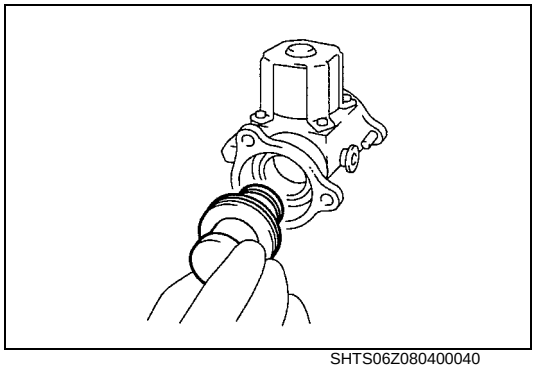
NOTICE

Align the inlet valve pin hole and piston pin hole and assemble the parts. After the assembly is completed, do not rotate the inlet valve to align the pin holes.



SHTS06Z080400039

(5) Position the spring seat collar so it faces the rear side and install the unit.
(6) Apply grease to the outer surface of the O-ring installed in the piston.


SHTS06Z080400040

(7) Apply grease to the inner surface of the body.
(8) Insert the piston inlet valve assembly in the body.

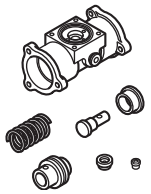
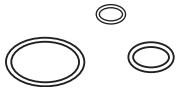
NOTICE

Do not turn the piston when inserting it.

INSPECTION AND REPAIR

EN06Z0804H300002

NOTICE
Isopropyl alcohol should only be used to wash the ES start control valve components.

Inspection item	Standard	Limit	Remedy	Inspection procedure
Valve body inside, piston, valve, valve seat, spring and inlet valve: Wear and damage	**—**	**—**	**Replace.**	**Visual check** 
O-ring: Crack and damage	**—**	**—**	**Replace.**	**Visual check** 

EXHAUST BRAKE

BR05-001

EXHAUST BRAKE SYSTEM BR05-2
SYSTEM DIAGRAM BR05-2
TROUBLESHOOTING..... BR05-3
ADJUSTMENT..... BR05-3

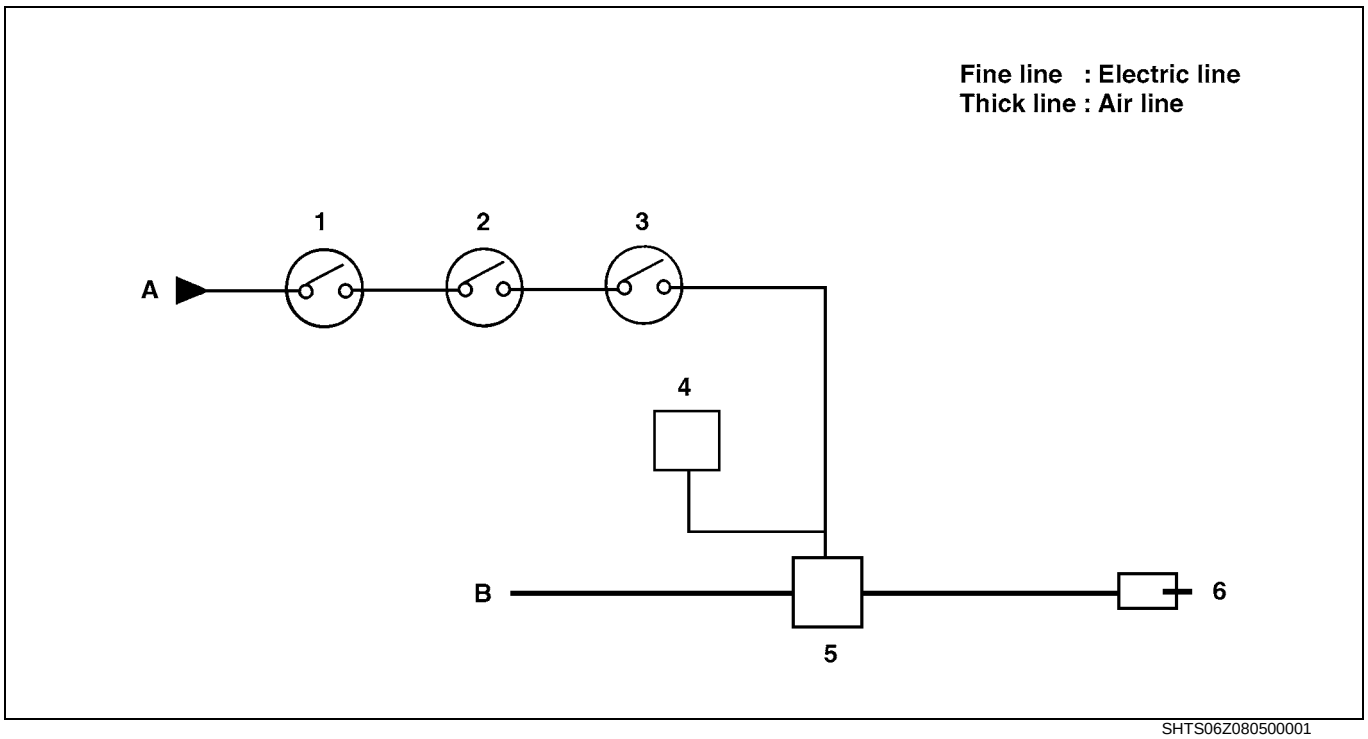
BRAKE CYLINDER
(MODELS: EXCEPT FOR FM2P) BR05-4
DATA AND SPECIFICATION BR05-4
DESCRIPTION BR05-4
COMPONENT LOCATOR BR05-5
OVERHAUL BR05-6
INSPECTION AND REPAIR..... BR05-6
ADJUSTMENT..... BR05-7

BRAKE CYLINDER (MODEL: FM2P) BR05-8
DATA AND SPECIFICATIONS..... BR05-8
DESCRIPTION BR05-8
COMPONENT LOCATOR BR05-9
OVERHAUL BR05-10
INSPECTION AND REPAIR..... BR05-11

EXHAUST BRAKE SYSTEM

SYSTEM DIAGRAM

EN06Z0805J100001



SHTS06Z080500001

1	Clutch switch	5	Magnetic valve
2	Accelerator switch	6	Exhaust brake control cylinder
3	Exhaust brake switch	A	From power source
4	Indicator light	B	From air tank

NOTICE

Figure shown above is a typical diagram; refer to Electric Wiring Diagram in the ELECTRIC WIRE chapter and Brake Piping Diagram in the BRAKE EQUIPMENT chapter for details.

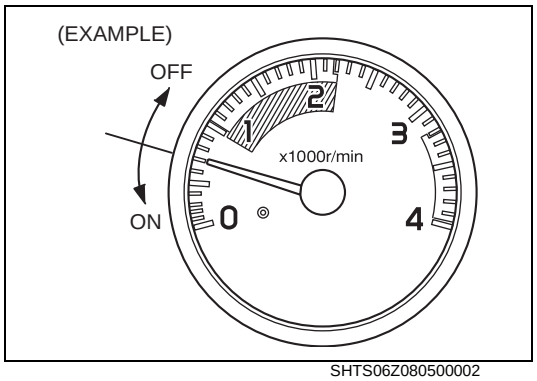
TROUBLESHOOTING

EN06Z0805F300001

Symptom	Possible cause	Remedy/Prevention
Switch does not work	Defective contacts	Check and correct.
	Open circuit in harness	Check and correct.
Valve does not close	Valve clogged with carbon	Remove carbon.
	Burnt shaft	Check and correct.

ADJUSTMENT

EN06Z0805H300001



SHTS06Z080500002

ACCELERATOR SWITCH ADJUSTMENT

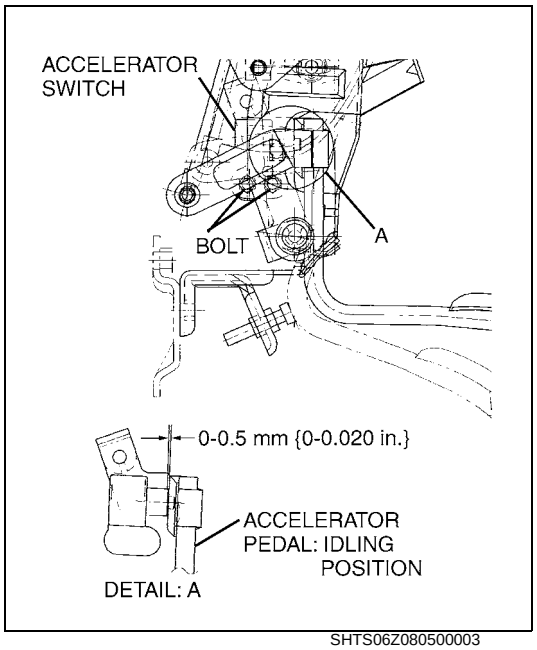
1. ADJUSTMENT OF THE EXHAUST BRAKE ACCORDING TO THE ENGINE SPEED

(1) Adjust the engine idling speed by turning the throttle knob.

(2) The accelerator switch should turn on (continuity) when the engine speed is lower than the following, and off (no continuity) when the engine speed is higher.

NOTICE

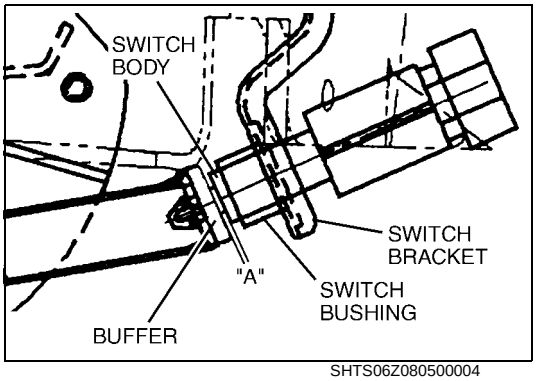
Use the accelerator pedal to change engine speeds.



SHTS06Z080500003

(3) Adjust the accelerator switch position if it is out of position.

Assembly standard: 0-0.5 mm {0-0.020 in.}



SHTS06Z080500004

CLUTCH PEDAL SWITCH ADJUSTMENT

The clutch pedal switch should not be knocked against.

When the clutch pedal is depressed, the clearance "A" (between the buffer and the switch body tip) should have 0.5-1.5 mm {0.020-0.059 in.}.

Assembly standard: 0.5-1.5 mm {0.020-0.059 in.}

BRAKE CYLINDER (MODELS: EXCEPT FOR FM2P)

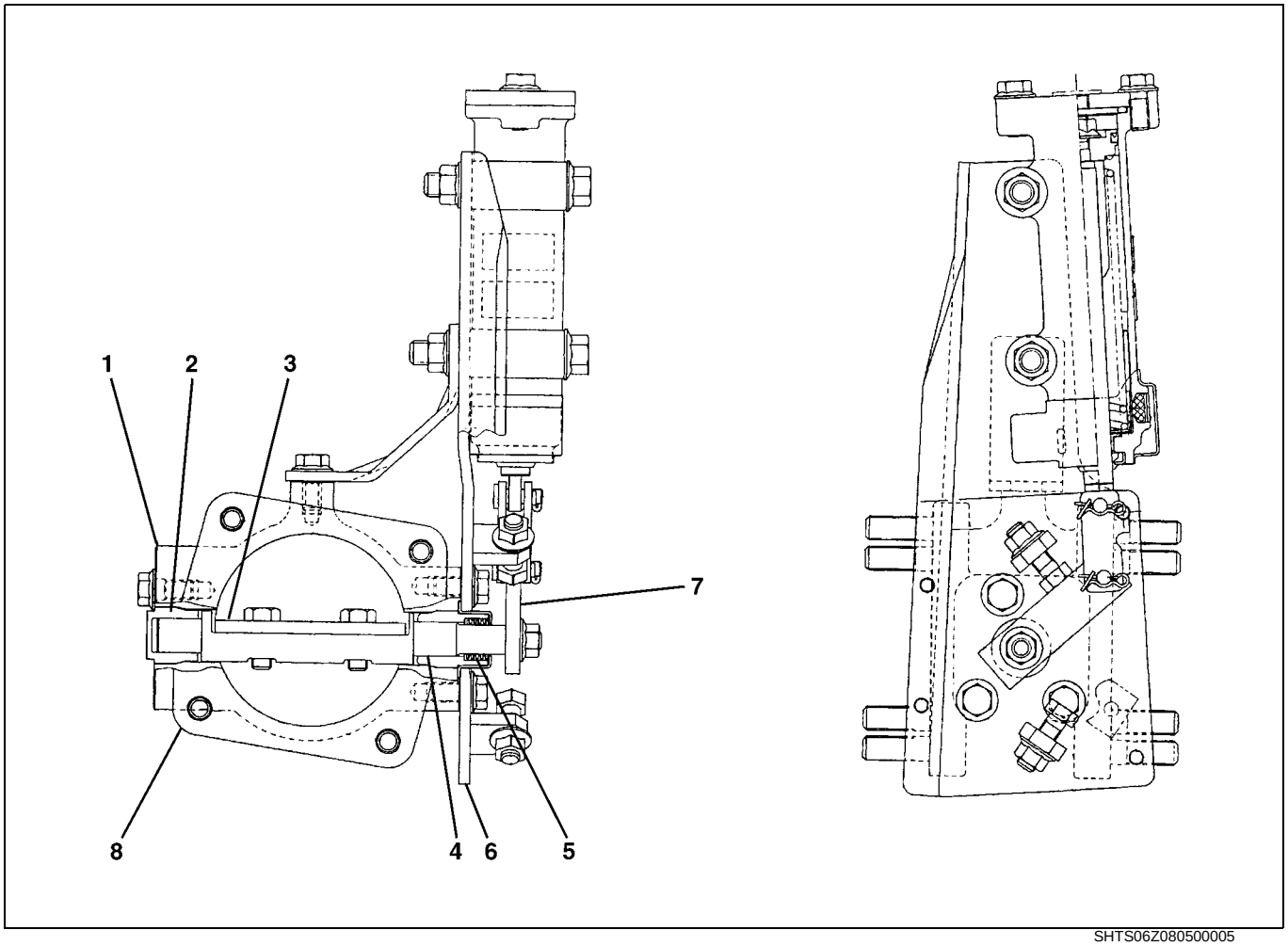
DATA AND SPECIFICATION

EN06Z0805I200001

Type	**Butterfly valve**

DESCRIPTION

EN06Z0805C100001

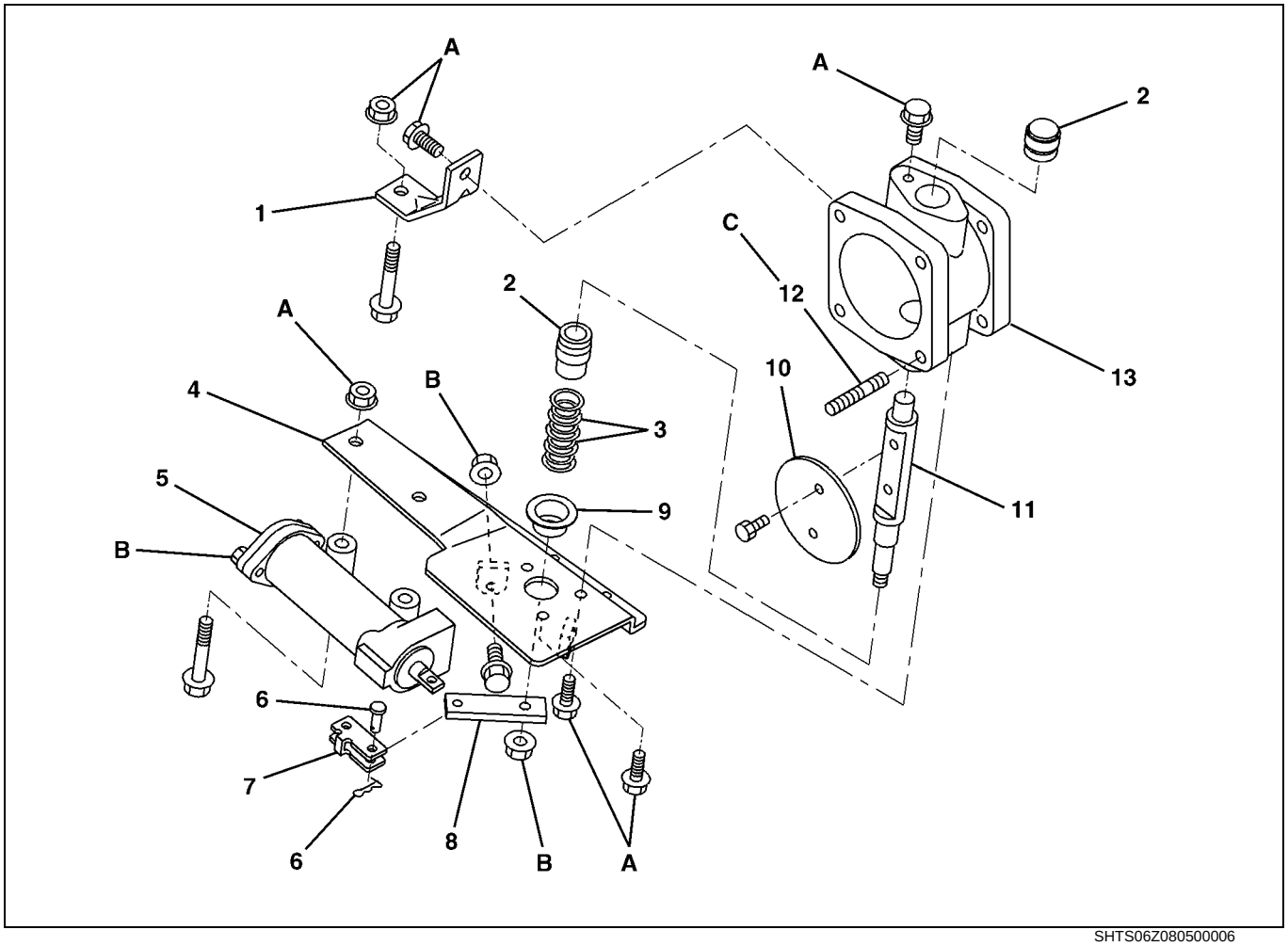


SHTS06Z080500005

1	Blind plate	5	Seal ring
2	Bushing	6	Plate
3	Valve	7	Lever
4	Shaft	8	Cylinder

COMPONENT LOCATOR

EN06Z0805D100001



SHTS06Z080500006

1	Arm	8	Lever
2	Bushing	9	Cover
3	Seal ring	10	Valve
4	Plate	11	Shaft
5	Control cylinder	12	Stud
6	Pin	13	Body
7	Clevis		

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

A	22.6-28.4 {240-280, 18-20}	C	19.6-24.5 {200-240, 15-17}
B	10.8-16.7 {120-170, 9-12}		

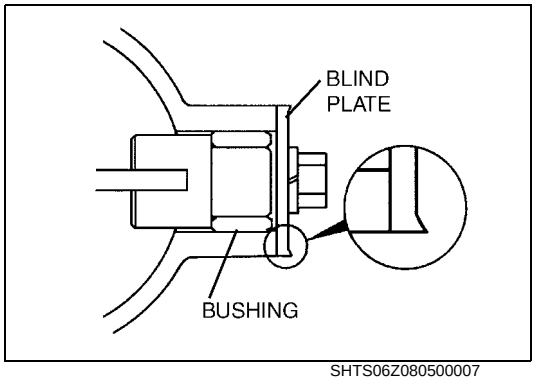
OVERHAUL

EN06Z0805H200001

IMPORTANT POINT - DISMOUNTING

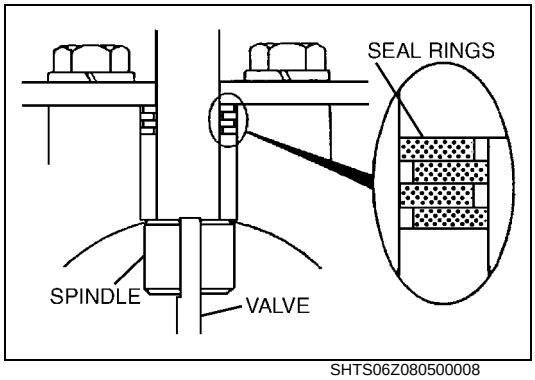
⚠ CAUTION
Do not work on the exhaust brake cylinder while it is still hot. This can result in personal injury.

IMPORTANT POINTS - ASSEMBLY



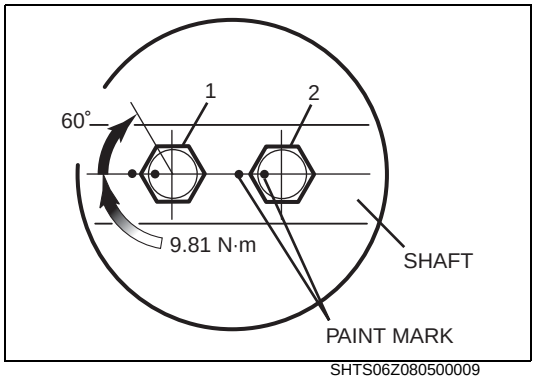
SHTS06Z080500007

1. INSTALLATION OF THE PLATE
(1) Before assembling the brake cylinder, remove the carbon with a scraper or emery paper (recommended: No.150).
(2) Beveled edge of blind plate is fitted outward as shown in the figure.



SHTS06Z080500008

2. INSTALLATION OF THE SEAL RINGS
(1) The small and large seal rings must be installed alternately as shown in the figure.



SHTS06Z080500009

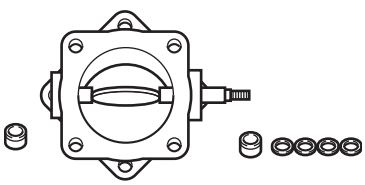
3. INSTALLATION OF THE VALVE
(1) Apply lithium molybdenum grease to the bolt seat surface and bolt threads.
(2) Tighten the bolts in order shown in the figure to the specified torque below.
Tightening Torque:
9.81 N·m {100 kgf·cm, 7 lbf·ft}

(3) Mark the bolt heads and shaft in the same direction with paint.
(4) Tighten the bolts 60° (1/6 turn) as in step 2.
(5) Make sure that the paint marks face the same direction.

NOTICE
When adding torque, never untighten the nuts, even if they have been overtightened.

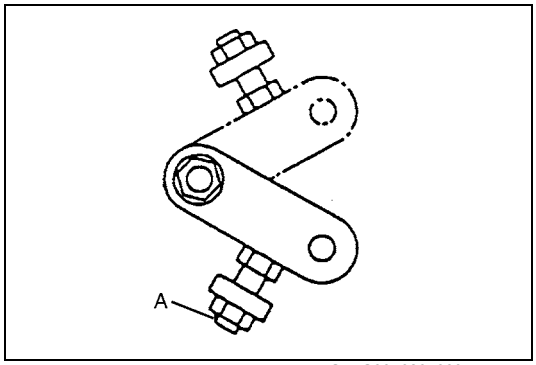
INSPECTION AND REPAIR

EN06Z0805H300002

Inspection item	Standard	Limit	Remedy	Inspection procedure
Brake cylinder, bushing and seal ring: Wear, any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 

ADJUSTMENT

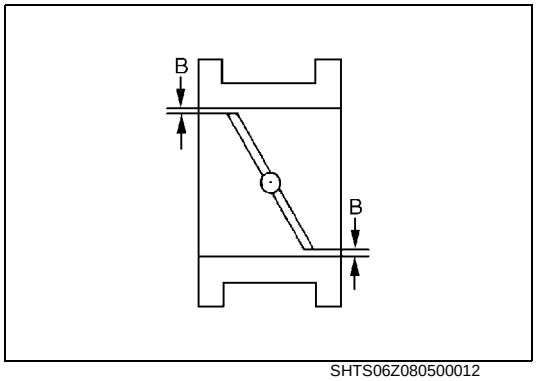
EN06Z0805H300003



SHTS06Z080500011

1. CLOSE SIDE ADJUSTMENT

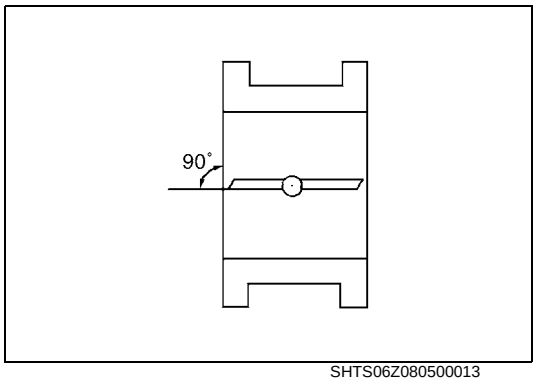
(1) Adjust the clearance between the cylinder and the butterfly valve with the adjusting screw "A".



SHTS06Z080500012

Limit: B = 0.1 mm {0.0039 in.}

(2) Lock the adjusting screw "A" with a lock nut.



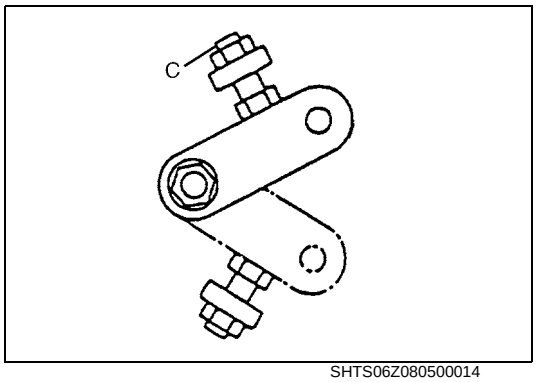
SHTS06Z080500013

2. OPEN SIDE ADJUSTMENT

(1) Set the lever to the open position.

(2) Adjust the butterfly valve may be right angle (90°) to the cylinder with the adjusting screw "C".

(3) Lock the adjusting screw "C" with a lock nut.



SHTS06Z080500014

BRAKE CYLINDER (MODEL: FM2P)

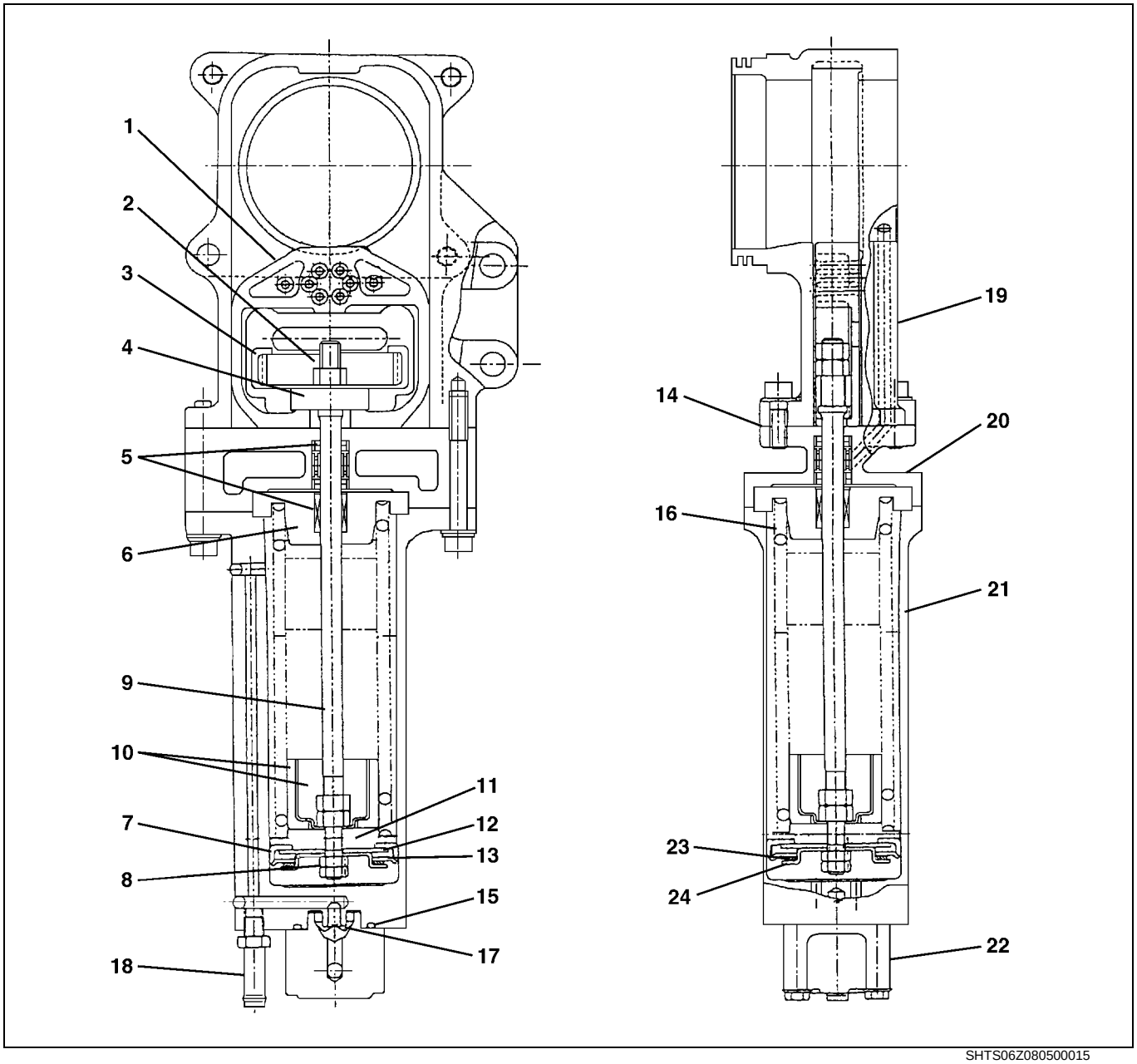
DATA AND SPECIFICATIONS

EN06Z0805I200002

Type	Brake cylinder	Slide valve
	Control cylinder	Spring type with compressed air

DESCRIPTION

EN06Z0805C100002

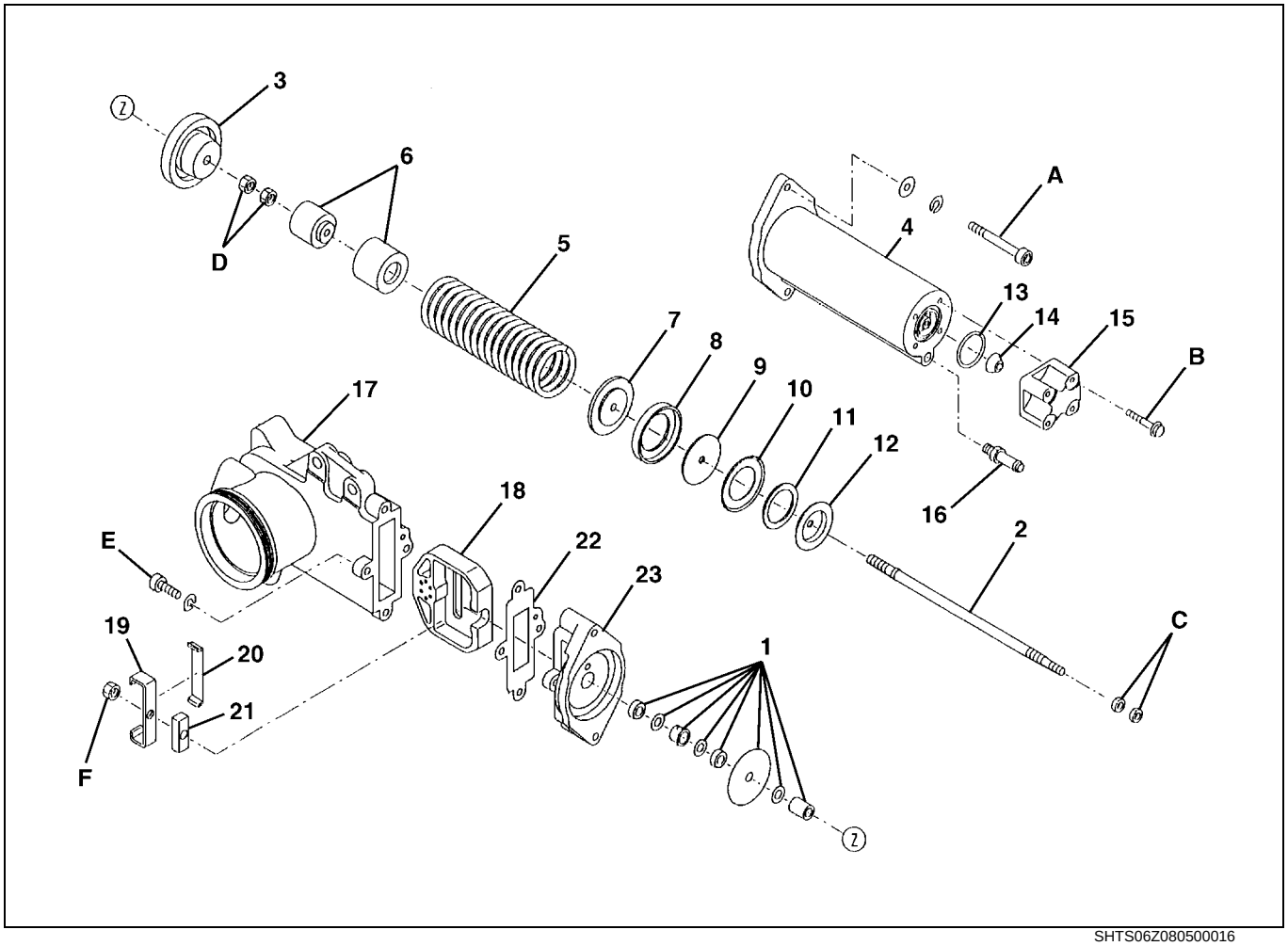


SHTS06Z080500015

1	Valve	9	Piston rod	17	Poppet valve
2	Liner	10	Collar	18	Connector
3	Liner guide	11	Piston	19	Valve housing
4	Stopper	12	Washer	20	Adapter plate
5	Bushing	13	Taper washer	21	Cylinder
6	Spring seat	14	Gasket	22	Poppet valve cover
7	Piston packing	15	O-ring	23	Wave washer
8	Piston lock nut	16	Spring	24	Retainer

COMPONENT LOCATOR

EN06Z0805D100002



SHTS06Z080500016

1	Bushing	13	O-ring
2	Piston rod	14	Poppet valve
3	Spring seat	15	Poppet valve cover
4	Cylinder	16	Connector
5	Spring	17	Valve housing
6	Collar	18	Valve
7	Piston	19	Liner guide
8	Piston packing	20	Liner
9	Washer	21	Stopper
10	Taper washer	22	Gasket
11	Wave washer	23	Adapter plate
12	Retainer		

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

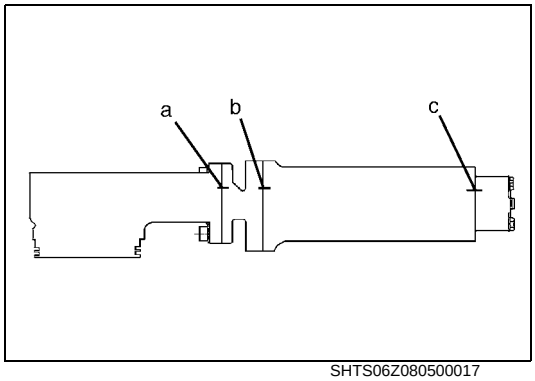
A	28-31 {280-320, 21-23}	D	20-21 {200-220, 14.5-15.9}
B	7.9-8.8 {80-90, 5.8-6.5}	E	28-31 {280-320, 21-23}
C	20-21 {200-220, 14.5-15.9}	F	50-58 {500-600, 37-43}

OVERHAUL

EN06Z0805H200002

IMPORTANT POINT - DISMOUNTING

⚠ **CAUTION**
Do not work on the exhaust brake cylinder while it is still hot. This can result in personal injury.



SHTS06Z080500017

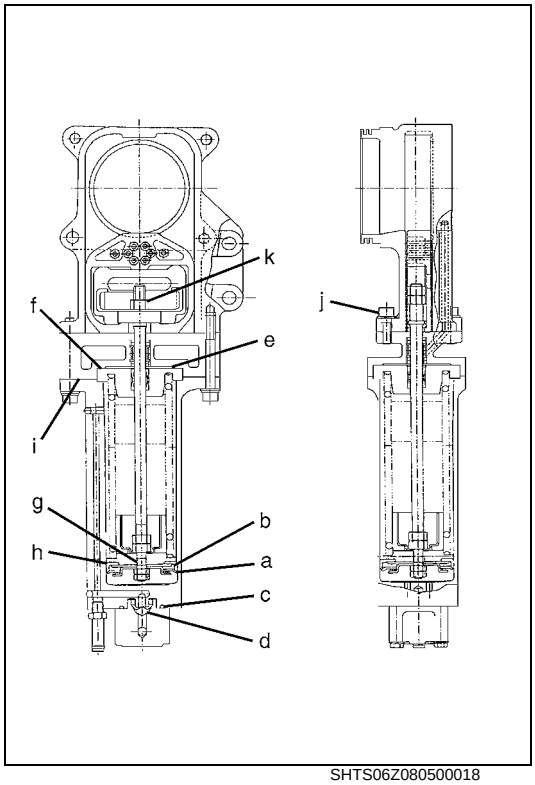
IMPORTANT POINT - DISASSEMBLY

1. DISASSEMBLE THE BRAKE CYLINDER.
(1) Before disassembling the brake cylinder, put the match marks on the following the parts.
a. Adapter plate and valve housing
b. Cylinder and adapter plate
c. Poppet valve cover and cylinder

NOTICE
When assembling the brake cylinder, align the match marks on the each parts.

(2) Remove the grease, anti-loose agent, anti-seizing agent and carbon completely with a scraper or emery paper.

NOTICE
Do not damage the parts.



SHTS06Z080500018

IMPORTANT POINT - ASSEMBLY

1. ASSEMBLE THE BRAKE CYLINDER.

NOTICE
Replace the bushing, gasket, poppet valve and O-ring with new ones.

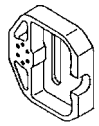
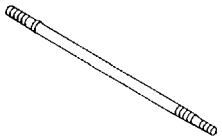
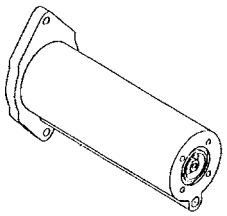
(1) Apply adequate amount of the silicone grease to the grooves for O-ring and for sliding surfaces of the component parts.
a. Piston retainer
b. Piston packing and cylinder
c. O-ring
d. Poppet valve
(2) Apply the lock agent for contact surfaces of the component parts.
e. Upper bushing and adapter plate
f. Spring seat and adapter plate
g. Piston and piston rod
h. Piston and piston packing
i. Adapter plate and cylinder

NOTICE
Do not apply the lock agent for the guide bushing hole and adapter plate hole.

(3) Apply anti-seizing agent to the threads of the bolt, before tightening the bolts.
j. Bolts
(4) After tightening the lock nut, caulk the threads with a punch.
k. Threads

INSPECTION AND REPAIR

EN06Z0805H300004

Inspection item	Standard	Limit	Remedy	Inspection procedure
Slide valve: Wear, any other damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Piston rod: Wear, any other damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Piston: Wear, any other damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Cylinder sliding surface: Wear, any other damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 

RETARDER BRAKE (ELECTROMAGNETIC RETARDER)

BR06-001

RETARDER BRAKE ASSEMBLY BR06-2

DATA AND SPECIFICATIONS BR06-2
DIAGRAM BR06-3
DESCRIPTION BR06-4
COMPONENT LOCATOR BR06-5
OVERHAUL BR06-7

RETARDER BRAKE ASSEMBLY

DATA AND SPECIFICATIONS

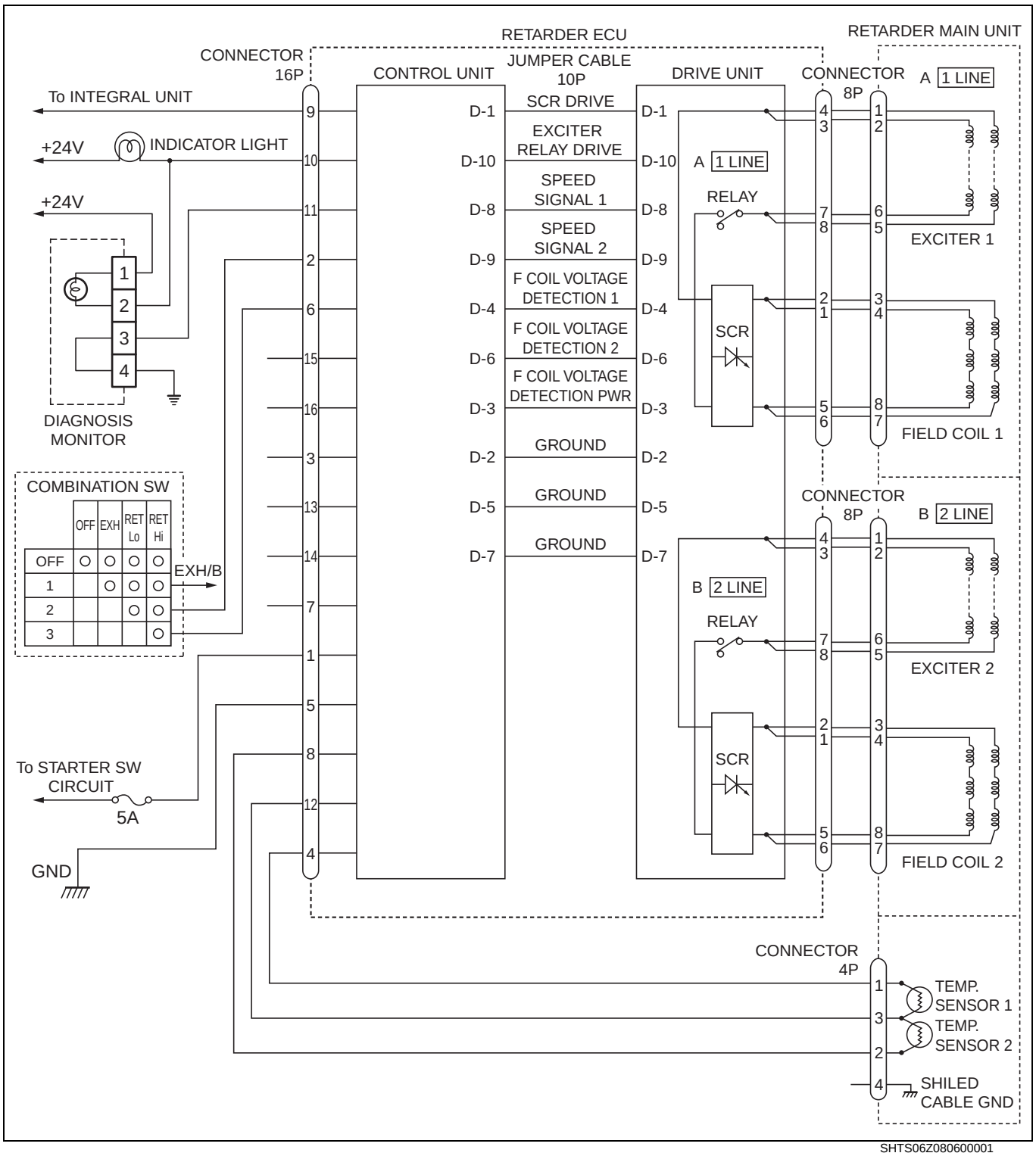
EN06Z0806I200001

Retarder type	**Electromagnetic type**
Brake torque	**490 N·m {5,000 kgf·cm, 362 lbf·ft}**
Cooling system	**Air cooling type**
Control system	**Electronic control system**
Working current	**Self generating**

DIAGRAM

EN06Z0806J100001

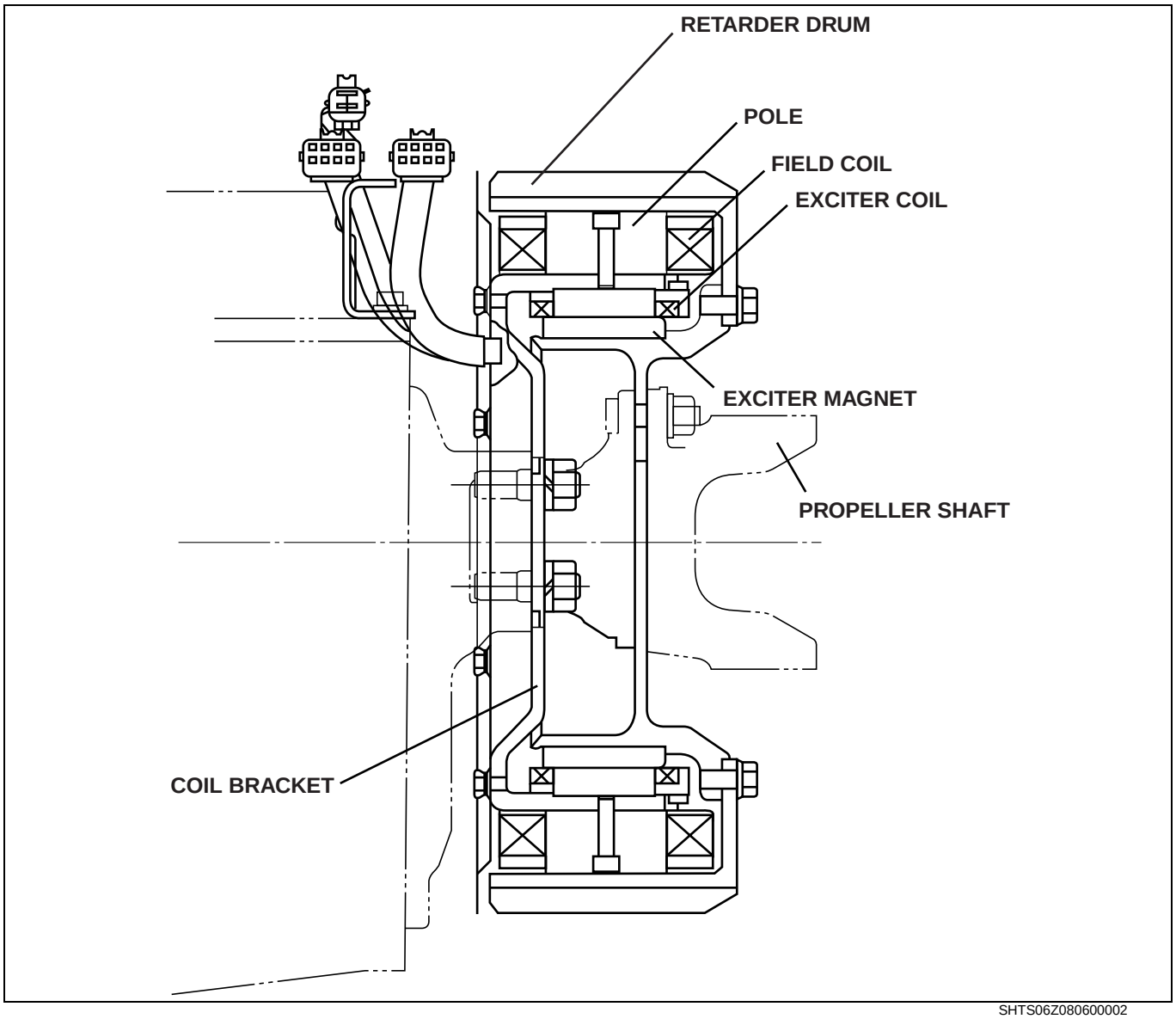
SYSTEM DIAGRAM



SHTS06Z080600001

DESCRIPTION

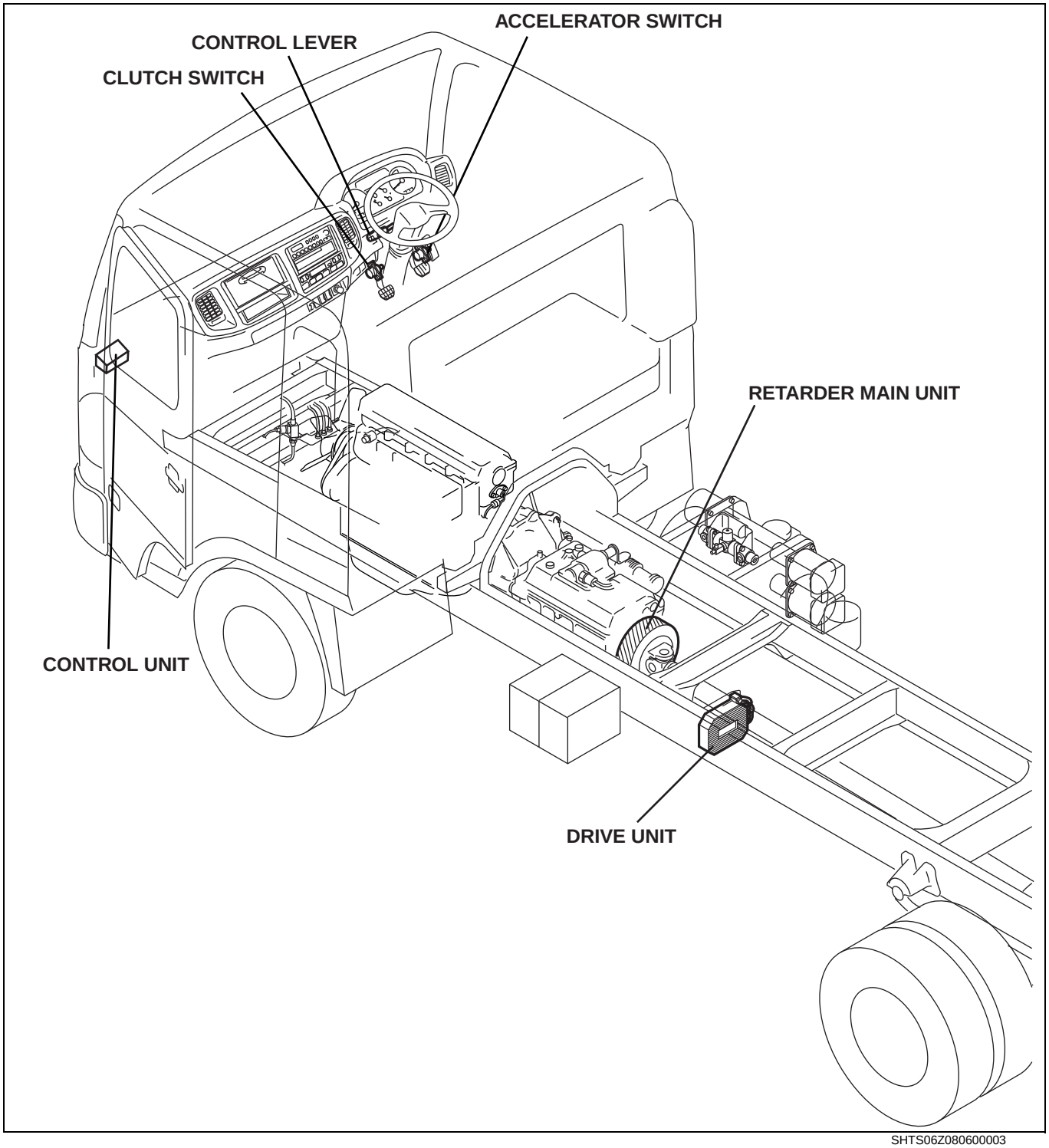
EN06Z0806C100001



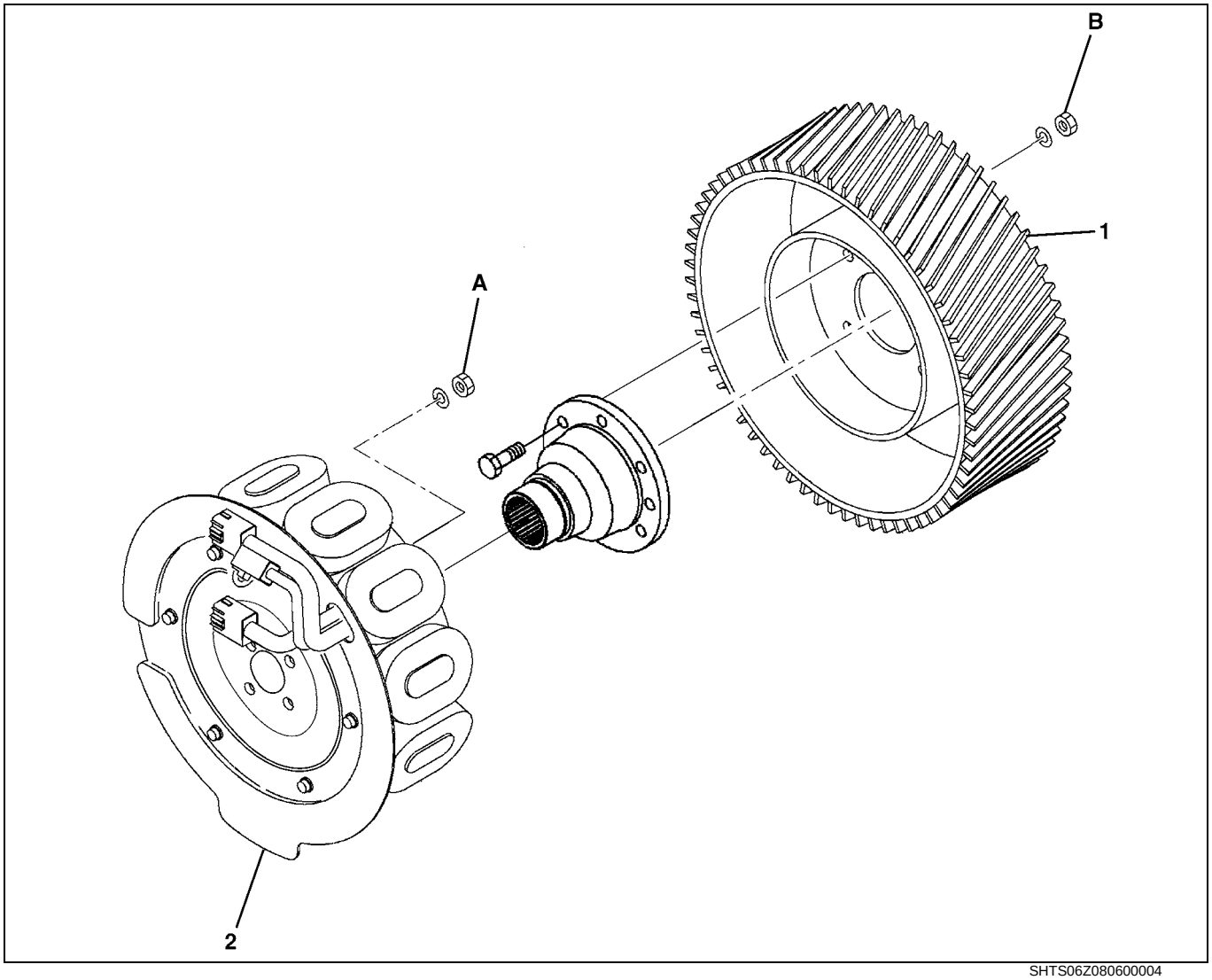
SHTS06Z080600002

COMPONENT LOCATOR

EN06Z0806D100001



SHTS06Z080600003



SHTS06Z080600004

1	Retarder drum	2	Retarder coil assembly

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

A	148-196 {1,500-2,000, 112-148} for FD, 109-147 {1,100-1,500, 82-111} for FG, GH	B	61-91 {620-930, 46-68} for FD 109-147 {1,100-1,500, 82-111} for FG, GH

OVERHAUL

EN06Z0806H200001

NOTICE

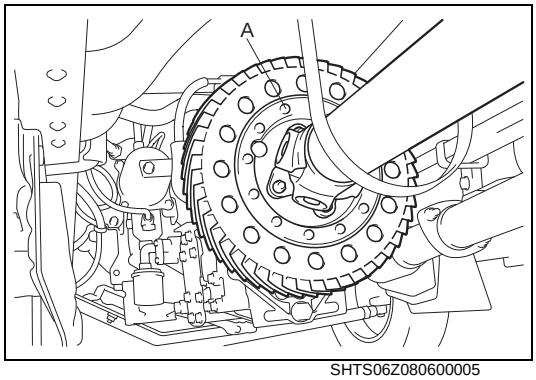
- **The main unit is very hot immediately after operating the retarder. So, cool down enough the unit before starting the work.**
- **If the retarder main unit is fouled with mud or sand, cool the unit down to about ambient temperature. And then wash the unit by washer with water or hot water.**

1. REMOVE THE RETARDER DRUM.

(1) Block the front wheels.

(2) Model for FD

a. Remove the nut to disconnect the propeller shaft and remove the retarder drum from the transmission.



SHTS06Z080600005

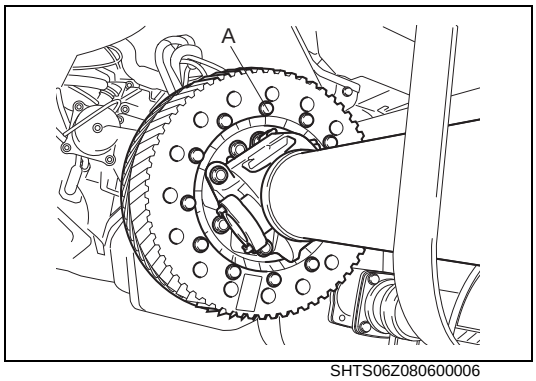
NOTICE

- **Pay attention not to drop or hit the retarder drum.**
- **Do not loosen or remove the fixing bolts (A) of the retarder drum.**
- **Since the propeller shaft and the retarder drum are fixed together in case of FD model, prevent the retarder drum from falling out when dismounting the propeller shaft.**

(3) Models for FG, GH

a. Remove the nut and disconnect the propeller shaft from the transmission.

b. Remove the retarder drum fitting nut and remove the retarder drum from the transmission.



SHTS06Z080600006

NOTICE

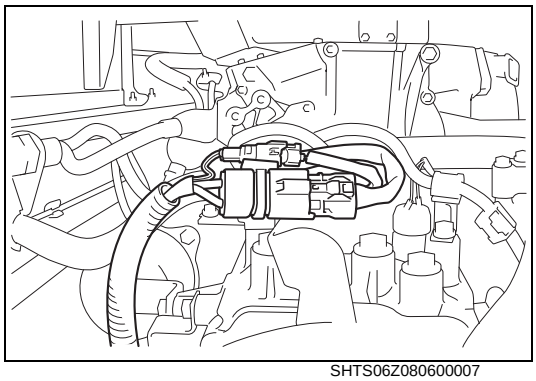
- **Pay attention not to drop or hit the retarder drum.**
- **Do not loosen or remove the fixing bolts (A) of the retarder drum.**

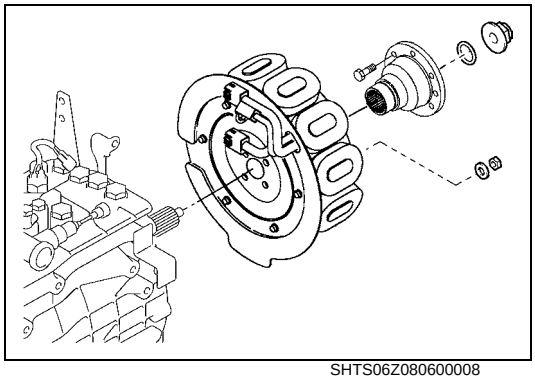
HINT

Since the propeller shaft and the retarder drum are fixed separately in case of FG and GH models, the propeller shaft can be dismounted separately.

2. REMOVE THE RETARDER COIL ASSEMBLY.

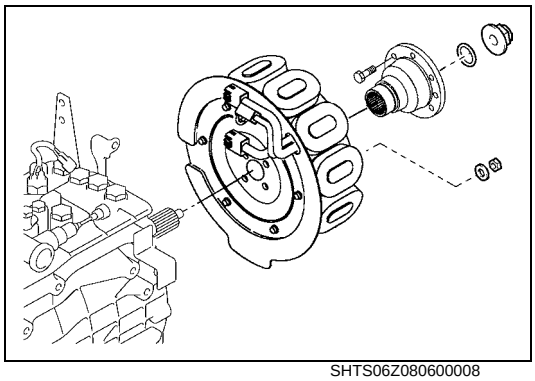
(1) Disconnect each connector for harness of retarder main unit from the holder.


SHTS06Z080600007


SHTS06Z080600008

(2) Remove the universal joint flange fitting nut of transmission and remove the universal joint flange from the retarder coil assembly.

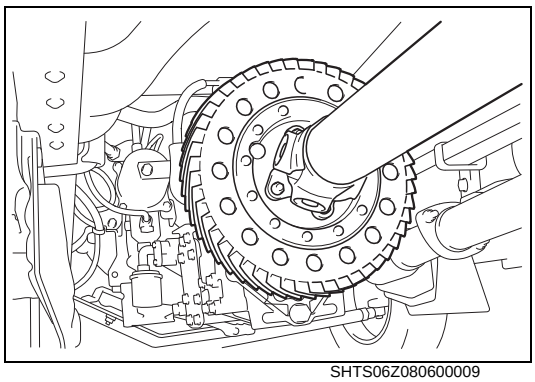
(3) Remove the retarder coil fitting nut and remove the retarder coil assembly from the transmission.


SHTS06Z080600008

3. INSTALL THE RETARDER COIL ASSEMBLY.

(1) After tightening the retarder coil assembly temporarily with fitting nuts (4 pieces), install it to transmission with standard tightening torque.

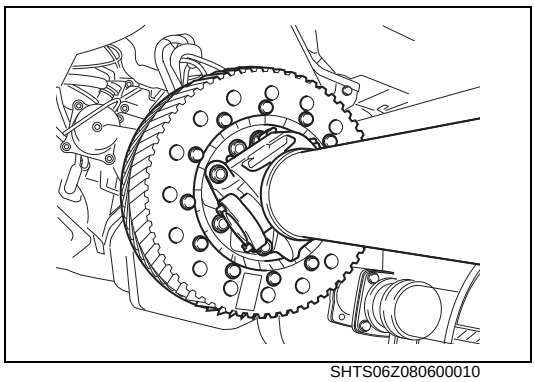
(2) Install the universal joint flange to the transmission output shaft and tighten it with O-ring and nut.


SHTS06Z080600009

4. INSTALL THE RETARDER DRUM.

(1) Model for FD

a. Install the propeller shaft to retarder drum with nuts (4 pieces).


SHTS06Z080600010

(2) Models for FG, GH

a. After tightening the retarder drum temporarily with fitting nuts (4 pieces), install it with standard torque.

b. Install the propeller shaft to retarder drum with nuts (4 pieces).

PARKING BRAKE (MODELS: FC, FD, GD)

BR07-001

PARKING BRAKE ASSEMBLY BR07-2
DATA AND SPECIFICATIONS..... BR07-2
DESCRIPTION BR07-2
TROUBLESHOOTING..... BR07-4
SPECIAL TOOL..... BR07-4
COMPONENT LOCATOR BR07-5
OVERHAUL BR07-8
INSPECTION AND REPAIR..... BR07-10
ADJUSTMENT..... BR07-11

PARKING BRAKE ASSEMBLY

DATA AND SPECIFICATIONS

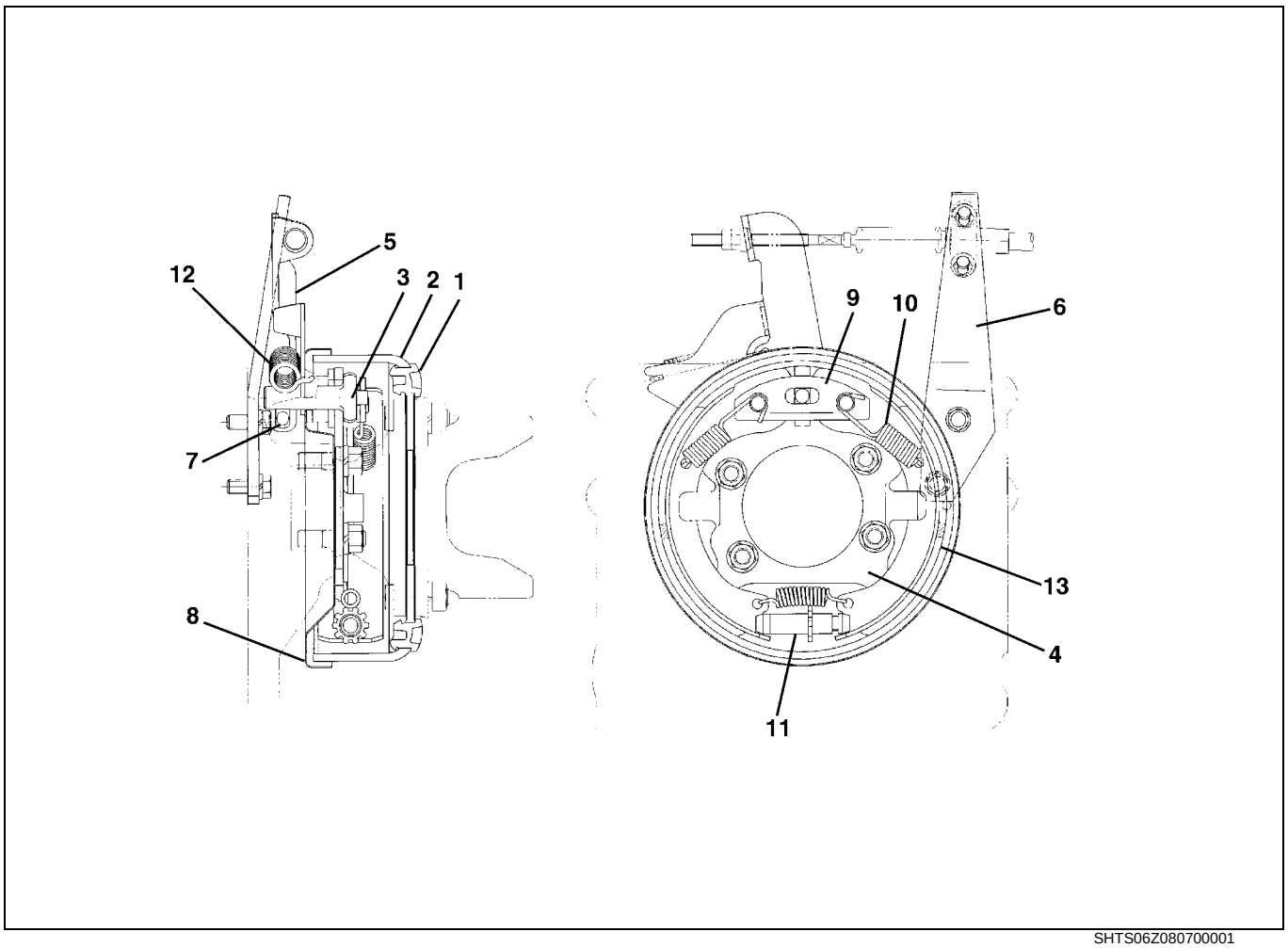
EN06Z0807I200001

Parking brake type	**Internally expanding, duo-servo type**
Parking brake control type	**Lever type control with control cable**
Drum inside diameter	**203.2 mm {8.0 in.}**
Brake lining	**Width x length x thickness 45 mm x 195 mm x 5 mm {1.772 in.} x {7.677 in.} x {0.197 in.}**

DESCRIPTION

EN06Z0807C100001

PARKING BRAKE

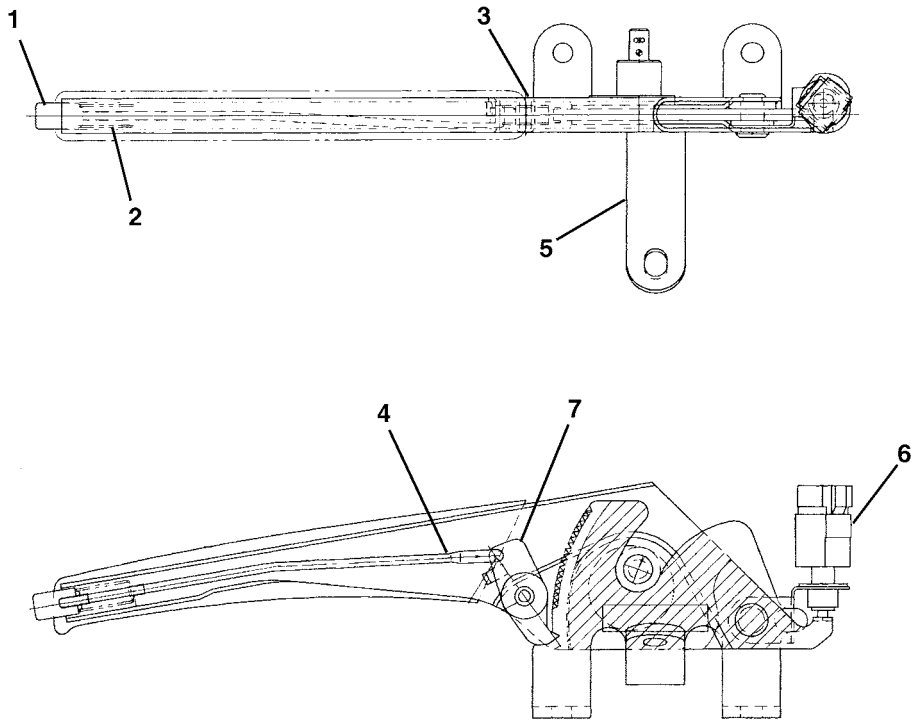


SHTS06Z080700001

1	Grommet	8	Dust cover
2	Brake drum	9	Anchor pin retainer
3	Camshaft	10	Return spring
4	Anchor bracket	11	Shoe adjuster
5	Cam lever	12	Cam lever return spring
6	Bracket	13	Brake shoe assembly
7	Lock pin		

PARKING BRAKE LEVER

(REPRESENTATIVE TYPE)



SHTS06Z080700002

1	Release rod knob	5	Brake lever bracket
2	Compression spring	6	Parking brake switch
3	Parking brake lever	7	Pawl
4	Pawl release rod		

TROUBLESHOOTING

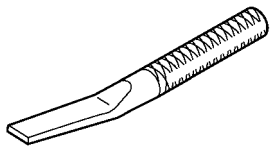
EN06Z0807F300001

Symptom	Possible cause	Remedy/Prevention
Too much play noted on parking brake lever	Excessively large drum-to-lining clearance.	Readjust the brake properly.
	Maladjusted control linkage.	Readjust.
Not enough braking force	Excessively large drum-to-lining clearance.	Readjust.
	Maladjusted control linkage.	Readjust.
	Burnt lining.	Repair or replace.
	Worn lining.	Replace.
	Shoes are too dirty with water, dust, etc.	Disassemble and clean.
	Linings are soaked with oil.	Replace.
Lining get burnt easily	Not enough drum-to-lining clearance.	Readjust.
	Shoe or drum is distorted.	Repair or replace.
	Springs are broken.	Replace.
Can not keep the lever in full stroke position	Over stroke of lever.	Adjust cable length.
	Wear or broken of ratchet.	Replace parts.
Not return the lever to running position, when cold weather. (below zero)	Water inside the cable (Frozen condition)	Replace the cable.

SPECIAL TOOL

EN06Z0807K100001

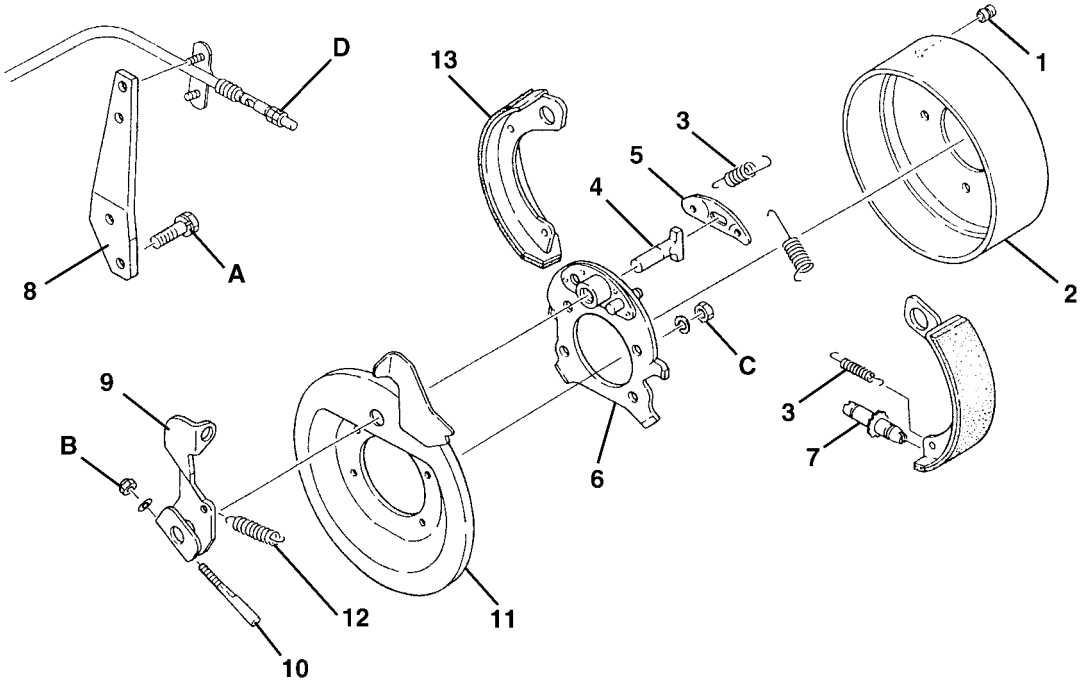
Prior to starting a parking brake adjustment, it is necessary to have the special tool.

Illustration	Part number	Tool name	Remarks
	S0966-51250	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN06Z0807D100001

PARKING BRAKE



SHTS06Z080700004

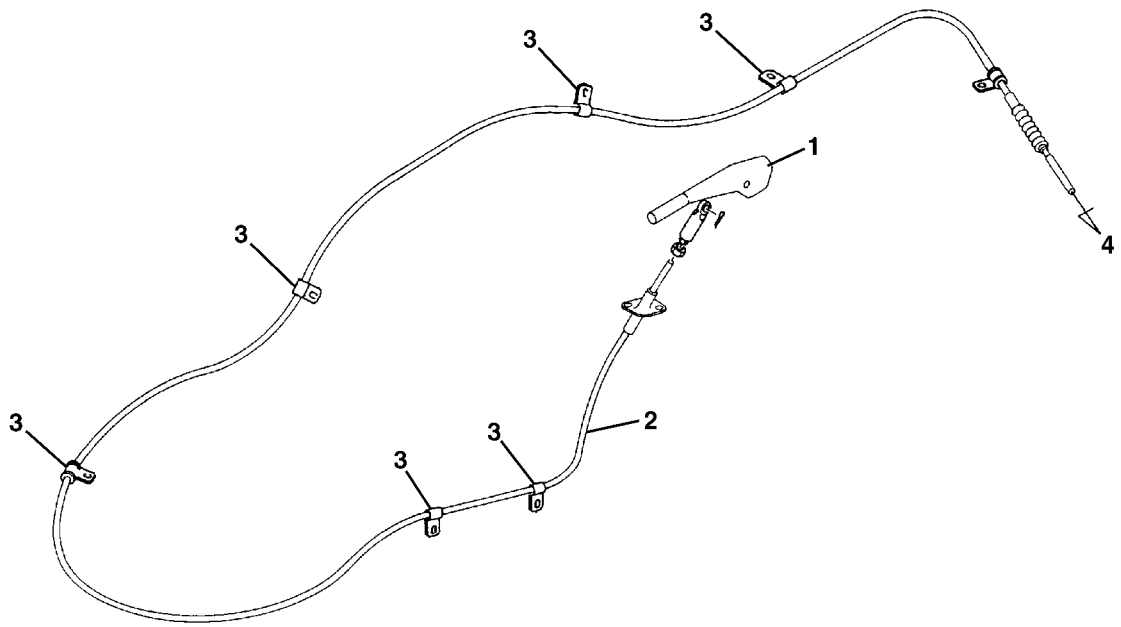
1	Grommet	8	Bracket
2	Brake drum	9	Cam lever
3	Return spring	10	Lock pin
4	Camshaft	11	Dust cover
5	Anchor pin retainer	12	Cam lever return spring
6	Anchor bracket	13	Brake shoe assembly
7	Shoe adjuster		

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

A	34.5-51.5 {351-527, 26-38}	C	88.5-117.5 {900-1,200, 66-86}
B	12.7-21.6 {130-220, 10-15}	D	18-26 {180-260, 13-19}

PARKING BRAKE CONTROL

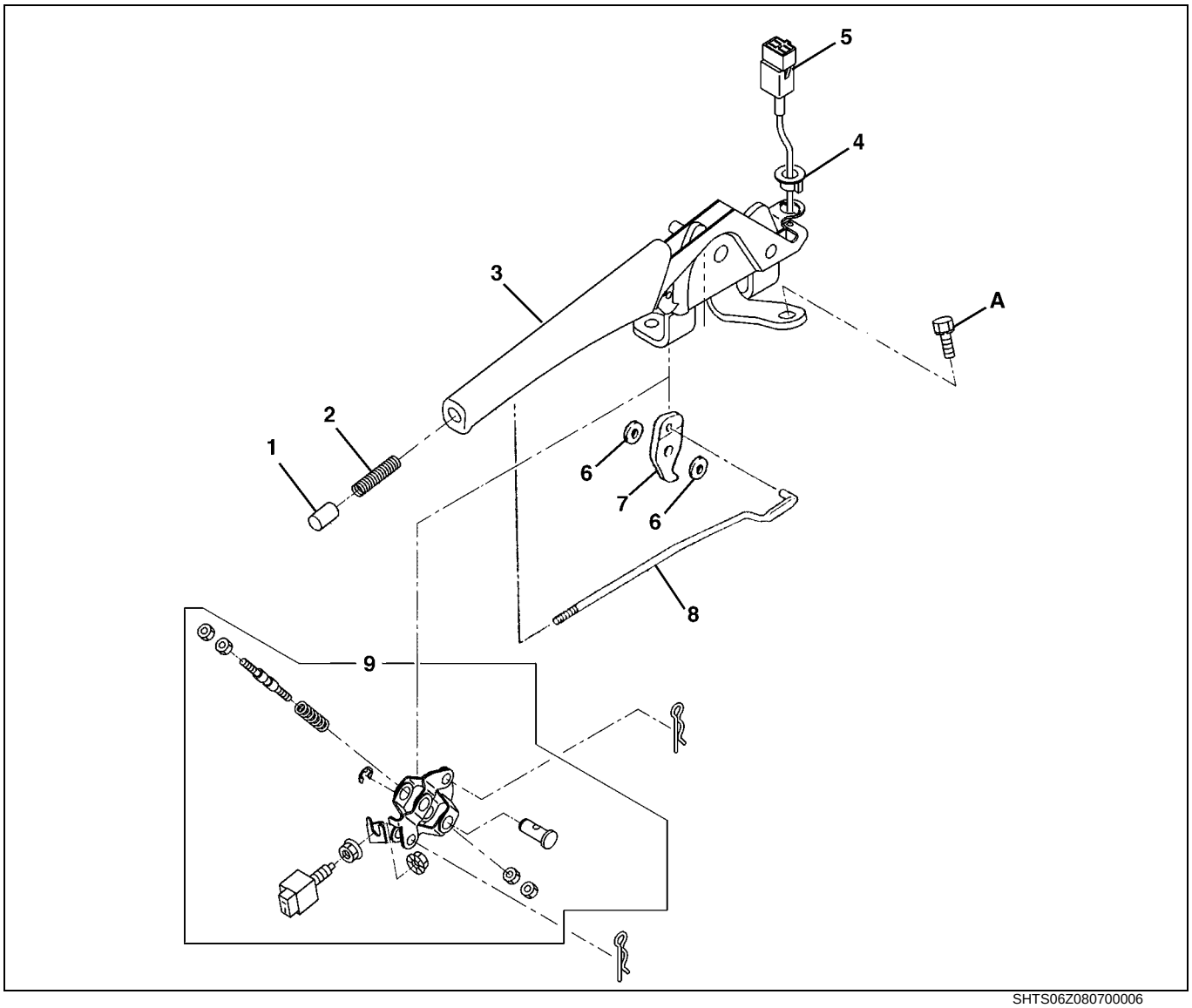
(REPRESENTATIVE TYPE)



SHTS06Z080700005

1	Parking brake lever assembly	3	Clips
2	Cable	4	To parking brake

PARKING BRAKE LEVER



SHTS06Z080700006

1	Knob	6	Spacer
2	Compression spring	7	Pawl
3	Lever assembly	8	Pawl release rod
4	Bushing	9	Parking brake sensor assembly (If so equipped)
5	Parking brake switch		

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

A	14.0-32.0 {143-327, 10.34-23.65}	

OVERHAUL

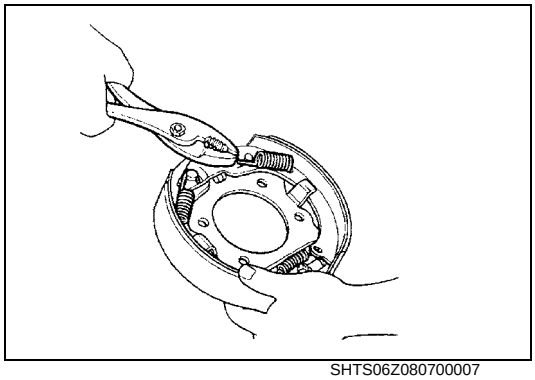
EN06Z0807H200001

IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT.
(1) Refer to the chapter **"PROPELLER SHAFT"**.

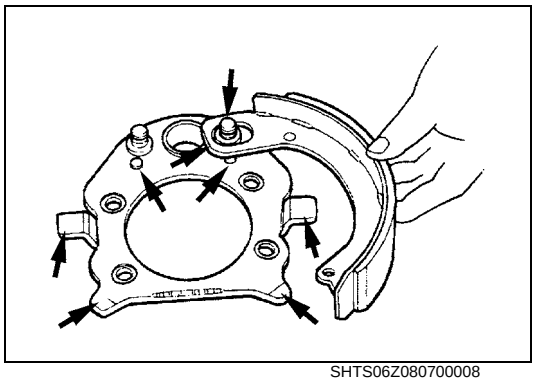
2. REMOVE THE LOCK NUT AND TRANSMISSION OUTPUT SHAFT FLANGE.
(1) Refer to the chapter **"TRANSMISSION MAIN UNIT"**.

IMPORTANT POINT - DISASSEMBLY

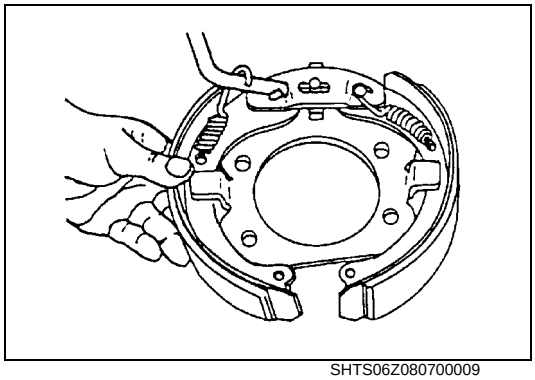

SHTS06Z080700007

1. REMOVE THE RETURN SPRING.
(1) Use the suitable tool to remove the return spring.

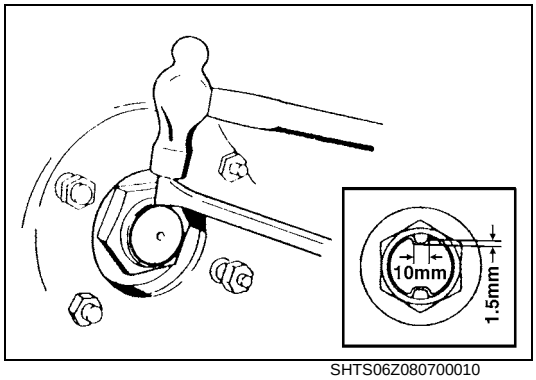
IMPORTANT POINTS - ASSEMBLY


SHTS06Z080700008

1. LUBRICATION
(1) Apply heat resistance grease on rubbing or matching faces of brake shoes, camshaft, shoe adjuster and position the adjuster in place.


SHTS06Z080700009

2. INSTALL THE RETURN SPRING.
(1) Use the suitable tool to install the return spring.



SHTS06Z080700010

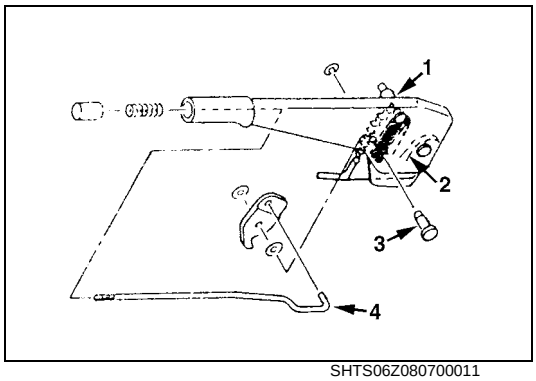
3. INSTALL FLANGE YOKE COUPLING.

(1) Install flange onto transmission output shaft and tighten lock nut.
Tightening torque:
587-783 N·m {6,000-8,000 kgf·cm, 434-578 lbf·ft}

(2) Caulk rim part of nut into groove on output shaft.

NOTICE

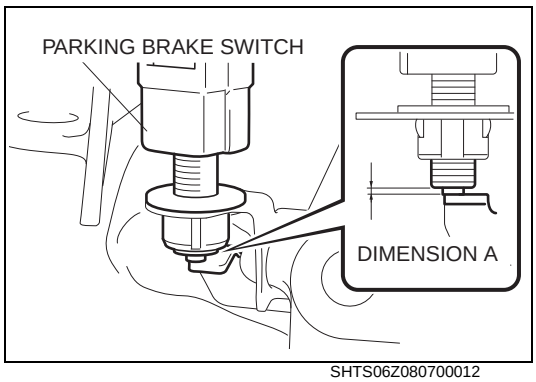
- **Caulked portion should be fitted in the groove thoroughly.**
- **Caulking should be done without rift.**



SHTS06Z080700011

4. APPLY BEARING GREASE ON THE FOLLOWING PARTS.

(1) Pin (Cable)
(2) Both sides of brake lever bracket
(3) Pin (Pawl)
(4) Pawl release rod



SHTS06Z080700012

5. PARKING BRAKE SWITCH.

(1) Install the switch to the brake lever bracket.

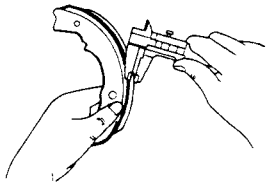
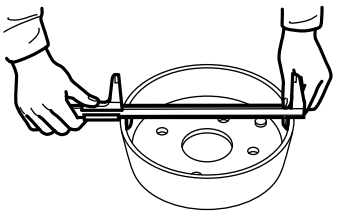
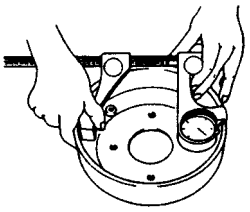
(2) Adjust the dimension A (Switch button projection) to 2.0 mm {0.0787 in.} when the parking brake lever is fully released.

(3) Confirm the parking brake indicator light lights, when the lever is pulled by the notches.

INSPECTION AND REPAIR

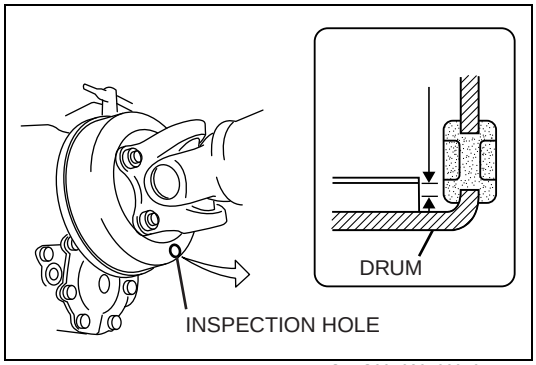
EN06Z0807H300001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Brake lining: Lining thickness	**5.0 {0.197}**	**1.0 {0.039}**	**Replace.**	**Measure** 
Brake drum: Inside diameter	**203.2 {8.0}**	**204.2 {8.039}**	**Replace.**	**Measure** 
Brake drum: Run out	**0-0.1 {0-0.0039}**	**0.2 {0.0078}**	**Replace.**	**Measure** 

ADJUSTMENT

EN06Z0807H300002

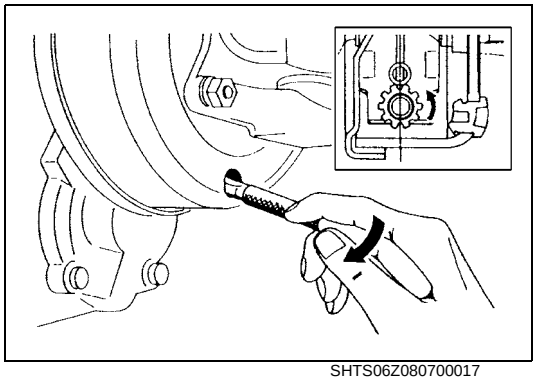


SHTS06Z080700016

1. CHECK THE REMAINING THICKNESS OF THE BRAKE LINING.

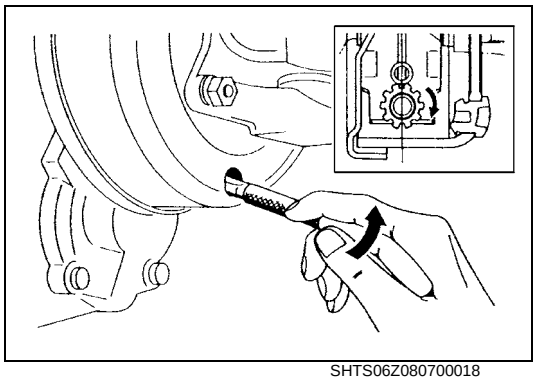
(1) Measure the remaining thickness of lining through the inspection hole of brake drum. Replace the brake shoe assembly when it is worn to the service limit.

Assembly standard	**5.0 mm {0.1969 in.}**
Service limit	**1.0 mm {0.0394 in.}**


SHTS06Z080700017

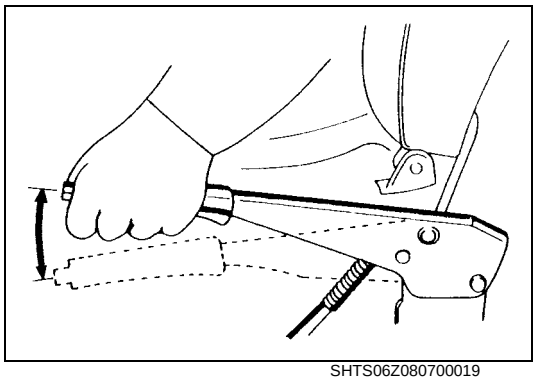
2. ADJUST THE CLEARANCE BETWEEN DRUM AND LINING.

(1) Lift the rear wheel to be adjusted off the ground.
(2) Release the control lever.
(3) Turn the adjuster to reduce the clearance to zero.
SST: Brake shoe adjusting tool (S0966-51250)

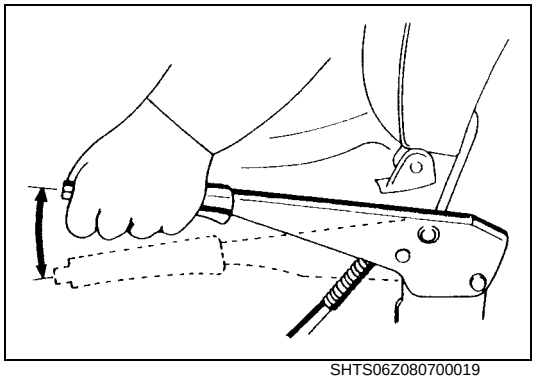

SHTS06Z080700018

(4) Turn the adjuster backward by specified notches.

Specified notches: 14 notches

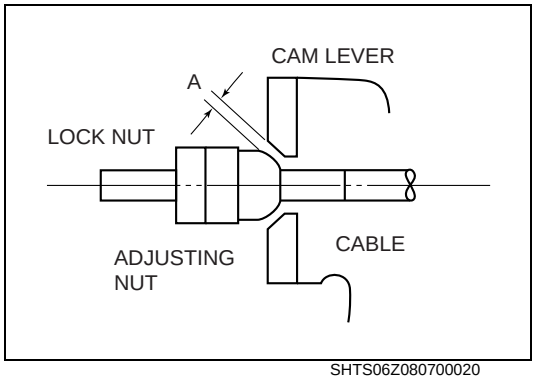

SHTS06Z080700019

(5) Pull the parking brake lever fully to three times and release the lever. Turn the drum by hand to see that the shoes are not dragging. If there is any dragging, repeat the operation from step 1.


SHTS06Z080700019

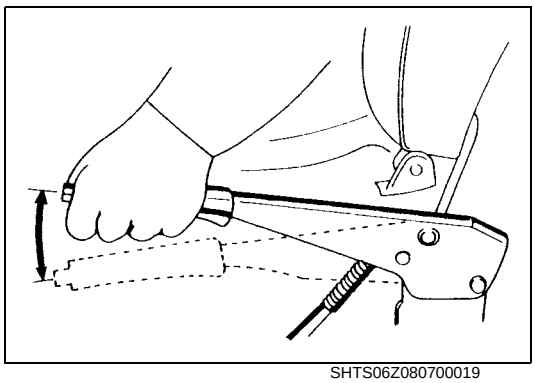
3. ADJUST THE CONTROL CABLE.

(1) Pull the parking brake lever fully to three times and release the lever.

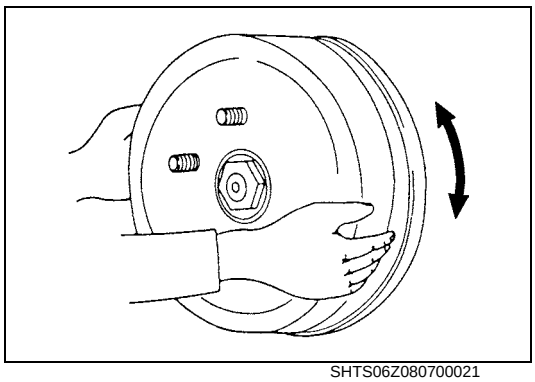


SHTS06Z080700020

(2) Adjust the clearance "A" between cable and cam lever on the parking brake to 1-2 mm {0.040-0.078 in.} by turning the adjusting nut.


SHTS06Z080700019

(3) Pull the parking brake lever with 294 N {30 kgf, 66.14 lbf} force and make sure that the lever stroke is within assembly standard. Then lock the adjusting nut with the lock nut.
Assembly standard: 8-11 notches


SHTS06Z080700021

(4) Pull the parking brake lever fully to three times and release the lever. Turn the drum by hand to see that the shoes are not dragging. If there is any dragging, repeat the operation from step 1.

PARKING BRAKE (MODELS: FG, GH, FL, FM, SG)

BR07-002

PARKING BRAKE.....BR07-2
DATA AND SPECIFICATIONS..... BR07-2
DESCRIPTION BR07-2
TROUBLESHOOTING..... BR07-6
SPECIAL TOOL..... BR07-6
COMPONENT LOCATOR BR07-7
OVERHAUL BR07-12
INSPECTION AND REPAIR..... BR07-14
ADJUSTMENT..... BR07-15

PARKING BRAKE

DATA AND SPECIFICATIONS

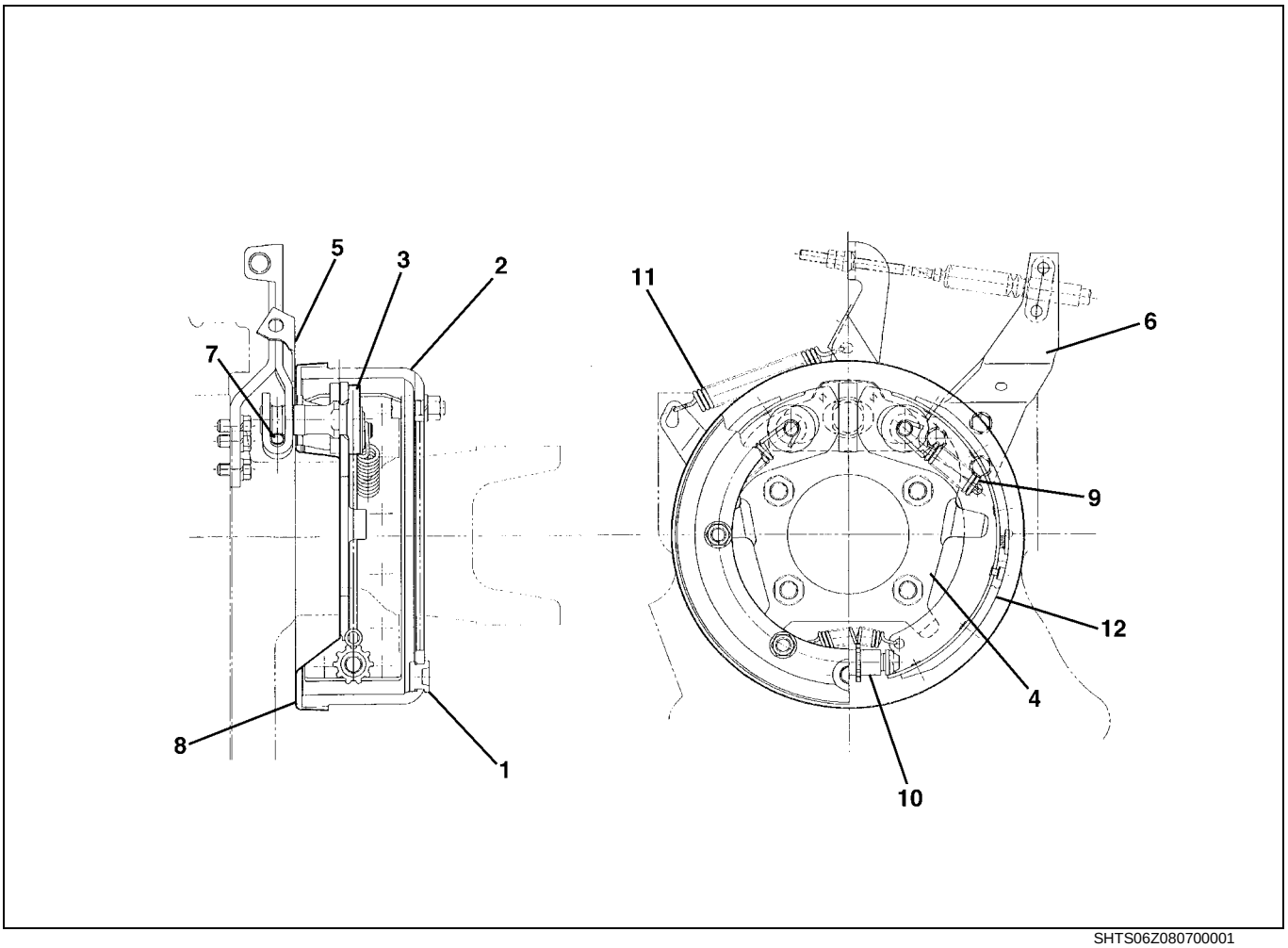
EN06Z0807I200001

Models	With LX06, LJ06, MF06, EATON transmission	With ZF transmission
Parking brake type	Internally expanding, duo-servo type	
Parking brake control type	Lever type control with control cable	
Drum inside diameter	254 mm {10.0 in.}	
Brake lining	Width x length x thickness 75 mm x 300 mm x 7 mm {2.952 in.} x {11.811 in.} x {0.275 in.}	Width x length x thickness 60 mm x 288 mm x 5.75 mm {2.362 in.} x {11.339 in.} x {0.226 in.}

DESCRIPTION

EN06Z0807C100001

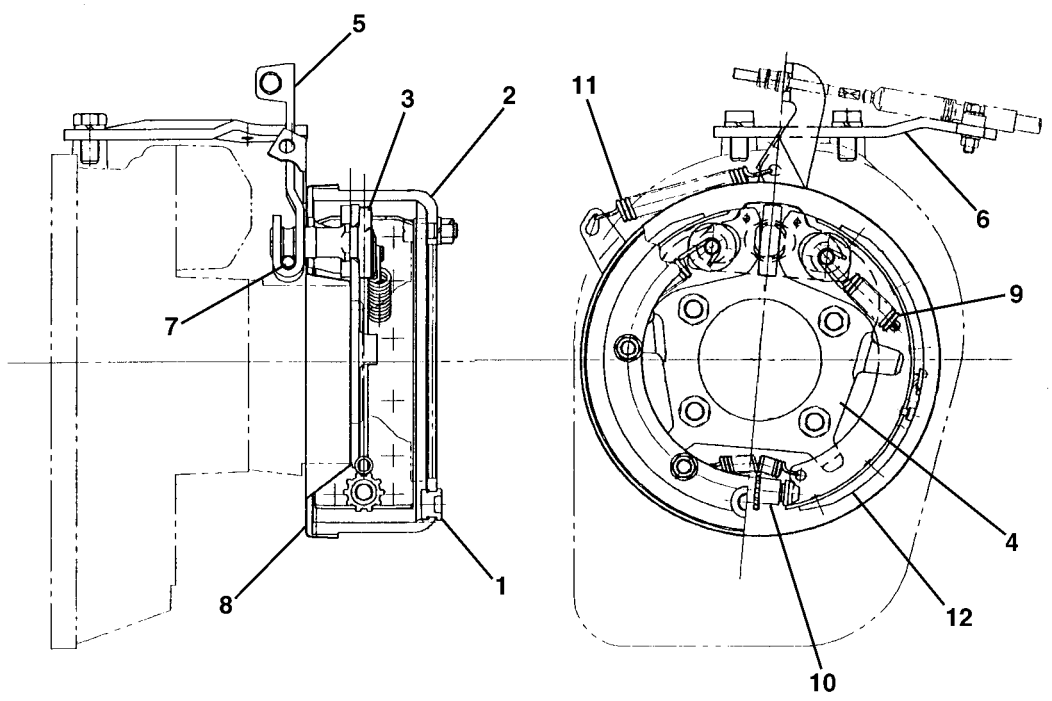
PARKING BRAKE (LX06, LJ06, MF06 transmission)



SHTS06Z080700001

1	Grommet	7	Lock pin
2	Brake drum	8	Dust cover
3	Camshaft	9	Return spring
4	Anchor bracket	10	Shoe adjuster
5	Cam lever	11	Cam lever return spring
6	Bracket	12	Brake shoe assembly

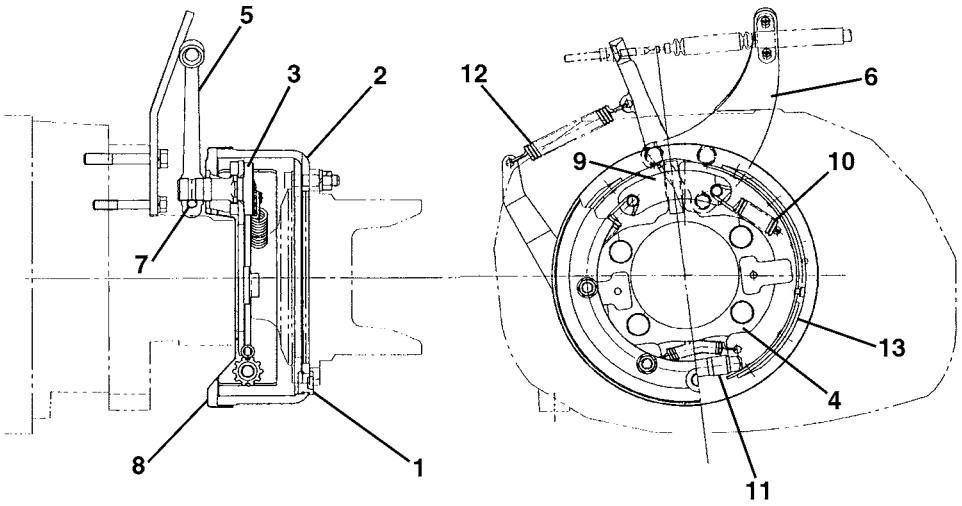
PARKING BRAKE
(EATON FS6109 / FS8209 transmission)



SHTS06Z080700002

1	Grommet	7	Lock pin
2	Brake drum	8	Dust cover
3	Camshaft	9	Return spring
4	Anchor bracket	10	Shoe adjuster
5	Cam lever	11	Cam lever return spring
6	Bracket	12	Brake shoe assembly

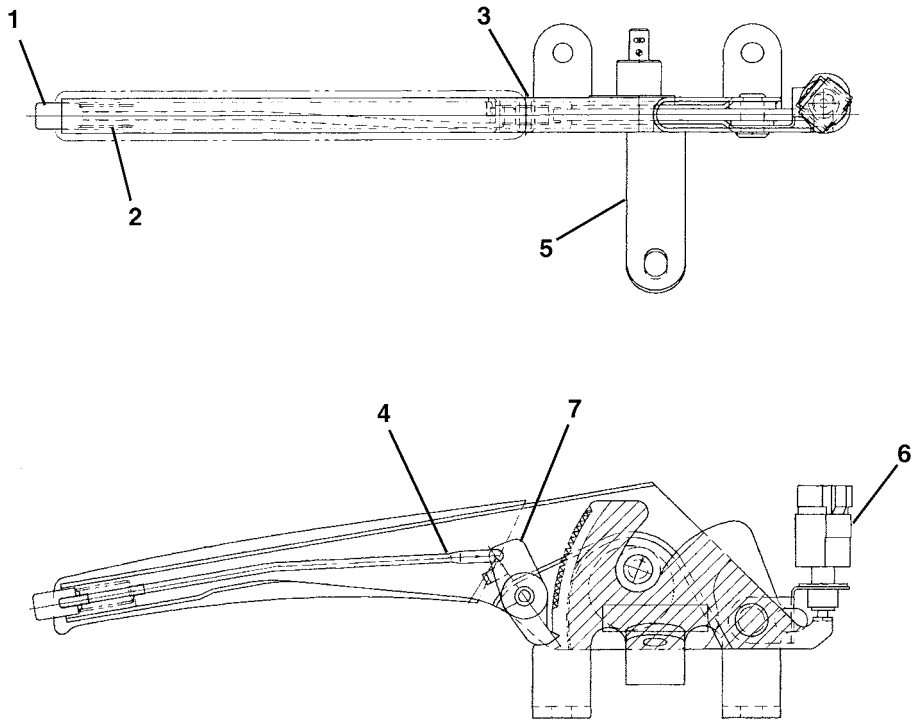
PARKING BRAKE
(ZF9S109, 9S1110, 9S1310 transmission)



SHTS06Z080700003

1	Grommet	8	Dust cover
2	Brake drum	9	Anchor pin retainer
3	Camshaft	10	Return spring
4	Anchor bracket	11	Shoe adjuster
5	Cam lever	12	Cam lever return spring
6	Bracket	13	Brake shoe assembly
7	Lock pin		

PARKING BRAKE LEVER



SHTS06Z080700004

1	Release rod knob	5	Brake lever bracket
2	Compression spring	6	Parking brake switch
3	Parking brake lever	7	Pawl
4	Pawl release rod		

TROUBLESHOOTING

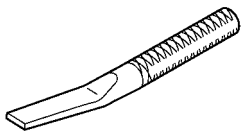
EN06Z0807F300001

Symptom	Possible cause	Remedy/Prevention
Too much play noted on parking brake lever	Excessively large drum-to-lining clearance.	Readjust the brake properly.
	Maladjusted control linkage.	Readjust.
Not enough braking force	Excessively large drum-to-lining clearance.	Readjust.
	Maladjusted control linkage.	Readjust.
	Burnt lining.	Repair or replace.
	Worn lining.	Replace.
	Shoes are too dirty with water, dust, etc.	Disassemble and clean.
	Linings are soaked with oil.	Replace.
Lining get burnt easily	Not enough drum-to-lining clearance.	Readjust.
	Shoe or drum is distorted.	Repair or replace.
	Springs are broken.	Replace.
Can not keep the lever in full stroke position	Over stroke of lever.	Adjust cable length.
	Wear or broken of ratchet.	Replace parts.
Not return the lever to running position, when cold weather. (below zero)	Water inside the cable (Frozen condition)	Replace the cable.

SPECIAL TOOL

EN06Z0807K100001

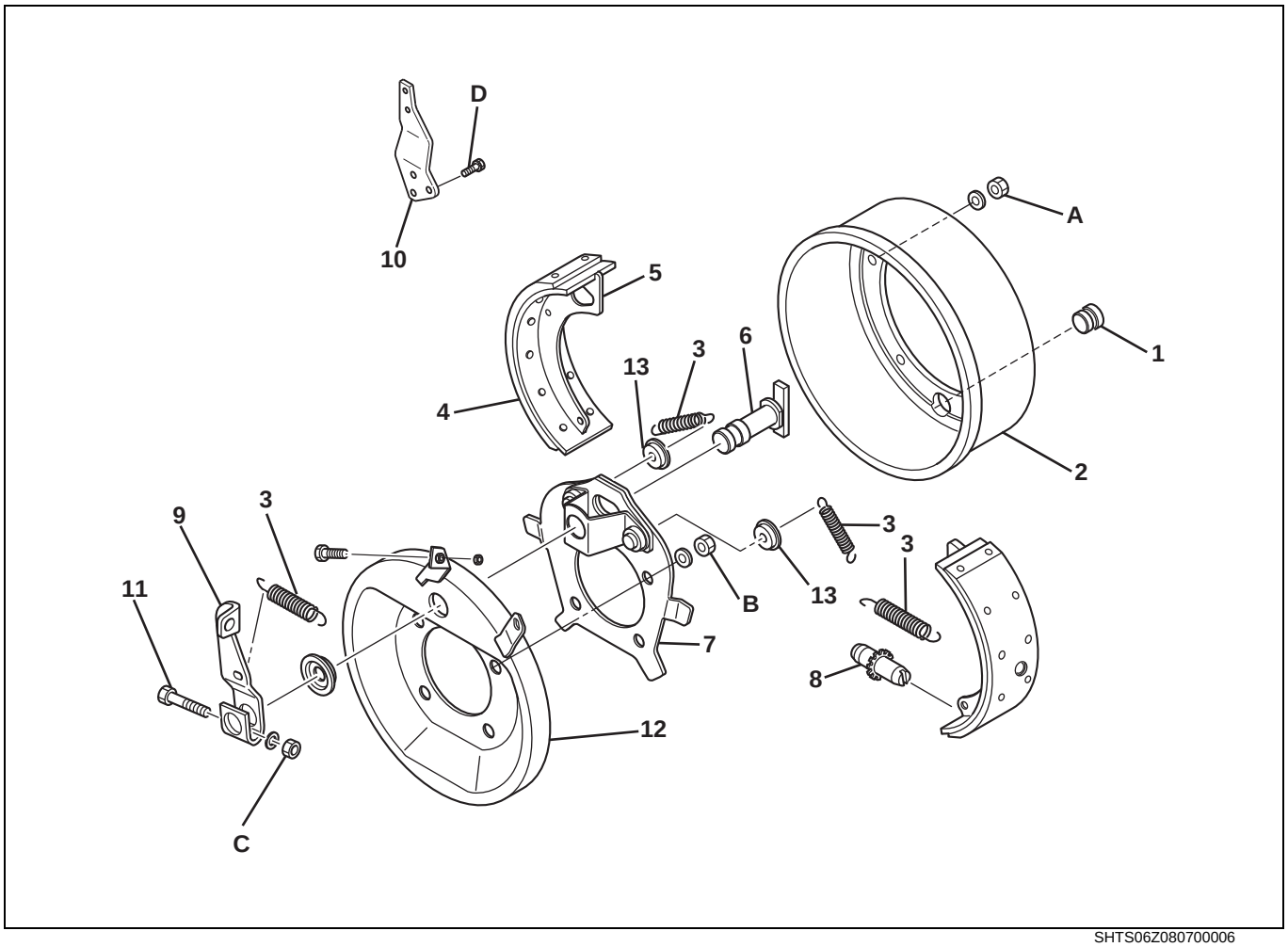
Prior to starting a parking brake adjustment, it is necessary to have the special tool.

Illustration	Part number	Tool name	Remarks
	S0966-51130	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

EN06Z0807D100001

PARKING BRAKE (LX06, LJ06, MF06 transmission)



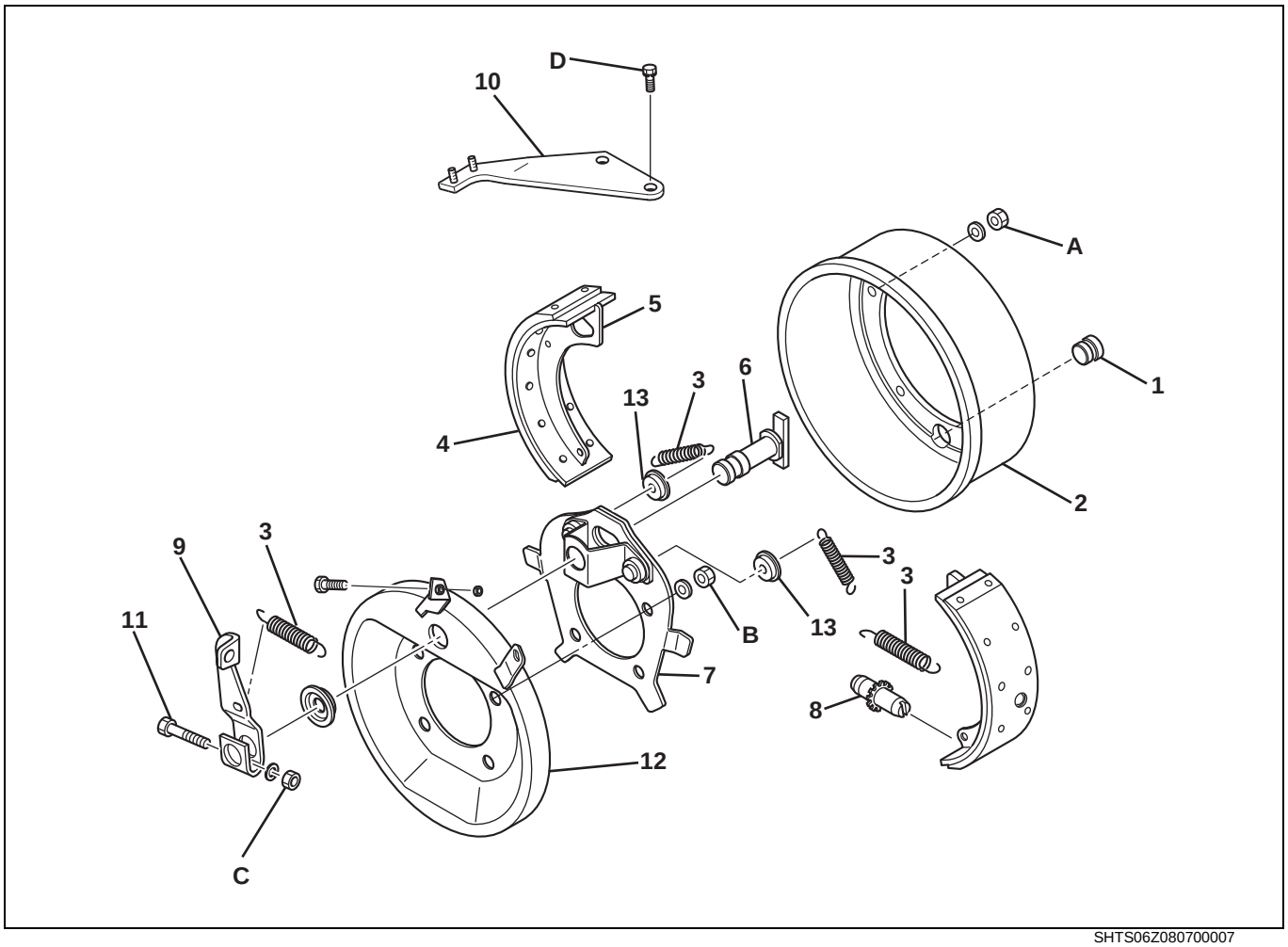
SHTS06Z080700006

1	Rubber plug	8	Shoe adjuster
2	Brake drum	9	Cam lever
3	Tension spring	10	Bracket
4	Brake lining	11	Lock pin
5	Brake shoe	12	Dust cover
6	Camshaft	13	Spacer
7	Anchor bracket		

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

A	64.5-85.5 {650-870, 48-63}	C	17.7-22.6 {180-230, 14-16}
B	147.5-166.5 {1,500-1,700, 109-122}	D	34.5-51.5 {351-525, 26-38}

PARKING BRAKE (EATON FS6109 / FS8209 transmission)



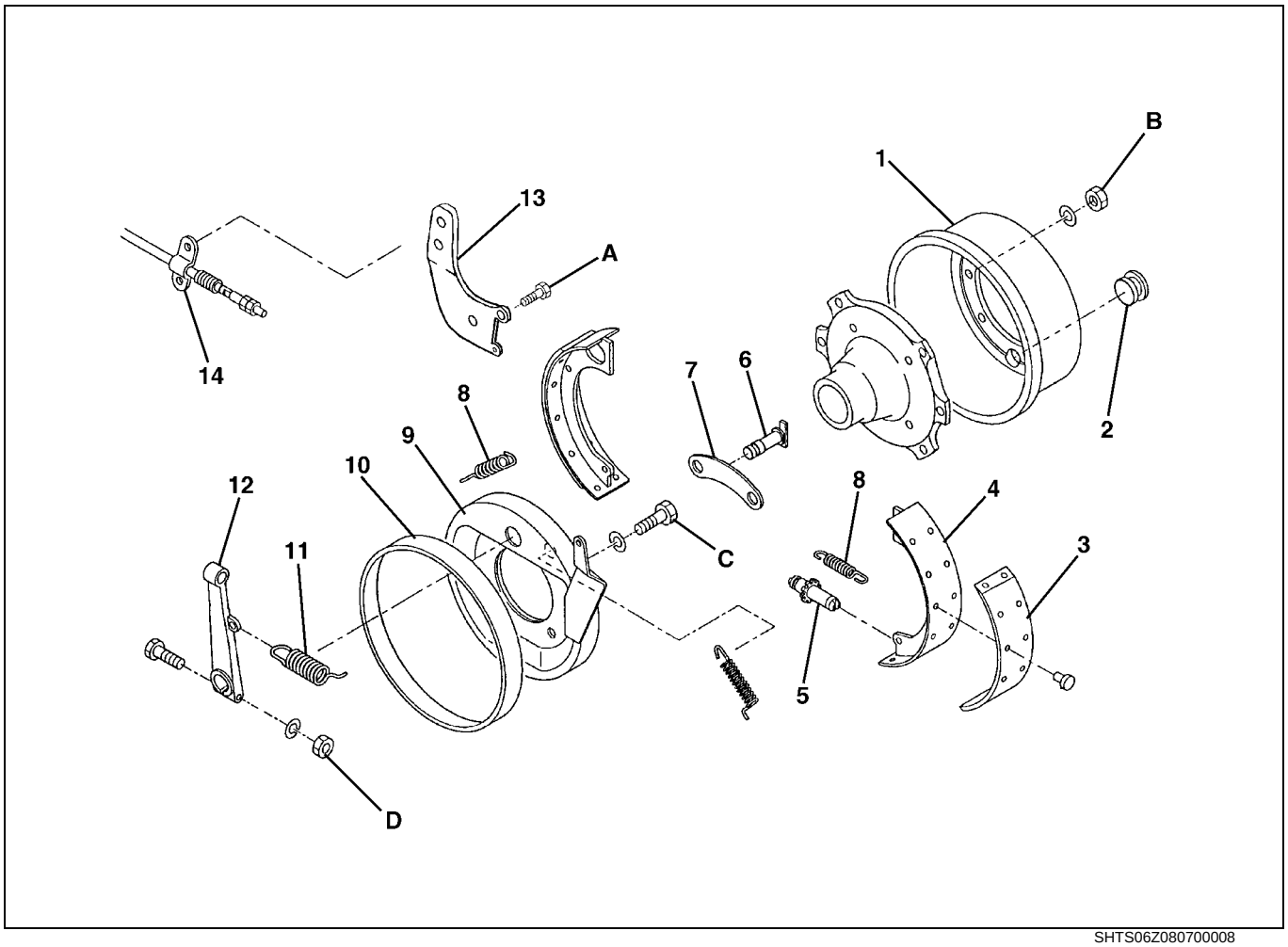
SHTS06Z080700007

1	Rubber plug	8	Shoe adjuster
2	Brake drum	9	Cam lever
3	Tension spring	10	Bracket
4	Brake lining	11	Lock pin
5	Brake shoe	12	Dust cover
6	Camshaft	13	Spacer
7	Anchor bracket		

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

A	64.5-85.5 {650-870, 48-63}	C	17.7-22.6 {180-230, 14-16}
B	147.5-166.5 {1,500-1,700, 109-122}	D	147.5-166.5 {1,504-1,698, 108-122}

PARKING BRAKE (ZF9S109, 9S1110, 9S1310 transmission)



SHTS06Z080700008

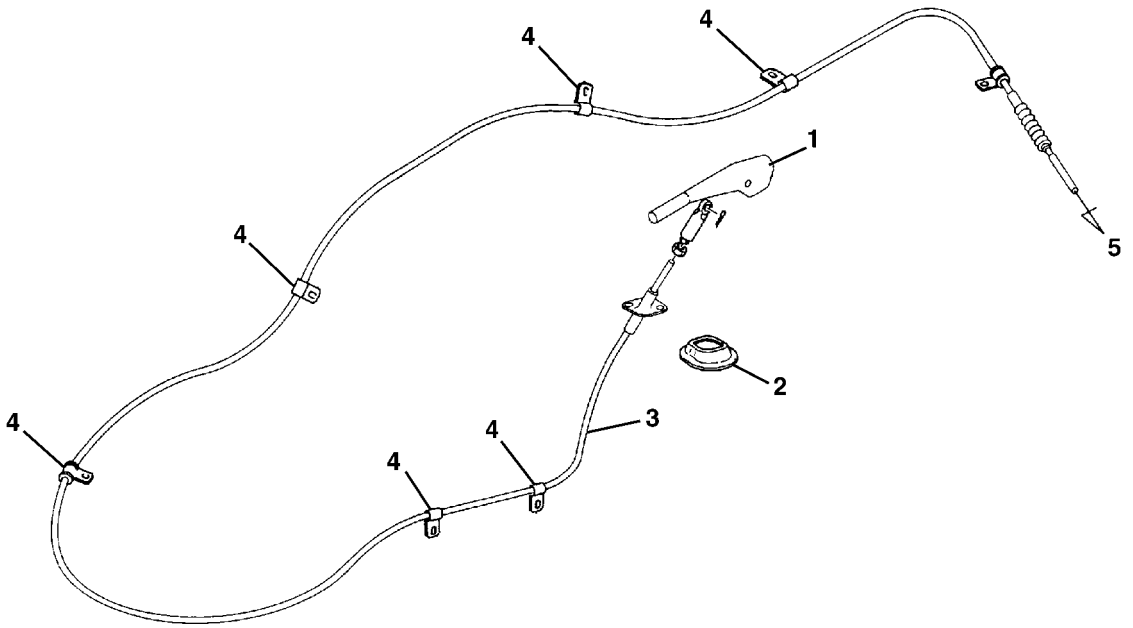
1	Brake drum	8	Tension spring
2	Grommet	9	Backing plate
3	Brake lining	10	Drum dust cover
4	Brake shoe	11	Spring
5	Shoe adjuster	12	Cam lever
6	Camshaft	13	Bracket
7	Pin	14	Cable

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

A	ϕ10: 45-55 {460-560, 33-40}	C	108.5-147.5 {1,100-1,500, 80-108}
	ϕ12: 71-87 {723-887, 52-64}	D	14.7-22.5 {150-230, 11-16}
B	64.5-85.5 {650-870, 48-62}		

PARKING BRAKE CONTROL

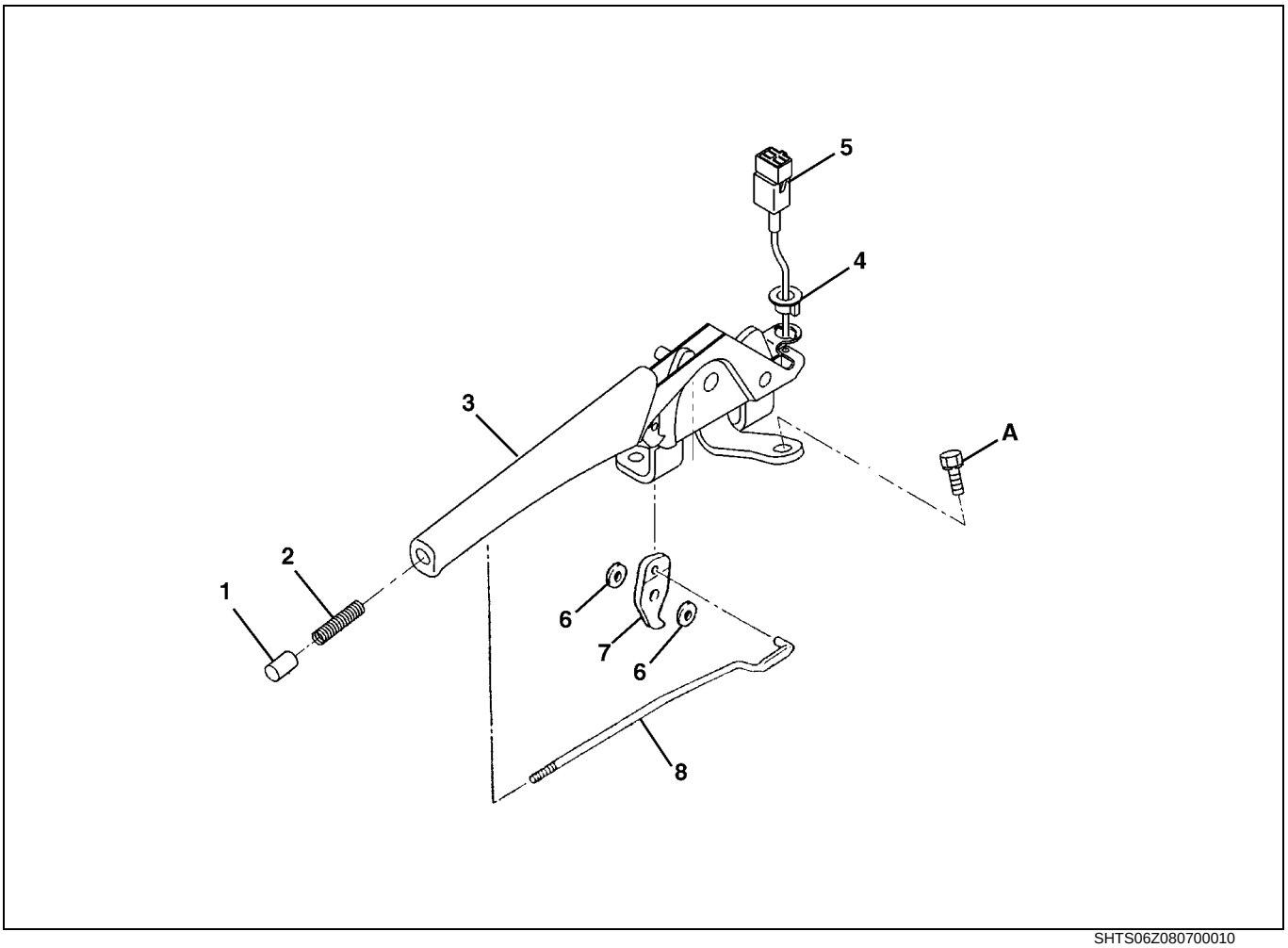
(REPRESENTATIVE TYPE)



SHTS06Z080700009

1	Parking brake lever assembly	4	Clips
2	Fixture	5	To parking brake
3	Cable		

PARKING BRAKE LEVER



SHTS06Z080700010

1	Knob	5	Parking brake switch
2	Compression spring	6	Spacer
3	Lever assembly	7	Pawl
4	Bushing	8	Pawl release rod

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

A	14.0-32.0 {143-327, 10.34-23.65}		

OVERHAUL

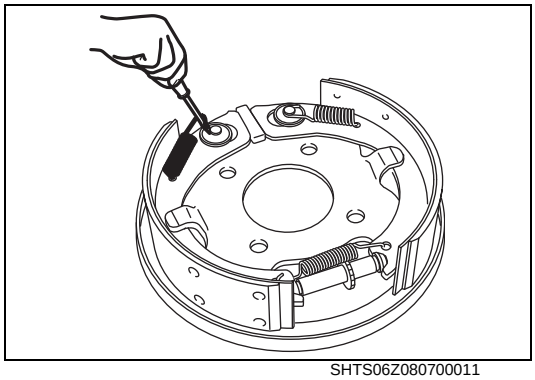
EN06Z0807H200001

IMPORTANT POINTS - DISMOUNTING

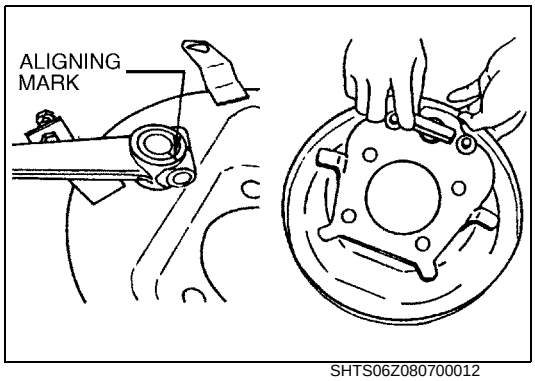
1. DISCONNECT THE PROPELLER SHAFT.
(1) Refer to the chapter "**PROPELLER SHAFT**".

2. REMOVE THE LOCK NUT AND TRANSMISSION OUTPUT SHAFT FLANGE.
(1) Refer to the chapter **"TRANSMISSION MAIN UNIT"**.

IMPORTANT POINTS - DISASSEMBLY


SHTS06Z080700011

1. REMOVE THE RETURN SPRING.
(1) Use the suitable tool to remove the return spring.

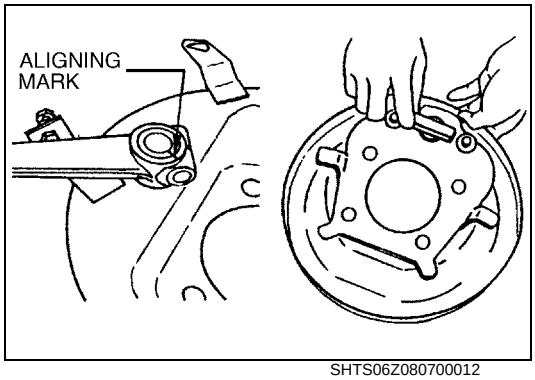


SHTS06Z080700012

2. REMOVE THE CAM LEVER.

NOTICE
Before removing the cam lever, make the aligning marks to cam lever and camshaft.

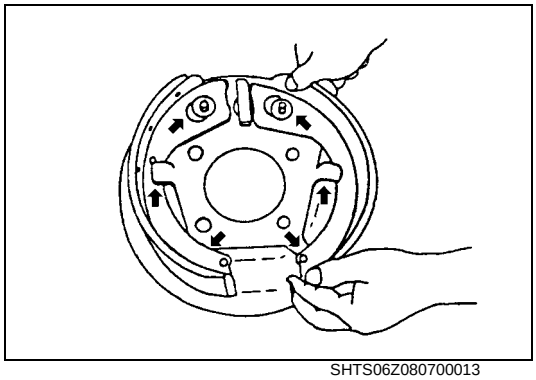
IMPORTANT POINTS - ASSEMBLY



SHTS06Z080700012

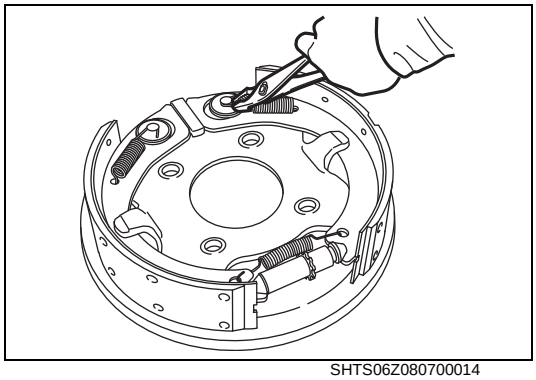
1. INSTALL THE CAM LEVER.

NOTICE
When installing the cam lever to camshaft, align the aligning marks which were applied at disassembly.


SHTS06Z080700013

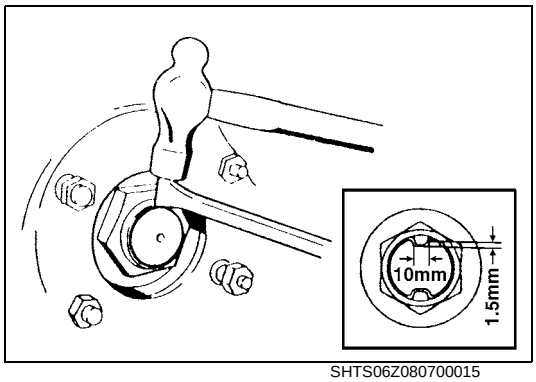
2. LUBRICATION

(1) Apply heat resistance grease on rubbing or matching faces of brake shoes, camshaft, shoe adjuster and position the adjuster in place.


SHTS06Z080700014

3. INSTALL THE RETURN SPRING.

(1) Use the suitable tool to install the return spring.



SHTS06Z080700015

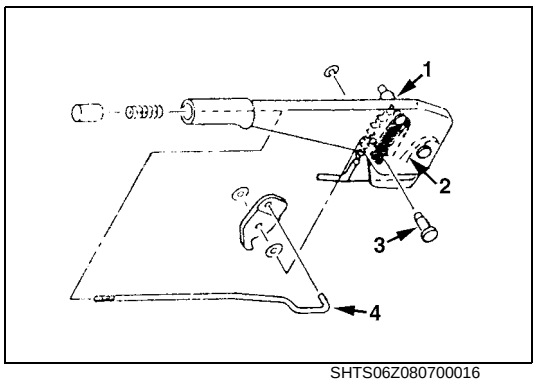
4. INSTALL FLANGE YOKE COUPLING.

(1) Install flange onto transmission output shaft and tighten lock nut.
Tightening torque:
587-783 N·m {6,000-8,000 kgf·cm, 434-578 lbf·ft}

(2) Caulk rim part of nut into groove on output shaft.

NOTICE

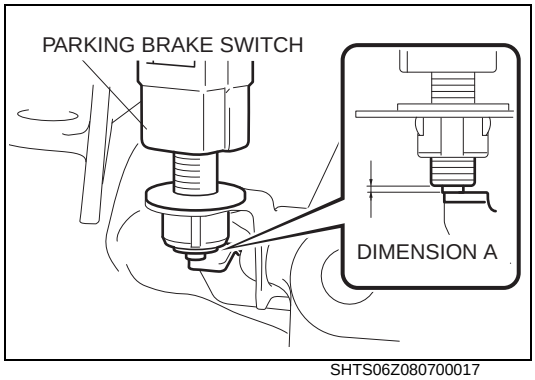
- **Caulked portion should be fitted in the groove thoroughly.**
- **Caulking should be done without rift.**



SHTS06Z080700016

5. APPLY BEARING GREASE ON THE FOLLOWING PARTS.

(1) Pin (Cable)
(2) Both sides of brake lever bracket
(3) Pin (Pawl)
(4) Pawl release rod



SHTS06Z080700017

6. PARKING BRAKE SWITCH.

(1) Install the switch to the brake lever bracket.

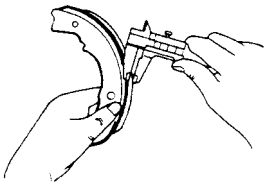
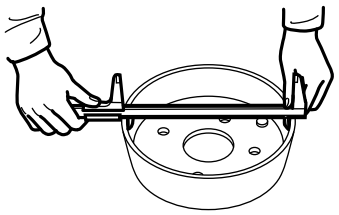
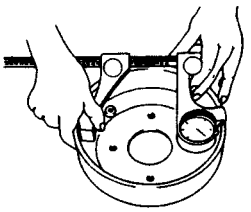
(2) Adjust the dimension A (Switch button projection) to 2.0 mm {0.0787 in.} when the parking brake lever is fully released.

(3) Confirm the parking brake indicator lamp lights, when the lever is pulled by the notches.

INSPECTION AND REPAIR

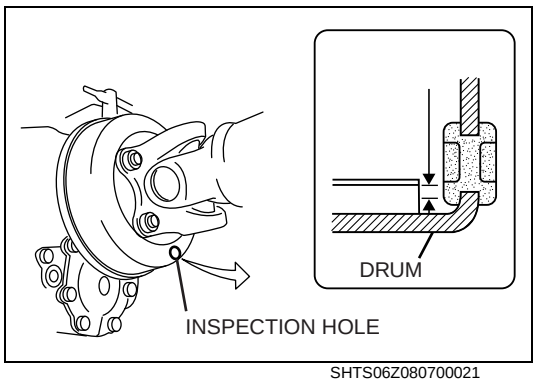
EN06Z0807H300001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Brake lining: Lining thickness	**7.0 {0.2756} Models: With LJ06, MF06, EATON transmission**	**4.0 {0.1575}**	**Replace.**	**Measure** 
	5.75 {0.2264} Models: With ZF transmission	**3.1 {0.1220}**		
Brake drum: Inside diameter	**254 {10.0}**	**256 {10.079}**	**Replace.**	**Measure** 
Brake drum: Run out	**0-0.1 {0-0.0039}**	**0.2 {0.0078}**	**Replace.**	**Measure** 

ADJUSTMENT

EN06Z0807H300002

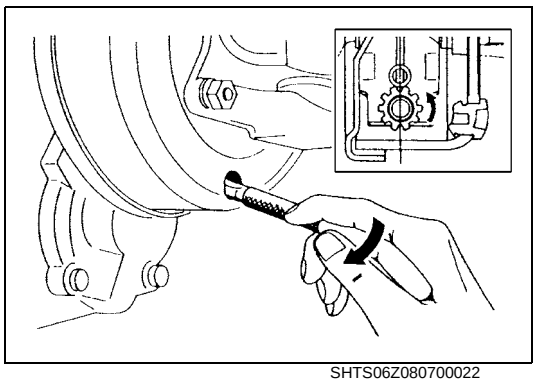


SHTS06Z080700021

1. CHECK THE REMAINING THICKNESS OF THE BRAKE LINING.

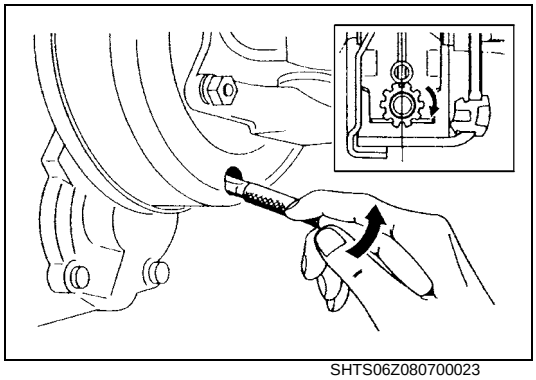
(1) Measure the remaining thickness of lining through the inspection hole of brake drum. Replace the brake shoe assembly when it is worn to the service limit.

Models	With LX06, LJ06, MF06, EATON transmission	With ZF transmission
Assembly standard	7.0 mm {0.276 in.}	5.75 mm {0.2264 in.}
Service limit	4.0 mm {0.157 in.}	3.10 mm {0.1220 in.}


SHTS06Z080700022

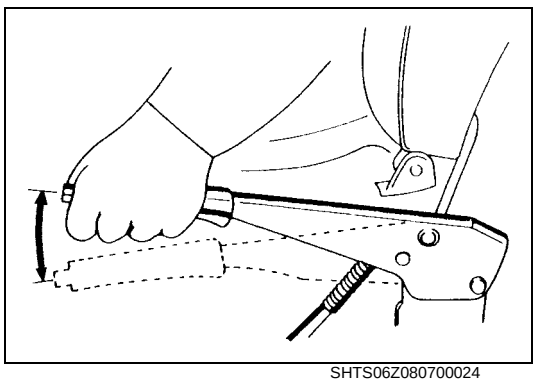
2. ADJUST THE CLEARANCE BETWEEN DRUM AND LINING.

(1) Lift the rear wheel to be adjusted off the ground.
(2) Release the control lever.
(3) Turn the adjuster to reduce the clearance to zero.
SST: Brake shoe adjusting tool (S0966-51130)

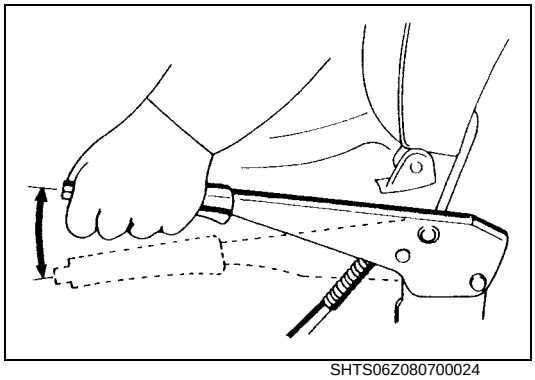

SHTS06Z080700023

(4) Turn the adjuster backward by specified notches.

Specified notches:
14 notches (Models: With LJ06, MF06, EATON transmission)
10-12 notches (Models: With ZF transmission)

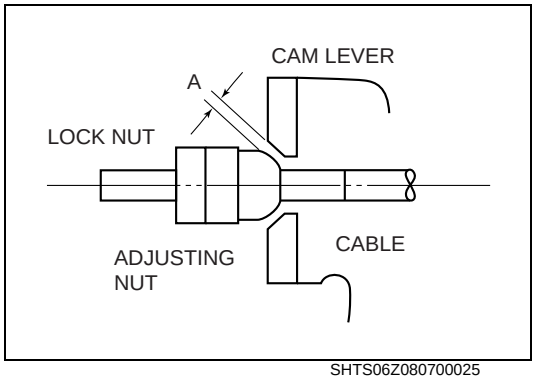

SHTS06Z080700024

(5) Pull the parking brake lever fully to three times and release the lever. Turn the drum by hand to see that the shoes are not dragging. If there is any dragging, repeat the operation from step 1.


SHTS06Z080700024

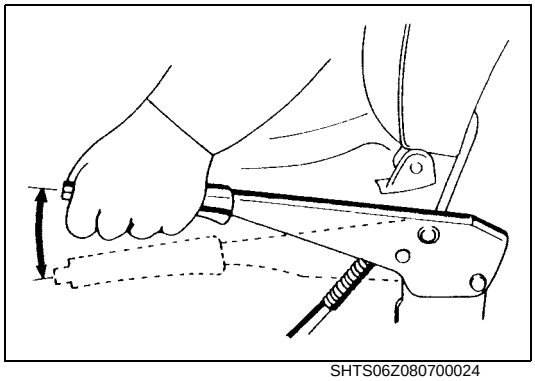
3. ADJUST THE CONTROL CABLE.

(1) Pull the parking brake lever fully to three times and release the lever.

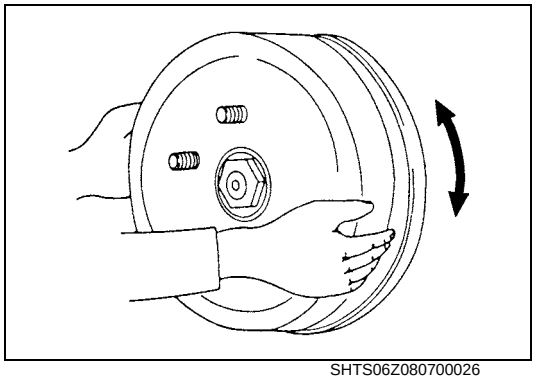


SHTS06Z080700025

(2) Adjust the clearance "A" between cable and cam lever on the parking brake to 1-2 mm {0.040-0.078 in.} by turning the adjusting nut.


SHTS06Z080700024

(3) Pull the parking brake lever with 294 N {30 kgf, 66.14 lbf} force and make sure that the lever stroke is within assembly standard. Then lock the adjusting nut with the lock nut.
Assembly standard: 8-11 notches


SHTS06Z080700026

(4) Pull the parking brake lever fully to three times and release the lever. Turn the drum by hand to see that the shoes are not dragging. If there is any dragging, repeat the operation from step 1.

STEERING EQUIPMENT

SR01-001

STEERING SYSTEM..... SR01-2
TROUBLESHOOTING..... SR01-2

STEERING SYSTEM

TROUBLESHOOTING

EN07Z0701F300001

Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Bent steering shaft, sliding shaft or column	Replace parts.
	Universal joint oscillates or catches.	Replace universal joint in the assembly.
	Column bearing does not revolve or catch.	Replace parts.
	Lack of lubrication in steering linkage.	Lubricate.
	Wheel alignment is incorrect.	Refer to the chapter **"FRONT AXLE"**.
	Power steering system is faulty.	Refer to the chapter **"POWER STEERING"**.
	Tire air pressure is too low.	Adjust properly.
Steering wheel shimmy	Steering system linkage is loose.	Tighten properly.
	Too much wear or play in steering linkage (spline and ball joints).	Replace parts.
	Other front axle problems.	Refer to the chapter **"FRONT AXLE"**.
	Power steering gear badly adjusted.	Refer to the chapter **"POWER STEERING"**.
	The wheels are out of balance.	Balance the wheels.
	Wheel wobbles.	Replace wheel.
	Tire air pressure is not uniform or sufficient.	Adjust tire pressure.
	Distorted disc wheel.	Replace parts.
Abnormal noises	Lack of lubrication in steering linkage.	Lubricate.
	Power steering system is faulty.	Refer to the chapter **"POWER STEERING"**.

STEERING UNIT

SR02-001

STEERING LINKAGE SR02-2
DESCRIPTION SR02-2
SPECIAL TOOL SR02-4
COMPONENT LOCATOR SR02-5
OVERHAUL SR02-8
INSPECTION AND REPAIR SR02-13

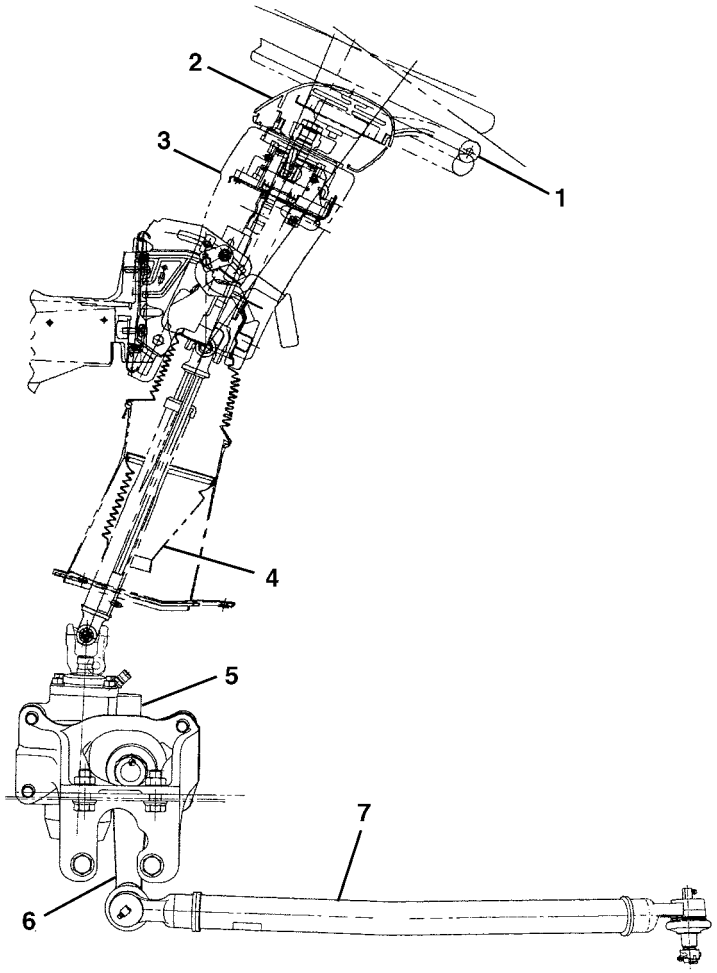
STEERING LINKAGE

DESCRIPTION

EN07Z0702C100001

RIGHT-HAND DRIVE MODEL

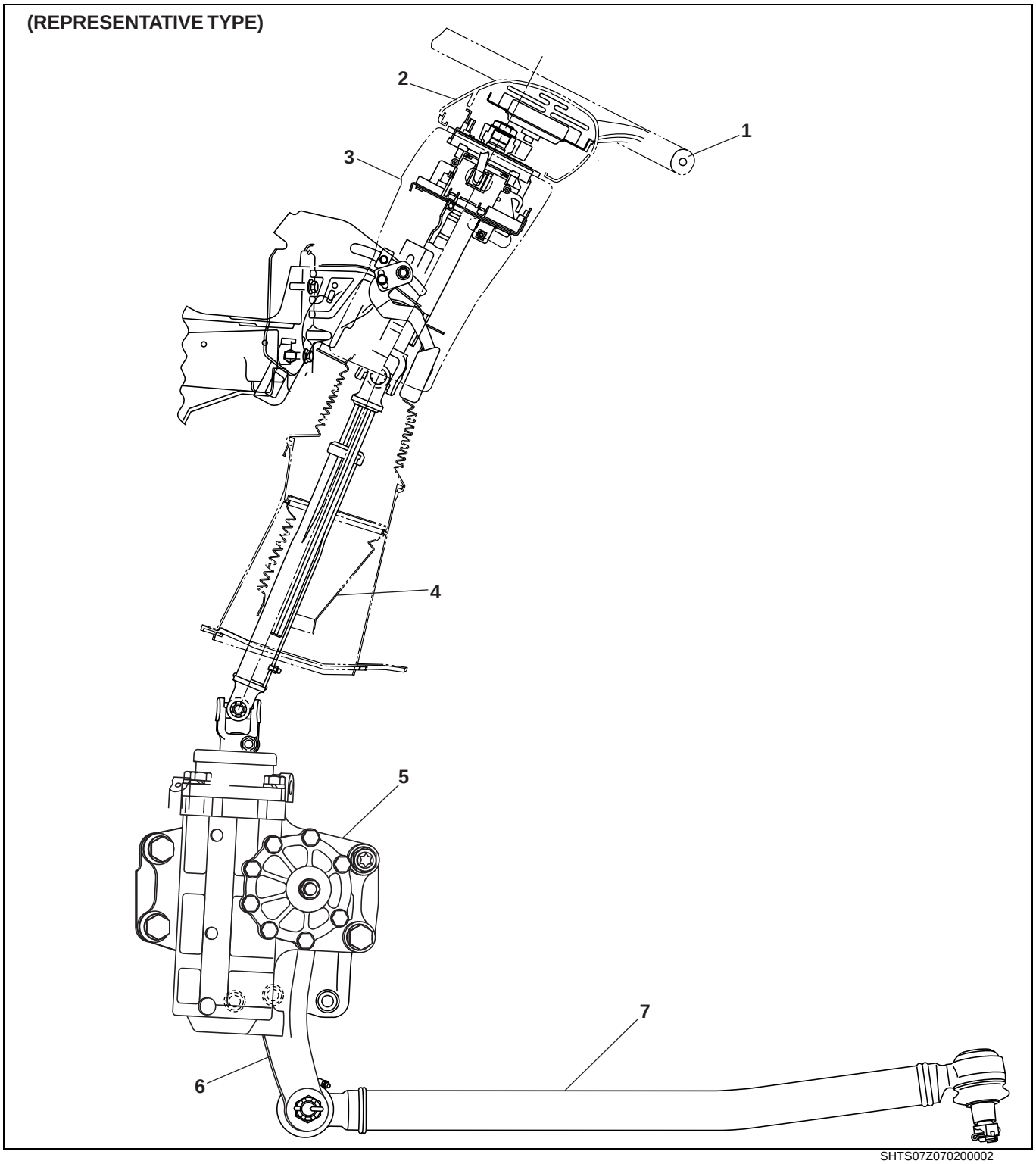
(REPRESENTATIVE TYPE)



SHTS07Z070200001

1	Steering wheel	5	Steering gear unit
2	Horn button	6	Pitman arm
3	Steering column assembly	7	Drag link
4	Dust cover		

LEFT-HAND DRIVE MODEL



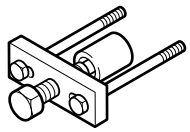
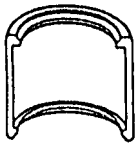
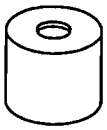
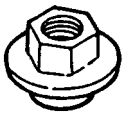
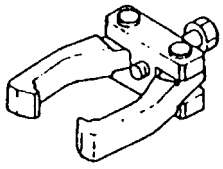
SHTS07Z070200002

1	Steering wheel	5	Steering gear unit
2	Horn button	6	Pitman arm
3	Steering column assembly	7	Drag link
4	Dust cover		

SPECIAL TOOL

EN07Z0702K100001

Prior to starting a steering linkage overhaul, it is necessary to have these special tools.

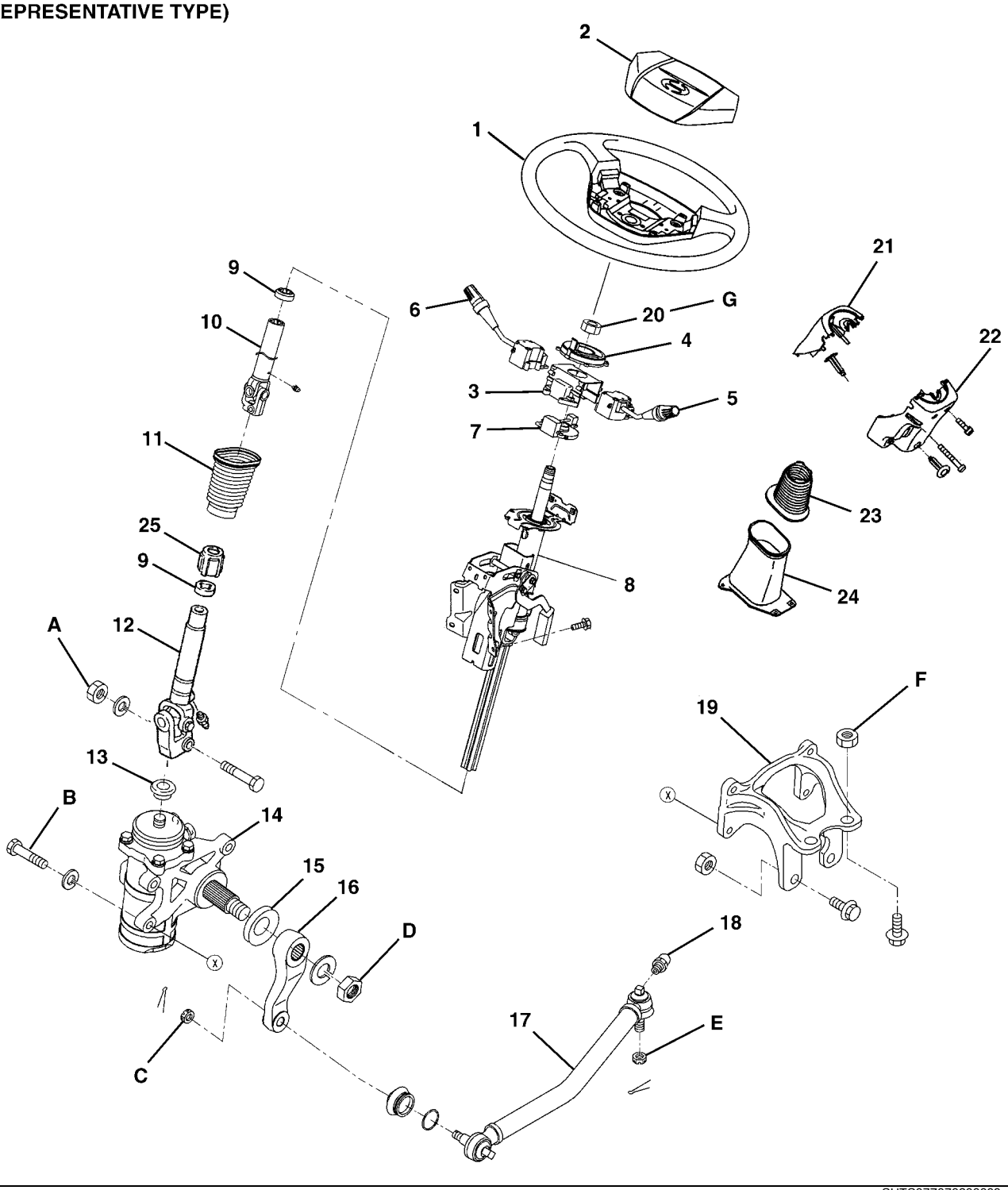
Illustration	Part number	Tool name	Remarks
	S0965-01341	STEERING WHEEL PULLER	
	S0965-72050	GUIDE	Models: FC, FD, GD
	S0965-71790	DUST COVER GUIDE INNER	2 pieces Models: except for FC, FD, GD
	S0965-71800	DUST COVER GUIDE OUTER	Models: except for FC, FD, GD
	SZ179-20001	DUST COVER GUIDE NUT	Models: except for FC, FD, GD
	S0965-01260	PITMAN ARM PULLER	

COMPONENT LOCATOR

EN07Z0702D100001

RIGHT-HAND DRIVE MODEL

(REPRESENTATIVE TYPE)



SHTS07Z070200009

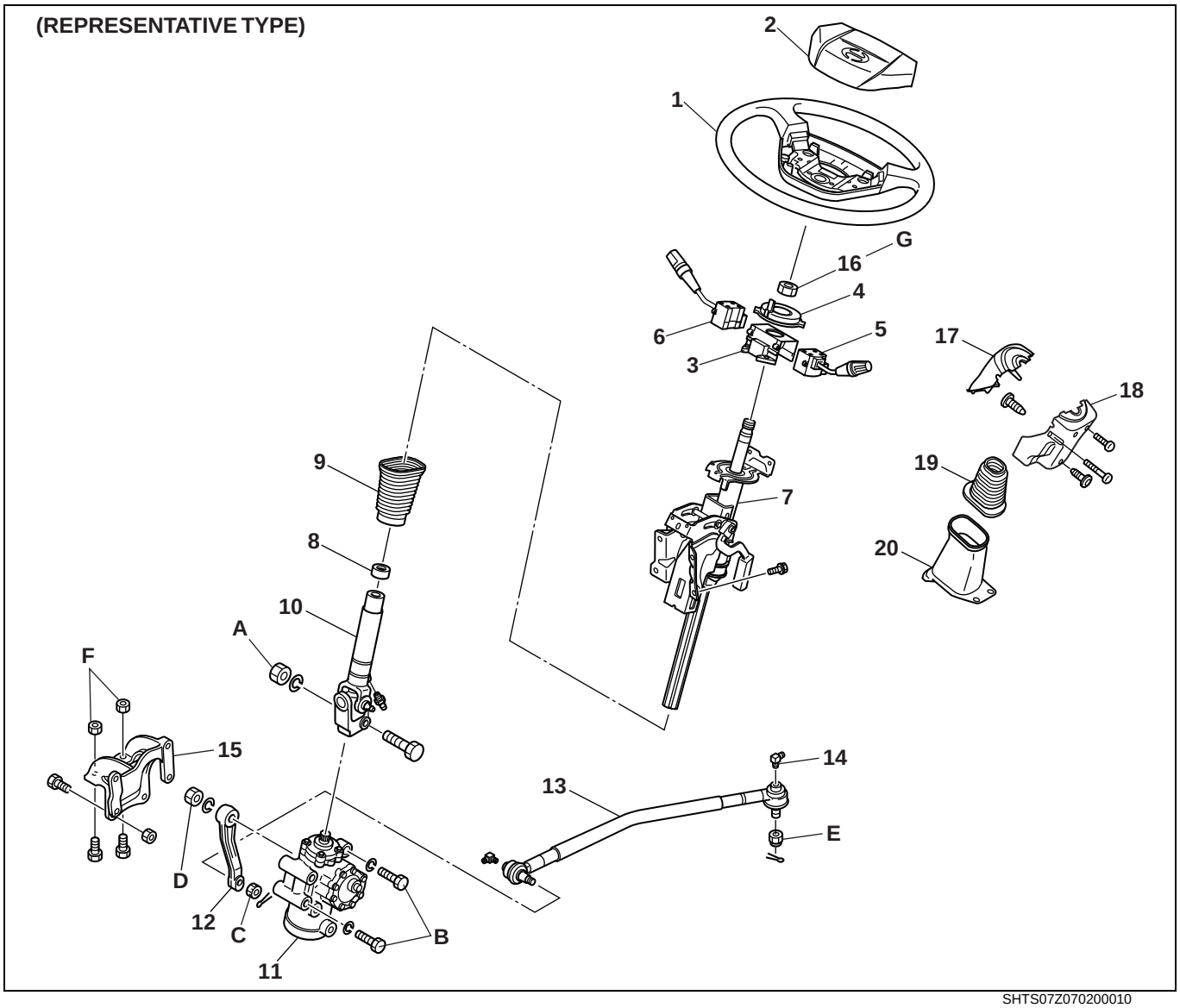
1	Steering wheel	10	Steering shaft universal joint assembly	19	Steering gear bracket
2	Horn button	11	Dust cover	20	Flange nut
3	Combination switch	12	Sliding yoke	21	Column upper cover
4	Spiral cable	13	Steering shaft dust cover	22	Column lower cover
5	Windshield wiper switch	14	Steering gear unit	23	Column lower boot
6	Light control switch	15	Steering gear dust seal	24	Column lower tube
7	Steering sensor	16	Pitman arm	25	Pivot bolt
8	Steering column assembly	17	Drag link		
9	Dust seal	18	Lubrication fitting		

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

A	48.5-57.5 {500-600, 37-43}	D	ϕ27: 211-289 {2,200-3,000, 156-213}
B	ϕ16: 146-224 {1,500-2,300, 109-167}		ϕ30: 341-439 {3,478-4,476, 252-323}
	ϕ18: 277-423 {2,830-4,310, 206-315}		ϕ36: 391-489 {3,988-4,986, 289-360}
C	146-244 {1,500-2,500, 109-180}	E	146-244 {1,500-2,500, 109-180}
		F	206-284 {2,100-2,895, 152-209}
		G	48.5-77.5 {500-800, 37-57}

NOTICE
When removing the nut "F", be sure to replace the nut with new one, because the nut "F" is coated with frictional coefficient stabilizer.

LEFT-HAND DRIVE MODEL



SHTS07Z070200010

1	Steering wheel	8	Dust seal	15	Steering gear bracket
2	Horn button	9	Dust cover	16	Flange nut
3	Combination switch	10	Sliding yoke	17	Column upper cover
4	Spiral cable	11	Steering gear unit	18	Column lower cover
5	Light control switch	12	Pitman arm	19	Column lower boot
6	Windshield wiper switch	13	Drag link	20	Column lower tube
7	Steering column assembly	14	Lubrication fitting		

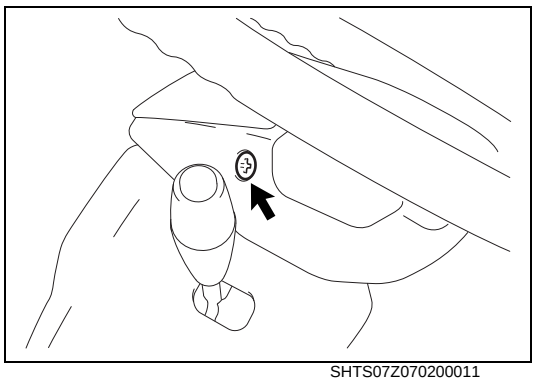
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	48.5-57.5 {500-600, 37-43}	D	ϕ27: 211-289 {2,200-3,000, 156-213}
B	ϕ16: 146-224 {1,500-2,300, 109-167}		ϕ30: 241-389 {3,000-4,000, 217-286}
	ϕ18: 277-423 {2,830-4,310, 206-315}		ϕ36: 391-489 {4,000-5,000, 289-360}
C	146-244 {1,500-2,500, 109-180}	E	146-244 {1,500-2,500, 109-180}
		F	206-284 {2,100-2,900, 152-209}
		G	48.5-77.5 {500-800, 37-57}

NOTICE
When removing the nut "F", because the nut "F" is coated with friction coefficient stabilizer be sure to replace the nut with new one.

OVERHAUL

EN07Z0702H200001



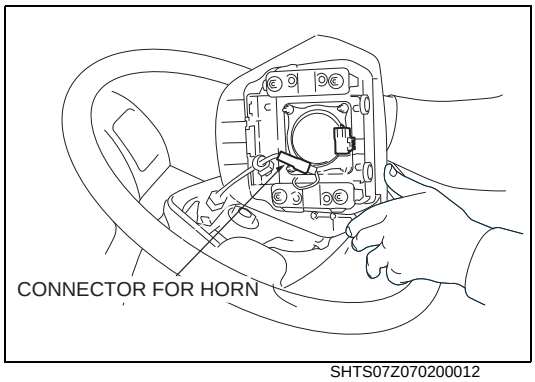
SHTS07Z070200011

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE STEERING WHEEL.

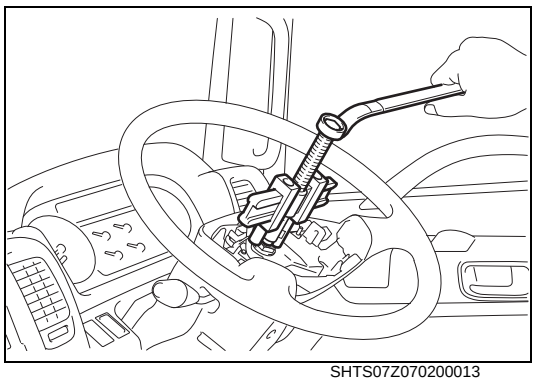
(1) Loosen the torx bolt for fixing the horn button using torx wrench.

(2) Remove the horn button from the steering wheel.



SHTS07Z070200012

(3) Remove the connector for the horn.



SHTS07Z070200013

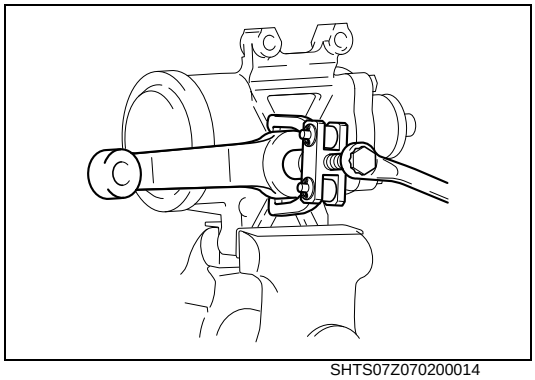
(4) Remove the steering wheel lock nut.

(5) Use the special tool or commercial tool to remove the steering wheel as shown in the figure.
SST: Steering Wheel Puller (S0965-01341)

NOTICE

- **Before removing the steering wheel from the steering shaft, make aligning marks on both so that they can be assembled in the same position.**
- **Because the puller hole is made of aluminum and it is easily damaged, screw the puller bolt deeply.**

(6) Fix the rotating part of spiral cable with tape etc. to prevent the spiral cable from rotating.



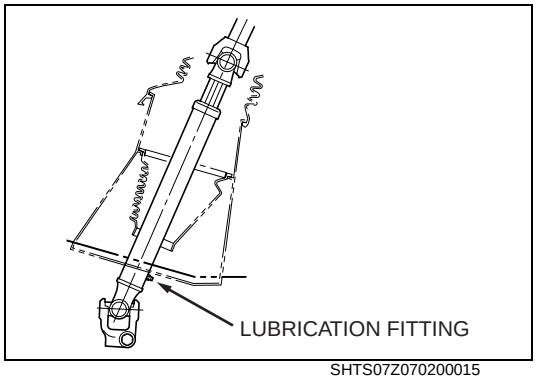
SHTS07Z070200014

2. REMOVE THE PITMAN ARM.

(1) Remove the nut, lock washer and plain washer from the sector shaft.

(2) Using the special tool, remove the pitman arm.
SST: Pitman Arm Puller (S0965-01260)

NOTICE
Do not use wedges or hit with a hammer.



SHTS07Z070200015

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLE THE STEERING SHAFT.

2. INSTALL THE DUST COVER.

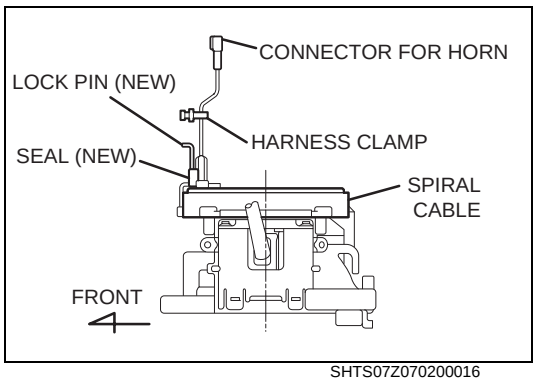
(1) The dust cover must be fitted with two bolts facing the relief mark "REAR" rearward. After tightening, make certain that the white paint mark will be faced frontward.

3. ASSEMBLE THE STEERING SHAFT.

(1) Before assembling, apply chassis grease to the spline of the sliding yoke, and after assembling also fill grease through lubrication fitting.

When replacing parts: 30g (1.1 oz.)
When replenishing parts: 15g (0.5 oz.)

NOTICE
When assembling, take care not to damage the steering shaft spline.

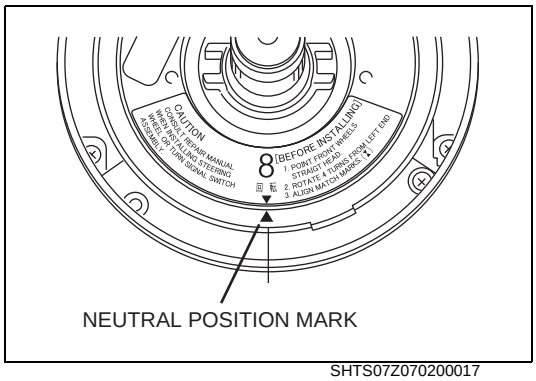


SHTS07Z070200016

4. INSTALL THE STEERING WHEEL.

(1) Set front axles toward rectilinear direction.

(2) When spiral cable is new, make sure that the lock pin is seated in the spiral cable assembly and the seal is not cut. When spiral cable is reused, make sure that the neutral position of the spiral cable does not get out of position.

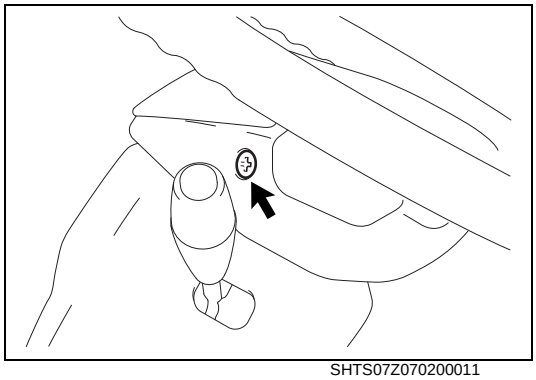


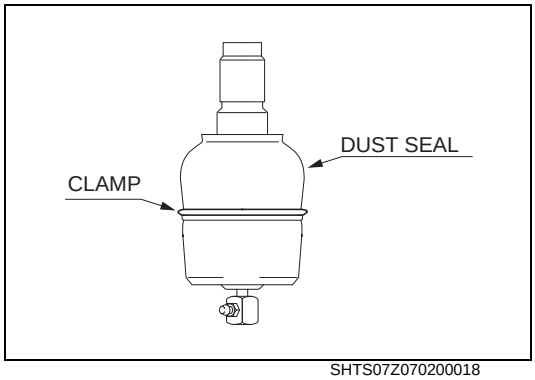
SHTS07Z070200017

NOTICE
When there is no lock pin though the spiral cable is new, or when the seal is cut though there is a lock pin, or when the neutral position of the spiral cable gets out of position in reuse, turn the spiral cable counterclockwise lightly. And turn it back clockwise by 4 rotations at the point of beginning of the hard steering. Then match the neutral position marks on the upper side of the spiral cable assembly.

(3) Pass the spiral cable through the steering wheel opening area and set the steering wheel straight to install it with nut. When the spiral cable is new, remove the lock pin. When it is reused, remove the tape etc. for fixing the rotation of the spiral cable.

(4) Tighten the set screw for fixing the horn button after pushing it in by using a torx wrench.
Tightening Torque:
6.5-13.5 N·m {66-138 kgf·cm, 4.8-9.9 lbf·ft}


SHTS07Z070200011



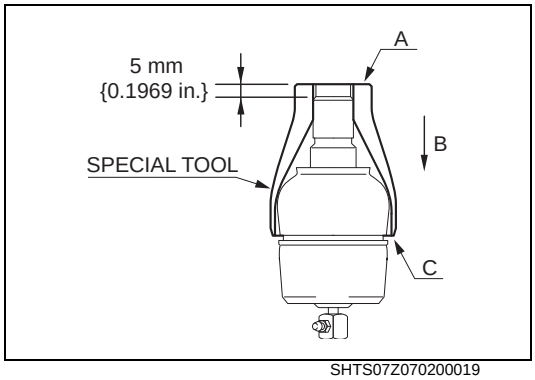
SHTS07Z070200018

5. IF NECESSARY, REPLACE THE DRAG LINK DUST SEAL. (MODELS: FC, FD, GD)

(1) Using a flat blade screwdriver etc., remove the clamp and then remove the dust seal.

NOTICE
If dust etc. is adhered to the socket groove, remove it.

(2) Set up the ball stud vertically to the end.
(3) Apply grease to the dust seal lip part.



SHTS07Z070200019

(4) Put a dust seal on the end and fit it into the groove. Screw in a clamp mounting special tool so that its end plane "A" is located 5 mm {0.1969 in.} above the upper end of the ball stud screw. At this moment, make sure that the pointed end of the tool is positioned to the seal groove as the illustration to the left shows.
SST: Guide (S0965-72050)

(5) Insert a clamp from "A" side of the tool and move it to the direction of B down to the plane "C". Then drop the clamp slowly into the dust seal groove.

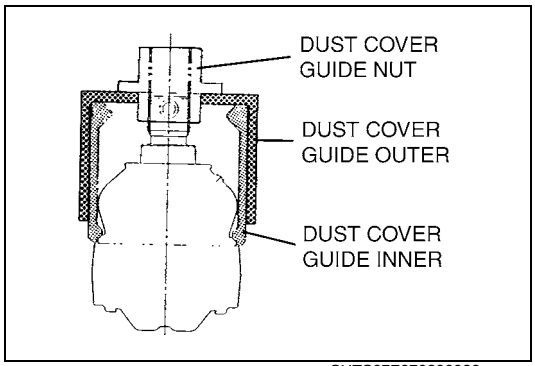
(6) After mounting the clamp, make sure that there is no deformation under torsion or running off the edge of the clamp. If such deformation or running out is found, touch it up by using a flat head screw driver or its equivalent.

NOTICE

- **If the dust seal is damaged or the clamp is deformed, replace them with new one.**
- **Do not reuse the clamp once used.**

(7) After mounting the clamp, fill the lubrication fitting of the drag link ball joint with chassis grease.

NOTICE
Fill with grease until it flows out from the hole of dust seal.

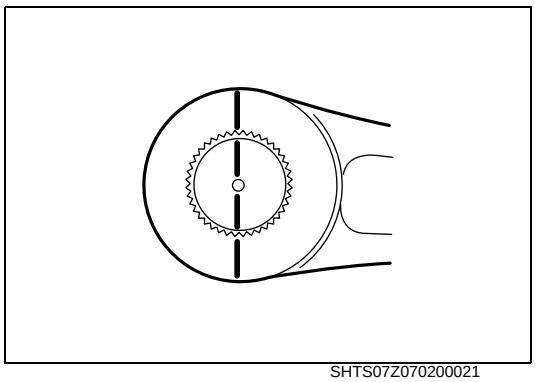


SHTS07Z070200020

6. IF NECESSARY, REPLACE THE DRUG LINK DUST SEAL AND RELAY ROD. (MODELS: EXCEPT FC, FD, GD)

(1) Observe the following procedure when changing the dust seal.
  a. Pry off the dust seal with a screw driver.
  b. Put 6.5 g {0.23 oz.} of lithium molybdenum grease in the seal.
  c. Use the special tools to install the dust seal onto the socket without damaging it.

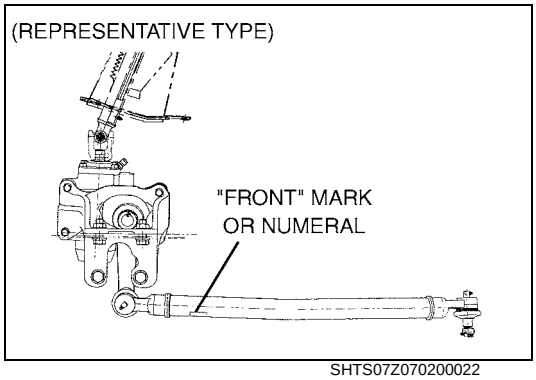
  SST:
  Dust Cover Guide Inner (S0965-71790)
  Dust Cover Guide Outer (S0965-71800)
  Dust Cover Guide Nut (SZ179-20001)


SHTS07Z070200021

7. INSTALL THE PITMAN ARM.

(1) Through the pitman arm, install the plain washer and lock washer to the sector shaft.
(2) Tighten the nut to the specified torque.

NOTICE
Align the aligning marks.



SHTS07Z070200022

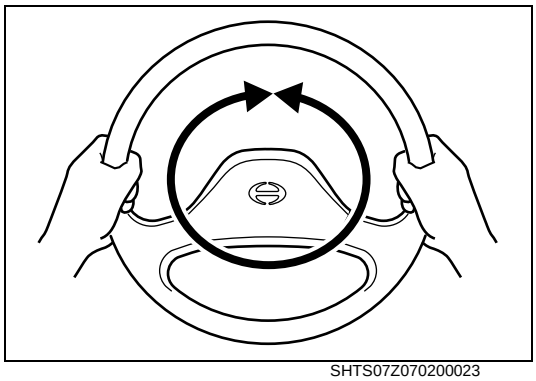
8. INSTALL THE DRAG LINK.

(1) Connect the drag link with the pitman arm and with the knuckle arm.

NOTICE

- **At this time, make sure that the arrow "FRONT" or numeral on the drag link is positioned toward the front of vehicle.**
- **When handling the drag link, take care not to damage the dust seal.**

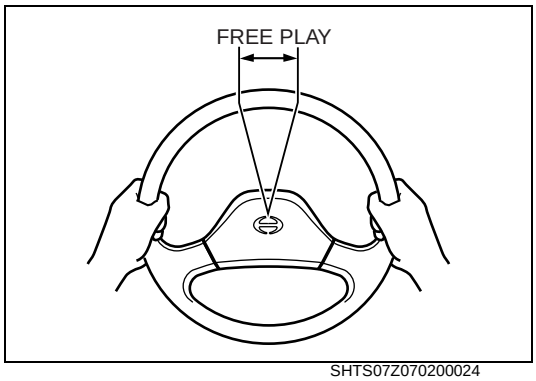
(2) Tighten the slotted nuts of the ball studs at both ends of the link to the specified torque, and then secure the nuts with the cotter pins.


SHTS07Z070200023

9. INSPECT THE STEERING SYSTEM FOR OPERATING ABILITY.

(1) Place the front wheels on turn tables.

(2) Make sure that the steering wheel turns smoothly without any jolts or abnormal resistance when the steering wheel is turned full range.



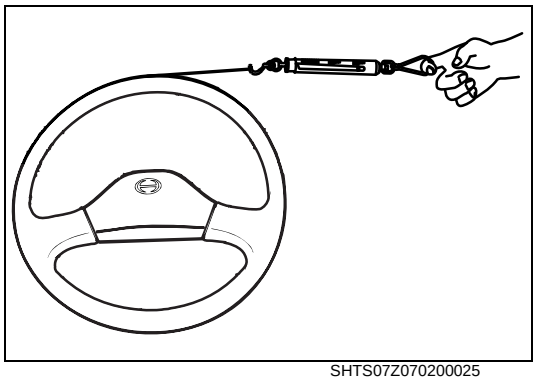
SHTS07Z070200024

(3) Check the steering wheel free play while engine is idling.
Wheel Free Play: 15-35 mm {0.591-1.377 in.}

(4) If wheel free play exceeds 15-35 mm {0.591-1.377 in.}, turn the set screw clockwise to decrease wheel free play and counterclockwise to increase it.

⚠ CAUTION

Excessive steering wheel free play may adversely affect vehicle handling. This can result in personal injury and/or property damage.

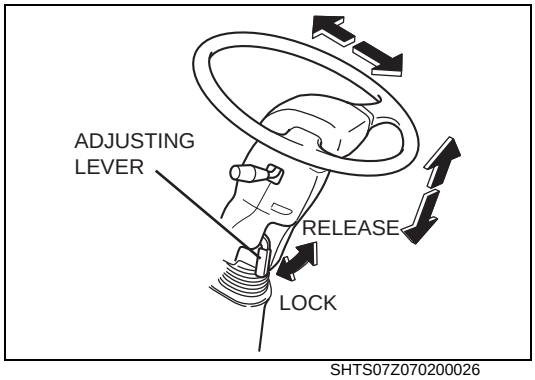

SHTS07Z070200025

(5) Measure the steering wheel turning force. Use a spring balancer to measure the steering wheel turning force.

NOTICE

Measure the steering wheel turning force while the engine is idling.

Turning force: 20 N {2.0 kgf, 4.4 lbf}



SHTS07Z070200026

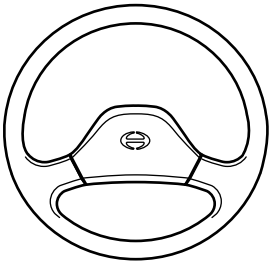
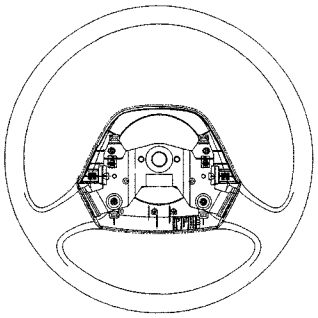
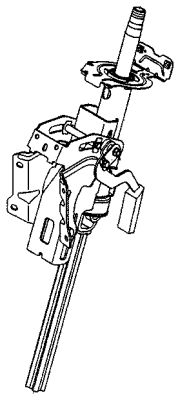
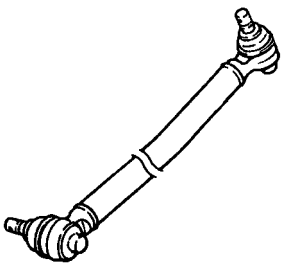
(6) The steering wheel must be locked securely in any position up, down, forward and backward.

⚠ CAUTION
Before moving the vehicle, tighten the lever securely and try to move the steering wheel up and down, and forward and backward to make sure that it is locked securely. Never try to adjust the steering wheel position while the vehicle is moving. Any adjustment of the steering wheel while driving can cause the driver to lose control, and result in personal injury and/or property damage.

(7) Check to see that the combination switch is operating properly.

INSPECTION AND REPAIR

EN07Z0702H300001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Steering wheel: Cracks, distortion and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Steering wheel serration: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Steering column assembly: Bent, oscillation and cracks	**—**	**—**	**Replace, if necessary**	**Visual check** 
Drag link: Cracks and damage Ball joint: Play Dust seal: Damage	**—**	**—**	**Replace the whole drag link assembly or replace only dust cover.**	**Visual check** 

POWER STEERING

SR03-001

POWER STEERING SYSTEM SR03-2
TROUBLESHOOTING SR03-2
AIR BLEEDING SR03-3
HYDRAULIC TEST SR03-4

POWER STEERING GEAR UNIT (MODELS: FC, FD) SR03-8
DATA AND SPECIFICATIONS SR03-8
DESCRIPTION SR03-8
OPERATION SR03-10
SPECIAL TOOL SR03-12
COMPONENT LOCATOR SR03-12
OVERHAUL SR03-14
INSPECTION AND REPAIR SR03-17

POWER STEERING GEAR UNIT (MODELS: GD, FG, GH, FL, FM, SG, FT, GT) SR03-18
DATA AND SPECIFICATIONS SR03-18
DESCRIPTION SR03-18
OPERATION SR03-20
SPECIAL TOOL SR03-22
COMPONENT LOCATOR SR03-24
OVERHAUL SR03-27
INSPECTION AND REPAIR SR03-41

POWER STEERING PUMP (MODELS: FC, FD) SR03-43
DATA AND SPECIFICATIONS SR03-43
DESCRIPTION SR03-43
OPERATION SR03-44
COMPONENT LOCATOR SR03-45
OVERHAUL SR03-47
INSPECTION AND REPAIR SR03-52

POWER STEERING PUMP (MODELS: GD, FG, GH, FL, FM8J, SG, FT, GT) SR03-54
DATA AND SPECIFICATIONS SR03-54
DESCRIPTION SR03-54
OPERATION SR03-55
COMPONENT LOCATOR SR03-56
OVERHAUL SR03-57
INSPECTION AND REPAIR SR03-61

POWER STEERING PUMP (MODEL: FM1A) SR03-62
DATA AND SPECIFICATIONS SR03-62
DESCRIPTION SR03-62
OPERATION SR03-63
COMPONENT LOCATOR SR03-64
OVERHAUL SR03-65
INSPECTION AND REPAIR SR03-70

POWER STEERING PUMP (MODEL: FM2P) SR03-71
DATA AND SPECIFICATIONS SR03-71
DESCRIPTION SR03-71
OPERATION SR03-72
COMPONENT LOCATOR SR03-73
OVERHAUL SR03-74
INSPECTION AND REPAIR SR03-79

OIL RESERVOIR (MODELS: FC, FD, GD, FT, GT) SR03-80
DESCRIPTION SR03-80
COMPONENT LOCATOR SR03-81
OVERHAUL SR03-82
INSPECTION AND REPAIR SR03-82

OIL RESERVOIR (MODELS: FG, GH, FL, FM, SG) SR03-83
DESCRIPTION SR03-83
COMPONENT LOCATOR SR03-84
OVERHAUL SR03-85
INSPECTION AND REPAIR SR03-85

POWER STEERING SYSTEM

TROUBLESHOOTING

EN07Z0703F300001

Symptom	Possible cause	Remedy/Prevention
Fluid leakage	Pump	Replace pump.
	Line joints	Replace leaky parts.
Fluid leakage (Gear box)	Oil seal, O-rings other than those for the seal lock nut and drain plug	Repair oil seal or O-ring.
	Seal lock nut, drain plug	Replace lock nut or plug.
Hard steering **(Excessive steering effort)** **(One side is hard)**	Steering gear faulty	Hydraulic test. Replace piston sub-assembly.
Hard steering **(Excessive steering effort)** **(Both sides are hard)**	Steering gear pump faulty	Hydraulic test.
		Measure pump discharge pressure. Replace pump.
	Incorrect preload of the sector shaft bearing	Measure system hydraulic pressure. Replace piston sub-assembly.
		Adjust sector shaft preload.
Hard steering **(Excessive steering effort)** **(Hard, when starting to steer)** **NOTICE** **Basic inspection items** • **Fluid level, fluid cleanliness** • **Air mixed in fluid** • **Tire pressure** • **Front alignment** • **Steering linkage** • **Universal joint**	Incorrect preload of the sector shaft bearing	Adjust sector shaft preload.
Abnormal noise (Pump) **NOTICE** **Basic inspection items** • **Fluid level, fluid cleanliness** • **Air mixed in fluid** • **Pump piping** • **Steering linkage**	Air sucked in at input pipe	Repair and bleed air or replace pump.
Abnormal noise	Gear box	Replace piston sub-assembly.

AIR BLEEDING

EN07Z0703H200001

1. FILL THE OIL RESERVOIR WITH POWER STEERING FLUID.

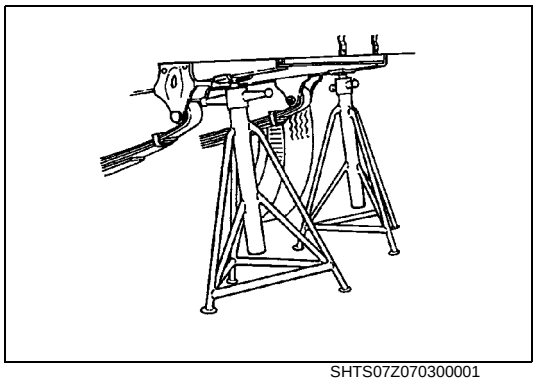
NOTICE

- **Use only specified fluid.**
- **Do not overfill the oil reservoir.**
- **Replace old fluid with new fluid after overhauling power steering gear unit or power steering pump.**
- **Specified fluid....Refer to recommended lubricant list.**

2. JACK UP THE FRONT AXLE AND SUPPORT THE FRAME WITH STANDS.

NOTICE

Block the rear wheels.

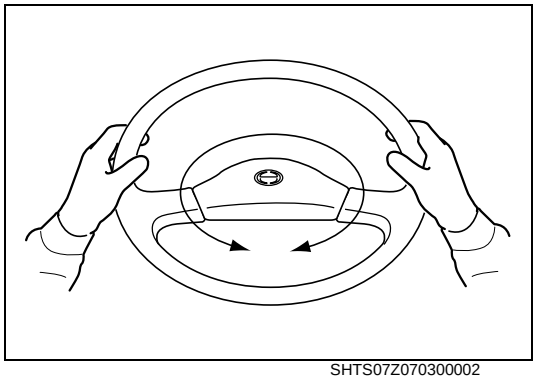


SHTS07Z070300001

3. TURN THE STEERING WHEEL FULLY IN BOTH DIRECTIONS SEVERAL TIMES.

4. CHECK THE FLUID LEVEL IN THE OIL RESERVOIR.

(1) Add the fluid, if necessary.



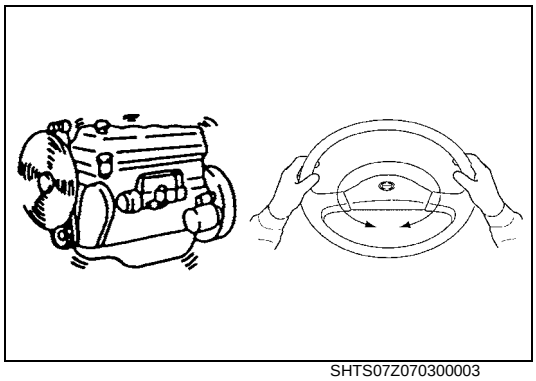
SHTS07Z070300002

5. START THE ENGINE AND TURN THE STEERING WHEEL FULLY IN BOTH DIRECTIONS SEVERAL TIMES WITH ENGINE IDLING.

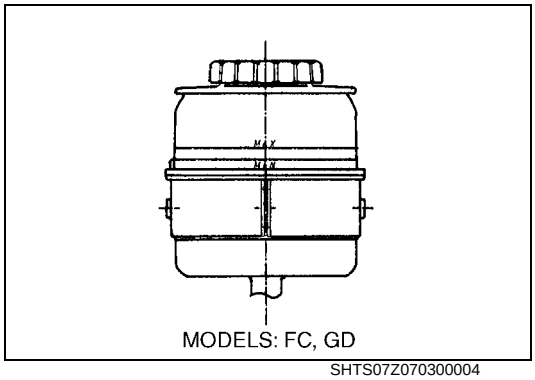
NOTICE

The fluid in the oil reservoir should be continuously replenished while air bleeding so that the oil reservoir never become empty.

6. RETURN THE STEERING WHEEL TO STRAIGHT AHEAD.

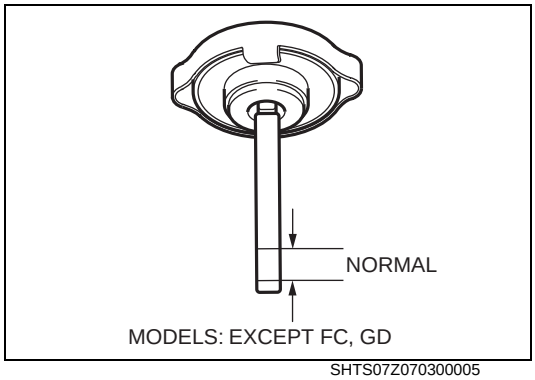


SHTS07Z070300003



MODELS: FC, GD

SHTS07Z070300004



MODELS: EXCEPT FC, GD

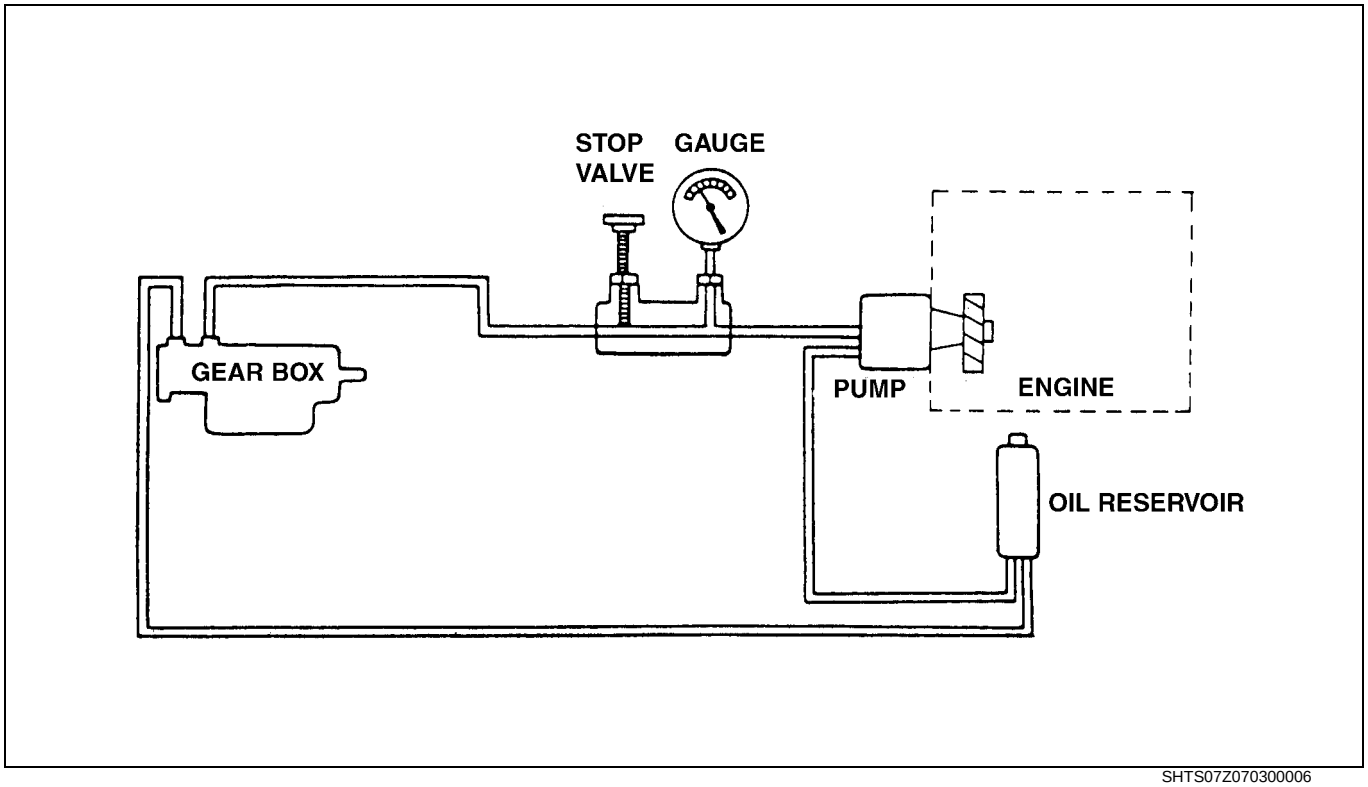
SHTS07Z070300005

7. RECHECK THE FLUID LEVEL WHEN THE ENGINE IS STOPPED.

(1) If necessary, add or decrease the power steering fluid to match the between "MAX" and "MIN" line.

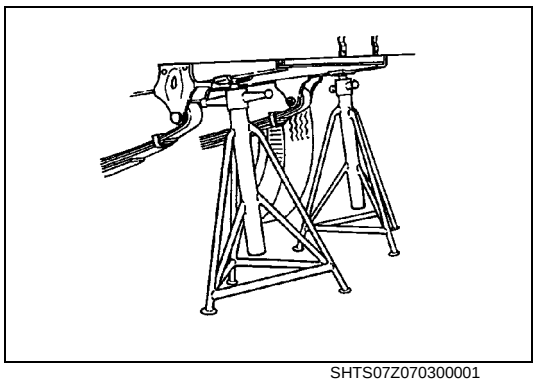
HYDRAULIC TEST

EN07Z0703H300001



SHTS07Z070300006

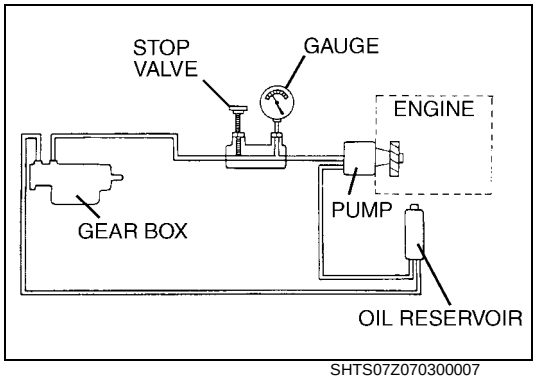
HYDRAULIC TEST



SHTS07Z070300001

1. JACK UP THE FRONT AXLE AND SUPPORT THE FRAME WITH STANDS.

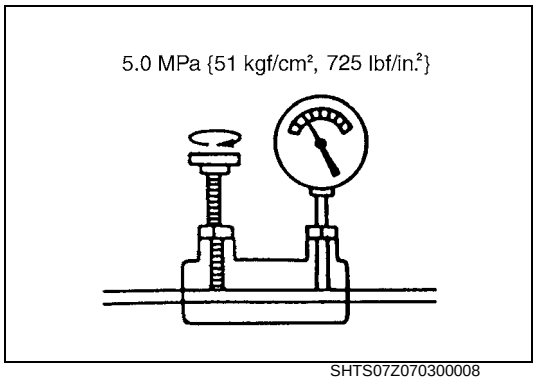
NOTICE
Block the rear wheels.



SHTS07Z070300007

2. SET THE STOP VALVE AND OIL PRESSURE GAUGE AS SHOWN IN THE FIGURE.

NOTICE
After setting the stop valve and oil pressure gauge, perform the air bleeding in the system according to "AIR BLEEDING".



SHTS07Z070300008

3. CHECK THE FLOW CONTROL VALVE OPERATION.

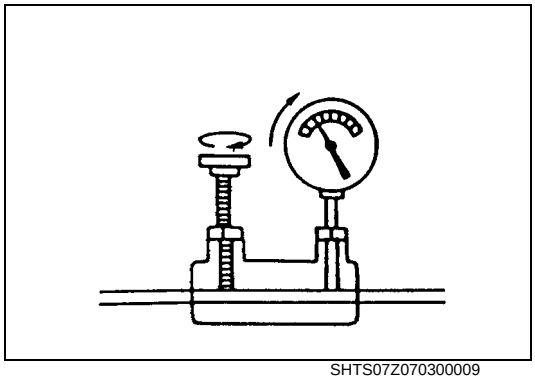
(1) Start the engine and idle then close the stop valve until the fluid pressure is at **5.0 MPa {51 kgf/cm^2, 725 lbf/in.^{2}}**.

(2) Run the engine up to 1,500 r/min., then reduce the engine speed suddenly.

NOTICE
This operation should be repeated more than 5 times.

(3) Good, if the set pressure of **5.0 MPa {51 kgf/cm^2, 725 lbf/in.^{2}}** is recovered immediately.
If the set pressure is not recovered immediately, stop the engine and replace the flow control valve assembly.

(4) Open the stop valve fully.


SHTS07Z070300009

4. CHECK THE RELIEF VALVE OPERATION.

(1) Run the engine up to 2,000 r/min.

(2) Close the stop valve until the fluid pressure is at "A".

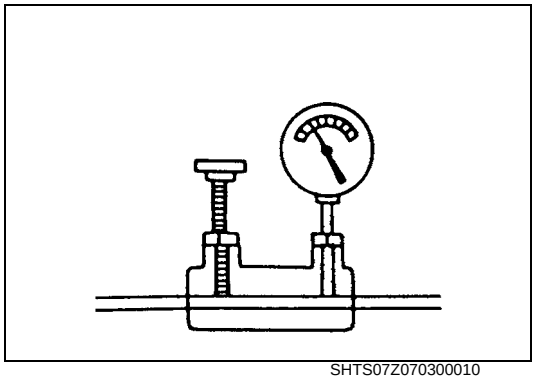
MODEL	"A"
FC, FD	13.5 MPa {138 kgf/cm^2, 1,963 lbf/in.^{2}}
GD	13.7 MPa {140 kgf/cm^2, 1,992 lbf/in.^{2}}
FG, GH, FL, FM8J, FM2P, SG	12.8 MPa {131 kgf/cm^2, 1,861 lbf/in.^{2}}
FM1A, FT, GT	12.7 MPa {129 kgf/cm^2, 1,841 lbf/in.^{2}}

NOTICE
Be careful not to exceed "A".

(3) Good, if the fluid pressure is maintained at "B".

MODEL	"B"
FC, FD	12.7-13.5 MPa {130-138 kgf/cm^2, 1,849-1,963 lbf/in.^{2}}
GD	13.0-13.7 MPa {133-140 kgf/cm^2, 1,890-1,992 lbf/in.^{2}}
FG, GH, FL, FM8J, FM2P, SG	12.1-12.8 MPa {124-131 kgf/cm^2, 1,759-1,861 lbf/in.^{2}}
FM1A, FT, GT	12.0-12.7 MPa {122-129 kgf/cm^2, 1,740-1,841 lbf/in.^{2}}

(4) If pressure is higher, stop the engine and replace the flow control valve assembly.


SHTS07Z070300010

5. MEASURE THE SYSTEM HYDRAULIC PRESSURE.

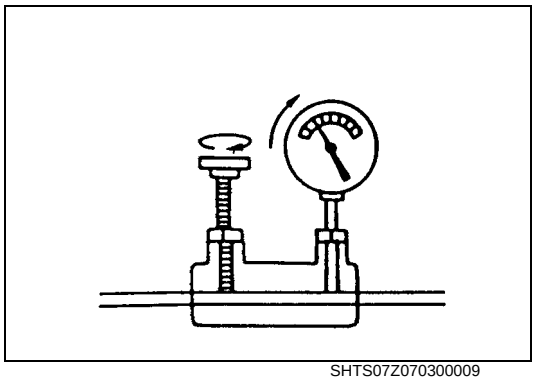
(1) Make sure that the stop valve is fully open.

(2) Start the engine and idle and then turn the steering wheel to a full stop.

(3) Apply a force of approx. **147.1 N {15 kgf, 33 lbf}** to the steering wheel and measure the hydraulic pressure.

(4) Repeat the measurement by fully turning the steering wheel in the opposite direction.
Hydraulic pressure: "B"

(5) If the above pressure is not attained, measure the discharge pressure or stop the engine and repair the power steering gear unit.


SHTS07Z070300009

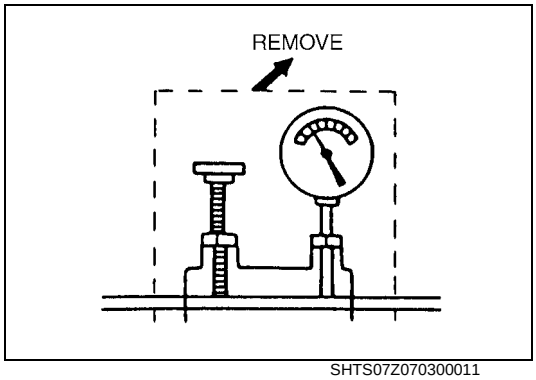
6. MEASURE THE DISCHARGE PRESSURE.

(1) Make sure that the stop valve is fully open.

(2) Start the engine and idle and measure the discharge pressure with the stop valve fully close.
Discharge Pressure: "B"

NOTICE
Do not allow the stop valve to remain closed for more than 15 seconds.

(3) Open the stop valve fully.



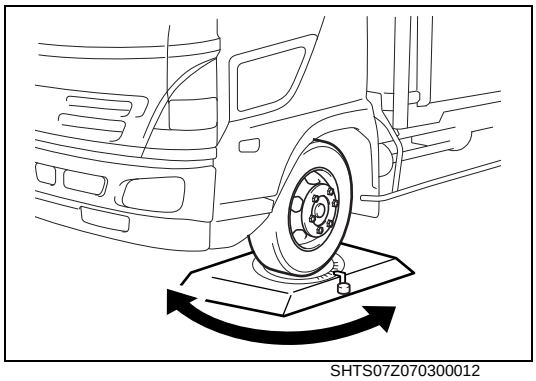
SHTS07Z070300011

7. REMOVE THE STOP VALVE AND OIL PRESSURE GAUGE.

(1) Stop the engine and remove the stop valve and oil pressure gauge.

NOTICE

After removing stop valve and oil pressure gauge, perform the air bleeding in according to "AIR BLEEDING".


SHTS07Z070300012

8. INSPECT THE STEERING SYSTEM FOR OPERATION ABILITY.

(1) Place the front wheels on turn tables then start the engine and idle.

(2) Check to see that the steering wheel turned smoothly without any jolts or abnormal resistance, when it is turned fully in both directions.

(3) Measure the steering wheel turning force.
Turning force: Less than 20 N {2 kgf, 4.41 lbf}

POWER STEERING GEAR UNIT (MODELS: FC, FD)

DATA AND SPECIFICATIONS

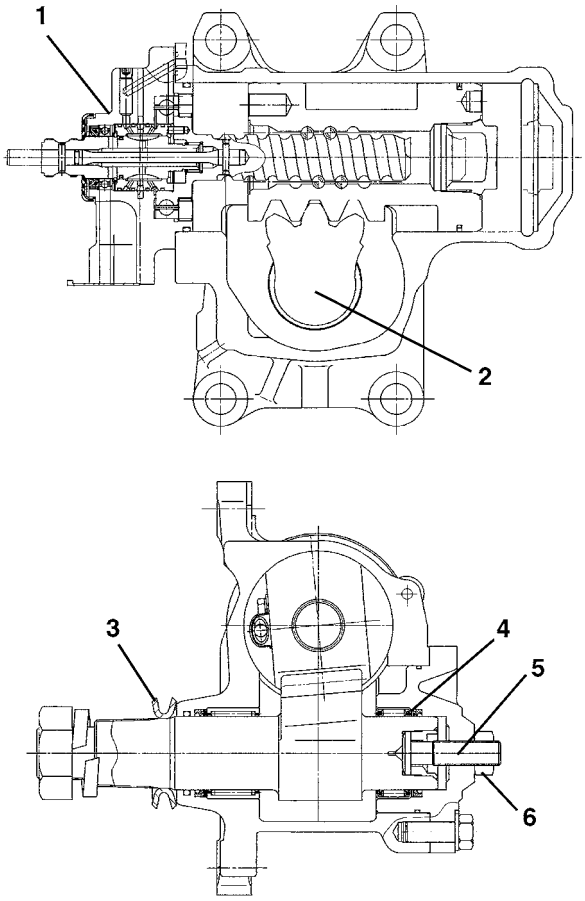
EN07Z0703I200001

Type	**Integral type power steering**
Gear ratio	**18.6: 1**
Cylinder inside diameter	**85 mm {3.346 in.}**

DESCRIPTION

EN07Z0703C100001

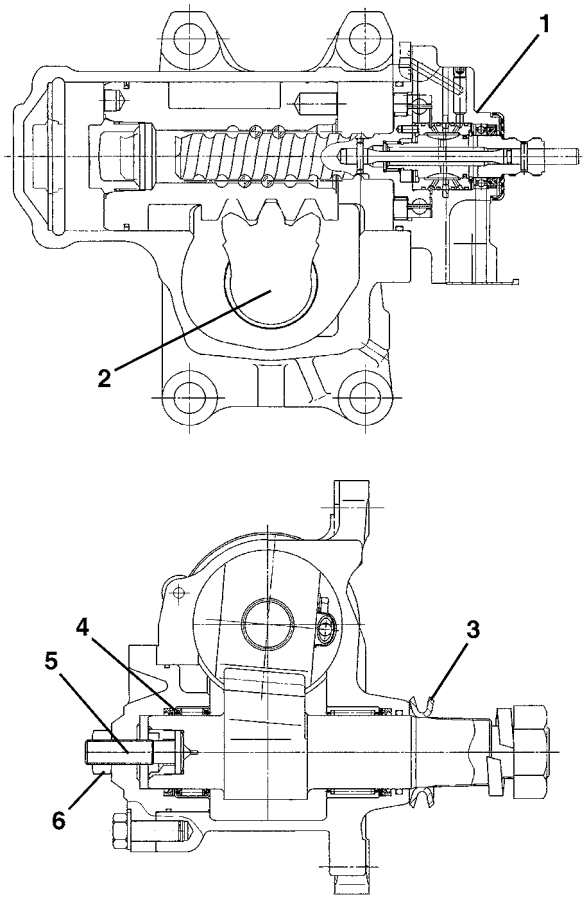
RIGHT-HAND DRIVE MODEL



SHTS07Z070300013

1	**Worm ball nut valve assembly**	**4**	**Oil seal**
2	**Sector shaft sub-assembly**	**5**	**Adjusting screw**
3	**Dust cover**	**6**	**Adjusting screw lock nut**

LEFT-HAND DRIVE MODEL



SHTS07Z070300014

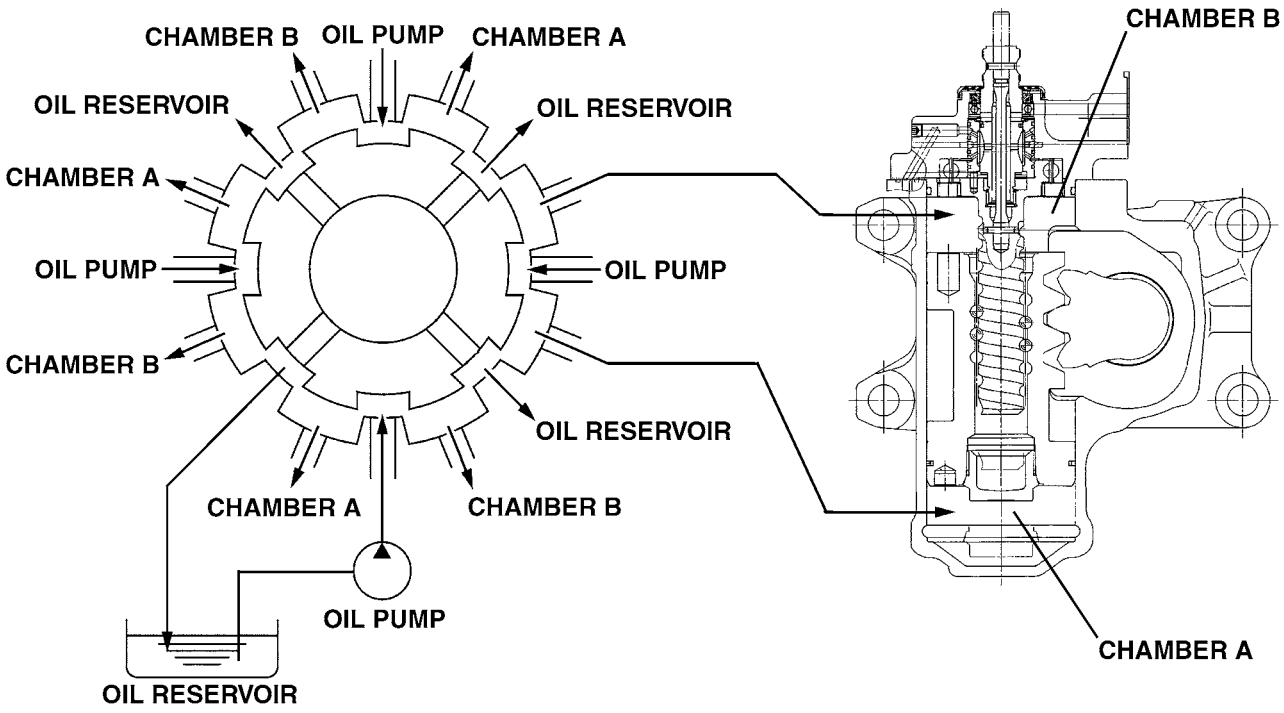
1	Worm ball nut valve assembly	4	Oil seal
2	Sector shaft sub-assembly	5	Adjusting screw
3	Dust cover	6	Adjusting screw lock nut

OPERATION

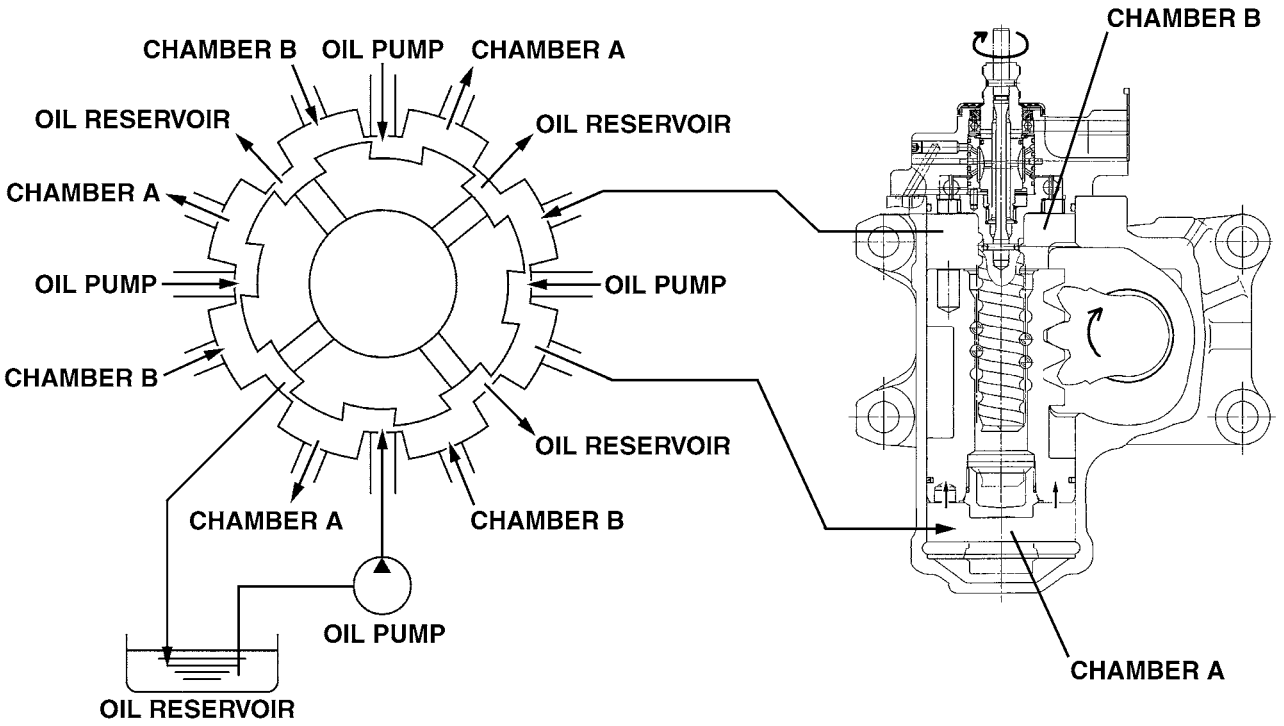
EN07Z0703C100002

RIGHT-HAND DRIVE MODEL

Neutral position



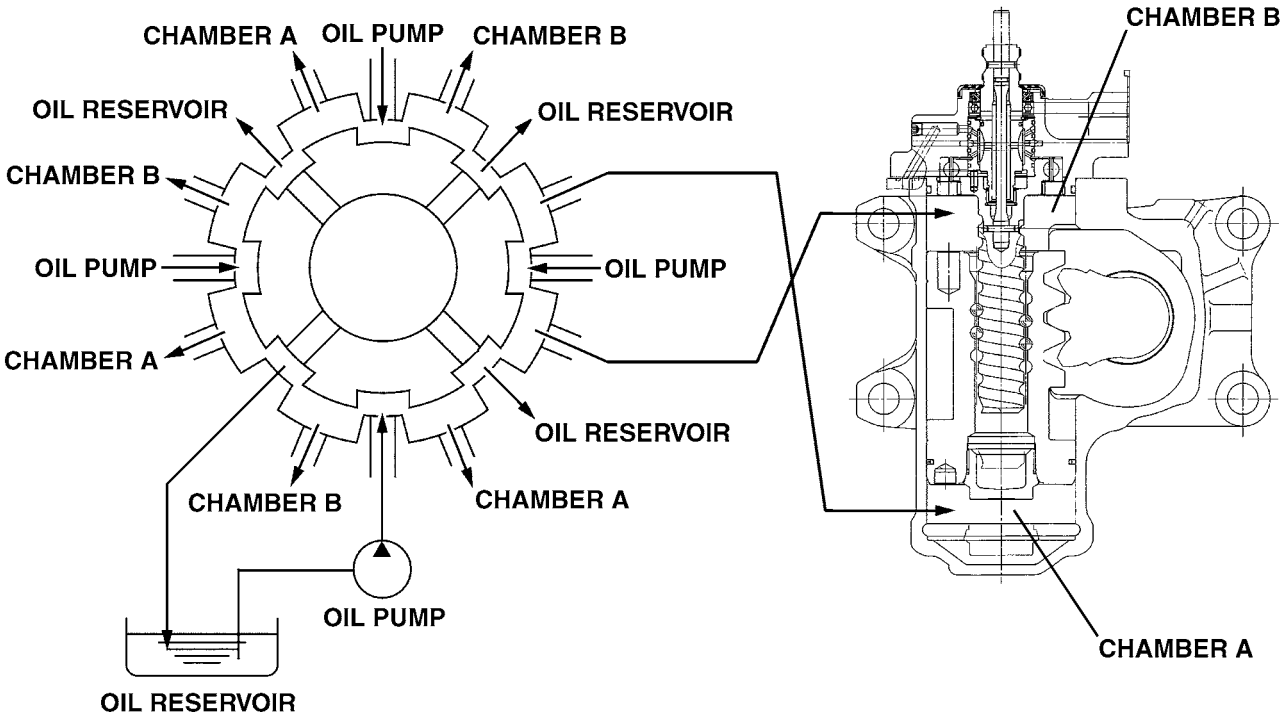
Power steering fluid circuit when turning the vehicle to the right
(Left turn is the reverse of the right turn)



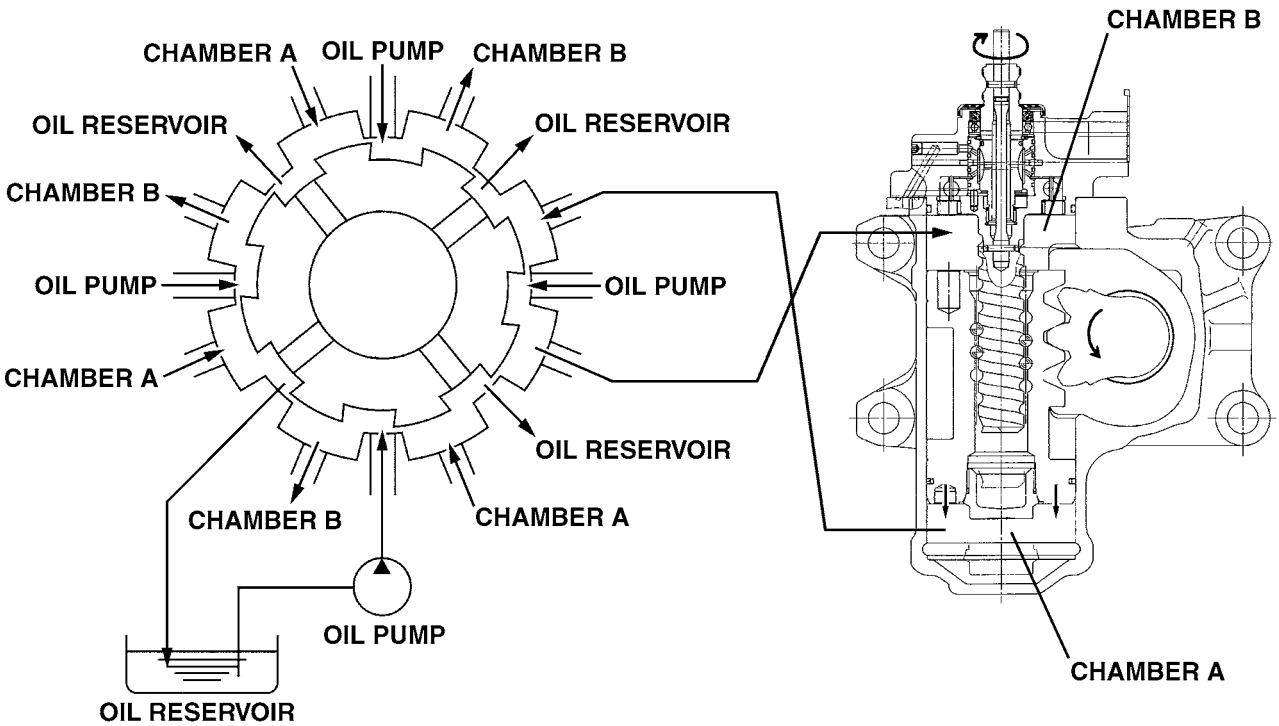
SHTS07Z070300015

LEFT-HAND DRIVE MODEL

Neutral position



Power steering fluid circuit when turning the vehicle to the right
(Left turn is the reverse of the right turn)

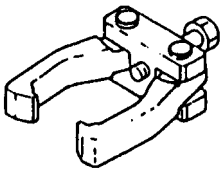


SHTS07Z070300016

SPECIAL TOOL

EN07Z0703K100001

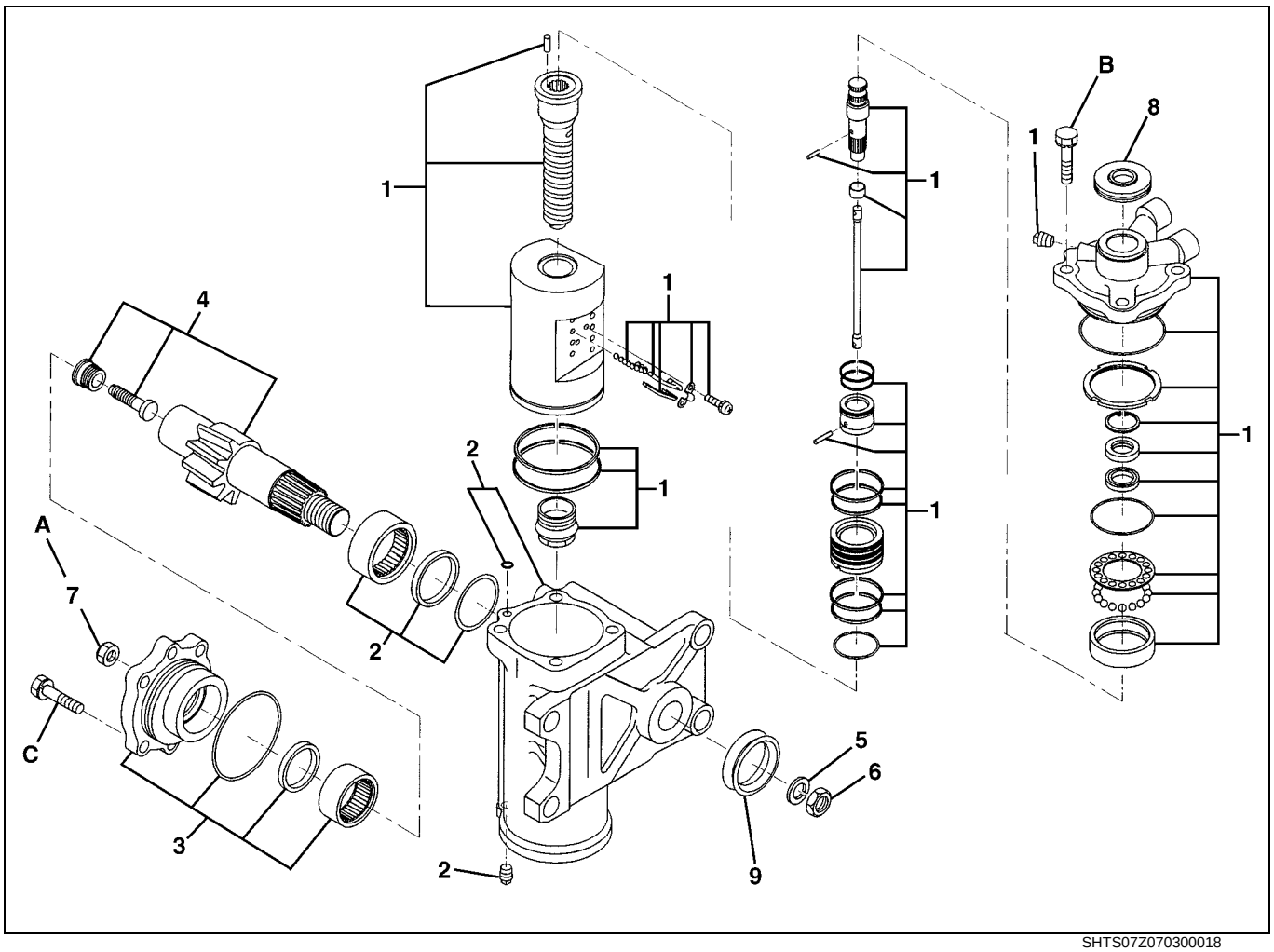
Prior to starting a power steering gear unit overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	S0965-01260	PITMAN ARM PULLER	

COMPONENT LOCATOR

EN07Z0703D100001

RIGHT-HAND DRIVE MODEL



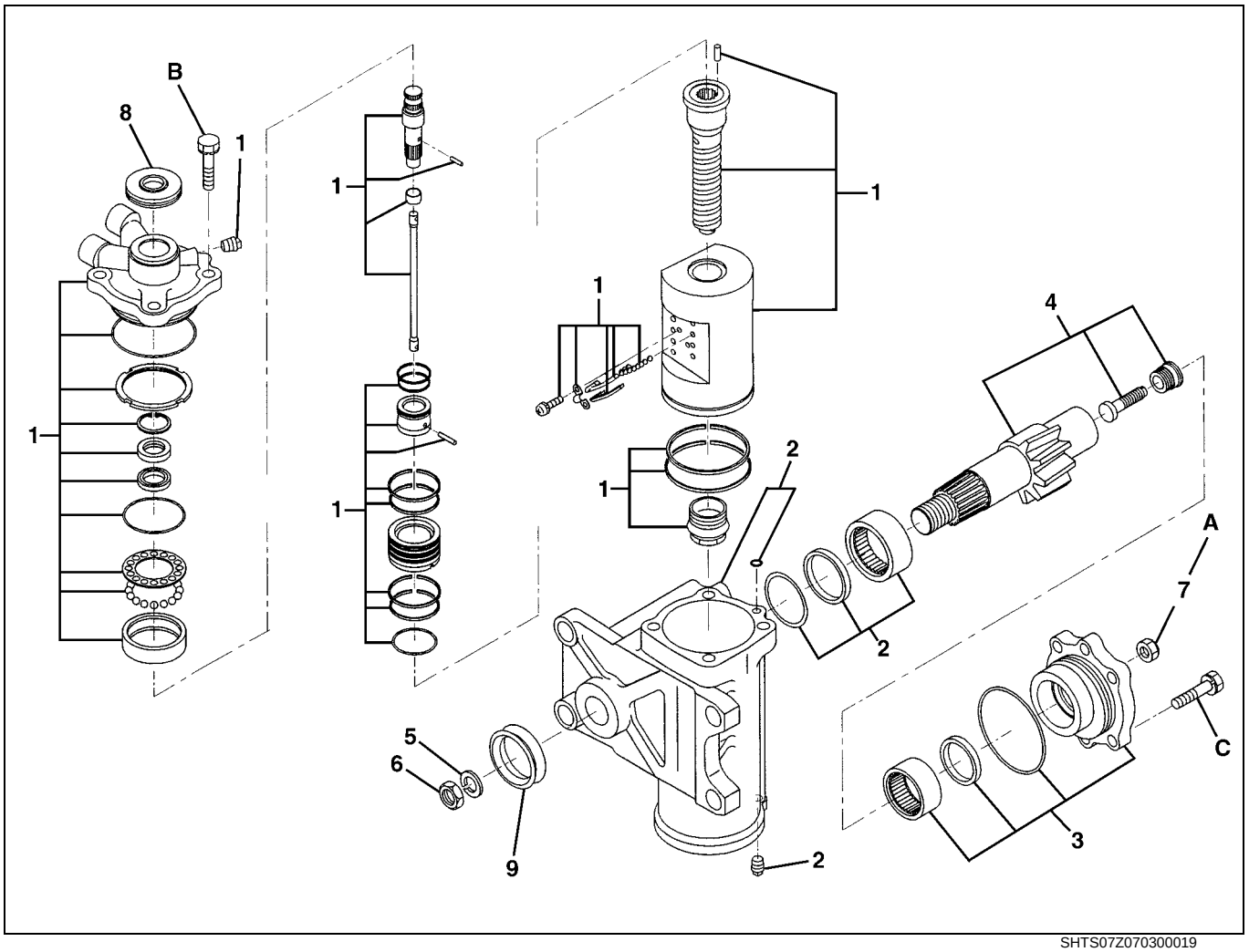
SHTS07Z070300018

1	Worm ball nut valve assembly	6	Pitman arm lock nut
2	Gear housing sub-assembly	7	Adjusting screw lock nut
3	Side cover sub-assembly	8	Dust cover
4	Sector shaft sub-assembly	9	Dust seal
5	Lock washer		

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

A	78.4-117.6 {800-1,200, 58-86}	C	73.5-102.9 {750-1,050, 55-75}
B	73.5-102.9 {750-1,050, 55-75}		

LEFT-HAND DRIVE MODEL



SHTS07Z070300019

1	Worm ball nut valve assembly	6	Pitman arm lock nut
2	Gear housing sub-assembly	7	Adjusting screw lock nut
3	Side cover sub-assembly	8	Dust cover
4	Sector shaft sub-assembly	9	Dust seal
5	Lock washer		

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

A	78.4-117.6 {800-1,199, 58-86}	C	73.5-102.9 {750-1,049, 55-75}
B	73.5-102.9 {750-1,049, 55-75}		

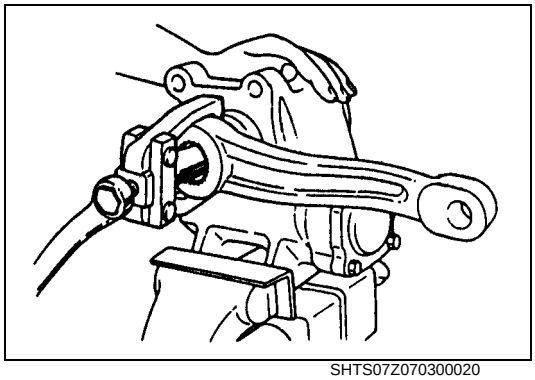
OVERHAUL

EN07Z0703H200002

NOTICE
Observe the following instructions before disassembly and assembly.

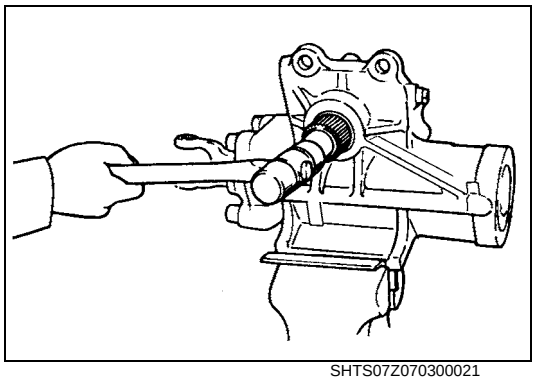
1. **All functional parts should be clean. Blow dirty parts off with dry compressed air, then clean them with volatile metal cleanser. Never use brushes or cloth.**
2. **Handle rubber parts, seals, etc., in clean condition. Any worn part should be replaced immediately.**
   Volatile metal cleanser may attack rubber parts, so they should never be used. Always use fluid.
3. **For disassembling and assembling, only use the specified fluid.**
4. **Never use standard tools in place of special tools and when using the special tools, read the instruction carefully.**

IMPORTANT POINTS - DISASSEMBLY


SHTS07Z070300020

1. REMOVE THE PITMAN ARM.
(1) Remove the pitman arm from the sector shaft by using the special tool, after loosening the lock nut.
SST: Pitman Arm Puller (S0965-01260)

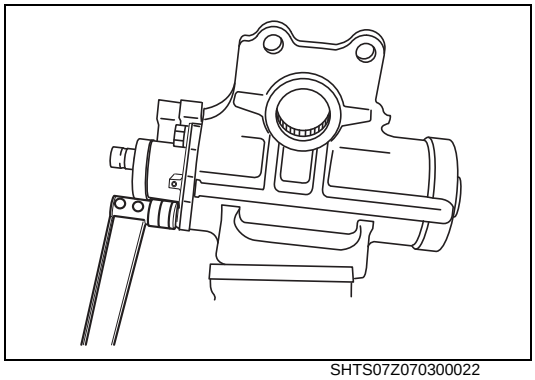
NOTICE
Do not use wedges or hit with a hammer.


SHTS07Z070300021

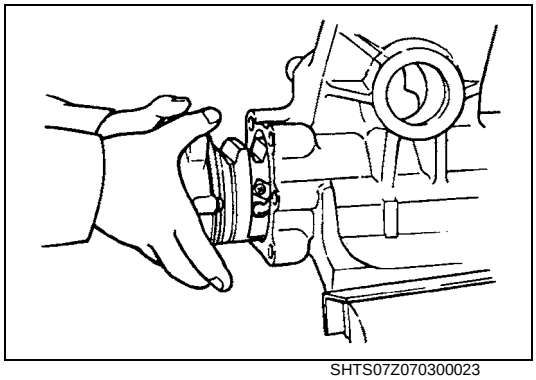
2. REMOVE THE SIDE COVER ASSEMBLY AND SECTOR SHAFT SUB-ASSEMBLY.
(1) Loosen the adjusting screw lock nut and then remove the side cover fitting bolts.
(2) Position the sector shaft so that its gear is in line with the gear housing opening. Use a plastic hammer to drive out the head of the sector shaft.

NOTICE
Never use a steel hammer.

(3) Turn the adjusting screw clockwise until it pushes the sector shaft out of the side cover assembly.


SHTS07Z070300022

3. REMOVE THE WORM BALL NUT VALVE ASSEMBLY.
(1) Remove the valve housing fitting bolts.


SHTS07Z070300023

(2) Turn the worm ball nut valve assembly counterclockwise until it locks so that valve housing raised from gear housing.

(3) Use a spatula to pry open the valve housing and remove the worm ball nut valve assembly from gear housing.

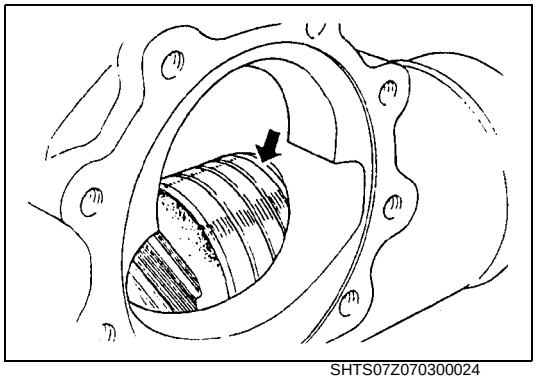
IMPORTANT POINTS - ASSEMBLY

1. INSTALL THE BALL NUT AND WORM VALVE ASSEMBLY.

(1) Install the O-ring on the ball nut.

NOTICE

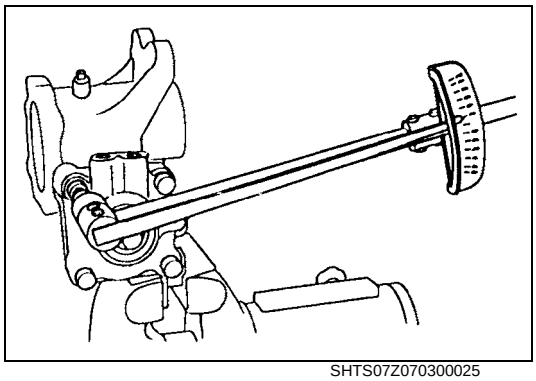
Do not allow the ball nut to hit the end of the worm valve assembly.


SHTS07Z070300024

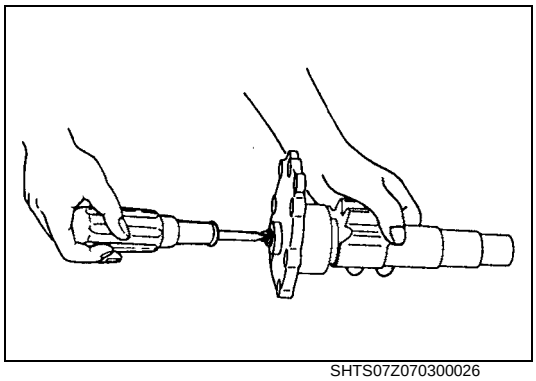
2. INSTALL THE BALL NUT ASSEMBLY.

(1) Apply the power steering fluid to inside surface of gear housing.

(2) Insert the ball nut assembly into the gear housing.

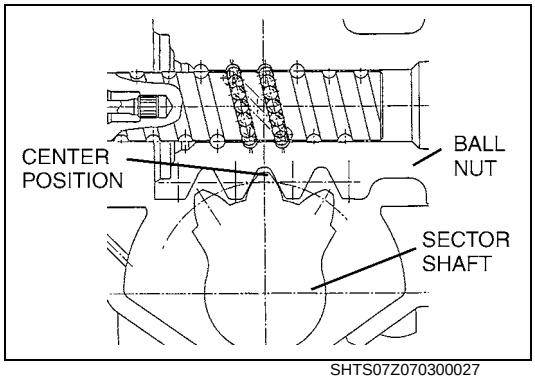

SHTS07Z070300025

(3) Tighten the valve housing fitting bolts.


SHTS07Z070300026

3. INSTALL THE SECTOR SHAFT ASSEMBLY.

(1) Insert the sector shaft into the side cover assembly then turn the adjusting screw counterclockwise until the sector shaft contacts with side cover assembly.

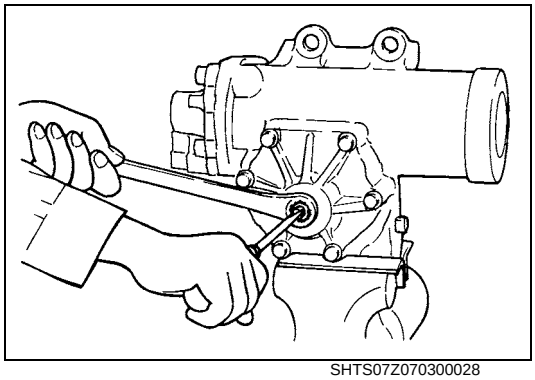


SHTS07Z070300027

(2) Align the center of the ball nut tooth and sector shaft center tooth then install the sector shaft assembly.

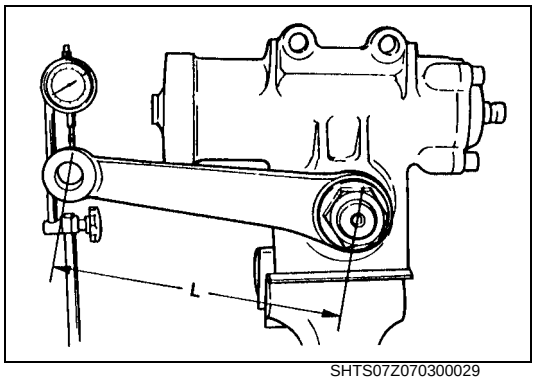
NOTICE
Apply fluid to the serrated part of the sector shaft so that the housing oil seal will not be damaged.

(3) Tighten the side cover fitting bolt.
(4) Install the adjusting screw lock nut temporary.
(5) Turn the adjusting screw clockwise until the sector shaft tooth contact with ball nut tooth then hold the adjusting screw lock nut.


SHTS07Z070300028

(6) Turn the adjusting screw counterclockwise fully once then lock the adjusting screw lock nut.

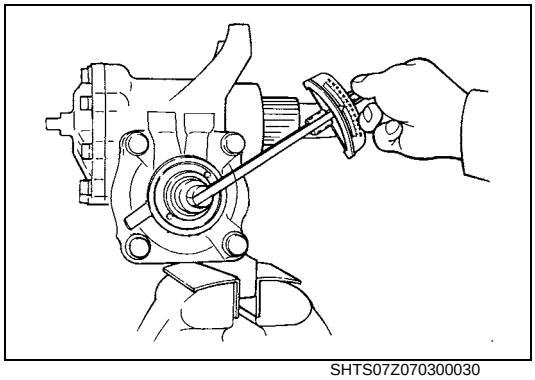
4. MEASURE THE SECTOR SHAFT BACKLASH.
(1) Align the marks on the sector shaft with pitman arm.
(2) Install the pitman arm and tighten the nut finger tight.
(3) Use a dial gauge to check to see that the sector shaft backlash in neutral position.



SHTS07Z070300029

L		Backlash
RHD model	197 mm {7.76 in.}	0.04-0.20 mm {0.0016-0.0078 in.}
LHD model	194 mm {7.64 in.}	

(4) If measurement is not within specification, readjust the backlash with adjusting screw.


SHTS07Z070300030

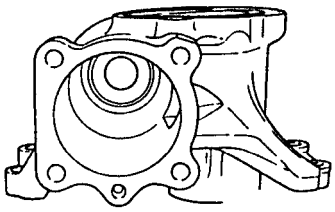
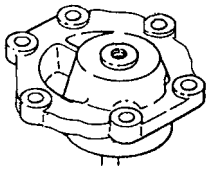
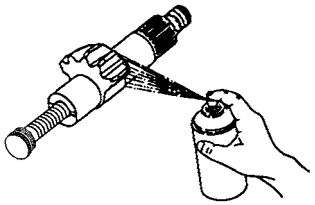
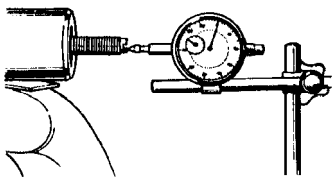
5. INSPECT THE WORM VALVE ASSEMBLY ROTATION CONDITION.
(1) Check to see that the worm valve assembly rotates smoothly without any shocks, abnormal resistance, noise and drag, when the worm valve assembly rotates full lock in both direction.

6. TIGHTEN THE PITMAN ARM LOCK NUT.

INSPECTION AND REPAIR

EN07Z0703H300002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Gear housing sub-assembly: Wear, damage and bearing damage	—	—	Replace gear housing sub-assembly, if necessary.	Visual check 
Side cover sub-assembly: Bearing damage	—	—	Replace side cover sub-assembly, if necessary.	Visual check 
O-ring and oil seal: Wear and damage	—	—	Replace, if necessary.	Visual check
Sector shaft sub-assembly: Teeth wear and damage, serration damage and adjusting screw thread damage	—	—	Replace sector shaft sub-assembly, if necessary.	Use the magnetic flow detector or color checking instrument 
Measure the sector shaft adjusting screw end play	—	0.03 {0.001}	Replace sector shaft sub-assembly.	Measure 

POWER STEERING GEAR UNIT
(MODELS: GD, FG, GH, FL, FM, SG, FT, GT)

DATA AND SPECIFICATIONS

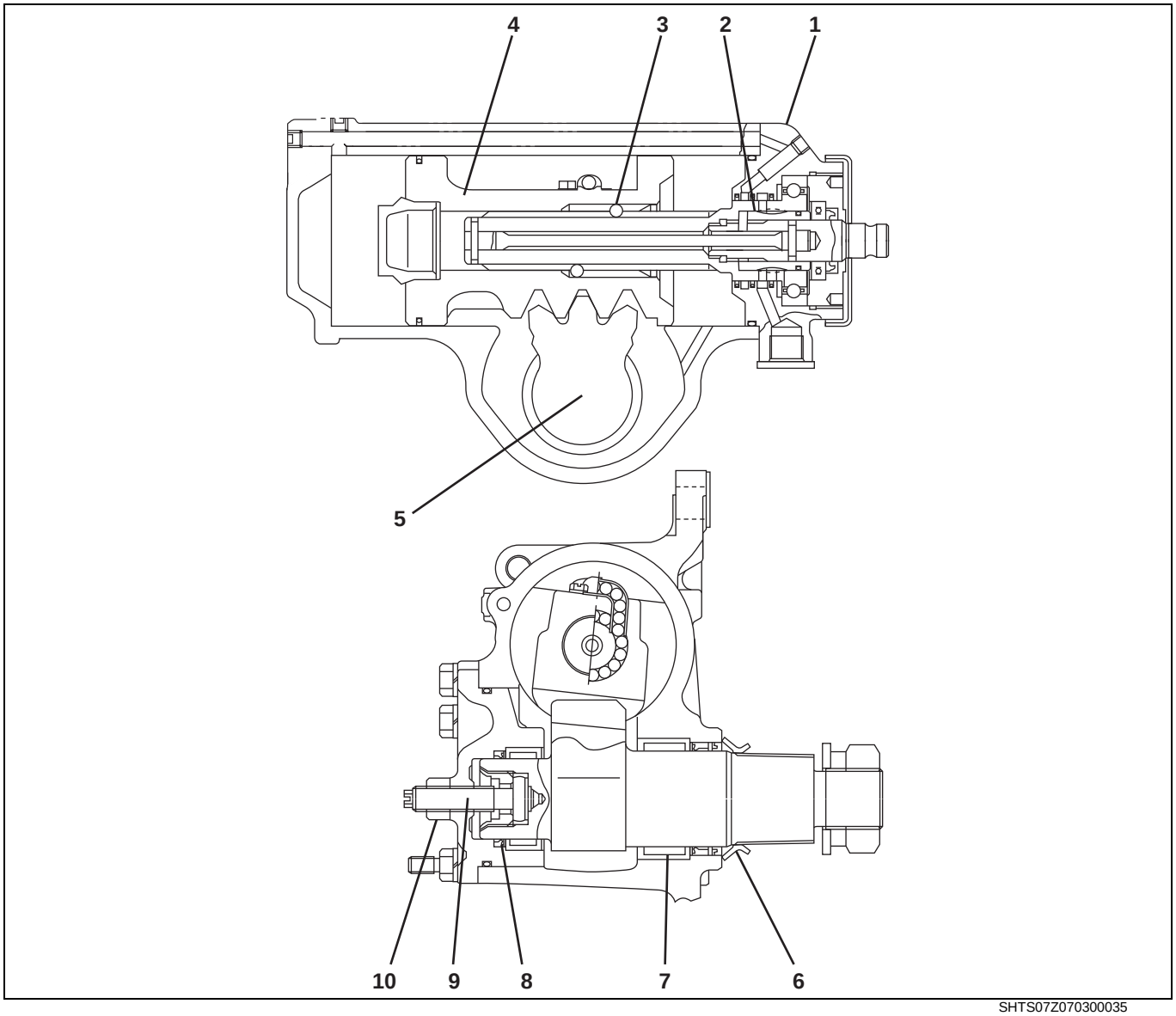
EN07Z0703I200002

Type			**Integral type power steering**
Gear ratio	**Models:**	**GD, FT, GT**	**19.05: 1**
		FG, GH, FL, FM, SG	**20.2: 1**
Cylinder inside diameter	**Models:**	**GD, FT, GT**	**90 mm {3.543 in.}**
		FG, GH, FL, FM, SG	**100 mm {3.937 in.}**

DESCRIPTION

EN07Z0703C100003

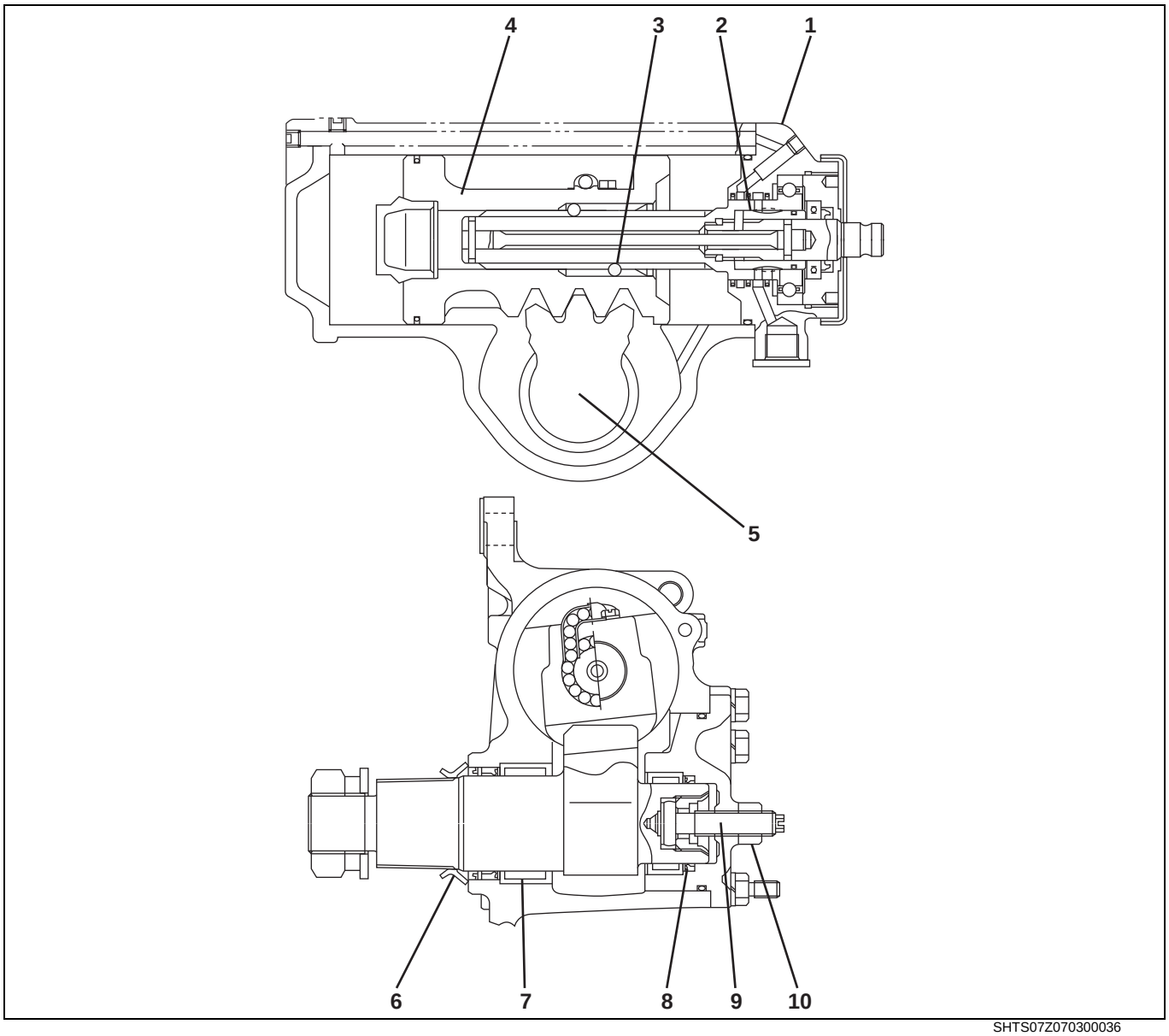
RIGHT-HAND DRIVE MODEL



SHTS07Z070300035

1	Valve housing assembly	5	Sector shaft	9	Adjusting screw
2	Worm valve assembly	6	Dust cover	10	Adjusting screw lock nut
3	Steel ball	7	Needle roller bearing		
4	Ball nut assembly	8	Oil seal		

LEFT-HAND DRIVE MODEL



SHTS07Z070300036

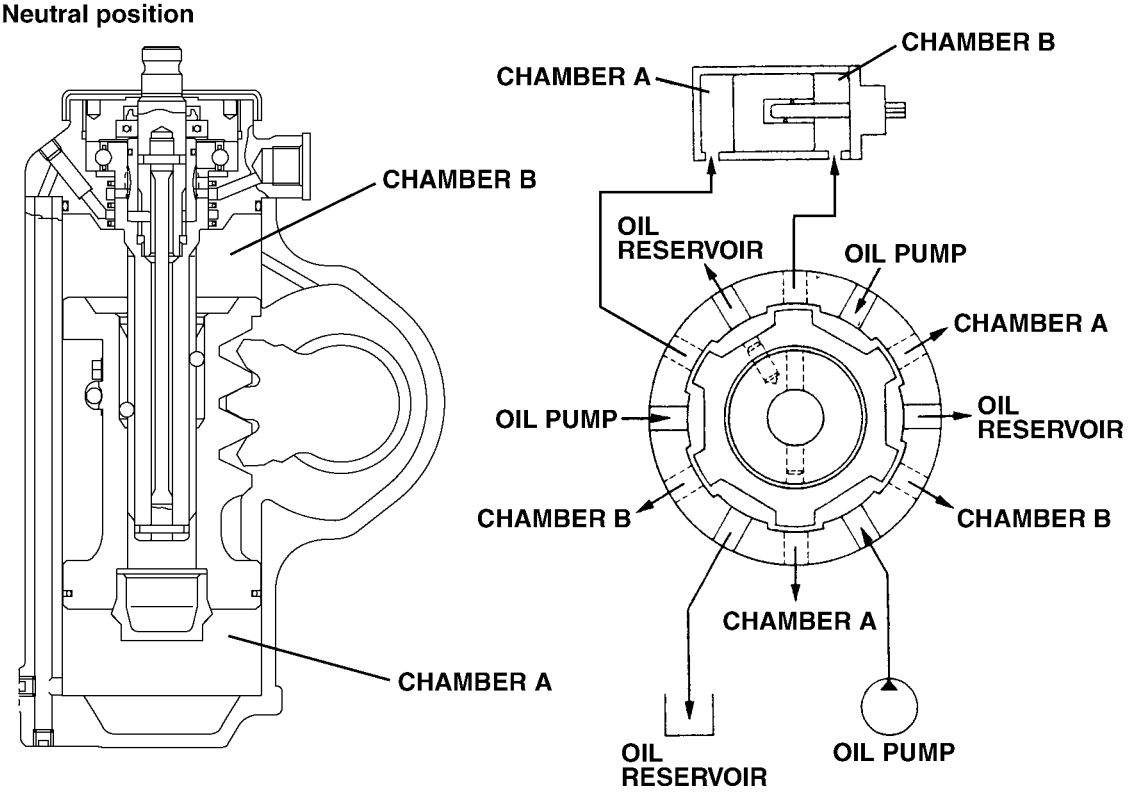
1	Valve housing assembly	5	Sector shaft	9	Adjusting screw
2	Worm valve assembly	6	Dust cover	10	Adjusting screw lock nut
3	Steel ball	7	Needle roller bearing		
4	Ball nut assembly	8	Oil seal		

OPERATION

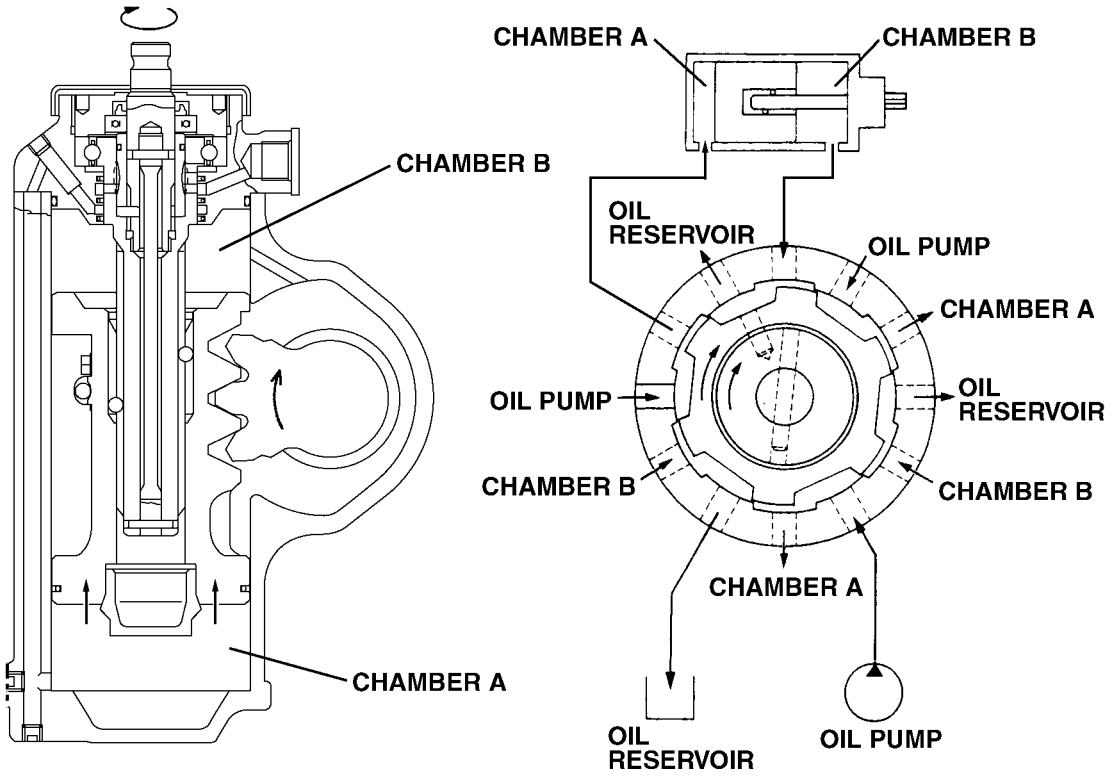
EN07Z0703C100004

RIGHT-HAND DRIVE MODEL

Neutral position



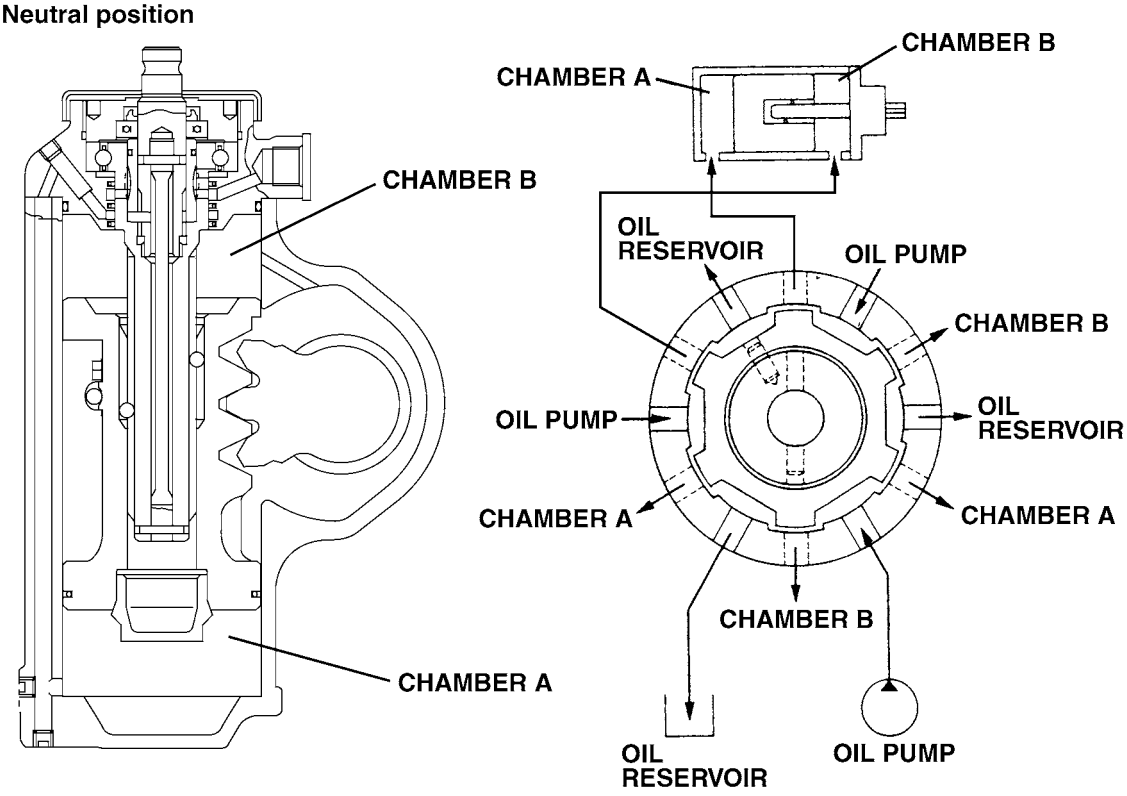
Power steering fluid circuit when turning the vehicle to the right
(Left turn is the reverse of the right turn)



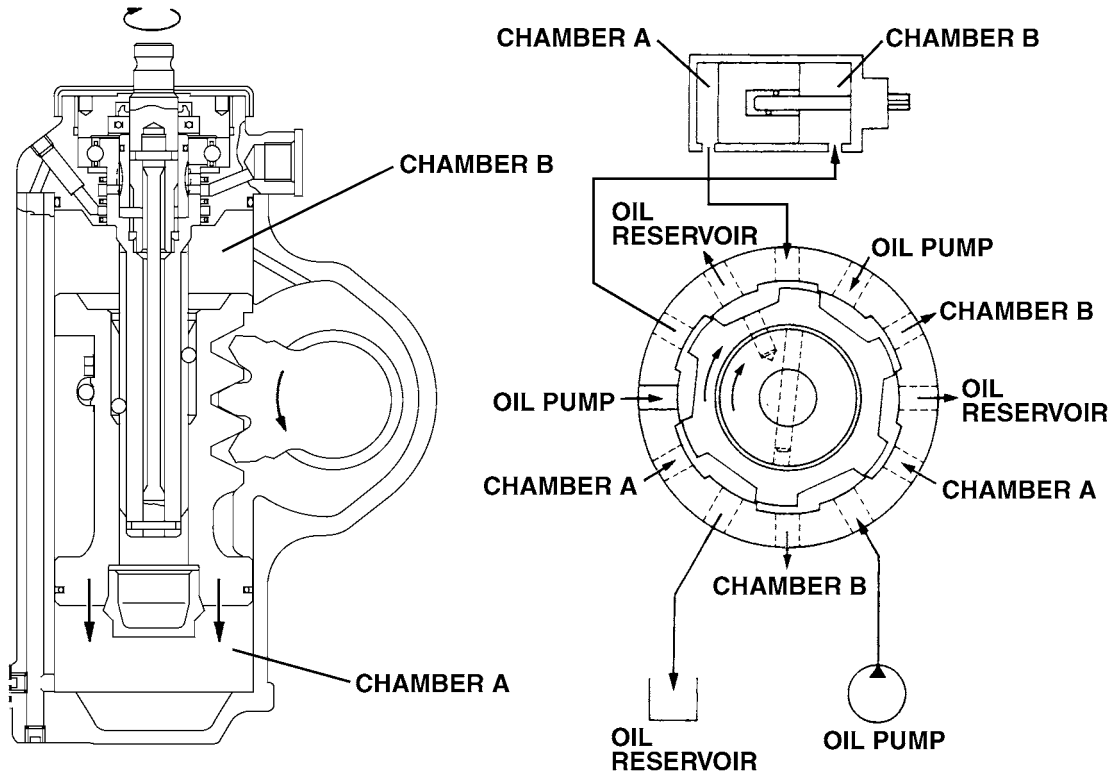
SHTS07Z070300037

LEFT-HAND DRIVE MODEL

Neutral position



Power steering fluid circuit when turning the vehicle to the right
(Left turn is the reverse of the right turn)



SHTS07Z070300038

SPECIAL TOOL

EN07Z0703K100002

Prior to starting a power steering gear unit overhaul, it is necessary to have the following special tools.

Tool and accessory set: S0903-04180

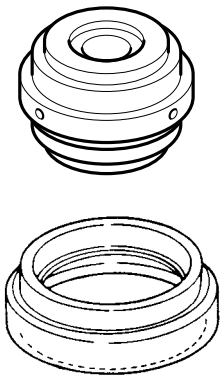
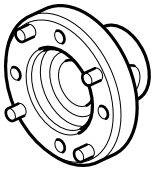
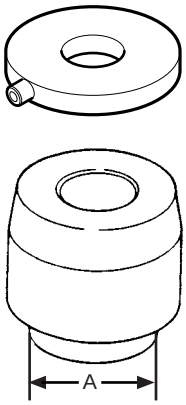
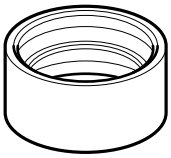
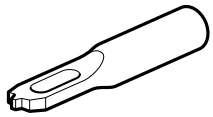
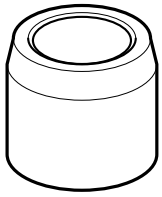
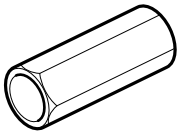
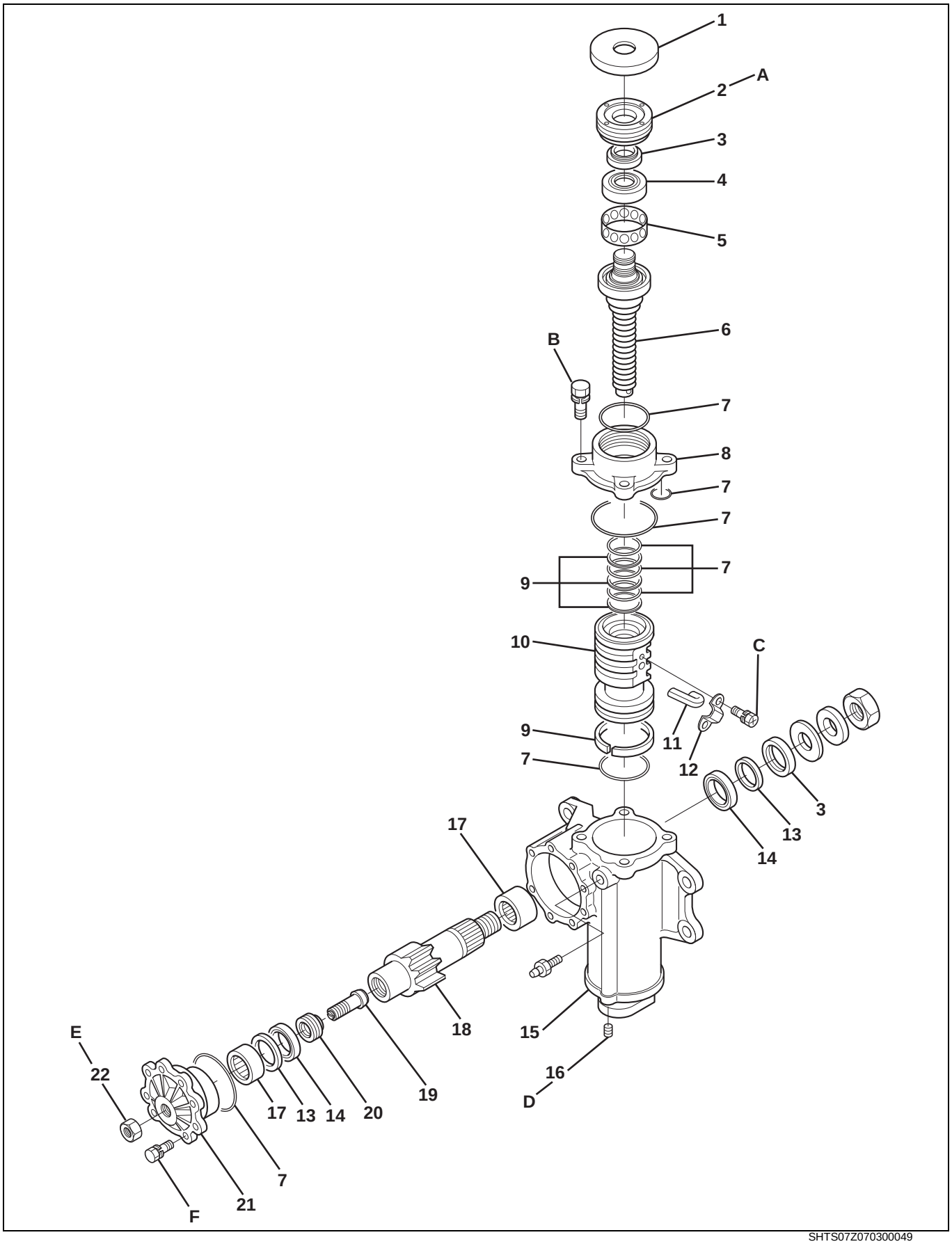
Illustration	Part number	Tool name	Remarks
	S0965-71870	TOOL ASSEMBLY • For 85 mm {3.346 in.} • For 90-110 mm {3.544-4.330 in.} (Used together with tool assembly)	
	S0965-91400	ATTACHMENT ASSEMBLY	
	S0960-31560	WRENCH ASSEMBLY	
	S0965-71860	INSERTER ASSEMBLY A: For 40 mm {1.575 in.} For 45 mm {1.772 in.} For 48 mm {1.890 in.} For 53 mm {2.087 in.} For 58 mm {2.283 in.} (Used together with inserter assembly)	
	S0965-91410	PRESS FITTER	
	S0969-91360	NEEDLE	
	S0965-71840	INSERTER	

Illustration	Part number	Tool name	Remarks
	S0969-41020	CAULKING TOOL	
	S0965-71850	INSERTER	
	S0971-21130	BAR	

COMPONENT LOCATOR

EN07Z0703D100002

RIGHT-HAND DRIVE MODEL



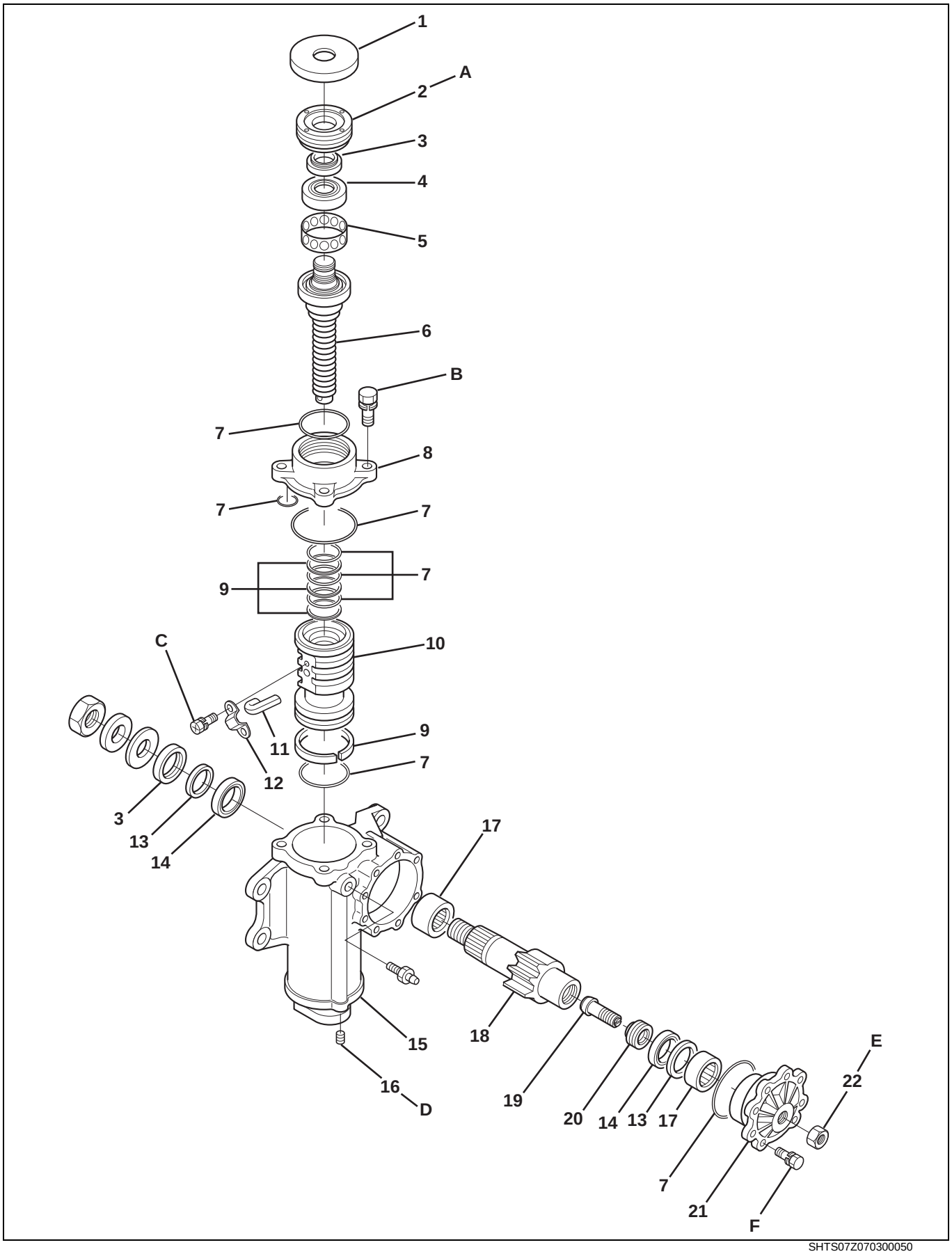
SHTS07Z070300049

1	Dust cover	12	Tube clip
2	Plug and seal assembly	13	Back-up ring
3	Oil seal	14	Y-packing
4	Ball bearing	15	Steering body
5	Bearing cage and steel ball	16	Tapered plug
6	Worm shaft assembly	17	Needle roller bearing
7	O-ring	18	Sector shaft
8	Valve housing	19	Adjusting screw
9	Seal ring	20	Retainer
10	Power piston (Ball nut)	21	Side cover
11	Ball tube	22	Lock nut

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

A	226-245 {2,300-2,500, 167-180}	D	8.9-12.7 {90-130, 6.5-9.4}
B	98.1-107.9 {1,000-1,100, 73-79} (GD, FT, GT)	E	117.7-127.5 {1,200-1,300, 87-94}
	117.7-127.5 {1,200-1,300, 87-94}	F	49.1-53.9 {500-550, 36-40} (GD, FT, GT)
	(FG, GH, FL, FM, SG)		73.6-83.4 {750-850, 55-61} (FG, GH, FL, FM, SG)
C	4.41-5.39 {45-55, 3.2-3.9}		

LEFT-HAND DRIVE MODEL



SHTS07Z070300050

1	Dust cover	12	Tube clip
2	Plug and seal assembly	13	Back-up ring
3	Oil seal	14	Y-packing
4	Ball bearing	15	Steering body
5	Bearing cage and steel ball	16	Tapered plug
6	Worm shaft assembly	17	Needle roller bearing
7	O-ring	18	Sector shaft
8	Valve housing	19	Adjusting screw
9	Seal ring	20	Retainer
10	Power piston (Ball nut)	21	Side cover
11	Ball tube	22	Lock nut

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

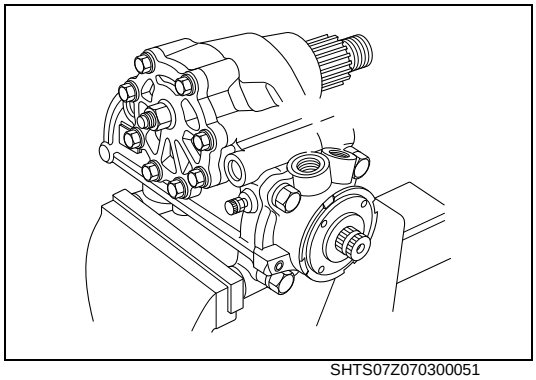
A	226-245 {2,300-2,500, 167-180}	D	8.9-12.7 {90-130, 6.5-9.4}
B	98.1-107.9 {1,000-1,100, 73-79} (GD)	E	117.7-127.5 {1,200-1,300, 87-94}
	117.7-127.5 {1,200-1,300, 87-94} (FG, GH, FL, FM)	F	49.1-53.9 {500-550, 36-40} (GD)
C	4.41-5.39 {45-55, 3.2-3.9}		73.6-83.4 {750-850, 55-61} (FG, GH, FL, FM)

OVERHAUL

EN07Z0703H200003

NOTICE
Observe the following instructions before disassembly and assembly.

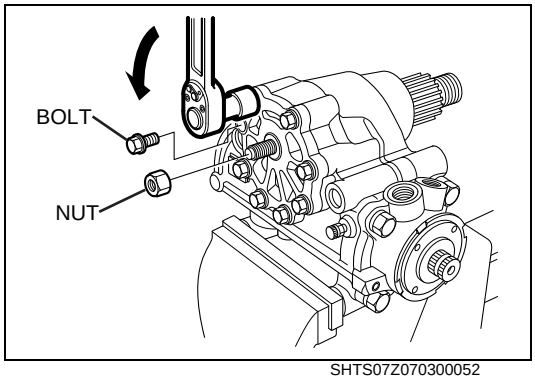
1. **All functional parts should be clean. Blow dirty parts off with dry compressed air, then clean them with volatile metal cleanser. Never use brushes or cloth.**
2. **Handle rubber parts, seals, etc., in clean condition. Any worn part should be replaced immediately.**
   Volatile metal cleanser may attack rubber parts, so they should never be used. Always use fluid.
3. **For disassembling and assembling, only use the specified fluid.**
4. **Never use standard tools in place of special tools and when using the special tools, read the instruction carefully.**



SHTS07Z070300051

IMPORTANT POINTS - DISASSEMBLY

1. **BEFORE DISASSEMBLY, SECURE THE POWER STEERING IN A VISE.**

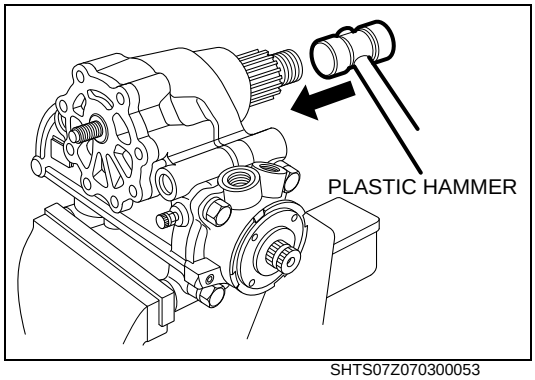


SHTS07Z070300052

2. REMOVE THE SIDE COVER ASSEMBLY AND SECTOR SHAFT.

(1) Loosen and remove the nut fixing the adjusting screw to the side cover.

(2) Remove the eight bolts and washers fitting the side cover to the steering body.

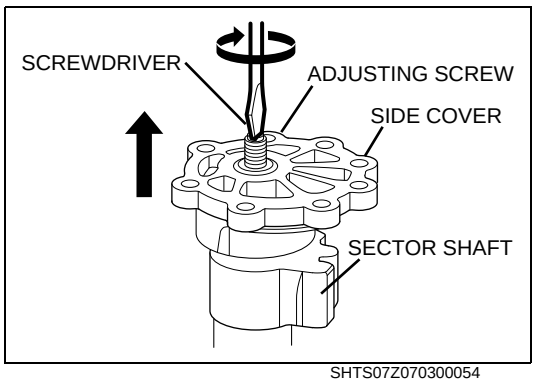


SHTS07Z070300053

(3) Confirm that the power piston is located in the center, and then gently tap the output end of the sector shaft with a plastic (or wooden) hammer to remove the sector shaft assembly and the side cover together from the steering body.

NOTICE

Never use a steel hammer when removing the sector shaft (as the threads will be damaged).

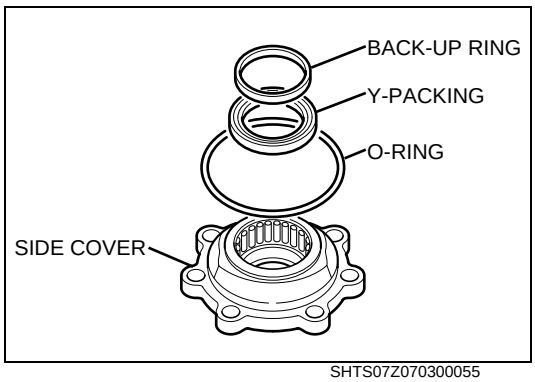


SHTS07Z070300054

(4) Turn the adjusting screw clockwise using a screwdriver to raise and separate the side cover assembly from the sector shaft assembly.

NOTICE

- **Do not secure the sector shaft directly in a vise.**
- **Always use a cloth etc. to protect the sector shaft.**



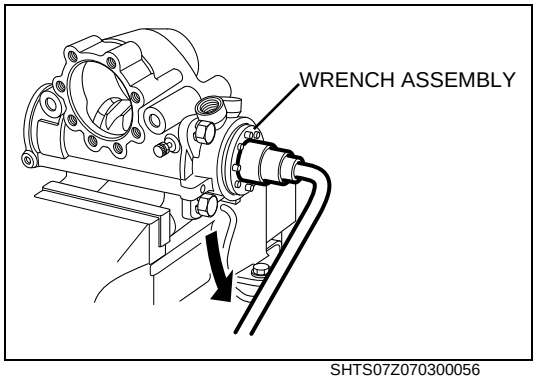
SHTS07Z070300055

(5) Remove the O-ring from the groove around the outside of the side cover using the special tool. Then remove the Y-packing from behind the needle roller bearing and the back-up ring using the special tool.

NOTICE

It is not necessary to remove the needle bearing unless it is damaged.

SST: Needle (S0969-91360)



SHTS07Z070300056

3. REMOVE THE VALVE HOUSING AND BALL NUT ASSEMBLY.

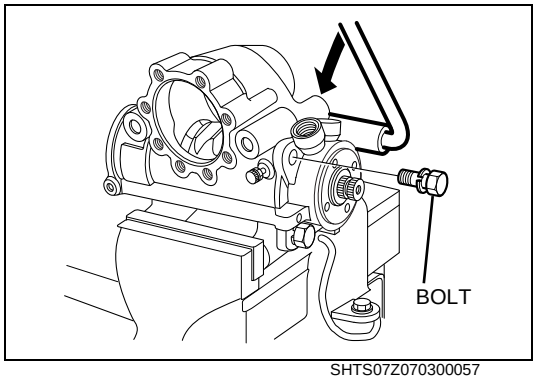
(1) Remove the dust cover from the valve housing.

(2) Loosen the plug and seal assembly in the valve housing section using the special tool. At this time, only back off the plug and seal assembly 180°. Do not remove it.

NOTICE

If the plug and seal assembly is removed, the steel balls (bearing) in the valve housing may spring out.

SST: Wrench assembly (S0960-31560)

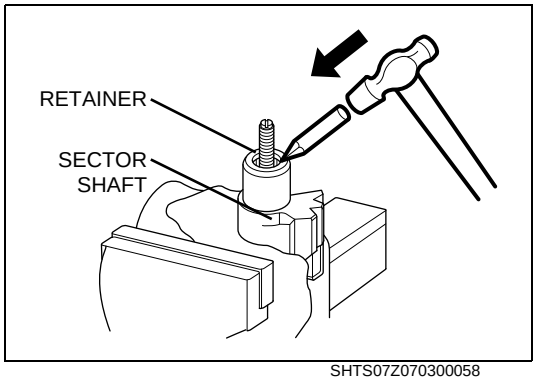


SHTS07Z070300057

(3) Remove the bolts to remove the worm shaft assembly and valve housing assembly from the steering body.

NOTICE

- **Do not damage the internal surface of the steering body when removing the worm shaft assembly and valve housing assembly.**
- **Do not let the steel balls spring out.**
- **Never damage the power piston.**



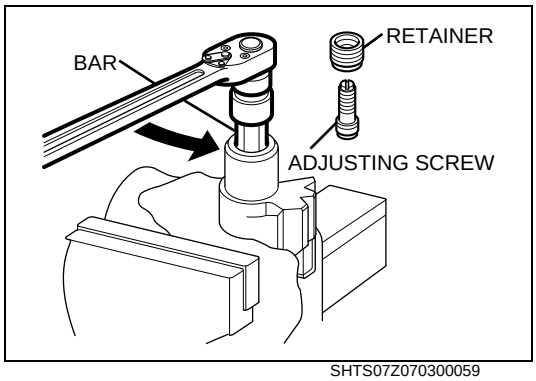
SHTS07Z070300058

4. REMOVE THE ADJUSTING SCREW AND SECTOR SHAFT.

(1) Uncaulk the retainer at two caulked positions.

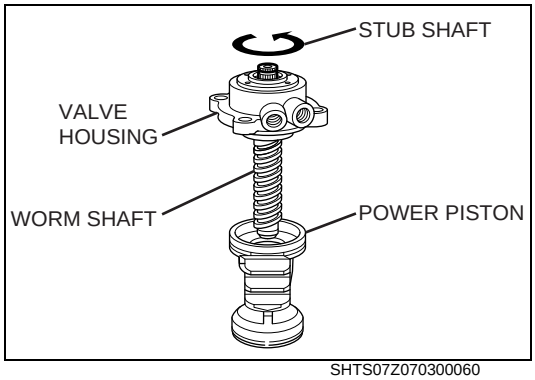
NOTICE

- **Do not disassemble the sector shaft assembly unless it is damaged.**
- **Do not secure the sector shaft directly in a vise. Always use a cloth etc. to protect the sector shaft.**



SHTS07Z070300059

(2) Remove the retainer using the special tool. Remove the adjusting screw at the same time.
SST: Bar (S0971-21130)



SHTS07Z070300060

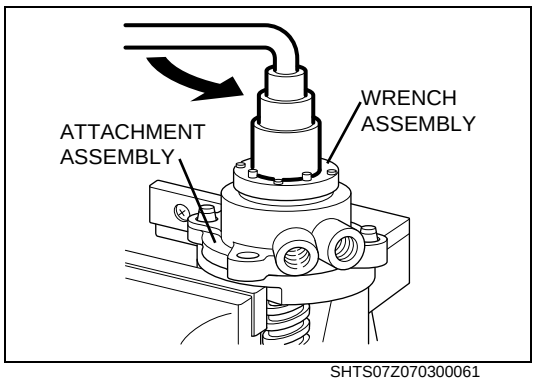
5. REMOVE THE WORM SHAFT ASSEMBLY, VALVE HOUSING AND POWER PISTON ASSEMBLY.

(1) Place the assembly on the work bench with the power piston side down. Turn the stub shaft while holding the valve housing, and remove the worm shaft from the power piston.

(2) Let the steel balls assembled in the power piston and ball race of the worm shaft drop into the power piston.

NOTICE

Do not tilt the piston as it contains the steel balls. Do not lose the steel balls.

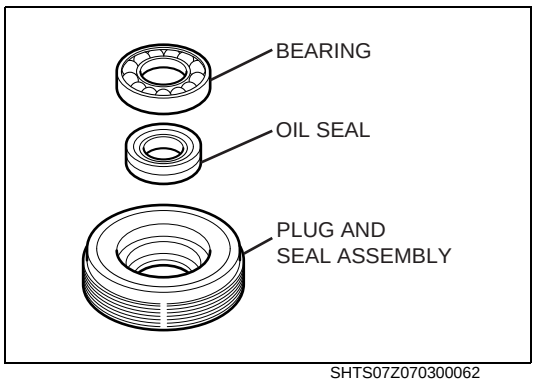


SHTS07Z070300061

(3) Secure the special tool in a vise.
SST: Attachment assembly (S0965-91400)

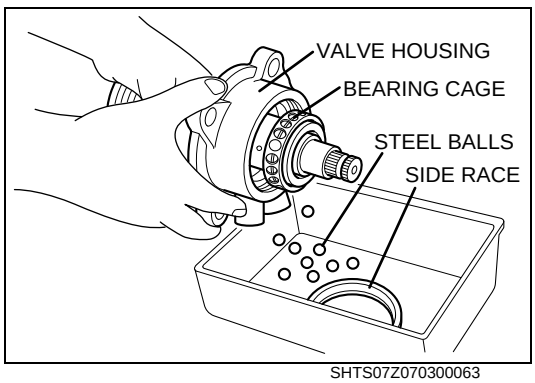
(4) Remove the O-rings fitted on the contact surfaces of the steering body of the valve housing.

(5) Attach the valve housing to the attachment assembly, and remove the previously loosened plug and seal assembly.
SST: Wrench assembly (S0960-31560)



SHTS07Z070300062

(6) Remove the ball bearing and oil seal from the plug and seal assembly.



SHTS07Z070300063

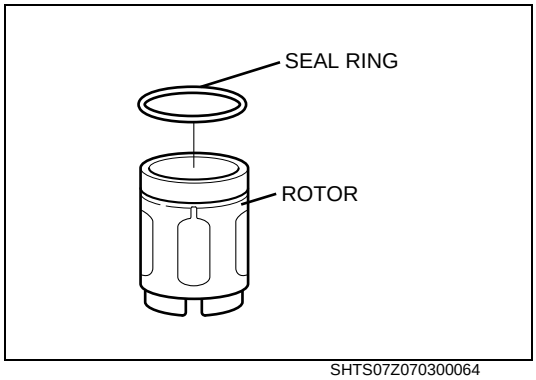
6. REMOVE THE WORM SHAFT ASSEMBLY AND VALVE HOUSING.

(1) Prepare a plastic box, etc. Hold the valve housing over the box and remove the worm shaft assembly by pushing it from the power piston side as shown in figure. The side race, steel balls, and bearing cage will come apart and fall into the box.

NOTICE

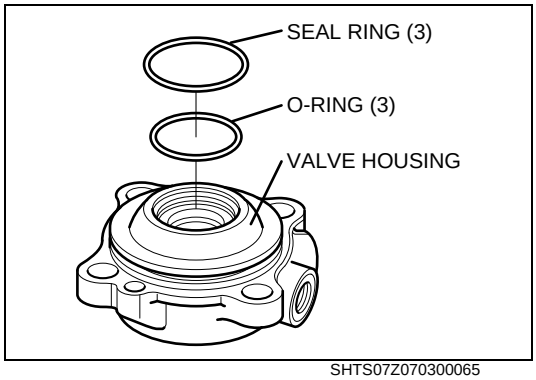
- **Do not lose any steel balls.**
- **If only one side race and/or steel ball is lost, the worm shaft and valve housing assembly must be replaced.**

  Number of the steel balls: 18 pieces.



SHTS07Z070300064

(2) Remove the rotor from the worm shaft assembly, and then remove the seal ring from the rotor using the special tool.
SST: Needle (S0969-91360)



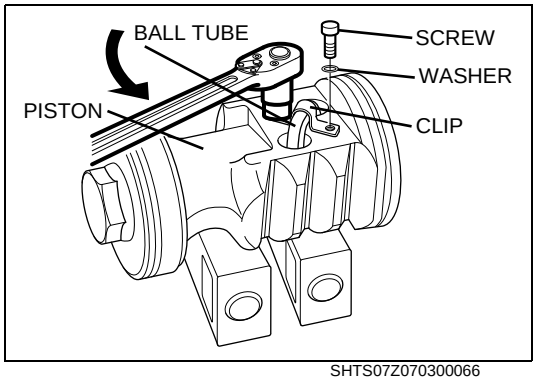
SHTS07Z070300065

(3) Remove the three seal rings and three O-rings from the valve housing using the special tool.
SST: Needle (S0969-91360)

7. REMOVE THE POWER PISTON.

(1) Place the piston's steel balls in a separate container.

(2) Loosen the screw of the tube clip securing the ball tube using a wrench. Remove the ball tube from the power piston by pinching it with your fingers and shaking it.



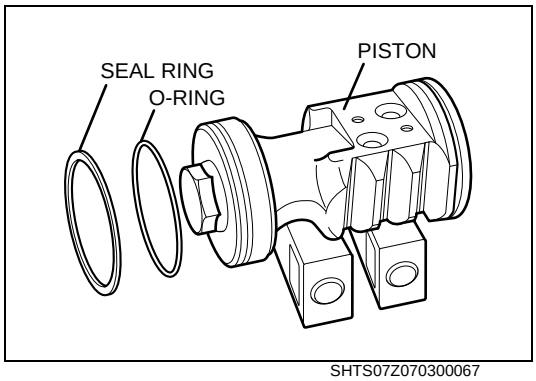
SHTS07Z070300066

NOTICE

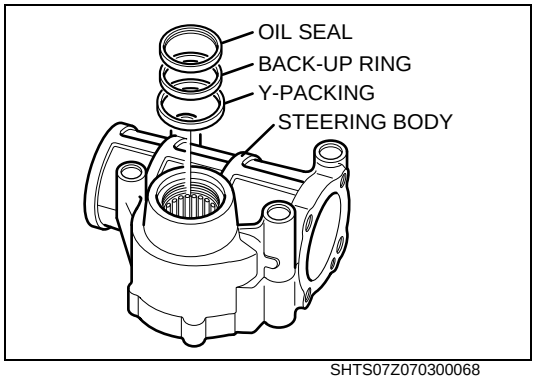
- **Never insert a screwdriver etc., between the ball tube and the piston to pry them apart.**
- **Check for any steel balls remaining in the ball tube.**

  Number of the steel balls: 32 pieces.

(3) Remove the seal ring and O-ring from the power piston using the special tool.
SST: Needle (S0969-91360)



SHTS07Z070300067



SHTS07Z070300068

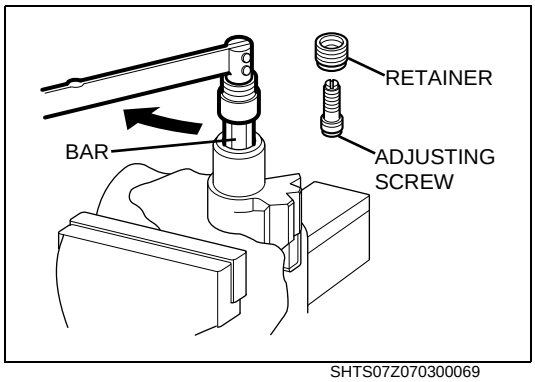
8. REMOVE THE STEERING BODY.

(1) Remove the oil seal, back-up ring, and Y-packing from the section of the steering body contacting the sector shaft.

NOTICE

Do not remove the needle roller bearing and tapered plug unless they are damaged.

IMPORTANT POINTS - ASSEMBLY

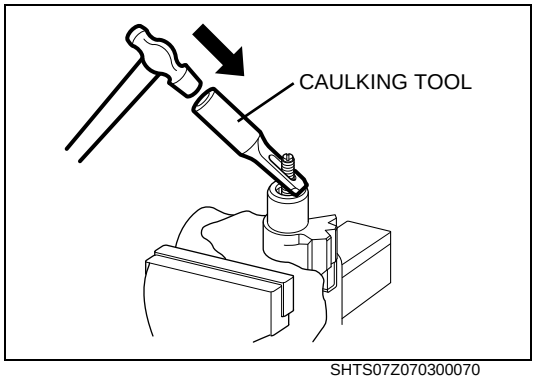


SHTS07Z070300069

1. INSTALL THE SECTOR SHAFT.

(1) Secure the sector shaft in a vise while protecting the geared base of the shaft with a rag.

(2) Fill the assembly with grease through the adjusting screw hole. Then, insert the adjusting screw, and fix the retainer using the special tool.
SST: Bar (S0971-21130)

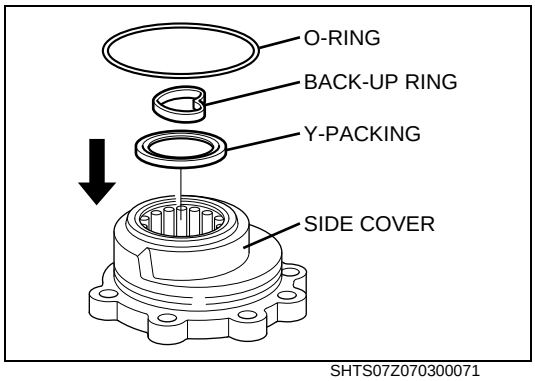


SHTS07Z070300070

NOTICE

How to tighten the retainer; After fully tightening, back off the retainer 180° and then, after retightening it to 4 kgf·m, back it off 20°. Ensure the adjusting screw rotates smoothly.

(3) After tightening the retainer, securely caulk it at two positions using the special tool.
SST: Caulking tool (S0969-41020)



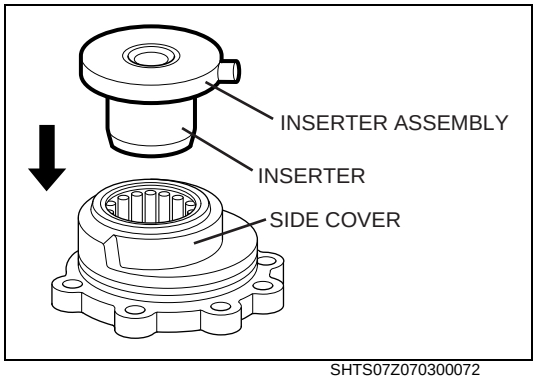
SHTS07Z070300071

2. INSTALL THE SIDE COVER.

(1) Insert the Y-packing and back-up ring in the bottom of the needle roller bearing press fitted inside the side cover.

NOTICE

- **The back-up ring can be assembled easily if inserted by pinching it with the fingers.**
- **After filling the groove with grease, assemble the Y-packing so that the lip faces to the needle roller bearing side.**



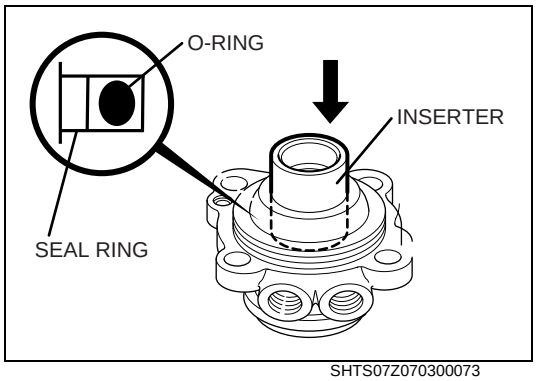
SHTS07Z070300072

(2) Form the back-up ring using the special tool.
SST: Inserter assembly (S0965-71860)

NOTICE
There are five kinds of inserters as below, and install the back-up ring using the inserter for the diameter 48 mm {1.890 in.}.

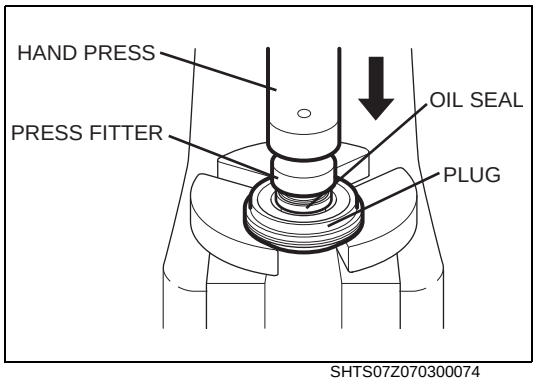
Unit: mm {in.}

INSERTER DIAMETER
40 {1.575}
45 {1.772}
48 {1.890}
53 {2.087}
58 {2.283}



SHTS07Z070300073

3. INSTALL THE VALVE HOUSING.
(1) Insert an O-ring and a seal ring into each of the three narrower grooves of the five grooves in the valve housing.
(2) Then, form the seal ring using the special tool.
SST: Inserter (S0965-71850)

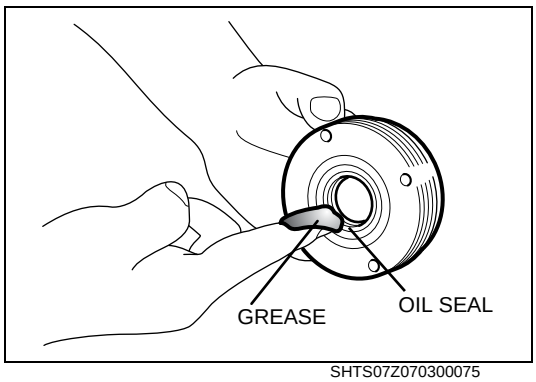


SHTS07Z070300074

4. INSTALL THE PLUG AND SEAL ASSEMBLY.
(1) Press fit the oil seal into the inside of the plug and seal assembly using the special tool.

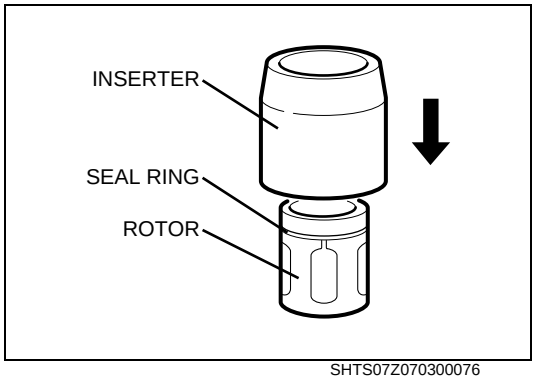
NOTICE
Always use a hand press when press fitting the oil seal.

SST: Press fitter (S0965-91410)



SHTS07Z070300075

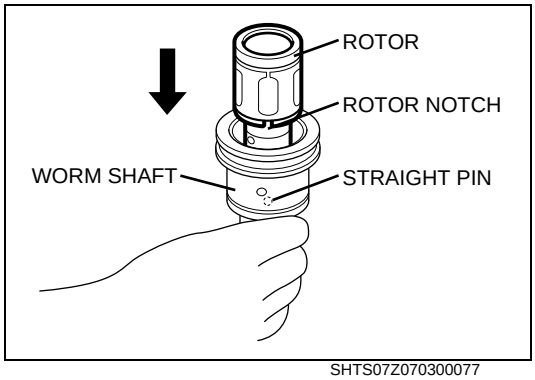
(2) Apply grease to the oil seal and then install the ball bearing.



SHTS07Z070300076

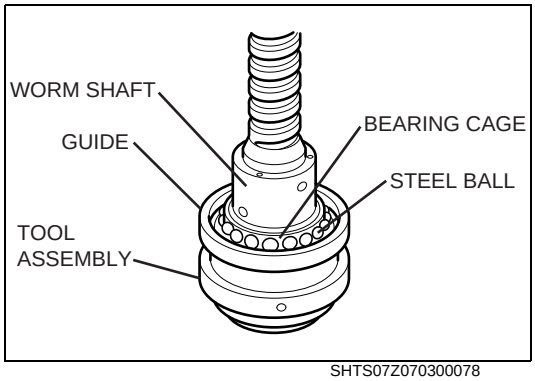
5. INSTALL THE WORM SHAFT AND THE VALVE HOUSING.

(1) Form the seal ring using the special tool after assembling the seal ring in the outer groove of the rotor.
SST: Inserter (S0965-71850)



SHTS07Z070300077

(2) Insert the rotor between the stub shaft and the worm shaft. At this time, assemble it so that the straight pin in the bottom fits in the rotor notch.



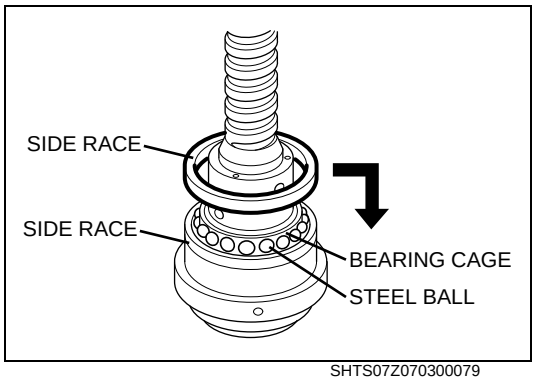
SHTS07Z070300078

(3) Fit the guide into the special tool and insert the previously assembled worm shaft assembly into the guide with the input side down.
SST: Tool assembly (S0965-71870)

NOTICE
There are two kinds of guide as below, and install worm shaft assembly using the guide for power piston diameter 90-110 mm {3.544-4.330 in.}.

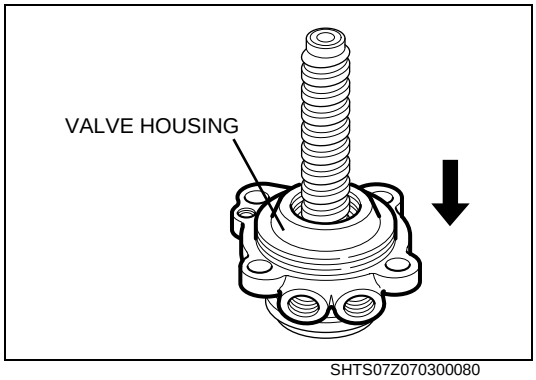
Unit: mm {in.}

POWER PISTON DIAMETER
85 {3.346}
90-110 {3.544-4.330}



SHTS07Z070300079

(4) Install the race of bearing side (one side), the bearing cage and the steel balls, and allow the tool assembly to slide down and set the balls in position.
(5) Remove the guide and fit the other side race.

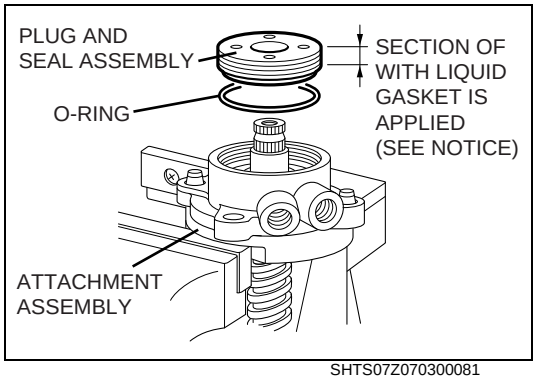


SHTS07Z070300080

(6) Assemble the valve housing to the worm shaft assembly and previously assembled bearing sub-assembly by inserting it from the worm shaft side.

NOTICE

- **When fitting the valve housing, do not damage the seal ring in the valve housing.**
- **Inserter (S0965-71850) can be used to form the seal rings of the valve housing part.**



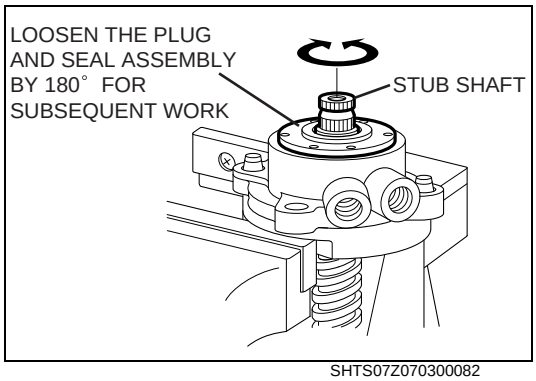
SHTS07Z070300081

(7) Secure the special tool in a vise.
SST: Attachment assembly (S0965-91400)

(8) Fit the previously assembled worm shaft assembly and valve housing onto the attachment assembly, place the O-ring in the inner groove of the valve housing, and screw the plug and seal assembly into the valve housing.

NOTICE

- **Apply liquid gasket (equivalent to ThreeBond 1102) to the screw section of the plug and seal assembly.**
- **The O-ring must not be fitted in the thread escape groove of the valve housing.**
- **When assembling the plug and seal assembly, do not let the stub shaft serration damage the oil seal.**

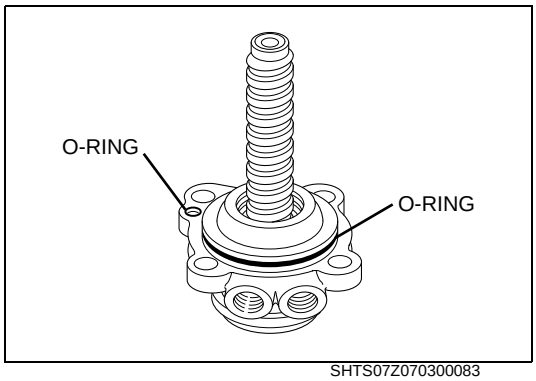


SHTS07Z070300082

(9) Tighten the plug and seal assembly using the special tool.
SST: Wrench assembly (S0960-31560)

NOTICE
Check that the stub shaft rotates smoothly and uniformly while holding the valve housing.

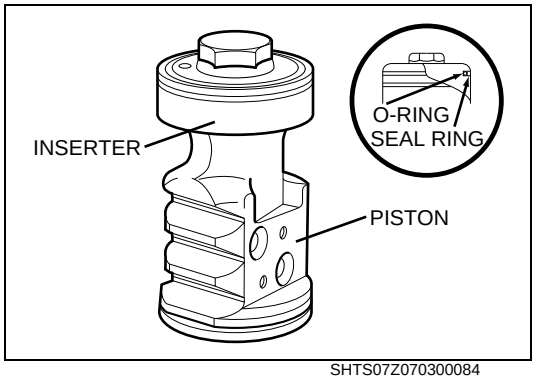
(10) Loosen the plug and seal assembly by approx 180°.



SHTS07Z070300083

(11) Install O-rings in the groove around the outside of the valve housing and in the oil port recess.

NOTICE
Do not twist the O-rings.



SHTS07Z070300084

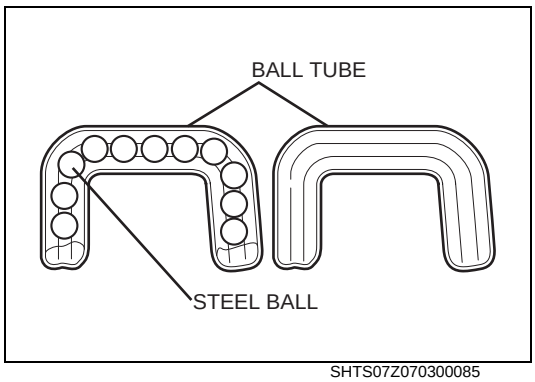
6. INSTALL THE POWER PISTON.

(1) Fit the O-ring and seal ring in the groove around the outside of the power piston and form the seal ring using the special tool.

NOTICE

Do not twist the O-ring or stretch the seal ring.

SST: Inserter (S0965-71840)



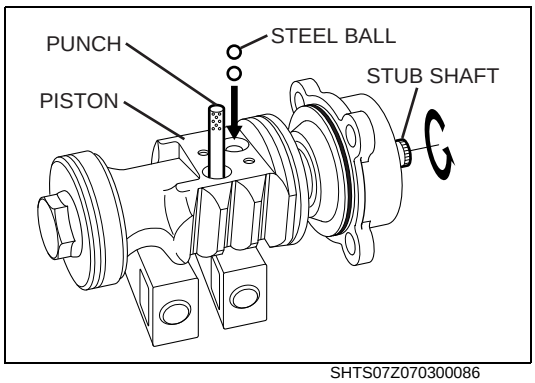
SHTS07Z070300085

(2) Place the power piston on the bench.

(3) Fill the ball tube with grease, lay 10-11 steel balls in the tube, and place the other side of the ball tube on top.

NOTICE

Never fix the piston in a vise.

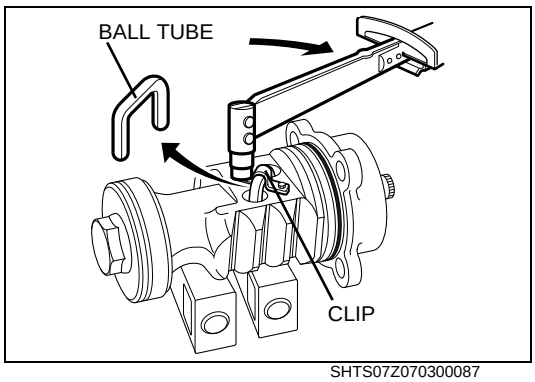


SHTS07Z070300086

(4) Insert the worm shaft and valve housing assembly in the center hole of the power piston, align the power piston and worm shaft ball races, and drop the remaining steel balls one by one through the piston's ball tube hole.

NOTICE

- **Drop the steel balls while turning the stub shaft to facilitate assembly.**
- **Steel balls sometimes come out of the hole on the other side of the ball tube after a certain number are inserted. Plug the hole with a punch to prevent the steel balls from coming out.**
- **When installing the steel balls, the worm shaft and valve housing assembly must not be drawn out to its extreme position, as the steel balls may drop outside the ball race.**



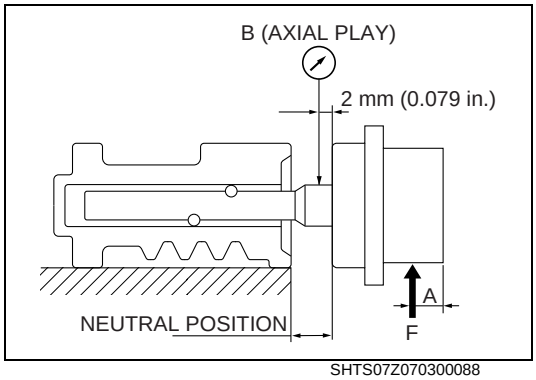
SHTS07Z070300087

(5) After inserting the steel balls in the power piston, insert the ball tube into the power piston and fix it using the clip, washer, and screw.

NOTICE

Always push in the ball tube by hand. Never force or strike it. If forced or struck, the ball tube may be deformed, the edge may be nipped, or otherwise damaged, causing malfunctions.

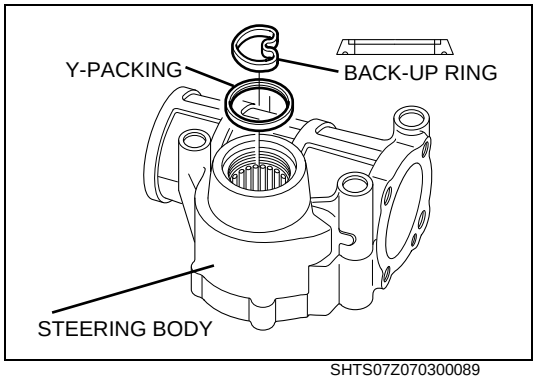
(6) Tighten the screw to the specified torque.



SHTS07Z070300088

(7) Measure the axial play between the power piston and the worm shaft assembly.

A (point of application)	**20 mm {0.787 in.}**
F (force)	**5 kg**
B (axial play)	**0.5 mm {0.0197 in.} or less**



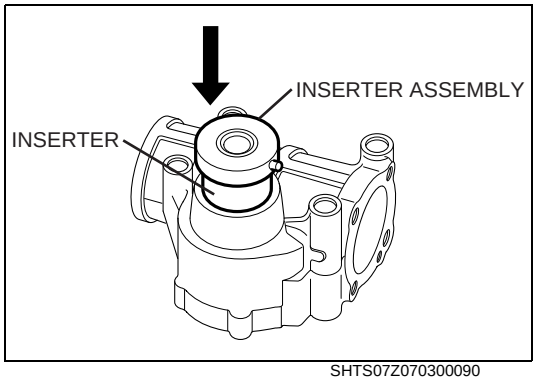
SHTS07Z070300089

7. INSTALL THE STEERING BODY.

(1) Fit the Y-packing and back-up ring in the groove in front of the needle roller bearing (in the hole for the steering body output shaft).

NOTICE

- **Back-up ring installation is facilitated by pinching the ring with the fingers as shown in figure.**
- **After filling the groove with grease, assemble the Y-packing so that the lip faces to the needle roller bearing.**



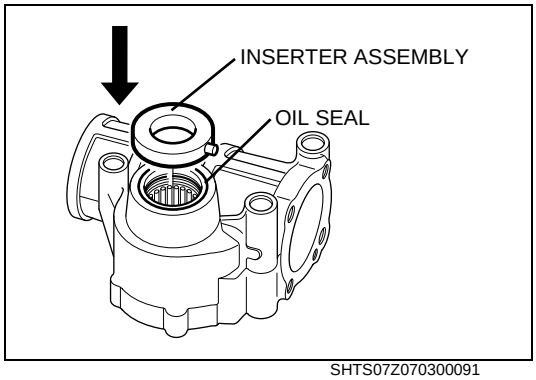
SHTS07Z070300090

(2) Form the back-up ring using the special tool.
SST: Inserter assembly (S0965-71860)

NOTICE
There are five kinds of inserters as below, and install the back-up ring using the inserter for the diameter 58 mm {2.283 in.}.

Unit: mm {in.}

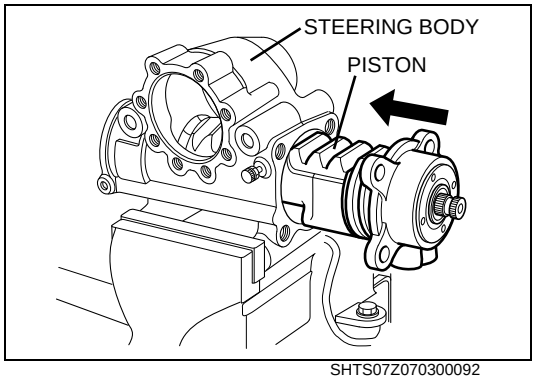
INSERTER DIAMETER
40 {1.575}
45 {1.772}
48 {1.890}
53 {2.087}
58 {2.283}



SHTS07Z070300091

(3) Press fit the oil seal into the steering body using the special tool.
SST: Inserter assembly (S0965-71860)

(4) Fill the oil seal with grease.



SHTS07Z070300092

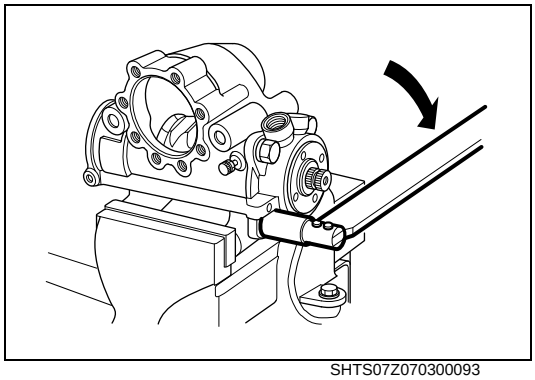
8. INSTALL THE VALVE HOUSING AND BALL NUT ASSEMBLY.

(1) Secure the steering body in the vise.

(2) Fit the worm shaft and valve housing assembly by inserting it into the steering body with the power piston gear placed on the side of the sector shaft. Hold the power piston lightly by hand so that it does not rotate.

NOTICE

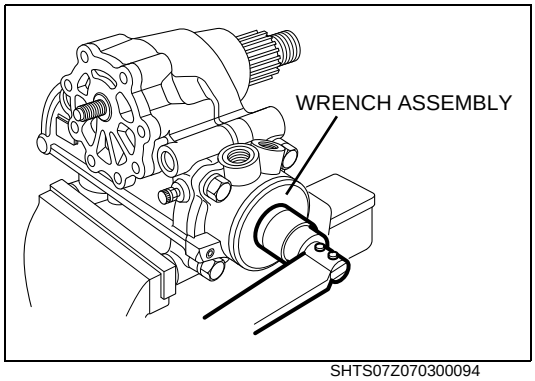
- **When inserting the worm shaft and valve housing assembly, do not damage the piston seal ring.**
- **Be careful that the O-ring does not fall out.**


SHTS07Z070300093

(3) Align the steering body and valve housing oil passage holes and tighten the bolt to the specified torque.

NOTICE

Insert a bar into the bolt hole to align the body and housing oil passage holes. Prevent housing rotation to prevent the O-ring from being cut or dislodged.



SHTS07Z070300094

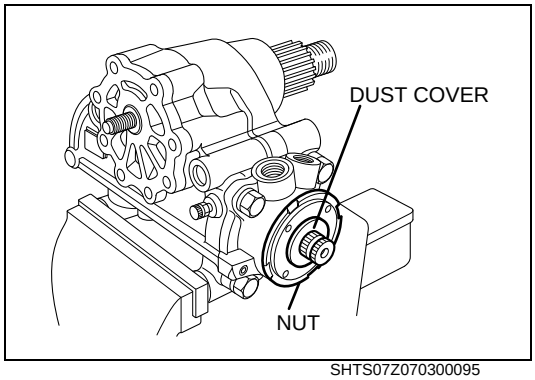
(4) Tighten the plug and seal assembly (which was previously loosened through 180°) to the specified torque using the wrench assembly.

SST: Wrench assembly (S0960-31560)

NOTICE

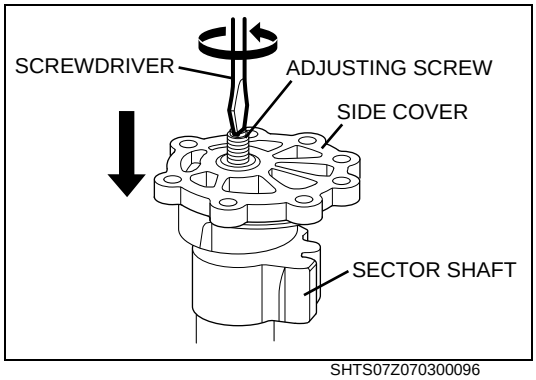
After applying a thin and uniform coat of liquid gasket to 3-5 whole threads of the screw part of the plug and seal assembly and tightening it with the indicated torque, apply turning stopper punches every 180°.

Liquid gasket: Equivalent to ThreeBond 1102



SHTS07Z070300095

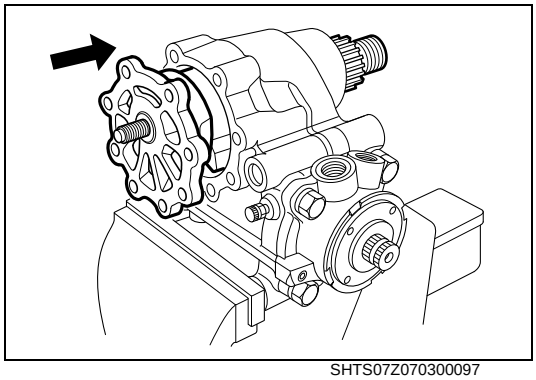
(5) Attach the dust cover to the valve housing.



SHTS07Z070300096

9. INSTALL THE SIDE COVER ASSEMBLY AND SECTOR SHAFT.

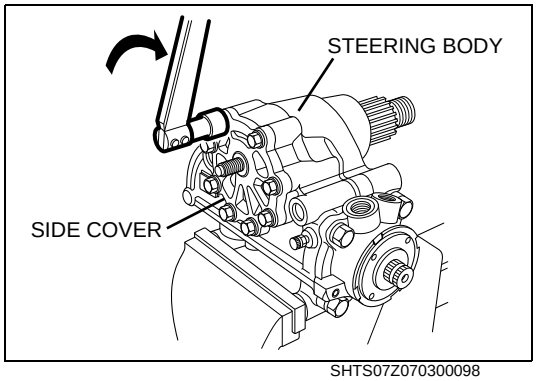
(1) Assemble the side cover assembly to the sector shaft assembly by aligning the screw hole in the center of the side cover with the adjusting screw and turning the adjusting screw.
Install the O-ring around the outside of the side cover.


SHTS07Z070300097

(2) Insert the sector shaft into the steering body so that its gear and the power piston gear engage in the center.

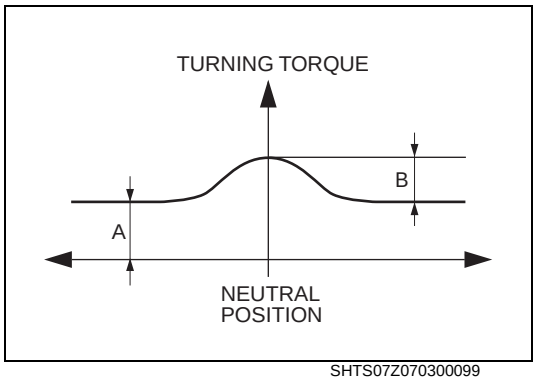
NOTICE

When inserting the sector shaft, do not let the sector shaft serration damage the lip of the Y-packing. Damage may affect oil tightness.



SHTS07Z070300098

(3) Assemble the side cover to the steering body using the bolts. Tighten them to the specified torque.

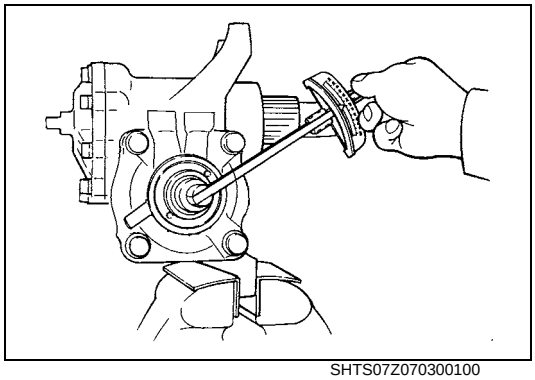


SHTS07Z070300099

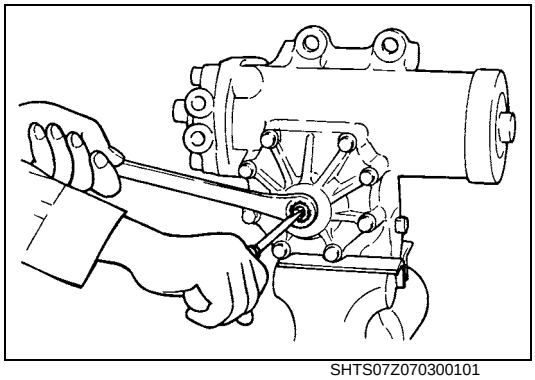
10. MEASURE THE WORM VALVE ASSEMBLY TURNING TORQUE. (MODELS: GD, FT, GT)

Assembly standard: **Unit: N·m {kgf·cm, lbf·ft}**

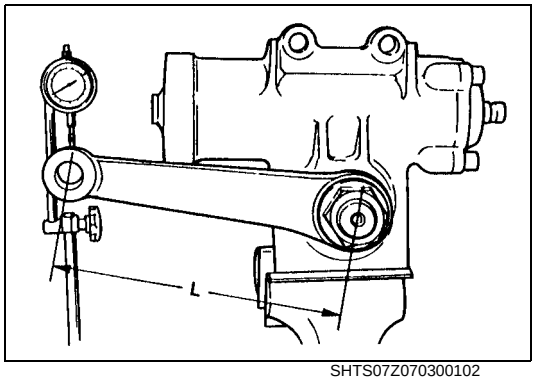
A	B
Less than 0.98 {10, 0.73}	0.1-0.39 {1-4, 0.07-0.29}


SHTS07Z070300100

NOTICE
If measurement is not within specification, readjust the backlash with adjusting screw.


SHTS07Z070300101

11. MEASURE THE SECTOR SHAFT BACKLASH. (MODELS: FG, GH, FL, FM, SG)
(1) Align the marks on the sector shaft with pitman arm.
(2) Install the pitman arm and tighten the nut finger-tight.

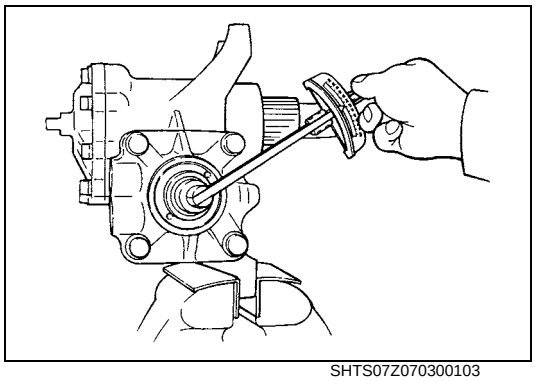


SHTS07Z070300102

(3) Use a dial gauge to check to see that the sector shaft backlash in neutral position.

L	Backlash
270 mm {10.63 in.}	**0.05-0.25 mm {0.002-0.009 in.}**

(4) If measurement is not within specification, readjust the backlash with adjusting screw.


SHTS07Z070300103

12. INSPECT THE WORM VALVE ASSEMBLY ROTATING CONDITION.
(1) Check to see that the worm valve assembly rotate smoothly without any shocks, abnormal resistance, noise and drag, when the worm valve assembly rotates full lock in both direction.

13. TIGHTEN THE PITMAN ARM LOCK NUT.

INSPECTION AND REPAIR

EN07Z0703H300003

METALLIC PARTS

Inspection item	Location	Remedy
Steering body	• The internal surface of the cylinder	Repair or replace the steering body if there is evidence of abrasion or stepped wear. Check visually and by touch for any flaws that may affect smooth piston stroke.
	• Side cover assembly surface	Repair or replace the steering body if there is evidence of any flaws, rust or gouging that may affect oil tightness (check visually and by touch).
	• Y-packing groove in the sector shaft hole	Repair or replace the steering body if there is evidence of any flaws, rust or gouging that may affect oil tightness (check visually and by touch).
Sector shaft	• Gear	Replace the gear if it is severely flawed or worn. Chipped gears must also be replaced. (Check visually and by touch)
	• Gear shaft and serrations	Check for cracks using magnetic-particle test equipment and a color penetration test. Replace any cracked parts.
	• Needle roller bearing contact surface	Check for wear, flaws or gouging (visually and by touch). Repair or replace if necessary.
	• Y-packing contact surface	Repair or replace if any flaws, rust or gouging affecting oil tightness are found (check visually and by touch).
	• Adjusting screw	Measure the axial clearance of the adjusting screw with a dial gauge. 0.01-0.1 mm is acceptable, but if excessive, the screw must be disassembled for inspection. Also check whether the adjusting screw rotates smoothly. If not, the screw must be disassembled and inspected.
Power piston	• Cylinder contact surface	Any wear or abrasion that affects smooth piston stroke must be corrected, or the power piston must be replaced.
	• Rack gear	Replace the rack gear if severely flawed, worn or chipped.
	• Steel ball race surface	Any wear or flaw that disturbs smooth rotation and movement of steel balls must be corrected, or the race must be replaced. (Visual inspection)
	• Seal ring and O-ring	Replace the seal ring or O-ring if any flaws or tears affecting oil tightness are found.
Ball tube	• Steel ball rotation surface	Replace the ball tube if any wear, flaws or gouging that affect smooth ball rotation are found on the inside at the tube.
	• Tang (end)	Replace the ball tube if any warping, bending, flaws or pits that affect smooth ball rotation are found on the tang.

Inspection item	Location	Remedy
Worm shaft (stub shaft)	• **Steel ball race surface**	**Repair or replace the race if any wear, flaws or pits that affect smooth ball rotation are found.**
	• **Seal ring**	**Any wear, flaw, or gouge affecting oil tightness must be corrected or the seal ring must be replaced.**
	• **Y-packing contact surface**	**Any wear, flaw, rust, or gouge which may affect oil tightness must be corrected or the packing must be replaced.**
	• **Thrust bearing (steel ball) contact surface**	**Check the bearing for wear, flaws or pits if shaft rotation is stiff or uneven. Repair or replace if found.**
Thrust bearing (steel ball) and bearing cage	• **Bearing race and steel ball**	**Check the bearing for wear, flaws or pits if shaft rotation is stiff or uneven. Repair or replace if found.**
	• **Bearing cage**	**Replace the cage if any flaws or damage affecting smooth rotation are found.**
Rotor	• **External surface**	**Repair or replace the rotor if any wear, flaws or gouging affecting smooth rotation are found.**
	• **Chamber**	**Replace the chamber if any flaws, breaks, or chips affecting steering characteristics are found.**
	• **Seal ring groove**	**Replace the seal ring if any flaws or tears affecting oil tightness are found.**
Side cover	• **Steering body contact surface**	**Repair or replace the side cover if any flaws, gouging or rust affecting oil tightness are found.**
	• **Y-packing groove**	**Repair or replace the side cover if any flaws, gouging or rust affecting oil tightness are found.**
	• **O-ring groove**	**Repair or replace the side cover if any flaws, gouging or rust affecting oil tightness are found.**
Plug and seal assembly	• **Thrust bearing side race contact surface**	**Repair or replace the plug and seal assembly if any flaws, rust or gouging affecting uniform tightening are found.**
	• **Y-packing press fitted section**	**Replace the plug and seal assembly if any flaws, rust or gouging affecting oil tightness are found.**
	• **O-ring contact surface**	**Replace the plug and assembly if any flaws, rust or gouging affecting oil tightness are found.**
Bearings		**Check that the bearing rotates smoothly. Replace the bearing if rotation is stiff or uneven.**

POWER STEERING PUMP (MODELS: FC, FD)

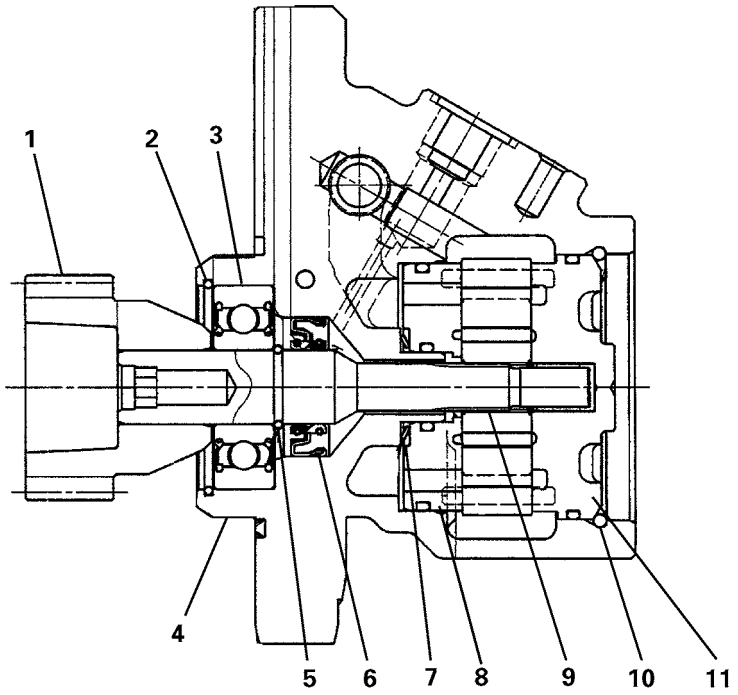
DATA AND SPECIFICATIONS

EN07Z0703I200003

Type	**Vane type**
Speed range	**500-6,000 r/min.**
Relief pressure	**12.7-13.5 MPa {130-138 kgf/cm^2, 1,849-1,963 lbf/in.^{2}}**
Flow rate	**11-13 L/min. {2.91-3.42 U.S.gal., 2.42-2.85 lmp.gal.} at 1,000 r/min.**

DESCRIPTION

EN07Z0703C100005

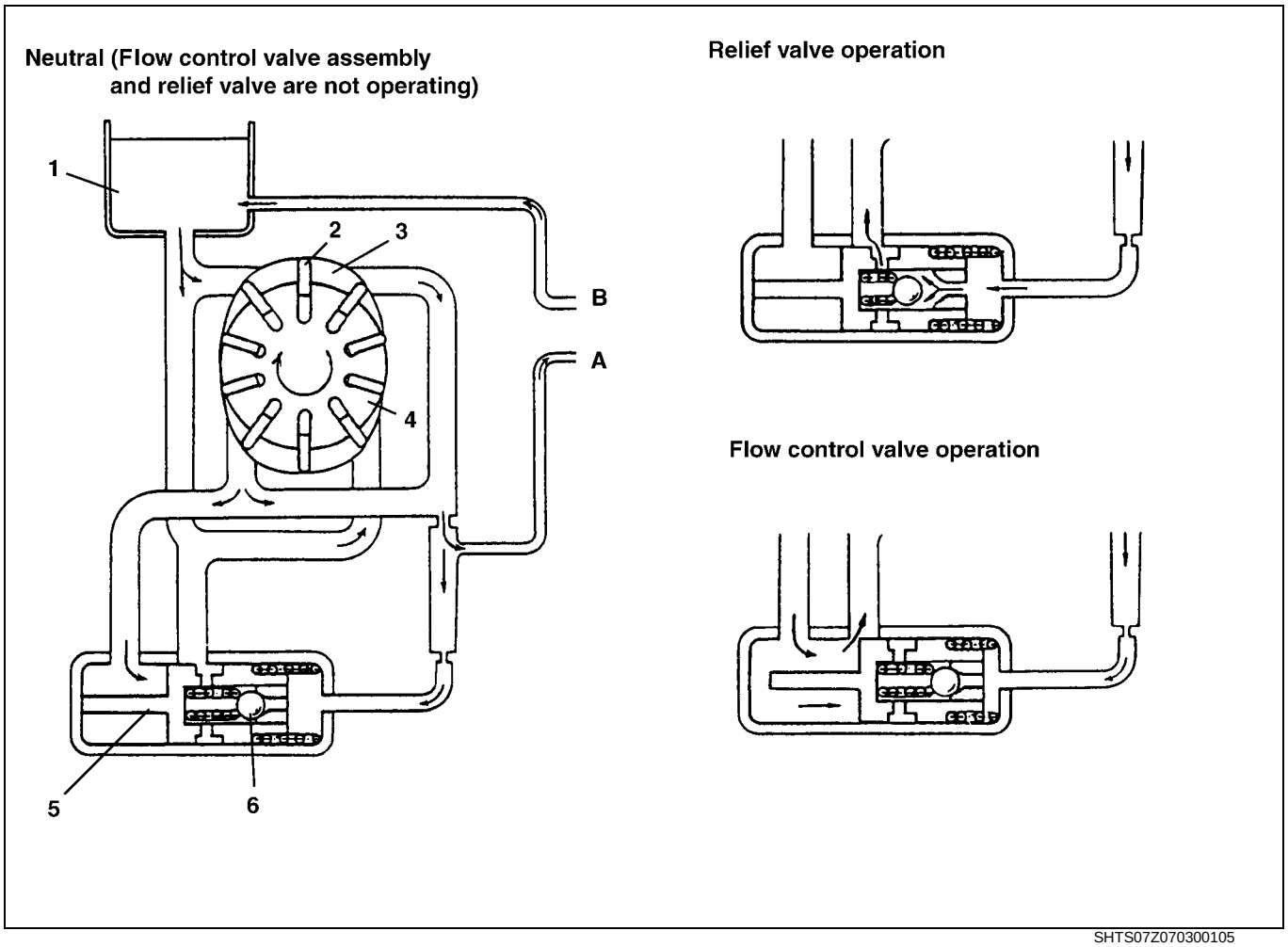


SHTS07Z070300104

1	**Drive gear**	**7**	**Spring seat**
2	**Retainer ring**	**8**	**Side plate**
3	**Ball bearing**	**9**	**Pump shaft**
4	**Pump body**	**10**	**Retainer ring**
5	**Retainer ring**	**11**	**Thrust plate**
6	**Oil seal**		

OPERATION

EN07Z0703C100006

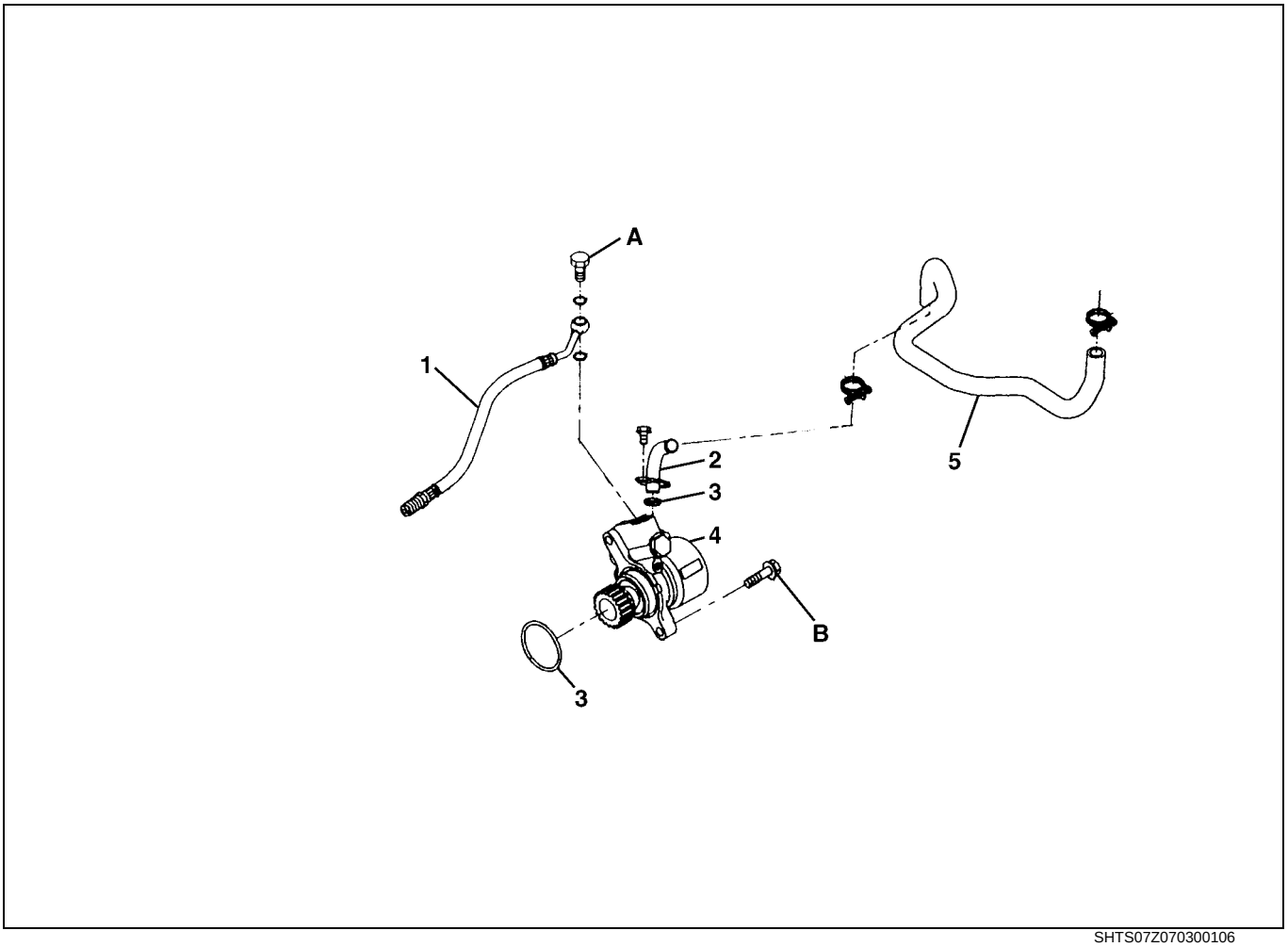


SHTS07Z070300105

1	Oil reservoir	5	Flow control valve assembly
2	Vane	6	Relief valve
3	Cam ring	A	To power steering gear unit
4	Rotor	B	From power steering gear unit

COMPONENT LOCATOR

EN07Z0703D100003

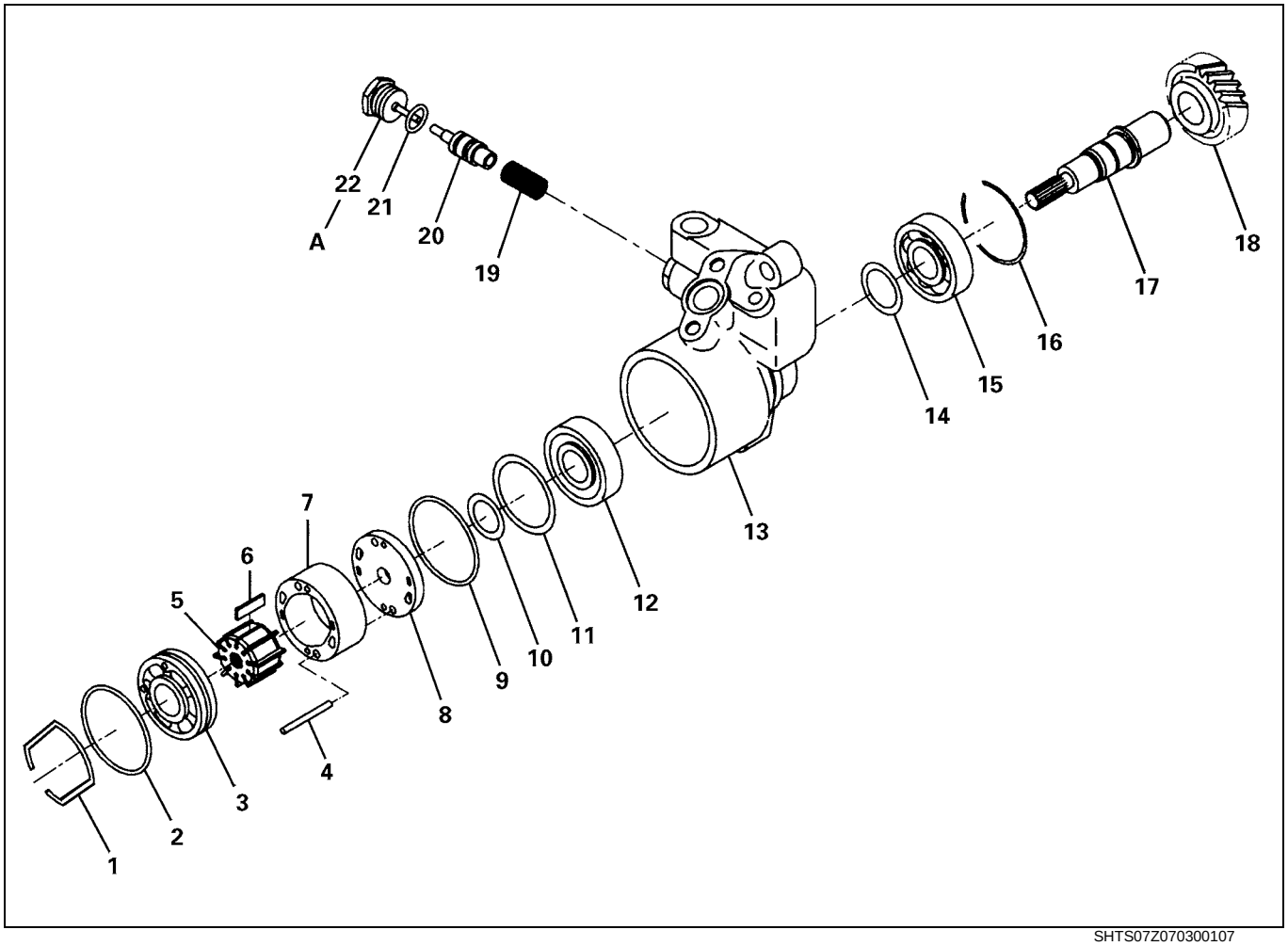


SHTS07Z070300106

1	Oil hose	4	Power steering pump
2	Power steering pipe	5	Suction hose
3	O-ring		

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

A	56 {575, 47}	B	47 {480, 35}



SHTS07Z070300107

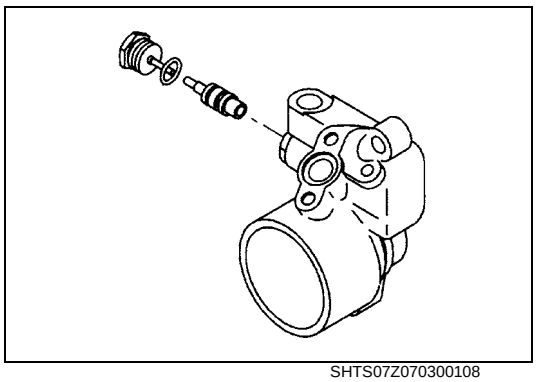
1	Retainer ring	12	Oil seal
2	O-ring	13	Pump body
3	Thrust plate	14	Retainer ring
4	Dowel	15	Ball bearing
5	Rotor	16	Retainer ring
6	Vane	17	Pump shaft
7	Cam ring	18	Drive gear
8	Side plate	19	Spring
9	O-ring	20	Flow control valve assembly
10	O-ring	21	O-ring
11	Spring seat	22	Orifice

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

A	59-78 {602-795, 44-57}		

OVERHAUL

EN07Z0703H200004


SHTS07Z070300108

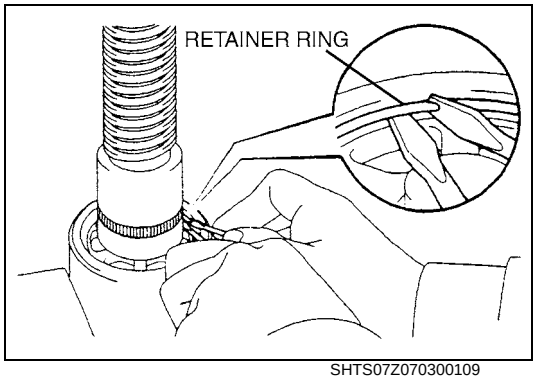
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE FLOW CONTROL VALVE ASSEMBLY.

(1) Remove the orifice and flow control valve assembly.

NOTICE

Be careful not to drop, scratch of nick the flow control valve assembly.



SHTS07Z070300109

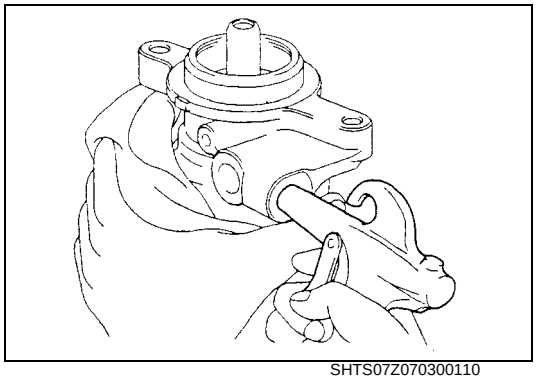
2. REMOVE THE THRUST PLATE, ROTOR, VANES, CAM RING AND SIDE PLATE.

(1) Using a press, lightly push in the thrust plate.

NOTICE

The push-in amount shall be the compression amount of the spring seat and no more.

(2) Using two pieces of screw drivers, remove the retainer ring.


SHTS07Z070300110

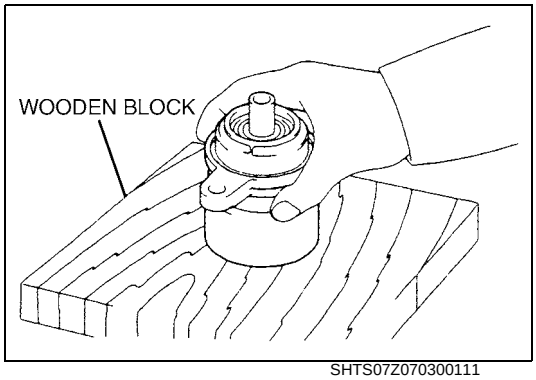
(3) Temporarily install the orifice.

(4) Close the suction port with a finger, using an air gun, apply air pressure from the pressure feed port and remove the thrust plate.

NOTICE

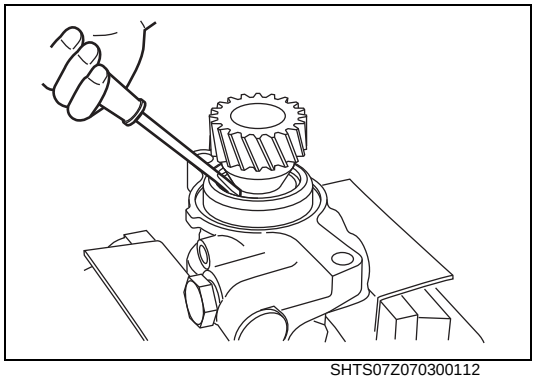
As oil flow out, cover the power steering pump with rags beforehand.

(5) Remove the rotor, vane, cam ring and dowel from the pump body.



SHTS07Z070300111

(6) Lightly tap the pump body on the wooden block and remove the side plate and spring seat.

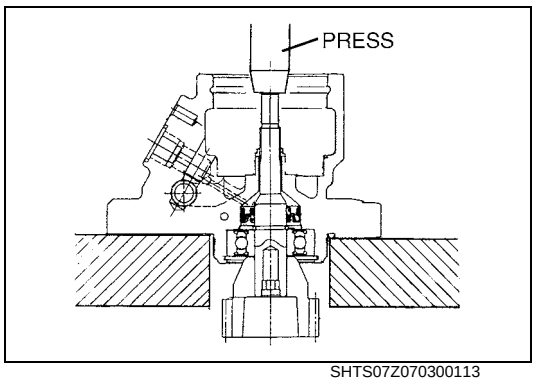

SHTS07Z070300112

3. REMOVE THE PUMP SHAFT WITH DRIVE GEAR AND BALL BEARING.

(1) Using a screw driver, remove the retainer ring.

NOTICE

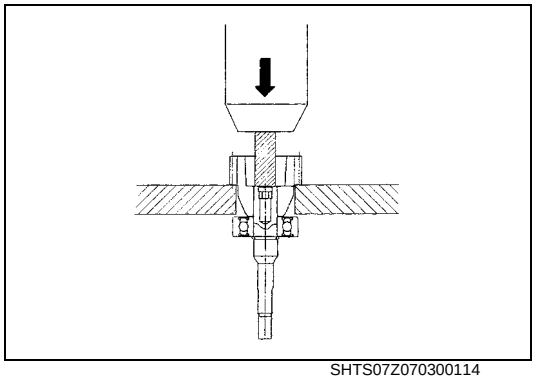
Do not tighten vise too tight when clamping the pump in vise.



SHTS07Z070300113

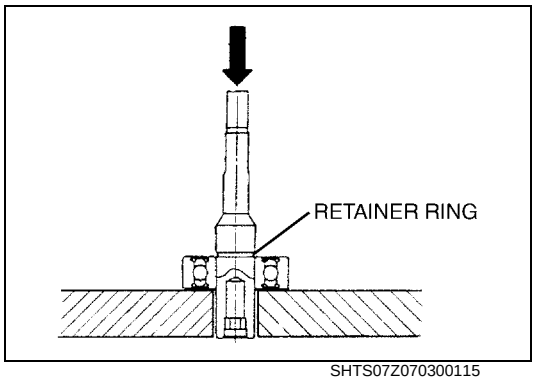
(2) Using a press, press out the pump shaft with drive gear and ball bearing.

IMPORTANT POINTS - REPLACEMENT


SHTS07Z070300114

1. REPLACE THE BALL BEARING, DRIVE GEAR AND PUMP SHAFT.

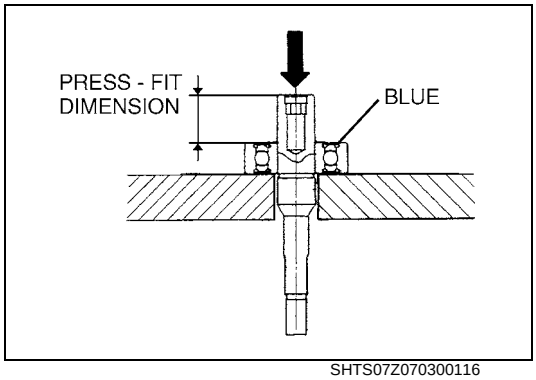
(1) Using a suitable tool and press, press out the pump shaft from the drive gear.



SHTS07Z070300115

(2) Using a retainer ring pliers, remove the retainer ring from the pump shaft.

(3) Using a press, press out the ball bearing.



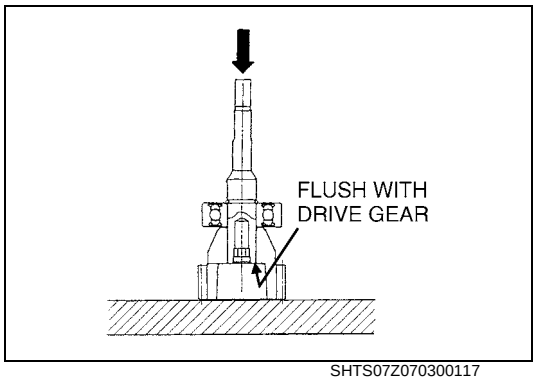
SHTS07Z070300116

(4) Using a press, press the pump shaft into the ball bearing.
Press fit dimension: 21.4-21.7 mm {0.8426-0.8543 in.}

NOTICE
Install the ball bearing with the blue oil seal facing outside of the pump.

(5) Install the retainer ring.

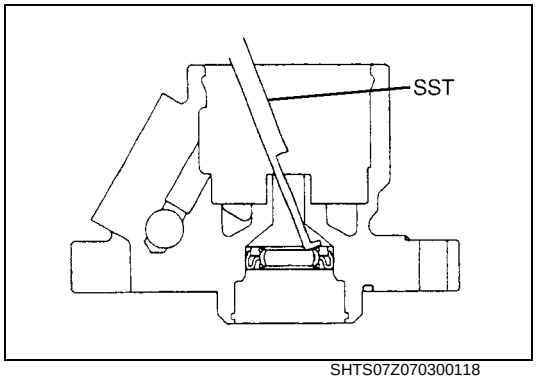
NOTICE
Make sure that the retainer ring seats in place.



SHTS07Z070300117

(6) Using a press, press the pump shaft into the drive gear.

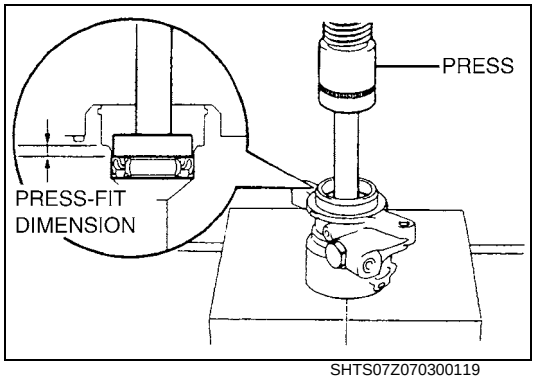
NOTICE
- **Bring the pump shaft flush with the drive gear.**
- **Take care to prevent tilt of the pump shaft.**



SHTS07Z070300118

2. REPLACE THE OIL SEAL.
(1) Using a suitable tapping rod and a hammer, remove the oil seal from the pump body.

NOTICE
Do not scrape or damage the inside of pump body.

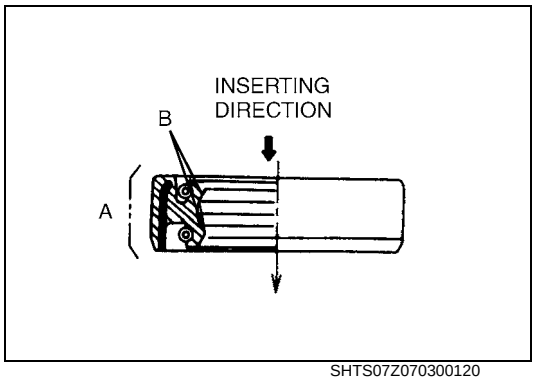


SHTS07Z070300119

(2) Using a suitable rod and a press, press the oil seal into the pump body.
Press fit dimension: 3.6-3.9 mm {0.1418-0.1535 in.}

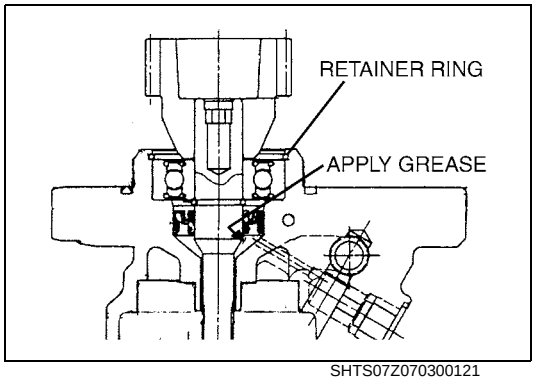
NOTICE

- **Make sure that oil seal is installed in the correct direction.**
- **To prevent oil leakage from oil seal due to lip wear, apply lithium base grease to "A" and "B".**



SHTS07Z070300120

IMPORTANT POINTS - ASSEMBLY



SHTS07Z070300121

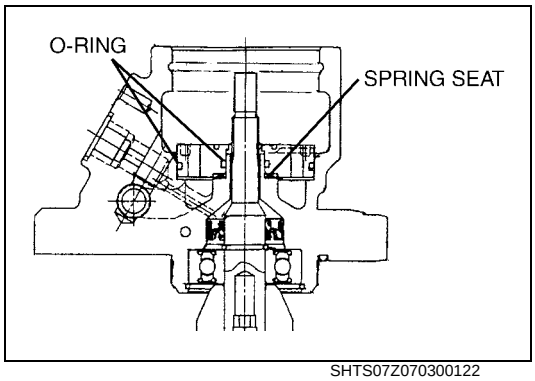
1. INSTALL THE PUMP SHAFT WITH DRIVE GEAR AND BALL BEARING.

(1) Press the pump shaft with drive gear and ball bearing into the pump body.

NOTICE

Apply grease to the pump shaft before installing.

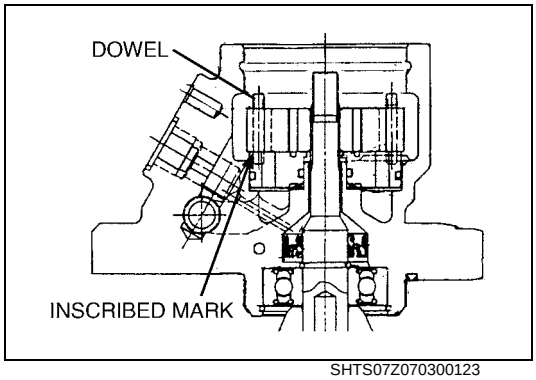
(2) Install the retainer ring.



SHTS07Z070300122

2. INSTALL THE SPRING SEAT AND SIDE PLATE.

(1) Install the two pieces of spring seats.
(2) Coat the O-ring with power steering fluid and install them to the side plate.
(3) Align the projection of the side plate with the recess of the pump body, then install the side plate into the pump body.

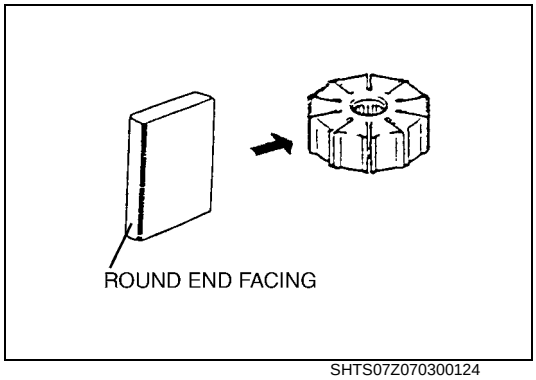


SHTS07Z070300123

3. INSTALL THE DOWELS TO THE SIDE PLATE.

4. INSTALL THE CAM RING.

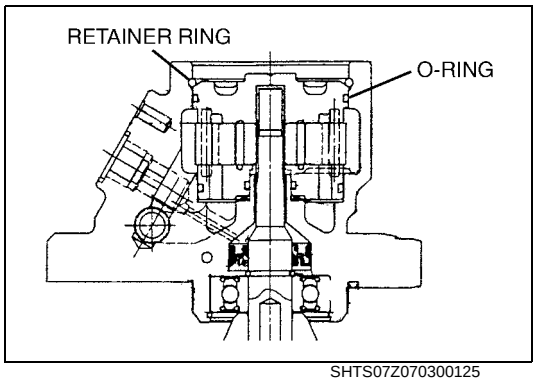
(1) Install the cam ring with the inscribed marks facing downward (side plate side).



SHTS07Z070300124

5. INSTALL THE ROTOR AND VANE.

(1) Install the rotor into the pump shaft.
(2) Install the vanes with the round end facing outward.



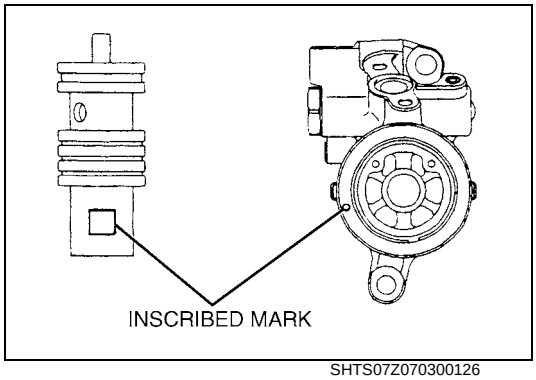
SHTS07Z070300125

6. INSTALL THE THRUST PLATE.

(1) Coat the O-ring with power steering fluid and install it to the thrust plate.
(2) Install the thrust plate into the pump body.
(3) Using a press, push in the thrust plate, then install the retainer ring to the pump body.

NOTICE

The push in amount shall be the compression amount of the spring seat and no more.



SHTS07Z070300126

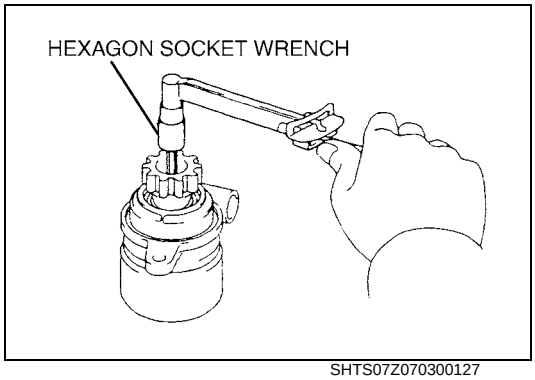
7. INSTALL THE FLOW CONTROL VALVE ASSEMBLY.

(1) Apply power steering fluid to the flow control valve and check that it falls smoothly into valve hole by its own weight.

NOTICE

There are four different valves in diameter, therefore be careful that the mark on both valve and pump body are always matched.

INSCRIBED MARK	PART NUMBER
A	S4433-02310
B	S4433-02320
C	S4433-02330
D	S4433-02340



SHTS07Z070300127

8. INSPECT THE POWER STEERING PUMP.

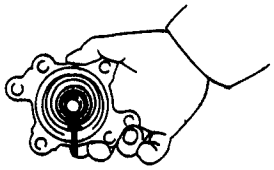
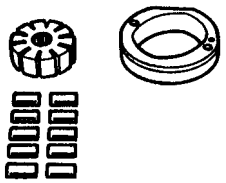
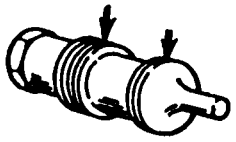
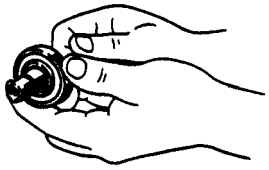
(1) Confirm that the shaft rotates smoothly and that there is no abnormal noise.

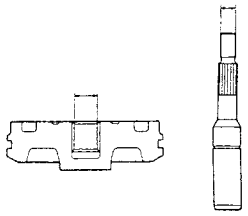
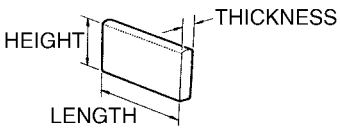
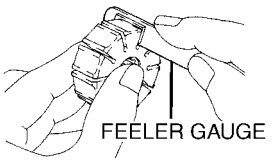
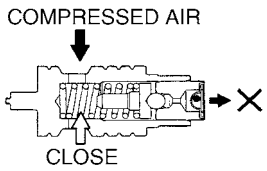
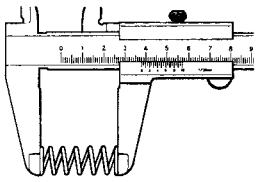
(2) Using a hexagon socket wrench, check the rotation torque of the pump shaft.
Standard: 0.27 N·m {2.8 kgf·cm, 0.2 lbf·ft} or less (during rotation)

INSPECTION AND REPAIR

EN07Z0703H300004

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Oil seal: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam ring inner surface, Rotor surface, Vanes: Wear, scratches and scoring	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Side plate: Abrasions and flaws	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Flow control valve assembly: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Pump shaft bearing: Scratched and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Clearance between pump shaft and thrust plate	**0.020-0.087 {0.0008-0.0034}**	**0.087 {0.0034} or more**	**Replace pump shaft and thrust plate.**	**Measure** 
Vane: Wear	**Height: 9.2-9.5 {0.3623-0.3740}** **Thickness: 1.965-1.972 {0.0774-0.0776}** **Length: 15.953-15.973 {0.6281-0.6288}**	**—**	**Replace rotor and vane with cam ring.**	**Measure** 
Clearance between rotor groove and vane	**0.015-0.030 {0.0006-0.0011}**	**0.03 {0.0012} or more**	**Replace rotor and vane with cam ring.**	**Measure** 
Flow control valve: Leakage (Apply compressed air: 392-490 kPa {4-5 kgf/cm^2, 57-71 lbf/in.^{2}})	**—**	**—**	**Replace flow control valve assembly.**	**Measure** 
Flow control valve compression spring: Free length	**33.4-38.0 {1.3150-1.4960}**	**—**	**Replace compression spring.**	**Measure** 

POWER STEERING PUMP
(MODELS: GD, FG, GH, FL, FM8J, SG, FT, GT)

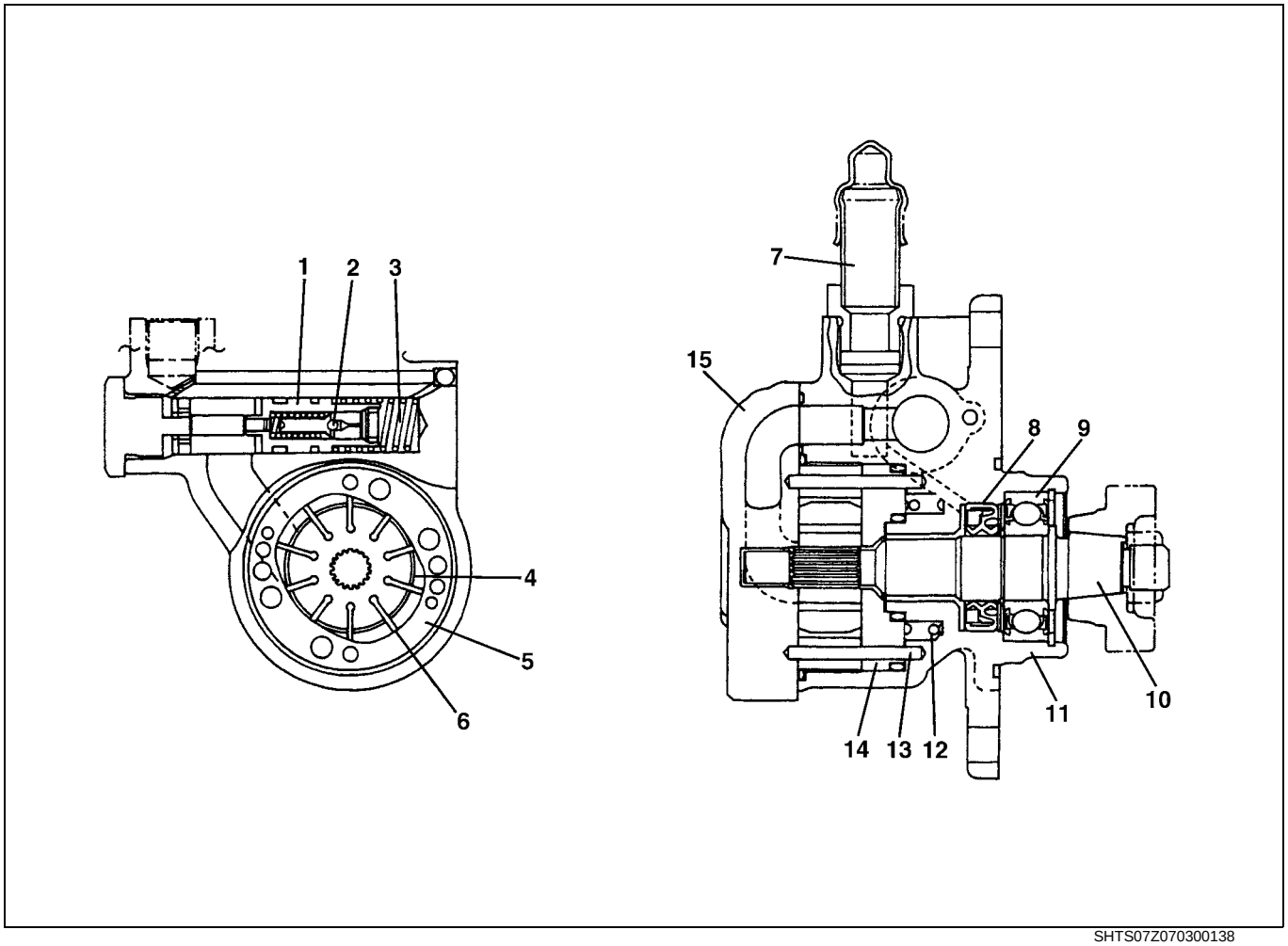
DATA AND SPECIFICATIONS

EN07Z0703I200004

Type			Vane type
Speed range	Model:	GD, FT, GT	715-4,901 r/min.
		FG, GH, FL, FM, SG	715-5,239 r/min.
Relief pressure	Model:	GD	13.0-13.7 MPa {133-139 kgf/cm^2, 1,886-1,987 lbf/in.^{2}}
		FG, GH, FL, FM, SG	12.1-12.8 MPa {123-130 kgf/cm^2, 1,750-1,849 lbf/in.^{2}}
		FT, GT	12.0-12.7 MPa {122-129 kgf/cm^2, 1,740-1,841 lbf/in.^{2}}
Flow rate	Model:	GD, FT, GT	12.0 L/min. {3.17 U.S.gal., 2.64 Imp.gal.} at 2,000 r/min.
		FG, GH, FL, FM, SG	17.0-20.0 L/min. {4.50-5.28 U.S.gal., 3.74-4.39 Imp.gal.} at 2,000 r/min.

DESCRIPTION

EN07Z0703C100007



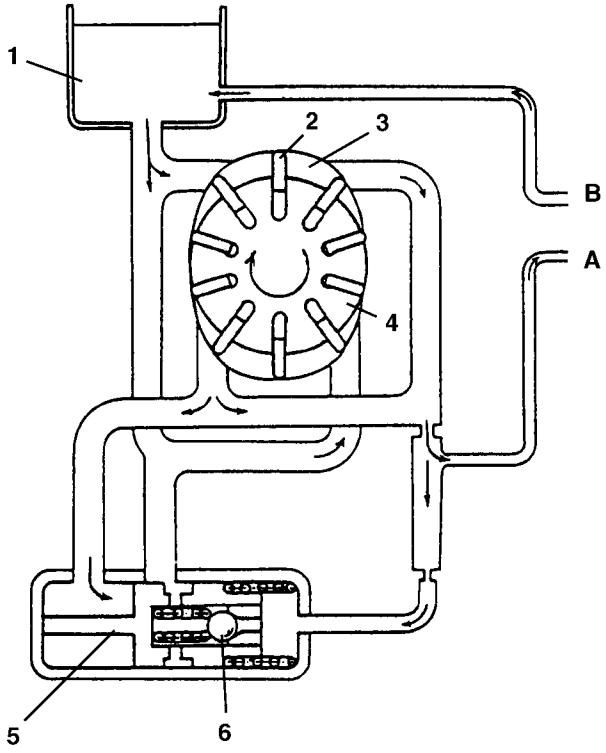
SHTS07Z070300138

1	Flow control valve assembly	6	Vane	11	Pump body sub-assembly
2	Relief valve	7	Suction connector	12	Spring
3	Flow control spring	8	Oil seal	13	Dowel
4	Rotor	9	Ball bearing	14	Side plate
5	Cam ring	10	Pump shaft	15	Body cover

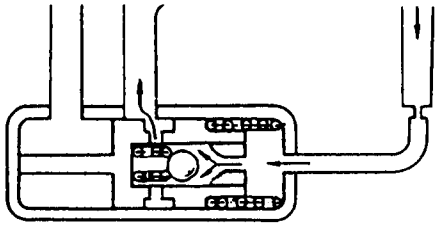
OPERATION

EN07Z0703C100008

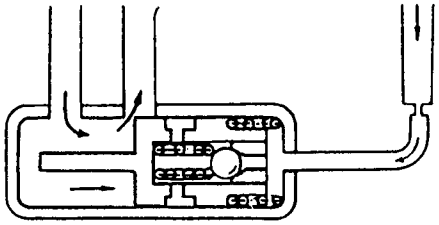
Neutral (Flow control valve assembly and relief valve are not operating)



Relief valve operation



Flow control valve operation

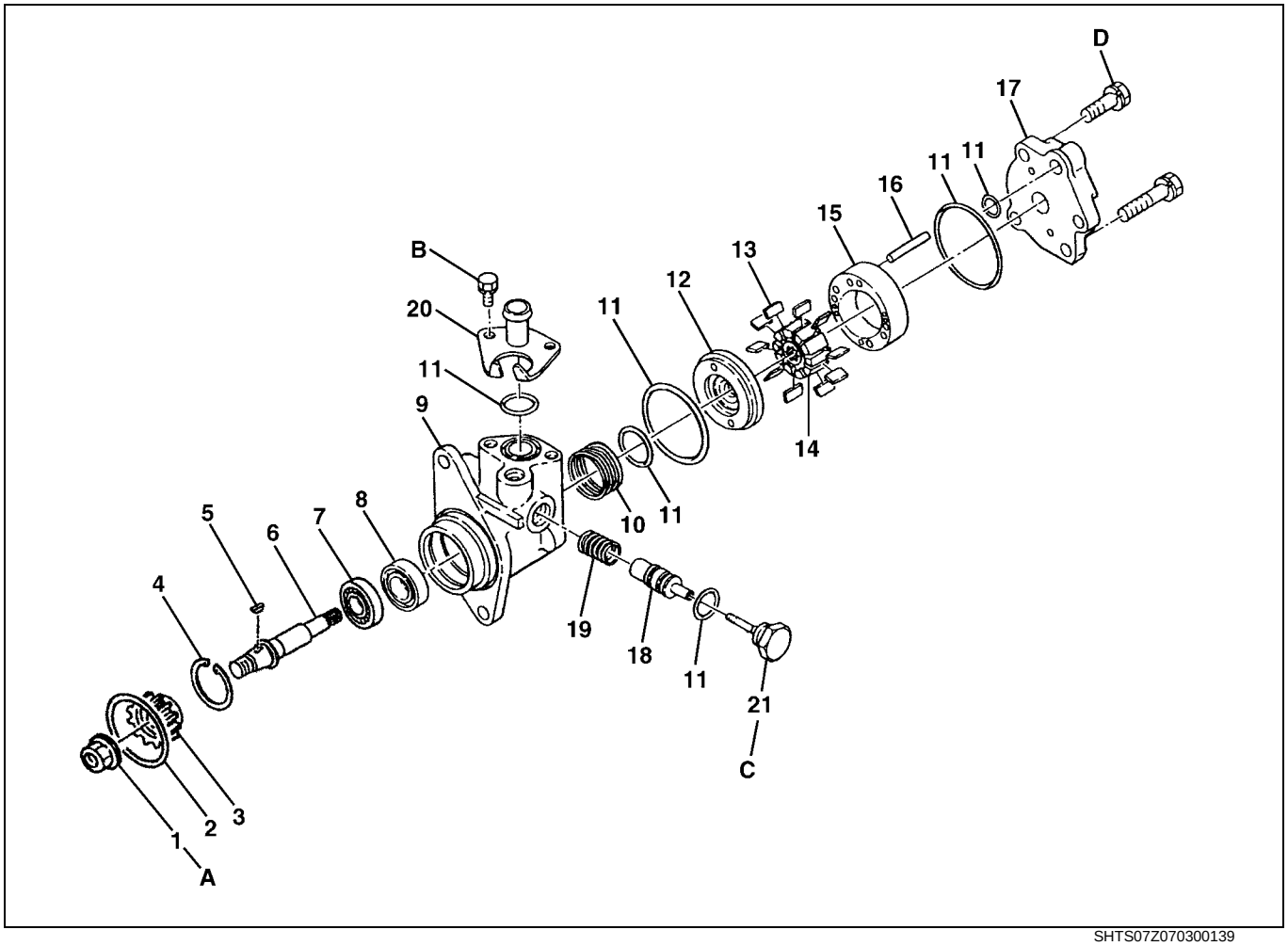


SHTS07Z070300105

1	Oil reservoir	5	Flow control valve assembly
2	Vane	6	Relief valve
3	Cam ring	A	To power steering gear unit
4	Rotor	B	From power steering gear unit

COMPONENT LOCATOR

EN07Z0703D100004



SHTS07Z070300139

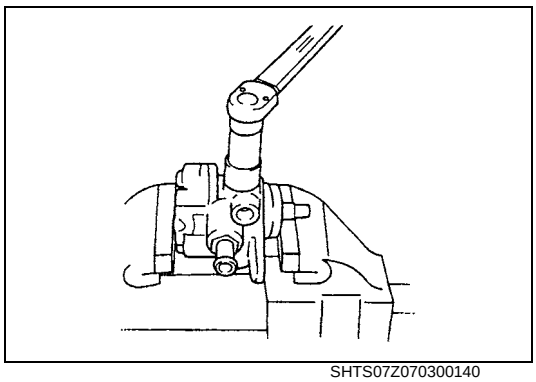
1	Lock nut	8	Oil seal	15	Cam ring
2	O-ring	9	Pump body sub-assembly	16	Dowel
3	Drive gear	10	Spring	17	Body cover
4	Snap ring	11	O-ring	18	Flow control valve assembly
5	Woodruff key	12	Side plate	19	Flow control spring
6	Pump shaft	13	Vane	20	Suction connector
7	Ball bearing	14	Rotor	21	Plug

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

A	99-107 {1,000-1,100, 73-79}	C	49-69 {500-700, 37-50}
B	22-26 {220-260, 16-18}	D	34-44 {350-450, 26-32}

OVERHAUL

EN07Z0703H200005


SHTS07Z070300140

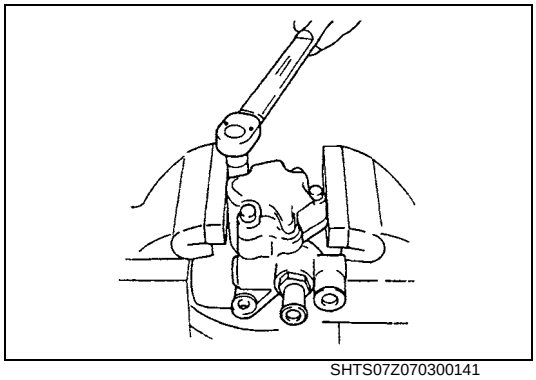
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE FLOW CONTROL VALVE ASSEMBLY.

(1) Remove the plug, flow control valve assembly and spring.

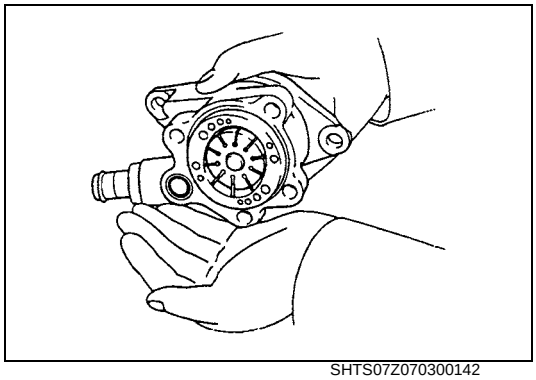
NOTICE

Be careful not to drop, scratch or nick the flow control valve assembly.


SHTS07Z070300141

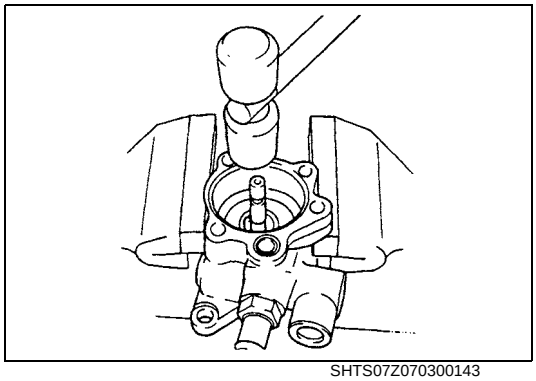
2. REMOVE THE BODY COVER.

(1) Loosen the four fixing bolts that secure the body cover, then remove the cover.


SHTS07Z070300142

3. REMOVE THE VANE PUMP CORE.

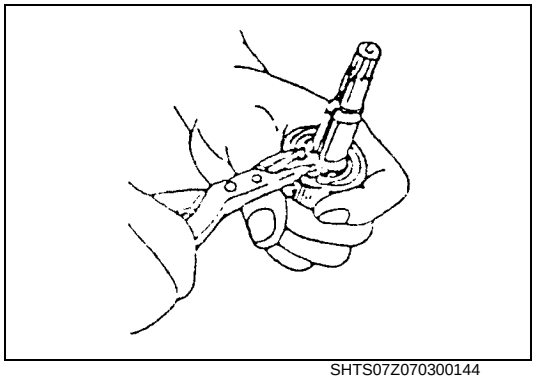
(1) As shown in the figure, face the vane pump core side downward and remove the vane pump core. The vane pump core consists of the cam ring, rotor and vane. Since dimensional checks of these parts have been completed, handle the vane pump core carefully. Remove the side plate and spring.


SHTS07Z070300143

4. DISASSEMBLE THE PUMP SHAFT ASSEMBLY.

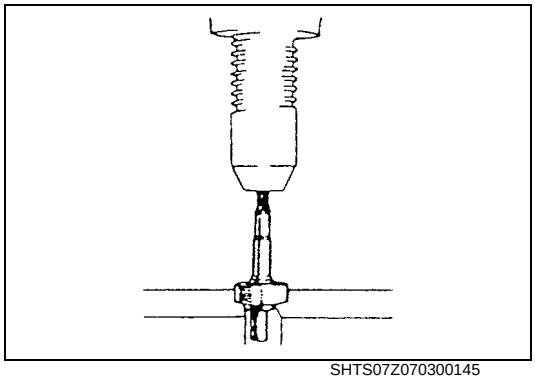
(1) Remove the snap ring from the pump body, and push and remove the spline edge surface of the pump shaft by hand or by using a plastic hammer. Be careful not to damage the oil seal lip. This process completes disassembly. Carry out inspection.

REPLACEMENT

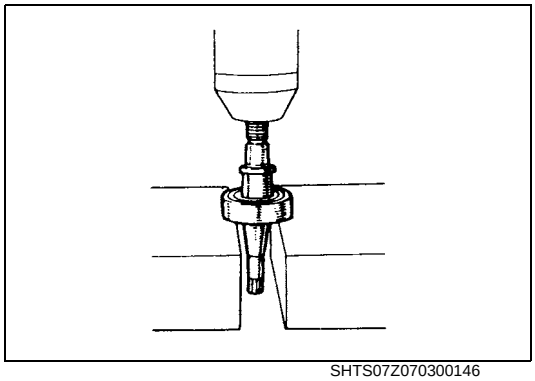

SHTS07Z070300144

1. REPLACE THE BALL BEARING, IF NECESSARY.

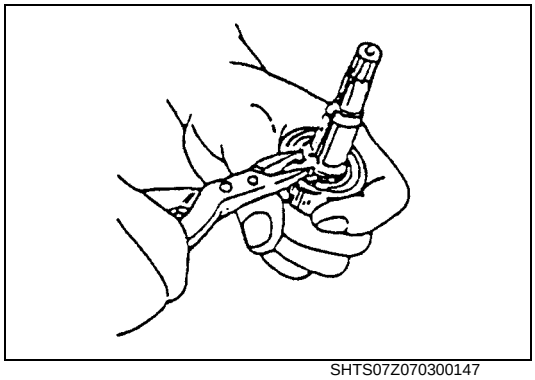
(1) Use a pair of snap ring pliers to remove the retainer ring.


SHTS07Z070300145

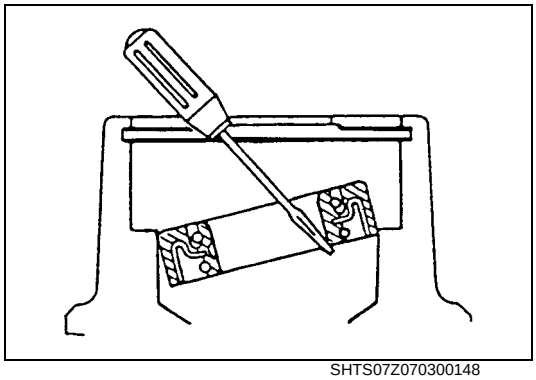
(2) Using a press, press out the ball bearing.


SHTS07Z070300146

(3) Using a press, press in the ball bearing.


SHTS07Z070300147

(4) Using a pair of snap ring pliers, install the retainer ring.

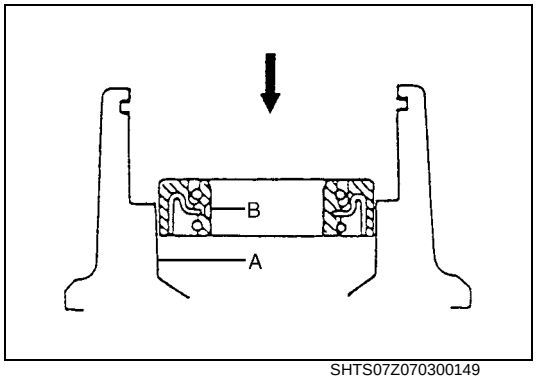

SHTS07Z070300148

2. REPLACE THE OIL SEAL, IF NECESSARY.

(1) Using a screw driver, remove the oil seal.

NOTICE

Do not scrape or damage the inside of pump body.



SHTS07Z070300149

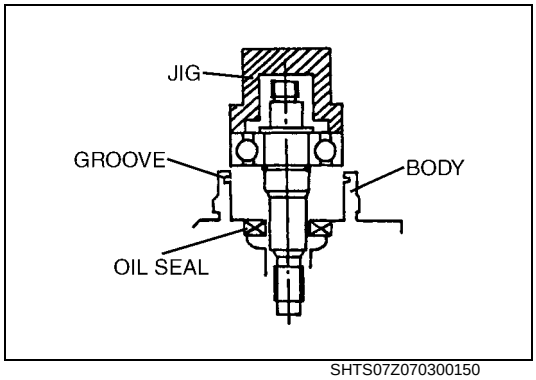
(2) Insert the oil seal as shown in the figure.

NOTICE

To prevent oil leakage from oil seal due to lip wear, apply lithium base grease to A and B.

(3) Using a press, press in the oil seal into the pump body.

IMPORTANT POINTS - ASSEMBLY



SHTS07Z070300150

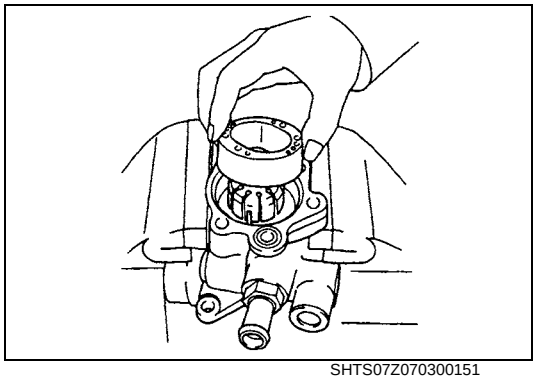
1. INSTALL THE PUMP SHAFT.

(1) Apply grease to the oil seal lip.

Recommended: Lithium grease

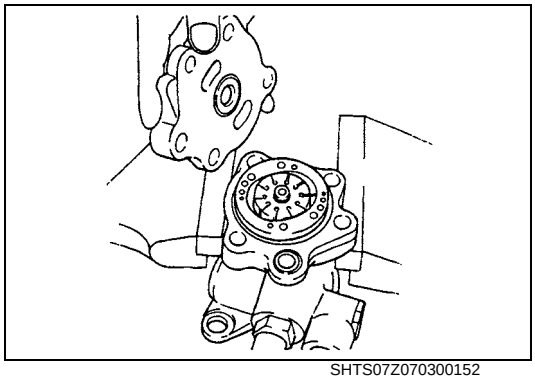
(2) Use a jig to install the shaft assembly.

(3) Install the snap ring into the groove completely.


SHTS07Z070300151

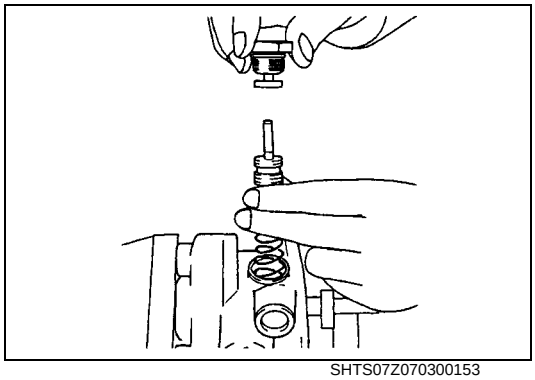
2. INSTALL THE VANE PUMP CORE.

(1) Press-fit the dowel pin into the pump body, then install in the order: O-ring, spring, side plate, rotor, cam ring, and vane. Install the cam ring so that the oval dowel hole is positioned at the valve side of the body and that the rotation direction is correct. Install the rotor so that the chamfer side of the spline faces the side plate. Install the vane so that the radius edge contacts the inner surface of the cam ring.


SHTS07Z070300152

3. INSTALL THE BODY COVER.

(1) Fit the O-ring and the body cover onto the pump body. Align the dowel hole in the cover with the dowel pin, press the cover to the edge surface of the body manually. Temporary tighten the bolts by hand, then retighten to the specified torque.


SHTS07Z070300153

4. INSTALL THE FLOW CONTROL VALVE.

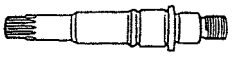
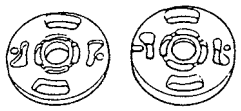
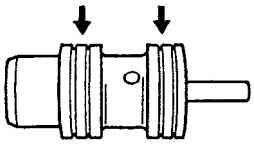
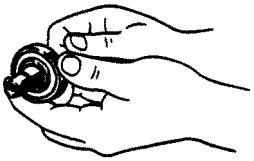
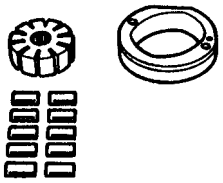
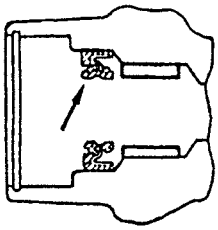
(1) Insert the flow control spring. Install the flow control valve assembly into the body so that the pin side faces the plug side. Tighten the plug.

5. INSPECT PUMP SHAFT ROTATING CONDITION.

(1) Check to see that the pump shaft rotates smoothly without abnormal noise.

INSPECTION AND REPAIR

EN07Z0703H300005

Inspection item	Standard	Limit	Remedy	Inspection procedure
Pump shaft: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Side plate: Abrasion and flaw	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Flow control valve assembly: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Pump shaft bearing: Scratched and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cam ring inner surface: Rotor surface: Vane surface: Wear, scratches and scoring	**—**	**—**	**Replace the vane pump core, if necessary.**	**Visual check** 
Oil seal: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

POWER STEERING PUMP (MODEL: FM1A)

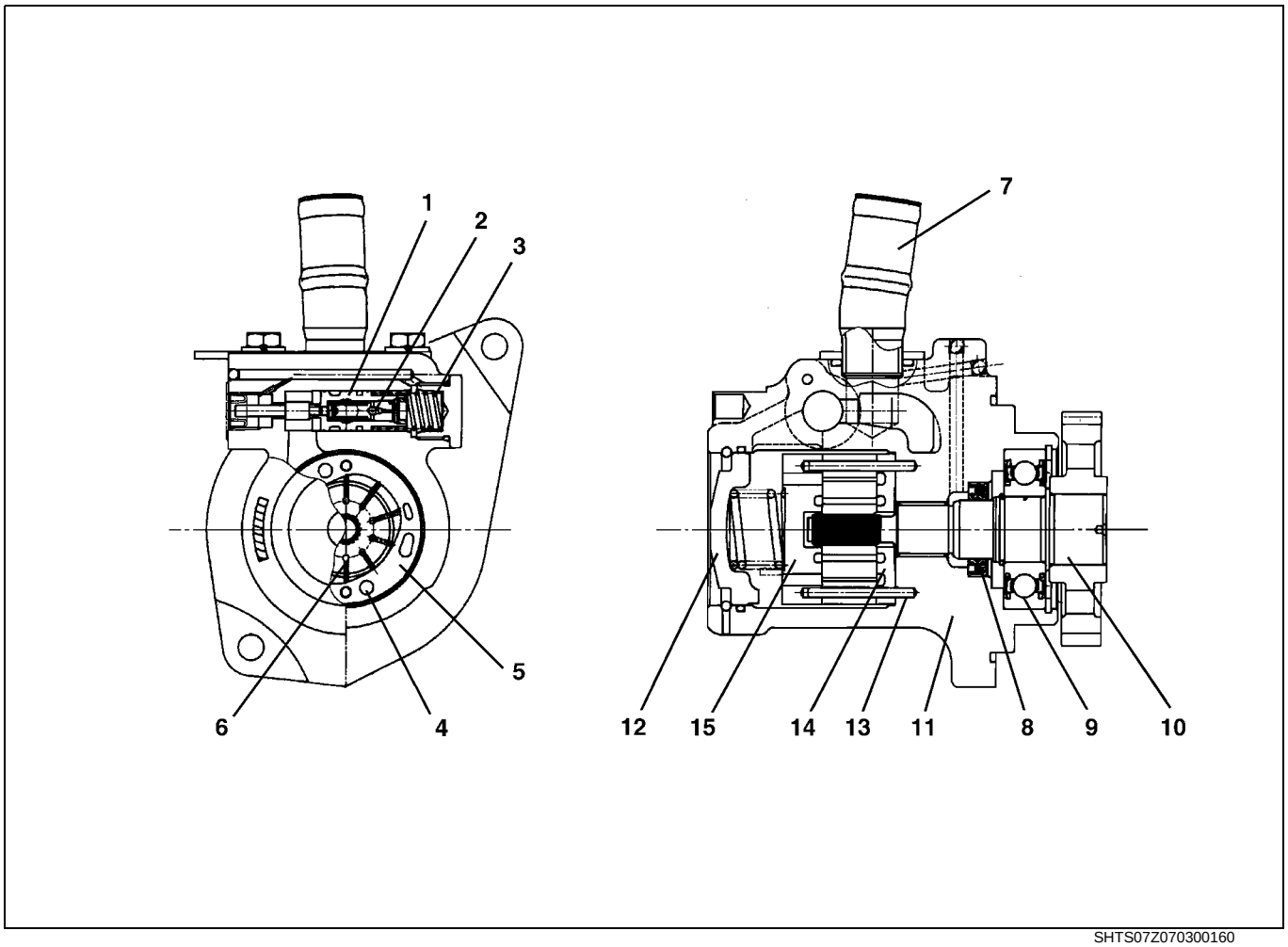
DATA AND SPECIFICATIONS

EN07Z0703I200005

Type	**Vane type**
Speed range	**780-5,150 r/min.**
Relief pressure	**12.0-12.7 MPa {123-129 kgf/cm^2, 1,741-1,841 lbf/in.^{2}}**
Flow rate	**15.0-19.0 L/min. {3.97-5.01 U.S.gal, 3.30-4.17 lmp.gal} at 2,000 r/min.**

DESCRIPTION

EN07Z0703C100009



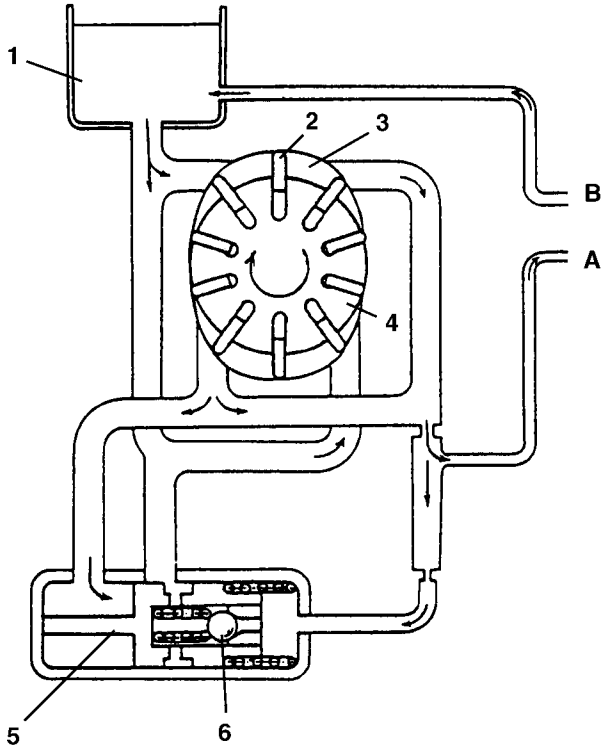
SHTS07Z070300160

1	Flow control valve assembly	9	Ball bearing
2	Relief valve	10	Pump shaft
3	Spring	11	Pump body
4	Rotor	12	Pump cover
5	Cam ring	13	Dowel
6	Vane	14	Front plate
7	Suction connector	15	Rear plate
8	Oil seal		

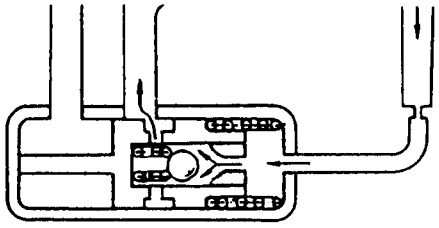
OPERATION

EN07Z0703C100010

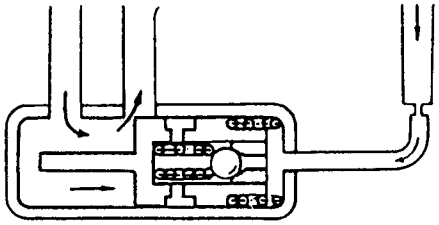
Neutral (Flow control valve assembly and relief valve are not operating)



Relief valve operation



Flow control valve operation

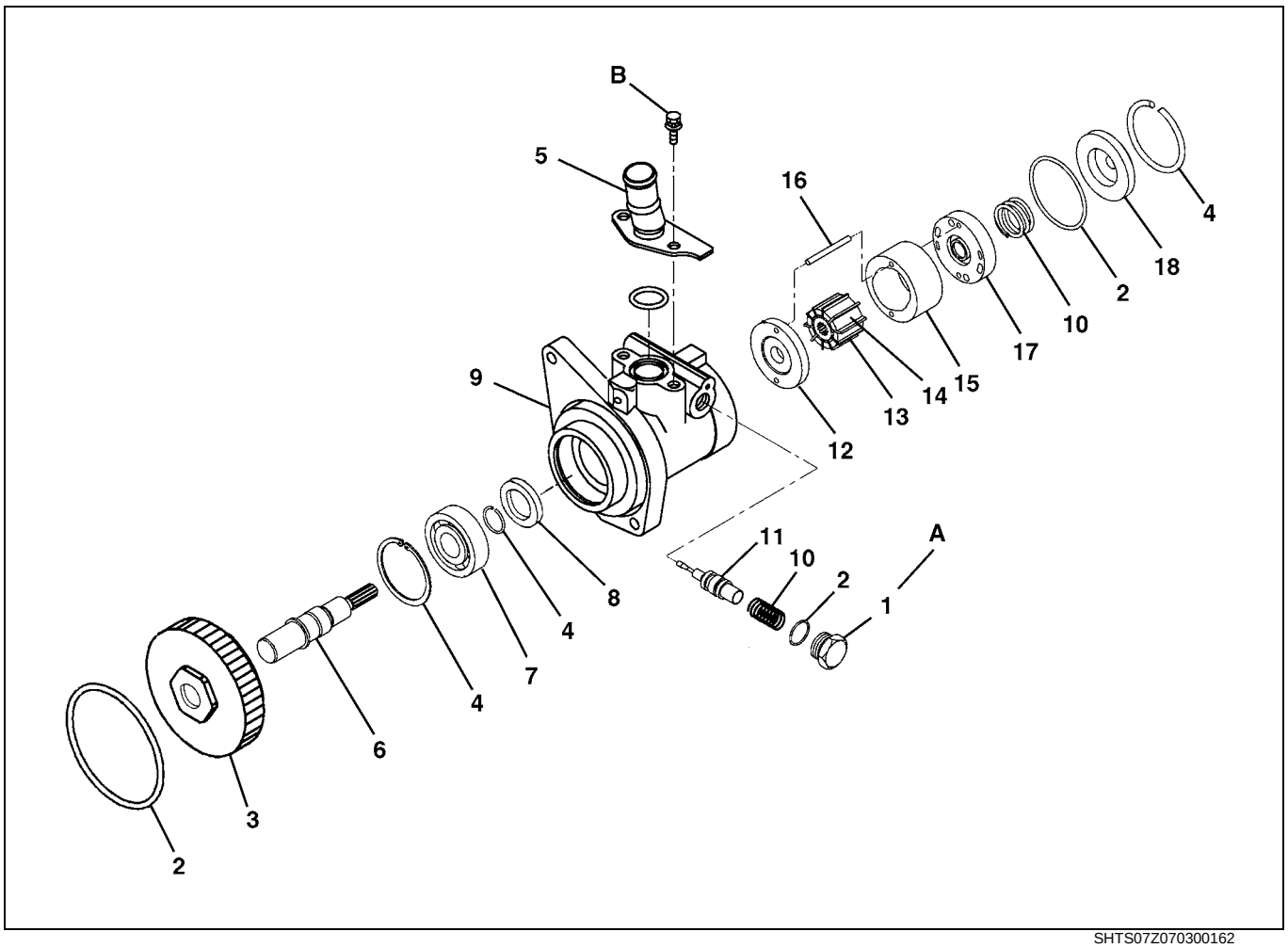


SHTS07Z070300161

1	Reservoir	5	Flow control valve assembly
2	Vane	6	Relief valve
3	Cam ring	A	To power steering gear unit
4	Rotor	B	From power steering gear unit

COMPONENT LOCATOR

EN07Z0703D100005



SHTS07Z070300162

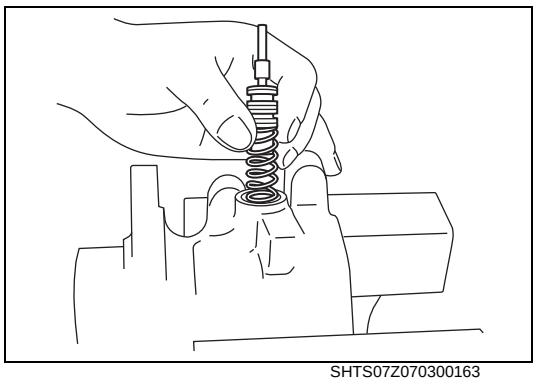
1	Plug	7	Bearing	13	Vane
2	O-ring	8	Oil seal	14	Rotor
3	Drive gear	9	Pump body	15	Cam ring
4	Retainer ring	10	Spring	16	Dowel
5	Suction connector	11	Flow control valve	17	Rear plate
6	Pump shaft	12	Front plate	18	Pump cover

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

A	108-127 {1,100-1,295, 80-93}	B	29-39 {295-397, 22-28}

OVERHAUL

EN07Z0703H200006


SHTS07Z070300163

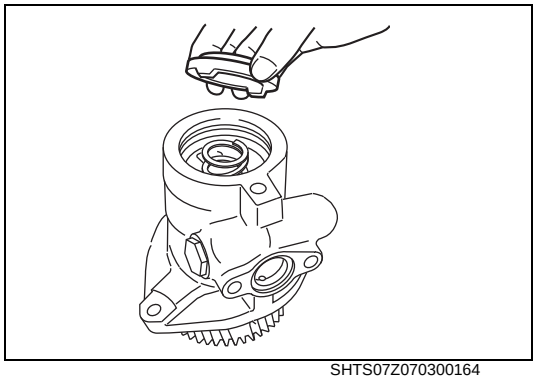
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE FLOW CONTROL VALVE ASSEMBLY.

(1) Remove the plug, spring and flow control valve assembly.

NOTICE

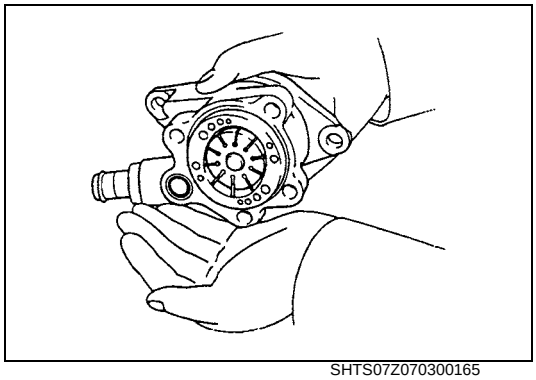
Be careful not to drop, scratch or nick the flow control valve assembly.


SHTS07Z070300164

2. REMOVE THE BODY COVER.

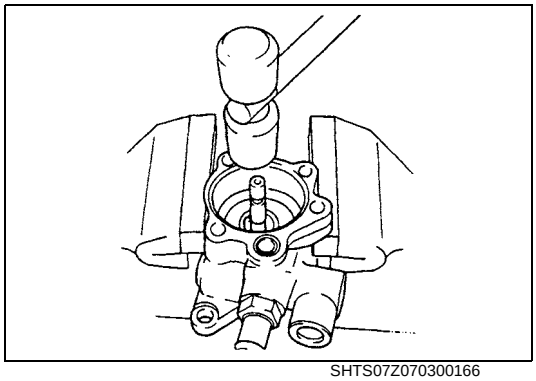
(1) Remove the retainer ring.

(2) Remove the body cover and spring.


SHTS07Z070300165

3. REMOVE THE VANE PUMP CORE.

(1) As shown in the figure, face the vane pump core side downward and remove the rear plate and vane pump core. The vane pump core consists of the cam ring, rotor and vane. Since dimensional checks of these parts have been completed, handle the vane pump core carefully. Remove the front plate.


SHTS07Z070300166

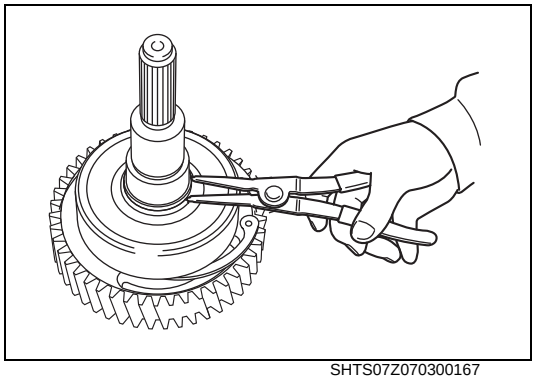
4. REMOVE THE PUMP SHAFT ASSEMBLY.

(1) Remove the retainer ring from the pump body, and push and remove the spline edge surface of the pump shaft by hand or by using a plastic hammer. Be careful not to damage the oil seal lip. This process completes disassembly. Carry out inspection.

REPLACEMENT

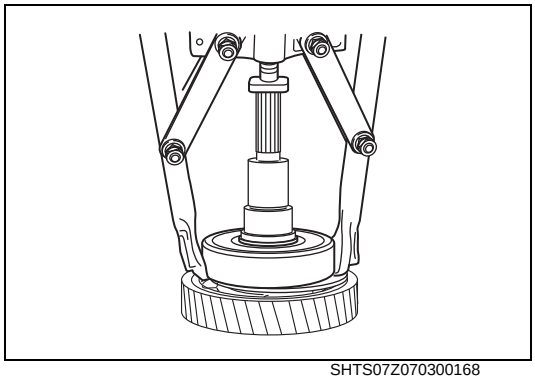
1. REPLACE THE BALL BEARING, IF NECESSARY.

(1) Use a pair of snap ring pliers to remove the retainer ring.



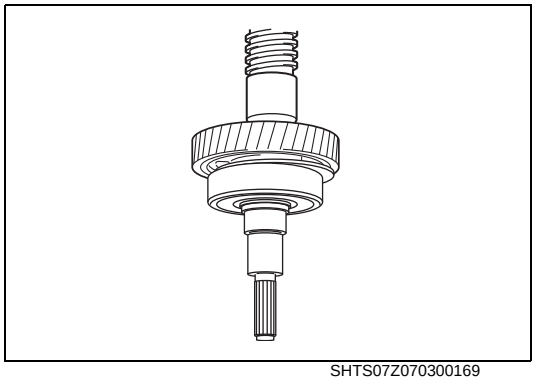
SHTS07Z070300167

(2) Use a press, press out the ball bearing.



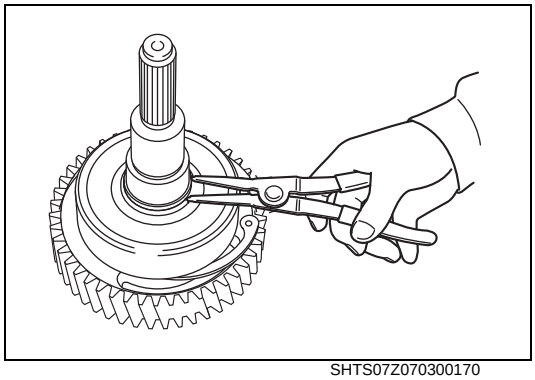
SHTS07Z070300168

(3) Use a press to press in the ball bearing.

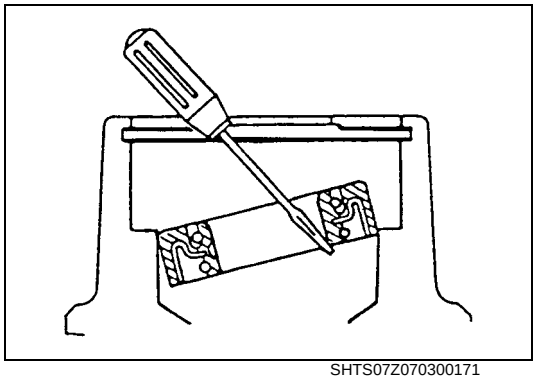


SHTS07Z070300169

(4) Use snap ring pliers to install the retainer ring.



SHTS07Z070300170

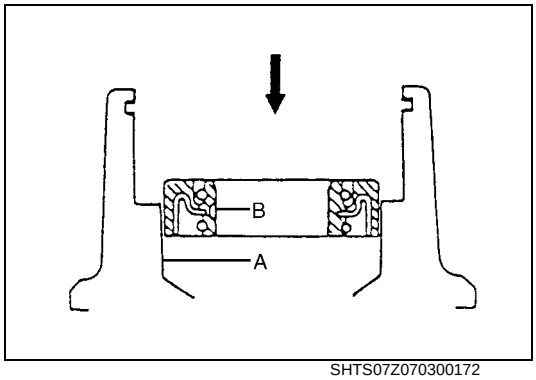

SHTS07Z070300171

2. REPLACE THE OIL SEAL, IF NECESSARY.

(1) Use a screw driver to remove the oil seal.

NOTICE

Do not scrape or damage the inside of pump body.



SHTS07Z070300172

(2) Insert the oil seal as shown in the figure.

NOTICE

To prevent oil leakage from oil seal due to lip wear, apply lithium base grease to A and B.

(3) Using a press, press in the oil seal into the pump body.

IMPORTANT POINTS - ASSEMBLY

NOTICE

- **Before assembling, clean all the parts and lubricate them with fluid.**
- **When assembling the power steering pump, be sure to use new O-rings.**

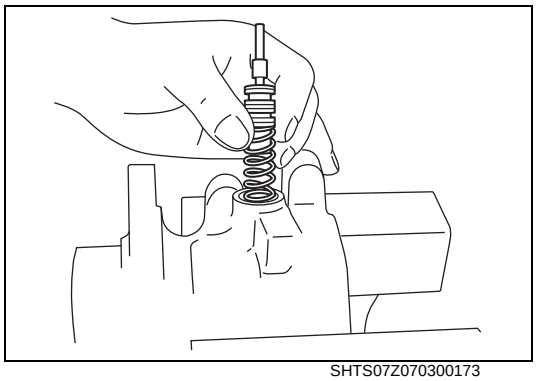
1. INSTALL THE FLOW CONTROL VALVE ASSEMBLY.

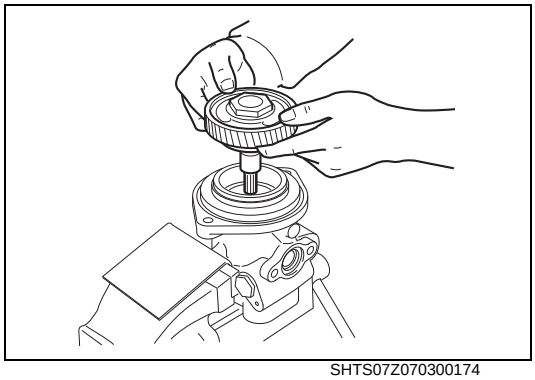
(1) Apply fluid to the valve and check to see that it falls smoothly into the valve hole by its own weight.
If a problem is detected, replace the flow control valve assembly.

(2) Install the spring and the flow control valve assembly, and tighten the plug.

NOTICE

Apply lithium base grease to an O-ring.


SHTS07Z070300173


SHTS07Z070300174

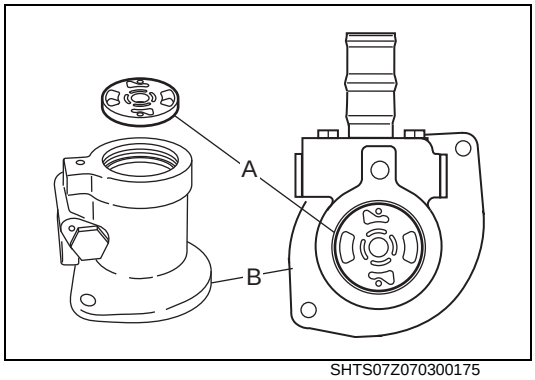
2. INSTALL THE PUMP SHAFT.

(1) Using a press, press in the pump shaft with bearing into the pump body.

(2) Install the retainer ring.

NOTICE

When installing the retainer ring, face the chamfer side toward ball bearing.



SHTS07Z070300175

3. INSTALL THE FRONT PLATE.

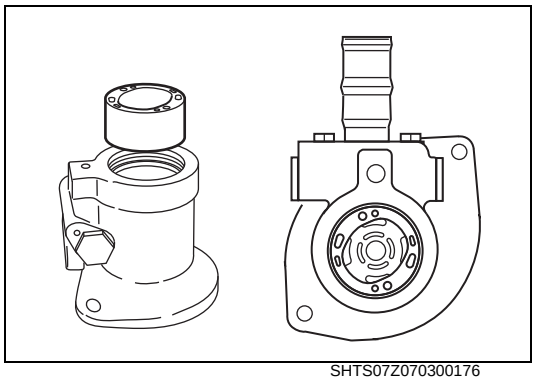
(1) As shown in the figure, insert the front plate into the pump body and the dowel into the standard hole and the long one of front plate

A: Front plate

B: Pump body

NOTICE

When inserting the front plate, the face with a stamped "RR" indication should be turned to the rear side and also the long hole be faced against the suction pipe side for the installation.

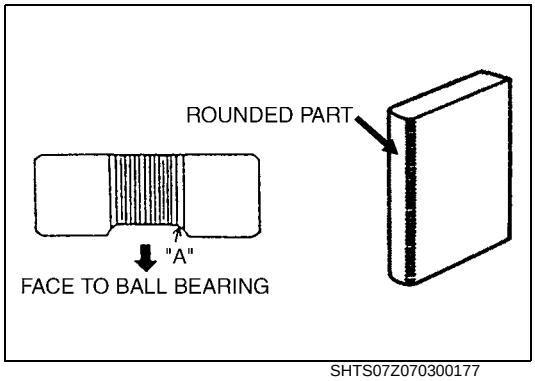

SHTS07Z070300176

4. INSTALL THE CAM RING.

(1) Insert the cam ring into the pump body through the standard hole and elliptic one with the dowel, as shown in the figure.

NOTICE

At this moment, the stamped side should be faced against ball bearing side and also the long hole turned against suction pipe side.

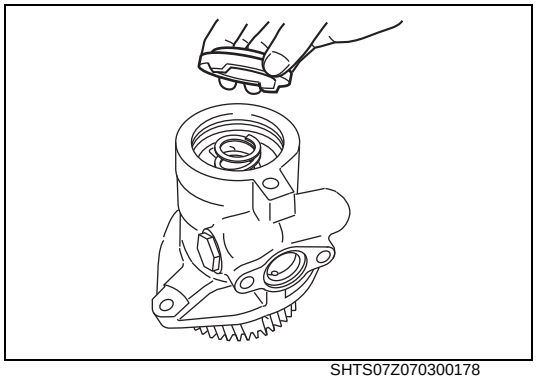


SHTS07Z070300177

5. INSTALL THE ROTOR AND VANE.

(1) Insert the rotor with the cut spline "A" side facing toward the ball bearing.

(2) Insert the vanes with the rounded part facing outward.



SHTS07Z070300178

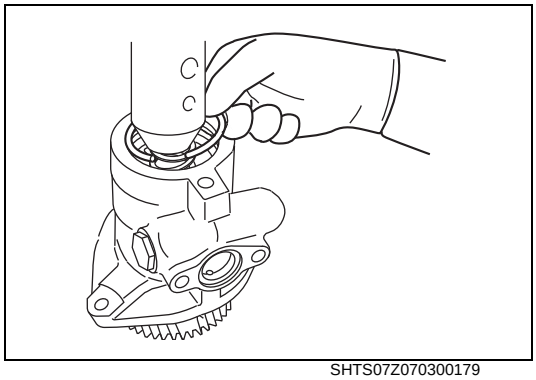
6. INSTALL THE REAR PLATE, SPRING, O-RING AND PUMP COVER.

(1) Put the rear plate on the cam ring through the standard hole and elliptic one with the dowel.

NOTICE

At this moment, the stamped side should be faced against ball bearing side and also the long hole turned against suction pipe side.

(2) Put the spring on the rear plate and insert the O-ring into the groove of the pump body.

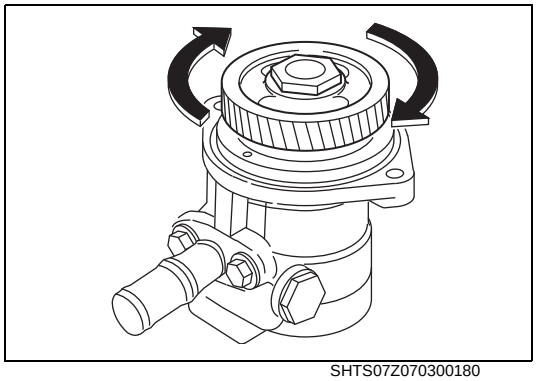


SHTS07Z070300179

(3) Using a press, press in the pump cover and then install the retainer ring securely.

NOTICE

- **Be careful to see that the O-ring is not pinched by the rear cover.**
- **With the pump cover pressed in completely fit the retainer ring to pump body.**



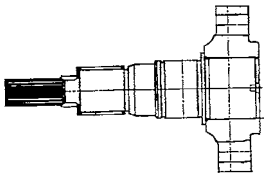
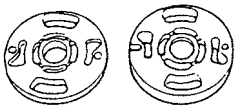
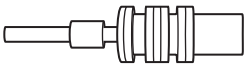
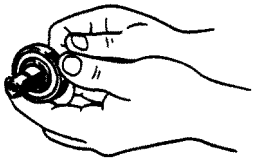
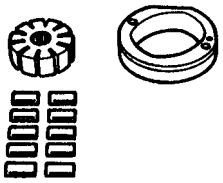
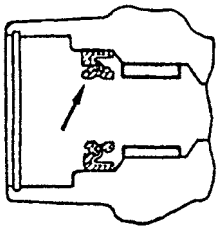
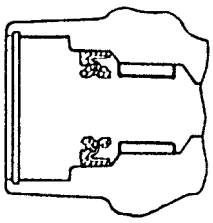
SHTS07Z070300180

7. INSPECT PUMP SHAFT ROTATING CONDITION.

(1) Check to see that the pump shaft rotates smoothly without abnormal noise.

INSPECTION AND REPAIR

EN07Z0703H300006

Inspection item	Standard	Limit	Remedy	Inspection procedure
Shaft: **Damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Side plate: **Abrasion and flaw**	—	—	**Replace,** **if necessary.**	**Visual check** 
Flow control valve assembly: **Wear and damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Ball bearing: **Scratched and damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Cam ring inner surface: **Rotor surface:** **Vane surface:** **Wear, scratches and scoring**	—	—	**Replace,** **if necessary.**	**Visual check** 
Oil seal: **Wear and damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Bushing: **Scratched and damage**	—	—	**Replace the** **pump body,** **if necessary.**	**Visual check** 

POWER STEERING PUMP (MODEL: FM2P)

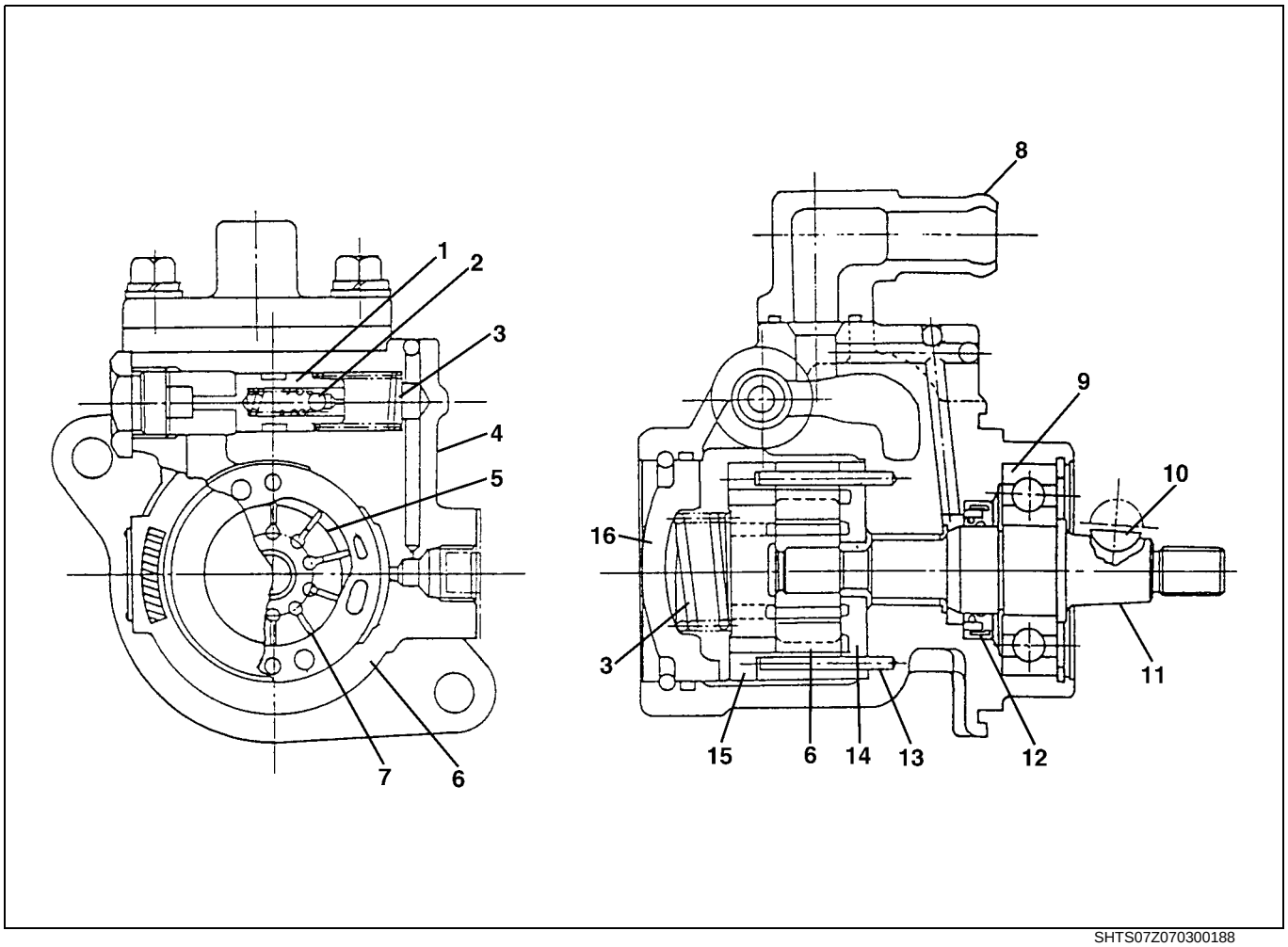
DATA AND SPECIFICATIONS

EN07Z0703I200006

Type	**Vane type**
Speed range	**625-4,790 r/min.**
Relief pressure	**12.1-12.8 MPa {123-130 kgf/cm^2, 1,750-1,849 lbf/in.^{2}}**
Flow rate	**15-19 L/min. {3.97-5.01 U.S.gal, 3.30-4.17 lmp.gal} at 2,000 r/min.**

DESCRIPTION

EN07Z0703C100011



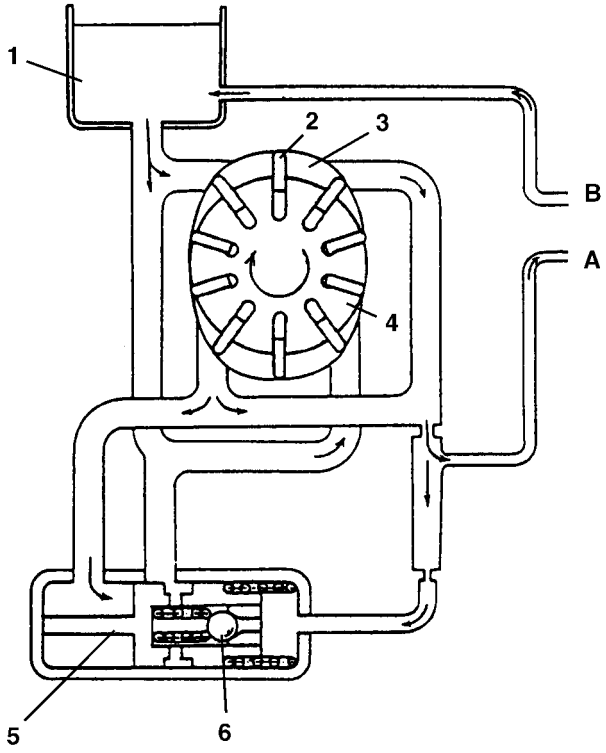
SHTS07Z070300188

1	Flow control valve assembly	9	Ball bearing
2	Relief valve	10	Woodruff key
3	Spring	11	Pump shaft
4	Pump body	12	Oil seal
5	Rotor	13	Dowel
6	Cam ring	14	Front plate
7	Vane	15	Rear plate
8	Suction connector	16	Pump cover

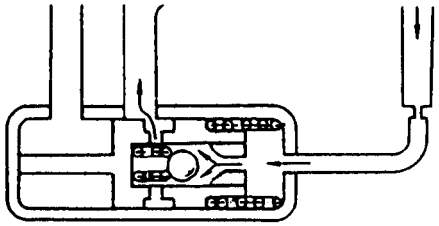
OPERATION

EN07Z0703C100012

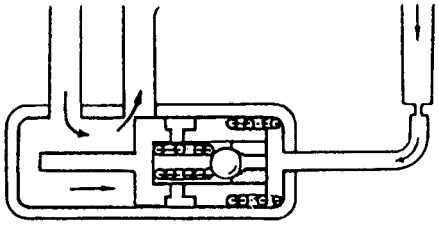
Neutral (Flow control valve assembly and relief valve are not operating)



Relief valve operation



Flow control valve operation

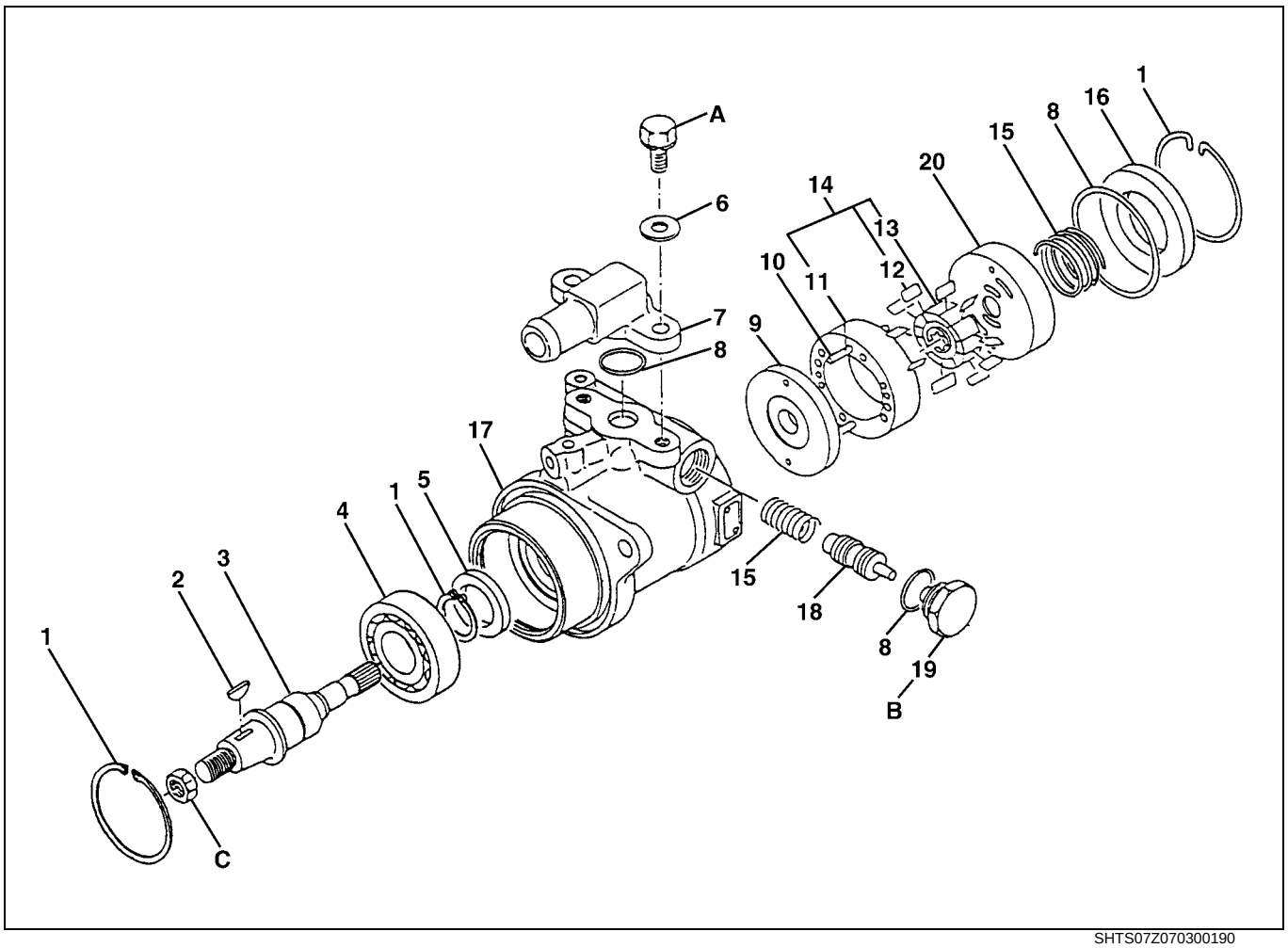


SHTS07Z070300189

1	Reservoir	5	Flow control valve assembly
2	Vane	6	Relief valve
3	Cam ring	A	To power steering gear unit
4	Rotor	B	From power steering gear unit

COMPONENT LOCATOR

EN07Z0703D100006



SHTS07Z070300190

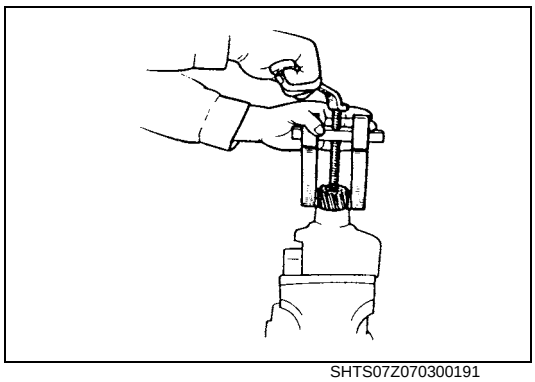
1	Retainer ring	8	O-ring	15	Spring
2	Woodruff key	9	Front plate	16	Pump cover
3	Pump shaft	10	Dowel	17	Pump body sub assembly
4	Bearing	11	Cam ring	18	Flow control valve assembly
5	Oil seal	12	Vane	19	Plug
6	Plain washer	13	Rotor	20	Rear plate
7	Suction connector	14	Cartridge sub assembly		

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

A	29-39 {300-400, 22-28}	C	99-107 {1,000-1,100, 73-79}
B	69-96 {700-1,000, 51-72}		

OVERHAUL

EN07Z0703H200007


SHTS07Z070300191

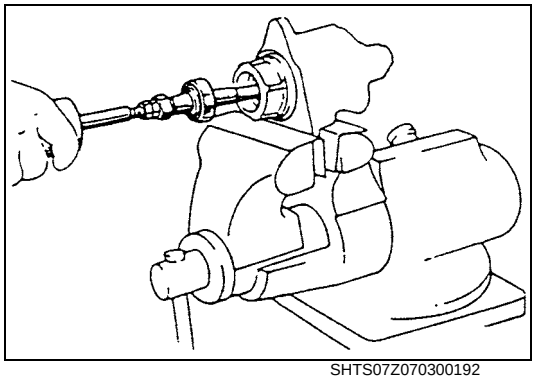
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE DRIVE GEAR.

(1) Use a commercial puller to remove the drive gear.

NOTICE

Do not tighten vise too tight when clamping the pump in vise.


SHTS07Z070300192

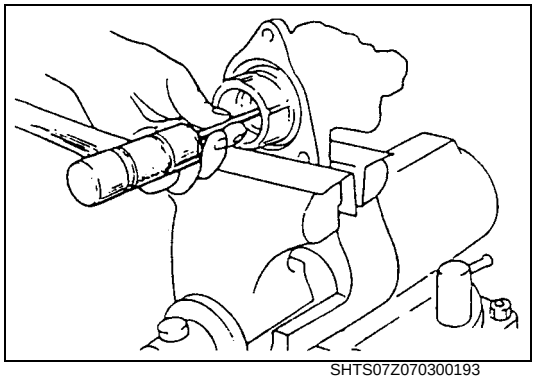
2. REMOVE THE PUMP SHAFT.

(1) Use a pair of snap ring pliers to remove the retainer ring.

⚠ CAUTION

Retainer ring is spring steel and may pop out from the groove when removing. Wear safety glasses during removal.

(2) Use a sliding hammer and adapter to remove the pump shaft with bearing.


SHTS07Z070300193

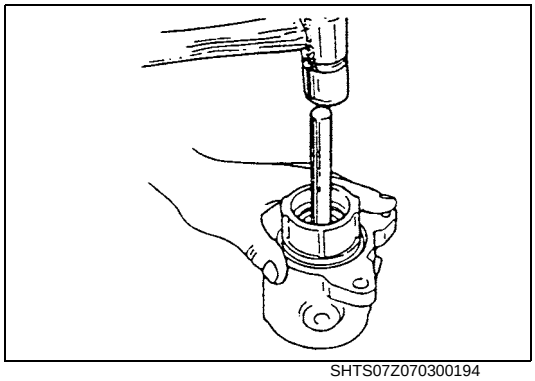
3. REMOVE THE PUMP COVER AND REAR PLATE.

(1) Remove the retainer ring.

(2) Remove the pump cover, spring, and rear plate using a plastic hammer and rod.

NOTICE

Avoid gripping the rear plate with pliers as this could mar it.


SHTS07Z070300194

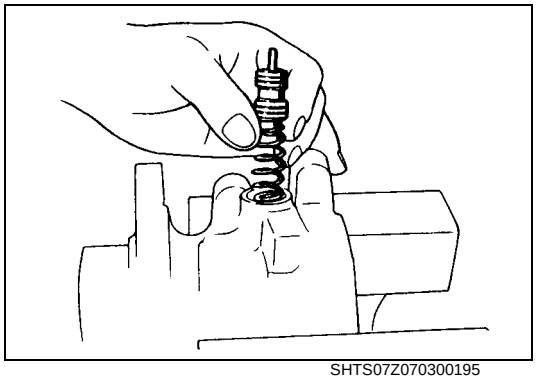
4. REMOVE THE ROTOR, VANES, CAM RING, AND FRONT PLATE.

(1) Using a plastic hammer and rod, tap the rod to remove the front plate, cam ring, rotor and vanes.

NOTICE

- **Be careful to see that the cam ring, rotor, and vanes do not fall out.**
- **Avoid gripping the front plate with pliers as this could mar it.**

(2) Remove the O-ring from the pump body.


SHTS07Z070300195

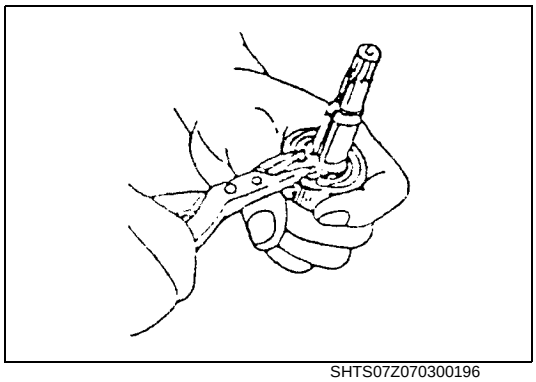
5. REMOVE THE FLOW CONTROL VALVE ASSEMBLY.

(1) Remove the plug, flow control valve assembly and spring.

NOTICE

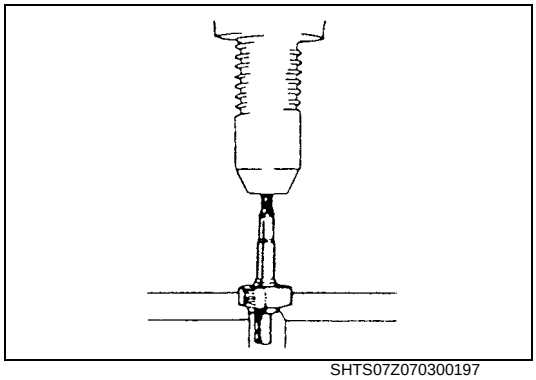
Be careful not to drop, scratch or nick the flow control valve assembly.

REPLACEMENT

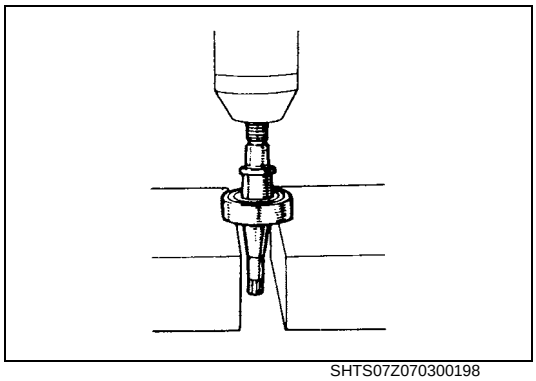

SHTS07Z070300196

1. REPLACE THE BALL BEARING, IF NECESSARY.

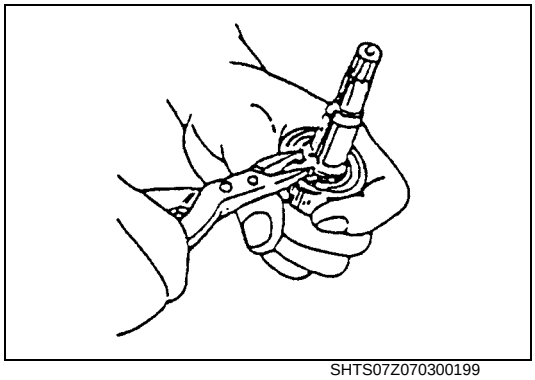
(1) Use a pair of snap ring pliers to remove the retainer ring.


SHTS07Z070300197

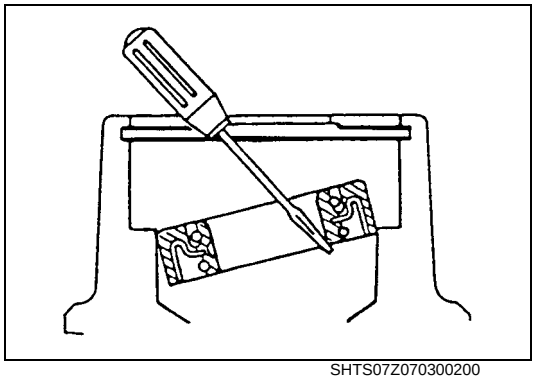
(2) Use a press, press out the ball bearing.


SHTS07Z070300198

(3) Use a press to press in the ball bearing.


SHTS07Z070300199

(4) Use a pair of snap ring pliers to install the retainer ring.

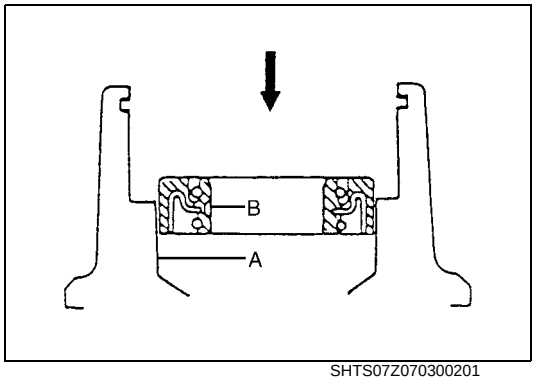

SHTS07Z070300200

2. REPLACE THE OIL SEAL, IF NECESSARY.

(1) Use a screw driver to remove the oil seal.

NOTICE

Do not scrape or damage the inside of pump body.



SHTS07Z070300201

(2) Insert the oil seal as shown in the figure.

NOTICE

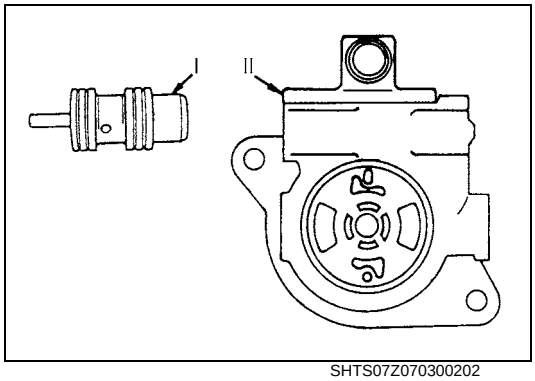
To prevent oil leakage from oil seal due to lip wear, apply lithium base grease to A and B.

(3) Using a press, press in the oil seal into the pump body.

IMPORTANT POINTS - ASSEMBLY

NOTICE

- **Before assembling, clean all the parts and lubricate them with fluid.**
- **When assembling the power steering pump, be sure to use new O-rings.**



SHTS07Z070300202

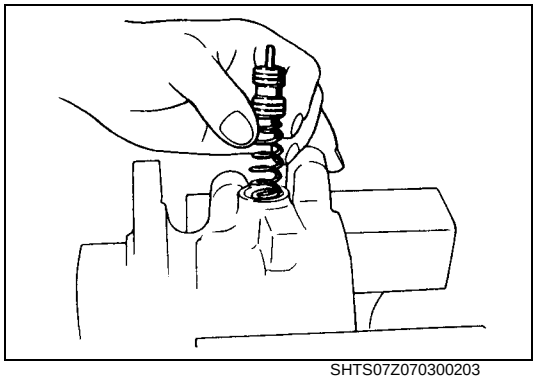
1. INSTALL THE FLOW CONTROL VALVE ASSEMBLY.

(1) Apply fluid to the valve and check to see that it falls smoothly into the valve hole by its own weight.
If a problem is detected, replace the flow control valve assembly.

NOTICE

There are three different valve diameters, therefore be careful that the mark on both valve and the pump body are always matched.
I - Valve: Letter II - Body: Letter

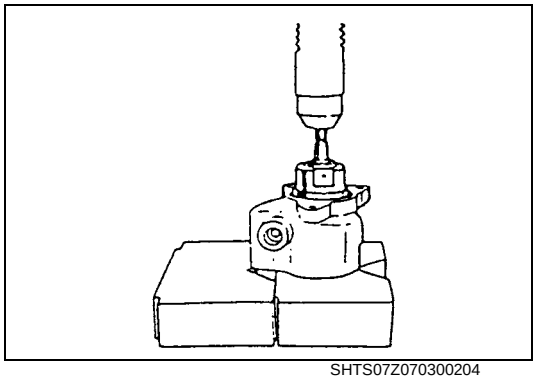
Match mark	I	A	B	C
	II	A	B	C


SHTS07Z070300203

(2) Install the spring and the flow control valve assembly, and tighten the plug.

NOTICE

Apply lithium base grease to an O-ring.


SHTS07Z070300204

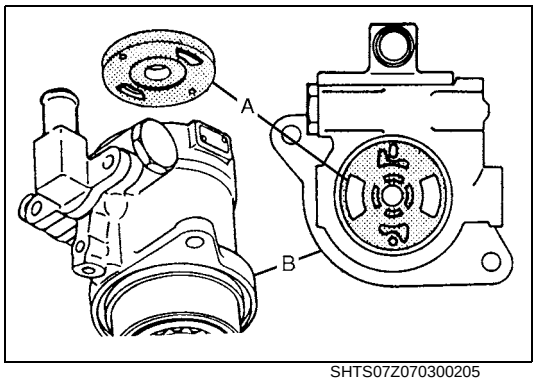
2. INSTALL THE PUMP SHAFT.

(1) Using a press, press in the pump shaft with bearing into the pump body.

(2) Install the retainer ring.

NOTICE

When installing the retainer ring, face the chamfer side toward ball bearing.



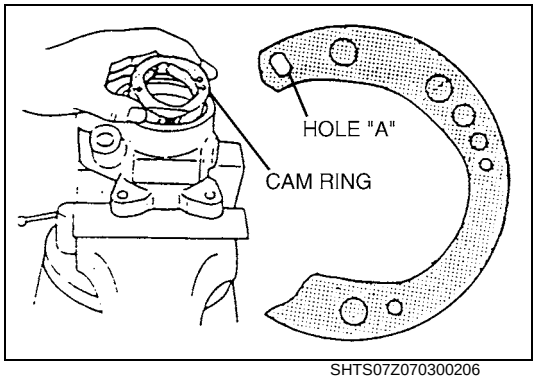
SHTS07Z070300205

3. INSTALL THE FRONT PLATE.

(1) Insert the front plate into the pump body as shown in figure.

A: Front plate

B: Pump body



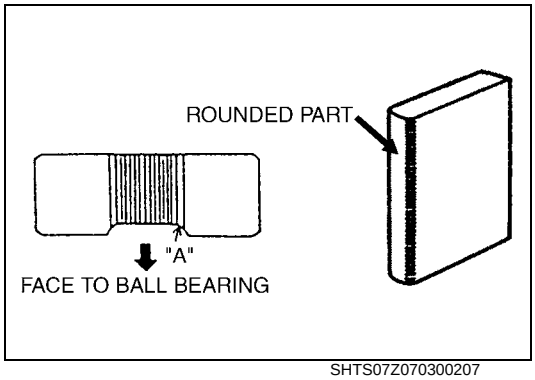
SHTS07Z070300206

4. INSTALL THE CAM RING.

(1) Insert the cam ring with hole "A" aligned with dowel.

NOTICE

At this time, make sure that the hole "A" in the side surface is positioned toward the ball bearing.

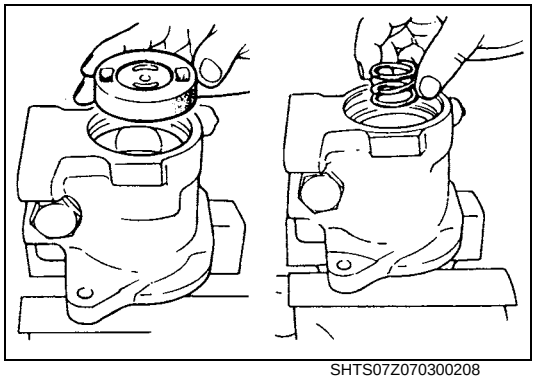


SHTS07Z070300207

5. INSTALL THE ROTOR AND VANE.

(1) Insert the rotor with the cut spline "A" side facing toward the ball bearing.

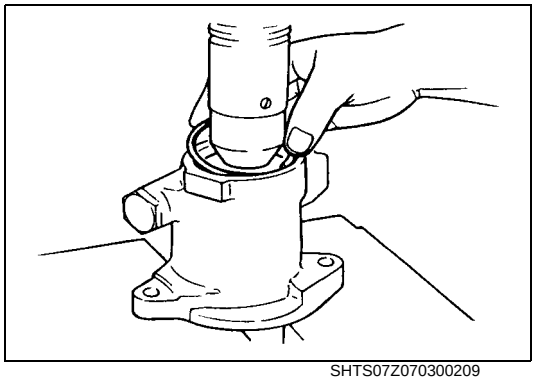
(2) Insert the vanes with the rounded part facing outward.


SHTS07Z070300208

6. INSTALL THE REAR PLATE, SPRING, O-RING AND PUMP COVER.

(1) Insert the rear plate on the cam ring and put the spring on the rear plate.

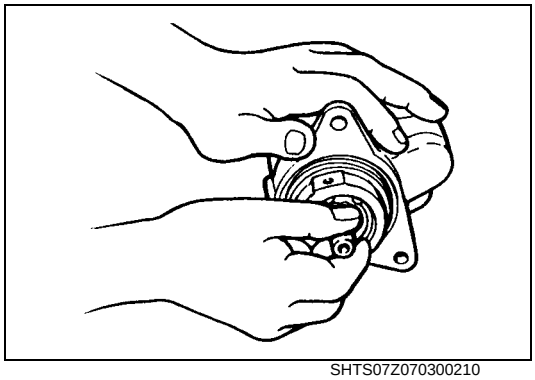
(2) Insert the O-ring into the groove of the pump body.


SHTS07Z070300209

(3) Using a press, press in the pump cover and then install the retainer ring securely.

NOTICE

- **Be careful to see that the O-ring is not pinched by the rear cover.**
- **With the pump cover pressed in completely fit the retainer ring to pump body.**

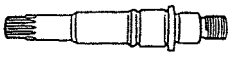
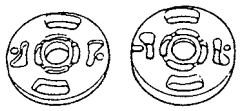
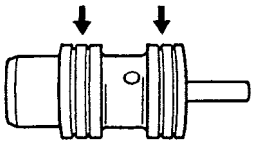
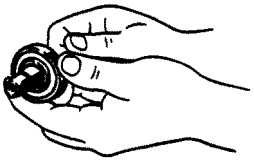
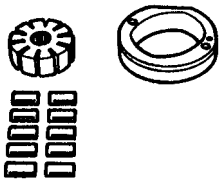
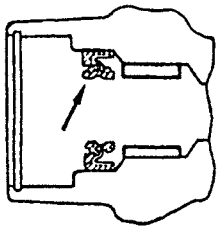
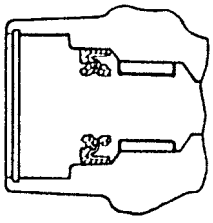

SHTS07Z070300210

7. INSPECT PUMP SHAFT ROTATION CONDITION.

(1) Check to see that the pump shaft rotates smoothly without abnormal noise.

INSPECTION AND REPAIR

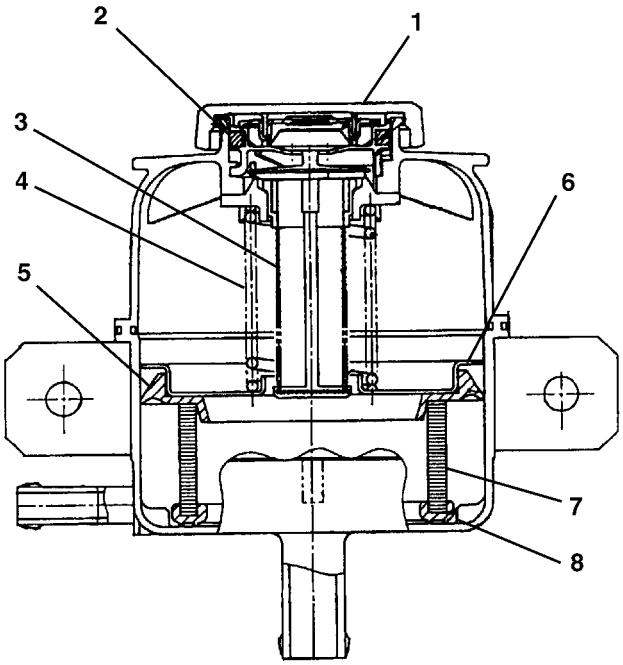
EN07Z0703H300007

Inspection item	Standard	Limit	Remedy	Inspection procedure
Shaft: **Damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Side plate: **Abrasion and flaw**	—	—	**Replace,** **if necessary.**	**Visual check** 
Flow control valve assembly: **Wear and damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Ball bearing: **Scratched and damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Cam ring inner surface: **Rotor surface:** **Vane surface:** **Wear, scratches and scoring**	—	—	**Replace,** **if necessary.**	**Visual check** 
Oil seal: **Wear and damage**	—	—	**Replace,** **if necessary.**	**Visual check** 
Bushing: **Scratched and damage**	—	—	**Replace the** **pump body,** **if necessary.**	**Visual check** 

OIL RESERVOIR (MODELS: FC, FD, GD, FT, GT)

DESCRIPTION

EN07Z0703C100013

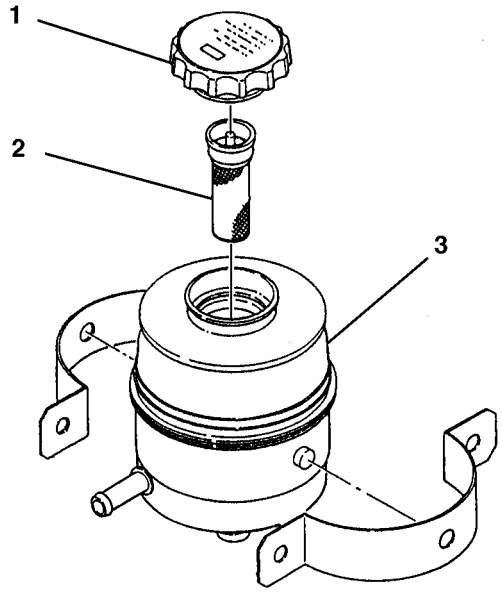


SHTS07Z070300218

1	Oil reservoir cap	5	Filter cover seal
2	Oil seal	6	Filter cover
3	Oil strainer	7	Oil filter
4	Spring	8	Filter gasket

COMPONENT LOCATOR

EN07Z0703D100007



SHTS07Z070300219

1	Oil reservoir cap	3	Oil reservoir
2	Oil strainer		

OVERHAUL

EN07Z0703H200008

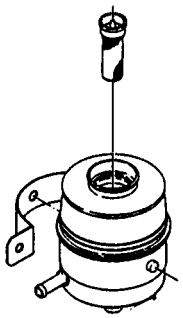
IMPORTANT POINT - ASSEMBLY

NOTICE

- **Use only compressed air to clean the oil filter.**
- **The oil filter is made of synthetic resin, so never wash it with hot water, solvent or detergent.**
- **Before assembling, clean all the parts.**

INSPECTION AND REPAIR

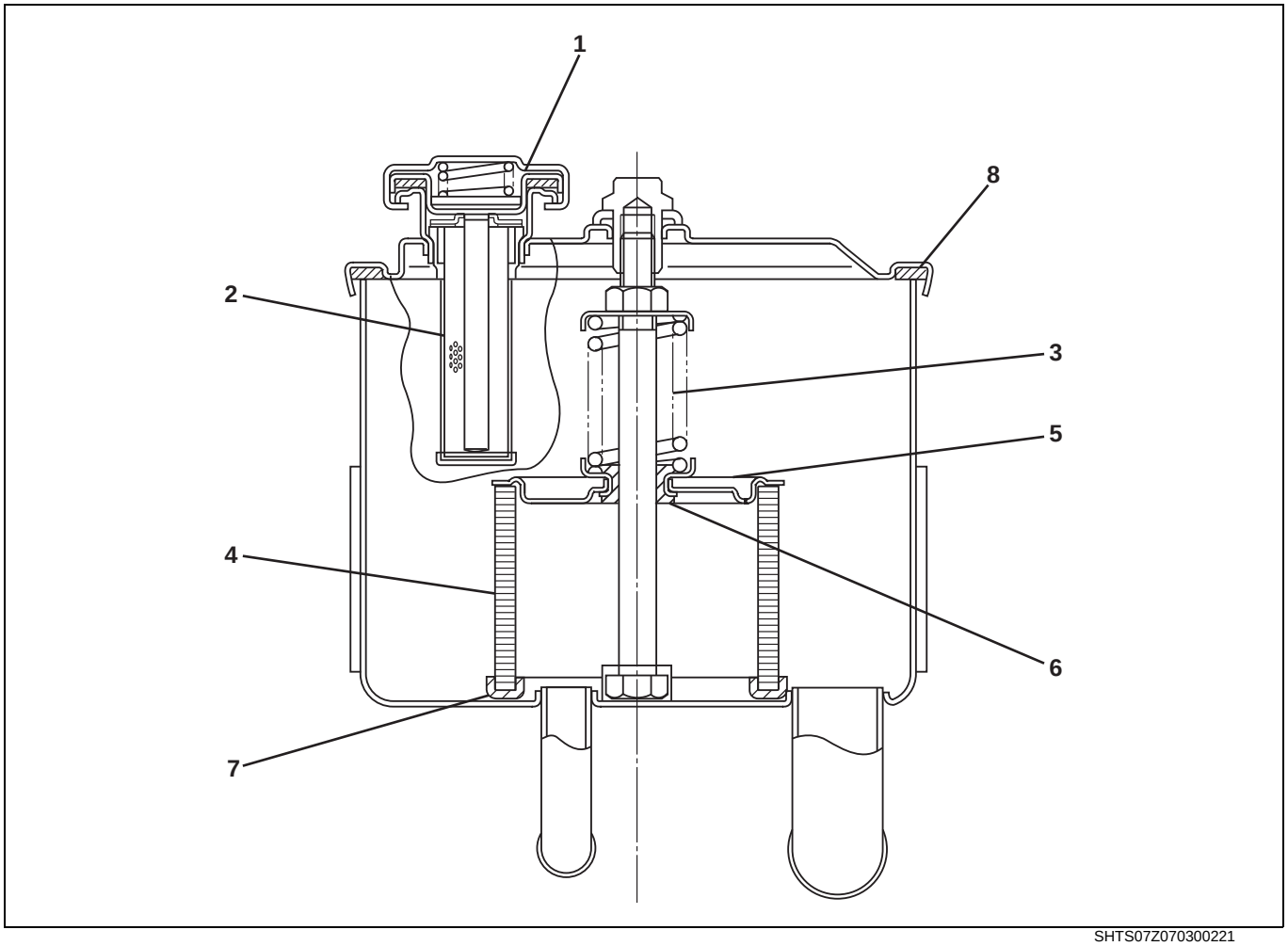
EN07Z0703H300008

Inspection item	Standard	Limit	Remedy	Inspection procedure
Oil strainer: Clogged and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Oil reservoir: Damage	**—**	**—**	**Replace, if necessary.**	

OIL RESERVOIR (MODELS: FG, GH, FL, FM, SG)

DESCRIPTION

EN07Z0703C100014

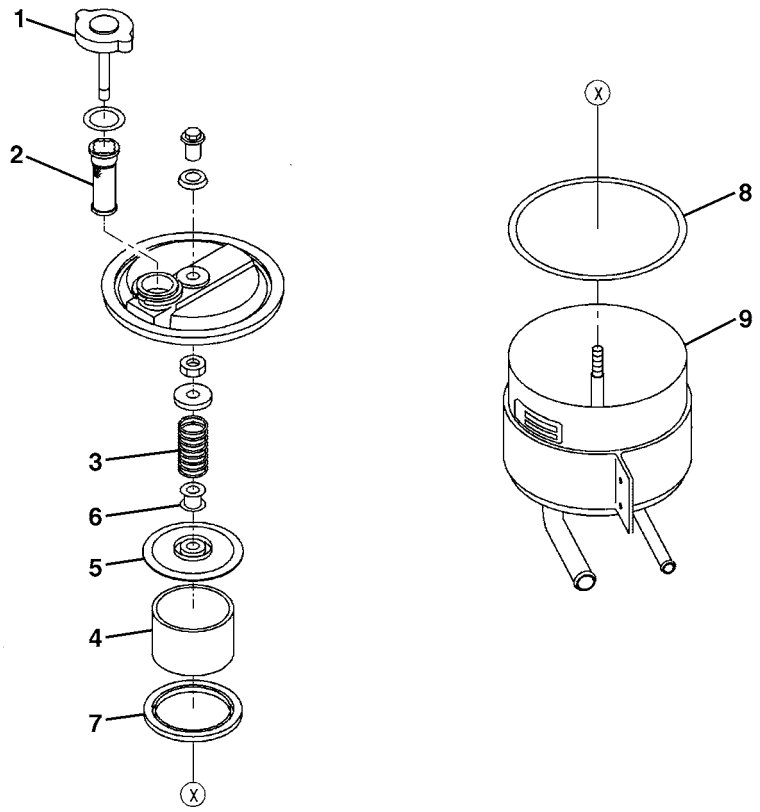


SHTS07Z070300221

1	Oil reservoir cap	5	Filter cover
2	Oil strainer	6	Filter cover seal
3	Spring	7	Filter seal
4	Oil filter	8	Oil filter gasket

COMPONENT LOCATOR

EN07Z0703D100008



SHTS07Z070300222

1	Oil reservoir cap	6	Filter cover seal
2	Oil strainer	7	Filter seal
3	Spring	8	Oil filter gasket
4	Oil filter	9	Oil reservoir
5	Filter cover		

OVERHAUL

EN07Z0703H200009

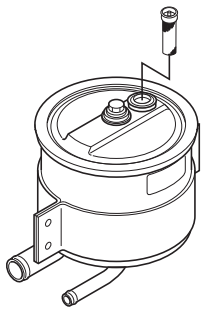
IMPORTANT POINT - ASSEMBLY

NOTICE

- **Use only compressed air to clean the oil filter.**
- **The oil filter is made of synthetic resin, so never wash it with hot water, solvent or detergent.**
- **Before assembling, clean all the parts.**

INSPECTION AND REPAIR

EN07Z0703H300009

Inspection item	Standard	Limit	Remedy	Inspection procedure
Oil strainer: Clogged and damage	**—**	**—**	**Clean or replace, if necessary.**	**Visual check** 
Oil reservoir: Damage	**—**	**—**	**Replace, if necessary.**	

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 2/3 ’08-3
S1-YFCE18G 2/3 ’08-5
S1-YFCE18H 2/3 ’08-7
S1-YFCE18I 2/3 ’09-2
S1-YFCE18J 2/3 ’10-2
S1-YFCE18K 2/3 ’10-4