FOREWORD

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

Applicable for FC4J series, equipped with J05C-TI engine

When making any repairs on your vehicle, be careful not to be injured through improper procedures.
As for maintenance items, refer to the Operation 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.
For matters regarding the engine, refer to manual No. S5-YJ05E07.

Hino Motors, Ltd.

CHAPTER REFERENCES REGARDING THIS WORKSHOP MANUAL

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

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ABS (ANTI-LOCK BRAKE SYSTEM)		BR03-001
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EXHAUST BRAKE		BR05-001
PARKING BRAKE		BR07-001
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HINO

WORKSHOP MANUAL

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

TRANSMISSION / TRANSFER CONTROL

PROPELLER SHAFT EQUIPMENT

PROPELLER SHAFT

DIFFERENTIAL EQUIPMENT

DIFFERENTIAL CARRIER

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SERVICE BRAKE

ABS (ANTI-LOCK BRAKE SYSTEM)

ES START (EASY & SMOOTH START) SYSTEM

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GENERAL INTRODUCTION

GENERAL PRECAUTIONS

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Some recommended and standard maintenance services for your vehicle are included in this section. When performing maintenance on your vehicle be careful not to get injured by improper work. Improper or incomplete work can cause a malfunction of the vehicle which may result in personal injury and/or property damage. If you have any question about performing maintenance, please consult your Hino dealer.

CAUTION
When working on your vehicle, observe the following general precautions to prevent personal injury and/or property damage in addition to the particular NOTICES or CAUTIONS in each chapter.
• Always wear safety glasses or goggles to protect your eyes.
• Remove rings, watches, ties, loose hanging jewelry and loose clothing before starting work on the vehicle.
• Bind long hair securely behind the head.
• When working on the vehicle, apply the parking brake firmly, place the gear shift lever in "Neutral" or "N" and block the wheels.
• Always turn off the starter switch to stop the engine, unless the operation requires the engine running. Removing the key from the switch is recommended.
• To avoid serious burns, keep yourself away from hot metal parts such as the engine, exhaust manifold, radiator, muffler, exhaust pipe and tail pipe.
• Do not smoke while working on the vehicle since fuel, and gas from battery are flammable.
• Take utmost care when working on the battery. It contains corrosive sulfuric acid.
• Large electric current flows through the battery cable and starter cable. Be careful not to cause a short which can result in personal injury and/or property damage.
• Read carefully and observe the instructions specified on the jack before using it.
• Use safety stands to support the vehicle whenever you need to work under it. It is dangerous to work under a vehicle supported only by a jack.
• When the cab is raised, always lock the cab stopper stay lock pin with the safety stopper. When the cab is lowered, always insert the stopper pin firmly to lock the cab lock lever.
• If it is necessary to run the engine after the cab is raised (tilted), make sure that the parking brake is firmly applied, the wheels are blocked, and the gear shift lever is positioned in "Neutral" before staring the engine.
• Run the engine only in a well-ventilated area to avoid inhalation of carbon monoxide.
• Keep yourself, your clothing and your tools away from moving parts such as the cooling fan and V-belts when the engine is running.
• Be careful not to damage lines and hoses by stepping or holding your feet on them.
• Be careful not to leave any tool in the engine compartment. The tool may be hit by moving parts, which can cause personal injury.

TOWING

- When being towed, always place the gear shift lever in "Neutral" and release the parking brake completely. In order to protect the bumper, fit a protection bar against the lower edge of the bumper and put a wood block under the frame near the No. 1 cross member when attaching the towing chain. Never lift or tow the vehicle if the chain is in direct contact with the bumper.

1. Towing procedures

(1) Make sure that the propeller shaft of the vehicle to be towed is removed. When the differential gear or rear axle shaft is defective, remove both right and left rear axle shafts, then cover the hub opening to prevent loss of axle lubricant and entry of dirt or foreign matter.
(2) Use a heavy duty cable or rope when towing the vehicle. Fasten the cable securely to the towing hook on the frame.
(3) The angle of pulling direction of the cable fastened to the towing hook must not exceed 15 in horizontal and vertical directions from the straight ahead, level direction. Avoid using the hook in a way that subjects it to jerk, as in towing a vehicle trapped in a gutter.
(4) Keep the gear shift lever in Neutral.
(5) Make sure that the starter switch is kept in the "ON" position, if the engine is not running.
(6) Make sure that the engine of the towed vehicle is kept running. If the engine is off, no compressed air/ no vacuum will be available for the brake. This is dangerous, as the brake system does not function if the engine is not running.
In addition, the power steering system will not function. The steering wheel, therefore, will become unusually hard to turn, making it impossible to control the vehicle.
(7) Note that the engine brake and exhaust brake cannot be applied, if the propeller shaft is removed.
(8) Make a slow start to minimize shock. Towing speed should be less than 30 km/h {18 mile/h}.

2. If the engine of the towed vehicle is defective, make sure that the vehicle is towed only by a tow truck designed for that purpose.

(1) Front end towing (with front wheels raised off the ground)
When towing from the front end with the front wheels raised off the ground, remove the rear axle shafts to protect the transmission and differential gears from being damaged. The hub openings should be covered to prevent the loss of axle lubricant or the entry of dirt or foreign matter. The above-mentioned precautions should be observed for vehicles equipped with either manual or automatic transmission, and for even short distance towing. After being towed, check and refill the rear axle housing with lubricant if necessary.
(2) Rear end towing
When being towed with the rear wheels raised off the ground, fasten and secure the steering wheel in a straight-ahead position.

HOW TO USE THIS WORKSHOP MANUAL

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This workshop manual is designed as a guide for servicing the vehicle. An INDEX is provided on the first page of each chapter.

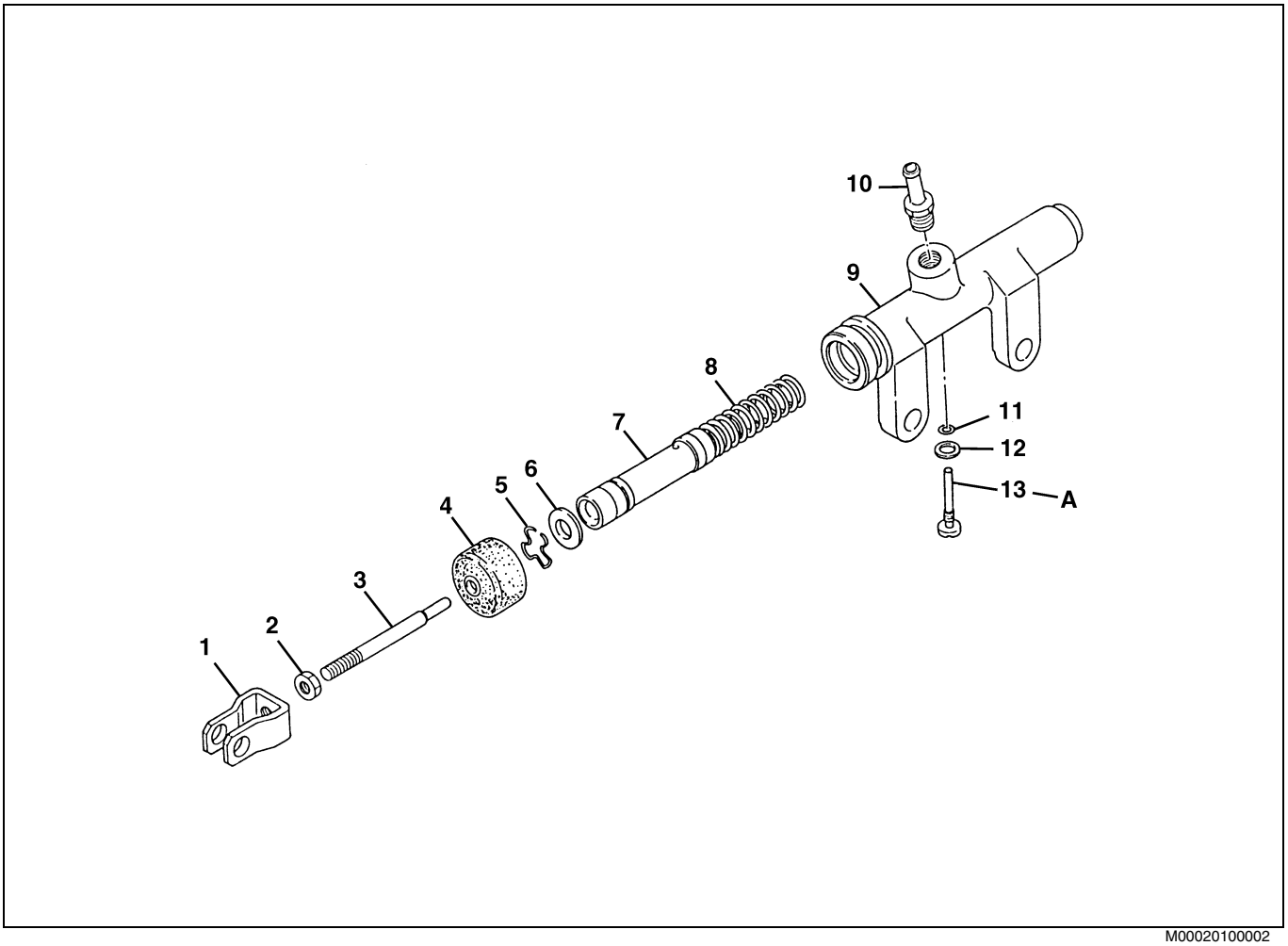
TROUBLESHOOTING is dealt with in each chapter.
When beginning operations, refer to the TROUBLESHOOTING section for a guide to appropriate diagnosis.

SPECIAL TOOL is dealt with in each chapter.
When ordering a special tool, confirm the part number with the applicable parts catalog.

- **RERAIR PROCEDURES**
  Repair procedures when self-explanatory, such as simple installation and removal of parts, have been omitted. Illustrations, such as the one below, have been provided to make such simple procedures clear. Only essential procedures requiring specific directions have been dealt with explicitly.

MAIN CYLINDER

EXAMPLE:



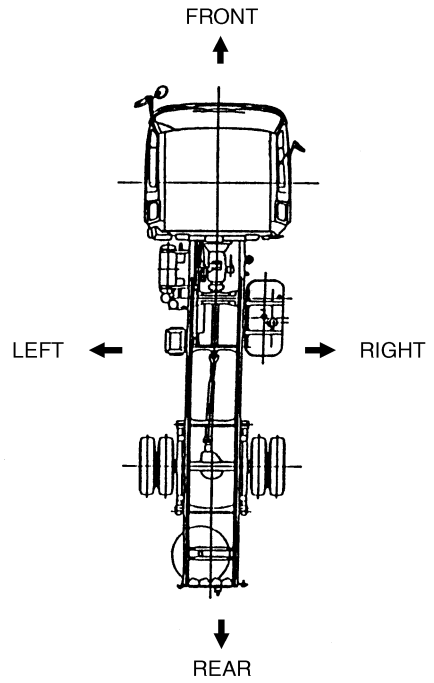
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1	**Clevis**	**8**	**Return spring**
2	**Lock nut**	**9**	**Body**
3	**Push rod**	**10**	**Hose joint**
4	**Boot**	**11**	**O-ring**
5	**Retainer ring**	**12**	**Soft washer**
6	**Thrust washer**	**13**	**Bolt**
7	**Piston**		

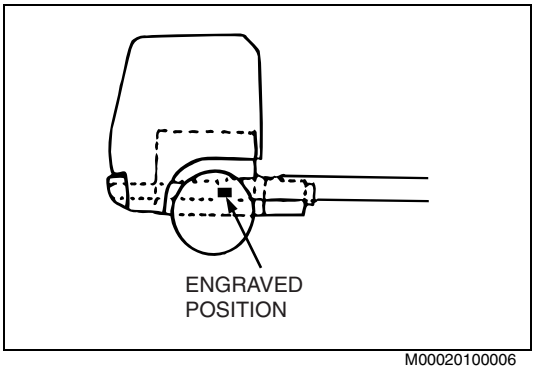
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

1	**2.5-4.4 {25-45, 1.8-3.2}**		

In some cases, illustrations may be of parts which differ in some nonessential way from the parts found on your particular vehicle. In such cases, the principle or procedure being illustrated applies regardless of such nonessential differences.



- **DEFINITION OF TERMS**
  Definition of vehicle right and left.
  Right and left refers to the left and right sides of the vehicle as seen while looking down the center line from the rear towards the front.



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IDENTIFICATION INFORMATION

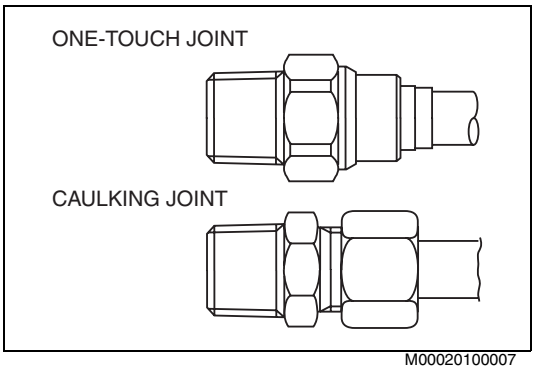
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- **IDENTIFICATION INFORMATION**
  These numbers are used for identification purposes when you have a vehicle registered or inspected. Please quote these numbers when ordering spare parts or reporting technical matter to receive prompt service attention.
- CHASSIS SERIAL NUMBER
  Chassis serial number is engraved on the left side frame near the front wheel.

NYLON TUBE REPLACEMENT METHOD

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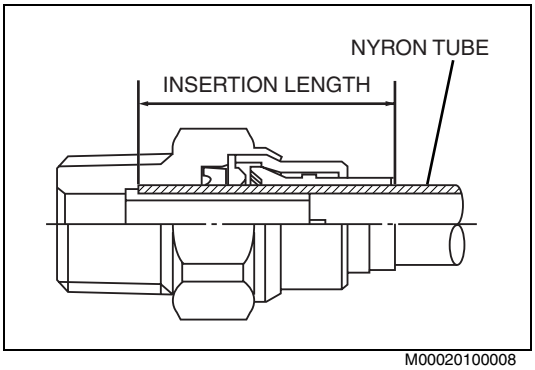
NYLON TUBE REPLACEMENT METHOD



M00020100007

- In this vehicle, nylon tubes are used for all the air tubes except those on the charge line and the rear axle, the tubing for the wheel power signal, a portion of the accessory system tubing, and for the unloader tubing, and it is also used in joints, depending on the connection conditions of the two types of joints; one-touch joints and caulking joints.

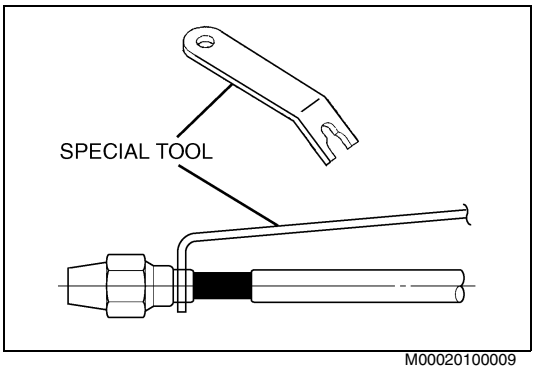
NOTICE:
Since the function and quality of nylon tubes and joints are guaranteed as tube and joint sets, the use of parts other than Hino Genuine Parts must be avoided.



M00020100008

1. ONE-TOUCH JOINT NYLON TUBE INSERTION LENGTH

DIAMETER (Outside diameter x inside diameter)	INSERTION LENGTH mm {in.}
6 x 4	20 {0.79}
10 x 7.5	20 {0.79}
12 x 9	21 {0.83}

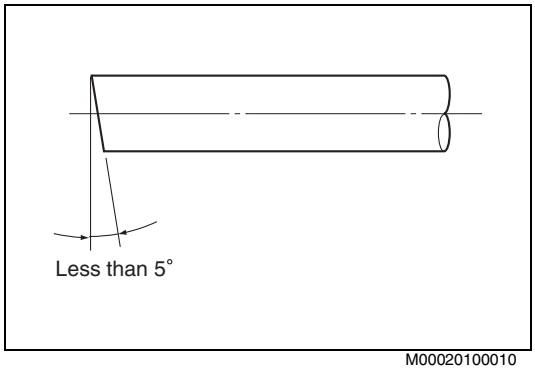


M00020100009

2. REMOVAL OF A ONE-TOUCH JOINT

(1) Make sure there is no dirt or grease stuck to the connector end. If the end is dirty, clean it thoroughly by air blowing or other means.

(2) Using the special tool for removing the nylon tube to push the connector end, pull off the nylon tube with your hand in one stroke, without stopping partway, pulling the tube in the connector axial direction.
SST: Puller (09421-1490)



M00020100010

INSTALLATION OF A ONE-TOUCH JOINT AND CAULKING JOINT

- Make sure the joint interior is free of dirt grease. If the interior is dirty, clean it thoroughly by air blowing or other means.
- Cut off the tube end where the tube surface is scarred by the joint pinch marks, and make sure that the part of the tube inserted into the joint has no surface damage. If the tube is damaged, cut off the damaged part (provided that the tube length is more than sufficient).

NOTICE:
Use the special nylon tube cutter when cutting the nylon tube, and cut the tube so that the angle of the cut end to the axial center is 85-95°.

1. INSTALLATION OF A ONE-TOUCH JOINT

- Before inserting the tube, mark the insertion length on the tube with a white-out pen or similar implement, in accordance with the dimensions, "ONE-TOUCH JOINT NYLON TUBE INSERTION LENGTH." Then insert the tube firmly in place as far as the marked point.

2. INSTALLATION OF A CAULKING JOINT

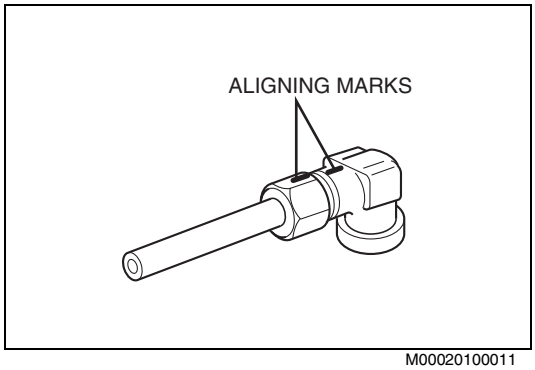
- Press in the tube so that it does not move (will not come out), and tighten the sleeve nut with the tightening tool to the torque shown in the following table.

3. NYLON TUBE NUT TIGHTENING TORQUE

Unit: ·N·m {kgf·cm, lbf·ft}

NUT DIAMETERS	TIGHTENING TORQUE
M6 x 1	20-25 {200-260, 15-18}
M10 x 1.25	35-44 {350-450, 26-32}
M12 x 1.5	50-58 {500-600, 37-43}
M15 x 1.5	54-58 {550-600, 40-43}

NOTICE:
Nuts must be tightened to 5°- 35°C.



M00020100011

4. ASSEMBLING THE CAULKING JOINT (AFTER THE TUBE HAS FIRST BEEN REMOVED FROM THE JOINT AND THEN RE-INSTALLED IN THE SAME PLACE)

(1) Make aligning marks on the connector and union to mark their positions before loosening the nut.
(2) When re-assembling the joint, tighten the nut until the pre-disassembly position (position of aligning marks) is reached, and then tighten the nut 60° more.
(3) Always check air leakage after assembling the joint. If air is leaking from the joint, continue tightening the sleeve nut until the leak stops.
(4) If the air leak does not stop, replace the tube, sleeve, and insert with new parts. If the air leak still continues, replace the nut and connector / union.

NOTICE:
- **During repair or other work, make sure the temperature limit of the nylon tube is within -40-90°C, especially during paint drying work.**
- **During boring, welding, sanding, and other work, protect nylon tubes from tools, cuts, heat sources, and sparks, or remove the nylon tubes beforehand.**
- **Do not attach a welding equipment clamp near a nylon tube.**
- **Do not pour battery fluid or other acidic fluid on a nylon tube.**

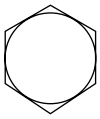
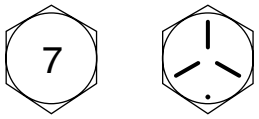
- **Do not bend a nylon tube beyond the nylon tube bending radius R values shown in the following table. Also, do not use the remaining portion of a tube that has broken due to overbending.**

OUTSIDE DIAMETER OF TUBE	MINIMUM BENDING RADIUS DURING HANDLING: R mm {in.}
6	30 {1.18}
10	65 {2.56}
12	70 {2.76}

SPECIFIED TORQUE FOR STANDARD BOLTS AND NUTS

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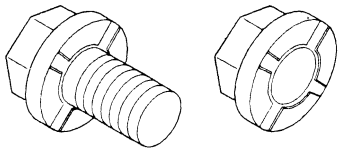
Unit: N·m {kgf·cm, lbf·ft.}

Class	4T	7T	9T
Representation Diameter	 No Mark		
M6	4.4-6.6 {45-67, 3.3-4.8}	7.2-10.8 {74-110, 5.4-7.9}	9.5-13.5 {94-140, 6.8-10.1}
M8	11.5-16.5 {114-172, 8.3-12.4}	18.0-26.0 {179-269, 13.0-19.4}	23.5-34.5 {237-355, 17.2-25.6}
M10	22.0-32.0 {221-331, 16.0-23.9}	34.5-51.5 {351-527, 25.4-38.1}	46.0-68.0 {466-698, 33.7-50.4}
M12	38.5-57.5 {392-588, 28.4-42.5}	61.0-91.0 {621-931, 44.9-67.3}	80.0-120.0 {816-1,224, 59.0-88.5}
M14	62.0-92.0 {629-943, 45.5-68.1}	96.0-144.0 {976-1,464, 70.6-105.8}	128.0-192.0 {1,304-1,956, 94.3-141.4}
M16	96.0-144.0 {976-1,464, 70.6-105.8}	152.0-228.0 {1,552-2,328, 112.3-168.3}	200.0-300.0 {2,040-3,060, 147.5-221.2}
M18	132.0-198.0 {1,344-2,016, 97.2-145.7}	208.0-312.0 {2,120-3,180, 153.3-229.9}	276.0-414.0 {2,816-4,224, 203.6-305.4}
M20	188.0-282.0 {1,920-2,880, 138.8-208.2}	296.0-444.0 {3,024-4,536, 218.7-327.9}	392.0-588.0 {4,000-6,000, 289.3-433.8}
M22	256.0-384.0 {2,616-3,924, 189.2-283.7}	405.0-605.0 {4,120-6,180, 297.9-446.8}	540.0-800.0 {5,470-8,210, 395.5-593.6}
M24	324.0-486.0 {3,304-4,956, 238.9-358.3}	515.0-765.0 {5,220-7,840, 377.5-566.8}	680.0-1,010.0 {6,900-10,340, 499.0-747.6}

SPECIFIED TORQUE FOR FLANGE BOLTS AND NUTS

M00020101BEC1006

Unit: N·m {kgf·cm, lbf·ft.}

Class / Diameter	7T	9T	Shape
M10	41.5-61.5 {421-631, 30.5-45.6}	55.0-82.0 {560-840, 40.5-60.7}	
M12	73.0-109.0 {744-1,116, 53.8-80.7}	96.0-114.0 {979-1,469, 70.8-106.2}	

CLUTCH MAIN UNIT (CS350)

CL02-001

CLUTCH ASSEMBLY (CS350) CL02-2
DATA AND SPECIFICATIONS CL02-2
DESCRIPTION CL02-3
TROUBLESHOOTING CL02-4
SPECIAL TOOL CL02-5
COMPONENT LOCATOR.....CL02-6
OVERHAUL CL02-7
INSPECTION AND REPAIR CL02-13

CLUTCH ASSEMBLY (CS350)

DATA AND SPECIFICATIONS

M02020103BEI2002

CLUTCH FACING

Unit: mm {in.}

Material	Molded non-asbestos	Sintered metal (Ceramic metal)
Type	Dry single plate with damper spring	
Outside diameter	350 {13.780}	
Inside diameter	220 {8.661}	
Thickness	4.5 {0.1772}	4.41 {0.1736}

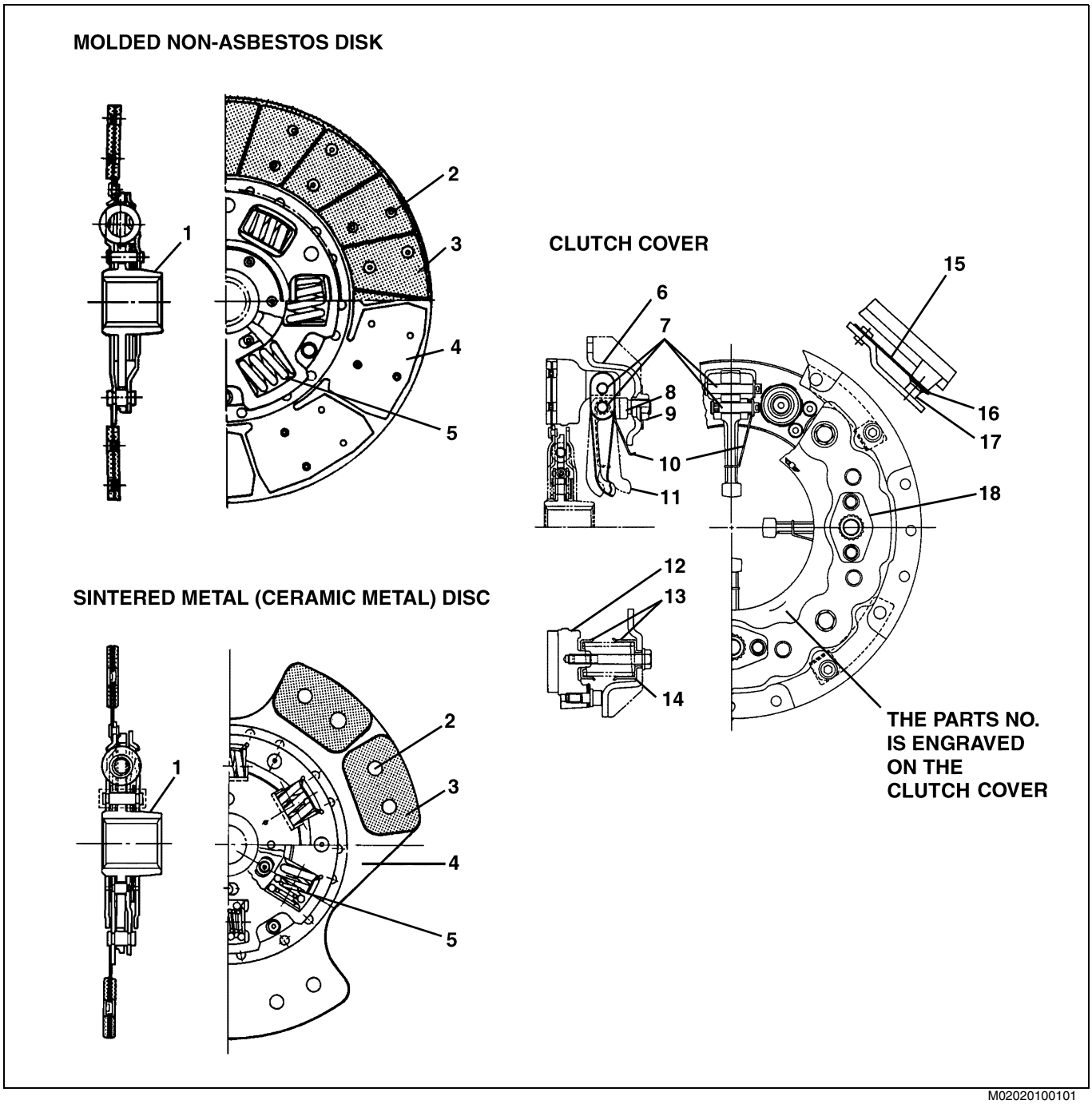
COMPRESSION SPRING

Unit: mm {in.}

Clutch cover parts No.	2730
Free length	83.4 {3.283}
Coil outside diameter	30.5 {1.201}
Diameter of wire	5.5 {0.217}
Quantity	12
Setting load	1,243.5 N {126.8 kgf, 279.5 lbf}
Setting length	54.8 {2.157}

DESCRIPTION

M02020103BEC1002



M02020100101

1	Clutch disc hub	10	Torsion spring
2	Rivet	11	Release lever
3	Clutch facing	12	Pressure plate
4	Clutch plate	13	Spring seat
5	Damper spring	14	Compression spring
6	Clutch cover	15	Strap plate
7	Release lever pin	16	Friction washer
8	Release lever support	17	Strap plate bolt
9	Release lever support nut	18	Lock plate

TROUBLESHOOTING

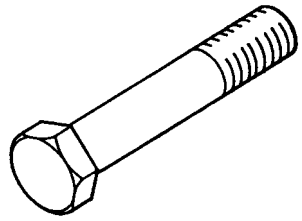
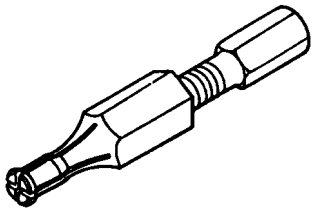
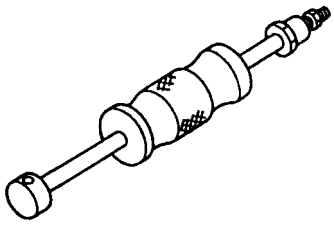
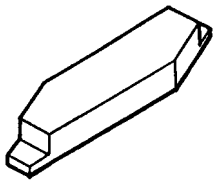
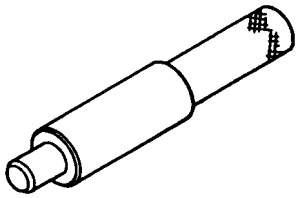
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Symptom	Possible cause	Remedy/Prevention
Clutch dragging	Clutch disc distorted or warped.	Replace clutch disc.
	Release lever incorrectly adjusted.	Adjust release lever.
	Transmission input shaft worn.	Replace input shaft and check clutch hub for excessive wear. If worn, replace disc. Check flywheel housing alignment.
Clutch slipping	Release lever and release bearing clearance incorrectly adjusted.	Adjust clearance.
	Clutch disc facing gummed with oil or grease.	Replace facing or disc assembly.
	Release bearing worn.	Replace bearing.
	Clutch pedal free-play incorrectly adjusted.	Adjust free-play.
	Compression spring weak.	Replace compression spring.
	Clutch facing worn.	Replace facing or disc assembly.
Vehicle vibrates when starting.	Improper engine idling.	Adjust idling.
	Clutch control incorrectly adjusted.	Adjust clutch control.
	Clutch disc facing gummed with oil or grease.	Replace facing or disc assembly.
	Glazed flywheel friction surface.	Unglazed flywheel surface with coarse emery cloth, stroking parallel to machining lines.
	Clutch disc distorted or warped.	Replace disc.
	Improper clutch cover tightening.	Tighten bolts.
	Flywheel housing misalignment.	Replace flywheel housing.
	Release lever incorrectly adjusted.	Adjust release lever.
Noisy clutch	Release bearing worn or dried.	Replace release bearing.
	Pilot bearing worn.	Replace pilot bearing.
	Clutch disc distorted or warped.	Replace clutch disc.
	Flywheel housing misalignment.	Replace flywheel housing.
	Transmission input shaft or clutch disc spline worn.	Clean and lubricate or replace.
	Release lever incorrectly adjusted.	Adjust release lever.
	Insufficient lubrication of pedal and its accessories.	Lubricate.
	Insufficient lubrication of release bearing hub.	Lubricate.
	Transmission input shaft retainer rusted or soiled.	Clean or replace if rusted.
	Clutch pedal free-play incorrectly adjusted.	Adjust free-play.
Clutch pedal can not be depressed.	Clutch control incorrectly adjusted.	Adjust clutch control.
	Insufficient lubricant release bearing hub.	Lubricate.
Change in clutch pedal give.	Air trapped in clutch fluid.	Bleed air.

SPECIAL TOOL

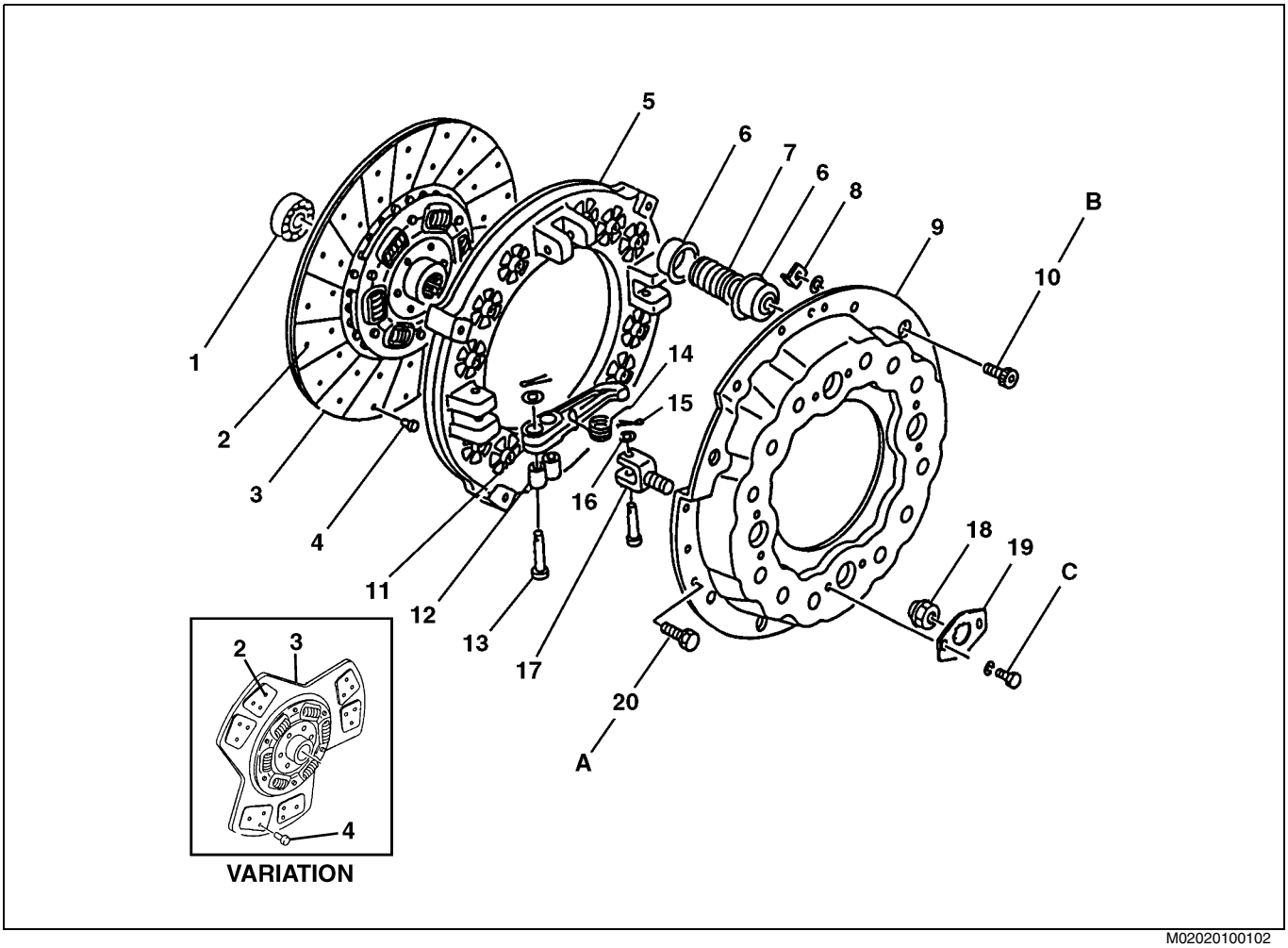
M02020103BEK1001

Prior to starting a clutch main unit overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	9010-10700	CLUTCH PRESSURE PLATE FIXING BOLT	
	9260-10240	PLAIN WASHER	
	09650-1970	CLUTCH PILOT BEARING PULLER	
	09420-1442	SLIDING HAMMER	
	09661-1030	CLUTCH RELEASE LEVER HEIGHT GAUGE	
	09662-1200	CLUTCH ALIGNING ARBOR	

COMPONENT LOCATOR

M02020103BED1002



M02020100102

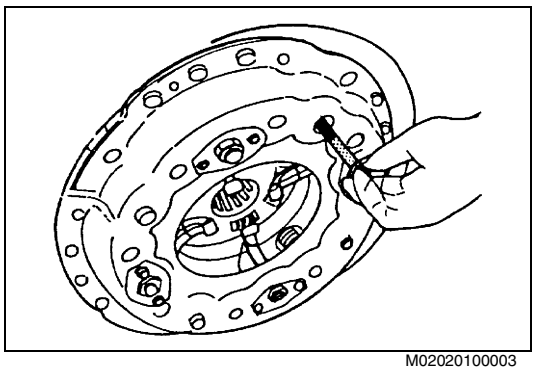
1	Pilot bearing	11	Release lever
2	Clutch facing	12	Bushing
3	Disc assembly	13	Release lever pin
4	Rivet	14	Torsion spring
5	Pressure plate	15	Cotter pin
6	Spring seat	16	Plain washer
7	Compression spring	17	Release lever support
8	Friction washer	18	Release lever support nut
9	Clutch cover	19	Lock plate
10	Strap plate bolt	20	Fitting bolt

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

A	37.5-48.5 {380-500, 28-36}	C	11.8-17.7 {120-180, 9-13}
B	39.2-49.0 {400-500, 29-36}		

OVERHAUL

M02020103BEH2001



M02020100003

IMPORTANT POINT - DISMOUNTING

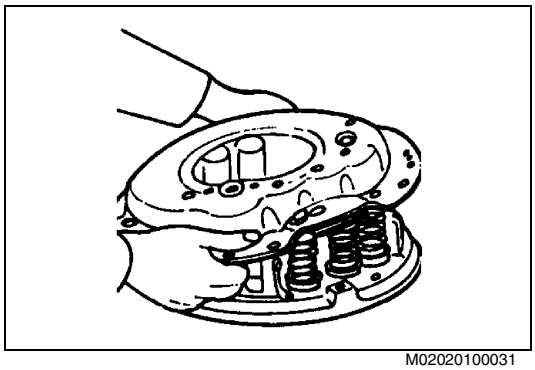
1. REMOVE THE CLUTCH COVER AND DISC.

(1) Install the four pressure plate fixing bolts and plain washers through the clutch cover into the tapped holes in the pressure plate.
SST:
Pressure Plate Fixing Bolt (9010-10700)
Plain Washer (9260-10240)

(2) Tighten the bolts in diagonal direction alternately and evenly to the compress the compression springs and release pressure plate tension.

(3) Loosen the fitting bolts.

CAUTION:
When removing the clutch cover and clutch disc, be careful not to drop them on your foot.



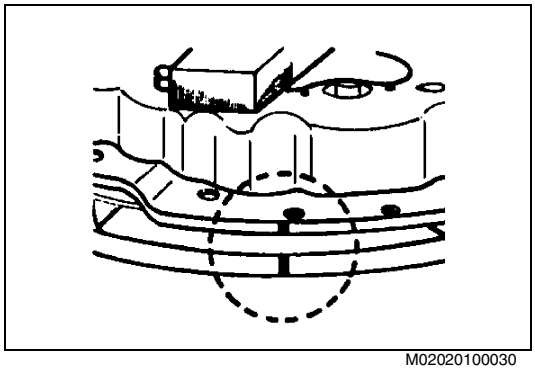
M02020100031

IMPORTANT POINTS - DISASSEMBLY

1. DISASSEMBLE THE CLUTCH COVER.

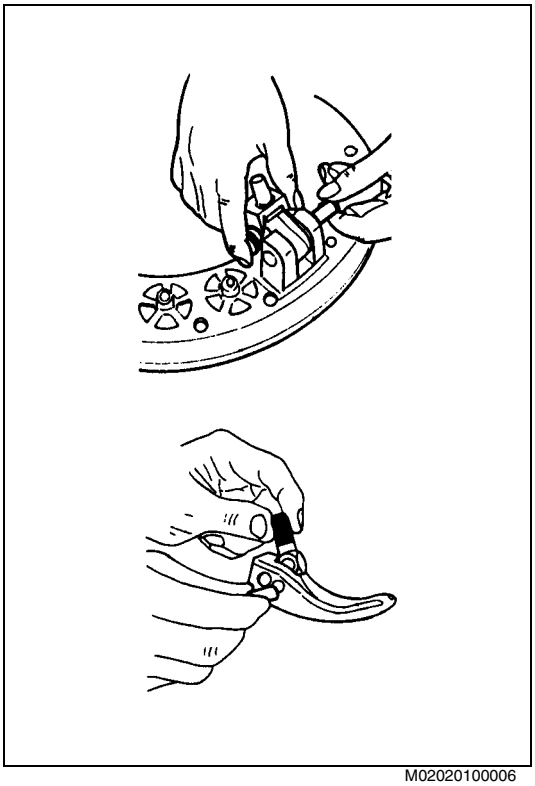
(1) Before removing the special tools and the strap plate bolt, compress the clutch cover to release the compression spring tension.

(2) Slowly release the press.



M02020100030

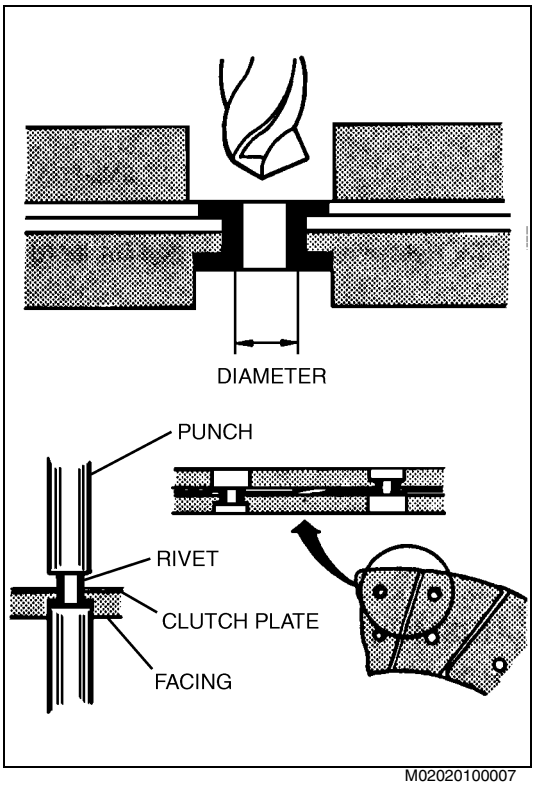
NOTICE:
Before disassembling, make aligning marks on the clutch cover and pressure plate.



M02020100006

2. DISASSEMBLE THE RELEASE LEVER ASSEMBLY.

(1) Remove the pin and the release lever.



M02020100007

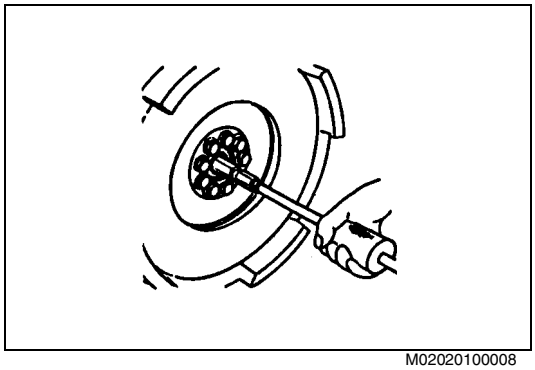
IMPORTANT POINTS - ASSEMBLY

1. REPLACE THE CLUTCH FACING.

(1) Drill off the rivets with a 5 mm {0.197 in.} diameter drill.

NOTICE:
Do not remove the clutch facing with a tapping rod and a hammer or a press.

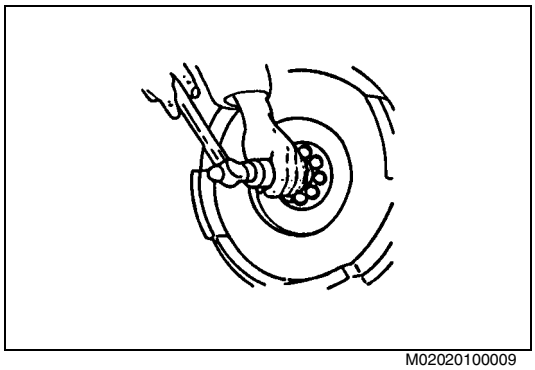
(2) Remove the old facing.
(3) Place the new facing on the clutch plate and insert the rivets into the holes so that the facing is held in position. (Secure the rivets with adhesive tape to prevent loosing them.)
(4) Using a suitable riveter, rivet the new facing. In order to distribute pressure evenly, rivet in diagonal direction alternately.
(5) Using a dial gauge, check the misalignment of the clutch disc after riveting.



M02020100008

2. REPLACE THE PILOT BEARING.

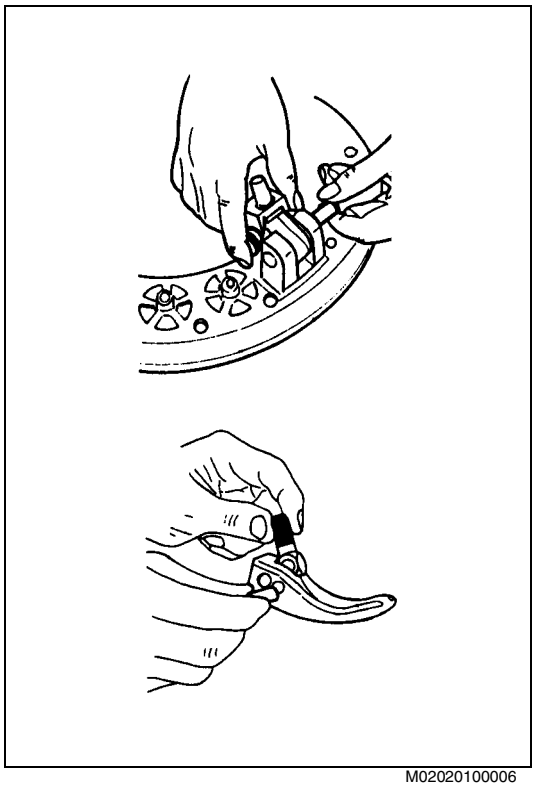
(1) Remove the pilot bearing.
SST:
Pilot Bearing Puller (09650-1970)
Sliding Hammer (09420-1442)



M02020100009

(2) Using a suitable tapping rod, install the pilot bearing.

NOTICE:
After installing the pilot bearing, ensure that it rotates smoothly.

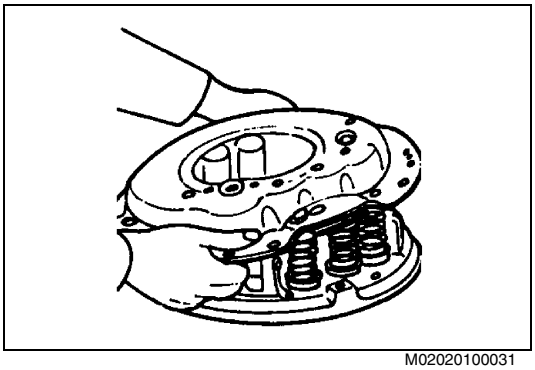


M02020100006

3. INSTALL THE RELEASE LEVER.

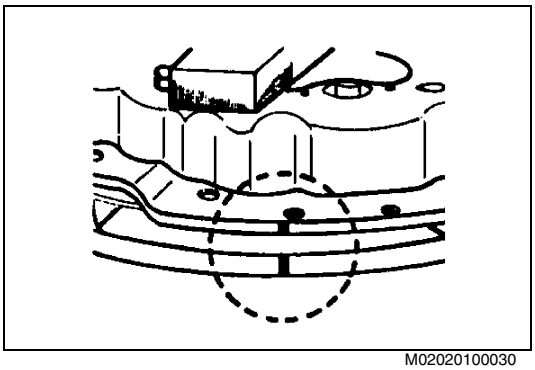
(1) Assemble the release lever, release lever support and torsion spring, then install the release lever assembly on the pressure plate.

NOTICE:
- **Do not coat any grease on the bushing.**
- **Coat lithium base grease to the sliding part between the clutch release lever and the pressure plate.**


M02020100031

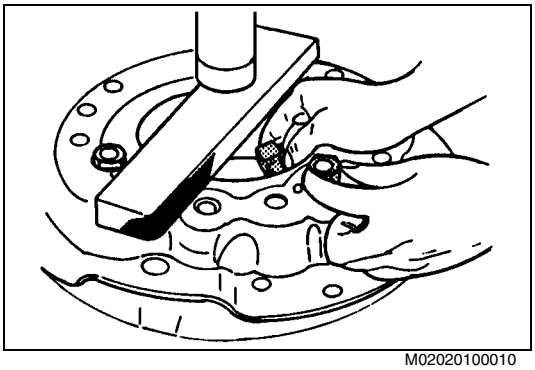
4. INSTALL THE CLUTCH COVER.

(1) Install the clutch cover in position according to the aligning marks. Compress the clutch cover to relieve the compression spring tension.


M02020100030

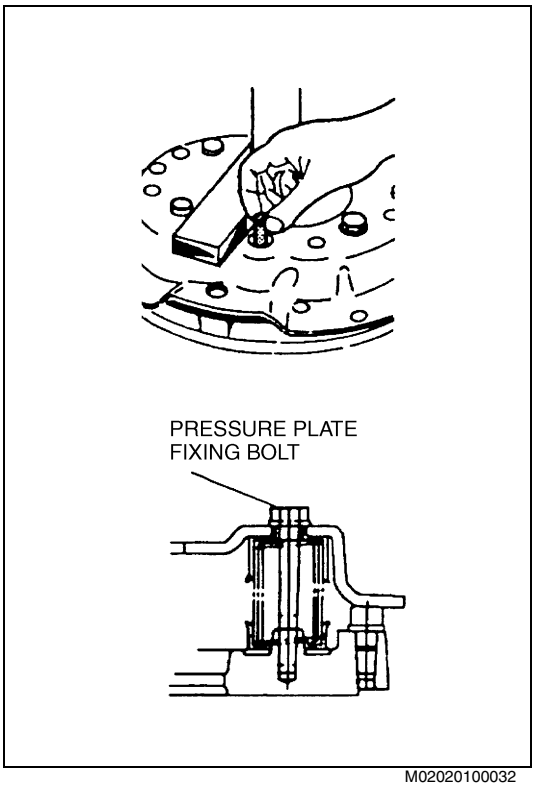
NOTICE:

- **When compressing the clutch cover, be sure to hook up the torsion springs between clutch cover and release lever.**
- **When compressing the clutch cover, pull the release lever support up through the holes in the clutch cover.**
- **Be sure to insert the compression spring upper seats in the pressure cover.**


M02020100010

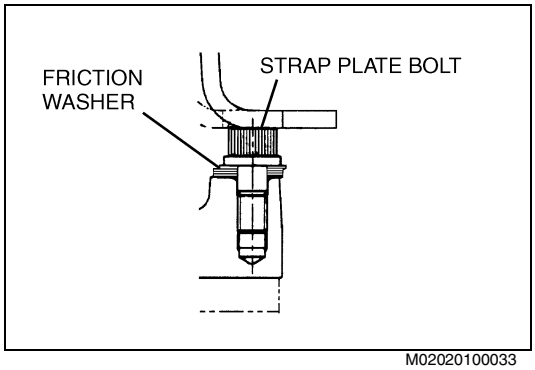
(2) Temporarily tighten the release lever support nuts.

NOTICE:
Coat the spherical seat of the clutch cover and threaded section of the release lever support with a small amount of anti-seizure agent.



M02020100032

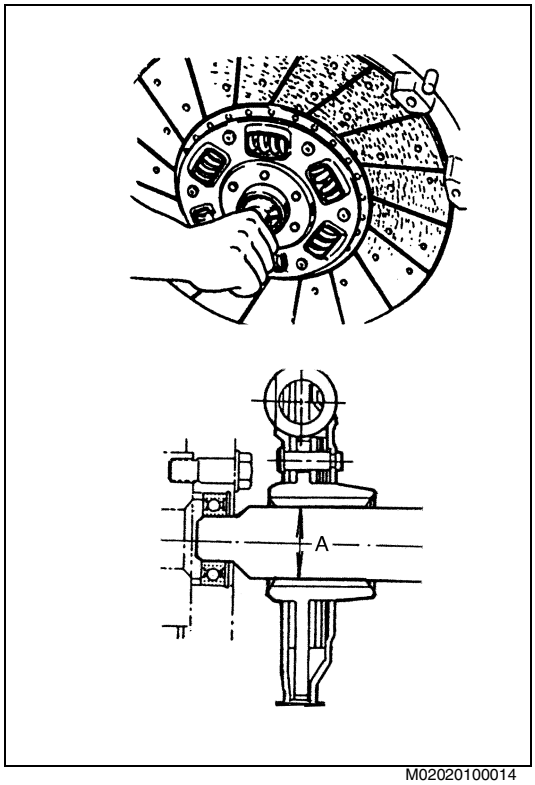
(3) Install the four pressure plate fixing bolts with the plain washers through the clutch cover into the tapped holes in the pressure plate.
SST:
Pressure Plate Fixing Bolt (9010-10700)
Plain Washer (9260-10240)



M02020100033

(4) Install the strap plate bolt with the friction washer and lock washer.

IMPORTANT POINTS - MOUNTING



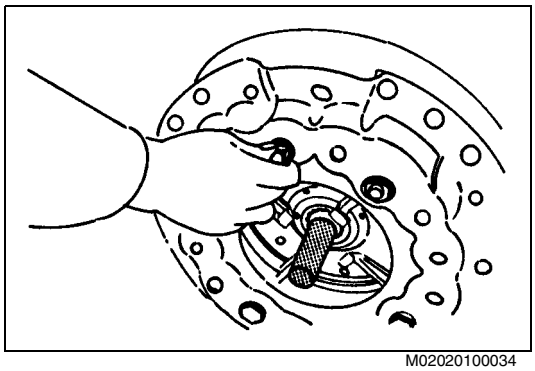
M02020100014

1. INSTALL THE CLUTCH DISC ON THE FLYWHEEL.

(1) Insert an aligning arbor or splined input shaft through the clutch disc hub and into the flywheel pilot bearing to position the clutch disc.

SST: Clutch Aligning Arbor (09662-1200)

Disc hub diameter A: 36 mm {1.417 in.}


M02020100034

2. INSTALL THE CLUTCH COVER ASSEMBLY.

(1) Insert the clutch cover aligning pins into each place of the clutch cover.

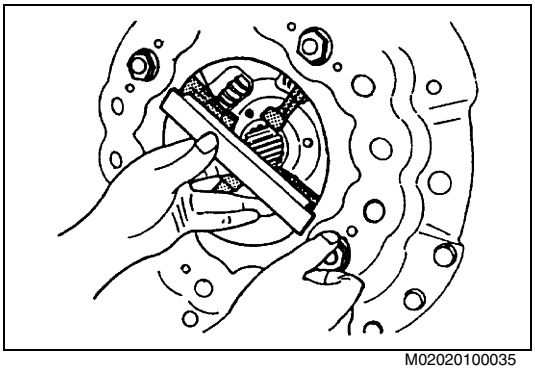
(2) Tighten the bolts evenly. Make several presses around the clutch cover until it is snug.

(3) Remove the pressure plate fixing bolts and plain washer.

(4) Remove the clutch aligning arbor.

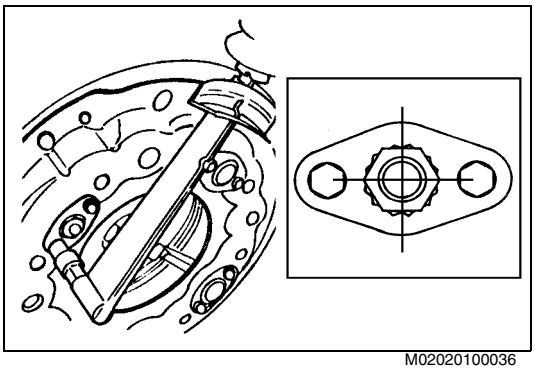
NOTICE:

When installing a new clutch cover assembly, do not forget to remove the four pressure plate fixing bolts from the clutch cover.


M02020100035

3. ADJUST THE RELEASE LEVER HEIGHT WHEN INSTALLING A NEW CLUTCH DISC.

(1) Adjust the clearance of the contact surface between the special tool and the release lever by turning the release lever support nut.
Clearance: Zero
SST: Clutch Release Lever Height Gauge (09661-1030)


M02020100036

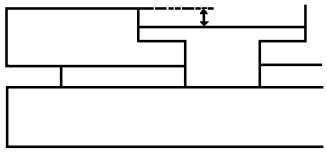
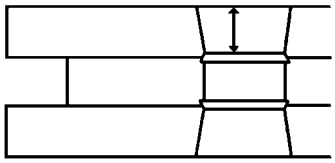
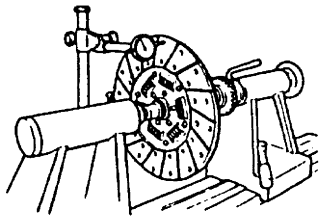
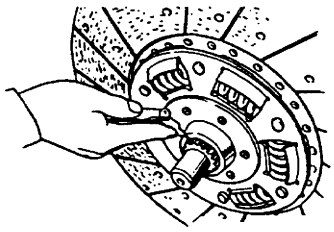
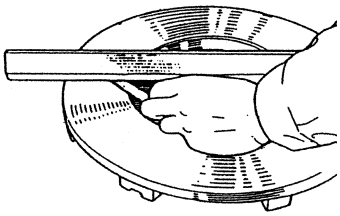
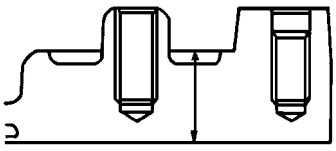
4. INSTALL THE LOCK PLATE.

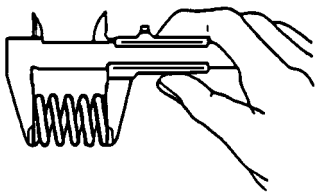
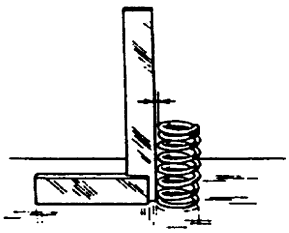
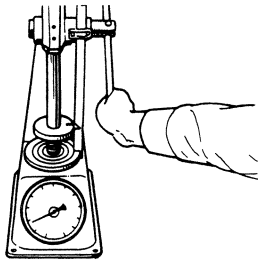
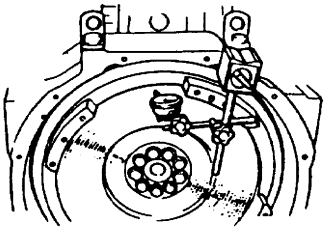
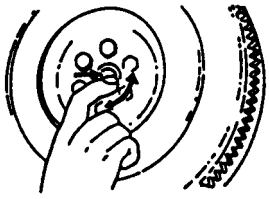
NOTICE:
Be sure to lock the support nut with the lock plate.

INSPECTION AND REPAIR

M02020103BEH3002

Unit: mm {in.}

Inspection item		Standard	Limit	Remedy	Inspection procedure
Rivet head depth	Molded non-asbestos	2.2-2.8 {0.0866-0.1102}	0.1 {0.0039}	Replace disc assembly or facing.	Measure 
	Sintered metal (Celamic metal)	2.4 {0.0945}	1.2 {0.0472}	Replace disc assembly or facing.	Measure 
Clutch disc misalignment		0-0.7 {0-0.0275}	0.7 {0.0275}	Replace.	Measure 
Oily facings Loose rivets Broken or loose damper springs		—	—	Replace disc assembly, if necessary.	Visual check
Clearance between clutch disc hub and transmission input shaft spline		0.05-0.15 {0.0020-0.0059}	0.3 {0.0118}	Replace the clutch disc or the transmission input shaft.	Measure 
Pressure plate misalignment		Less than 0.1 {0.0039}	0.5 {0.0197}	Regrind the friction surface or replace.	Measure 
Pressure plate thickness		24 {0.945}	23 {0.906}	Replace.	Measure 
Pressure plate friction surface scoring or roughness		—	—	Regrind the friction surface or replace, if necessary.	Visual check

Inspection item	Standard	Limit	Remedy	Inspection procedure
Compression spring free length	83.4 {3.283}	79.2 {3.118}	Replace.	Measure 
Compression spring squareness	—	5.0 {0.197}	Replace.	Measure 
Compression spring setting load at the specified setting length	1,243.5 N {126.8 kgf, 279.5 lbf} at 54.8 {2.157}	1,181.3 N {120.5 kgf, 266 lbf} at 54.8 {2.157}	Replace.	Measure 
Flywheel misalignment	—	0.15 {0.059}	Regrind the friction surface or replace.	Measure 
Flywheel friction surface scoring or roughness	—	—	Regrind the friction surface or replace, if necessary.	Visual check
Pilot bearing improper rotation	—	—	Replace, if necessary.	Visual check 

CLUTCH CONTROL (CLUTCH SERIES: CS350)

CL03-001

CLUTCH CONTROL UNIT (CLUTCH SERIES: CS350) CL03-2
DATA AND SPECIFICATIONS CL03-2
DESCRIPTION CL03-2
SPECIAL TOOL CL03-5
INSPECTION AND ADJUSTMENT CL03-6

CLUTCH PEDAL AND RELEASE UNIT (CLUTCH SERIES: CS350) CL03-9
COMPONENT LOCATOR.....CL03-9
OVERHAUL CL03-11
INSPECTION AND REPAIR CL03-13

CLUTCH MASTER CYLINDER (CLUTCH SERIES: CS350) CL03-14
COMPONENT LOCATOR.....CL03-14
OVERHAUL CL03-15
INSPECTION AND REPAIR CL03-15

CLUTCH BOOSTER (CLUTCH SERIES: CS350) CL03-16
COMPONENT LOCATOR.....CL03-16
OVERHAUL CL03-17
INSPECTION AND REPAIR CL03-22

CLUTCH CONTROL UNIT (CLUTCH SERIES: CS350)

DATA AND SPECIFICATIONS

M02030103BEI2002

CLUTCH BOOSTER

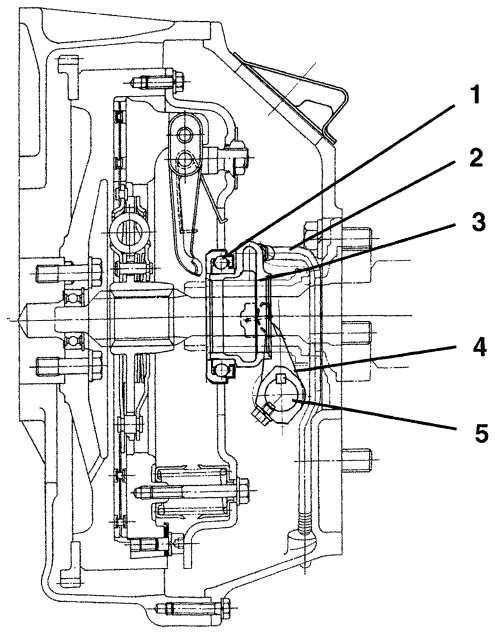
Unit: mm {in.}

Transmission series	**LX06S**
Power cylinder inside diameter	**90 {3.543}**
Hydraulic cylinder inside diameter	**19.8 {0.780}**
Relay valve piston outside diameter	**14.3 {0.563}**
Valve piston outside diameter	**27.0{1.063}**

DESCRIPTION

M02030103BEC1002

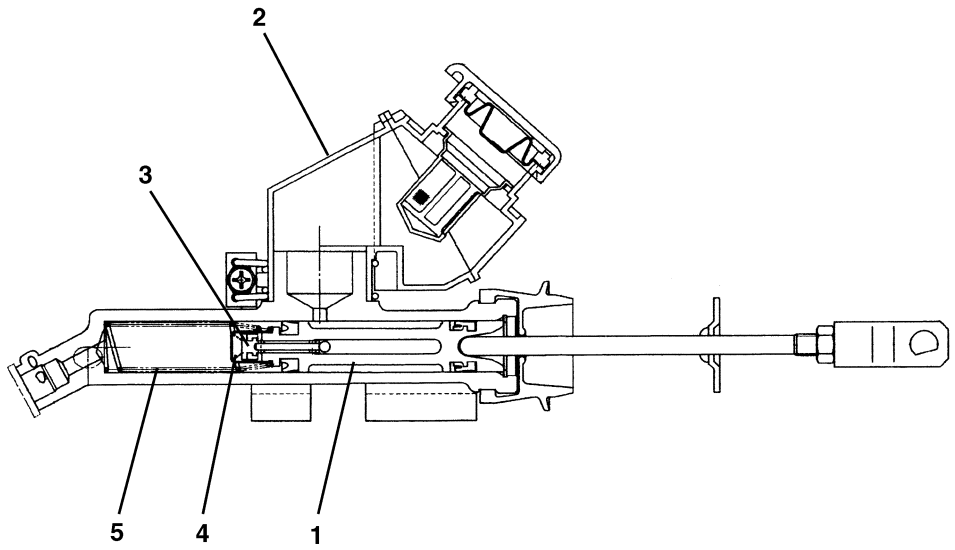
CLUTCH RELEASE UNIT



M02030100101

1	**Release bearing**	4	**Release fork**
2	**Lubrication hose**	5	**Release fork shaft**
3	**Release bearing hub**		

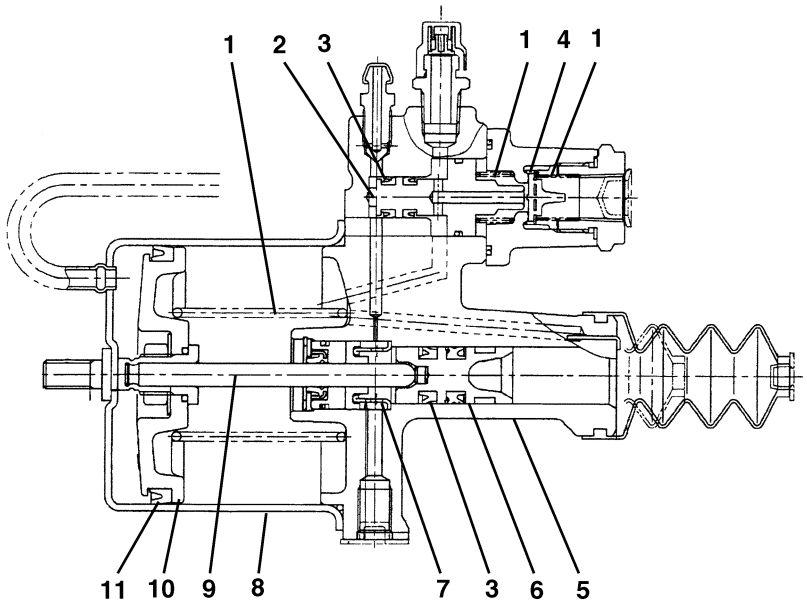
MASTER CYLINDER



M02030100002

1	Piston	4	Conical spring
2	Reservoir tank	5	Return spring
3	Check valve		

CLUTCH BOOSTER



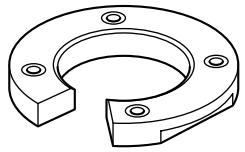
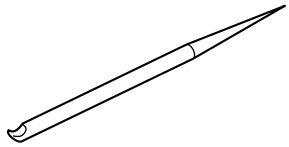
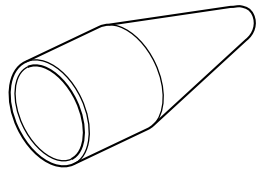
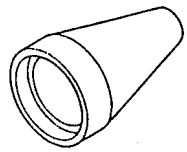
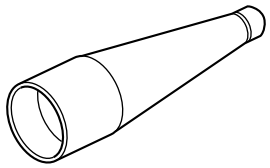
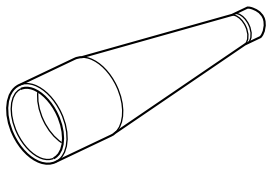
M02030100003

1	Return spring	7	Retainer
2	Relay valve piston	8	Cylinder shell
3	Piston cup	9	Push rod
4	Poppet valve	10	Power piston
5	Hydraulic cylinder	11	Piston seal
6	Hydraulic piston		

SPECIAL TOOL

M02030103BEK1001

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

Illustration	Part number	Tool name	Remarks
	09536-1020	STAND	
	09653-1780	HOOK	
	09657-2090	GUIDE	
	09657-2100	GUIDE	
	09657-2150	GUIDE	
	09657-2160	GUIDE	

INSPECTION AND ADJUSTMENT

M02030103BEH3002

AIR BLEEDING

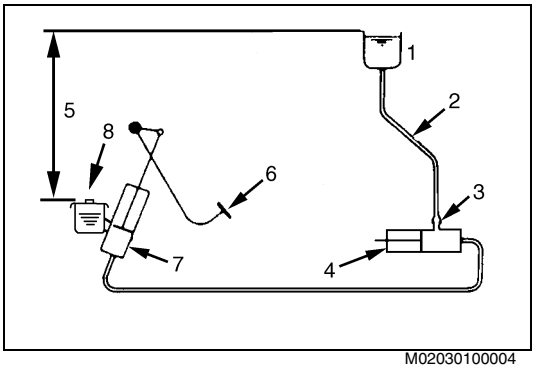
1. BLEED THE AIR FROM HYDRAULIC LINE.

NOTICE:

- **Do not mix the clutch fluid with different types or brands.**
- **Be careful not to spill clutch fluid from the reservoir tank or from the air bleeder during air bleeding. Clutch fluid can damage the paint finish on the body or floor.**
- **There are two methods of bleeding, gravity bleeding and manual air bleeding.**

2. GRAVITY BLEEDING

(1) Connect a funnel to a vinyl tube.
(2) Connect the other end of the vinyl tube to the bleeder screw.
(3) Hold the funnel about 1.5 m {4.92 ft} higher than the reservoir tank.
(4) Loosen the bleeder screw and pour the clutch fluid into the funnel.
(5) Observe the flow of clutch fluid into the reservoir tank.
(6) When the air bubbles cease, close the bleeder screw.
(7) Check the fluid level. If necessary, add or remove clutch fluid in order to match the "MAX" level.

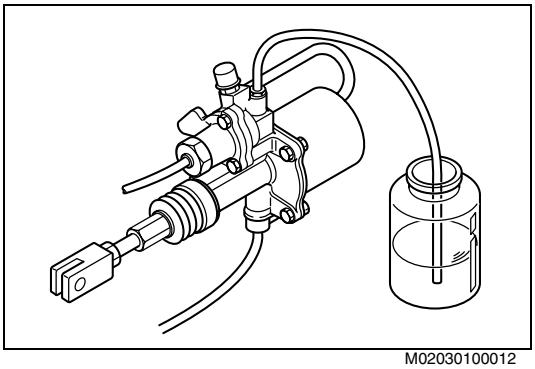


M02030100004

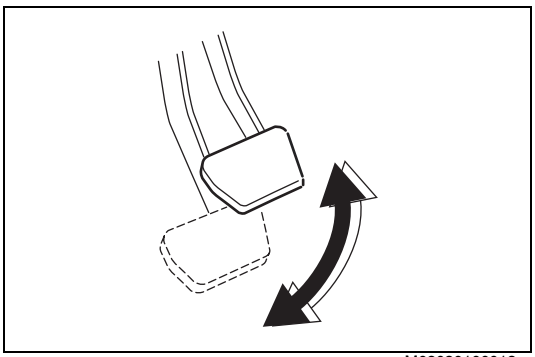
1. Funnel filled with clutch fluid
2. Vinyl tube (inside diameter: 6 mm)
3. Bleeder
4. Clutch booster
5. About 1.5 m {4.92 ft}
6. Clutch pedal
7. Master cylinder
8. Reservoir tank

3. MANUAL BLEEDING

(1) Fill the reservoir with clutch fluid.
(2) Connect the bleeder tube to the clutch booster screw. Place the other end of tube in a container half-filled with clutch fluid.



M02030100012

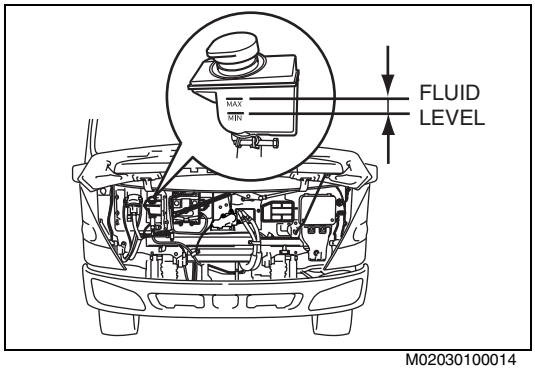


M02030100013

(3) Slowly pump the clutch pedal several times. While pressing on the pedal, loosen the bleeder screw. Repeat this procedure until there are no more air bubbles in the fluid.

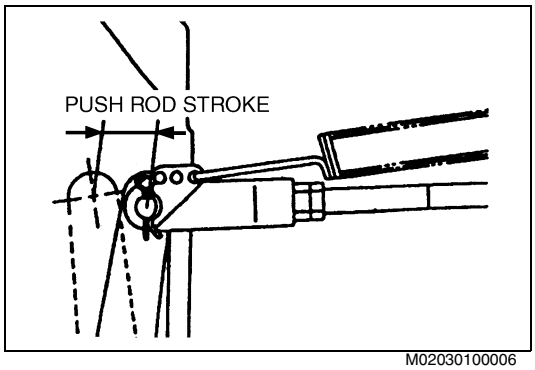
NOTICE:

- **Do not return the clutch pedal before closing the bleeder screw.**
- **Keep the reservoir filled with clutch fluid.**
- **Re-bleeding will be necessary if the reservoir is emptied during bleeding operation.**



M02030100014

(4) Check the fluid level. If necessary, add or remove clutch fluid in order to match the "MAX" level.

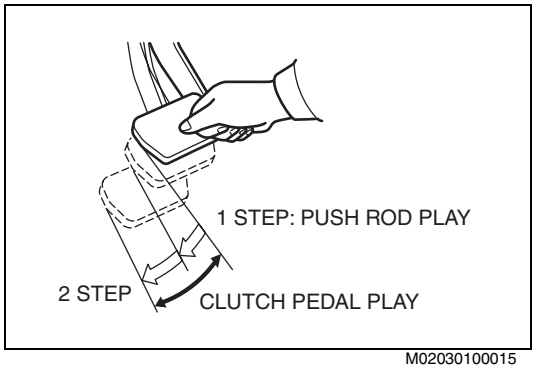


M02030100006

4. AFTER BLEEDING, MAKE SURE THE PUSH ROD STROKE IS AS SPECIFIED.

(1) Depress the clutch pedal fully and measure the push rod stroke. If the stroke is less than standard, re-bleed the hydraulic system.
Standard: More than 19.5 mm {0.768 in.}

CHECK AND ADJUSTMENT

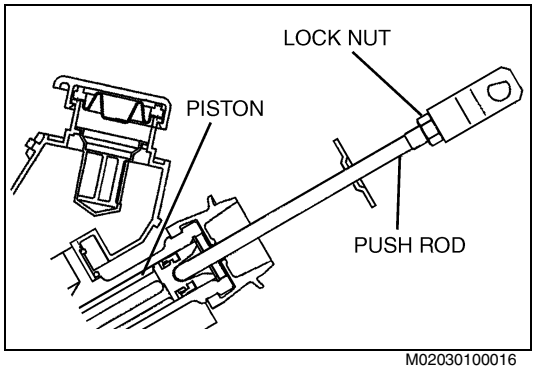


M02030100015

1. CHECK AND ADJUST THE CLUTCH PEDAL PLAY.

(1) Check the push rod play.

a. If necessary, adjust the push rod play.

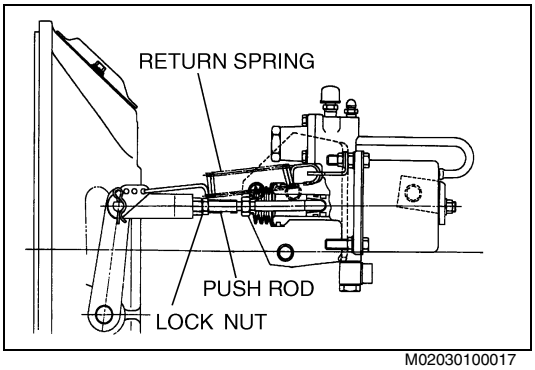


M02030100016

b. Loosen the lock nut and turn the master cylinder push rod until the push rod play is correct.

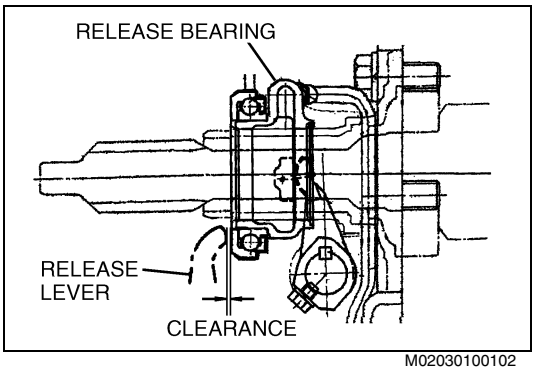
Standard: Clearance between push rod and piston: 0.5 mm {0.0197 in.}
Push rod play at pedal top: 2-4 mm {0.079-0.157 in.}

c. Tighten the lock nut.



M02030100017

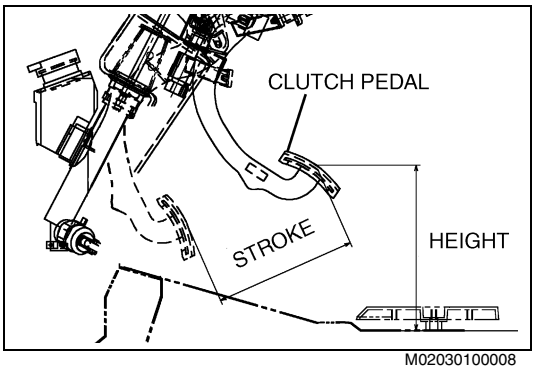
(2) Check the clutch pedal play.
a. Push the pedal until the beginning of clutch resistance is felt.
Assembly Standard: 52-65 mm {2.048-2.559 in.}
b. If necessary, adjust the clutch pedal play by adjusting the clutch release bearing clearance.
c. Loosen the lock nut and turn the push rod counterclockwise until the release bearing contacts the release lever plate.
d. Turn the push rod clockwise about 2.5 turns.



M02030100102

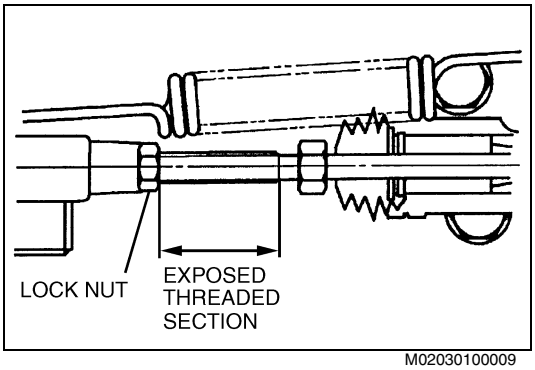
Standard: Clearance between release bearing and release lever plate: 2.0 mm {0.079 in.}

e. Tighten the lock nut.



M02030100008

2. CHECK THE CLUTCH PEDAL HEIGHT AND STROKE.
Assembly Standard:
Pedal Height: 169.2-179.2 mm {6.662-7.055 in.}
Pedal Stroke: 150-160 mm {5.906-6.299 in.}



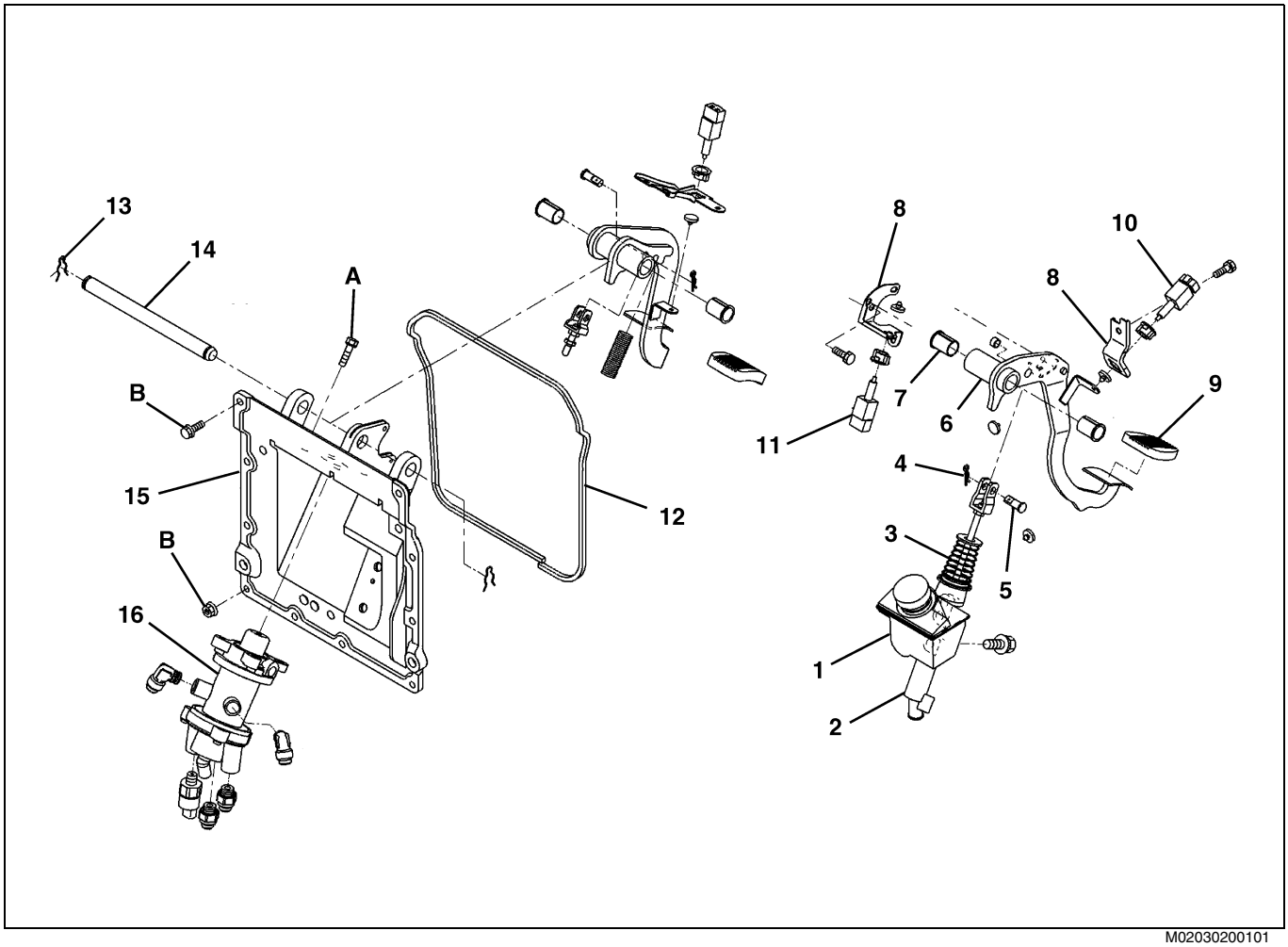
M02030100009

3. CHECK THE LENGTH OF THE EXPOSED THREADED SECTION OF THE PUSH ROD. IF ITS LENGTH IS LESS THAN THE SERVICE LIMIT, IT IS TIME TO REPLACE THE CLUTCH FACING.
Service limit: 18 mm {0.709 in.}

CLUTCH PEDAL AND RELEASE UNIT (CLUTCH SERIES: CS350)

COMPONENT LOCATOR

M02030203BED1002

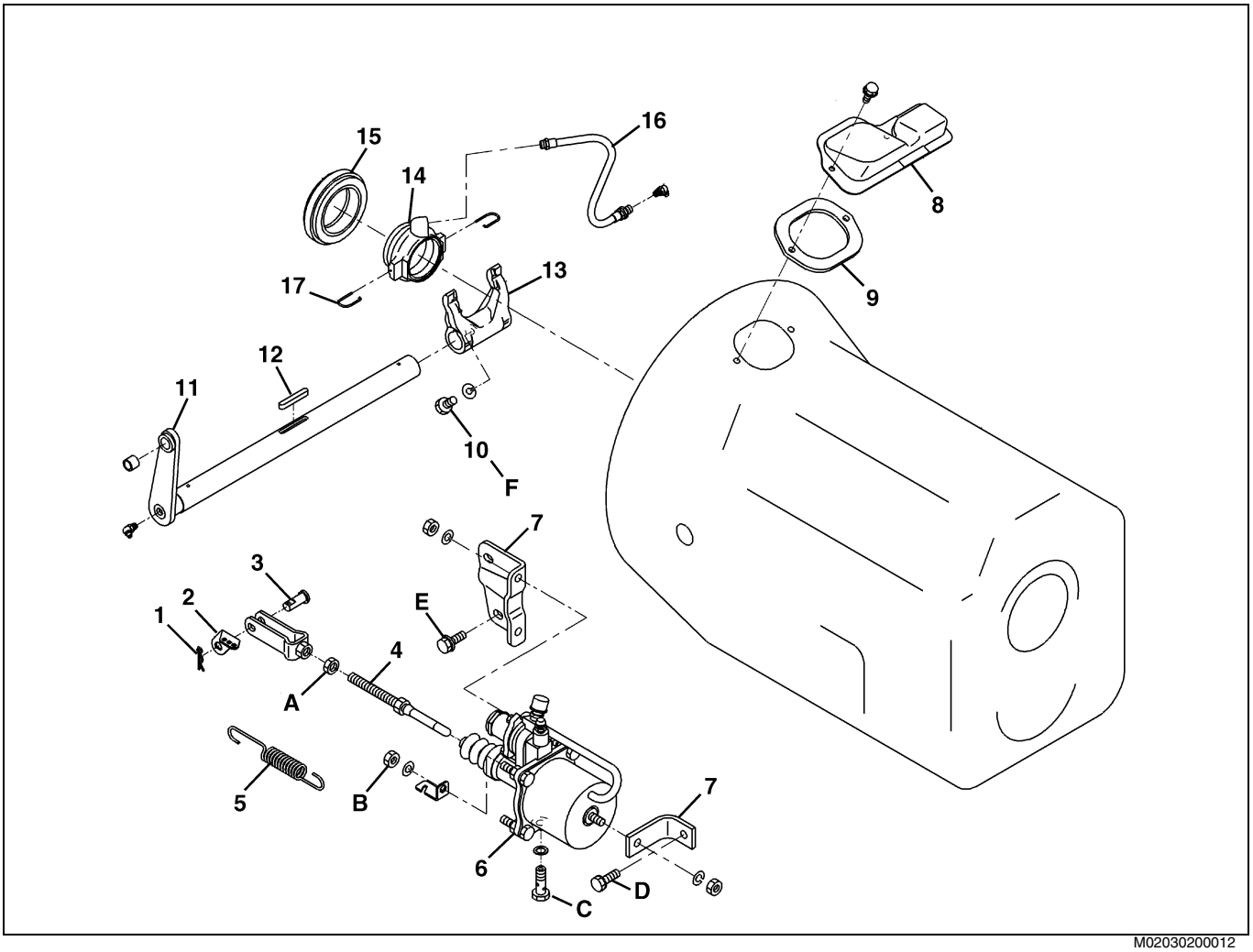


M02030200101

1	Reservoir tank	10	Switch (For exhaust brake)
2	Master cylinder	11	Switch (For transmission P.T.O. control) (If so equipped.)
3	Return spring		
4	Cotter pin	12	Seal
5	Pin	13	Clip
6	Clutch pedal	14	Pedal shaft
7	Bushing	15	Pedal bracket
8	Bracket	16	Brake valve
9	Pedal pad		

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

A	9.5-18.5 {97-188, 7.1-13.5}	B	18-31 {184-316, 14-22}



M02030200012

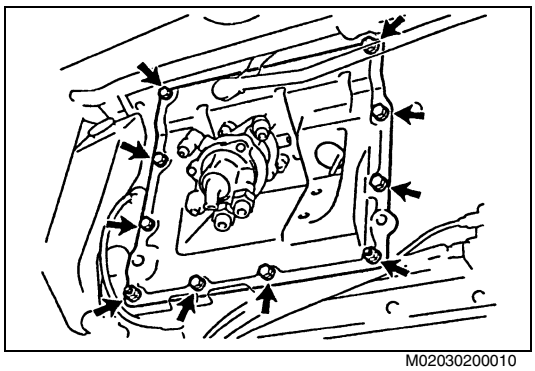
1	Cotter pin	10	Set screw
2	Spring hanger	11	Release shaft
3	Pin	12	Key
4	Push rod	13	Release fork
5	Tension spring	14	Release bearing hub
6	Clutch booster	15	Release bearing
7	Bracket	16	Lubrication hose
8	Cover	17	Anti-rattle spring
9	Gasket		

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

A	45.5-58.5 {465-597, 34-43}	D	37.5-48.5 {383-495, 28-35}
B	37.5-48.5 {383-495, 28-35}	E	37.5-48.5 {383-495, 28-35}
C	27.5-32.5 {281-331, 21-24}	F	14.5-17.5 {148-178, 11-12}

OVERHAUL

M02030203BEH2002

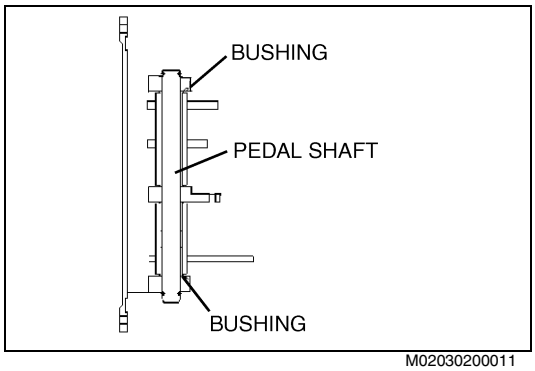

M02030200010

IMPORTANT POINTS - DISMOUNTING

1. REMOVE THE PEDAL UNIT ASSEMBLY.

(1) Remove the 8 bolts and 2 nuts and dismount the pedal bracket assembly from the vehicle.

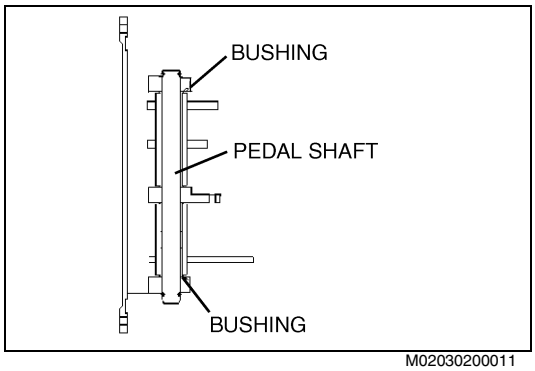
NOTICE:
Be careful not to damage the vehicle.



M02030200011

2. REMOVE THE CLUTCH PEDAL.

(1) Remove the clip, and tap the pedal shaft lightly to remove the clutch pedal using a brass bar and a hammer.



M02030200011

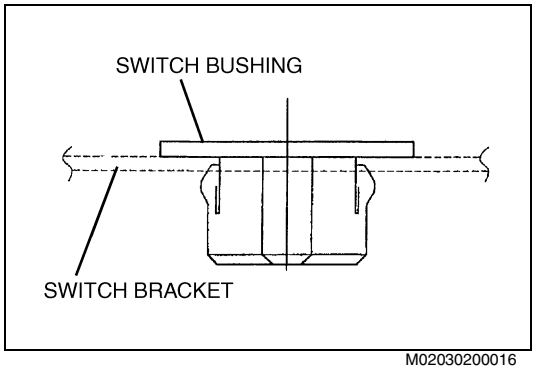
IMPORTANT POINT - MOUNTING

1. INSTALL THE CLUTCH PEDAL.

(1) Apply lithium grease to the inner side and outer periphery of the bushing, and install the bushing to the inserting hole on the shaft part of the clutch pedal.

(2) Install the clutch pedal to the installing axle for pedal shaft and install the pedal shaft to the pedal bracket using a plastic hammer.

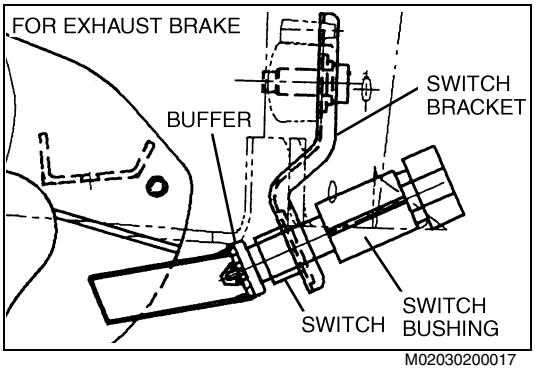
2. INSTALL THE PEDAL UNIT ASSEMBLY.



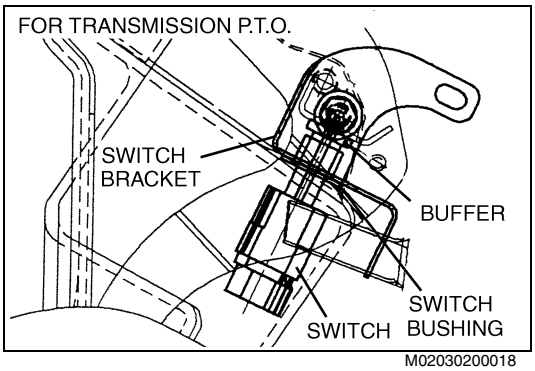
M02030200016

3. INSTALL THE SWITCH FOR EXHAUST BRAKE AND TRANSMISSION P.T.O.

(1) Install the switch bushing into the switch bracket.



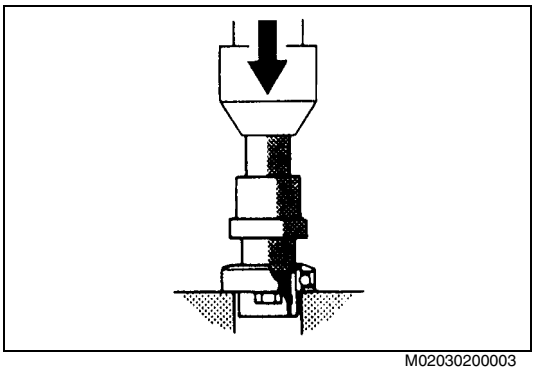
M02030200017



M02030200018

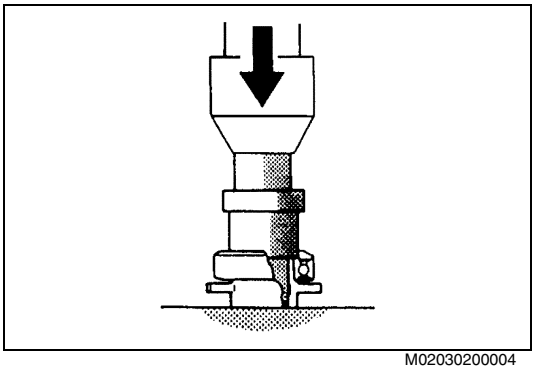
(2) Push the switch into the switch bushing until the switch pounds the buffer, then fix the switch by turning it clockwise.

NOTICE:
Check that the switch body does not contact the buffer and also that the switch rightly functions.


M02030200003

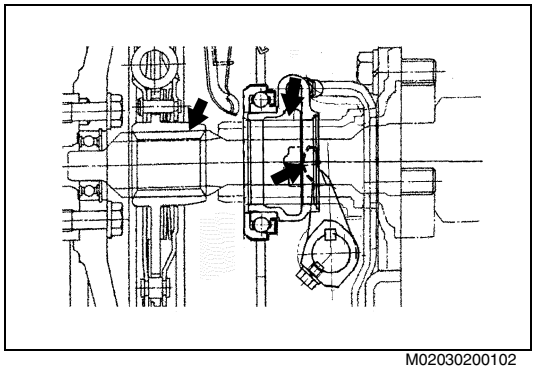
IMPORTANT POINTS - ASSEMBLY

1. REPLACE THE RELEASE BEARING.
(1) Using a suitable tool and a press, remove the bearing from the release bearing hub.


M02030200004

(2) Press the bearing into the hub.

NOTICE:
- **After installing the bearing, ensure that it rotates smoothly.**
- **The bearing is permanently lubricated and require no cleaning or lubrication.**
- **In order to prevent damage to the race surface, press fit slowly by a press and do not apply impact loads.**



M02030200102

2. APPLY BEARING GREASE OR HEAT RESISTANCE GREASE.

(1) Apply bearing grease to the following parts.
   a. The release fork and the release bearing hub contact point.
   b. The release bearing hub inner groove.

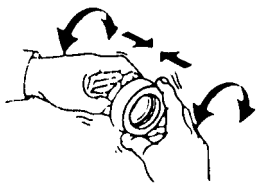
(2) Apply heat resistance grease to the transmission input shaft spline.

NOTICE:
Apply a small amount of grease to the spline.

INSPECTION AND REPAIR

M02030203BEH3001

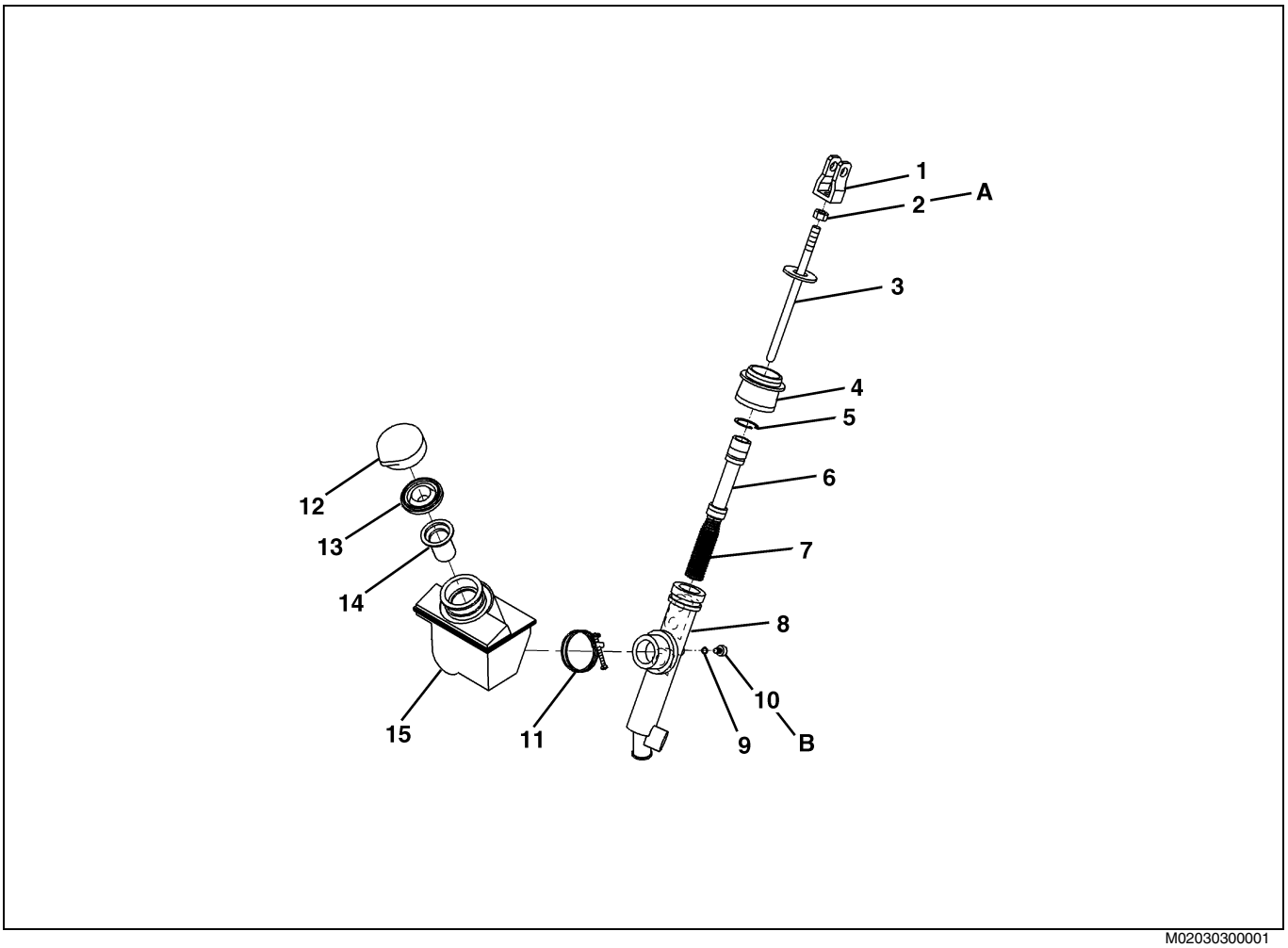
Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Release bearing improper rotation	**—**	**—**	**Replace release bearing, if necessary.**	**Visual check** 
Release fork and release hub: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check**

CLUTCH MASTER CYLINDER (CLUTCH SERIES: CS350)

COMPONENT LOCATOR

M02030301BED1002



M02030300001

1	Clevis	9	O-ring
2	Lock nut	10	Stopper bolt
3	Push rod	11	Clamp
4	Boot	12	Reservoir cap
5	Retainer ring	13	Gasket
6	Piston	14	Oil reservoir strainer
7	Return spring	15	Reservoir tank
8	Body		

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

A	11.5-16.9 {118-172, 8.5-12.4}	B	2.4-4.4 {25-45, 1.9-3.2}

OVERHAUL

M02030301BEH2002

IMPORTANT POINT - DISMOUNTING

1. REMOVE THE MASTER CYLINDER.

NOTICE:

- **Before removing the master cylinder, drain the clutch fluid from the hydraulic line.**
- **Place a small drain pan under the master cylinder to catch the hydraulic fluid. Do not let the clutch fluid remain on a painted floor. Wash it off immediately.**

IMPORTANT POINT - ASSEMBLY

1. INSTALL THE RETURN SPRING AND PISTON TO THE CYLINDER.

NOTICE:

Lubricate the cylinder bore and piston with clean clutch fluid.

INSPECTION AND REPAIR

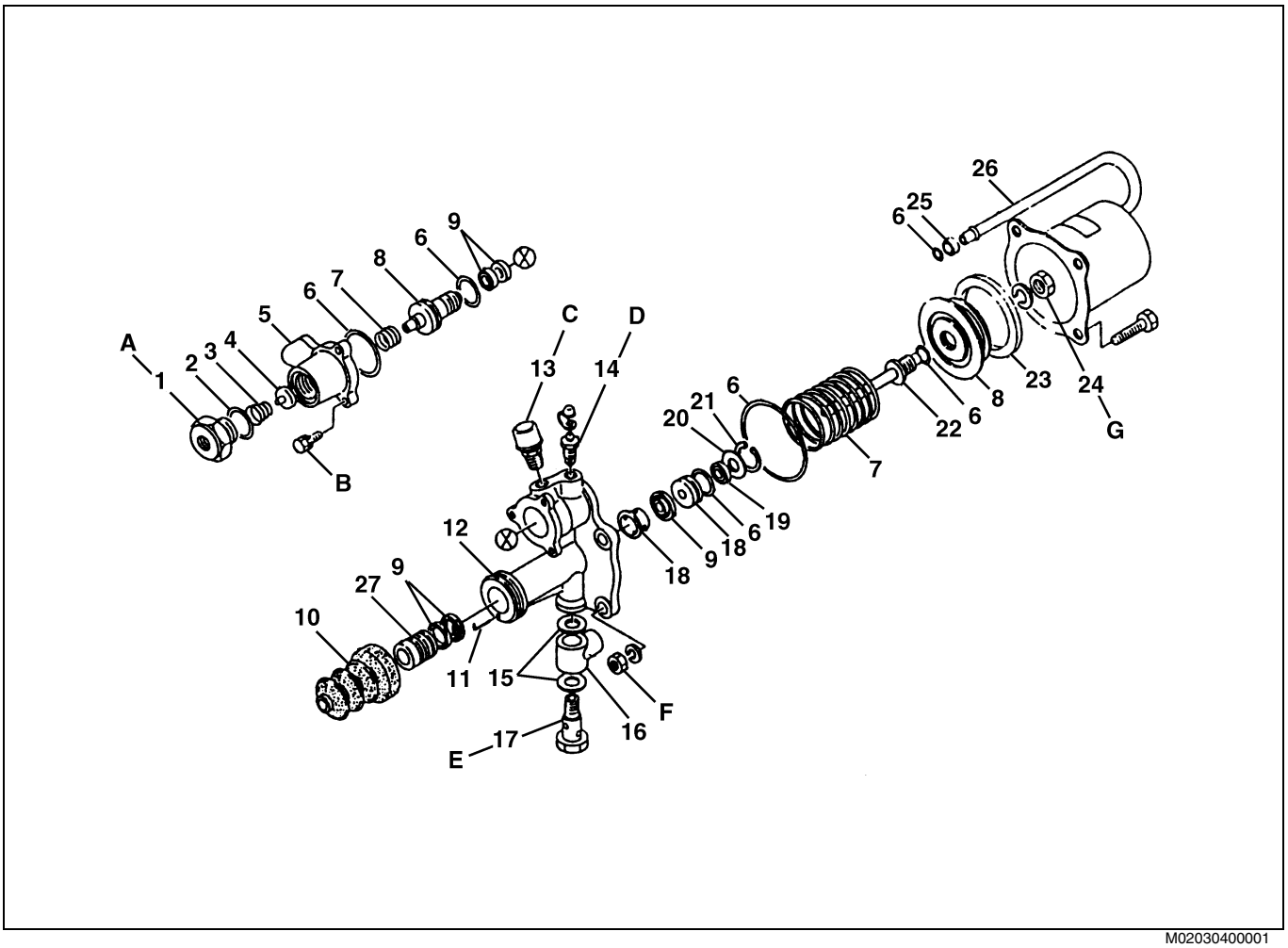
M02030301BEH3004

Inspection item	Standard	Limit	Remedy	Inspection procedure
Piston seal and cup: Wear and damage Cylinder bore: Scoring and corrosion	—	—	Replace the piston assembly and/or cylinder body, if necessary.	Visual check

CLUTCH BOOSTER (CLUTCH SERIES: CS350)

COMPONENT LOCATOR

M02030401BED1003



M02030400001

1	Poppet valve adapter	15	Soft washer
2	Gasket	16	Oil pipe connector
3	Conical spring	17	Pipe joint bolt
4	Poppet valve	18	Cup and washer retainer
5	Poppet valve body	19	Oil seal
6	O-ring	20	Push rod washer
7	Return spring	21	Retainer ring
8	Piston	22	Push rod
9	Piston cup	23	Piston seal
10	Push rod boot	24	Lock nut
11	Pin	25	Collar
12	Cylinder	26	Cylinder shell
13	Exhaust port	27	Hydraulic piston
14	Air bleeder		

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

A	19.6-29.4 {200-300, 15-21}	E	27.5-32.5 {281-331, 21-24}
B	3.9-5.9 {40-60, 2.9-4.3}	F	19.6-29.4 {200-300, 15-21}
C	14.7-19.6 {150-200,11-14}	G	19.6-29.4 {200-300, 15-21}
D	6.9-12.7 {70-130, 6-9}		

OVERHAUL

M02030401BEH2002

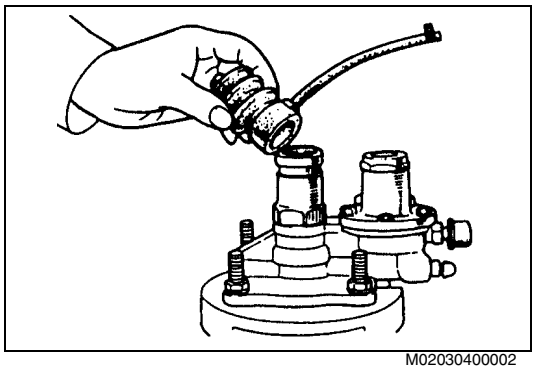
IMPORTANT POINT - DISMOUNTING

1. REMOVE THE CLUTCH BOOSTER.

NOTICE:

- **Before removing the clutch booster, drain the clutch fluid from the hydraulic line.**
- **Apply the parking brake and bleed the pressure from the air brake system.**

IMPORTANT POINTS - DISASSEMBLY

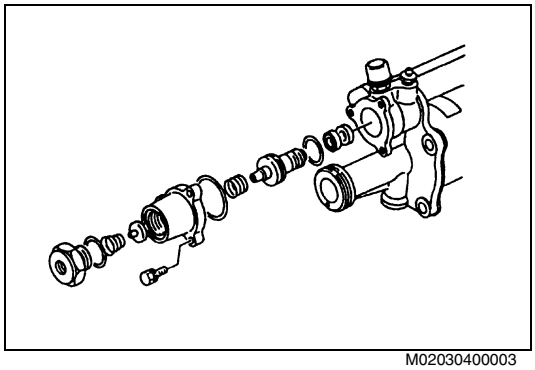


M02030400002

1. SET THE CLUTCH BOOSTER ON A STAND.

SST: Stand (09536-1020)

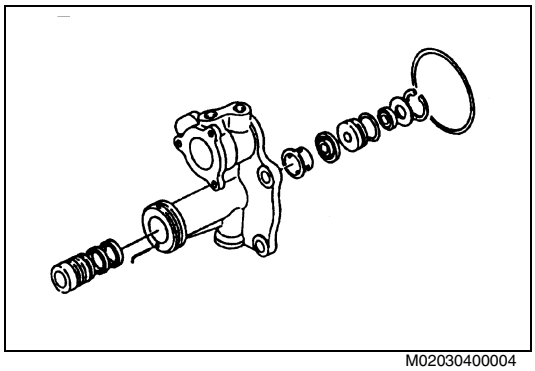
NOTICE:
Before disassembling the air booster, clean the outside of the booster.



M02030400003

2. DISASSEMBLE THE CONTROL VALVE.

(1) Remove the poppet valve adapter and gasket.
(2) Remove the conical spring and poppet valve.
(3) Remove the poppet valve body, return spring and piston.



M02030400004

3. DISASSEMBLE THE CYLINDER.

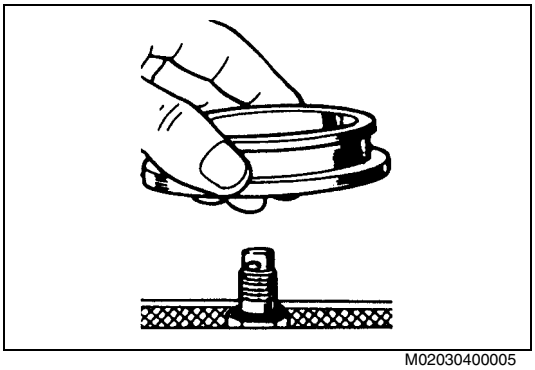
(1) Remove the pin and piston.
(2) Remove the retainer ring.
(3) Remove the push rod washers, the cup and washer retainer, piston cup and the oil seal.
(4) Using the special tool, remove the O-ring.
SST: Hook (09653-1780)

IMPORTANT POINTS - ASSEMBLY

- There is red colored and brown colored grease in the overhaul kit.
- The red colored grease should be used for the piston, the oil seals, the O-rings, and the piston cups on the end plate, hydraulic cylinder, and the relay valve.
- The brown colored grease should be used for the O-rings, the gasket, the piston seal and the inside of the cylinder shell.

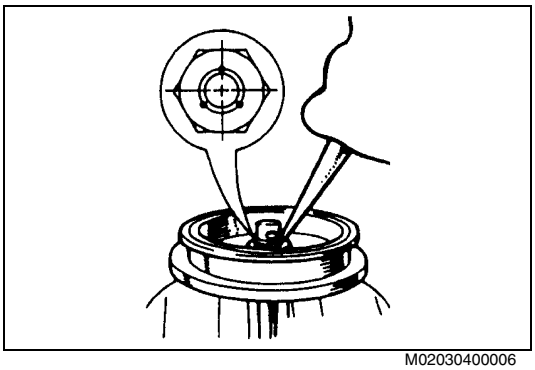
1. ASSEMBLE THE POWER PISTON.

(1) Apply the brown colored grease to the O-ring and install the O-ring on the push rod.



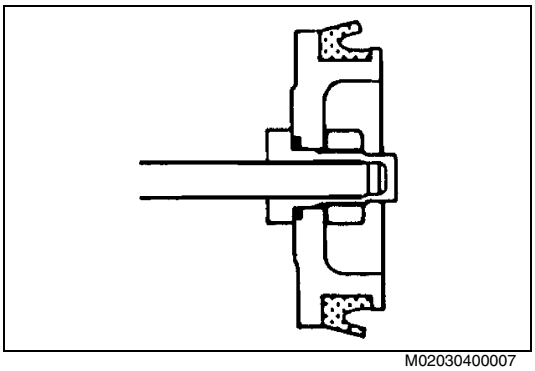
M02030400005

(2) After tightening the lock nut, secure the lock nut at three places with a punch to prevent loosening.



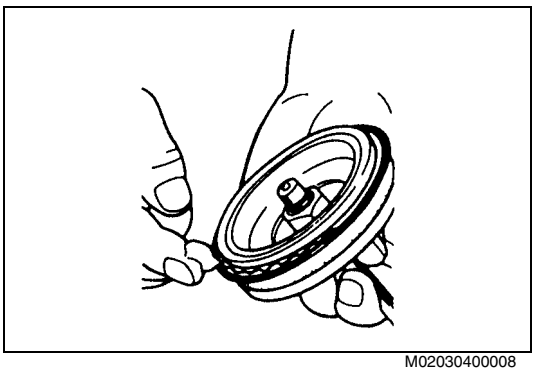
M02030400006

(3) Install the piston seal on the piston.

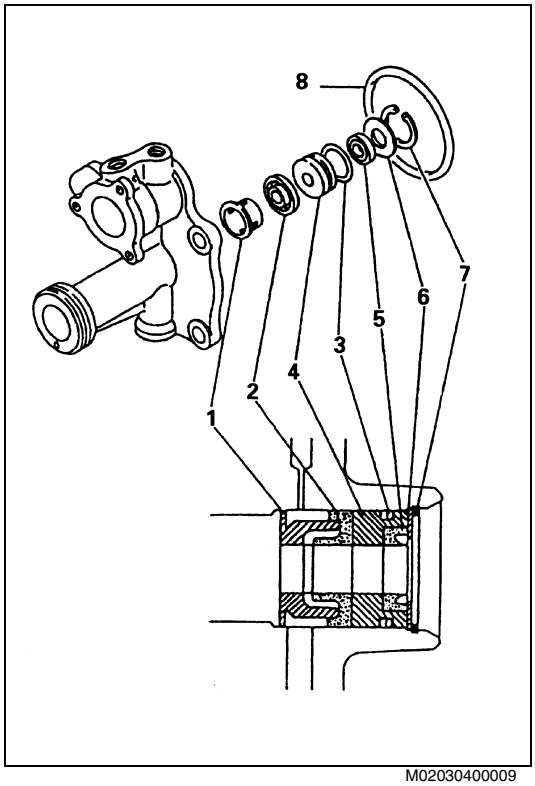


M02030400007

(4) Apply the brown colored grease on the piston seal and the inside of the cylinder shell.



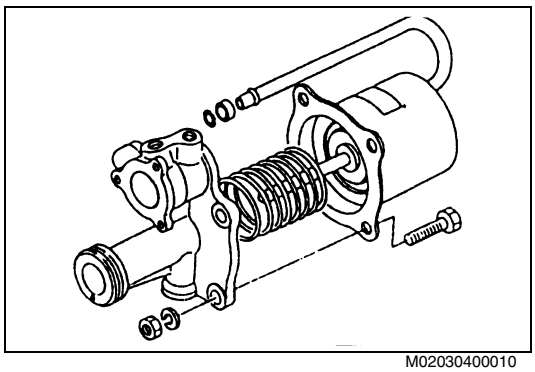
M02030400008



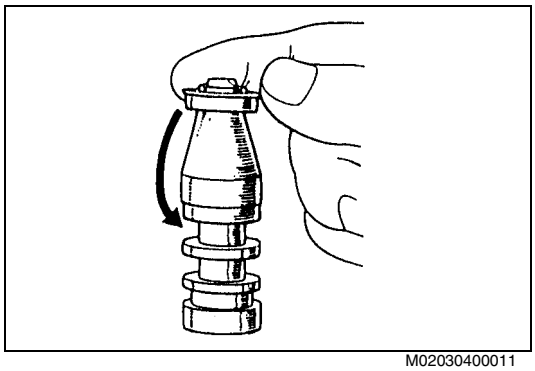
M02030400009

2. ASSEMBLE THE CYLINDER.
(1) Install the cup and washer retainer.
(2) Install the piston cup.
(3) Install the O-ring on the cup and washer retainer.
(4) Install the cup and washer retainer.
(5) Install the oil seal.
(6) Install the push rod washer.
(7) Install the retainer ring.
(8) Install the O-ring.

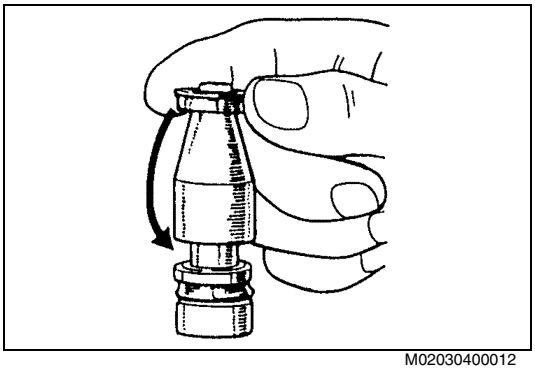
NOTICE:
Coat the parts with red colored grease.

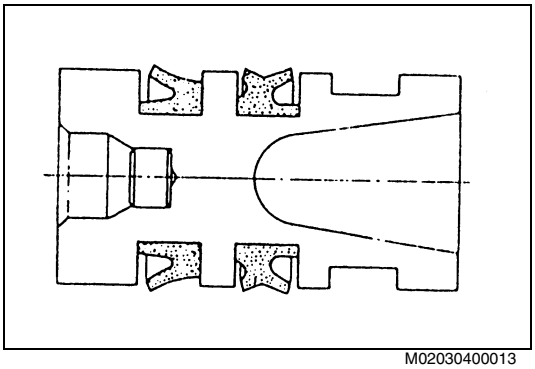

M02030400010

3. INSTALL THE CYLINDER ASSEMBLY ON THE POWER PISTON.
(1) Insert the control tube bushing and the seal on the control tube.

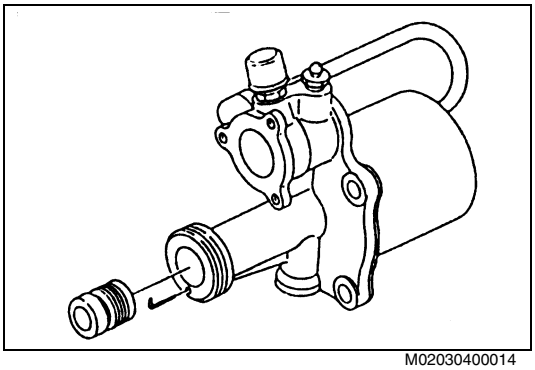

M02030400011

4. ASSEMBLE THE HYDRAULIC CYLINDER.
(1) Using the special tools, install the piston cups on the piston.
SST:
Guide (09657-2090)
Guide (09657-2100)

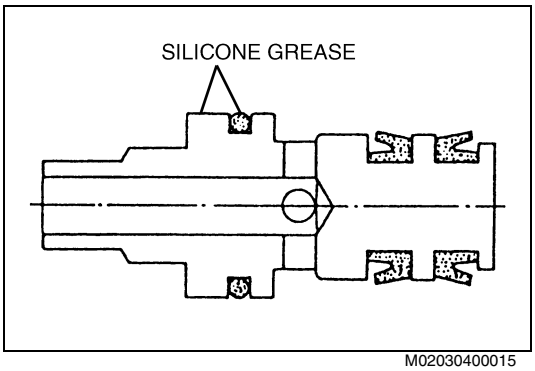

M02030400012


M02030400013

(2) Apply the red colored grease on the piston cups, the piston and the inside of the hydraulic cylinder.


M02030400014

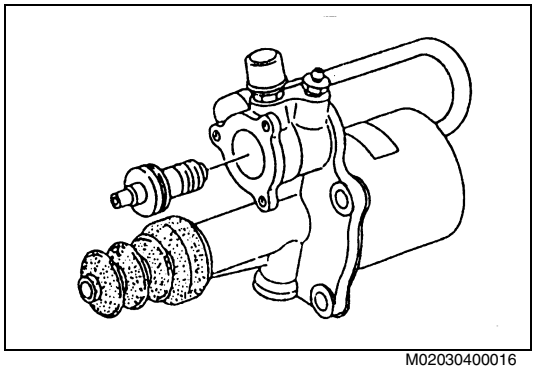
(3) Install the piston assembly in the hydraulic cylinder.
(4) Install the pin.



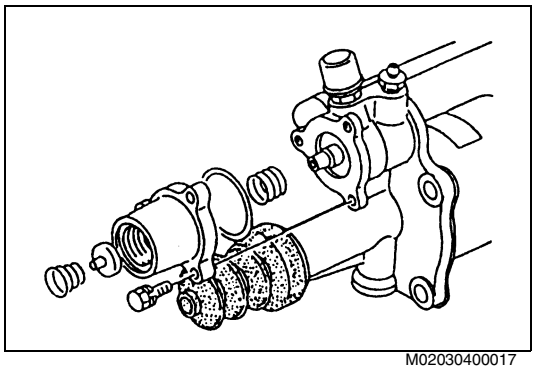
M02030400015

5. ASSEMBLE THE PISTON.
(1) Install the piston cups and O-ring on the piston.
(2) Coat the cups with red colored grease.
SST:
Guide (09657-2150)
Guide (09657-2160)

NOTICE:
- **Take care not to damage the piston cups when installing them on the piston.**
- **Coat the O-ring and sliding surfaces with silicone grease as shown in the figure.**

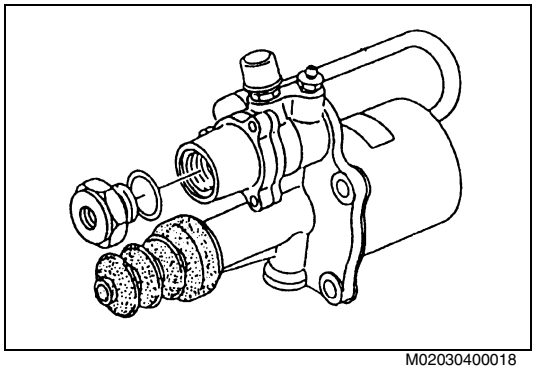

M02030400016

6. INSTALL THE PISTON ASSEMBLY TO THE CYLINDER.


M02030400017

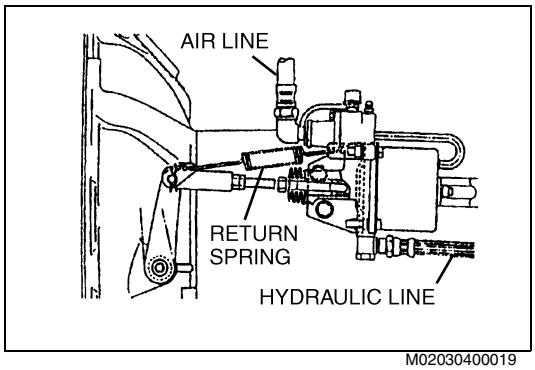
7. INSTALL THE RETURN SPRING, O-RING, POPPET VALVE BODY, POPPET VALVE AND CONICAL SPRING.

NOTICE:
Coat the O-ring with brown colored grease.


M02030400018

8. INSTALL THE ADAPTER.

(1) Coat the gasket with brown colored grease and install the gasket on the adapter.
(2) Install the adapter on the poppet valve body and tighten it.



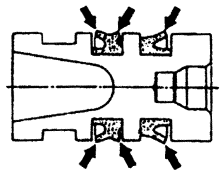
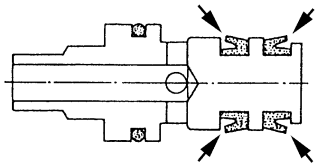
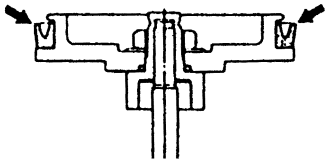
M02030400019

IMPORTANT POINT - MOUNTING

1. INSTALL THE CLUTCH BOOSTER.
(1) Connect the air and hydraulic lines to the clutch booster.
(2) Install the return spring.

INSPECTION AND REPAIR

M02030401BEH3004

Inspection item	Standard	Limit	Remedy	Inspection procedure
Piston cup: Wear and damage Cylinder body bore: Scoring and corrosion	**—**	**—**	**Replace, if necessary.**	**Visual check**  
Piston seal: Wear and damage Power cylinder bore: Scoring and corrosion	**—**	**—**	**Replace, if necessary.**	**Visual check** 

TRANSMISSION MAIN UNIT (LX06S)

TR02-001

TRANSMISSION ASSEMBLY (LX06S) TR02-2
DATA AND SPECIFICATIONS TR02-2
DESCRIPTION TR02-3
TROUBLESHOOTING TR02-4
SPECIAL TOOL TR02-5
PROPOSAL TOOL (TRANSMISSION CASE ASSEMBLY) TR02-6

GEAR SHIFT HOUSING (LX06S) TR02-8
COMPONENT LOCATOR TR02-8
OVERHAUL TR02-10

CASE AND MAIN UNIT (LX06S) TR02-14
COMPONENT LOCATOR TR02-14

TRANSMISSION CASE ASSEMBLY (LX06S) TR02-18
OVERHAUL TR02-18
INSPECTION AND REPAIR TR02-38

INPUT SHAFT ASSEMBLY(LX06S) TR02-39
OVERHAUL TR02-39
INSPECTION AND REPAIR TR02-43

OUTPUT SHAFT ASSEMBLY (LX06S) TR02-44
OVERHAUL TR02-44
INSPECTION AND REPAIR TR02-52

COUNTER SHAFT ASSEMBLY (LX06S) TR02-53
OVERHAUL TR02-53
INSPECTION AND REPAIR TR02-55

TRANSMISSION ASSEMBLY (LX06S)

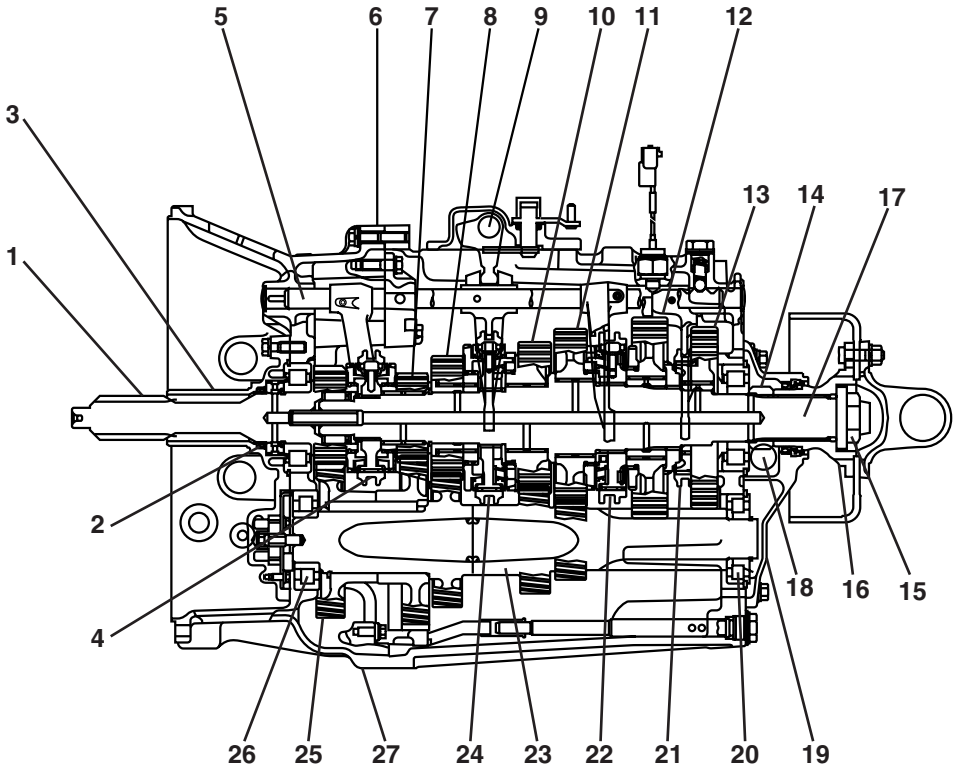
DATA AND SPECIFICATIONS

M03020106BEI2002

Type	**Six forward speeds, one reverse 2, 3, 4, 5, 6th Synchromesh, 1st and Reverse, Constant mesh**
Gear ratios:	**1st ····· 8.190 2nd ····· 5.073 3rd ····· 2.982 4th ····· 1.849 5th ····· 1.343 6th ····· 1.000 Reverse ····· 7.619**
Number of teeth:	**21**
Number of teeth: counter shaft	**Counter drive gear ····· 44 1st gear ····· 11 2nd gear ····· 19 3rd gear ····· 26 4th gear ····· 34 5th gear ····· 39 6th gear ····· - Reverse gear ····· 11**
Number of teeth: output shaft	**1st gear ····· 43 2nd gear ····· 46 3rd gear ····· 37 4th gear ····· 30 5th gear ····· 25 6th gear ····· - Reverse gear ····· 40**
Reverse idle gear	**23/11**
Power take-off opening	**On left side of gear case**
Oil capacity, gear box	**Approx. 5.0 liters {1.10 Imp.gal/1.32 US gal.}**
Lubricant, type	**Gear oil (API GL-4, MIL-L-2105)**
Viscosity, between-12 and 32°C {10 and 90°F}	**SAE90**
Viscosity, above 32°C {90°F}	**SAE140**

DESCRIPTION

M03020106BEC1001



M03020100002

1	Input shaft	15	Lock nut
2	Oil seal	16	Flange
3	Front bearing retainer	17	Output shaft
4	5th-6th shift sleeve	18	Speedometer driven gear
5	Shift shaft	19	Rear bearing retainer
6	Case cover	20	Cylindrical bearing
7	5th gear	21	Reverse shift sleeve
8	4th gear	22	1st-2nd shift sleeve
9	Inner shift lever	23	Counter shaft
10	3rd gear	24	3rd-4th shift sleeve
11	2nd gear	25	Counter drive gear
12	1st gear	26	Counter shaft front bearing
13	Reverse gear	27	Transmission case
14	Speedometer drive gear		

TROUBLESHOOTING

M03020106BEF3001

Symptom	Possible cause	Remedy/Prevention
Gear slip-off (Control system)	Joint worn and/or damaged	Replace joint.
	Bolts and nuts loose	Tighten bolts and nuts.
	Improper link rod adjustment	Adjust link rod.
Gear slip-off (Gear shift housing)	Lock ball and spring distorted and/or broken	Repair or replace as required.
	Groove for shift shaft worn	Replace shift fork.
Gear slip-off (Transmission gear)	Synchronizer hub and sleeve worn	Replace as required.
	Synchronizer sleeve and gear clutch teeth worn or damaged	Replace as required.
	Input shaft and/or output shaft bearing worn and/or broken	Replace bearing.
	Retainer ring and/or thrust washer worn and/or broken	Replace as required.
	Loosened transmission to engine mounting bolts	Tighten bolts.
Difficult gear engagement (Engine)	Engine idling speed too high	Adjust engine idling.
Difficult gear engagement (Clutch)	Improper disengagement of clutch	Adjust clutch.
	Clutch disc sticking	Repair or replace.
	Clutch shifter sleeve bent	Replace shifter sleeve.
Difficult gear engagement (Transmission)	Input shaft and/or output shaft bearing worn and/or damaged	Replace bearing.
	Engine crankshaft pilot bearing worn and/or damaged	Replace bearing.
	Synchronizer cone and ring worn	Replace as required.
Difficult gear engagement (Control system)	Looseness of control system and/or improper adjustment	Tighten and adjust control system.
	Improper motion of gear shift lever	Adjust shift lever.
	Shift and select rod worn	Replace shift and select rod.
	Rigid relay shaft nylon bushing and/or sticking of shafts	Replace as required.
Difficult gear engagement (Lubrication)	Improper lubrication of control lever	Lubricate as required.
	Shortage of gear oil and/or low oil viscosity	Add oil or change oil as required.
Noise (Transmission)	Grinding in transmission	Check screws, bolts or other foreign materials in transmission.
	Loose transmission-to-engine mounting bolts	Tighten bolts.
	Worn or damaged gear and bearing	Replace as required.
Noise (Lubrication)	Shortage of gear oil and/or low oil viscosity	Add oil or change oil as required.
Gear oil leaks (Transmission)	Leaks at the front and rear bearing retainer seal and gasket, case cover gasket, sand hole of case or shift shaft expansion plug	Repair and replace as required.
	Improper amount of gear oil and lack of oil viscosity	Check oil level and type.

Symptom	Possible cause	Remedy/Prevention
Gears are difficult to engage or cannot be engaged when engine is not operating.	Control cable damaged, bent, deteriorated or deformed due to heat	Replace control cable.
	Loose parts	Inspect and tighten.
	Damaged shift lever assembly	Replace shift lever.
	Damaged or bent parts on upper transmission cover section (lever, spring, etc.)	Replace.
	Faulty adjustment of control cable assembly and link rod	Adjust.
Excessive play in shift lever.	Worn bushing in joint or shift lever	Replace.
	Loose mounting bolts and nuts	Inspect and tighten.

SPECIAL TOOL

M03020106BEK1001

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

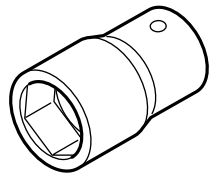
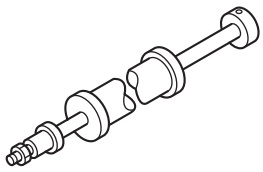
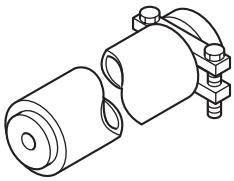
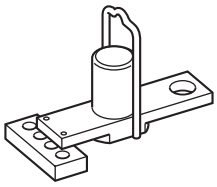
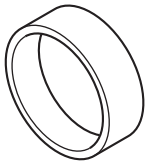
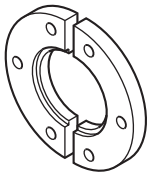
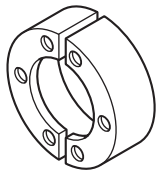
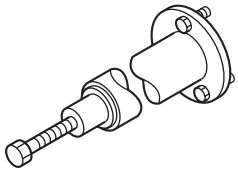
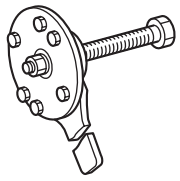
Illustration	Part number	Tool name	Remarks
	09839-4601	SOCKET WRENCH	
	09420-1442	SLIDING HAMMER	
	09650-2070	INPUT SHAFT PULLER	
	09630-2220	SHAFT HANGER	
	09699-1370	GUIDE	
	09653-1710	HOOK	

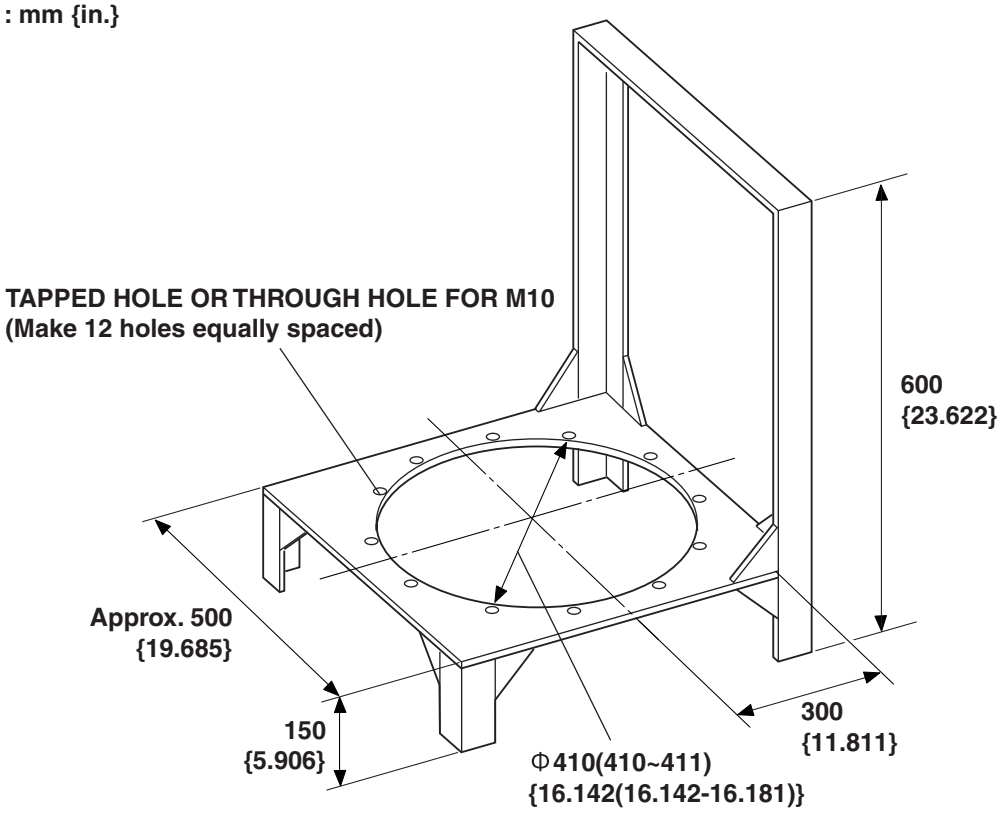
Illustration	Part number	Tool name	Remarks
	09653-1720 09653-1730 09653-1740	HOOK	
	09650-1881	PULLER	
	09650-2080	PULLER	

PROPOSAL TOOL (TRANSMISSION CASE ASSEMBLY)

M03020106BEK1003

TRANSMISSION WORKSTAND

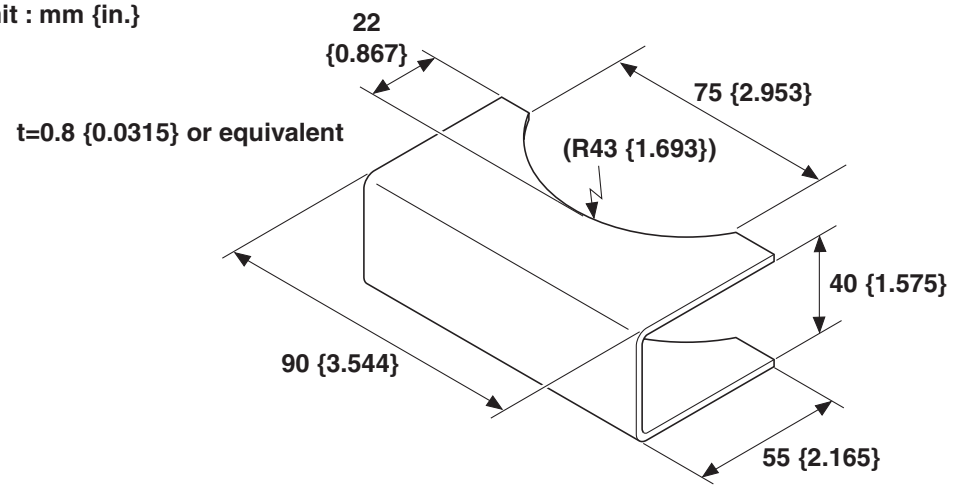
Unit : mm {in.}



M03020100004

JIG FOR PREVENTING DETACHMENT

Unit : mm {in.}



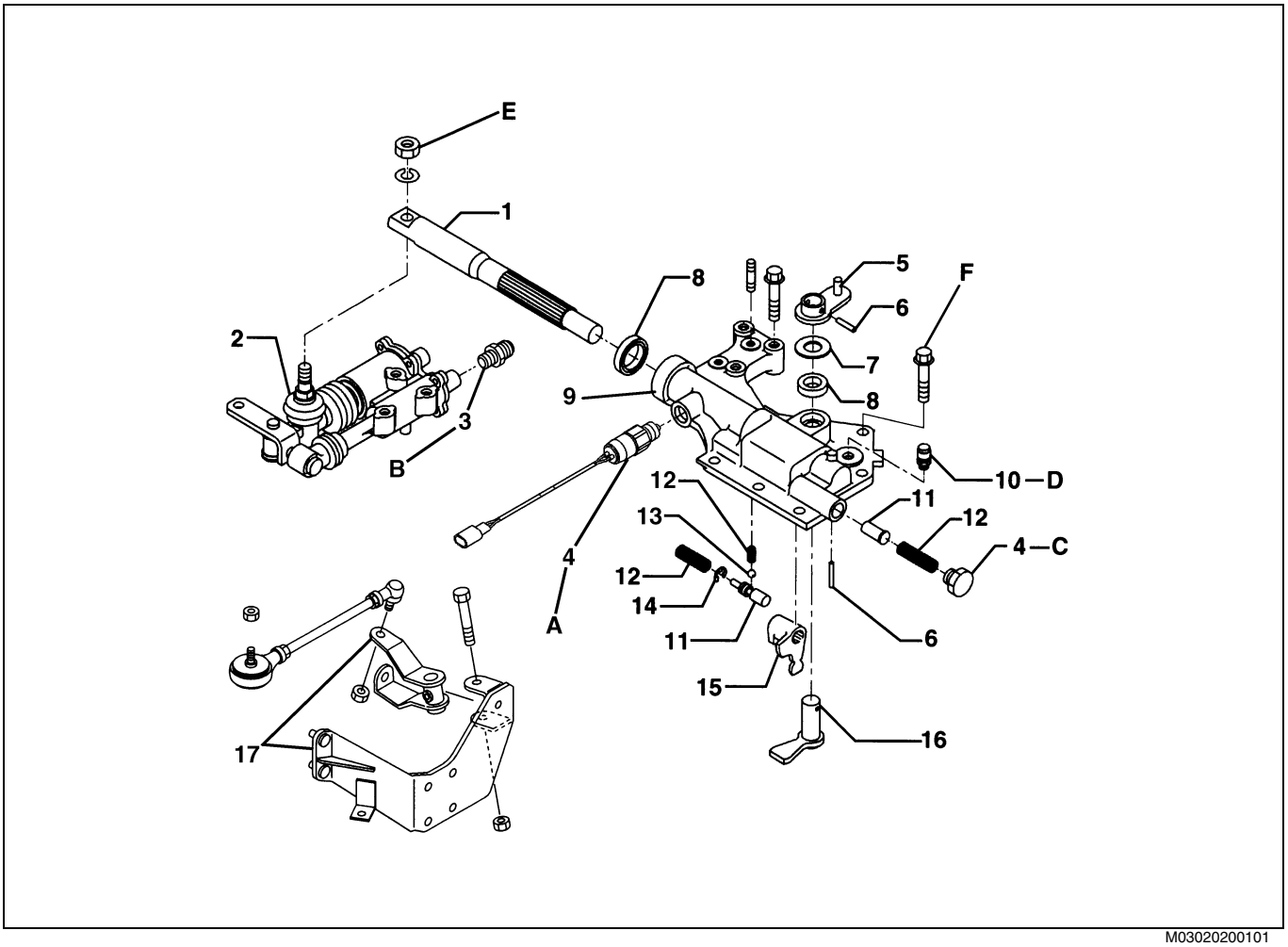
M03020100005

GEAR SHIFT HOUSING (LX06S)

COMPONENT LOCATOR

M03020206BED1003

WITH POWER SHIFT



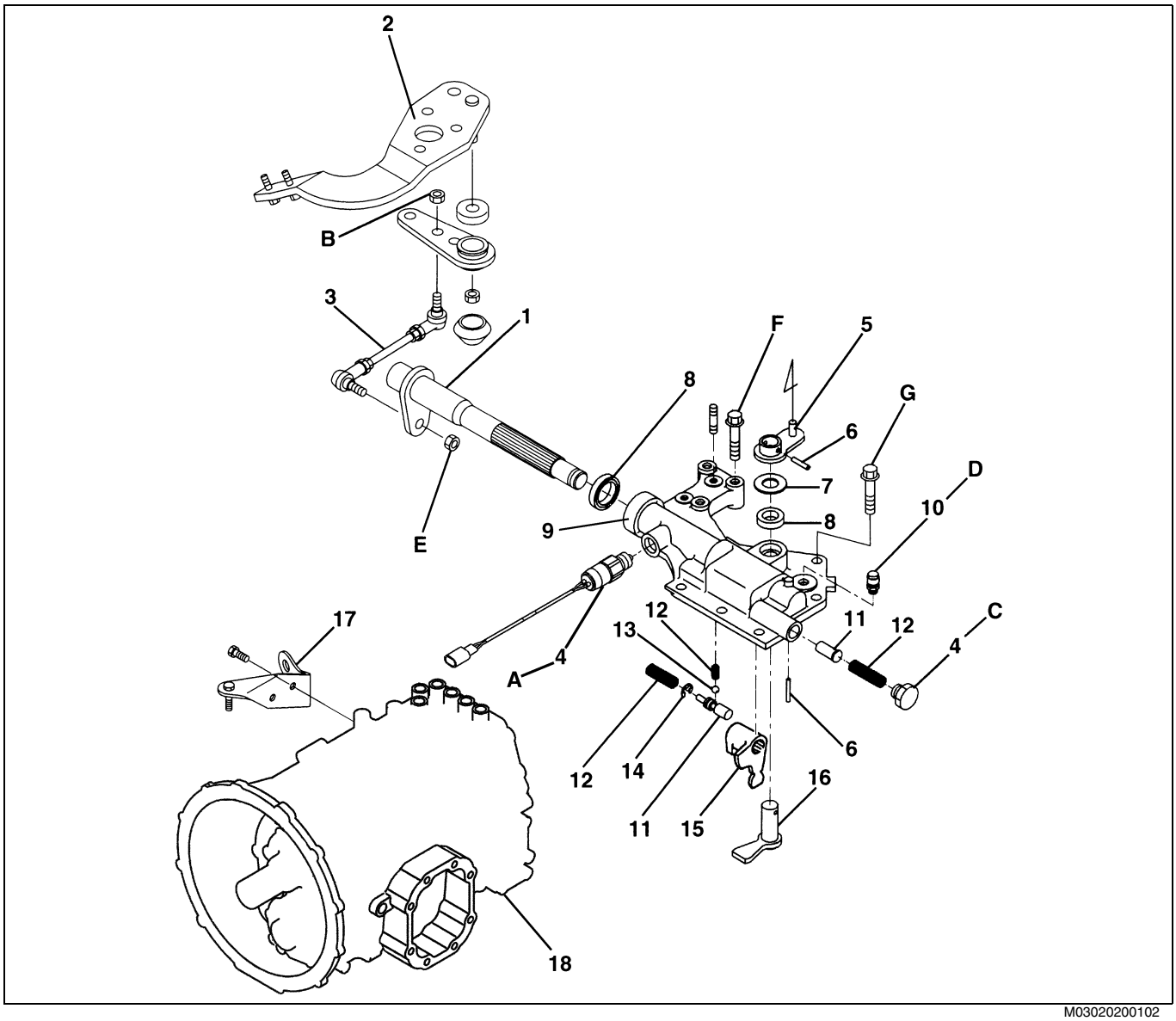
M03020200101

1	Shift lever shaft	10	Air breather
2	Power shift assembly	11	Lockout plunger
3	Pipe joint	12	Compression spring
4	Neutral start switch	13	Steel ball
5	Outer select lever	14	E-ring
6	Spring pin	15	Inner shift lever
7	Plain washer	16	Select lever shaft
8	Oil seal	17	Gear control lever assembly
9	Shift lever shaft housing		

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

A	34-38 {350-387,25-28}	D	9.8-11.8 {100-120, 7.3-8.6}
B	20-30 {204-305, 15-22}	E	75.5-91.2 {770-929, 56-67}
C	25-30 {255-305,19-22}	F	43.5-54.5 {444-555, 30-40}

WITHOUT POWER SHIFT



M03020200102

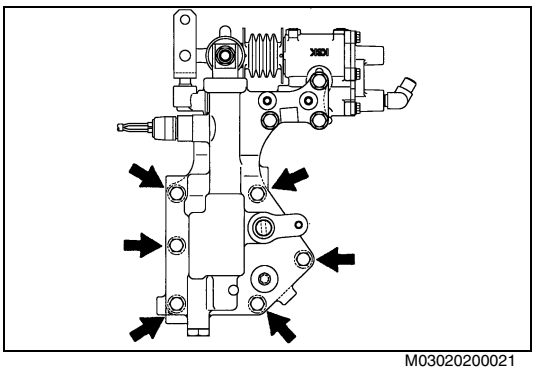
1	Shift lever shaft	10	Air breather
2	Control rod support	11	Lockout plunger
3	Control rod end	12	Compression spring
4	Neutral start switch	13	Steel ball
5	Outer select lever	14	E-ring
6	Spring pin	15	Inner shift lever
7	Plain washer	16	Select lever shaft
8	Oil seal	17	Pipe joint bracket
9	Shift lever shaft housing	18	Transmission case assembly

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

A	34-38 {350-387,25-28}	E	18.6-28.4 {190-289, 14-20}
B	18-26 {184-265, 14-19}	F	24.5-37.3 {250-380, 19-27}
C	25-30 {255-305,19-22}	G	43.5-54.5 {444-555, 33-40}
D	9.8-11.8 {100-120, 7.3-8.6}		

OVERHAUL

M03020206BEH2001

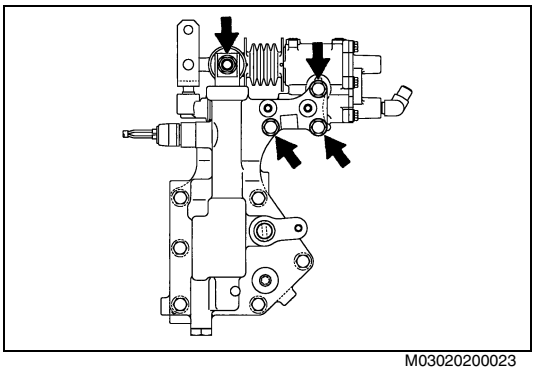

M03020200021

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE SHIFT LEVER HOUSING.

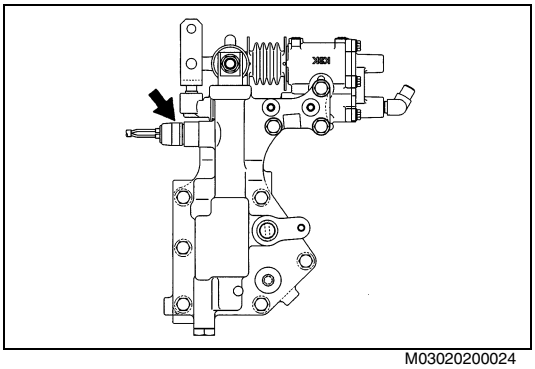
(1) Take off the liquid gasket adhered to the contact surface using a scraper.

NOTICE:
Be careful not to damage the contact surface.


M03020200023

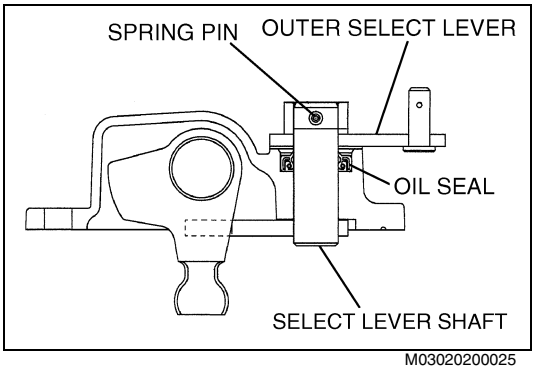
2. REMOVE THE POWER SHIFT.

(1) Remove the power shift.


M03020200024

3. REMOVE THE NEUTRAL SWITCH.

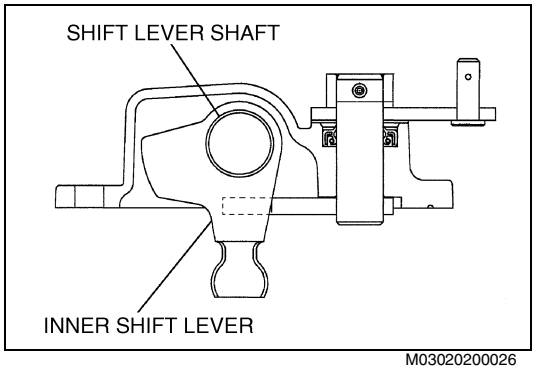
(1) Remove the neutral switch from the shift lever housing.



M03020200025

4. REMOVE THE OUTER SELECT LEVER AND SELECT LEVER SHAFT.

(1) Using a copper hammer and tapping rod, remove the spring pin.
(2) Remove the outer select lever and select lever shaft.
(3) Remove the oil seal from the shift lever housing.

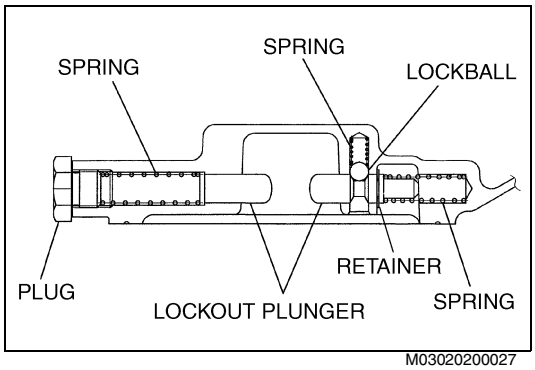


M03020200026

5. REMOVE THE SHIFT LEVER SHAFT AND INNER SHIFT LEVER.

(1) Remove the shift lever shaft and inner shift lever from the shift lever housing.

(2) Remove the oil seal from the shift lever housing.



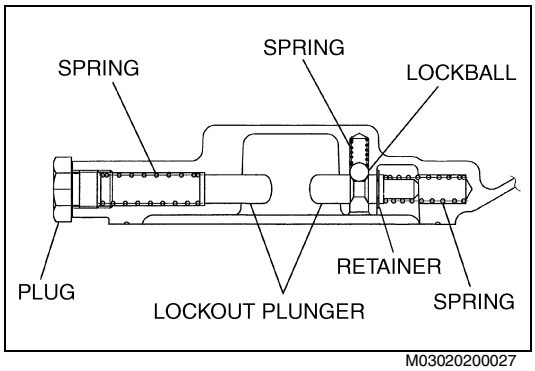
M03020200027

6. REMOVE THE LOCKOUT PLUNGER, LOCK BALL AND RETAINER.

(1) Loosen the plug to remove the spring, lock ball retainer and lock-out plunger.

NOTICE:
The spring may fly out of the groove. So wear safety glasses while working.

IMPORTANT POINTS - ASSEMBLY



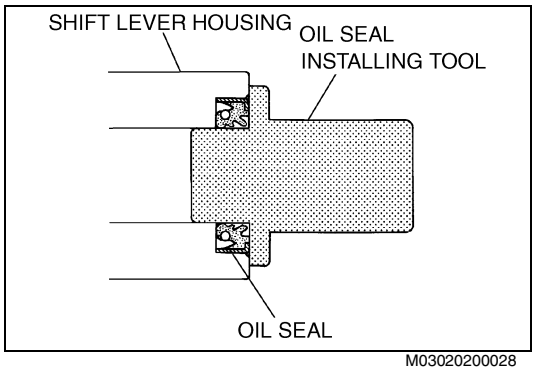
M03020200027

1. INSTALL THE LOCKOUT PLUNGER, LOCKBALL AND SPRING.

(1) Apply bearing grease to the lockout plunger.

(2) Insert the spring, lock ball to the installing hole for lockout plunger in order, and insert the lockout plunger so that the lock ball does not fly out and install the retainer.

(3) After applying adhesive to the plug, install the lockout plunger, the spring and the plug.



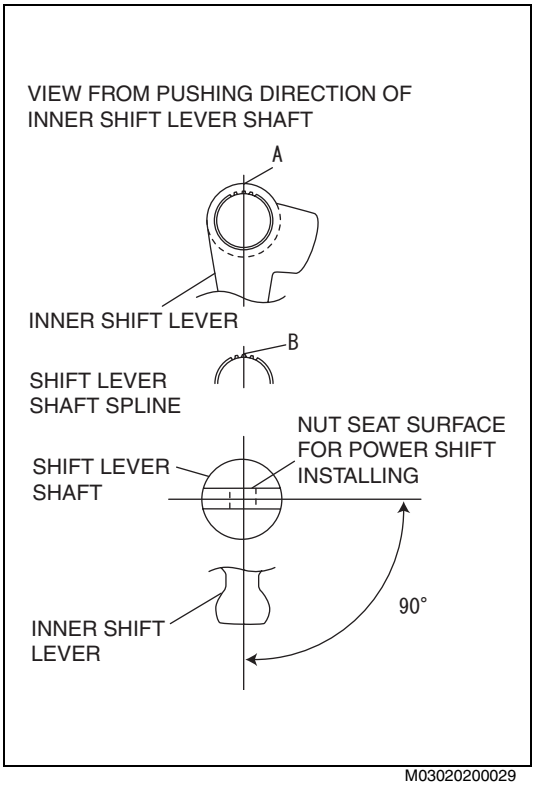
M03020200028

2. INSTALL THE SHIFT LEVER SHAFT AND INNER SHIFT LEVER.

(1) Using a receiving block and a hammer, drive a new oil seal into the shift lever housing.

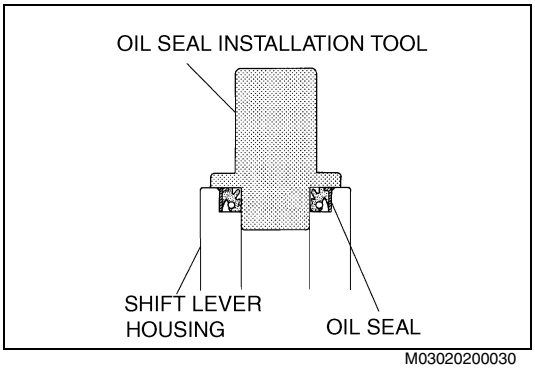
NOTICE:
Be careful not to damage the lip part of the oil seal.

(2) Apply bearing grease to the lip part of the oil seal and shaft part of the shift lever shaft.



M03020200029

(3) Match the shift lever shaft and inner shift lever as shown, and push the shift lever shaft into the inner shift lever. (They should be installed so that the nut seat surface for power shift installing makes an angle of 90° with inner shift lever.)



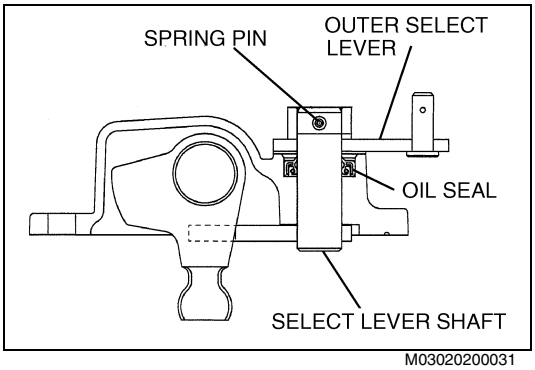
M03020200030

3. INSTALL THE SELECT LEVER SHAFT AND OUTER SELECT LEVER.

(1) Using a receiving block and hammer, drive a new oil seal into the shift lever housing.

NOTICE:
Be careful not to damage the lip part of the oil seal.

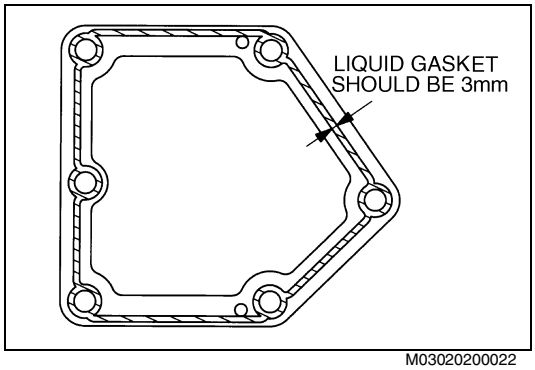
(2) Apply bearing grease to the lip part of the oil seal and shaft part of the select lever shaft.



M03020200031

(3) Match the installing position of the select lever shaft and outer select lever and fix the spring pin.

NOTICE:
Be sure to match the position of the select lever shaft, outer select lever and spring pin.



M03020200022

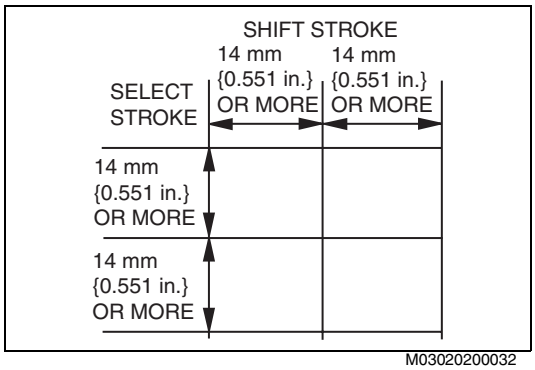
4. INSTALL THE SHIFT LEVER HOUSING

(1) Remove oil, dust etc. on the contact surface of the shift lever housing and transmission case.

(2) Coat the transmission case with liquid gasket (ThreeBond #1216 or equivalent) as shown in the figure.

NOTICE:

- **The race of the liquid gasket must be continuous.**
- **Coating width of the liquid gasket should be 3 mm {0.1181 in.}**



M03020200032

IMPORTANT POINT - INSPECTION

1. INSPECT THE STROKE OF THE INNER SHIFT LEVER.

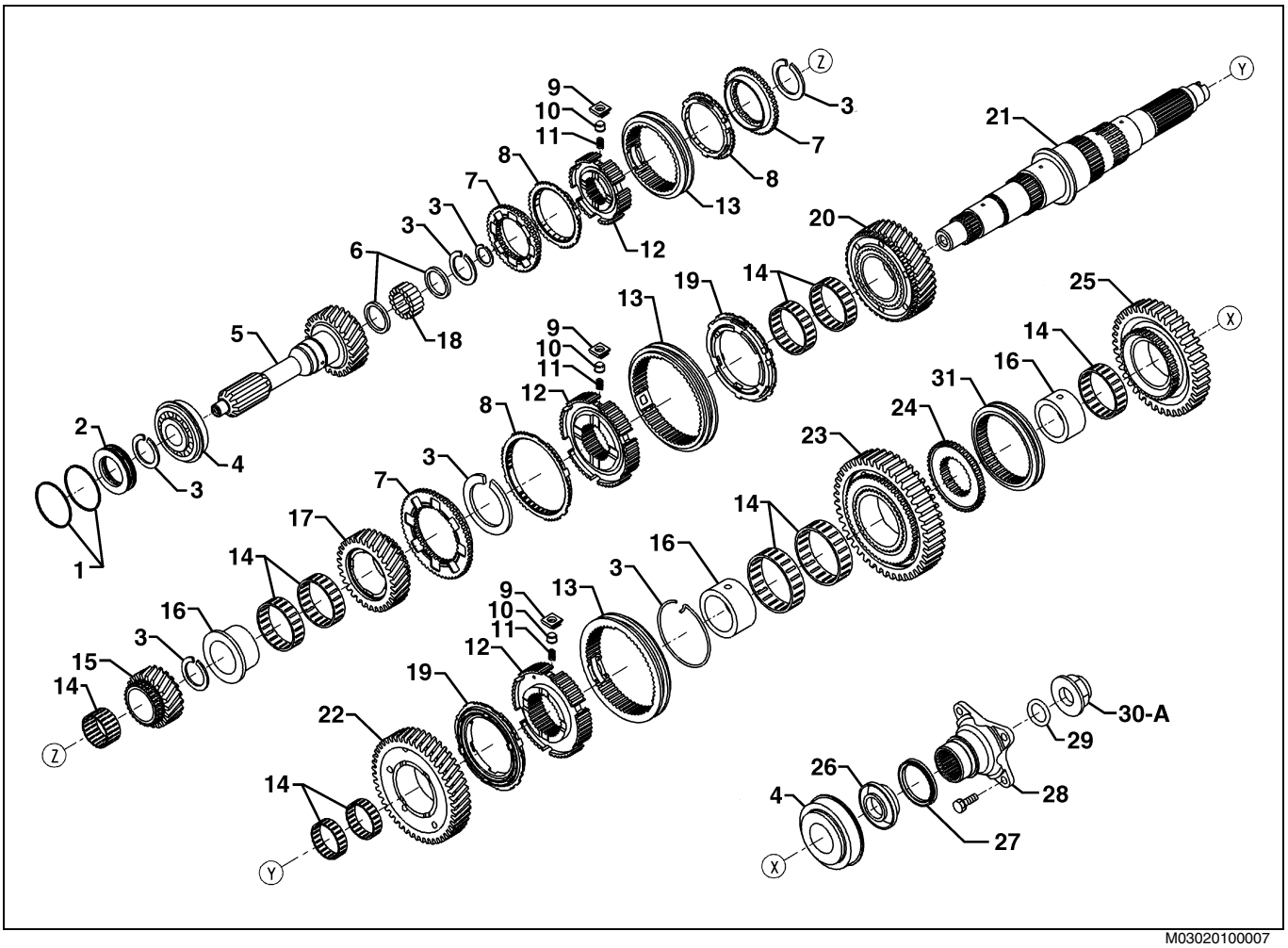
(1) Fit the scale to the inner shift lever and measure the shift stroke and select stroke of the inner shift lever.

	STANDARD
SHIFT STROKE	14 mm {0.551 in.} or more
SELECT STROKE	14 mm {0.551 in.} or more

CASE AND MAIN UNIT (LX06S)

COMPONENT LOCATOR

M03020506BED1001

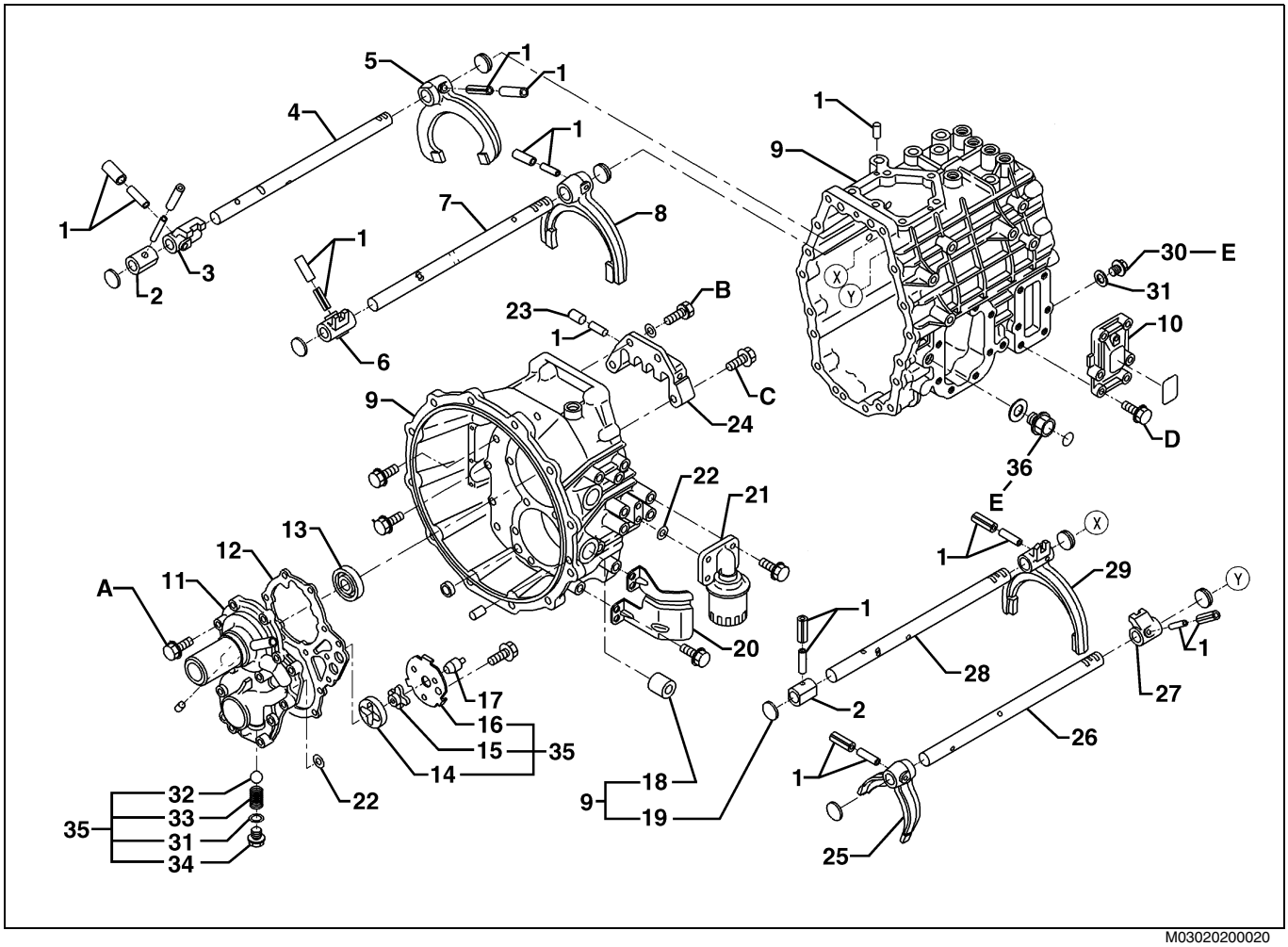


M03020100007

1	Seal ring	12	Synchronizer hub	23	1st gear sub-assembly
2	Oil muffler	13	Synchronizer sleeve	24	Constant hub
3	Retainer ring	14	Needle roller bearing	25	Reverse gear
4	Cylindrical bearing	15	5th gear	26	Oil seal
5	Input shaft sub-assembly	16	Bushing	27	Dust reflector
6	Spacer	17	4th gear	28	Flange
7	Synchronizer cone	18	Roller bearing	29	O-ring
8	Synchronizer ring	19	Synchronizer ring sub-assembly	30	Lock nut
9	Synchronizer key	20	3rd gear sub-assembly	31	Constant sleeve
10	Synchronizer head	21	Output shaft		
11	Compression spring	22	2nd gear sub-assembly		

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

A	587-783 {5,986-7,984, 433-577}	

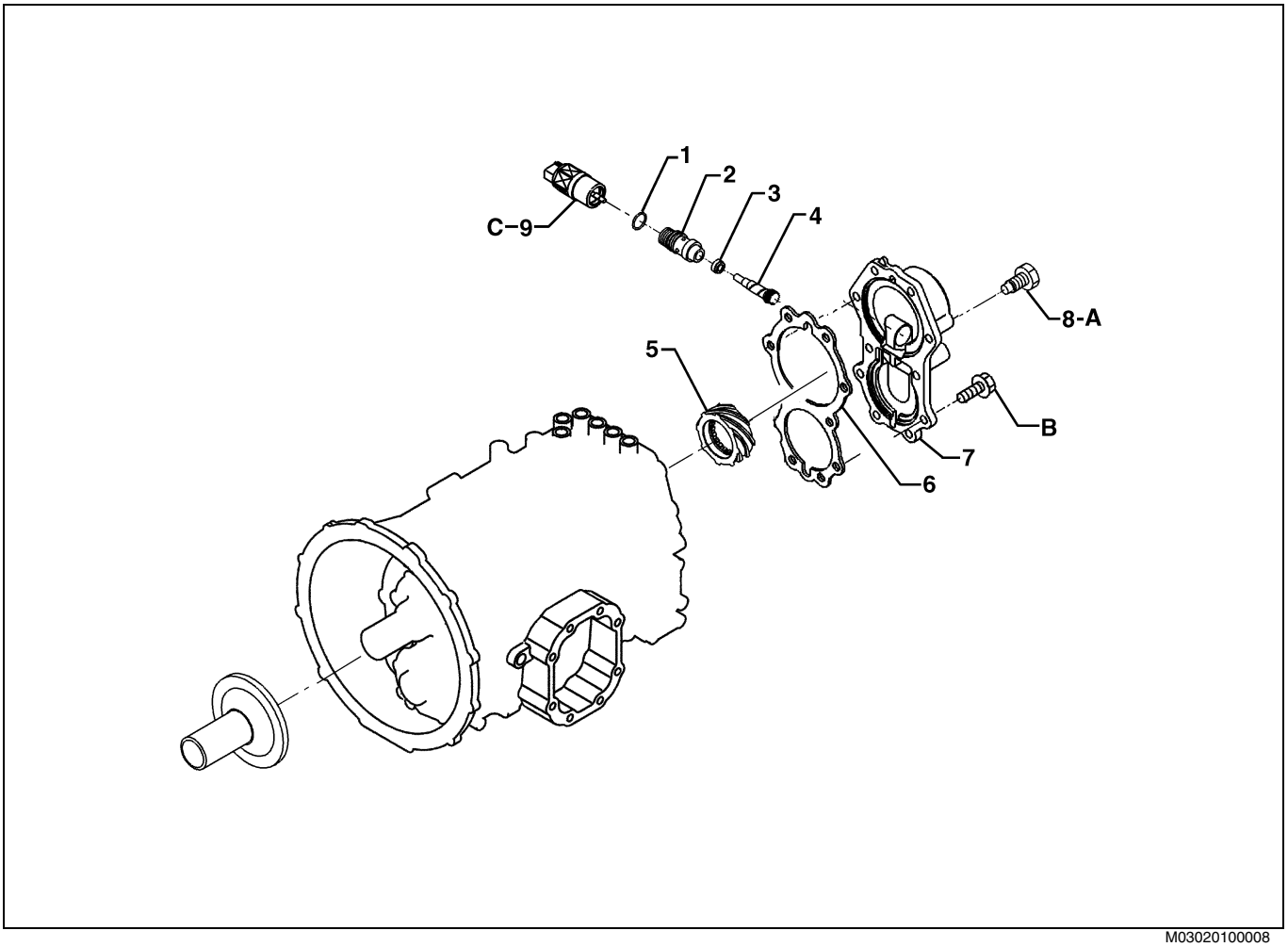


M03020200020

1	Concentric pin	19	Expansion plug
2	Spacer	20	Oil filter shield
3	Reverse shift head	21	Oil filter assembly
4	Reverse shift shaft	22	O-ring
5	Reverse shift fork	23	Lockout plunger
6	1st-reverse shift head	24	Control lever stopper
7	1st-reverse shift shaft	25	5th-6th shift fork
8	1st-reverse shift fork	26	5th-6th shift shaft
9	Transmission case cover assembly	27	5th-6th shift head
10	Idler gear cover	28	3rd-4th shift shaft
11	Front bearing retainer	29	3rd-4th shift fork
12	Gasket	30	Drain plug
13	Oil seal	31	Gasket
14	Outer rotor	32	Steel ball
15	Inner rotor	33	Compression spring
16	Oil pump cover	34	Plug
17	Oil pump drive shaft	35	Front bearing retainer assembly
18	Release shaft bearing	36	Filler plug

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

A	54-68 {550-700, 40-50}	D	23-29 {235-295, 17-21}
B	44.5-53.5 {454-545, 33-39}	E	63.5-92.5 {648-943, 47-68}
C	44.5-53.5 {454-545, 33-39}		

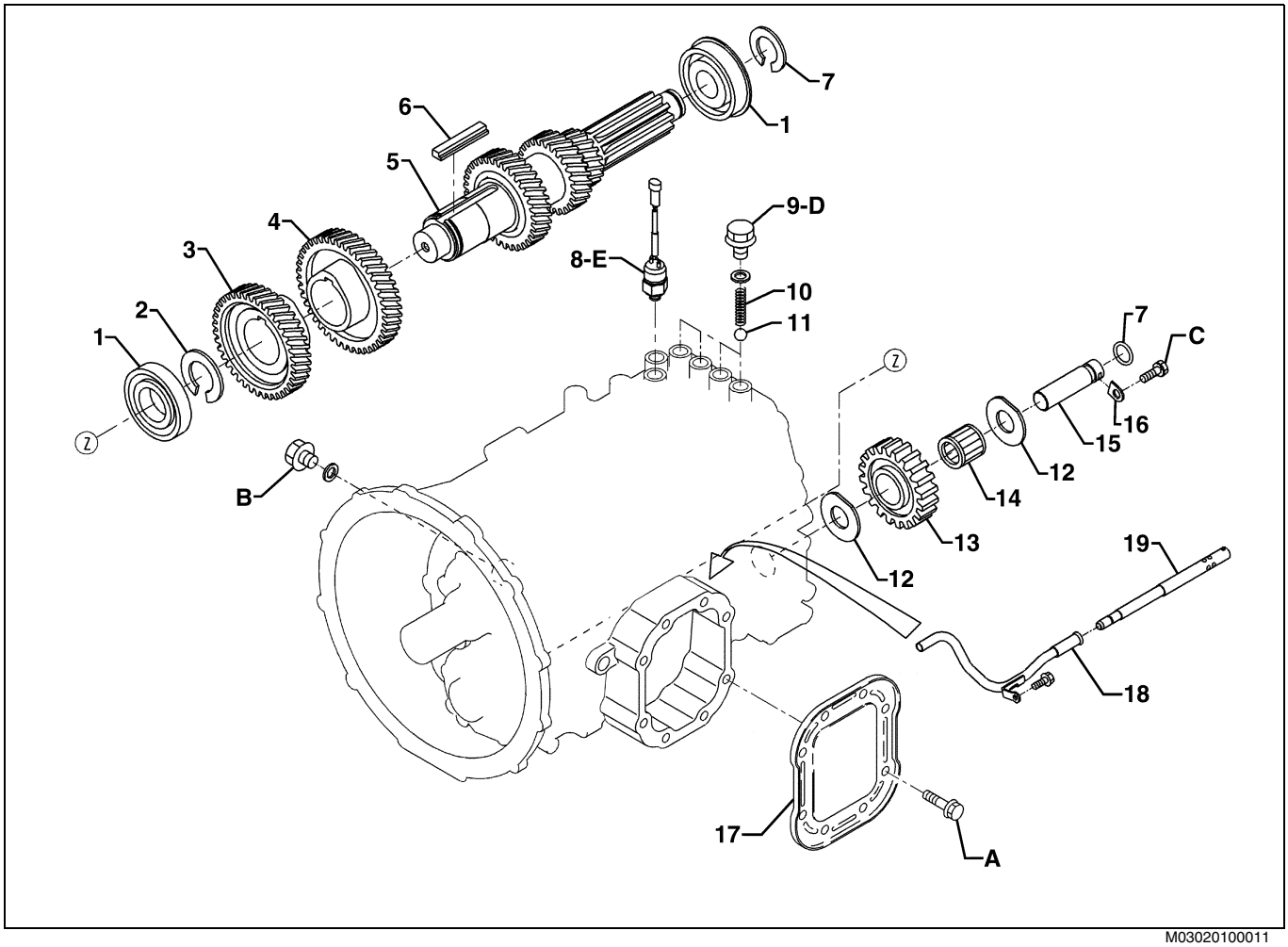


M03020100008

1	O-ring	6	Gasket
2	Speedometer gear bushing	7	Drain plug
3	Oil seal	8	Gasket
4	Speedometer driven gear	9	Rear bearing retainer assembly
5	Speedometer drive gear	10	Set screw

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

A	8.5-10.5 {87-107, 6.3-7.7}	B	54-68 {550-700, 40-50}



M03020100011

1	Cylindrical roller bearing	11	Lock ball
2	Retainer ring	12	Thrust washer
3	Counter drive gear	13	Reverse idler gear
4	Counter 5th gear	14	Needle roller bearing
5	Counter shaft	15	Reverse idler shaft
6	Key	16	Lock plate
7	Retainer ring	17	Power take-off cover
8	Back up lamp switch	18	Inlet oil pump pipe sub-assembly
9	Plug	19	Oil strainer
10	Compression spring		

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

A	Without power shift: 19.5-30.5 {199-311, 15-22}	C	19-25 {194-254, 15-18}
	With power shift: 54-68 {551-693, 40-50}	D	49-63 {500-642, 37-46}
B	63.5-92.5 {648-943, 47-68}	E	26-30 {266-305, 20-22}

TRANSMISSION CASE ASSEMBLY (LX06S)

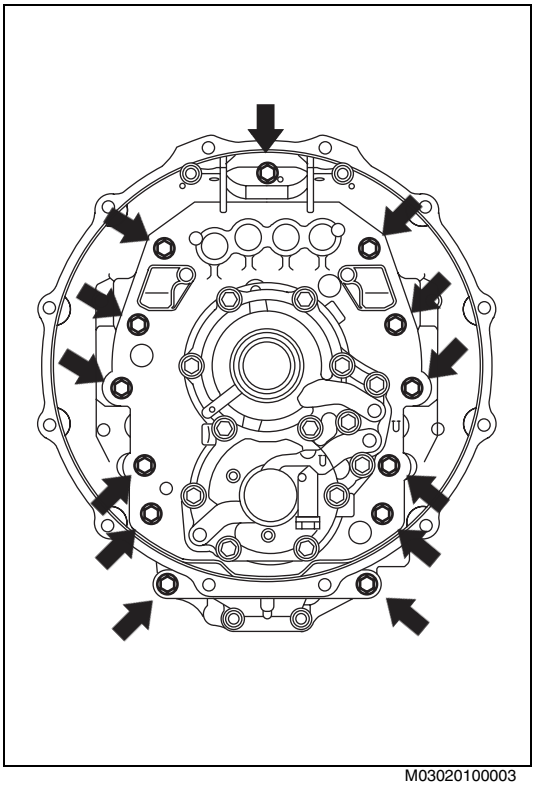
OVERHAUL

M03020606BEH2001

IMPORTANT POINTS - DISMOUNTING

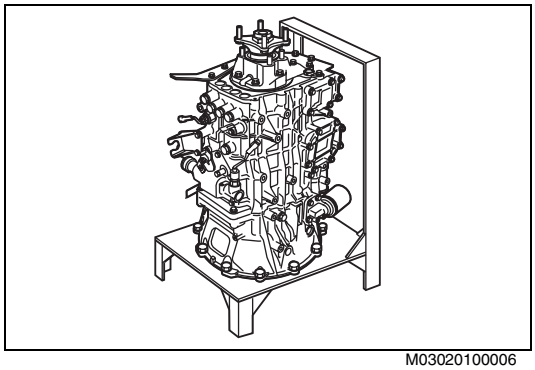
CAUTION:
Do not work on the transmission while it is still hot. This can result in personal injury.

1. **BLOCK THE WHEELS.**
2. **DRAIN THE TRANSMISSION OIL.**
3. **DISCONNECT THE PROPELLER SHAFT.**
4. **DISCONNECT THE ELECTRIC HARNESS AND OTHER ATTACHMENTS.**
5. **DISCONNECT THE PARKING BRAKE CABLE.**
6. **DISCONNECT THE TRANSMISSION CONTROL.**
7. **REMOVE THE CLUTCH CONTROL.**
8. **REMOVE THE TRANSMISSION CASE COVER FITTING BOLTS.**



M03020100003

HINT:
Disassembly and reassembly of the transmission is carried out basically by standing the transmission vertically. So, remove the bolts fixing the transmission case from the clutch housing side for better workability.

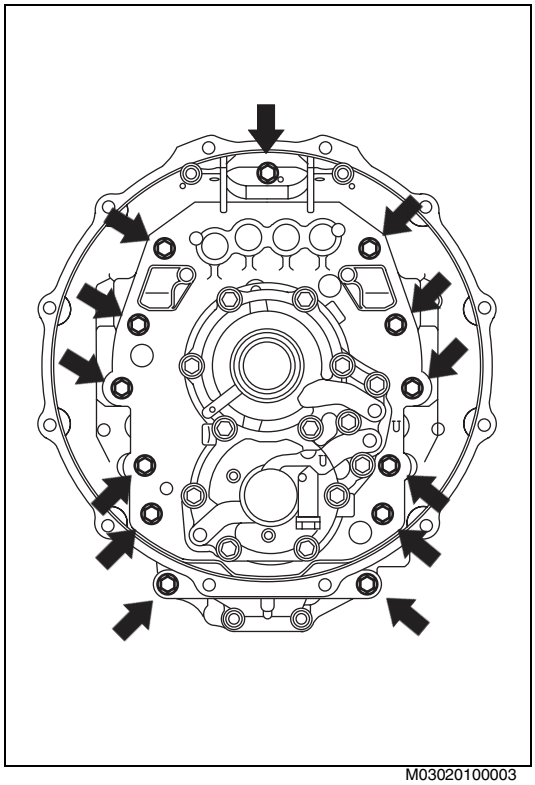

M03020100006

9. INSTALL THE TRANSMISSION ASSEMBLY INTO A TRANSMISSION WORKSTAND.

(1) Wire the transmission assembly rearward and lift it using a hoist.

NOTICE:
As the transmission case is made of aluminum, be careful not to shock it.

(2) Fix the transmission assembly to a workstand on the level ground with bolts and nuts.


M03020100003

IMPORTANT POINTS - MOUNTING

1. REMOVE THE TRANSMISSION WORKSTAND.

(1) Install the transmission case cover fitting bolts.

NOTICE:
Temporarily after tightening all bolts in equal, tighten them regularly.

2. INSTALL THE CLUTCH CONTROL.

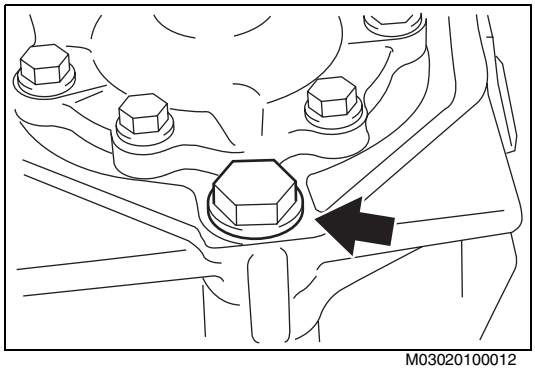
3. CONNECT THE TRANSMISSION CONTROL.

4. CONNECT THE PARKING BRAKE CABLE.

5. CONNECT THE ELECTRIC HARNESS AND OTHER ATTACHMENTS

6. CONNECT THE PROPELLER SHAFT.

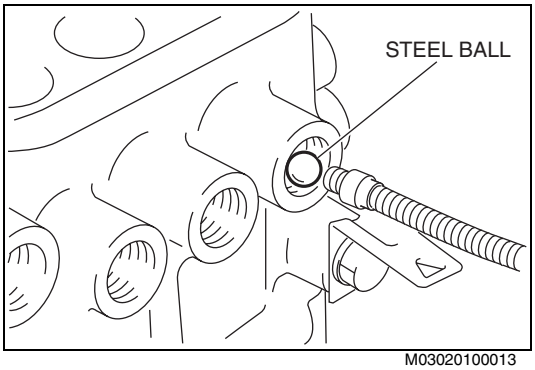
7. FILL THE TRANSMISSION WITH GEAR OIL UP TO THE FILLER PLUG HOLE.


M03020100012

IMPORTANT POINTS - DISASSEMBLY

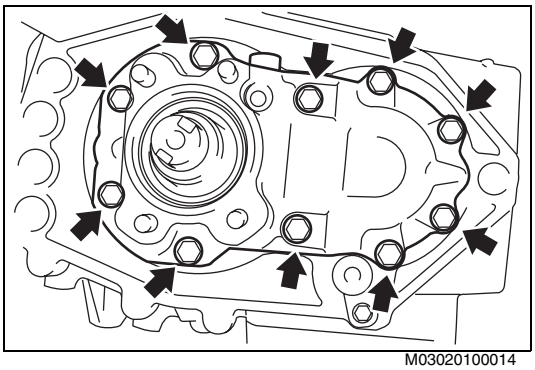
1. REMOVE THE PARKING BRAKE AND FLANGE COUPLING.

2. REMOVE THE OIL STRAINER.

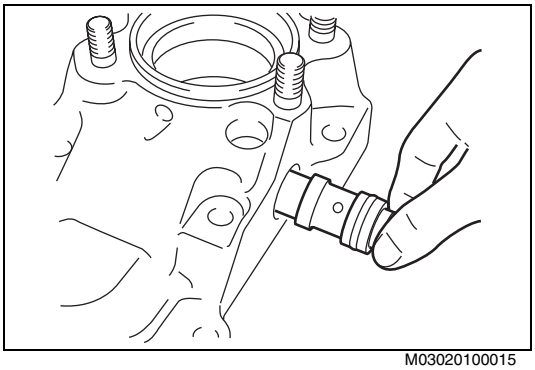


M03020100013

3. REMOVE THE STEEL BALL.
(1) Remove the plug on the transmission case upper surface.
(2) Remove the spring and steel ball using a magnetic finger.

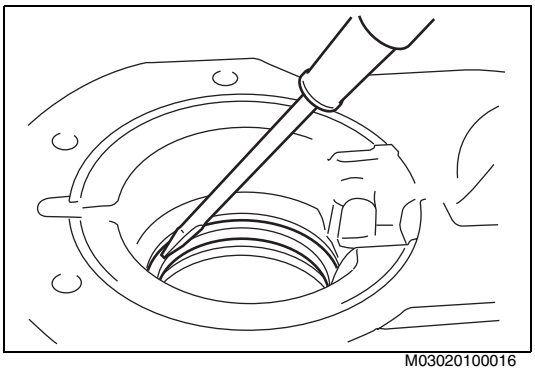

M03020100014

4. REMOVE THE REAR BEARING RETAINER ASSEMBLY.


M03020100015

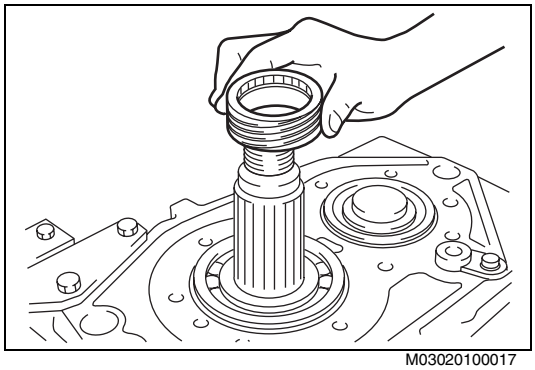
5. DISASSEMBLE THE REAR BEARING RETAINER ASSEMBLY.
(1) Remove the speedometer driven gear.
a. Remove the set screw of speedometer driven gear bushing and remove the driven gear and bushing.
b. Remove the O-ring and oil seal from the speedometer driven gear bushing.

NOTICE:
Remember the position of aligning marks when removing the speedometer driven gear bushing.

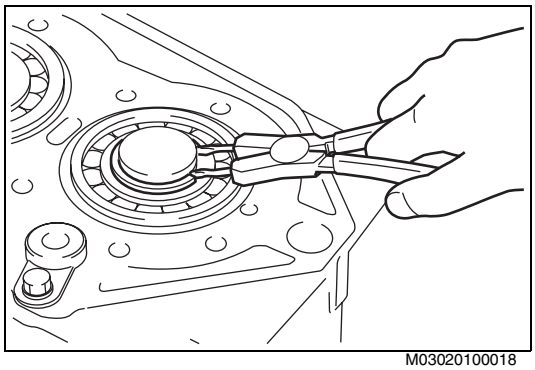

M03020100016

(2) Remove the oil seal.
a. Using a flat blade screwdriver, remove the oil seal from the rear bearing retainer.

NOTICE:
Be careful not to damage the rear bearing retainer.


M03020100017

6. REMOVE THE SPEEDOMETER DRIVE GEAR.


M03020100018

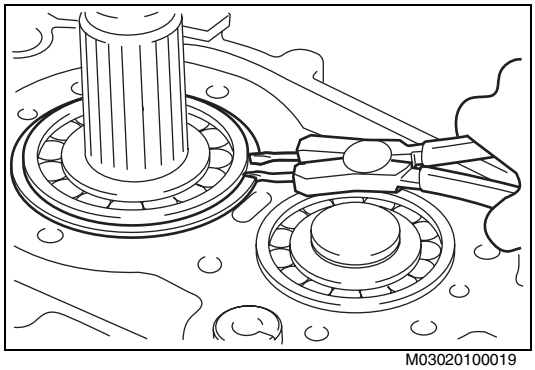
7. REMOVE THE TRANSMISSION CASE ASSEMBLY.

(1) Using a snap ring expander, remove the retainer ring from the counter shaft.

NOTICE:
The retainer ring may fly out of the groove. Wear safety glasses while working.

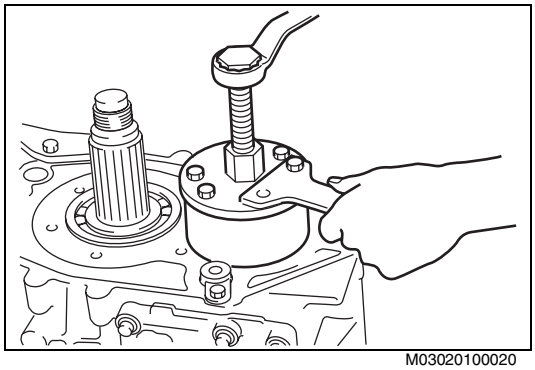
(2) Using a snap ring expander, remove the retainer ring from the rear bearing on the counter shaft side.

NOTICE:
The retainer ring may fly out of the groove. Wear safety glasses while working.


M03020100019

(3) Using a snap ring expander, remove the retainer ring from the rear bearing on the output shaft side.

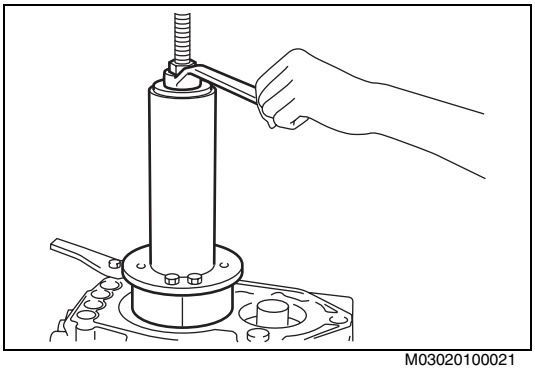
NOTICE:
The retainer ring may fly out of the groove. Wear safety glasses while working.


M03020100020

(4) Install the special tool to the groove of the rear bearing outer periphery on the counter shaft side.
SST:
Hook (09653-1730)
Puller (09650-2080)

(5) Pull out the rear bearing by tightening the bolt of the special tool puller part.

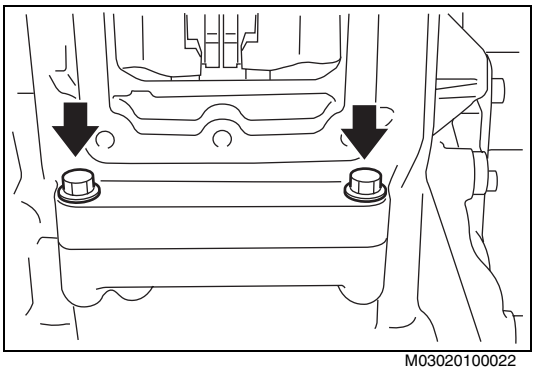
(6) Remove the spacer.


M03020100021

(7) Install the special tool to the groove of the rear bearing outer periphery on the output shaft side.
SST:
Hook (09653-1720)
Puller (09650-1881)

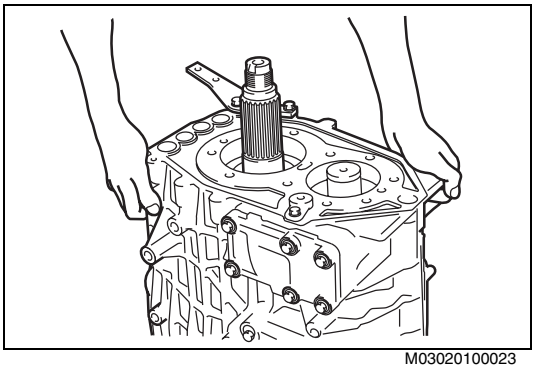
(8) Pull out the rear bearing by tightening the bolt of the special tool puller part.

(9) Remove the spacer.


M03020100022

(10) Remove the 4 bolts connected to the clutch housing from the transmission case side.

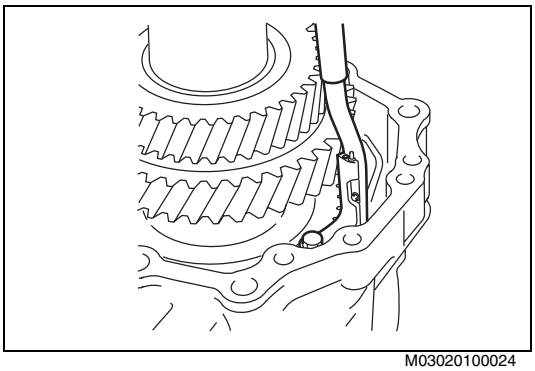
(11) Insert a chisel between lip parts of right and left side connected on the transmission case, and tap the chisel using a hammer to separate clutch housing and transmission case.


M03020100023

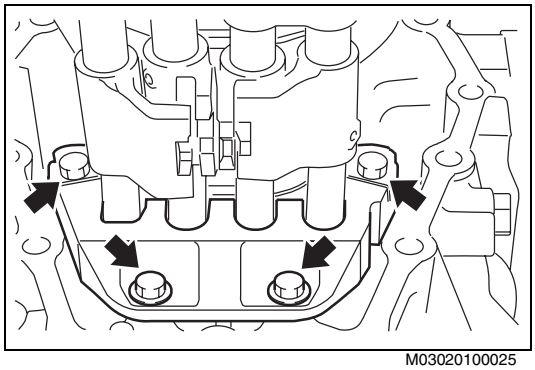
(12) Lift the transmission case assembly straight to remove it.

(13) Take off the liquid gasket adhered to the contact surface using a scraper.

NOTICE:
Be careful not to damage the contact surface.


M03020100024

8. REMOVE THE OIL PIPE.

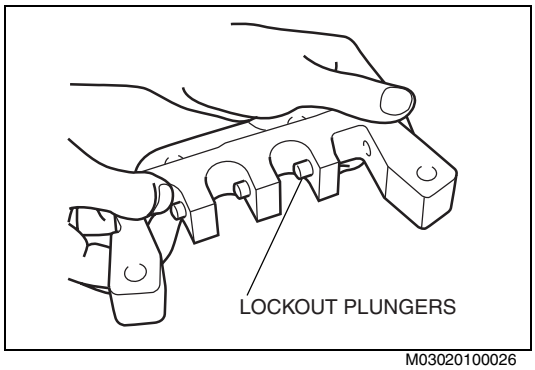

M03020100025

9. REMOVE THE CONTROL LEVER STOPPER, LOCKOUT PLUNGER AND INTER LOCK PIN.

(1) Loosen the 4 bolts to remove the control lever stopper.

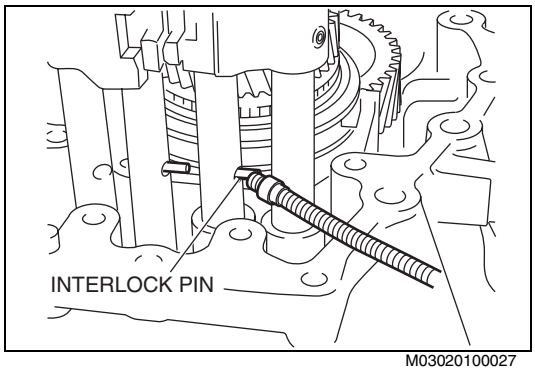
NOTICE:

The inner 2 bolts of the control lever stopper fitting bolts are reamer bolt, so keep the inner 2 bolts separately.



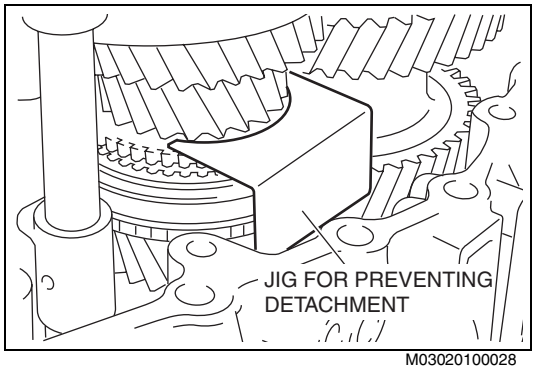
M03020100026

(2) Remove the 3 lockout plungers from the control lever stopper.



M03020100027

(3) Using a magnetic finger, remove the 2 interlock pins from the shift shaft.



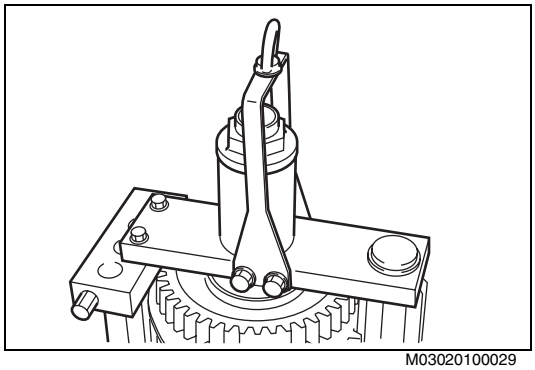
M03020100028

10. REMOVE THE OUTPUT SHAFT ASSEMBLY, COUNTER SHAFT ASSEMBLY AND SHIFT SHAFT ASSEMBLY.

(1) Install the jig for preventing detachment into the 5th-6th synchronizer unit to prevent the 5th-6th synchronizer cone and ring from detaching.

HINT:

In case of not using the jig for preventing detachment, support parts for the prevention of detachment by one of the worker.


M03020100029

(2) Using the special tool, fix the output shaft assembly, counter shaft assembly and shift shaft assembly.
SST: Shaft hanger (09630-2220)

HINT:

The retainer ring and the lock nut removed previously should be reused.

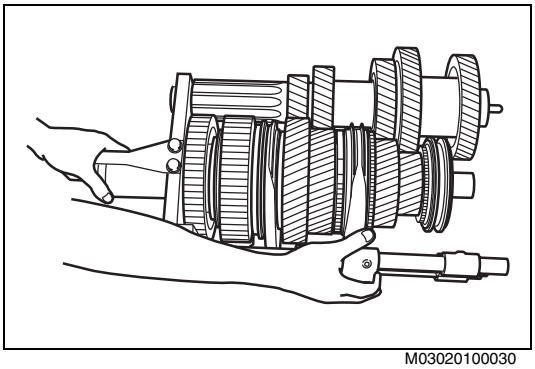
(3) Using a hoist, lift up the output shaft assembly, counter shaft assembly and shift shaft assembly together.

NOTICE:

- **Lift them up little by little.**
- **Be careful not to make shift shaft be caught.**

- **Be careful not to damage the gear and bearing etc. when lifting up.**

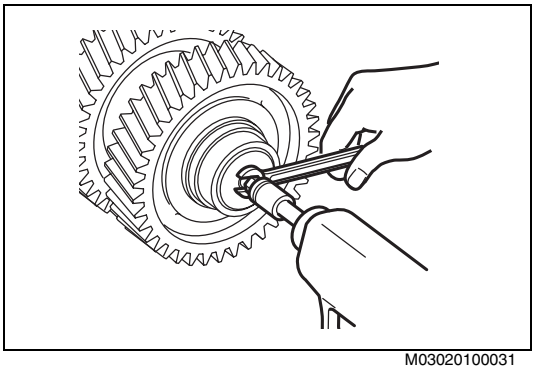
(4) Remove the special tool and separate the output shaft assembly, counter shaft assembly and shift shaft assembly.



M03020100030

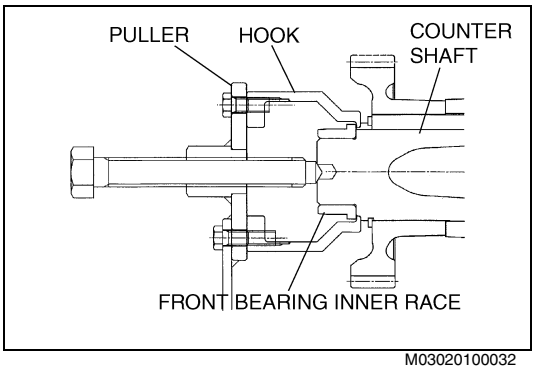
11. REMOVE THE COUNTER SHAFT FRONT BEARING INNER RACE.

(1) While holding the tapered portion of the oil pump drive pin by wrench, rotate (or vibrate) the oil pump drive pin by using impact wrench, and then pull it out.



M03020100031

(2) Using the special tool, pull out the front bearing inner race from the counter shaft.
SST:
Hook (09653-1740)
Puller (09650-2080)



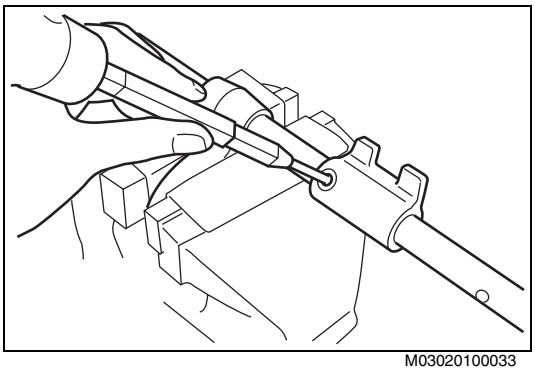
M03020100032

12. DISASSEMBLE THE SHIFT SHAFT ASSEMBLY.

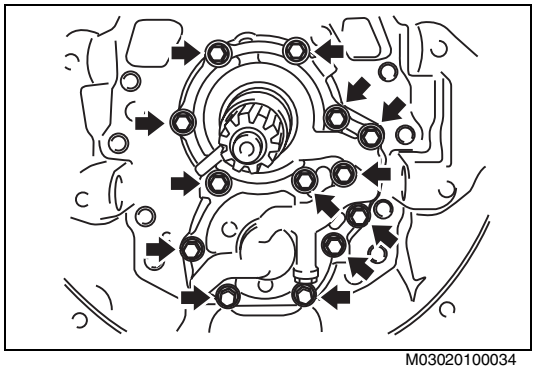
(1) Remove the shift fork and shift head.

a. Using a 5.0 mm {0.197 in.} diameter tapping rod and a hammer, drive out the inner pin and outer pin from the shift fork, shift head and spacer.

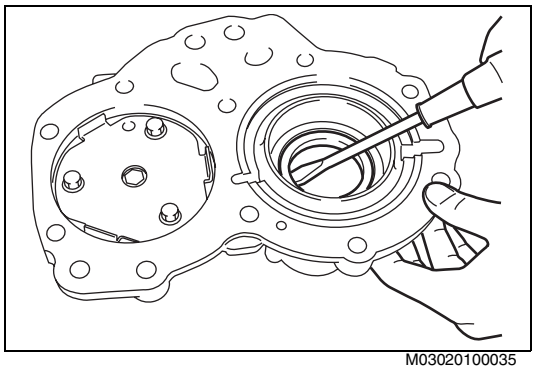
b. Remove the spacer, shift fork and shift head from the shift shaft.



M03020100033


M03020100034

13. REMOVE THE FRONT BEARING RETAINER ASSEMBLY.

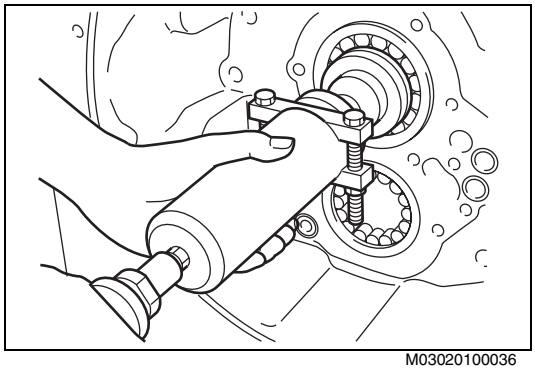

M03020100035

14. DISASSEMBLE THE FRONT BEARING RETAINER ASSEMBLY.

(1) Remove the oil seal.

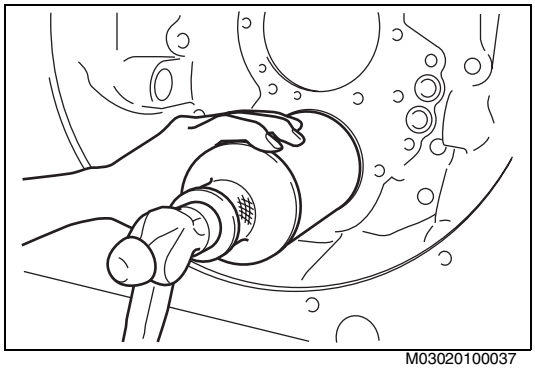
a. Using a flat blade screwdriver, remove the oil seal from the front bearing retainer.

NOTICE:
Be careful not to damage the front bearing retainer.


M03020100036

15. REMOVE THE INPUT SHAFT ASSEMBLY.

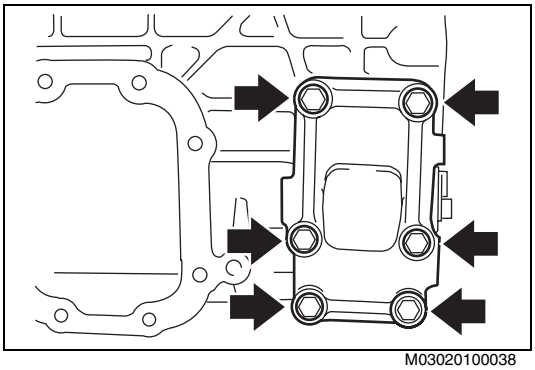
(1) Using the special tool, pull out the input shaft assembly from the clutch housing.
SST:
Sliding hammer (09420-1442)
Input shaft puller (09650-2070)


M03020100037

16. REMOVE THE FRONT BEARING OUTER RACE ON THE COUNTER SHAFT SIDE.

(1) Using a receiving block and a hammer, tap the front bearing outer race equally to drive it out.

17. REMOVE THE OIL FILTER ASSEMBLY.


M03020100038

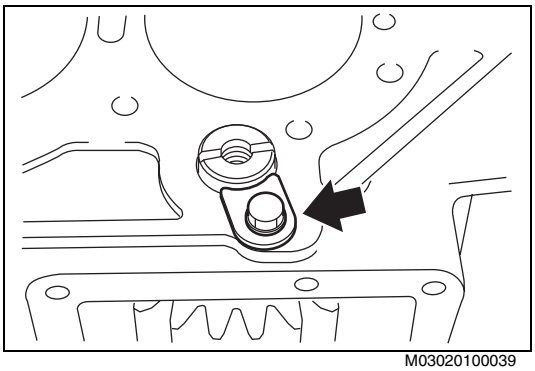
18. DISASSEMBLE THE TRANSMISSION CASE ASSEMBLY.

(1) Remove the idler cover.

a. Loosen the bolts to remove the idler cover.

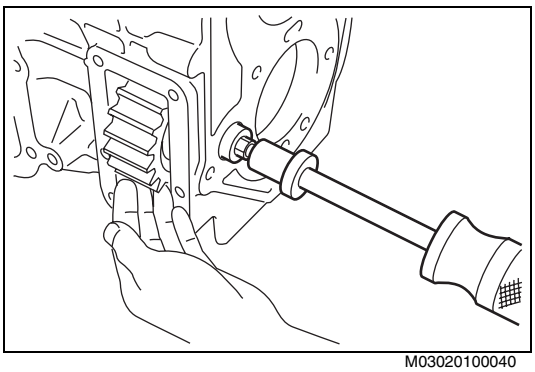
b. Take off the liquid gasket adhered to the contact surface using a scraper.

NOTICE:
Be careful not to damage the contact surface.

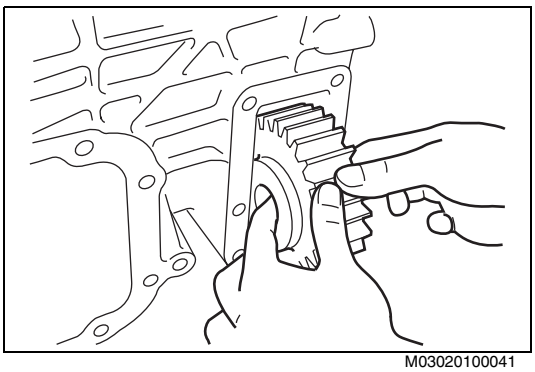

M03020100039

(2) Remove the reverse idler gear.

a. Loosen the bolt to remove the lock plate.

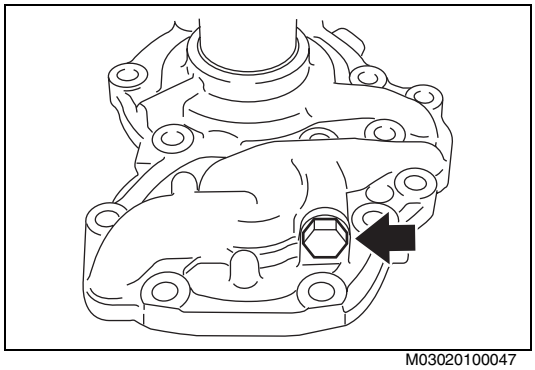

M03020100040

b. Using the special tool, pull out the reverse idler shaft.
SST: Sliding hammer (09420-1442)


M03020100041

c. Remove the O-ring from the reverse idler shaft.

d. Remove the needle roller bearing.


M03020100047

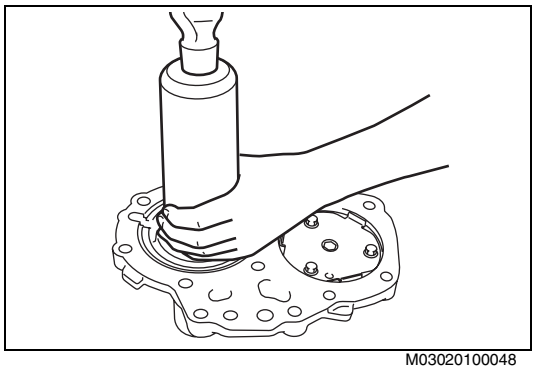
IMPORTANT POINTS-ASSEMBLY

1. ASSEMBLE THE FRONT BEARING RETAINER ASSEMBLY.

(1) Assemble the relief valve.

a. Install the steel ball and compression spring in order to the front bearing retainer.

b. Install a new soft washer and the plug.


M03020100048

(2) Install the oil seal.

a. Apply chassis grease to a new oil seal lip part.

b. Using a receiving block and a hammer, drive the oil seal into the front bearing retainer.

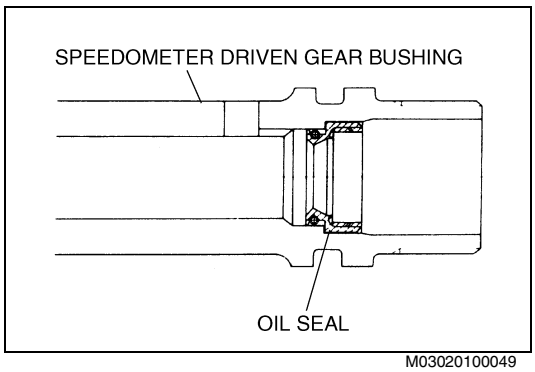
NOTICE:
- **Be careful not to damage the lip part.**
- **Do not deform the oil seal.**

2. ASSEMBLE THE REAR BEARING RETAINER ASSEMBLY.

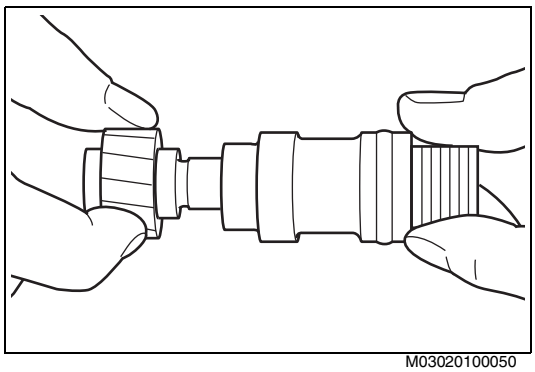
(1) Install the speedometer driven gear.

a. Apply chassis grease to a new O-ring and a new oil seal and install them to the speedometer driven gear bushing.

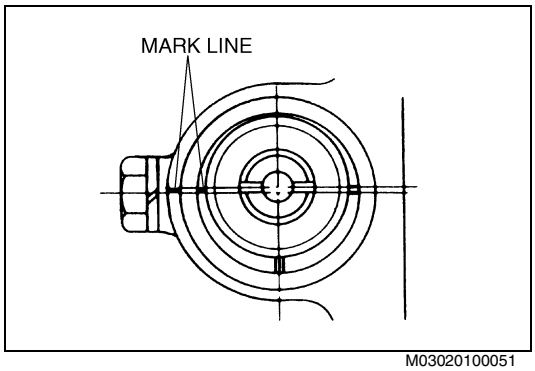
NOTICE:
- **Be sure that the oil seal is installed in the proper direction.**
- **Be careful not to damage the O-ring and the oil seal.**



M03020100049


M03020100050

(2) Apply chassis grease to the shaft part of the speedometer driven gear and insert it into the speedometer driven gear bushing.

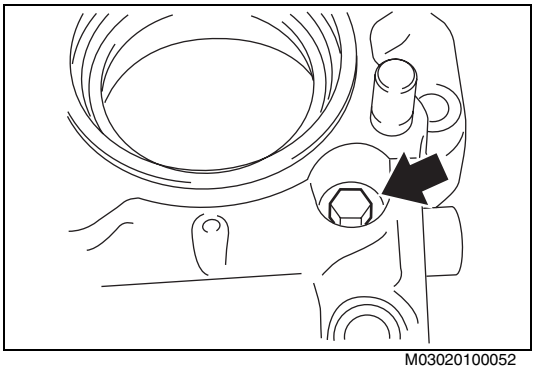


M03020100051

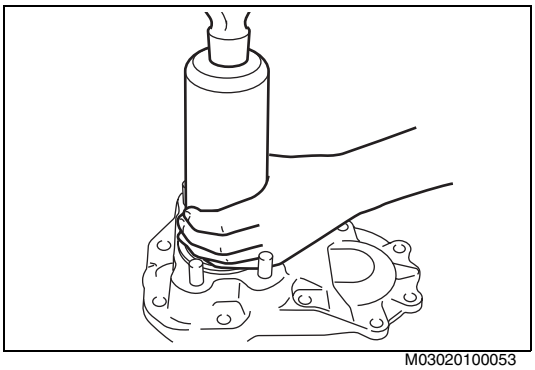
(3) Align the mark line engraved on the speedometer driven gear bushing with the mark line engraved on the rear bearing retainer and insert it.

No. of the drive gear teeth	No. of the driven gear teeth	No. of the mark lines
6	19	Three lines

NOTICE:
To prevent the drive gear and driven gear from damaging, align the mark lines.


M03020100052

(4) Fix the speedometer driven gear bushing with the set screw.


M03020100053

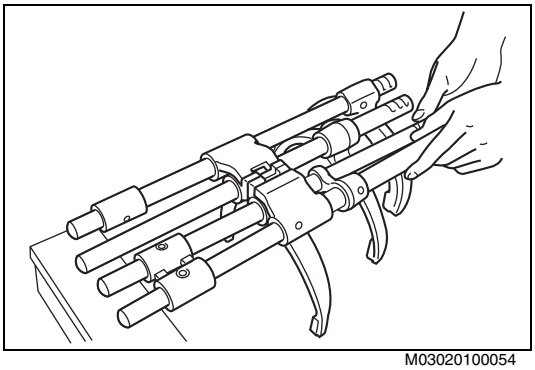
3. INSTALL THE OIL SEAL.

(1) Apply chassis grease to the lip part of a new oil seal.

(2) Using a receiving block or a hammer, drive the oil seal into the rear bearing retainer.

NOTICE:

- **Be careful not to damage the lip part of the oil seal.**
- **Do not deform the oil seal.**


M03020100054

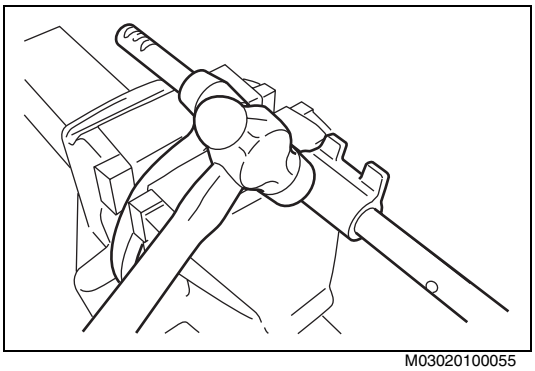
4. ASSEMBLE THE SHIFT SHAFT ASSEMBLY.

(1) Assemble the shift fork and shift head.

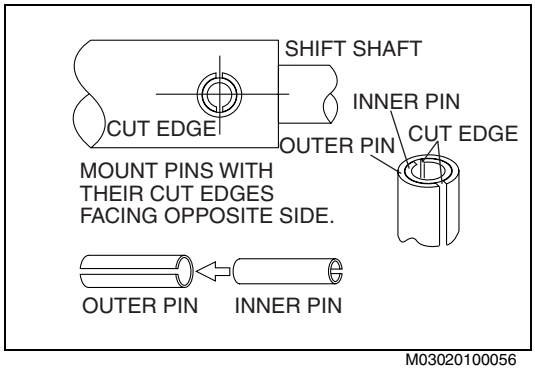
a. Match the spacer, shift fork and shift head with shift shaft installing position.

NOTICE:

Be sure that the shift fork and shift head are installed in proper position and direction.


M03020100055

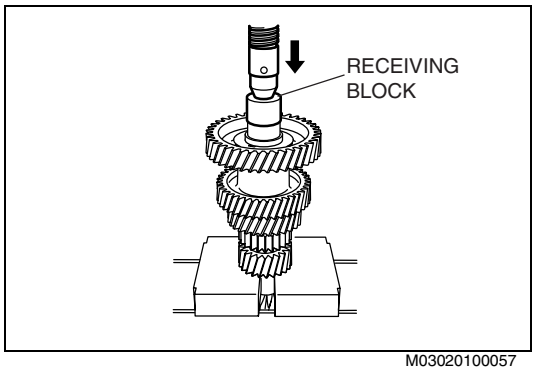
b. Using a hammer, drive a new inner pin and a new outer pin into the shift fork, shift head and spacer.



M03020100056

NOTICE:

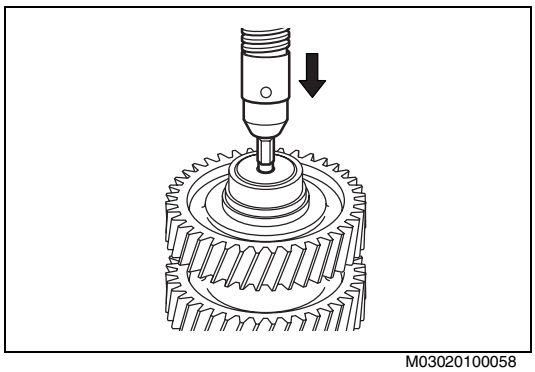
- **Mount the inner pin and outer pin with their cut edges facing opposite side to each other. Be sure that the cut edges of inner pin and outer pin are vertical to the shift shaft when knocking them into the shift fork and shift head.**
- **Knock home the inner pin and outer pin down to the knocking seat of the shift fork, shift head and spacer.**



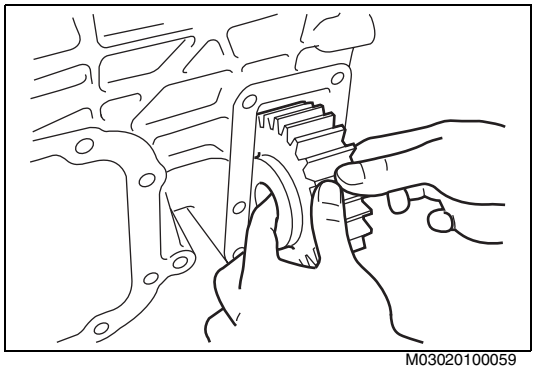
M03020100057

5. INSTALL THE COUNTER SHAFT FRONT BEARING INNER RACE.

(1) Using a receiving block and a hammer, press the front bearing inner race into the counter shaft.


M03020100058

(2) Using a press, press the oil pump drive pin into the counter shaft.


M03020100059

6. ASSEMBLE THE TRANSMISSION CASE ASSEMBLY.

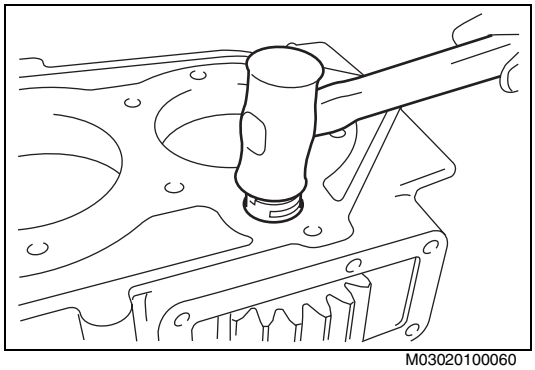
(1) Install the reverse idler gear.

a. Apply gear oil to the needle roller bearing and the thrust washer.

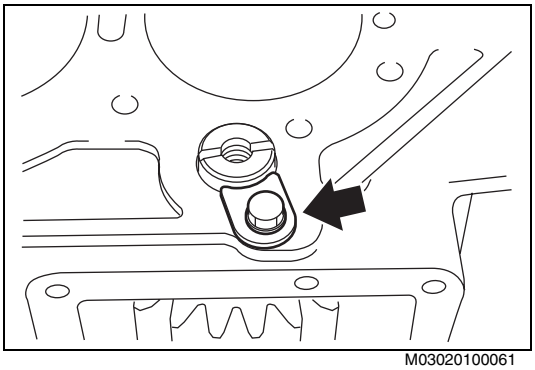
b. Assemble the reverse idler gear, needle roller bearing and thrust washer.

c. Apply bearing grease to the O-ring and install the O-ring to the groove of the reverse idler shaft.

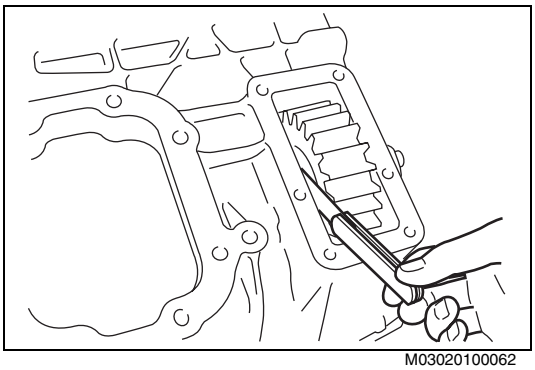
d. Match the reverse idler gear and thrust washer with the transmission case installing position.


M03020100060

e. Using a copper hammer, drive the reverse idler shaft into the transmission case assembly.

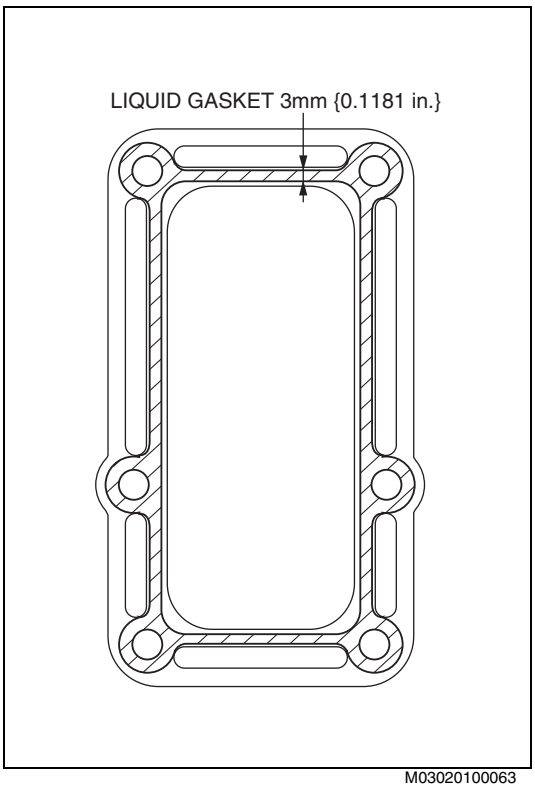

M03020100061

f. Match the lock plate with reverse idler shaft and install it with the bolt.


M03020100062

(2) Measure the reverse idler gear end play.

Assembly Standard: 0.15-0.60 mm {0.0060-0.0236 in.}
Service Limit: 0.65 mm {0.0256 in.}



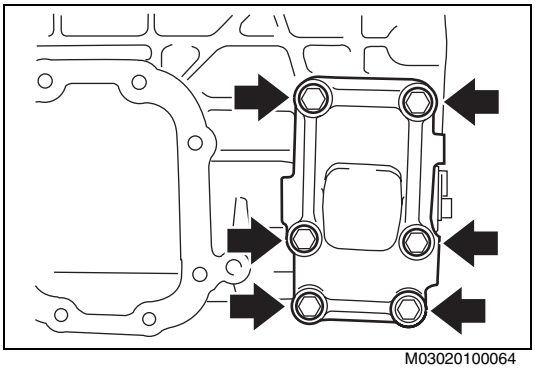
M03020100063

(3) Install the idler cover.

a. Remove oil, dust etc. on the contact surface of the idler cover and transmission case.

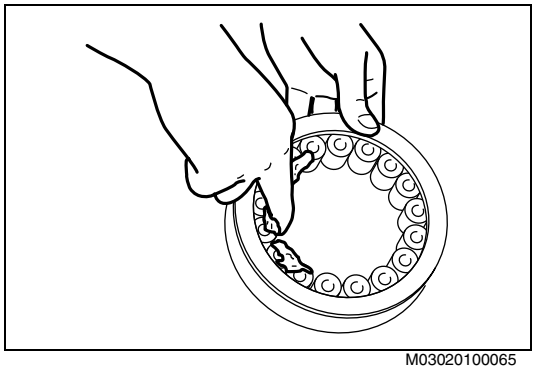
b. Coat the idler cover with liquid gasket (ThreeBond #1216 or equivalent) as shown in the figure.

NOTICE:
- **The trace of the liquid gasket must be continuous.**
- **Coating width of the liquid gasket should be 3 mm {0.1181 in.}.**


M03020100064

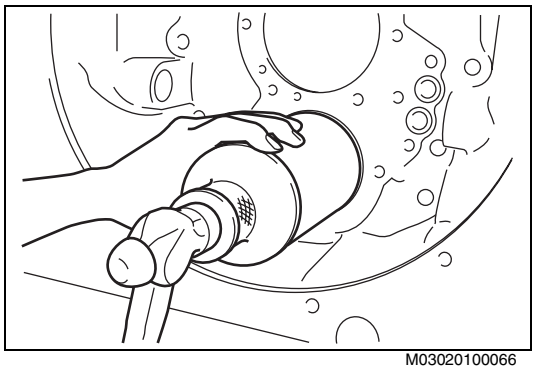
c. Install the idler cover to the transmission case with bolts.

NOTICE:
Temporarily after tightening all bolts in equal, tighten them regularly.

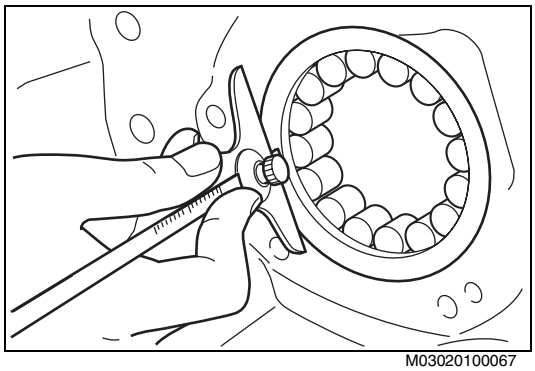

M03020100065

7. INSTALL THE FRONT BEARING OUTER RACE OF THE COUNTER SHAFT SIDE.

(1) Apply gear oil to the front bearing outer race.

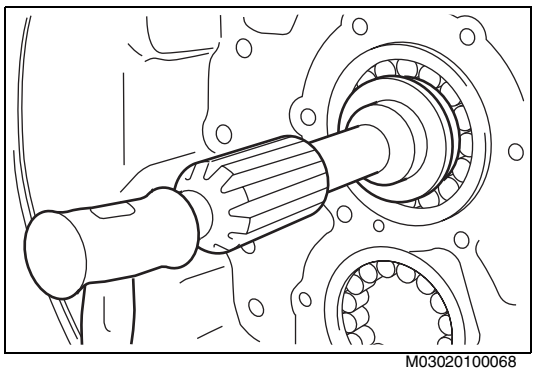

M03020100066

(2) Using a receiving block and a hammer, drive the front bearing outer race into the clutch housing.


M03020100067

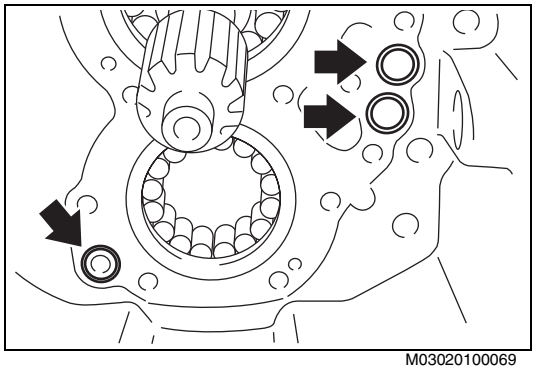
(3) Using a depth gauge, measure the dimension from the clutch housing front end surface to the front bearing outer race. If the dimension exceeds the standard value, adjust it to the standard value within the range.

Assembly Standard: 1.5-1.7 mm {0.0591-0.0669 in.}


M03020100068

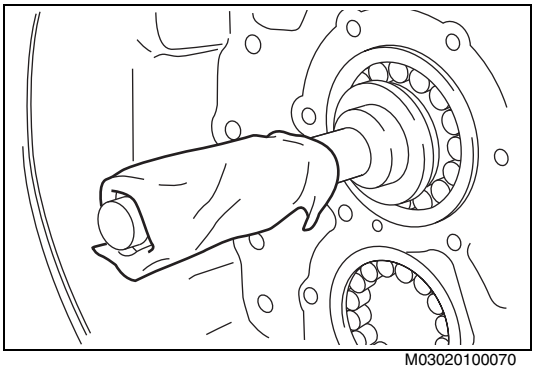
8. INSTALL THE INPUT SHAFT ASSEMBLY.

(1) Using a copper hammer, drive the input shaft assembly into the clutch housing.

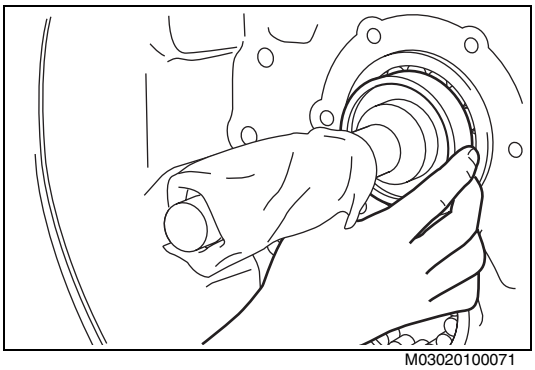

M03020100069

9. INSTALL THE FRONT BEARING RETAINER ASSEMBLY.

(1) Apply gear oil to a new O-ring (3 pieces) and install the O-rings to the clutch housing.

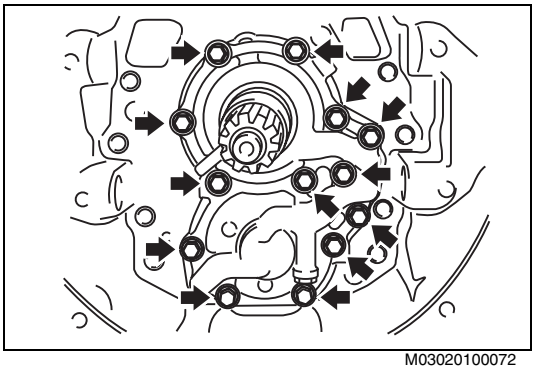

M03020100070

(2) After applying gear oil to the input shaft, cover the input shaft spline part with cloth etc. to prevent oil seal of the front bearing retainer from damaging.


M03020100071

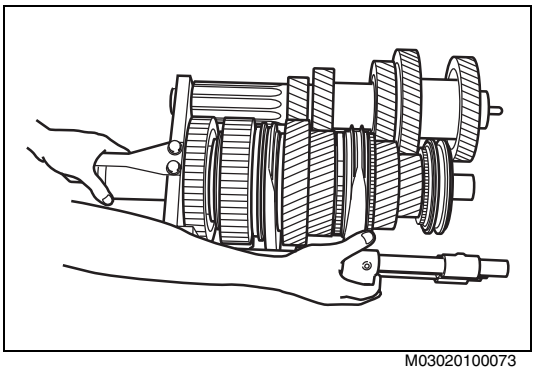
(3) Using the special tool, make the seal ring of the oil muffler get to fit to the groove part.
SST: Seal ring guide (09699-1370)

NOTICE:
Make sure that the seal ring of the input shaft assembly does not protrude from the oil muffler.


M03020100072

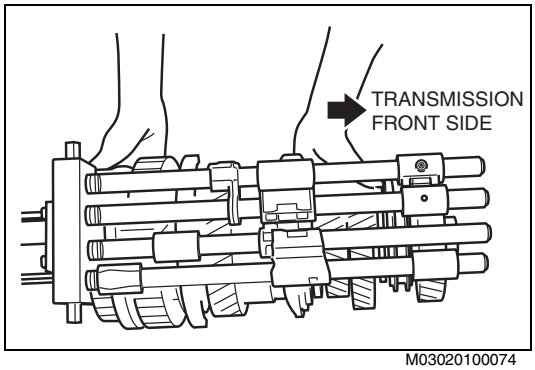
(4) Install the front bearing retainer assembly to the clutch housing with bolts through a new gasket.

NOTICE:
- **Be sure that there is no curled-up of oil seal lip or no pinching of seal ring when mounting the front bearing retainer.**
- **Temporarily after tightening all bolts in equal, tighten them regularly.**
- **Be care not to damage the gasket.**

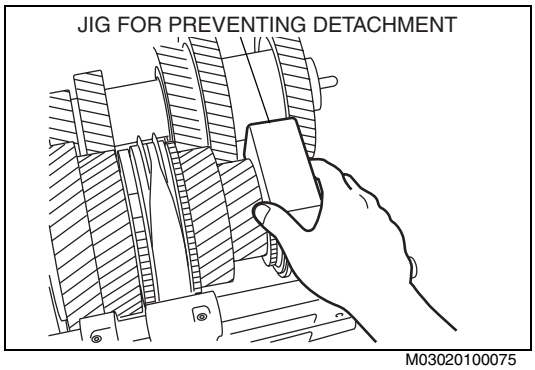

M03020100073

10. INSTALL THE OUTPUT SHAFT ASSEMBLY, COUNTER SHAFT ASSEMBLY AND SHIFT SHAFT ASSEMBLY.
(1) Apply gear oil to the sliding surface of the shift shaft.
(2) Using the special tool, fix the output shaft assembly, counter shaft assembly and shift shaft assembly.
SST: Shaft hanger (09630-2220)

HINT:
- **After assembling the shift shaft assembly to the output shaft assembly and fixing them with special tool, assemble the counter shaft assembly for better workability.**
- **Place the shift shaft assembly as shown in the figure.**



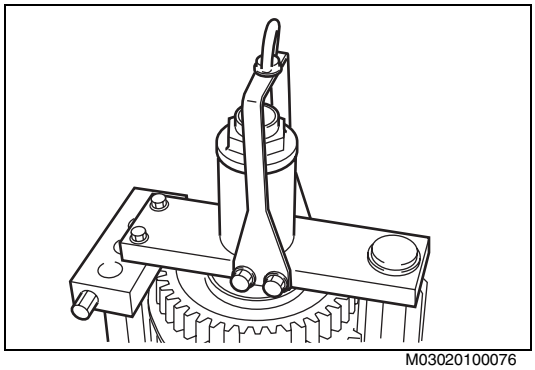
M03020100074



M03020100075

(3) Install the jig for preventing detachment into the 5th-6th synchronizer unit to prevent the 5th-6th synchronizer cone and ring from detaching.

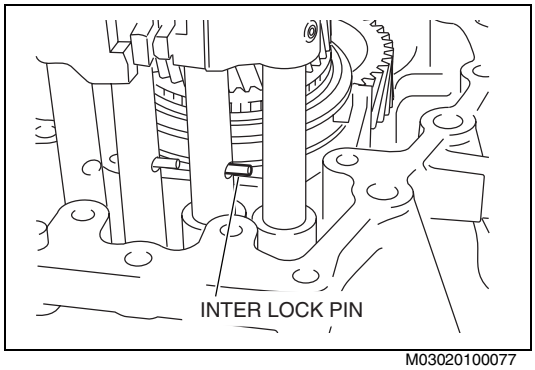
HINT:
In case of not using the jig for preventing detachment, support parts for the prevention of detachment by one of the worker.


M03020100076

(4) Using a hoist, lift up the output shaft assembly, counter shaft assembly and shift shaft assembly together and install them to the clutch housing.

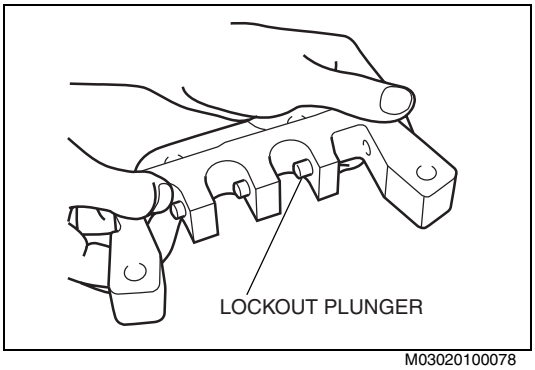
NOTICE:
- **Be sure to insert the shaft protruded from the input shaft into the hole of the output shaft point part.**
- **Be sure to insert the oil pump drive pin of counter shaft point part into the hole of the oil pump.**
- **Be careful not to damage the gear and bearing etc. when installing them.**

(5) Make sure that the gears of the output shaft and counter shaft rotate smoothly by rotating the input shaft.



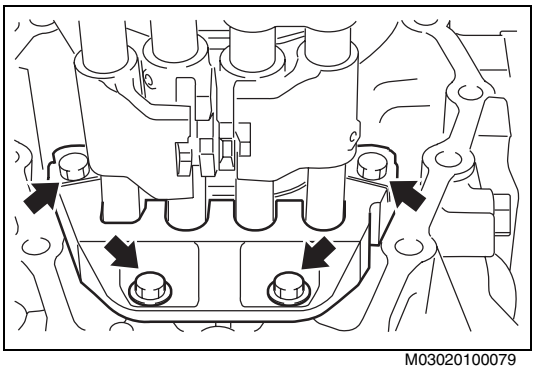
M03020100077

11. INSTALL THE STOPPER, LOCKOUT PLUNGER AND INTER LOCK PIN.
(1) Apply chassis grease to the lockout plunger and inter lock pin.
(2) Install the inter lock pin to the shift shaft.



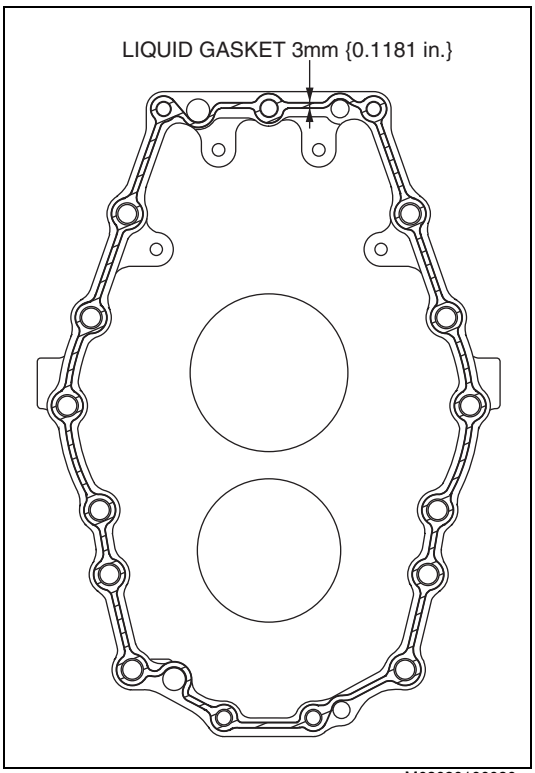
M03020100078

(3) Install the lockout plunger to the stopper.


M03020100079

(4) Install the stopper with bolts.

NOTICE:
- **Be careful that lockout plunger does not fall out.**
- **Reamer bolt should be used as the inner 2 bolts of the control lever stopper fitting bolts.**

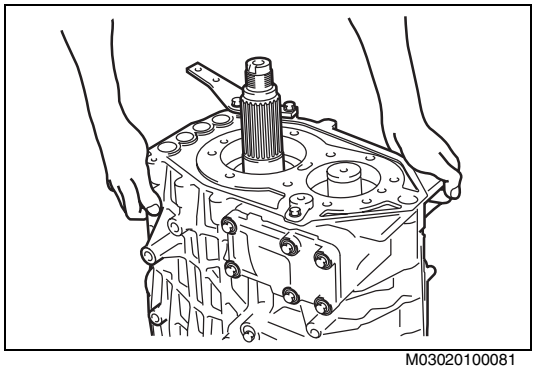


M03020100080

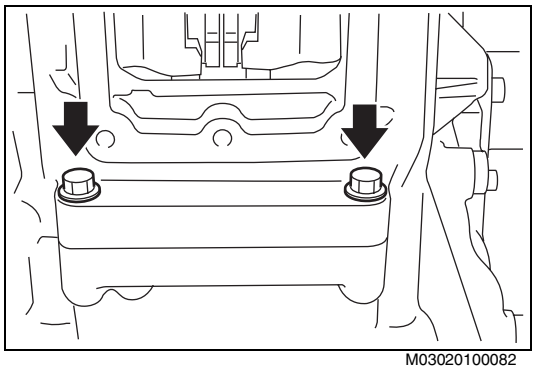
12. INSTALL THE OIL PIPE.

13. INSTALL THE TRANSMISSION CASE ASSEMBLY.
(1) Remove oil, dust etc. on the contact surface of the clutch housing and transmission case.
(2) Apply liquid gasket (ThreeBond #1216 or equivalent) to the clutch housing as shown in the figure.

NOTICE:
- **The trace of the liquid gasket must be continuous.**
- **Coating width of the liquid gasket should be 3 mm {0.1181 in.}.**

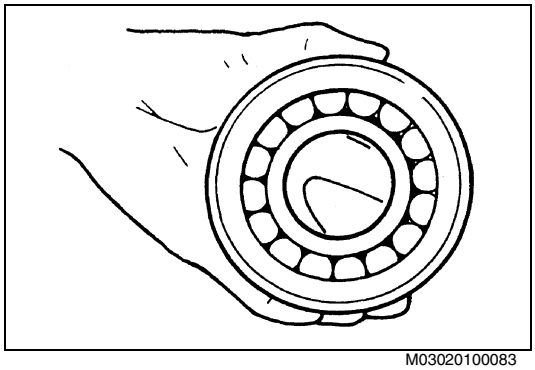

M03020100081

(3) Install the transmission case assembly from right above.


M03020100082

(4) Fix the transmission case assembly with 4 bolts.

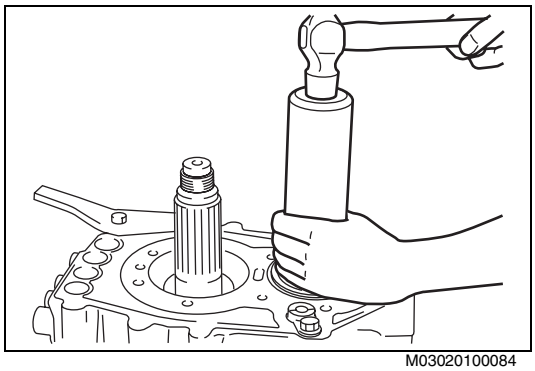
NOTICE:
Temporarily after tightening all bolts in equal, tighten them regularly.


M03020100083

(5) Apply gear oil to the rear bearings of the output shaft and counter shaft.

(6) Using a snap ring expander, install the retainer ring to the rear bearing of the output shaft side and counter shaft side.

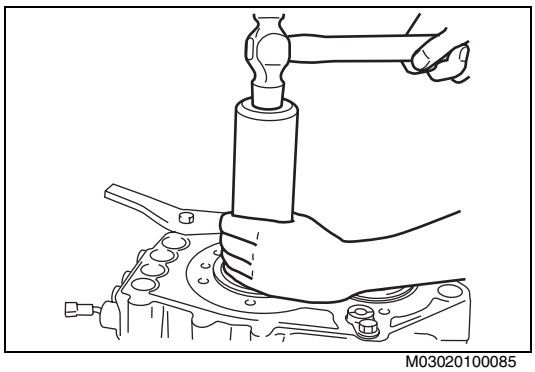
NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.


M03020100084

(7) Install the spacer to the counter shaft.

NOTICE:
The spacer should be installed with its chamfered side facing downward.

(8) Using a receiving block and a hammer, drive the rear bearing of counter shaft side into the transmission case.

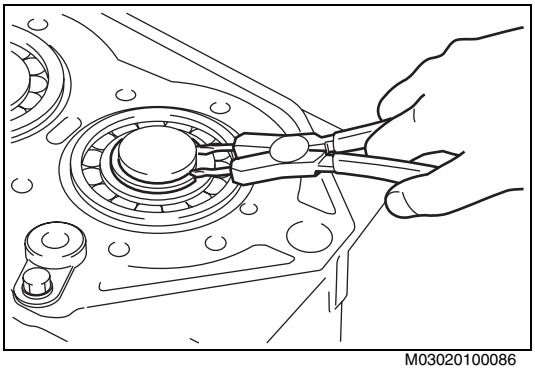

M03020100085

(9) Install the spacer to the output shaft.

NOTICE:
The spacer should be installed with its flange side facing downward.

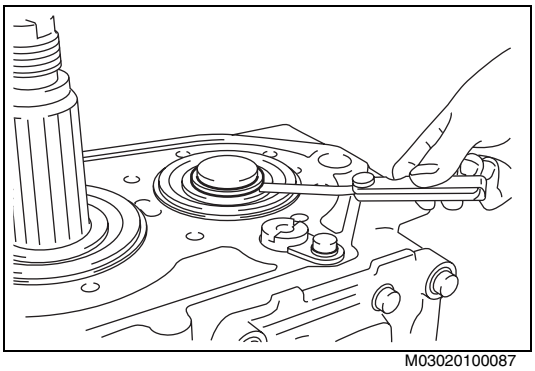
(10) Using a receiving block and a hammer, drive the rear bearing of output shaft side into the transmission case.

(11) Make sure that the gears of the output shaft and counter shaft rotate smoothly by rotating the input shaft.


M03020100086

(12) Using a snap ring expander, install a new retainer ring to the counter shaft.

NOTICE:
- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**

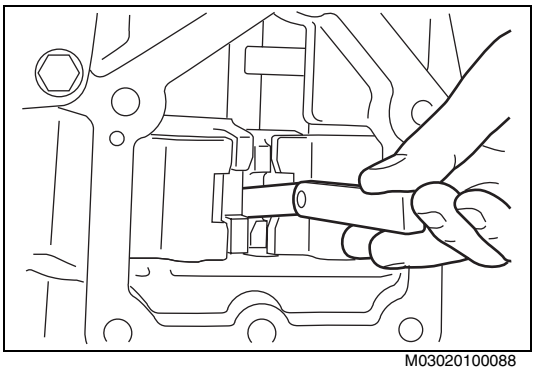

M03020100087

(13) Using a thickness gauge, measure the clearance (play in axial direction) between the rear bearing and the retainer ring. If the clearance exceeds standard value, select a suitable retainer ring and install it again.

Assembly Standard: 0.1 mm {0.0039 in.} or less

A kind of retainer ring

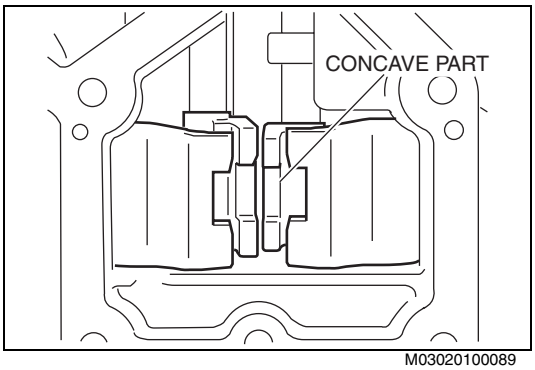
Thickness	Color code
2.4 mm {0.0945 in.}	None
2.5 mm {0.0984 in.}	White
2.6 mm {0.1024 in.}	Green
2.7 mm {0.1063 in.}	Brown


M03020100088

14. INSPECT THE SHIFT HEAD.

(1) Using a thickness gauge, measure the clearance between each shift head, and make sure it does not exceed the standard value.

Assembly Standard: 1.1-3.1 mm {0.0434-0.1220 in.}



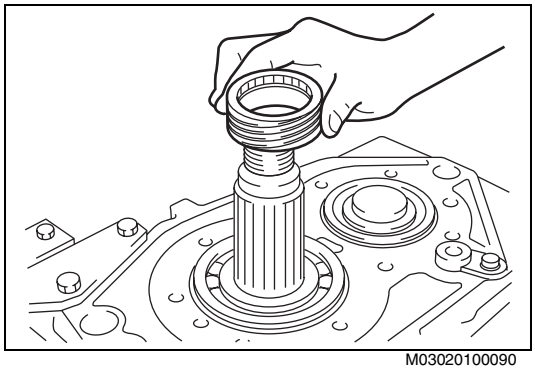
M03020100089

(2) Make sure that a inspection jig inserts in the concave part of the shift head smoothly.

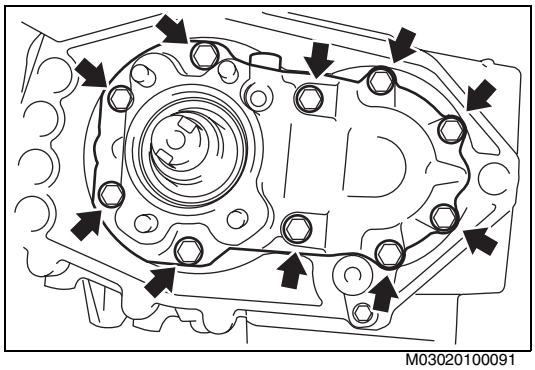
(3) Make sure that two shift shafts (shift heads) do not move at a time.

NOTICE:

If two shift shafts (shift heads) move at a time, it fails to install the lockout plunger.


M03020100090

15. INSTALL THE SPEEDOMETER DRIVE GEAR.


M03020100091

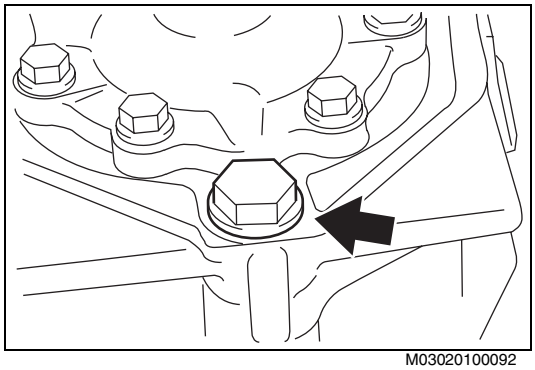
16. INSTALL THE REAR BEARING RETAINER.

(1) Install the rear bearing retainer assembly to the transmission case with bolts through a new gasket.

NOTICE:

- **Temporarily after tightening all bolts in equal, tighten them regularly.**
- **Be care not to damage the gasket.**

17. INSTALL THE LOCK BALL.


M03020100092

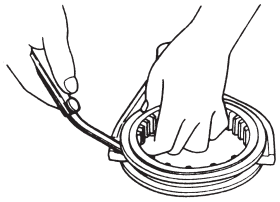
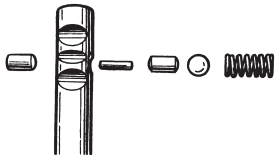
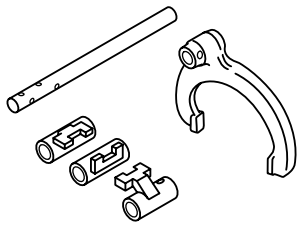
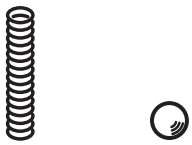
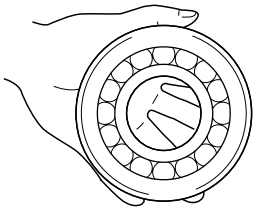
18. INSTALL THE OIL STRAINER.

19. INSTALL THE PARKING BRAKE AND FLANGE COUPLING.

INSPECTION AND REPAIR

M03020606BEH3001

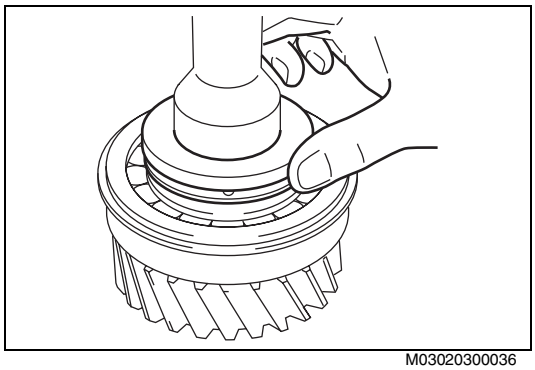
Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Clearance between shift fork and sleeve	0.02-0.45 {0.0008-0.0177}	1.5 {0.0591}	Replace.	Measure 
Interlock pin, interlock plunger, compression spring and steel ball: Wear and damage	—	—	Replace, if necessary.	Visual check 
Shift head, shift fork and shift shaft: Wear and damage	—	—	Replace, if necessary.	Visual check 
Inner rotor and outer rotor in oil pump: Wear and damage	—	—	Replace the parts as a set, if necessary.	Visual check
Front bearing retainer: Wear and damage	—	—	Replace, if necessary.	Visual check
Ball and spring in relief valve: Wear and damage	—	—	Replace, if necessary.	Visual check 
Bearing: Wear, damage and rotation condition	—	—	Replace, if necessary.	Visual check 
Reverse idler gear and reverse idler shaft: Wear and damage	—	—	Replace, if necessary.	Visual check
Thrust washer and needle roller bearing: Wear and damage	—	—	Replace, if necessary.	Visual check

INPUT SHAFT ASSEMBLY (LX06S)

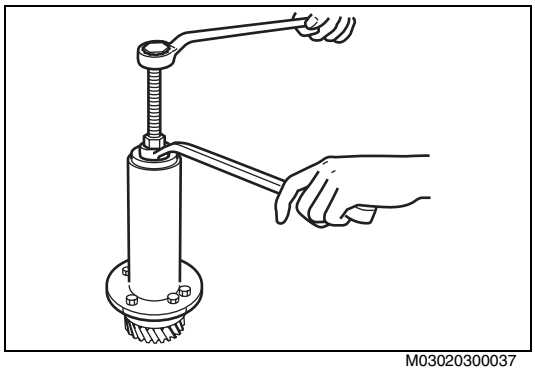
OVERHAUL

M03020706BEH2001


M03020300036

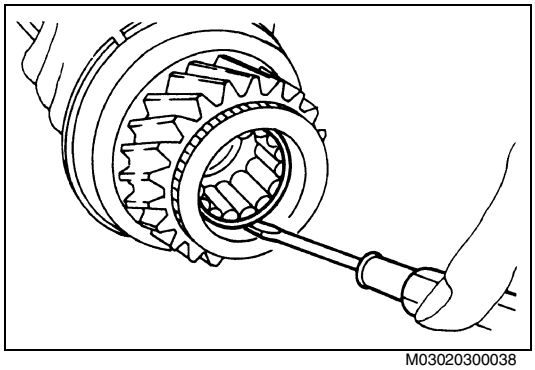
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE OIL MUFFLER.
(1) Remove the seal ring from the oil muffler.


M03020300037

(2) Install the special tool to the groove of the oil muffler outer periphery.
SST:
Puller (09650-1881)
Hook (09653-1710)

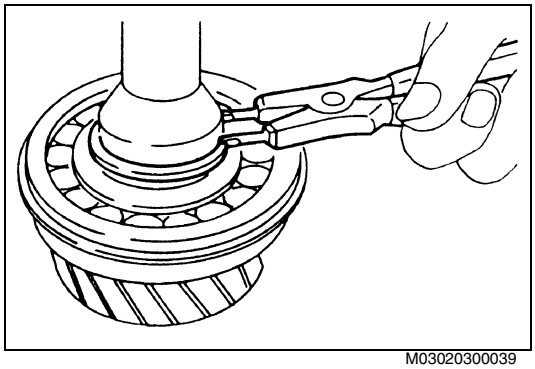
(3) Pull out the oil muffler by tightening the bolt of the special tool puller part.


M03020300038

2. REMOVE THE PILOT ROLLER BEARING.
(1) Using a flat blade screwdriver, remove the retainer ring on the input shaft groove.

NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.

(2) Remove the spacer and pilot roller bearing.

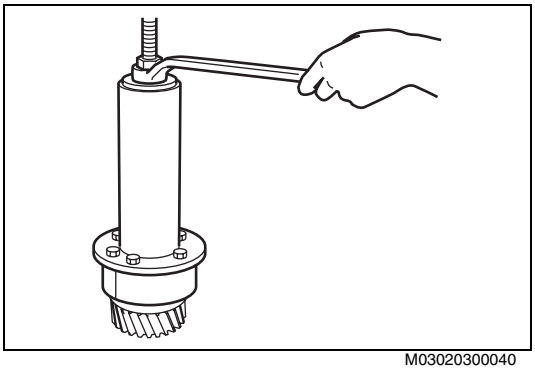

M03020300039

3. REMOVE THE FRONT BEARING.
(1) Using a snap ring expander, remove the retainer ring from the input shaft.

NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.

(2) Using a snap ring expander, remove the retainer ring from the front bearing.

NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.


M03020300040

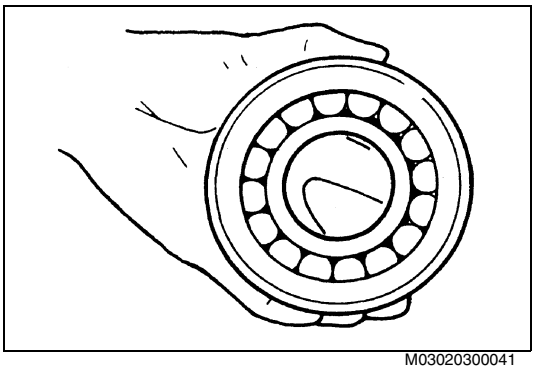
(3) Install the special tool to the groove of the front bearing outer periphery.
SST:
Hook (09653-1720)
Puller (09650-1881)

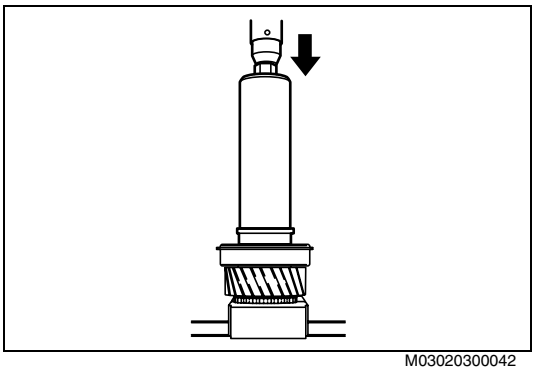
(4) Pull out the front bearing by tightening the bolt of the special tool puller part.

IMPORTANT POINTS - ASSEMBLY

1. INSTALL THE FRONT BEARING.

(1) Apply gear oil to the front bearing.


M03020300041

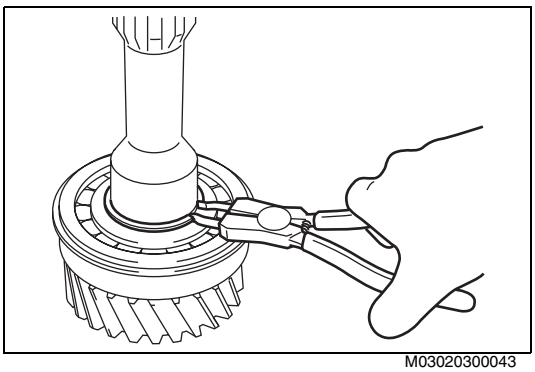

M03020300042

(2) Using a receiving block and a press, press the front bearing into the input shaft.

NOTICE:
A receiving block should be attached to the bearing inner race.

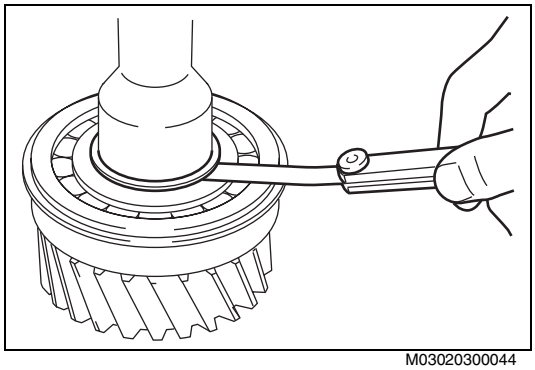
(3) Using a snap ring expander, install the retainer ring to the front bearing.

NOTICE:
- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**


M03020300043

(4) Using a snap ring expander, install a new retainer ring to the input shaft.

NOTICE:
- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**

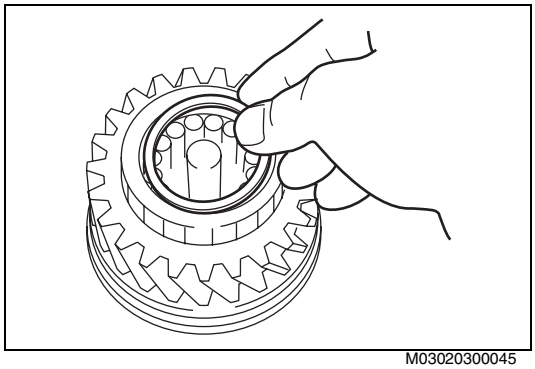

M03020300044

(5) Using a thickness gauge, measure the clearance (play in axial direction) between the front bearing and the retainer ring. If the clearance exceeds standard value, select a suitable retainer ring and install it again.

Assembly Standard: 0.1 mm {0.0039 in.} or less

A kind of retainer ring

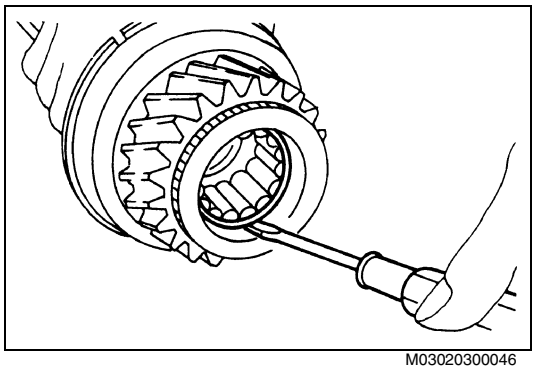
Thickness	Color code
2.4 mm {0.0945 in.}	None
2.5 mm {0.0984 in.}	White
2.6 mm {0.1024 in.}	Green
2.7 mm {0.1063 in.}	Brown


M03020300045

2. INSTALL THE PILOT ROLLER BEARING.

(1) Apply gear oil to the input shaft inner surface and pilot roller bearing.

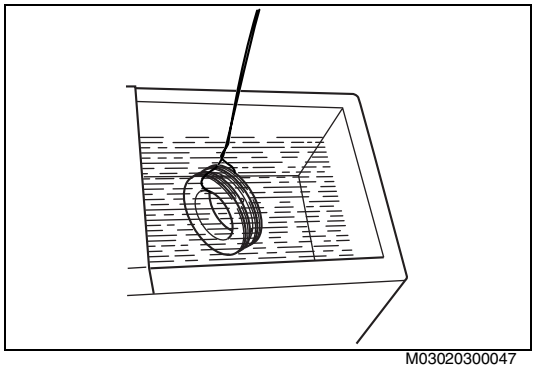
(2) Install the spacer, pilot roller bearing, spacer into the input shaft inner surface in order.


M03020300046

(3) Using a flat blade screwdriver, install a new retainer ring to the input shaft.

NOTICE:

- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**

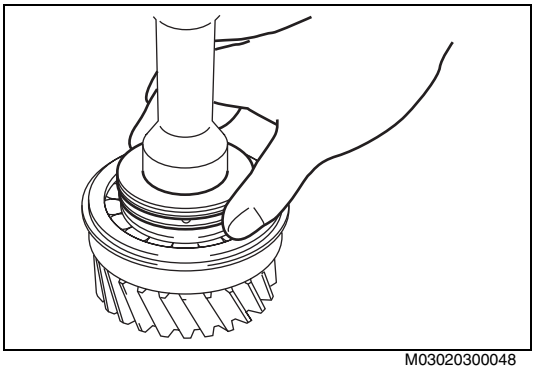

M03020300047

3. INSTALL THE OIL MUFFLER.

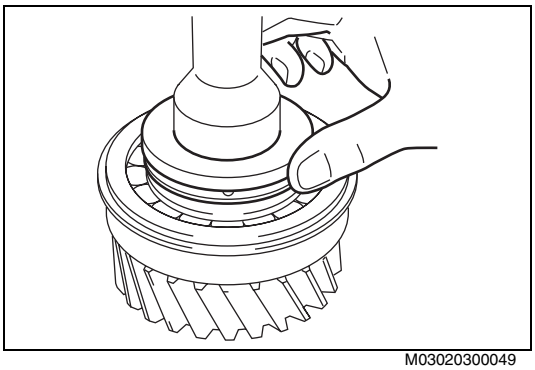
(1) Heat the oil muffler in hot water or oil to 90°C-120°C{194°F-248°F}.

NOTICE:

- **In case of using oil, do not heat the oil muffler in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**

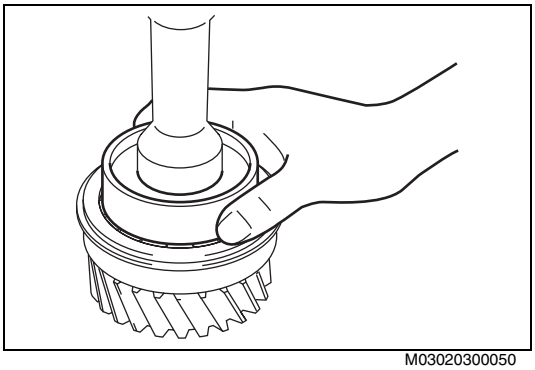

M03020300048

(2) Install the oil muffler to the input shaft.


M03020300049

(3) Install a new seal ring to the oil muffler.

NOTICE:
- **The oil muffler should be installed after its cooling down completely.**
- **Because the seal ring is easy to be deformed, extend it at minimum when mounting it.**
- **Make sure that the seal ring does not protrude from the oil muffler when installing seal ring.**


M03020300050

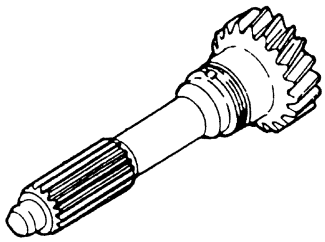
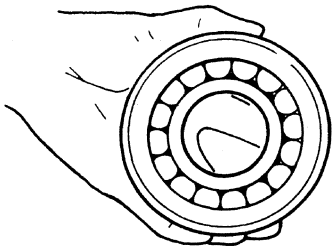
(4) Using the special tool, make the seal ring of the oil muffler get to fit to the groove part.
SST: Seal ring guide (09699-1370)

(5) Apply gear oil to the sliding surface of the oil muffler.

INSPECTION AND REPAIR

M03020706BEH3001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Input shaft: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Bearing: Wear, damage and rotate condition	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Oil muffler (Seal ring groove): Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check**

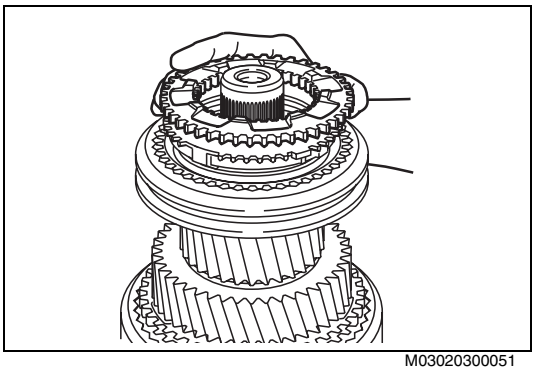
OUTPUT SHAFT ASSEMBLY (LX06S)

OVERHAUL

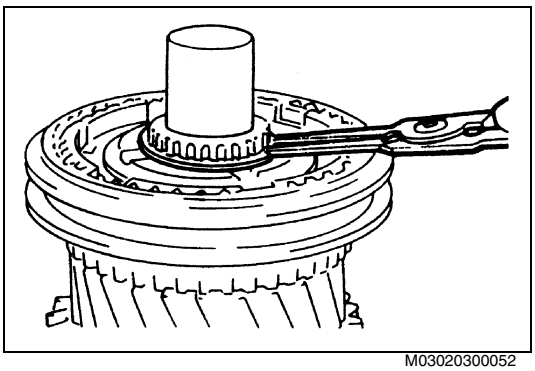
M03020806BEH2001

IMPORTANT POINTS-DISASSEMBLY

1. REMOVE THE 5TH-6TH SYNCHRONIZER UNIT.



M03020300051



M03020300052

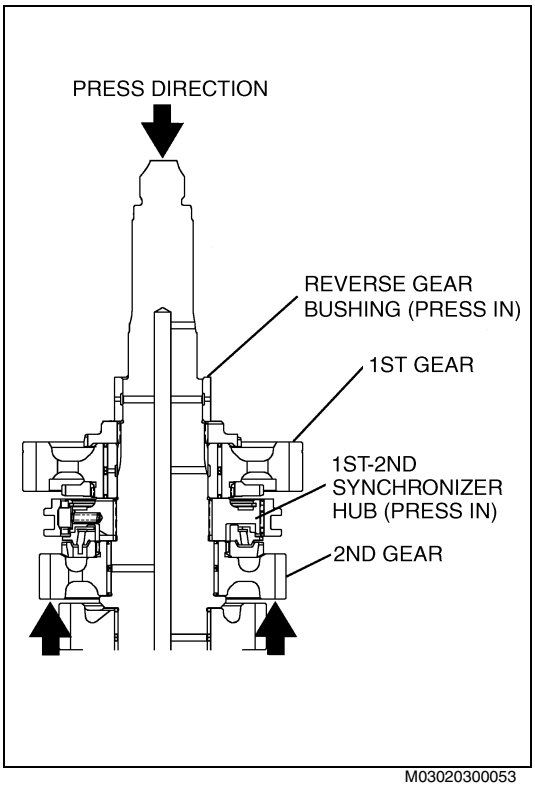
(1) Put the output shaft front end part upward and remove the retainer ring from the output shaft using a snap ring expander.

NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.

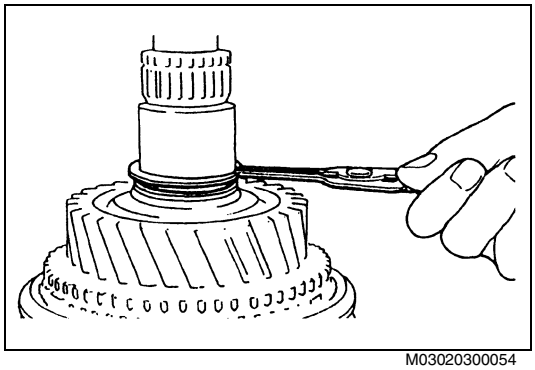
2. REMOVE THE 1ST GEAR ASSEMBLY, 1ST-2ND SYNCHRONIZER UNIT AND 2ND GEAR ASSEMBLY.

(1) Use the front side of 2nd gear as the support for pressing. Press the rear end of the output shaft to pull out the gears.

NOTICE:
- **When pressing the output shaft, put a wood block on the lower part of the shaft.**
- **Because the output shaft is heavy, support it securely.**



M03020300053

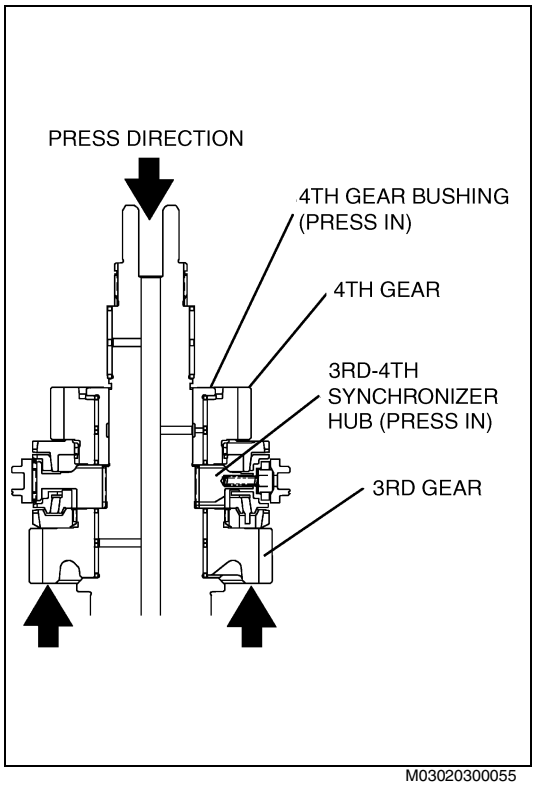

M03020300054

3. REMOVE THE 4TH GEAR ASSEMBLY, 3RD-4TH SYNCHRONIZER UNIT AND 3RD GEAR ASSEMBLY.

(1) Using a snap ring expander, remove the retainer ring from the output shaft.

NOTICE:

The retainer ring may fly out of the groove. So wear safety glasses while working.

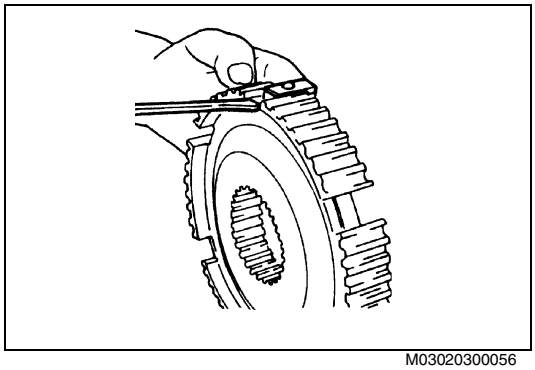


M03020300055

(2) Use the front side of 2nd gear as the support for pressing. Press the rear end of the output shaft to pull out the gears.

NOTICE:

- **When pressing the output shaft, put a wood block on the lower part of the shaft.**
- **Because the output shaft is heavy, support it securely.**

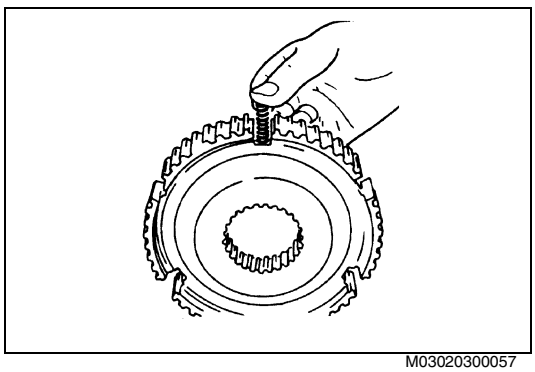

M03020300056

4. DISASSEMBLE THE SYNCHRONIZER UNIT. (1ST-2ND, 3RD-4TH, 5TH-6TH; 3 pieces)

(1) Using a snap ring expander, remove the retainer ring from the output shaft.

NOTICE:

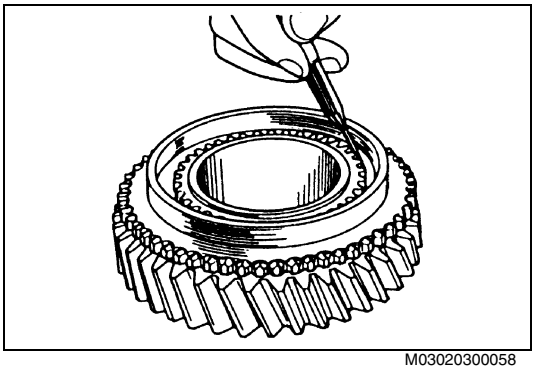
The retainer ring may fly out of the groove. So wear safety glasses while working.


M03020300057

(2) Remove the synchronizer key, synchronizer head and compression spring from the synchronizer hub.

NOTICE:

The retainer ring may fly out of the groove. So wear safety glasses while working.

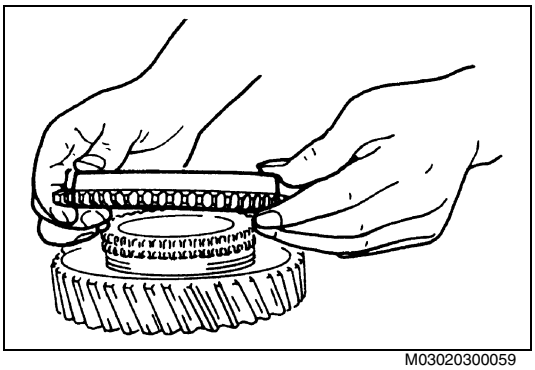

M03020300058

5. DISASSEMBLE THE GEAR (4TH GEAR, 5TH GEAR; 2 pieces)

(1) Using a snap ring expander, remove 4th and 5th gear.

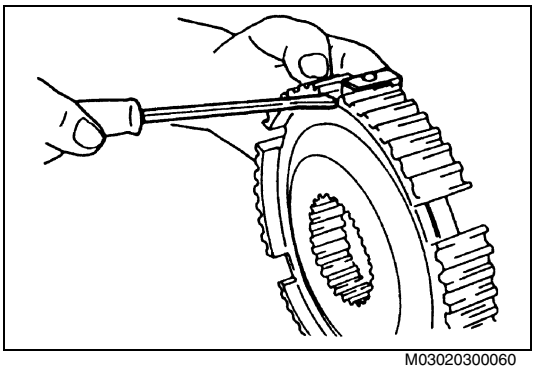
NOTICE:

The retainer ring may fly out of the groove. So wear safety glasses while working.


M03020300059

(2) Remove the synchronizer cone from 4th and 5th gear.

IMPORTANT POINTS-ASSEMBLY

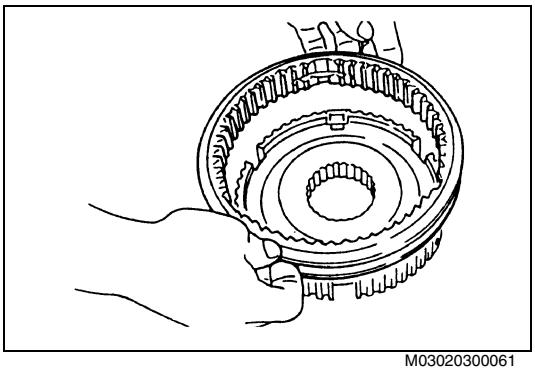

M03020300060

1. ASSEMBLE THE SYNCHRONIZER UNIT. (1ST-2ND, 3RD-4TH, 5TH-6TH; 3 pieces)

(1) Only for 1st and 2nd synchronizer unit, remove the retainer ring of 1st side.

NOTICE:

The retainer ring may fly out of the groove. So wear safety glasses while working.

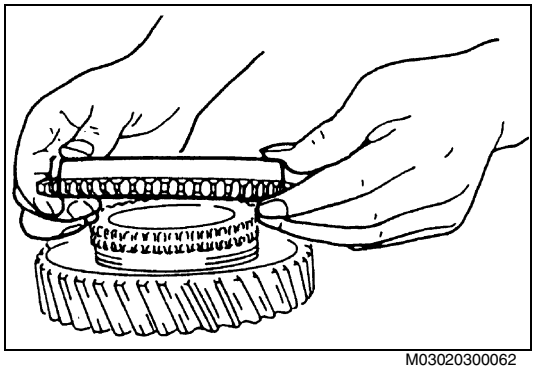

M03020300061

(2) Install the synchronizer sleeve.

(3) Install the retainer ring to the 1st side of 1st-2nd synchronizer unit.

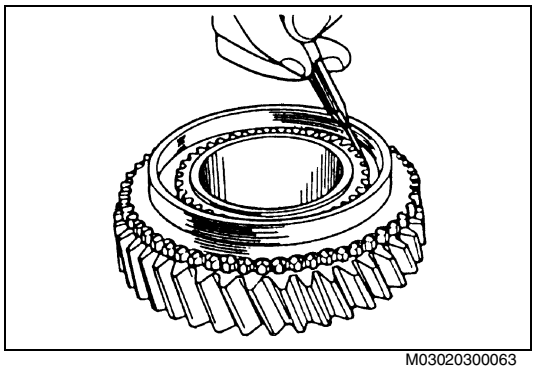
NOTICE:

The retainer ring may fly out of the groove. So wear safety glasses while working.


M03020300062

2. ASSEMBLE THE GEAR ASSEMBLY. (4TH GEAR, 5TH GEAR; 2 pieces)

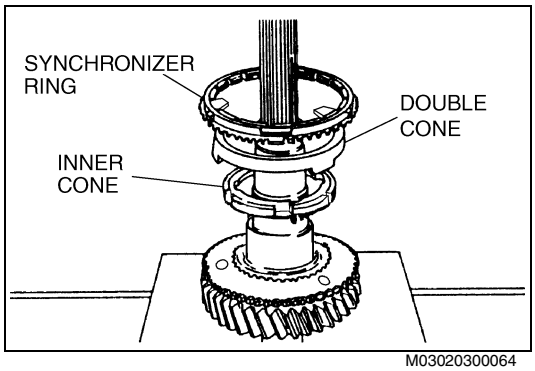
(1) Install the synchronizer cone to the 4th and 5th gear.


M03020300063

(2) Using a snap ring expander, install a new retainer ring to the groove of the synchronizer installing surface of 4th and 5th gear.

NOTICE:

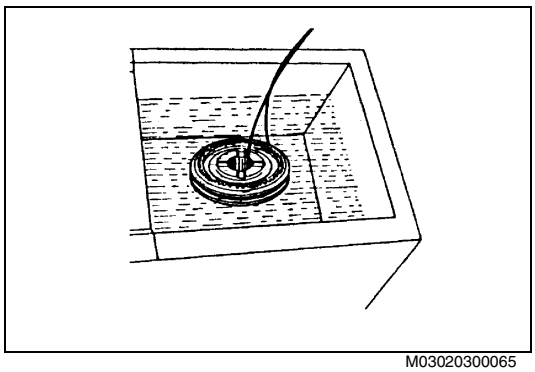
- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**



M03020300064

3. INSTALL THE 1ST-2ND SYNCHRONIZER UNIT.

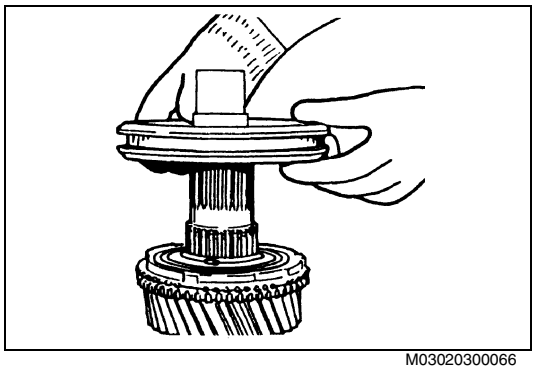
(1) Install the inner cone, double cone, synchronizer ring to the output shaft in order.


M03020300065

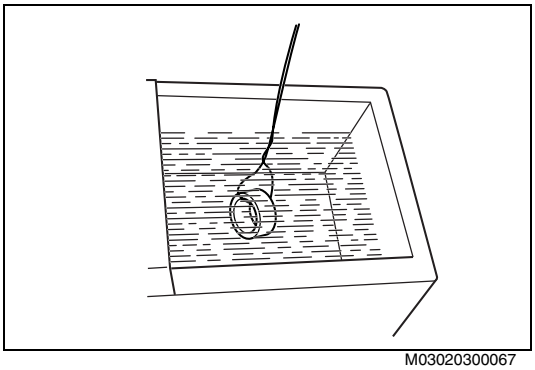
(2) Using a heater, (piston heater etc.) heat the synchronizer unit in hot water or oil to 90°C-120°C{194°F-248°F}.

NOTICE:

- **In case of using oil, do not heat the synchronizer unit in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**


M03020300066

(3) Install the synchronizer unit to the output shaft.

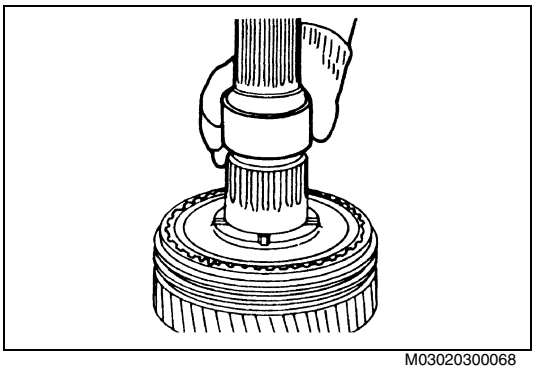

M03020300067

4. INSTALL THE 1ST GEAR ASSEMBLY.

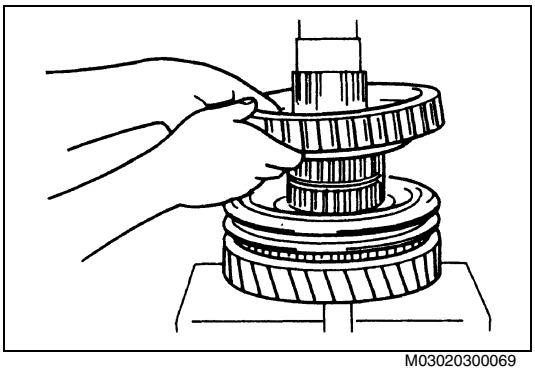
(1) Install the synchronizer bushing of the 2nd gear to the output shaft.

NOTICE:

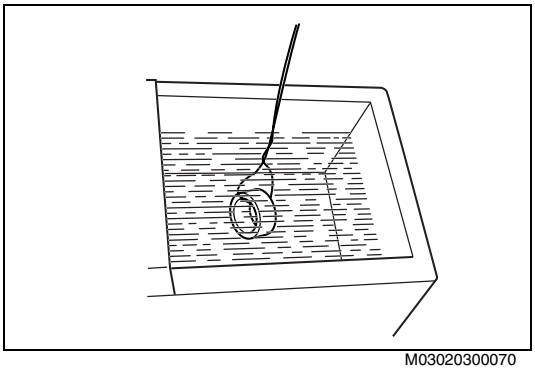
- **In case of using oil, do not heat the synchronizer unit in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**


M03020300068

(2) Install the synchronizer bushing of the 1st gear to the output shaft.


M03020300069

(3) Apply sulfide molybdenum grease to the both ends surface of the 1st gear boss part and install the 1st gear assembly.

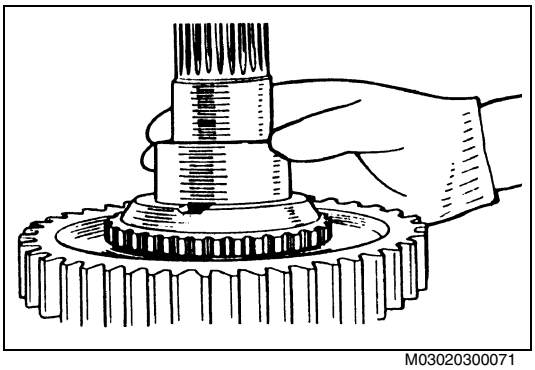

M03020300070

5. INSTALL THE REVERSE GEAR.

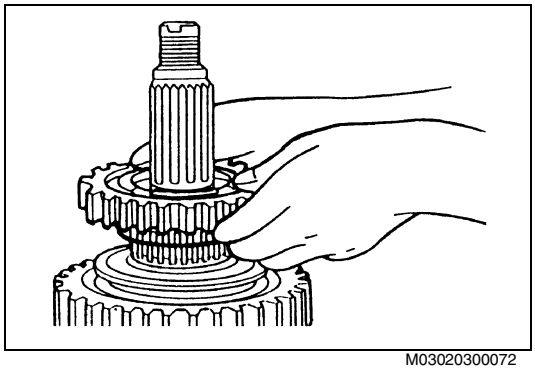
(1) Using a heater, (piston heater etc.) heat the bushing of reverse gear in hot water or oil to 90°C-120°C{194°F-248°F}.

NOTICE:

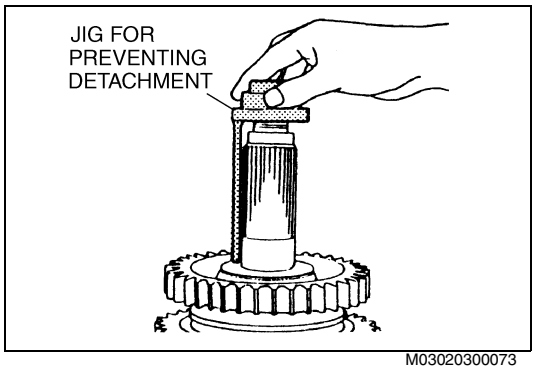
- **In case of using oil, do not heat the bushing of reverse gear in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**


M03020300071

(2) Install the bushing of the reverse gear to the output shaft.


M03020300072

(3) Apply sulfide molybdenum grease to the both ends surface of the reverse gear boss part and install the reverse gear.



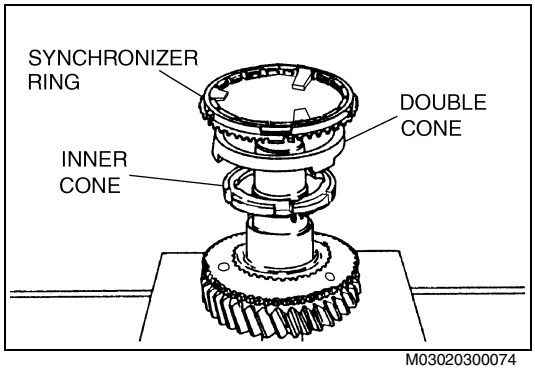
M03020300073

6. INSTALL THE 3RD GEAR ASSEMBLY.

(1) Install the jig for preventing detachment to the output shaft.

NOTICE:

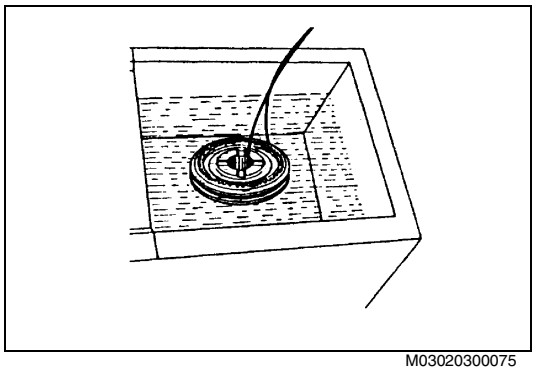
The jig should be used to prevent assembled gear and bearing from falling off.



M03020300074

7. INSTALL THE 3RD-4TH SYNCHRONIZER UNIT.

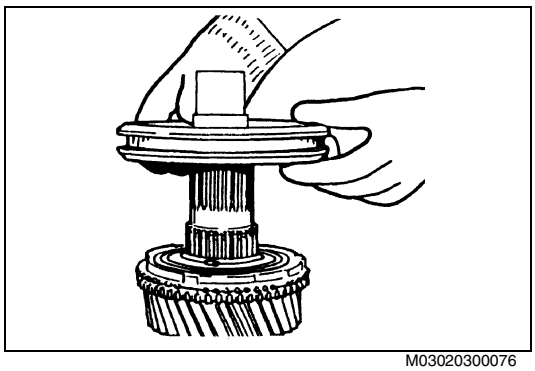
(1) Install the inner cone, double cone and synchronizer ring to the output shaft in order.


M03020300075

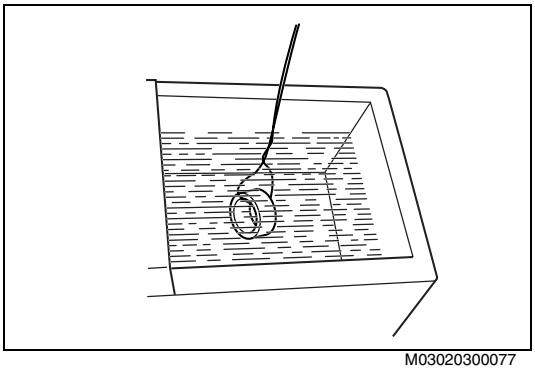
(2) Heat the synchronizer unit in hot water or oil to 90°C-120°C {194°F-248°F}.

NOTICE:

- **In case of using oil, do not heat the synchronizer unit in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**


M03020300076

(3) Install the synchronizer unit to the output shaft.
(4) Install the synchronizer ring.

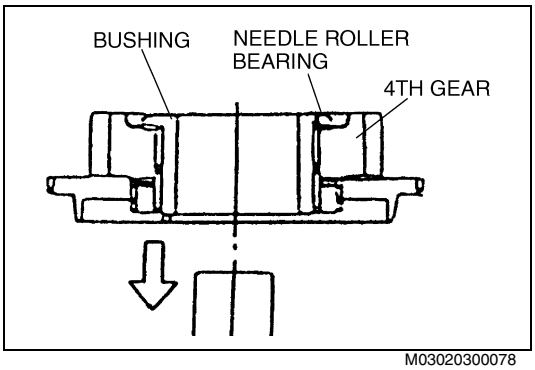

M03020300077

8. INSTALL THE 4TH GEAR ASSEMBLY.

(1) Heat the bushing of 4th gear in hot water or oil to 90°C-120°C {194°F-248°F}.

NOTICE:

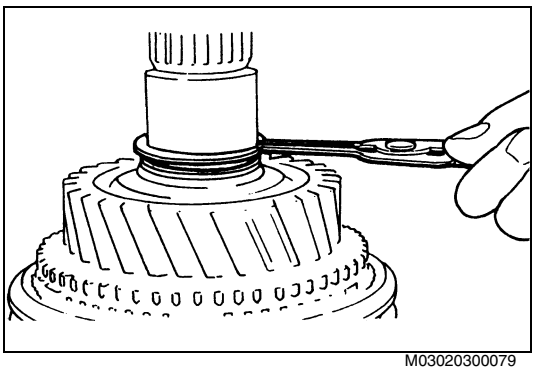
- **In case of using oil, do not heat the bushing of 4th gear in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**



M03020300078

(2) Apply gear oil to the needle roller bearing of the 4th gear and insert it into the 4th gear inner side.

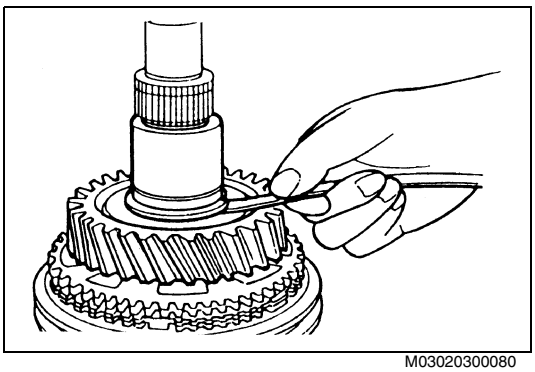
(3) Install the 4th gear assembly and bushing to the output shaft.


M03020300079

(4) Using a snap ring expander, install a new retainer ring to the output shaft.

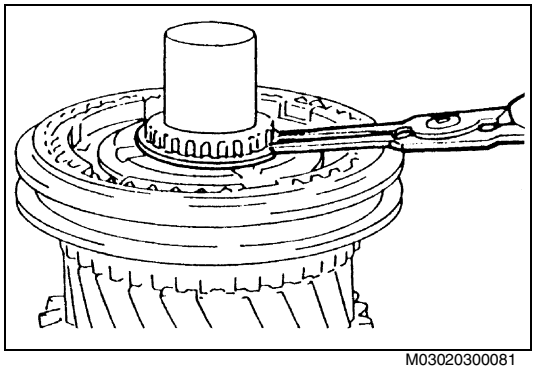
NOTICE:

- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**


M03020300080

(5) Using a thickness gauge, measure the clearance (play in axial direction) between the gear bushing and the retainer ring. If the clearance exceeds standard value, select a suitable retainer ring and install it again.
Assembly Standard: 0.1 mm {0.0039 in.} or less
A kind of retainer ring

Thickness	Color code
2.35 mm {0.0925 in.}	None
2.45 mm {0.0965 in.}	White
2.55 mm {0.1004 in.}	Green
2.65 mm {0.1043 in.}	Brown

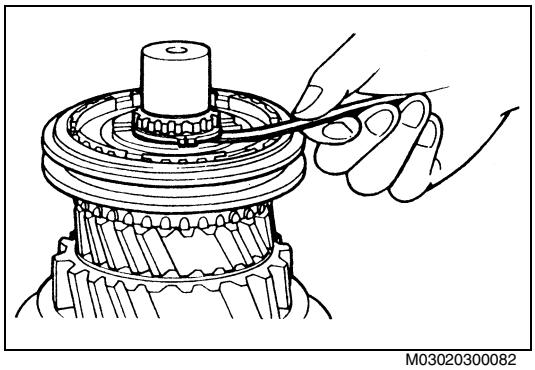

M03020300081

9. INSTALL THE 5TH-6TH SYNCHRONIZER UNIT.

(1) Using a snap ring expander, install a new retainer ring to the output shaft.

NOTICE:

- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**


M03020300082

(2) Using a thickness gauge, measure the clearance (play in axial direction) between the synchronizer hub and the retainer ring. If the clearance exceeds standard value, select a suitable retainer ring and install it again.

Assembly Standard: 0.1 mm {0.0039 in.} or less

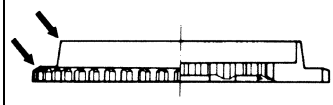
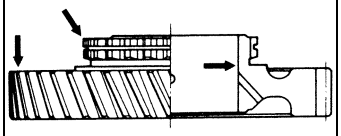
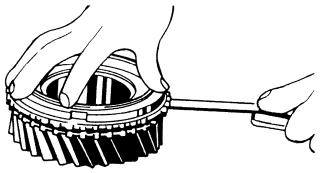
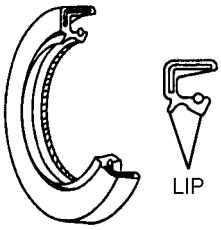
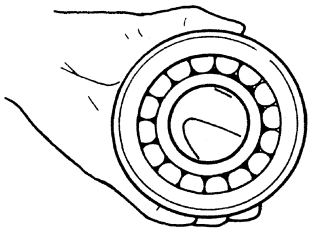
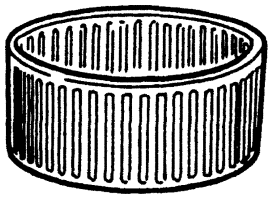
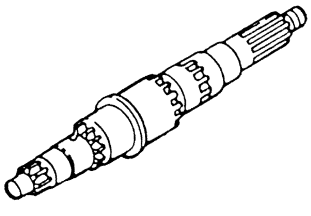
A kind of retainer ring

Thickness	Color code
1.9 mm {0.0784 in.}	None
2.0 mm {0.0787 in.}	White

INSPECTION AND REPAIR

M03020806BEH3001

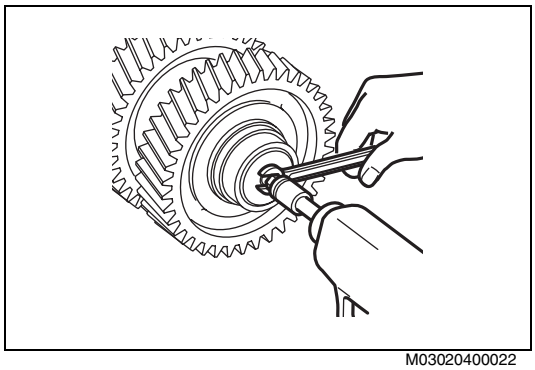
Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Synchronizer ring: Deformity, crack and excessive damage	—	—	Replace, if necessary.	Visual check 
Gear excessive: Wear, chips and cracks	—	—	Replace, if necessary.	Visual check 
Clearance between synchronizer ring and synchronizer cone and gear sub-assembly	2nd, 3rd and 4th gear 1.0-1.8 {0.0394-0.0708} 5th and input gear 1.2-2.0 {0.0473-0.0787}	0.2 {0.0079}	Replace the synchronizer ring and/or gear sub-assembly.	Measure 
Oil seal lip: Wear and damage	—	—	Replace, if necessary.	Visual check 
Cylindrical bearing, and ball bearing: Improper rotation	—	—	Replace, if necessary.	Visual check 
Needle roller bearing in deformed shape	—	—	Replace, if necessary.	Visual check 
Output shaft: Wear and damage	—	—	Replace, if necessary.	Visual check 

COUNTER SHAFT ASSEMBLY (LX06S)

OVERHAUL

M03020906BEH2001

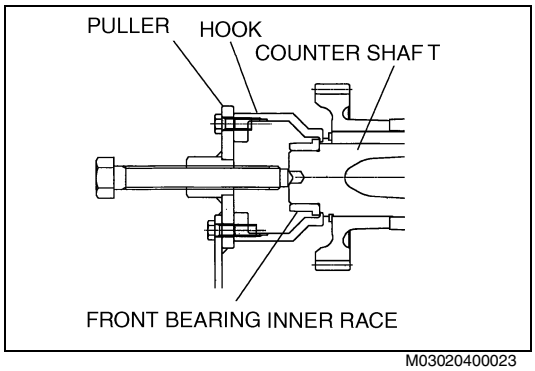


M03020400022

IMPORTANT POINTS-DISASSEMBLY

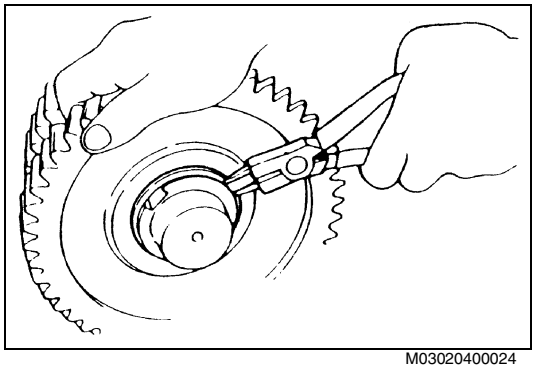
1. REMOVE THE FRONT BEARING INNER RACE.

(1) While holding the tapered portion of the oil pump drive pin by wrench, rotate (or vibrate) the oil pump drive pin by using impact wrench, and then pull it out.



M03020400023

(2) Using the special tool, pull out the front bearing inner race from the counter shaft.
SST:
Hook (09653-1740)
Puller (09650-2080)

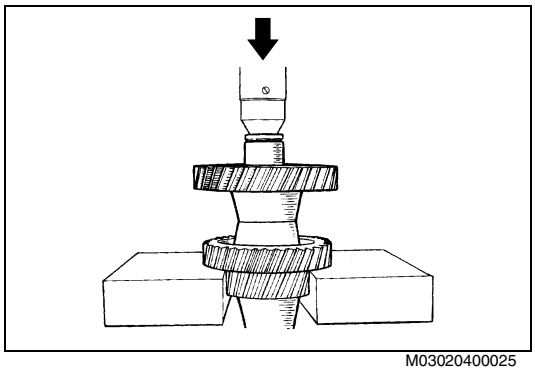


M03020400024

2. DISASSEMBLE THE COUNTER SHAFT ASSEMBLY.

(1) Using a snap ring expander, remove the retainer ring from the counter shaft.

NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.

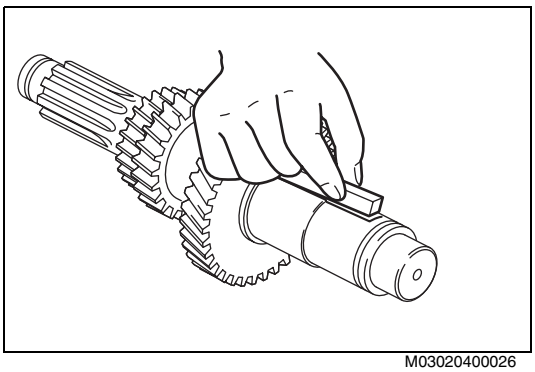


M03020400025

(2) Use the counter shaft 5th gear as the support for pressing. Press the counter shaft to pull out the counter drive gear and counter 5th gear.

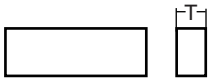
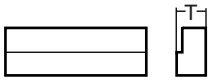
NOTICE:
- **When pressing the output shaft, put a wood block on the lower part of the shaft.**
- **Because the output shaft is heavy, support it securely.**

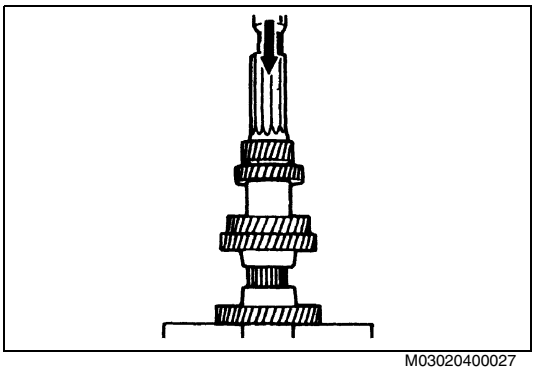
IMPORTANT POINTS-ASSEMBLY


M03020400026

1. ASSEMBLE THE COUNTER SHAFT ASSEMBLY.

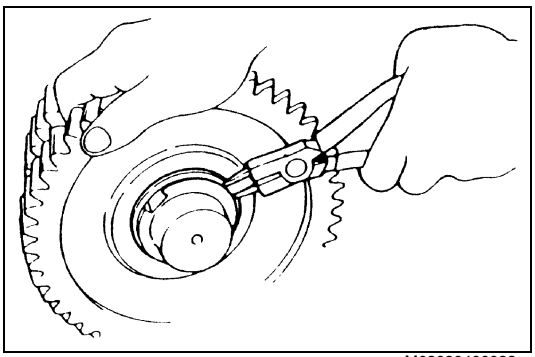
(1) Select the proper size key according to the size of the key groove and install it.

Thickness (T)	Shape
14.018-14.029 mm {0.5519-0.5523 in.}	
14.070-14.085 mm {0.5540-0.5545 in.}	


M03020400027

(2) Press the counter shaft into the gears making certain that counter shaft key and idler gear key groove are aligned.

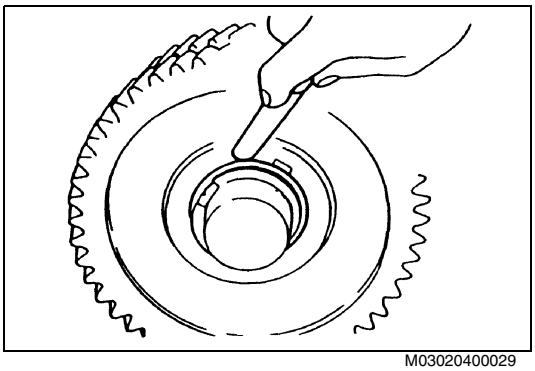
(3) Press the counter shaft into the gears making certain that counter shaft key and counter drive gear key groove are aligned.


M03020400028

(4) Using a snap ring expander, install a new retainer ring to the counter shaft.

NOTICE:

- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**

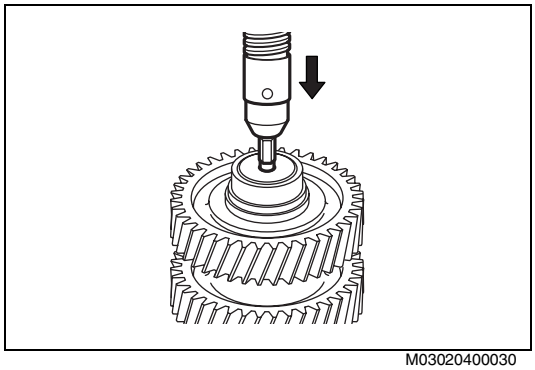

M03020400029

(5) Using a thickness gauge, measure the clearance (play in axial direction) between the counter drive gear and the retainer ring. If the clearance exceeds standard value, select a suitable retainer ring and install it again.

Assembly Standard: 0.1 mm {0.0039 in.} or less

A kind of retainer ring:

Thickness	Color code
2.45 mm {0.0965 in.}	**White**
2.55 mm {0.1004 in.}	**Red**
2.65 mm {0.1043 in.}	**Yellow**
2.75 mm {0.1083 in.}	**Blue**

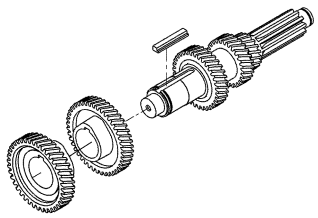
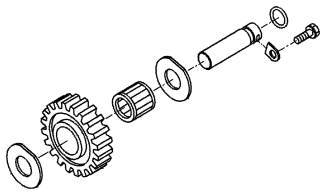
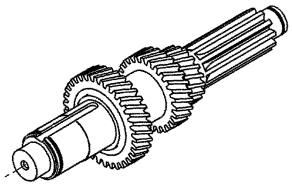
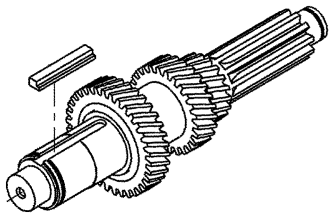

M03020400030

(6) Press the oil pump drive pin into the counter shaft.

INSPECTION AND REPAIR

M03020906BEH3001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
All gears: Cracks and defects	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Idle gear, shaft and needle roller bearing: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Counter shaft: Wear, chips and cracks	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Counter shaft key and key groove: Damage and looseness	**—**	**—**	**Replace the counter shaft and/or key, if necessary.**	**Visual check** 

P.T.O. (POWER TAKE-OFF) (TRANSMISSION SERIES: LX06S)

TR05-001

POWER TAKE-OFF ASSEMBLY TR05-2
DATA AND SPECIFICATIONS TR05-2
DESCRIPTION TR05-2
TROUBLESHOOTING TR05-3

POWER TAKE-OFF UNIT TR05-4
COMPOMENT LOCATOR TR05-4
OVERHAUL TR05-5
INSPECTION AND REPAIR TR05-9

POWER TAKE-OFF ASSEMBLY (TRANSMISSION SERIES: LX06S)

DATA AND SPECIFICATIONS

M03050102BEI2006

POWER TAKE-OFF

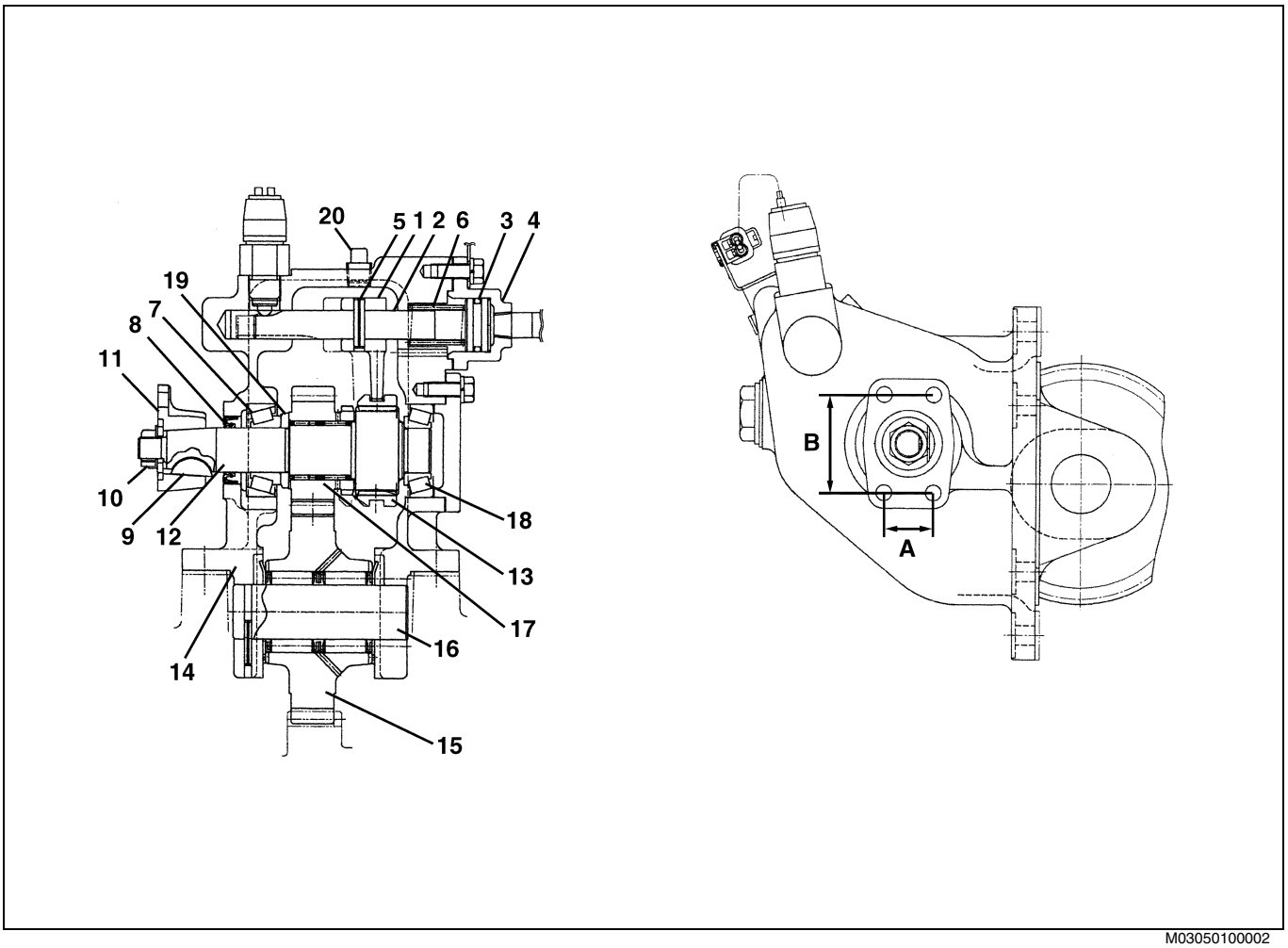
Type	**Side power take-off Driven by engaging the output shaft gear with counter 4th gear**
Direction of rotation	**Opposite engine's**
Gear ratio	**16/31**
Size of output shaft flange	**25 x 50 mm {0.985 x 1.968 in.} (A x B: Refer to description below)**

POWER TAKE-OFF CONTROL

Type	**Two switches in the cab engage and disengage the power take-off. These switches actuate a solenoid valve which regulate the compressed air to the control cylinder.**

DESCRIPTION

M03050102BEC1002



M03050100002

POWER TAKE-OFF UNIT

1	**Shift fork**	**11**	**Output shaft flange**
2	**Shift shaft**	**12**	**Output shaft**
3	**O-ring**	**13**	**Shift sleeve**
4	**Cylinder cup**	**14**	**Power take-off case**
5	**Spring pin**	**15**	**Input gear**
6	**Compression spring**	**16**	**Input shaft**
7	**Shim**	**17**	**Output gear**
8	**Oil seal**	**18**	**Taper roller bearing**
9	**Woodruff key**	**19**	**Collar**
10	**Lock nut**	**20**	**Screw plug**

TROUBLESHOOTING

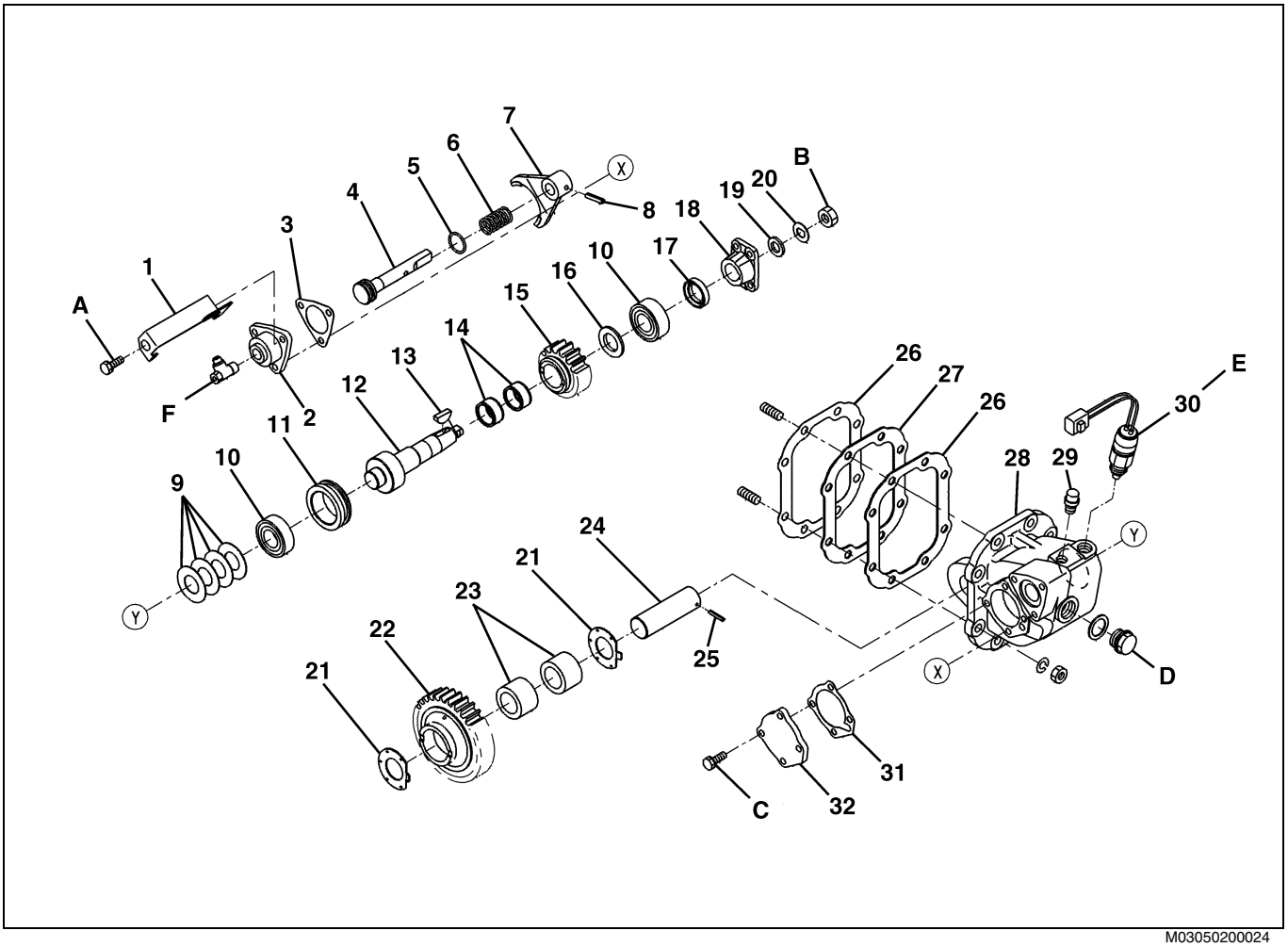
M03050102BEF3002

Symptom	Possible cause	Remedy/Prevention
Noise	Bearing worn and/or damaged.	Replace bearing.
	Output gear worn and/or damaged.	Replace gear.
	To much play in gear backlash.	Use proper power take-off gasket.
	Shortage gear oil and/or low oil viscosity.	Add oil or change oil as required.
Can not be operated	Faulty switches	Replace switch.
	Faulty solenoid valve.	Replace solenoid valve.

POWER TAKE-OFF UNIT
(TRANSMISSION SERIES: LX06S)

COMPOMENT LOCATOR

M03050202BED1002



M03050200024

1	Bracket	17	Oil seal
2	Cylinder cap	18	Output shaft flange
3	Packing	19	Plain washer
4	Shift rod	20	Lock washer
5	O-ring	21	Spacer
6	Compression spring	22	Input gear
7	Shift fork	23	Needle roller bearing
8	Spring pin	24	Input shaft
9	Shim	25	Spring pin
10	Taper roller bearing	26	Power take-off case gasket
11	Shift sleeve	27	Power take-off case adapter
12	Output shaft	28	Power take-off case
13	Woodruff key	29	Screw plug
14	Needle roller bearing	30	Power take-off position switch
15	Output gear	31	Packing
16	Collar	32	Cap

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

A	**19-25 {194-255, 14-18}**	**D**	**63.5-82.5 {648-841, 47-60}**
B	**39.2-47.0 {400-480, 29-34}**	**E**	**19.0-68.5 {500-698, 36-50}**
C	**19-25 {194-255, 14-18}**	**F**	**39.5-58.5 {400-600, 29-43}**

OVERHAUL

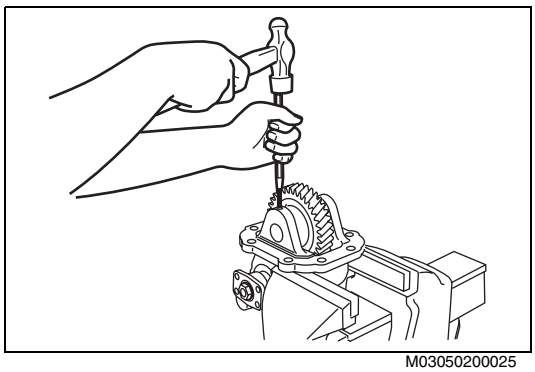
M03050202BEH2003

IMPORTANT POINT - DISMOUNTING

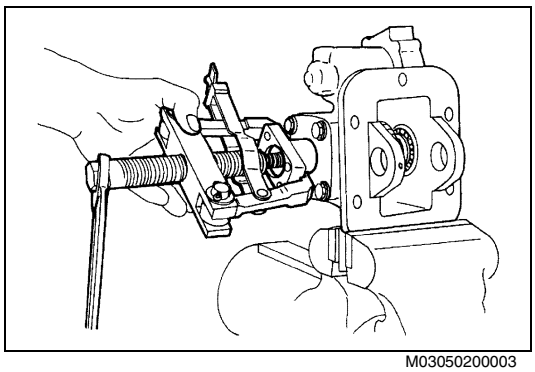
CAUTION:
Do not work on the transmission while it is still hot.
This can result in personal injury.

1. DRAIN THE TRANSMISSION OIL.

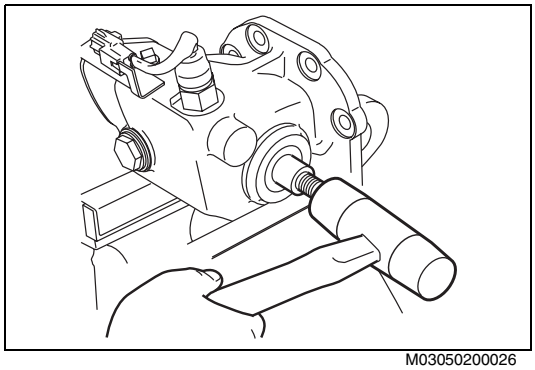
IMPORTANT POINTS - DISASSEMBLY


M03050200025

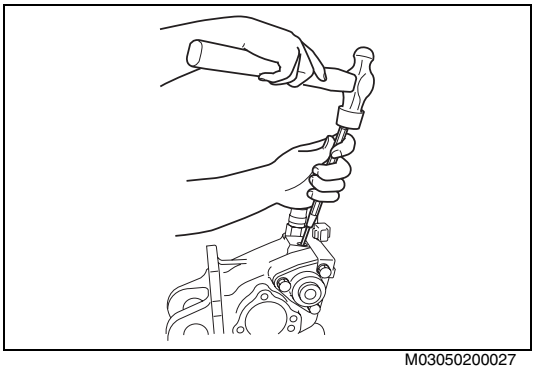
1. SET THE POWER TAKE-OFF ON A VISE.
REMOVE THE INPUT GEAR.
(1) Drive the spring pin into the hole of the shaft.
(2) Drive out the input shaft.


M03050200003

2. REMOVE THE OUTPUT SHAFT FLANGE.
(1) Remove the lock nut.
(2) Use a suitable puller to remove the output shaft flange.


M03050200026

3. REMOVE THE OUTPUT SHAFT.
(1) Remove the woodruff key.
(2) Remove the cap.
(3) Use a suitable tool to pull out the output shaft from the case. As the output shaft is removed, remove the taper roller bearing, shift sleeve, output gear, needle roller bearing, collar and shift fork from the output shaft and power take-off case.

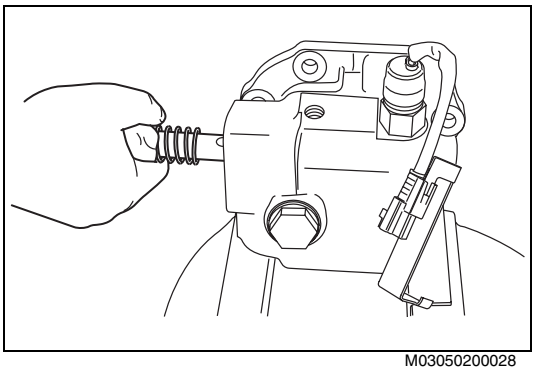

M03050200027

4. REMOVE THE SHIFT ROD.

(1) Remove the screw plug.

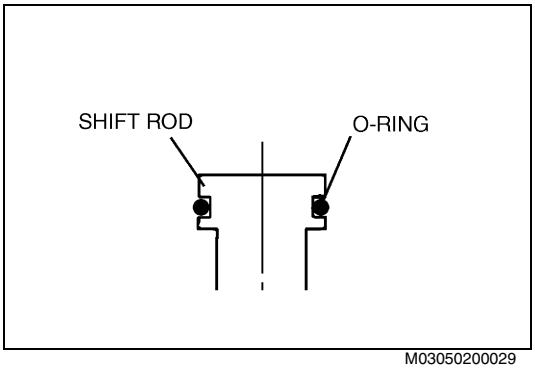
(2) Drive the spring pin into the hole of the shaft.

(3) Remove the cylinder cap.


M03050200028

(4) Remove the shift rod.

IMPORTANT POINTS - ASSEMBLY

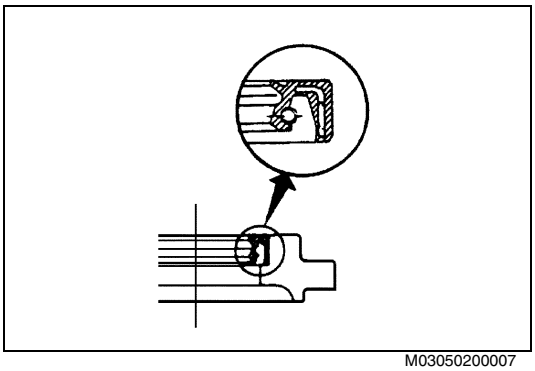


M03050200029

1. INSTALL THE O-RING ON THE SHIFT ROD.

NOTICE:

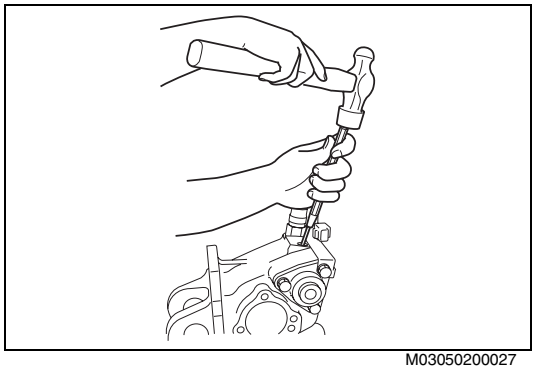
- **Coat the O-ring with grease.**
- **Be sure the O-ring is inserted in the proper direction.**


M03050200007

2. INSTALL THE OIL SEAL INTO THE POWER TAKE-OFF CASE.

NOTICE:

- **Take care not to damage the seal lip.**
- **Be sure the oil seal is inserted in the proper direction.**
- **Coat the sealing surface between the seal lips with chassis grease.**


M03050200027

3. INSTALL THE SHIFT ROD AND SHIFT FORK TO THE POWER TAKE-OFF CASE.

(1) Set the shift fork in its original position.

NOTICE:

Be sure the shift fork is installed in the correct direction.

(2) Insert the shift rod into the case and the shift fork.

(3) Rotate the shift rod so that spring pin hole of the shift rod is aligned with spring pin hole of the shift fork.

(4) Install the spring pin into the spring pin hole.

(5) Install the screw plug.

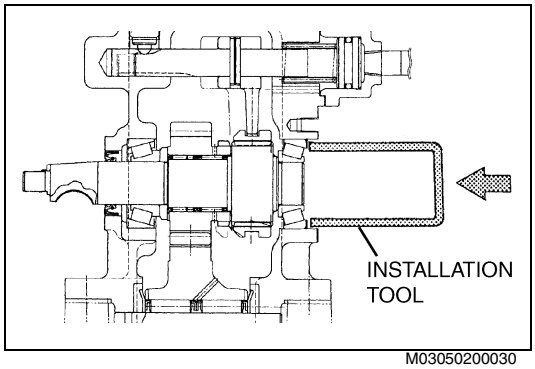
NOTICE:

Wrap seal tape around the screw plug.

(6) Install the cylinder cap.

NOTICE:

Apply grease to the inner surface of the cylinder cap.



M03050200030

4. INSTALL THE OUTPUT SHAFT TO THE POWER TAKE-OFF CASE.

(1) Install the taper roller bearing outer race into the case.

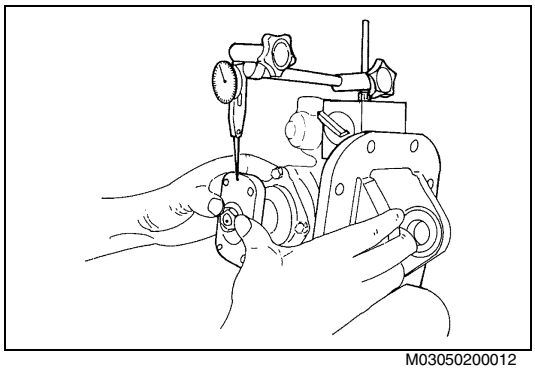
(2) Set the shift sleeve in its original position.

(3) Install the output shaft through the shift sleeve, needle roller bearing, output gear and collar into the case.

(4) Drive the output shaft into the taper roller bearing inner race.

(5) Drive the taper roller bearing on the output shaft.

(6) Drive the outer race in the case.


M03050200012

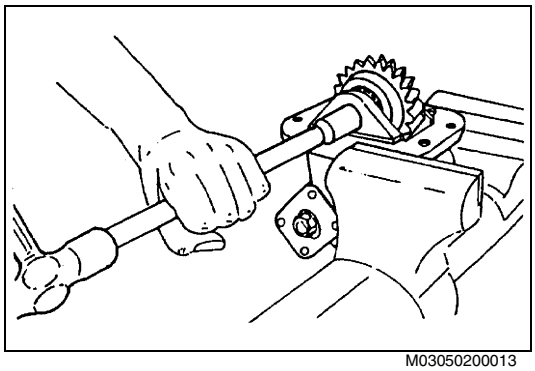
5. CHECK THE OUTPUT SHAFT AXIAL PLAY.

(1) Use a dial gauge to check the output shaft axial play.
Assembly Standard:0-0.05 mm {0-0.0019 in.}

(2) If it is not within specification, adjust the axial play with shims.

Shims are available in following sizes.

Shim Thickness:	**0.05 mm {0.0020 in.}**
	0.1 mm {0.0039 in.}
	0.2 mm {0.0079 in.}
	0.5 mm {0.0197 in.}


M03050200013

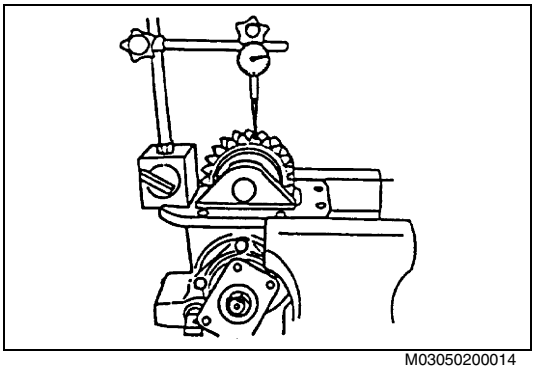
6. INSTALL THE INPUT GEAR.

(1) Place the taper roller bearing, input gear, shims and spacer in its original position.

(2) Drive the input shaft through the input gear into the case.

NOTICE:

Rotate the input shaft so that slot of the input shaft is aligned with hole of the case.

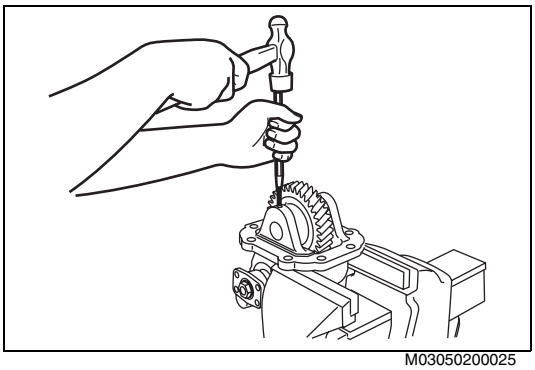

M03050200014

7. CHECK THE INPUT GEAR AXIAL PLAY.

(1) Use a dial gauge to check the input gear axial play.
Assembly Standard:0-0.05 mm {0-0.0019 in.}

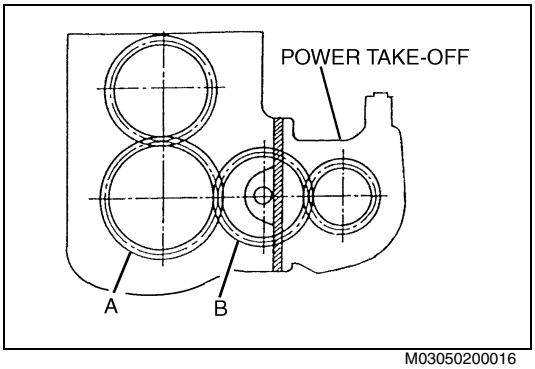
(2) If it is not within specification, adjust the axial play with shims.
Shims are available in following sizes.

Shim Thickness:	**0.05 mm {0.0020 in.}**
	0.1 mm {0.0039 in.}
	0.2 mm {0.0079 in.}
	0.5 mm {0.0197 in.}


M03050200025

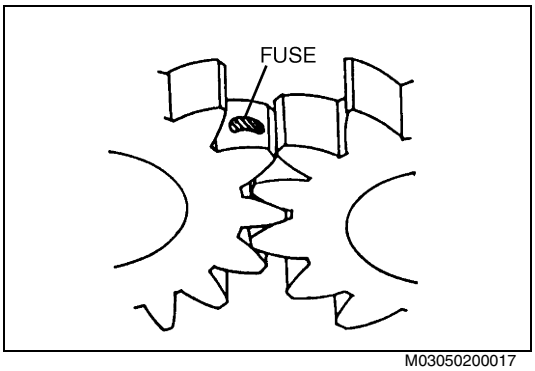
8. AFTER MEASURING THE AXIAL PLAY, INSTALL THE SPRING PIN INTO THE HOLE.

IMPORTANT POINTS - MOUNTING



M03050200016

1. MEASURE THE BACKLASH BETWEEN THE GEAR A AND B.



M03050200017

(1) Put the fuse (ϕ1 x 10 mm) on the surface of gear B with grease.

(2) Rotate the gears and measure the thickness of fuse.

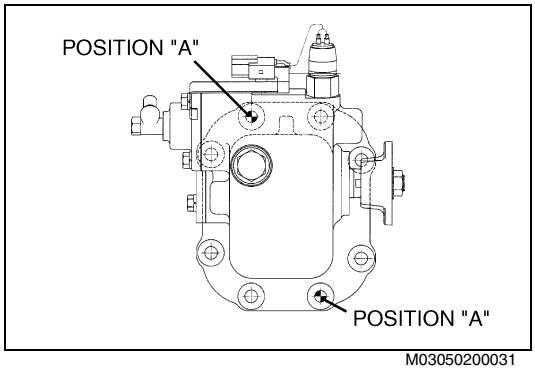
(3) The measurement should be carried out the three points on the gears.
Assembly Standard:
0.08-0.21mm {0.0031-0.0082 in.}

(4) If it is not within specification, adjust the backlash with adapter.

Adapters are available in following size.

Adapter Thickness:
Groove line: None 1.98 mm {0.0779 in.}
Groove line: One 1.87 mm {0.0736 in.}
Groove line: Two 1.77 mm {0.0697 in.}

NOTICE:
Gasket thickness: 0.19 mm {0.0075 in.}



M03050200031

2. INSTALL THE POWER TAKE-OFF ON THE TRANSMISSION.

(1) Install the power take-off on the transmission with gasket.

NOTICE:

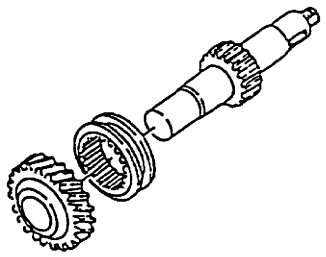
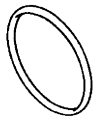
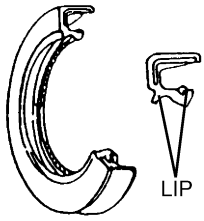
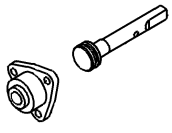
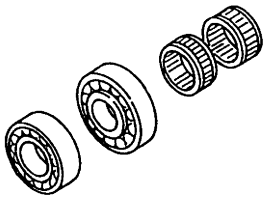
The trace of the liquid gasket should be continuous. The liquid gasket should be "ThreeBond #HP-17" or equivalent.

(2) Install the reamer bolts to the position "A".

3. FILL THE TRANSMISSION WITH TRANSMISSION OIL.

INSPECTION AND REPAIR

M03050202BEH3006

Inspection item	Standard	Limit	Remedy	Inspection procedure
Output shaft and output gear: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 
O-ring: Wear	—	—	**Replace, if necessary.**	**Visual check** 
Oil seal lip: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 
Shift rod and cylinder cap bore: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 
Bearing: Improper rotation	—	—	**Replace, if necessary.**	**Visual check** 

TRANSMISSION/TRANSFER CONTROL TR06-001

TRANSMISSION CONTROL UNIT TR06-2
TROUBLESHOOTING TR06-2

TRANSMISSION CONTROL LINKAGE ... TR06-3
COMPONENT LOCATOR TR06-3
DISMOUNTING AND MOUNTING TR06-4
ADJUSTMENT TR06-5

POWER SHIFT (TRANSMISSION SERIES: LX06S) TR06-7
DESCRIPTION TR06-7
PROPOSAL TOOL TR06-8
COMPONENT LOCATOR TR06-9
OVERHAUL TR06-10
INSPECTION AND REPAIR TR06-19

TRANSMISSION CONTROL UNIT

TROUBLESHOOTING

M03060101BEF3001

WITH POWER SHIFT

Symptom	Possible cause	Remedy/Prevention
Gears are difficult to engage or cannot be engaged when engine is not operating.	Control cable damaged, bent, deteriorated or deformed due to heat	Replace control cable.
	Loose parts	Inspect and tighten.
	Damaged shift lever assembly	Replace shift lever.
	Damaged power shift or faulty operation	Replace power shift.
	Damaged or bent parts on upper transmission cover section (lever, spring, etc.)	Replace.
	Faulty adjustment of control cable assembly and link rod	Adjust.
Shift operations are rough or heavy.	Faulty power shift operation [Air leakage (entering of foreign particles) in valves]	Replace power shift.
	Faulty power shift operation (air leakage in air pipes)	Inspect piping and correct problems.
	Mixing of contaminated water of foreign particles due to damaged boot of power shift (rusted ball joint, damaged O-ring, damaged packing, rusted or damaged rod)	Inspect parts and correct problems.
Excessive play in shift lever.	Worn bushing in joint or shift lever	Replace.
	Loose mounting bolts and nuts	Inspect and tighten.
Power shift slips out of gear on rough road.	Faulty adjustment of control cable assembly	Adjust.

WITHOUT POWER SHIFT

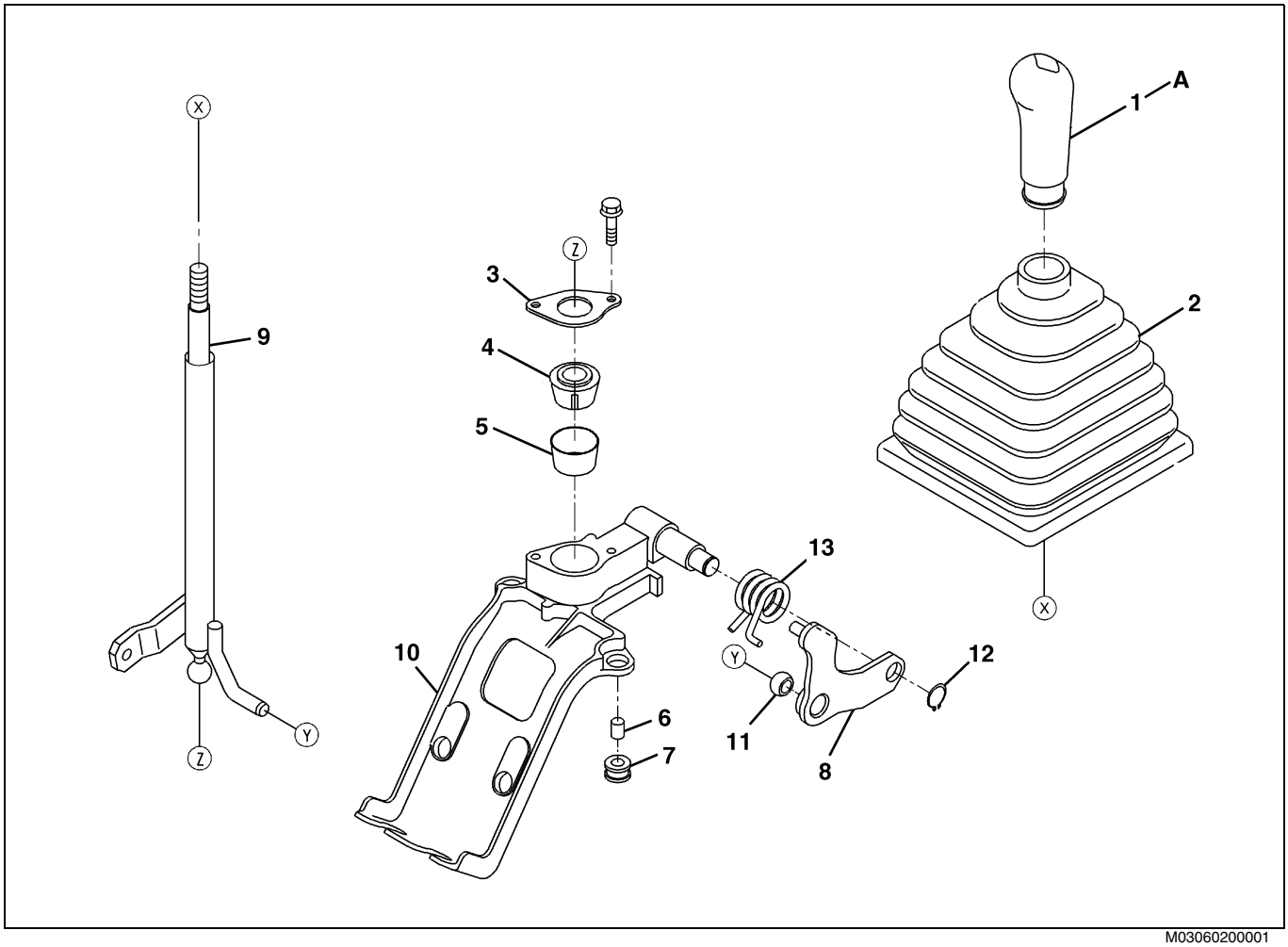
Symptom	Possible cause	Remedy/Prevention
Gears are difficult to engage or cannot be engaged when engine is not operating.	Control cable damaged, bent, deteriorated or deformed due to heat	Replace control cable.
	Loose parts	Inspect and tighten.
	Damaged shift lever assembly	Replace shift lever.
	Damaged or bent parts on upper transmission cover section (lever, spring, etc.)	Replace.
	Faulty adjustment of control cable assembly and link rod	Adjust.
Excessive play in shift lever.	Worn bushing in joint or shift lever	Replace.
	Loosen mounting bolts and nuts	Inspect and tighten.

TRANSMISSION CONTROL LINKAGE

COMPONENT LOCATOR

M03060202BED1001

CAB SIDE



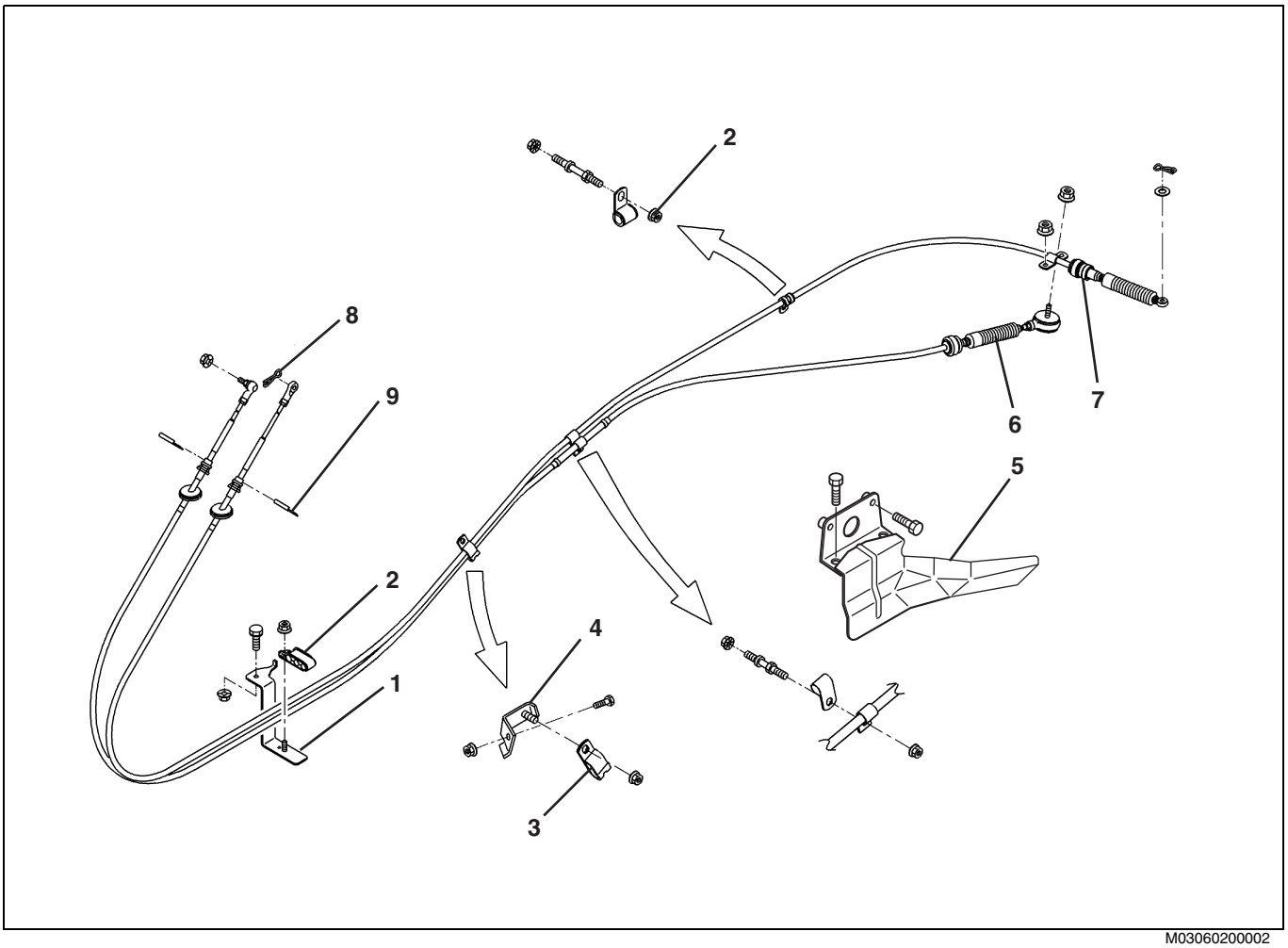
M03060200001

1	Shift lever knob	8	Select lever
2	Shift lever boot	9	Shift lever
3	Plate	10	Control rod support
4	Ball joint	11	Ball
5	Rubber seat	12	E-ring
6	Distance piece	13	Spring
7	Rubber cushion		

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

A	6.9-8.9 {70-90, 5.1-6.5}		

CHASSIS SIDE (REPRESENTATIVE TYPE)

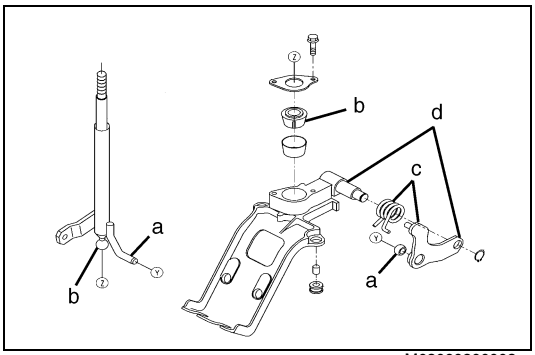


M03060200002

1	Cable retaining bracket	6	Control cable (Shift)
2	Clip	7	Control cable (Select)
3	Clip	8	Pin
4	Cable retaining bracket	9	Clamp
5	Gear control insulator		

DISMOUNTING AND MOUNTING

M03060202BEH1001



M03060200003

IMPORTANT POINTS - MOUNTING

1. COAT THE LITHIUM BASE GREASE OR CHASSIS GREASE.

(1) Coat lithium base grease to the following parts.

a. Shift lever and ball contact point.

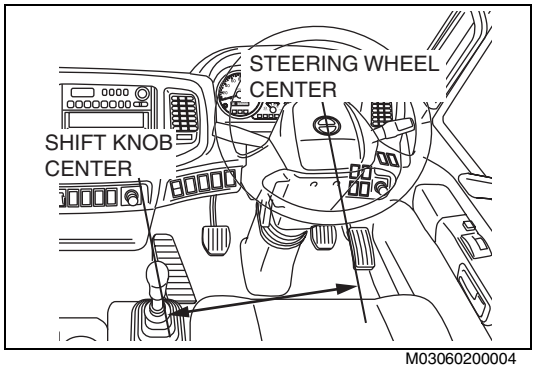
b. Shift lever and ball joint contact point.

c. Select lever and spring contact point.

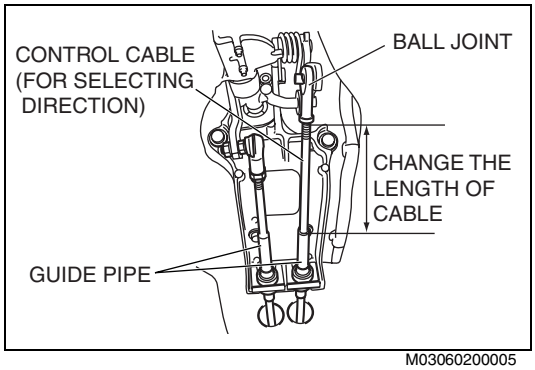
d. Shift lever and select lever contact point.

ADJUSTMENT

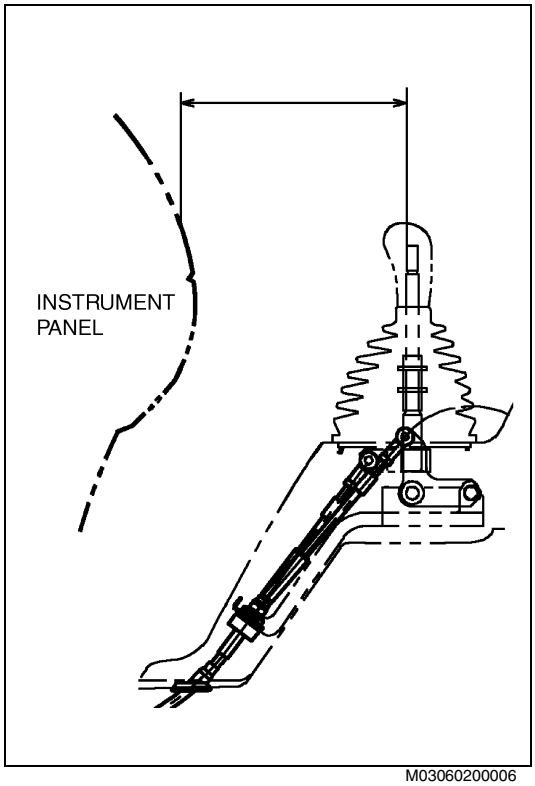
M03060202BEH3002



M03060200004



M03060200005



M03060200006

ADJUSTMENT PROCEDURE

1. ADJUST THE NEUTRAL POSITION OF THE GEAR SHIFT LEVER.

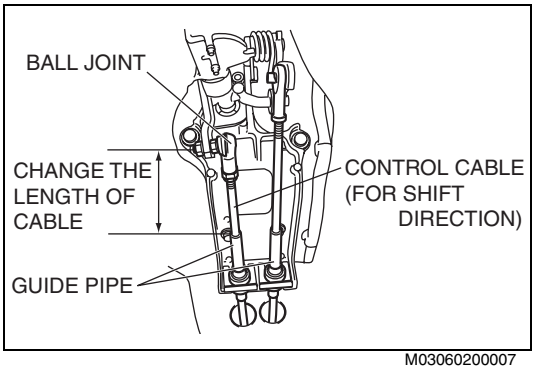
(1) Check that the distance between the knob center and the steering wheel center conforms to the following;
Assembly standard: 310-340 mm {12.205-13.385}

(2) If not, adjust the length of the select control cable.

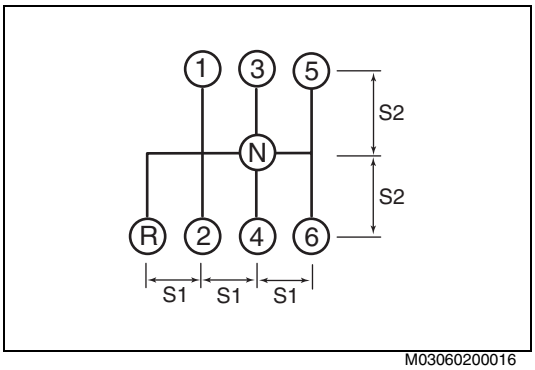
Length of cable	Position of selecting direction
To lengthen it	Distance gets shorter. (Lever leans right side.)
To shorten it	Distance gets longer. (Lever leans left side.)

NOTICE:
- **Do not adjust cables with holding guide pipe.**
- **When changing the length of cable, do not bend the cable.**

(3) Check that the distance between the knob center and the instrument cluster conforms to the following;
Assembly standard: 235-265 mm {9.252-10.433 in.}



M03060200007



M03060200016

(4) If not, adjust the length of the shift lever control cable.

Length of cable	Position of shifting direction
To lengthen it	Distance gets longer. (Lever leans backward.)
To shorten it	Distance gets shorter. (Lever leans frontward.)

NOTICE:
- **Do not adjust cables with holding guide pipe.**
- **When changing the length of cable, do not bend the cable.**

2. CHECK THE SHIFT AND SELECT STROKE.

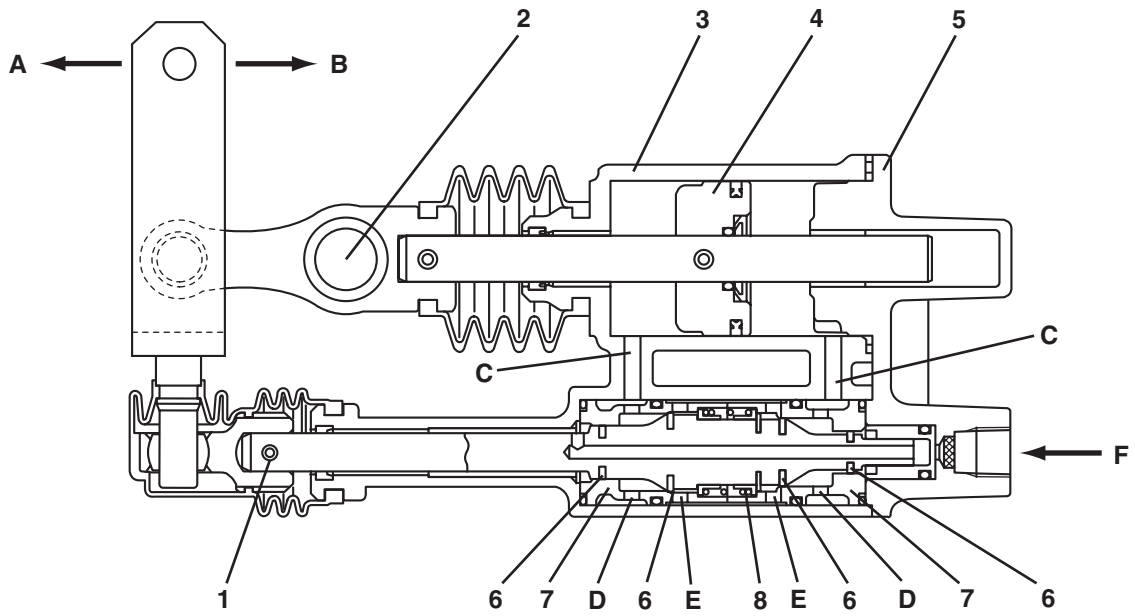
Unit: mm {in.}

	S1	S2
With power shift	45-55{1.772-2.165}	100-120 {3.937-4.724}
Without power shift		90-110 {3,544-4.330}

POWER SHIFT (TRANSMISSION SERIES: LX06S)

DESCRIPTION

M03060301BEC1001



M03060300001

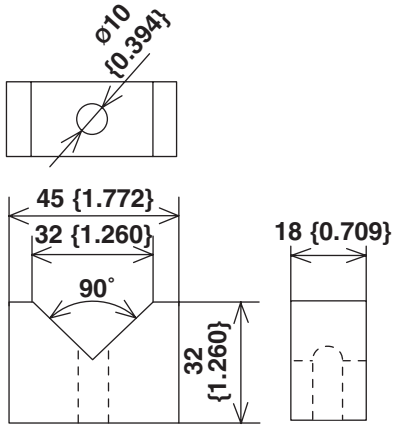
1	Valve joint	8	Return spring
2	Joint	A	Front
3	Booster cylinder	B	Rear
4	Piston	C	Air inlet and outlet
5	Cover	D	Air inlet
6	Valve seal	E	Air outlet
7	Valve seat	F	Compressed air

PROPOSAL TOOL

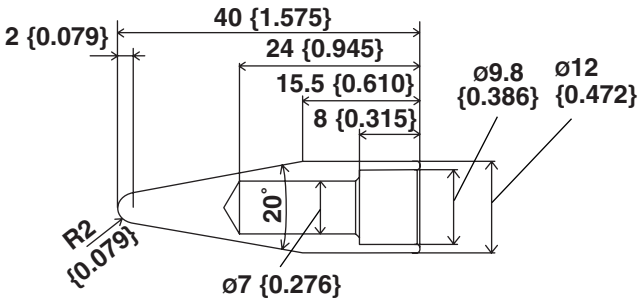
M03060301BEK1001

Unit: mm {in.}

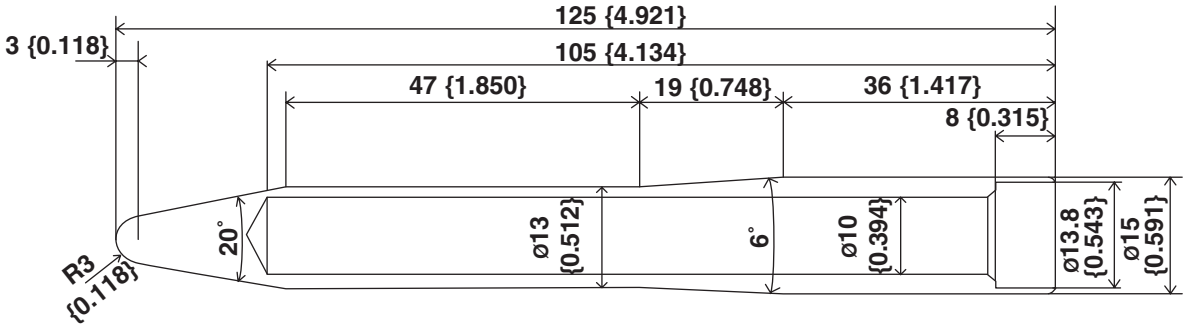
JIG A



JIG B



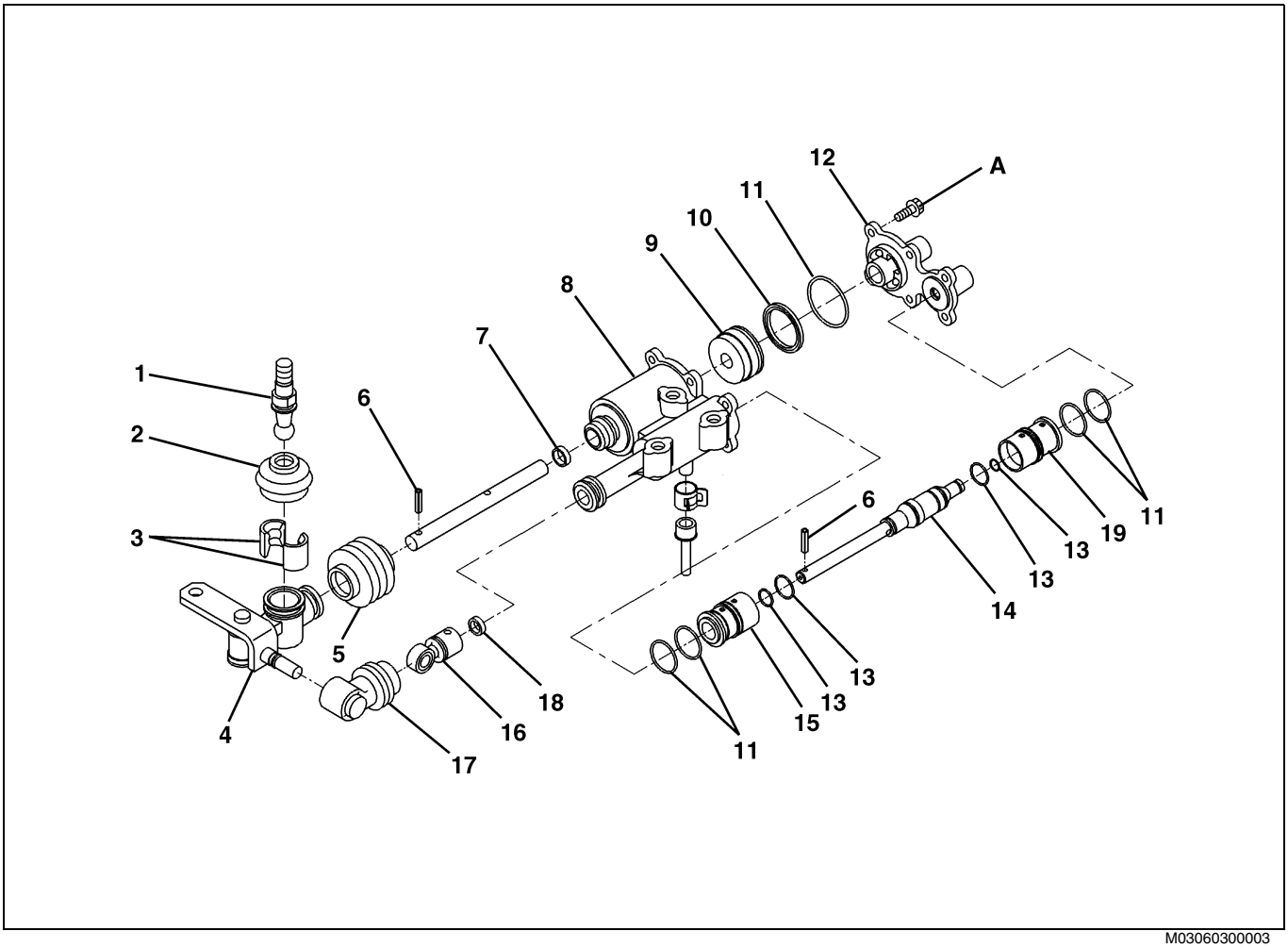
JIG C



M03060300002

COMPONENT LOCATOR

M03060301BED1001



M03060300003

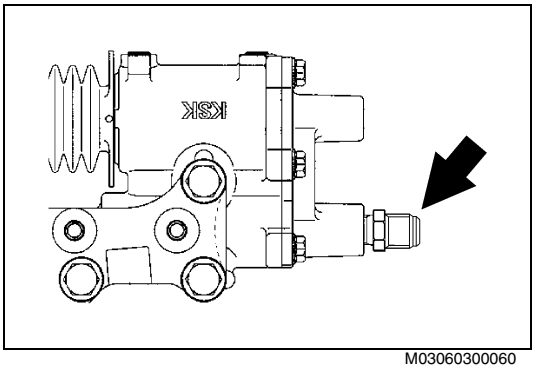
1	Ball joint stud	11	O-ring
2	Dust boot C	12	Cover
3	Ball joint	13	Valve seal
4	Joint	14	Power shift valve sub-assembly
5	Dust boot A	15	Valve seat A
6	Spring pin	16	Ball joint assembly
7	Rod seal A	17	Dust boot B
8	Booster cylinder	18	Rod seal B
9	Piston	19	Valve seat B
10	Piston seal		

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

A	4.0-7.8 {40-80, 2.9-5.7}		

OVERHAUL

M03060301BEH2001



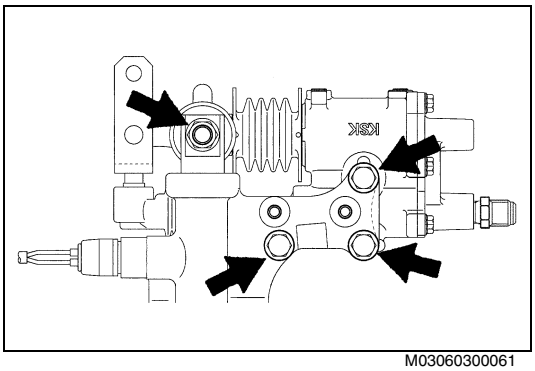
M03060300060

IMPORTANT POINT - DISMOUNTING

1. REMOVE THE AIR PIPE OF THE POWER SHIFT.

(1) Loosen the flare nuts of air pipe on the side of the power shift unit to remove the pipe.

NOTICE:
Cover the removed air pipe and power shift unit to prevent foreign materials from entering.



M03060300061

IMPORTANT POINT - MOUNTING

1. MOUNT THE POWER SHIFT.

(1) Mount the power shift to the transmission assembly.
Tightening Torque:
40.2-46.1 N·m {410-470 kgf·cm, 30-33 lbf·ft}

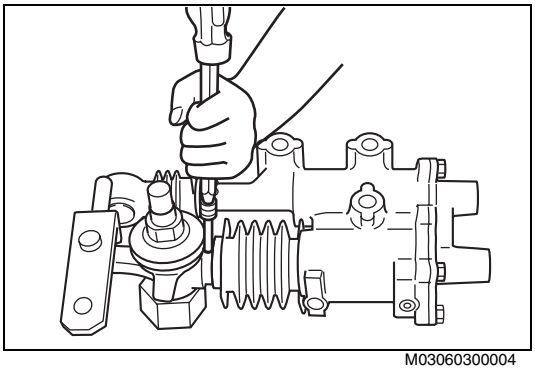
(2) Install the shift lever shaft to the power shift.
Tightening Torque:
75.5-91.2 N·m {770-929 kgf·cm, 56-67 lbf·ft}

IMPORTANT POINTS - DISASSEMBLY

1. CAUTIONS DURING DISASSEMBLY

(1) In order to maintain airtightness, handle all parts with care and do not forcefully remove any parts.

(2) Disassembly and assembly should be done in a clean position. Especially, remove dirt and dust attached to exterior parts before disassembling them and do operation with bare hands when assembling them, being careful not to allow foreign materials to enter.



M03060300004

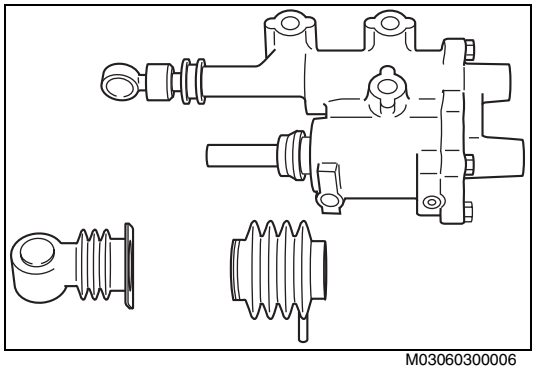
2. DISASSEMBLE THE POWER SHIFT.

(1) Remove the clips and exhaust hoses.

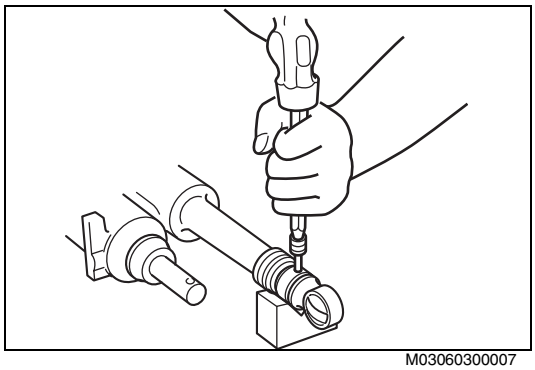
(2) Remove the boot C by inserting a spacer 13-15 mm {0.512-0.590 in} wide under the ball joint assembly and drive out the spring pin with a 5.0 mm {0.197 in.} diameter tapping rod.

(3) Remove the joint assembly.

HINT:
If the fitting part of the rod and joint assembly cannot be removed, tap the joint assembly body lightly to remove it. At this time, be careful not to damage the rod part in the booster cylinder.

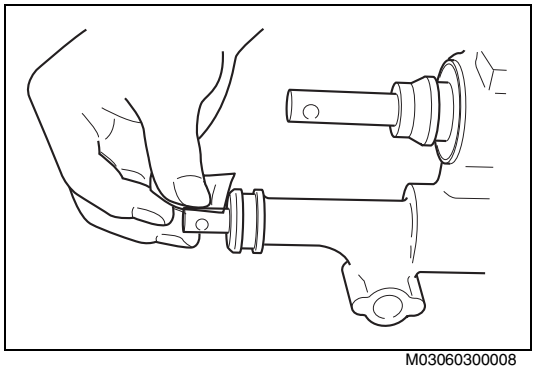

M03060300006

(4) Remove the boot A and B.


M03060300007

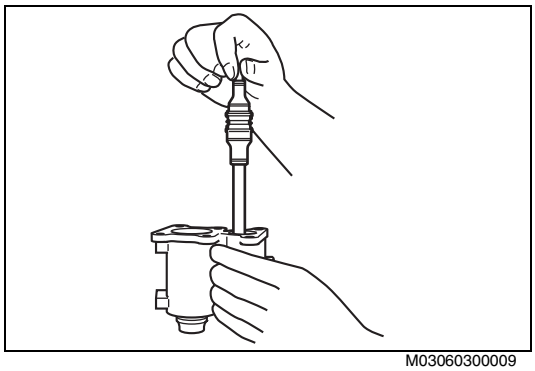
(5) Put the ball joint assembly on the jig A and drive out the spring pin with a tapping rod to remove the ball joint assembly.

HINT:
If the fitting part of the rod and ball joint assembly cannot be removed, tap the ball joint assembly body lightly to remove it. At this time, be careful not to damage the rod part in the booster cylinder.


M03060300008

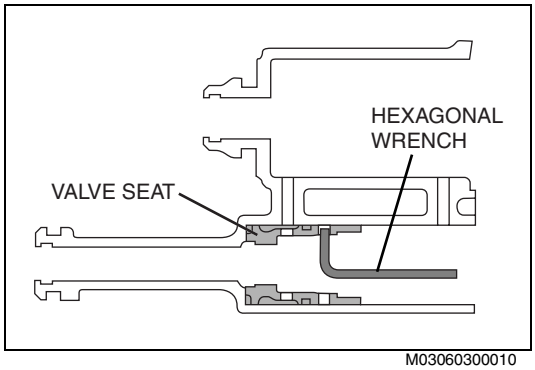
(6) When removing the power shift valve sub-assembly and piston from booster cylinder, rod seals can be damaged by holes for spring pin at the end. So wipe off grease on the end of the shaft and make sure that there is no flaws, burrs and gouge on the seals.

NOTICE:
Remove flaws completely with a emery paper (No.1000) if there is any flaw, burr and gouge.


M03060300009

3. PULL OUT THE POWER SHIFT VALVE AND PISTON.

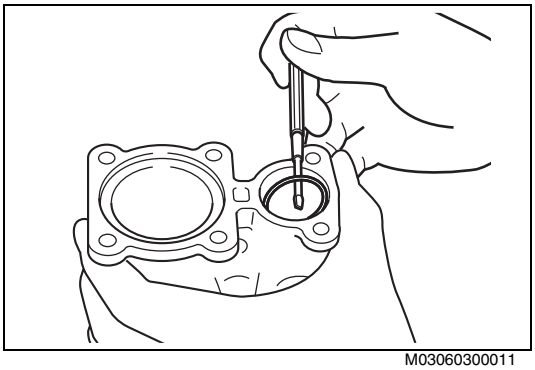
(1) Remove the power shift valve sub-assembly from the booster cylinder slowly.



M03060300010

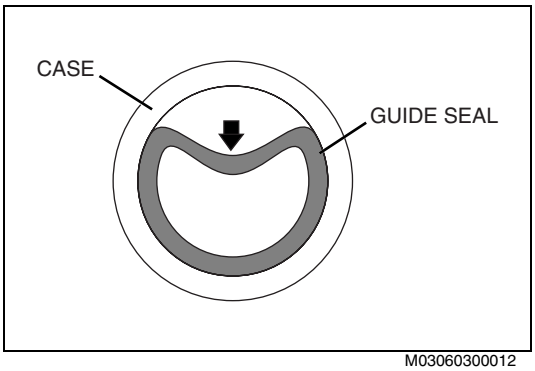
(2) Pull out the valve seat A by inserting a hexagonal wrench 4 mm {0.157 in.} width across flats into the hole of the valve seat A.

NOTICE:
Be careful not to damage the inner surface of the cylinder.


M03060300011

(3) Remove the O-ring on the inner part of the cylinder using a flat blade precision screwdriver etc.

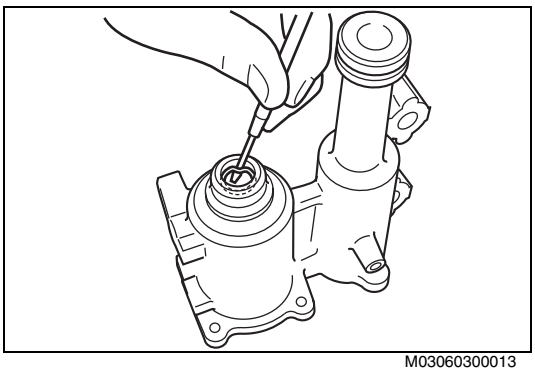
NOTICE:
Be careful not to damage the inner surface of the cylinder.



M03060300012

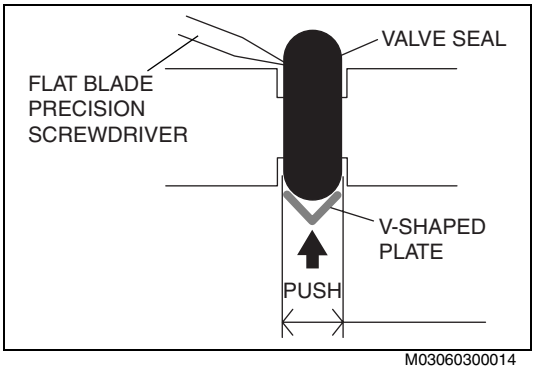
4. REMOVE THE ROD SEALS.

(1) Push aside the upper part of the rod seals inside slowly using a flat blade precision screwdriver etc.


M03060300013

(2) Pull up the rod seals slowly by inserting another flat blade precision screwdriver between the cylinder and the rod seals with the rod seals pushed aside inside, and remove the rod seals.

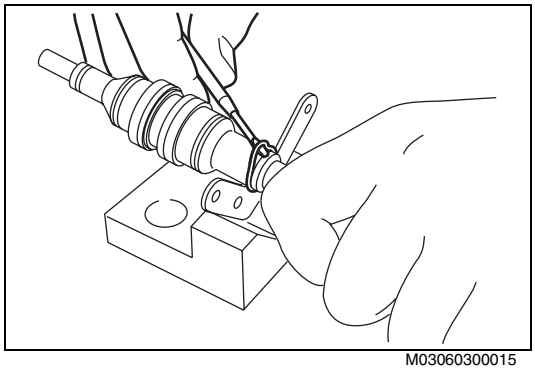
NOTICE:
Be careful not to damage the inner groove of the cylinder by the point of the precision screwdriver etc.



M03060300014

5. REMOVE THE VALVE SEAL.

(1) Attach the V-shaped plate 1.2-1.5 mm {0.0473-0.0590 in.} wide under the valve seal and push up the valve seal to rise it up.


M03060300015

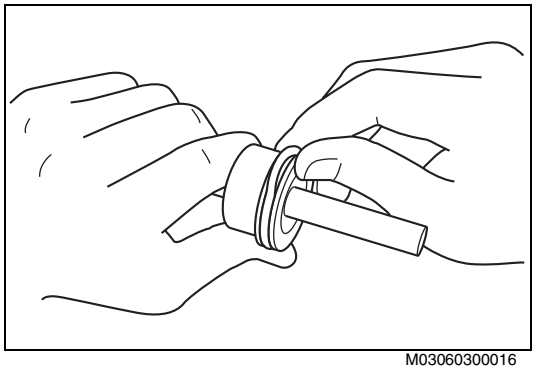
(2) Remove the valve seal by inserting a flat blade precision screwdriver between the power shift valve sub-assembly and valve seal.

NOTICE:
Be careful not to damage the valve shaft and valve seal.

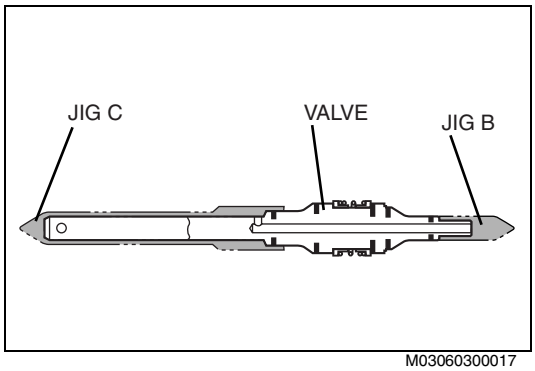
IMPORTANT POINTS - ASSEMBLY

1. CAUTIONS DURING ASSEMBLY
(1) In order to maintain airtightness, handle all parts with care and do not forcefully assemble any parts.
(2) Assemble parts carefully so that dirt and foreign materials do not enter the assembled parts.

2. ASSEMBLE THE PISTON SEAL AND VALVE SEAL.
(1) Apply silicone grease to the piston seal and install it to the piston.


M03060300016

(2) Apply silicone grease to the valve seal A and B and install them to the valve sub-assembly using a jig B and a Jig C.

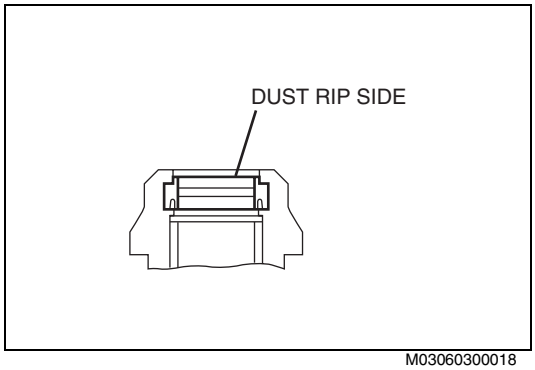


M03060300017

NOTICE:
Be careful not to distort the valve seals.

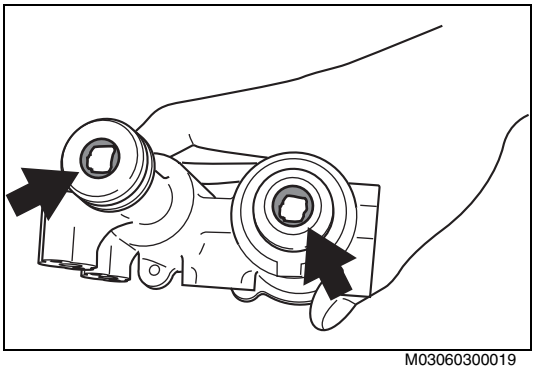
(3) Apply silicone grease to the valve seal C and D and install it to the valve sub-assembly.

3. ASSEMBLE THE ROD SEAL.
(1) Push the rod seals in the booster cylinder, bending them to fit them in easily with fingers.
Install the rod seals into the groove of the booster cylinder surely using a flat blade precision screwdriver.

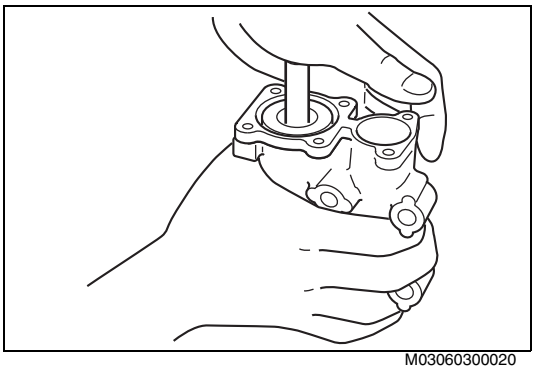


M03060300018

NOTICE:
- **Be careful of installing direction of the rod seals.**
- **Be careful not to damage the lip part of the booster cylinder and rod seals.**

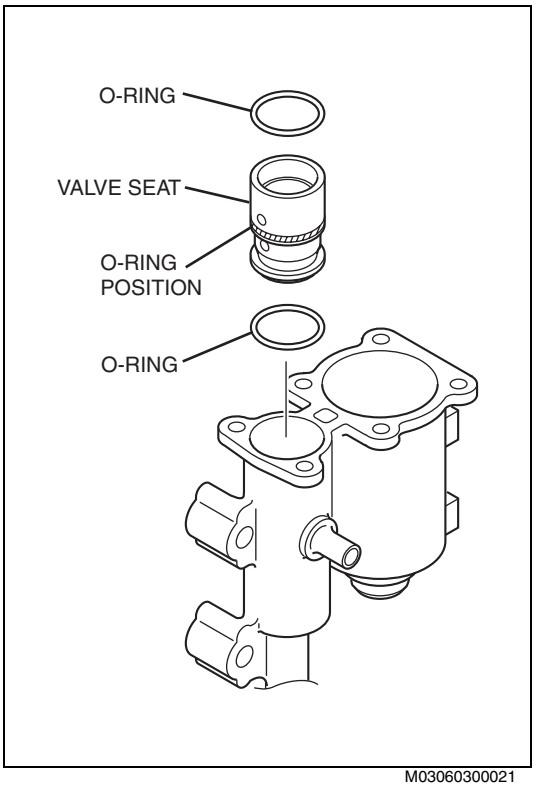

M03060300019

(2) Apply silicone grease to the inner surface of the rod seals.


M03060300020

4. ASSEMBLE THE PISTON AND POWER SHIFT VALVE SUB-ASSEMBLY.

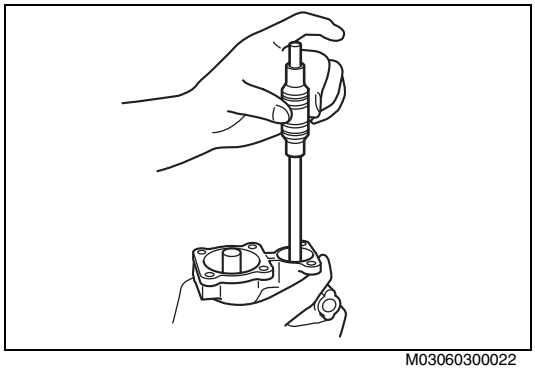
(1) Apply silicone grease to the inner surfaces of the valve cylinder part and piston cylinder part in the booster cylinder.
(2) Apply silicone grease to the outer periphery of the piston seal and insert the piston assembly into the booster cylinder slowly.



M03060300021

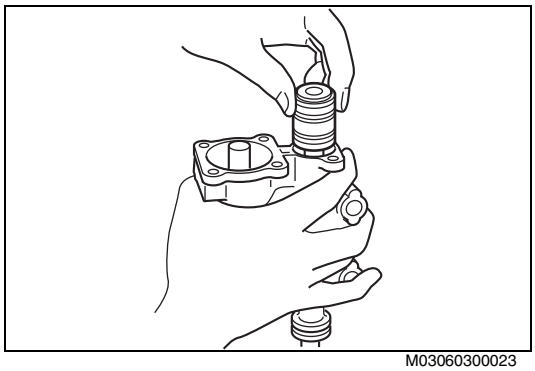
(3) Insert the O-ring into the inner part of the booster cylinder.
(4) Fit the O-ring to the outer periphery of the valve seat A.
(5) Apply silicone grease to the inner surface of the valve seat A and insert it into the inner part of the booster cylinder slowly.

NOTICE:
Be careful of inserting direction of the valve seat.


M03060300022

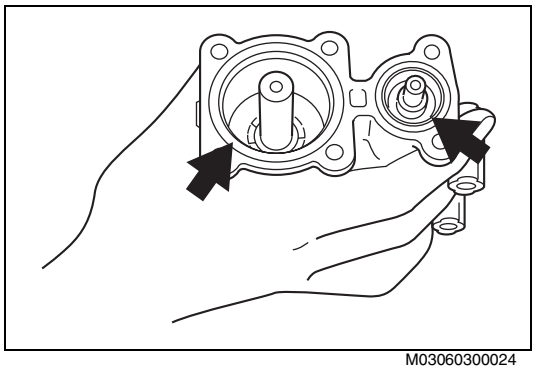
(6) After applying silicone grease to the outer periphery of the valve seal, insert the valve sub-assembly into the booster cylinder slowly.

(7) Fit the O-ring to the valve seat B.


M03060300023

(8) Apply silicone grease to the inner surface of the valve seat B and insert it into the booster cylinder slowly.

NOTICE:
Be careful of inserting direction of the valve seat.

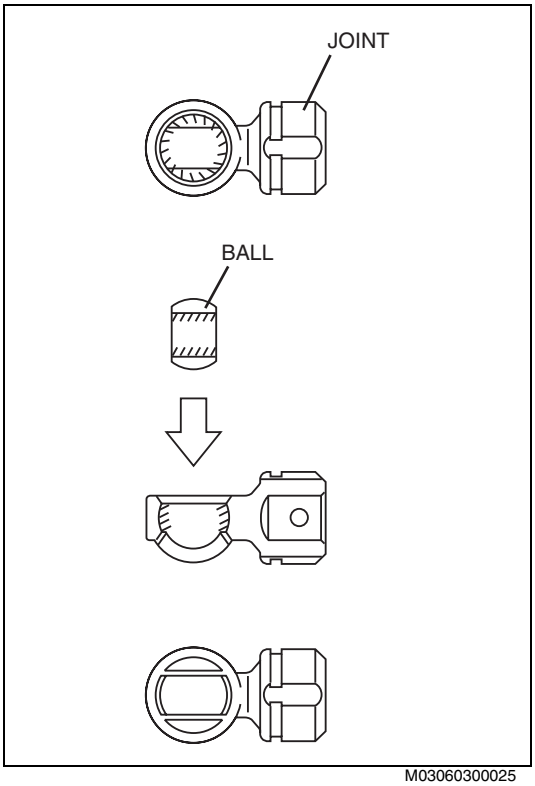

M03060300024

5. INSTALL THE COVER.
(1) Install the O-ring to the booster cylinder.

(2) Apply silicone grease to the inner surface of the bearing in the cover and install the cover to the booster cylinder.

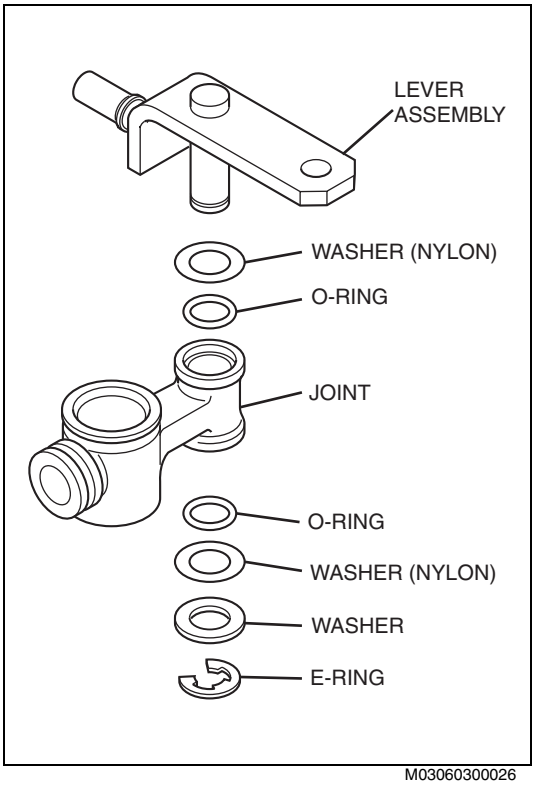
NOTICE:
Tighten the bolts in twice to prevent the cover from distorting due to warp of the cover.

6. CHECK THE OPERATION.
(1) By moving the top of piston 3 or 4 times, make sure that it moves smoothly and sliding resistance is 9.8 N {1 kgf, 2.2 lbf} or less.
(2) Move the valve sub-assembly to male sure that its motion is smooth without binding.



M03060300025

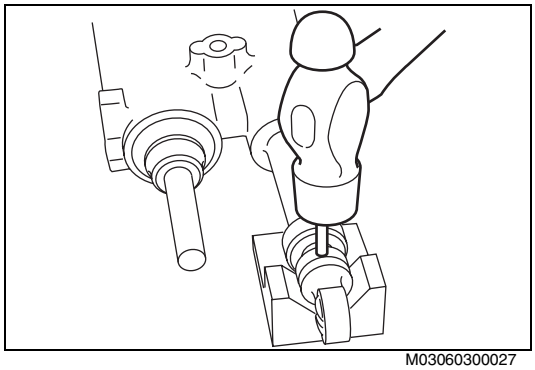
7. ASSEMBLE THE BALL JOINT ASSEMBLY.
(1) Apply silicone grease to the whole of the ball and the inner surface of the ball joint case.
(2) Install the ball with it stood into the joint.



M03060300026

8. ASSEMBLE THE JOINT ASSEMBLY.
(1) Apply silicone grease to the O-ring and the inner surface of the joint.
(2) Install each component part to the lever assembly and install the E-ring.

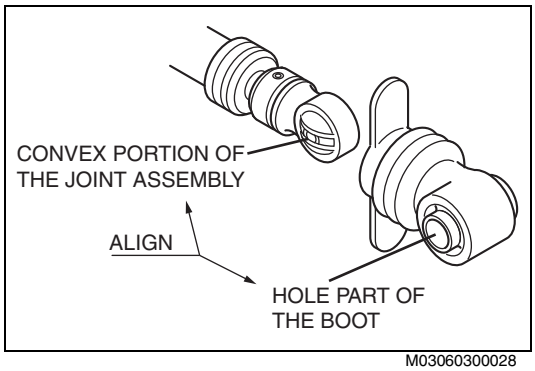
NOTICE:
Be careful of installing position of the joint.


M03060300027

9. ASSEMBLE THE BALL JOINT ASSEMBLY.

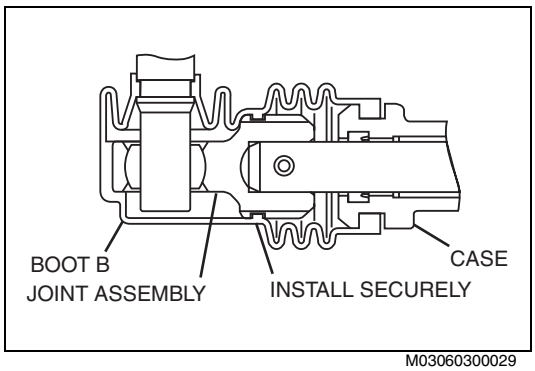
(1) Put the ball joint assembly on a jig A and align the hole of the valve assembly with the ball joint assembly to drive a new spring pin into them.

(2) Cover the ball joint assembly with the dust boot B and install the dust boot B into the groove of the booster cylinder.

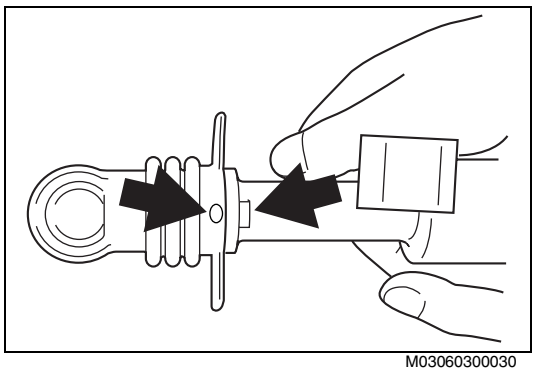


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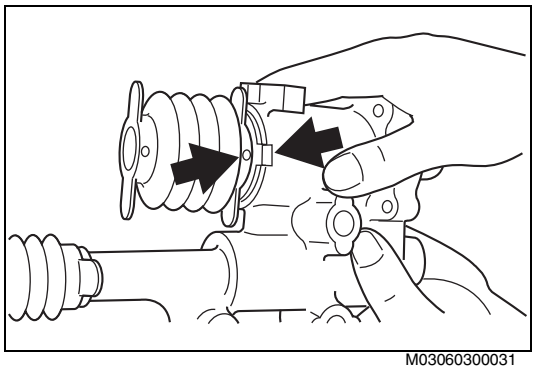
(3) Cover the convex portion of the ball joint assembly with the dust boot B, aligning the convex portion with the hole part of the dust boot B.
Install the inner convex portion of the dust boot B into the groove of the ball joint assembly securely.



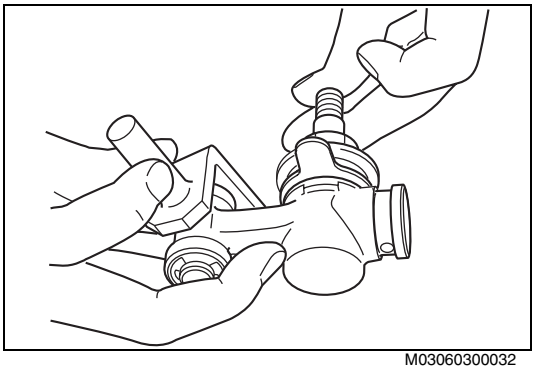
M03060300029


M03060300030

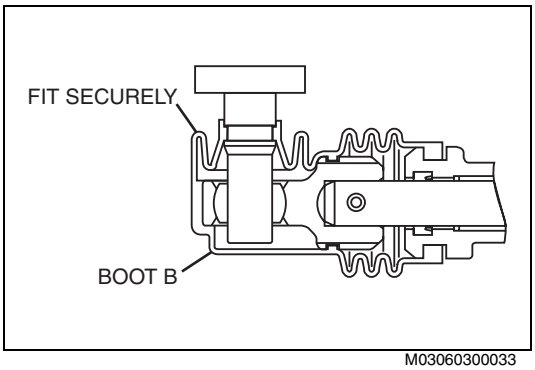
(4) Align the concave mark with the convex mark of boot B.


M03060300031

(5) Install the boot A to the groove of the booster cylinder and align the concave mark of the boot A with the convex mark of the booster cylinder.

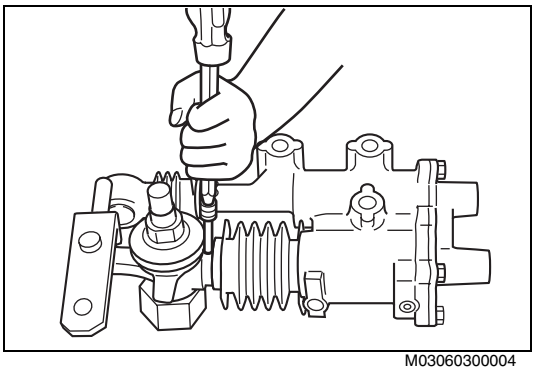

M03060300032

(6) Apply silicone grease to the inner surface of the boot C and install it to the joint assembly.



M03060300033

(7) Insert the top of the lever of the joint assembly to the boot B strongly.
Fit the boot B to the groove of the lever securely.


M03060300004

(8) Insert a spacer 13-15 mm {0.512-0.590 in.} wide under the ball joint assembly.
And align the hole position of the ball joint assembly with the one of piston to drive the spring pin into them using a 7-8 mm {0.2756-0.3149 in.} diameter tapping rod.

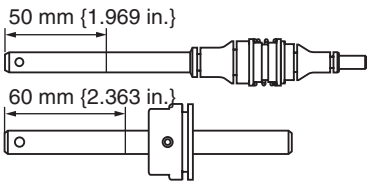
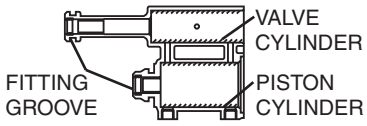
IMPORTANT POINT - INSPECTION

1. INSPECT AIR LEAKAGE.

(1) Supply the compressed air of 735 kPa {7.5 kgf/cm^2, 107 lbf/in^2} and mark sure of the neutral of the valve and the valve operation of the both pushing and pulling direction.

INSPECTION AND REPAIR

M03060301BEH3001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Valve seal, piston seal and dust boot: Setting, hardening, wear and deformation NOTICE: As for the rod seal and O-ring, replace them with new one at regular maintenance as a rule.	—	—	Replace the parts with new one, if necessary.	Visual check
Piston and power shift sub-assembly: Flaws and scratches due to wear in the sliding surface A and B as shown in figure.	A:50 mm {1.969 in.} B:60 mm {2.363 in.}	—	Replace the parts, if there is any flaw and scratch. Remove flaws with a emery paper (No.1000) if it is light.	Visual check 
Piston cylinder part and valve cylinder part: Flaws and scratches	—	—	Replace the parts, if there is any flaw and scratch. Remove flaws with a emery paper (No.1000) if it is light.	Visual check 
Fitting groove part for rod seals: Flaws and scratches	—	—	Replace the parts, if necessary.	
Other parts: Wear, play and damage NOTICE: If there is adhesion of foreign materials in the mesh filter of the cover, remove the foreign materials.	—	—	Replace the parts, if necessary.	Visual check and measure

PROPELLER SHAFT (LD0932)

PP02-001

PROPELLER SHAFT ASSEMBLY (LD0932)..... PP02-2

DATA AND SPECIFICATIONS PP02-2
DESCRIPTION PP02-2
TROUBLESHOOTING PP02-3
SPECIAL TOOL PP02-3
COMPONENT LOCATOR PP02-4
OVERHAUL PP02-6
INSPECTION AND REPAIR PP02-12

PROPELLER SHAFT ASSEMBLY (LD0932)

DATA AND SPECIFICATIONS

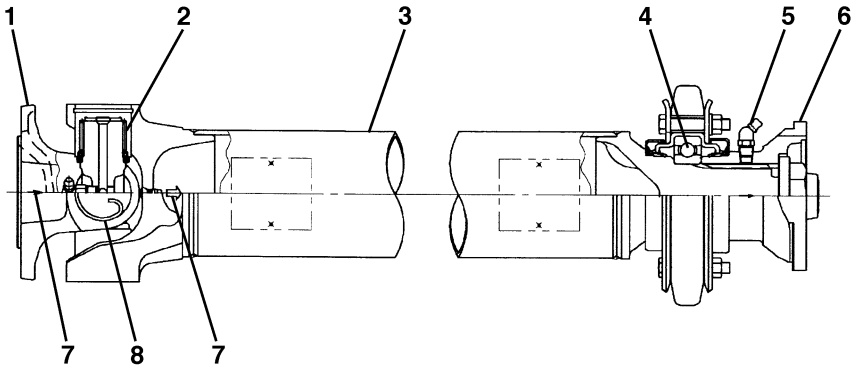
M04020101BEI2001

Type	**Tubular shaft type**
Universal joint	**All metal, round bearing type with needle roller bearing**

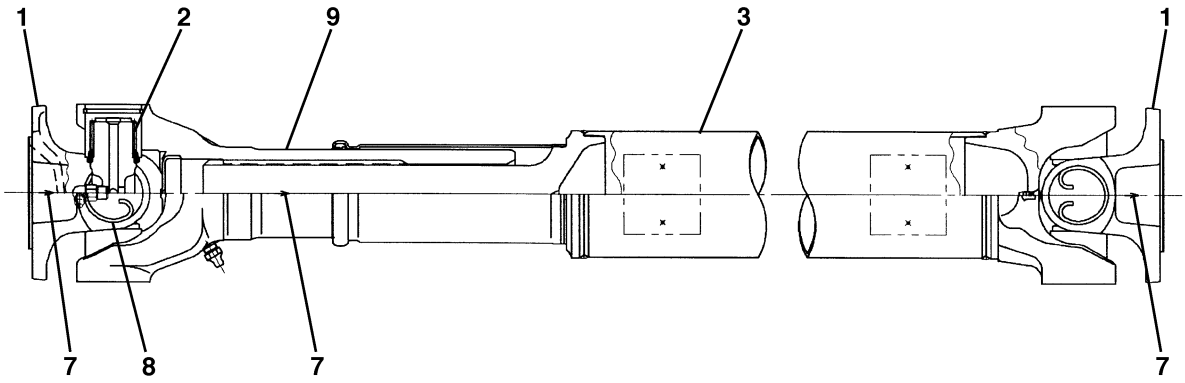
DESCRIPTION

M04020101BEC1001

FRONT



REAR



M04020100001

1	**Universal joint yoke**	**6**	**Universal joint flange**
2	**Needle roller bearing**	**7**	**Phasing arrow**
3	**Yoke shaft**	**8**	**Retainer ring**
4	**Center bearing**	**9**	**Sliding yoke**
5	**Lubrication fitting**		

TROUBLESHOOTING

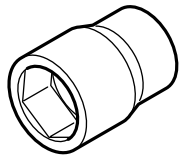
M04020101BEF3001

Symptom	Possible cause	Remedy/Prevention
Abnormal vibration when driving.	Looseness of universal joint yoke and flange tightening nuts.	Tighten the nuts.
	Looseness of universal joint flange lock nut.	Replace the lock nut with new one, then tighten the lock nut with specified torque and caulk the nut securely.
	Excessively bent propeller shaft.	Replace the shaft.
	Worn or damaged universal joint.	Replace the universal joint.
	Worn or damaged center bearing.	Replace the bearing.
	Worn or damaged center bearing rubber cushion.	Replace the rubber cushion.
	Incorrect phasing of the yokes.	Match the phasing arrows correctly.

SPECIAL TOOL

M04020101BEK1001

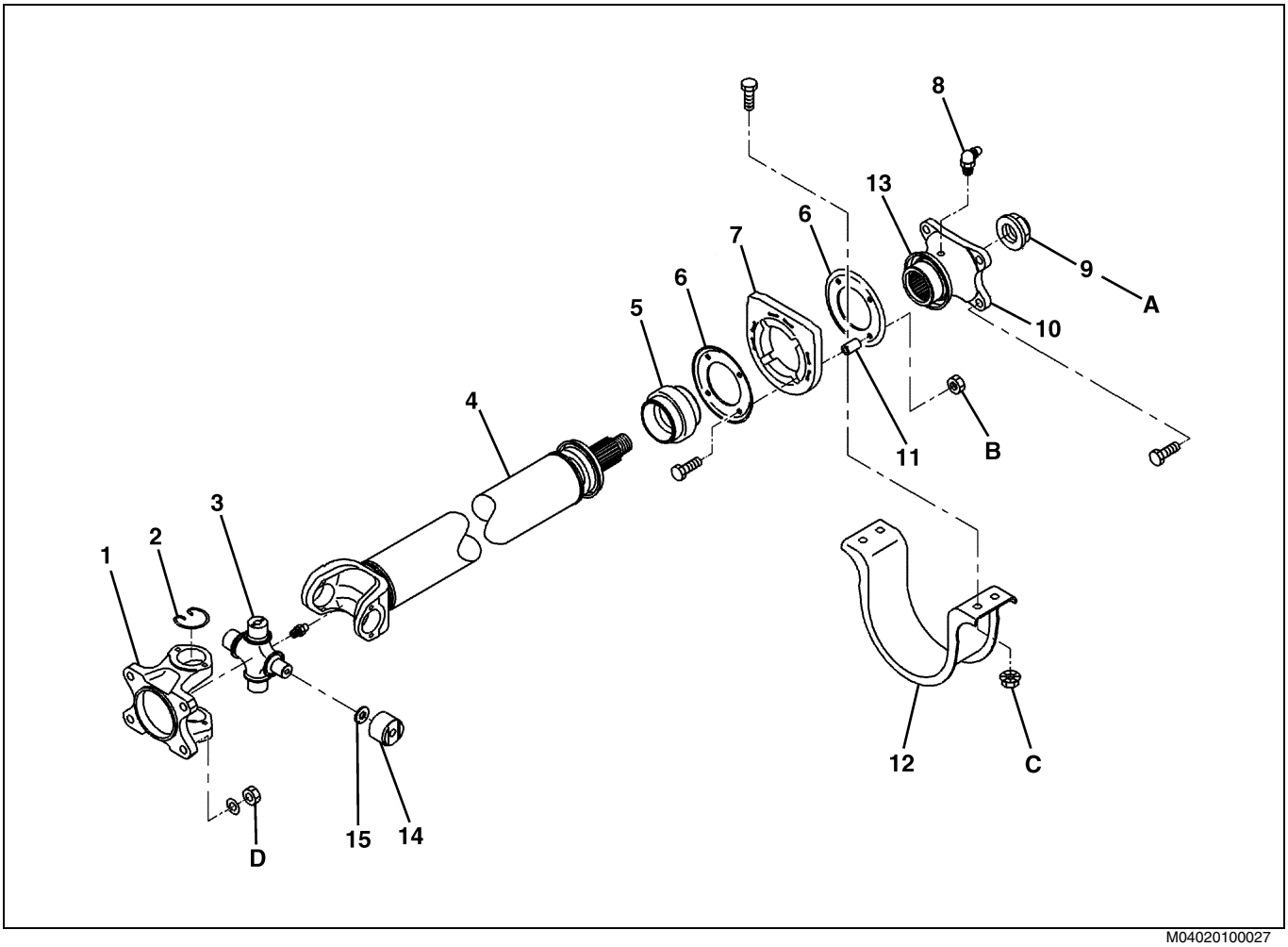
Prior to starting a propeller shaft overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	09839-4104	SOCKET WRENCH	

COMPONENT LOCATOR

M04020101BED1001

FRONT



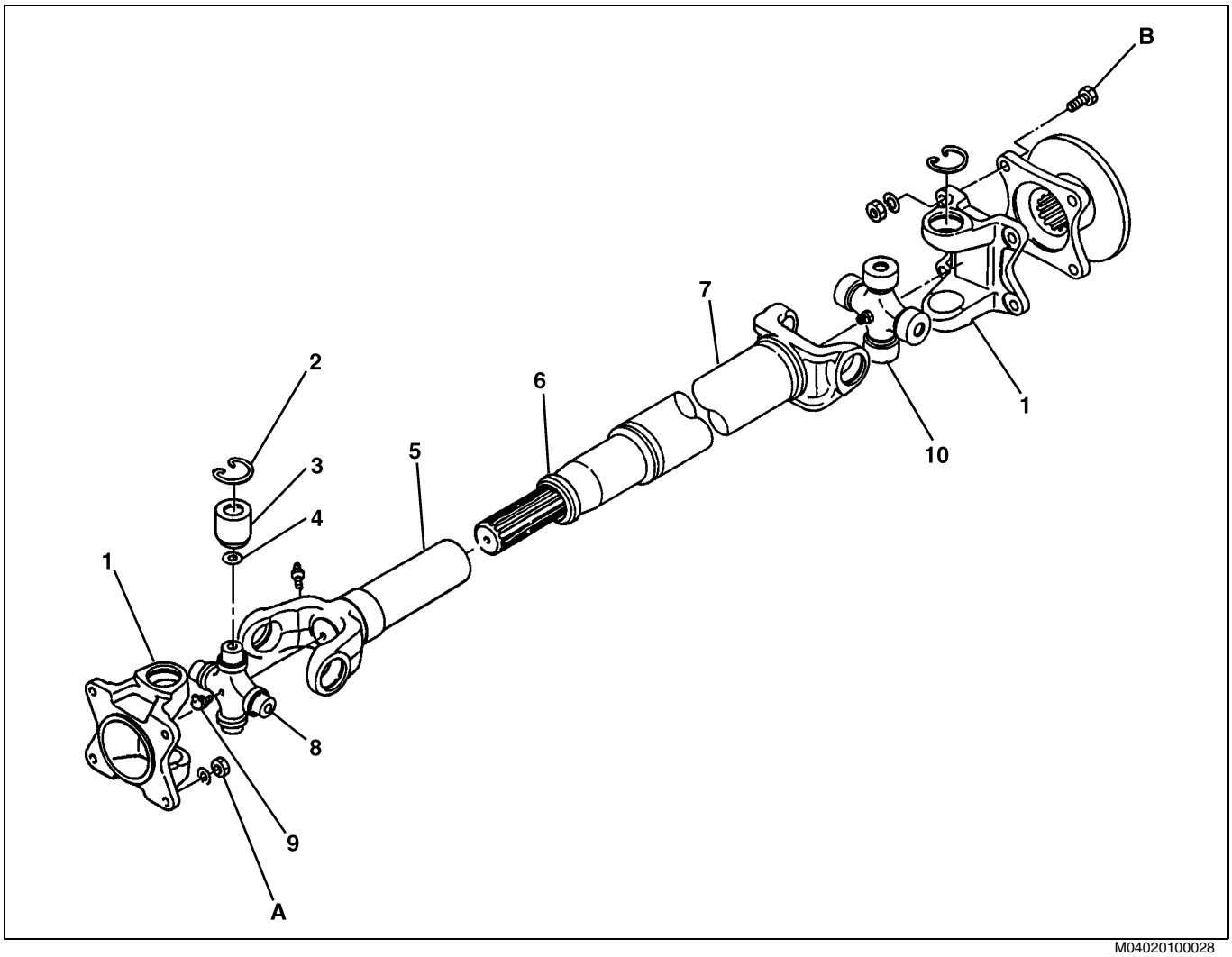
M04020100027

1	Universal joint yoke	9	Lock nut
2	Retainer ring	10	Universal joint flange
3	Universal joint spider	11	Collar
4	Yoke shaft	12	Center bearing holder
5	Center bearing	13	Dust deflector
6	Center bearing plate	14	Needle roller bearing
7	Center bearing cushion	15	Thrust washer
8	Lubrication fitting		

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

A	588.4-784.6 {6,000-8,000, 434-578}	C	41.5-61.5 {424-672, 31-45}
B	22.4-30.6 {229-312, 17-22}	D	61-91 {623-927, 45-67}

REAR



M04020100028

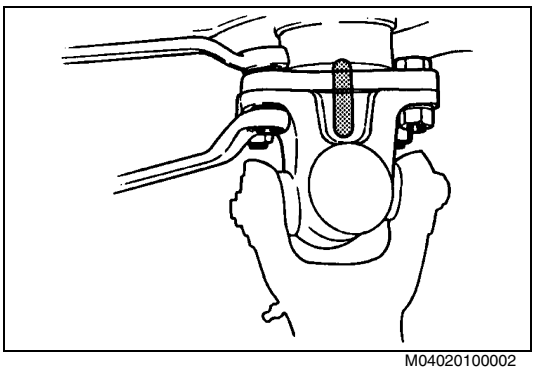
1	Universal joint yoke	6	Dust cover seal
2	Retainer ring	7	Yoke shaft
3	Needle roller bearing	8	Universal joint spider
4	Thrust washer	9	Lubrication fitting
5	Sliding yoke	10	Universal joint assembly

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

A	61-91 {623-927, 45-67}	B	61-91 {623-927, 45-67}

OVERHAUL

M04020101BEH2002


M04020100002

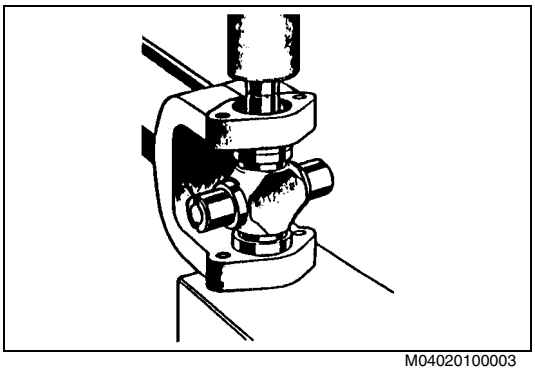
IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT FROM THE FLANGE ON ALL THE CONNECTING POINTS.

(1) Make aligning marks on the flange and yoke.

(2) Remove the nuts and the bolts.

NOTICE:
Park the vehicle on level ground, apply the parking brake and apply wheel stoppers in the front tires or rear tires.

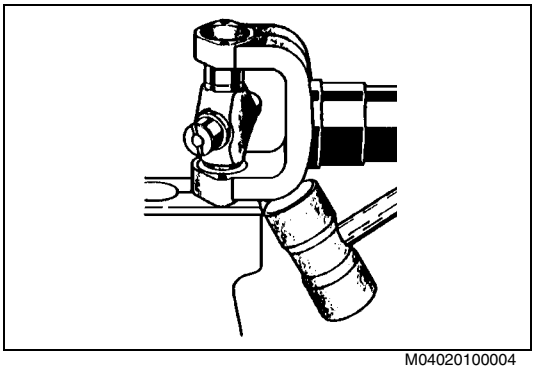

M04020100003

IMPORTANT POINTS - DISASSEMBLY

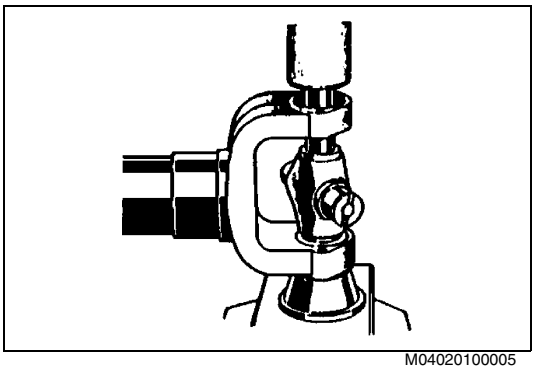
1. DISASSEMBLE THE UNIVERSAL JOINT ASSEMBLY.

(1) Remove the retainer ring from the yoke.

(2) Position the yoke under the arbor press and push universal joint partially out of the yoke lug. The bearing race will now protrude from the yoke.


M04020100004

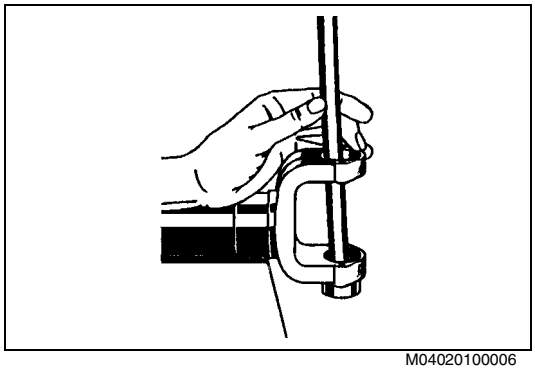
(3) Place the propeller shaft assembly in a vise, gripping the protruding bearing with the vise. Tap the yoke in area shown to achieve removal of universal joint bearing.


M04020100005

(4) Place the yoke under an arbor press with the opposite side of universal joint spider in the up position and place a small push tool on the universal joint spider end.

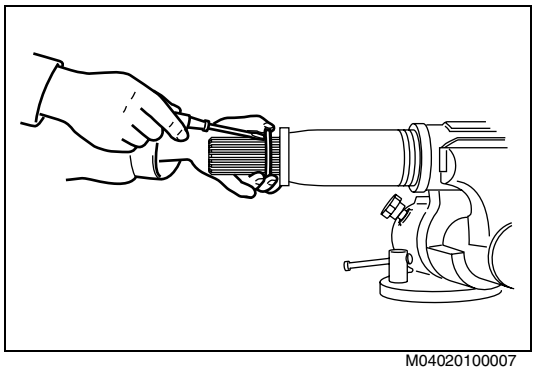
(5) Press the opposite bearing out of the yoke lug.

(6) Remove the spider from the yoke.

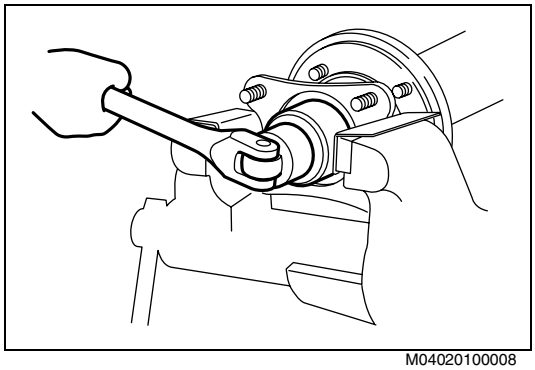

M04020100006

(7) Remove the bearing from the yoke lug.

NOTICE:
Keep the original location of the bearings, thrust washers, spider and retainer rings in mind. These parts have to be replaced in the same position as before disassembly when reassembling.

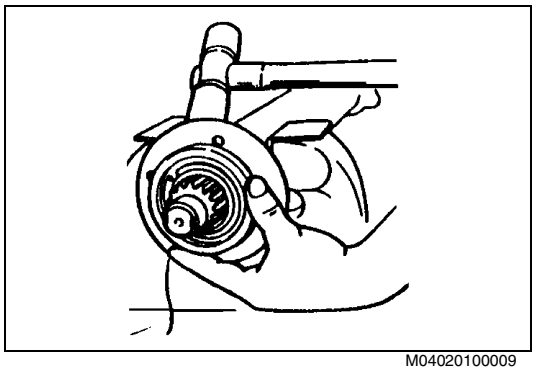

M04020100007

2. SEPARATE THE YOKE SHAFT AND SLIDING YOKE.
(1) Separate the yoke shaft and sliding yoke.
(2) Remove the dust cover seal from the yoke shaft.

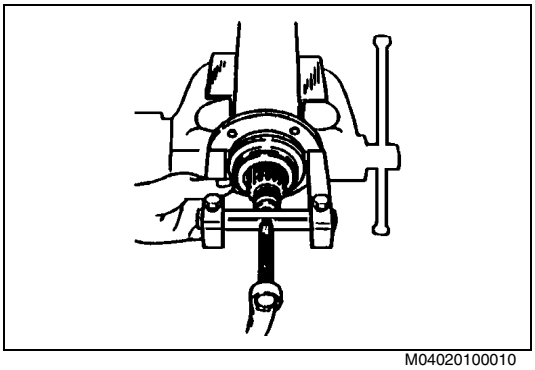

M04020100008

3. REMOVE THE CENTER BEARING.
(1) Place the propeller shaft in a vise.
(2) Uncaulk the lock nut on the shaft.
(3) Make aligning marks on the flange and shaft.
(4) Using the special tool, remove the lock nut.
SST: Socket Wrench (09839-4104)

(5) Remove the universal joint flange from the shaft.


M04020100009

(6) Using a hammer, tap the bearing plate to make a clearance.


M04020100010

(7) Using a commercial puller, remove the center bearing.

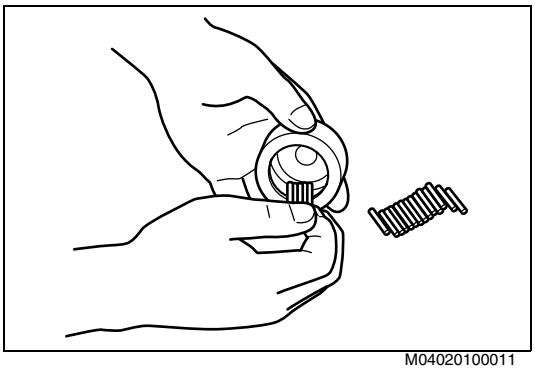
NOTICE:
Be careful not to catch your fingers between bearing plate and dust deflector.

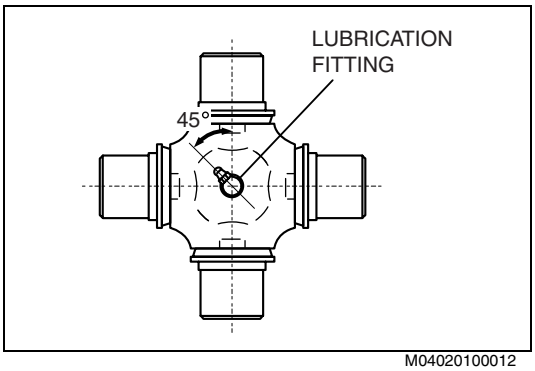
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLE THE NEEDLE ROLLER BEARINGS.

(1) After the needle roller bearings are thoroughly cleaned, apply clean lubricant to the rollers.
(2) Check each bearing for missing rollers.

NOTICE:
Remove stale grease from the bearing cage. Lubricate with grease containing molybdenum disulfide on the needle roller, seal lip and both surfaces of thrust washer.


M04020100011

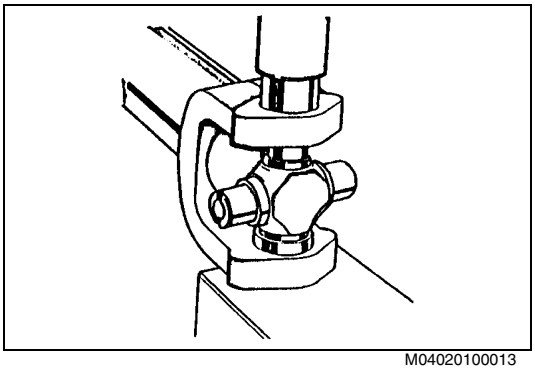


M04020100012

2. INSTALL THE SPIDERS AND UNIVERSAL JOINT BEARINGS INTO THE YOKES.

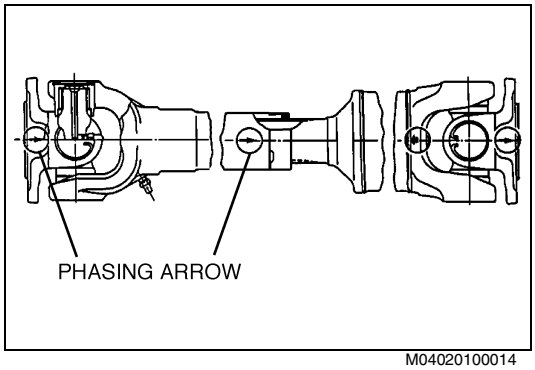
(1) Put the spider into the yoke and then set the universal joint bearings on the yoke.

NOTICE:
When assembling the universal joint spiders to the yokes, position the lubrication fitting so that it faces to the universal joint yoke side as shown in the figure.


M04020100013

(2) Press the universal joint bearings into the yokes over the spider journal.

NOTICE:
Pay attention not to damage the seal lip of the universal joint bearing when installing.

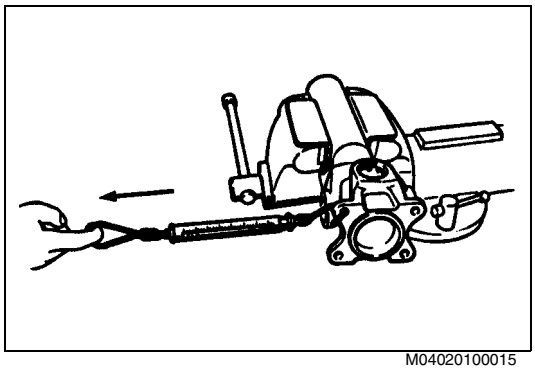


M04020100014

(3) Install the universal joint yokes to the universal joint spider.

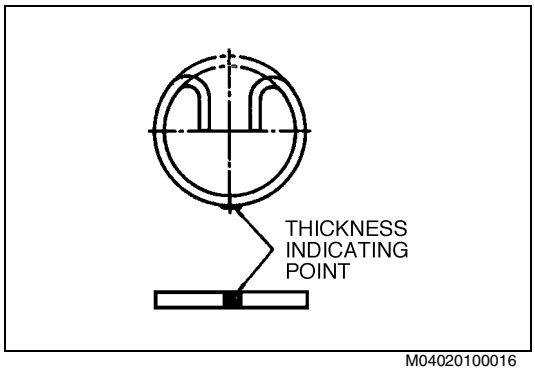
NOTICE:

Match the phasing arrows on the universal joint yoke with the phasing arrows on the yoke shaft or sliding yoke.


M04020100015

3. CHECK THE STARTING TORQUE OF THE UNIVERSAL JOINT USING A SPRING BALANCER.

Assembly Standard: 1.47-4.9 N·m {15-50 kgf·cm, 13-43 lbf·ft}



M04020100016

(1) If the measuring value is below the assembly standard, replace the retainer ring with the thicker one.

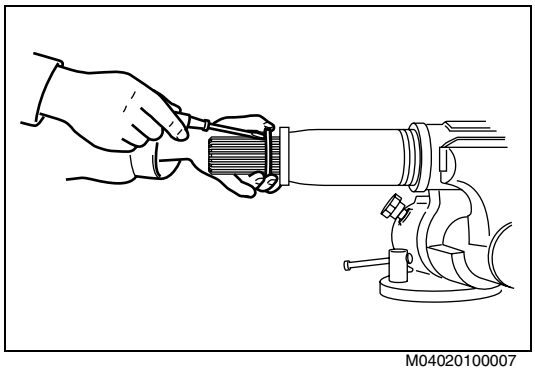
(2) If the measuring value is above the assembly standard, replace the retainer ring with the thinner one.

NOTICE:

Use retainer rings of the same thickness as possible for both ends.

Unit: mm {in.}

Thickness of retainer ring	Color of thickness indication point
2.22 {0.0874}	Gold
2.30 {0.0906}	Silver
2.38 {0.0937}	Brown

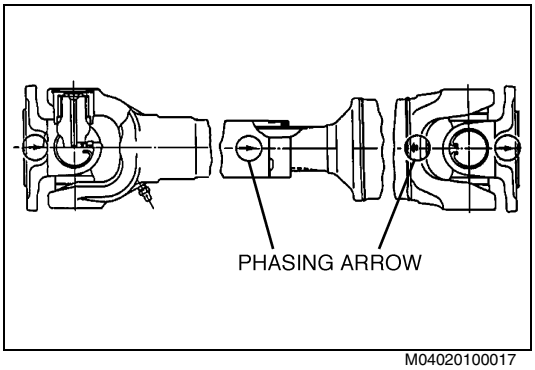

M04020100007

4. INSTALL THE DUST COVER SEAL.

(1) Remove the stale grease from the spline of the yoke shaft.

(2) Install the new dust cover seal on the shaft by pushing it in the seal groove.

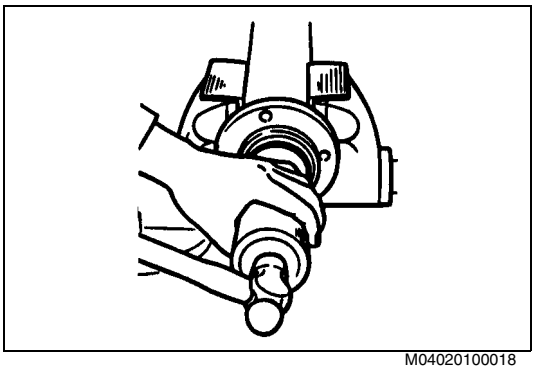
(3) Apply the grease containing molybdenum disulfide on the spline and sliding area of the dust cover seal.



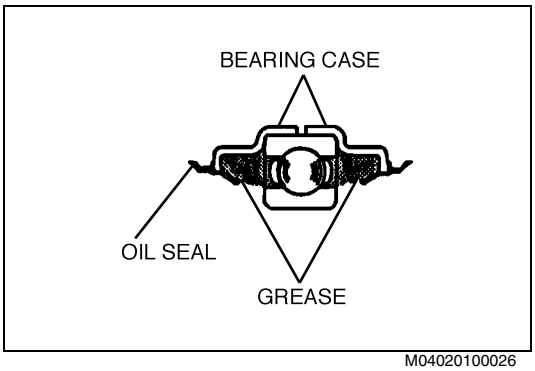
M04020100017

5. ASSEMBLE THE YOKE SHAFT AND SLIDING YOKE.

(1) Align the phasing arrows as show in the figure.


M04020100018

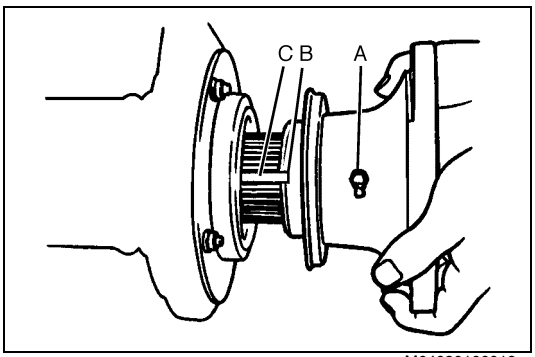
6. INSTALL THE CENTER BEARING PLATE AND CENTER BEARING.



M04020100026

NOTICE:
Prior to installation of center bearing assembly, remove stale grease and apply fresh grease between the bearing case and the center bearing.

Grease:
Refer to owner's manual.



M04020100019

(1) Install the universal joint flange.
   a. Prior to installing, heat the universal joint flange in either water or oil that has been heated to 80-100°C. {76-212F}.

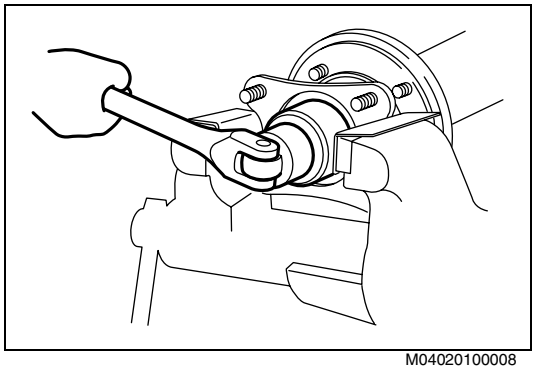
NOTICE:
Do not heat the universal joint flange in excess of 120°C {248°F}.

CAUTION:
Never touch hot water or oil nor heated universal joint flange with your bare band. This can result in personal injury.

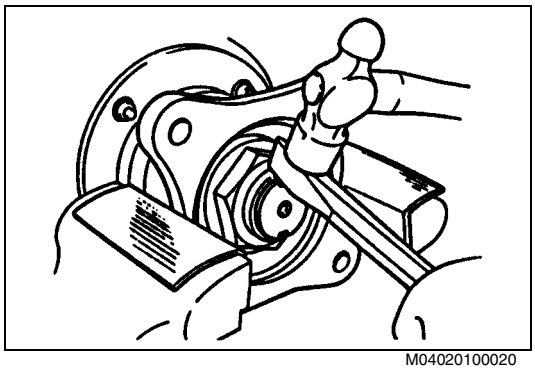
   b. Align lubrication fitting slit and grease passage in line as shown in figure.

- A: Lubrication fitting
- B: Lubrication fitting slit
- C: Grease passage

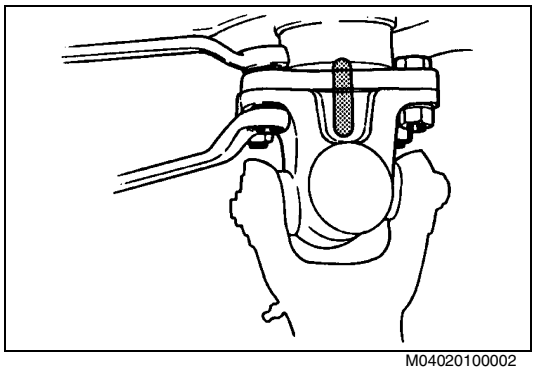
NOTICE:
Following installation, allow the assembly to cool for at least five minutes, prior to tightening to proper specified torque.


M04020100008

c. Using the special tool, tighten the lock nut.
SST: Socket Wrench (09839-4104)


M04020100020

(2) Caulk the lock nut.
a. Caulk deeper than 1.5 mm {0.06 in.}
b. The caulking should fill the groove thoroughly.
c. The caulking should be done without rift.


M04020100002

IMPORTANT POINTS - MOUNTING

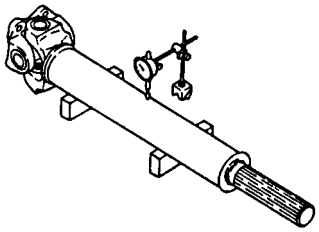
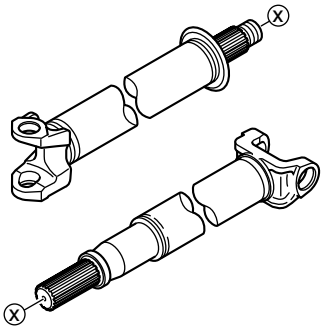
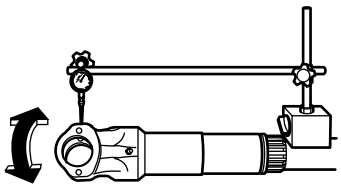
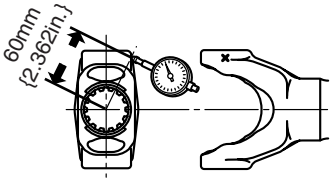
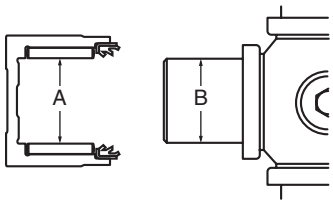
1. CONNECT THE PROPELLER SHAFT TO THE FLANGE ON ALL OF THE CONNECTING POINTS.
(1) Align the matching marks on the flange and yoke.
(2) Tighten the bolts and nuts.
(3) Lubricate the universal joints, sliding spline and center bearing, if so equipped.

Grease:
Refer to owner's manual.

INSPECTION AND REPAIR

M04020101BEH3002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Propeller shaft damage and bend	0-0.6 {0-0.0236}	1.0 {0.039}	Replace.	Measure 
Crack in the welding beads	—	—	Replace, if necessary.	Visual check 
Sliding spline damage	—	—	Replace, if necessary.	
Sliding spline backlash (Inspect the spline backlash at sliding yoke lug 60 mm {2.362 in.} from the shaft center.)	At spline 0.062-0.174 {0.0025-0.0068}	0.25 {0.0098}	Replace.	Measure
	At yoke lug 0.083-0.232 {0.0033-0.0091}	0.33 {0.0130}	Replace.	Measure  
Clearance (C) between universal joint spider and needle roller bearing (C = A - B)	0.024-0.043 {0.0010-0.0016}	0.1 {0.0039}	Replace needle roller bearing sub-assembly or universal joint spider.	Measure 

DIFFERENTIAL CARRIER (SH13)

DF02-001

DIFFERENTIAL CARRIER ASSEMBLY (SH13) DF02-2

DATA AND SPECIFICATIONS DF02-2
DESCRIPTION DF02-2
TROUBLESHOOTING DF02-3
SPECIAL TOOL DF02-3
COMPONENT LOCATOR DF02-4
OVERHAUL DF02-6
INSPECTION AND REPAIR DF02-14

DIFFERENTIAL CARRIER ASSEMBLY (SH13)

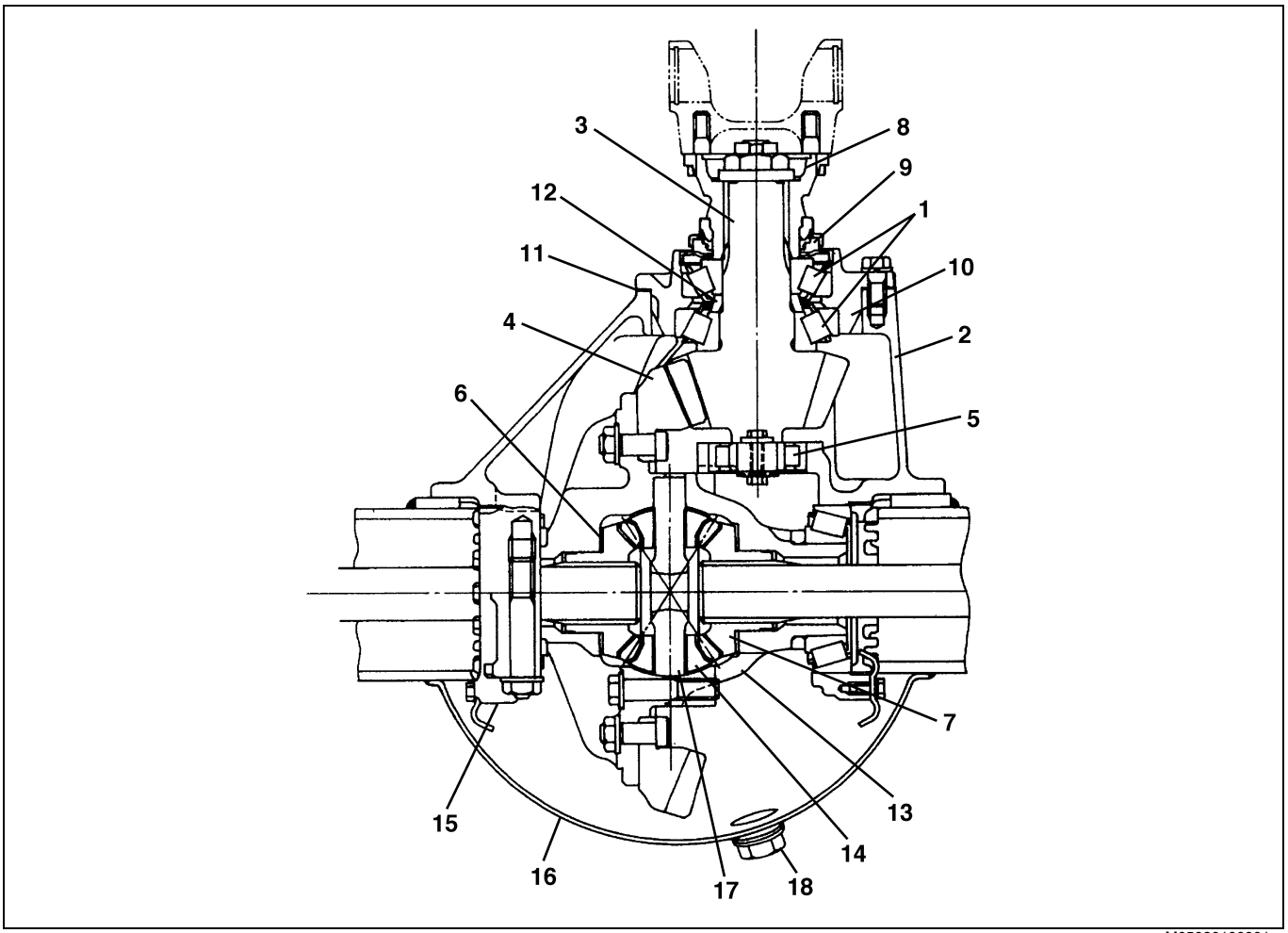
DATA AND SPECIFICATIONS

M05020101BEI2002

Type	**Single-reduction, single-speed, by hypoid gearing**
Gear ratios	**3.636, 3.900, 4.100, 4.333**
Oil capacity	**3.7 L {0.81 Imp gal. / 0.98 U.S. gal.}**

DESCRIPTION

M05020101BEC1002



M05020100001

1	Taper roller bearing	10	Bearing cage
2	Differential carrier case	11	Adjusting shim
3	Hypoid pinion	12	Spacer
4	Hypoid ring gear	13	Differential case
5	Cylindrical roller bearing	14	Differential pinion gear
6	Thrust washer	15	Bearing cap
7	Differential side gear	16	Axle housing
8	Flange yoke coupling	17	Spider
9	Oil seal	18	Oil filler plug

TROUBLESHOOTING

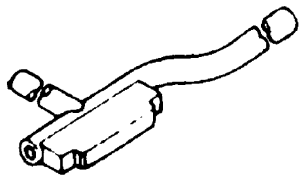
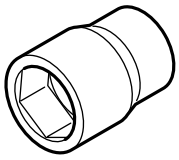
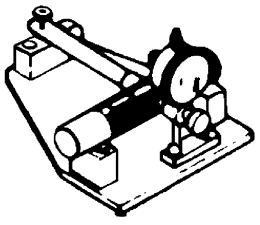
M05020101BEF3001

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

SPECIAL TOOL

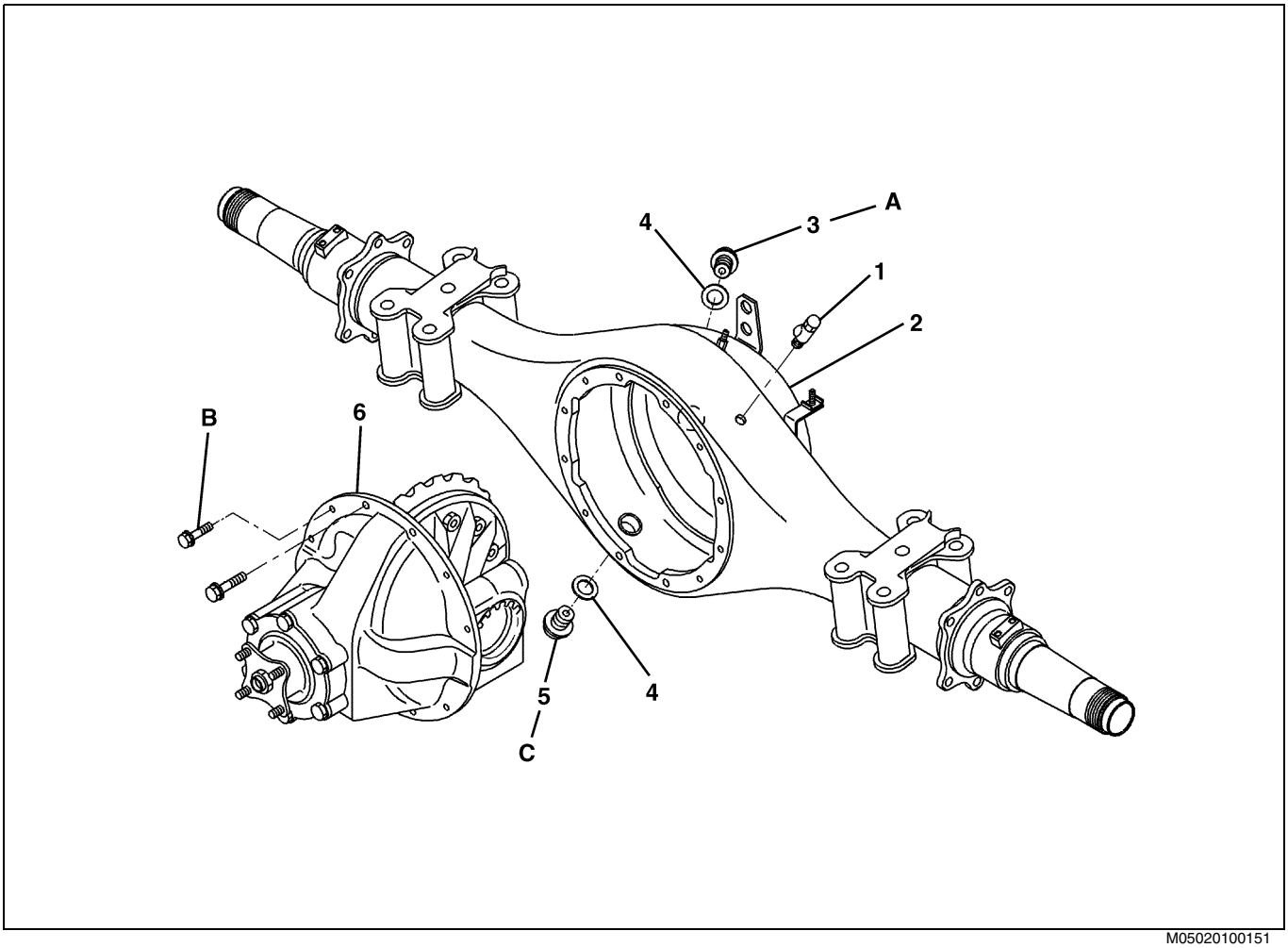
M05020101BEK1001

Prior to starting a differential carrier overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09665-1150	ADJUSTER TOOL	
	09839-4104	SOCKET WRENCH	
	09640-1022	GAUGE ASSEMBLY	

COMPONENT LOCATOR

M05020101BED1002

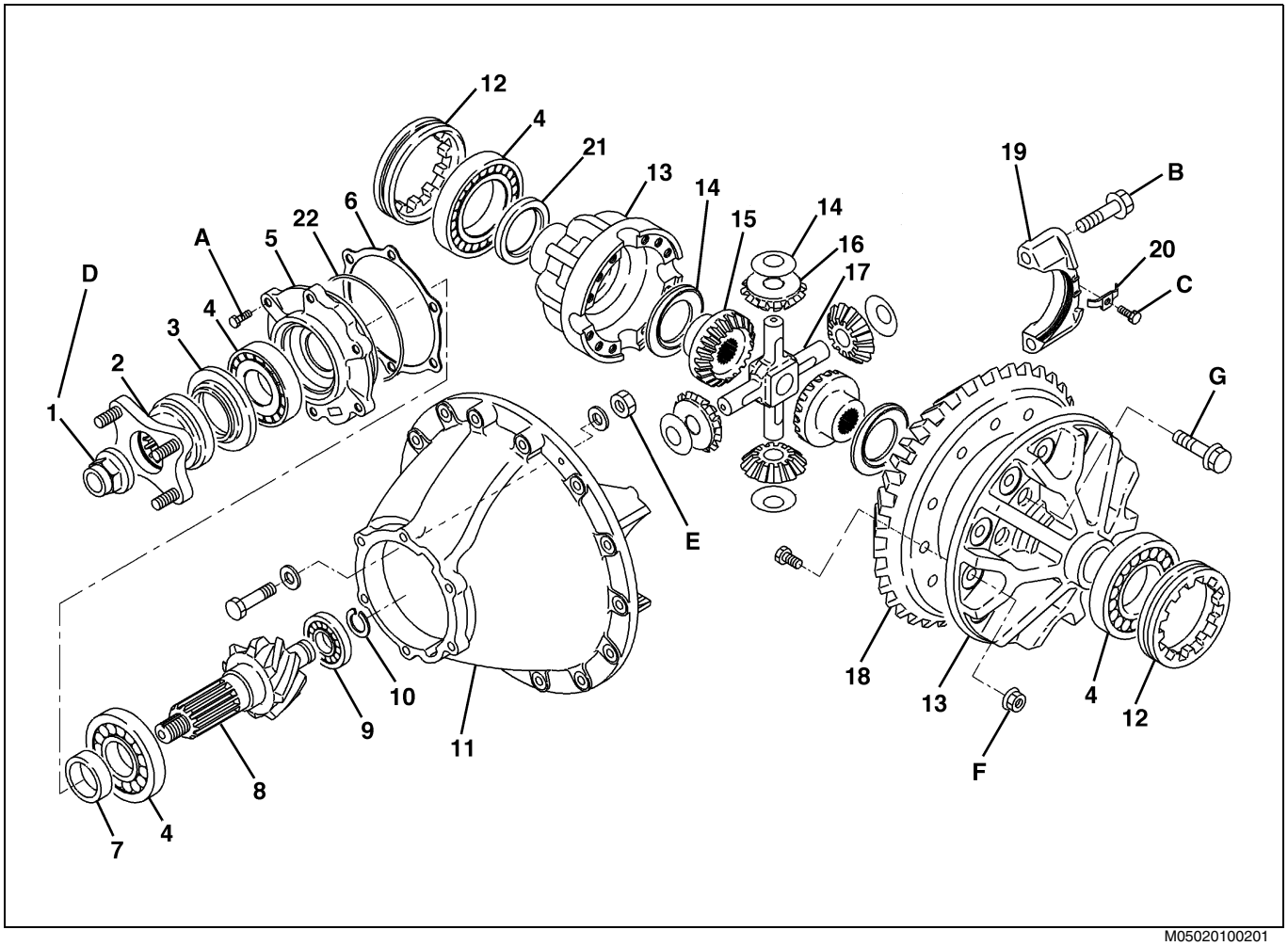


M05020100151

1	Air breather	4	Gasket
2	Axle housing assembly	5	Oil drain plug
3	Oil filler plug	6	Differential carrier assembly

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

A	78.4-117.6 {800-1,200, 58-86}	C	78.4-117.6 {800-1,200, 58-86}
B	ϕ12 bolt: 84.5-107.5 {860-1,100, 63-79}		
	ϕ14 bolt: 113-147 {1,150-1,500, 83-108}		



M05020100201

1	Lock nut	12	Adjusting nut
2	Flange yoke coupling	13	Differential case
3	Oil seal	14	Thrust washer
4	Taper roller bearing	15	Differential side gear
5	Bearing cage	16	Differential pinion gear
6	Adjusting shim	17	Spider
7	Spacer	18	Hypoid ring gear
8	Hypoid pinion	19	Bearing cap
9	Cylindrical roller bearing	20	Lock plate
10	Retainer ring	21	Differential case spacer
11	Differential carrier case	22	O-ring

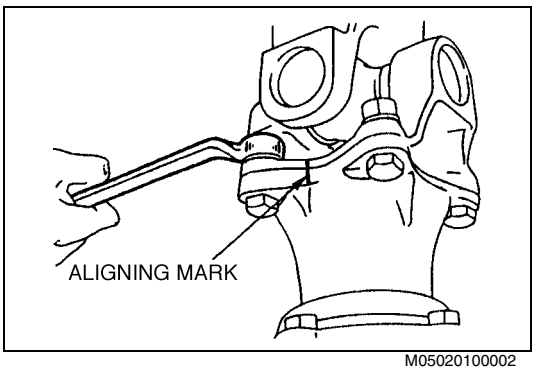
NOTICE: Installing position of No.21 (differential case spacer)
Gear ratio 3.636, 3.900, 4.100: Hypoid ring gear side (Same as this figure)
Gear ratio 4.333: Opposite side of hypoid ring gear

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

A	63.9-85.3 {650-870, 48-62}	E	18.7-25.5 {190-260, 14-18}
B	197-225 {2,000-2,300, 145-166}	F	246-294 {2,500-3,000, 182-216}
C	18.7-25.5 {190-260, 14-18}	G	246-294 {2,500-3,000, 182-216}
D	374-500 {3,800-5,100, 276-368}		

OVERHAUL

M05020101BEH2002



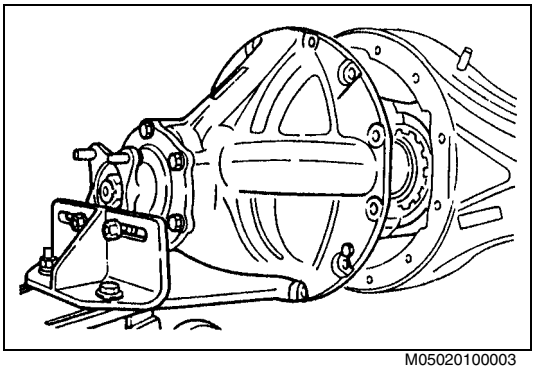
M05020100002

IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT.

NOTICE:

Make aligning marks before disassembling.


M05020100003

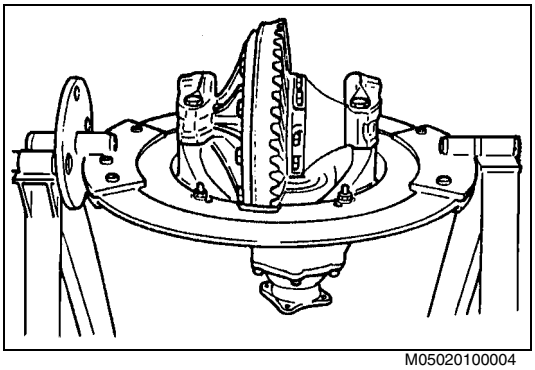
2. DISMOUNT THE DIFFERENTIAL CARRIER ASSEMBLY.

(1) Drain the gear oil and remove the axle shaft.

(2) Using a jack, dismount the differential carrier assembly.

IMPORTANT POINTS - DISASSEMBLY

1. MOUNT THE DIFFERENTIAL CARRIER ASSEMBLY ON A WORK STAND.

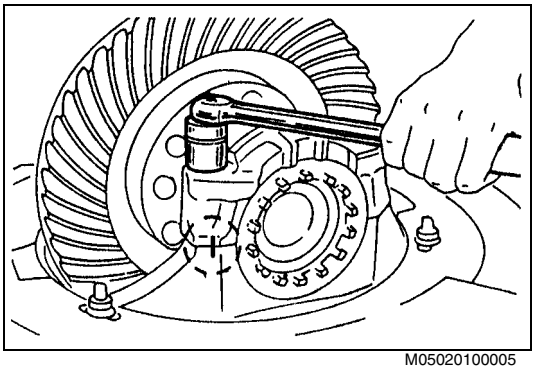

M05020100004

2. DIFFERENTIAL CASE

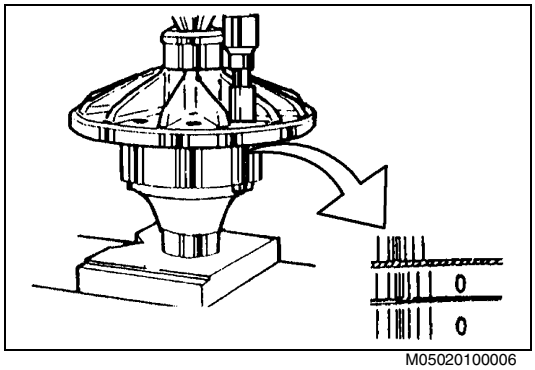
(1) Remove the bearing cap.

NOTICE:

Make aligning marks before disassembling.


M05020100005

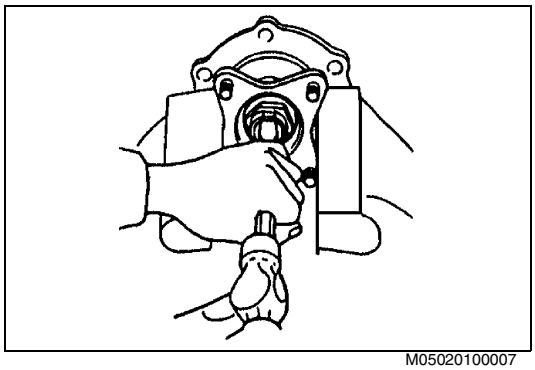
(2) Using a puller, remove the taper roller bearing.



M05020100006

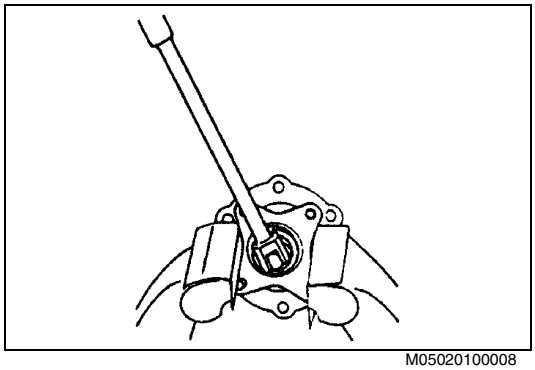
(3) Disassemble the differential case.

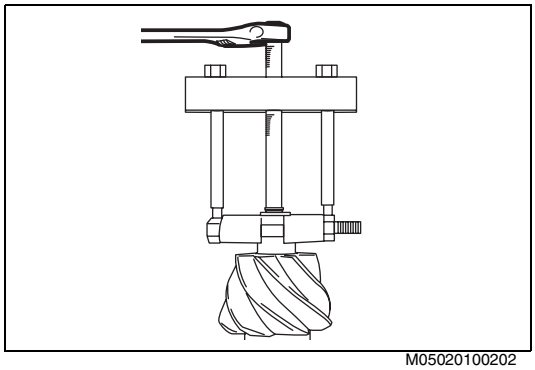
NOTICE:
Be sure to check the aligning marks on the differential case before disassembling. Remove the bolts so that the case separates.


M05020100007

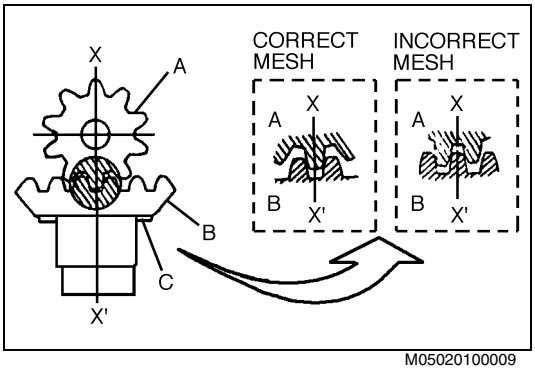
3. BEARING CAGE

(1) Uncaulk the lock nut and remove the nut.
SST: Socket Wrench (09839-4104)


M05020100008


M05020100202

(2) Using a puller, remove the taper roller bearing and inner race of the cylindrical roller bearing.



M05020100009

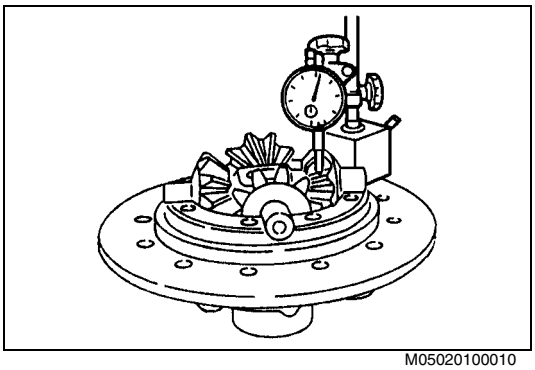
IMPORTANT POINTS - ASSEMBLY

1. DIFFERENTIAL CASE

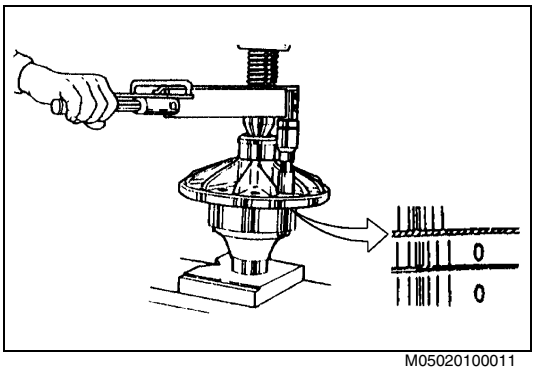
(1) Measure the pinion backlash.

NOTICE:
Be sure to set the chamfered side of the thrust washer for the side gear face to the gear side.

- A: Pinion
- B: Side gear
- C: Thrust washer

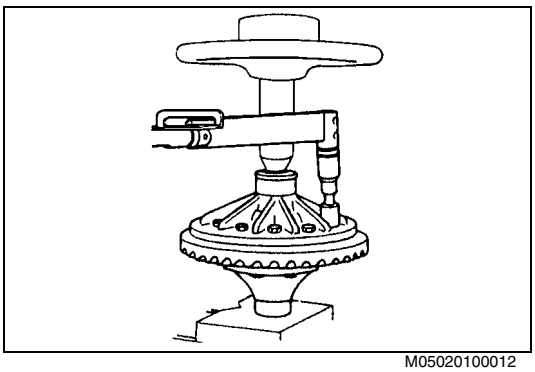

M05020100010

(2) If the backlash is more than service limit, replace the thrust washer for side gear and/or pinion.
Assembly standard: 0.20-0.60 mm {0.0079-0.0236 in.}
Service Limit: 0.9 mm {0.0354 in.}


M05020100011

(3) Assemble the differential case.

NOTICE:
- **Align the aligning marks when assembling.**
- **Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads.**


M05020100012

(4) Install the ring gear to the differential case and tighten it with bolts and nuts.

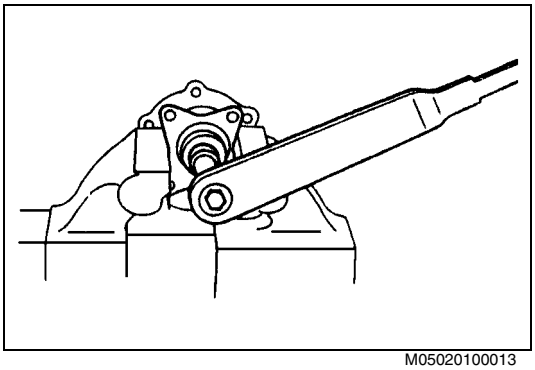
NOTICE:
Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads.

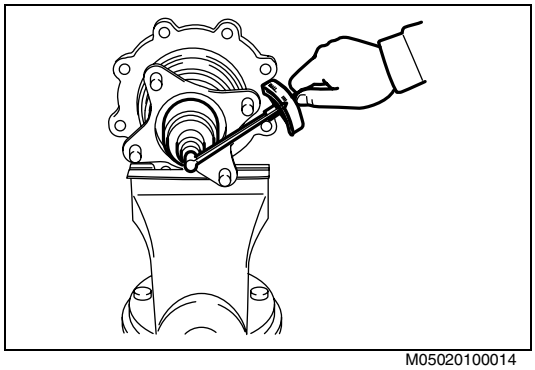
2. ADJUSTMENT OF THE PINION BEARING PRELOAD

(1) Assemble the hypoid pinion and bearing cage and then tighten the flange yoke coupling provisionally.

NOTICE:
The oil seal must be installed in the bearing cage after measurement of the preload.

SST: Socket Wrench (09839-4104)


M05020100013


M05020100014

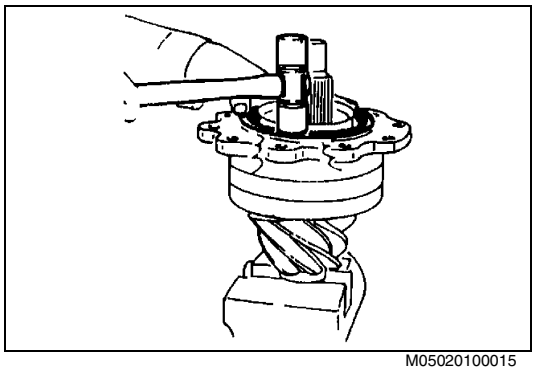
(2) Use a torque wrench to measure the preload of the bearings and if the preload is out of specific value shown below, adjust with spacer.

Assembly Standard: Turning torque

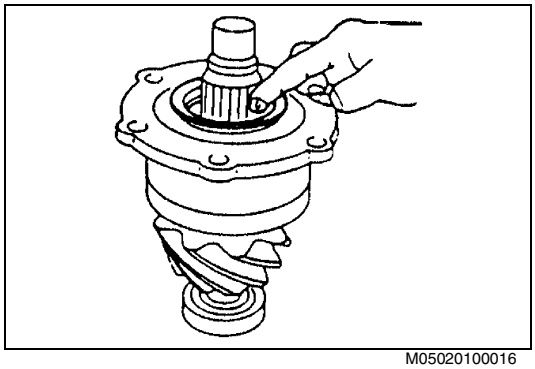
Unit: N·m {kgf·cm, lbf·ft}

New bearing	Re-used bearing
1.97-2.94 {20-30, 1.5-2.1}	1.48-2.45 {15-25, 1.1-1.8}

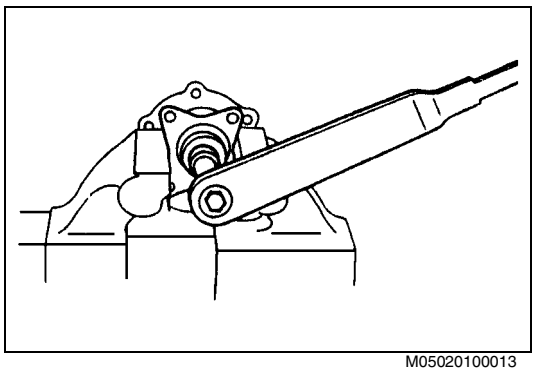
Adjusting spacer thickness:
20 kinds of thicknesses ranging from 13.900 to 14.375 mm {0.5473 to 0.5659 in.} each differing 0.025 mm {0.001 in.}


M05020100015

(3) After adjusting the preload, install the new oil seal.

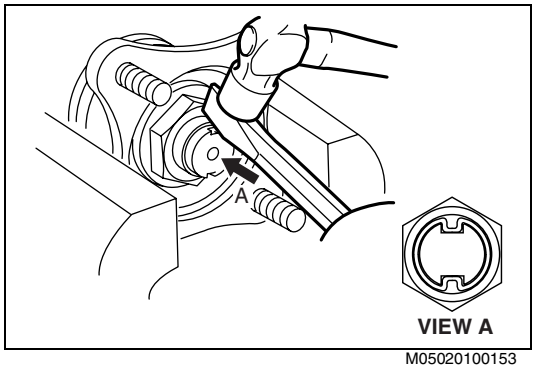

M05020100016

NOTICE:
Apply wheel bearing grease on the oil seal lip part.


M05020100013

(4) Install the flange yoke coupling and tighten the lock nut.
SST: Socket Wrench (09839-4104)

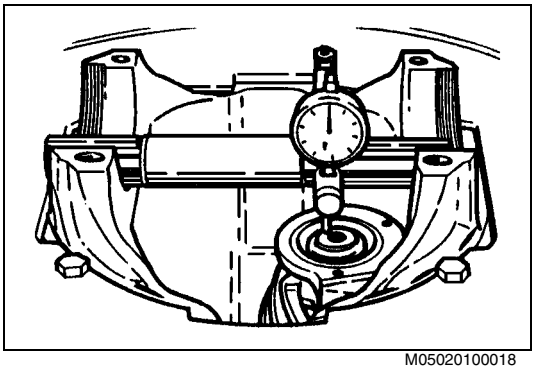
(5) Measure the preload and record it for measuring the total preload at the differential carrier bearings at a later time.



M05020100153

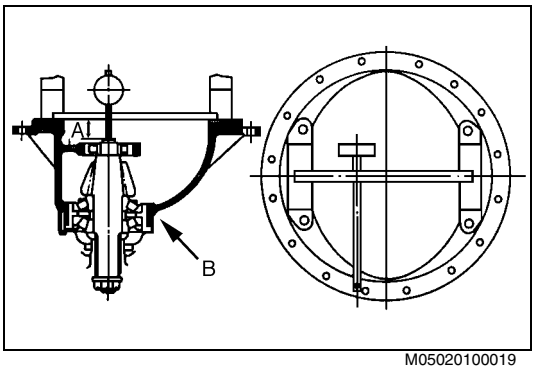
(6) Using a chisel and a hammer, caulk the lock nut.

NOTICE:
- **Caulk the nut securely as shown.**
- **Make sure that there is no rift in the caulked position.**


M05020100018

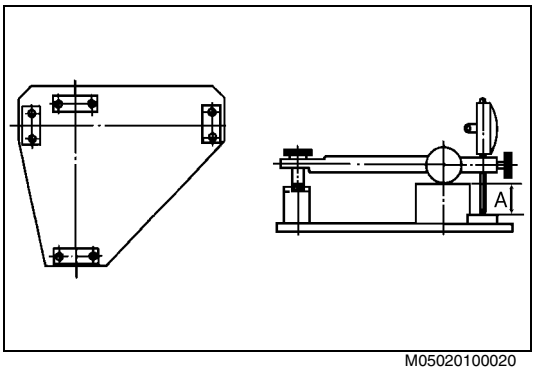
3. ADJUSTMENT OF PINION FITTING HEIGHT (CONICAL DISTANCE).

(1) Install the pinion cage assembly and adjust the height with shims.
SST: Gauge Assembly (09640-1022)



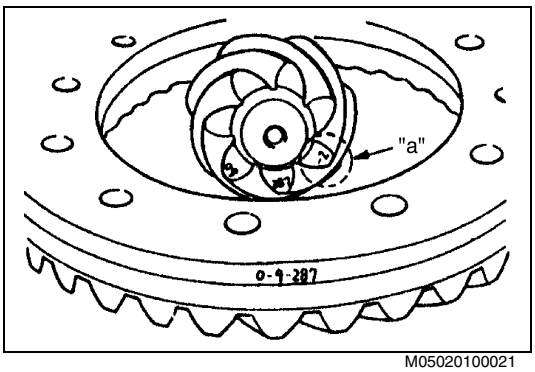
M05020100019

A: 21.5 mm {0.846 in.}
B: Adjusting shim
Thickness: 0.30 mm {0.0118 in.}
0.40 mm {0.0157 in.}
0.45 mm {0.0177 in.}
0.50 mm {0.0197 in.}



M05020100020

(2) How to use the pinion depth gauge: Set the pinion depth gauge.
A: 21.5 mm {0.846 in.}

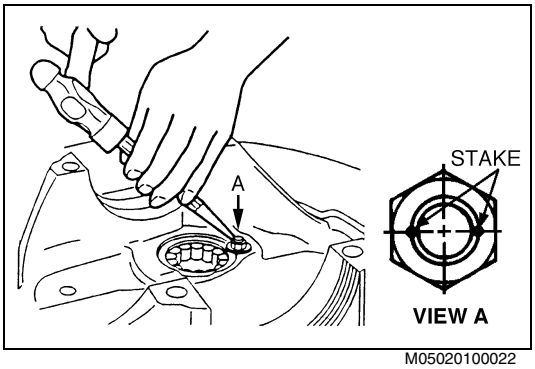


M05020100021

EXAMPLE:

In a case where the engraved value at the surface of the pinion gear is -20 (-20 means -0.2 mm):

Standard pinion height "A"				Measuring part (A')
21.5 mm	–	0.2 mm	=	21.3 mm
		The engraved value "a"		



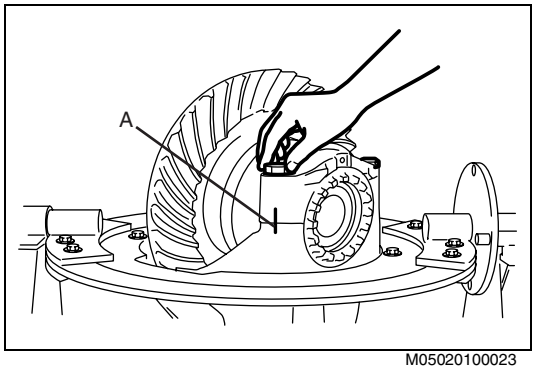
M05020100022

4. CYLINDRICAL ROLLER BEARING

(1) Install the cylindrical roller bearing and tighten the lock nut.

NOTICE:

- **Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads before attaching the lock nut.**
- **When lock agent is not applied, stake the lock nut as shown in the figure.**

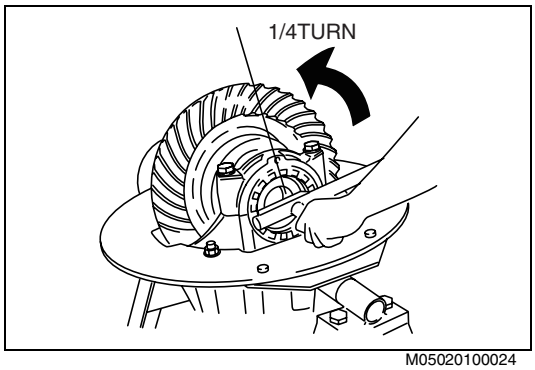


M05020100023

5. ADJUSTMENT OF HYPOID RING GEAR BACKLASH.

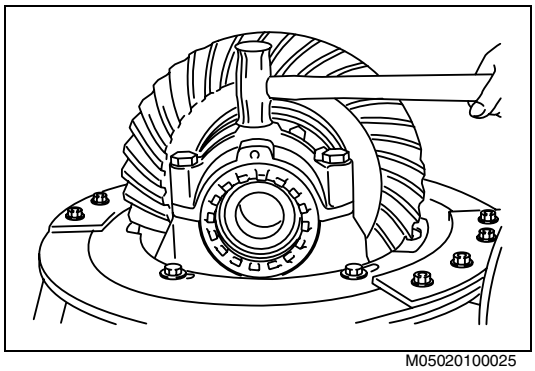
(1) Set the differential case assembly on the carrier case and install the adjusting nut and bearing cap.

NOTICE:
Align the aligning marks A.

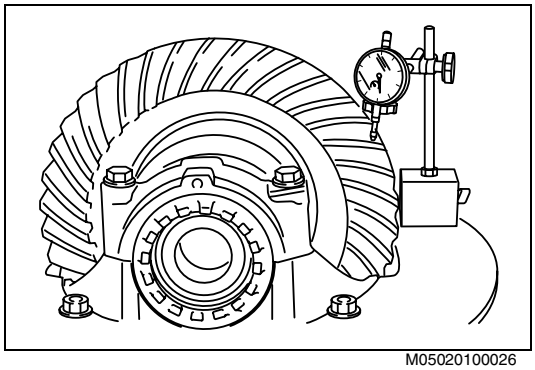


M05020100024

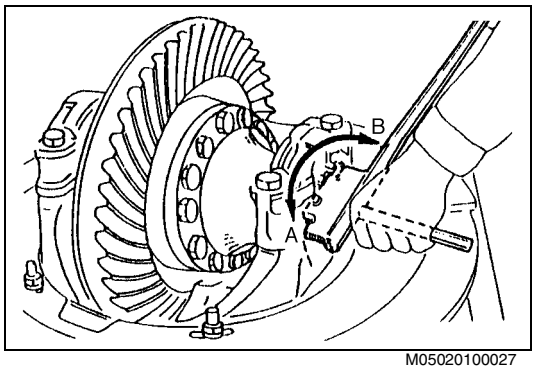
(2) Adjust the preload of the side bearing provisionally.
   a. Tighten the adjusting nut fully, then loosen the adjusting nut by 1/4 turn + 1 notch.
   SST: Adjuster Tool (09665-1150)


M05020100025

   b. Hit the bearing cap with a copper hammer.

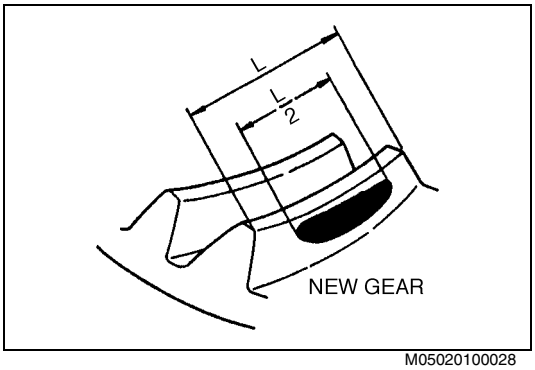

M05020100026

(3) Measure the gear backlash at three or four points on the circumference of the gear.
Assembly Standard: 0.25-0.33 mm {0.0098-0.0130 in.}



M05020100027

(4) Adjust the backlash by turning the adjusting nuts. Turn the both nuts by the same angle.
BACKLASH: A-Decrease B-Increase
SST: Adjuster Tool (09665-1150)



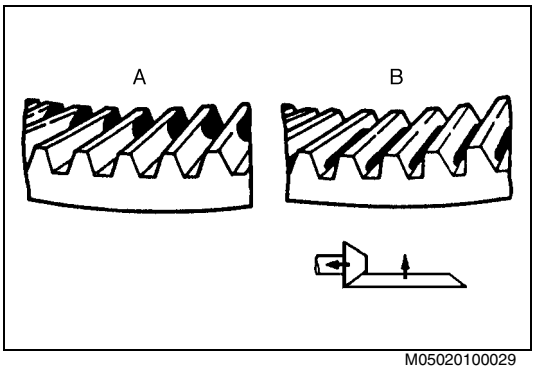
M05020100028

6. INSPECTION AND ADJUSTMENT OF GEAR MESHING

(1) Satisfactory gear meshing.

NOTICE:

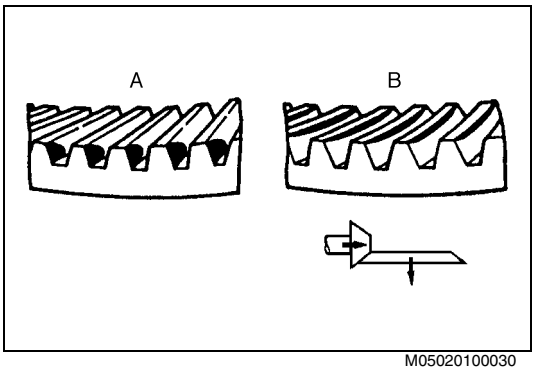
New gears are marked as shown to indicate proper gear meshing. Make necessary adjustment so that gears mesh corresponds with the factory's mark.



M05020100029

(2) Example of the unsatisfactory engagement
   a. Toe and flank contact

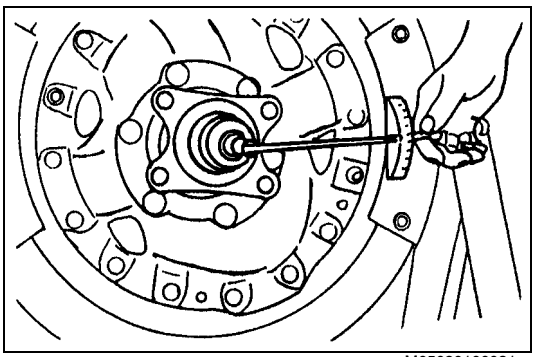
A: Toe contact - Unadjust, replace the pinion and ring gear as a set.
B: Flank contact - Adjust



M05020100030

   b. Heel and face contact

A: Heel contact - Unadjust, replace the pinion and ring gear as a set.
B: Face contact - Adjust


M05020100031

7. MEASUREMENT AND ADJUSTMENT OF THE DIFFERENTIAL CARRIER BEARING AND SIDE BEARING

(1) Measure and adjust the total preload at the differential carrier bearings, using a torque wrench.

NOTICE:

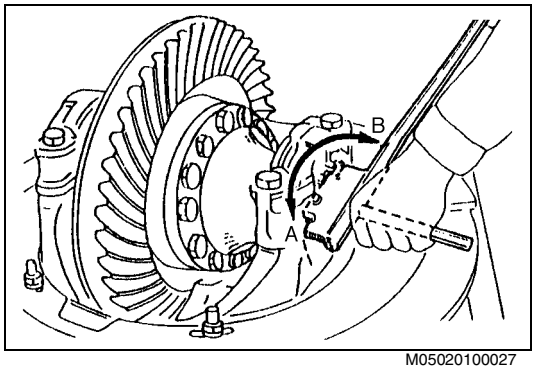
Total preload = pinion bearing preload (Refer to item 2 in page DC-8) + side bearing preload (Refer to the table below).

Assembly standard: Turning torque Unit: N·m {kgf·cm, lbf·ft}

Gear ratio	3.636	3.900	4.111	4.333
New bearing	0.54-0.81 {5.5-8.2, 0.40-0.59}	0.51-0.75 {5.2-7.6, 0.38-0.54}	0.48-0.71 {4.9-7.3, 0.35-0.52}	0.46-0.67 {4.7-6.9, 0.34-0.49}
Re-used bearing	0.40-0.67 {4.1-6.8, 0.30-0.49}	0.38-0.62 {3.9-6.4, 0.29-0.46}	0.35-0.59 {3.6-6.1, 0.26-0.44}	0.34-0.56 {3.5-5.4, 0.24-0.39}

NOTICE:

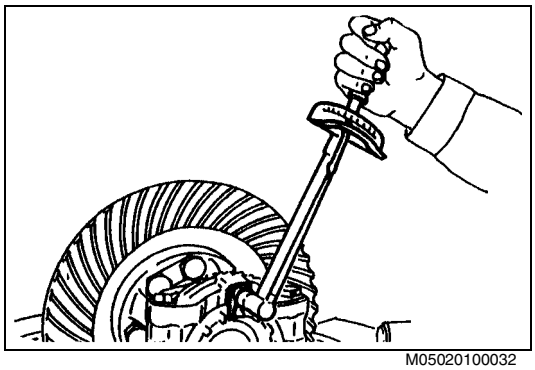
The gear ratio is indicated on the bearing cage.



M05020100027

(2) If necessary, adjust the side bearing preload with the adjusting nut.

- A: Counterclockwise: Decrease preload
- B: Clockwise: Increase preload
  SST: Adjuster Tool (09665-1150))


M05020100032

(3) Tighten the bearing cap and install the lock plate.

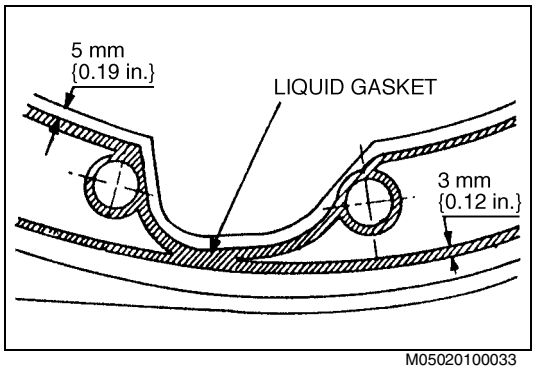
IMPORTANT POINTS - MOUNTING

1. MOUNTING

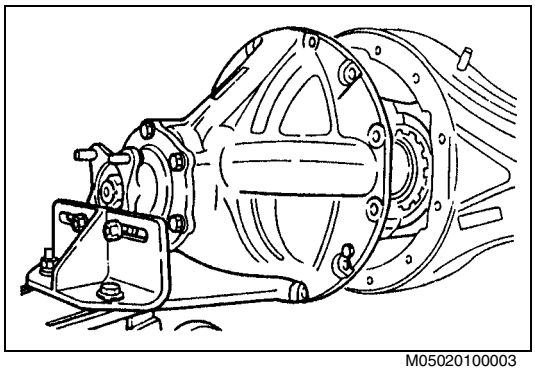
(1) Apply liquid gasket on the face of the housing flange.

NOTICE:

- **The liquid gasket must be ThreeBond #1215 or equivalent.**
- **The liquid gasket should be applied continuously.**
- **Application should be approximately 3 mm {0.12 in.} width and 5 mm {0.19 in.} away from the edge.**



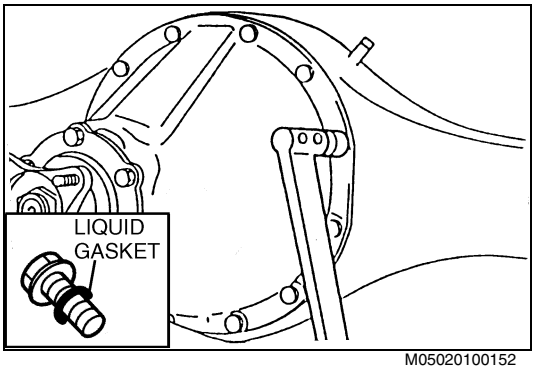
M05020100033


M05020100003

(2) Using a jack, install the differential carrier assembly to the axle housing.

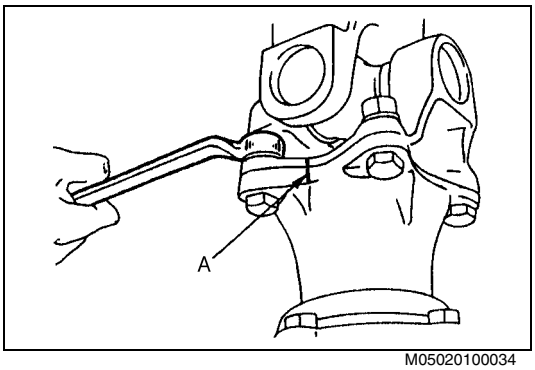
NOTICE:

Place the carrier assembly so that the ring gear teeth faces toward the right-hand side of vehicle.



M05020100152

(3) After applying the liquid gasket (ThreeBond #1215 or #1216 or equivalent) round ϕ12 bolts (8 pieces), install the bolts and tighten them regularly.



M05020100034

(4) Connect the propeller shaft.

NOTICE:
Align the aligning marks A.

Tightening Torque:
61-91N·m {623-927 kgf·cm, 45-67 lbf·ft}

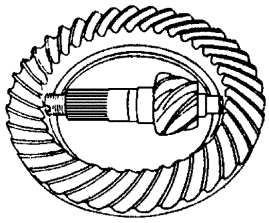
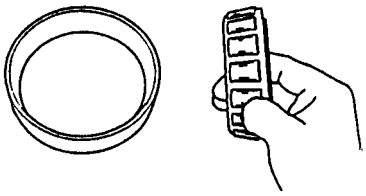
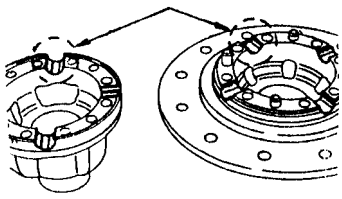
(5) Fill the axle housing with specified gear oil up to the filler plug hole.

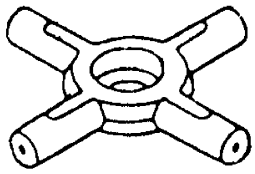
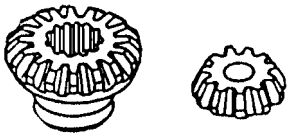
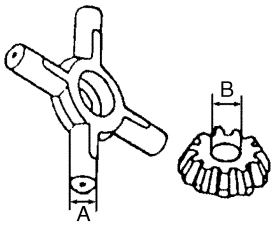
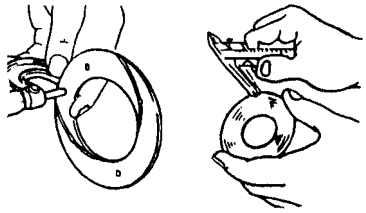
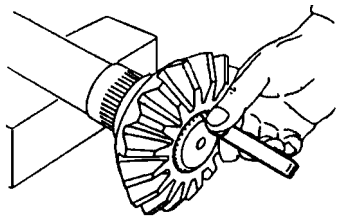
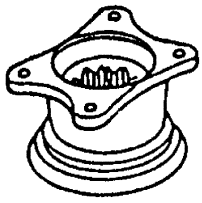
Gear oil:
Refer to the owner's manual

INSPECTION AND REPAIR

M05020101BEH3002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Pinion and ring gear: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 
Bearing and race: Burns and pitting	—	—	**Replace, if necessary.**	**Visual check** 
Differential case spider holes: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Spider: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Differential side gear and pinion: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Spider and pinion: Clearance	**A:24{0.945} B-A:0.141-0.261 {0.0056-0.0103}**	**0.4 {0.016}**	**Replace.**	**Measure** 
Thrust washers thickness (Side gear and pinion gear)	**Side gear: 1.9-2.1 {0.075-0.082}**	**1.7 {0.067}**	**Replace.**	**Measure** 
	Pinion gear: 1.5-1.7 {0.060-0.066}	**1.3 {0.051}**		
Differential side gear and axle shaft: Spline backlash	**0.054-0.148 {0.0021-0.0058}**	**0.5 {0.0196}**	**Replace.**	**Measure** 
Flange coupling: Wear and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

BRAKE EQUIPMENT

BR01-001

SERVICE BRAKE ASSEMBLY.....BR01-2
DESCRIPTION BR01-2
DIAGRAM BR01-3
TROUBLESHOOTING BR01-4
AIR BLEEDING BR01-5

SERVICE BRAKE ASSEMBLY

DESCRIPTION

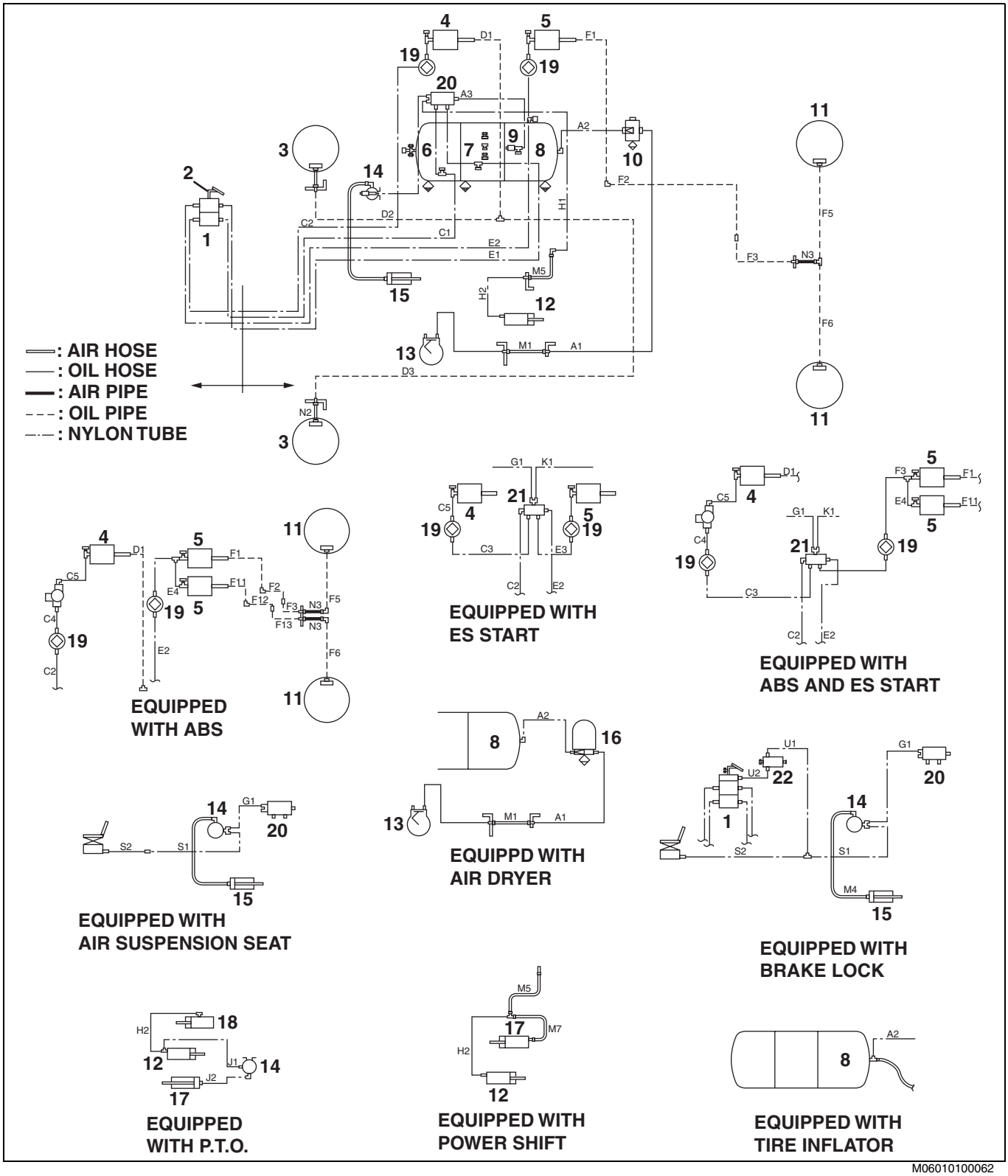
M06010101BEC1001

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 lamp switch is used to operate the stop lamps.
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

M06010101BEJ1002



M06010100062

1	Brake valve	9	Safety valve	17	Power take-off
2	Stop lamp switch	10	Pressure governor	18	Power shift
3	Wheel brake-Front	11	Wheel brake-Rear	19	Quick release valve
4	Brake air booster-Front	12	Clutch booster	20	Protection valve
5	Brake air booster-Rear	13	Air compressor	21	ES start control valve
6	Air tank-Front	14	Magnetic valve	22	Brake lock control valve
7	Air tank-Rear	15	Exhaust brake		
8	Air tank-Water separator	16	Air dryer		

TROUBLESHOOTING

M06010101BEF3001

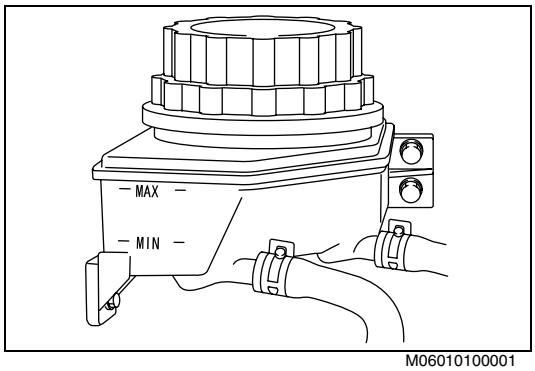
Symptom	Possible cause	Remedy/Prevention
Not enough braking (Wheel brake and drum)	Lining is wet with grease or fluid	Replace the lining.
	Improper contact of drum and lining	Correct.
	Improper lining material or glazed lining	Correct.
	Deformation or hardening of drum	Correct or replace.
	Excessively 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

M06010101BEH2001

IMPORTANT POINT - DISMOUNTING



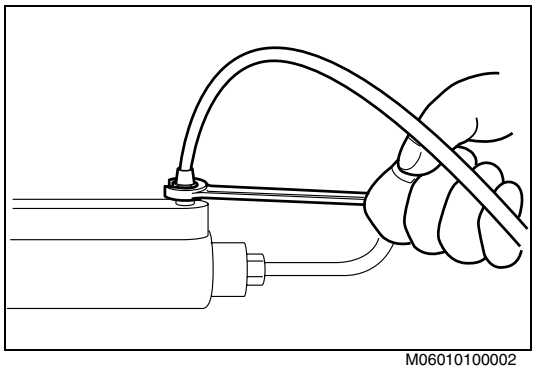
M06010100001

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.

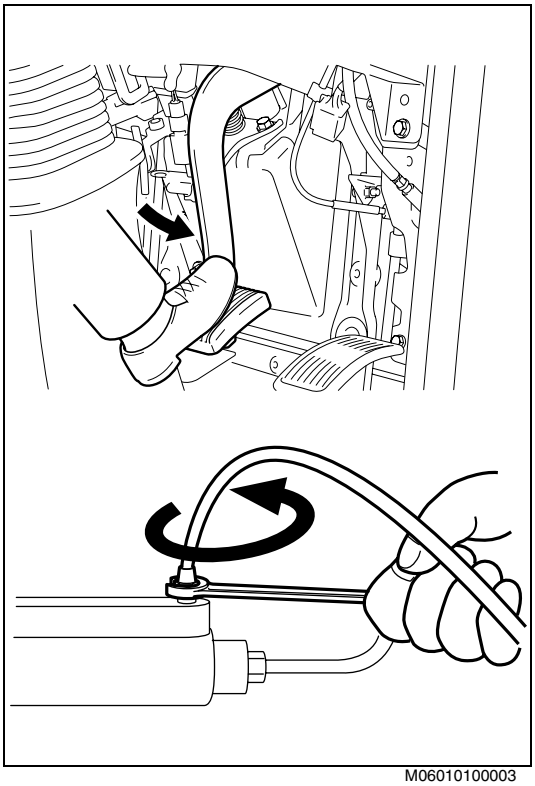
NOTICE:
Always first finish the replacement of either front or rear brake line and then start the replacement of the other.


M06010100002

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.

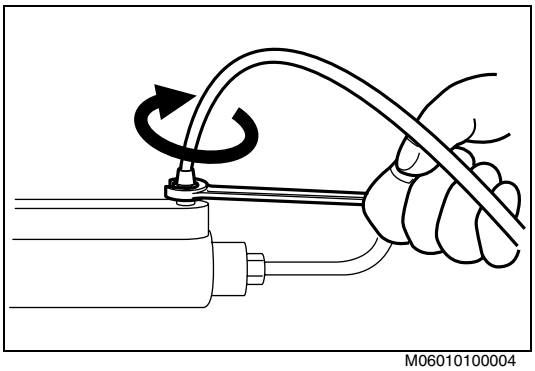
NOTICE:
Prepare a container box receiving brake fluid at the end of the vinyl tube.



M06010100003

(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.

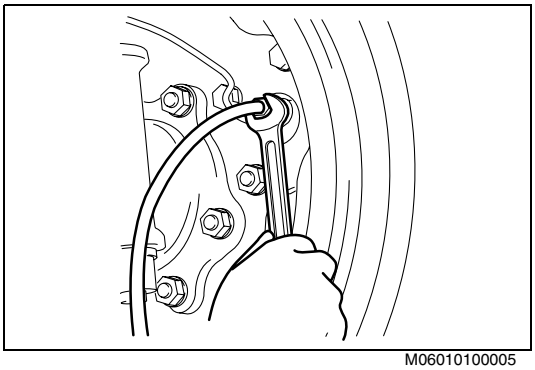


M06010100004

(3) While depressing the brake pedal, loosen 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:
For front: 7.0-12.0 N·m {71-122 kgf·cm, 5.2-8.8 lbf·ft}
For rear: 6.9-11.8 N·m {70-120 kgf·cm, 5.1-8.6 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.



M06010100005

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.

SERVICE BRAKE

BR02-001

PRESSURE GOVERNOR BR02-2
DESCRIPTION BR02-2
INSPECTION BR02-2

AIR DRYER BR02-3
DATA AND SPECIFICATIONS BR02-3
DESCRIPTION BR02-3
COMPONENT LOCATOR BR02-4
OVERHAUL BR02-5
INSPECTION AND REPAIR BR02-7

SAFETY VALVE BR02-8
DATA AND SPECIFICATIONS BR02-8
DESCRIPTION BR02-8
INSPECTION AND REPAIR BR02-8

BRAKE VALVE
(MAKER: SANWA SEIKI) BR02-9
DATA AND SPECIFICATIONS BR02-9
DESCRIPTION BR02-9
COMPONENT LOCATOR BR02-10
OVERHAUL BR02-12
INSPECTION AND REPAIR BR02-18

BRAKE FLUID RESERVOIR.....BR02-20
DATA AND SPECIFICATIONS BR02-20
DESCRIPTION BR02-20
COMPONENT LOCATOR BR02-21
DISMOUNTING AND MOUNTING BR02-22
INSPECTION AND REPAIR BR02-22

PROTECTION VALVE
(WITH 4-WAY PROTECTION VALVE) BR02-23
DATA AND SPECIFICATIONS BR02-23
DESCRIPTION BR02-23
COMPONENT LOCATOR BR02-24
OVERHAUL BR02-25
ADJUSTMENT BR02-25
INSPECTION AND REPAIR BR02-27

QUICK RELEASE VALVE.....BR02-28
DATA AND SPECIFICATION BR02-28
DESCRIPTION BR02-28
COMPONENT LOCATOR BR02-29
OVERHAUL BR02-30
INSPECTION AND REPAIR BR02-30

BRAKE AIR BOOSTER (AIRMASTER)
WITHOUT ABS BR02-31
DATA AND SPECIFICATIONS BR02-31
DESCRIPTION BR02-31
SPECIAL TOOL BR02-32
COMPONENT LOCATOR BR02-33
OVERHAUL BR02-34
INSPECTION BR02-38
INSPECTION AND REPAIR BR02-40

BRAKE AIR BOOSTER (AIRMASTER)
WITH ABS BR02-41
DATA AND SPECIFICATIONS BR02-41
DESCRIPTION BR02-41
SPECIAL TOOL BR02-42
COMPONENT LOCATOR BR02-43
OVERHAUL BR02-44
INSPECTION BR02-52
INSPECTION AND REPAIR BR02-54

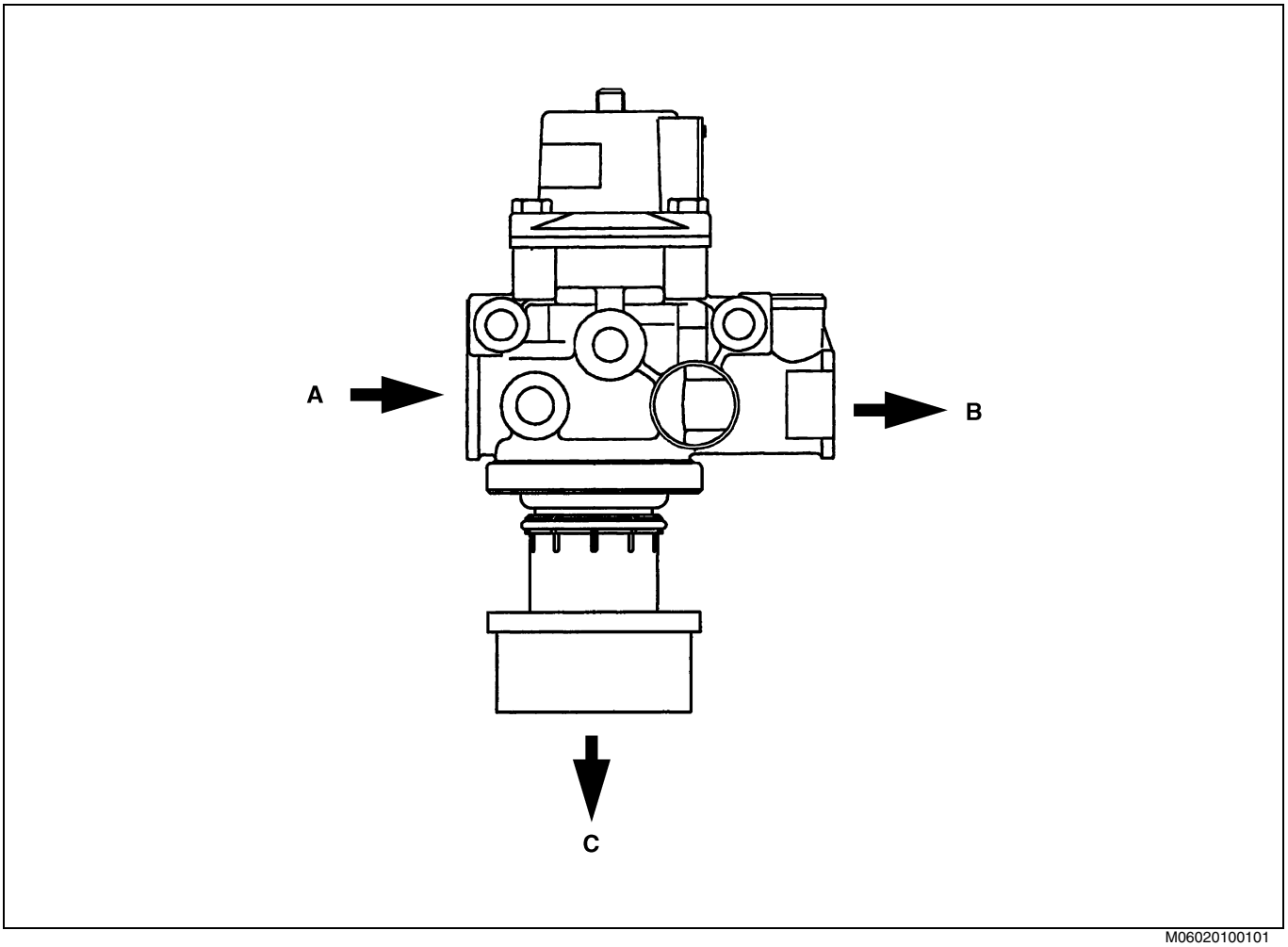
WHEEL BRAKE BR02-56
DATA AND SPECIFICATIONS BR02-56
DESCRIPTION BR02-56
SPECIAL TOOL BR02-58
COMPONENT LOCATOR BR02-59
OVERHAUL BR02-61
ADJUSTMENT BR02-65
INSPECTION AND REPAIR BR02-67

TWO-WAY VALVE
(BRAKE LOCK CONTROL VALVE)
(MODEL: FC4JEPM).....BR02-69
DATA AND SPECIFICATIONS BR02-69
DESCRIPTION BR02-69
COMPONENT LOCATOR BR02-70
OVERHAUL BR02-71
INSPECTION AND REPAIR BR02-72

PRESSURE GOVERNOR

DESCRIPTION

M06020101BEC1002



M06020100101

A	From air compressor	C	Exhaust
B	To reservoir		

INSPECTION

M06020101BEH3001

IMPORTANT POINT - INSPECTION

1. CHECK THE ALL PRESSURES

Cut-off pressure	890-930 kPa {9.08-9.48 kgf/cm2, 129.15-134.89 lbf/in2}
Cut-in pressure	770-860 kPa {7.85-8.77 kgf/cm2, 111.65-124.74 lbf/in2}

NOTICE:

- **All pressures should be measured when it is connected to air compressor which had achieved operating temperature.**
- **Pressure governor is not necessary to be disassembled. If the above specified value is not obtained, pressure governor should not be disassembled, but be replaced.**

AIR DRYER

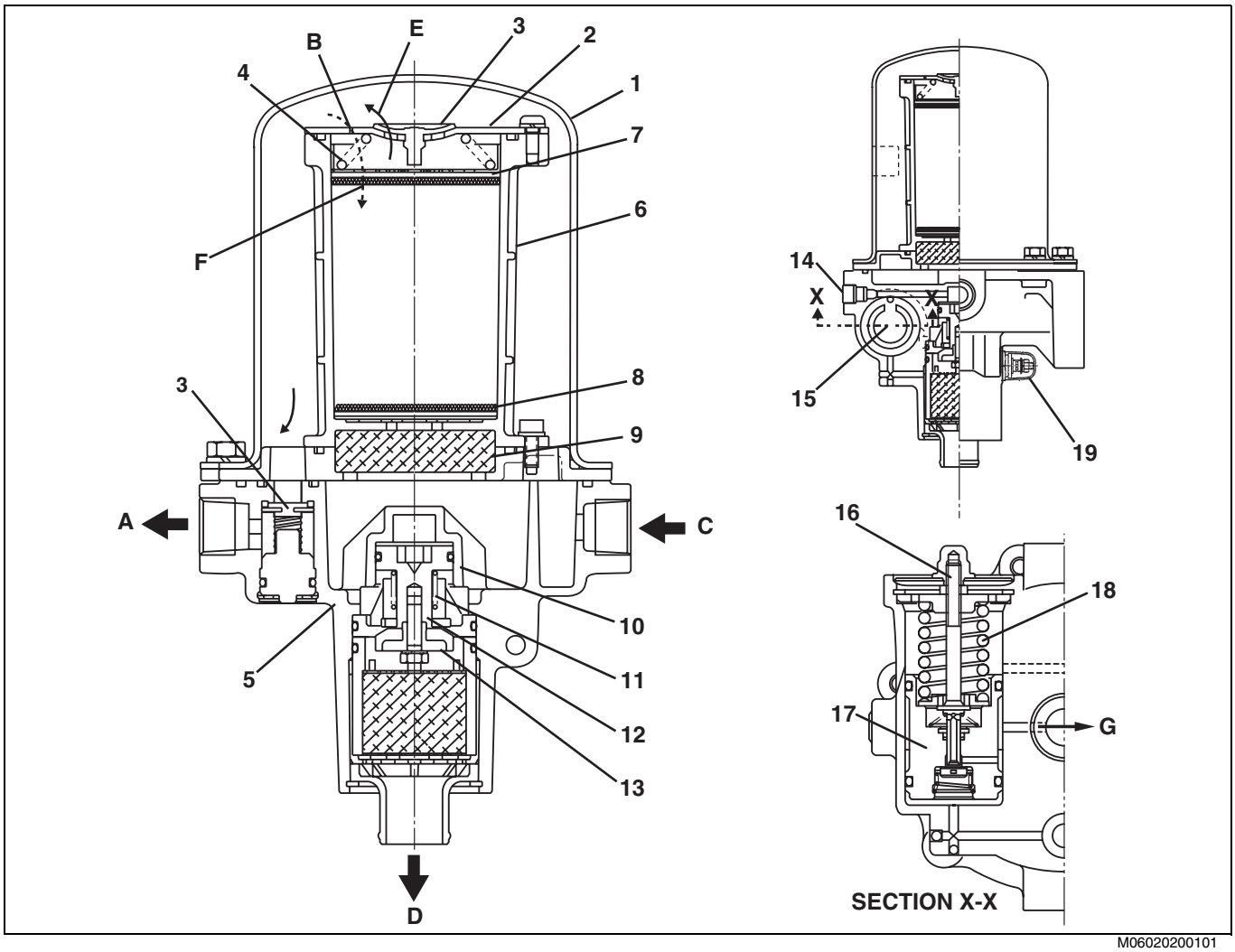
DATA AND SPECIFICATIONS

M06020201BEI2002

Type	Purge tank, desiccant, auto-purge valve.
Air and Water discharging time (Reclamation cycle)	Approx. 50 sec.

DESCRIPTION

M06020201BEC1002

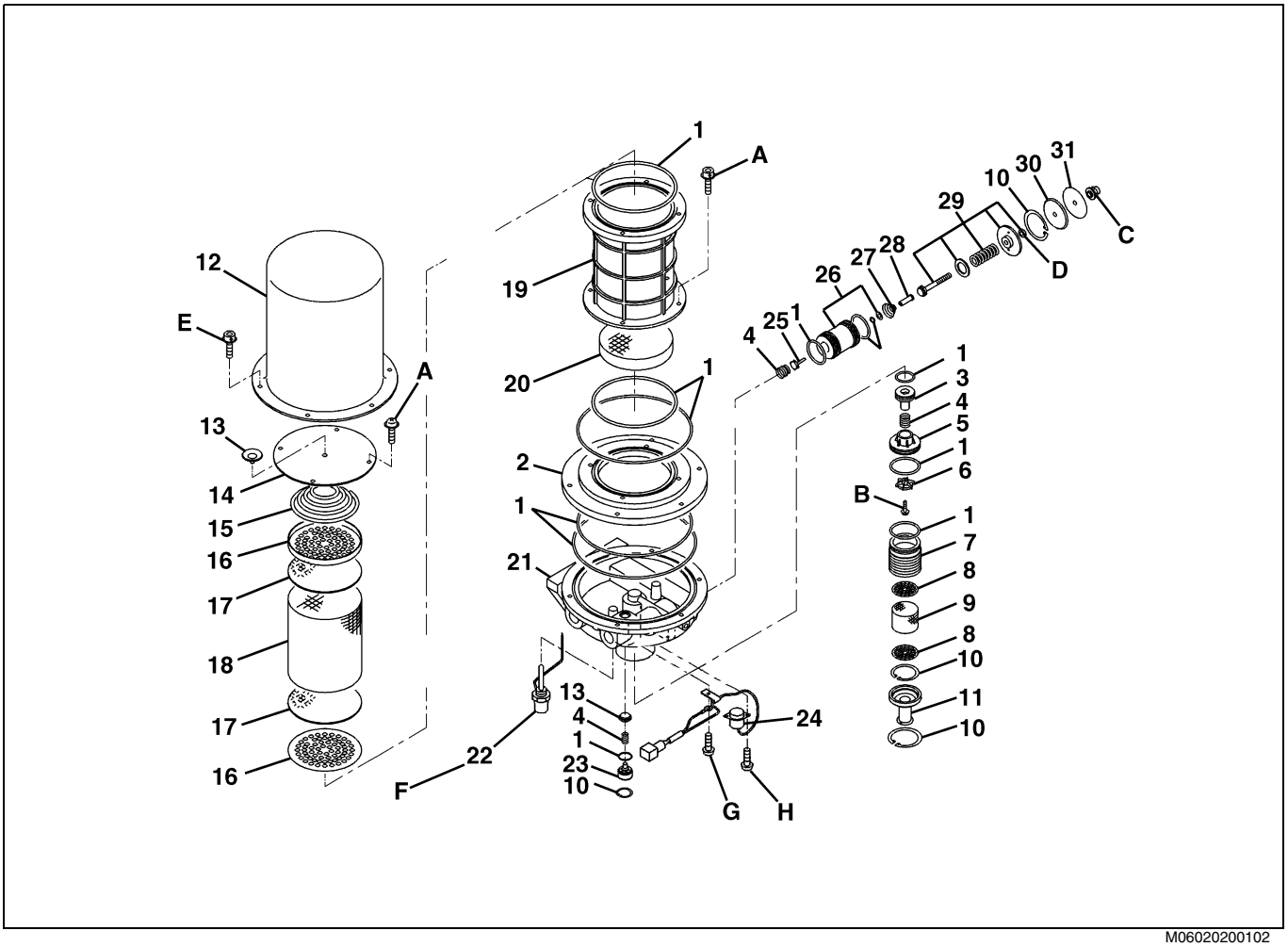


M06020200101

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

COMPONENT LOCATOR

M06020201BED1002



M06020200102

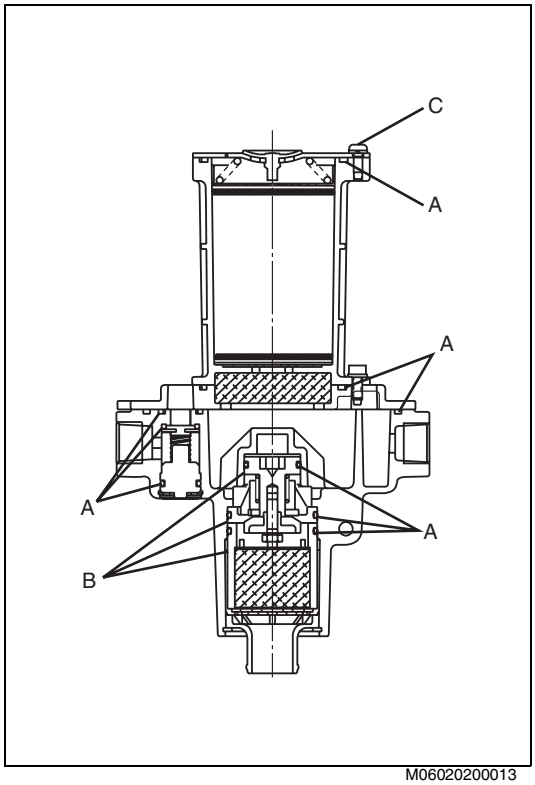
1	O-ring	17	Filter
2	Plate	18	Desiccant
3	Piston	19	Desiccant case
4	Valve spring	20	Oil separator filter
5	Valve body	21	Body
6	Purge valve	22	Heater (If so equipped)
7	Silencer case	23	Valve stopper
8	Silencer plate	24	Thermostat
9	Silencer	25	Governor valve
10	Retainer ring	26	Piston assembly
11	Exhaust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

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

A	2.0-3.9 {20-40, 1.5-2.9}	E	17.7-27.5 {180-280, 13-20}
B	3.9-6.9 {40-70, 2.9-5.0}	F	19.6-29.4 {200-300, 14-21}
C	4.9-5.9 {50-60, 3.7-4.3}	G	1.0-1.5 {10-15, 0.7-1.1}
D	6.9-7.8 {71-79, 5.2-5.7}	H	0.5-1.0 {5-10, 0.4-0.7}

OVERHAUL

M06020201BEH2001



M06020200013

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.

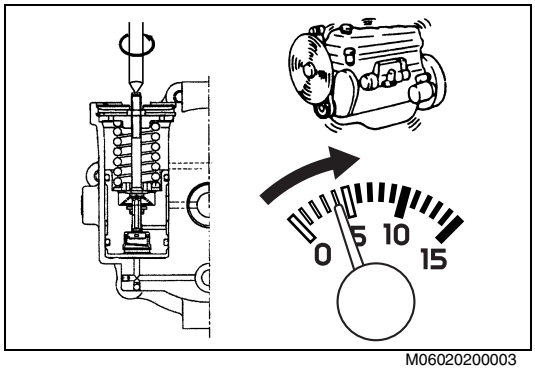
- **C: Bolt**

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).

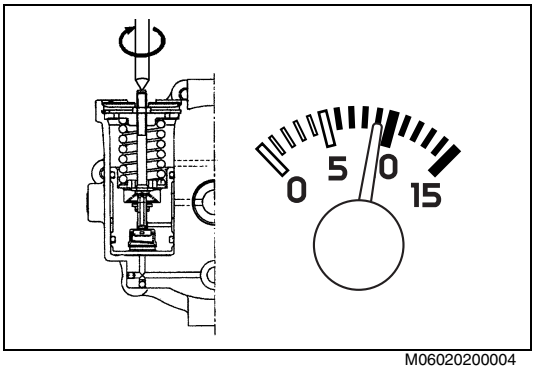
a. Check to see that there is no air leakage from the purge valve.



M06020200003

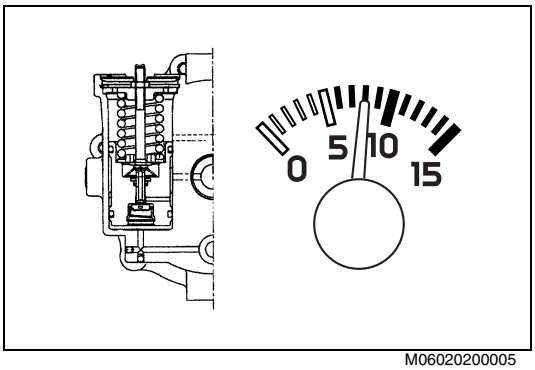
2. ADJUSTMENT

(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.



M06020200004

(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.

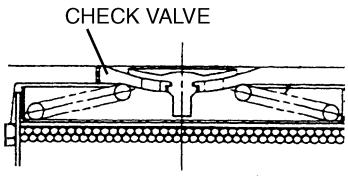
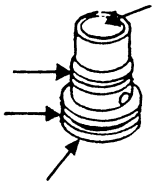
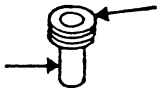
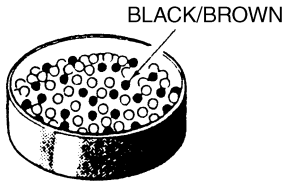


M06020200005

(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

M06020201BEH3004

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 

SAFETY VALVE

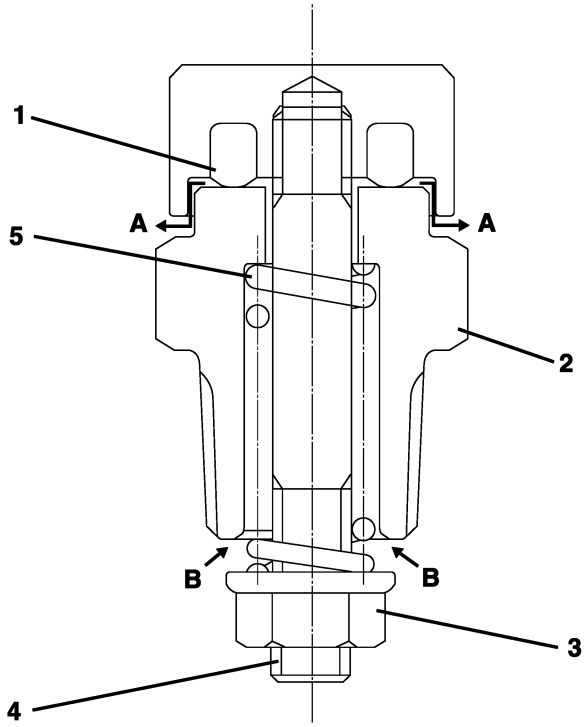
DATA AND SPECIFICATIONS

M06020501BEI2001

Type	Spring type
Valve opening pressure	931.4-970.6 kPa {9.5-9.9 kgf/cm^2, 135.2-140.8 lbf/in^2.}

DESCRIPTION

M06020501BEC1001



M06020500001

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

INSPECTION AND REPAIR

M06020501BEH3001

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

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Valve opening pressure	931.4-970.6 {9.5-9.9, 135.2-140.8}	—	Replace, if necessary.	Measure

BRAKE VALVE (MAKER: SANWA SEIKI)

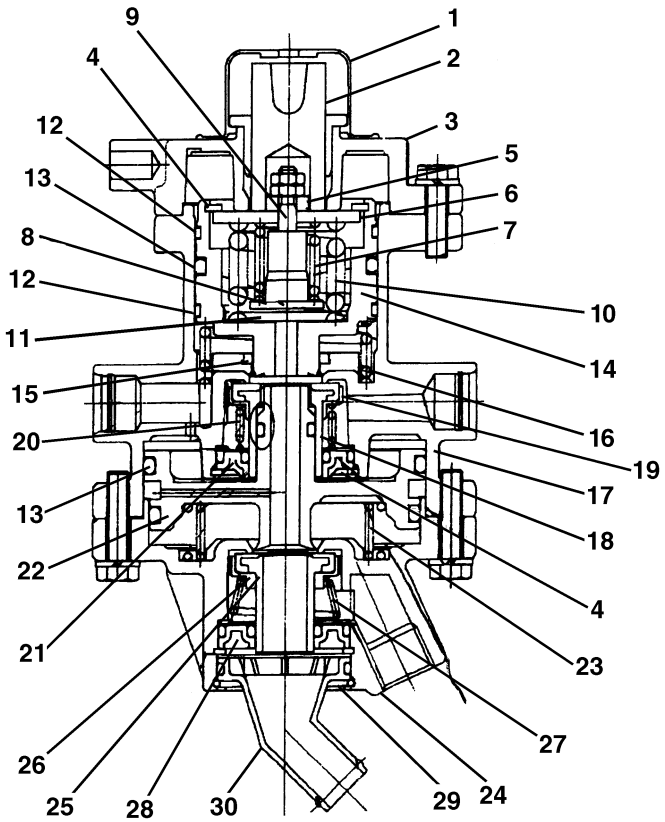
DATA AND SPECIFICATIONS

M06020601BEI2001

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

DESCRIPTION

M06020601BEC1002

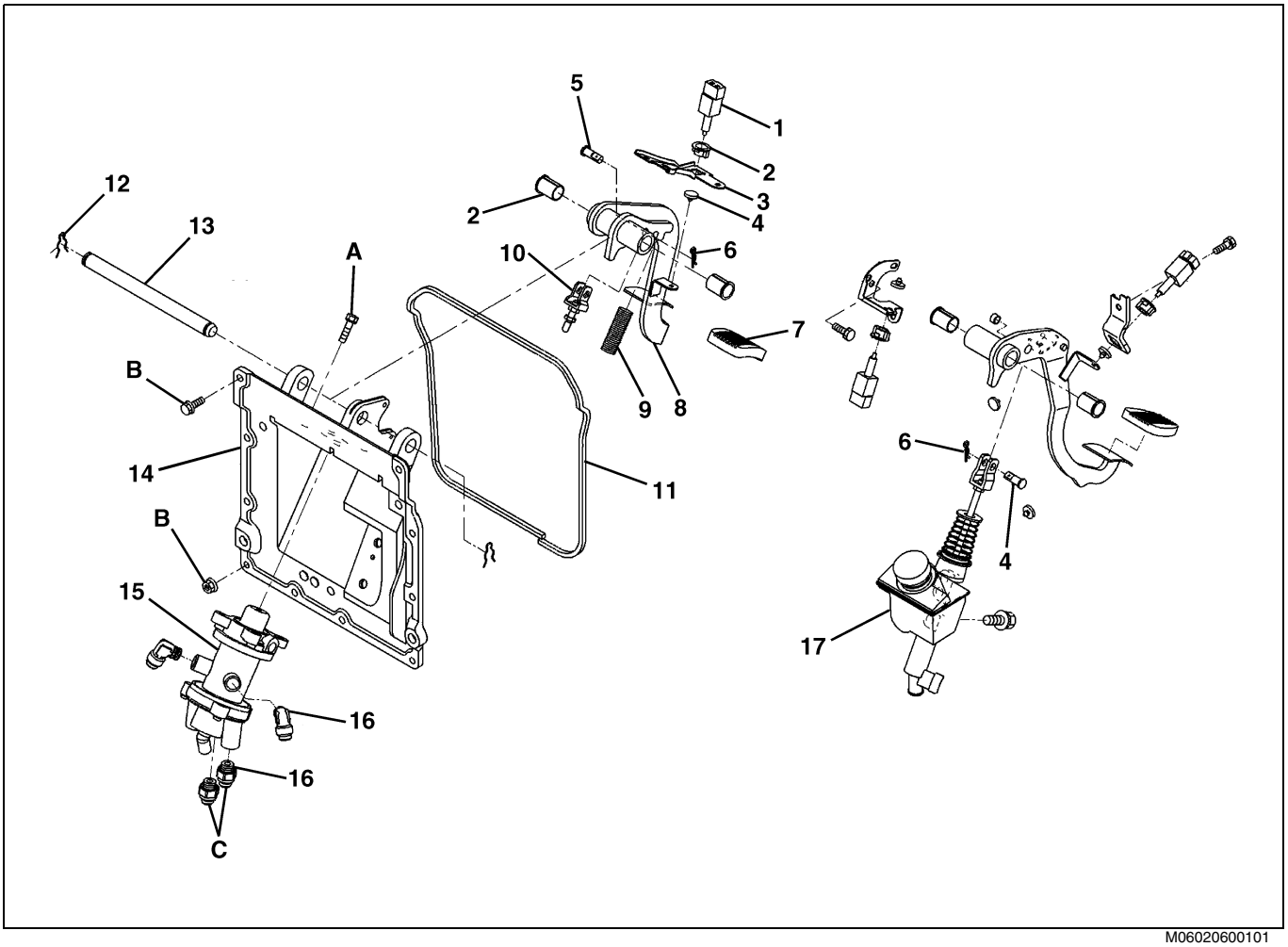


M06020600032

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

M06020601BED1001

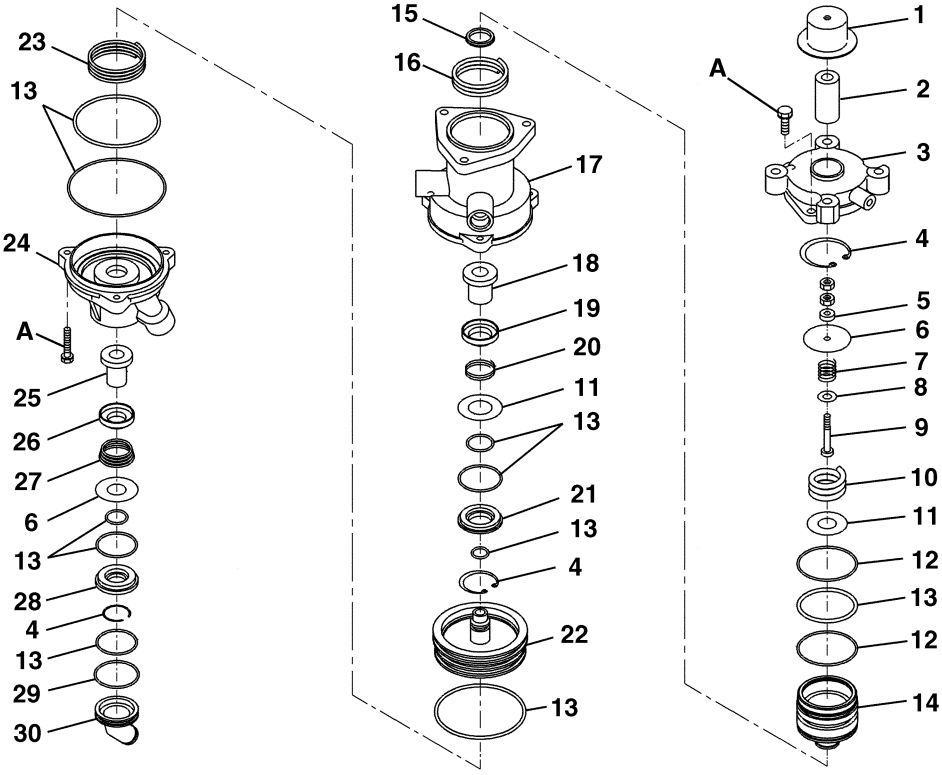


M06020600101

1	Stop lamp 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	24.4-34.4 {250-330, 18-25}
B	18-31 {184-316, 14-22}		



M06020600102

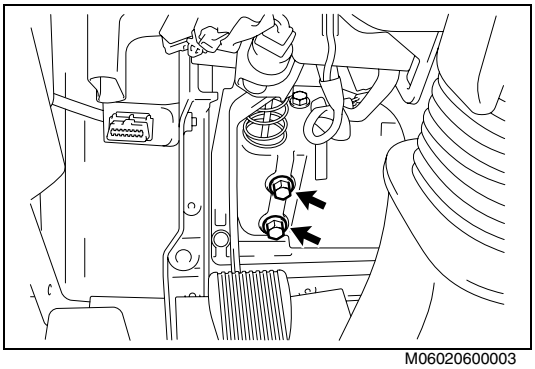
1	Boot	16	Primary piston return spring
2	Plunger	17	Primary valve body
3	Brake valve cover	18	Primary feed valve
4	Retainer ring	19	Retainer
5	Guide ring	20	Primary feed valve return spring
6	Spring seat	21	Primary feed valve retainer
7	Sub spring	22	Secondary piston
8	Shim	23	Secondary piston return 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	5.9-7.4 {60-75, 4.3-5.4}		

OVERHAUL

M06020601BEH2002


M06020600003

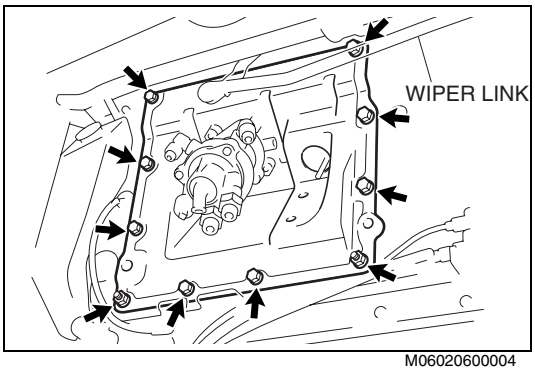
IMPORTANT POINTS - DISMOUNTING

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.



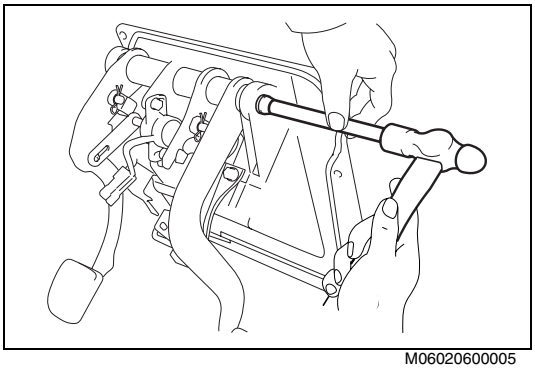
M06020600004

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.

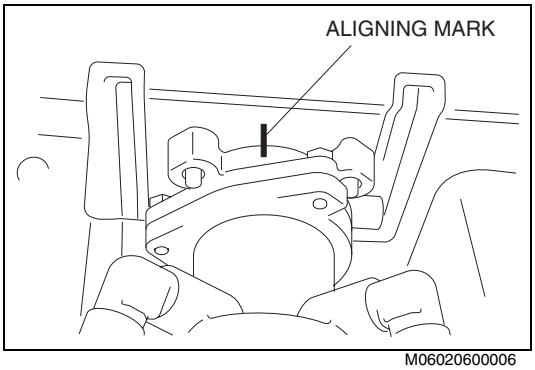

M06020600005

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:

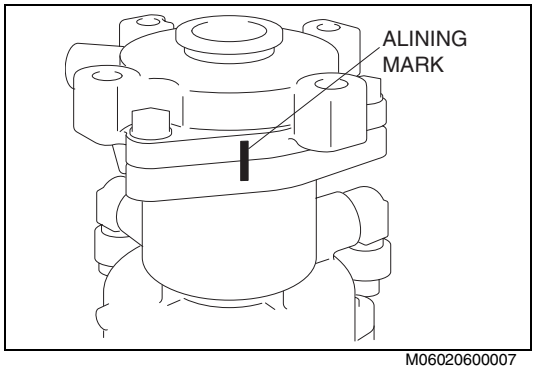
Do not pull out the shaft because the brake pedal and the clutch pedal are installed by one pedal shaft.



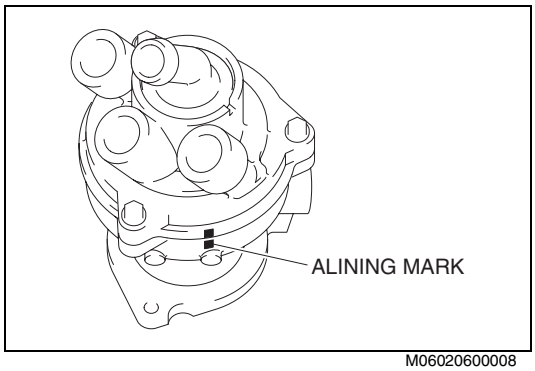
M06020600006

5. REMOVE THE BRAKE VALVE ASSEMBLY.

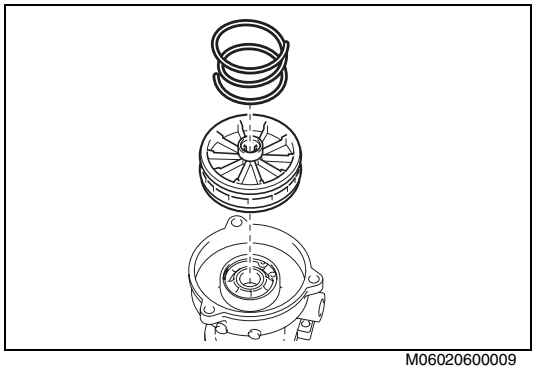
(1) Apply aligning marks on the brake valve assembly and pedal bracket assembly.



M06020600007



M06020600008


M06020600009

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.

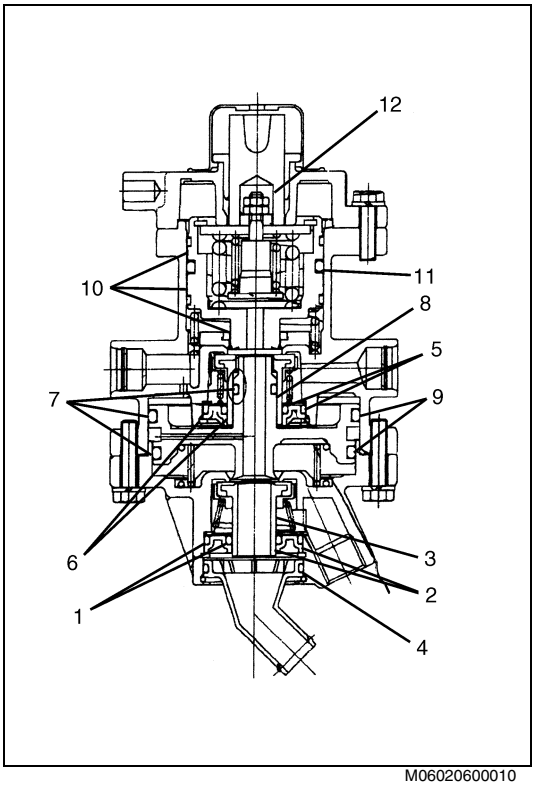
3. REMOVE THE SECONDARY PISTON.

NOTICE:
Pull out with hands to prevent the seat part of the secondary piston from being damaged by using a 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



M06020600010

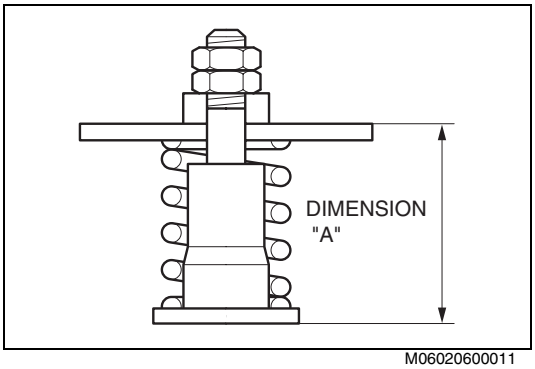
IMPORTANT POINTS - ASSEMBLY

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



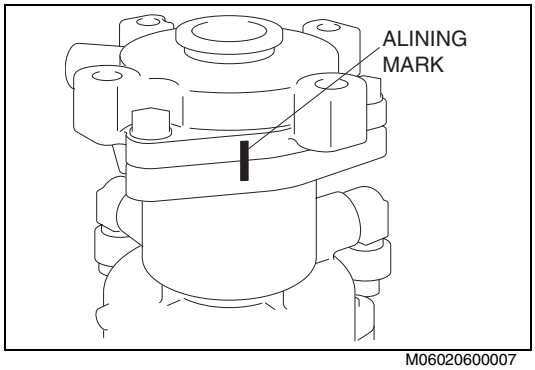
M06020600011

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

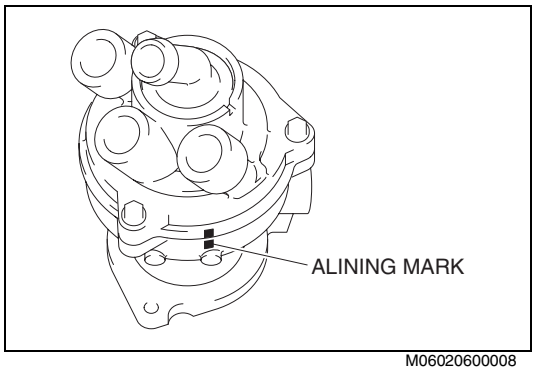
(1) Assemble the sub spring. At this time, adjust dimension "A" and the spring compression "P" by means of the lock nut and the shim.

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}



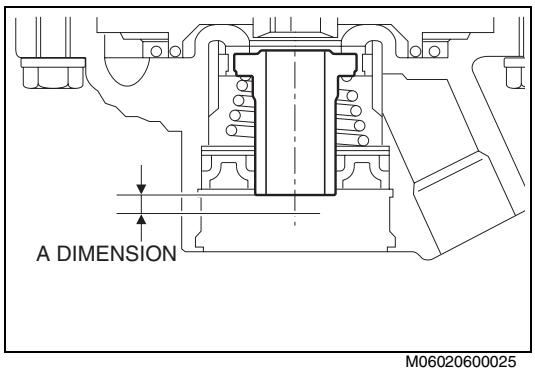
M06020600007



M06020600008

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.



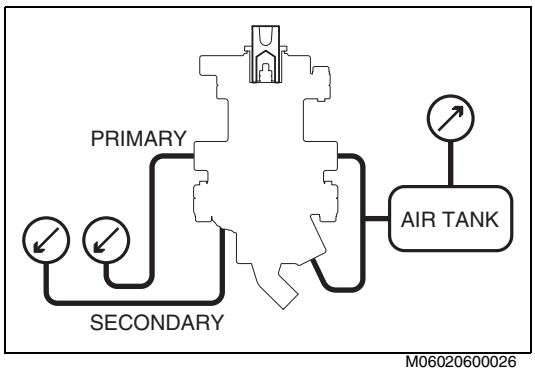
M06020600025

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

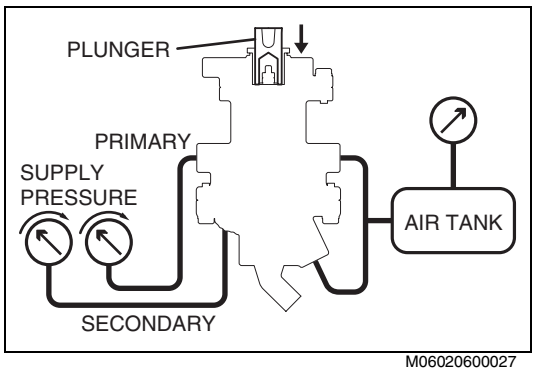


M06020600026

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}.

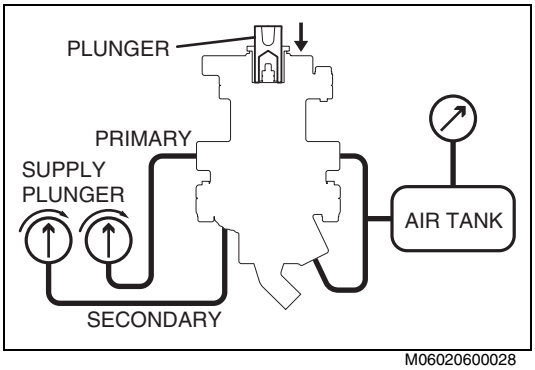
d. Apply soap water to the exhaust port and check to see there is no air leakage.



M06020600027

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.

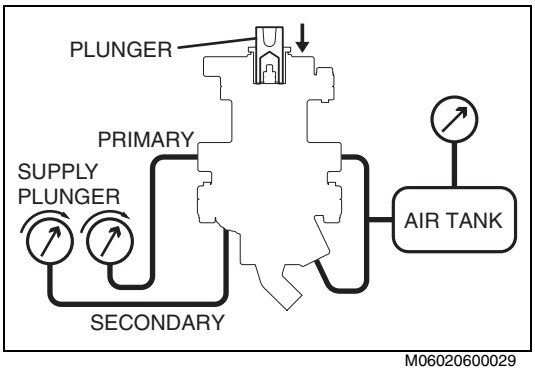
Measurement item	Standard value
Plunger stroke	1.6-2.4 mm {0.0630-0.0944 in.}
Supply pressure	10-25 kPa {0.1-0.25 kgf/cm^2, 1.43-3.55 lbf/in^2}



M06020600028

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.

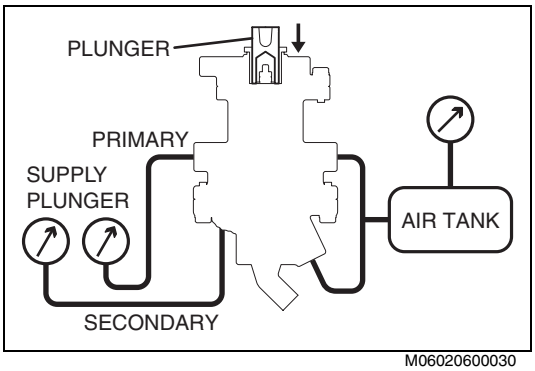
Measurement item	Standard value
Plunger stroke	4.85-5.95 mm {0.1910-0.2342 in.}
Supply pressure	186 kPa {1.9 kgf/cm^2, 27.02 lbf/in^2}



M06020600029

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.

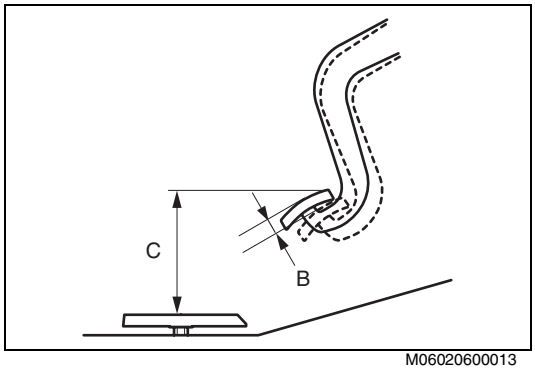
Measurement item	Standard value
Plunger stroke	7.19-8.51 mm {0.2831-0.3350 in.}
Supply pressure	593 kPa {6.0 kgf/cm^2, 85.32 lbf/in^2}



M06020600030

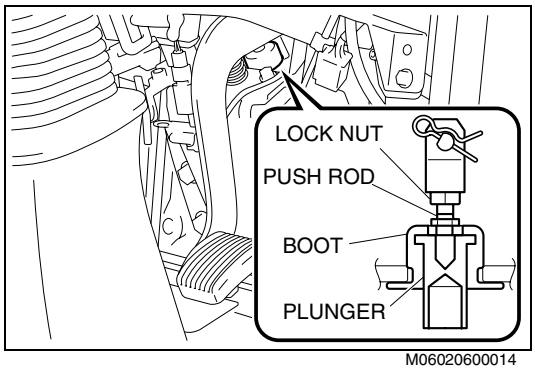
h. Drive in further the plunger. Measure the pedal stepping down angle and supply pressure at the point where the primary and secondary pressure are maximum. If the measurements do not match with the standard values, replace each spring.

Measurement item	Standard value
Plunger stroke	9.89-11.31 mm {0.3894-0.4452 in.}
Supply pressure	830 kPa {8.5 kgf/cm^2, 120.87 lbf/in^2}



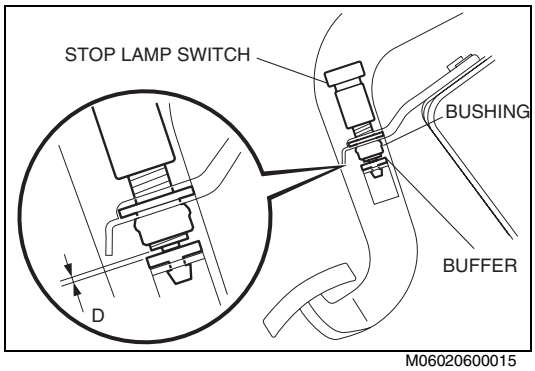
M06020600013

(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.}



M06020600014

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.

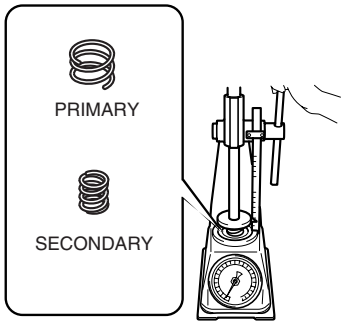
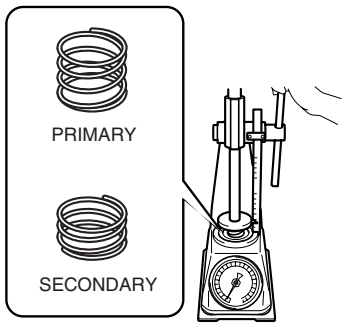
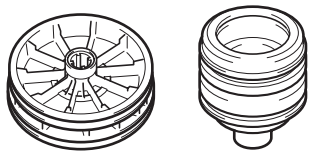
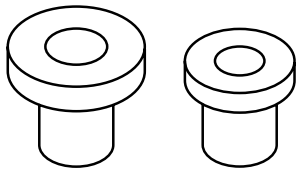
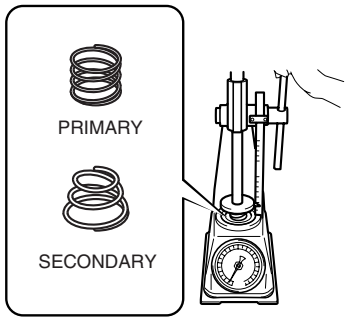


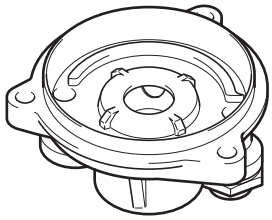
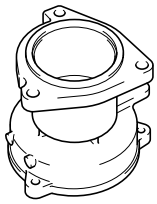
M06020600015

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

INSPECTION AND REPAIR

M06020601BEH3001

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Main spring: Free length/ setting length/ setting load	29.4 mm {1.16 in.}/ 27.6 mm {1.09 in.}/ 158.0 N {16.1 kgf, 35.99 lbf}	28.6 mm {1.13 in.}	Replace, if necessary.	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, if necessary.	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 
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, 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.}		

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** 

BRAKE FLUID RESERVOIR

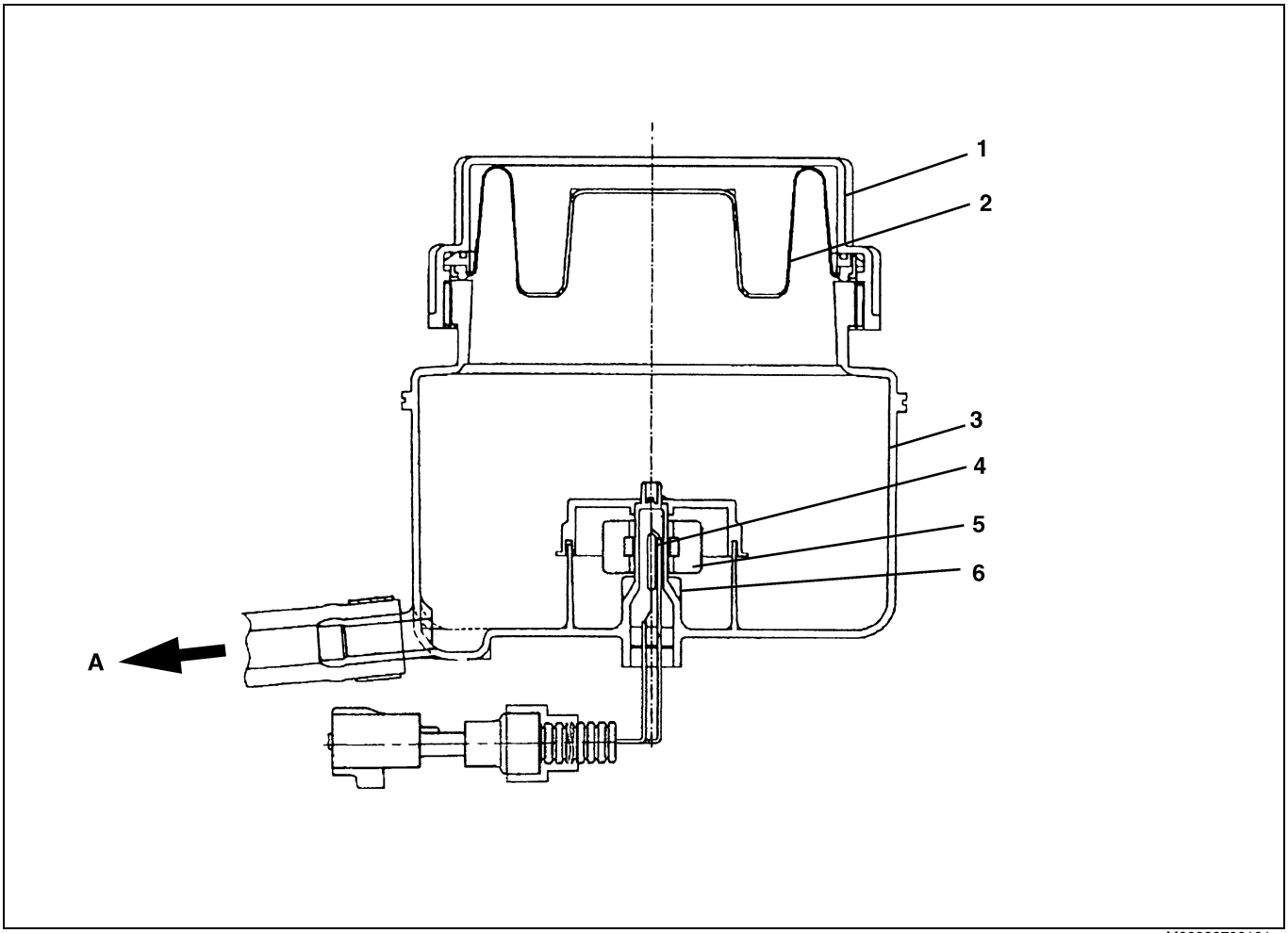
DATA AND SPECIFICATIONS

M06020701BEI2001

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

DESCRIPTION

M06020701BEC1002

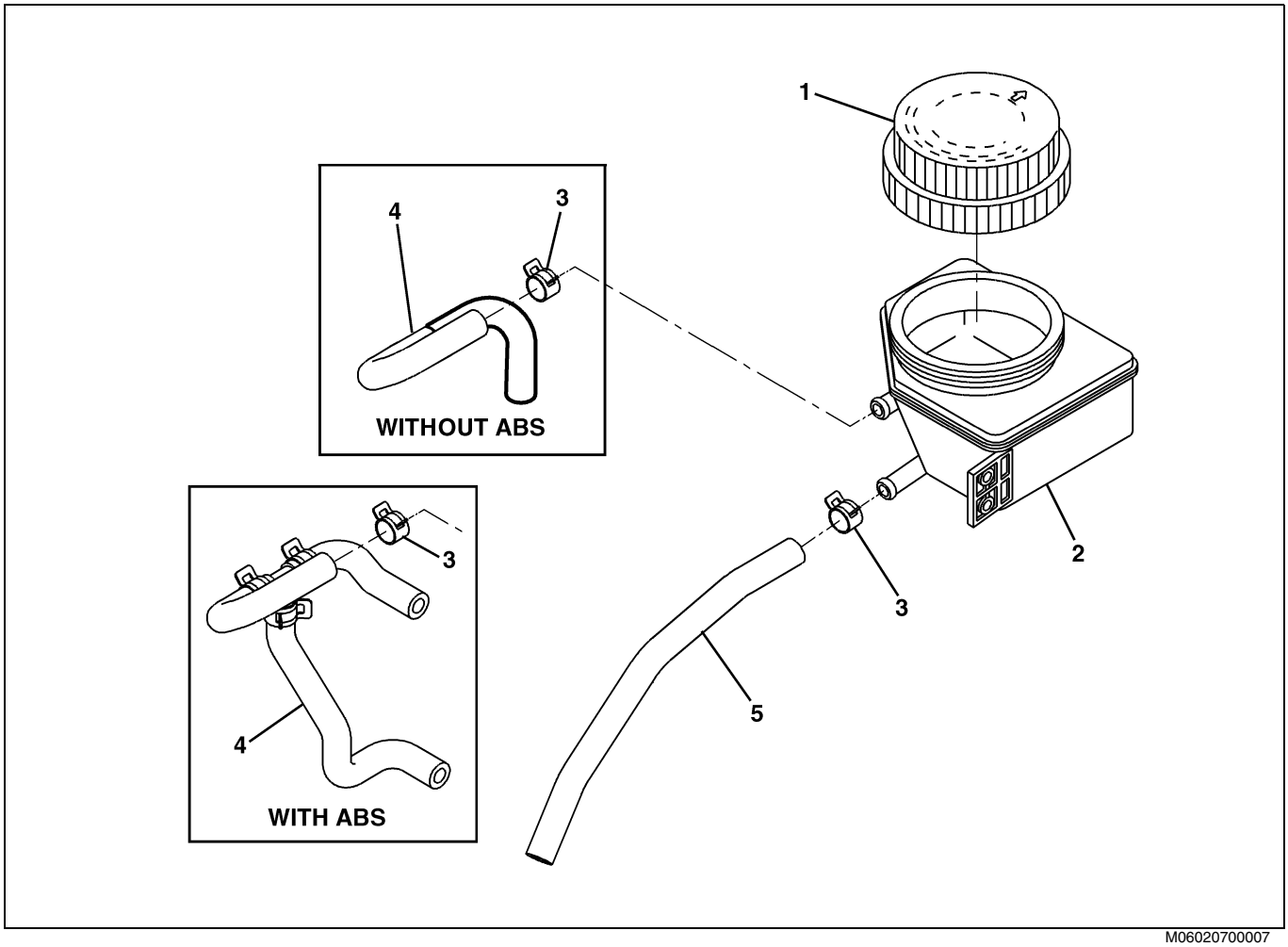


M06020700101

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

COMPONENT LOCATOR

M060207BED1002



M06020700007

1	Reservoir cap	4	Hose
2	Body	5	Tube
3	Clip		

DISMOUNTING AND MOUNTING

M06020701BEH1001

IMPORTANT POINT - DISMOUNTING

1. REMOVAL OF RESERVOIR.

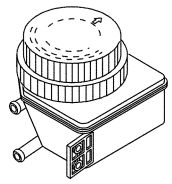
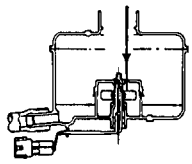
NOTICE:

- **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

M06020701BEH3001

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 lamp 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 

PROTECTION VALVE (WITH 4-WAY PROTECTION VALVE)

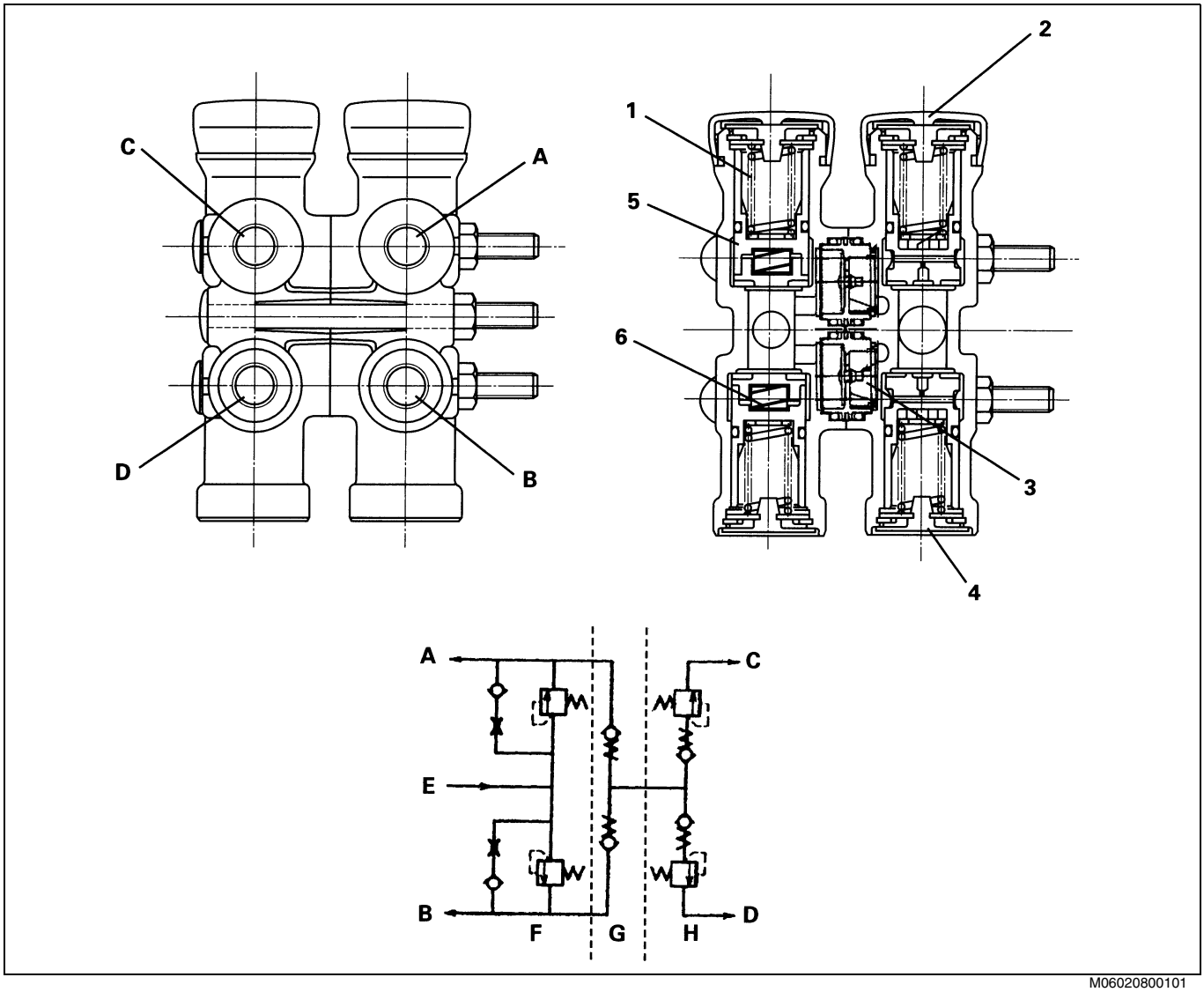
DATA AND SPECIFICATIONS

M06020801BEI2001

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

M06020801BEC1001

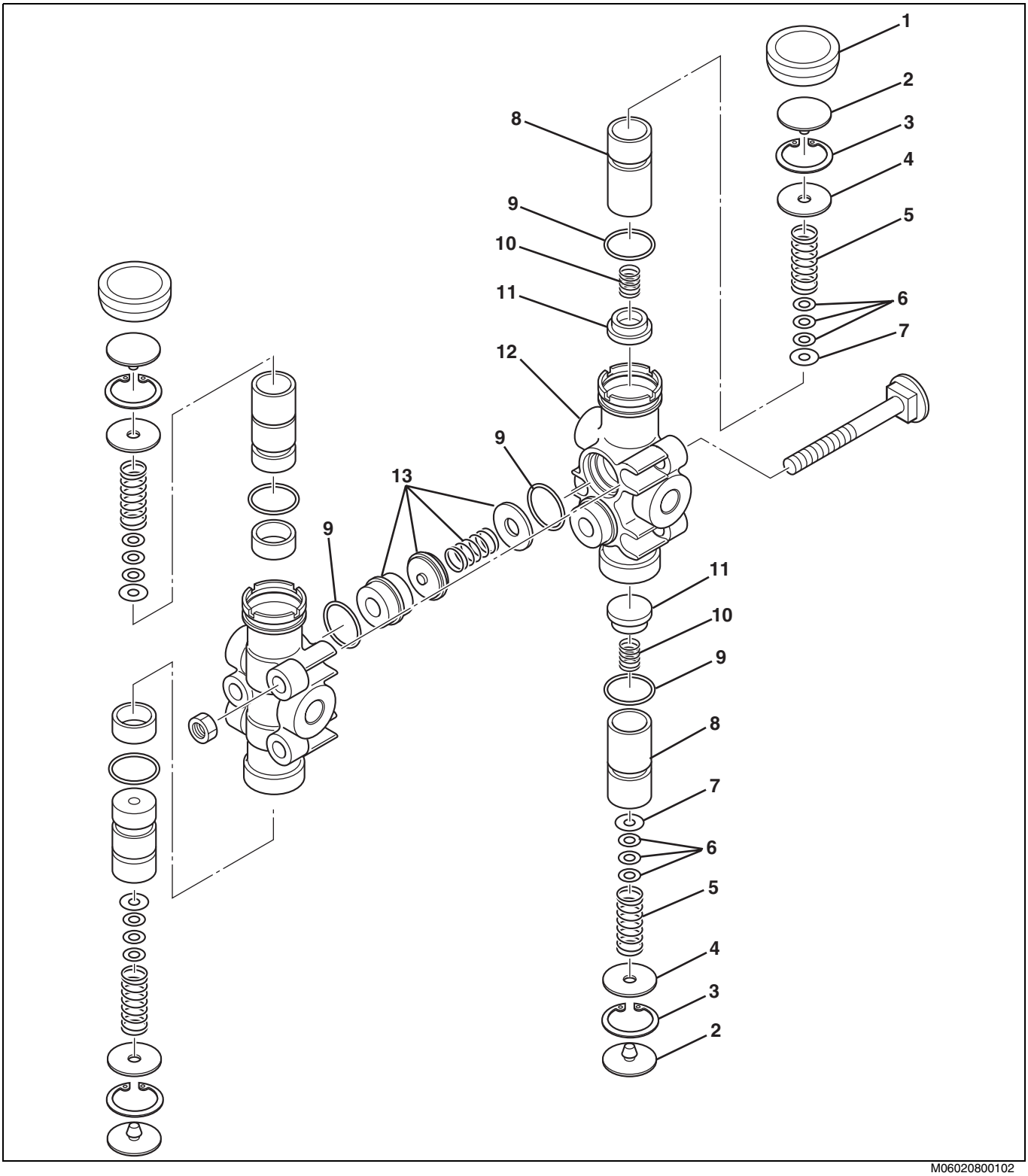


M06020800101

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

M06020801BED1001

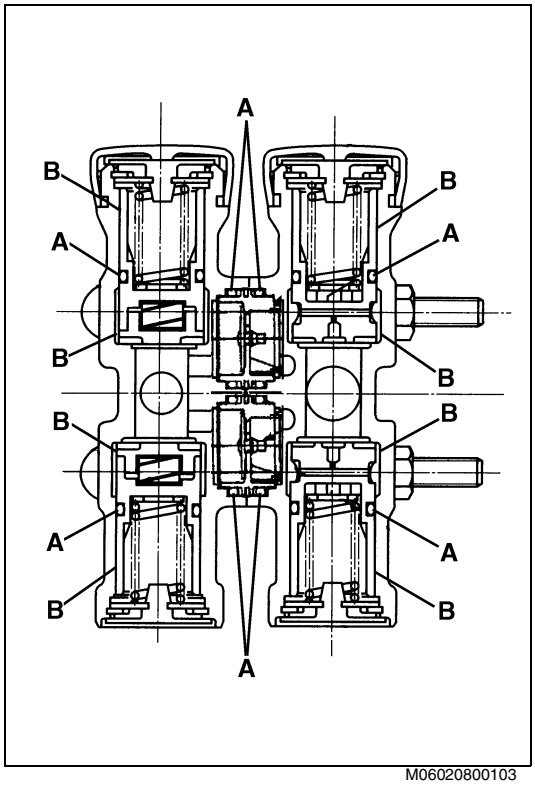


M06020800102

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

M06020801BEH2001



M06020800103

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

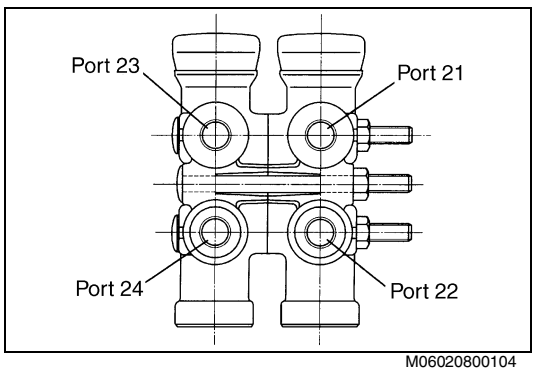
M06020801BEH3001

AIR LEAKAGE

1. Check valve

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

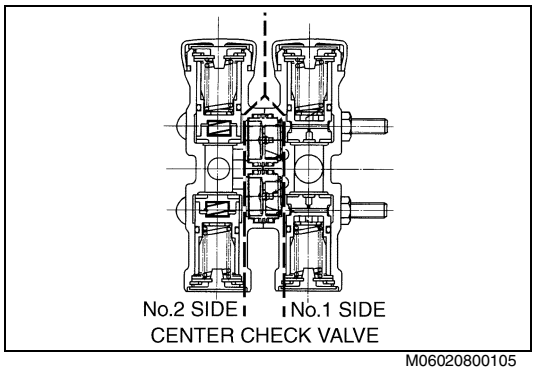
a. Confirm no leakage of air at inlet, No.1, when applying pressure to air under 49 kPa {0.5 kgf/cm^2, 7.11 lbf/in^2}, 392 kPa {4 kgf/cm^2, 56.89 lbf/in^2} from outlet No.21 and No.22.



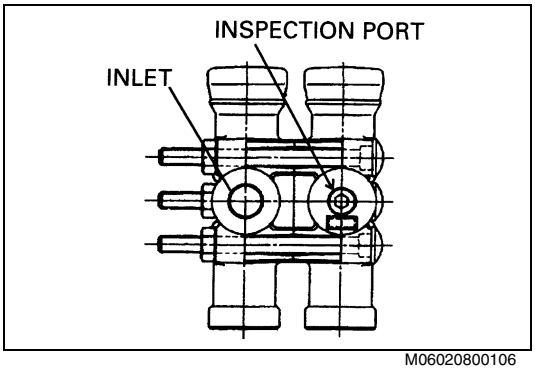
M06020800104

(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}, 880 kPa {9 kgf/cm^2, 128 lbf/in^2} from the inspection port.



M06020800105



M06020800106

(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 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 CHRACTERISTIC

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.

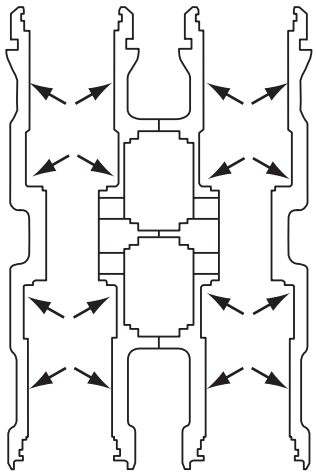
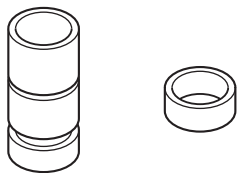
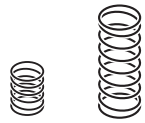
2. Closing valve pressure
(1) When discharging air through respective No.1 side and No.2 side inlet under a pressure of 880 kPa {9 kgf/cm^2, 128 lbf/in^2} at the inlet and the outlet, at discharging speed specified below, confirm that a pressure when the pressures saturated should be of Closing valve 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 3 seconds.

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

INSPECTION AND REPAIR

M06020801BEH3002

Unit: mm {in.}

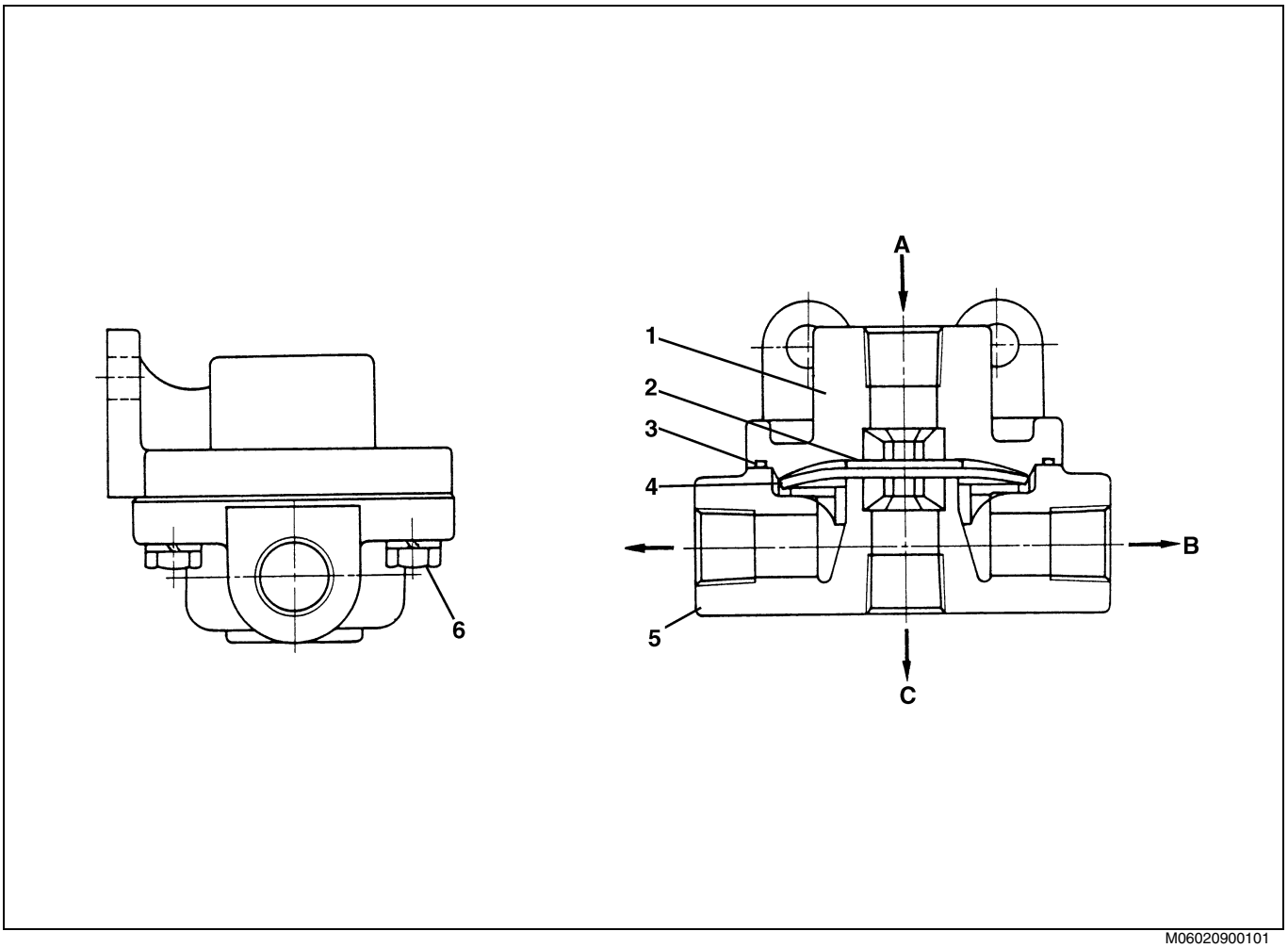
Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Sliding surface and contact surface of body: Wear and damage	—	—	Replace, if necessary.	Visual check 
Sliding surface and contact surface of valve seat and piston: Wear and damage	—	—	Replace, if necessary.	Visual check 
Conical spring and compression 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 

QUICK RELEASE VALVE

DATA AND SPECIFICATION

Type	**Diaphragm type**

DESCRIPTION

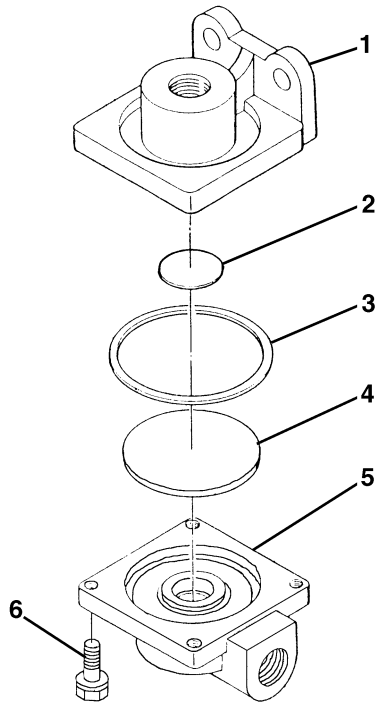


M06020900101

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

COMPONENT LOCATOR

M06020901BED1001

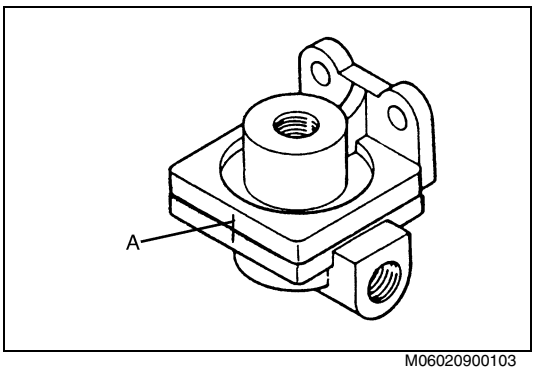


M06020900102

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

OVERHAUL

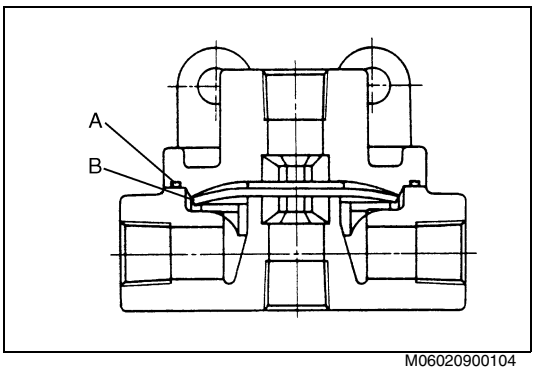
M06020901BEH2001



M06020900103

IMPORTANT POINT - DISASSEMBLY

NOTICE:
Before disassemble the relay valve apply the aligning mark "A" for the cover and valve body.



M06020900104

IMPORTANT POINT - ASSEMBLY

1. Assemble the relay valve

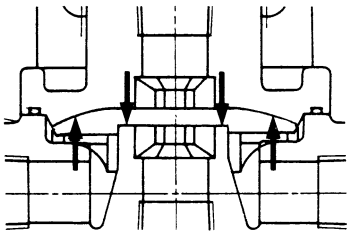
(1) When assembly the relay valve, use the new diaphragm and gasket.

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

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

INSPECTION AND REPAIR

M06020901BEH3001

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

BRAKE AIR BOOSTER (AIRMASTER) WITHOUT ABS

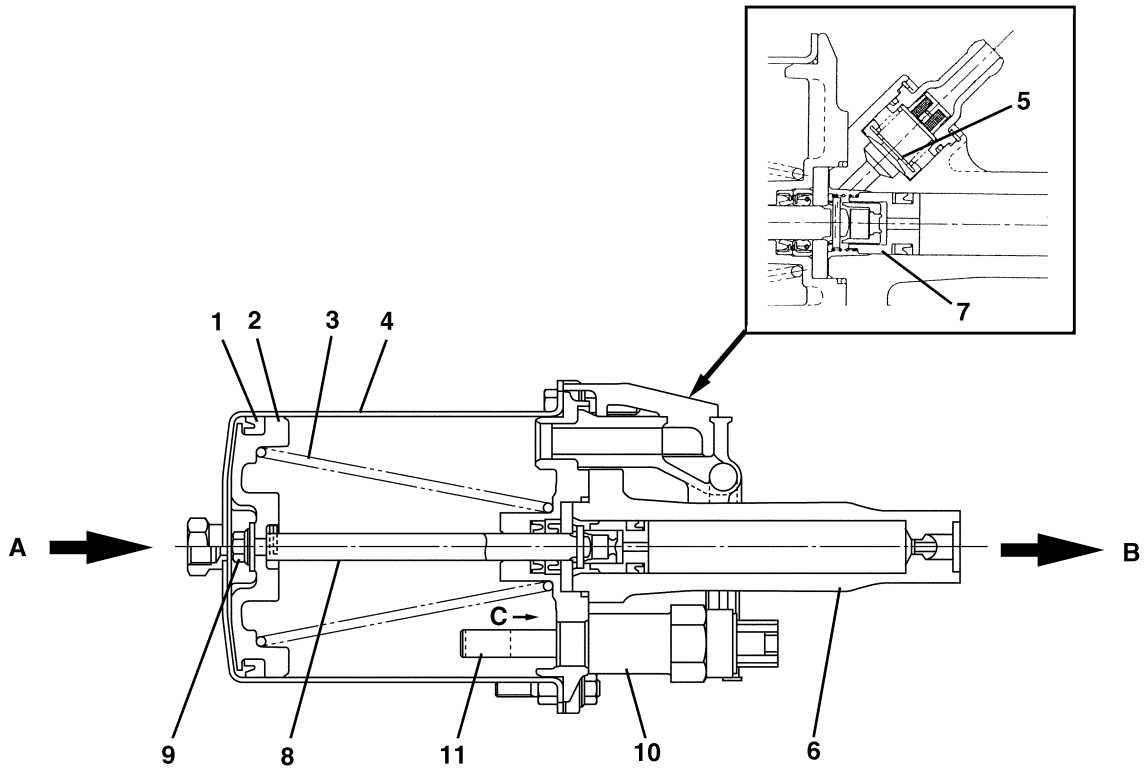
DATA AND SPECIFICATIONS

M060210BEI2001

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

M06021001BEC1001



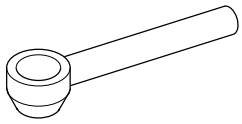
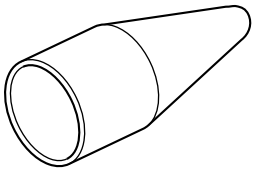
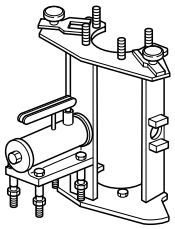
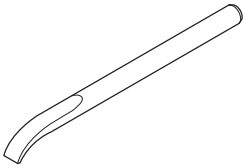
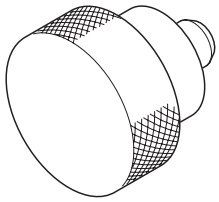
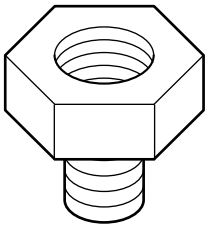
M06021000001

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

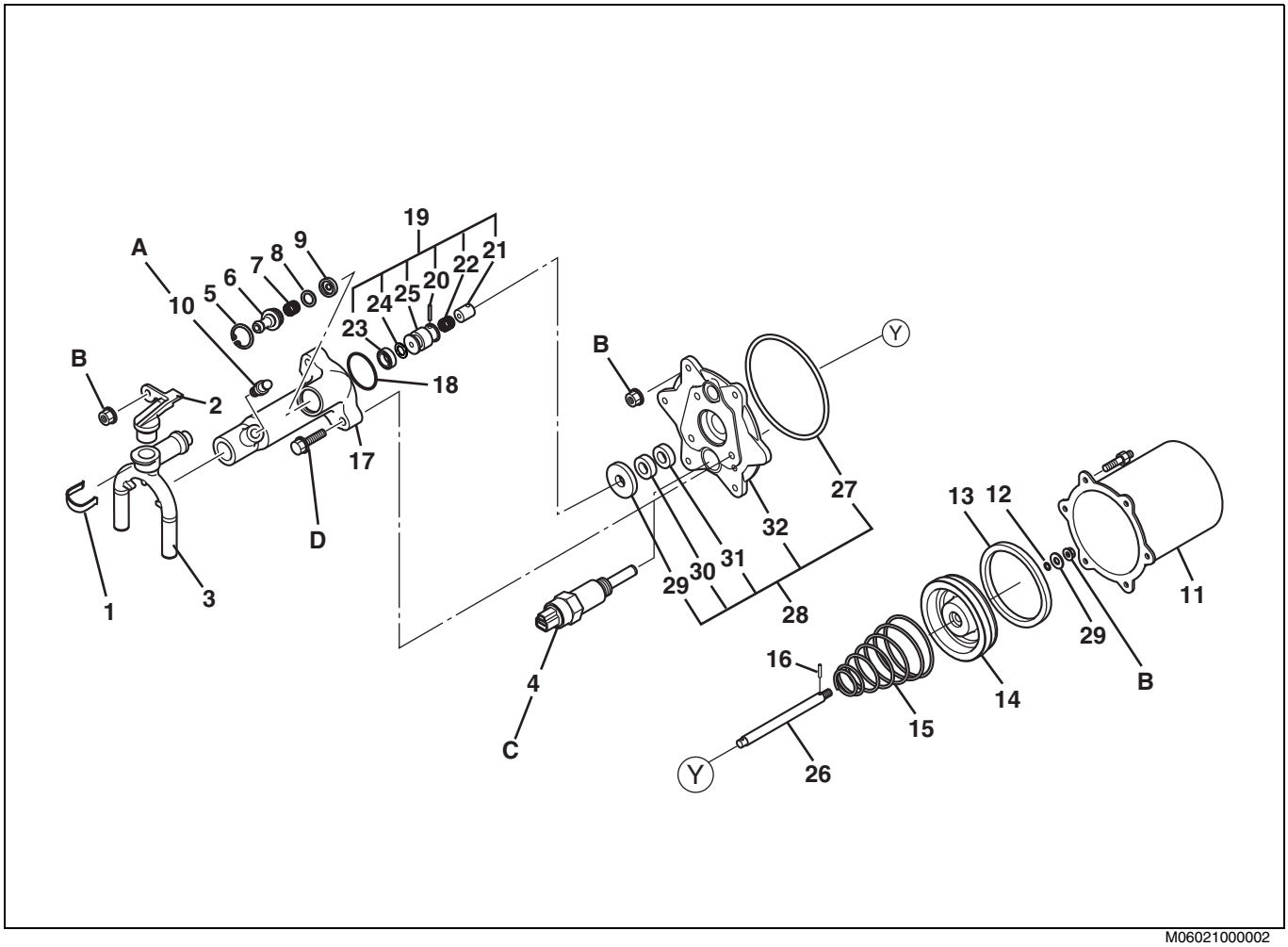
M06021001BEK1001

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

Illustration	Part number	Tool name	Remarks
	09699-1410	POWER PISTON HOLDER	
	09657-2060	PISTON CUP GUIDE	
	09630-2340	STAND	
	09651-1120	PULLER	
	09607-1160	PRESS FIT BAR	
	09699-1400	CONNECTER	

COMPONENT LOCATOR

M06021001D1001



M06021000002

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

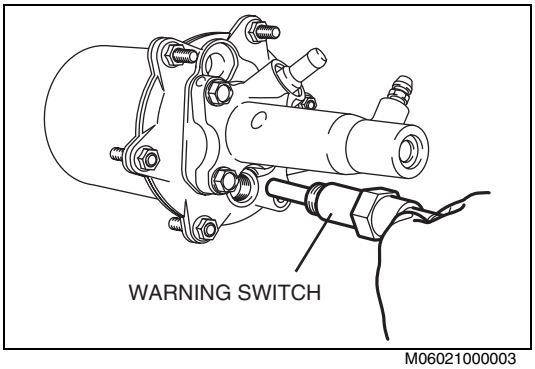
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

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

M06021001BEH2001

IMPORTANT POINT- DISASSEMBLY

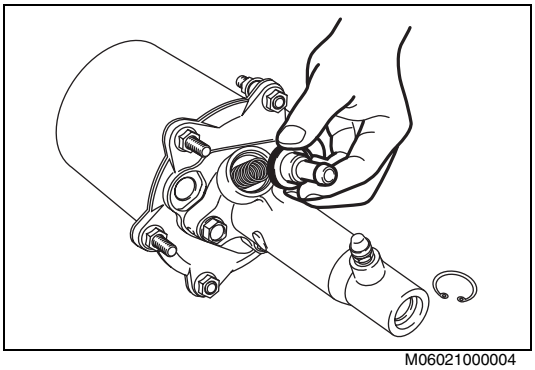


M06021000003

1. HYDRAULIC CYLINDER AND POWER CYLINDER

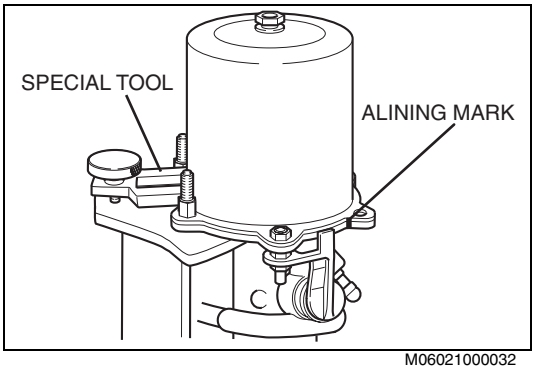
(1) Remove the nut and then remove the clamp, holder, and exhaust cover.

(2) Remove the stroke warning switch.


M06021000004

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

(4) Remove the cap and the bleeder screw.

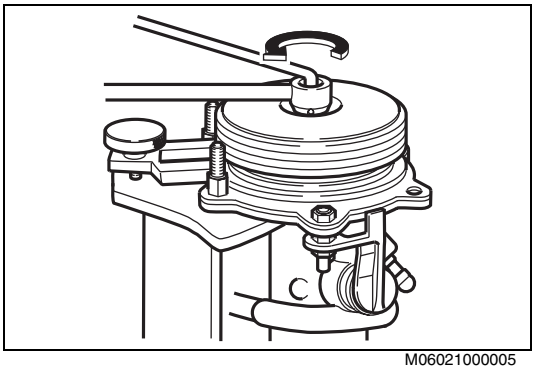


M06021000032

(5) Using the special tool, secure the brake booster.
SST: Stand (09630-2340)

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

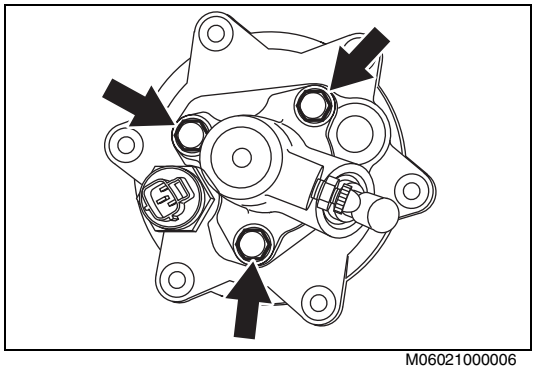
(6) Remove the nuts, then remove the power cylinder shell and O-ring.


M06021000005

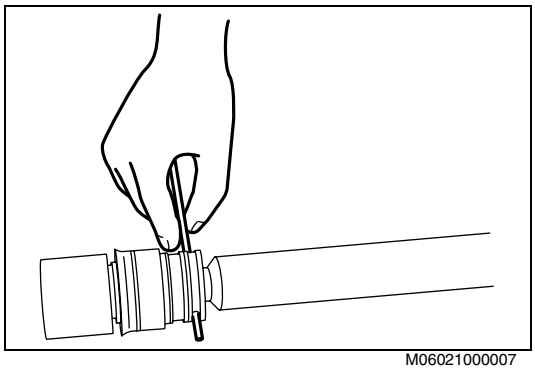
(7) Using the special tool, secure the power piston, then remove the nut.
SST: Power Piston Holder (09699-1410)

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.**

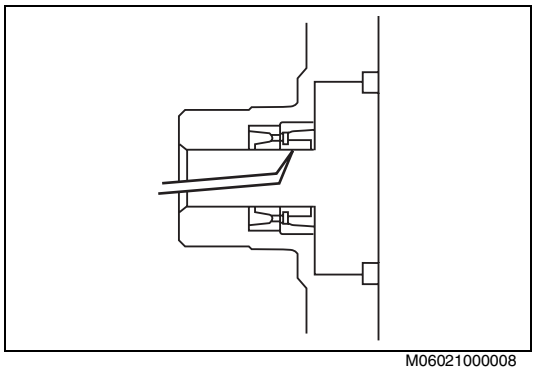
(8) Remove the O-ring, piston seal, power piston and return spring.


M06021000006

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


M06021000007

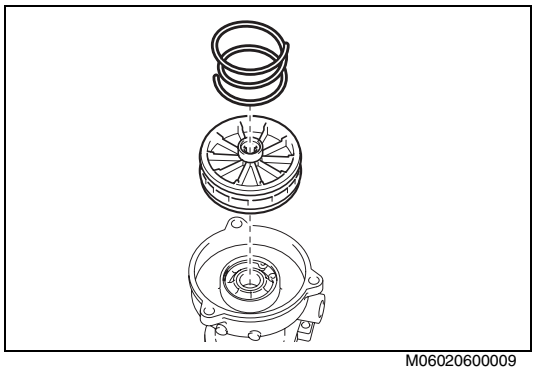
(10) Press and hold down the hydraulic piston spring and remove the pin, and then remove the hydraulic piston assembly.
(11) Remove the push rod, pulling it in the direction away from the push rod threaded part.

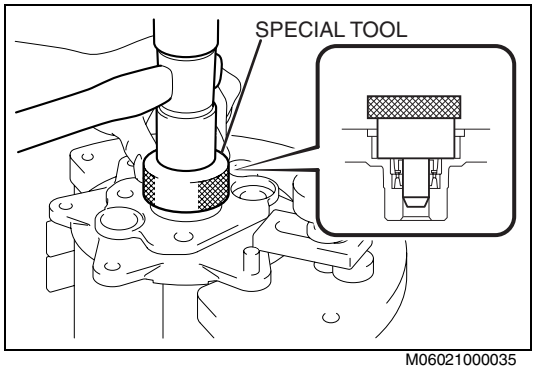

M06021000008

(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 (09651-1120)

IMPORTANT POINT - ASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER
(1) Using the special tool, secure the end plate.
SST: Stand (09630-2340)


M06020600009

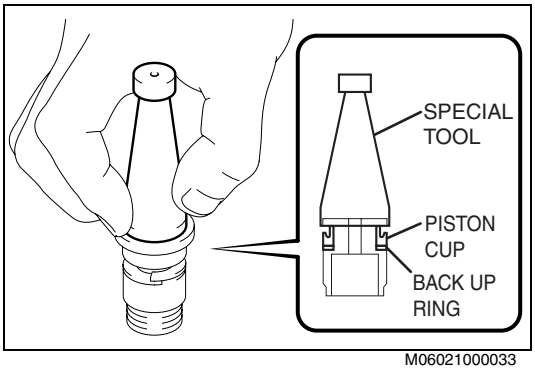


M06021000035

(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 (09607-1160)

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.

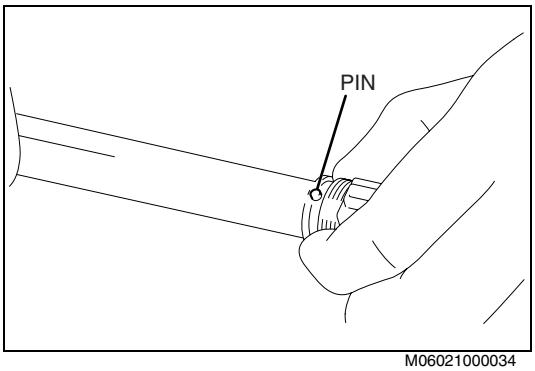


M06021000033

(4) Using the special tool, install the back up ring and hydraulic piston cup to the hydraulic piston.
SST: Piston Cup Guide (09657-2060)

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.**

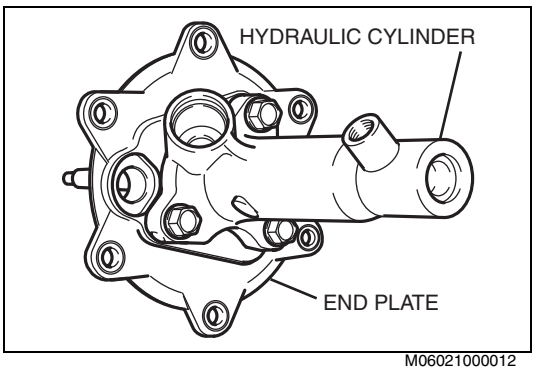
(5) Coat the push rod surfaces and valve seal with silicone grease, then install the push rod to the end plate, installing it in the direction away from the threaded parts.



M06021000034

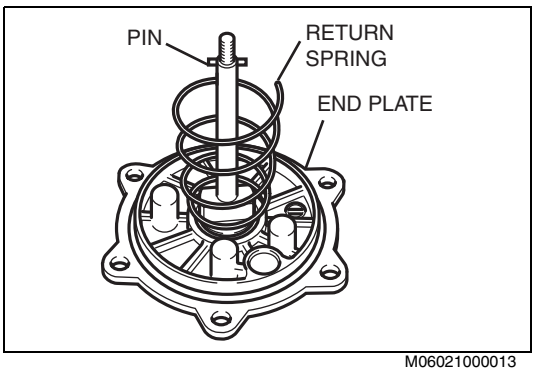
(6) Line up the push rod end pin, the valve seal hole and the hydraulic piston hole, and then insert the pin.

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



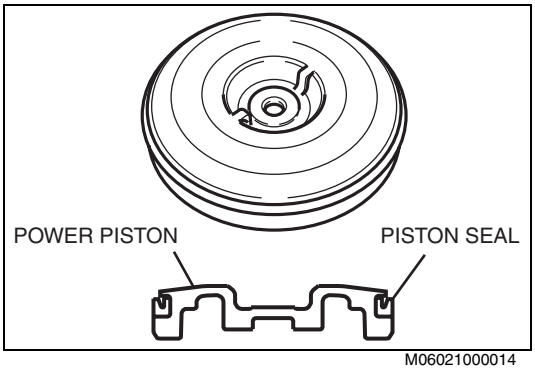
M06021000012

(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.



M06021000013

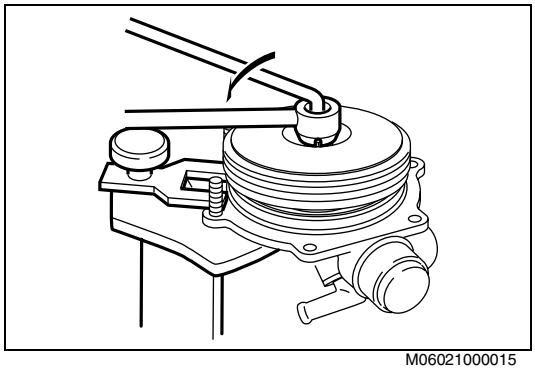
(10) Install the pin in the push rod threaded part hole.
(11) Install the return spring on the end plate.



M06021000014

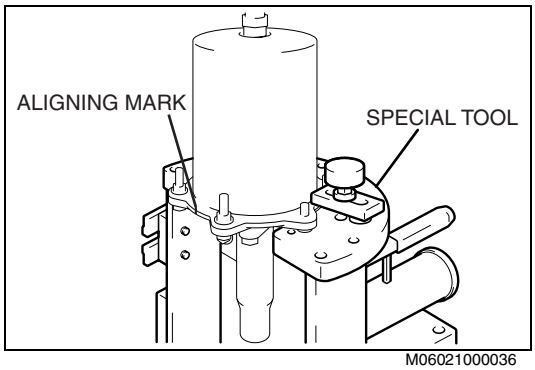
(12) Coat the piston seal groove of the power piston and piston seal with mineral grease (Air Master Paste or equivalent), and then install the piston seal to the power piston.

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


M06021000015

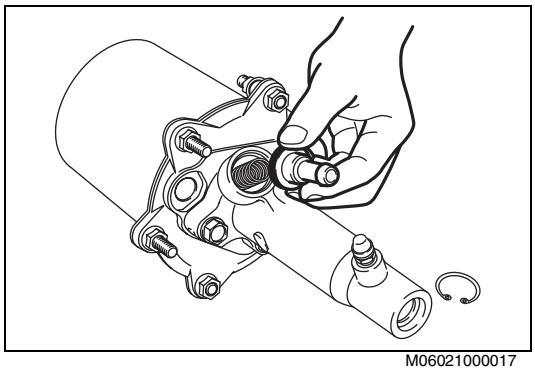
(13) While pressing and holding down the compression spring, install the O-ring and washer in that order, and then secure the hydraulic piston and push rod in place with the nut.
SST:
Power Piston Holder (09699-1410)
Stand (09630-2340)

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.**

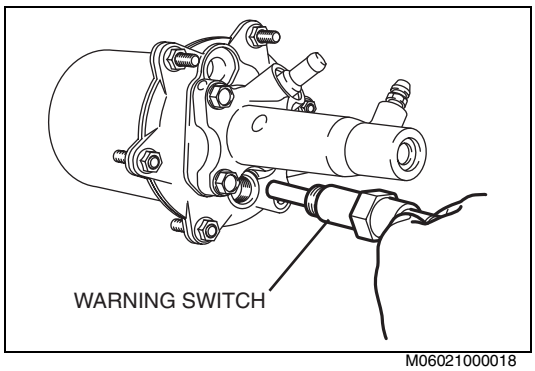


M06021000036

(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.


M06021000017

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

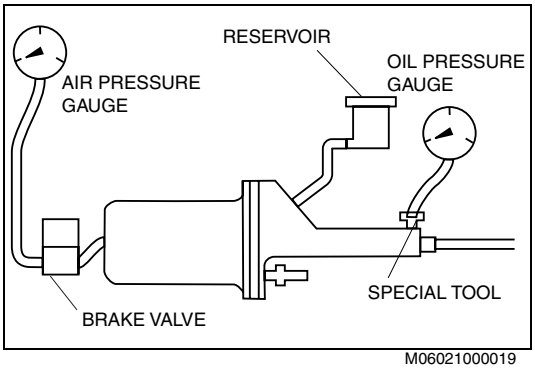


M06021000018

(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

M06021001BEH3001

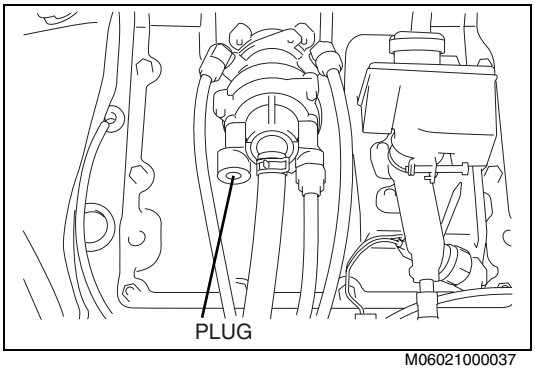


M06021000019

CHECKING OF BRAKE AIR BOOSTER FUNCTION

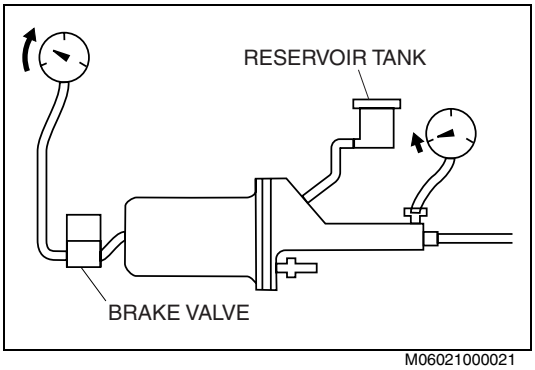
1. OPERATION CHECK OF BRAKE BOOSTER

(1) Remove the bleeder screw of hydraulic cylinder and attach an oil pressure gauge scaling 24.5 MPa {250 kgf/cm^2, 3.555 lbf/in^2} by using a special tool (connecting portion: M12 x 1.5).
SST: Connector (09699-1400)



M06021000037

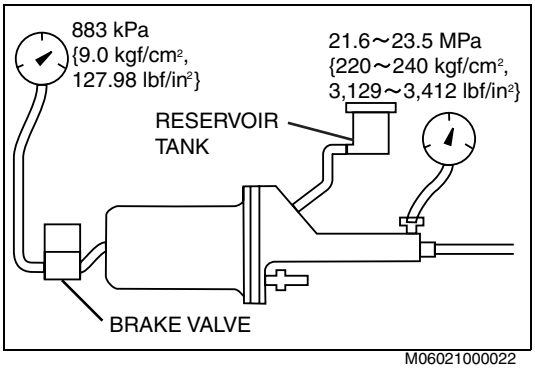
(2) Remove the plug from the brake valve assembly and attach an air pressure gauge to the brake valve assembly.



M06021000021

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}



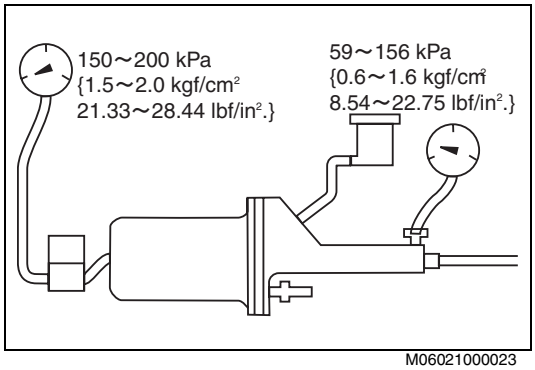
M06021000022

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 {9.0kgf/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 {220-240kgf/cm^2, 3.129-3.412 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.

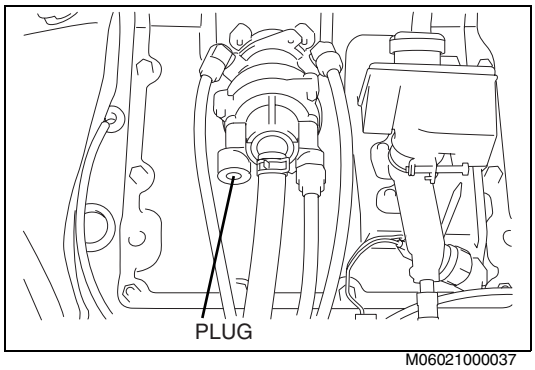


M06021000023

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/in2} in case of the vehicle equipped with drum brake, and 0 in case of the vehicle equipped with disk brake.



M06021000037

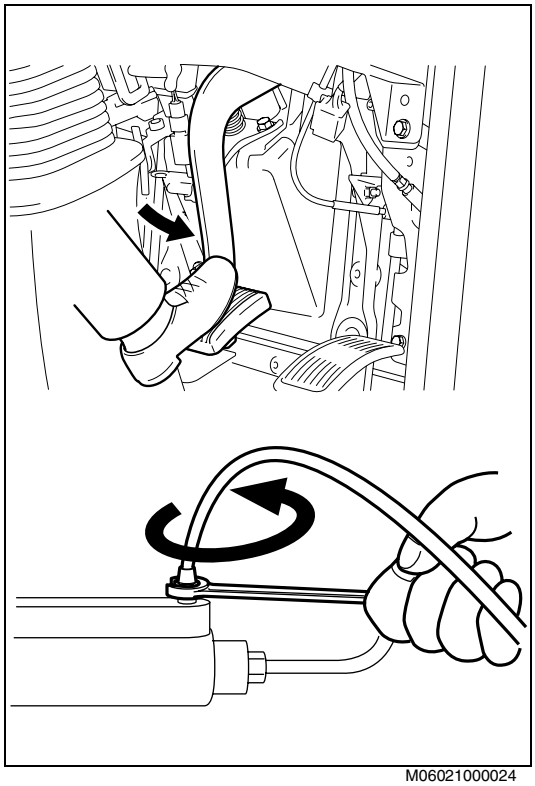
6. OPERATION AFTER CHECK

(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.


M06021000024

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 lamp lights up and the warning buzzer beeps.

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

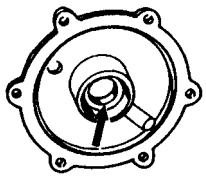
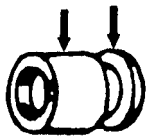
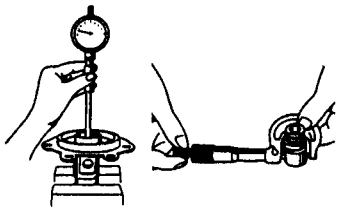
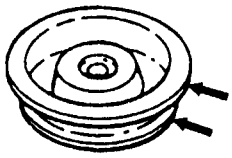
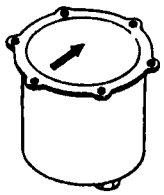
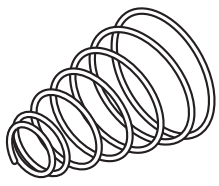
(4) Attach the bleeder screw of hydraulic cylinder.

INSPECTION AND REPAIR

M06021001BEH3011

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

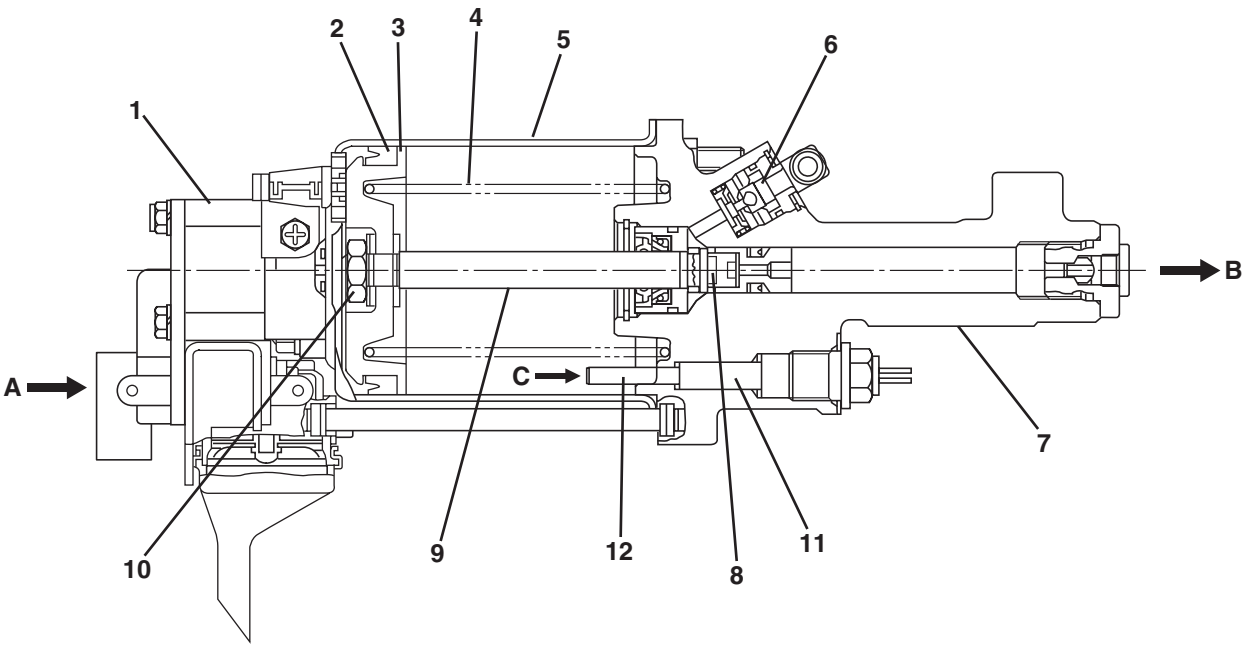
DATA AND SPECIFICATIONS

M06021001BEI2002

Type	AIRMASTER (Boosted air controlled by brake valve)
Power cylinder diameter	92 mm {3.62 in.}
Hydraulic cylinder diameter	17.46 mm {0.69 in.}

DESCRIPTION

M06021001BEC1002



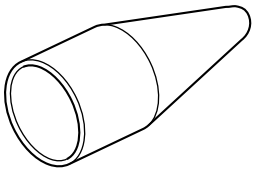
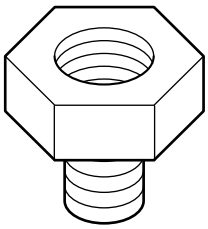
M06021000078

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

SPECIAL TOOL

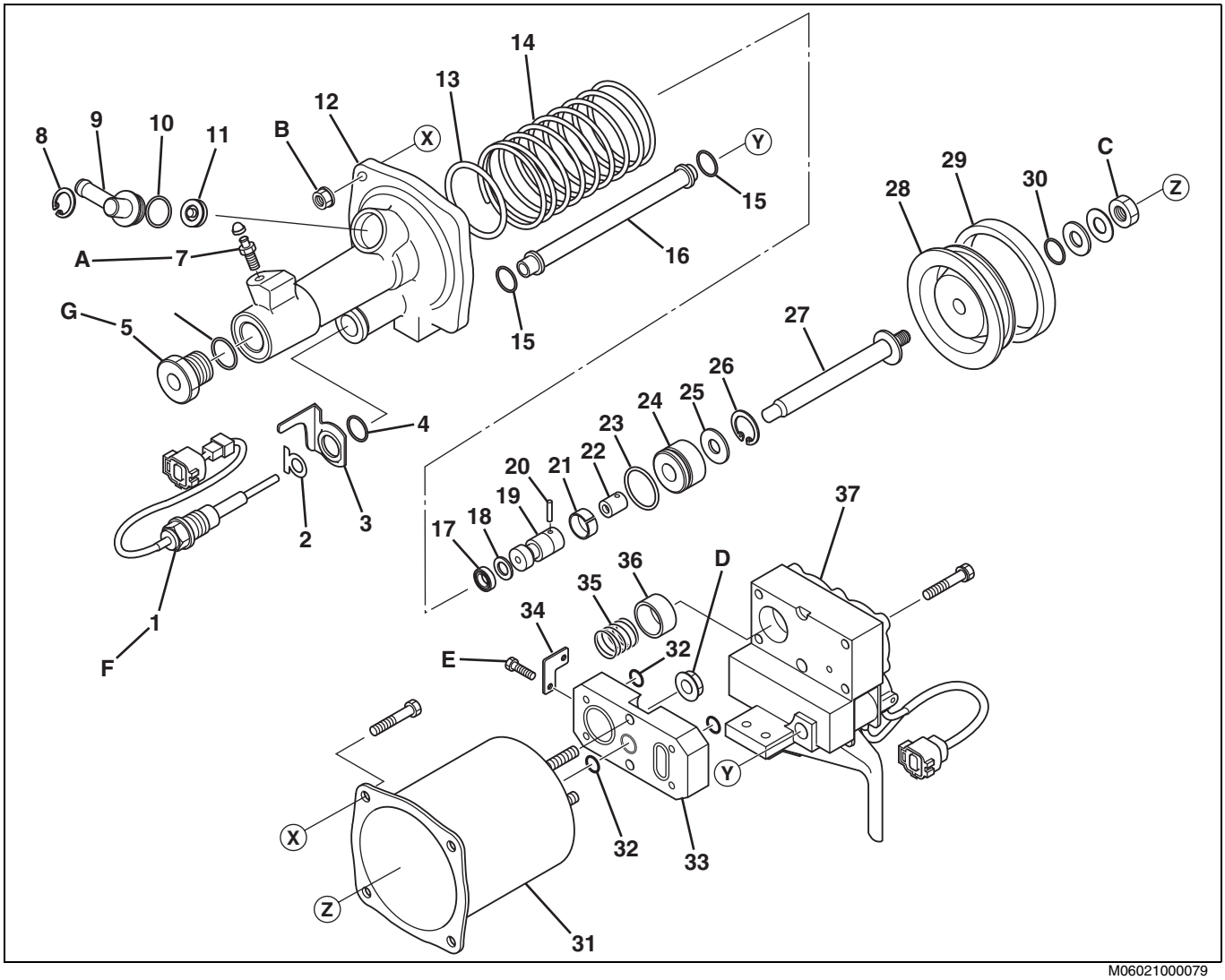
M06021001BEK1002

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

Illustration	Part number	Tool name	Remarks
	09657-2070	PISTON CUP GUIDE	
	09699-1400	CONNECTER	

COMPONENT LOCATOR

M06021001BED1002



M06021000079

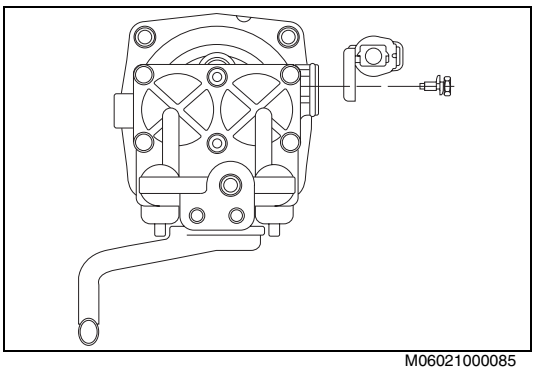
1	Stroke warning switch	14	Return spring	26	Retainer ring
2	Clip	15	O-ring	27	Piston rod
3	Bracket	16	Pipe	28	Power piston
4	O-ring	17	Piston cap	29	Piston seal
5	End plug	18	Back up ring	30	O-ring
6	O-ring	19	Hydraulic piston	31	Power cylinder shell
7	Air bleeder screw	19	Hydraulic piston	32	O-ring
8	Retainer ring	20	Pin	33	Housing
9	Oil pipe joint	21	Band	34	Bracket
10	O-ring	22	Valve	35	Spring
11	Check valve	23	O-ring	36	Return valve
12	Hydraulic cylinder	24	Plug	37	ABS control valve
13	O-ring	25	Oil seal holder		

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

A	6.9-11.8 {70-120, 5.1-8.6}	E	2.9-5.9 {30-60, 2.2-4.3}
B	17.7-26.5 {180-270, 13-19}	F	3.92-5.88 {40-60, 2.9-4.3}
C	19.6-29.4 {200-300, 15-21}	G	68.6-78.4 {700-800, 51-57}
D	6.9-12.7 {70-130, 5.1-8.6}		

OVERHAUL

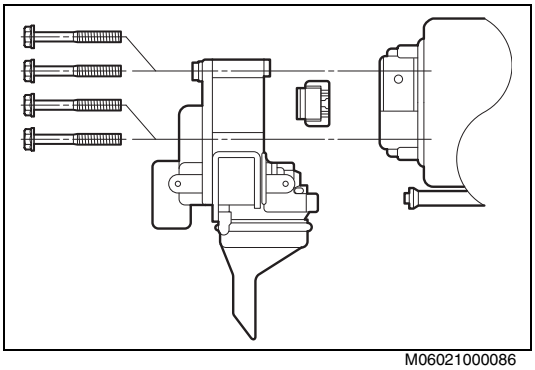
M06021001BEH2002


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IMPORTANT POINT - DISASSEMBLY

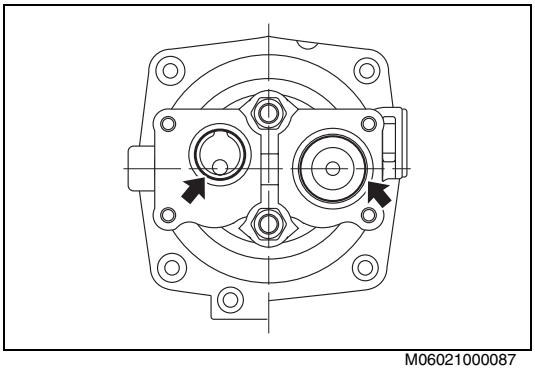
1. HYDRAULIC CYLINDER AND POWER CYLINDER

(1) Remove the mounting bolt of ABS control valve connector. Then remove the connector.

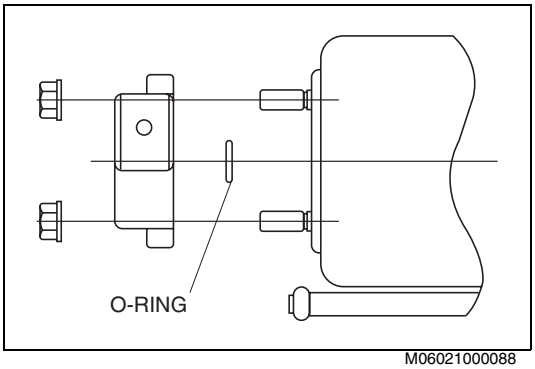

M06021000086

(2) Remove the bolts (4 pieces) and then remove ABS control valve, spring, and return valve.

NOTICE:
Do not disassemble ABS control valve.

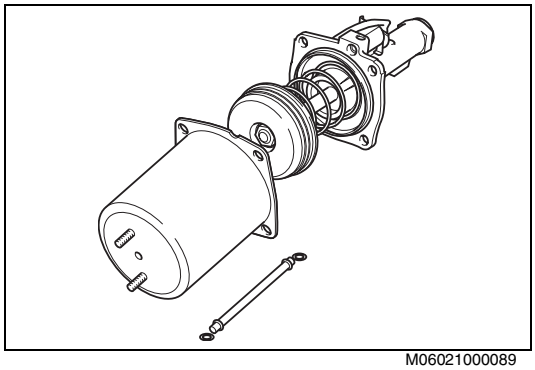

M06021000087

(3) Remove O-ring from the housing.



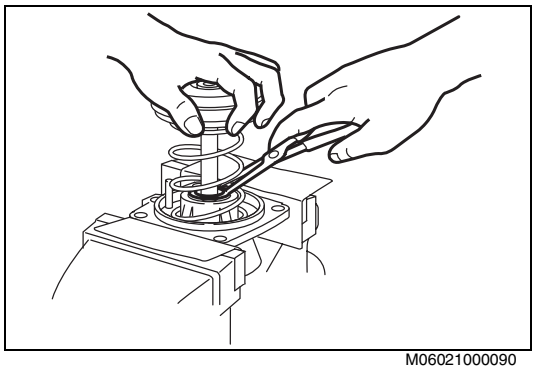
M06021000088

(4) Remove the nuts (2 pieces) and then remove the housing and O-ring from the air cylinder.


M06021000089

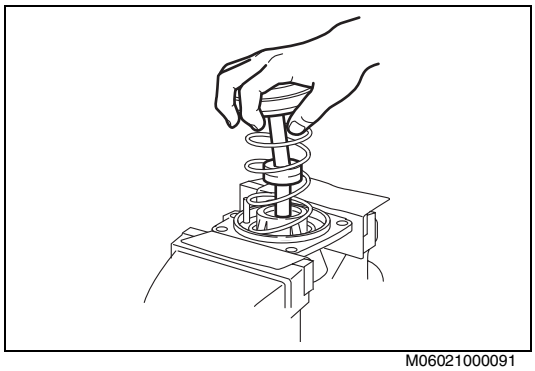
(5) Dismount the oil cylinder in assembly from the air cylinder.

NOTICE:
Be careful not to put any materials other than the lubricants which is specified on the parts on and after this step.


M06021000090

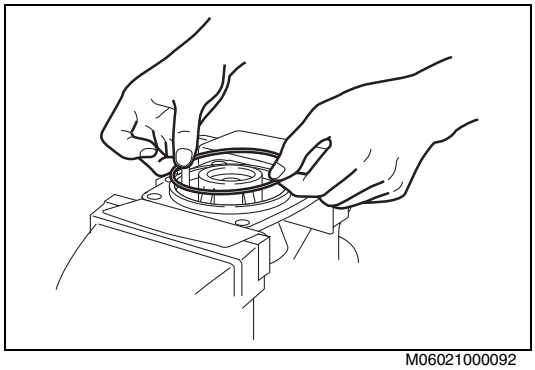
(6) Remove the snap ring from the oil cylinder using a suitable tool while pressing the air piston.

NOTICE:
- **Do not put grease in the air cylinder to the parts inside the oil cylinder.**
- **When removing the return spring, hold down the air piston to prevent it from coming out of the oil cylinder.**

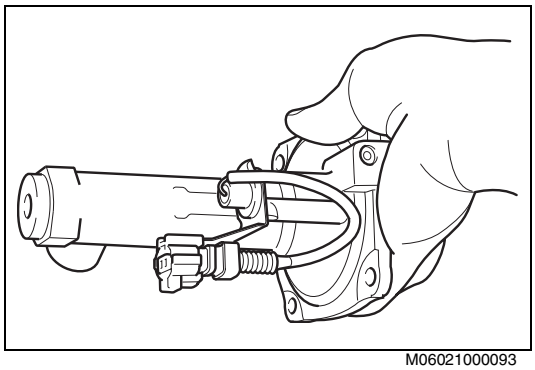

M06021000091

(7) Remove the air piston and return spring from the oil cylinder.

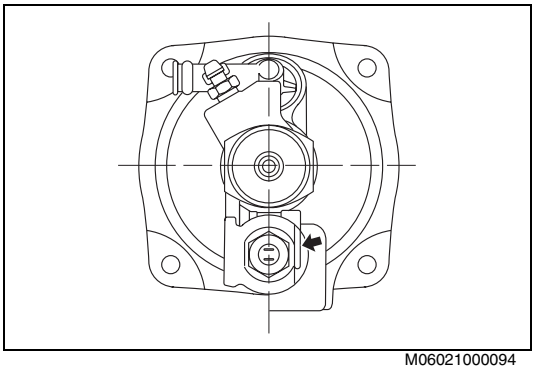
NOTICE:
When removing the plug, pull it out straightforward without twisting it forcibly.


M06021000092

(8) Remove O-ring from the oil cylinder.

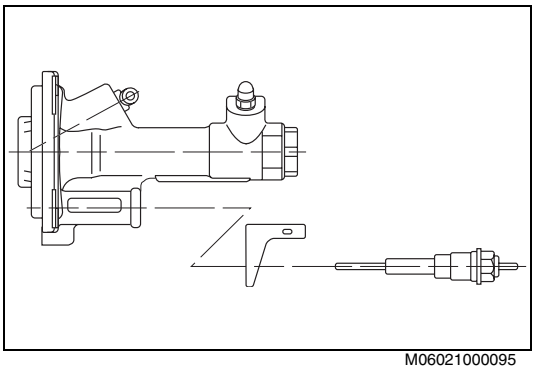

M06021000093

(9) Push the connector lock of the stroke detector switch using a small screwdriver or its equivalent. Then remove the connector from the bracket.



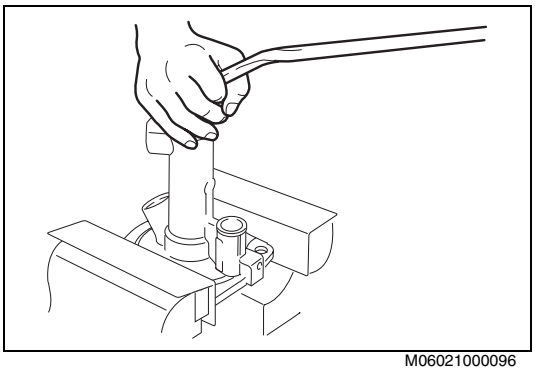
M06021000094

(10) Open the caulking section of the clip.



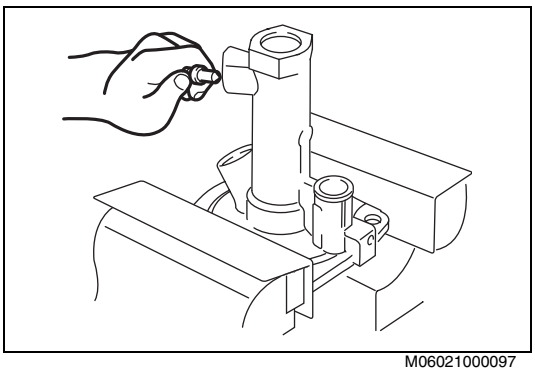
M06021000095

(11) Dismount the stroke detector switch, clip, bracket, and O-ring from the oil cylinder.



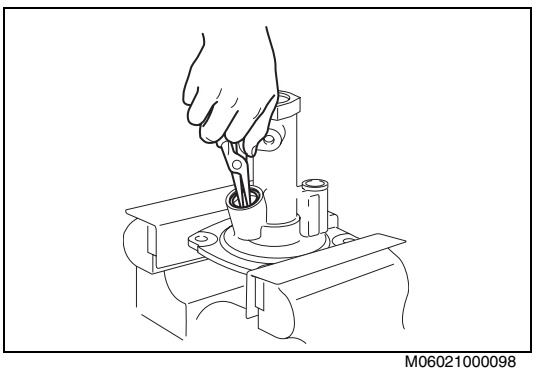
M06021000096

(12) Remove the end cap. Remove the O-ring from the oil cylinder.



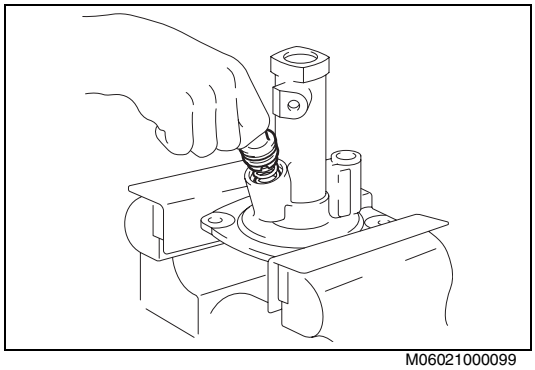
M06021000097

(13) Remove the cap and bleeder screw from the oil cylinder.

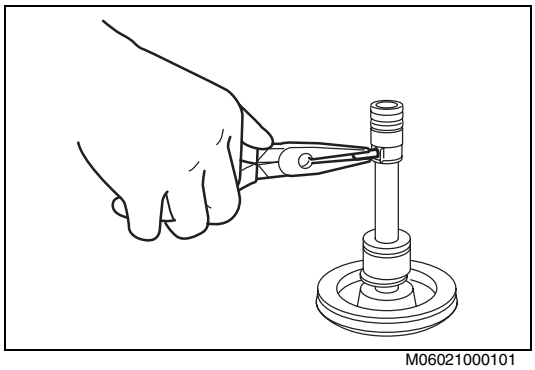


M06021000098

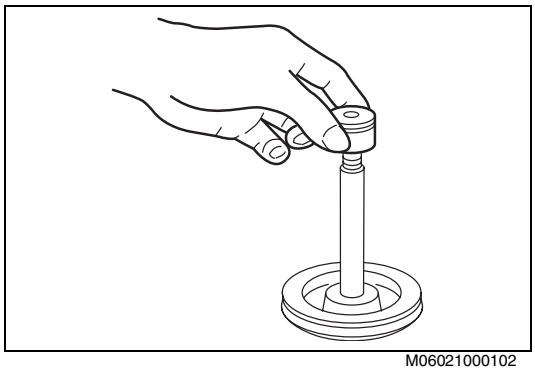
(14) Remove the retainer ring from the oil connector of oil cylinder by using a suitable tool.


M06021000099

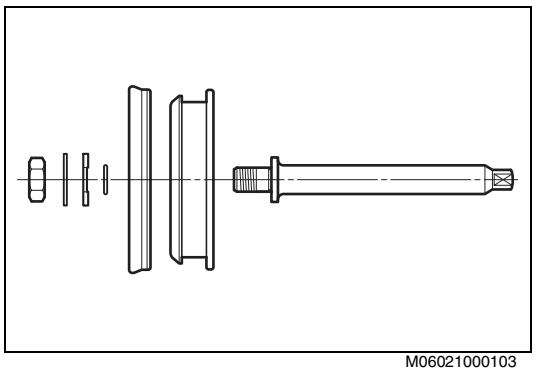
(15) Dismount the oil connector and O-ring from the oil cylinder.


M06021000101

(16) Dismount the check valve from the oil cylinder
(17) Remove the piston pin from the piston rod. Then dismount the band, piston cup, backup ring, hydraulic piston and valve.


M06021000102

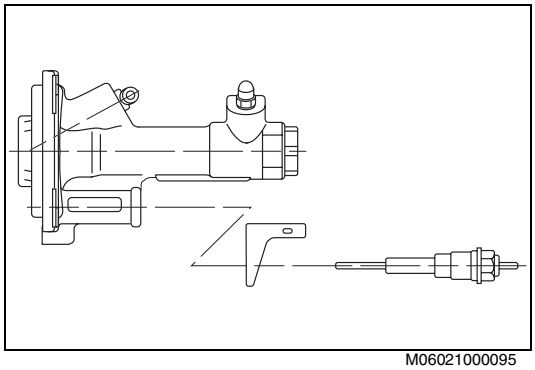
(18) Remove the O-ring, plug and oil seal holder from the piston rod.


M06021000103

(19) Remove the nut of the air piston and dismount the spring washer, plate, O-ring, piston seal, air piston and washer from the piston rod.

NOTICE:
Do not dismount the plate of piston rod.

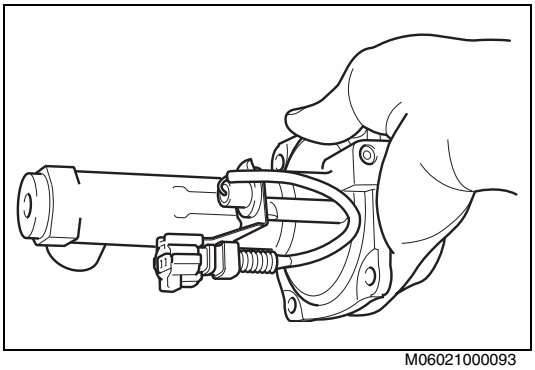
IMPORTANT POINT - ASSEMBLY


M06021000095

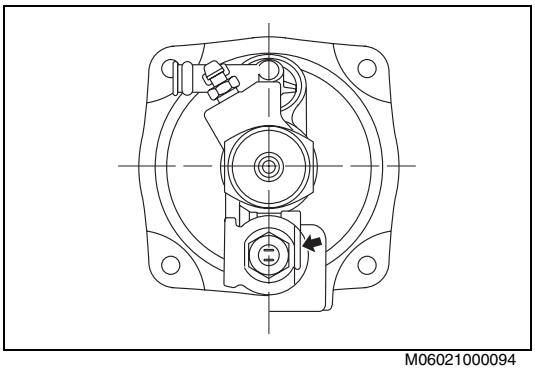
1. HYDRAULIC CYLINDER AND POWER CYLINDER
(1) Apply Albania grease to a new O-ring. Install this O-ring, clip, and bracket to the stroke detector switch.

NOTICE:
Be careful to the installing direction of the clip.

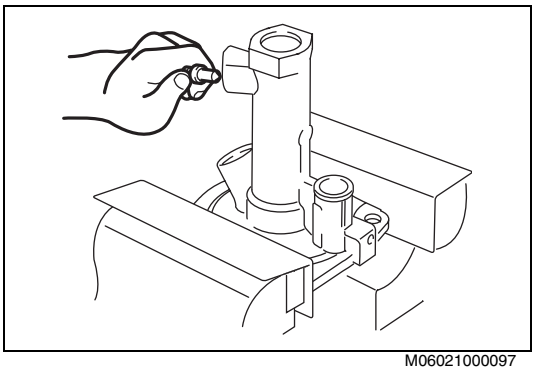
(2) Install the stroke detector switch to the oil cylinder.


M06021000093

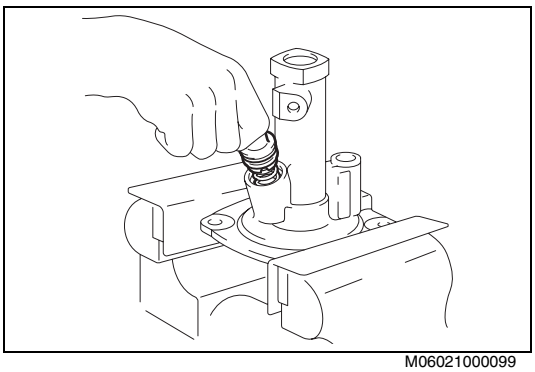
(3) Install the connector of the stroke detector switch to the bracket.


M06021000094

(4) Caulk and fix the clip to the bracket and stroke detector switch.


M06021000097

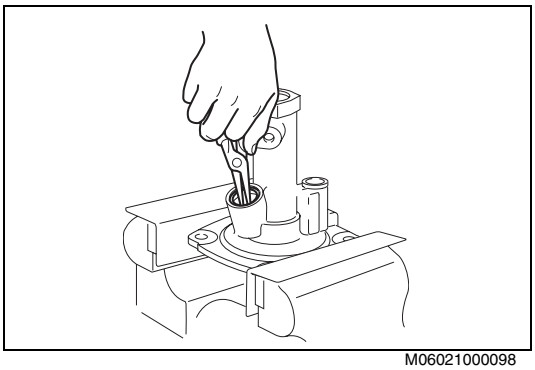
(5) Install the air bleeder screw to the oil cylinder.


M06021000099

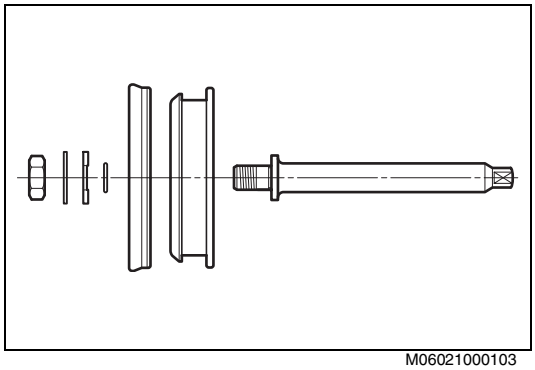
(6) Apply brake and clutch fluid to the check valve and install it to the oil cylinder.

NOTICE:
Install the check valve so that its rubber side is faced to the oil cylinder.

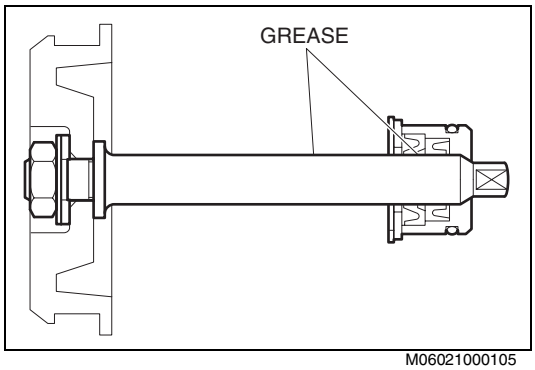
(7) Apply brake and clutch fluid to a new O-ring and install it to the oil connector.
(8) Install the oil connector to the oil cylinder.


M06021000098

(9) Using a suitable tool, install a new snap ring to fix the oil connector.

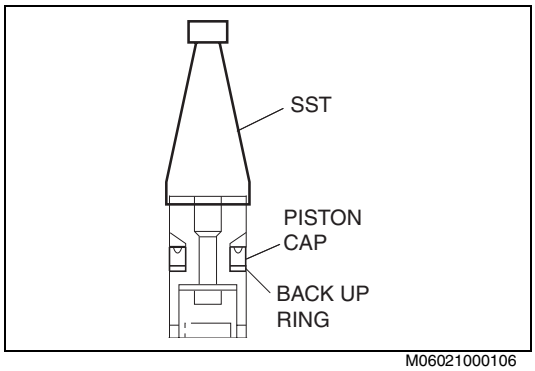

M06021000103

(10) Install to the piston rod the air piston, piston seal, new O-ring, plate and spring washer. Then tighten the nut.
(11) Using punch, caulk two points at 180 degree spacing the nut and the threads of the piston rod.



M06021000105

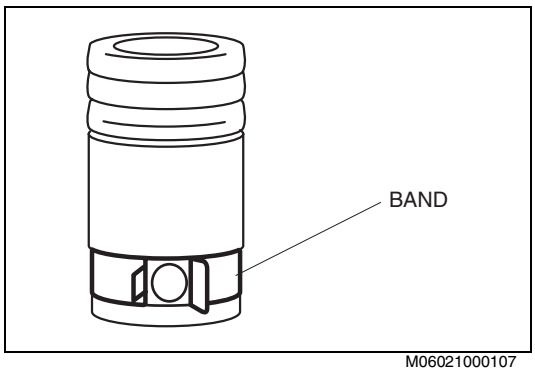
(12) Apply silicone grease to inner surface of a new plug and sliding part of the piston rod. Install to the piston rod a new retainer ring, oil seal holder, plug and O-ring.



M06021000106

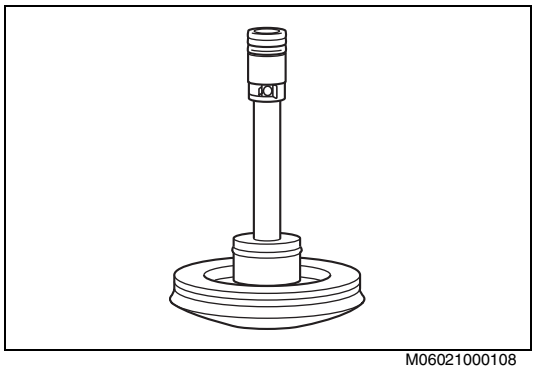
(13) Apply brake and clutch fluid to a new piston cup and backup ring. Install them to the hydraulic piston using special tool.
SST: PISTON CUP GUIDE (09657-2070)

NOTICE:
- **Be careful to the direction of the hydraulic piston cup and the position of the backup ring.**
- **Do not use other than brake and clutch fluid for assembly.**



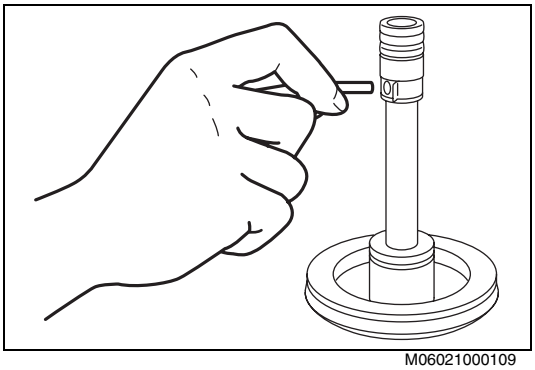
M06021000107

(14) Align the band hole to the pinhole of the hydraulic piston, and assemble them temporarily.

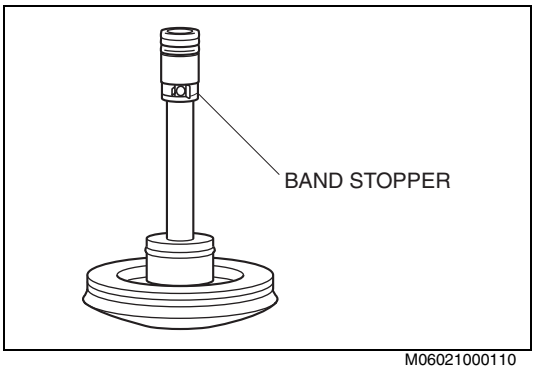

M06021000108

(15) Align the pinhole and install the hydraulic piston and valve to the piston rod.

NOTICE:
If the band hole is opened excessively and deformed, replace it with new one.

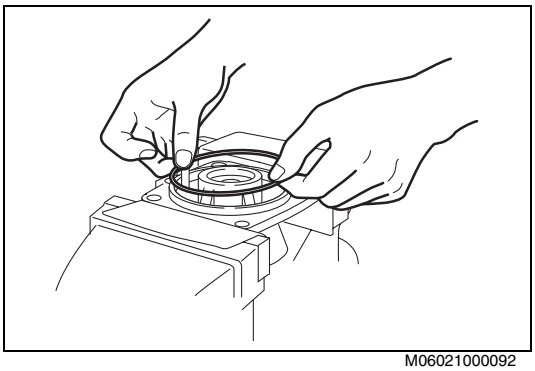

M06021000109

(16) Install the piston pin and assemble it.



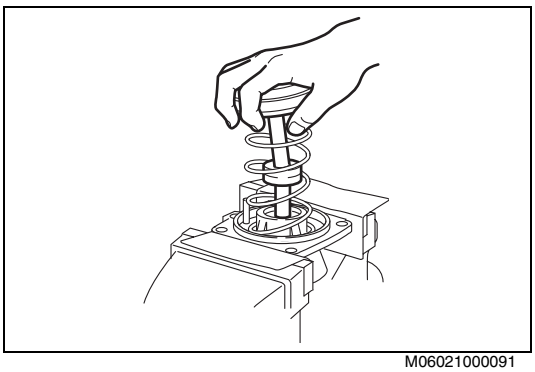
M06021000110

(17) Install the band stopper to the hole of hydraulic piston.


M06021000092

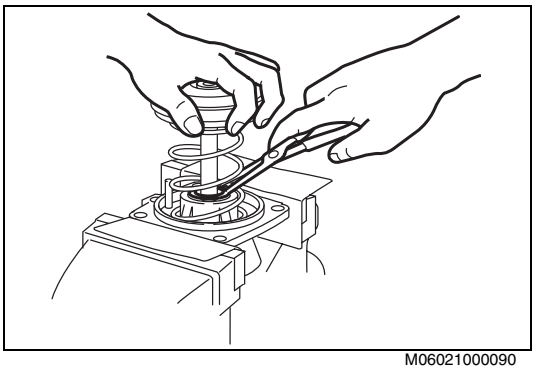
(18) Apply Albania grease No. 2 to a new O-ring and install it to the oil cylinder.

NOTICE:
Do not put grease to the parts inside the oil cylinder. If the grease is put on the parts, replace the parts with new ones.

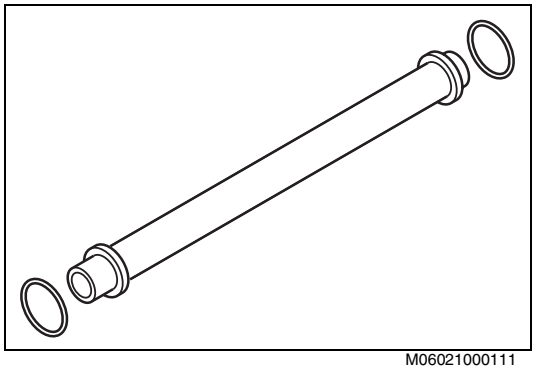

M06021000091

(19) Install the return spring and air piston in assembly to the oil cylinder.

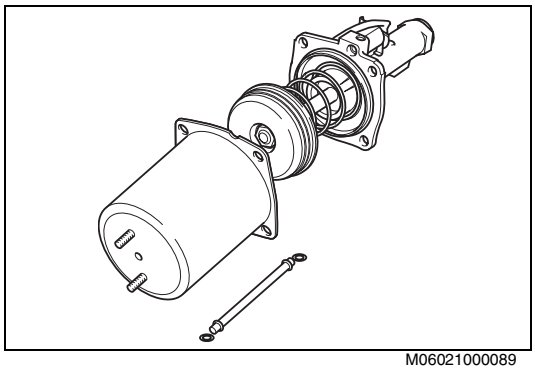
NOTICE:
Install the plug straightforward without pressing it forcibly when mounting it.


M06021000090

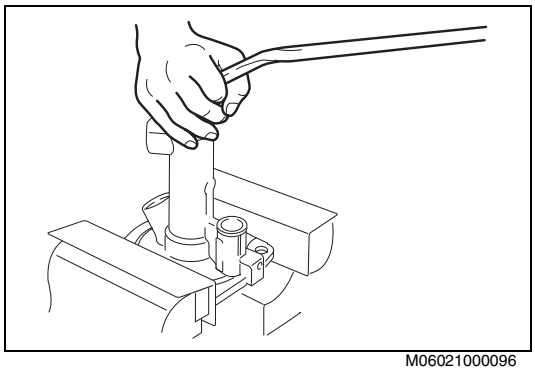
(20) Fix the plug by new retainer ring using a suitable tool.


M06021000111

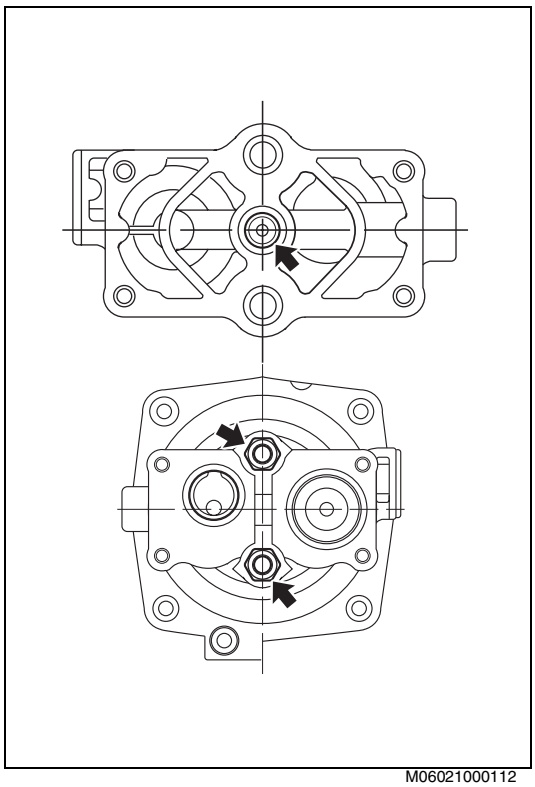
(21) Apply Albania grease No. 2 to new seals and mount them to the ends of the pipe.


M06021000089

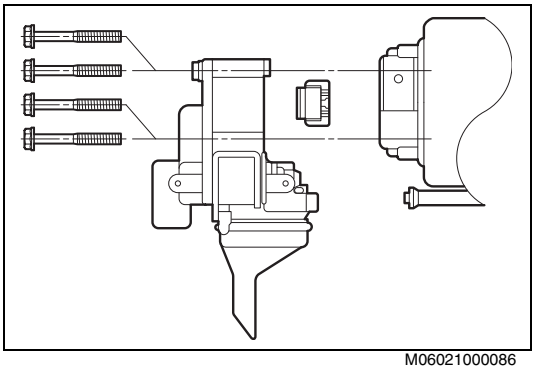
(22) Apply Albania grease No. 2 to the sliding part of the air piston of air cylinder. Mount the air cylinder and pipe to the oil cylinder.


M06021000096

(23) Install a new O-ring to the end cap and mount them to the oil cylinder.

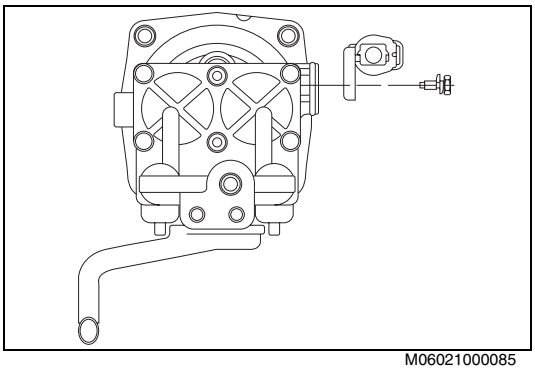

M06021000112

(24) Install a new O-ring to the housing and mount them to the air cylinder by nuts (2 pieces).


M06021000086

(25) Apply Albania grease No. 2 to the sliding part of the return valve and install it to ABS control valve. Then mount the housing. Install new O-rings (2 pieces) to the housing, and mount ABS control valve to the housing by bolts (4 pieces).

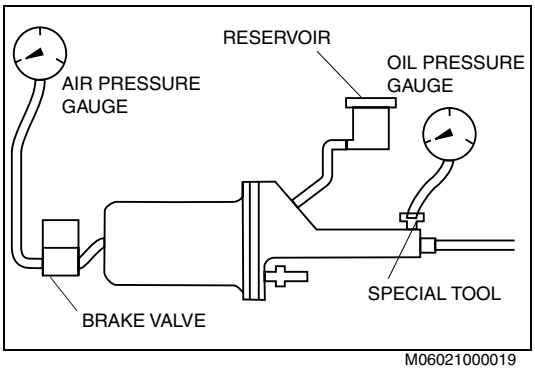
NOTICE:
- **Be careful to the mounting direction of return valve.**
- **Do not apply grease to the rubber seat of return valve.**
- **Do not remove the rubber located at the end of the return valve.**


M06021000085

(26) Mount the connector bracket to ABS control valve.

INSPECTION

M06021001BEH3002



M06021000019

CHECKING OF BRAKE BOOSTER FUNCTION

For the inspection after assembly, a special tester is available. Use this tester for inspection. For inspection procedure by special tester, refer to "Instruction manual" that has come with the tester. If the tester is not available, follow the instruction below to check oil and air leakage, performance, etc. At the inspection, use brake and clutch fluid as brake fluid. After the assembly, the valve is closed. So, operate the valve several times before inspection.

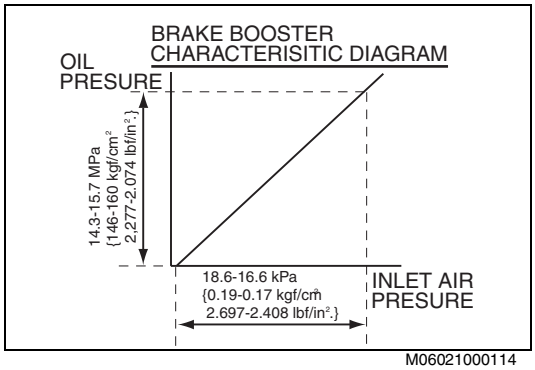
1. PREPARATION

(1) Remove the air bleeder of hydraulic cylinder. Using special tool, set an oil pressure gauge of 2.55 MPa {250 kgf/cm^2, 3,556 lbf/in^2.} scale.
Connection: M12 x 1.5
SST: CONNECTOR (09699-1400)

(2) Remove the stop lamp switch of brake valve and set an air pressure gauge.
Connection: PT 1/4

2. TIGHTNESS OF OIL AND AIR

(1) Apply air tank inlet pressure 834 kPa {8.5 kgf/cm^2, 121 lbf/in^2.} and stop the source pressure. On this condition, check that the oil pressure does not fluctuate for 15 seconds.
(2) Using soap water, check visually that there is no air leakage at the tightened connection.

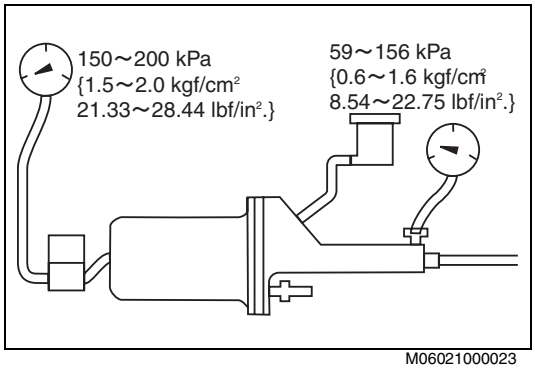


M06021000114

3. OPERATION CHARACTERISTIC

(1) Follow-up control
   a. With the air tank inlet pressure 834 KPa {8.5 kgf/cm^2, 121 lbf/in^2.}, vary the air pressure repeatedly from 0 kPa {0 kgf/cm^2, 0 lbf/in^2.} to 490 kPa {5.0 kgf/cm^2, 71 lbf/in^2.} and check that the oil pressure follows up the air pressure smoothly.

(2) Characteristic
   a. With the air tank inlet pressure 834 kPa {8.5 kgf/cm^2, 121 lbf/in^2.}, increase the air pressure from 0 kPa {0 kgf/cm^2, 0 lbf/in^2.} gradually and check that the characteristic meets the brake booster characteristic diagram. When inspecting the brake booster with check valve for residual pressure, make sure to release the residual pressure before inspection.



M06021000023

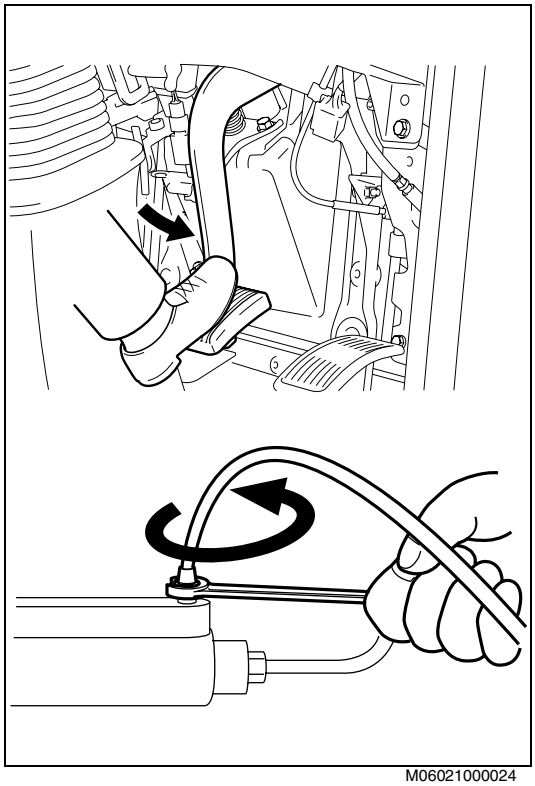
4. RESIDUAL PRESSURE TEST (CHECK VALVE TEST)

(1) Replace the oil pressure gauge with that of 690 kPa {7.0 kgf/cm^2, 100 lbf/in^2.} scale.

(2) Step the brake pedal until the air pressure drops to 150-200 kPa {1.5-2.0 kgf/cm^2, 21.34-28.45 lbf/in^2.} and then release the pedal. At this moment, check that the oil pressure is within the range of 78-127 kPa {0.8-1.3 kgf/cm^2, 11.38-18.49 lbf/in^2.}.

NOTE:

- **If the pressure is not attained, replace defective parts; check valve, spring, etc.**


M06021000024

5. INSPECTION OF STROKE DETECTOR SWITCH AND WARNING LAMP

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

(2) Step the brake pedal. Loosen the bleeder of hydraulic cylinder to leak the fluid.

NOTICE:

Do not spill out the brake fluid.

(3) Check that the warning lamp turns on and the warning buzzer beeps.

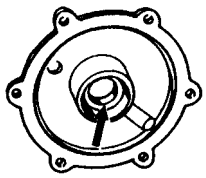
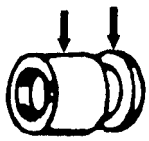
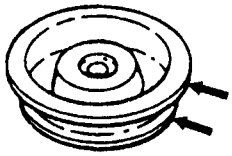
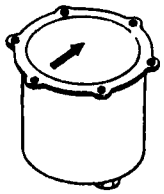
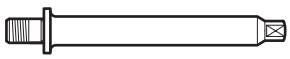
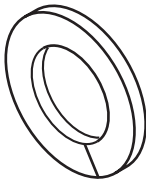
HINT:

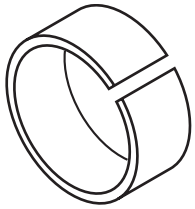
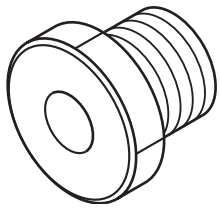
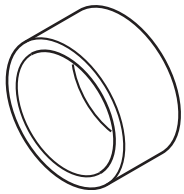
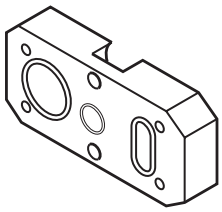
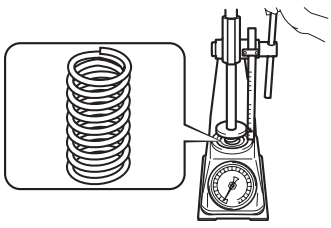
The warning buzzer does not beep unless the parking brake is released.

INSPECTION AND REPAIR

M06021001BEH3012

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

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 
Power piston: Rust, deformation and wear	—	—	Clean or replace, if necessary.	Visual check 
Power cylinder shell: Rust on inner surface and deformation.	—	—	Clean or replace, if necessary.	Visual check 
Piston rod: Rust, deformation and wear	—	—	Clean or replace, if necessary.	Visual check 
Back up ring: Rust, deformation and wear	—	—	Replace, if necessary.	Visual check 

Inspection Item	Standard	Limit	Remedy	Inspection Procedure
Band: Rust, deformation and wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
End plug: Rust, deformation and wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Return valve: Rust, deformation and wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Housing: Rust, deformation and wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Return spring: Rust, deformation and wear Setting load at specified height.			**Replace, if necessary.**	**Visual check** 

WHEEL BRAKE

DATA AND SPECIFICATIONS

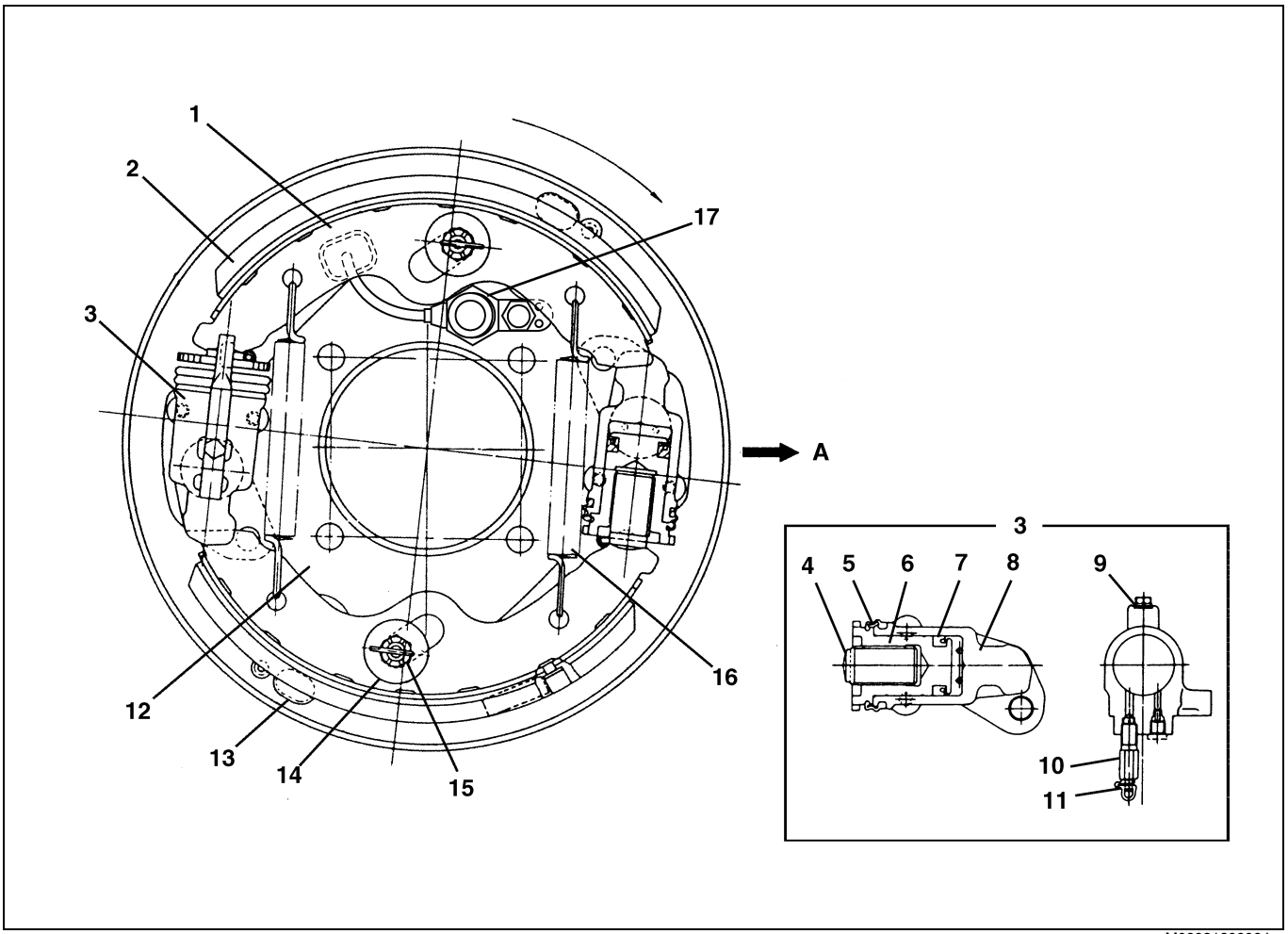
M06021801BEI2001

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

M06021801BEC1002

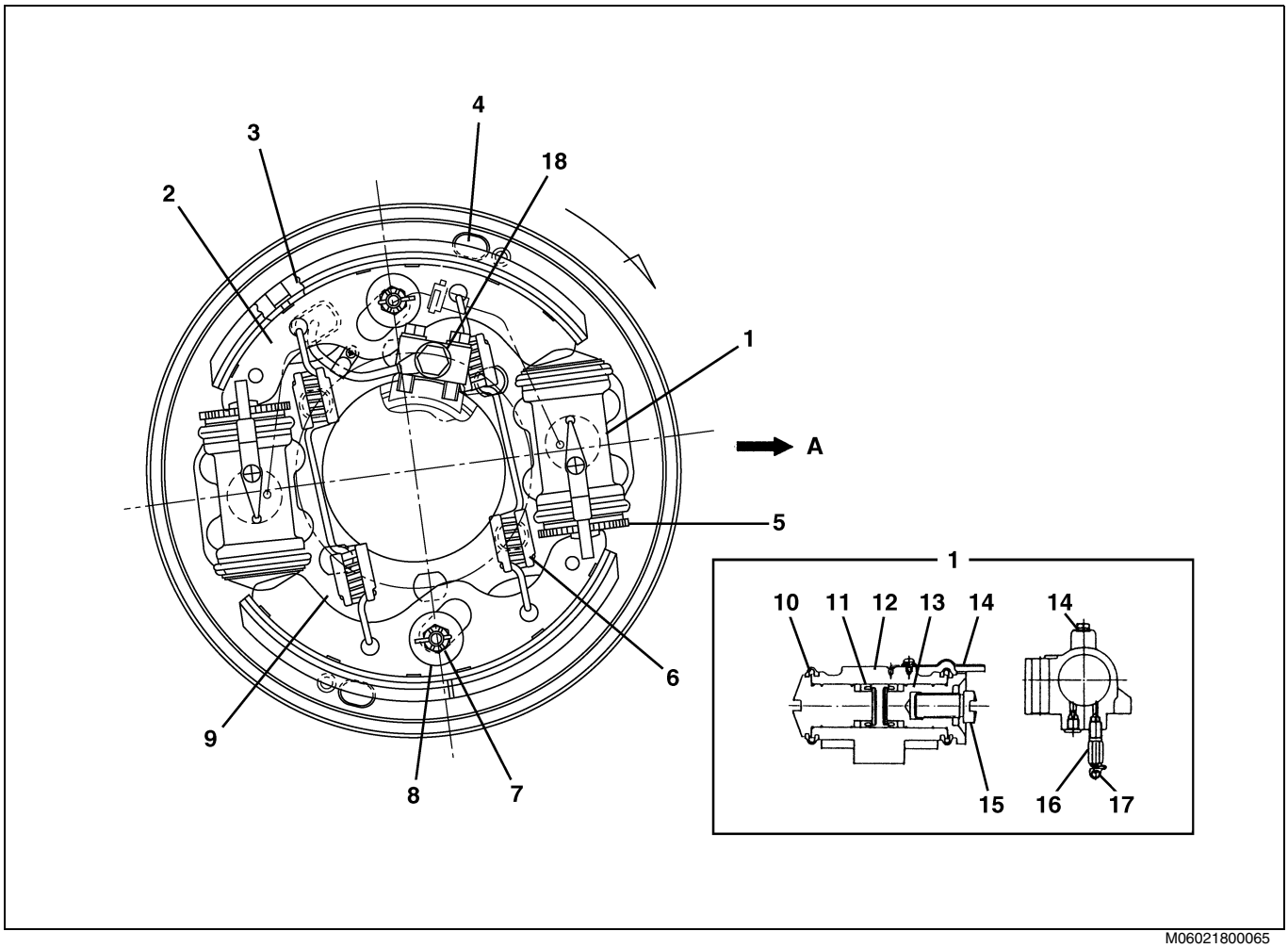
FRONT



M06021800064

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



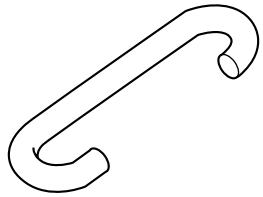
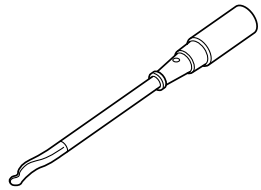
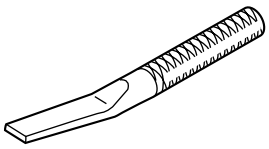
M06021800065

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

M06021801BEK1001

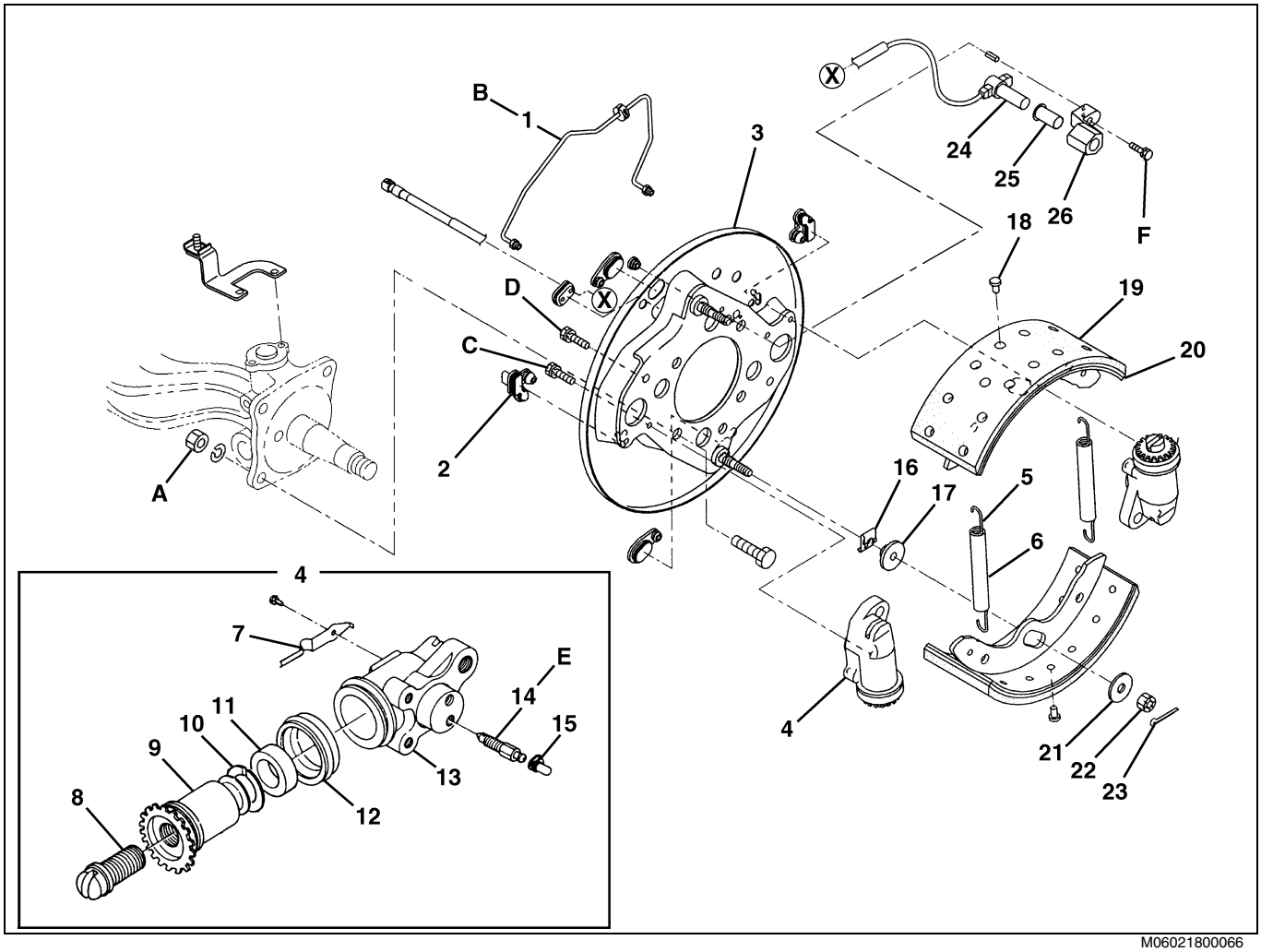
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09653-1100	HOOK (USE WITH 09683-1010)	
	09683-1010	RETRACTING SPRING PULL BACK TOOL	
	09655-1250	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

M06021801BED1002

FRONT



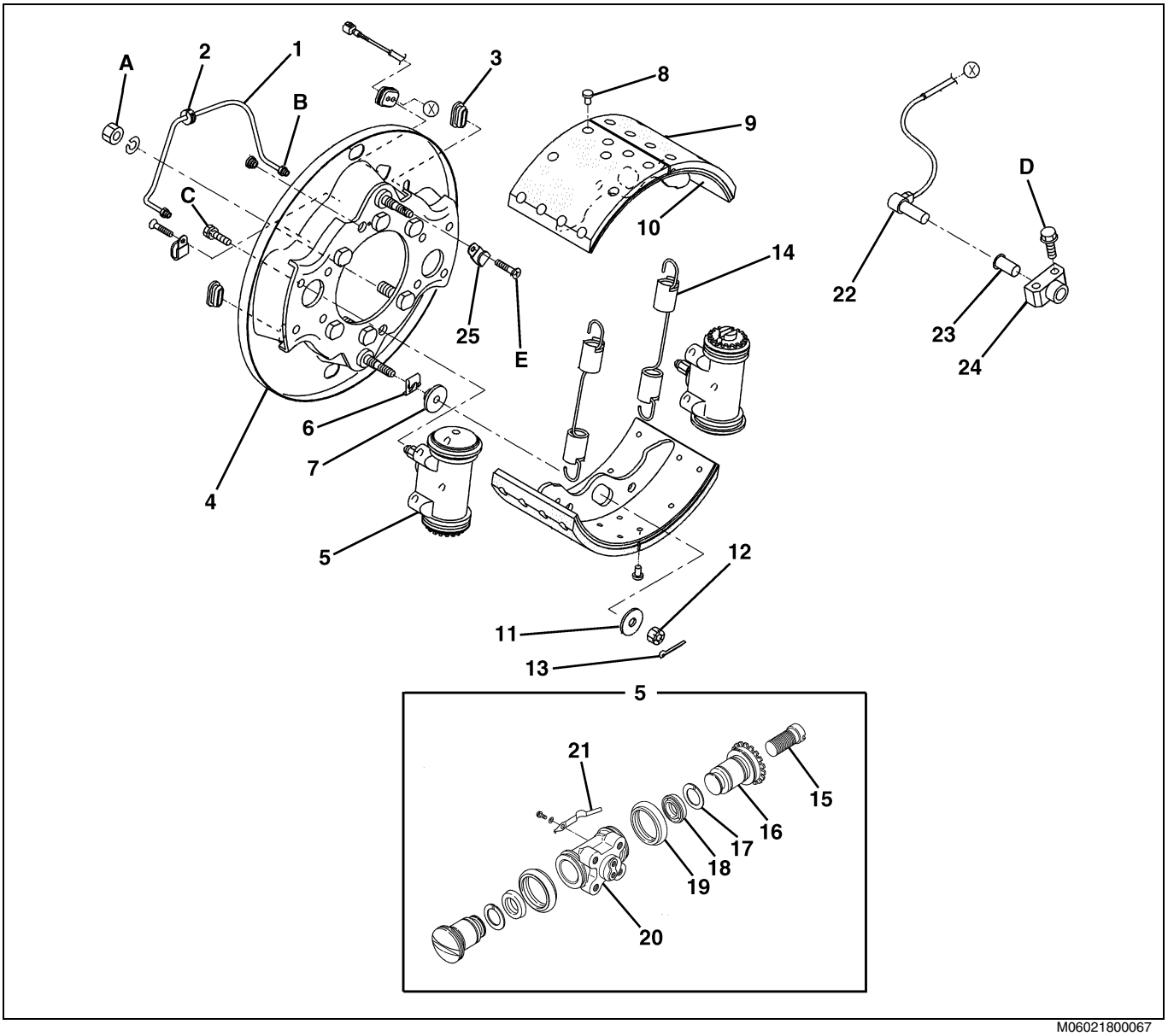
M06021800066

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 {1,500-2000, 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



M06021800067

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}**

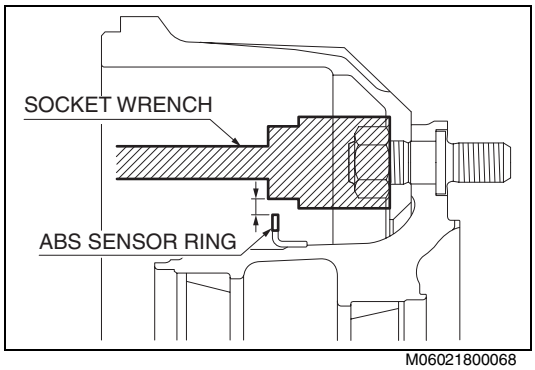
A	148-196 {1,500-2,000, 109-144}	D	34.5-51.5 {350-520, 25-38}
B	12.7-17.7 {130-180, 9.4-13}	E	1.3-1.9 {13-19, 1.0-1.4}
C	98.1-137.3 {1,000-1,400, 73-101}		

OVERHAUL

M06021801BEH2002

IMPORTANT POINTS - DISASSEMBLY

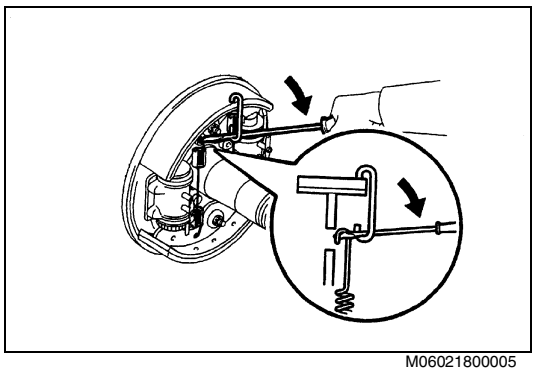
1. REMOVE THE TIRE.
(1) Refer to chapter for WHEEL & TIRE.



M06021800068

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.

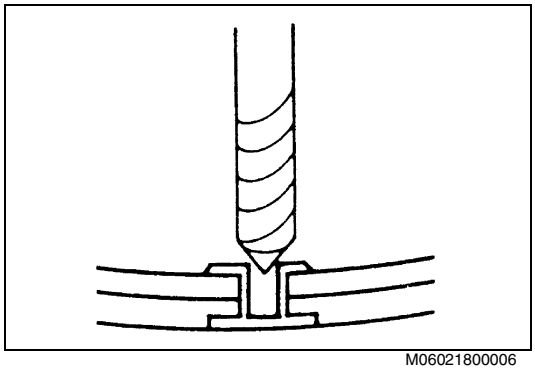

M06021800005

3. REMOVE THE BRAKE SHOE RETRACTING SPRING.
(1) Remove the retracting spring by using the special tools.
SST:
Hook (09653-1100)
Retracting spring pull back tool (09683-1010)

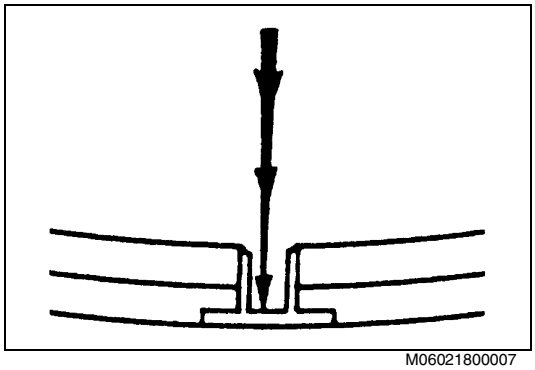
IMPORTANT POINTS - ASSEMBLY

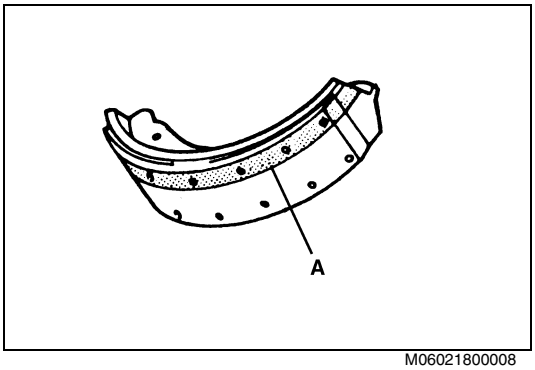
1. REPLACE THE BRAKE LINING.
(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

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


M06021800006

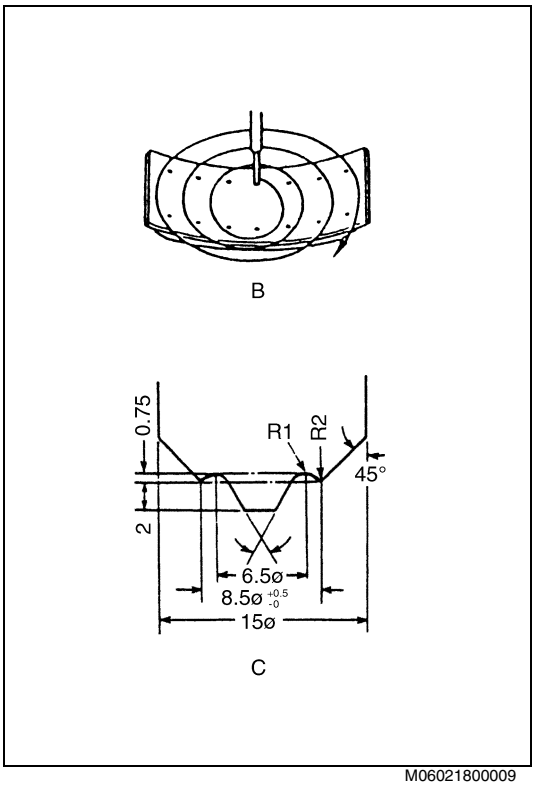
(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a riveting machine.


M06021800007



M06021800008

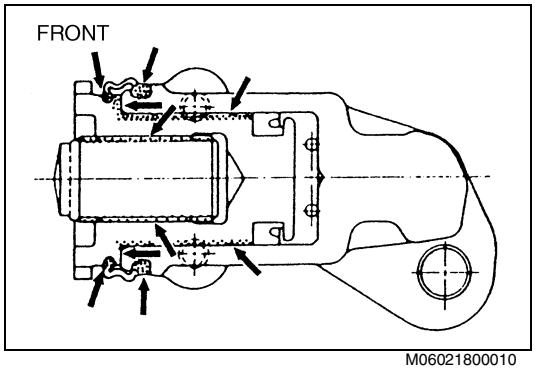
(3) Set the lining with shoe and insert the rivets into all holes, then hold them in place with adhesive tape A.



M06021800009

(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.



M06021800010

2. ASSEMBLE THE WHEEL CYLINDER.

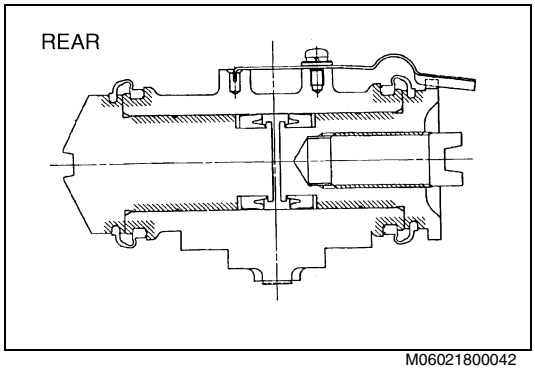
(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI NO.20): 04156-1010

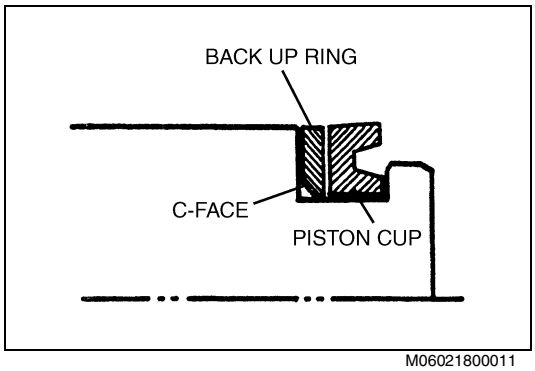
(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2): 04133-1080

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



M06021800042

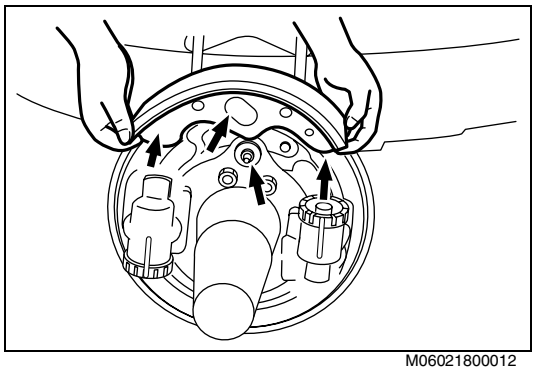


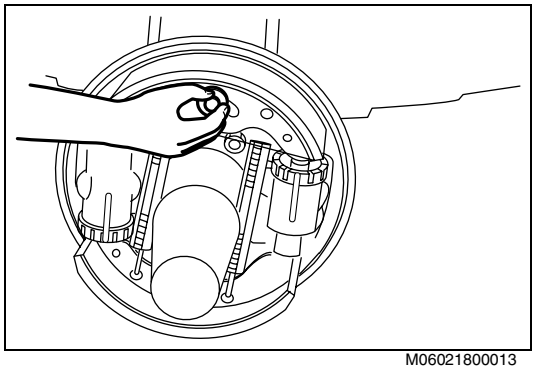
M06021800011

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

3. INSTALL THE BRAKE SHOE ASSEMBLY.

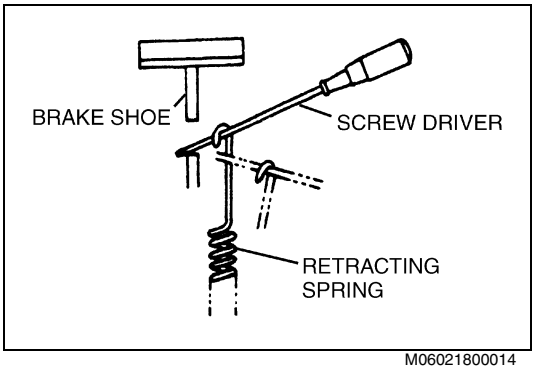
(1) Apply heat-resistant grease to both ends of the shoe web contacting with the piston, and to the top surface of the shoe web contacting the shoe hold washer.


M06021800012


M06021800013

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

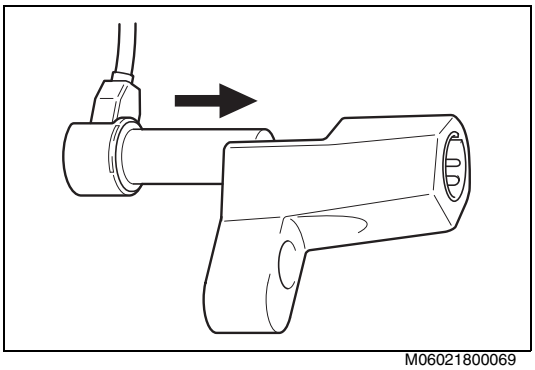
(3) Tighten the slotted nut and back off the nut by 1/3 turn, then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



M06021800014

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.


M06021800069

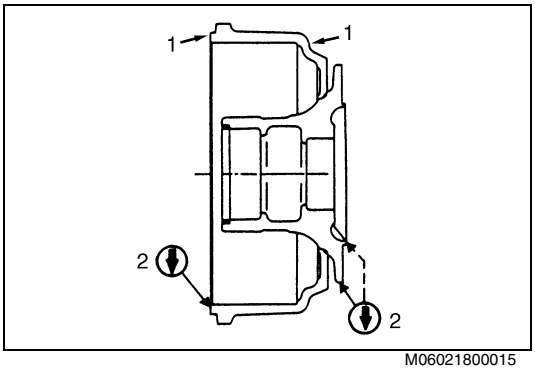
5. INSTALL THE WHEEL SENSOR.
(If so equipped)

(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.



M06021800015

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.

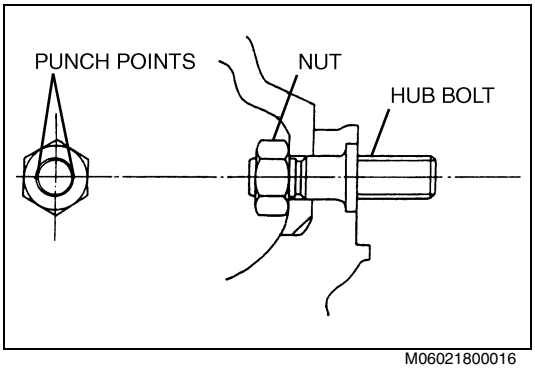
NOTICE:

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).



M06021800016

(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.

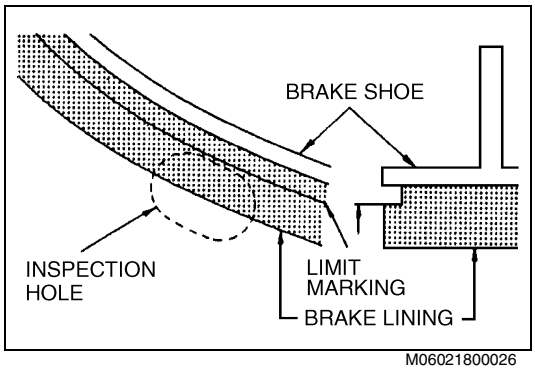
(1) Refer to chapter FRONT AXLE and REAR AXLE.

8. MOUNT THE TIRE.

(1) Refer to chapter for WHEEL AND TIRE.

ADJUSTMENT

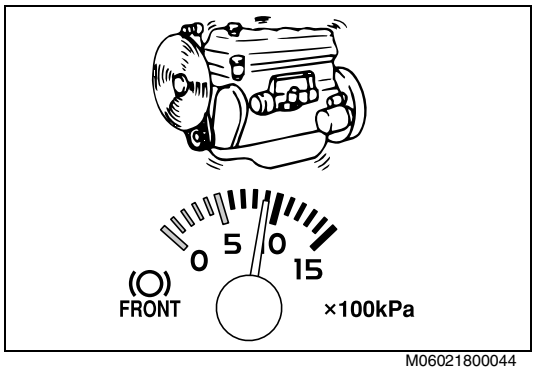
M06021801BEH3001



M06021800026

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.



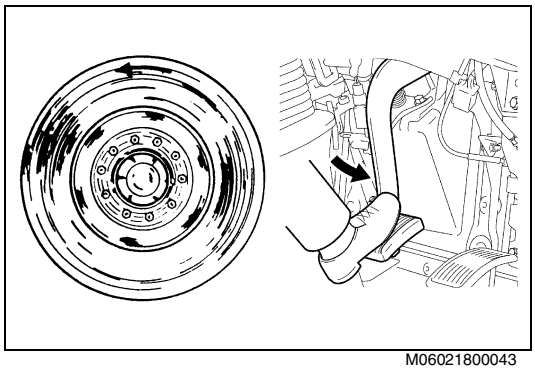
M06021800044

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:

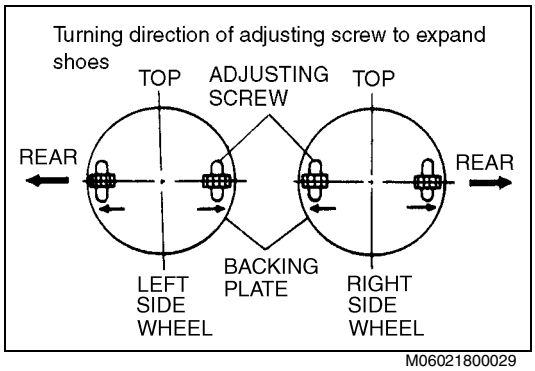
The specified air pressure in the air tank should be maintained when making the adjustment.


M06021800043

3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM

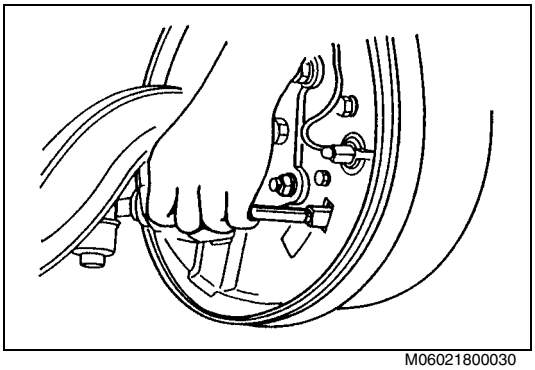
(1) Lift the wheel to be adjusted off the ground.

(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.



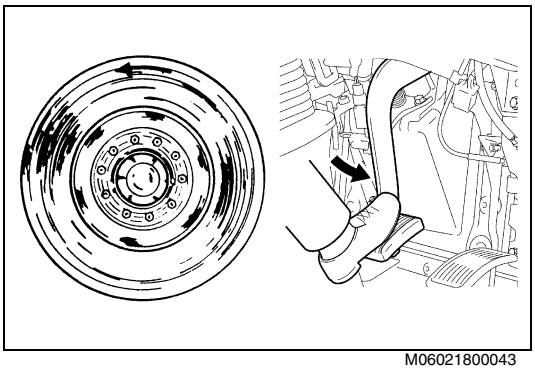
M06021800029

(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 (09665-1250)



M06021800030

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



M06021800043

(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.

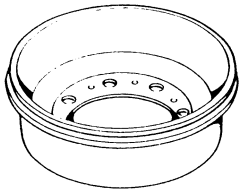
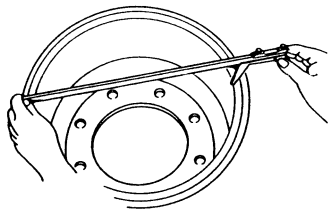
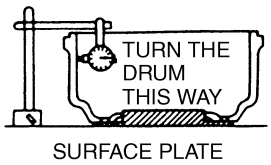
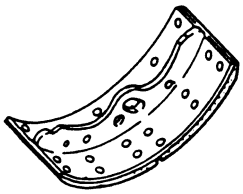
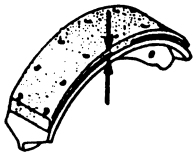
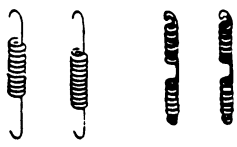
(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from 2.

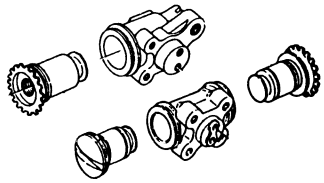
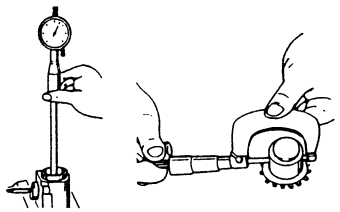
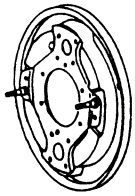
NOTICE:
Using the same procedure as above, adjust the clearance for all wheels.

INSPECTION AND REPAIR

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
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** 
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** 

TWO-WAY VALVE (BRAKE LOCK CONTROL VALVE) (MODEL: FC4JEPM)

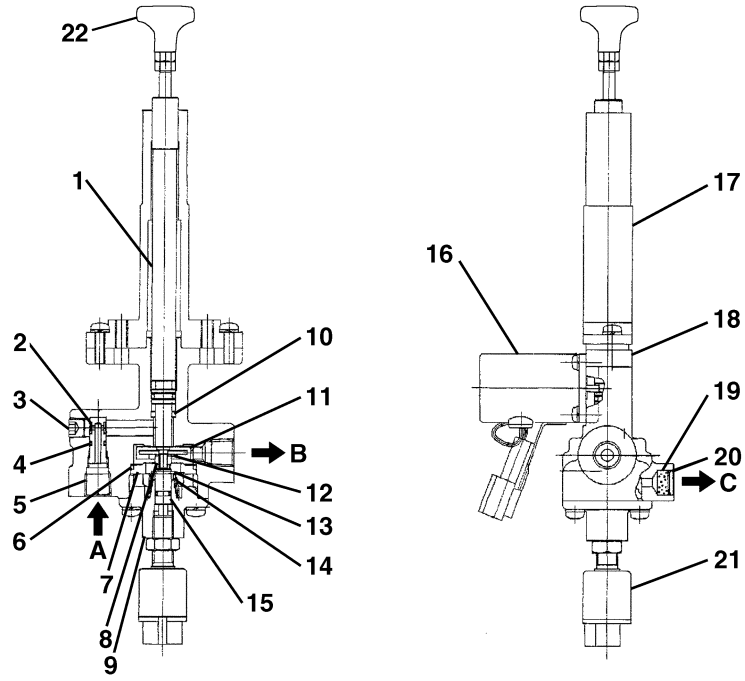
DATA AND SPECIFICATIONS

M06022301BEI2001

Type	Push-Pull type, with locking mechanism

DESCRIPTION

M06022301BEC1001

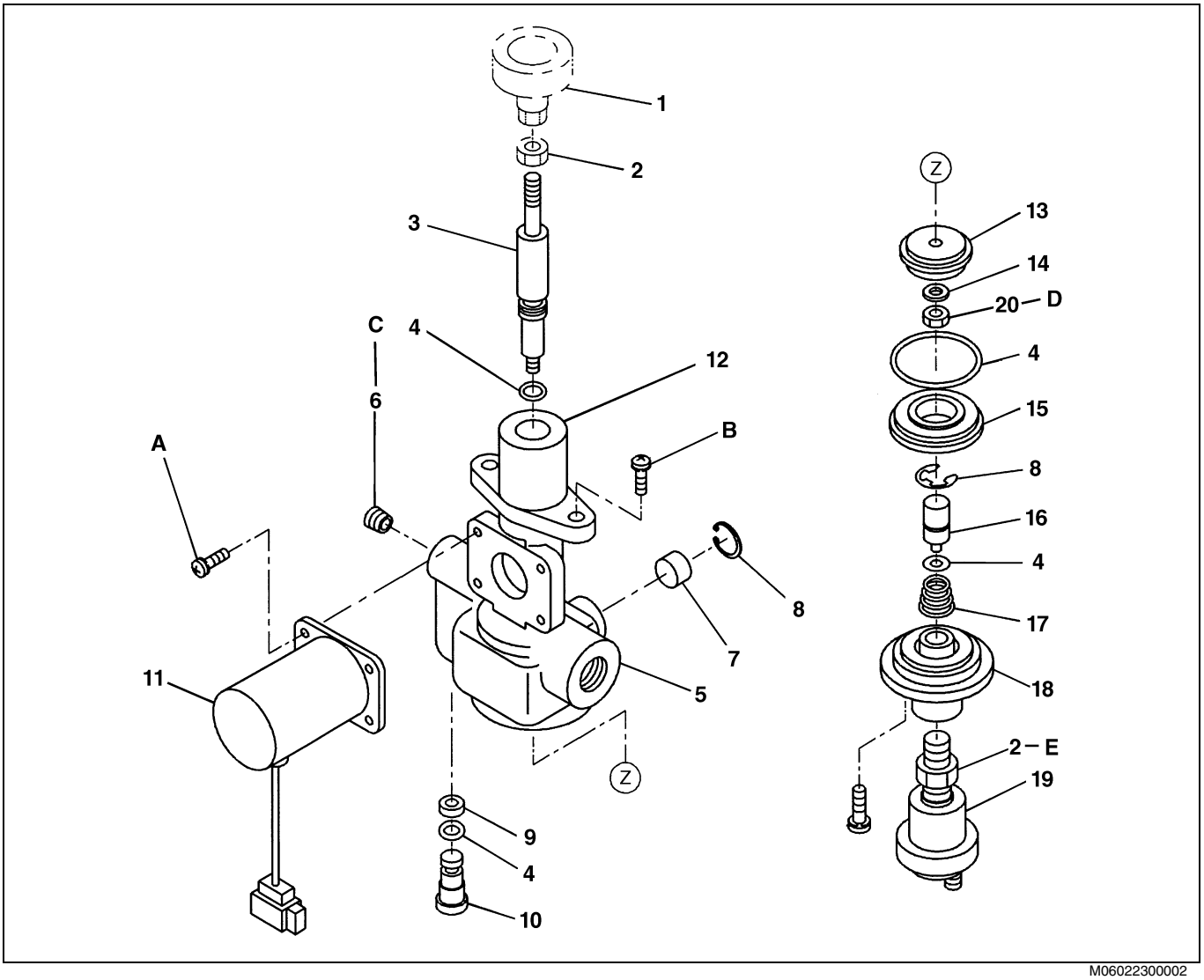


M06022300001

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

M0602223BED1001



M06022300002

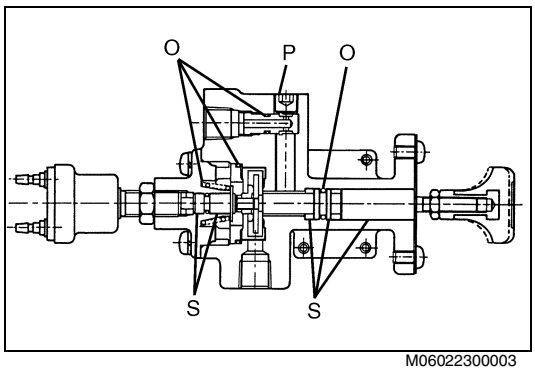
1	Knob	11	Solenoid assembly
2	Lock nut	12	Guide
3	Piston	13	Valve
4	O-ring	14	Washer
5	Valve body	15	Valve seat
6	Plug	16	Plunger
7	Filter	17	Spring
8	Retainer ring	18	Cover
9	Check valve	19	Switch assembly
10	Valve guide	20	Check bolt nut

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

M06022301BEH2001



M06022300003

IMPORTANT POINTS - ASSEMBLY

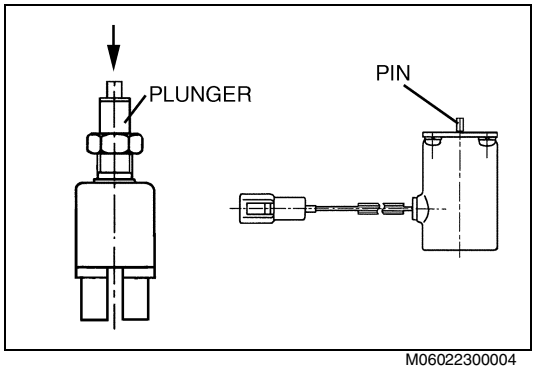
1. LUBRICATION

(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



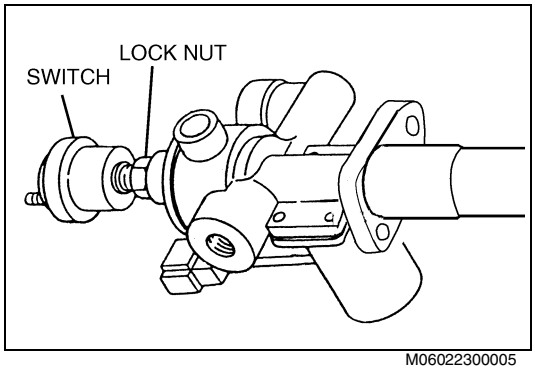
M06022300004

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 chapter ELECTRICAL EQUIPMENT for details.



M06022300005

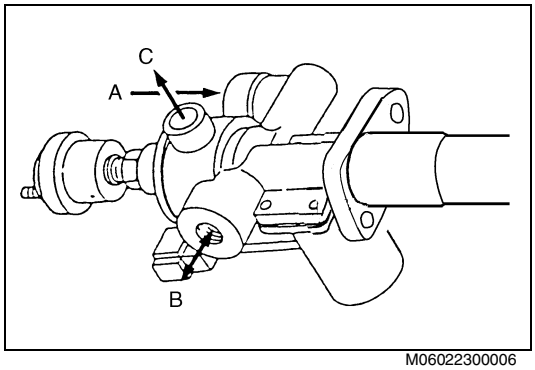
3. SWITCH INSTALLATION

(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.

IMPORTANT POINT - INSPECTION

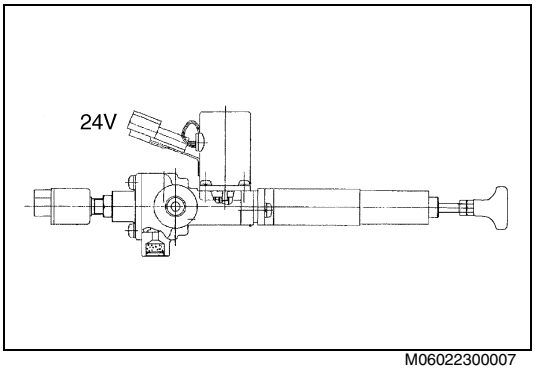


M06022300006

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.

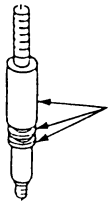
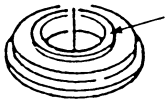
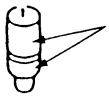
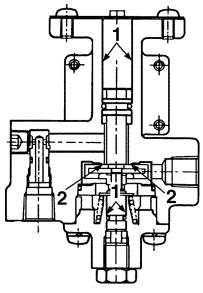


M06022300007

(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

M06022301BEH3001

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.**	

ABS (ANTI-LOCK BRAKE SYSTEM) (AKEBONO BRAKE MAKE)

BR03-001

ABS BR03-2
OVERVIEW BR03-2
COMPOSITION AND OPERATION BR03-3
FUNCTION BR03-7
OVERVIEW AND FUNCTION BR03-8

FRONT WHEEL BRAKE.....BR03-18
COMPONENT LOCATOR BR03-18
OVERHAUL BR03-19

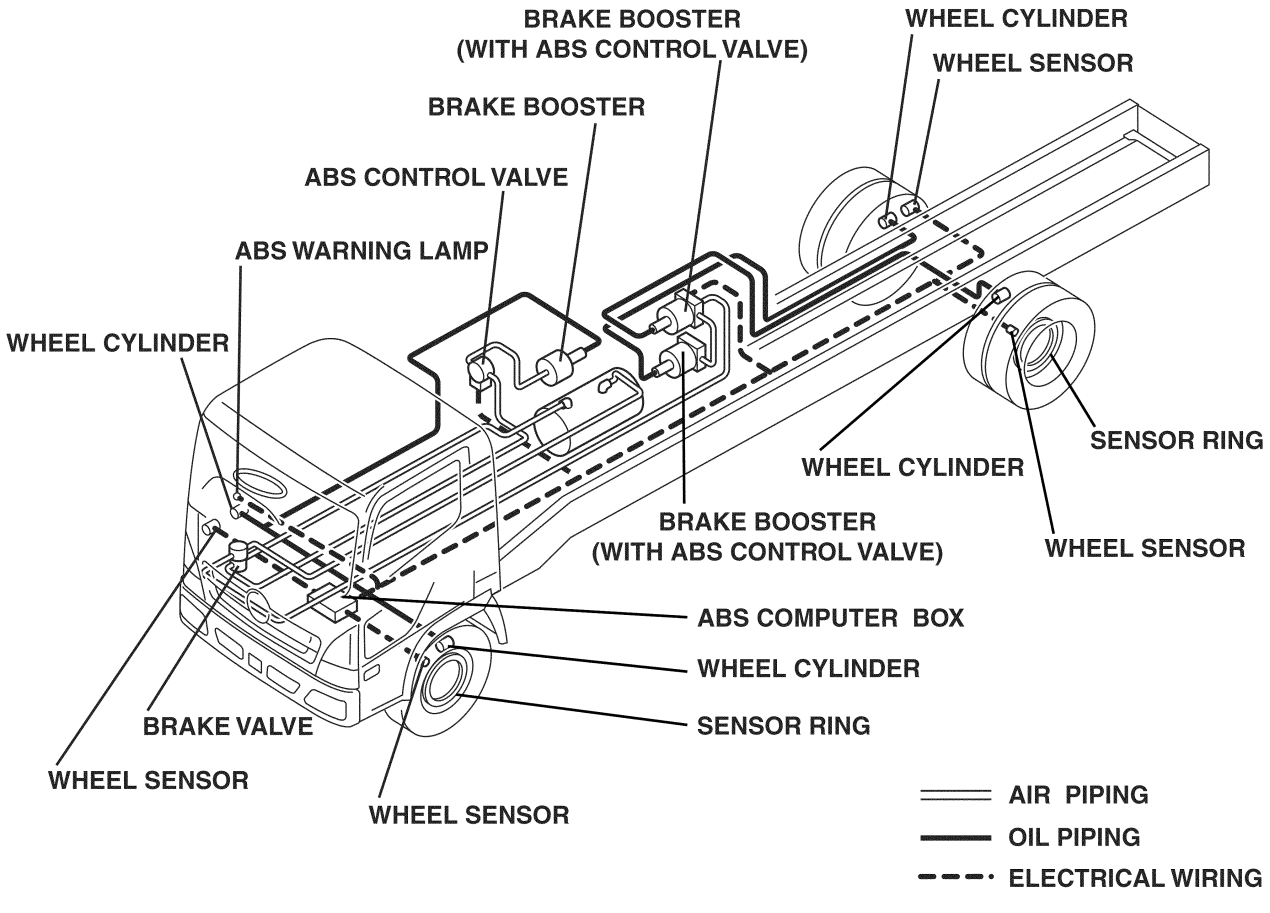
REAR WHEEL BRAKE.....BR03-22
COMPONENT LOCATOR BR03-22
OVERHAUL BR03-23

ABS

OVERVIEW

M16030101BEC1009

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 computer 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.



ABS SYSTEM OVERVIEW DIAGRAM (REPRESENTATIVE MODEL)

M06030100001

COMPOSITION AND OPERATION

M16030101BEC1010

The ABS system is comprised of the sensor rings mounted on the wheels, the ABS computer, 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 lamp, which gives an alarm if the system malfunctions; the piping, wire harnesses, etc., that link together the various units that compose the system.

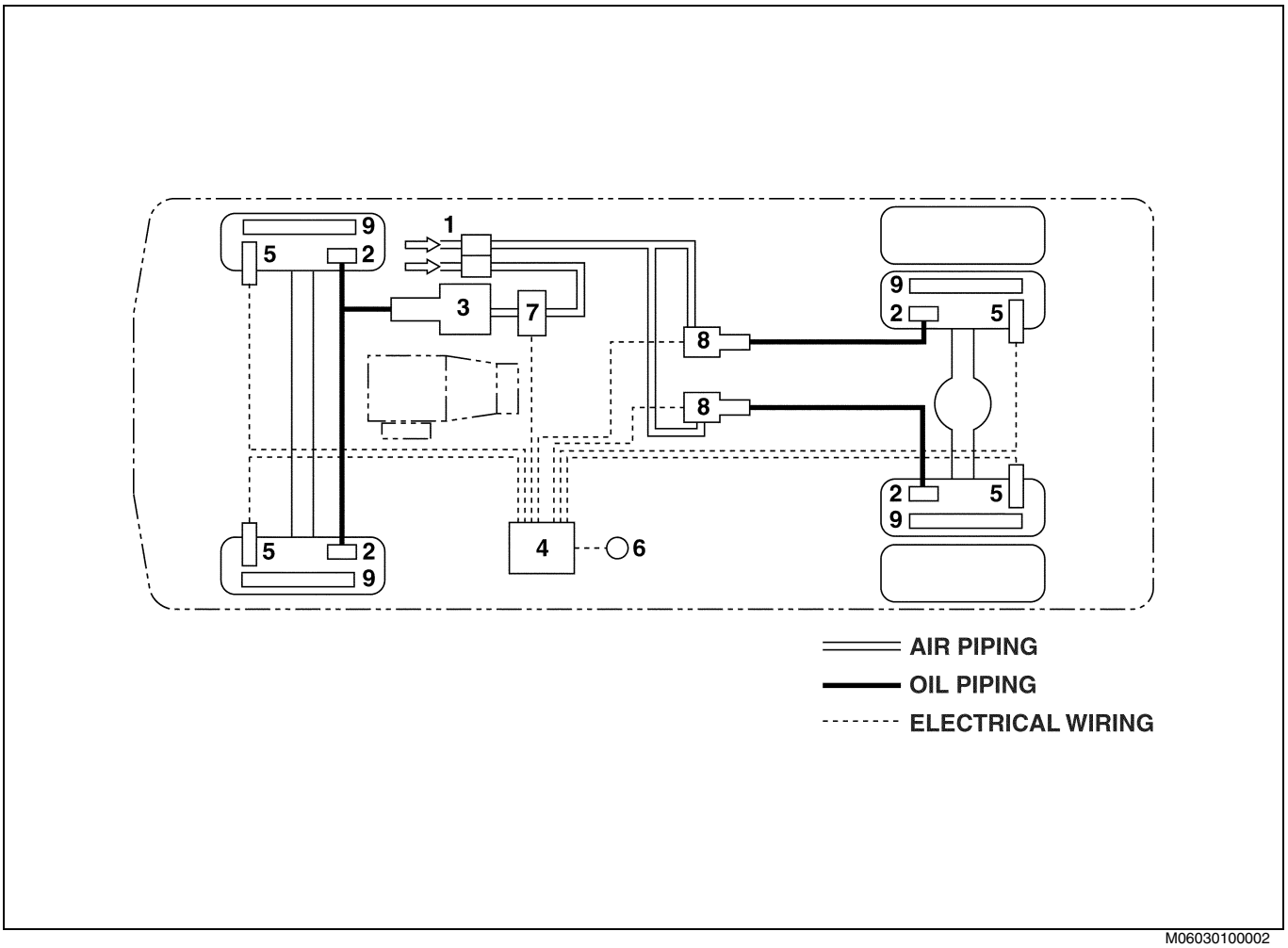
Pulse signals transmitted by the sensor rings mounted on the wheel hubs, rotated together with the wheels, and the wheel sensors mounted near sensor ring on the axles are sent to the ABS computer. The ABS computer then calculates the wheels' rotational speed, acceleration, deceleration, and amount of slippage, based on these signals.

If the limit values for the wheel's deceleration, or slippage ratio are exceeded, the ABS computer immediately transmits signals to the ABS control valves to adjust any excess braking force.

- ABS system operates as following table.

	FRONT AXLE	REAR AXLE
CONTROL SYSTEM	Control both right and left wheel together	Independently control right and left wheels

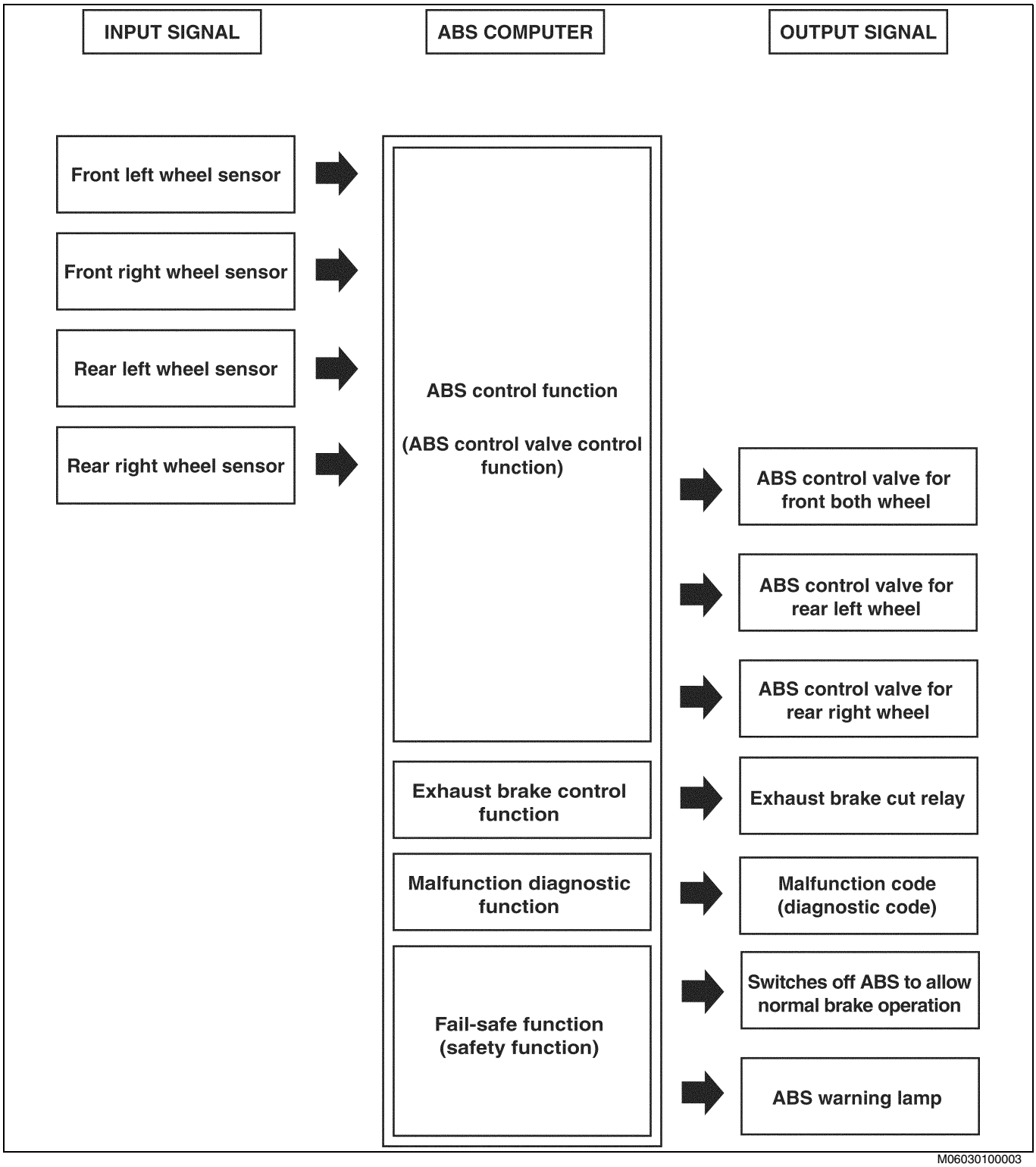
SYSTEM COMPOSITION DIAGRAM



M06030100002

1	Brake valve	6	ABS warning lamp
2	Wheel cylinder	7	ABS control valve
3	Brake booster	8	Brake booster (with ABS control valve)
4	ABS computer	9	Sensor ring
5	Wheel sensor		

ABS CONTROL FLOWCHART



M06030100003

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.

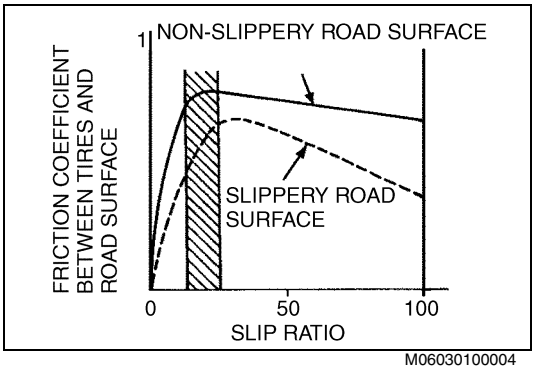
When the driver applies the brakes, the rotation of the wheels is controlled and the vehicle speed drops. However, the momentum of the vehicle attempts to push it forward further even though the rotation of the wheels is being braked. At this point, slipping will occur if there is a gap between the wheels' 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

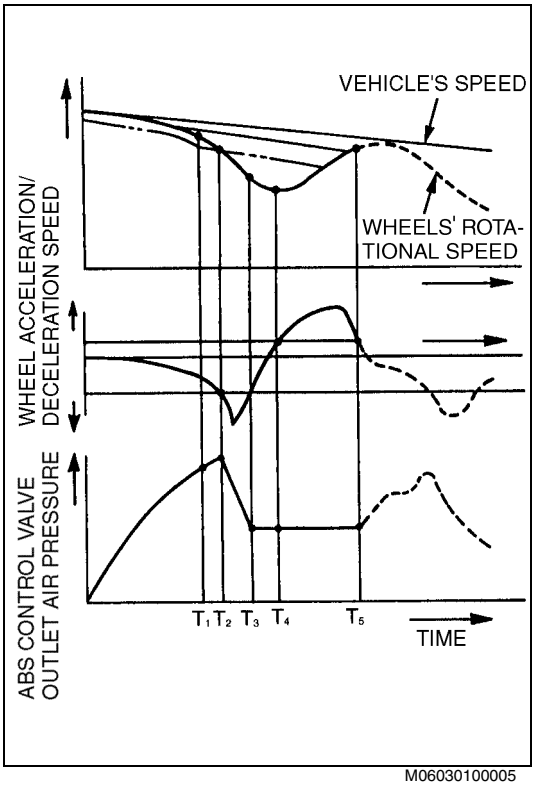


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The graph shown at left shows the relationship between the friction coefficient of the tires and of the road surface and the slip ratio.

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



M06030100005

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.

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 computer 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.

At point T3, the wheel acceleration/deceleration speed is starting to return to normal one, and the ABS computer stops lowering the air pressure at the ABS control valve outlet and maintains it at a constant level.

At point T5, the wheels' rotational speed and the vehicle's speed are about the same. The ABS computer detects that the wheels are no longer likely to be locked and increases the air pressure at the ABS control valve outlet.

The above processes is repeated over and over until the vehicle comes to a complete stop.

FUNCTION

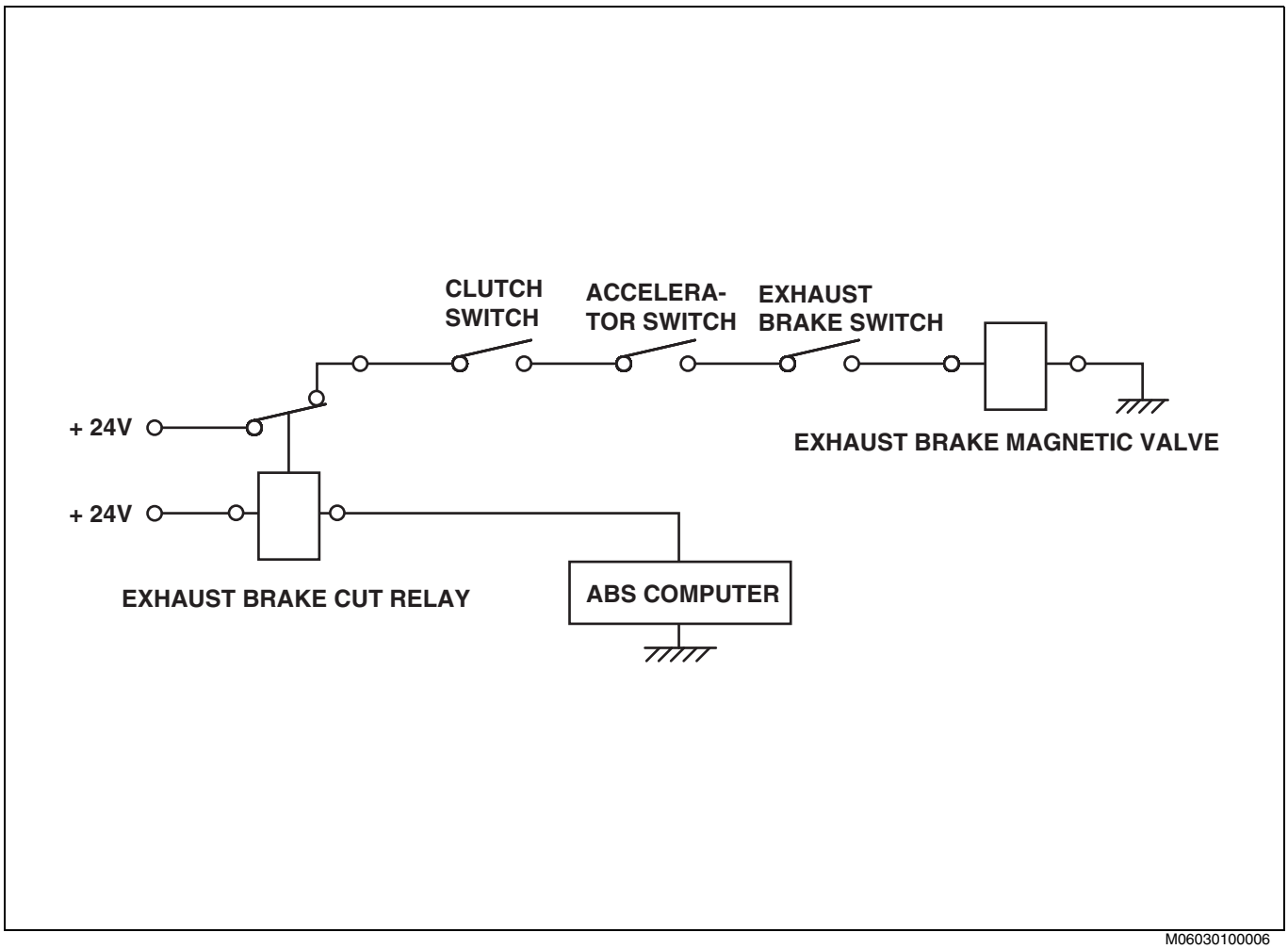
M06030101BEC1011

FAIL-SAFE FUNCTION

This ABS system is equipped with a fail-safe function that causes the ABS warning lamp 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

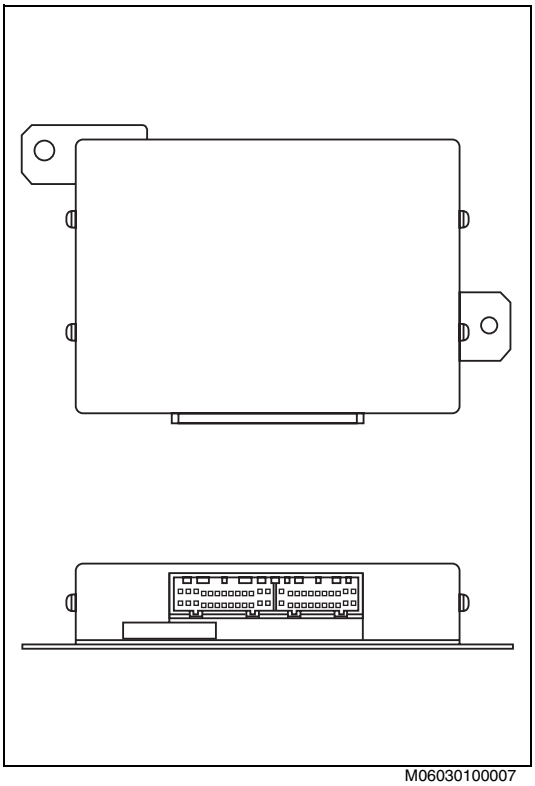
The ABS system of this vehicle is equipped with a function that controls the exhaust brake while ABS is operating.
If the exhaust brake is applied independently or together with the service brake on a road surface with very low friction coefficient, the driving wheels may lock. This ABS system prevents the driven wheels from locking in such cases by automatically releasing the exhaust brake, if necessary, during ABS operation.



M06030100006

OVERVIEW AND FUNCTION

M06030101BEC1012



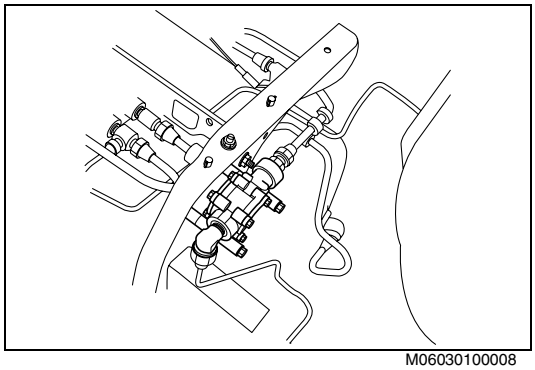
M06030100007

1. ABS COMPUTER

Based on pulse signals from the wheel sensors, the ABS computer 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 boosters 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 computer, and wire harnesses are constantly being checked by the ABS computers' fail-safe circuit. If some sort of malfunction occurs, the fail-safe circuit warns the driver by lighting the ABS warning lamp. At the same time, the ABS system that is experiencing the malfunction is shut off and braking is restored to normal (non-ABS) operation.



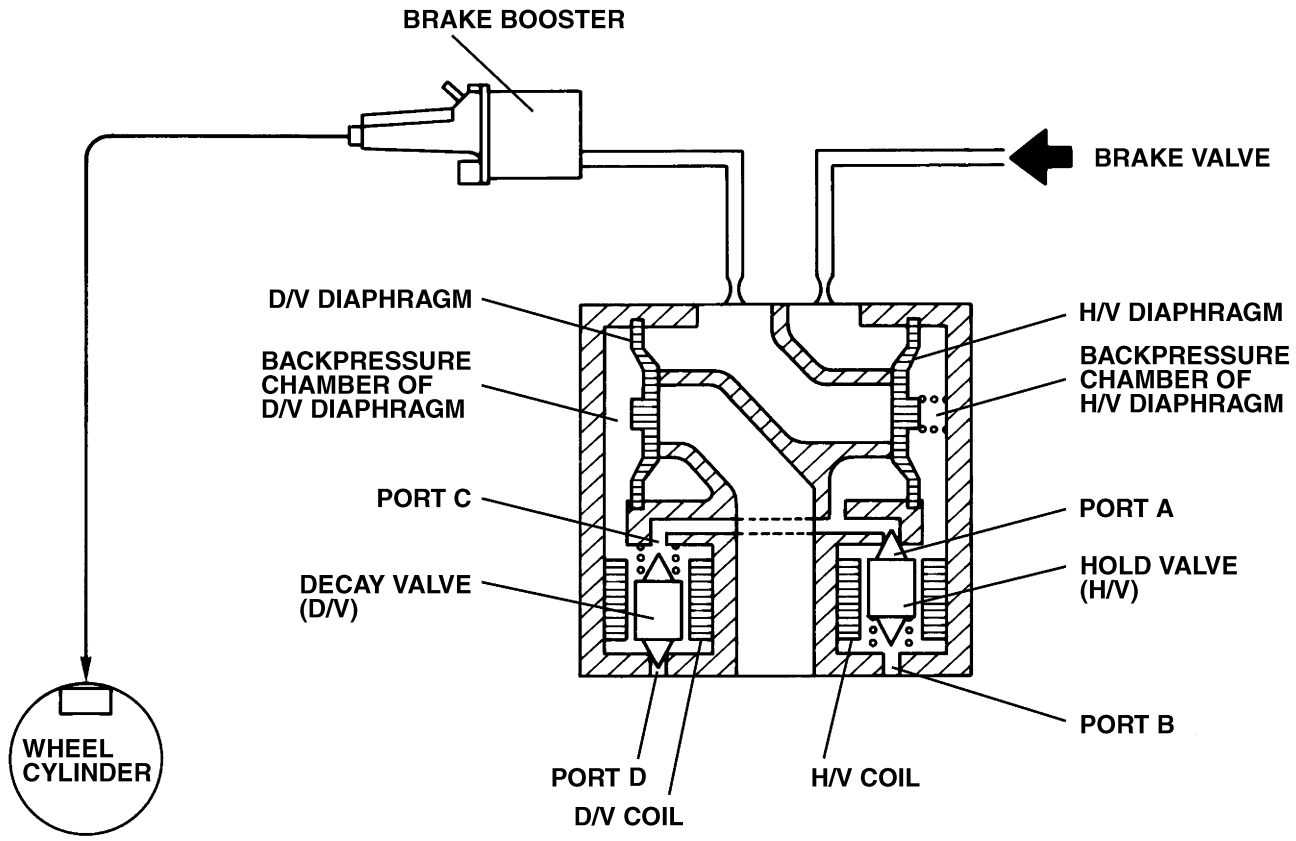
M06030100008

2. ABS CONTROL VALVE (FOR FRONT)

(1) Overview

- ABS control valve is located in the brake air circuit between the brake valve and brake booster. This valve is for controlling input air pressure of the brake booster in three mode by holding, depressurizing, or repressurizing the input air pressure of the brake booster according to the instruction signal from the computer.

ABS CONTROL VALVE

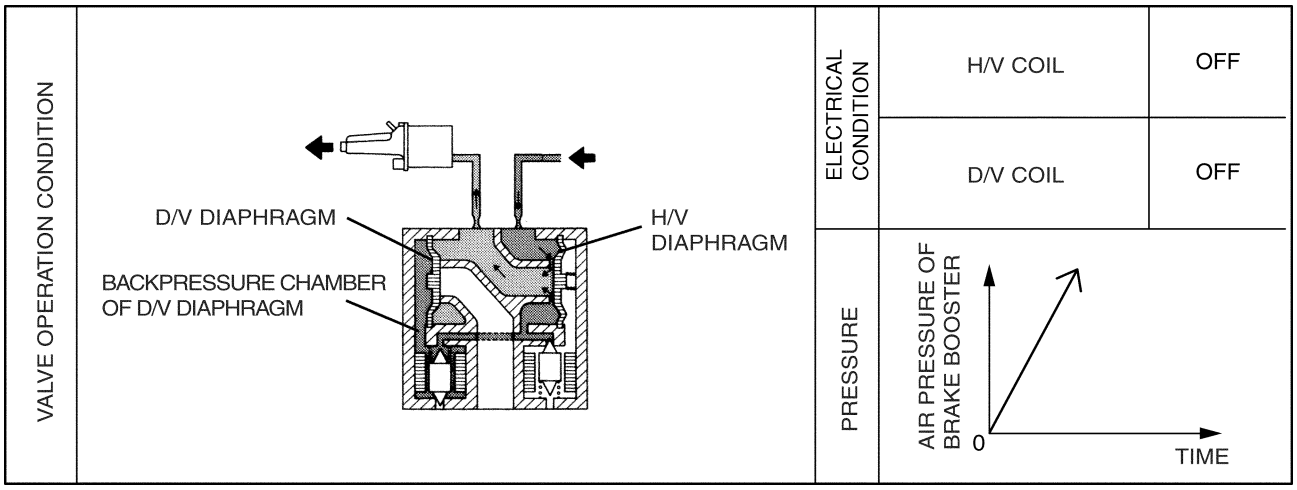


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(2) Operation

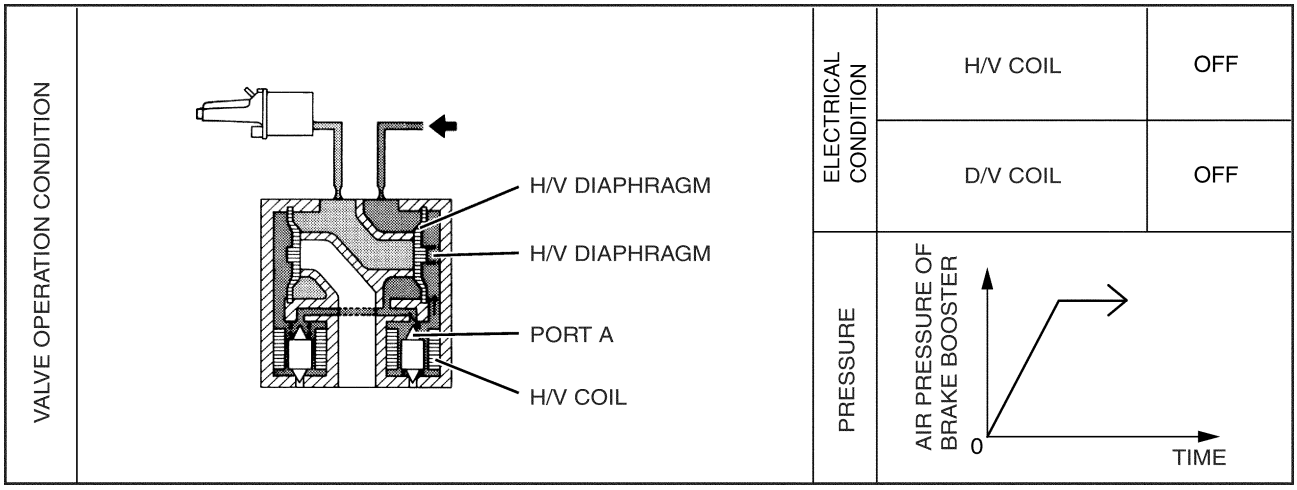
a. Application of normal brake pressure

- When the brake valve is depressed, air from the tank pushed open the H/V diaphragm and goes through the backpressure chamber to close the D/V diaphragm. Thus, the air pressure of the brake booster is increased.



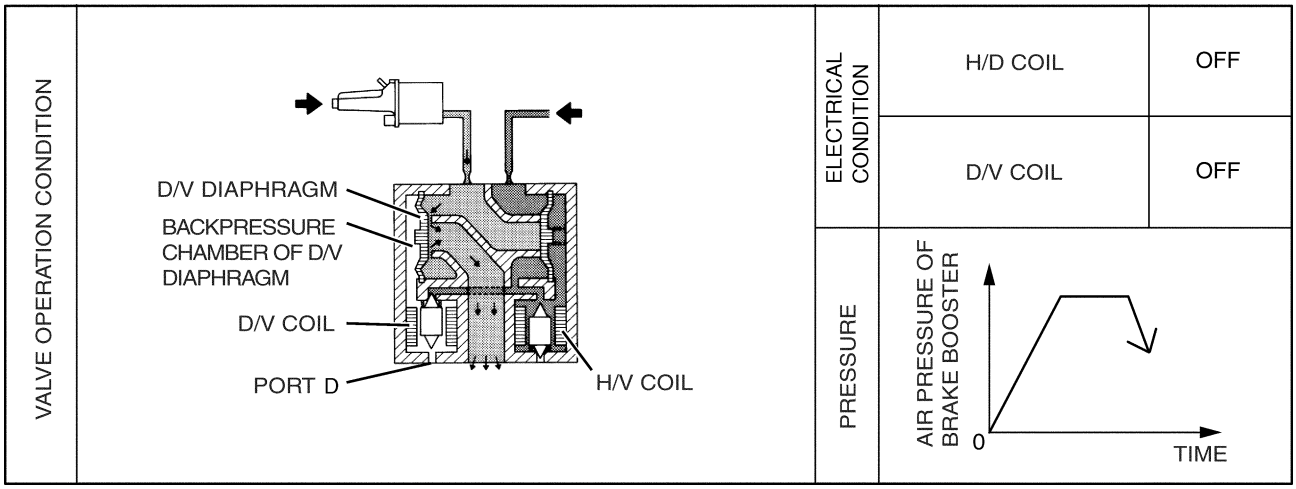
b. Pressure holding mode

- When the coil for H/V is energized, port A opens and air goes through the backpressure chamber of H/V diaphragm.
- This air pressure in the backpressure chamber keeps H/V diaphragm closed to shut down the air from the brake valve. Thus, the air pressure of the brake booster is increased.



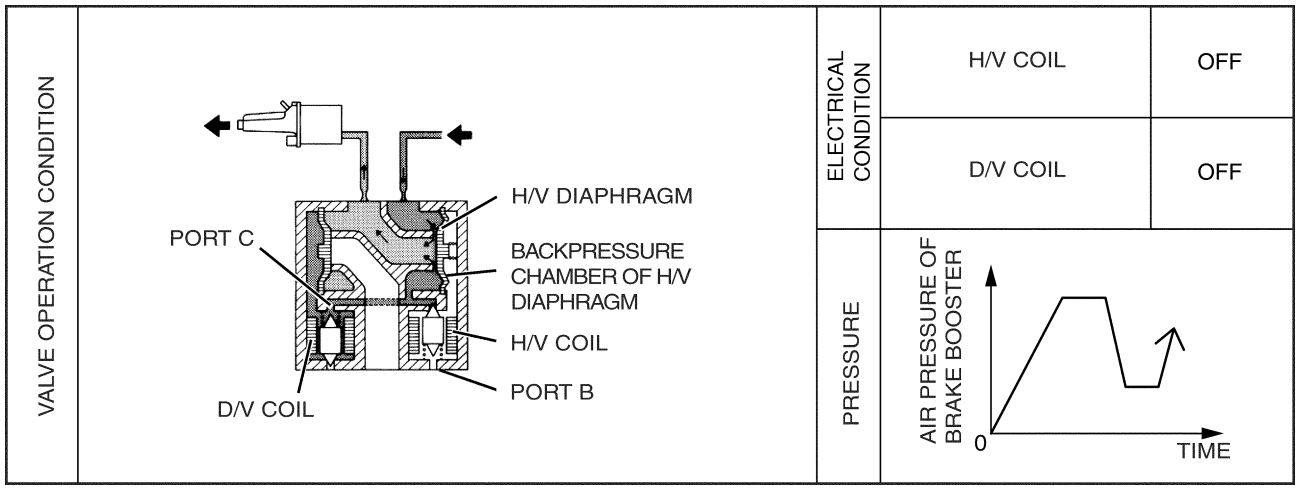
c. Depressurizing mode

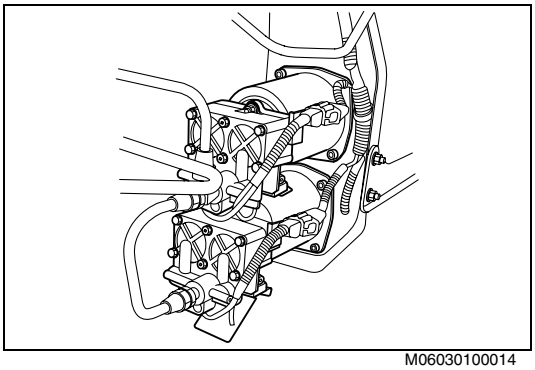
- When D/V coil is energized after turning on H/V coil shuts down the air from the brake valve, port D opens to discharge the air in the backpressure chamber of D/V diaphragm.
- The hold pressure of the brake booster open D/V diaphragm to discharge the air into the atmosphere. Thus, the air pressure of the brake booster is depressurized.



d. Repressurizing mode

- Port C opens when D/V coil is not energized to hold the air pressure of the brake booster.
- Next, turning off H/V coil opens port B to discharge the air in the backpressure chamber of H/V diaphragm. Thus, the air from the brake valve opens H/V diaphragm to repressurize the air pressure of the brake booster.



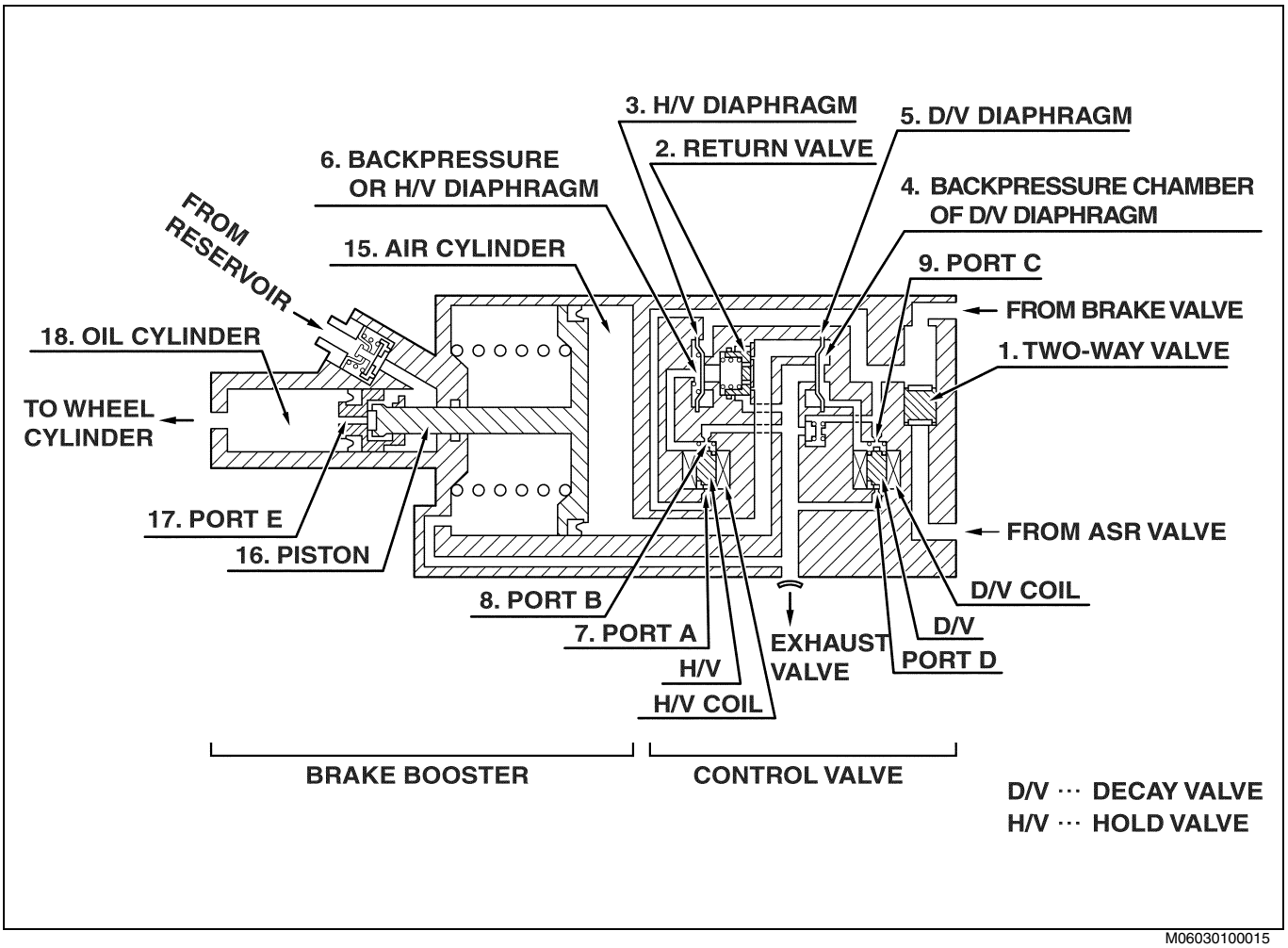


M06030100014

3. ABS CONTROL VALVE (FOR REAR)

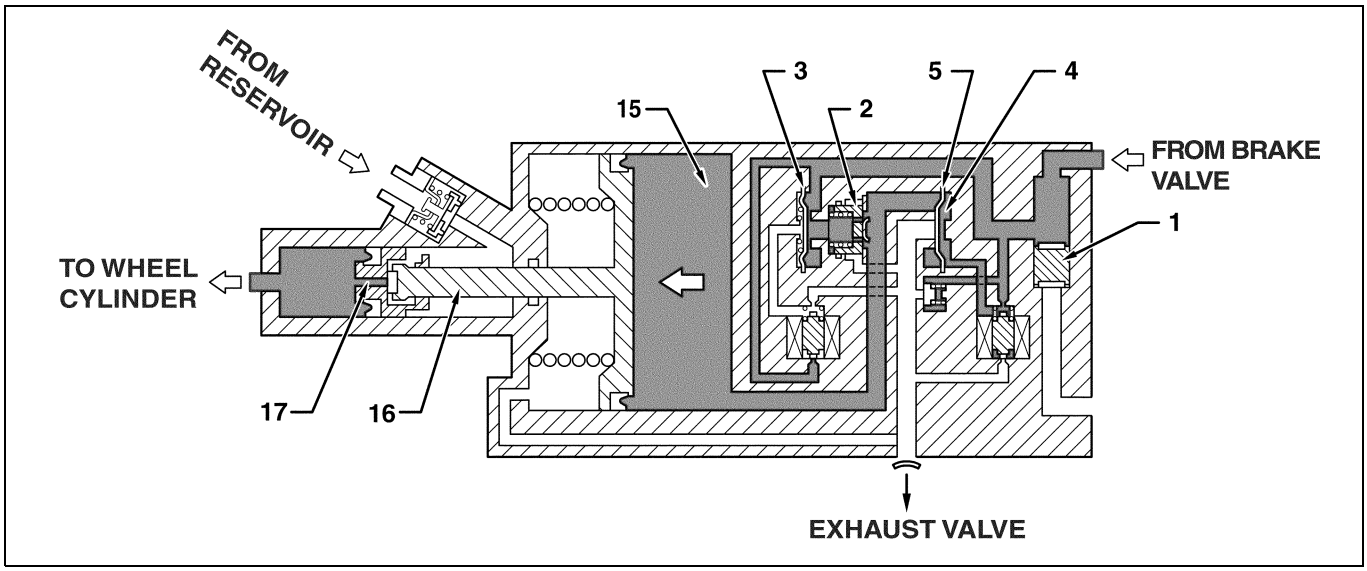
(1) Overview

- Brake booster with ABS control valve is unit incorporating ABS control valve unit and brake booster unit. This ABS control valve unit has the same function as the ABS control unit for front.

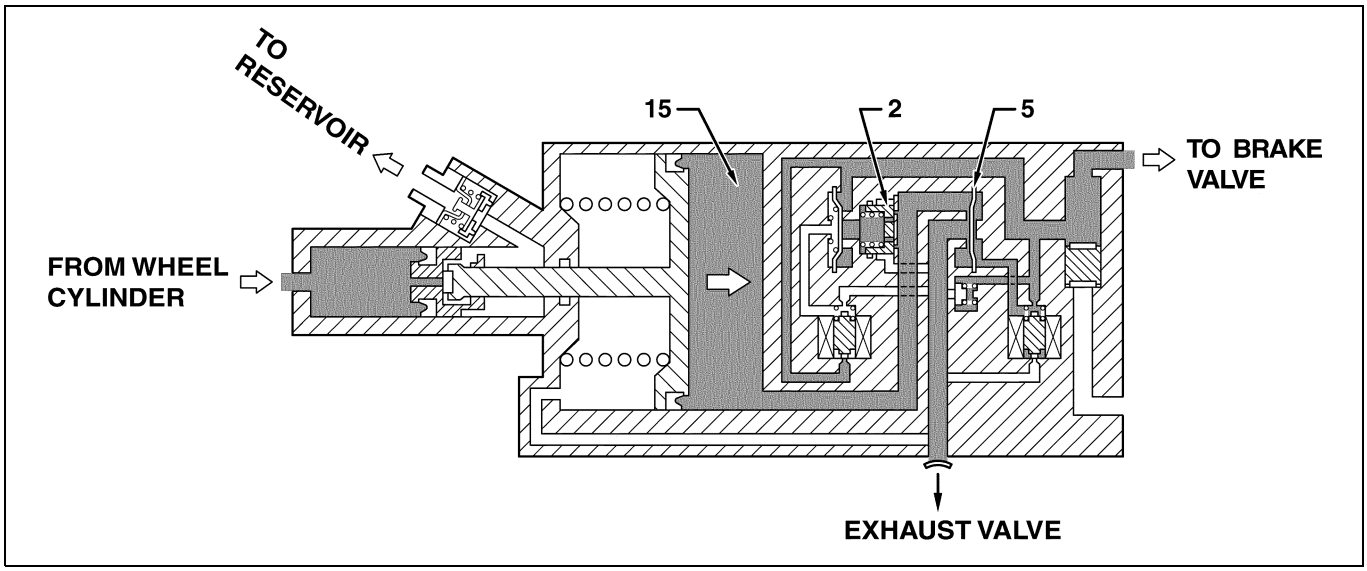


M06030100015

(2) When ABS is not operating (normal brake is operating)
a. When the brake valve is operating

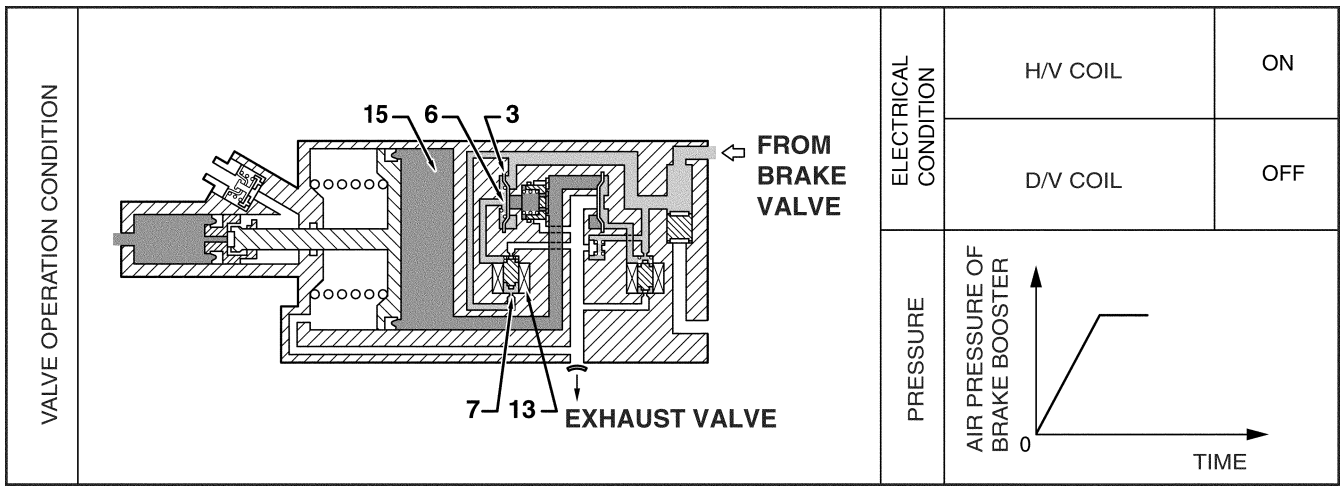


b. When the brake valve is released.

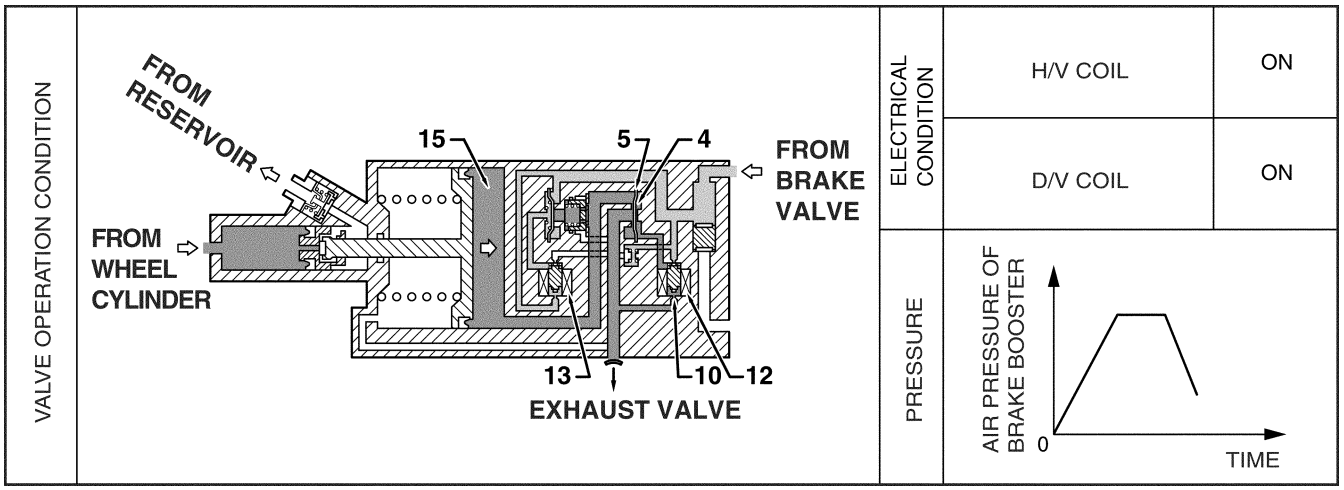


(3) When ABS is operating.

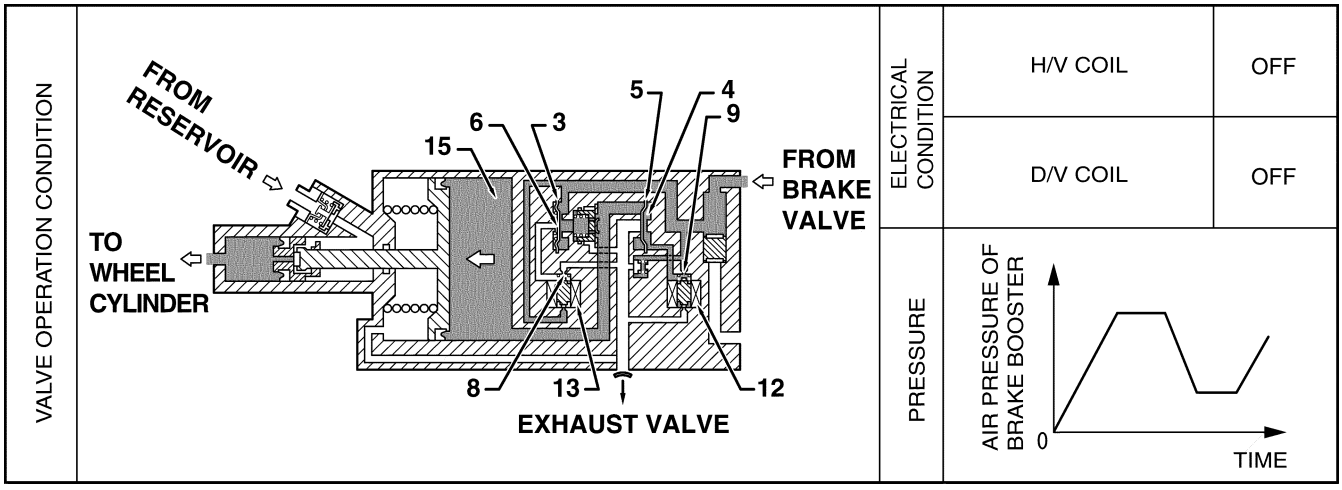
a. Pressure holding mode



b. Depressurizing mode



c. Repressurizing mode

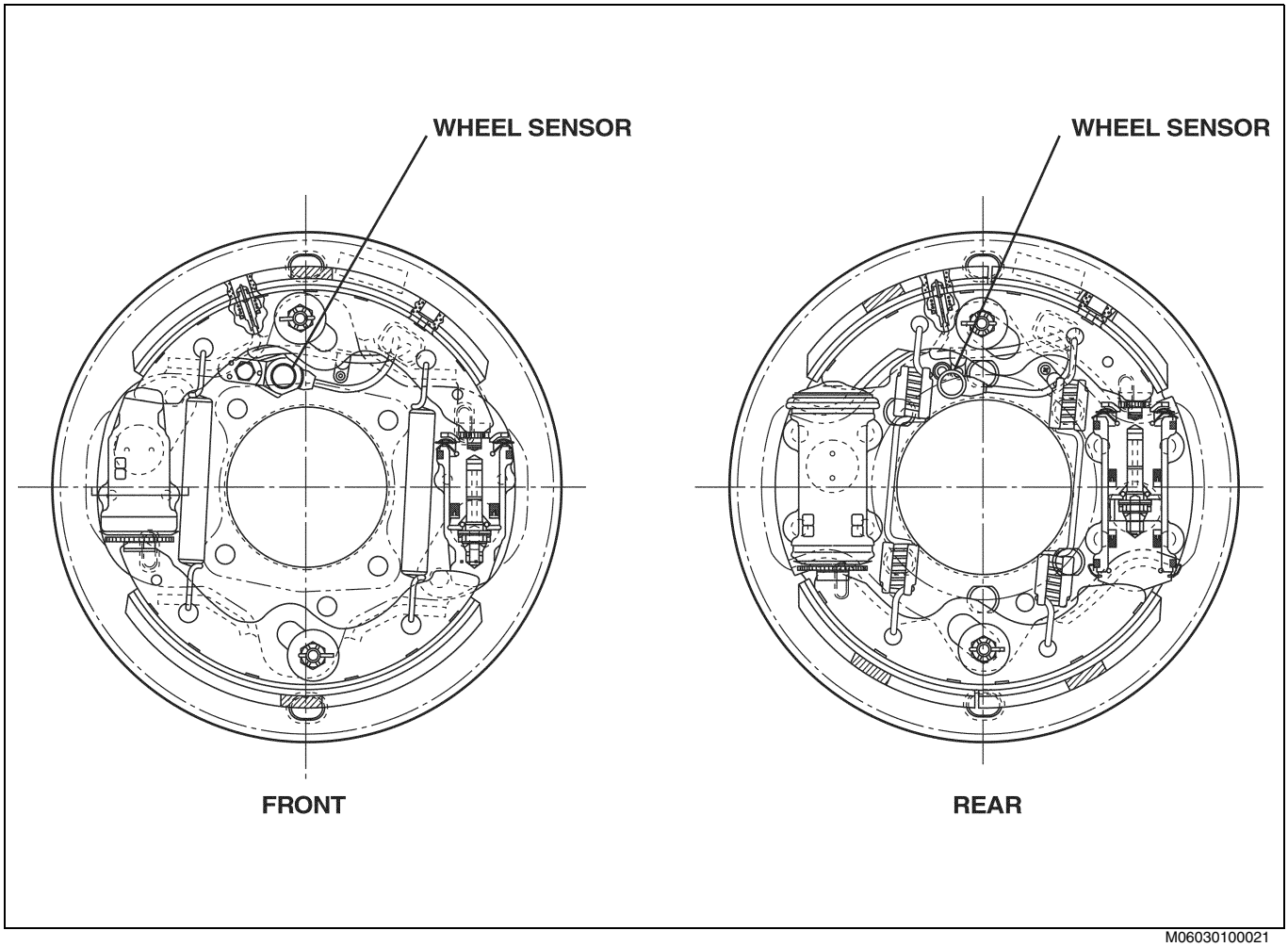


4. WHEEL SENSORS

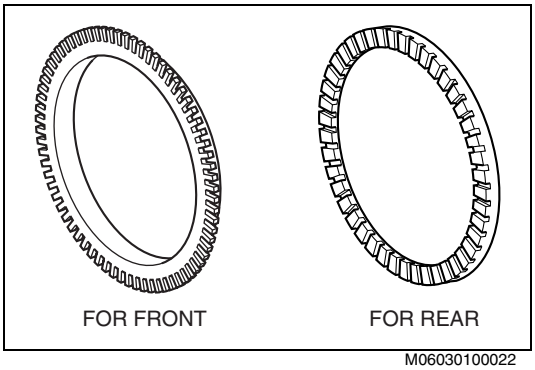
These sensors are mounted, facing the sensor rings on each wheel on the front and rear axles.

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 computer and are used to determine the wheels, rotational status.



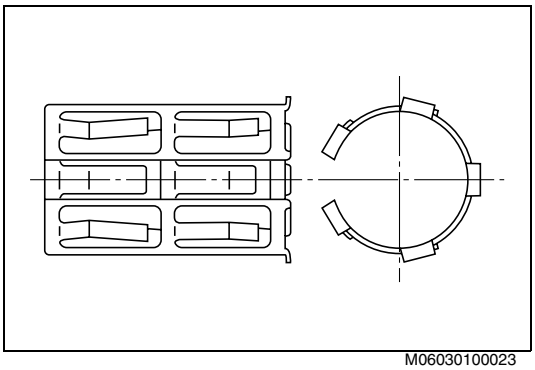
M06030100021



M06030100022

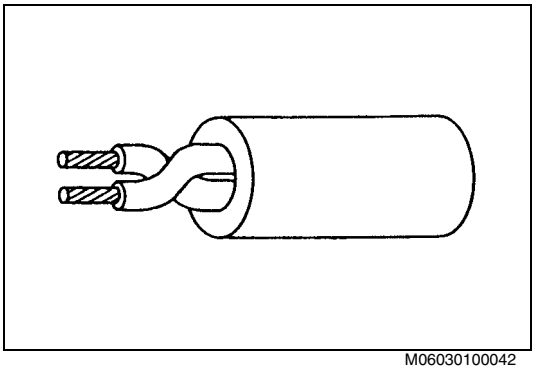
5. SENSOR RINGS

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.


M06030100023

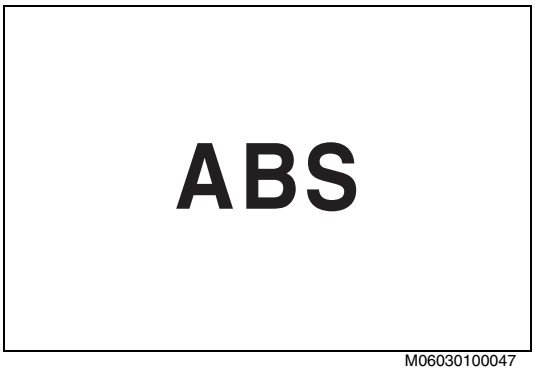
6. CLAMPING BUSHINGS

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.


M06030100042

7. 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.



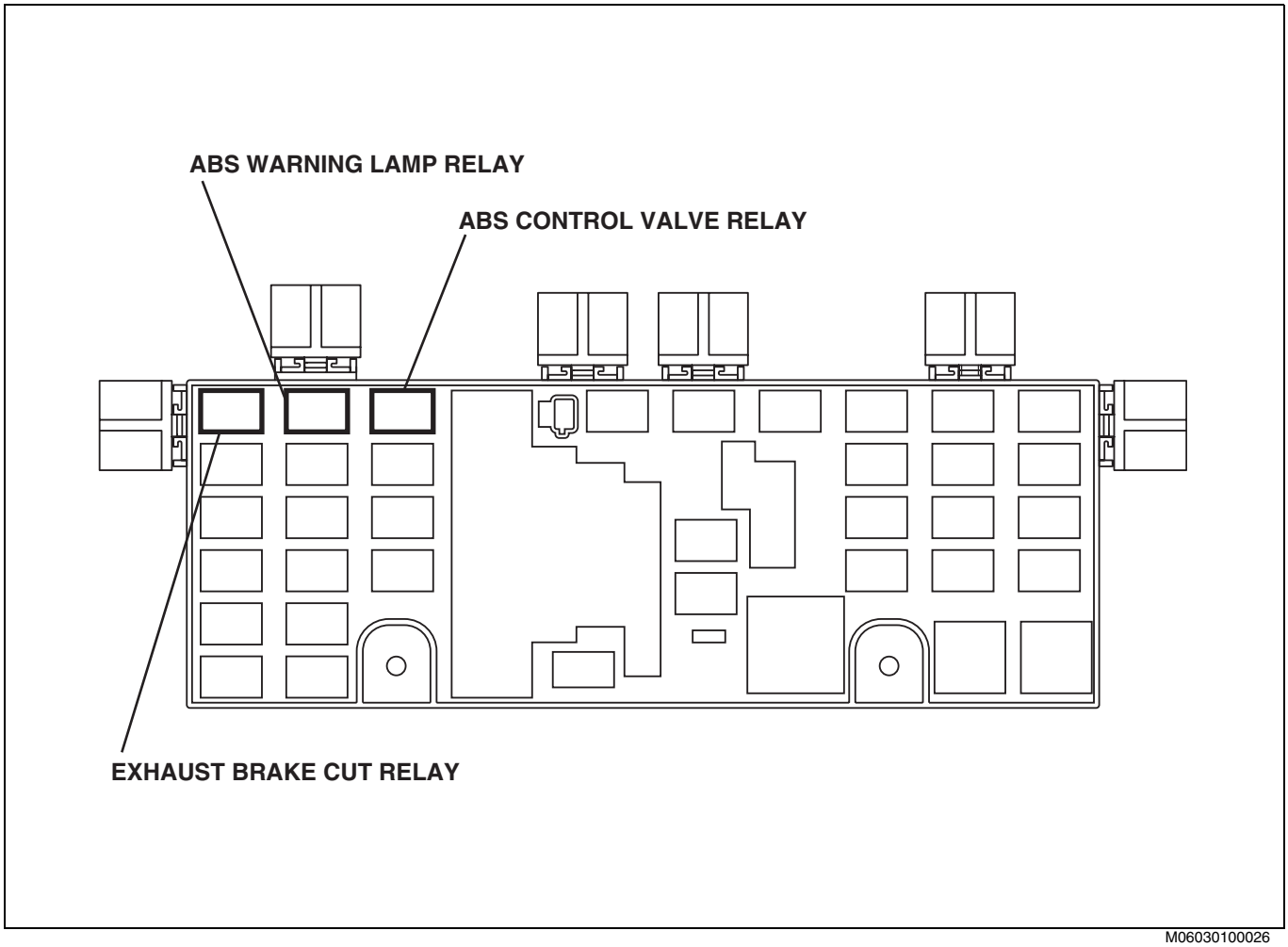
M06030100047

8. ABS WARNING LAMP

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 lamp lights to alert the driver.

9. RELAY

- The lelays are located in the instrument panel of the assistant seat side.



M06030100026

(1) ABS control valve relay

- This switches supply current to ABS control valve according to the instruction of ABS computer (When the coil of relay is energized, the relay contact closes to flow the current.)

(2) 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.

(3) ABS warning lamp relay

- This is a control relay for ABS warning lamp. When ABS is in normal condition, the relay coil is energized and the contact is kept open. When any abnormality is found in ABS, the energizing current for the coil is shut down to close the contact, and then the warning lamp turns up.

HINT:

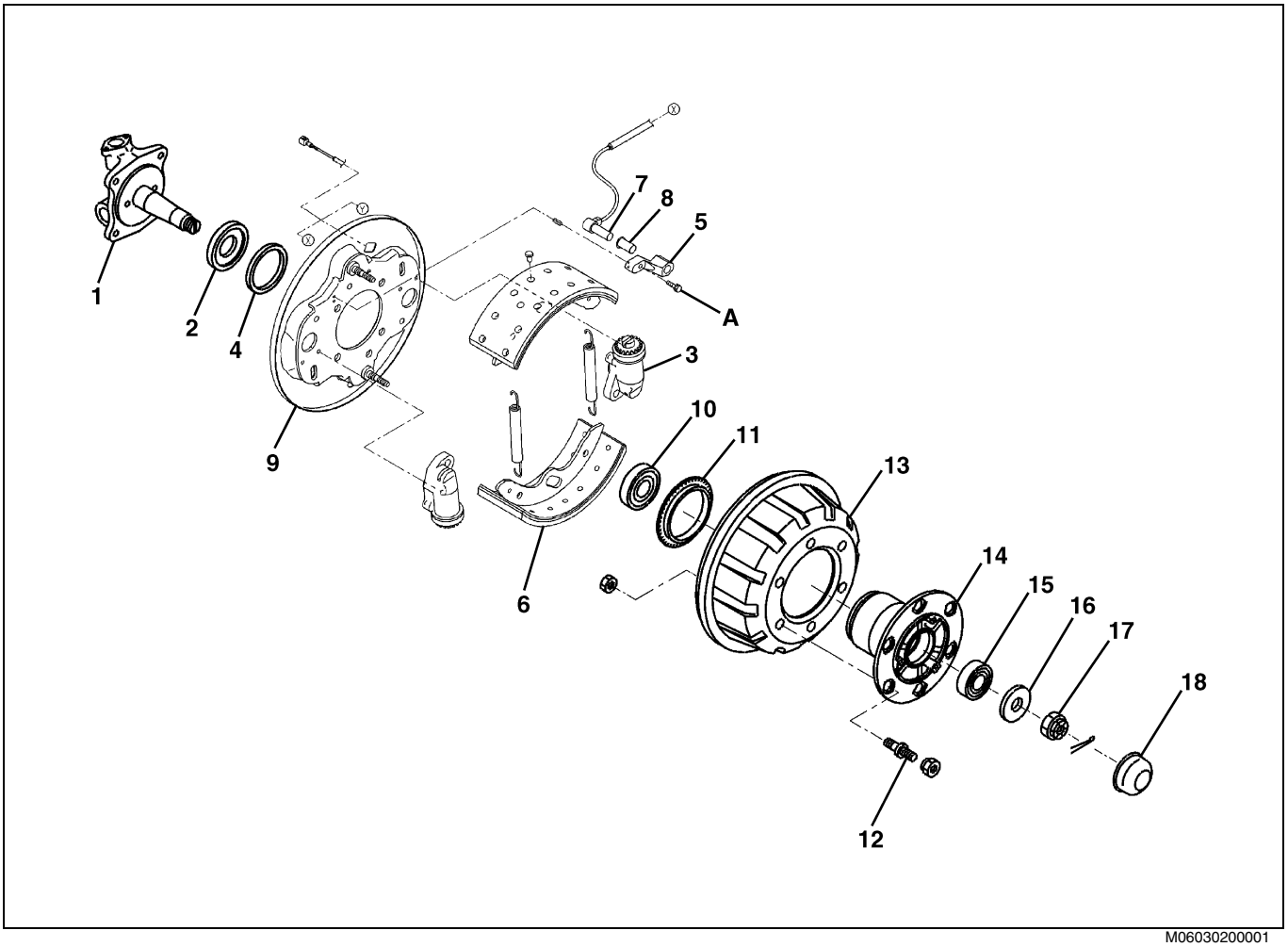
The terminal No. (symbol) of each relay is printed on each terminal.

FRONT WHEEL BRAKE

COMPONENT LOCATOR

M06030201BED1003

FRONT AXLE



M06030200001

1	Knuckle	10	Inner wheel hub bearing
2	Oil seal guide	11	Sensor ring
3	Wheel cylinder	12	Hub 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

M06030201BEH2003

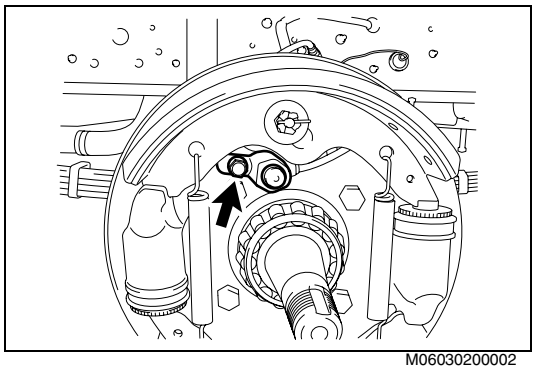
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL SENSOR.

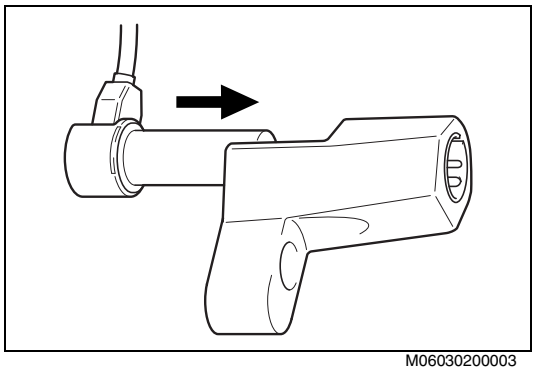
(1) Remove the wheels.
Refer to chapter WHEEL & TIRE.

(2) Remove the wheel hub, hub bearing and brake drum.
Refer to chapter FRONT AXLE.

(3) Loosen the bolt to remove the sensor holder and wheel sensor together from the back plate.



M06030200002



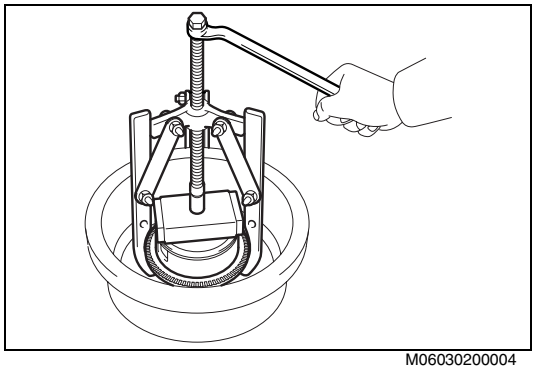
M06030200003

(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.



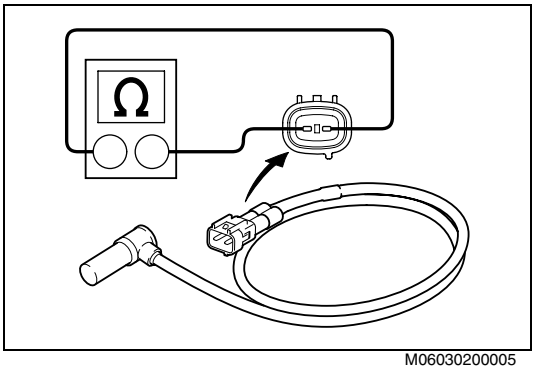
M06030200004

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.**



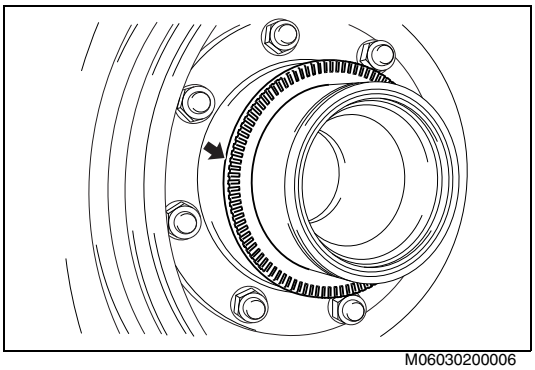
M06030200005

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.

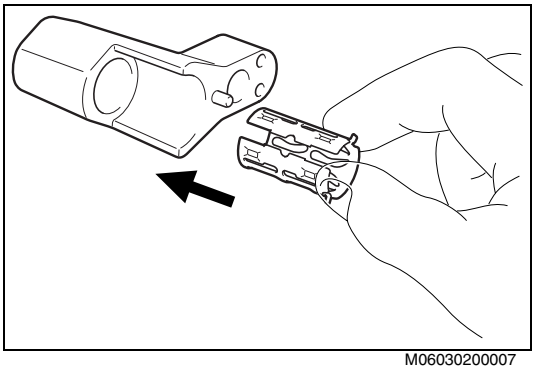

M06030200006

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.

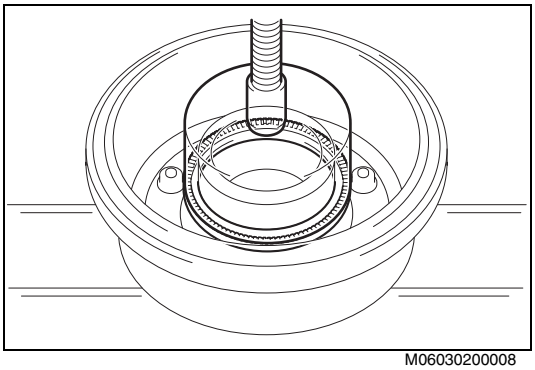
(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and press in it with a press again.


M06030200007

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.

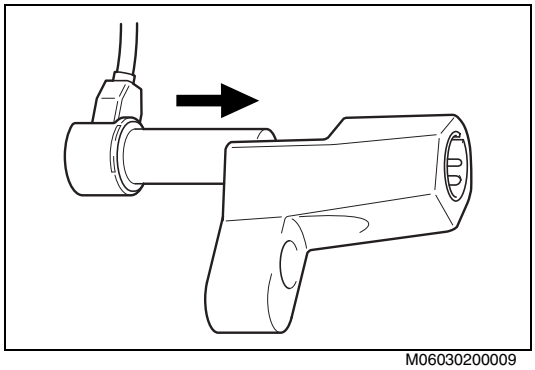

M06030200008

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.}


M06030200009

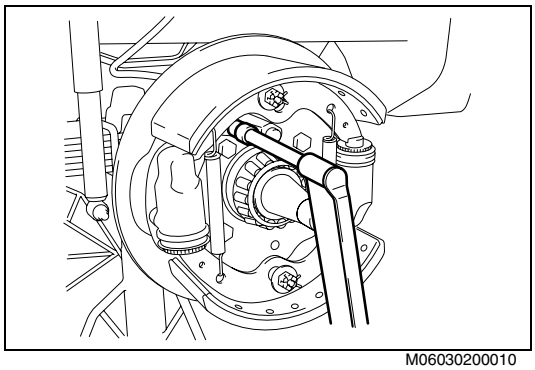
5. MOUNT THE WHEEL SENSOR.

(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.

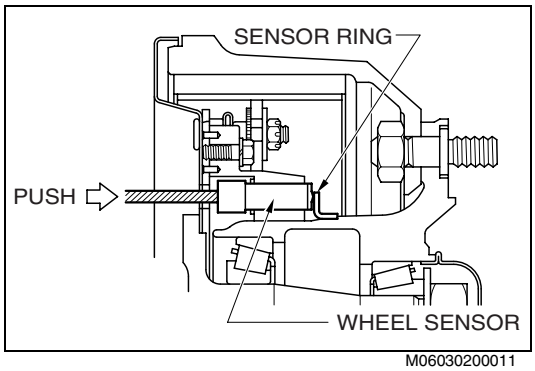
NOTICE:

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.


M06030200010

(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 chapter FRONT AXLE.



M06030200011

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:

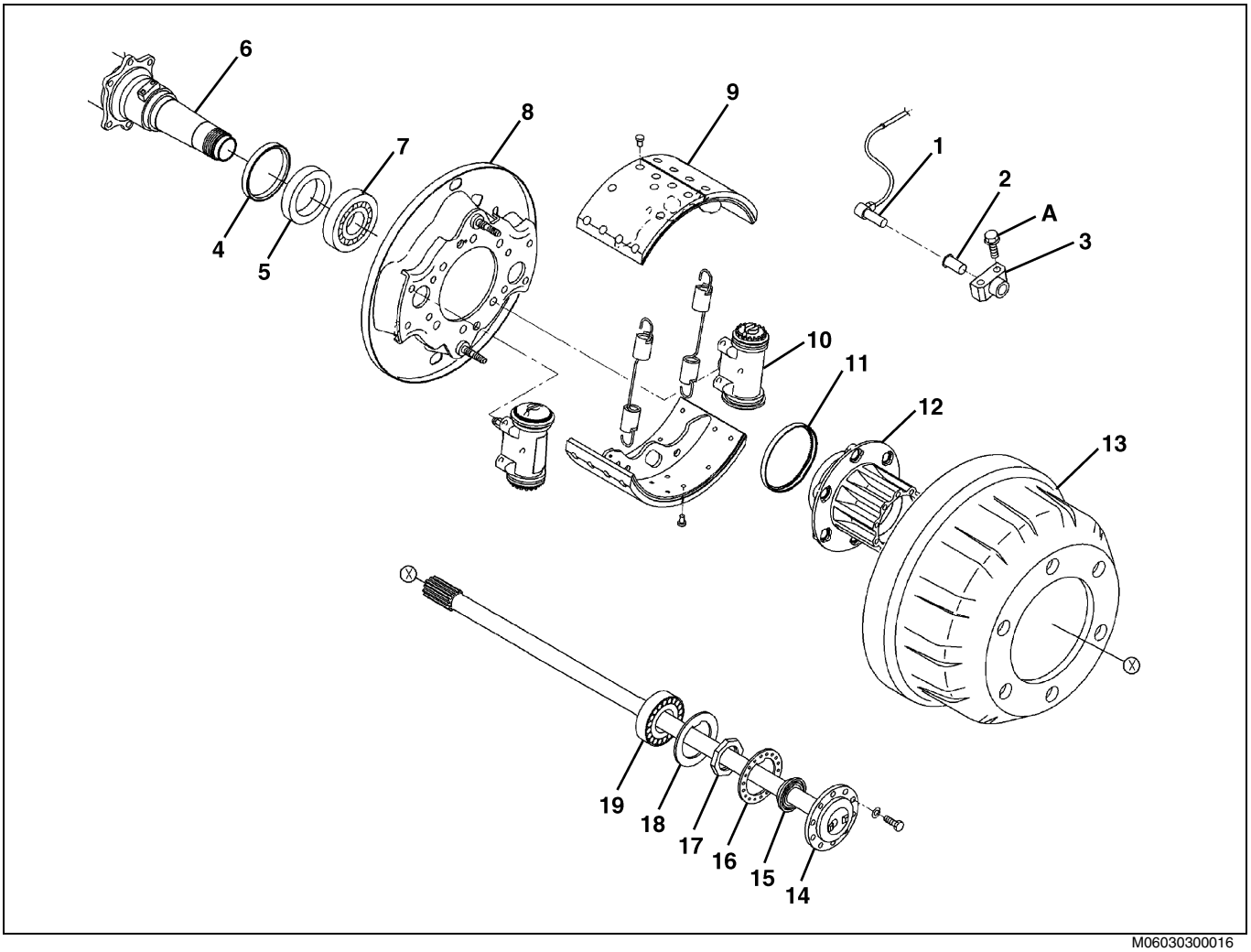
Do not tap by hammer or turn when pushing the wheel sensor. This may damage the wheel sensor.

REAR WHEEL BRAKE

COMPONENT LOCATOR

M06030301BED1003

REAR AXLE



M06030300016

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

M06030301BEH2003

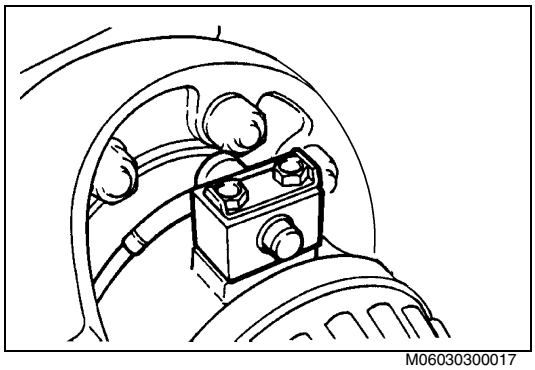
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE WHEEL SENSOR.

(1) Remove the wheels.
Refer to chapter WHEEL & TIRE.

(2) Remove the wheel hub, hub bearing and brake drum.
Refer to chapter REAR AXLE.

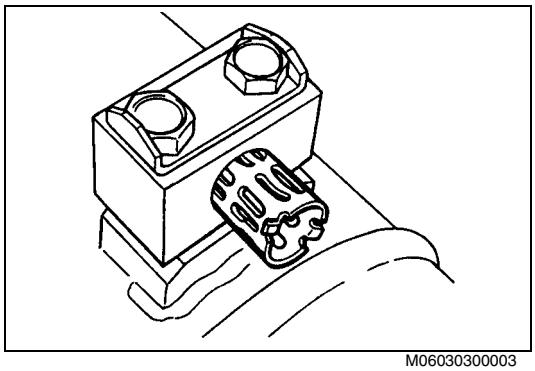
(3) Remove the wheel sensor.


M06030300017

NOTICE:

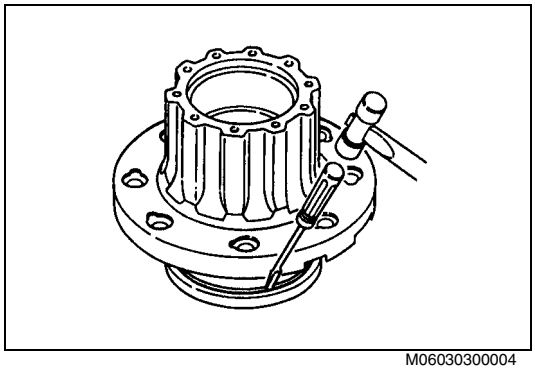
- **Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.**
- **Pull out the wheel sensor from the sensor holder by hand.**

(4) Remove the clamping bushing.
Remove the clamping bushing out of the wheel sensor holder.


M06030300003

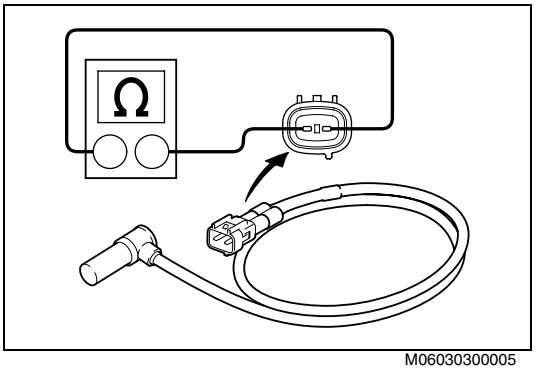
2. REMOVE THE SENSOR RING.

(1) Use a screwdriver or the like to gradually remove the sensor ring by tapping evenly on its outer ring.


M06030300004

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.**



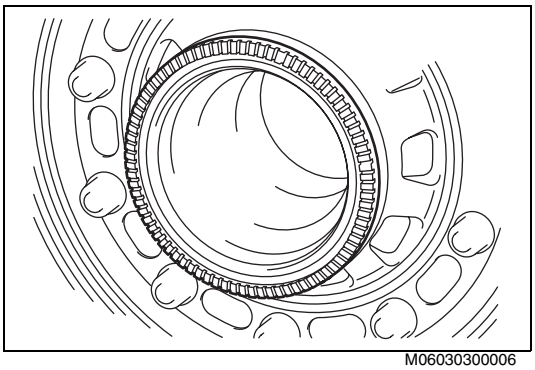
M06030300005

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.

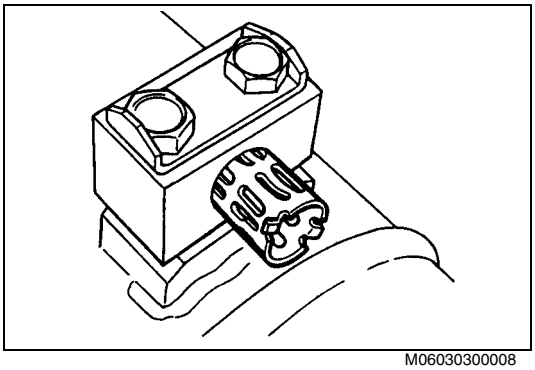

M06030300006

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.

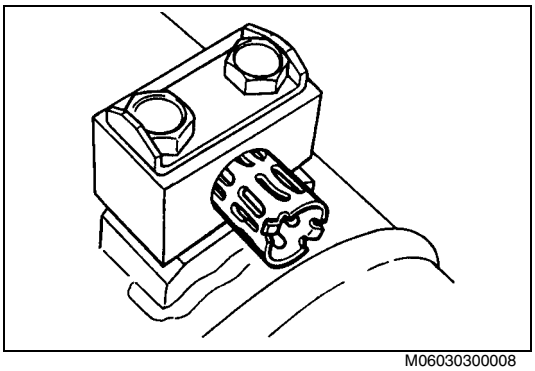
(2) If any damage or malformation is discovered, replace the sensor ring.

(3) If the sensor ring is coming loose from the wheel hub, use a dolly block and a press to pressure mount it again.


M06030300008

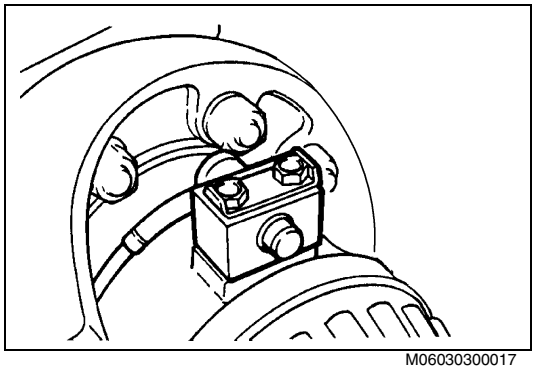
3. INSPECT THE CLAMPING BUSHING.

(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.


M06030300008

4. MOUNT THE WHEEL SENSOR

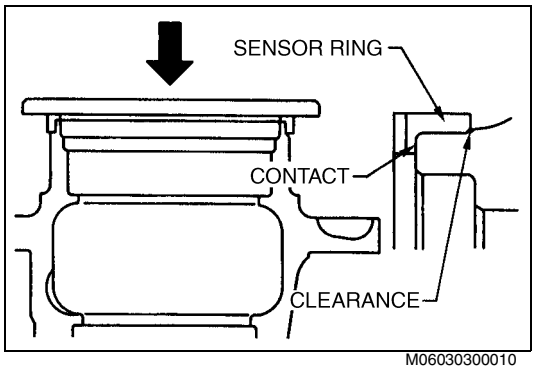
(1) Push in the clamping bushing until the stopper makes contact with the rear axle wheel sensor holder.


M06030300017

(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.



M06030300010

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 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)
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.

(4) Mount the axle shaft to the wheel hub and tighten the bolt on the axle shaft.
Refer to chapter REAR AXLE.

ES START (EASY & SMOOTH START SYSTEM)

BR04-001

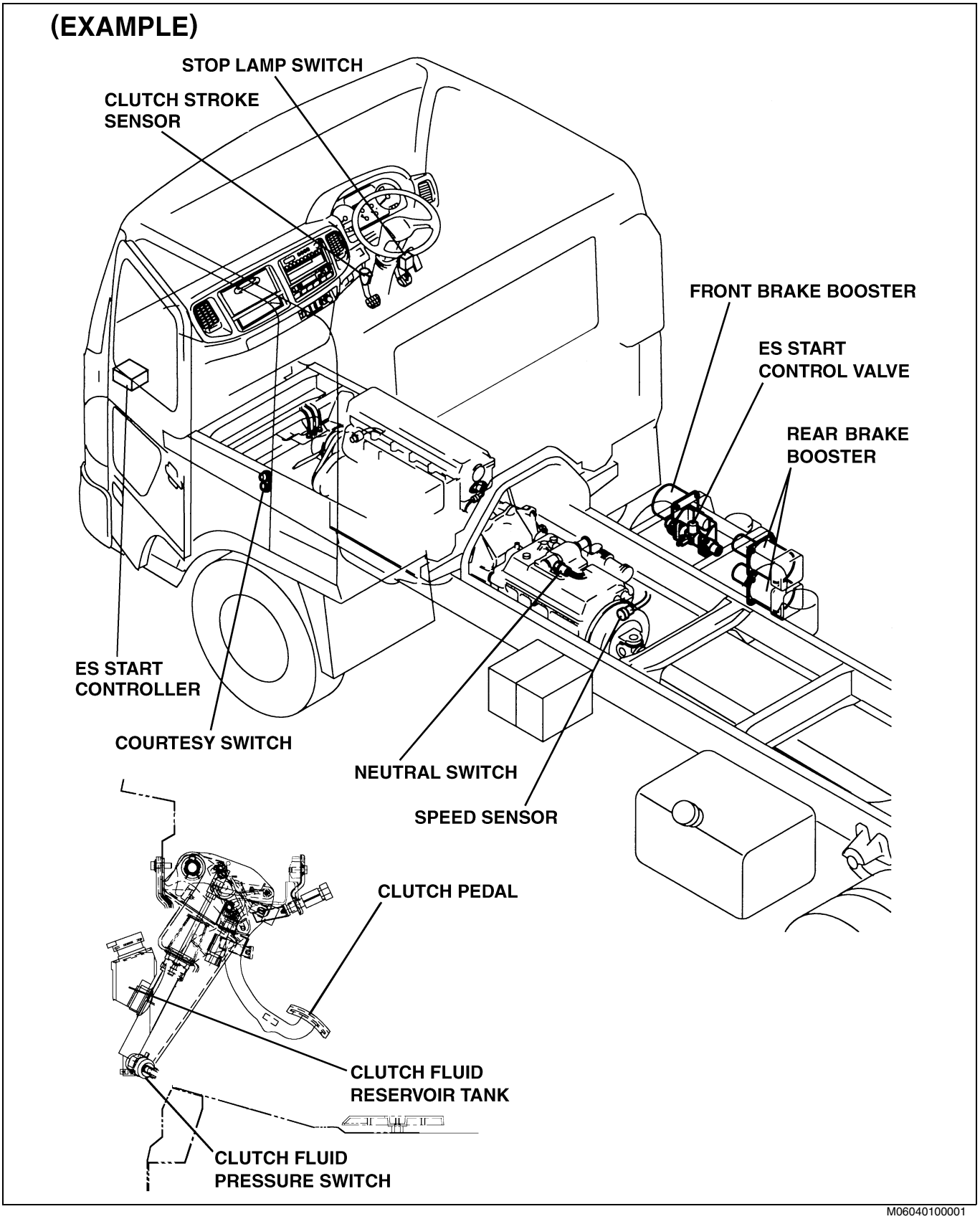
ES START BR04-2
DESCRIPTION BR04-2
DIAGRAM BR04-3
SPECIAL TOOL BR04-4
ADJUSTMENT BR04-5

ES START CONTROL VALVE BR04-10
COMPONENT LOCATOR BR04-10
OVERHAUL BR04-11
INSPECTION AND REPAIR BR04-13

ES START

DESCRIPTION

M06040101BEC1001

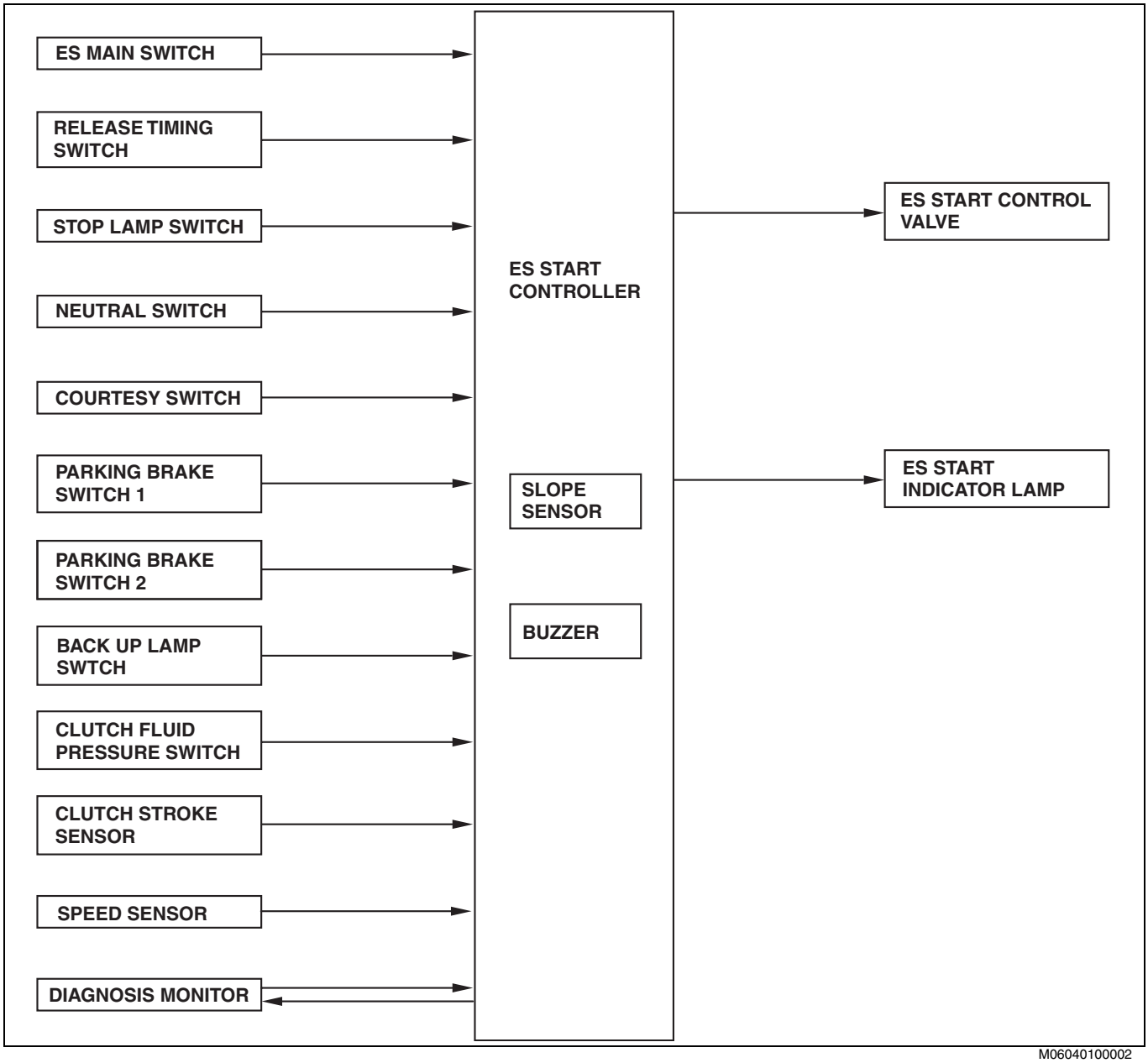


M06040100001

DIAGRAM

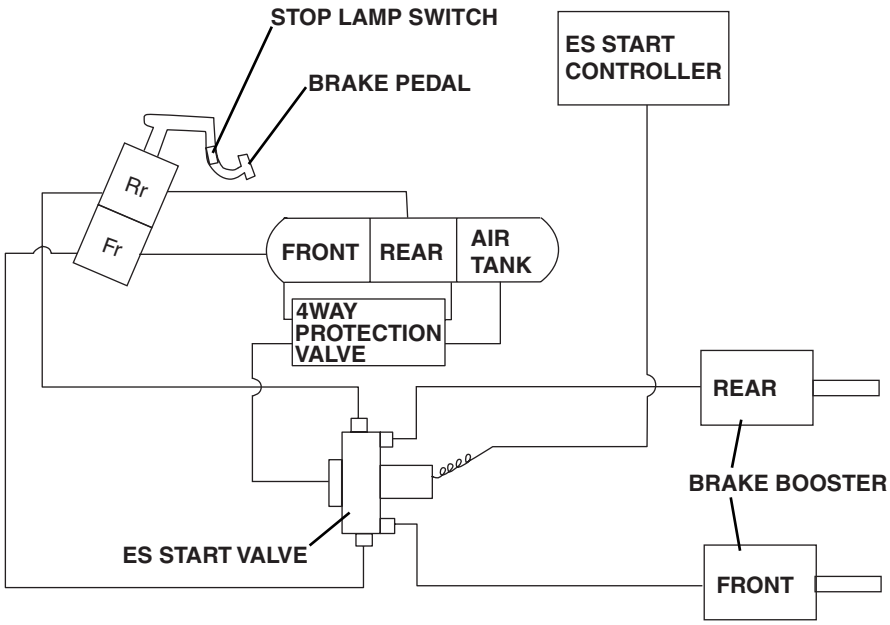
M06040101BEJ1001

SYSTEM DIAGRAM



M06040100002

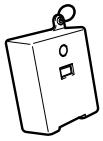
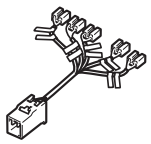
PIPING DIAGRAM



M06040100003

SPECIAL TOOL

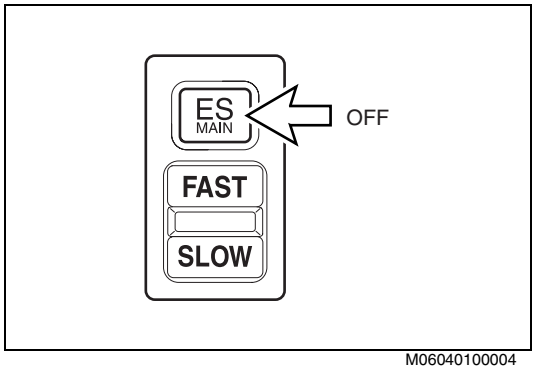
M06040101BEK1001

Illustration	Part number	Tool name	Remarks
	09630-1370	DIAGNOSIS MONITOR	FOR DIAGNOSING AND SETUP OF ES START
	09630-2300	SPECIAL WIRING HARNESS FOR INTENSIVE DIAGNOSIS CONNECTOR	FOR CONNECTING DIAGNOSIS MONITOR

ADJUSTMENT

M06040101BEH3001

NOTICE:
When replacing the clutch disc, clutch stroke sensor or ES start controller, do the following adjustment.

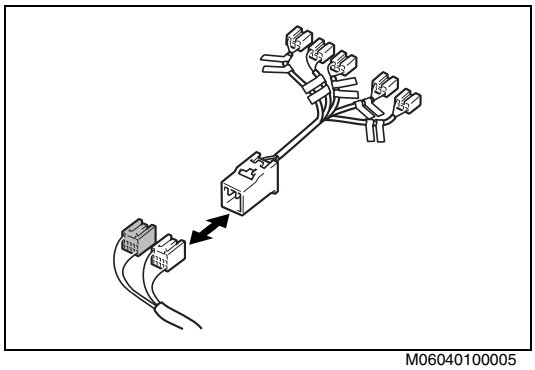


M06040100004

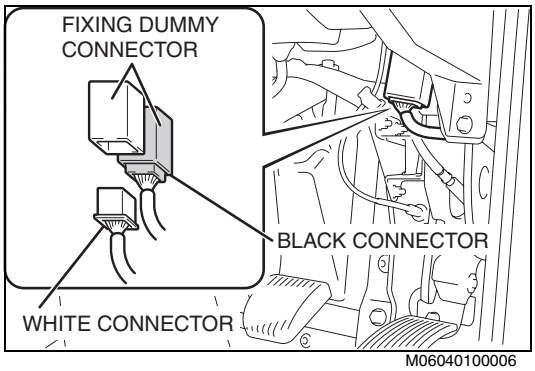
ADJUSTMENT OF THE CLUTCH STROKE SENSOR.

1. ADJUSTMENT PROCEDURE BY USING FUNCTION FOR CONFIRMATION OF THE SENSOR CONDITION.

(1) Set the starter key "ON".
(2) Set the ES main switch "OFF".

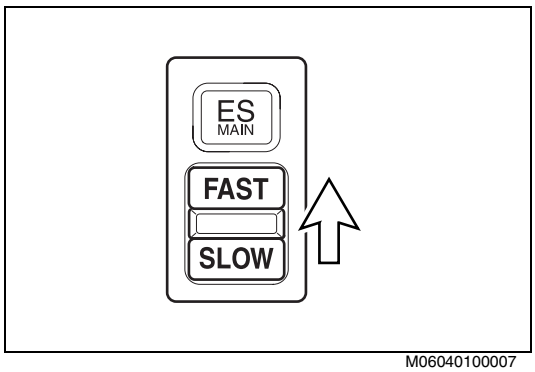

M06040100005

(3) Locate two intensive diagnosis connectors on lower right of the driver's side instrument panel. Connect the special wiring harness to the white connector and diagnosis monitor to the connector tagged by "ES start".
SST:
Special wiring harness for intensive diagnosis connector (09630-2300)
Diagnosis monitor (09630-1370)



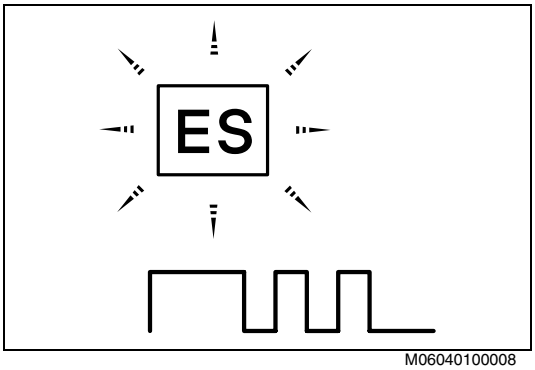
M06040100006

NOTICE:
The intensive diagnosis connector is usually connected to the fixing dummy connector. So, disconnect the connector from the dummy connector and pull it to use. When the connector is not in use, connect it firmly to the fixing dummy connector.



M06040100007

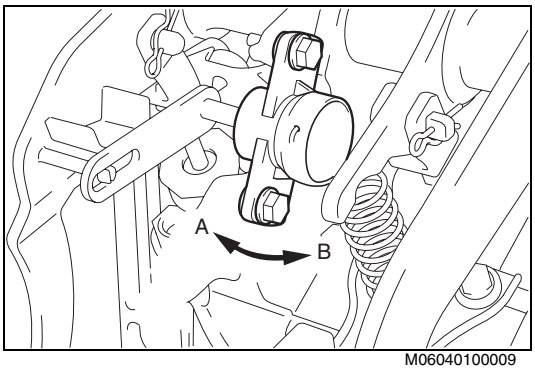
(4) Push "FAST" side of the release timing switch three times.



M06040100008

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.

(5) 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 3. How to complete.
The buzzer does not beep or beeps intermittently:
Out of the range of service limit (adjustment required) →Go to 2. Adjustment procedure.

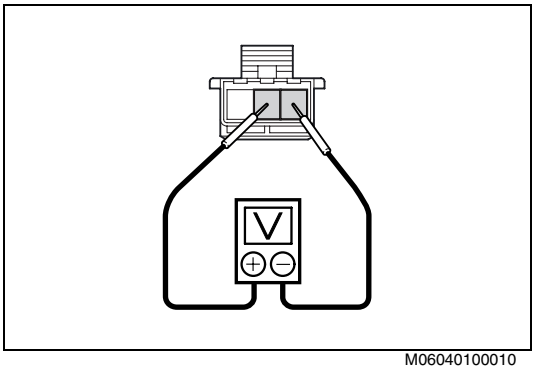


M06040100009

2. ADJUSTMENT PROCEDURE
(1) Loosen the clutch stroke sensor fitting bolt to adjust the sensor as shown in the figure.

Buzzer	Adjusting procedure
Beeping intermittently	Turn the sensor to A direction
Beeping continuously	Normal condition
No beeping	Turn the sensor to B direction

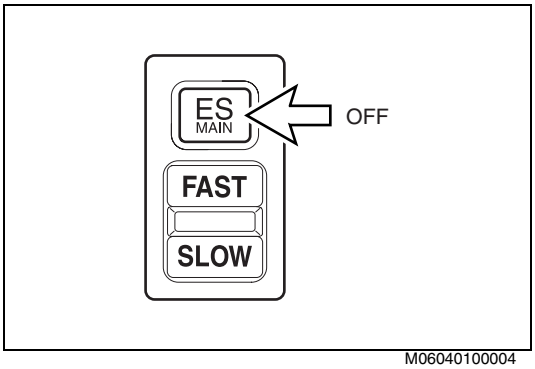
(2) After completing the adjustment, proceed to step 3.



M06040100010

3. HOW TO COMPLETE
(1) Tighten the clutch stroke sensor fitting bolt. (Make sure there is no misalignment.)
(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.

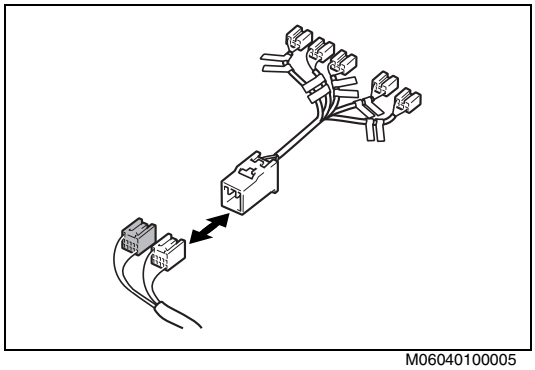
INITIALIZATION OF RELEASE POSITION



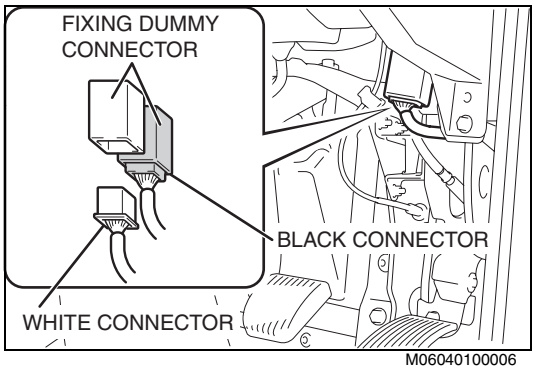
M06040100004

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 key "ON" and ES main switch "OFF". Then pull the parking brake lever.

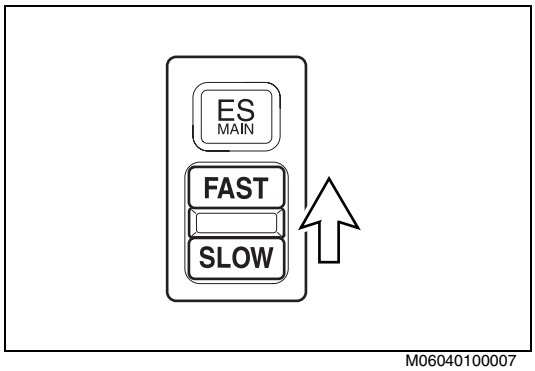

M06040100005

(2) Locate two intensive diagnosis connectors on lower right of the driver's side instrument panel. Connect the special wiring harness to the white connector and diagnosis monitor to the connector tagged by "ES start".
SST:
Special wiring harness for intensive diagnosis connector (09630-2300)
Diagnosis monitor (09630-1370)



M06040100006

NOTICE:
The intensive diagnosis connector is usually connected to the fixing dummy connector. So, disconnect the connector from the dummy connector and pull it to use. When the connector is not in use, connect it firmly to the fixing dummy connector.



M06040100007

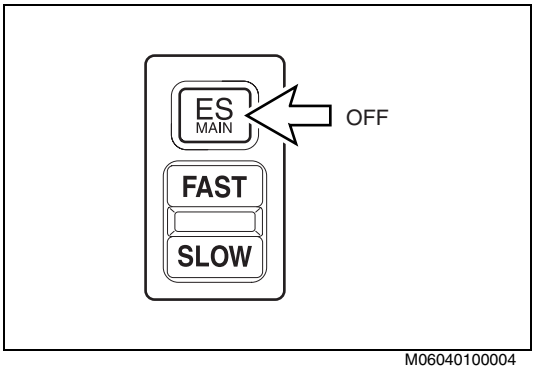
(3) Make sure that the clutch pedal has returned completely and press "FAST" side of the release timing switch for 3 seconds.

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.

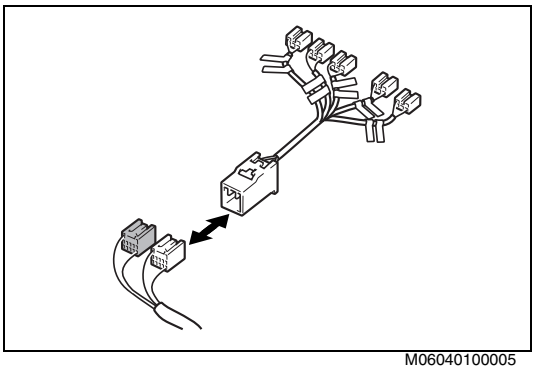
(4) Step the clutch pedal and shift the gear to the second and gradually engage the clutch.
(5) When the engine revolution comes into the condition below, press once more "FAST" side of the release timing switch.
Models equipped with mechanical governor:
Tachometer reading goes down by 50 r/min below the idling revolution.
Models equipped with electronic governor or
Tachometer reading goes down and then returns.
(6) The buzzer beeps once and ES start indicator lamp turns off and then the release position is memorized.
(7) 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 or above.
4. Parking brake lever has not been pulled.
5. Diagnosis monitor is not connected.



M06040100004


M06040100005

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.)

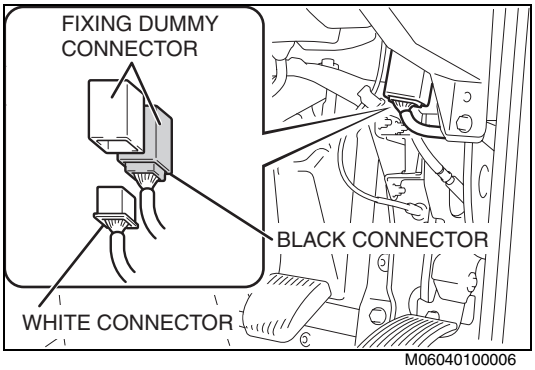
1. HOW TO SETUP

(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.

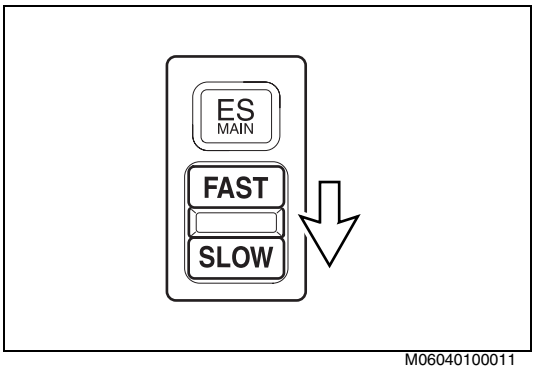
(3) Locate two intensive diagnosis connectors on lower right of the driver's side instrument panel. Connect the special wiring harness to the white connector and diagnosis monitor to the connector tagged by "ES start".

SST:
Special wiring harness for intensive diagnosis connector (09630-2300)
Diagnosis monitor (09630-1370)



M06040100006

NOTICE:
The intensive diagnosis connector is usually connected to the fixing dummy connector. So, disconnect the connector from the dummy connector and pull it to use. When the connector is not in use, connect it firmly to the fixing dummy connector.



M06040100011

(4) 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.)

(5) Press "SLOW" side of the release timing switch again.
(6) The buzzer beeps once and ES start indicator lamp turns off and then the slope sensor output value is memorized.
(7) After disconnecting the diagnosis monitor, turn the starter key to "LOCK" position to complete 0 point adjustment.

NOTICE:

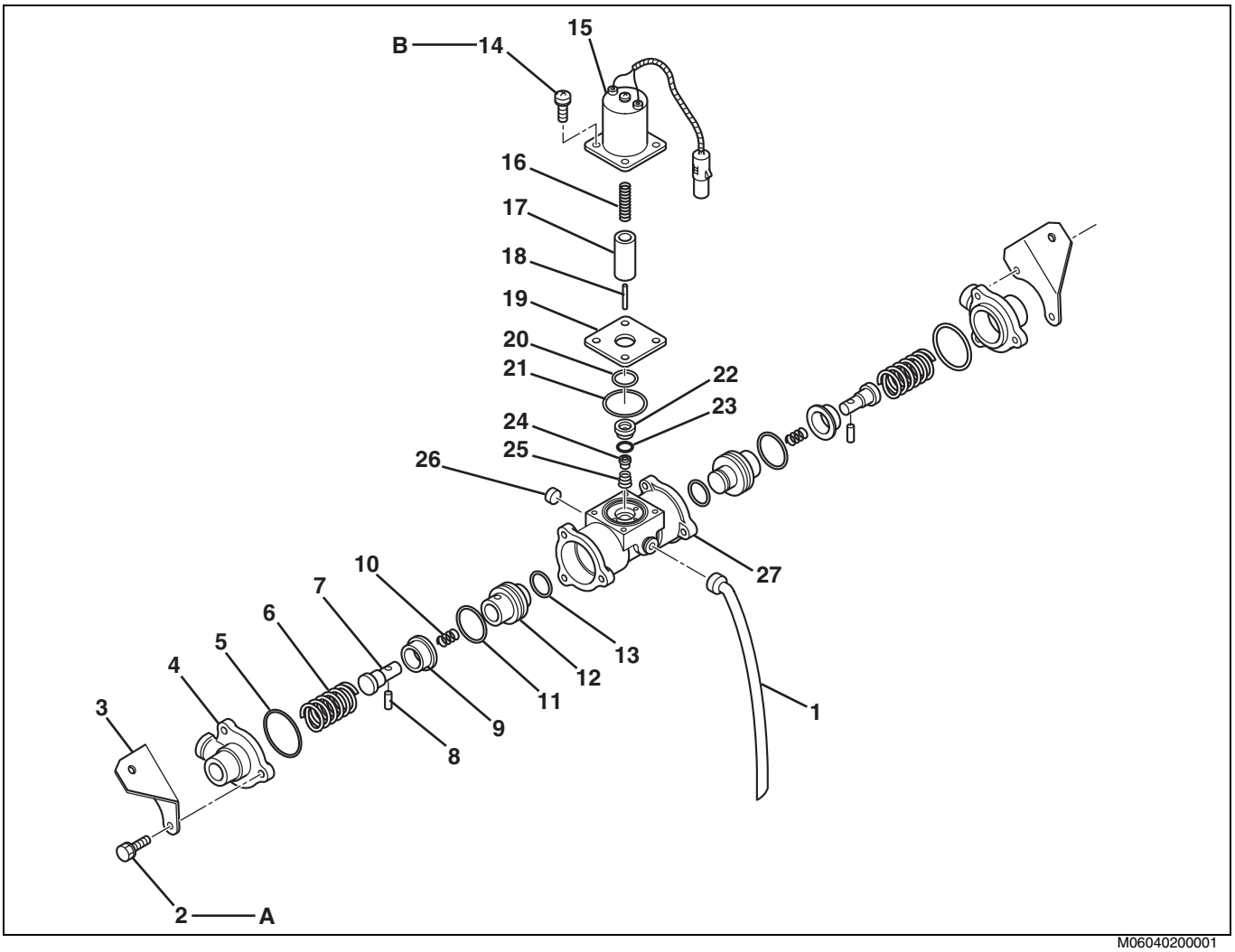
- **0 point adjustment of slope sensor must be done on the level road. (If the adjustment is done on slope road, the sensor does not function properly.)**
- **If startup of 0 point adjustment is impossible, the road condition is not on the level. Move the vehicle to a place on the level.**
- **On the following conditions, 0 point adjustment is impossible.**

1. **Failure alarm is alerting.**
2. **ES start is operating.**
3. **Vehicle speed is 0.5Km/h or above.**
4. **Parking brake lever has not been pulled.**
5. **Diagnosis monitor is not connected.**

ES START CONTROL VALVE

COMPONENT LOCATOR

M06040201BED1001



M06040200001

1	Hose	10	Spring	19	Coil cover
2	Bolt	11	O-ring	20	O-ring
3	Bracket	12	Piston	21	O-ring
4	Cover	13	O-ring	22	Valve seat
5	Seal	14	Screw	23	O-ring
6	Spring	15	Solenoid assembly	24	Valve
7	Inlet valve	16	Spring	25	Spring
8	Straight pin	17	Plunger	26	Filter
9	Spring seat	18	Rod	27	Body

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

A	4.0-6.0 {40-60, 2.9-4.3}	B	1.3-1.7 {13-17, 0.49-1.22}

OVERHAUL

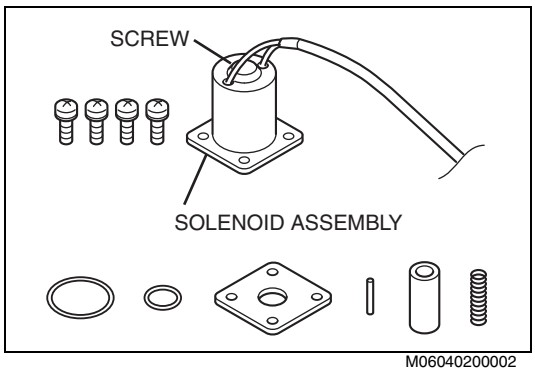
M06040201BEH2001

IMPORTANT POINTS - 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.**

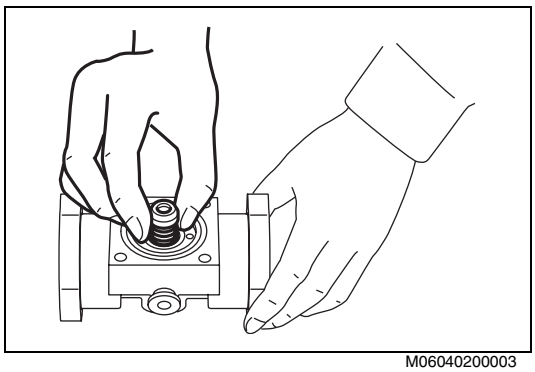
IMPORTANT POINTS - DISASSEMBLY



M06040200002

NOTICE:
Never loosen the screws in the solenoid assembly. Replace the solenoid assembly if the screws have been loosened.

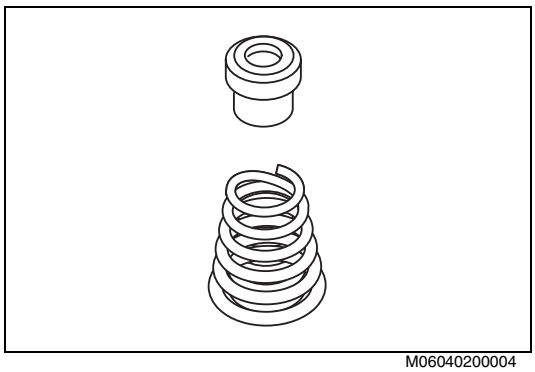
IMPORTANT POINTS - ASSEMBLY



M06040200003

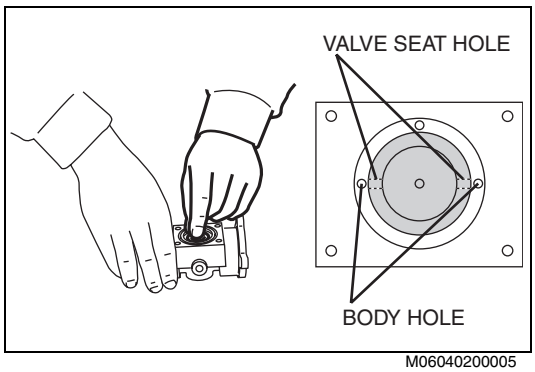
NOTICE:
Apply an adequate amount of grease to each O-ring before assembly.

1. **Insert the spring in the valve and assemble it in the body.**



M06040200004

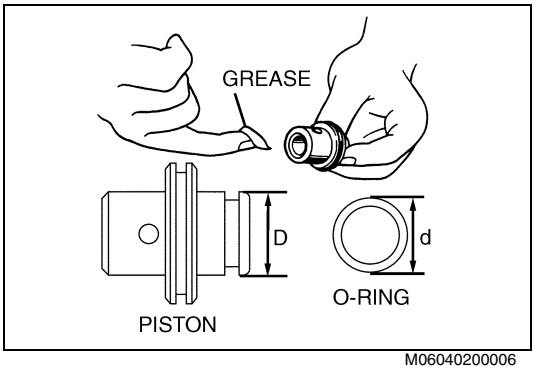
NOTICE:
Assemble the valve and the spring as shown in the figure.



M06040200005

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.

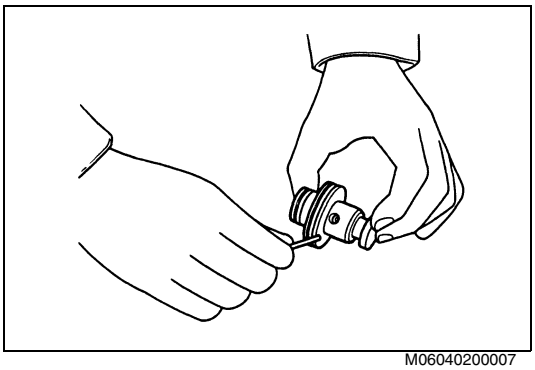


M06040200006

3. Assemble the O-rings (2 units) in the piston and lubricate the inside diameter of the piston with grease.

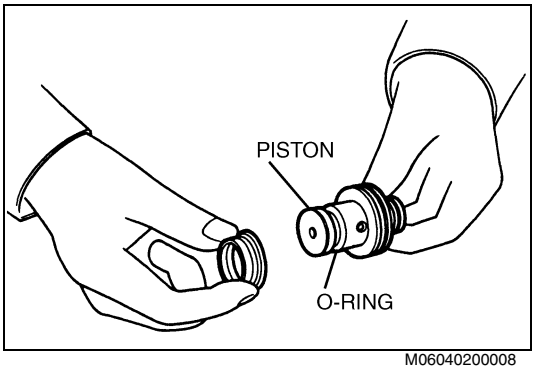
NOTICE:
Verify the diameter of the O-ring (small diameter) because there are multiple settings and then assemble the unit.

D dimension = 22 mm {0.87 in.}
d dimension = 22 mm {0.87 in.}


M06040200007

4. Assemble the spring, piston and inlet valve. Press in the inlet valve and install the straight pin.

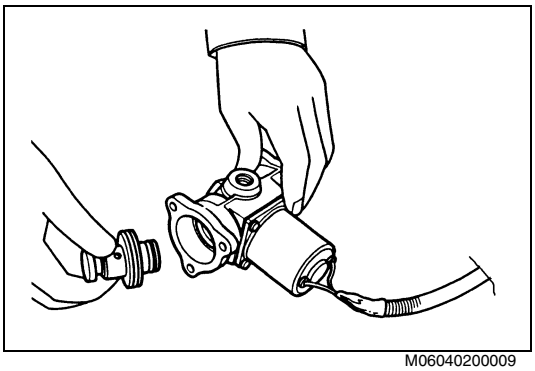
NOTICE:
Align the inlet valve pin hole and piston pin hole and assemble the parts. After the assembly is completed, do not rotate the inlet valve to align the pin holes.



M06040200008

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.


M06040200009

7. Apply grease to the inner surface of the body.

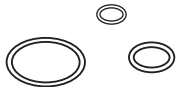
8. Insert the piston inlet valve assembly in the body.

NOTICE:
Do not turn the piston when inserting it.

INSPECTION AND REPAIR

M06040201BEH3001

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

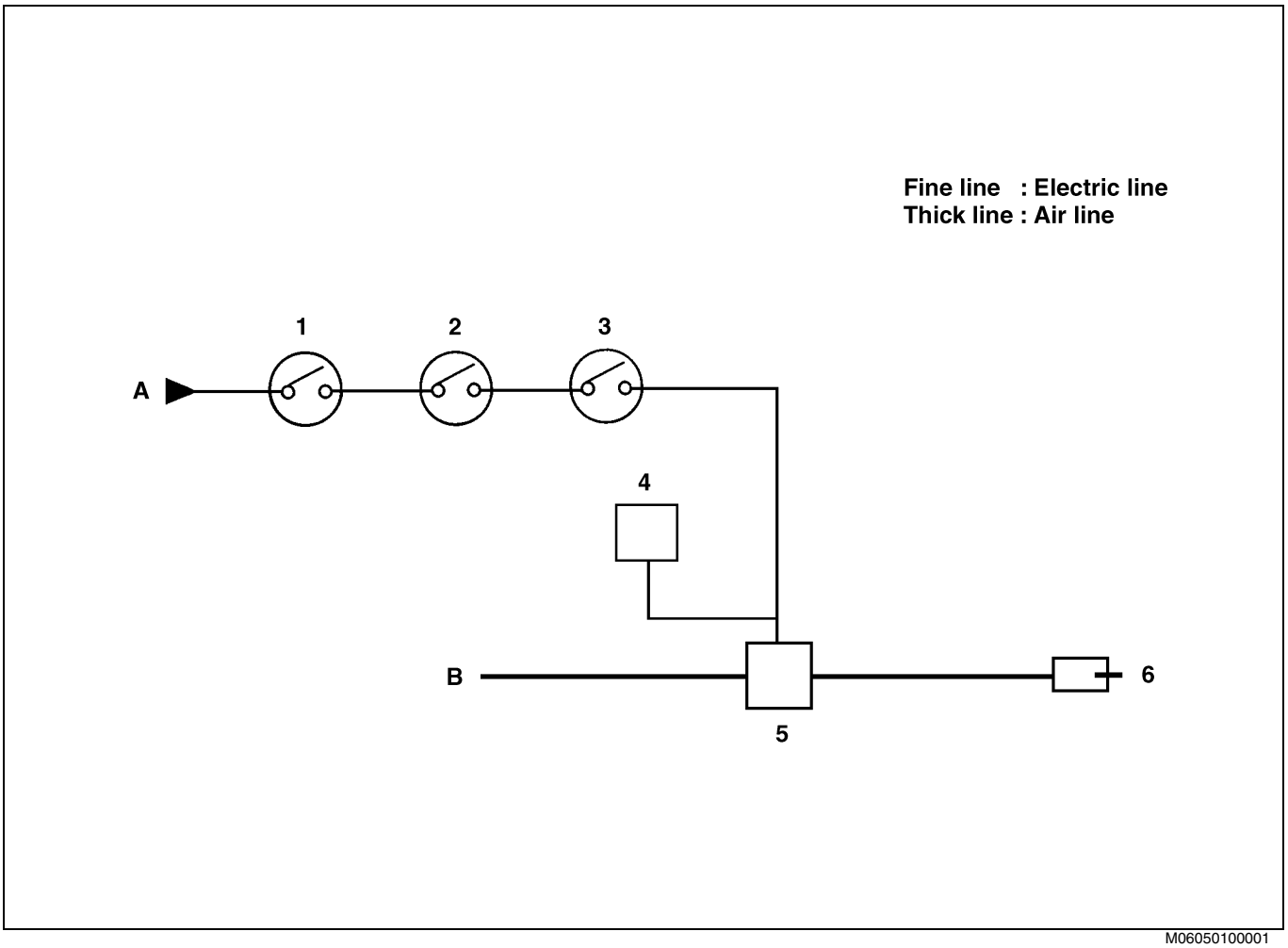
EXHAUST BRAKE SYSTEM BR05-2
SYSTEM DIAGRAM BR05-2
TROUBLESHOOTING BR05-3
ADJUSTMENT BR05-3

BRAKE CYLINDER.....BR05-4
DATA AND SPECIFICATIONS BR05-4
DESCRIPTION BR05-4
COMPONENT LOCATOR BR05-5
OVERHAUL BR05-6
INSPECTION AND REPAIR BR05-6
ADJUSTMENT BR05-7

EXHAUST BRAKE SYSTEM

SYSTEM DIAGRAM

M06050101BEJ1001



M06050100001

1	Clutch switch	5	Magnetic valve
2	Accelerator switch	6	Exhaust brake control cylinder
3	Exhaust brake switch	A	From power source
4	Indicator lamp	B	From air tank

NOTICE:
Figure shown above is a typical diagram; refer to DIAGRAM in the ELECTRIC WIRE chapter and DIAGRAM in the BRAKE EQUIPMENT chapter for details.

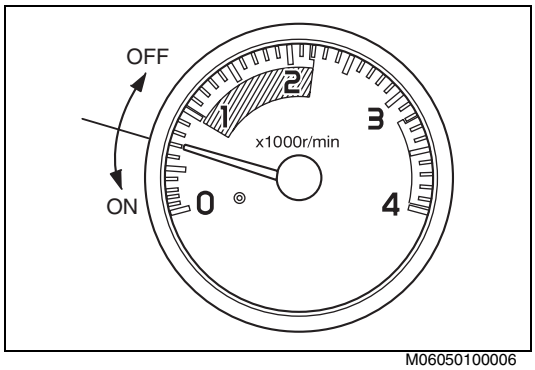
TROUBLESHOOTING

M06050101BEF3001

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

M06050101BEH3001



M06050100006

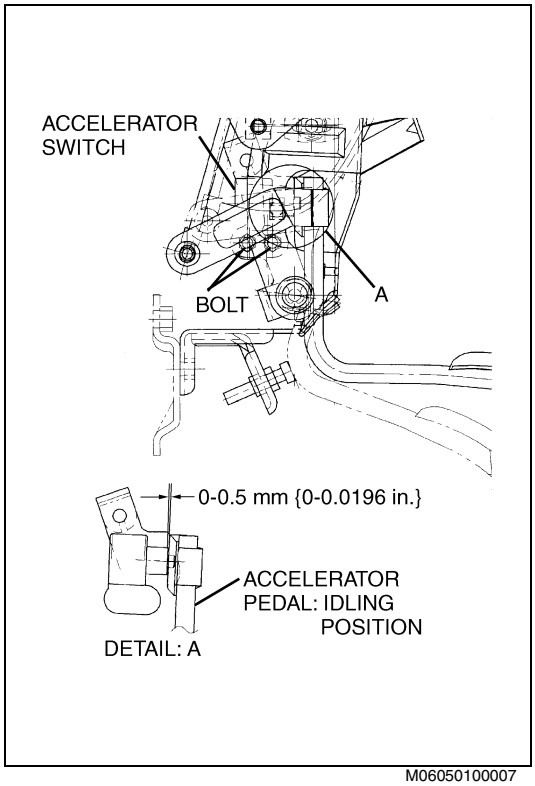
ACCELERATOR SWITCH ADJUSTMENT

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.



M06050100007

(3) Adjust the accelerator switch position if it is out of position.

Unit: r/min.

Engine speed	
Idling speed	**Accelerator switch turns on or off**
650	**550-700**

BRAKE CYLINDER

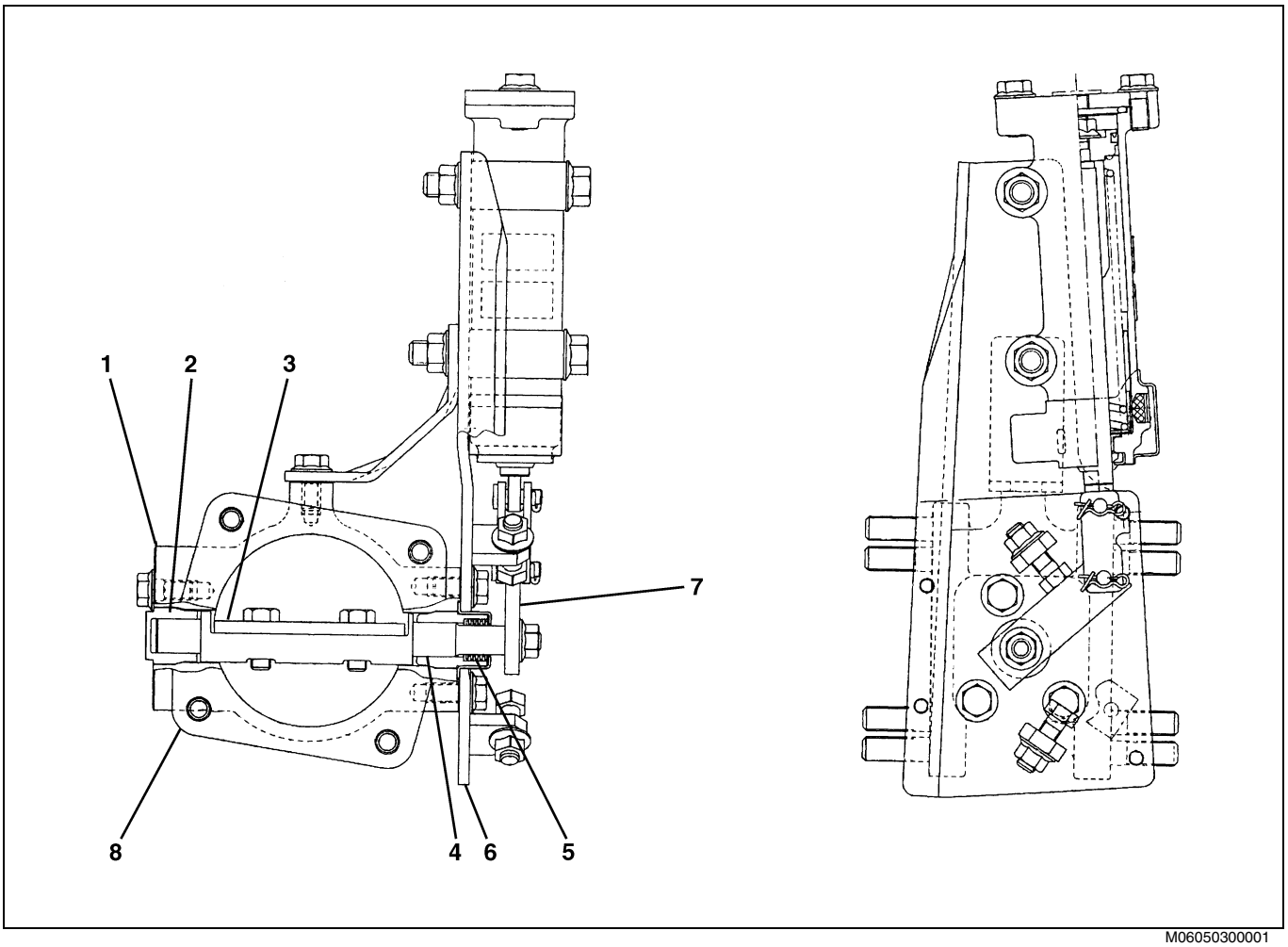
DATA AND SPECIFICATIONS

M06050301BEI2001

Type	Butterfly valve

DESCRIPTION

M06050301BEC1001

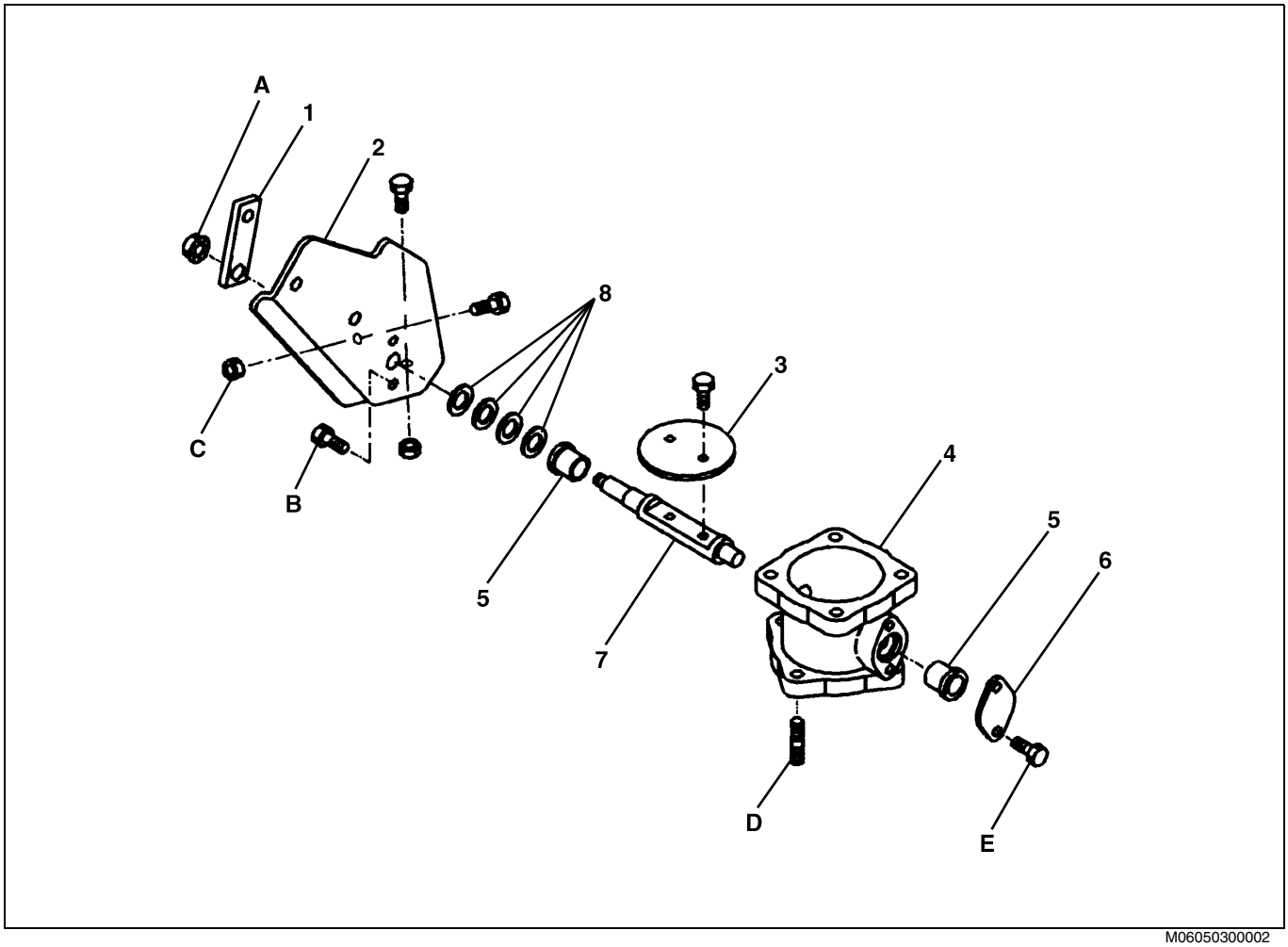


M06050300001

1	**Blind plate**	**5**	**Seal ring**
2	**Bushing**	**6**	**Plate**
3	**Valve**	**7**	**Lever**
4	**Shaft**	**8**	**Cylinder**

COMPONENT LOCATOR

M06050301BED1001



M06050300002

1	Lever	5	Bushing
2	Plate	6	Blind plate
3	Valve	7	Shaft
4	Cylinder	8	Seal ring

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

A	10.8-16.7 {120-170, 9-12}	D	19.6-24.5 {200-240, 15-17}
B	22.6-28.4 {240-280, 18-20}	E	22.6-28.4 {240-280, 18-20}
C	10.8-16.7 {120-170, 9-12}		

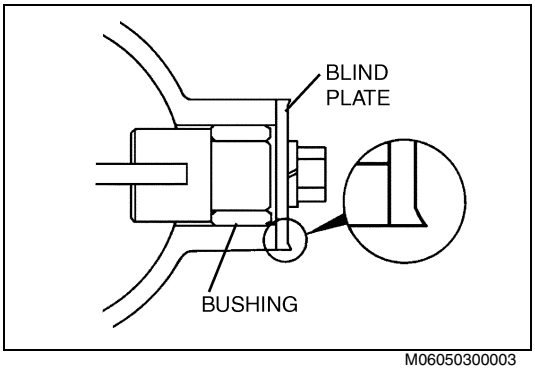
OVERHAUL

M06050301BEH2001

IMPORTANT POINT - DISMOUNTING

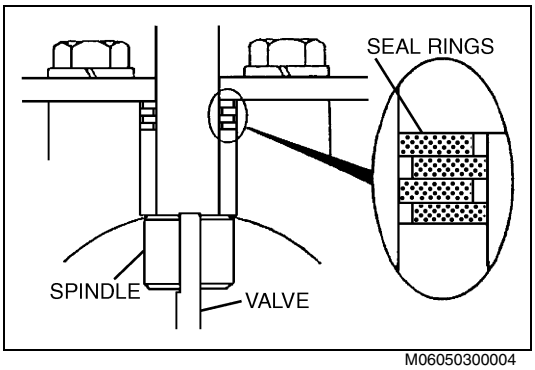
CAUTION:
Do not work on the exhaust brake cylinder while it is still hot. This can result in personal injury.

IMPORTANT POINTS - ASSEMBLY



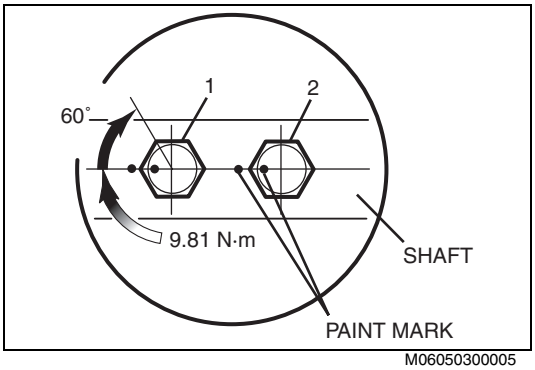
M06050300003

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.



M06050300004

2. INSTALLATION OF THE SEAL RINGS
(1) The small and large seal rings must be installed alternately as shown in the figure.



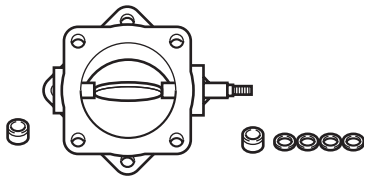
M06050300005

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.

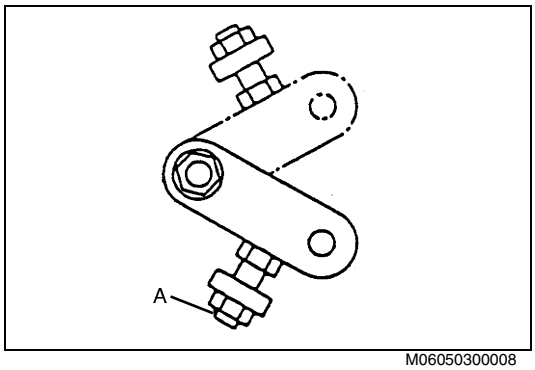
INSPECTION AND REPAIR

M06050301BEH3001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Brake cylinder, bushing and seal ring: Wear, any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 

ADJUSTMENT

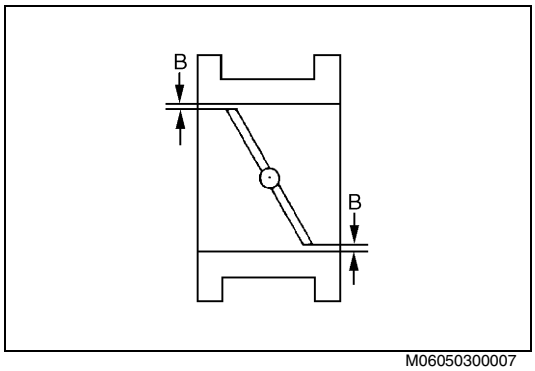
M06050301BEH3002



M06050300008

1. CLOSE SIDE ADJUSTMENT

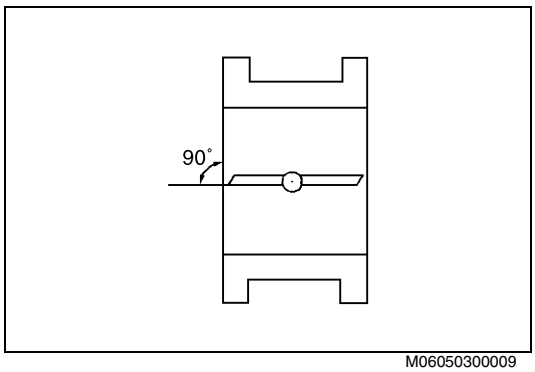
(1) Adjust the clearance between the cylinder and the butterfly valve with the adjusting screw "A".



M06050300007

Limit: B = 0.1 mm {0.0039 in.}

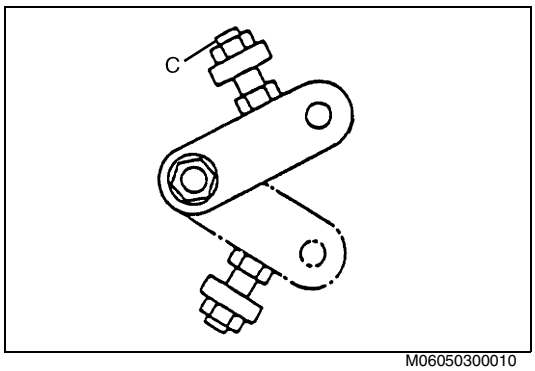
(2) Lock the adjusting screw "A" with a lock nut.



M06050300009

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.



M06050300010

PARKING BRAKE

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 BR07-7
INSPECTION AND REPAIR BR07-9
ADJUSTMENT BR07-10

PARKING BRAKE ASSEMBLY

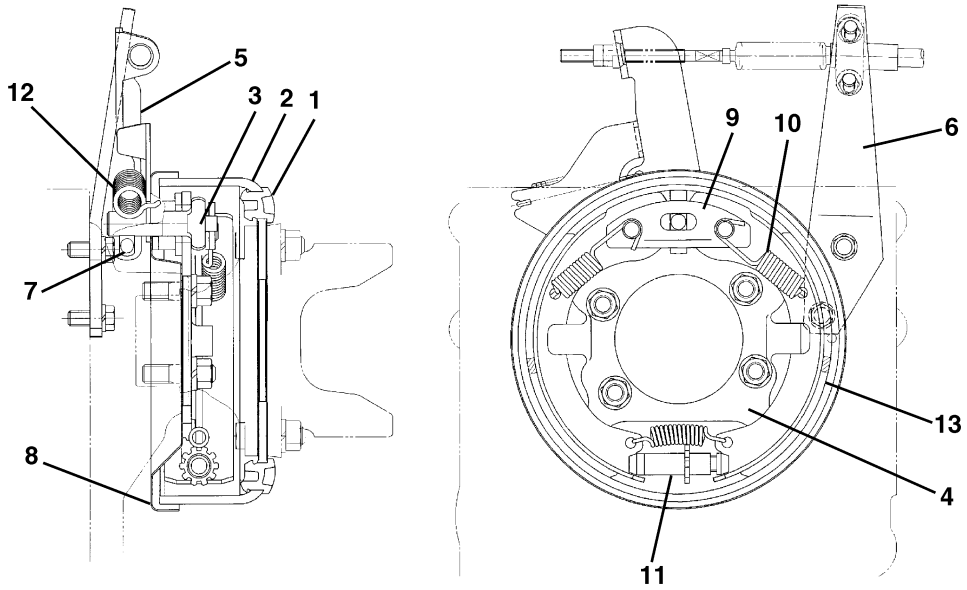
DATA AND SPECIFICATIONS

M06070101BEI2001

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

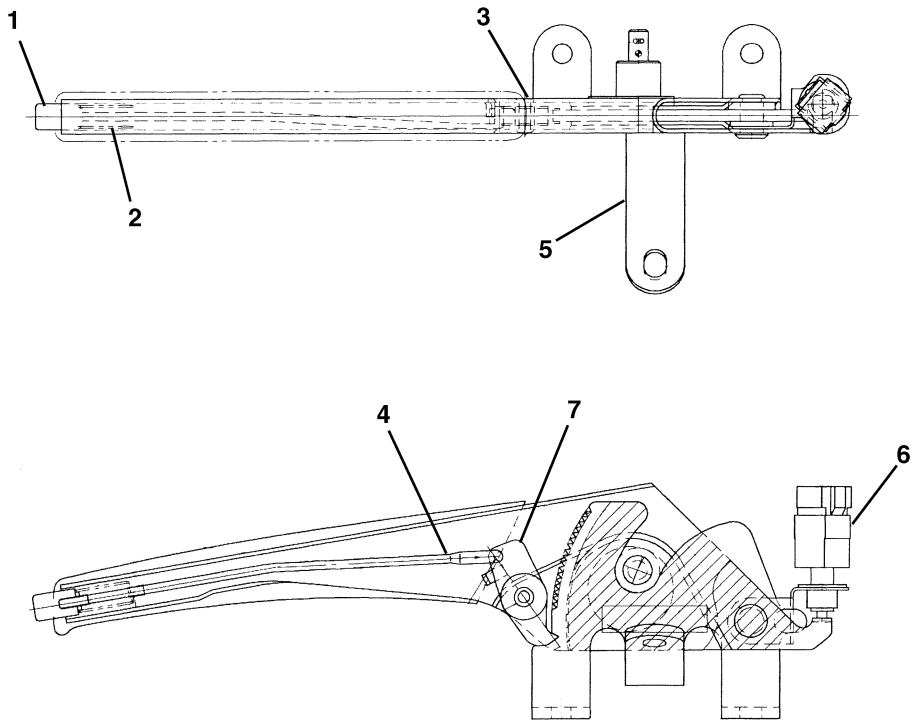
M06070101BEC1001



M06070100001

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)



M06070100002

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

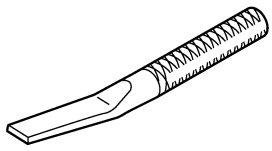
M06070101BEF3001

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

M06070101BEK1001

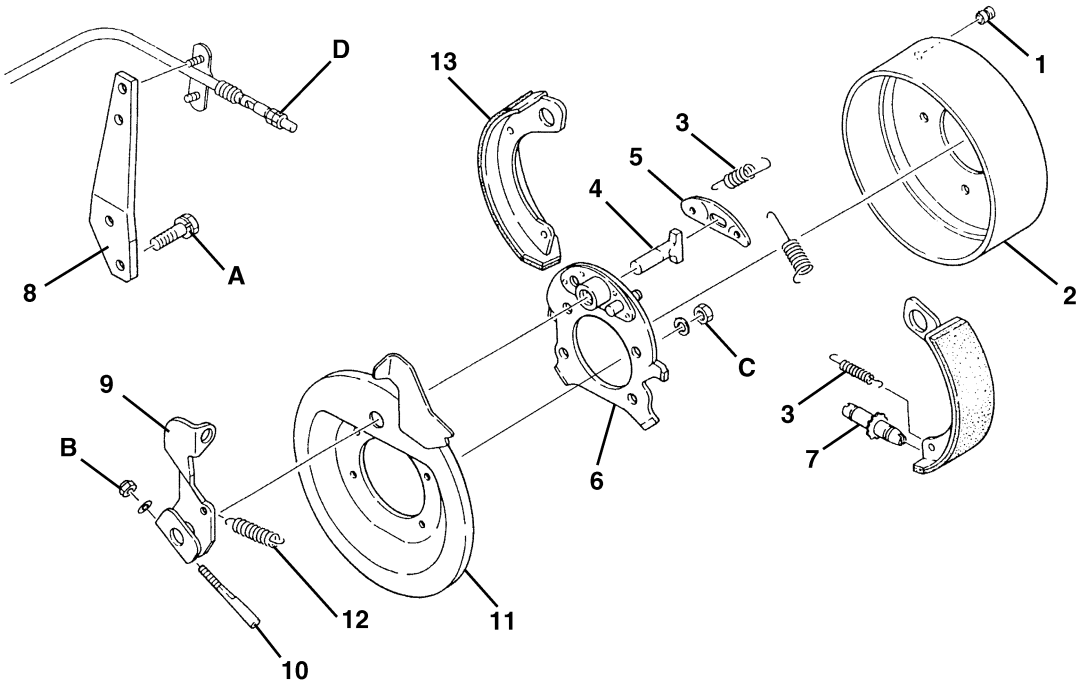
Prior to starting a parking brake adjustment, it is necessary to have the special tool.

Illustration	Part number	Tool name	Remarks
	09665-1250	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

M06070101BED1001

PARKING BRAKE



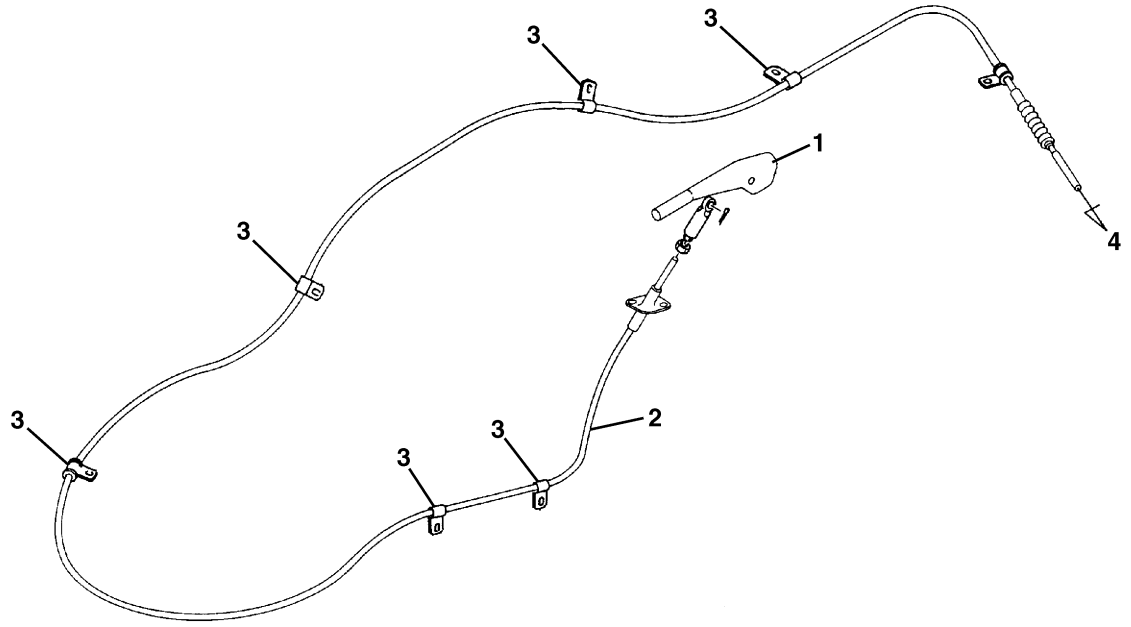
M06070100022

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}**

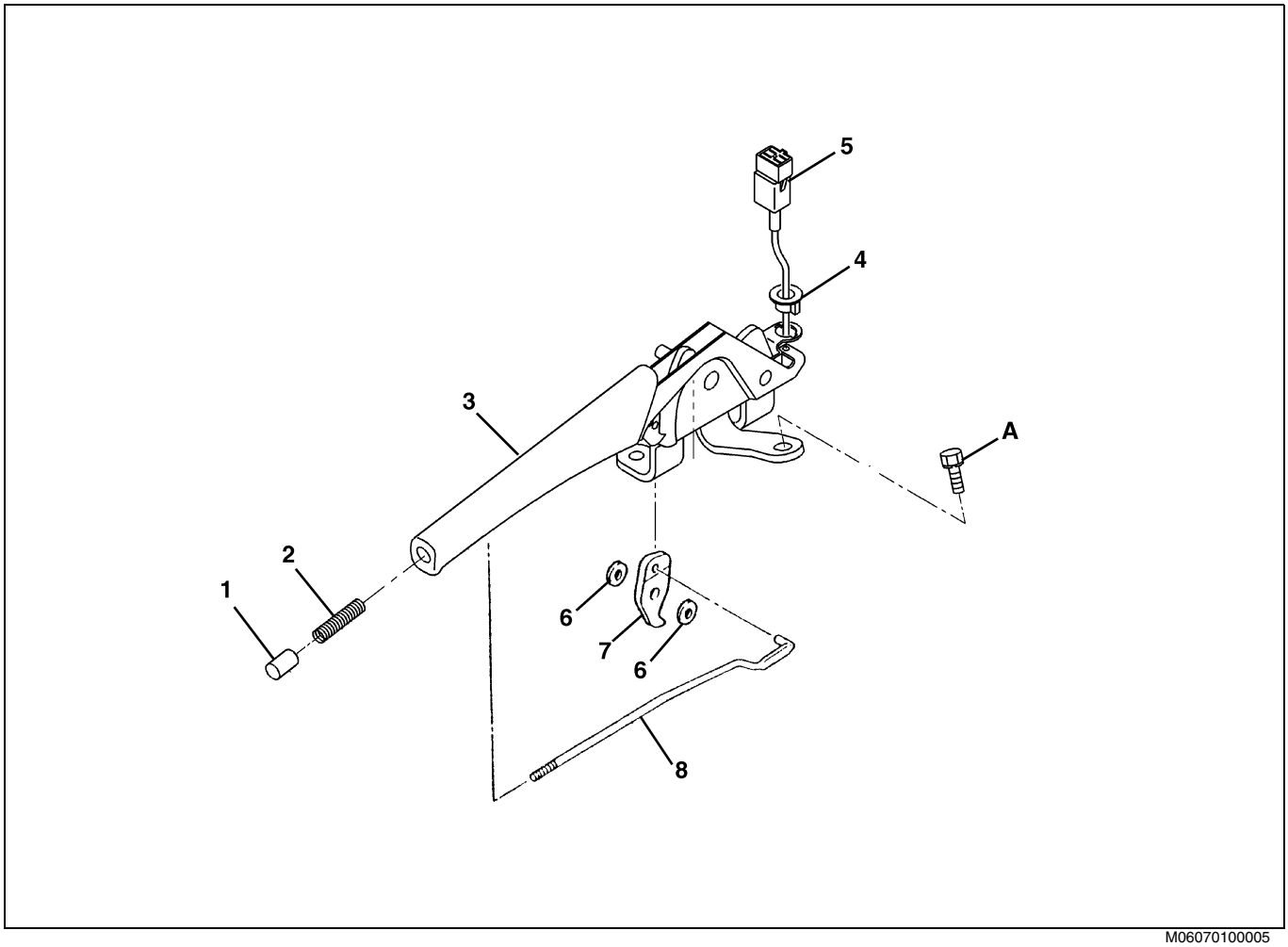
A	34.5-51.5 {351-527, 26-38}	C	88.5-117.5 {900-1,200, 66-86}
B	12.7-21.6 {130-220, 10-15}	D	18-26 {180-260,13-19}

(REPRESENTATIVE TYPE)



M06070100021

1	Parking brake lever assembly	3	Clips
2	Cable	4	To parking brake



M06070100005

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}		

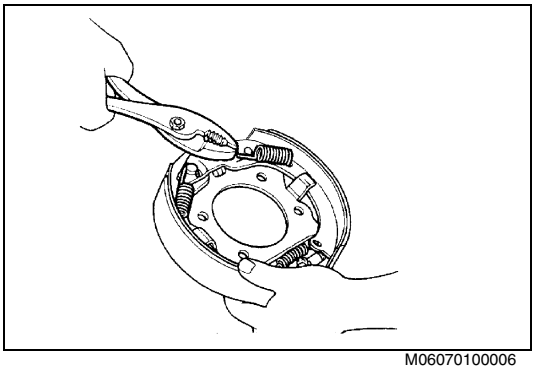
OVERHAUL

M06070101BEH2001

IMPORTANT POINTS - DISMOUNTING

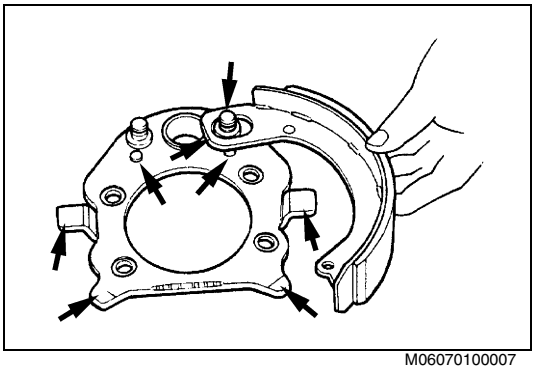
1. DISCONNECT THE PROPELLER SHAFT.
(1) Refer to chapter PROPELLER SHAFT.

2. REMOVE THE LOCK NUT AND TRANSMISSION OUTPUT SHAFT FLANGE.
(1) Refer to chapter TRANSMISSION.


M06070100006

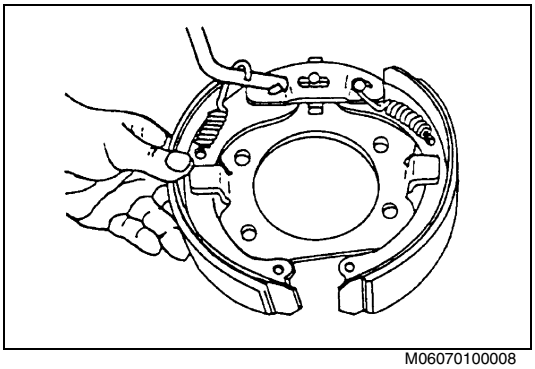
IMPORTANT POINT - DISASSEMBLY

1. REMOVE THE RETURN SPRING.
(1) Use the suitable tool to remove the return spring.

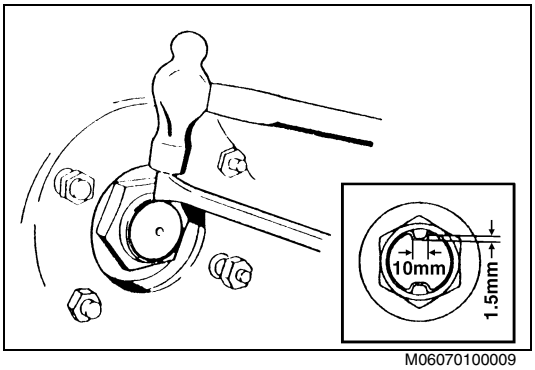

M06070100007

IMPORTANT POINTS - ASSEMBLY

1. APPLY HEAT RESISTANCE GREASE ON RUBBING OR MATCHING FACES OF BRAKE SHOES, CAMSHAFT, SHOE ADJUSTER AND POSITION THE ADJUSTER IN PLACE.


M06070100008

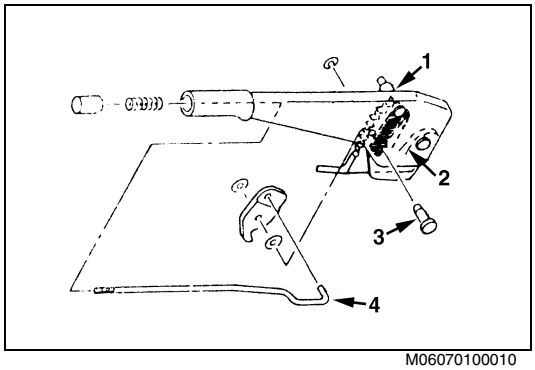
2. INSTALL THE RETURN SPRING.
(1) Use the suitable tool to install the return spring.



M06070100009

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.

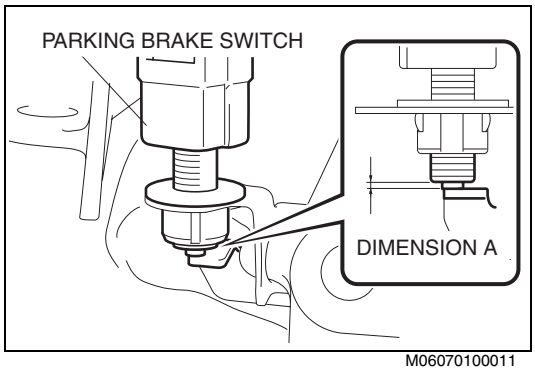
NOTICE:
- **Caulked portion should be fitted in the groove thoroughly.**
- **Caulking should be done without rift.**



M06070100010

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



M06070100011

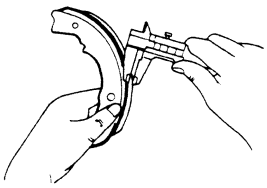
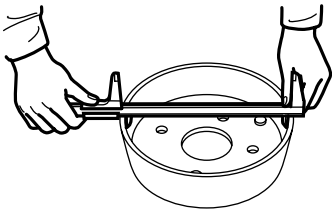
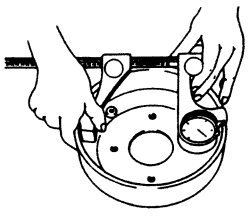
5. PARKING BRAKE SWITCH.

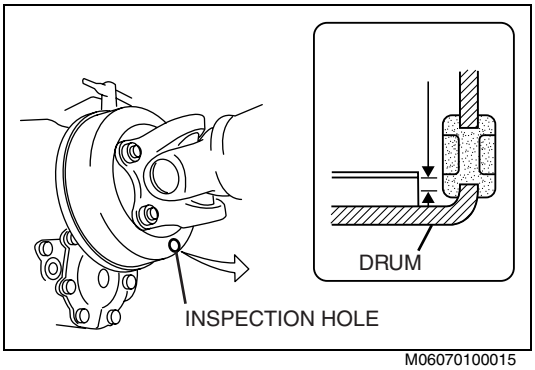
(1) Install the switch to the brake lever bracket.
(2) Adjust the dimension A (Switch button projection) to 2.0 mm {0.0787 in.} when the parking brake lever is fully released.
(3) Confirm the parking brake indicator lamp lights, when the lever is pulled by the notches.

INSPECTION AND REPAIR

M06070101BEH3001

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** 



M06070100015

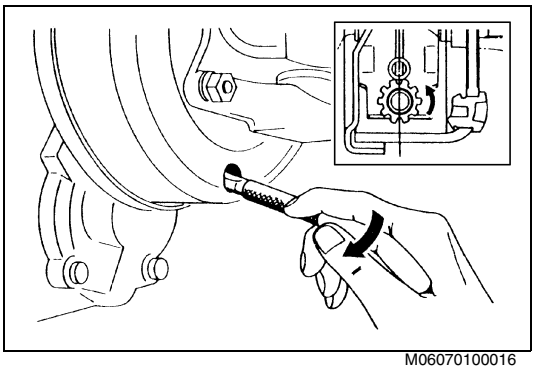
ADJUSTMENT

M06070101BEH3002

1. CHECK THE REMAINING THICKNESS OF THE BRAKE LINING.

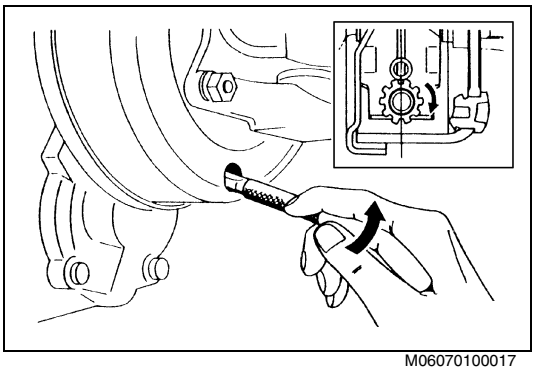
(1) Measure the remaining thickness of lining through the inspection hole of brake drum. Replace the brake shoe assembly when it is worn to the service limit.

Assembly standard	**5.0 mm {0.1969 in.}**
Service limit	**1.0 mm {0.0394 in.}**


M06070100016

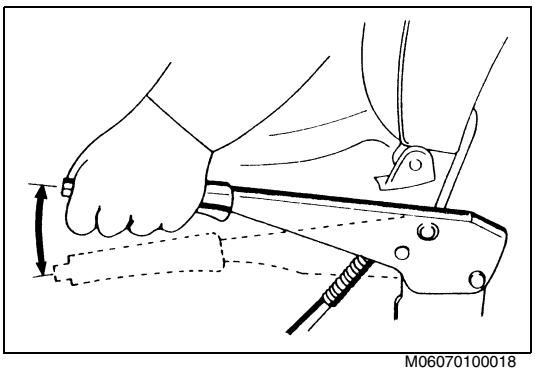
2. ADJUST THE CLEARANCE BETWEEN DRUM AND LINING.

(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 (09665-1250)

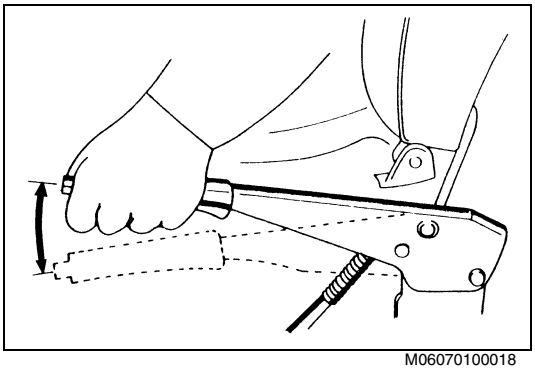

M06070100017

(4) Turn the adjuster backward by specified notches.

Specified notches: 14 notches

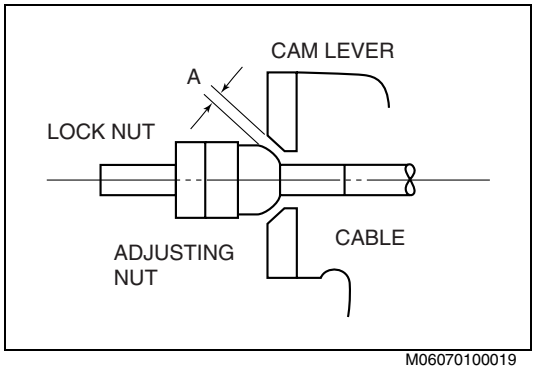

M06070100018

(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.


M06070100018

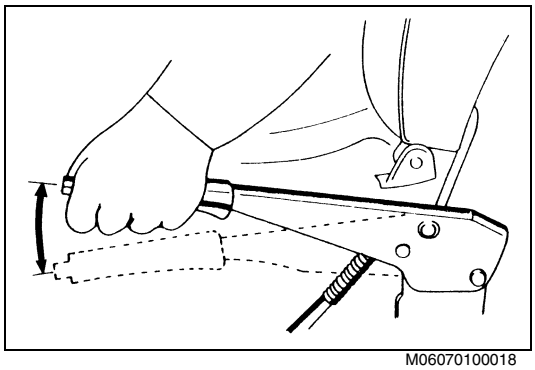
3. ADJUST THE CONTROL CABLE.

(1) Pull the parking brake lever fully to three times and release the lever.

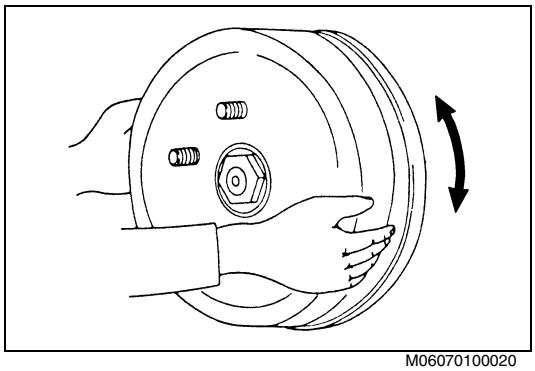


M06070100019

(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.


M06070100018

(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


M06070100020

(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

M07010102BEF3002

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 chapter FRONT AXLE.
	Power steering system is faulty.	Refer to 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 chapter FRONT AXLE.
	Power steering gear badly adjusted.	Refer to 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 chapter POWER STEERING.

STEERING UNIT

SR02-001

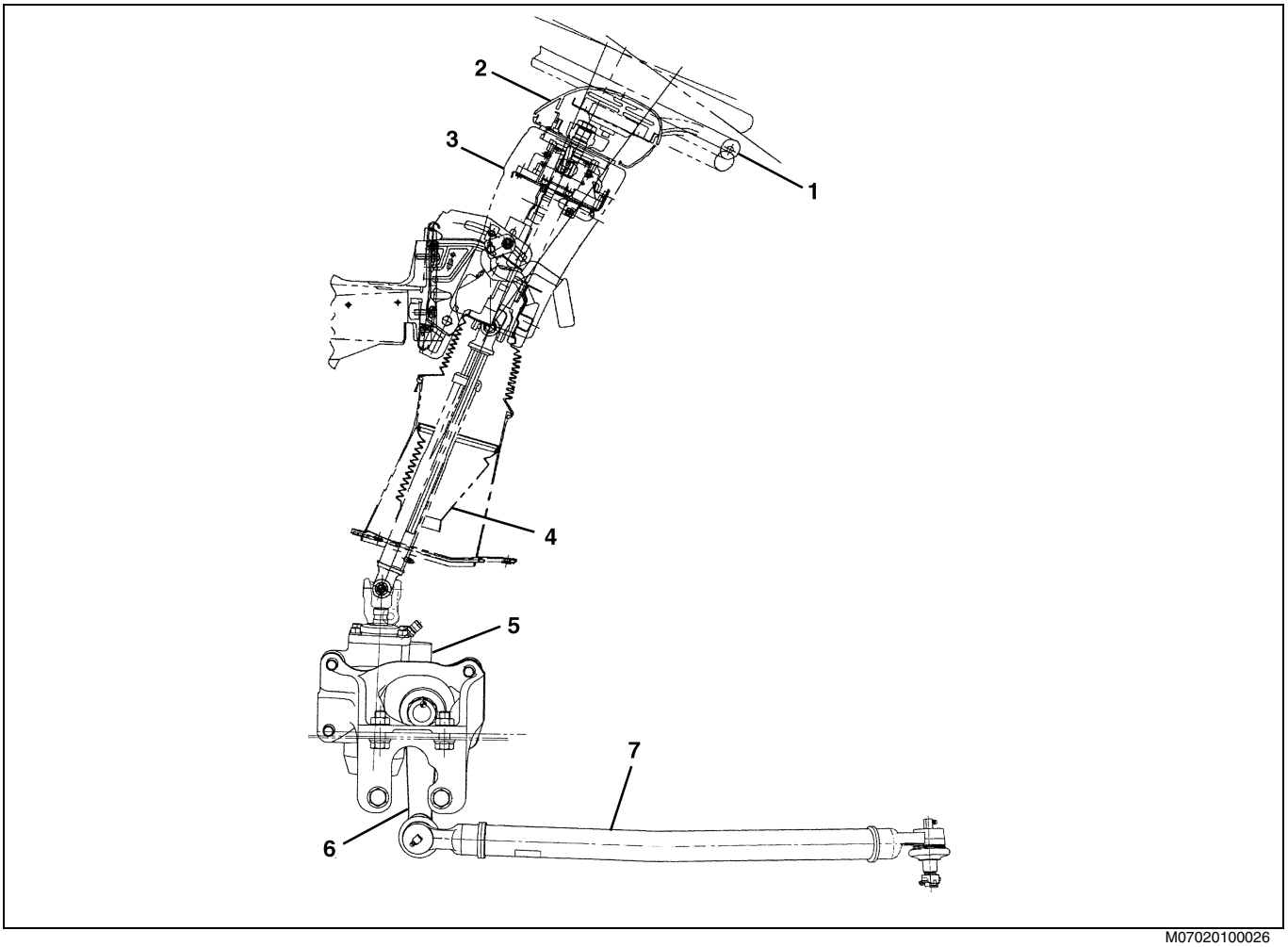
STEERING LINKAGE SR02-2
DESCRIPTION SR02-2
COMPONENT LOCATOR SR02-3
SPECIAL TOOL SR02-4
OVERHAUL SR02-4
INSPECTION AND REPAIR SR02-9

STEERING GEAR UNIT SR02-10
DATA AND SPECIFICATIONS SR02-10
DESCRIPTION SR02-10
SPECIAL TOOL SR02-11
COMPONENT LOCATOR SR02-12
OVERHAUL SR02-13
INSPECTION AND REPAIR SR02-15

STEERING LINKAGE

DESCRIPTION

M07020101BEC1001

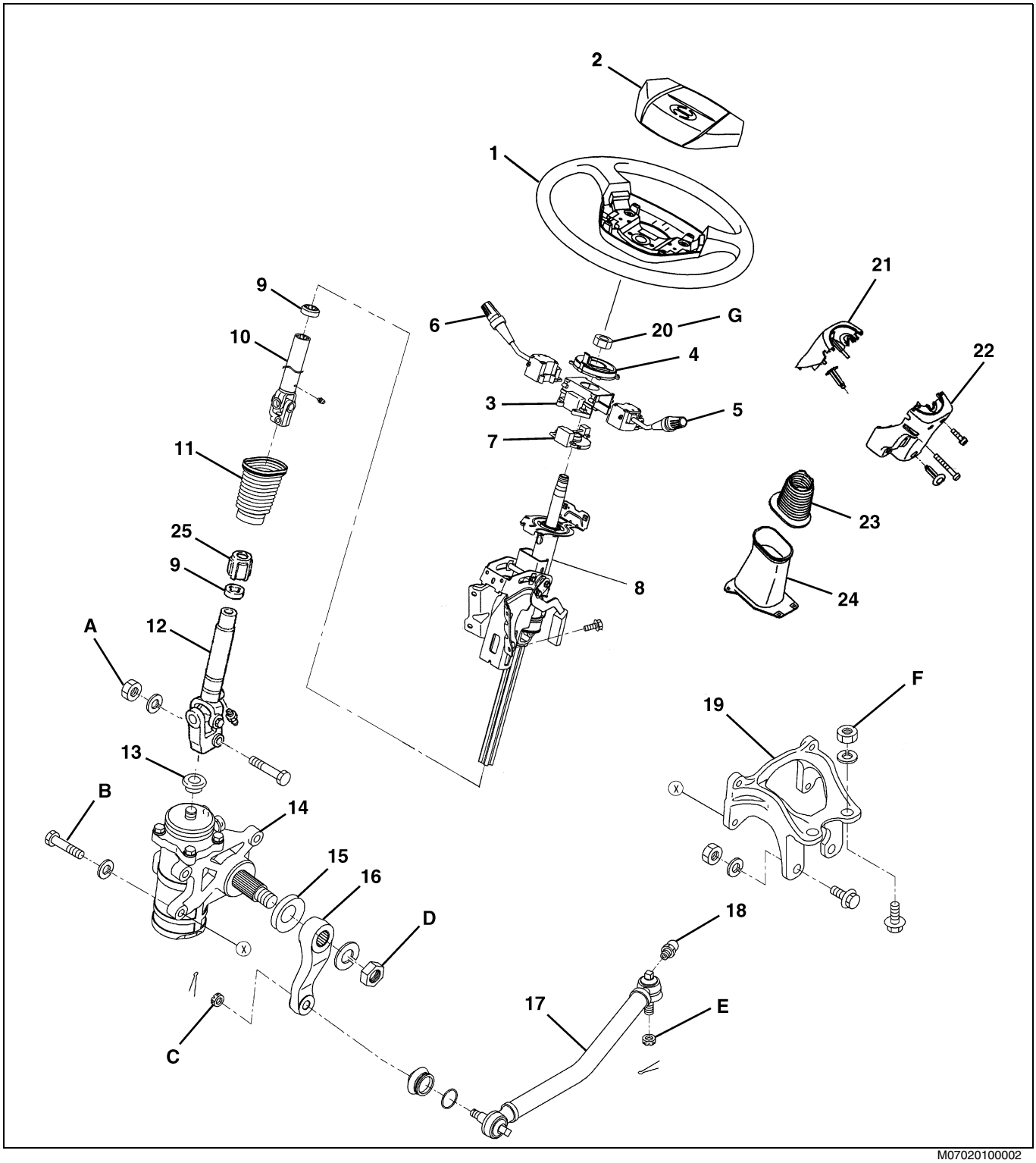


M07020100026

1	Steering wheel	5	Steering gear unit
2	Horn button	6	Pitman arm
3	Steering column assembly	7	Drag link
4	Dust cover		

COMPONENT LOCATOR

M07020101BED1002



M07020100002

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		

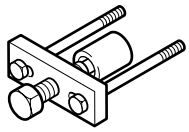
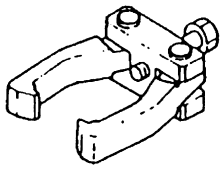
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	**48.5-57.5 {500-600, 37-43}**	**E**	**146-244 {1,489-2,488, 108-179}**
B	**146-224 {1,489-2,284, 108-165}**	**F**	**206-284 {2,100-2,895, 152-209}**
C	**146-244 {1,489-2,488, 108-179}**	**G**	**48.5-77.5 {500-800, 37-57}**
D	**ϕ27: 211-289 {2,152-2,946, 156-213}**		
	ϕ30: 341-439 {3,478-4,476, 252-323}		

SPECIAL TOOL

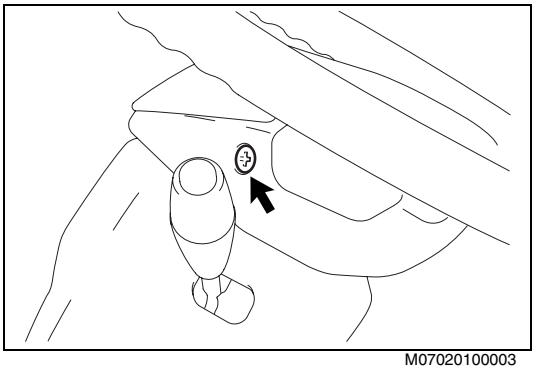
M07020101BEK1001

Prior to starting a steering linkage overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09650-1341	STEERING WHEEL PULLER	
	09657-2050	GUIDE	
	09650-1260	PITMAN ARM PULLER	

OVERHAUL

M07020101BEH2001



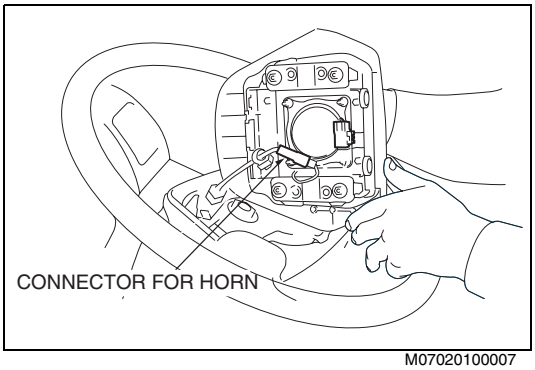
M07020100003

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE STEERING WHEEL.

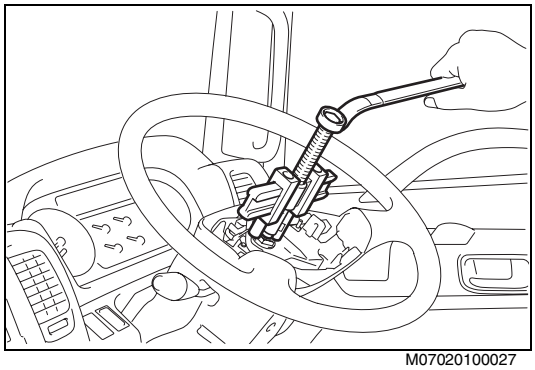
(1) Loosen the torx bolt for fixing the horn button using torx wrench.

(2) Remove the horn button from the steering wheel.



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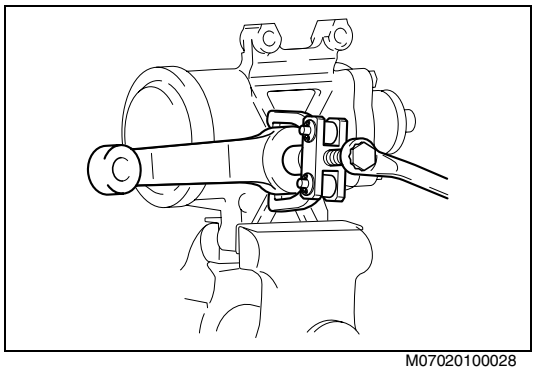
(3) Remove the connector for the horn.


M07020100027

(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 (09650-1341)

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.

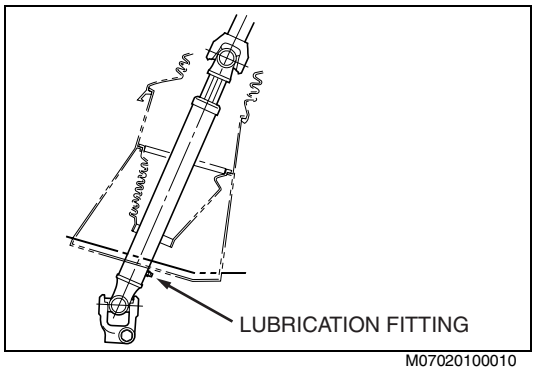

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2. REMOVE THE PITMAN ARM.
(1) Remove the nut, lock washer and plain washer from the sector shaft.
(2) Using the special tool, remove the pitman arm.
SST: Pitman Arm Puller (09650-1260)

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.

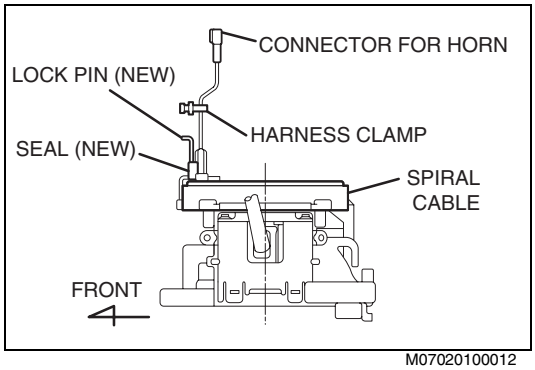


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3. ASSEMBLE THE STEERING SHAFT.
(1) Before assembling, apply chassis grease to the spline of the sliding yoke, and after assembling also fill grease through lubrication fitting.

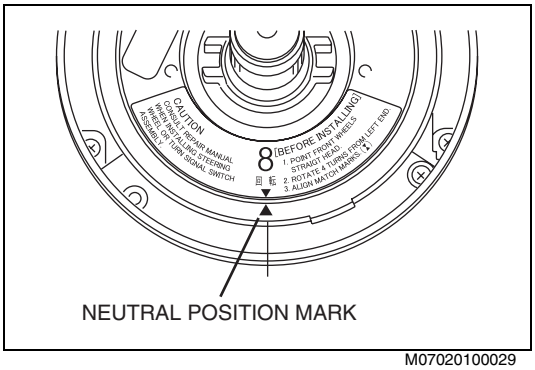
When replacing parts: 30g (1.1 oz)
When replenishing parts: 15g (0.5 oz)

NOTICE:
When assembling, take care not to damage the steering shaft spline.



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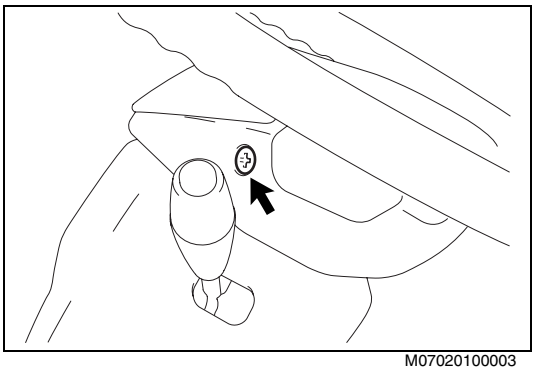
4. INSTALL THE STEERING WHEEL.
(1) Set front axles toward rectilinear direction.
(2) When spiral cable is new, make sure that the lock pin is seated in the spiral cable assembly and the seal is not cut. When spiral cable is reused, make sure that the neutral position of the spiral cable does not get out of position.



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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.

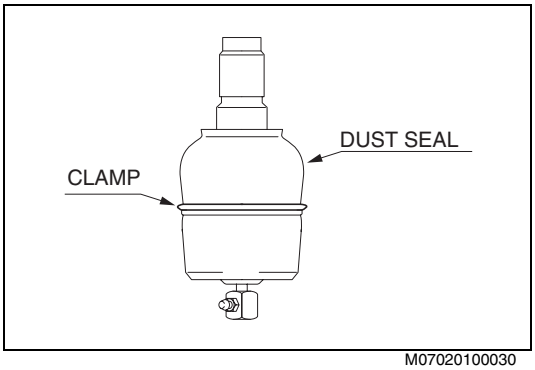


M07020100003

(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, 4.8-9.9 kgf·cm}

5. IF NECESSARY, REPLACE THE DRAG LINK DUST SEAL.

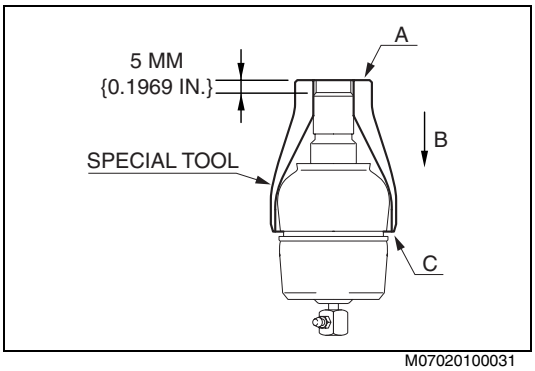
(1) Using a flat blade screwdriver etc., remove the clamp and then remove the dust seal.



M07020100030

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.



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(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 (09657-2050)

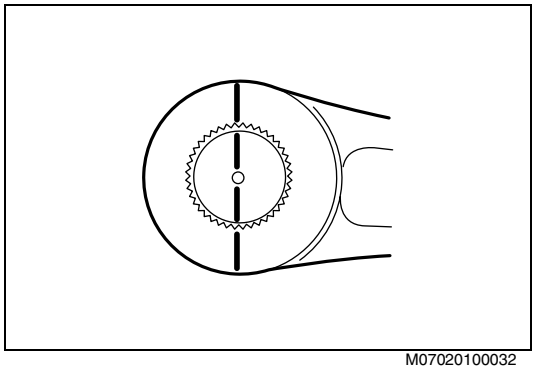
(5) Insert a clamp from A side of the tool and move it to the direction of B down to the plane C. Then drop the clamp slowly into the dust seal groove.

(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.



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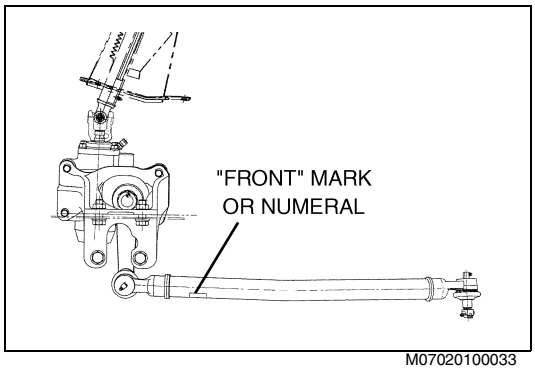
6. INSTALL THE PITMAN ARM.

(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.



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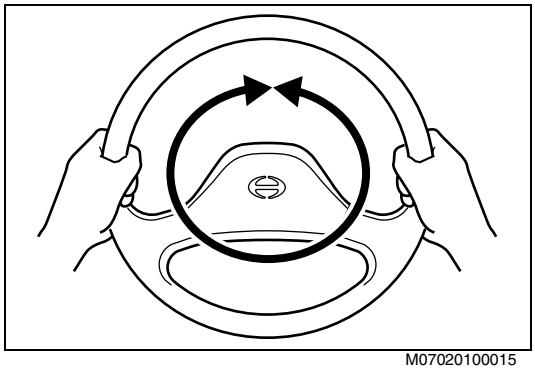
7. INSTALL THE DRAG LINK.

(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.

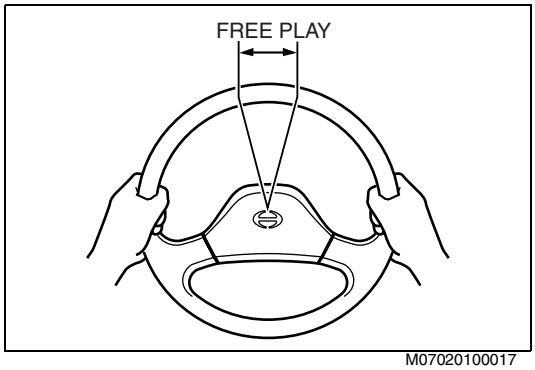


M07020100015

8. 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.



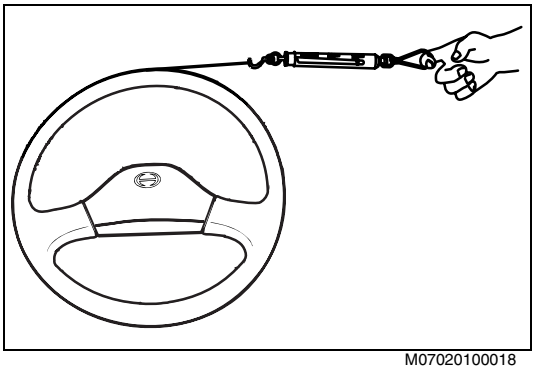
M07020100017

(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:

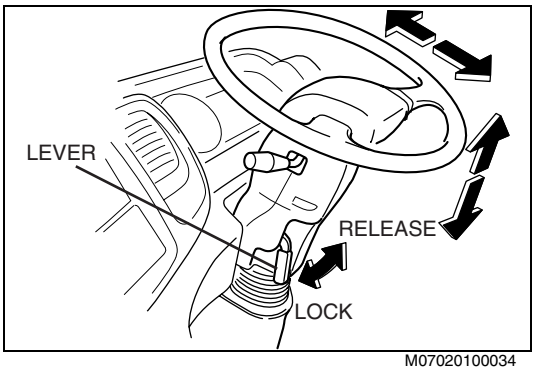
Excessive steering wheel free play may adversely affect vehicle handling. This can result in personal injury and/or property damage.


M07020100018

(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}



M07020100034

(6) The steering wheel must be locked securely in any position up, down, forward and backward.

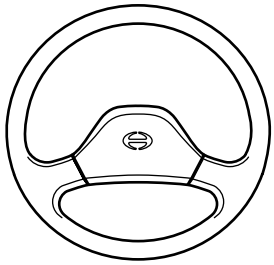
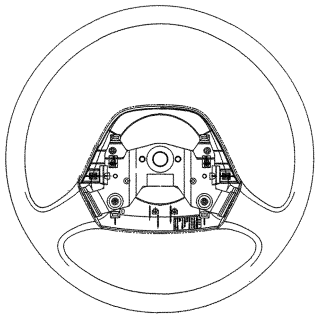
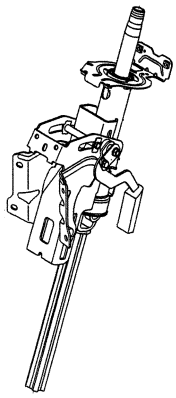
CAUTION:
Before moving the vehicle, tighten the lever securely and try to move the steering wheel up and down, and forward and backward to make sure that it is locked securely. Never try to adjust the steering wheel position while the vehicle is moving. Any adjustment of the steering wheel while driving 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

M07020101BEH3002

Unit: mm {in.}

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** 

STEERING GEAR UNIT

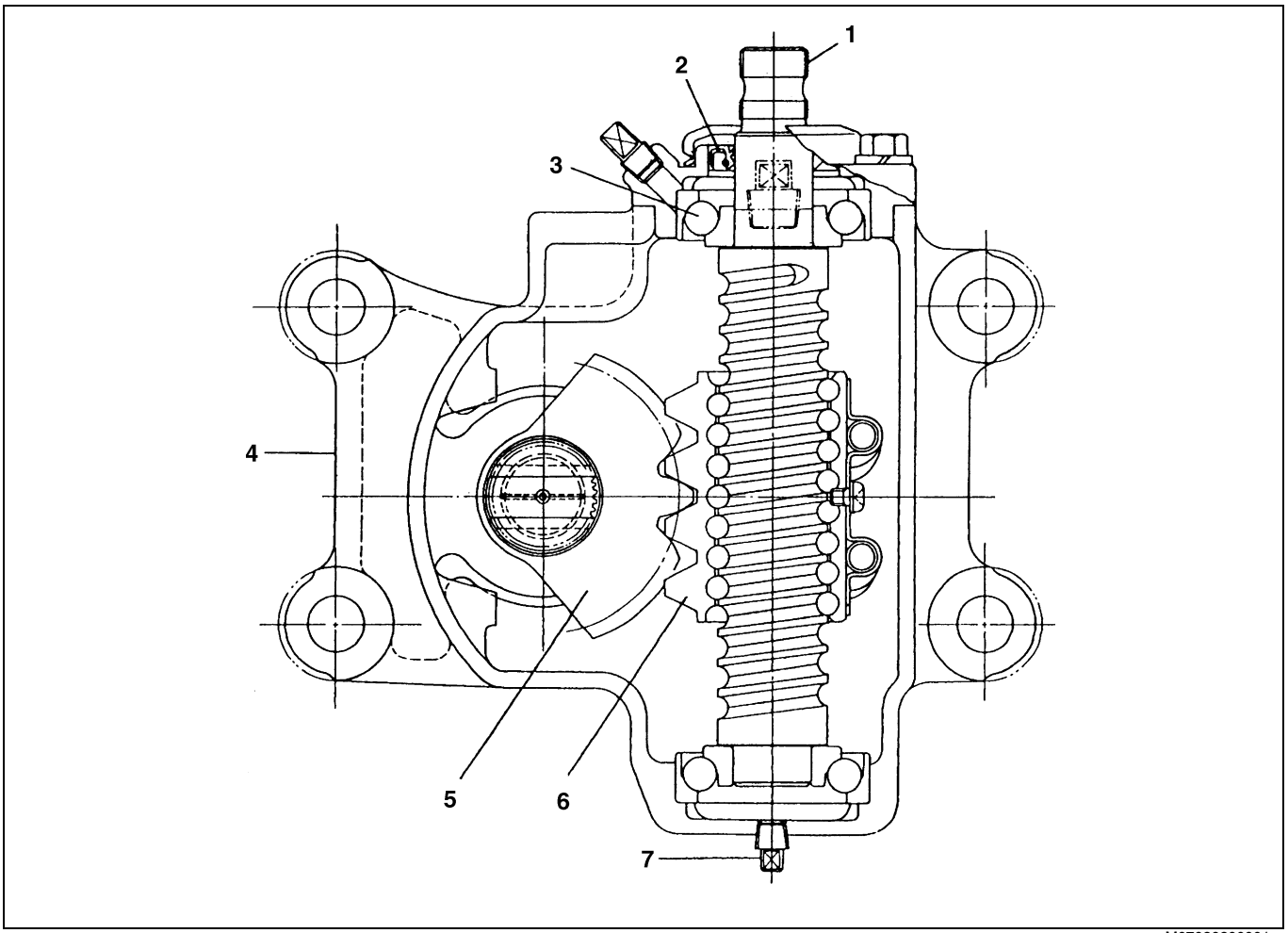
DATA AND SPECIFICATIONS

M07020201BEI2001

Type	**Recirculating ball**
Gear ratio	**26-30:1**
Oil capacity	**1L {0.221 Imp.gal., 0.255 U.S. gal}**

DESCRIPTION

M07020201BEC1001



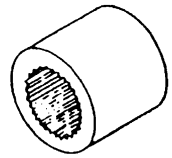
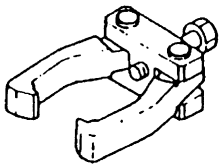
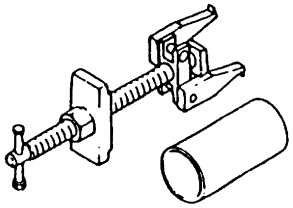
M07020200001

1	Worm shaft	5	Sector shaft
2	Oil seal	6	Ball nut
3	Ball bearing	7	Drain plug
4	Housing		

SPECIAL TOOL

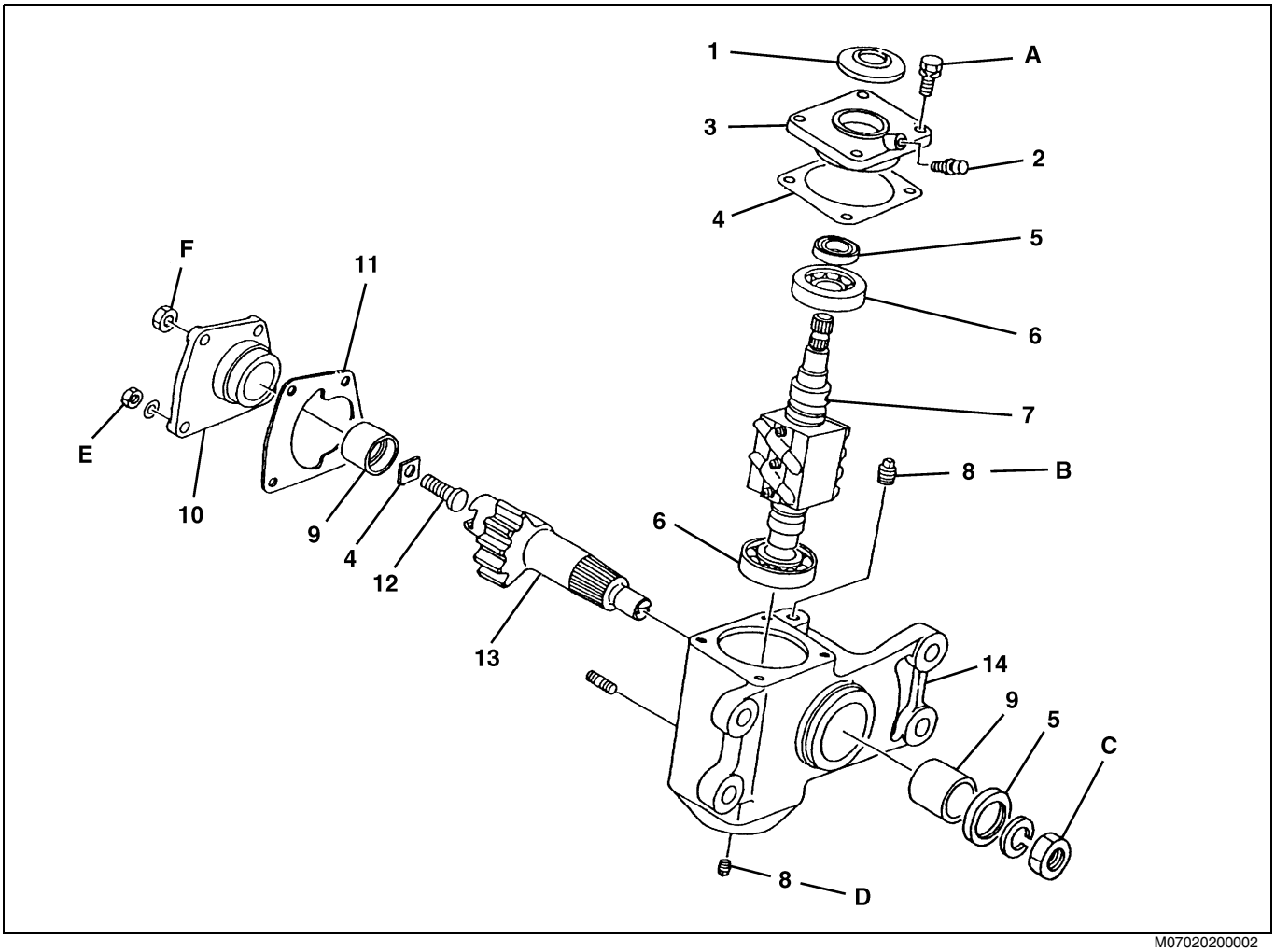
M07020201BEK1001

Prior to starting a steering gear unit overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09621-1031	MEASUREMENT ADAPTER	
	09650-1260	PITMAN ARM PULLER	
	09650-1580	BEARING RACE PULLER	

COMPONENT LOCATOR

M07020201BED1001



M07020200002

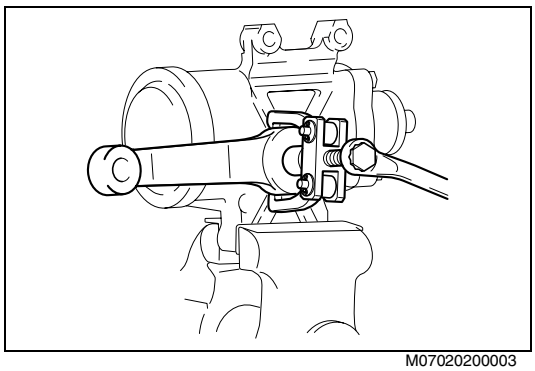
1	Dust seal	8	Drain plug
2	Breather plug	9	Bushing
3	Upper cover	10	Side cover
4	Shim	11	Gasket
5	Oil seal	12	Set screw
6	Ball bearing	13	Sector shaft
7	Ball nut and worm shaft assembly	14	Steering gear housing

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

A	39.3–53.9 {400–550, 29–39}	D	14.8–24.5 {150–250, 11–18}
B	14.8–24.5 {150–250, 11–18}	E	39.3–53.9 {400–550, 29–39}
C	215.8–294.1 {2,200–3,000, 160–216}	F	29.5–39.2 {300–400, 22–28}

OVERHAUL

M07020201BEH2002

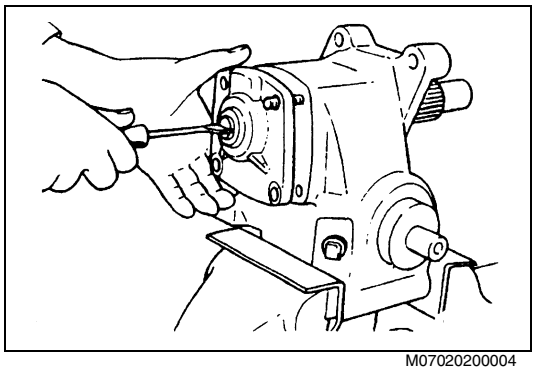

M07020200003

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE PITMAN ARM.

(1) Remove the pitman arm from the sector shaft using the special tool after loosing the lock nut.
SST: Pitman arm puller (09650–1260)

NOTICE:
Do not use wedges or hit with a hammer.


M07020200004

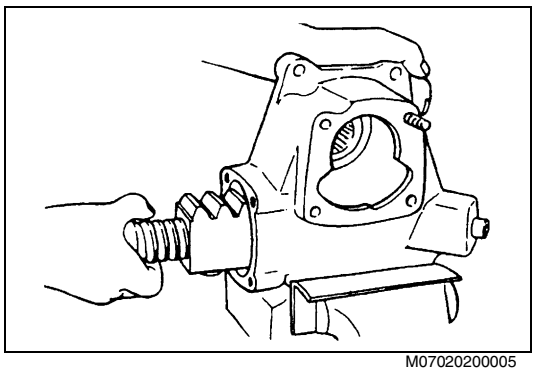
2. REMOVE THE SECTOR SHAFT.

(1) Remove the set screw lock nut and side cover fitting bolt and nut.

(2) Remove the side cover by tightening the set screw clockwise.

(3) Pull the sector shaft from the housing.

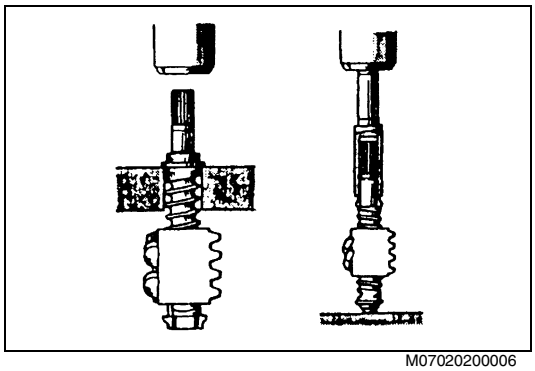
NOTICE:
Position the sector shaft mark at right angle to the housing and drive out the sector shaft end by using a plastic hammer.


M07020200005

3. REMOVE THE BALL NUT AND WORM SHAFT ASSEMBLY.

(1) Remove the upper cover and then pull out the ball nut and worm shaft assembly from the housing.

NOTICE:
Do not disassemble the ball nut and worm shaft assembly.


M07020200006

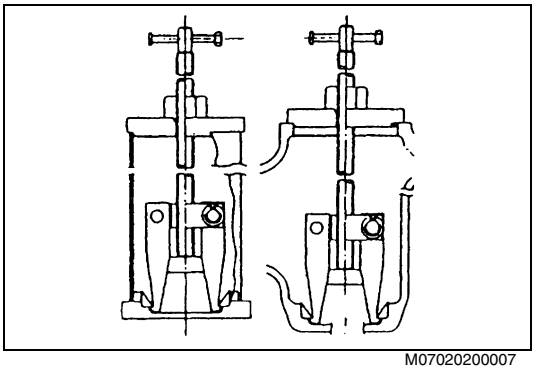
REPLACEMENT

1. IF NECESSARY, REPLACE BEARING AND BEARING OUTER RACE.

(1) Bearing

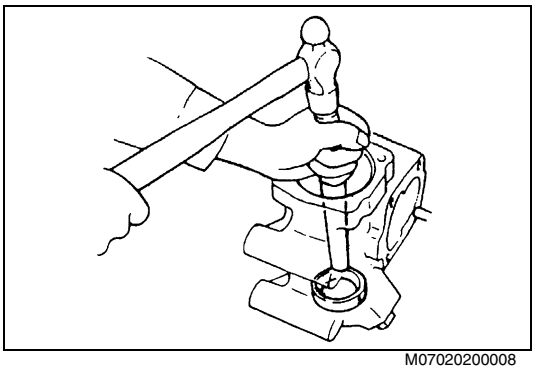
a. Use a press or commercial puller to remove the bearings from worm shaft.

b. Use a press and commercial driver to install the bearings into the worm shaft.

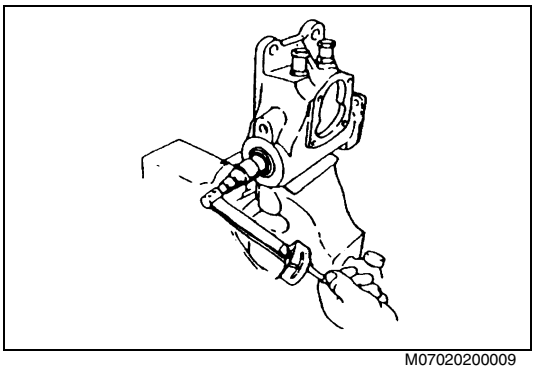

M07020200007

(2) Bearing outer race

a. Use the special tool to remove the bearing outer races from the housing and upper cover.
SST: Bearing race puller (09650–1580)


M07020200008

b. Use a brass rod and hammer to install the bearing outer races into the housing and upper cover.


M07020200009

IMPORTANT POINTS - ASSEMBLY

NOTICE:

- **When installing the ball nut and worm shaft assembly, apply chassis grease on the oil seal and apply the gear oil on the bearings.**
- **Install the same number of shims as there was before disassembly.**

1. MEASURE THE WORM SHAFT STARTING TORQUE.

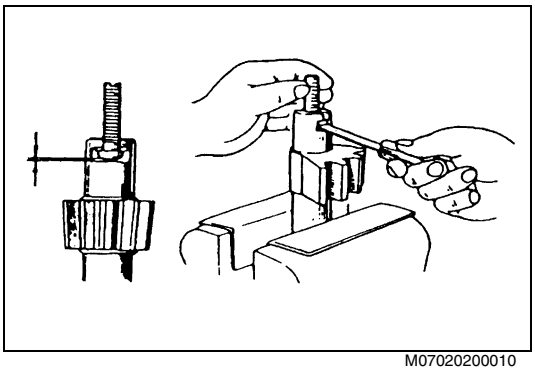
(1) Use a torque wrench and special tool to measure the starting torque.
SST: Measurement adapter (09621–1031)

Starting Torque: 0.40–0.68 N·m {4–7 kgf·cm, 0.30–0.51 lbf·ft}

(2) If the starting torque is not within limit, correct by selecting shims of proper thickness.

Unit: mm {in.}

0.05 {0.02}	**0.06 {0.0023}**	**0.07 {0.0028}**
0.1 {0.0039}	**0.2 {0.0079}**	**0.5 {0.02}**


M07020200010

2. MEASURE THE CLEARANCE BETWEEN SECTOR SHAFT AND SET SCREW.

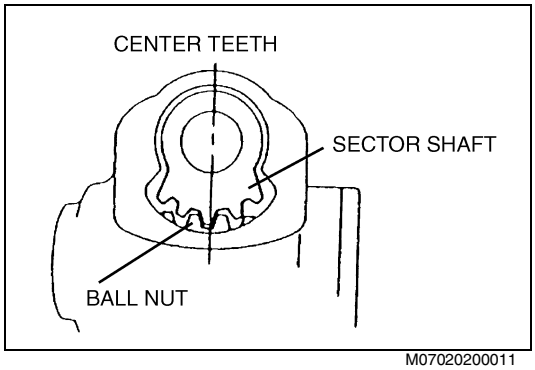
(1) Use a thickness gauge to measure the clearance between sector shaft and set screw.

Assembly Standard: Less than 0.1 mm {0.0039 in.}
Service Limit: 0.3 mm {0.0118 in.}

(2) If the clearance exceeds the service limit, correct by selecting shim of proper thickness.

Unit: mm {in.}

Shim thickness		
2.05 {0.081}	**2.00 {0.079}**	**1.95 {0.077}**



M07020200011

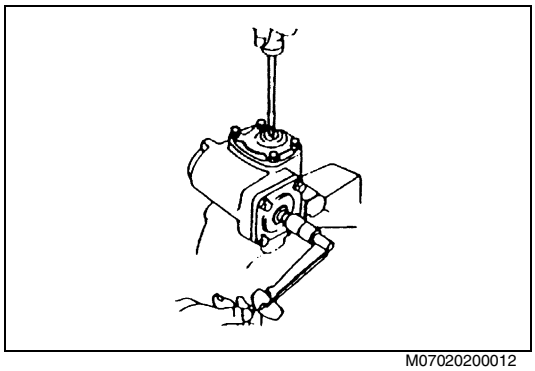
3. INSTALL THE SECTOR SHAFT INTO GEAR HOUSING.

(1) Set the ball nut at the center of gear housing.

(2) Insert the sector shaft into the gear housing so that the center teeth mesh together.

NOTICE:

- **Do not reuse the gasket.**
- **When installing the sector shaft, apply chassis grease to the oil seal and the liquid gasket "ThreeBond No.4" to the side cover.**

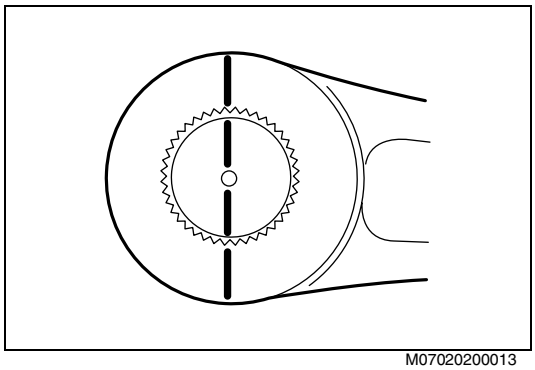

M07020200012

4. ADJUST TOTAL STARTING TORQUE.

(1) Use a torque wrench and special tool to turn the set screw while measuring the starting torque until it is correct.
SST: Measurement adapter (09621–1031)

Starting torque: 0.79–1.47 N·m {8–15 kgf·cm, 0.59–1.09 lbf·ft}

NOTICE:
Be sure that the worm shaft is in the neutral position.


M07020200013

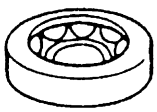
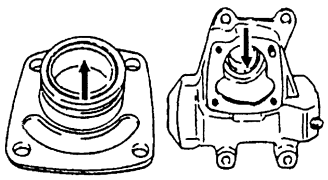
5. INSTALL THE PITMAN ARM.

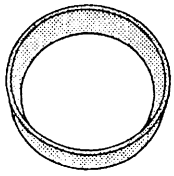
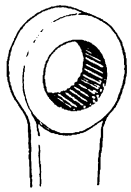
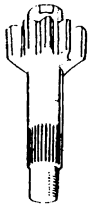
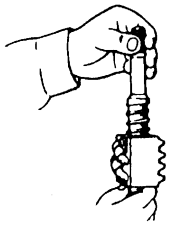
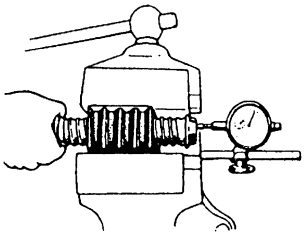
(1) Align the match marks on the sector shaft and pitman arm and then tighten the lock nut with specified torque.

INSPECTION AND REPAIR

M07020201BEH3002

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Ball bearing: Rattle, wear and damage	—	—	**Replace, if necessary.**	**Visual check** 
Needle roller bearing: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Bearing outer races and housing: Wear and damage	—	—	Replace, if necessary	Visual check 
Pitman arm: Serrations damage, ball stud hole for any damage cracks.	—	—	Replace, if necessary.	Visual check 
Sector shaft: Serration for twist and damage, Wear and damage	—	—	Replace, if necessary.	Visual check 
Ball nut and worm shaft assembly	Should turning smoothly by own weight. NOTE: Stop the ball nut with hand before it hits the worm shaft end.		Replace the ball nut and worm shaft assembly, if necessary.	Visual check 
Worm shaft thrust play	Less than 0.03 {0.00118}	—	Replace the ball nut and worm shaft assembly, if the thrust play is excessive.	Measure 

POWER STEERING

SR03-001

POWER STEERING SYSTEM SR03-2
TROUBLESHOOTING SR03-2
AIR BLEEDING SR03-3
HYDRAULIC TEST SR03-4

POWER STEERING GEAR UNIT SR03-7
DATA AND SPECIFICATIONS SR03-7
DESCRIPTION SR03-7
OPERATION SR03-8
SPECIAL TOOL SR03-9
COMPONENT LOCATOR SR03-9
OVERHAUL SR03-10
INSPECTION AND REPAIR SR03-13

POWER STEERING PUMP SR03-14
DATA AND SPECIFICATIONS SR03-14
DESCRIPTION SR03-14
OPERATION SR03-15
COMPONENT LOCATOR SR03-16
OVERHAUL SR03-18
INSPECTION AND REPAIR SR03-23

OIL RESERVOIR SR03-25
DESCRIPTION SR03-25
COMPONENT LOCATOR SR03-26
OVERHAUL SR03-26
INSPECTION AND REPAIR SR03-27

POWER STEERING SYSTEM

TROUBLESHOOTING

M07030101BEF3001

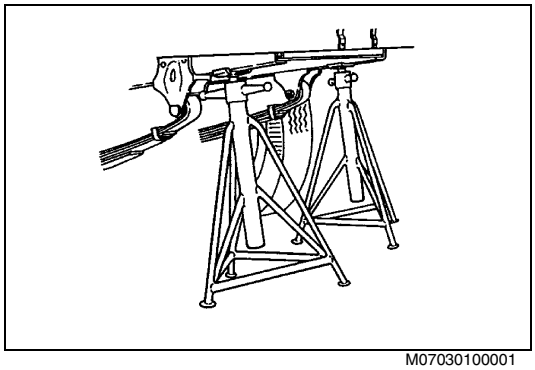
Symptom	Possible cause	Remedy/Prevention
Fluid leakage	Pump	Replace pump.
Fluid leakage (Gear box)	Oil seal, O-rings other than those for the seal lock nut and drain plug	Repair oil seal or O-ring.
	Seal lock nut, drain plug	Replace lock nut or plug.
Fluid leakage	Line joints	Replace leaky parts.
Hard steering (Excessive steering effort) (One side is hard)	Steering gear is 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 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

M07030101BEH2002

1. FILL THE OIL RESERVOIR WITH POWER STEERING FLUID.

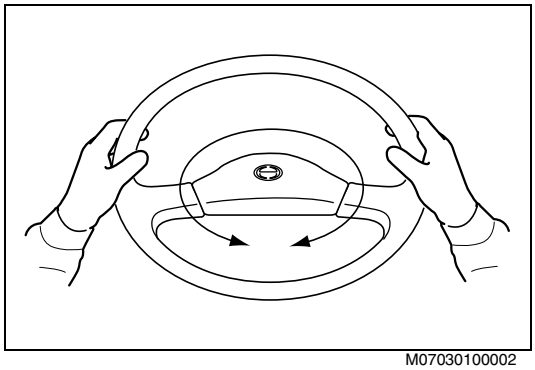
NOTICE:
- **Use only specified fluid.**
- **Do not overfill the oil reservoir.**
- **Replace old fluid with new fluid after overhauling power steering gear unit or power steering pump.**
- **Specified fluid....Refer to owner's manual.**



M07030100001

2. JACK UP THE FRONT AXLE AND SUPPORT THE FRAME WITH STANDS.

NOTICE:
Block the rear wheels.

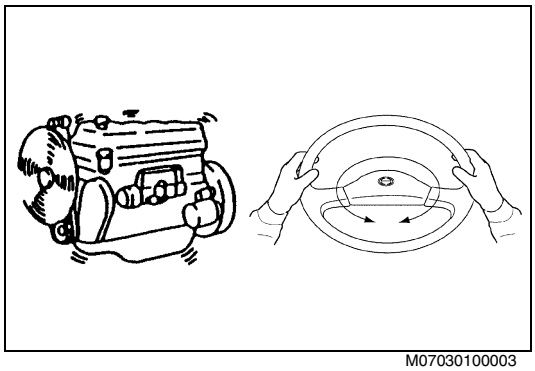


M07030100002

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.

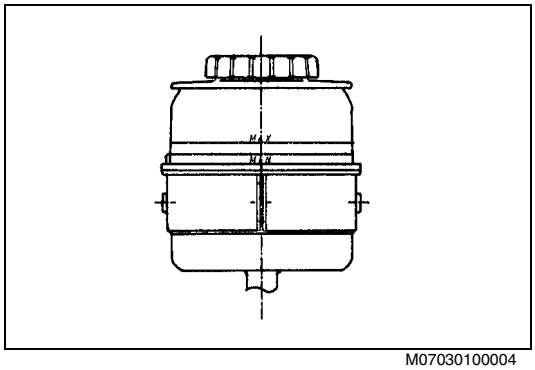


M07030100003

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.



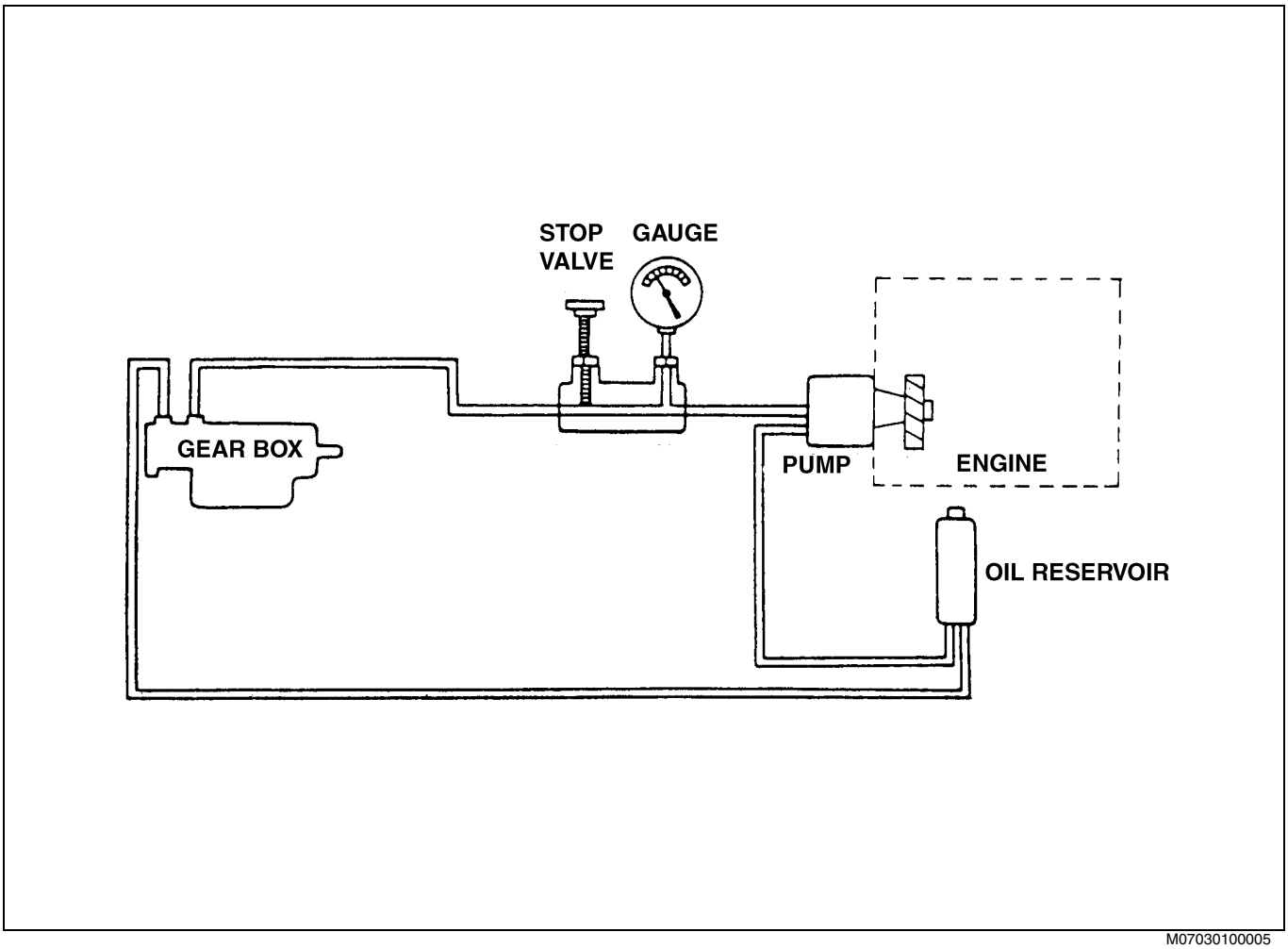
M07030100004

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".

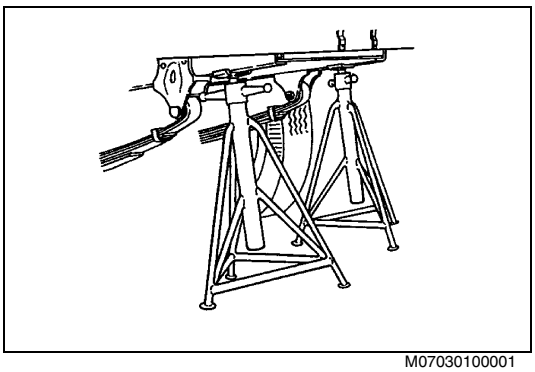
HYDRAULIC TEST

M07030101BEH3002



M07030100005

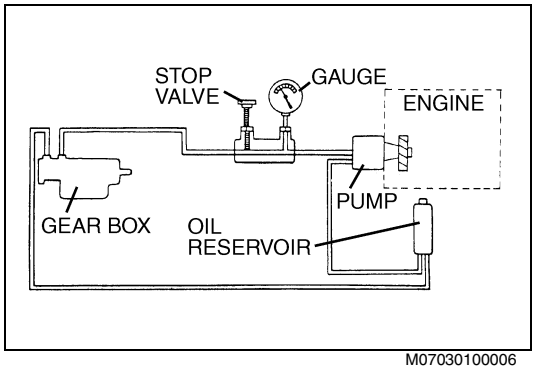
HYDRAULIC TEST



M07030100001

1. **JACK UP THE FRONT AXLE AND SUPPORT THE FRAME WITH STANDS.**

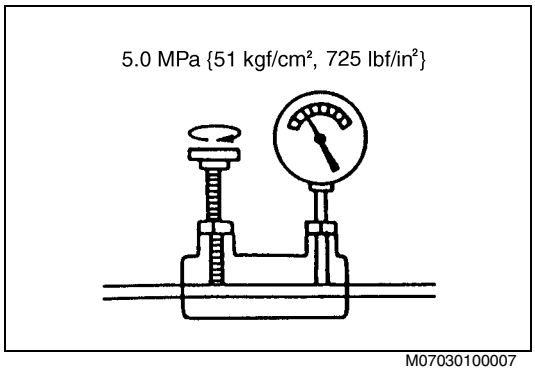
NOTICE:
Block the rear wheels.



M07030100006

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".



M07030100007

3. CHECK THE FLOW CONTROL VALVE OPERATION.

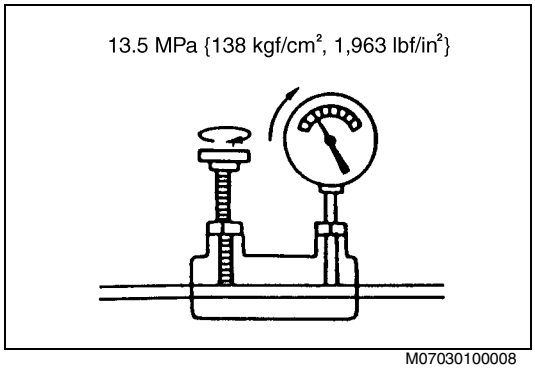
(1) Start the engine and idle then close the stop valve until the fluid pressure is at 5.0 MPa {51 kgf/cm^2,725 lbf/in^2}.

(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.



M07030100008

4. CHECK THE RELIEF VALVE OPERATION.

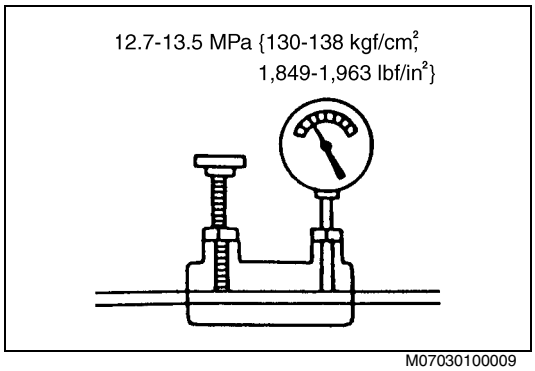
(1) Run the engine up to 2,000 r/min.

(2) Close the stop valve until the fluid pressure is at 13.5 MPa {138 kgf/cm^2, 1,963 lbf/in^2}.

NOTICE:
Be careful not to exceed 13.5 Mpa {138 kgf/cm^2, 1,963 lbf/in^2}.

(3) Good, if the fluid pressure is maintained at 12.7-13.5 MPa {130-138 kgf/cm^2, 1,849-1,963 lbf/in^2}

(4) If pressure is higher, stop the engine and replace the flow control valve assembly.



M07030100009

5. MEASURE THE SYSTEM HYDRAULIC PRESSURE.

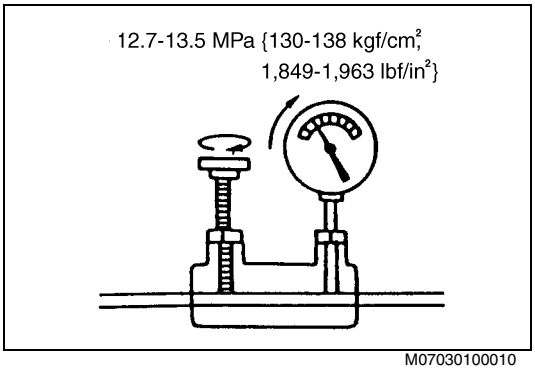
(1) Make sure that the stop valve is fully open.

(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:
12.7-13.5 MPa {130-138 kgf/cm^2, 1,849-1,963 lbf/in^2}

(5) If the above pressure is not attained, measure the discharge pressure or stop the engine and repair the power steering gear unit.



M07030100010

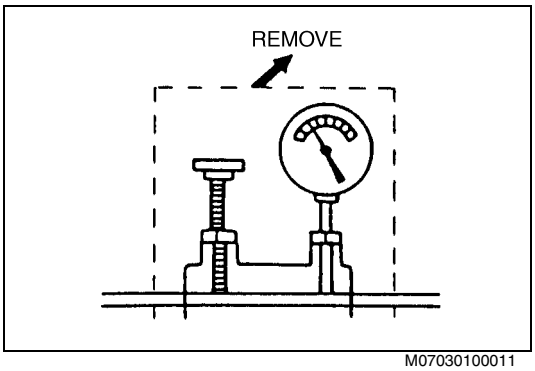
6. MEASURE THE DISCHARGE PRESSURE.

(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:
12.7-13.5 MPa {130-138 kgf/cm^2, 1,849-1,963 lbf/in^2}

NOTICE:
Do not allow the stop valve to remain closed for more than 15 seconds.

(3) Open the stop valve fully.



M07030100011

7. REMOVE THE STOP VALVE AND OIL PRESSURE GAUGE.

(1) Stop the engine and remove the stop valve and oil pressure gauge.

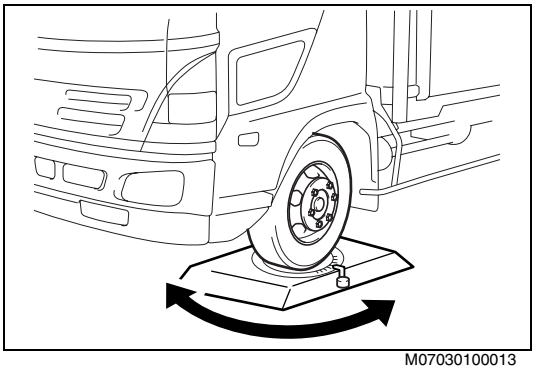
NOTICE:
After removing stop valve and oil pressure gauge, perform the air bleeding in according to "AIR BLEEDING".

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 {2.0 kgf, 4.41 lbf}


M07030100013

POWER STEERING GEAR UNIT

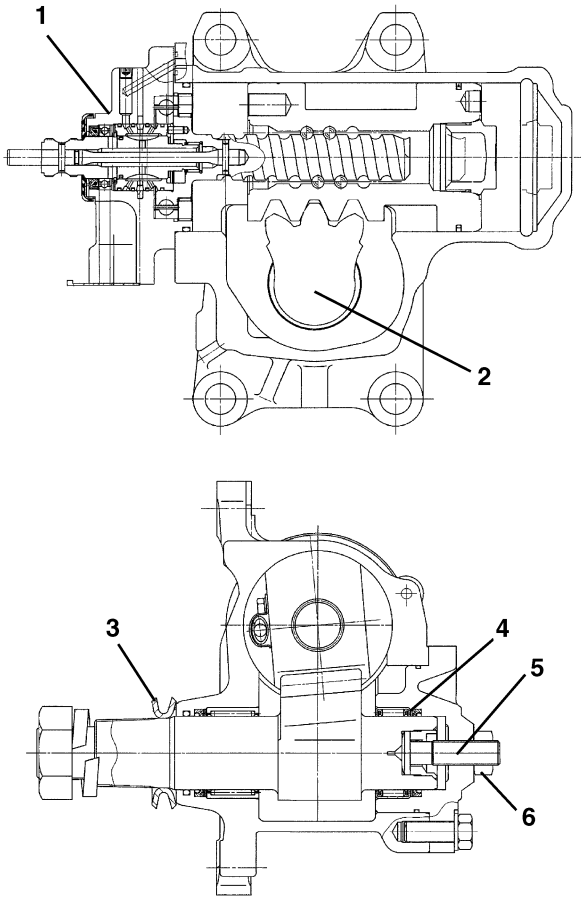
DATA AND SPECIFICATIONS

M07030201BEI2001

Model	**Integral type power steering**
Gear ratio	**18.6: 1**
Cylinder inside diameter	**85 mm {3.346 in.}**

DESCRIPTION

M07030201BEC1001



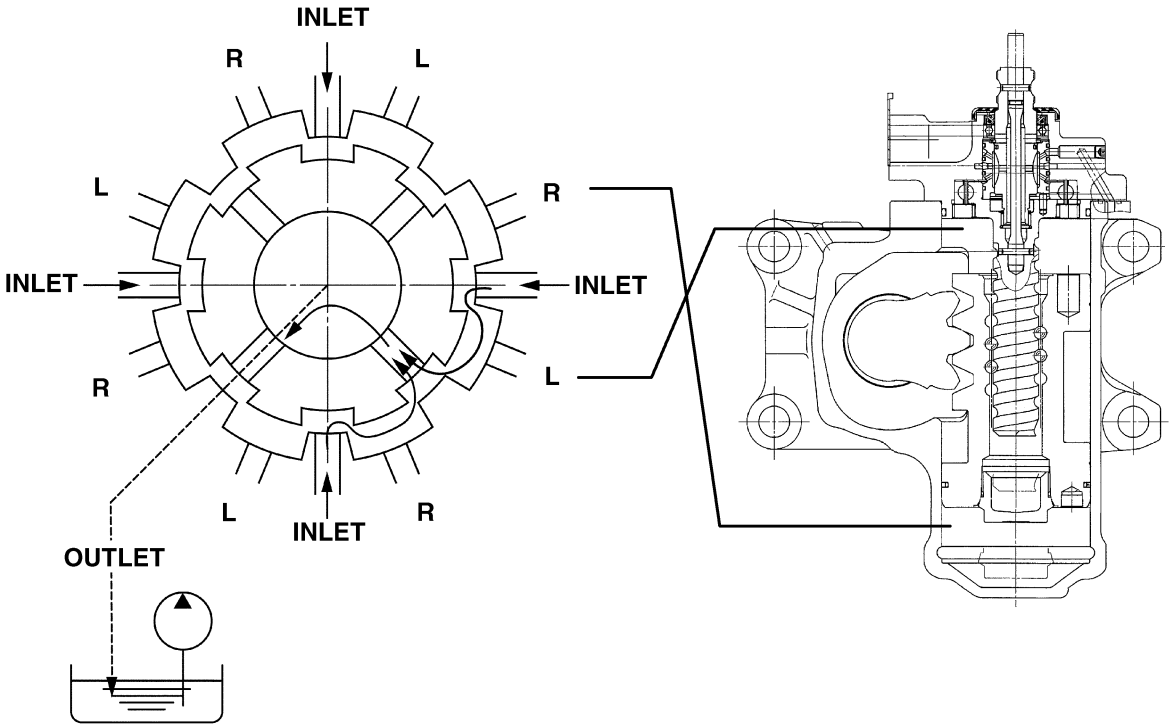
M07030200001

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**

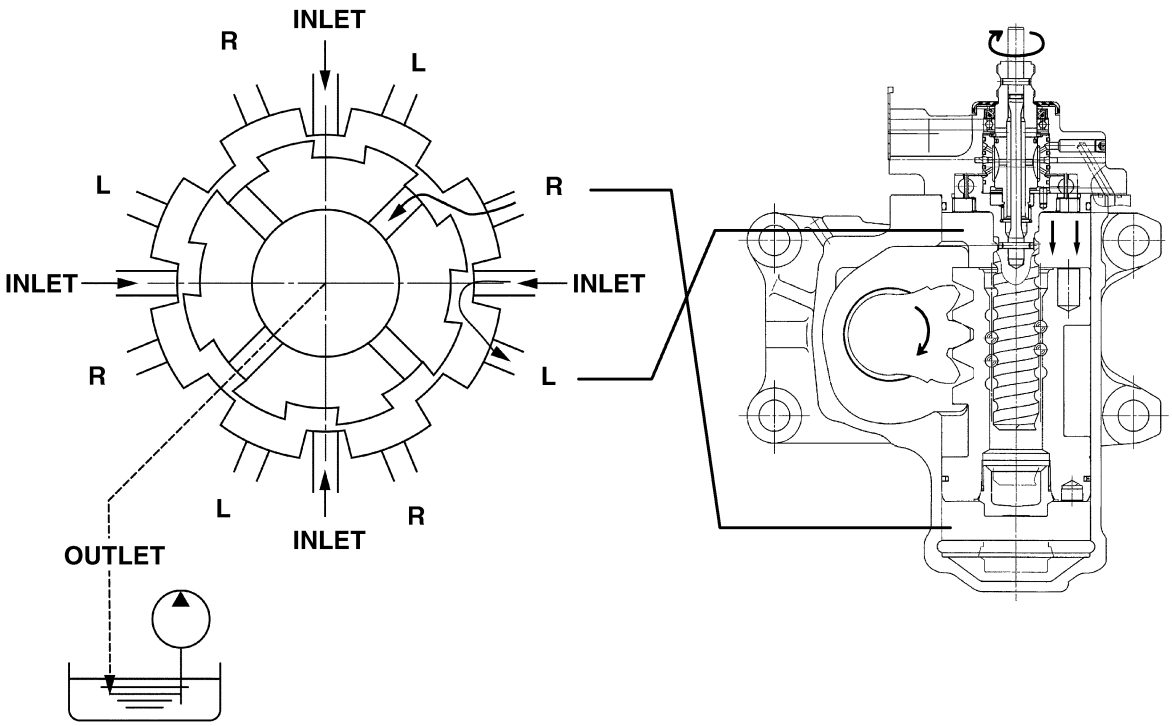
OPERATION

M07030201BEC1002

Neutral position



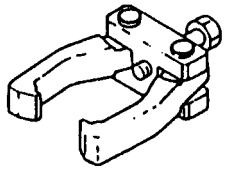
Power steering fluid circuit when turning the vehicle to the left (Right turn is the reverse of the left turn)



SPECIAL TOOL

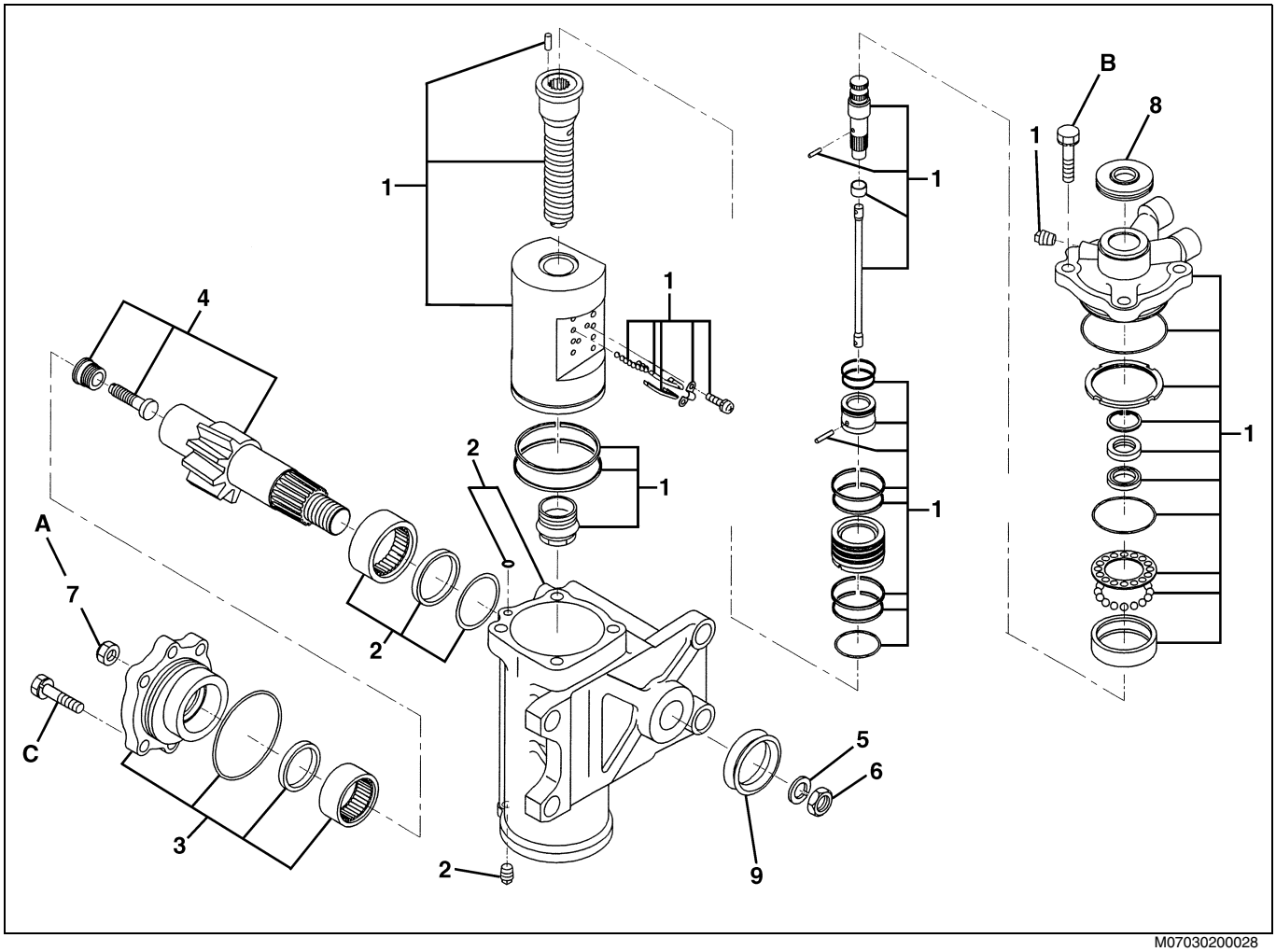
M07030201BEK1001

Prior to starting a power steering gear unit overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	09650-1260	PITMAN ARM PULLER	

COMPONENT LOCATOR

M07030201BED1001



M07030200028

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}		

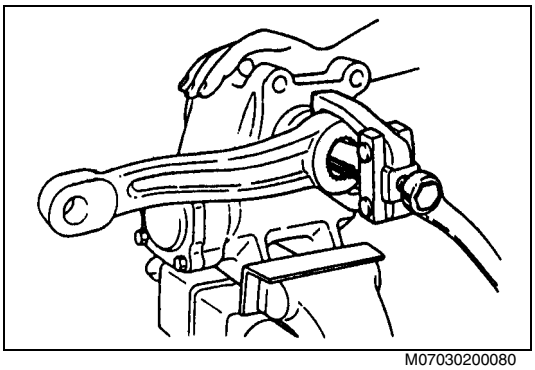
OVERHAUL

M07030201BEH2002

NOTICE:
OBSERVE THE FOLLOWING INSTRUCTIONS BEFORE DISASSEMBLING AND ASSEMBLING.

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. **Standard tools can generally be used for assembling and disassembling, although special tools may be required. When using special tools, read the instruction carefully, and never use standard tools in place of special tools.**

IMPORTANT POINTS - DISASSEMBLY

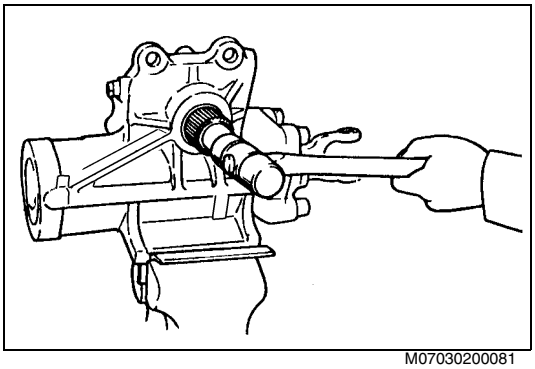


M07030200080

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 (09650-1260)

NOTICE:
Do not use wedges or hit with a hammer.



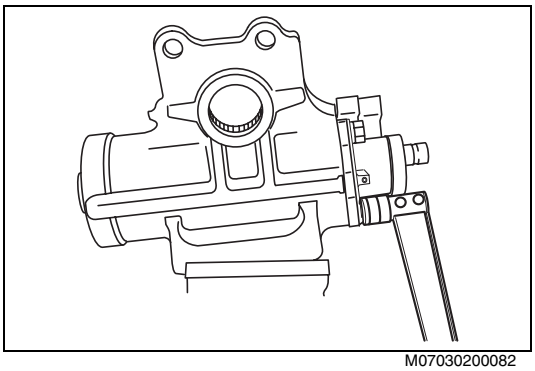
M07030200081

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.

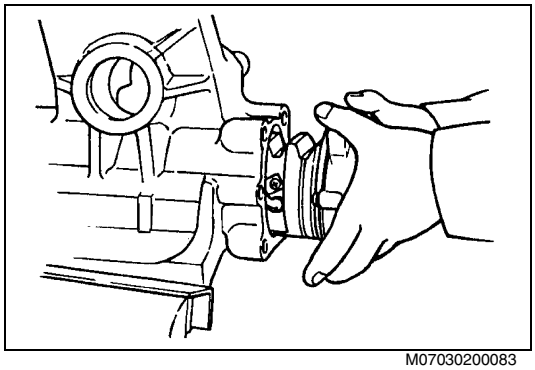
(3) Turn the adjusting screw clockwise until it pushes the sector shaft out of the side cover assembly.



M07030200082

3. REMOVE THE WORM BALL NUT VALVE ASSEMBLY.

(1) Remove the valve housing fitting bolts.


M07030200083

(2) Turn the worm ball nut valve assembly counterclockwise until it locks so that valve housing raised from gear housing.

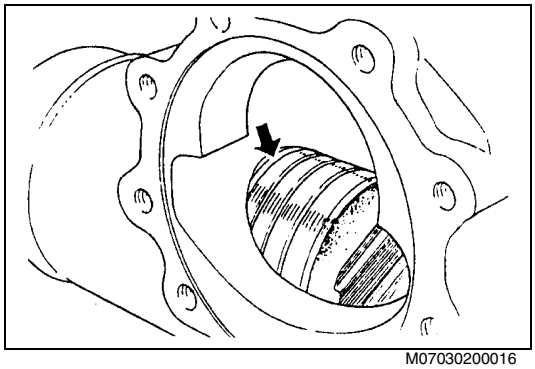
(3) Use a spatula to pry open the valve housing and remove the worm ball nut valve assembly from gear housing.

IMPORTANT POINTS - ASSEMBLY

1. INSTALL THE BALL NUT AND WORM VALVE ASSEMBLY.

(1) Install the O-ring on the ball nut.

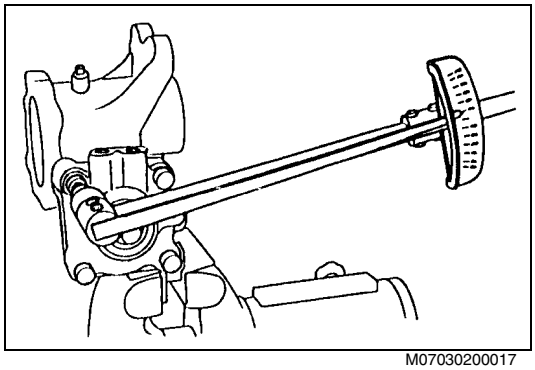
NOTICE:
Do not allow the ball nut to hit the end of the worm valve assembly.


M07030200016

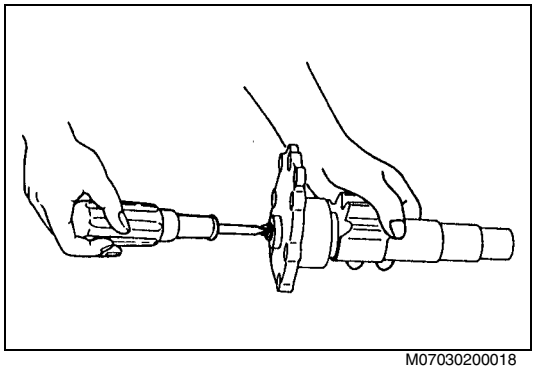
2. INSTALL THE BALL NUT ASSEMBLY.

(1) Apply the power steering fluid to inside surface of gear housing.

(2) Insert the ball nut assembly into the gear housing.

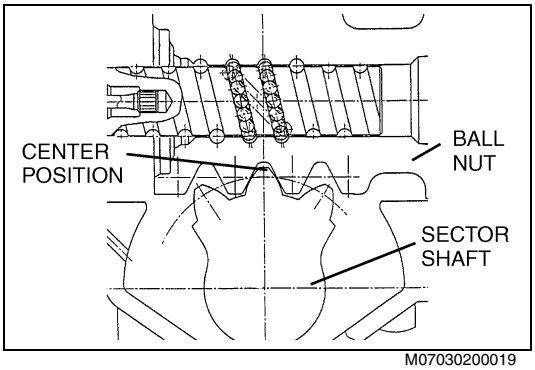

M07030200017

(3) Tighten the valve housing fitting bolts.


M07030200018

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.

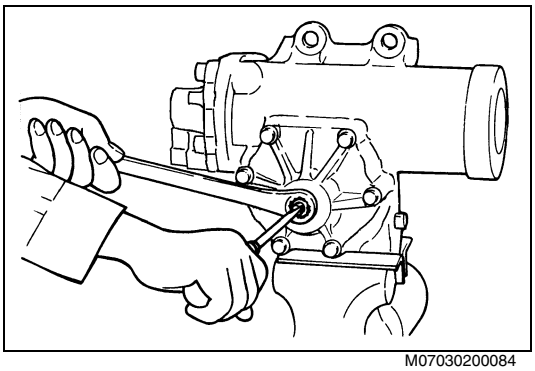


M07030200019

(2) Align the center of the ball nut tooth and sector shaft center tooth then install the sector shaft assembly

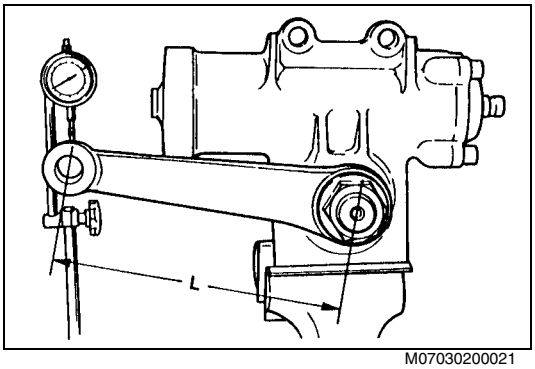
NOTICE:
Apply fluid to the serrated part of the sector shaft so that the housing oil seal will not be damaged.

(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 holding the adjusting screw lock nut.


M07030200084

(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.

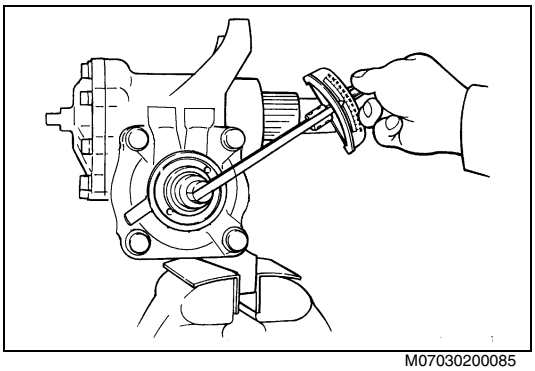


M07030200021

(3) Use a dial gauge to check to see that the sector shaft backlash in neutral position.

L	Backlash
190 mm {7.48 in.}	0.04-0.20 mm {0.0016-0.0078 in.}

(4) If measurement is not within specification, readjust the backlash with adjusting screw.


M07030200085

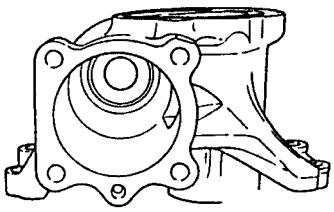
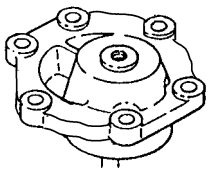
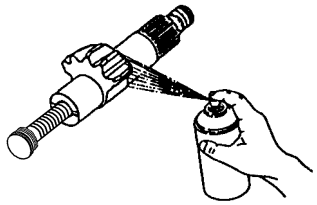
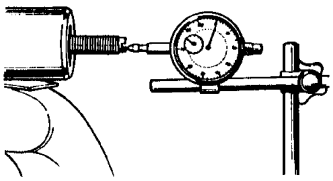
5. INSPECT THE WORM VALVE ASSEMBLY ROTATION CONDITION.
(1) Check to see that the worm valve assembly rotates smoothly without any shocks, abnormal resistance, noise and drag, when the worm valve assembly rotates full lock in both direction.

6. TIGHTEN THE PITMAN ARM LOCK NUT.

INSPECTION AND REPAIR

M07030201BEH3001

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, if necessary.	Measure 

POWER STEERING PUMP

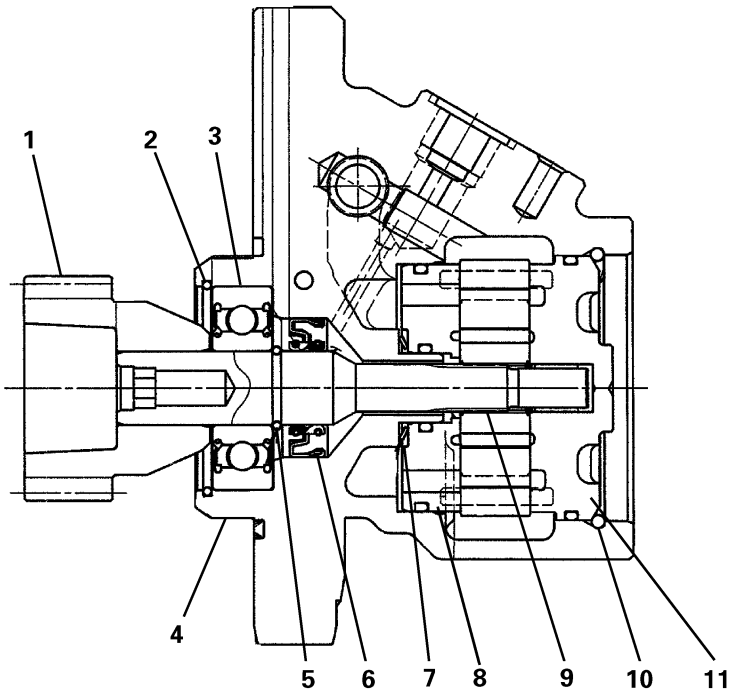
DATA AND SPECIFICATIONS

M07030301BEI2001

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 Imp.gal}**

DESCRIPTION

M07030301BEC1001



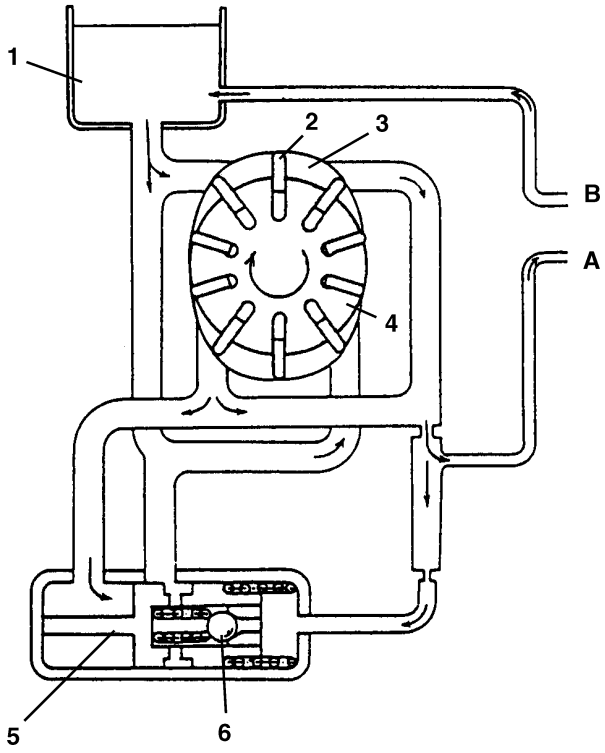
M07030300060

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		

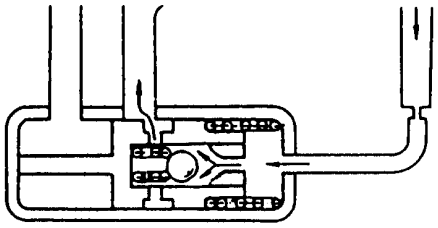
OPERATION

M07030301BEC1003

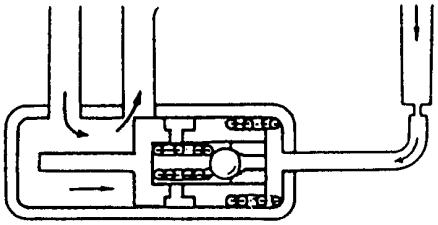
Neutral (Frow control valve assembly and relief valve are not operating)



Relief valve operation



Flow control valve operation

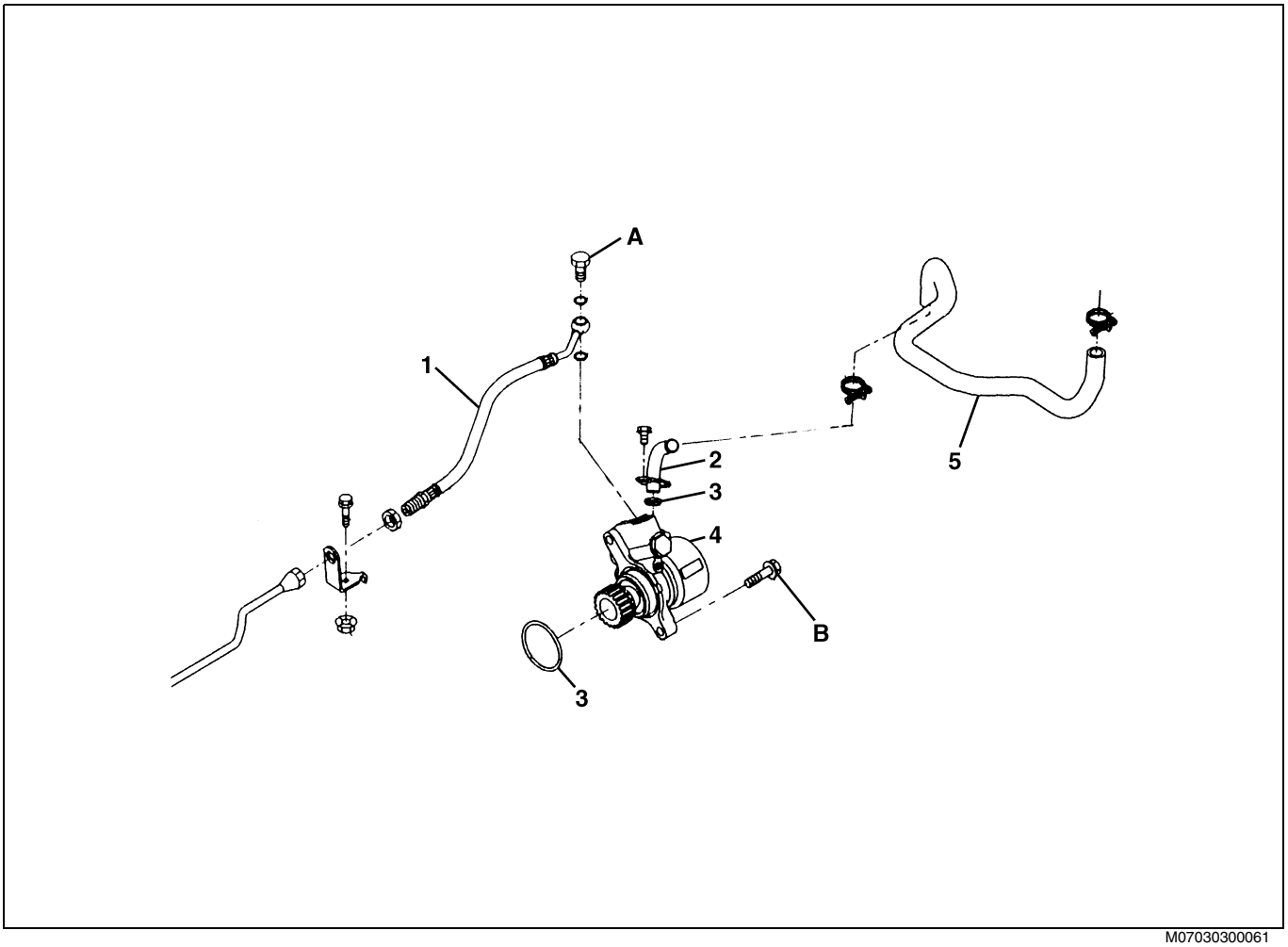


M07030300011

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

M07030301BED1001

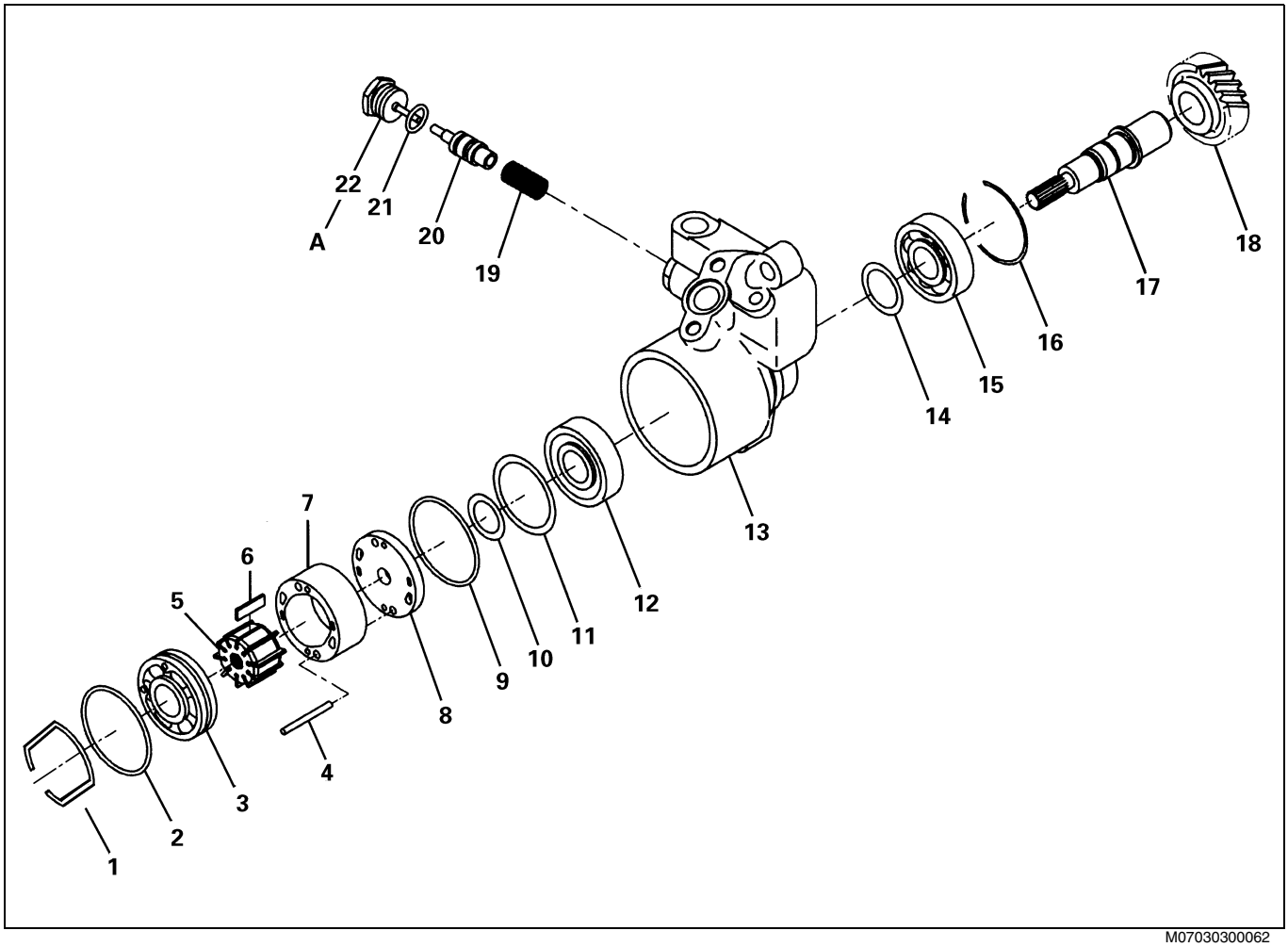


M07030300061

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, 42}	B	47 {480, 35}



M07030300062

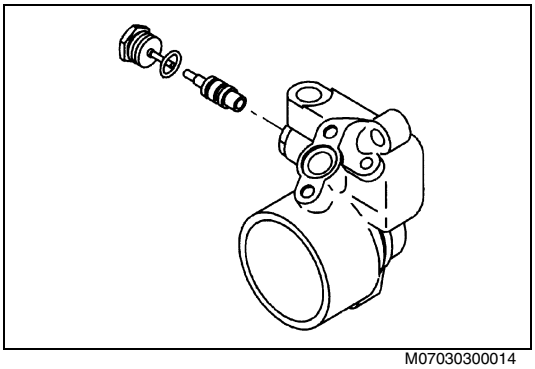
1	Retainer ring	12	Oil seal
2	O-ring	13	Pump body
3	Thrust plate	14	Retainer ring
4	Dowel	15	Ball bearing
5	Rotor	16	Retainer ring
6	Vane	17	Pump shaft
7	Cam ring	18	Drive gear
8	Side plate	19	Spring
9	O-ring	20	Flow control valve assembly
10	O-ring	21	O-ring
11	Spring seat	22	Orifice

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

A	59-78 {602-795, 44-57}	

OVERHAUL

M07030301BEH2001


M07030300014

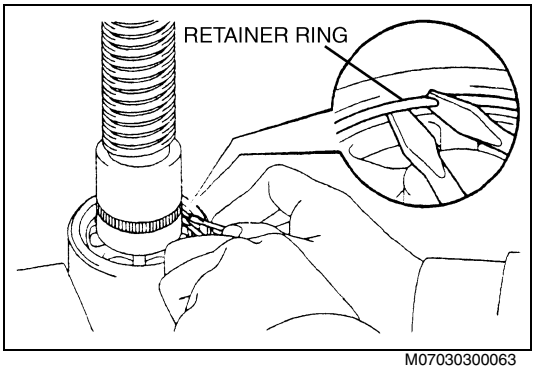
IMPORTANT POINTS - DISASSEMBLY

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.



M07030300063

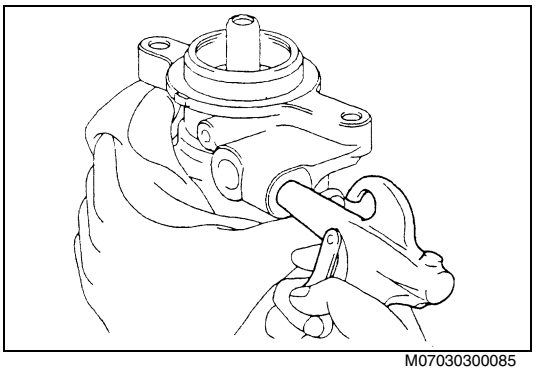
2. REMOVE THE THRUST PLATE, ROTOR, VANES, CAM RING AND SIDE PLATE.

(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.


M07030300085

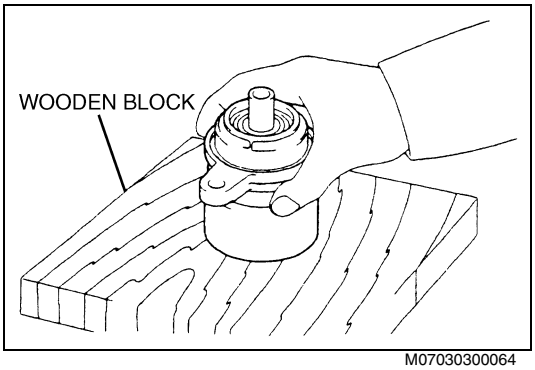
(3) Temporarily install the orifice.

(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:

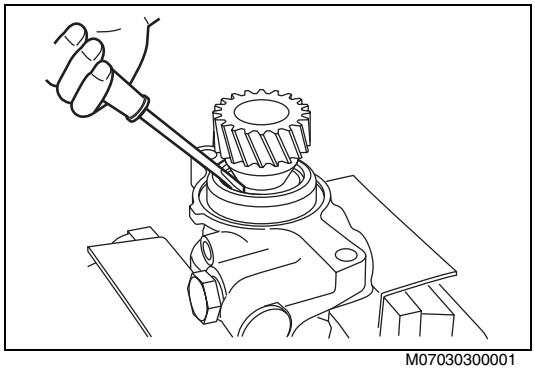
As oil flow out, cover the power steering pump with rags beforehand.

(5) Remove the rotor, vane, cam ring and dowel from the pump body.



M07030300064

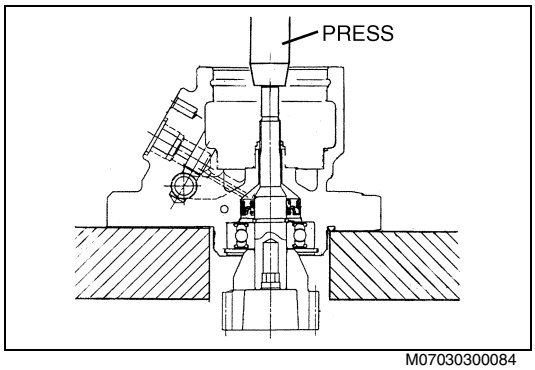
(6) Lightly tap the pump body on the wooden block and remove the side plate and spring seat.


M07030300001

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.



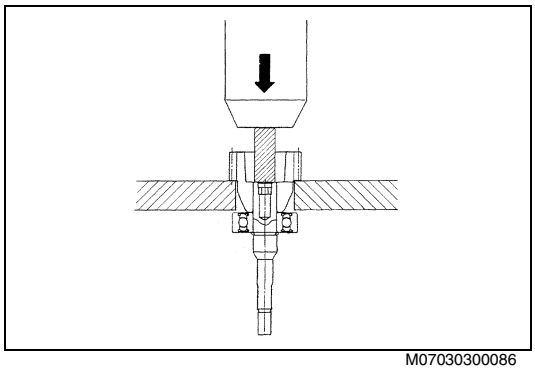
M07030300084

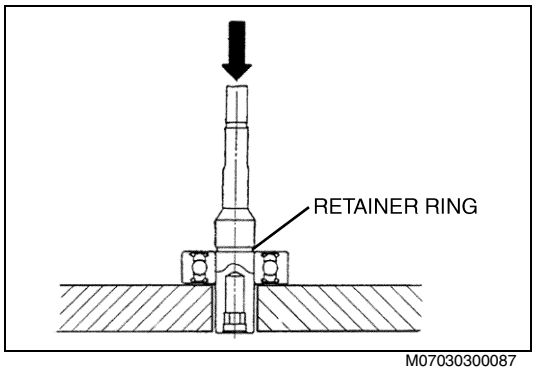
(2) Using a press, press out the pump shaft with drive gear and ball bearing.

IMPORTANT POINTS - REPLACEMENT

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.

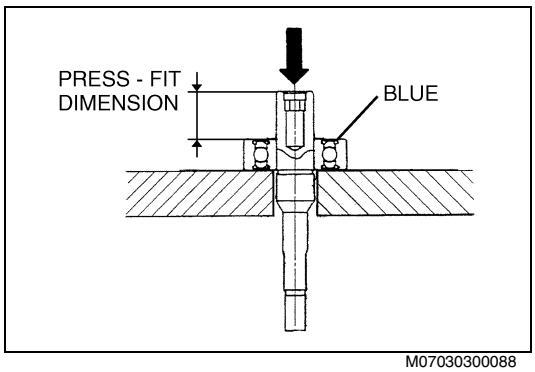

M07030300086



M07030300087

(2) Using a retainer ring pliers, remove the retainer ring from the pump shaft.

(3) Using a press, press out the ball bearing.



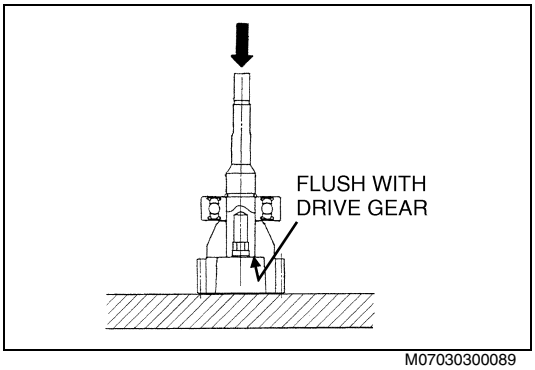
M07030300088

(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.

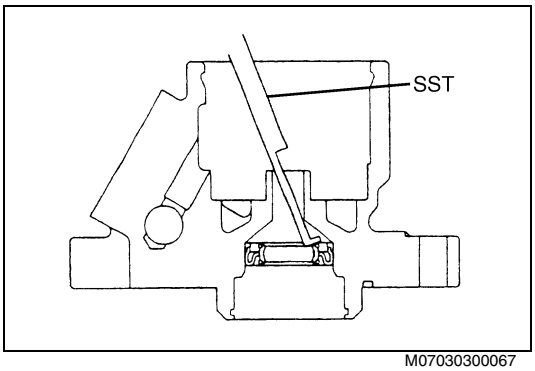
NOTICE:
Make sure that the retainer ring seats in place.



M07030300089

(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.**

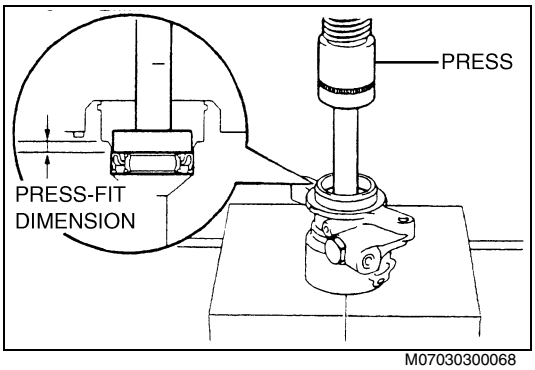


M07030300067

2. REPLACE THE OIL SEAL.

(1) Using a suitable tapping rod and a hammer, remove the oil seal from the pump body.

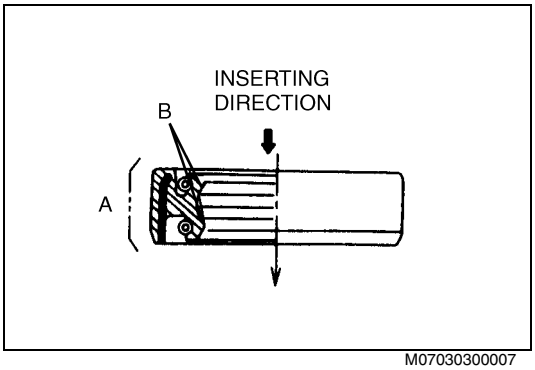
NOTICE:
Do not scrape or damage the inside of pump body.



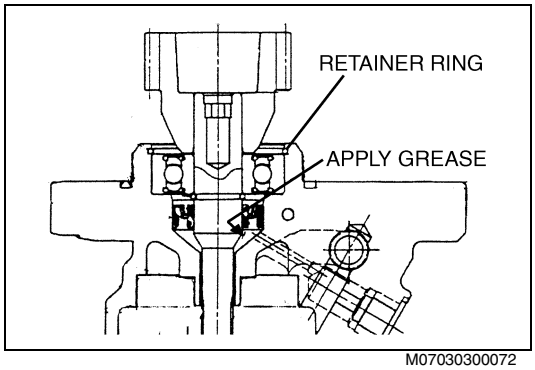
M07030300068

(2) Using a suitable rod and a press, press the oil seal into the pump body.
Press fit depth: 3.6-3.9 mm {0.9418-0.1535 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.**



M07030300007



M07030300072

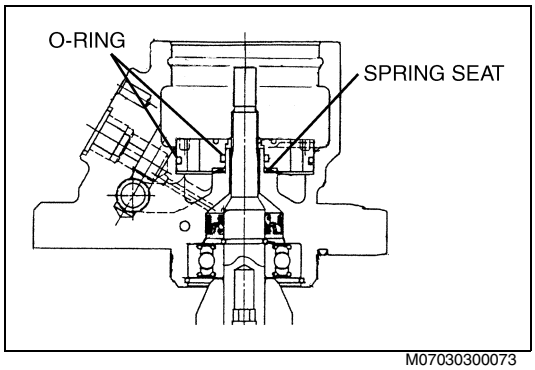
IMPORTANT POINTS - ASSEMBLY

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.

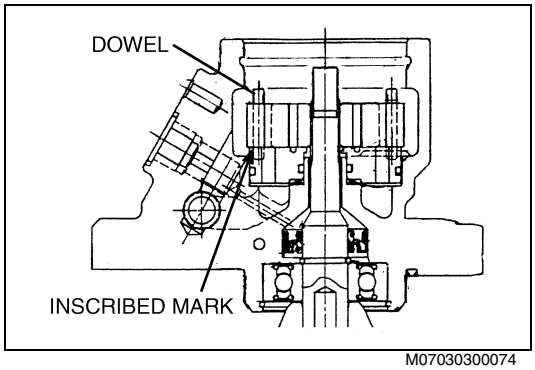
(2) Install the retainer ring.



M07030300073

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.

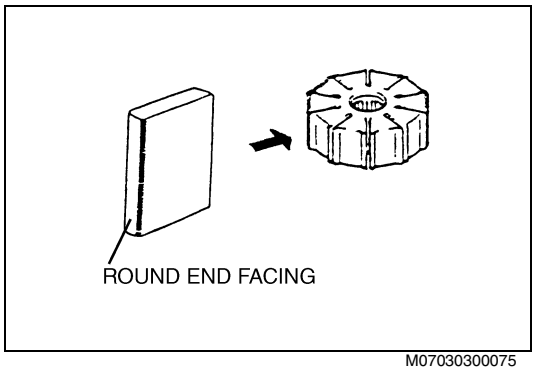


M07030300074

3. INSTALL THE DOWELS TO THE SIDE PLATE.

4. INSTALL THE CAM RING.

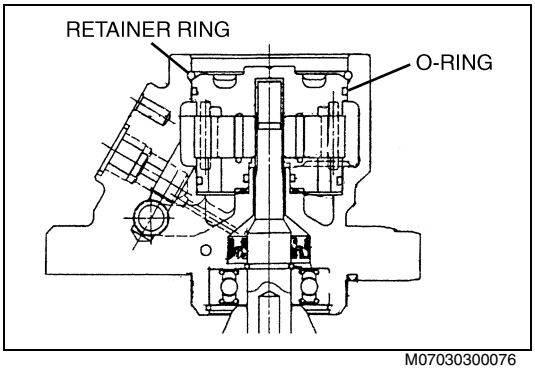
(1) Install the cam ring with the inseribed marks facing downward (side plate side).



M07030300075

5. INSTALL THE ROTOR AND VANE.

(1) Install the rotor in to the pump shaft.
(2) Install the vanes with the round end facing outward.

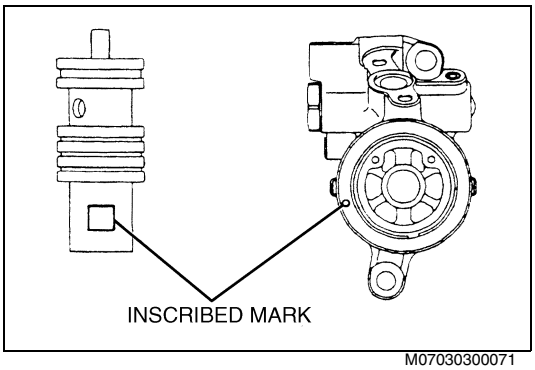


M07030300076

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.



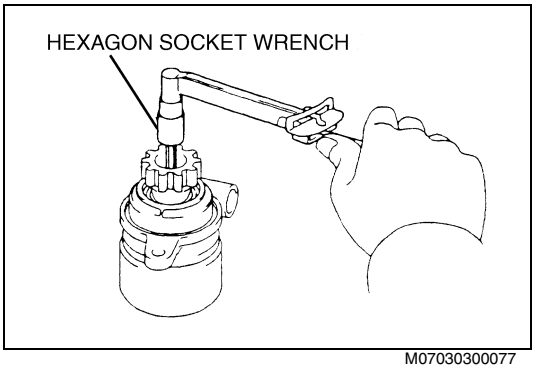
M07030300071

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	44330-2310
B	44330-2320
C	44330-2330
D	44330-2340



M07030300077

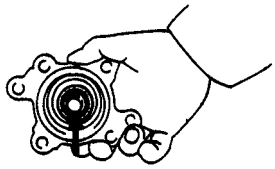
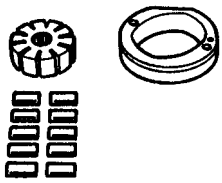
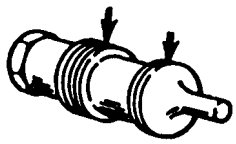
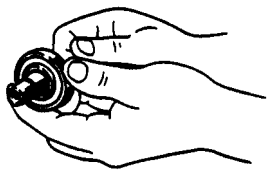
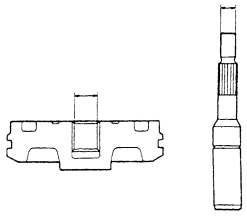
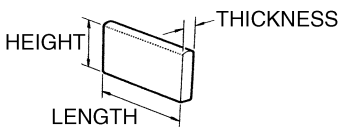
8. INSPECT THE POWER STEERING PUMP.

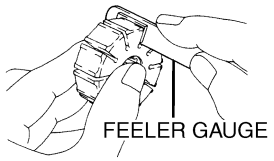
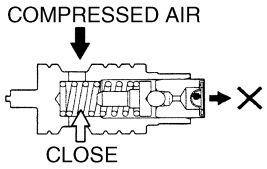
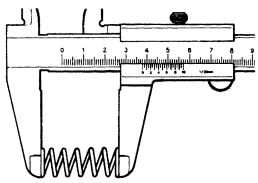
(1) Confirm that the shaft rotates smoothly and that there is no abnormal noise.
(2) Using a hexagon socket wrench, check the rotation torque of the pump shaft.
Standard: 0.27 N·m or less {2.8 kgf·cm, 2.43, 0.2 lbf·ft} (during rotation)

INSPECTION AND REPAIR

M07030301BEH3001

Unit: mm {in.}

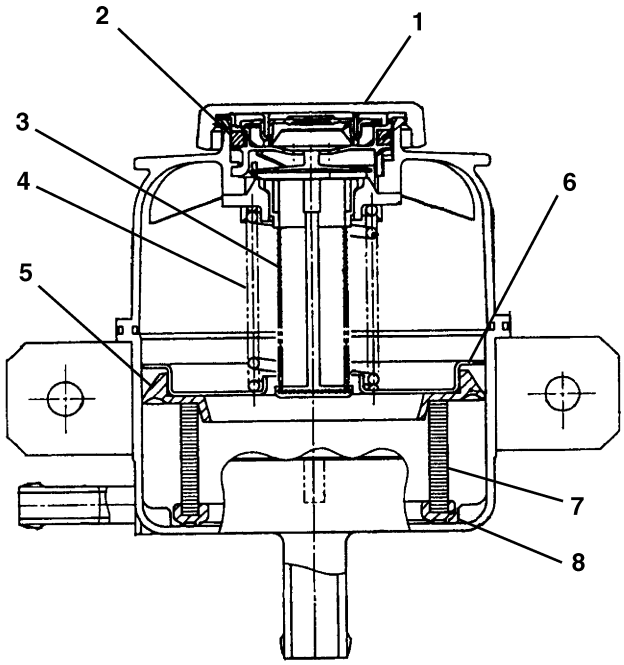
Inspection item	Standard	Limit	Remedy	Inspection procedure
Oil seal: Wear and damage	—	—	Replace, if necessary.	Visual check 
Cam ring inner surface, Rotor surface, Vanes: Wear, scratches and scoring	—	—	Replace the parts, if necessary.	Visual check 
Side plate: Abrasions and flaws	—	—	Replace, if necessary.	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 
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 

Inspection item	Standard	Limit	Remedy	Inspection procedure
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, 51-71 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** 

OIL RESERVOIR

DESCRIPTION

M07030401BEC1001

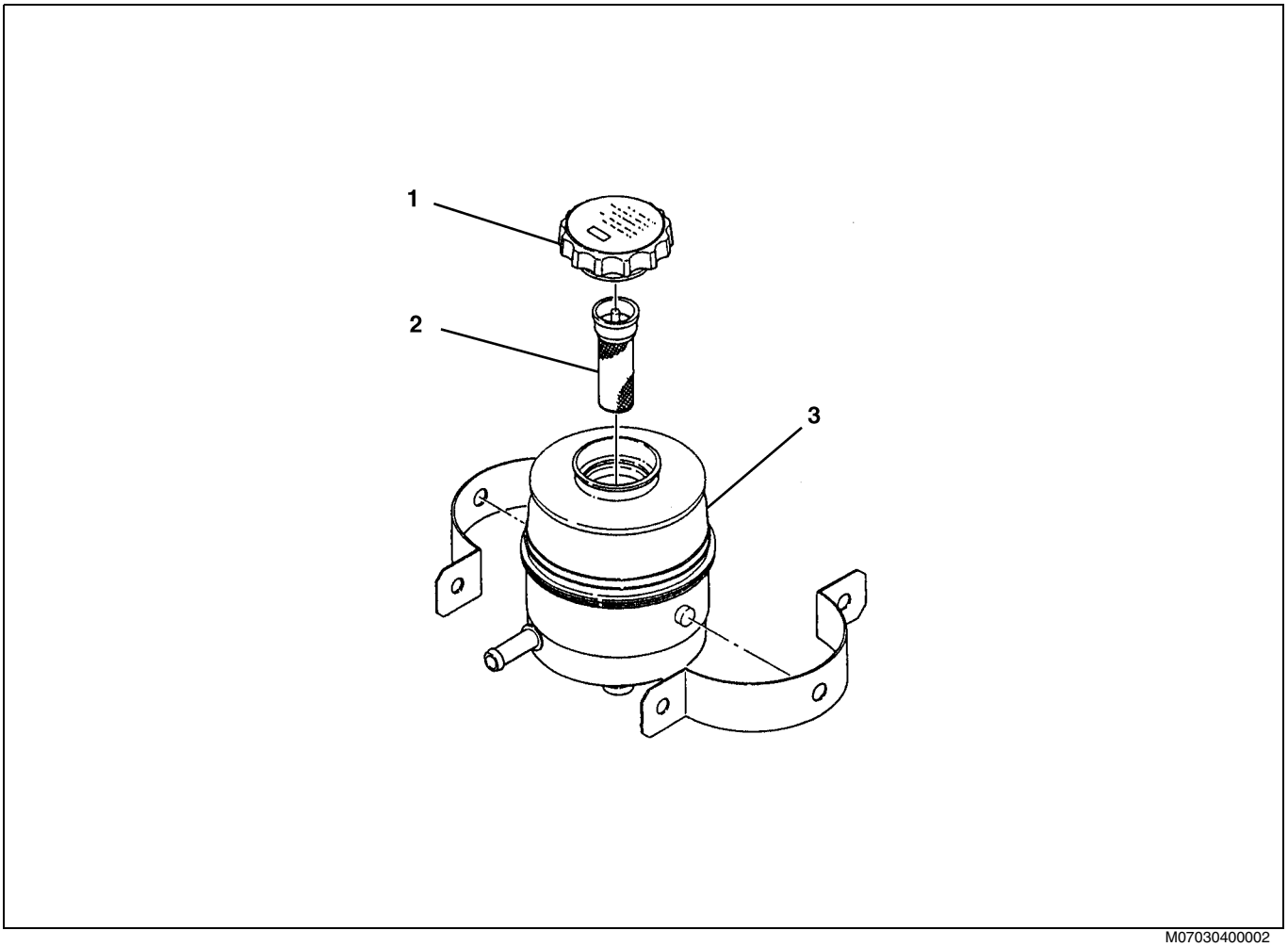


M07030400001

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

M07030401BED1001



M07030400002

1	Oil reservoir cap	3	Oil reservoir
2	Oil strainer		

OVERHAUL

M07030401BEH2001

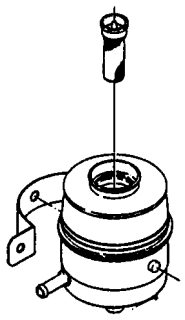
IMPORTANT POINTS - ASSEMBLY

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

M07030401BEH3001

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.	

FRONT AXLE (LF366)

AX02-001

FRONT AXLE (LF366) AX02-2
DATA AND SPECIFICATIONS AX02-2
DESCRIPTION AX02-3
TROUBLESHOOTING AX02-4
SPECIAL TOOL AX02-5
COMPONENT LOCATOR AX02-7
OVERHAUL AX02-8
INSPECTION AND ADJUSTMENT AX02-14
INSPECTION AND REPAIR AX02-15

FRONT AXLE (LF366)

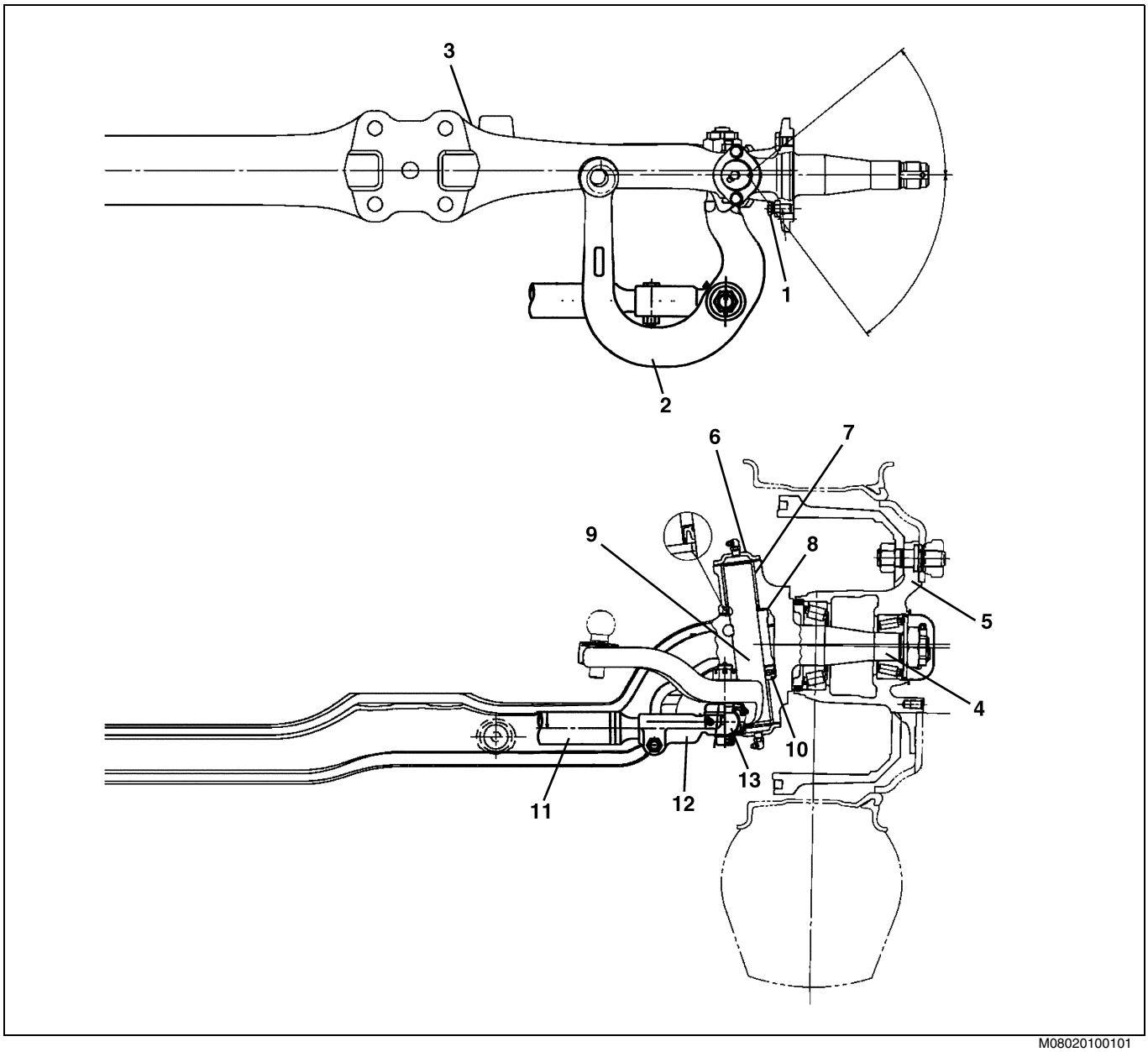
DATA AND SPECIFICATIONS

M08020103BEI2002

Front axle series No.			LF366
Axle beam type			Reversed Elliot "I" beam
Axle beam material			As rolled normalized steels
Brake drum location			Inboard mounted
Wheel bearing			Two tapered roller bearings
Amount of grease in a hub			430 g {15.1 oz} at one wheel
King pin thrust bearing			Ball bearing
Wheel alignment	Camber		0°-2°
	King pin angle		6°-8°
	Caster	Without power steering	0°
		With power steering	2°
	Toe-in	Diagonal tires	1-3 mm {0.0394-0.1181 in.}
		Radial tires	0-2 mm {0-0.0787 in.}
Knuckle turning angle		Inner turn	50°-53°
		Outer turn	39°

DESCRIPTION

M08020103BEC1002



M08020100101

1	Stopper bolt	8	Thrust washer
2	Knuckle arm	9	King pin
3	Axle beam	10	Thrust bearing
4	Knuckle	11	Tie rod
5	Wheel hub	12	Tie-rod end
6	King pin cover	13	Ball stud
7	Bushing		

TROUBLESHOOTING

M08020103BEF3002

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

SPECIAL TOOL

M08020103BEK1001

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

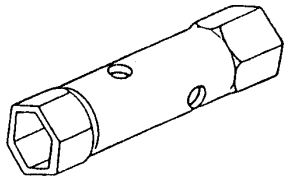
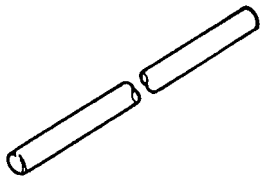
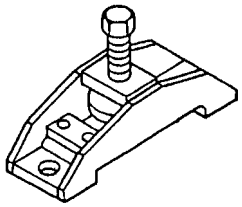
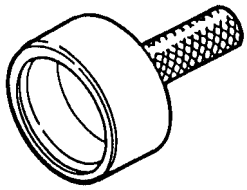
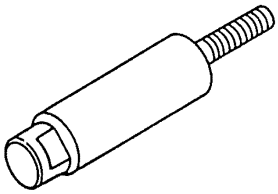
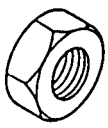
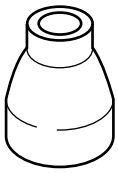
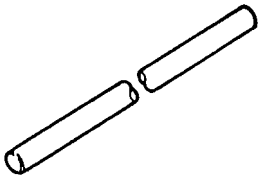
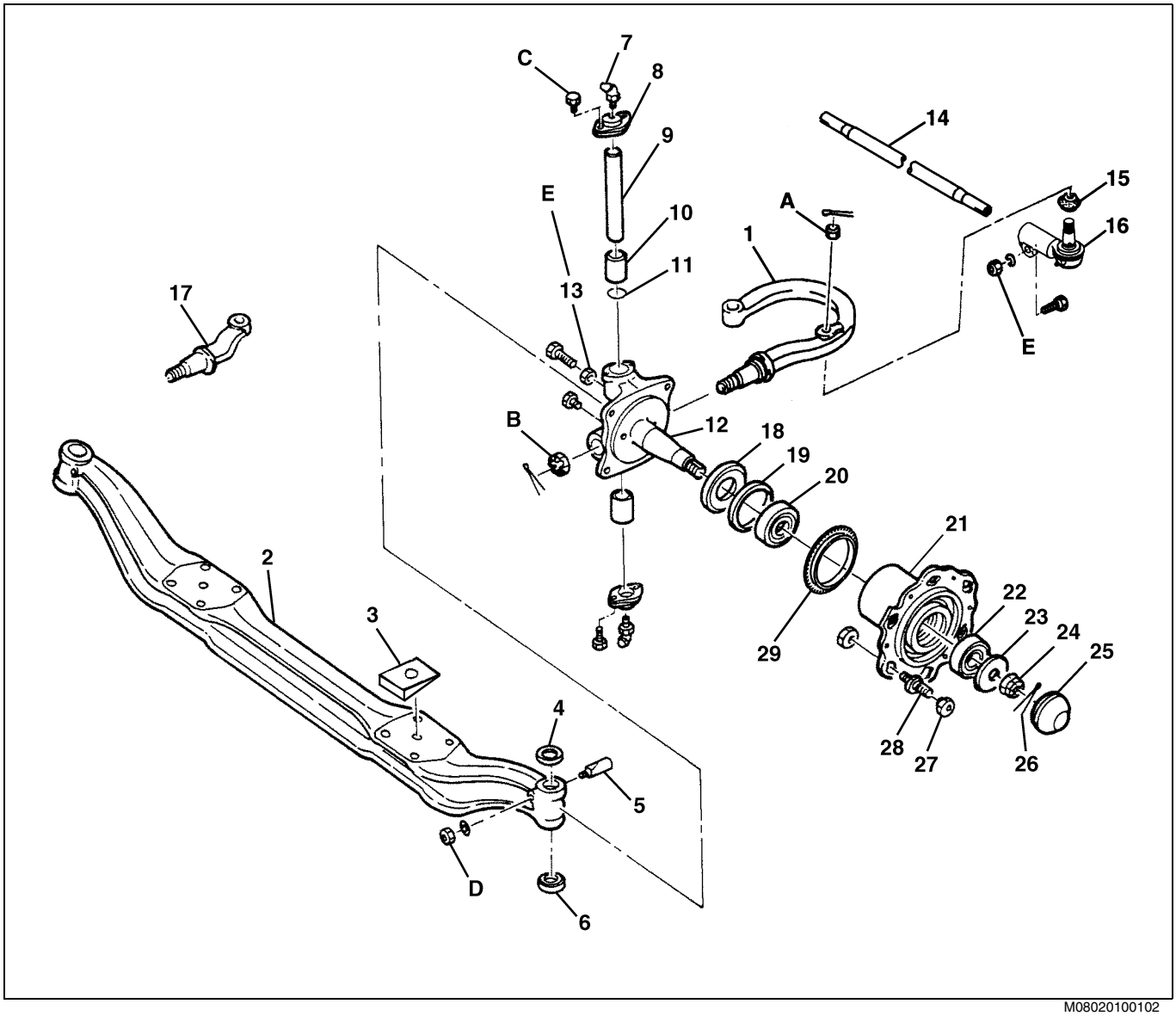
Illustration	Part number	Tool name	Remarks
	09839-5003	SOCKET WRENCH	
	09849-2001	HANDLE	
	09650-2051	WHEEL HUB PULLER	
	09607-1010	HUB CAP INSTALLER	
	09657-1131	KING PIN GUIDE	
	09654-1080	PLATE	
	9201-12100	NUT	

Illustration	Part number	Tool name	Remarks
	09657-2050	DUST COVER GUIDE	
	09712-1080	BAR	

COMPONENT LOCATOR

M08020103BED1002



M08020100102

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

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

A	**144-244 {1,488-2,488, 107-179}**	**D**	**37.5-48.5 {382-494, 27.6-35.7}**
B	**587-783 {5,949-7,984, 430-577}**	**E**	**63.5-84.5 {647-861, 47-62}**
C	**19-25 {193-257, 13.9-18.3}**		

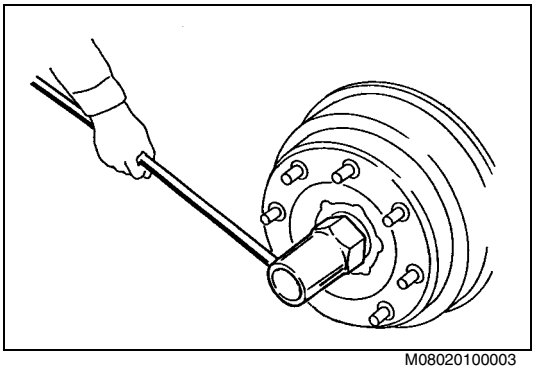
OVERHAUL

M08020103BEH2002

IMPORTANT POINTS - DISASSEMBLY

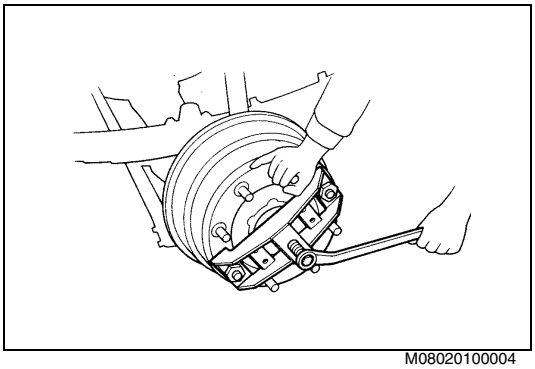
1. REMOVAL OF THE WHEELS

(1) Refer to chapter WHEEL AND TIRE.



M08020100003

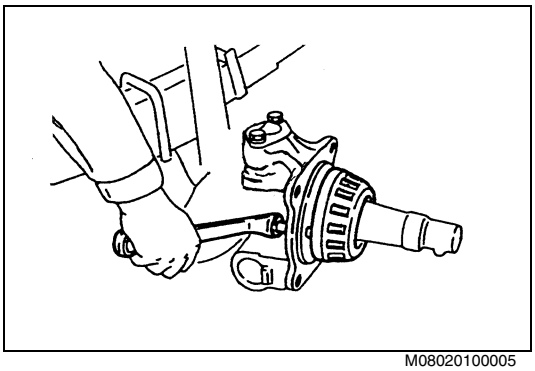
2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (09839-5003)
Handle (09849-2001)



M08020100004

3. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (09650-2051)
Handle (09849-2001)

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



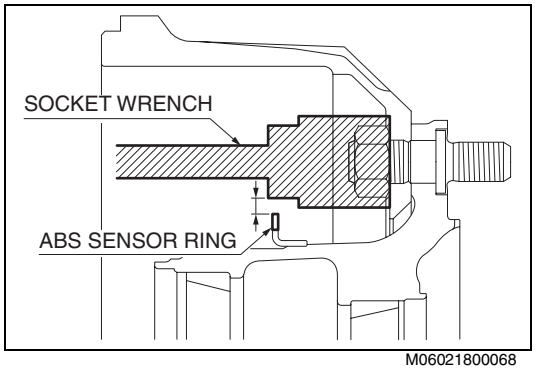
M08020100005

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

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

5. REMOVAL OF THE WHEEL BRAKE

(1) Refer to chapter SERVICE BRAKE.



M06021800068

6. DISMOUNTING THE WHEEL BOLT

(1) Remove the nuts.

NOTICE:

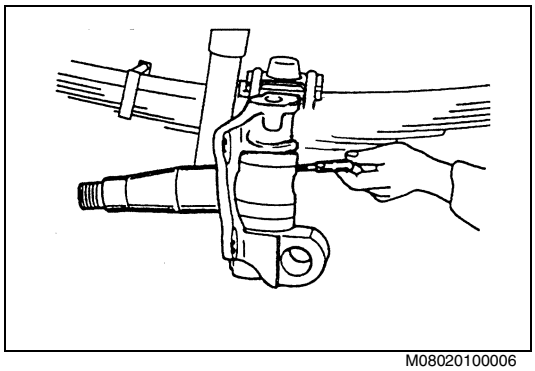
- **Removing the nuts without ABS sensor ring, be careful not to damage the ring by tool.**

(2) Separate the wheel hub and brake drum. (If necessary)

(3) Knock through the wheel bolt using blass bar and hammer.

NOTICE:

- **Put aligned marks on the wheel hub and brake drum.**


M08020100006

7. REMOVAL OF THE LOCK PIN

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

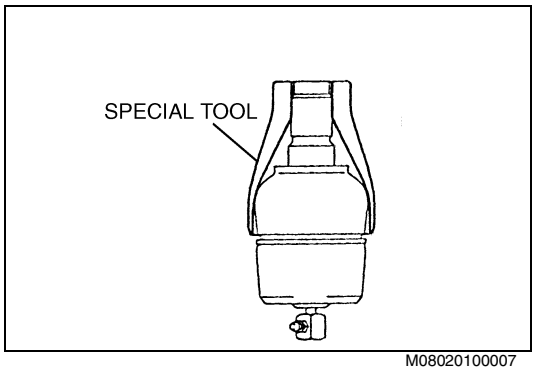
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE DUST COVER.

NOTICE:

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

SST: Dust Cover Guide (09657-2050)

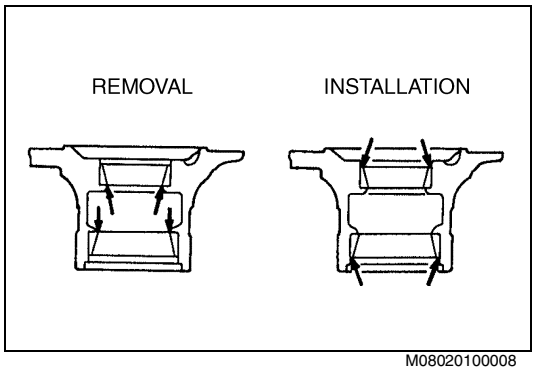


M08020100007

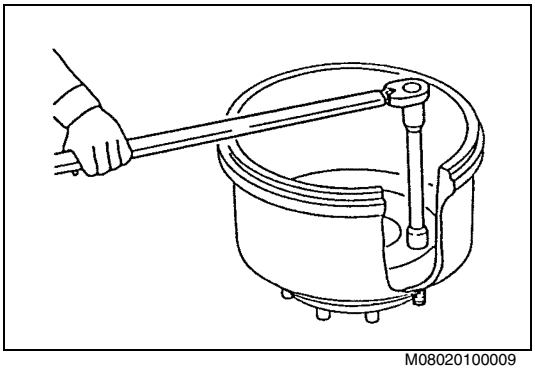
2. REPLACEMENT OF THE WHEEL HUB BEARING RACE

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

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



M08020100008


M08020100009

3. REPLACEMENT OF THE HUB BOLTS

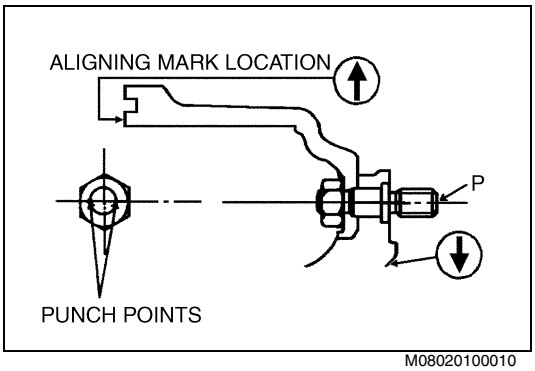
(1) Loosen the hub bolt fitting nuts and remove the hub bolts from the wheel hub.

(2) Install the new hub bolts.

NOTICE:

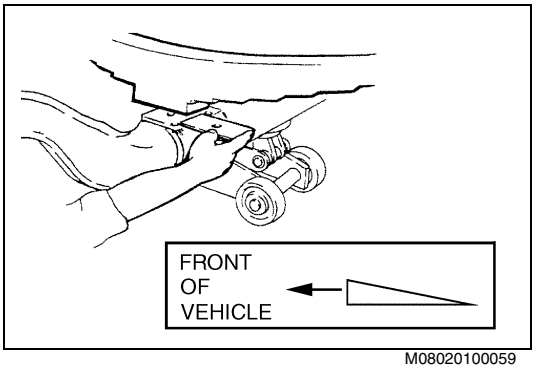
- **The right and left hub bolts differ, so install them according to the chart below.**

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



M08020100010

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



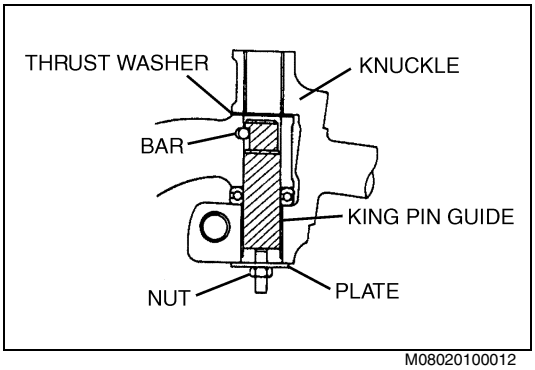
M08020100059

4. INSTALLATION OF THE AXLE BEAM

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

NOTICE:

Confirm the direction of caster shim.



M08020100012

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

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

Clearance: Assembly Standard Less than 0.1 mm {0.0039 in.}

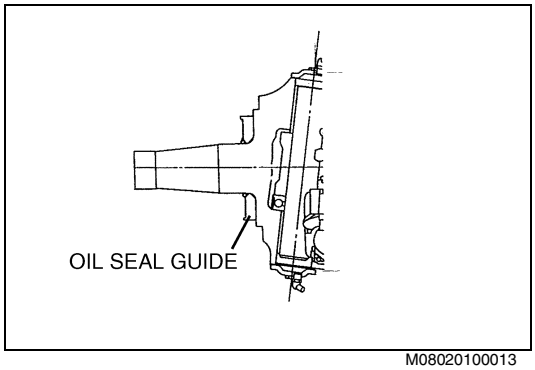
Thickness of Thrust Washer: mm {in.}

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

SST:
King Pin Guide (09657-1131)
Plate (09654-1080)
Nut (9201-12100)
Bar (09712-1080)

6. ASSEMBLY OF THE WHEEL BRAKE

(1) Refer to chapter SERVICE BRAKE.

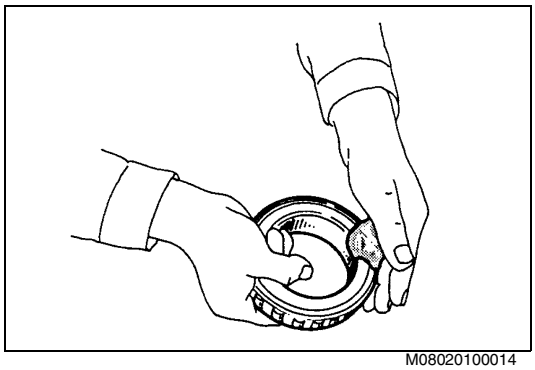


M08020100013

7. INSTALLATION OF THE OIL SEAL GUIDE

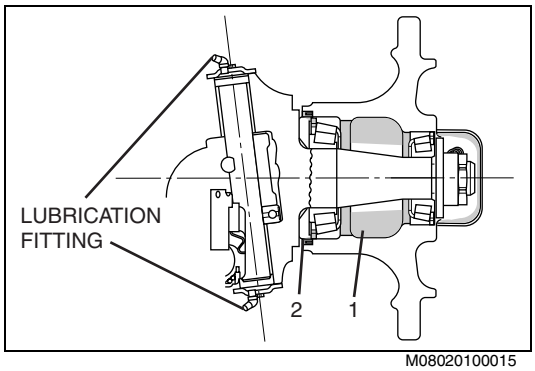
NOTICE:

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


M08020100014

8. GREASING

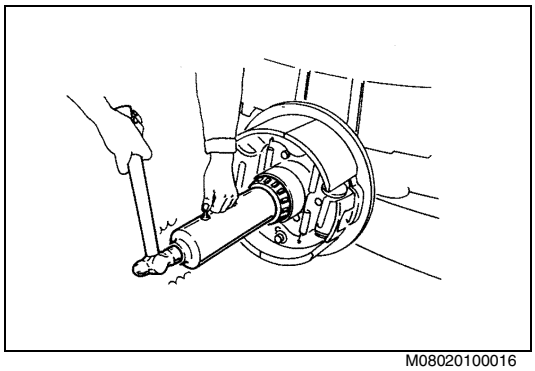
(1) Pack enough the wheel hub bearing grease between the bearing rollers.



M08020100015

(2) Apply wheel hub bearing grease to the wheel hub 1 and lip part 2 of the oil seal.

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

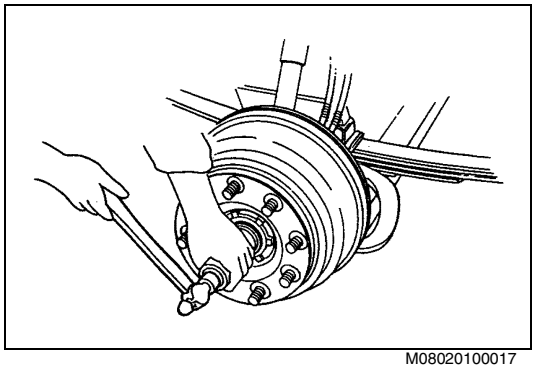

M08020100016

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

(1) Install the inner wheel hub bearing.

NOTICE:

- **Using a tool as shown simplifies installation.**

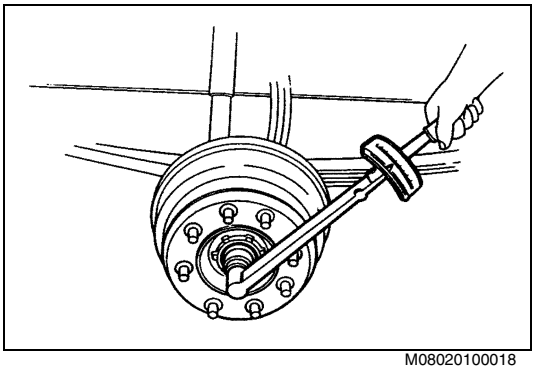

M08020100017

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

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

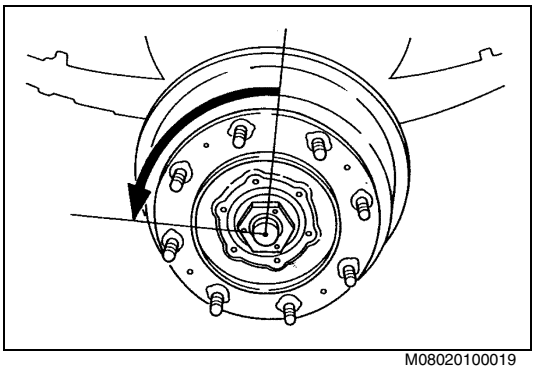
NOTICE:

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

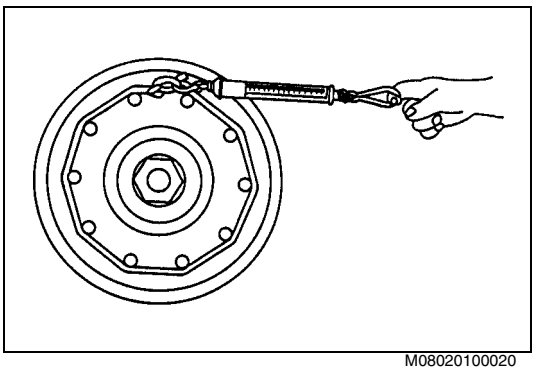

M08020100018

10. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

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

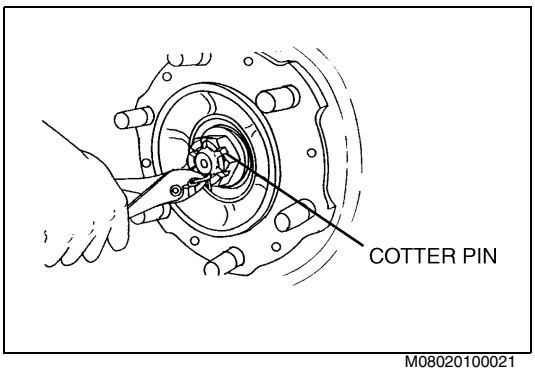

M08020100019

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


M08020100020

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

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



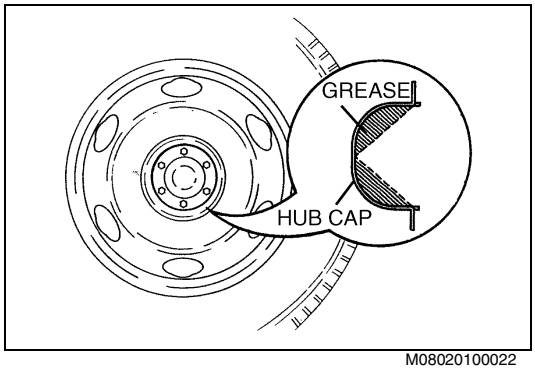
M08020100021

11. INSTALLATION OF THE COTTER PIN

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

12. INSTALLATION OF THE WHEELS

(1) Refer to chapter WHEEL AND TIRE.



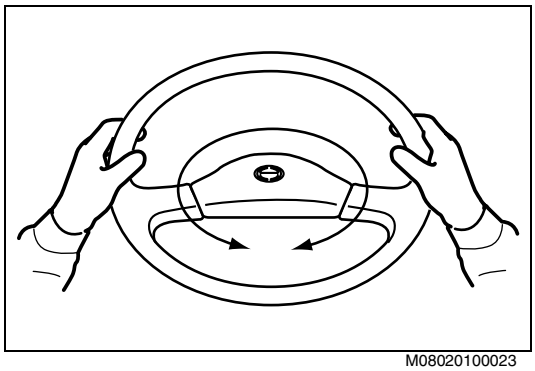
M08020100022

13. INSTALLATION OF THE HUB CAP

NOTICE:

Apply silicon based liquid gasket (ThreeBond #1215 or equivalent) to all around the fitting part of the hub cap with the hub, then strike it with special tool.

SST: Hub Cap Installer (09607-1010)


M08020100023

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

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

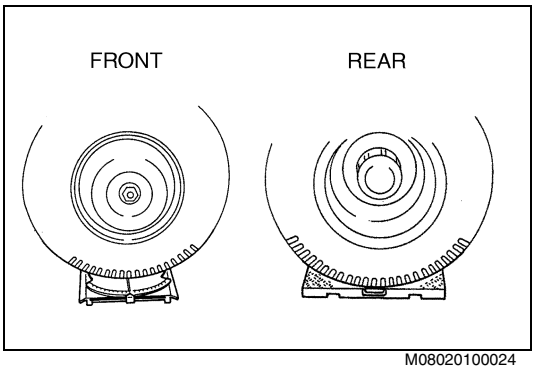
(1) On completion of the front axle overhaul, conduct the followings:

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

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

INSPECTION AND ADJUSTMENT

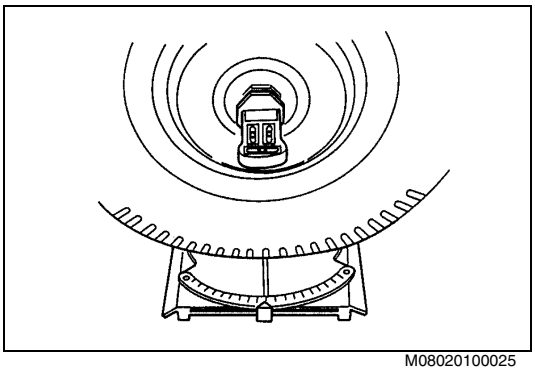
M08020103BEH3001



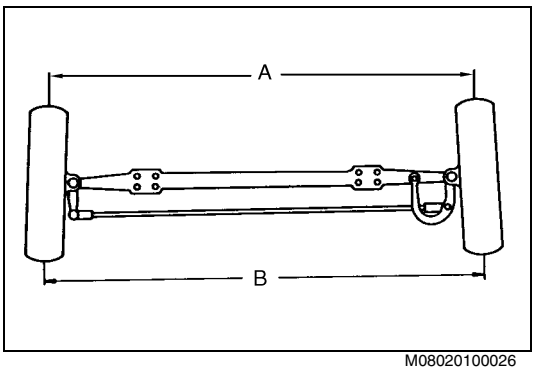
M08020100024

1. INSPECTION OF THE WHEEL ALIGNMENT

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


M08020100025

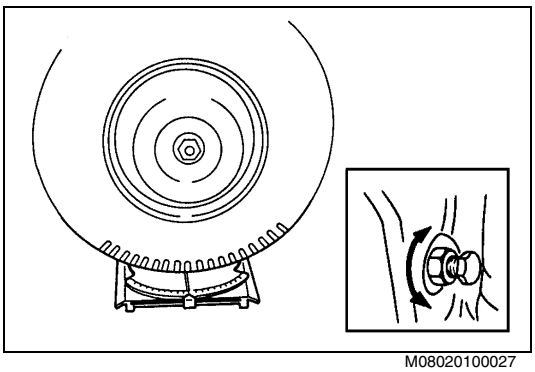
(2) Adjust the king pin inclination, caster, and camber.
Refer to DATA AND SPECIFICATIONS.



M08020100026

(3) Check the toe-in.

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


M08020100027

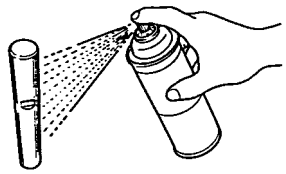
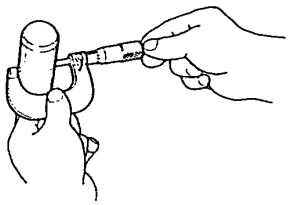
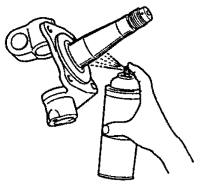
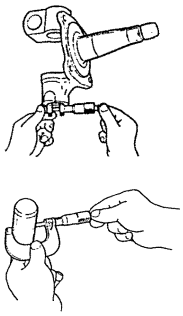
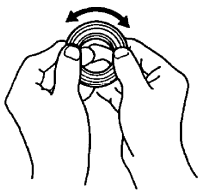
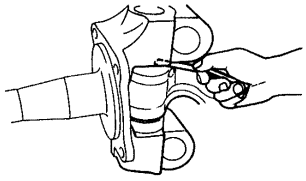
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

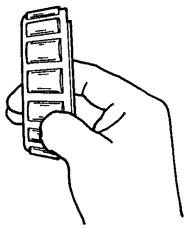
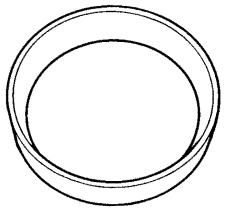
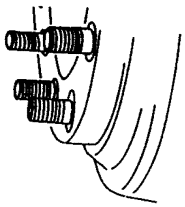
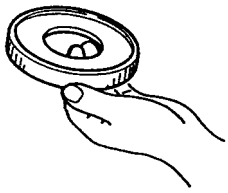
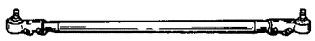
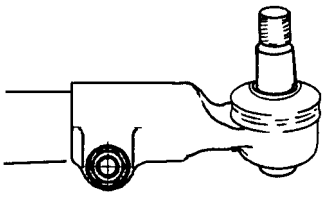
(1) Refer to DATA AND SPECIFICATIONS.

INSPECTION AND REPAIR

M08020103BEH3002

Unit: mm {in.}

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

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

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

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

REAR AXLE
(DIFFERENTIAL GEAR SERIES: SH13)

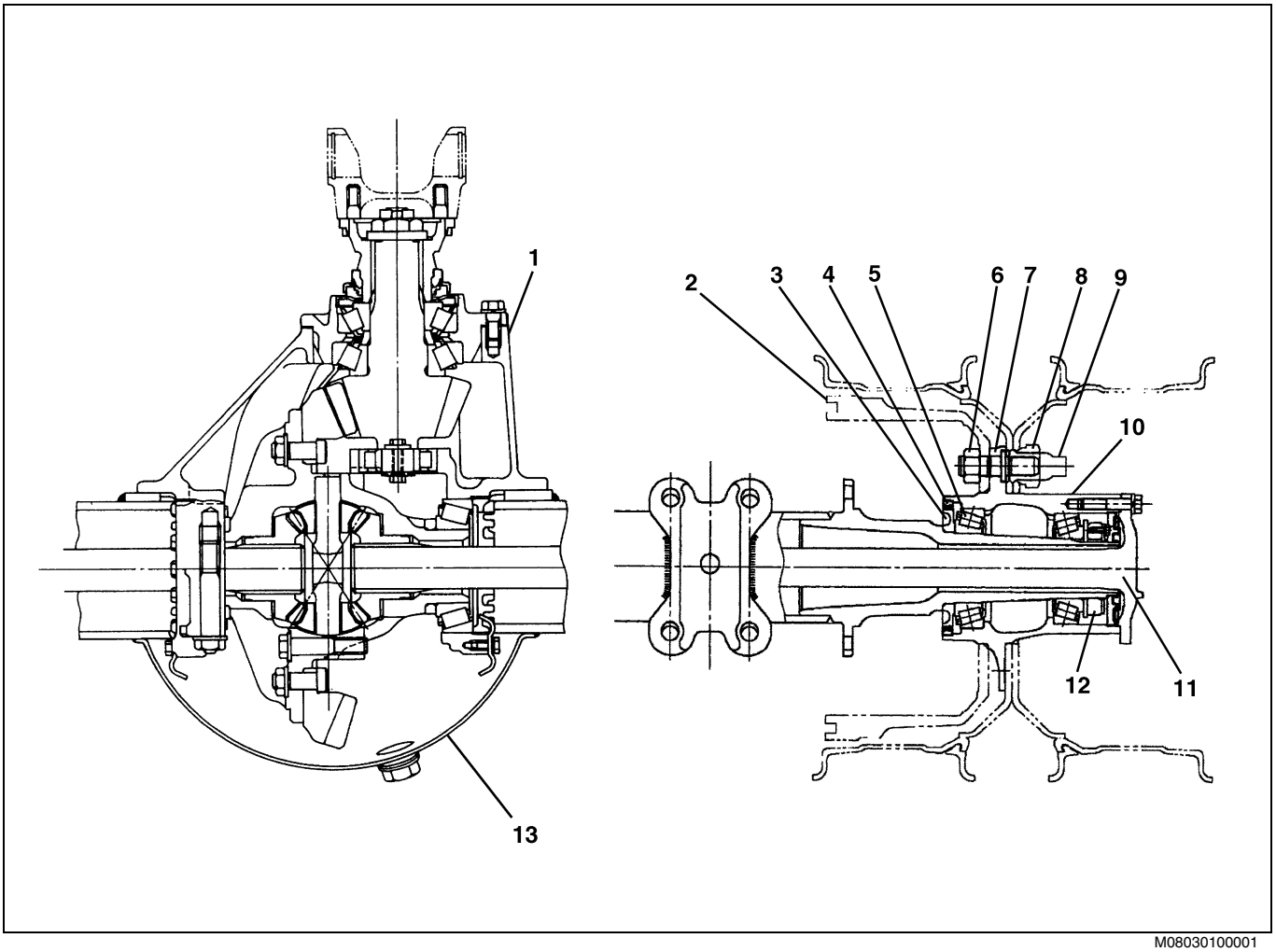
DATA AND SPECIFICATIONS

M08030101BEI2001

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

DESCRIPTION

M08030101BEC1001



M08030100001

1	Differential carrier assembly	8	Outer wheel nut
2	Brake drum	9	Inner wheel nut
3	Oil seal collar	10	Wheel hub
4	Oil seal	11	Axle shaft
5	Wheel hub bearing	12	Lock nut
6	Hub bolt fitting nut	13	Axle housing
7	Hub bolt		

TROUBLESHOOTING

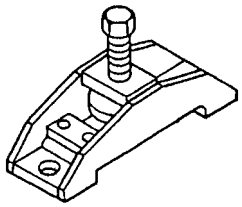
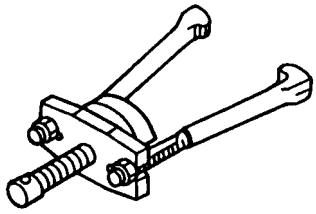
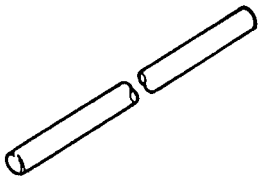
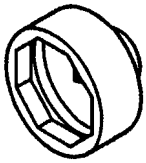
M08030101BEF3001

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

SPECIAL TOOL

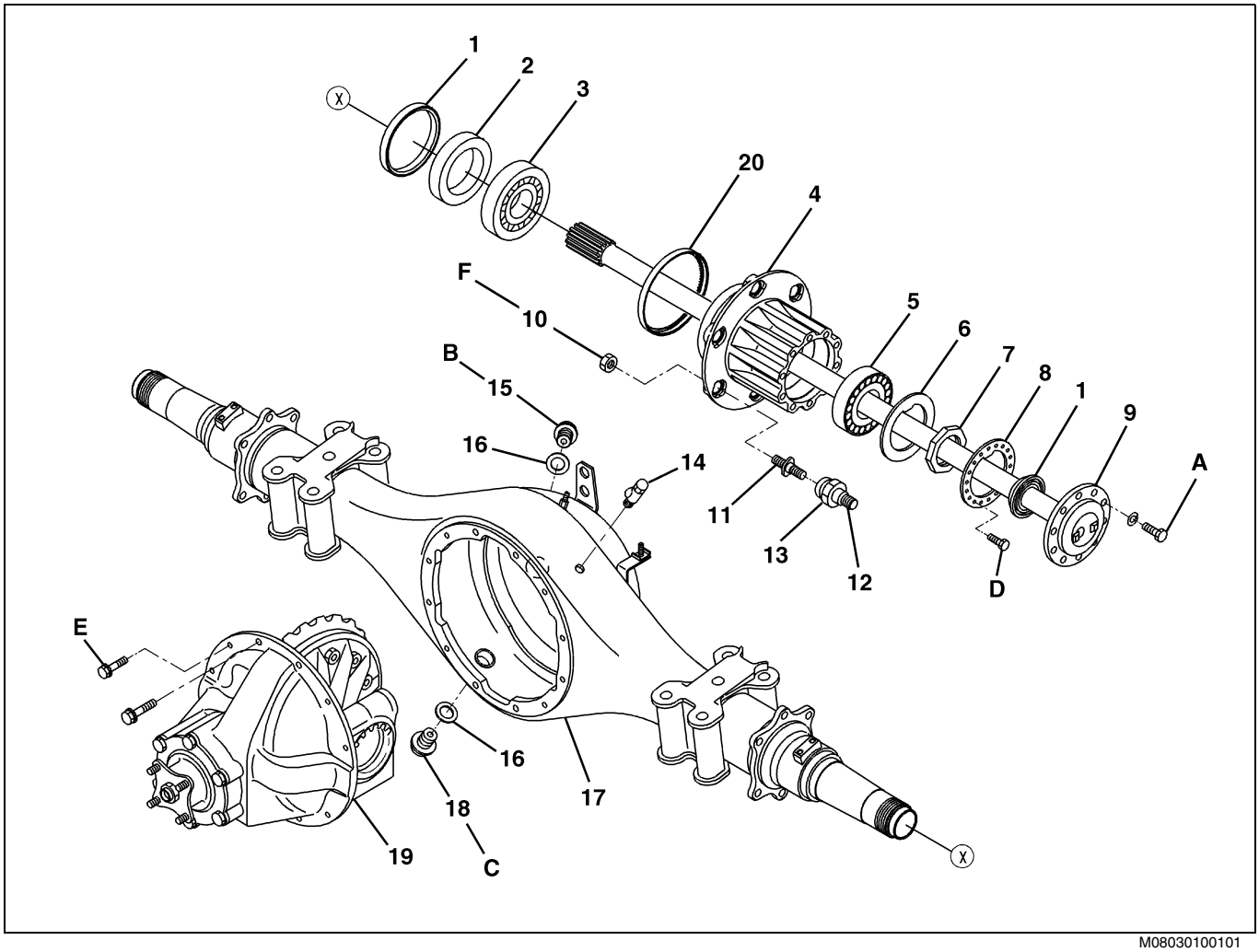
M08030101BEK1001

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

Illustration	Part number	Tool name	Remarks
	09650-2051	WHEEL HUB PULLER	
	09650-2090	HUB BEARING PULLER	
	09849-1601 09849-2001	HANDLE	
	09839-9401	SOCKET WRENCH	

COMPONENT LOCATOR

M08030101BED1002



M08030100101

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

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

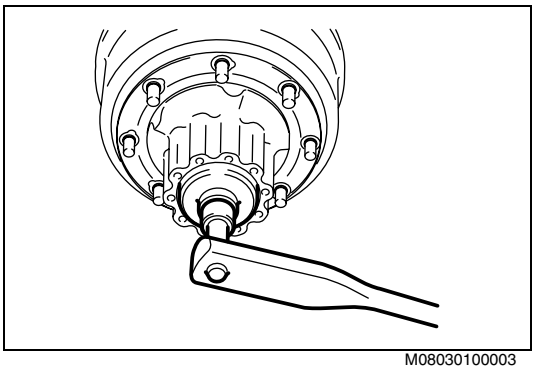
A	84.5-107.5 {862-1,097, 63-79}	E	ϕ12 bolt: 84.5-107.5 {862-1,097, 63-79}
B	78.4-117.6 {800-1,200, 58-86}		ϕ14 bolt: 113-147 {1,152-1,499, 83-108}
C	78.4-117.6 {800-1,200, 58-86}	F	392-470 {4,000-4,800, 290-347}
D	8.33-10.79 {85-110, 6.2-8.0}		

OVERHAUL

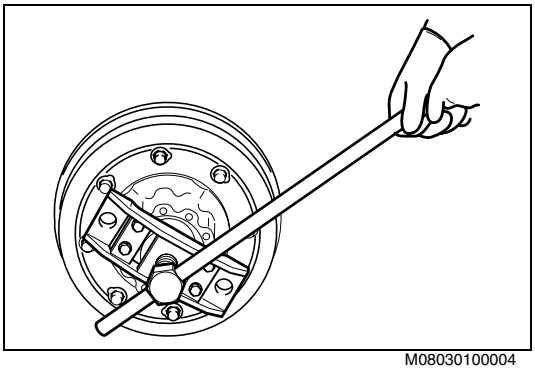
M08030101BEH2002

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS.
(1) Refer to chapter WHEEL AND TIRE.

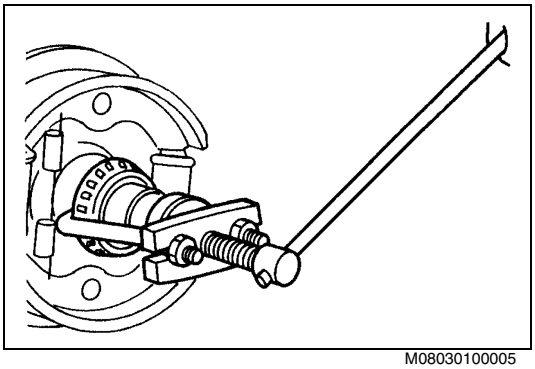

M08030100003

2. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT.
SST: Socket Wrench (09839-9401)


M08030100004

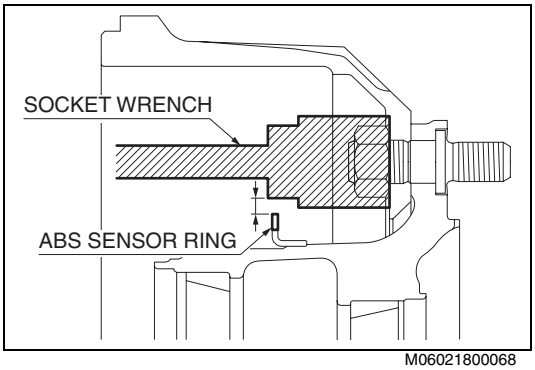
3. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING.
SST:
Wheel Hub Puller (09650-2051)
Handle (09849-1601)
Handle (09849-2001)

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


M08030100005

4. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR.
SST:
Hub Bearing Puller (09650-2090)
Handle (09849-1601)
Handle (09849-2001)

5. REMOVAL OF THE WHEEL BRAKE
(1) Refer to chapter SERVICE BRAKE.



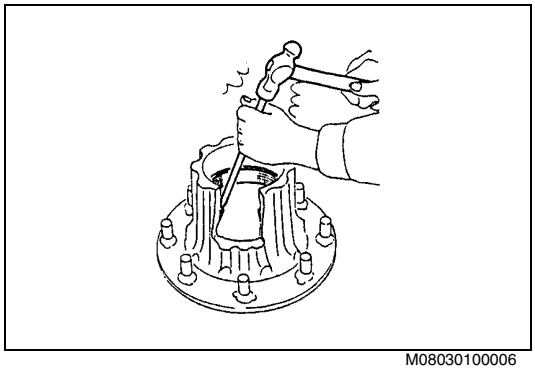
M06021800068

6. DISMOUNTING THE WHEEL BOLT
(1) Remove the nuts.

NOTICE:
- **Removing the nuts without ABS sensor ring, be careful not to damage the ring by tool.**

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

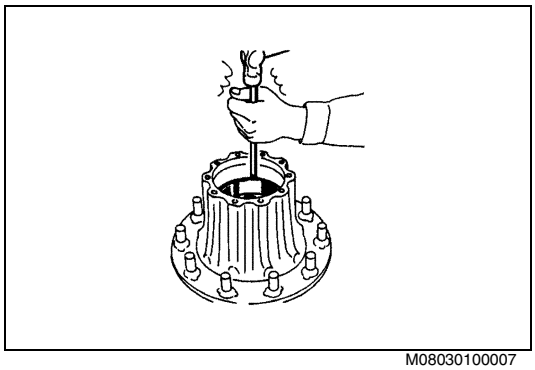
NOTICE:
- **Put aligned marks on the wheel hub and brake drum.**


M08030100006

IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE WHEEL HUB BEARING RACE.

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

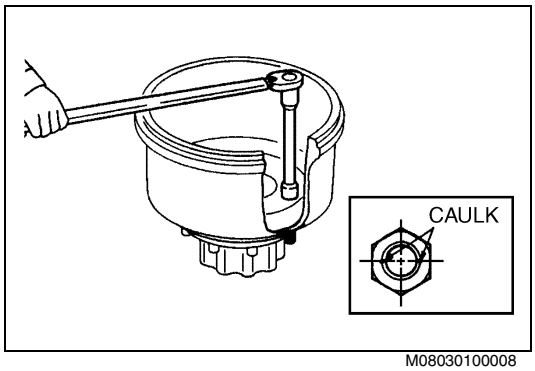

M08030100007

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

2. REPLACEMENT OF THE HUB BOLTS

NOTICE:

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



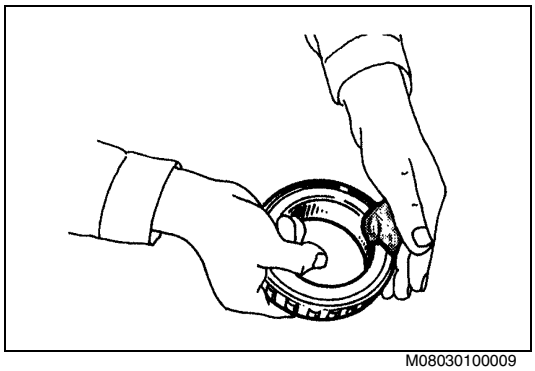
M08030100008

3. GREASING.

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

NOTICE:

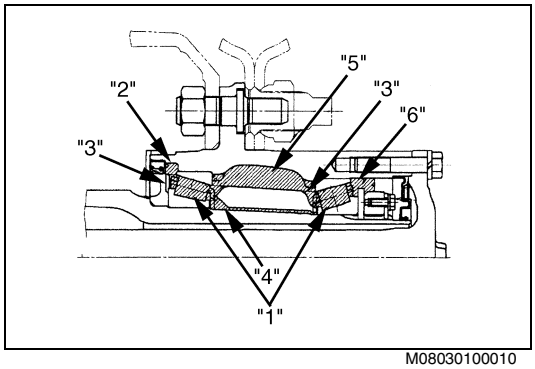
"1": Fill the grease to spaces among the inner race, rollers and retainer to the extent that there is not any vacancy remained.


M08030100009

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

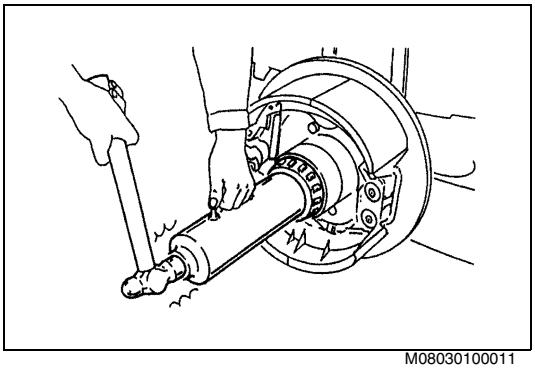
NOTICE:

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



M08030100010

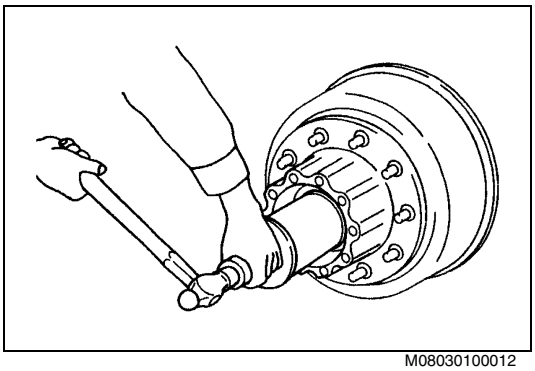
- **"6": Fill the grease up the half depth of the lock nut.**


M08030100011

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

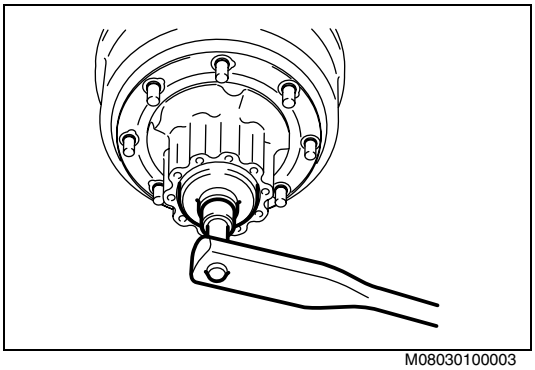
(1) Install the oil seal and the inner wheel hub bearing.

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


M08030100012

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

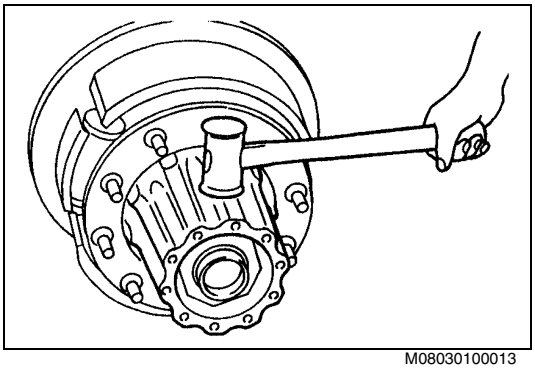
NOTICE:
- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


M08030100003

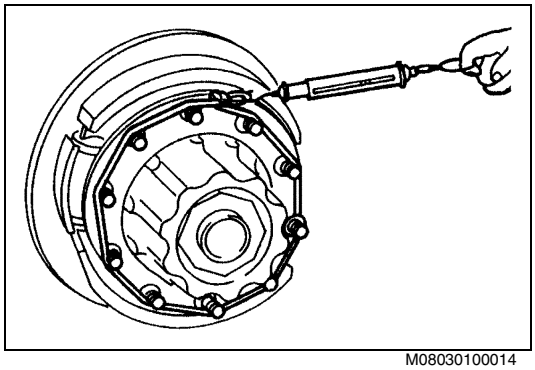
5. ADJUSTMENT-OF THE WHEEL HUB BEARING PRELOAD.

(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.
SST: Socket Wrench (09839-9401)

Tightening Torque:
490-588 N·m {5,000-6,000 kgf·cm, 362-433 lbf·ft}

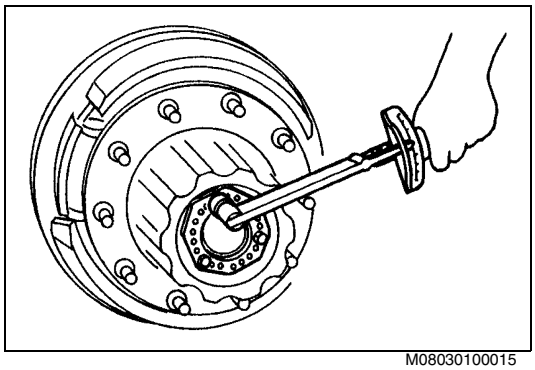

M08030100013

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


M08030100014

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

Turning Torque N·m {kgf·cm, lbf·ft}	**3.9-5.9 {40-60, 2.9-4.3}**
Spring balancer reading N {kgf, lbf}	**35.3-51.9 {3.6-5.3, 8.0-11.6}**


M08030100015

6. INSTALLATION OF THE LOCK PLATE

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

NOTICE:

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

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

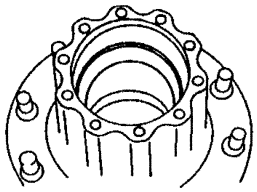
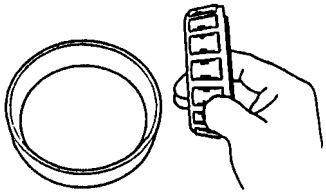
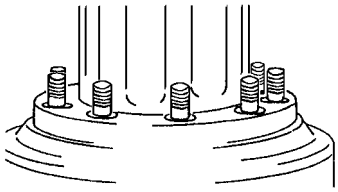
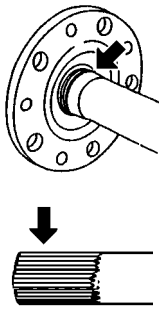
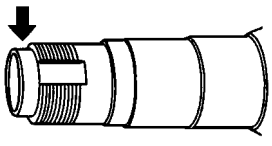
(1) On completion of the wheel hub and related parts reassembly, conduct the followings.

(2) Bleed the air from the brake lines according to the section SERVICE BRAKE ASSEMBLY in the chapter BRAKE EQUIPMENT.

(3) Adjust the brake shoe clearance according to the section WHEEL BRAKE in the chapter SERVICE BRAKE.

INSPECTION AND REPAIR

M08030101BEH3001

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

WHEEL & TIRE

AX04-001

WHEEL AND TIRE AX04-2
DATA AND SPECIFICATIONS AX04-2
DESCRIPTION AX04-8
TROUBLESHOOTING AX04-12
SPECIAL TOOL AX04-15
PRECAUTIONS AX04-16
INSPECTION AX04-17
INSPECTION AND REPAIR AX04-18

SAE, JIS, DIN AND ISO TYPE WHEEL AX04-19
OVERHAUL AX04-19

SPOKE WHEEL AND ADAPTER TYPE WHEEL AX04-24
OVERHAUL AX04-24

WHEEL AND TIRE

DATA AND SPECIFICATIONS

M08040101BEI2002

The figures given in the table are based on the recommendation by European Tire and Rim Technical Organization. (E.T.R.T.O.)

***(1). Tire radius given is dynamic effective radius for dual tires, for single tire, deduct 1.0 mm {0.039 in.} from the figure given.**

***(2). The rims with mark (•) are standard and others may be used.**

***(3). The max. air pressure and max. load refer to the recommendation by Japan Automobile Tire Manufacturers' Association. (J.A.T.M.A.)**

***(4). The tire is certified by ECE.**

***(5). Some vehicle specifications are not applicable to the following table. Refer to the Owner's Manual for details.**

1. Diagonal tires

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
*(3) 7.00-16-6PR	325 {3.25, 47}	880 {1,940}	840 {1,852}	*(1) 368 {14.49}	• 16 x 5.50F SDC
*(3) 7.00-16-10PR	500 {5.00, 73}	1,130 {2,491}	1,075 {2,370}		• 16 x 5.50F SDC
7.00-16-12PR	600 {6.12, 87}	1,285 {2,833}	1,250 {2,756}	373 {14.69}	• 16 x 5.50F SDC
7.50-16-12PR	650 {6.63, 94}	1,450 {3,197}	1,400 {3,086}	389 {15.31}	• 16 x 6.00GS SDC
*(3) 7.50-16-14PR	650 {6.50, 94}	1,510 {3,329}	1,440 {3,175}	383 {15.08}	
7.50-20-10PR	550 {5.61, 80}	1,550 {3,417}	1,500 {3,307}	451 {17.76}	• 20 x 6.00S
7.50-20-12PR	675 {6.88, 98}	1,800 {3,968}	1,750 {3,858}		
8.25-16-14PR	650 {6.63, 94}	1,800 {3,968}	1,700 {3,747}	404 {15.91}	• 16 x 6.40H 16 x 6.00S SDC 16 X 6.00GS
*(3) 8.25-16-14PR	575 {5.75, 83.4}	1,710 {3,770}	1,630 {3,593}	*(1) 404 {15.91}	• 16 x 6.00GS
8.25-20-12PR	600 {6.12, 87}	1,900 {4,188}	1,800 {3,968}	468 {18.43}	• 20 x 6.50T
8.25-20-14PR	675 {6.88, 98}	2,060 {4,541}	1,950 {4,299}		• 20 x 6.50T 20 x 6.00S
9.00-20-12PR	625 {6.37, 91}	2,240 {4,938}	2,060 {4,541}	488 {19.21}	• 20 x 7.00T 20 x 6.50T
9.00-20-14PR	700 {7.14, 102}	2,500 {5,511}	2,300 {5,071}		20 x 6.50T 20 x 7.00T 20 x 7.50V
*(3) 10.00-20-12PR	575 {5.75, 83}	2,450 {5,401}	2,210 {4,482}	*(1) 506 {19.92}	• 20 x 7.50V

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
10.00-20-14PR	650 {6.63, 94}	2,650 {5,842}	2,430 {5,357}	507 {19.96}	20 x 7.00T 20 x 7.50T
10.00-20-16PR	750 {7.65, 109}	3,000 {6,614}	2,725 {6,007}		20 x 7.00T 20 x 7.50V 20 x 8.00T
*(3) 11.00-20-12PR	575 {5.75, 83}	2,585 {5,699}	2,435 {5,368}	*(1) 520 {20.47}	• 20 x 8.00V
11.00-20-14PR	675 {6.88, 98}	3,000 {6,614}	2,725 {6,007}	521 {20.51}	20 x 7.50V
11.00-20-16PR	725 {7.39, 105}	3,250 {7,165}	2,900 {6,393}		20 x 7.50V 20 x 8.50V
*(3) 12.00-20-14PR	575 {5.75, 83}	2,900 {6,393}	2,760 {6,085}	*(1) 539 {21.22}	• 20 x 8.50V
12.00-20-16PR	675 {6.88, 98}	3,350 {7,385}	3,000 {6,613}	540 {21.26}	20 x 8.00V
12.00-20-18PR	775 {7.90, 112}	3,750 {8,267}	3,250 {7,165}		20 x 9.00V
12.00-24-16PR	675 {6.88, 98}	3,650 {8,047}	3,250 {7,165}	589 {23.19}	• 24 x 8.50V 24 x 8.00V 24 x 9.00V
12.00-24-18PR	775 {7.90, 112}	4,000 {8,818}	3,650 {8,047}		
*(3) 14.00-24-20PR	675 {6.75, 98}	4,990 {11,001}	4,755 {10,483}	*(1) 642 {25.28}	• 24 x 10.00WI 24 x 9.00V

2. Radial tires (with tube)

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
*(3) 7.00R-16-8PR	450 {4.5, 65}	1,025 {2,259}	980 {2,160}	*(1) 373 {14.69}	• 16 x 5.50F SDC
*(3) 7.00R-16-10PR	525 {5.25, 76}	1,130 {2,491}	1,075 {2,369}		• 16 x 5.50F SDC
*(3) 7.00R-16-12PR	600 {6.00, 87}	1,230 {2,711}	1,170 {2,579}		• 16 x 5.50F SDC
7.50R-16-12PR	625 {6.37, 91}	1,450 {3,197}	1,400 {3,086}	390 {15.35}	16 x 6.00GS
*(3) 7.50R-16-14PR	700 {7.00, 102}	1,510 {3,328}	1,440 {3,174}	*(1) 387 {15.24}	• 16 x 6.00GS SDC
7.50R-20-12PR	675 {6.88, 98}	1,800 {3,968}	1,750 {3,858}	451 {17.76}	• 20 x 6.00S 20 x 6.50T
8.25R-16-14PR	675 {6.88, 98}	1,800 {3,968}	1,700 {3,748}	418 {16.46}	• 16 x 6.00GS
8.25R-20-14PR	675 {6.88, 98}	2,060 {4,541}	1,950 {4,299}	467 {18.39}	• 20 x 6.50T 20 x 7.00T
9.00R-20-12PR	725 {7.39, 105}	2,336 {5,150}	2,050 {4,520}	491 {19.29}	20 x 7.00T
9.00R-20-14PR	725 {7.39, 105}	2,500 {5,511}	2,300 {5,071}	494 {19.45}	• 20 x 7.00T 20 x 6.50T 20 x 7.50V
10.00R-20-14PR	725 {7.39, 105}	2,650 {5,842}	2,430 {5,357}	508 {20.00}	• 20 x 7.50V 20 x 6.50T 20 x 7.00T 20 x 8.00V
10.00R-20-16PR	800 {8.16, 116}	3,000 {6,614}	2,725 {6,007}	511 {20.12}	• 20 x 7.50V 20 x 7.00T
11.00R-20-14PR	725 {7.39, 105}	3,000 {6,614}	2,725 {6,007}	523 {20.59}	• 20 x 8.00V 20 x 7.50V 20 x 8.50V
11.00R-20-16PR	800 {8.16, 116}	3,250 {7,165}	2,900 {6,393}	525 {20.67}	• 20 x 8.00V 20 x 7.50V 20 x 8.50V
12.00R-20-16PR	750 {7.65, 109}	3,350 {7,385}	3,000 {6,613}	542 {21.34}	• 20 x 8.50V 20 x 9.00V
12.00R-20-18PR	850 {8.67, 123}	3,750 {8,267}	3,250 {7,165}	545 {21.46}	• 20 x 8.50V 20 x 8.50
14.00R-20-18PR	700 {7.14, 102}	4,500 {9,921}	4,125 {9,094}	601 {23.66}	20 x 10.00V 20 x 10.00W

3. Radial tires (Tubeless)

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
205/75R17.5 122/120	675 {6.88, 81}	1,500 {3,307}	1,400 {3,086}	366 {14.41}	• 17.5 x 6.00 17.5 x 5.25 17.5 x 6.75
215/75R17.5	817.87 {8.34, 118.6}	2,180 {4,806}	2,060 {4,542}	—	17.5 x 6.00 17.5 x 6.75
*(3) 225/80R17.5-14PR	700 {7.00, 102}	1,550 {3,417}	1,500 {3,307}	*(1) 389 {15.31}	• 17.5 x 6.75 17.5 x 6.00
*(3) 225/90R17.5-14PR	700 {7.00, 102}	1,750 {3,858}	1,650 {3,638}	*(1) 410 {16.14}	• 17.5 x 6.75 17.5 x 6.00
*(4) 225/90R17.5 -128/126	720 {7.34, 104}	1,800 {3,968}	1,700 {3,748}	*(1) 410 {16.14}	• 17.5 x 6.00
255/70R22.5	800 {8.16, 116}	2,500 {5,511}	2,300 {5,071}	452 {17.80}	• 22.5 x 7.50
235/70R22.5	900 {9.18, 131}	2,360 {5,202}	2,180 {4,806}	439 {17.28}	• 22.5 x 6.75
235/70R17.5	725 {7.39, 105}	1,900 {4,189}	1,800 {3,968}	387 {15.24}	17.5 x 6.75
235/75R17.5	725 {7.39, 105}	1,900 {4,189}	1,800 {3,968}	372 {14.65}	17.5 x 6.75
255/70R22.5	900 {9.18, 131}	2,725 {6,007}	2,500 {5,511}	452 {17.80}	• 22.5 x 7.50 22.5 x 6.75 22.5 x 8.25
275/70R22.5	900 {9.18, 131}	3,150 {6,944}	2,900 {6,393}	465 {18.31}	• 22.5 x 8.25 22.5 x 7.50
275/80R22.5	809.05 {8.25, 117.3}	3,000 {6,613}	2,725 {6,007}	490 {19.29}	• 22.5 x 8.25 22.5 x 7.50
275/80R22.5 -149/146J	850 {8.67, 123}	3,250 {7,165}	3,000 {6,614}	491 {19.33}	• 22.5 x 7.50
295/70R22.5	882.60 {9.00, 128.0}	3,450 {7,605}	3,150 {6,944}	467 {18.39}	• 22.5 x 9.00 22.5 x 8.25
295/80R22.5	800 {8.16, 116}	3,350 {7,385}	3,000 {6,614}	507 {19.96}	• 22.5 x 8.25
315/80R22.5	825 {8.41, 120}	3,750 {8,267}	3,350 {7,385}	523 {20.59}	• 22.5 x 9.00
8R17.5 117/116	600 {6.12, 87}	1,285 {2,833}	1,250 {2,756}	381 {15.00}	• 17.5 x 5.25 • 17.5 x 6.00 17.5 x 6.75
*(3) 8.5R17.5-12PR	625 {6.25, 91}	1,450 {3,196}	1,400 {3,086}	*(1) 389 {15.31}	• 17.5 x 6.00 16 x 6.00GS SDC
*(3) 9R22.5-14PR	725 {7.25, 105}	2,030 {4,475}	1,930 {4,255}	*(1) 470 {18.50}	• 22.5 x 6.75 22.5 x 6.00

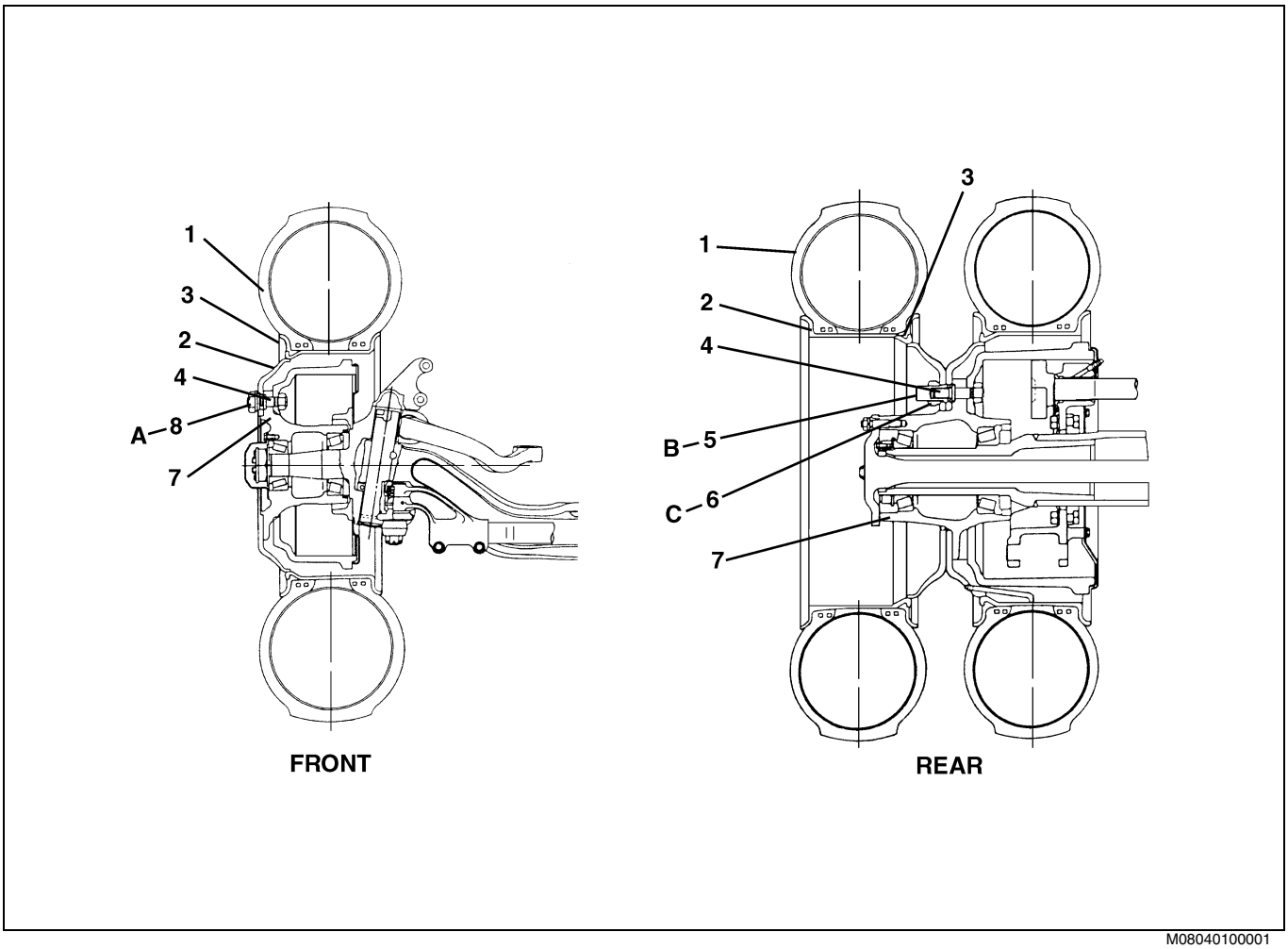
Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb}		Tire radius mm {in.}	*(2) Applicable rim size
		Single	Dual		
9.5R-17.5-14PR	671.76 {6.85, 97.4}	1,700 {3,748}	1,600 {3,527}	408 {16.06}	• 17.5 x 6.00 17.5 x 6.75
9.5R-17.5 129/127	671.76 {6.85, 97.4}	1,700 {3,748}	1,600 {3,527}	408 {16.06}	• 17.5 x 6.00 17.5 x 6.75
*(3) 10R22.5-14PR	725 {7.25, 105}	2,415 {5,324}	2,300 {5,071}	*(1) 492 {19.37}	• 22.5 x 7.50 22.5 x 6.75
*(3) 11R22.5-14PR	700 {7.00, 102}	2,725 {6,007}	2,500 {5,511}	*(1) 508 {20.0}	• 22.5 x 8.25 22.5 x 7.50
*(3) 11R22.5-16PR	800 {8.00, 116}	3,000 {6,614}	2,725 {6,007}	*(1) 508 {20.0}	• 22.5 x 8.25 22.5 x 7.50
*(3) 12R22.5-14PR	725 {7.25, 105}	3,000 {6,614}	2,725 {6,007}	*(1) 523 {20.59}	• 22.5 x 9.00 22.5 x 7.50 22.5 x 8.25
*(3) 12R22.5-16PR	800 {8.00, 116}	3,250 {7,165}	2,900 {6,393}	*(1) 523 {20.59}	• 22.5 x 9.00 22.5 x 8.25
12R22.5-152/148	850 {8.67, 123}	3,550 {7,826}	3,150 {6,944}	526 {20.71}	• 22.5 x 8.25

4. Off the road tires

Tire size	Max. air press. kPa {kgf/cm^2, lbf/in.^{2}}	Allowable max. load kg {lb}	Tire radius mm {in.}	*(2) Applicable rim size
		Single		
*(3) 7.50-20-12PR	525 {5.25, 76}	1,600 {3,527}	*(1) 447 {17.60}	• 6.00S
*(3) 8.25-20-12PR	525 {5.25, 76}	1,890 {4,167}	*(1) 465 {18.31}	• 6.50T 6.00S
*(3) 8.25-20-14PR	600 {6.00, 87}	2.045 {4,508}		
*(3) 9.00-20-12PR	475 {4.75, 69}	2,120 {4,674}	*(1) 485 {19.09}	• 7.00T 6.50T
*(3) 9.00-20-14PR	550 {5.50, 80}	2,310 {5,093}		
*(3) 10.00-20-14PR	500 {5.00, 73}	2.470 {5,445}	*(1) 500 {19.69}	• 7.50V 7.00T 8.00V
*(3) 11.00-20-14PR	475 {4.75, 69}	2.605 {5,743}	*(1) 513 {20.20}	• 8.00V 7.50V 8.50V
*(3) 12.00-20-14PR	425 {4.25, 62}	2,795 {6,162}	*(1) 532 {20.94}	• 8.50V 8.00V 9.00V
*(3) 12.00-20-16PR	500 {5.00, 73}	3,075 {6,779}		
*(3) 12.00-20-18PR	550 {5.50, 80}	3,250 {7,165}		
*(3) 12.00-24-16PR	500 {5.00, 73}	3,460 {7,628}	*(1) 582 {22.91}	• 8.50V 8.00V 9.00V
*(3) 13.00-24-18PR	500 {5.00, 73}	4,000 {8,818}	*(1) 606 {23.86}	• 9.00V 8.50V
*(3) 14.00-20-16PR	425 {4.25, 62}	3,850 {8,488}	*(1) 584 {22.99}	• 10.00WI 9.00V
*(3) 14.00-24-16PR	425 {4.25, 62}	4,295 {9,469}	*(1) 635 {25.00}	• 10.00WI 9.00V
*(3) 14.00-24-20PR	525 {5.25, 76}	4,865 {10,725}		
*(3) 14.00-24-24PR	650 {6.50, 94}	5,510 {12,147}		

DESCRIPTION

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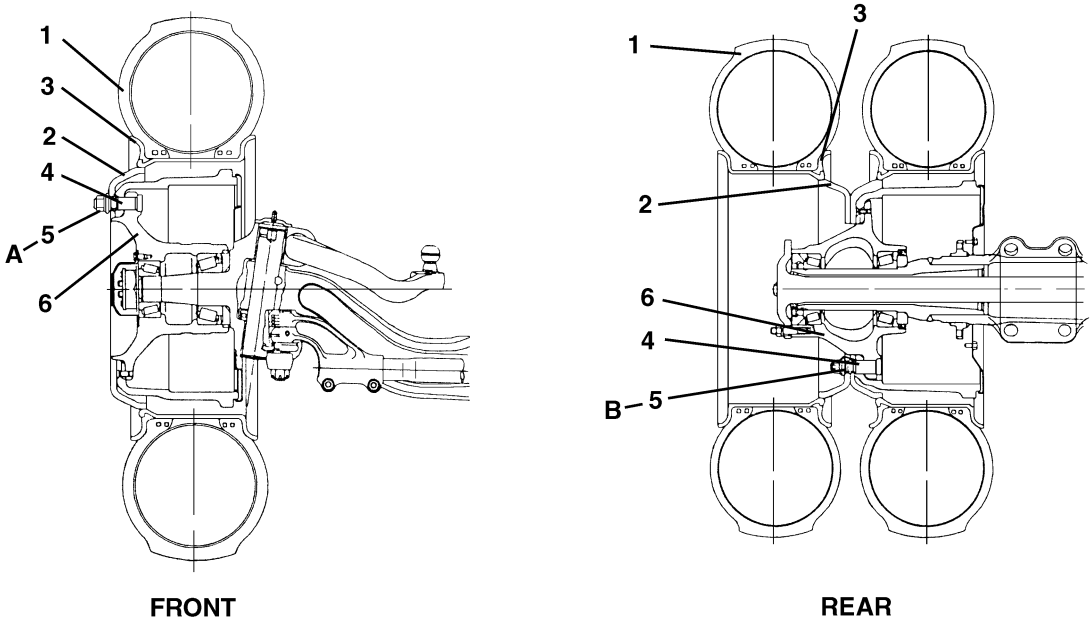


M08040100001

SAE AND JIS TYPE

1	Tire	5	Inner wheel nut
2	Disc wheel	6	Outer wheel nut
3	Side ring	7	Hub
4	Hub bolt	8	Wheel nut

	Hub bolt diameter mm {in.}	Tightening torque N·m {kgf·cm, lbf·ft}
A	20 {0.787}	392.27-470.71 {4,000-4,800, 290-347}
	18 {0.709}	235.36-294.19 {2,400-3,000, 174-216}
B, C	20 {0.787}	392.27-470.71 {4,000-4,800, 290-347}
	18 {0.709}	235.36-294.19 {2,400-3,000, 174-216}

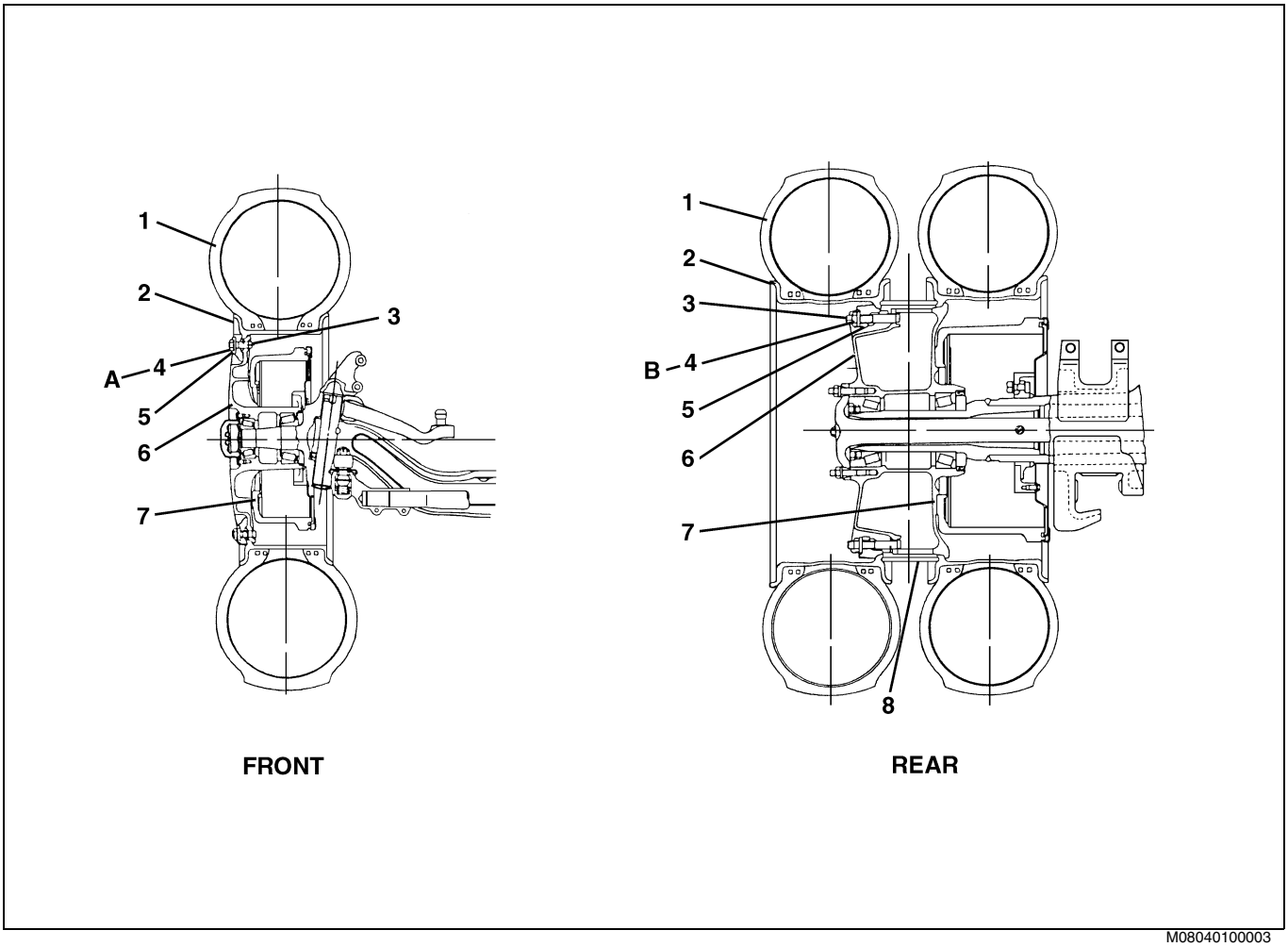


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DIN AND JIS TYPE

1	Tire	4	Hub bolt
2	Disc wheel	5	Wheel nut
3	Side ring	6	Hub

	Type	Tightening torque N·m {kgf·cm, lbf·ft}
A	DIN	490.34-588.39 {5,000-6,000, 362-433}
	ISO	490-539 {5,000-5,500, 362-397}
B	DIN	490.34-588.39 {5,000-6,000, 362-433}
	ISO	490-539 {5,000-5,500, 362-397}

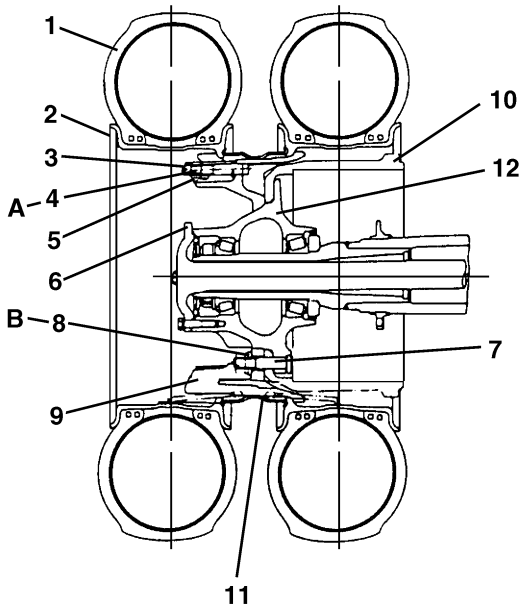


M08040100003

SPOKE WHEEL TYPE

1	Tire	5	Clamp
2	Rim	6	Spoke wheel
3	Clamp bolt	7	Brake drum
4	Clamp nut	8	Band spacer

	Tightening torque N·m {kgf·cm, lbf·ft}
A	264.78-294.19 {2,700-3,000, 196-216}
B	264.78-294.19 {2,700-3,000, 196-216}

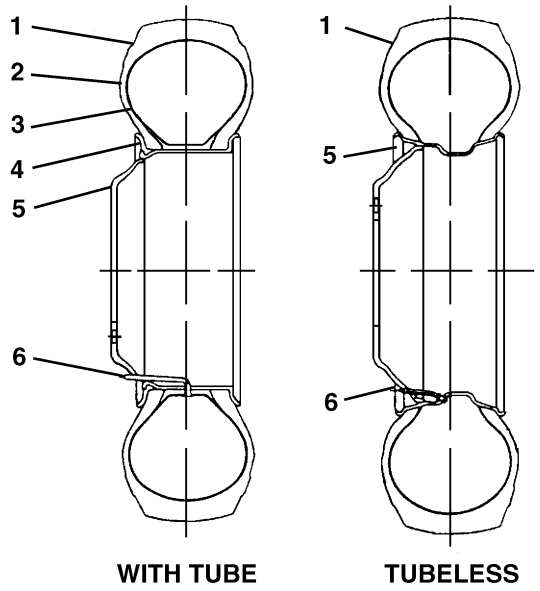


M08040100004

ADAPTER TYPE SPOKE WHEEL (Only for rear)

1	Tire	7	Hub bolt
2	Rim	8	Hub nut
3	Clamp bolt	9	Adapter
4	Clamp nut	10	Brake drum
5	Clamp	11	Band spacer
6	Axle shaft	12	Hub

	Tightening torque N·m {kgf·cm, lbf·ft}
A	294.20-323.61 {3,000-3,300, 217-238}
B	490.34-588.39 {5,000-6,000, 362-433}



M08040100005

WHEEL AND TIRE

1	**Tire**	**4**	**Side ring**
2	**Tube**	**5**	**Disc wheel**
3	**Flap**	**6**	**Valve**

TROUBLESHOOTING

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Symptom	Possible cause	Remedy/Prevention
Excessive wear on edges of tread	Under inflated tires	Properly inflate with the recommended pressure.
	Vehicle overloading	Correct as required by Factory spec.
	High speed cornering	Correct as required by Factory spec.
	Incorrect wheel alignment	Set to the correct specifications.
Tires show excessive wear in center of tread	Tires overinflated	Properly inflate with the recommended pressure.
Excessive tire wear	Improper tire pressure	Properly inflate with the recommended pressure.
	Incorrect tire wheel usage	Install the correct tire wheel combination.
	Bent wheel	Repair or replace.
	Front end out of alignment	Align front end.
	Loose, worn or damaged steering linkage, joints, suspension components, bushing or ball joints	Inspect, repair or replace as required

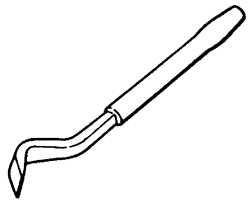
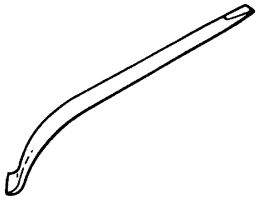
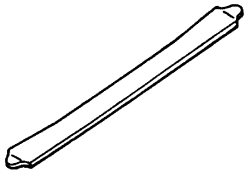
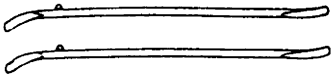
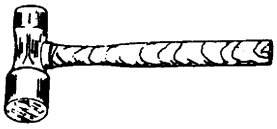
Symptom	Possible cause	Remedy/Prevention
Wheel hopping (vehicle vibration and rough steering) (Disc wheels)	Rocks or debris wedged between dual disc wheels	Remove the rocks and the debris.
	Out-of-balance tire and/or hub and drum	Determine the out-of-balance component and balance or replace.
	Improper positioning of the side ring split	Reassemble with ring split, opposite (180 degrees) to the valve opening to improve the balance.
Wheel hopping (vehicle vibration and rough steering) (Vehicle)	Loose or worn drive line or suspension	Identify the location of vibration carefully. Then repair or replace the loose or worn parts. (Refer to PROPELLER SHAFT for vehicle vibration.)
Wobbling (vehicle vibration and rough steering) (Disc wheels)	Bent or distorted due to the overloading or improper handling	Replace the wheel.
	Loose mountings, damaged studs, wheel nuts, enlarged stud holes, worn or broken hub face, or foreign material on mounting surfaces	Replace worn or damaged parts. Clean mounting surfaces.
Wobbling (vehicle vibration and rough steering) (Vehicle)	Improper alignment	Have vehicle aligned.
	Loose, worn or broken suspension parts	Repair or replace.
Cracked or broken wheel discs (cracks develop in the wheel disc from hand hole to hand hole, from hand hole to rim, or from hand hole to stud hole.)	Metal fatigue resulting from overloading	Replace wheel.
Damaged hub bolt holes (hub bolt holes become worn, elongated or deformed, metal builds up around hub bolt hole edges, cracks develop from hub bolt hole to hub bolt hole.)	Loose wheel mounting	• Replace wheel and check the installation of correct hub bolt and nuts. • Check the cracked or broken hub bolt-replace. • Check the worn hub face-replace. • Check the broken or cracked hub-replace. • Clean mounting surfaces (Retorque the wheel nuts periodically.) • Rust streaks fanning out from hub bolts holes: indicates that the wheel nuts are or have been loose.
Tire slippage on rim (Disc wheels)	Improper storage or operating conditions	Correct as required.
	Poor maintenance	Follow the proper maintenance procedures.
	Rust, corrosion or bead seating	Correct as required.
	Loss of pressure	Follow the proper maintenance procedures.
Tire mounting difficulties (Wheel rims)	Mismatched tire and rim sizes	Correct as required.
	Defective or mismatched rings for the rim	Correct as required.
	Tires overinflated	Properly inflate with the recommended pressure.
	Corrosion and dirt	Correct as required.

Symptom	Possible cause	Remedy/Prevention
Loose inner wheel	Excessive hub bolt standout from the mounting face of hub allowing the wheel nut to bottom out	Replace with the proper length hub bolt.
	Improper torque	Follow the recommended torque procedure.
	Wrong inner nut	Use correct inner nuts.
Broken hub bolts	Loose wheel nuts	Replace the hub bolt and follow the proper torque procedures.
	Overloading	Replace the hub bolt.
Stripped threads	Excessive clamp load	Replace hub bolt and follow the proper torque procedures.
Rust streaks from hub bolt holes	Loose wheel nuts	Check complete assembly, replace damaged parts and follow the proper torque procedures.
Damaged inner or outer wheel nuts	Loose wheel assembly	Replace wheel nuts. Check the proper torque procedures.
Frozen inner or outer wheel nuts	Corrosion or damage	Replace wheel nuts and hub bolts.

SPECIAL TOOL

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

Illustration	Part number	Tool name	Remarks
	09672-1010	LEVER	
	09672-1020	LEVER	
	09672-1040	LEVER	
	09609-1210	LEVER	
	09609-1220	RUBBER HUMMER	

PRECAUTIONS

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CAUTION:
Failure to comply with the following procedures may result in faulty positioning of the tire and/or rim parts, and can cause the assembly to burst with a explosive force sufficient to cause serious physical injury or death.

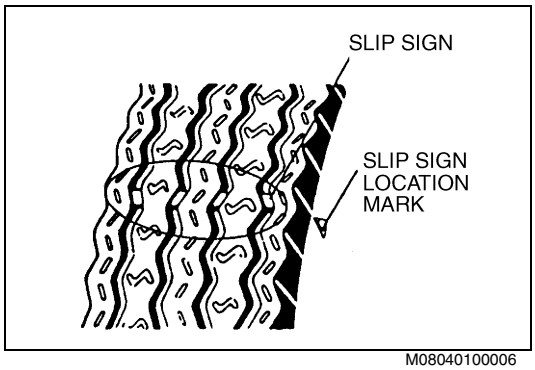
1. DEFLATION AND DISASSEMBLY
(1) Always check the tire/rim assembly for the proper components seating prior to the removal from the vehicle.
(2) Always deflate the tire by removing the valve core prior to removing the wheel from vehicle or disassembling of the components.
(3) Never position your body in front of the rim during deflation.
(4) Always follow the assembly and disassembly procedures outlined in this instruction manual and obtain safety literature from the Authorities.
(5) Never use a steel hammer to assemble or disassemble the rim components. Use a lead, brass, or plastic type mallet.

2. RIM INSPECTION
(1) Always select the proper tire size and construction to match the rim or wheel rating and size.
(2) Never use damaged, worn, or corroded rims, wheels, or mounting hardware.
(3) Always clean and repaint lightly rusted rims.
(4) Never use a rim or wheel component you cannot identify.

3. ASSEMBLY AND INFLATION
(1) Always perform the double check to see that the removable rings are properly seated before inflating.
(2) Always inflate the tire in a safety cage or use a portable lock ring guard. Use a clip-on type air chuck with a remote valve so that you can stand clear during the tire inflation.
(3) Never attempt to seat the rings while the tire is totally or partially inflated.
(4) Never re-inflate or add inflation pressure to a tire that has been run flat or seriously under inflated without removing and checking for ring seating and rim damage.
(5) Tire pressure should be checked while cold. Do not bleed air from tires while hot. This will result in an under inflated condition. Under inflated tires build up excessive heat due to overdeflection that may result in sudden tire deterioration, causing severe handling problems.
(6) Never use an assembly with excessive side ring play, wide gaps between ring ends, or butting ring ends.
(7) Never hammer on the components of an inflated or partially inflated assembly.

INSPECTION

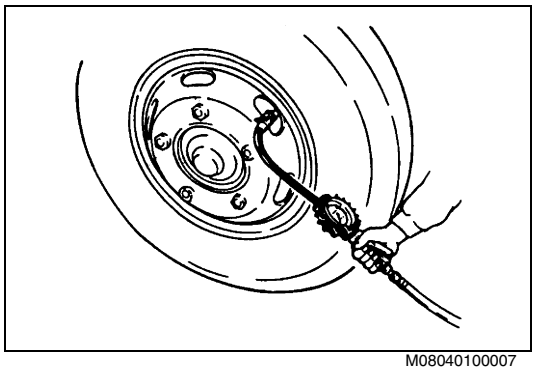
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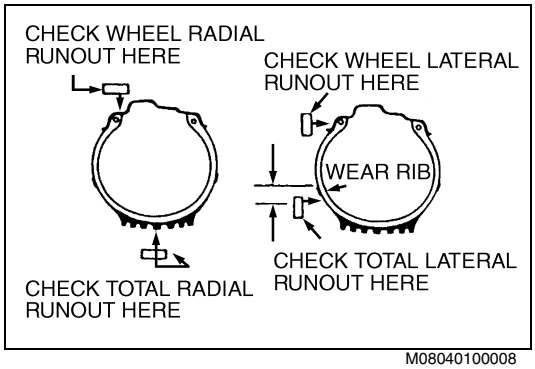
M08040100006

1. GENERAL INSPECTION

(1) Check the tire tread wear (groove depth) and tire damage. If the slip sign on the tire tread comes out, replace the tire.
Groove depth (Remaining groove)
General running: 1.6 mm {0.063 in.}
High-speed running: 3.2 mm {0.126 in.}


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(2) Check the air pressure.
If improper, inflate the tire to the proper pressure as previously described in this chapter.



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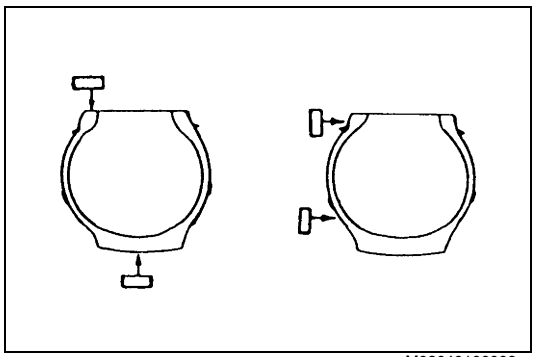
2. CHECK RUNOUT IN THE TIRE AND WHEEL RIM.

NOTICE:
Eliminate any flat spots in the tire by driving the vehicle a little.

(1) Jack up the vehicle and the check the runout in the tire and wheel rim.

Unit: mm {in.}

	Tire	Wheel rim
Lateral runout	**Less than 2.5 {0.098}**	**Less than 1.8 {0.071}**
Radial runout	**Less than 2.5 {0.098}**	**Less than 1.8 {0.071}**


M08040100009

(2) If the wheel rim does not conform to the runout limits, try re-mounting the wheel in a different position.
(3) If the wheel rim is still not within 1.8 mm {0.072 in.} of runout, then replace it with a new rim.
(4) If the tire does not conform to runout standards, reinstall it in different position on the rim.

3. WHEEL AND TIRE BALANCING.

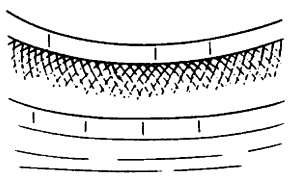
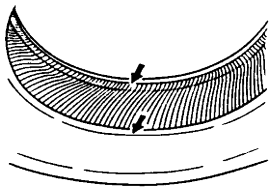
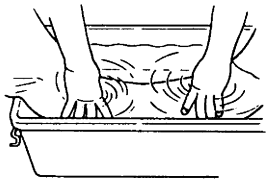
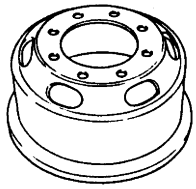
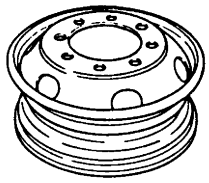
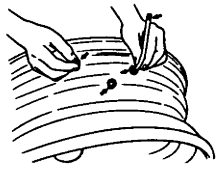
(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- Static balancing
  This is relatively effective when operating at low speeds; however, if operating at high speeds, dynamic balancing is recommended.
- Dynamic balancing
  Please balance the wheels, using a balancing machine.

INSPECTION AND REPAIR

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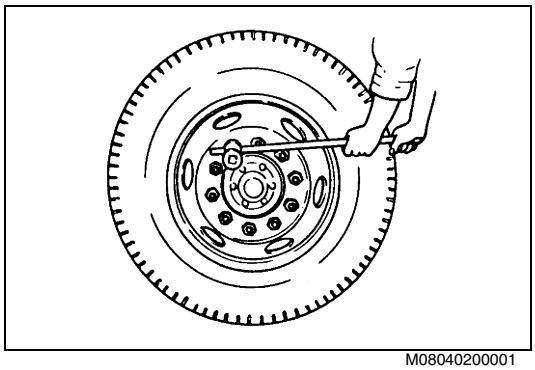
Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Tire: Damage, foreign matter, etc.	—	—	Replace, if necessary.	Visual check 
Tubeless tire: Damage	—	—	Replace, if necessary.	Visual check 
Tube: Air leakage	—	—	Replace, if necessary.	Visual check 
Wheel (With tube): Cracks and deformation	—	—	Replace, if necessary.	Visual check 
Wheel (Tubeless tire): Cracks and deformation	—	—	Replace, if necessary.	Visual check 
Rim (Tubeless tire): Damage	—	—	Replace, if necessary.	Visual check 
Pipe, nut and O-ring of the valve (tubeless tire): Damage	—	—	Replace, if necessary.	Visual check 

SAE, JIS, DIN AND ISO TYPE WHEEL

OVERHAUL

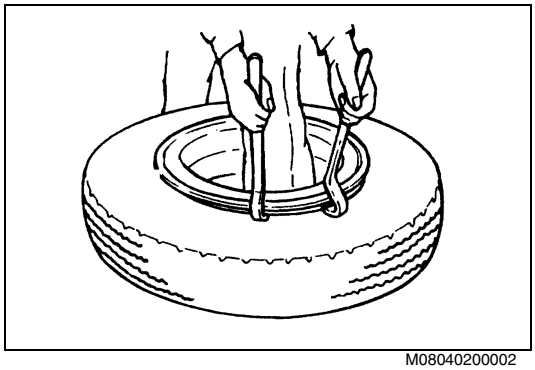
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IMPORTANT POINT– REMOVAL

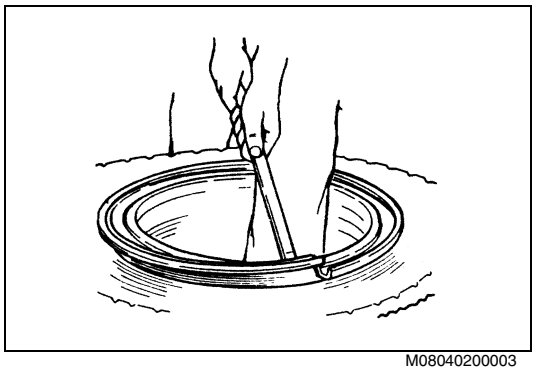
1. REMOVE THE WHEEL AND TIRE.
(1) Loosen the wheel nuts, but do not remove them.
(2) Raise the vehicle until the tire clear the floor.
(3) Remove the wheel nuts and tire from the hub and drum.
On dual tires, the inner wheel nuts will also have to be removed for the inner tire to be removed.

NOTICE:
- **Be sure to apply the wheel stoppers in the front or rear tires.**
- **The wheel nuts on the right side of the vehicle have right hand threads, and those on the left side have left hand threads.**

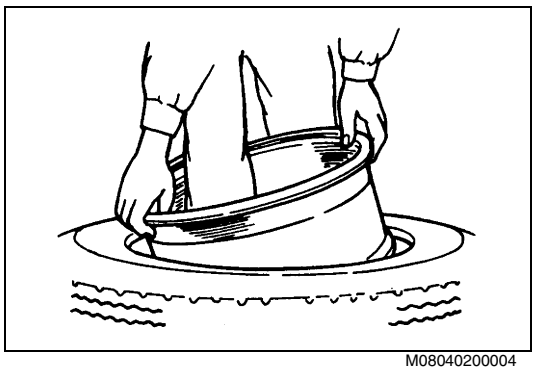

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IMPORTANT POINT - DISASSEMBLY

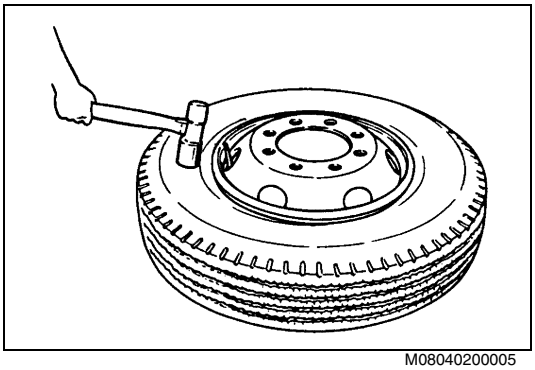
1. DISASSEMBLE THE WHEEL AND TIRE (WITH TUBE).
(1) Place the wheel and tire on the floor with side ring up.
(2) Make certain that the tire is completely deflated with the valve core removed.
(3) With the special tools, insert the hooked end between the side ring and side wall of the tire and pry the bead loose from the side ring with a downward pressure on the tools.
(4) Continue prying progressively around the tire until the bead is completely freed from side ring.


M08040200003

(5) With the special tool, pry the side ring from its groove in the rim by prying progressively around the tire until the ring is freed.
SST: Lever (09672-1040)


M08040200004

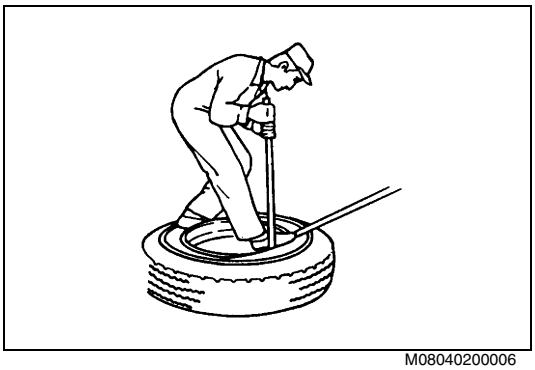
(6) Turn the assembly over and unseat the second tire bead from the rim. Lift the rim from the tire.
Remove the tube and flap, if any, from the tire.


M08040200005

2. DISASSEMBLE THE WHEEL AND TIRE (TUBELESS).

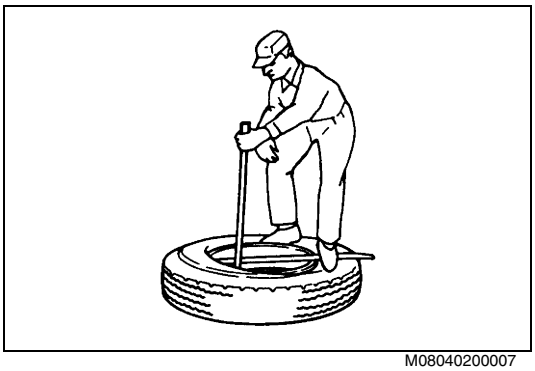
(1) Make certain the tire completely deflated with the valve core removed.

(2) With the tire lying flat, loosen both beads with the special tool or by standing on the tire with your heels close to the rim.
SST: Rubber hammer (09609-1220)

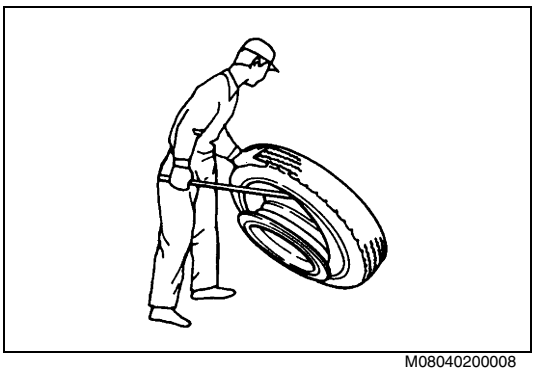

M08040200006

(3) With the wide side of the rim down, lubricate the top bead.

(4) With the stops toward the rim, insert the spoon ends of the special tools about 250 mm {10 in.} apart. Holding the bead in the well with one foot, pull one tool towards the center of the rim.
SST: Lever (09609-1210)


M08040200007

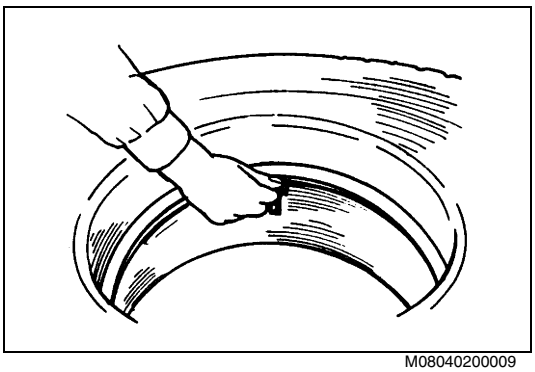
(5) Hold the tool in position with one foot and pull the second tool toward the center of the rim. Progressively work the bead off the rim, taking additional bites with the tools as necessary.


M08040200008

(6) Stand the assembly in a vertical position.
Lubricate the second bead.

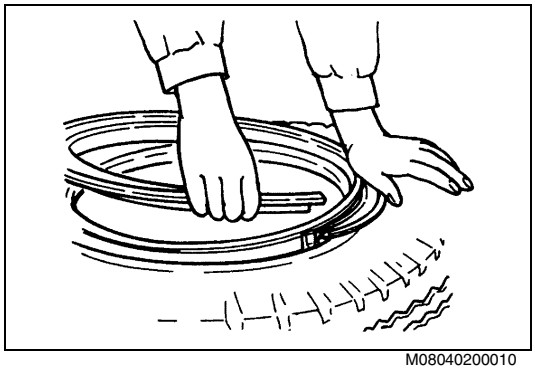
(7) At the top of the assembly, insert the straight end of the tool between the bead and back the flange of the rim at about 45 degrees angle.
Turn the tool so that it is perpendicular to the rim. Pry the second bead off.

IMPORTANT POINTS – ASSEMBLY

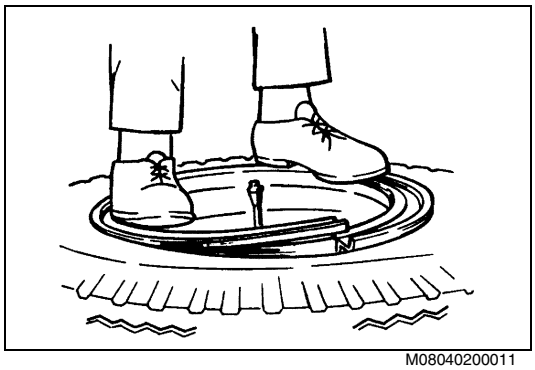

M08040200009

1. ASSEMBLY THE WHEEL AND TIRE (WITH TUBE).

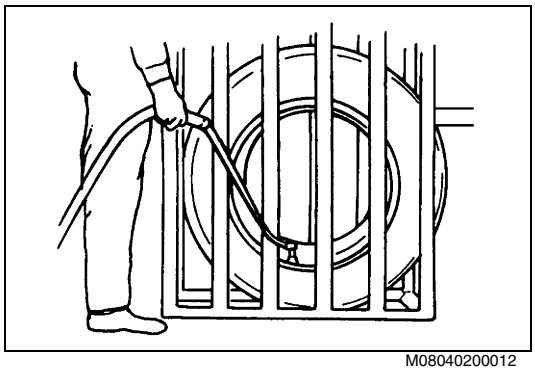
(1) Insert the tube and the flap into the tire and partially inflate to round out the tube. Apply the rubber lubricant to the inside and outside surfaces of both beads and to that portion of the tube and flap that appears between the beads. Lay the rim flat on the floor with the valve slot up. Align the valve with the rim valve slot, and place the tire onto the rim, and insert the valve through the valve slot.


M08040200010

(2) Place the side-ring on the rim base so that the ring split is opposite to the valve stem. Place the leading end of the ring into the groove in the rim as shown.


M08040200011

(3) Starting at the valve side progressively walk the side-ring into place. Check to ensure that the ring is fully seated in the groove.


M08040200012

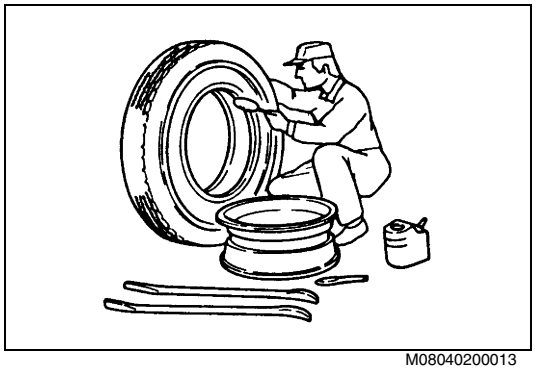
(4) Place the tire assembly in a safety cage and inflate the tire as previously described in this chapter. Again check the side-ring, tapping lightly with a mallet to ensure the proper engagement. Check to see that the beads are properly seated. Completely deflate the tire to prevent the tube from the buckling. Reinflate according to the recommended pressure, and check the tire assembly.

2. ASSEMBLY THE WHEEL AND TIRE (TUBELESS).

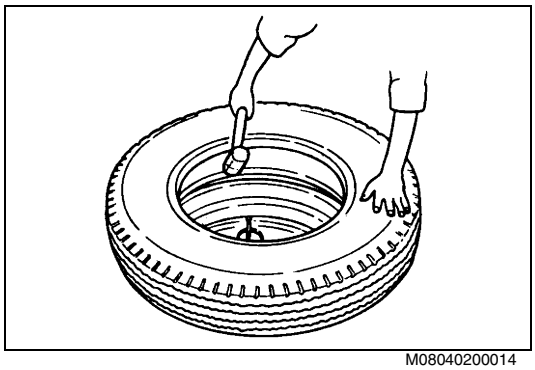
(1) Be sure that the right valve is used and is properly installed in the rim.
Valve nut tightening torque: 12.7 N·m {130 kgf·cm, 9.4 lbf·ft}

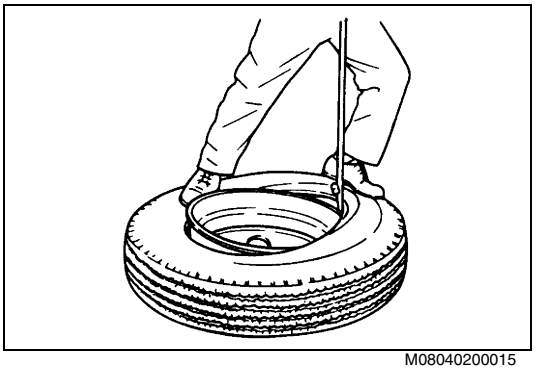
(2) Inspect the rim to ensure that the bead seats are clean and smooth.

(3) Place the rim on the floor with the wide side down and lubricate the first bead of the tire and upper bead seat of the rim.

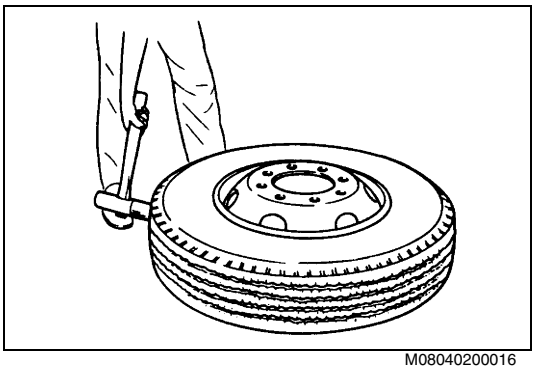

M08040200013

(4) Push the first bead into the well of the rim and onto the rim as far as possible.
With the special tool, hammer the first bead so that the bead gets over the rim flange.
SST: Rubber hammer (09609-1220)


M08040200014


M08040200015

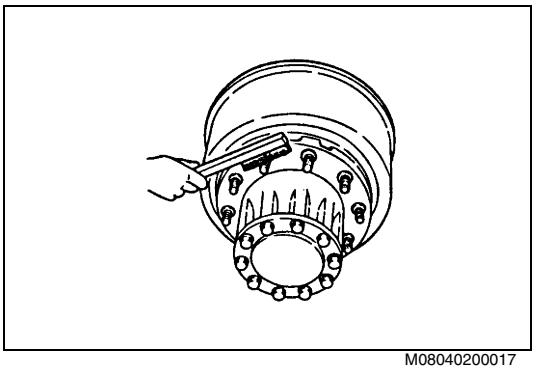
(5) Insert the lever between the rim flange and the tire bead and then raise the lever so that the bead gets over the rim flange.
SST: Lever (09609-1210)


M08040200016

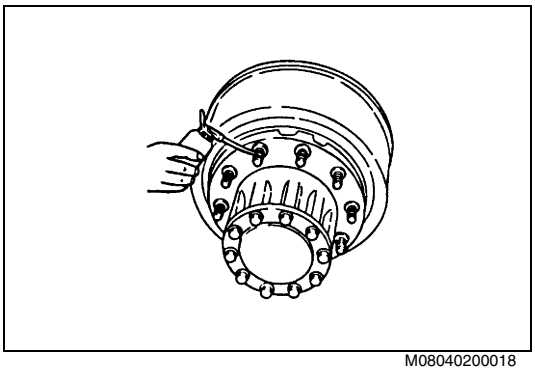
(6) With the special tool, hammer the tire tread so that the bead and the rim will be seated.
SST: Rubber hammer (09609-1220)

(7) Inflate the tire as described in this chapter, making certain that all the safety precautions are followed. Check for the leakage.

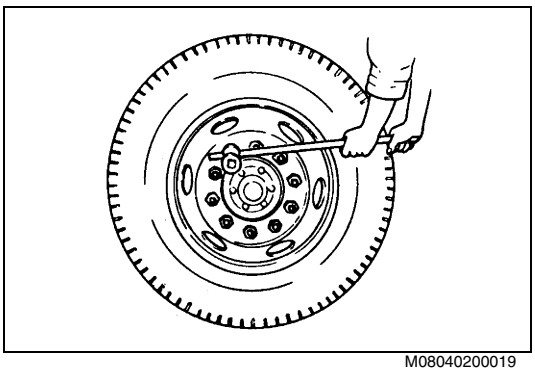
IMPORTANT POINT – INSTALLATION


M08040200017

1. INSTALL THE WHEEL AND TIRE.
(1) Be sure to check all parts and replace any parts that are overly worn or damaged. Clean and remove any foreign matter from hub bolts, wheel nuts and wheel side is contacting with the brake drum.

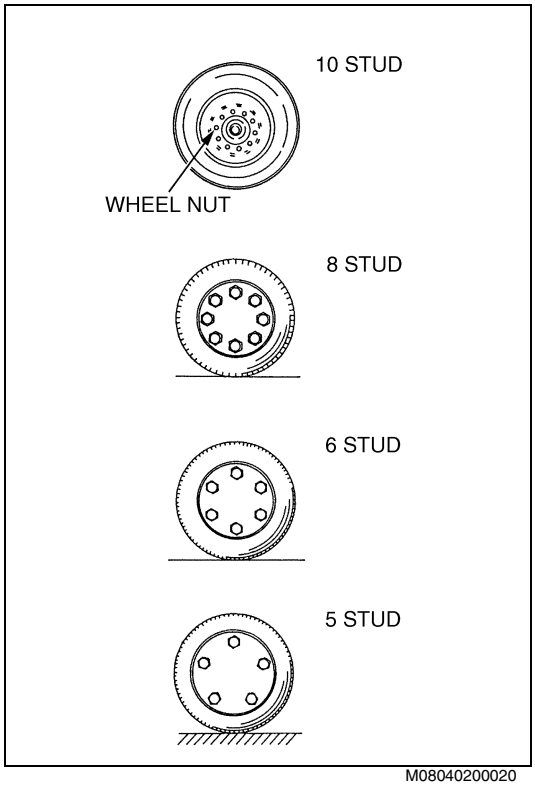

M08040200018

(2) Apply lubricant (engine oil or grease) to the thread part of the hub bolts and wheel nuts.


M08040200019

(3) Rotate the wheel if necessary and check to see that the hub bolts are in the center of the wheel's hub bolt holes, then tighten the wheel nuts lightly.

NOTICE:
The wheel nuts on the right side of the vehicle have right hand threads, and those on the left side have left hand threads.



M08040200020

(4) Using a wheel nut wrench, tighten the wheel nuts in accordance with specified torque using diagonal method.

		Tightening torque N·m {kgf·cm, lbf·ft}
DIN type		490.34-588.39 {5,000-6,000, 362-434}
SAE and JIS type	10 stud	392.27-470.71 {4,000-4,800, 290-347}
	8 stud	
	6 stud	
	5 stud	235.36-294.19 {2,400-3,000, 174-217}
ISO type		490-539 {5,000-5,500, 362-497}

NOTICE:
Tighten the wheel nuts with several repetitions in the tightening order so as to reach the proper torque evenly and gradually.

CAUTION:
The specified torque should be referred to the torque tightening wheel nuts. Tightening it with incorrect can cause the wheel to come off while driving. This can result in physical injury and/or property damage due to the loss of vehicle control.
When the vehicle, wheels, or wheel nuts are new, the wheel nuts should be checked and tightened with specified torque at 50-100 km {30-60 miles} since they may not be well tightened. The tightening torque should be checked with the proper torque wrench.

2. THE FOLLOWING ORDER AND INSTRUCTIONS ARE NECESSARY FOR INSTALLING THE DUAL TIRES.

(1) Installation procedures for the inner wheel nuts are the same as in 1. through 4. above.
(2) Installation procedures for the outer wheel nuts are the same as above.
(3) When only the outer wheel is replaced, first tighten all the inner wheel nuts to the specified torque. Then mount the outer wheel and tighten all the outer wheel nuts to the specified torque.

NOTICE:
- **Install the dual rear wheels with their valve stems positioned at 180 degrees apart to facilitate inflation.**
- **Tighten all the inner nuts and outer nuts according to the above-mentioned procedures.**

3. WHEEL AND TIRE BALANCING

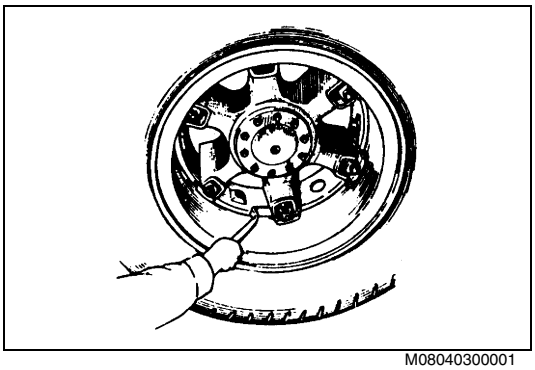
(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- Static balancing
  This is relatively effective when operating at low speeds; however, if operating at high speeds, dynamic balancing is recommended.
- Dynamic balancing
  Please balance the wheels, using a balancing machine.

SPOKE WHEEL AND ADAPTER TYPE WHEEL

OVERHAUL

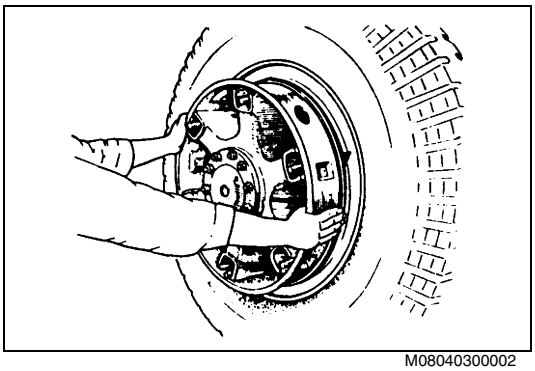
M08040301BEH2001


M08040300001

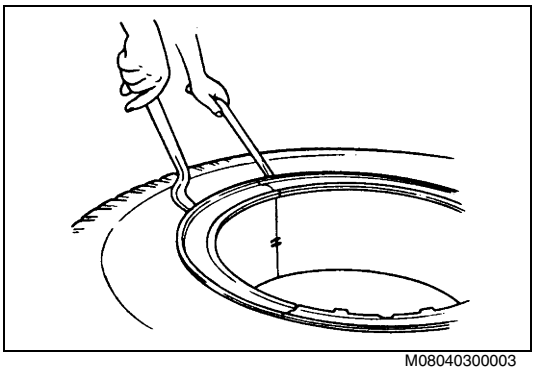
IMPORTANT POINT – REMOVAL

1. REMOVAL OF THE RIM AND TIRE.
(1) Loosen the clamp nuts, but do not remove them completely.
(2) Raise the vehicle until the tire clear from floor.
(3) Remove the clamp nuts and then use the special tool to pry off the clamps.
SST: Lever (09672–1010)

NOTICE:
Block the wheels.

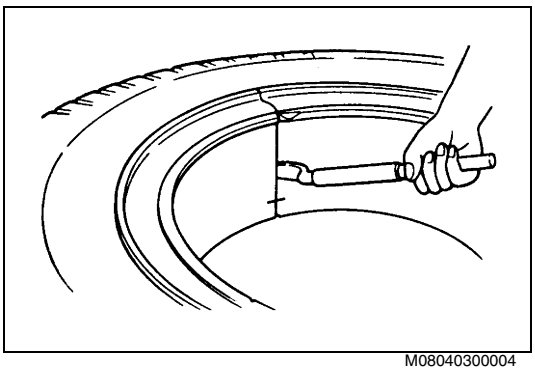

M08040300002

(4) On the dual tires, the band spacer will also have to be removed and then remove the inner wheel.


M08040300003

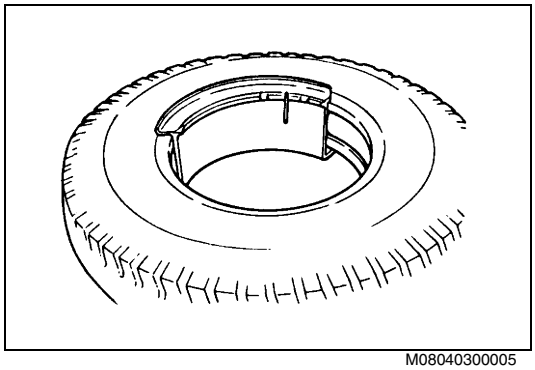
IMPORTANT POINT – DISASSEMBLY

1. DISASSEMBLE THE RIM AND TIRE.
(1) Place the wheel on the floor with valve side up.
(2) Make sure the tire is completely deflated with the valve core removed.
(3) With the special tools, insert the hooked end between the rim and side wall of tire and pry the bead loose from the rim with a downward pressure on the special tools.
SST: Lever (09672–1010, 09672–1020)


M08040300004

(4) Continue prying progressively around the tire until the bead is completely freed from the rim.
(5) Make a matching marks on the segments.
(6) Place the special tool in the rim joint groove and pry the rim segments apart.
SST: Lever (09672–1010)

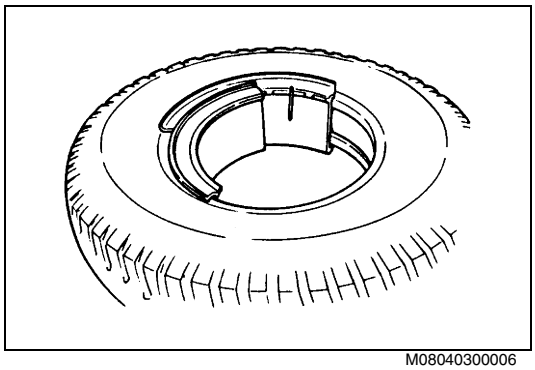
(7) Remove the rim segments.


M08040300005

IMPORTANT POINT – ASSEMBLY

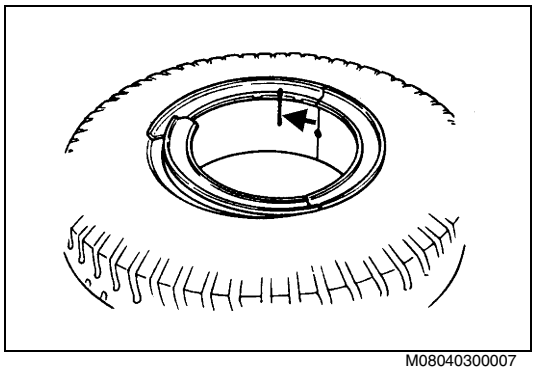
1. ASSEMBLE THE RIM AND TIRE.

(1) Clean the rim segments and check for damages, if there is any damage, repair or replace.
(2) Fit the tube and flap in the tire.
(3) Place the segment with valve hole in the tire.
The valve must point upwards.

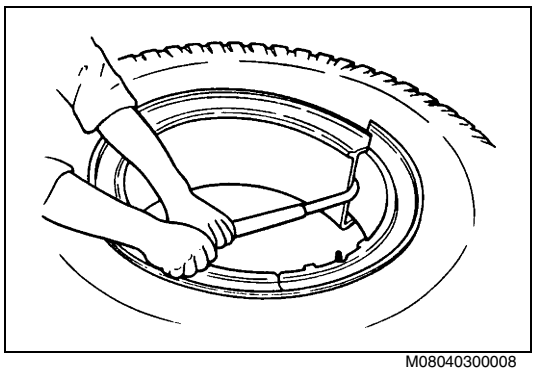

M08040300006

(4) Place the other segment on the first one as shown in the figure.

NOTICE:
Align the matching marks on the segments.


M08040300007

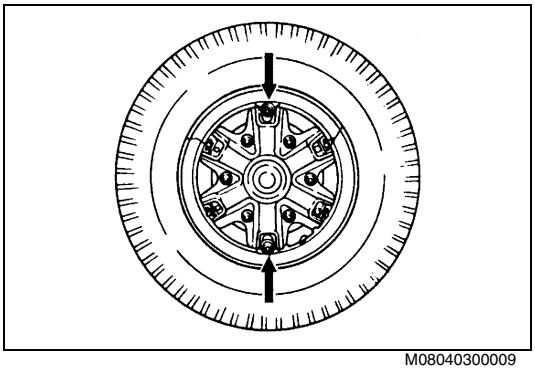
(5) Place the other segment together with the first one.
Fit the segment so that the valve lies against the side of the hole marked with an arrow.


M08040300008

(6) With the special tool, pry the segments to fit the last segment in position.
SST: Lever (09672–1020)

NOTICE:
Do not pull upwards.

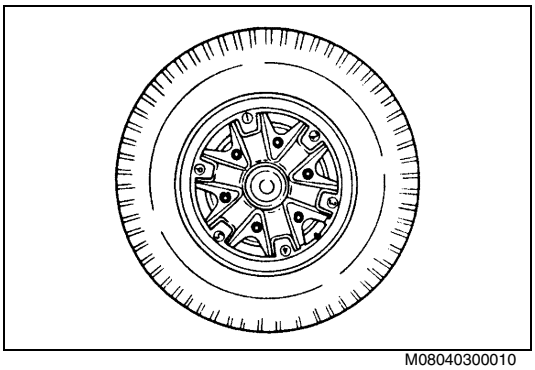
(7) Install the valve core and then inflate the tire as previously described in this chapter, making sure that all the safety precautions are followed. Check for the leakage.


M08040300009

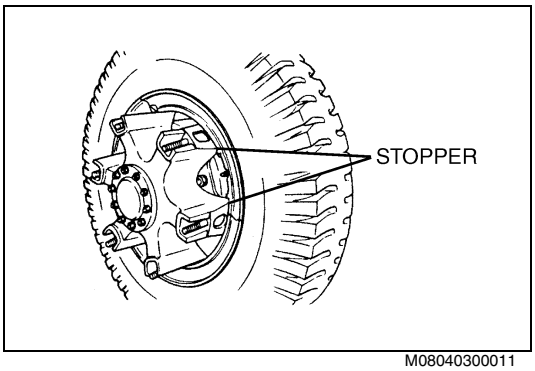
IMPORTANT POINTS – INSTALLATION

1. INSTALL THE SINGLE WHEEL.

(1) Clean the spoke ends, rim edges, clamps and nuts.
(2) Lubricate the clamp bolts.
(3) Install the wheel over the spoke ends so that the valve and rim stopper are between two spokes.
(4) Install two clamps and nuts on opposite sides of the rim as indicated by arrows on the drawing.
Tighten the nuts lightly.


M08040300010

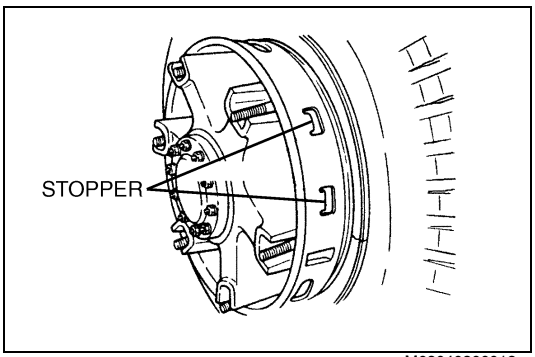
(5) Install the remaining clamps and nuts.
Tighten the nuts in sequence round the rim edge to sufficient torque as described in this chapter.
(6) Check and retighten the nuts after driving the vehicle in a distance.



M08040300011

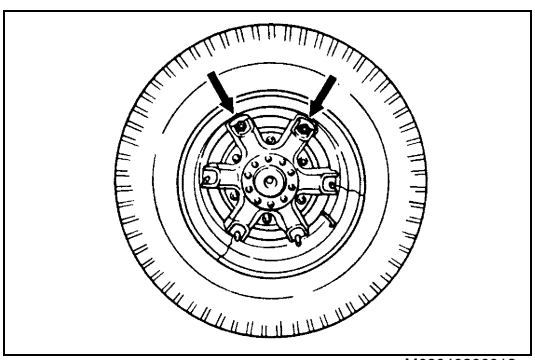
2. INSTALL THE DUAL WHEEL.

(1) Clean the spoke ends, rim edge, band spacer, clamps and nuts.
(2) Lubricate the clamp bolts.
(3) Install the inner wheel so that the valve and rim stopper are between two spokes.

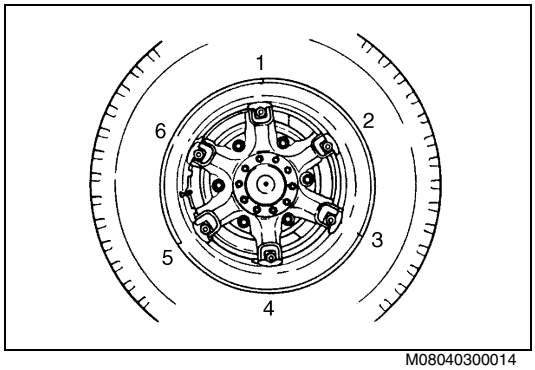


M08040300012

(4) Install the band spacer over the spokes so that it is tightened up against the inner wheel rim.
The band spacer stopper must be between two spokes. Make sure that the band spacer stopper does not cover the inner wheel valve.


M08040300013

(5) Install the outer wheel and press it tight against the band spacer. Make sure that the rim stopper and valve are between two spokes and diagonally to the inner wheel valve.
Install two top clamps and nuts as indicated by the arrows on the drawing and tighten the nuts lightly.



M08040300014

(6) Install the remaining clamps and nuts.
(7) Tighten the nuts in sequence round the rim edge to sufficient torque as previously described in this chapter.
(8) Check and retighten the nuts after driving the vehicle in a distance.

3. WHEEL AND TIRE BALANCING

(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- Static balancing
This is relatively effective when operating at low speeds; however, if operating at high speeds, dynamic balancing is recommended.
- Dynamic balancing
Please balance the wheels, using a balancing machine.

SUSPENSION

SU02-001

SUSPENSION ASSEMBLY..... SU02-2
DATA AND SPECIFICATIONS SU02-2
DESCRIPTION SU02-3
TROUBLESHOOTING SU02-5
SPECIAL TOOL SU02-5
COMPONENT LOCATOR SU02-6
OVERHAUL SU02-8
INSPECTION AND REPAIR SU02-13

SUSPENSION ASSEMBLY

DATA AND SPECIFICATIONS

M09020101BEI2002

FRONT SUSPENSION

Unit: mm {in.}

Type		Semi-elliptic leaf springs with shock absorber		
		Taper		Multi
Dimensions of leaf springs:	Span	1,300 {51.181}		1,300 {51.181}
	Width	70 {2.760}		70 {2.760}
	Thickness of leaves	Standard	Hard	10 {0.394}
		14.0 {0.551}	16.2 {0.638}	
		18.5 {0.728}	18.5 {0.728}	11 {0.433}
		19.8 {0.780}	19.8 {0.780}	
Shock absorbers:	Type	Double acting		Single acting
	Stroke	255 {10.039}		255 {10.039}
	Min. length	359 {14.134}		359 {14.134}
	Max. length	614 {24.173}		614 {24.173}

REAR SUSPENSION

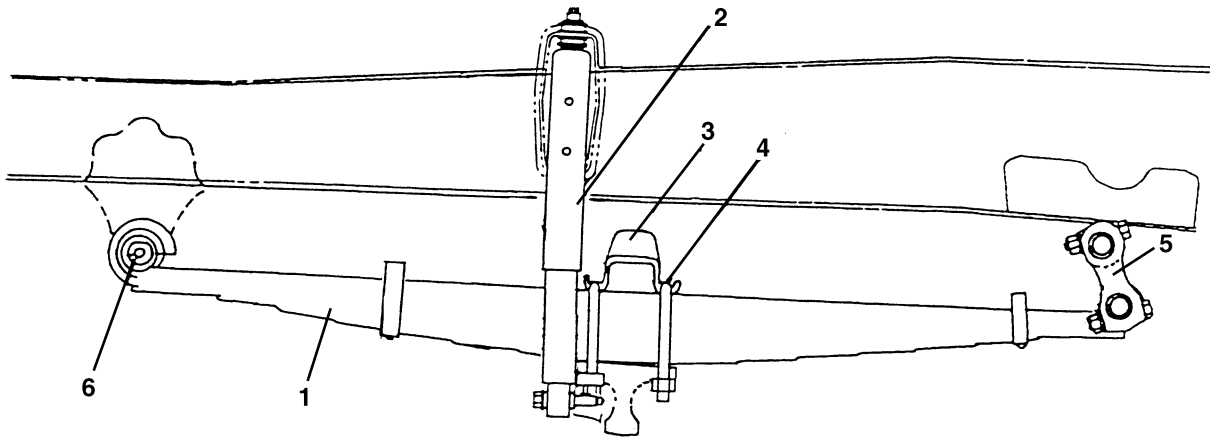
Unit: mm {in.}

Type		Semi-elliptic main and auxiliary leaf springs
Dimensions of main leaf springs:	Span	1,300 {51.181}
	Width	70 {2.760}
	Thickness of leaves	11 {0.433}
Dimensions of auxiliary leaf springs:	Span	900 {35.433}
	Width	70 {2.760}
	Thickness of leaves	9 {0.354}
		10 {0.394}

DESCRIPTION

M09020101BEC1001

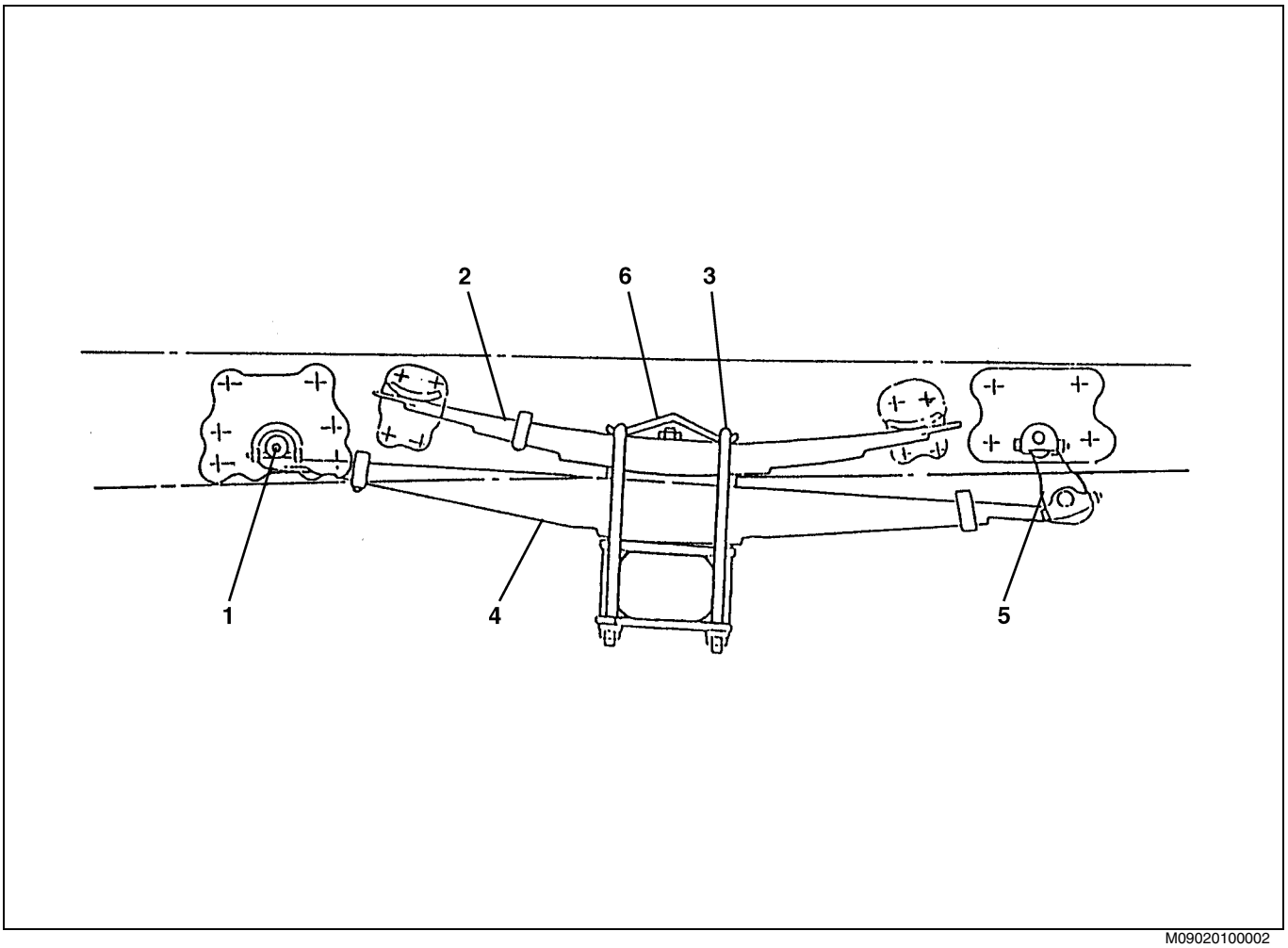
FRONT SUSPENSION



M09020100058

1	Leaf spring assembly	4	U-bolt
2	Shock absorber	5	Shackle
3	Spring bumper	6	Spring pin

REAR SUSPENSION



M09020100002

1	Spring pin	4	Main leaf spring assembly
2	Auxiliary leaf spring assembly	5	Shackle
3	U-bolt	6	Spring bumper

TROUBLESHOOTING

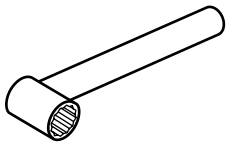
M09020101BEF3001

Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Replace the leaves and tighten the U-bolts to specified torque.
Squeaking of the leaves	Friction between the leaves	Replace the silencers and/or apply chassis grease between leaves.

SPECIAL TOOL

M09020101BEK1001

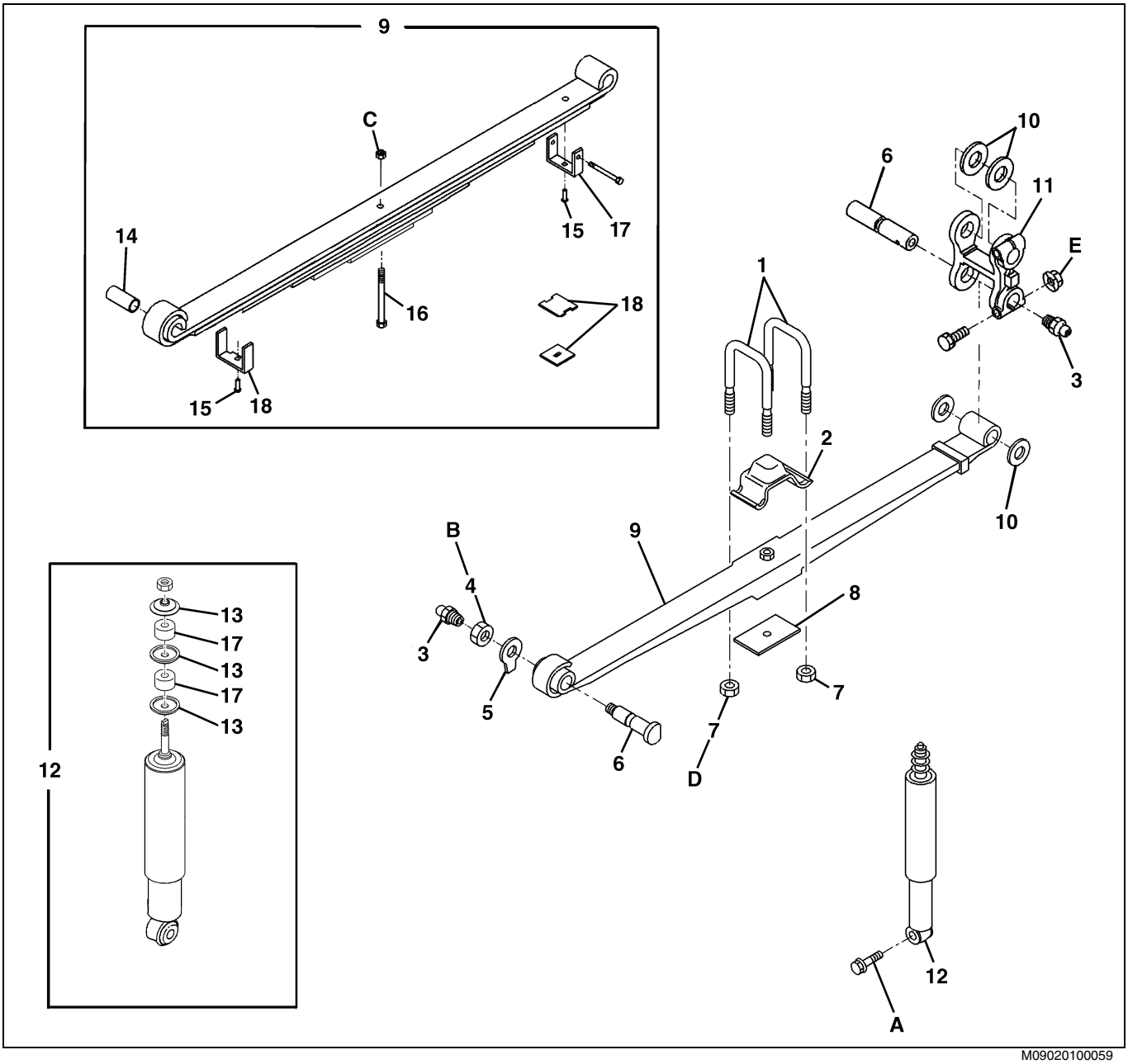
Prior to starting a suspension overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09839-2204	SOCKET WRENCH	FOR FRONT U-BOLT
	09603-1160	SOCKET WRENCH	FOR REAR U-BOLT

COMPONENT LOCATOR

M09020101BED1001

FRONT SUSPENSION



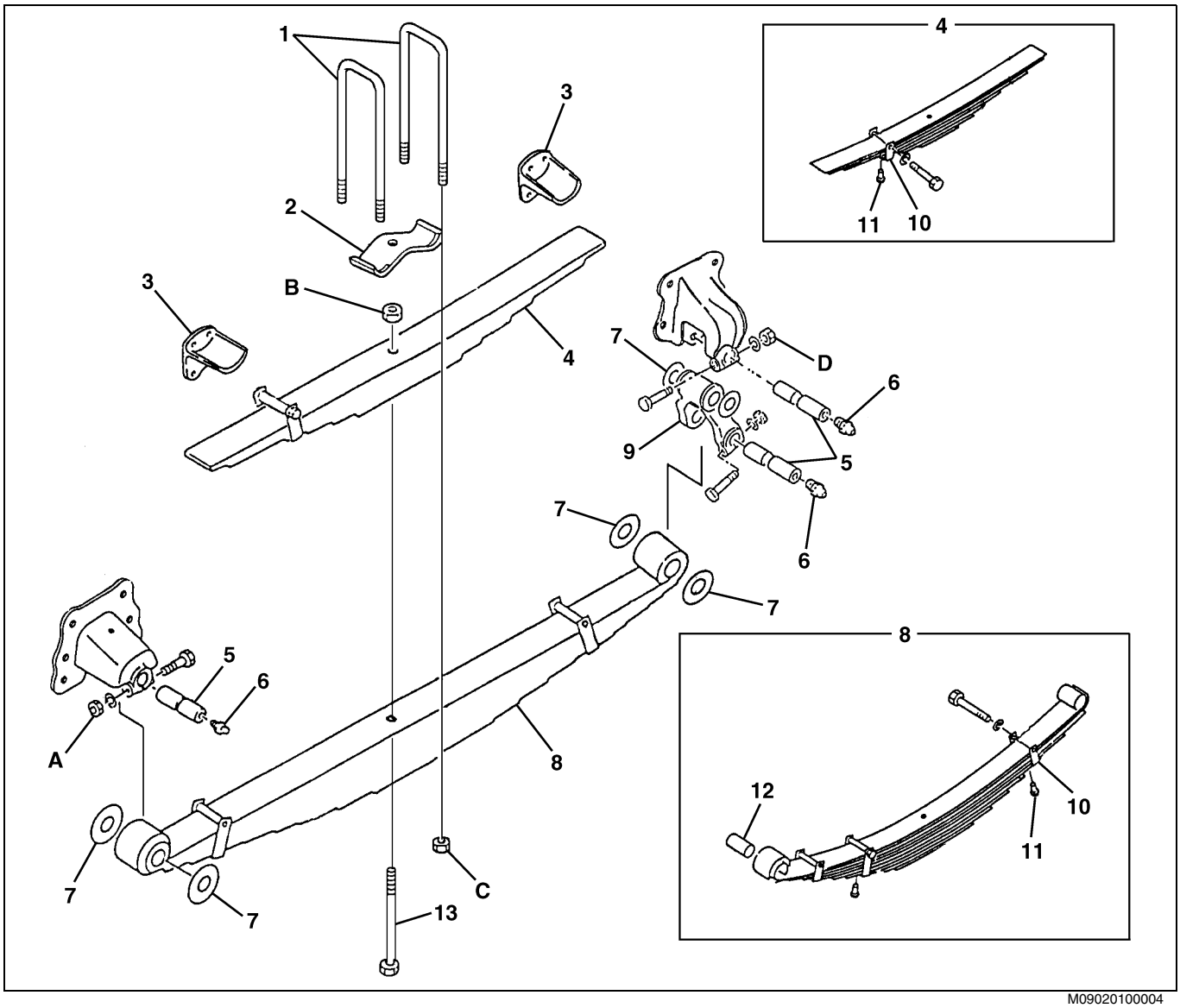
M09020100059

1	U-bolt	10	Thrust washer
2	Spring bumper	11	Shackle
3	Lubrication fitting	12	Shock absorber
4	Lock nut	13	Cushion washer
5	Lock washer	14	Bushing
6	Spring pin	15	Rivet
7	U-bolt nut	16	Center bolt
8	Spacer (Driver's seat side)	17	Clip
9	Leaf spring assembly	18	Silencer

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

A	76-114 {775-1,162, 57-84}	D	200-280 {2,040-2,855, 148-206}
B	64-93 {653-948, 48-68}	E	41.5-61.5 {424-627, 31-45}
C	85-108 {867-1,101, 63-79}		

REAR SUSPENSION



M09020100004

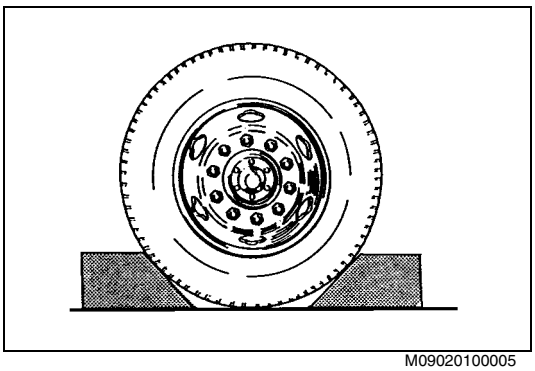
1	U-bolt	8	Main leaf spring assembly
2	Spring pad	9	Shackle
3	Slide seat	10	Clip
4	Auxiliary leaf spring assembly	11	Rivet
5	Spring pin	12	Bushing
6	Lubrication fitting	13	Center bolt
7	Thrust washer		

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

A	73-109 {745-1,111, 54-80}	C	265-315 {2,703-3,212, 196-232}
B	85-108 {867-1,101, 63-79}	D	73-109 {745-1,111, 54-80}

OVERHAUL

M09020101BEH2001

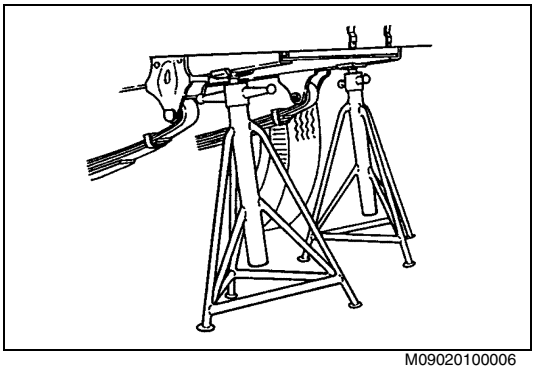

M09020100005

IMPORTANT POINTS - DISMOUNTING

1. SUPPORT OF THE FRAME WITH STANDS

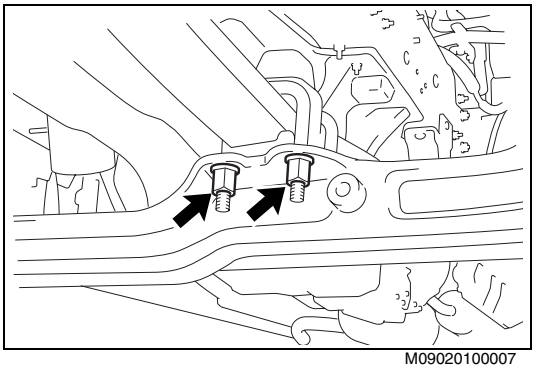
(1) Park the vehicle on level ground.

(2) Be sure to block the wheels before dismounting.


M09020100006

(3) Jack up the axle, and support the frame with stands.

(4) Remove the tires.


M09020100007

2. REMOVAL OF THE U-BOLT

(1) Remove the shock absorber. (Front suspension only)

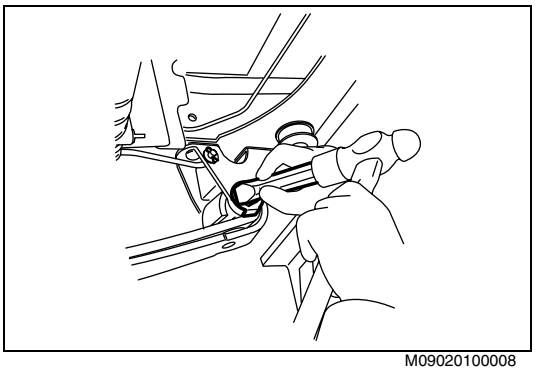
(2) Support the axle with a floor jack.

(3) Remove the U-bolt mounting nuts.

NOTICE:

When cutting off the U-bolts (Due to rusted threads) with a torch, never direct the flame toward the leaves or allow sparks to come in contact with the leaves.

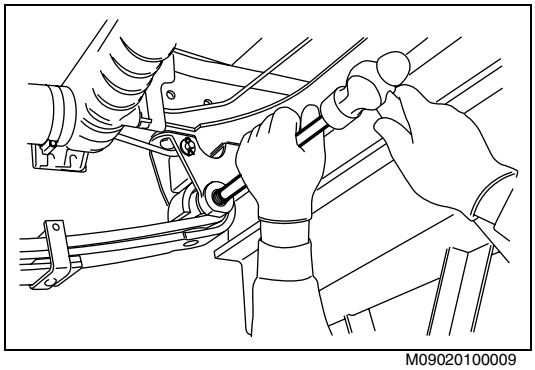
SST:
Socket Wrench for Front U-bolt (09839-2204)
Socket Wrench for Rear U-bolt (09603-1160)


M09020100008

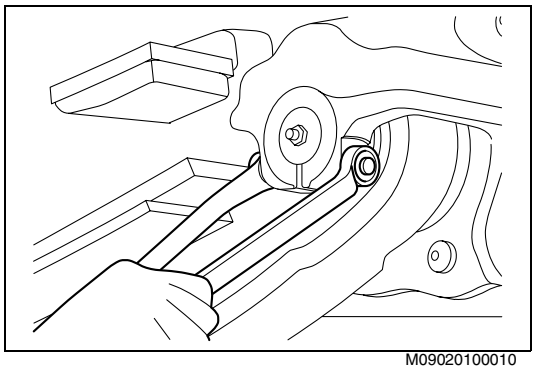
3. REMOVAL OF THE SPRING PIN (FRONT SUSPENSION)

(1) Remove the lubrication fitting.

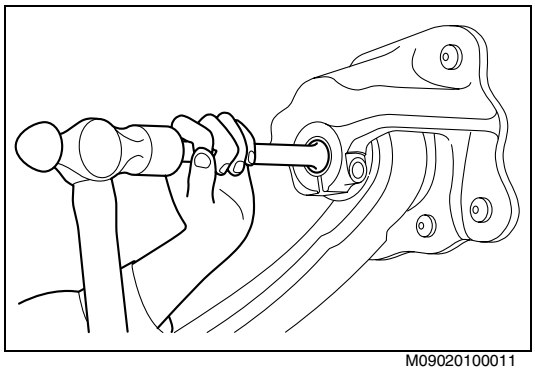
(2) Uncaulk the nut with a chisel, then loosen the nut. (Front side of spring)


M09020100009

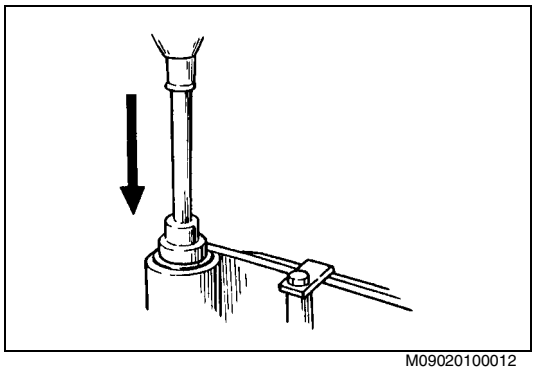
(3) Remove the spring pin lock bolt. (Rear side of spring)
(4) Use a brass rod to remove the spring pins from the shackle and spring bracket.


M09020100010

4. REMOVAL OF THE SPRING PIN (REAR SUSPENSION)
(1) Remove the lubrication fitting and spring pin lock bolt.

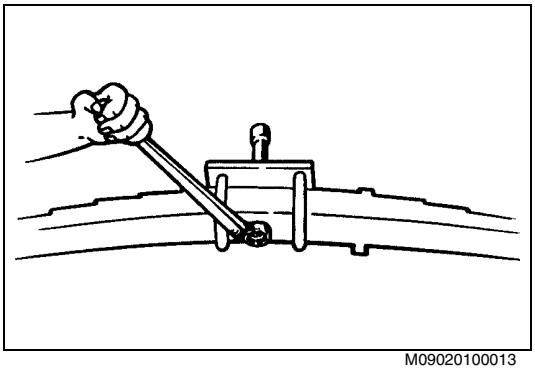

M09020100011

(2) Use a brass rod to remove the spring pins from the shackle and spring bracket.


M09020100012

IMPORTANT POINTS - DISASSEMBLY

1. REPLACEMENT OF THE EYE BUSHING
(1) Use a suitable tool to press out the old eye bushing.
(2) Use a suitable tool to press in the new eye bushing.

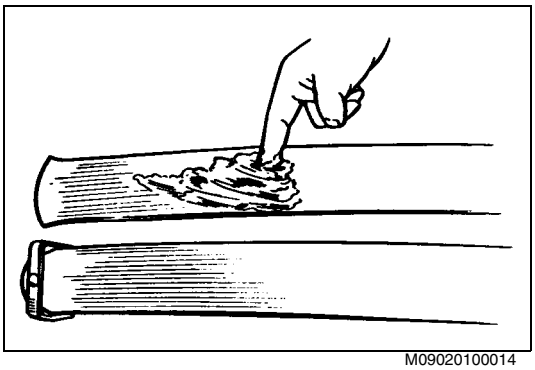

M09020100013

2. DISASSEMBLY OF THE LEAF SPRING

CAUTION:
When removing the center bolt lock nut, the spring leaves may jump. Care should be taken to avoid possible personal injury.

(1) Remove the clip bolts.
(2) Use a vise or an arbor press to hold the leaf spring near the center bolt.
(3) Remove the center bolt.
(4) Loosen a vise or an arbor press slowly, and separate the leaves.

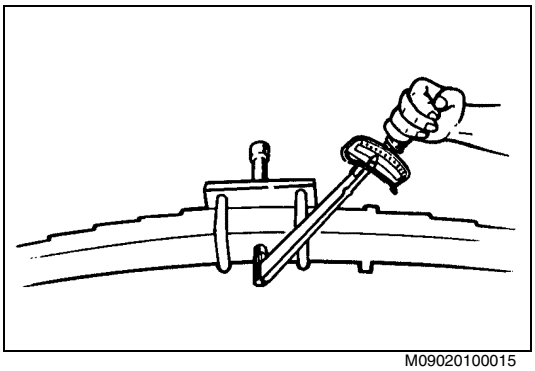
IMPORTANT POINTS - ASSEMBLY


M09020100014

1. ASSEMBLY OF THE LEAF SPRING

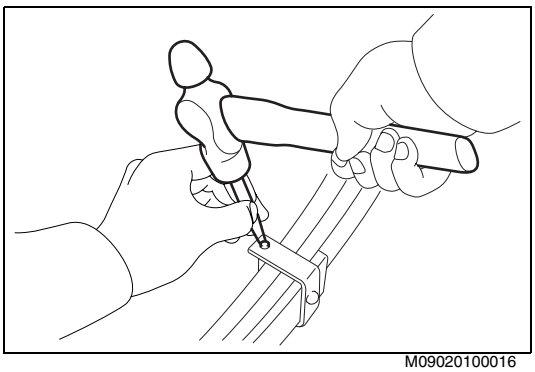
CAUTION:
When clamping the spring leaves, they may jump. Care should be taken to avoid possible personal injury.

(1) Apply coating on the leaf after removing rust, and apply chassis grease on both surfaces at leaves.


M09020100015

(2) Align the leaf holes and silencers (Front suspension only), then secure the leaves with a vise or an arbor press.
(3) Insert the center bolt and tighten the lock nut.

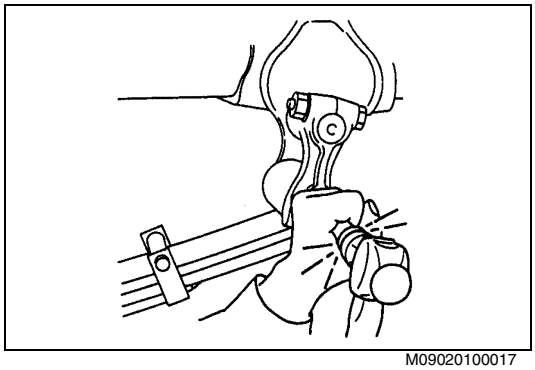
NOTICE:
When reassembling the leaf spring, replace the center bolt with a new one.


M09020100016

(4) Tighten the clip bolts.

NOTICE:
When tightening the clip bolts, use a new clip bolts.

(5) Use a punch to peen the thread of the clip bolts.


M09020100017

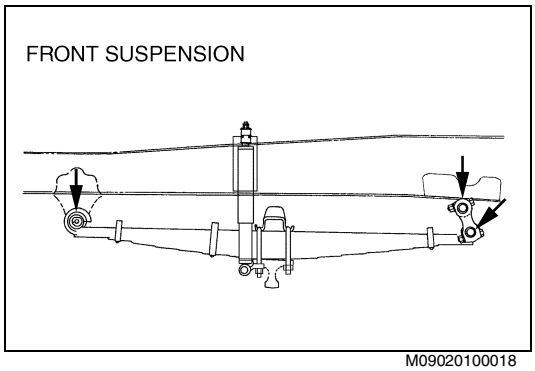
IMPORTANT POINTS - MOUNTING

1. INSTALLATION OF THE SPRING PIN

(1) Use a copper hammer to install the spring pin with thrust washers.

NOTICE:
Apply chassis grease on the surface of the eye bushing and spring pin before installing.

(2) Install the spring pin lock bolt and nut.
(3) Install and secure the lock nut.

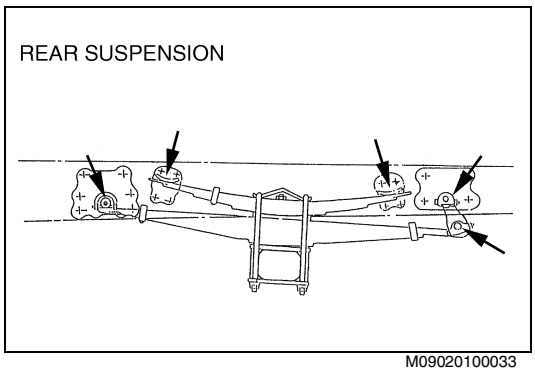


M09020100018

2. LUBRICATION

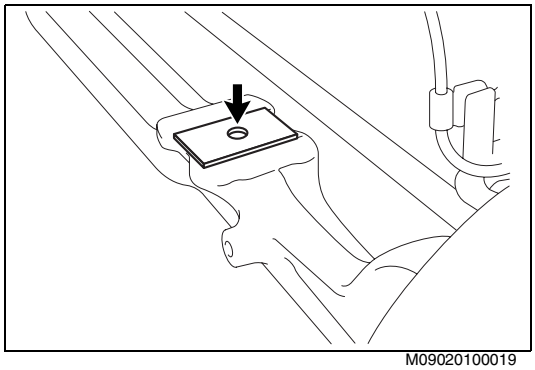
(1) Lubricate the following parts with chassis grease.

1. Spring pins



M09020100033

2. Auxiliary spring slide seats

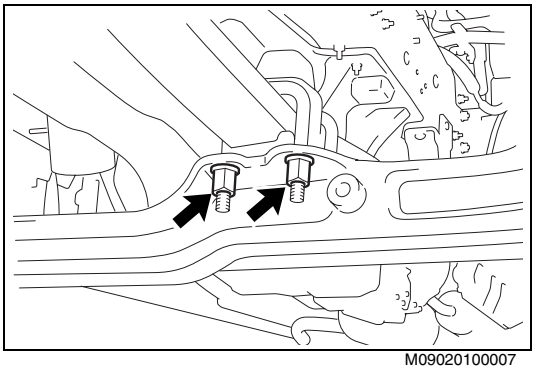

M09020100019

3. INSTALLATION OF THE U-BOLT

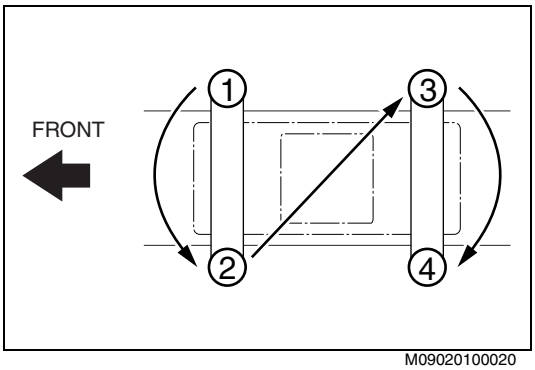
(1) Put the spacer on the front axle I-beam part of the driver's seat side. (For front suspension)

(2) Lift the axle using a jack and align the hole of the leaf spring center bolt and the hole of the axle I-beam.

NOTICE:
Axle and suspension assembly are heavy, therefore be careful when handling them.


M09020100007

(3) Put the spring pads on the leaf springs.
(4) Set the U-bolts so that they catch the spring pads and tighten the U-bolt nuts temporarily.



M09020100020

(5) Using the special tool, tighten the U-bolt nuts (4 pieces) alternately right and left and equally.
After repeating this operation 3 to 5 times, tighten the nuts to the specified torque.

SST:
Socket Wrench for Front U-bolt (09839-2204)
Socket Wrench for Rear U-bolt (09603-1160)

4. ADJUSTMENT OF THE SUSPENSION AFTER ASSEMBLING
(1) If the vehicle inclination is observed after assembling suspension, correct it by inserting the following spacer between the spring and the axle.

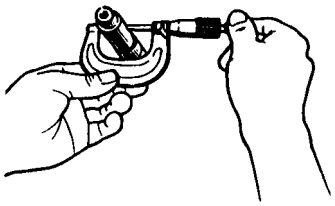
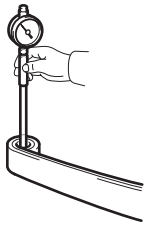
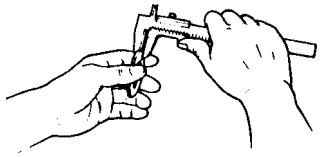
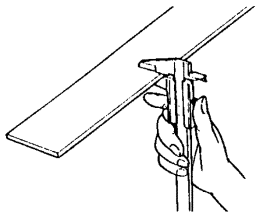
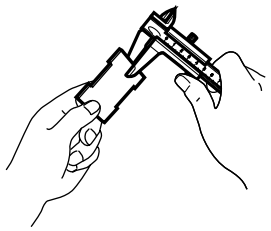
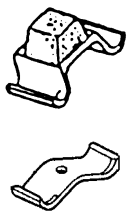
Spacer:

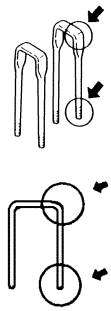
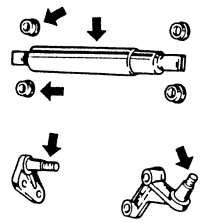
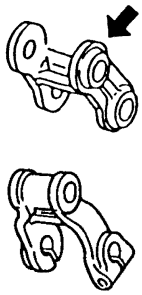
	Part No.	Thickness (mm)
Front suspension	**9004-85526**	**4.5**
Rear suspension	**9004-85184**	**6.0**

INSPECTION AND REPAIR

M09020101BEH3001

Unit: mm {in.}

Inspection item		Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	Front	25 {0.984}	24.7 {0.9724}	Replace.	Measure 
	Rear	30 {1.181}	29.7 {1.1693}		
Clearance between spring pin and eye bushing		0.125 {0.0049}	0.5 {0.0197}	Replace the pin and/or bushing.	Measure 
Thrust washer: Wear		3.0 {0.118}	2.5 {0.0984}	Replace.	Measure 
Leaf: Damage and wear		—	More than 15%	Replace.	Measure 
Silencer: Wear		3.0 {0.118}	1.0 {0.0394}	Replace, if necessary.	Measure 
Spring bumper: Damage and wear		—	—	Replace, if necessary.	Visual check 

Inspection item	Standard	Limit	Remedy	Inspection procedure
U-Bolt: **Damage**	—	—	**Replace, if necessary.**	**Visual check** 
Shock absorber: **Operation, oil leak and damage**	—	—	**Replace, if necessary.**	**Visual check** 
Cushion: **Damage and wear**	—	—		
Shock absorber pin and bracket: **Damage and wear**	—	—		
Shackle: **Damage**	—	—	**Replace, if necessary.**	**Visual check** 

CHASSIS FRAME

FC02-001

CHASSIS FRAME FC02-2
TROUBLESHOOTING FC02-2
REPAIR FC02-2
INSPECTION AND REPAIR FC02-7

CHASSIS FRAME

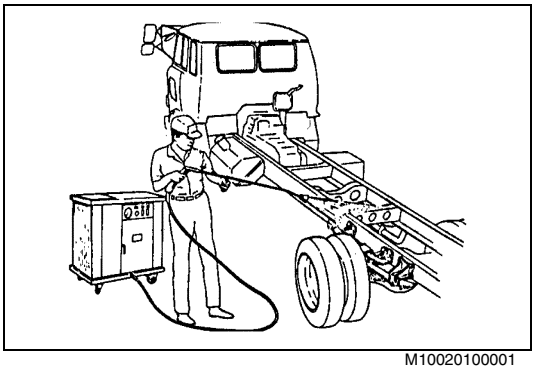
TROUBLESHOOTING

M10020101BEF3001

Symptom	Possible cause	Remedy/Prevention
Frame distortion (Vehicle inclination)	Flattening or breakage of springs on one side	Replace spring
	Incorrect mounting (Attachment of heavy weight on one side of the vehicle)	Correct mounting
Bent frame	Overloading or concentrated weight on rear end of frame	• Correct load • Correct with frame correction device
Frame cracking or rivets breaking	Wrong body mounting	Correct mounting
	Overloading	• Improvement of the usage • Reinforce with stiffener

REPAIR

M10020101BEH2001



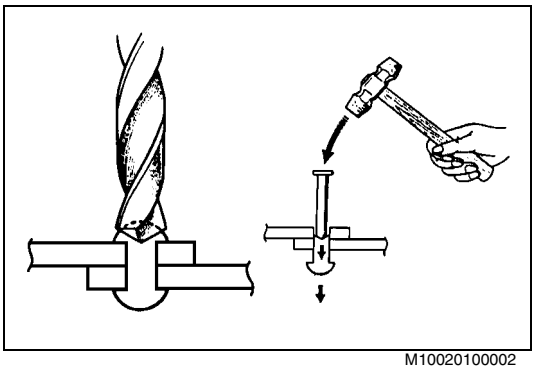
M10020100001

1. REPLACEMENT OF LOOSENED RIVETS

(1) Clean the frame.

NOTICE:

While inspecting or repairing, stop the vehicle engine and block the wheels. When cleaning with a steam cleaner, use safety goggles.

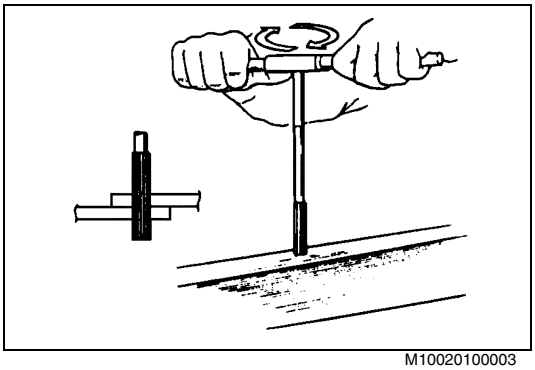


M10020100002

(2) Drill out the head of the loosened rivets with a drill or grind.

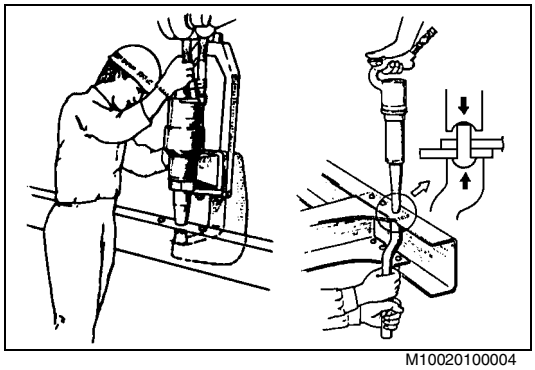
NOTICE:

When drilling, do not use the gloves. They can get caught up in the drill.



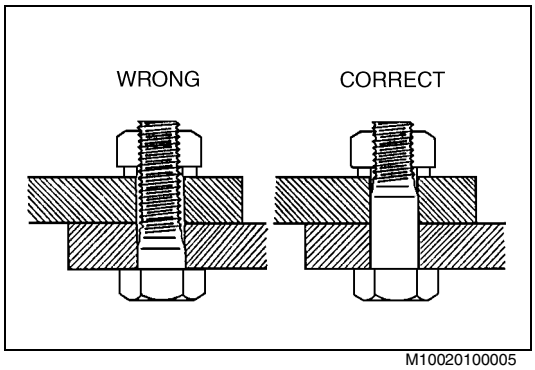
M10020100003

(3) Ream out the hole with a reamer.


M10020100004

(4) Rivet with proper force, using a pneumatic riveter.

Rivet	Rivet hole	
ϕ10mm {ϕ0.39in.}	Standard:	ϕ11mm {ϕ0.43in.}
	Repair limit:	ϕ11.5mm {ϕ0.45in.}
ϕ11mm {ϕ0.43in.}	Standard:	ϕ12mm {ϕ0.47in.}
	Repair limit:	ϕ12.5mm {ϕ0.49in.}
ϕ13mm {ϕ0.51in.}	Standard:	ϕ14mm {ϕ0.55in.}
	Repair limit:	ϕ14.5mm {ϕ0.57in.}
ϕ16mm {ϕ0.63in.}	Standard:	ϕ17mm {ϕ0.67in.}
	Repair limit:	ϕ17.5mm {ϕ0.69in.}

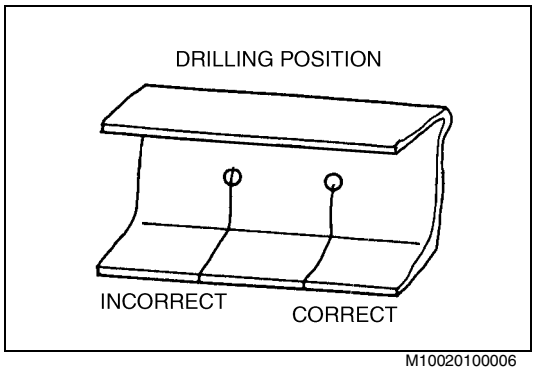


M10020100005

(5) If it is impossible to tighten with rivets, finish the rivet hole with a reamer and tighten with reamer bolts.

NOTICE:
The tensile strength of the bolts material of the bolts must be above 686 MPa {70kgf/mm^2, 99,562 lbf/in.^{2}}

Tightening Torque:
10 mm {0.39 in.} Bolt: 37.27-49.03 N·m {380-500 kgf·cm, 28-36 lbf·ft}
12 mm {0.47 in.} Bolt: 63.74-85.32 N·m {650-870 kgf·cm, 47-62 lbf·ft}
14 mm {0.55 in.} Bolt: 107.88-147.09 N·m {1,100-1,500 kgf·cm, 80-108 lbf·ft}
16 mm {0.63 in.} Bolt: 166.72-225.55 N·m {1,700-2,300 kgf·cm, 123-166 lbf·ft}
18 mm {0.71 in.} Bolt: 245.17-323.61 N·m {2,500-3,300 kgf·cm, 181-238 lbf·ft}
20 mm {0.79 in.} Bolt: 343.24-460.91 N·m {3,500-4,700 kgf·cm, 254-339 lbf·ft}
22 mm {0.87 in.} Bolt: 470.72-627.62 N·m {4,800-6,400 kgf·cm, 348-462 lbf·ft}

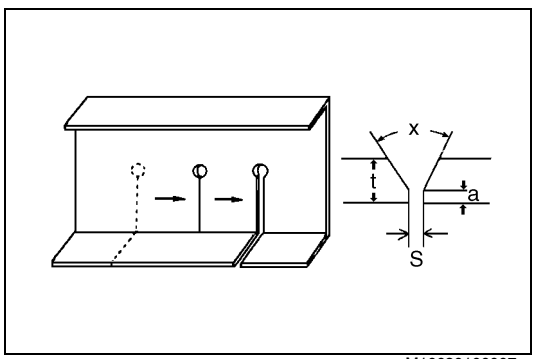


M10020100006

1. REPAIRING OF FRAME CRACKS

(1) Perform the procedure for preventing the enlargement of cracks.

NOTICE:
Do not make drill holes on the frame flanges except when repairing the cracks.

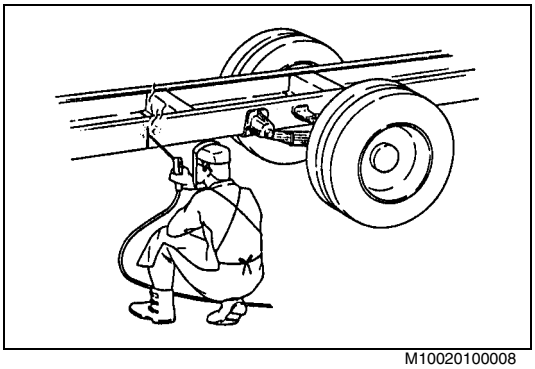


M10020100007

(2) Make the V-shape groove with a grinder along the frame crack according the following table.

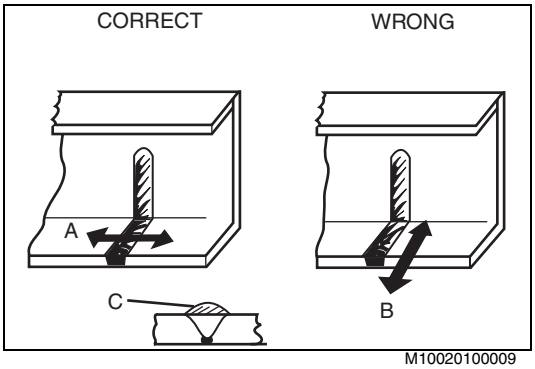
Unit: mm {in.}

t	x°	s	a
4.5 {0.18}	90	1.0 {0.039}	0
6 {0.24}	70	1.0 {0.039}	0
7 {0.28}	70	1.5 {0.059}	1 {0.039}
8 {0.31}	70	1.5 {0.059}	1 {0.039}
9 {0.35}	70	1.5 {0.059}	1 {0.039}
10 {0.39}	60	1.5 {0.059}	1 {0.039}
12 {0.47}	60	1.5 {0.059}	1 {0.039}
16 {0.63}	60	2.0 {0.079}	1 {0.039}


M10020100008

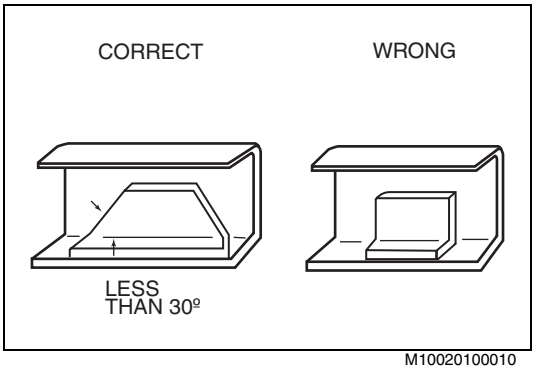
(3) Use an electric welder.
Refer to page FC02-7 for WELDING CONDITION (WHEN WELDING ROD IS USED).

CAUTION:
- **Disconnect the negative battery ground cable before using arc welding equipment.**
- **While welding, make sure that there are no flammable materials such as oil, rags, etc. around. As welded parts becomes extremely hot and sparks are present, make sure that there are no items such as harnesses, tubes, pipes, suspension component, etc. which may be damaged.**
- **If material is allowed to sputter onto the spring leaf during welding its strength will be significantly diminished. It should therefore be covered with a protective sheet. Also, for the same reason, the spring leaf should never be used as a ground for arc welding.**
- **When arc welding, ventilate or wear antitoxic mask for noxious gas.**
- **To prevent burns, electric shock and gas poisoning during arc welding, wear a helmet, apron, antitoxin mask, safety goggles, arm coverings, leg covering, safety boots and gloves.**



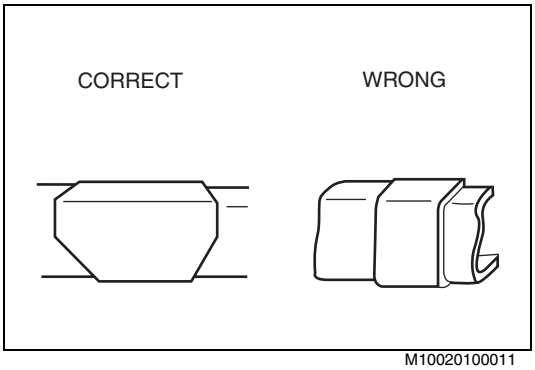
M10020100009

(4) After welding, shake the grinder crosswise the bead line A, along direction B, to polish the welded area as illustrated in C.
Grind and polish the bead line A so that the frame surface becomes even.

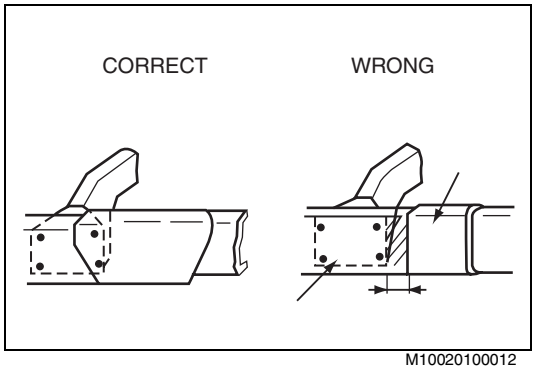


M10020100010

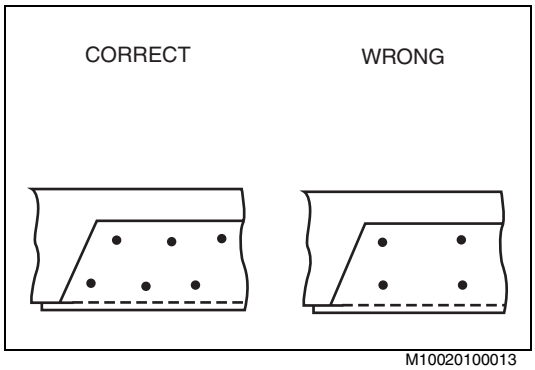
(5) Reinforcement patching method.
Patch-plate with ends squared off rather than tapered can cause damage.
The patching plate thickness should be the same as the frame.



M10020100011

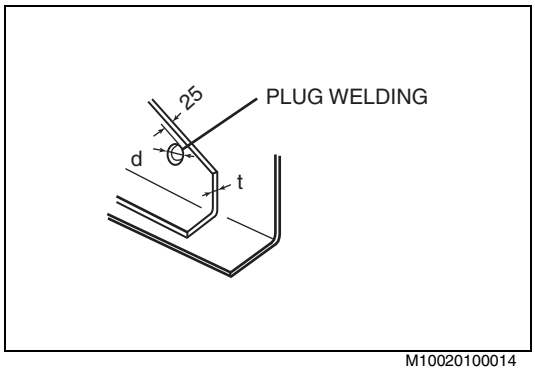


M10020100012



M10020100013

(6) Be sure to fasten the bolts at the hole locations of ups and downs (use rivets or perform the plug welding).

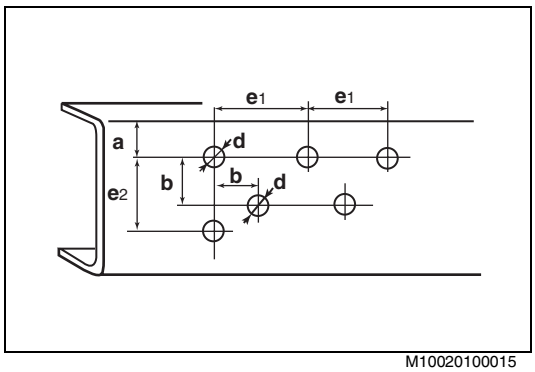


M10020100014

(7) Diameter of plug welding hole.

NOTICE:
Prohibit plug welding on the flange.

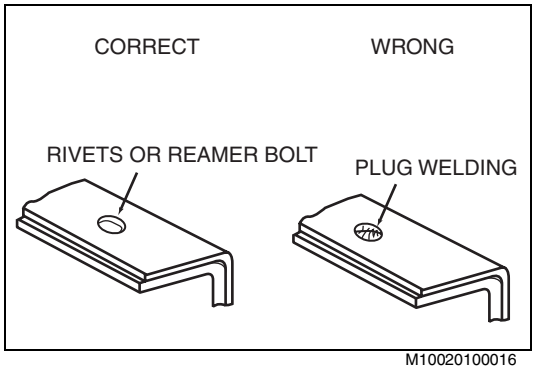
t	dϕ
3.2	15
4.5	15
6	18



M10020100015

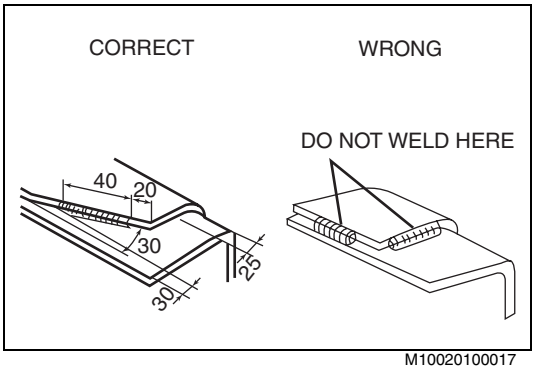
(8) Interval of the holes

a ≥50+d/2
b≥ 3d
e1e2≥701+a
dϕ: 20 or less

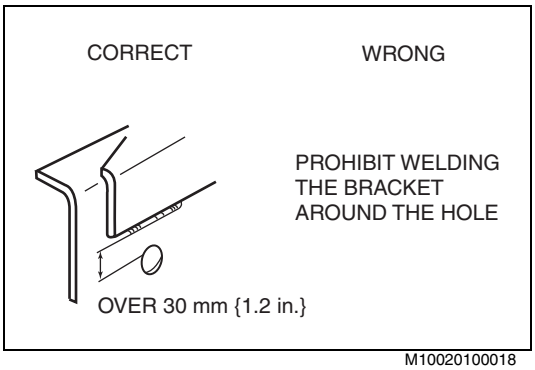


M10020100016

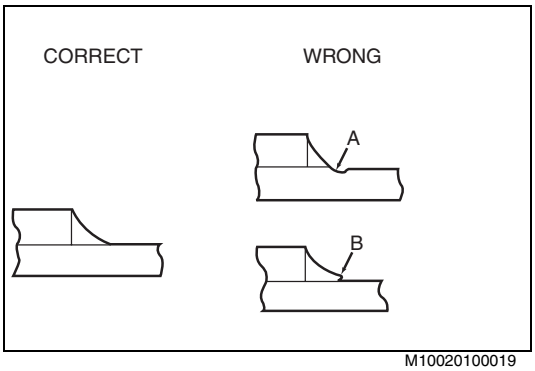
(9) Method of fixing on the flange.



M10020100017



M10020100018



M10020100019

(10) Method of welding on the flange.

(11) In welding, be sure that there is no undercut A or the overlap B of the bead and a pin hole.

NOTICE:
An experienced professional welder should always perform the welding since a poor welding job on the frame can cause damage.

WELDING CONDITION (WHEN WELDING ROD IS USED)

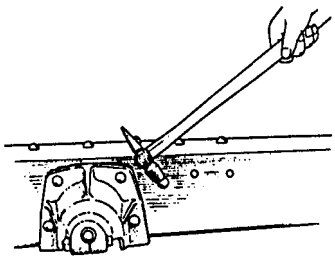
		Electric current (Unit: A)					
	Rod dia ϕ	3.2 mm {0.126 in.}		4mm {0.157 in.}		5 mm {0.197 in.}	
	Welding position	Flat	Vertical overhead	Flat	Vertical overhead	Flat	Vertical overhead
Mechanical property of weld metal & rod	Weld Metal (Hot roll plate) Tensile strength; 441 MPa {45 kgf/mm^2, 64.004 lbf/in.^{2}} Welding Rod Tensile strength; 422 MPa {43 kgf/mm^2, 61.160 lbf/in.^{2}} Illuminate type (JIS D4301 AWS E6019) Coated electrode	80-130	60-110	120-180	100-150	170-250	130-200
	Weld Metal (Hot roll plate) Tensile strength; 539 MPa {55 kgf/mm^2, 78.228 lbf/in.^{2}} Welding Rod Tensile strength; 490 MPa {50 kgf/mm^2, 71.116 lbf/in.^{2}} Illuminate type (JIS D4301 AWS E6019) Coated electrode	90-140	80-130	141-190	110-160	180-250	—

NOTICE:
- **Diameter of welding rod ϕ3.2 mm {0.126 in.} or ϕ4 mm {0.157 in.} - plate thinner than 5 mm {0.197 in.}**
- **Diameter of welding rod ϕ4 mm {0.157 in.} or ϕ5 mm {0.197 in.} - plate thicker than 6 mm {0.236 in.}**

INSPECTION AND REPAIR

M10020101BEH3001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Looseness of the rivets	—	—	Replace the rivet, if necessary.	
Frame cracking	—	—	Repair the frame.	

CAB

CA02-001

CAB ASSEMBLY CA02-2
DATA AND SPECIFICATIONS CA02-2
TROUBLESHOOTING CA02-3
DISMOUNTING AND MOUNTING CA02-4

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COMPONENT LOCATOR..... CA02-7
OVERHAUL CA02-10

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REPLACEMENT CA02-28

CAB ASSEMBLY

DATA AND SPECIFICATIONS

M11020101BEI2001

Type	**All steel welded construction, safety glass fitted to all windows**
Tilt system	**Torsion bar**
Tilt angle	**40° ("Over-tilt" position: 50°)**

TROUBLESHOOTING

M11020101BEF3001

CAB TILT

Symptom	Possible cause	Remedy/Prevention
Cab does not tilt up.	Cab mounting hook does not release.	Inspection of cab mounting hook mechanism.
	Safety rod does not release.	Inspection of safety rod mechanism.
	Damaged torsion bar	Replace torsion bar.
Cab tilting is difficult.	Heavy items in or attached to cab	Adjustment of shim for anchor lever or removal of the heavy items.
	Tilt up force is weak.	Adjustment of shim for anchor lever. Replace torsion bar.
Cab does not lock to cab mounting member.	Mounting hook does not operate.	Adjustment of mounting hook mechanism.
	Cab mounting cushion is not correctly installed.	Correct installation of cab mounting.

DOOR

Symptom	Possible cause	Remedy/Prevention
Door does not close properly.	Door is not adjusted	Adjust door installing.
	Striker is not adjusted	Adjustment of shim for door lock striker
	Damaged door lock	Replace door lock.
Door does not lock by inside lock knob.	Deformation of rod	Replace rod.
	Rod is disconnected	Connect rod.
	Damaged door lock	Replace door lock.
Door does not lock by key.	Rod is disconnected	Connect rod.
	Damaged door lock	Replace door lock.
	Damaged lock cylinder	Replace lock cylinder.
Door does not open by outside handle.	Outside handle push rod is not adjusted.	Adjust push rod.
	Damaged door lock	Replace door lock.
Door does not open by inside handle.	Inside handle is not installed properly.	Install inside handle properly.
	Deformation of rod	Replace rod.
	Rod is disconnected.	Connect rod.
	Damaged door lock	Replace door lock.
Inside handle does not return to its normal position.	Interference between rods.	Replace rod.
	Inside handle is not installed properly.	Adjust inside handle.
	Return spring is damaged.	Replace inside handle.
Door window goes down while driving.	Window is not in the glass holder.	Repair.
	Regulator is damaged.	Replace regulator.
Regulator makes abnormal noise while driving.	Window sill weather strip is installed improperly.	Install properly or replace clips.

BLOWER

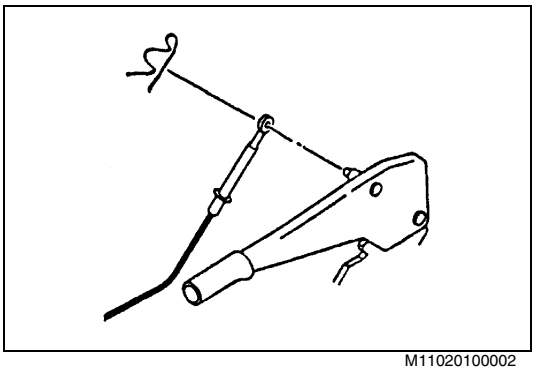
Symptom	Possible cause	Remedy/Prevention
Malfunction of blower when power is ON.	Blown fuse	Change fuse or check for short circuit.
	Malfunction in heater relay	Inspect relay.
	Malfunction of heater blower switch	Inspect power switch.
	Malfunction of register	Check register.
	Blower motor malfunction	Replace motor.
	Damaged electrical wiring or poor grounding	Repair as necessary.

DISMOUNTING AND MOUNTING

M11020101BEH1001

1. BEFORE DISMOUNT THE CAB

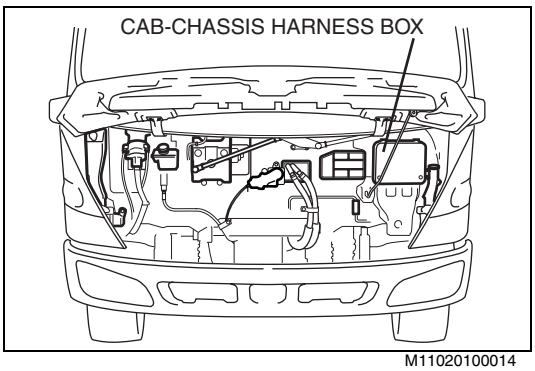
- Be sure to block the front wheels.
- Disconnect the battery cable from the battery ground terminal.
- Drain engine coolant, clutch fluid and refrigerant of the air conditioner.



M11020100002

2. CAB INSIDE

(1) Remove the parking brake cable retainer spring and pin.

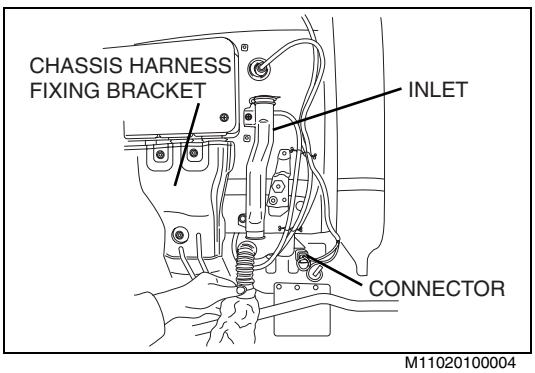


M11020100014

3. CAB FRONT SIDE

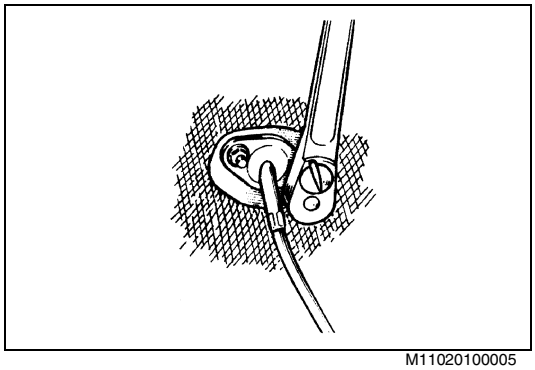
(1) Remove the front bumper and open the front panel.

(2) Remove the cab-chassis harness box lid and disconnect all the connectors of the harness connected to the cab and chassis.

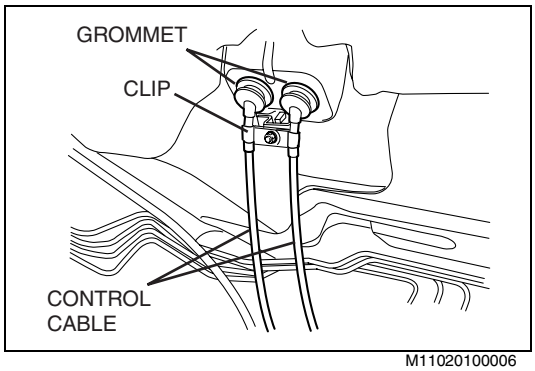


M11020100004

(3) Disconnect the inlet hose from washer tank.



M11020100005



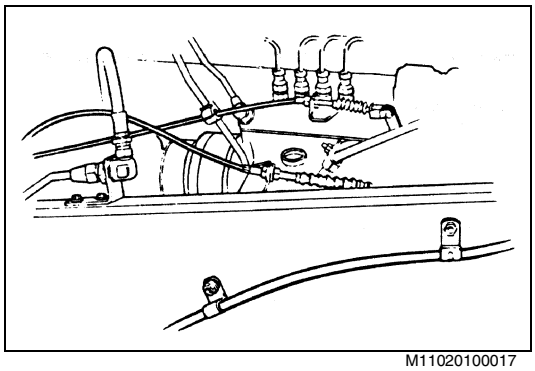
M11020100006

4. AFTER TILTING THE CAB

(1) Disconnect the parking brake cable and transmission control cables.

(2) Remove the harness clips located under the floor of the cab. Disconnect the air brake hoses and clutch hose.

(3) Remove the engine control cable and engine stop cable with clips.

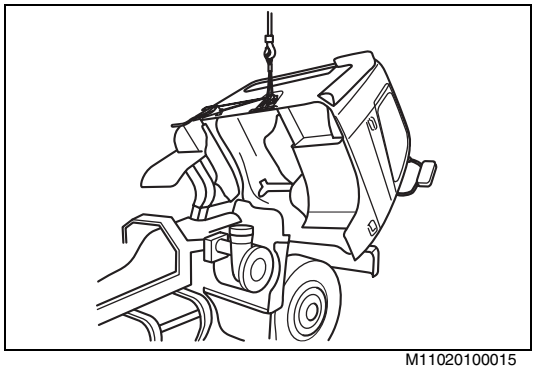


M11020100017

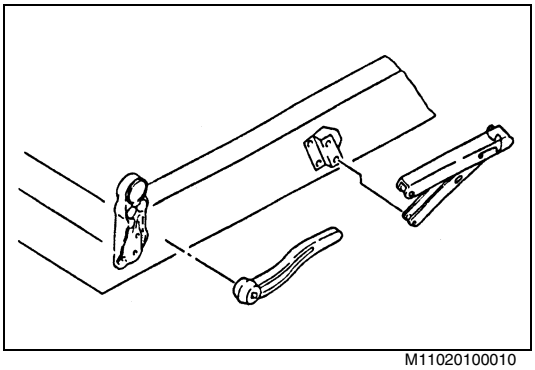
5. REMOVE ANCHOR LEVER

(1) Raise the cab to OVER-TILT position.
Refer to CAB TILT OPERATING TENSION ADJUSTMENT (1) OVER-TILT.
Suspend the cab with crane or hoist as shown in figure.

NOTICE:
Do not raise cab excessively, because the cab will fall forward.

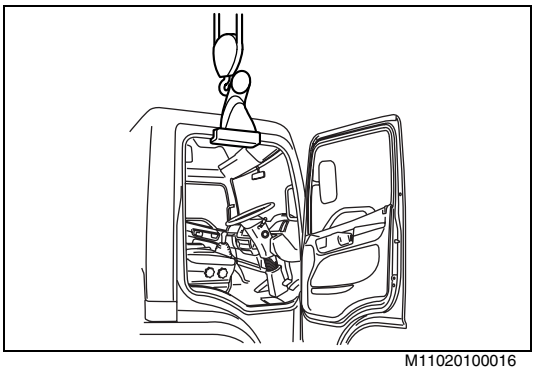


M11020100015


M11020100010

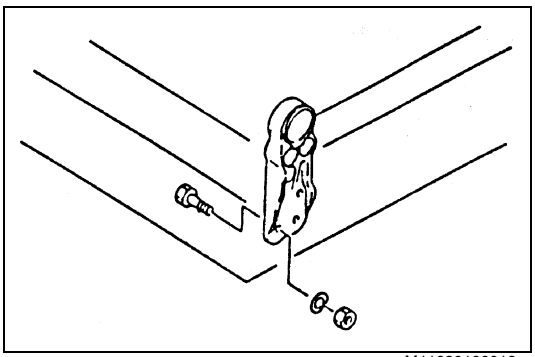
(2) Remove the set screws of the anchor lever, and pull out the anchor levers.
Remove the cab stopper stay.
Slowly lower the cab with crane or hoist.

CAUTION:
Never go under the cab when lowering the cab. It is very dangerous.

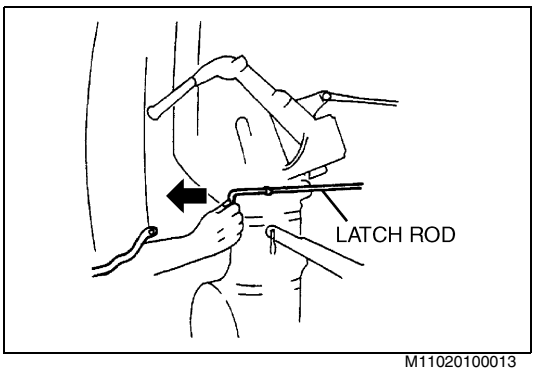

M11020100016

6. DISMOUNTING CAB ASSEMBLY

(1) Open the doors and hook the hooks of the cab lifting device.


M11020100012

(2) Initially raise the cab so that most of its weight is borne by the lifting device, then remove the bolts of the tilt hinge brackets.



M11020100013

(3) Pull the cab tilt latch rod and lift the cab slowly.

NOTICE:
Make sure that all of connecting parts are disconnected.

(4) Set the cab on a cab stand.

7. CAB MOUNTING

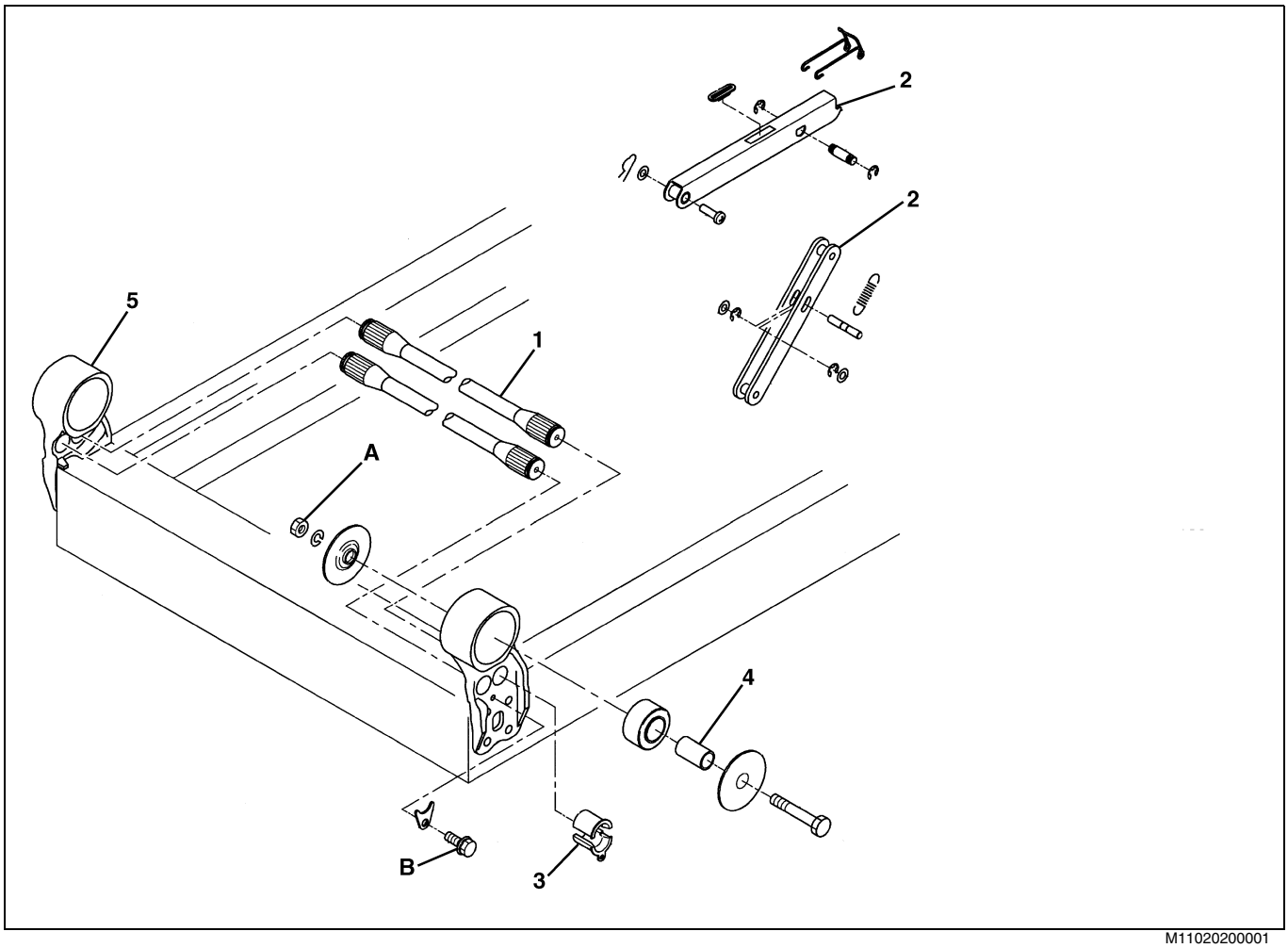
(1) Pay attention to the points below, and mount in the reverse order of dismounting.

1. Steering sliding shaft inserting
2. Anchor lever fitting position
3. Damage or interference of harness wire, cable and hose

CAB MOUNTING PARTS

COMPONENT LOCATOR

M11020201BED1001

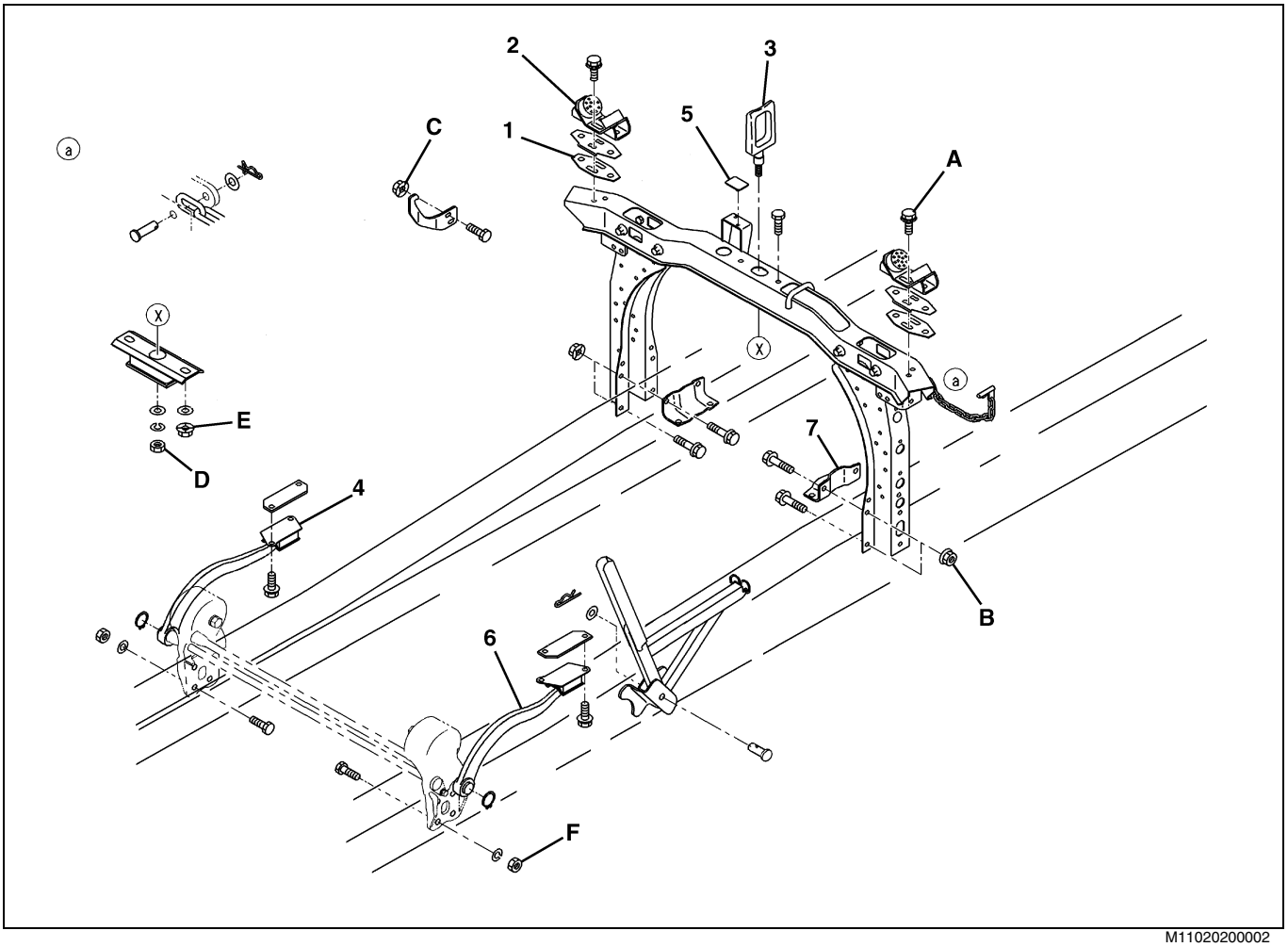


M11020200001

1	Torsion bar	4	Collar
2	Cab stopper stay	5	Tilt hinge bracket
3	Fitting collar		

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

A	156-244 {1,590-2,488, 115-180}	B	34.5-51.5 {352-525, 26-37}

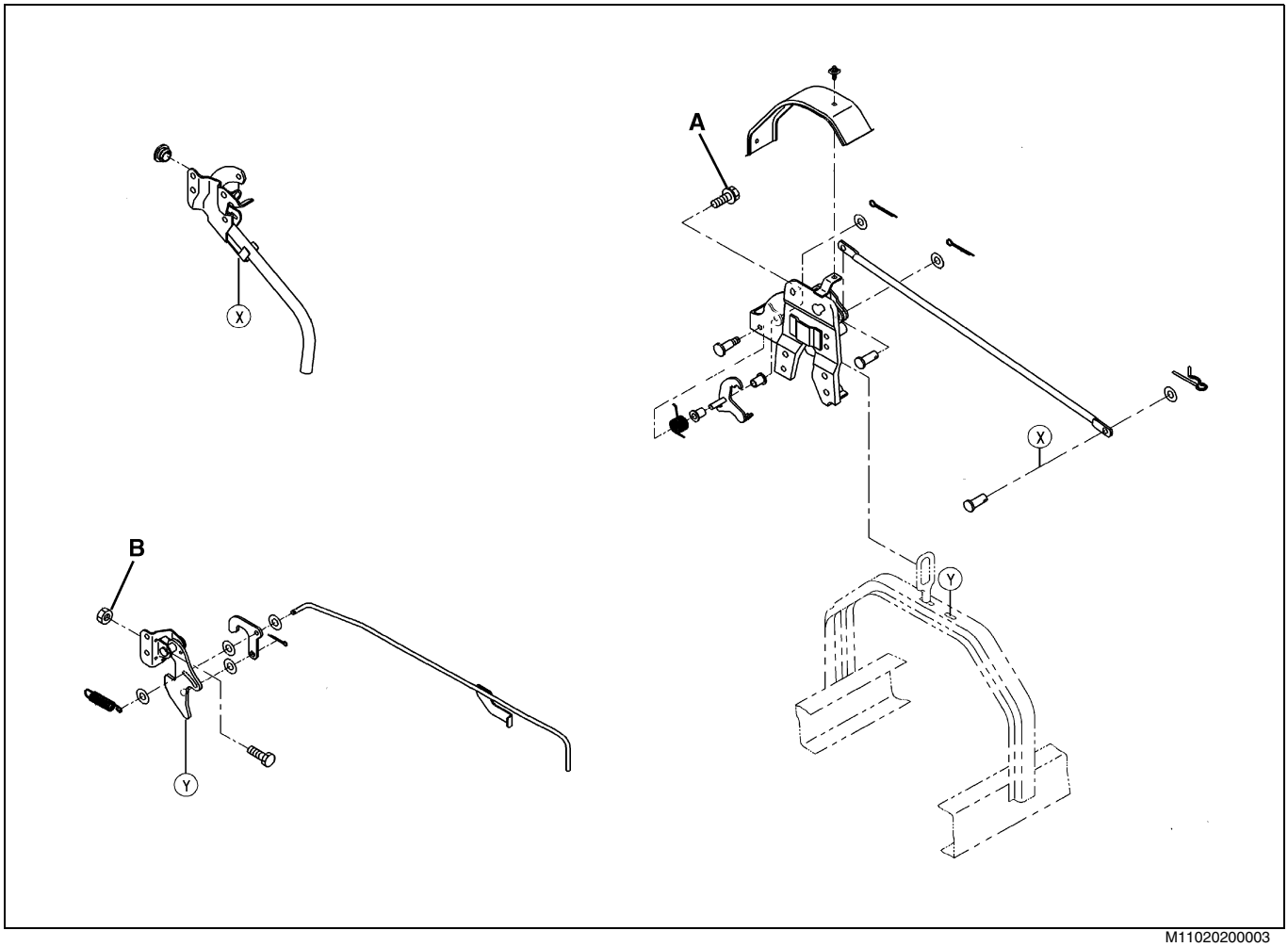


M11020200002

1	Adjusting shim	5	Rebound rubber
2	Cab mounting cushion	6	Anchor lever
3	Eye bolt	7	Bracket
4	Stopper		

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

A	34.5-51.5 {352-525, 26-37}	D	110-150 {1,122-1,529, 82-110}
B	55.0-82.0 {561-836, 41-60}	E	34.5-51.5 {352-525, 26-37}
C	55.0-82.0 {561-836, 41-60}	F	150-180 {1,530-1,835, 110-133}



M11020200003

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

A 34.5-51.5 {352-525, 26-37}	**B 8.2-10.8 {83.0-110.0, 6.1-7.9}**

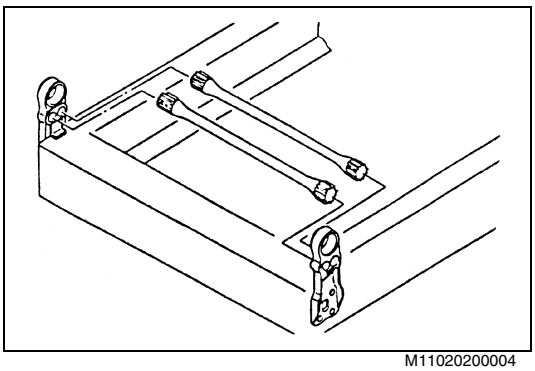
Tightening torques:

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

NOTICE:
- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

OVERHAUL

M11020201BEH2002


M11020200004

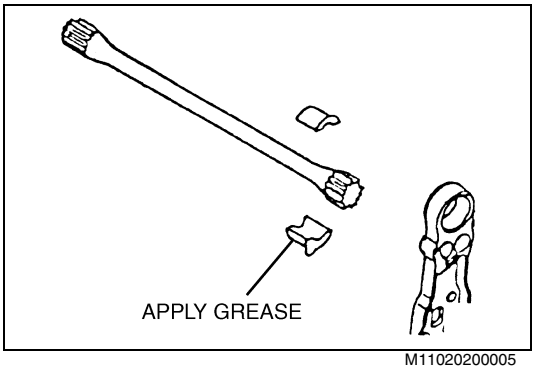
FRONT CAB MOUNTING PARTS

1. TORSION BAR INSPECTION

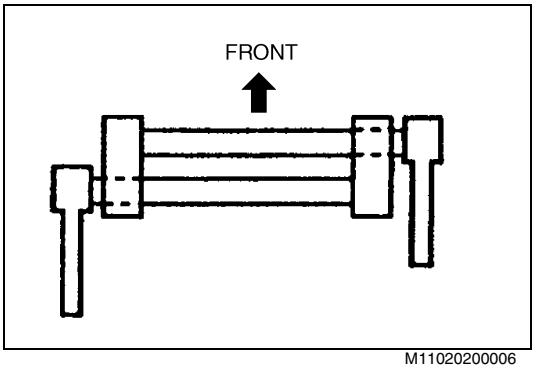
(1) Visually inspect the torsion bars for rust.
If it is severely rusted, replace torsion bars.

NOTICE:

- **A rusted torsion bar may be broken while tilting, and it will be very dangerous.**
- **Visually inspect the fitting collars for wear or fatigue.**
- **If it is slight wear or fatigue, replace the collars.**



M11020200005



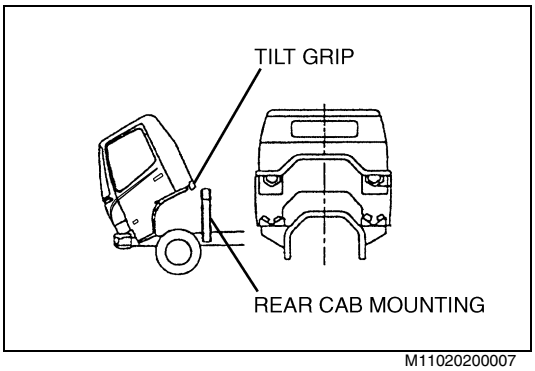
M11020200006

2. TORSION BAR INSTALLING

(1) Check the marks on the torsion bars, then install them as shown in figure.

NOTICE:

- **Be sure to install the levers in their correct positions.**
- **If the cab is raised with the torsion bars improperly installed, the torsion bars will drastically lose strength, and then it must be replaced with new ones.**

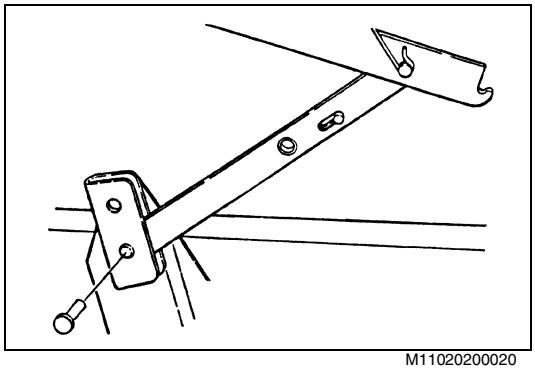


M11020200007

3. STANDARD CAB TILT OPERATING TENSION

(1) Tilt the cab several times, without lifting by hand, to determine the average rise of the cab.

UP	DOWN
255 N {26 kgf, 57 lbf} or less	**510 N {52 kgf, 114.6 lbf} or less**

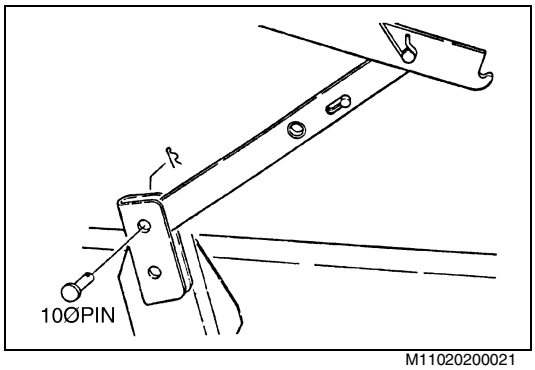

M11020200020

4. CAB TILT OPERATING TENSION ADJUSTMENT

(1) OVER-TILT

a. Remove the radiator grille and tilt up the cab.

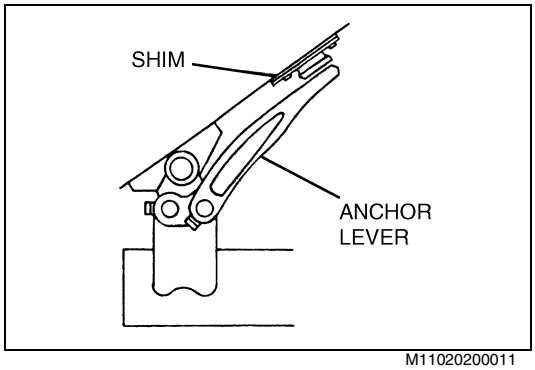
b. Pull out the pin at the lower part of cab stopper stay bracket.



M11020200021

c. Align the hole on the cab stopper stay with the hole for OVER-TILT at the upper part of the cab stopper stay bracket and insert 10 mm {0.39 in.} pin.
Use a cotter pin so that the pin does not come out.

CAUTION:
Make sure that the cab stopper pin is locked. If it is not properly locked, the cab may fall.



M11020200011

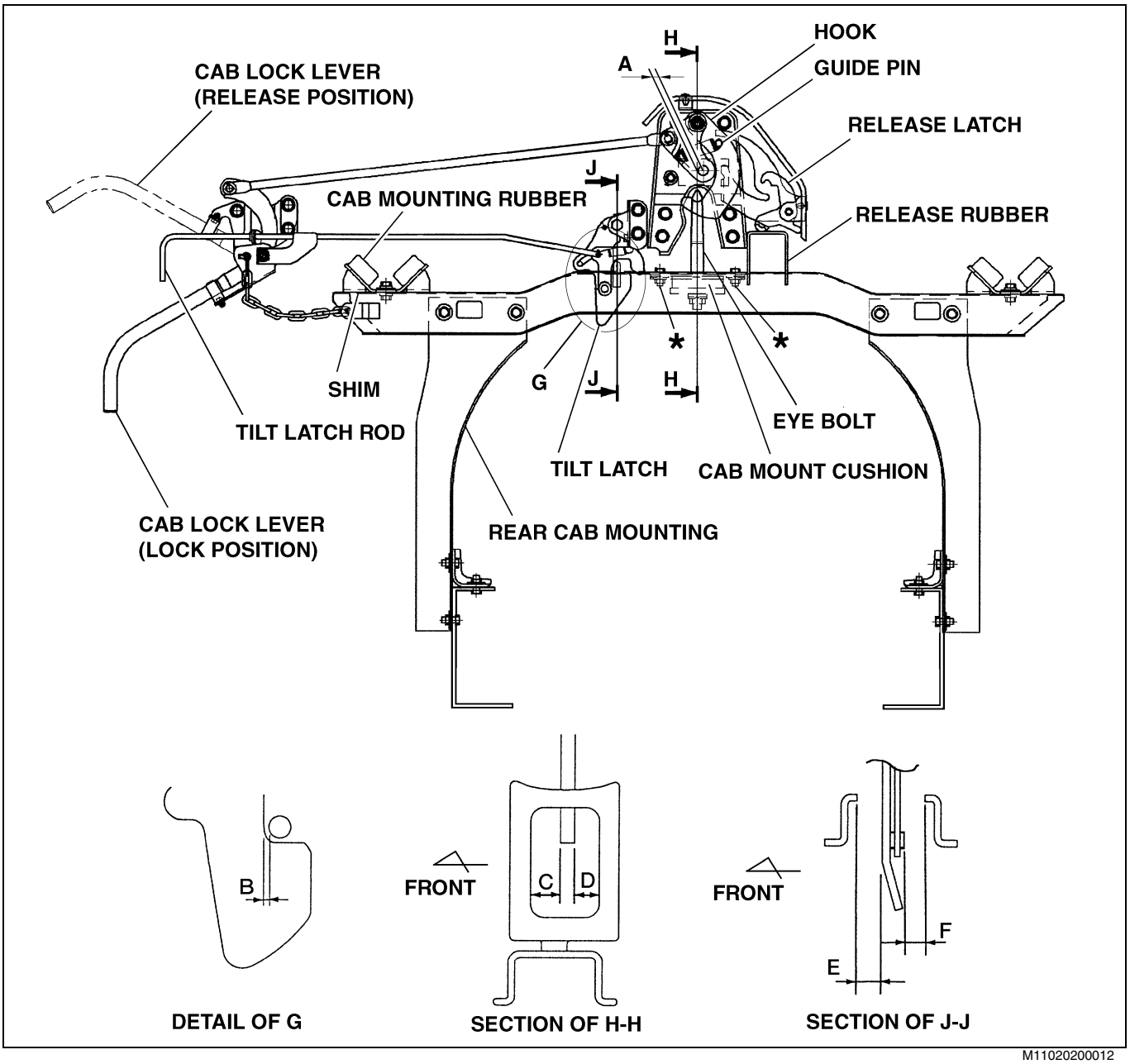
(2) ADJUSTING SHIM INSTALLING

a. Adjust the cab tilt operating tension by increasing or decreasing the number of shims when cab tilt up to OVER-TILT position.
For each 6 mm {0.24 in.} thick shim added, the cab tilt up effort by hand will be reduced about 49N {5 kgf, 11 lbf}.
However, do not add more than 5 shims (Maximum 5 shims).
When more than 5 shims are needed, or the torsion bar sage, replace the torsion bar.
If the clearance between the stopper rubber and the anchor lever is too narrow to insert the spacers, tilt the cab for 3-5 times to obtain the clearance.

REAR CAB MOUNTING PARTS

1. CAB LOCK MECHANISM ADJUSTMENT

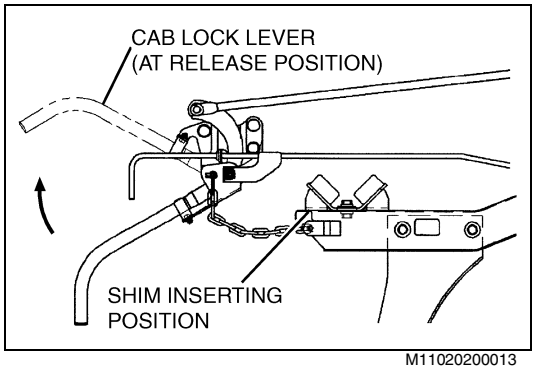
Adjust dimension A, B, C, D, E and F as follows:



M11020200012

Unit: mm {in.}

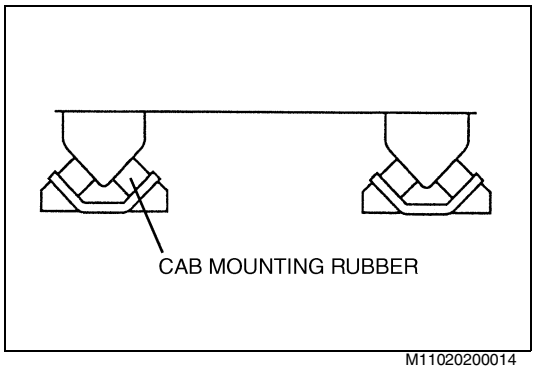
Position	Related parts	Dimensions
A: Eye bolt, crank pin off set	* Mark bolts	9-13 {0.36-0.51}
B: Tilt latch, pin clearance	Tilt latch adjusting bolt	3-6 {0.12-0.23}
C: Hook, eye bolt clearance	Mounting member attaching bolt	12-22 {0.48-0.86}
D: Hook, eye bolt clearance	Mounting member attaching bolt	20-30 {0.79-1.18}
E: Mounting member, tilt latch clearance	Mounting member attaching bolt	20-22 {0.79-0.86}
F: Mounting member, tilt latch clearance	Mounting member attaching bolt	9-11 {0.36-0.43}



M11020200013

2. CAB LOCK LEVER OPERATING RESISTANCE ADJUSTMENT

(1) Adjust the mounting cushion shims to bring the operating tension of the lock lever to 166-266 N {17-27 kgf, 38-59 lbf.}. If the cab is not directly aligned, the operating resistance of the lock lever increases. In this case, correct the cab mounting cushions.

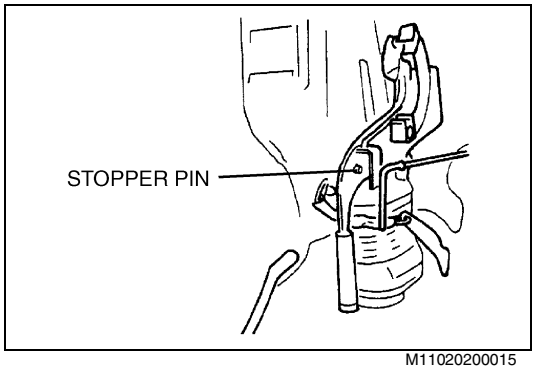


M11020200014

3. CAB MOUNTING CUSHION ADJUSTMENT

(1) If the cab shifts sideways, loosen the mounting rubber attaching bolts and adjust the mounting rubbers so that there is no clearance there.

NOTICE:
Replace cab mounting rubbers which are hardened or deformed.



M11020200015

4. INSPECTION

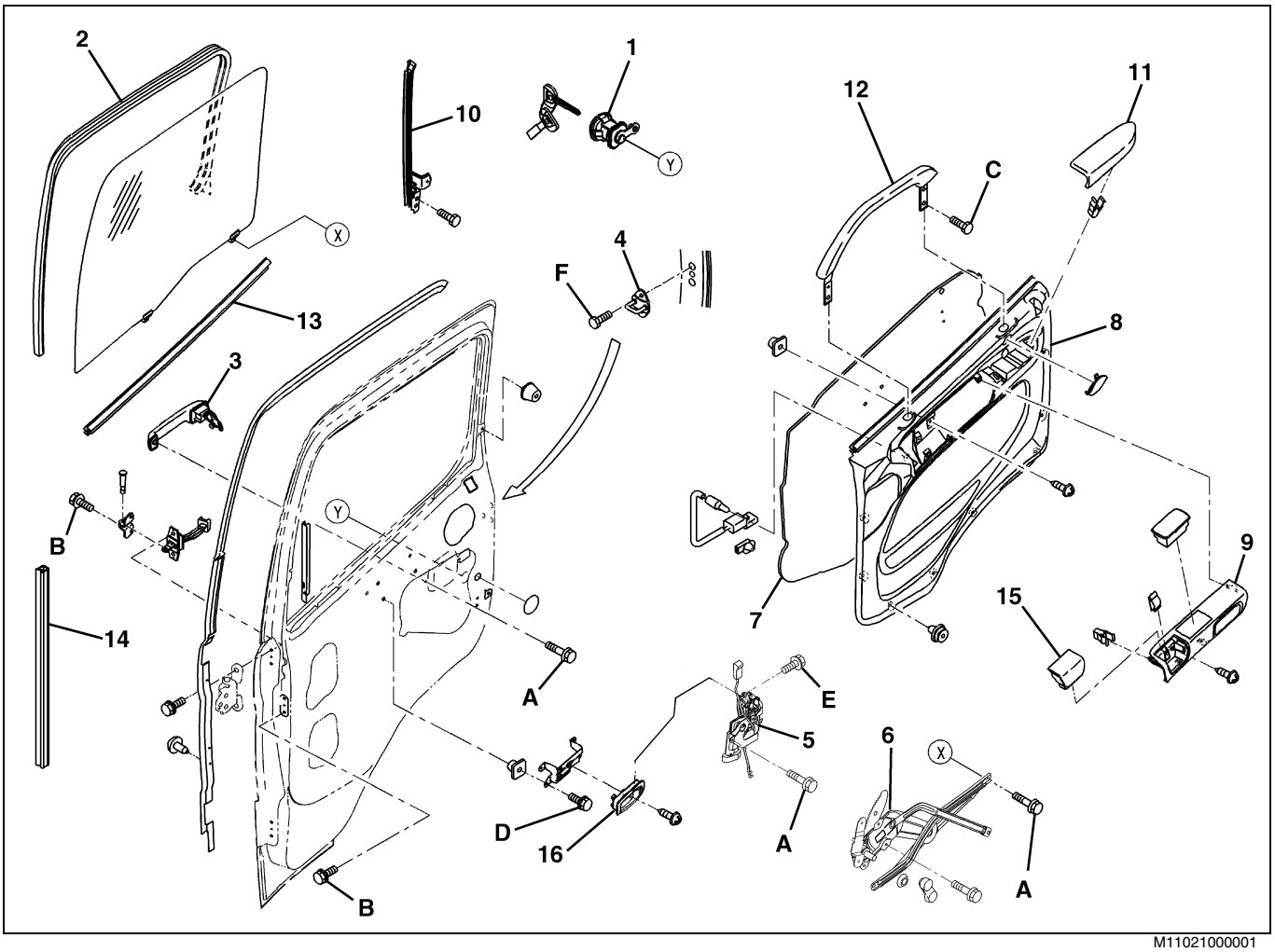
(1) Operate the cab lock lever, and confirm that each part operates smoothly, that the hook and eye bolt fit in the lock position, and that the stopper pin is securely inserted.

CAUTION:
If the stopper pin is not inserted securely in place while driving, external shock such as road bumps or collision may cause a tilting of the cab. This can result in personal injury and/or property damage. If the stopper pin is lost, immediately install a new stopper pin. Make sure that the hook engages with the eye bolt securely.

DOOR

COMPONENT LOCATOR

M11021001BED1001



M11021000001

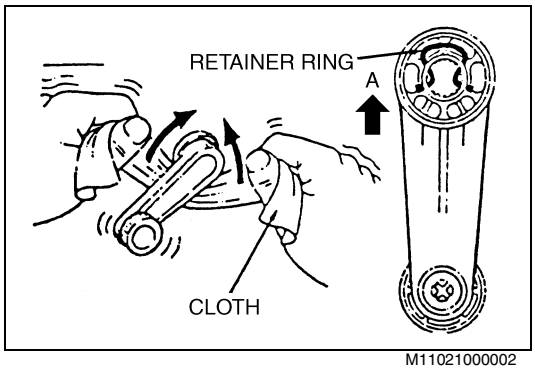
1	Lock cylinder	9	Inside upper trim
2	Weather strip	10	Door frame
3	Outside handle	11	Armrest
4	Striker	12	Door assist grip
5	Door lock	13	Outer oscillate-proof
6	Regulator	14	Glass run weather strip
7	Inside hole cover	15	Ashtray
8	Inside trim	16	Inside handle case

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

A	4.4-6.6 {45-67, 3.3-4.8}	D	2.0-3.0 {20-30, 1.5-2.1}
B	7.2-10.8 {74-110, 5.4-7.9}	E	7.2-10.8 {74-110, 5.4-7.9}
C	10.8-20.2 {110-206, 8.0-14.8}	F	18-26 {184-264, 13.3-19.0}

OVERHAUL

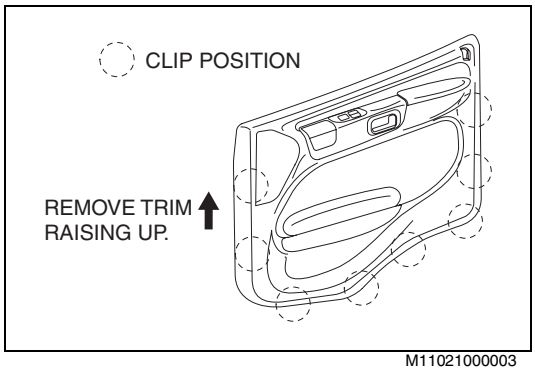
M11021001BEH2001



M11021000002

1. REMOVE REGULATOR HANDLE.

(1) Use a piece of cloth to catch the two ends of the retainer ring and pull the cloth back and forth as shown, to remove the ring.

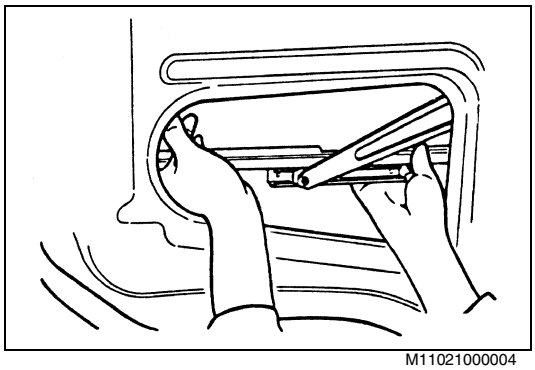


M11021000003

2. REMOVE INSIDE TRIM.

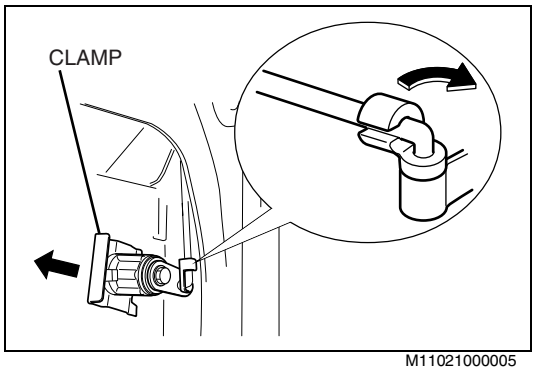
(1) Remove the parts below in the listed.
(Refer to the DOOR COMPONENT LOCATOR)
   a. Ashtray
   b. Armrest
   c. Inside upper trim
   d. Inside handle case

(2) Pull off the inside trim.


M11021000004

3. REMOVE WINDOW.

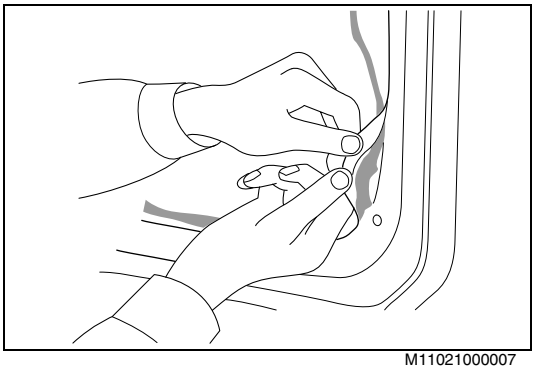
(1) Disconnect regulator from window channel.



M11021000005

4. REMOVE DOOR LOCK.

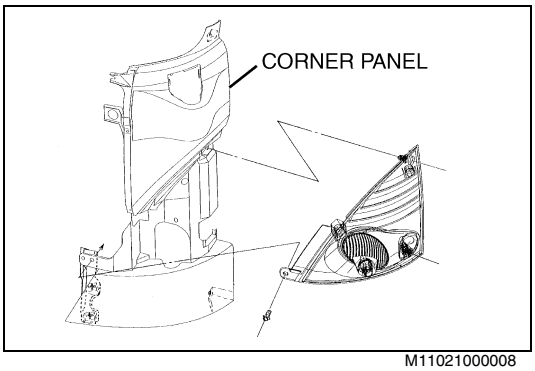
(1) Disconnect the lock cylinder from the door lock.
(2) Remove the lock cylinder.
(3) Remove the door lock with rods.


M11021000007

5. SERVICE HOLE COVER AND REGULATOR INSTALLING

(1) Stick butyl rubber tape along lower tangent line of the drain hole of the door.

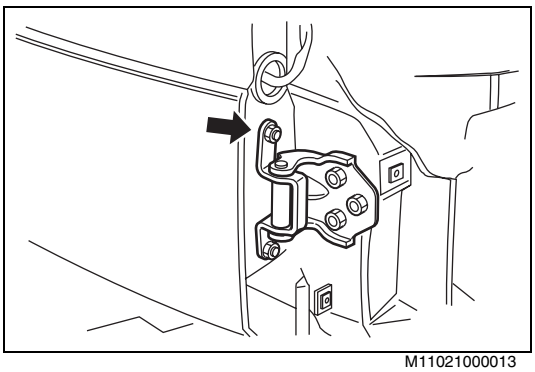
(2) Insert the regulator handle with retainer ring into the regulator.



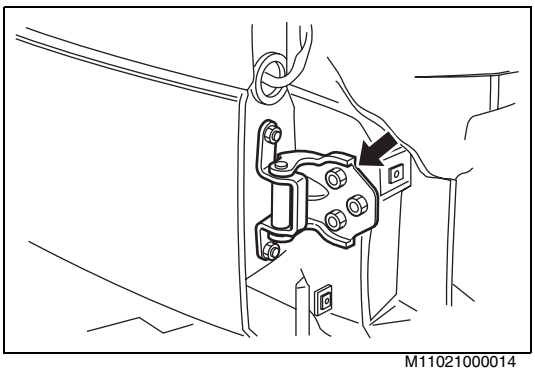
M11021000008

6. DOOR HINGE ADJUSTMENT

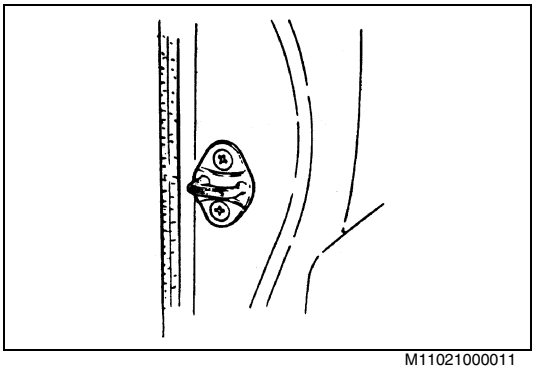
(1) Remove the corner panel.


M11021000013

(2) Make vertical and horizontal adjustments by loosening the hinge bolts on the door.


M11021000014

(3) Make depth adjustments by loosening the hinge bolts on the body.

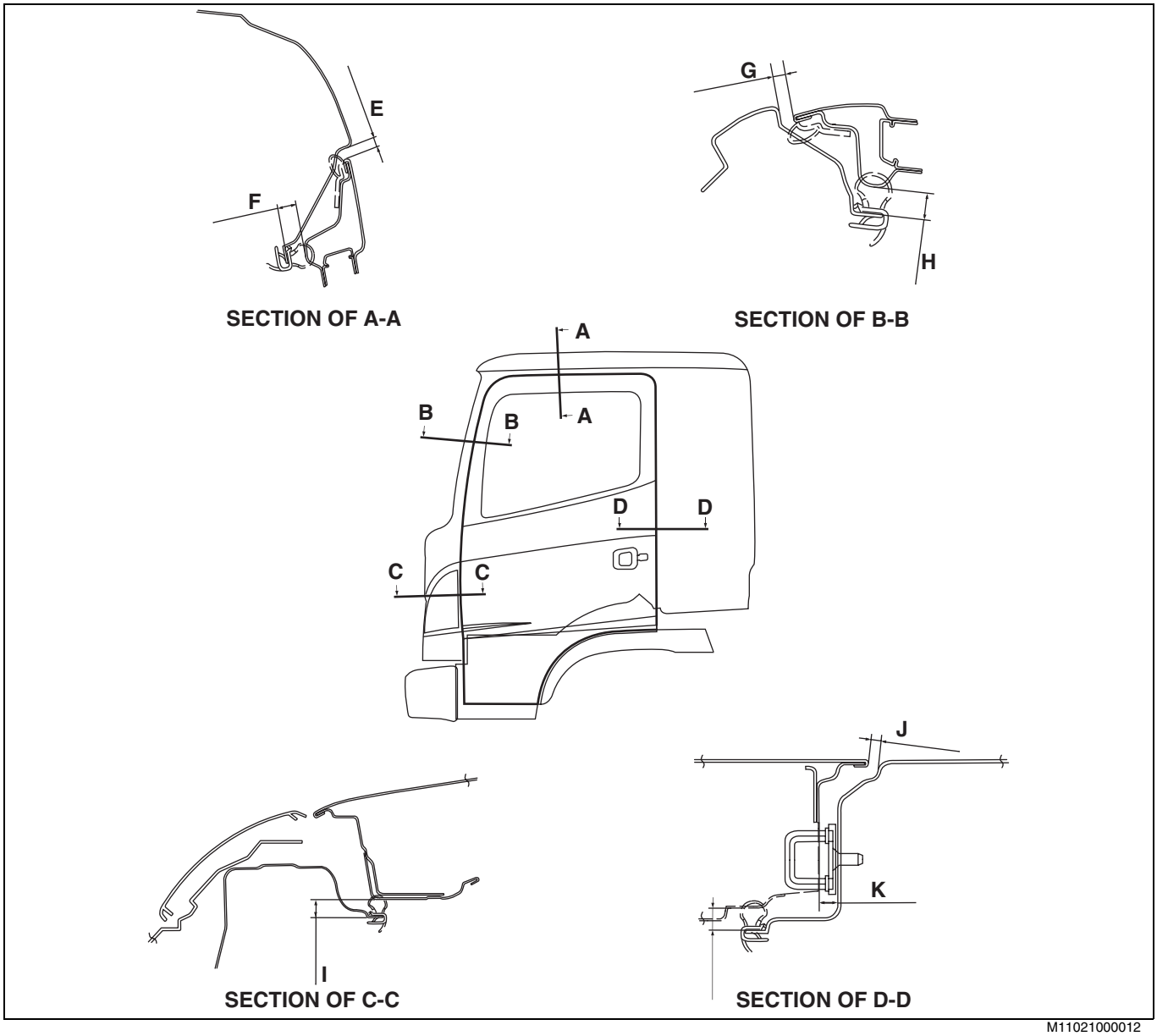

M11021000011

7. STRIKER ADJUSTMENT

(1) Check the engagement between the door lock and the striker. Make the top and bottom contact even.

(2) Perform adjustment so that the outside of the door and the outside of the rear quarter panel are flush with each other. After adjustment, properly tighten the bolts.

NOTICE:
When adjusting the door in the vertical direction, do not force in into alignment by using the door lock striker.



M11021000012

CLEARANCES BETWEEN BODY AND DOOR **Unit: mm {in.}**

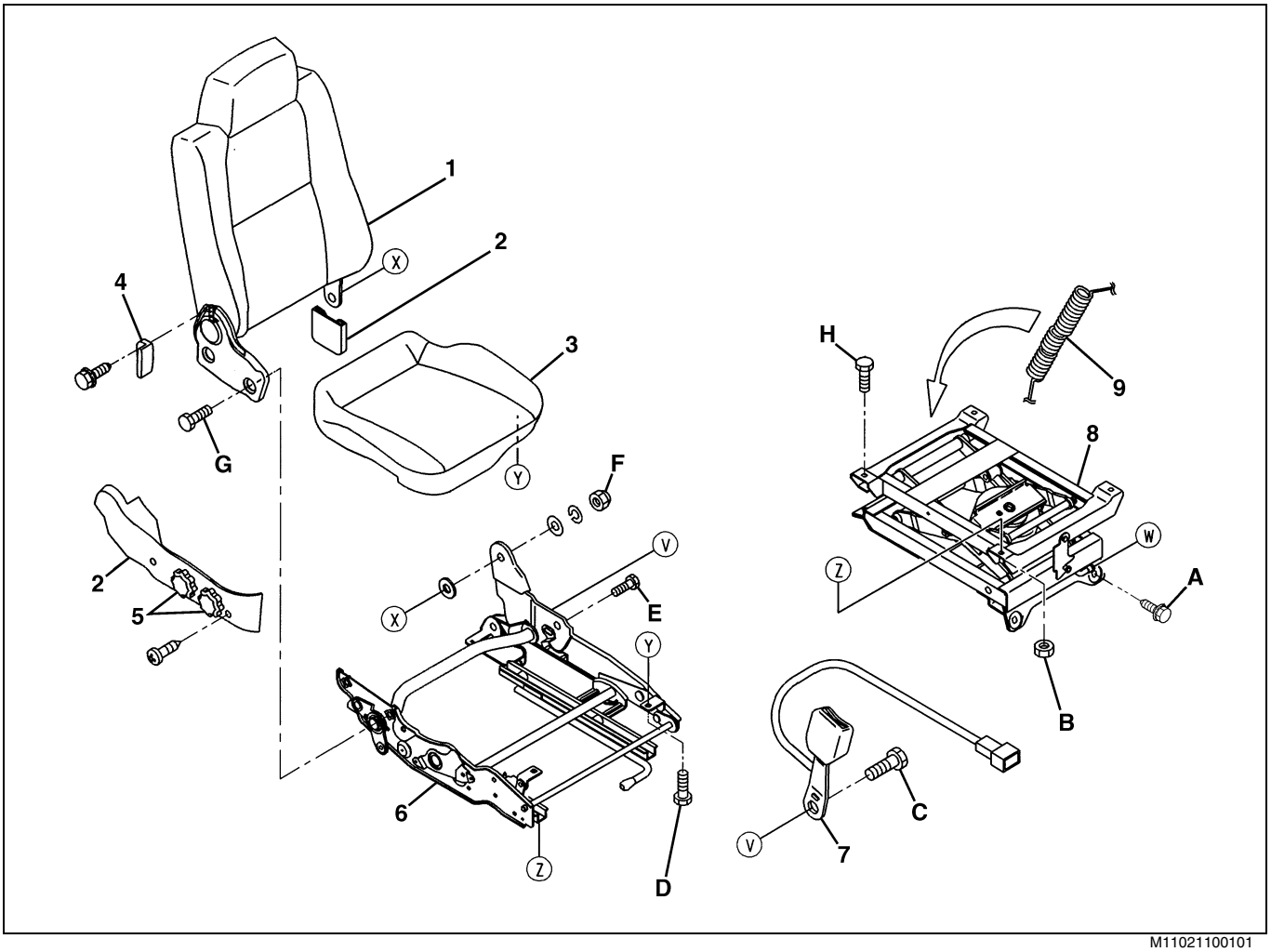
E	**6.0-9.0 {0.24-0.35}**	**I**	**14.4-18.4 {0.57-0.72}**
F	**12.5-16.5 {0.50-0.64}**	**J**	**6.0-9.0 {0.24-0.35}**
G	**6.0-9.0 {0.24-0.35}**	**K**	**11.3-15.3 {0.45-0.60}**
H	**12.5-16.5 {0.50-0.64}**		

SEAT

COMPONENT LOCATOR

M11021101BED1002

DRIVER'S SEAT



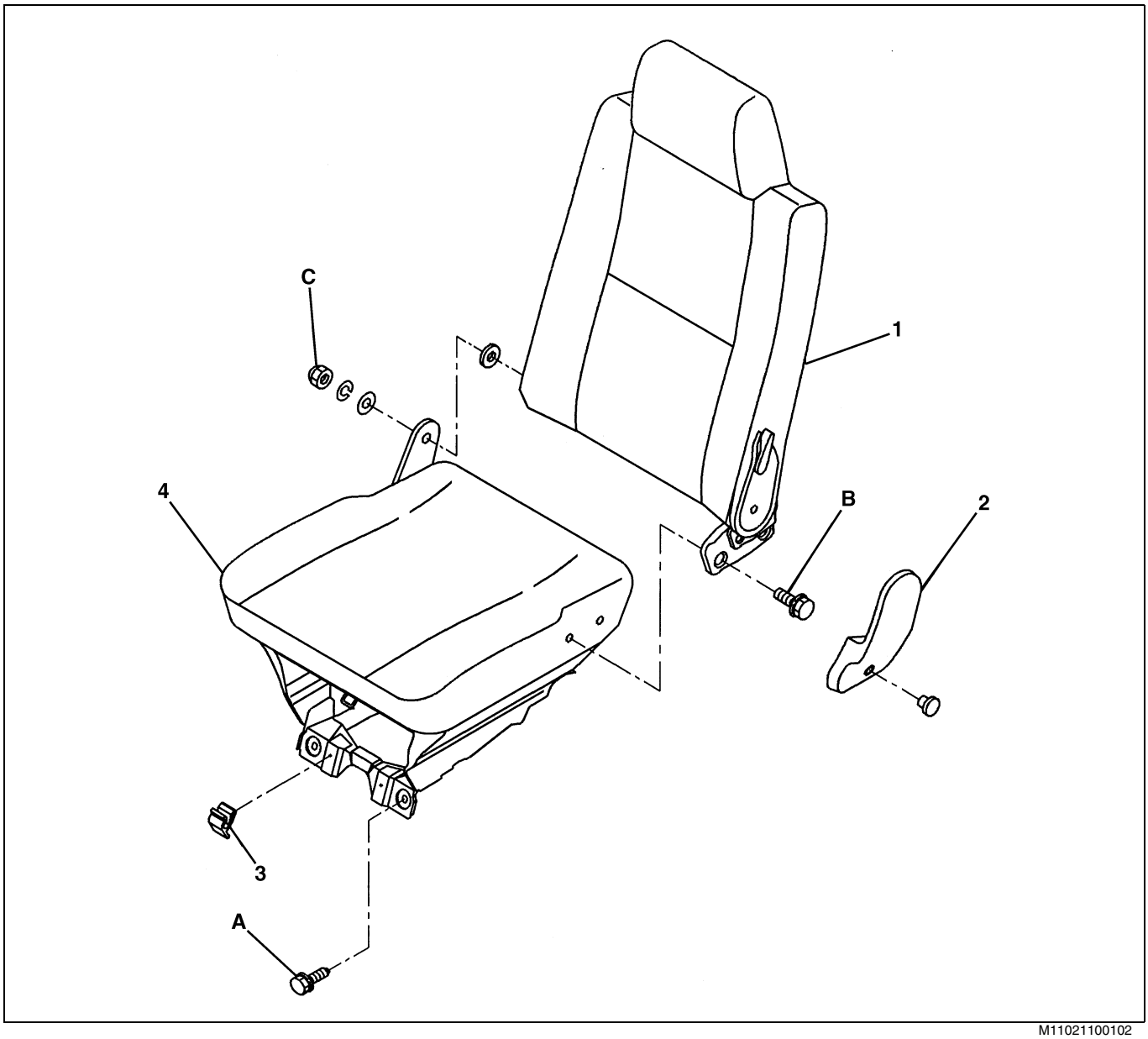
M11021100101

1	Driver's seat	6	Seat adjuster
2	Seat back	7	Inner seat belt
3	Seat cushion	8	Seat suspension
4	Seat reclining knob	9	Wire
5	Seat tilt adjuster handle		

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

A	17.5-32.5 {179-331, 13-23}	E	20.5-34.3 {210-350, 15-25}
B	27.1-41.0 {280-420, 20-30}	F	11.8-14.7 {120-150, 9-11}
C	23.5-35.3 {240-360, 17-26}	G	40.1-53.9 {410-550, 30-40}
D	20.5-34.3 {210-350, 15-25}	H	40.1-53.9 {410-550, 30-40}

ASSISTANT'S SEAT



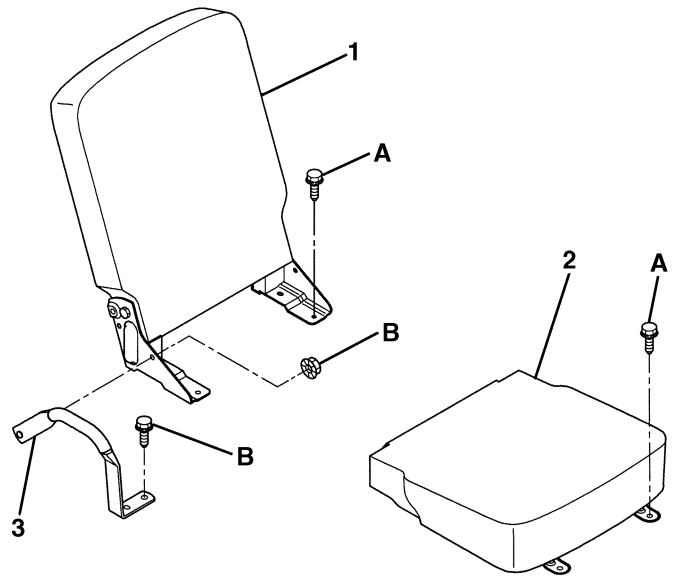
M11021100102

1	Seat back	3	Clamp
2	Seat reclining cover	4	Seat cushion

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

A	17.5-32.5 {179-331, 13-23}	C	11.8-14.7 {120-150, 9-11}
B	20.5-34.3 {210-350, 15-25}		

CENTER SEAT



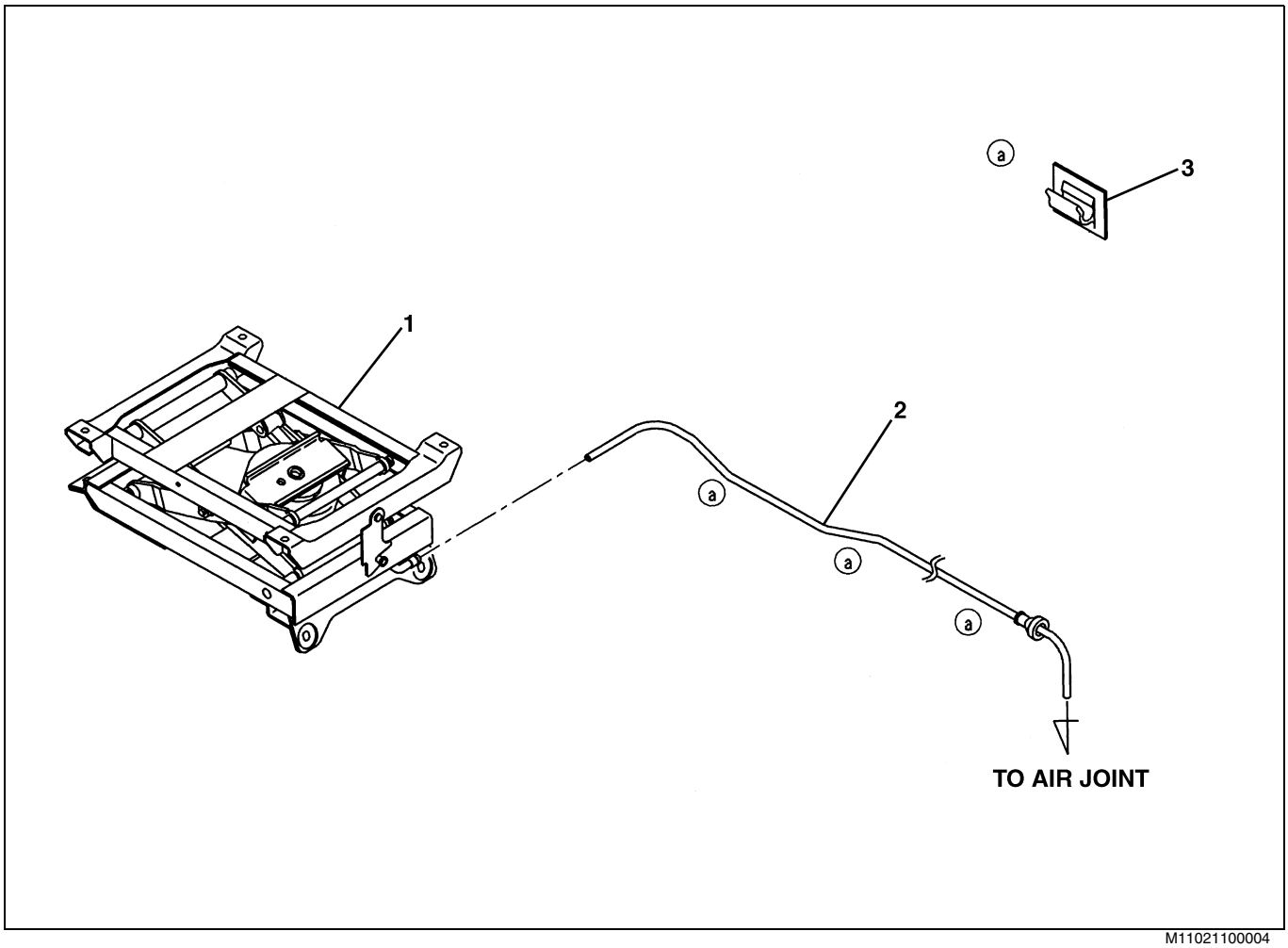
M11021100003

1	Seat back	3	Center grip
2	Cushion		

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

A	17.5-32.5 {179-331, 13-23}	B	14.5-32.5 {148-331, 11-23}

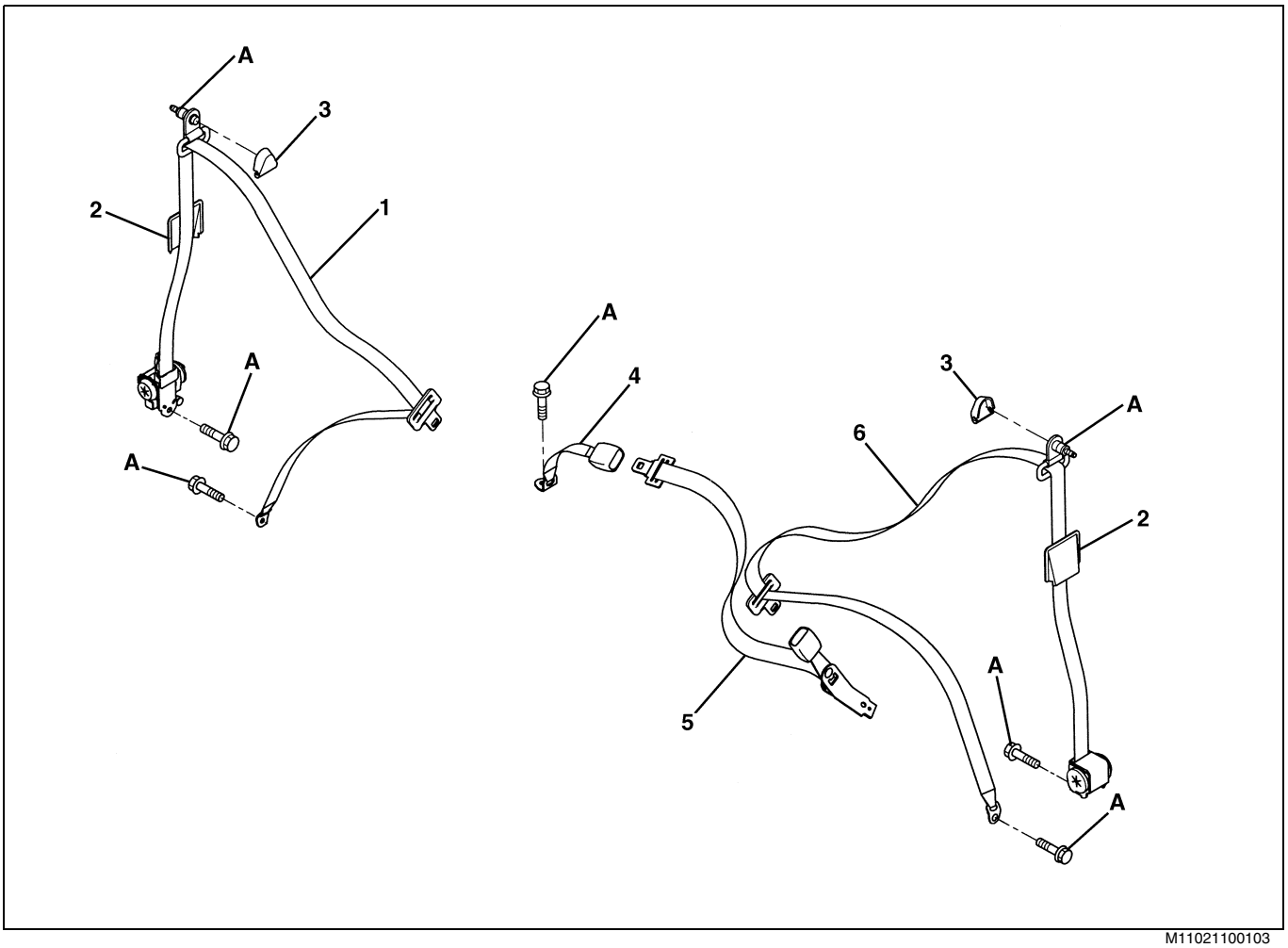
AIR SUSPENSION SEAT



M11021100004

1	Seat suspension	3	Clip
2	Air hose		

SEAT BELT



M11021100103

1	Outer seat belt (Driver's seat)	4	Center seat belt
2	Seat belt guide	5	Inner seat belt (Assistant's seat)
3	Seat belt cover	6	Outer seat belt (Assistant's seat)

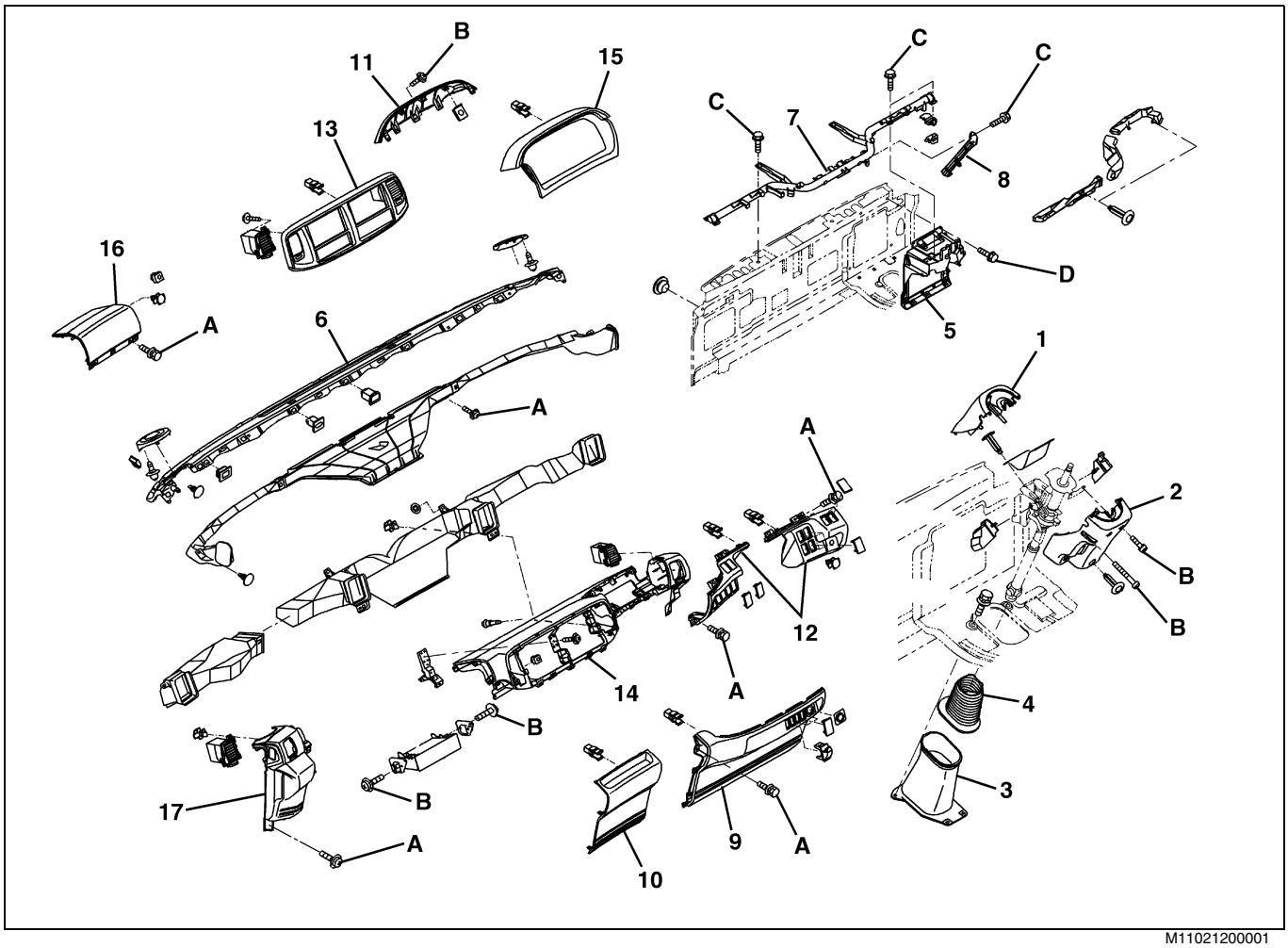
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	29-55 {296-560, 22-40}		

INSTRUMENT PANEL

COMPONENT LOCATOR

M11021201BED1001



M11021200001

1	Steering column upper cover	10	Lower left cover
2	Steering column lower cover	11	Panel upper cover
3	Steering column lower tube	12	Switch board panel
4	Steering column lower boots	13	Cluster finish panel
5	Pedal bracket support	14	Cluster housing
6	Upper panel	15	Cluster bezel
7	Instrument panel cross member	16	Upper left cover
8	Gusset	17	Side cover
9	Lower center cover		

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

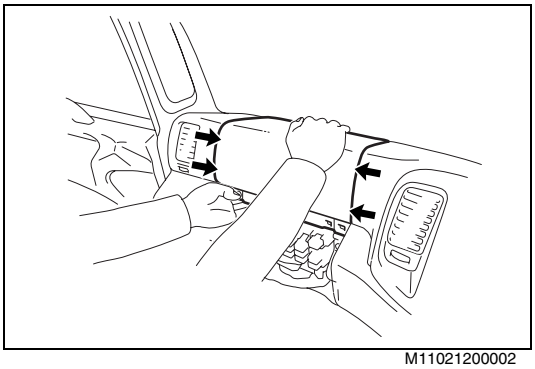
A	2.8-3.2 {29-32, 2.1-2.3}	C	7.5-16.5 {77-168, 5.6-12.1}
B	1.5-2.5 {16-25, 1.2-1.8}	D	9.5-16.5 {96-168, 7.0-12.1}

DISMOUNTING AND MOUNTING

M11021201BEH1001

1. BEFORE REMOVE THE INSTRUMENT PANEL.

(1) Disconnect the battery cable from the battery ground terminal.



M11021200002

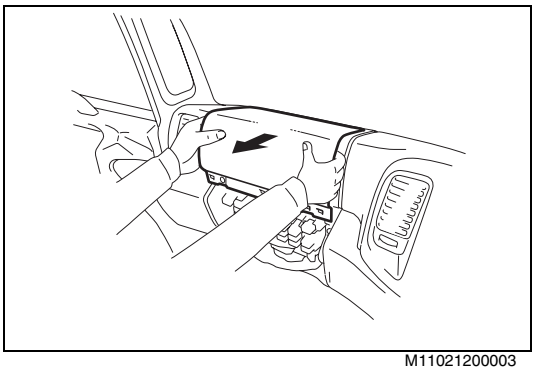
2. REMOVE THE UPPER LEFT COVER.

(1) Remove the lower bolt on the upper left cover.

(2) Pull the upper left cover toward you, remove the 4 clips of this side.

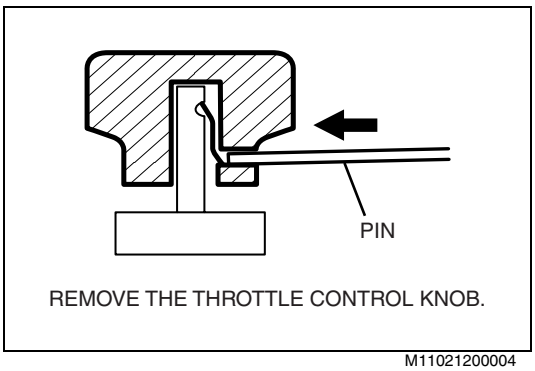
CAUTION:

- **When pulling the upper left cover, be careful not to damage the clips.**
- **Be sure to remove the 4 clips of this side previously because pulling out the upper left cover at one time may damage it.**



M11021200003

(3) Pull the upper left cover straight with both hands to remove the inner clip and remove the upper left cover.



REMOVE THE THROTTLE CONTROL KNOB.

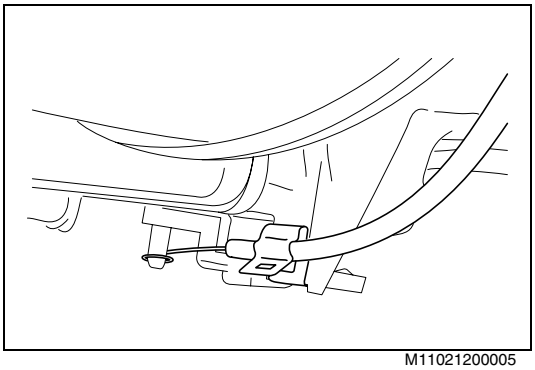
M11021200004

3. REMOVE THE SWITCH BOARD PANEL.

(1) Remove the throttle control knob.

(2) Remove the wire of the front lid opener.

(3) Remove the bolt and pull out the switch board panel.



M11021200005

4. REMOVE THE INSTRUMENT PANEL CLUSTER.

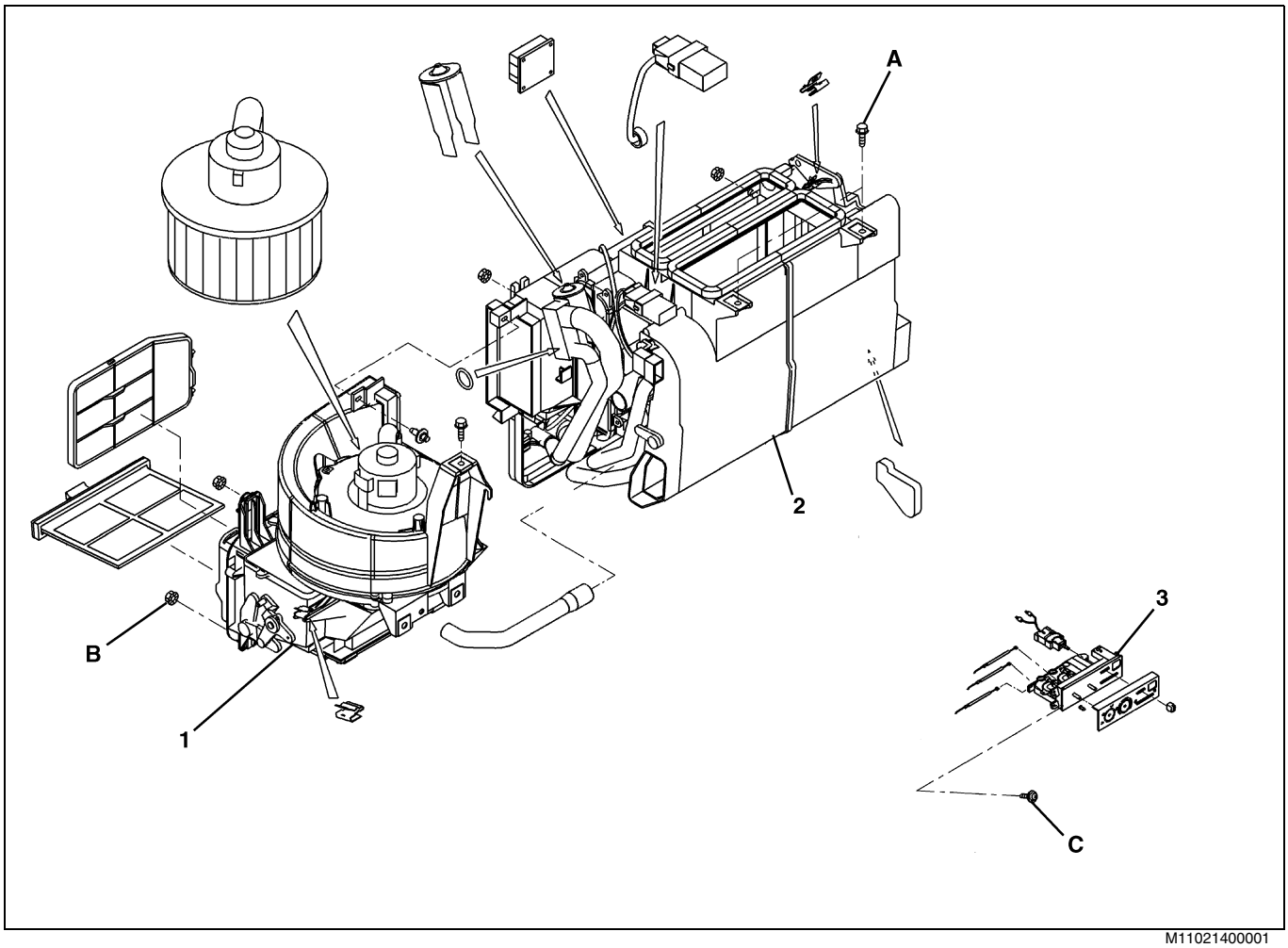
(1) Remove the cable of the blower part.

(2) Loosen the bolt to remove the instrument panel cluster.

HEATER AND AIR CONDITIONER

COMPONENT LOCATOR

M11021301BED1001



M11021400001

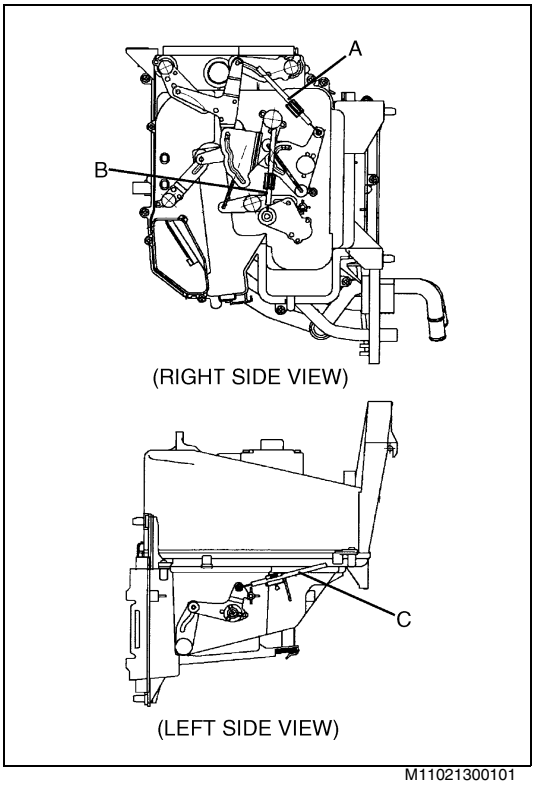
1	Blower assembly	3	Control panel assembly
2	Air conditioner assembly		

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

A	3.9-4.9 {40-50, 2.9-3.6}	C	1.4-2.4 {14-24, 1.0-1.7}
B	3.9-4.9 {40-50, 2.9-3.6}		

DISMOUNTING AND MOUNTING

M11021301BEH1001



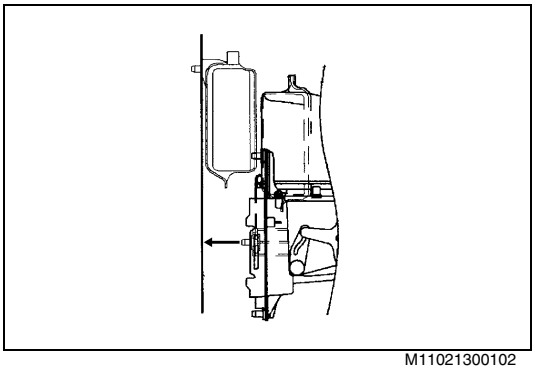
M11021300101

IMPORTANT POINTS - MOUNTING

NOTICE:

- **Should not bend the Inner cable when cable route.**
- **Set the cable at pulled state and make sure the link to boss. Set position is as forrows.**

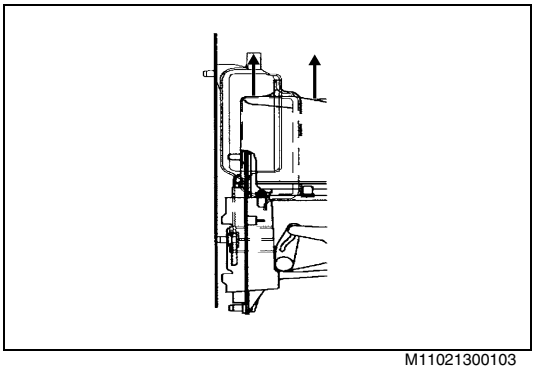
Cable	Color	Position
A: Mode switch	GRAY	FACE
B: Temperature control	BLACK	MAX COOL
C: Inside and outside air switch	NATURAL	INSIDE



M11021300102

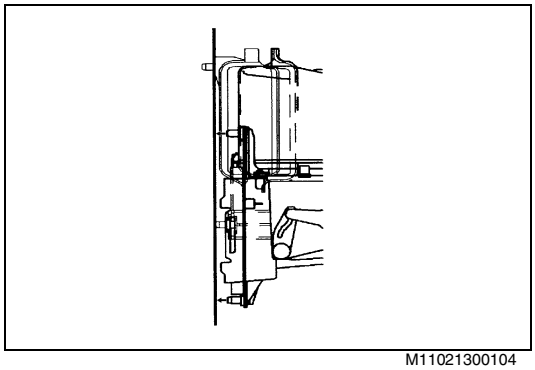
1. MOUNTING BLOWER ASSEMBLY.

(1) Blower assembly lower than installation hole, 15 mm and hold to dash panel.



M11021300103

(2) Blower assembly lift 15 mm.



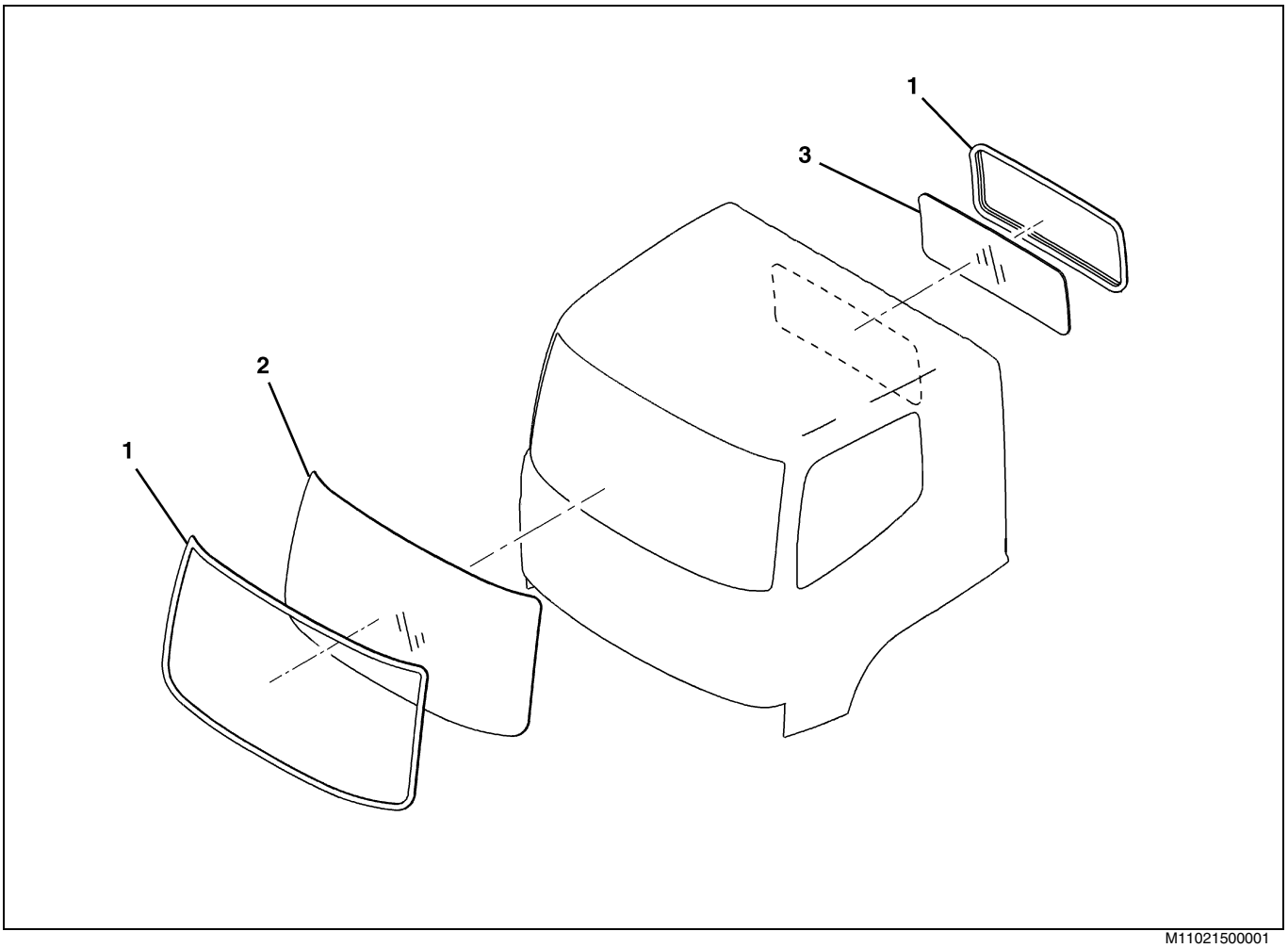
M11021300104

(3) Blower assembly shift to vehicle front way and fit with installation hole.

WINDSHIELD

COMPONENT LOCATOR

M11021501BED1001



M11021500001

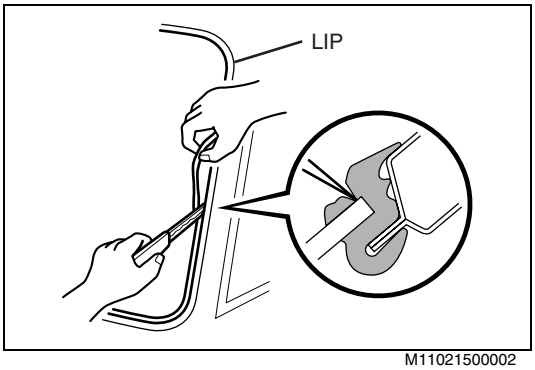
1	Weatherstrip	3	Back window
2	Windshield glass		

REPLACEMENT

M11021501BEH1001

1. BEFORE REPLACE THE WINDSHIELD.

(1) Remove the windshield wiper.

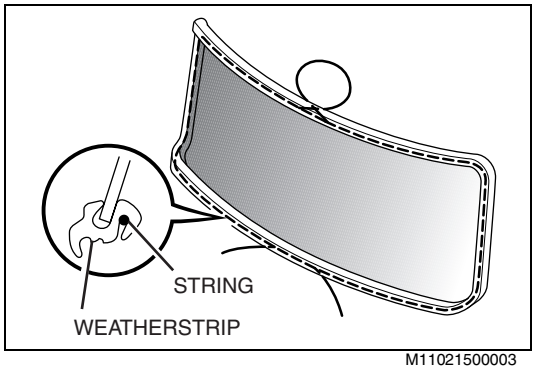


M11021500002

2. REMOVE THE WINDSHIELD.

(1) Cut the lip of the weatherstrip with a knife.

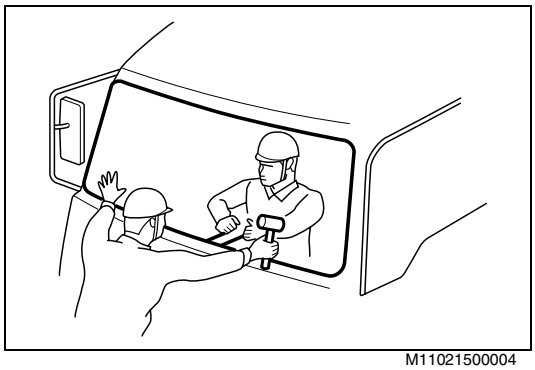
(2) The windshield is heavy so remove it using at least two persons.



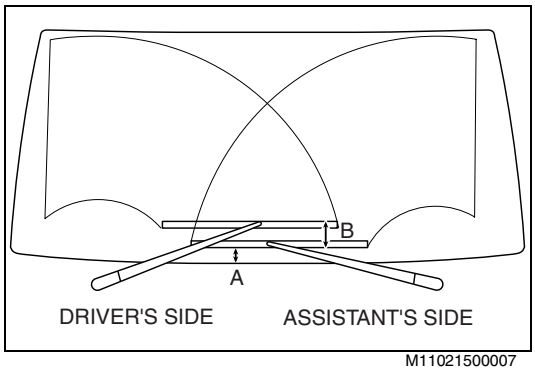
M11021500003

3. MOUNTING THE WINDSHIELD.

(1) Clean the weatherstrip, mounting flange of cab and contact surface of the window.
(2) Repair any wavy area at the mounting flange as necessary.
(3) Insert the working string as shown in the figure.


M11021500004

(4) Pull the working string from the interior of the cab, and gradually install the lip of the weatherstrip on the mounting flange.
(5) During this operation, knock the glass from outside. Use soapy water as necessary.
(6) After install the glass properly, knock the glass from inside and outside.



M11021500007

4. INSTALL THE WINDSHIELD WIPER.

(1) Install the wiper arm.

Assembly standard: Unit: mm {in.}

Driver's side clearance (A)	Assistant's side clearance (B)
30-50 {1.2-1.9}	70-90 {2.8-3.5}

ELECTRICAL EQUIPMEMT

EL01-001

ELECTRICAL PARTS EL01-2
DATA AND SPECIFICATIONS EL01-2
COMPONENT LOCATOR EL01-3
TROUBLESHOOTING EL01-8
GENERAL INSTRUCTION EL01-9
HANDLING PRECAUTION EL01-13
INSPECTION EL01-14
INSPECTION AND ADJUSTMENT EL01-31
SPEEDOMETER CONVERSION
RATE LIST EL01-33

ELECTRICAL PARTS

DATA AND SPECIFICATIONS

M12010113BEI2002

ELECTRICAL SYSTEM

Voltage	Direct current 24 volts
Ground	Negative (-) ground

BULB WATTAGE RATING

Head lamp	75/70W
Fog lamp (If so equipped)	70W
Clearance lamp	5W
Front turn signal lamp	21W
Front side turn signal lamp	12W
Dome lamp	10W
Rear turn signal lamp	25W
Stop/tail lamp	22/5W
Back up lamp	21W
License plate lamp	5W

GAUGE TYPE

Fuel	Coil type
Coolant temperature	Coil type
Tachometer	Coil type
Speedometer	Coil type
Air pressure	Coil type

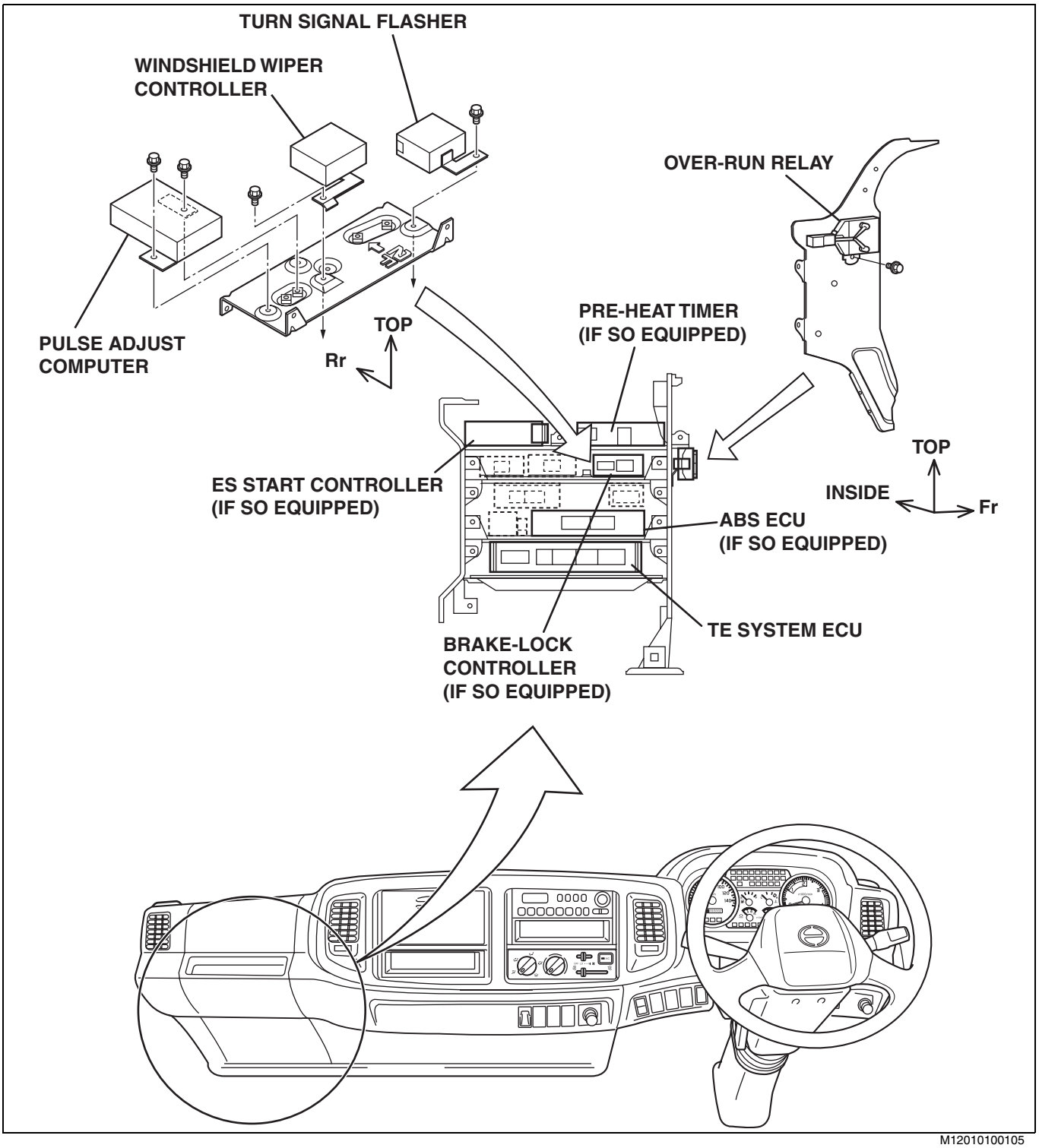
COMPONENT LOCATOR

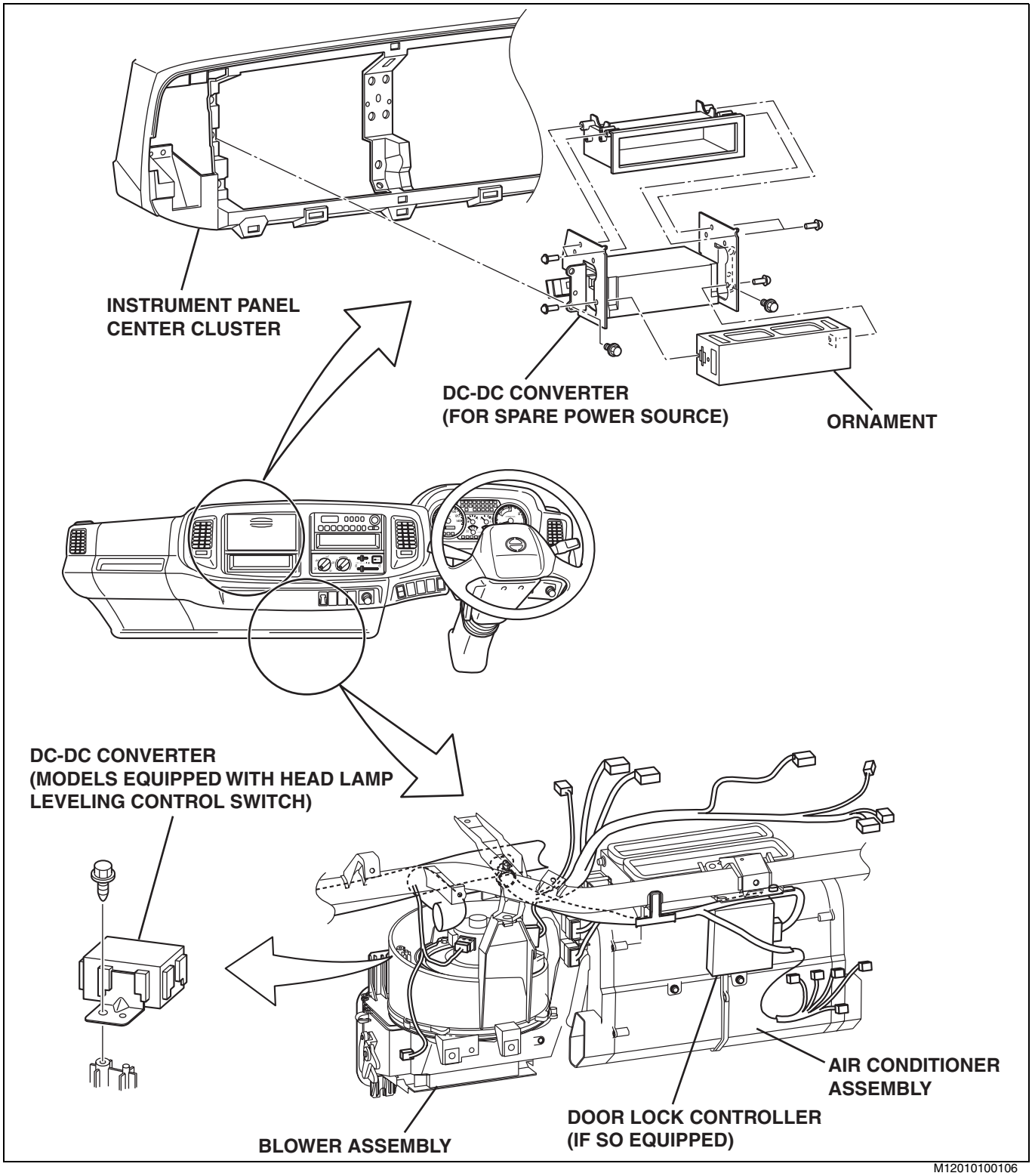
M12010113BED01002

PARTS INSTALLED POSITION

PARTS	INSTALLED POSITION	PARTS	INSTALLED POSITION
HEAD LAMP RELAY (HIGH,LOW)	RELAY PANEL	TURN SIGNAL FLASHER	ECU RACK
		OVER-RUN RELAY	
POWER RELAY No.1,2,3,4		WINDSHIELD WIPER CONTROLLER	
TAIL LAMP RELAY No.1,2			
LAMP CHECK RELAY		PULSE ADJUST COMPUTER	
ENGINE STOP MOTOR RELAY		ABS ECU (IF SO EQUIPPED)	
STOP LAMP RELAY		ES START CONTROLLER (IF SO EQUIPPED)	
FOG LAMP RELAY (IF SO EQUIPPED)		TE SYSTEM ECU	
		PRE-HEAT TIMER (IF SO EQUIPPED)	
HORN RELAY		BRAKE-LOCK CONTROL-LER (IF SO EQUIPPED)	
HEATER RELAY		ENGINE STOP ELECTRIC MOTOR	FRONT PANEL
AIR CONDITIONER RELAY (IF SO EQUIPPED)		WINDSHIELD WIPER MOTOR	
AIR CONDITIONER CONDENSER RELAY (IF SO EQUIPPED)		WINDSHIELD WASHER MOTOR (WASHER JAR)	
POWER ACCESSORY RELAY		ACCELERATOR PEDAL SWITCH	PEDAL BRACKET
		CLUTCH PEDAL SWITCH	
ECU MAIN RELAY		COOLANT TEMPERATURE GAUGE SENDER UNIT	ENGINE
ABS WARNING LAMP RELAY		OIL PRESSURE SWITCH	
		REVOLUTION SENSOR	
ABS CONTROL VALVE RELAY (IF SO EQUIPPED)		STARTER RELAY	REAR CAB MOUNTING
DC-DC CONVERTER (FOR SPARE POWER SOURSE)	INSTRUMENT PANEL CENTER	PRE-HEATER RELAY (IF SO EQUIPPED)	
DC-DC CONVERTER (MODELS EQUIPPED WITH HEAD LAMP LEVEL-ING CONTROL SWITCH)		BRAKE STROKE WARNING SWITCH	BRAKE AIR BOOSTER
		FUEL GAUGE SENDER UNIT	FUEL TANK
DOOR LOCK CONTROL-LER (IF SO EQUIPPED)		NEUTRAL SWITCH	TRANSMISSION
		BACK-UP LAMP SWITCH	

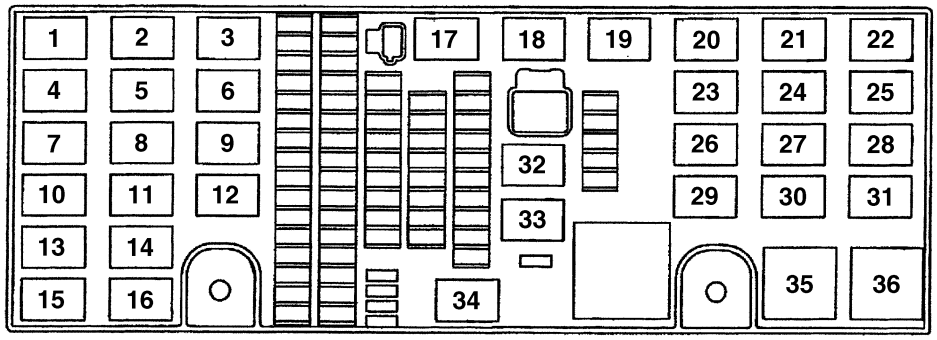
ECU RACK


TURN SIGNAL FLASHER
WINDSHIELD WIPER CONTROLLER
OVER-RUN RELAY
PULSE ADJUST COMPUTER
TOP
Rr
PRE-HEAT TIMER (IF SO EQUIPPED)
TOP
INSIDE
Fr
ES START CONTROLLER (IF SO EQUIPPED)
ABS ECU (IF SO EQUIPPED)
TE SYSTEM ECU
BRAKE-LOCK CONTROLLER (IF SO EQUIPPED)
M12010100105



M12010100106

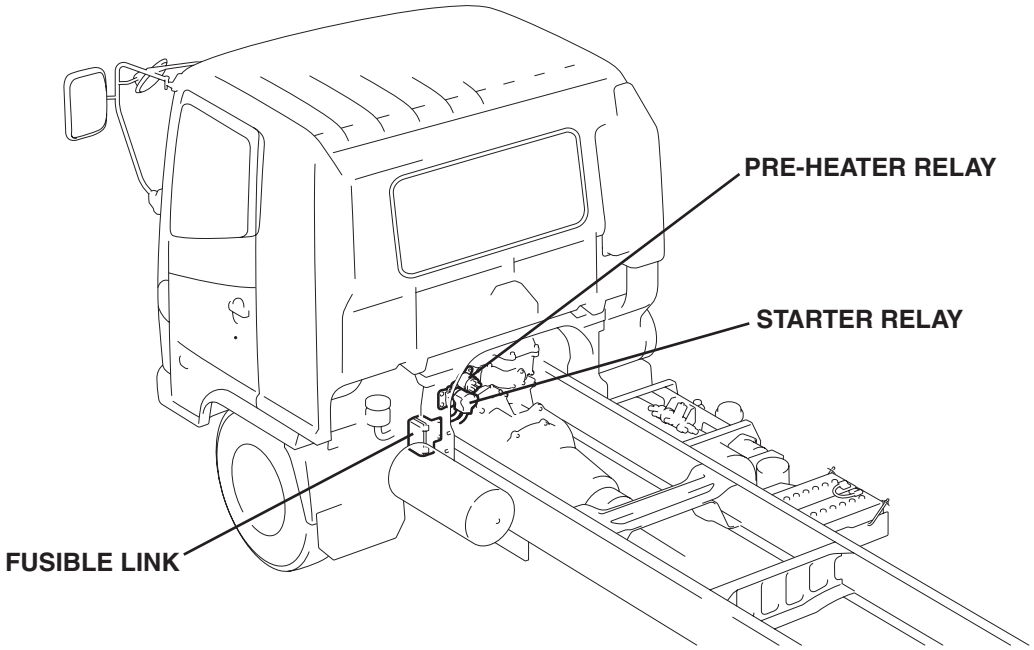
RELAY PANEL



M12010100107

1	Exhaust brake cut relay (If so equipped)	13	Disengaged	25	Heater relay
2	ABS warning lamp relay (If so equipped)	14	Disengaged	26	Disengaged
3	ABS control valve relay (If so equipped)	15	Disengaged	27	Lamp check relay
4	Disengaged	16	Disengaged	28	Horn relay
5	Disengaged	17	Power relay No.1	29	Fog lamp relay (If so equipped)
6	Disengaged	18	Power relay No.3	30	Head lamp relay (Low)
7	Disengaged	19	Power relay No.2	31	Head lamp relay (High)
8	Disengaged	20	Power relay No.4	32	Tail lamp relay No.1
9	Disengaged	21	Power accessory relay	33	Tail lamp relay No.2
10	Disengaged	22	ECU main relay	34	Actuator power relay
11	Disengaged	23	Air condenser relay (If so equipped)	35	Engine stop motor relay
12	Disengaged	24	Air conditioner condenser relay (If so equipped)	36	Stop lamp relay

REAR CAB MOUNTING



M12010100108

TROUBLESHOOTING

M12010113BEF3001

STARTING SYSTEM

Symptom	Possible cause	Remedy/Prevention
Engine does not operate (Starter switch)	Poor contact condition	Clean or replace contacts.
Engine does not operate (Battery)	Open circuit in harness	Check and correct.
	Short circuit between electrodes	Replace battery.
	Poor contact condition of battery terminal	Clean or retighten.
Engine does not operate (Engine oil)	Improper viscosity oil	Change oil.
Engine does not operate (Starter relay)	Defective or poor contact of starter relay	Repair or replace.
Engine does not operate (Starter)	Starter does not operate	Repair or replace. Refer to chapter STARTER.

HEAD LAMP CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Head lamp does not turn on (Head lamp)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
Head lamp does not turn on (Fuse)	Fuse burned out	Replace fuse.
Head lamp does not turn on (Head lamp relay)	Defective relay	Replace relay.
Head lamp does not turn on (Lighting switch)	Broken wire between relay and switch	Repair wire.
	Defective switch	Replace switch.

TURN SIGNAL CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Turn signal does not work (Turn signal lamp)	Bulb burned out	Replace bulb.
	Broken wire	Repair wire.
Turn signal does not work (Fuse)	Fuse burned out	Replace fuse.
Turn signal does not work (Turn signal flasher)	Not grounded	Check the grounding.
	Defective flasher	Replace flasher.
Turn signal does not work (Turn signal switch)	Broken wire between fuse and switch	Repair wire.
	Defective switch	Replace switch.

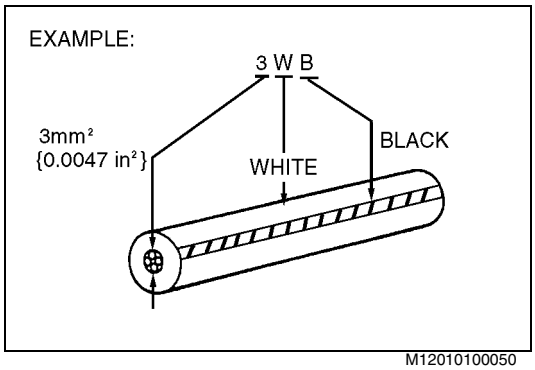
TAIL AND LICENSE PLATE LAMP CIRCUIT

Symptom	Possible cause	Remedy/Prevention
Tail and license plate lamp does not turn on (Lamp)	Bulb burned out	Replace bulb.
	Not grounded	Check the grounding.
Tail and license plate lamp does not turn on (Fuse)	Fuse burned out	Replace fuse.
Tail and license plate lamp does not turn on (Tail lamp relay)	Defective relay	Replace relay
Tail and license plate lamp does not turn on (Lighting switch)	Broken wire between fuse and switch	Replace wire.
	Defective switch	Replace switch.

GENERAL INSTRUCTION

M12010113BEC1003

CAUTION:
Be sure to disconnect the ground cable before servicing the electrical circuits except for testing on-vehicle.



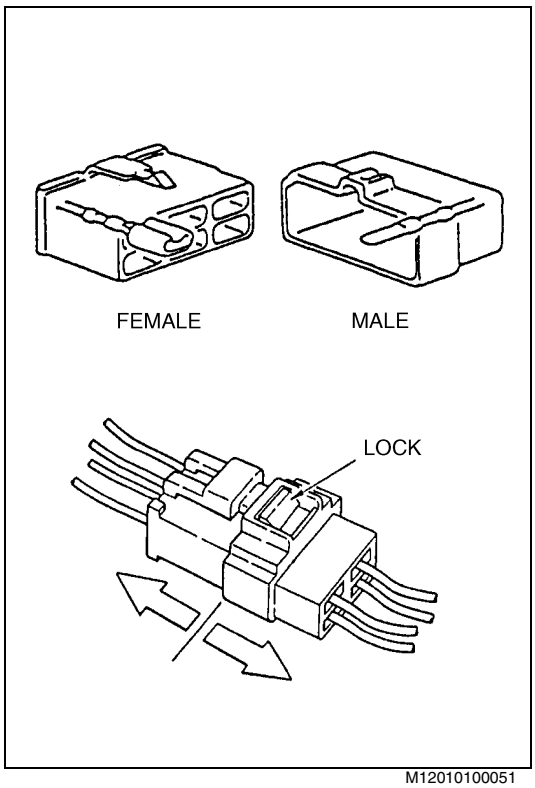
M12010100050

1. WIRING CODE

(1) Wiring colors are indicated by a code.

B	: Black	Lg	: Light green
Br	: Brown	R	: Red
G	: Green	W	: White
L	: Blue	Y	: Yellow

(2) The first letter indicates the ground wire color and second letter indicated the strip color.
(3) Arabic numerals indicates the cross sectional area of wire.
Example: 3 indicates 3 mm^2 {0.0047 in^2}

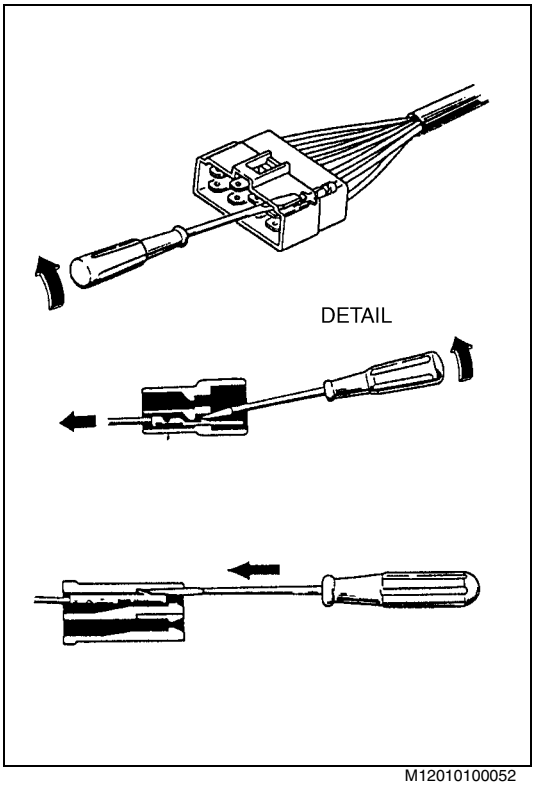


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2. CONNECTOR

(1) The connector consists of the male and female connectors.
Male and female connectors are classified according to the shape of the terminals in the connector.
Male and female connectors are provided with a lock, so that they can not be separated easily.
To separate the connectors, unlock the lock, then hold one connector with one hand and the other one with the other hand, and pull each other.

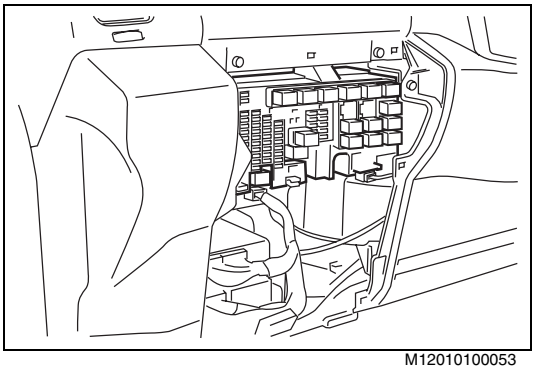
NOTICE:
When the connector is disconnected by pulling the wires, the connection between the terminals and the wires will be damaged.



M12010100052

(2) Removing the terminal from the connector.
   a. Insert a miniature screwdriver or a terminal puller between terminal and connector, and unlock the lock between terminal and connector.
   b. When the lock has been released, pull the wire to remove the terminal.

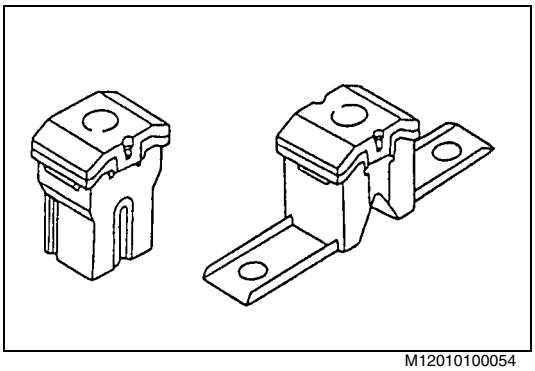
(3) Installing the terminal in the connector.
   a. Insert the terminal into the connector until it clicks.
   b. Pull the wire to confirm correct lock engagement.


M12010100053

3. FUSE

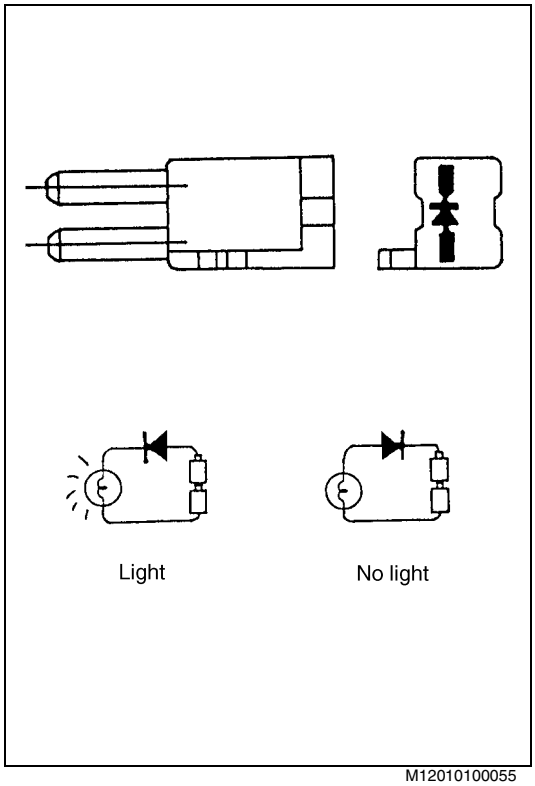
(1) The power supply must be switched off for fuse replacement.
Use a proper amperage fuse.

NOTICE:
Wire burning may be caused when a fuse with an excessively large current capacity is used.
If the fuse should blow frequently, investigate the cause and correct it.


M12010100054

4. FUSIBLE LINK

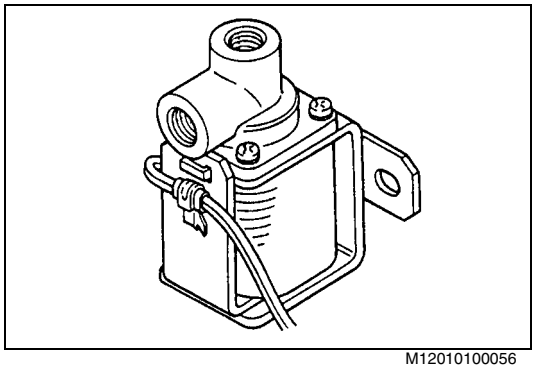
(1) The cause of an overload current should be determined and corrected before a melted fusible link is replaced.
A melted fusible link can be determined swollen or melted insulation of the link.



M12010100055

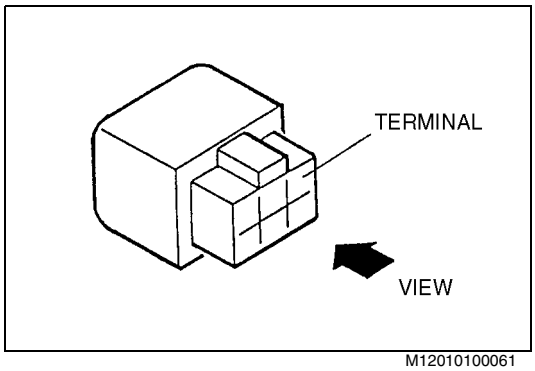
5. DIODE

(1) Diode allows the flow of electric current in only one direction.


M12010100056

6. SOLENOID VALVE

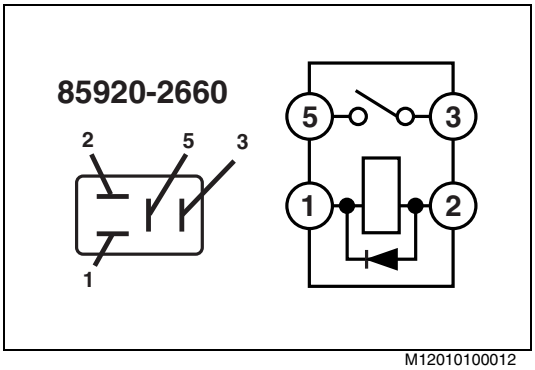
(1) Solenoid valve controls the current of compressed air by electric. Check the continuity between terminals. If there is no continuity, replace the solenoid valve.



M12010100061

RELAY (TYPE, NAME AND INSPECTION)

TYPE-1:	Head lamp relay (High, low) Fog lamp relay (If so equipped) Horn relay Tail lamp relay No.1, 2 Air conditioner relay (If so equipped) Air conditioner condenser relay (If so equipped) Heater relay ECU main relay ABS control valve relay (If so equipped)
TYPE-2:	Power relay No.1, 2, 3, 4 Power accessory relay Lamp check relay
TYPE-3:	Stop lamp relay
TYPE-4:	Engine stop motor relay
TYPE-5:	Actuator power relay (If so equipped)
TYPE-6:	Exhaust brake cut relay (If so equipped) ABS warning lamp (if so equipped)

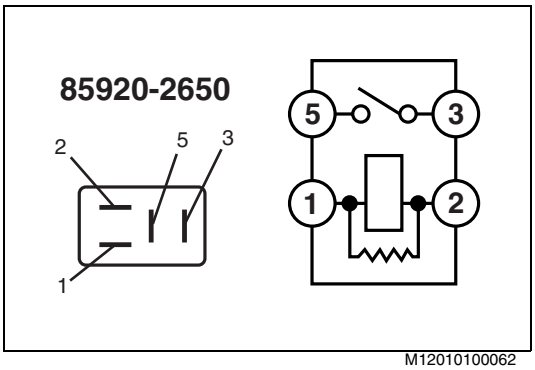


M12010100012

1. TYPE-1 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

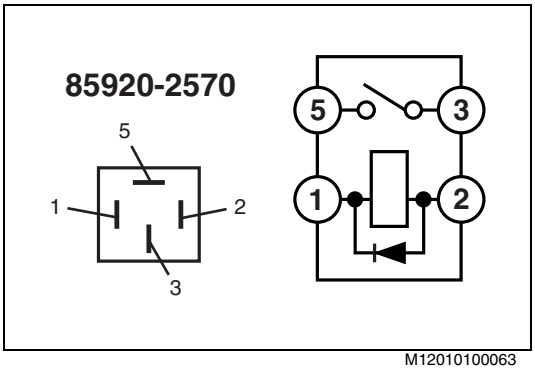


M12010100062

2. TYPE-2 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

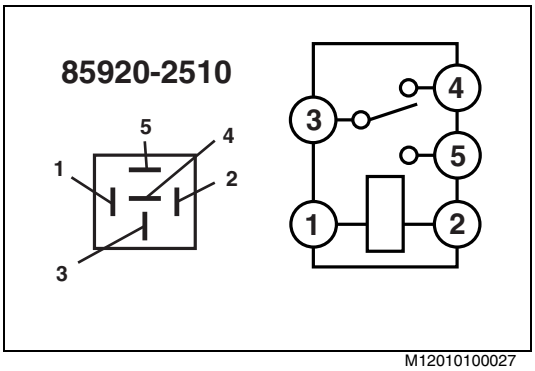


M12010100063

3. TYPE-3 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

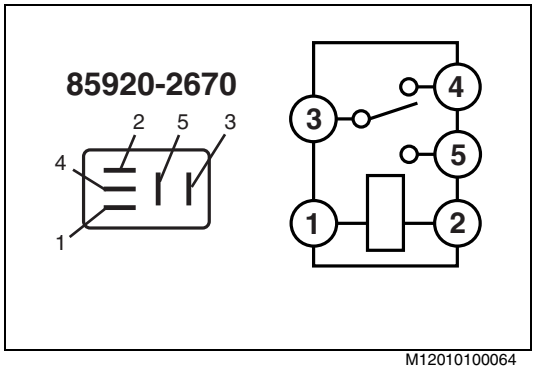


M12010100027

4. TYPE-4 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.

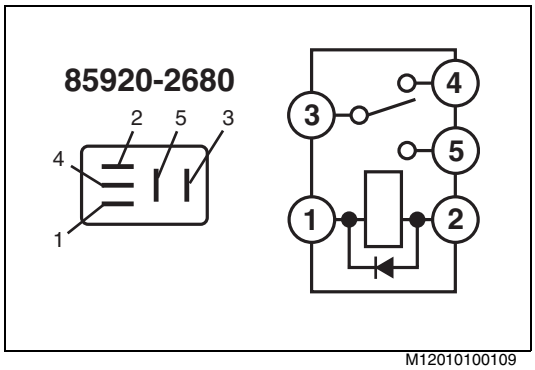


M12010100064

5. TYPE-5 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.



M12010100109

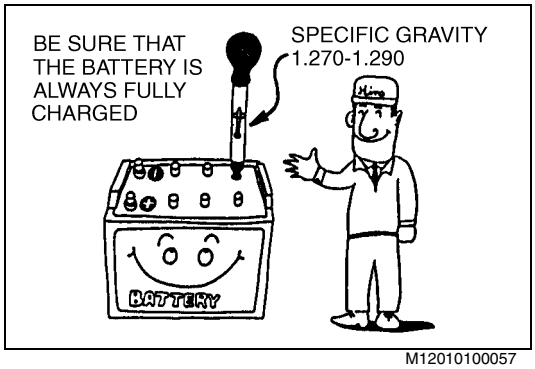
6. TYPE-6 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.

HANDLING PRECAUTION

M12010113BEC01002



M12010100057

BATTERY

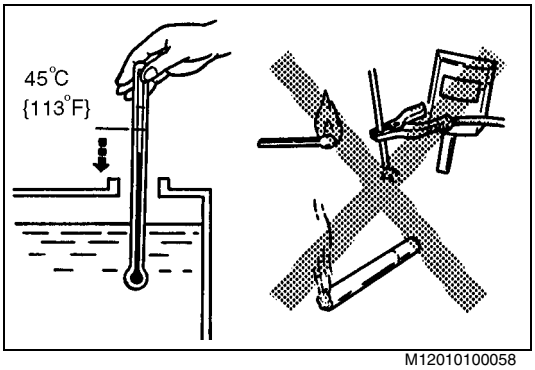
1. CONVERSION FORMULA FOR SPECIFIC GRAVITY

(1) The specific gravity of the electrolyte changes according to the temperature of the electrolyte itself, therefore a temperature of 20°C {68°C} is used as reference temperature.
Consequently, if the temperature is not 20°C when the specific gravity is measured, it is necessary to convent the measured value to value calculated under the following conversion formula at 20°C.
Temperature conversion formula: S20=St+0.0007(t-20)

(2) Where,

- "S20" is the specific gravity at 20°C (Reference temperature)
- "St" is the specific gravity at the measuring temperature
- "t" is the temperature during measurement
- "0.0007" is the temperature coefficient of the electrolyte

NOTICE:
As a rough guide, if the temperature of the electrolyte rises or falls by 15°C (59°F), the specific gravity of the electrolyte will vary by about 0.01.



M12010100058

2. BATTERY CHARGING

- Be careful of the following points.

(1) While the battery is being charged, ensure that the temperature of the electrolyte does not rise above 45°C {113°F}.
(2) While the battery is being charged, be particularly careful to keep it away from sources of fire.
(3) The amount of electrolyte must be within the specified level.
Specific gravity when battery is fully charged:
1.270-1.290 at 20°C {68°F}

3. CLEANING THE BATTERY

- If the terminals at the top of the battery are dirty, clean them with cold water or lukewarm water.
- Apply a light coating of grease to the terminals to prevent them from rusting so as to prevent faulty contact.

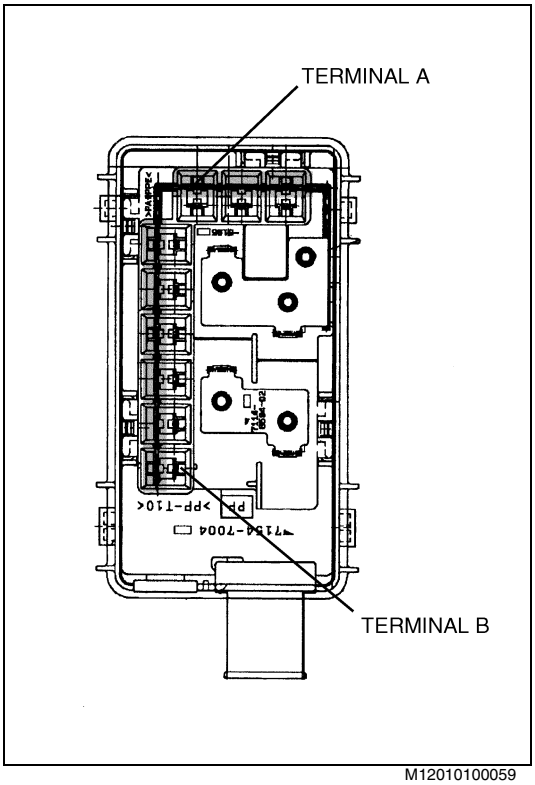
4. CONNECTING THE BATTERY CABLES

- Clamp the cables securely to prevent improper contact between the cables and the battery terminals.
- Be very careful not to connect the (+) and (-) leads in reverse. (Because this may cause damage to the equipment and batteries)

INSPECTION

M12010113BEH3003

POWER SUPPLY CIRCUIT

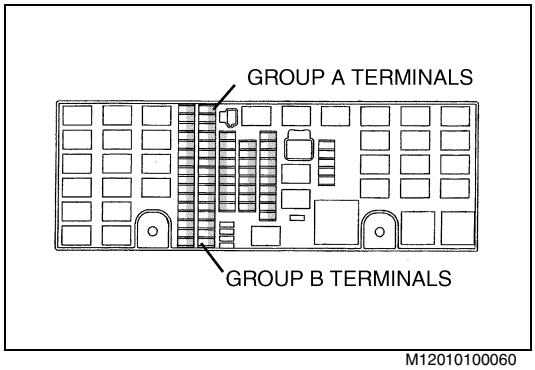


M12010100059

1. FUSIBLE LINK BLOCK INSPECTION

(1) Check the voltage between fusible link block terminal A and chassis body ground.
(2) Under normal condition, the voltage is about 24V.
(3) If it is not correct, check the battery cable, wiring harness, etc.

- Battery cable (Open circuit, loosen connection, etc.)
- Wiring harness (Open circuit, etc.)
- Battery (Discharged)



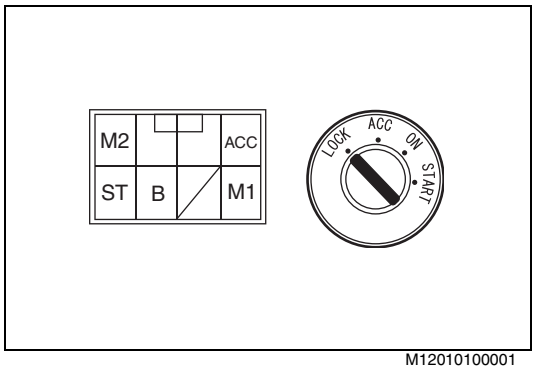
M12010100060

2. FUSE BLOCK INSPECTION

(1) Check the voltage between group A terminals of fuse block and cab body ground.
(2) Under normal condition, the voltage is about 24V.
(3) If it is not correct, check the circuit from battery to fuse.

- Coupler connection between cab harness and chassis harness
- Coupler connection of each electrical parts
- Cab harness and chassis harness
  (Open circuit, against short, etc.)
- Fusible link burn out

NOTICE:
Group A terminals: From battery
Group B terminals: To each electrical parts



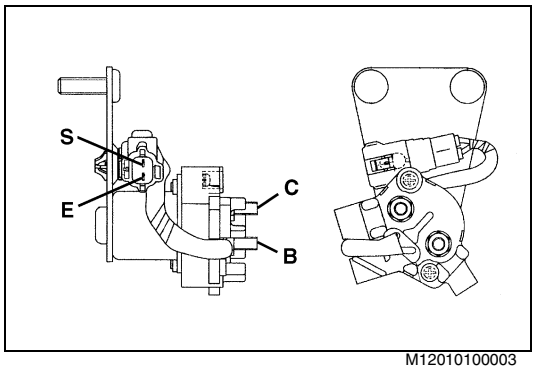
M12010100001

ENGINE STARTING CIRCUIT

1. STARTER SWITCH INSPECTION

(1) Check the continuity between terminals.

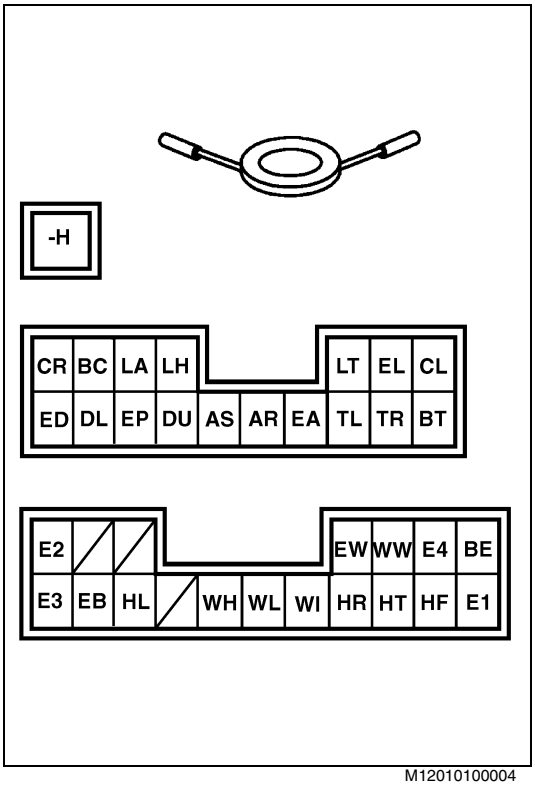
Terminals / Switch position	B	ACC	M2	M1	ST
LOCK					
ACC	○	○			
ON	○	○	○	○	
ST	○		○	○	○



M12010100003

2. STARTER RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal S,
Ground to terminal E.
(2) Under normal condition, terminals C and B switch on.



M12010100004

HEAD LAMP CIRCUIT

1. COMBINATION SWITCH INSPECTION

(1) Check the continuity between terminals.

Lighting (ON, OFF):

Terminals / Switch position	EL	LT	LH
OFF			
TAIL	○——	——○	
TAIL AND HEAD	○——	——○	——○

Lighting (HIGH, LOW):

Terminals / Switch position	ED	DL	DU	EP
PASSING	○——	——○	○——	——○
LOW BEAM	○——	——○		
HIGH BEAM	○——		——○	

Turn signal:

Terminals / Switch position	BT	TL	TR
LEFT	○——	——○	
OFF			
RIGHT	○——		——○

Hazard warning:

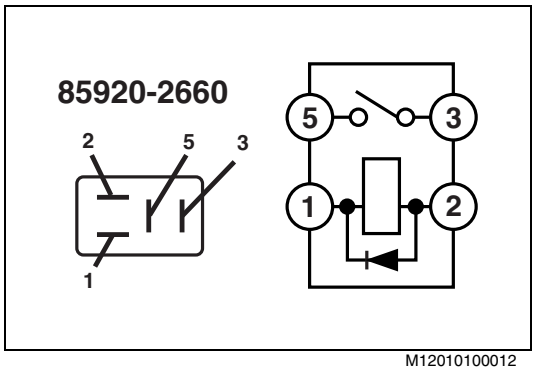
Terminals / Switch position	HF	HL	HR	HT
OFF				
ON	○——	——○	——○	——○

Exhaust brake:

Terminals / Switch position	EB	E1
OFF		
ON	○——	——○

Windshield wiper and washer:

Switch position \ Terminals	WW	EW	WI	WL	WH
OFF					
WIPER: INT		○	○		
MEDIUM		○		○	
HIGH		○		○	○
WASHER: ON	○	○			

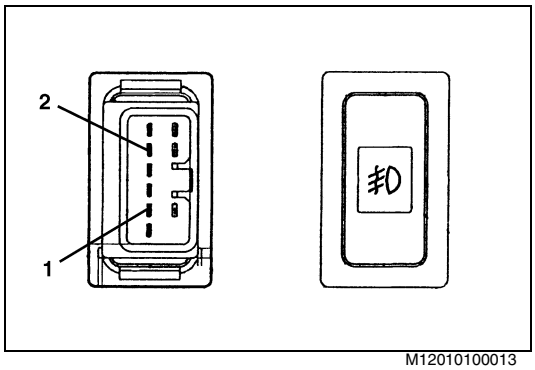


M12010100012

2. HEAD LAMP RELAY INSPECTION

(1) Apply voltage terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switches on.



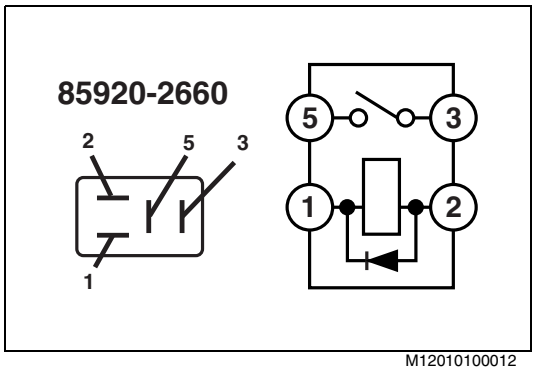
M12010100013

FOG LAMP CIRCUIT (IF SO EQUIPPED)

1. FOG LAMP SWITH INSPECTION

(1) Check the continuity between terminals.

Switch position \ Terminals	1	2
OFF		
ON	○	○

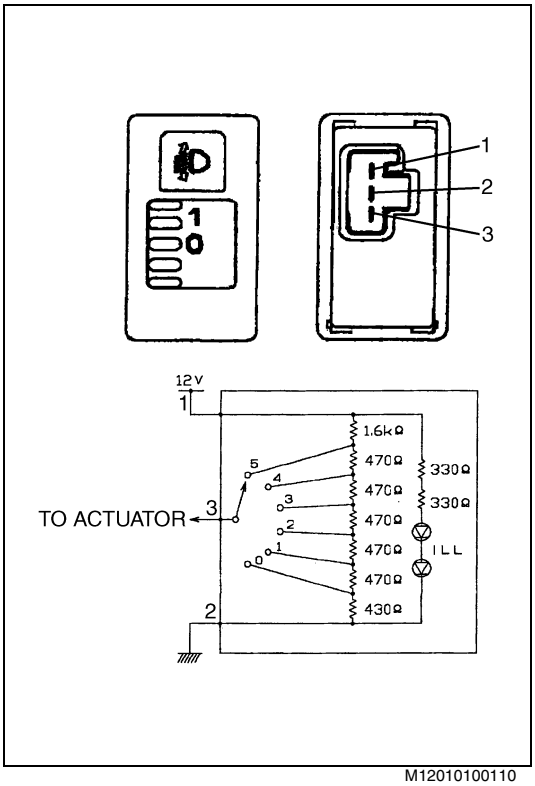


M12010100012

2. FOG LAMP RELAY INSPECTION

(1) Apply voltage terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switches on.



M12010100110

HEAD LAMP CONTROL CIRCUIT (IF SO EQUIPPED)

1. HEAD LAMP LEVELING CONTROL SWITCH INSPECTION

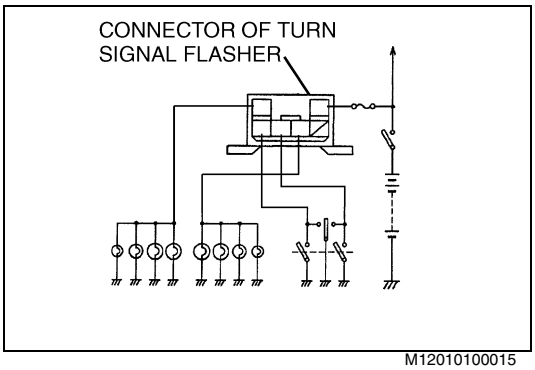
(1) Measure resistance between terminals.

Between No.1 and No.3 terminals

Switch position	Resistance
0	1.60 kΩ
1	2.07 kΩ
2	2.54 kΩ
3	3.01 kΩ
4	3.48 kΩ
5	3.95 kΩ

Between No.1 and No.2 terminals

Resistance
4.38kΩ



M12010100015

TURN SIGNAL, HAZARD, CLEARANCE, TAIL AND LICENSE PLATE LAMP CIRCUIT

1. TURN SIGNAL FLASHER INSPECTION

(1) Wire the turn signal flasher, bulbs, battery and fuse as shown in figure.

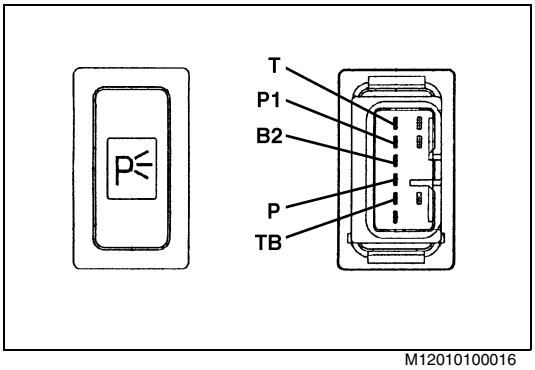
(2) Under normal condition, bulbs turn on and off.

NOTICE:

Take care quantity of installing bulbs.

TURN SIGNAL: **21W x 2 pcs,12W x 1 pcs, LED x 1pcs**

HAZARD WARNING: **21W x 4 pcs, 12W x 2 pcs, LED x 2 pcs**

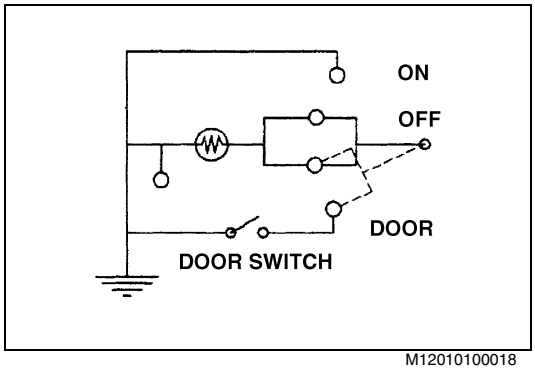


M12010100016

2. PARKING LAMP SWITCH INSPECTION (IF SO EQUIPPED)

(1) Check the continuity between terminals.

Terminals / Switch position	T	P	B2	TB	P1
OFF	○—○				
ON		○—○	○—○	○—○	

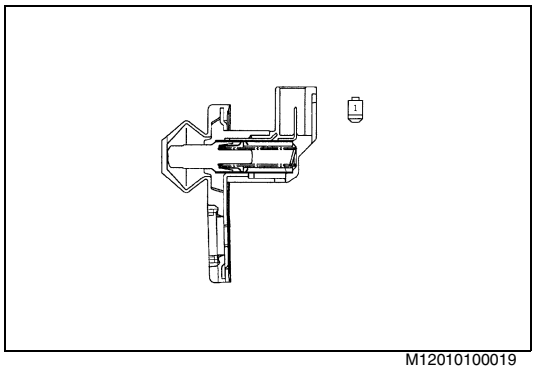


M12010100018

DOME LAMP

1. DOME LAMP INSPECTION

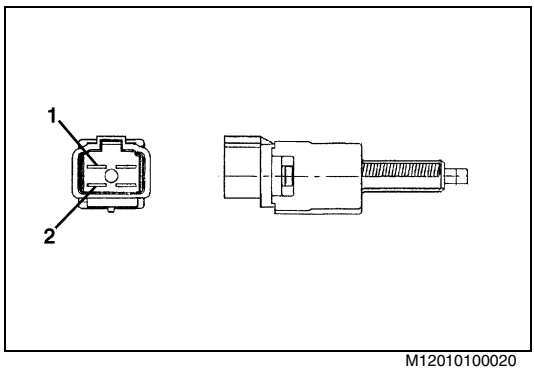
(1) Apply voltage to terminals and check the bulbs lighting.


M12010100019

2. COURTESY SWITCH INSPECTION

(1) Check the continuity between terminal and body ground.

	Between terminals
PUSH	No continuity
FREE	Continuity



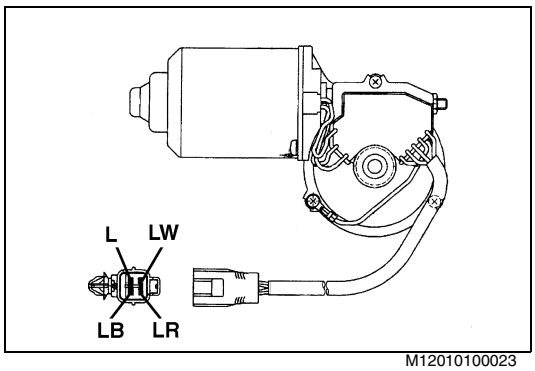
M12010100020

STOP LAMP CIRCUIT

1. STOP LAMP SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
PUSH		
FREE	○———	———○



M12010100023

WINDSHIELD WIPER CIRCUIT

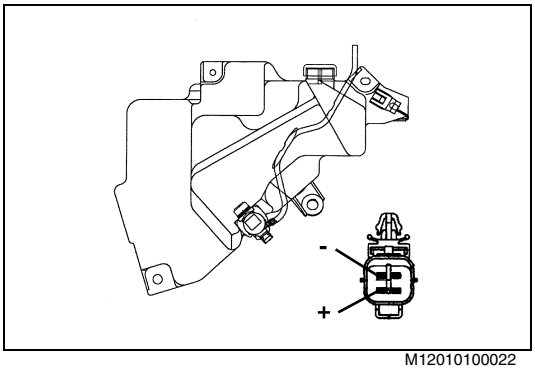
1. WIPER MOTOR INSPECTION

(1) Apply 24V to terminals, the motor operates as below.

NOTICE:

Connect a 10A fuse between the terminal and the 24V power source. If the fuse is burned out or the motor does not operate, replace the motor.

Terminals / Switch position	LW	LB	L	LR
OFF	○———	———○		
LOW	○———		———○	
HIGH			○———	———○

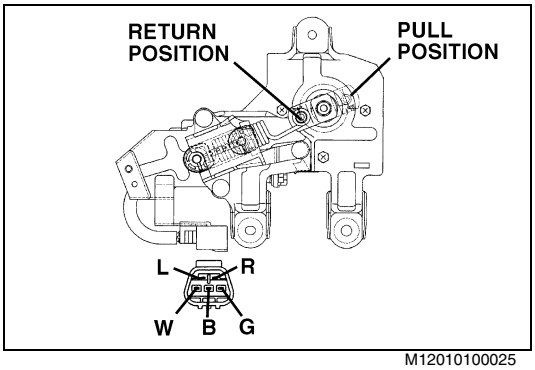


M12010100022

2. WASHER PUMP INSPECTION

(1) Check the continuity between terminals of the motor.
If no continuity, replace jar and pump assembly.

NOTICE:
Do not apply voltage to the pump motor for operational with an empty jar, or the motor will be damaged.



M12010100025

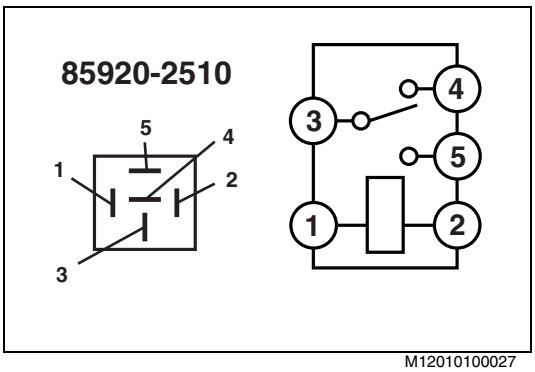
ENGINE STOP CIRCUIT

1. ENGINE STOP ELECTRIC MOTOR INSPECTION

(1) Apply 24V to terminals as shown in the chart.
(2) Under normal condition, it should be operated as below

Terminals / Switch position	+	–
PULL	G	W
RETURN	G	B

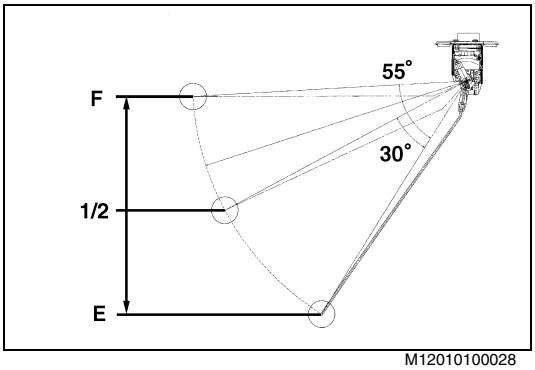
NOTICE:
Connect a 10A fuse between the terminal and the 24V power source. If the fuse is burned out or the motor does not operate, replace the motor.



M12010100027

2. ENGINE STOP RELAY

(1) Apply voltage terminals;
24V to terminal 1,
Ground to terminal 2.
(2) Under normal condition, relay switches the continuity from terminals 3 and 4 to 3 and 5.



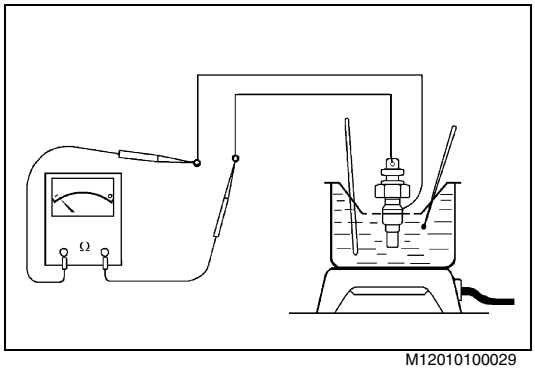
M12010100028

GAUGE, METER AND WARNING CIRCUIT

1. FUEL GAUGE SENDER UNIT INSPECTION

(1) Measure resistance between terminals.

Float position	F	1/2	E
Resistance: Ω	0-1.2	29.5-32.5	146.5-153.5

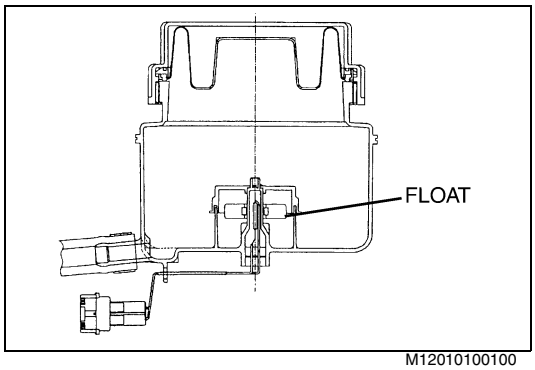


M12010100029

2. COOLANT TEMPERATURE GAUGE SENDER UNIT INSPECTION

(1) Warm up the sender gauge and measure the resistance between the terminal and the body ground.

Temperature	75°C {167°F}	100°C {212°F}
Resistance:Ω	79-92	35.5-42.5

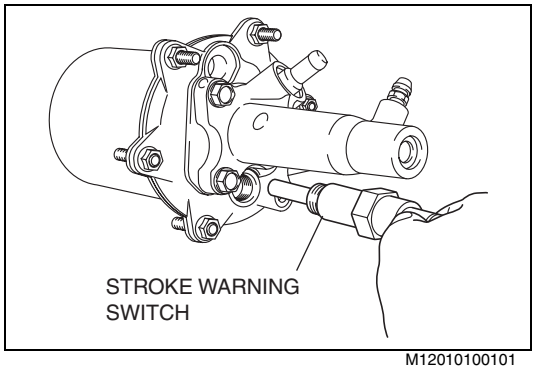


M12010100100

3. BRAKE FLUID LEVEL SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
Float position UP	No continuity
Float position DOWN	Continuity



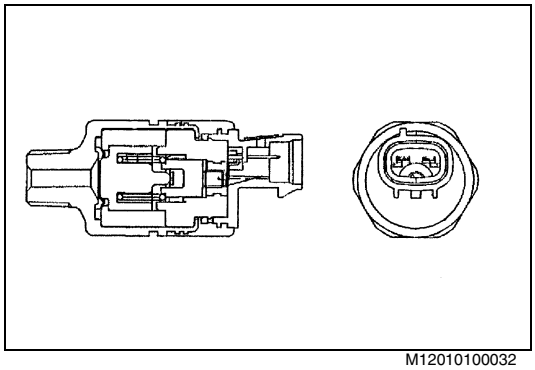
M12010100101

4. BRAKE STROKE WARNING SWITCH (Installed at the service brake air booster) INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

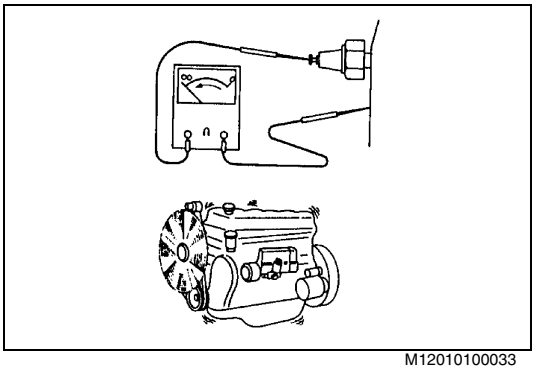
NOTICE:
When the head of the detector is depressed, the warning lamp goes on to indicate brake shoe needs adjustment or lining replacement.


M12010100032

5. AIR PRESSURE SWITCH INSPECTION

(1) Apply air pressure.
(2) Check the continuity between terminal and body ground.

	Between terminals
Less than 588.4 kPa {6.0 kgf/cm^2 85.3 lbf/in^2}	Continuity
More than 588.4 kPa {6.0 kgf/cm^2 85.3 lbf/in^2}	No continuity

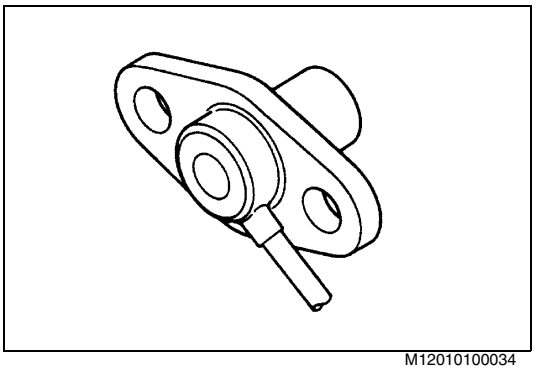


M12010100033

6. OIL PRESSURE SWITCH INSPECTION

(1) Start engine and disconnect the coupler.
(2) Check the continuity between terminal and engine ground.

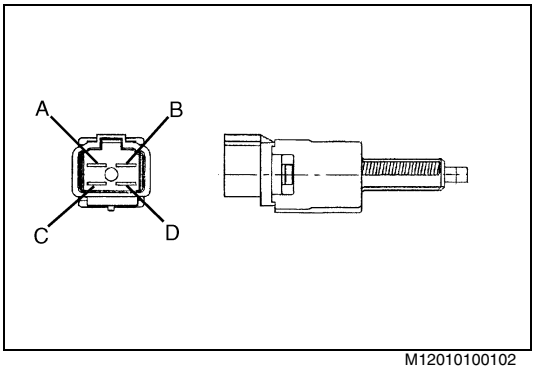
	Terminal	Engine ground
Engine stop	○	○
Engine running		



M12010100034

7. REVOLUTION SENSOR INSPECTION

(1) Check the continuity between terminals.
If the revolution sensor is normal, there will be continuity between the terminals.



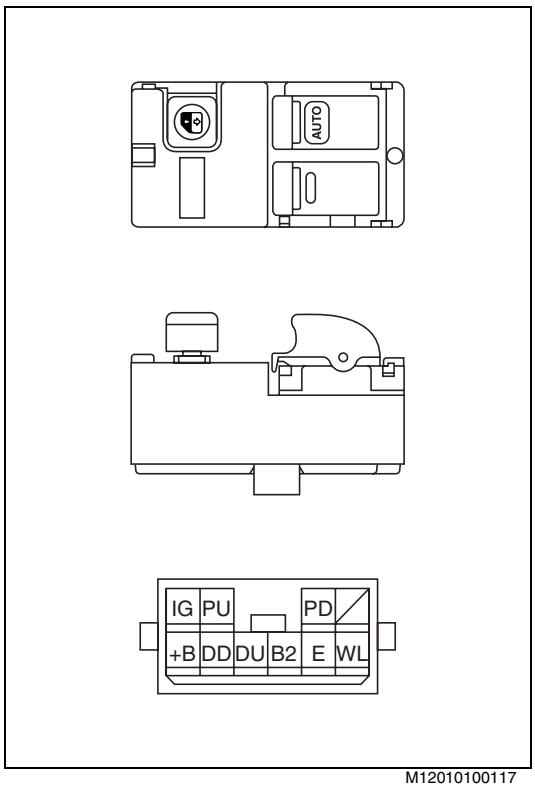
M12010100102

8. PARKING BRAKE SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	A	B	C	D
PUSH	○		○	
FREE		○		○

POWER WINDOW CIRCUIT (IF SO EQUIPPED)



M12010100117

1. DRIVER'S SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

DRIVER'S SIDE:

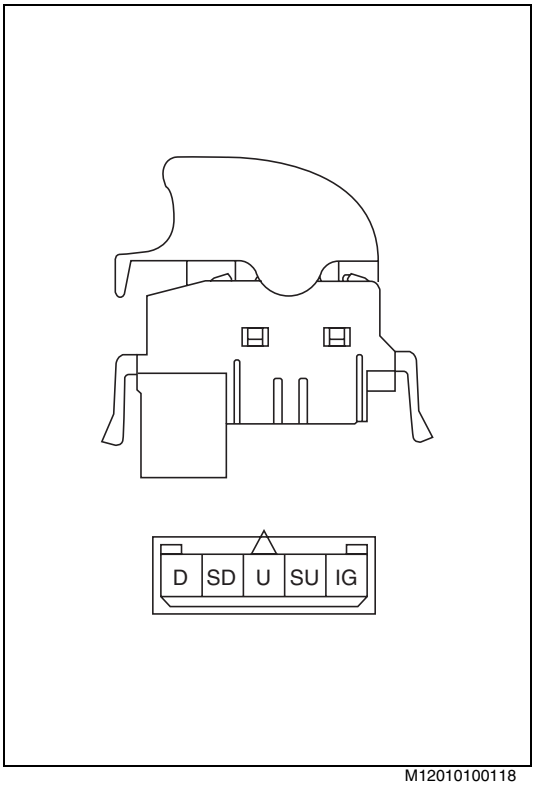
Terminals / Switch position	+B	DU	DD	E
AUTO CLOSE	○——	——○	○——	——○
CLOSE	○——	——○	○——	——○
↕	✕			✕
OFF		○——		——○
			○——	——○
↕	✕			✕
OPEN	○——		——○	
		○——	——○	
AUTO OPEN	○——		——○	
		○——	——○	

ASSISTANT'S SIDE: LOCK SWITCH OFF POSITION

Terminals / Switch position	+B	PU	PD	E	WL
CLOSE	○——	——○		○——	——○
			○——	——○	
↕	✕			✕	
OFF		○——		○——	——○
			○——	——○	
↕	✕			✕	
OPEN	○——		——○	○——	——○
		○——		——○	

ASSISTANT'S SIDE: LOCK SWITCH ON POSITION

Terminals / Switch position	+B	PU	PD	E	WL
CLOSE	○——	——○		✕——	——✕
↕	✕			✕	
OFF		○——	——○	✕——	——✕
↕	✕			✕	
OPEN	○——		——○	✕——	——✕

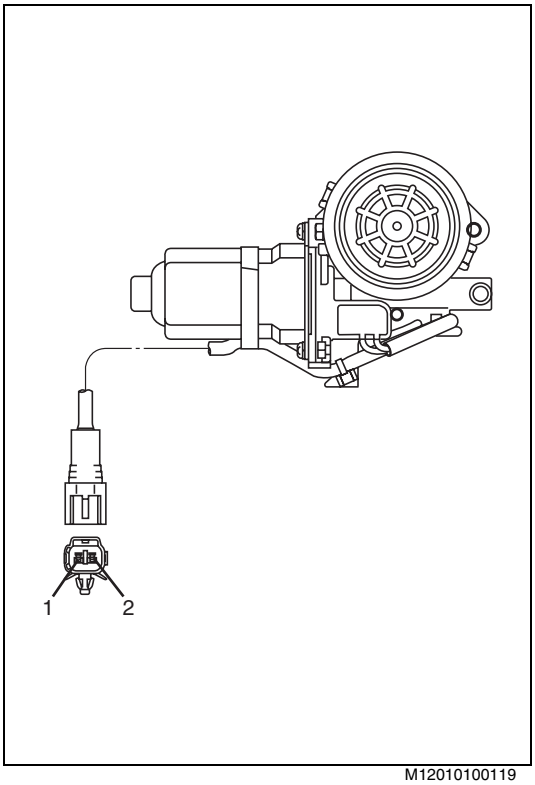


M12010100118

2. ASSISTANT'S SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	SU	U	IG	D	SD
CLOSE		○—○		○—○	
↕	✕		✕		
OFF	○—○			○—○	
↕			✕		✕
OPEN	○—○		○—○		



M12010100119

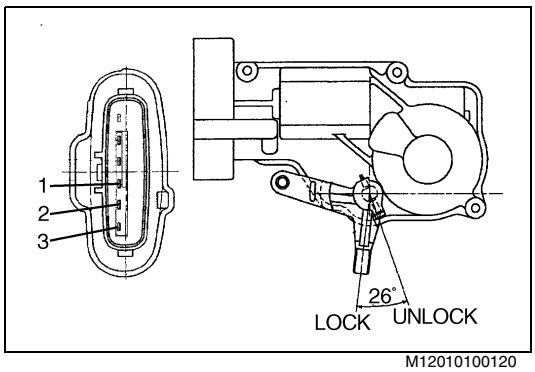
3. POWER WINDOW MOTOR INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the motor.

(2) Apply 24V to terminals, inspect the motor operation as below.

Terminals / Direction of rotation (View from out put shaft)	1	2
CLOCKWISE	+	−
COUNTERCLOCKWISE	−	+

POWER DOOR LOCK CIRCUIT (IF SO EQUIPPED)

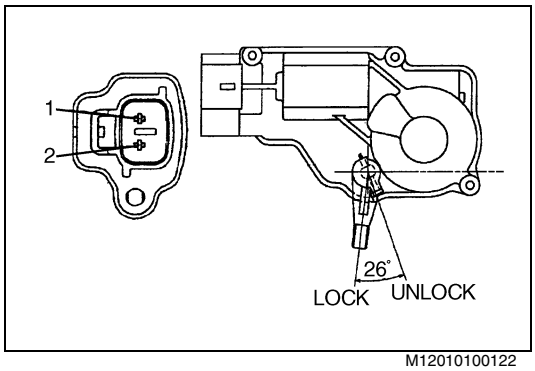


M12010100120

1. DRIVER'S SIDE DOOR LOCK SWITCH INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the switch.

Terminals / Lever position	1	2	3
LOCK	○		○
UNLOCK		○	○

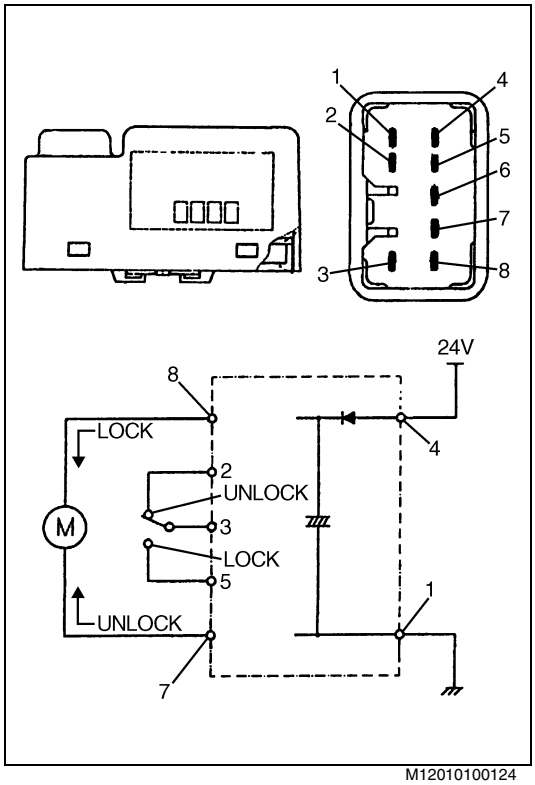


M12010100122

2. ASSISTANT'S SIDE DOOR LOCK ACTUATOR INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the actuator.

Terminals / Lever position	1	2
LOCK	+	−
UNLOCK	−	+

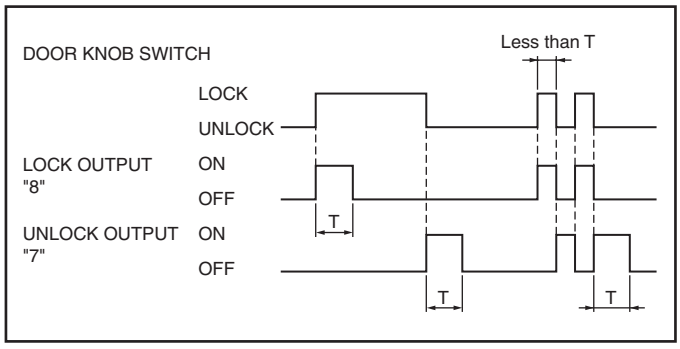


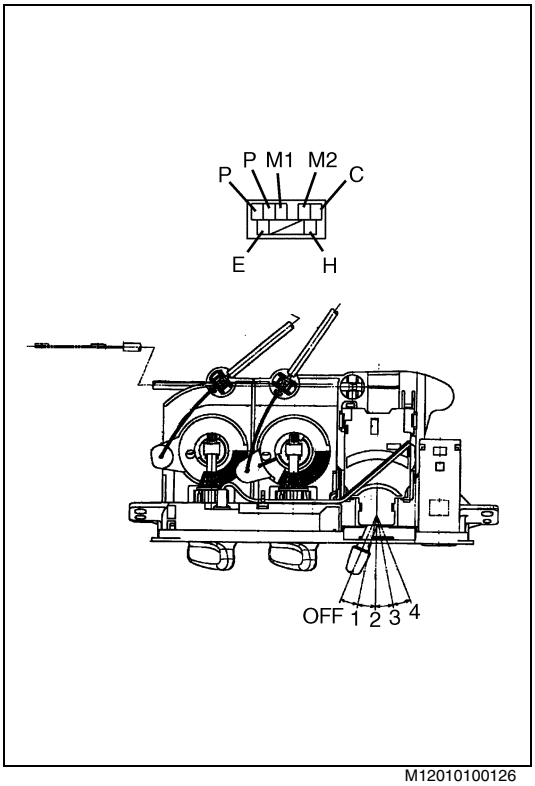
M12010100124

3. DOOR LOCK CONTROLLER INSPECTION

(1) Wire the door lock controller as shown in the figure.

(2) Check the function.





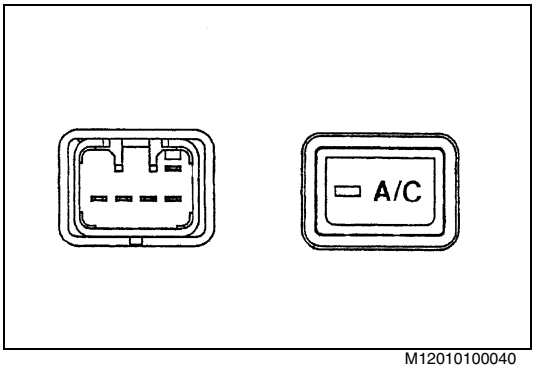
M12010100126

HEATER AND COOLER CIRCUIT

1. BLOWER SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	E	C	M1	M2	H	P	P
OFF						LAMP	
1	○—○						
2	○—○—○						
3	○—○			○			
4	○—○				○		

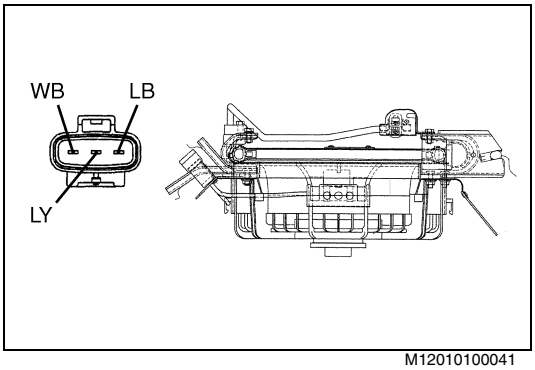


M12010100040

2. COOLER CONTROL SWITCH

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

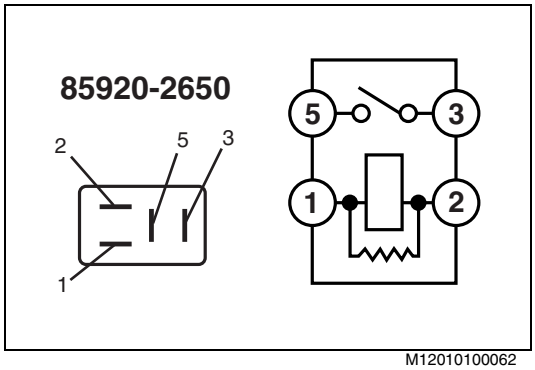


M12010100041

3. CONDENSER ASSEMBLY INSPECTION

(1) Check continuity between terminals.

Terminal / Switch position	LB	WB	LY
OFF			
LO	○—○		
HIGH	○—		—○

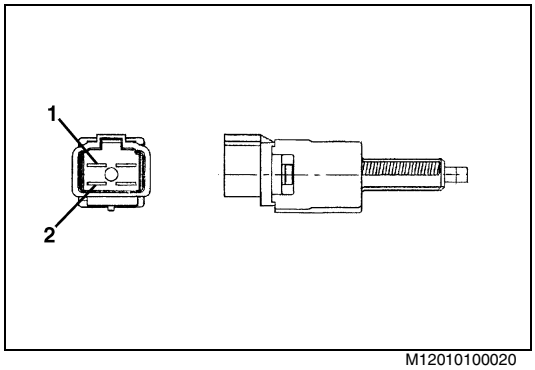


M12010100062

4. POWER RELAY No.2 INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.



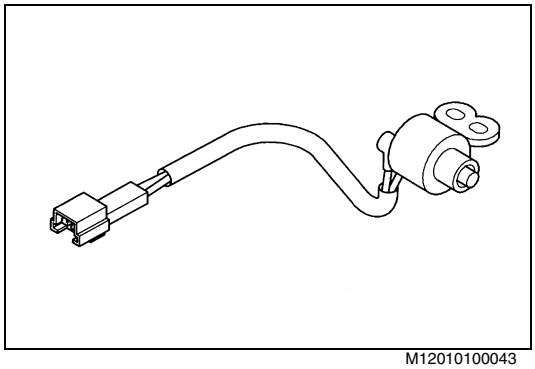
M12010100020

EXHAUST BRAKE CIRCUIT

1. CLUTCH PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

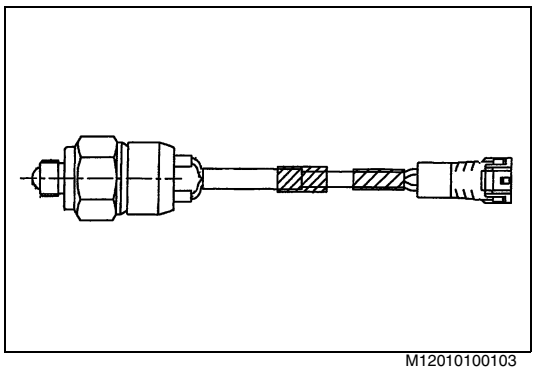
Terminals / Switch position	1	2
PUSH		
FREE	○	○


M12010100043

2. ACCELERATOR PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

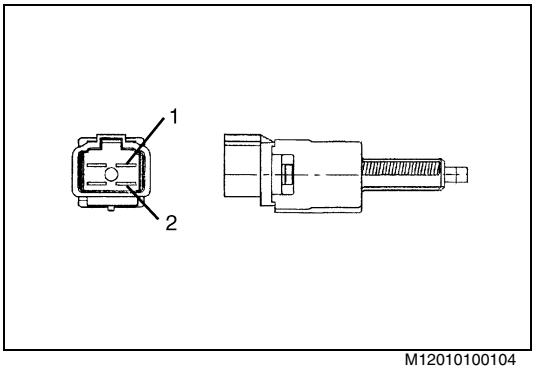

M12010100103

BACK UP LAMP CIRCUIT

1. BACK UP LAMP SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity



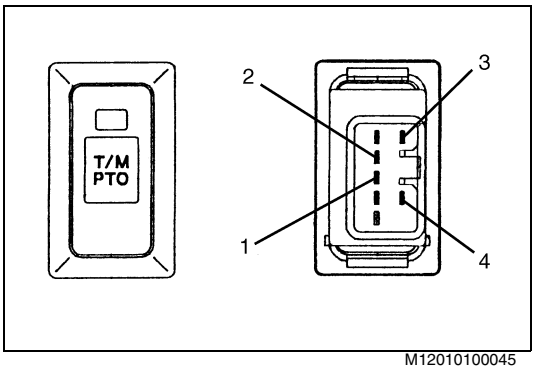
M12010100104

POWER TAKE-OFF CIRCUIT (IF SO EQUIPPED)

1. CLUTCH PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
PUSH		
FREE	○	○

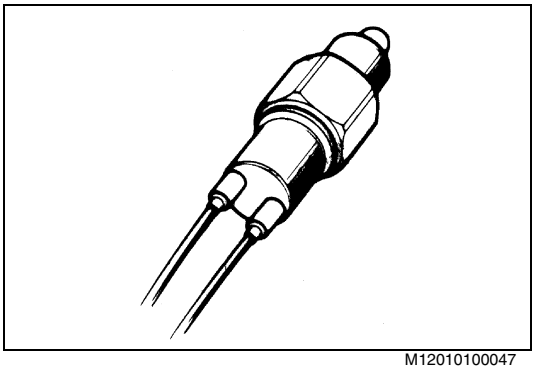


M12010100045

2. PTO CONTROL SWITCH INSPECTION

(1) Check the continuity between terminals.

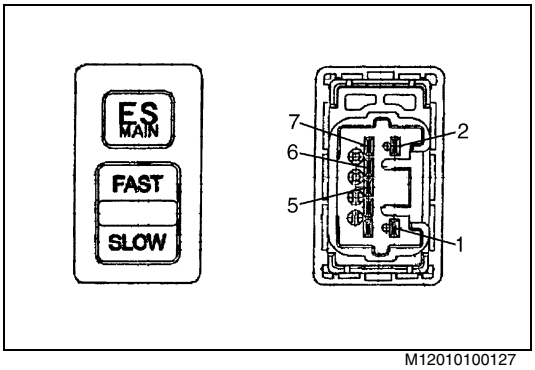
Terminal / Switch position	1	2	3	4
OFF				
ON	○	○		


M12010100047

3. PTO POSITION SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity



M12010100127

ES START CIRCUIT (IF SO EQUIPPED)

1. ES MAIN SWITCH INSPECTION

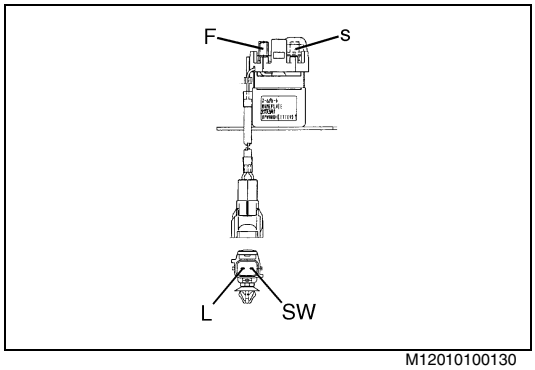
(1) Check the continuity between terminals.

Terminals / Switch position	5	6	7
OFF	○	○	
ON	○		○

2. RELEASE TIMING SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	5	1	2
FAST	○	○	
SLOW	○		○



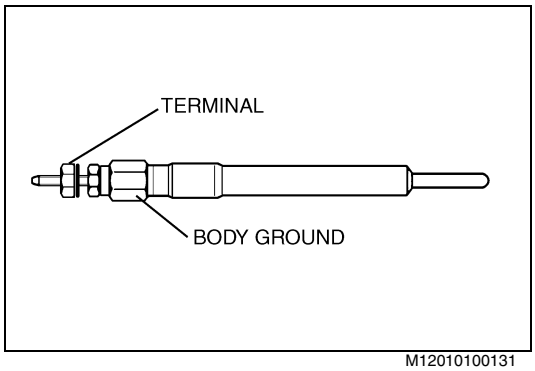
M12010100130

PRE-HEATING CIRCUIT (IF SO EQUIPPED)

1. PRE-HEAT RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal SW,
Ground to terminal L.

(2) Under normal condition, terminals S and F switch on.

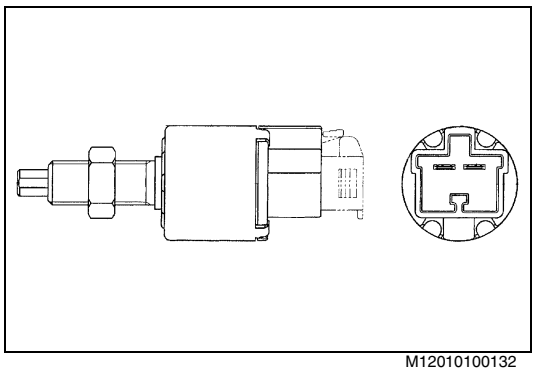


M12010100131

2. GLOW PLUG INSPECTION

(1) Check continuity between terminal and body ground.

(2) Under normal condition, the terminal and body ground is continuity.

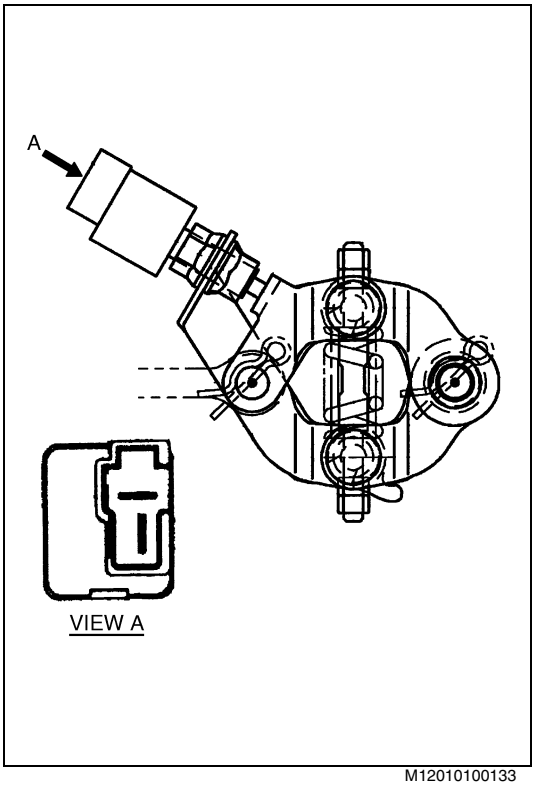

M12010100132

BRAKE- LOCK CIRCUIT (IF SO EQUIPPED)

1. BRAKE-LOCK CONTROL VALVE POSITION SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

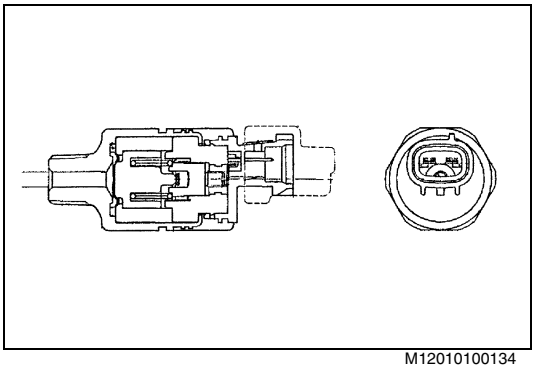


M12010100133

2. PARKING BRAKE LEVER SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
Pull parking brake lever	Continuity
Released position	No continuity



M12010100134

3. PRESSURE SWITCH INSPECTION

(1) Apply air pressure.

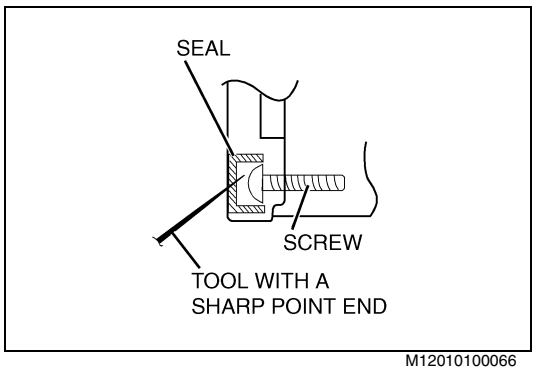
(2) Check the continuity between terminals.

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

Air pressure	Between terminals
More than 274.6 {2.8, 40}	No continuity
Less than 274.6 {2.8, 40}	Continuity

INSPECTION AND ADJUSTMENT

M12010113BEH3002



M12010100066

ADJUSTMENT OF PULSE ADJUST COMPUTER

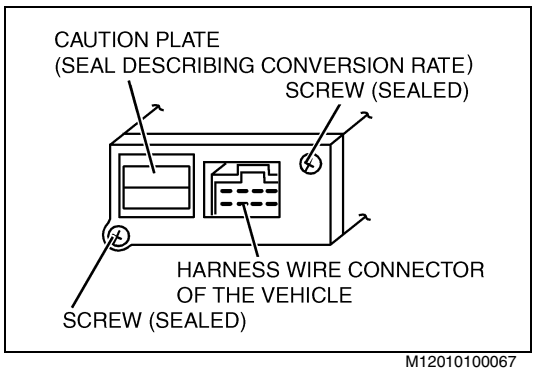
HINT:

This is a device that enables a fine-tuning of compensating ratio of speedometer without modifying the speedometer driven gear of the transmission.

1. CONNECTING INPUT TOOL

(1) Remove the instrument panel cover of assistant seat side in the cabin.

(2) Remove the seal around the screws by using a tool with a sharp point end.

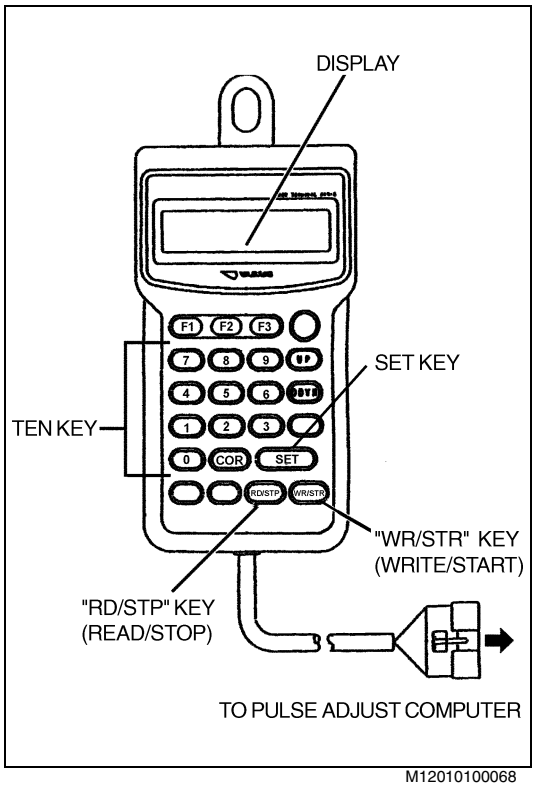


M12010100067

(3) Remove the screws and then the cover of pulse adjust computer.

(4) If you disconnected the wire harness connector of the vehicle when removing the cover of pulse adjust computer, connect again the wire harness connector.

(5) Connect the input tool connector.
SST: Input tool (09630-2400)



M12010100068

2. THE METHOD OF WRITING IN OR READING OUT THE CONVERSION RATE

NOTICE:

The vehicle condition at writing in or reading out: Starter switch is turned on.

(1) Reading out the conversion rate.
   a. The "RD/STP" key is pushed.
   b. Reading out the conversion rate correctly, "GOOD" is indicated and buzzer is rung for three seconds, then the conversion rate which is written in the pulse adjust computer is indicated.
   (Reading out it incorrectly, "bad 0" is indicated and buzzer is rung. In this case, put the connector again.)
   c. It becomes a condition of writing the conversion rate when the set key is pushed after reading out the conversion rate.

HINT:

Refer to operation manual which belongs to input tool for details.

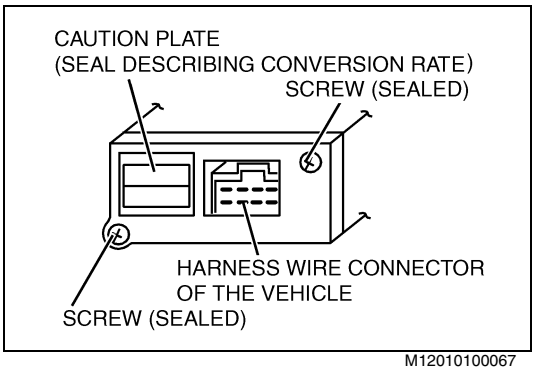
(2) Writing in the conversion rate.
   a. While the condition of inputting the conversion rate (" *.****" indication), the conversion rate is inputted to push the ten key or [UP] [DOWN] key.
   If the conversion rate is inputted, omit a decimal point.
   EX.) When you want to input the conversion rate "1.8210", push the ten key as "18210" and the set key.

NOTICE:

Refer to the following "Pulse conversion rate table".

   b. If the set key is pushed, the input value is decided.
   When it is inputted correctly, the buzzer is rung and the display becomes the same condition before inputting with ten key.
   c. The "WR/STR" key is pushed.
   Writing in the conversion rate correctly, "GOOD" is indicated and buzzer is rung for three seconds, then the conversion rate

which is contained an error and which was actually written in the pulse converter is indicated.
Writing in it incorrectly, "bad 0" is indicated and buzzer is rung.
In this case, write in it correctly again.



M12010100067

3. DISCONNECTING INPUT TOOL

(1) Turn the starter switch to "LOCK" position.
(2) Disconnect the input tool connector and mount the cover of pulse adjust computer.
(3) Apply new seal (83179-1140) on the screws to seal them.
(4) Write conversion rate on a new caution plate (conversion rate record seal (76588-3800) and stick it on the place.
(5) Mount the instrument panel cover of assistant seat side.

SPEEDOMETER CONVERSION RATE LIST

M12010113BEI3001

LF05,06,LH05,LX06 TRANSMISSION SERIES

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS	*3.363*	*3.636*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*
225/60R17.5	0.349	1.370	1.267	1.181	1.123	1.071	1.063	1.011	0.996
215/70R17.5	0.364	1.428	1.321	1.232	1.172	1.117	1.109	1.055	1.039
195/80R17.5	0.367	1.440	1.332	1.242	1.181	1.126	1.118	1.063	1.047
205/80R17.5	0.374	1.468	1.357	1.266	1.204	1.148	1.139	1.084	1.067
235/70R17.5	0.376	1.476	1.365	1.272	1.210	1.154	1.145	1.089	1.073
7.50-16	0.383	1.503	1.390	1.296	1.233	1.175	1.166	1.110	1.093
7.50R16	0.387	1.519	1.405	1.310	1.246	1.188	1.179	1.121	1.104
235/75R17.5	0.387	1.519	1.405	1.310	1.246	1.188	1.179	1.121	1.104
225/80R17.5	0.389	1.527	1.412	1.316	1.252	1.194	1.185	1.127	1.110
225/70R19.5	0.395	1.550	1.434	1.337	1.271	1.212	1.203	1.144	1.127
8.25-16	0.404	1.586	1.466	1.367	1.300	1.240	1.230	1.170	1.153
245/70R19.5	0.407	1.597	1.477	1.377	1.310	1.249	1.240	1.179	1.161
8.25R16	0.409	1.605	1.485	1.384	1.317	1.255	1.246	1.185	1.167
9.5R17.5	0.409	1.605	1.485	1.384	1.317	1.255	1.246	1.185	1.167
225/90R17.5	0.410	1.609	1.488	1.387	1.320	1.258	1.249	1.188	1.170
9.00-16	0.420		1.525	1.421	1.352	1.289	1.279	1.217	1.198
265/70R19.5	0.421		1.528	1.425	1.355	1.292	1.282	1.220	1.201
7.50-18	0.423		1.535	1.431	1.362	1.298	1.288	1.226	1.207
7.50R18	0.426		1.546	1.442	1.371	1.307	1.297	1.234	1.216
9R19.5	0.433		1.572	1.465	1.394	1.329	1.319	1.255	1.236
265/60R22.5	0.438		1.590	1.482	1.410	1.344	1.334	1.269	1.250
235/70R22.5	0.440		1.597	1.489	1.416	1.350	1.340	1.275	1.256
7.50-20	0.448		1.626	1.516	1.442	1.375	1.365	1.298	1.278
285/60R22.5	0.450		1.633	1.523	1.449	1.381	1.371	1.304	1.284
7.50R20	0.452		1.641	1.530	1.455	1.387	1.377	1.310	1.290
255/70R22.5	0.453		1.644	1.533	1.458	1.390	1.380	1.312	1.293
275/70R22.5	0.465			1.574	1.497	1.427	1.416	1.347	1.327
11/70R22.5	0.468			1.584	1.506	1.436	1.425	1.356	1.335
8.25-20	0.468			1.584	1.506	1.436	1.425	1.356	1.335
8.25R20	0.470			1.591	1.513	1.443	1.432	1.362	1.341
9R22.5	0.470			1.591	1.513	1.443	1.432	1.362	1.341
265/75R22.5	0.474			1.604	1.526	1.455	1.444	1.373	1.353
295/70R22.5	0.479				1.542	1.470	1.459	1.388	1.367
9.00-20	0.490				1.577	1.504	1.492	1.420	1.398
275/80R22.5	0.491				1.581	1.507	1.496	1.423	1.401
9.00R20	0.492				1.584	1.510	1.499	1.426	1.404
10R22.5	0.492				1.584	1.510	1.499	1.426	1.404
295/75R22.5	0.493				1.587	1.513	1.502	1.428	1.407
295/80R22.5	0.505				1.626	1.550	1.538	1.463	1.441
10.00-20	0.506				1.629	1.553	1.541	1.466	1.444
11.1-20	0.506				1.629	1.553	1.541	1.466	1.444
10.00R20	0.508				1.635	1.559	1.547	1.472	1.450
11.1R20	0.508				1.635	1.559	1.547	1.472	1.450
11R22.5	0.508				1.635	1.559	1.547	1.472	1.450
11.00-20	0.520				1.674	1.596	1.584	1.507	1.484
315/80R22.5	0.520				1.674	1.596	1.584	1.507	1.484
11.00R20	0.523				1.684	1.605	1.593	1.515	1.492
12R22.5	0.523				1.684	1.605	1.593	1.515	1.492

M12010100069

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS	4.875	5.125	5.142	5.250	5.285	5.428	5.571	5.857
225/60R17.5	0.349	0.945	0.899	0.896					
215/70R17.5	0.364	0.985	0.937	0.934	0.915	0.909	0.885		
195/80R17.5	0.367	0.993	0.945	0.942	0.922	0.916	0.892		
205/80R17.5	0.374	1.012	0.963	0.960	0.940	0.934	0.909	0.886	
235/70R17.5	0.376	1.018	0.968	0.965	0.945	0.939	0.914	0.891	
7.50-16	0.383	1.037	0.986	0.983	0.963	0.956	0.931	0.907	
7.50R16	0.387	1.048	0.996	0.993	0.973	0.966	0.941	0.917	
235/75R17.5	0.387	1.048	0.996	0.993	0.973	0.966	0.941	0.917	
225/80R17.5	0.389	1.053	1.002	0.998	0.978	0.971	0.946	0.921	
225/70R19.5	0.395	1.069	1.017	1.014	0.993	0.986	0.960	0.936	0.890
8.25-16	0.404	1.094	1.040	1.037	1.015	1.009	0.982	0.957	0.910
245/70R19.5	0.407	1.102	1.048	1.044	1.023	1.016	0.989	0.964	0.917
8.25R16	0.409	1.107	1.053	1.050	1.028	1.021	0.994	0.969	0.921
9.5R17.5	0.409	1.107	1.053	1.050	1.028	1.021	0.994	0.969	0.921
225/90R17.5	0.410	1.110	1.056	1.052	1.031	1.024	0.997	0.971	0.924
9.00-16	0.420	1.137	1.081	1.078	1.056	1.049	1.021	0.995	0.946
265/70R19.5	0.421	1.140	1.084	1.080	1.058	1.051	1.023	0.997	0.948
7.50-18	0.423	1.145	1.089	1.086	1.063	1.056	1.028	1.002	0.953
7.50R18	0.426	1.153	1.097	1.093	1.071	1.064	1.036	1.009	0.960
9R19.5	0.433	1.172	1.115	1.111	1.088	1.081	1.053	1.026	0.976
265/60R22.5	0.438	1.186	1.128	1.124	1.101	1.094	1.065	1.037	0.987
235/70R22.5	0.440	1.191	1.133	1.129	1.106	1.099	1.070	1.042	0.991
7.50-20	0.448	1.213	1.154	1.150	1.126	1.119	1.089	1.061	1.009
285/60R22.5	0.450	1.218	1.159	1.155	1.131	1.124	1.094	1.066	1.014
7.50R20	0.452	1.224	1.164	1.160	1.136	1.129	1.099	1.071	1.018
255/70R22.5	0.453	1.226	1.166	1.163	1.139	1.131	1.101	1.073	1.021
275/70R22.5	0.465	1.259	1.197	1.193	1.169	1.161	1.131	1.101	1.048
11/70R22.5	0.468	1.267	1.205	1.201	1.176	1.169	1.138	1.109	1.054
8.25-20	0.468	1.267	1.205	1.201	1.176	1.169	1.138	1.109	1.054
8.25R20	0.470	1.272	1.210	1.206	1.181	1.174	1.143	1.113	1.059
9R22.5	0.470	1.272	1.210	1.206	1.181	1.174	1.143	1.113	1.059
265/75R22.5	0.474	1.283	1.221	1.217	1.191	1.184	1.152	1.123	1.068
295/70R22.5	0.479	1.297	1.233	1.229	1.204	1.196	1.165	1.135	1.079
9.00-20	0.490	1.327	1.262	1.258	1.232	1.224	1.191	1.161	1.104
275/80R22.5	0.491	1.329	1.264	1.260	1.234	1.226	1.194	1.163	1.106
9.00R20	0.492	1.332	1.267	1.263	1.237	1.229	1.196	1.165	1.109
10R22.5	0.492	1.332	1.267	1.263	1.237	1.229	1.196	1.165	1.109
295/75R22.5	0.493	1.335	1.269	1.265	1.239	1.231	1.199	1.168	1.111
295/80R22.5	0.505	1.367	1.300	1.296	1.269	1.261	1.228	1.196	1.138
10.00-20	0.506	1.370	1.303	1.299	1.272	1.264	1.230	1.199	1.140
11.1-20	0.506	1.370	1.303	1.299	1.272	1.264	1.230	1.199	1.140
10.00R20	0.508	1.375	1.308	1.304	1.277	1.269	1.235	1.203	1.145
11.1R20	0.508	1.375	1.308	1.304	1.277	1.269	1.235	1.203	1.145
11R22.5	0.508	1.375	1.308	1.304	1.277	1.269	1.235	1.203	1.145
11.00-20	0.520	1.408	1.339	1.335	1.307	1.298	1.264	1.232	1.172
315/80R22.5	0.520	1.408	1.339	1.335	1.307	1.298	1.264	1.232	1.172
11.00R20	0.523	1.416	1.347	1.342	1.315	1.306	1.272	1.239	1.178
12R22.5	0.523	1.416	1.347	1.342	1.315	1.306	1.272	1.239	1.178

M12010100070

		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS	6.142	6.285	6.428	6.571	6.833	7.166
225/60R17.5	0.349						
215/70R17.5	0.364						
195/80R17.5	0.367						
205/80R17.5	0.374						
235/70R17.5	0.376						
7.50-16	0.383						
7.50R16	0.387						
235/75R17.5	0.387						
225/80R17.5	0.389						
225/70R19.5	0.395						
8.25-16	0.404						
245/70R19.5	0.407						
8.25R16	0.409						
9.5R17.5	0.409						
225/90R17.5	0.410						
9.00-16	0.420	0.902	0.882				
265/70R19.5	0.421	0.904	0.884				
7.50-18	0.423	0.909	0.888				
7.50R18	0.426	0.915	0.894				
9R19.5	0.433	0.930	0.909	0.889			
265/60R22.5	0.438	0.941	0.920	0.899			
235/70R22.5	0.440	0.945	0.924	0.903	0.884		
7.50-20	0.448	0.962	0.941	0.920	0.900		
285/60R22.5	0.450	0.967	0.945	0.924	0.904		
7.50R20	0.452	0.971	0.949	0.928	0.908		
255/70R22.5	0.453	0.973	0.951	0.930	0.910		
275/70R22.5	0.465	0.999	0.976	0.955	0.934	0.898	
11/70R22.5	0.468	1.005	0.983	0.961	0.940	0.904	
8.25-20	0.468	1.005	0.983	0.961	0.940	0.904	
8.25R20	0.470	1.010	0.987	0.965	0.944	0.908	
9R22.5	0.470	1.010	0.987	0.965	0.944	0.908	
265/75R22.5	0.474	1.018	0.995	0.973	0.952	0.915	
295/70R22.5	0.479	1.029	1.006	0.983	0.962	0.925	0.882
9.00-20	0.490	1.053	1.029	1.006	0.984	0.946	0.902
275/80R22.5	0.491	1.055	1.031	1.008	0.986	0.948	0.904
9.00R20	0.492	1.057	1.033	1.010	0.988	0.950	0.906
10R22.5	0.492	1.057	1.033	1.010	0.988	0.950	0.906
295/75R22.5	0.493	1.059	1.035	1.012	0.990	0.952	0.908
295/80R22.5	0.505	1.085	1.060	1.037	1.014	0.975	0.930
10.00-20	0.506	1.087	1.062	1.039	1.016	0.977	0.932
11.1-20	0.506	1.087	1.062	1.039	1.016	0.977	0.932
10.00R20	0.508	1.091	1.067	1.043	1.020	0.981	0.935
11.1R20	0.508	1.091	1.067	1.043	1.020	0.981	0.935
11R22.5	0.508	1.091	1.067	1.043	1.020	0.981	0.935
11.00-20	0.520	1.117	1.092	1.068	1.044	1.004	0.958
315/80R22.5	0.520	1.117	1.092	1.068	1.044	1.004	0.958
11.00R20	0.523	1.124	1.098	1.074	1.050	1.010	0.963
12R22.5	0.523	1.124	1.098	1.074	1.050	1.010	0.963

M12010100071

LJ06, MF06 TRANSMISSION SERIES

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS	*3.363*	*3.636*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*
225/60R17.5	0.349	1.112	1.029	0.959	0.912	0.870	0.863	0.821	0.808
215/70R17.5	0.364	1.160	1.073	1.000	0.951	0.907	0.900	0.856	0.843
195/80R17.5	0.367	1.169	1.082	1.008	0.959	0.914	0.908	0.863	0.850
205/80R17.5	0.374	1.192	1.102	1.028	0.977	0.932	0.925	0.880	0.866
235/70R17.5	0.376	1.198	1.108	1.033	0.983	0.937	0.930	0.884	0.871
7.50-16	0.383	1.220	1.129	1.052	1.001	0.954	0.947	0.901	0.887
7.50R16	0.387	1.233	1.141	1.063	1.011	0.964	0.957	0.910	0.897
235/75R17.5	0.387	1.233	1.141	1.063	1.011	0.964	0.957	0.910	0.897
225/80R17.5	0.389	1.240	1.146	1.069	1.017	0.969	0.962	0.915	0.901
225/70R19.5	0.395	1.259	1.164	1.085	1.032	0.984	0.977	0.929	0.915
8.25-16	0.404	1.287	1.191	1.110	1.056	1.007	0.999	0.950	0.936
245/70R19.5	0.407	1.297	1.200	1.118	1.064	1.014	1.006	0.957	0.943
8.25R16	0.409	1.303	1.205	1.124	1.069	1.019	1.011	0.962	0.948
9.5R17.5	0.409	1.303	1.205	1.124	1.069	1.019	1.011	0.962	0.948
225/90R17.5	0.410	1.307	1.208	1.127	1.072	1.022	1.014	0.964	0.950
9.00-16	0.420		1.238	1.154	1.098	1.047	1.039	0.988	0.973
265/70R19.5	0.421		1.241	1.157	1.100	1.049	1.041	0.990	0.975
7.50-18	0.423		1.247	1.162	1.106	1.054	1.046	0.995	0.980
7.50R18	0.426		1.256	1.171	1.113	1.062	1.054	1.002	0.987
9R19.5	0.433		1.276	1.190	1.132	1.079	1.071	1.019	1.003
265/60R22.5	0.438		1.291	1.204	1.145	1.092	1.083	1.030	1.015
235/70R22.5	0.440		1.297	1.209	1.150	1.097	1.088	1.035	1.019
7.50-20	0.448		1.320	1.231	1.171	1.116	1.108	1.054	1.038
285/60R22.5	0.450		1.326	1.237	1.176	1.121	1.113	1.059	1.043
7.50R20	0.452		1.332	1.242	1.181	1.126	1.118	1.063	1.047
255/70R22.5	0.453		1.335	1.245	1.184	1.129	1.120	1.066	1.050
275/70R22.5	0.465			1.278	1.215	1.159	1.150	1.094	1.077
11/70R22.5	0.468			1.286	1.223	1.166	1.157	1.101	1.084
8.25-20	0.468			1.286	1.223	1.166	1.157	1.101	1.084
8.25R20	0.470			1.291	1.228	1.171	1.162	1.106	1.089
9R22.5	0.470			1.291	1.228	1.171	1.162	1.106	1.089
265/75R22.5	0.474			1.302	1.239	1.181	1.172	1.115	1.098
295/70R22.5	0.479				1.252	1.194	1.185	1.127	1.110
9.00-20	0.490				1.281	1.221	1.212	1.153	1.135
275/80R22.5	0.491				1.283	1.224	1.214	1.155	1.138
9.00R20	0.492				1.286	1.226	1.217	1.157	1.140
10R22.5	0.492				1.286	1.226	1.217	1.157	1.140
295/75R22.5	0.493				1.289	1.229	1.219	1.160	1.142
295/80R22.5	0.505				1.320	1.259	1.249	1.188	1.170
10.00-20	0.506				1.323	1.261	1.251	1.190	1.172
11.1-20	0.506				1.323	1.261	1.251	1.190	1.172
10.00R20	0.508				1.328	1.266	1.256	1.195	1.177
11.1R20	0.508				1.328	1.266	1.256	1.195	1.177
11R22.5	0.508				1.328	1.266	1.256	1.195	1.177
11.00-20	0.520				1.359	1.296	1.286	1.223	1.205
315/80R22.5	0.520				1.359	1.296	1.286	1.223	1.205
11.00R20	0.523				1.367	1.303	1.294	1.230	1.212
12R22.5	0.523				1.367	1.303	1.294	1.230	1.212

M12010100072

		REAR AXLE GEAR RATIO							
TIRE SIZE	RADIUS	4.875	5.125	5.142	5.250	5.285	5.428	5.571	5.857
225/60R17.5	0.349	0.767	0.730	0.727					
215/70R17.5	0.364	0.800	0.761	0.758	0.743	0.738	0.718		
195/80R17.5	0.367	0.807	0.767	0.765	0.749	0.744	0.724		
205/80R17.5	0.374	0.822	0.782	0.779	0.763	0.758	0.738	0.719	
235/70R17.5	0.376	0.826	0.786	0.783	0.767	0.762	0.742	0.723	
7.50-16	0.383	0.842	0.801	0.798	0.782	0.776	0.756	0.737	
7.50R16	0.387	0.851	0.809	0.806	0.790	0.785	0.764	0.744	
235/75R17.5	0.387	0.851	0.809	0.806	0.790	0.785	0.764	0.744	
225/80R17.5	0.389	0.855	0.813	0.811	0.794	0.789	0.768	0.748	
225/70R19.5	0.395	0.868	0.826	0.823	0.806	0.801	0.780	0.760	0.723
8.25-16	0.404	0.888	0.845	0.842	0.824	0.819	0.797	0.777	0.739
245/70R19.5	0.407	0.895	0.851	0.848	0.831	0.825	0.803	0.783	0.744
8.25R16	0.409	0.899	0.855	0.852	0.835	0.829	0.807	0.787	0.748
9.5R17.5	0.409	0.899	0.855	0.852	0.835	0.829	0.807	0.787	0.748
225/90R17.5	0.410	0.901	0.857	0.854	0.837	0.831	0.809	0.788	0.750
9.00-16	0.420	0.923	0.878	0.875	0.857	0.851	0.829	0.808	0.768
265/70R19.5	0.421	0.925	0.880	0.877	0.859	0.854	0.831	0.810	0.770
7.50-18	0.423	0.930	0.884	0.881	0.863	0.858	0.835	0.814	0.774
7.50R18	0.426	0.936	0.891	0.888	0.869	0.864	0.841	0.819	0.779
9R19.5	0.433	0.952	0.905	0.902	0.884	0.878	0.855	0.833	0.792
265/60R22.5	0.438	0.963	0.916	0.913	0.894	0.888	0.865	0.842	0.801
235/70R22.5	0.440	0.967	0.920	0.917	0.898	0.892	0.869	0.846	0.805
7.50-20	0.448	0.985	0.937	0.934	0.914	0.908	0.884	0.862	0.820
285/60R22.5	0.450	0.989	0.941	0.938	0.918	0.912	0.888	0.865	0.823
7.50R20	0.452	0.993	0.945	0.942	0.922	0.916	0.892	0.869	0.827
255/70R22.5	0.453	0.996	0.947	0.944	0.925	0.918	0.894	0.871	0.829
275/70R22.5	0.465	1.022	0.972	0.969	0.949	0.943	0.918	0.894	0.851
11/70R22.5	0.468	1.029	0.978	0.975	0.955	0.949	0.924	0.900	0.856
8.25-20	0.468	1.029	0.978	0.975	0.955	0.949	0.924	0.900	0.856
8.25R20	0.470	1.033	0.983	0.979	0.959	0.953	0.928	0.904	0.860
9R22.5	0.470	1.033	0.983	0.979	0.959	0.953	0.928	0.904	0.860
265/75R22.5	0.474	1.042	0.991	0.988	0.967	0.961	0.936	0.912	0.867
295/70R22.5	0.479	1.053	1.001	0.998	0.978	0.971	0.946	0.921	0.876
9.00-20	0.490	1.077	1.025	1.021	1.000	0.993	0.967	0.942	0.896
275/80R22.5	0.491	1.079	1.027	1.023	1.002	0.995	0.969	0.944	0.898
9.00R20	0.492	1.081	1.029	1.025	1.004	0.998	0.971	0.946	0.900
10R22.5	0.492	1.081	1.029	1.025	1.004	0.998	0.971	0.946	0.900
295/75R22.5	0.493	1.084	1.031	1.027	1.006	1.000	0.973	0.948	0.902
295/80R22.5	0.505	1.110	1.056	1.052	1.031	1.024	0.997	0.971	0.924
10.00-20	0.506	1.112	1.058	1.054	1.033	1.026	0.999	0.973	0.926
11.1-20	0.506	1.112	1.058	1.054	1.033	1.026	0.999	0.973	0.926
10.00R20	0.508	1.117	1.062	1.059	1.037	1.030	1.003	0.977	0.929
11.1R20	0.508	1.117	1.062	1.059	1.037	1.030	1.003	0.977	0.929
11R22.5	0.508	1.117	1.062	1.059	1.037	1.030	1.003	0.977	0.929
11.00-20	0.520	1.143	1.087	1.084	1.061	1.054	1.027	1.000	0.951
315/80R22.5	0.520	1.143	1.087	1.084	1.061	1.054	1.027	1.000	0.951
11.00R20	0.523	1.150	1.094	1.090	1.067	1.060	1.032	1.006	0.957
12R22.5	0.523	1.150	1.094	1.090	1.067	1.060	1.032	1.006	0.957

M12010100073

		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS	6.142	6.285	6.428	6.571	6.833	7.166
225/60R17.5	0.349						
215/70R17.5	0.364						
195/80R17.5	0.367						
205/80R17.5	0.374						
235/70R17.5	0.376						
7.50-16	0.383						
7.50R16	0.387						
235/75R17.5	0.387						
225/80R17.5	0.389						
225/70R19.5	0.395						
8.25-16	0.404						
245/70R19.5	0.407						
8.25R16	0.409						
9.5R17.5	0.409						
225/90R17.5	0.410						
9.00-16	0.420	0.733	0.716				
265/70R19.5	0.421	0.734	0.718				
7.50-18	0.423	0.738	0.721				
7.50R18	0.426	0.743	0.726				
9R19.5	0.433	0.755	0.738	0.722			
265/60R22.5	0.438	0.764	0.747	0.730			
235/70R22.5	0.440	0.768	0.750	0.733	0.717		
7.50-20	0.448	0.781	0.764	0.747	0.730		
285/60R22.5	0.450	0.785	0.767	0.750	0.734		
7.50R20	0.452	0.788	0.771	0.753	0.737		
255/70R22.5	0.453	0.790	0.772	0.755	0.739		
275/70R22.5	0.465	0.811	0.793	0.775	0.758	0.729	
11/70R22.5	0.468	0.816	0.798	0.780	0.763	0.734	
8.25-20	0.468	0.816	0.798	0.780	0.763	0.734	
8.25R20	0.470	0.820	0.801	0.783	0.766	0.737	
9R22.5	0.470	0.820	0.801	0.783	0.766	0.737	
265/75R22.5	0.474	0.827	0.808	0.790	0.773	0.743	
295/70R22.5	0.479	0.836	0.817	0.798	0.781	0.751	0.716
9.00-20	0.490	0.855	0.835	0.817	0.799	0.768	0.733
275/80R22.5	0.491	0.857	0.837	0.818	0.801	0.770	0.734
9.00R20	0.492	0.858	0.839	0.820	0.802	0.771	0.736
10R22.5	0.492	0.858	0.839	0.820	0.802	0.771	0.736
295/75R22.5	0.493	0.860	0.840	0.822	0.804	0.773	0.737
295/80R22.5	0.505	0.881	0.861	0.842	0.823	0.792	0.755
10.00-20	0.506	0.883	0.863	0.843	0.825	0.793	0.757
11.1-20	0.506	0.883	0.863	0.843	0.825	0.793	0.757
10.00R20	0.508	0.886	0.866	0.847	0.828	0.797	0.759
11.1R20	0.508	0.886	0.866	0.847	0.828	0.797	0.759
11R22.5	0.508	0.886	0.866	0.847	0.828	0.797	0.759
11.00-20	0.520	0.907	0.886	0.867	0.848	0.815	0.777
315/80R22.5	0.520	0.907	0.886	0.867	0.848	0.815	0.777
11.00R20	0.523	0.912	0.892	0.872	0.853	0.820	0.782
12R22.5	0.523	0.912	0.892	0.872	0.853	0.820	0.782

M12010100074

HK06 TRANSMISSION SERIES

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS	*3.636*	*3.900*	*4.100*	*4.300*	*4.333*	*4.555*	*4.625*	*4.875*	*5.250*
215/70R17.5	*0.364*	1.073	1.000	0.951	0.907	0.900	0.856	0.843	0.800	
195/80R17.5	*0.367*	1.082	1.008	0.959	0.914	0.908	0.863	0.850	0.807	
205/80R17.5	*0.374*	1.102	1.028	0.977	0.932	0.925	0.880	0.866	0.822	0.763
235/70R17.5	*0.376*	1.108	1.033	0.983	0.937	0.930	0.884	0.871	0.826	0.767
7.50-16	*0.383*	1.129	1.052	1.001	0.954	0.947	0.901	0.887	0.842	0.782
7.50R16	*0.387*	1.141	1.063	1.011	0.964	0.957	0.910	0.897	0.851	0.790
225/80R17.5	*0.389*	1.146	1.069	1.017	0.969	0.962	0.915	0.901	0.855	0.794
225/70R19.5	*0.395*	1.164	1.085	1.032	0.984	0.977	0.929	0.915	0.868	0.806
8.25-16	*0.404*	1.191	1.110	1.056	1.007	0.999	0.950	0.936	0.888	0.824
245/70R19.5	*0.407*	1.200	1.118	1.064	1.014	1.006	0.957	0.943	0.895	0.831
8.25R16	*0.409*	1.205	1.124	1.069	1.019	1.011	0.962	0.948	0.899	0.835
225/90R17.5	*0.410*	1.208	1.127	1.072	1.022	1.014	0.964	0.950	0.901	0.837
9.00-16	*0.420*	1.238	1.154	1.098	1.047	1.039	0.988	0.973	0.923	0.857
265/70R19.5	*0.421*	1.241	1.157	1.100	1.049	1.041	0.990	0.975	0.925	0.859
7.50-18	*0.423*	1.247	1.162	1.106	1.054	1.046	0.995	0.980	0.930	0.863
7.50R18	*0.426*	1.256	1.171	1.113	1.062	1.054	1.002	0.987	0.936	0.869
265/60R22.5	*0.438*	1.291	1.204	1.145	1.092	1.083	1.030	1.015	0.963	0.894
235/70R22.5	*0.440*	1.297	1.209	1.150	1.097	1.088	1.035	1.019	0.967	0.898
7.50-20	*0.448*	1.320	1.231	1.171	1.116	1.108	1.054	1.038	0.985	0.914
285/60R22.5	*0.450*		1.237	1.176	1.121	1.113	1.059	1.043	0.989	0.918
7.50R20	*0.452*		1.242	1.181	1.126	1.118	1.063	1.047	0.993	0.922
255/70R22.5	*0.453*		1.245	1.184	1.129	1.120	1.066	1.050	0.996	0.925
275/70R22.5	*0.465*		1.278	1.215	1.159	1.150	1.094	1.077	1.022	0.949
11/70R22.5	*0.468*		1.286	1.223	1.166	1.157	1.101	1.084	1.029	0.955
8.25-20	*0.468*		1.286	1.223	1.166	1.157	1.101	1.084	1.029	0.955
8.25R20	*0.470*		1.291	1.228	1.171	1.162	1.106	1.089	1.033	0.959
9R22.5	*0.470*		1.291	1.228	1.171	1.162	1.106	1.089	1.033	0.959
295/70R22.5	*0.479*		1.316	1.252	1.194	1.185	1.127	1.110	1.053	0.978
9.00-20	*0.490*			1.281	1.221	1.212	1.153	1.135	1.077	1.000
275/80R22.5	*0.491*			1.283	1.224	1.214	1.155	1.138	1.079	1.002
10R22.5	*0.492*			1.286	1.226	1.217	1.157	1.140	1.081	1.004
9.00R20	*0.492*			1.286	1.226	1.217	1.157	1.140	1.081	1.004
295/75R22.5	*0.493*			1.289	1.229	1.219	1.160	1.142	1.084	1.006
295/80R22.5	*0.505*				1.259	1.249	1.188	1.170	1.110	1.031
10.00-20	*0.506*				1.261	1.251	1.190	1.172	1.112	1.033
11.1-20	*0.506*				1.261	1.251	1.190	1.172	1.112	1.033
10.00R20	*0.508*				1.266	1.256	1.195	1.177	1.117	1.037
11.1R20	*0.508*				1.266	1.256	1.195	1.177	1.117	1.037
11R22.5	*0.508*				1.266	1.256	1.195	1.177	1.117	1.037
11.00-20	*0.520*				1.296	1.286	1.223	1.205	1.143	1.061
315/80R22.5	*0.520*				1.296	1.286	1.223	1.205	1.143	1.061
11.00R20	*0.523*				1.303	1.294	1.230	1.212	1.150	1.067
12R22.5	*0.523*				1.303	1.294	1.230	1.212	1.150	1.067
12.00-20	*0.539*						1.268	1.249	1.185	1.100
12.00R20	*0.542*						1.275	1.256	1.191	1.106
12.00-24	*0.593*								1.304	1.210
12.00R24	*0.594*								1.306	1.212

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		REAR AXLE GEAR RATIO						
TIRE SIZE	RADIUS	5.285	5.428	5.857	6.142	6.428	6.833	7.166
215/70R17.5	0.364							
195/80R17.5	0.367							
205/80R17.5	0.374	0.758						
235/70R17.5	0.376	0.762						
7.50-16	0.383	0.776	0.756					
7.50R16	0.387	0.785	0.764					
225/80R17.5	0.389	0.789	0.768					
225/70R19.5	0.395	0.801	0.780					
8.25-16	0.404	0.819	0.797					
245/70R19.5	0.407	0.825	0.803					
8.25R16	0.409	0.829	0.807					
225/90R17.5	0.410	0.831	0.809	0.750				
9.00-16	0.420	0.851	0.829	0.768				
265/70R19.5	0.421	0.854	0.831	0.770				
7.50-18	0.423	0.858	0.835	0.774				
7.50R18	0.426	0.864	0.841	0.779				
265/60R22.5	0.438	0.888	0.865	0.801	0.764			
235/70R22.5	0.440	0.892	0.869	0.805	0.768			
7.50-20	0.446	0.908	0.884	0.820	0.781			
285/60R22.5	0.450	0.912	0.888	0.823	0.785	0.750		
7.50R20	0.452	0.916	0.892	0.827	0.788	0.753		
255/70R22.5	0.453	0.918	0.894	0.829	0.790	0.755		
275/70R22.5	0.465	0.943	0.918	0.851	0.811	0.775		
11/70R22.5	0.468	0.949	0.924	0.856	0.816	0.780		
8.25-20	0.468	0.949	0.924	0.856	0.816	0.780		
8.25R20	0.470	0.953	0.928	0.860	0.820	0.783		
9R22.5	0.470	0.953	0.928	0.860	0.820	0.783		
295/70R22.5	0.479	0.971	0.946	0.876	0.836	0.798	0.751	
9.00-20	0.490	0.993	0.967	0.896	0.855	0.817	0.768	
275/80R22.5	0.491	0.995	0.969	0.898	0.857	0.818	0.770	
10R22.5	0.492	0.998	0.971	0.900	0.858	0.820	0.771	
9.00R20	0.492	0.998	0.971	0.900	0.858	0.820	0.771	
295/75R22.5	0.493	1.000	0.973	0.902	0.860	0.822	0.773	
295/80R22.5	0.505	1.024	0.997	0.924	0.881	0.842	0.792	0.755
10.00-20	0.506	1.026	0.999	0.926	0.883	0.843	0.793	0.757
11.1-20	0.506	1.026	0.999	0.926	0.883	0.843	0.793	0.757
10.00R20	0.508	1.030	1.003	0.929	0.886	0.847	0.797	0.759
11.1R20	0.508	1.030	1.003	0.929	0.886	0.847	0.797	0.759
11R22.5	0.508	1.030	1.003	0.929	0.886	0.847	0.797	0.759
11.00-20	0.520	1.054	1.027	0.951	0.907	0.867	0.815	0.777
315/80R22.5	0.520	1.054	1.027	0.951	0.907	0.867	0.815	0.777
11.00R20	0.523	1.060	1.032	0.957	0.912	0.872	0.820	0.782
12R22.5	0.523	1.060	1.032	0.957	0.912	0.872	0.820	0.782
12.00-20	0.539	1.093	1.064	0.986	0.940	0.898	0.845	0.806
12.00R20	0.542	1.099	1.070	0.992	0.946	0.903	0.850	0.810
12.00-24	0.593	1.202	1.171	1.085	1.035	0.989	0.930	0.887
12.00R24	0.594	1.204	1.173	1.087	1.036	0.990	0.931	0.888

M12010100076

ZF TRANSMISSION

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS	3.636	3.727	3.900	4.100	4.300	4.333	4.555	4.625	4.875
7.50-16	0.383	0.678	0.661	0.632	0.601	0.573	0.569	0.541	0.533	0.506
7.50R16	0.387	0.685	0.668	0.639	0.608	0.579	0.575	0.547	0.538	0.511
235/75R17.5	0.387	0.685	0.668	0.639	0.608	0.579	0.575	0.547	0.538	0.511
225/80R17.5	0.389	0.689	0.672	0.642	0.611	0.582	0.578	0.550	0.541	0.513
225/70R19.5	0.395	0.699	0.682	0.652	0.620	0.591	0.587	0.558	0.550	0.521
8.25-16	0.404	0.715	0.698	0.667	0.634	0.605	0.600	0.571	0.562	0.533
245/70R19.5	0.407	0.721	0.703	0.672	0.639	0.609	0.605	0.575	0.566	0.537
8.25R16	0.409	0.724	0.706	0.675	0.642	0.612	0.608	0.578	0.569	0.540
9.5R17.5	0.409	0.724	0.706	0.675	0.642	0.612	0.608	0.578	0.569	0.540
225/90R17.5	0.410	0.726	0.708	0.677	0.644	0.614	0.609	0.579	0.571	0.541
9.00-16	0.420	0.744	0.725	0.693	0.659	0.629	0.624	0.593	0.584	0.554
265/70R19.5	0.421	0.745	0.727	0.695	0.661	0.630	0.625	0.595	0.586	0.556
7.50-18	0.423	0.749	0.731	0.698	0.664	0.633	0.628	0.598	0.589	0.558
7.50R18	0.426	0.754	0.736	0.703	0.669	0.638	0.633	0.602	0.593	0.562
9R19.5	0.433	0.767	0.748	0.715	0.680	0.648	0.643	0.612	0.603	0.572
265/60R22.5	0.438	0.775	0.756	0.723	0.688	0.656	0.651	0.619	0.610	0.578
235/70R22.5	0.440	0.779	0.760	0.726	0.691	0.659	0.654	0.622	0.612	0.581
7.50-20	0.448	0.793	0.774	0.739	0.703	0.671	0.665	0.633	0.623	0.591
285/60R22.5	0.450	0.797	0.777	0.743	0.706	0.674	0.668	0.636	0.626	0.594
7.50R20	0.452	0.800	0.781	0.746	0.710	0.677	0.671	0.639	0.629	0.597
255/70R22.5	0.453	0.802	0.782	0.748	0.711	0.678	0.673	0.640	0.630	0.598
275/70R22.5	0.465			0.768	0.730	0.696	0.691	0.657	0.647	0.614
11/70R22.5	0.468			0.772	0.735	0.701	0.695	0.661	0.651	0.618

M12010100077

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS	3.636	3.727	3.900	4.100	4.300	4.333	4.555	4.625	4.875
8.25-20	0.468			0.772	0.735	0.701	0.695	0.661	0.651	0.618
8.25R20	0.470			0.776	0.738	0.704	0.698	0.664	0.654	0.621
9R22.5	0.470			0.776	0.738	0.704	0.698	0.664	0.654	0.621
265/75R22.5	0.474				0.744	0.710	0.704	0.670	0.660	0.626
295/70R22.5	0.479				0.752	0.717	0.712	0.677	0.667	0.632
9.00-20	0.490				0.769	0.734	0.728	0.692	0.682	0.647
275/80R22.5	0.491				0.771	0.735	0.729	0.694	0.683	0.648
9.00R20	0.492				0.772	0.737	0.731	0.695	0.685	0.650
10R22.5	0.492				0.772	0.737	0.731	0.695	0.685	0.650
295/75R22.5	0.493				0.774	0.738	0.732	0.697	0.686	0.651
295/80R22.5	0.505					0.756	0.750	0.714	0.703	0.667
10.00-20	0.506					0.757	0.752	0.715	0.704	0.668
11.1-20	0.506					0.757	0.752	0.715	0.704	0.668
10.00R20	0.508					0.760	0.755	0.718	0.707	0.671
11.1R20	0.508					0.760	0.755	0.718	0.707	0.671
11R22.5	0.508					0.760	0.755	0.718	0.707	0.671
11.00-20	0.520					0.778	0.773	0.735	0.724	0.687
315/80R22.5	0.520					0.778	0.773	0.735	0.724	0.687
11.00R20	0.523					0.783	0.777	0.739	0.728	0.691
12R22.5	0.523					0.783	0.777	0.739	0.728	0.691
12.00-20	0.539							0.762	0.750	0.712
12.00R20	0.542							0.766	0.754	0.716
12.00-24	0.593									0.783
12.00R24	0.594									0.784

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		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS	5.125	5.250	5.285	5.428	5.857	6.142	6.428	6.833	7.166
7.50-16	0.383	0.481	0.469	0.466	0.454					
7.50R16	0.387	0.486	0.474	0.471	0.459					
235/75R17.5	0.387	0.486	0.474	0.471	0.459					
225/80R17.5	0.389	0.488	0.477	0.474	0.461					
225/70R19.5	0.395	0.496	0.484	0.481	0.468					
8.25-16	0.404	0.507	0.495	0.492	0.479					
245/70R19.5	0.407	0.511	0.499	0.496	0.482					
8.25R16	0.409	0.514	0.501	0.498	0.485					
9.5R17.5	0.409	0.514	0.501	0.498	0.485					
225/90R17.5	0.410	0.515	0.503	0.499	0.486					
9.00-16	0.420	0.527	0.515	0.511	0.498	0.461				
265/70R19.5	0.421	0.529	0.516	0.513	0.499	0.463				
7.50-18	0.423	0.531	0.518	0.515	0.501	0.465				
7.50R18	0.426	0.535	0.522	0.519	0.505	0.468	0.446			
9R19.5	0.433	0.544	0.531	0.527	0.513	0.476	0.454			
265/60R22.5	0.438	0.550	0.537	0.533	0.519	0.481	0.459			
235/70R22.5	0.440	0.553	0.539	0.536	0.522	0.483	0.461			
7.50-20	0.448	0.563	0.549	0.546	0.531	0.492	0.469			
285/60R22.5	0.450	0.565	0.552	0.548	0.534	0.494	0.471			
7.50R20	0.452	0.568	0.554	0.550	0.536	0.497	0.474			
255/70R22.5	0.453	0.569	0.555	0.552	0.537	0.498	0.475			
275/70R22.5	0.465	0.584	0.570	0.566	0.551	0.511	0.487	0.465		
11/70R22.5	0.468	0.588	0.574	0.570	0.555	0.514	0.490	0.468		

M12010100079

		REAR AXLE GEAR RATIO								
TIRE SIZE	RADIUS	5.125	5.250	5.285	5.428	5.857	6.142	6.428	6.833	7.166
8.25-20	0.468	0.588	0.574	0.570	0.555	0.514	0.490	0.468		
8.25R20	0.470	0.590	0.576	0.572	0.557	0.516	0.492	0.470		
9R22.5	0.470	0.590	0.576	0.572	0.557	0.516	0.492	0.470		
265/75R22.5	0.474	0.595	0.581	0.577	0.562	0.521	0.497	0.474		
295/70R22.5	0.479	0.602	0.587	0.583	0.568	0.526	0.502	0.479		
9.00-20	0.490	0.615	0.601	0.597	0.581	0.538	0.513	0.491	0.461	
275/80R22.5	0.491	0.617	0.602	0.598	0.582	0.539	0.514	0.492	0.462	
9.00R20	0.492	0.618	0.603	0.599	0.583	0.541	0.515	0.493	0.463	
10R22.5	0.492	0.618	0.603	0.599	0.583	0.541	0.515	0.493	0.463	
295/75R22.5	0.493	0.619	0.604	0.600	0.585	0.542	0.517	0.494	0.464	
295/80R22.5	0.505	0.634	0.619	0.615	0.599	0.555	0.529	0.506	0.476	
10.00-20	0.506	0.635	0.620	0.616	0.600	0.556	0.530	0.507	0.476	
11.1-20	0.506	0.635	0.620	0.616	0.600	0.556	0.530	0.507	0.476	
10.00R20	0.508	0.638	0.623	0.619	0.602	0.558	0.532	0.509	0.478	
11.1R20	0.508	0.638	0.623	0.619	0.602	0.558	0.532	0.509	0.478	
11R22.5	0.508	0.638	0.623	0.619	0.602	0.558	0.532	0.509	0.478	
11.00-20	0.520	0.653	0.637	0.633	0.617	0.571	0.545	0.521	0.490	0.467
315/80R22.5	0.520	0.653	0.637	0.633	0.617	0.571	0.545	0.521	0.490	0.467
11.00R20	0.523	0.657	0.641	0.637	0.620	0.575	0.548	0.524	0.493	0.470
12R22.5	0.523	0.657	0.641	0.637	0.620	0.575	0.548	0.524	0.493	0.470
12.00-20	0.539	0.677	0.661	0.656	0.639	0.592	0.565	0.540	0.508	0.484
12.00R20	0.542	0.681	0.664	0.660	0.643	0.596	0.568	0.543	0.510	0.487
12.00-24	0.593	0.745	0.727	0.722	0.703	0.652	0.621	0.594	0.559	0.533
12.00R24	0.594	0.746	0.728	0.723	0.704	0.653	0.622	0.595	0.559	0.533

M12010100080

EATON T/M (SPEEDOMETER CORRECTION RATE 0.96)

		REAR AXLE GEAR RATIO											
TIRE SIZE	RADIUS	3.636	3.727	3.900	4.100	4.300	4.333	4.555	4.625	4.875	5.125	5.250	5.285
7.50-16	0.383	1.024	0.999	0.955	0.908	0.866	0.859	0.817	0.805	0.764	0.726	0.709	0.704
7.50R16	0.387	1.035	1.010	0.965	0.918	0.875	0.868	0.826	0.813	0.772	0.734	0.717	0.712
235/75R17.5	0.387	1.035	1.010	0.965	0.918	0.875	0.868	0.826	0.813	0.772	0.734	0.717	0.712
225/80R17.5	0.389	1.040	1.015	0.970	0.922	0.880	0.873	0.830	0.818	0.776	0.738	0.720	0.716
225/70R19.5	0.395	1.056	1.031	0.985	0.937	0.893	0.886	0.843	0.830	0.788	0.749	0.731	0.727
8.25-16	0.404	1.080	1.054	1.007	0.958	0.913	0.907	0.862	0.849	0.806	0.766	0.748	0.743
245/70R19.5	0.407	1.088	1.062	1.015	0.965	0.920	0.913	0.869	0.856	0.812	0.772	0.754	0.749
8.25R16	0.409	1.094	1.067	1.020	0.970	0.925	0.918	0.873	0.860	0.816	0.776	0.757	0.752
9.5R17.5	0.409	1.094	1.067	1.020	0.970	0.925	0.918	0.873	0.860	0.816	0.776	0.757	0.752
225/90R17.5	0.410	1.096	1.070	1.022	0.972	0.927	0.920	0.875	0.862	0.819	0.778	0.759	0.754
9.00-16	0.420	1.123	1.096	1.047	0.996	0.950	0.942	0.896	0.883	0.838	0.797	0.778	0.773
265/70R19.5	0.421	1.126	1.098	1.050	0.998	0.952	0.945	0.899	0.885	0.840	0.799	0.780	0.774
7.50-18	0.423	1.131	1.104	1.055	1.003	0.956	0.949	0.903	0.689	0.844	0.802	0.783	0.778
7.50R18	0.426	1.139	1.111	1.062	1.010	0.963	0.956	0.909	0.896	0.850	0.808	0.789	0.784
9R19.5	0.433	1.158	1.130	1.080	1.027	0.979	0.972	0.924	0.910	0.864	0.821	0.802	0.797
265/60R22.5	0.438	1.171	1.143	1.092	1.039	0.990	0.983	0.935	0.921	0.874	0.831	0.811	0.806
235/70R22.5	0.440	1.177	1.148	1.097	1.043	0.995	0.987	0.939	0.925	0.878	0.835	0.815	0.809
7.50-20	0.448	1.198	1.169	1.117	1.062	1.013	1.005	0.956	0.942	0.893	0.850	0.830	0.824
285/60R22.5	0.450	1.203	1.174	1.122	1.067	1.018	1.010	0.961	0.946	0.897	0.854	0.833	0.828
7.50R20	0.452	1.209	1.179	1.127	1.072	1.022	1.014	0.965	0.950	0.901	0.857	0.837	0.831
255/70R22.5	0.453	1.211	1.182	1.129	1.074	1.024	1.017	0.967	0.952	0.903	0.859	0.839	0.833
275/70R22.5	0.465			1.159	1.103	1.051	1.043	0.993	0.978	0.927	0.882	0.861	0.855
11/70R22.5	0.468			1.167	1.110	1.058	1.050	0.999	0.984	0.933	0.888	0.867	0.861
8.25-20	0.468			1.167	1.110	1.058	1.050	0.999	0.984	0.933	0.888	0.867	0.861
8.25R20	0.470			1.172	1.115	1.063	1.055	1.003	0.988	0.937	0.892	0.870	0.865
9R22.5	0.470			1.172	1.115	1.063	1.055	1.003	0.988	0.937	0.892	0.870	0.865
265/75R22.5	0.474				1.124	1.072	1.064	1.012	0.998	0.945	0.899	0.878	0.872
295/70R22.5	0.479				1.136	1.083	1.075	1.022	1.007	0.955	0.909	0.887	0.881
9.00-20	0.490				1.162	1.108	1.100	1.046	1.030	0.977	0.930	0.907	0.901
275/80R22.5	0.491				1.164	1.110	1.102	1.048	1.032	0.979	0.931	0.909	0.903
9.00R20	0.492				1.167	1.113	1.104	1.050	1.034	0.981	0.933	0.911	0.905
10R22.5	0.492				1.167	1.113	1.104	1.050	1.034	0.981	0.933	0.911	0.905
295/75R22.5	0.493				1.169	1.115	1.106	1.052	1.036	0.983	0.935	0.913	0.907
295/80R22.5	0.505					1.142	1.133	1.078	1.062	1.007	0.958	0.935	0.929
10.00-20	0.506					1.144	1.136	1.080	1.064	1.009	0.960	0.937	0.931
11.1-20	0.506					1.144	1.136	1.080	1.064	1.009	0.960	0.937	0.931
10.00R20	0.508					1.149	1.140	1.084	1.068	1.013	0.964	0.941	0.935
11.1R20	0.508					1.149	1.140	1.084	1.068	1.013	0.964	0.941	0.935
11R22.5	0.508					1.149	1.140	1.084	1.068	1.013	0.964	0.941	0.935
11.00-20	0.520					1.176	1.167	1.110	1.093	1.037	0.987	0.963	0.957
315/80R22.5	0.520					1.176	1.167	1.110	1.093	1.037	0.987	0.963	0.957
11.00R20	0.523					1.183	1.174	1.116	1.100	1.043	0.992	0.969	0.962
12R22.5	0.523					1.183	1.174	1.116	1.100	1.043	0.992	0.969	0.962
12.00-20	0.539							1.151	1.133	1.075	1.023	0.998	0.992
12.00R20	0.542							1.157	1.140	1.081	1.028	1.004	0.997
12.00-24	0.593									1.183	1.125	1.098	1.091
12.00R24	0.594									1.185	1.127	1.100	1.093

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		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS	5.428	5.857	6.142	6.428	6.833	7.166
7.50-16	0.383	0.686					
7.50R16	0.387	0.693					
235/75R17.5	0.387	0.693					
225/80R17.5	0.389	0.697					
225/70R19.5	0.395	0.707					
8.25-16	0.404	0.724					
245/70R19.5	0.407	0.729					
8.25R16	0.409	0.733					
9.5R17.5	0.409	0.733					
225/90R17.5	0.410	0.734					
9.00-16	0.420	0.752	0.697				
265/70R19.5	0.421	0.754	0.699				
7.50-18	0.423	0.758	0.702				
7.50R18	0.426	0.763	0.707	0.674			
9R19.5	0.433	0.776	0.719	0.685			
265/60R22.5	0.438	0.784	0.727	0.693			
235/70R22.5	0.440	0.788	0.730	0.696			
7.50-20	0.448	0.802	0.744	0.709			
285/60R22.5	0.450	0.806	0.747	0.712			
7.50R20	0.452	0.810	0.750	0.715			
255/70R22.5	0.453	0.811	0.752	0.717			
275/70R22.5	0.465	0.833	0.772	0.736	0.703		
11/70R22.5	0.468	0.838	0.777	0.741	0.708		
8.25-20	0.468	0.838	0.777	0.741	0.708		
8.25R20	0.470	0.842	0.780	0.744	0.711		
9R22.5	0.470	0.842	0.780	0.744	0.711		
265/75R22.5	0.474	0.849	0.787	0.750	0.717		
295/70R22.5	0.479	0.858	0.795	0.758	0.724		
9.00-20	0.490	0.878	0.813	0.776	0.741	0.697	
275/80R22.5	0.491	0.879	0.815	0.777	0.743	0.699	
9.00R20	0.492	0.881	0.817	0.779	0.744	0.700	
10R22.5	0.492	0.881	0.817	0.779	0.744	0.700	
295/75R22.5	0.493	0.883	0.818	0.780	0.746	0.701	
295/80R22.5	0.505	0.905	0.838	0.799	0.764	0.718	
10.00-20	0.506	0.906	0.840	0.801	0.765	0.720	
11.1-20	0.506	0.906	0.840	0.801	0.765	0.720	
10.00R20	0.508	0.910	0.843	0.804	0.768	0.723	
11.1R20	0.508	0.910	0.843	0.804	0.768	0.723	
11R22.5	0.508	0.910	0.843	0.804	0.768	0.723	
11.00-20	0.520	0.931	0.863	0.823	0.786	0.740	0.705
315/80R22.5	0.520	0.931	0.863	0.823	0.786	0.740	0.705
11.00R20	0.523	0.937	0.868	0.828	0.791	0.744	0.709
12R22.5	0.523	0.937	0.868	0.828	0.791	0.744	0.709
12.00-20	0.539	0.965	0.895	0.853	0.815	0.767	0.731
12.00R20	0.542	0.971	0.900	0.858	0.820	0.771	0.735
12.00-24	0.593	1.062	0.984	0.939	0.897	0.844	0.805
12.00R24	0.594	1.064	0.986	0.940	0.898	0.845	0.806

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EATON T/M (SPEEDOMETER CORRECTION RATE 0.98)

		REAR AXLE GEAR RATIO											
TIRE SIZE	RADIUS	3.636	3.727	3.900	4.100	4.300	4.333	4.555	4.625	4.875	5.125	5.250	5.285
7.50-16	0.383	1.003	0.979	0.935	0.890	0.848	0.842	0.801	0.789	0.748	0.712	0.695	0.690
7.50R16	0.387	1.014	0.989	0.945	0.899	0.857	0.851	0.809	0.797	0.756	0.719	0.702	0.697
235/75R17.5	0.387	1.014	0.989	0.945	0.899	0.857	0.851	0.809	0.797	0.756	0.719	0.702	0.697
225/80R17.5	0.389	1.019	0.994	0.950	0.904	0.862	0.855	0.813	0.801	0.760	0.723	0.706	0.701
225/70R19.5	0.395	1.035	1.009	0.965	0.918	0.875	0.868	0.826	0.813	0.772	0.734	0.716	0.712
8.25-16	0.404	1.058	1.032	0.987	0.939	0.895	0.888	0.846	0.832	0.789	0.751	0.733	0.728
245/70R19.5	0.407	1.066	1.040	0.994	0.945	0.901	0.895	0.851	0.838	0.795	0.756	0.738	0.733
8.25R16	0.409	1.071	1.045	0.999	0.950	0.906	0.899	0.855	0.842	0.799	0.760	0.742	0.737
9.5R17.5	0.409	1.071	1.045	0.999	0.950	0.906	0.899	0.855	0.842	0.799	0.760	0.742	0.737
225/90R17.5	0.410	1.074	1.048	1.001	0.952	0.908	0.901	0.857	0.844	0.801	0.762	0.744	0.739
9.00-16	0.420	1.100	1.073	1.026	0.976	0.930	0.923	0.878	0.865	0.821	0.780	0.762	0.757
265/70R19.5	0.421	1.103	1.076	1.028	0.978	0.933	0.925	0.880	0.867	0.822	0.782	0.764	0.759
7.50-18	0.423	1.108	1.081	1.033	0.983	0.937	0.930	0.884	0.871	0.826	0.786	0.767	0.762
7.50R18	0.426	1.116	1.089	1.040	0.990	0.944	0.936	0.891	0.877	0.832	0.792	0.773	0.768
9R19.5	0.433	1.134	1.107	1.058	1.006	0.959	0.952	0.905	0.892	0.846	0.805	0.785	0.780
265/60R22.5	0.438	1.147	1.119	1.070	1.018	0.970	0.963	0.916	0.902	0.856	0.814	0.795	0.789
235/70R22.5	0.440	1.153	1.125	1.075	1.022	0.975	0.967	0.920	0.906	0.860	0.818	0.798	0.793
7.50-20	0.448	1.174	1.145	1.094	1.041	0.992	0.985	0.937	0.923	0.875	0.833	0.813	0.807
285/60R22.5	0.450	1.179	1.150	1.099	1.045	0.997	0.989	0.941	0.927	0.879	0.836	0.816	0.811
7.50R20	0.452	1.184	1.155	1.104	1.050	1.001	0.994	0.945	0.931	0.883	0.840	0.820	0.815
255/70R22.5	0.453	1.187	1.158	1.106	1.052	1.003	0.996	0.947	0.933	0.885	0.842	0.822	0.816
275/70R22.5	0.465			1.136	1.080	1.030	1.022	0.972	0.958	0.908	0.864	0.844	0.838
11/70R22.5	0.468			1.143	1.087	1.037	1.029	0.979	0.964	0.914	0.870	0.849	0.843
8.25-20	0.468			1.143	1.087	1.037	1.029	0.979	0.964	0.914	0.870	0.849	0.843
8.25R20	0.470			1.148	1.092	1.041	1.033	0.983	0.968	0.918	0.873	0.853	0.847
9R22.5	0.470			1.148	1.092	1.041	1.033	0.983	0.968	0.918	0.873	0.853	0.847
265/75R22.5	0.474				1.101	1.050	1.042	0.991	0.976	0.926	0.881	0.860	0.854
295/70R22.5	0.479				1.113	1.061	1.053	1.002	0.986	0.936	0.890	0.869	0.863
9.00-20	0.490				1.138	1.085	1.077	1.025	1.009	0.957	0.911	0.889	0.883
275/80R22.5	0.491				1.141	1.088	1.079	1.027	1.011	0.959	0.912	0.891	0.885
9.00R20	0.492				1.143	1.090	1.082	1.029	1.013	0.961	0.914	0.893	0.887
10R22.5	0.492				1.143	1.090	1.082	1.029	1.013	0.961	0.914	0.893	0.887
295/75R22.5	0.493				1.145	1.092	1.084	1.031	1.015	0.963	0.916	0.894	0.888
295/80R22.5	0.505					1.119	1.110	1.056	1.040	0.987	0.939	0.916	0.910
10.00-20	0.506					1.121	1.112	1.058	1.042	0.989	0.940	0.918	0.912
11.1-20	0.506					1.121	1.112	1.058	1.042	0.989	0.940	0.918	0.912
10.00R20	0.508					1.125	1.117	1.062	1.046	0.993	0.944	0.922	0.915
11.1R20	0.508					1.125	1.117	1.062	1.046	0.993	0.944	0.922	0.915
11R22.5	0.508					1.125	1.117	1.062	1.046	0.993	0.944	0.922	0.915
11.00-20	0.520					1.152	1.143	1.087	1.071	1.016	0.966	0.943	0.937
315/80R22.5	0.520					1.152	1.143	1.087	1.071	1.016	0.966	0.943	0.937
11.00R20	0.523					1.159	1.150	1.094	1.077	1.022	0.972	0.949	0.943
12R22.5	0.523					1.159	1.150	1.094	1.077	1.022	0.972	0.949	0.943
12.00-20	0.539							1.127	1.110	1.053	1.002	0.978	0.971
12.00R20	0.542							1.133	1.116	1.059	1.007	0.983	0.977
12.00-24	0.593									1.159	1.102	1.076	1.069
12.00R24	0.594									1.181	1.104	1.078	1.071

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		REAR AXLE GEAR RATIO					
TIRE SIZE	RADIUS	5.428	5.857	6.142	6.428	6.833	7.166
7.50-16	0.383	0.672					
7.50R16	0.387	0.679					
235/75R17.5	0.387	0.679					
225/80R17.5	0.389	0.682					
225/70R19.5	0.395	0.693					
8.25-16	0.404	0.709					
245/70R19.5	0.407	0.714					
8.25R16	0.409	0.718					
9.5R17.5	0.409	0.718					
225/90R17.5	0.410	0.719					
9.00-16	0.420	0.737	0.683				
265/70R19.5	0.421	0.739	0.684				
7.50-18	0.423	0.742	0.688				
7.50R18	0.426	0.747	0.693	0.660			
9R19.5	0.433	0.760	0.704	0.671			
265/60R22.5	0.438	0.768	0.712	0.679			
235/70R22.5	0.440	0.772	0.715	0.682			
7.50-20	0.448	0.786	0.728	0.695			
285/60R22.5	0.450	0.790	0.732	0.698			
7.50R20	0.452	0.793	0.735	0.701			
255/70R22.5	0.453	0.795	0.737	0.702			
275/70R22.5	0.465	0.816	0.756	0.721	0.689		
11/70R22.5	0.468	0.821	0.761	0.726	0.693		
8.25-20	0.468	0.821	0.761	0.726	0.693		
8.25R20	0.470	0.825	0.764	0.729	0.696		
9R22.5	0.470	0.825	0.764	0.729	0.696		
265/75R22.5	0.474	0.832	0.771	0.735	0.702		
295/70R22.5	0.479	0.840	0.779	0.743	0.710		
9.00-20	0.490	0.860	0.797	0.760	0.726	0.683	
275/80R22.5	0.491	0.862	0.798	0.761	0.727	0.684	
9.00R20	0.492	0.863	0.800	0.763	0.729	0.686	
10R22.5	0.492	0.863	0.800	0.763	0.729	0.686	
295/75R22.5	0.493	0.865	0.802	0.764	0.730	0.687	
295/80R22.5	0.505	0.886	0.821	0.783	0.748	0.704	
10.00-20	0.506	0.888	0.823	0.785	0.750	0.705	
11.1-20	0.506	0.888	0.823	0.785	0.750	0.705	
10.00R20	0.508	0.891	0.826	0.788	0.753	0.708	
11.1R20	0.508	0.891	0.826	0.788	0.753	0.708	
11R22.5	0.508	0.891	0.826	0.788	0.753	0.708	
11.00-20	0.520	0.912	0.846	0.806	0.770	0.725	0.691
315/80R22.5	0.520	0.912	0.846	0.806	0.770	0.725	0.691
11.00R20	0.523	0.918	0.850	0.811	0.775	0.729	0.695
12R22.5	0.523	0.918	0.850	0.811	0.775	0.729	0.696
12.00-20	0.539	0.946	0.876	0.836	0.799	0.751	0.716
12.00R20	0.542	0.951	0.881	0.840	0.803	0.755	0.720
12.00-24	0.593	1.041	0.964	0.920	0.879	0.827	0.788
12.00R24	0.594	1.042	0.966	0.921	0.880	0.828	0.789

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ELECTRIC WIRE

EL02-001

DIAGRAM..... EL02-2
HOW TO USE THIS CHAPTER.....EL02-2
SPECIFICATION SYMBOL LIST EL02-4
DIAGRAM EL02-16
WIRE TO WIRE CONNECTOR EL02-88

DIAGRAM

HOW TO USE THIS CHAPTER

M12020101BEJ1001

- In this chapter, "specification symbols" are used as prefix of each wiring diagram in order to specify the circuits that are different in accordance with the models and specifications. For further detail on how to use this chapter, refer to "1. Description of specification symbol list" and "2. Description of wiring diagram".

1. Description of specification symbol list

a		b	c	d	e
Circuit name		Specification symbol	Specifications	Remarks	Page
A	METER CIRCUIT (CAB SIDE)	□	Common to all models	○	EL02-16
		⊠	Except for models with P11C engine	○	
		⊟	Models with P11C engine		
		△	Models equipped with air over hydraulic brake (without brake-lock)	○	
		⧋	Models equipped with air over hydraulic brake (with brake-lock)		
		▽	Models equipped with center parking brake	○	
		⌁	Models equipped with wheel parking brake		
		⊖	Models equipped with brake-lock (as option)		
		▭	Models equipped with mechanical governor	○	
		⊠	Models for Australia and New Zealand		
		✡	For tractor models		

M12020100104

a. Circuit name
Designates the circuit names on the wiring diagram.

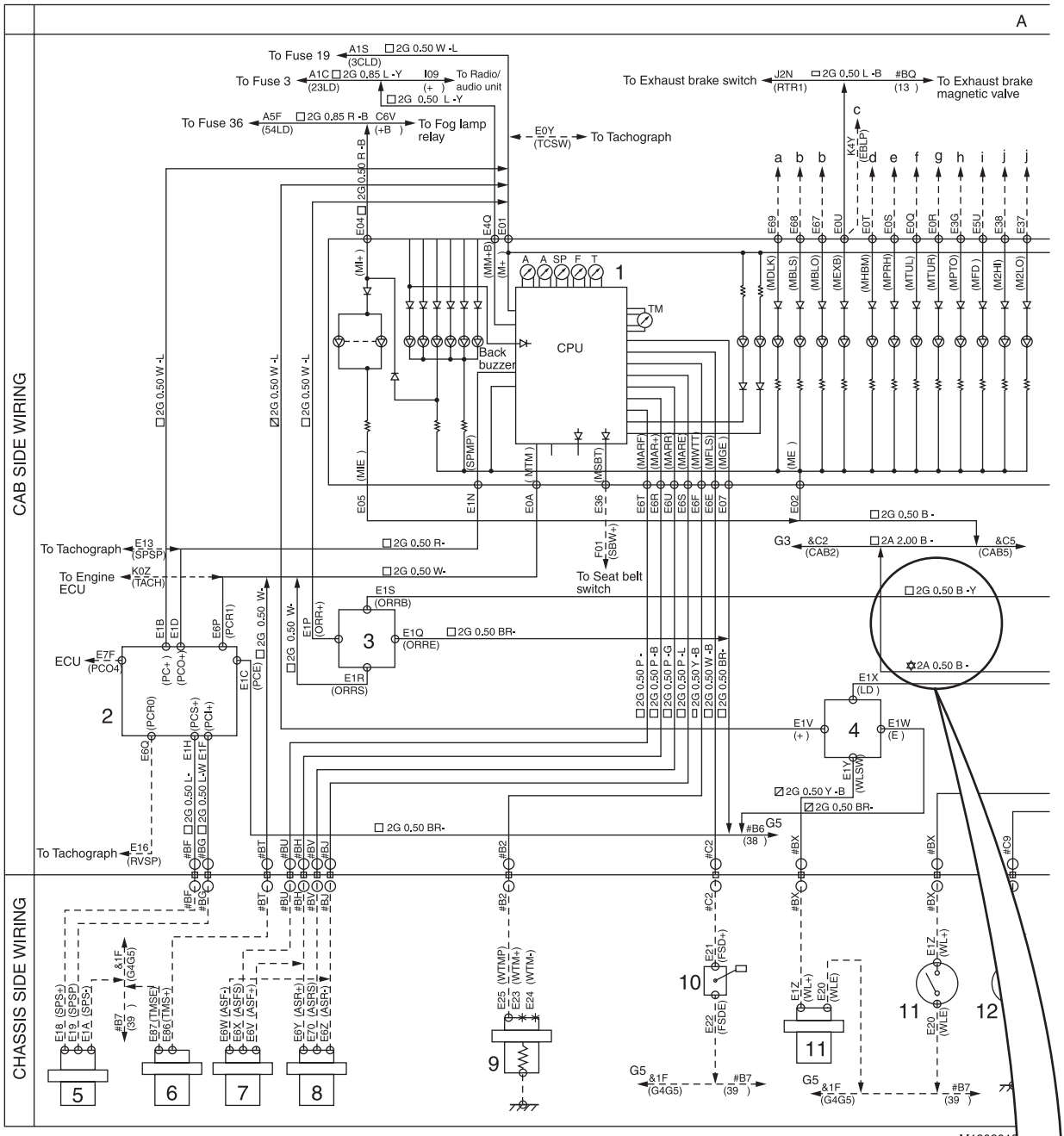
b. Specification symbol
This is the symbol of the specification listed on the "Specifications" column. On the wiring diagram, this symbol is prefixed to all the wiring type mark (example: 2G 0.50 W-L).
Each wiring is installed only on the vehicles of the specifications that the relevant specification symbol designates.

c. Specifications
Describes the contents of specifications that each specification symbol designates. All the wirings are classified according to the specifications listed here.

d. Remarks
"O" means that this is the wiring common to all the models on this manual. Model name means that this is the wiring relating only to that model. The blank means that this is the wiring not relating to the models covered by this manual.

e. Page
Indicates the page where the relevant wiring diagram is found.

2. Description of wiring diagram



This is the circuit name.

A. METER CIRCUIT (CAB SIDE)

1. Combination meter
2. Pulse adjust computer
3. Over revolution detector
4. Coolant level warning relay
5. Speed sensor
6. Tachometer sensor
7. Front air gauge sensor
8. Rear air gauge sensor
9. Coolant temperature gauge sender unit
10. Fuel gauge sender unit
11. Coolant level warning switch
12. Oil pressure warning switch
13. Warning buzzer
14. Center parking brake switch
15. Trailer hand brake switch
16. Brake-lock short-circuit connector
17. Warning lamp check relay
18. Low oil pressure warning switch
19. Brake adjust warning switch
20. Brake fluid level warning switch
21. Spring brake switch
22. Buzzer cancel switch

This is name of the parts on the diagram and the number corresponds to that on the diagram.

Specification symbol (□,✡,etc.)

Each wiring is installed to the vehicles relevant to the specification that the specification symbol designates.

M12020100105

SPECIFICATION SYMBOL LIST

M12020101BEJ1002

Circuit name		Specification symbol	Specifications	Remarks	Page
A	METER CIRCUIT (CAB SIDE)	□	Common to all models	O	EL02-16
		⊠	Except for models with P11C engine	O	
		⊟	Models with P11C engine		
		△	Models equipped with air over hydraulic brake (without brake-lock)	O	
		⧋	Models equipped with air over hydraulic brake (with brake-lock)	O	
		▽	Models equipped with center parking brake	O	
		⌒	Models equipped with wheel parking brake		
		⊖	Models equipped with brake-lock (as option)	O	
		▭	Models equipped with mechanical governor	O	
		⊠	Models for Australia and New Zealand	O	
		✡	For tractor models		

Circuit name		Specification symbol	Specifications	Remarks	Page
B	METER CIRCUIT (CHASSIS SIDE 1)	□	Common to all models	○	EL02-20
		◪	Models with automatic transmission		
		⋈	For tractor models		
		⊖	Models equipped with air over hydraulic brake	○	
		⊕	Models without air tank for auxiliary equipment	○	
		⊠	Models with one pointer type air pressure gauge		
		△△	Models with two pointers type air pressure gauge	○	
		✡	Models with air tank for auxiliary equipment	○	
		△	Models for Australia	○	
		⧋	Except for models for Australia	○	
		⊗	Models equipped with air over hydraulic brake (with ABS)	○	
		▽	Models FG, GH, FL, FM, SG (with air over hydraulic brake and ABS)		
		○	Models FT, GT (without ABS)		
		◍	Models FT, GT (with ABS)		

Circuit name		Specification symbol	Specifications	Remarks	Page
C	METER CIRCUIT (CHASSIS SIDE 2)	□	Common to all models	O	EL02-22
		⊟	Model FC3J		
		◪	Models with J08C engine		
		⌁	Models FT, GT (except for tractor models)		
		◍	Models FT, GT (for tractor models)		
		△	Models with J08C-TI engine		
		⊕	Model FC4J	O	
		⊠	Models with P11C engine		
		○	Except for models with P11C engine	O	
D	POWER SUPPLY CIRCUIT	□	Common to all models	O	EL02-24
		◪	Models equipped with power mirror		
		⊟	Models equipped with electromagnetic retarder		
		△	Models equipped with electronic governor		
		⏃	Models with transfer or automatic transmission		
		⋈	Models equipped with P.T.O.	O	
		⊞	Models equipped with P11C engine (with intake air heater)		
		⊠	Models equipped with P11C engine (without intake air heater)		
		⊕	For double cab models		
E	HOUR METER CIRCUIT	◪	Models equipped with hour meter		EL02-26
F	EXHAUST BRAKE CIRCUIT (EXCEPT FOR MODELS WITH AUTOMATIC TRANSMISSION AND ALL MODELS WITH P11C ENGINE)	◪	Models with manual transmission	O	EL02-27
		△	Models without ABS	O	
		⊕	Models equipped with ABS	O	

Circuit name		Specification symbol	Specifications	Remarks	Page
G	EXHAUST BRAKE CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)		Models with automatic transmission		EL02-28
			Models without ABS		
			Models equipped with ABS		
H	EXHAUST BRAKE CIRCUIT (MODELS WITH P11C ENGINE)		Models with P11C engine		EL02-29
			Models equipped with TE system		
			Models equipped with ABS		
I	TACHOGRAPH CIRCUIT		Common to all models		EL02-30
J	HEAD LAMP, FRONT FOG LAMP AND REAR COMBINATION LAMP CIRCUIT (CAB SIDE)		Common to all models	○	EL02-32
			Models equipped with halogen head lamps	○	
			Models equipped with rear fog lamp		
			Models equipped with discharge head lamps		
			Models without parking lamp	○	
			Models equipped with parking lamp (for tractor models)		
			Models equipped with parking lamp (except for tractor models)	○	
			For tractor models		
			Except for tractor models	○	
			Models equipped with wheel parking brake for Hong Kong		
			Models equipped with parking lamp (as option)	○	
K	REAR FOG LAMP CIRCUIT (CAB SIDE)		Models equipped with rear fog lamp		EL02-33
L	MARKER LAMP CIRCUIT (CAB SIDE)		Models equipped with roof marker lamp	○	EL02-33
			Models equipped with front side marker lamp		
			Models equipped with rear fog lamp		

Circuit name		Specification symbol	Specifications	Remarks	Page
M	HEAD LAMP, FRONT FOG LAMP AND REAR COMBINATION LAMP CIRCUIT (CHASSIS SIDE)	□	Common to all models	O	EL02-34
		⊠	For full-tractor models		
		◪	Except for models FT, GT tractors	O	
		○	Models for mixer models	O	
		⊟	Models FT, GT		
		△	For tractor models		
N	REAR FOG LAMP CIRCUIT (CHASSIS SIDE)	⧋	Models equipped with rear fog lamp (except for models FT,GT)		EL02-35
		⋈	Models equipped with rear fog lamp (models FT,GT)		
O	MARKER LAMP CIRCUIT (CHASSIS SIDE)	–	–	–	EL02-35
P	TURN SIGNAL AND HAZARD LAMP CIRCUIT	□	Common to all models	O	EL02-36
		⊟	For tractor models		
		◪	Except for tractor models	O	
		△	For left-hand drive models with power window		
		⋈	Models without power window	O	
		⧋	For right-hand drive models with power window	O	
		⊠	For full-tractor models		
		▽	Except for models FT, GT tractors	O	
		⊗	Models for mixer models	O	
		○	Models FT, GT		
Q	SPOT LAMP CIRCUIT	⊟	For tractor models		EL02-38
R	HEAD LAMP CONTROL CIRCUIT	◪	Models equipped with head lamp beam level control switch	O	EL02-39

Circuit name		Specification symbol	Specifications	Remarks	Page
S	BACK-UP LAMP CIRCUIT (MODELS WITH MANUAL TRANSMISSION)		For tractor models (with two back-up lamps)		EL02-40
			With one back-up lamp	O	
			With two back-up lamps		
			For full-tractor models		
			For tractor models		
			Models FT, GT		
			Except models FT, GT	O	
			Models for mixer models	O	
			Models for Hong Kong		
			Except for models for Hong Kong	O	
T	BACK-UP LAMP CIRCUIT (MODELS WITH AUTO-MATIC TRANSMISSION)		Models with automatic transmission		EL02-41
U	ROOM LAMP CIRCUIT		With two room lamps	O	EL02-42
			Models equipped with fluorescent lamp		
			For double cab models		
			With one room lamp		
V	WIPER AND WASHER CIRCUIT		Common to all models	O	EL02-44
W	POWER MIRROR CIRCUIT		Models equipped with power mirror		EL02-45
X	HORN CIRCUIT		Common to all models	O	EL02-45
Y	CIGARETTE LIGHTER CIRCUIT		Common to all models	O	EL02-45
Z	SEAT BELT WARNING LAMP CIRCUIT		Models equipped with seat belt warning lamp	O	EL02-46
AA	POWER DOOR LOCK CIR-CUIT (FOR RIGHT-HAND DRIVE VEHICLE)		Models equipped with power door lock	O	EL02-46
			For double cab models		

Circuit name		Specification symbol	Specifications	Remarks	Page
AB	POWER DOOR LOCK CIRCUIT (FOR LEFT-HAND DRIVE VEHICLE)	⊠	Models equipped with power door lock		EL02-47
AC	POWER WINDOW CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)	⊠	Models equipped with power window	O	EL02-48
		△△	For double cab models		
AD	POWER WINDOW CIRCUIT (FOR LEFT-HAND DRIVE VEHICLE)	⊠	Models equipped with power window		EL02-49
AE	RADIO/AUDIO CIRCUIT	□	Common to all models	O	EL02-50
AF	DST-1 CIRCUIT	⊠	Models equipped with ABS (Models FC, FD, GD, FT, GT)	O	EL02-51
		⊟	Models equipped with ABS (Models FG, GH, FL, FM, SG)		
AG	HEATER AND MANUAL AIR CONDITIONER CIRCUIT	□	Common to all models	O	EL02-52
AH	SPARE POWER SOURCE CIRCUIT	□	Common to all models	O	EL02-54
		○	All models equipped with 12V spare power source	O	
		⊟	For tractor models		
		⊠	Except for tractor models	O	
		⊕	Models equipped with 12V power source (for tractor models)		
		⊖	Models equipped with 12V power source (except for tractor models)	O	
		⚠	For semi-tractor models		
		⊠	For full-tractor models		
AI	12V SPARE POWER SOURCE CIRCUIT	○	All models equipped with 12V spare power source	O	EL02-55
		⊕	Models equipped with 12V spare power source (for tractor models)		
		⊖	Models equipped with 12V spare power source (except for tractor models)	O	

Circuit name		Specification symbol	Specifications	Remarks	Page
AJ	GROUND CIRCUIT	□	Common to all models	○	EL02-56
		⧄	Except for FT tractor	○	
		⊟	Models FT, GT		
		△	For tractor models		
		⧋	Models equipped with ES start, electromagnetic retarder, or transfer	○	
		⋈	Models equipped with automatic transmission and ABS		
AK	ENGINE STARTING CIRCUIT (MODELS WITH MANUAL TRANSMISSION)	⧄	Except for models with P11C engine	○	EL02-58
		⊠	Models equipped with sub-starter switch		
AL	ENGINE STARTING CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)	⊟	Models with automatic transmission		EL02-59
AM	ENGINE STARTING CIRCUIT (MODELS WITH P11C ENGINE)	○	Models equipped with 3kW intake air heater		EL02-60
		⊗	Models without intake air heater		
		△	All models with P11C engine		
AN	PRE-HEATER CIRCUIT (MODELS WITH MANUAL TRANSMISSION AND J-SERIES ENGINE)	⧄	Models equipped with pre-heater	○	EL02-61
AO	PRE-HEATER CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)	⧄	Models equipped with pre-heater		EL02-62
AP	PRE-HEATER CIRCUIT (MODELS WITH P11C ENGINE)	△	Models equipped with intake air heater		EL02-63

Circuit name		Specification symbol	Specifications	Remarks	Page
AQ	CHARGING CIRCUIT	□	Common to all models	○	EL02-63
		⋈	Models with P11C engine (with intake air heater)		
		▽	Models with P11C engine (without intake air heater)		
		⊞	Model FC3J		
		○	Model FC4J	○	
		⊠	Models with J08C engine		
		△	Models with J08C-TI engine		
AR	TE SYSTEM (TICS) CIRCUIT	◪	Models equipped with mechanical governor	○	EL02-64
		◮	Models with P11C engine		
		▽	Except for model FC		
		⊗	Model FC	○	
AS	TE SYSTEM (ELECTRONIC GOVERNOR) CIRCUIT	◪	Models equipped with electronic governor		EL02-66
		⊟	Models with automatic transmission		
		△	Models with manual transmission		
AT	TE SYSTEM (ELECTRONIC GOVERNOR) POWER TAKE-OFF CIRCUIT	◪	Except for models with EATON FS6109/8209 transmission		EL02-68
		⊟	Models with manual transmission		
		△	Models with automatic transmission		
		◮	Models with EATON FS6109/8209 transmission		
AU	ENGINE STOP CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)	◪	Except for models equipped with electronic governor	○	EL02-69
AV	ENGINE STOP CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)	◪	Except for models equipped with electronic governor		EL02-69

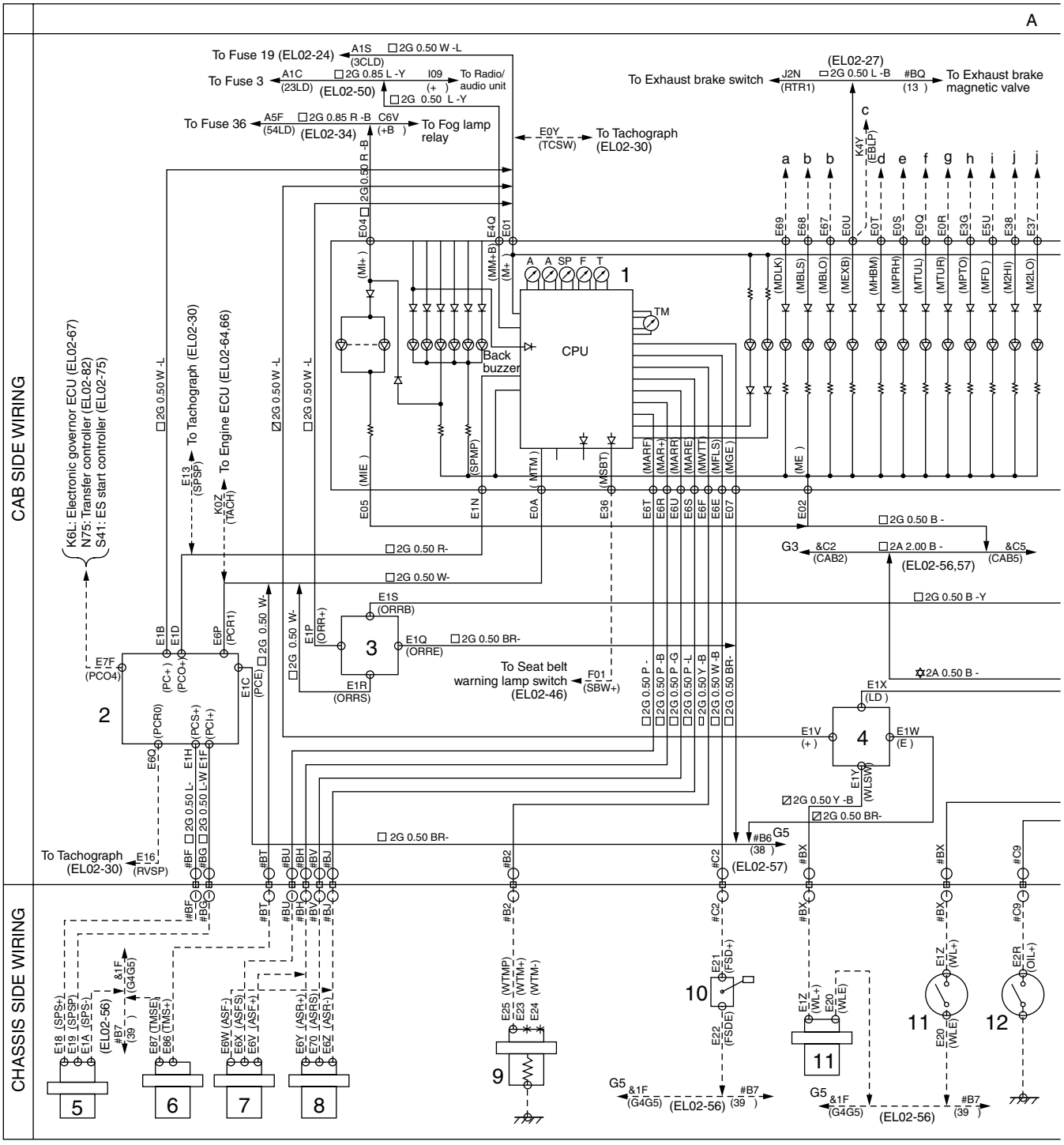
Circuit name		Specification symbol	Specifications	Remarks	Page
AW	ABS CIRCUIT (MODELS FC, FD, GD, FT, GT)	⊠	All models equipped with ABS	○	EL02-70
		⊟	Models FT, GT		
		△	Except for models FT, GT	○	
		⩚	Models equipped with exhaust brake	○	
AX	ABS CIRCUIT (MODELS FG, GH, FL, FM, SG)	⊠	All models equipped with ABS		EL02-72
		⊟	Models equipped with full air brake		
		△	Models equipped with air over hydraulic brake		
		⩚	Models with manual transmission and exhaust brake (for right-hand drive vehicle)		
		⋈	Models with automatic transmission and exhaust brake (for right-hand drive vehicle)		
		△△	Models with manual transmission and exhaust brake (for left-hand drive vehicle)		
AY	ES START SYSTEM CIRCUIT	⊠	All models equipped with ES start system	○	EL02-74
		⊟	Models equipped with center parking brake	○	
		△	Models equipped with wheel parking brake		
		⩚	Models equipped with electronic governor		
		⋈	Models FT, GT		
		▽	Models with J08C, J08C-TI engine (with pre-heater)		
		○	Models with P11C engine		
		⌒	Except for models equipped with electronic governor and models FT, GT	○	
		▭	Models with J08C, J08C-TI engine (without pre-heater)		
		□	Models with two back-up lamps or tractor models		
		⊠	With one back-up lamp	○	

Circuit name		Specification symbol	Specifications	Remarks	Page
AZ	BRAKE-LOCK CIRCUIT (MODELS EQUIPPED WITH CENTER PARKING BRAKE)	⧄	Models equipped with brake-lock	O	EL02-76
BA	BRAKE-LOCK CIRCUIT (MODELS EQUIPPED WITH WHEEL PARKING BRAKE)	⧅	Models equipped with brake-lock		EL02-77
BB	ELECTROMAGNETIC RETARDER CIRCUIT	⧄	Models equipped with electromagnetic retarder		EL02-78
BC	INTER-AXLE DIFFERENTIAL LOCK CIRCUIT	⧄	Model FM		EL02-79
		⧅	For tractor models		
		△	Except for tractor models		
BD	AUTOMATIC TRANSMISSION CIRCUIT	⧄	Models with automatic transmission		EL02-80
BE	TRANSFER CONTROL CIRCUIT	⧄	Models FT, GT		EL02-82
BF	TRANSMISSION P.T.O. CONTROL CIRCUIT (EXCEPT FOR MODELS WITH EATON FS6109/8209 TRANSMISSION)	⧄	Models equipped with transmission P.T.O.	O	EL02-83
		△	For dump models		
BG	TRANSMISSION P.T.O. CONTROL CIRCUIT (MODELS WITH EATON FS6109/8209 TRANSMISSION)	⧅	Models equipped with transmission P.T.O.		EL02-83
		⧋	For dump models		
BH	CAB TILT CIRCUIT (MODELS FOR DOUBLE CAB)	⧄	For double cab models		EL02-84
BI	TRAILER CONNECTOR CIRCUIT	⧄	For tractor models		EL02-85

Circuit name		Specification symbol	Specifications	Remarks	Page
BJ	AIR DRIER CIRCUIT	○	Models equipped with manual transmission (the drier is mounted on the left of the chassis)	○	EL02-85
		▽	Models equipped with manual transmission (the drier is mounted on the right of the chassis)	○	
		⊞	Models equipped with automatic transmission (the drier is mounted on the left of the chassis)		
		⊠	Models equipped with automatic transmission (the drier is mounted on the right of the chassis)		
BK	TRANSMISSION CONTROL CIRCUIT (MODELS WITH EATON FS6109/8209 TRANSMISSION)	◹	All models with EATON FS6109/8209 transmission		EL02-86
		⊟	For tractor models		
		△	Except for tractor models		
BL	TRANSMISSION CONTROL CIRCUIT (MODELS WITH ZF 9S109 TRANSMISSION)	◮	All models with ZF 9S109 transmission		EL02-86
		⋈	For tractor models		
		▽	Except for tractor models		
BM	DIAGNOSIS MONITOR CIRCUIT	◹	Models equipped with electronic governor		EL02-87
		△	Models equipped with ABS	○	
		◮	Models equipped with ES start system	○	
		⋈	Models equipped with electromagnetic retarder		

DIAGRAM

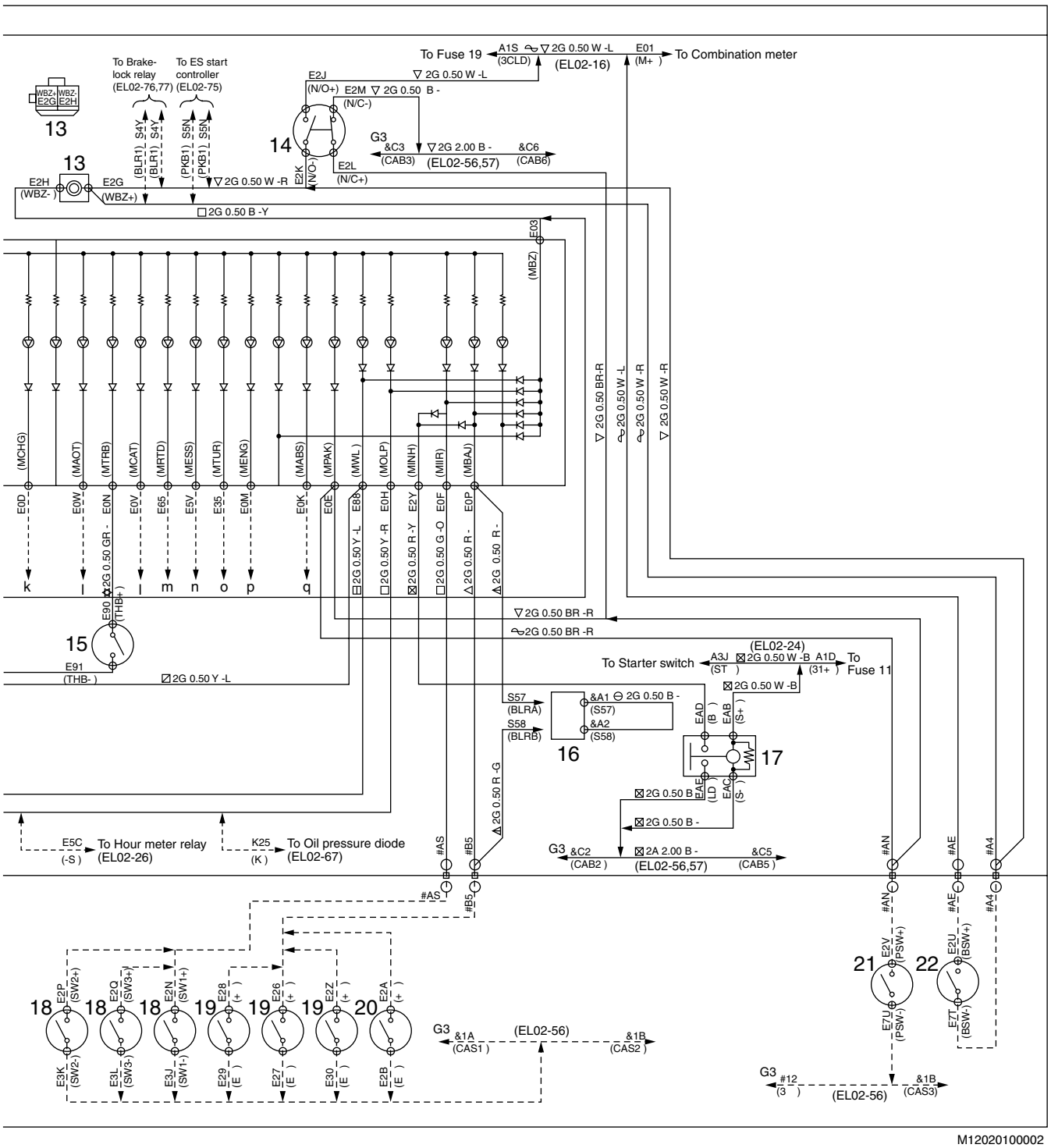
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M12020100001

A. METER CIRCUIT (CAB SIDE)

1. Combination meter
2. Pulse adjust computer
3. Over revolution detector
4. Coolant level warning relay
5. Speed sensor
6. Tachometer sensor
7. Front air gauge sensor
8. Rear air gauge sensor
9. Coolant temperature gauge sender unit
10. Fuel gauge sender unit
11. Coolant level warning switch
12. Oil pressure warning switch
13. Warning buzzer
14. Center parking brake switch
15. Trailer hand brake switch
16. Brake-lock short-circuit connector
17. Warning lamp check relay
18. Low oil pressure warning switch
19. Brake adjust warning switch
20. Brake fluid level warning switch
21. Spring brake switch
22. Buzzer cancel switch



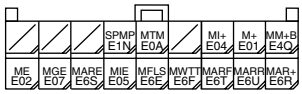
M12020100002

a. To Inter-axle differential lock switch (EL02-79)
b. To Brake-lock relay (EL02-76,77)
c. To Engine ECU (EL02-17)
d. To Head lamp (LH) (EL02-32,34)
e. To Pre-heat timer (EL02-61 to 63)
f. To Flasher unit (EL02-36)
g. To Flasher unit (EL02-36)
h. To Transmission P.T.O. diode (EL02-83)
i. To Transfer controller (EL02-82)
j. To Transfer circuit (Models FT, GT) (EL02-82)
To Transmission control circuit
(Models equipped with EATON FS6109/8209 and ZF 9S109 transmission) (EL02-86)
k. To Alternator (EL02-63)
l. To Automatic transmission ECU (EL02-80)
m. To Electromagnetic retarder control unit (EL02-78)
n. To ES start controller (EL02-74)
o. To TICS ECU
(Models equipped with P11C engine) (EL02-64)
p. To Engine ECU (EL02-64,66)
q. To ABS ECU (EL02-71,72)

CAB SIDE WIRING



1



1



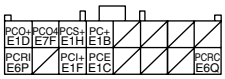
1
(For Automatic transmission)



1



1
(For Manual transmission)



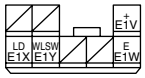
2

CHASSIS SIDE WIRING

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3



4



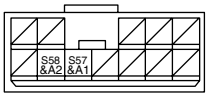
14



15

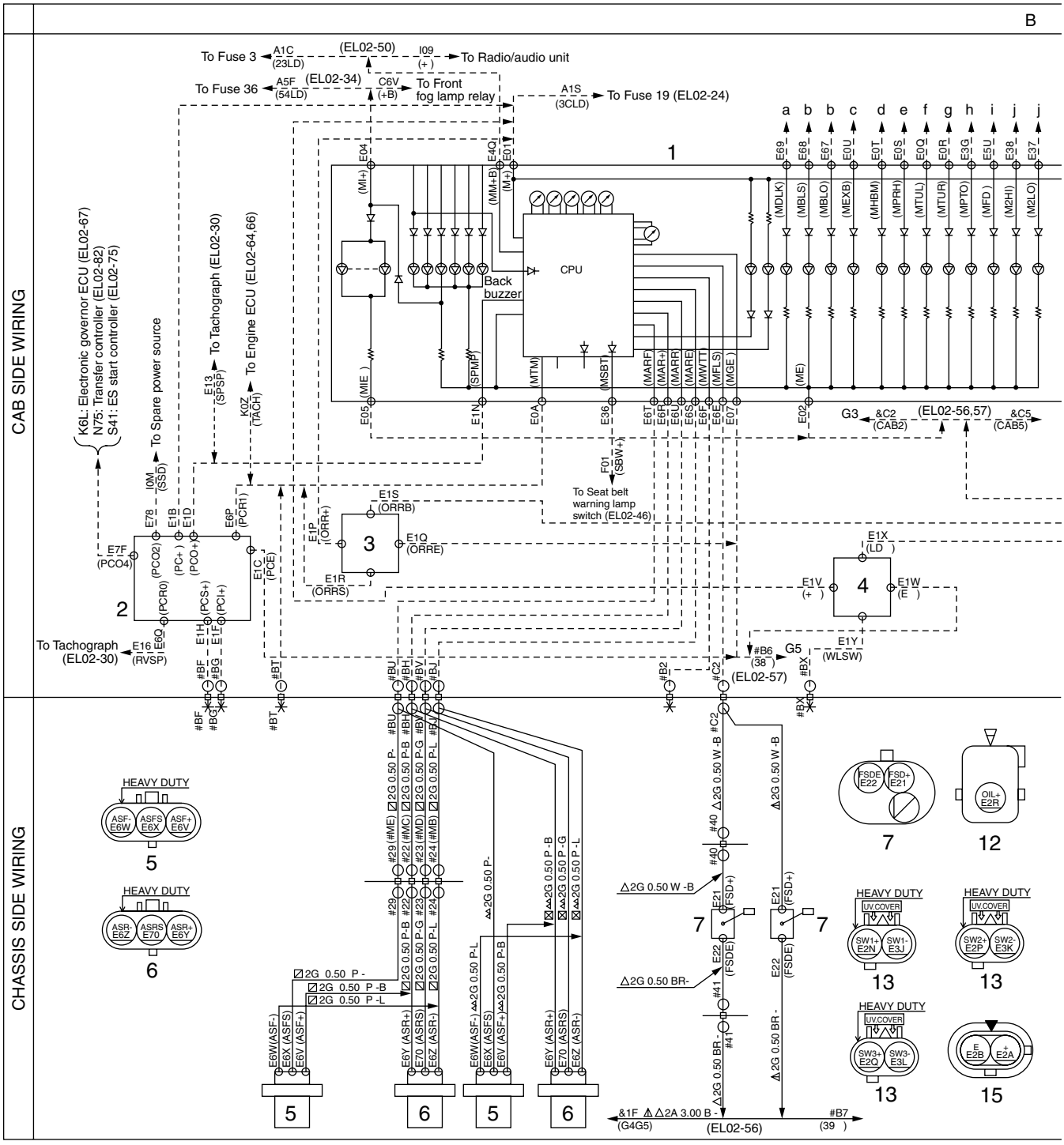


16
(With brake-lock control)



16
(Without brake-lock control)

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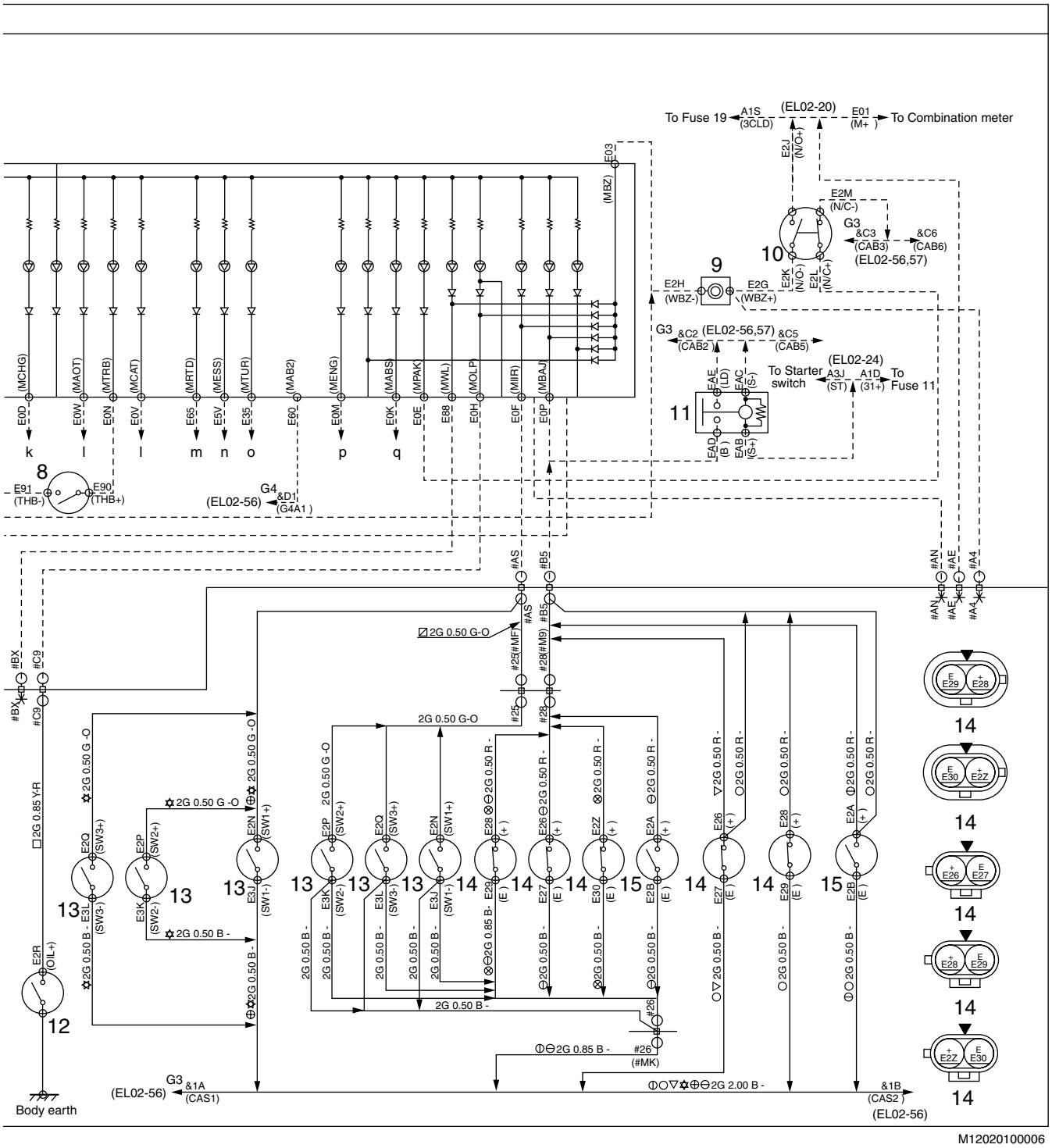


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B. METER CIRCUIT (CHASSIS SIDE 1)

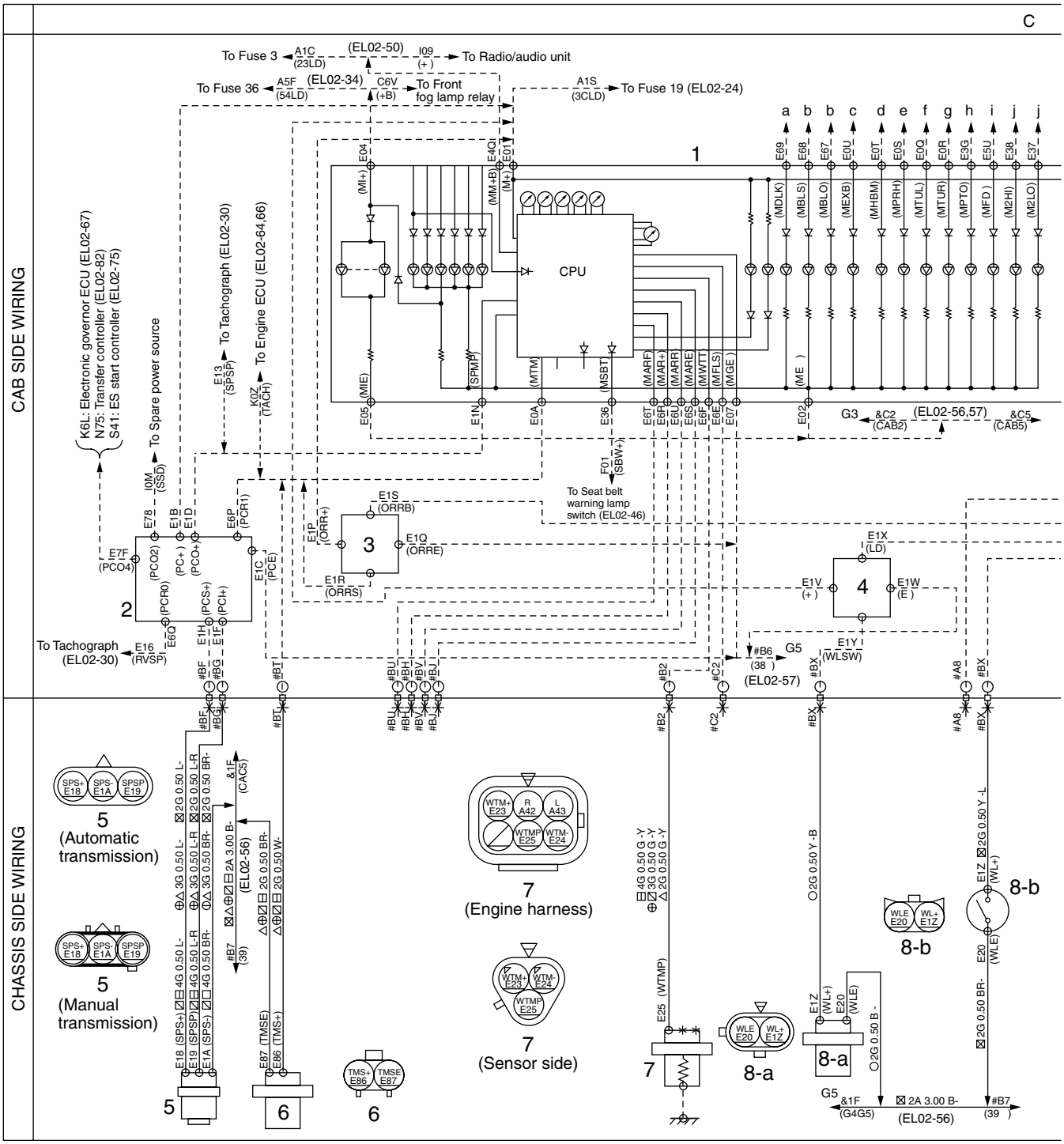
1. Combination meter
2. Pulse adjust computer
3. Over revolution detector
4. Coolant level warning relay
5. Front air gauge sensor
6. Rear air gauge sensor
7. Fuel gauge sender unit
8. Trailer hand brake switch
9. Warning buzzer
10. Center parking brake switch
11. Warning lamp check relay
12. Oil pressure warning switch
13. Low oil pressure warning switch
14. Brake adjust warning switch
15. Brake fluid level warning switch

a. To Inter-axle differential lock switch (EL02-79)
b. To Brake-lock relay (EL02-76,77)
c. To Engine ECU (EL02-17)
d. To Head lamp (LH) (EL02-32,34)
e. To Pre-heat timer (EL02-61 to 63)
f. To Flasher unit (EL02-36)
g. To Flasher unit (EL02-36)



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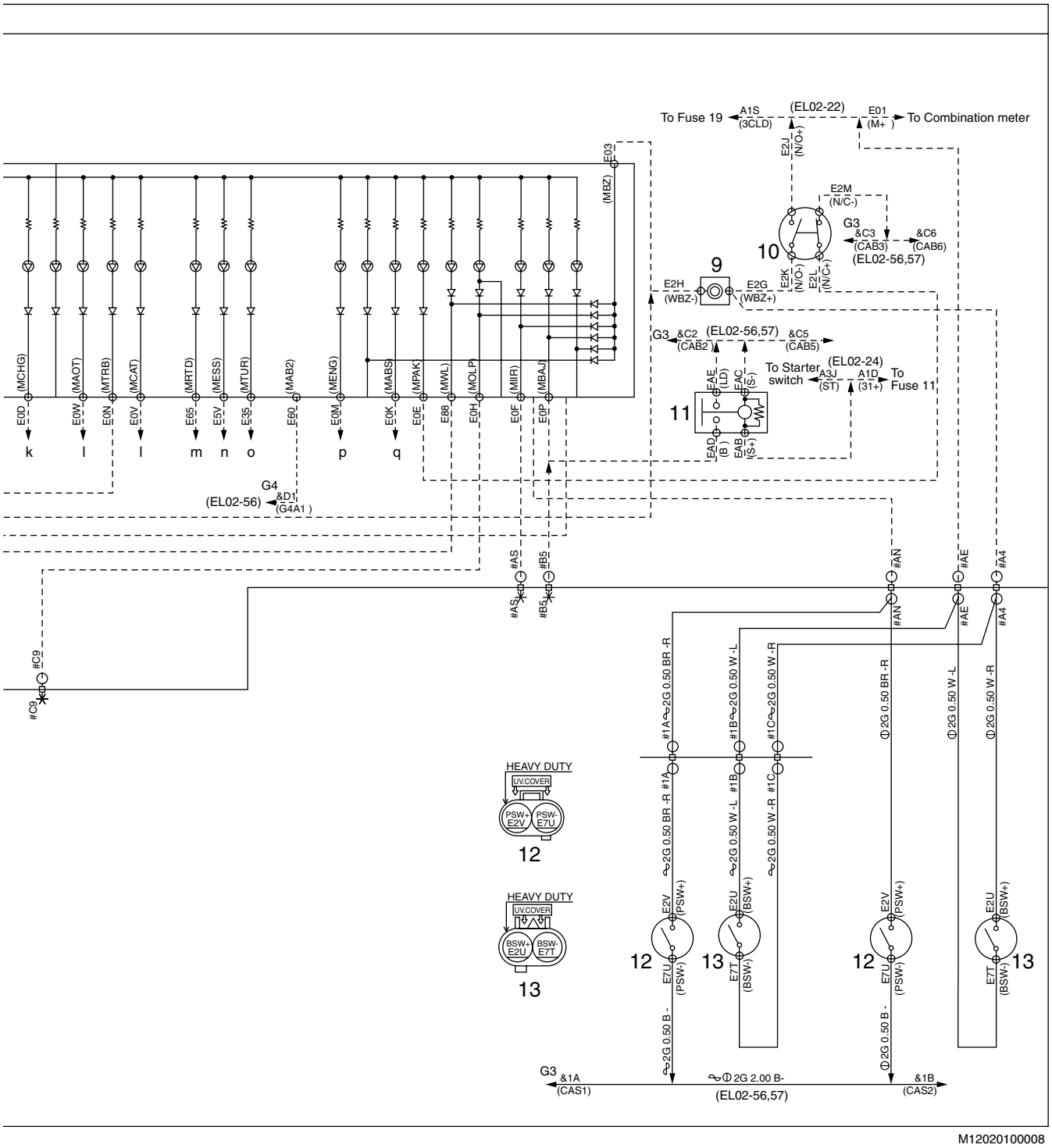
h. To Transmission P.T.O. diode (EL02-83)
i. To Transfer controller (EL02-82)
j. To Transfer circuit (Models FT, GT) (EL02-82)
To Transmission control circuit
(Models equipped with EATON FS6109/8209 and ZF 9S109 transmission) (EL02-86)
k. To Alternator (EL02-63)
l. To Automatic transmission ECU (EL02-80)
m. To Electromagnetic retarder control unit (EL02-78)
n. To ES start controller (EL02-74)
o. To TICS ECU
(Models equipped with P11C engine) (EL02-64)
p. To Engine ECU (EL02-64,66)
q. To ABS ECU (EL02-71,72)



C. METER CIRCUIT (CHASSIS SIDE 2)

1. Combination meter
2. Pulse adjust computer
3. Over revolution detector
4. Coolant level warning relay
5. Speed sensor
6. Tachometer sensor
7. Coolant temperature gauge sender unit
8. Coolant level warning switch
9. Warning buzzer
10. Center parking brake switch
11. Warning lamp check relay
12. Spring brake switch
13. Buzzer cancel switch

a. To Inter-axle differential lock switch (EL02-79)
b. To Brake-lock relay (EL02-76,77)
c. To Engine ECU (EL02-17)
d. To Head lamp (LH) (EL02-32,34)
e. To Pre-heat timer (EL02-61 to 63)
f. To Flasher unit (EL02-36)
g. To Flasher unit (EL02-36)
h. To Transmission P.T.O. diode (EL02-83)



M12020100008

i. To Transfer controller (EL02-82)

j. To Transfer circuit (Models FT, GT) (EL02-82)
To Transmission control circuit
(Models equipped with EATON FS6109/8209 and ZF 9S109 transmission) (EL02-86)

k. To Alternator (EL02-63)

l. To Automatic transmission ECU (EL02-80)

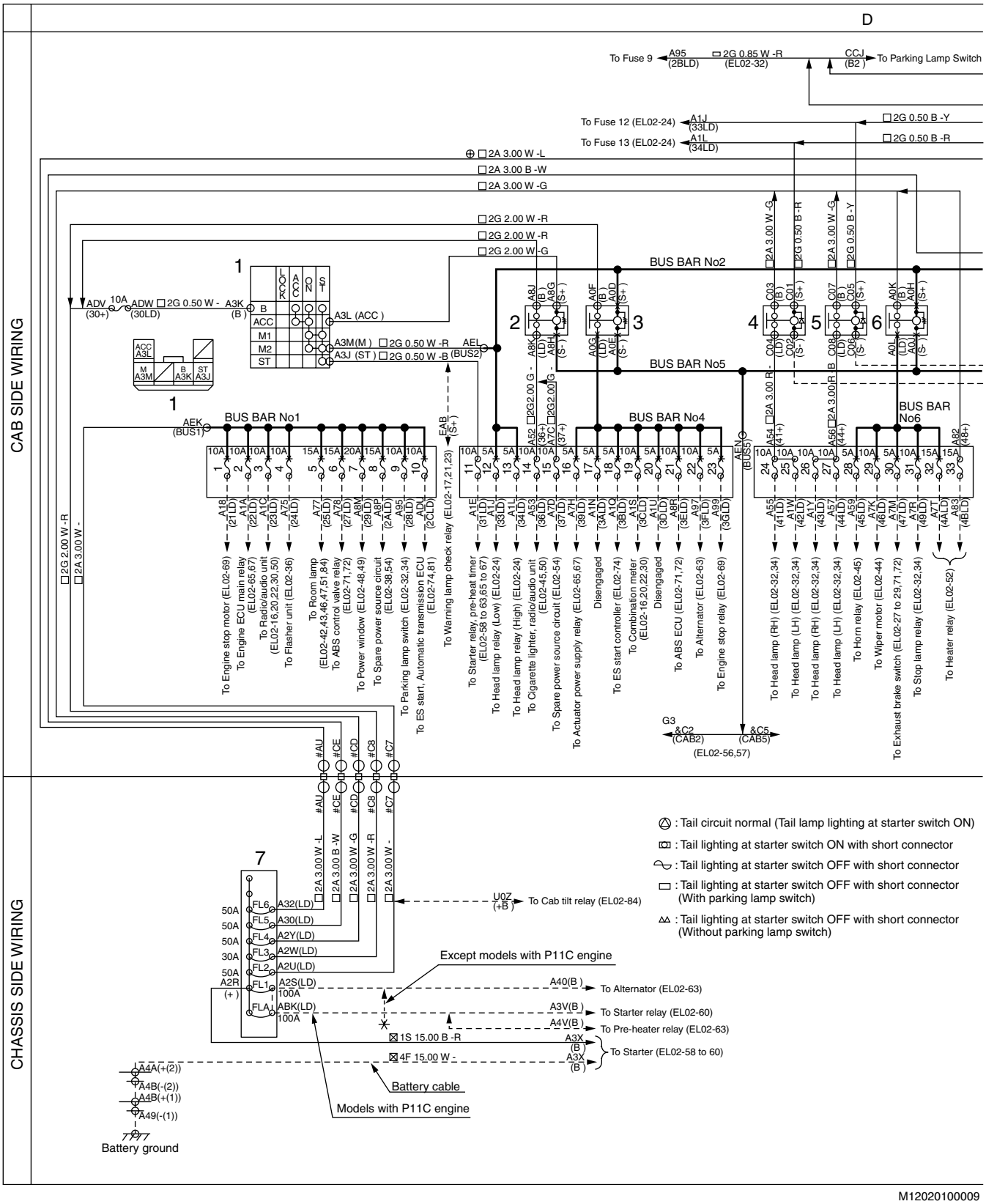
m. To Electromagnetic retarder control unit (EL02-78)

n. To ES start controller (EL02-74)

o. To TICS ECU
(Models equipped with P11C engine) (EL02-64)

p. To Engine ECU (EL02-64,66)

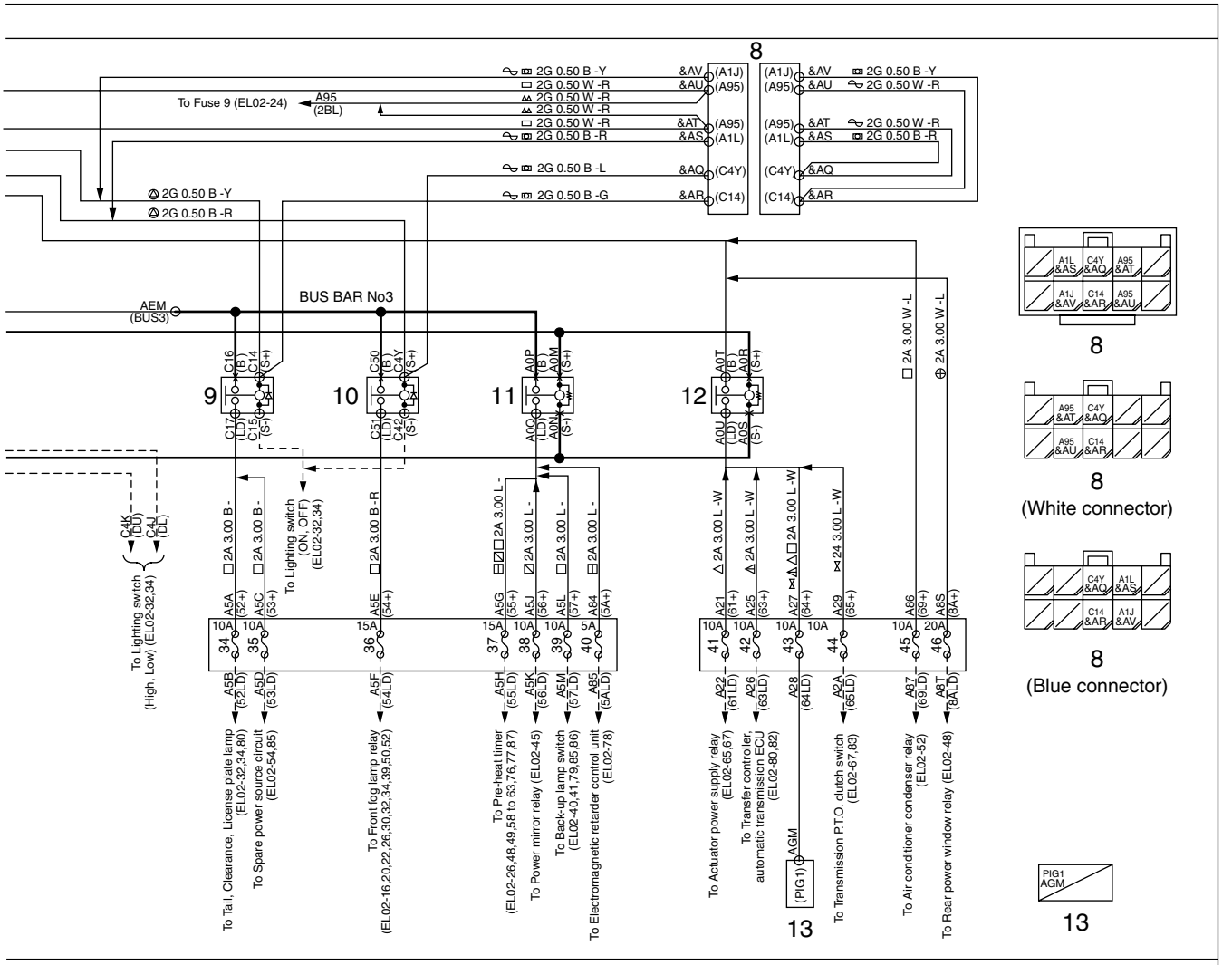
q. To ABS ECU (EL02-71,72)

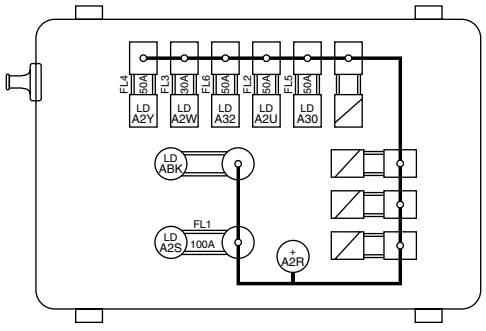


M12020100009

D. POWER SUPPLY CIRCUIT

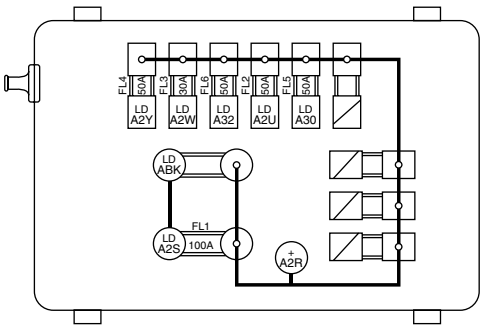
1. Starter switch
2. Power accessory relay
3. Power relay No.1
4. Head lamp relay (High)
5. Head lamp relay (Low)
6. Power relay No.2
7. Fusible link block 1
8. Short connector (If so equipped)
9. Tail lamp relay No.1
10. Tail lamp relay No.2
11. Power relay No.3
12. Power relay No.4
13. Spare power source connector





7

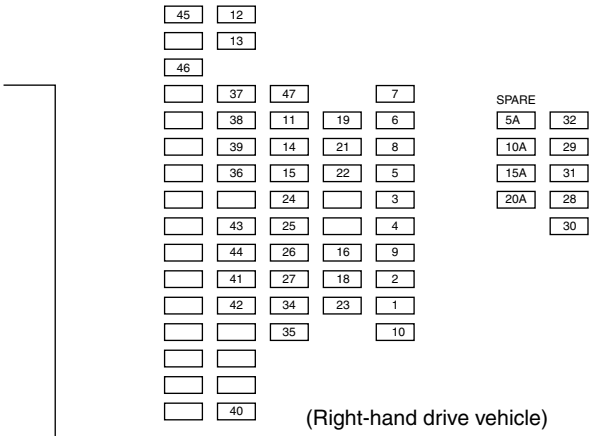
(Except P11C engine with 80A alternator)



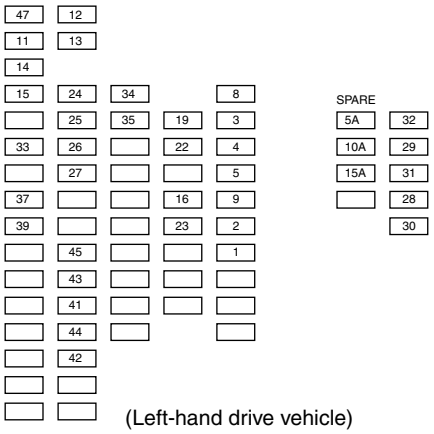
7

(For P11C engine with 80A alternator)

FUSE LAYOUT

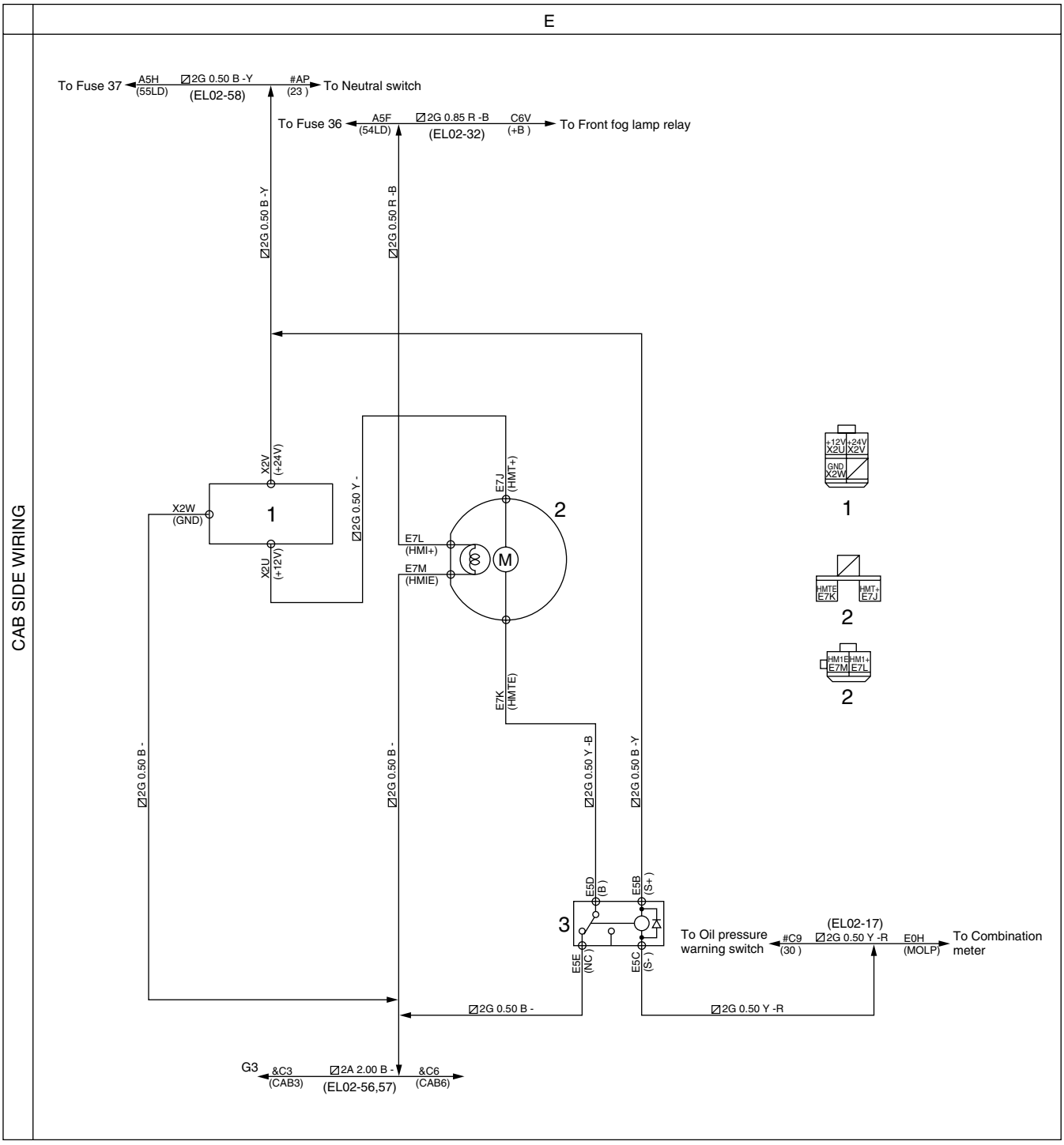


(Right-hand drive vehicle)



(Left-hand drive vehicle)

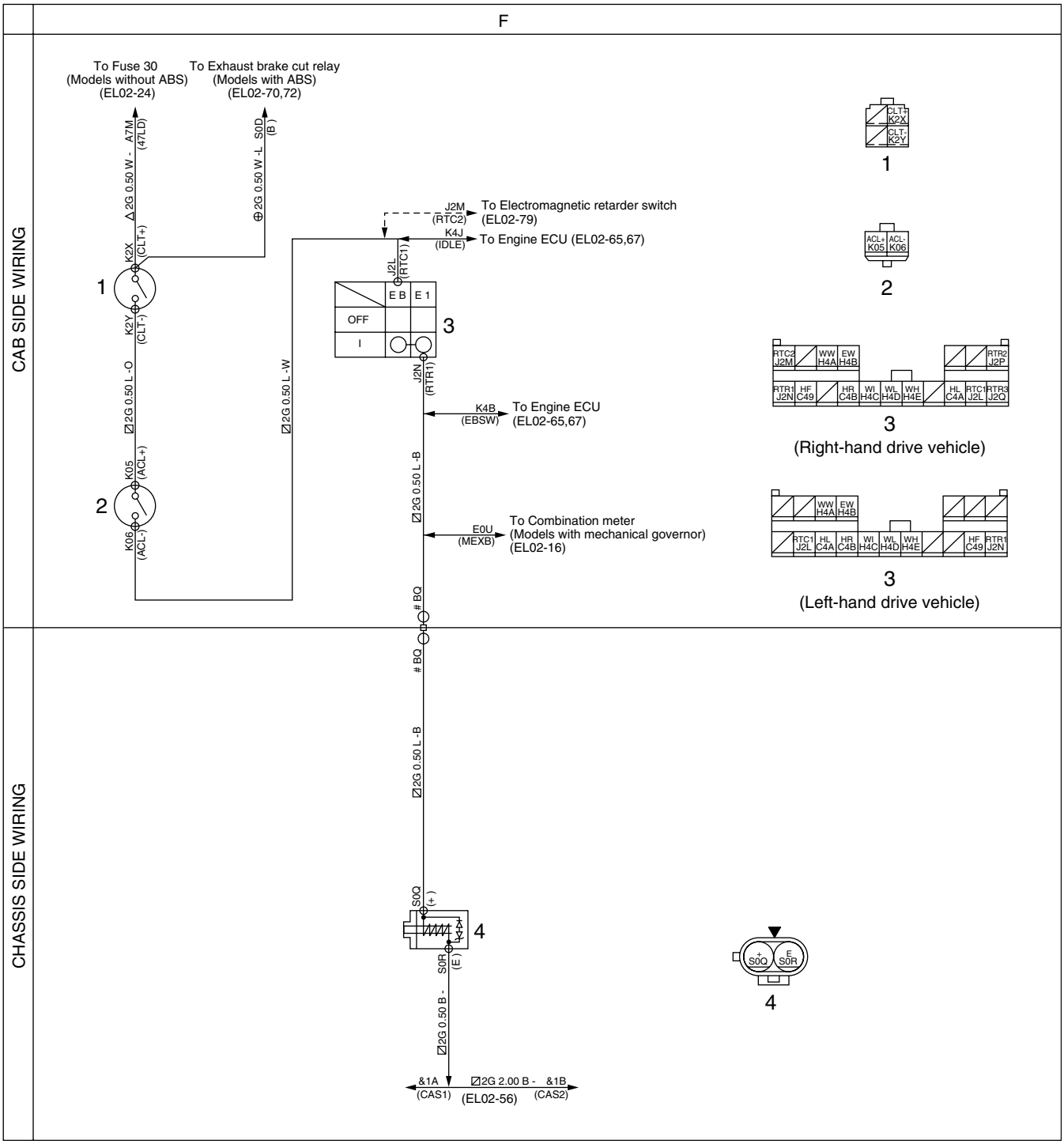
M12020100010



M12020100011

E. HOUR METER CIRCUIT

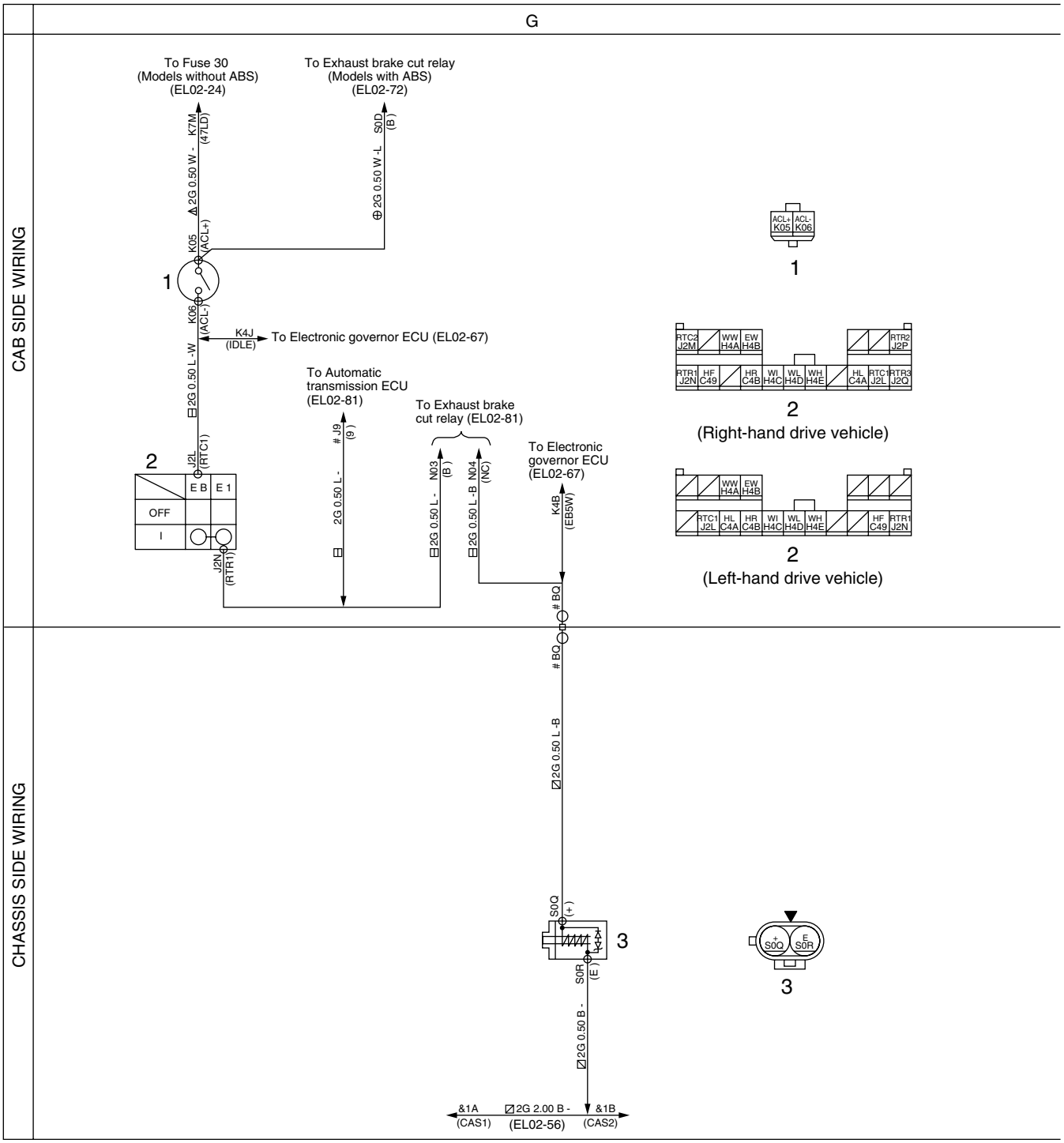
1. DC-DC converter
2. Hour meter
3. Hour meter relay



M12020100012

F. EXHAUST BRAKE CIRCUIT
(EXCEPT FOR MODELS WITH AUTOMATIC TRANSMISSION AND ALL MODELS OF P11C ENGINE)

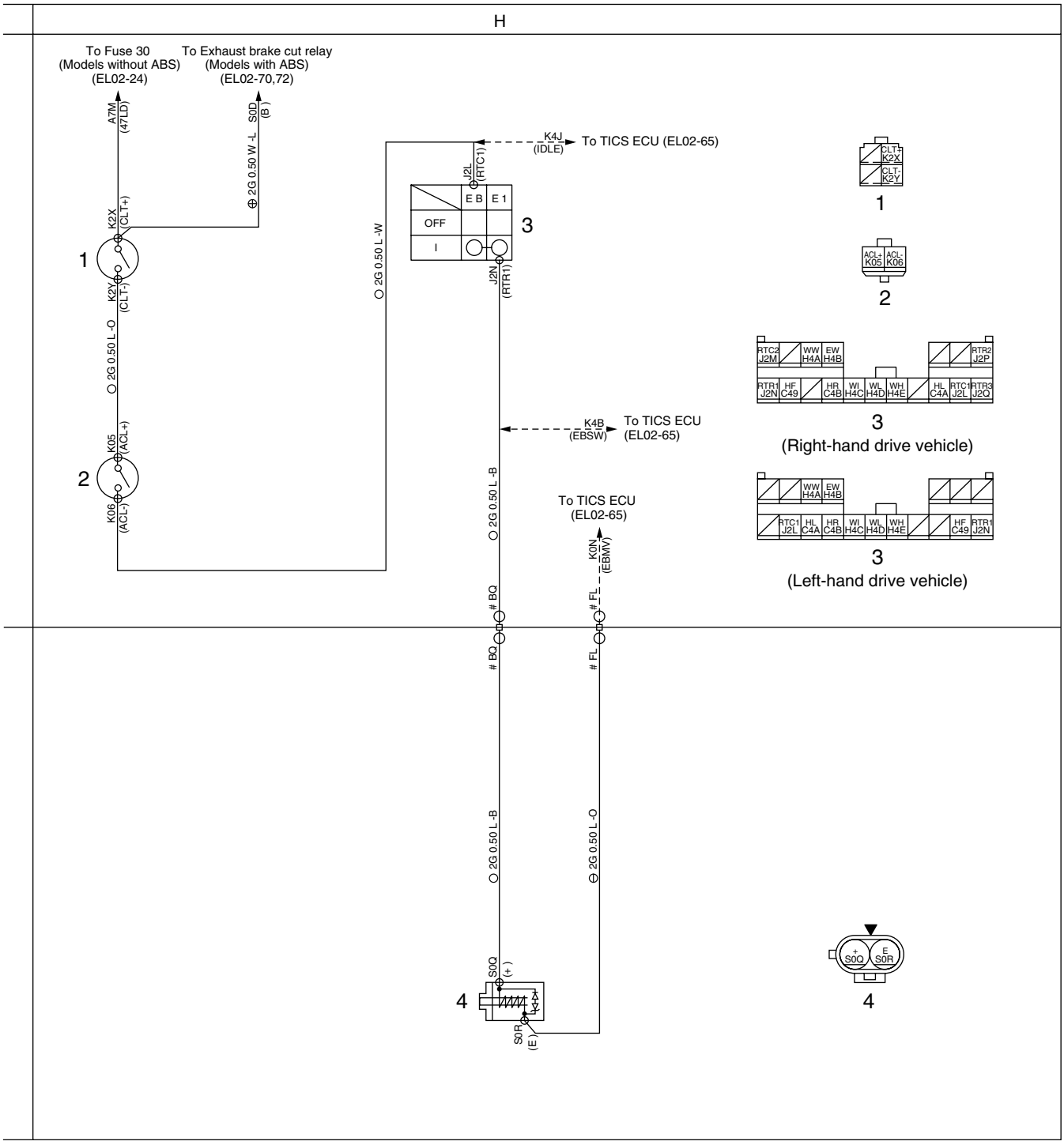
1. Clutch pedal switch
2. Accelerator pedal switch
3. Exhaust brake switch
4. Exhaust brake magnetic valve



M12020100013

G. EXHAUST BRAKE CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

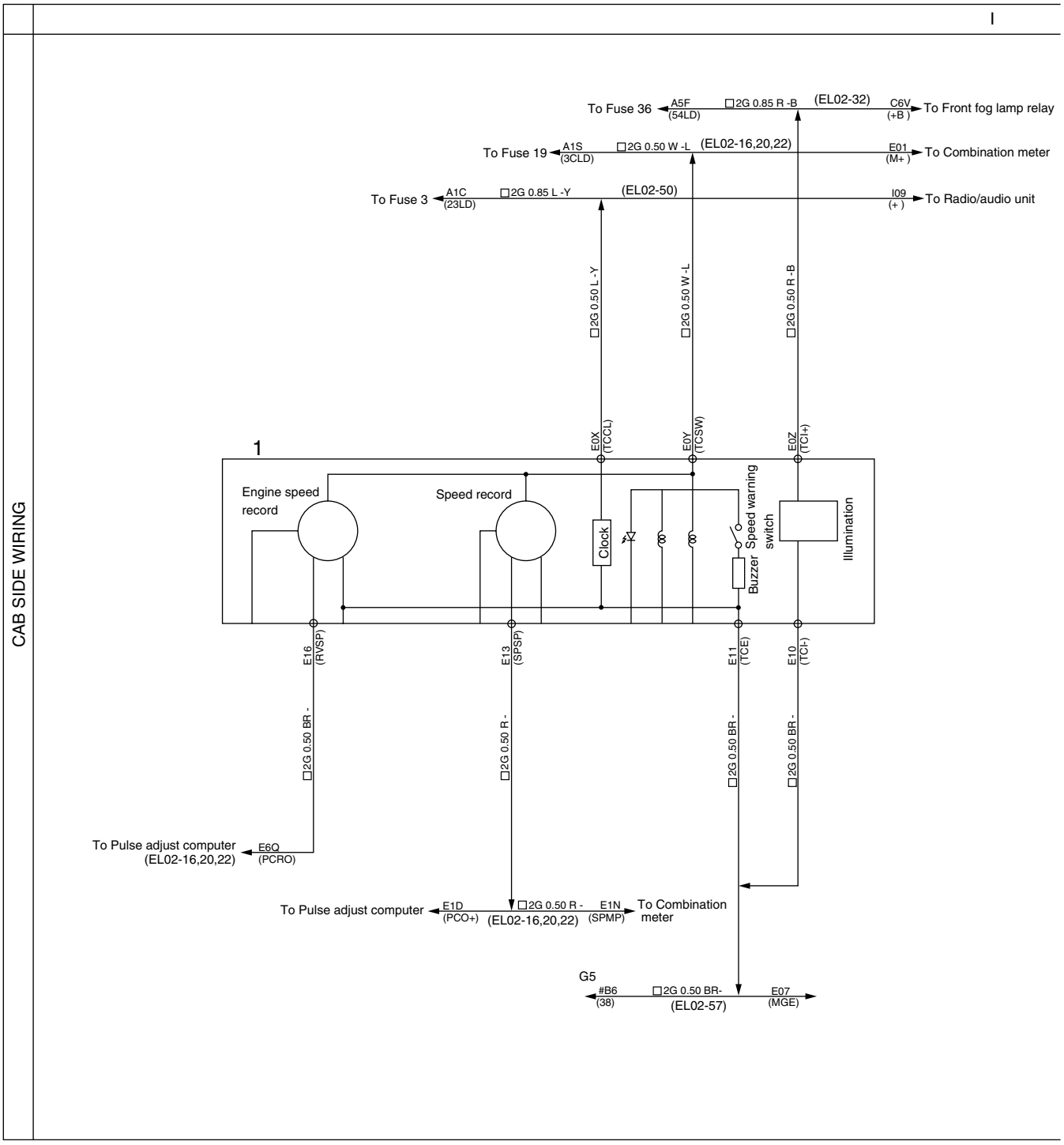
1. Accelerator pedal switch
2. Exhaust brake switch
3. Exhaust brake magnetic valve



M12020100014

H. EXHAUST BRAKE CIRCUIT (MODELS WITH P11C ENGINE)

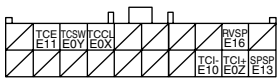
1. Clutch pedal switch
2. Accelerator pedal switch
3. Exhaust brake switch
4. Exhaust brake magnetic valve



M12020100015

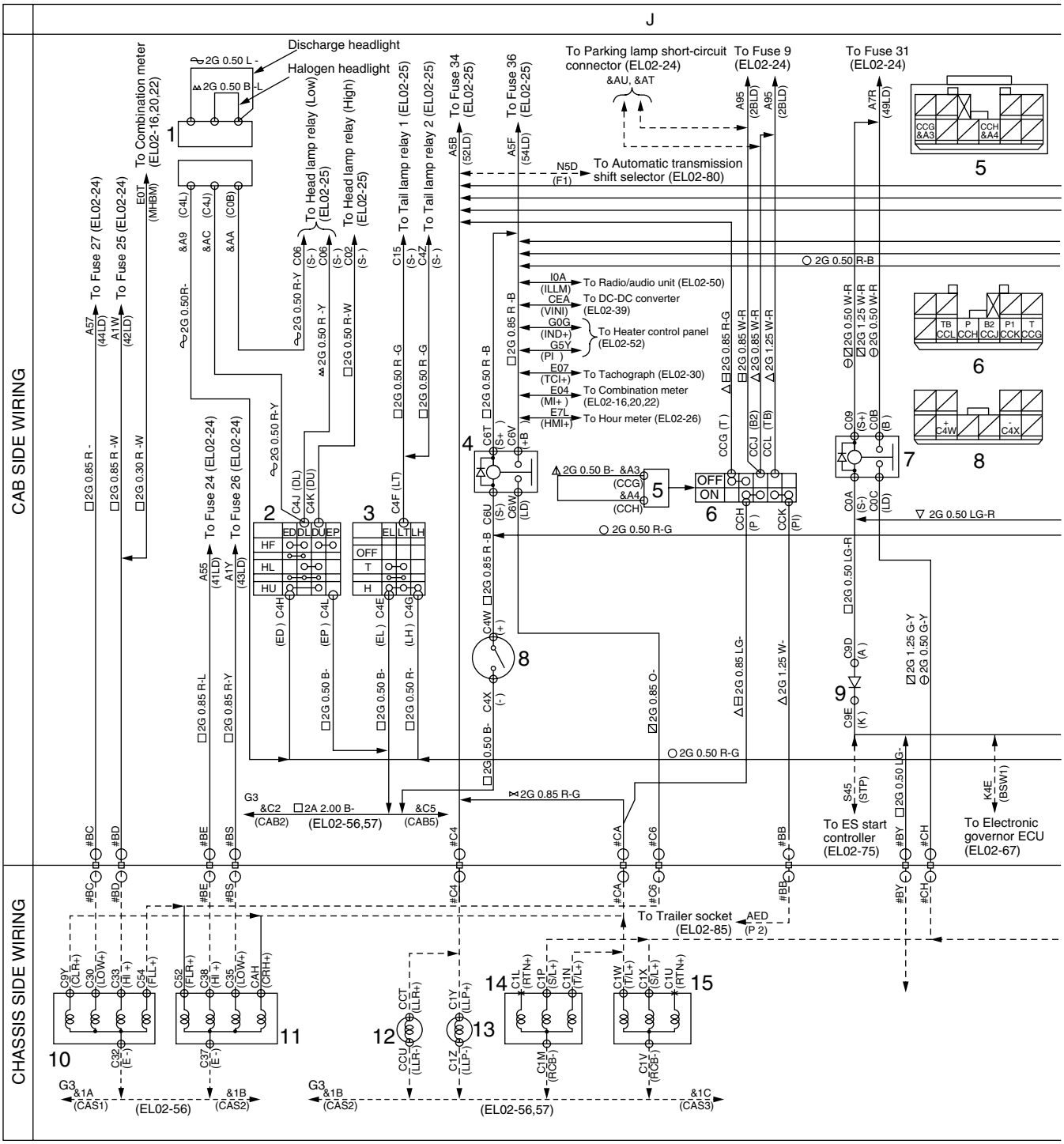
I. TACHOGRAPH CIRCUIT

1. Electric tachograph



1

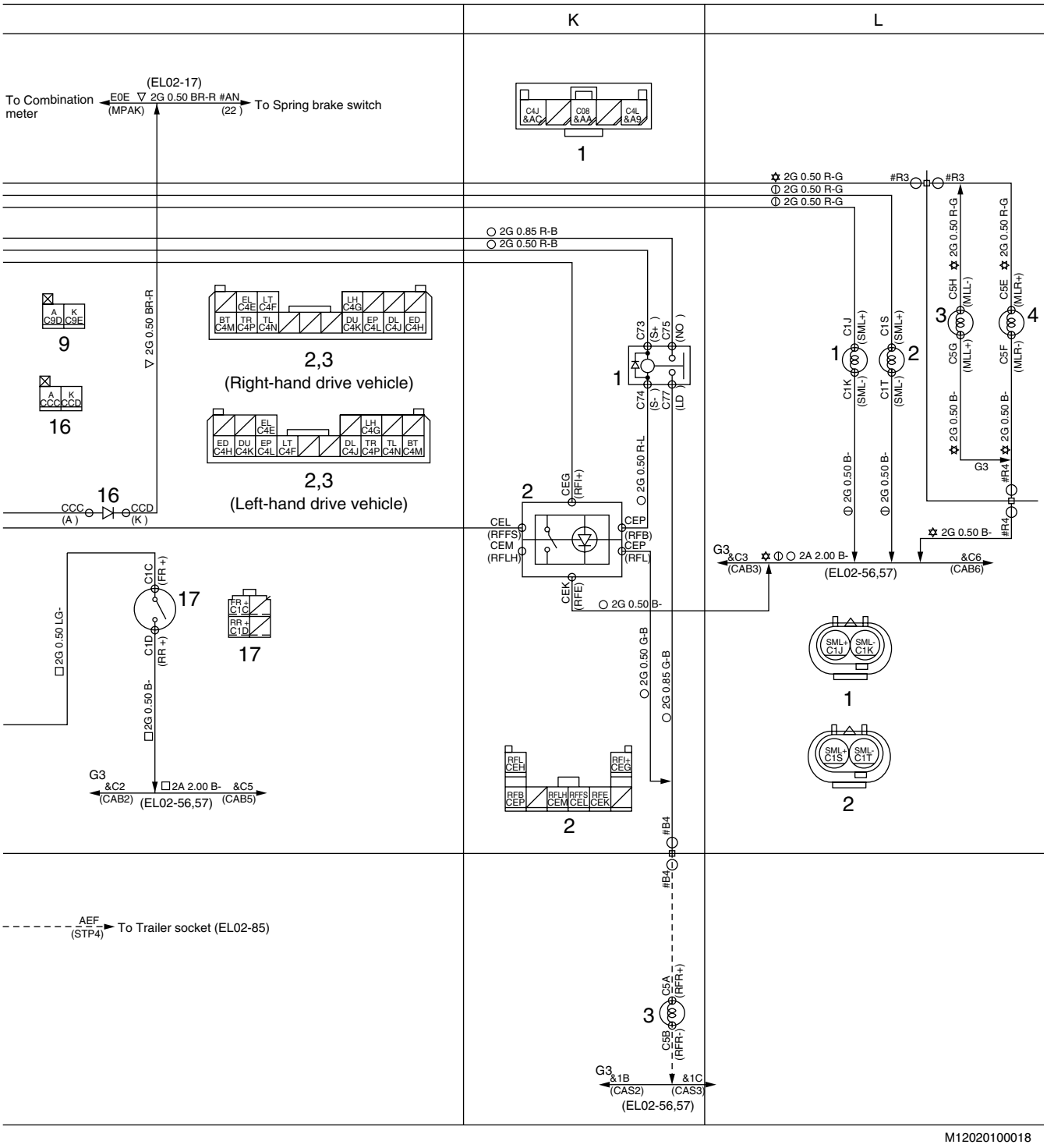
M12020100016



M12020100017

J. HEAD LAMP, FRONT FOG LAMP AND REAR COMBINATION LAMP CIRCUIT (CAB SIDE)

1. Head lamp short-circuit connector
2. Lighting switch (High, Low)
3. Lighting switch (ON, OFF)
4. Front fog lamp relay
5. Parking lamp short-circuit connector (Models without parking lamp)
6. Parking lamp switch
7. Stop lamp relay
8. Front fog lamp switch
9. Diode 2 (Models for Hong Kong)
10. Head lamp (LH)
11. Head lamp (RH)
12. License plate lamp (RH)
13. License plate lamp (LH)
14. Rear combination lamp (LH)
15. Rear combination lamp (RH)
16. Diode 1 (Models for Hong Kong)
17. Stop lamp switch



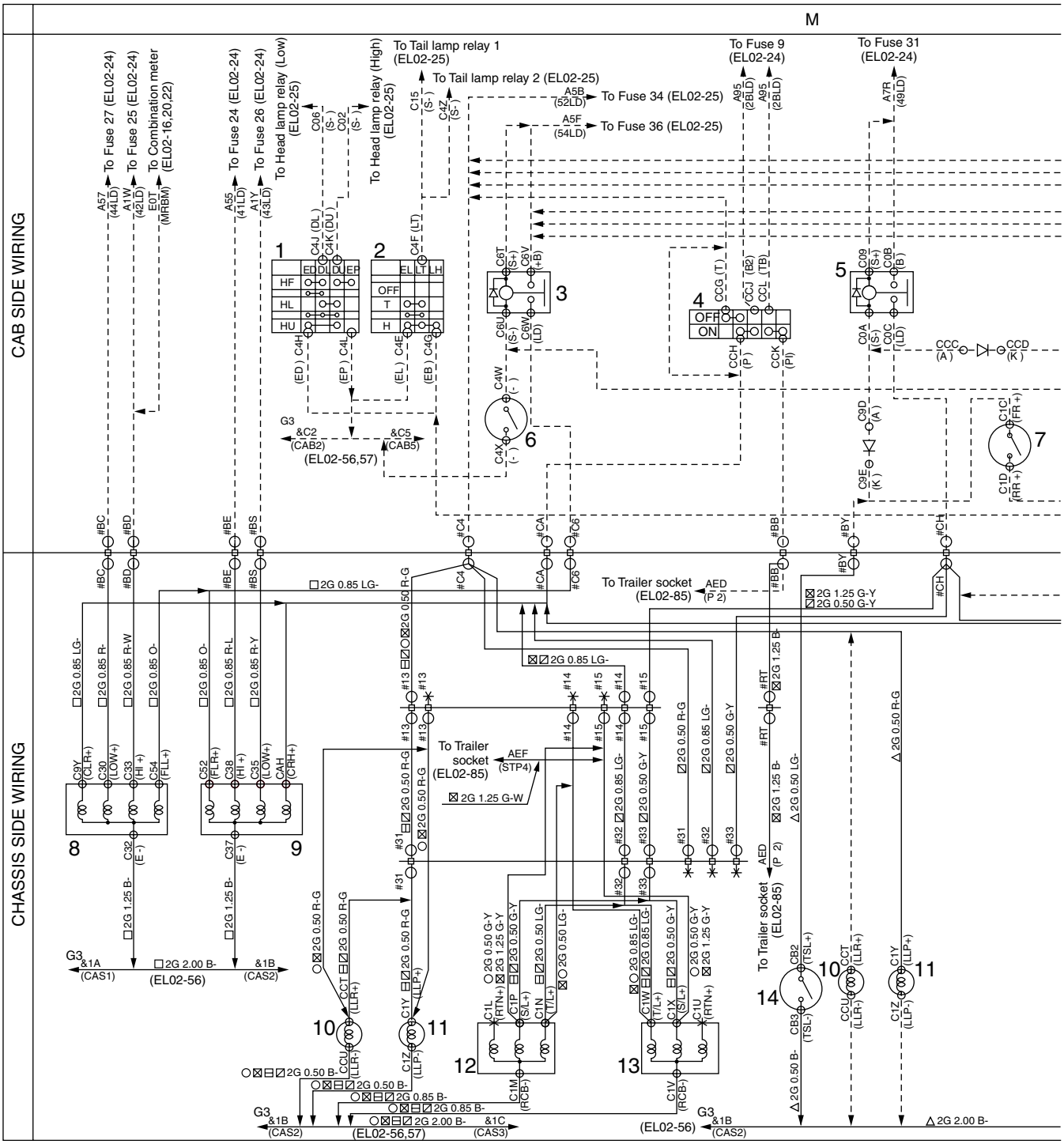
M12020100018

K. REAR FOG LAMP CIRCUIT (CAB SIDE)

1. Rear fog lamp relay
2. Rear fog lamp switch
3. Rear fog lamp

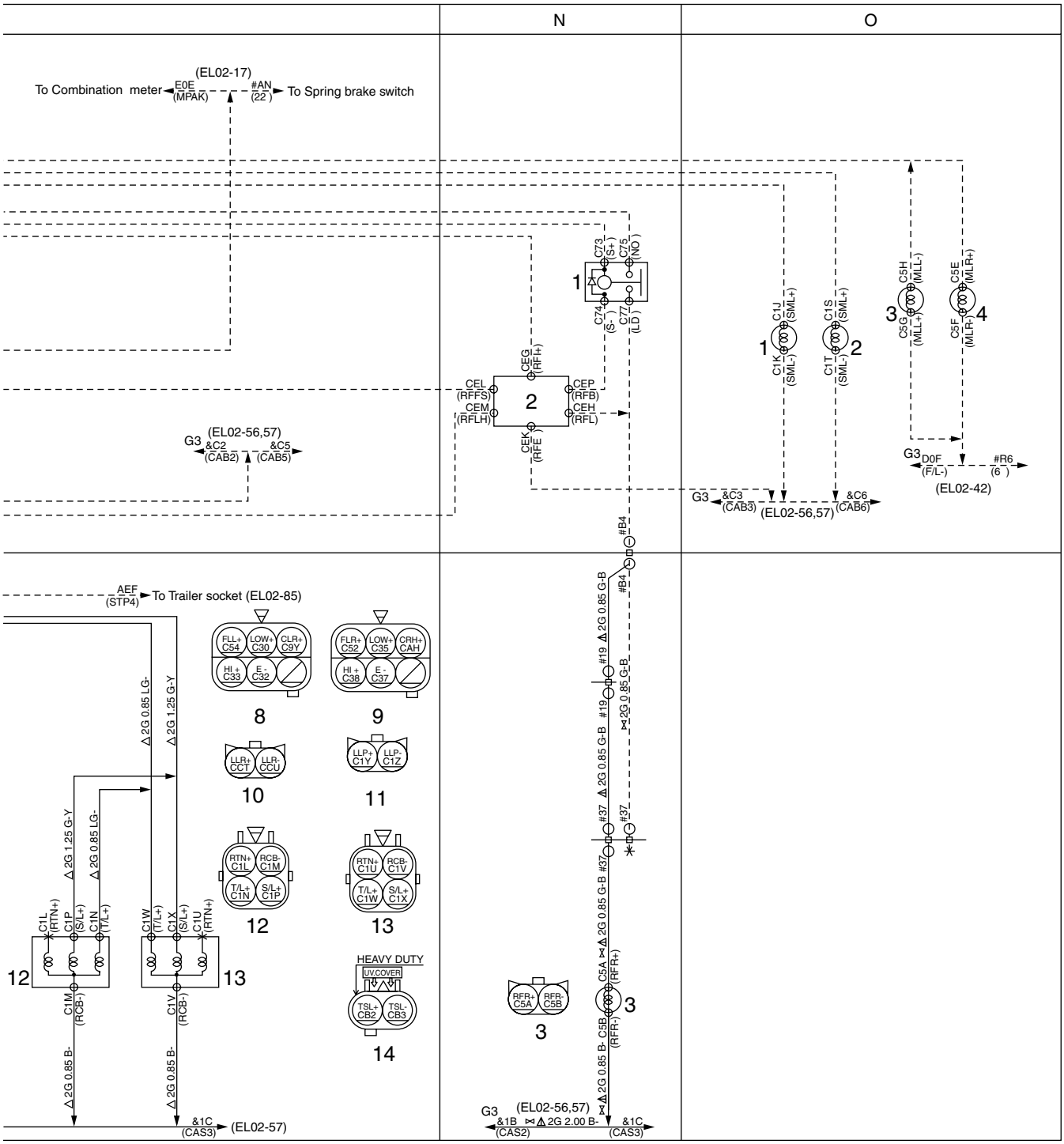
L. MARKER LAMP CIRCUIT (CAB SIDE)

1. Side marker lamp (LH)
2. Side marker lamp (RH)
3. Roof marker lamp (LH)
4. Roof marker lamp (RH)



M. HEAD LAMP, FRONT FOG LAMP AND REAR COMBINATION LAMP CIRCUIT (CHASSIS SIDE)

1. Lighting switch (High, Low)
2. Lighting switch (ON, OFF)
3. Front fog lamp relay
4. Parking lamp switch
5. Stop lamp relay
6. Front fog lamp switch
7. Stop lamp switch
8. Head lamp (LH)
9. Head lamp (RH)
10. License plate lamp (RH)
11. License plate lamp (LH)
12. Rear combination lamp (LH)
13. Rear combination lamp (RH)
14. Trailer stop lamp switch



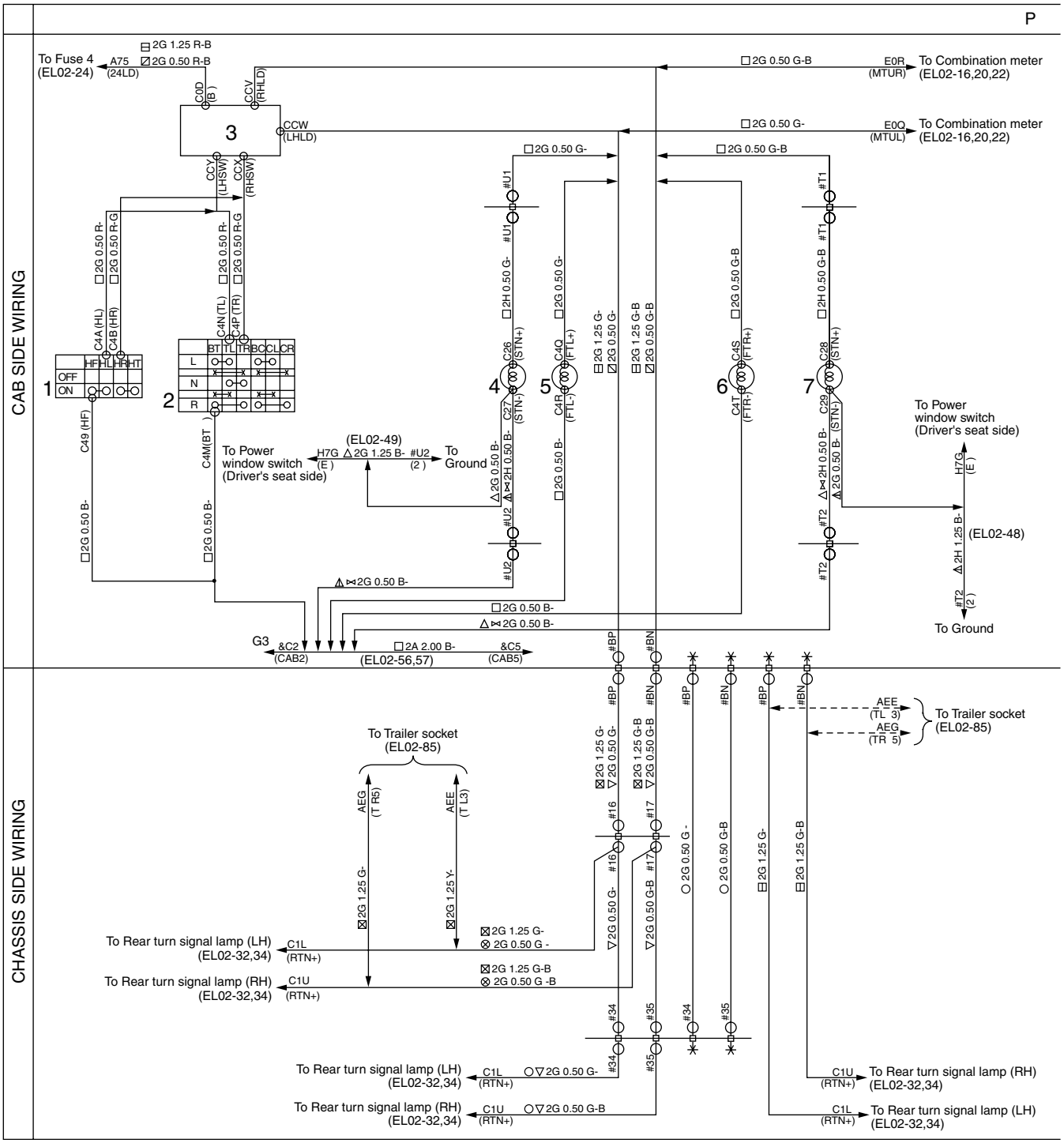
M12020100020

N. REAR FOG LAMP CIRCUIT (CHASSIS SIDE)

1. Rear fog lamp relay
2. Rear fog lamp switch
3. Rear fog lamp

O. MARKER LAMP CIRCUIT (CHASSIS SIDE)

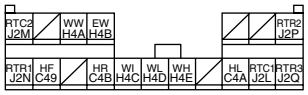
1. Side marker lamp (LH)
2. Side marker lamp (RH)
3. Roof marker lamp (LH)
4. Roof marker lamp (RH)



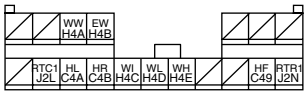
M12020100021

P. TURN SIGNAL AND HAZARD LAMP CIRCUIT

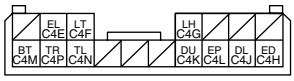
1. Hazard lamp switch
2. Turn signal lamp switch
3. Flasher unit
4. Side turn signal lamp (LH)
5. Front turn signal lamp (LH)
6. Front turn signal lamp (RH)
7. Side turn signal lamp (RH)



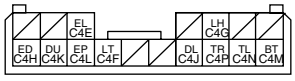
1
(Right-hand drive vehicle)



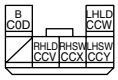
1
(Left-hand drive vehicle)



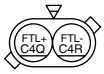
2
(Right-hand drive vehicle)



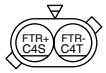
2
(Left-hand drive vehicle)



3

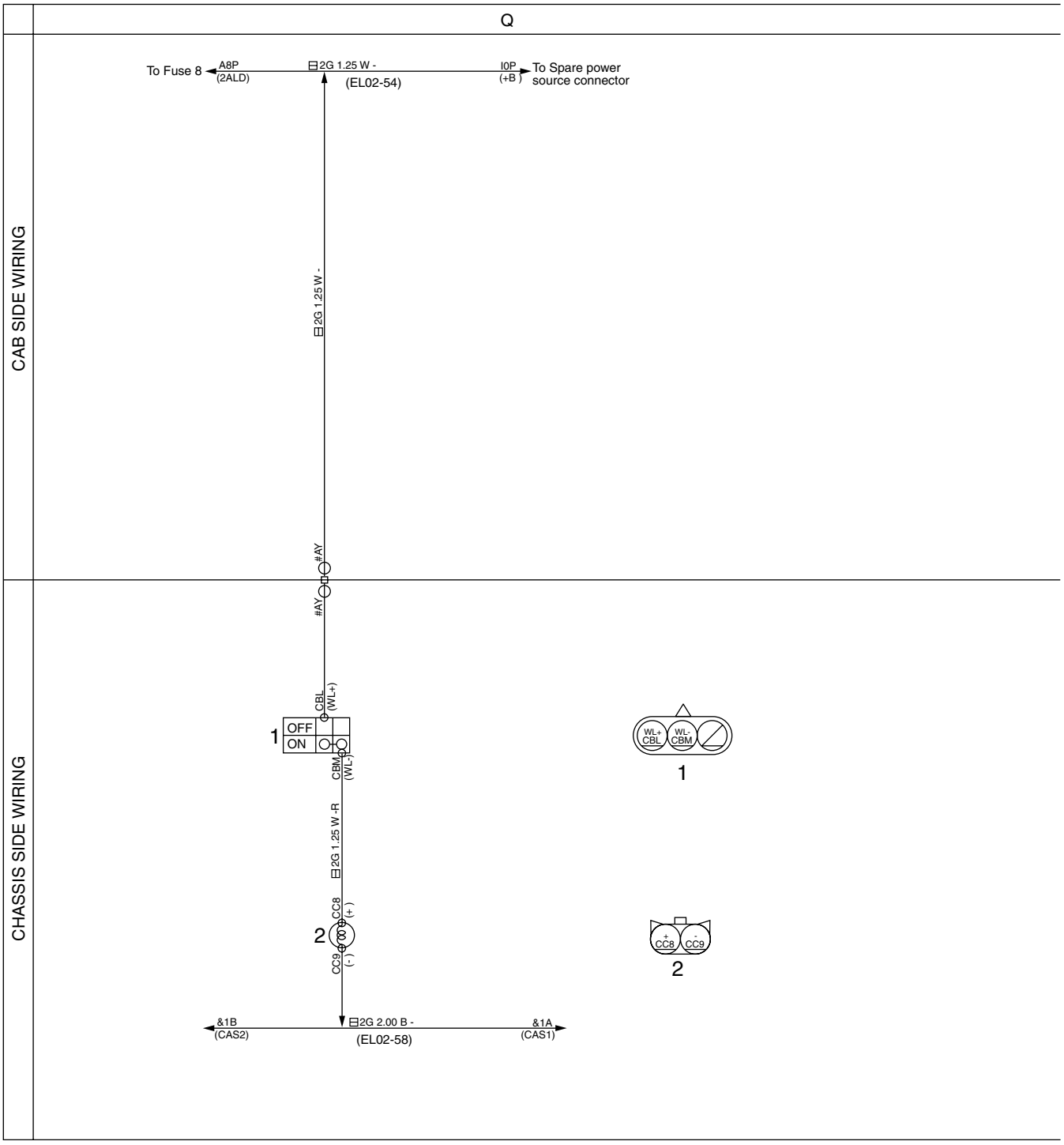


5



6

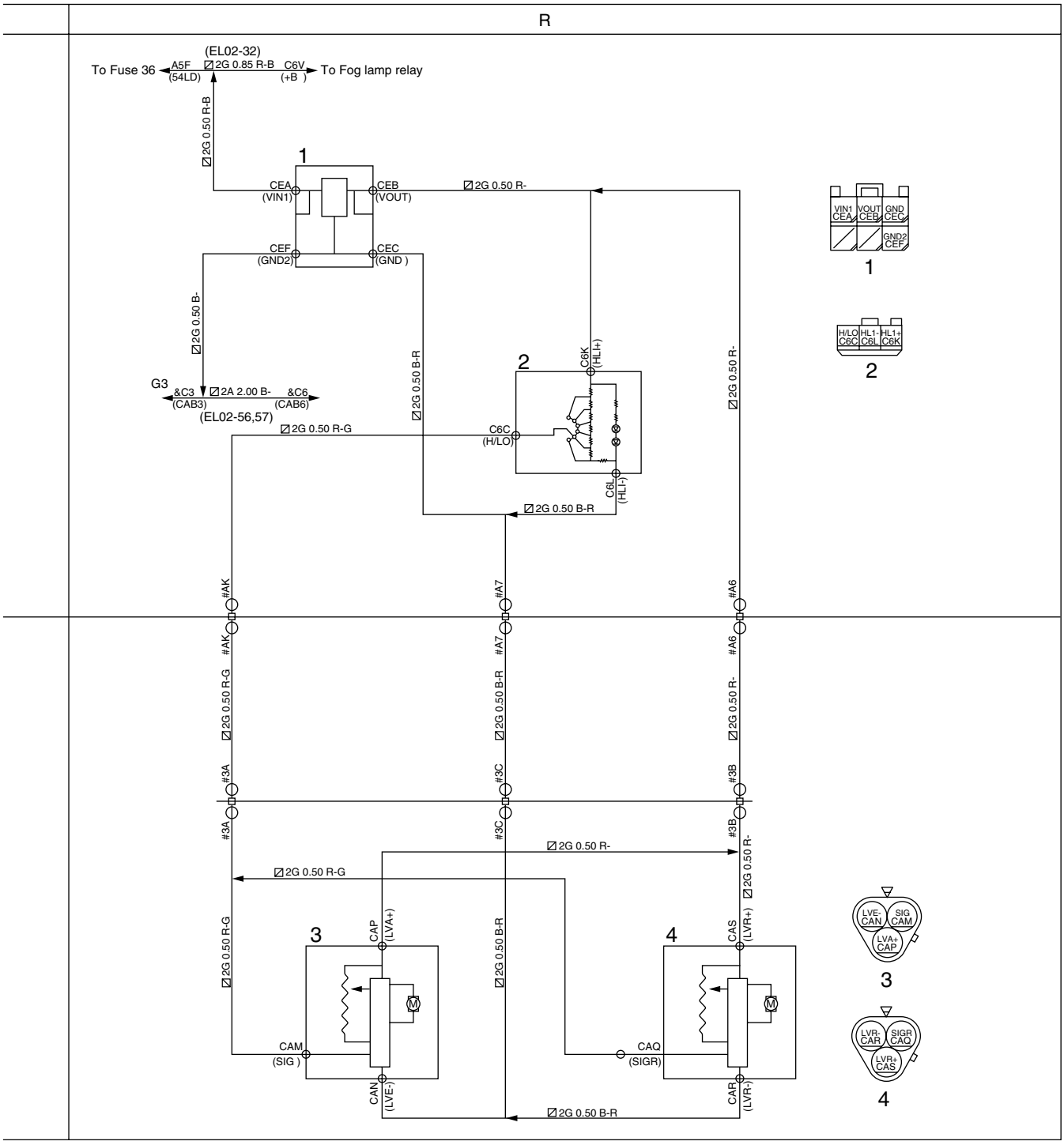
M12020100022



M12020100023

Q. SPOT LAMP CIRCUIT

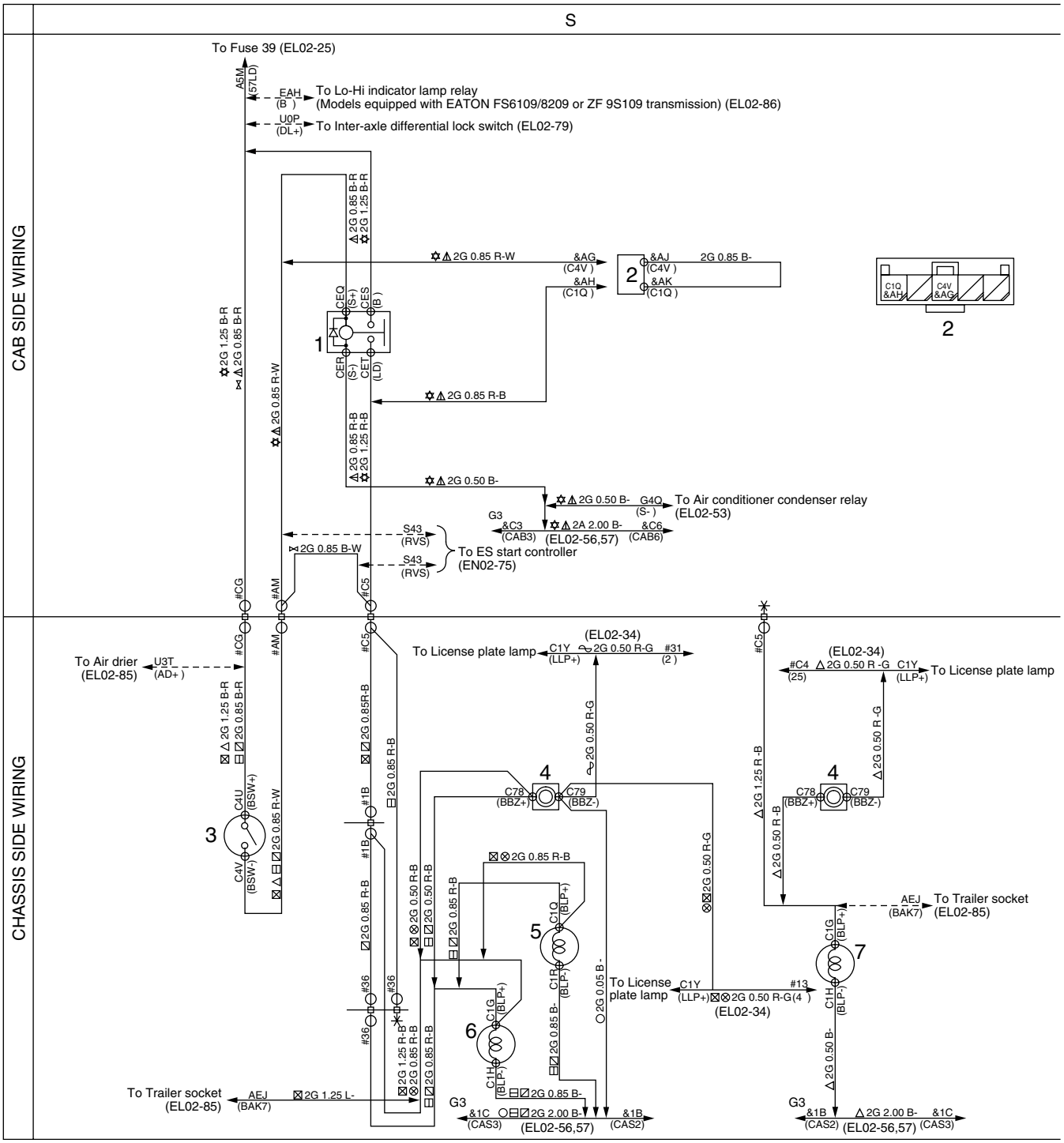
1. Spot lamp switch
2. Spot lamp



M12020100024

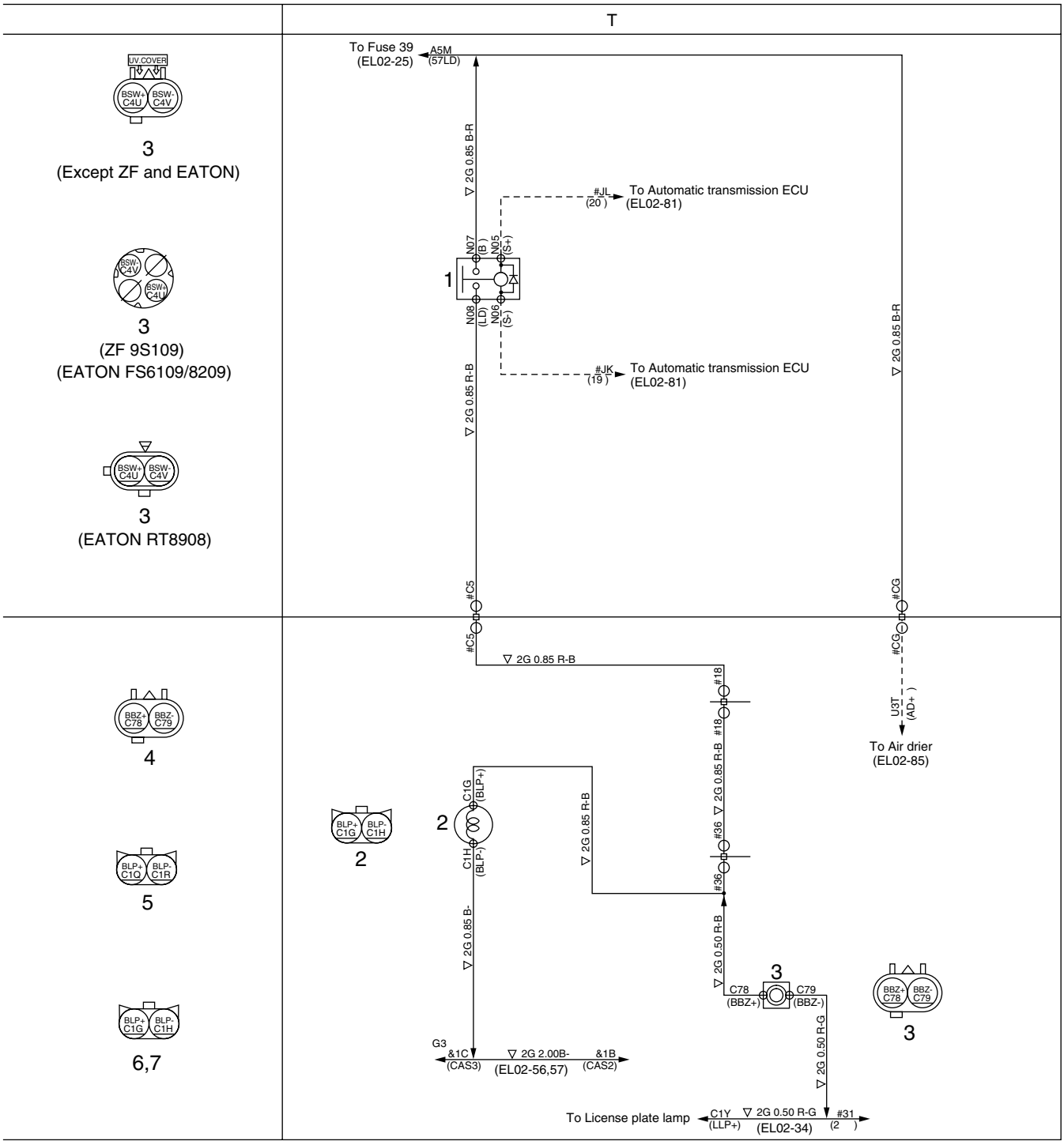
R. HEAD LAMP CONTROL CIRCUIT

1. DC-DC converter
2. Head lamp leveling control switch
3. Head lamp leveling actuator (LH)
4. Head lamp leveling actuator (RH)



S. BACK-UP LAMP CIRCUIT (MODELS WITH MANUAL TRANSMISSION)

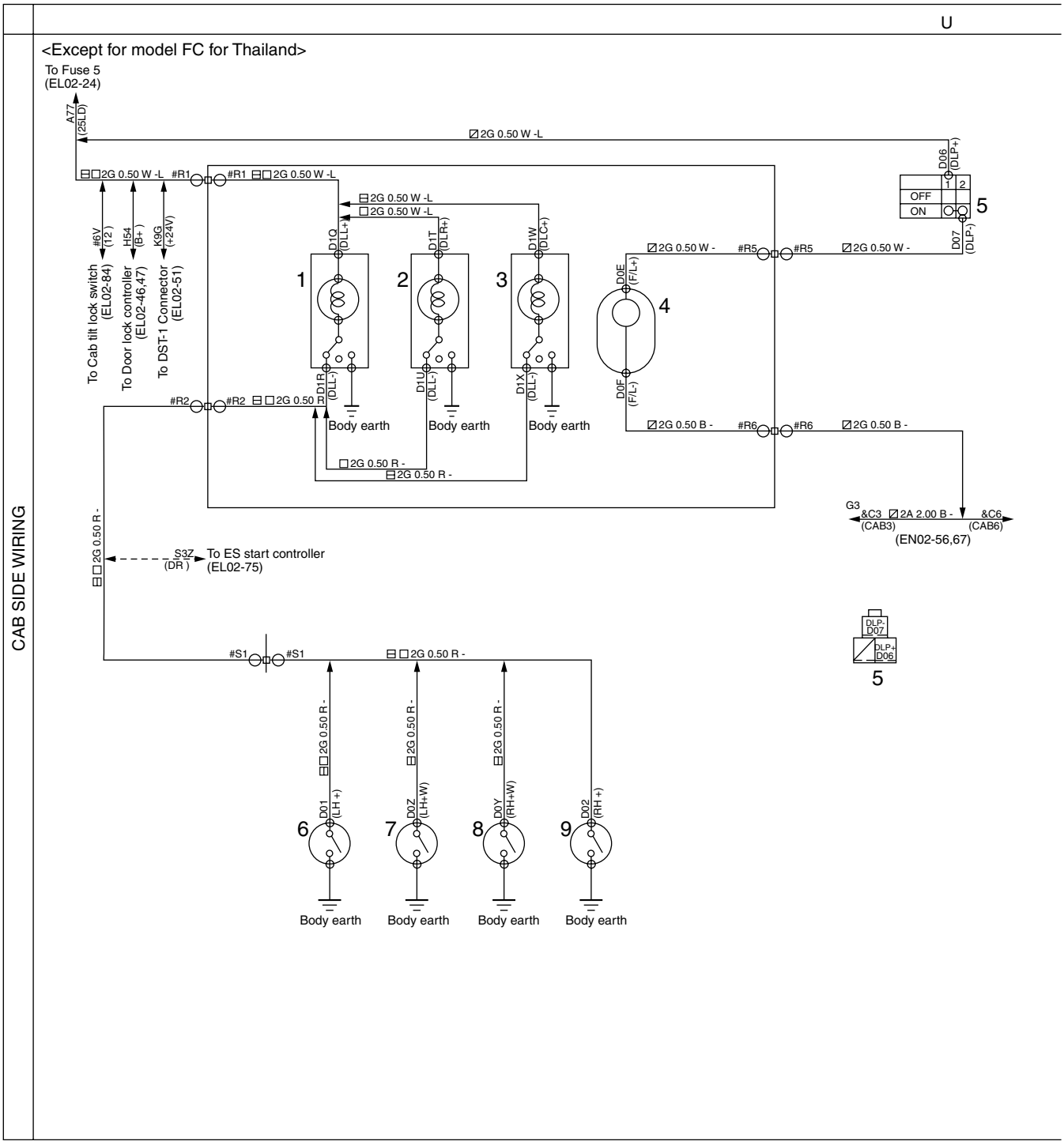
1. Back-up lamp relay
2. Back-up lamp short-circuit connector
3. Back-up lamp switch
4. Back-up buzzer
5. Back-up lamp (RH)
6. Back-up lamp (LH)
7. Back-up lamp



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T. BACK-UP LAMP CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

1. Back-up lamp relay
2. Back-up lamp
3. Back-up buzzer

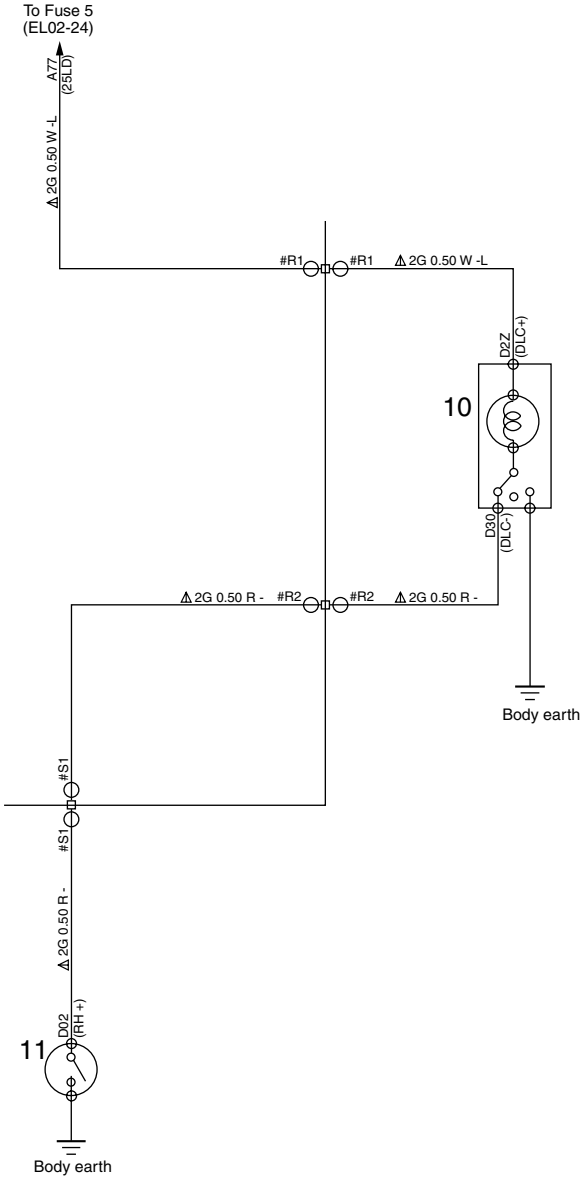


M12020100027

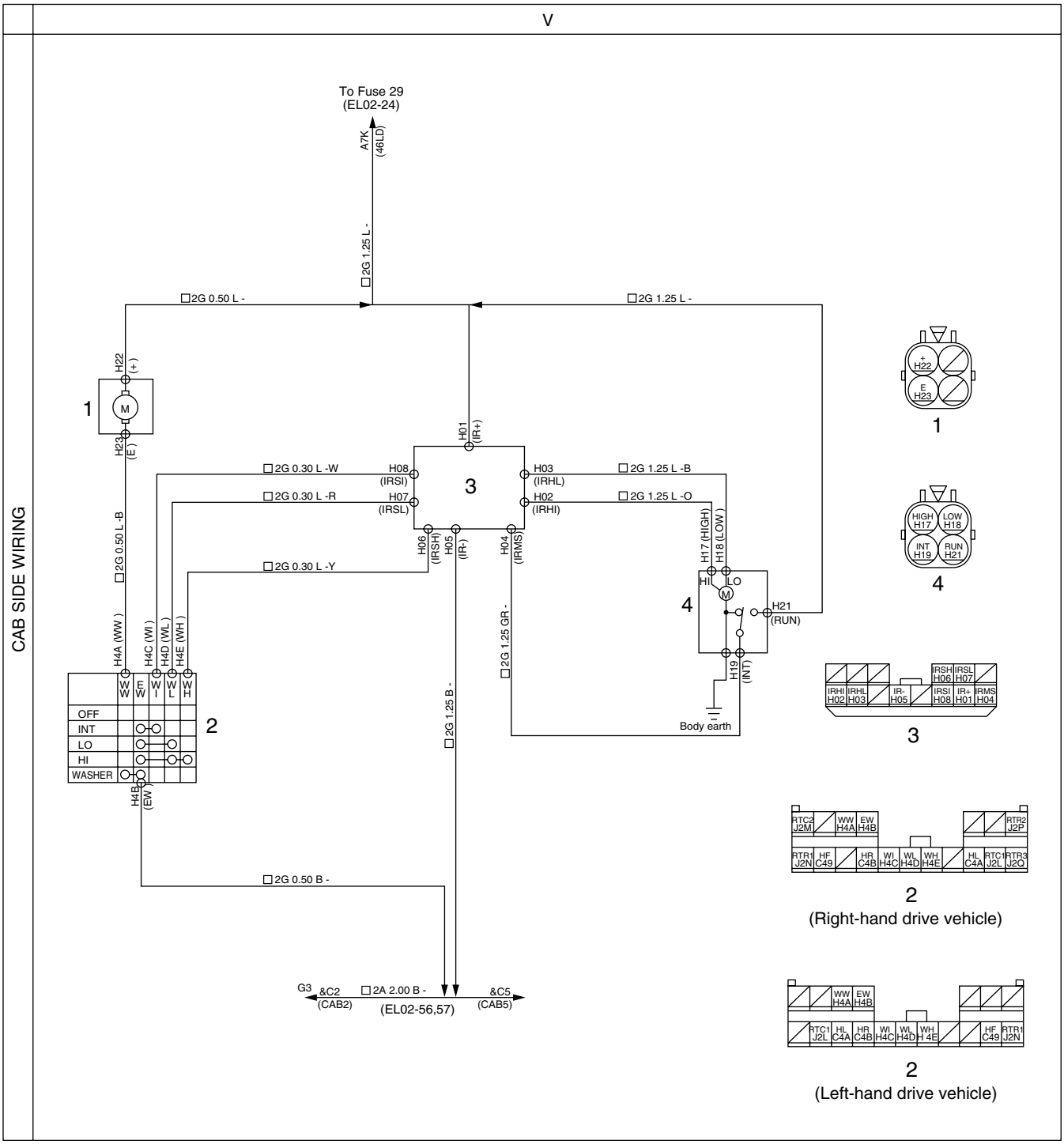
U. ROOM LAMP CIRCUIT

1. Front room lamp (LH)
2. Front room lamp (RH)
3. Rear room lamp
4. Fluorescent lamp
5. Fluorescent lamp switch
6. Front courtesy switch (LH)
7. Rear courtesy switch (LH)
8. Rear courtesy switch (RH)
9. Front courtesy switch (RH)
10. Center room lamp
11. Courtesy switch

<Model FC for Thailand>



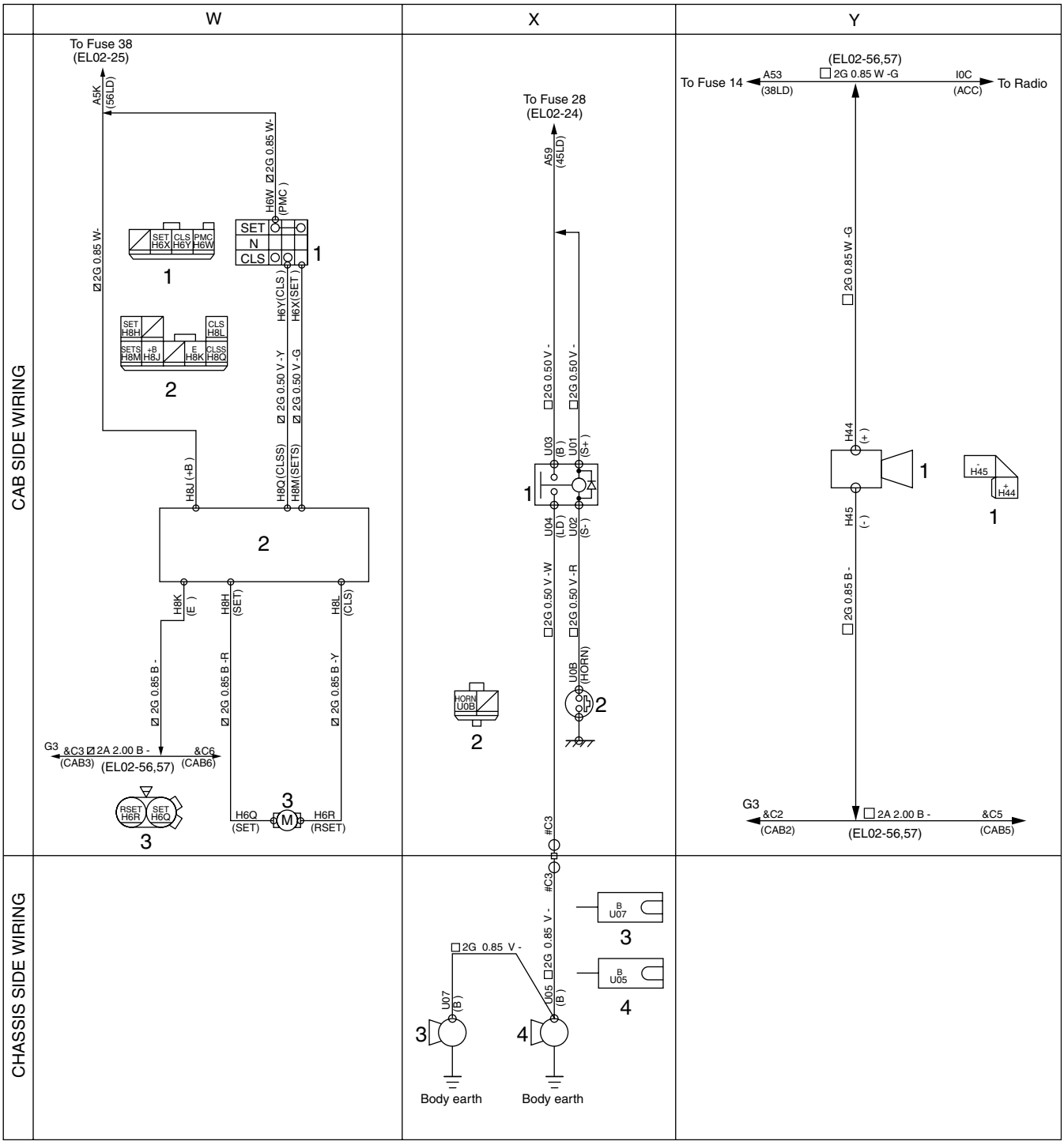
M12020100028



M12020100029

V. WIPER AND WASHER CIRCUIT

1. Washer motor
2. Wiper switch
3. Intermittent wiper relay
4. Wiper motor



M12020100030

W. POWER MIRROR CIRCUIT

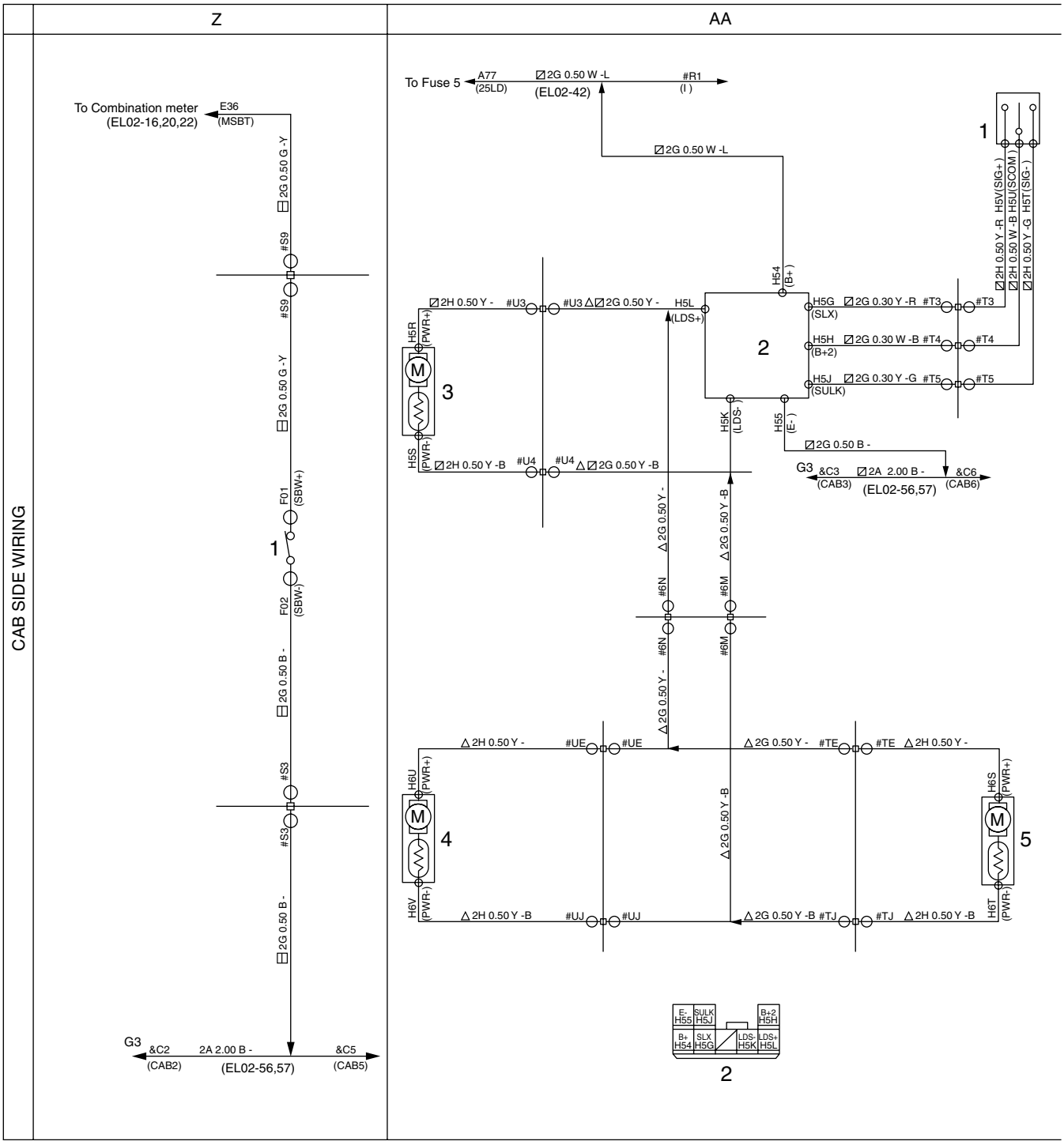
1. Power mirror switch
2. Power mirror relay
3. Power mirror motor

X. HORN CIRCUIT

1. Horn relay
2. Horn switch
3. Horn (Low)
4. Horn (High)

Y. CIGARETTE LIGHTER CIRCUIT

1. Cigarette lighter



M12020100031

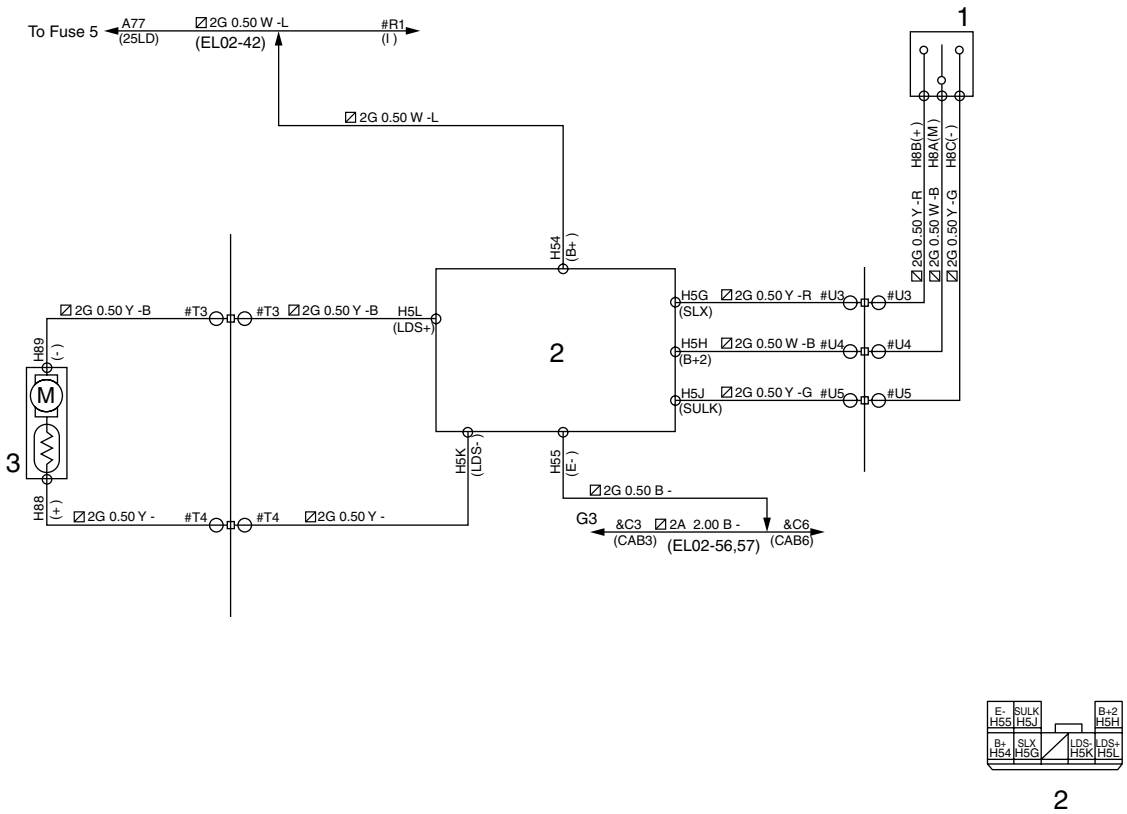
Z. SEAT BELT WARNING LAMP CIRCUIT

1. Seat belt warning lamp switch

AA. POWER DOOR LOCK CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)

1. Door lock switch (Driver's seat side)
2. Door lock controller
3. Door lock actuator (Assistant's seat side)
4. Rear door lock actuator (LH)
5. Rear door lock actuator (RH)

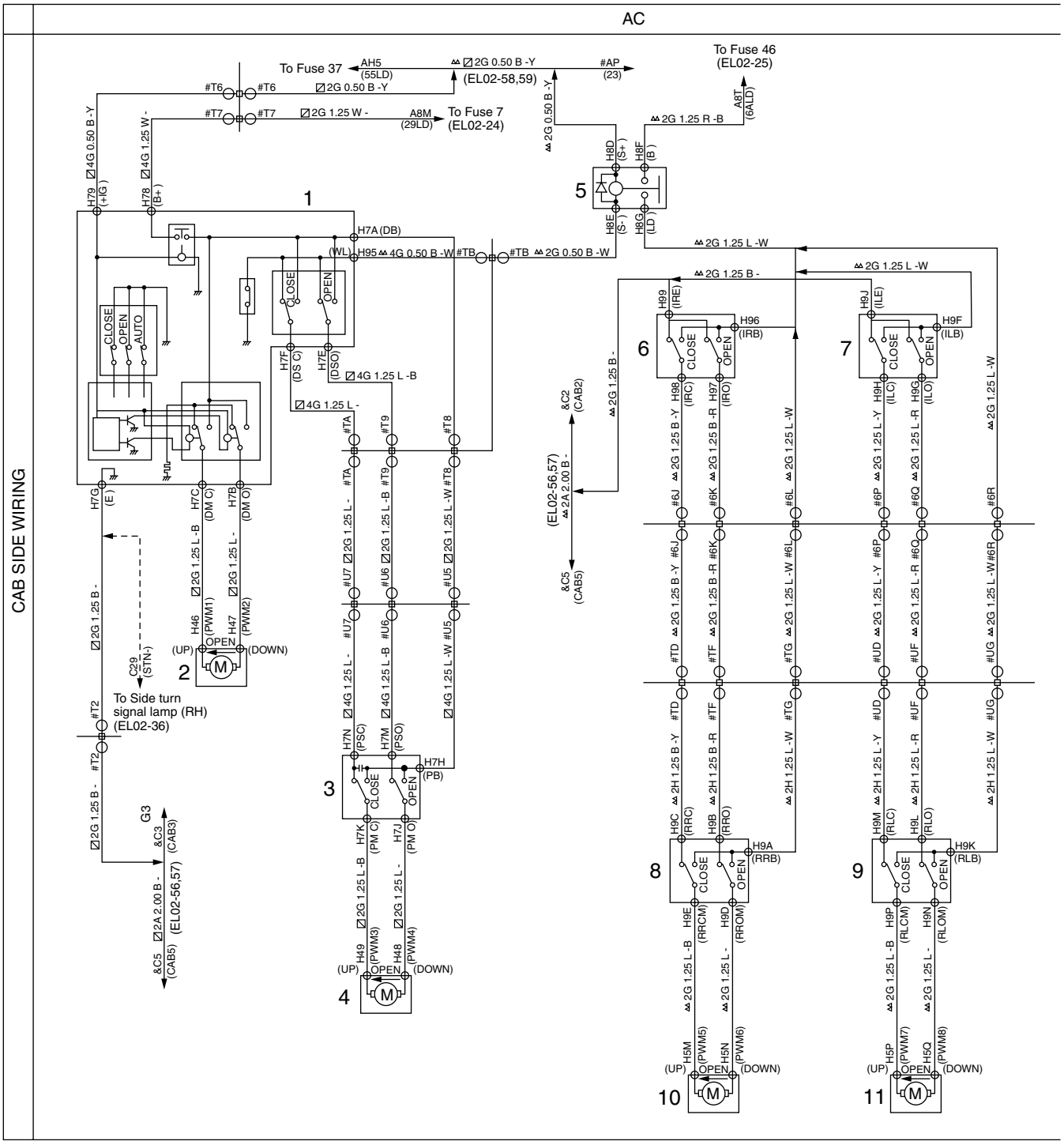
AB



M12020100032

AB. POWER DOOR LOCK CIRCUIT (FOR LEFT-HAND DRIVE VEHICLE)

1. Door lock switch (Driver's seat side)
2. Door lock controller
3. Door lock actuator (Assistant's seat side)

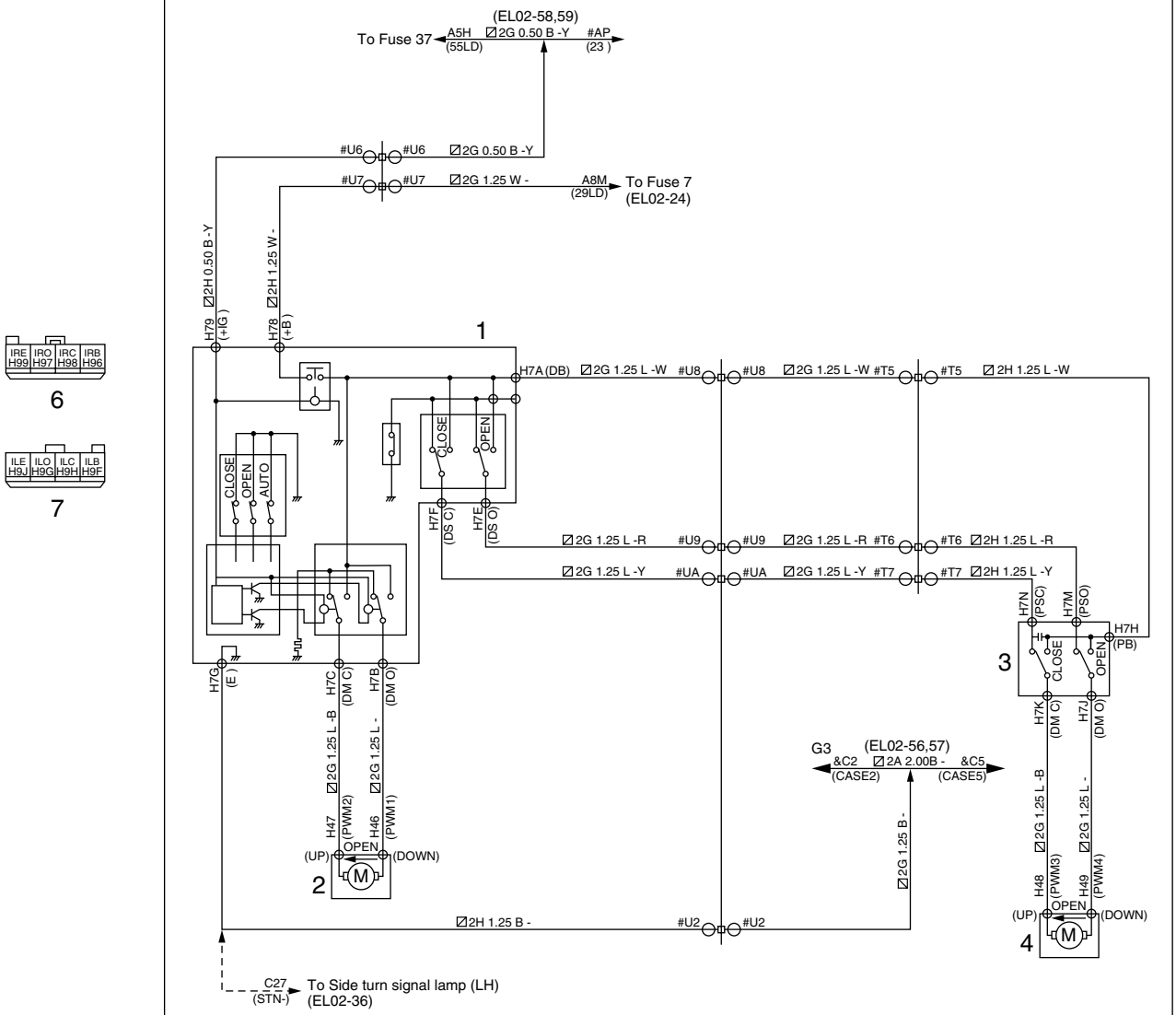


M12020100033

AC. POWER WINDOW CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)

1. Power window switch (Driver's seat side)
2. Power window motor (Driver's seat side)
3. Power window switch (Assistant's seat side)
4. Power window motor (Assistant's seat side)
5. Rear power window relay
6. Rear power window switch (RH) (Driver's seat side)
7. Rear power window switch (LH) (Driver's seat side)
8. Rear power window switch (RH) (Rear seat side)
9. Rear power window switch (LH) (Rear seat side)
10. Rear power window motor (RH)
11. Rear power window motor (LH)

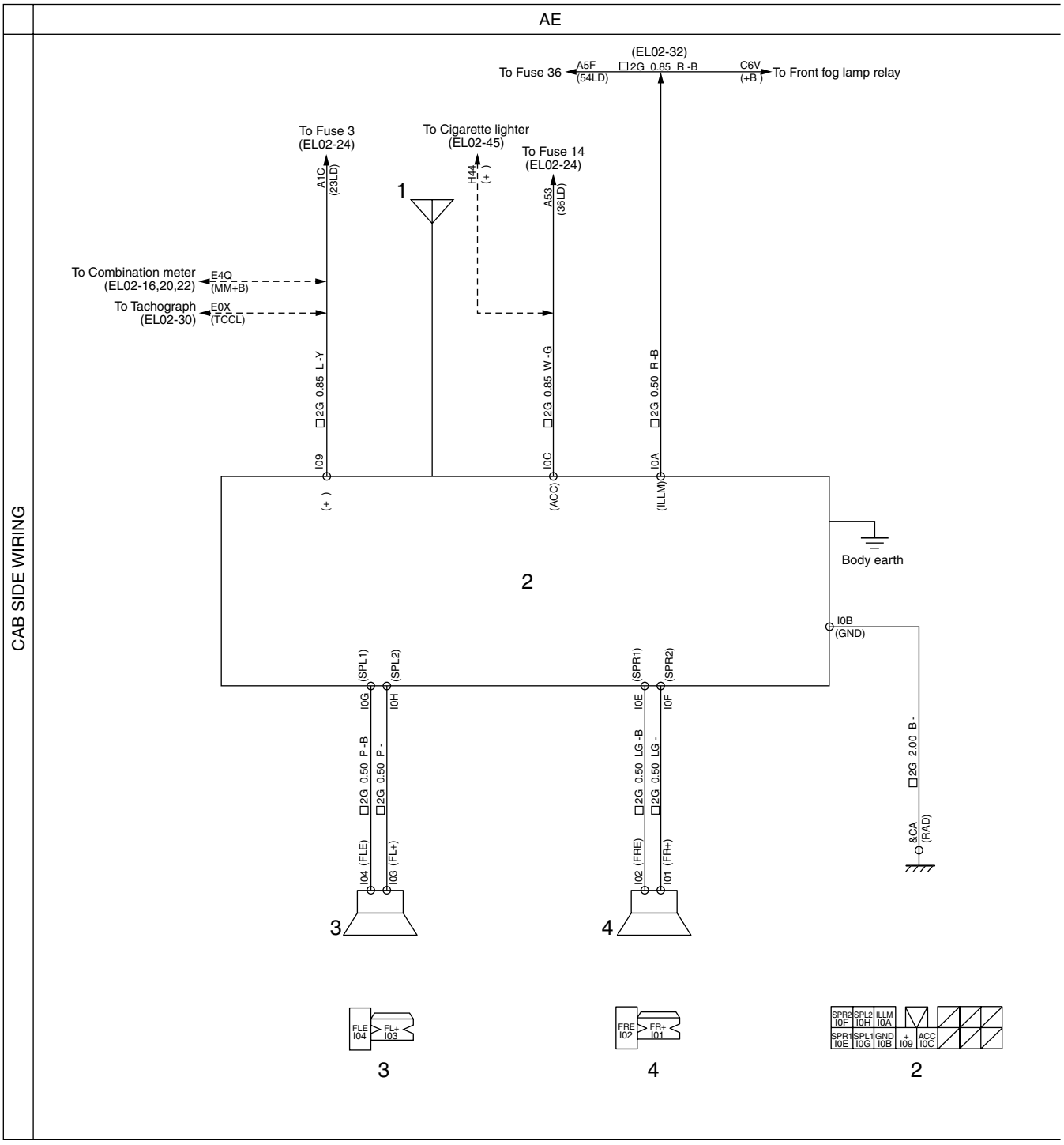
AD



M12020100034

AD. POWER WINDOW CIRCUIT (FOR LEFT-HAND DRIVE VEHICLE)

1. Power window switch (Driver's seat side)
2. Power window motor (Driver's seat side)
3. Power window switch (Assistant's seat side)
4. Power window motor (Assistant's seat side)

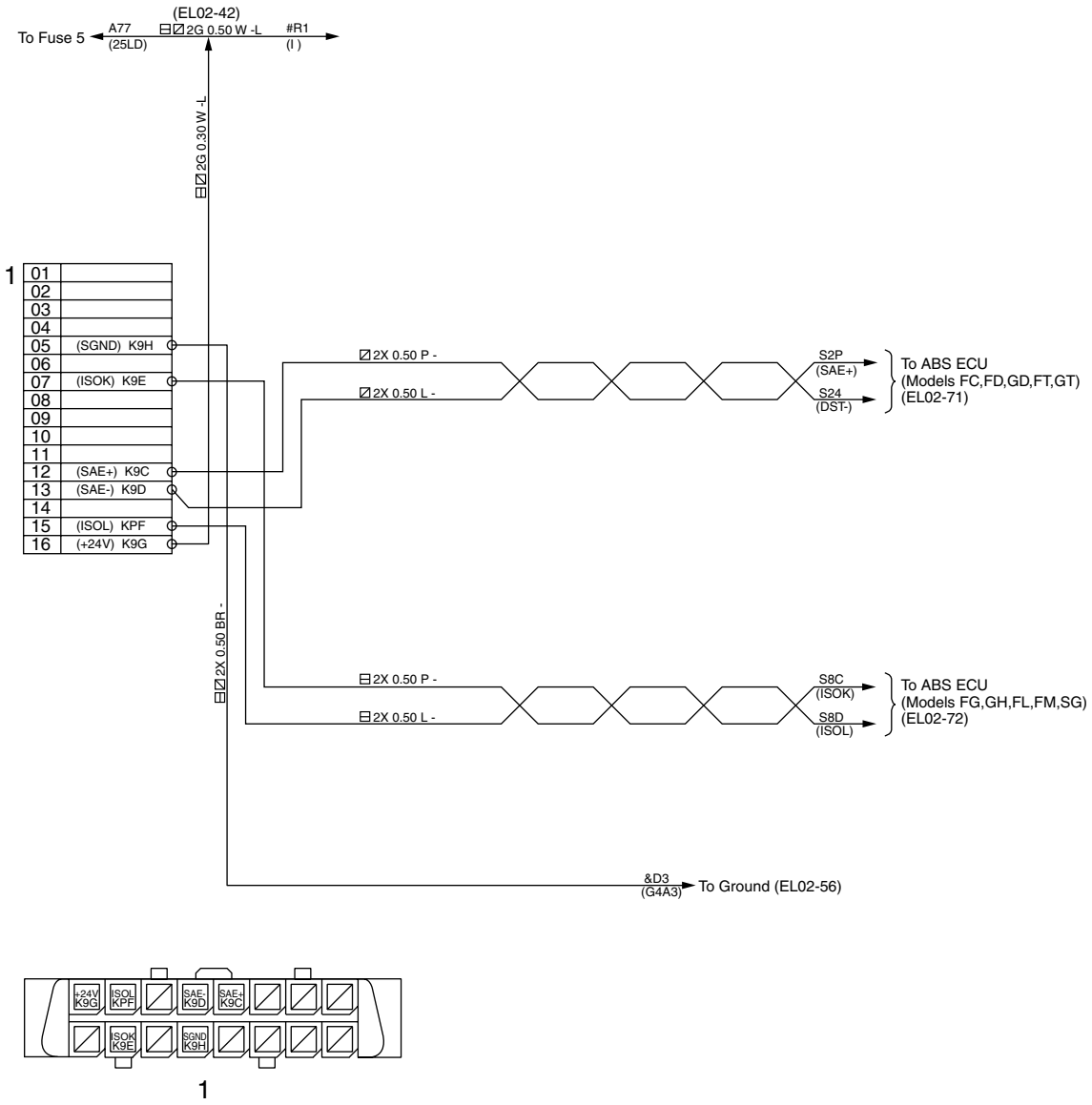


M12020100035

AE. RADIO/AUDIO CIRCUIT

1. Antenna
2. Radio/audio unit
3. Front speaker (LH)
4. Front speaker (RH)

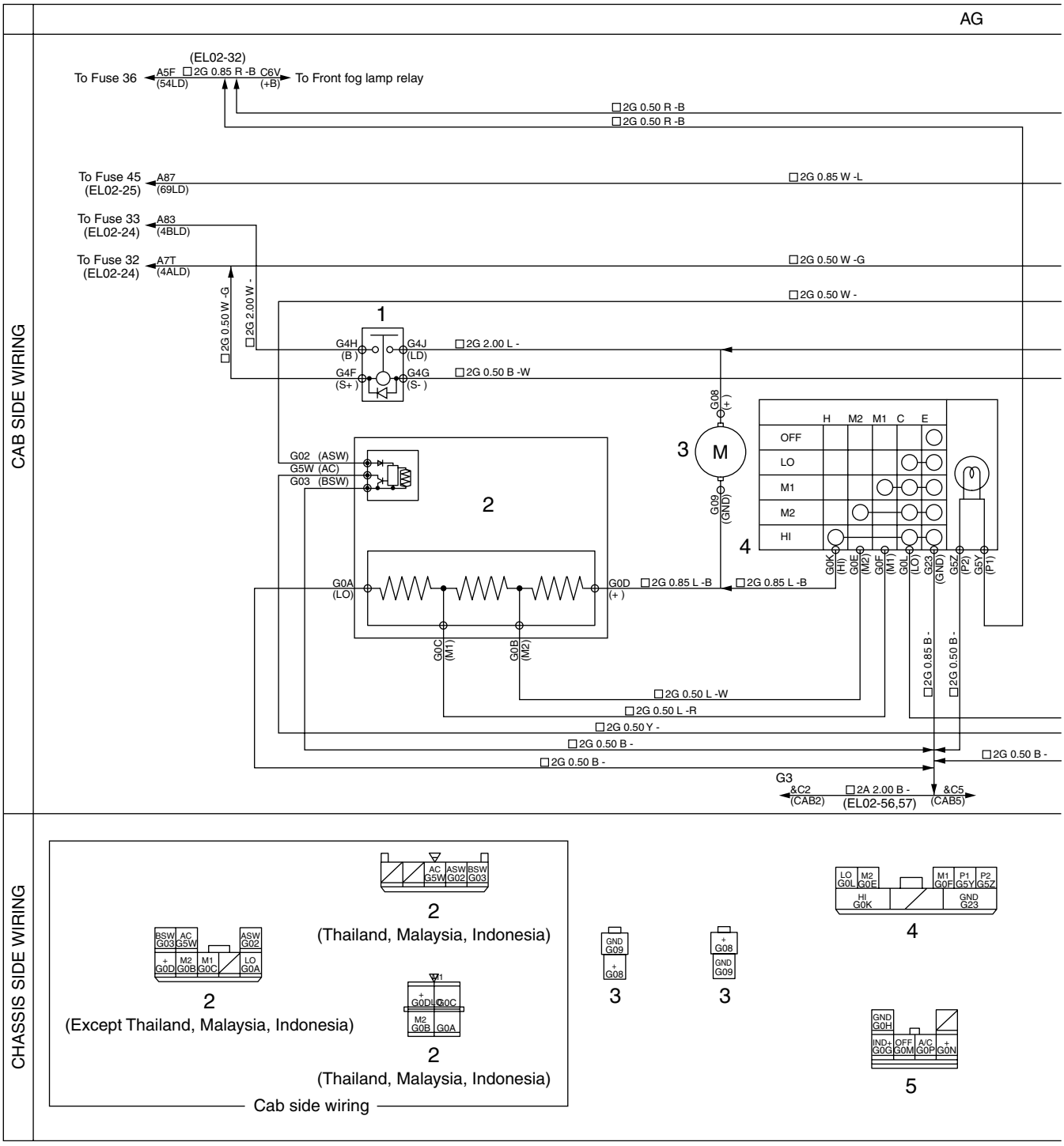
AF



M12020100036

AF. DST-1 CIRCUIT

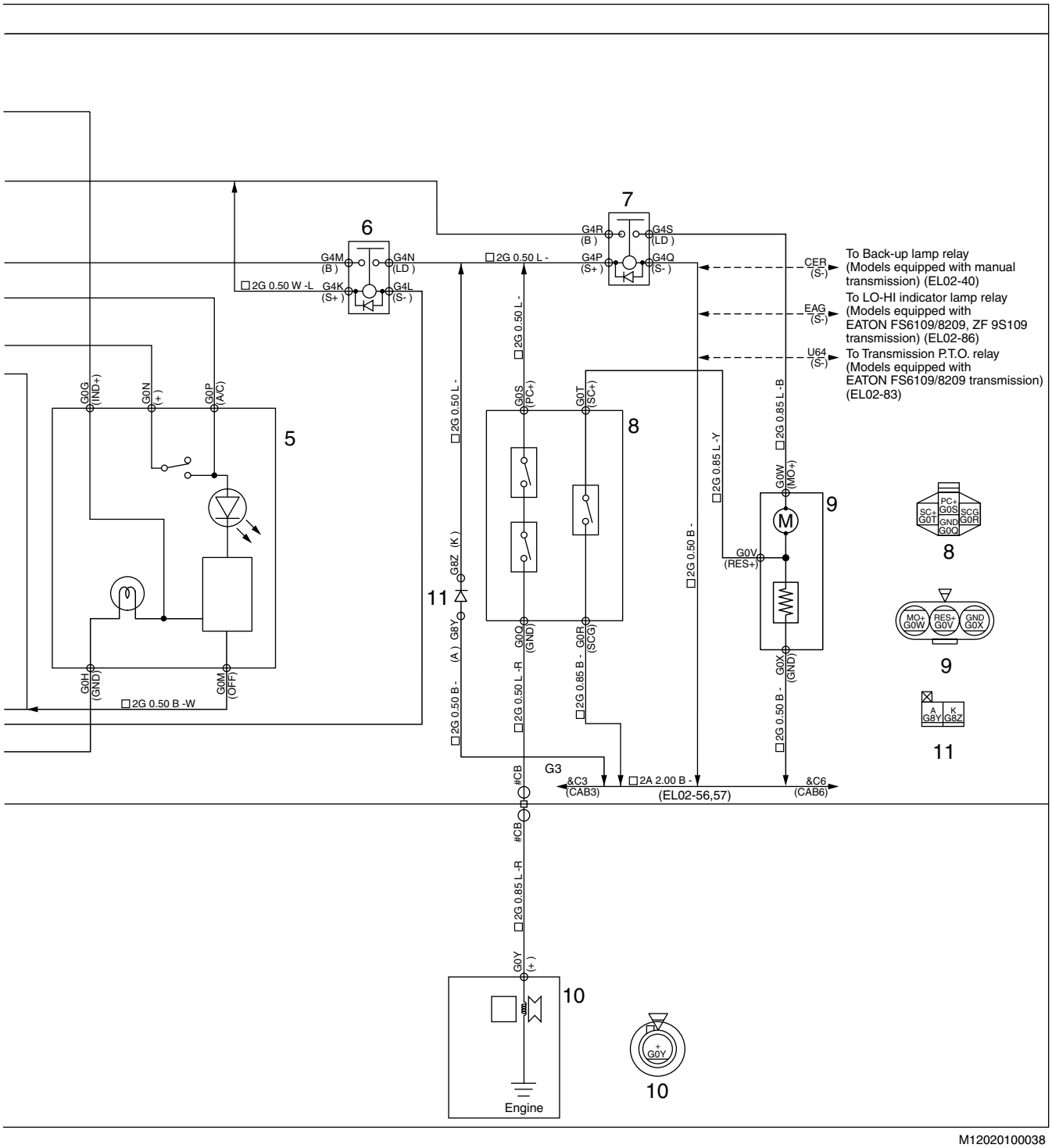
1. DST-1 connector



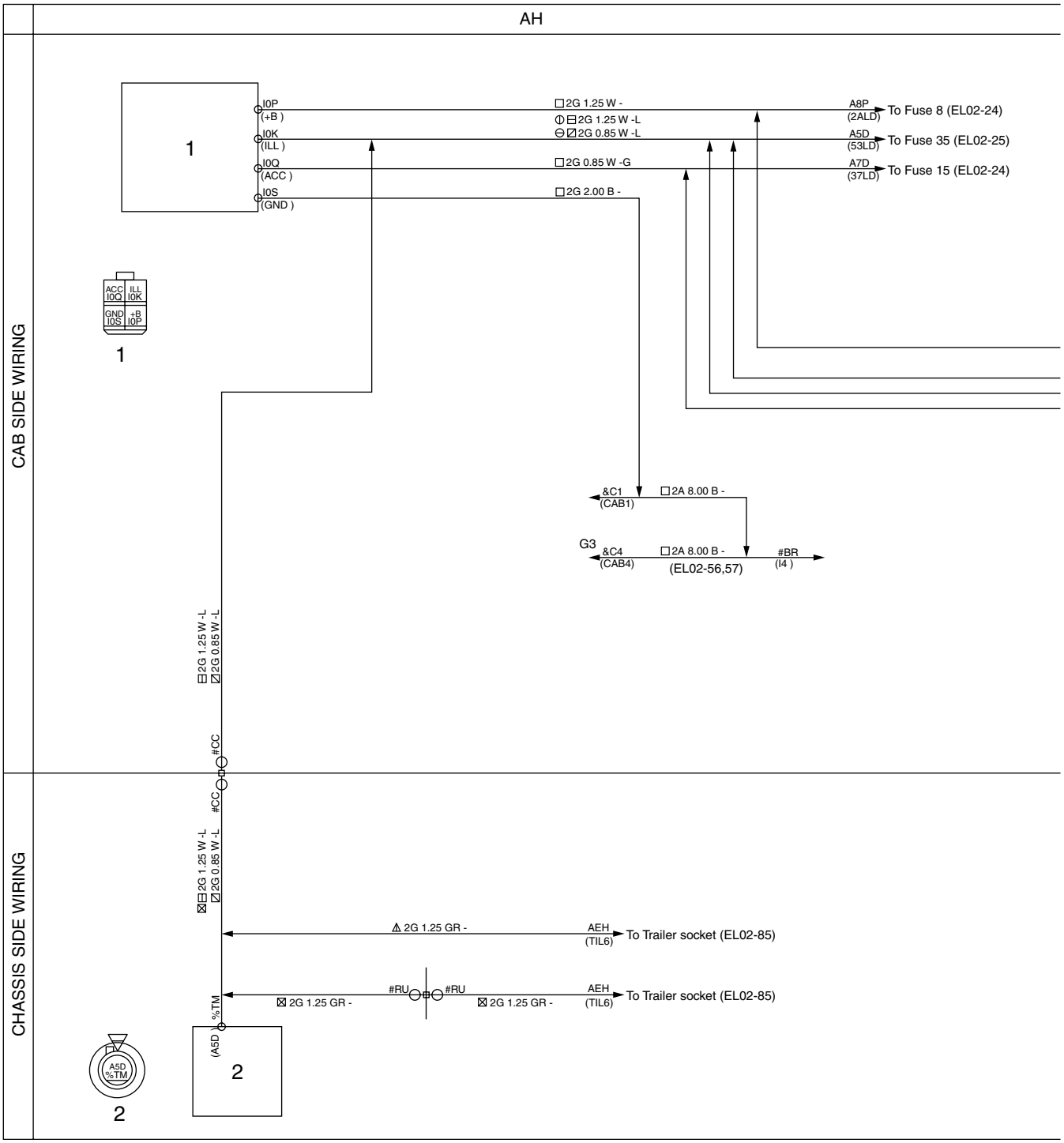
M12020100037

AG. HEATER AND MANUAL AIR CONDITIONER CIRCUIT

1. Heater relay
2. Heater and cooler unit
3. Blower motor
4. Heater blower switch
5. Air conditioner switch
6. Air conditioner relay
7. Air conditioner condenser relay
8. High-Low pressure cut switch
9. Air conditioner condenser
10. Compressor
11. Diode



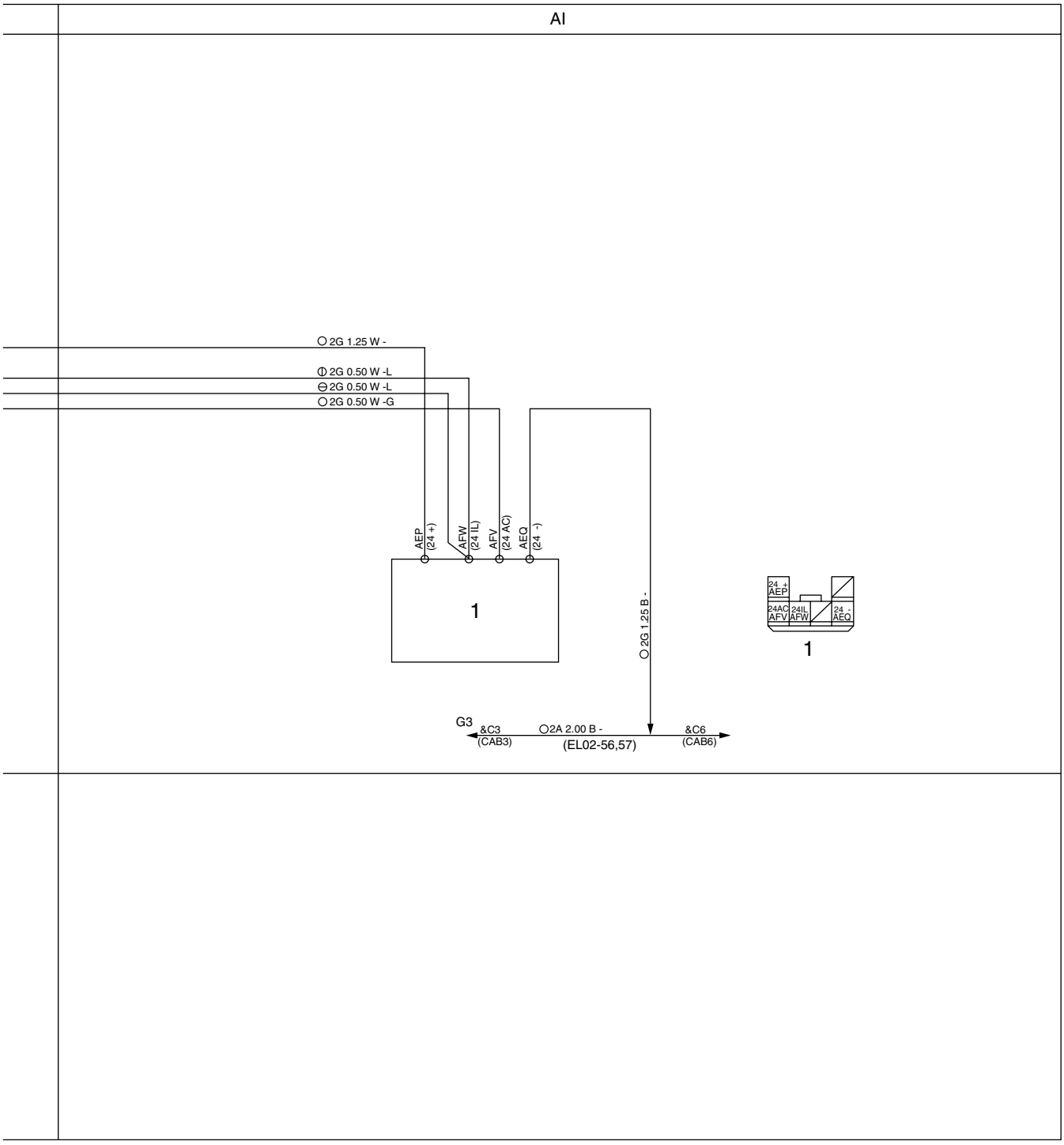
M12020100038



M12020100039

AH. SPARE POWER SOURCE CIRCUIT

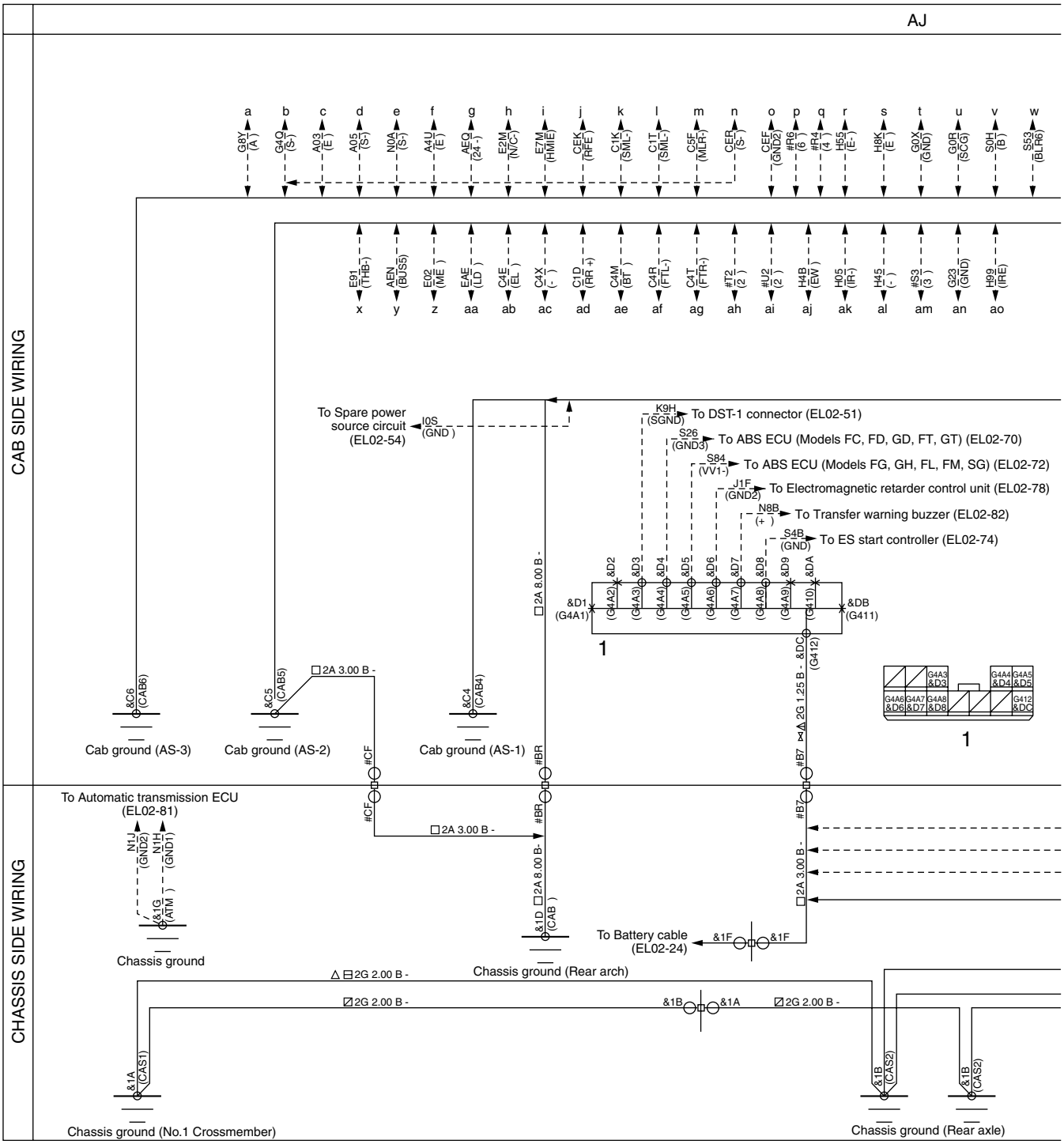
1. Spare power source connector
2. Spare power source connector



M12020100040

AI. 12V SPARE POWER SOURCE CIRCUIT

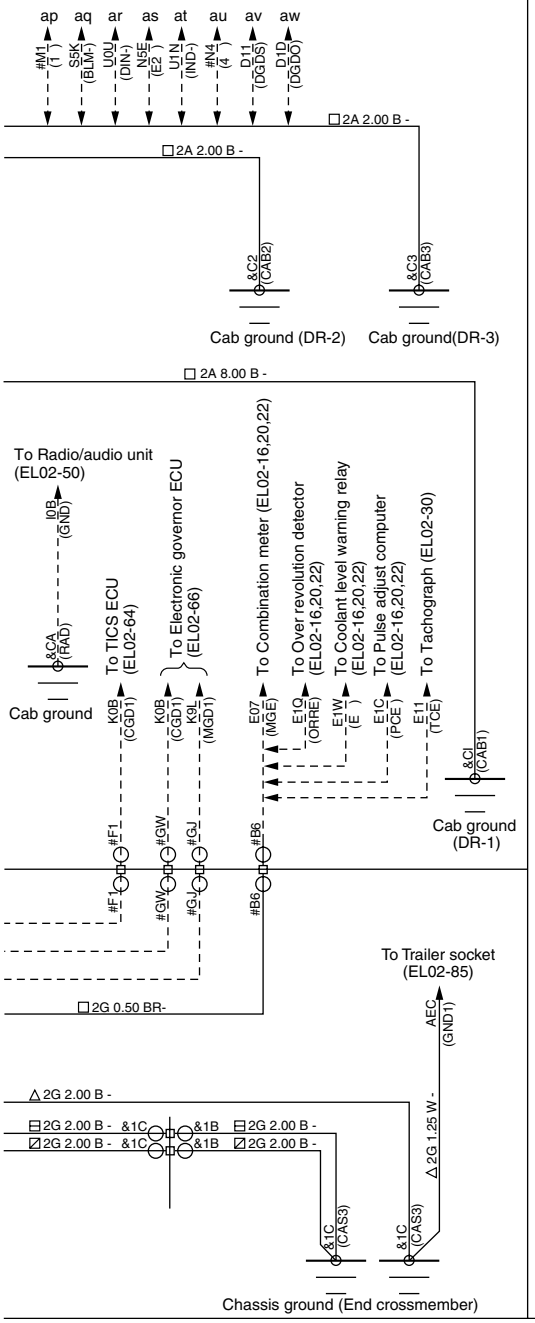
1 DC-DC converter



M12020100041

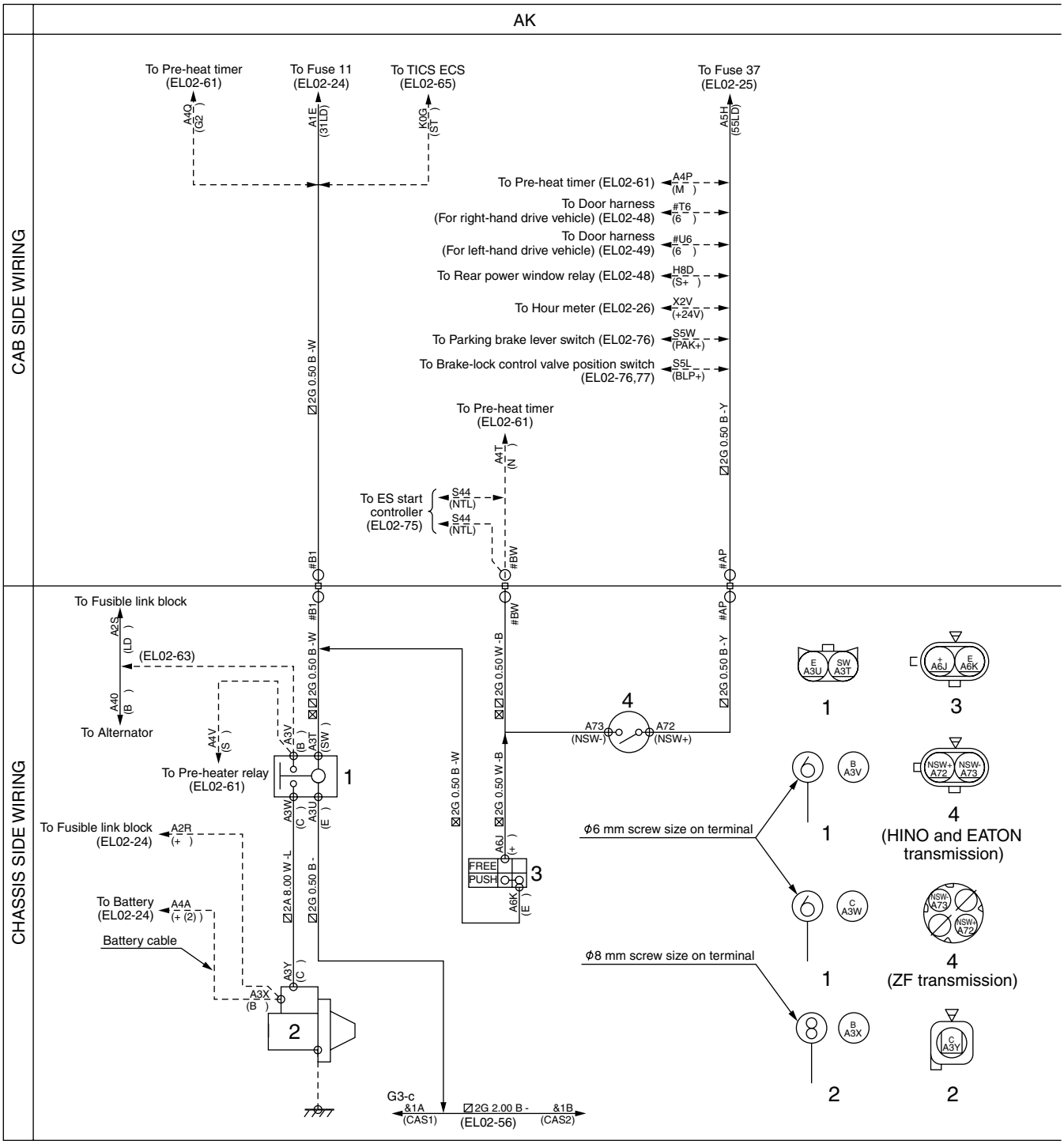
AJ. GROUND CIRCUIT

1. Cab-chassis harness connector



a. To Air conditioner diode (EL02-53)
b. To Air conditioner condenser relay (EL02-53)
c. To Engine stop electric motor (EL02-69)
d. To Engine stop relay (EL02-69)
e. To Automatic transmission neutral relay (EL02-59)
f. To Pre-heat timer (EL02-61)
g. To DC-DC converter (For 12V spare power source circuit) (EL02-55)
h. To Center parking brake switch (EL02-17,21,23)
i. To Hour meter (EL02-26)
j. To Rear fog lamp switch (EL02-33,35)
k. To Side marker lamp (LH) (EL02-33,35)
l. To Side marker lamp (RH) (EL02-33,35)
m. To Roof marker lamp (EL02-33,35)
n. To Back-up lamp relay
(Models equipped with manual transmission) (EL02-40)
o. To DC-DC converter (For head lamp control circuit) (EL02-39)
p. To Fluorescent lamp (EL02-42)
q. To Roof marker lamp (EL02-33)
r. To Door lock controller (EL02-46,47)
s. To Power mirror relay (EL02-45)
t. To Air conditioner condenser (EL02-53)
u. To Air conditioner high-low pressure cut switch (EL02-53)
v. To ABS warning lamp relay (Models FC, FD, GD, FT, GT) (EL02-70)
w. To Brake-lock relay (EL02-76,77)
x. To Trailer hand brake switch (EL02-16,20)
y. To Power relay (EL02-24)
z. To Combination meter (EL02-16,20,22)
aa. To Warning lamp check relay (EL02-17,21,23)
ab. To Lighting switch (ON, OFF) (EL02-32,34)
ac. To Front fog lamp switch (EL02-32,34)
ad. To Stop lamp switch (EL02-33,35)
ae. To Turn signal lamp switch (EL02-36)
af. To Front turn signal lamp (LH) (EL02-36)
ag. To Front turn signal lamp (RH) (EL02-36)
ah. To Power window switch (For right-hand drive vehicle) (EL02-48)
ai. To Power window switch (For left-hand drive vehicle) (EL02-49)
aj. To Wiper switch (EL02-44)
ak. To Intermittent wiper relay (EL02-44)
al. To Cigarette lighter (EL02-45)
am. To Seat belt warning lamp switch (EL02-47)
an. To Heater blower switch (EL02-52)
ao. To Rear power window switch (EL02-48)
ap. To Brake-lock pressure switch (EL02-76,77)
aq. To Brake-lock control valve (EL02-76,77)
ar. To Inter-axle differential lock switch (EL02-79)
as. To Automatic transmission shift selector (EL02-80)
at. To Transmission P.T.O. switch (EL02-83)
au. To Transmission P.T.O. magnetic valve (EL02-83)
av. To Diagnosis connector (White) (EL02-87)
aw. To Diagnosis connector (Black) (EL02-87)

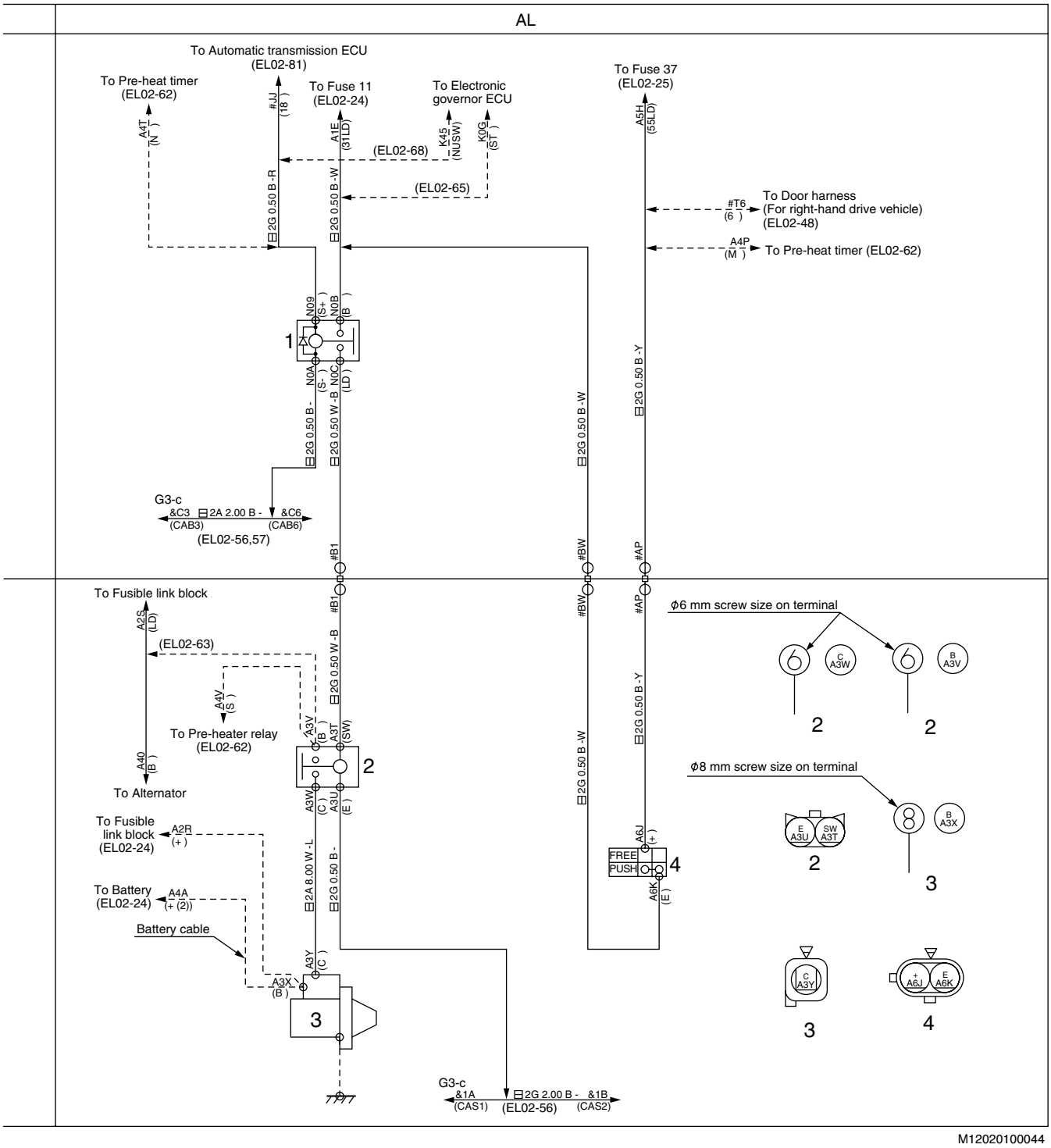
M12020100042



M12020100043

AK. ENGINE STARTING CIRCUIT (MODELS WITH MANUAL TRANSMISSION)

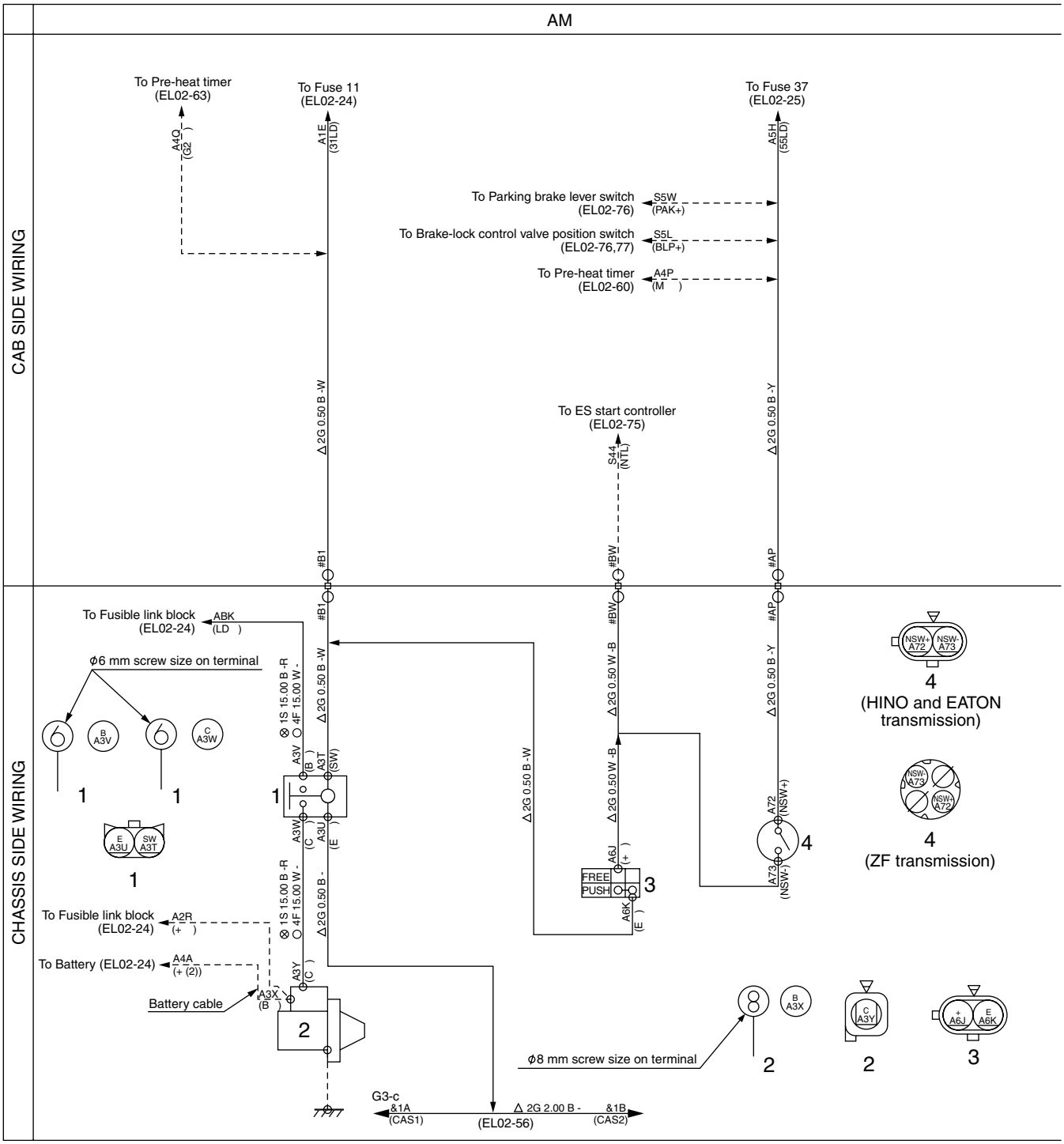
1. Starter relay
2. Starter
3. Sub-starter switch
4. Neutral switch



M12020100044

AL. ENGINE STARTING CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

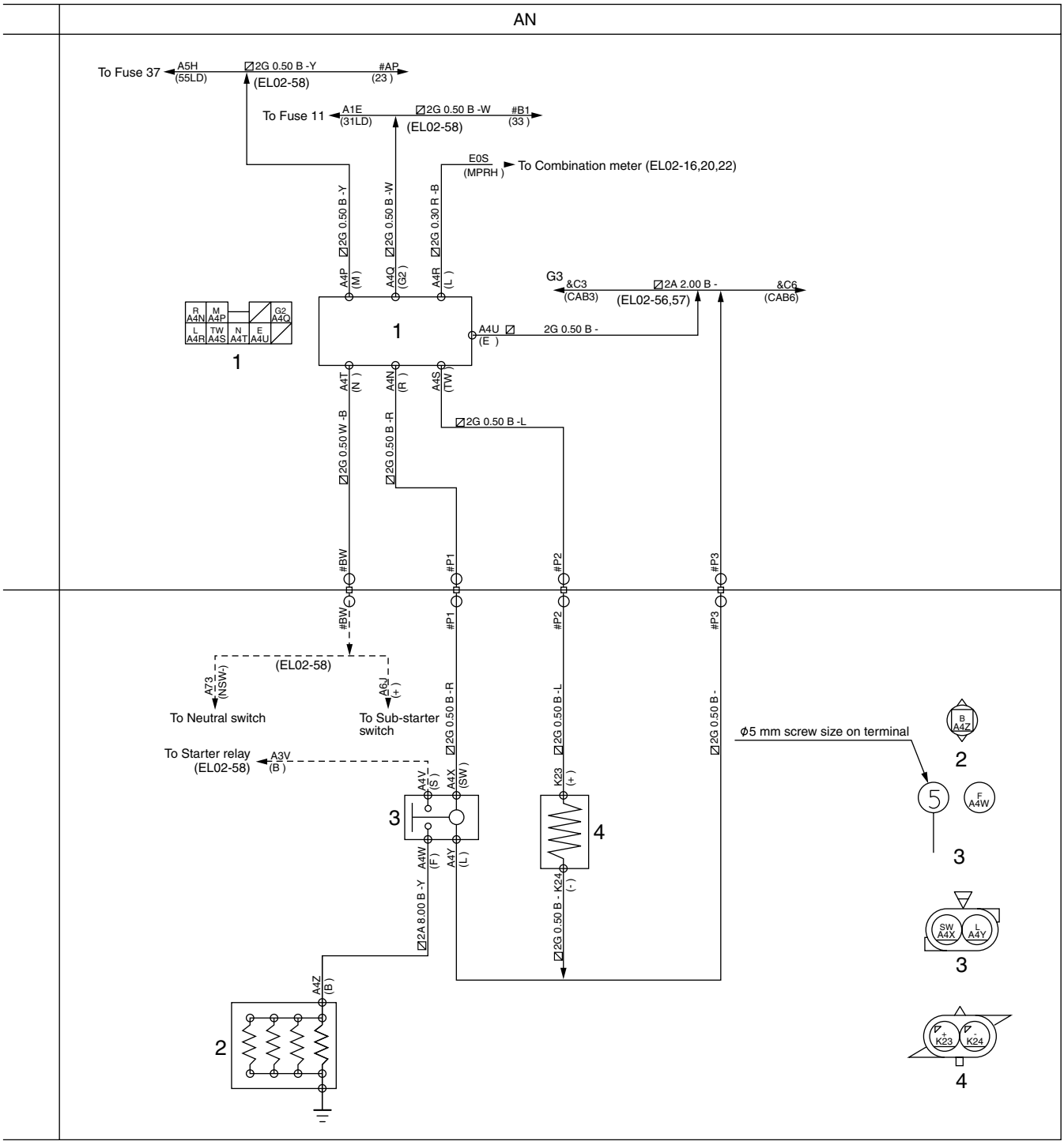
1. Automatic transmission neutral relay
2. Starter relay
3. Starter
4. Sub-starter switch



M12020100045

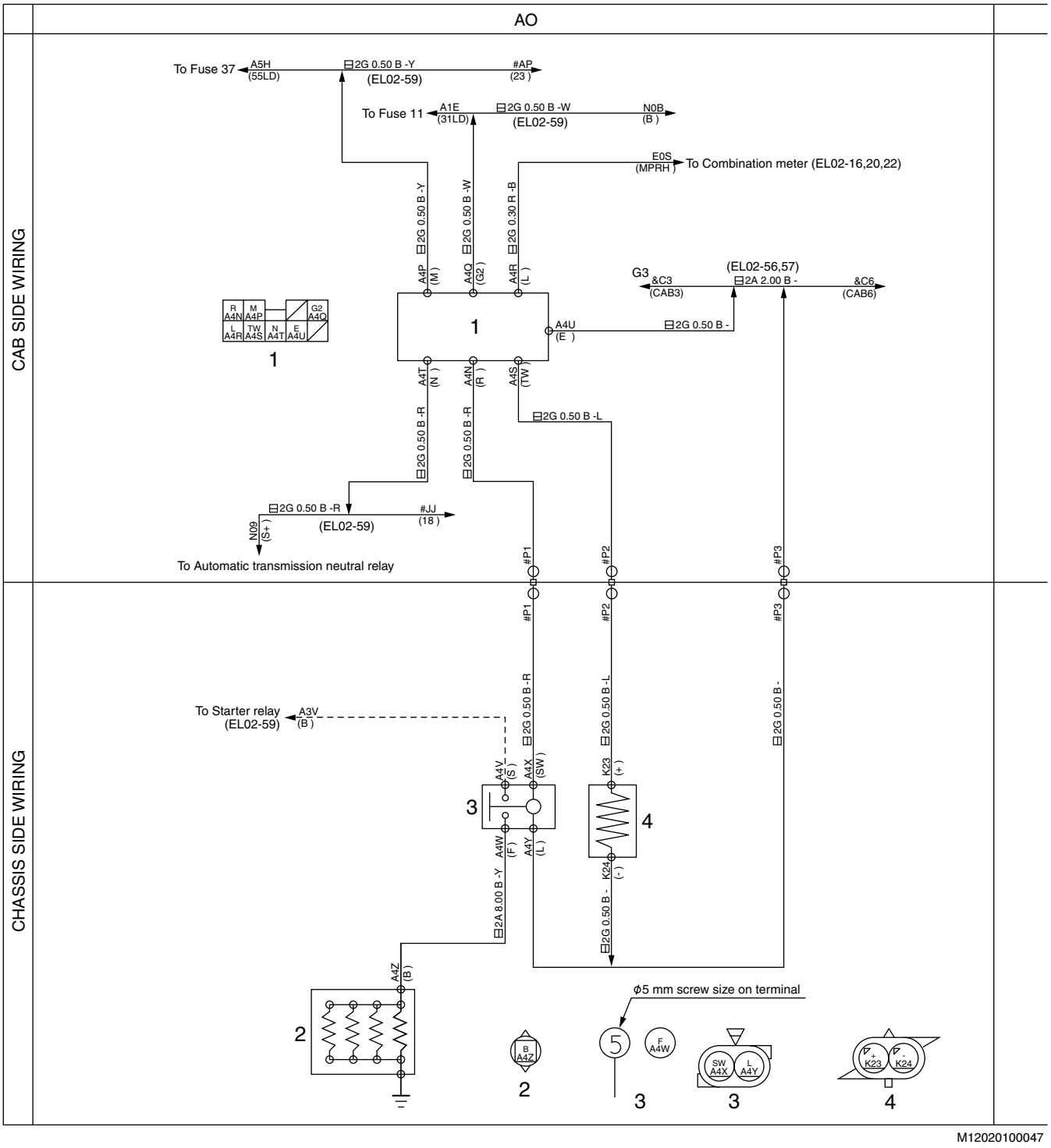
AM. ENGINE STARTING CIRCUIT (MODELS WITH P11C ENGINE)

1. Starter relay
2. Starter
3. Sub-starter switch
4. Neutral switch



AN. PRE-HEATER CIRCUIT (MODELS WITH MANUAL TRANSMISSION)

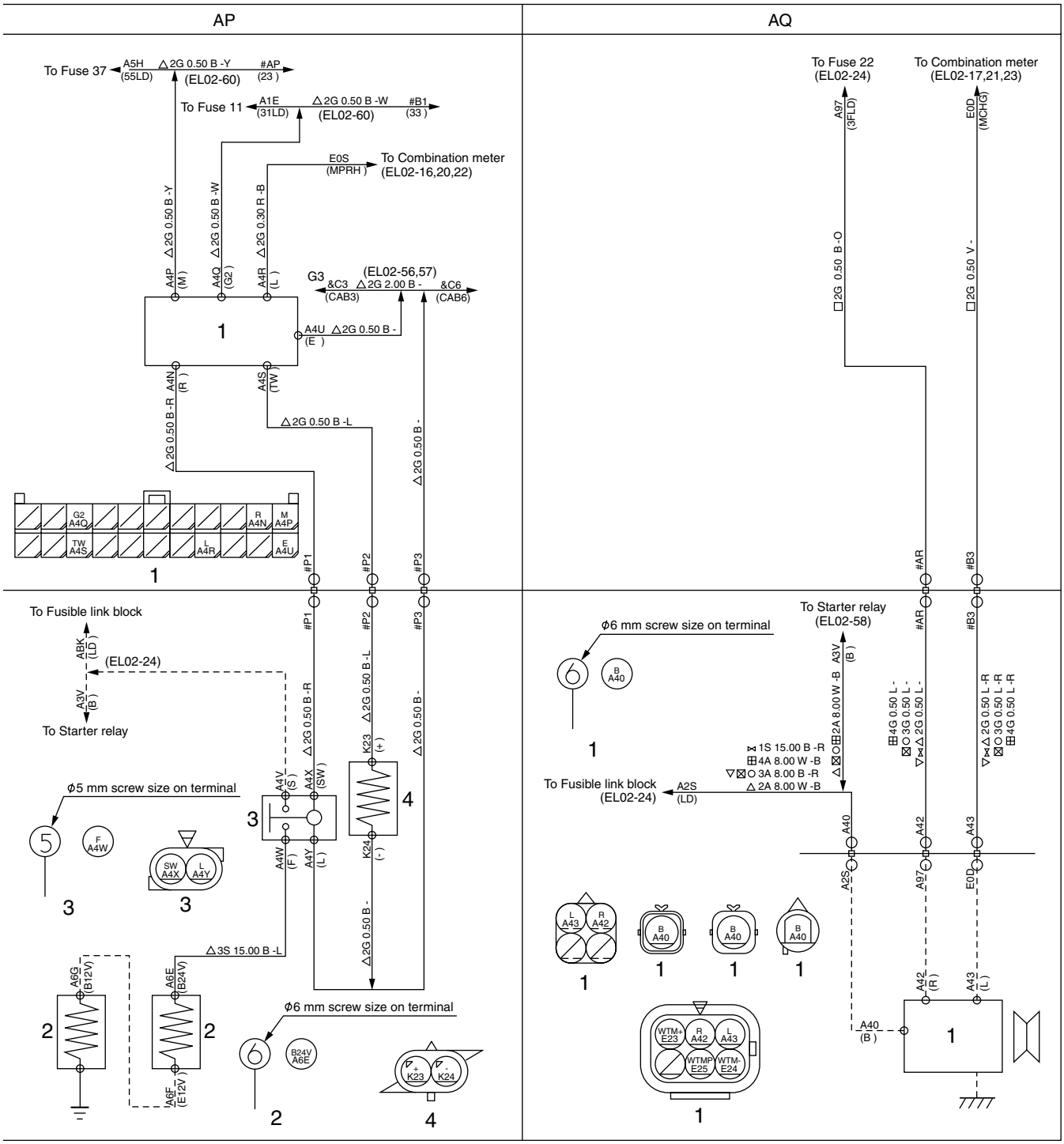
1. Pre-heat timer
2. Grow plug
3. Pre-heater relay
4. Coolant temperature sensor



M12020100047

AO. PRE-HEATER CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

1. Pre-heat timer
2. Grow plug
3. Pre-heater relay
4. Coolant temperature sensor



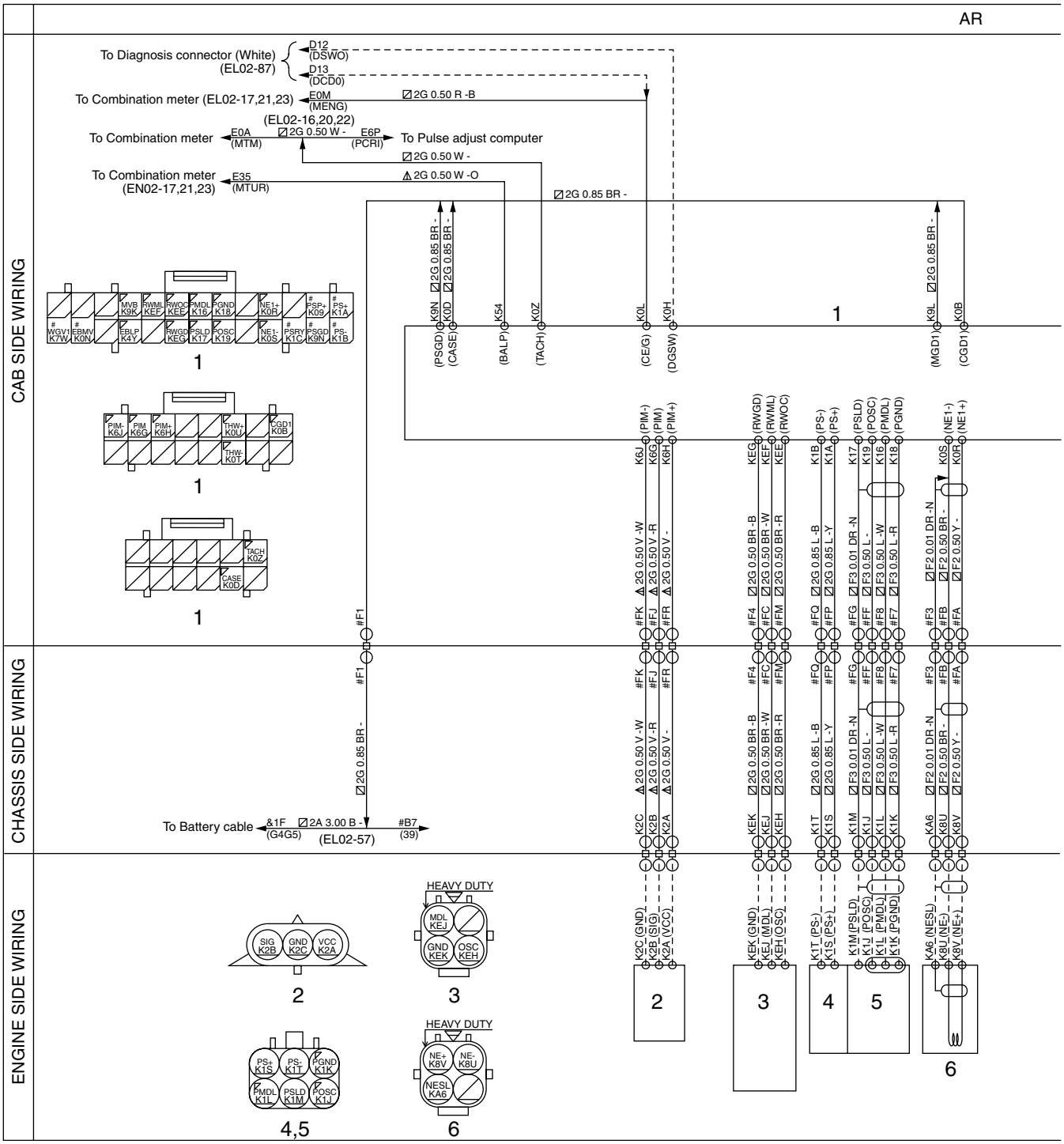
M12020100048

AP. PRE-HEATER CIRCUIT (MODELS WITH P11C ENGINE)

1. Pre-heat timer
2. Intake air heater
3. Pre-heater relay
4. Coolant temperature sensor

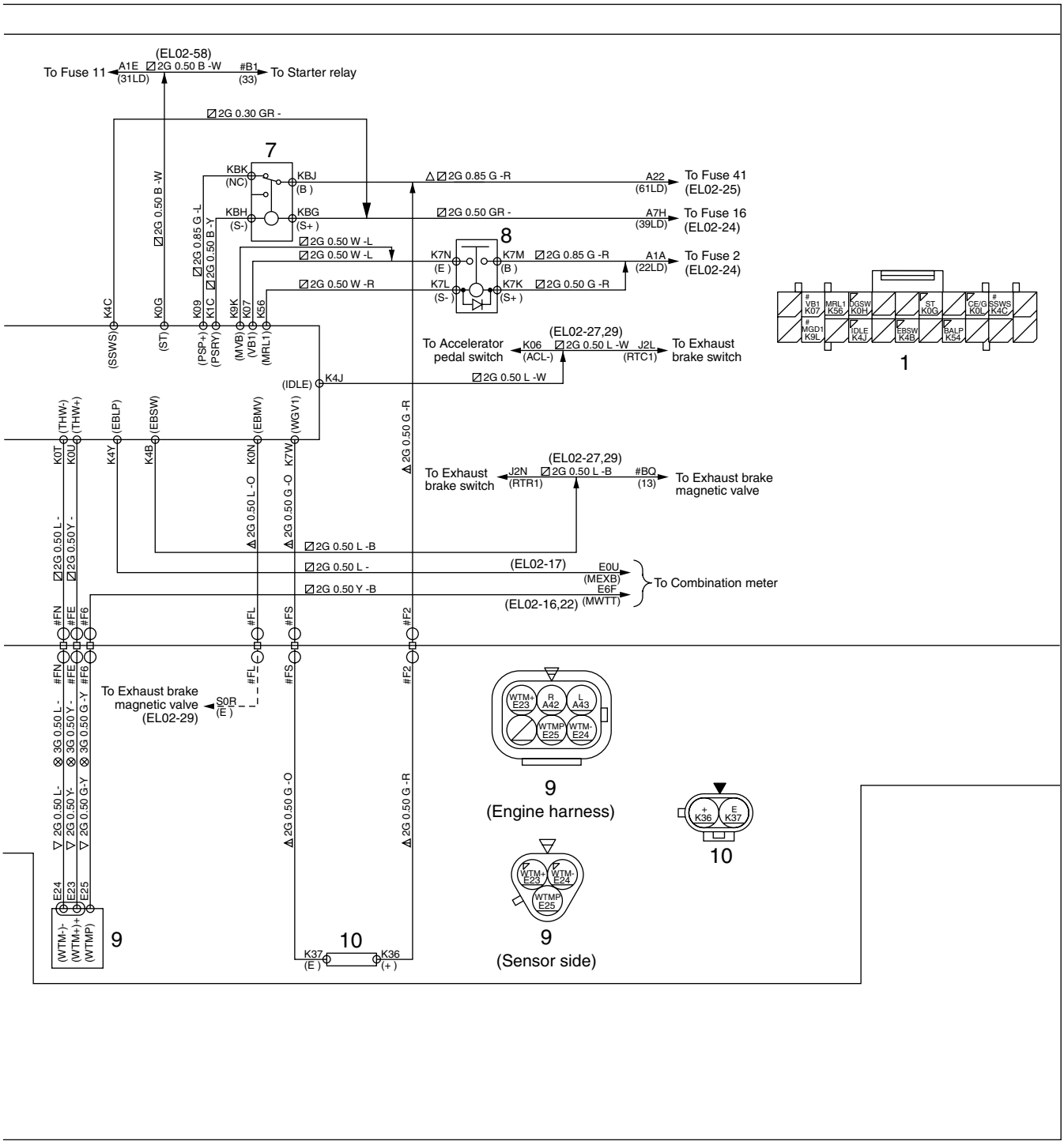
AQ. CHARGING CIRCUIT

1. Alternator

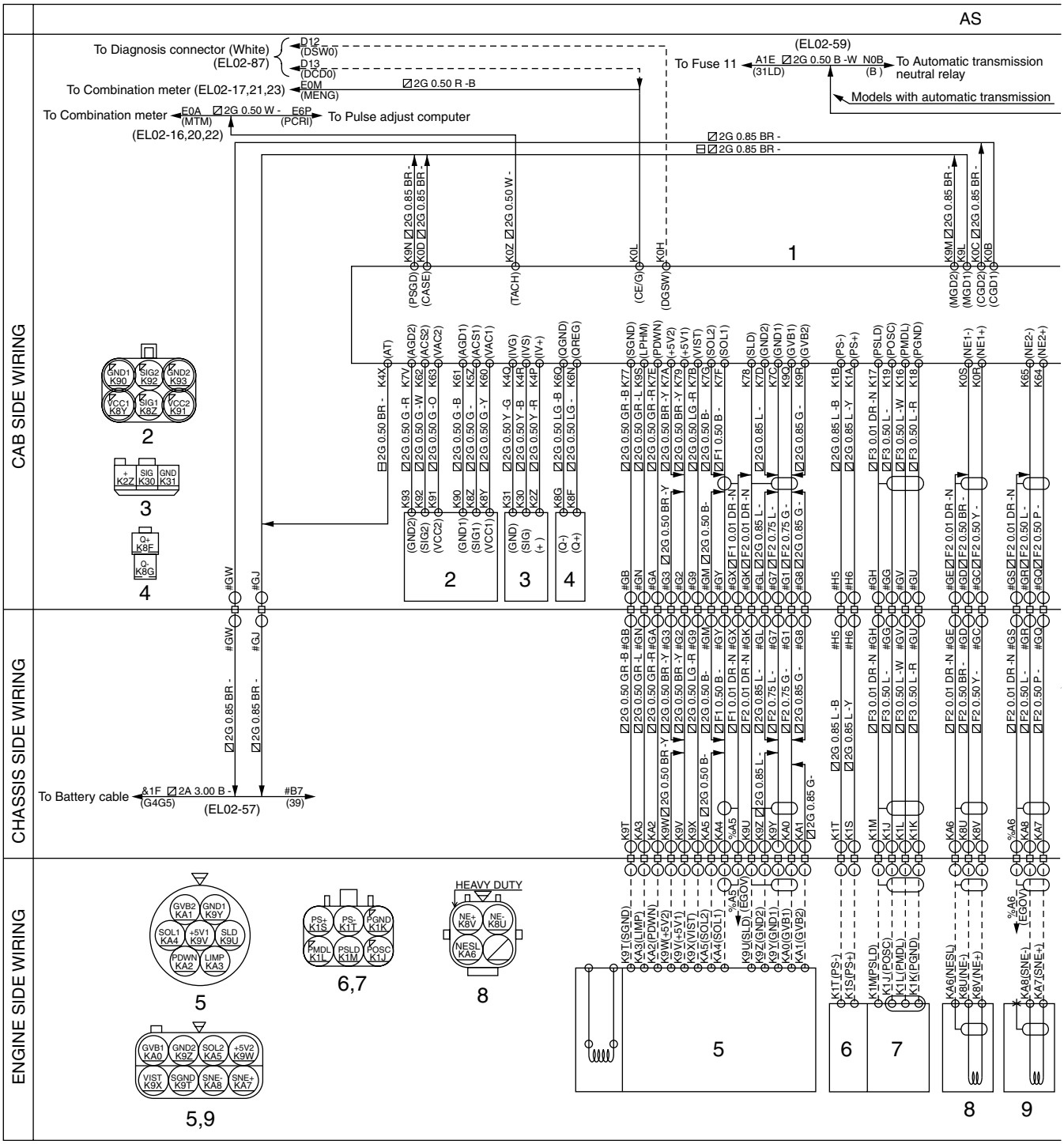


AR. TE SYSTEM (TICS) CIRCUIT

1. TICS ECU
2. Boost pressure sensor
3. Rack sensor
4. Pre-stroke actuator
5. Pre-stroke sensor
6. Engine revolution sensor
7. Actuator power supply relay
8. ECU main relay
9. Coolant temperature sensor
10. Waste gate control magnetic valve

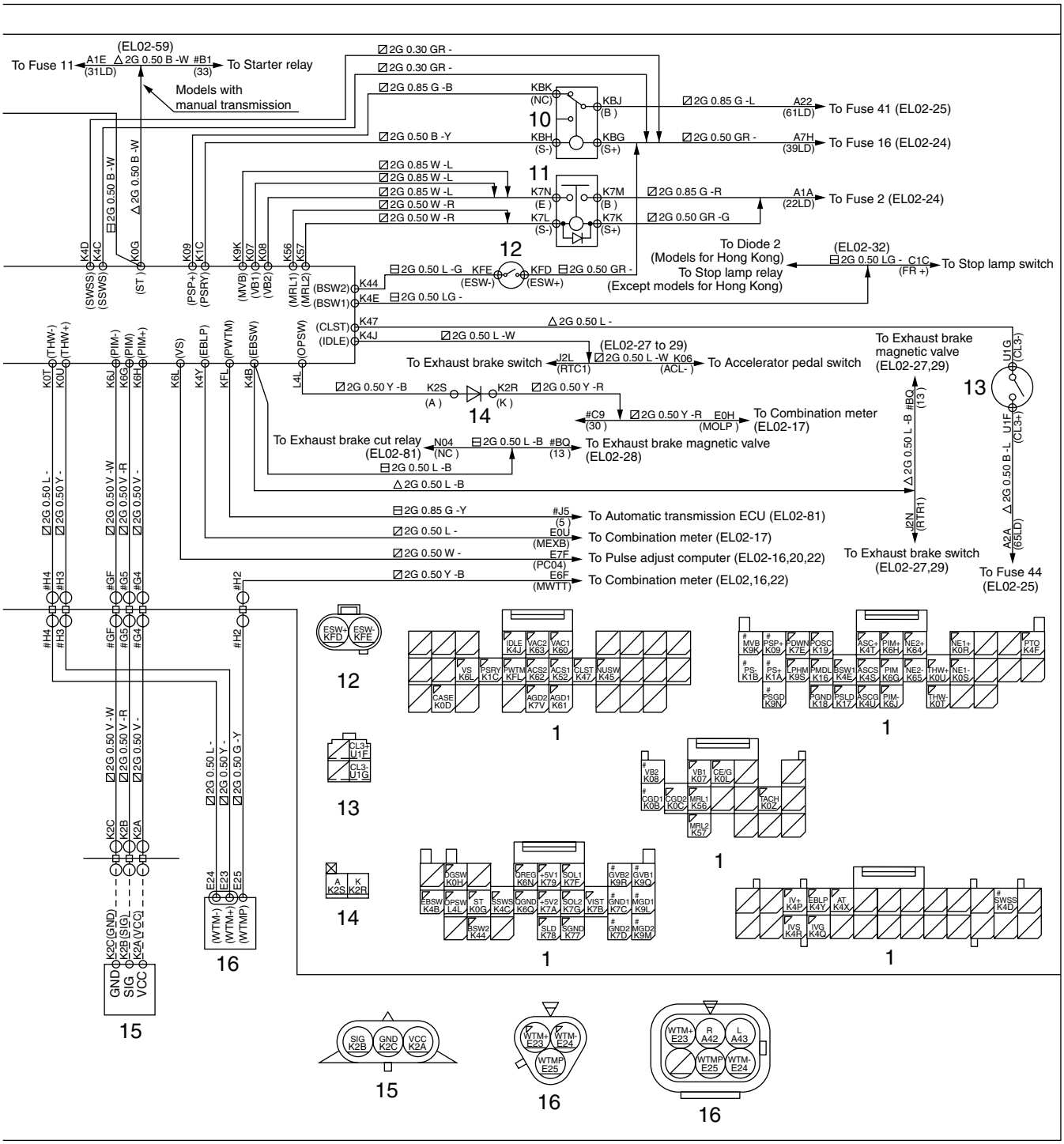


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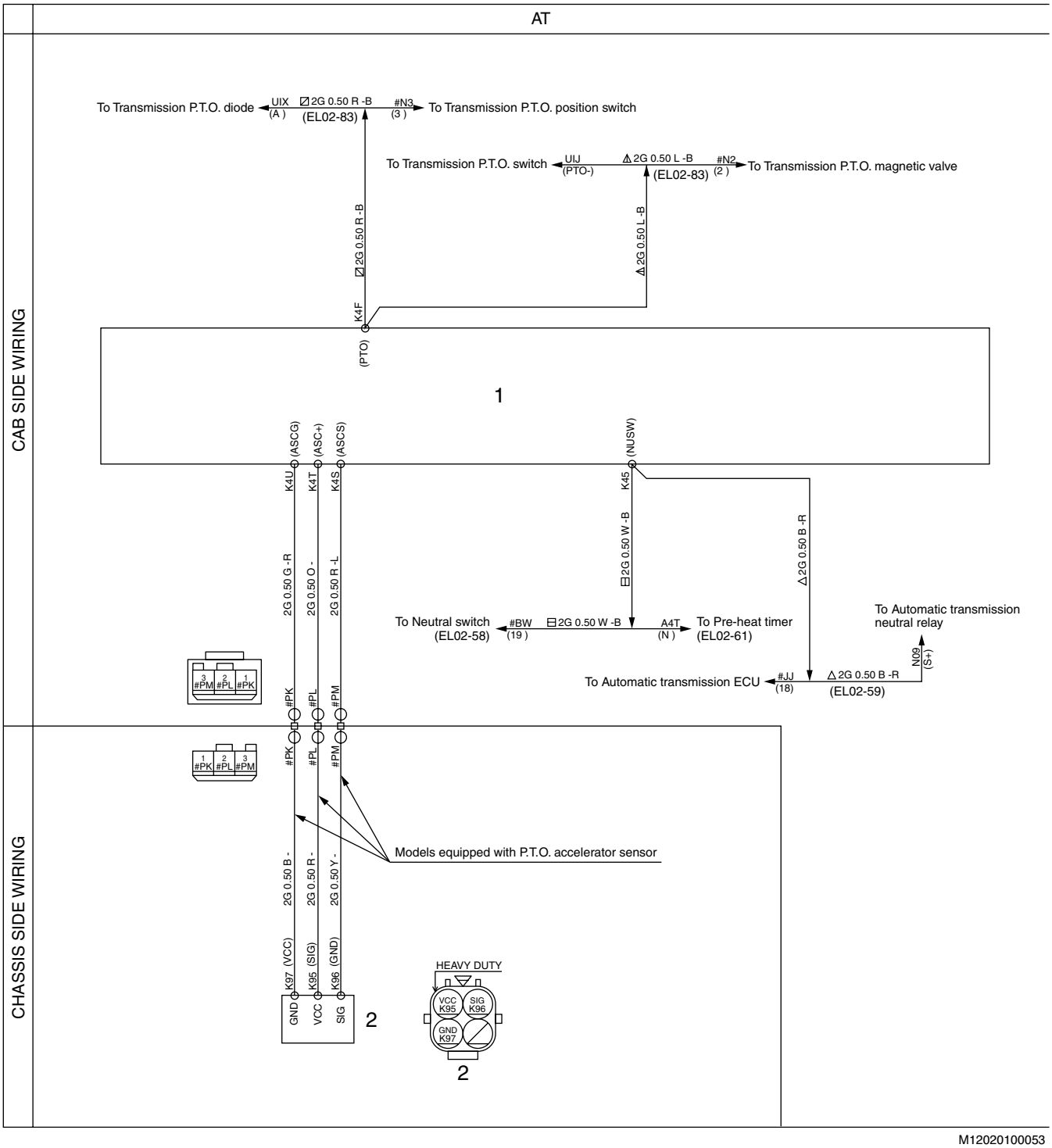


AS. TE SYSTEM (ELECTRONIC GOVERNOR) CIRCUIT

1. Electronic governor ECU
2. Accelerator pedal stroke sensor
3. Idle controller
4. Q-Adjustment register
5. Rack sensor
6. Pre-stroke actuator
7. Pre-stroke sensor
8. Engine revolution sensor (main)
9. Engine revolution sensor (sub)
10. Actuator power supply relay
11. ECU main relay
12. Brake switch
13. Clutch pedal switch
14. Oil pressure diode
15. Boost pressure sensor
16. Coolant temperature sensor



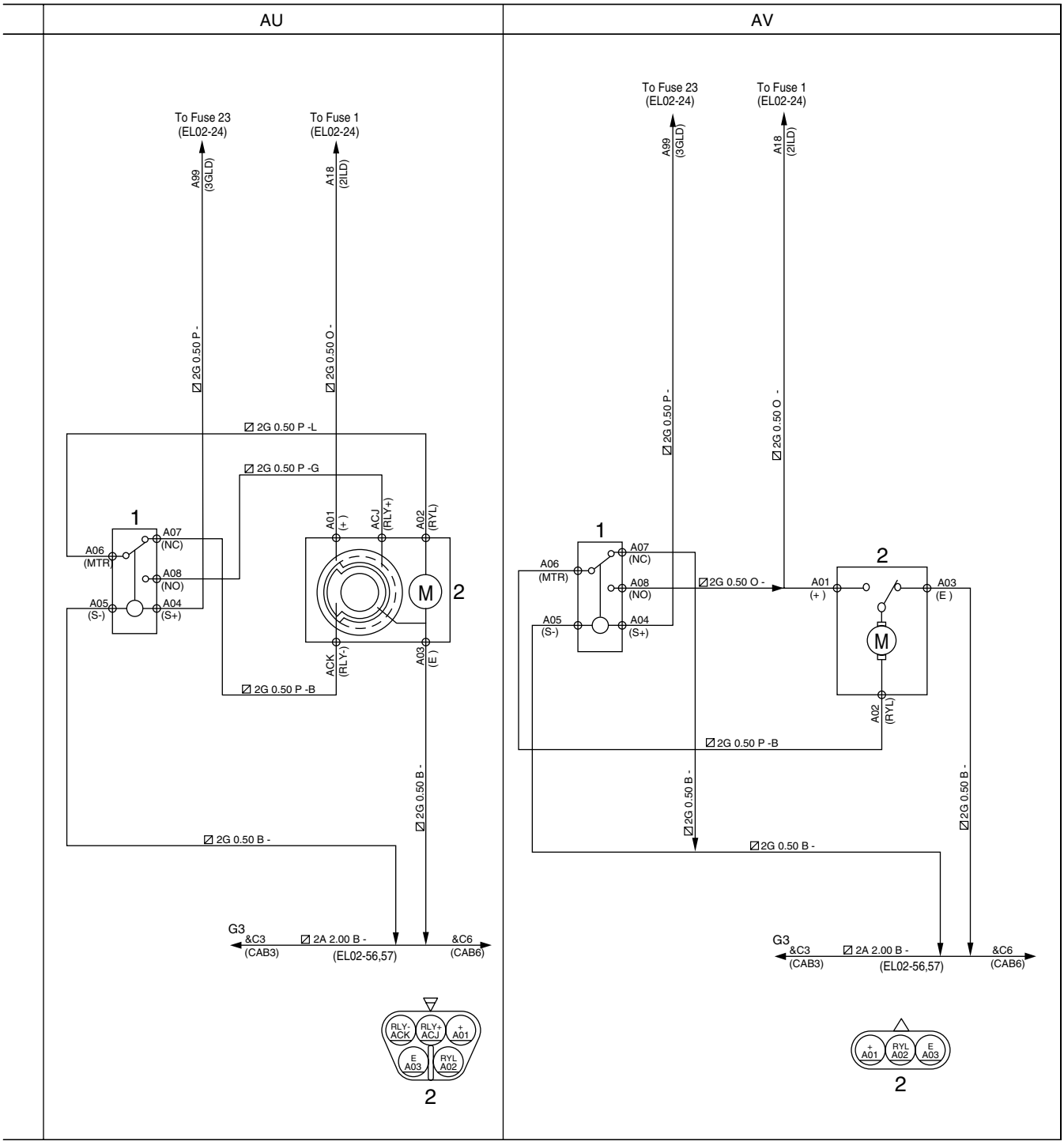
M12020100052



M12020100053

AT. TE SYSTEM (ELECTRONIC GOVERNOR) POWER TAKE-OFF CIRCUIT

1. Electronic governor ECU



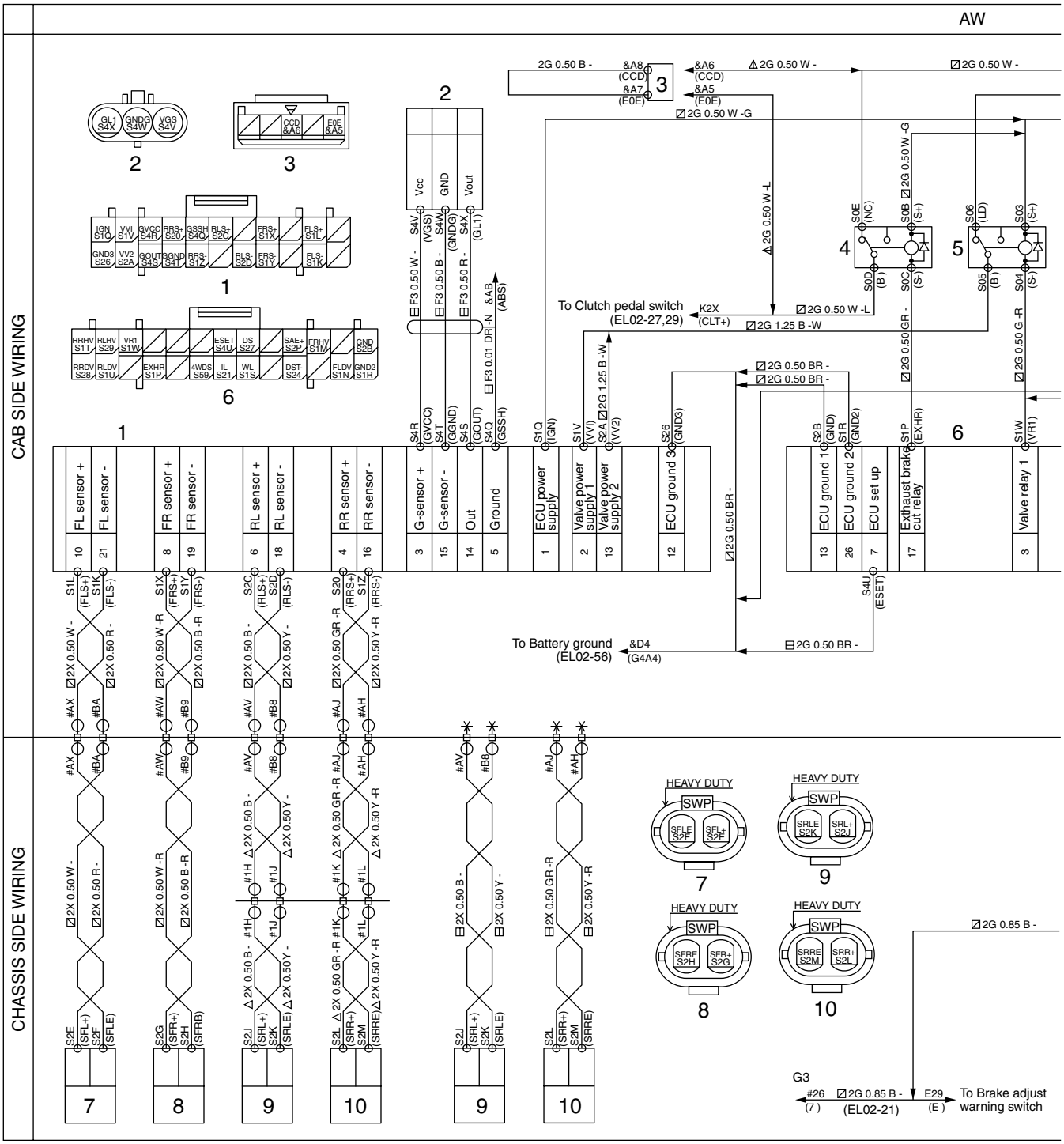
M12020100054

AU. ENGINE STOP CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)

1. Engine stop relay
2. Engine stop electric motor

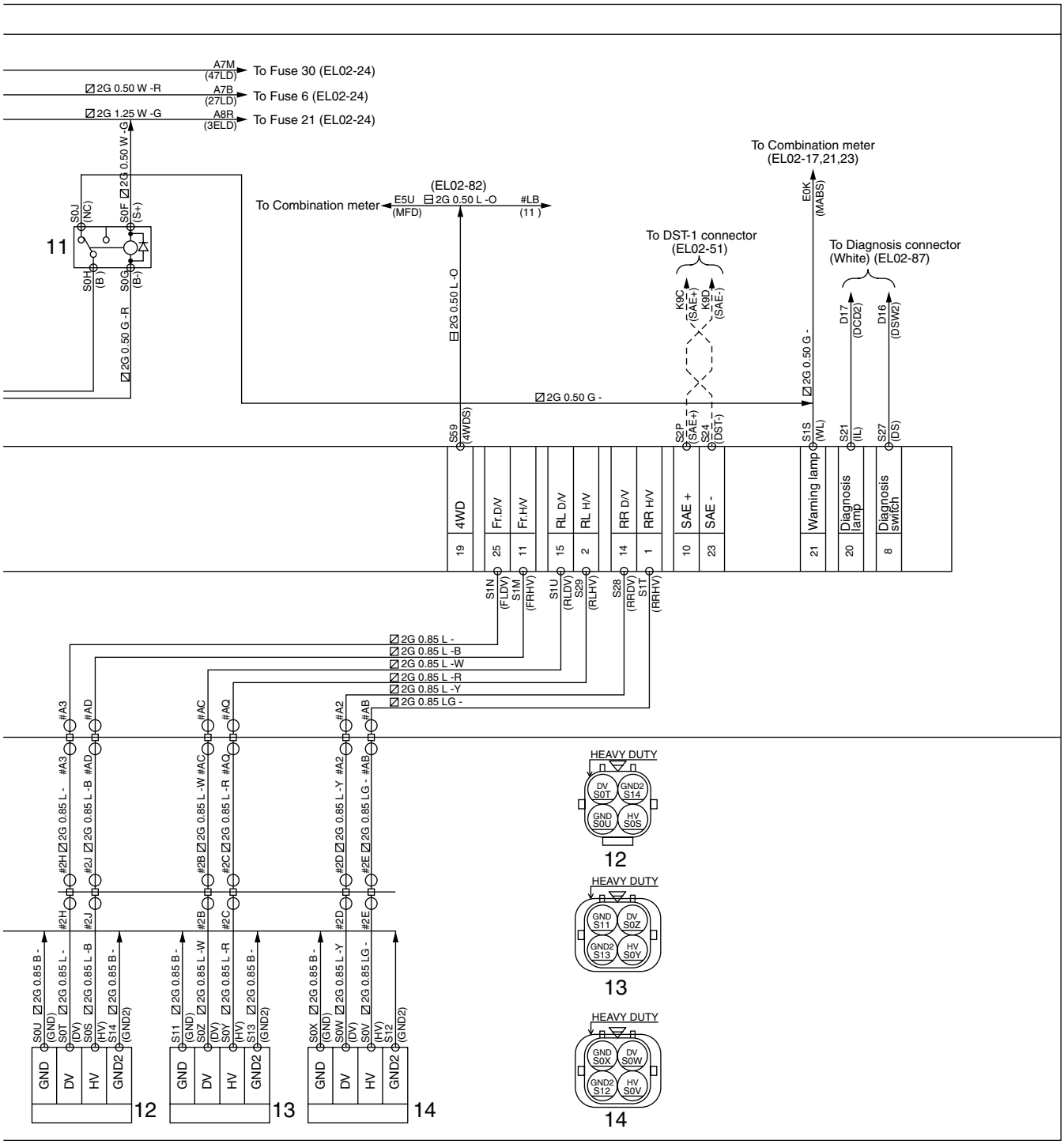
AV. ENGINE STOP CIRCUIT (FOR LEFT-HAND DRIVE VEHICLE)

1. Engine stop relay
2. Engine stop electric motor

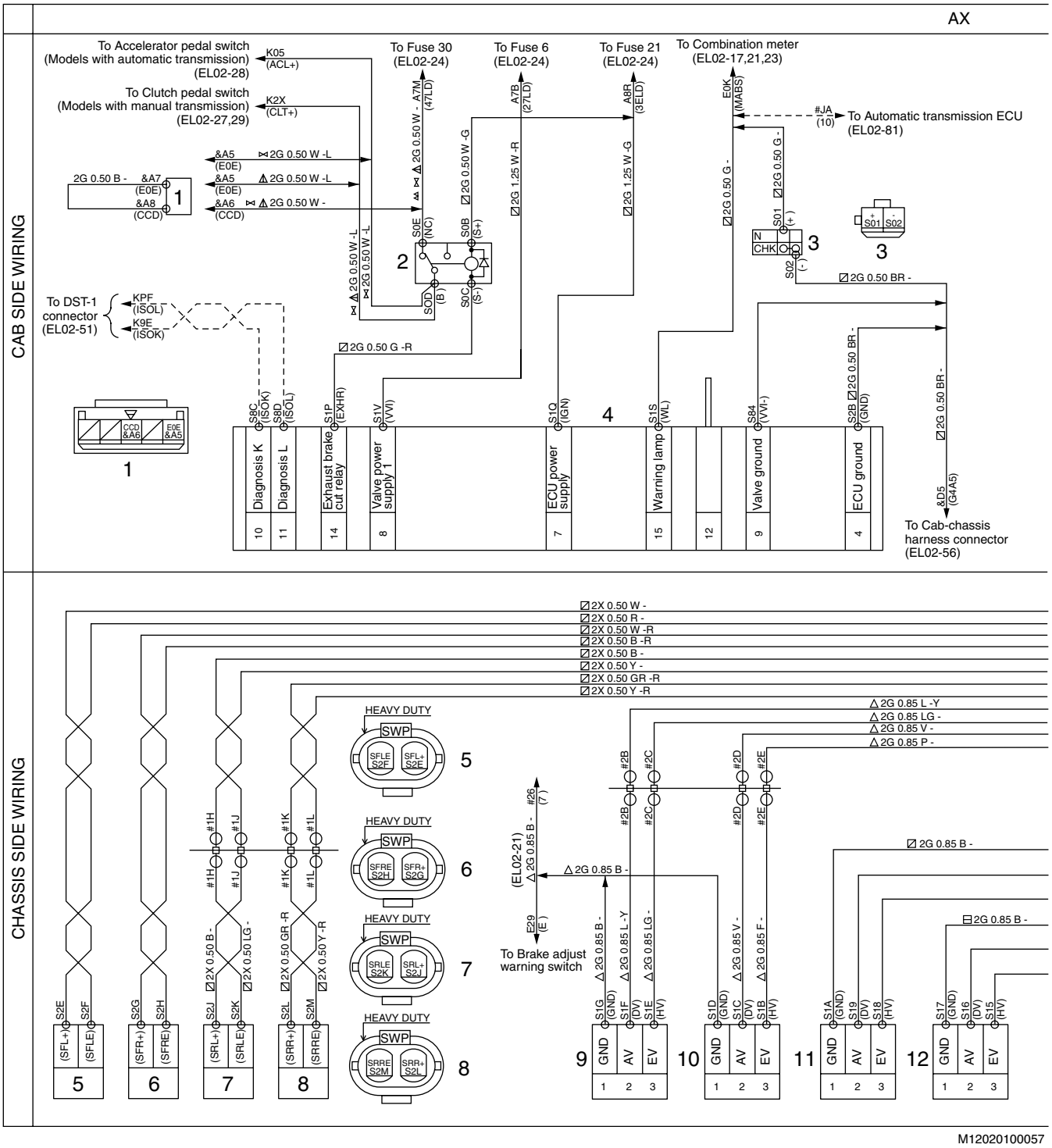


AW. ABS CIRCUIT (MODELS FC, FD, GD, FT, GT)

1. ABS ECU No.1
2. G-sensor
3. ABS short-circuit connector
4. Exhaust brake cut relay
5. ABS control valve relay
6. ABS ECU No.2
7. Wheel sensor (FrLH)
8. Wheel sensor (FrRH)
9. Wheel sensor (RrLH)
10. Wheel sensor (RrRH)
11. ABS warning lamp relay
12. Modulator (Fr)
13. Modulator (RrLH)
14. Modulator (RrRH)



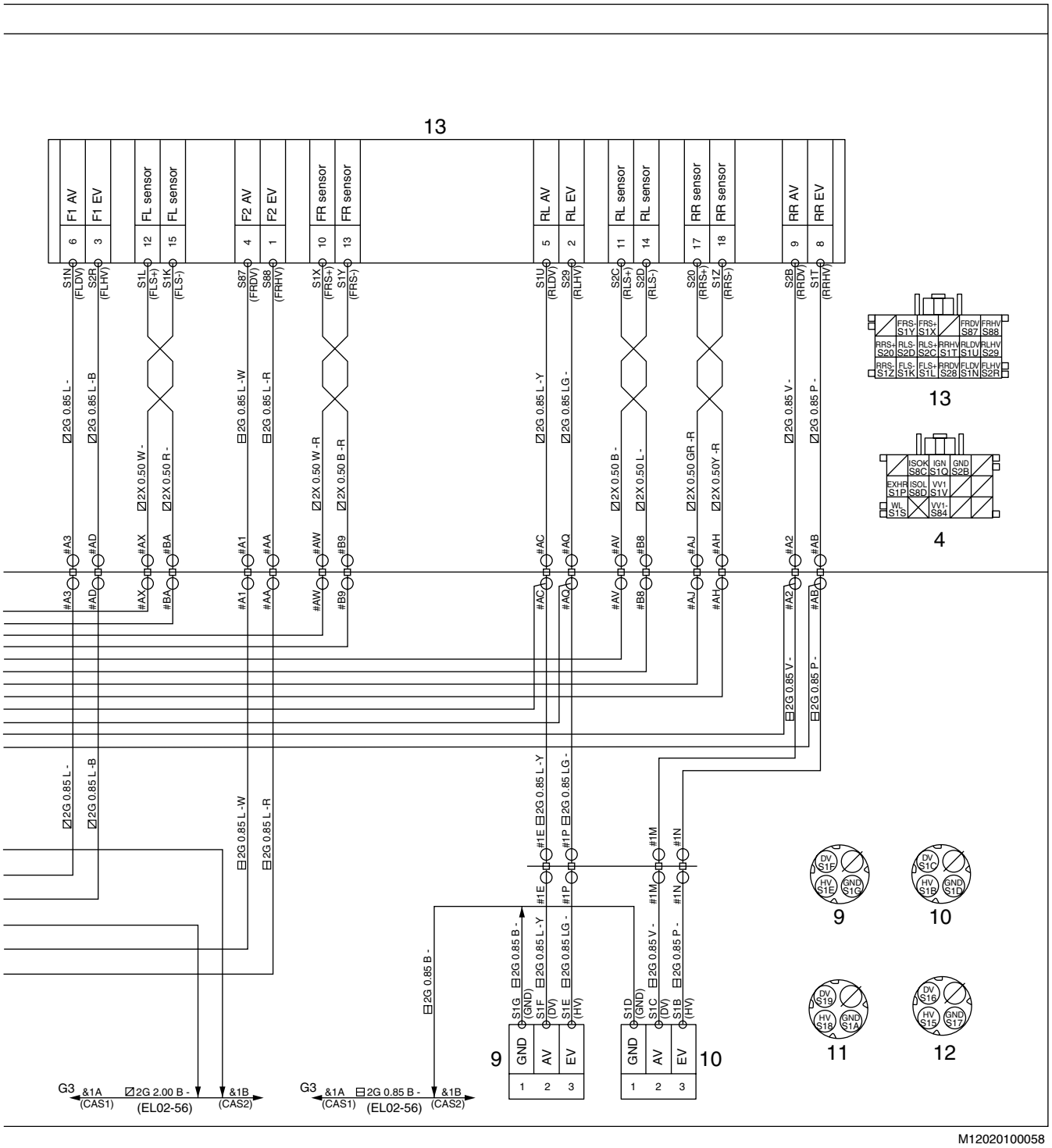
M12020100056



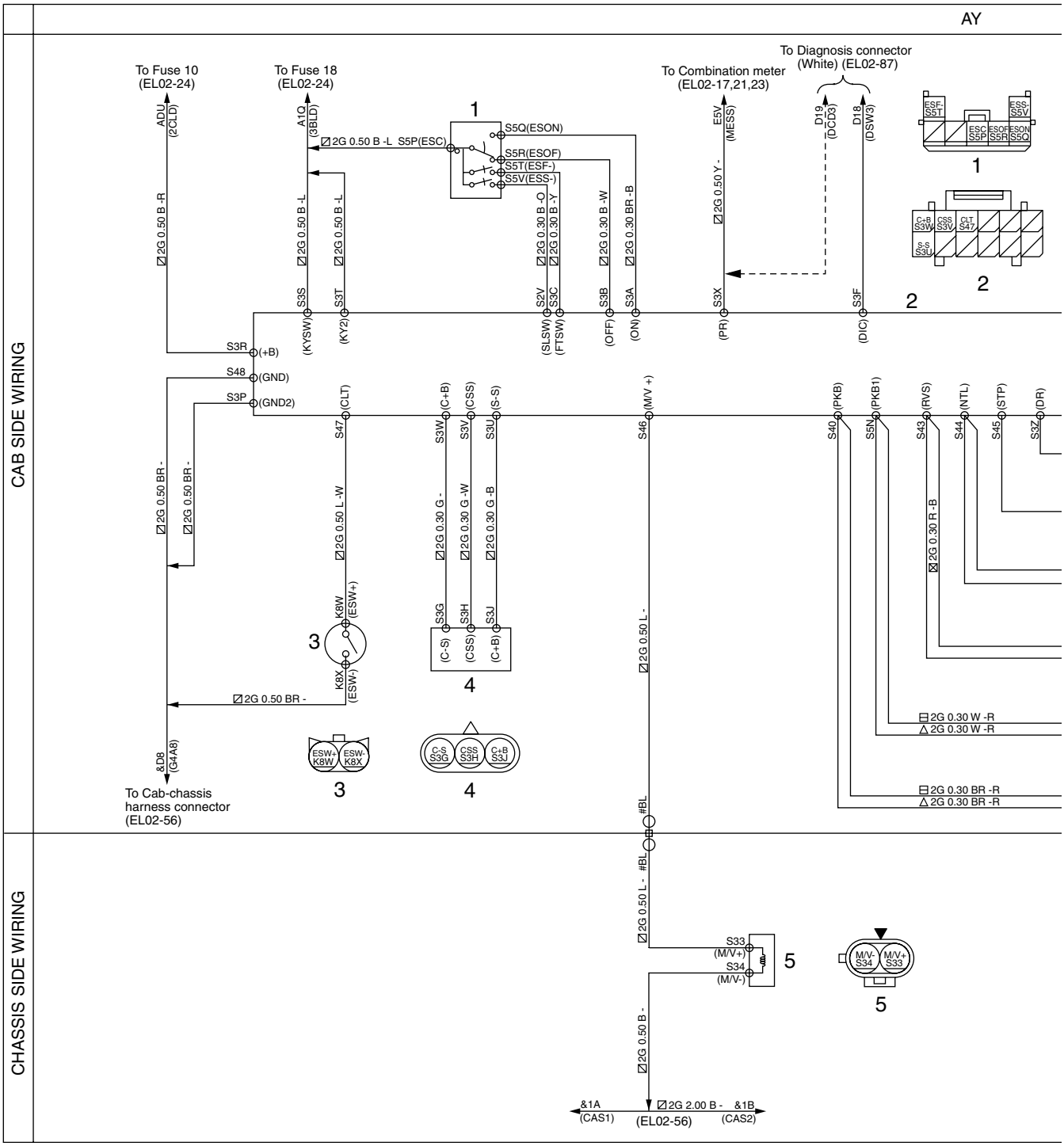
M12020100057

AX. ABS CIRCUIT (MODELS FG, GH, FL, FM, SG)

1. ABS short-circuit connector
2. Exhaust brake cut relay
3. ABS diagnosis switch
4. ABS ECU No.1
5. Wheel sensor (FrLH)
6. Wheel sensor (FrRH)
7. Wheel sensor (RrLH)
8. Wheel sensor (RrRH)
9. Modulator (RrLH)
10. Modulator (RrRH)
11. Modulator (FrLH)
12. Modulator (FrRH)
13. ABS ECU No.2



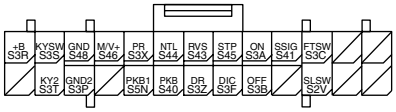
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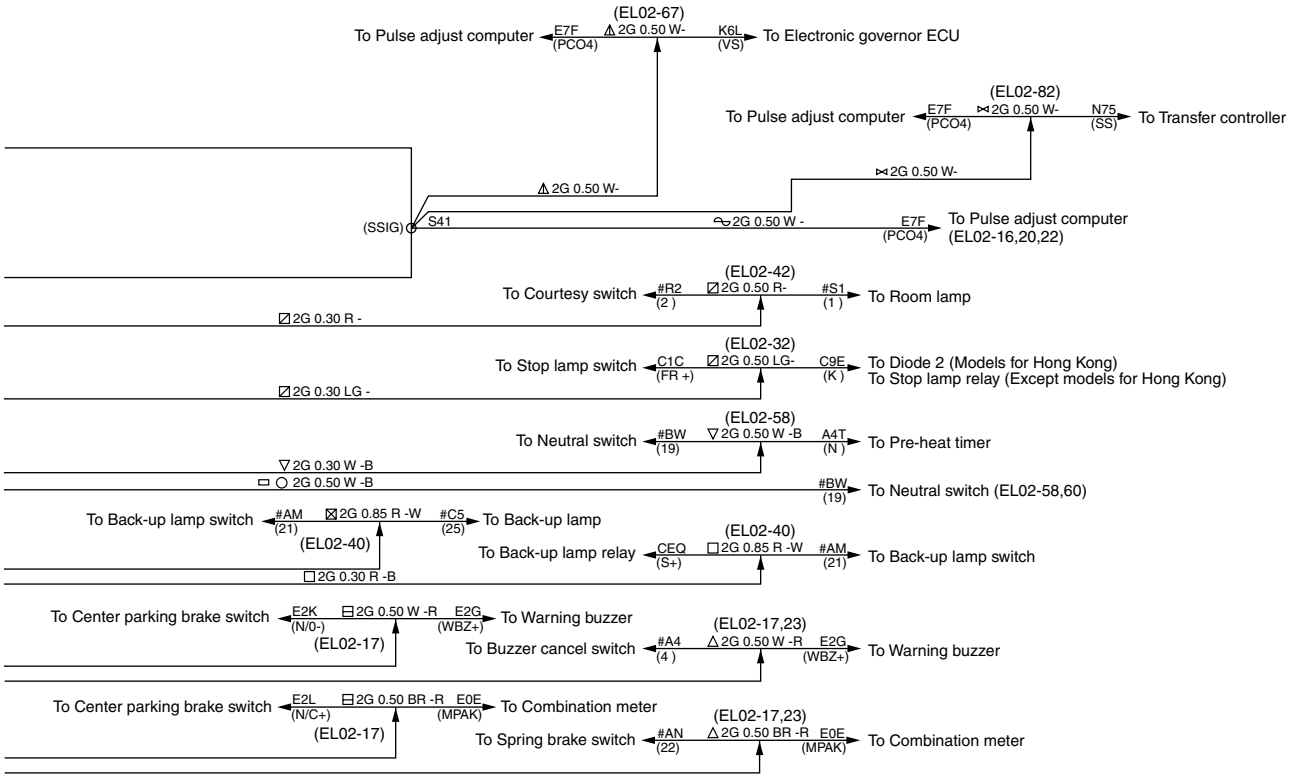


M12020100059

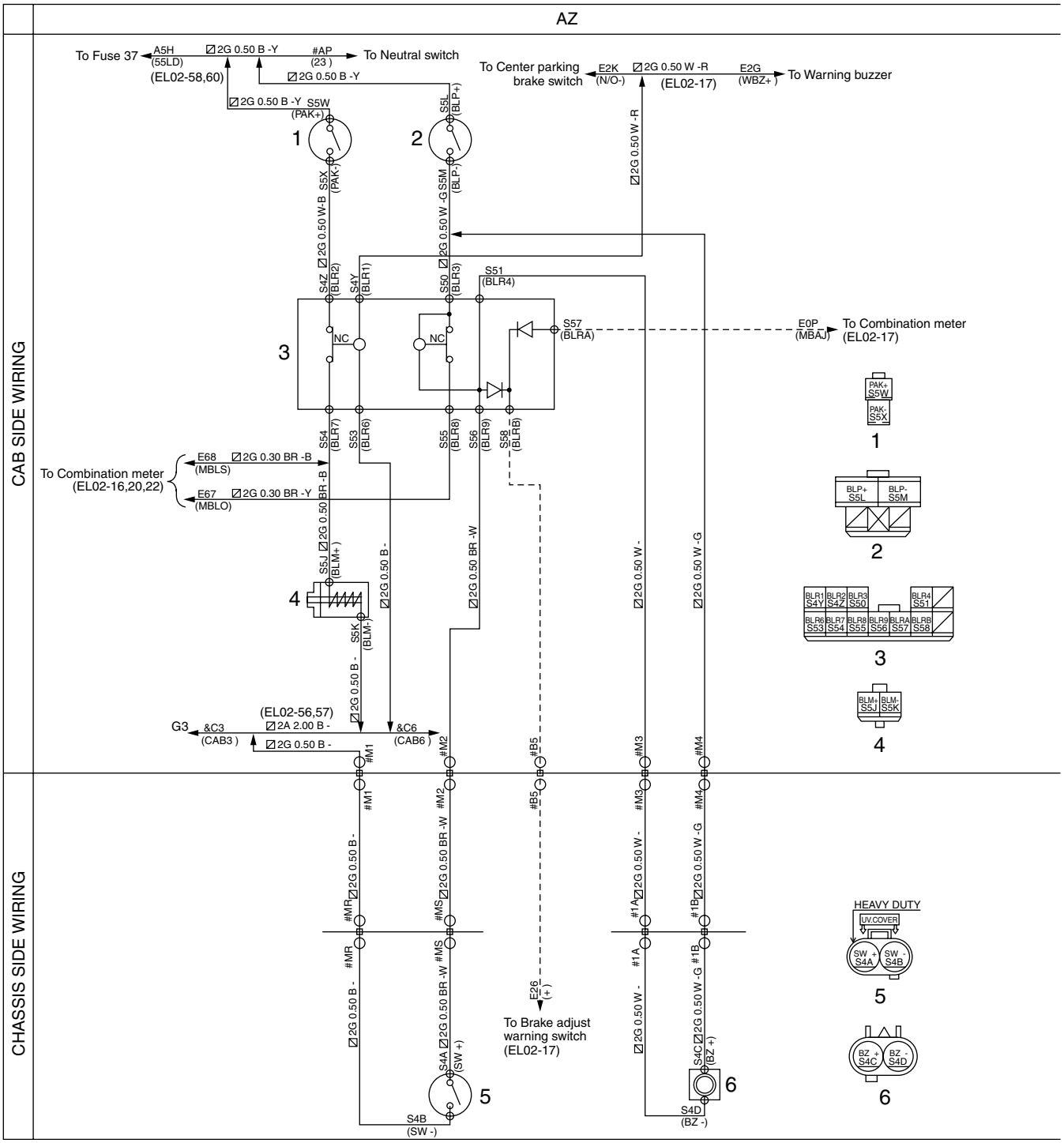
AY. ES START SYSTEM CIRCUIT

1. ES main switch
2. ES start controller
3. Clutch fluid pressure switch
4. Clutch pedal stroke sensor
5. ES start control valve





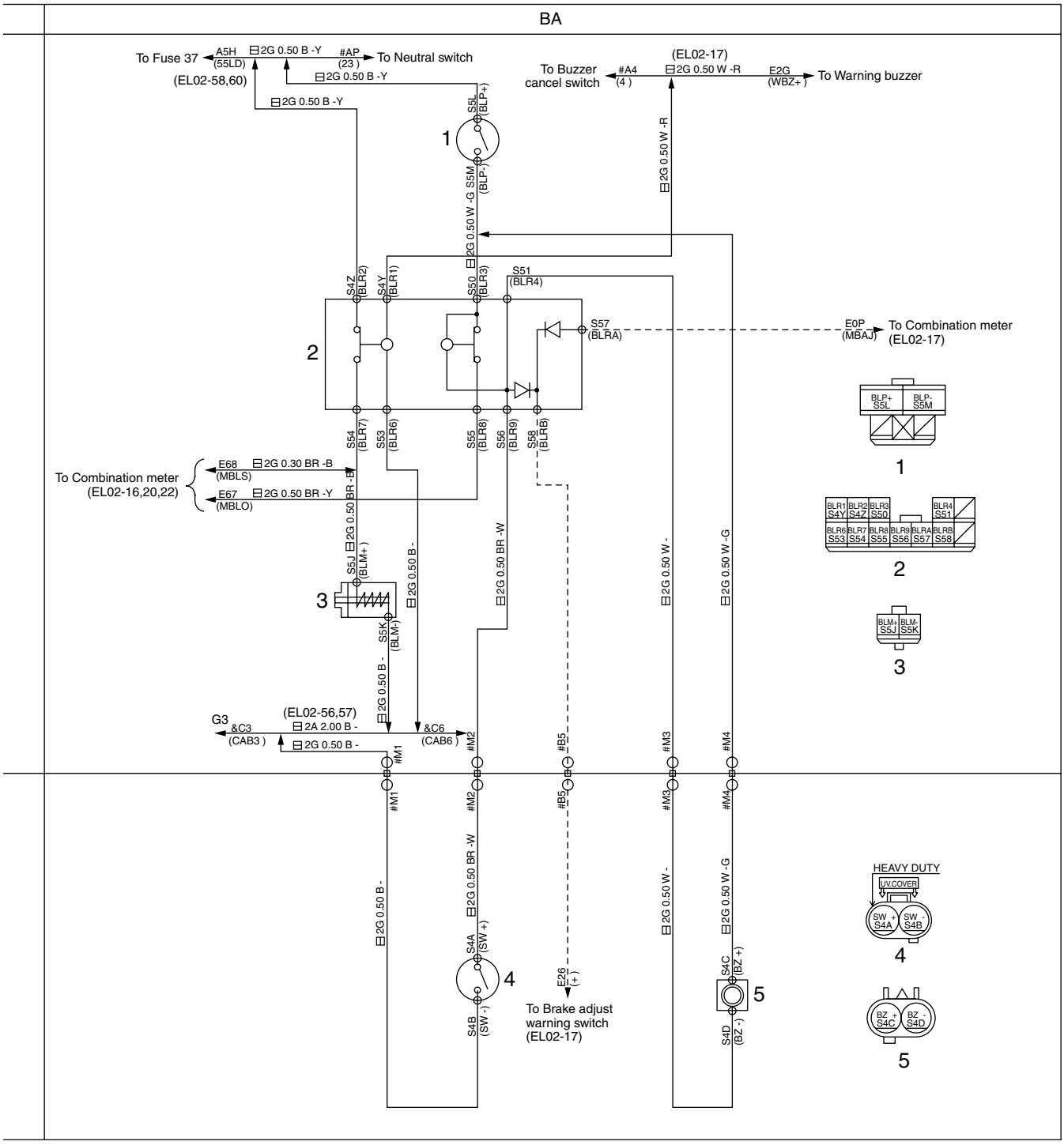
M12020100060



M12020100061

AZ. BRAKE-LOCK CIRCUIT (MODELS EQUIPPED WITH CENTER PARKING BRAKE)

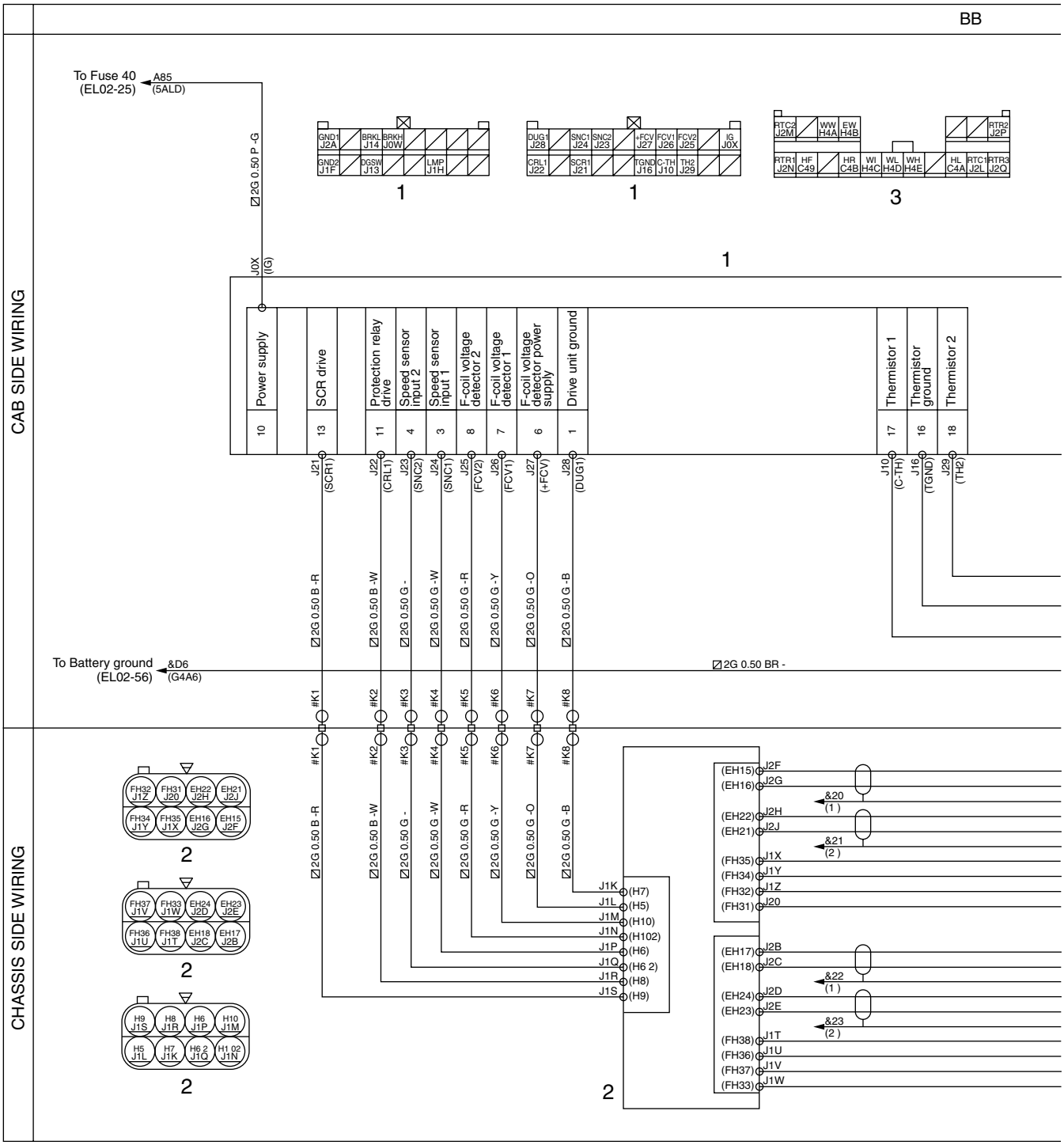
1. Parking brake lever switch
2. Brake-lock control valve position switch
3. Brake-lock relay
4. Brake-lock control magnetic valve
5. Brake-lock pressure switch
6. Brake-lock warning buzzer



M12020100062

BA. BRAKE-LOCK CIRCUIT (MODELS EQUIPPED WITH WHEEL PARKING BRAKE)

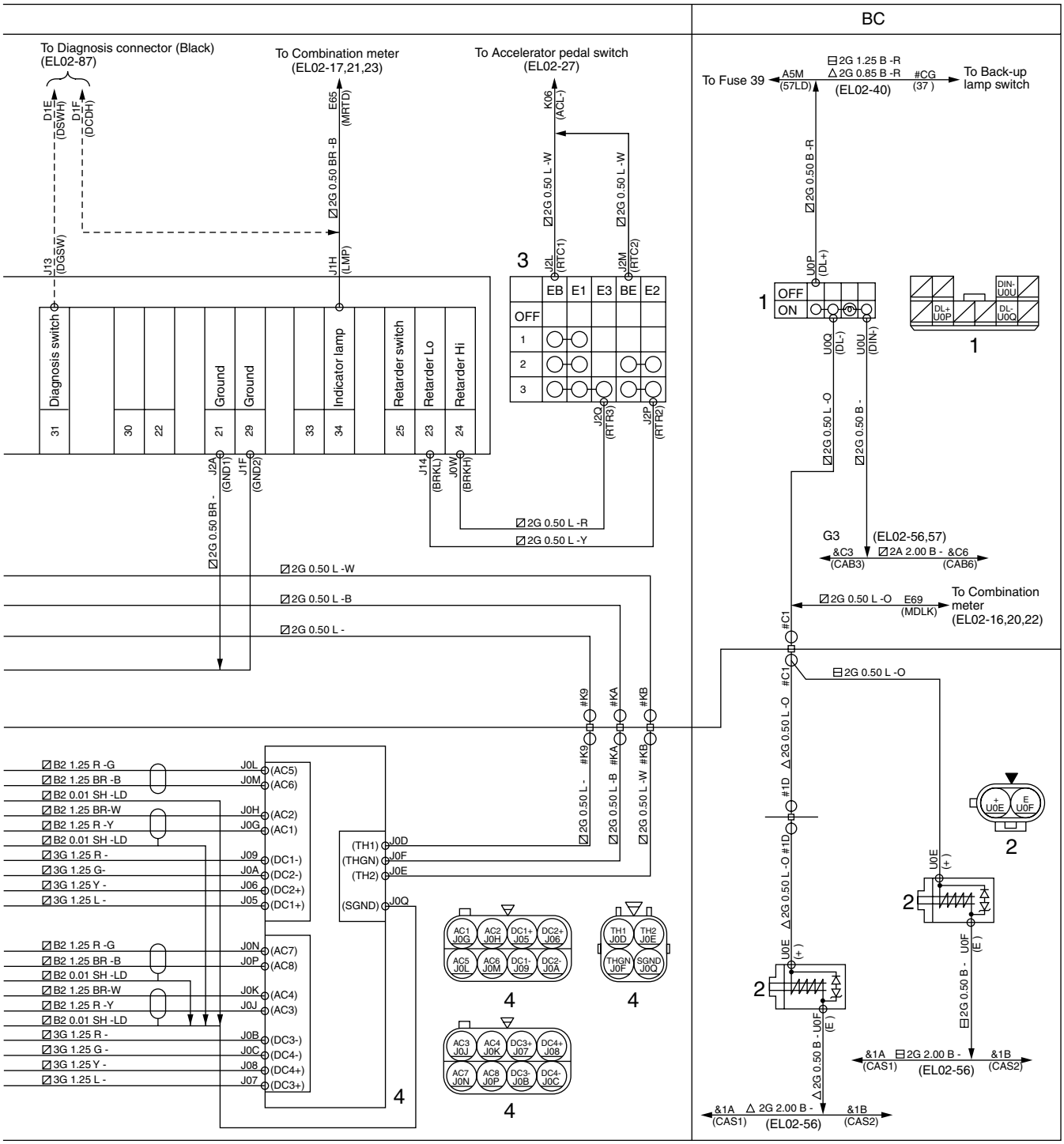
1. Brake-lock control valve position switch
2. Brake-lock relay
3. Brake-lock control magnetic valve
4. Brake-lock pressure switch
5. Brake-lock warning buzzer



M12020100063

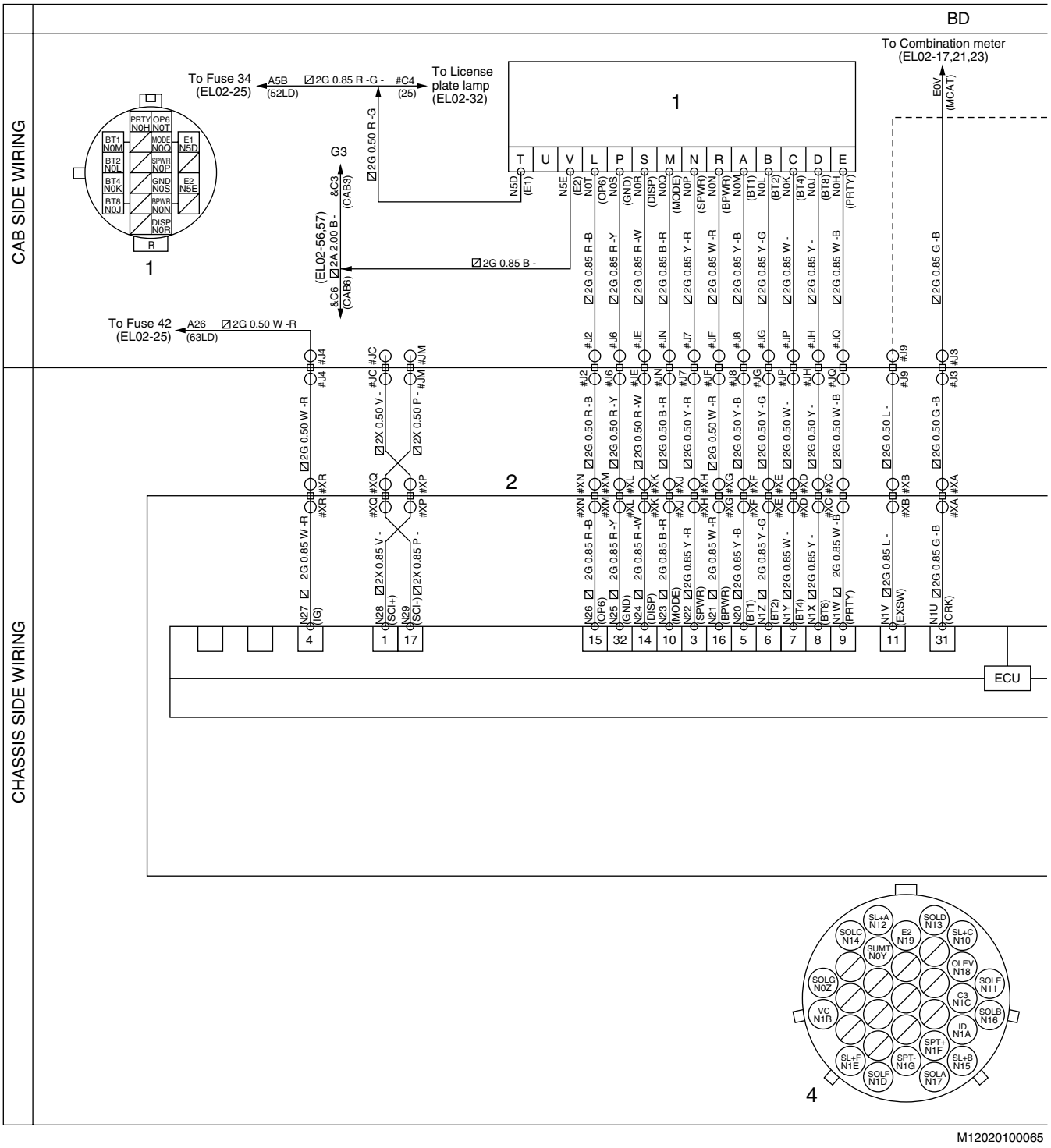
BB. ELECTROMAGNETIC RETARDER CIRCUIT

1. Electromagnetic retarder control unit
2. Electromagnetic retarder drive unit
3. Electromagnetic retarder switch
4. Electromagnetic retarder main unit



BC. INTER-AXLE DIFFERENTIAL LOCK CIRCUIT

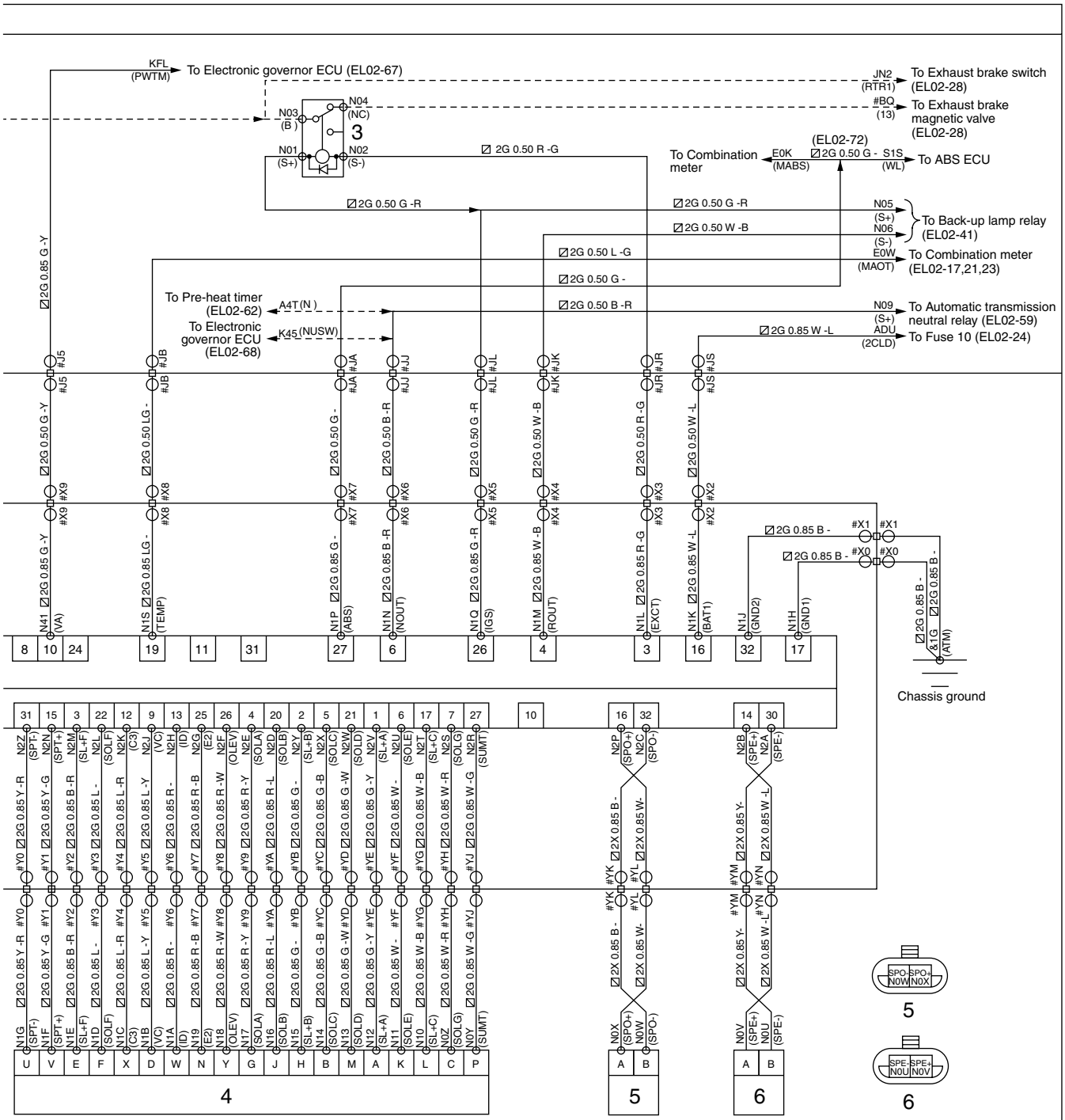
1. Differential lock switch
2. Differential lock magnetic valve



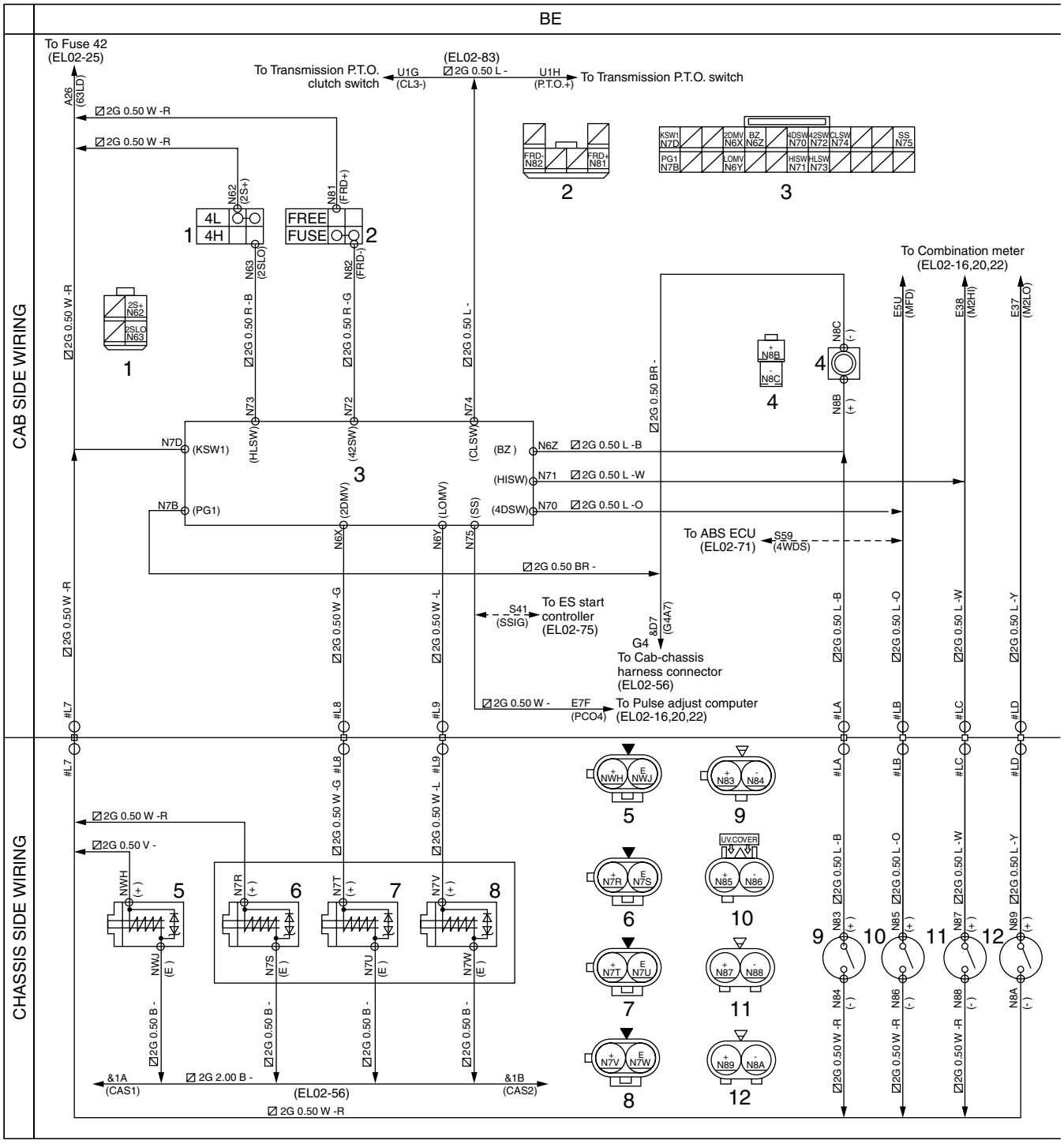
M12020100065

BD. AUTOMATIC TRANSMISSION CIRCUIT

1. Automatic transmission shift selector
2. Automatic transmission ECU
3. Exhaust brake cut relay
4. Automatic transmission main unit
5. Output speed sensor
6. Engine revolution sensor



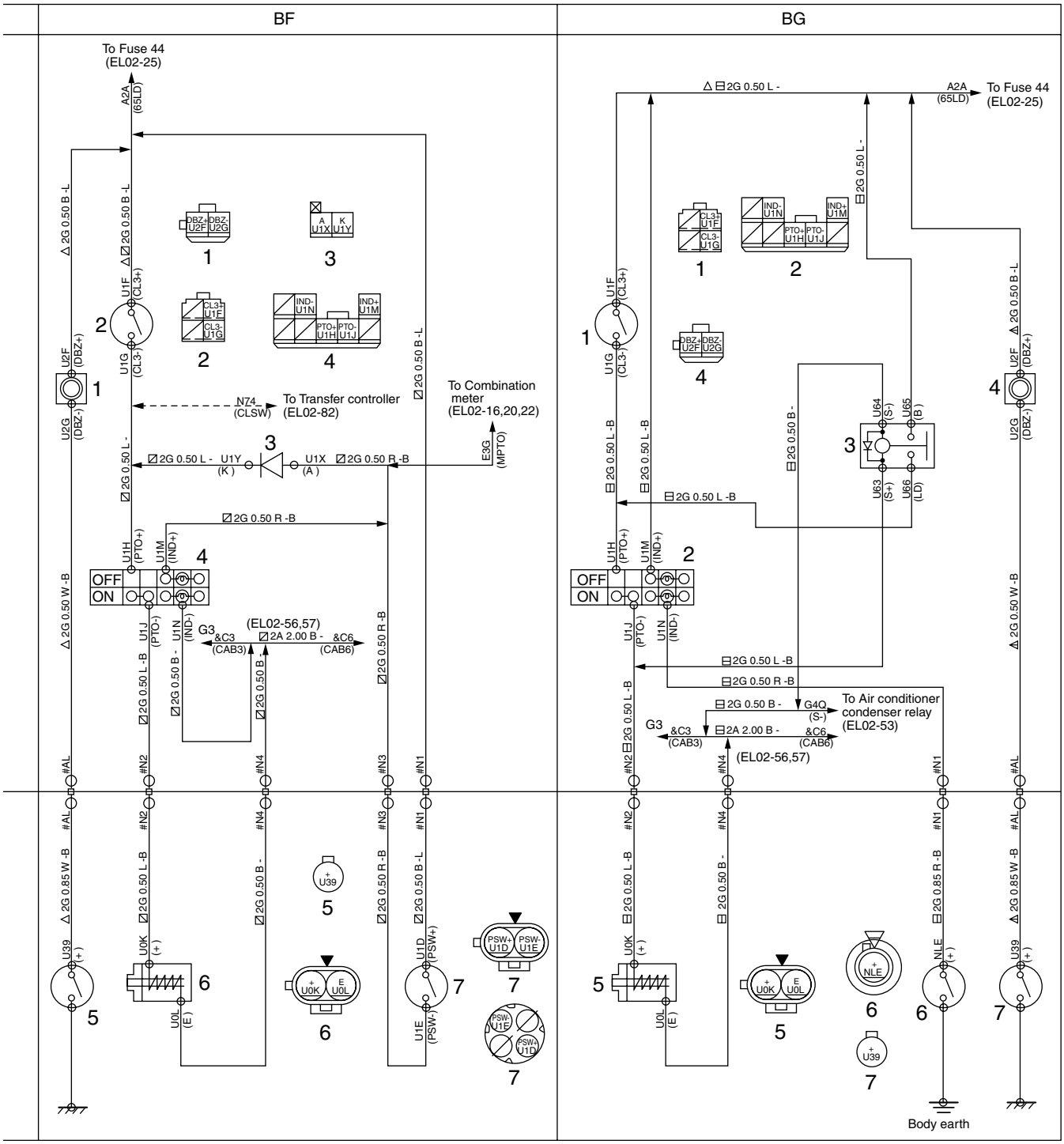
M12020100066



M12020100067

BE. TRANSFER CONTROL CIRCUIT

1. Transfer Low-High selector switch
2. 4WD selector switch
3. Transfer controller
4. Transfer warning buzzer
5. Low position magnetic valve
6. Transfer control magnetic valve
7. 4WD/2WD magnetic valve
8. Transfer Low-High magnetic valve
9. Neutral switch
10. 4WD position switch
11. High position switch
12. Low position switch

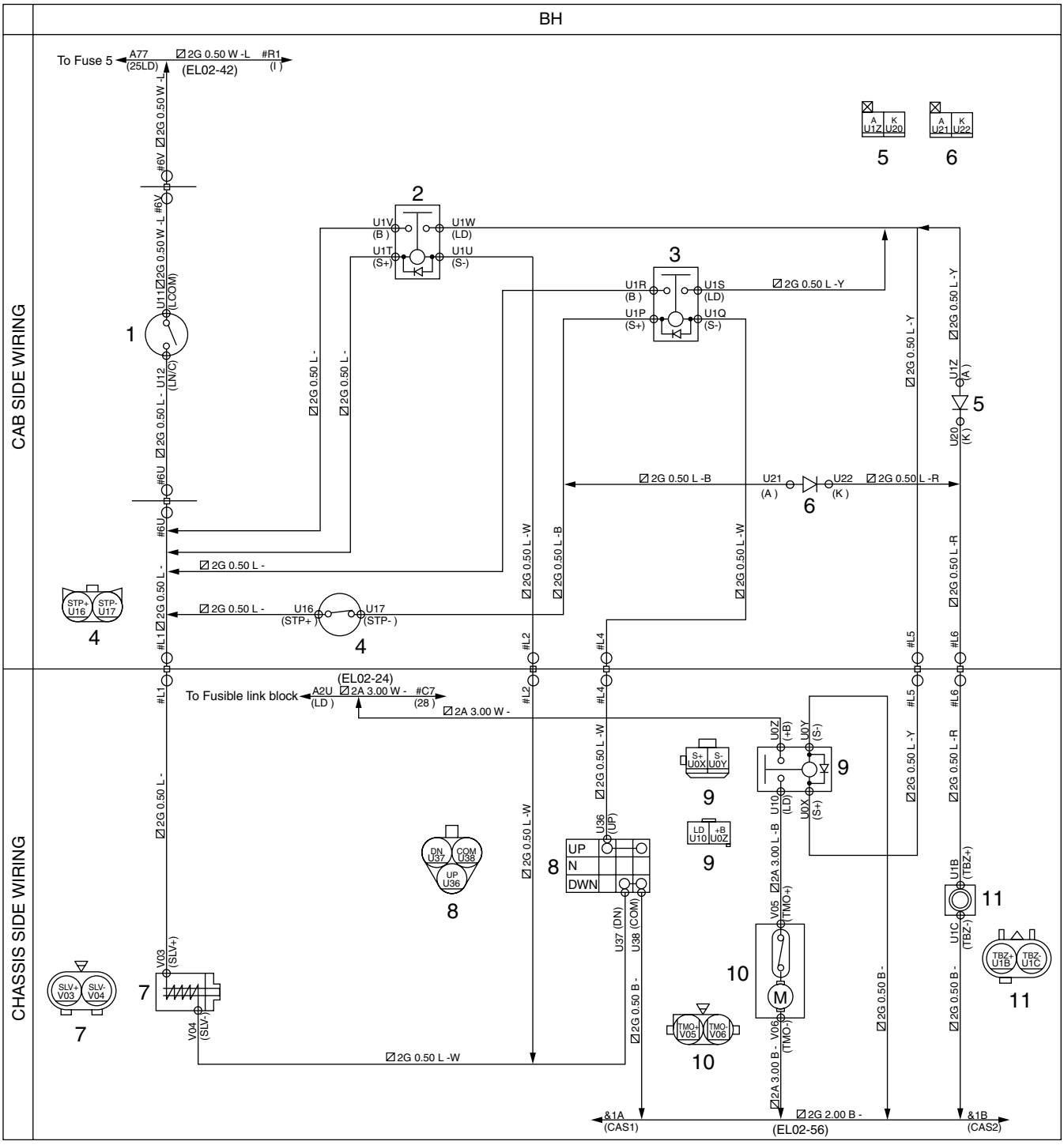


BF. TRANSMISSION P.T.O. CONTROL CIRCUIT (EXCEPT FOR MODELS WITH EATON FS6109/8209 TRANSMISSION)

1. Dump warning buzzer
2. Clutch pedal switch
3. P.T.O. diode
4. Transmission P.T.O. switch
5. Dump up switch
6. P.T.O. magnetic valve
7. P.T.O. position switch

BG. TRANSMISSION P.T.O. CONTROL CIRCUIT (MODELS WITH EATON FS6109/8209 TRANSMISSION)

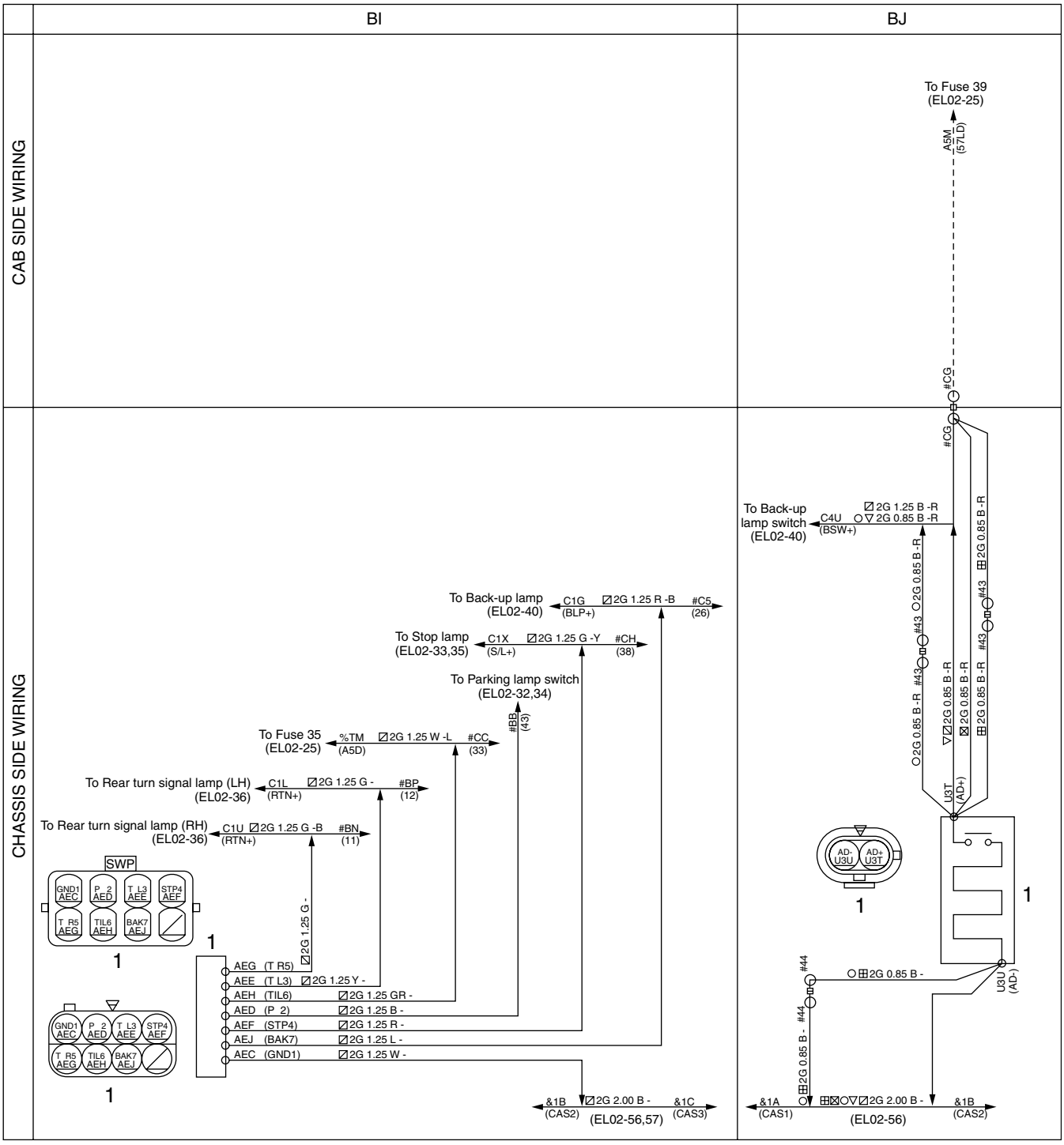
1. Clutch pedal switch
2. Transmission P.T.O. switch
3. P.T.O. relay
4. Dump warning buzzer
5. P.T.O. magnetic valve
6. Transmission P.T.O. switch
7. Dump up switch



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BH. CAB TILT CIRCUIT (MODELS FOR DOUBLE CAB)

1. Cab tilt lock switch
2. Cab tilt down relay
3. Cab tilt up relay
4. Cab tilt stopper switch
5. Cab tilt diode No.1
6. Cab tilt diode No.2
7. Cab tilt magnetic valve
8. Cab tilt switch
9. Cab tilt relay
10. Cab tilt motor
11. Cab tilt warning buzzer



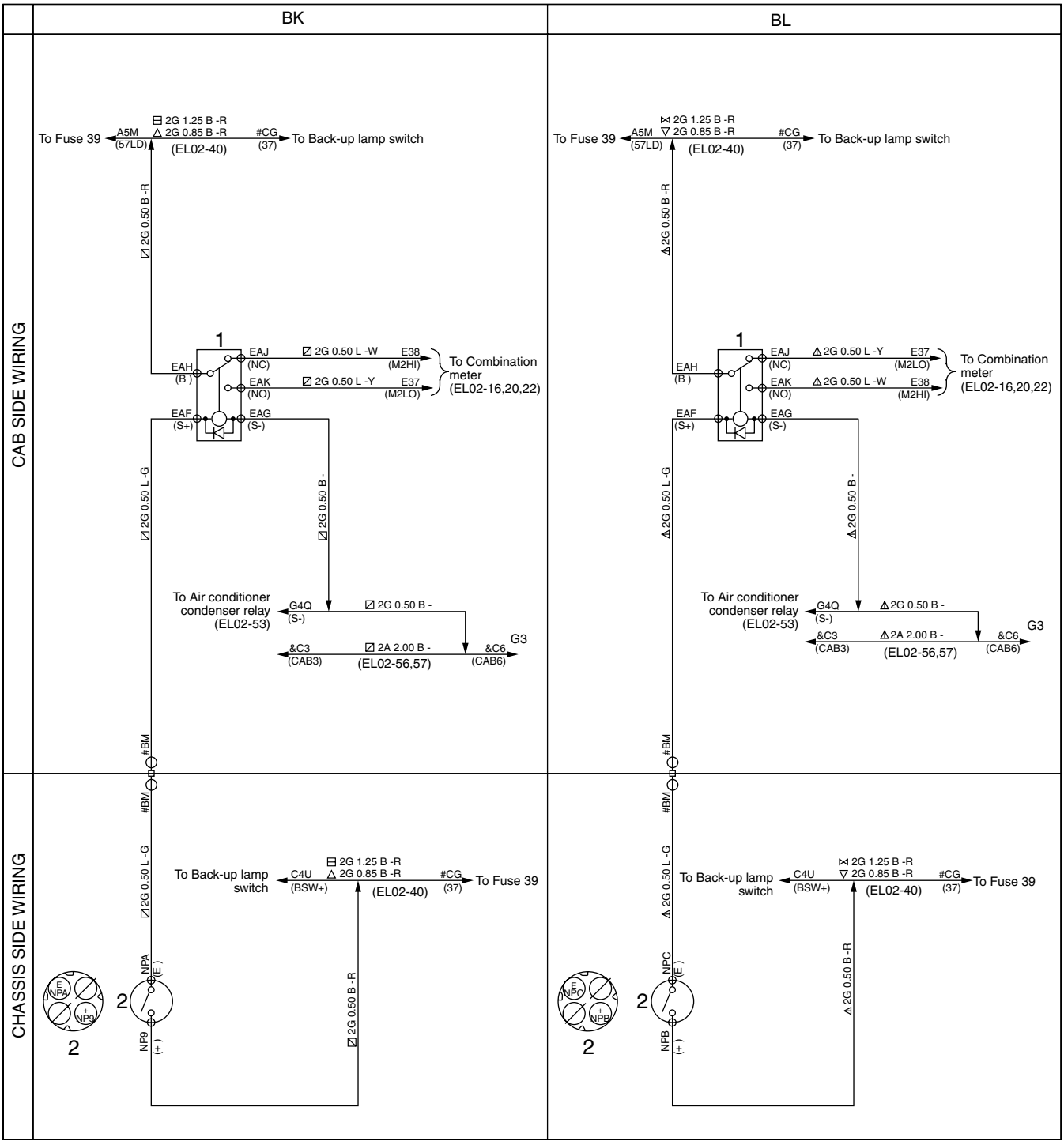
M12020100070

BI. TRAILER CONNECTOR CIRCUIT

1. Trailer socket

BJ. AIR DRIER CIRCUIT

1. Air drier



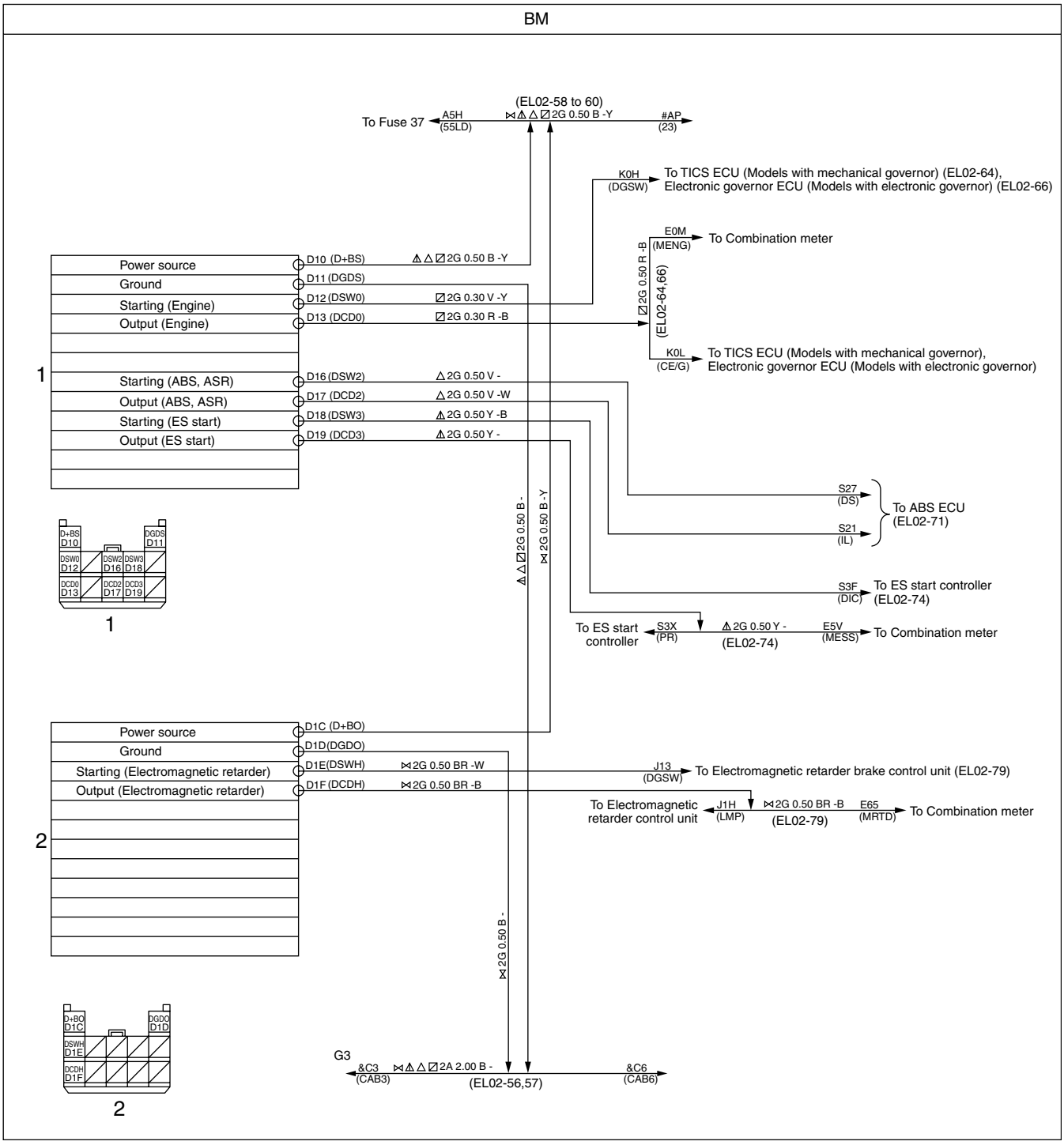
M12020100071

BK. TRANSMISSION CONTROL CIRCUIT (MODELS WITH EATON FS6109/8209 TRANSMISSION)

1. LO-HI indicator lamp relay
2. Range LO switch

BL. TRANSMISSION CONTROL CIRCUIT (MODELS WITH ZF 9S109 TRANSMISSION)

1. LO-HI indicator lamp relay
2. Range LO switch



M12020100072

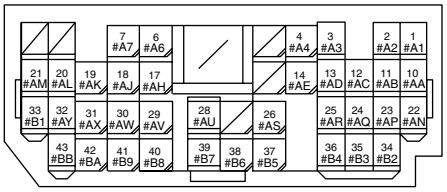
BM. DIAGNOSIS MONITOR CIRCUIT

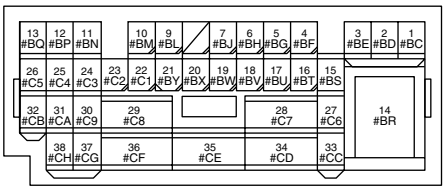
1. Diagnosis connector (White)
2. Diagnosis connector (Black)

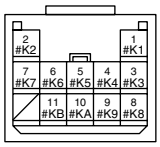
WIRE TO WIRE CONNECTOR

M12020101BEJ1004

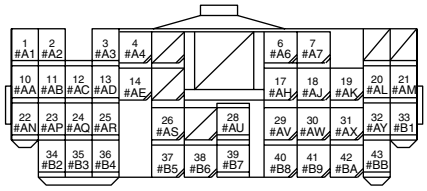
CAB HARNESS

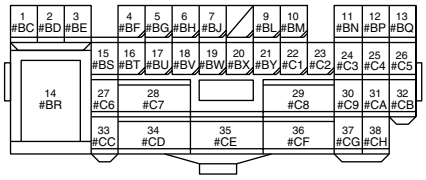


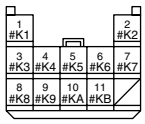




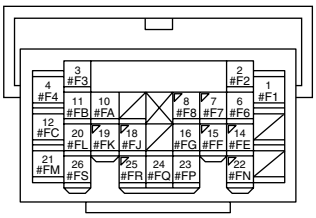
CHASSIS HARNESS

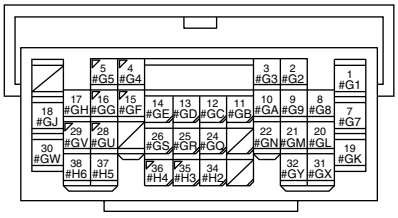


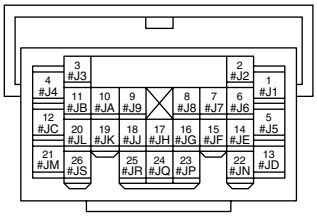


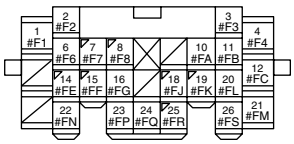


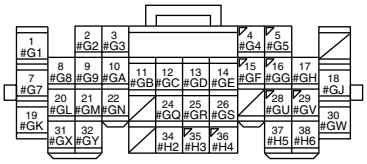
M12020100106

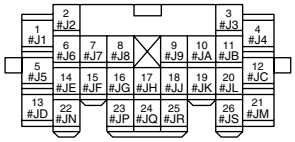






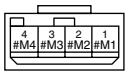


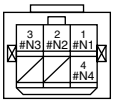


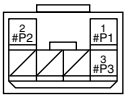


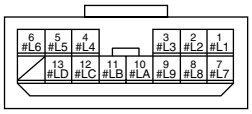
M12020100107

CAB HARNESS



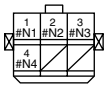


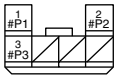


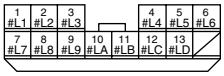


CHASSIS HARNESS



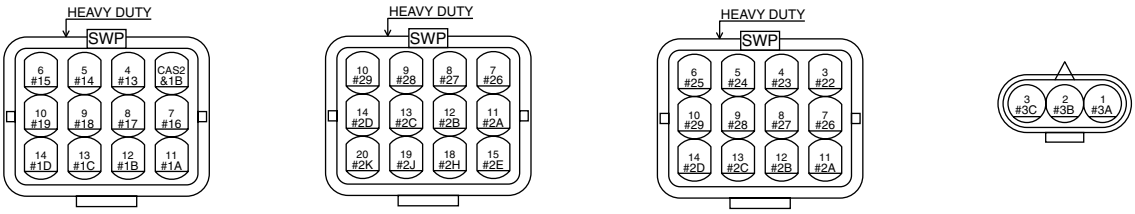




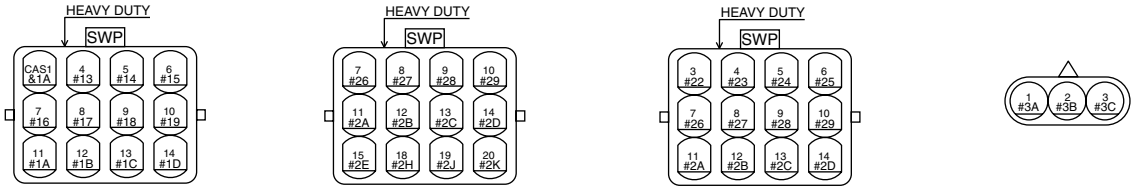


M12020100108

CHASSIS HARNESS

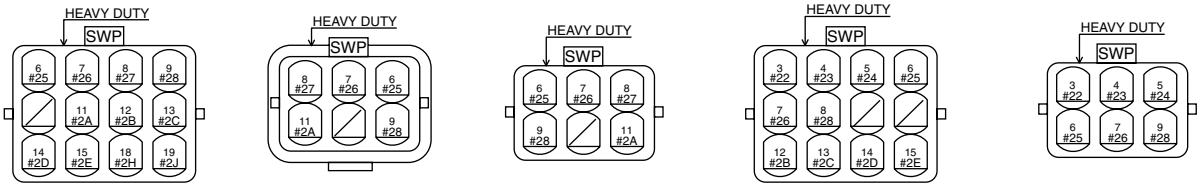


FRONT HARNESS

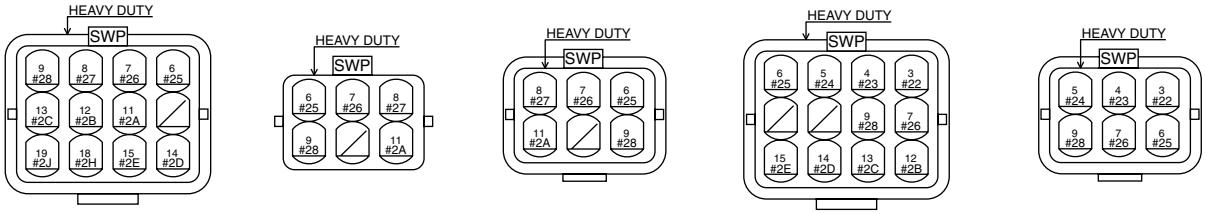


M12020100109

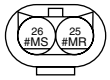
CHASSIS HARNESS



FRONT HARNESS



M12020100110

FRONT HARNESS	
AUTOMATIC TRANSMISSION HARNESS	

M12020100111

BRAKE CONTROL (ABS: AKEBONO BRAKE MAKE)

DN03-001

ANTI-LOCK BRAKE DN03-2
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ANTI-LOCK BRAKE

INSPECTION

(ABS SYSTEM OPERATION AND FAILURE DIAGNOSTICS)

M16030101BEF2001

ABS SYSTEM REGULAR INSPECTION

Inspect the operation of the ABS system once per year in accordance with the procedure below.

OPERATION STATUS INSPECTION

Refer to the section below "OPERATION STATUS INSPECTION" for information on the inspection procedure. If this inspection reveals any malfunctions, be sure to carry out next inspection.

OPERATION STATUS INSPECTION

1. PREPARATION BEFORE INSPECTION

(1) With the vehicle stopped, step on the brake pedal and check for air leakage from the ABS control valves. If air leaking from the pipe connectors is found by applying soapy water, or the like, correct the problem by tightening the connectors or take a similar corrective action. Also, if air is leaking from the ABS control valve body, replace the ABS control valve.

(2) Release the brake pedal and inspect the exhaust status of the ABS control valves.
The above inspection should be carried out on all ABS control valves.

2. ABS OPERATION STATUS INSPECTION IN TEST DRIVE

NOTICE:

When inspecting the ABS operation status in a test drive, exercise caution with regard to the following points.

- **Use a large, safe area for the test.**
- **Conduct the test with nothing loaded on the vehicle.**
- **Apply white tape, or the like, to the sides of the front and rear wheels to enable you to determine the wheel's rotational status.**

(1) Turn the starter switch "ON". Confirm that the ABS warning lamp lights and then goes off.

(2) Start driving the vehicle and, accelerate to a speed of vehicle to 20 - 30 km/h {12.4 - 18.6 mile/h}, then apply the brakes hard. Confirm that none of the wheels are locked.

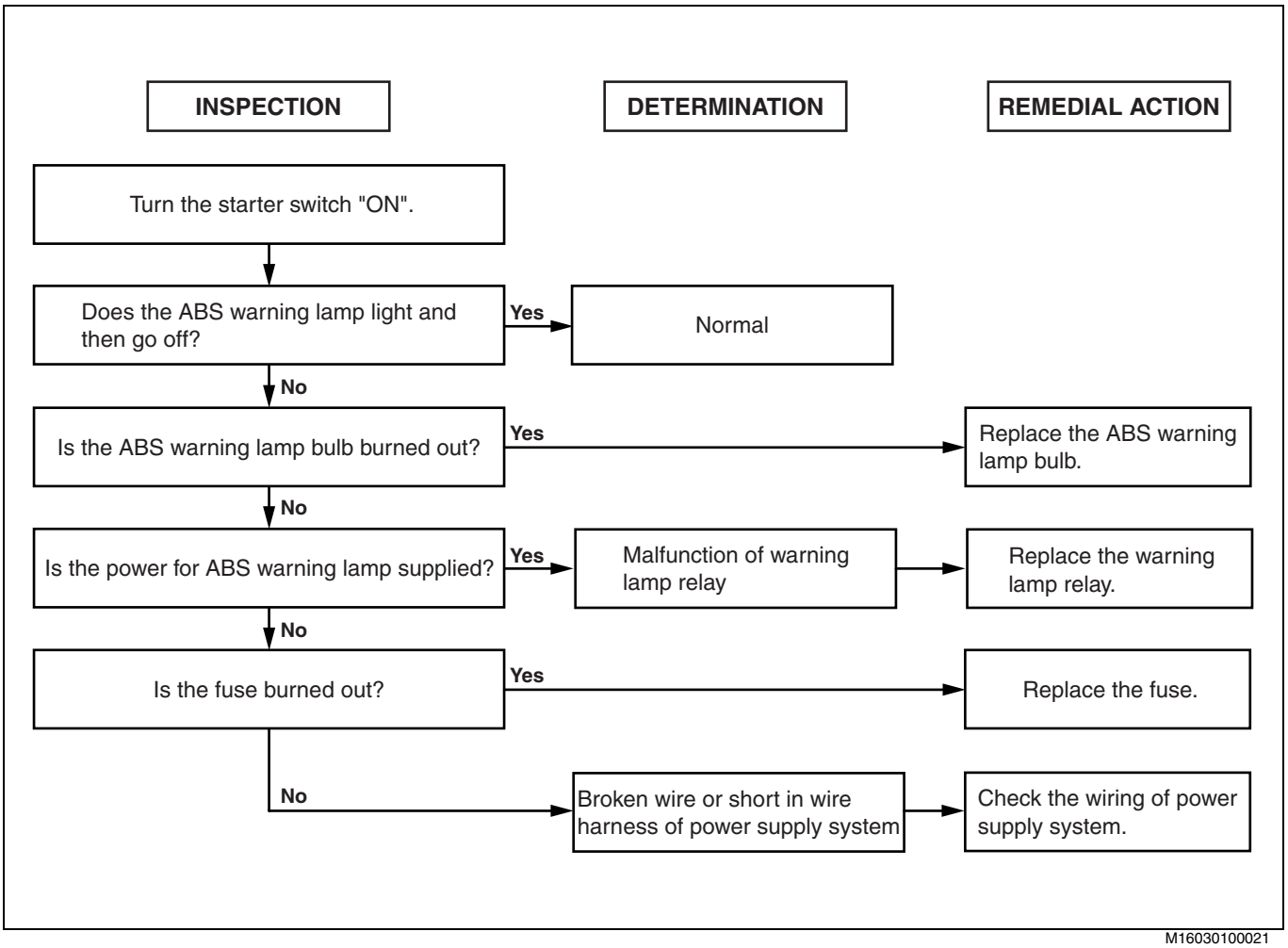
FAILURE DIAGNOSTICS BASED ON ILLUMINATION OF WARNING LAMPS

LIT LAMP	CAUSE OF MALFUNCTION	FAIL-SAFE FUNCTION
ABS warning lamp (Lamp lights while driving vehicle.)	POWER SUPPLY RELATED • Fuse burned out • Wire harness connector disconnected • Bad contact with wire harness • Wire broken in wire harness • Low battery voltage	Entire ABS system becomes non-functional. (Brakes of all wheels return to normal braking operation.)
	WHEEL SENSOR RELATED • Sensor clearance too wide • Bad sensor unit • Broken wire in wire harness • Wire harness connector disconnected or bad contact.	ABS becomes nonfunctional on wheels in the system where sensor malfunctioned, and those wheels return to normal braking operation.
	ABS CONTROL VALVE RELATED • Wire broken or short circuit in solenoid coil • Broken wire in wire harness of ABS control valve, wire harness connector disconnected, bad contact	ABS becomes non-functional on wheel in the system where ABS control valve malfunctioned, and those wheel return to normal braking operation.
	COMPUTER • Internal malfunction in computer	ABS becomes non-functional on wheel in the system controlled by faulty computer, and those wheels return to normal braking operation.

NOTICE:
The ABS warning lamp may remain lit if the ABS system experiences a temporary malfunction and then recovers. Should this occur, reset it by turn "LOCK" the starter switch temporarily while the vehicle is stopped.

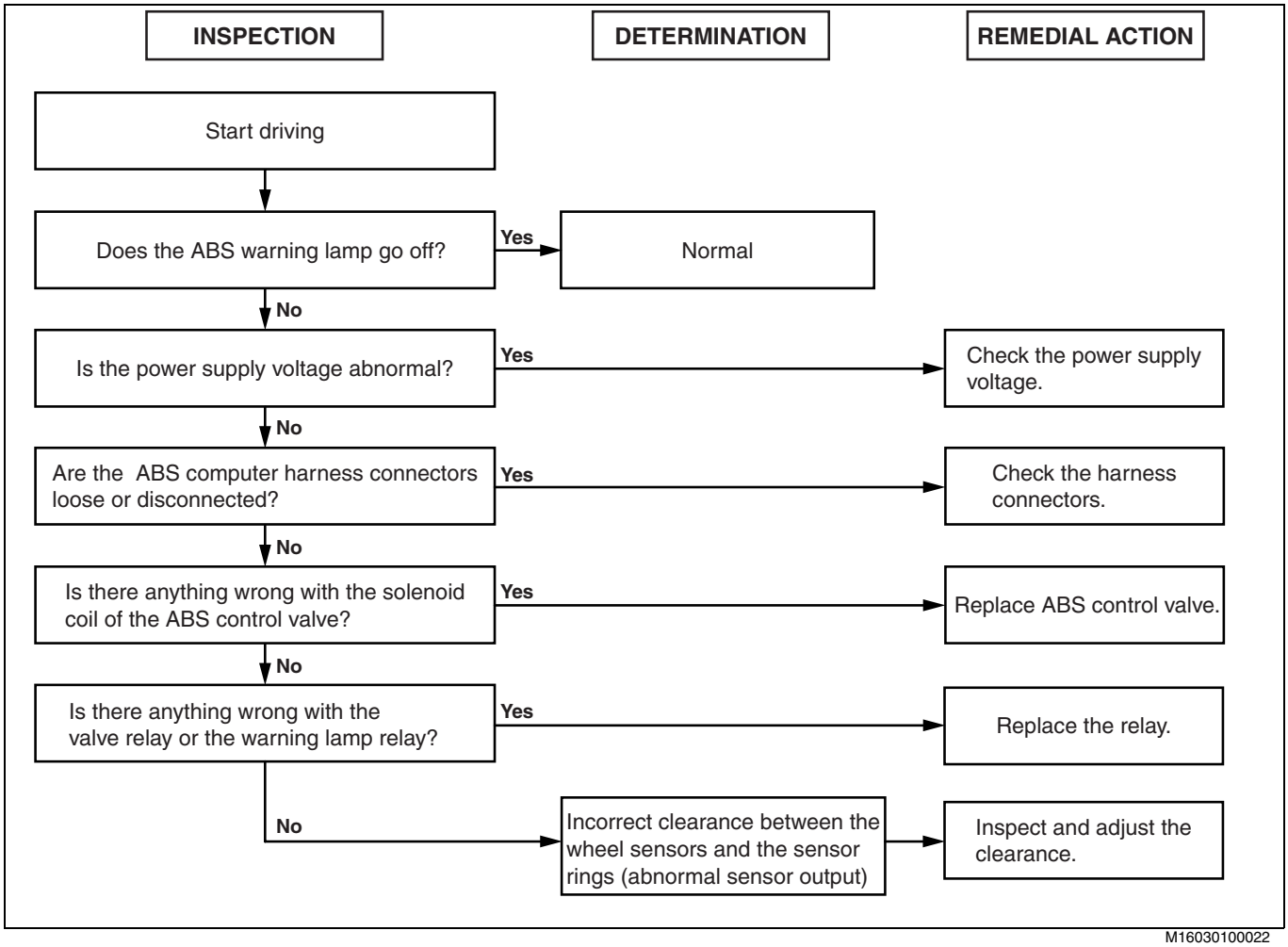
ABS SYSTEM FAILURE DIAGNOSTICS FLOWCHART

1. WHEN THE ENGINE IS STARTED UP



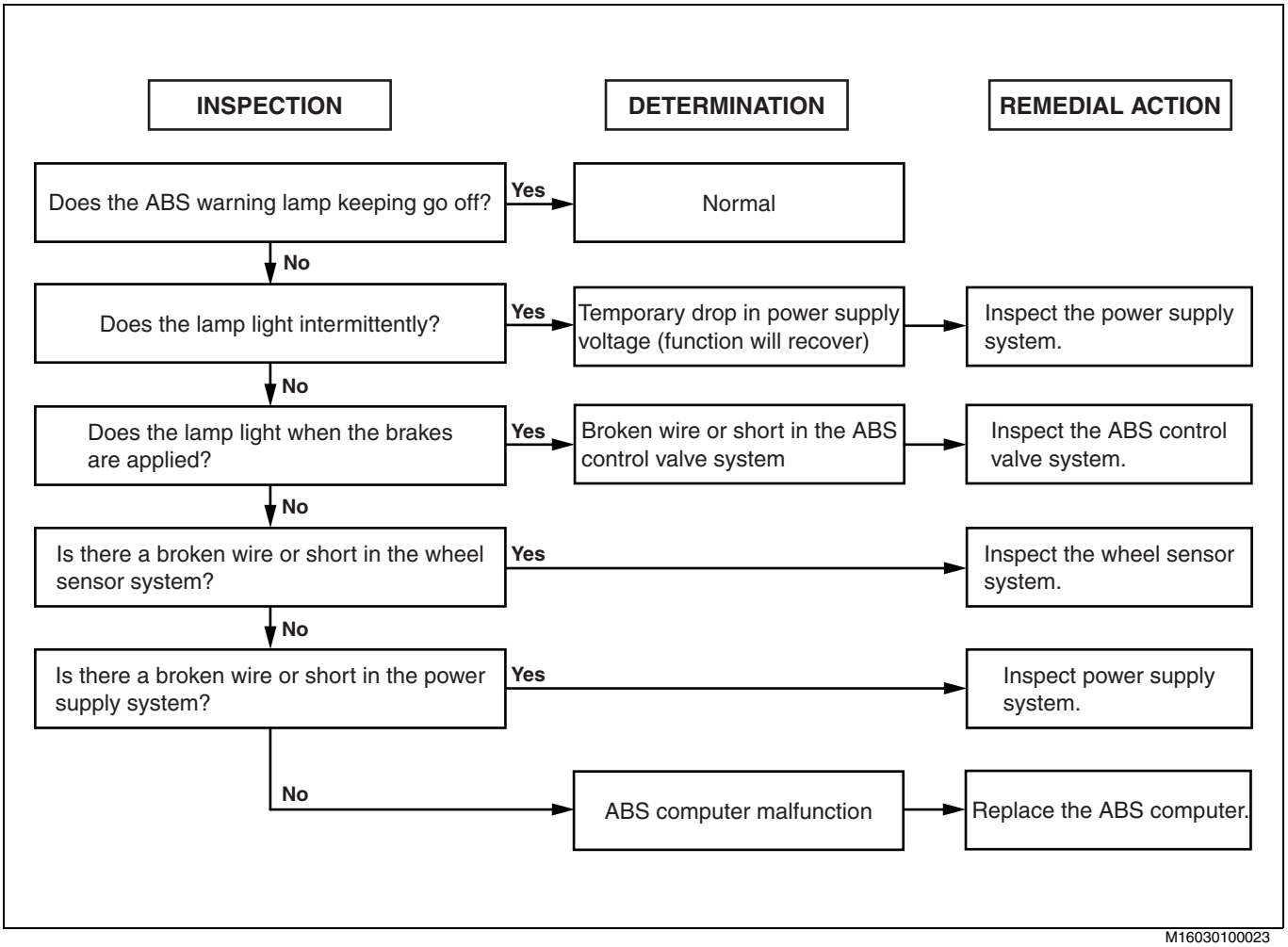
M16030100021

2. WHEN STARTING TO DRIVE



M16030100022

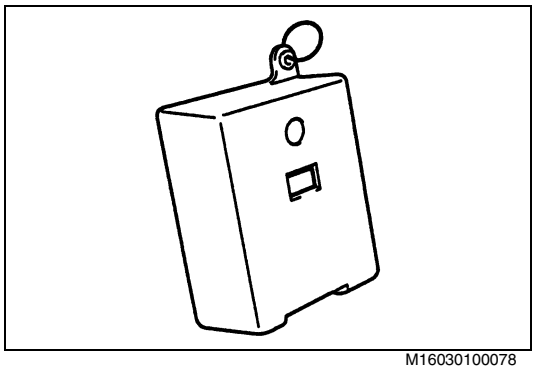
3. WHILE DRIVING AND BRAKING



M16030100023

DIAGNOSIS USING THE DIAGNOSIS MONITOR

M16030101BEF2043

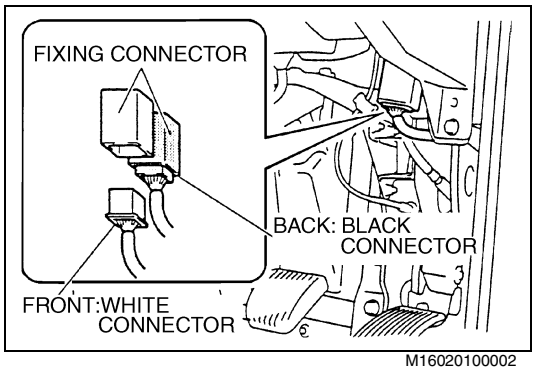


M16030100078

1. CONNECT THE DIAGNOSIS MONITOR.
SST: Diagnosis monitor (09630-1370)

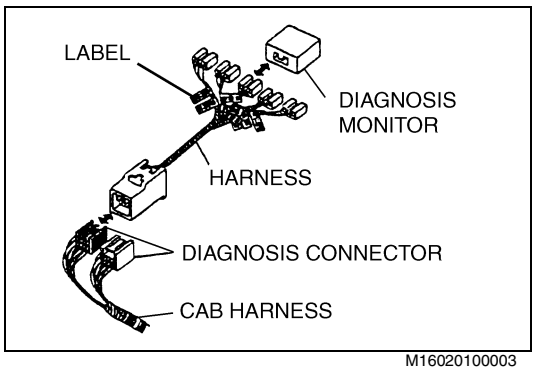
NOTICE:
Trouble diagnosis can be performed using the diagnosis monitor. The malfunction codes are indicated by sound and light.

(1) Turn the starter switch to the "ON".



M16020100002

(2) Connect the harness to the diagnosis connector.
SST: Harness (09630-2300)



M16020100003

(3) Connect the diagnosis monitor to the connector which tagged a "STD: ABS/ASR" label.

2. READ OUT THE MALFUNCTION CODE.

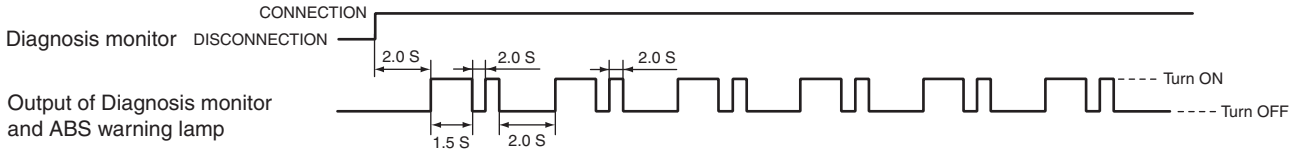
(1) Check the diagnosis monitor or ABS warning lamp flashes on and off to inform the malfunction codes.

(2) Read out the malfunction codes and write down the malfunction codes that are displayed.

NOTICE:

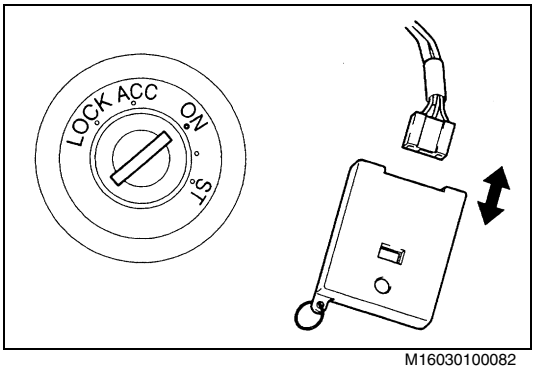
Malfunction codes are displayed, starting from the lowest and progressing upward, with no distinction between present and past malfunction codes.

MALFUNCTION CODE DISPLAY PATTERN



OUTPUT CODE 6: Abnormal signal of the wheel sensor, LH on front axle

M16030100081



M16030100082

3. ERASE THE MALFUNCTION CODE MEMORY.

(1) Disconnect the diagnosis monitor with the starter switch set to "ON".

NOTICE:

In case of disconnecting with the starter switch set to "LOCK", the malfunction code memory will not be erased. Always disconnect the diagnosis monitor with the starter switch set to ON.

(2) Wait 5 seconds and connect the diagnosis monitor.

(3) This time, only the present malfunction codes are displayed.

(4) Compare the two sets of codes you get to determine which are the present codes and which are the past one's.

TABLE OF TROUBLE CORD

M16030101BEF2002

OUTPUT CODE	MALFUNCTION CONTENTS	CORRESPONDING TERMNAL NUMBER OF ABS COMPUTER (CONNECTOR PIN NO.)
1	Normal function of system	—
2	Abnormality of ABS computer internal	—
3	Abnormality of ABS computer power supply voltage	22 pin connector-1st
4	Wrong sensor ring or wrong tire size	—
6	Abnormal signal of the wheel sensor, LH on front axle	—
7	Abnormal signal of the wheel sensor, RH on front axle	—
8	Abnormal signal of the wheel sensor, LH on rear axle	—
9	Abnormal signal of the wheel sensor, RH on rear axle	—
11	Abnormality of the wheel sensor, LH on front axle	22 pin connector-10th, 21th
12	Abnormality of the wheel sensor, RH on front axle	22 pin connector-8th, 19th
13	Abnormality of the wheel sensor, LH on rear axle	22 pin connector-6th, 18th
14	Abnormality of the wheel sensor, RH on rear axle	22 pin connector-4th, 16th
17	Abnormality of ABS control valve, on front axle	26 pin connector-25th, 11th
18	Abnormality of ABS control valve, LH on rear axle	26 pin connector-15th, 2nd
19	Abnormality of ABS control valve, RH on rear axle	26 pin connector-14th, 1st
21 or 22	Abnormality of ABS control valve relay power supply or abnormality of ABS control valve relay	22 pin connector-2nd, 13th 26 pin connector-3rd
23	Leakage of ABS control valve power supply	—
24	Abnormality on exhaust brake cut relay	—
29	Wrong ABS computer	—

ABNORMALITY OF ABS COMPUTER INTERNAL

(DIAGNOSIS CODE 2)

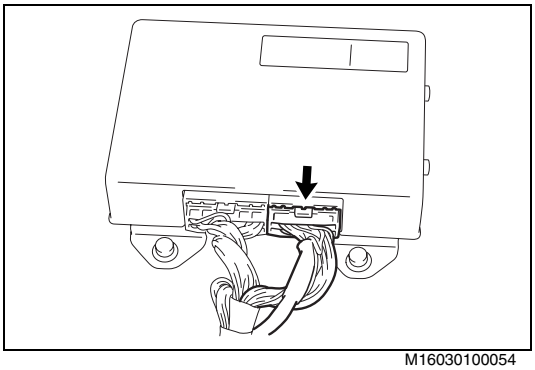
M16030101BEF2003

If this code is output frequently, replace ABS computer. (The computer cannot be disassembled, so do not disassemble it.)
If the ABS computer operates normally again by the starter switch "ON" to "LOCK", it is a temporary malfunction caused by harness or connectors.
Check the fitting of ABS computer connector and ground.

ABNORMALITY OF ABS COMPUTER

POWER SUPPLY VOLTAGE (DIAGNOSIS CODE 3)

M16030101BEF2004

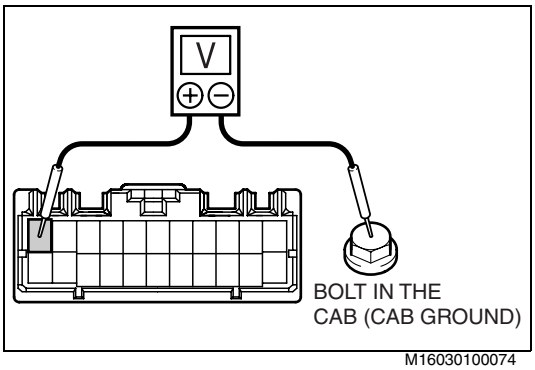


M16030100054

1. CHECK THE VOLTAGE OF COMPUTER POWER SUPPLY.

(1) Set the starter switch to "LOCK".

(2) Disconnect the 22 pin connectors of ABS computer.



M16030100074

(3) Start the engine and measure the voltage between 1st terminal of 22 pin connectors (Chassis harness side) and the bolt in the cab (Ground).
Standard: 22-28V

NG

- Under standard:
  Check the fitting condition of 22 pin connectors and fuse (ABS 2)
- Over the battery and alternator.

OK

Abnormality of ABS computer

(4) Stop the engine and set the starter switch to "LOCK".

WRONG SENSOR RING OR WRONG TIRE SIZE

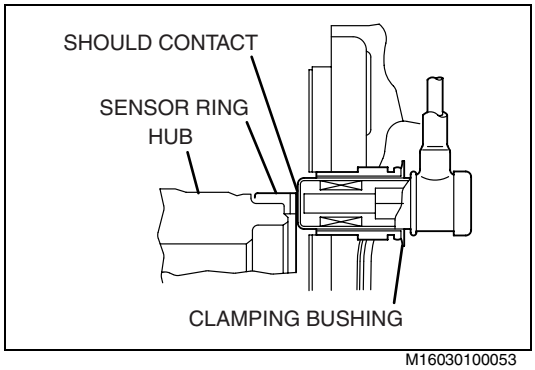
(DIAGNOSIS CODE 4)

M16030101BEF2005

If this code is output, check whether the specified sensor ring and tire is installed or not. If it is wrong, replace the sensor ring and tire. (When the tire is worn excessively, this code can be output.)

ABNORMAL SIGNAL OF THE WHEEL SENSOR (DIAGNOSIS CODE 6 TO 9)

M16030101BEF2006



M16030100053

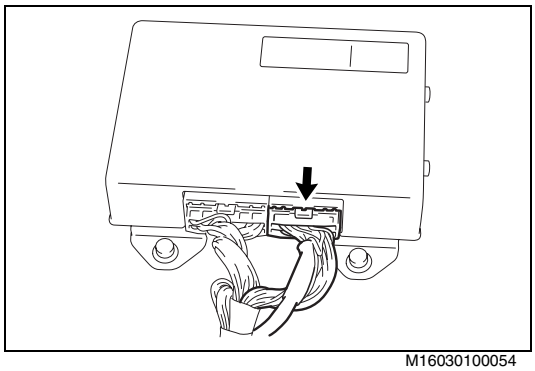
1. CHECK THE WHEEL SENSOR.

(1) Push the wheel sensor using a round end bar until the sensor contacts with the sensor ring.

(2) Check the damage of wheel sensor, holding status of sensor holder and play of wheel hub bearing.
Refer to CHAPTER ABS, SECTION FRONT AXLE and REAR AXLE.

ABNORMARITY OF THE WHEEL SENSOR, LH ON FRONT AXLE (DIAGNOSIS CODE 11)

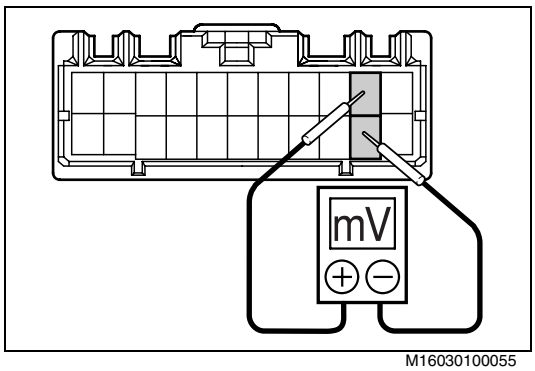
M16030101BEF2007


M16030100054

1. CHECK THE VOLTAGE OF THE WHEEL SENSOR.

(1) Set the starter switch to "LOCK".

(2) Disconnect the 22 pin connectors of ABS computer.



M16030100055

(3) Measure the voltage between 10th and 21th terminals of 22 pin connectors (Chassis harness side), measure it's voltage by rotating the tire by one time for 5 seconds.
Standard: 170-1,999 mV

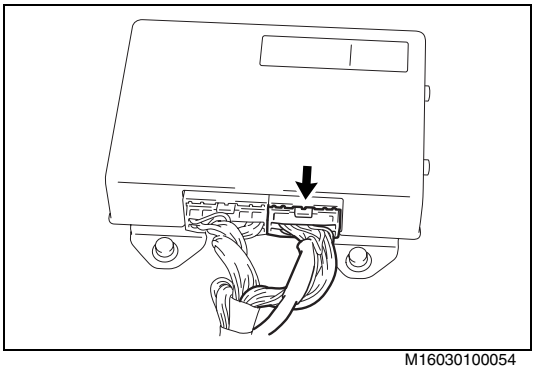
NG → Abnormality of harness or wheel sensor

OK

- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

ABNORMARITY OF THE WHEEL SENSOR, RH ON FRONT AXLE (DIAGNOSIS CODE 12)

M16030101BEF2008

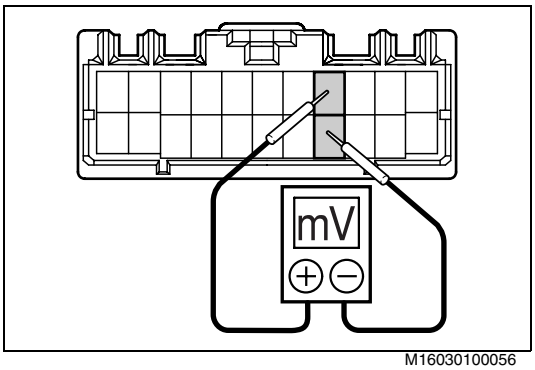


M16030100054

1. CHECK THE VOLTAGE OF THE WHEEL SENSOR.

(1) Set the starter switch to "LOCK".

(2) Disconnect the 22 pin connectors of ABS computer.



M16030100056

(3) Measure the voltage between 8th and 19th terminals of 22 pin connectors (Chassis harness side), measure it's voltage by rotating the tire by one time for 5 seconds.
Standard: 170-1,999 mV

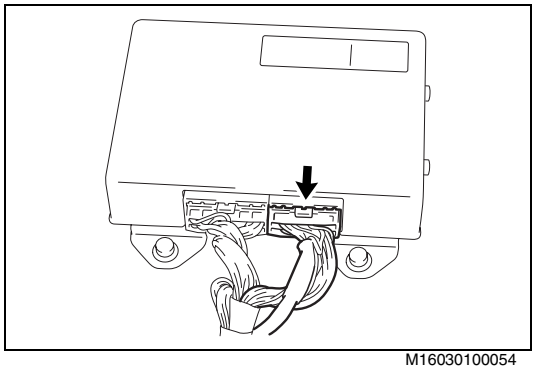
NG → Abnormality of harness or wheel sensor

OK

- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

ABNORMARITY OF THE WHEEL SENSOR, LH ON REAR AXLE (DIAGNOSIS CODE 13)

M16030101BEF2009

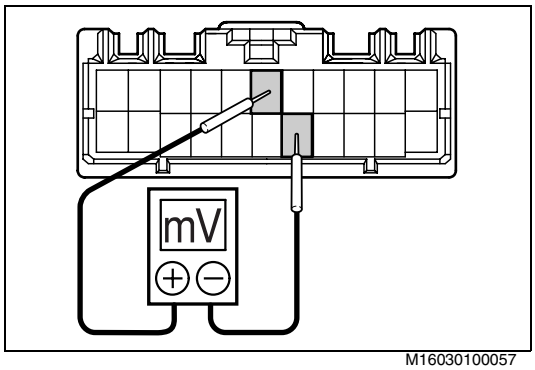


M16030100054

1. CHECK THE VOLTAGE OF THE WHEEL SENSOR.

(1) Set the starter switch to "LOCK".

(2) Disconnect the 22 pin connectors of ABS computer.



M16030100057

(3) Measure the voltage between 6th and 18th terminals of 22 pin connectors (Chassis harness side), measure it's voltage by rotating the tire by one time for 5 seconds.
Standard: 170-1,999 mV

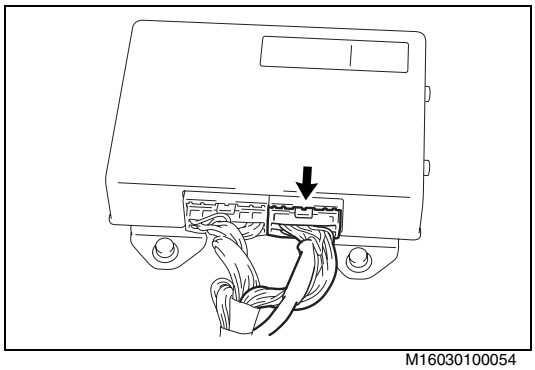
NG → Abnormality of harness or wheel sensor

OK

- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

ABNORMARITY OF THE WHEEL SENSOR, RH ON REAR AXLE (DIAGNOSIS CODE 14)

M16030101BEF2010

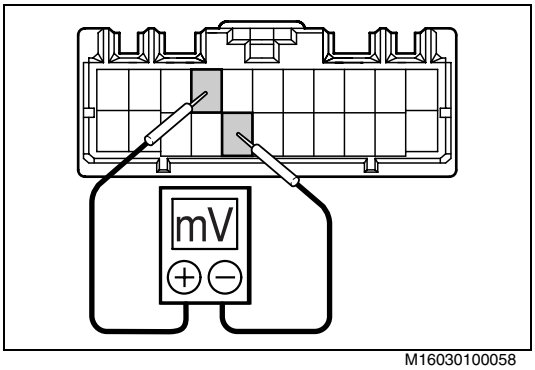


M16030100054

1. CHECK THE VOLTAGE OF THE WHEEL SENSOR.

(1) Set the starter switch to "LOCK".

(2) Disconnect the 22 pin connectors of ABS computer.



M16030100058

(3) Measure the voltage between 4th and 16th terminals of 22 pin connectors (Chassis harness side), measure it's voltage by rotating the tire by one time for 5 seconds.
Standard: 170-1,999 mV

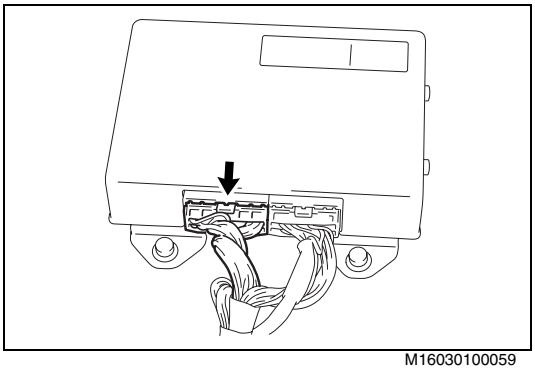
NG → Abnormality of harness or wheel sensor

OK

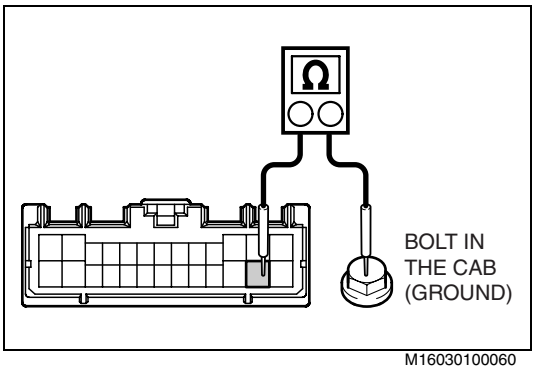
- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

ABNORMALITY OF ABS CONTROL VALVE, ON FRONT AXLE (DIAGNOSIS CODE 17)

M16030101BEF2011


M16030100059

1. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.
(1) Set the starter switch to "LOCK".
(2) Disconnect the 26 pin connectors of ABS computer.

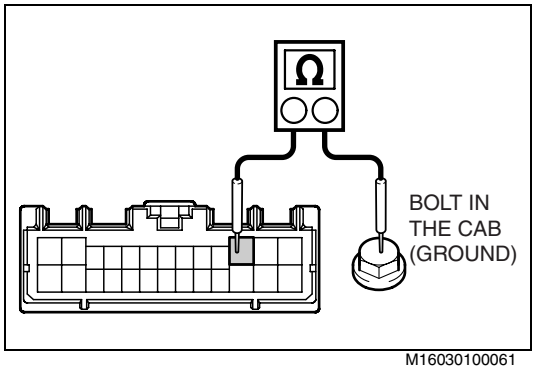


M16030100060

(3) Measure the resistance between 25th terminal (Chassis harness side) and the bolt in the cab (Ground).
Standard: 9-25 Ω

NG → Proceed to 3.

OK



M16030100061

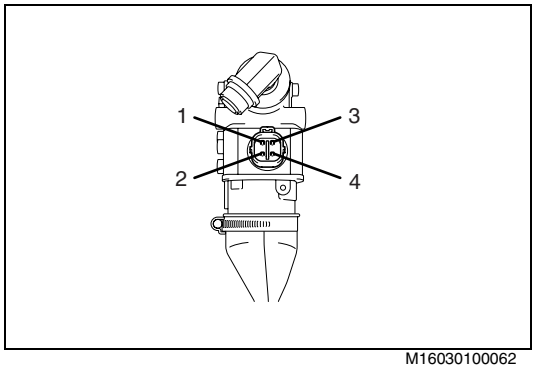
2. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(1) Measure the resistance between 11th terminal (Chassis harness side) and the bolt in the cab (Ground).
Standard: 9-25 Ω

NG → Proceed to 3.

OK →

- Temporary malfunction because of abnormality of harness or abnormality of connectors
- Abnormality of ABS computer



M16030100062

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

(1) Disconnect the connector of ABS control valve.
(2) Measure the resistance between 1st-2nd terminals and 3rd-4th terminals (Control valve side).
Standard:

Terminals	Resistance
Between 1st-2nd	**9-25 Ω**
Between 3rd-4th	**9-25 Ω**

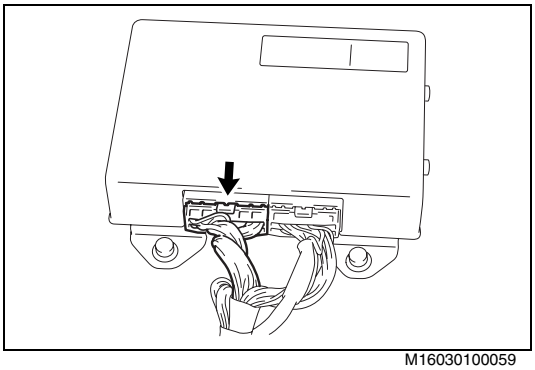
NG → Abnormality of control valve

OK →

Abnormality of harness

ABNORMALITY OF ABS CONTROL VALVE, LH ON REAR AXLE (DIAGNOSIS CODE 18)

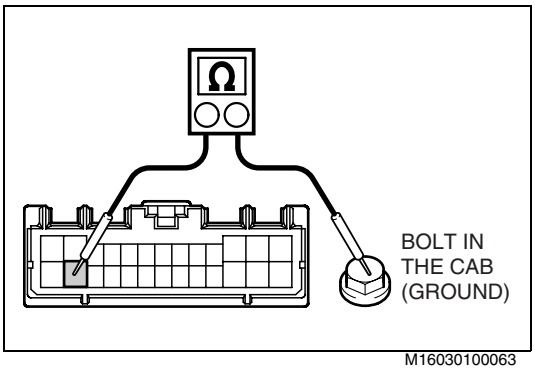
M16030101BEF2012



M16030100059

1. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(1) Set the starter switch to "LOCK".
(2) Disconnect the 26 pin connectors of ABS computer.



M16030100063

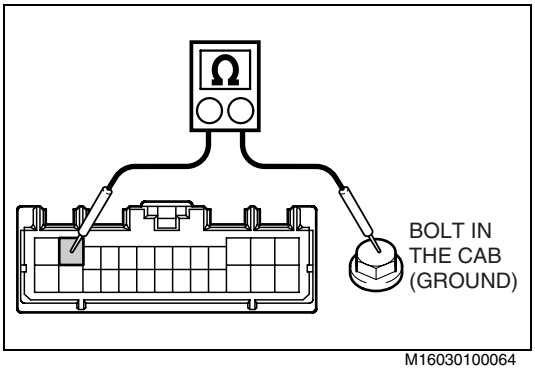
(3) Measure the resistance between 15th terminal (Chassis harness side) and the bolt in the cab (Ground).
Standard: 9-25 Ω

NG → Proceed to 3.

OK

2. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(1) Measure the resistance between 2nd terminal (Chassis harness side) and the bolt in the cab (Ground).
Standard: 9-25 Ω

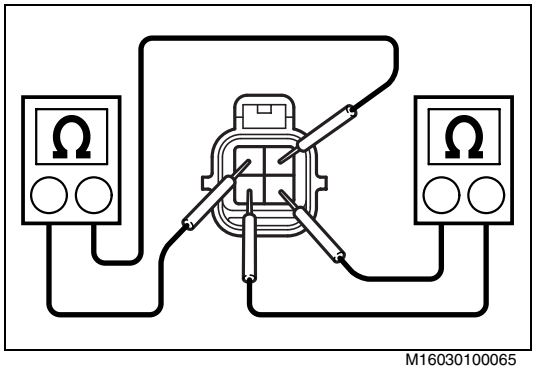


M16030100064

NG → Proceed to 3.

OK

- Temporary malfunction because of abnormality of harness or abnormality of connectors
- Abnormality of ABS computer



M16030100065

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

(1) Disconnect the connector of ABS control valve.

(2) Measure the resistance between 1st-2nd terminals and 3rd-4th terminals (control valve side).
Standard:

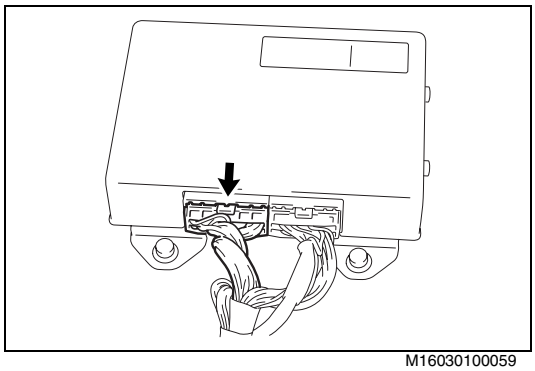
Terminals	Resistance
Between 1st-2nd	**9-25 Ω**
Between 3rd-4th	**9-25 Ω**

NG → Abnormality of control valve

OK → Abnormality of harness

ABNORMALITY OF ABS CONTROL VALVE, RH ON REAR AXLE (DIAGNOSIS CODE 19)

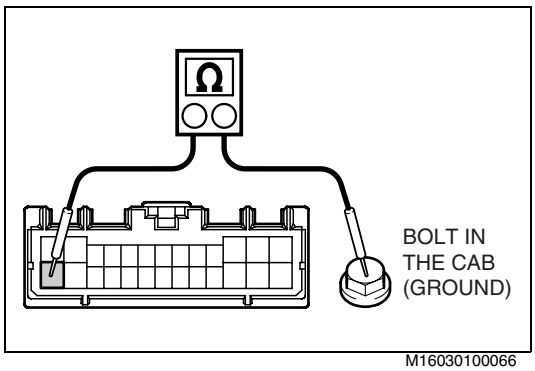
M16030101BEF2013


M16030100059

1. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(1) Set the starter switch to "LOCK".

(2) Disconnect the 26 pin connectors of ABS computer.

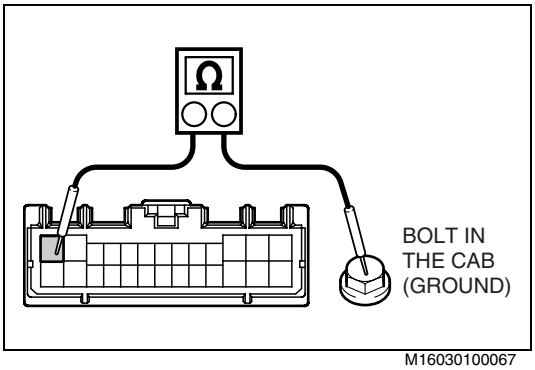


M16030100066

(3) Measure the resistance between 14th pin connectors (Chassis harness side) and the bolt in the cab (Ground).
Standard: 9-25 Ω

NG → Proceed to 3.

OK



M16030100067

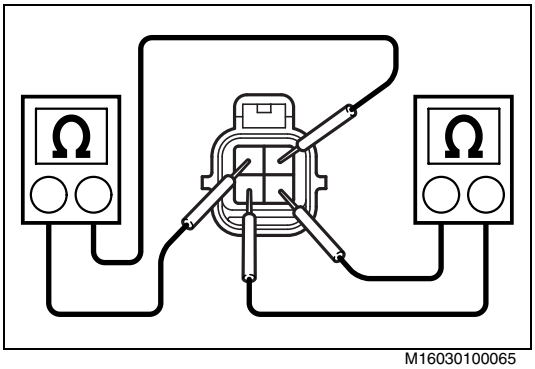
2. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(1) Measure the resistance between 1st pin connectors (Chassis harness side) and the bolt in the cab (Ground).
Standard: 9-25 Ω

NG → Proceed to 3.

OK →

- Temporary malfunction because of abnormality of harness or abnormality of connectors
- Abnormality of ABS computer


M16030100065

3. CHECK THE RESISTANCE OF THE ABS CONTROL VALVE.

(1) Disconnect the connector of ABS control valve.
(2) Measure the resistance between 1st-2nd terminals and 3rd-4th terminals (control valve side).
Standard:

Terminals	Resistance
Between 1st-2nd	**9-25 Ω**
Between 3rd-4th	**9-25 Ω**

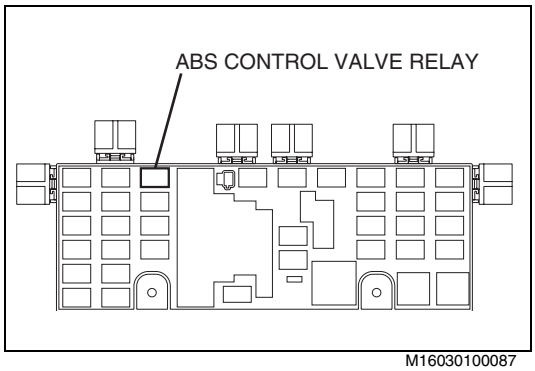
NG → Abnormality of control valve

OK →

Abnormality of harness

ABNORMALITY OF ABS CONTROL VALVE RELAY POWER SUPPLY OR ABNORMALITY OF ABS CONTROL VALVE RELAY (DIAGNOSIS CODE 21 OR 22)

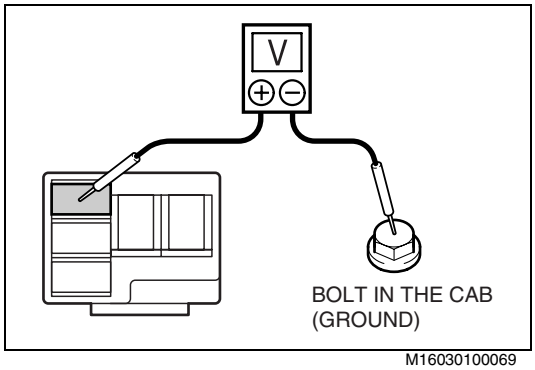
M16030101BEF2014



M16030100087

1. CHECK THE VOLTAGE BETWEEN TERMINAL AND GROUND.

(1) Set the starter switch to "LOCK".
(2) Remove the ABS control valve relay.
(3) Set the starter switch "ON" (The engine is stopped).



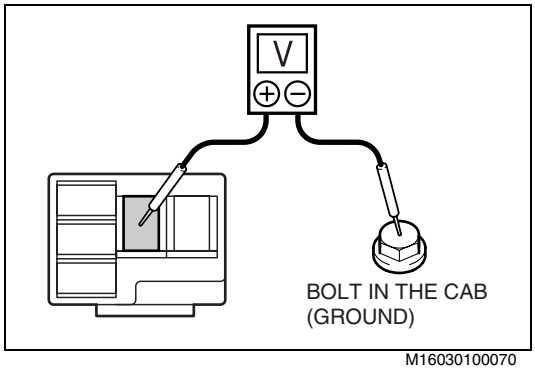
M16030100069

(4) Measure the voltage between 1st terminal of valve relay socket (Relay block side) and the bolt in the cab (Ground).
Standard: 22-28 V

NG

- Burn out Fuse
- Harness disconnection

OK



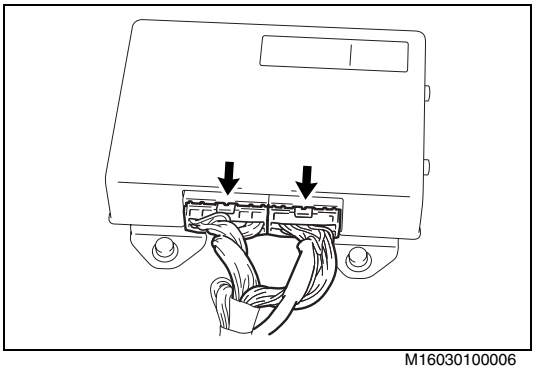
M16030100070

(5) Measure the voltage between 5th terminal of valve relay socket (Relay block side) and the bolt in the cab (Ground).
Standard: 22-28 V

NG

- Burn out Fuse
- Harness disconnection

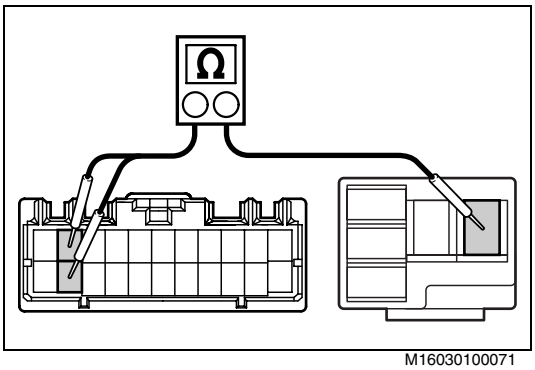
OK


M16030100006

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK".

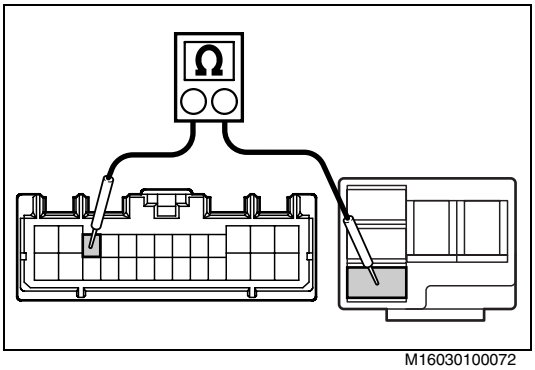
(2) Disconnect the 22 pin and 26 pin connectors of ABS computer.


M16030100071

(3) Check the continuity between 2nd terminal of 22 pin connectors and 3rd terminal of valve relay socket, 13th terminal of 22 pin and 3rd terminal of valve relay (Chassis harness side, Relay block side).
Standard: Continuity

NG → Harness disconnection

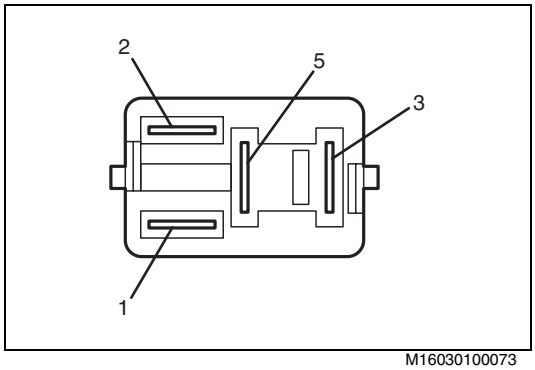
OK


M16030100072

(4) Check the continuity between 3rd terminal of 26 pin connectors and 2nd terminal of valve relay socket (Chassis harness side, Relay block side).
Standard: Continuity

NG → Harness disconnection

OK



M16030100073

3. CHECK THE CONTINUITY AND INSULATION OF ABS CONTROL VALVE RELAY.

(1) According to the table below, check the continuity between terminals

Standard:

	Between 3-5
Turning on electricity under 24 V to 1-2	Continuity
No electricity to 1-2	Insulation

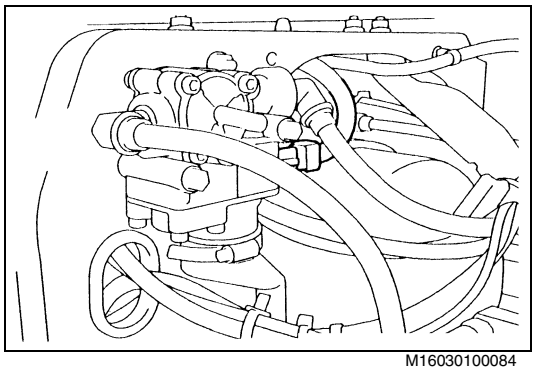
NG → Abnormality of ABS control valve relay

OK

Abnormality of ABS computer

LEAKAGE OF ABS CONTROL VALVE POWER SUPPLY (DIAGNOSIS CODE 23)

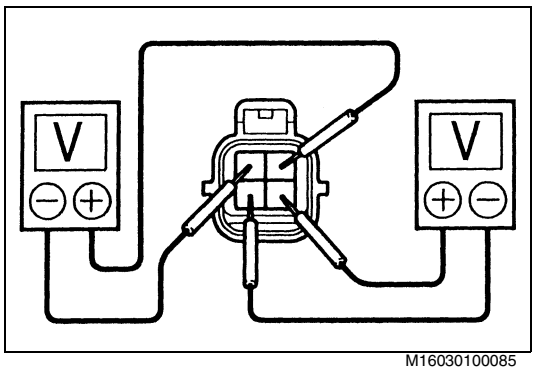
M16030101BEF2041


M16030100084

1. CHECK THE VOLTAGE OF THE ABS CONTROL VALVE FOR FRONT WHEEL.

(1) Set the starter switch to "LOCK".

(2) Disconnect the connector of ABS control valve for front axle.



M16030100085

(3) Measure the voltage between 1st-2nd terminals, 3rd-4th terminals (Chassis harness side).

Standard: 1V or less

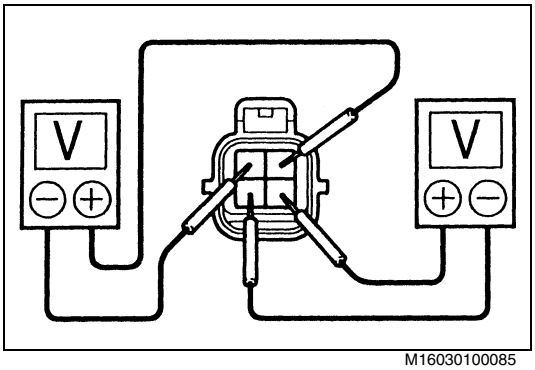
NG

- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

OK

2. CHECK THE VOLTAGE OF THE ABS CONTROL VALVE FOR LH ON REAR AXLE.

(1) Set the starter switch to "LOCK".
(2) Disconnect the connector of ABS control valve for LH on rear axle.
(3) Measure the voltage between 1st-2nd terminals, 3rd-4th terminals (Chassis harness side).
Standard: 1V or less



M16030100085

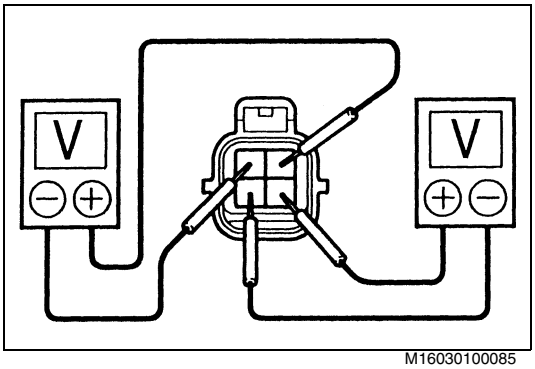
NG

OK

- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

3. CHECK THE VOLTAGE OF THE ABS CONTROL VALVE FOR RH ON THE REAR AXLE.

(1) Set the starter switch to "LOCK".
(2) Disconnect the connector of ABS control valve for RH on rear axle.
(3) Measure the voltage between 1st-2nd terminals, 3rd-4th terminals (Chassis harness side).
Standard: 1V or less



M16030100085

NG

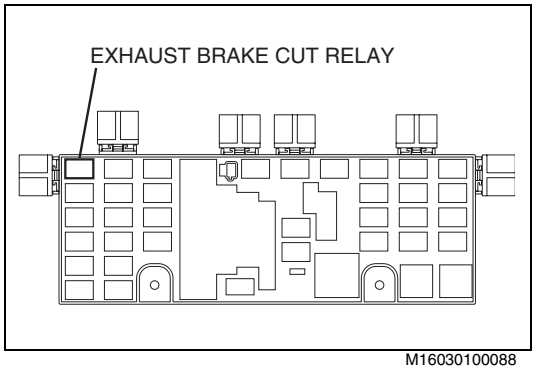
OK

- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

Delete the past failure and check again by diagnosis monitor.

ABNORMALITY ON THE EXHAUST BRAKE CUT RELAY (DIAGNOSIS CODE 24)

M16030101BEF2042

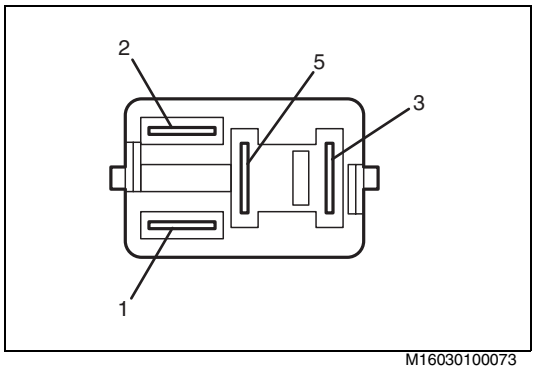


M16030100088

1. CHECK THE CONTINUITY AND INSULATION OF EXHAUST BRAKE CUT RELAY.

(1) Set the starter switch to "LOCK".

(2) Remove the exhaust brake cut relay.



M16030100073

(3) According to the table below, check the continuity between terminals

Standard:

	Between 3-5
Turning on electricity under 24 V to 1-2	Continuity
No electricity to 1-2	Insulation

NG → Abnormality of exhaust brake cut relay

OK

- Abnormality of harness
- Abnormality of ABS computer

WRONG ABS COMPUTER (DIAGNOSIS CODE 29)

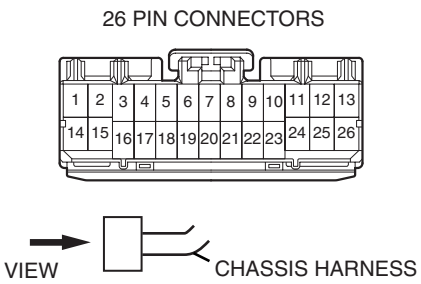
M16030101BEF2044

If this code is output, check the parts number of ABS computer.

ABS COMPUTER CHASSIS SIDE

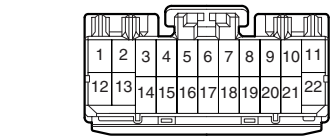
CONNECTOR PIN ASSIGNMENT

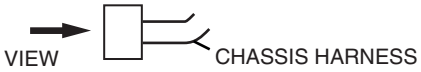
M16030101BEF2015



No.	SIGNAL	CONNECTING DESTINETION	No.	SIGNAL	CONNECTING DESTINETION
1	RRHV	ABS control valve for rear right wheel	14	RRDV	ABS control valve for rear right wheel
2	RLHV	ABS control valve for rear left wheel	15	RLDV	ABS control valve for rear left wheel
3	VR1	ABS valve relay and ABS warning lamp relay	16	—	—
4	—	—	17	EXBR	Exhaust brake cut relay
5	—	—	18	—	—
6	—	—	19	—	—
7	ESET	Battery ground	20	IL	For diagnosis monitor
8	DS	For diagnosis monitor	21	WL	ABS warning lamp
9	—	—	22	—	—
10	—	—	23	—	—
11	FRHV	ABS control valve for front wheel	24	—	—
12	—	—	25	FLDV	ABS control valve for front wheel
13	GND	Computer ground 1	26	GND2	Computer ground 2

22 PIN CONNECTORS





No.	SIGNAL	CONNECTING DESTINETION	No.	SIGNAL	CONNECTING DESTINETION
1	IGN	ABS Computer power supply (Fuse)	12	GND3	Computer ground 3
2	VV1	ABS control valve relay	13	VV2	ABS control valve relay
3	—	—	14	—	—
4	RRS+	Wheel sensor for rear right wheel	15	—	—
5	—	—	16	RRS-	Wheel sensor for rear right wheel
6	RLS+	Wheel sensor for rear left wheel	17	—	—
7	—	—	18	RLS-	Wheel sensor for rear left wheel
8	FRS+	Wheel sensor for front right wheel	19	FRS-	Wheel sensor for front right wheel
9	—	—	20	—	—
10	FLS+	Wheel sensor for front left wheel	21	FLS-	Wheel sensor for front left wheel
11	—	—	22	—	—

BRAKE CONTROL (ES START)

DN03-002

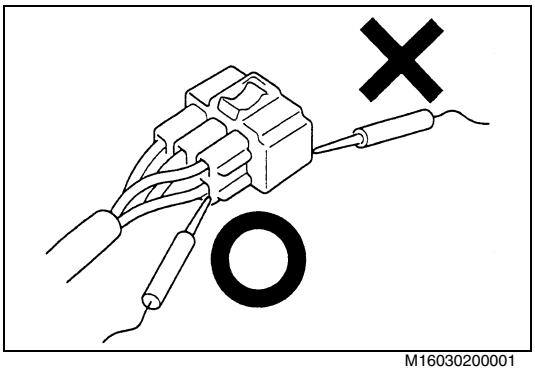
ES START (EASY & SMOOTH START) SYSTEM DN03-2

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NEUTRAL SWITCH AND BACK-UP LAMP SWITCH MALFUNCTION (DIAGNOSIS CODE 11) DN03-27
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STOP LAMP SWITCH DAMAGE (DIAGNOSIS CODE 13) DN03-30
ES START CONTROLLER MALFUNCTION (DIAGNOSIS CODE 16) DN03-31
ES MAIN SWITCH DAMAGE (DIAGNOSIS CODE 18) DN03-32
ES START RELEASE TIMING SWITCH (DIAGNOSIS CODE 21) DN03-34

ES START (EASY & SMOOTH START) SYSTEM

HANDLING PRECAUTIONS

M16030201BEF2001



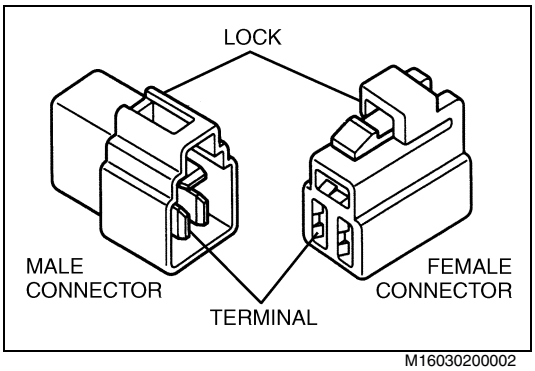
M16030200001

1. ABOUT CONNECTORS

(1) Before performing the inspection operation, make sure that all connectors are connected securely.

(2) Do not contact the tester bar to the connection surface of the connector. This may cause terminal damage or a short-circuit.

(3) All connectors in the connector diagram are observed from the contact surfaces. However, the tester bar is put from the rear side.

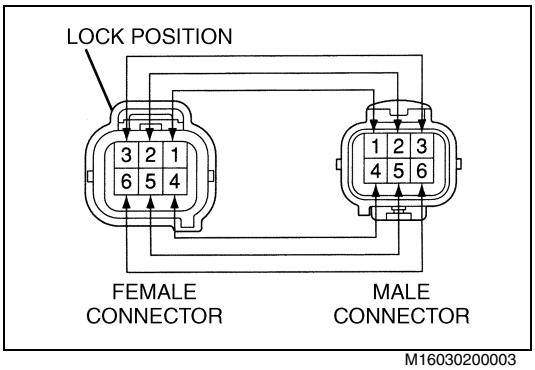


M16030200002

(4) The connector is displayed from the view of the mating surface when the connector lock is positioned above.

Reference

- **Female connector: The terminal is female.**
- **Male connector: The terminal is male.**



M16030200003

(5) As for the terminal numbers of the connecor, the first terminal is located on the top right terminal of the male connector and the top left tereminal of the female connector.
Reference:
When viewed from the mating surface, the terminal numbers of both connectors are located symmetrically (reversed horizontally).

(6) When disconnecting the connectors, be sure to position the starter switch "LOCK".

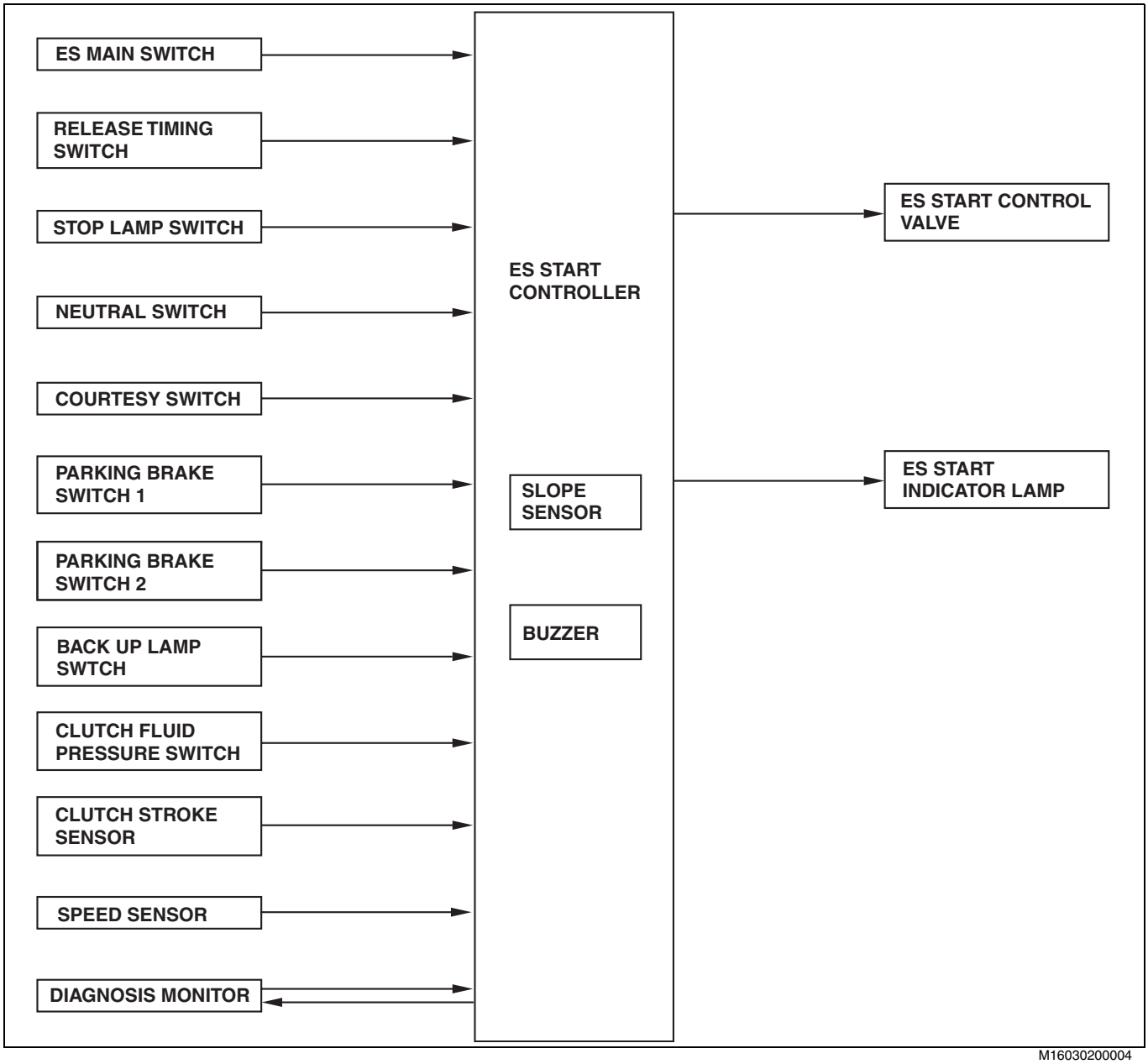
2. ABOUT DIAGNOSIS MONITOR

(1) Erase the previous damage data after they have been recorded, then perform the damage diagnosis again and confirm the current damage.

(2) After the damage analysis is completed, delete the previous damage data.

SYSTEM DIAGRAM

M16030201BEF2002



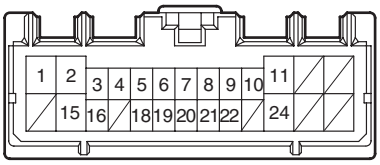
M16030200004

ARRANGEMENT OF CONNECTOR PIN

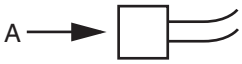
M16030201BEF2019

ES START CONTROLLER

26-PIN CONNECTOR



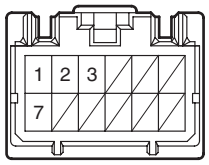
VIEW A



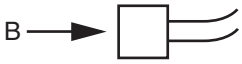
CAB SIDE HARNESS

No.	CODE	SIGNAL	No.	CODE	SIGNAL
1	+B	Power	14	—	—
2	KYSW	Starter switch	15	KY2	Starter switch
3	GND	System ground	16	GND2	System ground 2
4	M/V+	ES start control valve output	17	—	—
5	PR	ES start warning lamp	18	PKB1	Parking brake switch No.2
6	NTL	Neutral switch	19	PKB	Parking brake switch No.1
7	RVS	Back-up lamp switch	20	DR	Courtesy switch
8	STP	Stop lamp switch	21	DIC	Diagnosis monitor input
9	ON	ES main switch "ON"	22	OFF	ES main switch "OFF"
10	SSIG	Speed sensor signal	23	—	—
11	FTSW	Release timing switch "FAST"	24	SLSW	Release timing switch "SLOW"
12	—	—	25	—	—
13	—	—	26	—	—

12-PIN CONNECTOR



VIEW B



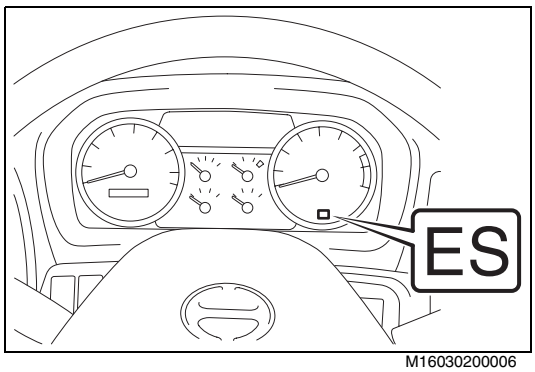
CAB SIDE HARNESS

No.	CODE	SIGNAL	No.	CODE	SIGNAL
1	C+B	Clutch stroke sensor power	7	S-S	Clutch stroke sensor ground
2	CSS	Clutch stroke sensor signal	8	—	—
3	CLT	Clutch fluid pressure switch	9	—	—
4	—	—	10	—	—
5	—	—	11	—	—
6	—	—	12	—	—

M16030200005

PRE-INSPECTION

M16030201BEF2003



M16030200006

1. CHECKING DISPLAY CODES OF ES INDICATOR LAMP

(1) ES start controller alerts by beeping the warning buzzer and lighting or blinking the indicator lamp to classify the alarms when malfunctions or failures occur.

NOTICE:
When a failure alarm is displayed, perform the failure diagnosis by using diagnosis function.

Display and warning item		Indicator lamp	Warning buzzer	Warning content	Treatment
Under "ON" condition of starter switch, check if the lamp lights or not		Lighting for one second	Beeping once	—	—
Operation	ES start is operating	Lighting	Beeping once	—	—
	ES start is released	Lighting off	No beeping	—	—
Warning	Failure alarm	Blinking	Beeping continuously	Defects of signal switches or sensors	Perform failure diagnosis by diagnosis function.
	Non-adjustment alarm	Blinking	No beeping	Initialization is not completed.	Initialize.
Caution to mis-operation	Quitting seat alarm	Lighting	Beeping continuously	Door (either driver's side or assistant's side) opens when ES start is operating	Pull parking brake lever.
	Starter switch OFF alarm	Lighting off	Beeping continuously	Starter switch is set to "LOCK" when ES start is operating during neutral position.	Pull parking brake lever or set main switch to "OFF".
	Vehicle moving alarm	Lighting	Beeping continuously	Vehicle moves when ES start is operating.	Pull parking brake lever or step brake pedal
	Operation time information	Lighting	Operation time from 1 to 9 minutes 1 minute has passed: beeping once 2 minutes have passed: beeping two times 9 minutes have passed: beeping nine times Operation time 10 minutes or more: Beeping continuously	Displaying every minute ES start operation time	Release ES start.

M16030200057

- Check the battery voltage.
  Reference value: More than 20V
- Check that the ES start controller connectors are connected correctly.
- Check the fuse.
- Check that the speed sensor connector is connected correctly.
- Check that the ES start valve connector is connected correctly.
- Check that the clutch hydraulic switch connector is connected correctly.
- Check that the clutch stroke sensor connector is connected correctly.
- Check that the back-up lamp switch connector is connected correctly.
- Check that the neutral switch connector is connected correctly.

TROUBLESHOOTING

M16030201BEF2004

THE ES START OPERATION FAILS.

1 Is there an operation malfunction?
- The starter switch is in either the [LOCK] or [ACC] position.
- The ON/OFF switch is in the [OFF] position.
- The brake pedal is released.
- The parking brake lever is pulled back.
- Going forward downhill.
- Going in reverse uphill.

An operation malfunction occurred.
→ Correct the operation.

An operation malfunction did not occur.

2 Set the starter key to [ON] and check the main power.

3 Check if a warning is occurred.
A warning occurred.
→ Refer to table of warning

A warning did not occur.

4 Check the stop lamp switch.

5 Check the parking brake switch.

6 Check the speed sensor.

7 Check the clutch stroke sensor.

8 Check the air piping.

9 Check the ES start control valve.

10 The ES start controller is damaged.

M16030200058

THE ES START IS NOT CANCELED.
(THE CANCEL OPERATION IS PERFORMED BY THE STARTING OPERATION.)

1 **Check if there was an operation malfunction.**
- The gear shift lever is in neutral.
- The start operation is not performed correctly.

An operation malfunction occurred.
→ Correct the operation.

An operation malfunction did not occur.

2 **Check if a warning is occurred.**
A warning occurred.
→ Refer to table of warning

A warning did not occur.

3 **Check the neutral switch and the back-up lamp switch.**

4 **Check the clutch stroke sensor.**

5 **Check the air piping.**

6 **Check the ES start control valve.**

7 **The ES start controller is damaged.**

M16030200059

THE ES START IS NOT CANCELED.
(THE CANCEL OPERATION IS PERFORMED BY THE PARKING BRAKE.)

1 **Check if there was an operation malfunction.**
- The parking brake must not be pulled back.

An operation malfunction occurred.
→ Correct the operation.

An operation malfunction did not occur.

2 **Check if a warning is occurred.**
A warning occurred.
→ Refer to table of warning

A warning did not occur.

3 **Check the parking brake switch.**

4 **Check the air piping.**

5 **Check the ES start control valve.**

6 **The ES start controller is damaged.**

M16030200060

THE ES START IS NOT CANCELED.
(THE CANCEL OPERATION IS PERFORMED BY THE ES MAIN SWITCH.)

1 **Check if there was an operation malfunction.**
- The main switch is not set to [OFF] .

An operation malfunction occurred.
→ Correct the operation.

An operation malfunction did not occur.

2 **Check if a warning is occurred.**
A warning occurred.
→ Refer to table of warning

A warning did not occur.

3 **The ES start controller is damaged.**

M16030200061

THE INITIAL SETTING OF THE CANCEL POSITION CANNOT BE PERFORMED.

1 **Check if an operation malfunction occurred.**
An operation malfunction occurred.
→ Correct the operation.

An operation malfunction did not occur.

2 **Check if the following conditions are not satisfied.**
- The ES start operation is currently being performed.
- The 0-point adjustment is being performed.
- The cancel position is being adjusted.

3 **Check if a warning is occurred.**
A warning occurred.
→ Refer to table of warning

A warning did not occur.

4 **Check the parking brake switch.**

5 **Check the neutral switch and the back-up lamp switch.**

6 **Check the clutch stroke sensor.**

7 **The ES start controller is damaged.**

M16030200062

THE 0-POINT ADJUSTMENT OF THE SLOPE SENSOR CANNOT BE PERFORMED.

1 Check if an operation malfunction occurred.
An operation malfunction occurred.
→ Correct the operation.

An operation malfunction did not occur.

2 Check if the following conditions are not satisfied.
- The ES start operation is currently being performed.
- The initial setting of the cancel position is being performed.
- The cancel position is being adjusted.

3 Check if a warning is occurred.
A warning occurred.
→ Refer to table of warning

A warning did not occur.

4 Check the parking brake switch.

5 The ES start controller is damaged.

M16030200063

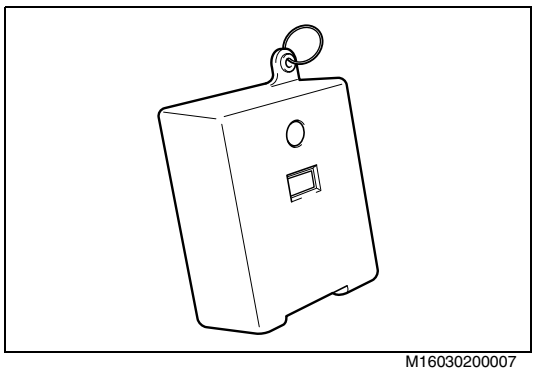
THE BRAKE IS NOT RELEASED WHEN THE CANCELLATION IS PERFORMED. (OR VEHICLE SLIDES DOWN.)

Adjust the release timing.

M16030200064

FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR

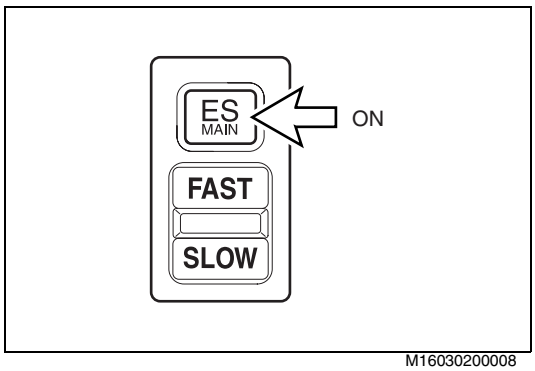
M16030201BEF2020



M16030200007

1. FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR

(1) Diagnosis monitor alerts the failure location with sound and light by being connected to the special diagnosis connector of ES start system.

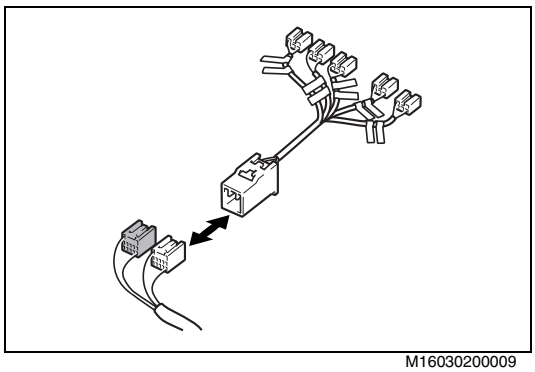


M16030200008

2. CONNECTION OF THE DIAGNOSIS MONITOR

(1) Set the ES main switch to [ON].

(2) Set the starter switch to [ON].



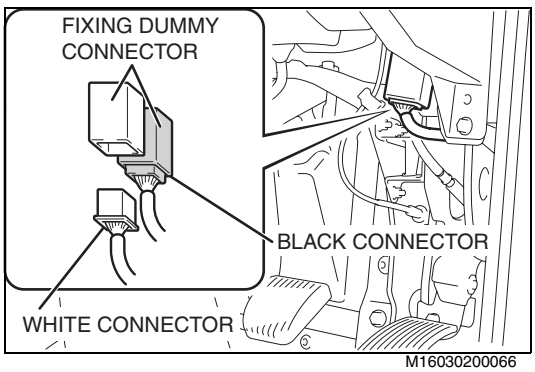
M16030200009

(3) Locate two intensive diagnosis connectors on lower right of the driver's side instrument panel. Connect the special wiring harness to the white connector and diagnosis monitor to the connector tagged by "ES start".

SST:

Special wiring harness for intensive diagnosis connector (09630-2300)

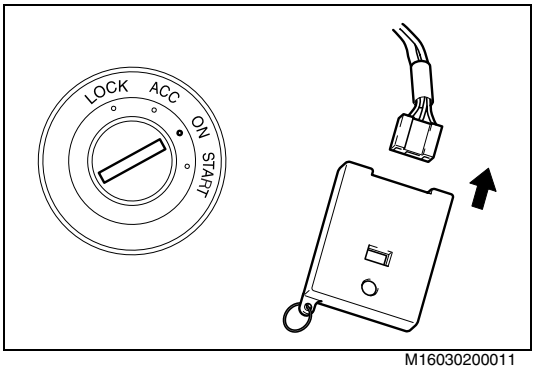
Diagnosis monitor (09630-1370)



M16030200066

NOTICE:

The intensive diagnosis connector is usually connected to the fixing dummy connector. So, disconnect the connector from the dummy connector and pull it to use. When the connector is not in use, connect it firmly to the fixing dummy connecor.



M16030200011

3. DISPLAYING THE FAILURE CODE

(1) Because the failure codes are output repeatedly in ascending order of failure codes without distinguishing present and past failures, delete the past failure by referring "4. Deleting the past failures".

HINT:
If there are no failure codes, the system outputs "Diagnosis code 1".

4. DELETING THE PAST FAILURES

NOTICE:
Regarding the diagnosis codes 8, 12 and 13, the way of deleting the past codes is different. Refer to the individual way of deleting.

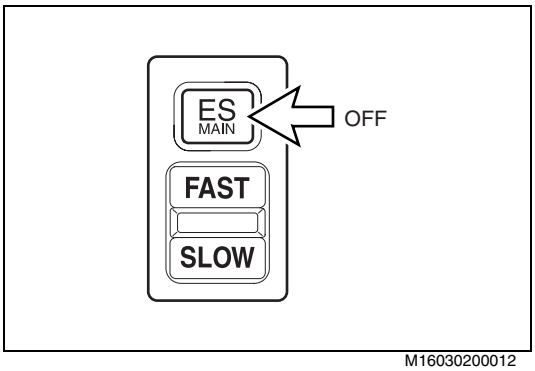
(1) Record the first diagnosis code output.
(2) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

NOTICE:
If the starter key is set to "LOCK" position, the past failures cannot be deleted. Make sure to keep the key at "ON" position.

(3) Wait for several seconds. Then connect the diagnosis monitor to output the present failure.

HOW TO DELETE THE DIAGNOSIS CODE 8

M16030201BEF2021



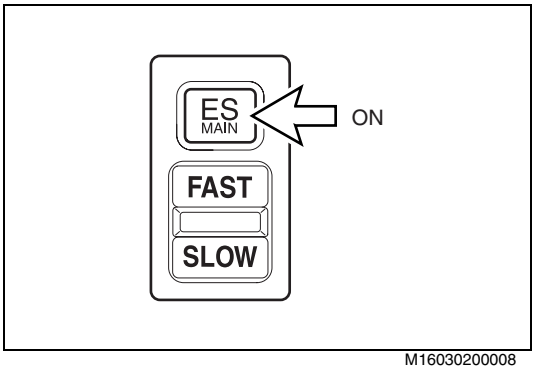
M16030200012

1. DELETING PROCEDURE

(1) Turn the starter switch to "ON" position and ES main switch "OFF".

(2) After having repaired the failure, step and release the clutch pedal for more than three times to make the controller recognize the ON/OFF of hydraulic switch.

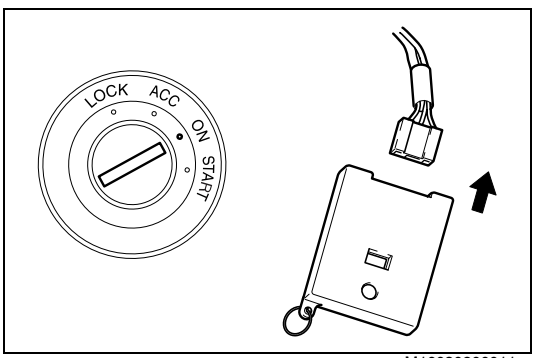
HINT:
Until the controller recognizes the ON/OFF of hydraulic switch, the diagnosis code cannot be deleted.



M16030200008

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 8 is output.



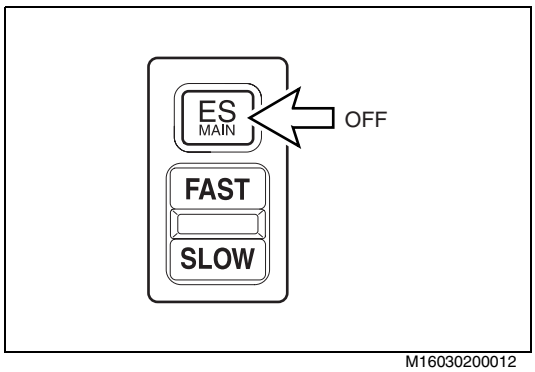
M16030200011

(5) Disconnect the diagnosis monitor while keeping the starter switch at "ON" position.

(6) Wait for several seconds. Then connect the diagnosis monitor to check that the diagnosis code 8 has been deleted.

HOW TO DELETE THE DIAGNOSIS CODE 12

M16030201BEF2022



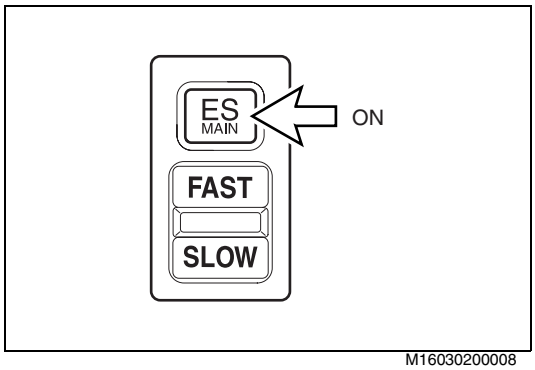
M16030200012

1. DELETING PROCEDURE

(1) Turn the starter switch to "ON" position and ES main switch "OFF".

(2) After having repaired the failure, engage and disengage the transmission for more than three times to make the controller recognize the ON/OFF of neutral switch.

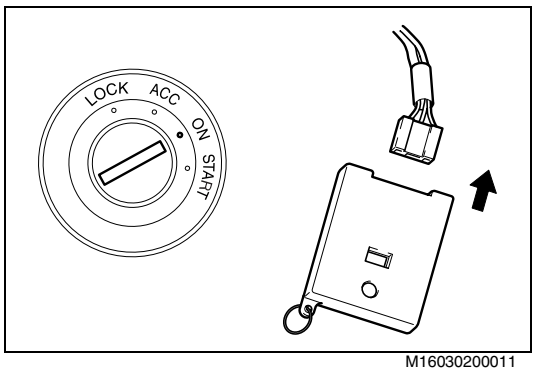
HINT:
Until the controller recognizes the ON/OFF of neutral switch, the diagnosis code cannot be deleted.



M16030200008

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 12 is output.



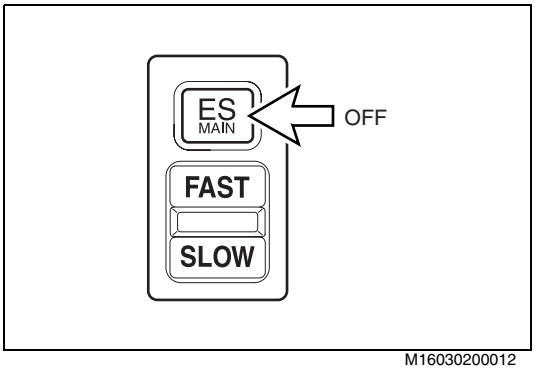
M16030200011

(5) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

(6) Wait for several seconds. Then connect the diagnosis monitor to check that the diagnosis code 12 has been deleted.

HOW TO DELETE THE DIAGNOSIS CODE 13

M16030201BEF2023



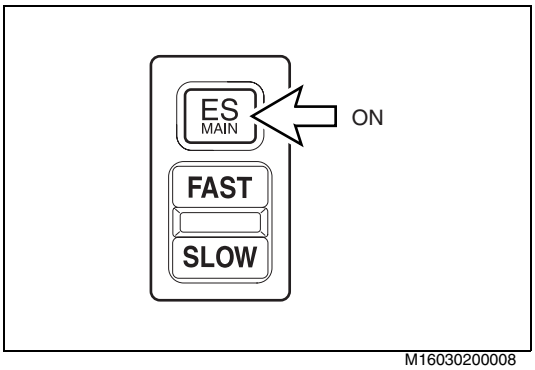
M16030200012

1. DELETING PROCEDURE

(1) Turn the stater switch to "ON" position and ES main switch "OFF".

(2) After having repaired the failure, step and release the brake pedal for more than three times to make the controller recognize the ON/OFF of stop lamp switch.

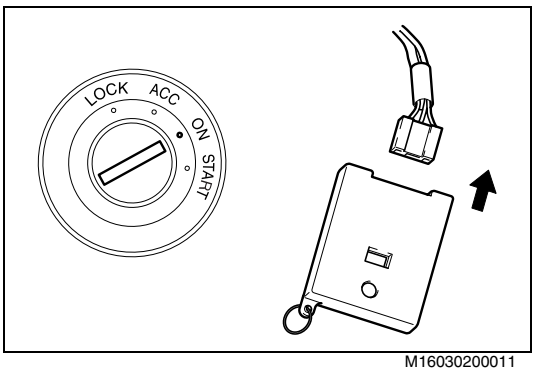
HINT:
Until the controller recognizes the ON/OFF of stop lamp switch, the diagnosis code cannot be deleted.



M16030200008

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 13 is output.

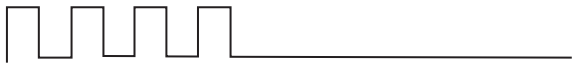
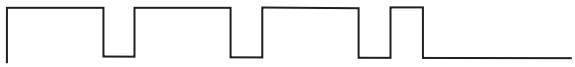
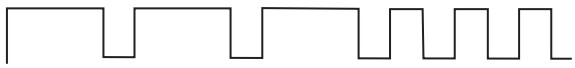
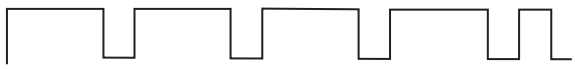


M16030200011

(5) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

(6) Wait for several seconds. Then connect the diagnosis monitor to check that the diagnosis code 13 has been deleted.

DIAGNOSIS CODE TABLE

Diagnosis code No.	Inspection item	Diagnosis monitor and indicator lamp output
1	Normal	
2	Power harness voltage malfunction	
3	Clutch stroke sensor system damage (disconnection, short-circuit)	
4	Speed sensor system damage	
7	ES start control valve damage	
8	Clutch fluid pressure switch system damage	
9	Clutch stroke sensor power system malfunction	
11	Neutral switch and back up lamp switch malfunction	
12	Neutral switch system or speed sensor system malfunction	
13	Stop lamp switch damage	
16	ES start controller malfunction	
18	ES main switch damage	
21	Release timing position switch damage	

DAMAGE ANALYSIS BY DIAGNOSIS CODE

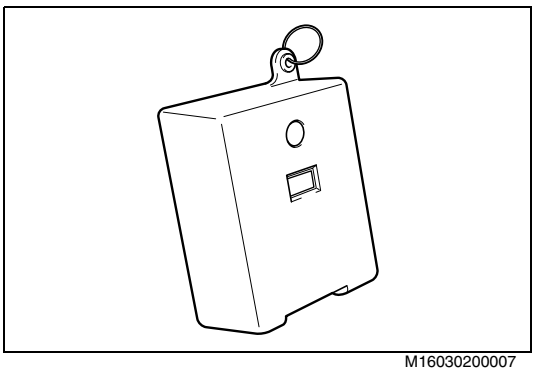
M16030201BEF2005

NOTICE:

1. **When replacing the clutch hydraulic switch, always initialize the brake releasing position.**
2. **When replacing the clutch stroke sensor, always initialize the brake releasing position.**
3. **When replacing ES start controller, always initialize the brake releasing position and perform 0 point adjustment of slope sensor.**

POWER MALFUNCTION (NO DIAGNOSIS CODE)

M16030201BEF2006



M16030200007

1. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to [LOCK] and remove the 26-pin connector of the ES start controller.

(2) Set the starter switch [ON] and measure the voltage between the terminal 2 and 3 and the terminal 15 and 16 of the 26-pin connector (harness side).
Standard value: More than 20 V

NG

OK

- Less than 20 V: Go to the item 3.
- 0 V: Go to the item 4.

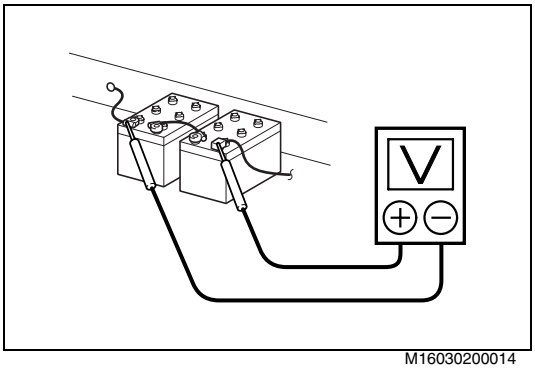
2. CHECK THE OPERATION OF THE ES START SYSTEM.
Standard: Normal operation

NG

OK

ES start controller malfunction

ES start controller connector contact failure, faulty harness contact failure



M16030200014

3. MEASURE THE VOLTAGE OF BATTERY.

(1) Measure the voltage between the (+) terminal and the (-) terminal of the battery.
Standard value: More than 20 V

NG

OK

Battery malfunction

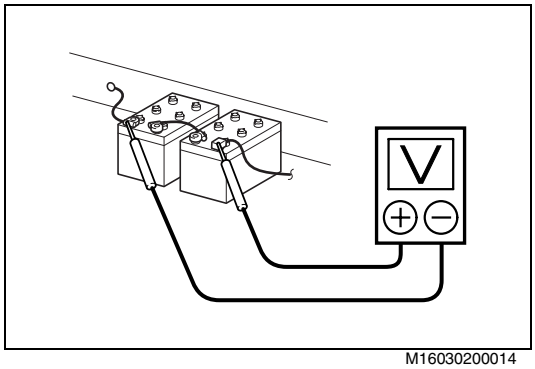
Power supply harness contact failure or disconnection

4. CHECK THE ES START FUSE.

(1) Check the ES start fuse in the fuse block.
Standard: Not melting

NG → Go to the item 6.

OK



M16030200014

5. MEASURE THE VOLTAGE OF BATTERY.

(1) Measure the voltage between the (+) terminal and the (-) terminal of the battery.
Standard value: More than 20 V

NG → Battery malfunction

OK

Power supply harness contact failure or disconnection

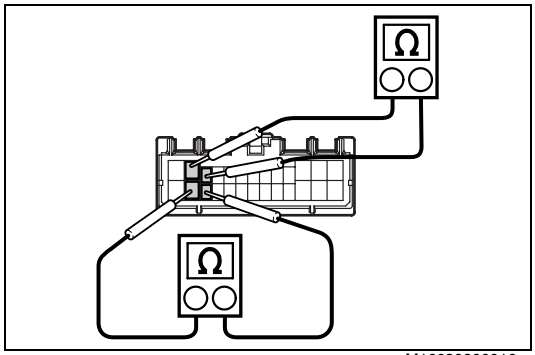
6. RECHECK THE ES START FUSE.

(1) Set the starter switch to [LOCK], replace the fuse and set the starter switch [ON].
Standard: Not melting

NG → Go to the item 7.

OK

Normal



M16030200016

7. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Set the starter switch to [LOCK], remove the 26-pin connector of the ES start controller and check the conductiviry between the terminal 2 and 3 and the terminal 15 and 16 of the 26-pin connector (harness side).
Standard: No conductivity

NG → Short-circuit in the harness

OK

8. RECHECK THE OPERATION OF THE ES START SYSTEM.
Standard: Normal operation

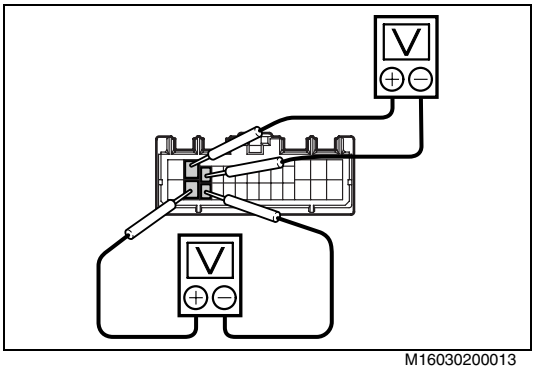
NG → ES start controller malfunction

OK

ES start controller connector contact failure, faulty harness contact failure

POWER SUPPLY VOLTAGE MALFUNCTION (DIAGNOSIS CODE 2)

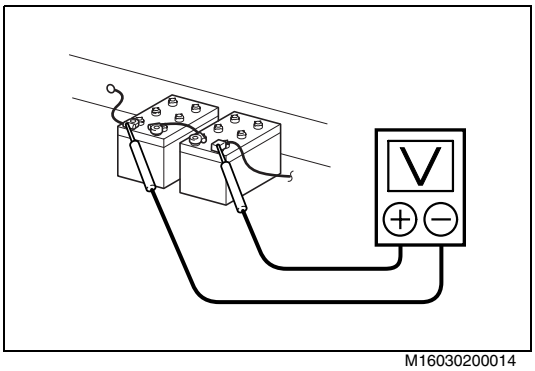
M16030201BEF2007


M16030200013

1. MEASURE THE VOLTAGE BETWEEN TERMINALS.
(1) Set the starter switch to [LOCK] and remove the 26-pin connector of the ES start controller.
(2) Measure the voltage between the terminal 2 and 3 and the terminal 15 and 16 of the 26-pin connector (harness side.)
Standard value: More than 20 V

NG → Go to the item 3.

OK

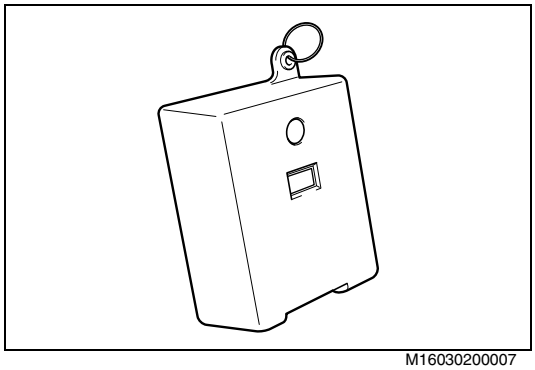

M16030200014

2. MEASURE THE VOLTAGE OF BATTERY.
(1) Measure the voltage between the (+) terminal and (-) terminal of the battery.
Standard value: More than 20 V

NG → Battery malfunction

OK

Power supply harness contact failure or disconnection


M16030200007

3. CHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis monitor memory and confirm the diagnosis code by diagnosis functions again.
Standard: Diagnosis code: 1

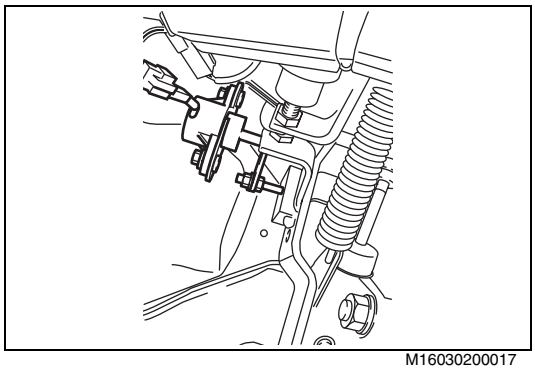
NG → ES start controller malfunction

OK

- Harness contact failure
- Charging system malfunction

CLUTCH STROKE SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 3)

M16030201BEF2008


M16030200017

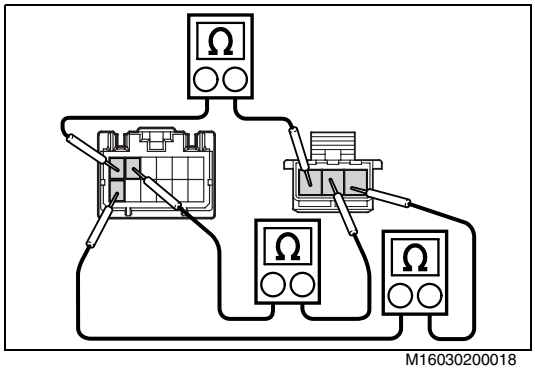
1. CHECK THE CLUTCH STROKE SENSOR.

(1) Check the installation location of the clutch stroke sensor.
Standard: Correct installation

NG → Install the sensor correctly.

OK

(2) Measure the voltage of the set position.
Standard voltage: 0.28-0.77 V

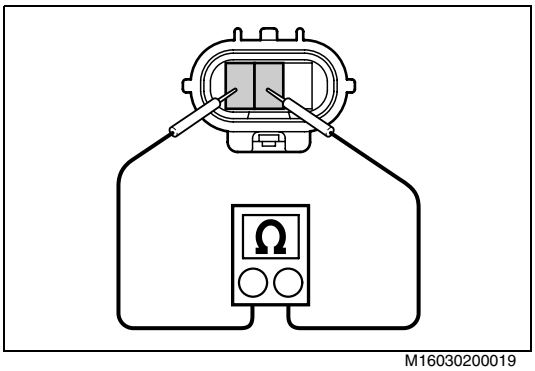

M16030200018

2. CHECK THE CONDUCTIVITY BETWEEN THE TERMINALS.

(1) Remove the 12-pin connector of the ES start controller and clutch stroke sensor connector and check the conductivity between the terminal 1 and 1, the terminal 2 and 2 and the terminal 7 and 3 of both connectors (harness side).
Standard: Conductivity

NG → Harness disconnection

OK



M16030200019

3. MEASURE THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between the terminal 2 and 3 of the connector (sensor side).
Standard value:
When pressing the clutch pedal: Approx. 2 kΩ
When releasing the clutch pedal: Approx. 700 Ω

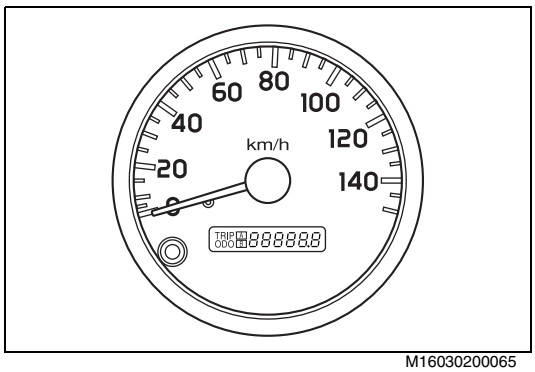
NG → Clutch stroke sensor damage

OK

Go to diagnosis code 9.

SPEED SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 4)

M16030201BEF2009



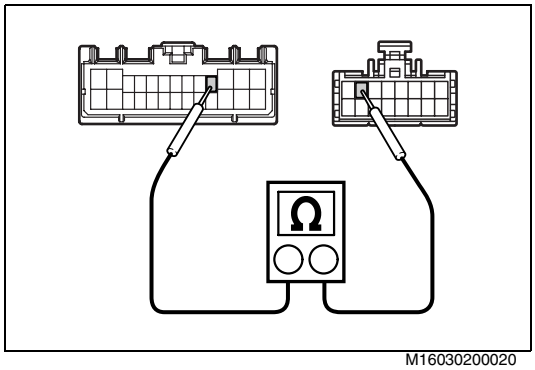
M16030200065

1. CHECK THE SPEEDOMETER OPERATION.

(1) Check if the speedometer operates correctly when driving.
Standard: Normal operation

NG → Speed sensor or pulse adjust computer malfunction

OK



M16030200020

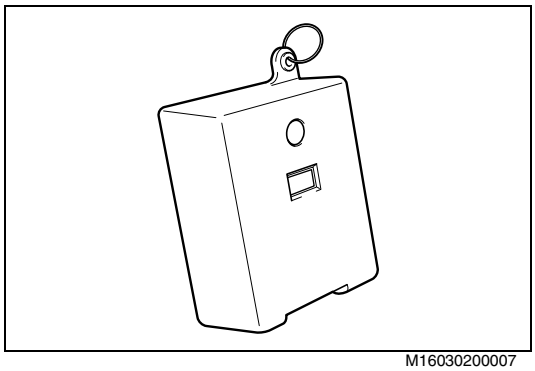
2. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 26-pin connector of the ES start controller and pulse adjust computer connector and check the conductivity between the terminal 10 and 2 of both connectors (harness side).
Standard: Conductivity

NG → Harness disconnection

OK

Go to the item 3 after checking the pulse adjust computer.


M16030200007

3. CHECKING THE DIAGNOSIS CODE

(1) After having restored the connector and deleted the past failures, drive the vehicle at 30 km/h or above for more than two minutes. Then output again the diagnosis code. (This is because vibrations are necessary for slope sensor output. Inspection by circuit tester has no meaning.)
Standard: Diagnosis code: 4

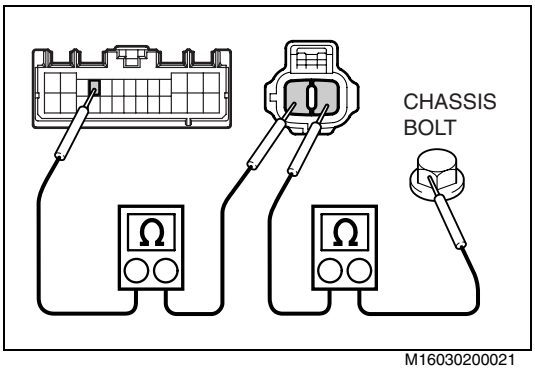
NG → Connector or harness contact failure

OK

ES start controller malfunction

ES START CONTROL VALVE DAMAGE (DIAGNOSIS CODE 7)

M16030201BEF2010



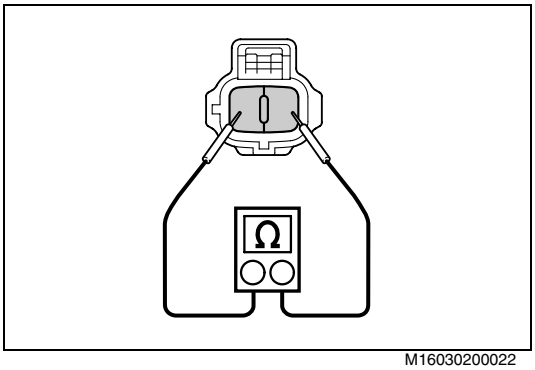
M16030200021

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 26-pin connector of the ES start controller and the ES start control valve connector. Check the conductivity between terminal 4 and terminal 1 and the chassis ground and terminal 2 (harness side).
Standard: Conductivity

NG → Harness disconnection

OK

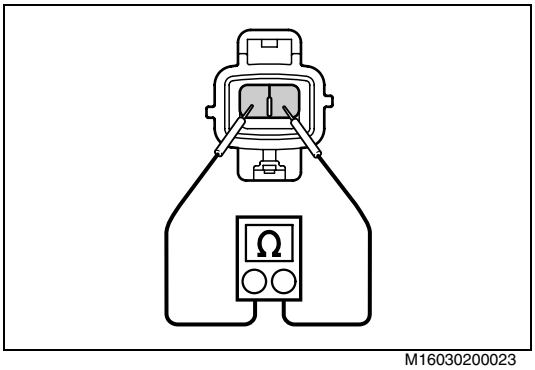

M16030200022

2. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Check the conductivity between terminal 1 and terminal 2 of the ES start valve connector (harness side).
Standard: No conductivity

NG → Short-circuit in the harness

OK

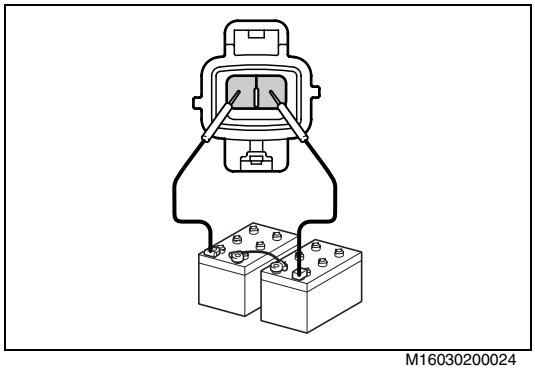

M16030200023

3. MEASURE THE RESISTANCE BETWEEN TERMINALS.

(1) Measure the resistance between terminal 1 and terminal 2 of the connector (part side).
Standard value: 30-45 Ω

NG → ES start control valve malfunction

OK

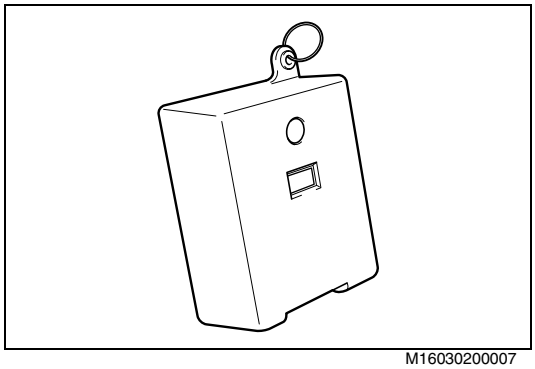

M16030200024

4. CHECK THE ES START VALVE OPERATION.

(1) Apply the power voltage and check the ES start control valve operation.
Standard: Normal operation

NG → ES start control valve malfunction

OK


M16030200007

5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code and output the diagnosis code again.
Standard: Diagnosis code: 7

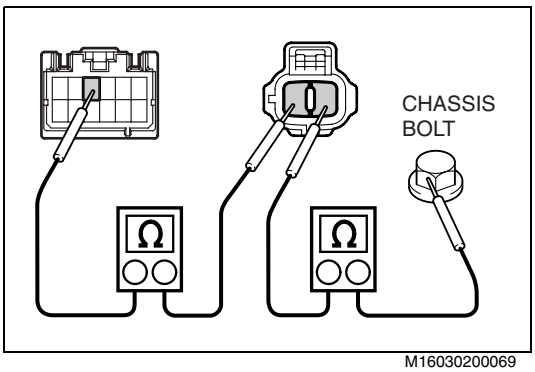
NG → Faulty contact in harness or connector

OK

ES start controller malfunction

CLUTCH FLUID PRESSURE SWITCH DAMAGE (DIAGNOSIS CODE 8)

M16030201BEF2011



M16030200069

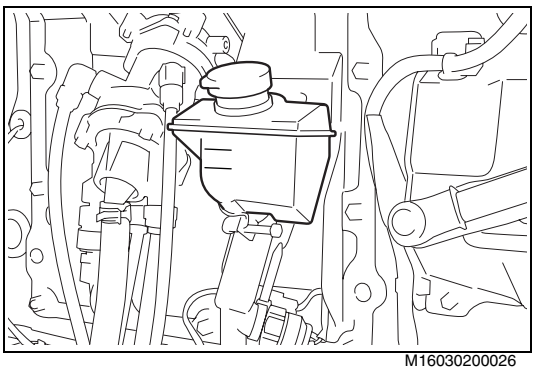
1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 12-pin connector of the ES start controller and clutch fluid pressure switch connector and check the conductivity between the terminal 3 and the terminal 1 and the chassis ground and the terminal 2 (harness side).

Standard: Conductivity

NG → Harness disconnection

OK


M16030200026

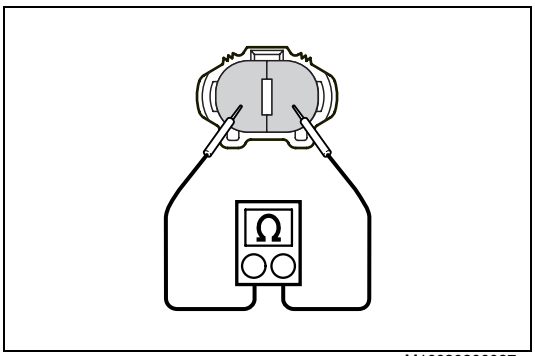
2. CHECK THE CLUTCH FLUID.

(1) Check if the clutch fluid level is between L and H of the reservoir tank.

Standard: Between L and H

NG → Supply the clutch fluid.

OK


M16030200027

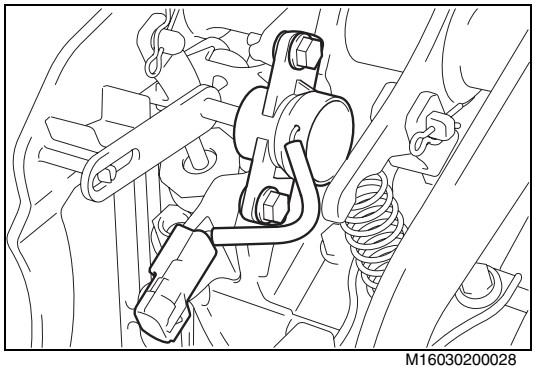
3. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Check the conductivity between the terminal 1 and 2 of the clutch fluid pressure switch (switch side).

Standard: When pressing the clutch pedal: Conductivity
When releasing the clutch pedal: No conductivity

NG → Clutch fluid pressure switch malfunction

OK


M16030200028

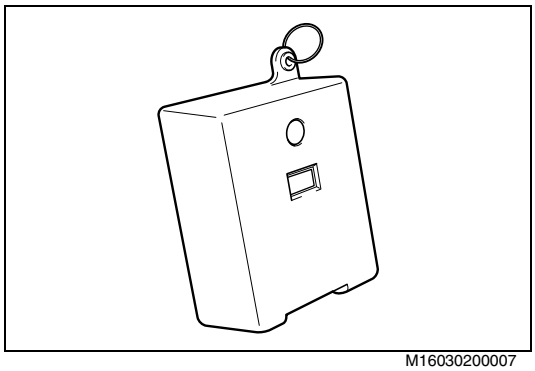
4. CHECK THE CLUTCH STROKE SENSOR.

(1) Check the installation location of the clutch stroke sensor.
Standard: Correct installation

NG → Install the sensor correctly.

OK

(2) Measure the voltage of the set position.
Standard voltage: 0.28-0.77 V


M16030200007

5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Press the clutch pedal a few times and output the diagnosis code again.

NOTICE:
The way of deleting the past failure is different to others.

Refer to the section of the "How to delete the diagnosis code 8".
Standard: Diagnosis code: 8

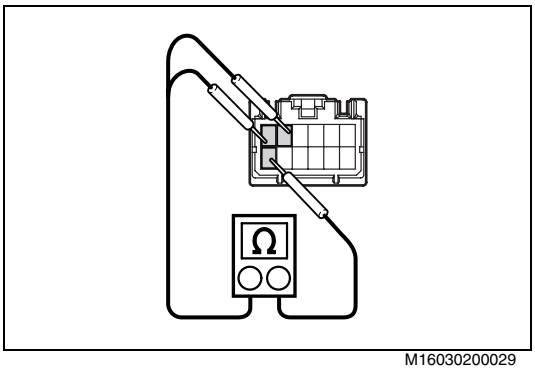
NG → Faulty contact in connector or harness

OK

Clutch fluid pressure switch malfunction

CLUTCH STROKE SENSOR POWER SYSTEM MALFUNCTION (DIAGNOSIS CODE 9)

M16030201BEF2012

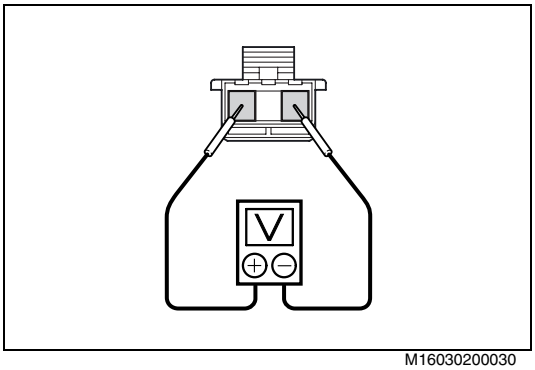

M16030200029

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 12-pin connector of the ES start controller. Check the conductivity between terminals 1 and 7 and terminals 2 and 7 of the ES start controller connector (harness side).
Standard: No conductivity

NG → Short-circuit in the harness

OK


M16030200030

2. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) After having restored the ES start controller connector, remove the clutch stroke sensor connector and set the starter switch [ON]. Measure the voltage between the terminals 1 and 3 of the clutch stroke sensor connector (harness side).

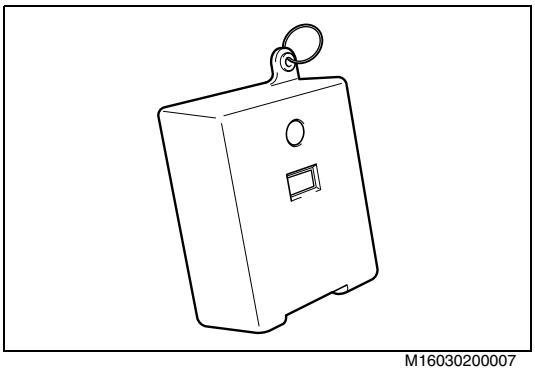
NOTICE:
Be careful not to make a short-circuit.

Standard value: 4-6V

NG → Go to the item 3.

OK

Clutch stroke sensor malfunction


M16030200007

3. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Output the diagnosis code again.
Standard: Diagnosis code: 9

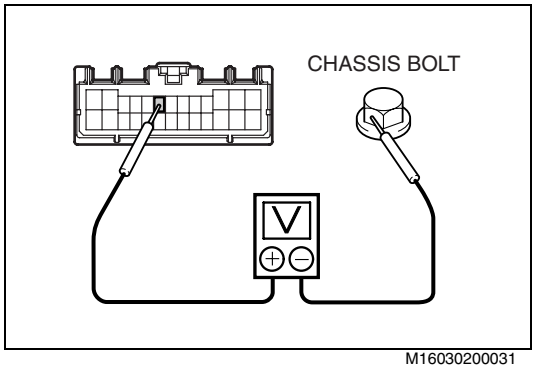
NG → Connector or harness contact failure.

OK

ES start controller malfunction

NEUTRAL SWITCH AND BACK-UP LAMP SWITCH MALFUNCTION (DIAGNOSIS CODE 11)

M16030201BEF2013



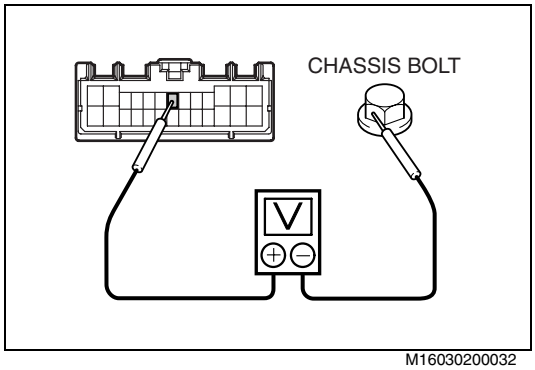
M16030200031

1. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Remove the 26-pin connector of ES start controller and set the starter switch to [ON]. Measure the voltage between the harness connector terminal 6 and the chassis ground.
Standard value:
When the transmission is in gear: Less than 1 V
When the transmission is in neutral: More than 20 V

NG → Neutral switch malfunction, disconnection or installation error

OK



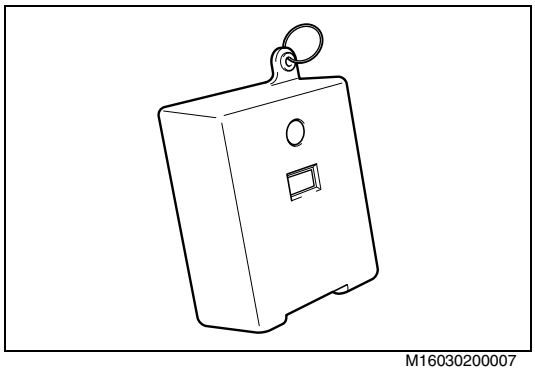
M16030200032

2. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Measure the voltage between the harness connector terminal 7 and the chassis ground.
Standard value:
When the transmission is in reverse: More than 20 V
When the transmission is in other position: Less than 1 V

NG → Back-up lamp switch malfunction, disconnection or installation error

OK


M16030200007

3. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Shift into reverse and output the diagnosis code again.
Standard: Diagnosis code: 11

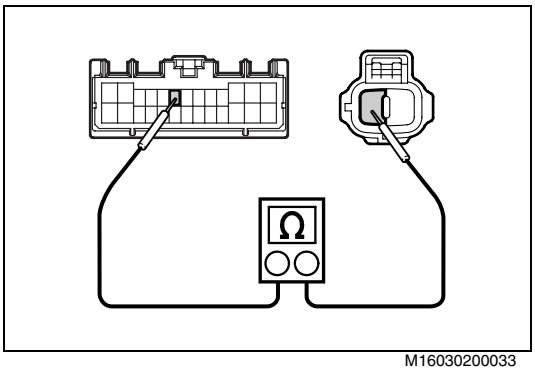
NG → Connector or harness contact failure.

OK

ES start controller malfunction

NEUTRAL SWITCH SYSTEM OR SPEED SENSOR SYSTEM MALFUNCTION (DIAGNOSIS CODE 12)

M16030201BEF2014



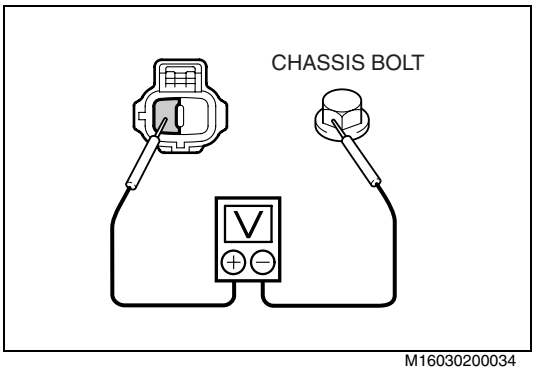
M16030200033

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Remove the 26-pin connector of the ES start controller and the neutral switch connector. Check the conductivity between terminal 6 and terminal 1 of both connectors (harness side).
Standard: Conductivity

NG → Harness disconnection

OK



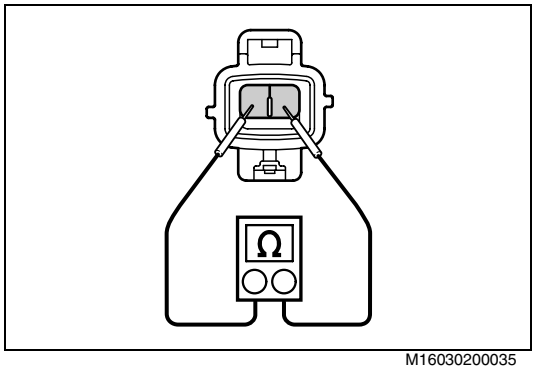
M16030200034

2. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Restore the ES start controller connector and set the starter switch to [ON]. Measure the voltage between the neutral switch connector terminal 1 and the chassis ground.
Standard value: More than 20 V

NG → Harness or power supply malfunction

OK



M16030200035

3. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Check the conductivity between connector terminal 1 and 2 of the part side.

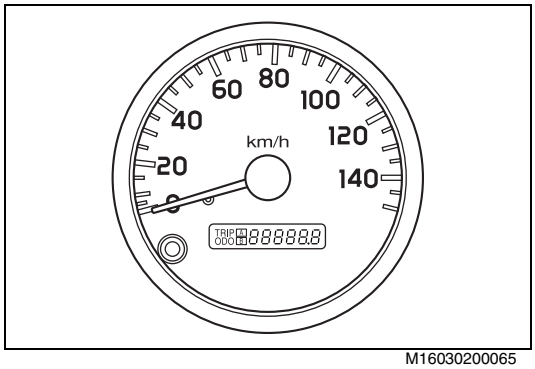
NOTICE:

Check that the switch does not change within the motion range of the shift lever.

Standard :
When the transmission is in gear: No conductivity
When the transmission is in neutral: Conductivity

NG → Neutral switch malfunction

OK



M16030200065

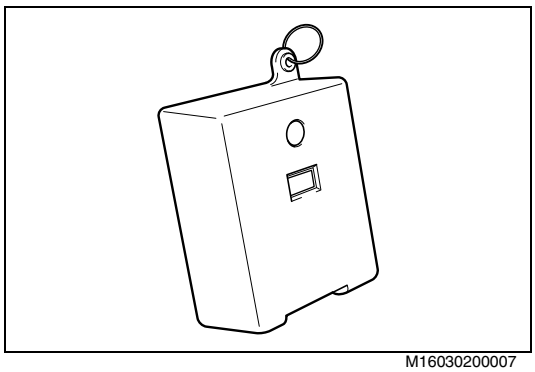
4. CHECK THE SPEEDOMETER OPERATION.

(1) Check if the speedometer operates correctly when driving.
Standard: Normal operation

NG → Go to the item 5 after checking the speed sensor and pulse adjust computer.

OK

Go to the item 5 after checking the pulse adjust computer.


M16030200007

5. RECHECK THE DIAGNOSIS CODE.

(1) Erase the diagnosis code. Accelerate and decelerate from 0 to 50 km/h more than 10 times. Output the diagnosis code again.

NOTICE:

The way of deleting the past failure is different to others.

Refer to the section of the "How to delete the diagnosis code 12".
Standard: Diagnosis code: 12

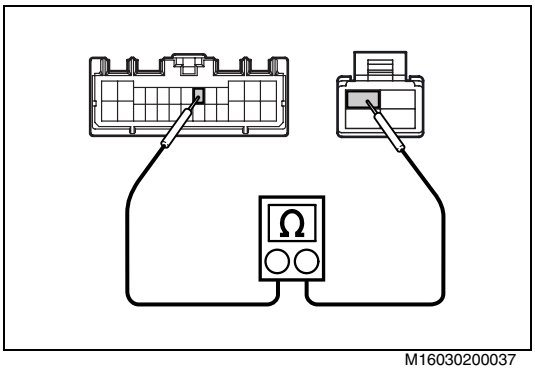
NG → Connector or harness contact failure

OK

ES start controller malfunction

STOP LAMP SWITCH DAMAGE (DIAGNOSIS CODE 13)

M16030201BEF2015



M16030200037

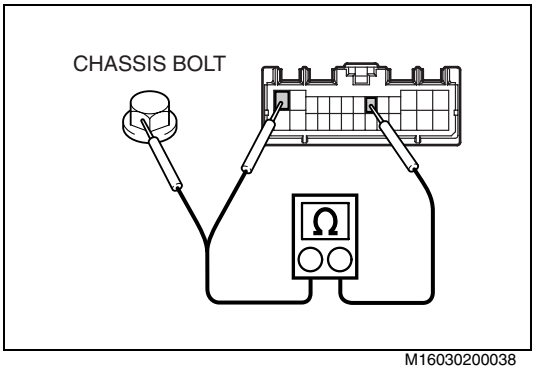
1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Set the starter switch to [LOCK], remove the 26-pin connector of the ES start controller and the connector of the stop lamp switch.

(2) Check the conductivity between the terminal 8 and 1 of both connectors (harness side).
Standard: Conductivity

NG → Harness contact failure or disconnection

OK



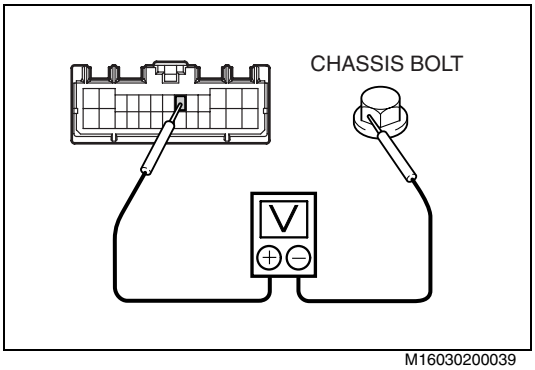
M16030200038

2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

(1) Check if the harness connectors between terminal 8 and terminal 1 of 26-pin connector (harness side) and between terminal 8 and chassis ground cause a short-circuit.
Standard: No conductivity

NG → Short-circuit in the harness

OK



M16030200039

3. CHECK THE VOLTAGE OF TERMINALS.

(1) Restore the connector and set the starter switch to "ON" and measure the voltage between No.8 terminal of 26-pin connector of ES start controller and chassis ground.
Standard value:
When stepping brake pedal: Less than 1V
When releasing brake pedal: More than 18V

NG → Go to the item 4.

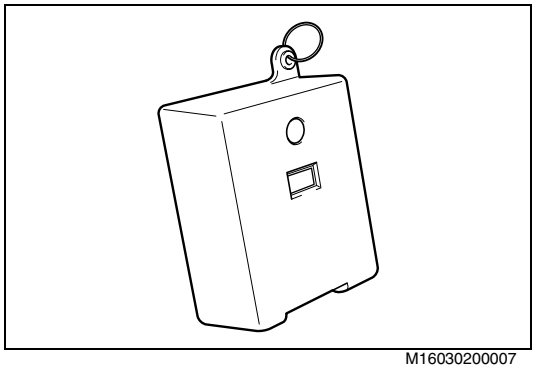
OK

Go to the item 5.

4. CHECK THE STOP LAMP SWITCH.
(1) Check the stop lamp switch.

NG → Stop lamp switch malfunction

OK


M16030200007

5. RECHECK THE DIAGNOSIS CODE.
(1) Erase the diagnosis code. Repeat for more than five times in succession the acceleration from 0 km/h to 50 km/h or above and the deceleration from 50 km/h to 0 km/h. Output the diagnosis code again.

NOTICE:
The way of deleting the past failure is different to others.

Refer to the section of the "How to delete the diagnosis code 13".
Standard: Diagnosis code: 13

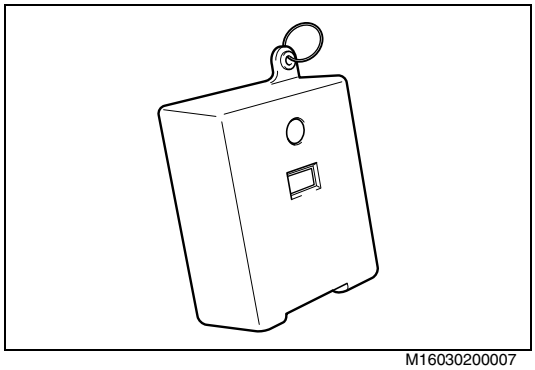
NG → Connector or harness contact failure

OK

ES start controller malfunction

ES START CONTROLLER MALFUNCTION (DIAGNOSIS CODE 16)

M16030201BEF2016


M16030200007

1. CHECK THE DIAGNOSIS CODE.
(1) Erase the diagnosis code and output the diagnosis code again.
Standard: Diagnosis code: 1

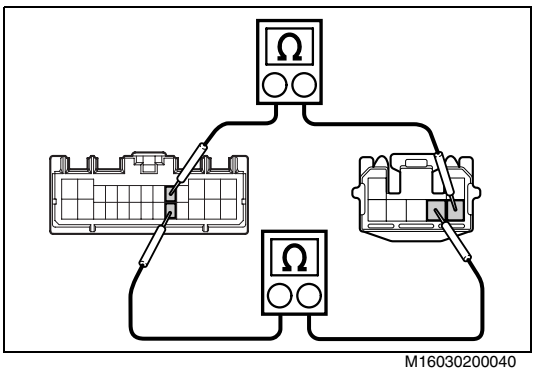
NG → ES start controller malfunction

OK

Normal

ES MAIN SWITCH DAMAGE (DIAGNOSIS CODE 18)

M16030201BEF2017


M16030200040

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(1) Set the starter switch to [LOCK], and remove the 26-pin connector of ES start controller and the connector of ES main switch.

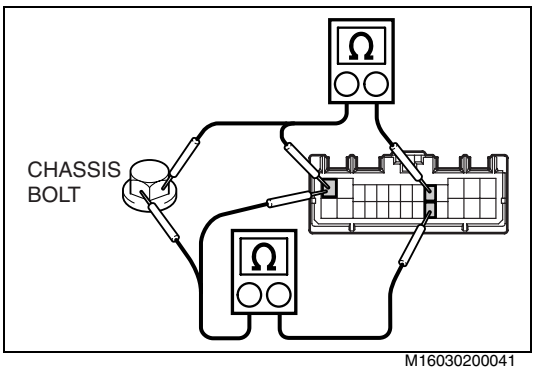
(2) Check the conductivity between terminal 9 and terminal 7 and between terminal 22 and terminal 6 of both connectors (harness side).

Standard: Conductivity

NG

OK

Harness disconnection



M16030200041

2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

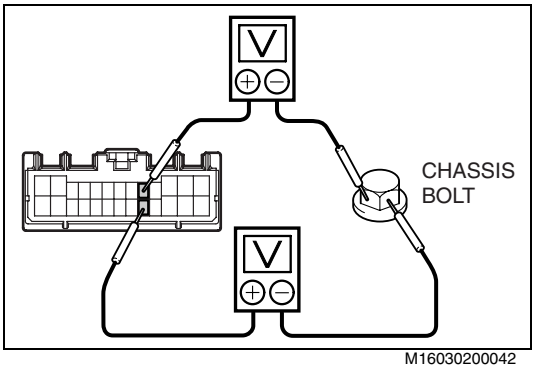
(1) Check a short-circuit of harness connector between terminal 9 and terminal 1 of 26-pin connector, between terminal 9 and chassis ground, between terminal 22 and terminal 1 and between terminal 22 and chassis ground.

Standard: No conductivity

NG

OK

Short-circuit in the harness



M16030200042

3. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to [ON] and measure the voltage between the terminal 9 of the 26-pin connector and chassis ground and between the terminal 22 and chassis ground.

Standard value:
When main switch is [ON]:
Between terminal 9 and chassis ground: More than 20V
Between terminal 22 and chassis ground: Less than 1V
When main switch is [OFF]:
Between terminal 9 and chassis ground: Less than 1V
Between terminal 22 and chassis ground: More than 20V

NG

OK

Go to the item 4.

Go to the item 5.

4. CHECK THE ES MAIN SWITCH.

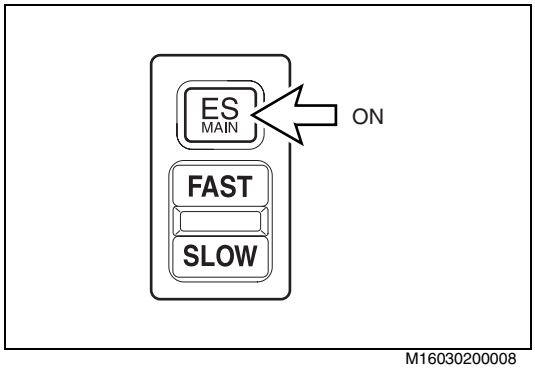
(1) Check the ES main switch.
Standard: Normal

NG

ES main switch malfunction

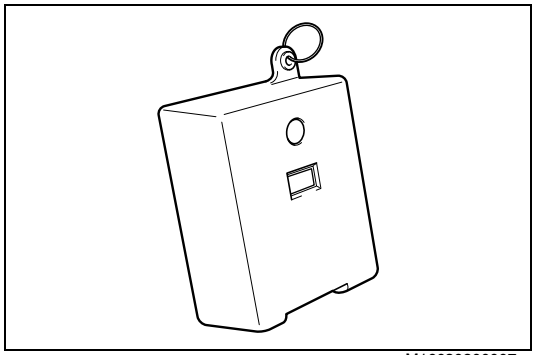
OK

5. RECHECK THE DIAGNOSIS CODE.



M16030200008

(1) Erase the diagnosis code and set the ES main switch to [ON].


M16030200007

(2) More than 10 seconds later, output the diagnosis code again.
Standard: Diagnosis code: 18

NG

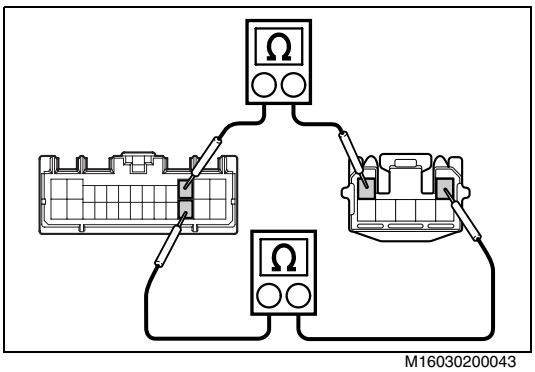
Connector or harness contact failure

OK

ES start controller malfunction

ES START RELEASE TIMING SWITCH (DIAGNOSIS CODE 21)

M16030201BEF2018


M16030200043

1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

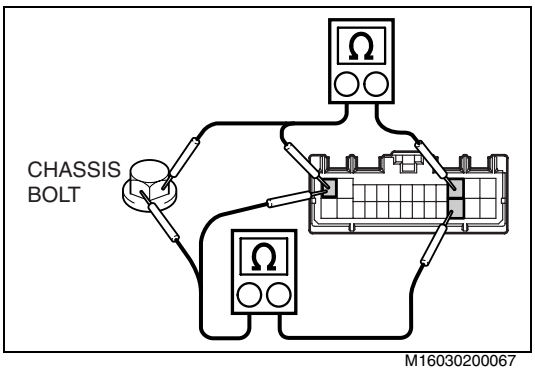
(1) Set the starter switch to [LOCK] and disconnect the connector of 26-pin connector of ES start controller and the connector of release timing switch.

(2) Check the conductivity between the terminal 11 and terminal 1 and between terminal 24 and terminal 2 of both connectors (harness side).

Standard: Conductivity

NG → Harness disconnection

OK



M16030200067

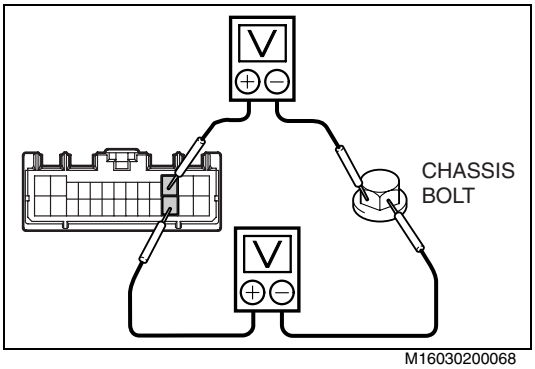
2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

(1) Check a short-circuit of harness connector between terminal 11 and terminal 1 of 26-pin connector, between terminal 11 and chassis ground, between terminal 24 and terminal 1 and between terminal 24 and chassis ground.

Standard: No conductivity

NG → Short-circuit in the harness

OK



M16030200068

3. MEASURE THE VOLTAGE BETWEEN TERMINALS.

(1) Set the starter switch to [ON] and measure the voltage between the terminal 11 of the 26-pin connector and chassis ground and between the terminal 24 and chassis ground.

Standard value:
When release timing switch is [FAST]:
Between terminal 11 and chassis ground: More than 20V
Between terminal 24 pand chassis ground: Less than 1V
When release timing switch is [SLOW]:
Between terminal 11 and chassis ground: Less than 1V
Between terminal 24 and chassis ground: More than 20V

NG → Go to the item 4.

OK

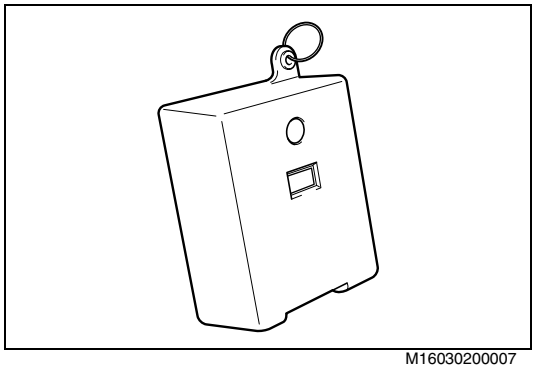
Go to the item 5.

4. CHECK THE RELEASE TIMING SWITCH.

(1) Check the release timing switch.
Standard: Normal

NG → Release timing switch malfunction

OK


M16030200007

5. RECHECKING THE DIAGNOSIS CODE

(1) Delete the past failures. Press for more than three seconds "FAST" and "SLOW" side each of the release timing switch. Then output again the diagnosis code.
Standard: Diagnosis code: 21

NG → Connector or harness contact failure

OK

ES start controller malfunction

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