FOREWORD

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

Applicable for FT1J, GT1J series, equipped with J08C-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-YJ08E17A.

Hino Motors, Ltd.

CHAPTER REFERENCES REGARDING THIS WORKSHOP MANUAL

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

CHAPTER	MANUAL NO.	S1-YFTE05A			
	MODEL	FT1J, GT1J			
GENERAL INTRODUCTION		GN02-001			
CLUTCH MAIN UNIT		CL02-001			
CLUTCH CONTROL		CL03-001			
TRANSMISSION MAIN UNIT		TR02-001			
TRANSFER MAIN UNIT		TR03-001			
P.T.O. (POWER TAKE-OFF)		TR05-001			
TRANSMISSION/TRANSFER CONTROL		TR06-001			
PROPELLER SHAFT		PP02-001			
DIFFERENTIAL EQUIPMENT		DF01-001			
DIFFERENTIAL CARRIER		DF02-001	DF02-002	DF02-003	DF02-004
BRAKE EQUIPMENT		BR01-001			
SERVICE BRAKE		BR02-001			
ABS (ANTI-LOCK BRAKE SYSTEM)		BR03-001			
ES START (EASY & SMOOTH START) SYSTEM		BR04-001			
EXHAUST BRAKE		BR05-001			
STEERING EQUIPMENT		SR01-001			
STEERING UNIT		SR02-001			
POWER STEERING		SR03-001			
FRONT AXLE		AX02-001		AX02-002	
REAR AXLE		AX03-001		AX03-002	
WHEEL & TIRE		AX04-001			
SUSPENSION		SU02-001			
CHASSIS FRAME		FC02-001			
CAB		CA02-001			
ELECTRICAL EQUIPMENT		EL01-001			
ELECTRIC WIRE		EL02-001			
BRAKE CONTROL (ABS)		DN03-001			
BRAKE CONTROL (ES START)		DN03-002			

HINO

WORKSHOP MANUAL

INDEX: CHASSIS GROUP 1/4

Hino Motors, Ltd.

INDEX: CHASSIS GROUP 2/4

ELECTRICAL EQUIPMENT

ELECTRIC WIRE

INDEX: CHASSIS GROUP 4/4

GENERAL INTRODUCTION (CHASSIS) GN02-001

GENERAL INTRODUCTION

GENERAL PRECAUTIONS

M00020101BEC1001

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.

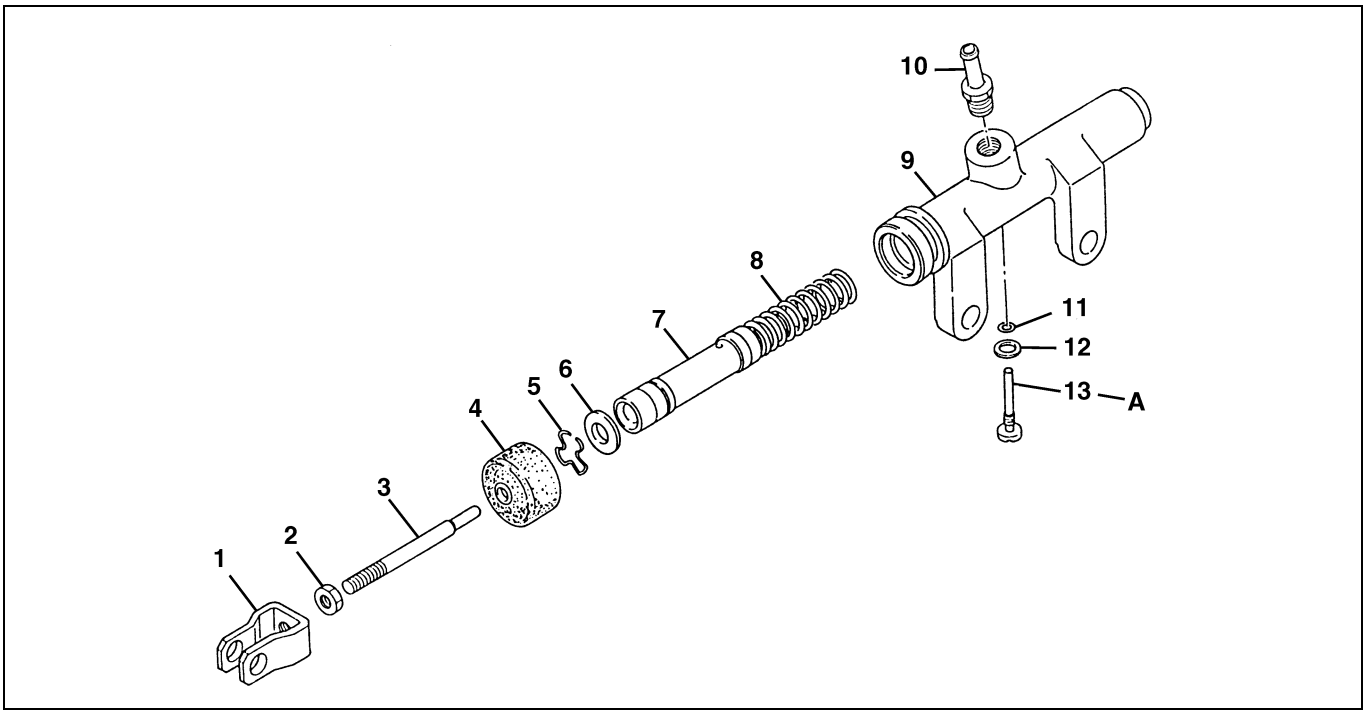
TROUBLESHOOTING is dealt with in each chapter.
When beginning operations, refer to the TROUBLESHOOTING section for a guide to appropriate diagnosis.

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:



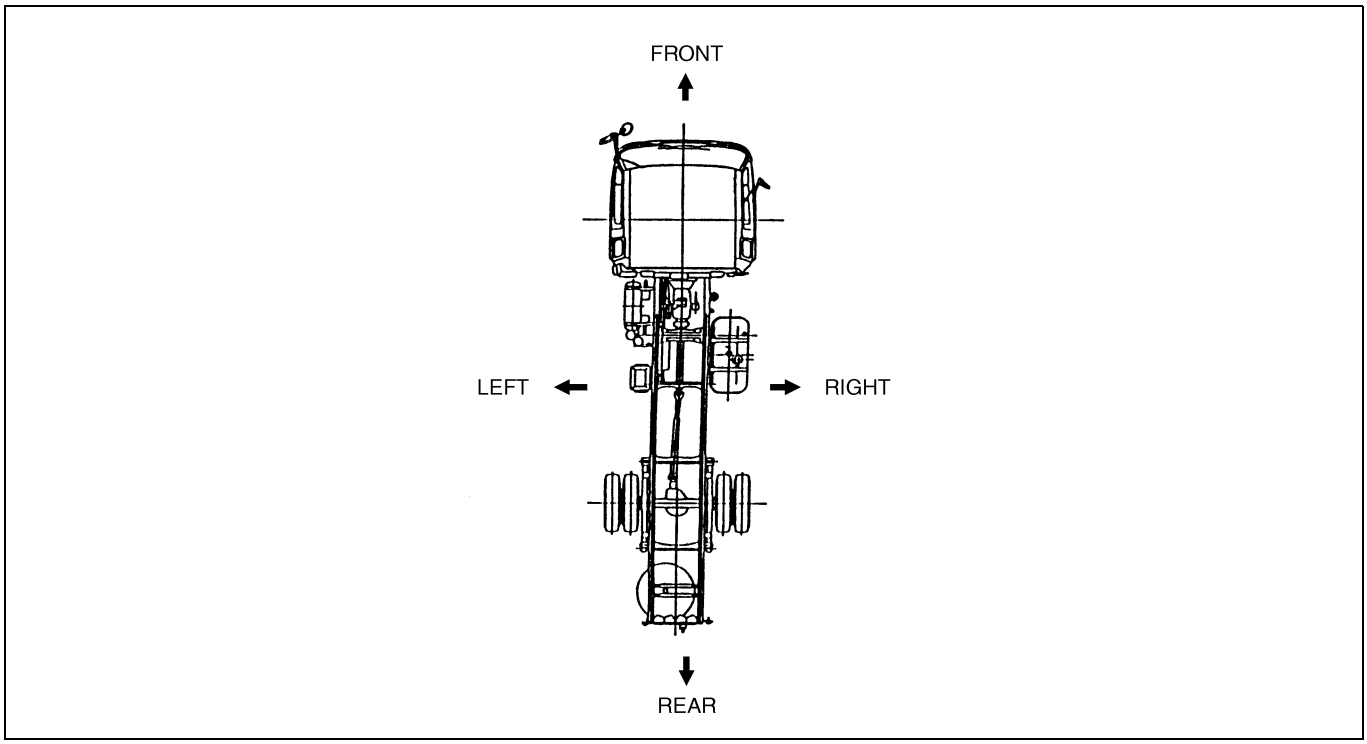
M00020100002

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.

IDENTIFICATION INFORMATION

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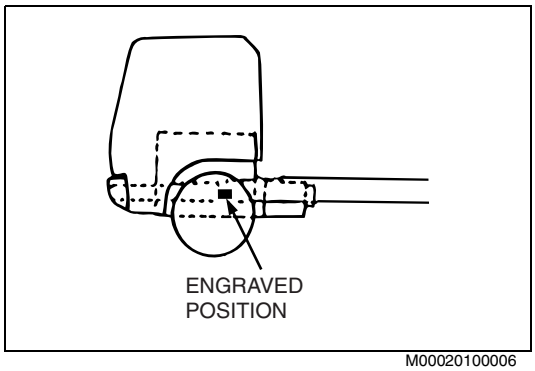

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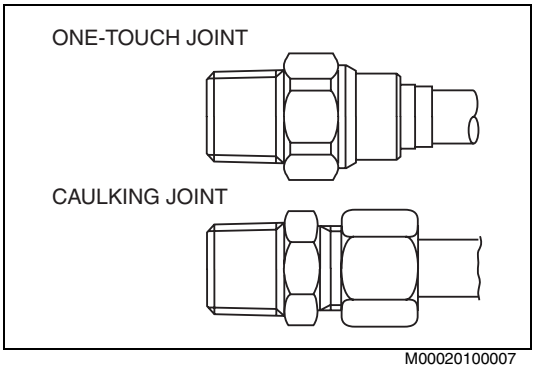
- **IDENTIFICATION INFORMATION**
  These numbers are used for identification purposes when you have a vehicle registered or inspected. Please quote these numbers when ordering spare parts or reporting technical matter to receive prompt service attention.
- CHASSIS SERIAL NUMBER
  Chassis serial number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

NYLON TUBE REPLACEMENT METHOD

M00020101BEC1004

NYLON TUBE REPLACEMENT METHOD



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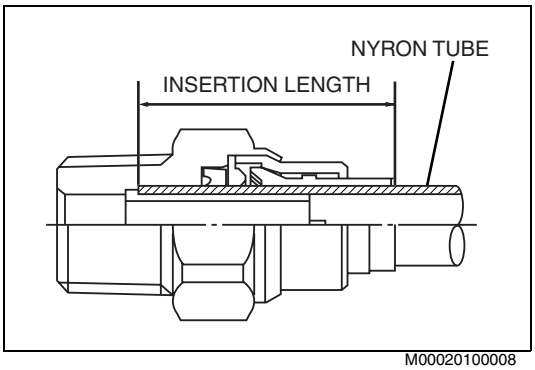
- In this vehicle, nylon tubes are used for all the air tubes except those on the charge line and the rear axle, the tubing for the wheel power signal, a portion of the accessory system tubing, and for the unloader tubing, and it is also used in joints, depending on the connection conditions of the two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

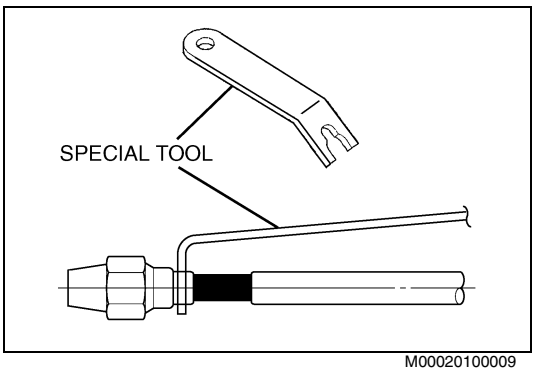
NOTICE:
Since the function and quality of nylon tubes and joints are guaranteed as tube and joint sets, the use of parts other than Hino Genuine Parts must be avoided.



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}

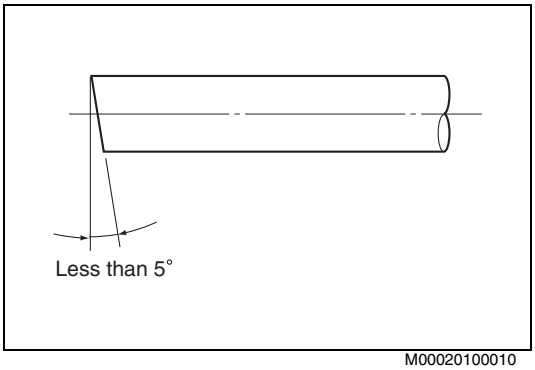


M00020100009

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

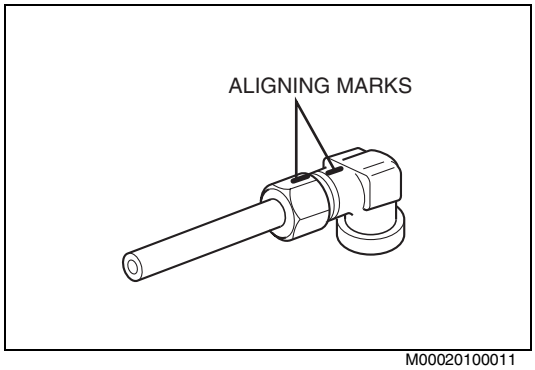
- Press in the tube so that it does not move (will not come out), and tighten the sleeve nut with the tightening tool to the torque shown in the following table.

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:

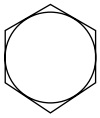
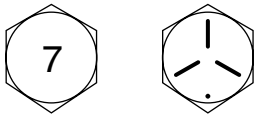
- **During repair or other work, make sure the temperature limit of the nylon tube is within -40-90°C, especially during paint drying work.**
- **During boring, welding, sanding, and other work, protect nylon tubes from tools, cuts, heat sources, and sparks, or remove the nylon tubes beforehand.**
- **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

M00020101BEC1005

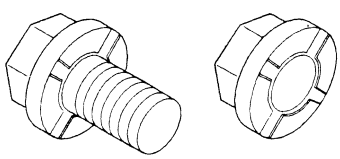
Unit: N·m {kgf·cm, lbf·ft.}

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)

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

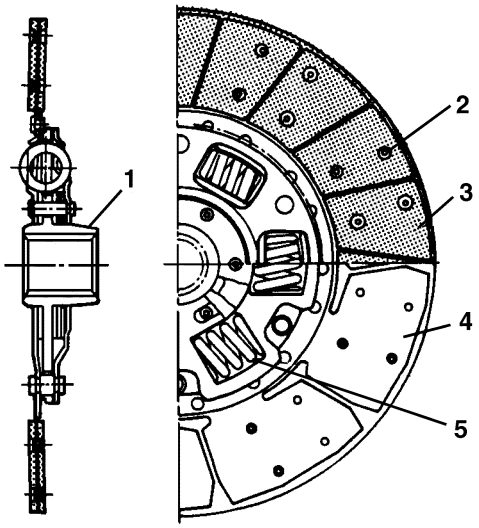
Unit: mm {in.}

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}

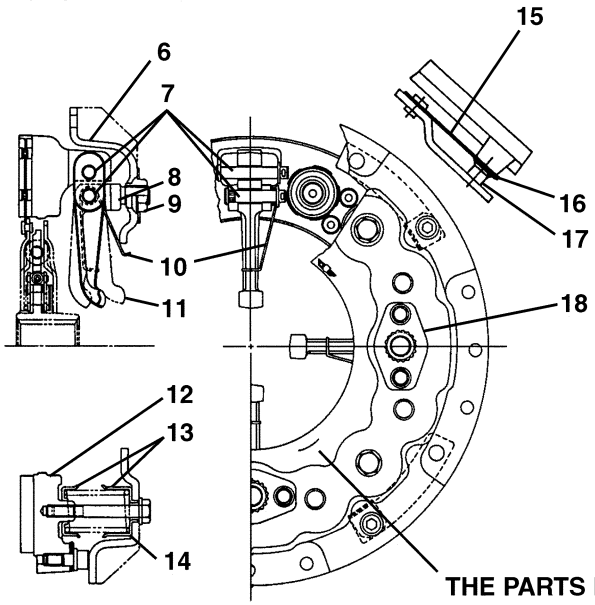
DESCRIPTION

M02020103BEC1002

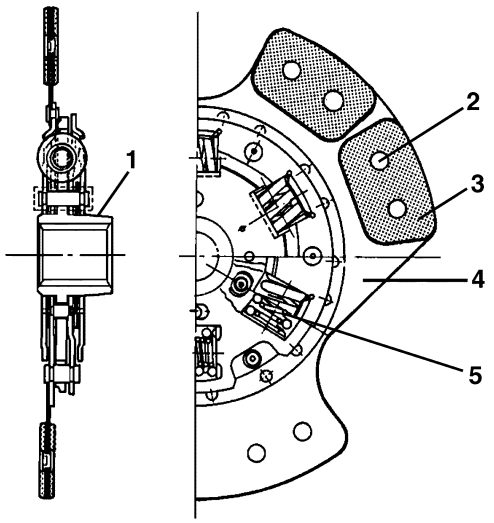
MOLDED NON-ASBESTOS DISK



CLUTCH COVER



SINTERED METAL (CERAMIC METAL) DISC



THE PARTS NO. IS ENGRAVED ON THE CLUTCH COVER

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

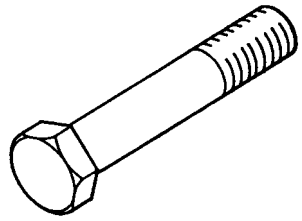
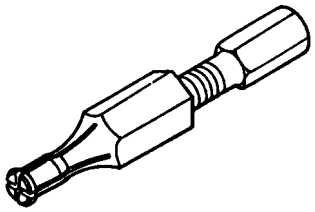
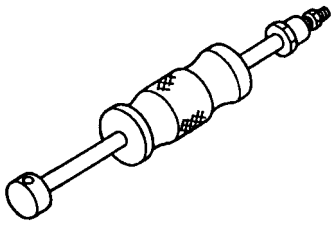
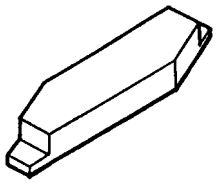
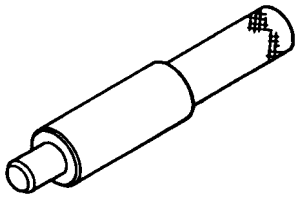
M02020103BEF3001

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

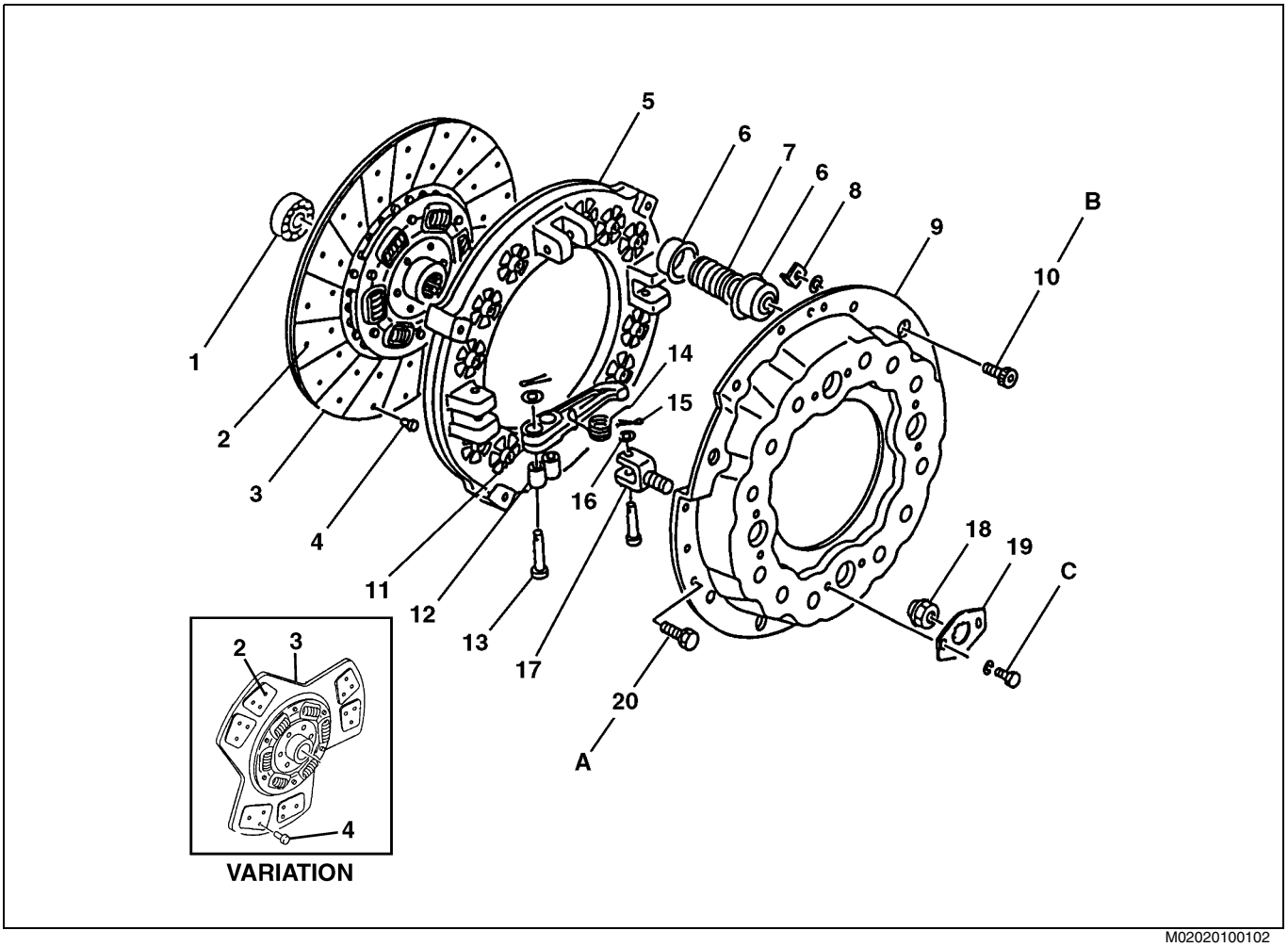
M02020103BEK1001

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

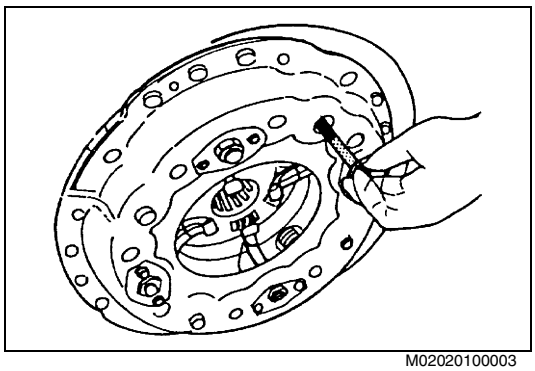
1	Pilot bearing	11	Release lever
2	Clutch facing	12	Bushing
3	Disc assembly	13	Release lever pin
4	Rivet	14	Torsion spring
5	Pressure plate	15	Cotter pin
6	Spring seat	16	Plain washer
7	Compression spring	17	Release lever support
8	Friction washer	18	Release lever support nut
9	Clutch cover	19	Lock plate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

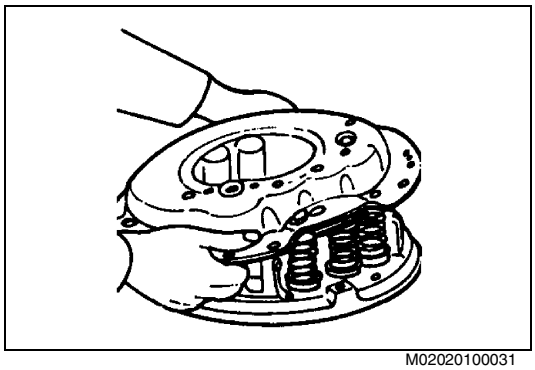
1. REMOVE THE CLUTCH COVER AND DISC.

(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.



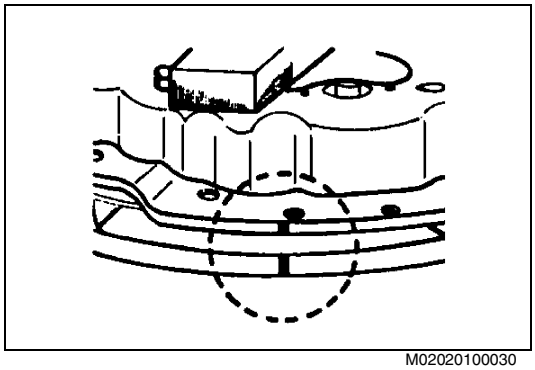
M02020100031

IMPORTANT POINTS - DISASSEMBLY

1. DISASSEMBLE THE CLUTCH COVER.

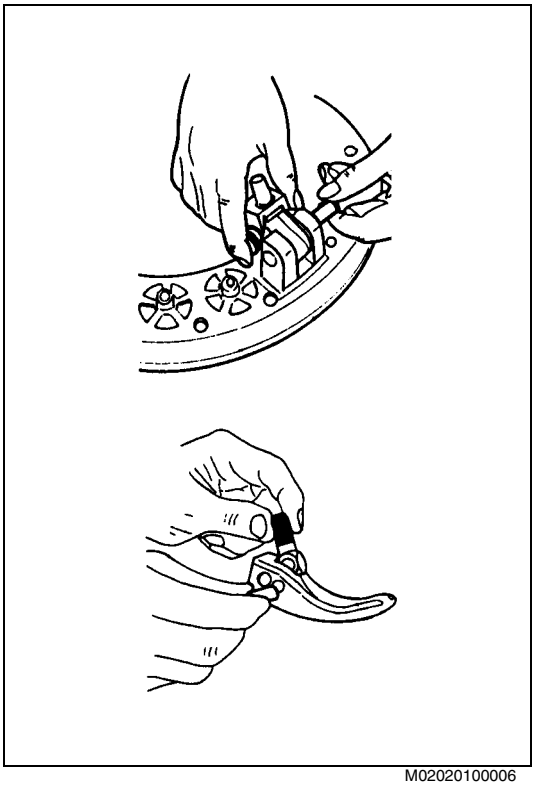
(1) Before removing the special tools and the strap plate bolt, compress the clutch cover to release the compression spring tension.

(2) Slowly release the press.



M02020100030

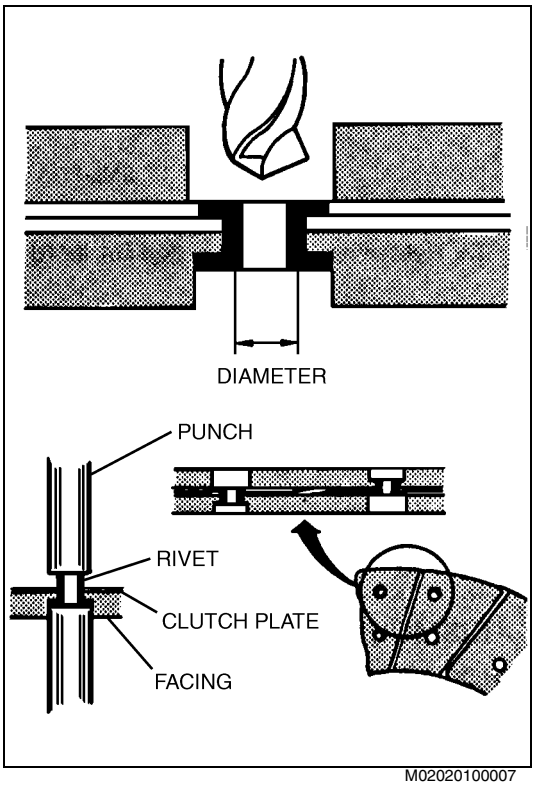
NOTICE:
Before disassembling, make aligning marks on the clutch cover and pressure plate.



M02020100006

2. DISASSEMBLE THE RELEASE LEVER ASSEMBLY.

(1) Remove the pin and the release lever.



M02020100007

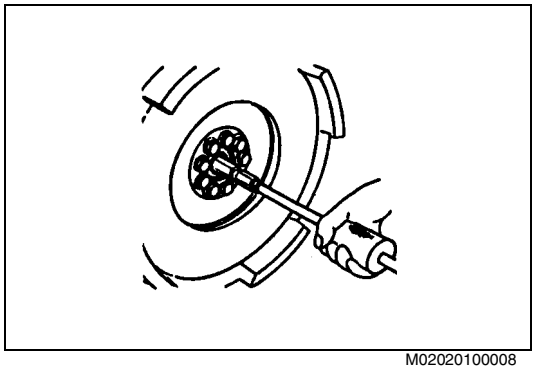
IMPORTANT POINTS - ASSEMBLY

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.

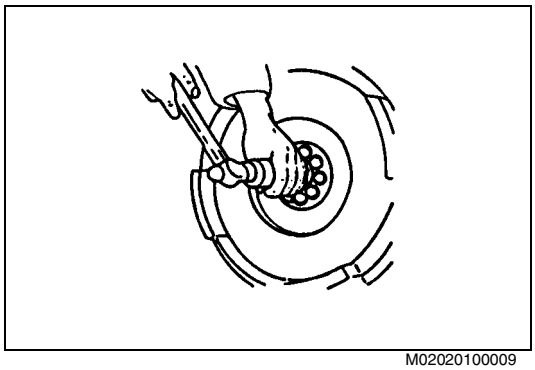
(2) Remove the old facing.
(3) Place the new facing on the clutch plate and insert the rivets into the holes so that the facing is held in position. (Secure the rivets with adhesive tape to prevent loosing them.)
(4) Using a suitable riveter, rivet the new facing. In order to distribute pressure evenly, 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.

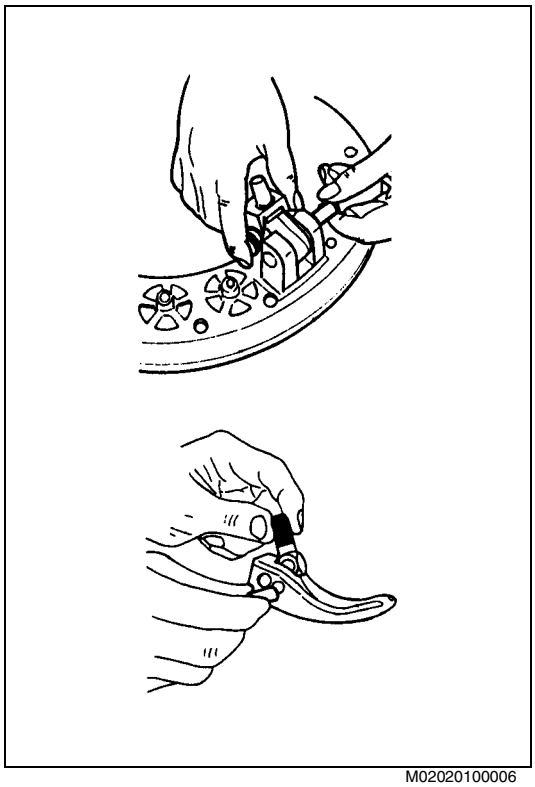
(1) Remove the pilot bearing.
SST:
Pilot Bearing Puller (09650-1970)
Sliding Hammer (09420-1442)



M02020100009

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

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

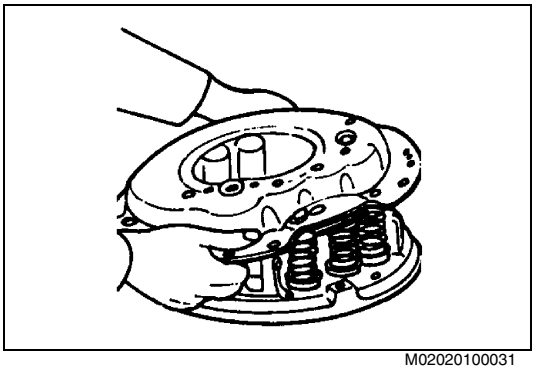


M02020100006

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.

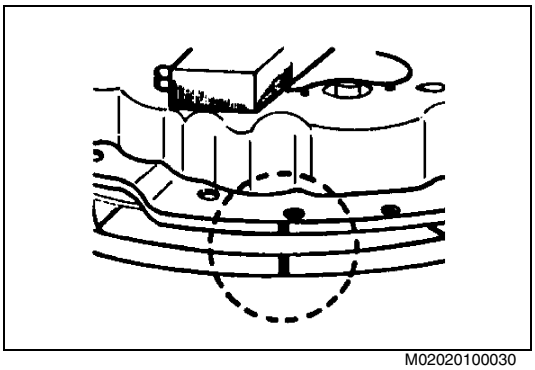
NOTICE:
- **Do not coat any grease on the bushing.**
- **Coat lithium base grease to the sliding part between the clutch release lever and the pressure plate.**



M02020100031

4. INSTALL THE CLUTCH COVER.

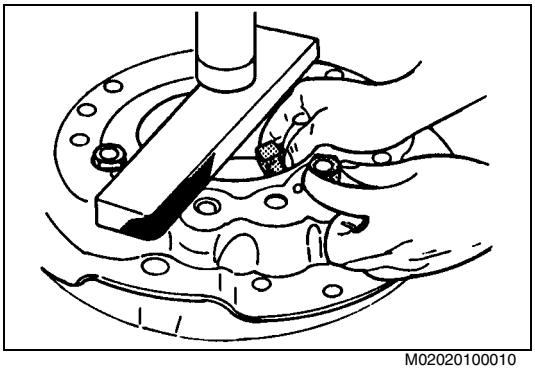
(1) Install the clutch cover in position according to the aligning marks. Compress the clutch cover to relieve the compression spring tension.



M02020100030

NOTICE:

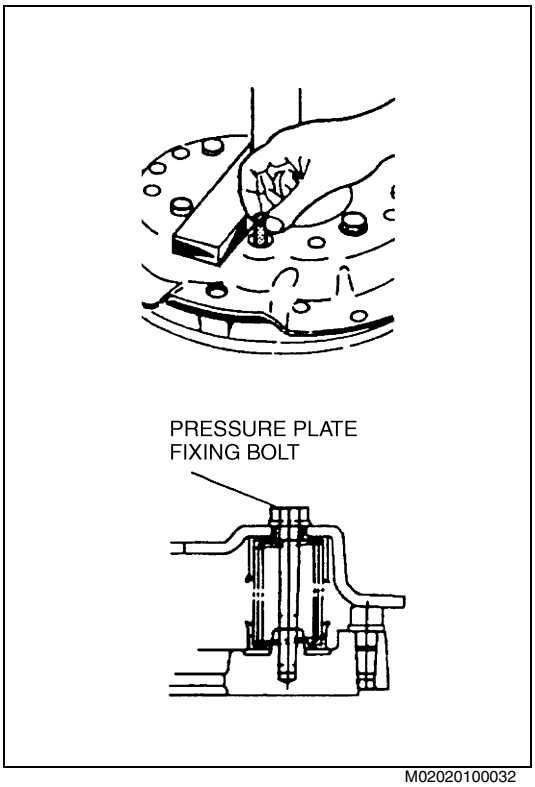
- **When compressing the clutch cover, be sure to hook up the torsion springs between clutch cover and release lever.**
- **When compressing the clutch cover, pull the release lever support up through the holes in the clutch cover.**
- **Be sure to insert the compression spring upper seats in the pressure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



M02020100010

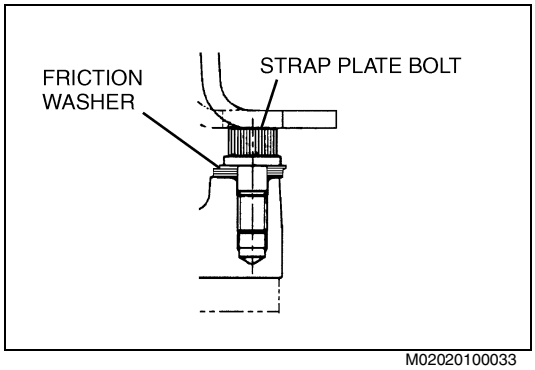
(2) Temporarily tighten the release lever support nuts.

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

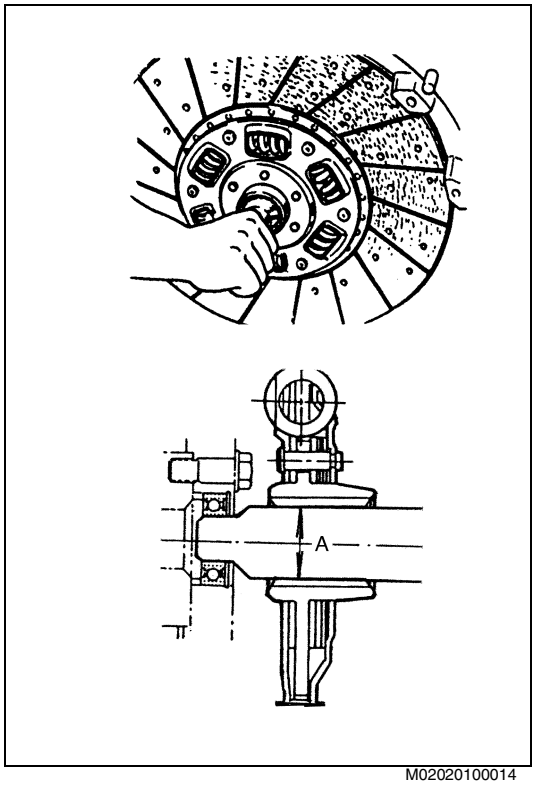
(3) Install the four pressure plate fixing bolts with the plain washers through the clutch cover into the tapped holes in the pressure plate.
SST:
Pressure Plate Fixing Bolt (9010-10700)
Plain Washer (9260-10240)



M02020100033

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

IMPORTANT POINTS - MOUNTING



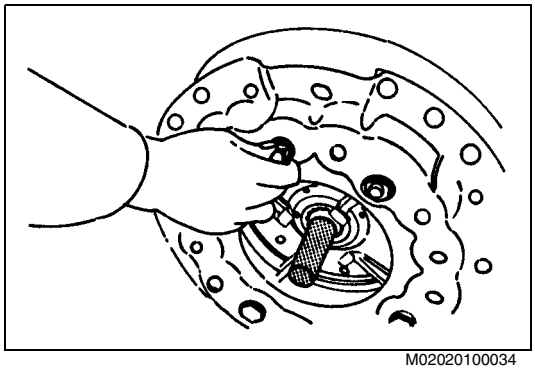
M02020100014

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.

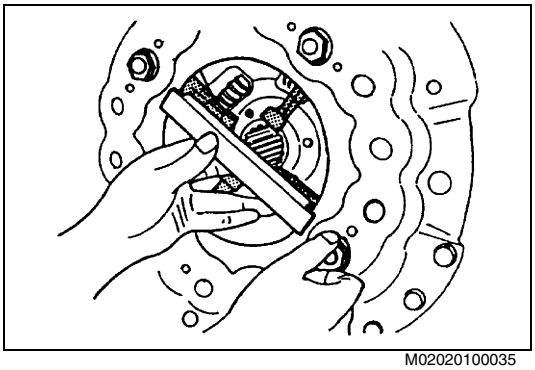
(2) Tighten the bolts evenly. Make several presses around the clutch cover until it is snug.

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

(4) Remove the clutch aligning arbor.

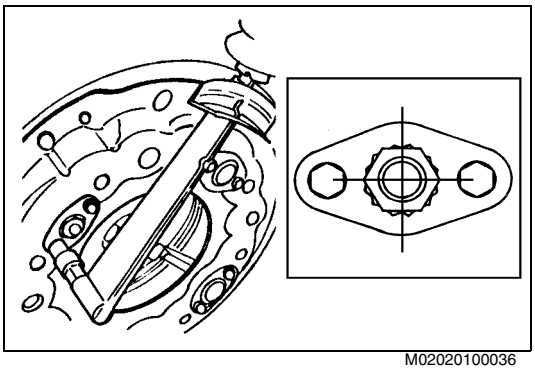
NOTICE:

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

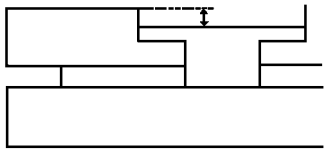
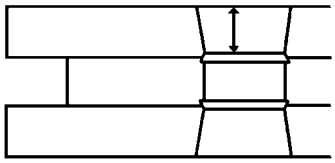
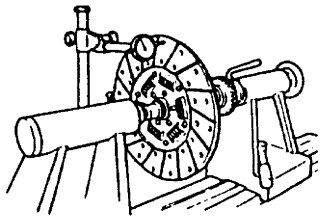
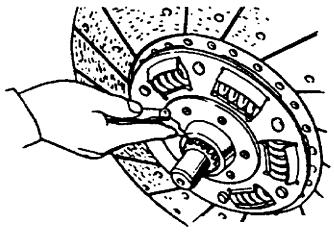
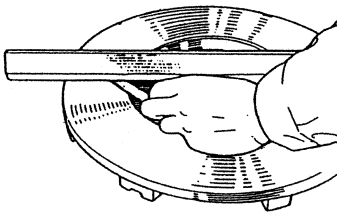
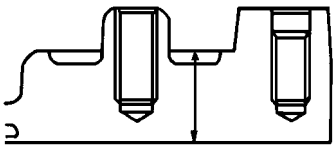
4. INSTALL THE LOCK PLATE.

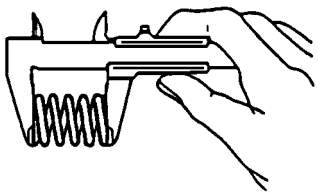
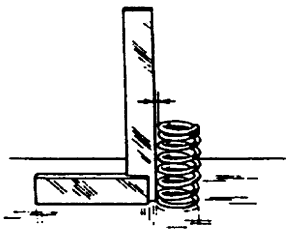
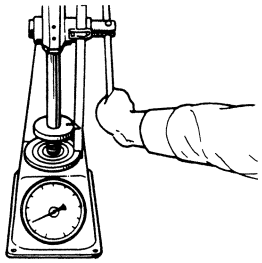
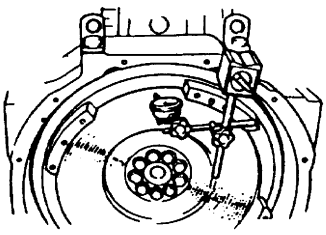
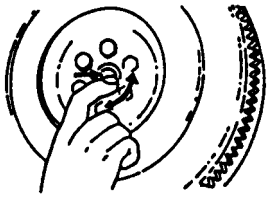
NOTICE:
Be sure to lock the support nut with the lock plate.

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)

DATA AND SPECIFICATIONS

M02030103BEI2002

CLUTCH BOOSTER

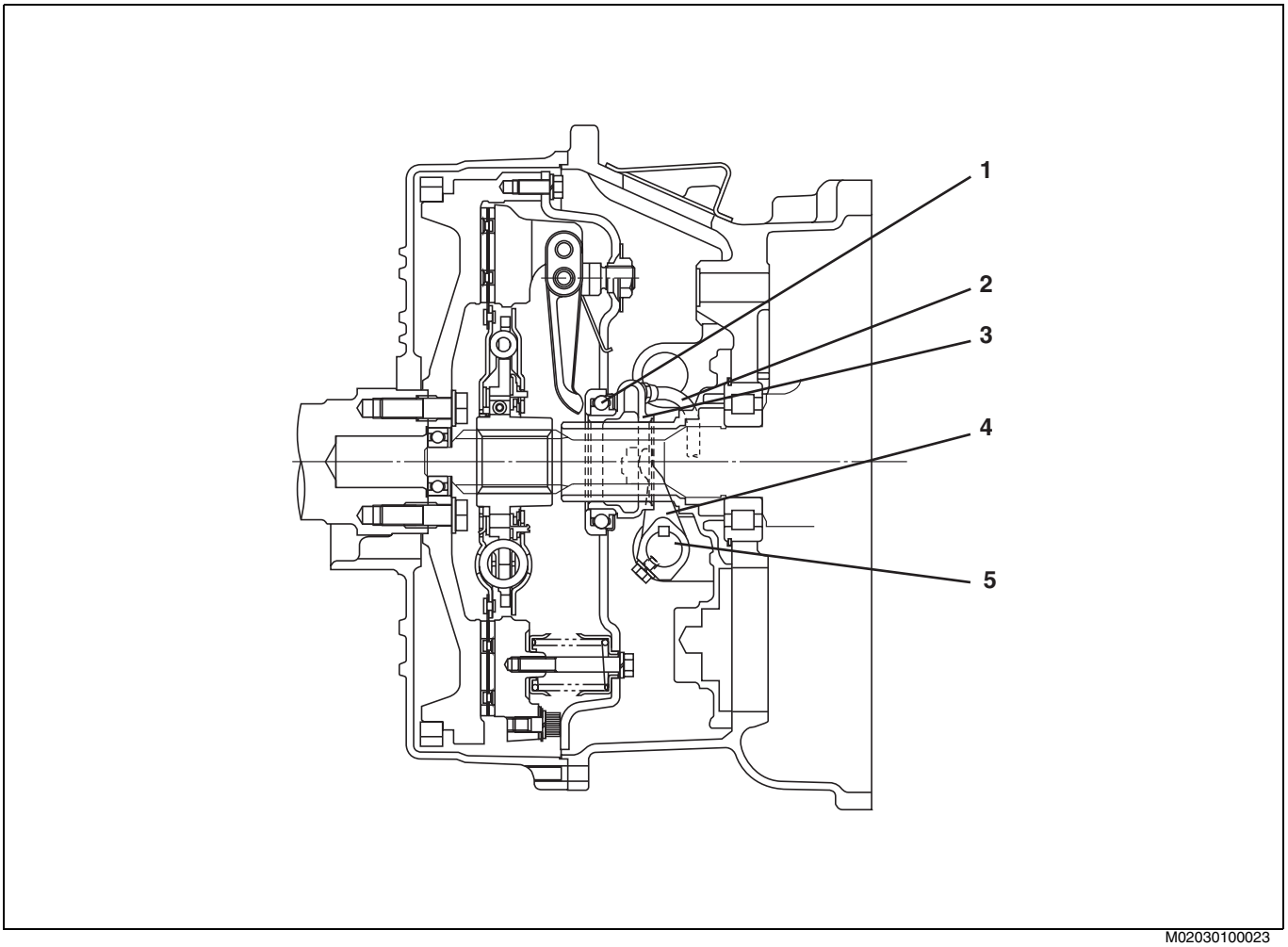
Unit: mm {in.}

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

M02030103BEC1004

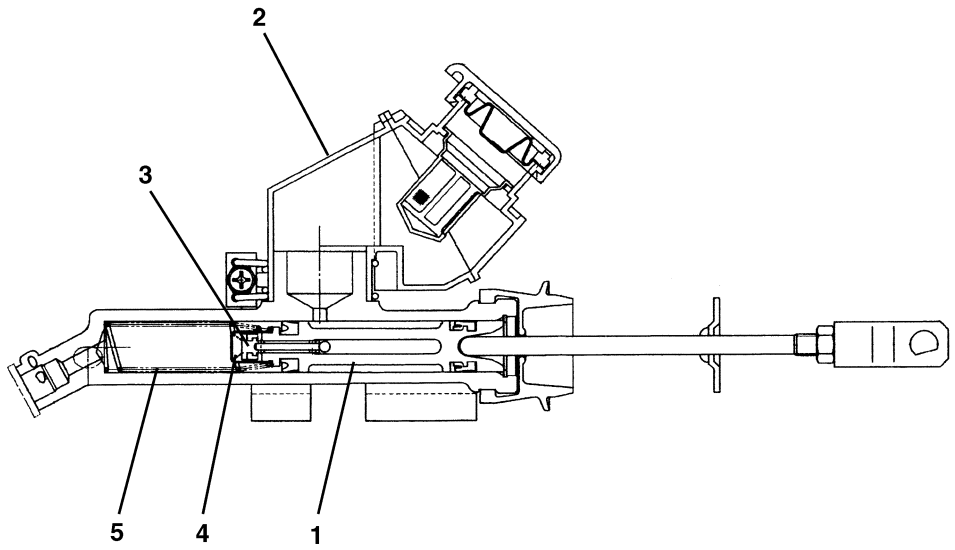
CLUTCH RELEASE UNIT



M02030100023

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

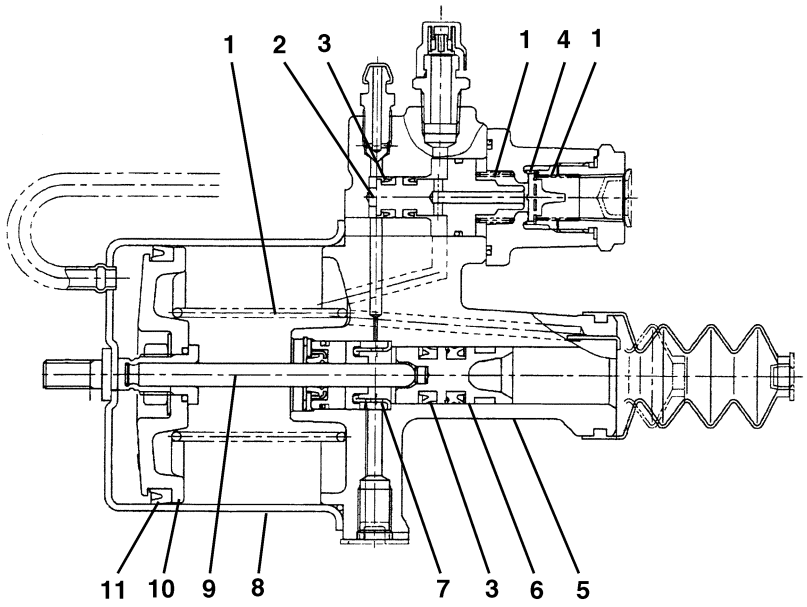
MASTER CYLINDER



M02030100002

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

CLUTCH BOOSTER



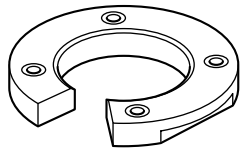
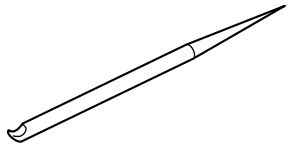
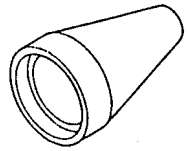
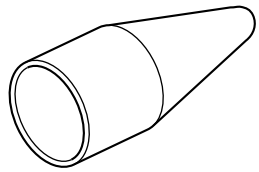
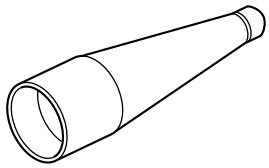
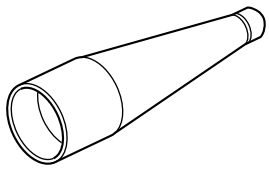
M02030100003

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

M02030103BEK1003

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

M02030103BEH3003

AIR BLEEDING

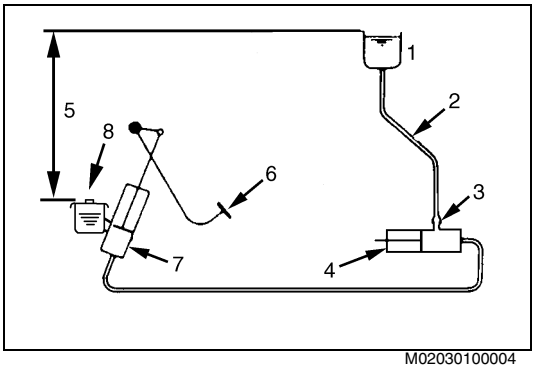
1. BLEED THE AIR FROM HYDRAULIC LINE.

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.

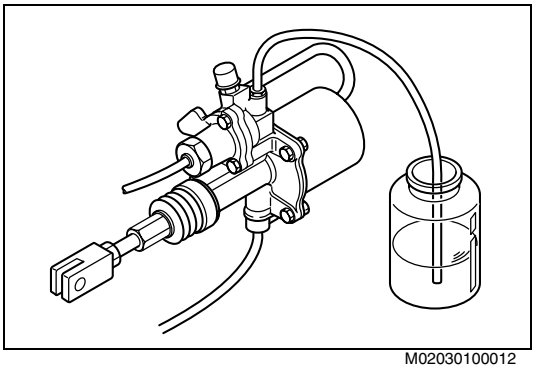


M02030100004

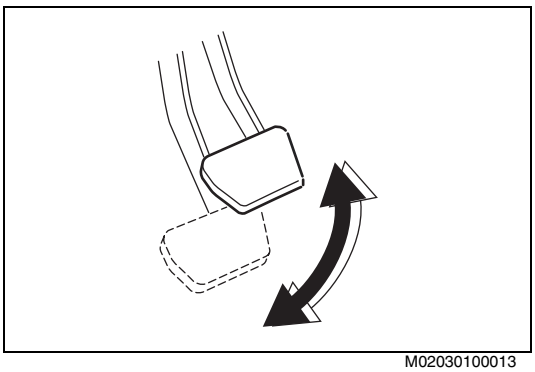
1. Funnel filled with clutch fluid
2. Vinyl tube (inside diameter: 6 mm)
3. Bleeder
4. Clutch booster
5. About 1.5 m {4.92 ft}
6. Clutch pedal
7. Master cylinder
8. Reservoir tank

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

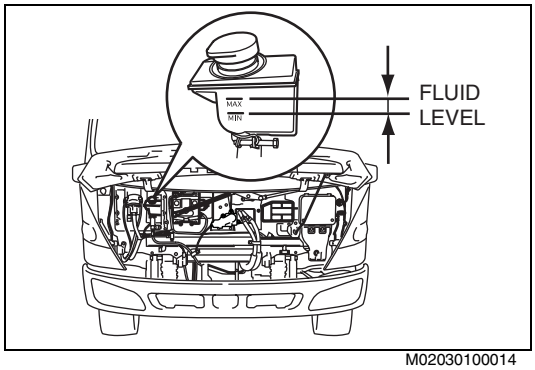


M02030100013

(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.

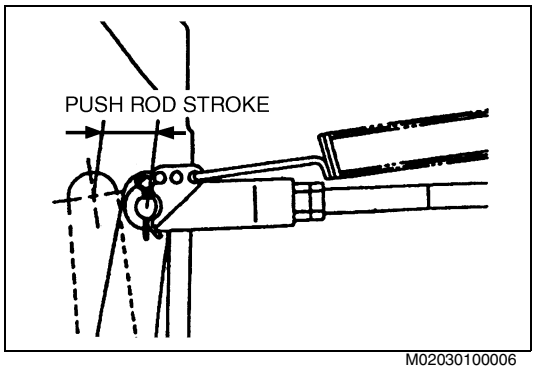
NOTICE:

- **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.

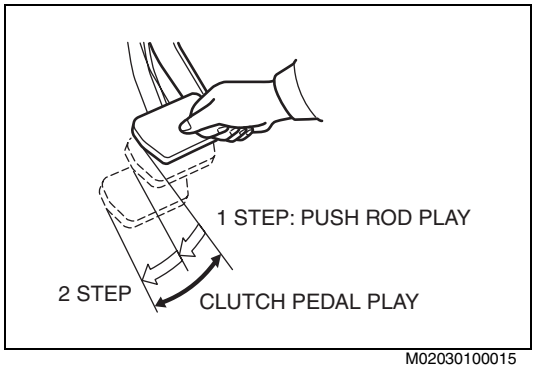


M02030100006

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

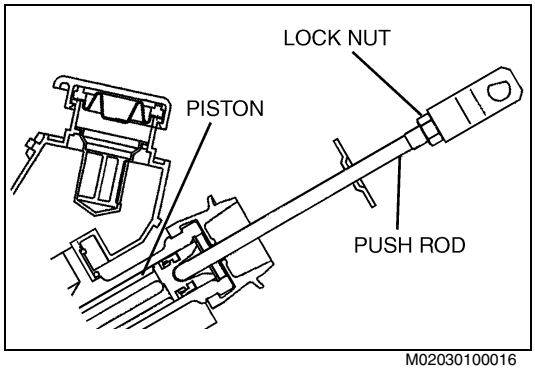


M02030100015

1. CHECK AND ADJUST THE CLUTCH PEDAL PLAY.

(1) Check the push rod play.

a. If necessary, adjust the push rod play.

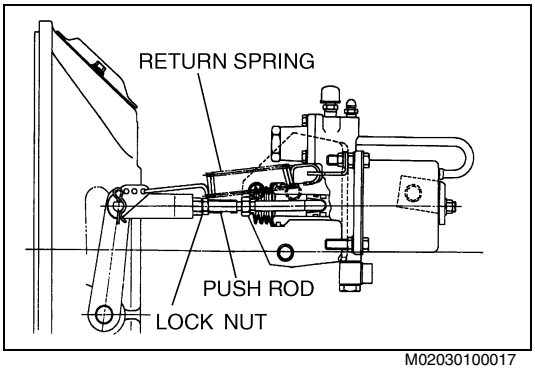


M02030100016

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

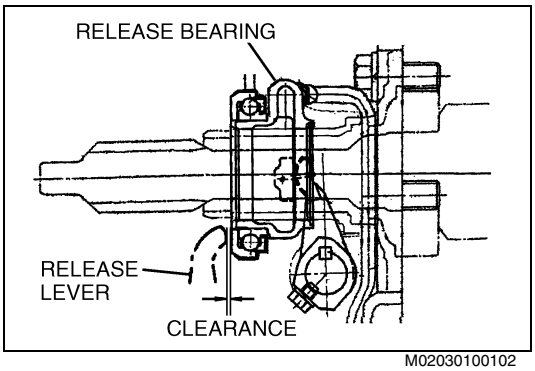
Standard: Clearance between push rod and piston: 0.5 mm {0.0197 in.}
Push rod play at pedal top: 2-4 mm {0.079-0.157 in.}

c. Tighten the lock nut.



M02030100017

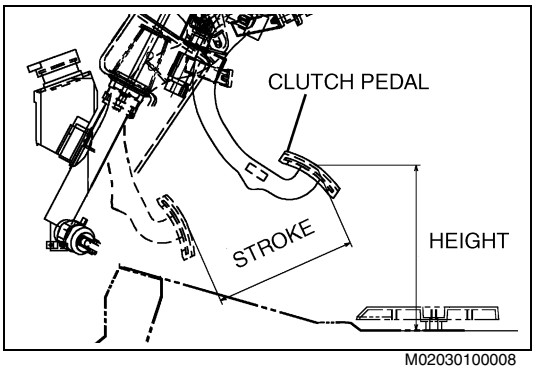
(2) Check the clutch pedal play.
a. Push the pedal until the beginning of clutch resistance is felt.
Assembly Standard: 52-65 mm {2.048-2.559 in.}
b. If necessary, adjust the clutch pedal play by adjusting the clutch release bearing clearance.
c. Loosen the lock nut and turn the push rod counterclockwise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



M02030100102

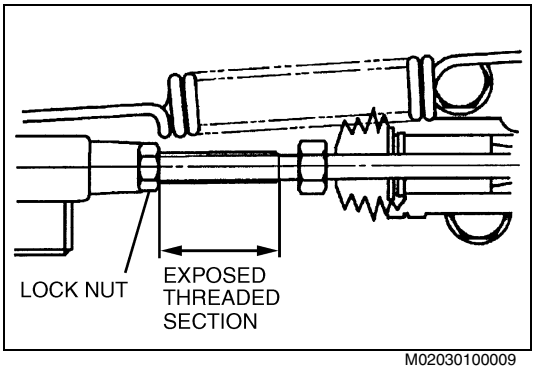
Standard: Clearance between release bearing and release lever plate: 2.0 mm {0.079 in.}

e. Tighten the lock nut.



M02030100008

2. CHECK THE CLUTCH PEDAL HEIGHT AND STROKE.
Assembly Standard:
Pedal Height: 169.2-179.2 mm {6.67-7.05 in.}
Pedal Stroke: 150-160 mm {5.91-6.29 in.}



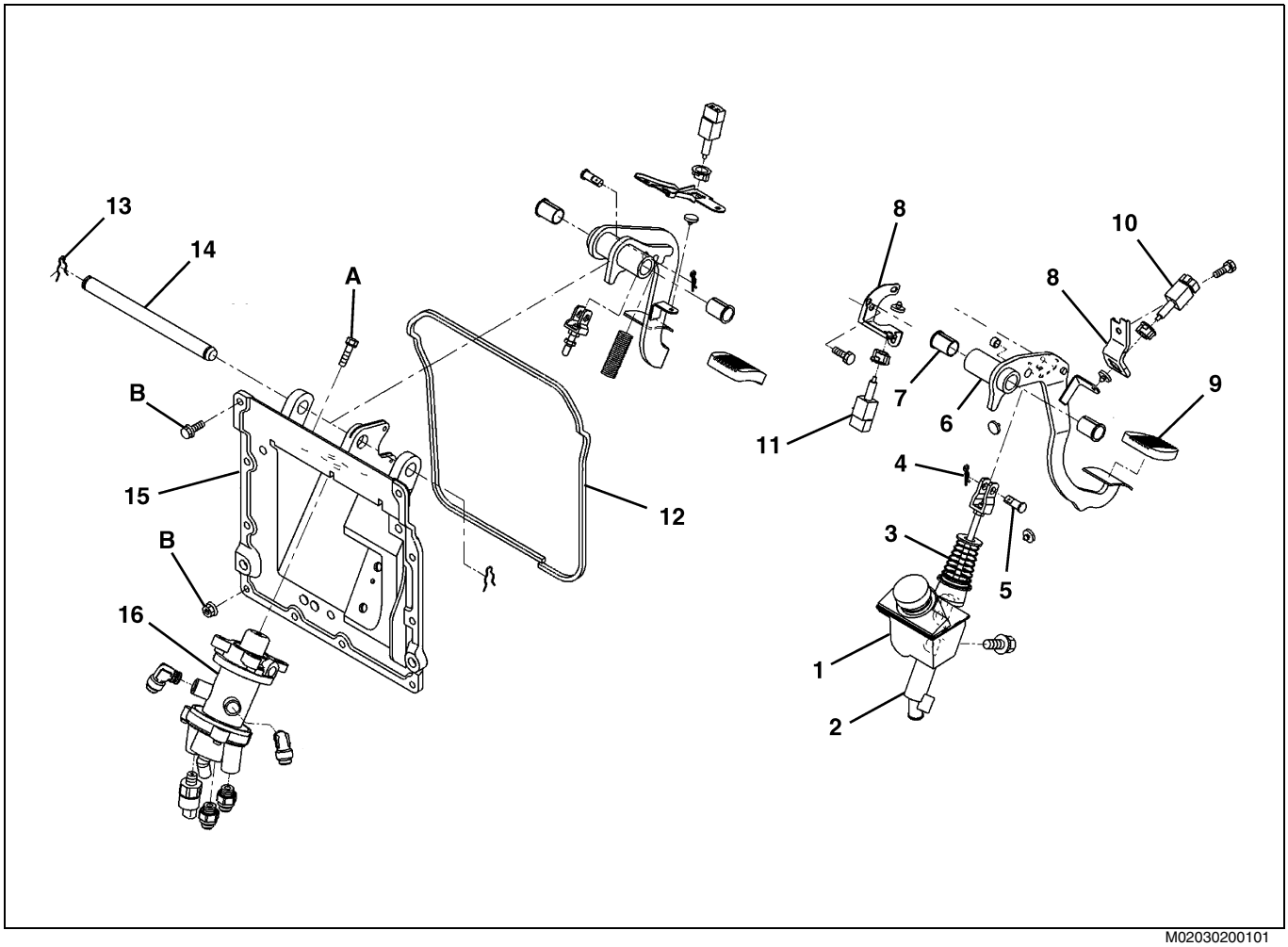
M02030100009

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

M02030203BED1004

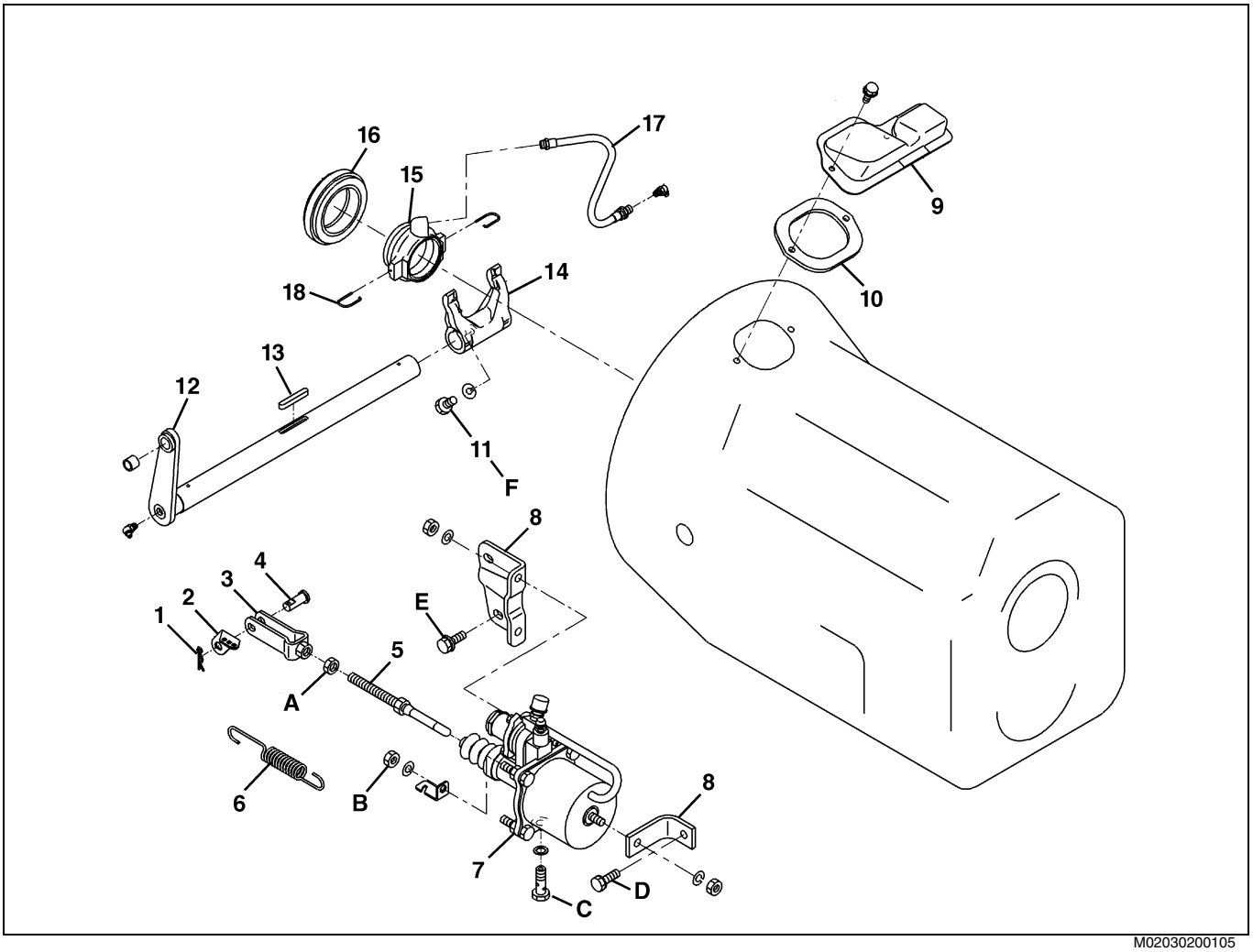


M02030200101

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}



M02030200105

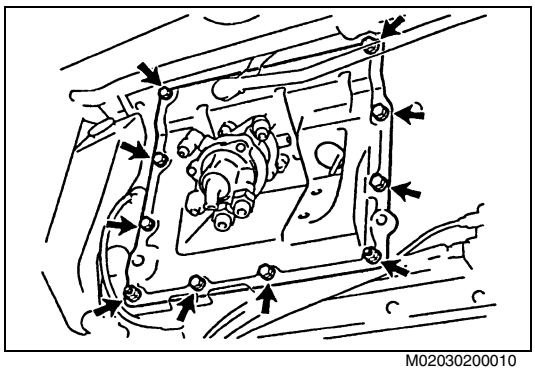
1	Cotter pin	10	Gasket
2	Spring hanger	11	Set screw
3	Clevis	12	Release shaft
4	Pin	13	Key
5	Push rod	14	Release fork
6	Tension spring	15	Release bearing hub
7	Clutch booster	16	Release bearing
8	Bracket	17	Lubrication hose
9	Cover	18	Anti-rattle spring

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

A	45.5-58.5 {464-596, 34-43}	D	37.5-48.5 {383-494, 28-35}
B	37.5-48.5 {383-494, 28-35}	E	37.5-48.5 {383-494, 28-35}
C	27.5-32.5 {281-331, 21-23}	F	14.5-17.5 {148-178, 11-12}

OVERHAUL

M02030203BEH2002

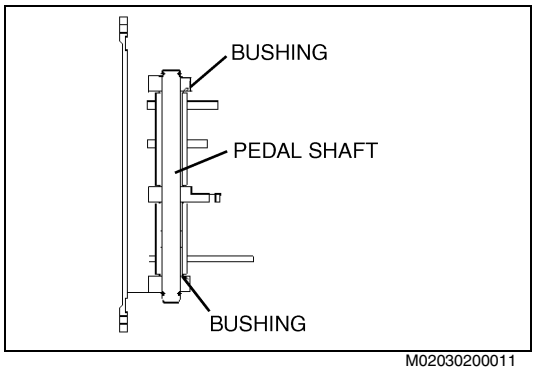

M02030200010

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.

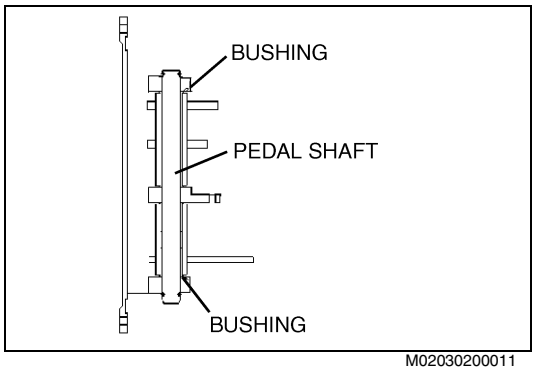
NOTICE:
Be careful not to damage the vehicle.



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

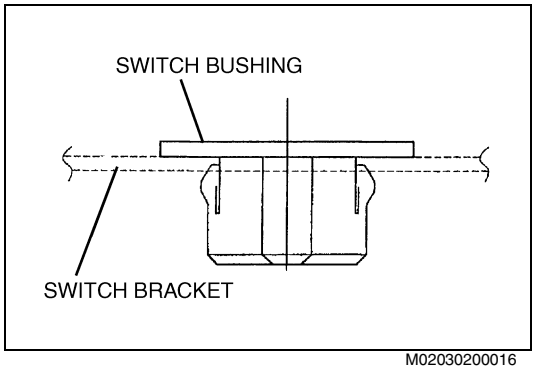
IMPORTANT POINT - MOUNTING

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.

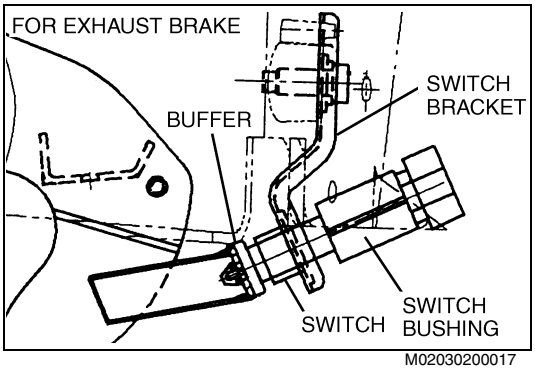
2. INSTALL THE PEDAL UNIT ASSEMBLY.



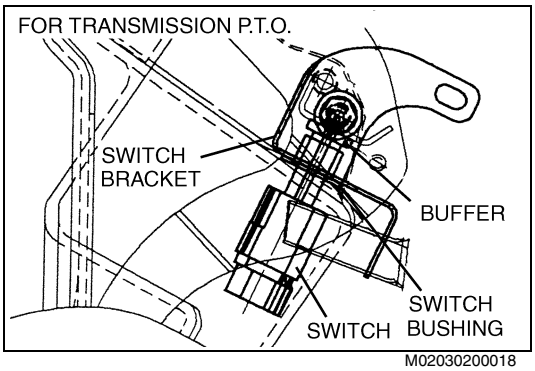
M02030200016

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

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



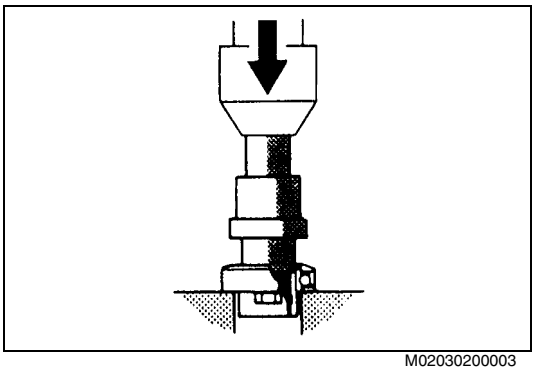
M02030200017



M02030200018

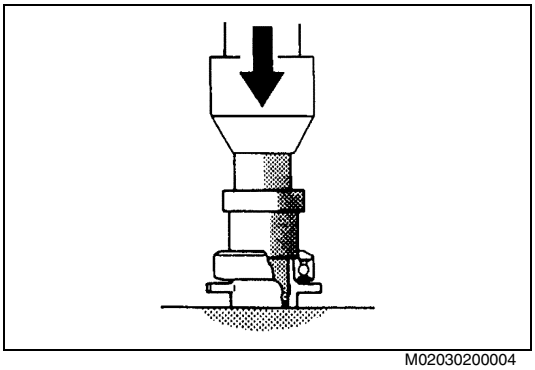
(2) Push the switch into the switch bushing until the switch pounds the buffer, then fix the switch by turning it clockwise.

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


M02030200003

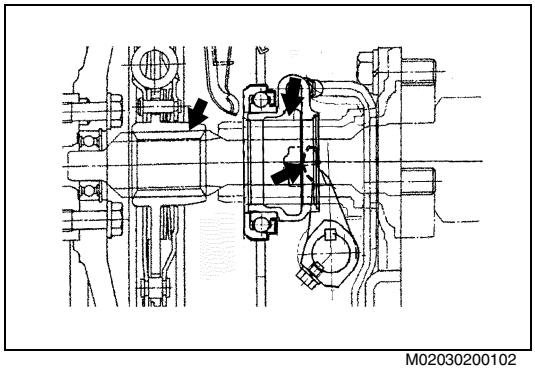
IMPORTANT POINTS - ASSEMBLY

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.

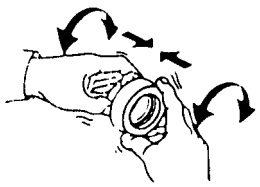
(2) Apply heat resistance grease to the transmission input shaft spline.

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

INSPECTION AND REPAIR

M02030203BEH3001

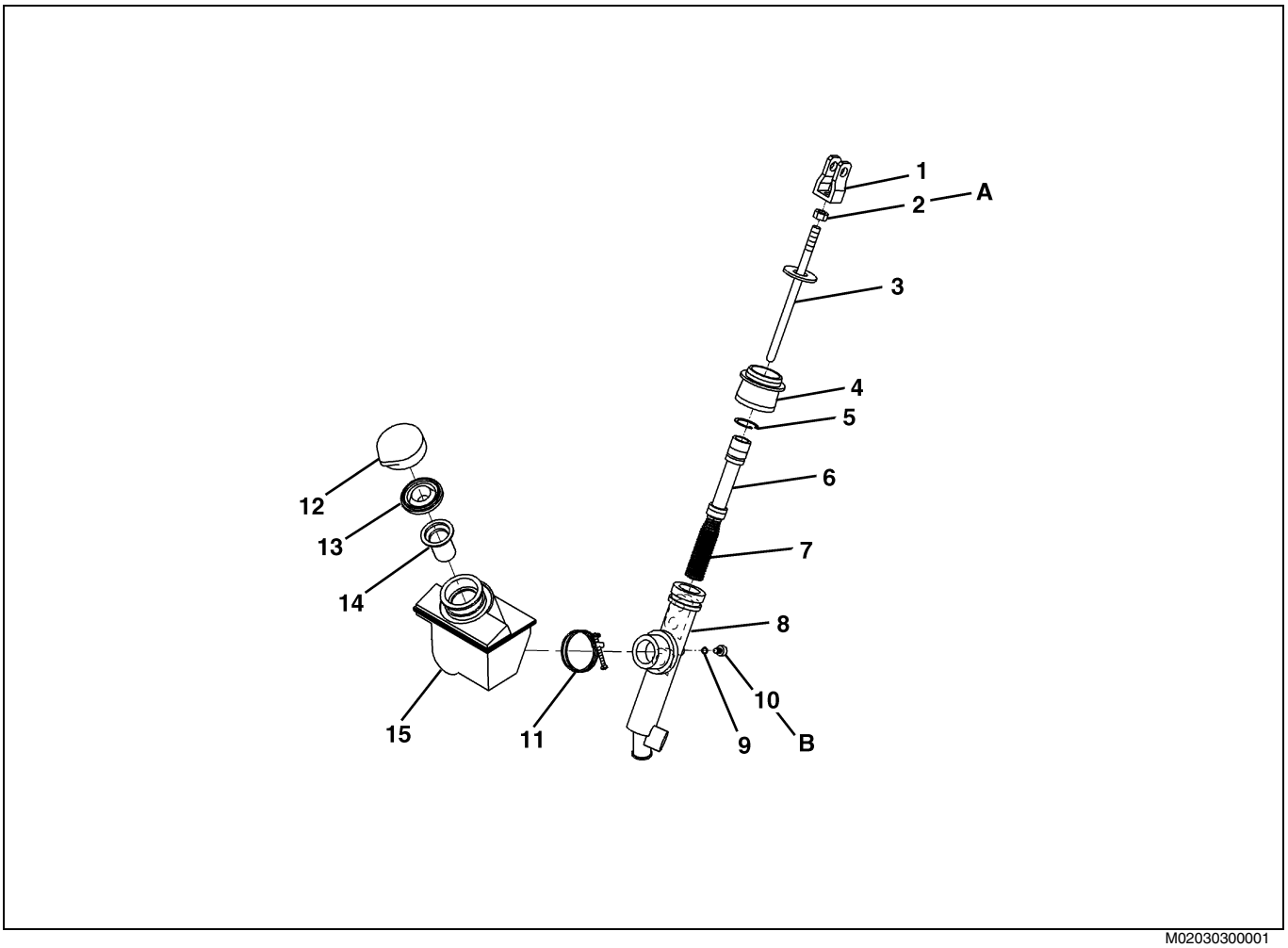
Unit: mm {in.}

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

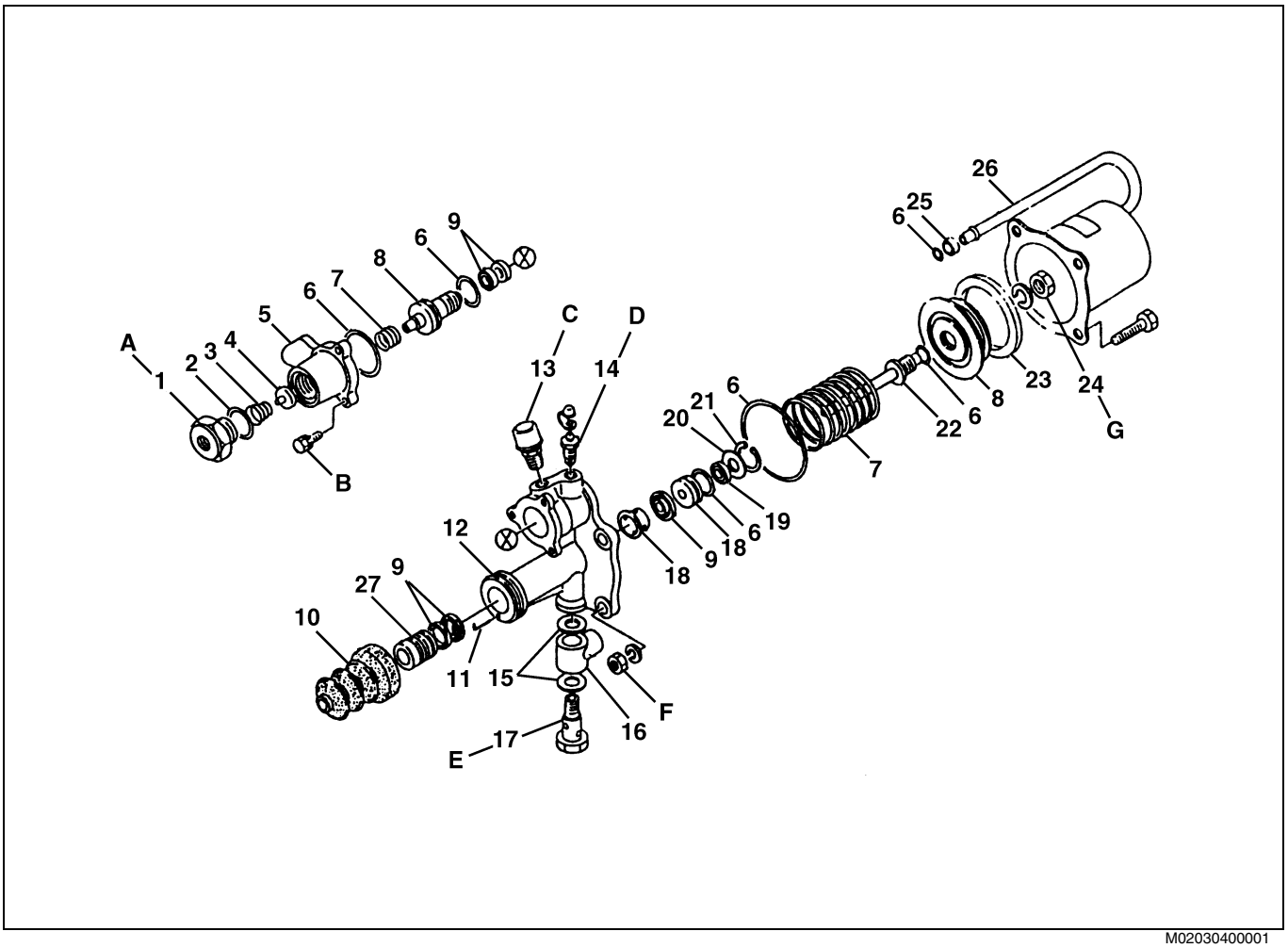
M02030301BEH3004

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

M02030401BED1004



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 {280-330, 20-23}
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

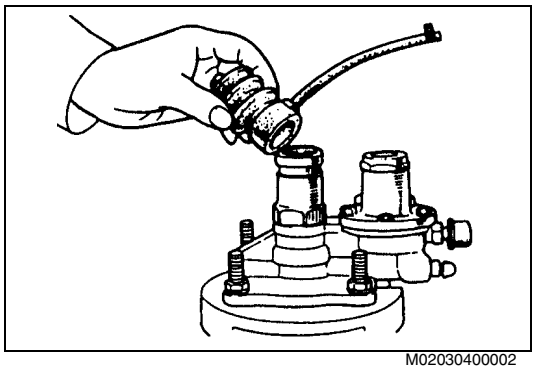
IMPORTANT POINT - DISMOUNTING

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

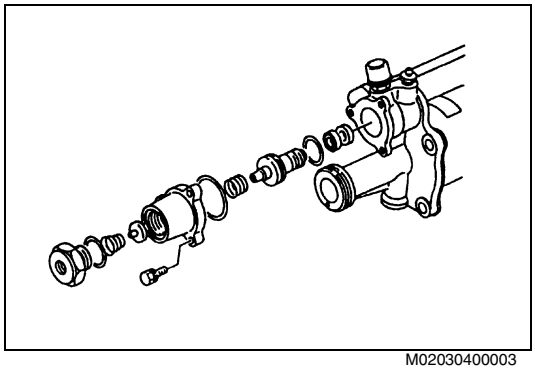


M02030400002

1. SET THE CLUTCH BOOSTER ON A STAND.

SST: Stand (09536-1020)

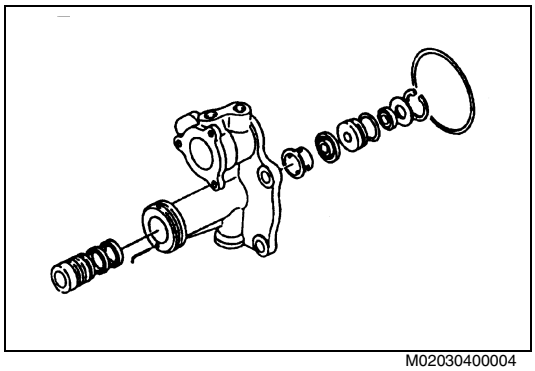
NOTICE:
Before disassembling the air booster, clean the outside of the booster.



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.

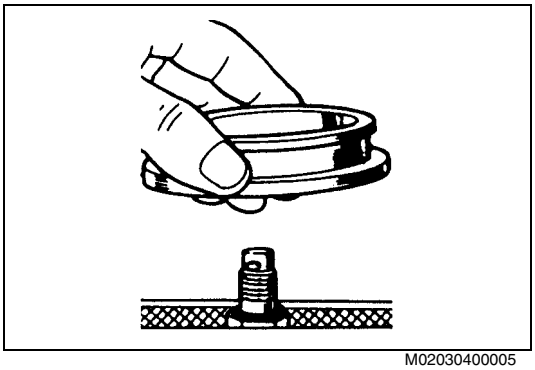
(1) Remove the pin and piston.
(2) Remove the retainer ring.
(3) Remove the push rod washers, the cup and washer retainer, piston cup and the oil seal.
(4) Using the special tool, remove the O-ring.
SST: Hook (09653-1780)

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.

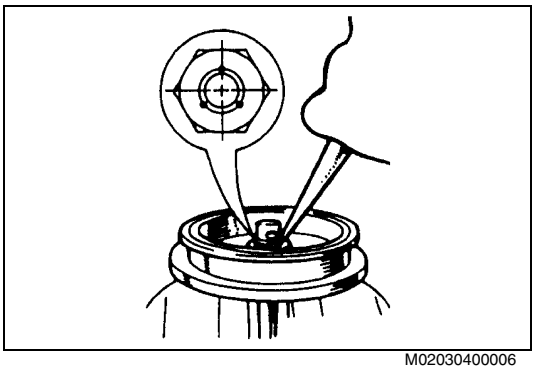
1. ASSEMBLE THE POWER PISTON.

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



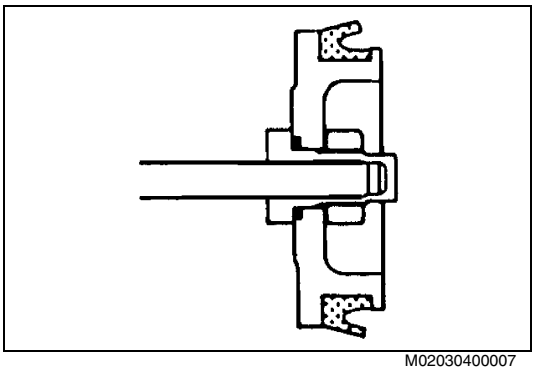
M02030400005

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



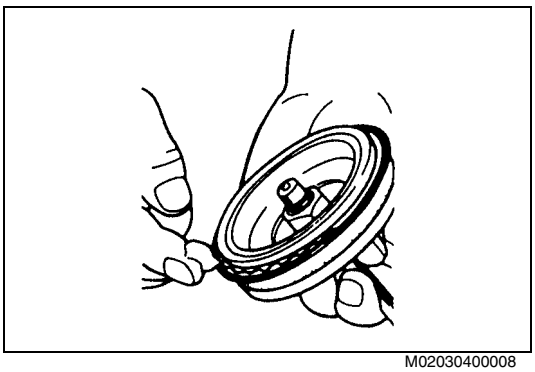
M02030400006

(3) Install the piston seal on the piston.

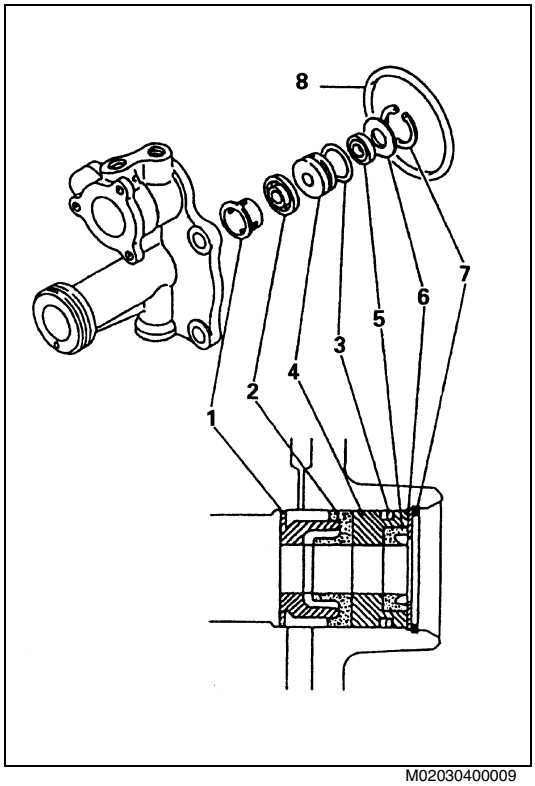


M02030400007

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



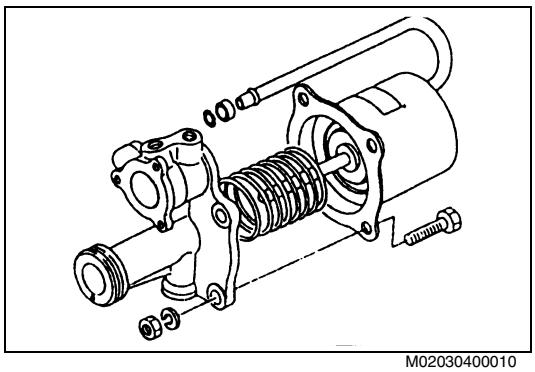
M02030400008



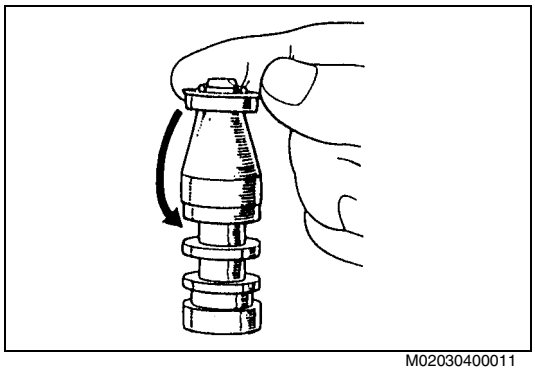
M02030400009

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.

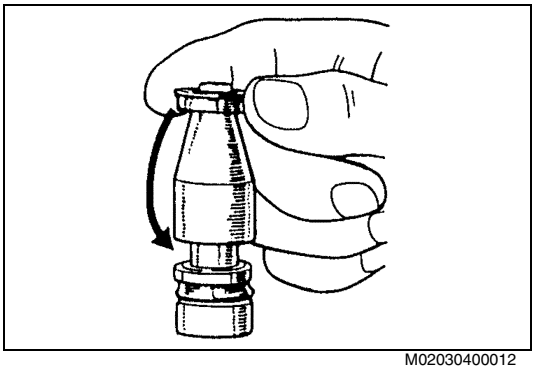
NOTICE:
Coat the parts with red colored grease.

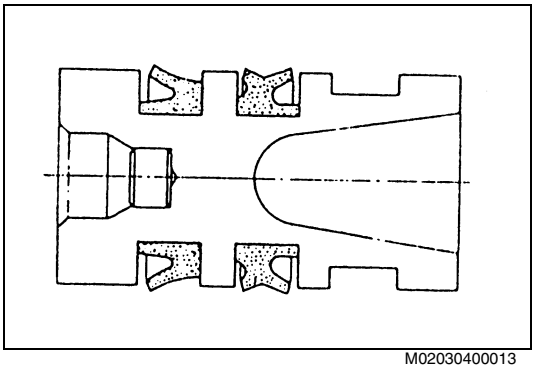

M02030400010

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

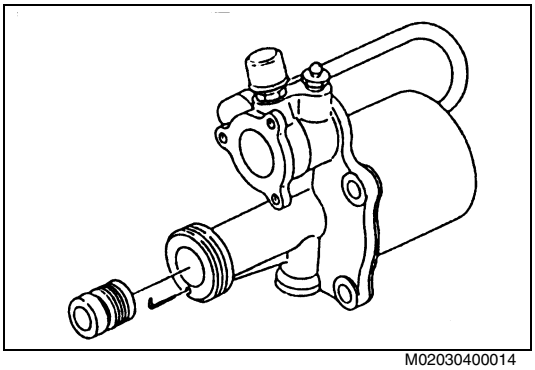

M02030400011

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

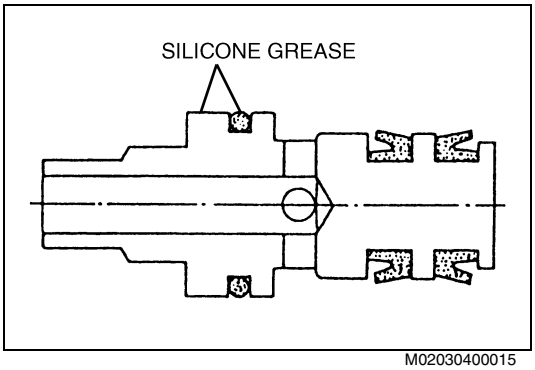

M02030400012


M02030400013

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


M02030400014

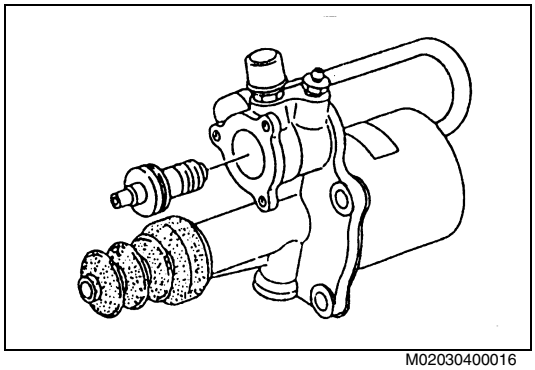
(3) Install the piston assembly in the hydraulic cylinder.
(4) Install the pin.



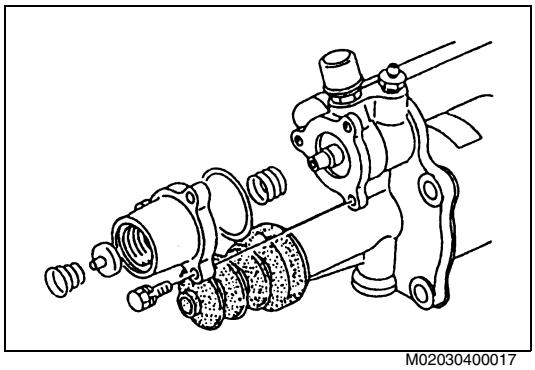
M02030400015

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.**

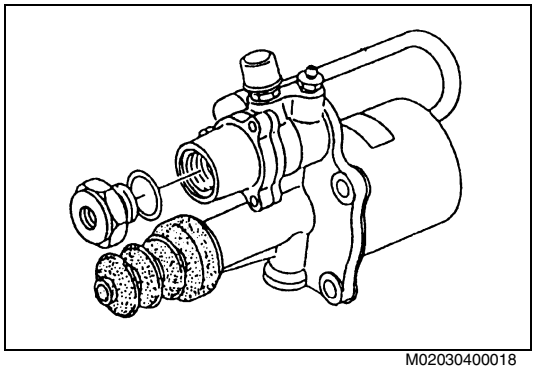

M02030400016

6. INSTALL THE PISTON ASSEMBLY TO THE CYLINDER.


M02030400017

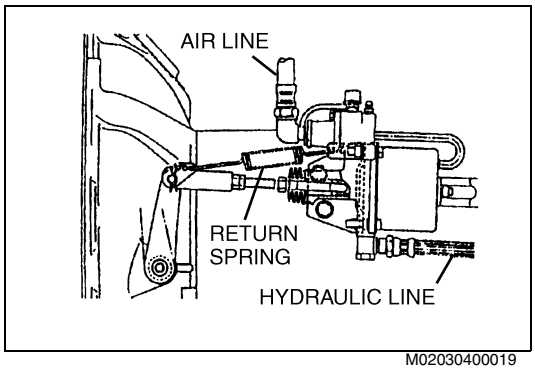
7. INSTALL THE RETURN SPRING, O-RING, POPPET VALVE BODY, POPPET VALVE AND CONICAL SPRING.

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.



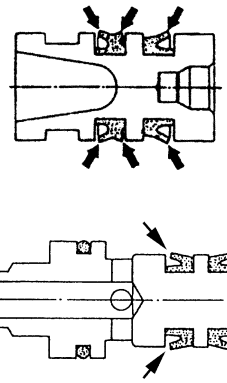
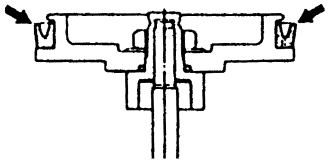
M02030400019

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)

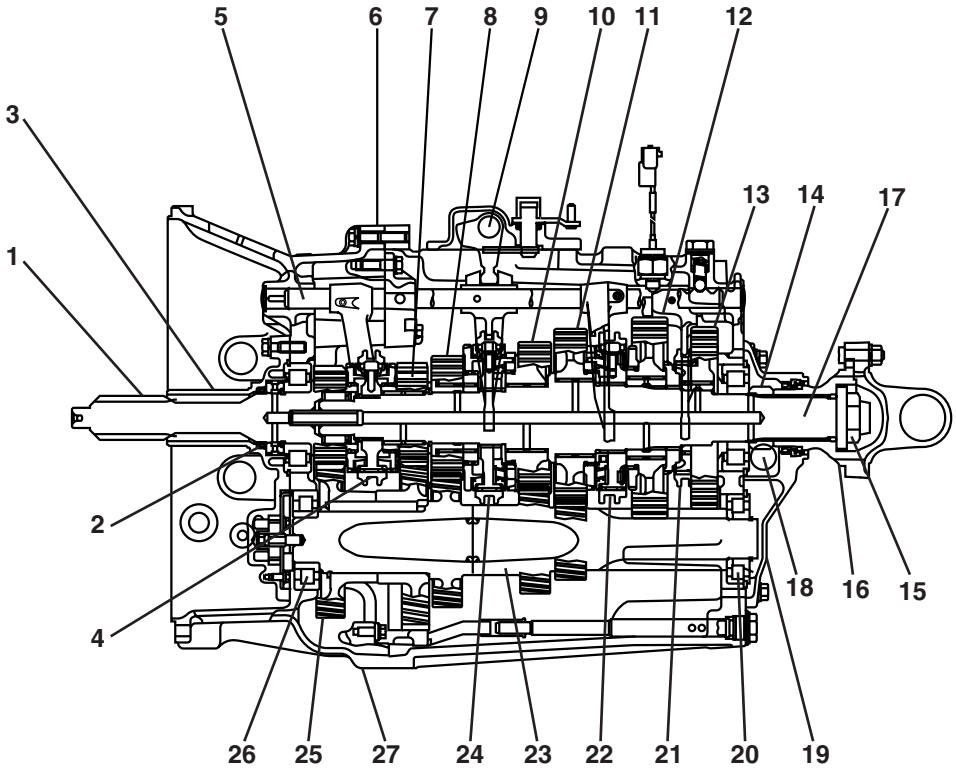
DATA AND SPECIFICATIONS

M03020106BEI2003

Type	Six forward speeds, one reverse 2, 3, 4, 5, 6th Synchromesh, 1st and Reverse, Constant mesh
Gear ratios:	1st ····· 6.515 2nd ····· 4.122 3rd ····· 2.500 4th ····· 1.718 5th ····· 1.261 6th ····· 1.000 Reverse ····· 6.060
Number of teeth: input shaft	24
Number of teeth: counter shaft	Counter drive gear ····· 40 1st gear ····· 11 2nd gear ····· 19 3rd gear ····· 26 4th gear ····· 32 5th gear ····· 37 6th gear ····· - Reverse gear ····· 11
Number of teeth: output shaft	1st gear ····· 43 2nd gear ····· 47 3rd gear ····· 39 4th gear ····· 33 5th gear ····· 28 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)
Viscosity, between-12 and 32°C {10 and 90°F}	SAE90
Viscosity, above 32°C {90°F}	SAE140

DESCRIPTION

M03020106BEC1002



M03020100107

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.

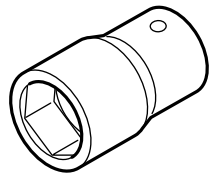
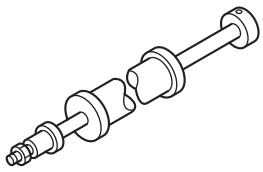
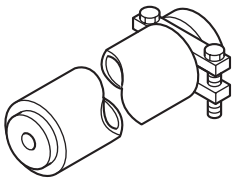
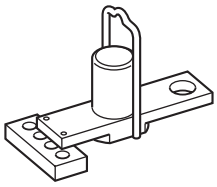
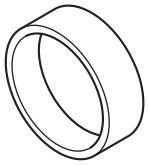
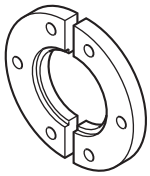
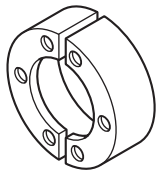
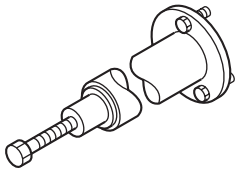
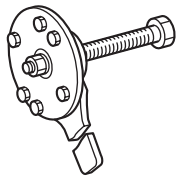
Illustration	Part number	Tool name	Remarks
	09839-4601	SOCKET WRENCH	
	09420-1442	SLIDING HAMMER	
	09650-2070	INPUT SHAFT PULLER	
	09630-2220	SHAFT HANGER	
	09699-1370	GUIDE	
	09653-1710	HOOK	

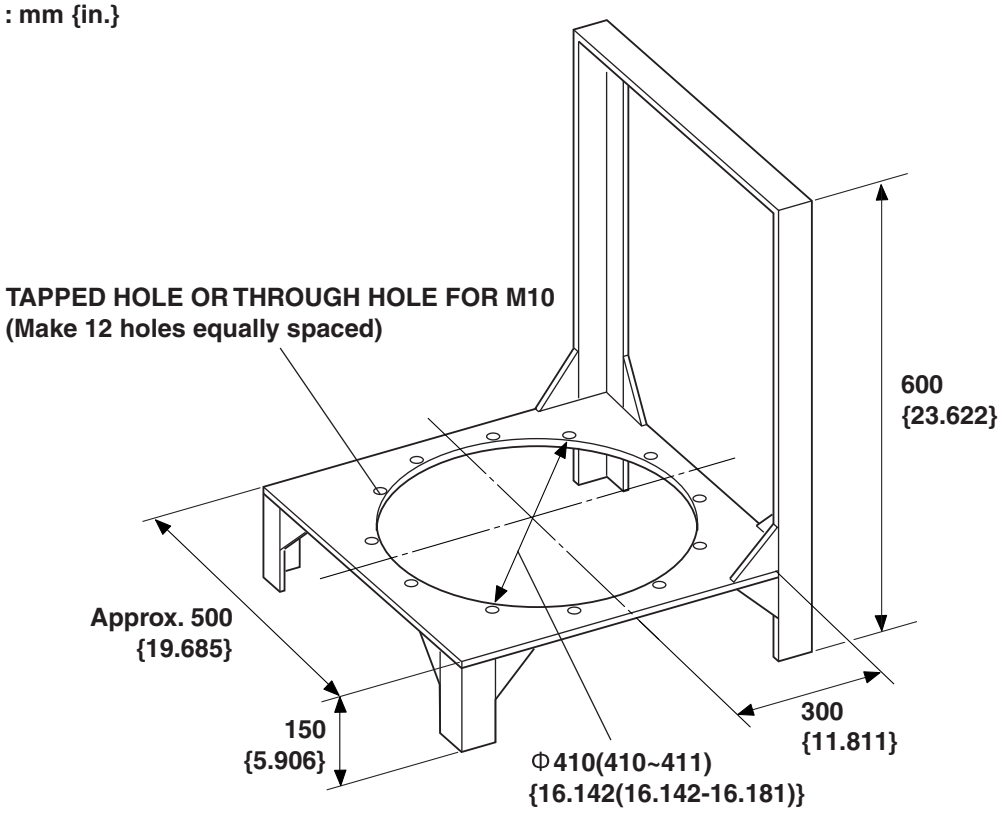
Illustration	Part number	Tool name	Remarks
	09653-1720 09653-1730 09653-1740	HOOK	
	09650-1881	PULLER	
	09650-2080	PULLER	

PROPOSAL TOOL (TRANSMISSION CASE ASSEMBLY)

M03020106BEK1003

TRANSMISSION WORKSTAND

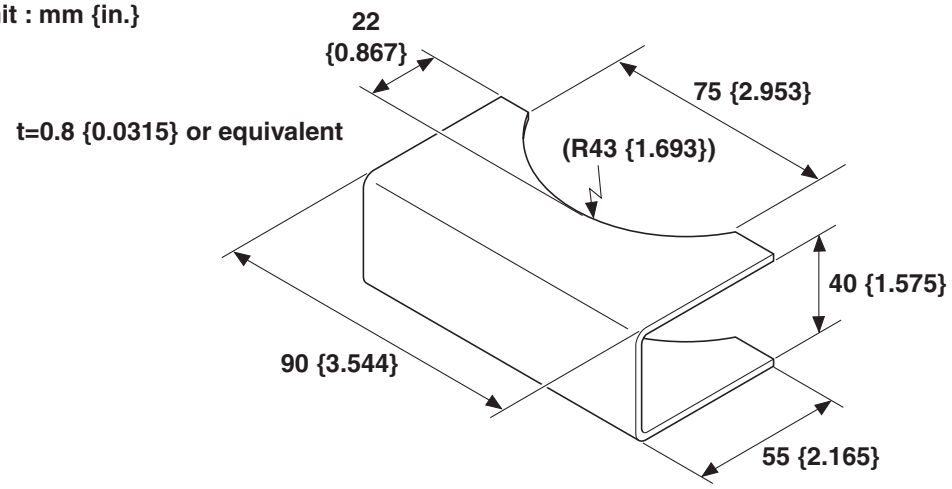
Unit : mm {in.}



M03020100004

JIG FOR PREVENTING DETACHMENT

Unit : mm {in.}



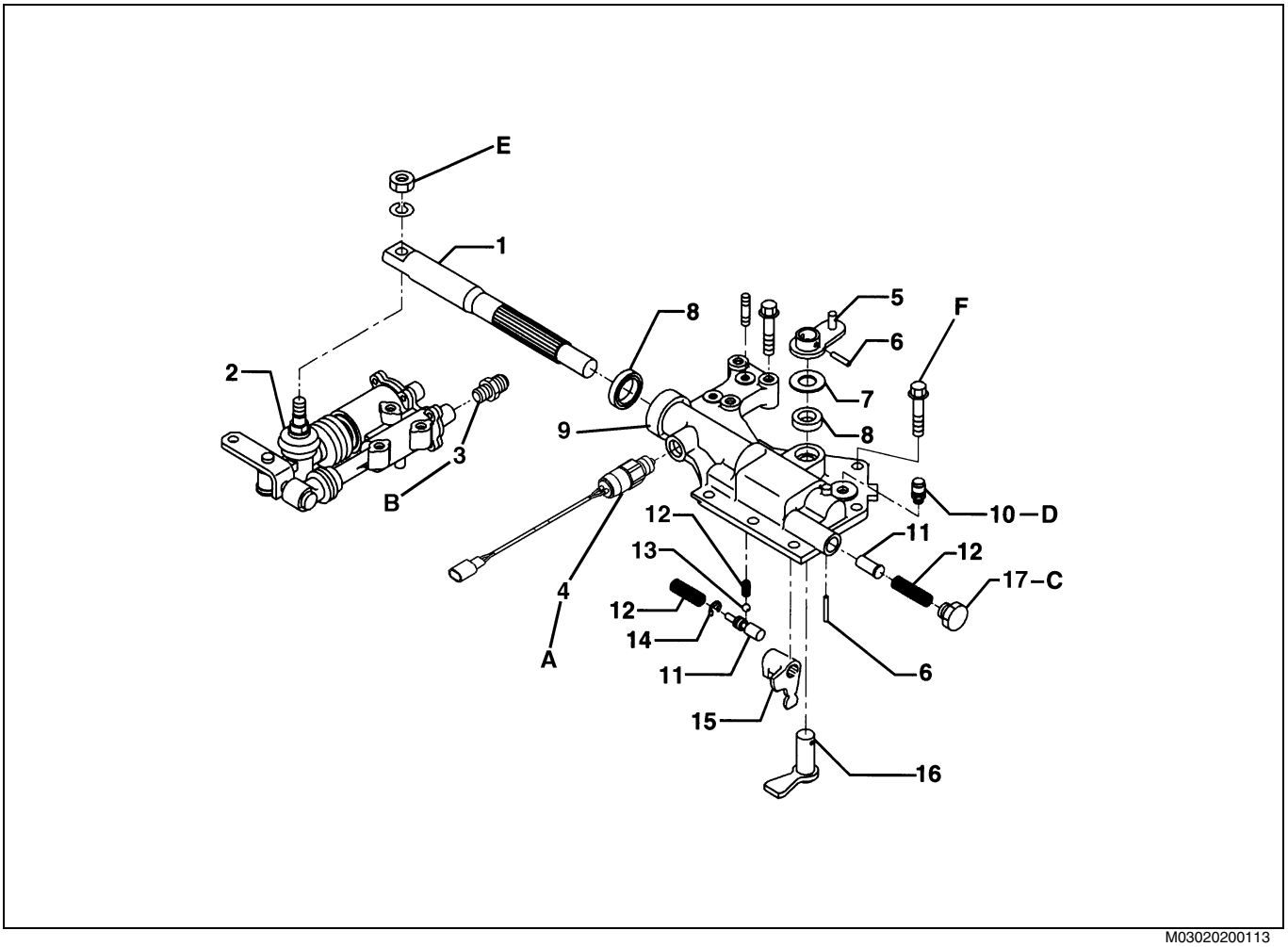
M03020100005

GEAR SHIFT HOUSING (LX06S)

COMPONENT LOCATOR

M03020206BED1005

WITH POWER SHIFT

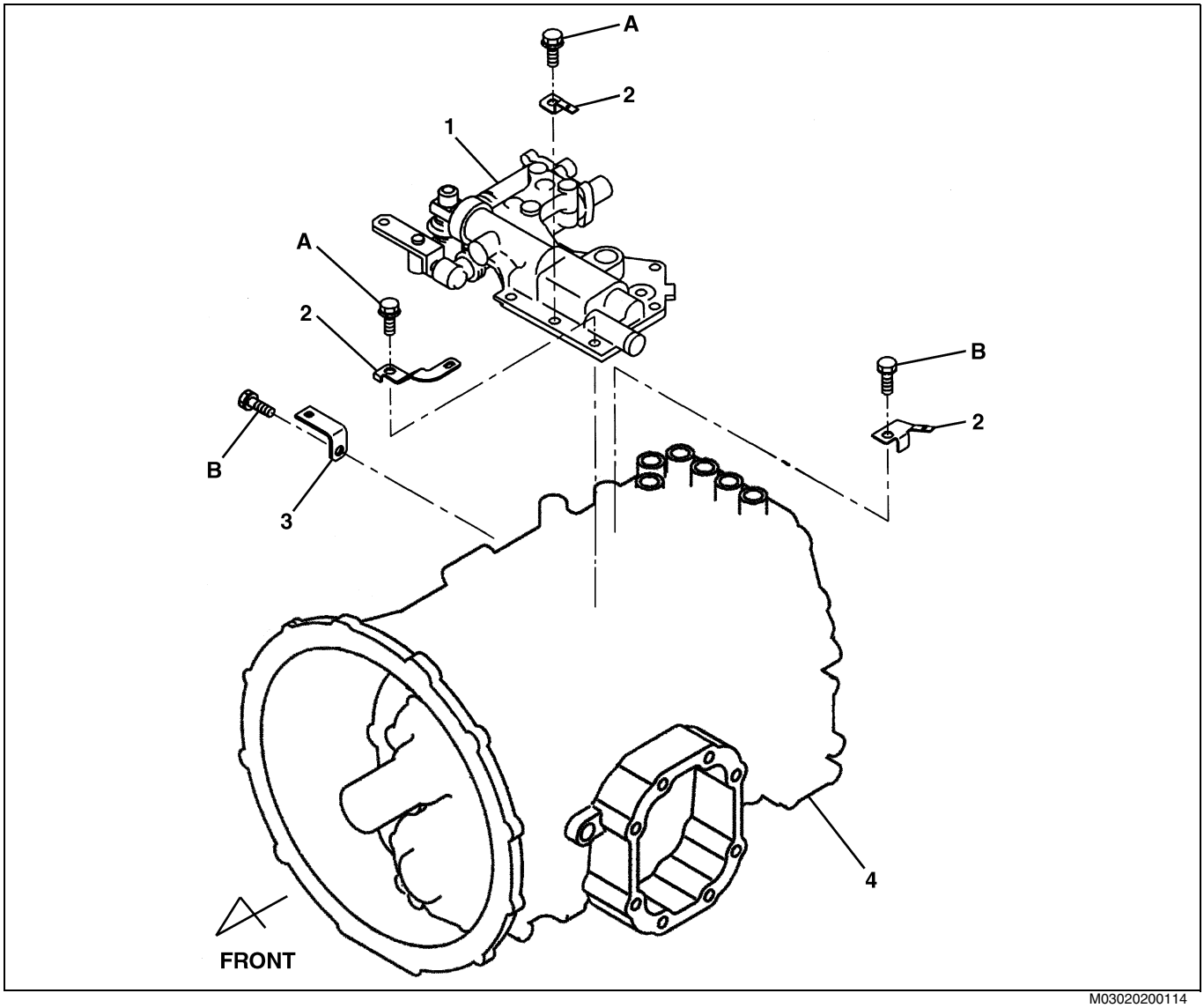


M03020200113

1	Shift lever shaft	10	Air breather
2	Power shift assembly	11	Lockout plunger
3	Pipe joint	12	Compression spring
4	Neutral 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	Plug
9	Shift lever shaft housing		

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

A	34-38 {350-387,26-28}	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, 33-40}



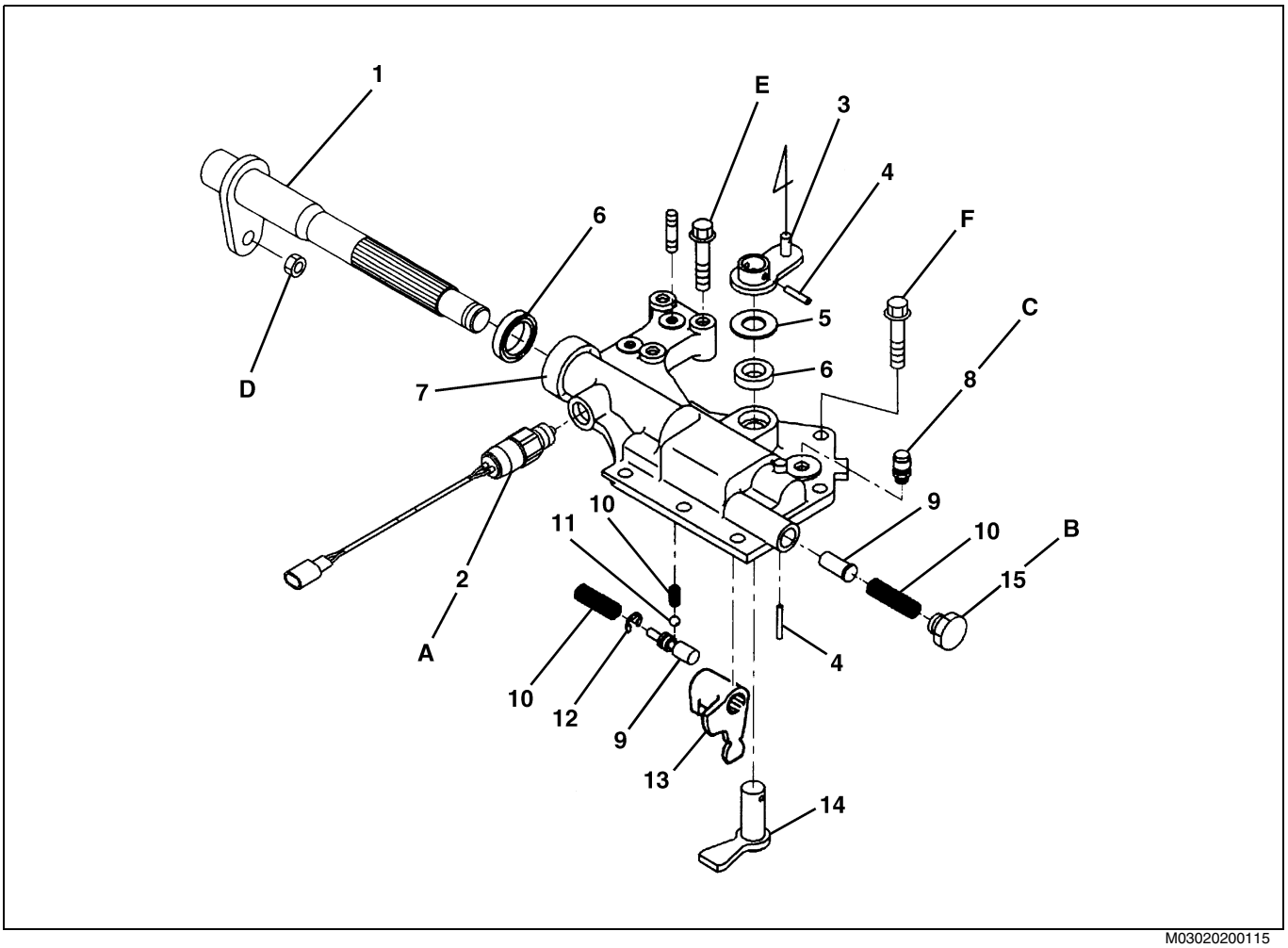
M03020200114

1	Shift lever shaft housing assembly	3	Clip holder
2	Bracket	4	Transmission case assembly

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

A	43.5-54.5 {444-555, 33-40}	B	37.5-48.5 {383-494, 28-35}

WITHOUT POWER SHIFT

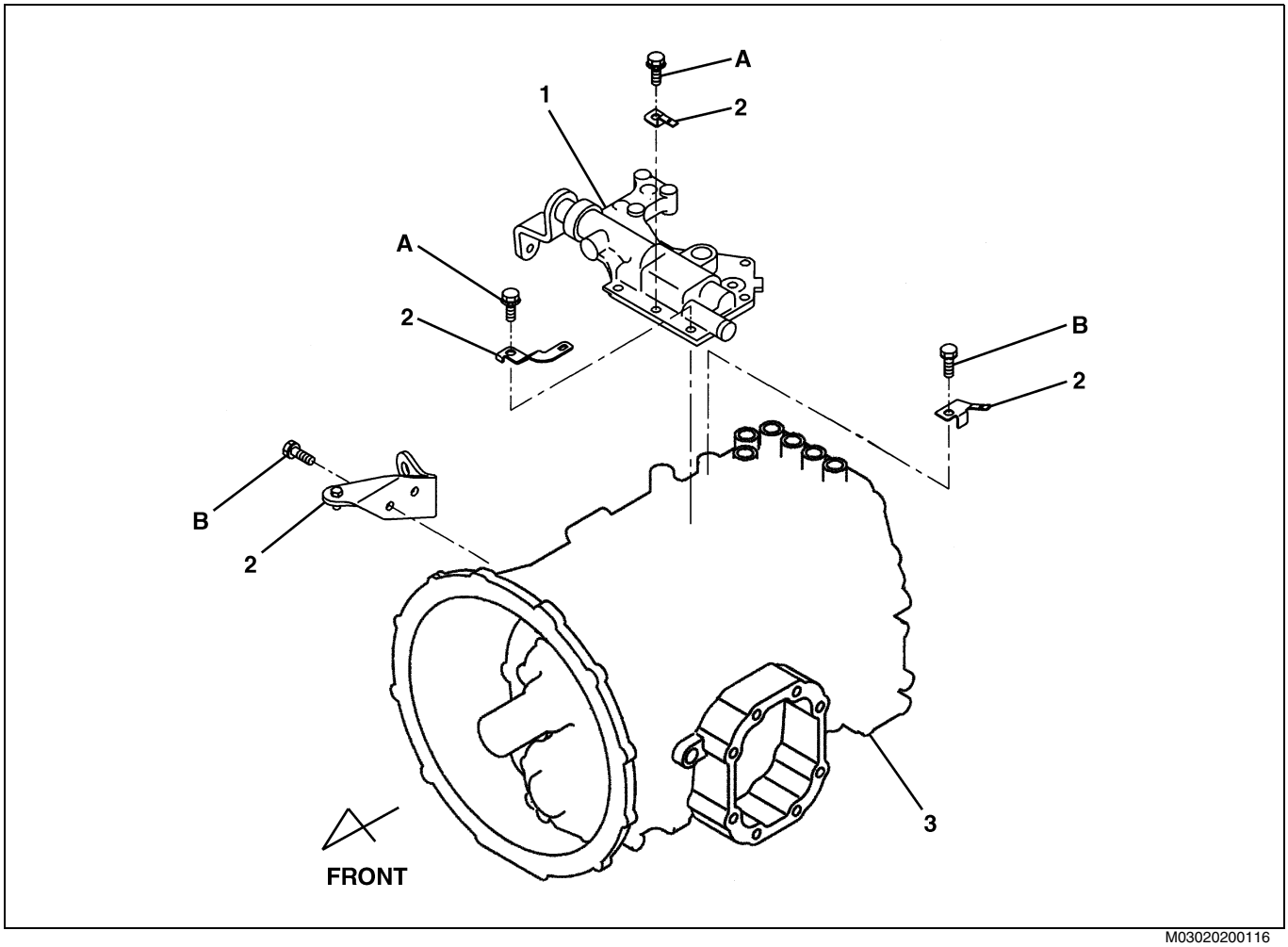


M03020200115

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

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

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



M03020200116

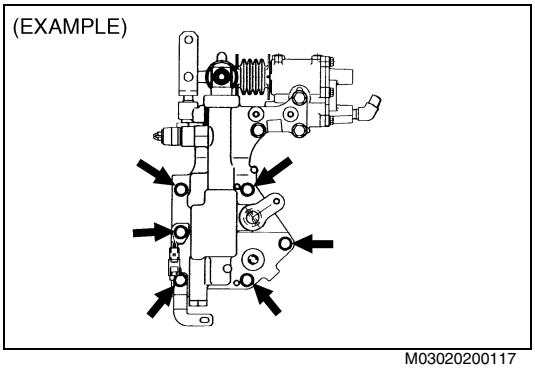
1	Shift lever shaft housing assembly	3	Transmission case assembly
2	Bracket		

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

A	43.5-54.5 {444-555, 33-40}	B	37.5-48.5 {383-494, 28-35}

OVERHAUL

M03020206BEH2002



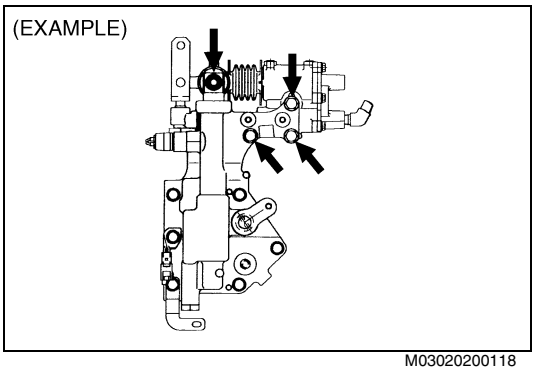
M03020200117

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE SHIFT LEVER HOUSING.

(1) Take off the liquid gasket adhered to the contact surface using a scraper.
(2) Loosen the bolt and remove the shift lever housing.

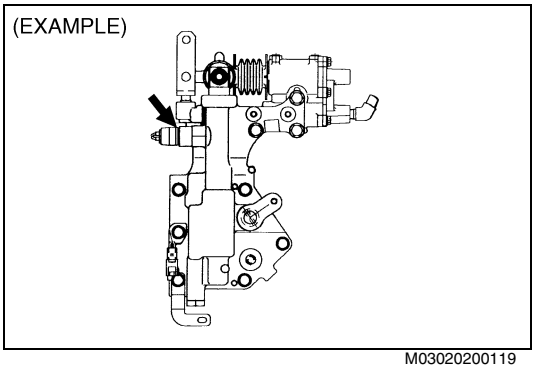
NOTICE:
Be careful not to damage the contact surface.



M03020200118

2. REMOVE THE POWER SHIFT (IF SO EQUIPPED).

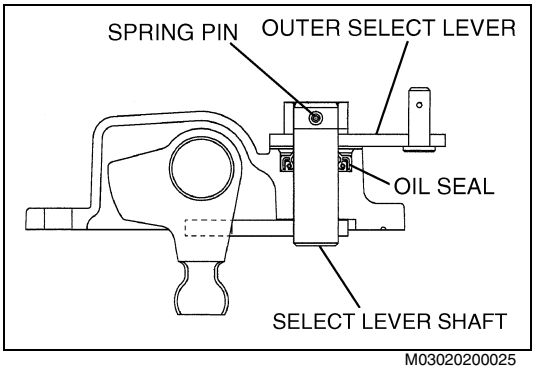
(1) Remove the power shift.



M03020200119

3. REMOVE THE NEUTRAL SWITCH.

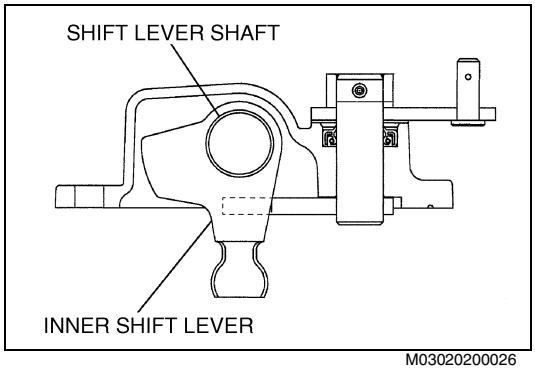
(1) Remove the neutral switch from the shift lever housing.



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.

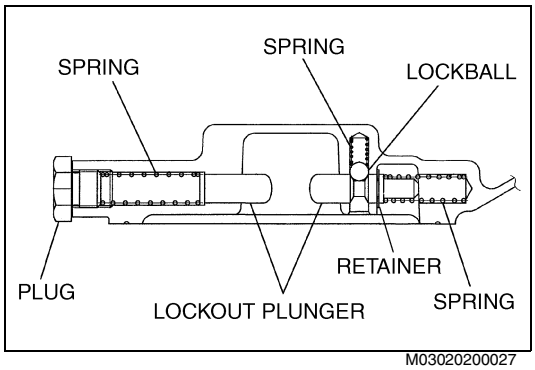


M03020200026

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.



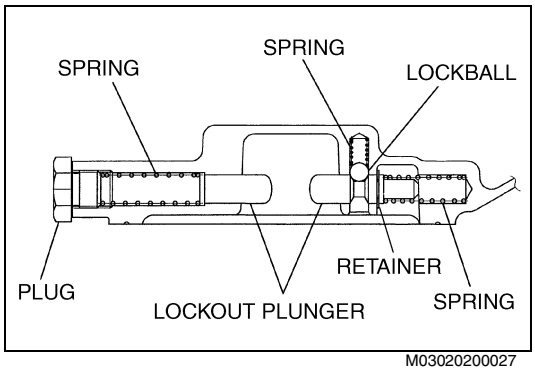
M03020200027

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



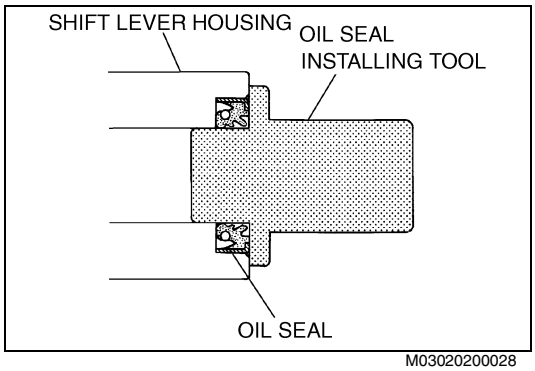
M03020200027

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.



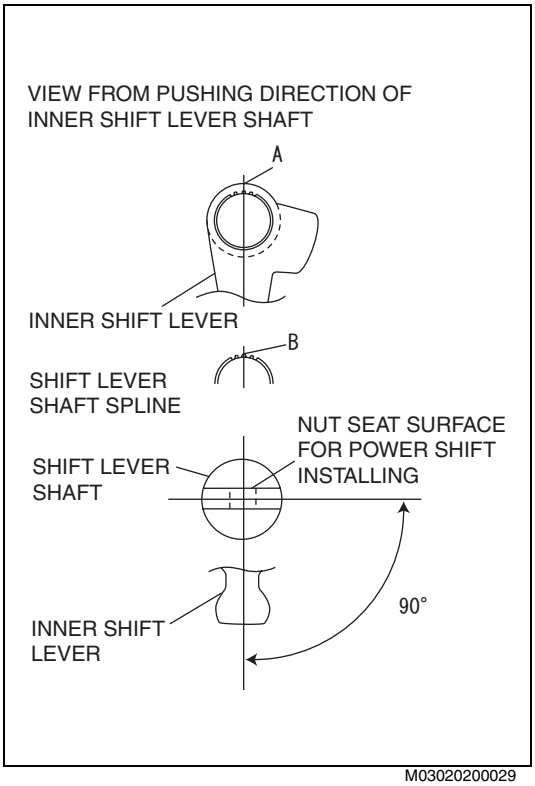
M03020200028

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.

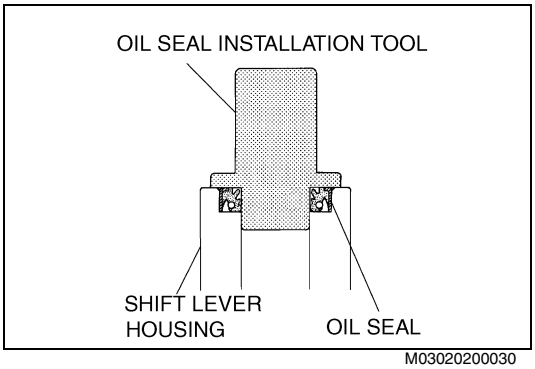
NOTICE:
Be careful not to damage the lip part of the oil seal.

(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.)



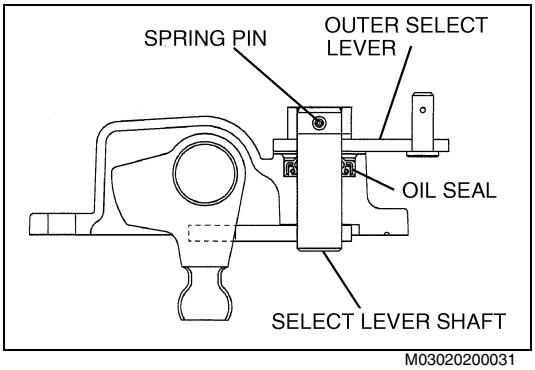
M03020200030

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.

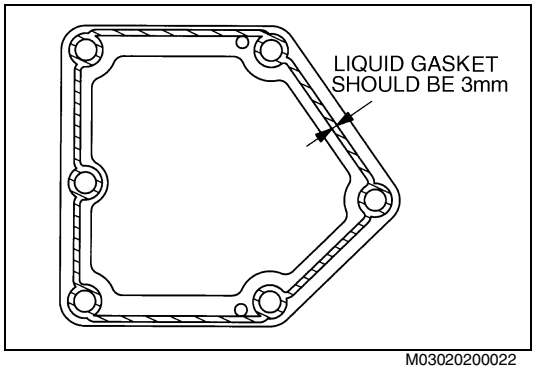
(2) Apply bearing grease to the lip part of the oil seal and shaft part of the select lever shaft.



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

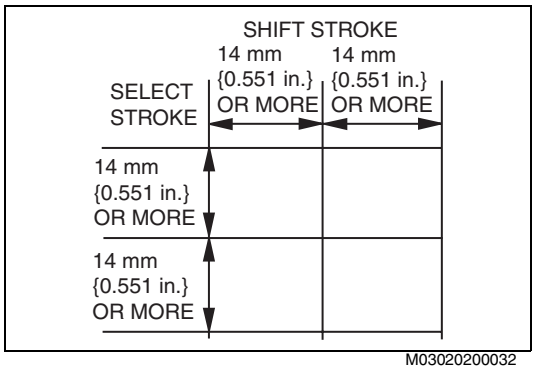
4. INSTALL THE SHIFT LEVER HOUSING

(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.

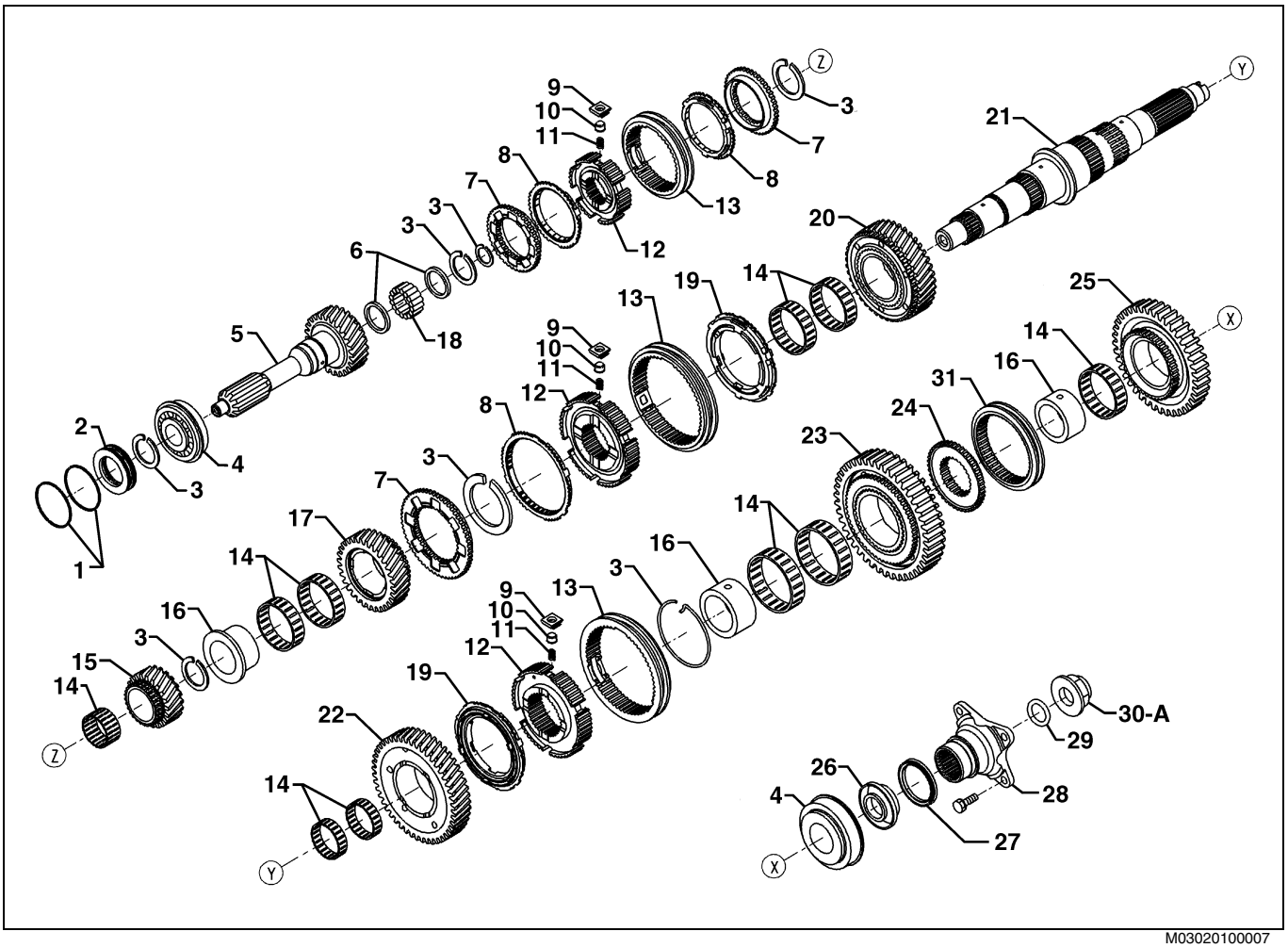
(1) Fit the scale to the inner shift lever and measure the shift stroke and select stroke of the inner shift lever.

	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

M03020506BED1002

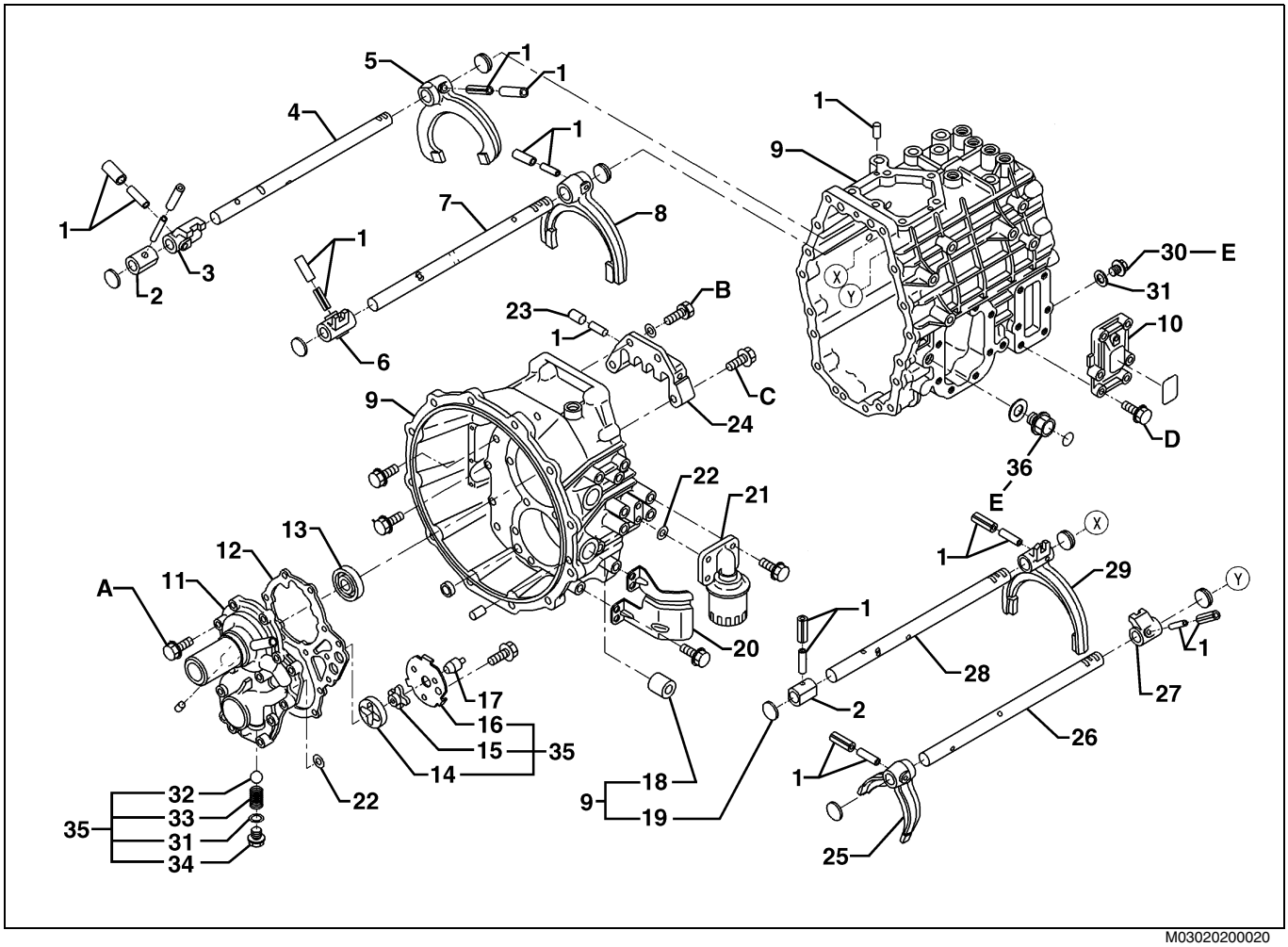


M03020100007

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}	

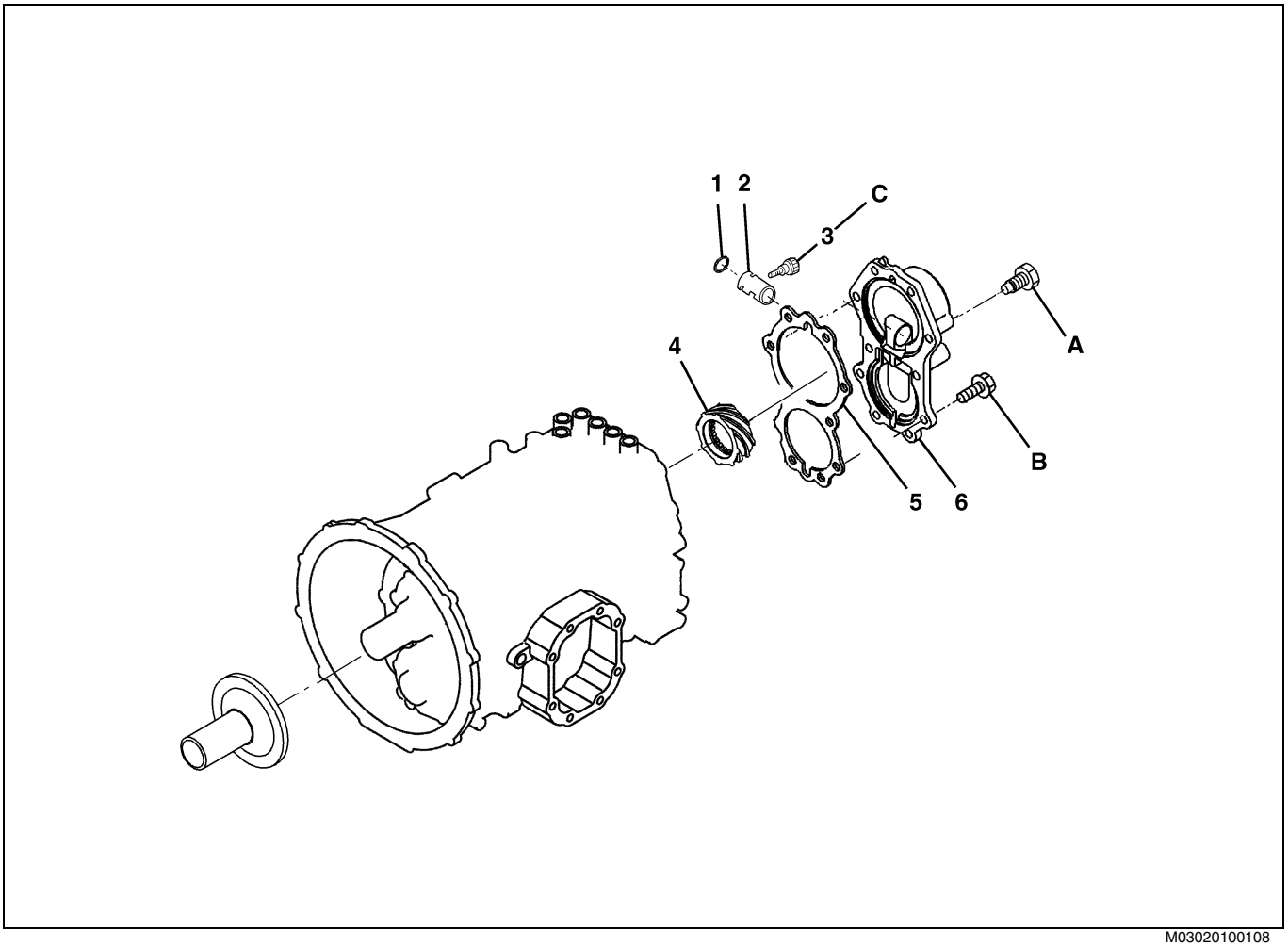


M03020200020

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}		

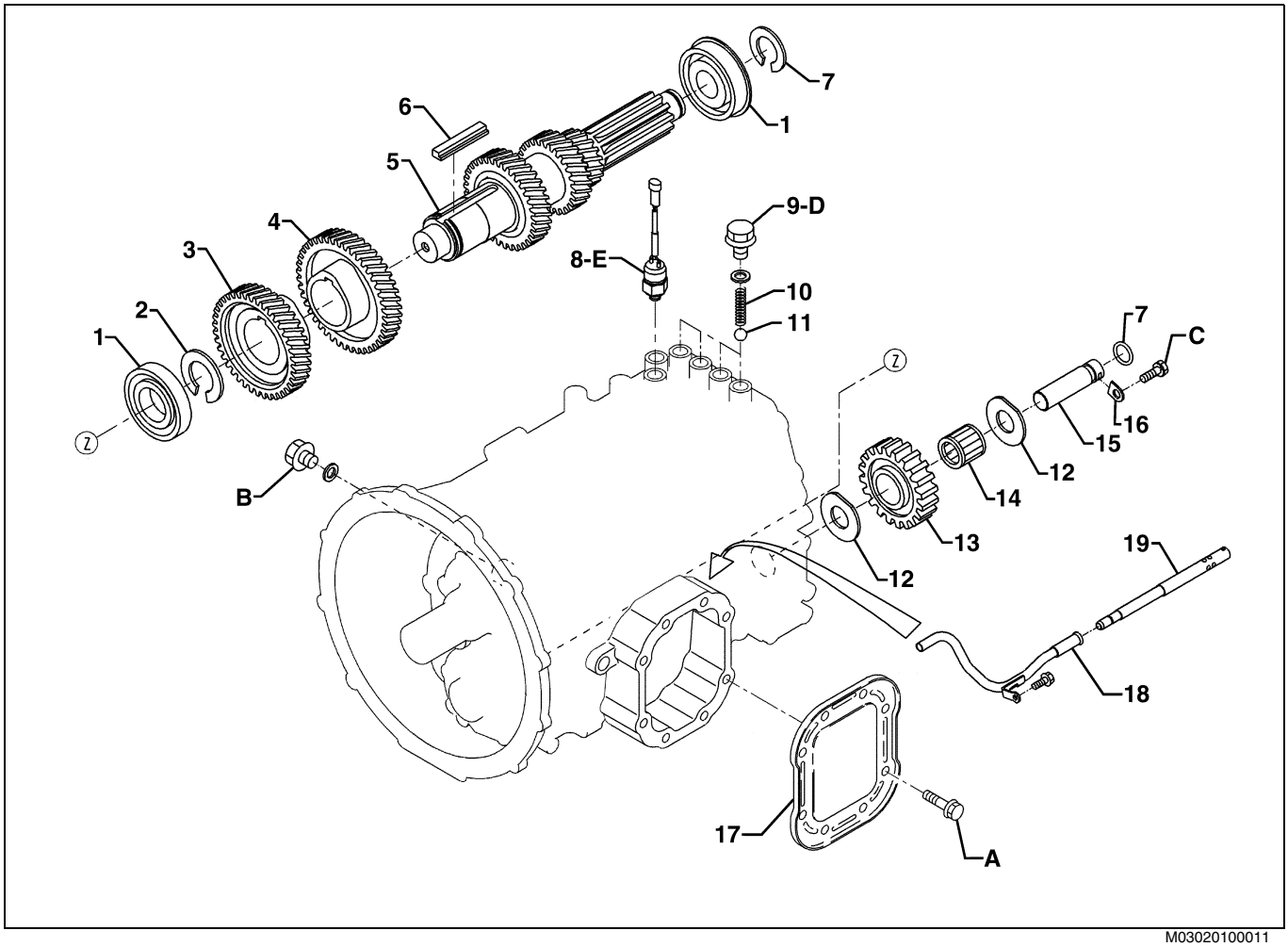


M03020100108

1	O-ring	4	Speedometer drive gear
2	Speedometer gear bushing	5	Gasket
3	Set screw	6	Rear bearing retainer assembly

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

A	54-68 {550-700, 40-50}	C	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 take-off: 19.5-30.5 {199-311, 15-22}	C	19-25 {194-254, 15-18}
	With power take-off: 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)

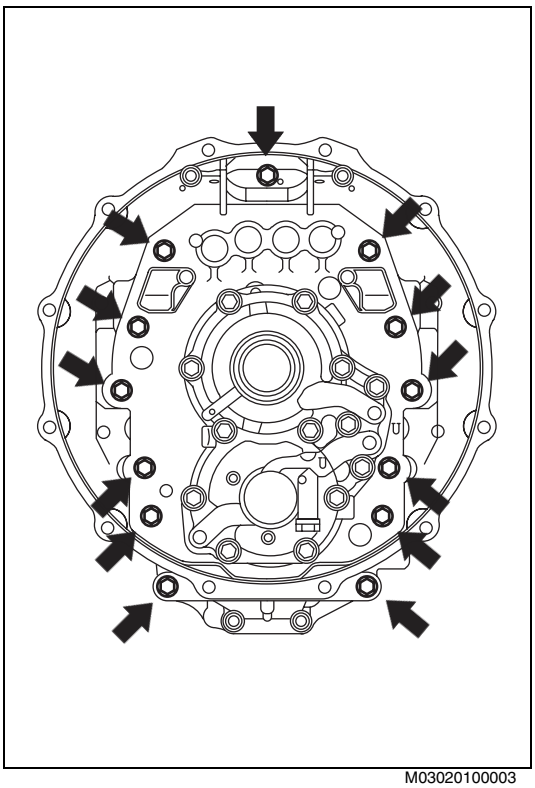
OVERHAUL

M03020606BEH2002

IMPORTANT POINTS - DISMOUNTING

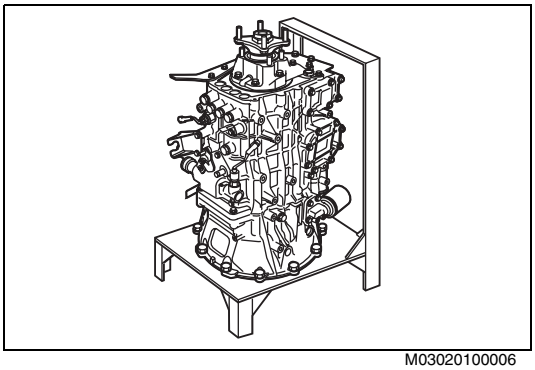
CAUTION:
Do not work on the transmission while it is still hot. This can result in personal injury.

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 TRANSMISSION CONTROL.**
6. **REMOVE THE CLUTCH CONTROL.**
7. **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.



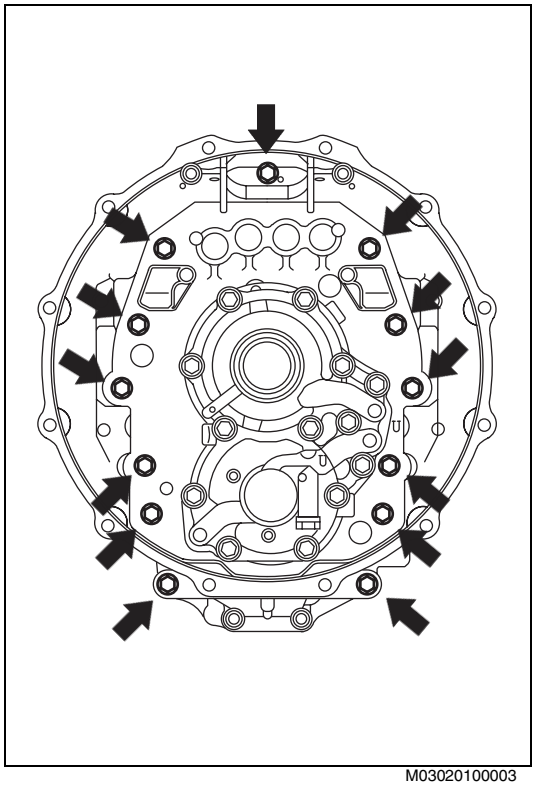
M03020100006

8. **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.

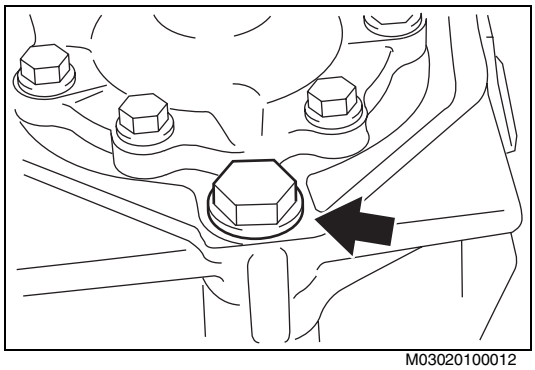
2. INSTALL THE CLUTCH CONTROL.

3. CONNECT THE TRANSMISSION CONTROL.

4. CONNECT THE ELECTRIC HARNESS AND OTHER ATTACHMENTS

5. CONNECT THE PROPELLER SHAFT.

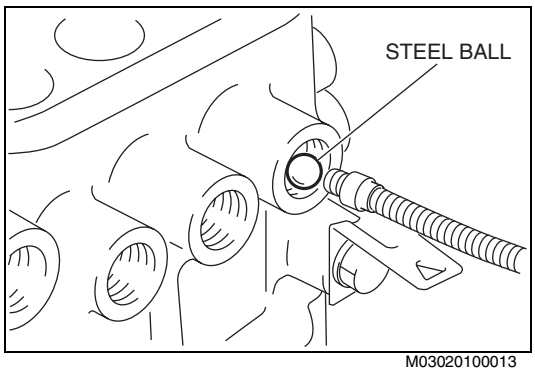
6. FILL THE TRANSMISSION WITH GEAR OIL UP TO THE FILLER PLUG HOLE.


M03020100012

IMPORTANT POINTS - DISASSEMBLY

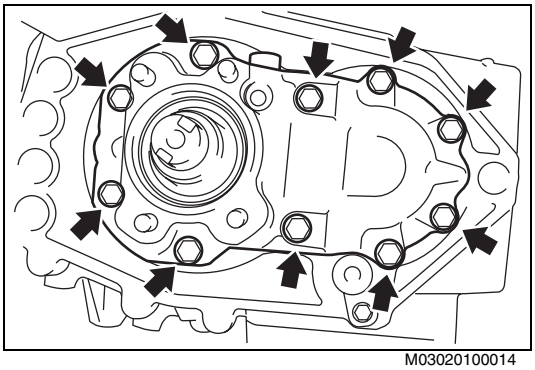
1. REMOVE THE PARKING BRAKE AND FLANGE COUPLING.

2. REMOVE THE OIL STRAINER.

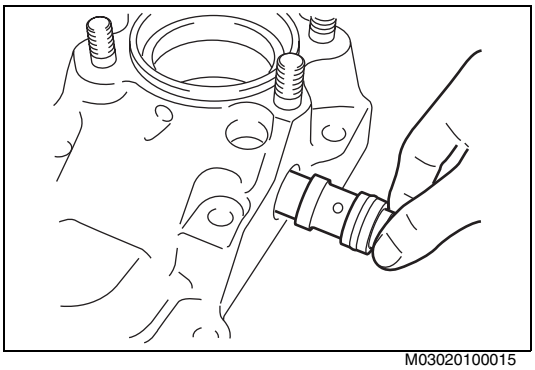


M03020100013

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

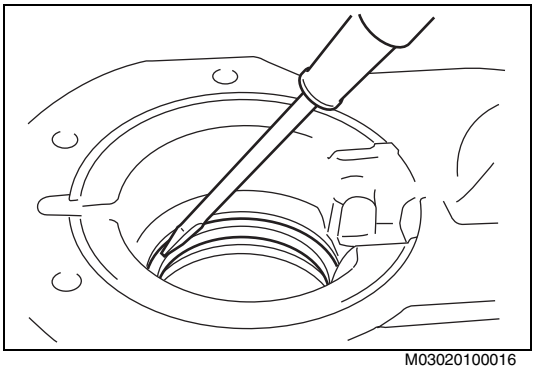
5. DISASSEMBLE THE REAR BEARING RETAINER ASSEMBLY.

(1) Remove the speedometer gear bushing.

a. Remove the set screw and remove the speedometer gear bushing.

b. Remove the O-ring from the speedometer gear bushing.

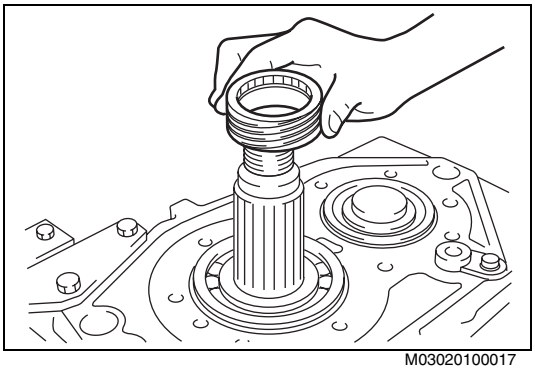
NOTICE:
Remember the position of aligning marks when removing the speedometer gear bushing.


M03020100016

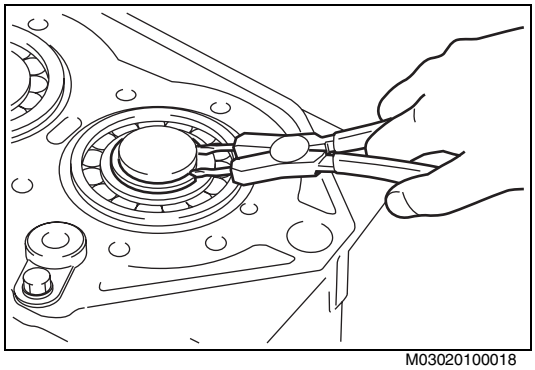
(2) Remove the oil seal.

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

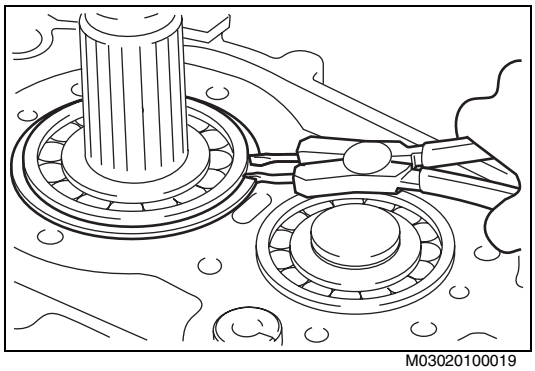
7. REMOVE THE TRANSMISSION CASE ASSEMBLY.

(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.

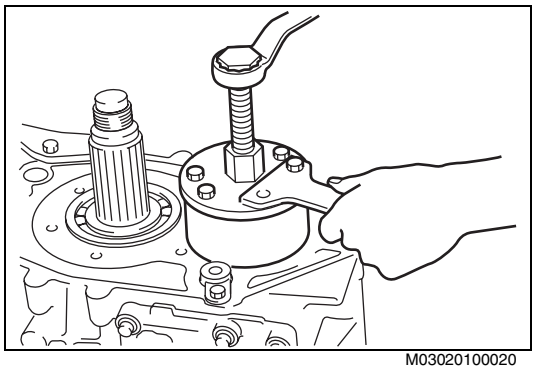
(2) Using a snap ring expander, remove the retainer ring from the rear bearing on the counter shaft side.

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


M03020100019

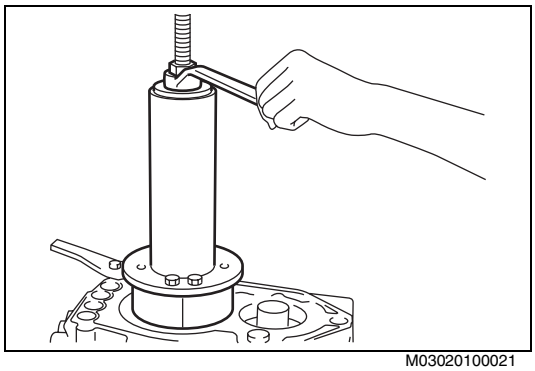
(3) Using a snap ring expander, remove the retainer ring from the rear bearing on the output shaft side.

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


M03020100020

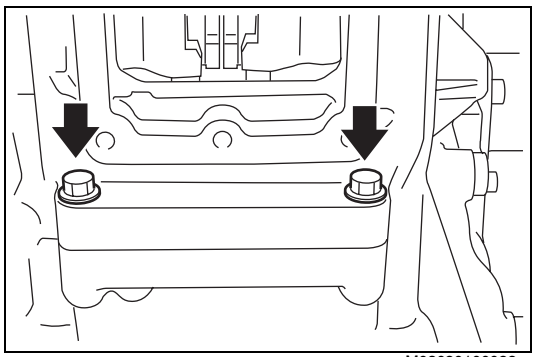
(4) Install the special tool to the groove of the rear bearing outer periphery on the counter shaft side.
SST:
Hook (09653-1730)
Puller (09650-2080)

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


M03020100021

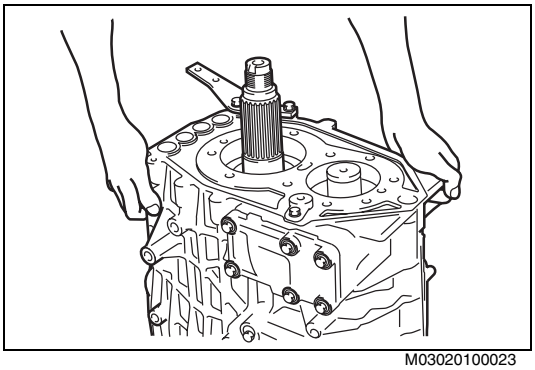
(7) Install the special tool to the groove of the rear bearing outer periphery on the output shaft side.
SST:
Hook (09653-1720)
Puller (09650-1881)

(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.

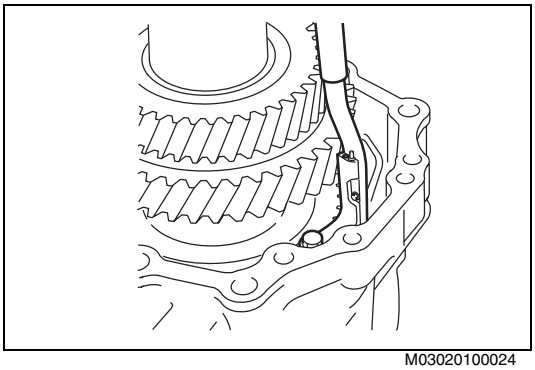
(11) Insert a chisel between lip parts of right and left side connected on the transmission case, and tap the chisel using a hammer to separate clutch housing and transmission case.


M03020100023

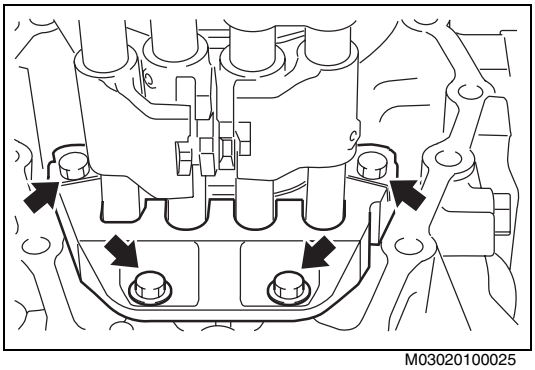
(12) Lift the transmission case assembly straight to remove it.

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

NOTICE:
Be careful not to damage the contact surface.


M03020100024

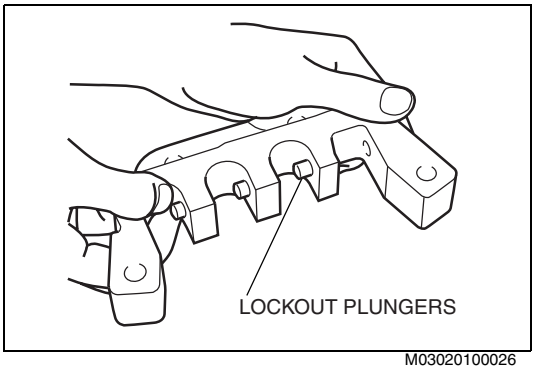
8. REMOVE THE OIL PIPE.


M03020100025

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

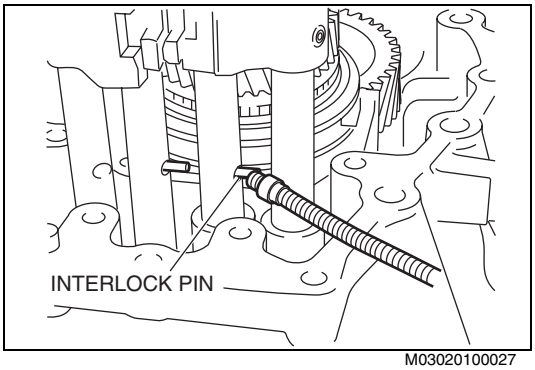
(1) Loosen the 4 bolts to remove the control lever stopper.

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



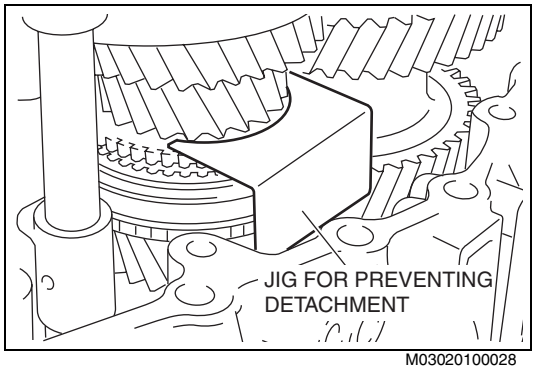
M03020100026

(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.

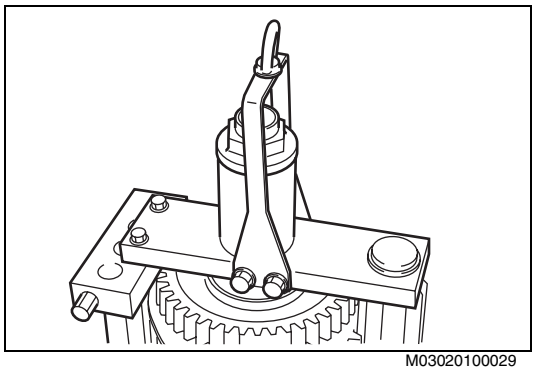


M03020100028

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.

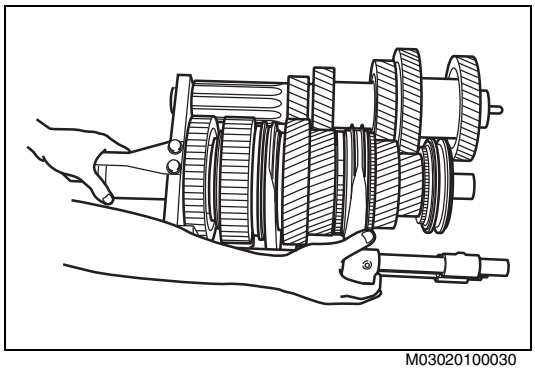

M03020100029

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

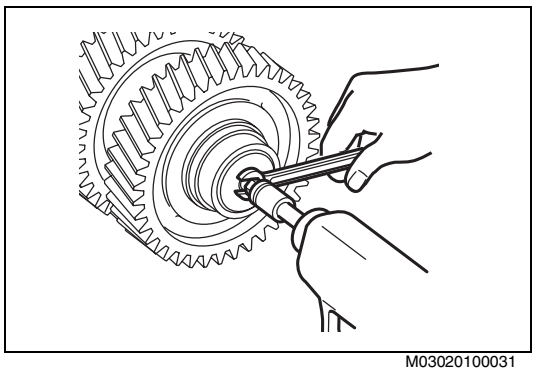
HINT:
The retainer ring and the lock nut removed previously should be reused.

(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.**

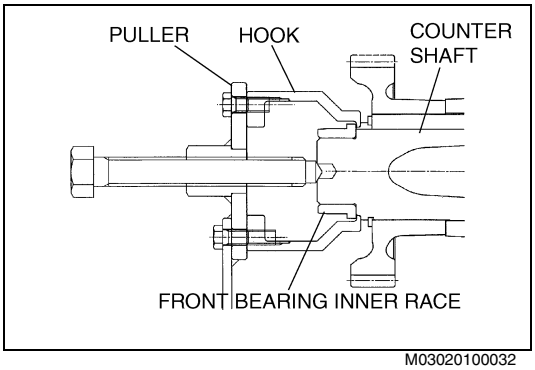

M03020100030

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


M03020100031

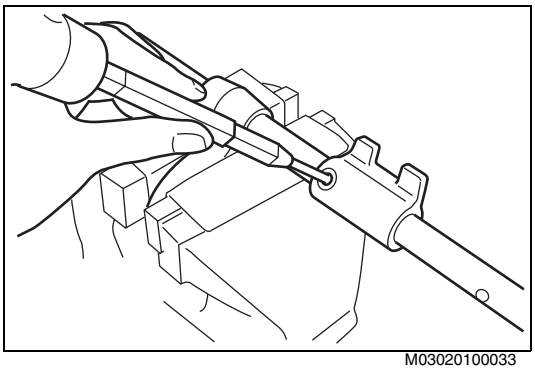
11. REMOVE THE COUNTER SHAFT FRONT BEARING INNER RACE.

(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.

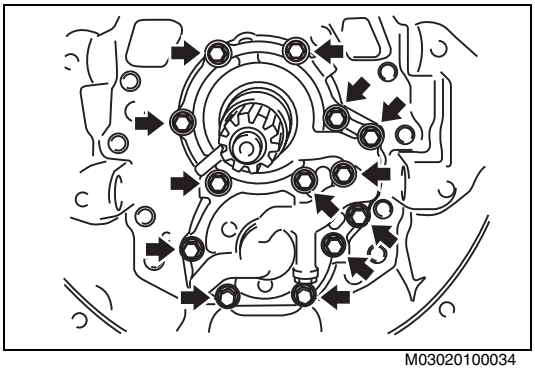


M03020100032

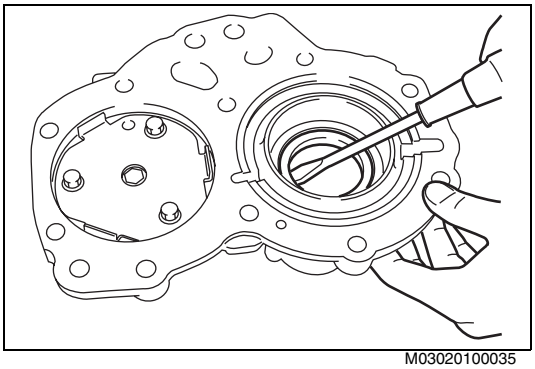
(2) Using the special tool, pull out the front bearing inner race from the counter shaft.
SST:
Hook (09653-1740)
Puller (09650-2080)


M03020100033

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.

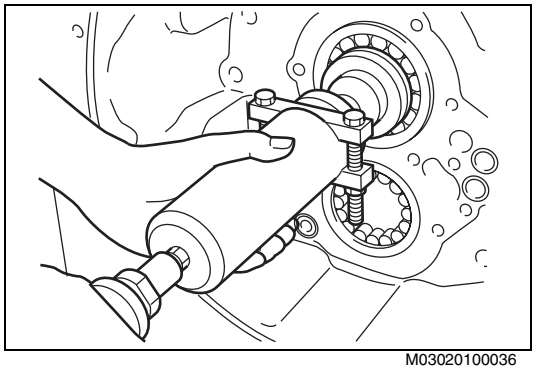

M03020100034

13. REMOVE THE FRONT BEARING RETAINER ASSEMBLY.


M03020100035

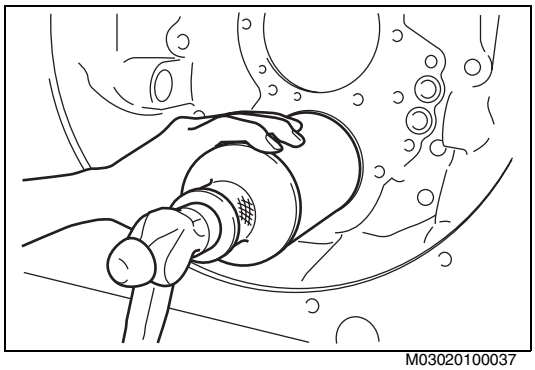
14. DISASSEMBLE THE FRONT BEARING RETAINER ASSEMBLY.
(1) Remove the oil seal.
a. Using a flat blade screwdriver, remove the oil seal from the front bearing retainer.

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


M03020100036

15. REMOVE THE INPUT SHAFT ASSEMBLY.

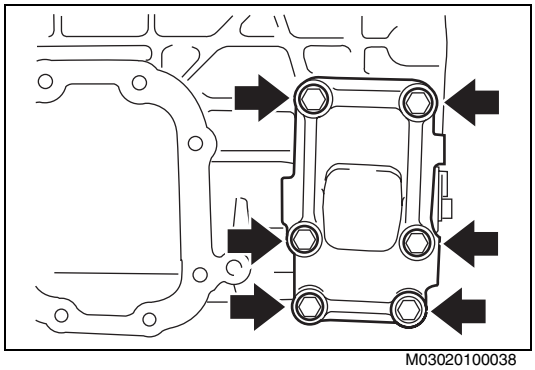
(1) Using the special tool, pull out the input shaft assembly from the clutch housing.
SST:
Sliding hammer (09420-1442)
Input shaft puller (09650-2070)


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

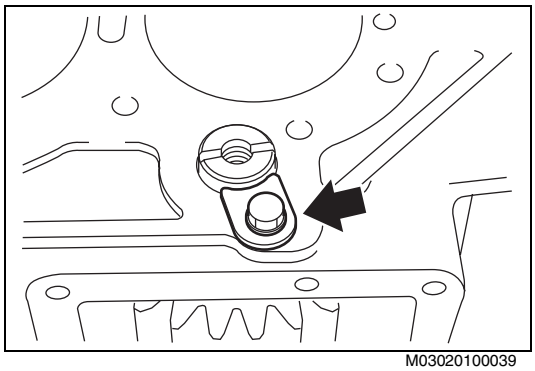
18. DISASSEMBLE THE TRANSMISSION CASE ASSEMBLY.

(1) Remove the idler cover.

a. Loosen the bolts to remove the idler cover.

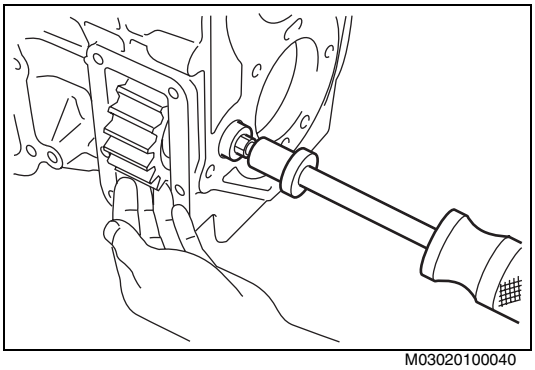
b. Take off the liquid gasket adhered to the contact surface using a scraper.

NOTICE:
Be careful not to damage the contact surface.

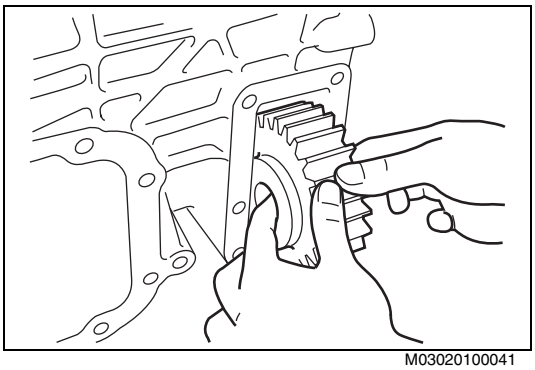

M03020100039

(2) Remove the reverse idler gear.

a. Loosen the bolt to remove the lock plate.


M03020100040

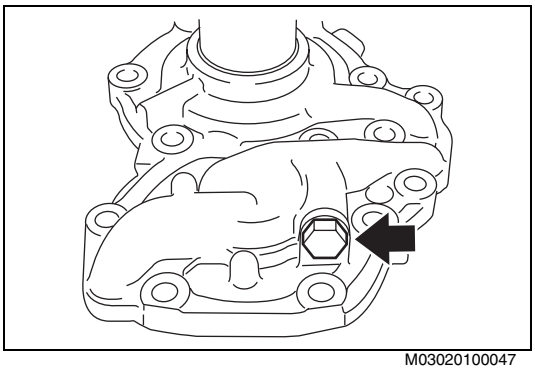
b. Using the special tool, pull out the reverse idler shaft.
SST: Sliding hammer (09420-1442)


M03020100041

c. Remove the O-ring from the reverse idler shaft.
d. Remove the needle roller bearing.

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.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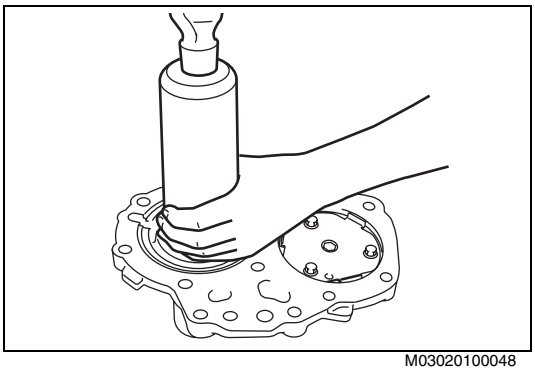
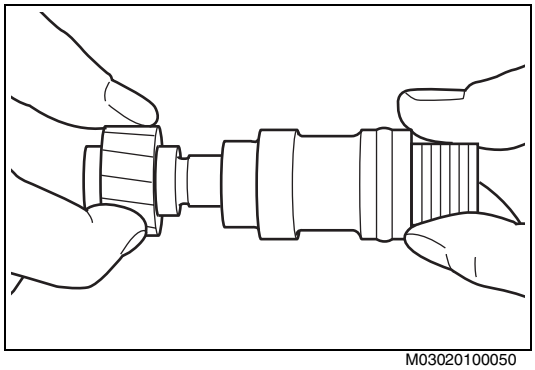

M03020100048

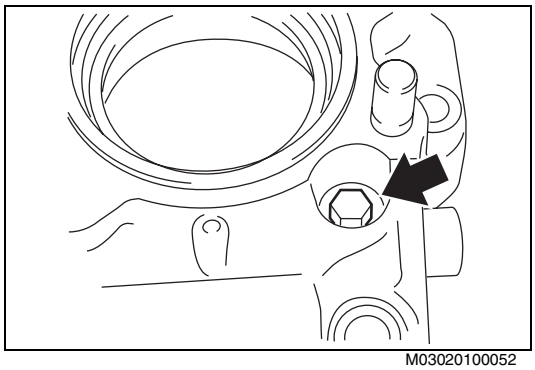
(2) Install the oil seal.
a. Apply chassis grease to a new oil seal lip part.
b. Using a receiving block and a hammer, drive the oil seal into the front bearing retainer.

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

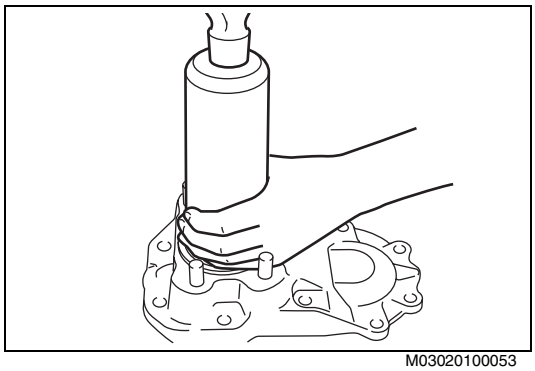

M03020100050

2. ASSEMBLE THE REAR BEARING RETAINER ASSEMBLY.

(1) Apply chassis grease to the speedometer gear bushing and insert it.


M03020100052

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


M03020100053

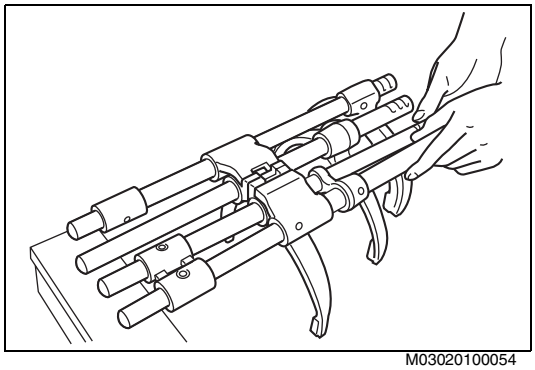
3. INSTALL THE OIL SEAL.

(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

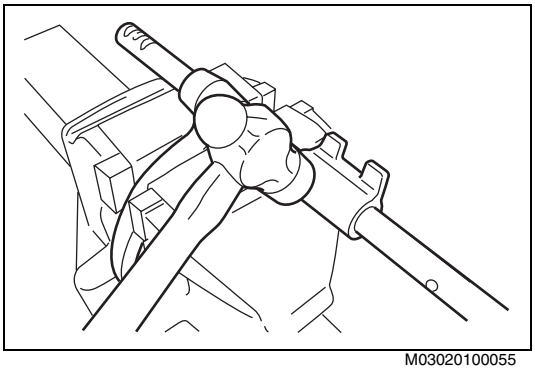
4. ASSEMBLE THE SHIFT SHAFT ASSEMBLY.

(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.



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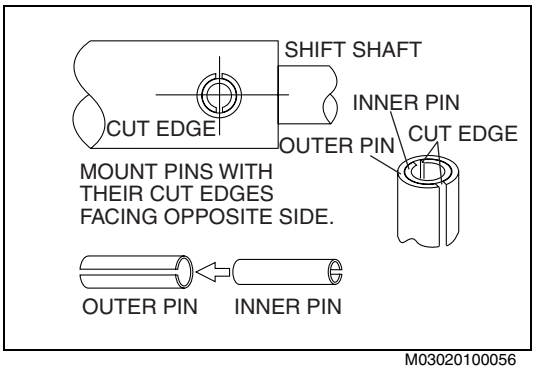
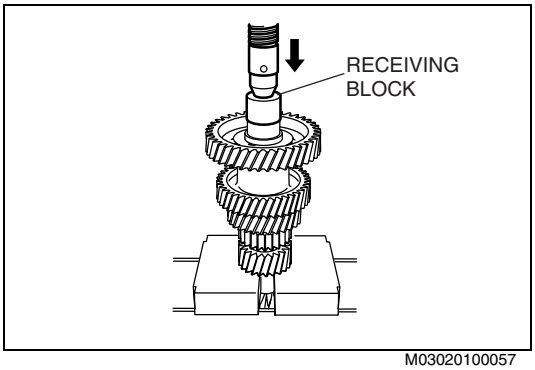
b. Using a hammer, drive a new inner pin and a new outer pin into the shift fork, shift head and spacer.



M03020100056

NOTICE:

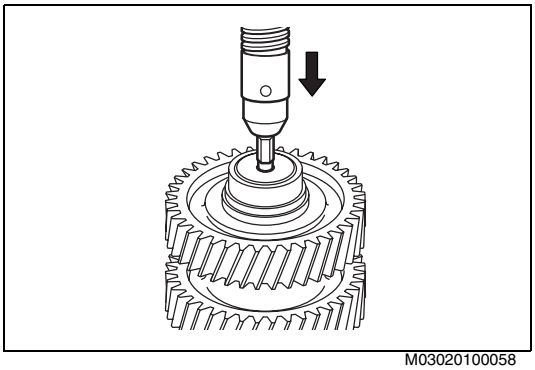
- **Mount the inner pin and outer pin with their cut edges facing opposite side to each other. Be sure that the cut edges of inner pin and outer pin are vertical to the shift shaft when knocking them into the shift fork and shift head.**
- **Knock home the inner pin and outer pin down to the knocking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



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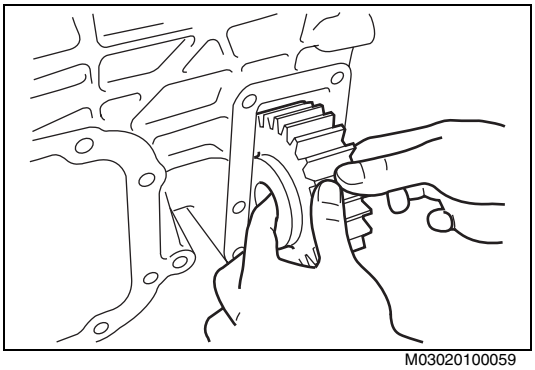
(2) Using a press, press the oil pump drive pin into the counter shaft.



M03020100059

6. ASSEMBLE THE TRANSMISSION CASE ASSEMBLY.

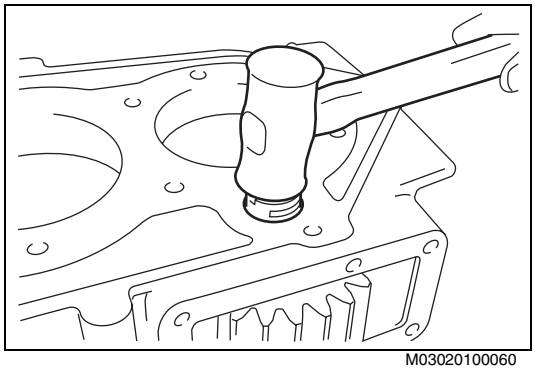
(1) Install the reverse idler gear.

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

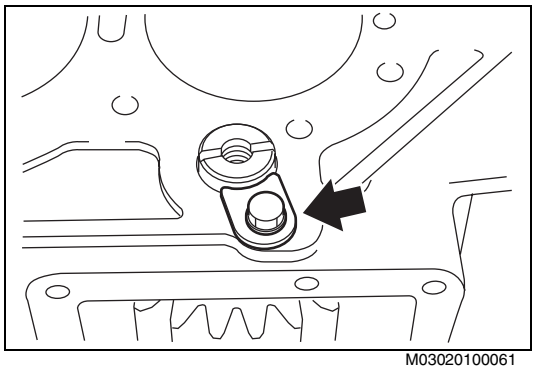
b. Assemble the reverse idler gear, needle roller bearing and thrust washer.

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

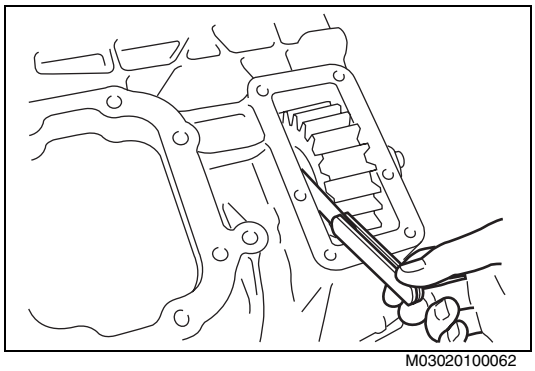
d. Match the reverse idler gear and thrust washer with the transmission case installing position.


M03020100060

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

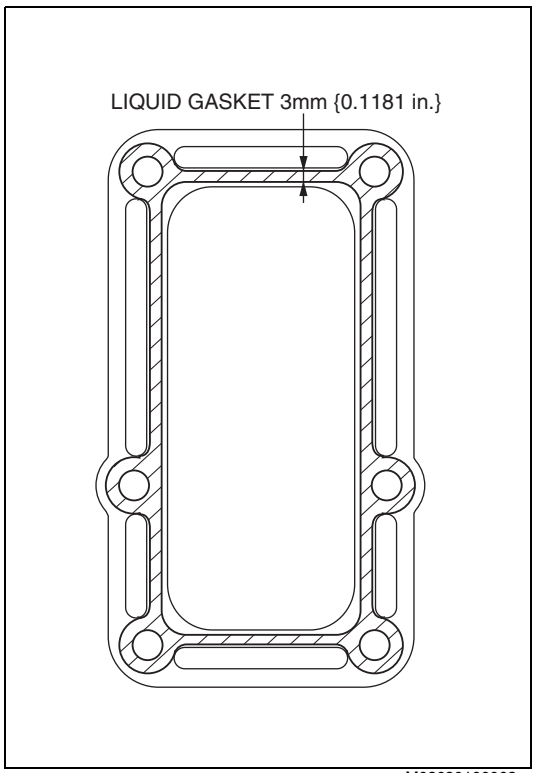

M03020100061

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.}



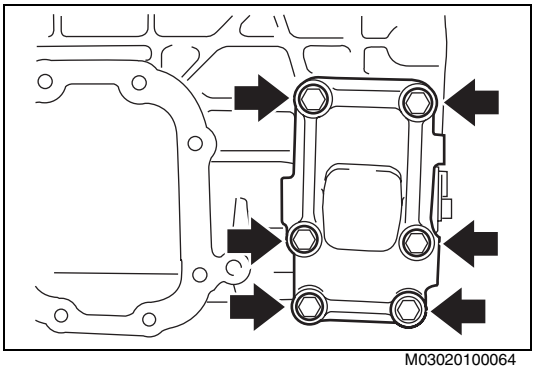
M03020100063

(3) Install the idler cover.

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

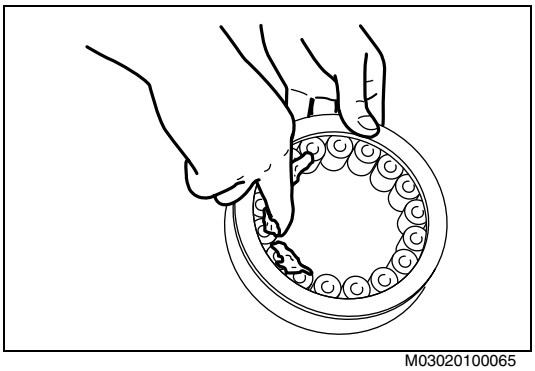
b. Coat the idler cover with liquid gasket (ThreeBond #1216 or equivalent) as shown in the figure.

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


M03020100064

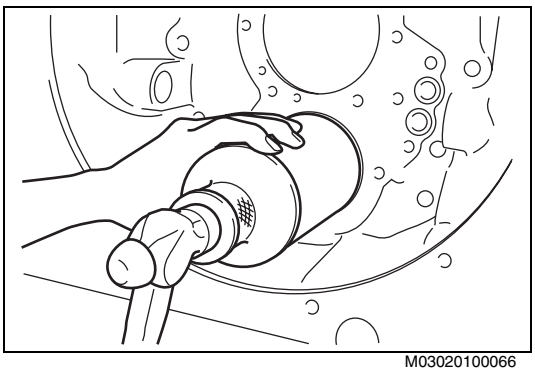
c. Install the idler cover to the transmission case with bolts.

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

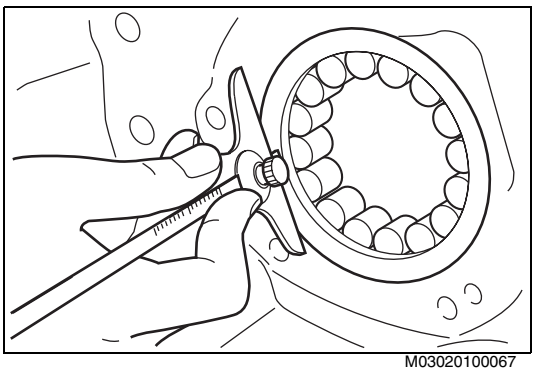

M03020100065

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

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

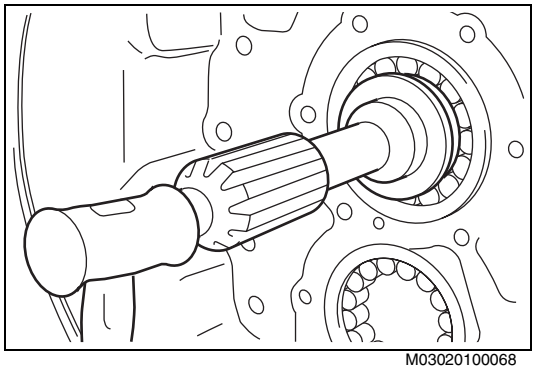

M03020100066

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


M03020100067

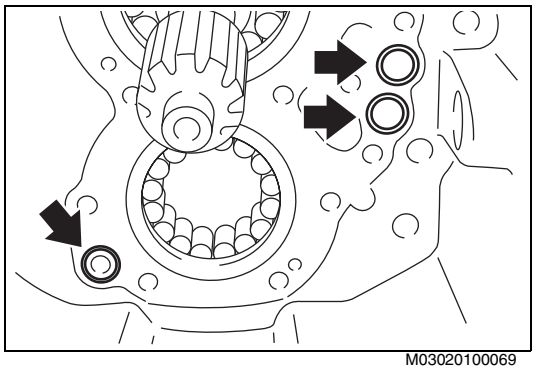
(3) Using a depth gauge, measure the dimension from the clutch housing front end surface to the front bearing outer race. If the dimension exceeds the standard value, adjust it to the standard value within the range.

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


M03020100068

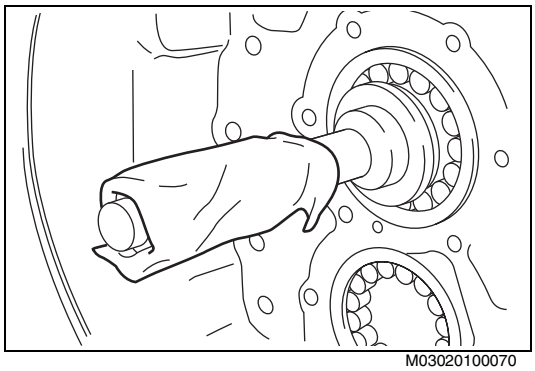
8. INSTALL THE INPUT SHAFT ASSEMBLY.

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

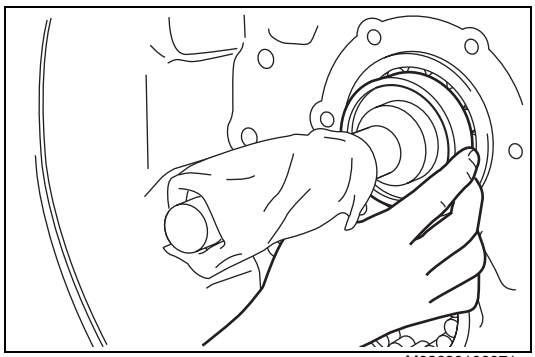

M03020100069

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.

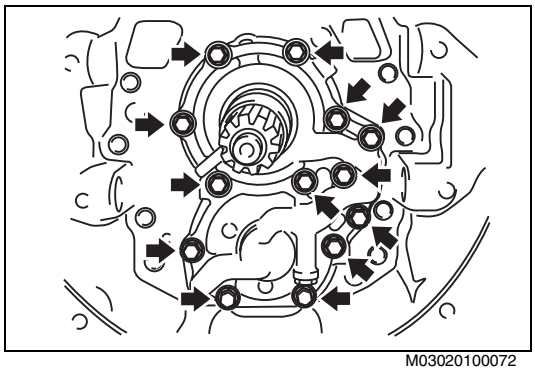

M03020100070

(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

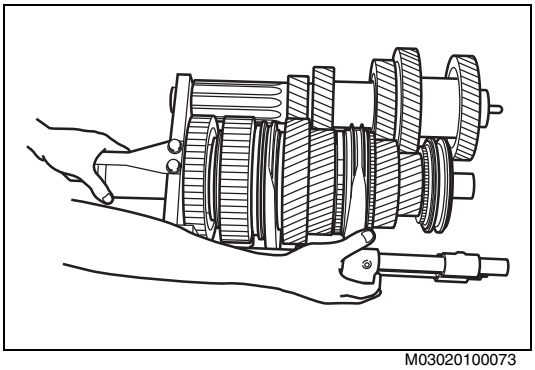
(3) Using the special tool, make the seal ring of the oil muffler get to fit to the groove part.
SST: Seal ring guide (09699-1370)

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

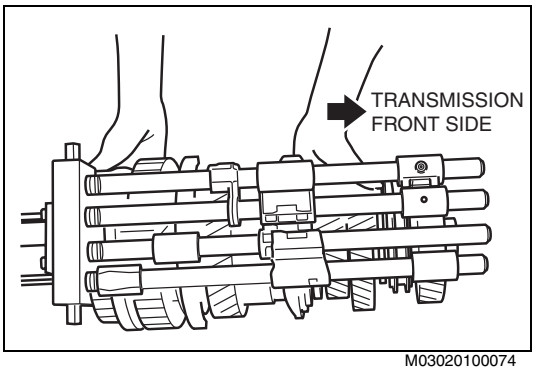
10. INSTALL THE OUTPUT SHAFT ASSEMBLY, COUNTER SHAFT ASSEMBLY AND SHIFT SHAFT ASSEMBLY.

(1) Apply gear oil to the sliding surface of the shift shaft.

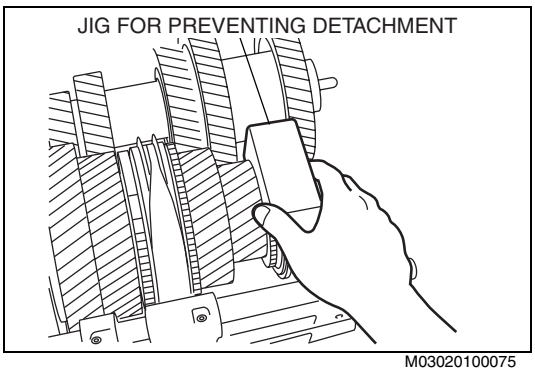
(2) Using the special tool, fix the output shaft assembly, counter shaft assembly and shift shaft assembly.
SST: Shaft hanger (09630-2220)

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.**



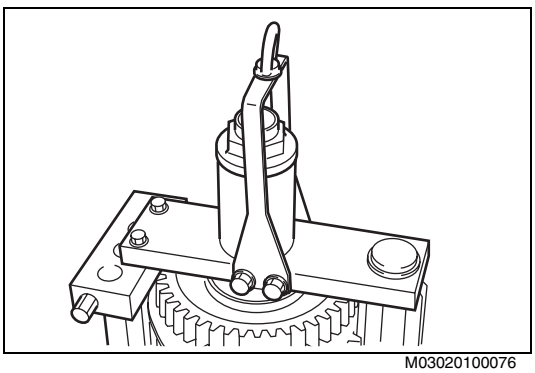
M03020100074



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.



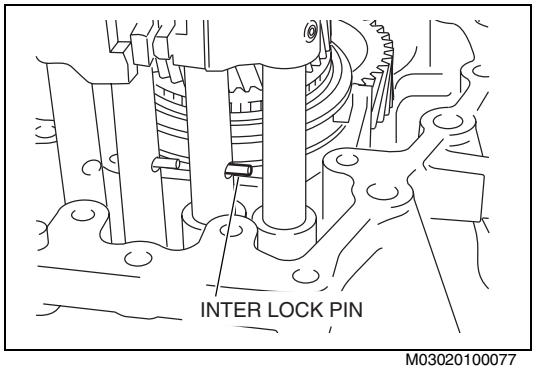
M03020100076

(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.

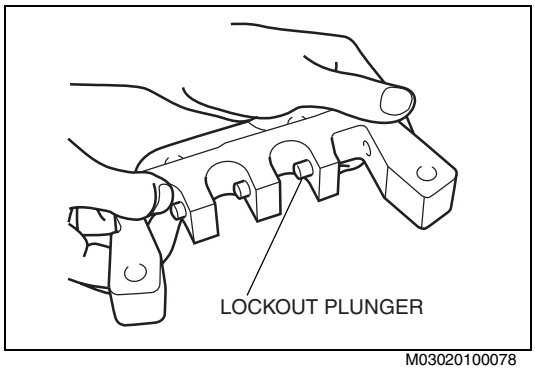


M03020100077

11. INSTALL THE STOPPER, LOCKOUT PLUNGER AND INTER LOCK PIN.

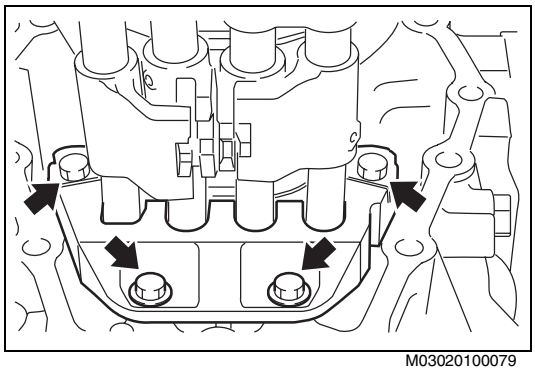
(1) Apply chassis grease to the lockout plunger and inter lock pin.

(2) Install the inter lock pin to the shift shaft.



M03020100078

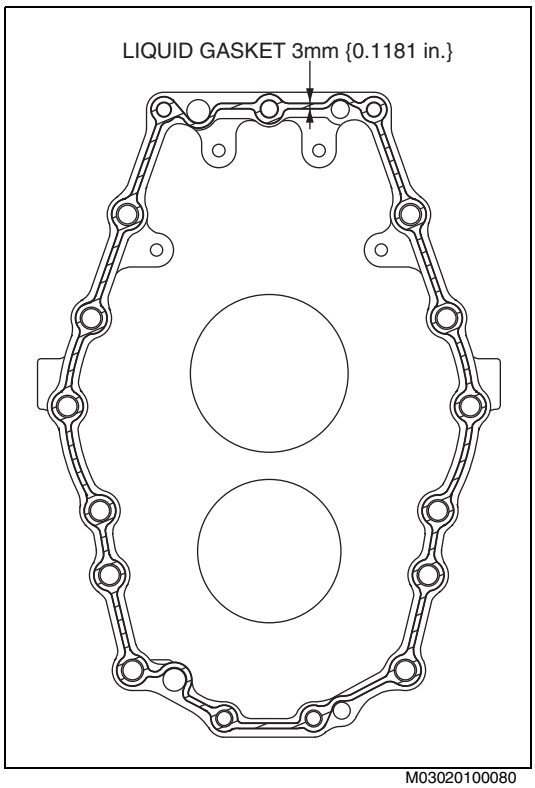
(3) Install the lockout plunger to the stopper.


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.

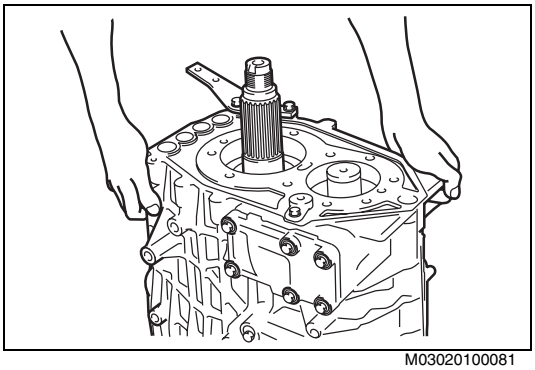
13. INSTALL THE TRANSMISSION CASE ASSEMBLY.

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

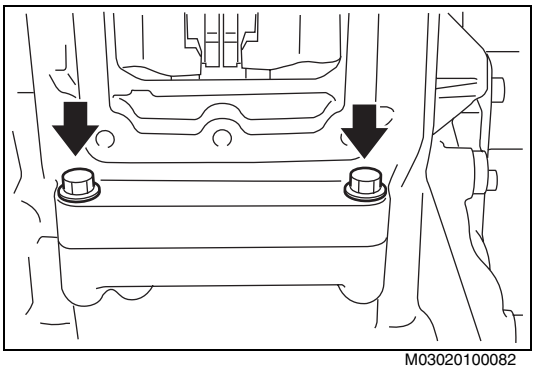
(2) Apply liquid gasket (ThreeBond #1216 or equivalent) to the clutch housing as shown in the figure.

NOTICE:

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

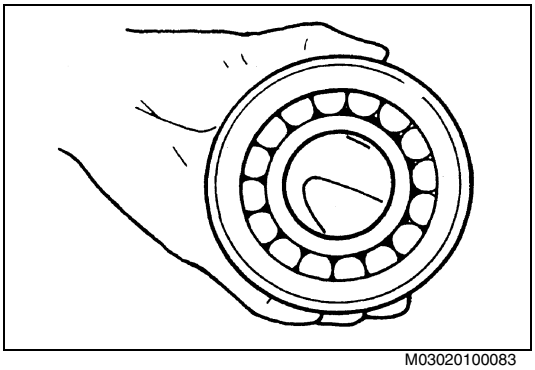

M03020100081

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


M03020100082

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

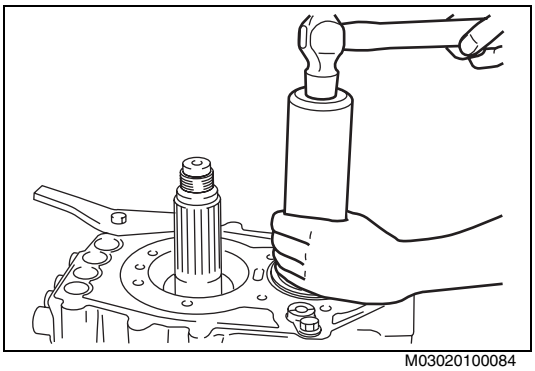
NOTICE:
Temporarily after tightening all bolts in equal, tighten them regularly.


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.

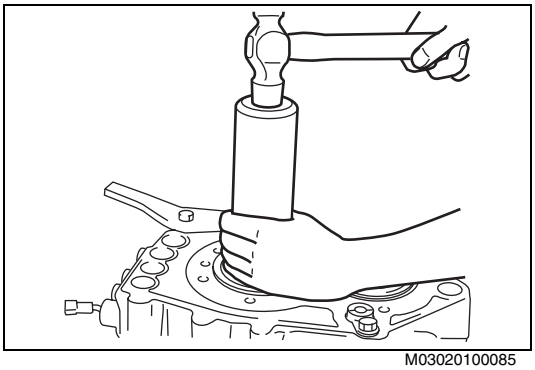
NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.


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.

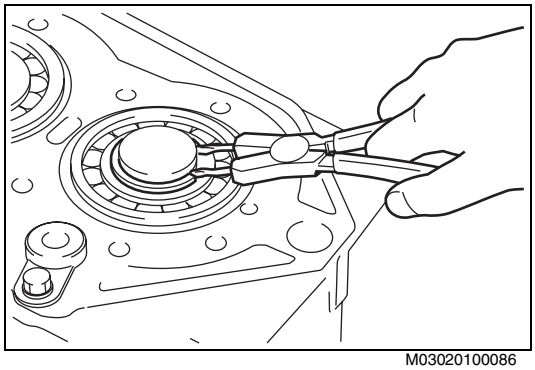

M03020100085

(9) Install the spacer to the output shaft.

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

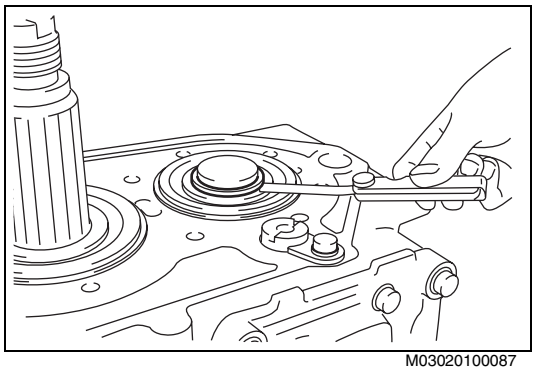
(10) Using a receiving block and a hammer, drive the rear bearing of output shaft side into the transmission case.

(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.**

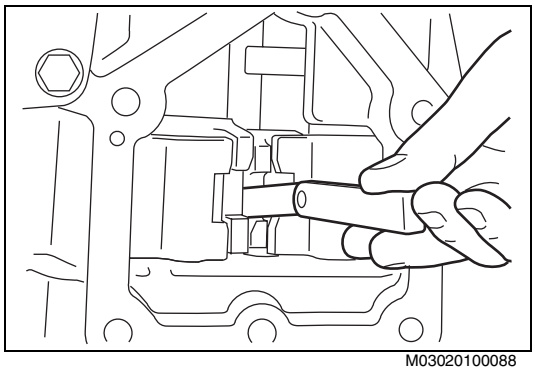

M03020100087

(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

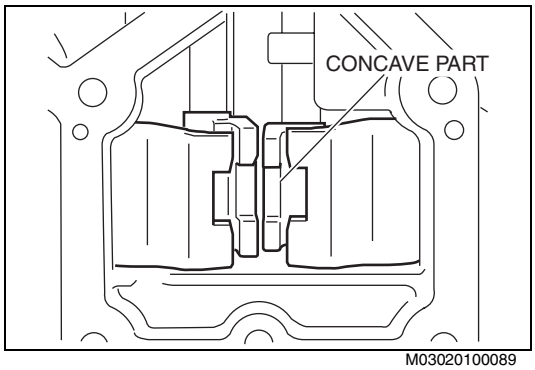
Thickness	Color code
2.4 mm {0.0945 in.}	None
2.5 mm {0.0984 in.}	White
2.6 mm {0.1024 in.}	Green
2.7 mm {0.1063 in.}	Brown


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.}



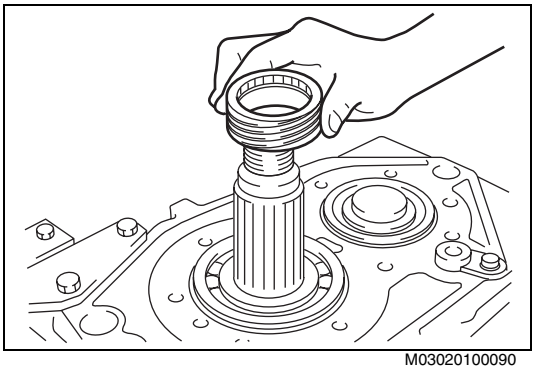
M03020100089

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

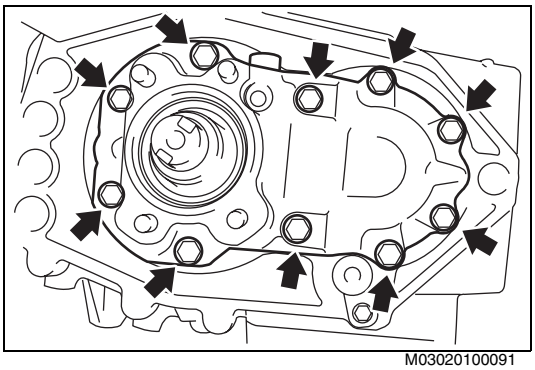
(3) Make sure that two shift shafts (shift heads) do not move at a time.

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

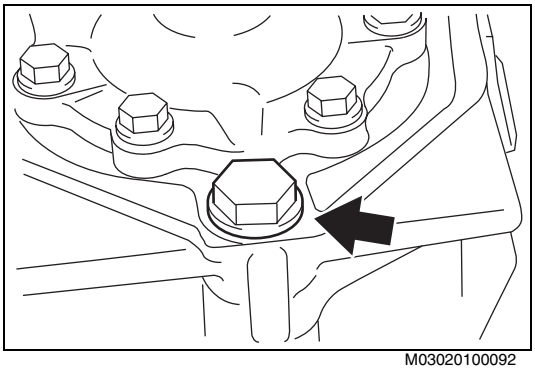
16. INSTALL THE REAR BEARING RETAINER.

(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

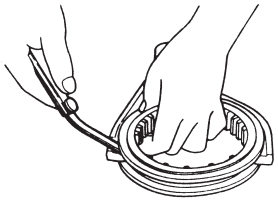
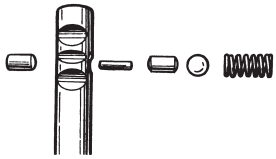
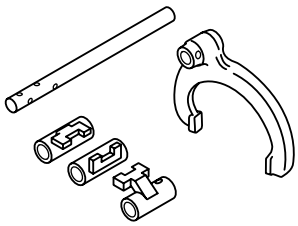
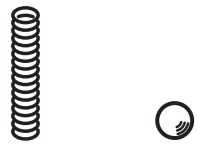
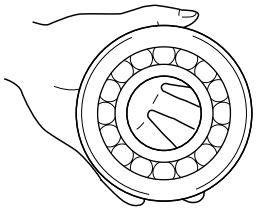
18. INSTALL THE OIL STRAINER.

19. INSTALL THE PARKING BRAKE AND FLANGE COUPLING.

INSPECTION AND REPAIR

M03020606BEH3001

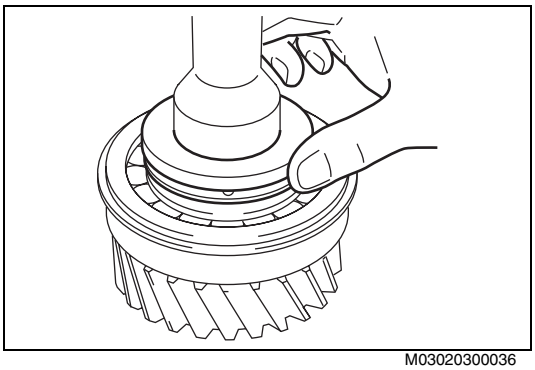
Unit: mm {in.}

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)

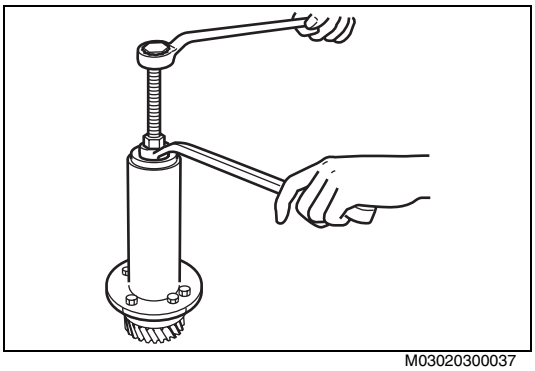
OVERHAUL

M03020706BEH2001


M03020300036

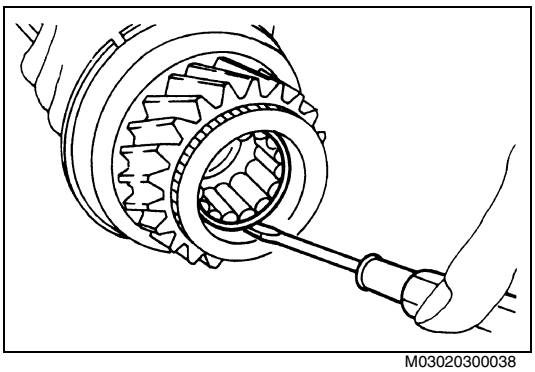
IMPORTANT POINTS - DISASSEMBLY

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)

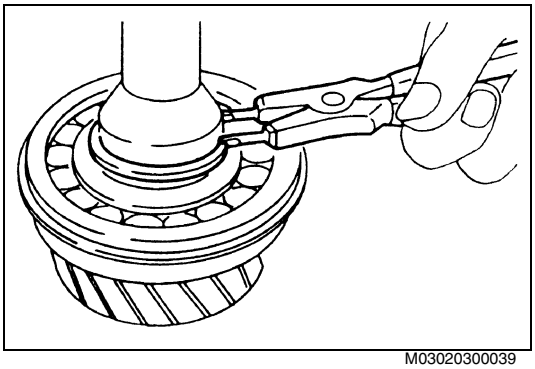
(3) Pull out the oil muffler by tightening the bolt of the special tool puller part.


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.

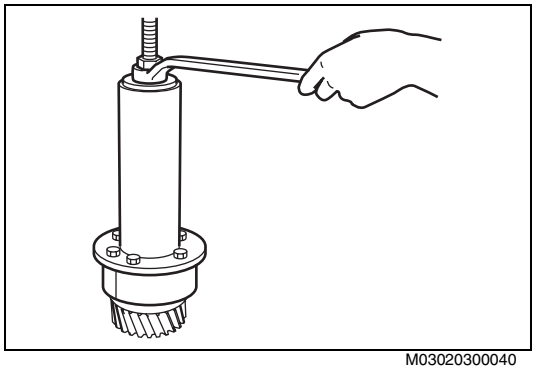

M03020300039

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

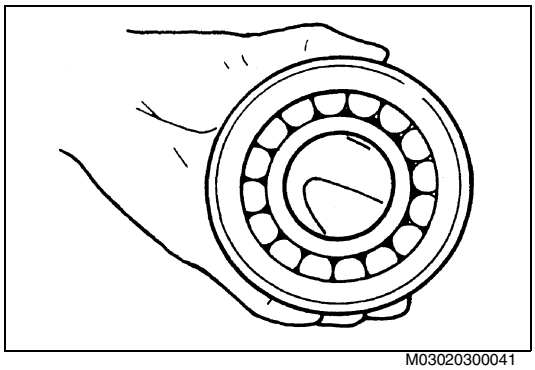
(3) Install the special tool to the groove of the front bearing outer periphery.
SST:
Hook (09653-1720)
Puller (09650-1881)

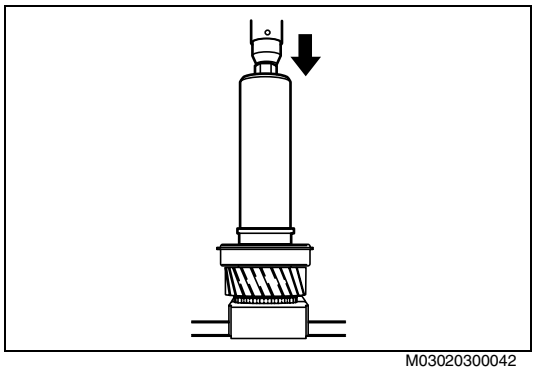
(4) Pull out the front bearing by tightening the bolt of the special tool puller part.

IMPORTANT POINTS - ASSEMBLY

1. INSTALL THE FRONT BEARING.

(1) Apply gear oil to the front bearing.


M03020300041

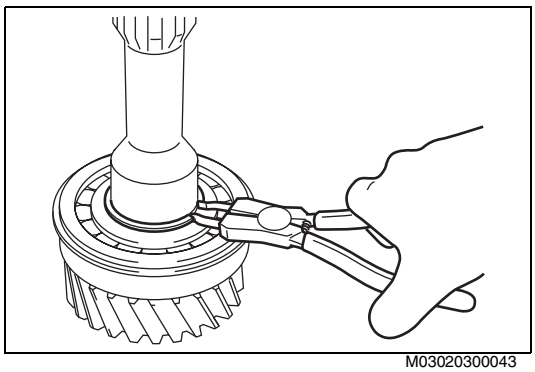

M03020300042

(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.

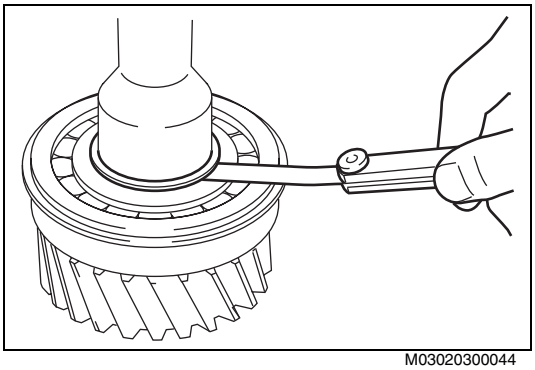
(3) Using a snap ring expander, install the retainer ring to the front bearing.

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.**

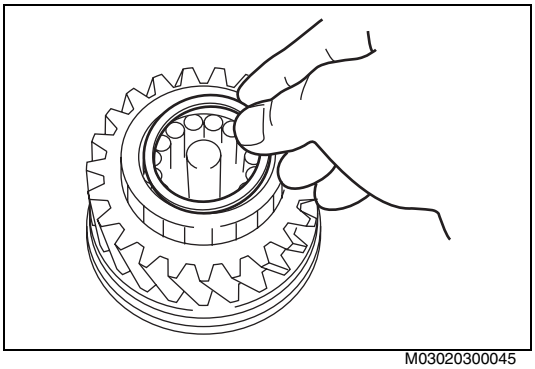

M03020300044

(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

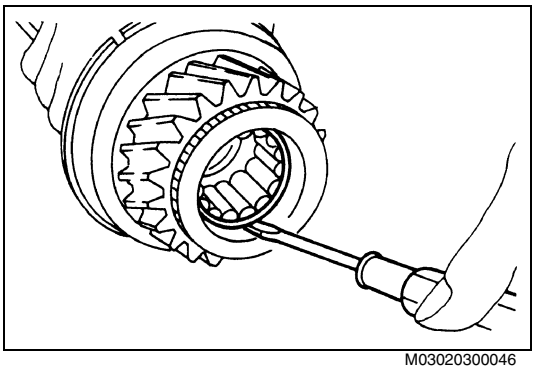
Thickness	Color code
2.4 mm {0.0945 in.}	None
2.5 mm {0.0984 in.}	White
2.6 mm {0.1024 in.}	Green
2.7 mm {0.1063 in.}	Brown


M03020300045

2. INSTALL THE PILOT ROLLER BEARING.

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

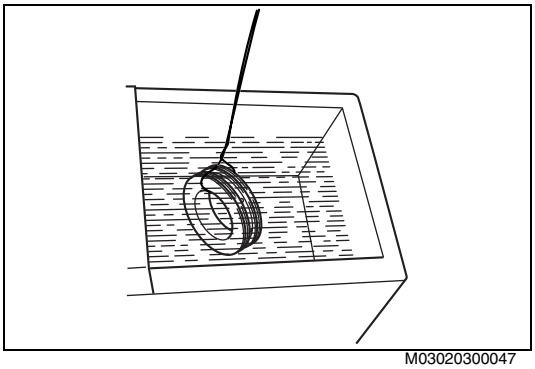
(2) Install the spacer, pilot roller bearing, spacer into the input shaft inner surface in order.


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.**

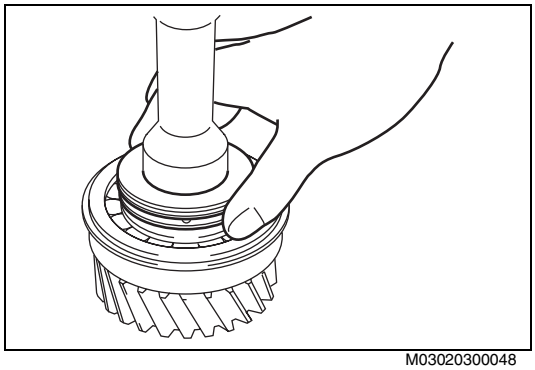

M03020300047

3. INSTALL THE OIL MUFFLER.

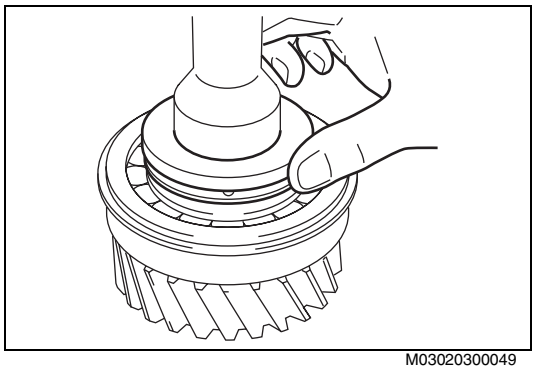
(1) Heat the oil muffler in hot water or oil to 90°C-120°C{194°F-248°F}.

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.**

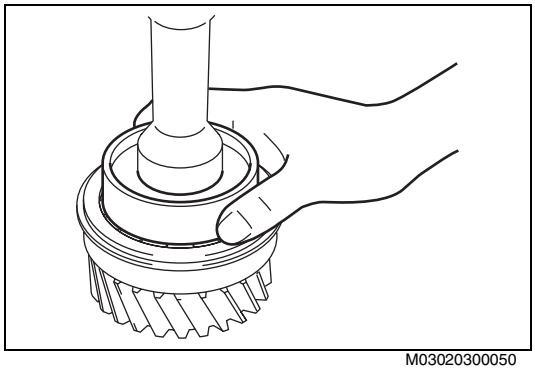

M03020300048

(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

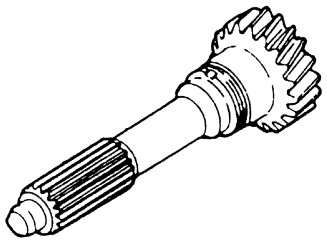
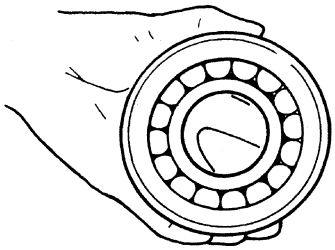
(4) Using the special tool, make the seal ring of the oil muffler get to fit to the groove part.
SST: Seal ring guide (09699-1370)

(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**

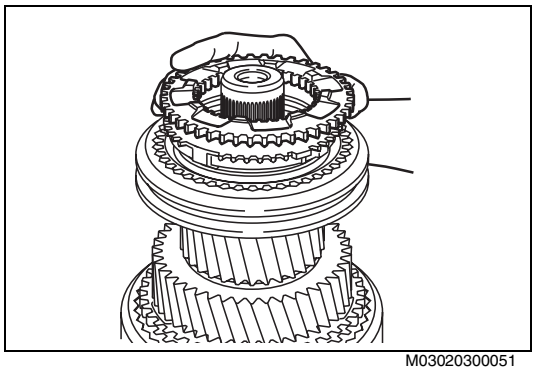
OUTPUT SHAFT ASSEMBLY (LX06S)

OVERHAUL

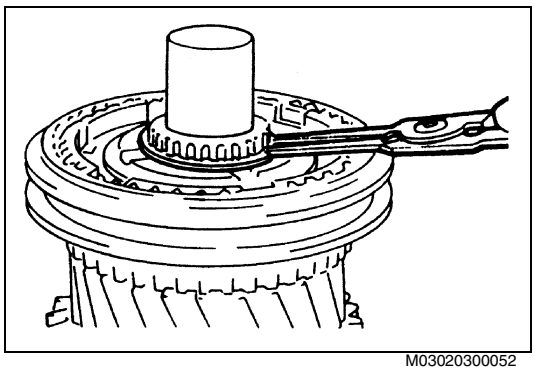
M03020806BEH2001

IMPORTANT POINTS-DISASSEMBLY

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



M03020300051



M03020300052

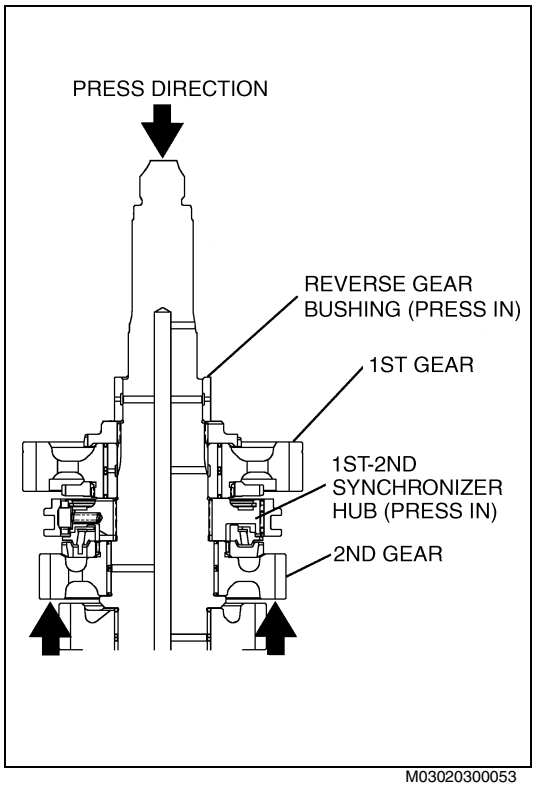
(1) Put the output shaft front end part upward and remove the retainer ring from the output shaft using a snap ring expander.

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

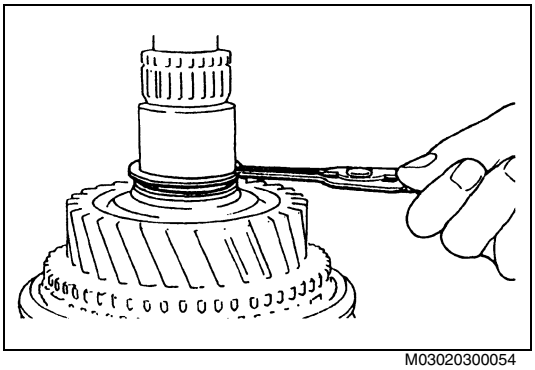
2. REMOVE THE 1ST GEAR ASSEMBLY, 1ST-2ND SYNCHRONIZER UNIT AND 2ND GEAR ASSEMBLY.

(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

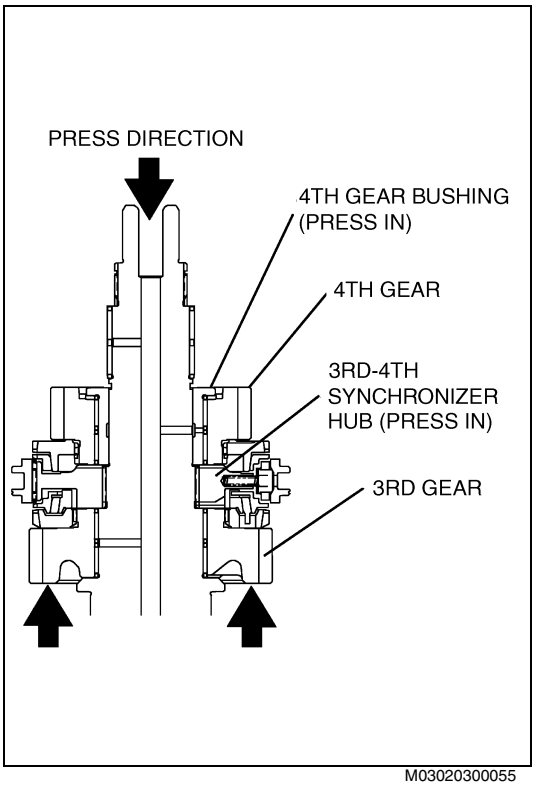


M03020300054

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.

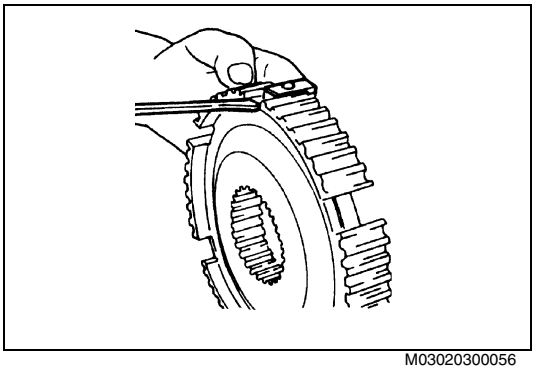
NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.



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.**

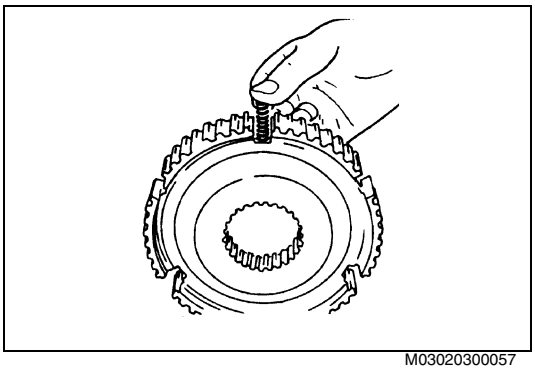


M03020300056

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.

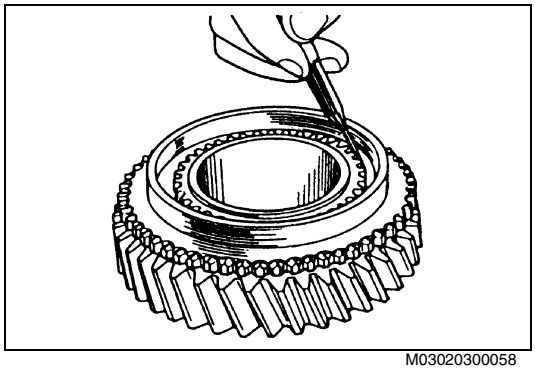
NOTICE:
The retainer ring may fly out of the groove. So wear safety glasses while working.



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.

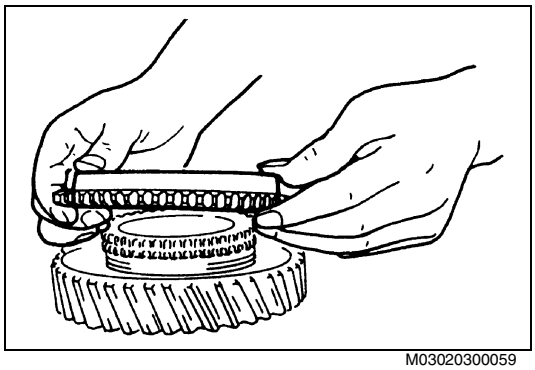

M03020300058

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

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

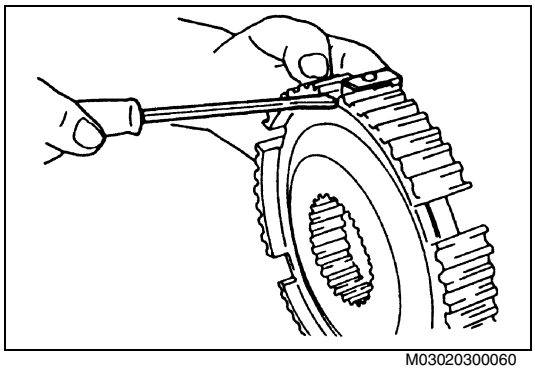
NOTICE:

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

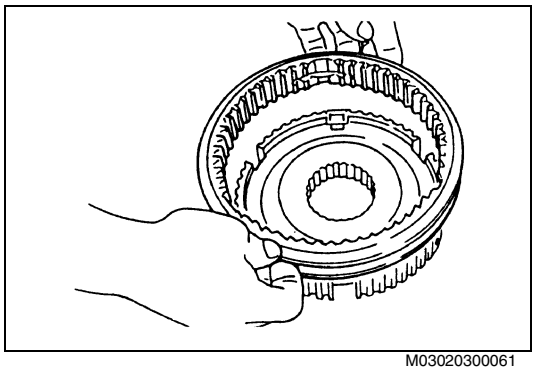

M03020300060

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.

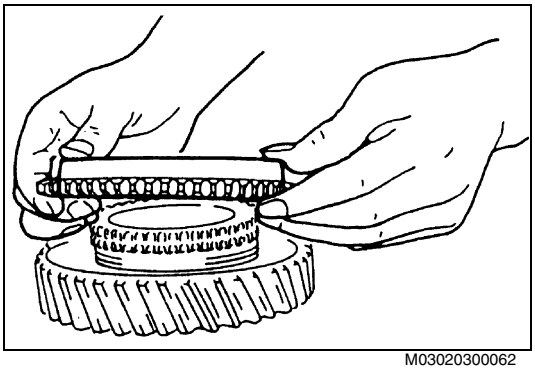

M03020300061

(2) Install the synchronizer sleeve.

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

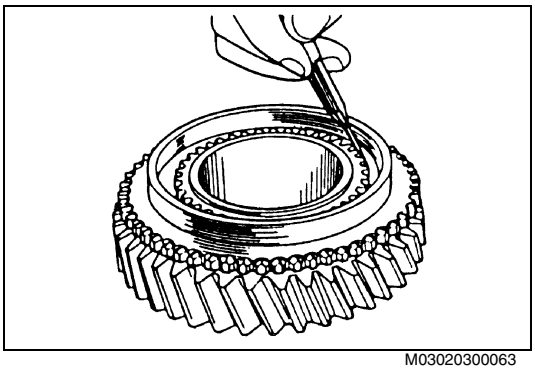
NOTICE:

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)

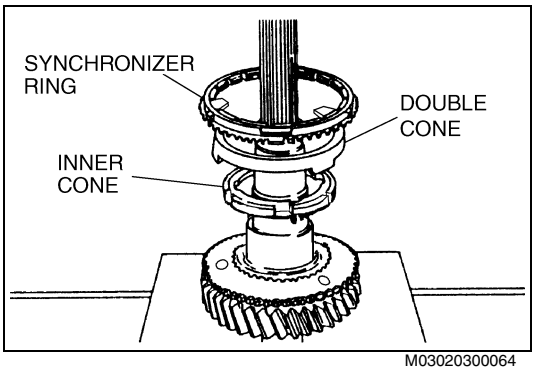
(1) Install the synchronizer cone to the 4th and 5th gear.


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:

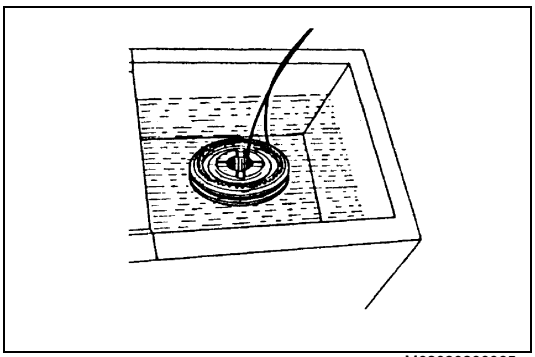
- **The retainer ring may fly out of the groove. So wear safety glasses while working.**
- **Make sure that the retainer ring fits in the groove surely.**



M03020300064

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

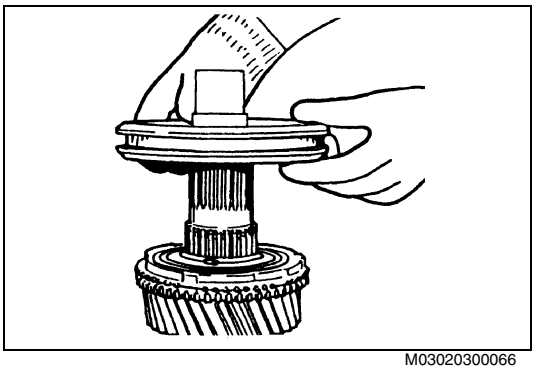
(1) Install the inner cone, double cone, synchronizer ring to the output shaft in order.


M03020300065

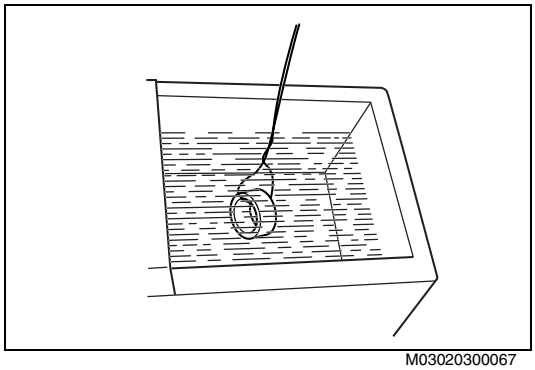
(2) Using a heater, (piston heater etc.) heat the synchronizer unit in hot water or oil to 90°C-120°C{194°F-248°F}.

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.

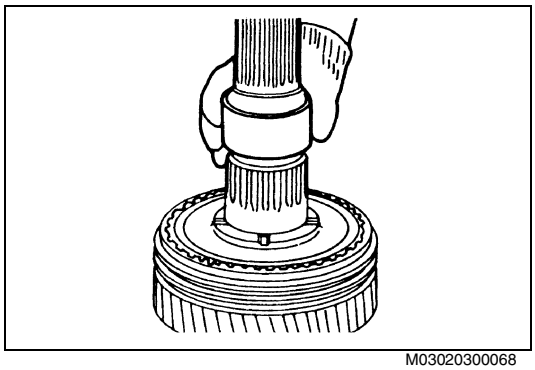

M03020300067

4. INSTALL THE 1ST GEAR ASSEMBLY.

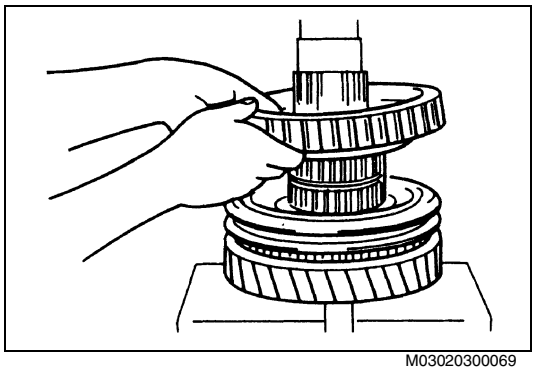
(1) Install the synchronizer bushing of the 2nd gear to the output shaft.

NOTICE:

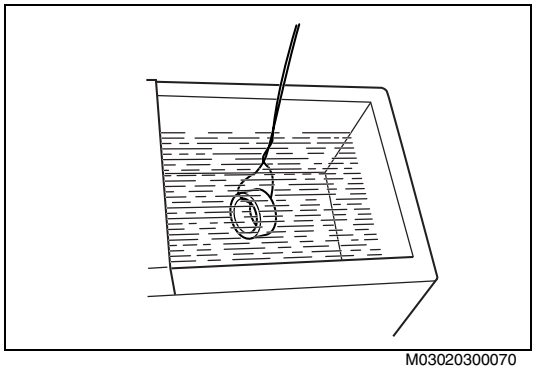
- **In case of using oil, do not heat the synchronizer unit in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**


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.

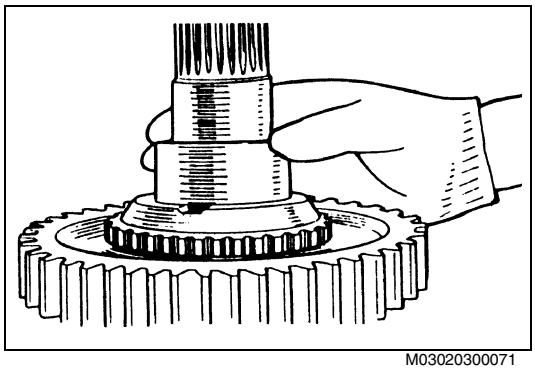

M03020300070

5. INSTALL THE REVERSE GEAR.

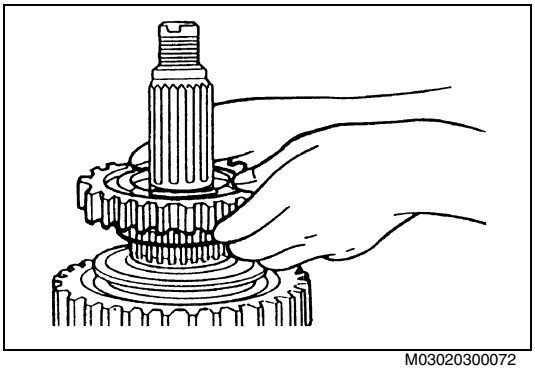
(1) Using a heater, (piston heater etc.) heat the bushing of reverse gear in hot water or oil to 90°C-120°C{194°F-248°F}.

NOTICE:

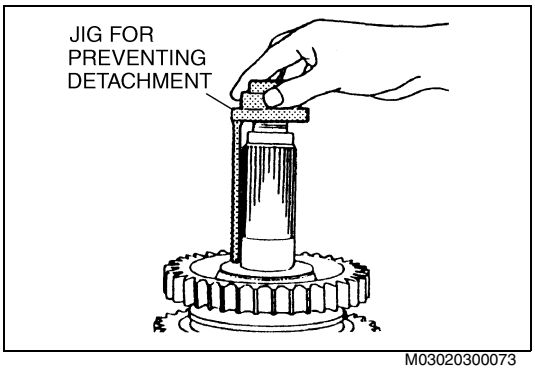
- **In case of using oil, do not heat the bushing of reverse gear in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**


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.



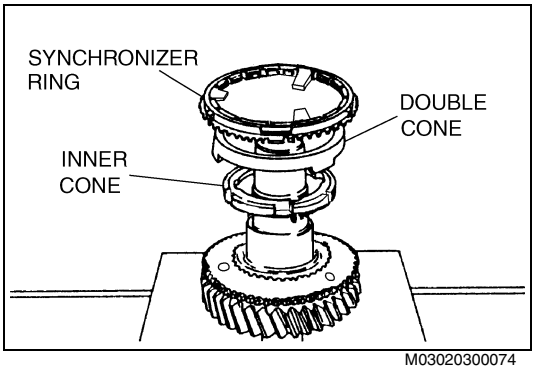
M03020300073

6. INSTALL THE 3RD GEAR ASSEMBLY.

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

NOTICE:

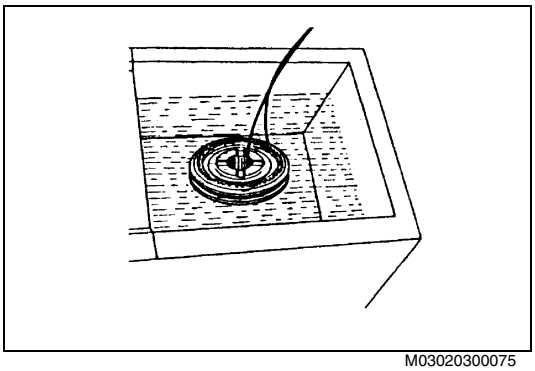
The jig should be used to prevent assembled gear and bearing from falling off.



M03020300074

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

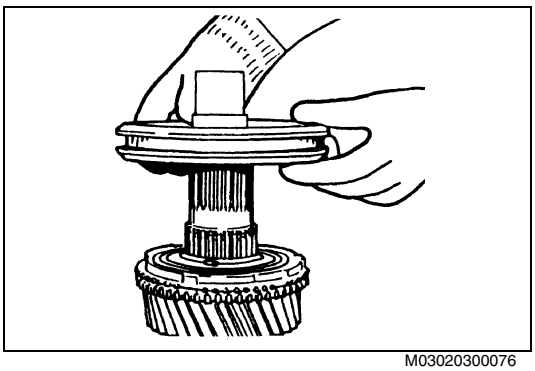
(1) Install the inner cone, double cone and synchronizer ring to the output shaft in order.


M03020300075

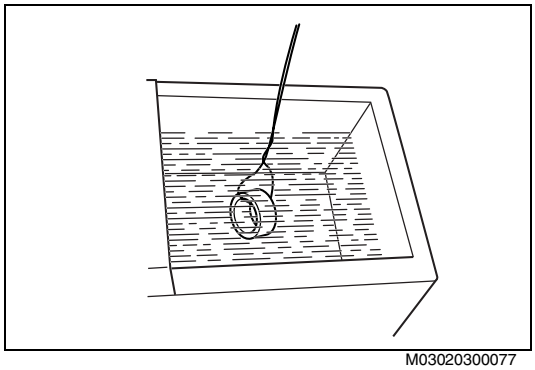
(2) Heat the synchronizer unit in hot water or oil to 90°C-120°C {194°F-248°F}.

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.

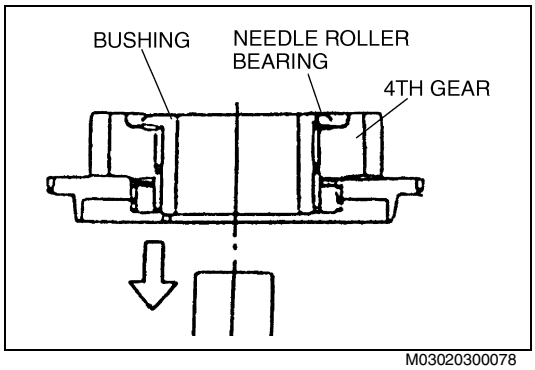

M03020300077

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:

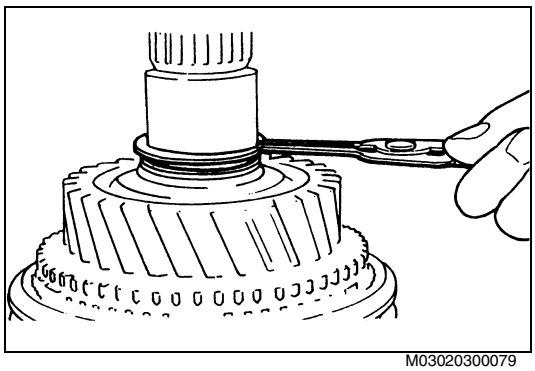
- **In case of using oil, do not heat the bushing of 4th gear in excess of 120°C {248°F}.**
- **Hot water or oil and parts are high temperature, so never touch hot water or oil and parts with your bare hands.**
- **In case of using hot water, remove moisture before installation.**



M03020300078

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

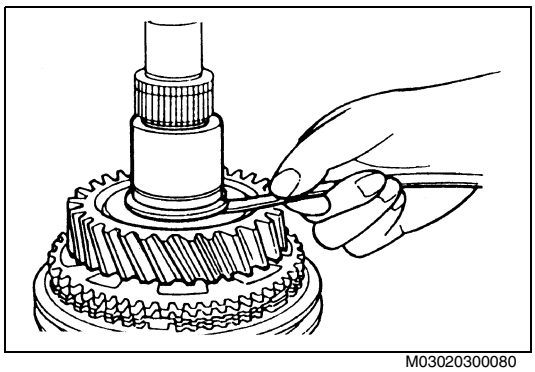
(3) Install the 4th gear assembly and bushing to the output shaft.


M03020300079

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

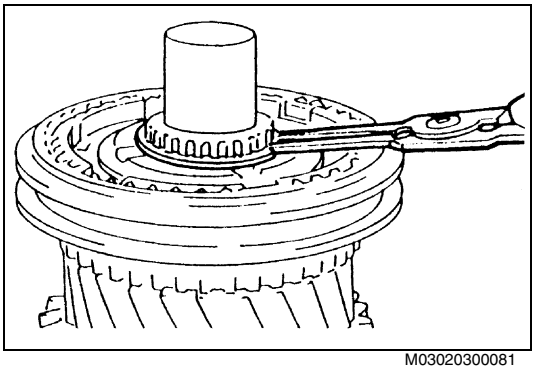
NOTICE:

- **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

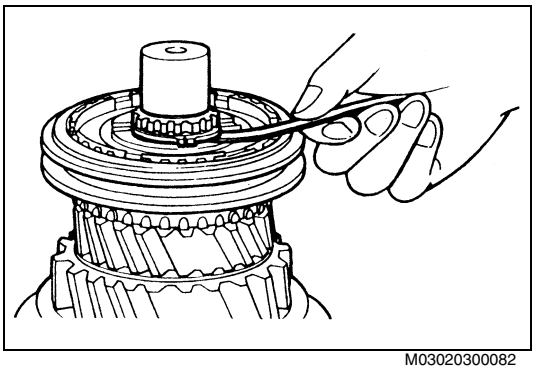

M03020300081

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

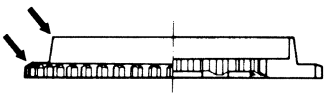
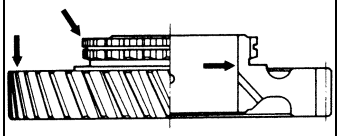
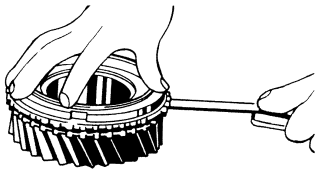
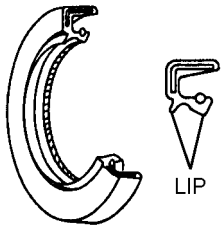
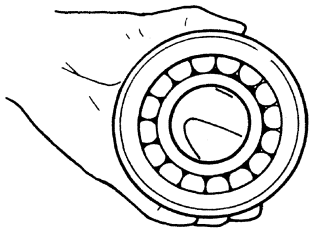
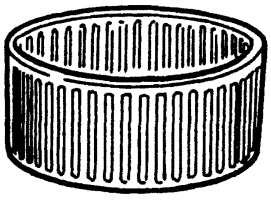
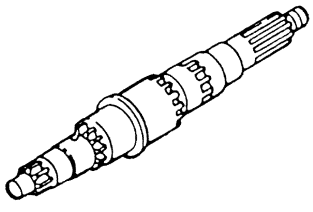
A kind of retainer ring

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

INSPECTION AND REPAIR

M03020806BEH3001

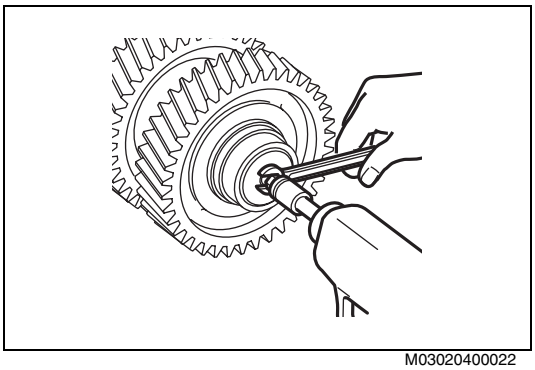
Unit: mm {in.}

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

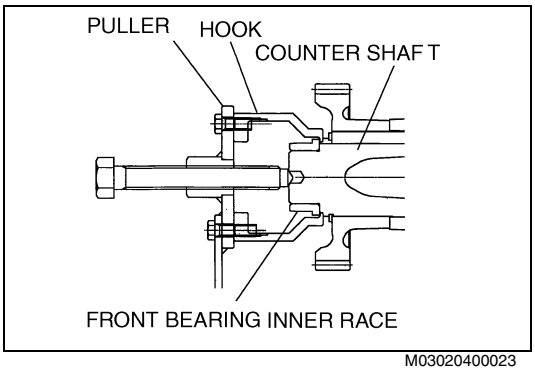


M03020400022

IMPORTANT POINTS-DISASSEMBLY

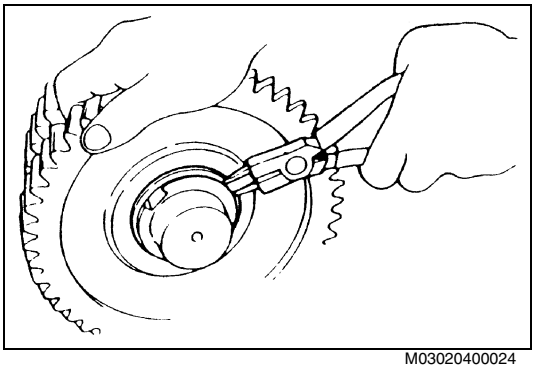
1. REMOVE THE FRONT BEARING INNER RACE.

(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)

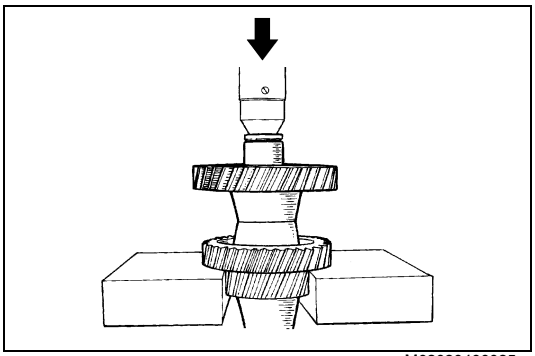


M03020400024

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.

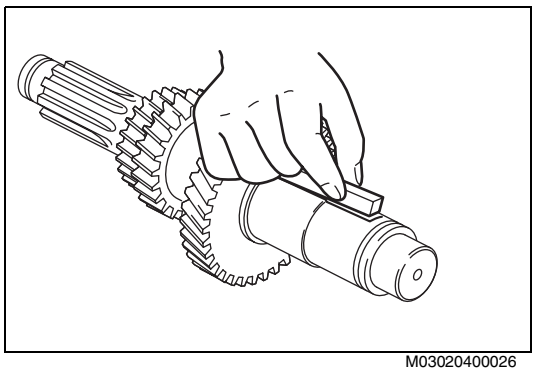


M03020400025

(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.

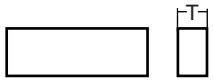
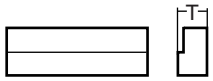
NOTICE:
- **When pressing the output shaft, put a wood block on the lower part of the shaft.**
- **Because the output shaft is heavy, support it securely.**

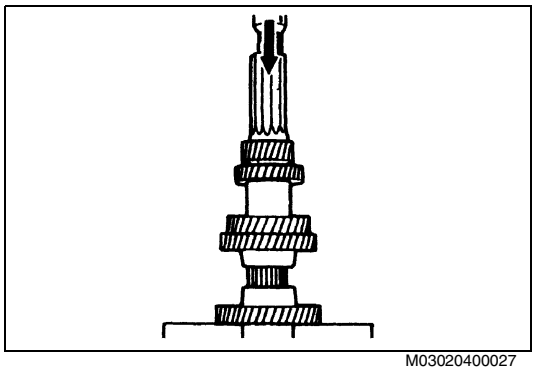
IMPORTANT POINTS-ASSEMBLY


M03020400026

1. ASSEMBLE THE COUNTER SHAFT ASSEMBLY.

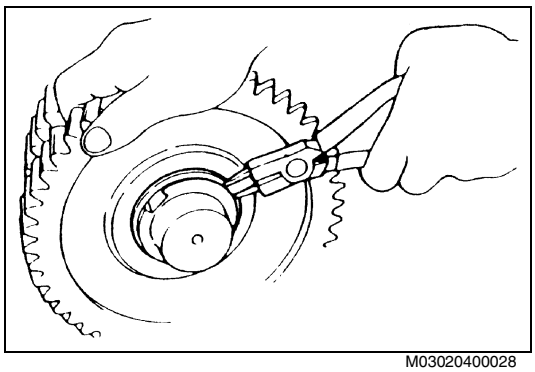
(1) Select the proper size key according to the size of the key groove and install it.

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.

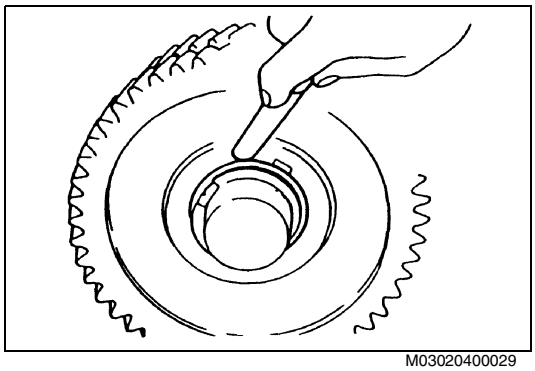
(3) Press the counter shaft into the gears making certain that counter shaft key and counter drive gear key groove are aligned.


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.**

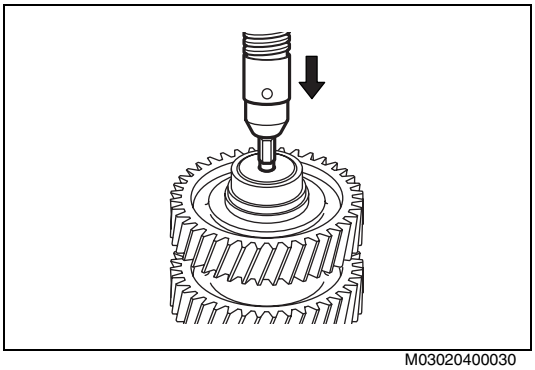

M03020400029

(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**

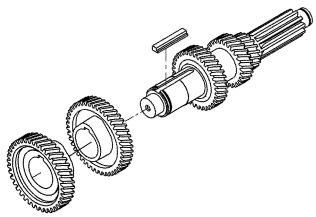
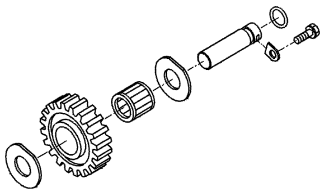
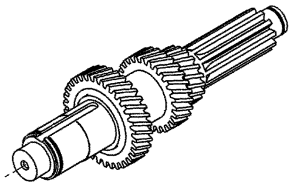
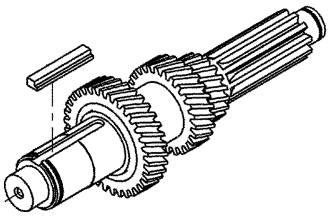

M03020400030

(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** 

TRANSFER MAIN UNIT (MA12C)

TR03-001

TRANSFER ASSEMBLY

DATA AND SPECIFICATIONS

M03030101BEI2001

TRANSFER

Type		**Two speed, constantmesh with helical gear**
Transfer series		**MA12C**
Reduction ratio:	**Low gear**	**2.224**
	High gear	**1.000**
Oil capacity		**Approx. 3.4 L {0.75 lmp·gal./ 0.90 US·gal.}**
Lubricant grade		**Gear oil (API GL-4)**
Oil viscosity:	**Between -12 and 32°C {10 and 90°F}**	**SAE 90**
	Above 32°C {90°F}	**SAE 140**

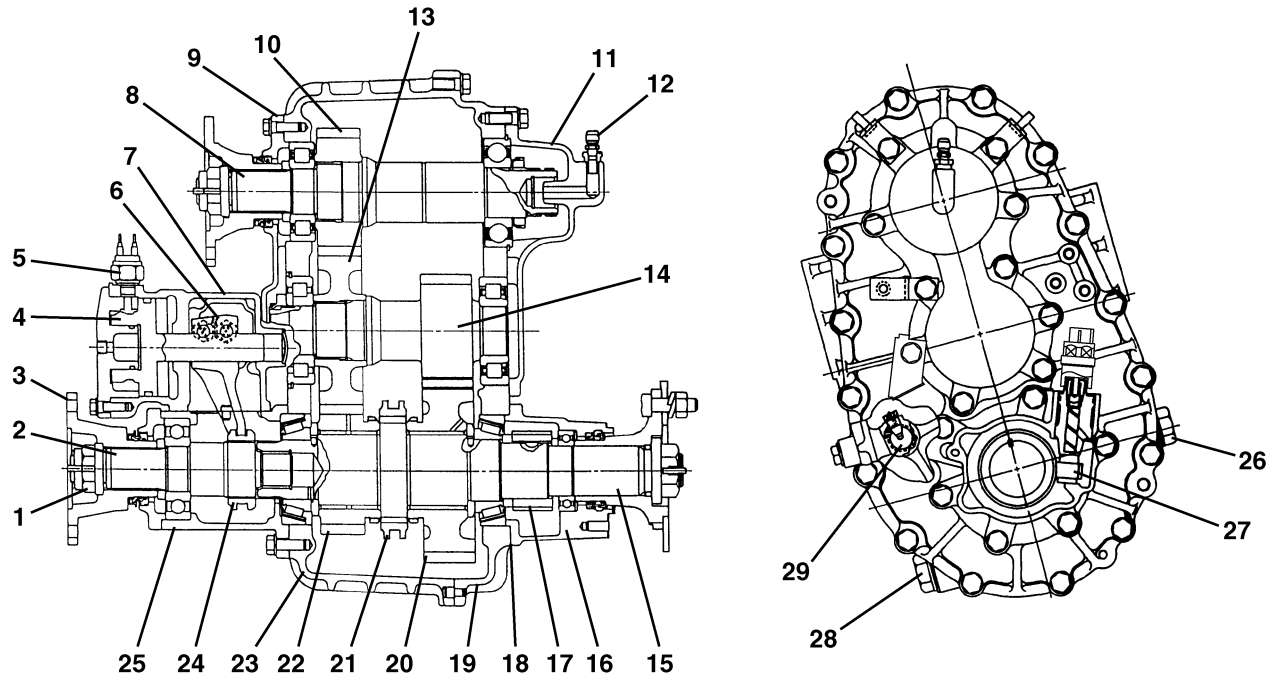
SHIFT CONTROL

High-Low speed	**Electric and pneumatic control**
Four wheel drive	

DESCRIPTION

M03030101BEC1001

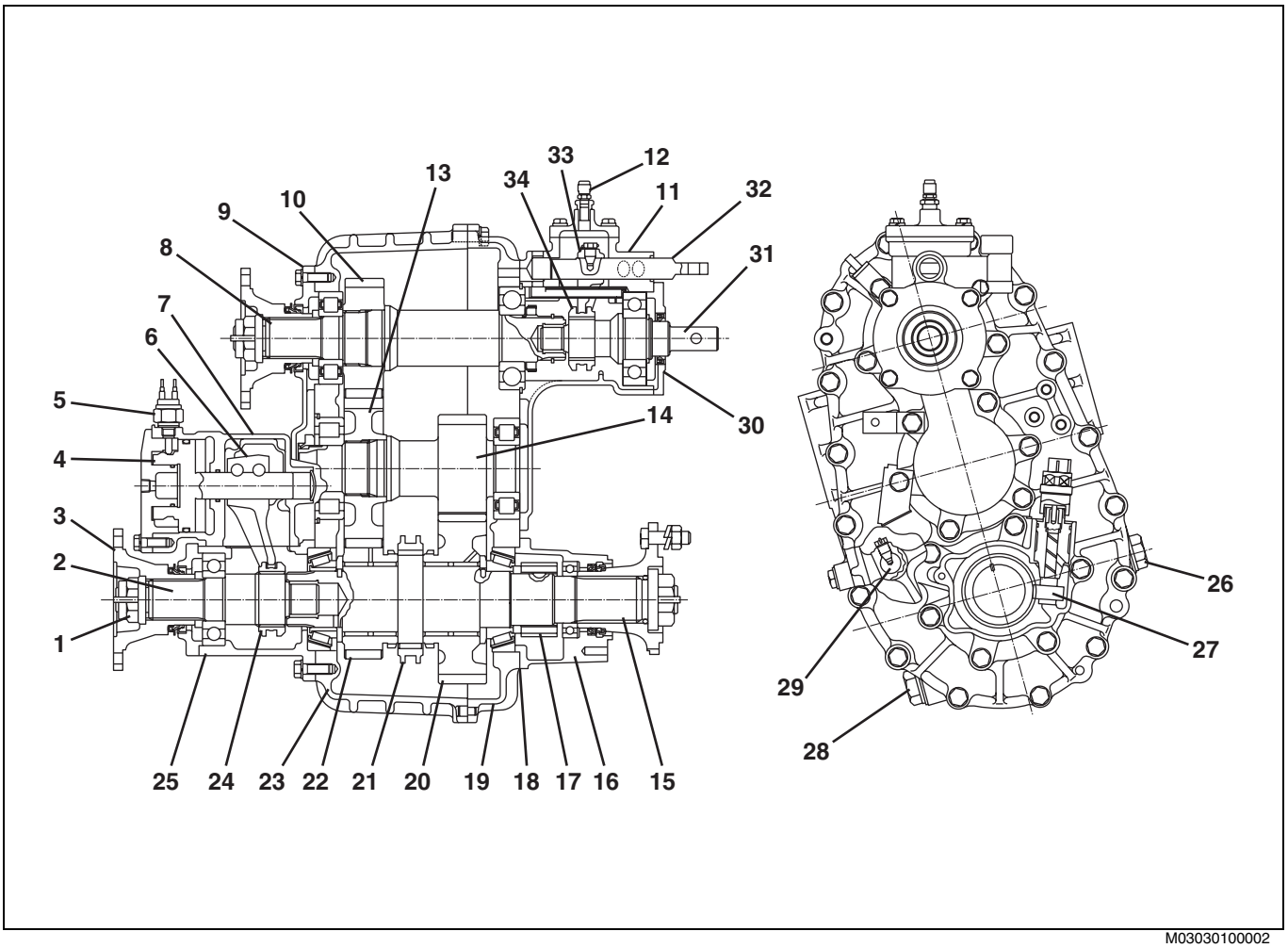
MODELS: WITHOUT POWER TAKE-OFF



M03030100001

1	Lock nut	11	Rear bearing retainer	21	High-Low constant sleeve
2	Front output shaft	12	Breather plug	22	Output shaft high gear
3	Universal joint flange	13	Idler shaft high gear	23	Transfer case
4	Power piston and shift shaft	14	Idler shaft low gear	24	4WD constant sleeve
5	4WD selector warning switch	15	Rear output shaft	25	Front output shaft bearing retainer
6	Shift fork	16	Rear output shaft bearing retainer	26	Filler plug
7	4WD shift unit	17	Speedometer drive gear	27	Speedometer driven gear
8	Input shaft	18	Shim	28	Drain plug
9	Front bearing retainer	19	Transfer case cover	29	Shift shaft
10	Input shaft gear	20	Output shaft low gear		

MODELS: WITH POWER TAKE-OFF



M03030100002

1	Lock nut	13	Idler shaft high gear	25	Front output shaft bearing retainer
2	Front output shaft	14	Idler shaft low gear	26	Filler plug
3	Universal joint flange	15	Rear output shaft	27	Speedometer driven gear
4	Power piston and shift shaft	16	Rear output shaft bearing retainer	28	Drain plug
5	4WD selector warning switch	17	Speedometer drive gear	29	Shift shaft
6	4WD Shift fork	18	Shim	30	Power-take off bearing retainer
7	4WD shift unit	19	Transfer case cover	31	Power-take off output shaft
8	Input shaft	20	Output shaft low gear	32	Power-take off shift shaft
9	Front bearing retainer	21	High-Low constant sleeve	33	Power-take off shift fork
10	Input shaft gear	22	Output shaft high gear	34	Power-take off sleeve
11	Transfer power take-off case	23	Transfer case		
12	Breather plug	24	4WD constant sleeve		

TROUBLESHOOTING

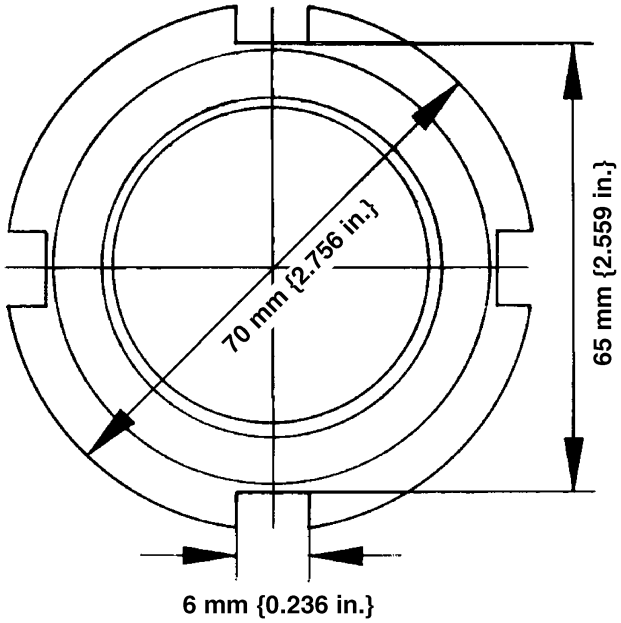
M03030101BEF3001

Symptom	Possible cause	Remedy/Prevention
Noise (Lubrication)	Insufficient oil	Add oil to correct level.
	Lack of oil viscosity	Change oil as required.
Noise (Transfer)	Gear teeth or spline worn or damaged	Replace.
	Bearing damaged	Replace.
Noise (Clutch)	Damper spring defective	Replace clutch disc assembly.
Gear jump-out (Transfer)	Shift fork bent	Replace.
	Shift shaft steel ball and steel ball bore worn.	Replace or repair.
	Compression spring broken or fatigued.	Replace.
	Shift sleeve teeth worn or damaged	Replace.
	Bearing worn	Replace.
Gear jump-out (Control)	Transfer control switch or solenoid valve defective	Replace or repair.
Gear jump-out (Mounting)	Engine or transfer vibrated	Replace mounting cushion rubber or tighten cushion rubber fitting bolt or nut.
Difficult gear engagement (Lubrication)	Oil viscosity too high	Change oil as required.
Difficult gear engagement (Transfer)	Shift sleeve teeth worn or damaged	Replace.
	Shift fork bent	Replace.
Difficult gear engagement (Control)	Transfer control switch or solenoid valve defective	Replace or repair.
Difficult gear engagement (Clutch)	Improper disengagement	Adjust.

PROPOSAL TOOL

M03030101BEK1001

SOCKET WRENCH



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COMPONENT LOCATOR

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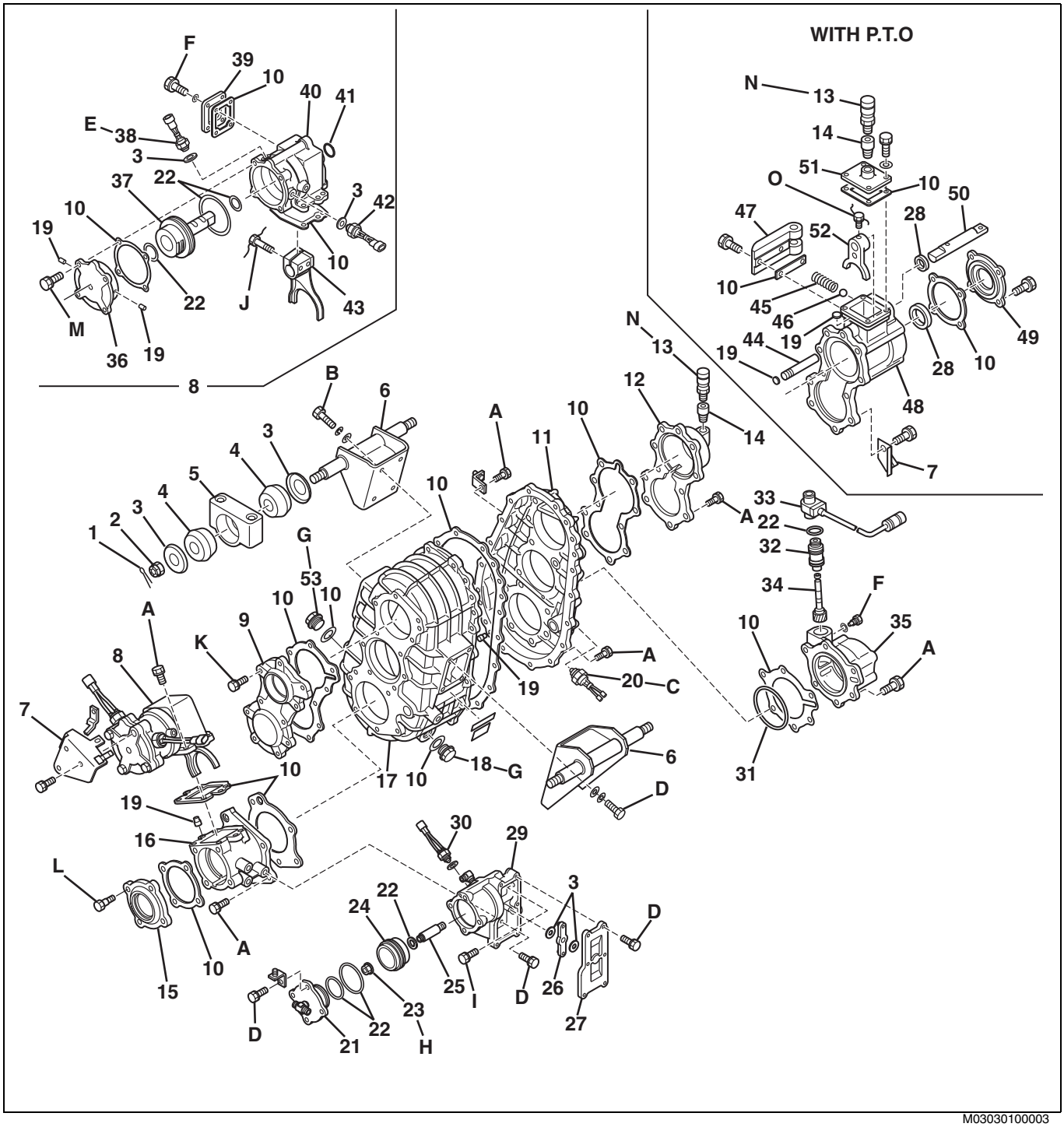
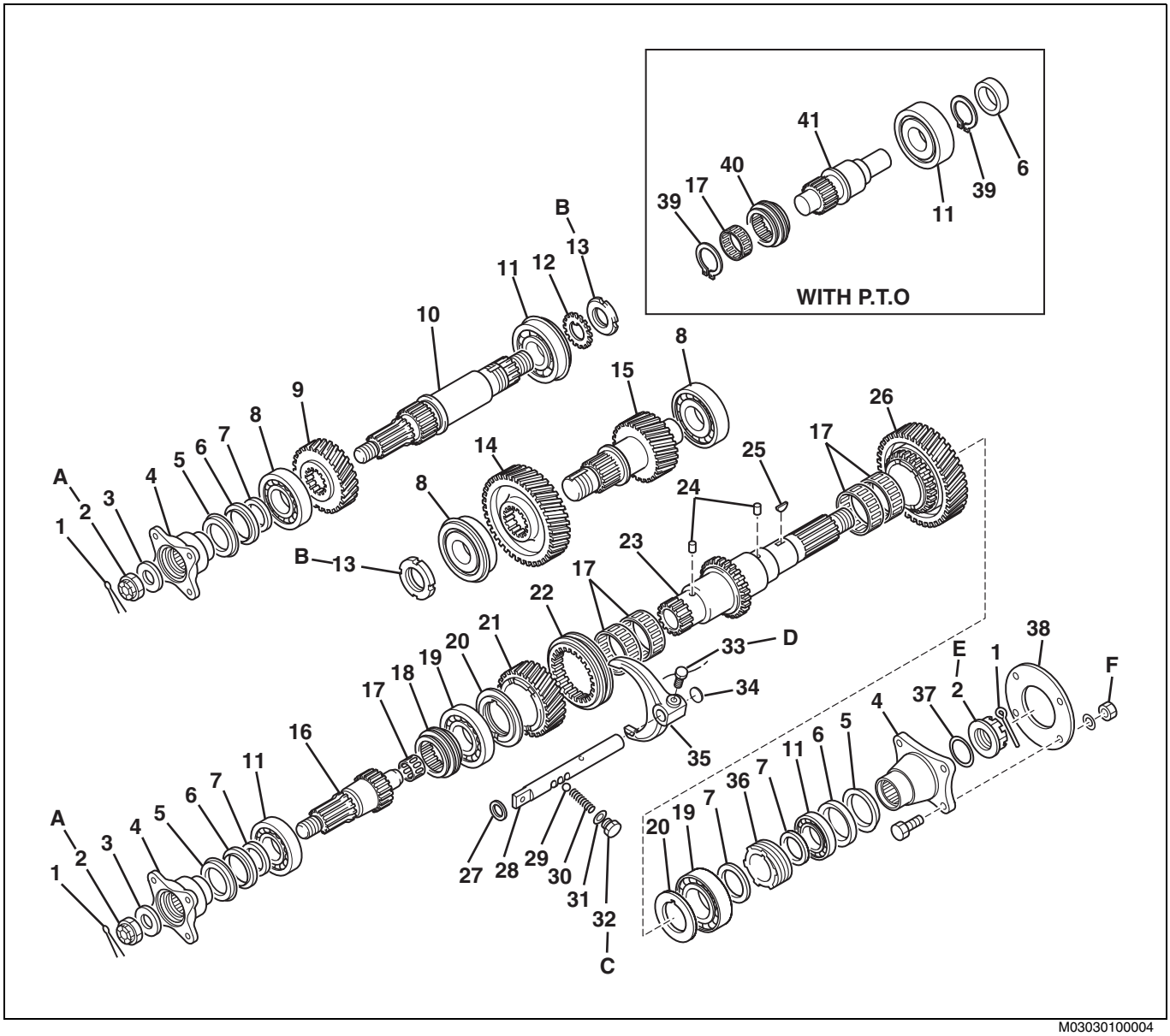


M03030100003

1	Cotter pin	19	Pin	37	Power piston and shift shaft
2	Slotted nut	20	Low detection switch	38	4WD selector warning switch
3	Washer	21	High-Low shift unit case cover	39	4WD shift unit cover
4	Cushion rubber	22	O-ring	40	4WD shift unit case
5	Holder	23	Lock nut	41	Expansion plug
6	Transfer case bracket	24	Piston	42	4WD detection switch
7	Bracket	25	Rod	43	4WD shift fork
8	4WD shift unit	26	Lever	44	Oil pipe
9	Front bearing retainer	27	High-Low shift unit cover	45	Compression spring
10	Gasket	28	Oil seal	46	Steel ball
11	Transfer case cover	29	High-Low shift unit	47	Power take-off shift support
12	Rear bearing retainer	30	High detection switch	48	Transfer power take-off case
13	Breather plug	31	Shim	49	Power-take off bearing retainer
14	Plug connection	32	Speedometer driven gear bushing	50	Power-take off shift shaft
15	Dust seal retainer	33	Revolution sensor	51	Power take-off case cover
16	Front output shaft bearing retainer	34	speedometer driven gear	52	Power-take off shift fork
17	Transfer case	35	Rear output shaft bearing retainer	53	Filler plug
18	Drain plug	36	4WD shift unit case cover		

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

A	64-85 {650-870, 47-62}	I	56-83 {571-846, 42-61}
B	64.5-85.5 {658-871, 48-63}	J	59-78 {602-795, 44-57}
C	35-39 {357-397, 26-28}	K	37-49 {378-499, 28-36}
D	42-62 {429-632, 31-45}	L	38-49 {388-499, 28-36}
E	34-39 {347-397, 26-28}	M	37-44 {378-448, 28-32}
F	15-21 {153-214, 11-15}	N	3-6 {31-61, 2.3-4.4}
G	27-48 {274-489, 20-35}	O	25-29 {255-295, 19-21}
H	20-29 {204-295, 15-21}		



1	Cotter pin	15	Idler shaft and low gear	29	Steel ball
2	Slotted nut	16	Front output shaft	30	Compression spring
3	Plain washer	17	Needle roller bearing	31	Copper washer
4	Universal joint flange	18	4WD constant sleeve	32	Plug
5	Dust deflector	19	Tapered roller bearing	33	Set screw
6	Oil seal	20	Thrust washer	34	Expansion plug
7	Collar	21	Output shaft high gear	35	High-Low shift fork
8	Cylindrical roller bearing	22	High-Low constant sleeve	36	speedometer drive gear
9	Input shaft gear	23	Rear output shaft	37	O-ring
10	Input shaft	24	Straight pin	38	Spacer
11	Ball bearing	25	Woodruff key	39	Retainer ring
12	Lock washer	26	Output shaft low gear	40	Power take-off sleeve
13	Lock nut	27	Oil seal	41	Power take-off output shaft
14	Idler shaft high gear	28	High-Low shift shaft		

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

A	245-294 {2,500-3,000, 181-216}	D	25-29 {250-300, 19-21}
B	196-294 {2,000-3,000, 145-216}	E	344-470 {3,500-4,800, 254-346}
C	35-39 {357-397, 26-28}	F	108-147 {1,100-1,500, 80-108}

OVERHAUL

M03030101BEH2001

IMPORTANT POINTS - DISMOUNTING

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

1. BLOCK THE WHEELS.

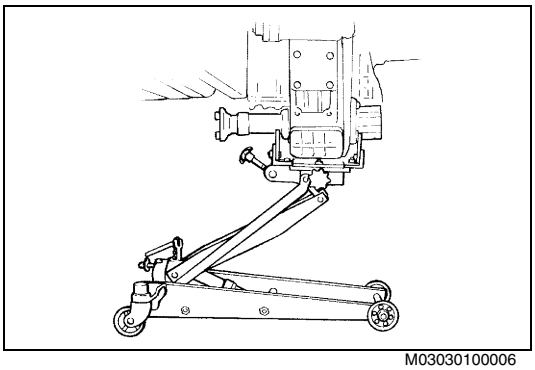
2. DRAIN THE TRANSFER OIL.

3. EXHAUST THE COMPRESSED AIR FROM THE AIR TANK.

4. DISCONNECT THE ELECTRIC HARNESS AND OTHER ATTACHMENTS.

5. DISCONNECT THE AIR PIPE AND HOSE.

6. DISCONNECT THE PROPELLER SHAFT.

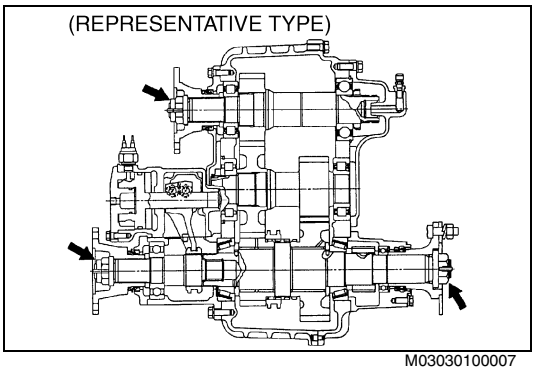


M03030100006

7. REMOVE THE TRANSER.
(1) Crane the transfer with chain block or place the transmission jack under the transfer.
(2) Remove the fitting bolts and nuts.
(3) Dismount the transfer from the chassis.

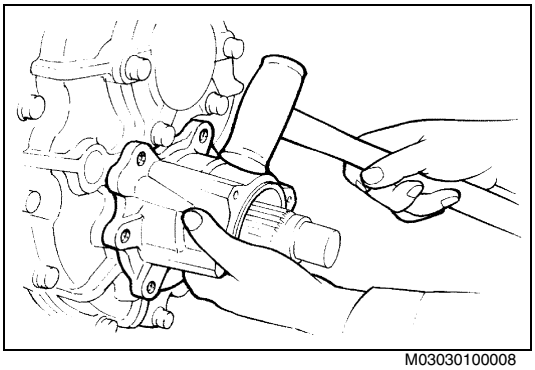
NOTICE:
In using the transmission jack, take care to mount or dismount the transfer so as to prevent dropping the jack because the transfer is vertically long and instable.

IMPORTANT POINTS - DISASSEMBLY



M03030100007

1. REMOVE THE UNIVERSAL JOINT FLANGE LOCK NUT.
(1) Remove the cotter pin.
(2) Using a socket wrench, remove the lock nut.



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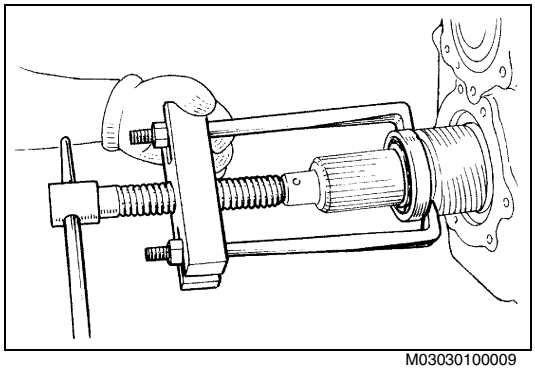
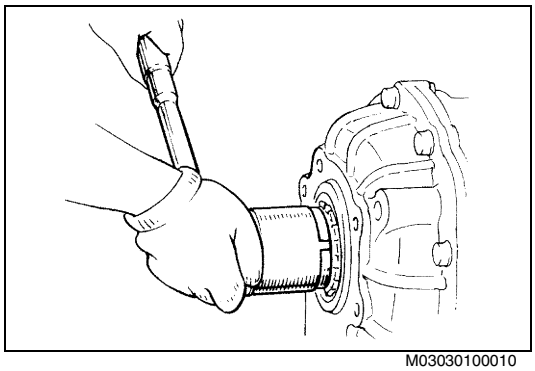
2. REMOVE THE REAR OUTPUT SHAFT BEARING RETAINER.
(1) Remove the bearing retainer by tapping it lightly.


M03030100009

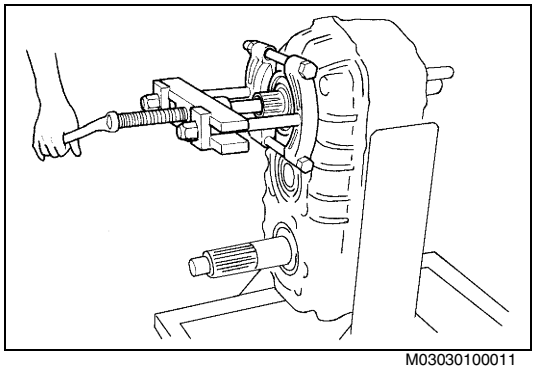
3. REMOVE THE REAR OUTPUT SHAFT BALL BEARING.
(1) Using a suitable commercial puller, remove the ball bearing from the rear output shaft.

4. REMOVE THE SPEEDOMETER DRIVE GEAR.
(1) Remove the speedometer drive gear and collar.
(2) Remove the woodruff key.
(3) Remove the collar.

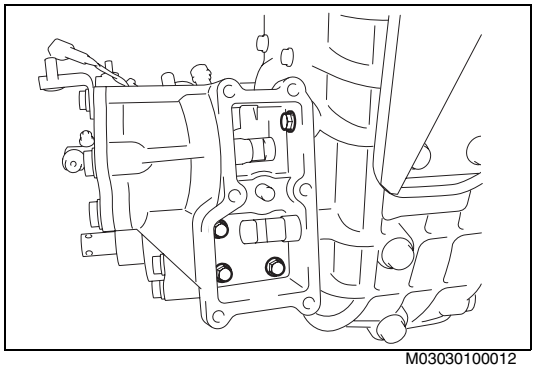
5. REMOVE THE REAR BEARING RETAINER OR POWER TAKE-OFF UNIT (MODELS: WITH POWER TAKE-OFF).


M03030100010

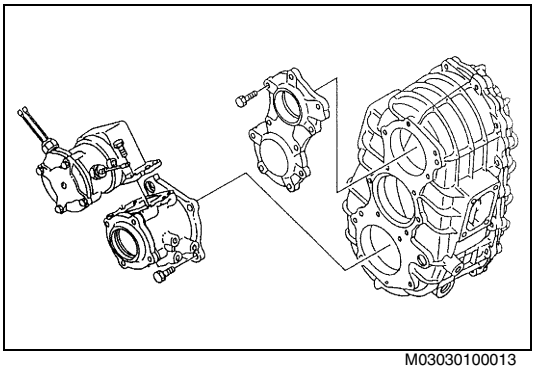
6. REMOVE THE INPUT SHAFT REAR LOCK NUT.
(1) Lift the caulked part completely out of nut groove.
(2) Using a proposal tool remove the lock nut.
Proposal tool: Socket Wrench


M03030100011

7. REMOVE THE INPUT SHAFT REAR BALL BEARING.
(1) Using a copper hammer, drive out the input shaft to the rearward about 5 mm {0.1969 in.},
(2) Using a suitable commercial puller, remove the ball bearing from the input shaft.


M03030100012

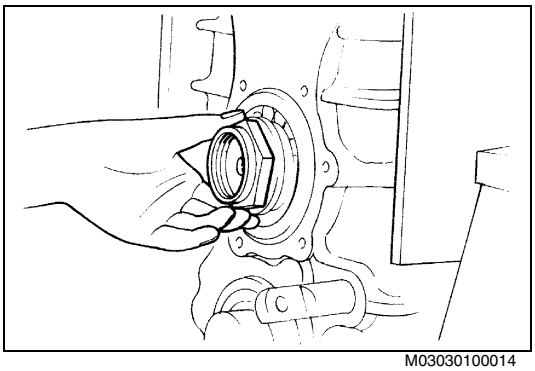
8. REMOVE THE HIGH-LOW SHIFT UNIT.
(1) Remove the bolts, remove the High-Low shift unit.


M03030100013

9. REMOVE THE 4WD SHIFT UNIT.

10. REMOVE THE FRONT OUTPUT SHAFT BEARING RETAINER.
(1) Remove the bearing retainer by tapping it lightly.

11. REMOVE THE FRONT BEARING RETAINER.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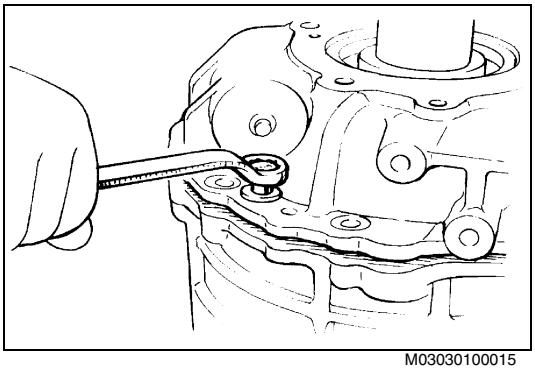
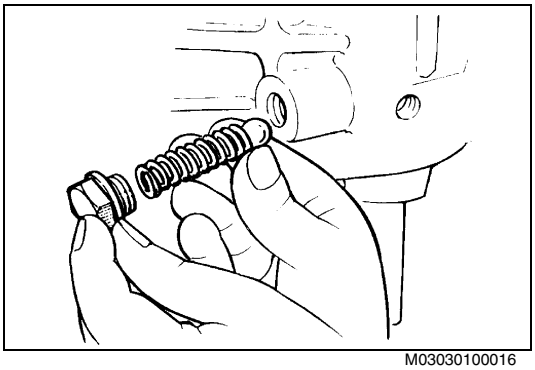
12. REMOVE THE IDLER SHAFT LOCK NUT.


M03030100015

13. REMOVE THE TRANSFER CASE COVER.
(1) Using puler bolts, separate the case cover from the transfer case.
(2) Remove the case cover.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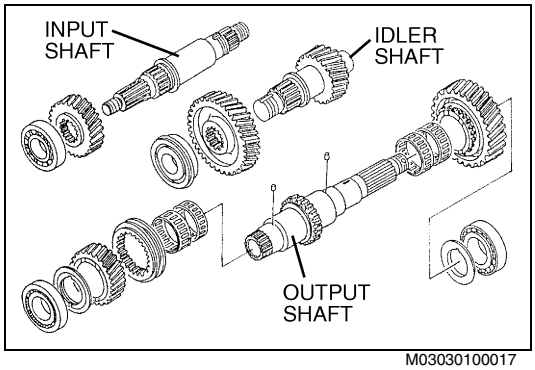
14. REMOVE THE SHAFT ASSEMBLY FROM THE TRANSFER CASE.
(1) Remove the steel ball and compression spring.
(2) Remove the output shaft assembly.
(3) Remove the idler shaft assembly.
(4) Remove the input shaft assembly.



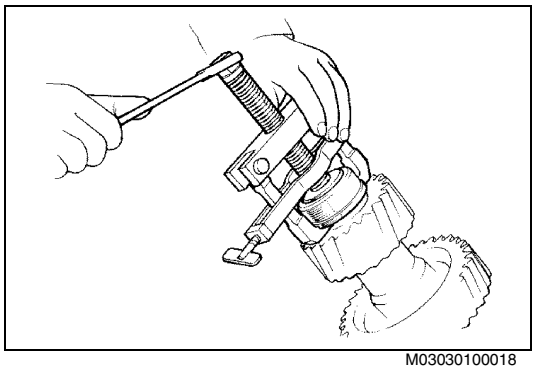
M03030100017

15. DISASSEMBLE THE INPUT SHAFT ASSEMBLY, IDLER SHAFT ASSEMBLY AND OUTPUT SHAFT ASSEMBLY.

(1) Using a press, remove the bearing and gears from the shaft.

CAUTION:
Stay out from under the shaft during removal. The shaft could drop suddenly resulting in personal injury.

NOTICE:
When removing the shaft, do not drop on a hard surface.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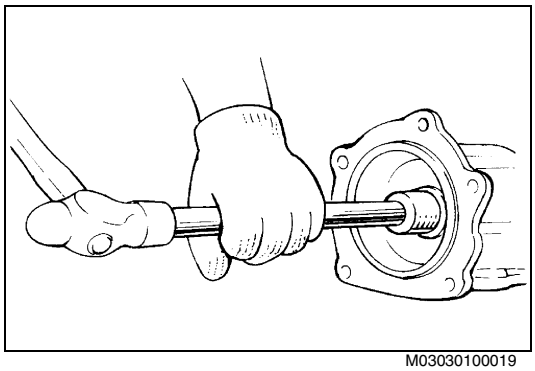
(2) Using a suitable puller, remove the idler shaft rear bearing inner race.

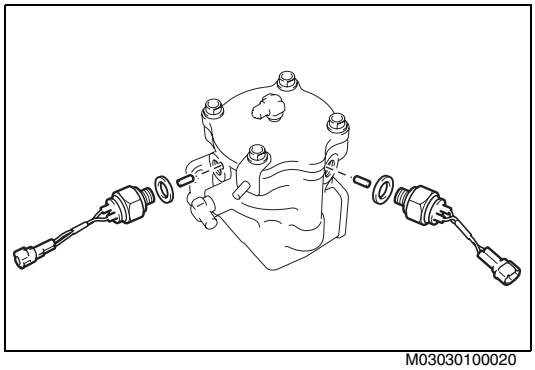

M03030100019

16. DISASSEMBLE THE FRONT OUTPUT SHAFT BEARING RETAINER.

(1) Remove the dust seal retainer.

(2) Using a brass bar and a hammer, drive out the front output shaft with ball bearing.

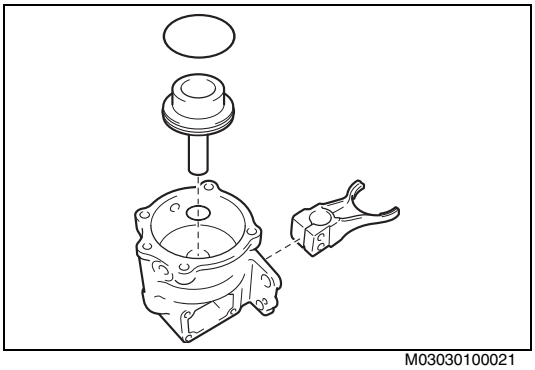
(3) Using a press, press the shaft front end until it is free of ball bearing.


M03030100020

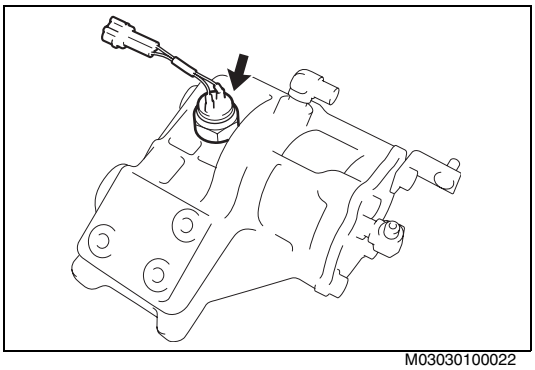
17. DISASSEMBLE THE 4WD SHIFT UNIT.

(1) Remove the 4WD selector warning switch, 4WD detection switch and pins.

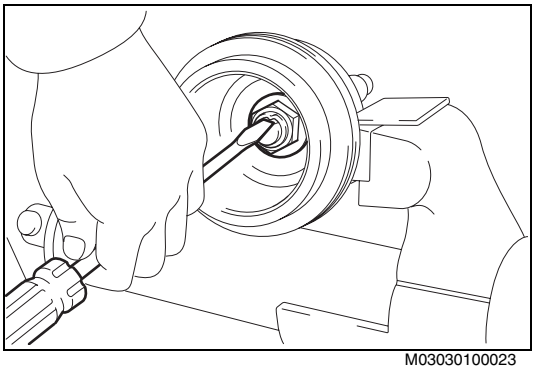
(2) Remove the case cover and cover.


M03030100021

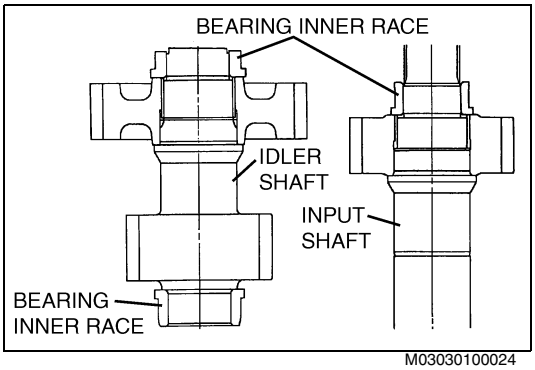
(3) Remove the reamer bolts.
(4) Remove the shift shaft, shift fork and O-rings.


M03030100022

18. DISASSEMBLE THE HIGH-LOW SHFT UNIT
(1) Remove the high detection switch and gasket.
(2) Remove the case cover.
(3) Remove the piston from the case.


M03030100023

(4) Uncaulk the caulked part of the lock nut and remove the nut.
(5) Remove the O-ring and rod from the piston.
(6) Remove the O-rings.

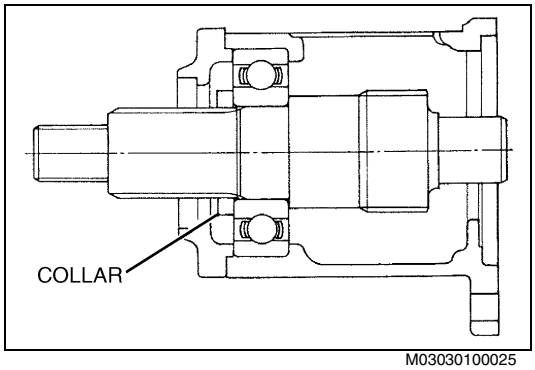


M03030100024

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLE THE IDLER SHAFT.
(1) Install the idler shaft high gear on the shaft and press the bearing inner race on the shaft.
(2) Press the bearing inner race on the shaft.

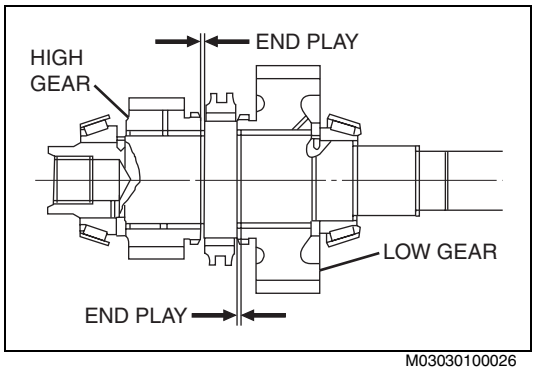
2. ASSEMBLE THE INPUT SHAFT.
(1) Install the input shaft gear and press the bearing inner race on the shaft.



M03030100025

3. ASSEMBLE THE FRONT OUTPUT SHAFT BEARING RETAINER.

(1) Drive the ball bearing and constant sleeve on the front out put shaft.
(2) Install the shaft into the bearing retainer.
(3) Install the collar.
(4) Install the dust seal retainer.



M03030100026

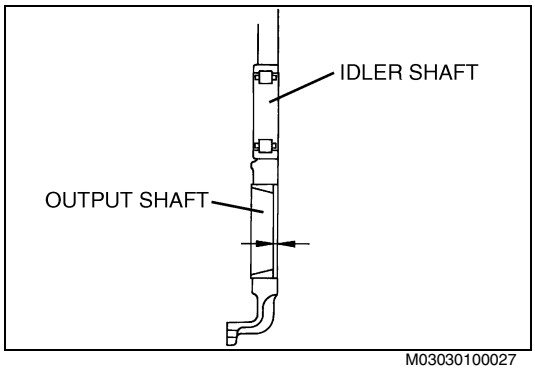
4. ASSEMBLE THE REAR OUTPUT SHAFT.

(1) Install the needle roller bearing, high gear, pin and thrust washer on the shaft.
(2) Press the bearing inner race on the shaft.
(3) Check the high gear end play.

Assembly Standard:	**0.2-0.4 mm {0.0079-0.0157 in.}**
Service Limit:	**0.6 mm {0.0236 in.}**

(4) Install the constant sleeve, needle roller bearing, low gear, pin and thrust washer on the shaft.
(5) Press the inner bearing on the shaft.
(6) Check the low gear end play.

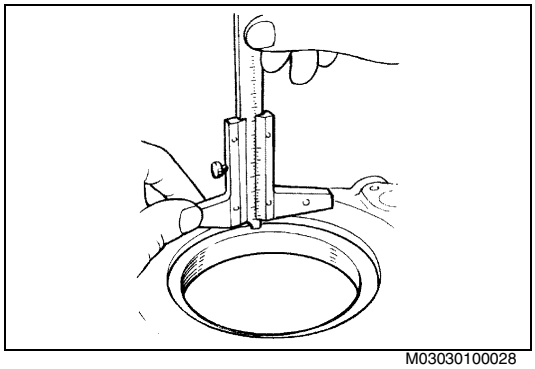
Assembly Standard:	**0.2-0.4 mm {0.0079-0.0157 in.}**
Service Limit:	**0.6 mm {0.0236 in.}**



M03030100027

5. INSTALL THE BEARING OUTER RACE AND CYLINDRICAL ROLLER BEARING IN THE CASE COVER.

(1) Tap the outer race in the cover bore as specified position.
Assembly Standard: 3.5-4.0 mm {0.1378-0.1574 in.}
(2) Tap the cylindrical bearing in the cover bore as specified position.
Assembly Standard: 0.2-1.2 mm {0.0079-0.0472 in.}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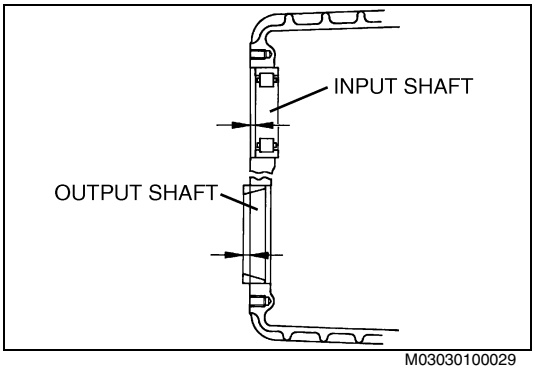
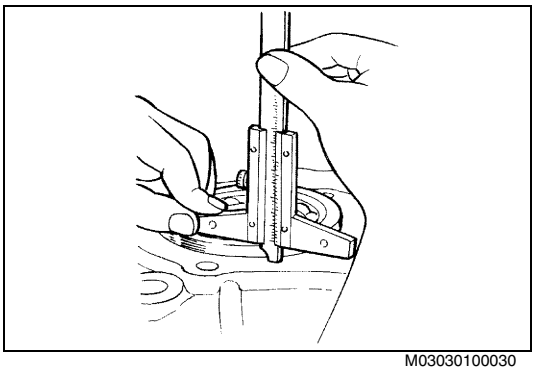


M03030100029

6. INSTALL THE BEARING OUTER RACE AND CYLINDRICAL ROLLER BEARING IN THE CASE.

(1) Tap the outer race in the case bore as specified position.
Assembly Standard: 6.8-7.3 mm {0.2678-0.2874 in.}

(2) Tap the cylindrical bearing in the case bore as specified position.
Assembly Standard: 4.0-5.0 mm {0.1575-0.1968 in.}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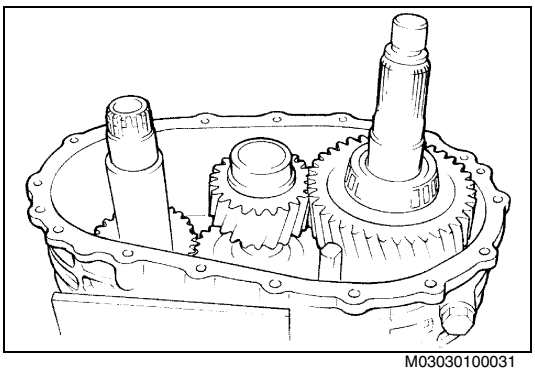
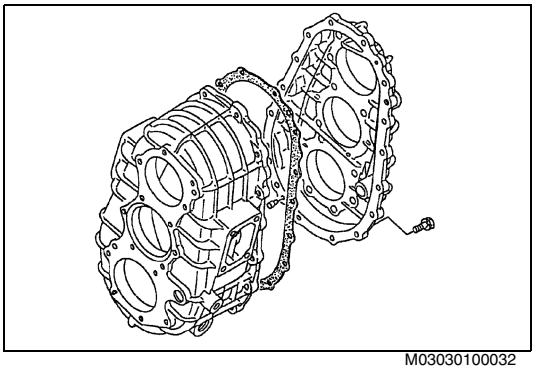

M03030100031

7. PLACE THE INPUT SHAFT ASSEMBLY, IDLER SHAFT ASSEMBLY AND OUTPUT SHAFT ASSEMBLY IN THE CASE.

(1) Install the input shaft assembly.
(2) Install the idler shaft assembly.
(3) Install the output shaft assembly with shift fork and shift shaft.
(4) Install the steel ball, compression spring and plug in the case.


M03030100032

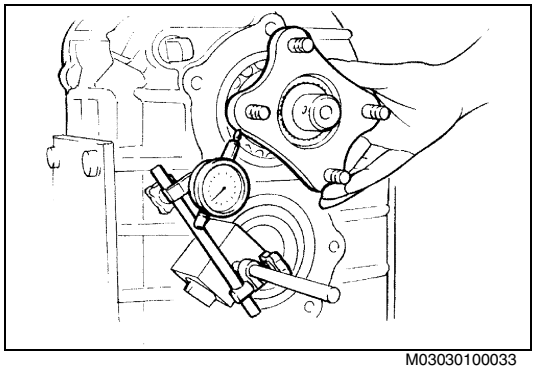
8. INSTALL THE CASE COVER ON THE CASE.

(1) Coat both sides of the gasket with liquid gasket.

NOTICE:

- **The trace of the liquid gasket must be continuous.**
- **The liquid gasket must be the ThreeBond #1215 or equivalent.**

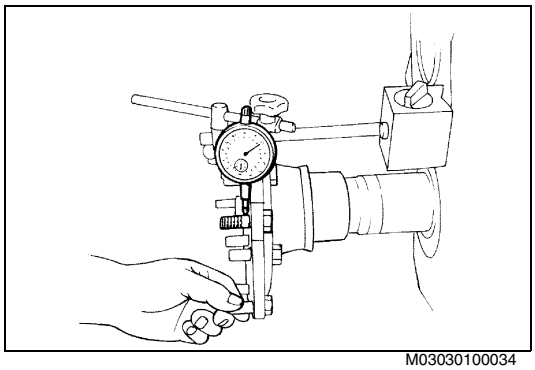
(2) Install the low detection switch


M03030100033

9. MEASURE THE BACKLASH BETWEEN INPUT SHAFT GEAR AND IDLER SHAFT HIGH GEAR.

(1) Install the universal joint flange on the input shaft.
(2) Measure the backlash at flange bolt.

Assembly Standard:	**0.10-0.28 mm {0.0040-0.0110 in.}**
Service Limit:	**0.5 mm {0.0197 in.}**


M03030100034

10. MEASURE THE BACKLASH BETWEEN OUTPUT SHAFT GEAR AND IDLER SHAFT GEAR.

(1) Install the universal joint flange on the rear output shaft.
(2) Shift the transfer in the low position and measure the backlash at flange bolt.

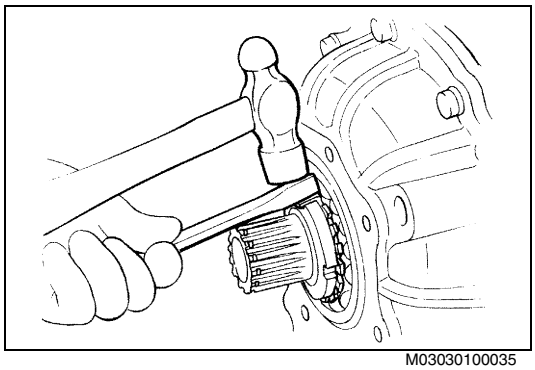
Assembly Standard:	**0.10-0.28 mm {0.0040-0.0110 in.}**
Service Limit:	**0.5 mm {0.0197 in.}**

(3) Shift the transfer in the high position and measure the backlash at flange bolt.

Assembly Standard:	**0.10-0.28 mm {0.0040-0.0110 in.}**
Service Limit:	**0.5 mm {0.0197 in.}**

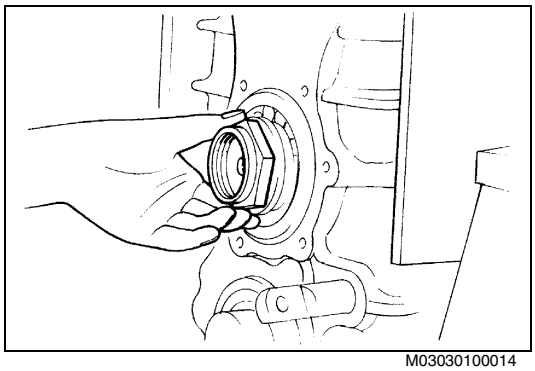
NOTICE:

- **Before measuring the gear backlash, check the tapered roller bearings on both ends of output shaft that there is no play. If there is play, tap outer race in until the play is eliminated.**
- **Measure the backlashes of the low gear and high gear on the output shaft to the constant sleeve, and subtract the measured values from the measured value specified in Item 2 above. The resultant values are the backlashes of the individual gears on the output shaft.**


M03030100035

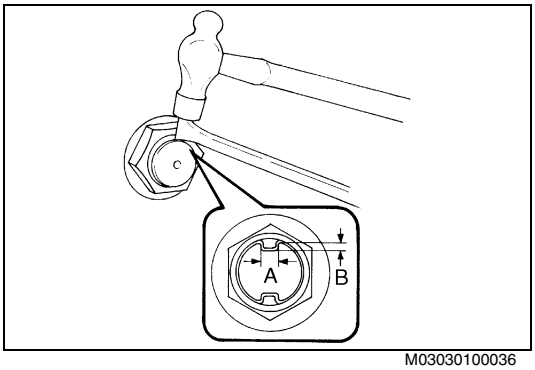
11. INSTALL THE INPUT SHAFT REAR BEARING.

(1) Install the ball bearing in the case cover.
(2) Install the retainer ring.
(3) Using a suitable socket wrench, tighten the lock nut.
(4) Secure the lock nut by bending the lock washer teeth in the slot in the nut.


M03030100014

12. INSTALL THE IDLER SHAFT FRONT BEARING LOCK NUT.

(1) Install the bearing side ring and lock nut on the shaft.
(2) Using a suitable socket wrench, tighten the lock nut.

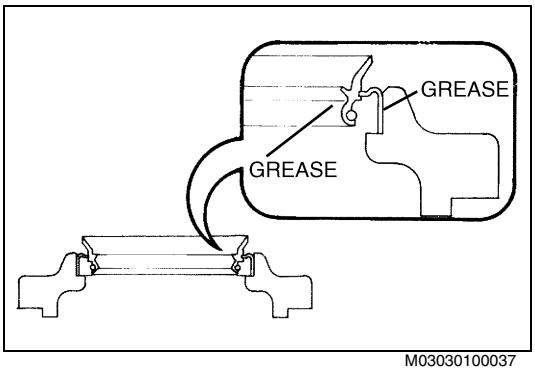


M03030100036

(3) Caulk the outside rim of the nut into the groove on the shaft.

A: 10 mm {0.394 in.}
B: More than 1.5 mm {0.0591 in,}

NOTICE:
- **The caulking should fit the groove thoroughly.**
- **The caulking should be done without rift.**



M03030100037

13. REPLACE THE OIL SEAL.

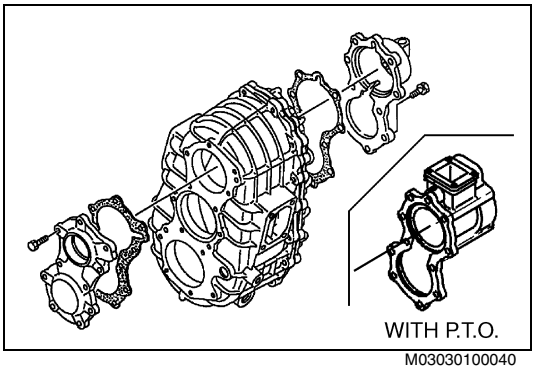
(1) Coat the outer surface of the oil seal with liquid gasket.

NOTICE:
The liquid gasket must be ThreeBond #1215 or equivalent.

(2) Drive the oil seal into the retainer.

NOTICE:
- **Do not damage the seal lip.**
- **The oil seal is inserted in the proper direction.**

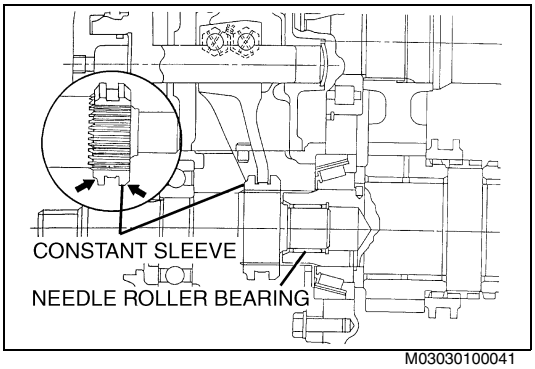
(3) Coat the sealing surface between the seal lips with grease.



M03030100040

14. INSTALL THE FRONT BEARING RETAINER AND REAR BEARING RETAINER OR POWER TAKE-OFF UNIT (MODELS: WITH POWER TAKE-OFF).

NOTICE:
- **Coat the both sides of the gasket with liquid gasket.**
- **The liquid gasket must be continuous.**
- **The liquid gasket must be ThreeBond #1215 or equivalent.**



M03030100041

15. INSTALL THE FRONT OUTPUT SHAFT BEARING RETAINER ON THE CASE.

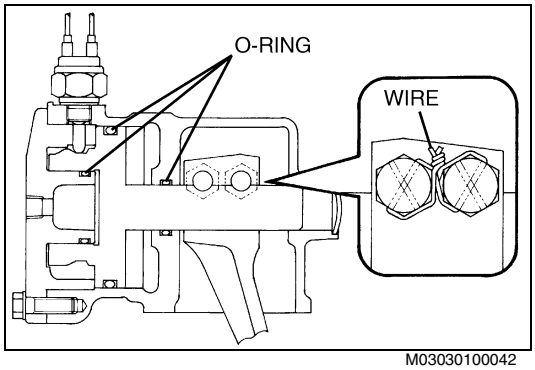
(1) Install the needle roller bearing in the output shaft bore.

(2) Install the constant sleeve on the front output shaft.

NOTICE:
The constant sleeve is installed in proper direction.

(3) Install the bearing retainer on the case.

NOTICE:
- **Coat the both sides of the gasket with liquid gasket.**
- **The liquid gasket must be ThreeBond #1215 or equivalent.**



M03030100042

16. ASSEMBLE THE 4WD SHIFT UNIT.

(1) Install the O-rings in the case, case cover and shift shaft.

NOTICE:
Coat the O-rings with grease.

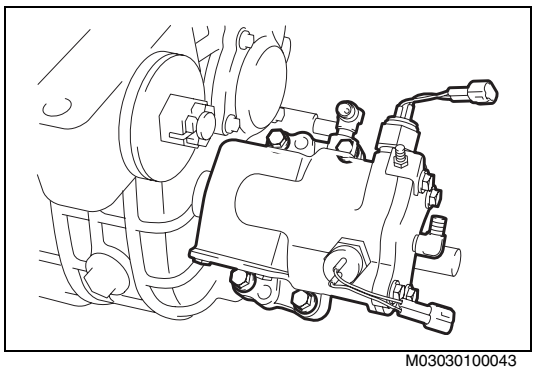
(2) Install the shift shaft into the case. When inserting the shaft, install the shift fork on the shaft.

(3) Install the reamer bolts, and secure the bolts with wire.

(4) Install the case cover and cover.

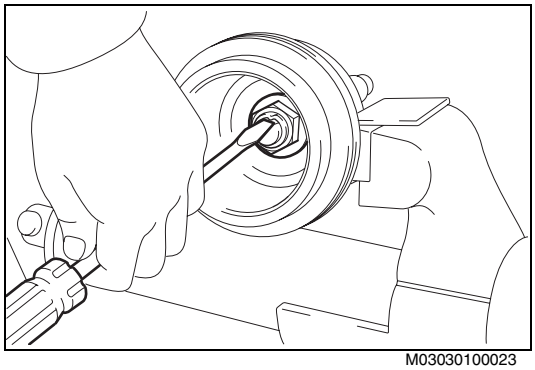
NOTICE:
- **Coat the both sides of the gasket with liquid gasket.**
- **The liquid gasket must be ThreeBond #1215 or equivalent.**

(5) Install the pins and switches.


M03030100043

17. INSTALL THE 4WD SHIFT UNIT ON THE BEARING RETAINER.

NOTICE:
- **Coat the both sides of the gasket with liquid gasket.**
- **The liquid gasket must be ThreeBond #1215 or equivalent.**


M03030100023

18. ASSEMBLE THE HIGH-LOW SHIFT UNIT.

(1) Install the O-rings in the case, piston and case cover.

NOTICE:
Coat the O-rings with grease.

(2) Install the rod and O-ring into the piston.

NOTICE:
Coat the O-rings with grease.

(3) Tighten the lock nut and caulk the lock nut.

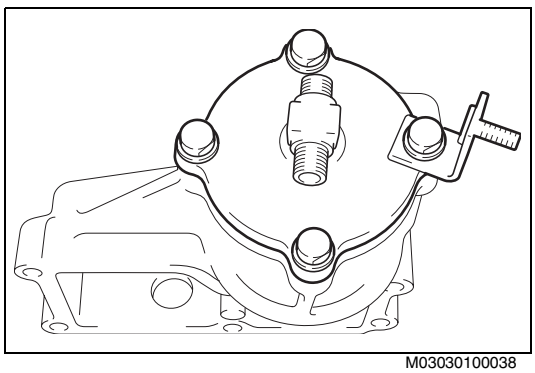
(4) Install the piston into the case.

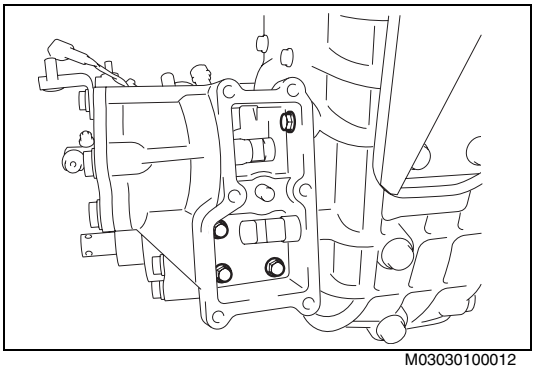
NOTICE:
Coat the sliding surface of the piston with the gear oil.

(5) Install the case cover.

NOTICE:
- **Coat the both sides of the gasket with liquid gasket.**
- **The liquid gasket must be ThreeBond #1215 or equivalent.**

(6) Install the high detection switch.


M03030100038

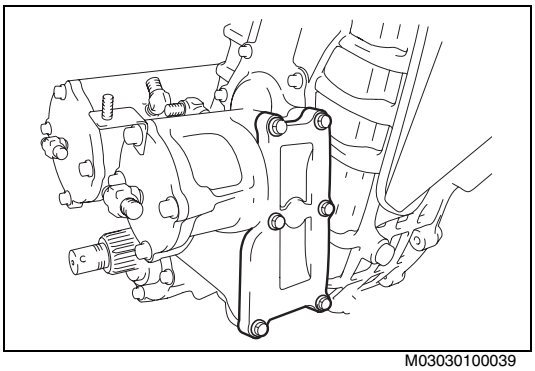

M03030100012

19. INSTALL THE HIGH-LOW SHIFT UNIT.

(1) Coat between the High-Low shift unit and the transfer case with the liquid gasket.

NOTICE:
The liquid gasket must be ThreeBond #1215 or equivalent.

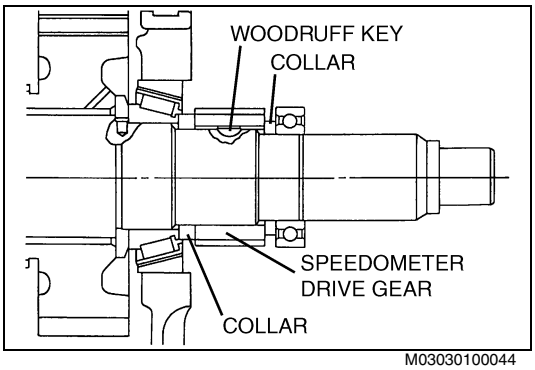
(2) Install the High-low shift unit.


M03030100039

(3) Coat between the case cover and case with the liquid gasket.

NOTICE:
The liquid gasket must be ThreeBond #1215 or equivalent.

(4) Install the cover.

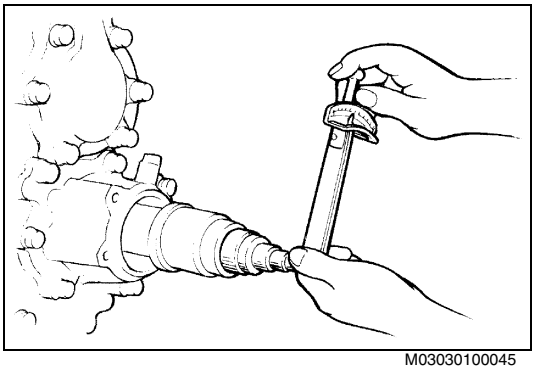


M03030100044

20. INSTALL THE SPEEDOMETER DRIVE GEAR ON THE OUTPUT SHAFT.

(1) Install the collar on the shaft.
(2) Install the woodruff key in the shaft, drive the speedometer drive gear on the shaft.
(3) Install the collar on the shaft.
(4) Install the ball bearing on the shaft.

21. INSTALL THE REAR OUTPUT SHAFT BEARING RETAINER.

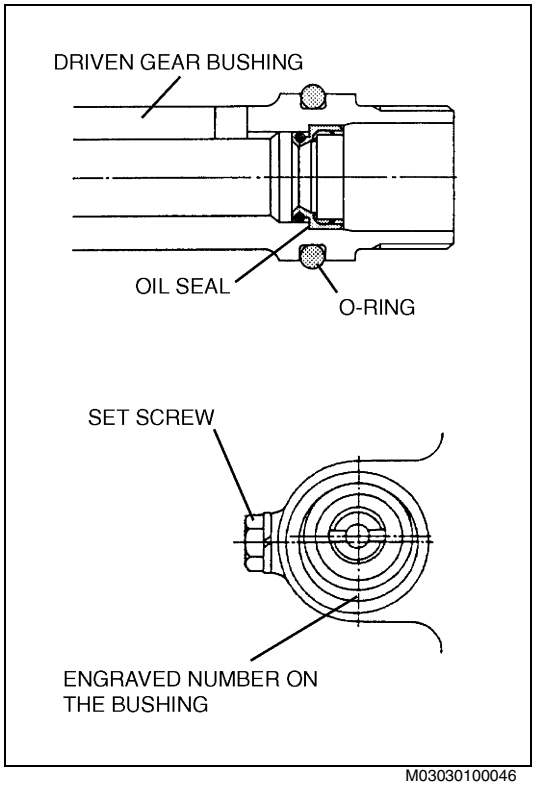

M03030100045

22. CHECK AND ADJUST THE OUTPUT SHAFT BEARING PRELOAD.

(1) Install the rear output bearing retainer with shims and gasket.
Assembly Standard: 1.8-2.1 N·m
{18-22 kgf·cm, 15.7-19.0 lbf·in.}

(2) Measure the bearing preload. If not within specification, adjust the preload with shim.

Shims
Thickness: Unit: mm {in.}
0.08 {0.0031}, 0.10 {0.0039}, 0.13 {0.0051}
0.15 {0.0059}, 0.30 {0.0118}, 0.50 {0.0197}



M03030100046

23. INSTALL THE SPEEDOMETER DRIVEN GEAR BUSHING.

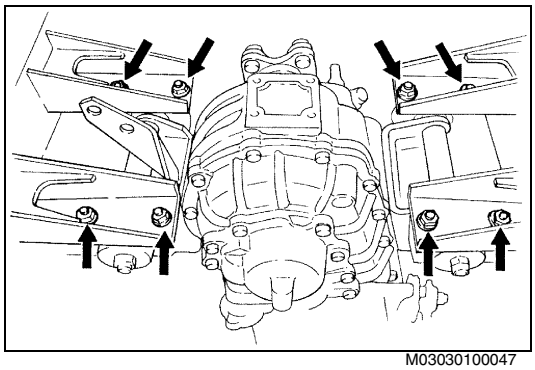
(1) Install the O-ring and oil seal to the bushing.

NOTICE:

- **Coat the O-ring, oil seal and driven gear with grease.**
- **Be sure the oil seal is installed in the proper direction when replacing it.**

(2) Match the engraved number on the bushing to the set screw.

Number of the drive gear teeth	Number of the driven gear teeth	The engraved No. should be matched to the set screw
6	19	19


M03030100047

IMPORTANT POINTS - MOUNTING

1. INSTALL THE TRANSFER.

(1) Crane the transfer with chain block or place the transfer on the transmission jack.

(2) Align the bolt holes, install the fitting bolts and nuts.

2. CONNECT THE PROPELLER SHAFT.

3. CONNECT THE AIR PIPE AND HOSE.

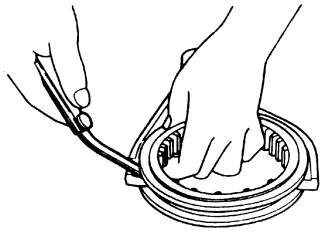
4. CONNECT THE ELECTRIC HARNESS AND OTHER ATTACHMENTS.

5. FILL THE TRANSFER WITH GEAR OIL UP TO FILER PLUG.

INSPECTION AND REPAIR

M03030101BEH3001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Ball bearing, cylindrical roller bearing and tapered roller bearing: Wear, damage and rotation	—	—	Replace, if necessary.	Visual check
Needle roller bearing: Roundness	—	—	Replace, if necessary.	Visual check
Gears and constant sleeve: Wear, crack, and damage	—	—	Replace, if necessary.	Visual check
Shift shaft: Wear and scoring	—	—	Replace, if necessary.	Visual check
Splines on shaft: Wear and damage	—	—	Replace, if necessary.	Visual check
Clearance between shift fork and constant sleeve	0.20-0.45 {0.0079-0.0177}	1.5 {0.0591}	Replace.	Measure 

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

TR05-001

POWER TAKE-OFF ASSEMBLY (TRANSMISSION SERIES: LX06S)

DATA AND SPECIFICATIONS

M03050102BEI2007

POWER TAKE-OFF

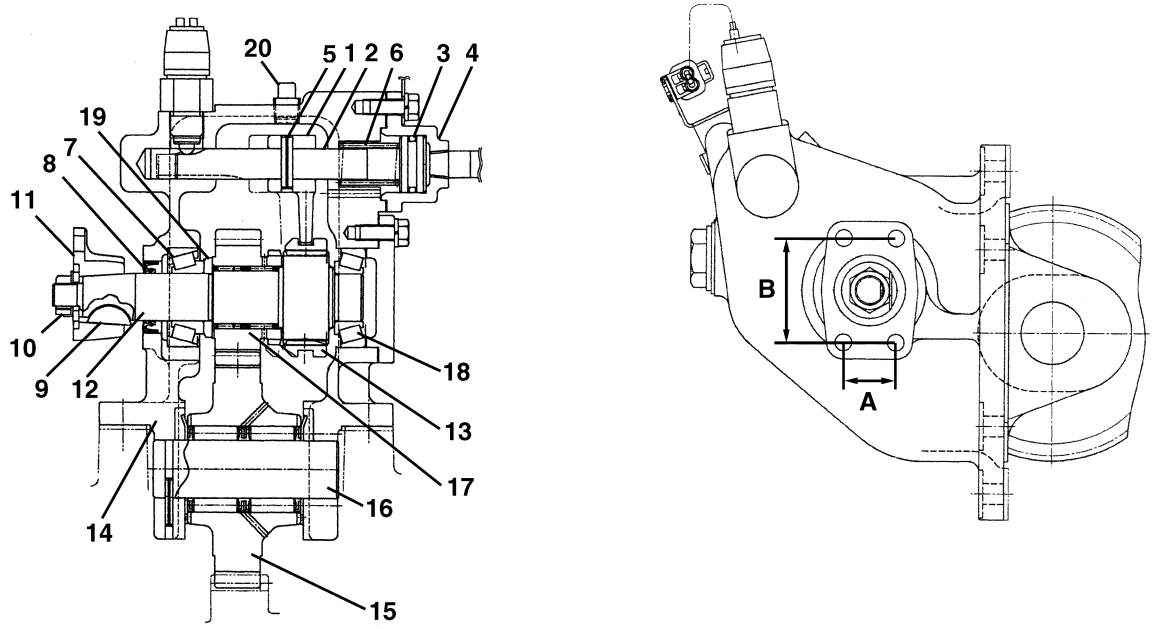
Type	**Side power take-off Driven by engaging the output shaft gear with counter 3rd gear**
Direction of rotation	**Opposite engine's**
Gear ratio	**20/31**
Size of output shaft flange	**25 x 50 mm {0.984 x 1.969 in.} (A x B: Refer to description below)**

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

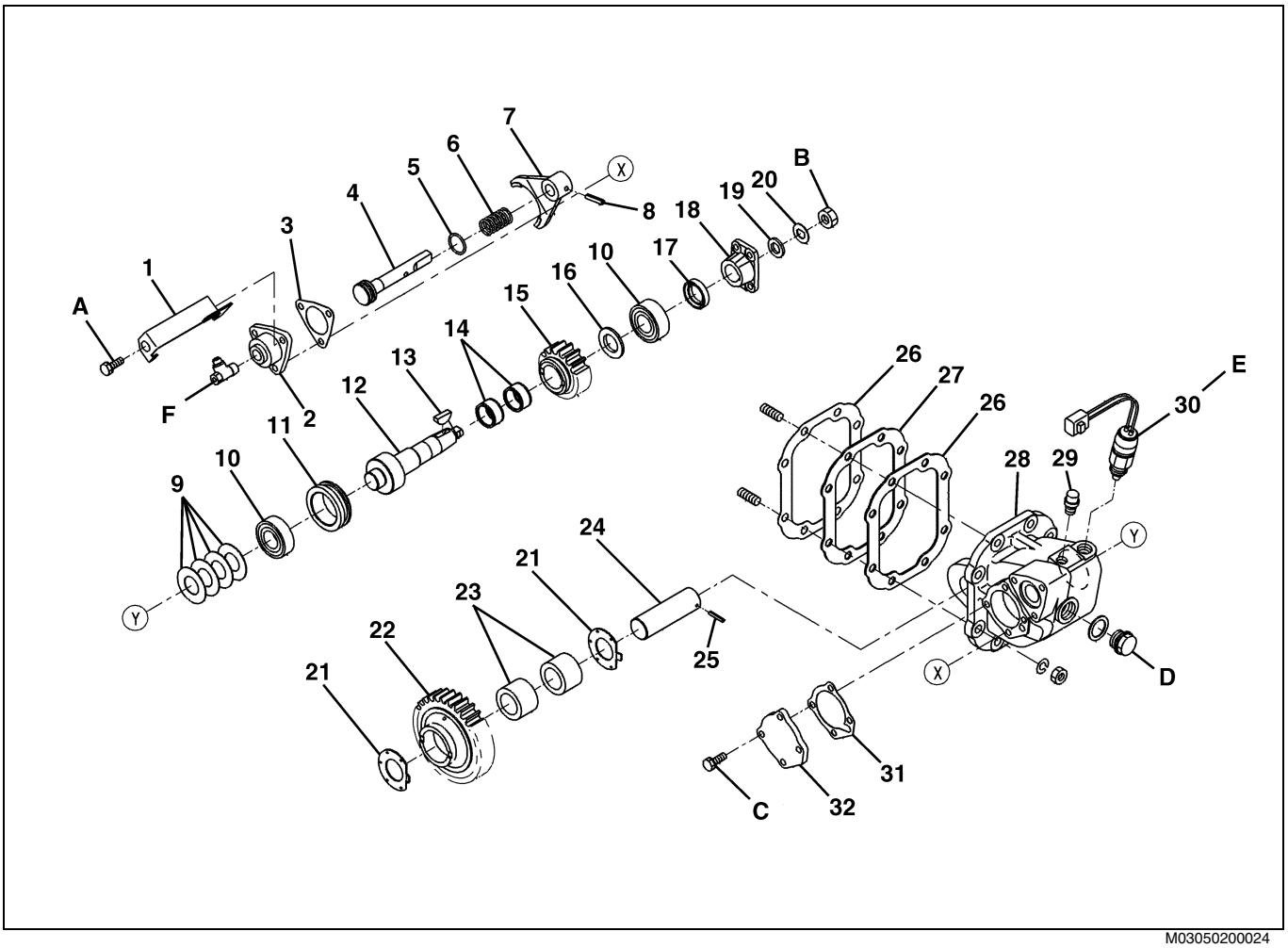
M03050102BEF3006

Symptom	Possible cause	Remedy/Prevention
Noise	Bearing worn and/or damaged	Replace bearing.
	Output gear worn and/or damaged	Replace gear.
	Too 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

M03050202BED1008



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 {194-254, 14-18}	D	63.5-92.5 {648-943, 47-68}
B	39.2-47.0 {400-479, 29-34}	E	48.5-67.5 {495-688, 36-49}
C	19-25 {194-254, 14-18}	F	39.5-58.5 {403-596, 30-43}

OVERHAUL

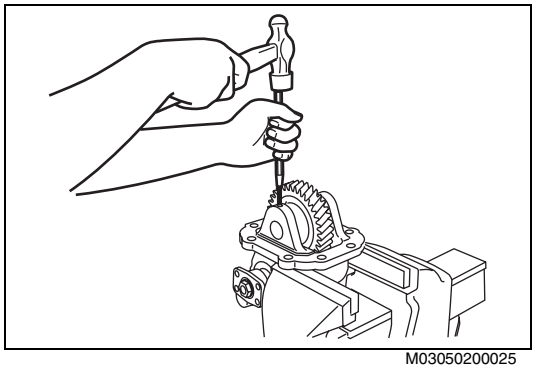
M03050202BEH2009

IMPORTANT POINT - DISMOUNTING

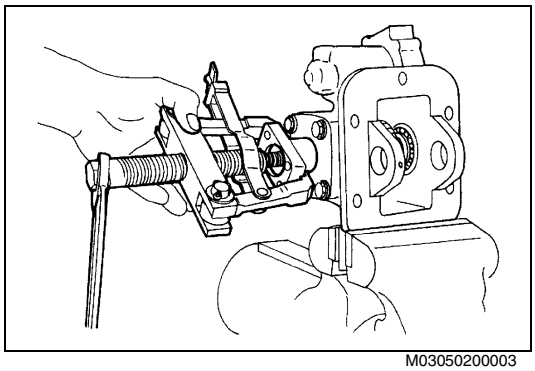
CAUTION:
Do not work on the transmission while it is still hot.
This can result in personal injury.

1. DRAIN THE TRANSMISSION OIL.

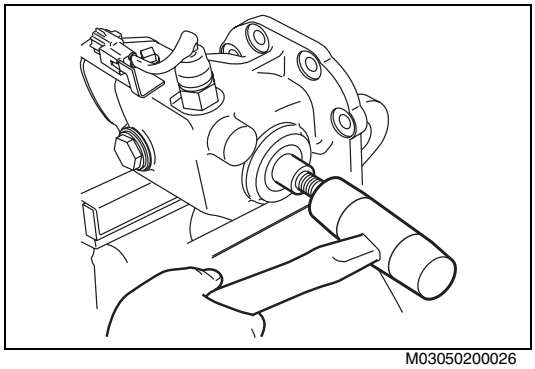
IMPORTANT POINTS - DISASSEMBLY


M03050200025

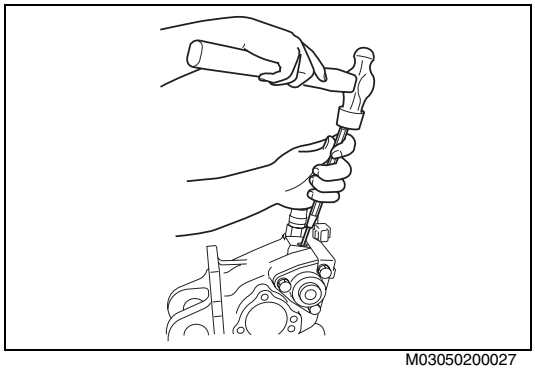
1. SET THE POWER TAKE-OFF ON A VISE.
REMOVE THE INPUT GEAR.
(1) Drive the spring pin into the hole of the shaft.
(2) Drive out the input shaft.


M03050200003

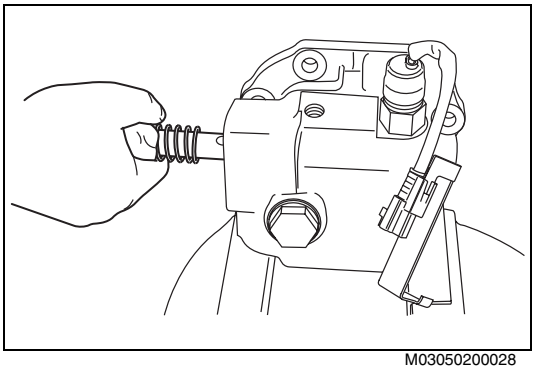
2. REMOVE THE OUTPUT SHAFT FLANGE.
(1) Remove the lock nut.
(2) Use a suitable puller to remove the output shaft flange.


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.

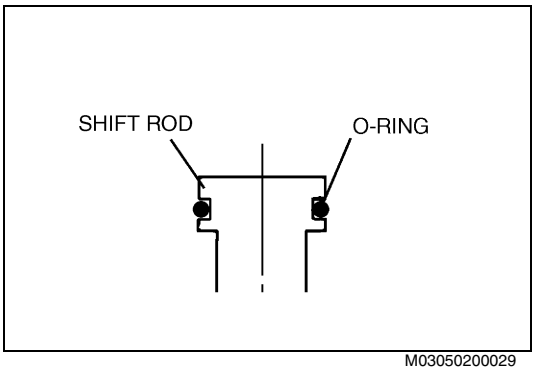

M03050200027

4. REMOVE THE SHIFT ROD.
(1) Remove the screw plug.
(2) Remove the spring pin into the hole of the shaft.
(3) Remove the cylinder cap.


M03050200028

(4) Remove the shift rod.

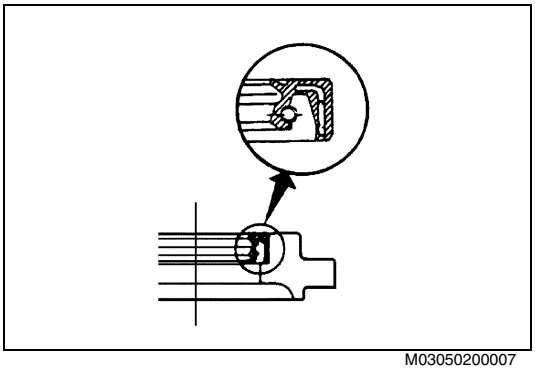
IMPORTANT POINTS - ASSEMBLY



M03050200029

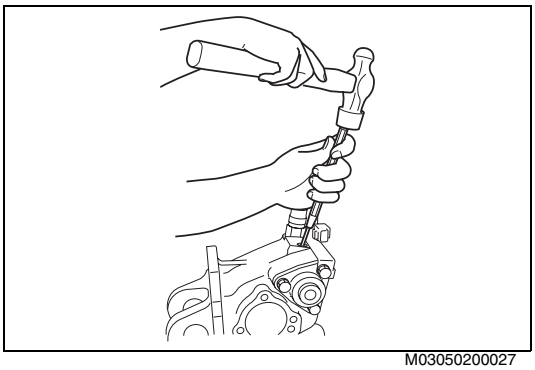
1. INSTALL THE O-RING ON THE SHIFT ROD.

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.

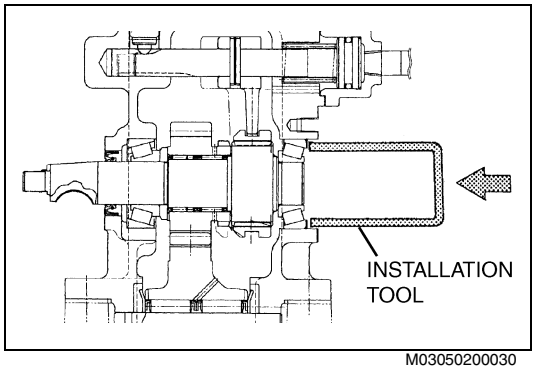
NOTICE:
Be sure the shift fork is installed in the correct direction.

(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.

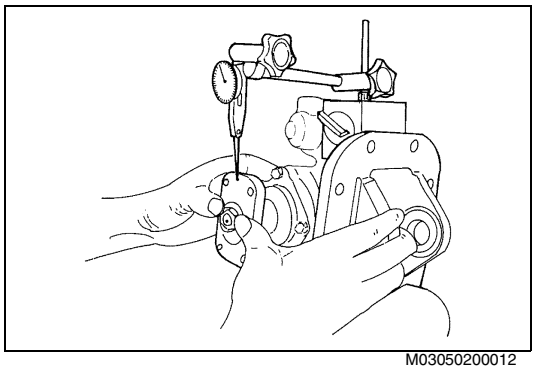
NOTICE:
Apply grease to the inner surface of the cylinder cap.



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.

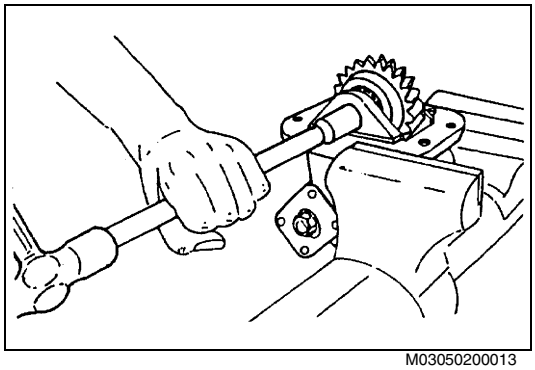

M03050200012

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.

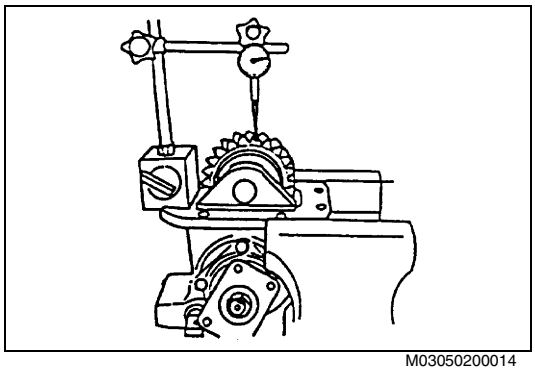
Shim Thickness:	**0.05 mm {0.0020 in.}**
	0.1 mm {0.0039 in.}
	0.2 mm {0.0079 in.}
	0.5 mm {0.0197 in.}


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.

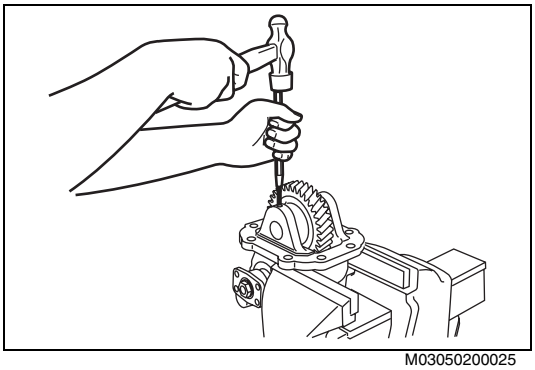

M03050200014

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.}

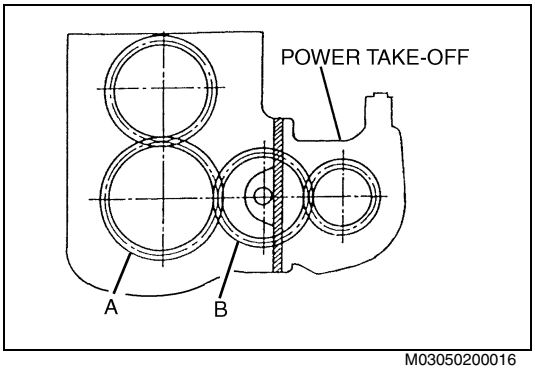
(2) If it is not within specification, adjust the axial play with shims.
Shims are available in following sizes.

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

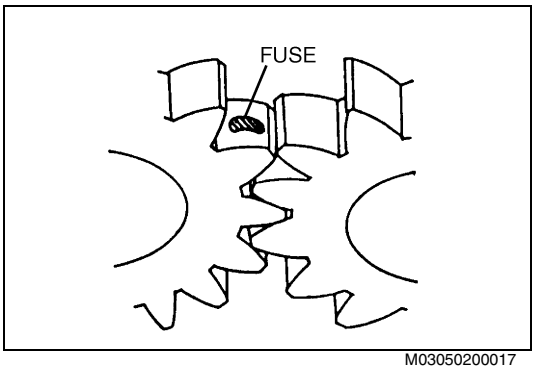
8. AFTER MEASURING THE AXIAL PLAY, INSTALL THE SPRING PIN INTO THE HOLE.

IMPORTANT POINTS - MOUNTING



M03050200016

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



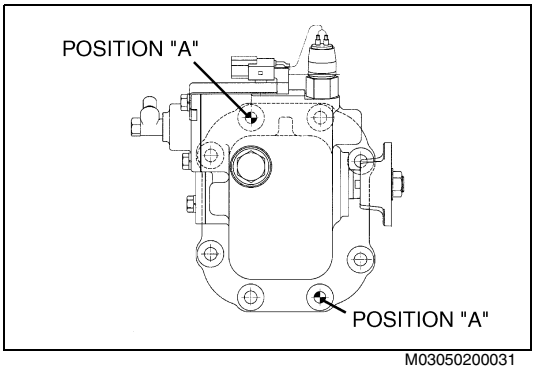
M03050200017

(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 {0.0032-0.0082 in.}
(4) If it is not within specification, adjust the backlash with adapter.

Adapters are available in following size.

Adapter Thickness:
Groove line: None 8.15 mm {0.3209 in.}
Groove line: One 8.04 mm {0.3165 in.}
Groove line: Two 7.94 mm {0.3126 in.}

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



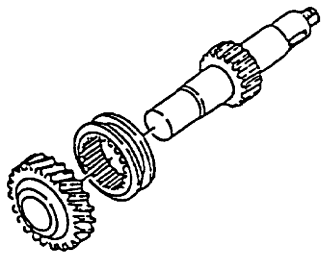
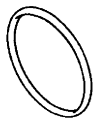
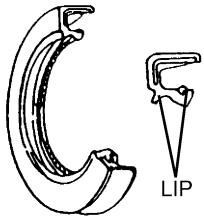
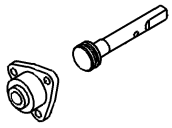
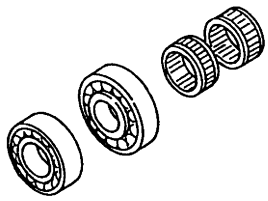
M03050200031

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

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

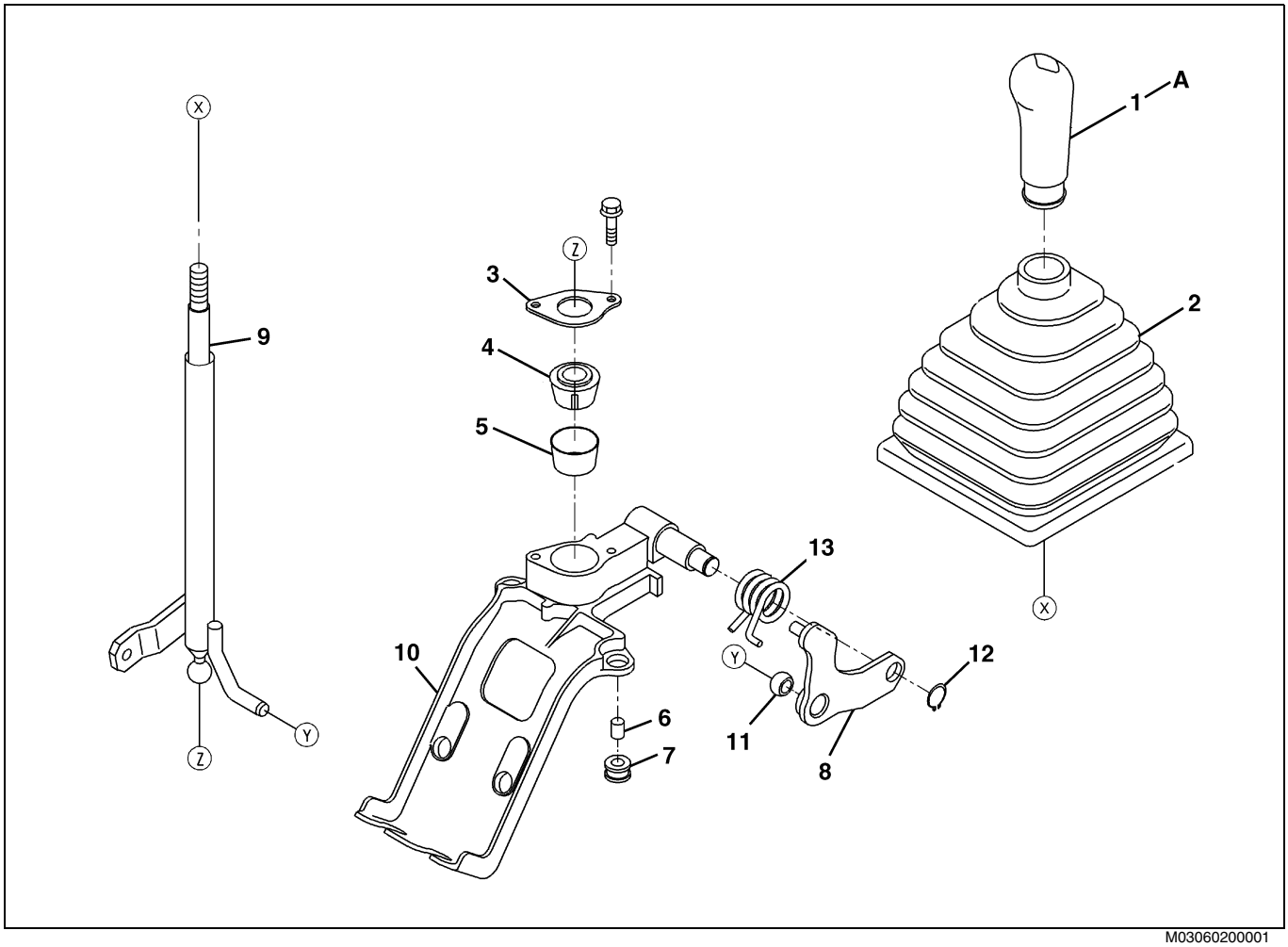
Symptom	Possible cause	Remedy/Prevention
Gears are difficult to engage or cannot be engaged when engine is not operating.	Control cable damaged, bent, deteriorated or deformed due to heat	Replace control cable.
	Loose parts	Inspect and tighten.
	Damaged shift lever assembly	Replace shift lever.
	Damaged 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

M03060202BED1002

CAB SIDE



M03060200001

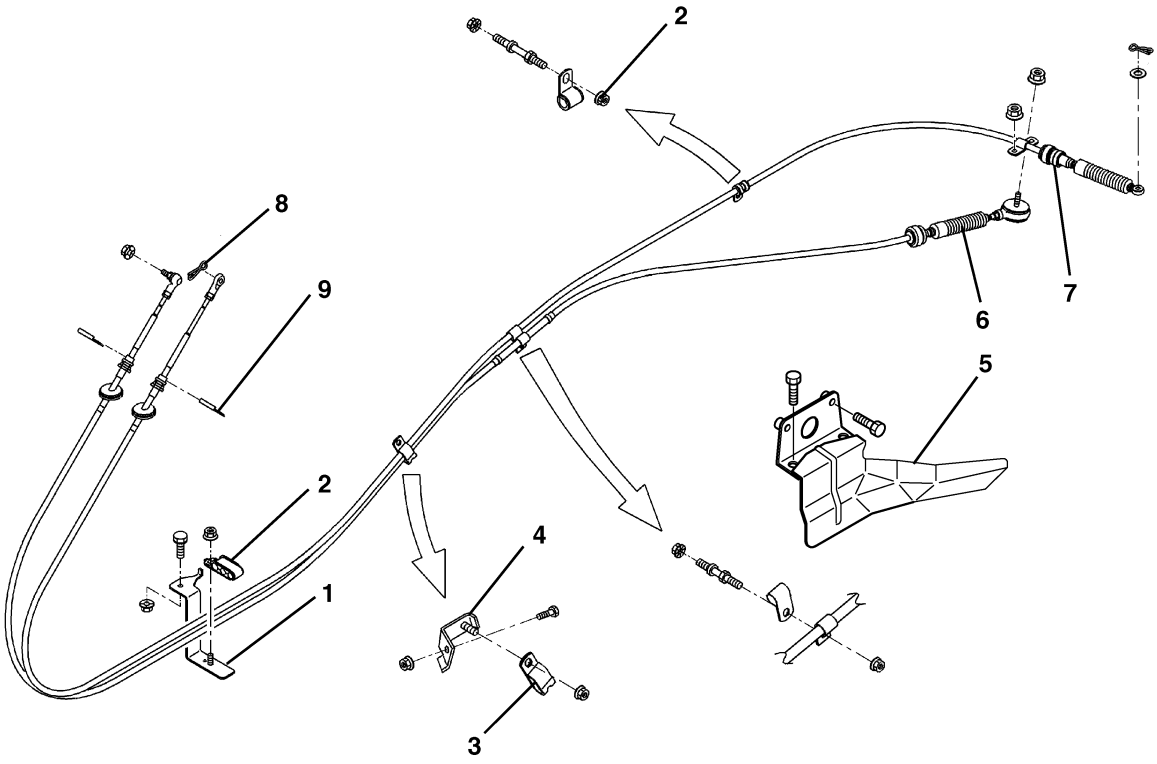
1	Shift lever knob	8	Select lever
2	Shift lever boot	9	Shift lever
3	Plate	10	Control rod support
4	Ball joint	11	Ball
5	Rubber seat	12	E-ring
6	Distance piece	13	Spring
7	Rubber cushion		

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

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

CHASSIS SIDE

(EXAMPLE)

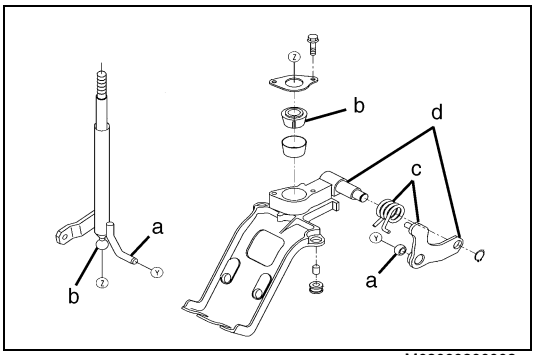


M03060200019

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.

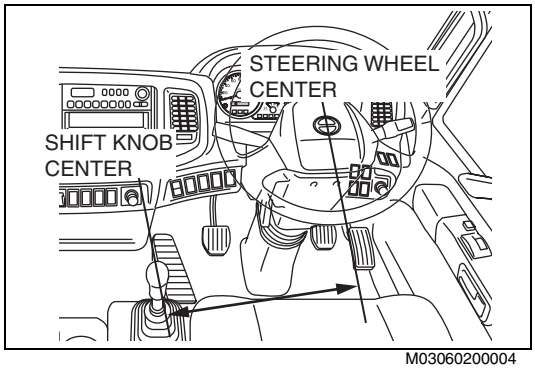
b. Shift lever and ball joint contact point.

c. Select lever and spring contact point.

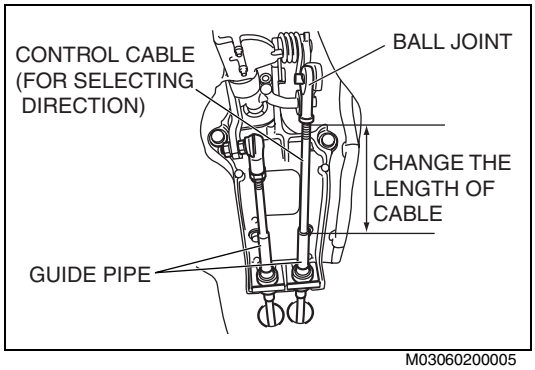
d. Shift lever and select lever contact point.

ADJUSTMENT

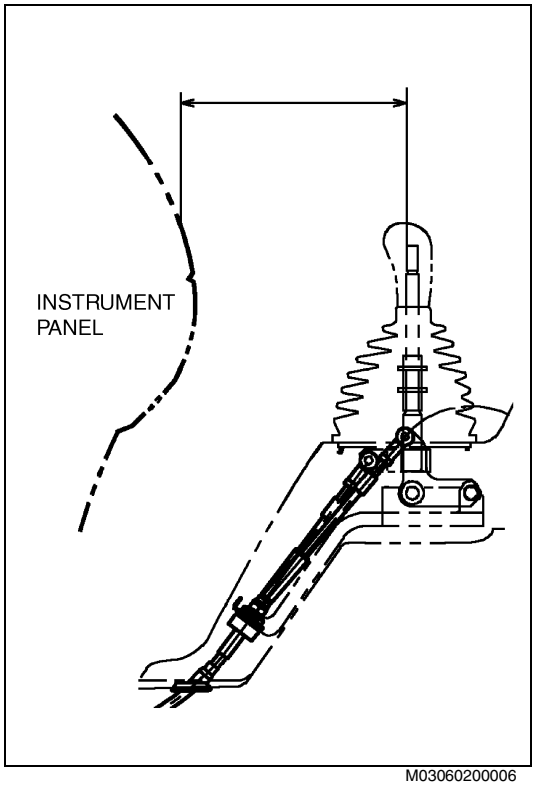
M03060202BEH3003



M03060200004



M03060200005



M03060200006

ADJUSTMENT PROCEDURE

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

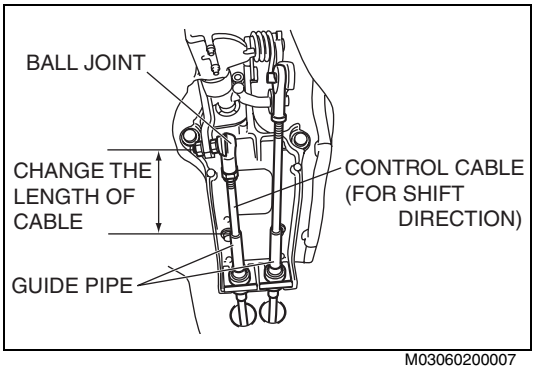
(1) Check that the distance between the knob center and the steering wheel center conforms to the following;
Assembly standard: 350-380 mm {13.780-14.960 in.}

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

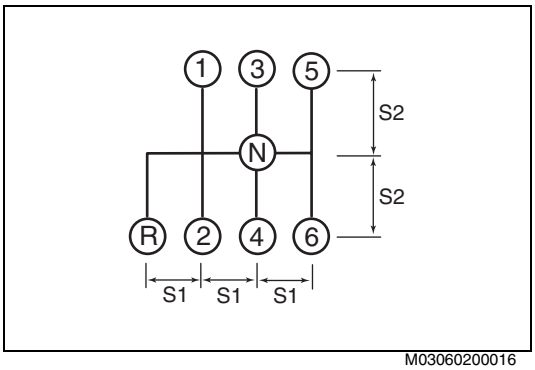
Length of cable	Position of selecting direction
To lengthen it	Distance gets shorter. (Lever leans right side.)
To shorten it	Distance gets longer. (Lever leans left side.)

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.

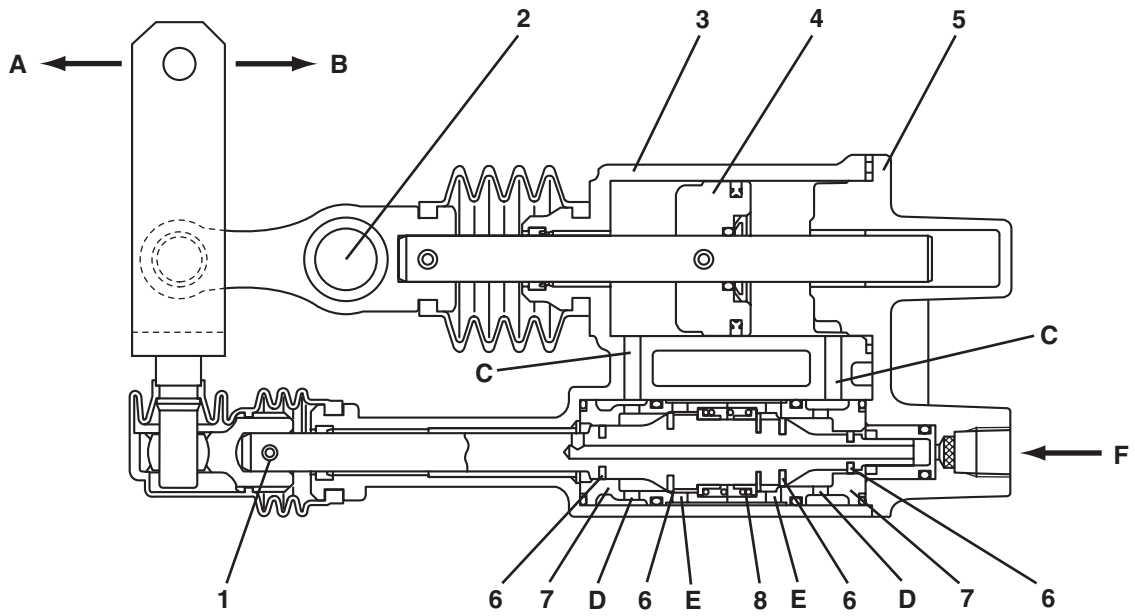
Unit: mm {in.}

	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

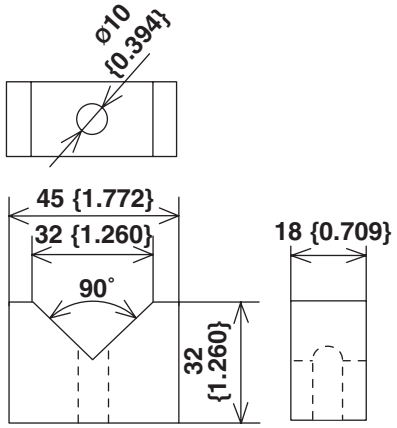
1	Valve joint	8	Return spring
2	Joint	A	Front
3	Booster cylinder	B	Rear
4	Piston	C	Air inlet and outlet
5	Cover	D	Air inlet
6	Valve seal	E	Air outlet
7	Valve seat	F	Compressed air

PROPOSAL TOOL

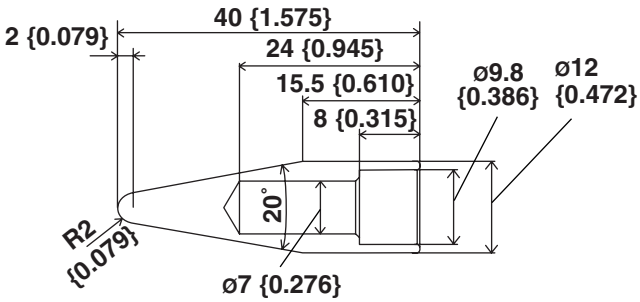
M03060301BEK1001

Unit: mm {in.}

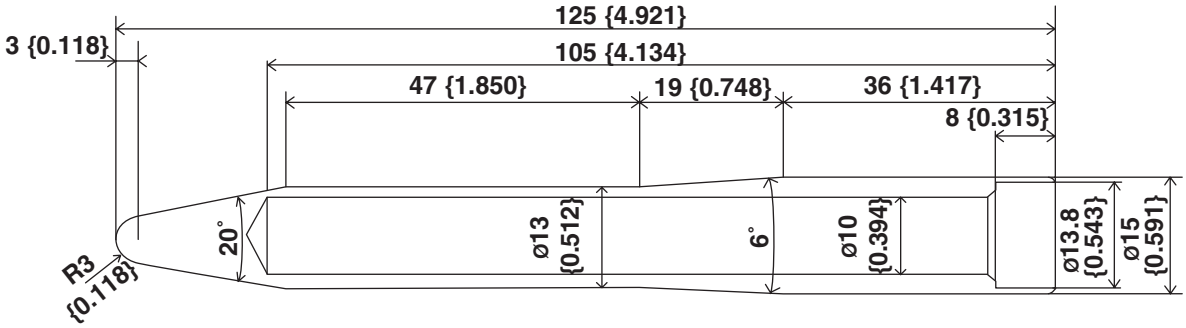
JIG A



JIG B



JIG C



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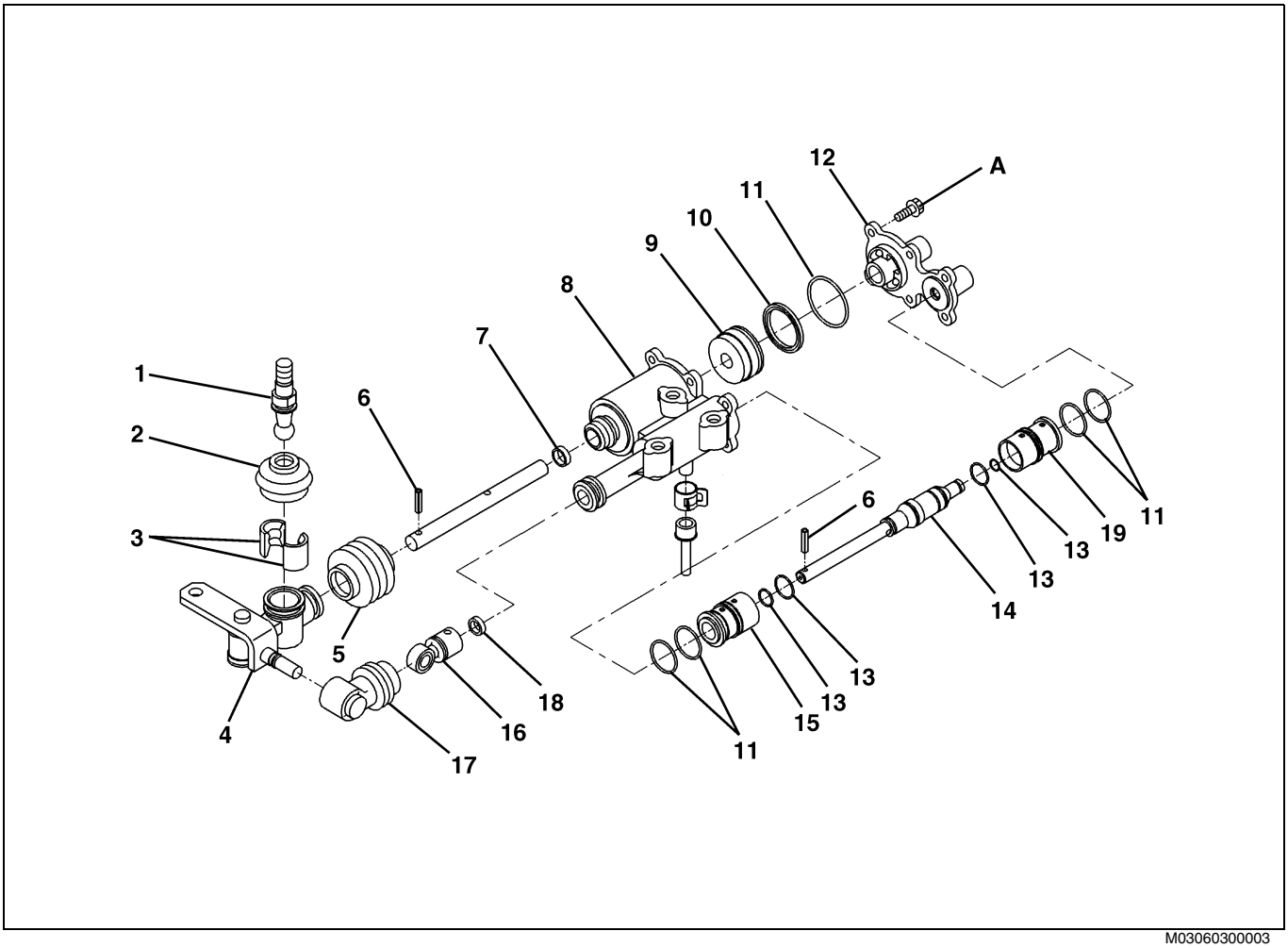
COMPONENT LOCATOR

M03060301BED1001



M03060300003

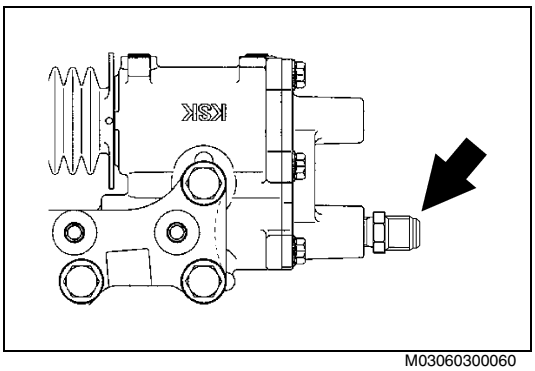
1	Ball joint stud	11	O-ring
2	Dust boot C	12	Cover
3	Ball joint	13	Valve seal
4	Joint	14	Power shift valve sub-assembly
5	Dust boot A	15	Valve seat A
6	Spring pin	16	Ball joint assembly
7	Rod seal A	17	Dust boot B
8	Booster cylinder	18	Rod seal B
9	Piston	19	Valve seat B
10	Piston seal		

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

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

OVERHAUL

M03060301BEH2001

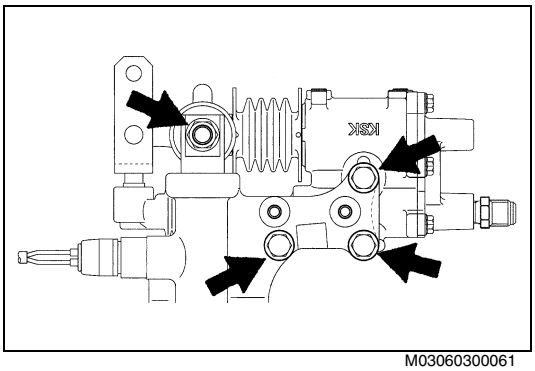

M03060300060

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}

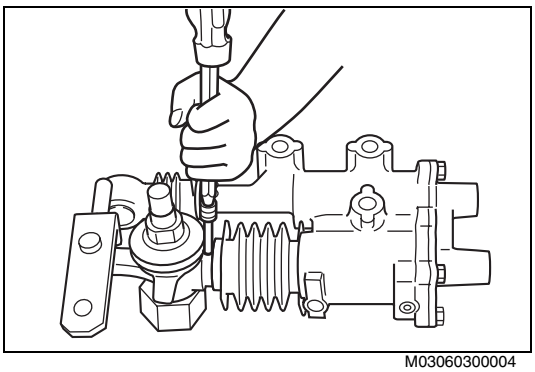
(2) Install the shift lever shaft to the power shift.
Tightening Torque:
75.5-91.2 N·m {770-929 kgf·cm, 56-67 lbf·ft}

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

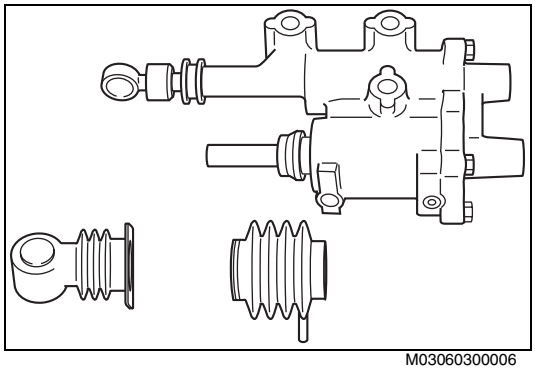
2. DISASSEMBLE THE POWER SHIFT.

(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.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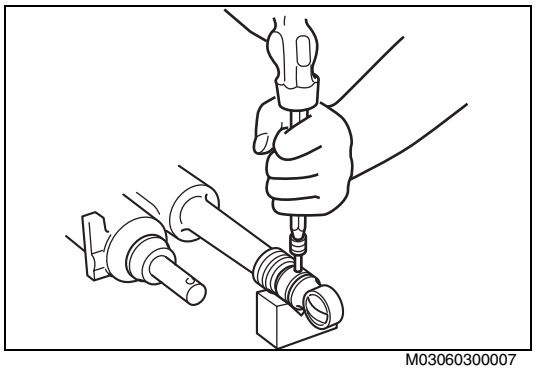
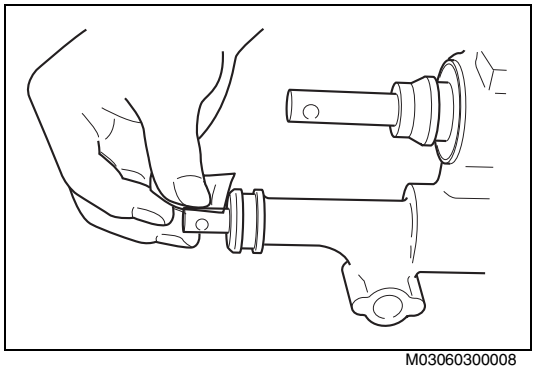
(4) Remove the boot A and B.


M03060300007

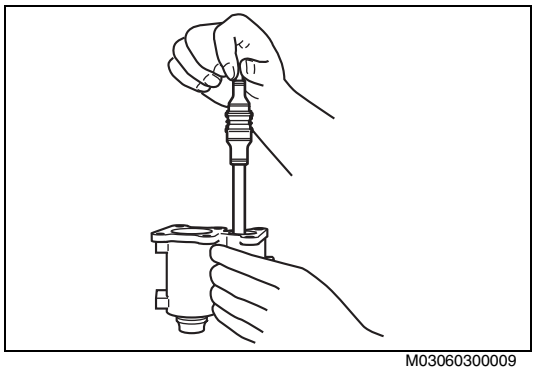
(5) Put the ball joint assembly on the jig A and drive out the spring pin with a tapping rod to remove the ball joint assembly.

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.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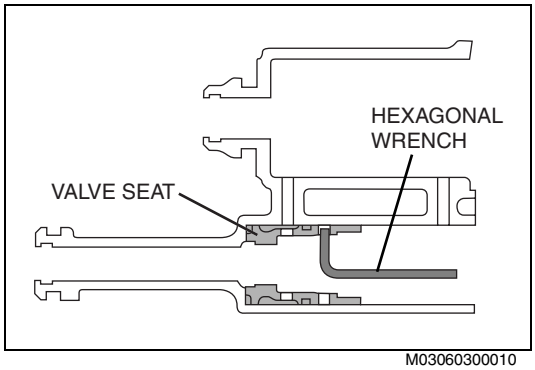
3. PULL OUT THE POWER SHIFT VALVE AND PISTON.

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



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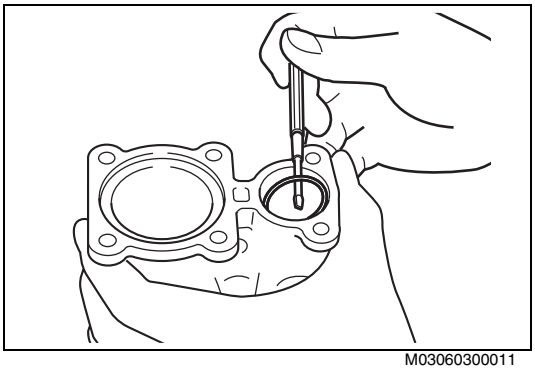
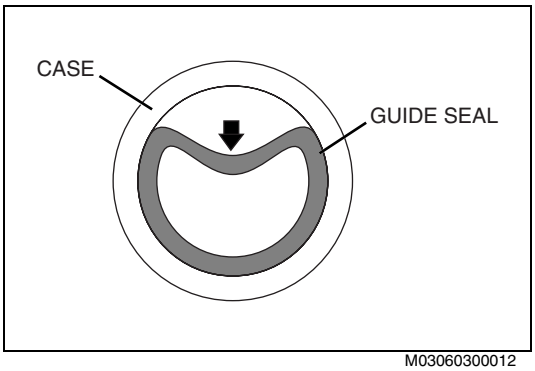
(2) Pull out the valve seat A by inserting a hexagonal wrench 4 mm {0.157 in.} width across flats into the hole of the valve seat A.

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.

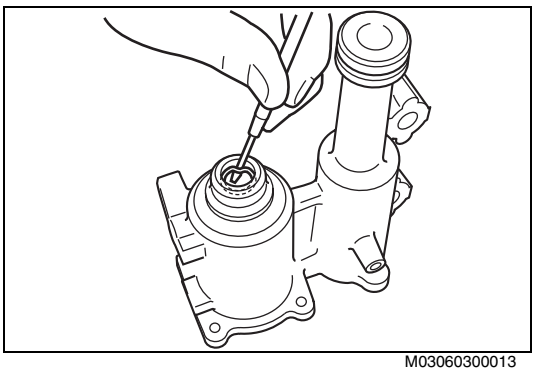
NOTICE:
Be careful not to damage the inner surface of the cylinder.



M03060300012

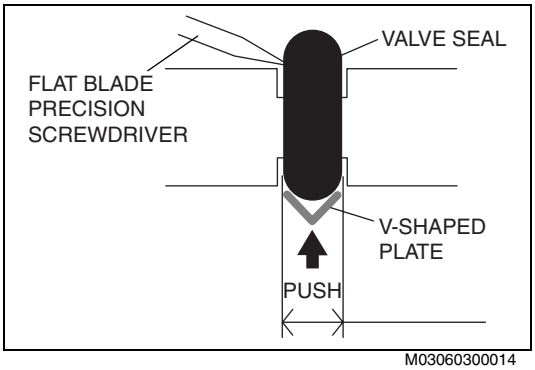
4. REMOVE THE ROD SEALS.

(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.

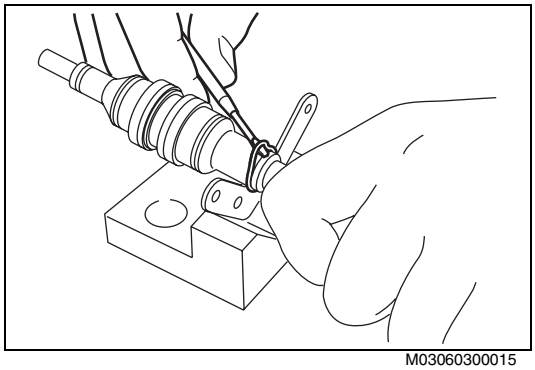
NOTICE:
Be careful not to damage the inner groove of the cylinder by the point of the precision screwdriver etc.



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

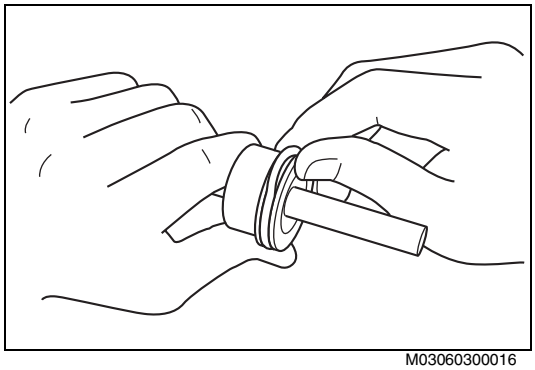
(2) Remove the valve seal by inserting a flat blade precision screwdriver between the power shift valve sub-assembly and valve seal.

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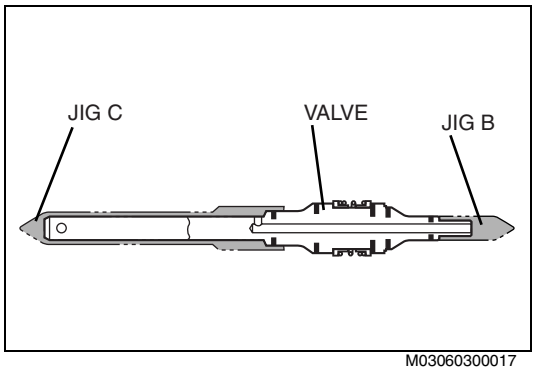
(2) Apply silicone grease to the valve seal A and B and install them to the valve sub-assembly using a jig B and a Jig C.

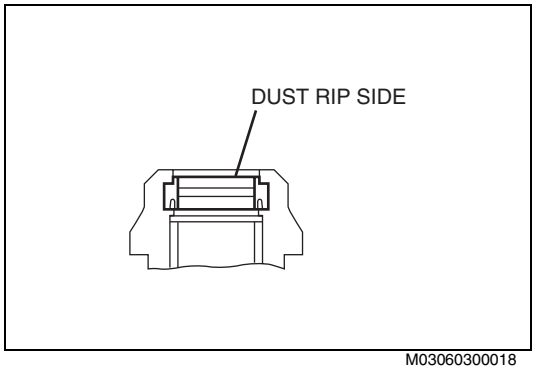


M03060300017

NOTICE:
Be careful not to distort the valve seals.

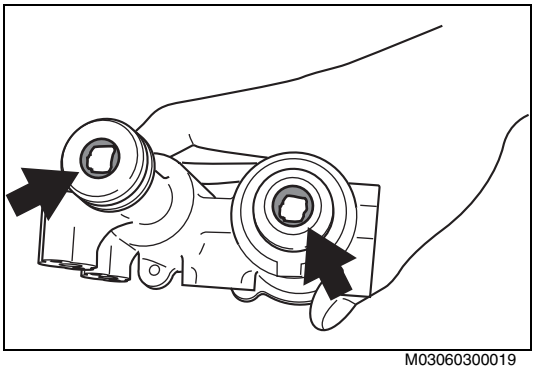
(3) Apply silicone grease to the valve seal C and D and install it to the valve sub-assembly.

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.

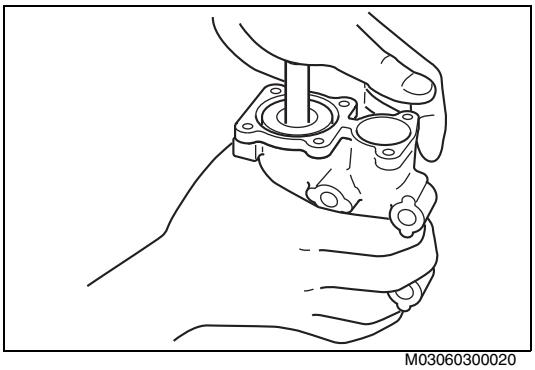


M03060300018

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.**

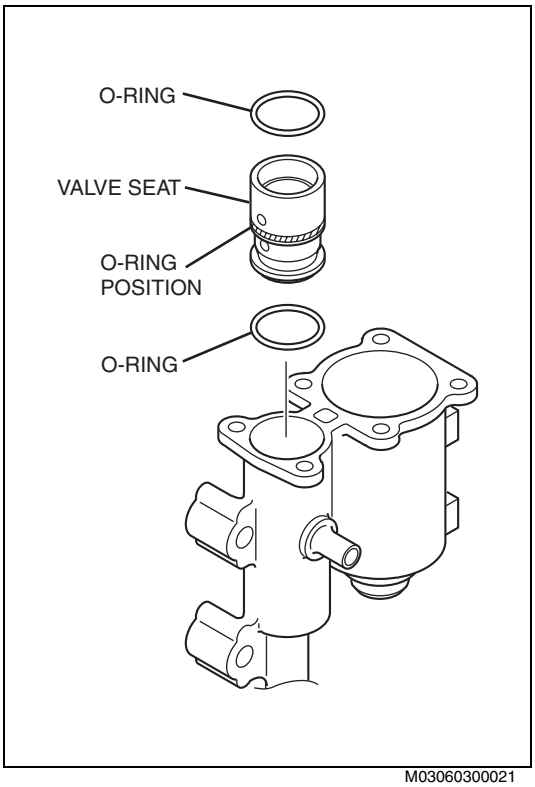

M03060300019

(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.



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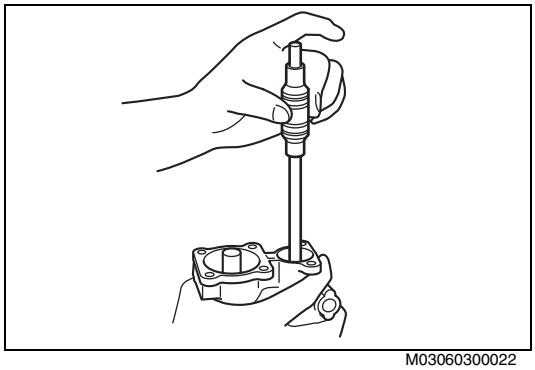
(3) Insert the O-ring into the inner part of the booster cylinder.
(4) Fit the O-ring to the outer periphery of the valve seat A.
(5) Apply silicone grease to the inner surface of the valve seat A and insert it into the inner part of the booster cylinder slowly.

NOTICE:
Be careful of inserting direction of the valve seat.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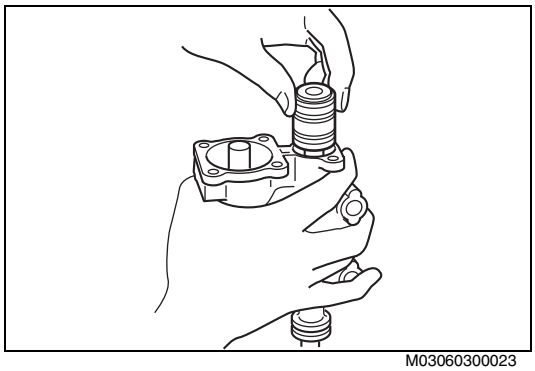
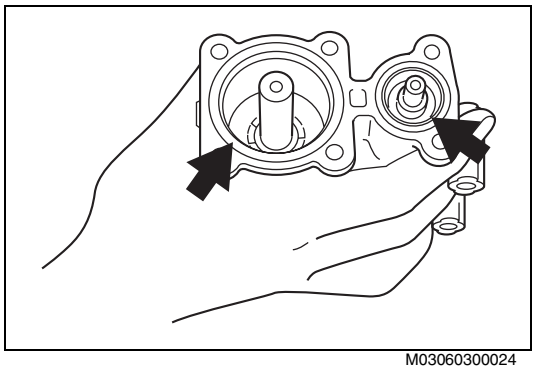
(6) After applying silicone grease to the outer periphery of the valve seal, insert the valve sub-assembly into the booster cylinder slowly.

(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.

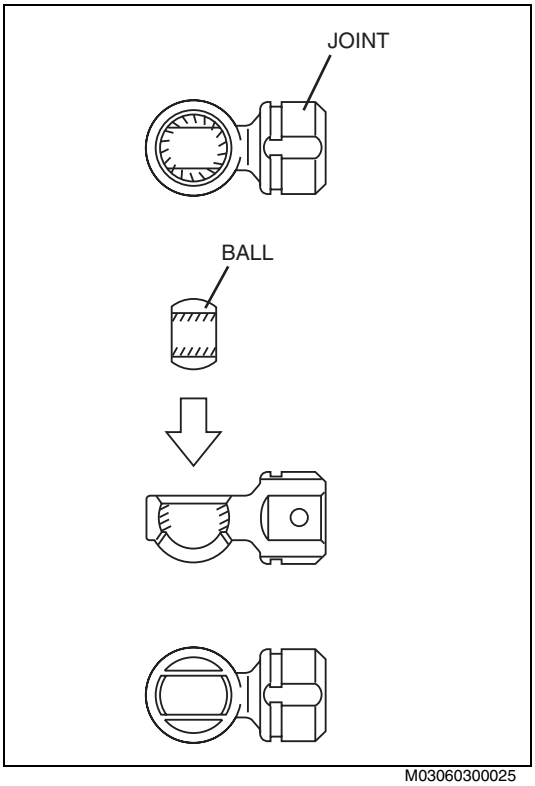
(2) Apply silicone grease to the inner surface of the bearing in the cover and install the cover to the booster cylinder.

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

6. CHECK THE OPERATION.

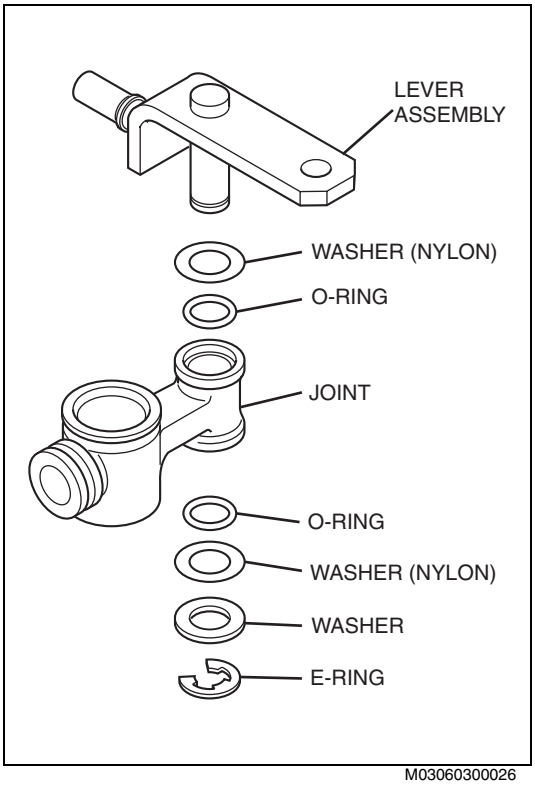
(1) By moving the top of piston 3 or 4 times, make sure that it moves smoothly and sliding resistance is 9.8 N {1 kgf, 2.2 lbf} or less.

(2) Move the valve sub-assembly to male sure that its motion is smooth without binding.



M03060300025

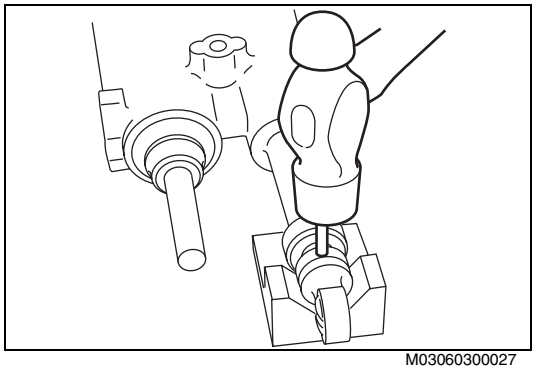
7. ASSEMBLE THE BALL JOINT ASSEMBLY.
(1) Apply silicone grease to the whole of the ball and the inner surface of the ball joint case.
(2) Install the ball with it stood into the joint.



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.

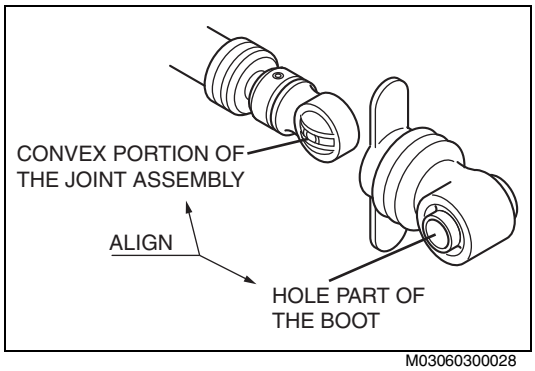
NOTICE:
Be careful of installing position of the joint.


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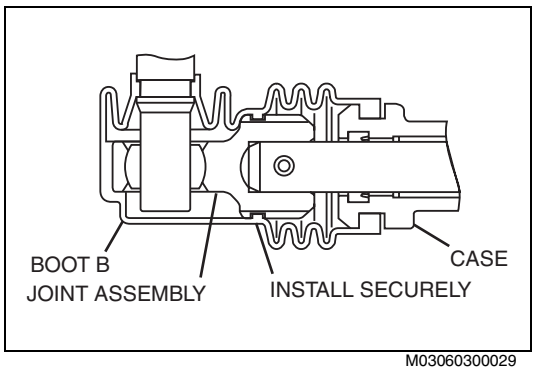
(3) Cover the convex portion of the ball joint assembly with the dust boot B, aligning the convex portion with the hole part of the dust boot B.
Install the inner convex portion of the dust boot B into the groove of the ball joint assembly securely.



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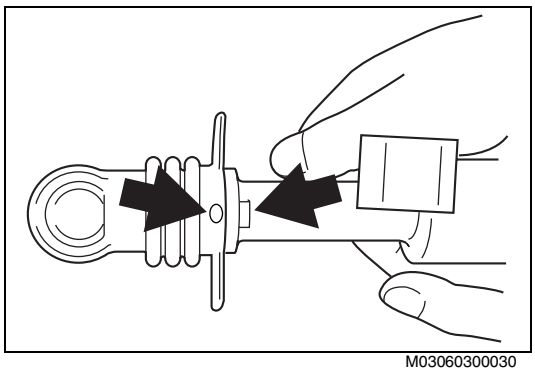
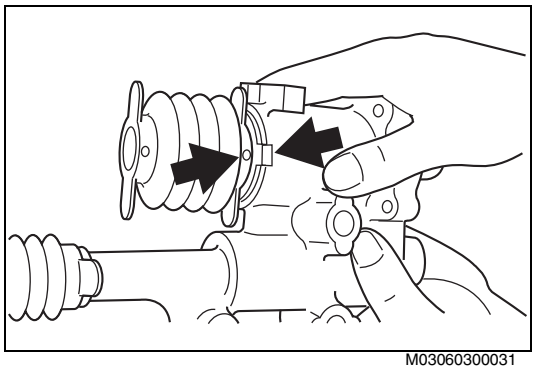
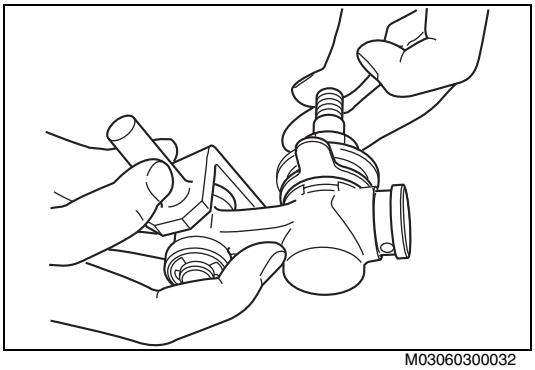

M03060300030

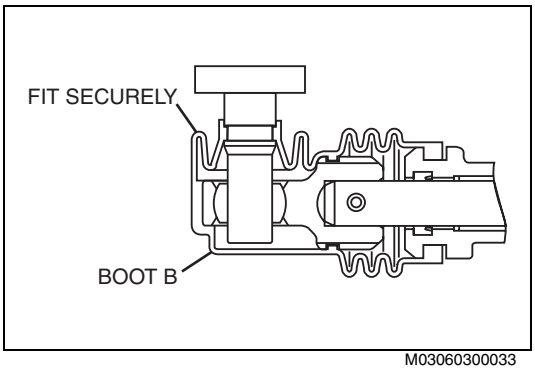
(4) Align the concave mark with the convex mark of boot B.


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.



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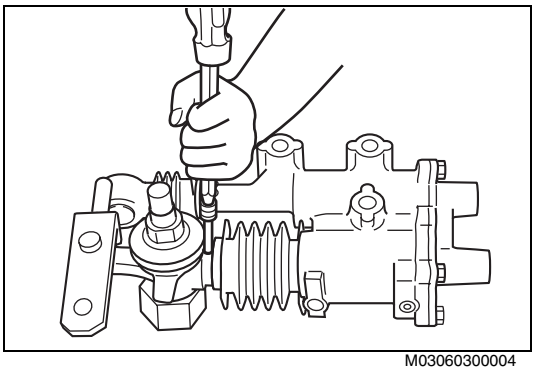
(7) Insert the top of the lever of the joint assembly to the boot B strongly.
Fit the boot B to the groove of the lever securely.


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.

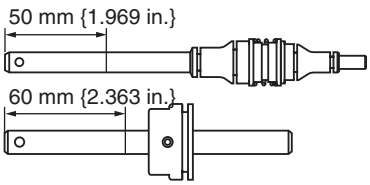
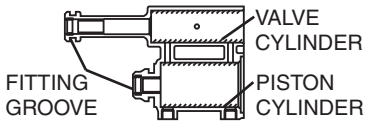
IMPORTANT POINT - INSPECTION

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

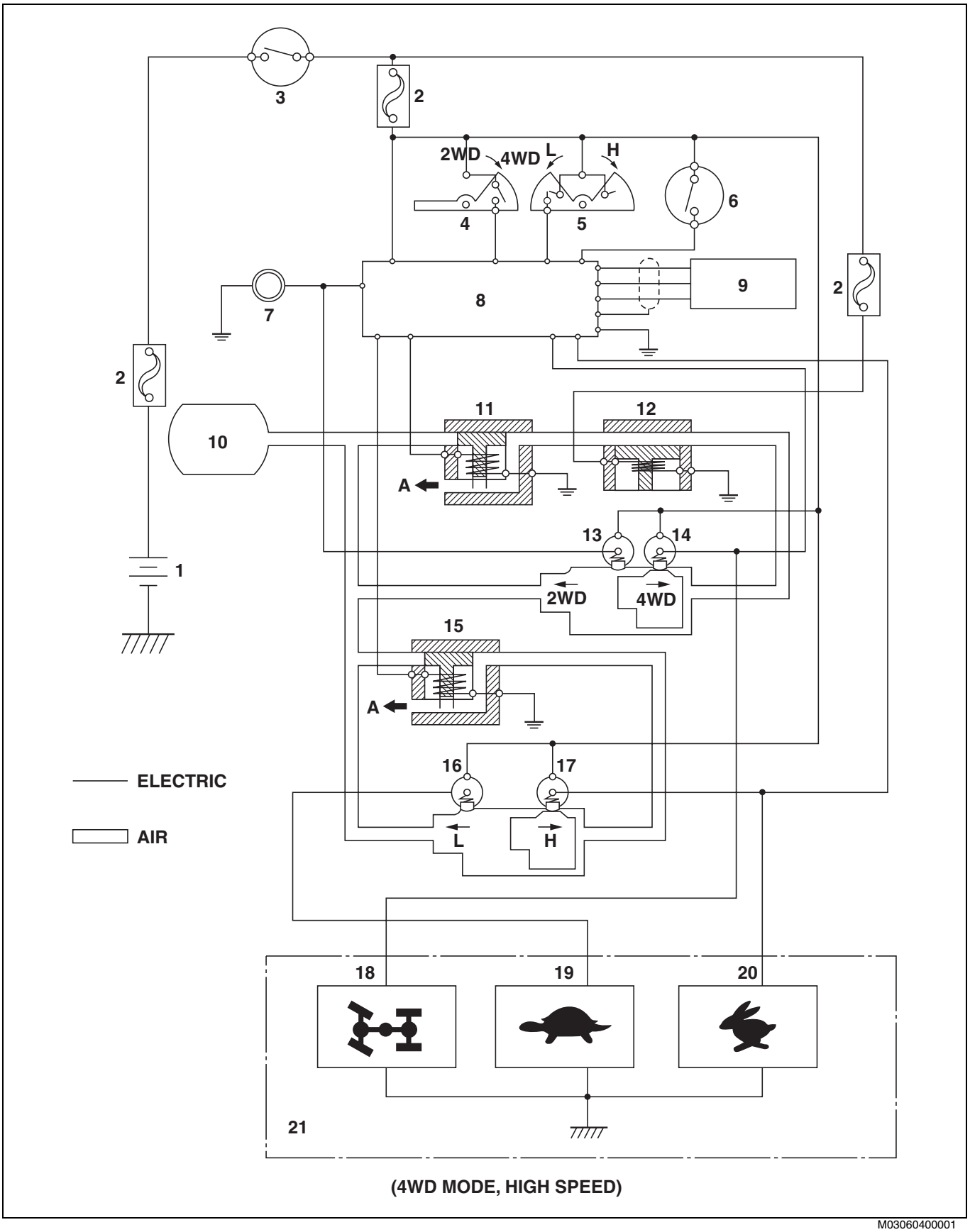
M03060301BEH3001

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

TRANSFER SHIFT CONTROL (TRANSFER SERIES: MA12C)

DIAGRAM

M03060402BEJ1001



(4WD MODE, HIGH SPEED)

M03060400001

1	Battery	12	Hold on solenoid valve
2	Fusible link	13	4WD selector warning switch
3	Starter switch	14	4WD detection switch
4	4WD selector switch	15	High-Low selector solenoid valve
5	High-Low selector switch	16	Low detection switch
6	Clutch pedal switch	17	High detection switch
7	Warning buzzer	18	4WD indicator lamp
8	Transfer controller	19	Low indicator lamp
9	Speedometer	20	High indicator lamp
10	Air tank	21	Instrument panel
11	4WD selector solenoid valve	A	Exhaust

TROUBLESHOOTING

M03060402BEF3001

Symptom	Possible cause	Remedy/Prevention
Transfer High-Low cannot be shift.	High-Low selector switch defective	Replace.
	High-Low selector solenoid valve defective	Replace.
	Clutch pedal switch defective	Replace.
	Transfer controller defective	Replace.
Transfer High-Low cannot be shift (Warning buzzer sounding during standing).	Speed sensor defective	Replace.
	Transfer controller defective	Replace.
Transfer High-Low can be shift without stepping clutch pedal.	Clutch pedal switch defective	Replace.
	Transfer controller defective	Replace.
Remain 4WD mode, High speed.	Fuse burned out	Replace.
	Transfer controller ECU defective	Replace.
Transfer 2WD-4WD cannot be shift.	4WD selector switch defective	Replace.
	4WD selector solenoid valve defective	Replace.
	4WD detection switch defective	Replace.
	High detection switch defective	Replace.
	Hold on solenoid valve defective	Replace.
	Fuse burned out	Replace.

PROPELLER SHAFT (LD0932 & LF0932)

PP02-001

PROPELLER SHAFT ASSEMBLY

DATA AND SPECIFICATIONS

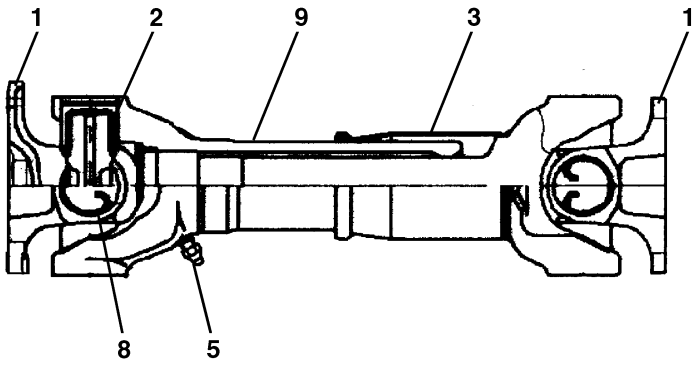
M04020102BEI2001

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

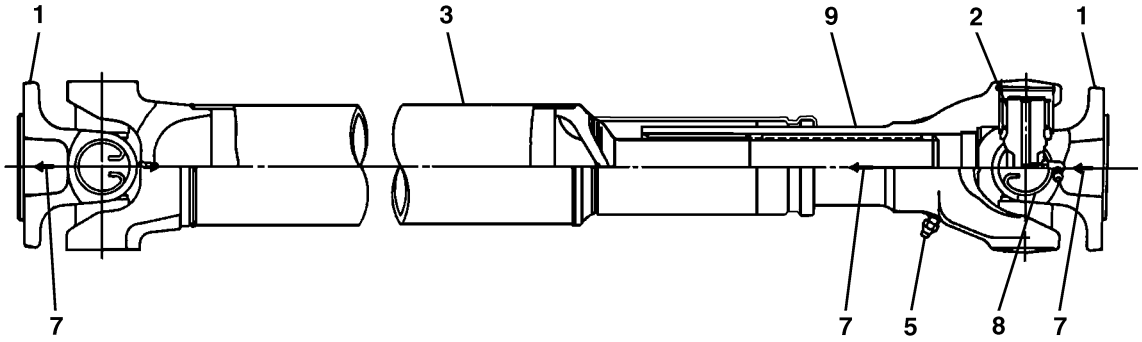
DESCRIPTION

M04020102BEC1002

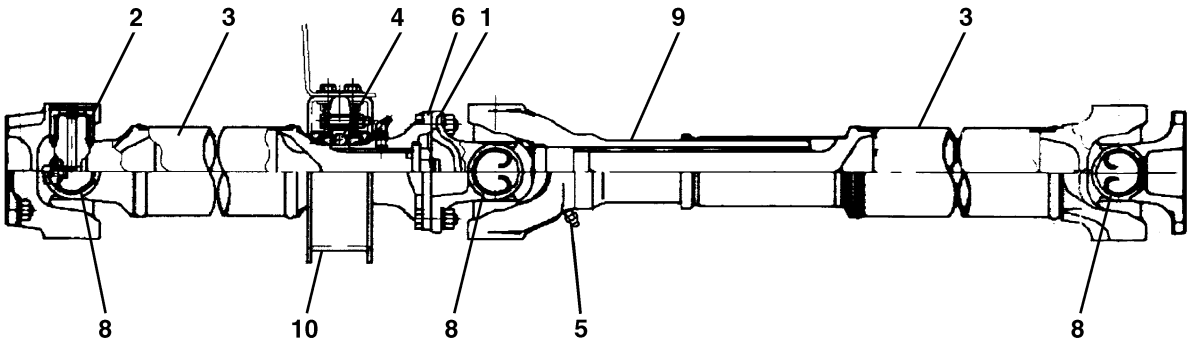
TRANSFER TO FRONT AXLE



TRANSFER TO REAR AXLE (FRONT)



TRANSFER TO REAR AXLE (REAR)



M04020100080

1	Universal joint yoke	6	Flange
2	Needle roller bearing	7	Phasing arrow
3	Yoke shaft	8	Retainer ring
4	Center bearing (If so equipped)	9	Sliding yoke
5	Lubrication fitting	10	Center bearing holder (If so equipped)

TROUBLESHOOTING

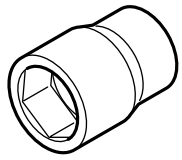
M04020102BEF3001

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

M04020102BEK1001

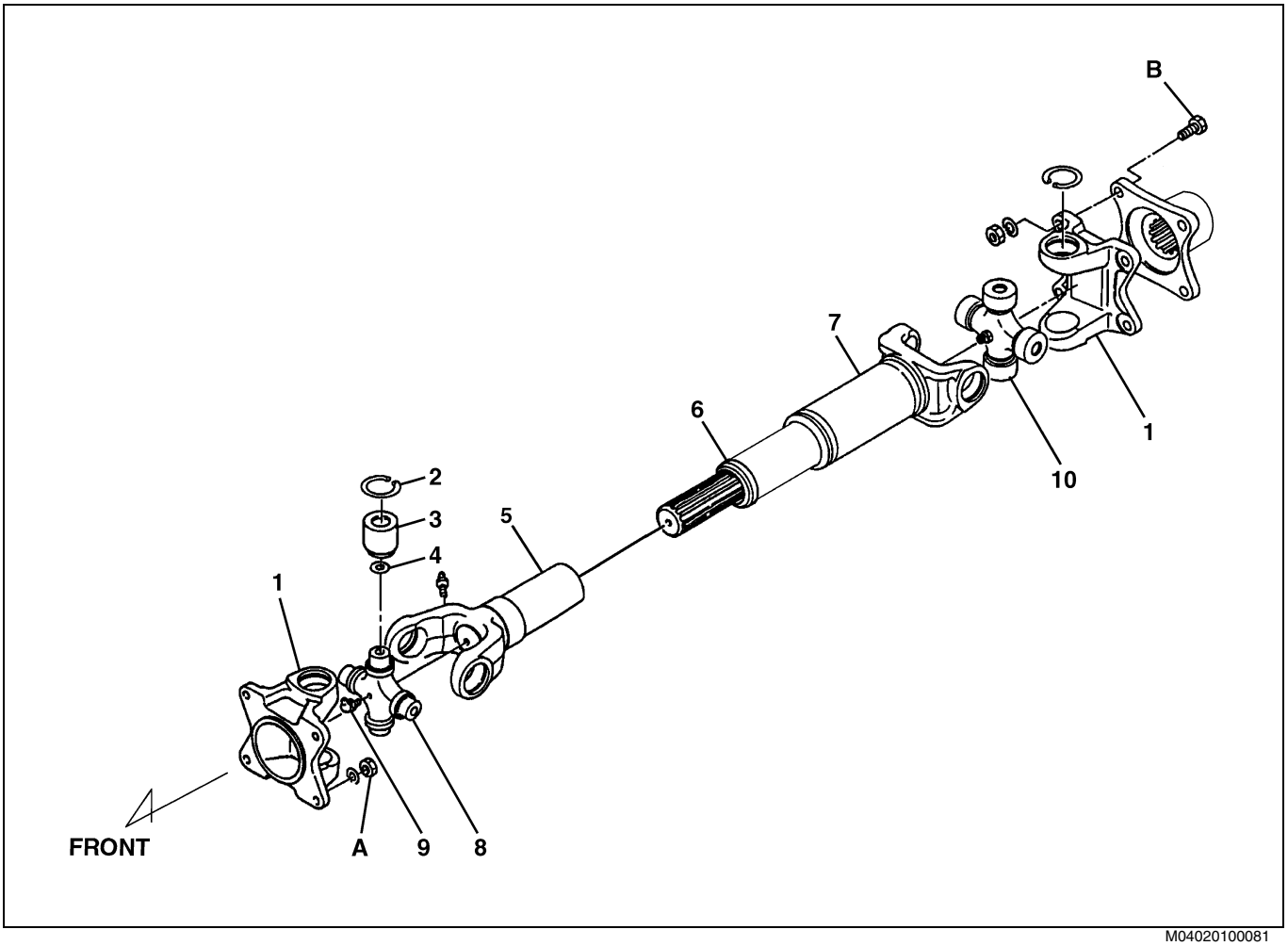
Prior to starting a propeller shaft overhaul, it is necessary to have this special tool.

Illustration	Part number	Tool name	Remarks
	09839-4104	SOCKET WRENCH	

COMPONENT LOCATOR

M04020102BED1003

TRANSFER TO FRONT AXLE



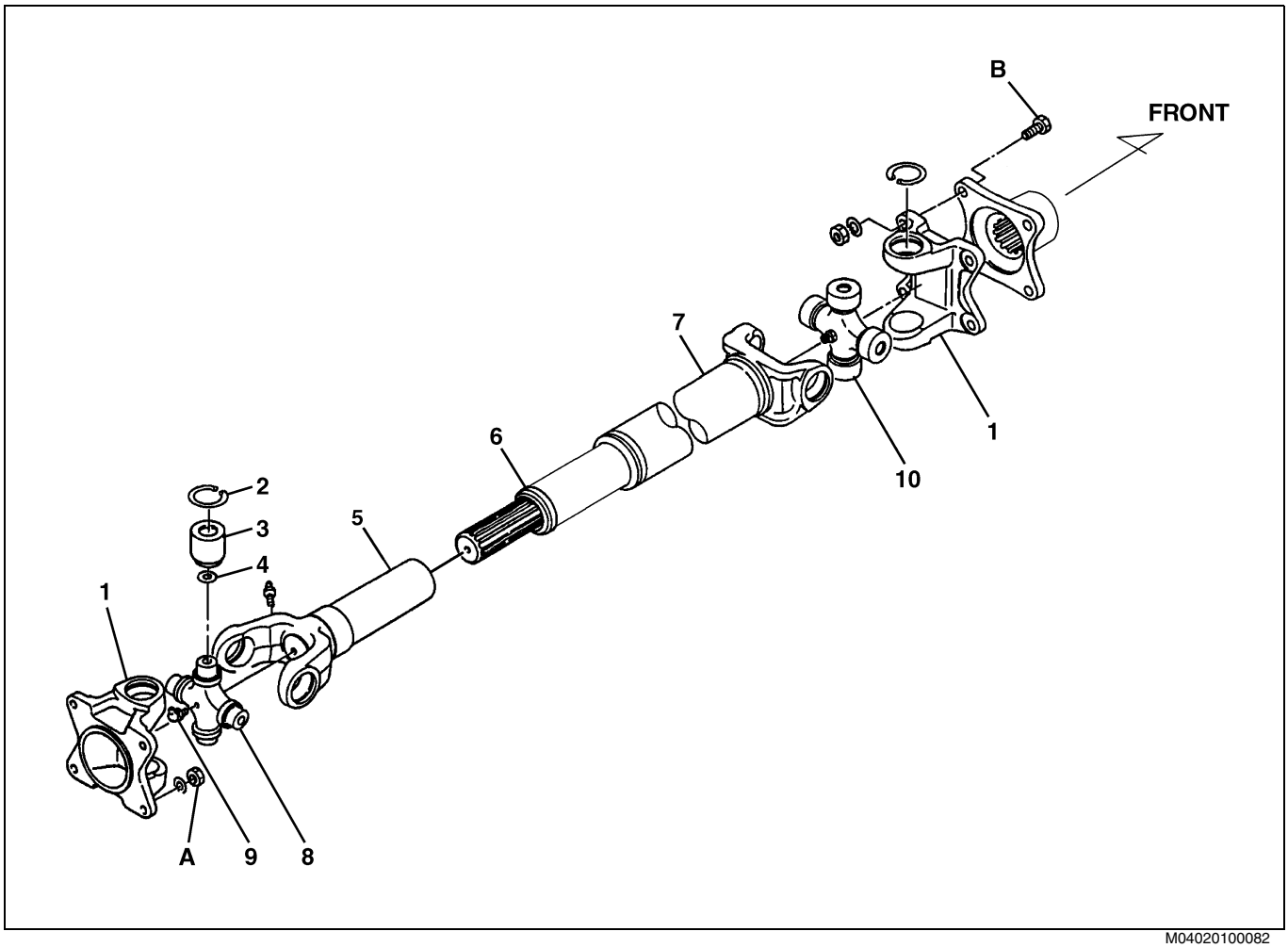
M04020100081

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	63.8-85.2 {651-868, 48-62}	B	63.8-85.2 {651-868, 48-62}

TRANSFER TO REAR AXLE (FRONT)



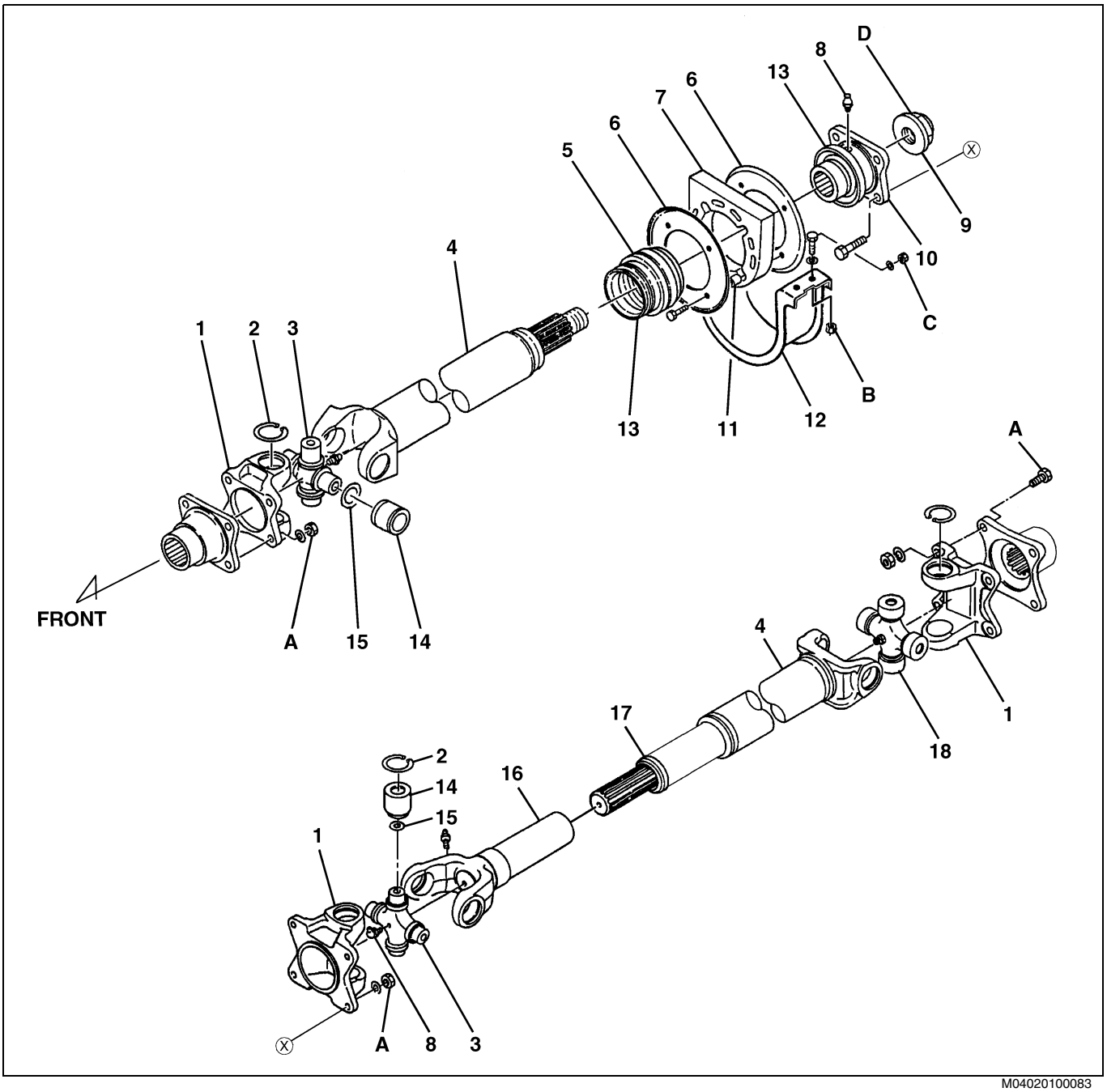
M04020100082

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	63.8-85.2 {651-868, 48-62}	B	63.8-85.2 {651-868, 48-62}

TRANSFER TO REAR AXLE (REAR)



M04020100083

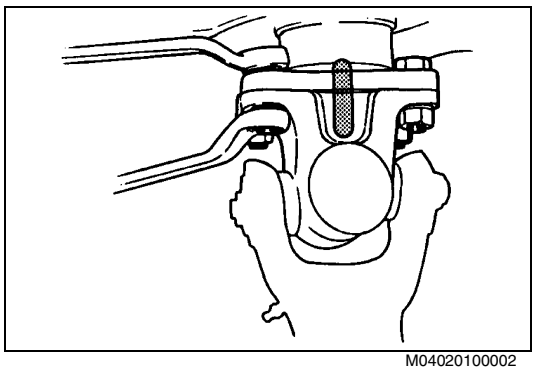
1	Universal joint yoke	10	Flange (If so equipped)
2	Retainer ring	11	Collar (If so equipped)
3	Universal joint spider	12	Center bearing holder (If so equipped)
4	Yoke shaft	13	Dust deflector (If so equipped)
5	Center bearing (If so equipped)	14	Needle roller bearing
6	Center bearing plate (If so equipped)	15	Thrust washer
7	Center bearing cushion (If so equipped)	16	Sliding yoke
8	Lubrication fitting	17	Dust cover seal
9	Lock nut (If so equipped)	18	Universal joint assembly

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

A	63.8-85.2 {651-868, 48-62}	C	22.4-30.6 {229-312, 17-22}
B	41.5-61.5 {424-627, 31-45}	D	588.4-784.6 {6,000-8,000, 434-578}

OVERHAUL

M04020102BEH2002


M04020100002

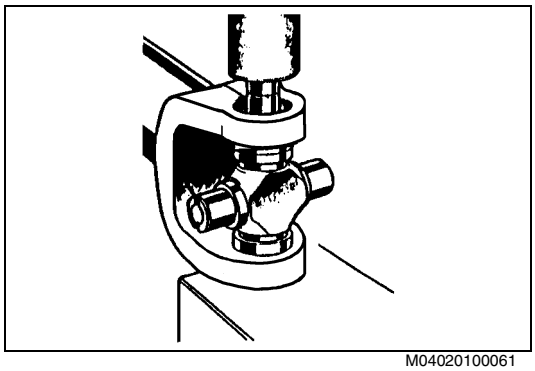
IMPORTANT POINT - DISMOUNTING

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.

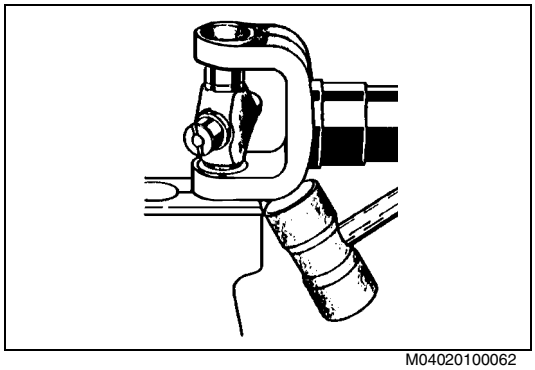

M04020100061

IMPORTANT POINTS - DISASSEMBLY

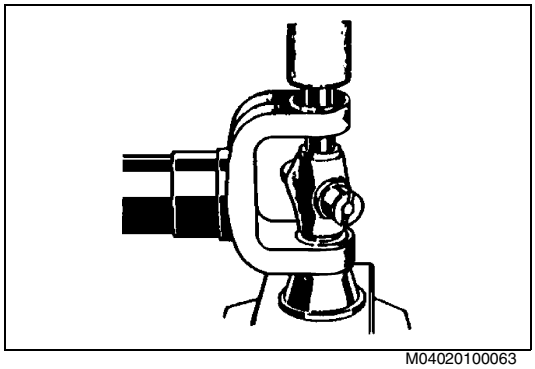
1. DISASSEMBLE THE UNIVERSAL JOINT ASSEMBLY.

(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.


M04020100062

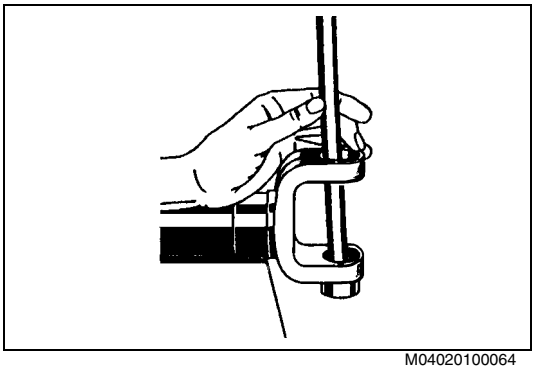
(3) Place the propeller shaft assembly in a vise, gripping the protruding bearing with the vise. Tap the yoke in area shown to achieve removal of universal joint bearing.


M04020100063

(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.

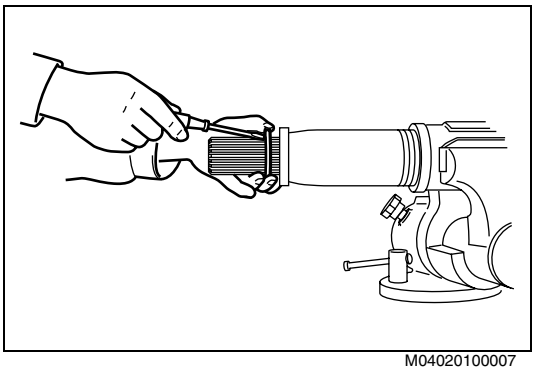
(5) Press the opposite bearing out of the yoke lug.

(6) Remove the spider from the yoke.

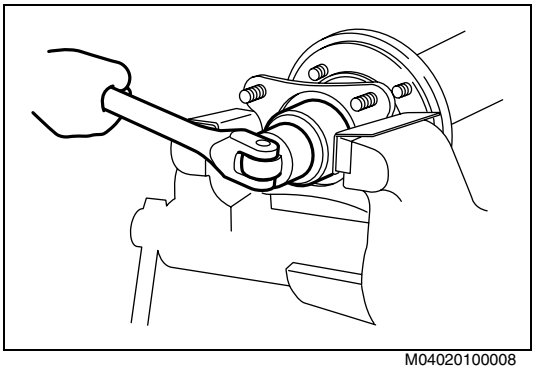

M04020100064

(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.

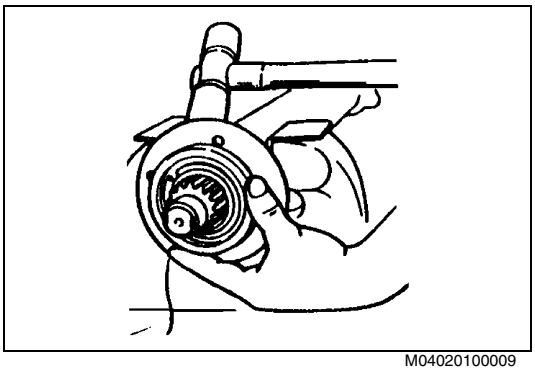

M04020100007

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.

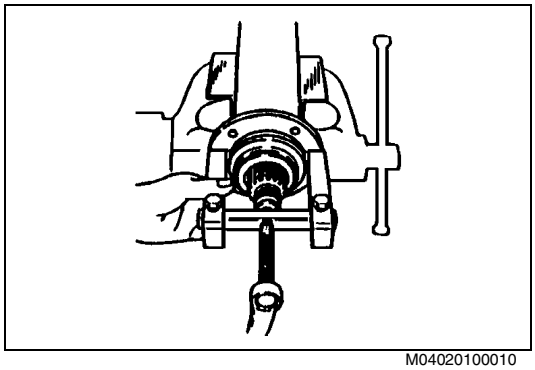

M04020100008

3. REMOVE THE CENTER BEARING (IF SO EQUIPPED).
(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.

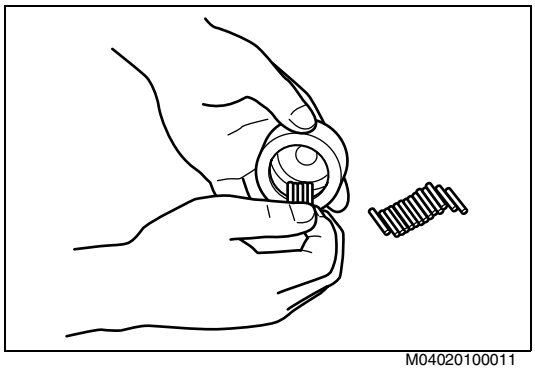

M04020100009

(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.

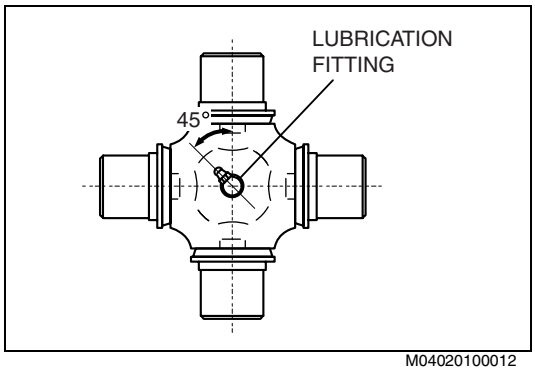

M04020100011

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.

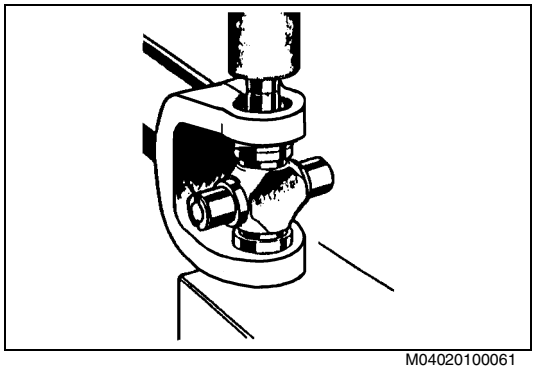


M04020100012

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

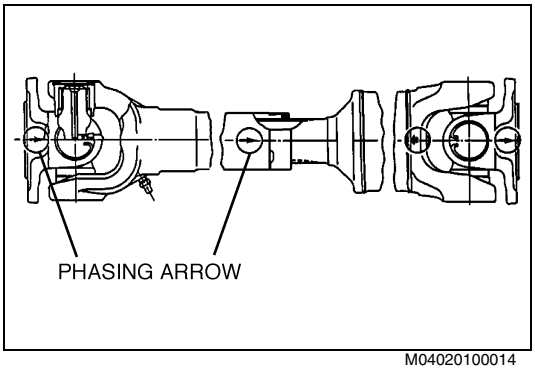
(1) Put the spider into the yoke and then set the universal joint bearings on the yoke.

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.


M04020100061

(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.

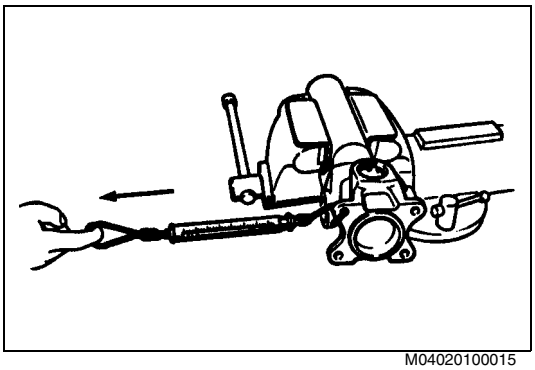


M04020100014

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

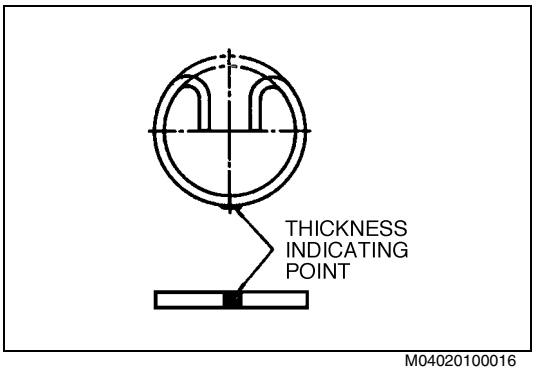
NOTICE:

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: 1.5-4.9 N·m {16-50 kgf·cm, 1.2-3.6 lbf·ft}



M04020100016

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

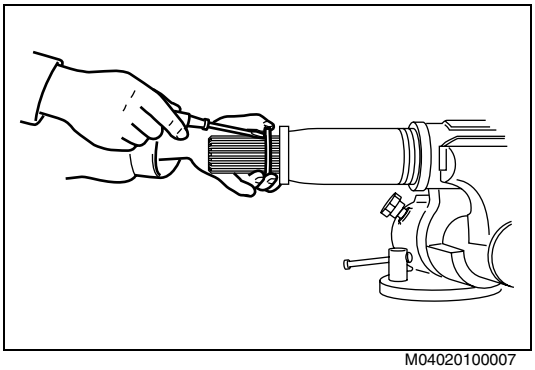
(2) If the measuring value is above the assembly standard, replace the retainer ring with the thinner one.

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}	White
2.30 {0.0906}	Red
2.38 {0.0937}	Green

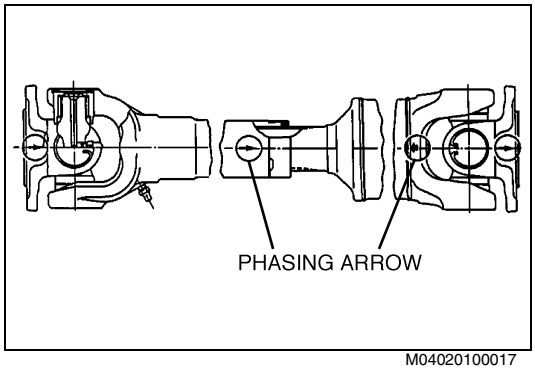

M04020100007

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.

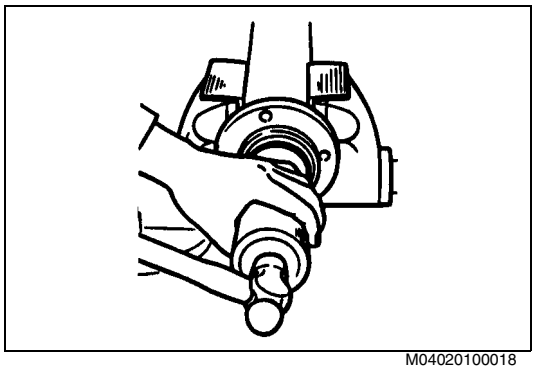
(3) Apply the grease containing molybdenum disulfide on the spline and sliding area of the dust cover seal.



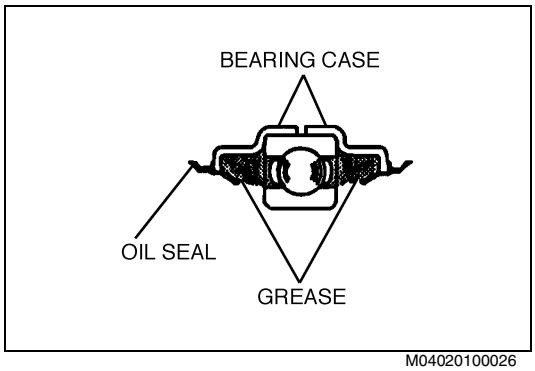
M04020100017

5. ASSEMBLE THE YOKE SHAFT AND SLIDING YOKE.

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


M04020100018

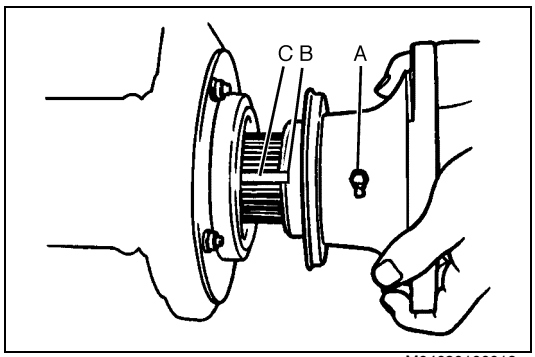
6. INSTALL THE CENTER BEARING PLATE AND CENTER BEARING (IF SO EQUIPPED).



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 between 80-100°C {176-212°F}.

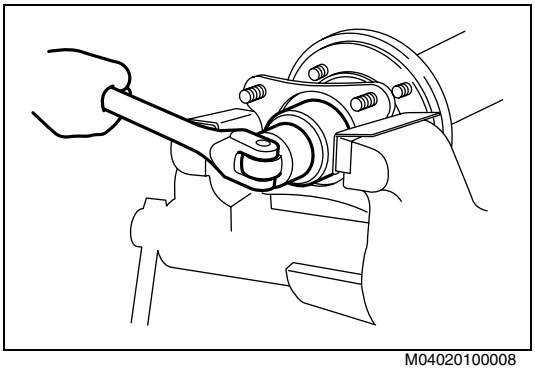
NOTICE:
Do not heat the universal joint flange in excess of 120°C {248°F}.

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

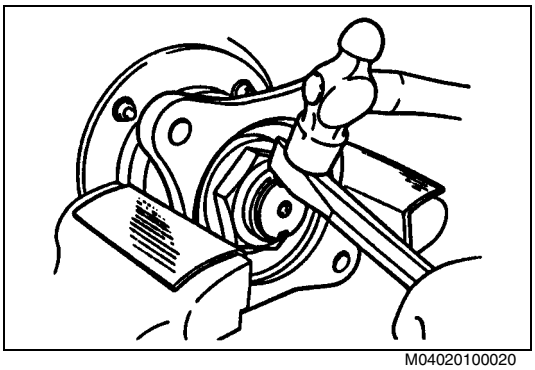
   b. Align lubrication fitting slit and grease passage in line as shown in figure.

- 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.

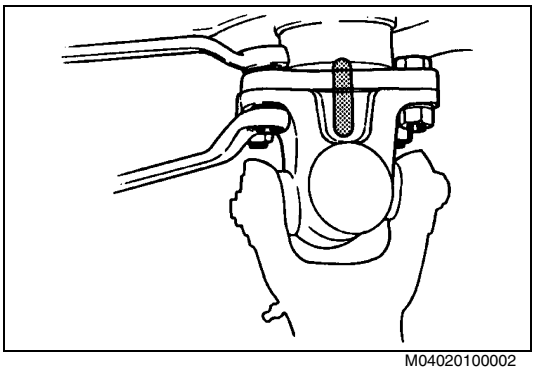

M04020100008

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 POINT - 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.

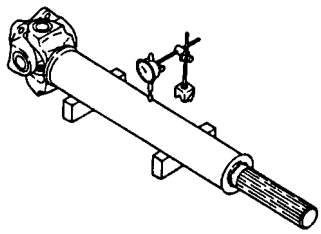
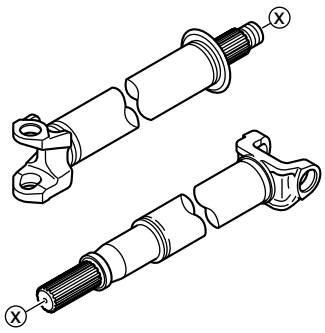
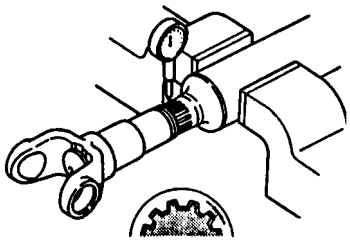
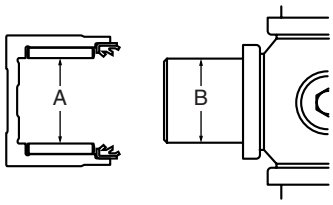
(3) Lubricate the universal joints, sliding spline and center bearing, if so equipped.

Grease:
Refer to owner's manual.

INSPECTION AND REPAIR

M04020102BEH3001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Propeller shaft damage and bend	0-0.5 {0-0.0197}	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	At spline 0.062-0.174 {0.0025-0.0068}	0.25 {0.0098}	Replace.	Measure 
Clearance (C) between universal joint spider and needle roller bearing (C = A - B)	0.024-0.064 {0.0010-0.0025}	0.1 {0.0039}	Replace needle roller bearing sub-assembly or universal joint spider.	Measure 

DIFFERENTIAL EQUIPMENT (LOCKING TYPE DIFFERENTIAL GEAR)

DF01-001

LOCKING TYPE DIFFERENTIAL GEAR (NO SPIN)

DATA AND SPECIFICATIONS

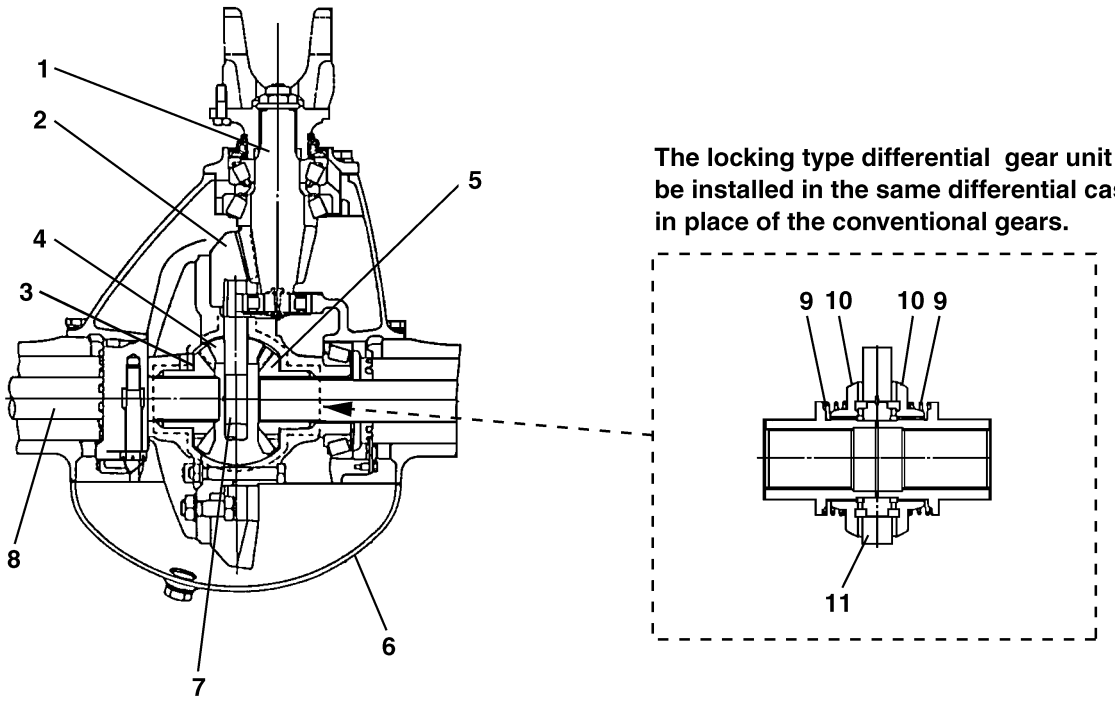
M05010101BEI2001

Differential carrier series	SH13	SH16
Type	Silent type (with two hold-out rings)	
Diameter of spider ring Unit: mm {in.}	125 {4.92}	148 {5.83}
Diameter of spider shaft Unit: mm {in.}	24 {0.94}	26 {1.02}
Max. allowable torque par side Unit: N·m {kgf·m, lbf·ft}	9,806.7 {1,000, 7,233}	1,7651.9 {1,800, 13,019}

DESCRIPTION

M05010101BEC1001

(REPRESENTATIVE TYPE)



- Conventional differential gear -

- Locking type differential gear -

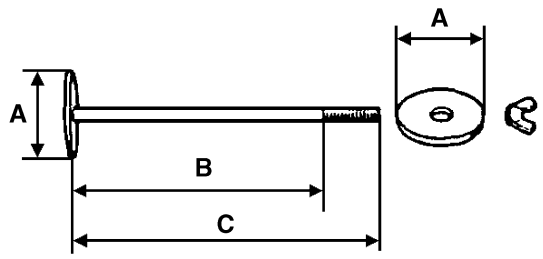
M05010100001

1	Pinion gear	7	Spider
2	Ring gear	8	Axle shaft
3	Thrust washer	9	Spring
4	Differential pinion	10	Driven clutch
5	Differential side gear	11	Spider with center cam
6	Axle housing		

PROPOSAL TOOL

M05010101BEK1001

ASSEMBLING TOOL



M05010100012

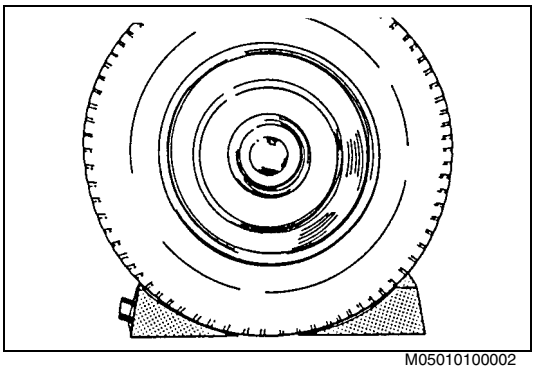
Dimension of tool Unit: mm {in.}

Differential carrier series	A	B	C
SH13	47 {1.85}	155 {6.10}	180 {7.09}
SH16	53 {2.09}	205 {8.07}	230 {9.06}

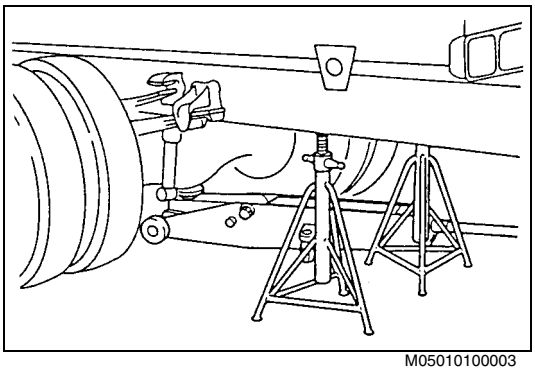
INSPECTION

M05010101BEH3001

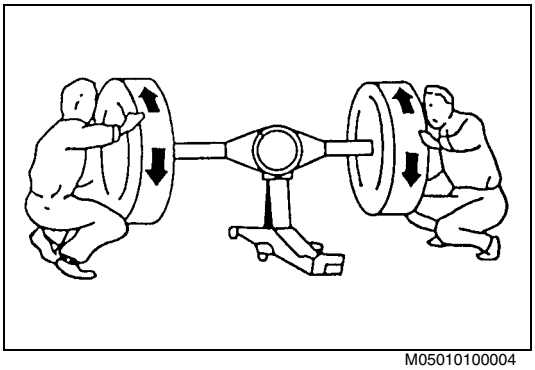
NOTICE:
Before overhauling, the operation of locking differential can be confirmed using the following procedure:


M05010100002

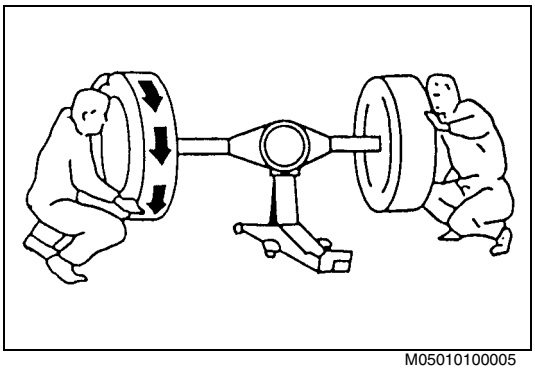
1. SUPPORT THE FRAME WITH STANDS.
(1) Park the vehicle on a level ground, apply the parking brake and block the front wheels.


M05010100003

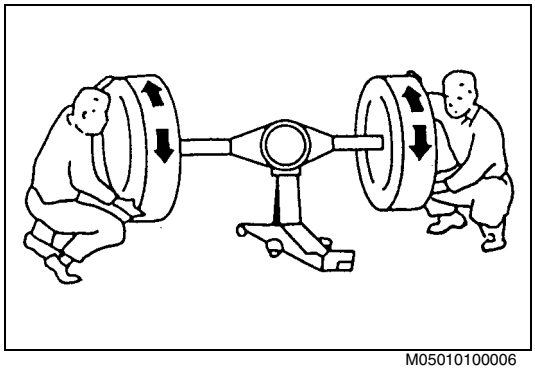
(2) Jack up the rear axle and support the frame with stands.
NOTICE:
Do not run the engine.


M05010100004

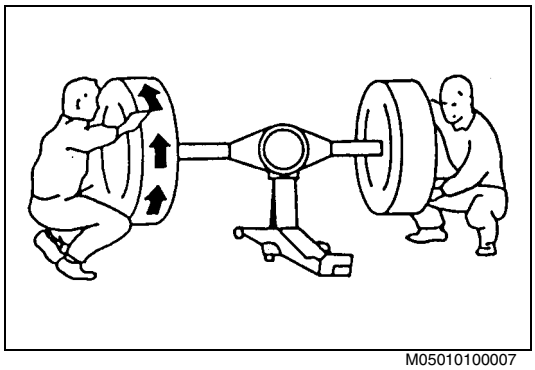
(3) Press the 4WD selector switch and release the paking brake. Check to see that both rear wheels can be rotated slightly in both directions. (About 5-6 cm {1.97-2.36 in.})


M05010100005

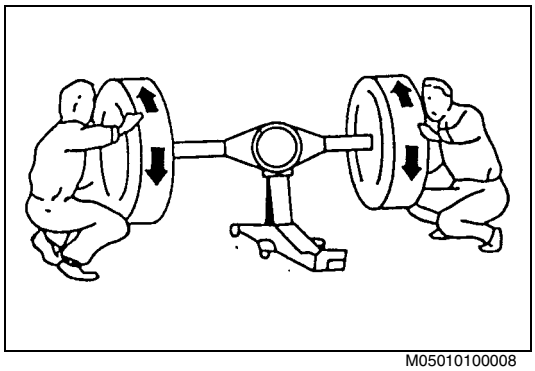
2. LEFT SIDE INSPECTION
(1) Turn the right wheel in the forward direction until it stops, and hold the wheel in the stopped position and turn the left wheel in the rearward direction. A clicking noise in the differential should be heard.


M05010100006

(2) Next, turn the right wheel in the rearward direction slightly. The wheel can be turned only slightly, as in step (3) above.


M05010100007

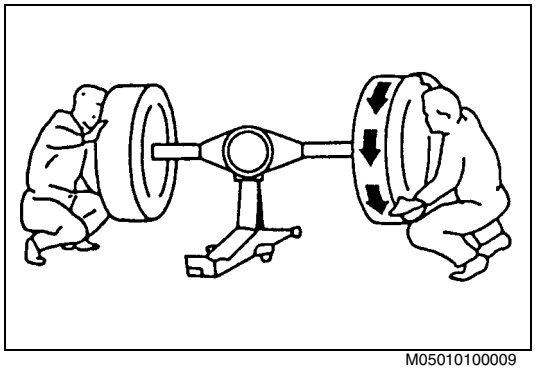
(3) Turn the right wheel in the rearward direction until it stops, and hold the wheel in the stopped position and turn the left wheel in the forward direction. A clicking noise in the differential should be heard.


M05010100008

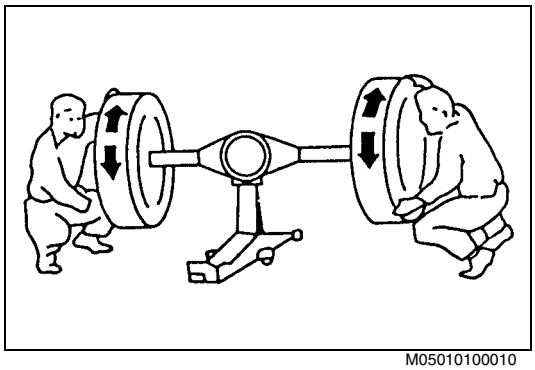
(4) Next, turn the right wheel in the forward direction slightly. The left wheel can be turned only slightly, as in step (3) above.

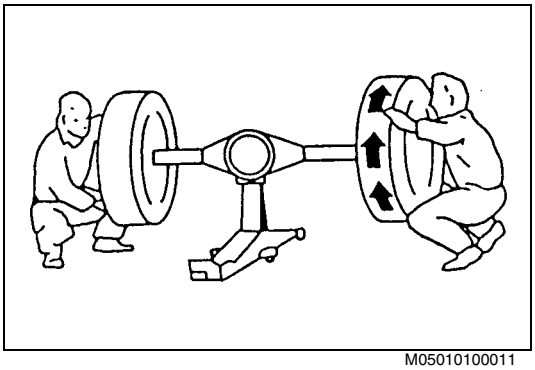
3. RIGHT SIDE INSPECTION

(1) Turn the left wheel in the forward direction until it stops, and hold the wheel in the stopped position and turn the right wheel in the rearward direction. A clicking noise in the differential should be heard.


M05010100009

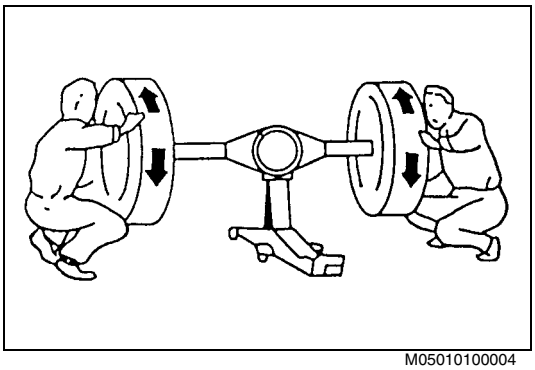
(2) Next, turn the left wheel in the rearward direction slightly. The right wheel can be turned only slightly, as in step (3) above.


M05010100010



M05010100011

(3) Turn the left wheel in the rearward direction until it stops, and hold the wheel in the stopped position and turn the right wheel in the forward direction. A clicking noise in the differential should be heard.



M05010100004

(4) Next, turn the left wheel in the forward direction slightly. The right wheel can be turned only slightly, as in step (3) above.

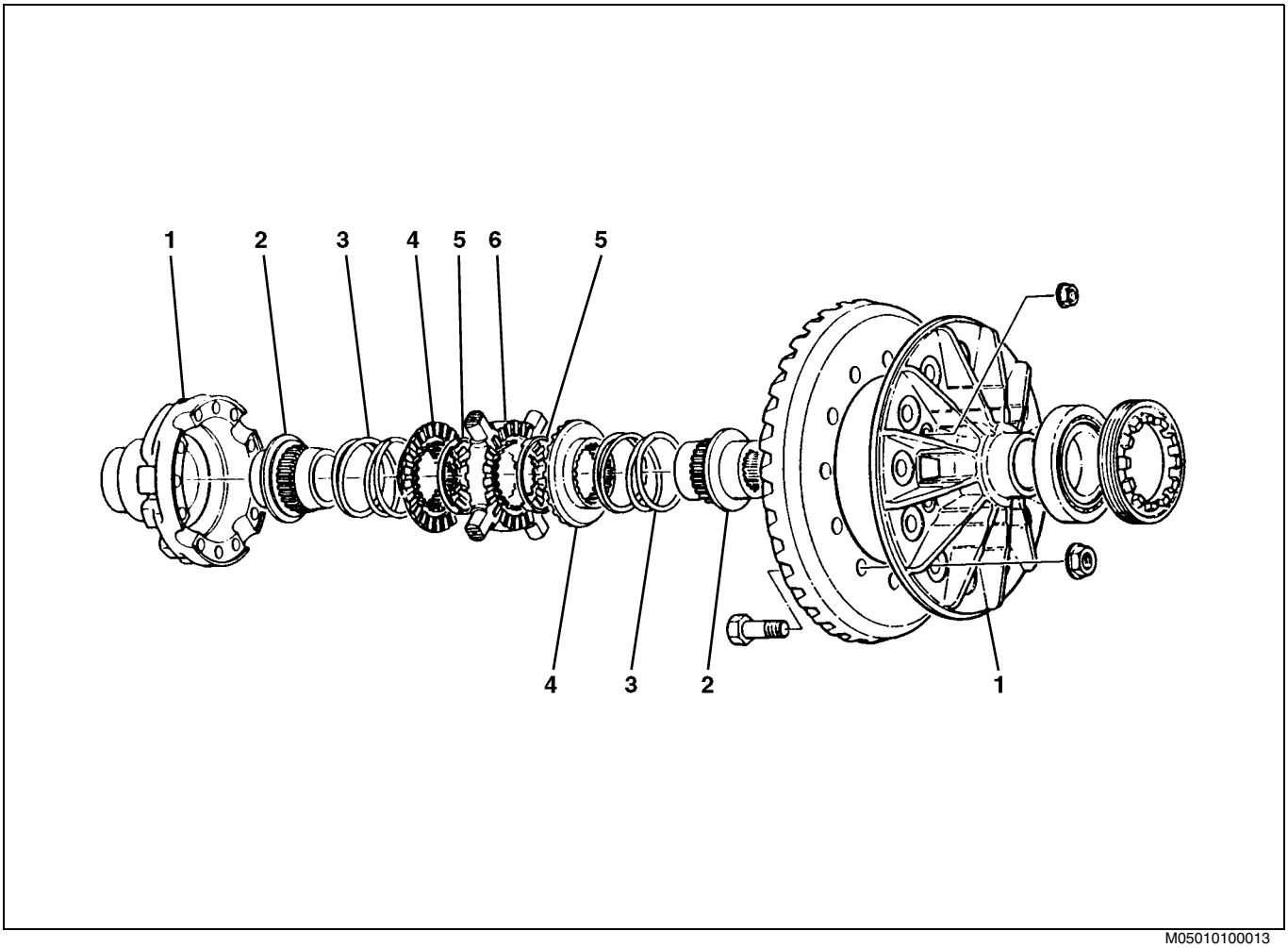
TROUBLESHOOTING

M05010101BEF3001

Symptom	Possible cause	Remedy/Prevention
Faint clicking noise while turning.	Normal differential operation (Clutch teeth)	
Faint clicking noise while going straight.	Tire diameters are different between the left and right side.	Adjust the tire inflation pressure or replace tire.
Steering wheel pulls to one side, when accelerating.	Clutch and cam teeth and/or spring on either side are defective.	Replace the defective parts.
Clicking noise when alternately accelerating and decelerating while turning.	Normal differential operation (Clutch teeth)	
Anbormal wear and dragging of tire.	Driven clutch and/or spider with center cam on either side are defective.	Replace the defective parts.
Clutch teeth disengages when starting to drive in 1st gear.	Excessive wear of clutch teeth.	Replace the defective parts.

COMPONENT LOCATOR

M05010101BED1001

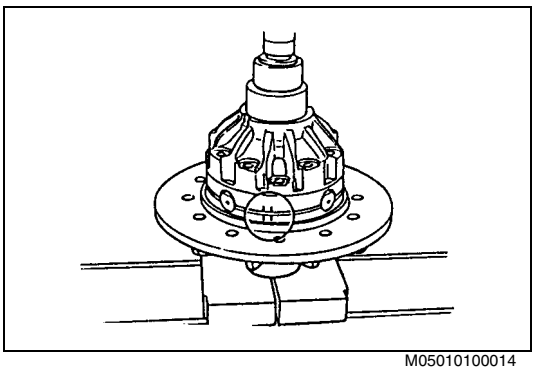


M05010100013

1	**Differential case**	**4**	**Driven clutch**
2	**Differential side gear**	**5**	**Hold-out ring**
3	**Spring**	**6**	**Spider with center cam**

OVERHAUL

M05010101BEH2001



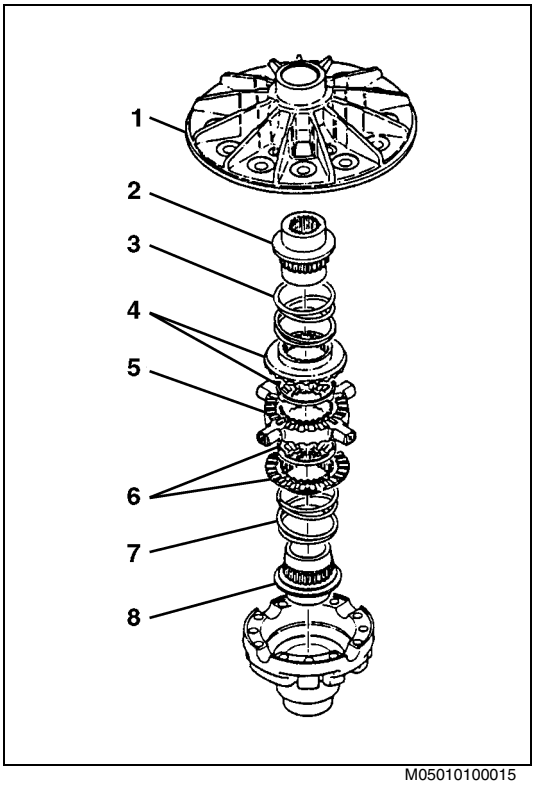
M05010100014

IMPORTANT POINTS - DISASSEMBLY

NOTICE:
Refer to chapter DIFFERENTIAL CARRIER.

1. DISASSEMBLE THE DIFFERENTIAL GEAR
(1) Make aligning marks to the differential gear case before disassembling.

NOTICE:
The differential case may suddenly open while disassembling therefore, place the differential gear assembly in a press.

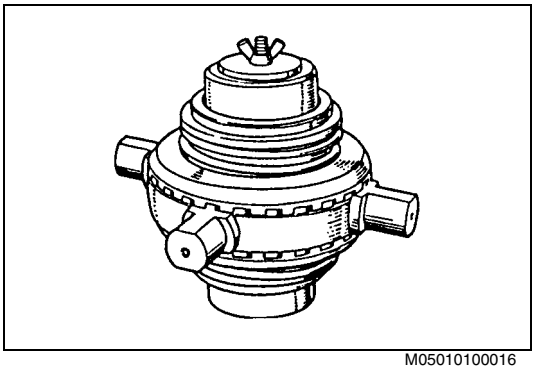


M05010100015

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLE THE DIFFERENTIAL GEAR.
(1) Refer to chapter DIFFERENTIAL CARRIER.

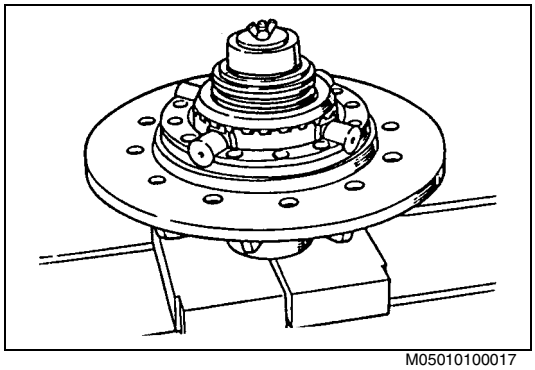
NOTICE:
- **Align the side gear spline and the driven clutch.**
- **Align indented side of the hold-out ring to driven clutches and the another side to spider.**



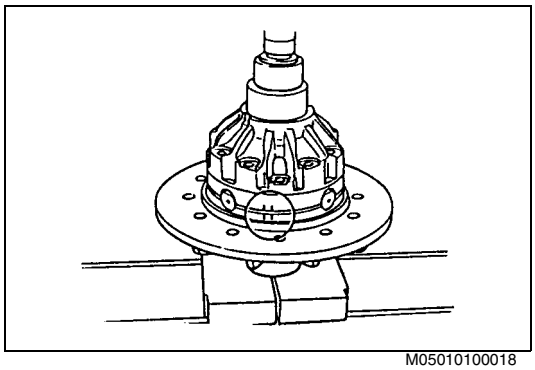
M05010100016

(2) Hold the parts using the proposal tool.
Proposal tool: Assembling tool

NOTICE:
Align the spline of the side gear and the driven clutch.


M05010100017

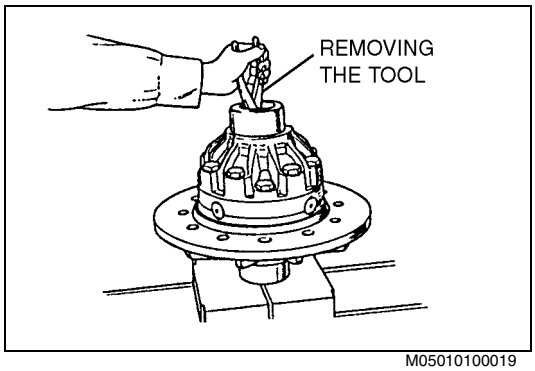
(3) Install the differential gear assembly to the differential case.


M05010100018

2. ASSEMBLE THE DIFFERENTIAL CASE.

NOTICE:

- **Align the aligning marks before assembling.**
- **Apply the gear oil on all inner parts.**
- **Since the differential case is under pressure from locking differential springs, depress the differential case with a press. Also, remember that the assembly will not fit into the differential case unless the locking differential side gear and the driven clutch spline are aligned.**



M05010100019

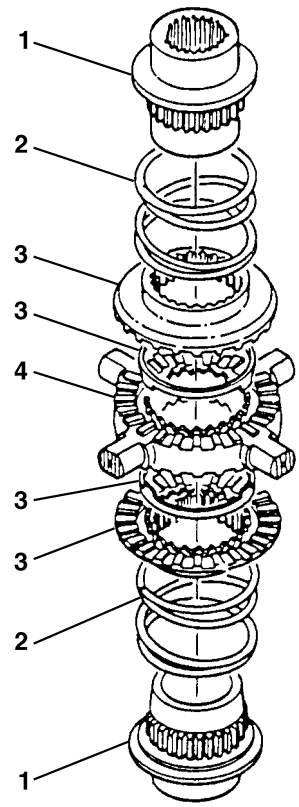
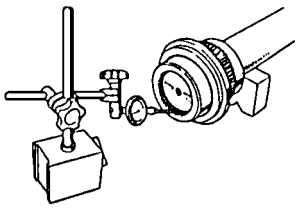
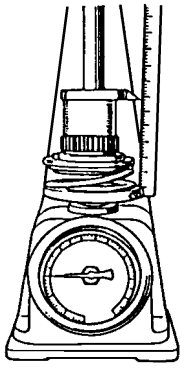
(1) If the differential gear is assembled using a tool, be sure to remove the tool from the differential gear.

INSPECTION AND REPAIR

M05010101BEH3002

Regarding differential case and related parts, refer to chapter DIFFERENTIAL CARRIER.

Unit: mm {in.}

<table>
<tr><th>Inspection item</th><th>Standard</th><th>Limit</th><th>Remedy</th><th>Inspection procedure</th></tr>
<tr><td>Side gear 1. Spline, Flange:
Wear and damage</td><td>—</td><td>—</td><td>Repair or replace, if necessary.</td><td rowspan="3">Visual check
 
</td></tr>
<tr><td>Spring 2.
Damage</td><td>—</td><td>—</td><td>Replace,
if necessary.</td></tr>
<tr><td>Driven clutch assembly 3.
(with hold-out ring)
Spline and Teeth:
Wear and damage
Hold-out ring movement</td><td>Ring rotates on clutch by hand</td><td>—</td><td>Repair or replace, if necessary.
Ring and clutch may be replaced individually.</td></tr>
<tr><td>Spider assembly 4.
Teeth:
Wear and damage
Center cam free movement</td><td>Rotates freely within limit of key in spider</td><td>—</td><td>Replace,
if necessary.</td><td></td></tr>
<tr><td>Side gear and axle shaft:
Spline backlash</td><td>0.05-0.15
{0.0020-0.0059}</td><td>0.03
{0.0012}</td><td>Replace the side gear and/or axle shaft.</td><td>Measure
  </td></tr>
<tr><td rowspan="2">Spring:
Setting load at specified height</td><td>SH13: 294.2N
{30.0 kgf, 66.1lbf}
at 20.2 mm
{0.795 in.}</td><td>235.4 N
{24 kgf, 52.9 lbf}</td><td rowspan="2">Replace.</td><td rowspan="2">Measure
  </td></tr>
<tr><td>SH16: 350.1 N
{35.7 kgf, 78.7 lbf}
at 23.2 mm
{0.913 in.}</td><td>274.6 N
{28 kgf, 61.7 lbf}</td></tr>
</table>

DIFFERENTIAL CARRIER (SH13)

DF02-001

DIFFERENTIAL CARRIER ASSEMBLY (SH13)

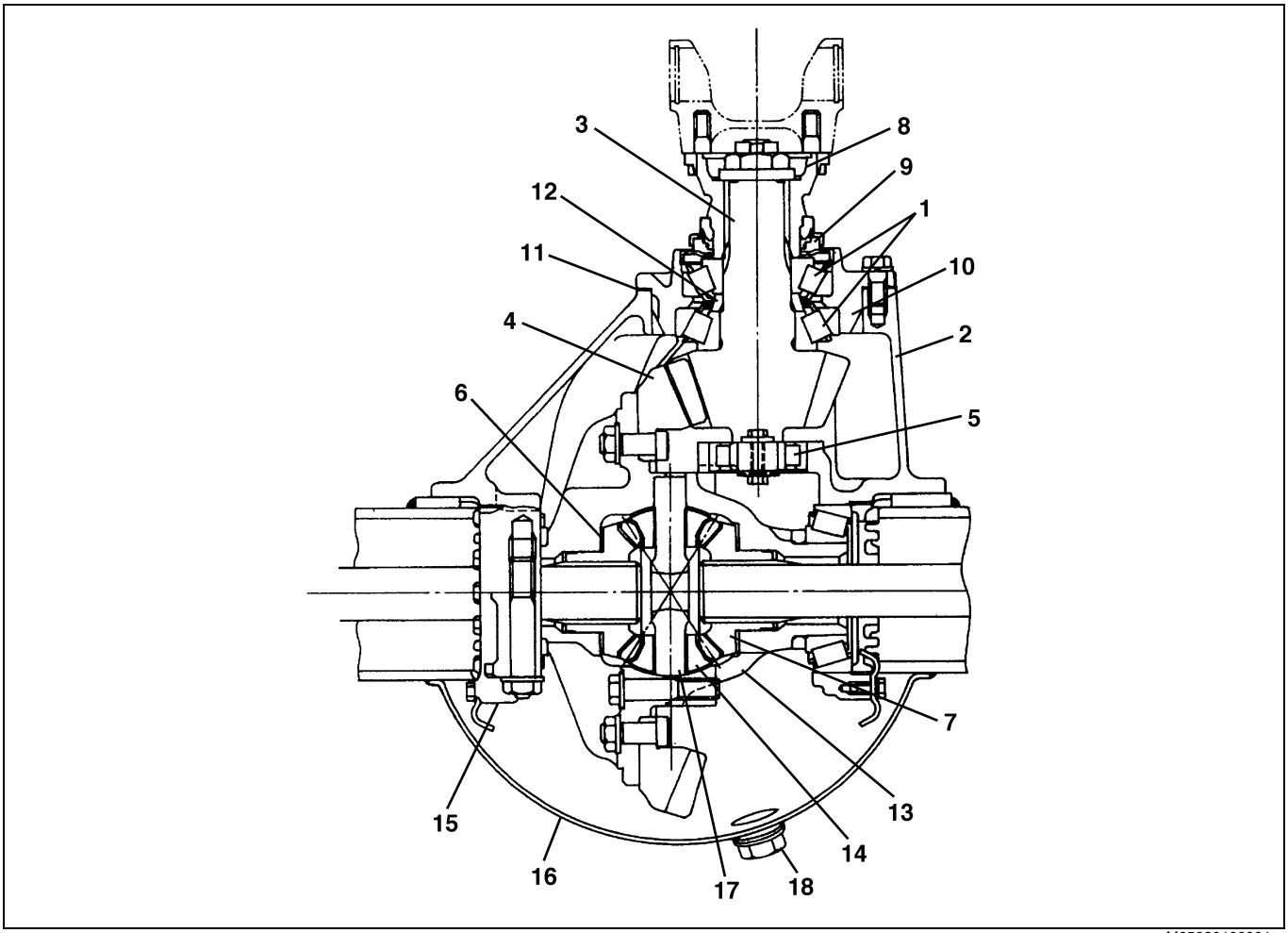
DATA AND SPECIFICATIONS

M05020101BEI2003

Type	**Single-reduction, single-speed, by hypoid gearing**
Gear ratios	**5.142**
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

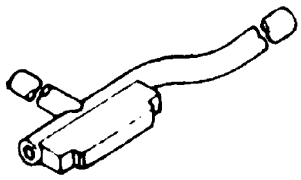
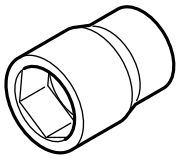
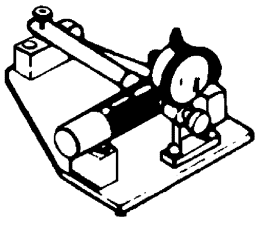
M05020101BEF3001

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

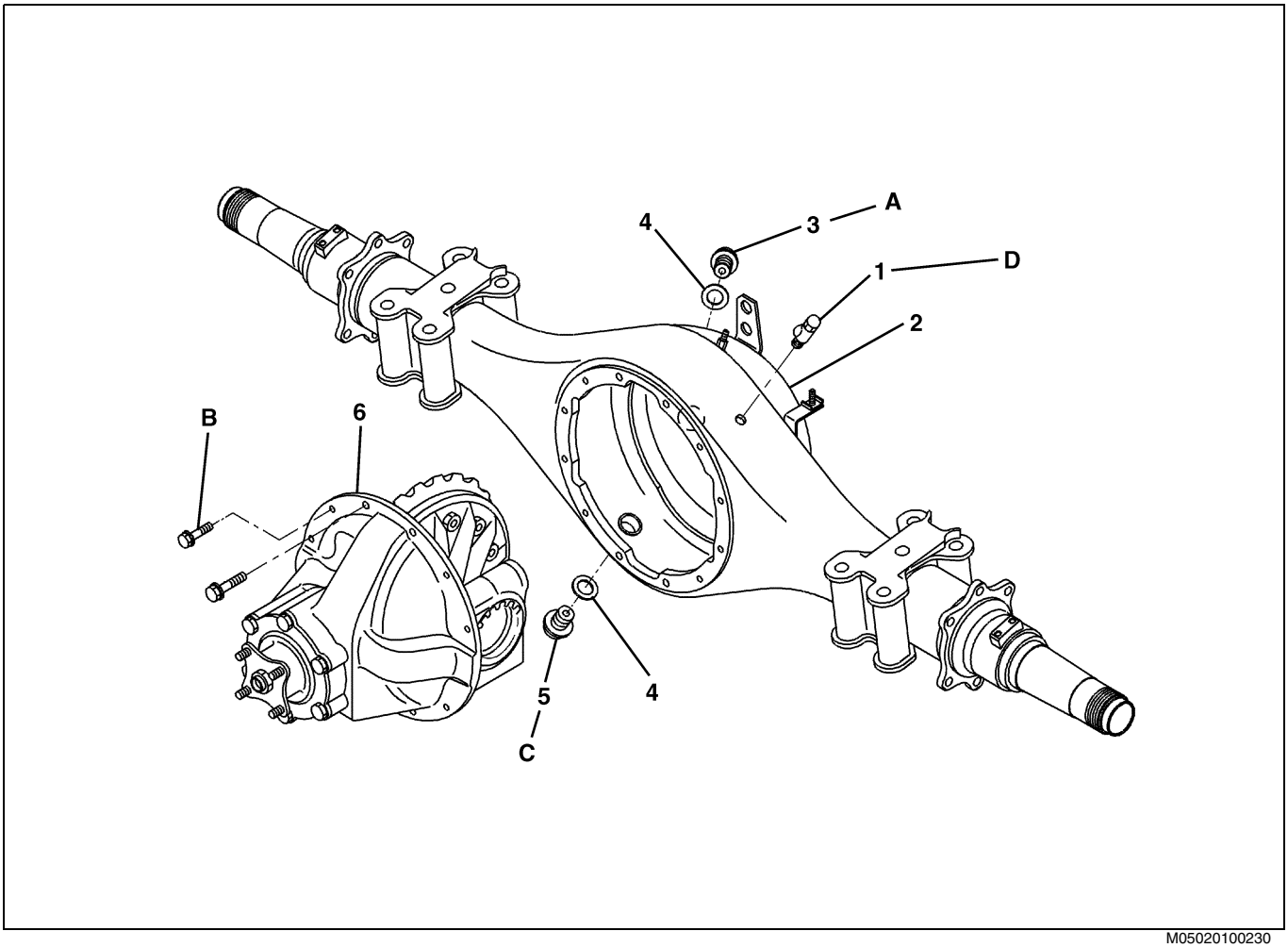
M05020101BEK1001

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

M05020101BED1003

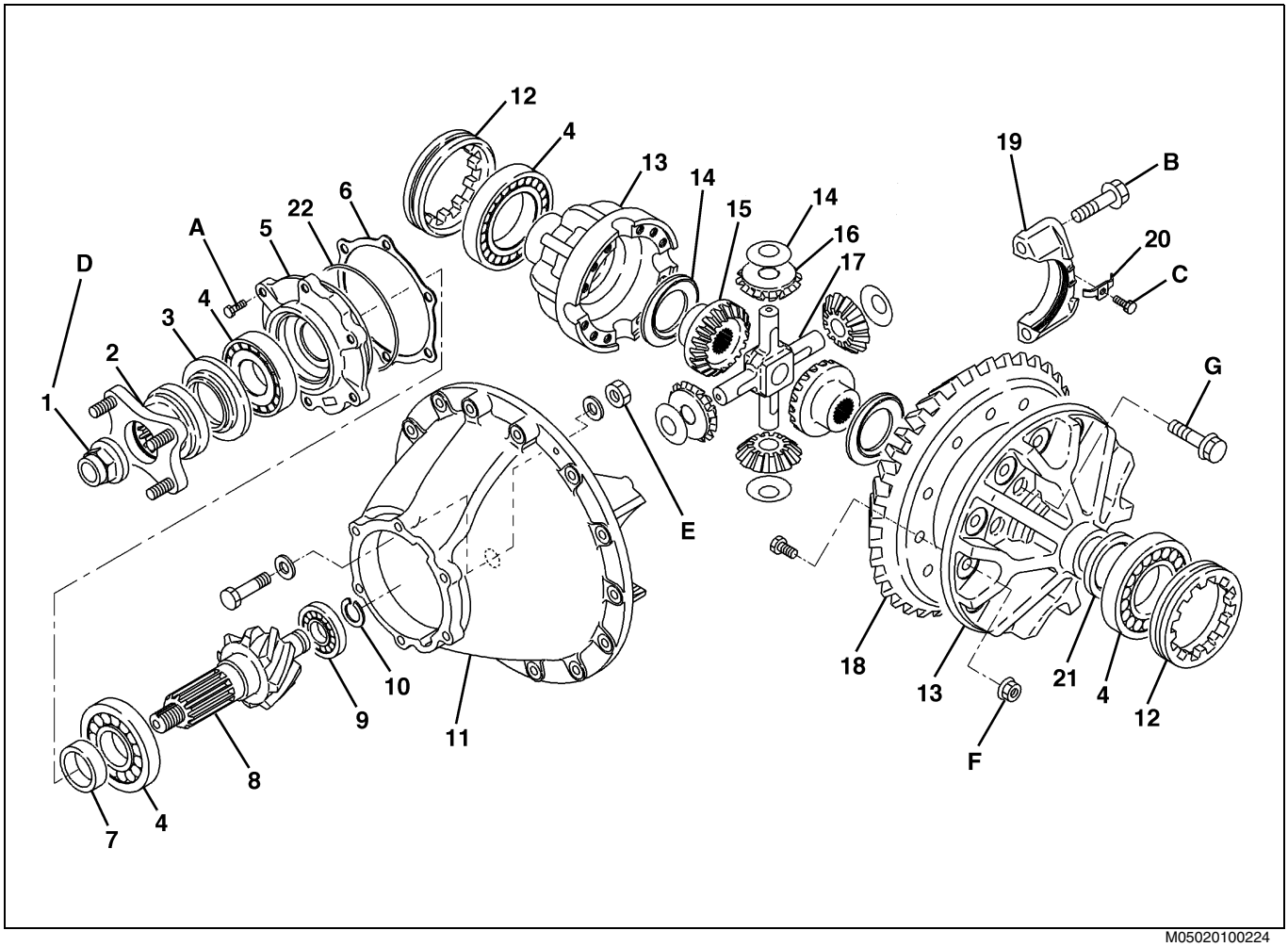


M05020100230

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	39.2-68.6 {400-700, 29-50}
B	ϕ12 bolt: 84.5-107.5 {860-1,100, 63-79}	D	9.8-19.6 {100-200, 7-14}
	ϕ14 bolt: 113-147 {1,150-1,500, 83-108}		



M05020100224

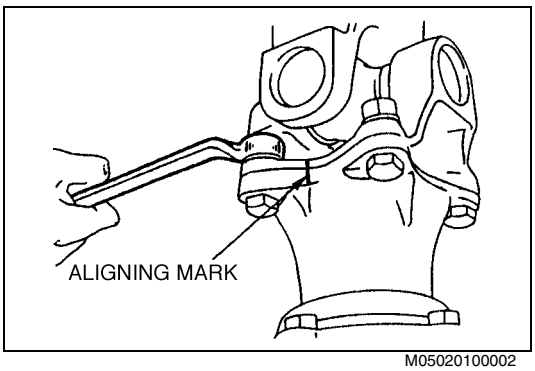
1	Lock nut	12	Adjusting nut
2	Flange yoke coupling	13	Differential case
3	Oil seal	14	Thrust washer
4	Taper roller bearing	15	Differential side gear
5	Bearing cage	16	Differential pinion gear
6	Adjusting shim	17	Spider
7	Spacer	18	Hypoid ring gear
8	Hypoid pinion	19	Bearing cap
9	Cylindrical roller bearing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

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

M05020101BEH2003



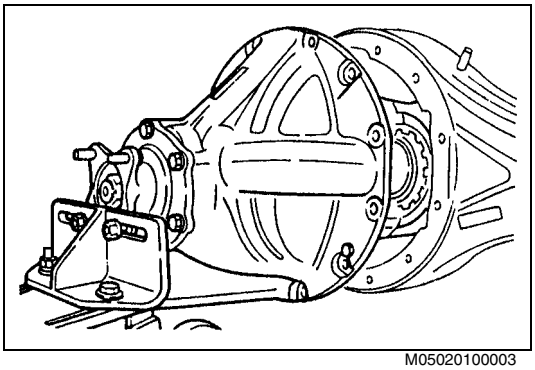
M05020100002

IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT.

NOTICE:

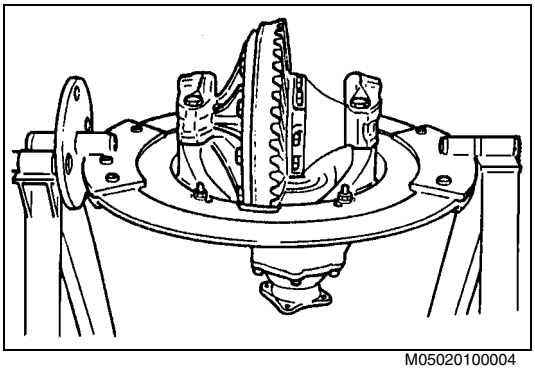
Make aligning marks before disassembling.


M05020100003

2. DISMOUNTING OF THE DIFFERENTIAL CARRIER ASSEMBLY

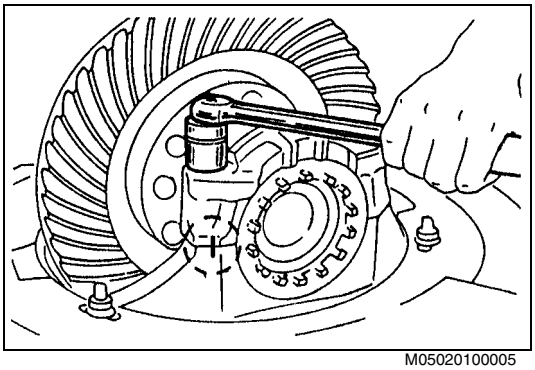
(1) Drain the gear oil and remove the axle shaft.

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


M05020100004

IMPORTANT POINTS - DISASSEMBLY

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


M05020100005

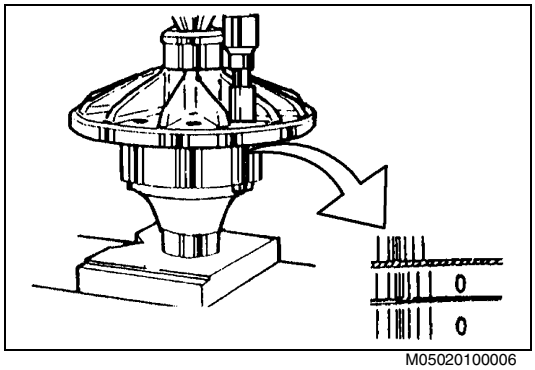
2. DIFFERENTIAL CASE

(1) Remove the bearing cap.

NOTICE:

Make aligning marks before disassembling.

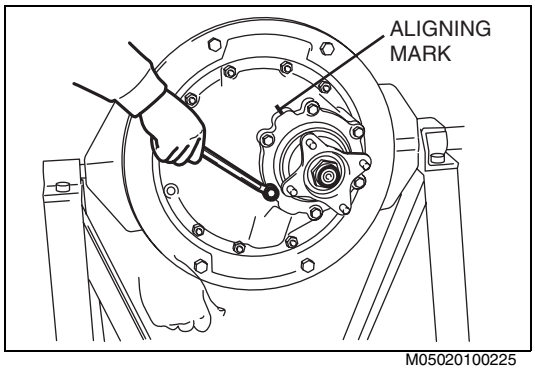
(2) Using a puller, remove the taper roller bearing.



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.

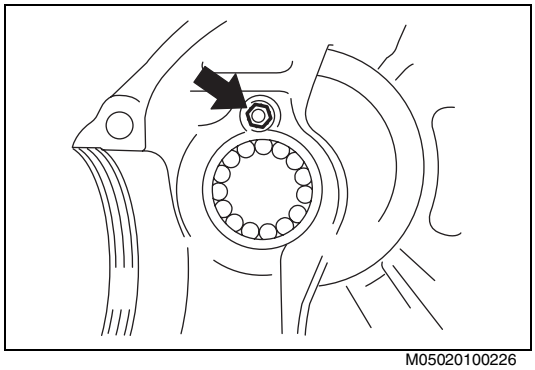


M05020100225

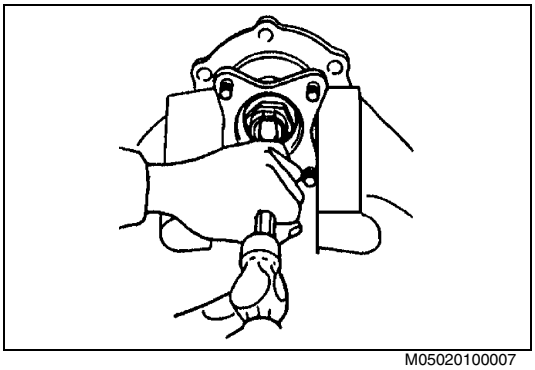
3. DISMOUNTING OF THE HYPOID PINION

(1) Remove the bolts and then dismount the hypoid pinion and the shims.

NOTICE:
Make aligning mark the differential cage and differential carrier.

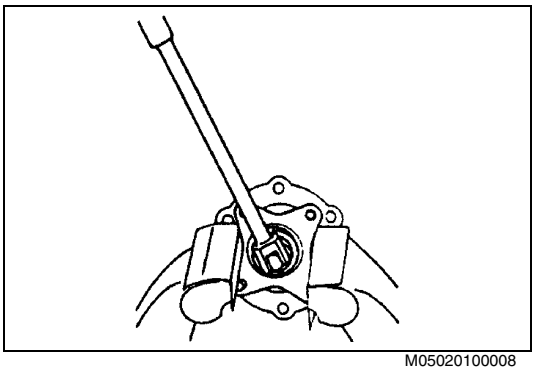

M05020100226

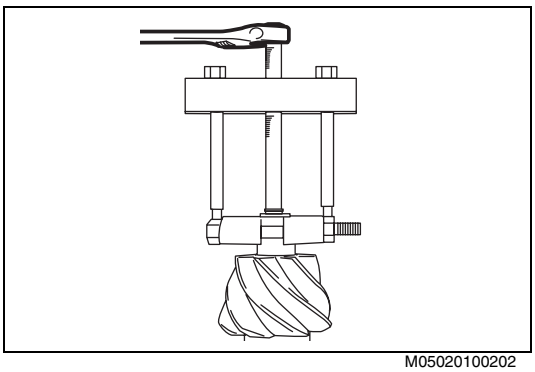
(2) Remove the bolts, nuts, and washers.
(3) Using brass bar and hammer, knock through the cylindrical roller bearing outer race.


M05020100007

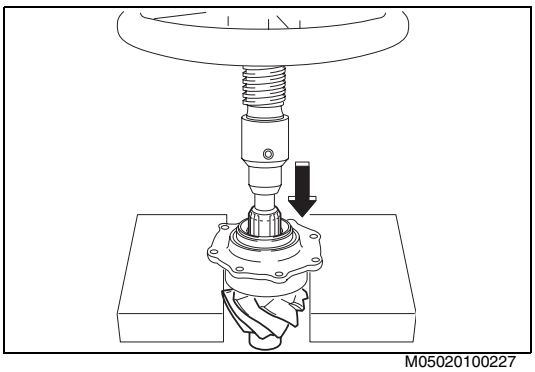
4. BEARING CAGE

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

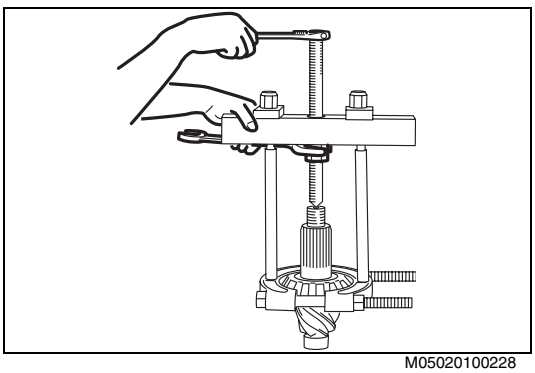

M05020100008


M05020100202

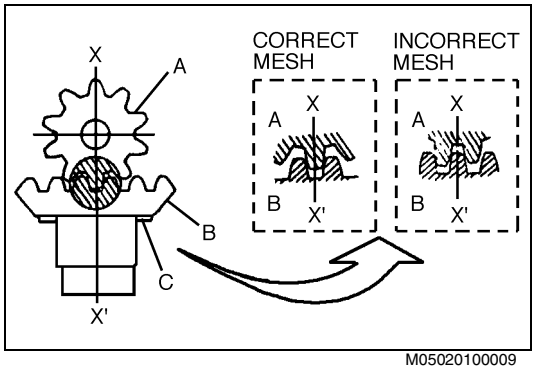
(2) Using a puller, remove the cylindrical roller bearing inner race.


M05020100227

(3) Using a press, remove the hypoid pinion.


M05020100228

(4) Using a puller, remove the taper roller bearing inner race.



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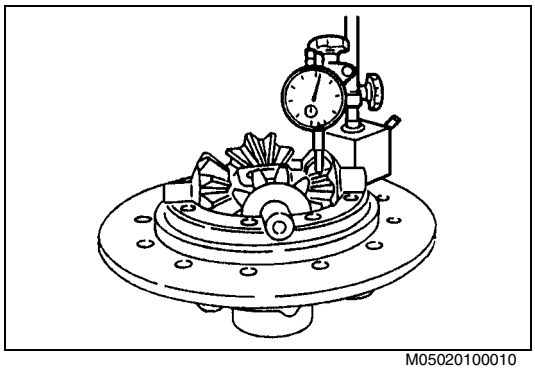
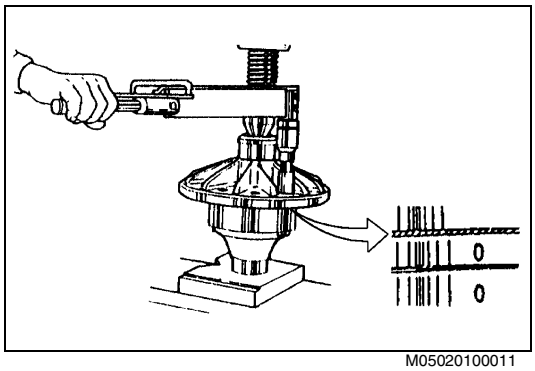
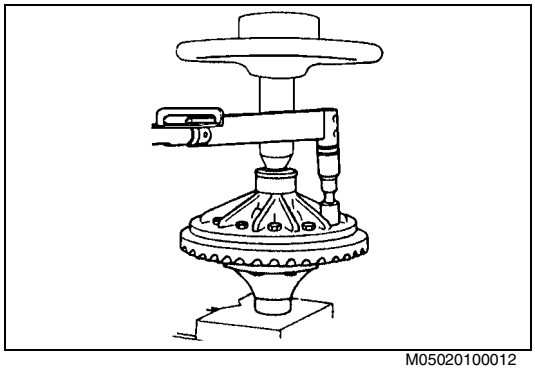

M05020100010



M05020100011


M05020100012

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

(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.}

(3) Assemble the differential case.

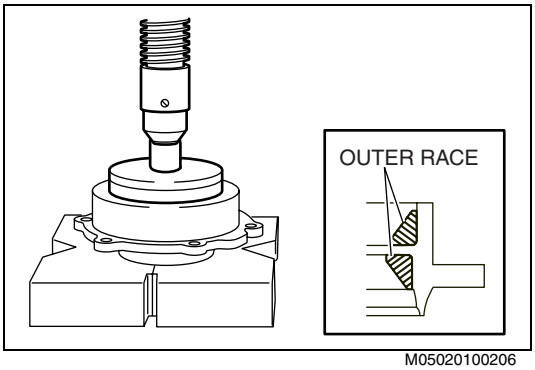
NOTICE:

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

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

NOTICE:

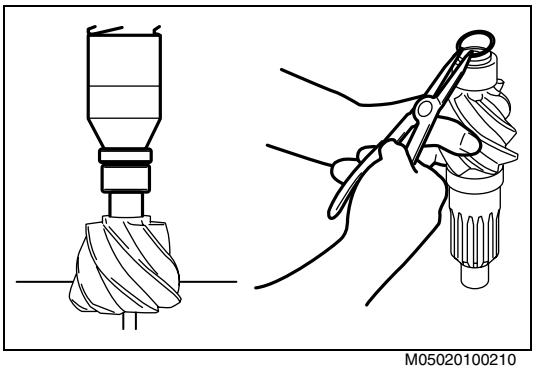
Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads.



M05020100206

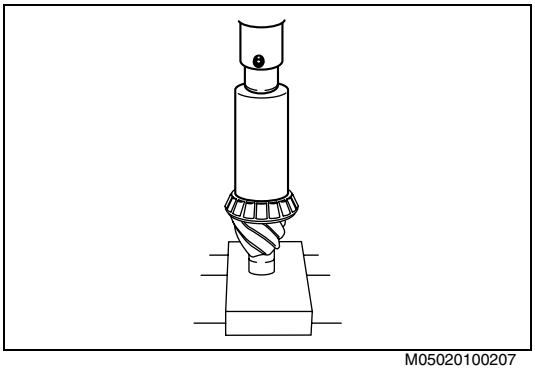
2. ASSEMBLY OF THE HYPOID PINION

(1) Installing the inner and outer taper roller bearing outer race
   a. Apply gear oil to the inner and outer taper roller bearing outer race.
   b. Using wear plates and press, press into the differential cage the inner and outer taper roller bearing outer race.

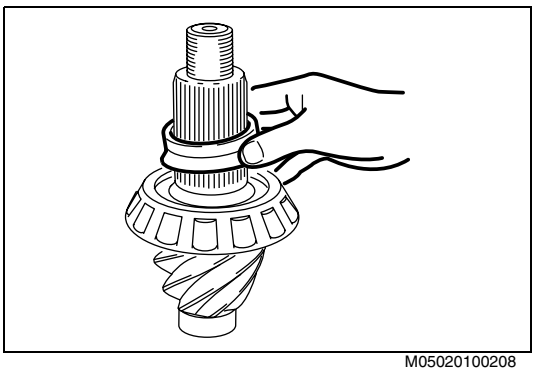

M05020100210

(2) Installing the cylindrical roller bearing inner race
   a. Apply gear oil to the cylindrical roller bearing inner race.
   b. Using press, press the cylindrical roller bearing inner race to the end of the hypoid pinion.
   c. Install a new retainer ring.

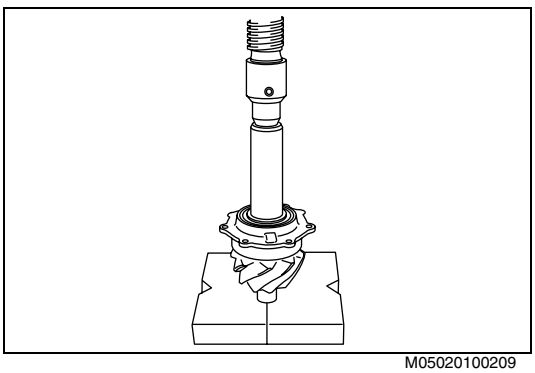
CAUTION:
The retainer ring is spring steel and may fly out of the groove during removal. Wear safety glasses during removal.


M05020100207

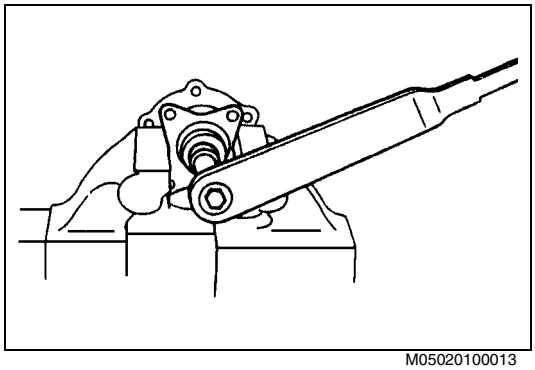
(3) Installing the inner taper roller bearing inner race
   a. Apply gear oil to the inner taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of hypoid pinion the inner taper roller bearing inner race.


M05020100208

   c. Install the spacer.


M05020100209

(4) Installing the differential cage and outer taper roller bearing inner race
   a. Apply gear oil to the outer taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of hypoid pinion the differential cage and outer taper roller bearing inner race.

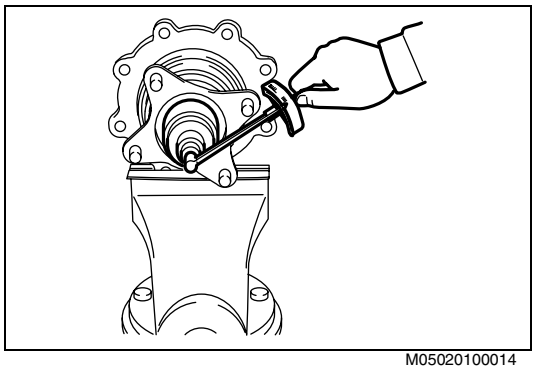

M05020100013

3. 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)


M05020100014

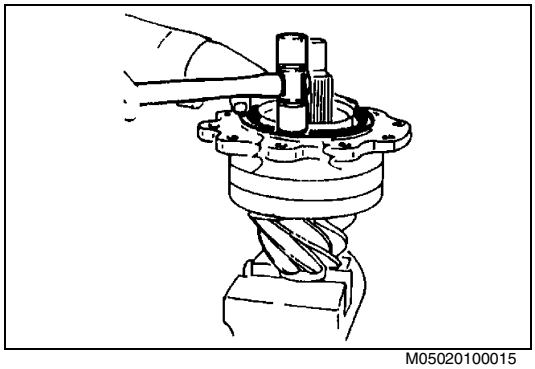
(2) Use a torque wrench to measure the preload of the bearings and if the preload is out of specific value shown below, adjust with spacer.

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}	1.47-2.45 {15-25, 1.1-1.8}

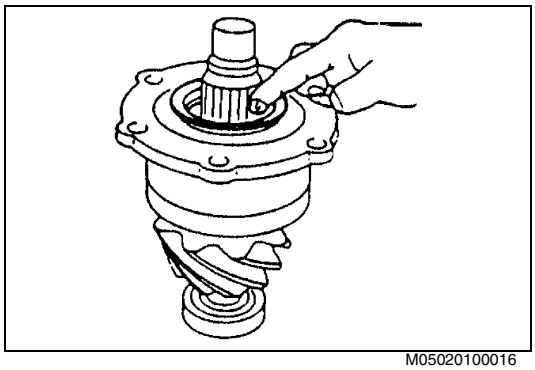
Adjusting spacer thickness:
20 kinds of thicknesses ranging from 13.900 to 14.375 mm {0.5473 to 0.5659 in.} each differing 0.025 mm {0.001 in.}

NOTICE:
Measure the preload and record it for measuring the total preload at the differential carrier bearings at a later time.

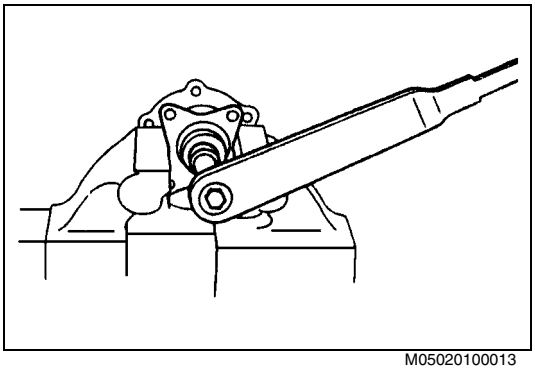

M05020100015

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

NOTICE:
Tap the oil seal in small steps and evenly to prevent it from being at slant position.

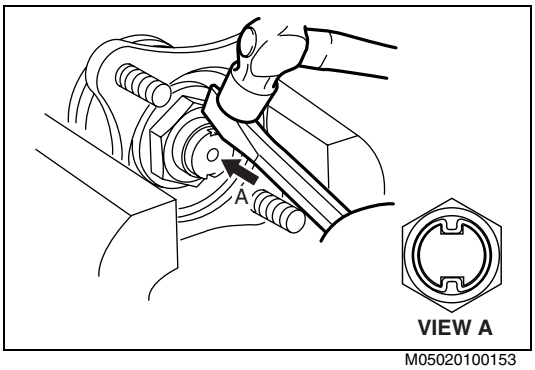

M05020100016

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



M05020100013

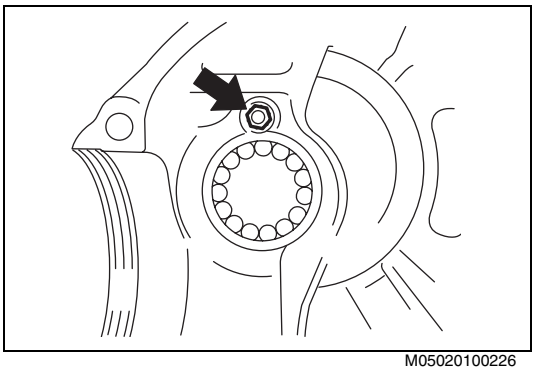
(4) Install the flange yoke coupling and tighten the lock nut.
SST: Socket Wrench (09839-4104)



M05020100153

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

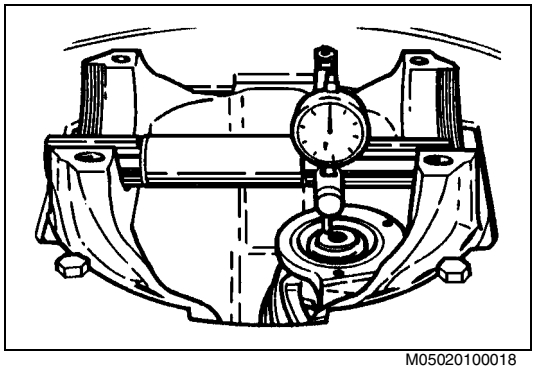
NOTICE:
- **Caulk the nut securely as shown.**
- **Make sure that there is no rift in the caulked position.**



M05020100226

4. INSTALLATION OF THE CYLINDRICAL ROLLER BEARING OUTER RACE

(1) Apply gear oil to the cylindrical roller bearing outer race.
(2) Install the cylindrical roller bearing outer race by nuts, bolts, and washers.
Tightening Torque:
19-25 N·m (190-260 kgf·cm. 14-18 lbf·ft)

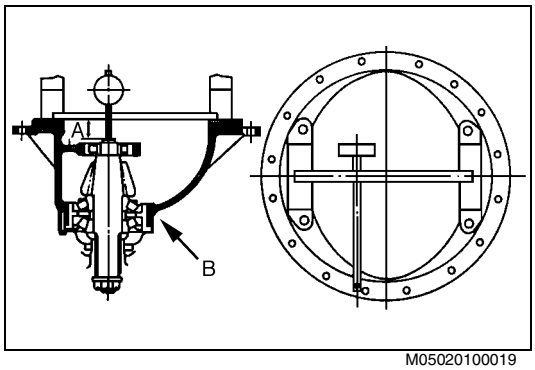

M05020100018

5. ADJUSTMENT OF THE PINION FITTING HEIGHT (CONICAL DISTANCE)

(1) Install the Bearing cage assembly and adjust the height with shims.

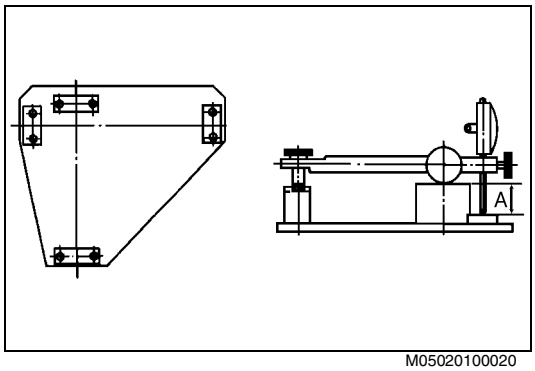
NOTICE:
Apply grease to the O-ring when installing bearing cage.

SST: Gauge Assembly (09640-1022)



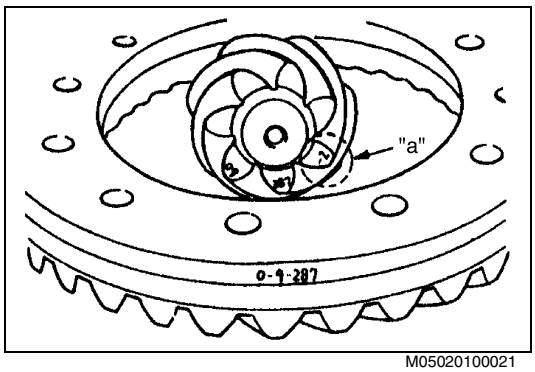
M05020100019

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

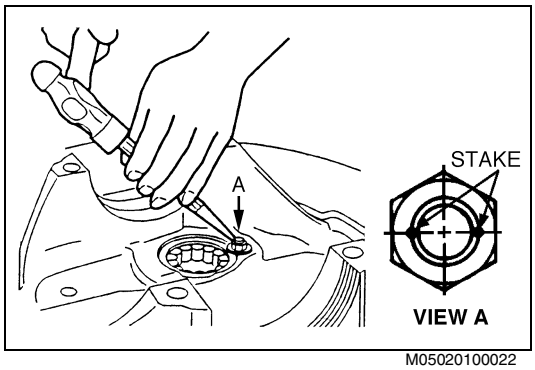
(2) How to use the pinion depth gauge: Set the pinion depth gauge.
A: 21.5 mm {0.846 in.}



M05020100021

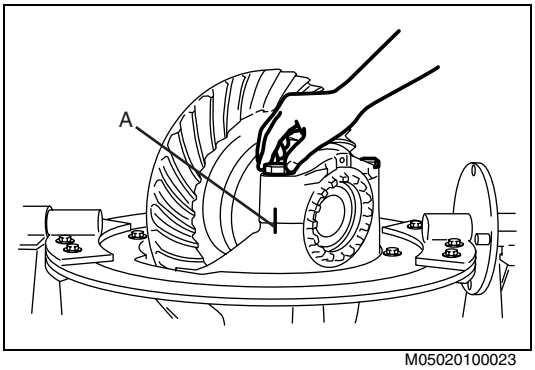
EXAMPLE:
In a case where the engraved value at the surface of the pinion gear is -20 (-20 means -0.2 mm):

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



M05020100022

(3) Stake the lock nut. securely as shown in the figure.

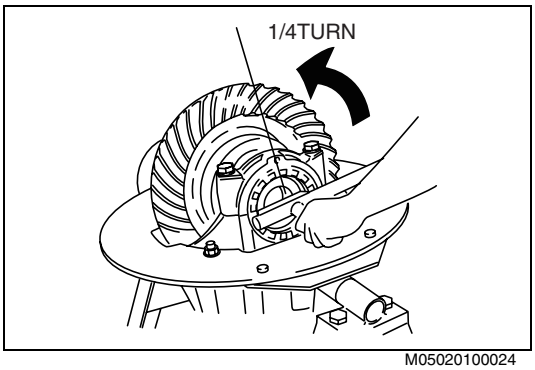


M05020100023

6. ADJUSTMENT OF THE HYPOID RING GEAR BACKLASH

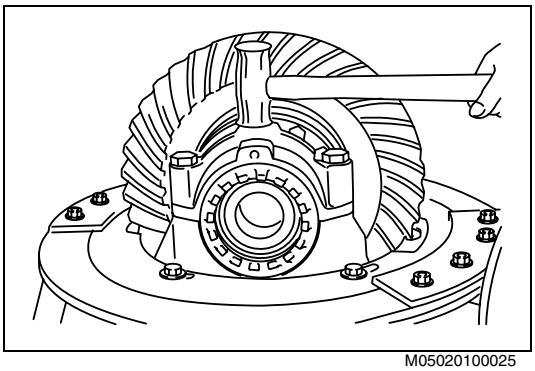
(1) Set the differential case assembly on the carrier case and install the adjusting nut and bearing cap.

NOTICE:
Align the aligning marks A.

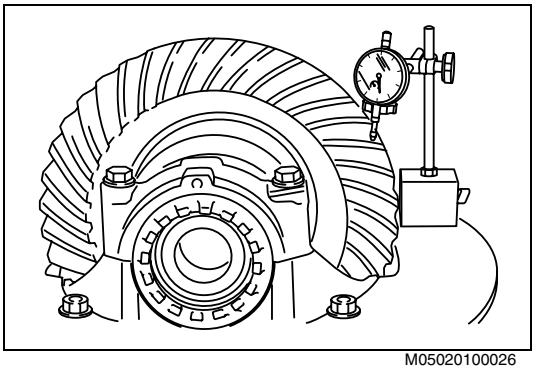


M05020100024

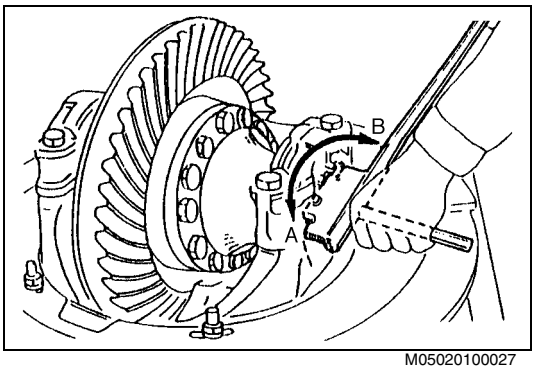
(2) Adjust the preload of the side bearing provisionally.
   a. Tighten the adjusting nut fully, then loosen the adjusting nut by 1/4 turn + 1 notch.
   SST: Adjuster Tool (09665-1150)


M05020100025

   b. Hit the bearing cap with a copper hammer.

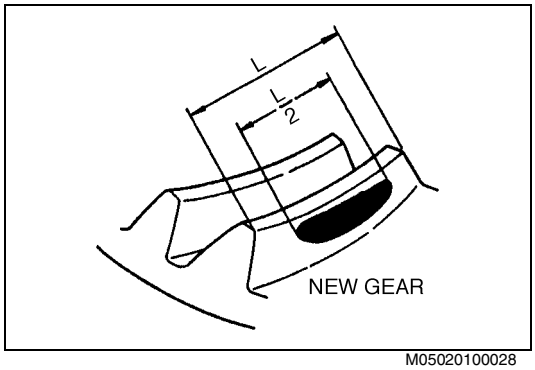

M05020100026

(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)



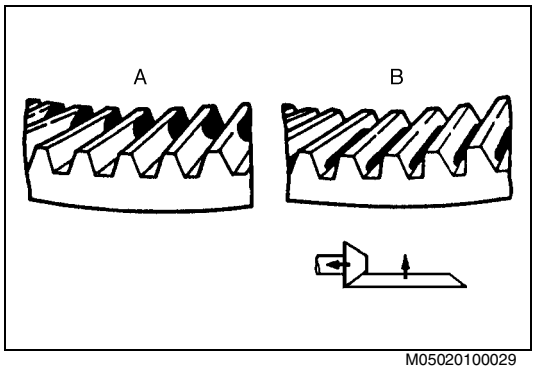
M05020100028

7. INSPECTION AND ADJUSTMENT OF GEAR MESHING

(1) Satisfactory gear meshing.

NOTICE:

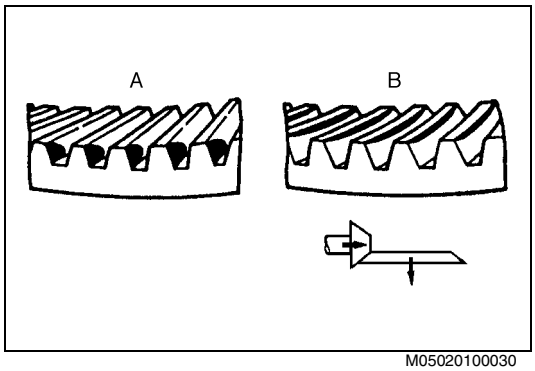
New gears are marked as shown to indicate proper gear meshing. Make necessary adjustment so that gears mesh corresponds with the factory's mark.



M05020100029

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

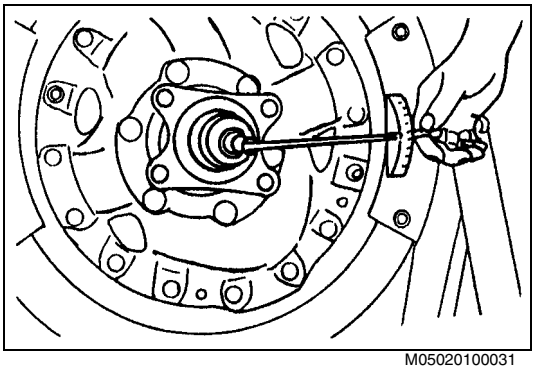
A: Toe contact - Unadjust, replace the pinion and ring gear as a set.
B: Flank contact - Adjust



M05020100030

   b. Heel and face contact

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


M05020100031

8. MEASUREMENT AND ADJUSTMENT OF THE SIDE BEARING

(1) Measure the total preload using a torque wrench at the flange coupling.

NOTICE:

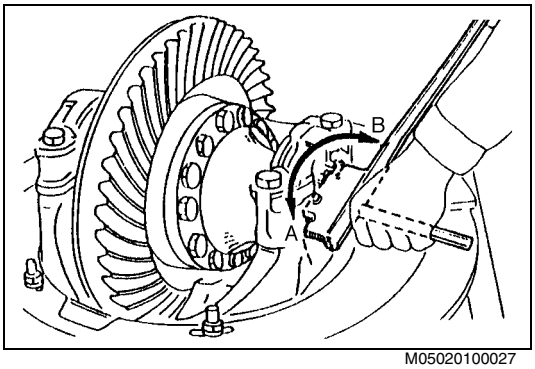
Side bearing preload = Differential total preload - Pinion bearing preload (refer to item 3).

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

New bearing	Re-used bearing
0.39-0.47 {3.9-4.8, 0.28-0.34}	0.29-0.38 {3.0-3.8, 0.22-0.27}

NOTICE:

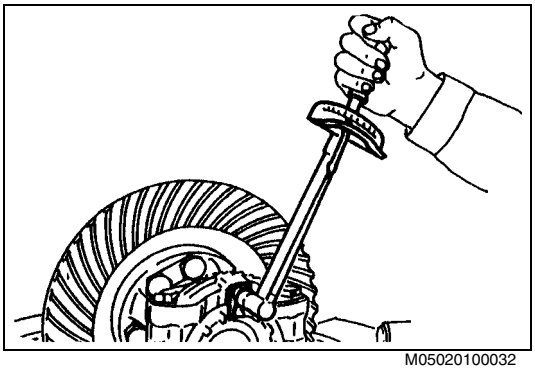
The gear ratio is indicated on the bearing cage.



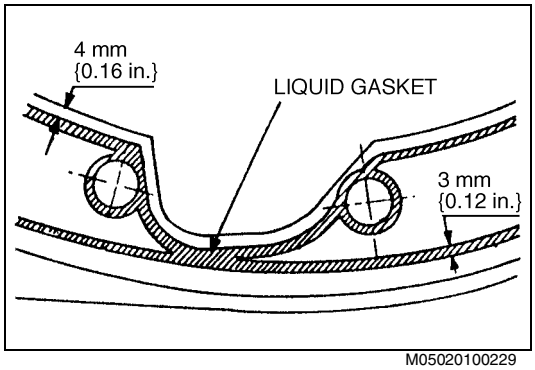
M05020100027

(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.



M05020100229

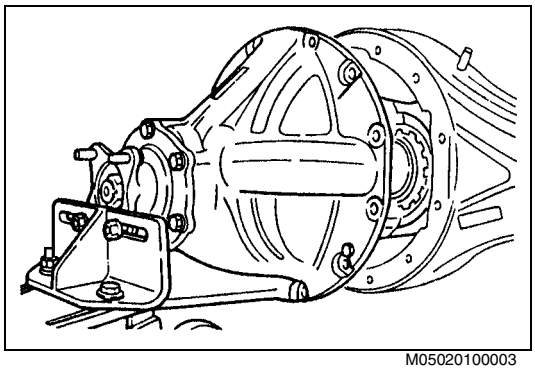
IMPORTANT POINTS - MOUNTING

1. MOUNTING

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

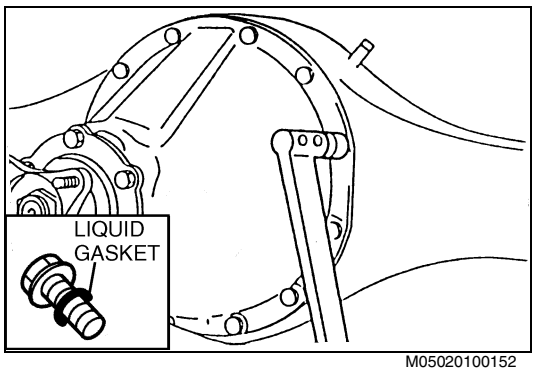
NOTICE:

- **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 4 mm {0.16 in.} away from the edge.**


M05020100003

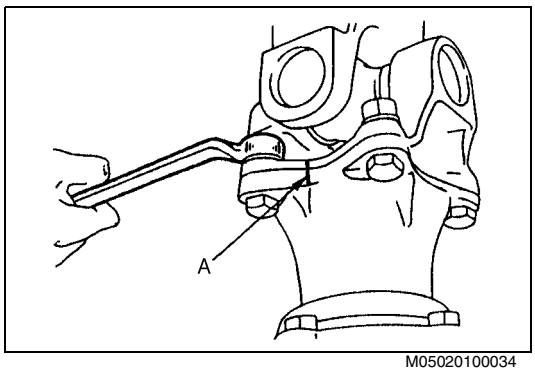
(2) Using a jack, install the differential carrier assembly to the axle housing.

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}

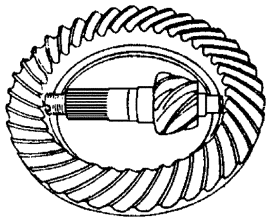
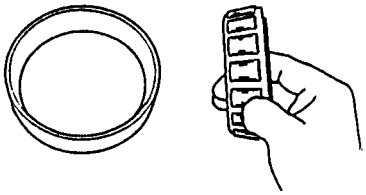
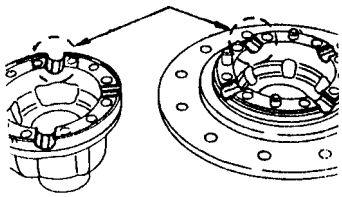
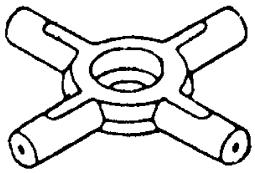
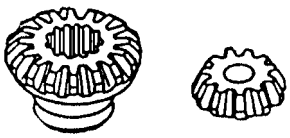
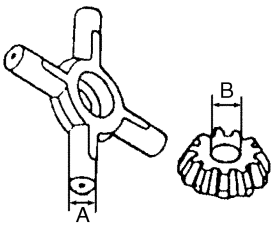
(5) Fill the axle housing with specified gear oil up to the filler plug hole.

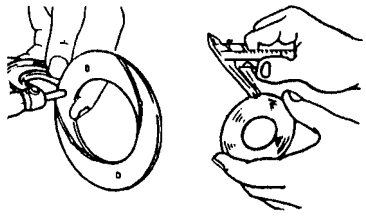
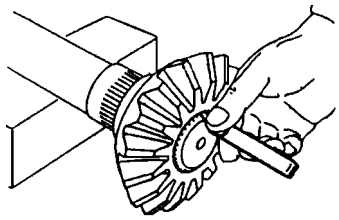
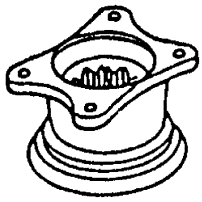
Gear oil:
Refer to the owner's manual

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 
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 

Inspection item	Standard	Limit	Remedy	Inspection procedure
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** 

DIFFERENTIAL CARRIER (SH16)

DF02-002

DIFFERENTIAL CARRIER ASSEMBLY (SH16)

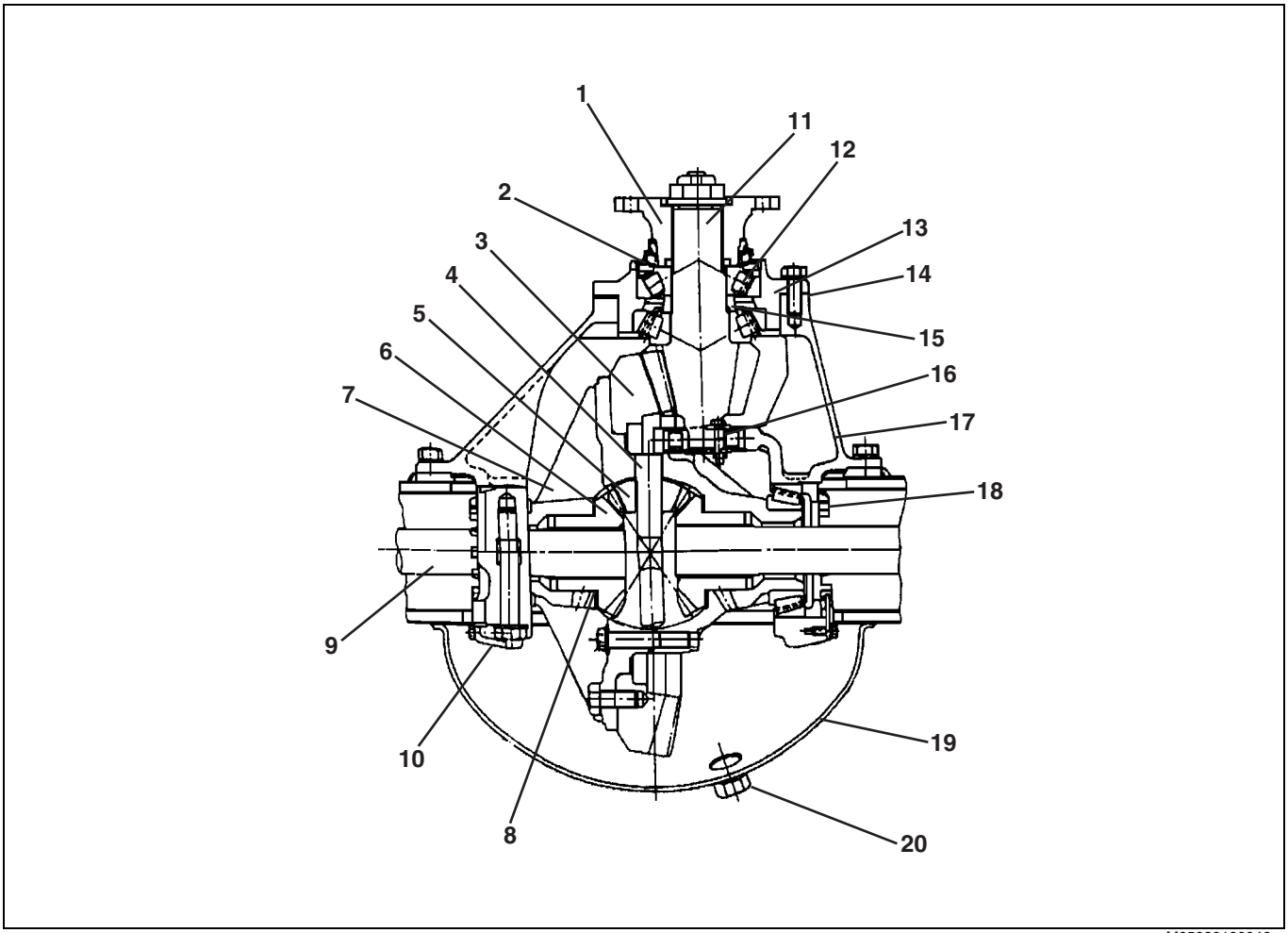
DATA AND SPECIFICATIONS

M05020103BEI2002

Type	Single-reduction, single-speed, by hypoid gearing
Gear ratios	5.428, 6.428
Oil capacity	10 L {2.20 Imp gal. / 2.64 U.S gal.}

DESCRIPTION

M05020103BEC1001



M05020100046

1	Flange yoke coupling	8	Thrust washer	15	Spacer
2	Oil seal	9	Axle shaft	16	Cylindrical roller bearing
3	Hypoid ring gear	10	Bearing cap	17	Differential carrier case
4	Spider	11	Hypoid pinion	18	Adjusting nut
5	Differential pinion gear	12	Taper roller bearing	19	Axle housing
6	Differential side gear	13	Bearing cage	20	Oil filler plug
7	Differential case	14	Adjusting shim		

TROUBLESHOOTING

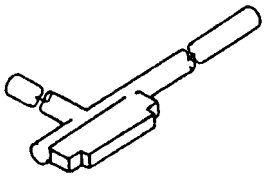
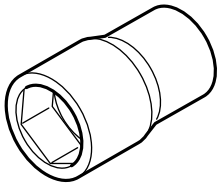
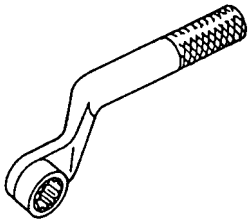
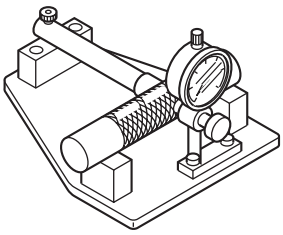
M05020103BEF3001

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

M05020103BEK1001

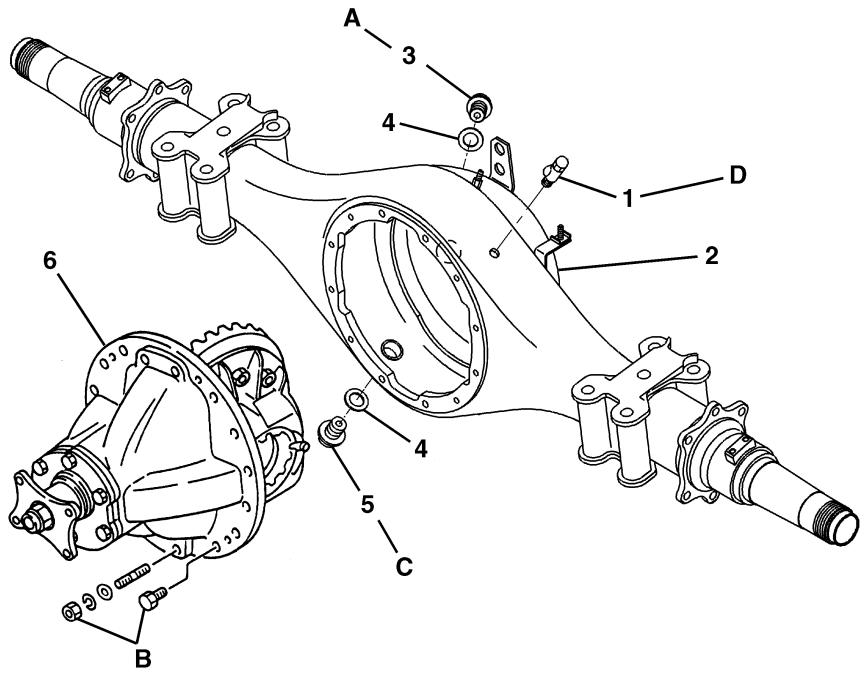
Prior to starting a differential carrier overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09665-1040	ADJUSTER TOOL	
	09839-4601	SOCKET WRENCH	
	09603-1150	SOCKET WRENCH	
	09640-1151	GAUGE ASSEMBLY	

COMPONENT LOCATOR

M05020103BED1002

(EXAMPLE)

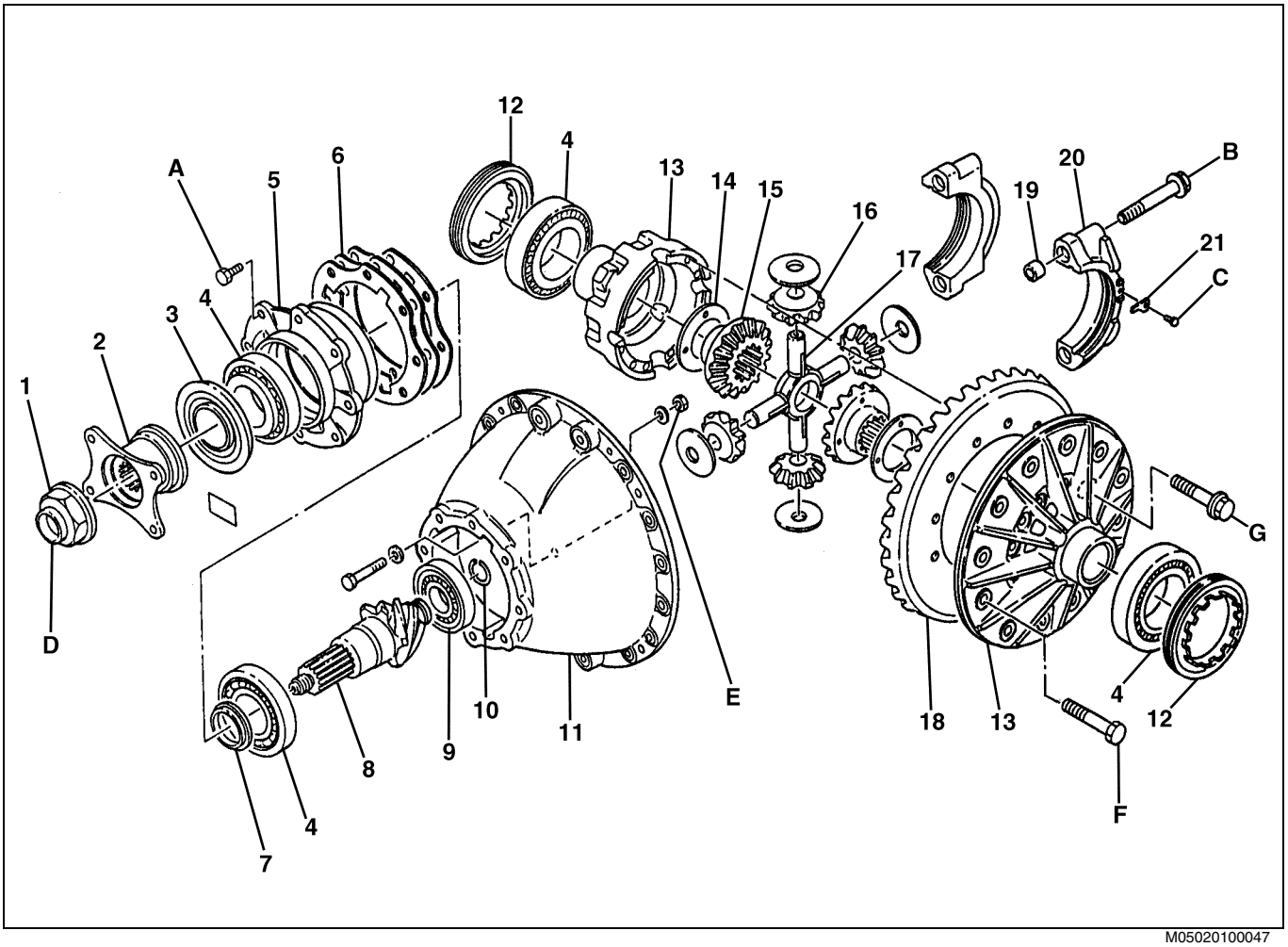


M05020100231

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	39.2-68.6 {400-700, 29-50}
B	113-147 {1,150-1,500, 83-108}	D	9.8-19.6 {100-200, 7-14}



M05020100047

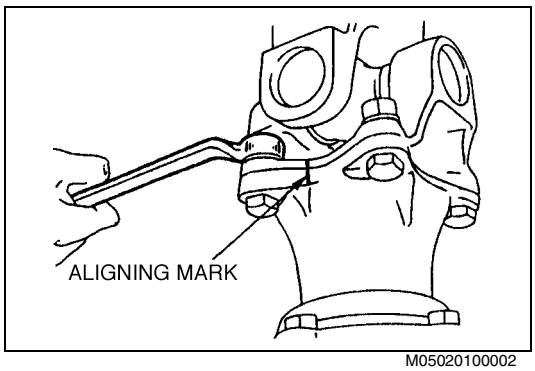
1	Lock nut	8	Hypoid pinion	15	Differential side gear
2	Flange yoke coupling	9	Cylindrical roller bearing	16	Differential pinion gear
3	Oil seal	10	Retainer ring	17	Spider
4	Taper roller bearing	11	Differential carrier case	18	Hypoid ring gear
5	Bearing cage	12	Adjusting nut	19	Collar
6	Adjusting shim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

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

A	113-147 {1,150-1,500, 83-108}	E	19-25 {190-260, 14-18}
B	277-353 {2,800-3,600, 203-260}	F	368-422 {3,700-4,300, 268-311}
C	19-25 {190-260, 14-18}	G	246-294 {2,500-3,000, 181-216}
D	589-781 {6,000-8,000, 434-578}		

OVERHAUL

M05020103BEH2002



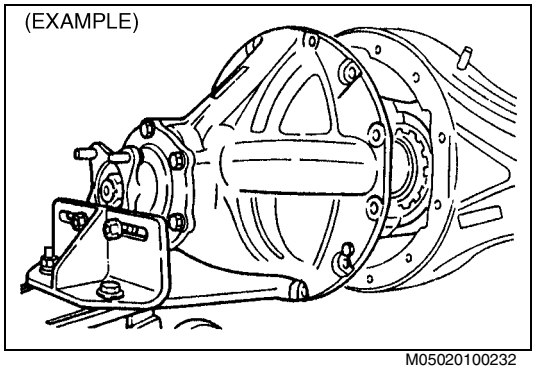
M05020100002

IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT.

NOTICE:

Make aligning marks before disassembling.

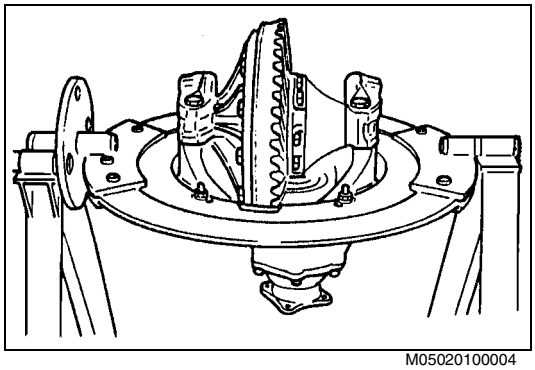


M05020100232

2. DISMOUNTING OF THE DIFFERENTIAL CARRIER ASSEMBLY

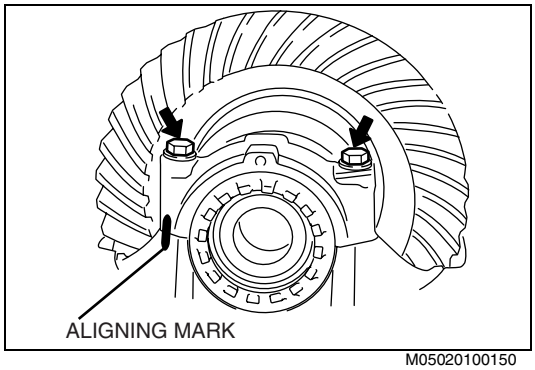
(1) Drain the gear oil and remove the axle shaft.

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


M05020100004

IMPORTANT POINTS - DISASSEMBLY

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



M05020100150

2. DIFFERENTIAL CASE

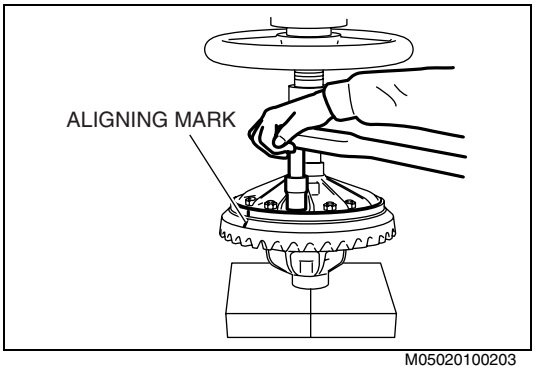
(1) Remove the bearing cap.

NOTICE:

Make aligning marks before disassembling.

SST: Socket Wrench (09603-1150)

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

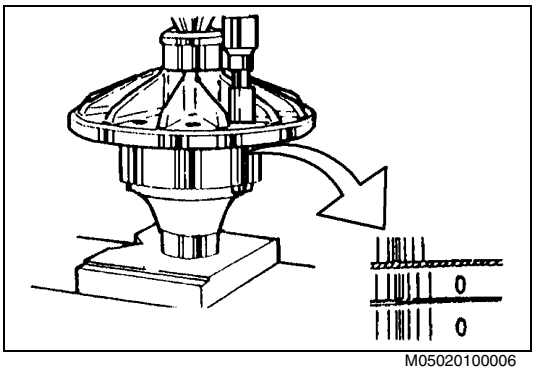


M05020100203

(3) Dismounting the ring gear

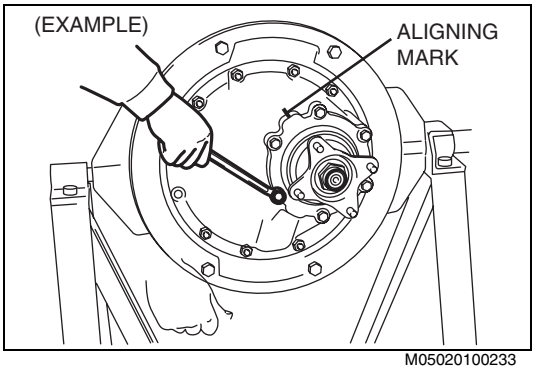
a. Make aligning mark both the differential case and the ring gear.
b. Using press, fix the differential gear assembly.
c. Remove the bolts and then ring gear.

NOTICE:
Be careful not to drop the ring gear.


M05020100006

(4) 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.

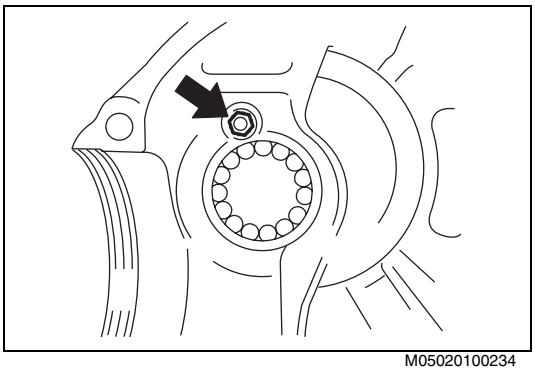


M05020100233

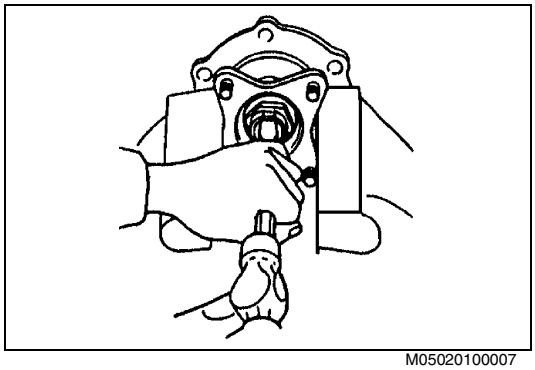
3. DISMOUNTING OF THE HYPOID PINION

(1) Remove the bolts and then dismount the hypoid pinion and the shims.

(2) Make aligning mark the differential cage and differential carrier.

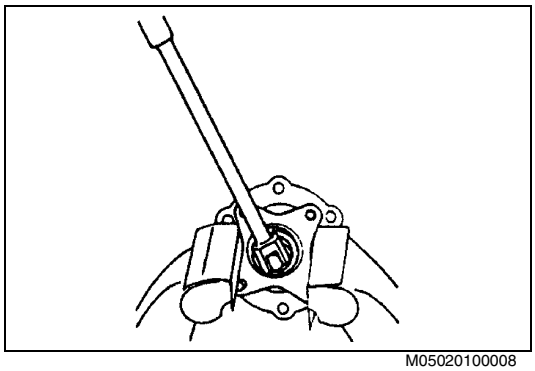

M05020100234

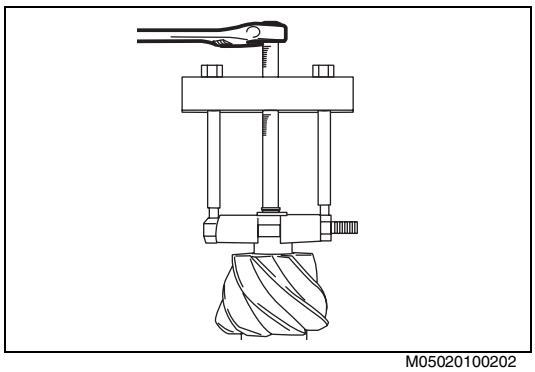
(3) Remove the bolts, nuts, and washers.
(4) Using brass bar and hammer, knock through the cylindrical roller bearing outer race.


M05020100007

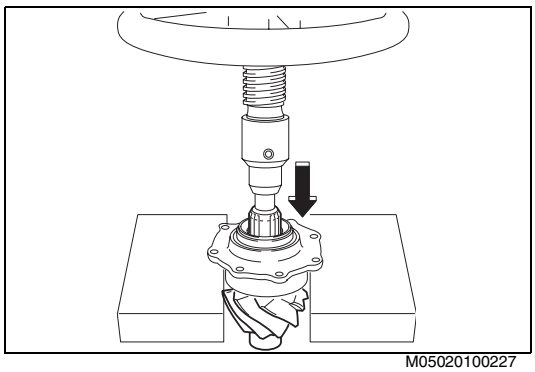
4. BEARING CAGE

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

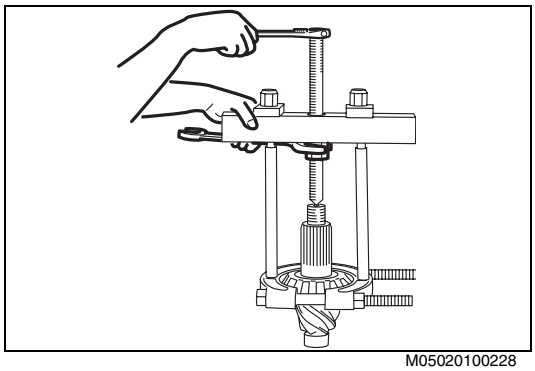

M05020100008


M05020100202

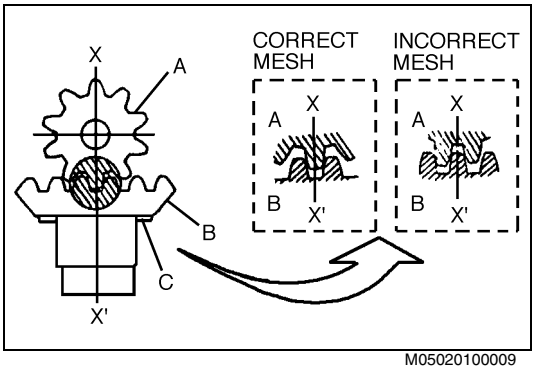
(2) Using a puller, remove the cylindrical roller bearing inner race.


M05020100227

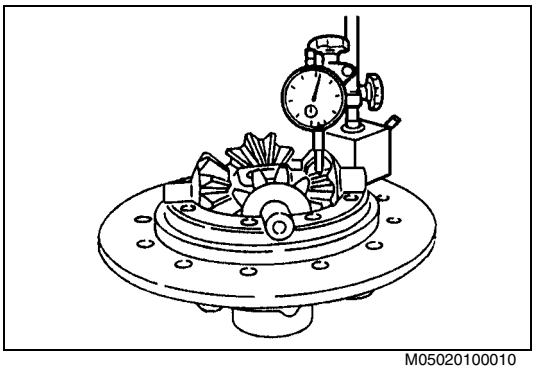
(3) Using a press, remove the hypoid pinion.

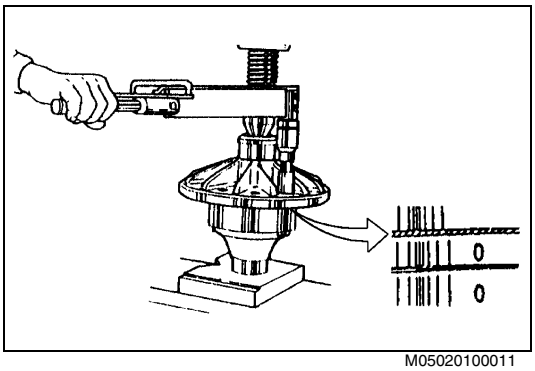

M05020100228

(4) Using a puller, remove the taper roller bearing inner race.

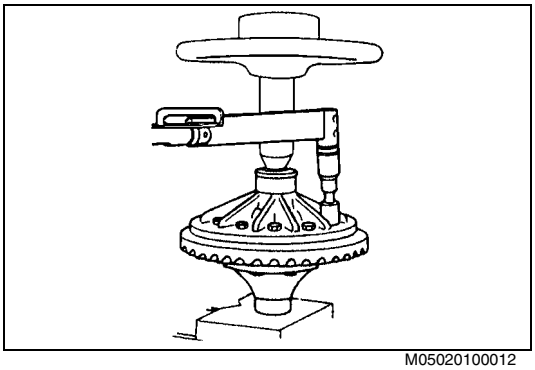


M05020100009


M05020100010



M05020100011


M05020100012

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

(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.}

(3) Assemble the differential case.

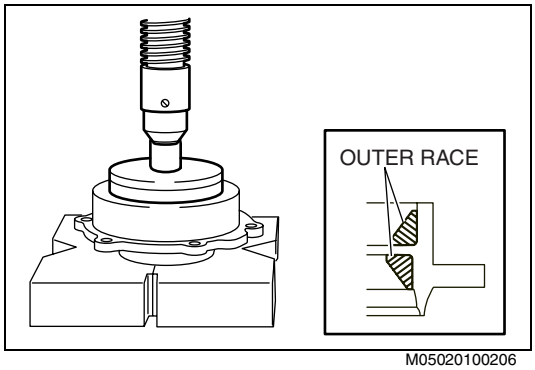
NOTICE:

- **Align the aligning marks when assembling.**
- **Apply lock agent (ThreeBond 1360K or equivalent) on the bolt threads.**

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

NOTICE:

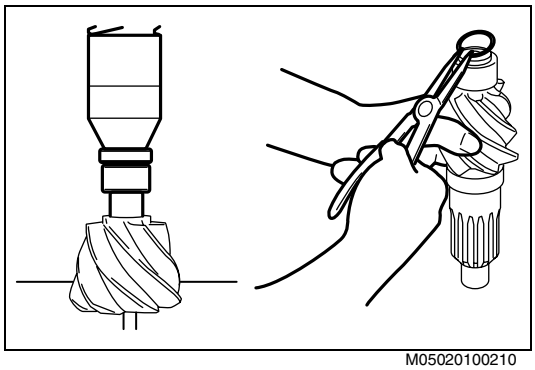
Apply lock agent (ThreeBond 1360K or equivalent) on the bolt threads.



M05020100206

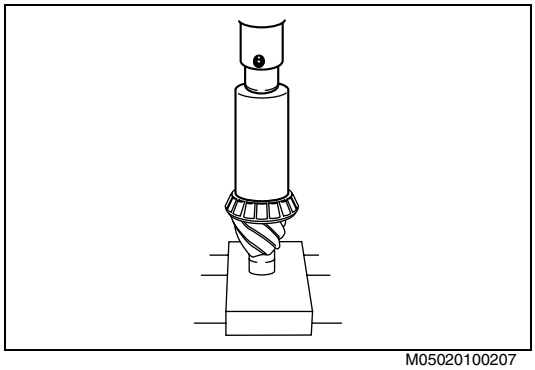
2. ASSEMBLY OF THE HYPOID PINION

(1) Installing the inner and outer taper roller bearing outer race
   a. Apply gear oil to the inner and outer taper roller bearing outer race.
   b. Using wear plates and press, press into the differential cage the inner and outer taper roller bearing outer race.

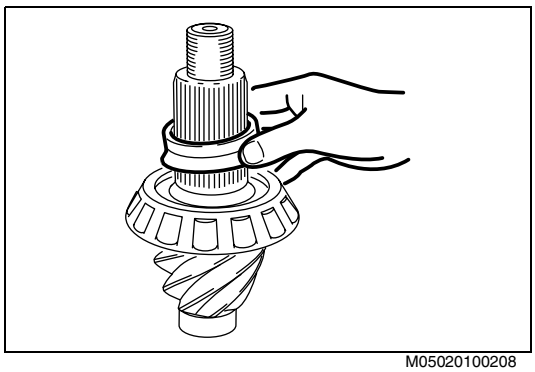

M05020100210

(2) Installing the cylindrical roller bearing inner race
   a. Apply gear oil to the cylindrical roller bearing inner race.
   b. Using press, press the cylindrical roller bearing inner race to the end of the hypoid pinion.
   c. Install a new retainer ring.

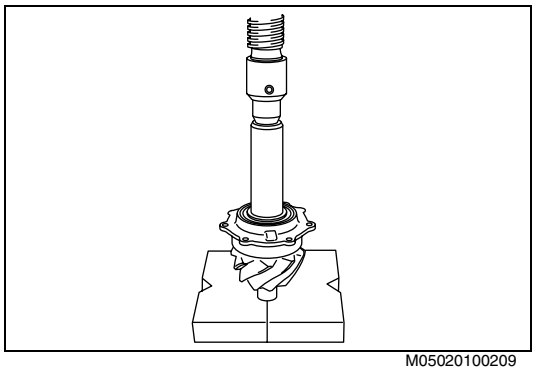
CAUTION:
The retainer ring is spring steel and may fly out of the groove during removal. Wear safety glasses during removal.


M05020100207

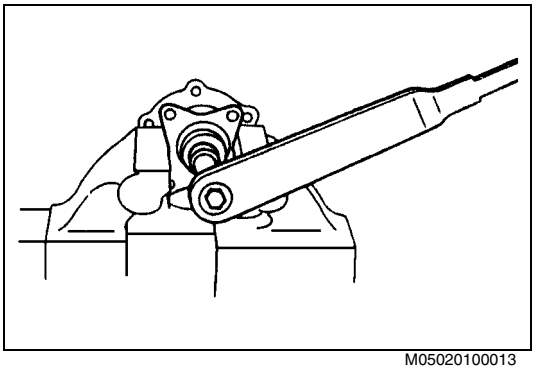
(3) Installing the inner taper roller bearing inner race
   a. Apply gear oil to the inner taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of hypoid pinion the inner taper roller bearing inner race.


M05020100208

   c. Install the spacer.


M05020100209

(4) Installing the differential cage and outer taper roller bearing inner race
   a. Apply gear oil to the outer taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of hypoid pinion the differential cage and outer taper roller bearing inner race.

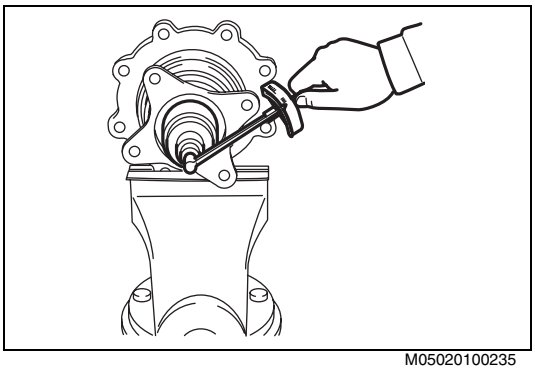

M05020100013

3. 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 (09839-4601)


M05020100235

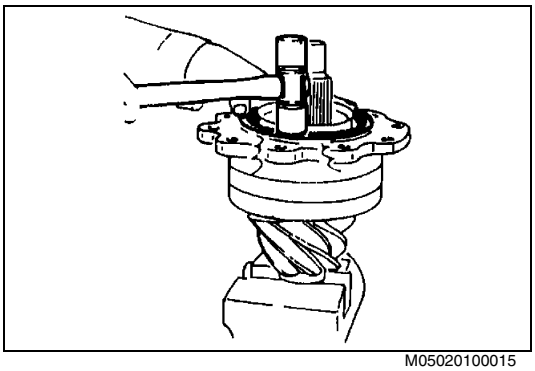
(2) Use a torque wrench to measure the preload of the bearings and if the preload is out of specific value shown below, adjust with spacer.

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}	1.47-2.45 {15-25, 1.1-1.8}

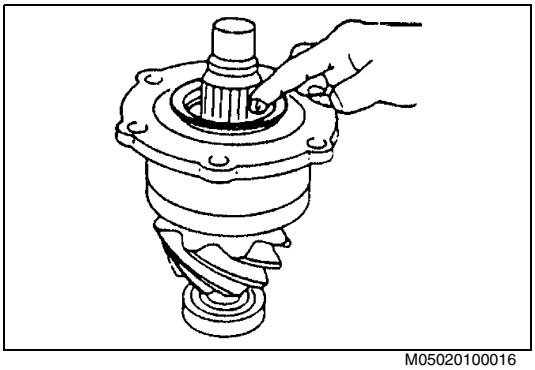
Adjusting spacer thickness:
17 kinds of thicknesses ranging from 17.250 to 17.650 mm {0.679 to 0.694 in.} each differing 0.025 mm {0.001 in.}

NOTICE:
Measure the preload and record it for measuring the total preload at the differential carrier bearings at a later time.

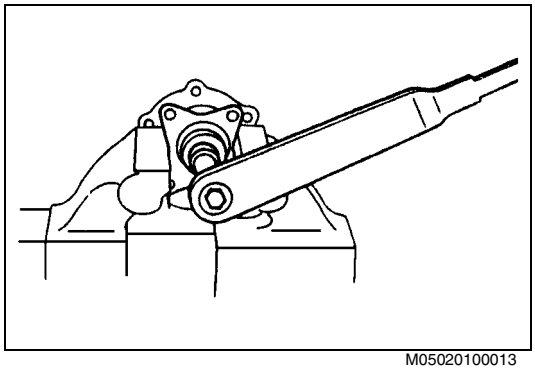

M05020100015

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

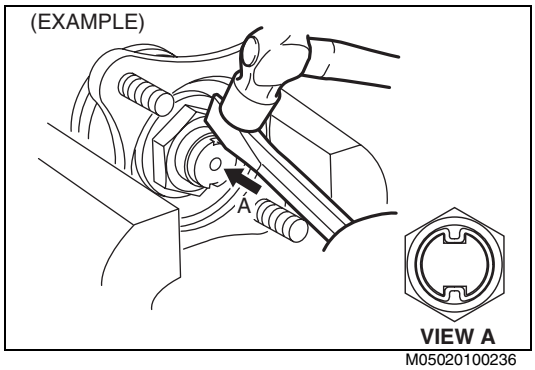
NOTICE:
Tap the oil seal in small steps and evenly to prevent it from being at slant position.


M05020100016

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


M05020100013

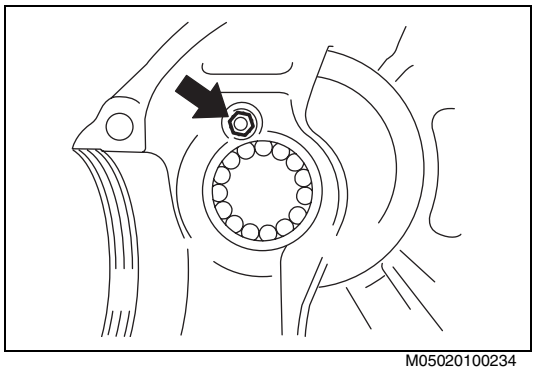
(4) Install the flange yoke coupling and tighten the lock nut.
SST: Socket Wrench (09839-4601)



M05020100236

(5) Caulk the lock nut.

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

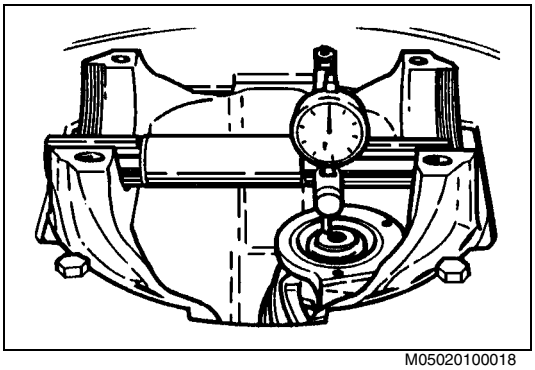

M05020100234

4. Installing the cylindrical roller bearing outer race

(1) Apply gear oil to the cylindrical roller bearing outer race.
(2) Install the cylindrical roller bearing outer race by nuts, bolts, and washers.

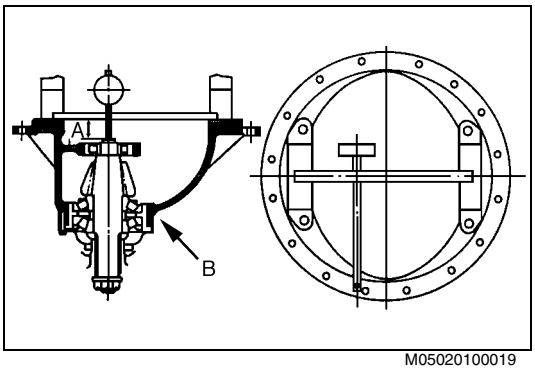
Tightening Torque:
19-25 N·m {190-260 kgf·cm, 14-18 lbf·ft}

NOTICE:
Apply lock agent (ThreeBond 1360K or equivalent) on the bolt threads.


M05020100018

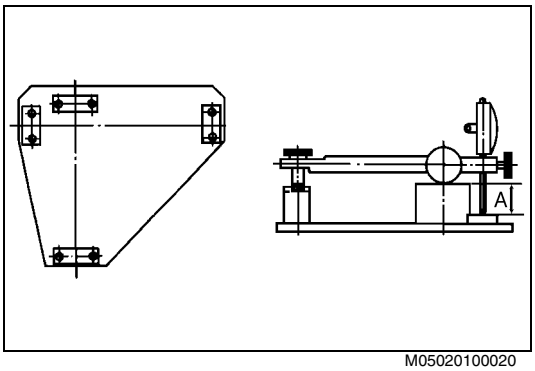
5. ADJUSTMENT OF THE PINION FITTING HEIGHT (CONICAL DISTANCE)

(1) Install the bearing cage assembly and adjust the height with shims.
SST: Gauge Assembly (09640-1151)



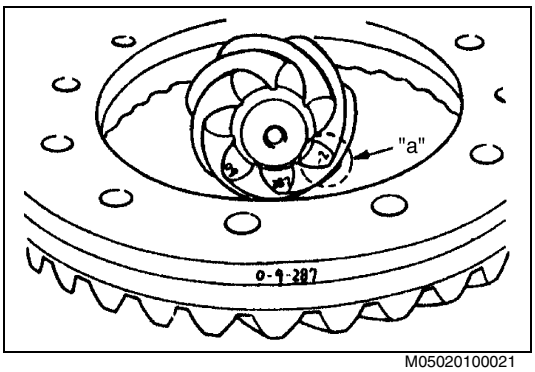
M05020100019

A: 33 mm {1.299 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:33 mm {1.299 in.}



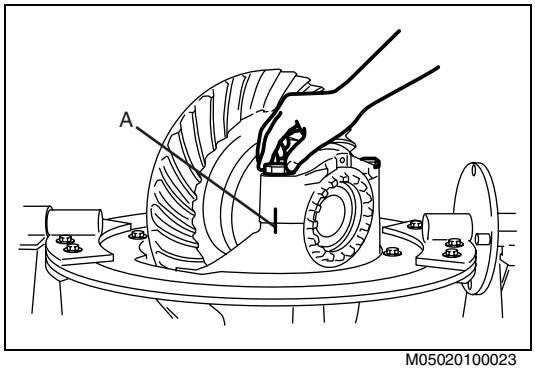
M05020100021

EXAMPLE:

In a case where the engraved value at the surface of the pinion gear is -2 (-2 means -0.2 mm):

Standard pinion height "A"				Measuring part (A')
33.0 mm	–	0.2 mm The engraved value "a"	=	32.8 mm

NOTICE:
Upon completing the adjustment, remove the bearing cage assembly and apply liquid gasket (ThreeBond #1215 or equivalent) on the mounting surfaces of differential carrier case and bearing cage.

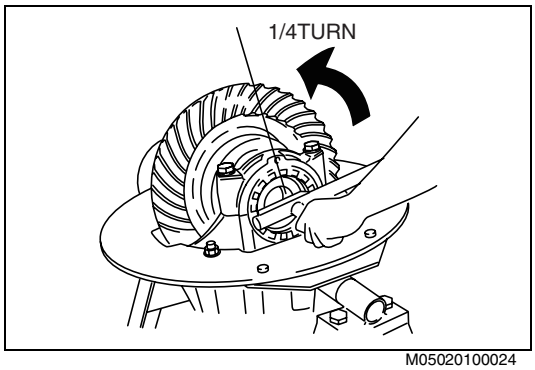


M05020100023

6. ADJUSTMENT OF THE HYPOID RING GEAR BACKLASH

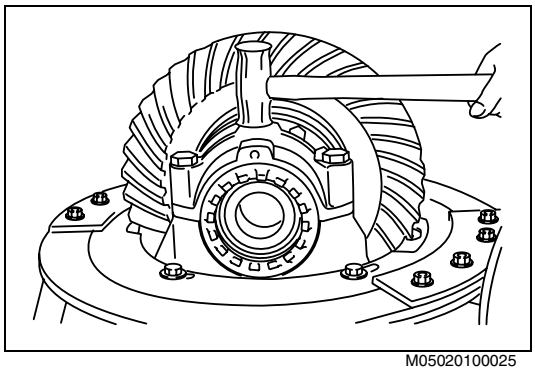
(1) Set the differential case assembly on the carrier case and install the adjusting nut and bearing cap.

NOTICE:
Align the aligning marks A.

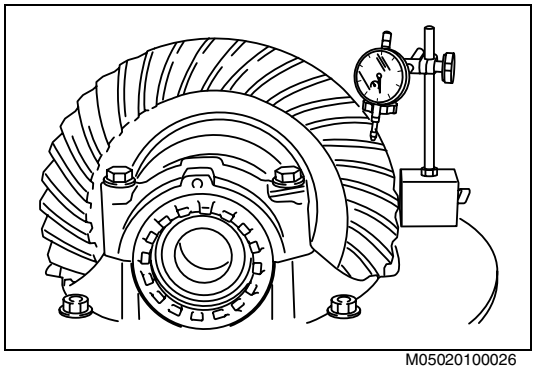


M05020100024

(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 (09665-1040)


M05020100025

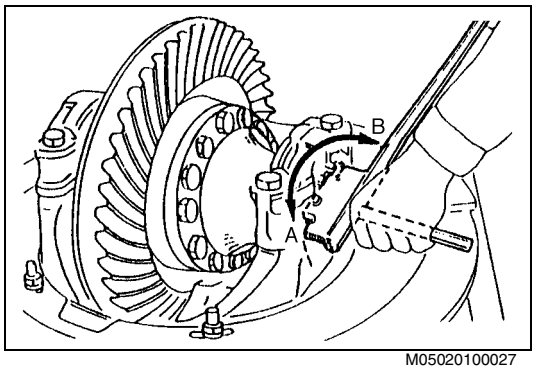
   b. Hit the bearing cap with a copper hammer.


M05020100026

(3) Measure the gear backlash at three or four points on the circumference of the gear.

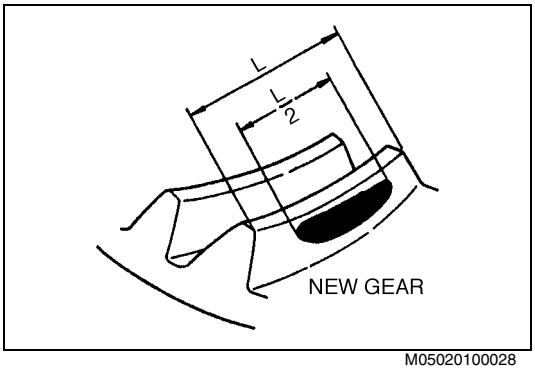
Assembly Standard: Unit: N·m {kgf·cm, lbf·ft}

Gear ratio	5.428	6.428
Back lash	0.30-0.41 {0.012-0.016}	0.25-0.33 {0.010-0.013}



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 (09665-1040)



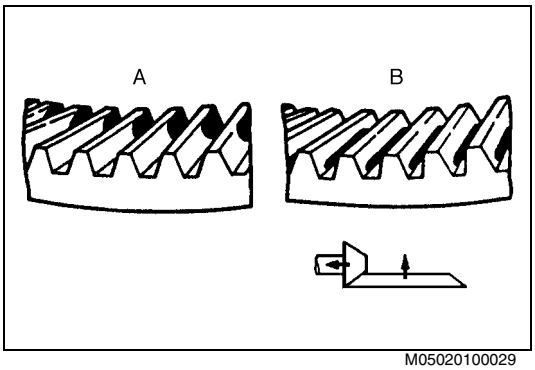
M05020100028

7. 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.

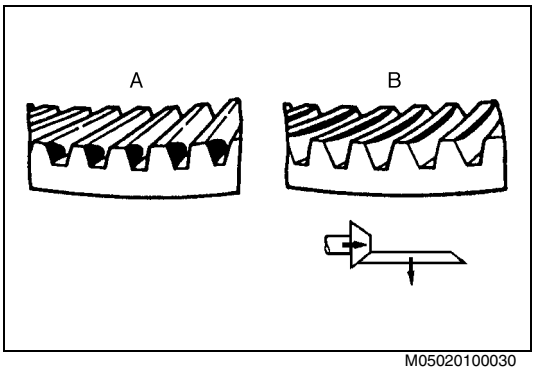


M05020100029

(2) Example of the unsatisfactory engagement

a. Toe and flank contact

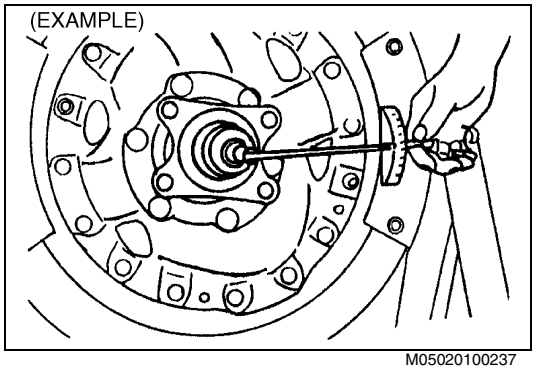
A: Toe contact -	Unadjust, replace the pinion and ring gear as a set.
B: Flank contact -	Adjust



M05020100030

b. Heel and face contact

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



M05020100237

8. MEASUREMENT AND ADJUSTMENT OF THE SIDE BEARING

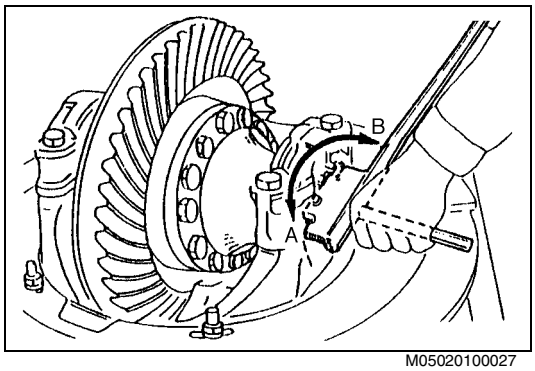
(1) Measure the total preload using a torque wrench at the flange coupling.

NOTICE:
Side bearing preload = Differential total preload - Pinion bearing preload (Refer to item 3).

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

Gear ratio	5.428	6.428
New bearing	0.37-0.45 {3.7-4.6, 0.27-0.33}	0.31-0.45 {3.2-4.6, 0.23-0.33}
Re-used bearing	0.28-0.36 {2.8-3.6, 0.20-0.26}	0.23-0.38 {2.4-3.8, 0.17-0.28}

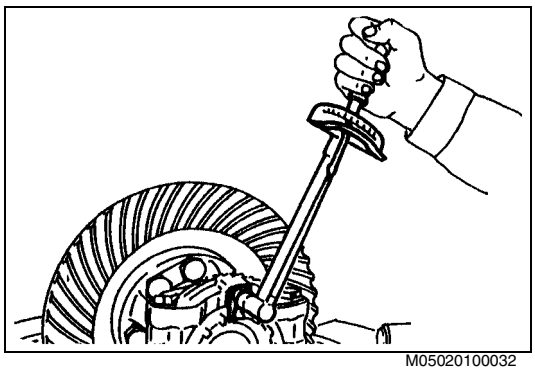
NOTICE:
The gear ratio is indicated on the bearing cage.



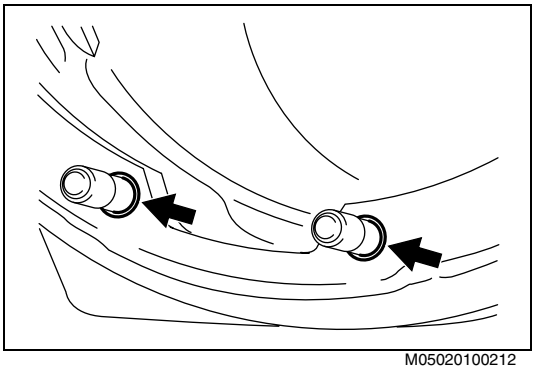
M05020100027

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

- A: Counterclockwise: Decrease preload
- B: Clockwise: Increase preload
  SST: Adjuster Tool (09665-1040))


M05020100032

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


M05020100212

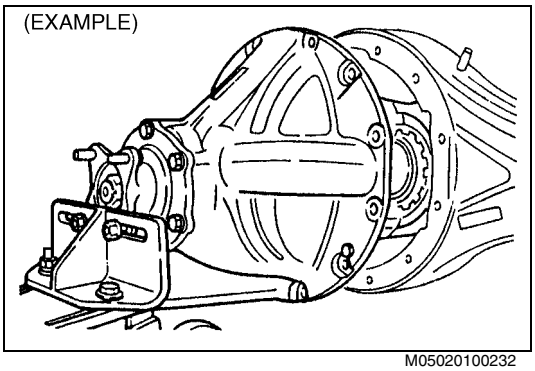
IMPORTANT POINTS - MOUNTING

1. MOUNTING

(1) Using scraper, remove the rust on the joint surface between the axle housing and the differential carrier assembly.

(2) Install a new O-ring.

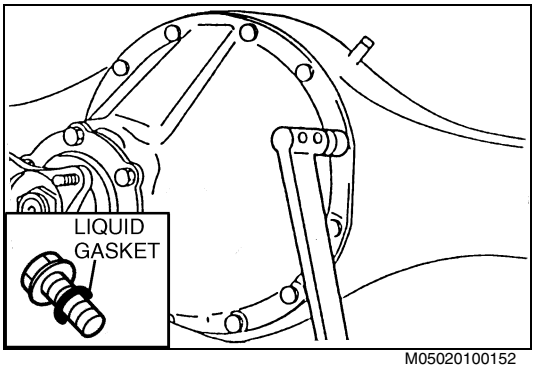
(3) Apply liquid gasket on the face of the housing flange.



M05020100232

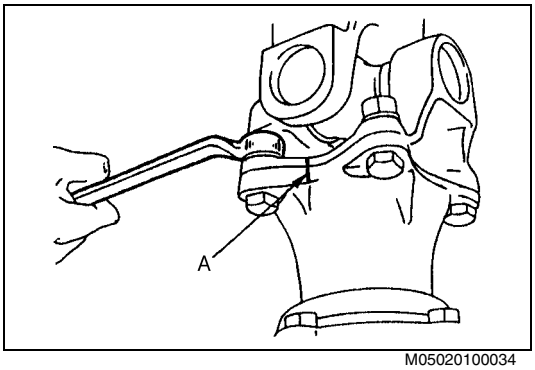
(4) Using a jack, install the differential carrier assembly to the axle housing.

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



M05020100152

(5) After applying the liquid gasket (ThreeBond #1215 or #1216 or equivalent) round ϕ14 bolts (16 pieces), install the bolts and tighten them regularly.



M05020100034

(6) Connect the propeller shaft.

NOTICE:
Align the aligning marks A.

Tightening Torque:
63.8-85.2 N·m {651-868 kgf·cm, 47-62 lbf·ft}

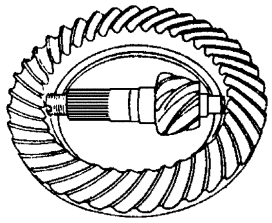
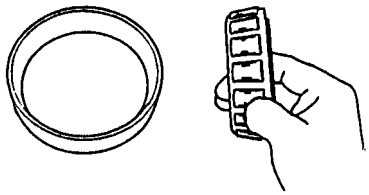
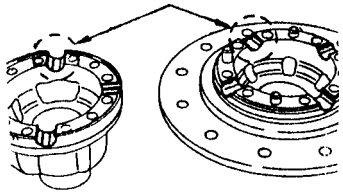
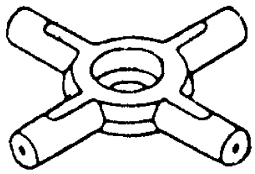
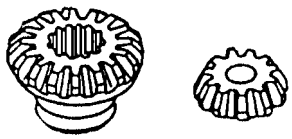
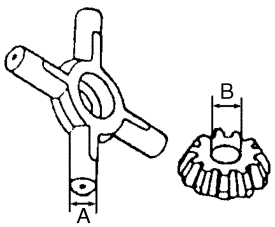
(7) Fill the axle housing with specified gear oil up to the filler plug hole.

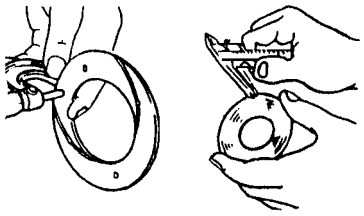
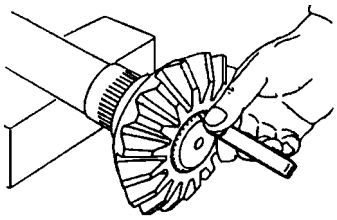
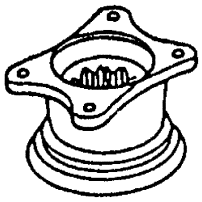
Gear oil:
Refer to owner's manual.

INSPECTION AND REPAIR

M05020103BEH3001

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 
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: 26 {1.024} B-A: 0.140-0.201 {0.0055-0.0079}	0.4 {0.016}	Replace.	Measure 

Inspection item	Standard	Limit	Remedy	Inspection procedure
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: 1.7-1.9 {0.067-0.074}	1.5 {0.059}		
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 

DIFFERENTIAL CARRIER (SS12)

DF02-003

DIFFERENTIAL CARRIER ASSEMBLY (SS12)

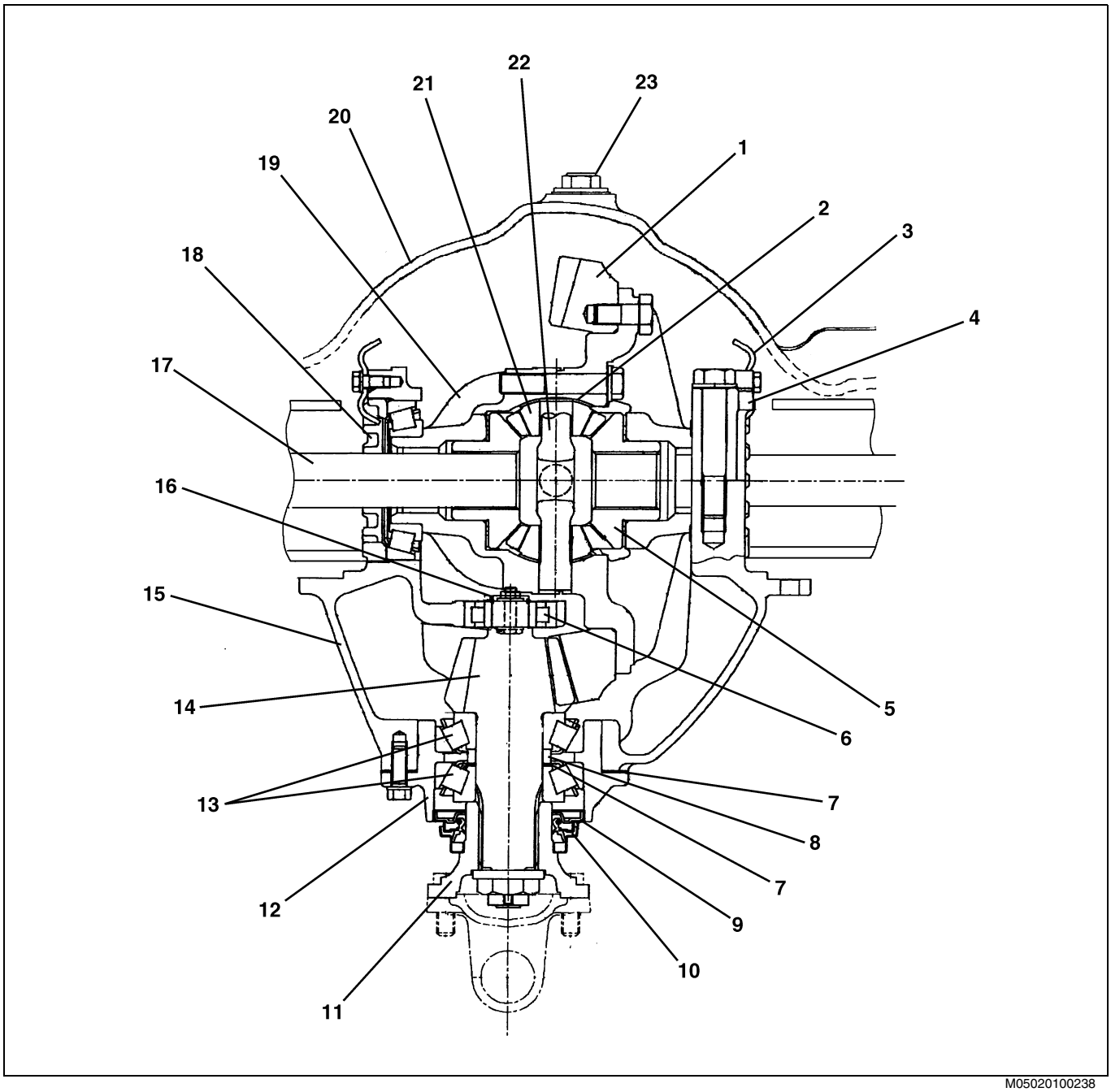
DATA AND SPECIFICATIONS

M05020107BEI2001

Type	**Single-reduction, single-speed, by Spiral bevel gearing**
Gear ratios	**5.142**
Oil capacity	**7 L {1.54 Imp gal. / 1.85 U.S. gal.}**

DESCRIPTION

M05020107BEC1001



M05020100238

1	Ring gear	9	Oil seal	17	Axle shaft
2	Thrust washer	10	Dust deflector	18	Adjusting nut
3	Lock plate	11	Frange yoke coupling	19	Differential case
4	Bearing cap	12	Bearing cage	20	Axle housing
5	Differential side gear	13	Taper roller bearing	21	Differential pinion gear
6	Cylindrical roller bearing	14	Drive pinion	22	Spider
7	Adjusting shim	15	Differential carrier case	23	Oil filler plug
8	Spacer	16	Retainer ring		

TROUBLESHOOTING

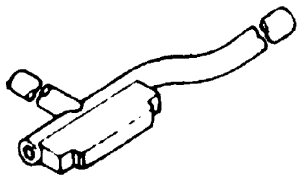
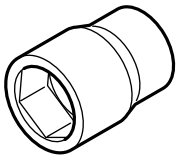
M05020107BEF3001

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 (Front axle system)	Worn front axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
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

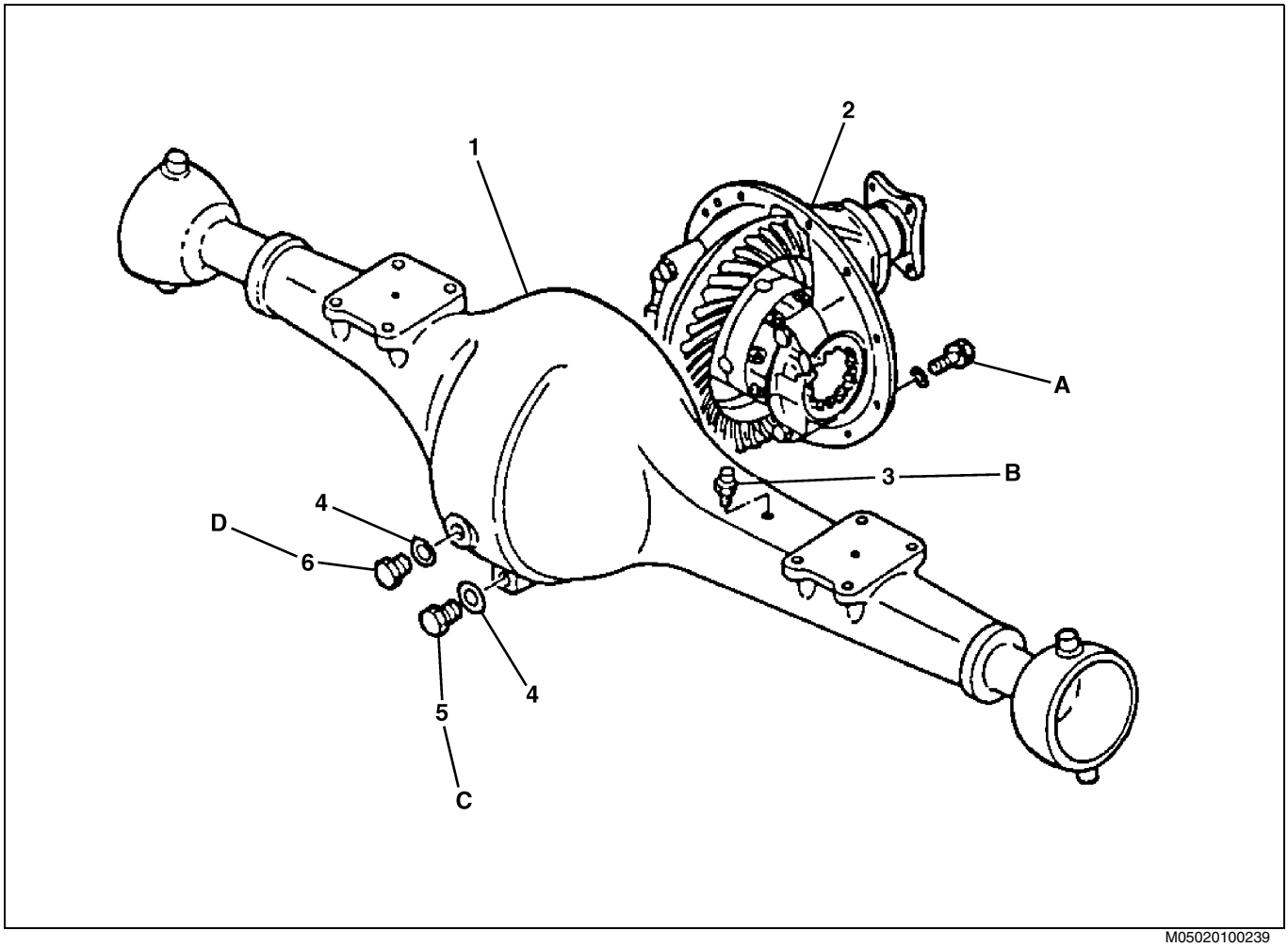
M05020107BEK1001

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

Illustration	Part number	Tool name	Remarks
	09665-1190	ADJUSTER TOOL	
	09839-3606	SOCKET WRENCH	

COMPONENT LOCATOR

M05020107BED1001

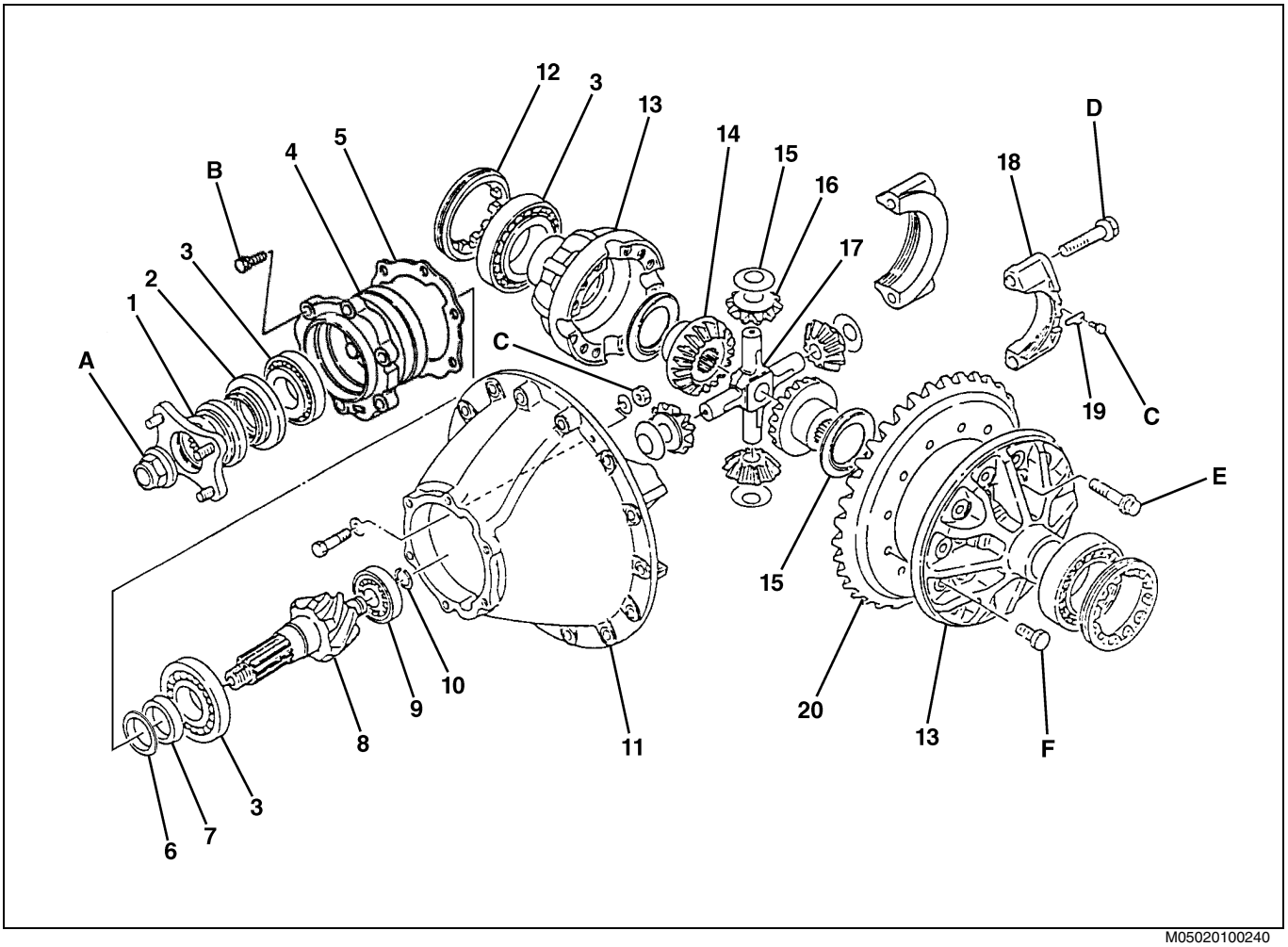


M05020100239

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

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

A	85.4-107.8 {870-1,100, 63-79}	C	39.2-68.6 {400-700, 29-50}
B	9.8-19.6 {100-200, 7.3-14.4}	D	78.5-117.5 {800-1,200, 58-86}



M05020100240

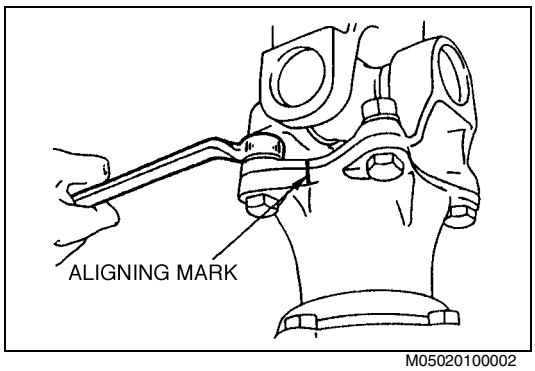
1	Flange yoke coupling	11	Differential carrier case
2	Oil seal	12	Adjusting nut
3	Taper roller bearing	13	Differential case
4	Bearing cage	14	Differential side gear
5	Adjusting shim	15	Thrust washer
6	Adjusting shim	16	Differential pinion gear
7	Spacer	17	Spider
8	Drive pinion	18	Bearing cap
9	Cylindrical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

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

A	247-313 {2,500-3,200, 181-231}	D	167-223 {1,700-2,270, 123-164}
B	38-49 {380-500, 28-36}	E	167-213 {1,700-2,170, 123-157}
C	19-25 {190-260, 14-18}	F	166-214 {1,690-2,180, 123-157}

OVERHAUL

M05020107BEH2001



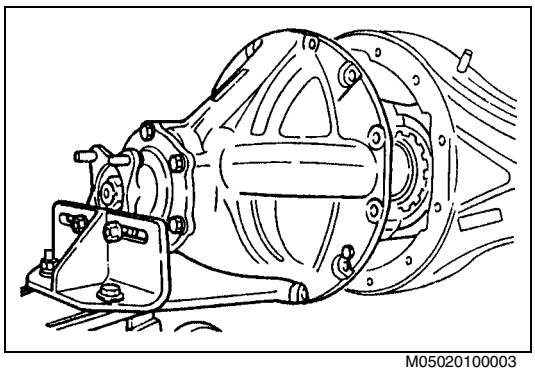
M05020100002

IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT.

NOTICE:

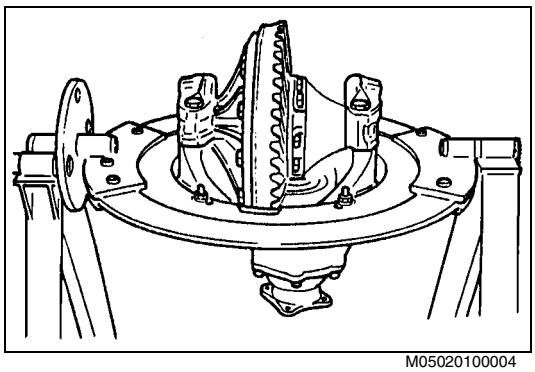
Make aligning marks before disassembling.


M05020100003

2. DISMOUNTING OF THE DIFFERENTIAL CARRIER ASSEMBLY

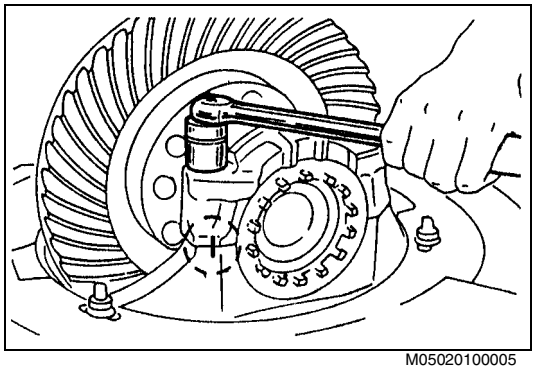
(1) Drain the gear oil and remove the axle shaft.

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


M05020100004

IMPORTANT POINTS - DISASSEMBLY

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


M05020100005

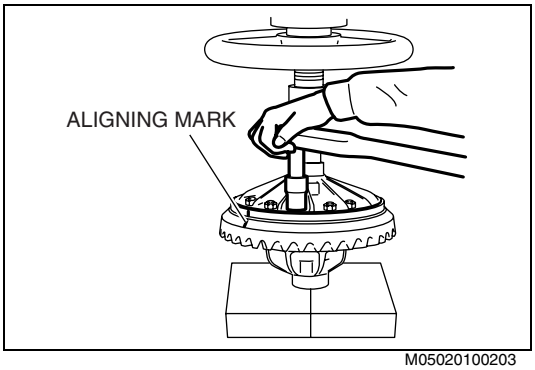
2. DIFFERENTIAL CASE

(1) Remove the bearing cap.

NOTICE:

Make aligning marks before disassembling.

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

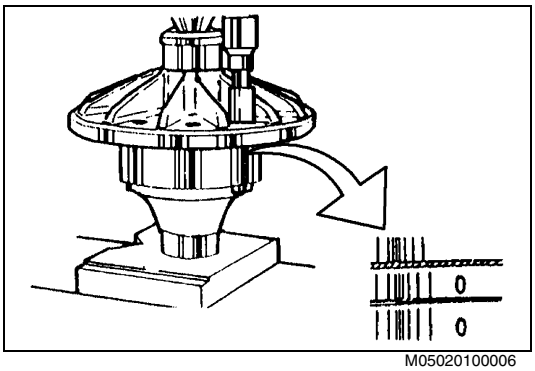


M05020100203

(3) Dismounting the ring gear

a. Make aligning mark both the differential case and the ring gear.
b. Using press, fix the differential gear assembly.
c. Remove the bolts and then ring gear.

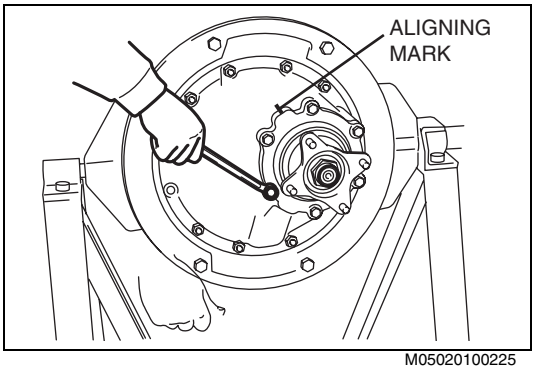
NOTICE:
Be careful not to drop the ring gear.



M05020100006

(4) 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.

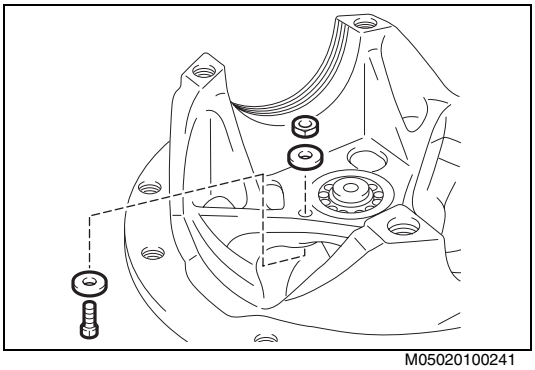


M05020100225

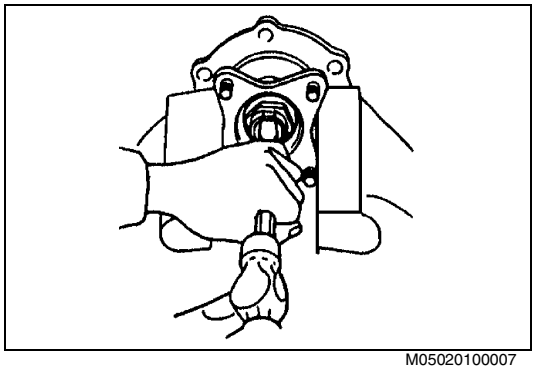
3. DISMOUNTING OF THE DRIVE PINION

(1) Remove the bolts and then dismount the drive pinion and the shims.

NOTICE:
Make aligning mark the differential cage and differential carrier.

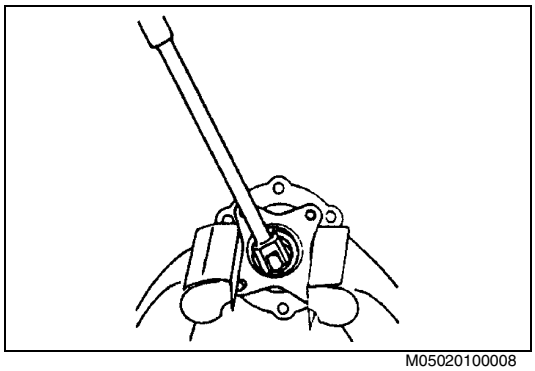

M05020100241

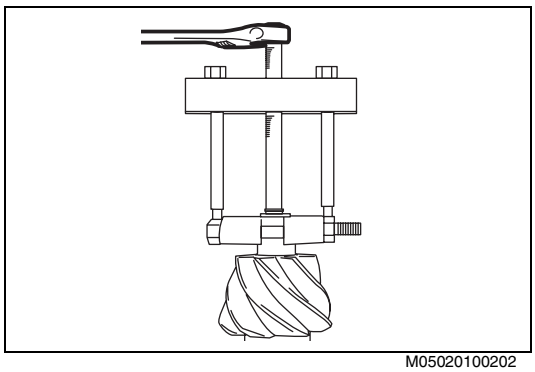
(2) Remove the bolts, nuts, and washers.
(3) Using brass bar and hammer, knock through the cylindrical roller bearing outer race.


M05020100007

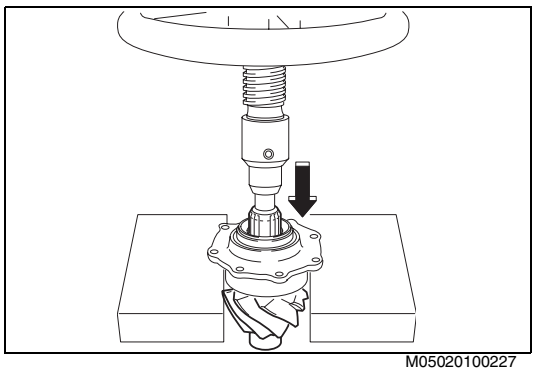
4. BEARING CAGE

(1) Uncaulk the lock nut and remove the nut.
SST: Socket Wrench (09839-3606)

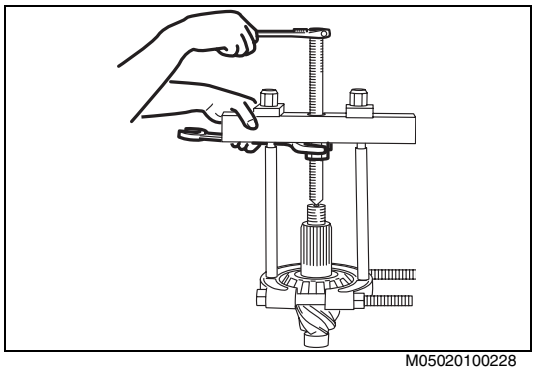

M05020100008


M05020100202

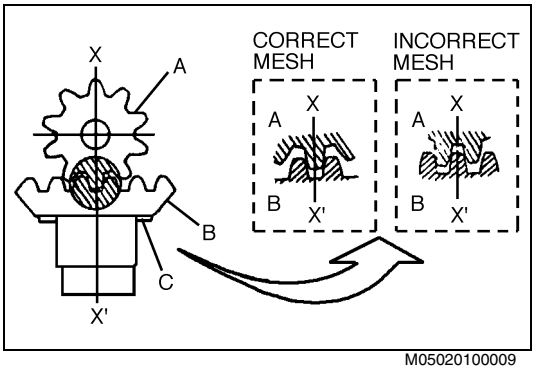
(2) Using a puller, remove the cylindrical roller bearing inner race.


M05020100227

(3) Using a press, remove the drive pinion.


M05020100228

(4) Using a puller, remove the taper roller bearing inner race.



M05020100009

IMPORTANT POINTS - ASSEMBLY

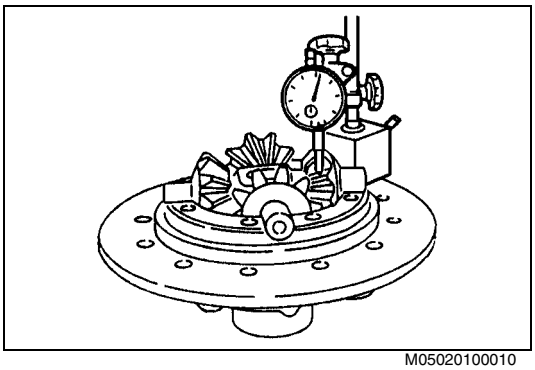
1. DIFFERENTIAL CASE

(1) Measure the pinion backlash.

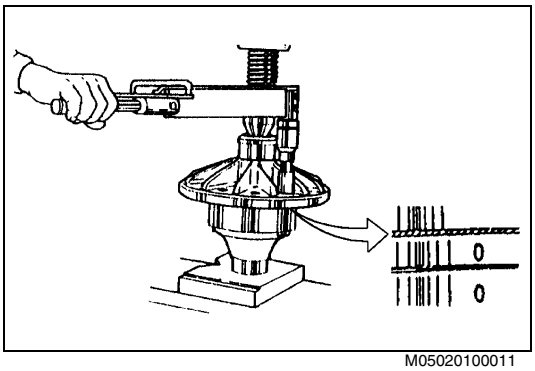
NOTICE:

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

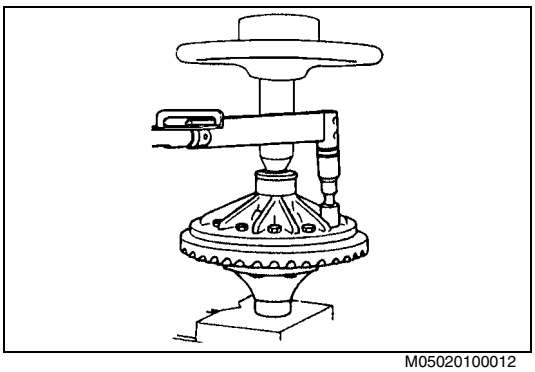
(2) If the backlash is more than service limit, replace the thrust washer for side gear and/or pinion.
Assembly standard: 0.20-0.60 mm {0.0079-0.0236 in.}
Service Limit: 0.9 mm {0.0354 in.}


M05020100011

(3) Assemble the differential case.

NOTICE:

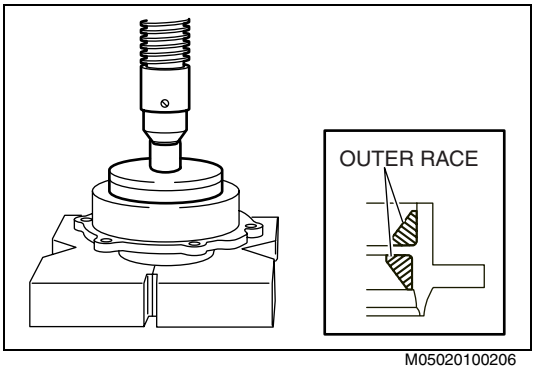
- **Align the aligning marks when assembling.**
- **Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads.**


M05020100012

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

NOTICE:

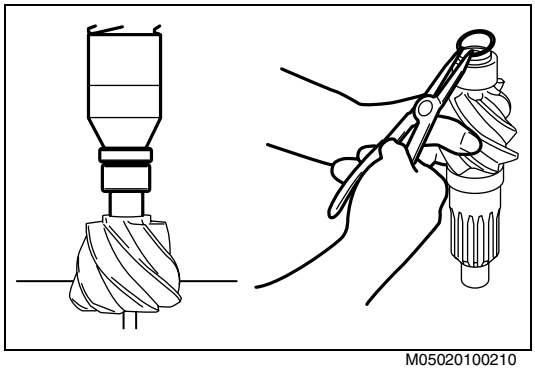
Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads.



M05020100206

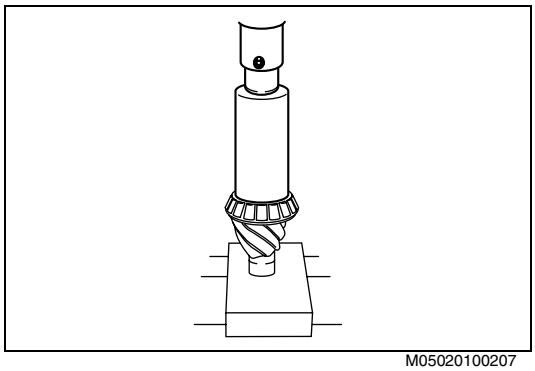
2. ASSEMBLY OF THE DRIVE PINION

(1) Installing the inner and outer taper roller bearing outer race
   a. Apply gear oil to the inner and outer taper roller bearing outer race.
   b. Using wear plates and press, press into the differential cage the inner and outer taper roller bearing outer race.

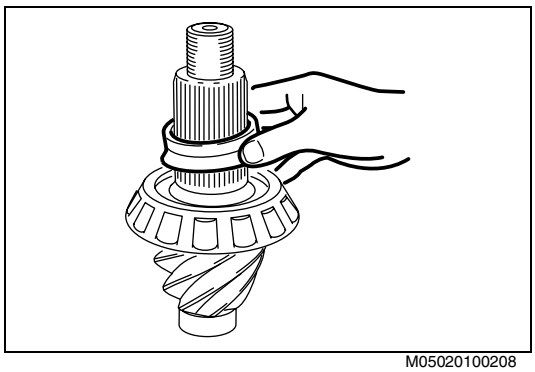

M05020100210

(2) Installing the cylindrical roller bearing inner race
   a. Apply gear oil to the cylindrical roller bearing inner race.
   b. Using press, press the cylindrical roller bearing inner race to the end of the hypoid pinion.
   c. Install a new retainer ring.

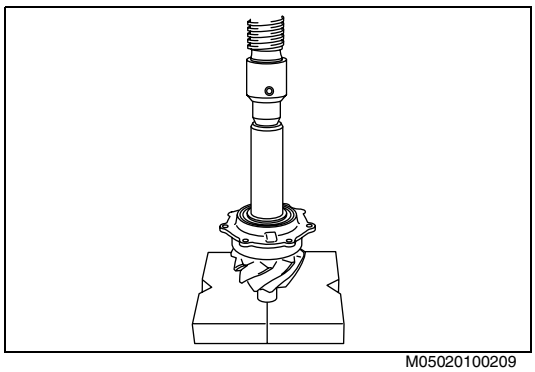
CAUTION:
The retainer ring is spring steel and may fly out of the groove during removal. Wear safety glasses during removal.


M05020100207

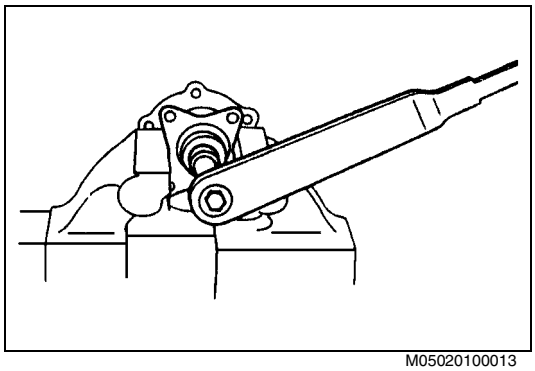
(3) Installing the inner taper roller bearing inner race
   a. Apply gear oil to the inner taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of drive pinion the inner taper roller bearing inner race.


M05020100208

   c. Install the spacer.


M05020100209

(4) Installing the differential cage and outer taper roller bearing inner race
   a. Apply gear oil to the outer taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of hypoid pinion the differential cage and outer taper roller bearing inner race.

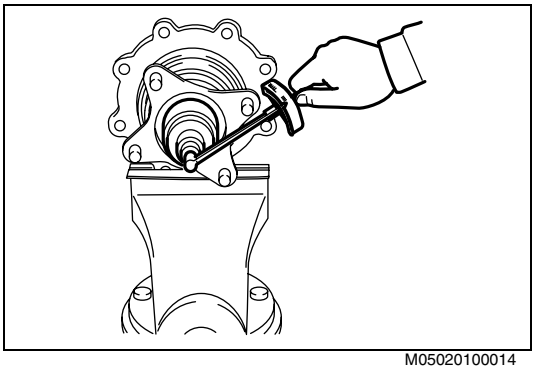

M05020100013

3. 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 (09839-3606)


M05020100014

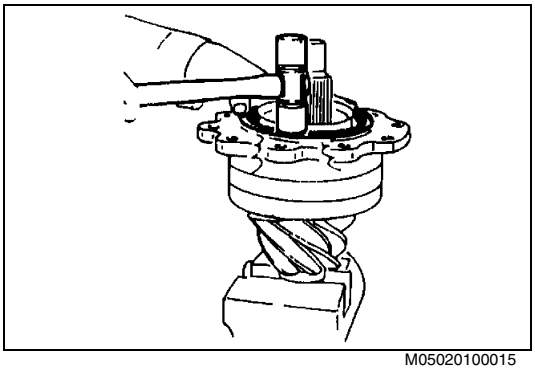
(2) Use a torque wrench to measure the preload of the bearings and if the preload is out of specific value shown below, adjust with adjusting shims.

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

New bearing	Re-used bearing
1.47-1.96 {15-20, 1.1-1.4}	0.98-1.47 {10-15, 0.8-1.0}

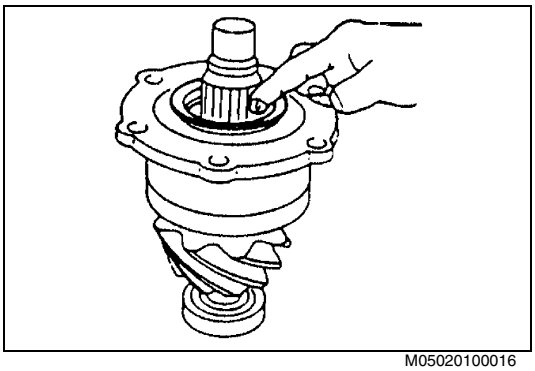
Adjusting shim
Thickness: 0.40 mm {0.0157 in.]
0.45 mm {0.0177 in.}
0.50 mm {0.0197 in.}

NOTICE:
Measure the preload and record it for measuring the total preload at the differential carrier bearings at a later time.

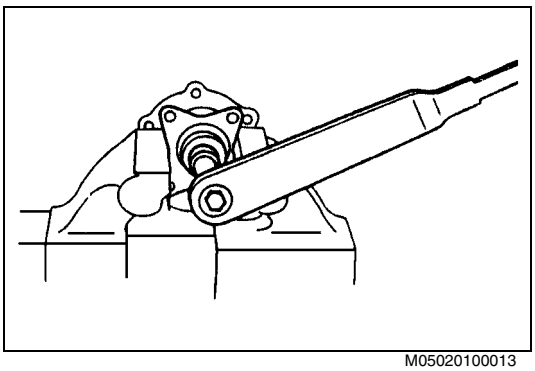

M05020100015

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

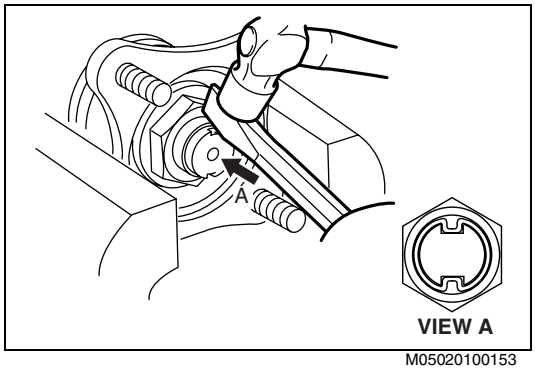
NOTICE:
Tap the oil seal with small steps to make even the oil seal.


M05020100016

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


M05020100013

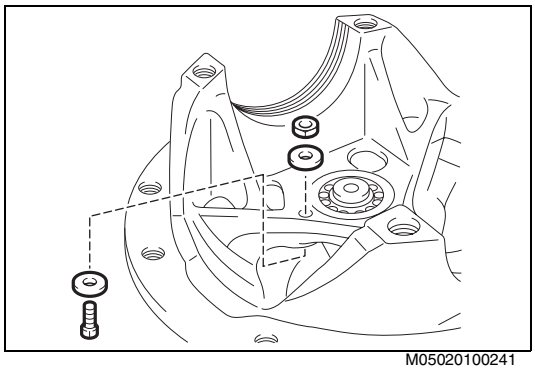
(4) Install the flange yoke coupling and tighten the lock nut.
SST: Socket Wrench (09839-3606)



M05020100153

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

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

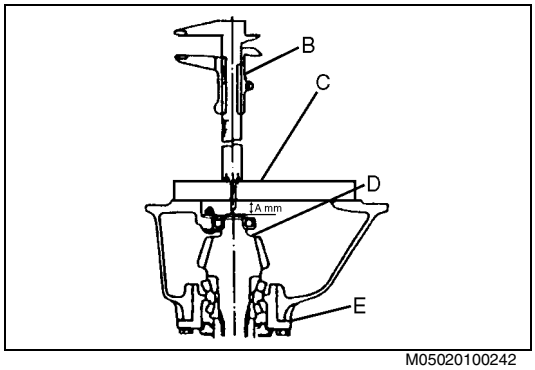

M05020100241

4. INSTALLATION OF THE CYLINDRICAL ROLLER BEARING OUTER RACE

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

(2) Install the cylindrical roller bearing outer race by nuts, bolts, and washers.

Tightening Torque:
19-25 N·m (190-260 kgf·cm. 14-18 lbf·ft)



M05020100242

5. ADJUSTMENT OF THE PINION FITTING HEIGHT (CONICAL DISTANCE)

(1) Install the bearing cage assembly and adjust the height "A" by shims "E".

Standard pinion height: 24.5 mm {0.965 in.}

A : Pinion height

B : Vernier calipers

C : Straight edge

D : Engraved value for gear toothing adjustment

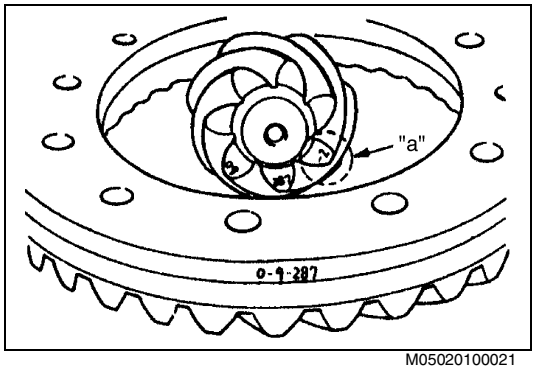
E : Adjusting shims

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.}

EXAMPLE:

In a case where the engraved value at the surface of the pinion gear is -2 (-2 means -0.2 mm):

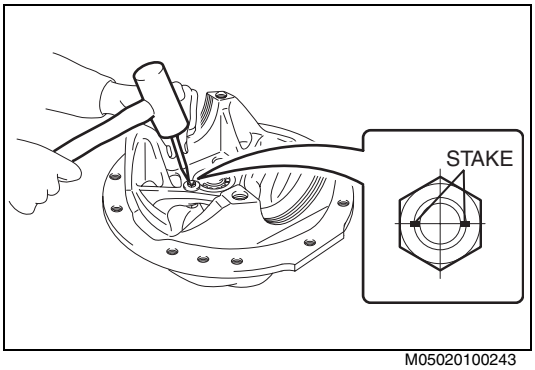
Standard pinion height "A"		The engraved value "a"		Measuring part (A')
24.5 mm	–	0.2 mm	=	24.3 mm



M05020100021

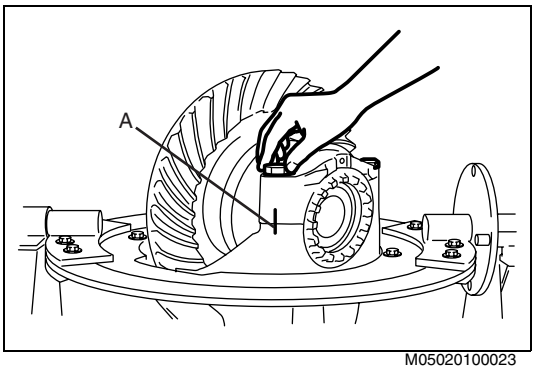
NOTICE:

Upon completing the adjustment, remove the bearing cage assembly and apply liquid gasket (ThreeBond 1215 or equivalent) on the mounting surfaces of differential carrier case and bearing cage.



M05020100243

(2) Stake the lock nut securely as shown in the figure.

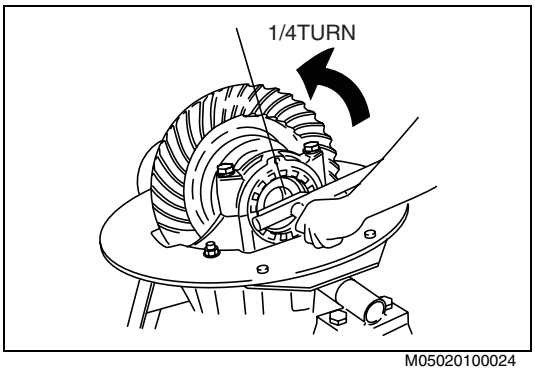


M05020100023

6. ADJUSTMENT OF THE RING GEAR BACKLASH.

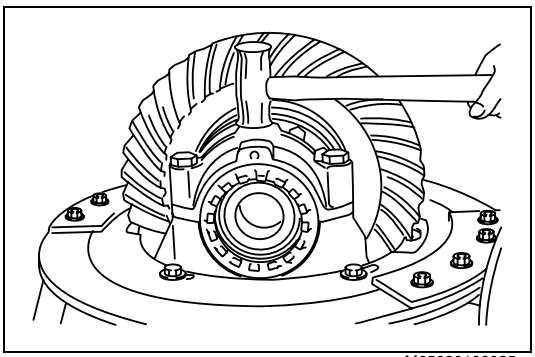
(1) Set the differential case assembly on the carrier case and install the adjusting nut and bearing cap.

NOTICE:
Align the aligning marks A.

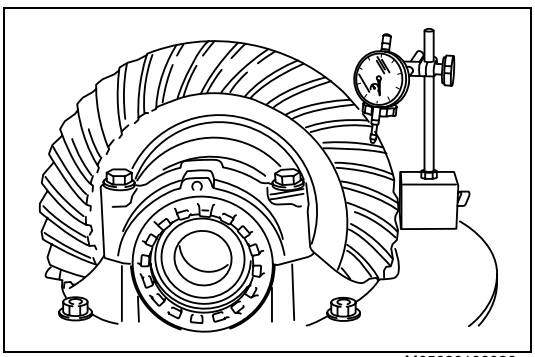


M05020100024

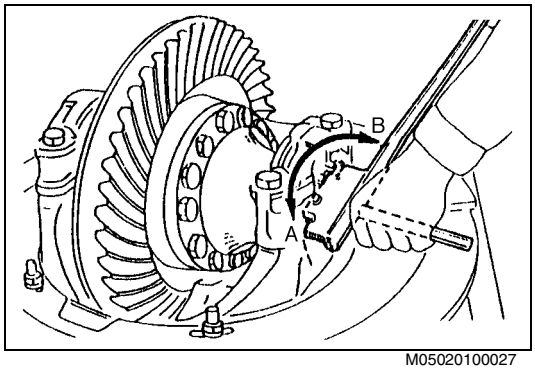
(2) Adjust the preload of the side bearing provisionally.
   a. Tighten the adjusting nut fully, then loosen the adjusting nut by 1/4 turn + 1 notch.
   SST: Adjuster Tool (09665-1190)


M05020100025

   b. Hit the bearing cap with a copper hammer.

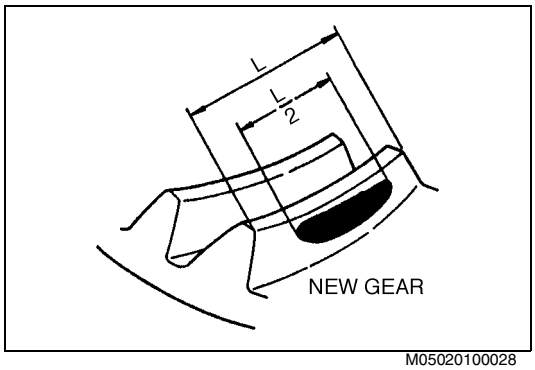

M05020100026

(3) Measure the gear backlash at three or four points on the circumference of the gear.
   Assembly Standard: 0.20-0.28 mm {0.0079-0.0110 in.}



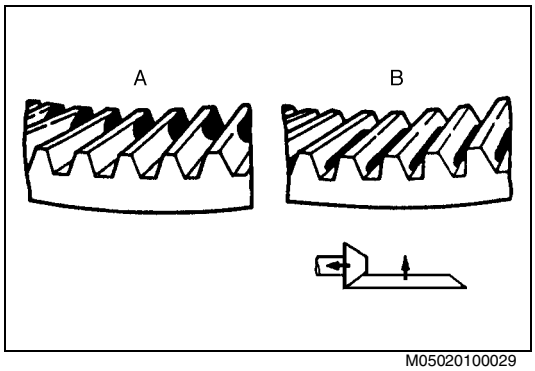
M05020100027

(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 (09665-1190)



M05020100028

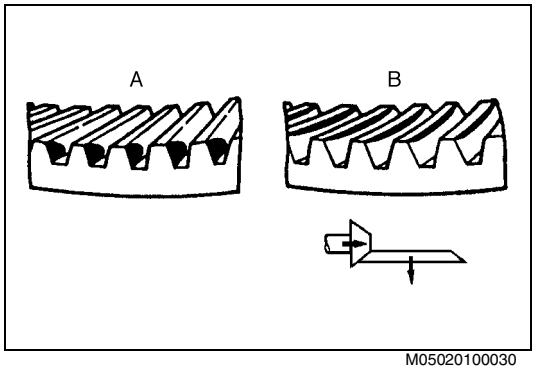
7. INSPECTION AND ADJUSTMENT OF GEAR MESHING
(1) Satisfactory gear meshing.
NOTICE:
New gears are marked as shown to indicate proper gear meshing. Make necessary adjustment so that gears mesh corresponds with the factory's mark.



M05020100029

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

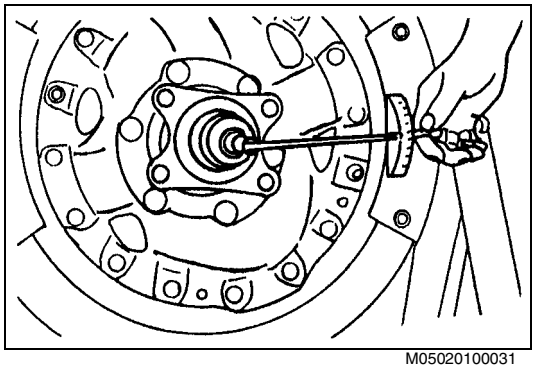
A: Toe contact - Unadjust, replace the pinion and ring gear as a set.
B: Flank contact - Adjust



M05020100030

b. Heel and face contact

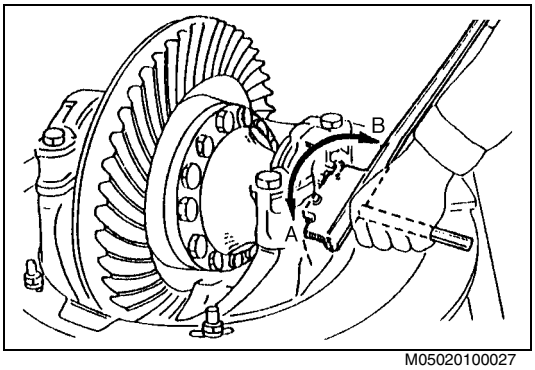
A: Heel contact - Unadjust, replace the pinion and ring gear as a set.
B: Face contact - Adjust


M05020100031

8. MEASUREMENT AND ADJUSTMENT OF THE SIDE BEARING
(1) Measure the total preload using a torque wrench at the flange coupling.
NOTICE:
Side bearing preload = defferential total preload - pinion bearing preload (refer to item 3).

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

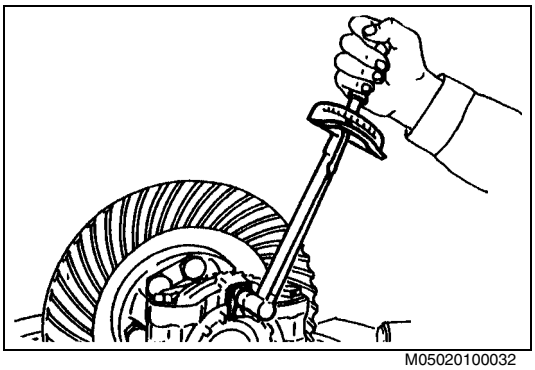
New bearing	Re-used bearing
0.29-0.38 {2.9-3.9, 0.21-0.28}	0.19-0.28 {2.0-2.9, 0.14-0.21}



M05020100027

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

- A: Counterclockwise: Decrease preload
- B: Clockwise: Increase preload
  SST: Adjuster Tool (09665-1190))


M05020100032

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

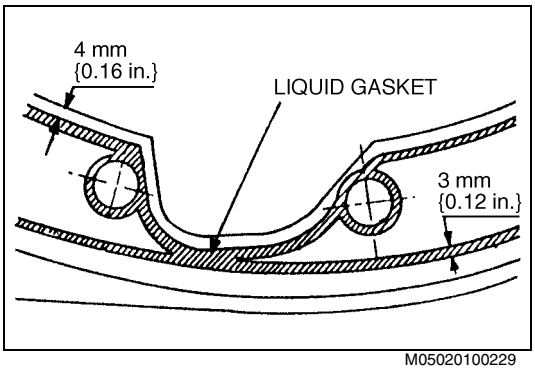
IMPORTANT POINTS - MOUNTING

1. MOUNTING

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

NOTICE:

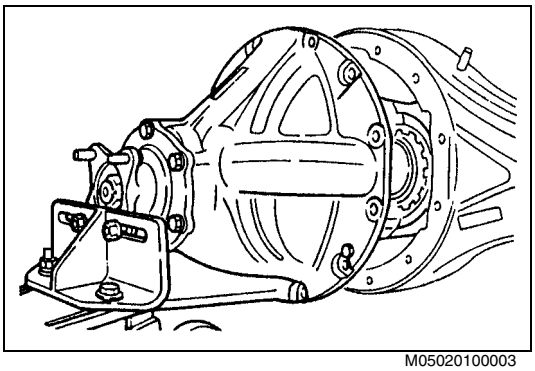
- **The liquid gasket must be ThreeBond #1215 or equivalent.**
- **The liquid gasket should be applied continuously.**
- **Application should be approximately 3 mm {0.12 in.} width and 4 mm {0.16 in.} away from the edge.**

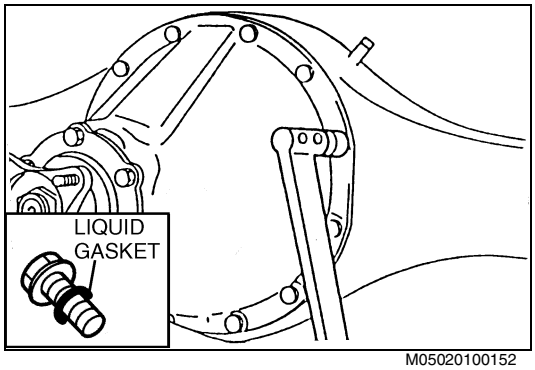


M05020100229

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

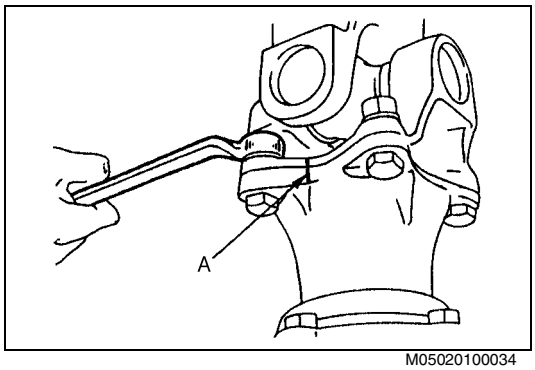
NOTICE:
Place the carrier assembly so that the ring gear teeth faces toward the right-hand side of vehicle.


M05020100003



M05020100152

(3) After applying the liquid gasket (ThreeBond #1215 or #1216 or equivalent) round ϕ12 bolts (10pieces), 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}

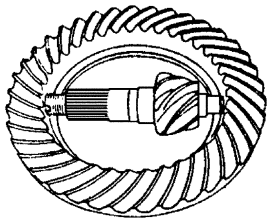
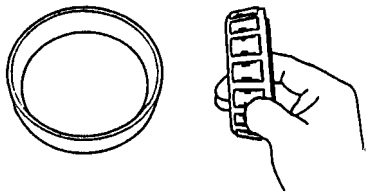
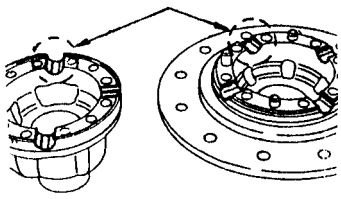
(5) Fill the axle housing with specified gear oil up to the filler plug hole.

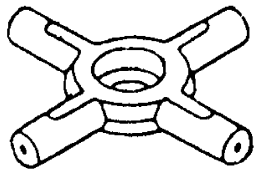
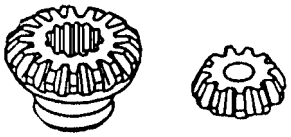
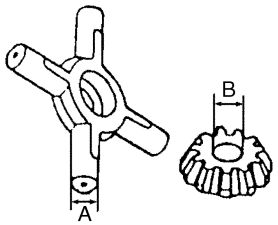
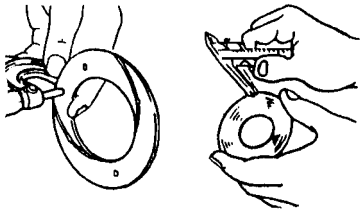
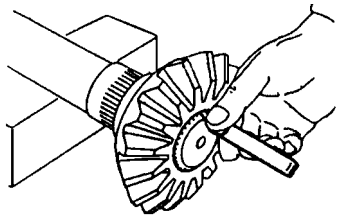
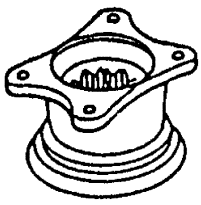
Gear oil:
Refer to the owner's manual

INSPECTION AND REPAIR

M05020107BEH3001

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:22 {0.866} B-A:0.140-0.261 {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** 

DIFFERENTIAL CARRIER (SS15)

DF02-004

DIFFERENTIAL CARRIER ASSEMBLY (SS15)

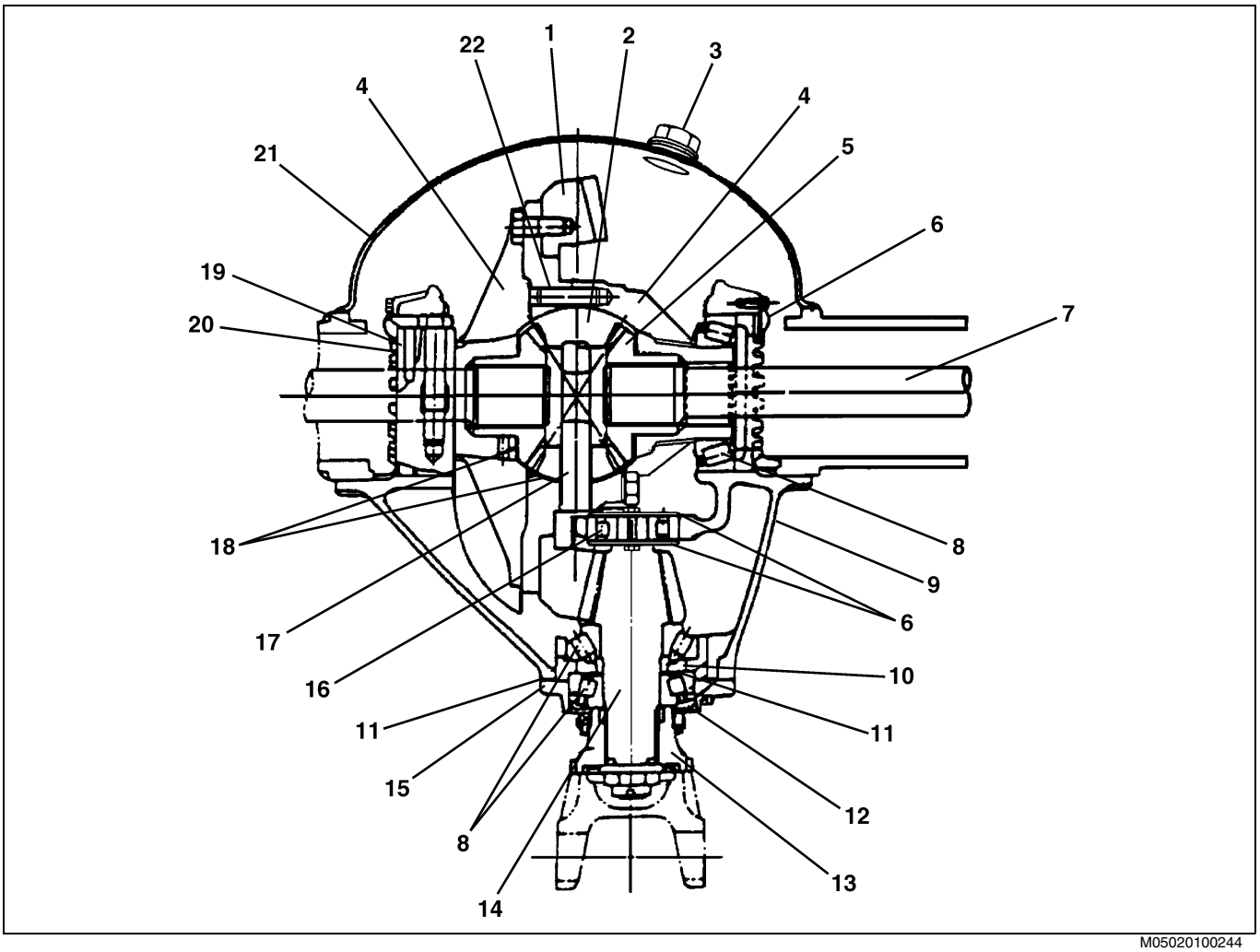
DATA AND SPECIFICATIONS

M05020108BEI2001

Type	**Single-reduction, single-speed, by Spiral bevel gearing**
Gear ratios	**5.428, 6.428**
Oil capacity	**7 L {1.54 Imp gal. / 1.85 U.S. gal.}**

DESCRIPTION

M05020108BEC1001



M05020100244

1	Ring gear	9	Differential carrier case	17	Spider
2	Differential pinion gear	10	Spacer	18	Thrust washer
3	Oil filler plug	11	Adjusting shim	19	Bearing cap
4	Differential case	12	Oil seal	20	Adjusting nut
5	Differential side gear	13	Frange yoke coupling	21	Axle housing
6	Lock plate	14	Drive pinion	22	Straight pin
7	Axle shaft	15	Bearing cage		
8	Taper roller bearing	16	Cylindrical roller bearing		

TROUBLESHOOTING

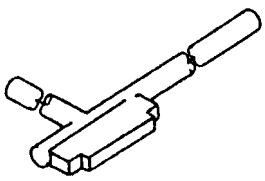
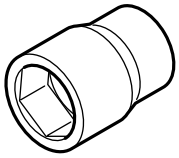
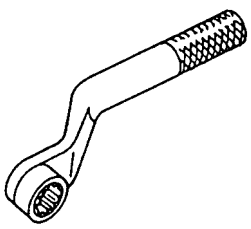
M05020108BEF3001

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 (Front axle system)	Worn front axle shaft spline	Replace.
	Worn hub bearings	Replace.
	Loose hub bearings	Adjust bearing preload.
	Loose differential case tightening bolts	Tighten bolts.
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

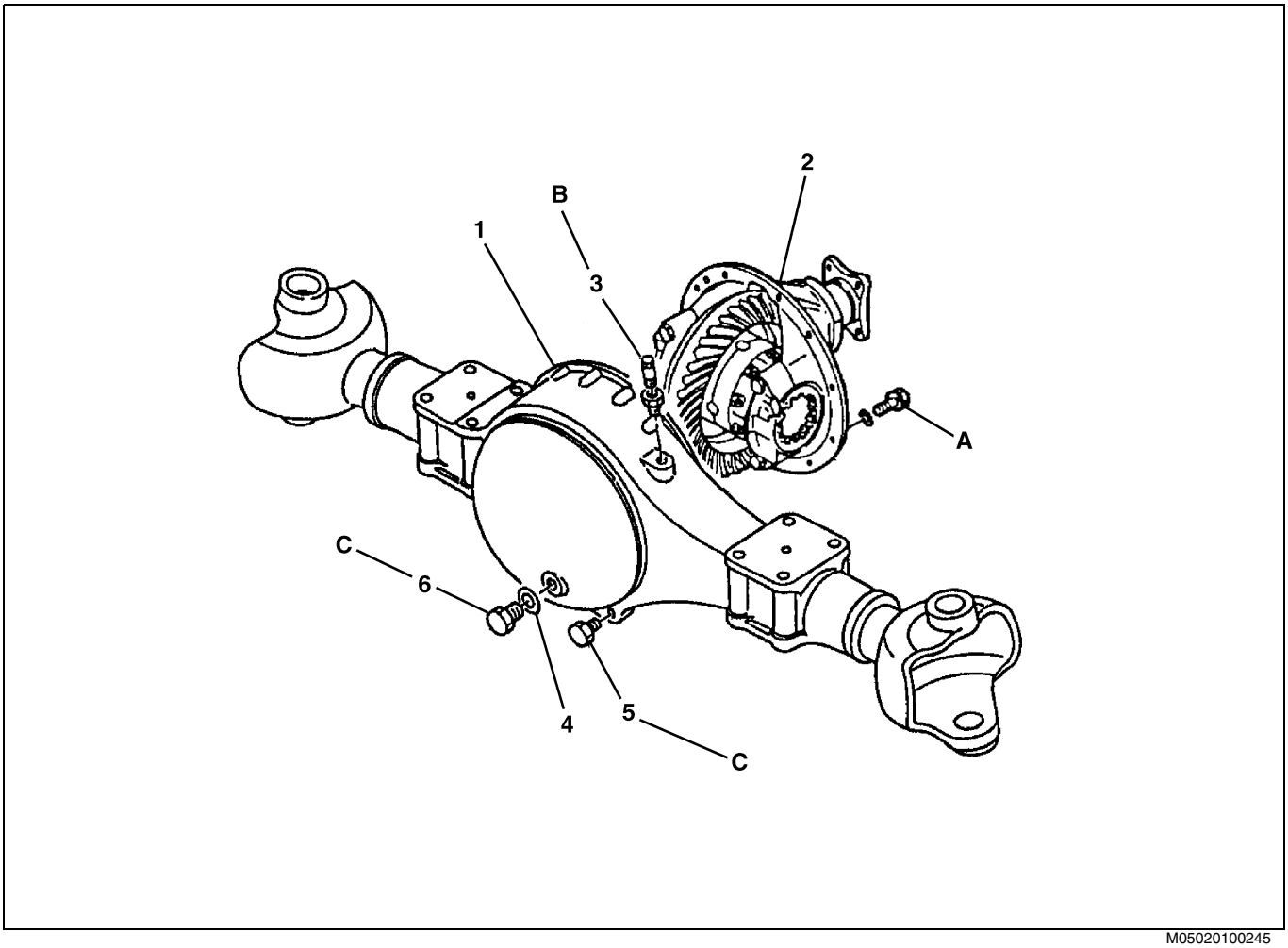
M05020108BEK1001

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

Illustration	Part number	Tool name	Remarks
	09665-1040	ADJUSTER TOOL	
	09839-4104	SOCKET WRENCH	
	09603-1150	SOCKET WRENCH	

COMPONENT LOCATOR

M05020108BED1001

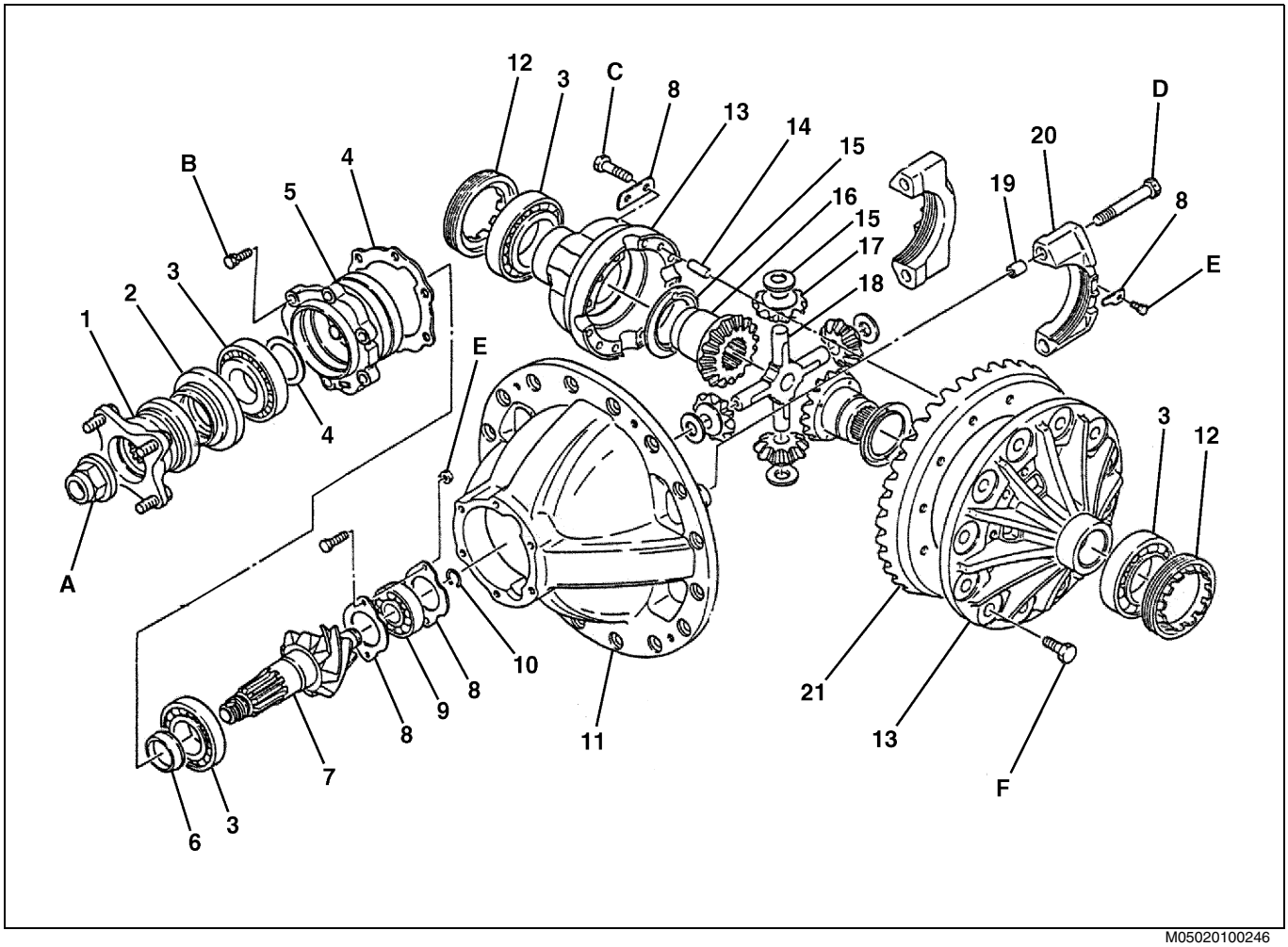


M05020100245

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

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

A	85.4-107.8 {870-1,100, 63-79}	C	78.5-117.5 {800-1,200, 58-86}
B	9.8-19.6 {100-200, 7.3-14.4}		



M05020100246

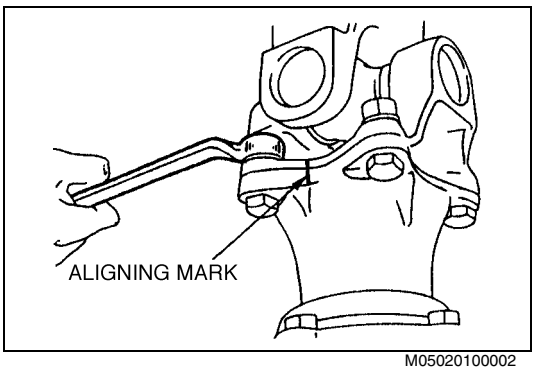
1	Flange yoke coupling	12	Adjusting nut
2	Oil seal	13	Differential case
3	Taper roller bearing	14	Straight pin
4	Adjusting shim	15	Thrust washer
5	Bearing cage	16	Differential side gear
6	Spacer	17	Differential pinion gear
7	Drive pinion	18	Spider
8	Lock plate	19	Collar
9	Cylindrical roller bearing	20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

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

A	589-784 {6,00-8,000, 434-578}	D	275-353 {2,800-3,600, 203-260}
B	64-85 {650-870, 47-62}	E	18.7-25.5 {190-260, 14-18}
C	245-294 {2,500-3,000, 181-216}		

OVERHAUL

M05020108BEH2001



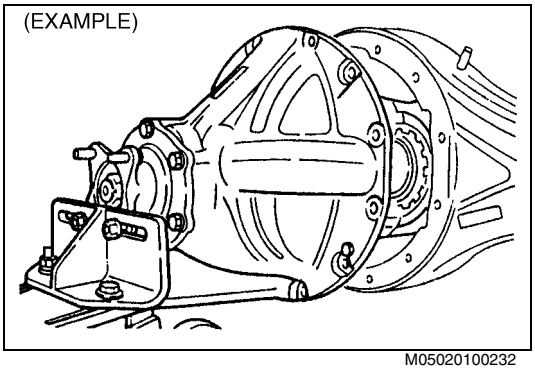
M05020100002

IMPORTANT POINTS - DISMOUNTING

1. DISCONNECT THE PROPELLER SHAFT.

NOTICE:

Make aligning marks before disassembling.

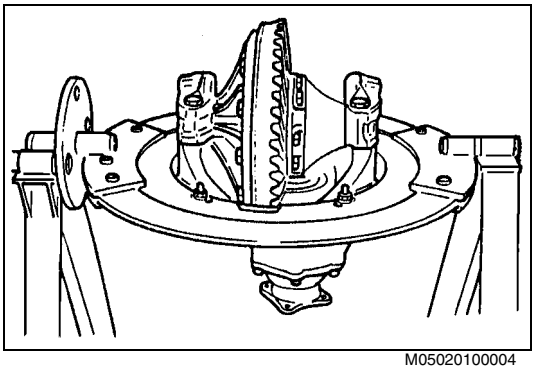


M05020100232

2. DISMOUNTING OF THE DIFFERENTIAL CARRIER ASSEMBLY

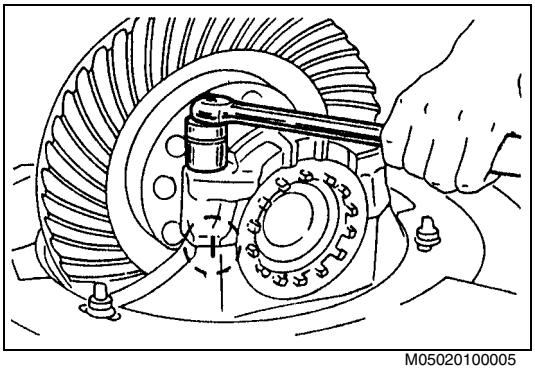
(1) Drain the gear oil and remove the axle shaft.

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


M05020100004

IMPORTANT POINTS - DISASSEMBLY

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


M05020100005

2. DIFFERENTIAL CASE

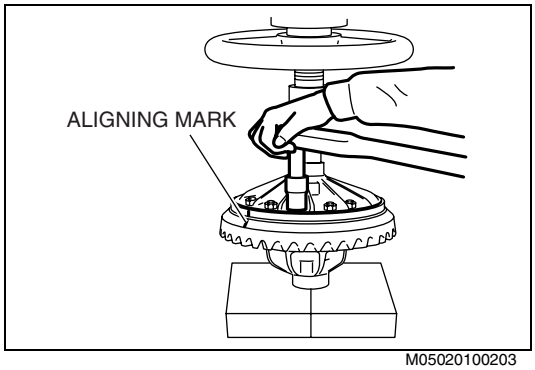
(1) Remove the bearing cap.

NOTICE:

Make aligning marks before disassembling.

SST: Socket wrench (09603-1150)

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

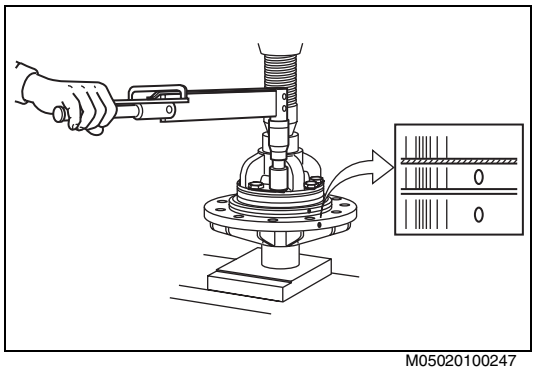


M05020100203

(3) Dismounting the ring gear

a. Make aligning mark both the differential case and the ring gear.
b. Using press, fix the differential gear assembly.
c. Remove the bolts and then ring gear.

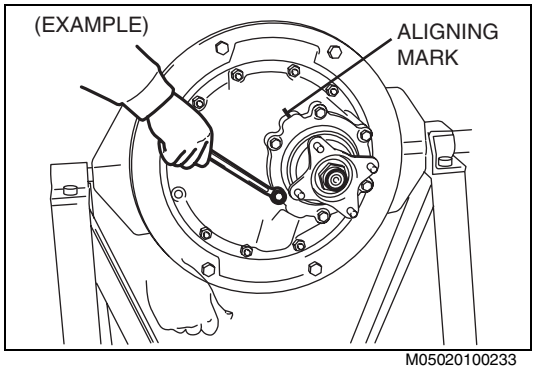
NOTICE:
Be careful not to drop the ring gear.



M05020100247

(4) 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.

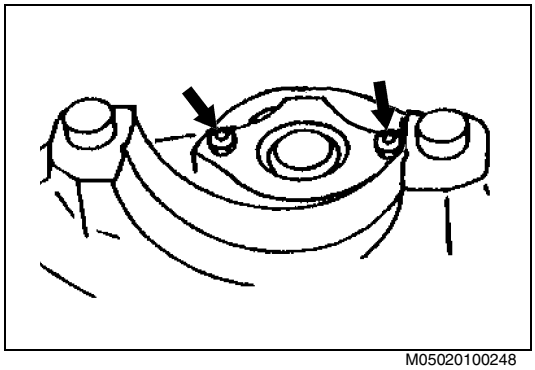


M05020100233

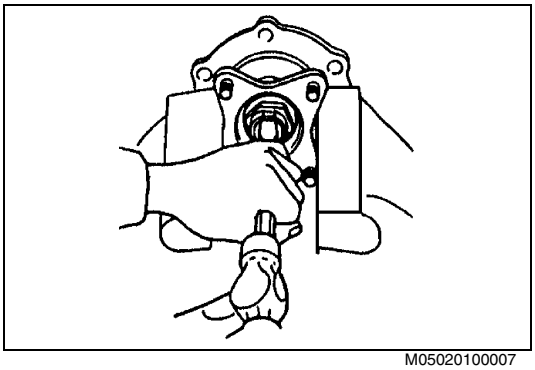
3. DISMOUNTING OF THE DRIVE PINION

(1) Remove the bolts and then dismount the drive pinion and the shims.

NOTICE:
Make aligning mark the differential cage and differential carrier.

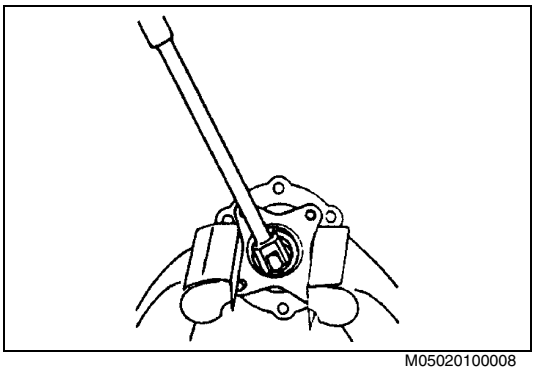

M05020100248

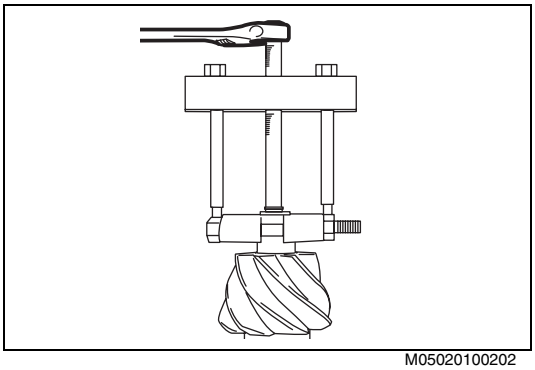
(2) Remove the bolts, nuts, and lock plates.
(3) Using brass bar and hammer, knock through the cylindrical roller bearing outer race.


M05020100007

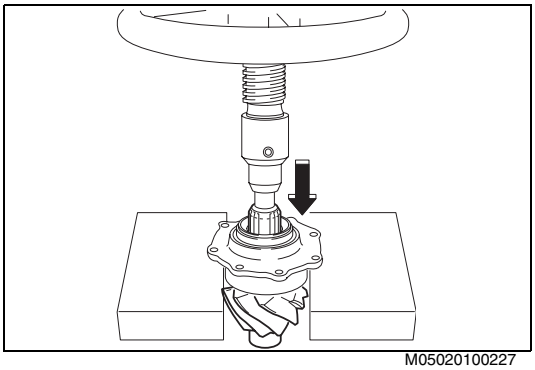
4. BEARING CAGE

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

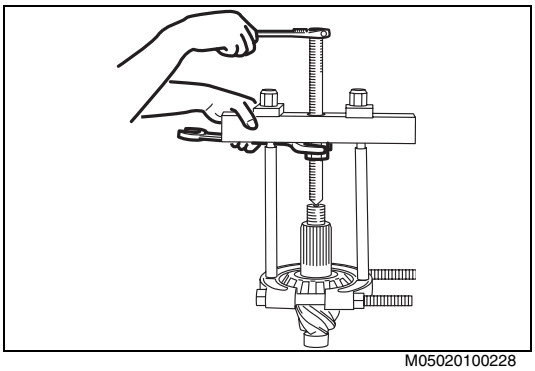

M05020100008


M05020100202

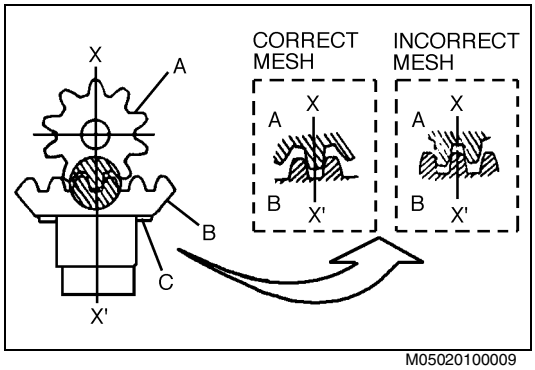
(2) Using a puller, remove the cylindrical roller bearing inner race.


M05020100227

(3) Using a press, remove the drive pinion.


M05020100228

(4) Using a puller, remove the taper roller bearing inner race.



M05020100009

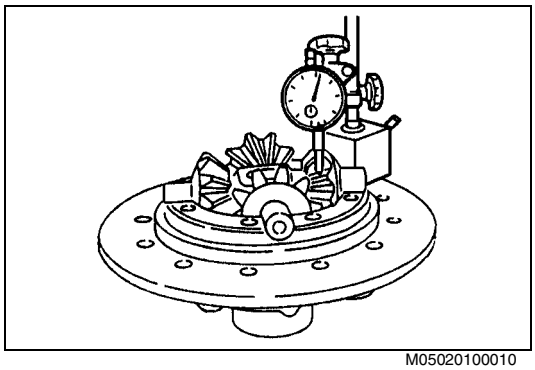
IMPORTANT POINTS - ASSEMBLY

1. DIFFERENTIAL CASE

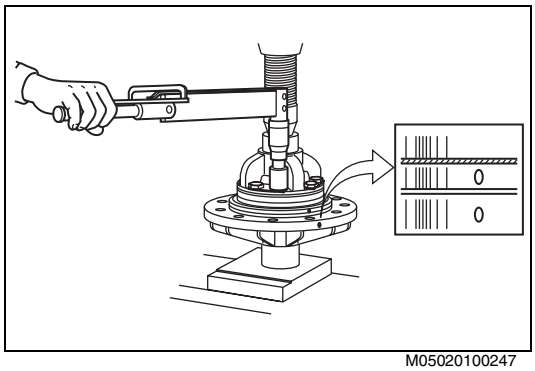
(1) Measure the pinion backlash.

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

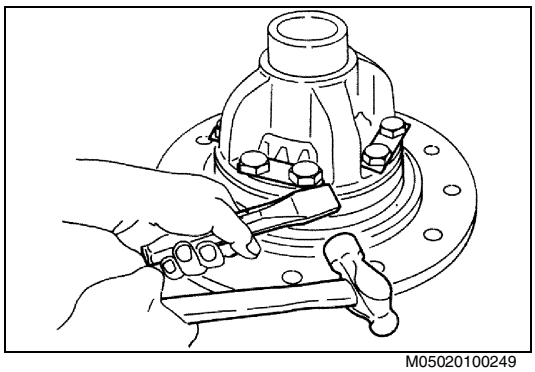

M05020100010

(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.}

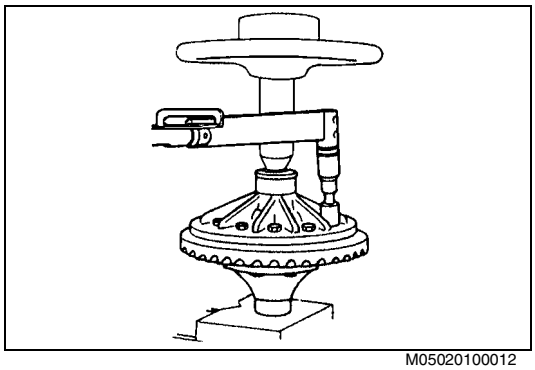

M05020100247

(3) Assemble the differential case.

NOTICE:
Align the aligning marks when assembling.

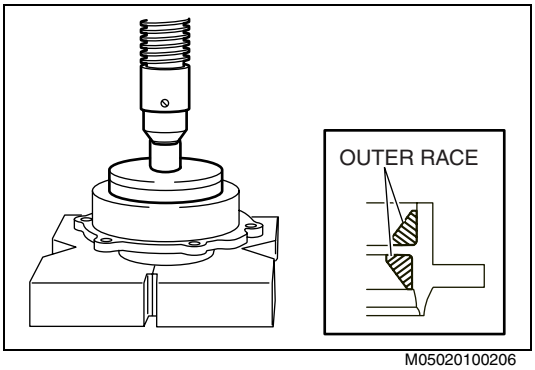

M05020100249

(4) Bend the lock plates.


M05020100012

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

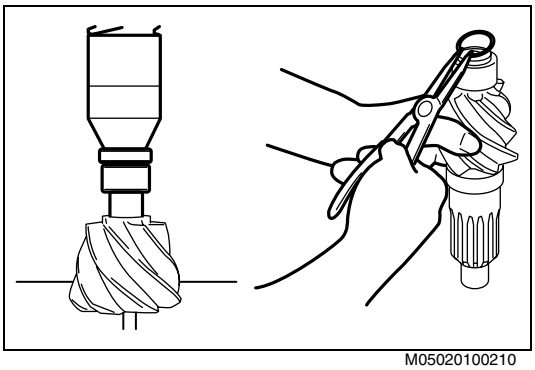
NOTICE:
Apply lock agent (Lock tight) which is equivalent to ThreeBond 1360K on the bolt threads.



M05020100206

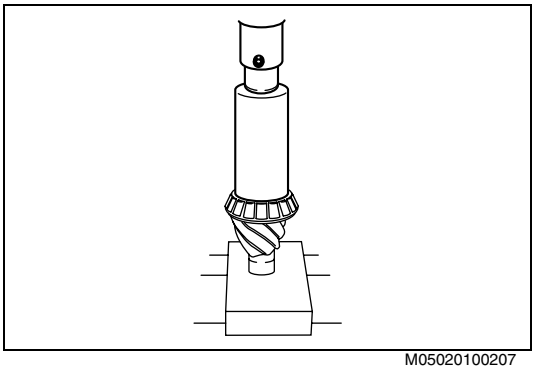
2. ASSEMBLY OF THE DRIVE PINION

(1) Installing the inner and outer taper roller bearing outer race
   a. Apply gear oil to the inner and outer taper roller bearing outer race.
   b. Using wear plates and press, press into the differential cage the inner and outer taper roller bearing outer race.

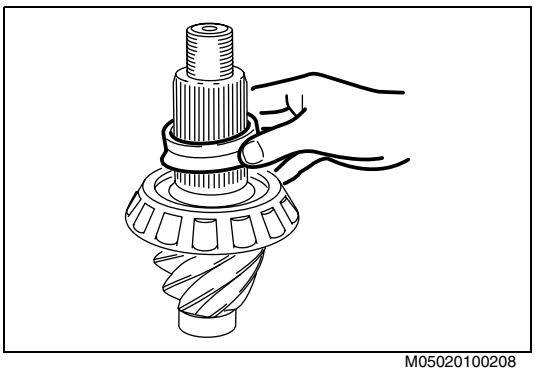

M05020100210

(2) Installing the cylindrical roller bearing inner race
   a. Apply gear oil to the cylindrical roller bearing inner race.
   b. Using press, press the cylindrical roller bearing inner race to the end of the hypoid pinion.
   c. Install a new retainer ring.

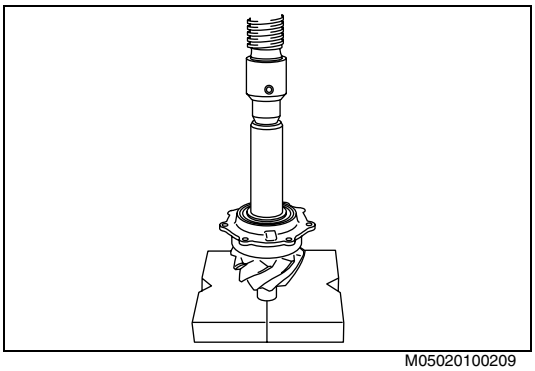
CAUTION:
The retainer ring is spring steel and may fly out of the groove during removal. Wear safety glasses during removal.


M05020100207

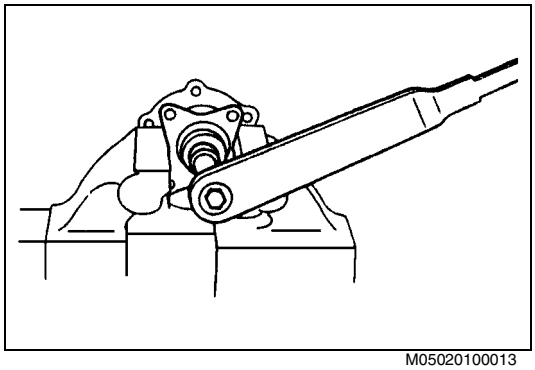
(3) Installing the inner taper roller bearing inner race
   a. Apply gear oil to the inner taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of drive pinion the inner taper roller bearing inner race.


M05020100208

   c. Install the spacer.


M05020100209

(4) Installing the differential cage and outer taper roller bearing inner race
   a. Apply gear oil to the outer taper roller bearing inner race.
   b. Using wear plates and press, press into the shaft of drive pinion the differential cage and outer taper roller bearing inner race.


M05020100013

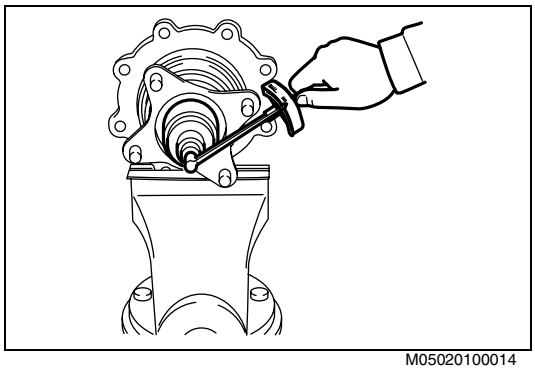
3. ADJUSTMENT OF THE PINION BEARING PRELOAD.

(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)


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 adjusting shims.

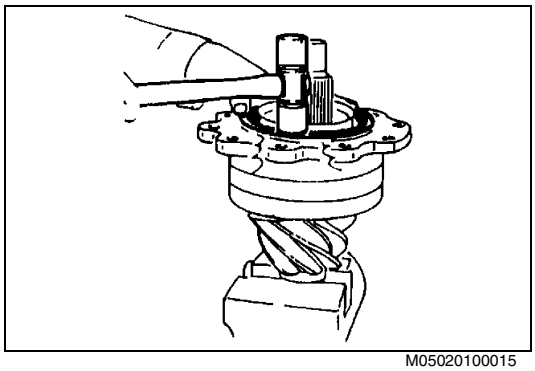
Assembly Standard: Turning torque Unit: N·m {kgf·cm, lbf·ft}

New bearing	Re-used bearing
1.97-2.94 {20-30, 1.5-2.1}	1.47-2.45 {15-25, 1.1-1.8}

Adjusting shim
Thickness: 0.40 mm {0.0157 in.]
0.45 mm {0.0177 in.}
0.50 mm {0.0197 in.}

NOTICE:

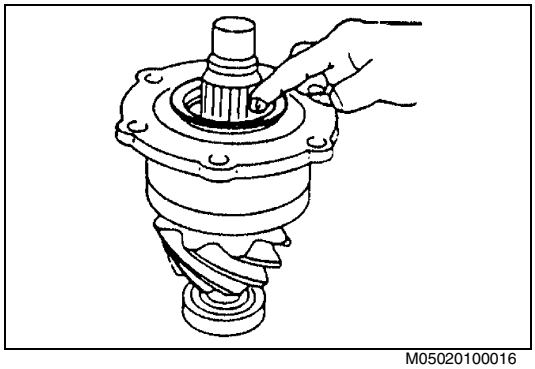
Measure the preload and record it for measuring the total preload at the differential carrier bearings at a later time.


M05020100015

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

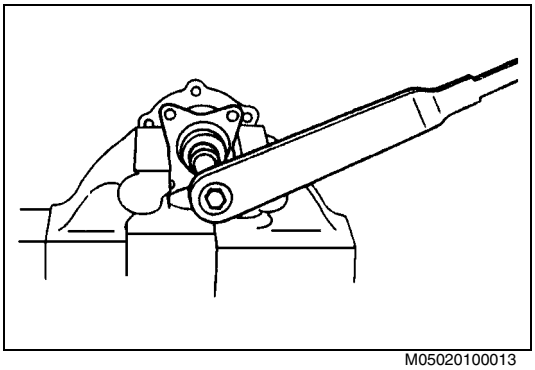
NOTICE:

Tap the oil seal in small steps and evenly to prevent it from being at slant position.

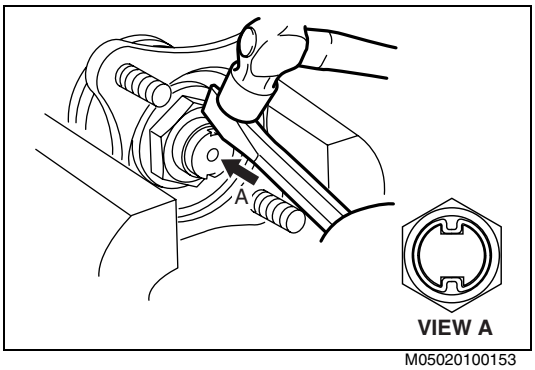

M05020100016

NOTICE:

Apply wheel bearing grease on the oil seal lip part.


M05020100013

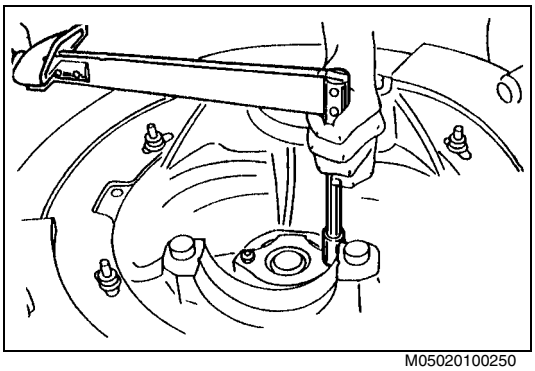
(4) Install the flange yoke coupling and tighten the lock nut.
SST: Socket Wrench (09839-4104)



M05020100153

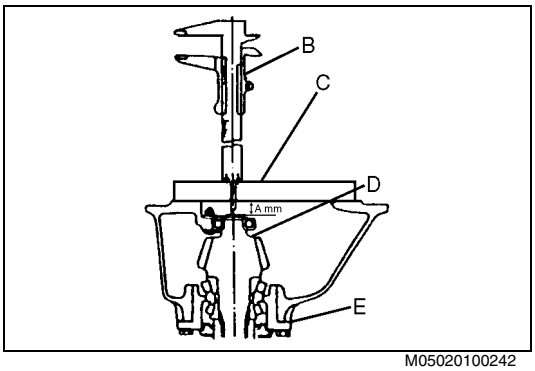
(5) Using a chisel and a hammer, caulk the lock nut.

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


M05020100250

4. INSTALLATION OF THE CYLINDRICAL ROLLER BEARING OUTER RACE

(1) Apply gear oil to the cylindrical roller bearing outer race.
(2) Install the cylindrical roller bearing outer race.
(3) Install the bearing lock plates and tighten the nuts and bolts.
Tightening Torque:
19-25 N·m (190-260 kgf·cm. 14-18 lbf·ft)



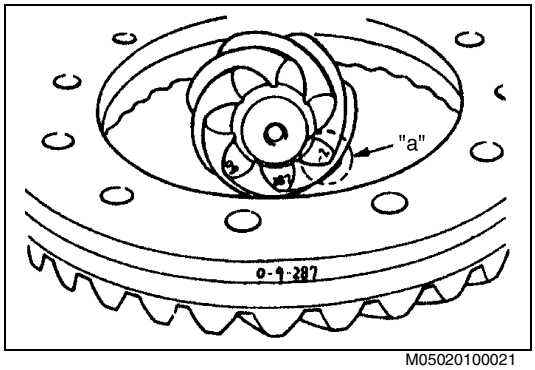
M05020100242

5. ADJUSTMENT OF THE PINION FITTING HEIGHT (CONICAL DISTANCE)

(1) Install the bearing cage assembly and adjust the height "A" by sims "E".
Standard pinion height: 24.5 mm {0.965 in.}

A: Pinion height
B: Vernier calipers
C: Straight edge
D: Engraved value for gear toothing adjustment
E: Adjusting shims

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.}

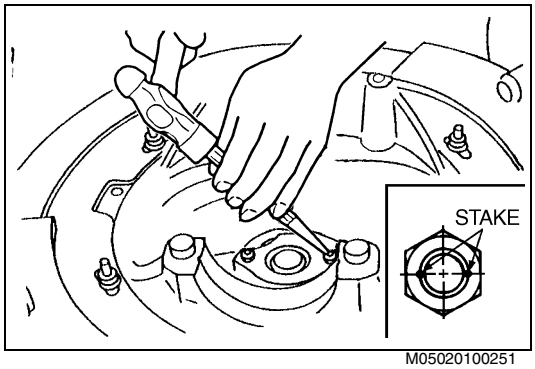


M05020100021

EXAMPLE:
In a case where the engraved value at the surface of the pinion gear is -2 (-2 means -0.2 mm):

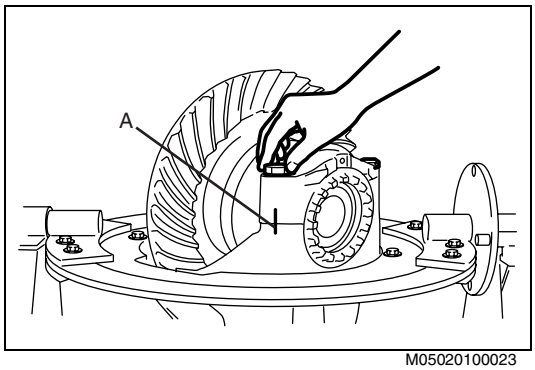
Standard pinion height "A"				Measuring part (A')
35.0 mm	–	0.2 mm	=	34.8 mm
		The engraved value "a"		

NOTICE:
Upon completing the adjustment, remove the bearing cage assembly and apply liquid gasket (ThreeBond 1102 or equivalent) on the mounting surfaces of differential carrier case and bearing cage.



M05020100251

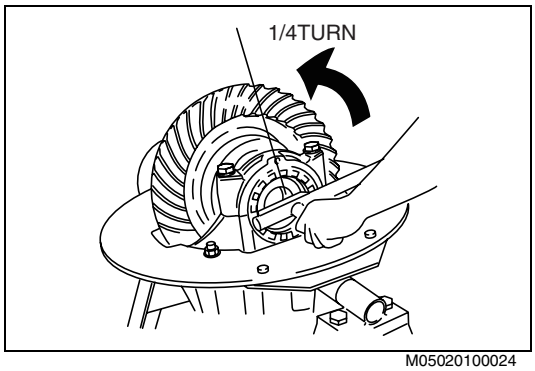
(2) Stake the lock nut securely as shown in the figure.



M05020100023

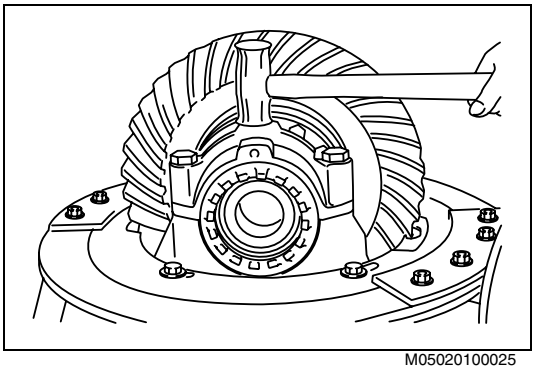
6. ADJUSTMENT OF THE RING GEAR BACKLASH
(1) Set the differential case assembly on the carrier case and install the adjusting nut and bearing cap.

NOTICE:
Align the aligning marks A.

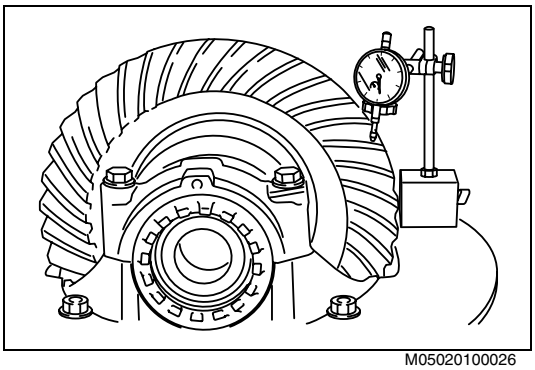


M05020100024

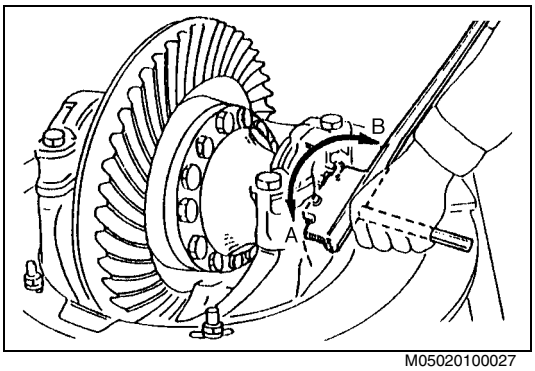
(2) Adjust the preload of the side bearing provisionally.
a. Tighten the adjusting nut fully, then loosen the adjusting nut by 1/4 turn + 1 notch.
SST: Adjuster Tool (09665-1040)


M05020100025

b. Hit the bearing cap with a copper hammer.

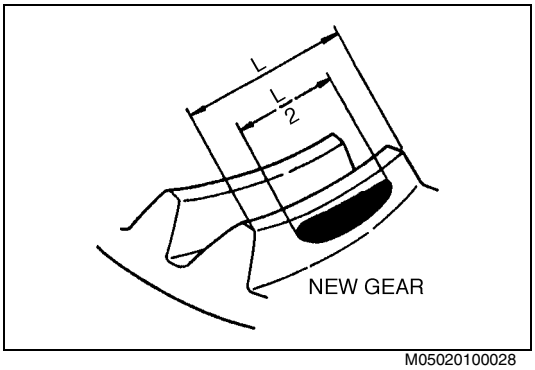

M05020100026

(3) Measure the gear backlash at three or four points on the circumference of the gear.
Assembly Standard: 0.20-0.28 mm {0.0079-0.0110 in.}



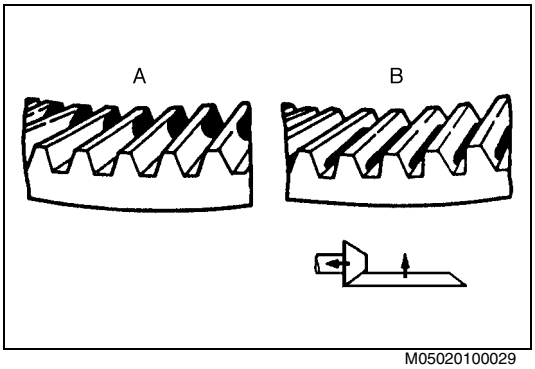
M05020100027

(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 (09665-1040)



M05020100028

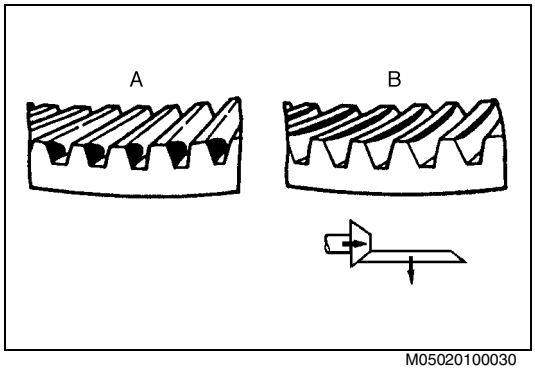
7. INSPECTION AND ADJUSTMENT OF GEAR MESHING
(1) Satisfactory gear meshing.
NOTICE:
New gears are marked as shown to indicate proper gear meshing. Make necessary adjustment so that gears mesh corresponds with the factory's mark.



M05020100029

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

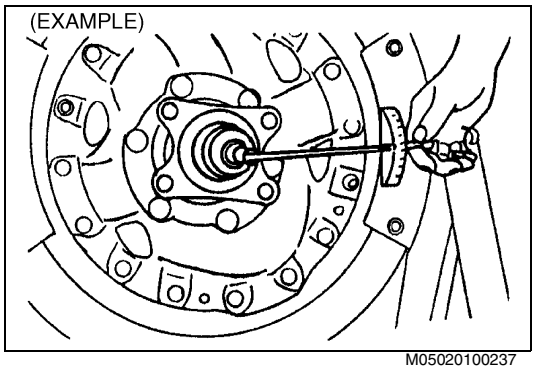
A: Toe contact - Unadjust, replace the pinion and ring gear as a set.
B: Flank contact - Adjust



M05020100030

b. Heel and face contact

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



M05020100237

8. MEASUREMENT AND ADJUSTMENT OF THE SIDE BEARING

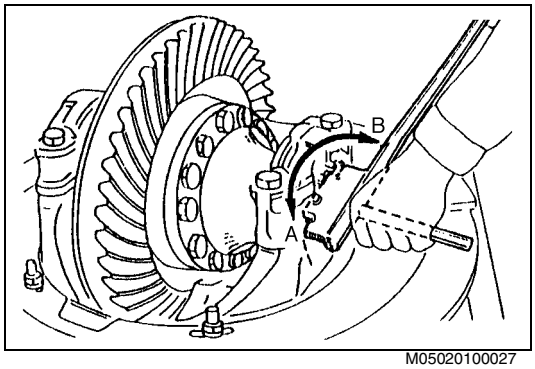
(1) Measure the total preload using a torque wrench at the flange coupling.

NOTICE:
Side bearing preload = Differential total preload - Pinion bearing preload (refer to item 3).

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

Gear ratio	5.428	6.428
New bearing	0.37-0.45 {3.7-4.6, 0.27-0.33}	0.31-0.45 {3.2-4.6, 0.23-0.33}
Re-used bearing	0.28-0.36 {2.8-3.6, 0.20-0.26}	0.23-0.38 {2.4-3.8, 0.17-0.28}

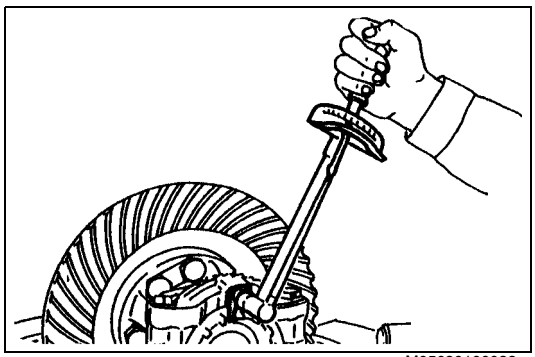
NOTICE:
The gear ratio is indicated on the bearing cage.



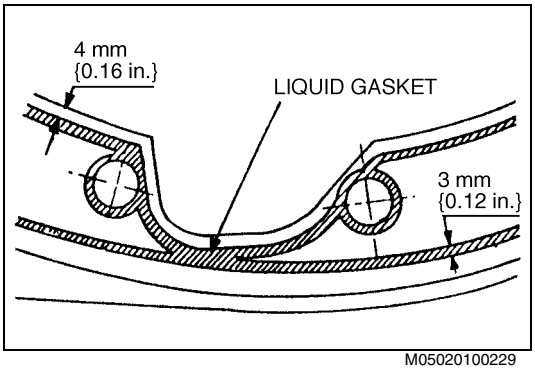
M05020100027

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

- A: Counterclockwise: Decrease preload
- B: Clockwise: Increase preload
  SST: Adjuster Tool (09665-1040)


M05020100032

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



M05020100229

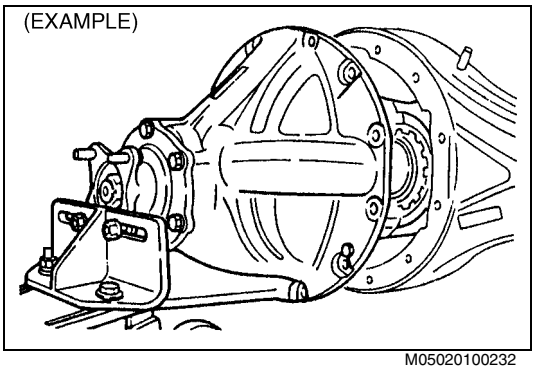
IMPORTANT POINTS - MOUNTING

1. MOUNTING

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

NOTICE:

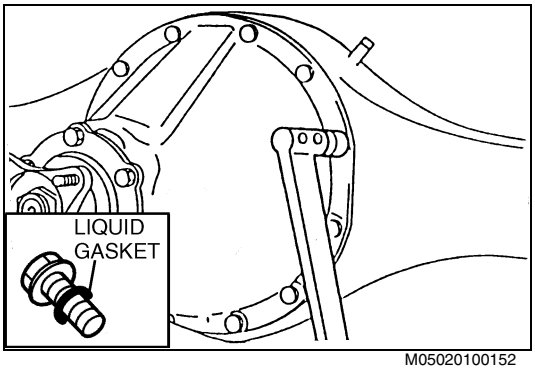
- **The liquid gasket must be ThreeBond #1215 or equivalent.**
- **The liquid gasket should be applied continuously.**
- **Application should be approximately 3 mm {0.12 in.} width and 4 mm {0.16 in.} away from the edge.**



M05020100232

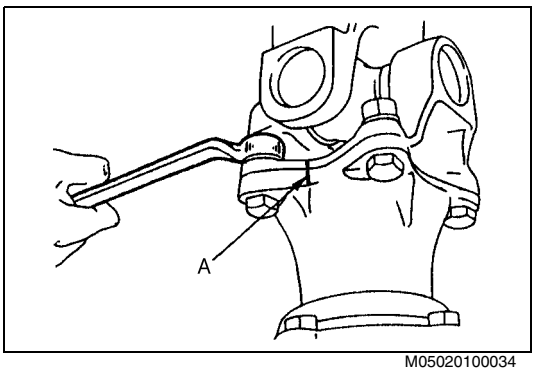
(2) Using a jack, install the differential carrier assembly to the axle housing.

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 ϕ14 bolts (16 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}

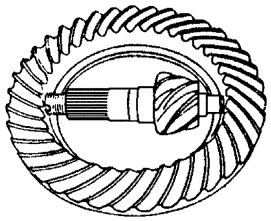
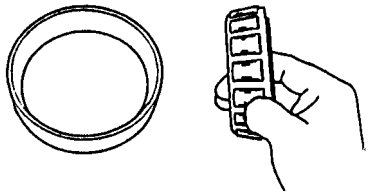
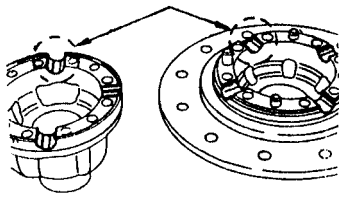
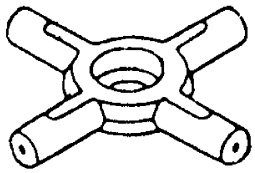
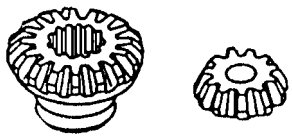
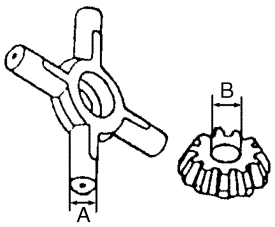
(5) Fill the axle housing with specified gear oil up to the filler plug hole.

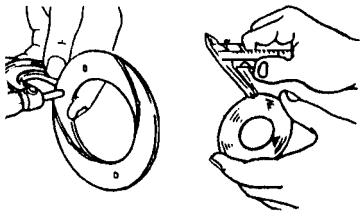
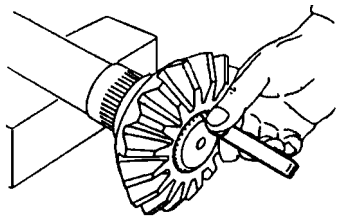
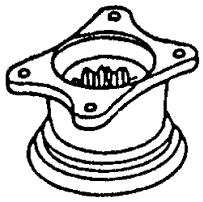
Gear oil:
Refer to the owner's manual

INSPECTION AND REPAIR

M05020108BEH3001

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 
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:26 {1.024} B-A:0.140-0.201 {0.0055-0.0079}	0.4 {0.016}	Replace.	Measure 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Thrust washers thickness (Side gear and pinion gear)	**Side gear: 1.5-1.7 {0.059-0.066}**	**1.3 {0.051}**	**Replace.**	**Measure** 
	Pinion gear: 1.45-1.75 {0.057-0.068}	**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 (MODELS WITH AIR OVER HYDRAULIC BRAKE)

BR01-001

SERVICE BRAKE ASSEMBLY

DESCRIPTION

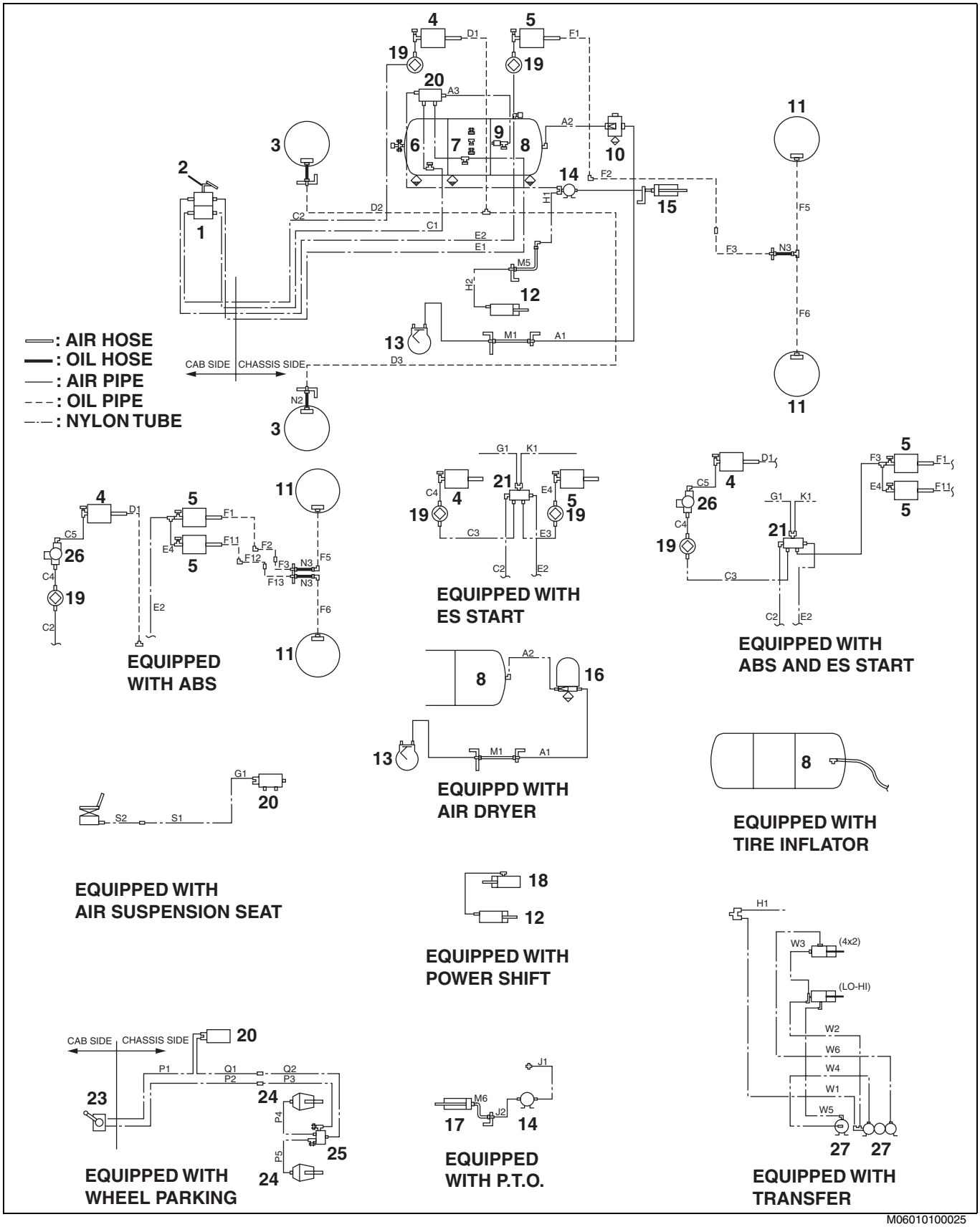
M06010101BEC1001

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

M06010101BEJ1005



M06010100025

1	Brake valve	15	Exhaust brake
2	Stop lamp switch	16	Air dryer
3	Wheel brake-Front	17	Power take-off
4	Brake air booster-Front	18	Power shift
5	Brake air booster-Rear	19	Quick release valve
6	Air tank-Front	20	Protection valve
7	Air tank-Rear	21	ES start control valve
8	Air tank-Water separator	22	Brake lock valve
9	Safety valve	23	Parking brake control valve
10	Pressure governor	24	Parking brake chamber
11	Wheel brake-Rear	25	Relay valve
12	Clutch booster	26	ABS control valve
13	Air compressor	27	Transfer magnetic valve
14	Magnetic valve		

TROUBLESHOOTING

M06010101BEF3001

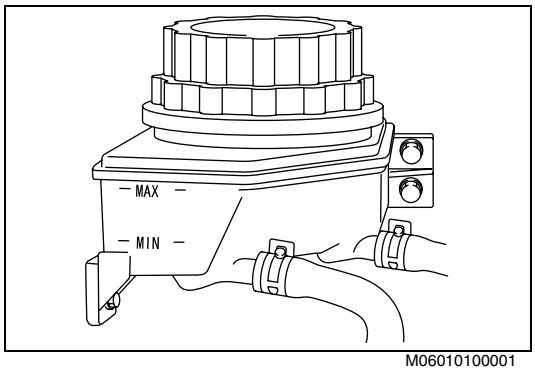
Symptom	Possible cause	Remedy/Prevention
Not enough braking (Wheel brake and drum)	Lining is wet with grease or fluid	Replace the lining.
	Improper contact of drum and lining	Correct.
	Improper lining material or glazed lining	Correct.
	Deformation or hardening of drum	Correct or replace.
	Excessively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



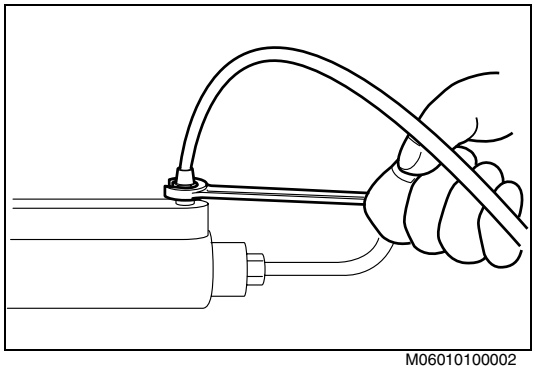
M06010100001

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.

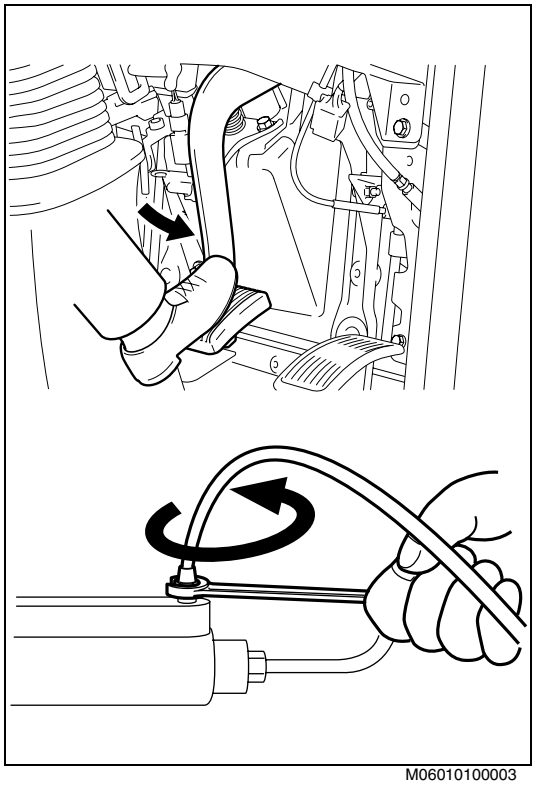
NOTICE:
Always first finish the replacement of either front or rear brake line and then start the replacement of the other.


M06010100002

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

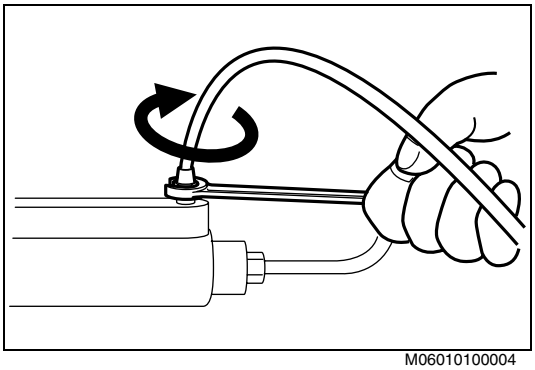
(1) Attach a vinyl tube to the bleeder screw of the brake booster.

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.

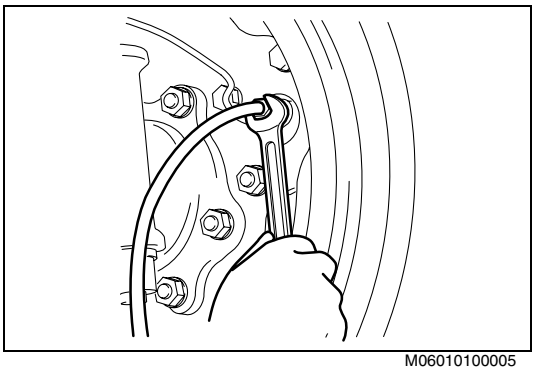


M06010100004

(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.

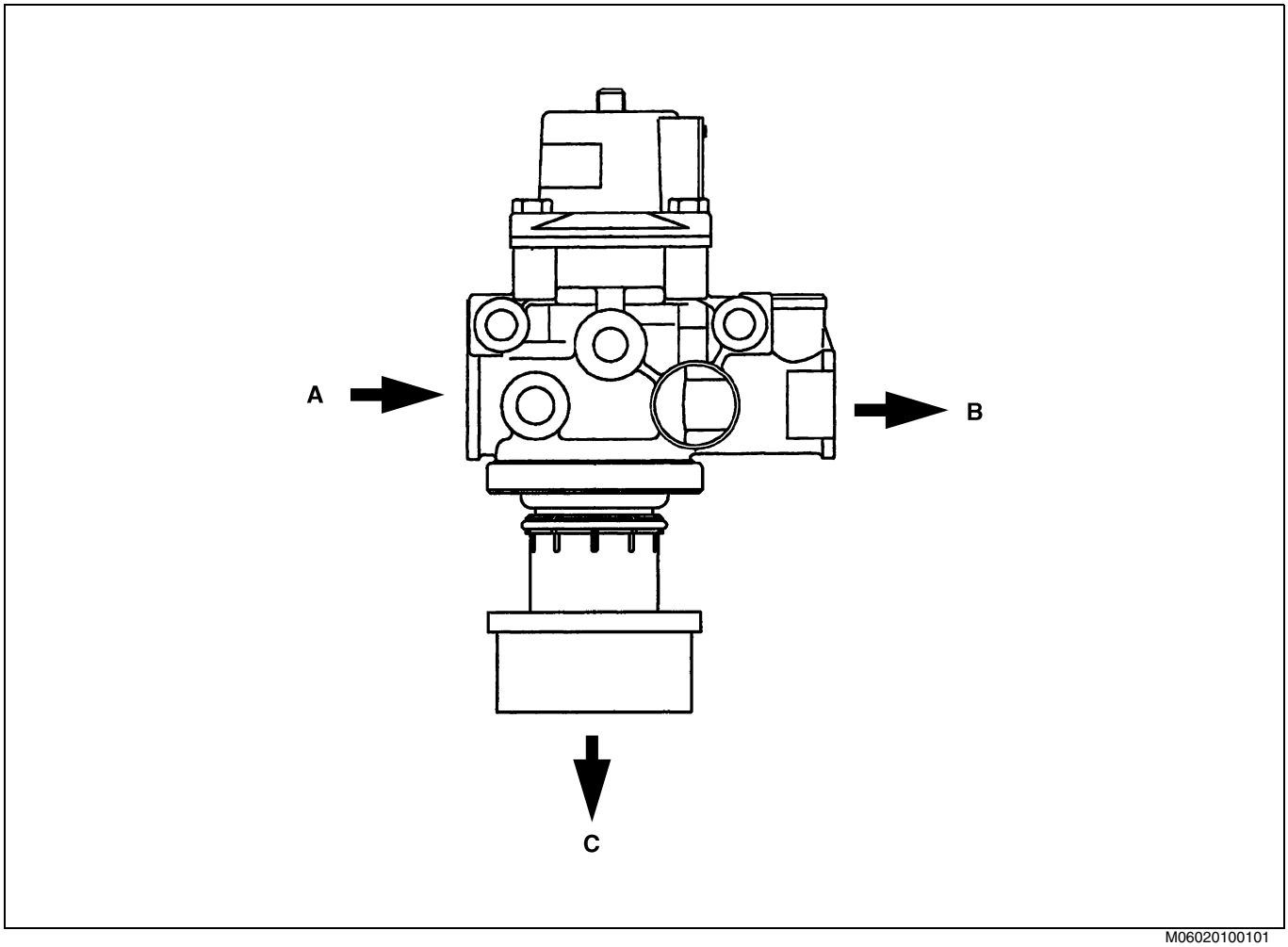
SERVICE BRAKE

BR02-001

PRESSURE GOVERNOR

DESCRIPTION

M06020101BEC1002



M06020100101

A	From air compressor	C	Exhaust
B	To reservoir		

INSPECTION

M06020101BEH3001

IMPORTANT POINTS-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

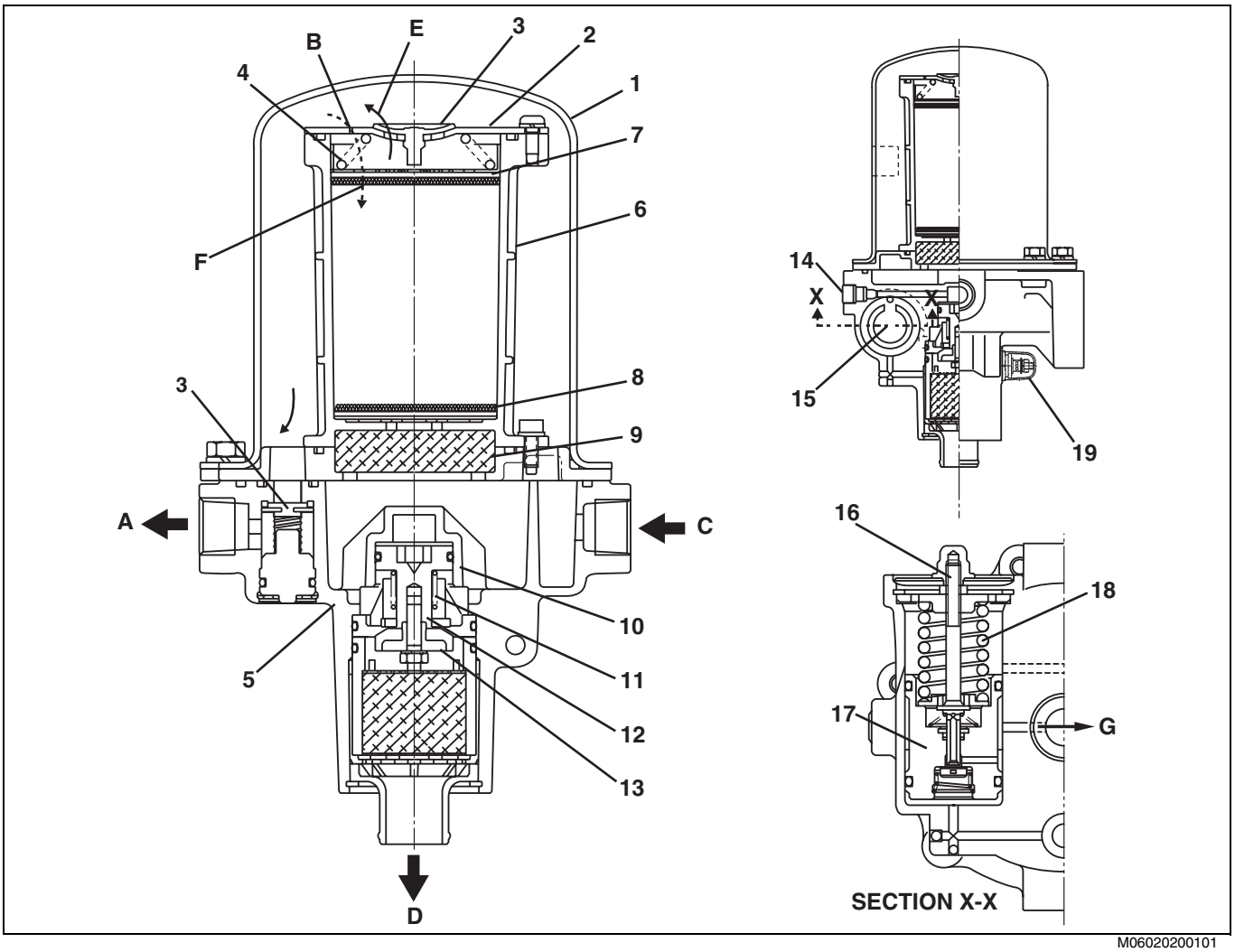
DATA AND SPECIFICATIONS

M06020201BEI2002

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

DESCRIPTION

M06020201BEC1002

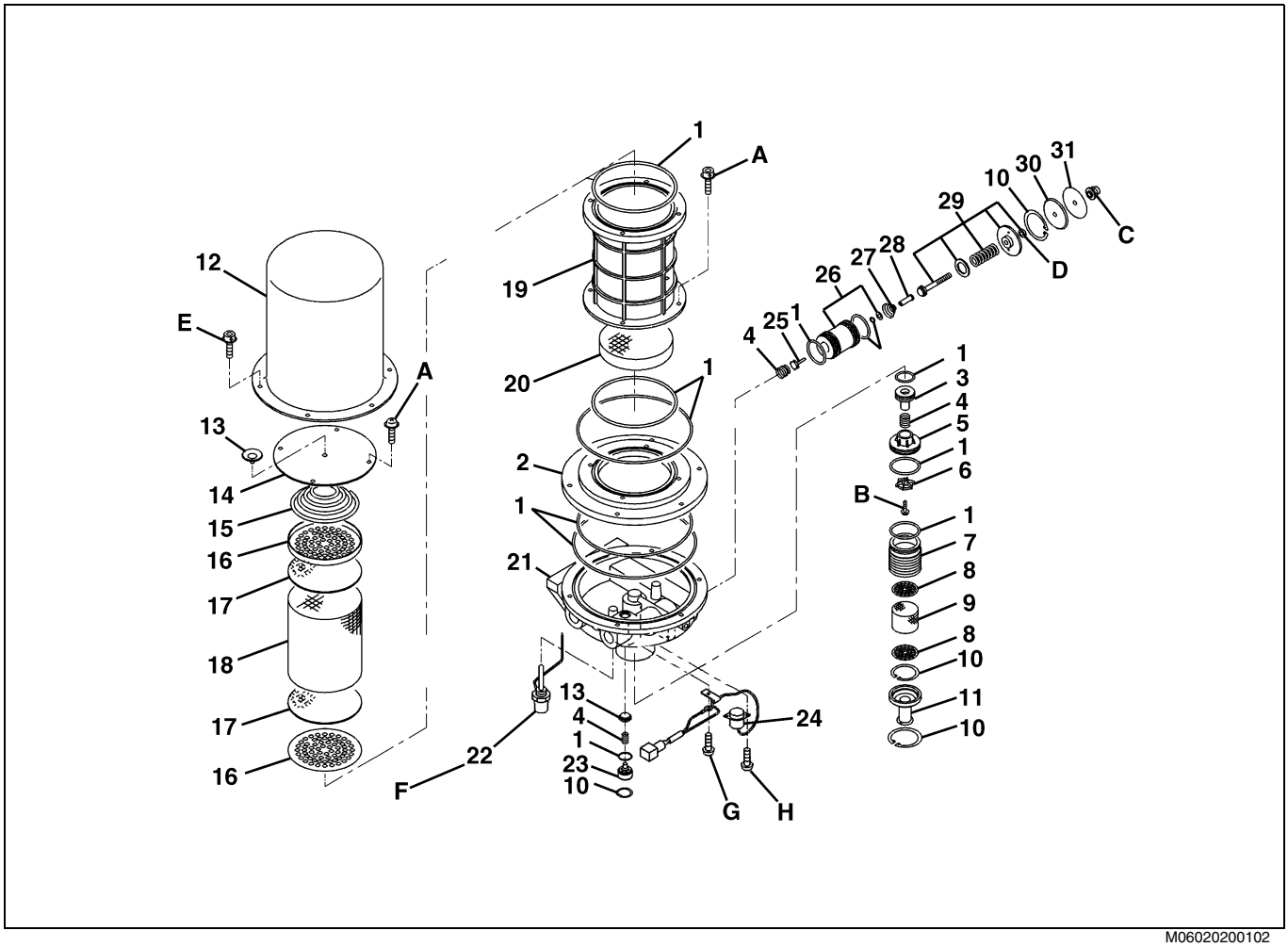


M06020200101

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

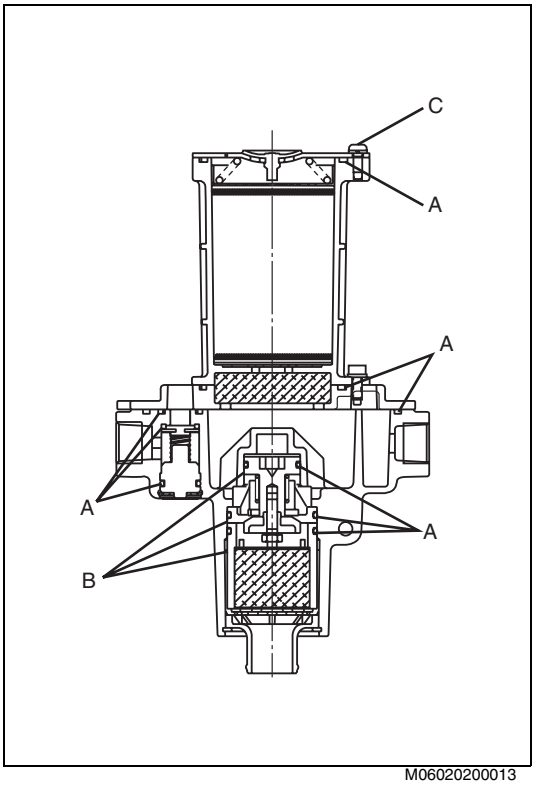
1	O-ring	17	Filter
2	Plate	18	Desiccant
3	Piston	19	Desiccant case
4	Valve spring	20	Oil separator filter
5	Valve body	21	Body
6	Purge valve	22	Heater (If so equipped)
7	Silencer case	23	Valve stopper
8	Silencer plate	24	Thermostat (If so equipped)
9	Silencer	25	Governor valve
10	Retainer ring	26	Piston 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.

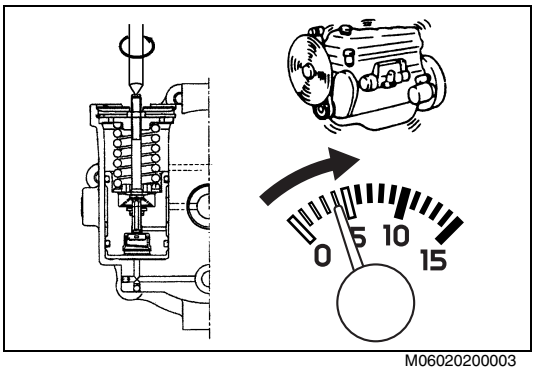
- **C: Bolt**

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).

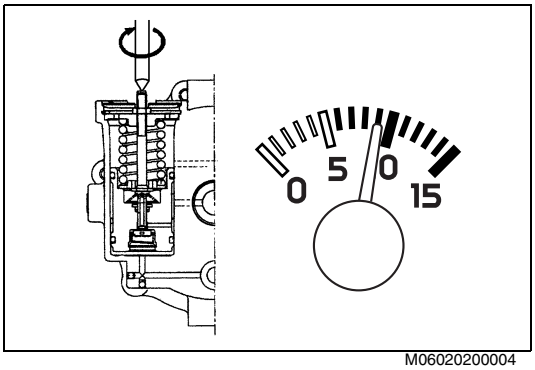
a. Check to see that there is no air leakage from the purge valve.



M06020200003

2. ADJUSTMENT

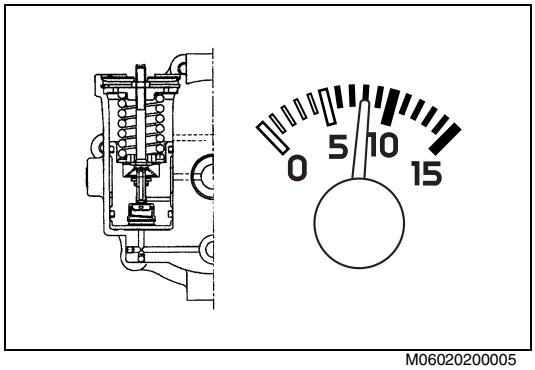
(1) Loosen the adjusting screw until the rod spring tension is released, and start and idle the engine to charge the air for the air tank.



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: 880kpa {9.0 kgf/cm^2, 128 lbf/in^2.}

(3) Tighten the adjusting screw lock nut.

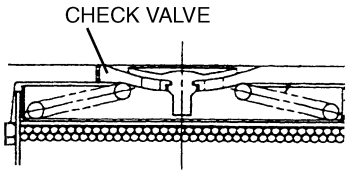
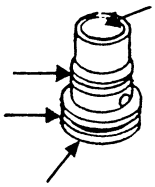
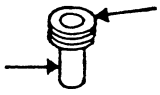
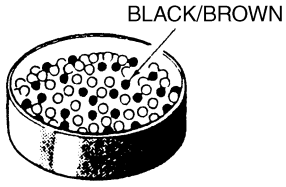


M06020200005

(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

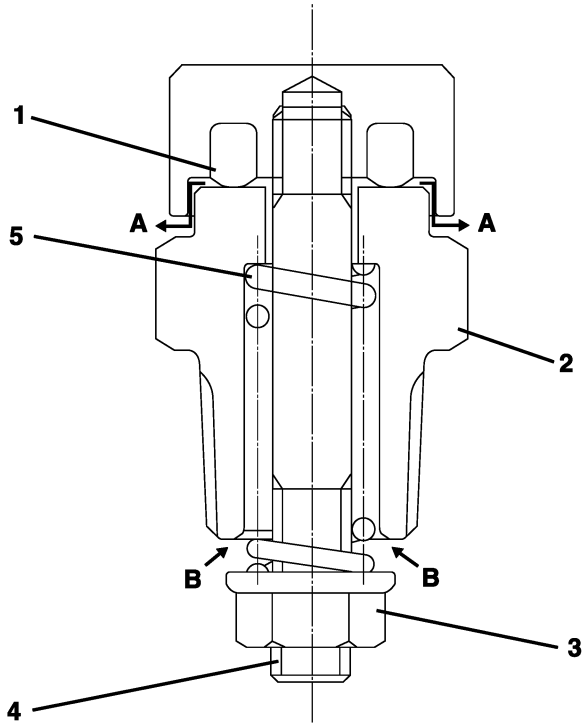
DATA AND SPECIFICATIONS

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

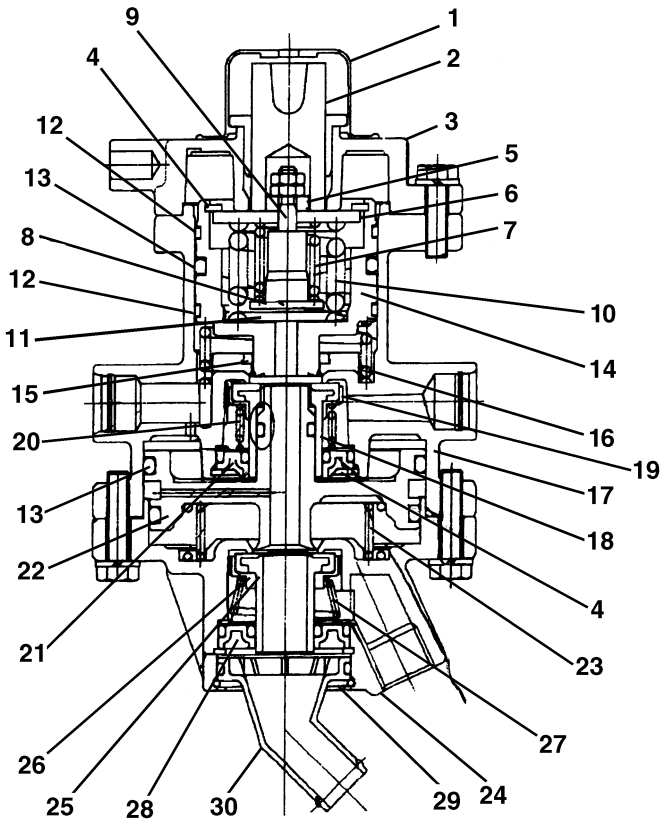
DATA AND SPECIFICATIONS

M06020601BEI2001

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

DESCRIPTION

M06020601BEC1002

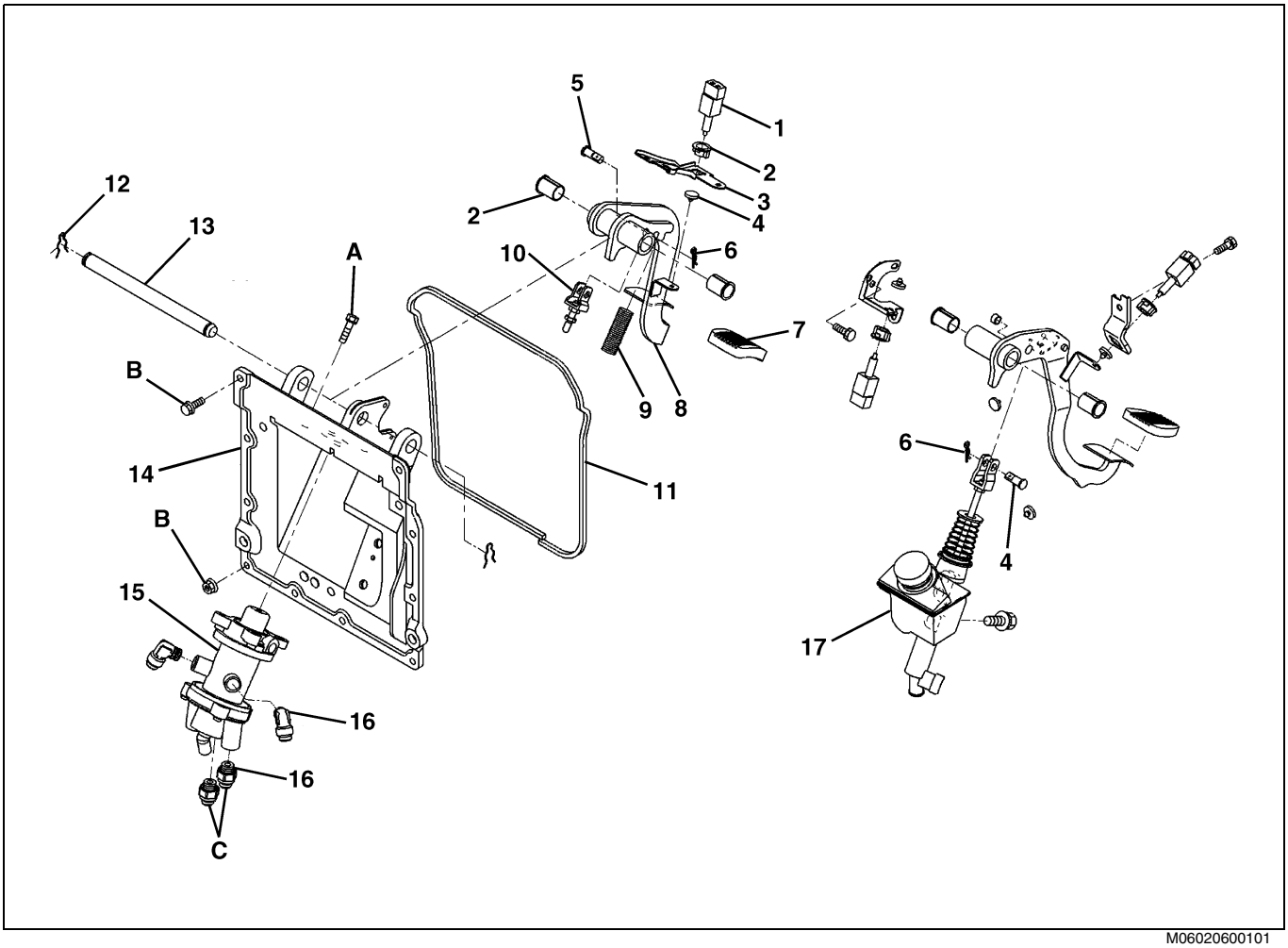


M06020600032

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

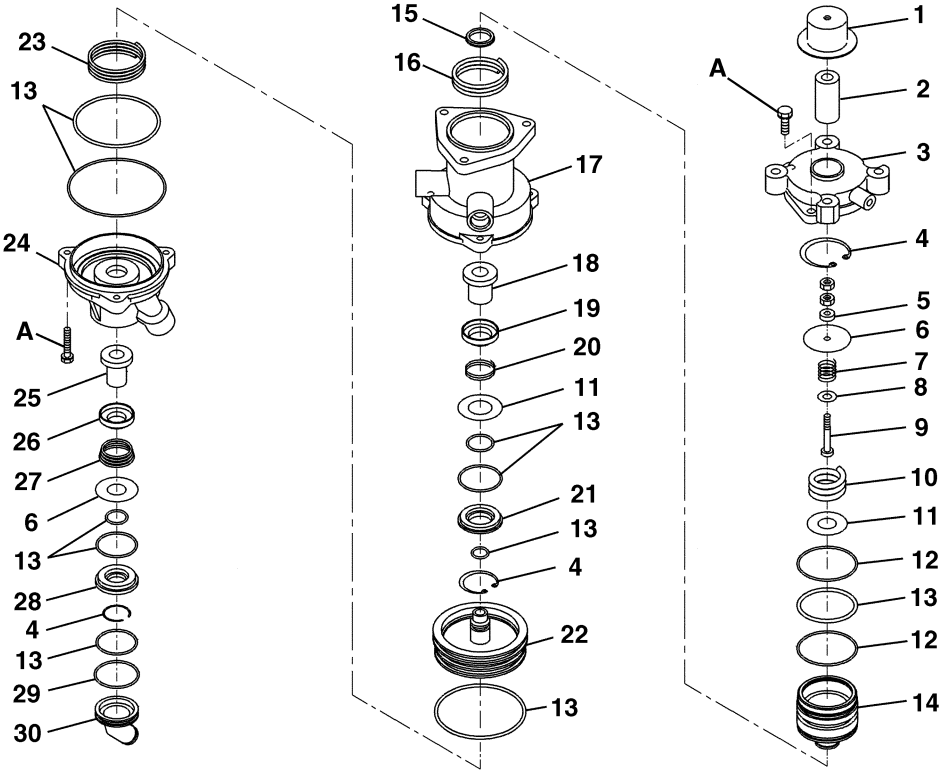


M06020600101

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

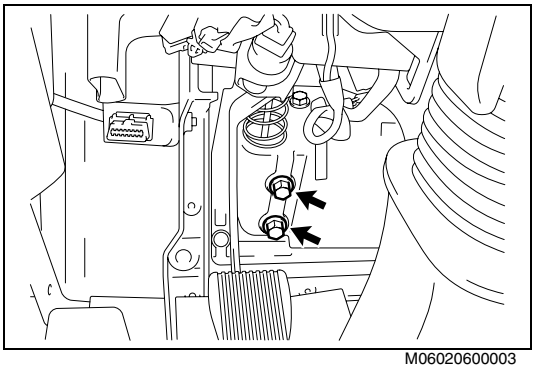
1	Boot	16	Primary piston return spring
2	Plunger	17	Primary valve body
3	Brake valve cover	18	Primary feed valve
4	Retainer ring	19	Retainer
5	Guide ring	20	Primary feed valve return spring
6	Spring seat	21	Primary feed valve retainer
7	Sub spring	22	Secondary piston
8	Shim	23	Secondary piston return 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

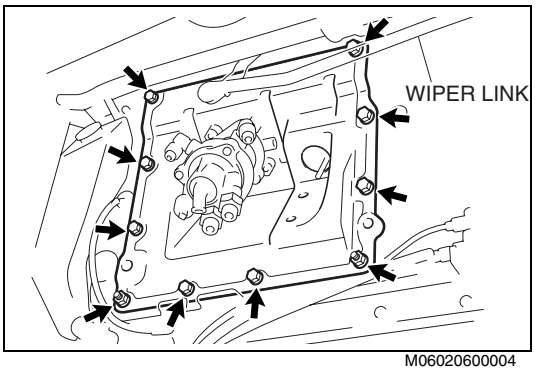
IMPORTANT POINTS - DISMOUNTING

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.



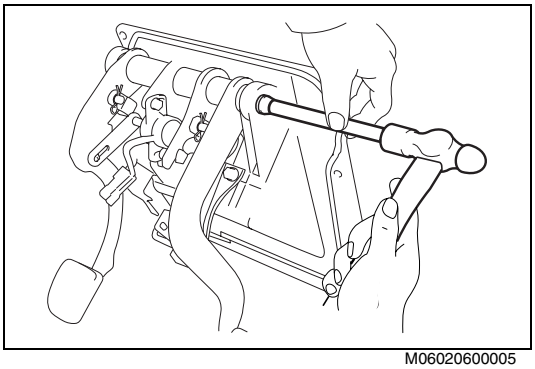
M06020600004

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.

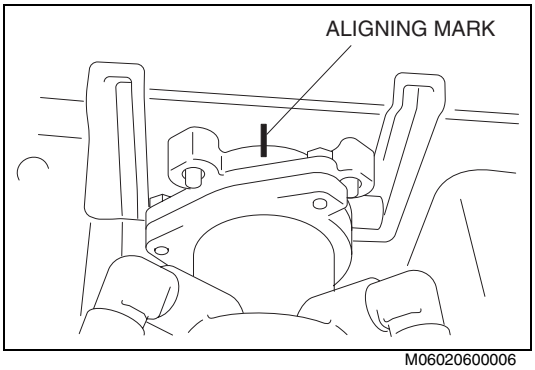

M06020600005

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:

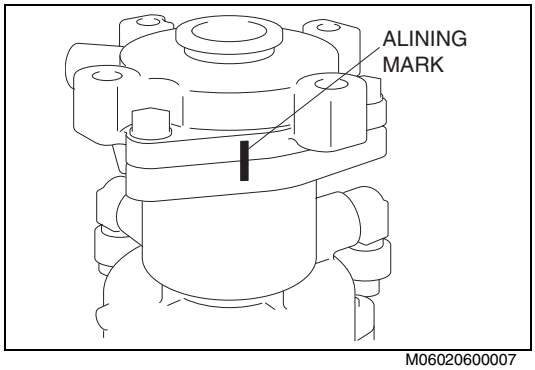
Do not pull out the shaft because the brake pedal and the clutch pedal are installed by one pedal shaft.



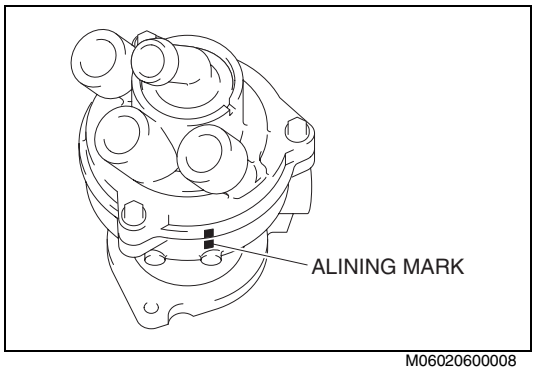
M06020600006

5. REMOVE THE BRAKE VALVE ASSEMBLY.

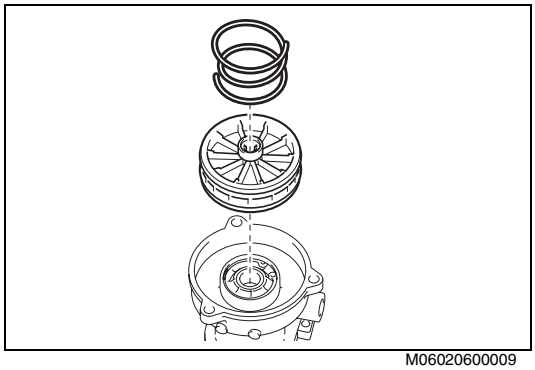
(1) Apply aligning marks on the brake valve assembly and pedal bracket assembly.



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.

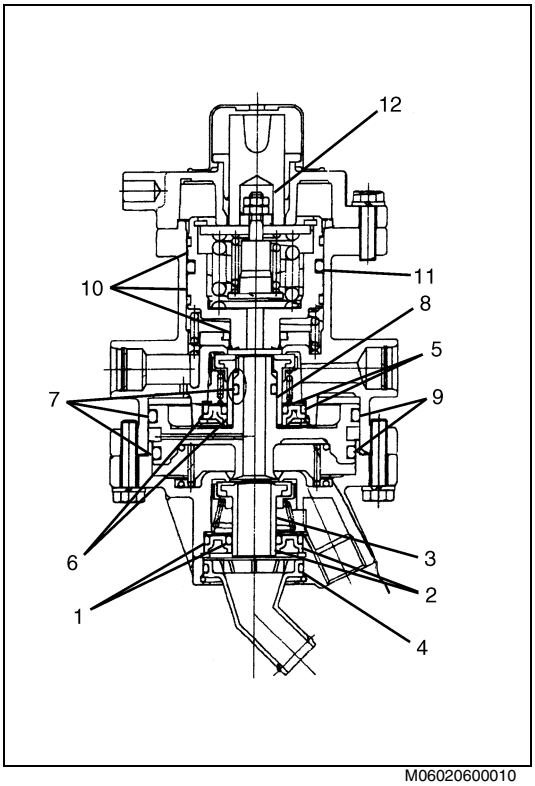
3. REMOVE THE SECONDARY PISTON.

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

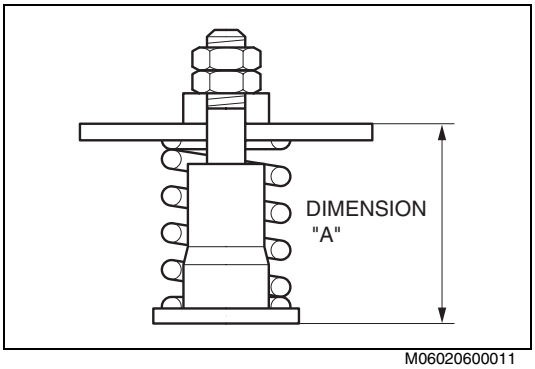
IMPORTANT POINTS - ASSEMBLY

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



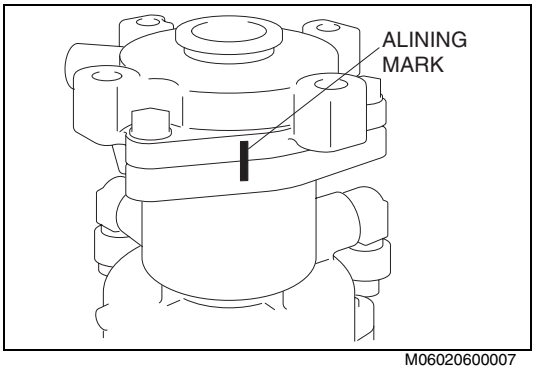
M06020600011

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.

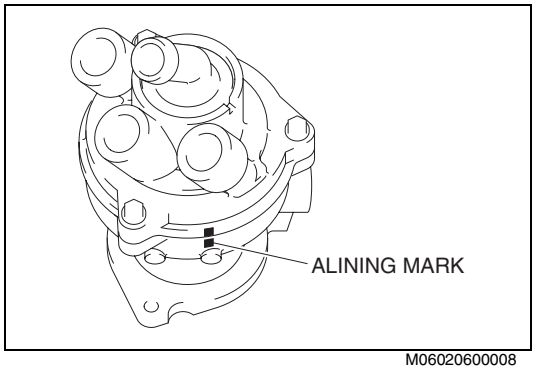
Dimension "A": 27.15-27.55 mm {1.0689-1.0846 in.}
Setting load: 0-9.8 N {0-1 kgf, 0-2.2 lbf}



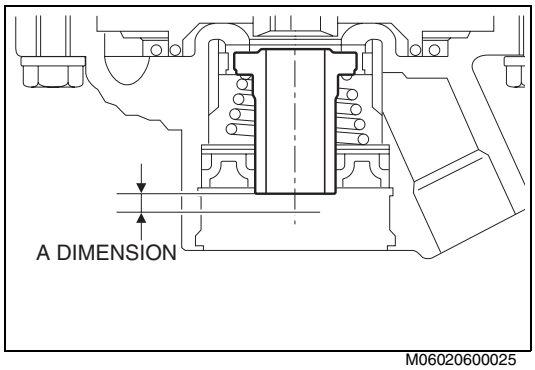
M06020600007

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.



M06020600008



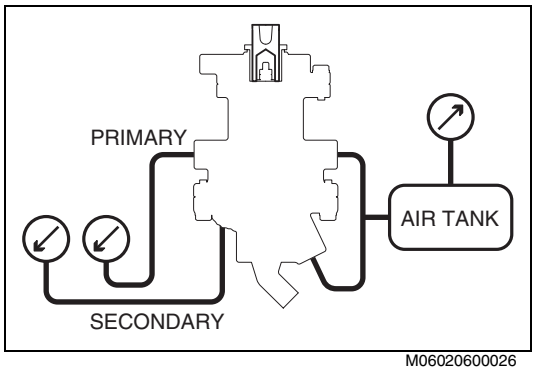
M06020600025

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

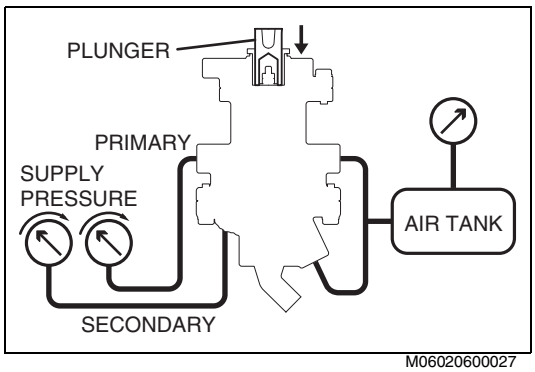


M06020600026

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}.

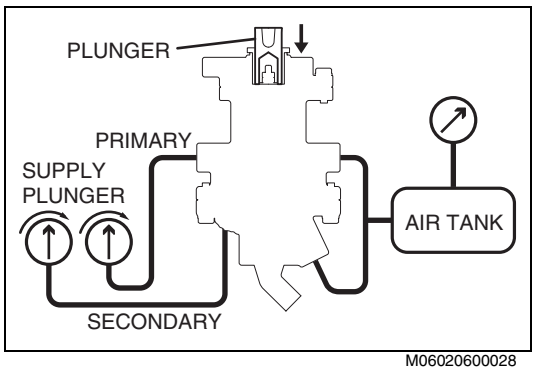
d. Apply soap water to the exhaust port and check to see there is no air leakage.



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.

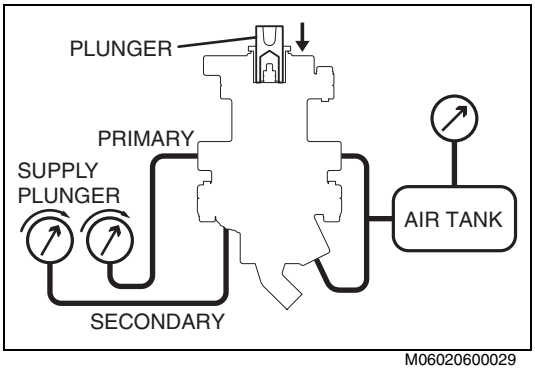
Measurement item	Standard value
Plunger stroke	1.6-2.4 mm {0.0630-0.0944 in.}
Supply pressure	10-25 kPa {0.1-0.25 kgf/cm^2, 1.43-3.55 lbf/in^2}



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.

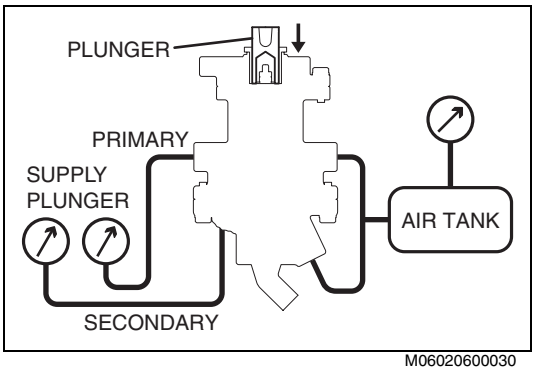
Measurement item	Standard value
Plunger stroke	4.85-5.95 mm {0.1910-0.2342 in.}
Supply pressure	186 kPa {1.9 kgf/cm^2, 27.02 lbf/in^2}



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.

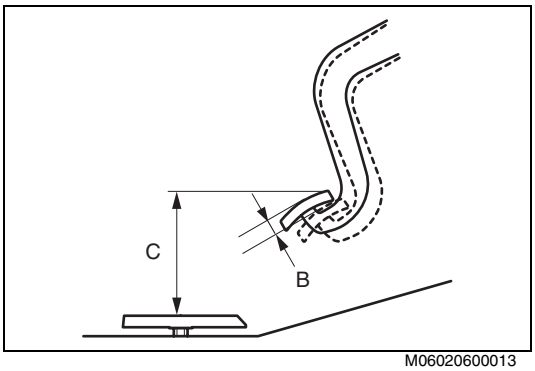
Measurement item	Standard value
Plunger stroke	7.19-8.51 mm {0.2831-0.3350 in.}
Supply pressure	593 kPa {6.0 kgf/cm^2, 85.32 lbf/in^2}



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}



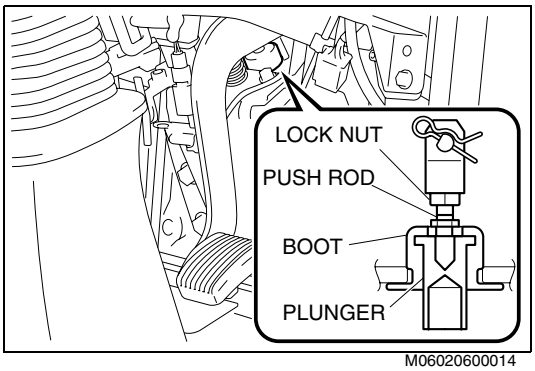
M06020600013

(2) Brake pedal

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

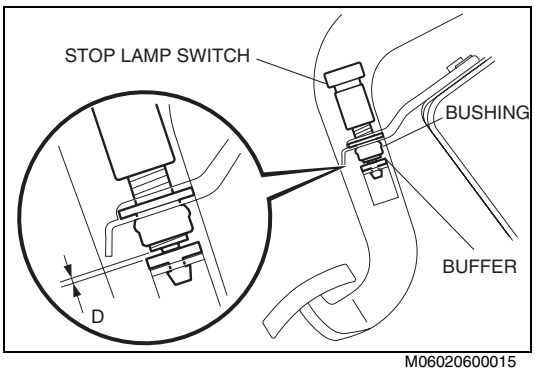
"B": 2-5 mm {0.0788-0.1968 in.}

"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.



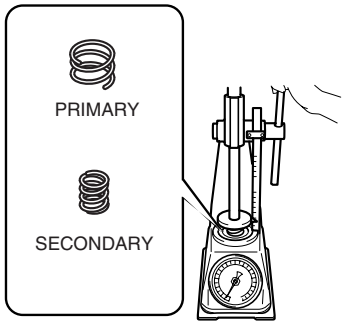
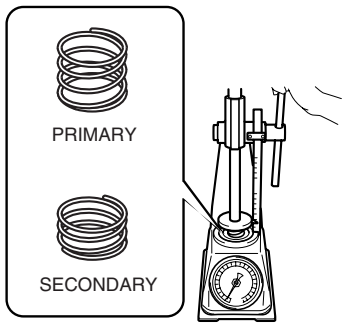
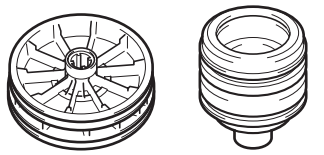
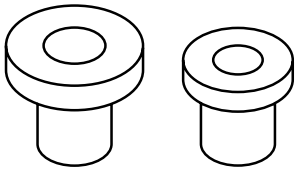
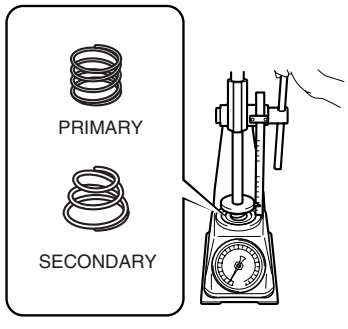
M06020600015

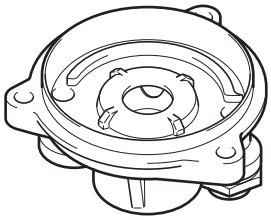
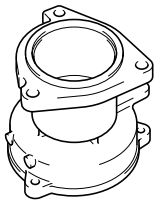
(3) Check the clearance between stop lamp switch and buffer.

"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

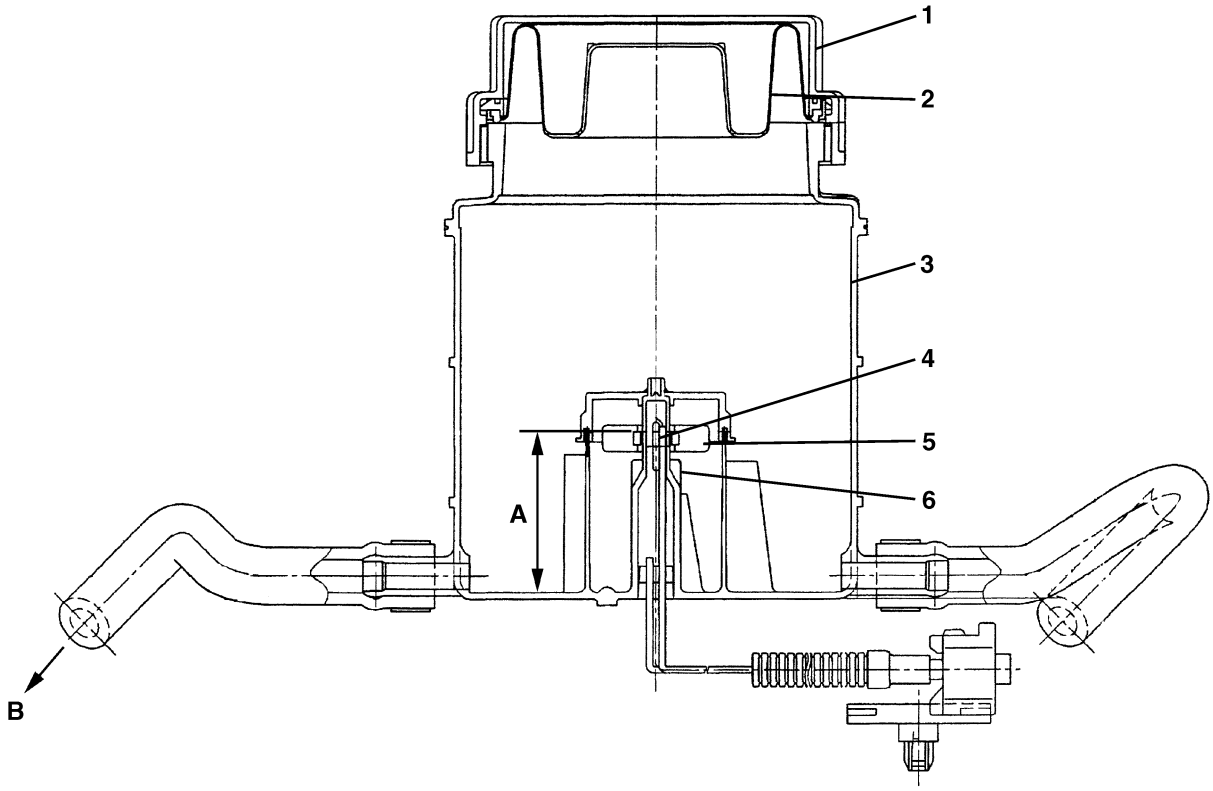
DATA AND SPECIFICATIONS

M06020701BEI2003

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

DESCRIPTION

M06020701BEC1004

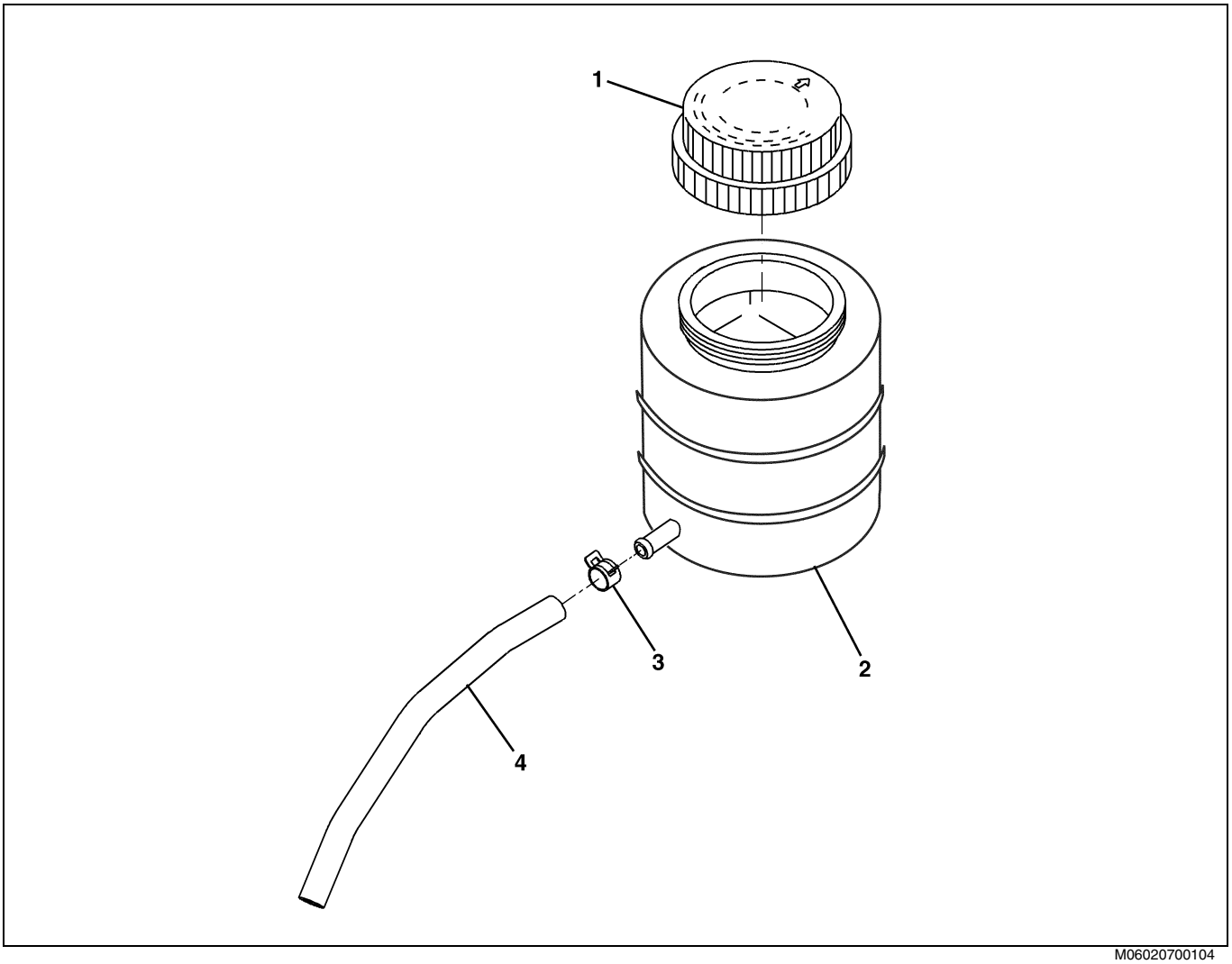


M06020700103

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

COMPONENT LOCATOR

M060207BED1004



M06020700104

1	Reservoir cap	3	Clip
2	Body	4	Hose

DISMOUNTING AND MOUNTING

M06020701BEH1001

IMPORTANT POINT - DISMOUNTING

1. REMOVAL OF RESERVOIR.

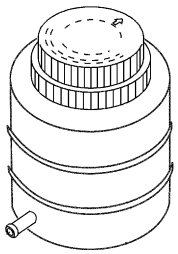
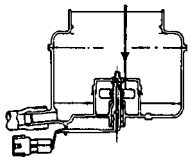
NOTICE:

- **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

M06020701BEH3003

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)

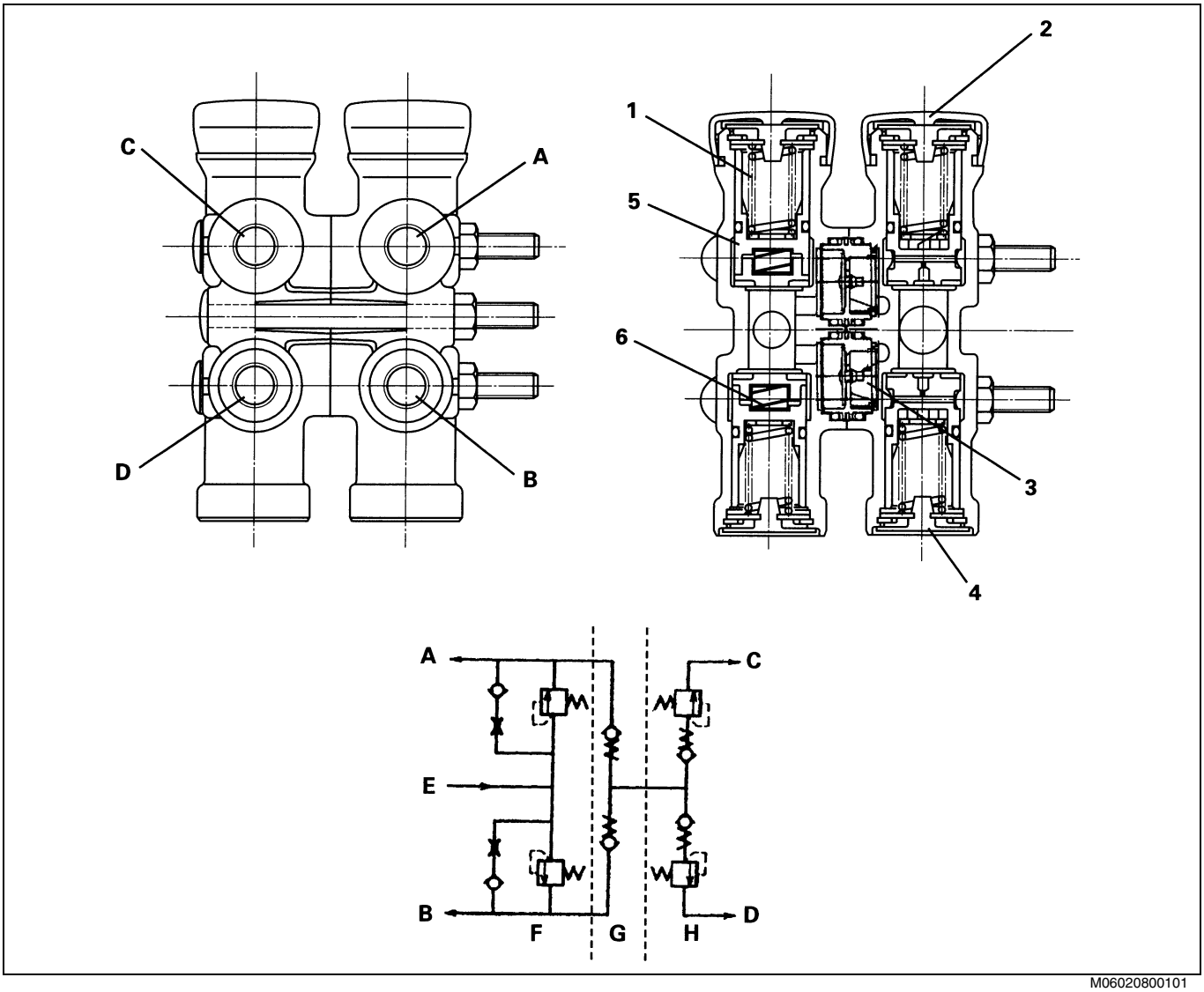
DATA AND SPECIFICATIONS

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

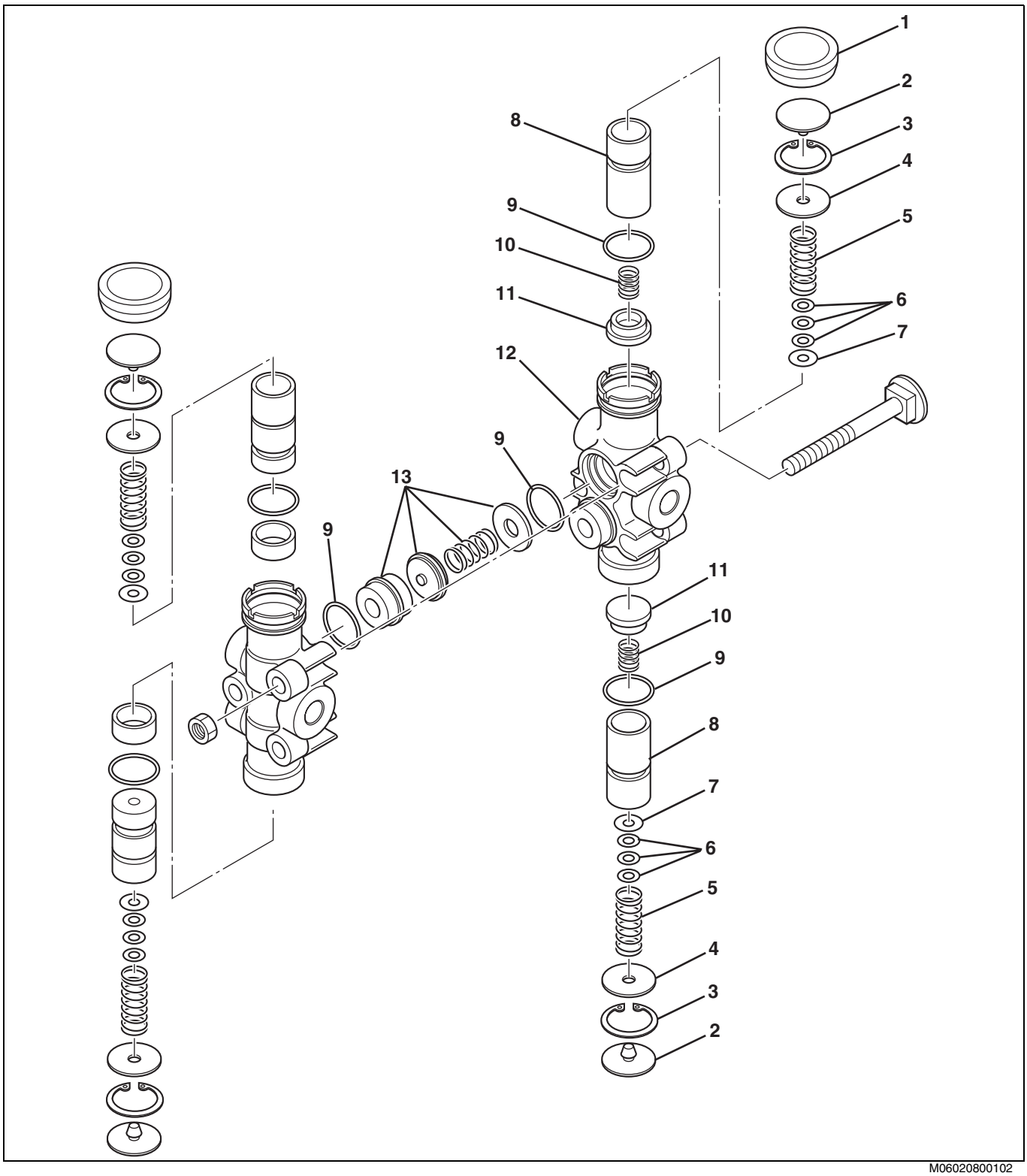


M06020800101

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

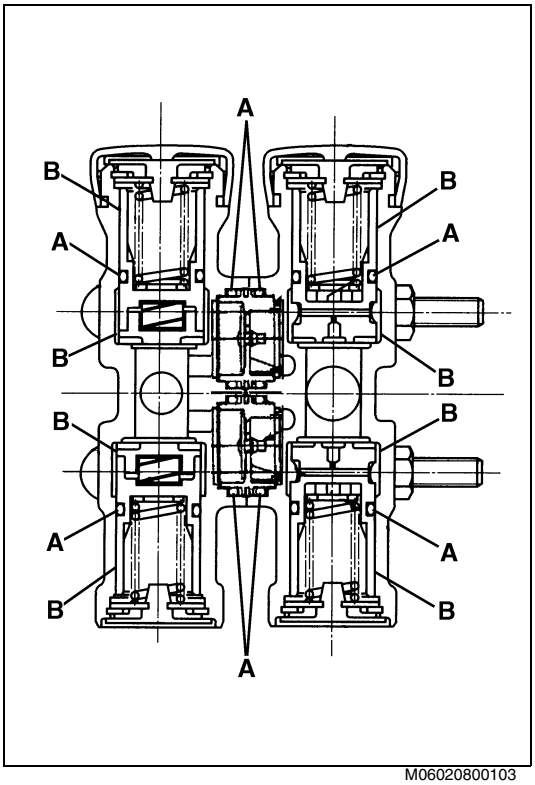


M06020800102

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 POINTS - ASSEMBLY

1. LUBRICATION

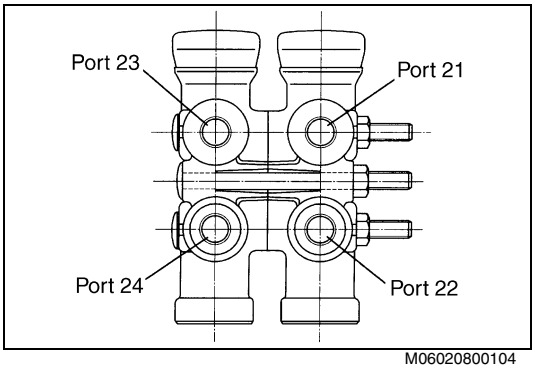
(1) When assembling the protection valve use the new O-rings and valves.

(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

M06020801BEH3002



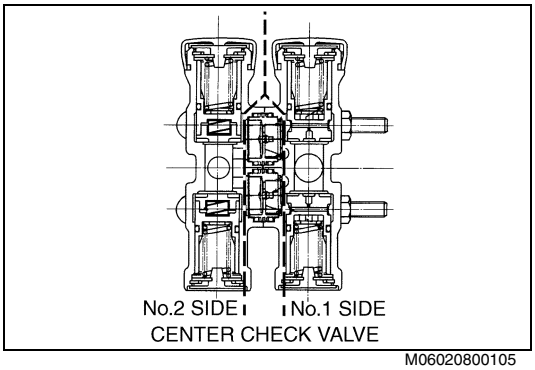
M06020800104

AIR LEAKAGE

1. Check valve

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

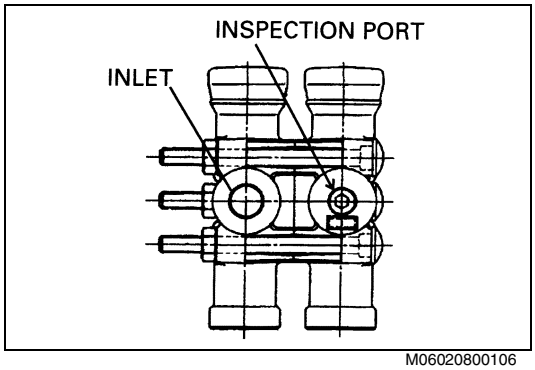
a. Confirm no leakage of air at inlet, No.1, when applying pressure to air under 49 kpa {0.5 kgf/cm^2, 7.11 lbf/in^2}, 392 kpa {4 kgf/cm^2, 56.89 lbf/in^2} from outlet No.21 and No.22.



M06020800105

(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.



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.

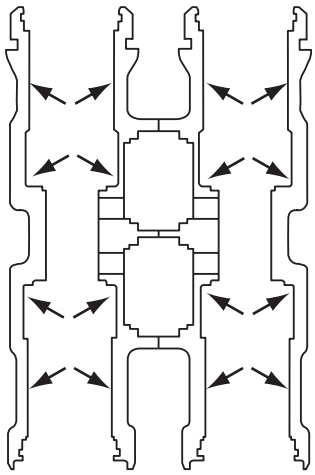
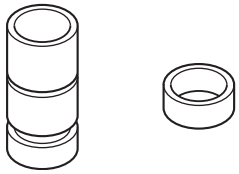
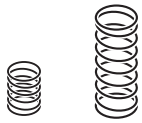
2. Closing valve pressure
(1) When discharging air through respective No.1 side and No.2 side inlet under a pressure of 880 kpa {9 kgf/cm^2, 128 lbf/in^2} at the inlet and the outlet, at discharging speed specified below, confirm that a pressure when the pressures saturated should be of Closing valve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

M06020801BEH3100

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

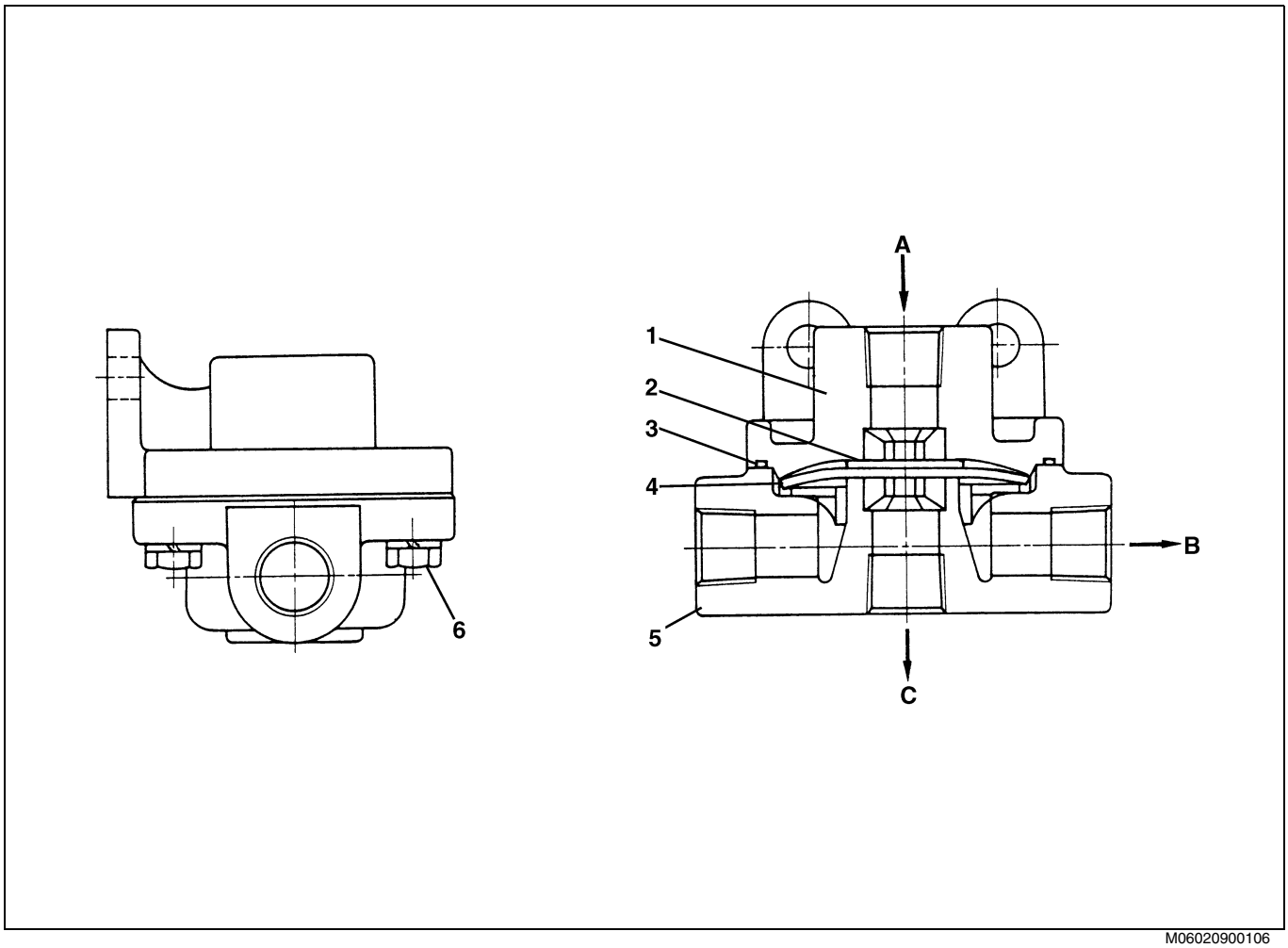
DATA AND SPECIFICATION

M06020901BEI2001

Type	Diaphragm type

DESCRIPTION

M06020901BEC1001

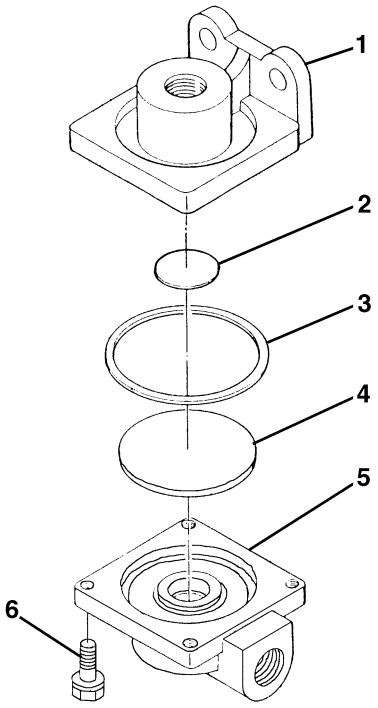


M06020900106

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

COMPONENT LOCATOR

M06020901BED1001

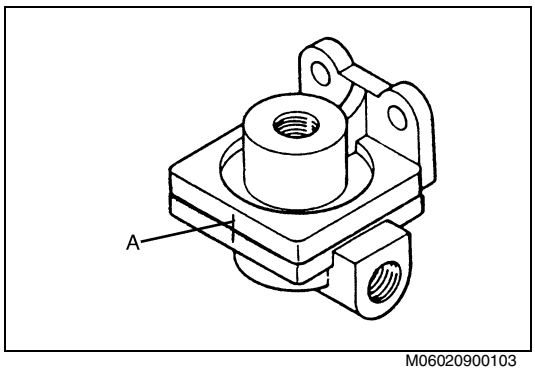


M06020900102

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

OVERHAUL

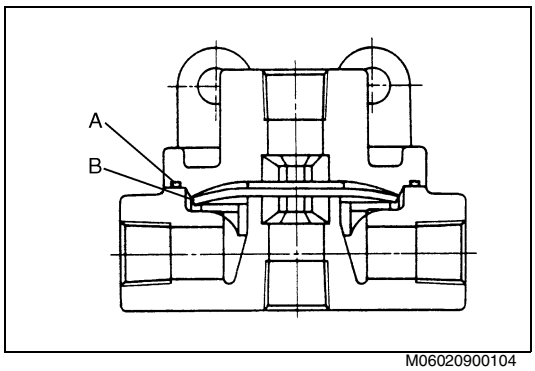
M06020901BEH2001



M06020900103

IMPORTANT POINTS - DISASSEMBLY

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



M06020900104

IMPORTANT POINTS - ASSEMBLY

1. Assemble the relay valve

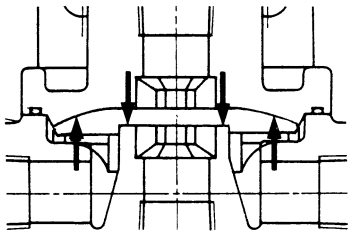
(1) When assembly the relay valve, use the new diaphragm and gasket.

- **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

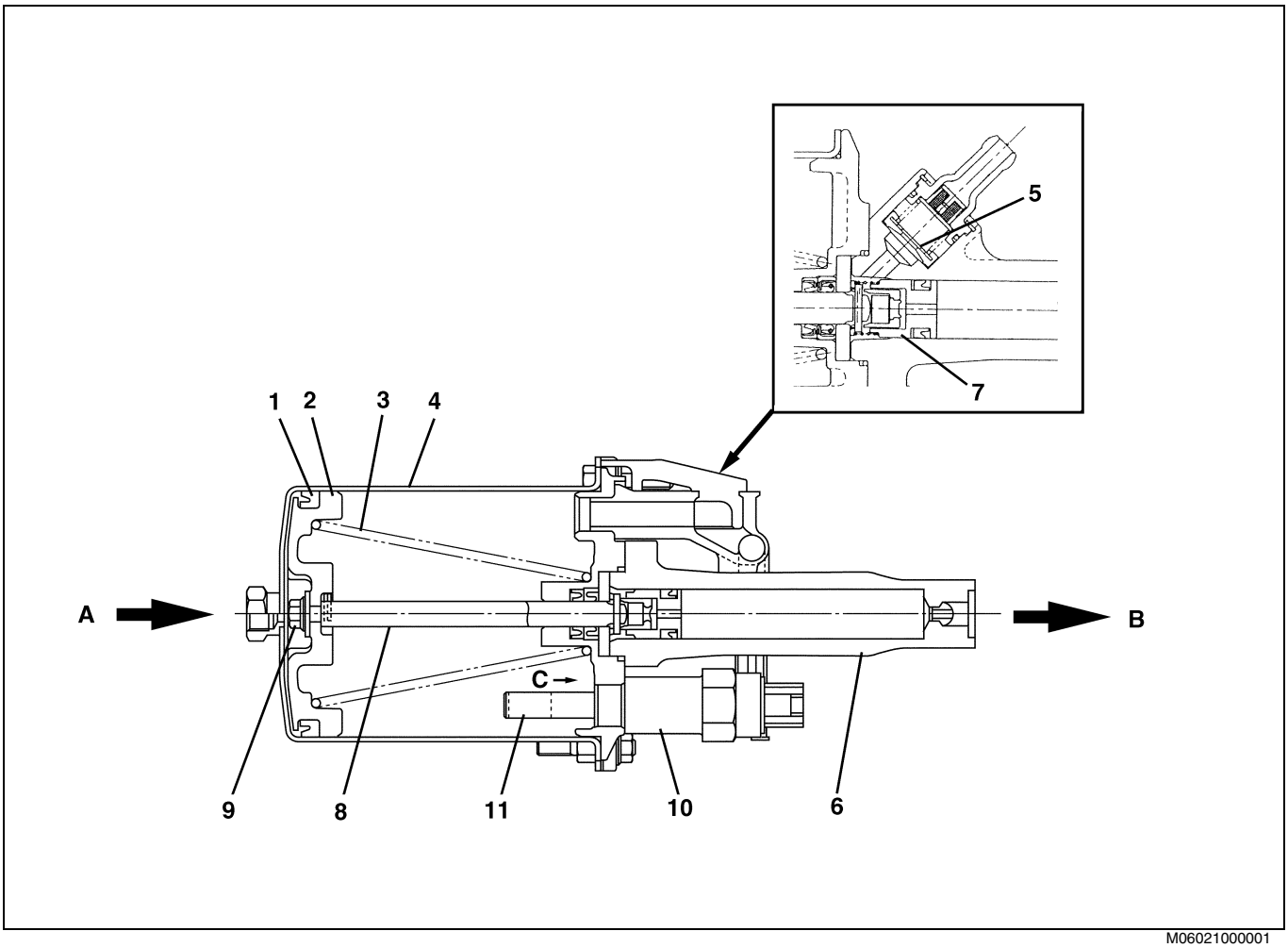
DATA AND SPECIFICATIONS

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



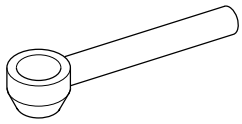
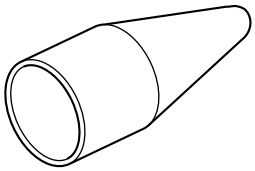
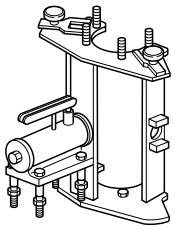
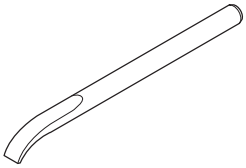
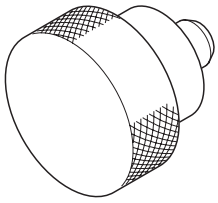
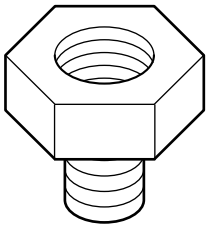
M06021000001

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

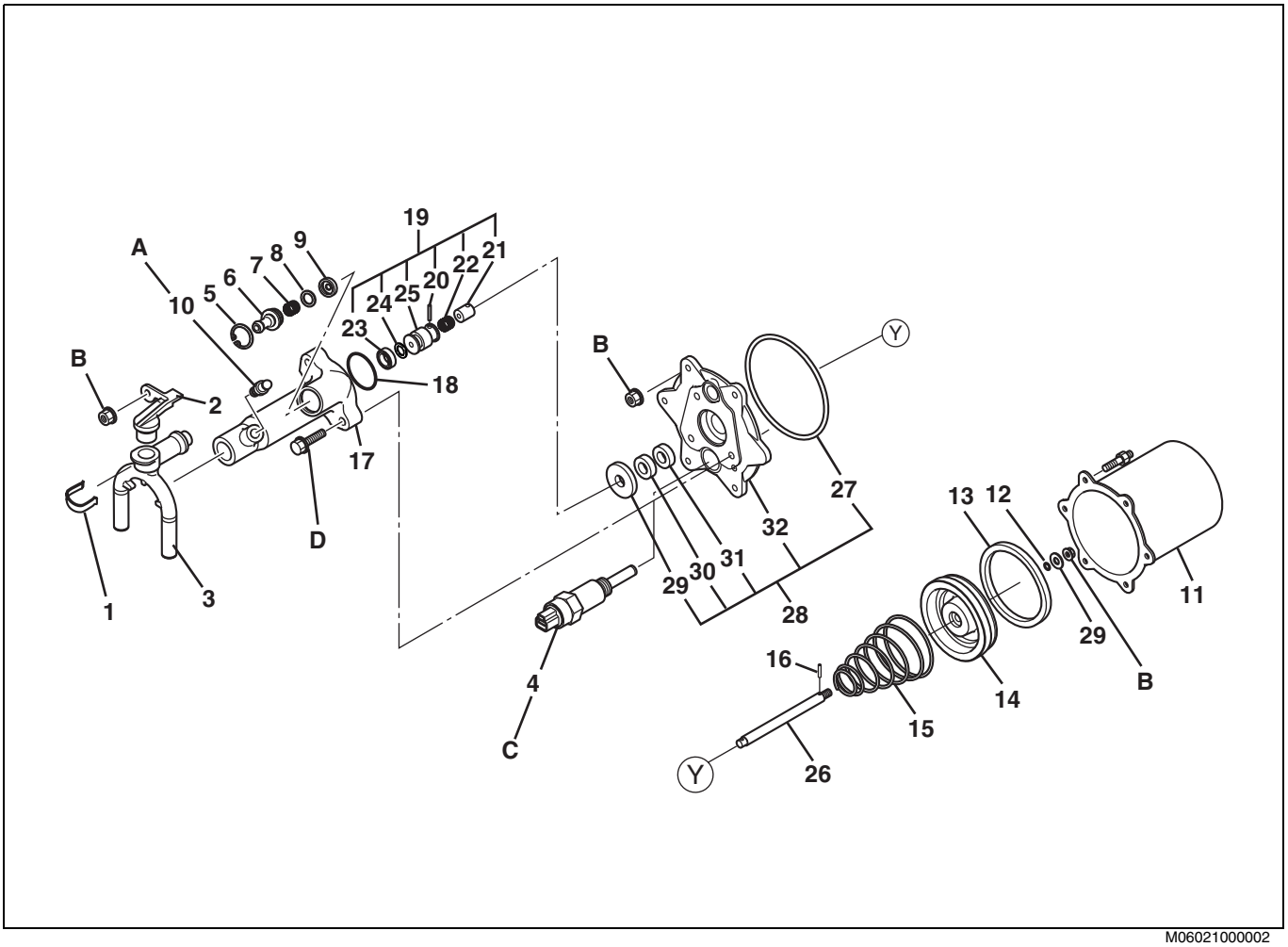
M06021001BEK1001

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

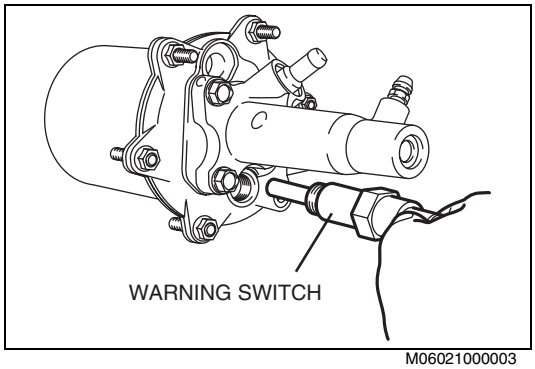
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

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 POINTS - DISASSEMBLY

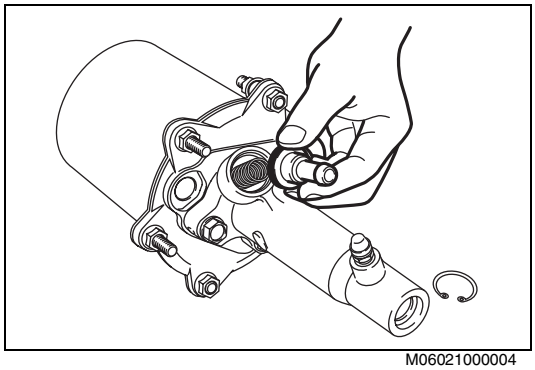


M06021000003

1. HYDRAULIC CYLINDER AND POWER CYLINDER

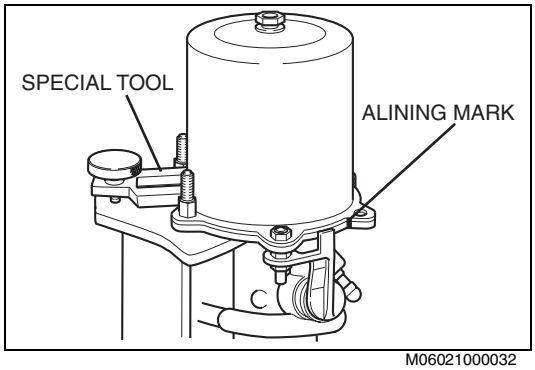
(1) Remove the nut and then remove the clamp, holder, and exhaust cover.

(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.

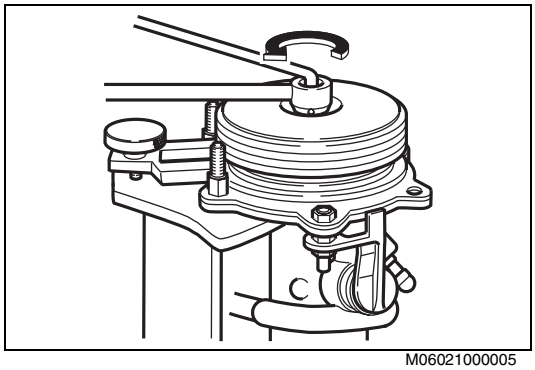


M06021000032

(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.

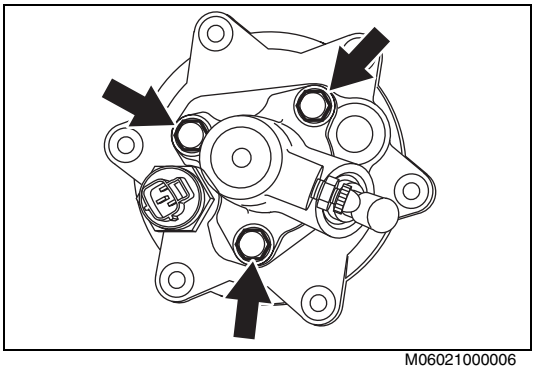
(6) Remove the nuts, then remove the power cylinder shell and O-ring.


M06021000005

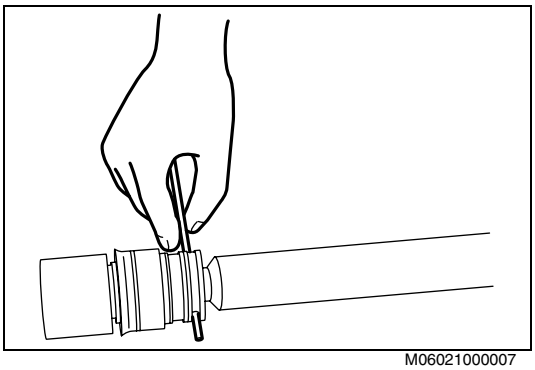
(7) Using the special tool, secure the power piston, then remove the nut.
SST: Power Piston Holder (09699-1410)

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.**

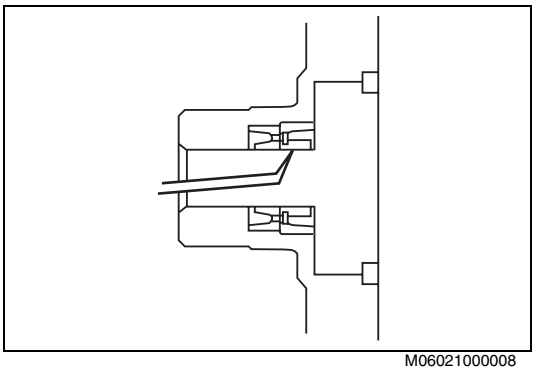
(8) Remove the O-ring, piston seal, power piston and return spring.


M06021000006

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


M06021000007

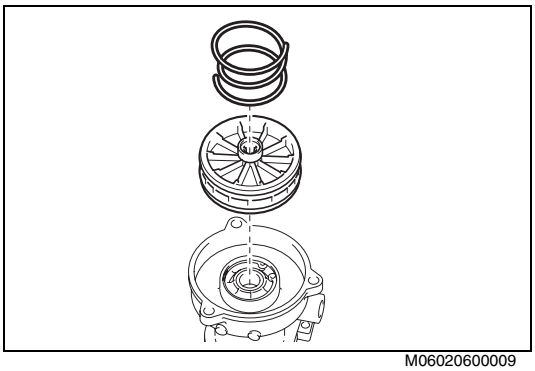
(10) Press and hold down the hydraulic piston spring and remove the pin, and then remove the hydraulic piston assembly.
(11) Remove the push rod, pulling it in the direction away from the push rod threaded part.


M06021000008

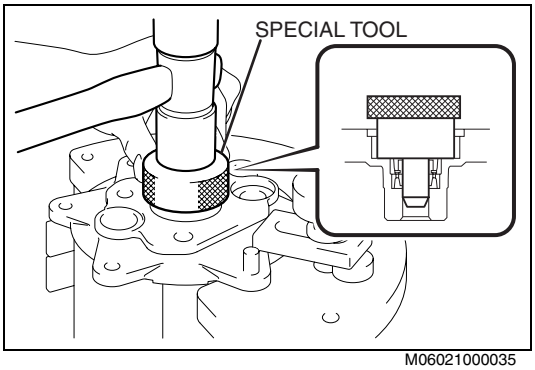
(12) Remove the washer from the end plate.
(13) Using the special tool, remove the oil seal (2 pieces) from the end plate.
SST: Puller (09651-1120)

IMPORTANT POINTS - ASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER


M06020600009

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

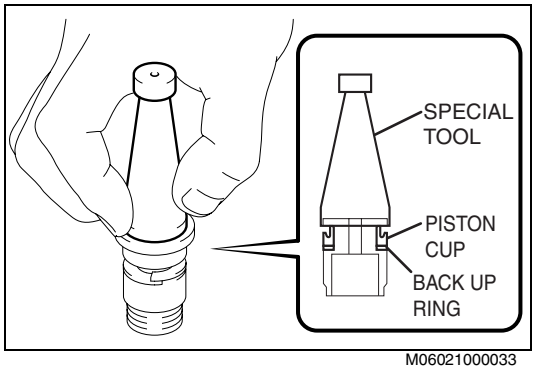


M06021000035

(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.

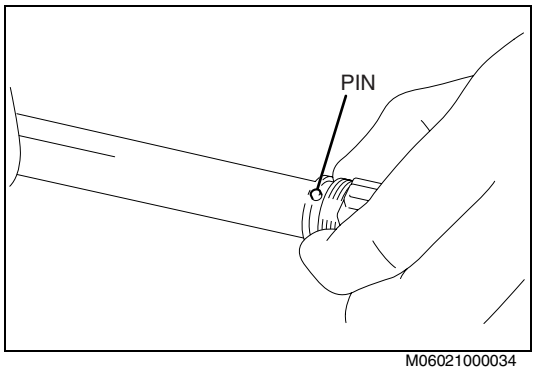


M06021000033

(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.**

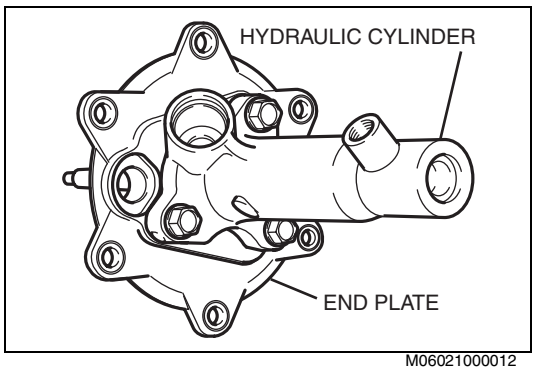
(5) Coat the push rod surfaces and valve seal with silicone grease, then install the push rod to the end plate, installing it in the direction away from the threaded parts.



M06021000034

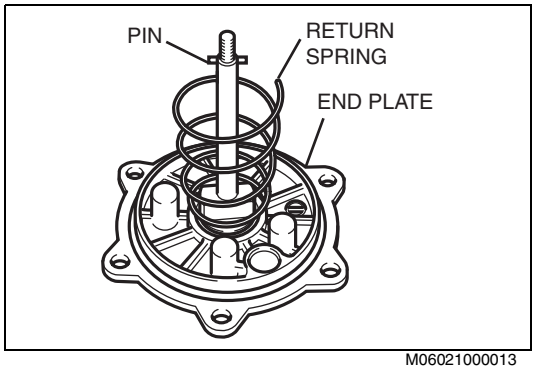
(6) Line up the push rod end pin, the valve seal hole and the hydraulic piston hole, and then insert the pin.

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



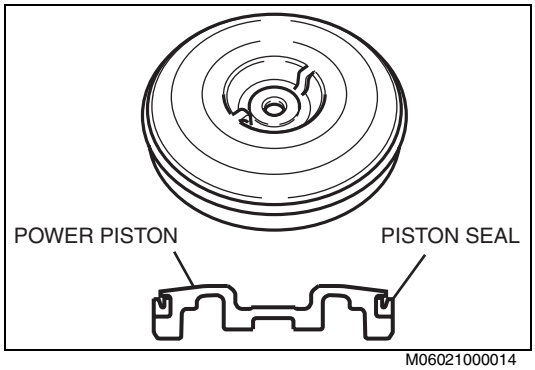
M06021000012

(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

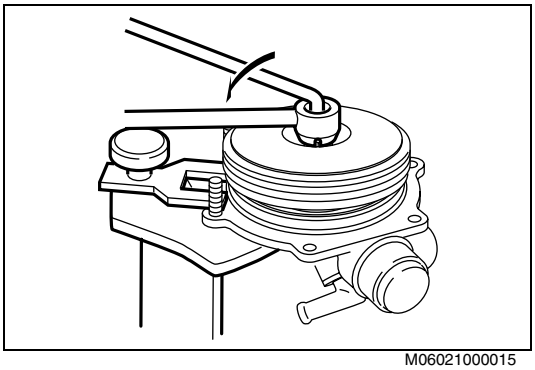
(10) Install the pin in the push rod threaded part hole.
(11) Install the return spring on the end plate.



M06021000014

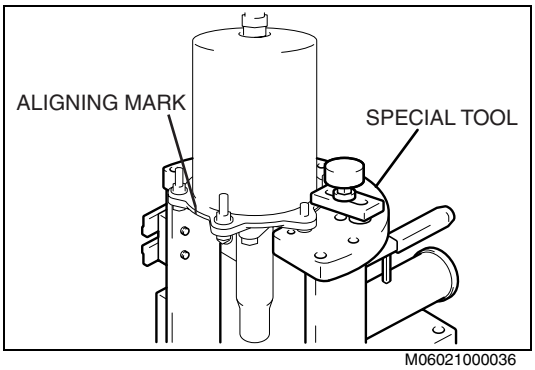
(12) Coat the piston seal groove of the power piston and piston seal with mineral grease (Air Master Paste or equivalent), and then install the piston seal to the power piston.

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


M06021000015

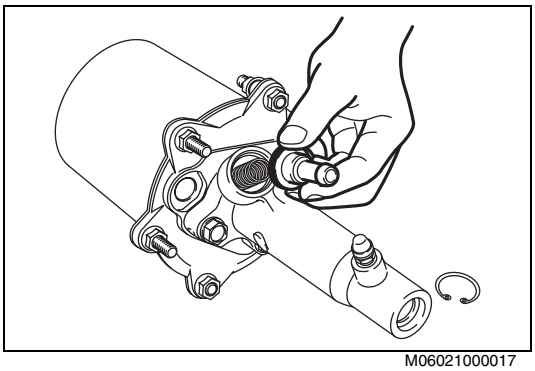
(13) While pressing and holding down the compression spring, install the O-ring and washer in that order, and then secure the hydraulic piston and push rod in place with the nut.
SST:
Power Piston Holder (09699-1410)
Stand (09630-2340)

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.**

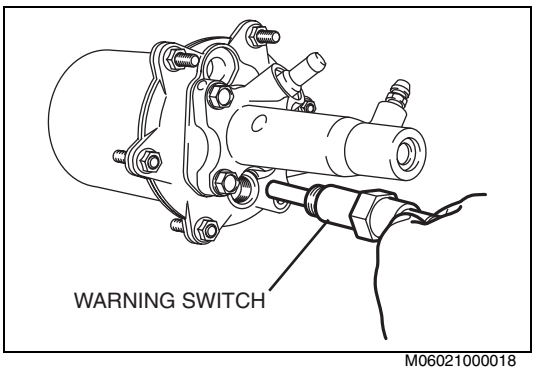


M06021000036

(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.



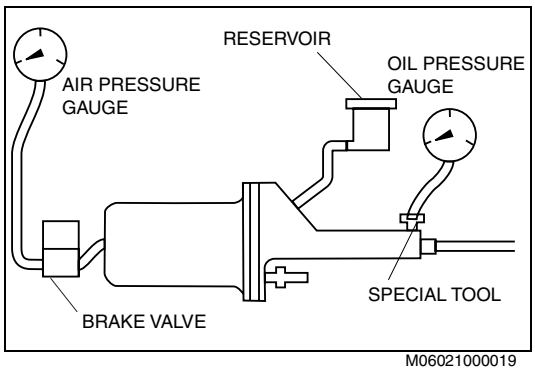
M06021000018

(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

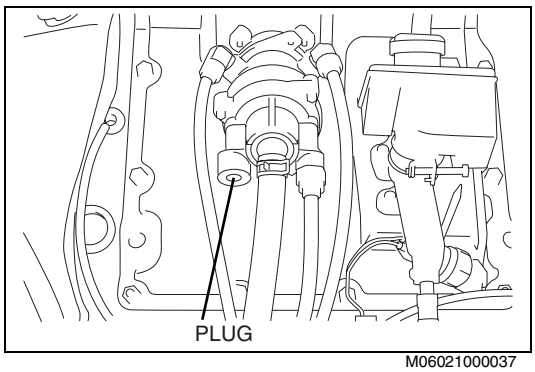
CHECKING OF BRAKE AIR BOOSTER FUNCTION



M06021000019

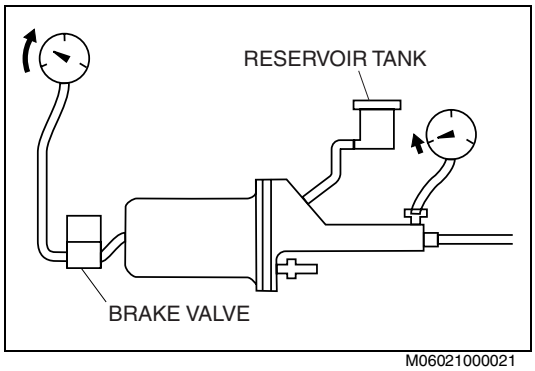
1. OPERATION CHECK OF BRAKE BOOSTER

(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

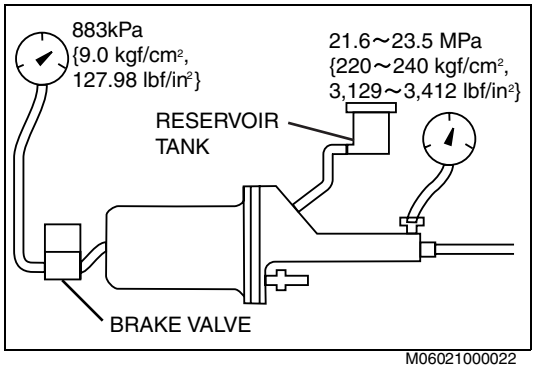
(2) Remove the plug from the brake valve assembly and attach an air pressure gauge to the brake valve assembly.



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 69kPa {0.7 kgf/cm^2, 9.95 lbf/in^2}



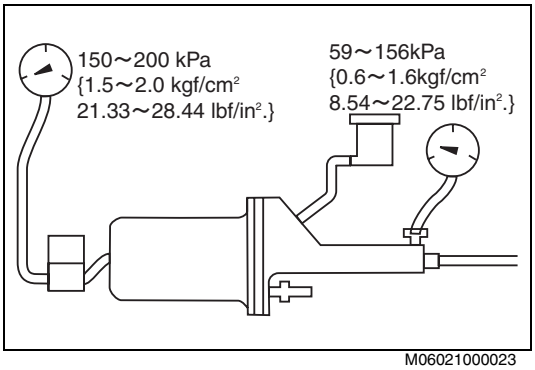
M06021000022

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 883kPa {9.0kgf/cm^2, 127.98 lbf/in^2}.
(4) Check to see that the oil pressure at that moment is between 21.6-23.5MPa {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.

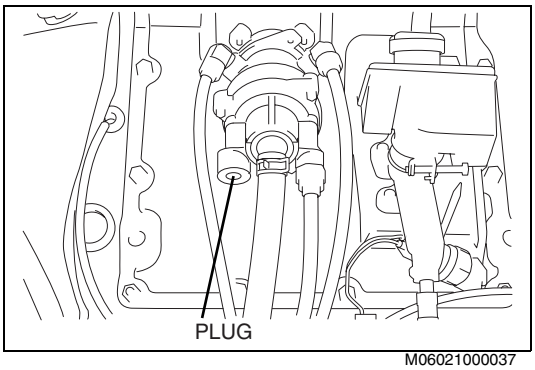


M06021000023

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

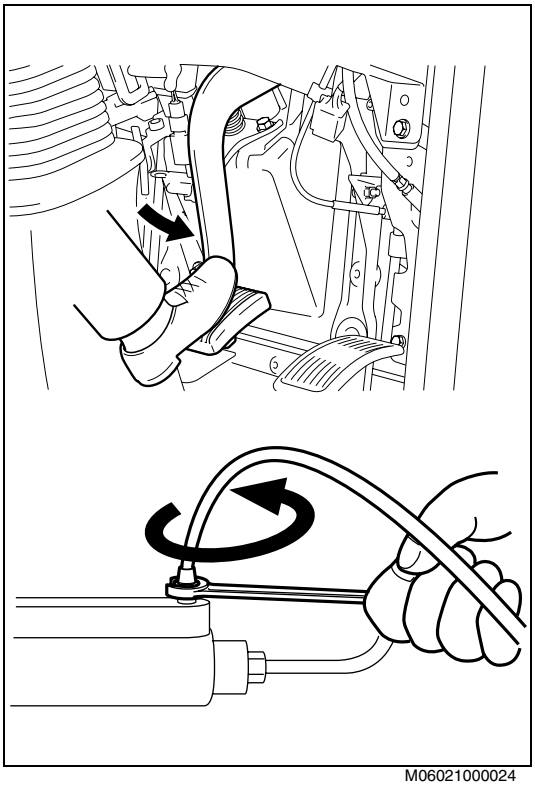
6. OPERATION AFTER CHECK

(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.

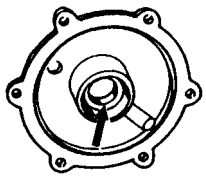
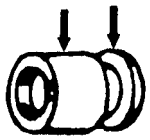
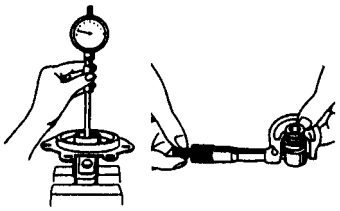
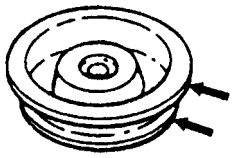
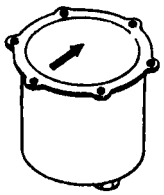
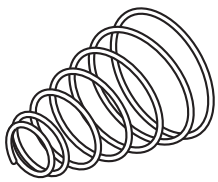
(4) Attach the bleeder screw of hydraulic cylinder.

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

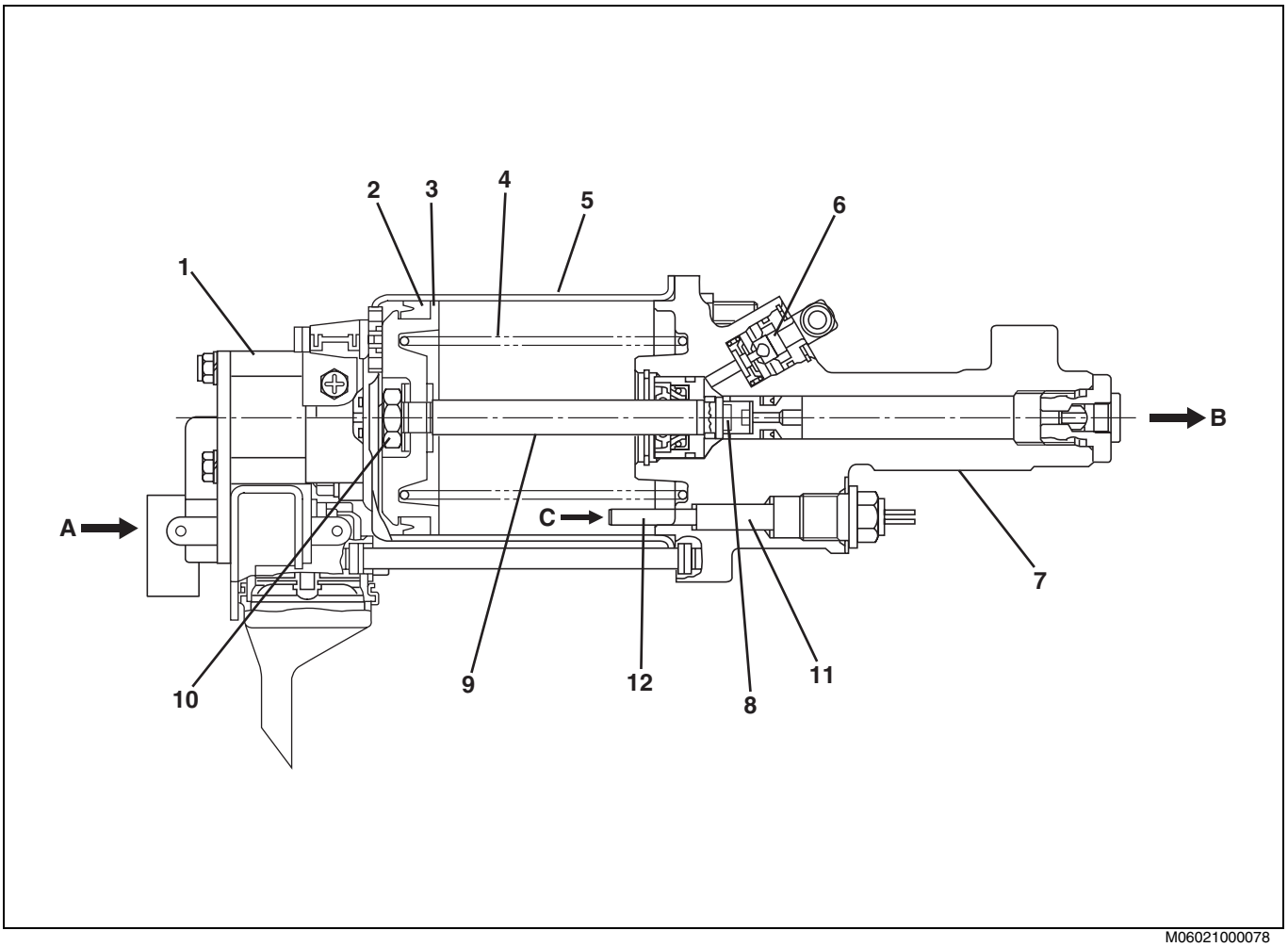
DATA AND SPECIFICATIONS

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



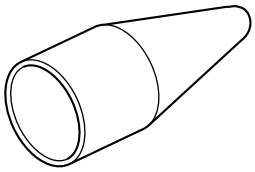
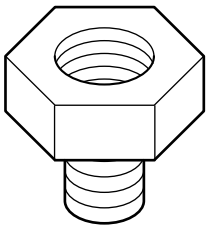
M06021000078

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

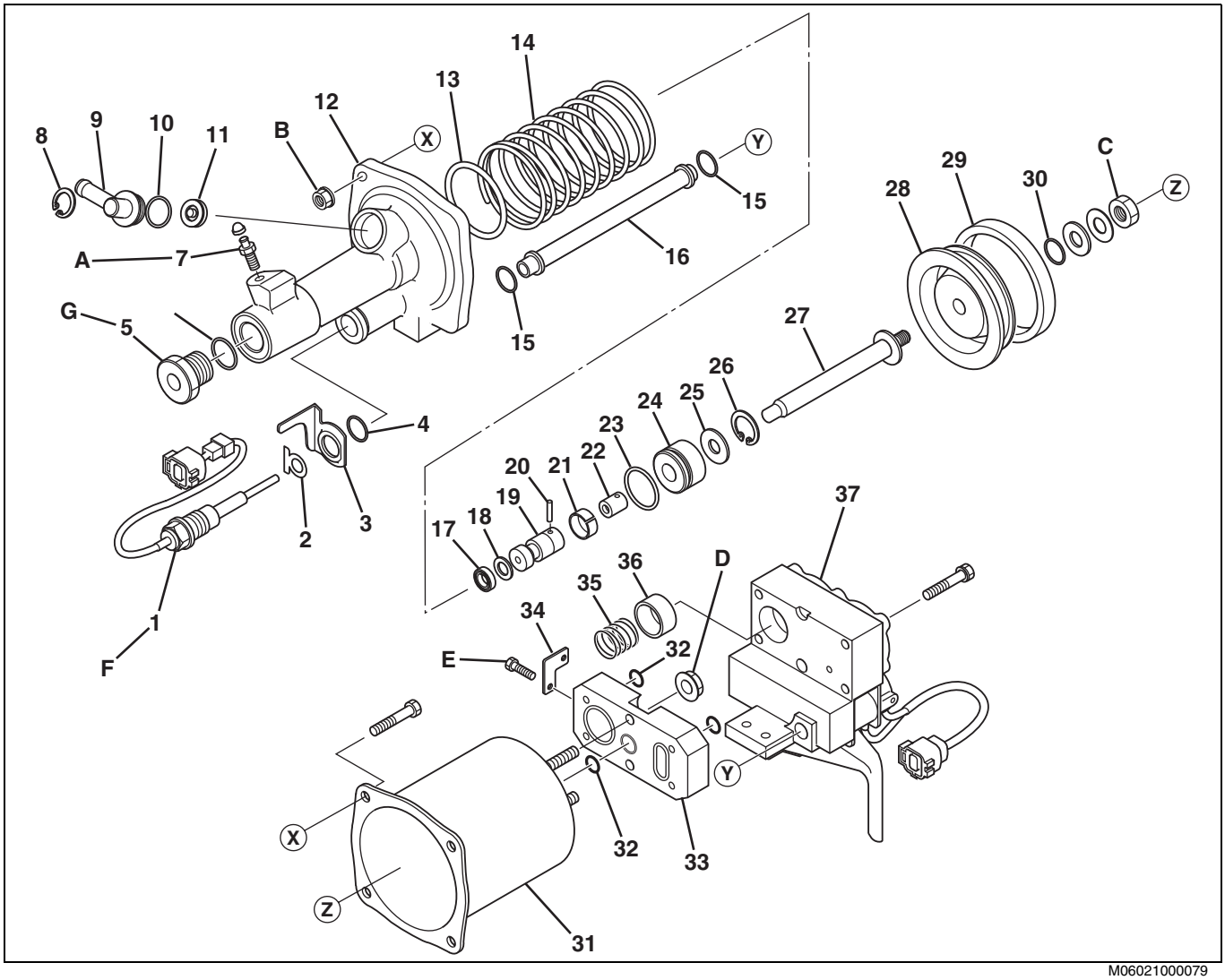
M06021001BEK1002

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

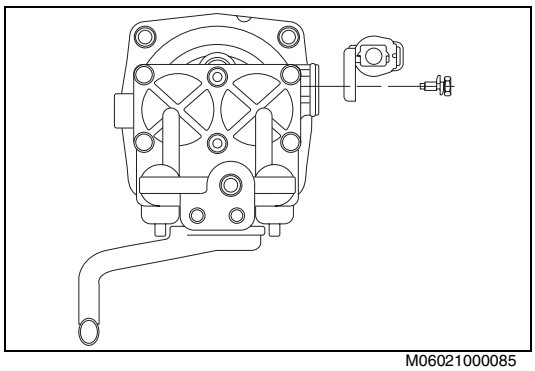
1	Stroke warning switch	20	Pin
2	Clip	21	Band
3	Bracket	22	Valve
4	O-ring	23	O-ring
5	End plug	24	Plug
6	O-ring	25	Oil seal holder
7	Air bleeder screw	26	Retainer ring
8	Retainer ring	27	Piston rod
9	Oil pipe joint	28	Power piston
10	O-ring	29	Piston seal
11	Check valve	30	O-ring
12	Hydraulic cylinder	31	Power cylinder shell
13	O-ring	32	O-ring
14	Return spring	33	Housing
15	O-ring	34	Bracket
16	Pipe	35	Spring
17	Piston cap	36	Return valve
18	Back up ring	37	ABS control valve
19	Hydraulic piston		

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

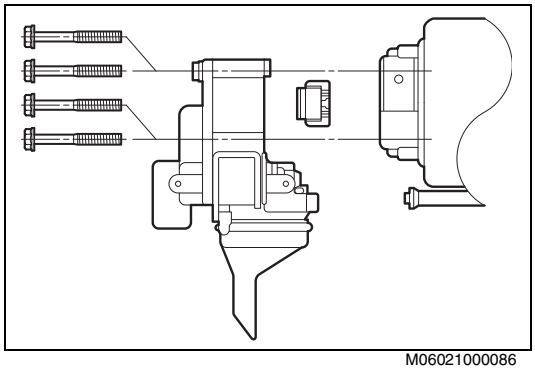
M06021001BEH2002


M06021000085

IMPORTANT POINTS - DISASSEMBLY

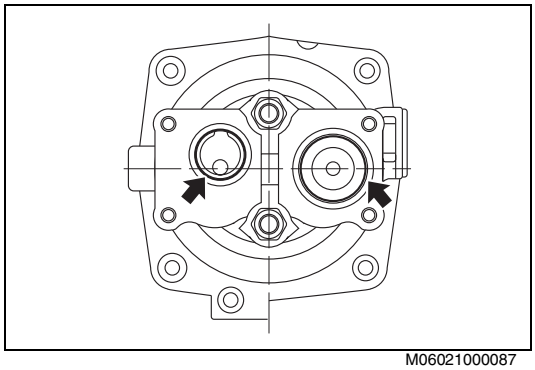
1. HYDRAULIC CYLINDER AND POWER CYLINDER

(1) Remove the mounting bolt of ABS control valve connector. Then remove the connector.

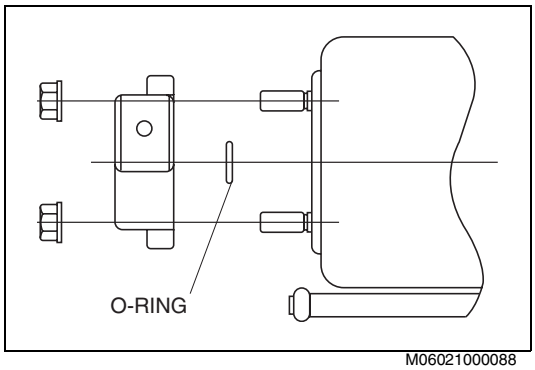

M06021000086

(2) Remove the bolts (4 pieces) and then remove ABS control valve, spring, and return valve.

NOTICE:
Do not disassemble ABS control valve.

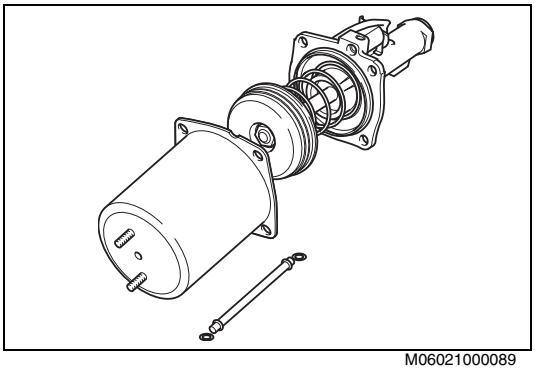

M06021000087

(3) Remove O-ring from the housing.



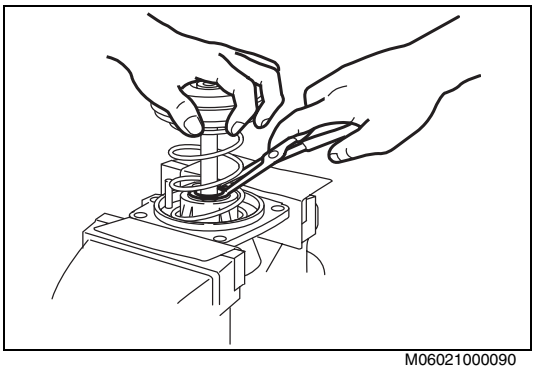
M06021000088

(4) Remove the nuts (2 pieces) and then remove the housing and O-ring from the air cylinder.


M06021000089

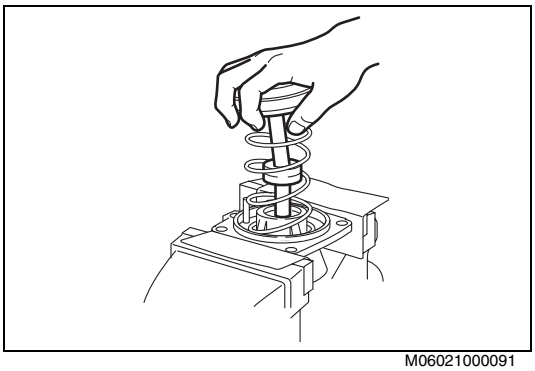
(5) Dismount the oil cylinder in assembly from the air cylinder.

NOTICE:
Be careful not to put any materials other than the lubricants which is specified on the parts on and after this step.


M06021000090

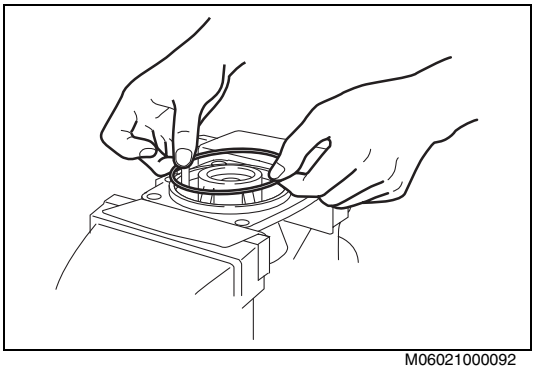
(6) Remove the snap ring from the oil cylinder using a suitable tool while pressing the air piston.

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.**

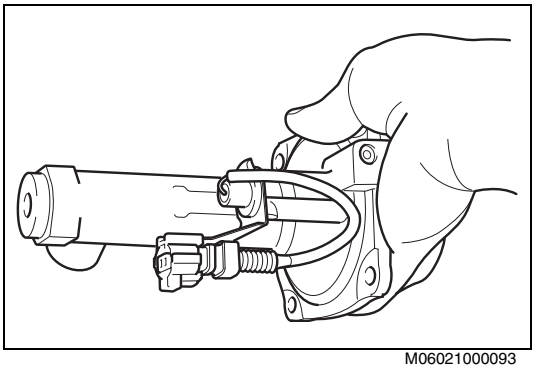

M06021000091

(7) Remove the air piston and return spring from the oil cylinder.

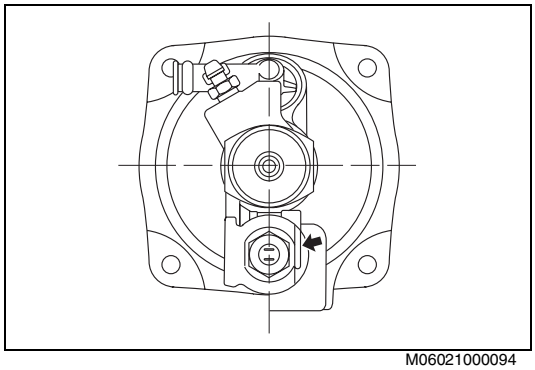
NOTICE:
When removing the plug, pull it out straightforward without twisting it forcibly.


M06021000092

(8) Remove O-ring from the oil cylinder.

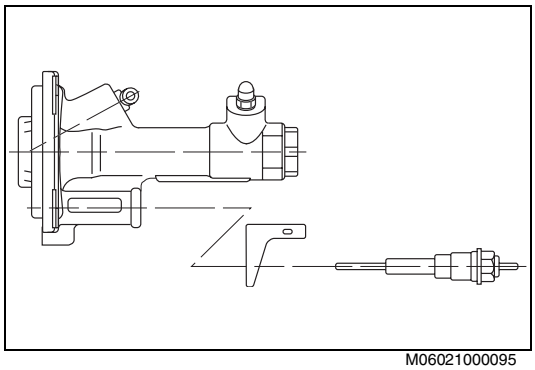

M06021000093

(9) Push the connector lock of the stroke detector switch using a small screwdriver or its equivalent. Then remove the connector from the bracket.



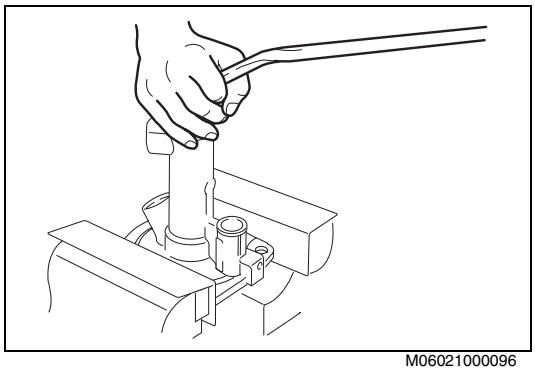
M06021000094

(10) Open the caulking section of the clip.



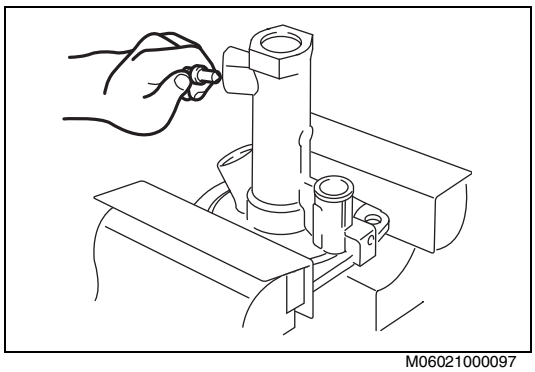
M06021000095

(11) Dismount the stroke detector switch, clip, bracket, and O-ring from the oil cylinder.



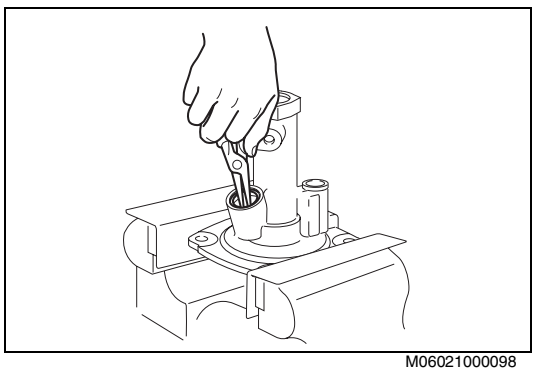
M06021000096

(12) Remove the end cap. Remove the O-ring from the oil cylinder.



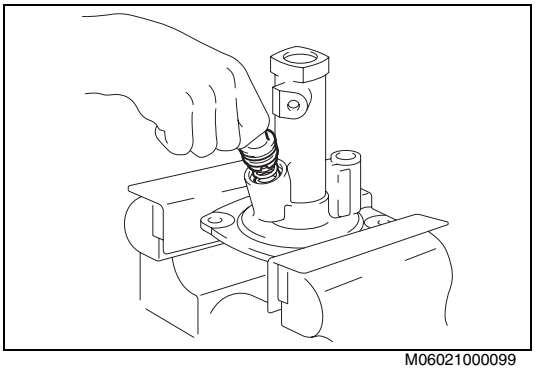
M06021000097

(13) Remove the cap and bleeder screw from the oil cylinder.

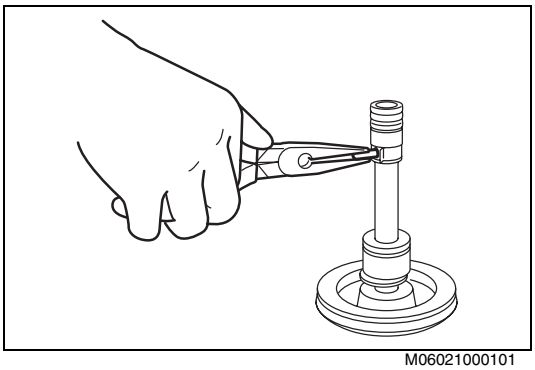


M06021000098

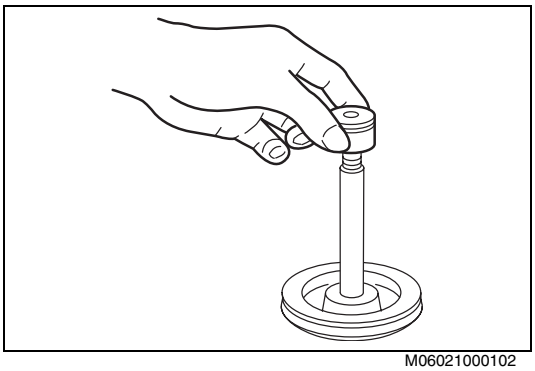
(14) Remove the retainer ring from the oil connector of oil cylinder by using a suitable tool.


M06021000099

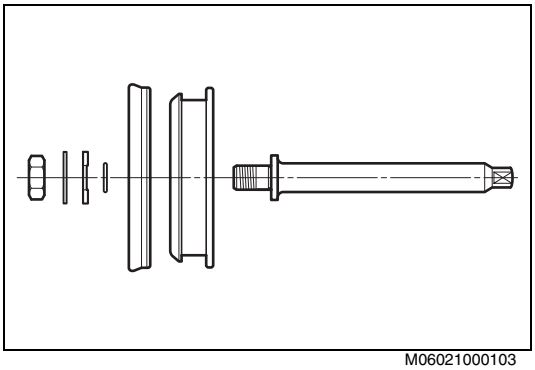
(15) Dismount the oil connector and O-ring from the oil cylinder.


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.

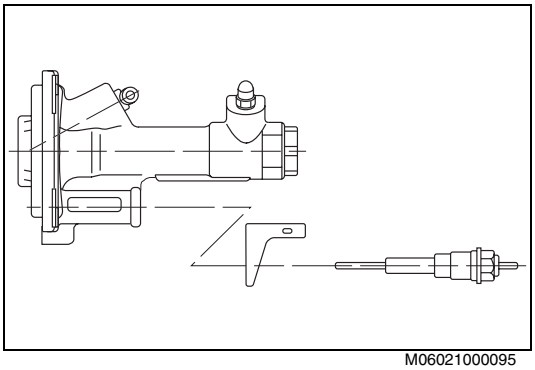

M06021000102

(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.


M06021000095

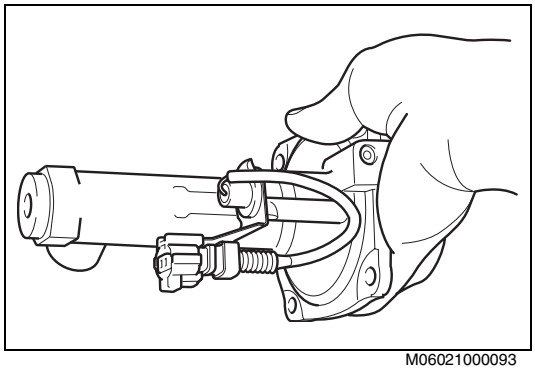
IMPORTANT POINTS - ASSEMBLY

1. HYDRAULIC CYLINDER AND POWER CYLINDER

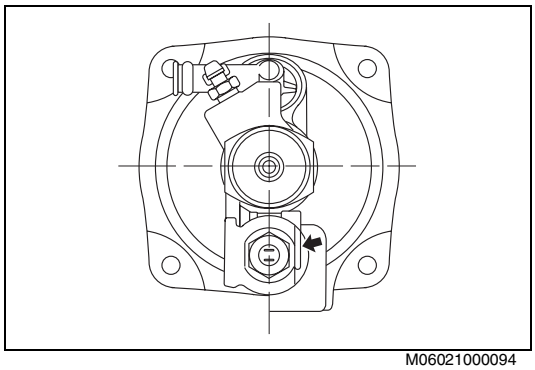
(1) Apply Albania grease to a new O-ring. Install this O-ring, clip, and bracket to the stroke detector switch.

NOTICE:
Be careful to the installing direction of the clip.

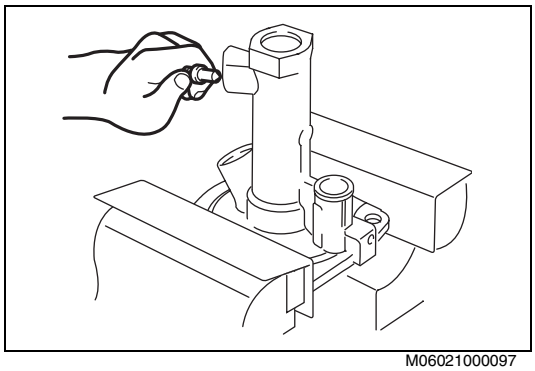
(2) Install the stroke detector switch to the oil cylinder.


M06021000093

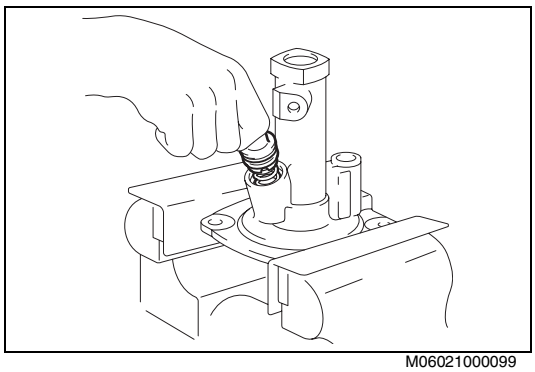
(3) Install the connector of the stroke detector switch to the bracket.


M06021000094

(4) Caulk and fix the clip to the bracket and stroke detector switch.


M06021000097

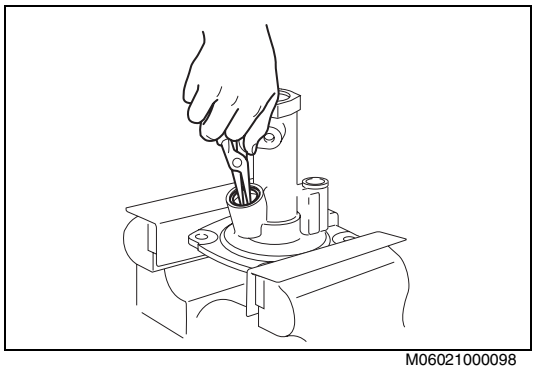
(5) Install the air bleeder screw to the oil cylinder.


M06021000099

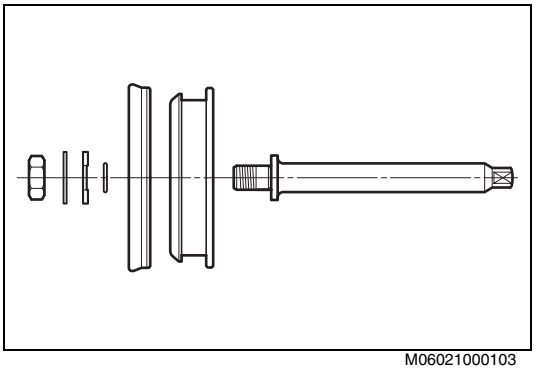
(6) Apply brake and clutch fluid to the check valve and install it to the oil cylinder.

NOTICE:
Install the check valve so that its rubber side is faced to the oil cylinder.

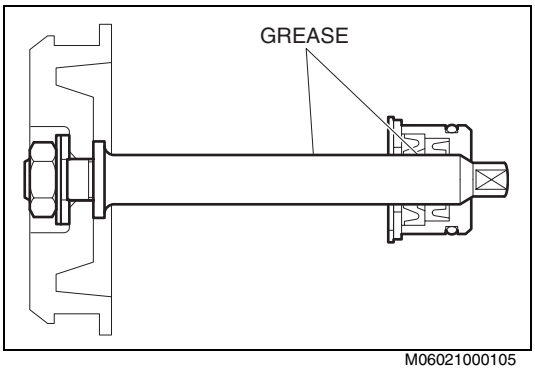
(7) Apply brake and clutch fluid to a new O-ring and install it to the oil connector.
(8) Install the oil connector to the oil cylinder.


M06021000098

(9) Using a suitable tool, install a new snap ring to fix the oil connector.

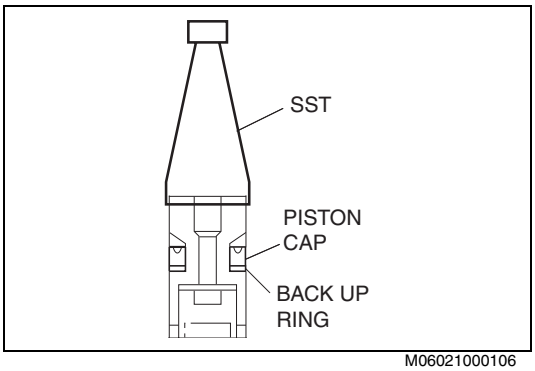

M06021000103

(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

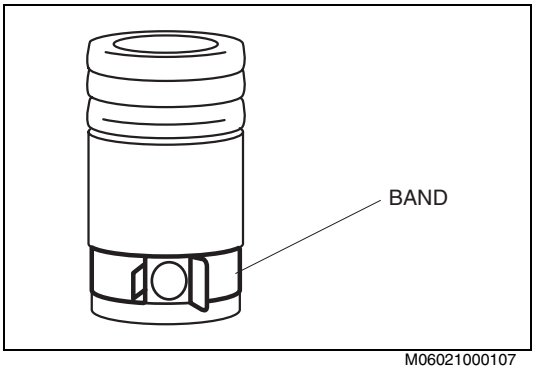
(12) Apply silicone grease to inner surface of a new plug and sliding part of the piston rod. Install to the piston rod a new retainer ring, oil seal holder, plug and O-ring.



M06021000106

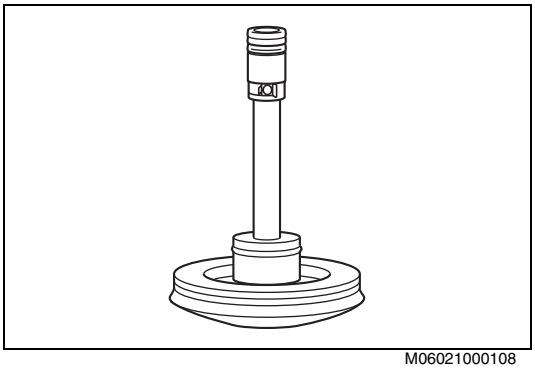
(13) Apply brake and clutch fluid to a new piston cup and backup ring. Install them to the hydraulic piston using special tool.
SST: PISTON CUP GUIDE (09657-2070)

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.**



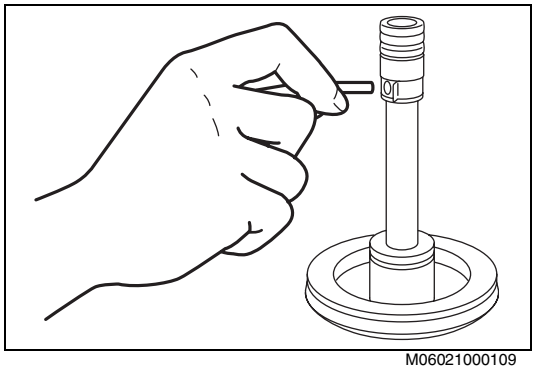
M06021000107

(14) Align the band hole to the pinhole of the hydraulic piston, and assemble them temporarily.

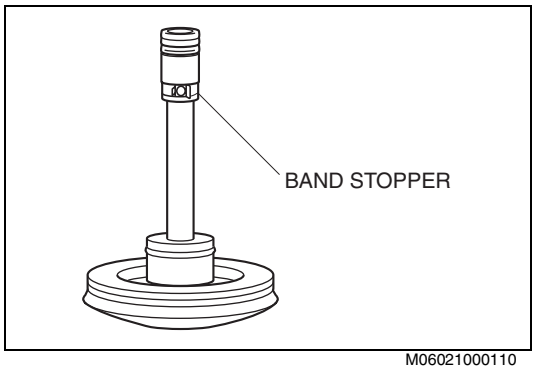

M06021000108

(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.

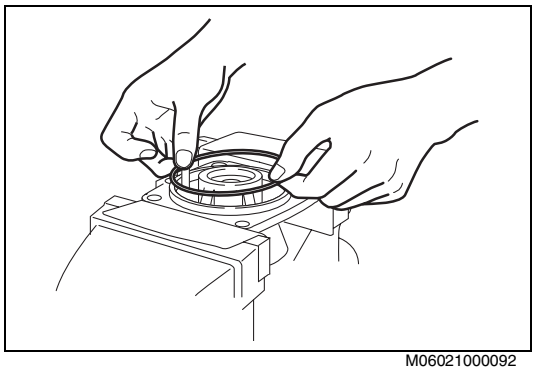

M06021000109

(16) Install the piston pin and assemble it.



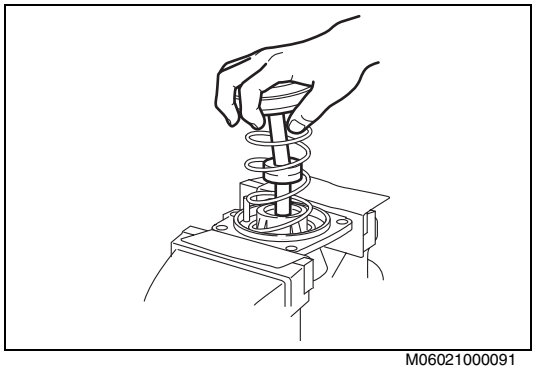
M06021000110

(17) Install the band stopper to the hole of hydraulic piston.


M06021000092

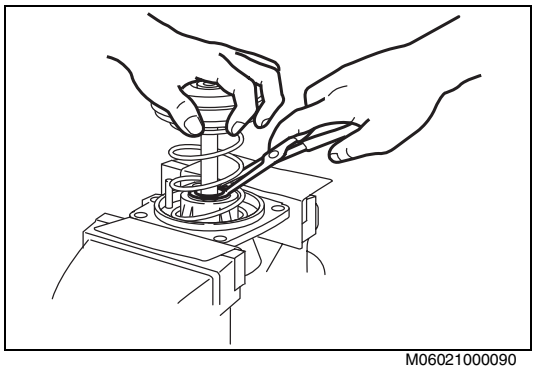
(18) Apply Albania grease No. 2 to a new O-ring and install it to the oil cylinder.

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.

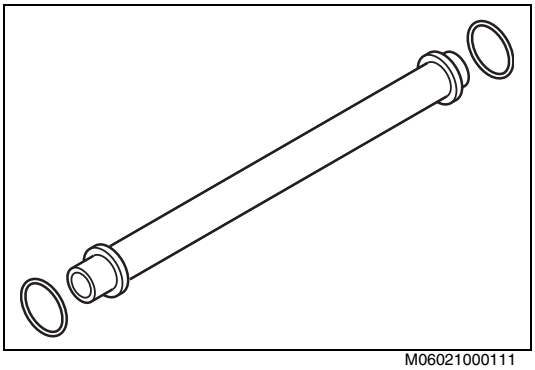

M06021000091

(19) Install the return spring and air piston in assembly to the oil cylinder.

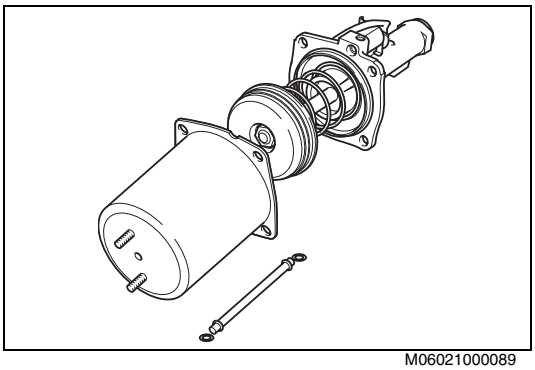
NOTICE:
Install the plug straightforward without pressing it forcibly when mounting it.


M06021000090

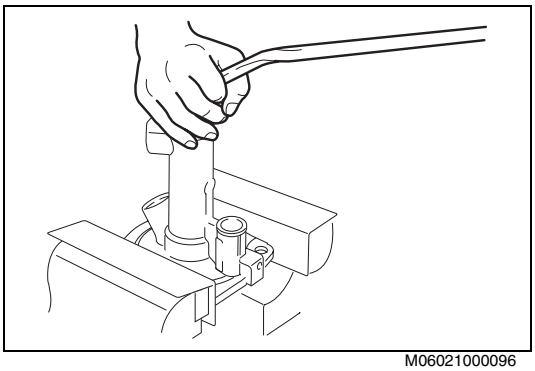
(20) Fix the plug by new retainer ring using a suitable tool.


M06021000111

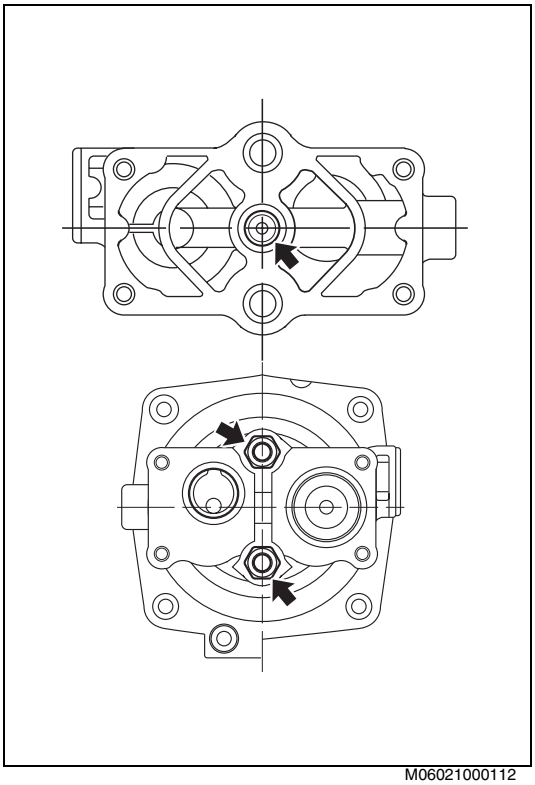
(21) Apply Albania grease No. 2 to new seals and mount them to the ends of the pipe.


M06021000089

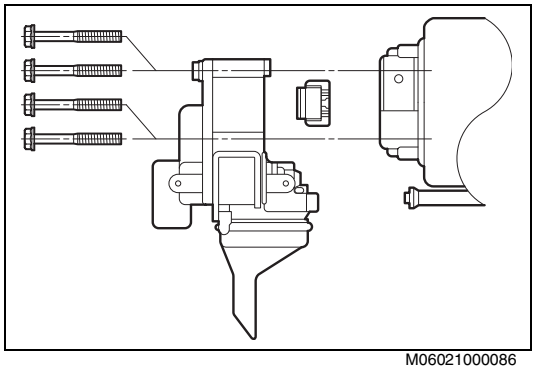
(22) Apply Albania grease No. 2 to the sliding part of the air piston of air cylinder. Mount the air cylinder and pipe to the oil cylinder.


M06021000096

(23) Install a new O-ring to the end cap and mount them to the oil cylinder.

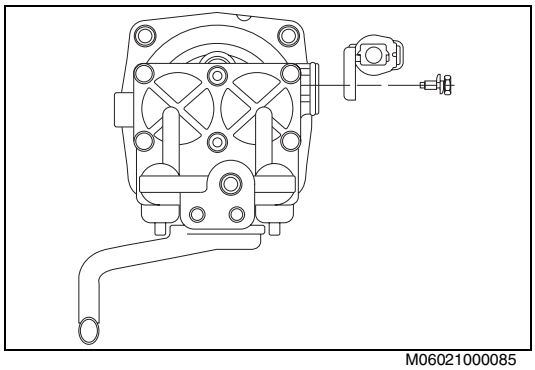

M06021000112

(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).

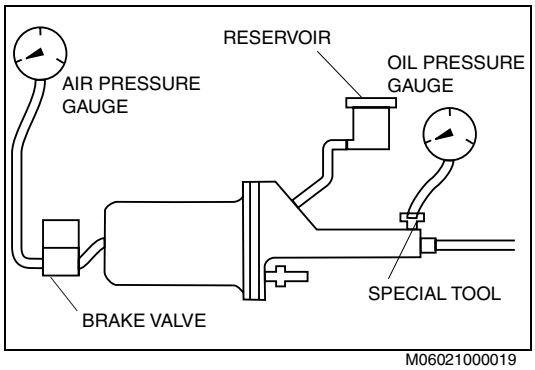
NOTICE:
- **Be careful to the mounting direction of return valve.**
- **Do not apply grease to the rubber seat of return valve.**
- **Do not remove the rubber located at the end of the return valve.**


M06021000085

(26) Mount the connector bracket to ABS control valve.

INSPECTION

M06021001BEH3005



M06021000019

CHECKING OF BRAKE BOOSTER FUNCTION

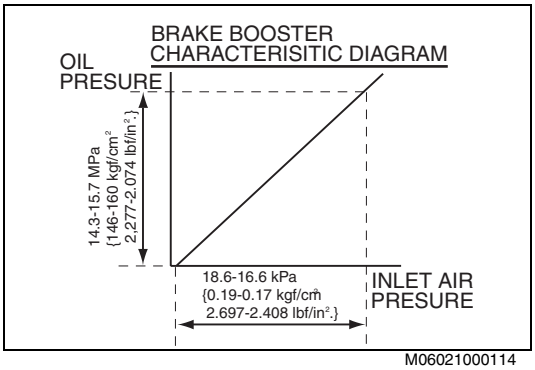
For the inspection after assembly, a special tester is available. Use this tester for inspection. For inspection procedure by special tester, refer to "Instruction manual" that has come with the tester. If the tester is not available, follow the instruction below to check oil and air leakage, performance, 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

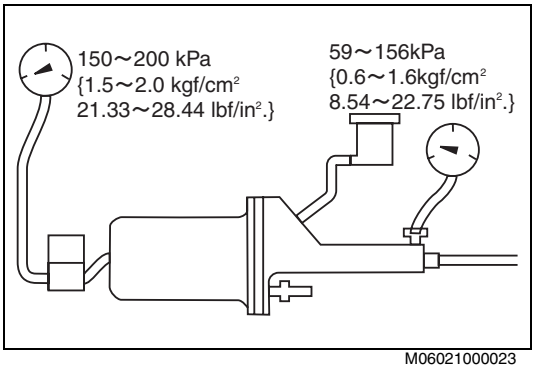
(1) Remove the air bleeder of hydraulic cylinder. Using special tool, set an oil pressure gauge of 2.55 MPa {250 kgf/cm^2, 3,556 lbf/in^2.} scale.
Connection: M12 x 1.5
SST: CONNECTOR (09699-1400)

2. TIGHTNESS OF OIL AND AIR

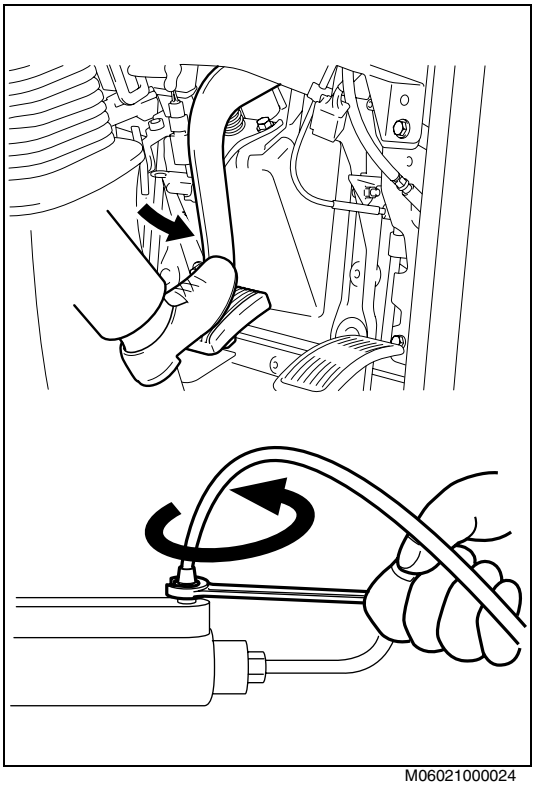
(1) Apply air tank inlet pressure 834 kPa {8.5 kgf/cm^2, 121 lbf/in^2.} and stop the source pressure. On this condition, check that the oil pressure does not fluctuate for 15 seconds.
(2) Using soap water, check visually that there is no air leakage at the tightened connection.



M06021000114



M06021000023


M06021000024

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.

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.**

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.

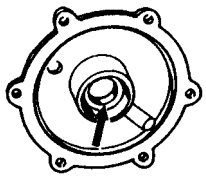
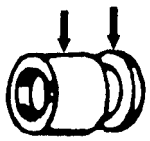
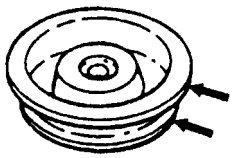
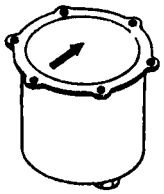
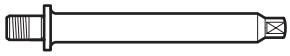
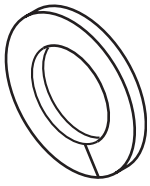
HINT:

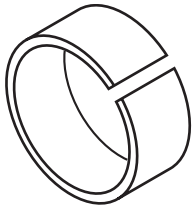
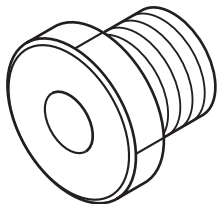
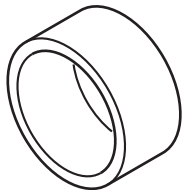
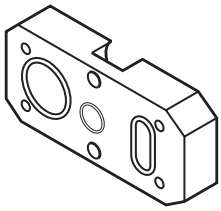
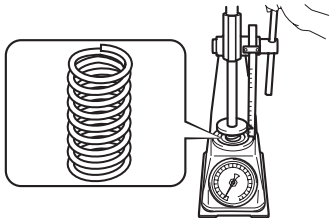
The warning buzzer does not beep unless the parking brake is released.

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** 

RELAY VALVE

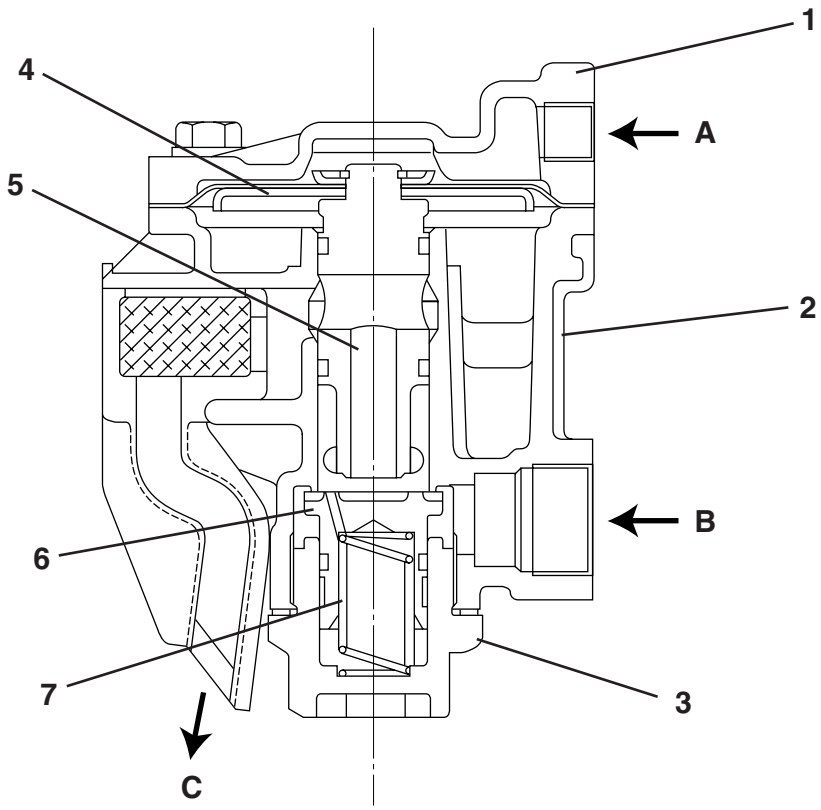
DATA AND SPECIFICATIONS

M06021301BEI2002

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

DESCRIPTION

M060213BEC1002

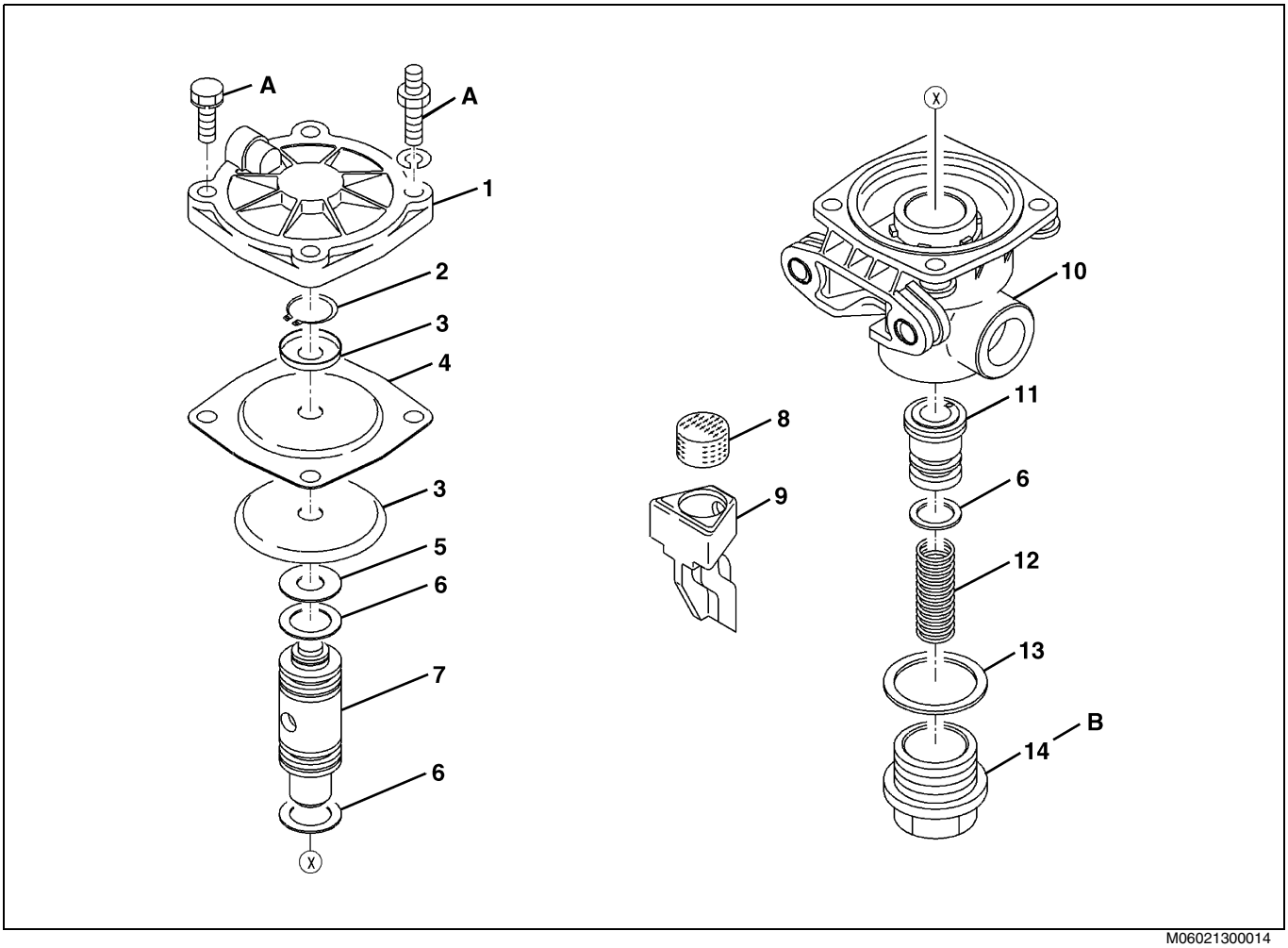


M06021300013

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

COMPONENT LOCATOR

M06021301BED1002



M06021300014

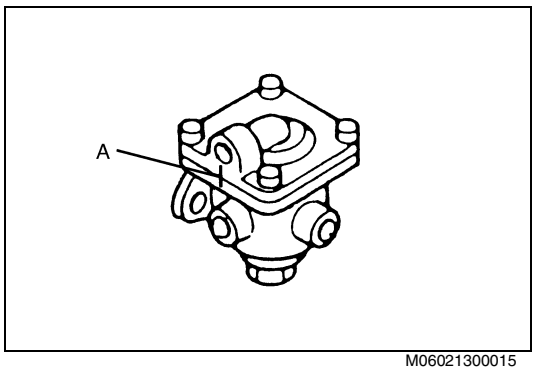
1	Cover	8	Filter
2	Retainer ring	9	Dust cover
3	Washer	10	Body
4	Diaphragm	11	Feed valve
5	Shim	12	Return spring
6	O-ring	13	Gasket
7	Exhaust valve	14	Cap

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

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

OVERHAUL

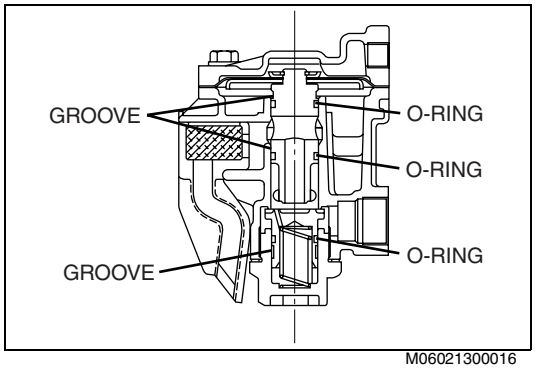
M06021301BEH2002



M06021300015

IMPORTANT POINT - DISASSEMBLY

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



M06021300016

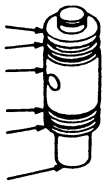
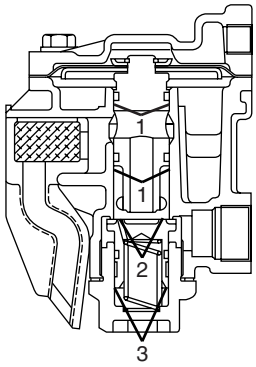
IMPORTANT POINT - ASSEMBLY

1. LUBRICATION
(1) When reassembling the relay valve, replace the O-rings, diaphragm, gasket and feed valve with new ones.
(2) Apply adequate amount of the silicone grease to the O-rings, grease groove and sliding surfaces of the component parts.
(3) When installing the cover to the body, align the aligning marks which were applied at disassembly.

INSPECTION AND REPAIR

M06021301BEH3002

Unit: mm {in.}

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

SPRING BRAKE CONTROL VALVE

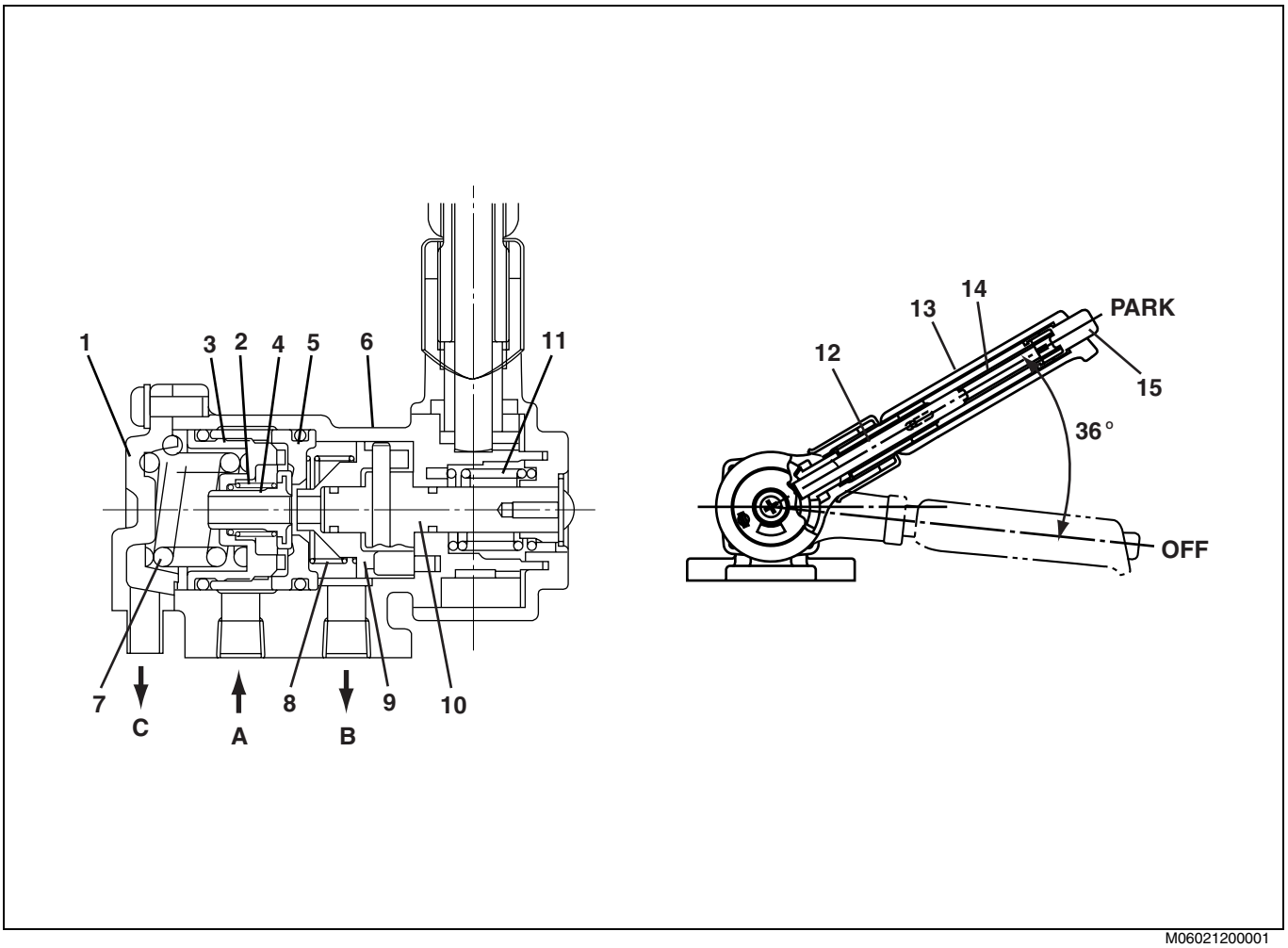
DATA AND SPECIFICATIONS

M06021201BEI2001

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

DESCRIPTION

M06021201BEC1001

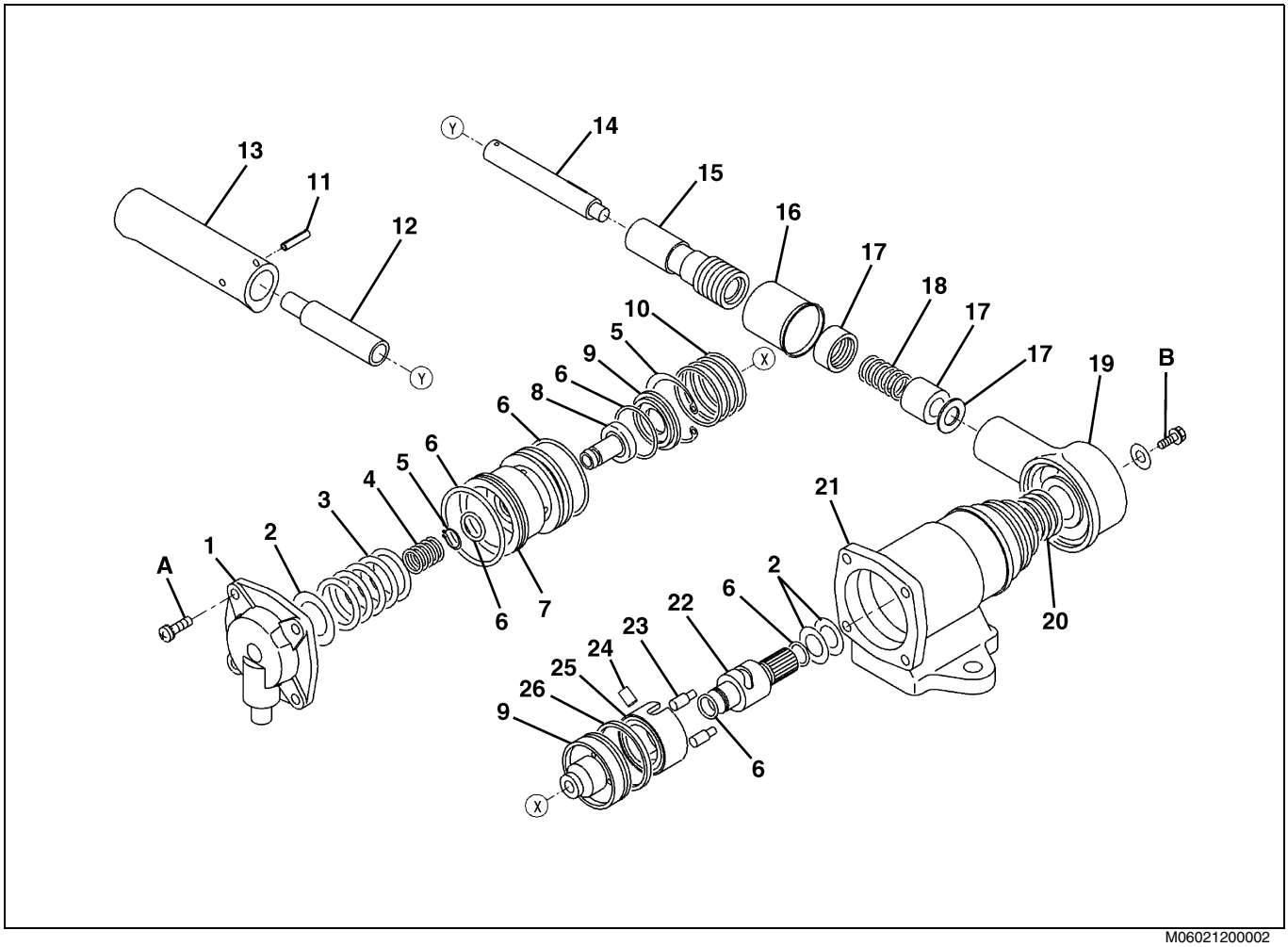


M06021200001

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

COMPONENT LOCATOR

M06021201BED1001



M06021200002

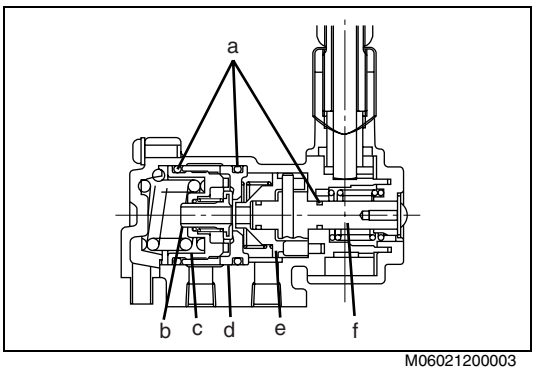
1	Body cover	10	Valve seat spring	19	Body cap
2	Shim	11	Lock pin	20	Return spring (If so equipped)
3	Piston spring	12	Release rod knob	21	Valve body
4	Feed valve spring	13	Grip	22	Cam holder
5	Retainer ring	14	Pull rod	23	Body pin
6	O-ring	15	Supporter	24	Cam holder pin
7	Piston	16	Cover	25	Cam
8	Feed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

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

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

OVERHAUL

M06021201BEH2002



M06021200003

IMPORTANT POINTS - ASSEMBLY

1. LUBRICATION

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

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

a. O-ring

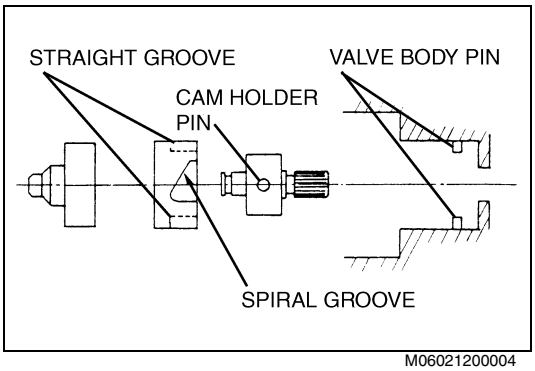
b. Feed valve

c. Piston

d. Valve seat

e. Cam

f. Cam holder

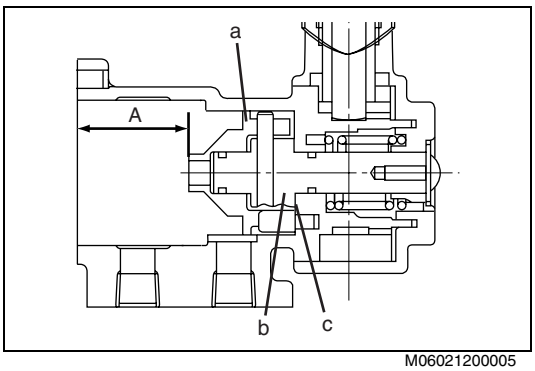


M06021200004

2. ASSEMBLE THE CAM ASSEMBLY.

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

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



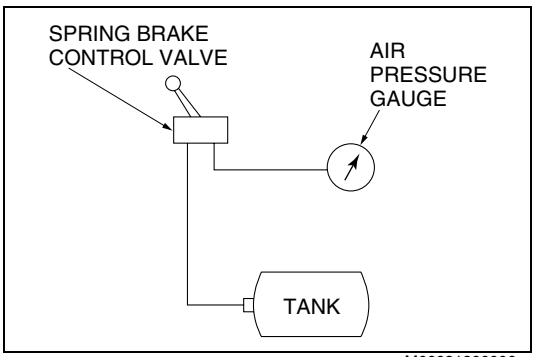
M06021200005

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

a. Cam

b. Cam holder

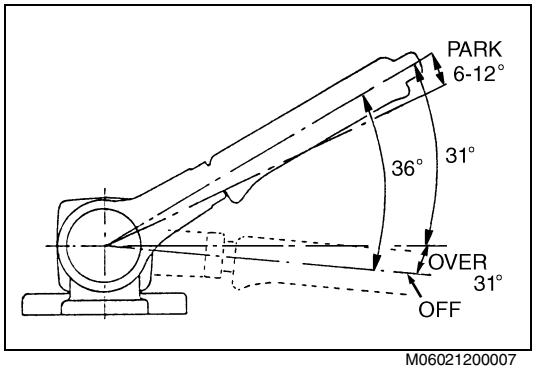
c. Shim



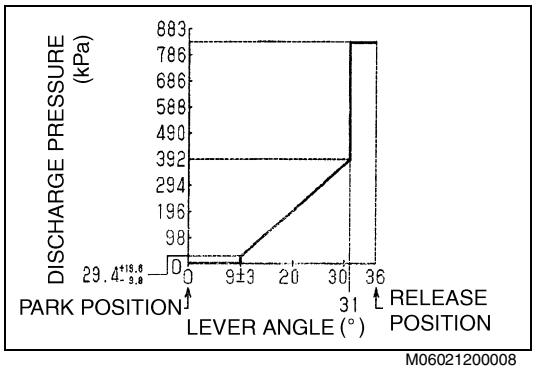
M06021200006

3. SPRING BRAKE CONTROL VALVE PERFORMANCE TEST

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



M06021200007



M06021200008

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

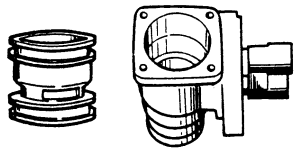
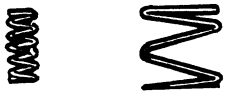
Lever angle:	Outlet pressure: kPa {kgf/cm^2, lbf/in^2.}
6-12°	19.6-49 {0.2-0.5, 2.85-7.11}
Over 31°	834 {8.5, 121}

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

INSPECTION AND REPAIR

M06021201BEH3001

Unit: mm {in.}

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

SPRING BRAKE CHAMBER

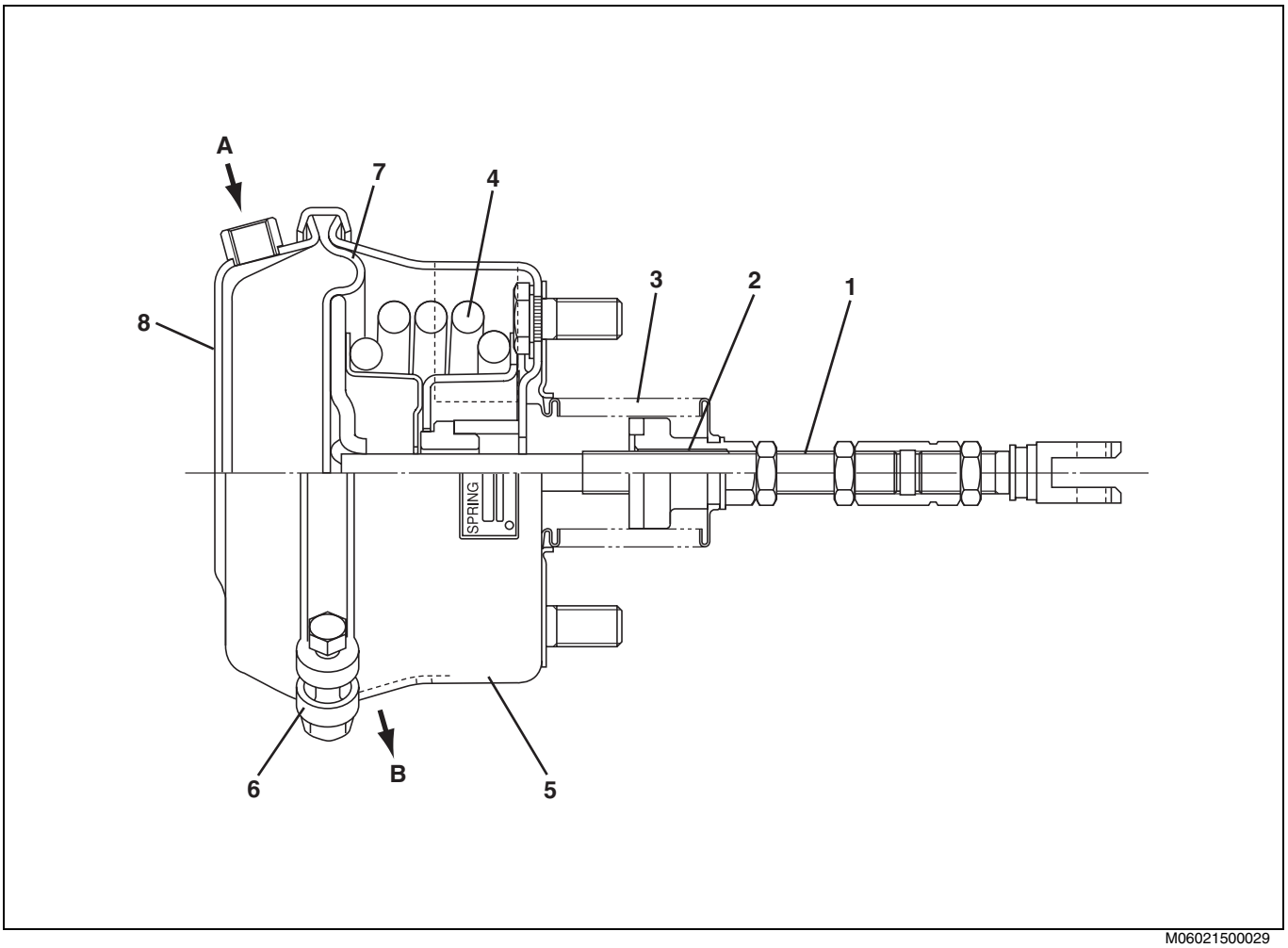
DATA AND SPECIFICATIONS

M06021501BEI2003

Type	**Diaphragm type**

DESCRIPTION

M06021501BEC1006

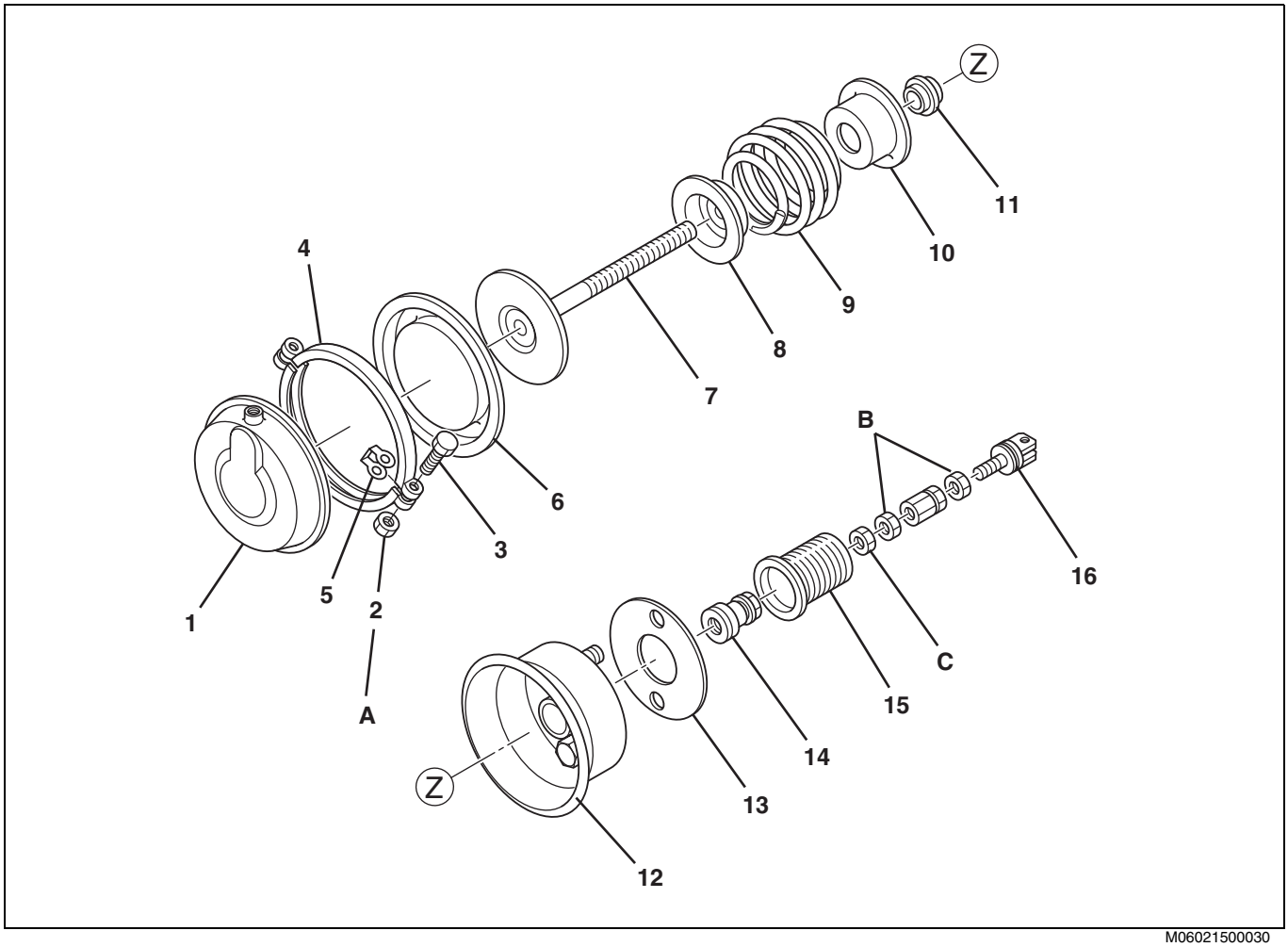


M06021500029

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

COMPONENT LOCATOR

M06021501BED1003



M06021500030

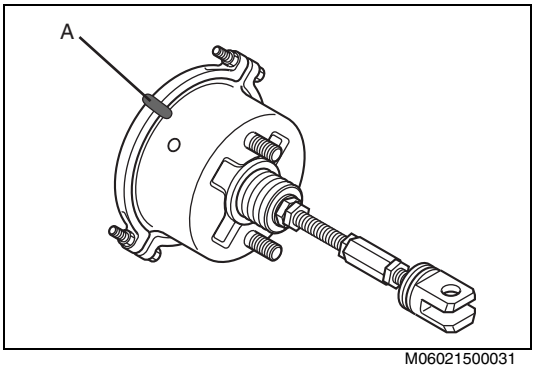
1	Chamber cover	9	Return spring
2	Clamp nut	10	Spring seat
3	Clamp bolt	11	Guide
4	Clamp	12	Chamber
5	Spacer	13	Boot retainer
6	Diaphragm	14	Rod holder
7	Push rod	15	Dust boot
8	Spring holder	16	Clevis

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

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

OVERHAUL

M06021501BEH2003



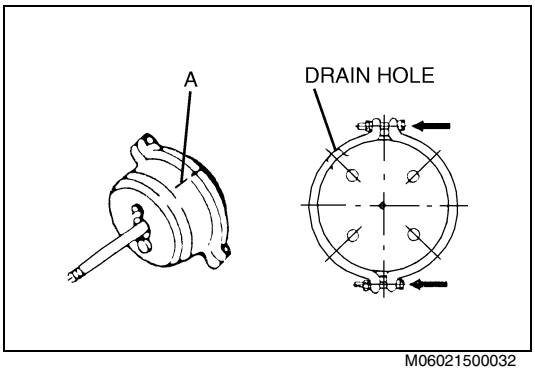
M06021500031

IMPORTANT POINT - DISMOUNTING

1. DISMOUNTING OF THE SPRING BRAKE CHAMBER

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

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



M06021500032

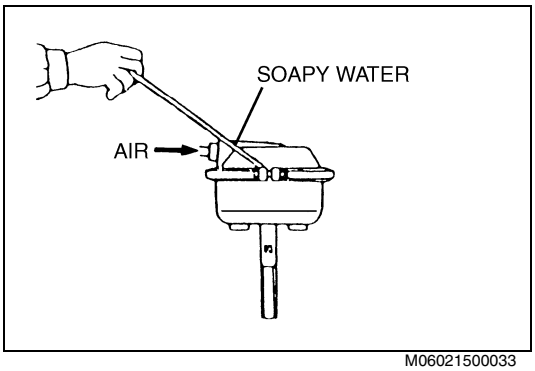
IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLING THE SPRING BRAKE CHAMBER

(1) Replace the diaphragm with new one.

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

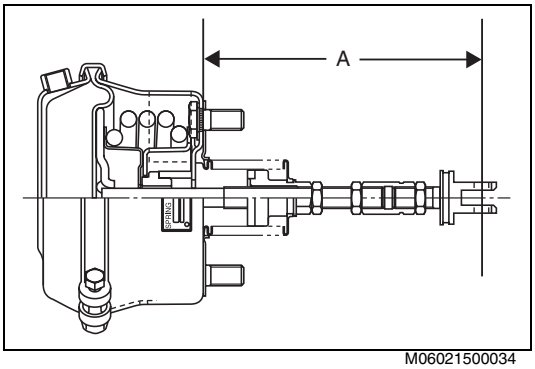
(3) Insert the bolt from opposite side of drain hole and tighten the bolts evenly with nut within specified torque.



M06021500033

2. CHECKING FOR AIR LEAKAGE

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



M06021500034

3. INSTALLATION OF CLEVIS.

(1) Install the clevis to the push rod and adjust the dimension A for specified value.
Assembly standard: A
For model FD: 273.5 mm {10.768 in.}
For model GD: 204 mm {8.031 in.}

IMPORTANT POINT - MOUNTING

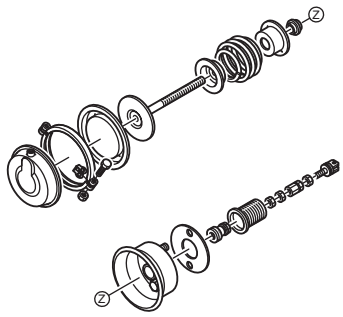
The chamber should be installed for former side.

NOTICE:

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

INSPECTION AND REPAIR

M06021501BEH3003

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

WHEEL BRAKE

DATA AND SPECIFICATIONS

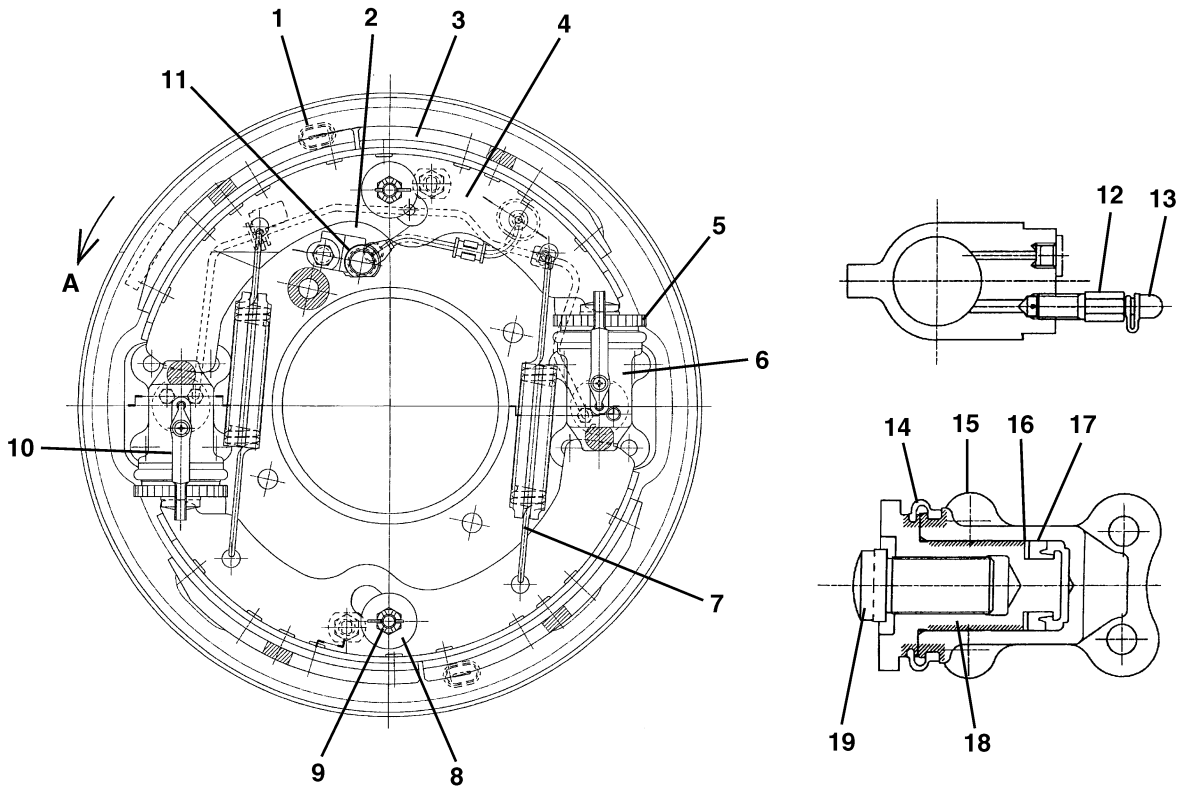
M06021801BEI2002

Model		FT	GT
Type		Drum brake with hydraulically actuated, internally expanding, two-leading shoes in front wheels and dual two-leading shoes in rear wheels.	
Brake drum inside diameter		400 mm {15.75 in.} for both front and rear.	
Brake lining (Width x Thickness)	Front	120 x 15 mm {4.72 x 0.59 in.}	
	Rear	130 x 15 mm {5.12 x 0.59 in.}	155 x 15 mm {6.10 x 0.59 in.}
Wheel cylinder bore diameter	Front	38.10 mm {1.50 in.}	
	Rear	38.10 mm {1.50 in.}	

DESCRIPTION

M06021801BEC1006

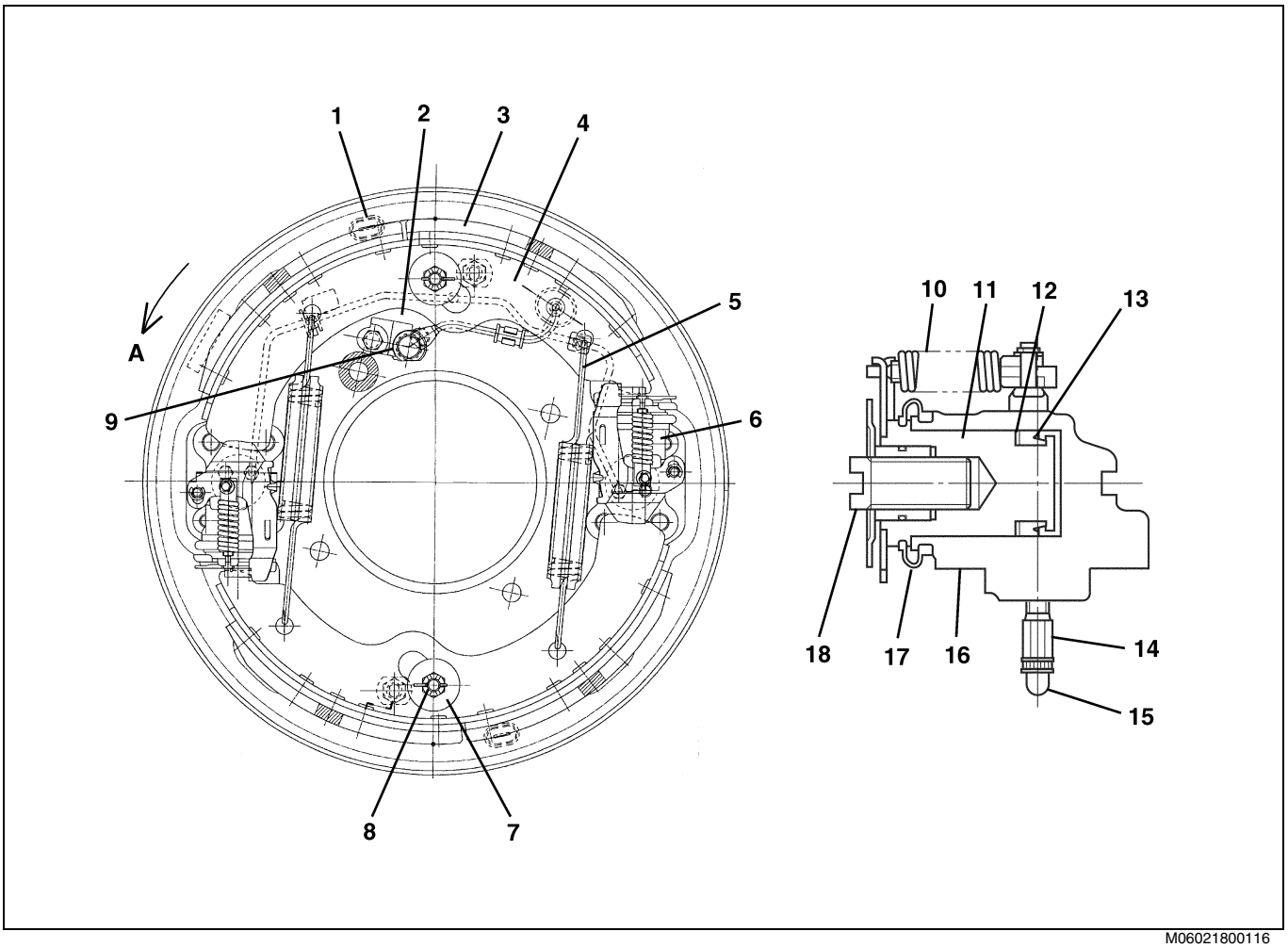
FRONT



M06021800115

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

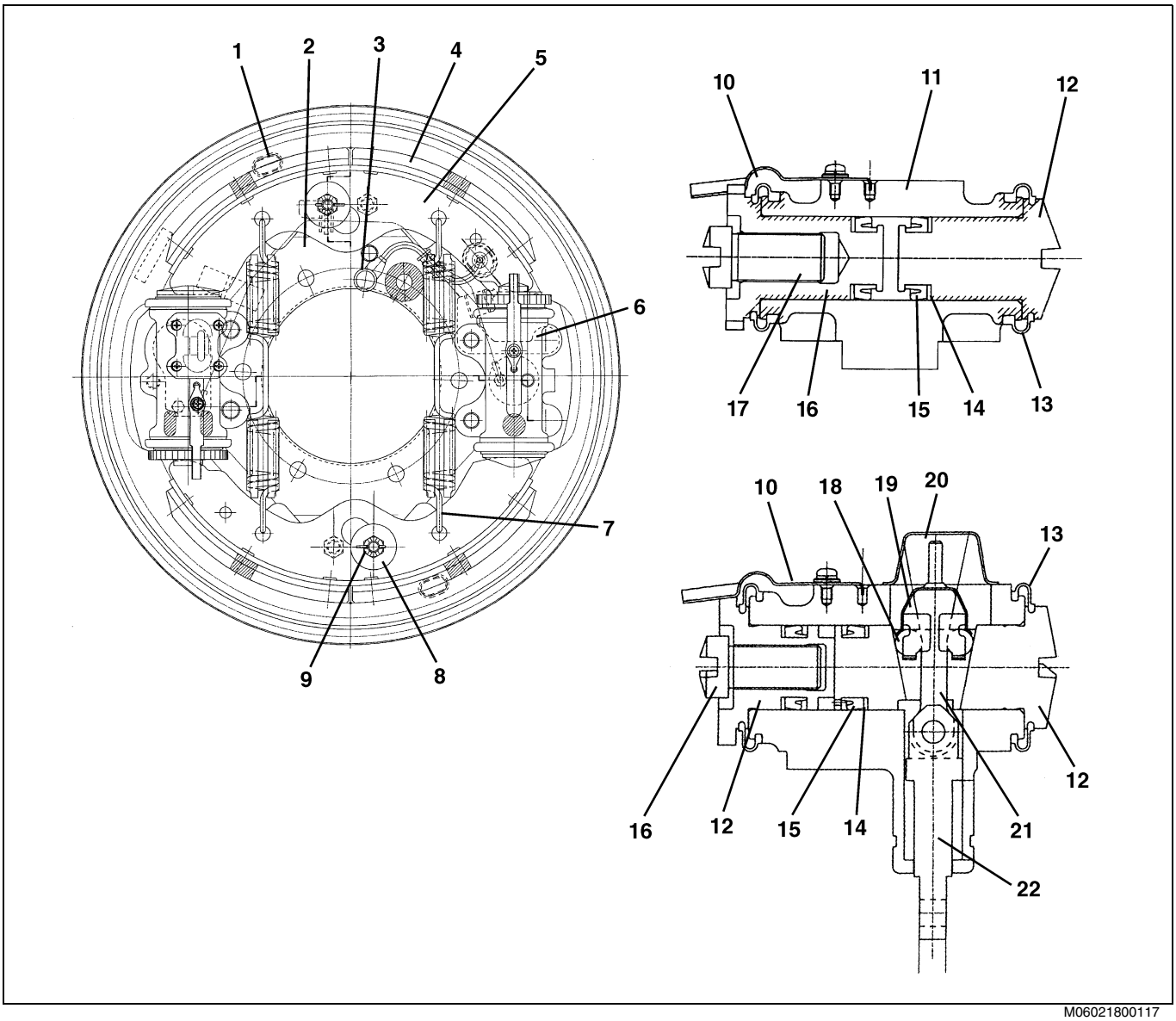
FRONT (WITH AUTO-ADJUSTER)



M06021800116

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

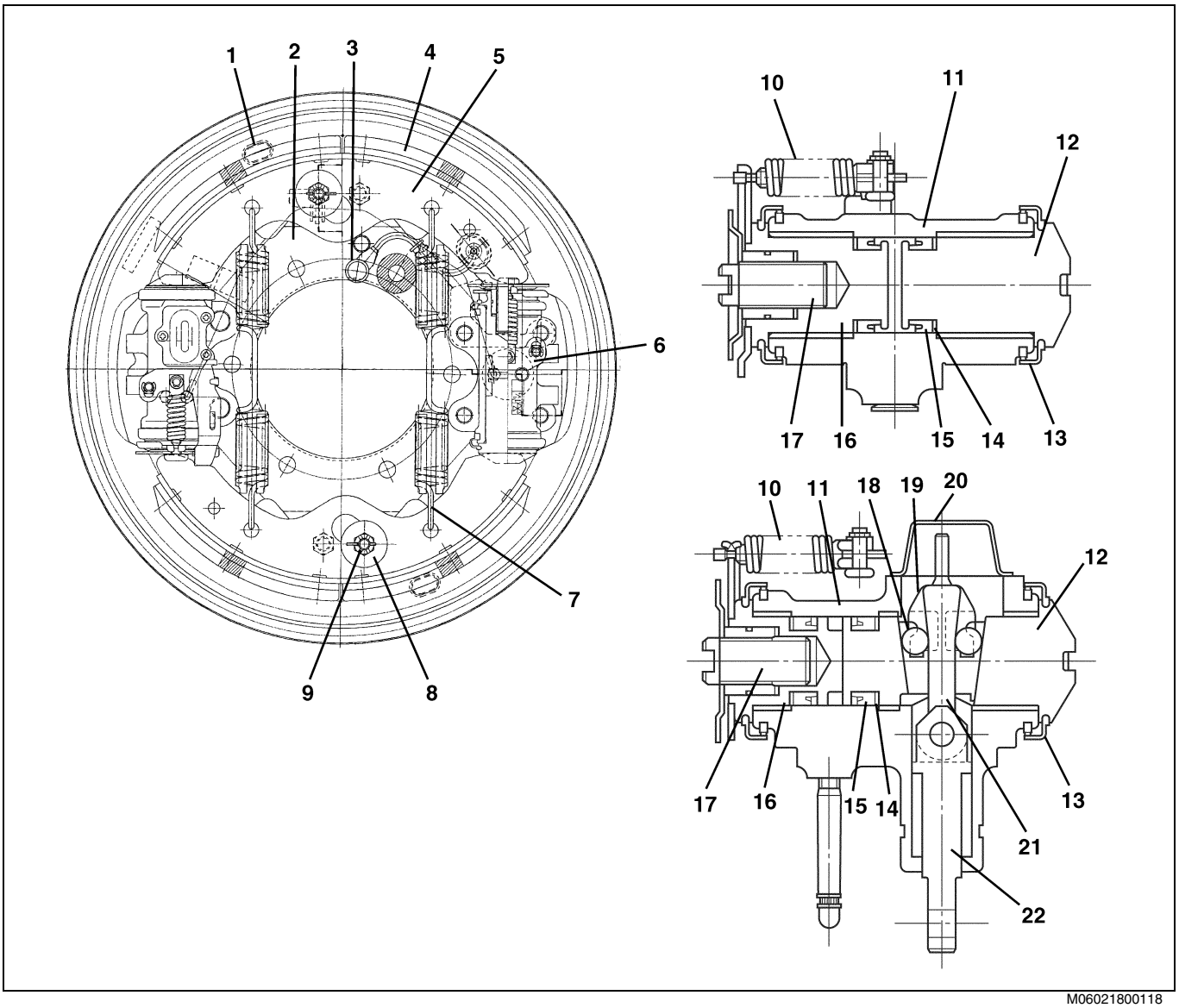
REAR



M06021800117

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

REAR (WITH AUTO-ADJUSTER)



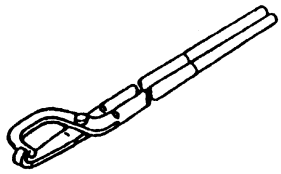
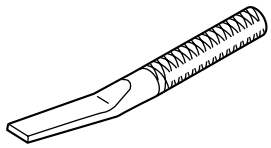
M06021800118

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

SPECIAL TOOL

M06021801BEK1005

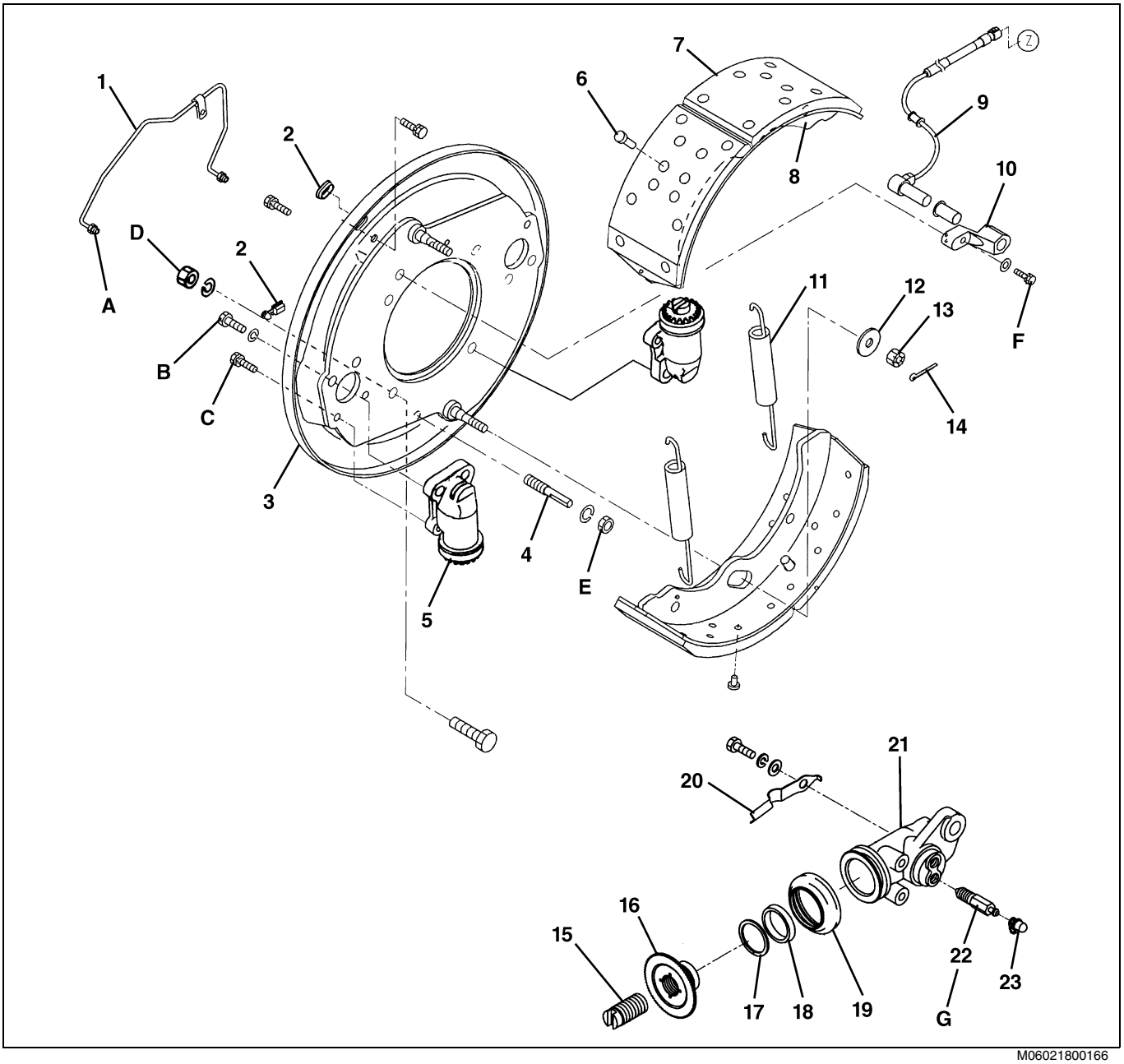
Prior to starting a wheel brake overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09606-1040	RETRACTING SPRING PULL BACK TOOL	
	09665-1130	BRAKE SHOE ADJUSTING TOOL	

COMPONENT LOCATOR

M06021801BED1003

FRONT



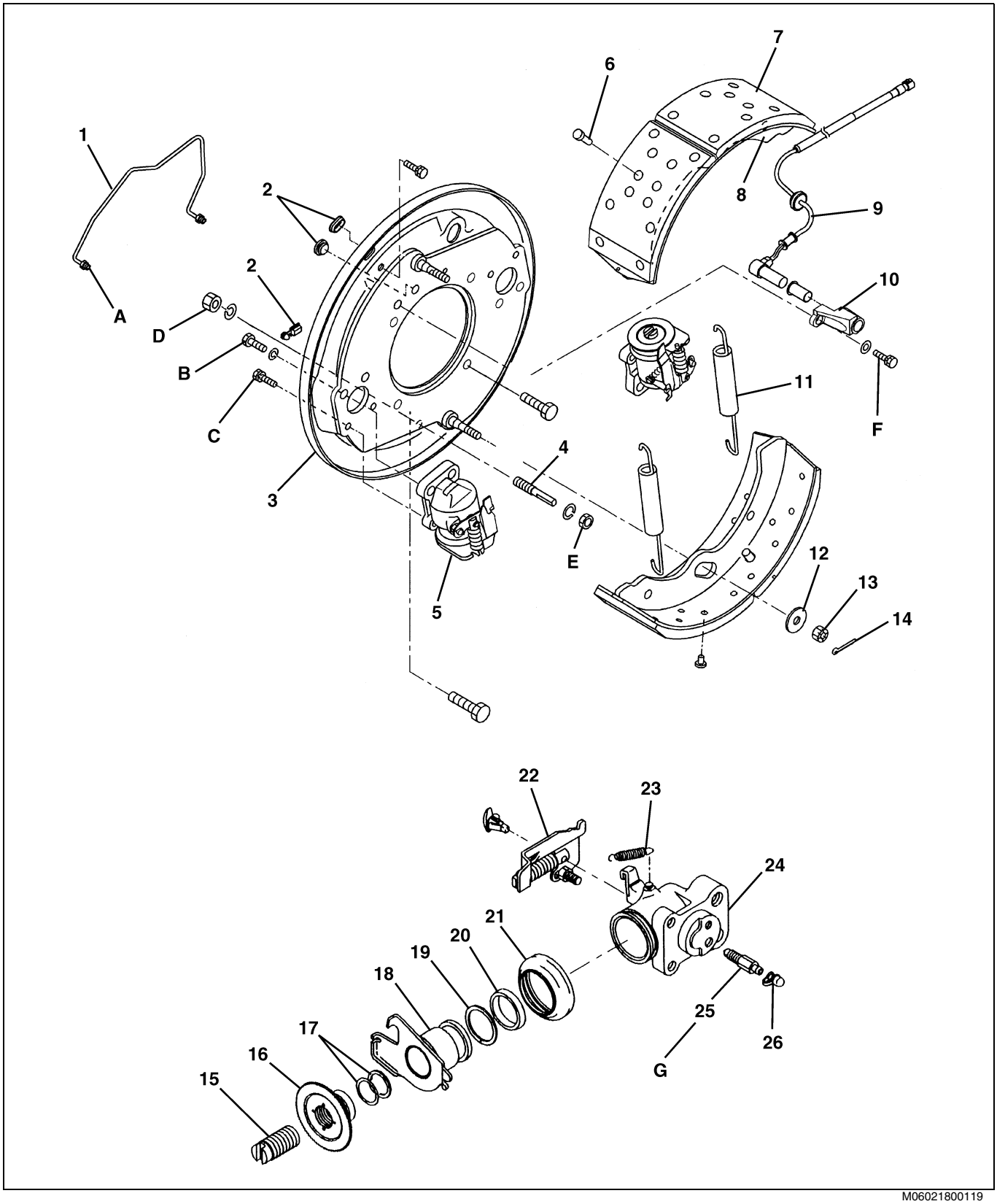
M06021800166

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

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

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

FRONT (WITH AUTO-ADJUSTER)



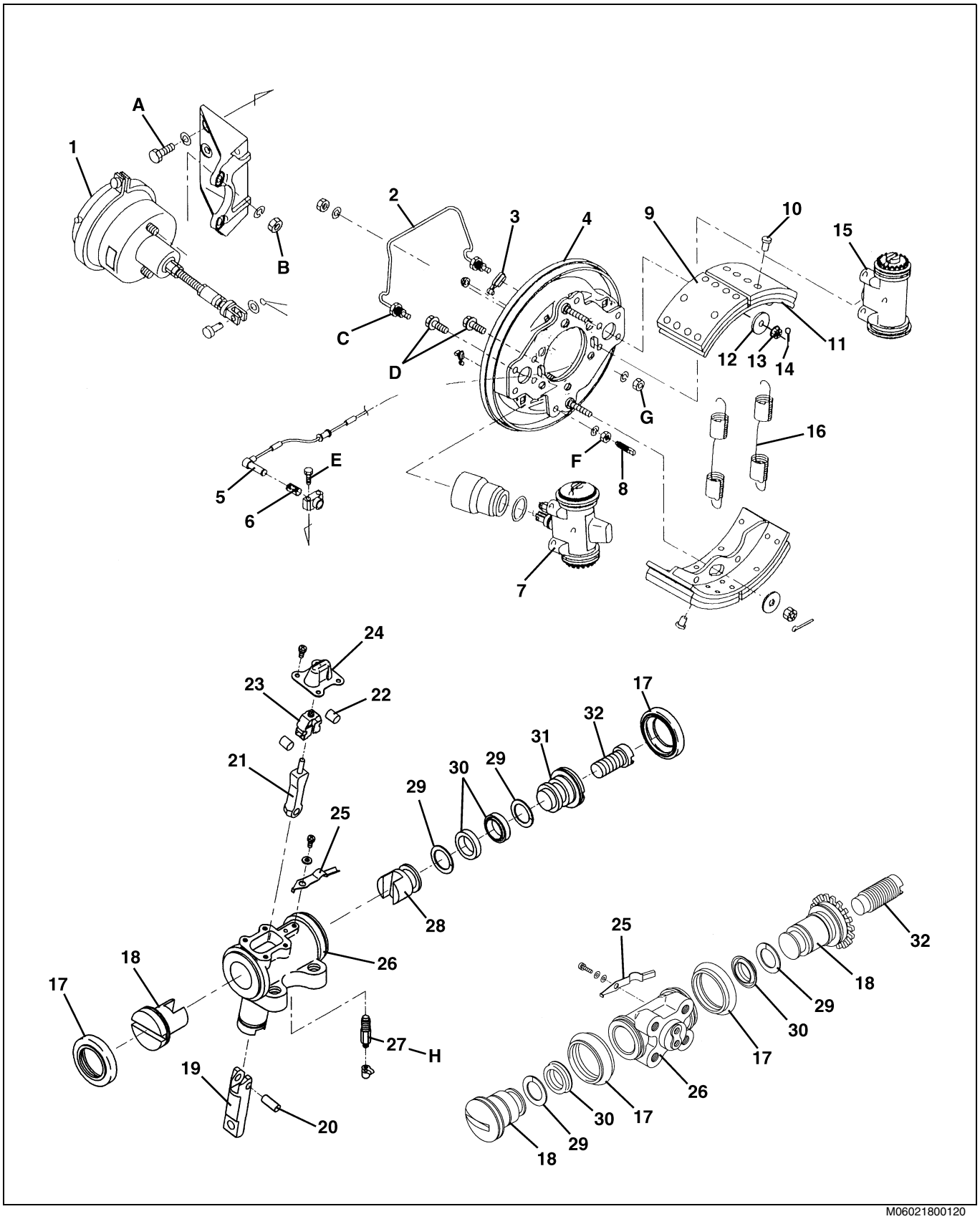
M06021800119

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

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

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

REAR



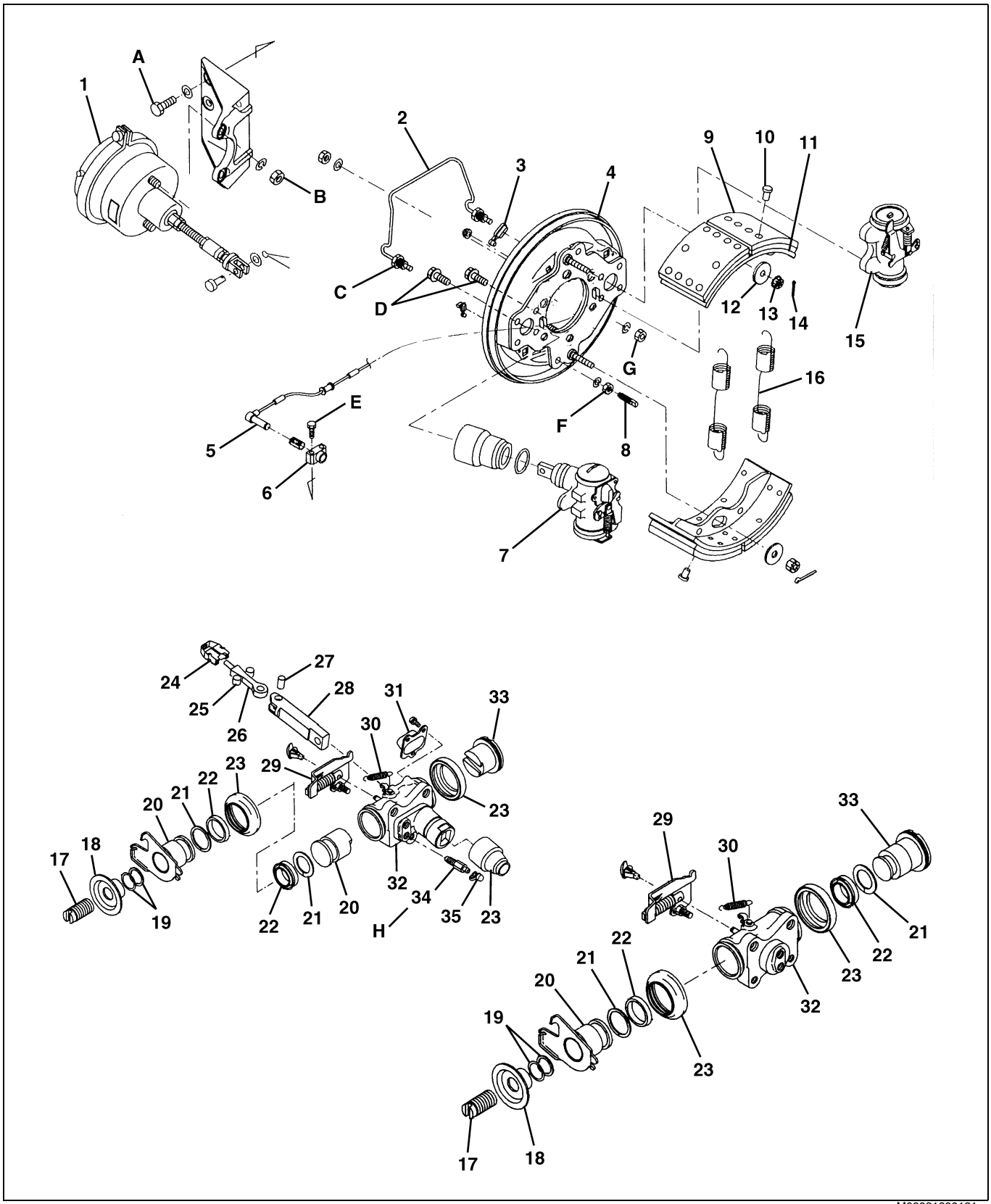
M06021800120

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

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

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

REAR (WITH AUTO-ADJUSTER)



M06021800121

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

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

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

OVERHAUL

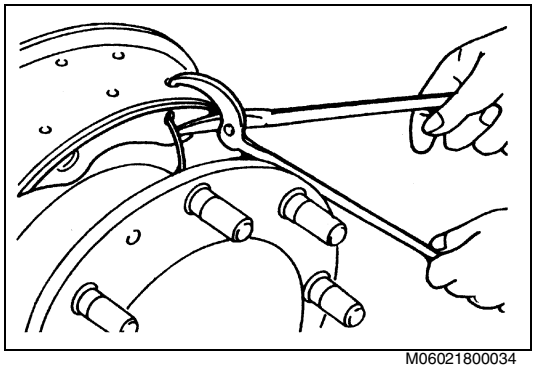
M06021801BEH2008

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF TIRE.
(1) Refer to chapter WHEEL & TIRE.

2. REMOVAL OF BRAKE DRUM WITH WHEEL HUB AND WHEEL HUB BEARINGS.
(1) Refer to chapter FRONT AXLE and REAR AXLE.

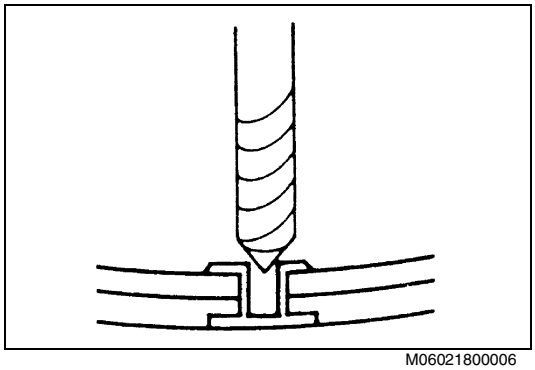
3. REMOVAL OF BRAKE SHOE RETRACTING SPRING.
(1) Remove the retracting spring by using the special tools.
SST: Retracting spring pull back tool (09606-1040)


M06021800034

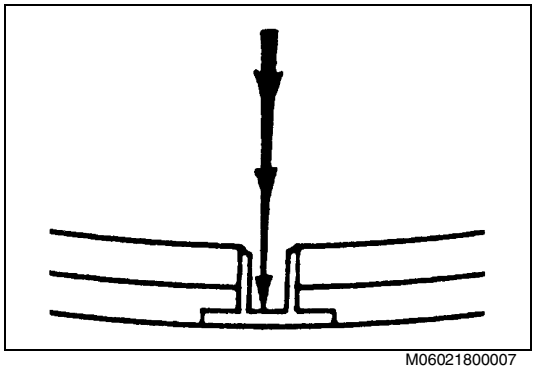
IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE BRAKE LINING.
(1) Drill the rivet caulking section with a drill smaller than the rivet diameter.

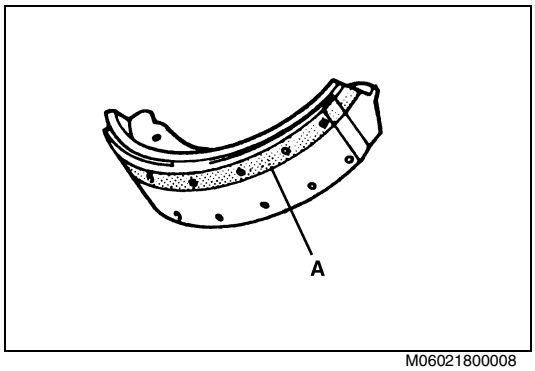
NOTICE:
At this time, be careful not to scratch the brake shoe.


M06021800006

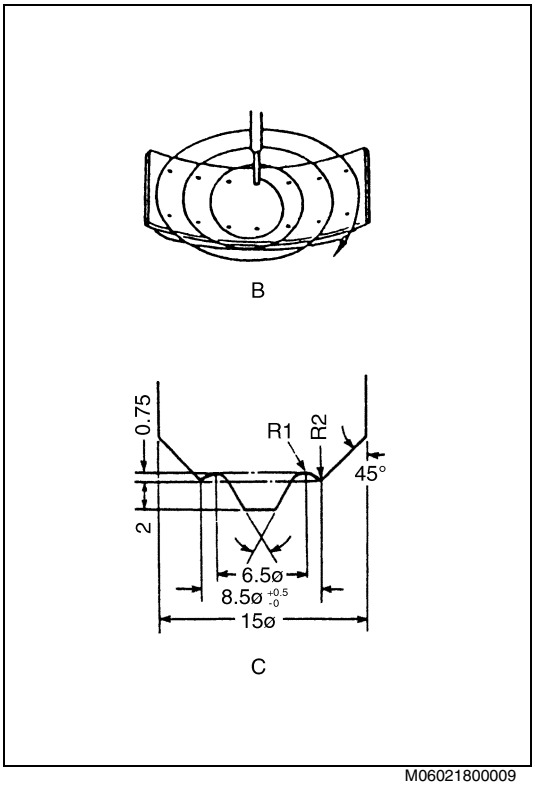
(2) After drilling, remove the remaining portion of the rivet with a fine chisel or a rivetting machine.


M06021800007

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



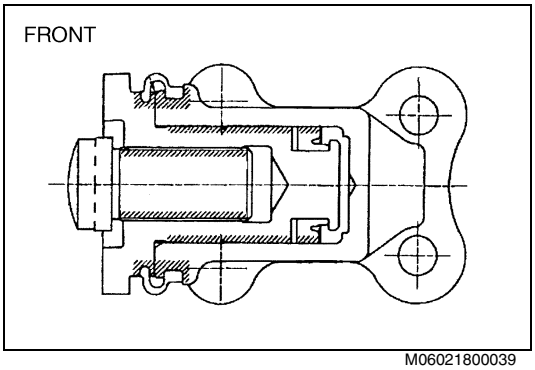
M06021800008



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.



M06021800039

2. ASSEMBLY OF THE WHEEL CYLINDER.

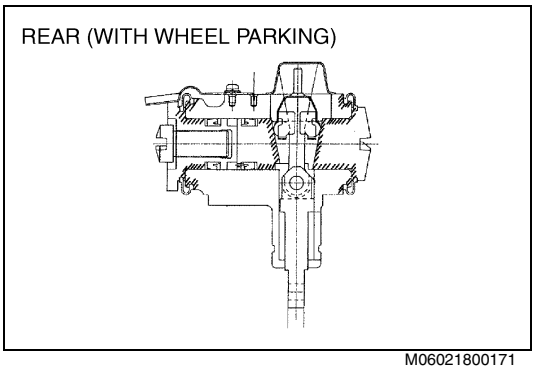
(1) Apply rustproof oil to the internal surface of the cylinder.

Rustproof oil (CCI No. 20):
04156-1010

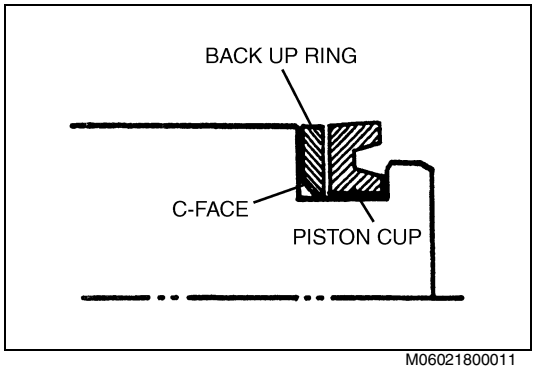
(2) Apply rubber grease to the threads of adjusting bolt, inside of boot, groove for boot, sliding surface of piston.

Rubber grease (RX-2):
04133-1080

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

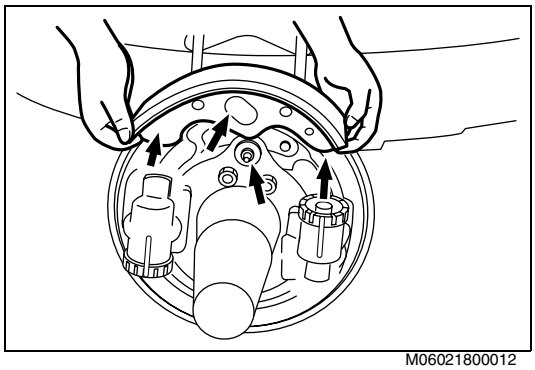


M06021800171



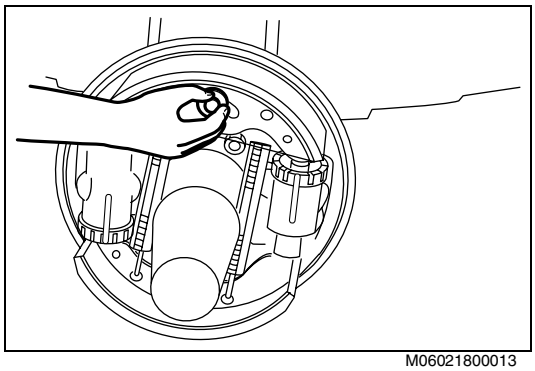
M06021800011

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

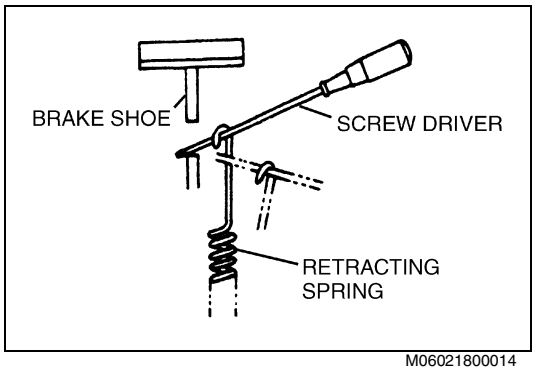

M06021800012

3. INSTALLATION OF BRAKE SHOE ASSEMBLY.

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


M06021800013

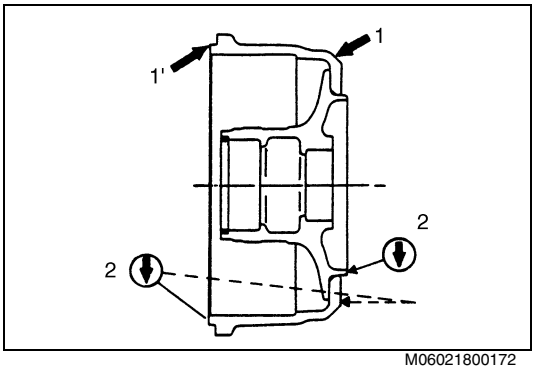
(2) Adjust the clearance between the hold down washer and the shoe.
Tighten the slotted nut and back off the nut by 1/3 turn.
Then secure the nut with the cotter pin.
If the cotter pin cannot be inserted into the hole, loosen the slotted nut (within 1/6 turn) to align it with the bolt hole.



M06021800014

4. INSTALLATION OF BRAKE SHOE RETRACTING SPRING.

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



M06021800172

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

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

NOTICE:

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

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

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

NOTICE:

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

6. MOUNTING OF WHEEL HUB WITH BRAKE DRUM.

(1) Refer to chapter FRONT AXLE and REAR AXLE.

7. MOUNTING OF TIRE.

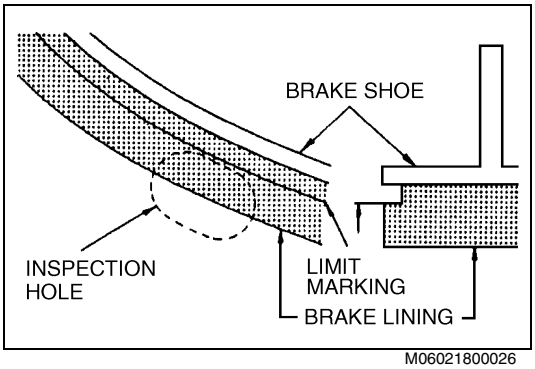
(1) Refer to chapter WHEEL & TIRE.

8. ADJUSTMENT.

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

ADJUSTMENT

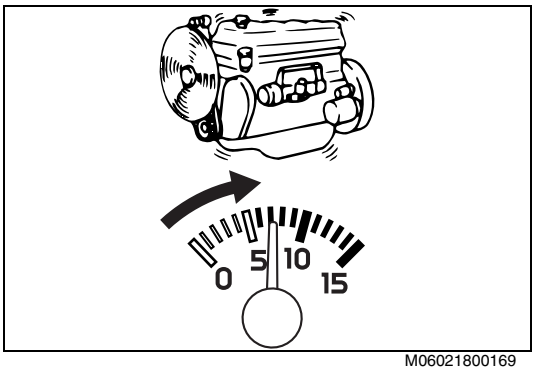
M06021801BEH3002



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.



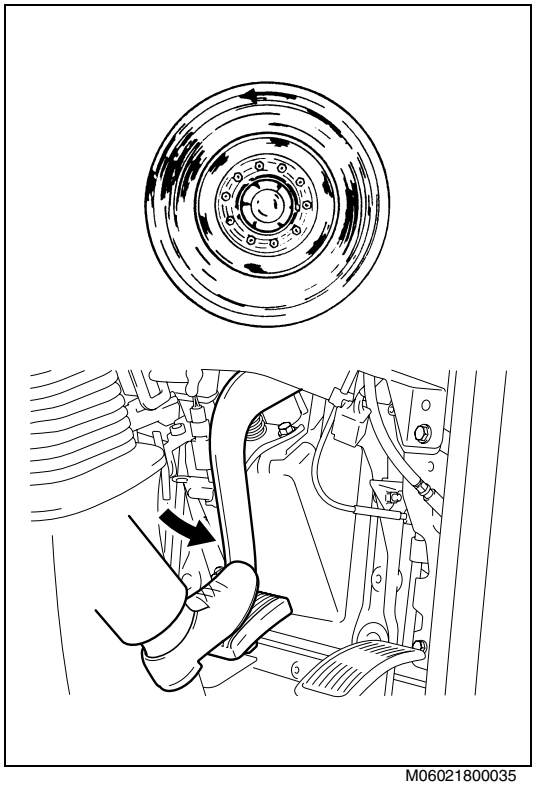
M06021800169

2. AIR PRESSURE IN THE AIR TANK.

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

NOTICE:

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



M06021800035

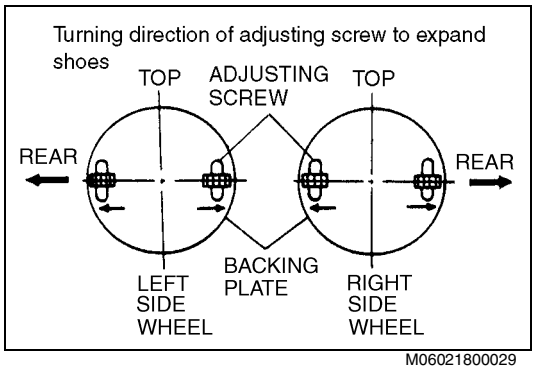
3. CLEARANCE BETWEEN BRAKE LINING AND BRAKE DRUM.

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

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

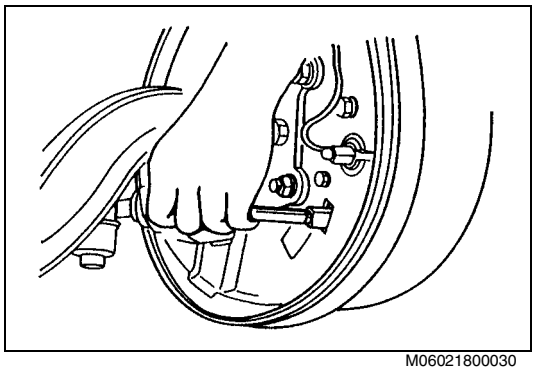
NOTICE:

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



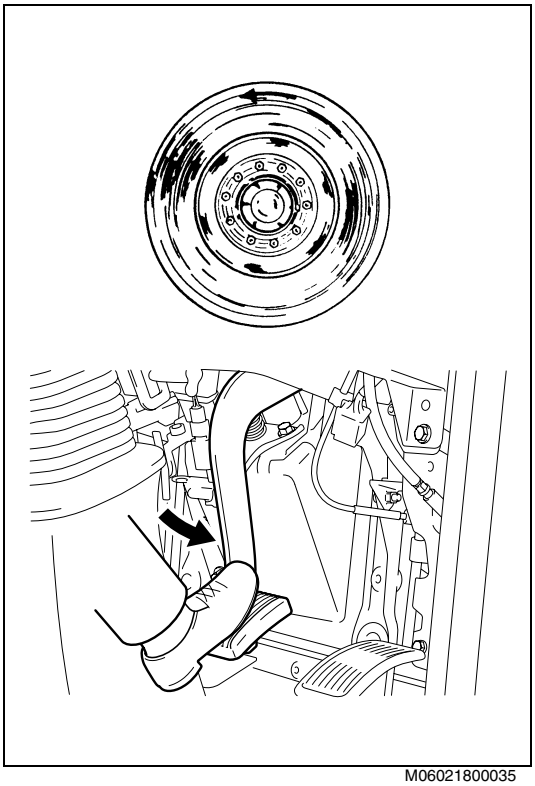
M06021800029

(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 (09665-1130)



M06021800030

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



M06021800035

(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.

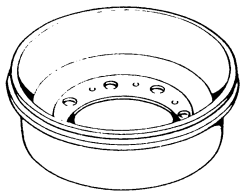
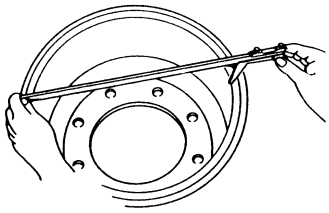
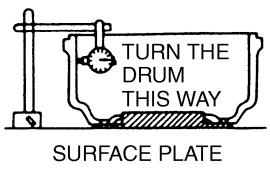
(6) See to it that there is no dragging, when turning the wheel by hand. If there is any dragging, repeat the operation over again from 2.

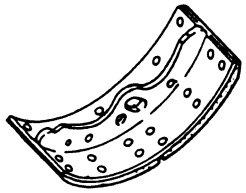
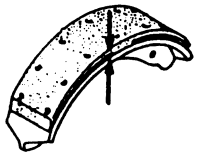
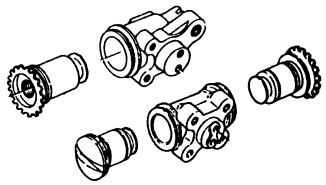
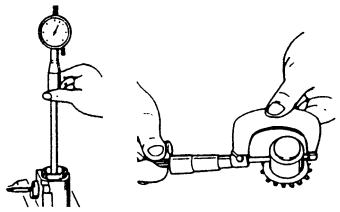
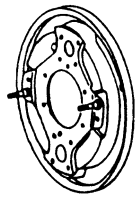
NOTICE:
Using the same procedure as above, adjust the clearance for all wheels.

INSPECTION AND REPAIR

M06021801BEH3012

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

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

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

ABS (ANTI-LOCK BRAKE SYSTEM)

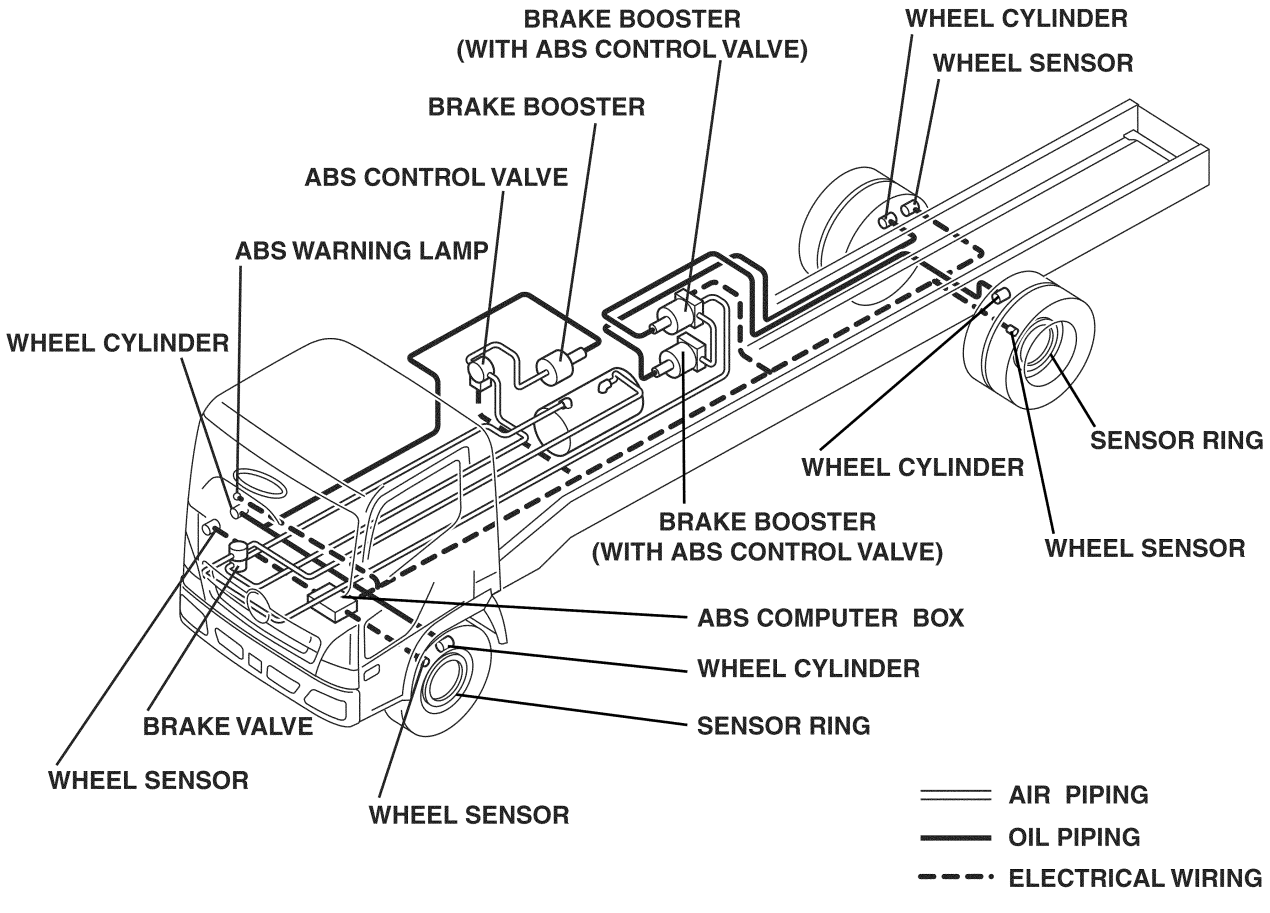
BR03-001

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.

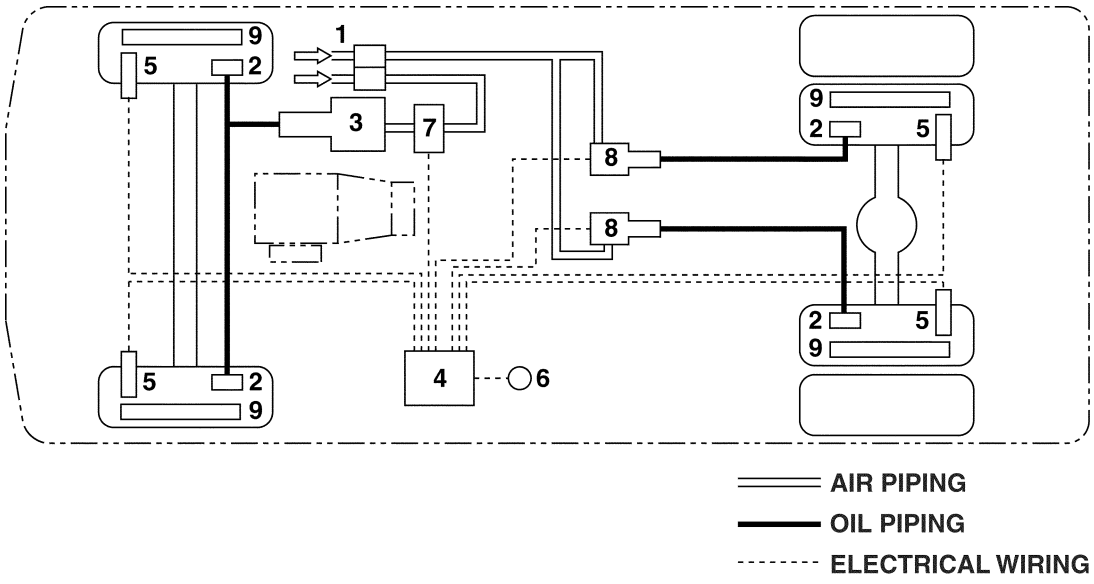
Pulse signals transmitted by the sensor rings mounted on the wheel hubs, rotated together with the wheels, and the wheel sensors mounted near sensor ring on the axles are sent to the ABS computer. The ABS computer then calculates the wheels' rotational speed, acceleration, deceleration, and amount of 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

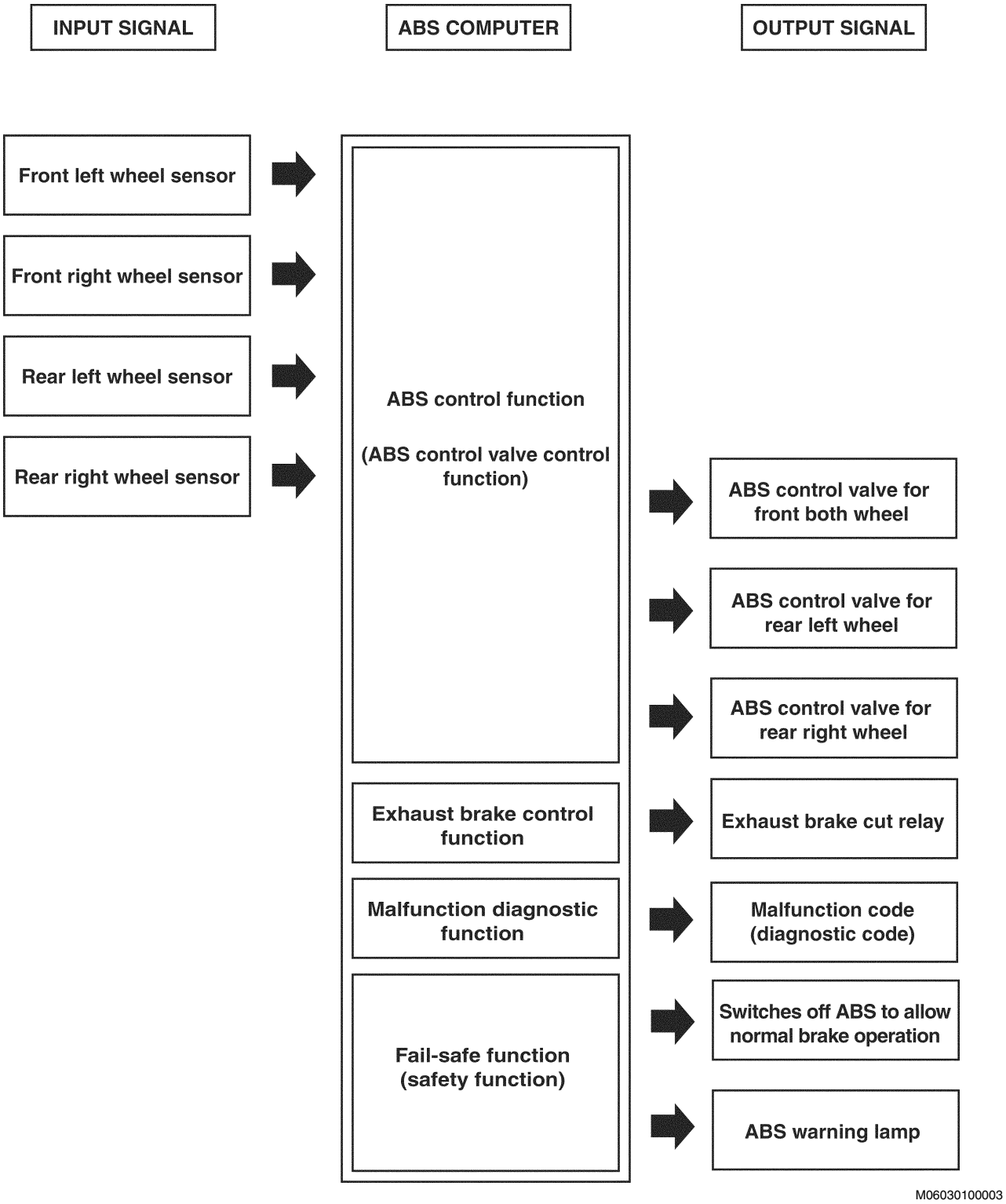
SYSTEM COMPOSITION DIAGRAM



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

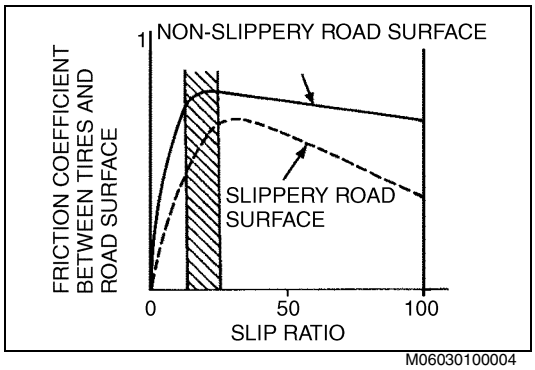
BASIC PRINCIPLE

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

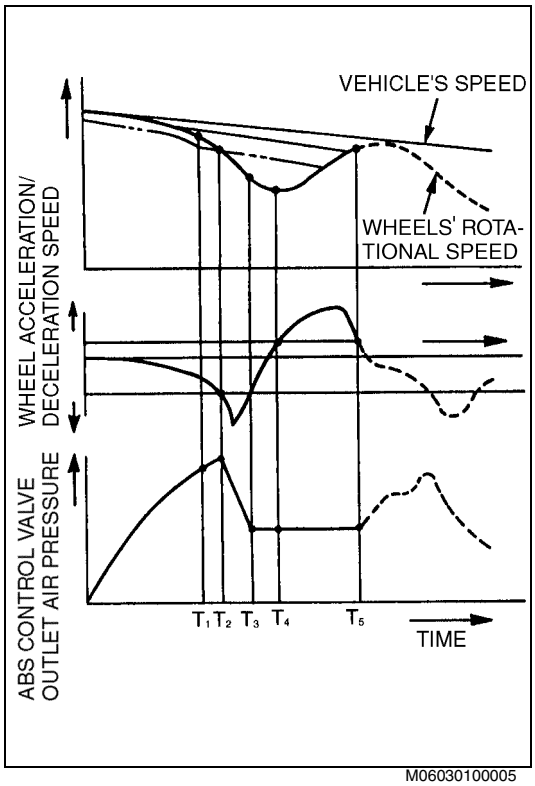


M06030100004

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

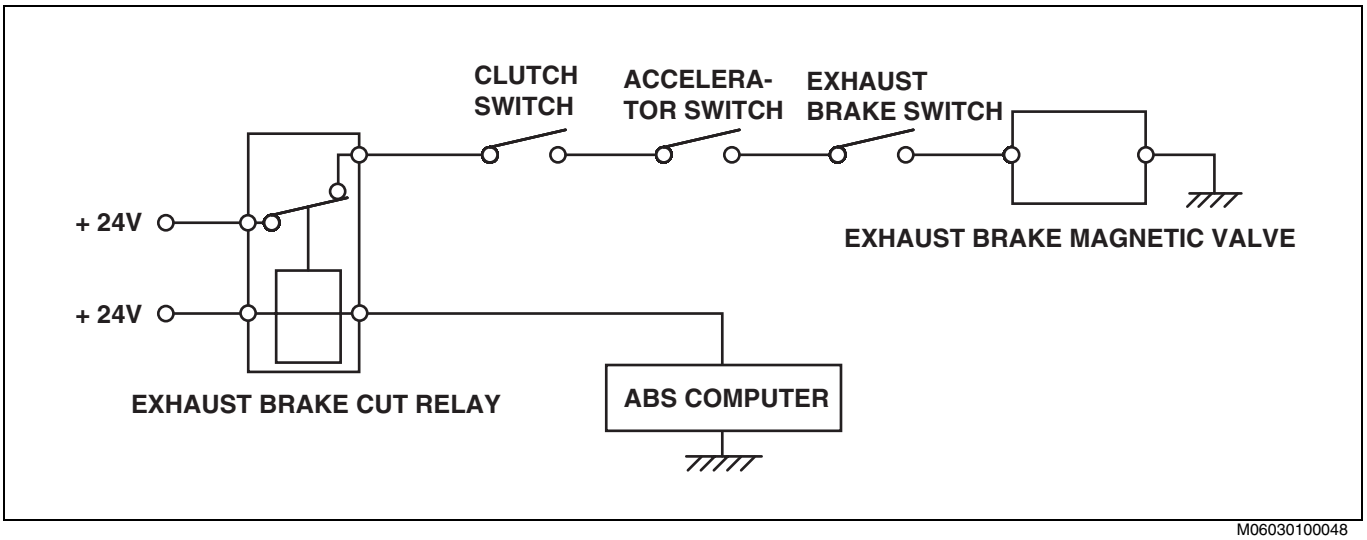
M06030101BEC1013

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

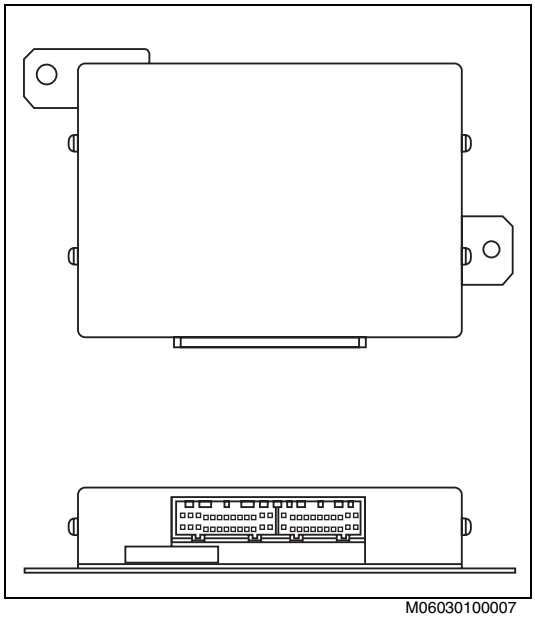
The ABS system of this vehicle is equipped with a function that controls the exhaust brake while ABS is operating.
If the exhaust brake is applied independently or together with the service brake on a road surface with very low friction coefficient, the driving wheels may lock. This ABS system prevents the driven wheels from locking in such cases by automatically releasing the exhaust brake, if necessary, during ABS operation.



M06030100048

OVERVIEW AND FUNCTION

M06030101BEC1014

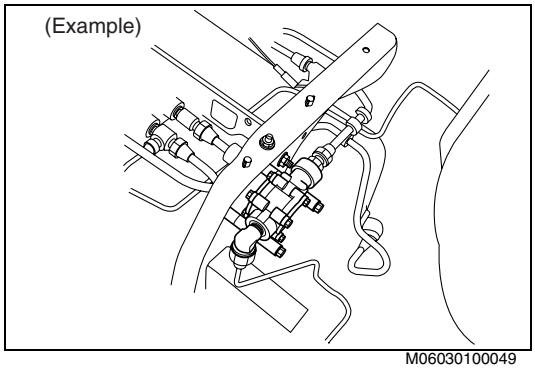

M06030100007

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.



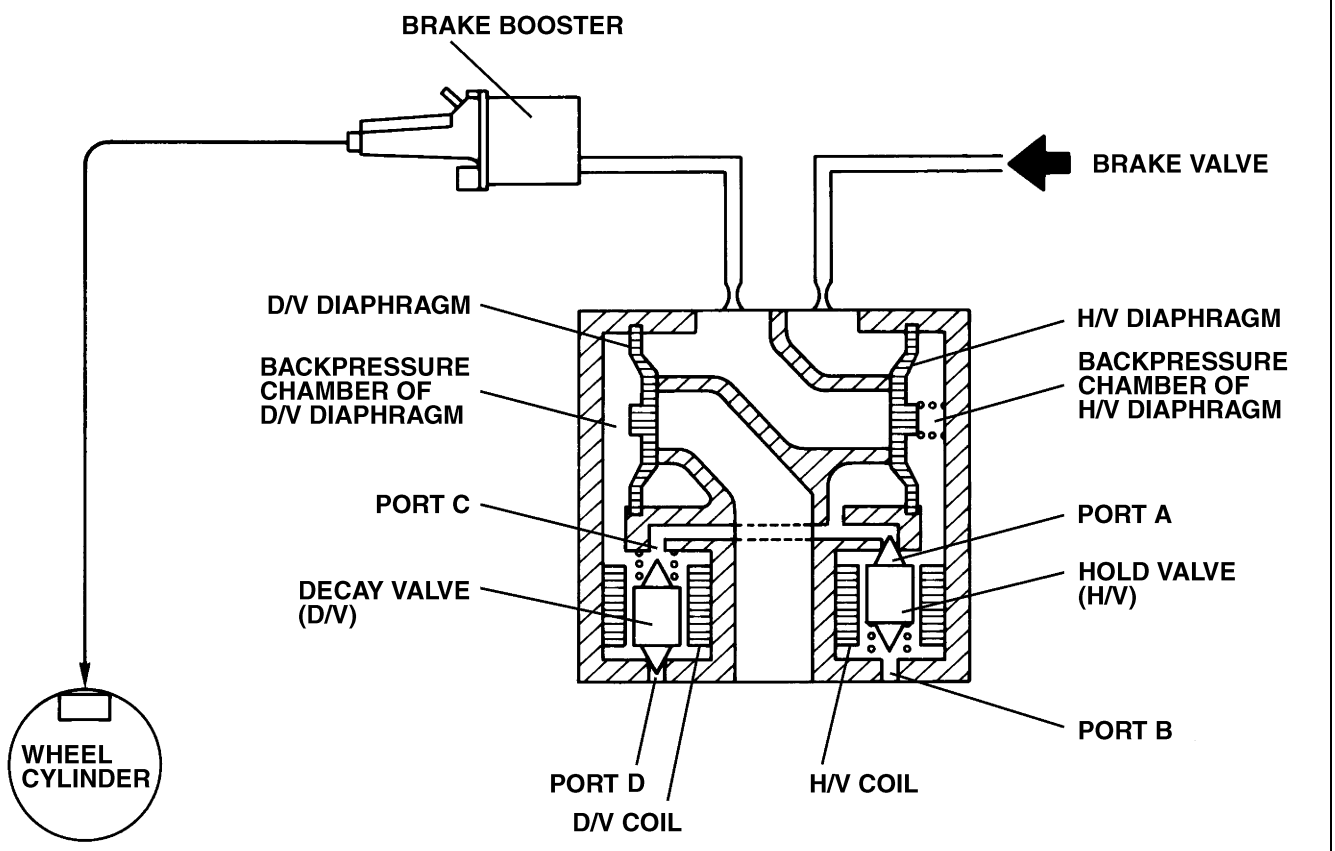
M06030100049

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

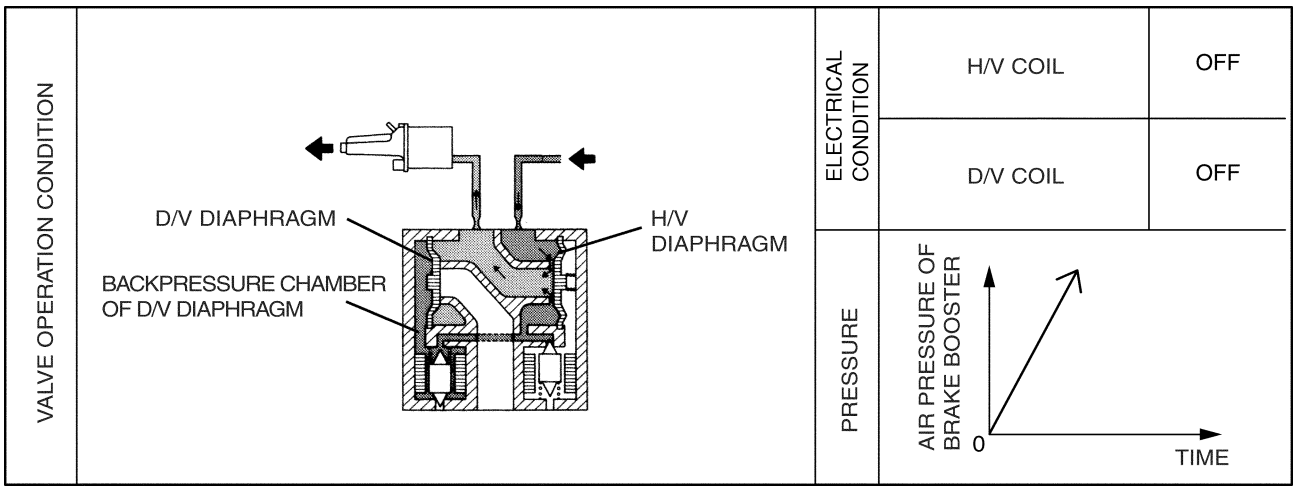


M06030100009

(2) Operation

a. Application of normal brake pressure

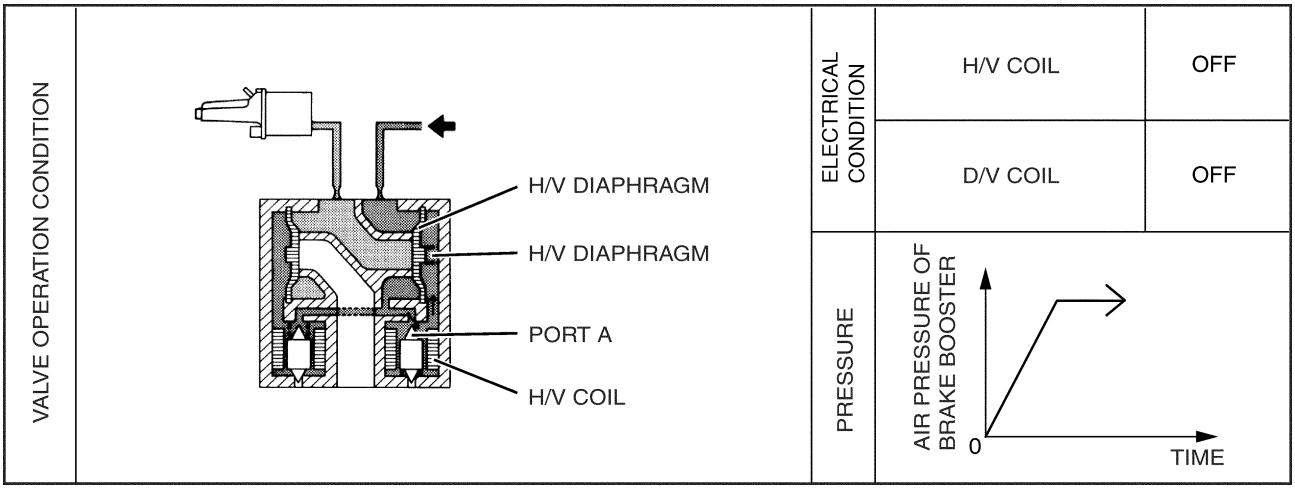
- When the brake valve is depressed, air from the tank pushed open the H/V diaphragm and goes through the backpressure chamber to close the D/V diaphragm. Thus, the air pressure of the brake booster is increased.



M06030100010

b. Pressure holding mode

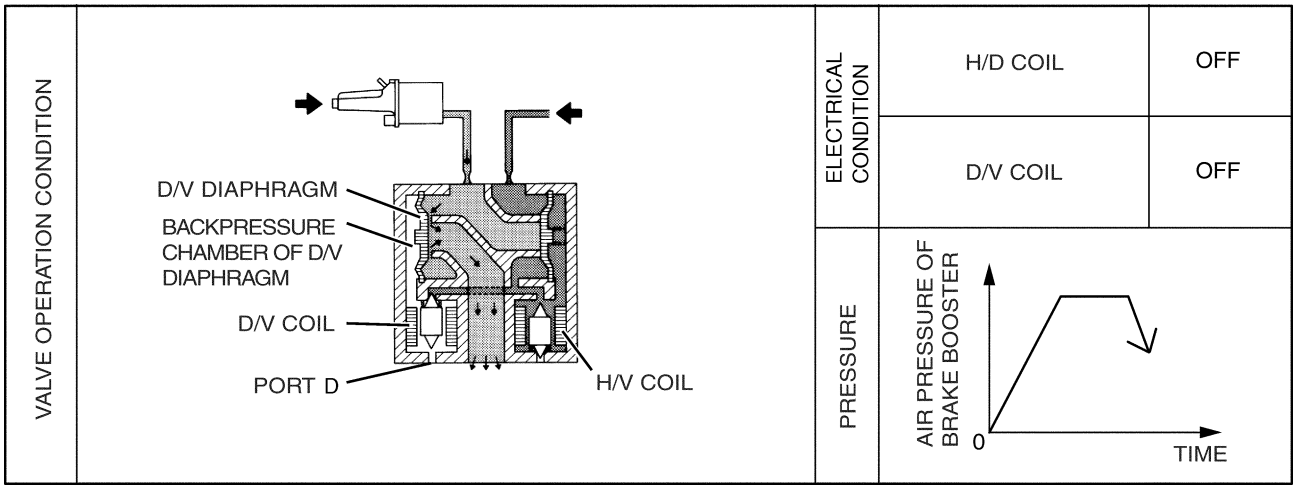
- When the coil for H/V is energized, port A opens and air goes through the backpressure chamber of H/V diaphragm.
- This air pressure in the backpressure chamber keeps H/V diaphragm closed to shut down the air from the brake valve. Thus, the air pressure of the brake booster is increased.



M06030100011

c. Depressurizing mode

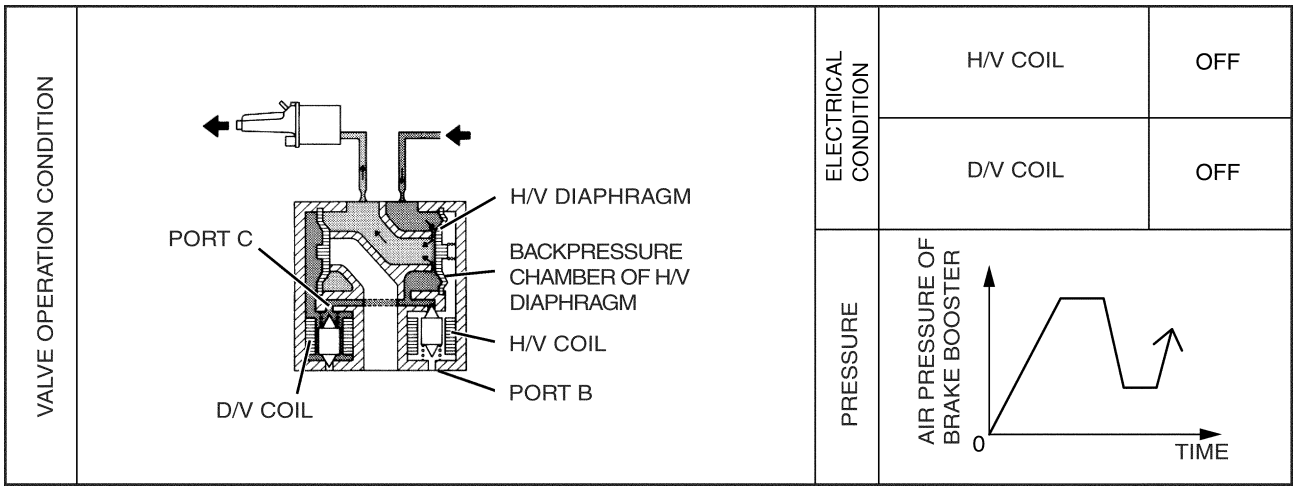
- When D/V coil is energized after turning on H/V coil shuts down the air from the brake valve, port D opens to discharge the air in the backpressure chamber of D/V diaphragm.
- The hold pressure of the brake booster open D/V diaphragm to discharge the air into the atmosphere. Thus, the air pressure of the brake booster is depressurized.



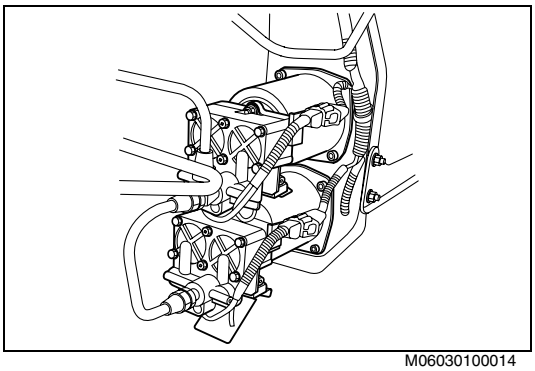
M06030100012

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.



M06030100013

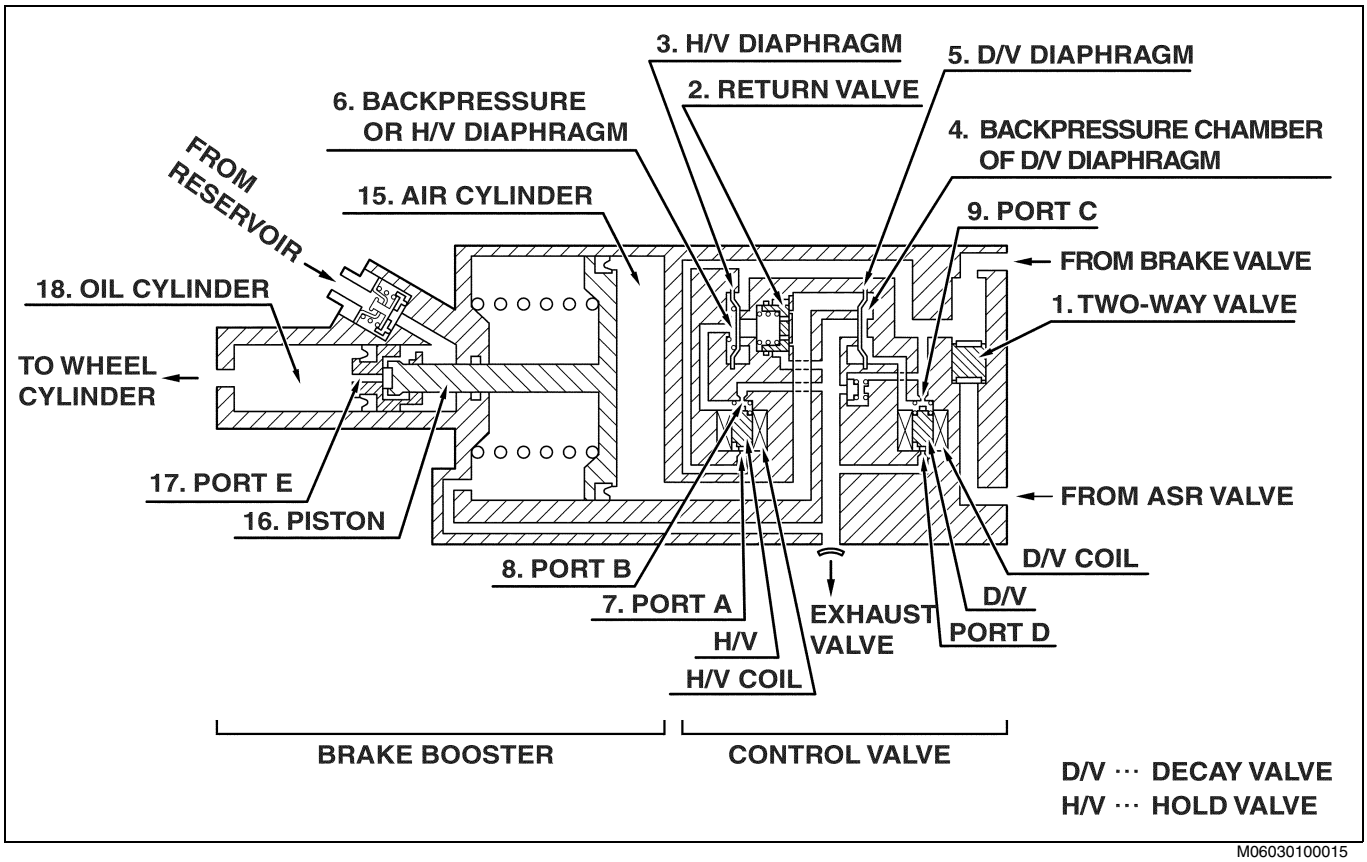


M06030100014

3. ABS CONTROL VALVE (FOR REAR)

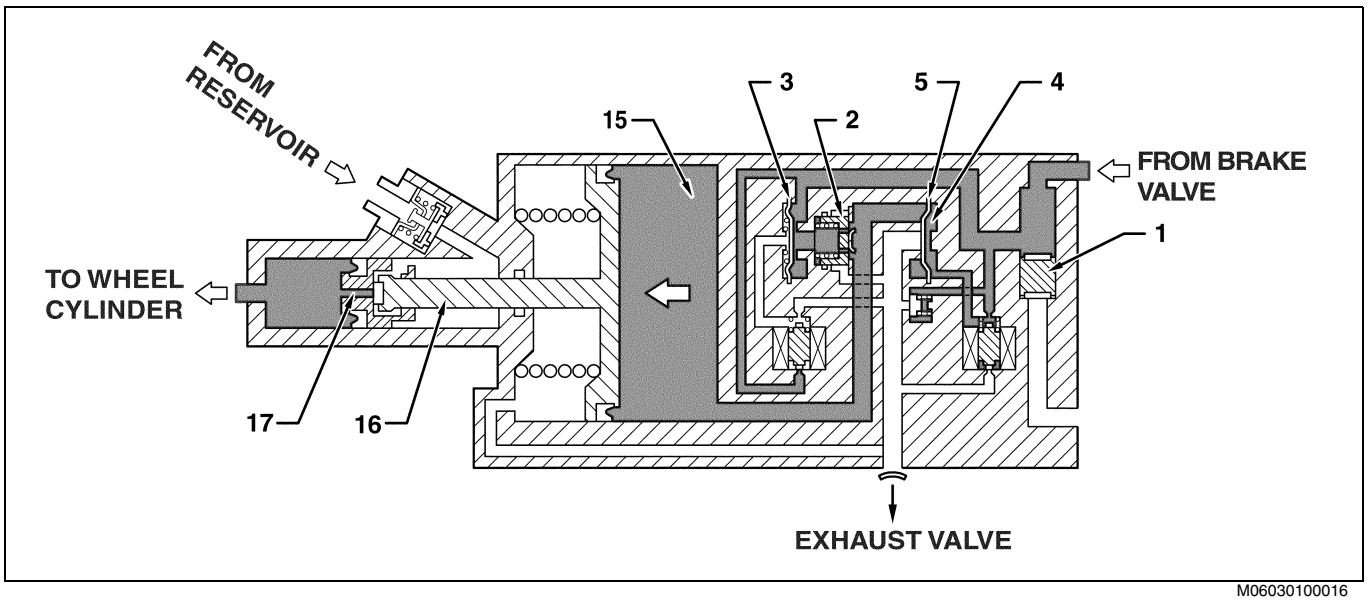
(1) Overview

- 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.



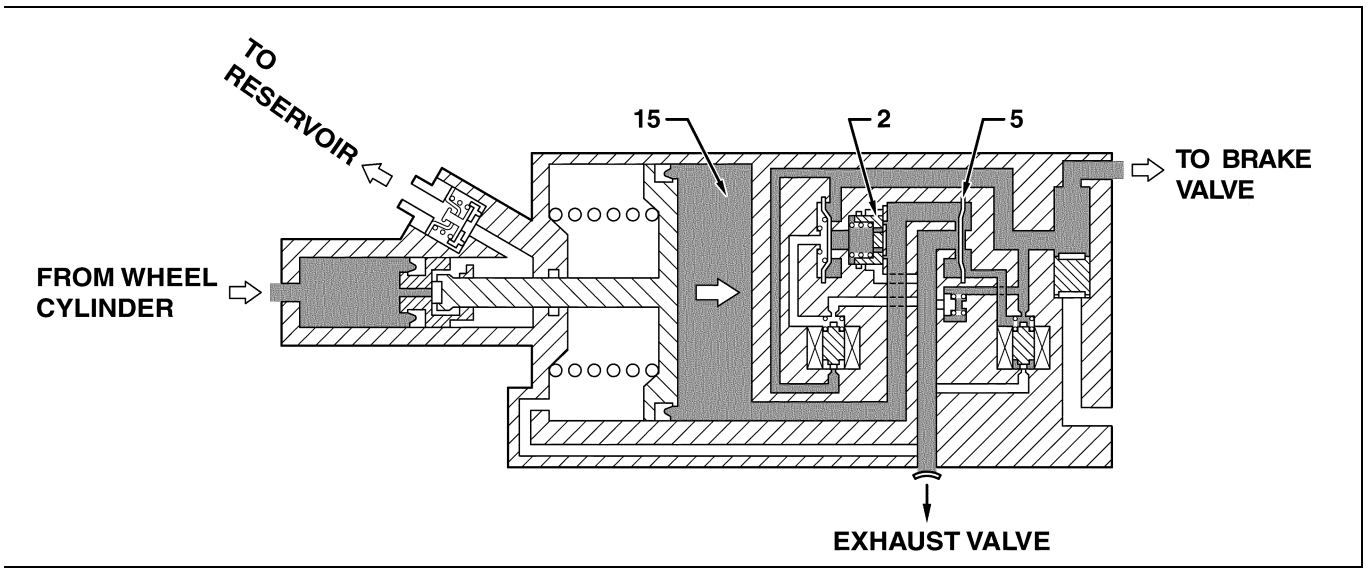
M06030100015

(2) When ABS is not operating (normal brake is operating)
a. When the brake valve is operating



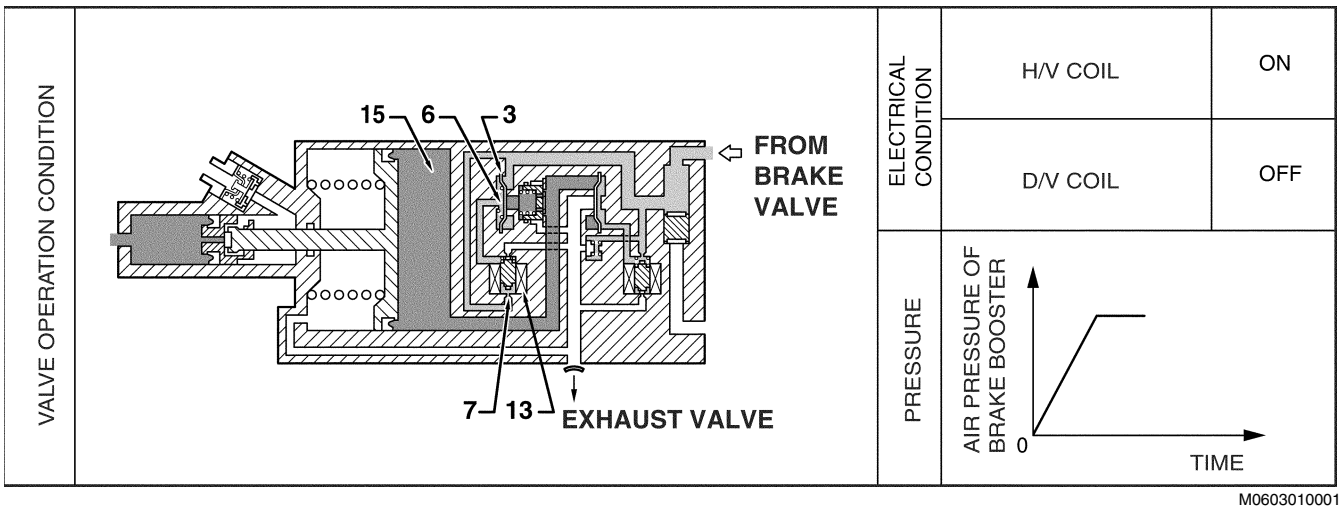
M06030100016

b. When the brake valve is released.



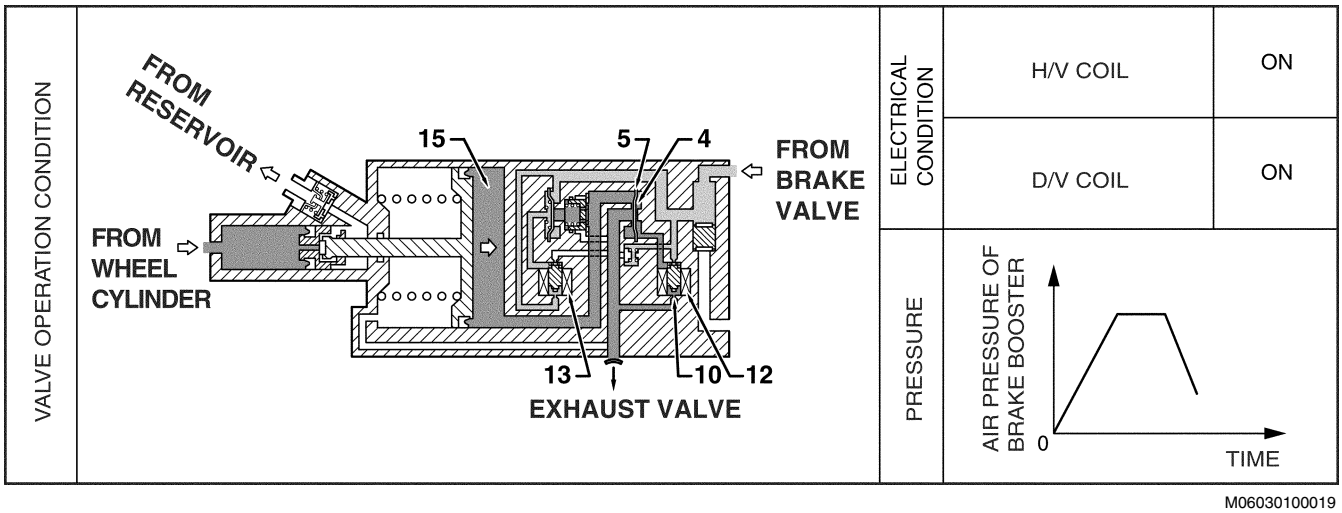
M06030100017

(3) When ABS is operating.
a. Pressure holding mode



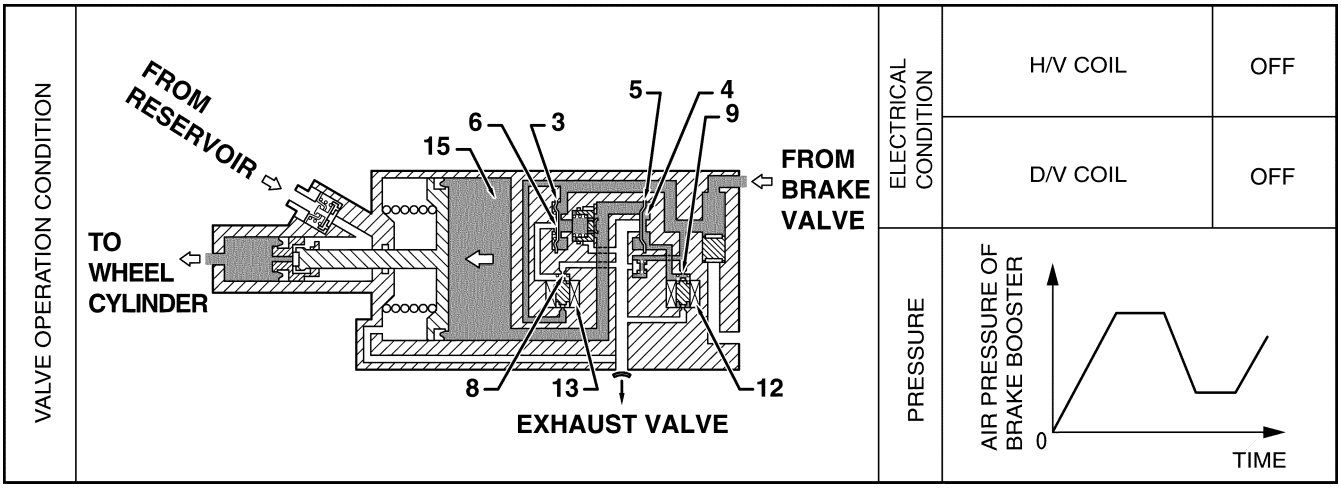
M06030100018

b. Depressurizing mode



M06030100019

c. Repressurizing mode



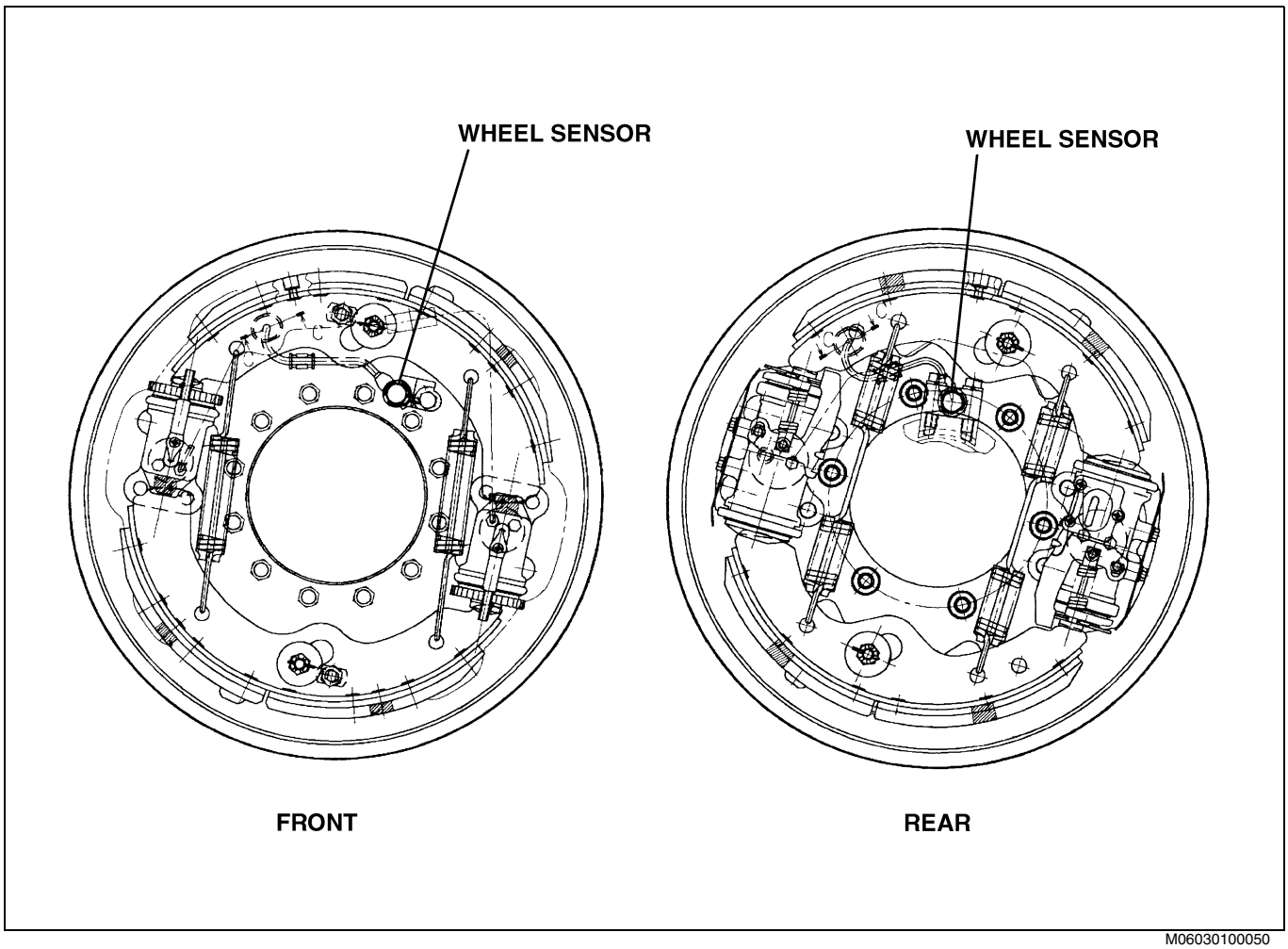
M06030100020

4. WHEEL SENSORS

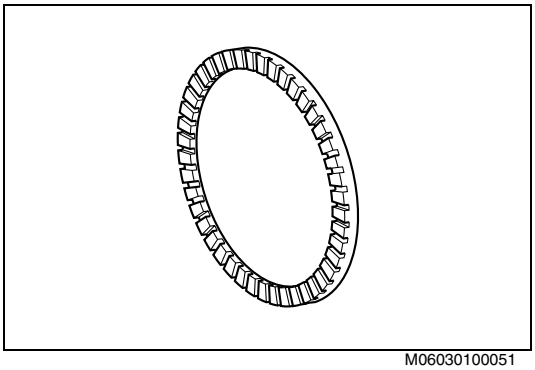
These sensors are mounted, facing the sensor rings on each wheel on the front and rear axles.

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.

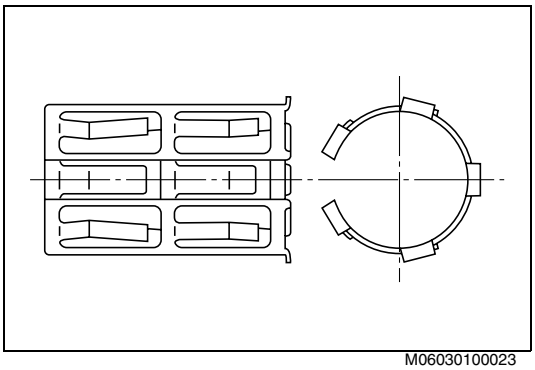


M06030100050


M06030100051

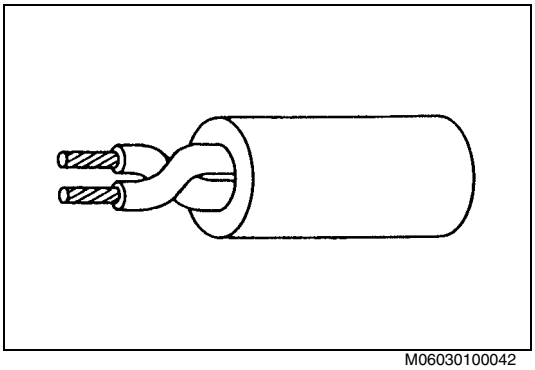
5. SENSOR RINGS

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

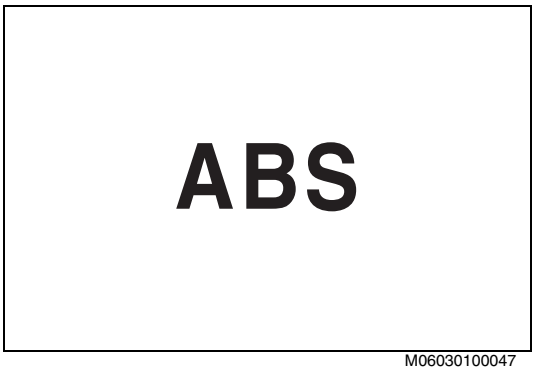
6. CLAMPING BUSHINGS

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.



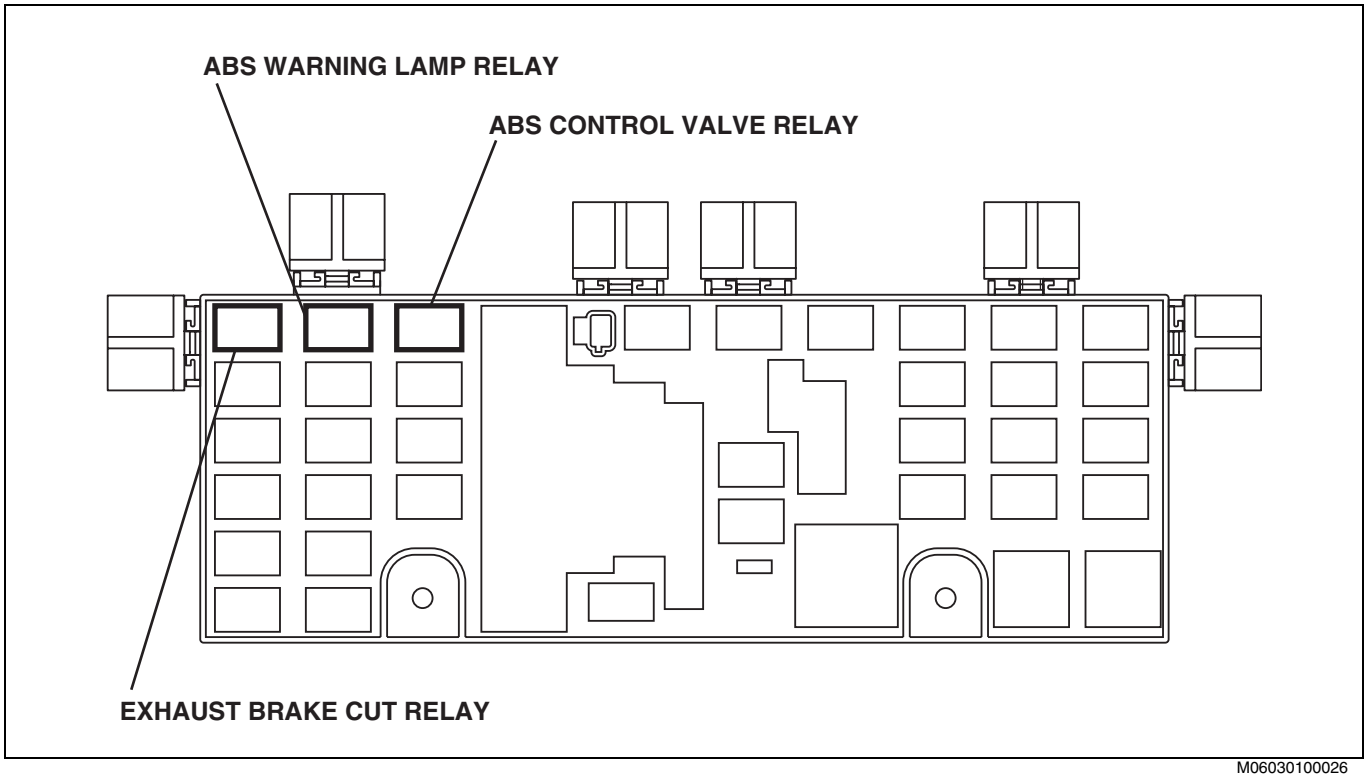
M06030100047

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.

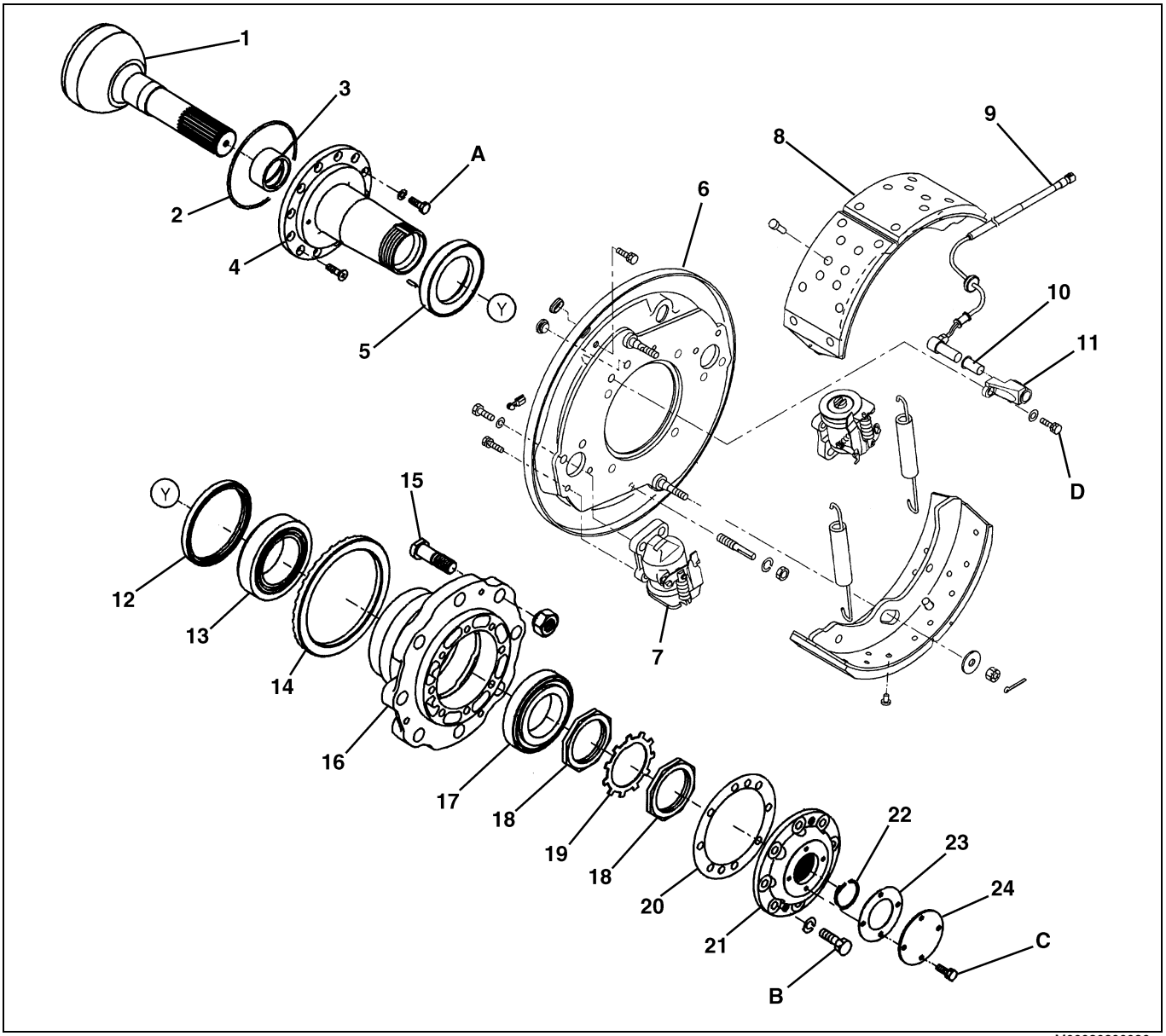
HINT:
The terminal No. (symbol) of each relay is printed on each terminal.

FRONT WHEEL BRAKE

COMPONENT LOCATOR

M06030201BED1003

FRONT AXLE



M06030200026

1	Birfield joint	9	Wheel sensor	17	Outer bearing
2	O-ring	10	Clamping bushing	18	Wheel hub bearing lock nut
3	Bushing	11	Holder	19	Lock washer
4	Spindle	12	Oil seal	20	Gasket
5	Oil seal guide	13	Inner bearing	21	Flange
6	Back plate	14	Sensor ring	22	Ring retainer
7	Wheel cylinder	15	Hub bolt	23	Gasket
8	Brake shoe	16	Wheel hub	24	Cap

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

A	85.5-114.5 {872-1,167, 64-84}	C	13.0-18.0 {133-183, 10-13}
B	108.5-147.5 {1,107-1,504, 80-108}	D	14.0-22.0 {143-224, 11-16}

OVERHAUL

M06030201BEH2003

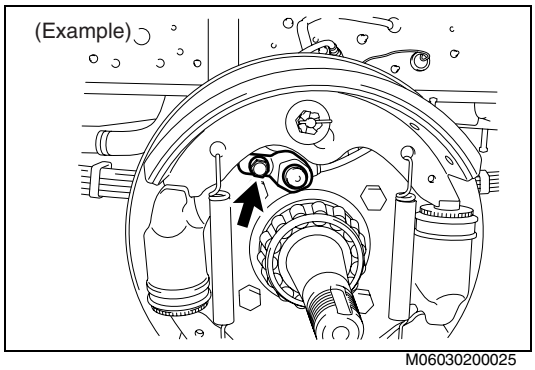
IMPORTANT POINTS - DISASSEMBLY

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.



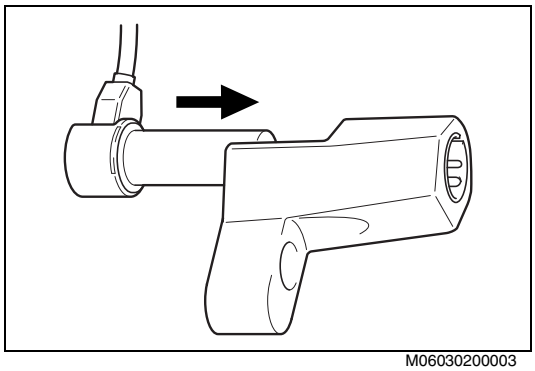
M06030200025

(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.

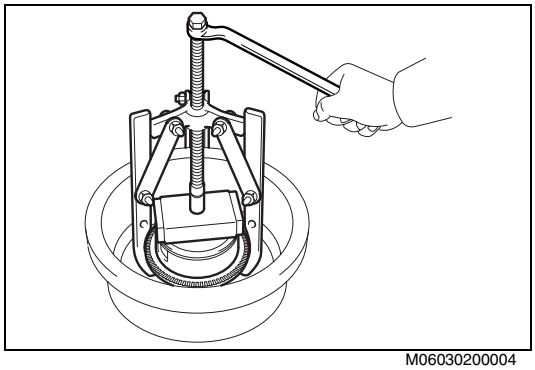

M06030200003

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.**

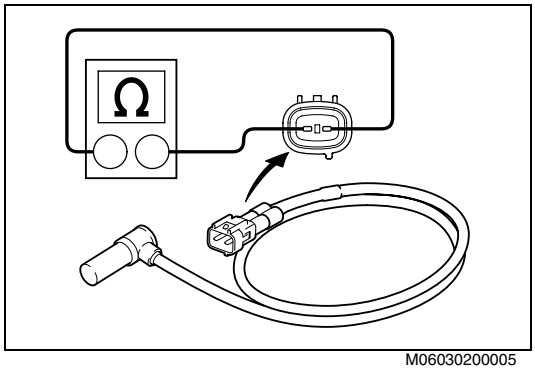

M06030200004

IMPORTANT POINTS - INSPECTION

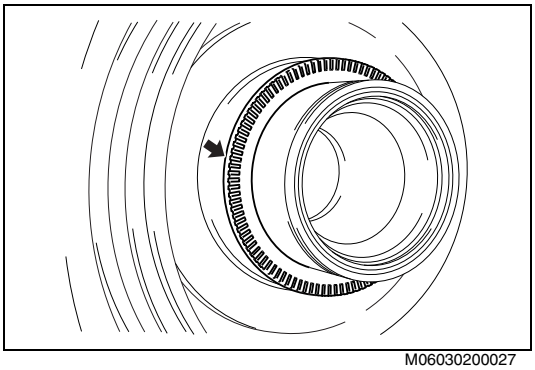
1. INSPECT THE ONLY WHEEL SENSOR.

(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.

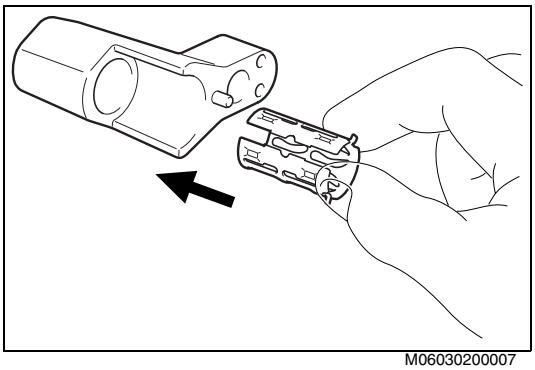


M06030200005


M06030200027

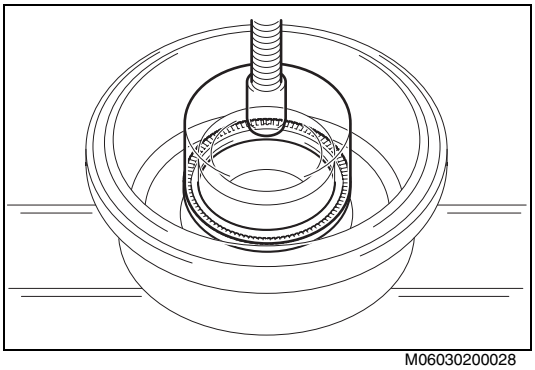
2. INSPECT THE SENSOR RING.

(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.

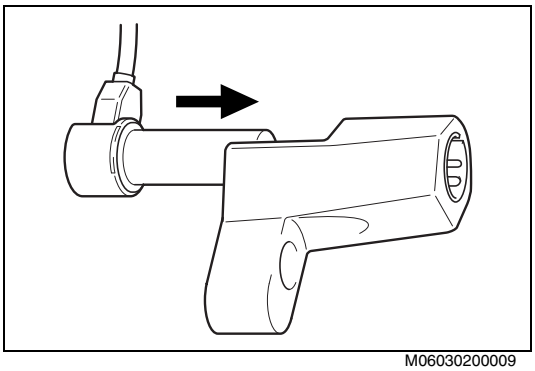

M06030200028

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.

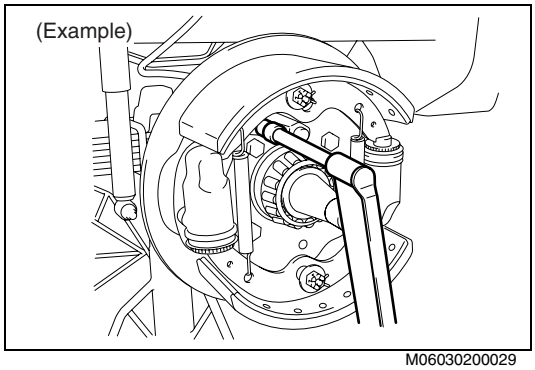
(2) After pressure mounting it, check for flutter of the sensor ring in the axle direction.
Assembly standard: Less than 0.2 mm {0.0078 in.}


M06030200009

5. MOUNT THE WHEEL SENSOR.

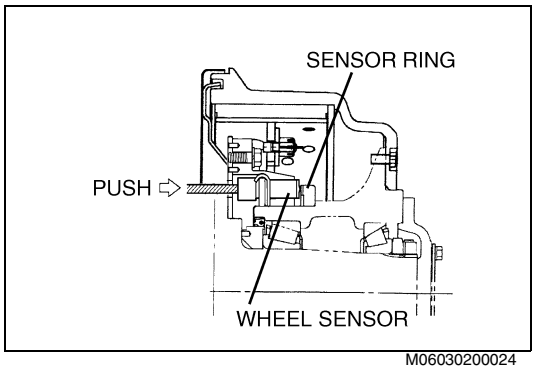
(1) Push in the clamping bushing until the stopper makes contact with the wheel sensor holder.
(2) Push the wheel sensor fully in the wheel sensor holder with hands until the wheel sensor makes contact with the clamping bushing.

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.



M06030200029

(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.



M06030200024

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.

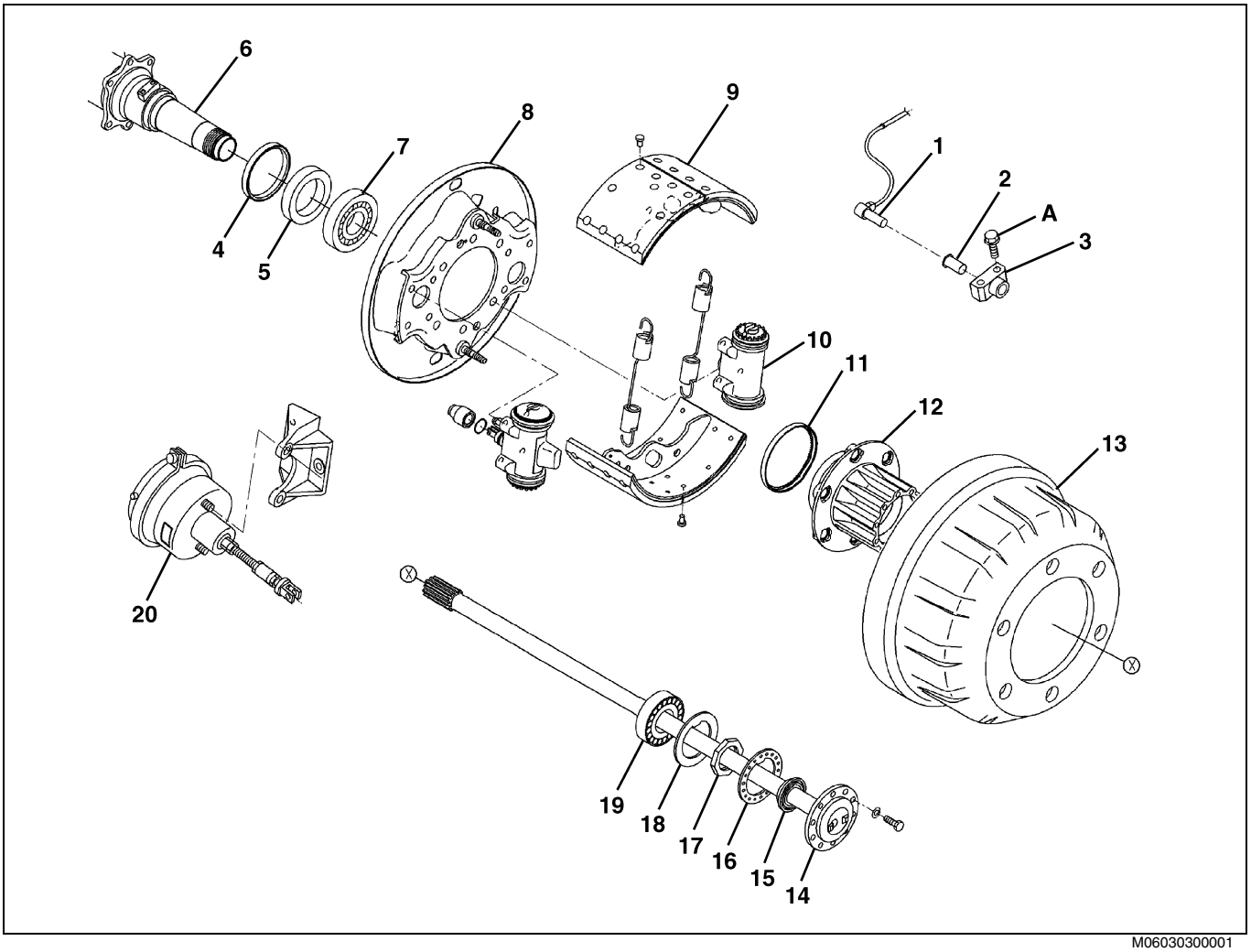
NOTICE:
Do not tap by hammer or turn when pushing the wheel sensor. This may damage the wheel sensor.

REAR WHEEL BRAKE

COMPONENT LOCATOR

M06030301BED1003

REAR AXLE



M06030300001

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	20	Brake chamber

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

A	35-51 {352-525, 26-37}	

OVERHAUL

M06030301BEH2003

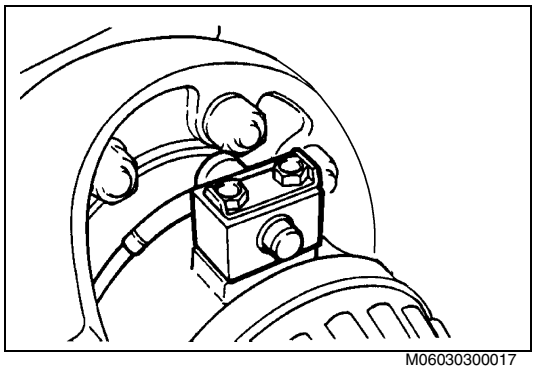
IMPORTANT POINTS - DISASSEMBLY

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.

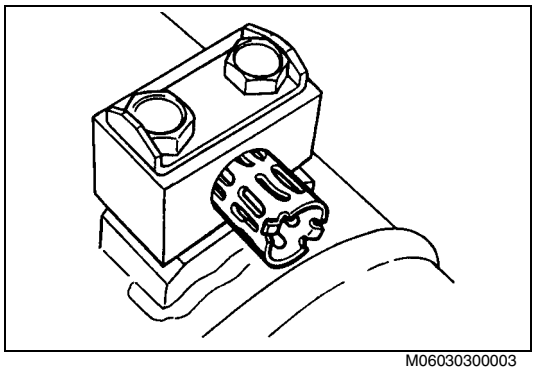
(3) Remove the wheel sensor.


M06030300017

NOTICE:

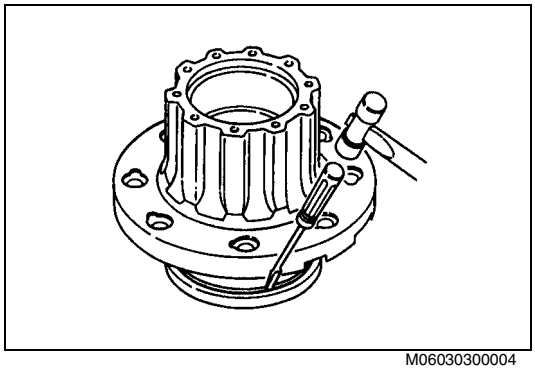
- **Exposing the wheel sensor to strong bumps could cause interior damage. Never hit the wheel sensor with a hammer or bang it into other parts.**
- **Pull out the wheel sensor from the sensor holder by hand.**

(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:

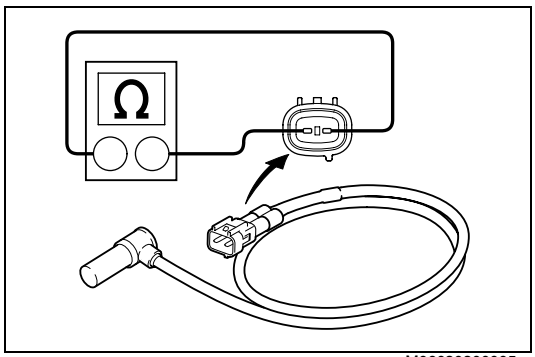
- **Do not remove the sensor ring unless it is required.**
- **When tapping on the sensor ring to remove it, be careful not to scratch the wheel hub.**
- **Do not reuse the removed sensor ring, be sure to replace it with new one.**

IMPORTANT POINTS - INSPECTION

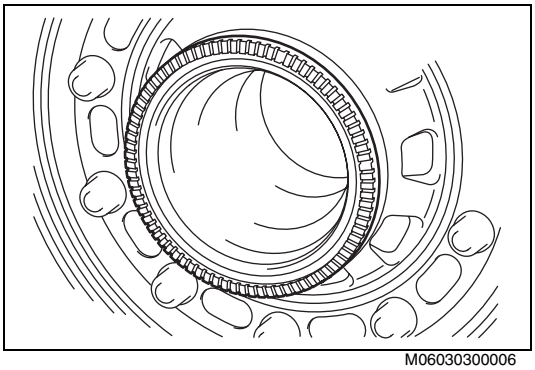
1. INSPECT THE ONLY WHEEL SENSOR.

(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.

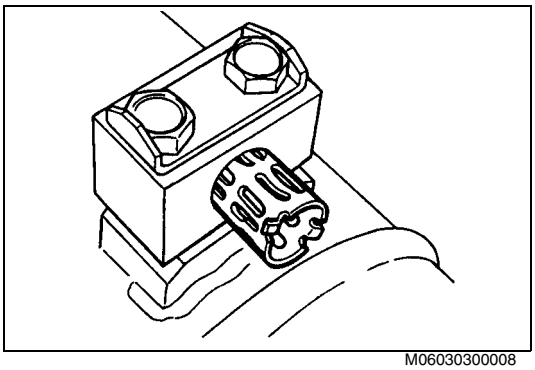


M06030300005


M06030300006

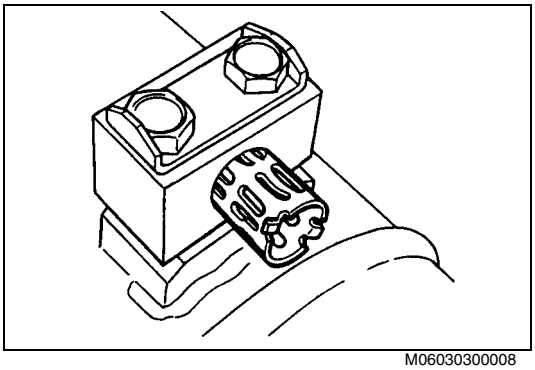
2. INSPECT THE SENSOR RING.

(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

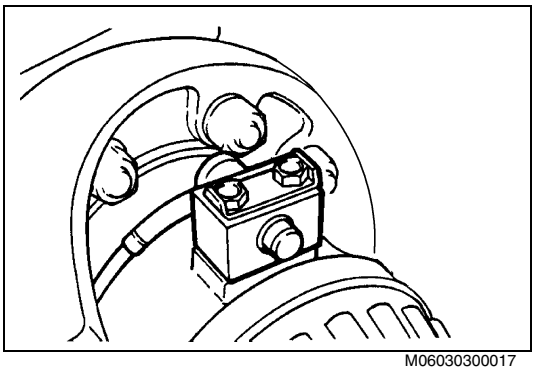
3. INSPECT THE CLAMPING BUSHING.

(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

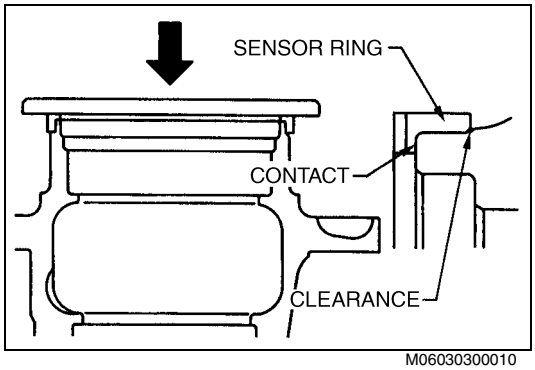
(1) Push in the clamping bushing until the stopper makes contact with the rear axle wheel sensor holder.


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.

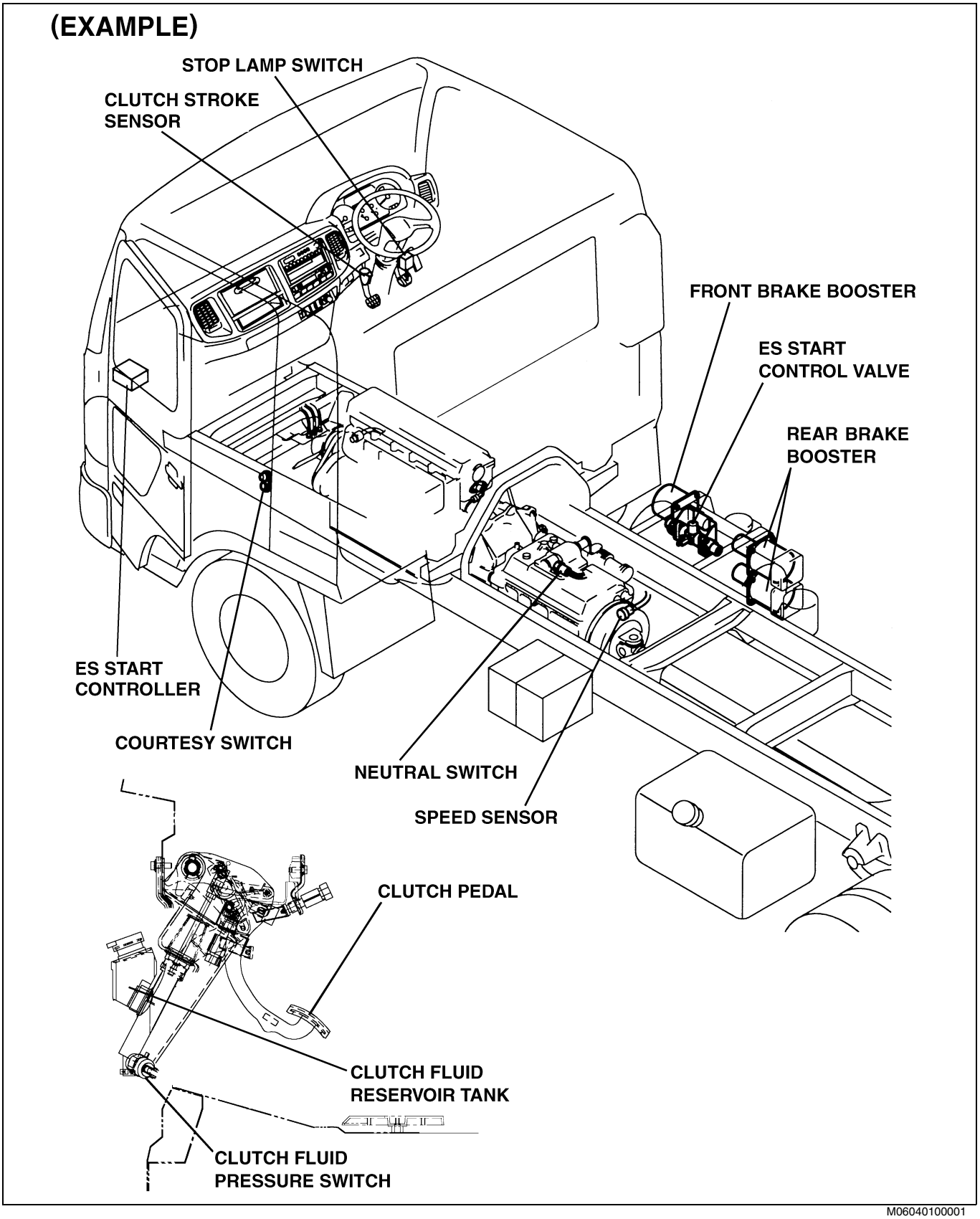
ES START (EASY & SMOOTH START SYSTEM)

BR04-001

ES START

DESCRIPTION

M06040101BEC1001

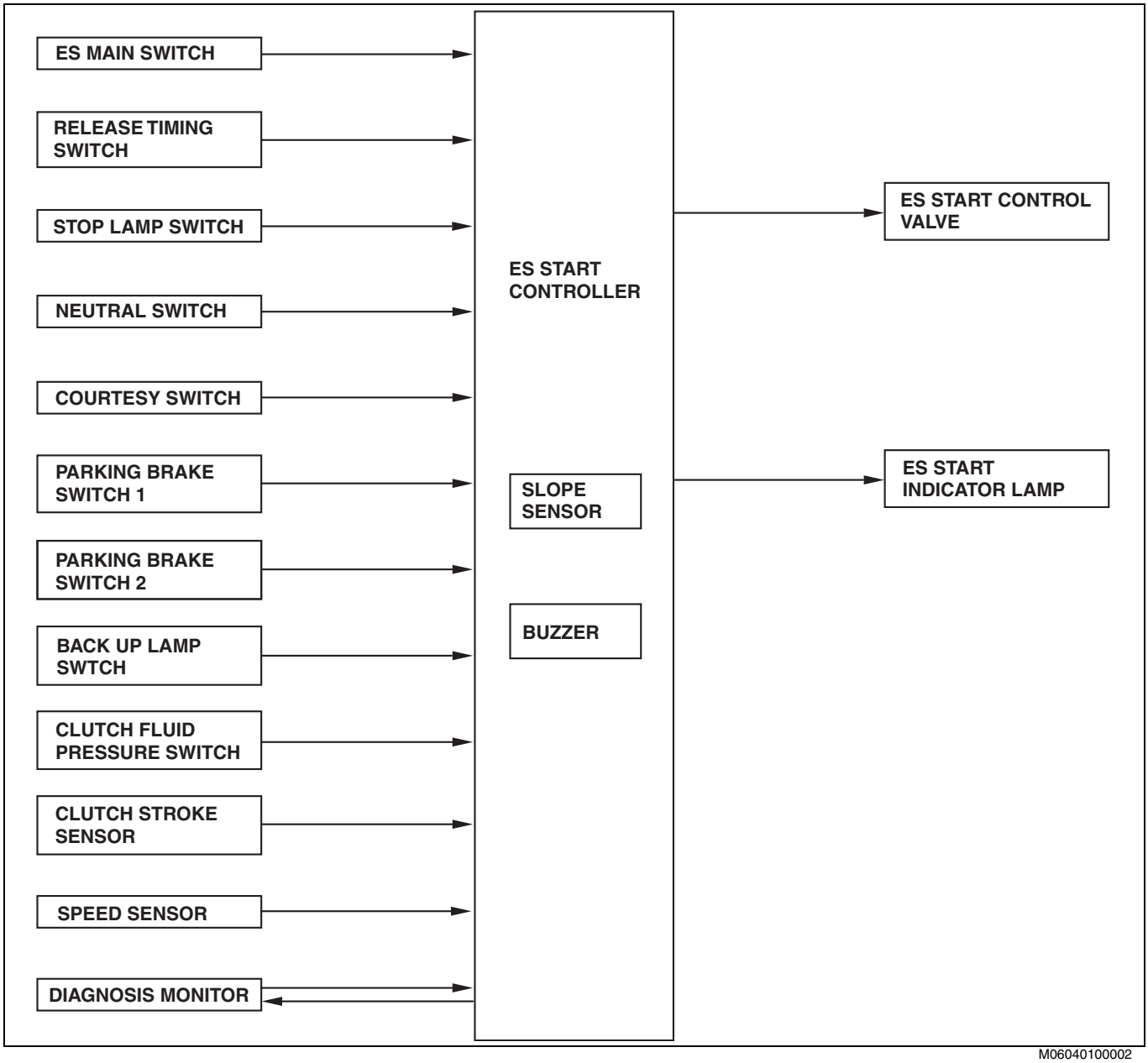


M06040100001

DIAGRAM

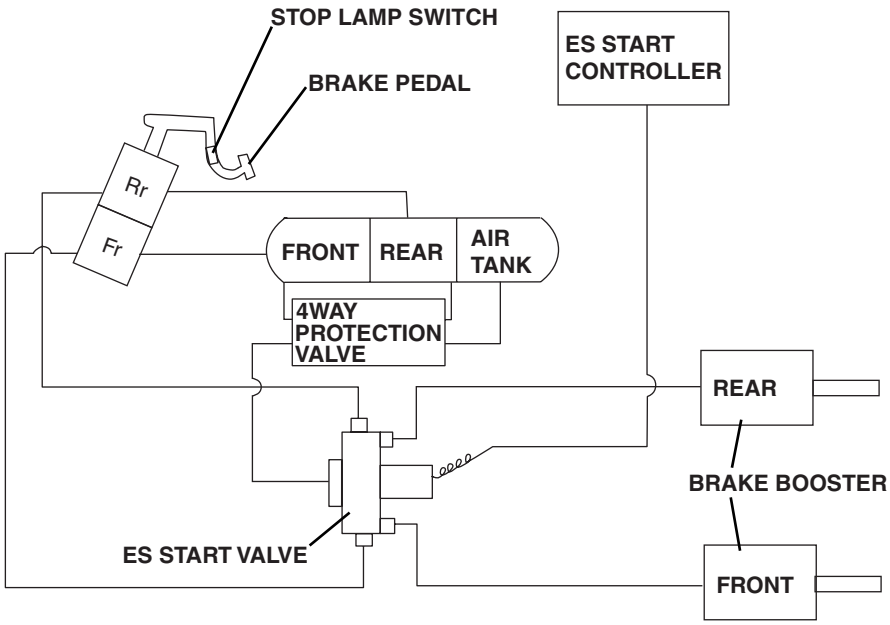
M06040101BEJ1001

SYSTEM DIAGRAM



M06040100002

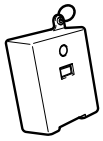
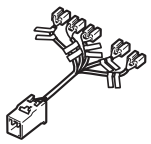
PIPING DIAGRAM



M06040100003

SPECIAL TOOL

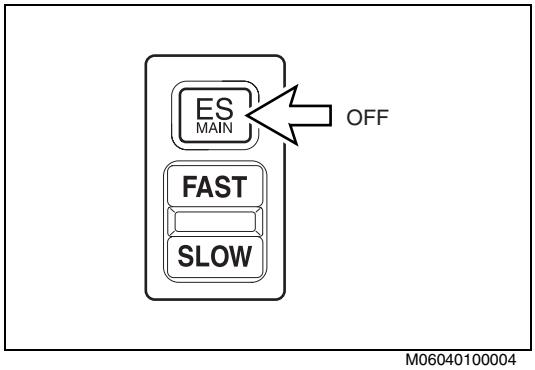
M06040101BEK1001

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

M06040101BEH3002

NOTICE:
When replacing the clutch disc, clutch stroke sensor or ES start controller, do the following adjustment.

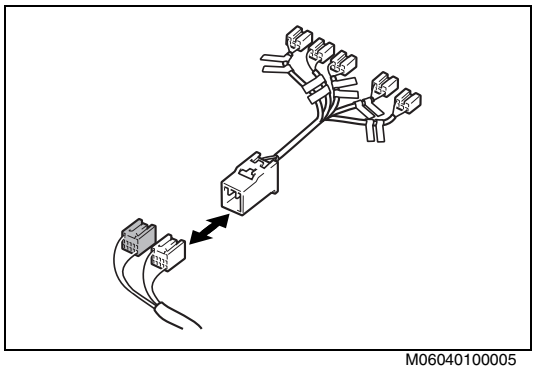


M06040100004

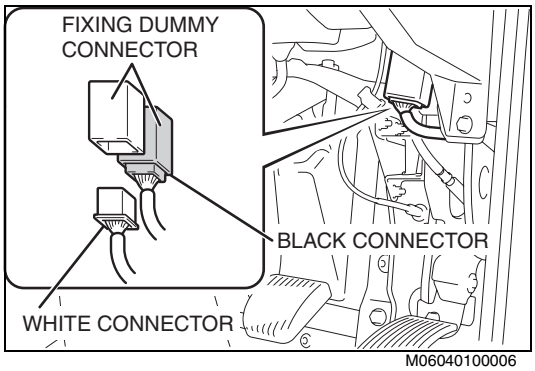
ADJUSTMENT OF THE CLUTCH STROKE SENSOR.

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".

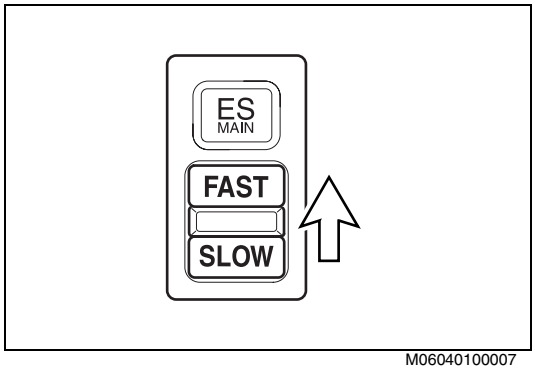

M06040100005

(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)



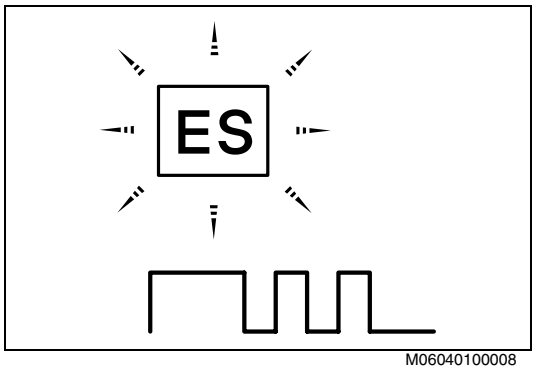
M06040100006

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

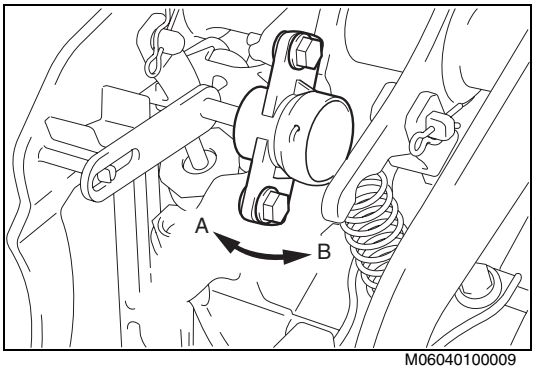
(4) Push "FAST" side of the release timing switch three times.



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

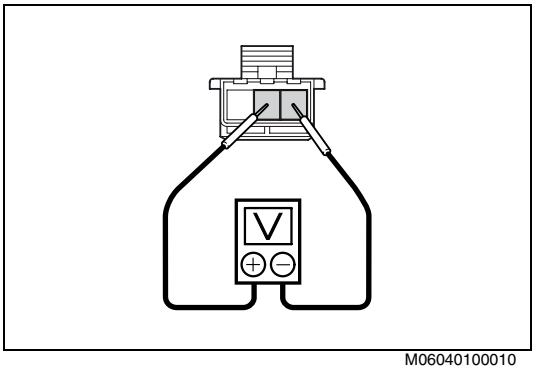
(1) Loosen the clutch stroke sensor fitting bolt to adjust the sensor as shown in the figure.

Buzzer	Adjusting procedure
Beeping intermittently	Turn the sensor to A direction
Beeping continuously	Normal condition
No beeping	Turn the sensor to B direction

HINT:

When the clutch sensor is fitted correctly, the voltage between terminals 2 and 3 of the clutch stroke sensor connector is 0.28-0.77 V.

(2) After completing the adjustment, proceed to step 3.



M06040100010

3. HOW TO COMPLETE

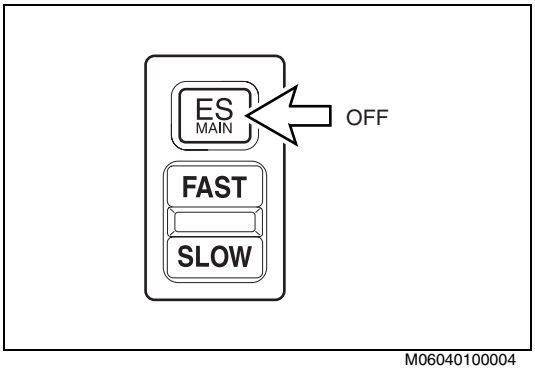
(1) Tighten the clutch stroke sensor fitting bolt. (Make sure there is no misalignment.)

(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

HINT:

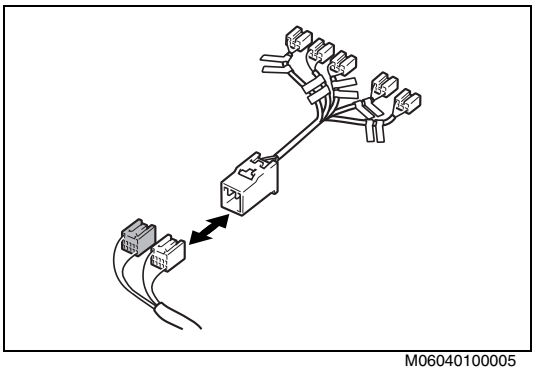
This is for memorizing the default value of ES start release position (engaging point of clutch) to ES start controller.



M06040100004

1. HOW TO SETUP

(1) Turn the starter key "ON" and ES main switch "OFF". Then pull the parking brake lever.

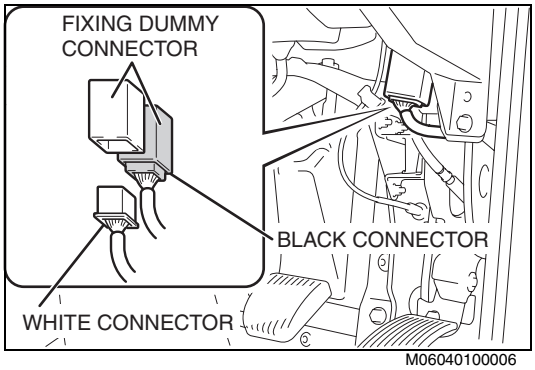

M06040100005

(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:

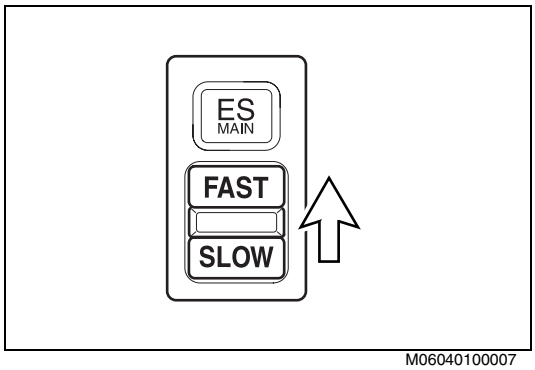
Special wiring harness for intensive diagnosis connector (09630-2300)

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

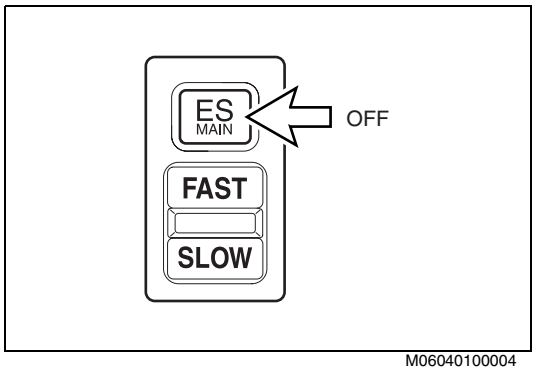
(3) Make sure that the clutch pedal has returned completely and press "FAST" side of the release timing switch for 3 seconds.

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.
(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.

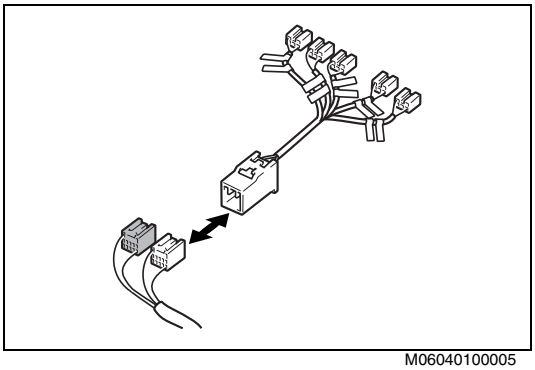


M06040100004

0 POINT ADJUSTMENT OF SLOPE SENSOR

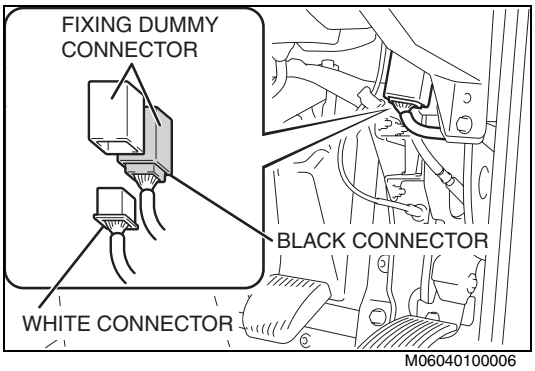
HINT:
This is for memorizing the slope sensor signal when the vehicle is on the level to ES start controller.

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.


M06040100005

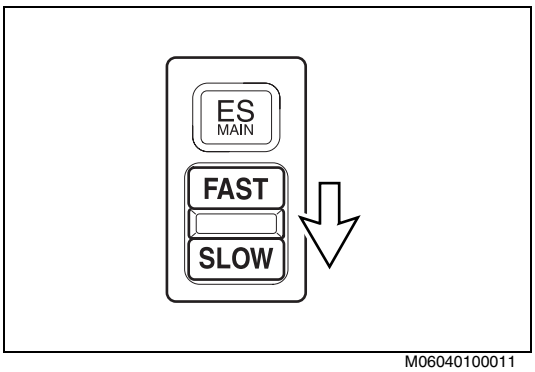
(3) Locate two intensive diagnosis connectors on lower right of the driver's side instrument panel. Connect the special wiring harness to the white connector and diagnosis monitor to the connector tagged by "ES start".

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.



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.

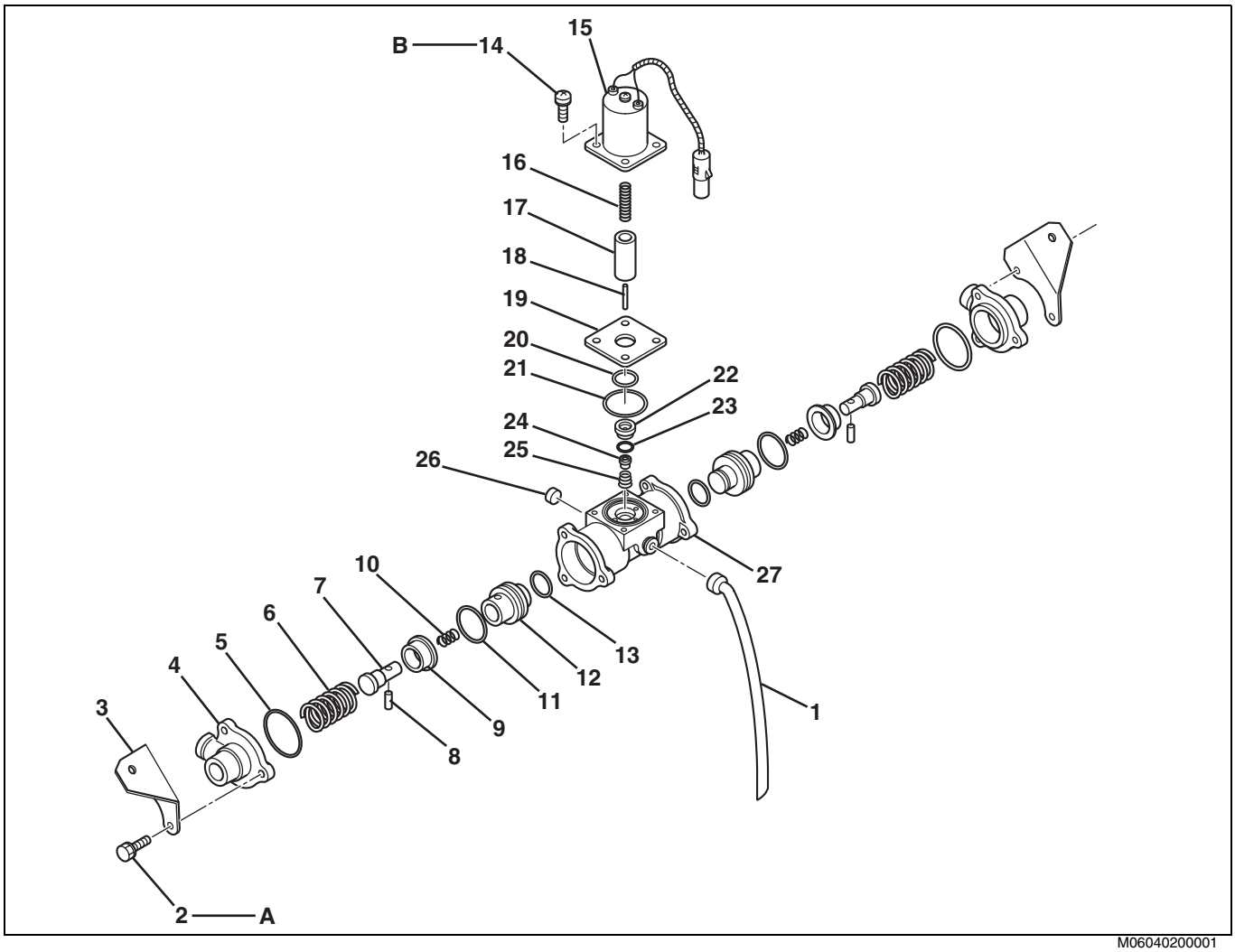
NOTICE:
- **0 point adjustment of slope sensor must be done on the level road. (If the adjustment is done on slope road, the sensor does not function properly.)**
- **If startup of 0 point adjustment is impossible, the road condition is not on the level. Move the vehicle to a place on the level.**
- **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

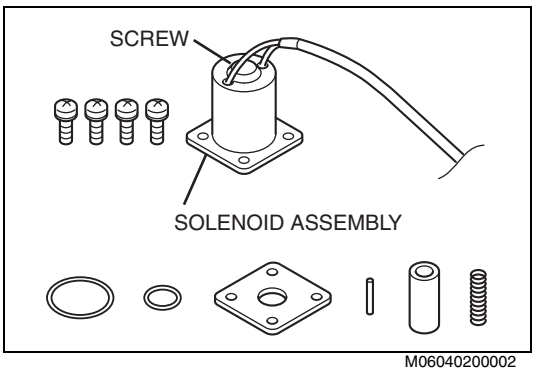
M06040201BEH2001

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.**

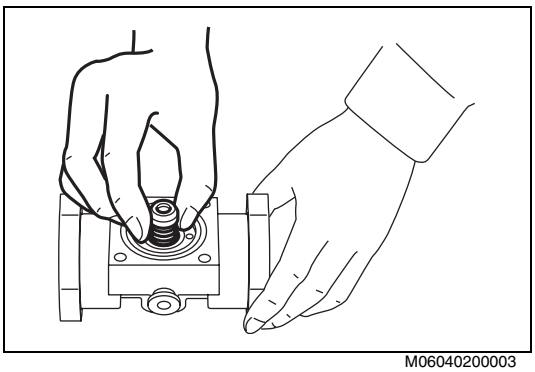
IMPORTANT POINTS - DISASSEMBLY



M06040200002

NOTICE:
Never loosen the screws in the solenoid assembly. Replace the solenoid assembly if the screws have been loosened.

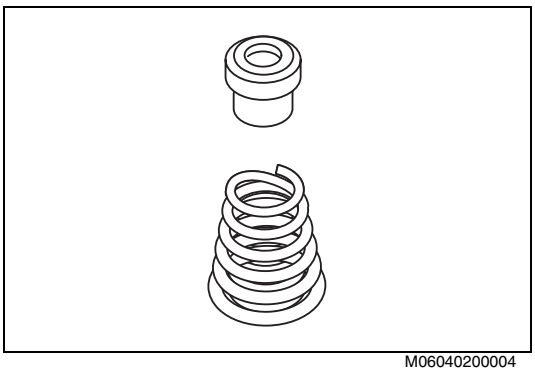
IMPORTANT POINTS - ASSEMBLY



M06040200003

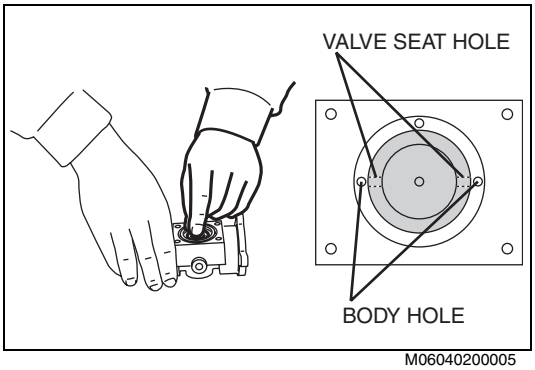
NOTICE:
Apply an adequate amount of grease to each O-ring before assembly.

1. **Insert the spring in the valve and assemble it in the body.**



M06040200004

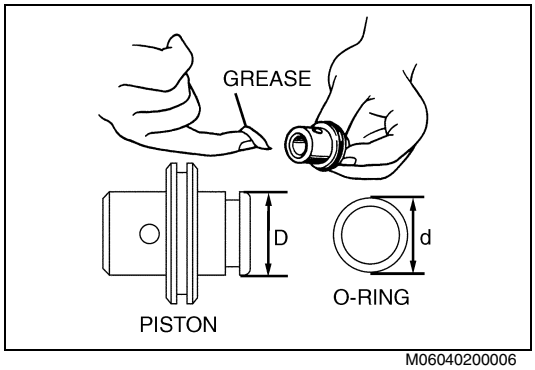
NOTICE:
Assemble the valve and the spring as shown in the figure.



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.

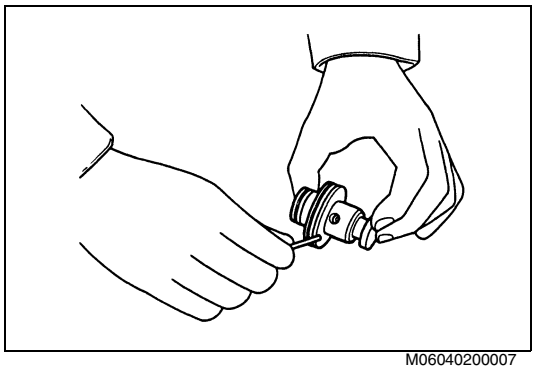


M06040200006

3. Assemble the O-rings (2 units) in the piston and lubricate the inside diameter of the piston with grease.

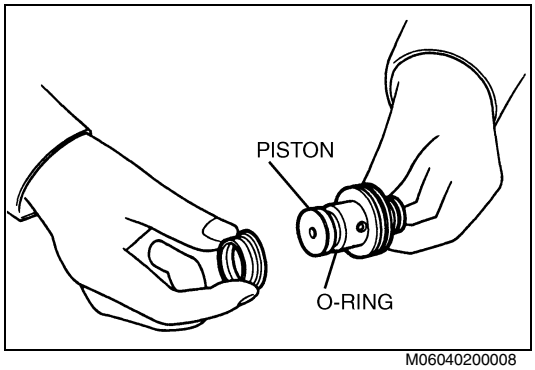
NOTICE:
Verify the diameter of the O-ring (small diameter) because there are multiple settings and then assemble the unit.

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.

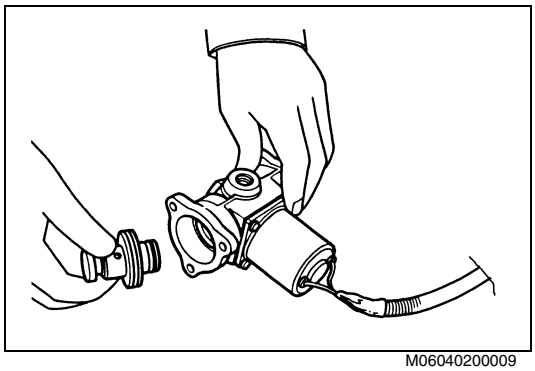
NOTICE:
Align the inlet valve pin hole and piston pin hole and assemble the parts. After the assembly is completed, do not rotate the inlet valve to align the pin holes.



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.

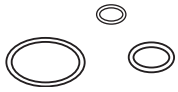
8. Insert the piston inlet valve assembly in the body.

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 

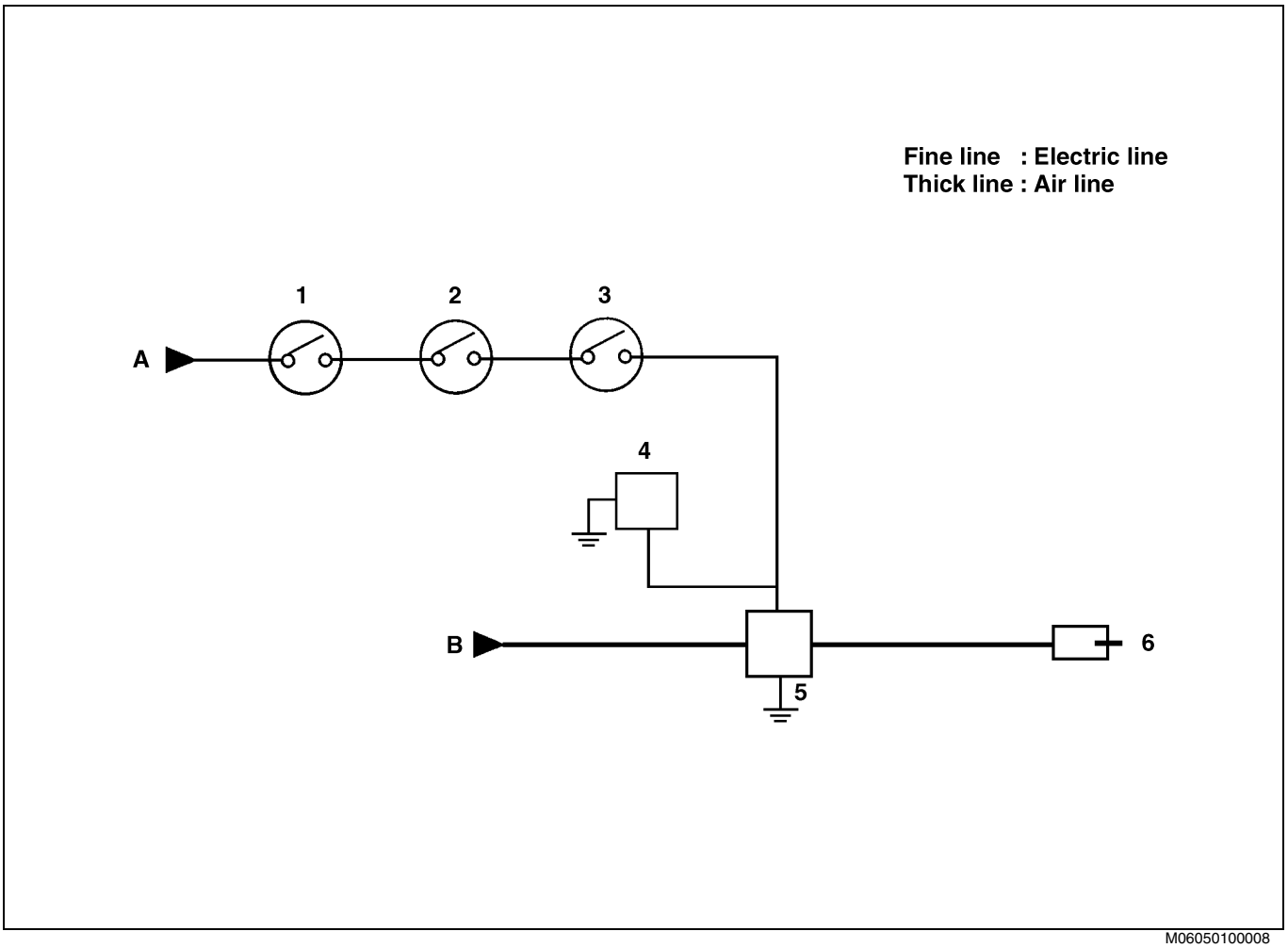
EXHAUST BRAKE

BR05-001

EXHAUST BRAKE SYSTEM

SYSTEM DIAGRAM

M060501BEJ1002



M06050100008

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 Electric Wiring Diagram in the ELECTRICAL EQUIPMENT chapter and Brake Piping Diagram in the SERVICE BRAKE chapter for details.

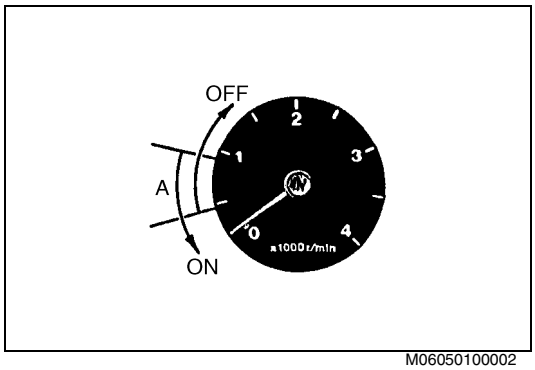
TROUBLESHOOTING

M060501BEF3001

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

M060501BEH3001



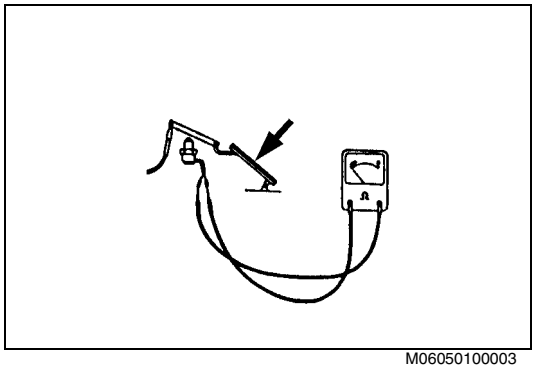
M06050100002

ACCELERATOR SWITCH ADJUSTMENT

1. ADJUSTMENT OF THE EXHAUST BRAKE ACCORDING TO THE ENGINE SPEED

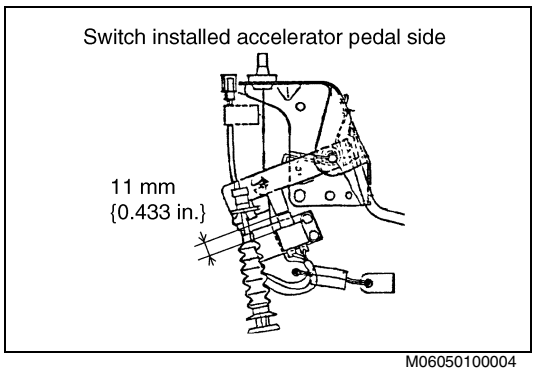
(1) Adjust the engine idling speed by turning the throttle knob.

(2) The accelerator switch should turn on (0 Ω) when the engine speed is lower than the following, and off (∞ Ω) when the engine speed is higher.



M06050100003

NOTICE:
Use the accelerator pedal to change engine speeds.

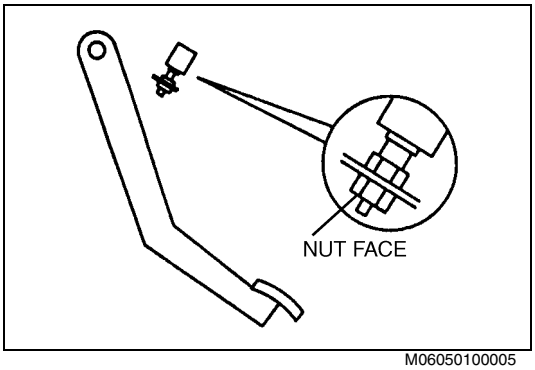


M06050100004

(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**
500-550	**550-700**



M06050100005

CLUTCH SWITCH ADJUSTMENT

1. FIT THE SWITCH SO THAT THE THREAD AND NUT FACE ARE FLUSH.

BRAKE CYLINDER

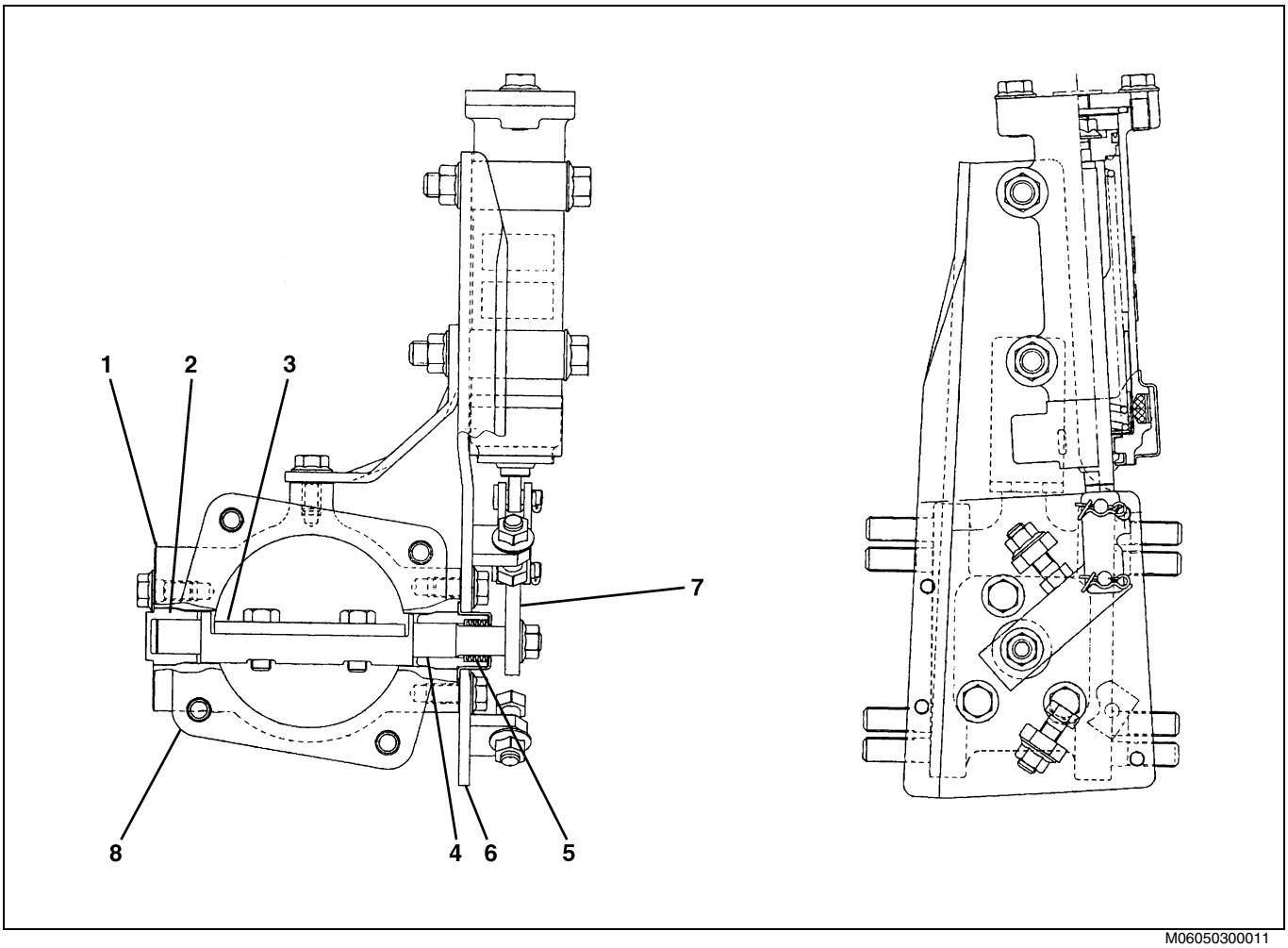
DATA AND SPECIFICATIONS

M06050301BEI2001

Type	Butterfly valve

DESCRIPTION

M06050301BEC1001

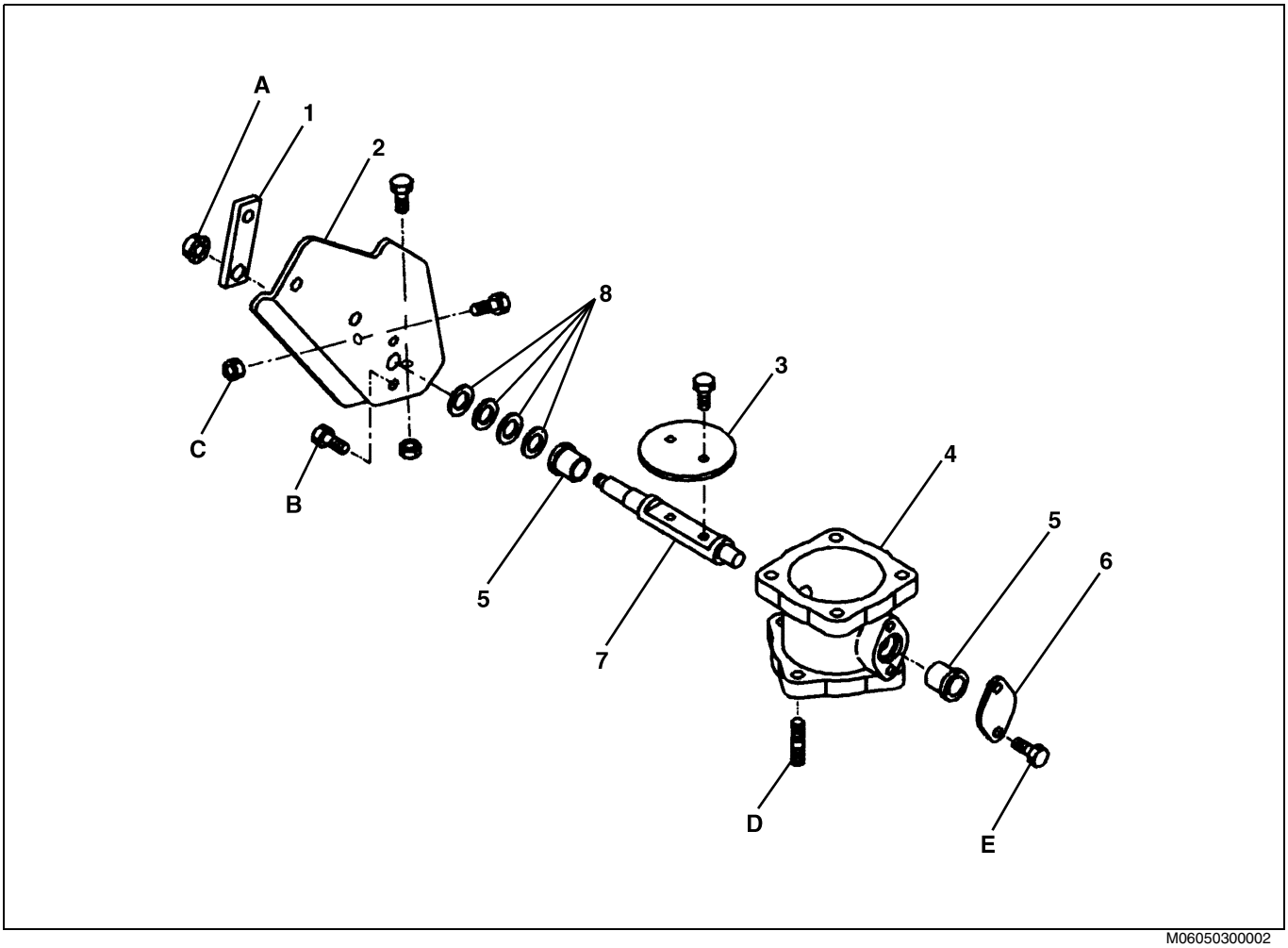


M06050300011

1	Blind plate	5	Seal ring
2	Bushing	6	Plate
3	Valve	7	Lever
4	Shaft	8	Cylinder

COMPONENT LOCATOR

M0650301BED1001



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}**

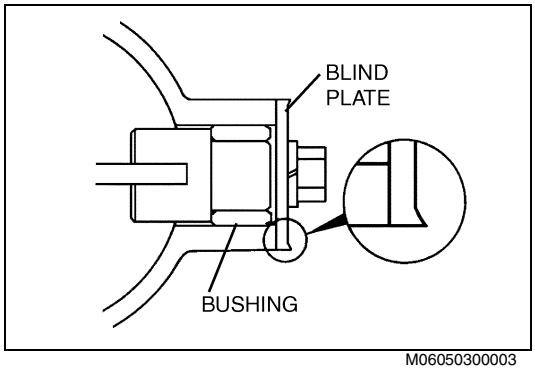
A	10.8-16.7 {120-170, 9-12}	D	19.6-24.5 {200-240, 15-17}
B	22.6-28.4 {240-280, 18-20}	E	22.6-28.4 {240-280, 18-20}
C	10.8-16.7 {120-170, 9-12}		

OVERHAUL

M06050301BEH2001

IMPORTANT POINT - DISMOUNTING

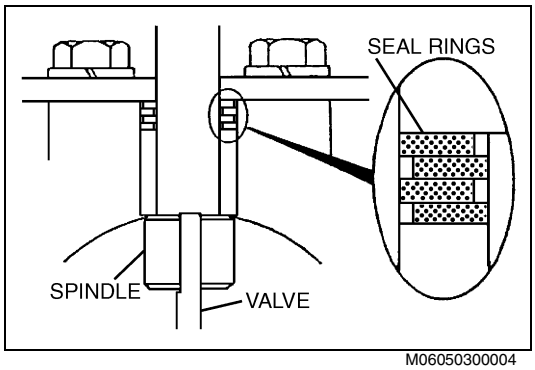
CAUTION:
Do not work on the exhaust brake cylinder while it is still hot. This can result in personal injury.



M06050300003

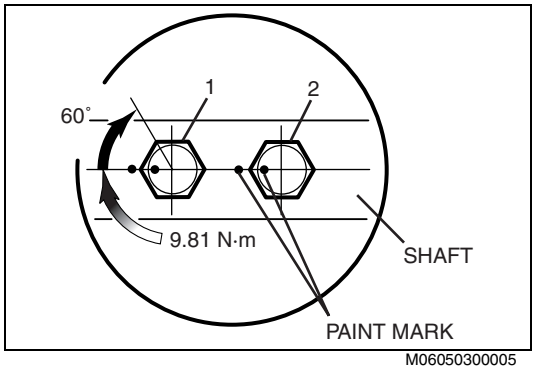
IMPORTANT POINTS - ASSEMBLY

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

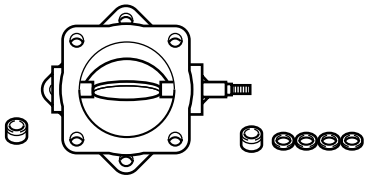
3. INSTALLATION OF THE VALVE
(1) Apply lithium molybdenum grease to the bolt seat surface and bolt threads.
(2) Tighten the bolts in order shown in the figure to the specified torque below.
Tightening Torque:
9.81 N·m {100 kgf·cm, 7 lbf·ft}
(3) Mark the bolt heads and shaft in the same direction with 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

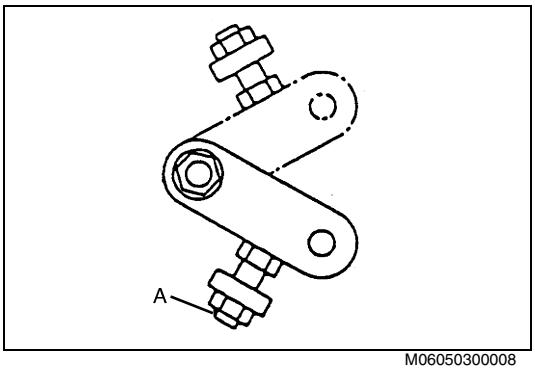
M06050301BEH3001

Unit: mm {in.}

Inspection item	Standard	Limit	Remedy	Inspection procedure
Brake cylinder, bushing and seal ring: Wear, any other damages	**—**	**—**	**Replace, if necessary.**	**Visual check** 

ADJUSTMENT

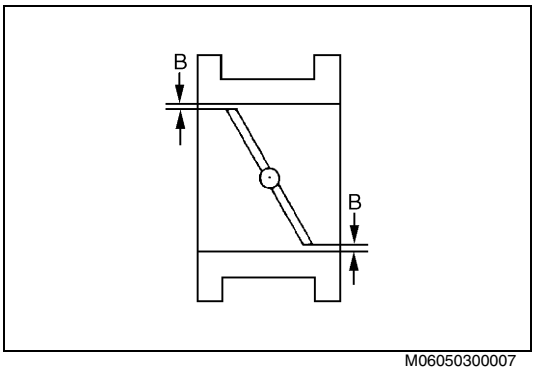
M06050301BEH3002



M06050300008

1. CLOSE SIDE ADJUSTMENT

(1) Adjust the clearance between the cylinder and the butterfly valve with the adjusting screw "A".



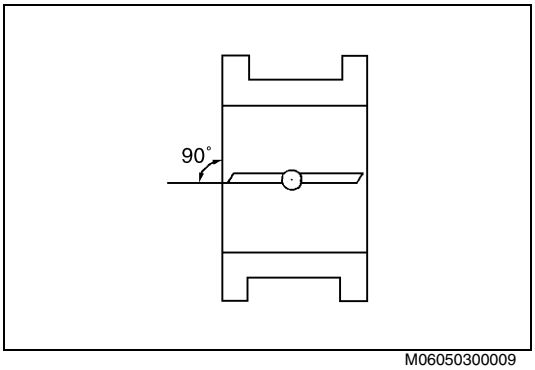
M06050300007

Limit: B = 0.1 mm {0.0039 in.}

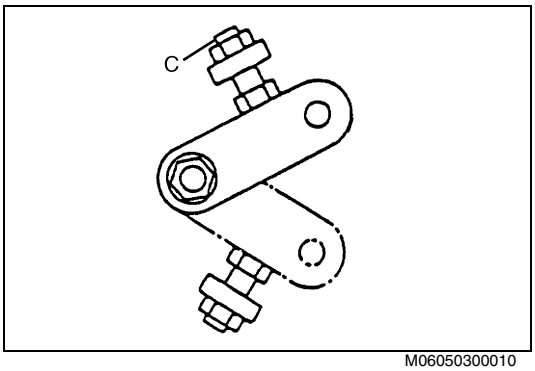
(2) Lock the adjusting screw "A" with a lock nut.

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.



M06050300009



M06050300010

STEERING EQUIPMENT

SR01-001

STEERING SYSTEM

TROUBLESHOOTING

M07010102BEF3001

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 chapte 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.

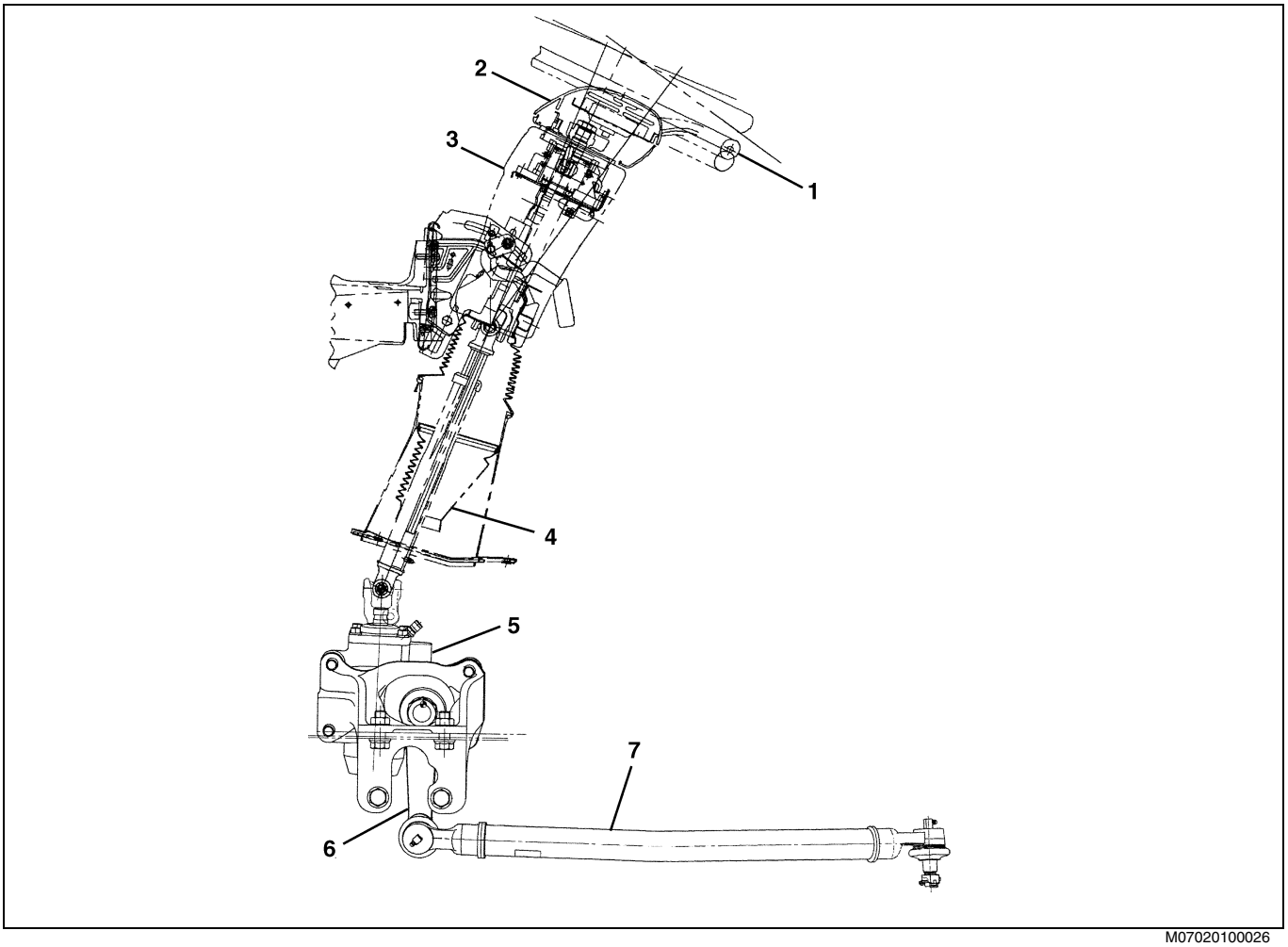
STEERING UNIT

SR02-001

STEERING LINKAGE

DESCRIPTION

M07020101BEC1001

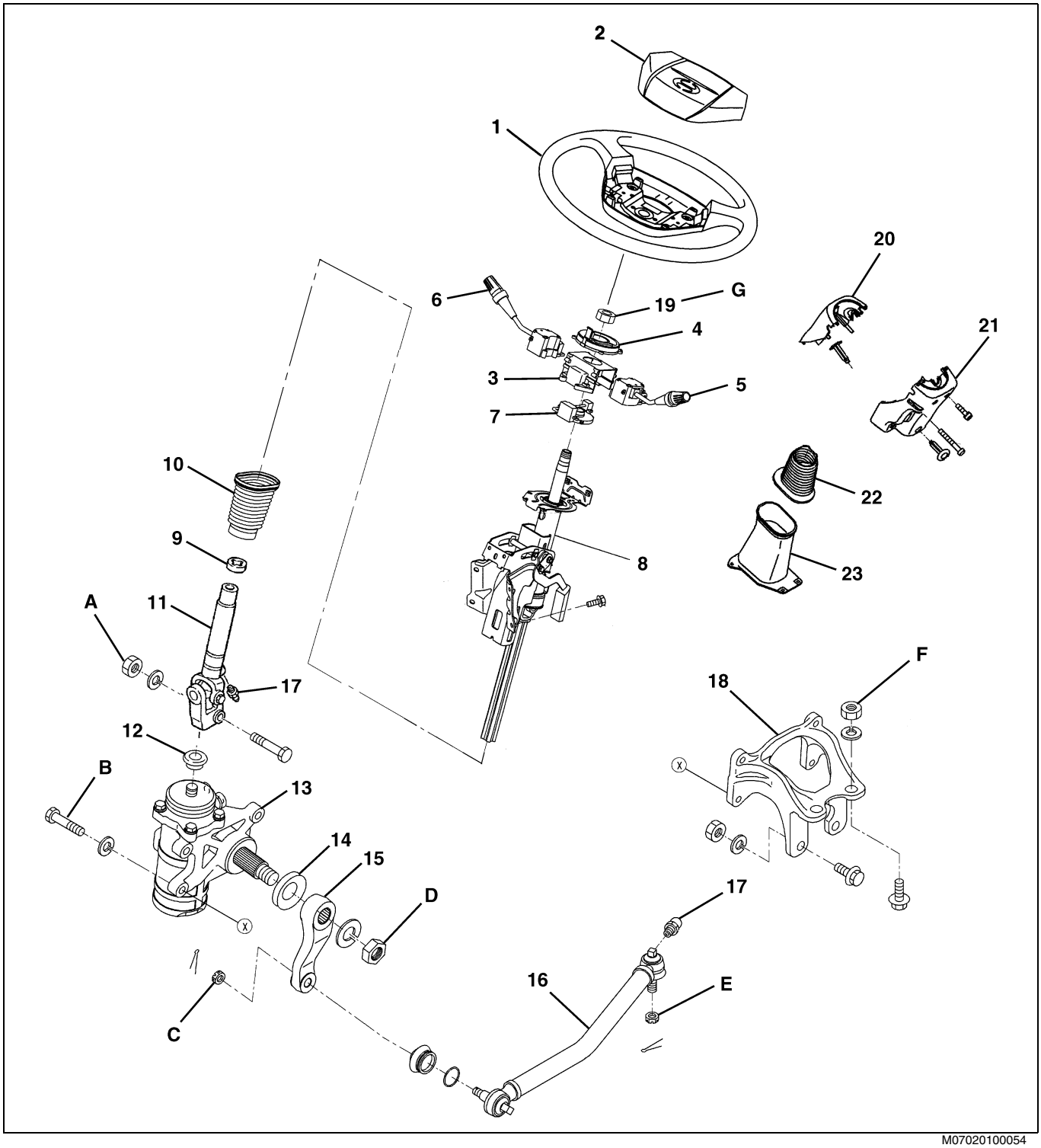


M07020100026

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

M07020101BED1003



M07020100054

1	Steering wheel	9	Dust seal	16	Drag link
2	Horn button	10	Dust cover	17	Lubrication fitting
3	Combination switch	11	Steering shaft universal joint assembly	18	Steering gear bracket
4	Spiral cable			19	Flange nut
5	Windshield wiper switch	12	Steering shaft dust cover	20	Column upper cover
6	Light control switch	13	Steering gear unit	21	Column lower cover
7	Steering sensor	14	Steering gear dust seal	22	Column lower boot
8	Steering column assembly	15	Pitman arm	23	Column lower tube

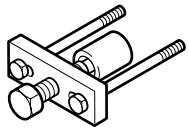
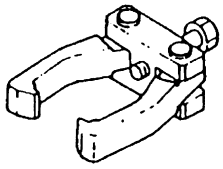
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

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	**291-389 {2,968-3,966, 215-286}**		

SPECIAL TOOL

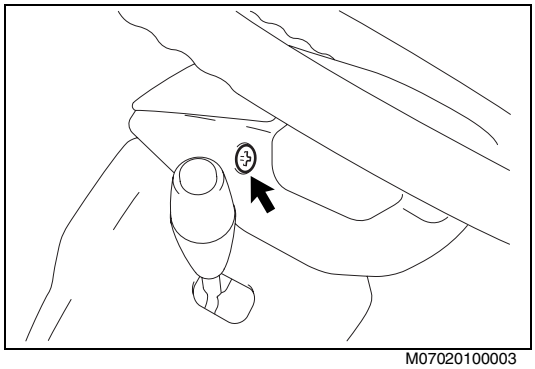
M07020101BEK1001

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

M07020101BEH2002

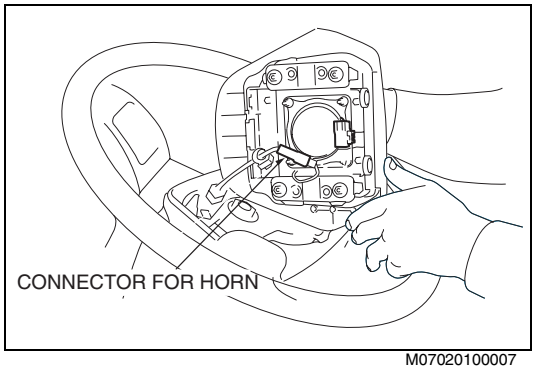

M07020100003

IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE STEERING WHEEL.

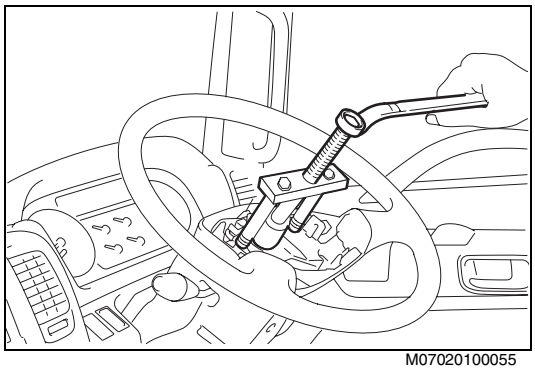
(1) Loosen the torx bolt for fixing the horn button using torx wrench.

(2) Remove the horn button from the steering wheel.



M07020100007

(3) Remove the connector for the horn.


M07020100055

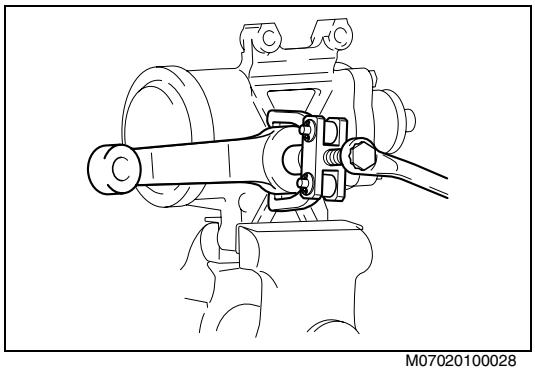
(4) Remove the steering wheel lock nut.

(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.**

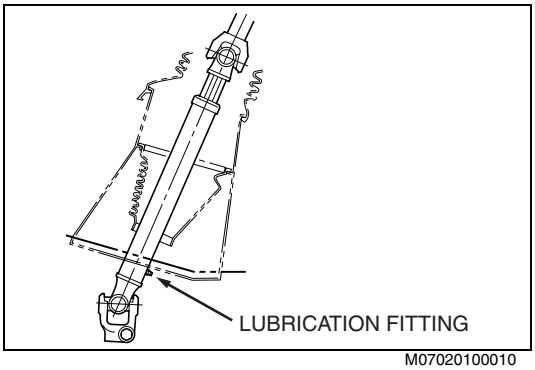
(6) Fix the rotating part of spiral cable with tape etc. to prevent the spiral cable from rotating.


M07020100028

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)



M07020100010

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLE THE STEERING SHAFT.

2. INSTALL THE DUST COVER.

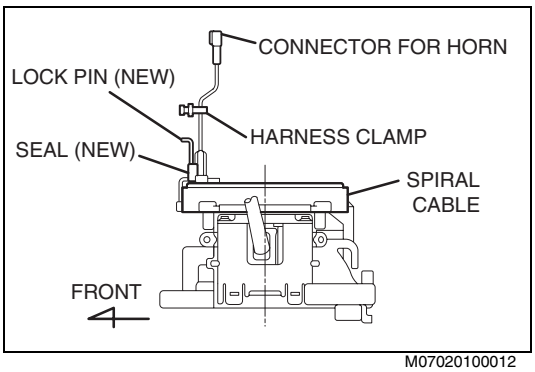
(1) The dust cover must be fitted with two bolts facing the relief mark "REAR" rearward. After tightening, make certain that the white paint mark will be faced frontward.

3. ASSEMBLE THE STEERING SHAFT.

(1) Before assembling, apply chassis grease to the spline of the sliding yoke, and after assembling also fill grease through lubrication fitting.

When replacing parts: 30g (1.1 oz)
When replenishing parts: 15g (0.5 oz)

NOTICE:
When assembling, take care not to damage the steering shaft spline.

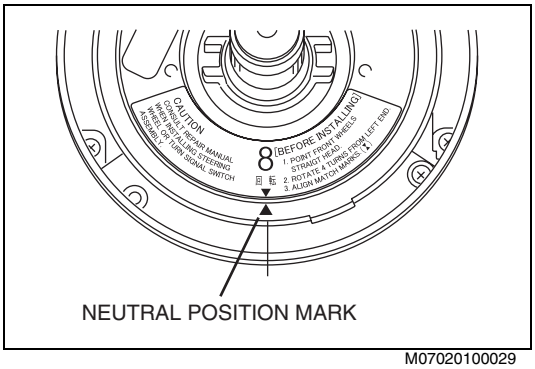


M07020100012

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.

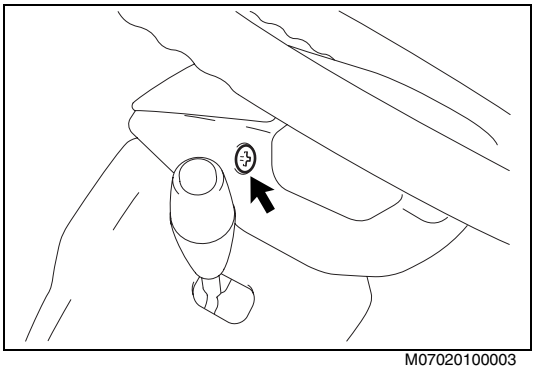


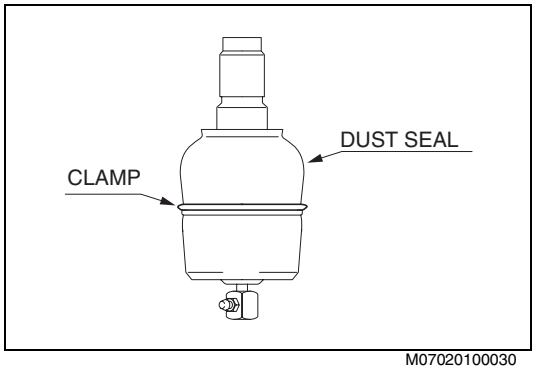
M07020100029

NOTICE:
When there is no lock pin though the spiral cable is new, or when the seal is cut though there is a lock pin, or when the neutral position of the spiral cable gets out of position in reuse, turn the spiral cable counterclockwise lightly. And turn it back clockwise by 4 rotations at the point of beginning of the hard steering. Then match the neutral position marks on the upper side of the spiral cable assembly.

(3) Pass the spiral cable through the steering wheel opening area and set the steering wheel straight to install it with nut. When the spiral cable is new, remove the lock pin. When it is reused, remove the tape etc. for fixing the rotation of the spiral cable.

(4) Tighten the set screw for fixing the horn button after pushing it in by using a torx wrench.
Tightening Torque:
6.5-13.5 N·m {66-138, 4.8-9.9 kgf·cm}


M07020100003



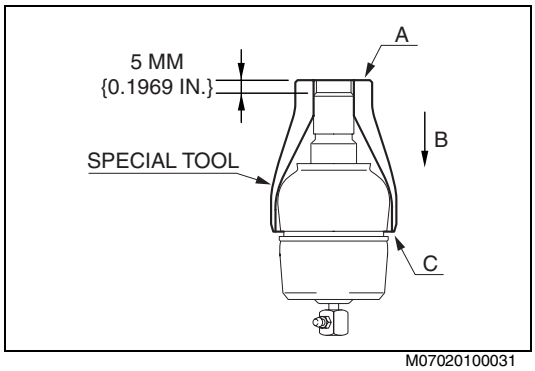
M07020100030

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.

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.



M07020100031

(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)

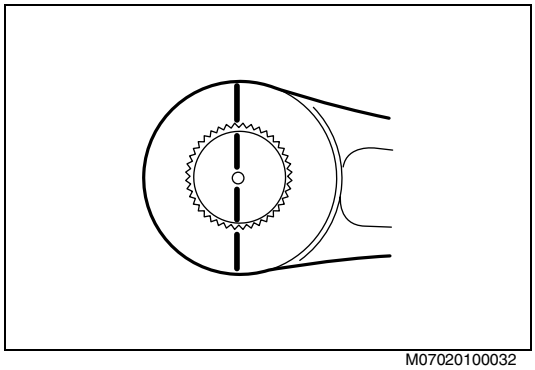
(5) Insert a clamp from A side of the tool and move it to the direction of B down to the plane C. Then drop the clamp slowly into the dust seal groove.

(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.

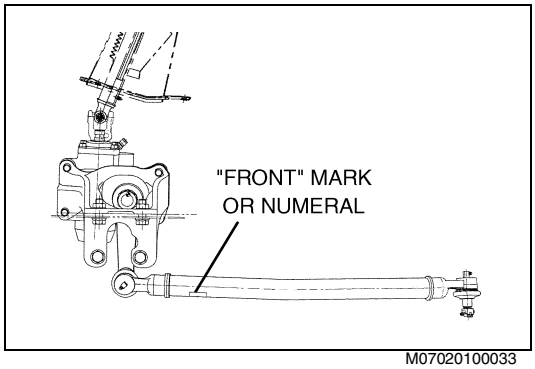
NOTICE:
Fill with grease until it flows out from the hole of dust seal.


M07020100032

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.



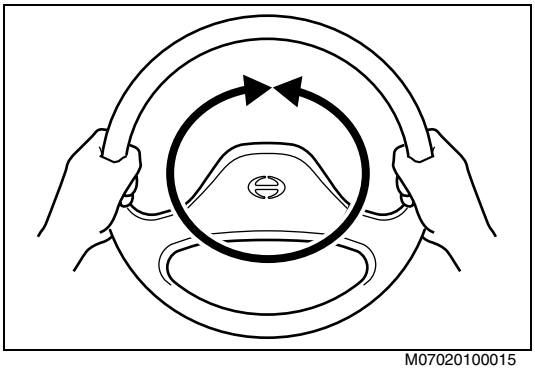
M07020100033

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.**

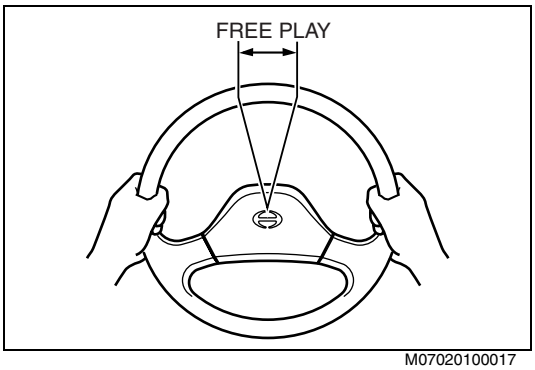
(2) Tighten the slotted nuts of the ball studs at both ends of the link to the specified torque, and then secure the nuts with the cotter pins.


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.

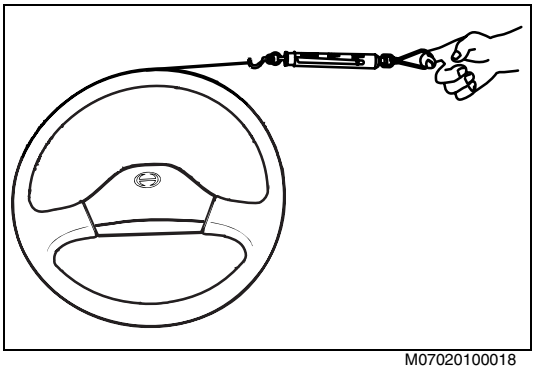


M07020100017

(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.

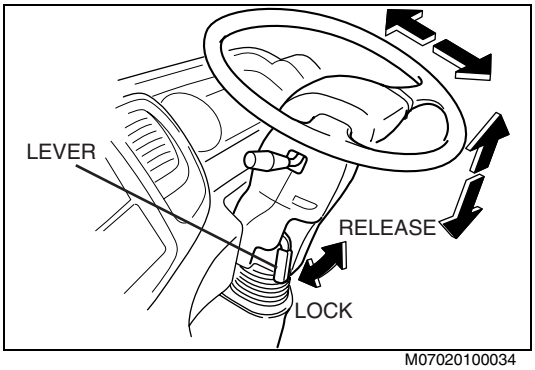
CAUTION:
Excessive steering wheel free play may adversely affect vehicle handling. This can result in personal injury and/or property damage.


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.

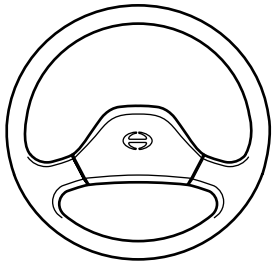
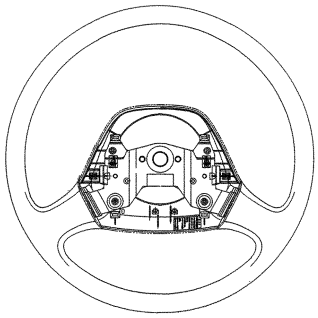
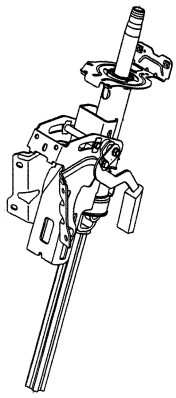
CAUTION:
Before moving the vehicle, tighten the lever securely and try to move the steering wheel up and down, and forward and backward to make sure that it is locked securely. Never try to adjust the steering wheel position while the vehicle is moving. Any adjustment of the steering wheel while driving 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** 

POWER STEERING

SR03-001

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. • Measure system hydraulic pressure. Replace piston sub-assembly.
	Incorrect preload of the sector shaft bearing	Adjust sector shaft preload.
Hard steering (Excessive steering effort) (Hard, when starting to steer)	Incorrect preload of the sector shaft bearing	Adjust sector shaft preload.

NOTICE:
Basic inspection items
- **Fluid level, Fluid cleanliness**
- **Air in fluid**
- **Tire pressure**
- **Front alignment**
- **Steering linkage**
- **Universal joint**

Symptom	Possible cause	Remedy/Prevention
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.

NOTICE:
Basic inspection items
- **Fluid level, fluid cleanliness**
- **Air mixed in fluid**
- **Pump piping**
- **Steering linkage**

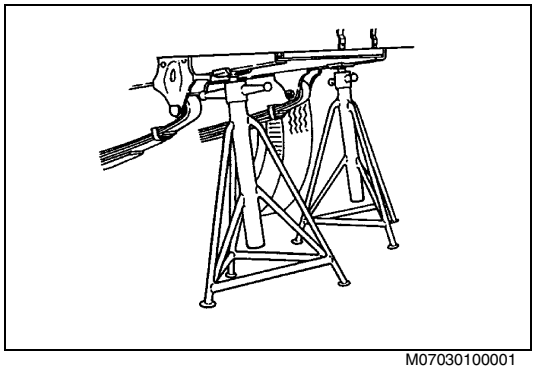
AIR BLEEDING

M07030101BEH2003

1. FILL THE OIL RESERVOIR WITH POWER STEERING FLUID.

NOTICE:

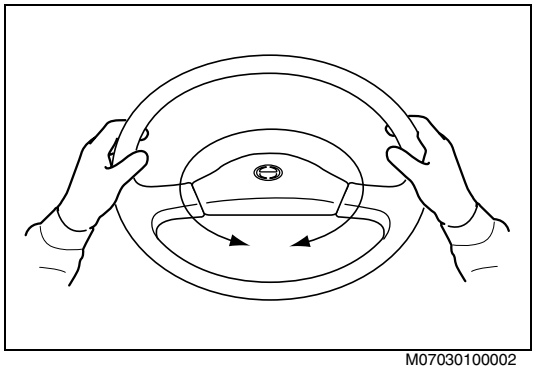
- **Use only specified fluid.**
- **Do not overfill the oil reservoir.**
- **Replace old fluid with new fluid after overhauling power steering gear unit or power steering pump.**
- **Specified fluid....Refer to owner's manual.**



M07030100001

2. JACK UP THE FRONT AXLE AND SUPPORT THE FRAME WITH STANDS.

NOTICE:
Block the rear wheels.

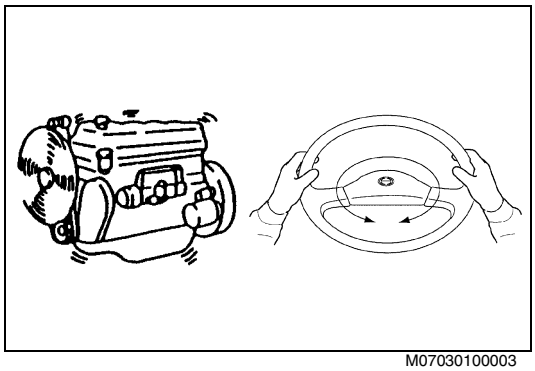


M07030100002

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.

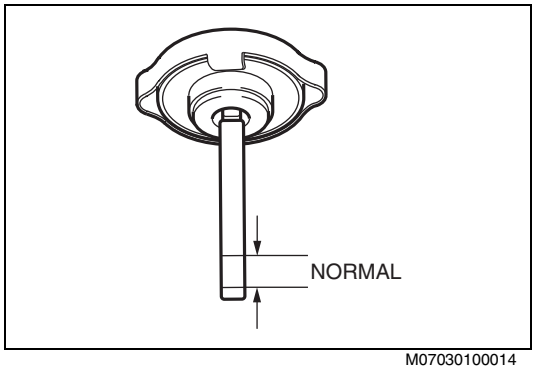


M07030100003

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.



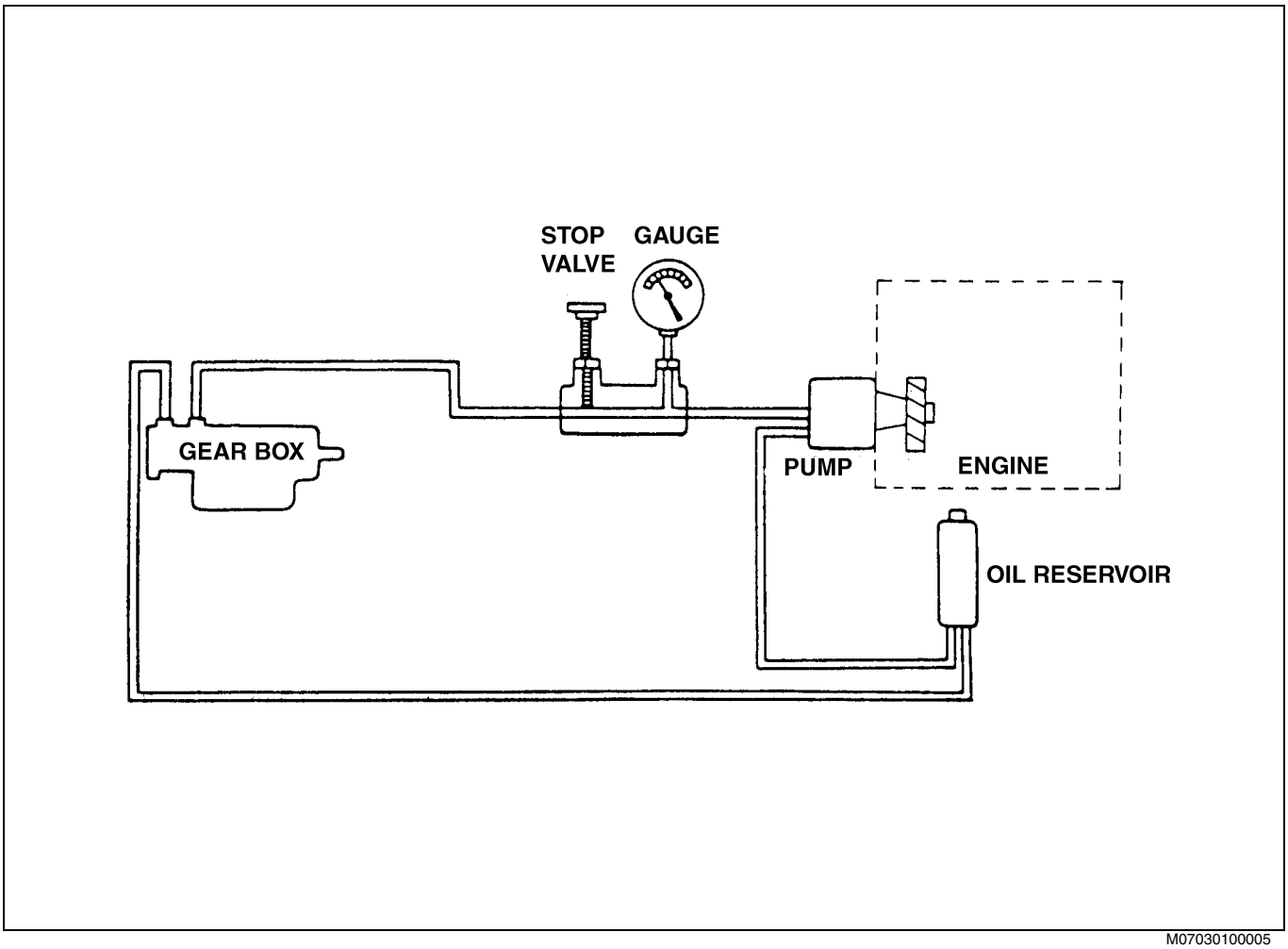
M07030100014

7. RECHECK THE FLUID LEVEL WHEN THE ENGINE IS STOPPED.

(1) If necessary, increase or decrease the power steering fluid to match the between the upper and the lower line.

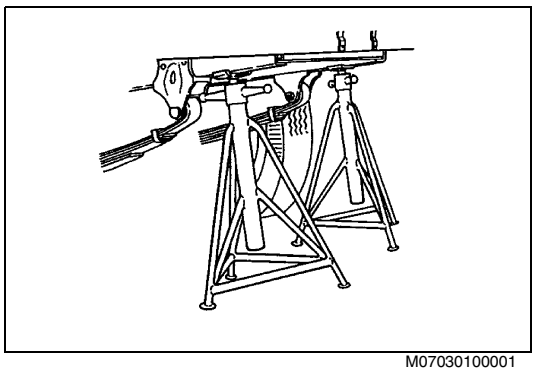
HYDRAULIC TEST

M07030101BEH3003



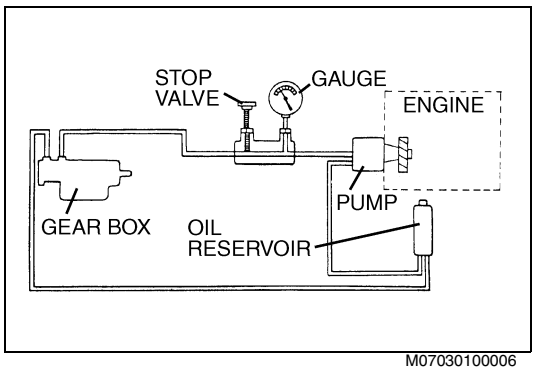
M07030100005

HYDRAULIC TEST


M07030100001

1. JACK UP THE FRONT AXLE AND SUPPORT THE FRAME WITH STANDS.

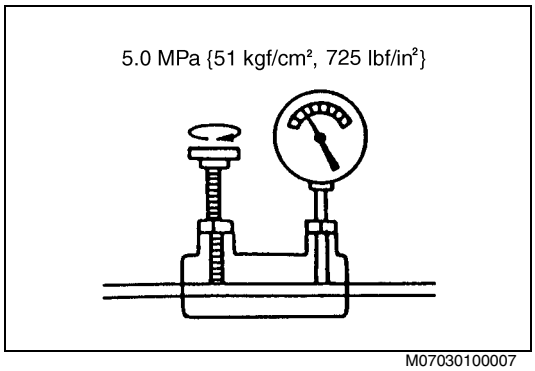
NOTICE:
Block the rear wheels.



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.

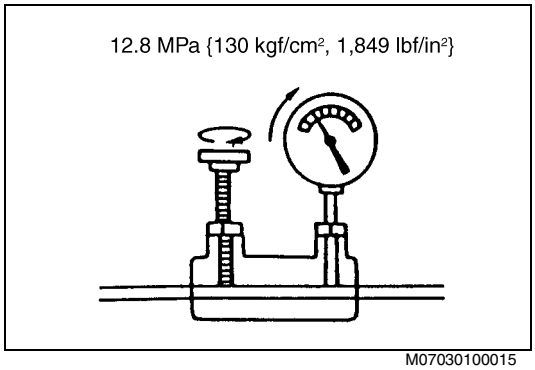
(1) Start the engine and idle then close the stop valve until the fluid pressure is at 5.0 MPa {51 kgf/cm^2,725 lbf/in^2}.

(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.



M07030100015

4. CHECK THE RELIEF VALVE OPERATION.

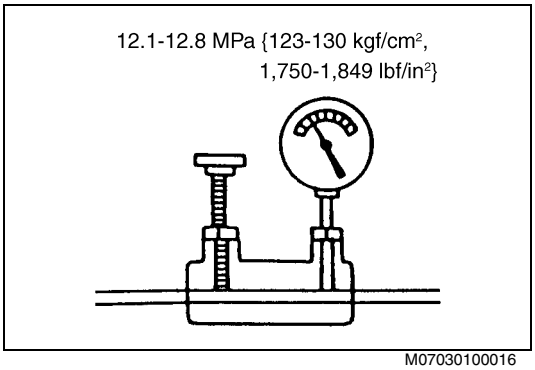
(1) Run the engine up to 2,000 r/min.

(2) Close the stop valve until the fluid pressure is at 12.8 MPa {130 kgf/cm^2, 1,849 lbf/in^2}.

NOTICE:
Be careful not to exceed 12.8 Mpa {130 kgf/cm^2, 1,849 lbf/in^2}.

(3) Good, if the fluid pressure is maintained at 12.1-12.8 MPa {123-130 kgf/cm^2, 1,750-1,849 lbf/in^2 }

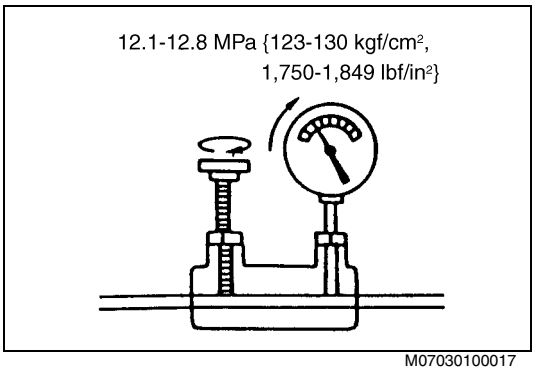
(4) If pressure is higher, stop the engine and replace the flow control valve assembly.



M07030100016

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:
12.1-12.8 MPa {123-130 kgf/cm^2, 1,750-1,849 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.



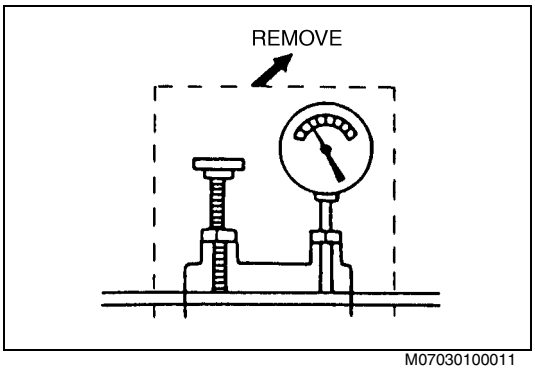
M07030100017

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:
12.1-12.8 MPa {123-130 kgf/cm^2, 1,750-1,849 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

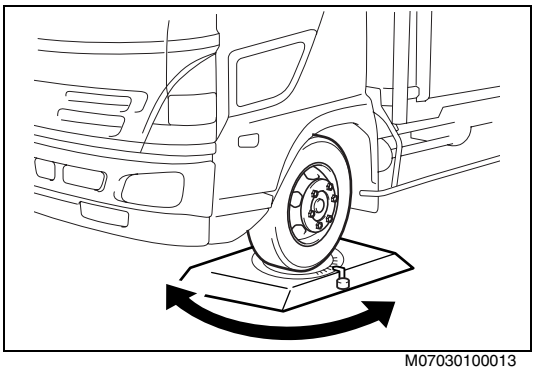
7. REMOVE THE STOP VALVE AND OIL PRESSURE GAUGE.

(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 kgf, 4.41 lbf}


M07030100013

POWER STEERING GEAR UNIT

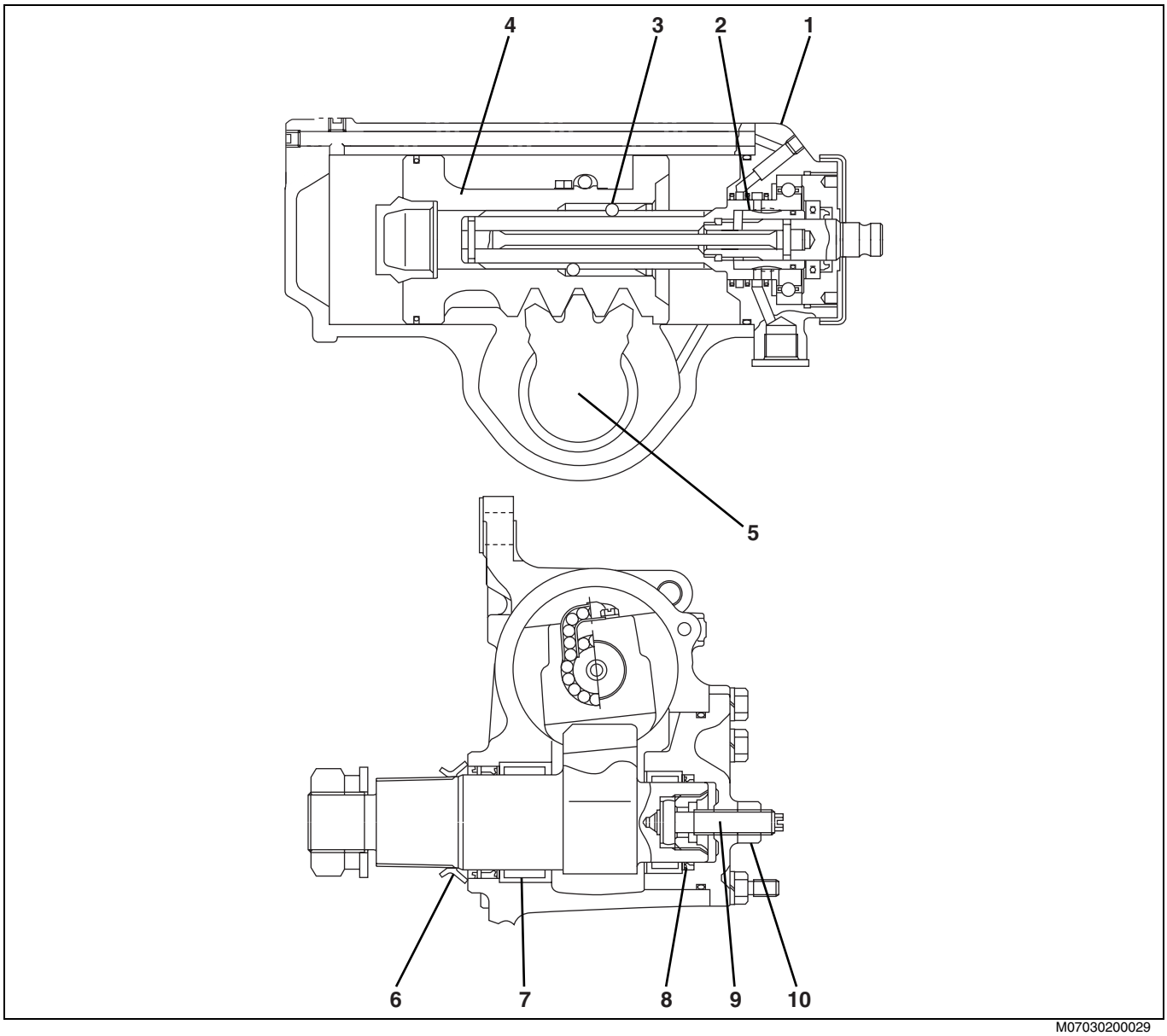
DATA AND SPECIFICATIONS

M07030201BEI2003

Model	**Integral type power steering**
Gear ratio	**19.05 : 1**
Cylinder inside diameter	**90 mm {3.543 in.}**

DESCRIPTION

M07030201BEC1003



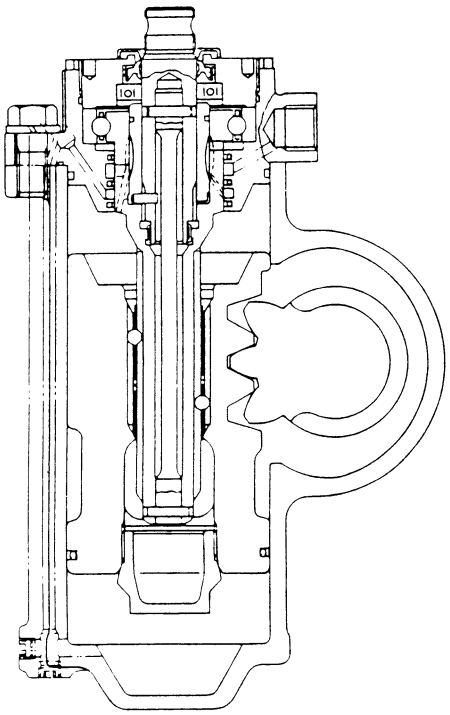
M07030200029

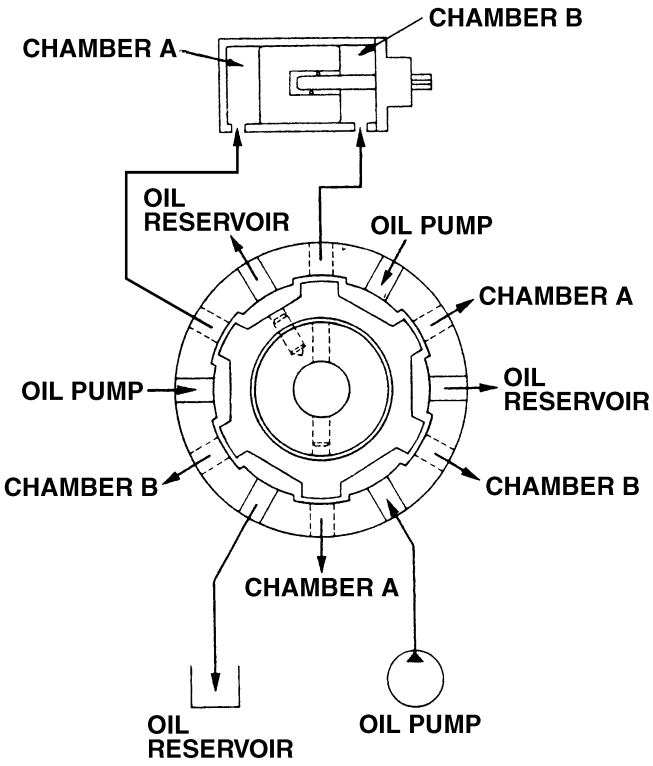
1	Valve housing assembly	6	Dust cover
2	Worm valve assembly	7	Needle roller bearing
3	Steel ball	8	Oil seal
4	Ball nut assembly	9	Adjusting screw
5	Sector shaft	10	Adjusting screw lock nut

OPERATION

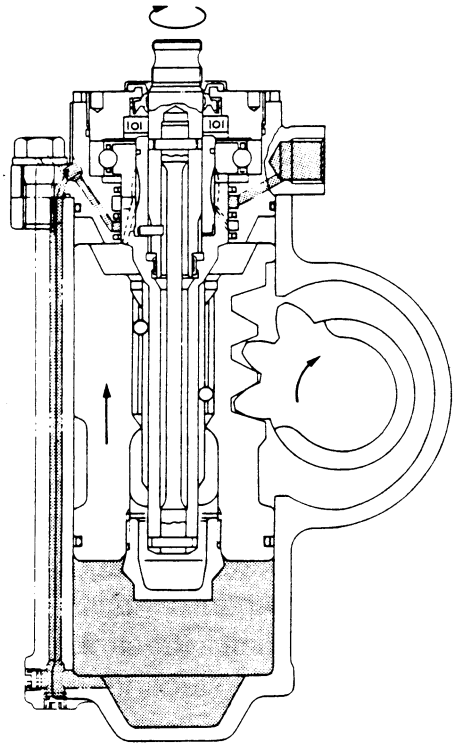
M07030201BEC1004

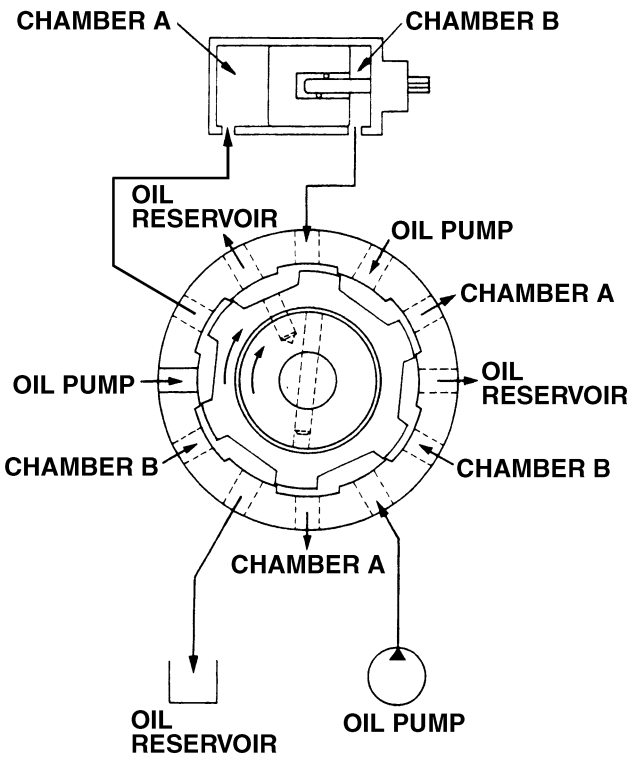
Neutral position





Power steering fluid circuit when turning the vehicle to the right
(Left turn is the reverse of the right turn)





M07030200030

SPECIAL TOOL

M07030201BEK1002

Prior to starting a power steering gear unit overhaul, it is necessary to have the following special tools.

Tool and accessory set: 09030-4180

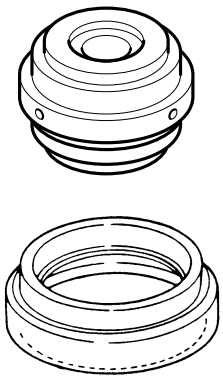
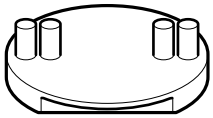
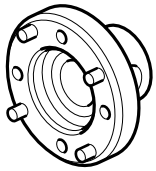
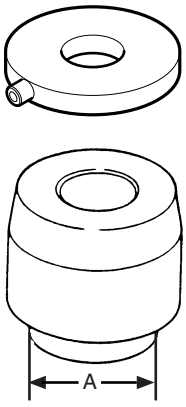
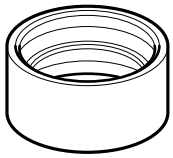
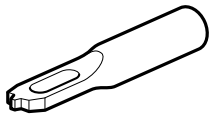
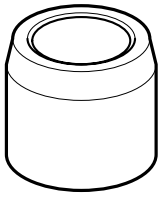
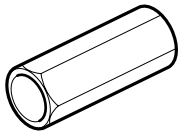
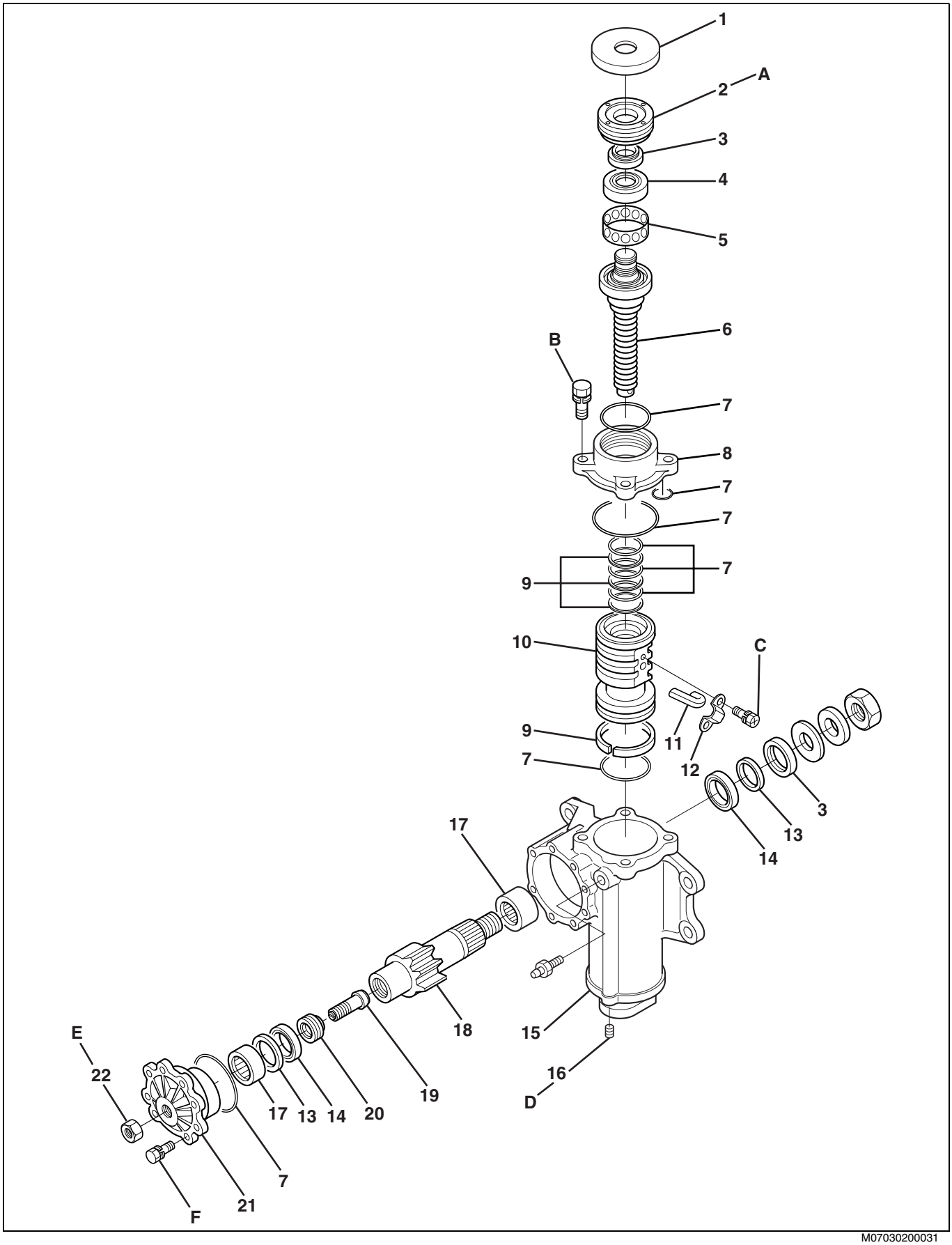
Illustration	Part number	Tool name	Remarks
	09657-1870	Tool assembly • For 85 mm {3.346 in.} • For 90-110 mm {3.544-4.330 in.} (Used together with tool assembly)	
	09659-1400	Attachment assembly	
	09603-1560	Wrench assembly	
	09657-1860	Inserter assembly A: For 40 mm {1.575 in.} For 45 mm {1.772 in.} For 48 mm {1.890 in.} For 53 mm {2.087 in.} For 58 mm {2.283 in.} (Used together with inserter assembly)	
	09659-1410	Pressfitter	
	09699-1360	Needle	
	09657-1840	Inserter	

Illustration	Part number	Tool name	Remarks
	09694-1020	Caulking tool	
	09657-1850	Inserter	
	09712-1130	Bar	

COMPONENT LOCATOR

M07030201BED1003



M07030200031

1	Dust cover	12	Tube clip
2	Plug and seal assembly	13	Back-up ring
3	Oil seal	14	Y-packing
4	Ball bearing	15	Steering body
5	Bearing cage and steel ball	16	Taper plug
6	Worm shaft assembly	17	Needle roller bearing
7	O-ring	18	Sector shaft
8	Valve housing	19	Adjusting screw
9	Seal ring	20	Retainer
10	Power piston (Ball nut)	21	Side cover
11	Ball tube	22	Lock nut

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

A	226-245 {2,300-2,500, 167-180}	D	8.9-12.7 {90-130, 6.5-9.4}
B	98.1-107.9 {1,000-1,100, 73-79}	E	117.7-127.5 {1,200-1,300, 87-94}
C	4.41-5.39 {45-55, 3.2-3.9}	F	49.1-53.9 {500-550, 37-39}

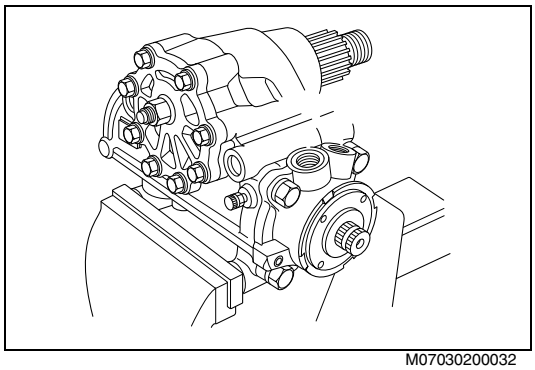
OVERHAUL

M07030201BEH2003

NOTICE:
OBSERVE THE FOLLOWING INSTRUCTIONS BEFORE DISASSEMBLY AND ASSEMBLY.

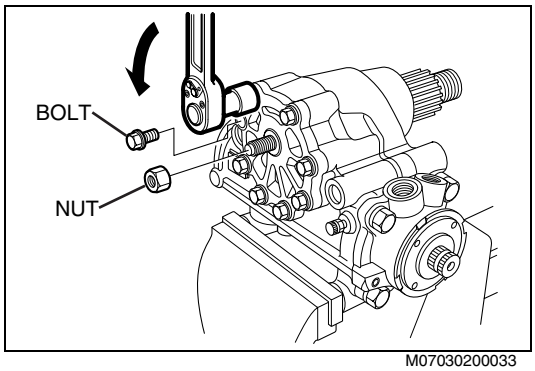
1. **All functional parts should be clean. Blow dirty parts off with dry compressed air, then clean them with volatile metal cleanser. Never use brushes or cloth.**
2. **Handle rubber parts, seals, etc., in clean condition. Any worn part should be replaced immediately.**
   Volatile metal cleanser may attack rubber parts, so they should never be used. Always use fluid.
3. **For disassembling and assembling, only use the specified fluid.**
4. **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



M07030200032

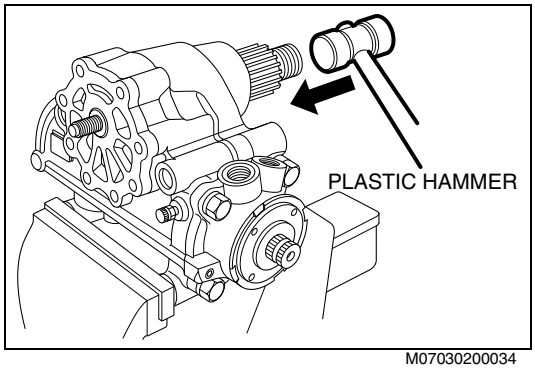
1. **BEFORE DISASSEMBLY, SECURE THE POWER STEERING IN THE VISE, AND THEN CENTER THE POWER PISTON.**



M07030200033

2. **REMOVE THE SIDE COVER ASSEMBLY AND SECTOR SHAFT**

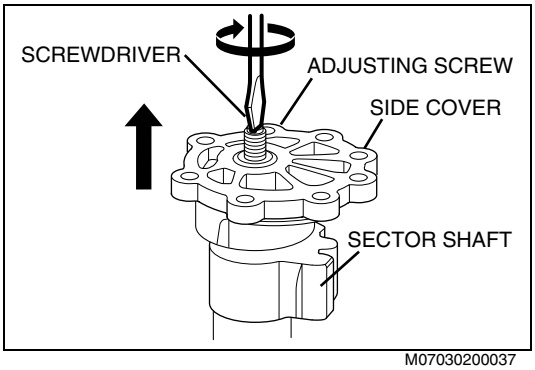
(1) Loosen and remove the nut fixing the adjusting screw to the side cover.
(2) Remove the eight bolts and washers fitting the side cover to the steering body.



M07030200034

(3) Confirm that the power piston is located in the center, and then gently tap the output end of the sector shaft with a plastic (or wooden) hammer to remove the sector shaft assembly and the side cover together from the steering body.

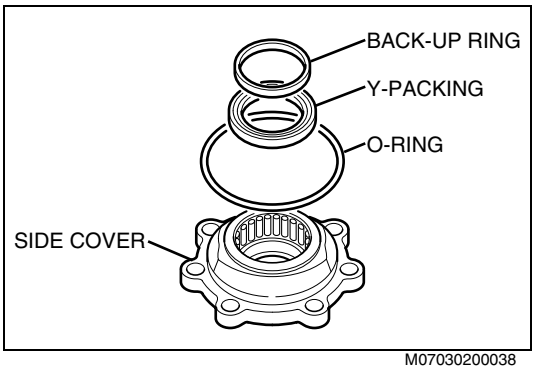
NOTICE:
Never use a steel hammer when removing the sector shaft (as the threads will be damaged).



M07030200037

(4) Trun the adjusting screw clockwise using a screwdriver to raise and separate the side cover assembly from the sector shaft assembly.

NOTICE:
- **Do not secure the sector shaft directly in the vise.**
- **Always use a cloth etc. to protect the sector shaft.**

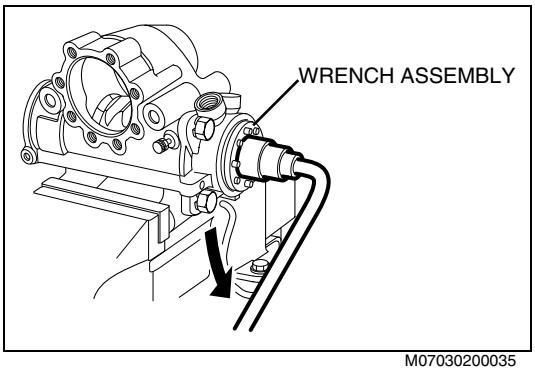


M07030200038

(5) Remove the O-ring from the groove around the outside of the side cover using the special tool. Then remove the Y-packing from behind the needle roller bearing and the back-up ring using the special tool.

NOTICE:
It is not necessary to remove the needle bearing unless it is damaged.

SST: Needle (09699-1360)



M07030200035

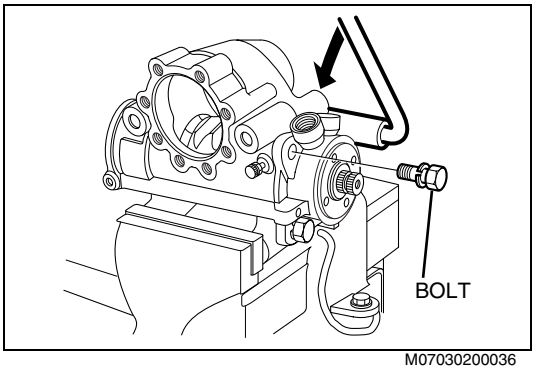
3. REMOVE THE VALVE HOUSING AND BALL NUT ASSEMBLY

(1) Remove the dust cover from the valve housing.

(2) Loosen the plug and seal assembly in the valve housing section using the special tool. At this time, only back off the plug and seal assembly 180°. Do not remove it.

NOTICE:
If the plug and seal assembly is removed, the steel balls (bearing) in the valve housing may spring out.

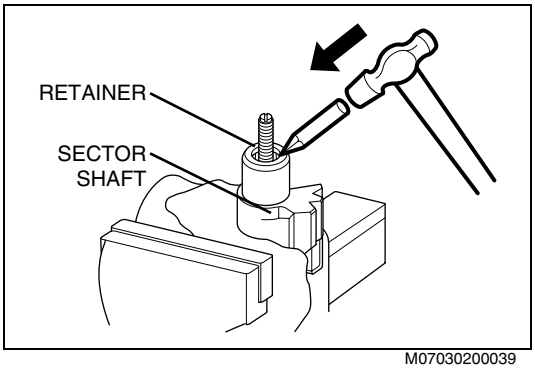
SST: Wrench assembly (09603-1560)



M07030200036

(3) Remove the bolts to remove the worm shaft assembly and valve housing asssembly from the steering body.

NOTICE:
- **Do not damage the internal surface of the steering body when removing the worm shaft assembly and valve housing assembly.**
- **Do not let the steel balls spring out.**
- **Never damage the power piton.**

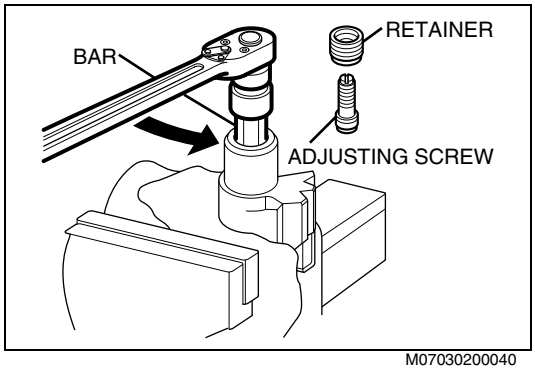


M07030200039

4. REMOVE THE ADJUSTING SCREW AND SECTOR SHAFT

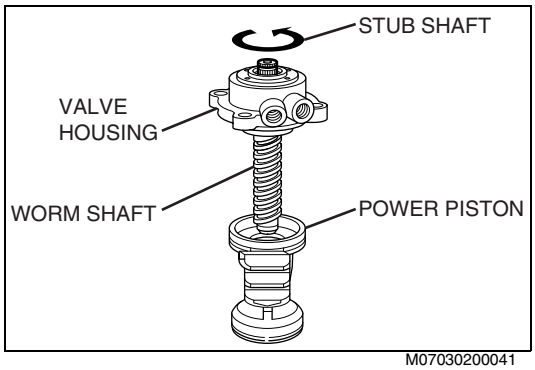
(1) Uncaulk the retainer at two caulked positions.

NOTICE:
- **Do not disassemble the sector shaft assembly unless it is damaged.**
- **Do not secure the sector shaft directly in the vise. Always use a cloth etc. to protect the sector shaft.**



M07030200040

(2) Remove the retainer using the special tool. Remove the adjusting screw at the same time.
SST: Bar (09712-1130)

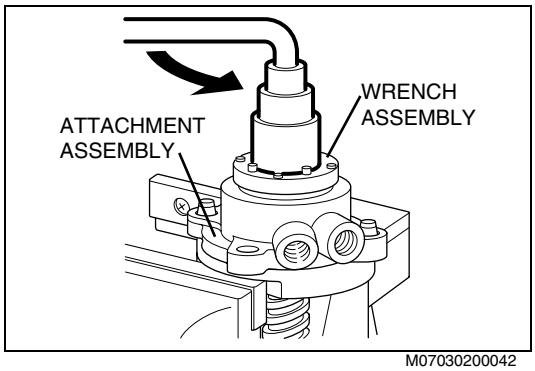


M07030200041

5. REMOVE THE WORM SHAFT ASSEMBLY, VALVE HOUSING AND POWER PISTON ASSEMBLY.

(1) Place the assembly on the work bench with the power piston side down. Turn the stub shaft while holding the valve housing, and remove the worm shaft from the power piston.
(2) Let the steel balls assembled in the power piston and ball race of the worm shaft drop into the power piston.

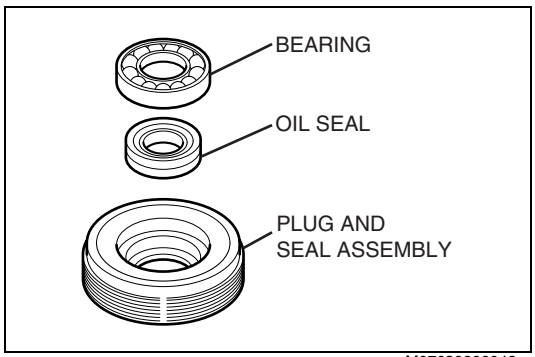
NOTICE:
Do not tilt the piston as it contains the steel balls. Do not lose the steel balls.



M07030200042

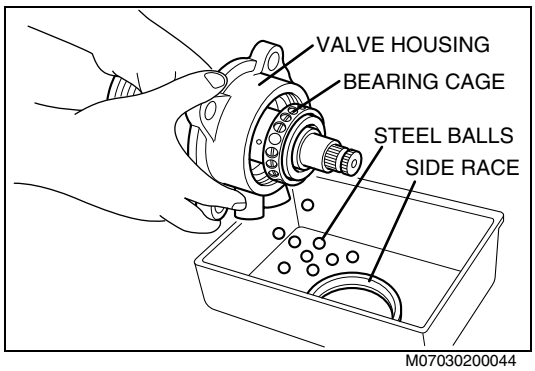
(3) Secure the special tool in the vise.
SST: Attachment assembly (09659-1400)

(4) Remove the O-rings fitted on the contact surfaces of the steering body of the valve housing.
(5) Attach the valve housing to the attachment assembly, and remove the previously loosened plug and seal assembly.
SST: Wrench assembly (09603-1560)



M07030200043

(6) Remove the ball bearing and oil seal from the plug and seal assembly.



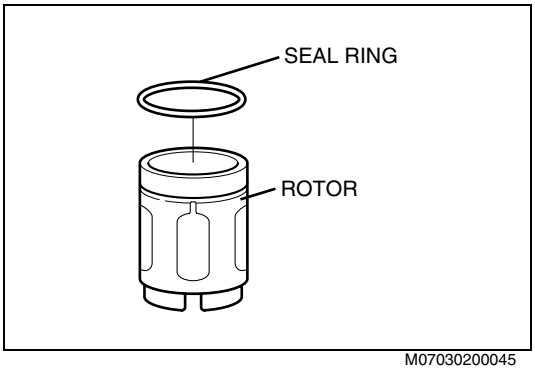
M07030200044

6. REMOVE THE WORM SHAFT ASSEMBLY AND VALVE HOUSING.

(1) Prepare a plastic box, etc. Hold the valve housing over the box and remove the worm shaft assembly by pushing it from the power piston side as shown in figure. The side race, steel balls, and bearing cage will come apart and fall into the box.

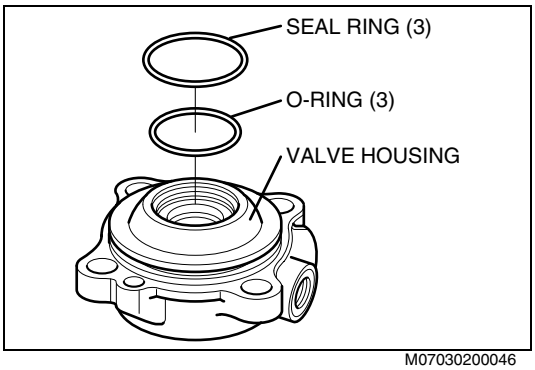
NOTICE:
- **Do not lose any steel balls.**
- **If only one side race and/or steel ball is lost, the worm shaft and valve housing assembly must be replaced.**

Number of the steel balls: 18 pieces.



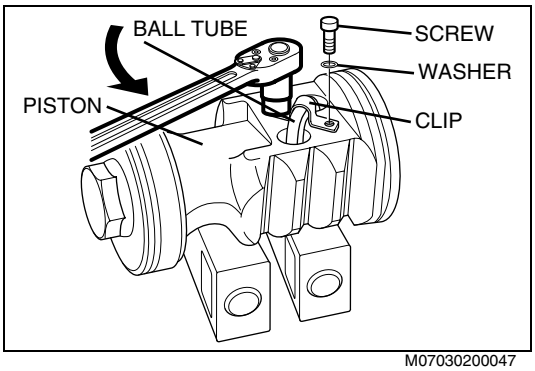
M07030200045

(2) Remove the rotor from the worm shaft assembly, and then remove the seal ring from the rotor using the special tool.
SST: Needle (09699-1360)



M07030200046

(3) Remove the three seal rings and three O-rings from the valve housing using the special tool.
SST: Needle (09699-1360)

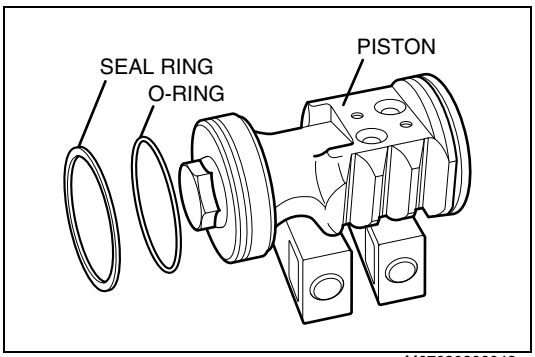


M07030200047

7. REMOVE THE POWER PISTON.
(1) Place the piston's steel balls in a separate container.
(2) Loosen the screw of the tube clip securing the ball tube using a wrench. Remove the ball tube from the power piston by pinching it with your fingers and shaking it.

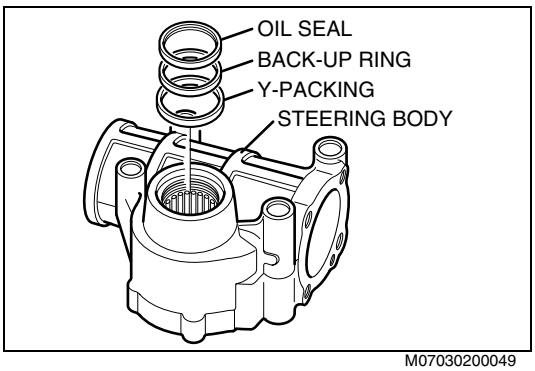
NOTICE:
- **Never insert a screwdriver etc, between the ball tube and the piston to pry them apart.**
- **Check for any steel balls remaining in the ball tube.**

  Number of the steel balls: 32 pieces.



M07030200048

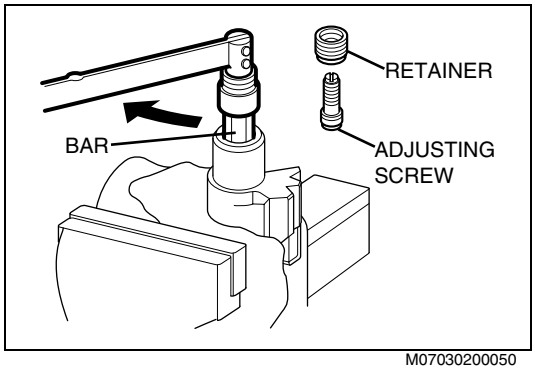
(3) Remove the seal ring and O-ring from the power piston using the special tool.
SST: Needle (09699-1360)



M07030200049

8. REMOVE THE STEERING BODY.
(1) Remove the oil seal, back-up ring, and Y-packing from the section of the steering body contacting the sector shaft.

NOTICE:
Do not remove the needle roller bearing and taper plug unless they are damaged.



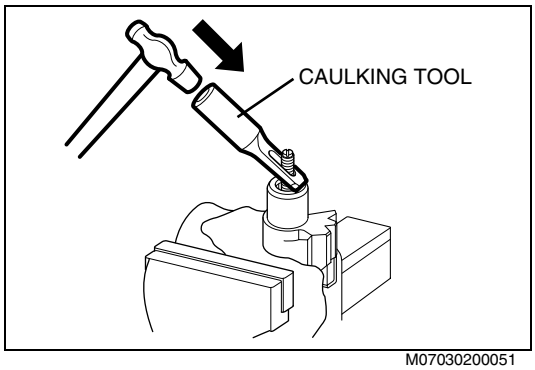
M07030200050

IMPORTANT POINTS - ASSEMBLY

1. INSTALL THE SECTOR SHAFT.

(1) Secure the sector shaft in the vise while protecting the geared base of the shaft with a rag.

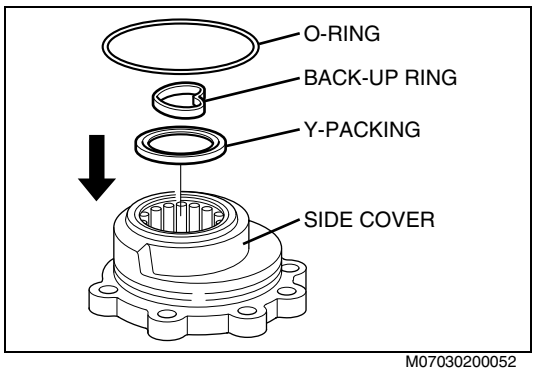
(2) Fill the assembly with grease through the adjusting screw hole. Then, insert the adjusting screw, and fix the retainer using the special tool.
SST: Bar (09712-1130)



M07030200051

NOTICE:
How to tighten the retainer; After fully tightening, back off the retainer 180° and then, after retightening it to 0.04 N·m {0.4 kgf·cm, 0.03 lbf·ft} back it off 20°. Ensure the adjusting screw rotates smoothly.

(3) After tightening the retainer, securely caulk it at two positions using the special tool.
SST: Caulking tool (09694-1020)

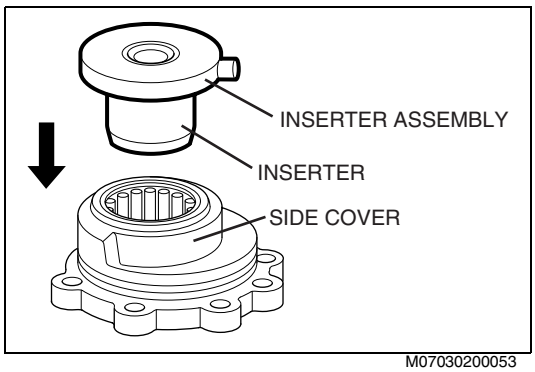


M07030200052

2. INSTALL THE SIDE COVER.

(1) Insert the Y-packing and back-up ring in the bottom of the needle roller bearing pressfitted inside the side cover.

NOTICE:
- **The back-up ring can be assembled easily if inserted by pinching it with the fingers as shown in figure.**
- **After filling the groove with grease, assemble the Y-packing so that the lip faces to the needle roller bearing side.**



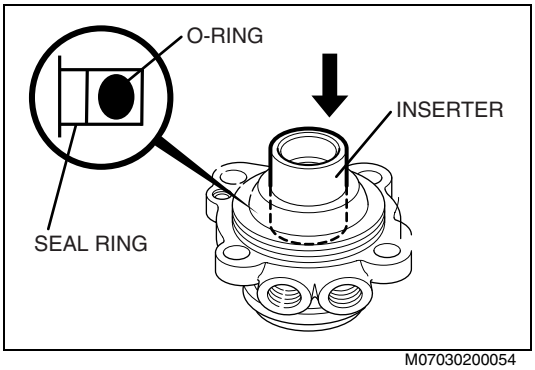
M07030200053

(2) Form the back-up ring using the special tool.
SST: Inserter assembly (09657-1860)

NOTICE:
There are five kinds of inserters as below, and install the back-up ring using the inserter for the diameter 48 mm {1.890 in.}.

Unit: mm {in.}

INSERTER DIAMETER
40 {1.575}
45 {1.772}
48 {1.890}
53 {2.087}
58 {2.283}

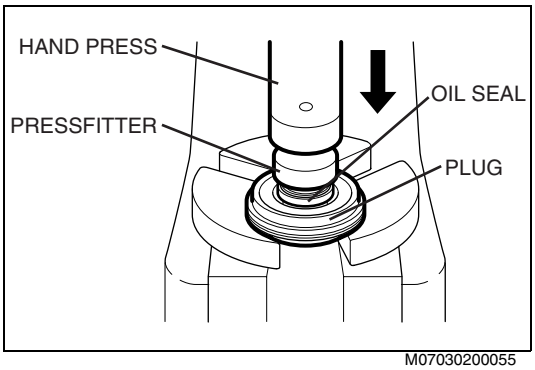


M07030200054

3. INSTALL THE VALVE HOUSING.

(1) Insert an O-ring and a seal ring into each of the three narrower grooves of the five grooves in the valve housing.

(2) Then, form the seal ring using the special tool.
SST: Inserter (09657-1850)



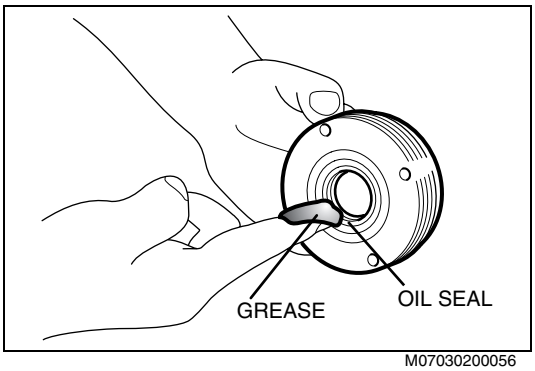
M07030200055

4. INSTALL THE PLUG AND SEAL ASSEMBLY.

(1) Press fit the oil seal into the inside of the plug and seal assembly using the special tool.

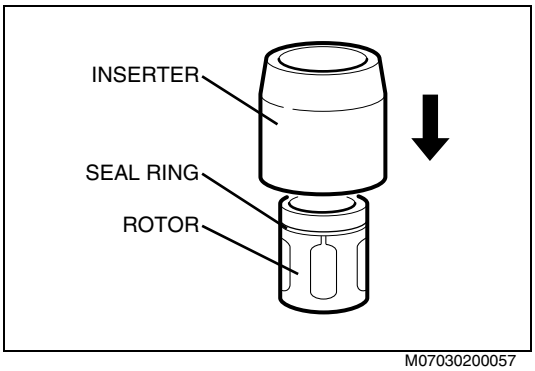
NOTICE:
Always use a hand press when press fitting the oil seal.

SST: Pressfitter (09659-1410)



M07030200056

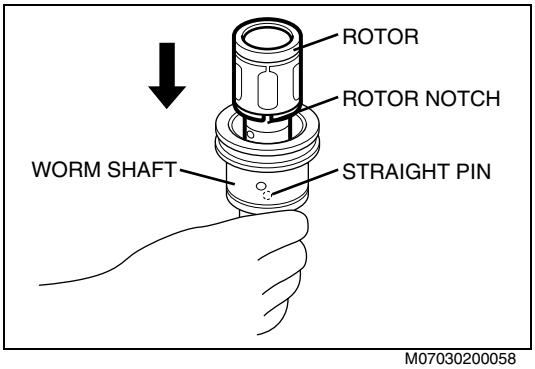
(2) Apply grease to the oil seal and then install the ball bearing.



M07030200057

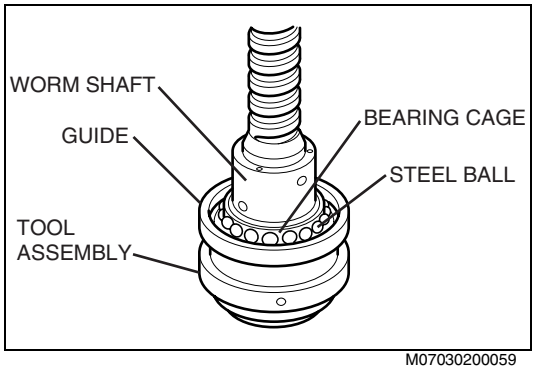
5. INSTALL THE WORM SHAFT AND THE VALVE HOUSING.

(1) Form the seal ring using the special tool after assembling the seal ring in the outer groove of the rotor.
SST: Inserter (09657-1850)



M07030200058

(2) Insert the rotor between the stub shaft and the worm shaft. At this time, assemble it so that the straight pin in the bottom fits in the rotor notch.



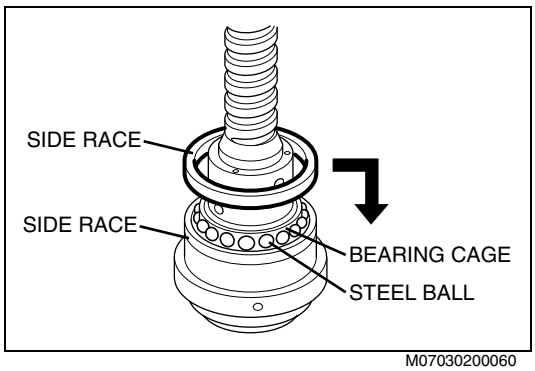
M07030200059

(3) Fit the guide into the special tool and insert the previously assembled worm shaft assembly into the guide with the input side down.
SST: Tool assembly (09657-1870)

NOTICE:
There are two kinds of guide as below, and install worm shaft assembly using the guide for power piston diameter 90-110 mm {3.544-4.330 in.}.

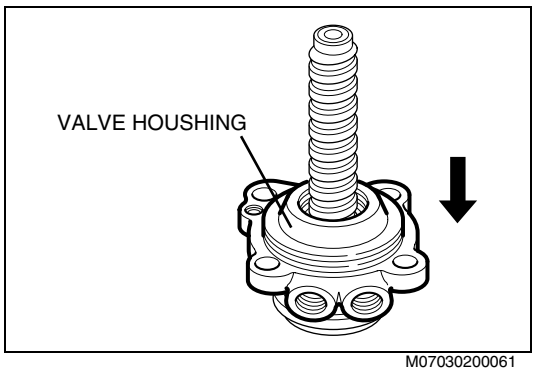
Unit: mm {in.}

POWER PISTON DIAMETER
85 {3.346}
90-110 {3.544-4.330}



M07030200060

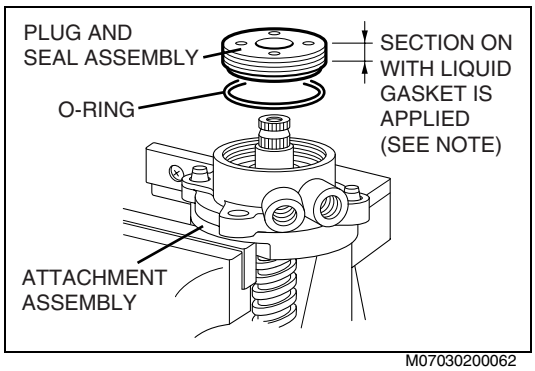
(4) Install the race of bearing side (one side), the bearing cage and the steel balls, and allow the tool assembly to slide down and set the balls in position.
(5) Remove the guide and fit the other side race.



M07030200061

(6) Assemble the valve housing to the worm shaft assembly and previously assembled bearing sub-assembly by inserting it from the worm shaft side.

NOTICE:
- **When fitting the valve housing, do not damage the seal ring in the valve housing.**
- **Inserter (09657-1850) can be used to form the seal rings of the valve housing part.**

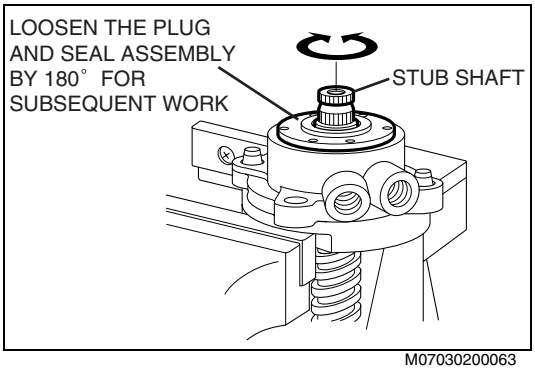


M07030200062

(7) Secure the special tool in the vise.
SST: Attachment assembly (09659-1400)

(8) Fit the previously assembled worm shaft assembly and valve housing onto the attachment assembly, place the O-ring in the inner groove of the valve housing, and screw the plug and seal assembly into the valve housing.

NOTICE:
- **Apply liquid gasket (equivalent to ThreeBond 1102) to the screw section of the plug and seal assembly.**
- **The O-ring must not be fitted in the thread escape groove of the valve housing.**
- **When assembling the plug and seal assembly, do not let the stub shaft serration damage the oil seal.**

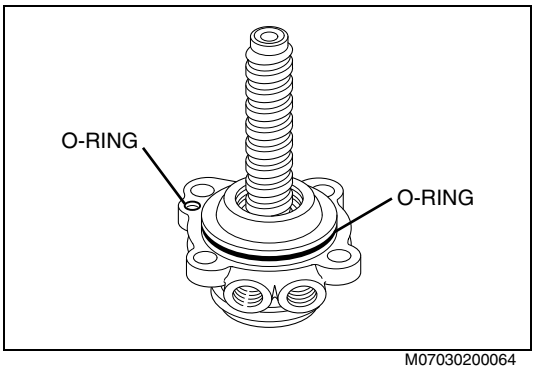


M07030200063

(9) Tighten the plug and seal assembly using the special tool.
SST: Wrench assembly (09603-1560)

NOTICE:
Check that the stub shaft rotates soomthly and uniformly while holding the valve housing.

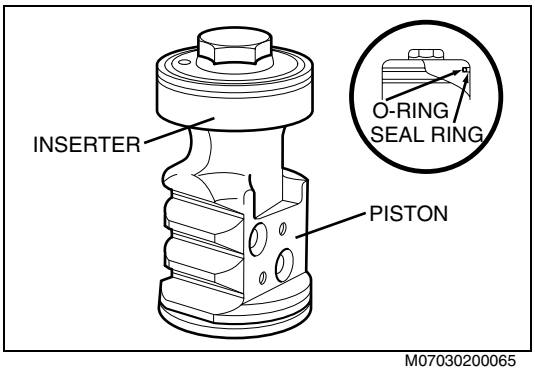
(10) Loosen the plug and seal assembly by approx 180°.



M07030200064

(11) Install O-rings in the groove around the outside of the valve housing, and in the oil port recess.

NOTICE:
Do not twist the O-rings.



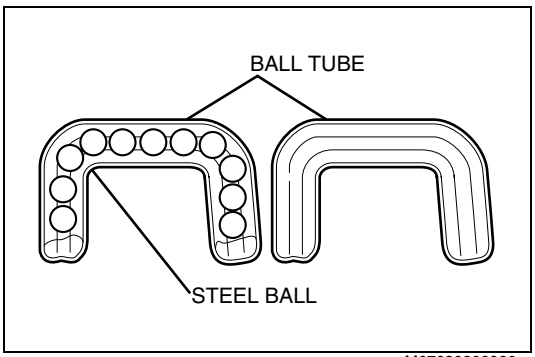
M07030200065

6. INSTALL THE POWER PISTON.

(1) Fit the O-ring and seal ring in the groove around the outside of the power piston and form the seal ring using the special tool.

NOTICE:
Do not twist the O-ring or stretch the seal ring.

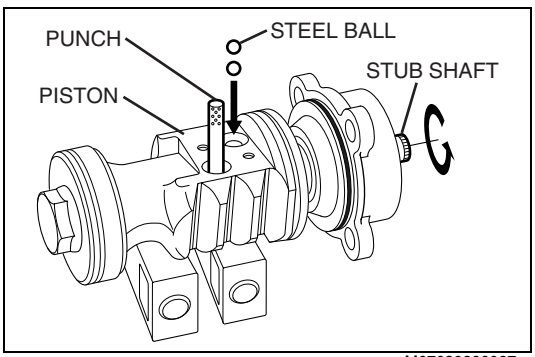
SST: Inserter (09657-1840)



M07030200066

(2) Place the power piston on the bench.
(3) Fill the ball tube with grease, lay 10-11 steel balls in the tube, and place the other side of the ball tube on top.

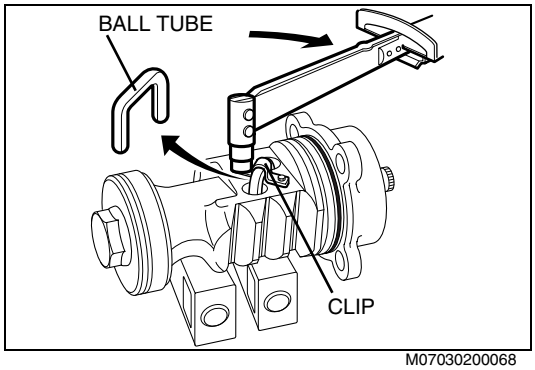
NOTICE:
Never fix the piston in a vise.



M07030200067

(4) Insert the worm shaft and valve housing assembly in the center hole of the power piston, align the power piston and worm shaft ball races, and drop the remaining steel balls one by one through the piston's ball tube hole.

NOTICE:
- **Drop the steel balls while turning the stub shaft to facilitate assembly.**
- **Steel balls sometimes come out of the hole on the other side of the ball tube after a certain number are inserted. Plug the hole with a punch to prevent the steel balls from coming out.**
- **When installing the steel balls, the worm shaft and valve housing assembly must not be drawn out to its extreme position, as the steel balls may drop outside the ball race.**

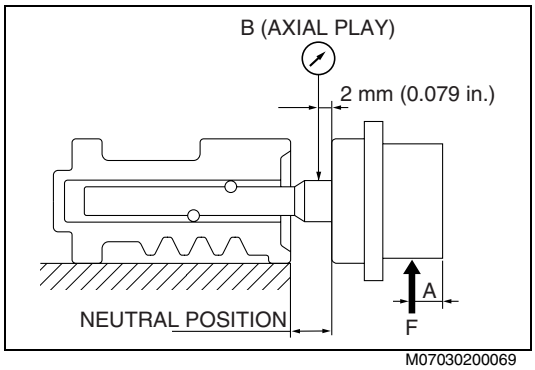


M07030200068

(5) After inserting the steel balls in the power piston, insert the ball tube into the power piston and fix it using the clip, washer, and screw.

NOTICE:
Always push in the ball tube by hand. Never force or strike it. If forced or struck, the ball tube may be deformed, the edge may be nipped, or otherwise damaged, causing malfunctions.

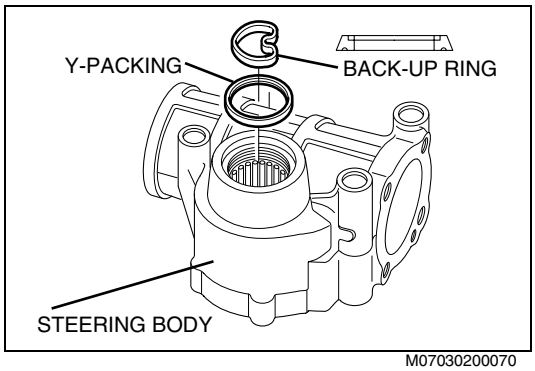
(6) Tighten the screw to the specified torque.



M07030200069

(7) Measure the axial play between the power piston and the worm shaft assembly.

A (point of application)	**20 mm {0.787 in.}**
F (force)	**5 kg**
B (axial play)	**0.5 mm {0.0197 in.} or less**

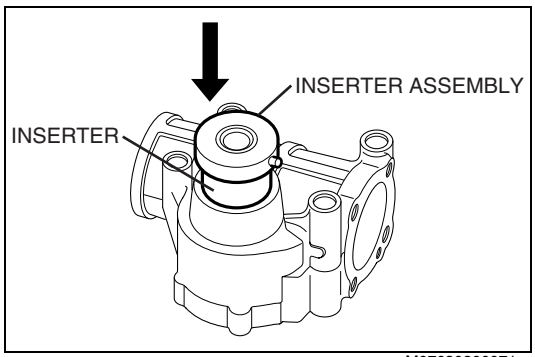


M07030200070

7. INSTALL THE STEERING BODY.

(1) Fit the Y-packing and back-up ring in the groove in front of the needle roller bearing (in the hole for the steering body output shaft).

NOTICE:
- **Back-up ring installation is facilitated by pinching the ring with the fingers as shown in figure.**
- **After filling the groove with grease, assemble the Y-packing so that the lip faces to the needle roller bearing.**



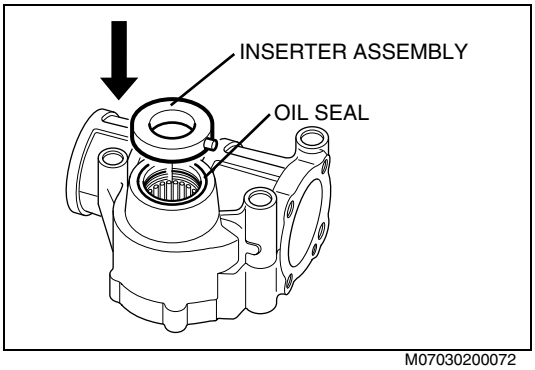
M07030200071

(2) Form the back-up ring using the special tool.
SST: Inserter assembly (09657-1860)

NOTICE:
There are five kinds of inserters as below, and install the back-up ring using the inserter for the diameter 58 mm {2.283 in.}.

Unit: mm {in.}

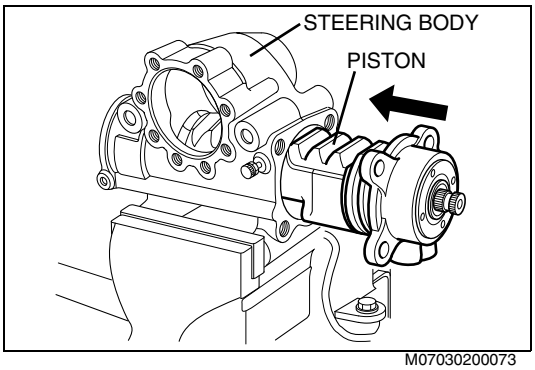
INSERTER DIAMETER
40 {1.575}
45 {1.772}
48 {1.890}
53 {2.087}
58 {2.283}



M07030200072

(3) Press fit the oil seal into the steering body using the special tool.
SST: Inserter assembly (09657-1860)

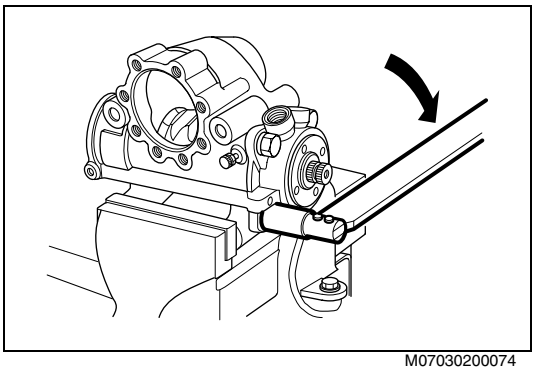
(4) Fill the oil seal with grease.



M07030200073

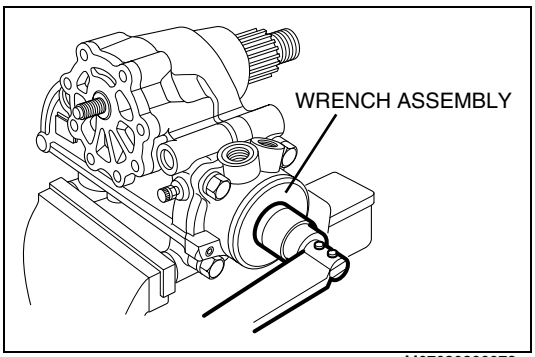
8. INSTALL THE VALVE HOUSING AND BALL NUT ASSEMBLY.
(1) Secure the steering body in the vise.
(2) Fit the worm shaft and valve housing assembly by inserting it into the steering body with the power piston gear placed on the side of the sector shaft. Hold the power piton lightly by hand so that it dose not rotate.

NOTICE:
- **When inserting the worm shaft and valve housing assembly, do not damage the piston seal ring.**
- **Be careful that the O-ring dose not fall out.**


M07030200074

(3) Align the steering body and valve housing oil passage holes and tighten the bolt to the specified torque.

NOTICE:
Insert a bar into the bolt hole to align the body and housing oil passage holes. Prevent housing rotation to prevent the O-ring from being cut or dislodged.

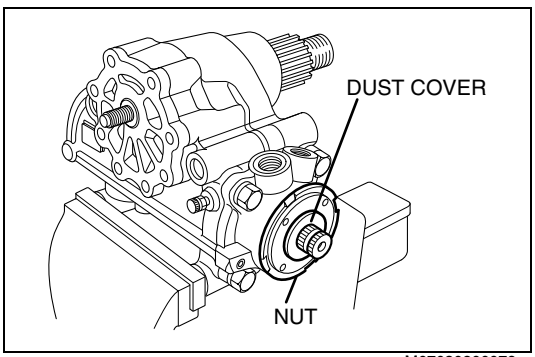


M07030200078

(4) Tighten the plug and seal assembly (which was previously loosened through 180°) to the specified torque using the wrench assembly.
SST: Wrench assembly (09603-1560)

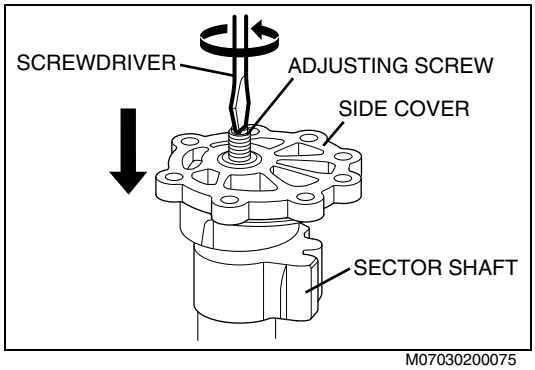
NOTICE:
After applying a thin and uniform coat of liquid gasket to 3-5 whole threads of the screw part of the plug and seal assembly and tightening it with the indicated torque, apply turning stopper punches every 180°.

Liquid gasket: Equivalent to ThreeBond 1102



M07030200079

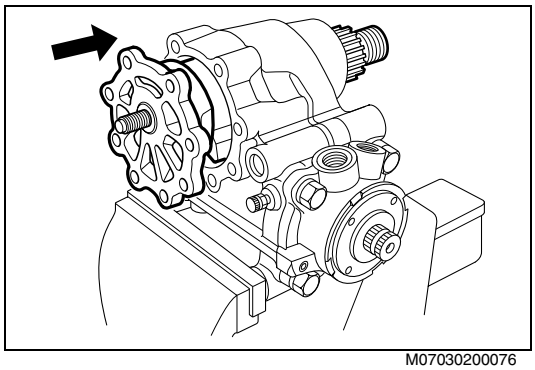
(5) Attach the dust cover to the valve housing.



M07030200075

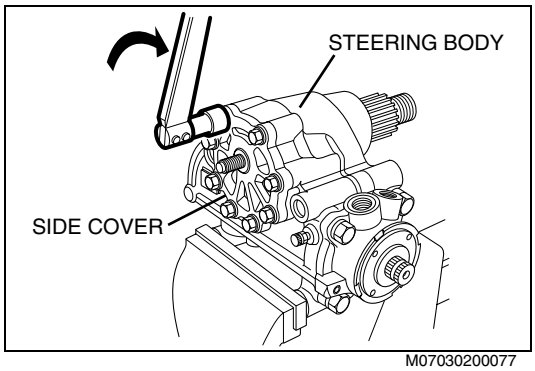
9. INSTALL THE SIDE COVER ASSEMBLY AND SECTOR SHAFT.

(1) Assemble the side cover assembly to the sector shaft assembly by aligning the screw hole in the center of the side cover with the adjusting screw and turning the adjusting screw.
Install the O-ring around the outside of the side cover.


M07030200076

(2) Insert the sector shaft into the steering body so that its gear and the power piston gear engage in the center.

NOTICE:
When inserting the sector shaft, do not let the sector shaft serration damage the lip of the Y-packing. Damage may affect oil tightness.

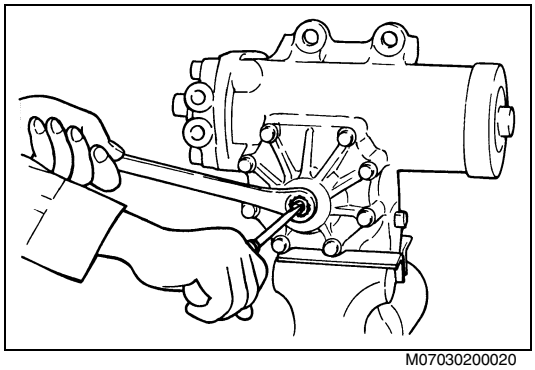


M07030200077

(3) Assemble the side cover to the steering body using the bolts. Tighten them to the specified torque.

10. 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.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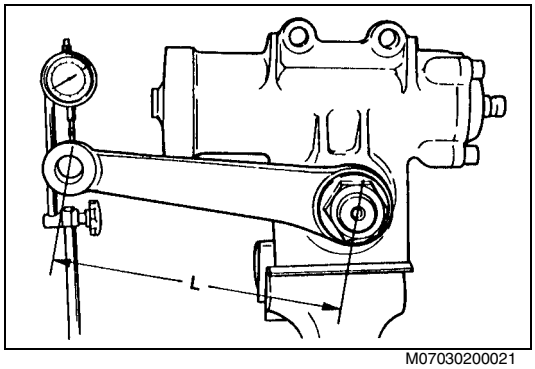
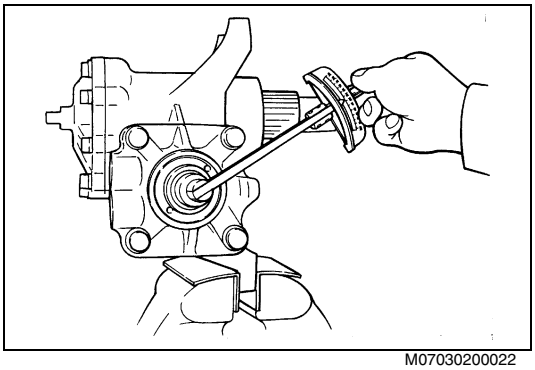


M07030200021

(3) Use a dial gauge to check to see that the sector shaft backlash in neutral position.

L	Backlash
270 mm {10.63 in.}	0.05-0.25 mm {0.002-0.009 in.}

(4) If measurement is not within specification, readjust the backlash with adjusting screw.


M07030200022

11. INSPECT THE WORM VALVE ASSEMBLY ROTATION CONDITION.

(1) Check to see that the worm valve assembly rotate smoothly without any shocks, abnormal resistance, noise and drag, when the worm valve assembly rotates full lock in both direction.

12. TIGHTEN THE PITMAN ARM LOCK NUT.

INSPECTION AND REPAIR

M07030201BEH3002

METALLIC PARTS

Inspection item	Location	Remedy
Steering body	• The internal surface of the cylinder	Repair or replace the steering body if there is evidence of abrasion or stepped wear. Check visually and by touch for any flaws that may affect smooth piston stroke.
	• Side cover assembly surface	Repair or replace the steering body if there is evidence of any flaws, rust or gouging that may affect oil tightness (check visually and by touch).
	• Y-packing groove in the sector shaft hole	Repair or repalce the steering body if there is evidence of any flaws, rust or gouging that may affect oil tightness (check visually and by touch).
Sector shaft	• Gear	Replace the gear if it is severely flawed or worn. Chipped gears must also be repalced. (Check visually and by touch)
	• Gear shaft and serrations	Check for cracks using magnetic-particle test equipment and a color penetration test. Replace any cracked parts.
	• Needle roller bearing contact surface	Check for wear, flaws or gouging (visually and by touch). Repair or replace if necessary.
	• Y-packing contact surface	Repair or replace if any flaws, rust or gouging affecting oil tightness are found (check visually and by touch).
	• Adjusting screw	Measure the axial clearance of the adjusting screw with a dial gauge. 0.01-0.1 mm is acceptable, but if excessive, the screw must be disassembled for inspection. Also check whether the adjusting screw rotates smoothly. If not, the screw must be disassembled and inspected.
Power piston	• Cylinder contact surface	Any wear or abrasion that affects smooth piston stroke must be corrected, or the power piston must be replaced.
	• Rack gear	Replace the rack gear if severely flawed, worn or chipped.
	• Steel ball race surface	Any wear or flaw that disturbs smooth rotation and movement of steel balls must be corrected, or the race must be replaced. (Visual inspection)
	• Seal ring and O-ring	Replace the seal ring or O-ring if any flaws or tears affecting oil tightness are found.

Inspection item	Location	Remedy
Ball tube	• **Steel ball rotation surface**	**Replace the ball tube if any wear, flaws or gouging that affect smooth ball rotation are found on the inside at the tube.**
	• **Tang (end)**	**Replace the ball tube if any warping, bending, flaws or pits that affect smooth ball rotation are found on the tang.**
Worm shaft (stub shaft)	• **Steel ball race surface**	**Repair or replace the race if any wear, flaws or pits that affect smooth ball rotation are found.**
	• **Seal ring**	**Any wear, flaw, or gouge affecting oil tightness must be corrected or the seal ring must be replaced.**
	• **Y-packing contact surface**	**Any wear, flaw, rust, or gouge which may affect oil tightness must be corrected or the packing must be replaced.**
	• **Thrust bearing (steel ball) contact surface**	**Check the bearing for wear, flaws or pits if shaft rotation is stiff or uneven. Repair or replace if found.**
Thrust bearing (steel ball) and bearing cage	• **Bearing race and steel ball**	**Check the bearing for wear, flaws or pits if shaft rotation is stiff or uneven. Repair or replace if found.**
	• **Bearing cage**	**Replace the cage if any flaws or damage affecting smooth rotation are found.**
Rotor	• **External surface**	**Repair or replace the rotor if any wear, flaws or gouging affecting smooth rotation are found.**
	• **Chamber**	**Replace the chamber if any flaws, breaks, or chips affecting steering characteristics are found.**
	• **Seal ring groove**	**Replace the seal ring if any flaws or tears affecting oil tightness are found.**
Side cover	• **Steering body contact surface**	**Repair or replace the side cover if any flaws, gouging or rust affecting oil tightness are found.**
	• **Y-packing groove**	**Repair or replace the side cover if any flaws, gouging or rust affecting oil tightness are found.**
	• **O-ring groove**	**Repair or replace the side cover if any flaws, gouging or rust affecting oil tightness are found.**
Plug and seal assembly	• **Thrust bearing side race contact surface**	**Repair or replace the plug and seal assembly if any flaws, rust or gouging affecting uniform tightening are found.**
	• **Y-packing press fitted section**	**Replace the plug and seal assembly if any flaws, rust or gouging affecting oil tighteness are found.**
	• **O-ring contact surface**	**Replace the plug and assembly if any flaws, rust or gouging affecting oil tightness are found.**
Bearings		**Check that the bearing rotates smoothly. Replace the bearing if rotation is stiff or uneven.**

POWER STEERING PUMP (J08C ENGINE)

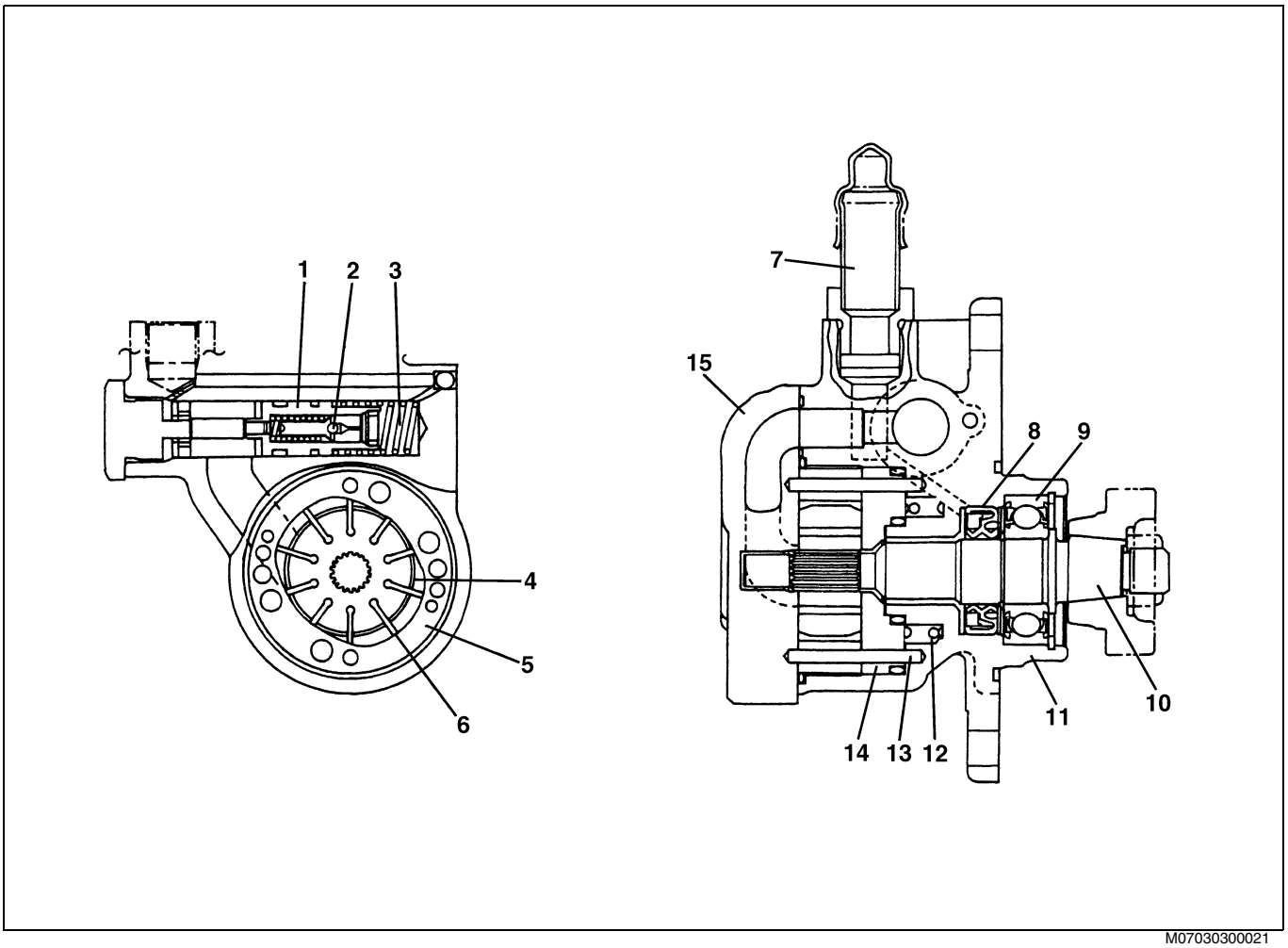
DATA AND SPECIFICATIONS

M07030302BEI2001

Type	Vane type
Speed range	715-5,239 r/min
Relief pressure	12.1-12.8 MPa {123-130 kgf/cm^2, 1,750-1,849 lbf/in^2}
Flow rate	17.0-20.0 L/min. {4.50-5.28 U.S.gal, 3.74-4.39 Imp.gal}

DESCRIPTION

M07030302BEC1001



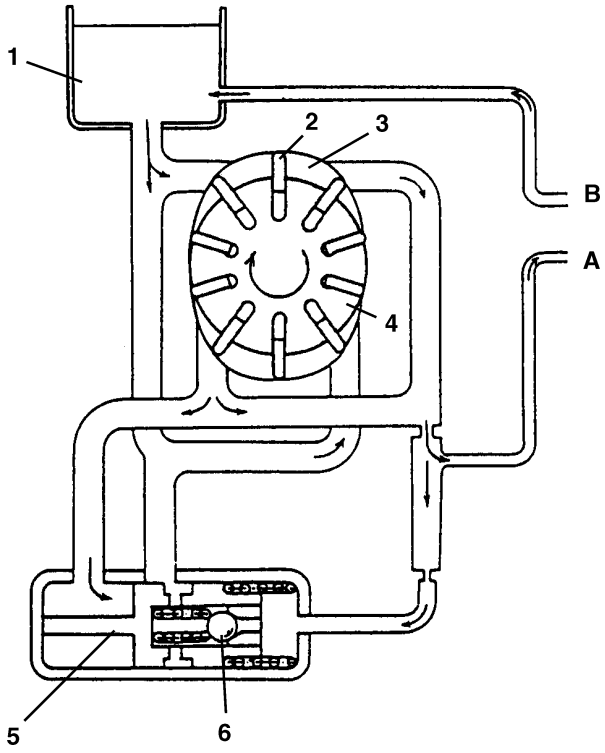
M07030300021

1	Flow control valve assembly	6	Vane	11	Pump body sub-assembly
2	Relief valve	7	Suction connector	12	Spring
3	Flow control spring	8	Oil seal	13	Dowel
4	Rotor	9	Ball bearing	14	Side plate
5	Cam ring	10	Pump shaft	15	Body cover

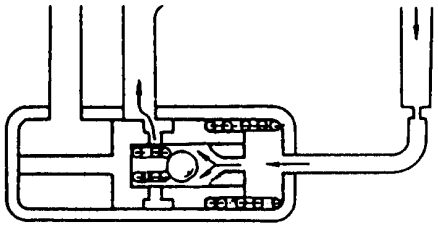
OPERATION

M07030301BEC1003

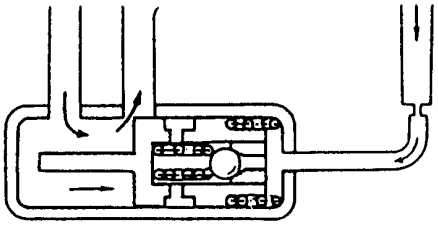
Neutral (Frow control valve assembly and relief valve are not operating)



Relief valve operation



Flow control valve operation

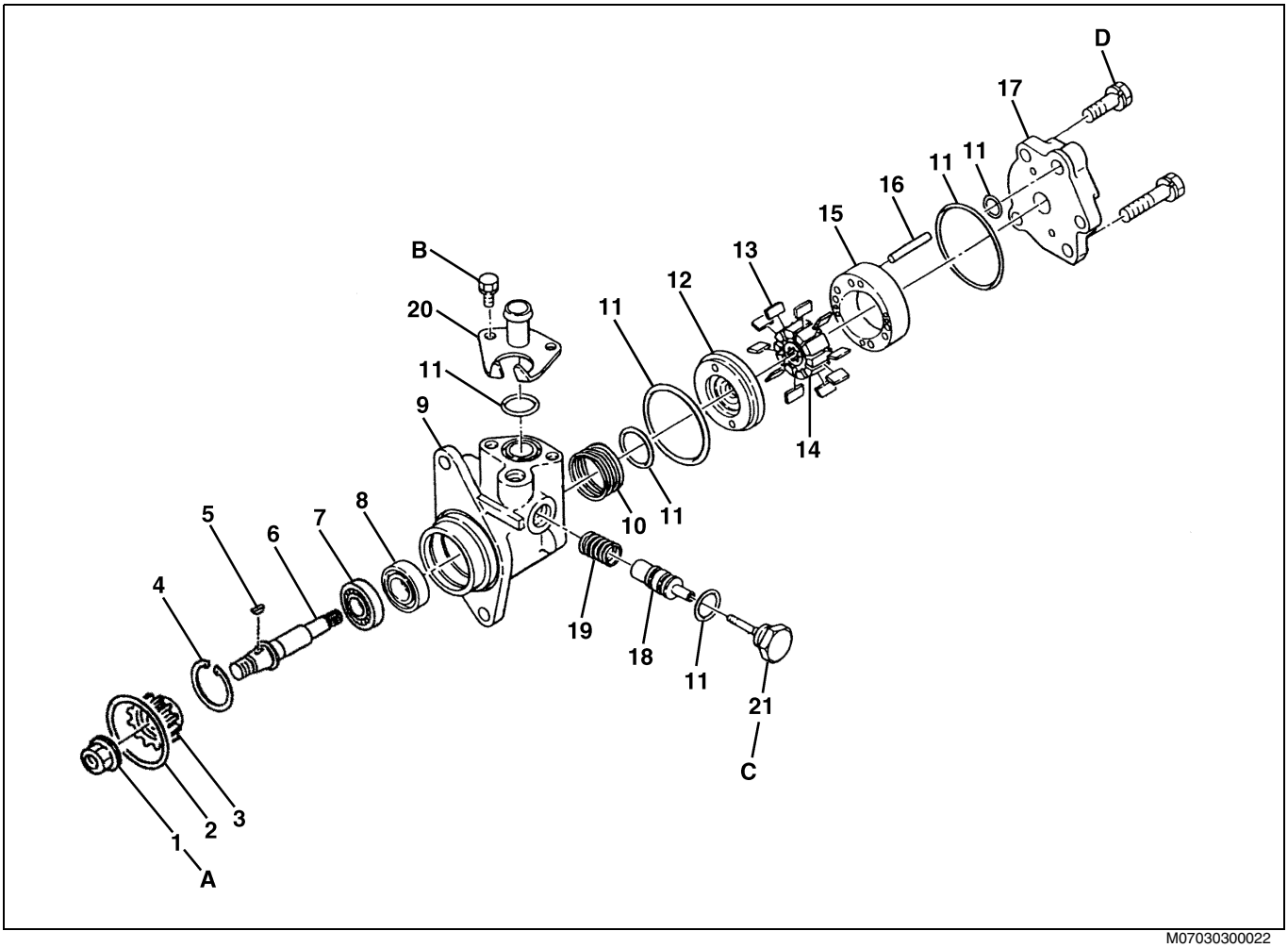


M07030300011

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

M07030302BED1001



M07030300022

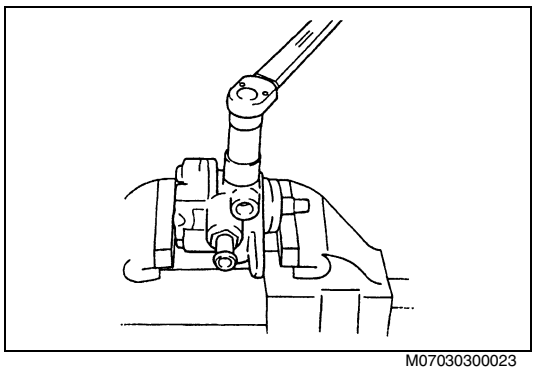
1	Lock nut	8	Oil seal	15	Cam ring
2	O-ring	9	Pump body sub-assembly	16	Dowel
3	Drive gear	10	Spring	17	Body cover
4	Snap ring	11	O-ring	18	Flow control valve assembly
5	Wooduff key	12	Side plate	19	Flow control spring
6	Pump shaft	13	Vane	20	Suction connector
7	Ball bearing	14	Rotor	21	Plug

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

A	99-107 {1,000-1,100 73-79}	C	49-69 {500-700, 37-50}
B	22-26 {220-260, 16-18}	D	34-44 {350-450, 26-32}

OVERHAUL

M07030302BEH2001


M07030300023

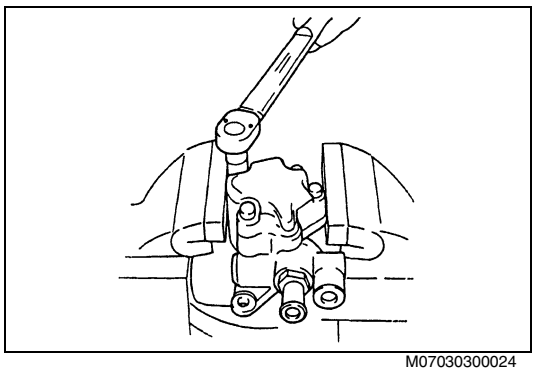
IMPORTANT POINTS - DISASSEMBLY

1. REMOVE THE FLOW CONTROL VALVE ASSEMBLY

(1) Remove the plug, flow control valve assembly and spring.

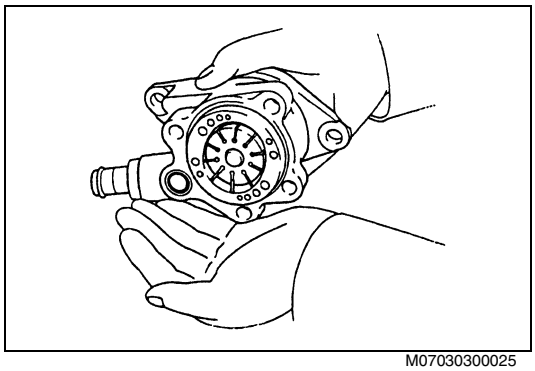
NOTICE:

Be careful not to drop, scratch or nick the flow control valve assembly.


M07030300024

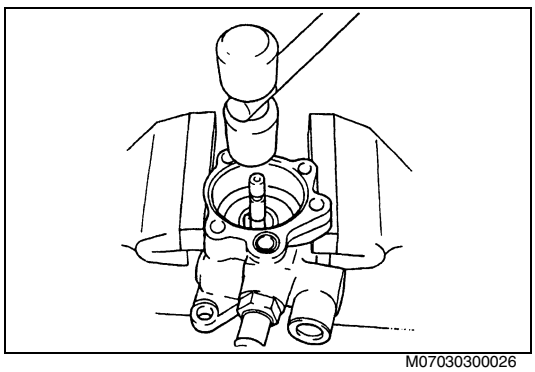
2. REMOVE THE BODY COVER

(1) Loosen the four fixing bolts that secure the body cover, then remove the cover.


M07030300025

3. REMOVE THE VANE PUMP CORE

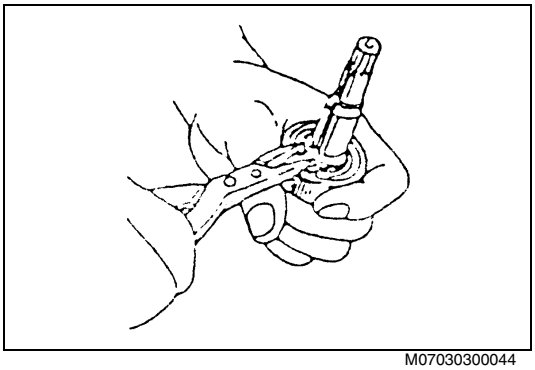
(1) As shown in the figure, face the vane pump core side downward and remove the vane pump core. The vane pump core consists of the cam ring, rotor and vane. Since dimensional checks of these parts have been completed, handle the vane pump core carefully. Remove the side plate and spring.


M07030300026

4. DISASSEMBLY OF PUMP SHAFT ASSEMBLY

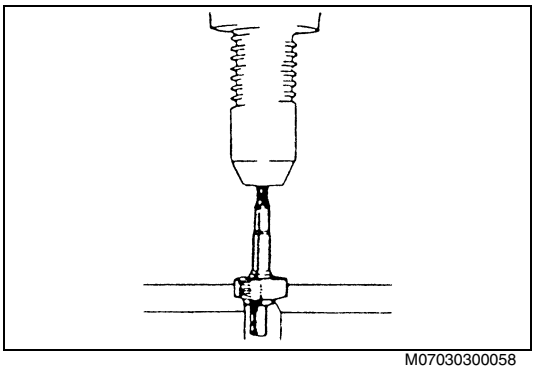
(1) Remove the snap ring from the pump body, and push and remove the spline edge surface of the pump shaft by hand or by using a plastic hammer. Be caresul not to damage the oil seal lip. This process completes disassembly. Carry out inspection.

REPLACEMENT


M07030300044

1. REPLACE THE BALL BEARING, IF NECESSARY.

(1) Use a pair of snap ring pliers to remove the retainer ring.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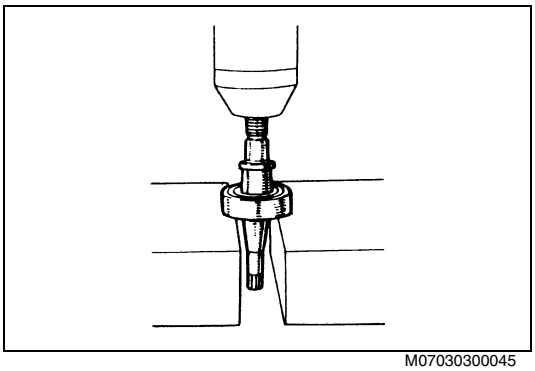
(2) Use a press, press out the ball bearing.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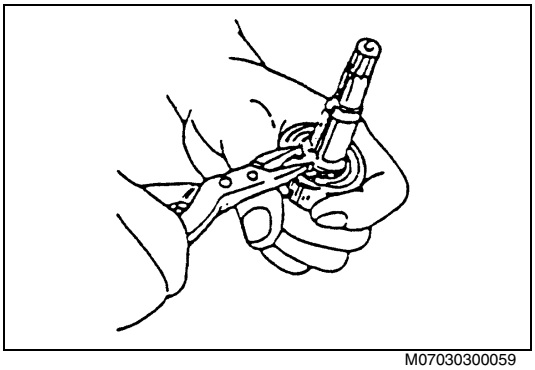
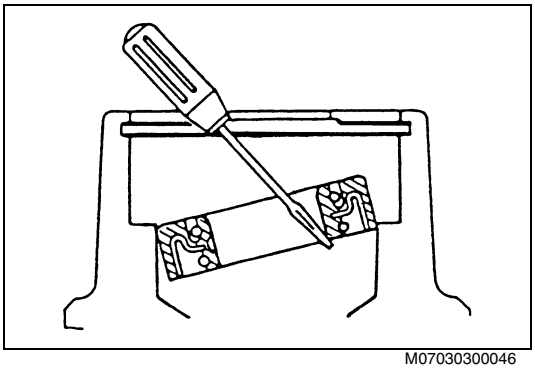
(3) Use a press to press in the ball bearing.


M07030300059

(4) Use a pair of snap ring pliers to install the retainer ring.

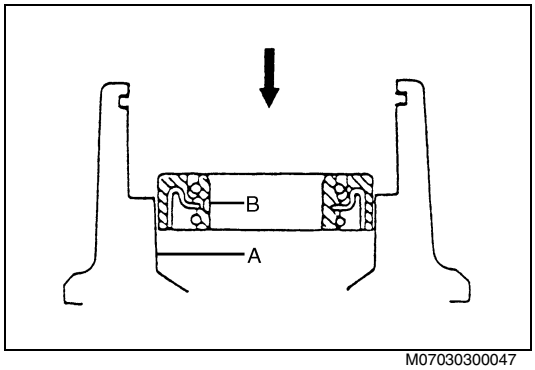

M07030300046

2. REPLACE THE OIL SEAL, IF NECESSARY.

(1) Use a screw driver to remove the oil seal.

NOTICE:

Do not scrape or damage the inside of pump body.

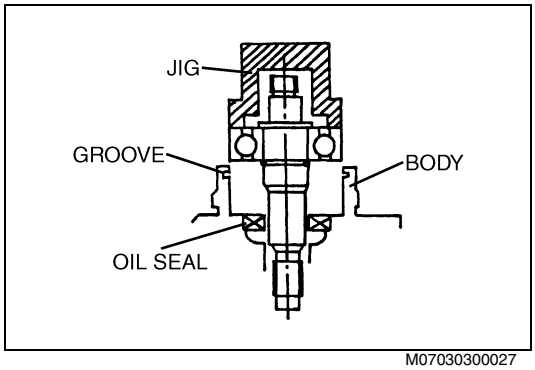


M07030300047

(2) Insert the oil seal as shown in the figure.

NOTICE:
To prevent oil leakage from oil seal due to lip wear, apply lithium base grease to A and B.

(3) Using a press, press in the oil seal into the pump body.



M07030300027

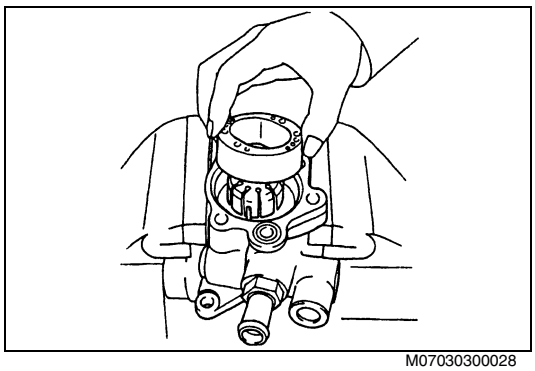
IMPORTANT POINTS - ASSEMBLY

1. INSTALL THE PUMP SHAFT

(1) Apply grease to the oil seal lip.

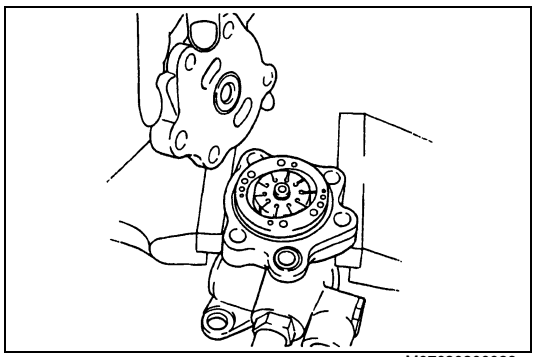
Recommended: Lithium grease

(2) Use a jig to install the shaft assembly.
(3) Install the snap ring into the groove completely.


M07030300028

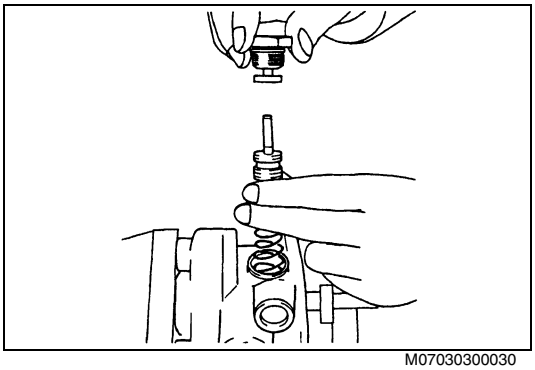
2. INSTALL THE VANE PUMP CORE

(1) Press-fit the dowel pin into the pump body, then install in the order: O-ring, spring, side plate, rotor, cam ring, and vane. Install the cam ring so that the oval dowel hole is positioned at the valve side of the body and that the rotation direction is correct. Install the rotor so that the chamfer side of the spline faces the side plate. Install the vane so that the radius edge contacts the inner surface of the cam ring.


M07030300029

3. INSTALL THE BODY COVER

(1) Fit the O-ring and the body cover onto the pump body. Align the dowel hole in the cover with the dowel pin, press the cover to the edge surface of the body manually. Temporary tighten the bolts by hand, then retighten to the specified torque.


M07030300030

4. INSTALL THE FLOW CONTROL VALVE

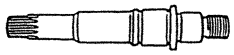
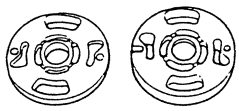
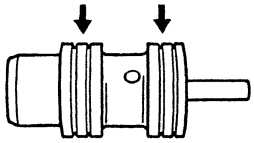
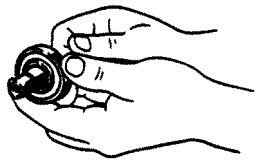
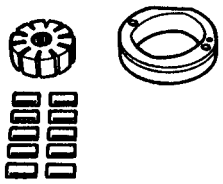
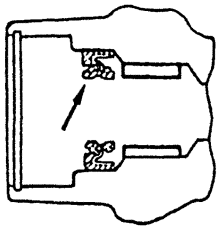
(1) Insert the flow control spring. Install the flow control valve assembly into the body so that the pin side faces the plug side. Tighten the plug.

5. INSPECT PUMP SHAFT ROTATION CONDITION

(1) Check to see that the pump shaft rotates smoothly without abnormal noise.

INSPECTION AND REPAIR

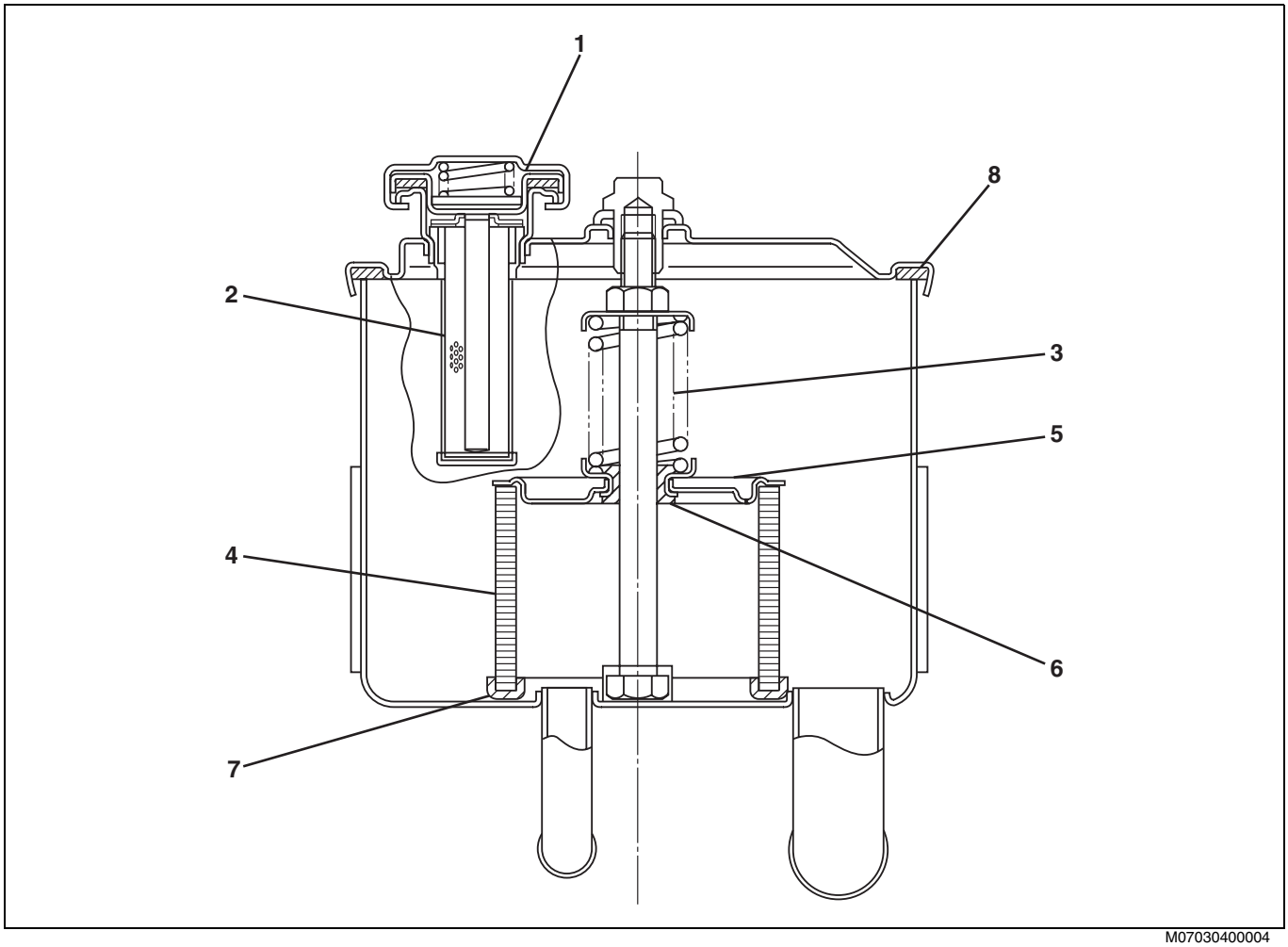
M07030302BEH3001

Inspection item	Standard	Limit	Remedy	Inspection procedure
Pump shaft: Damage	—	—	**Replace, if necessary.**	**Visual check** 
Side plate: Abrasion and flaw	—	—	**Replace, if necessary.**	**Visual check** 
Flow control valve assembly: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 
Pump shaft bearing: Scratched and damage	—	—	**Replace, if necessary.**	**Visual check** 
Cam ring inner surface: Rotor surface: Vane surface: Wear, scratches and scoring	—	—	**Replace the vane pump core, if necessary.**	**Visual check** 
Oil seal: Wear and damage	—	—	**Replace, if necessary.**	**Visual check** 

OIL RESERVOIR

DESCRIPTION

M07030401BEC1002

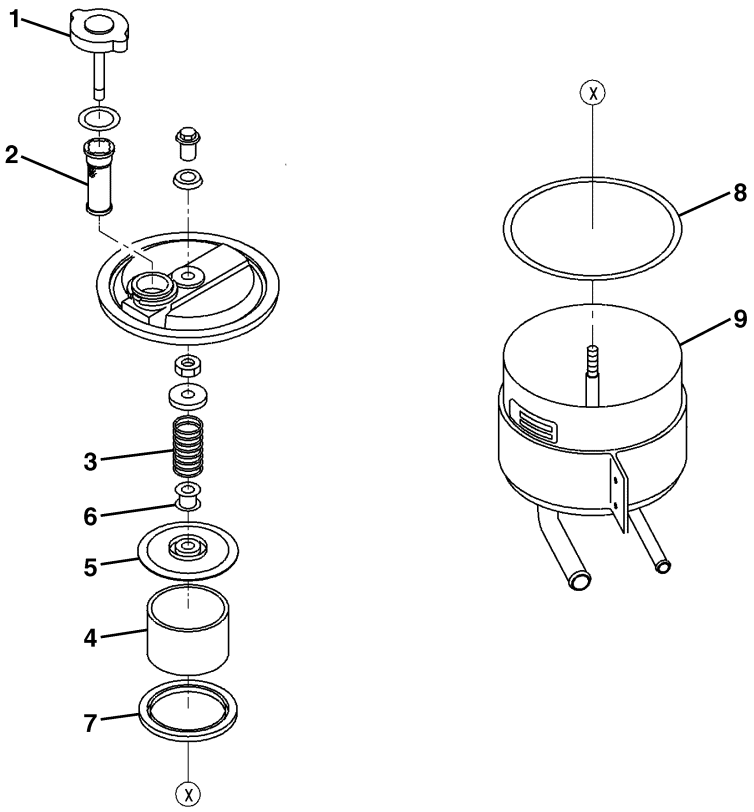


M07030400004

1	Oil reservoir cap	5	Filter cover
2	Oil strainer	6	Filter cover seal
3	Spring	7	Filter seal
4	Oil filter	8	Oil filter gasket

COMPONENT LOCATOR

M07030401BED1002



M07030400005

1	Oil reservoir cap	6	Filter cover seal
2	Oil strainer	7	Filter seal
3	Spring	8	Oil filter gasket
4	Oil filter	9	Oil reservoir
5	Filter cover		

OVERHAUL

M07030401BEH2002

IMPORTANT POINTS - ASSEMBLY

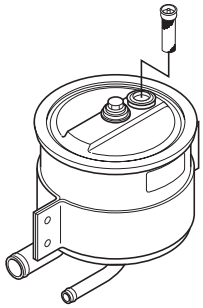
NOTICE:

- **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

M07030401BEH3002

Unit: mm {in.}

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 (DIFFERENTIAL GEAR SERIES: SS12) AX02-001

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS12)

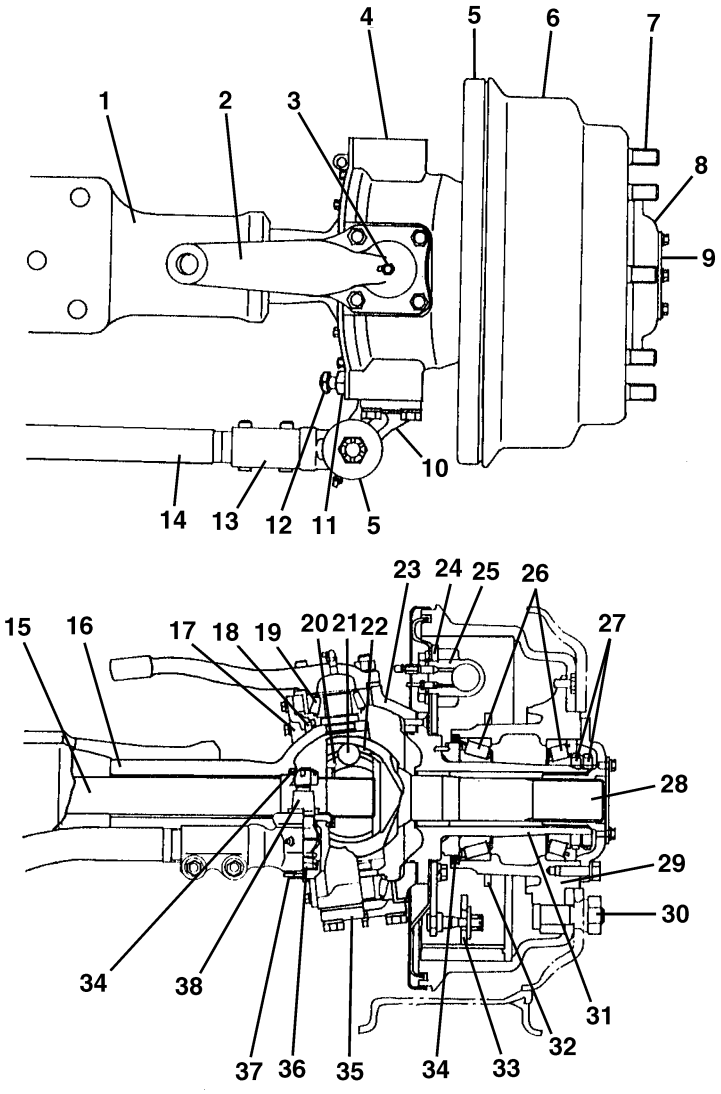
DATA AND SPECIFICATIONS

M08020119BEI2001

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

DESCRIPTION

M08020119BEC1001



M08020100116

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

TROUBLESHOOTING

M08020119BEF3001

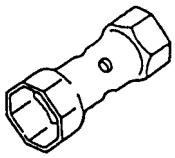
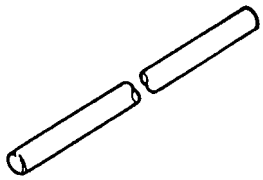
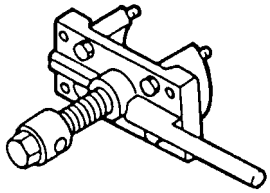
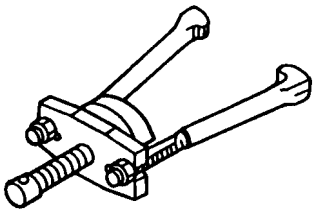
Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate.
	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out or damaged socket pin bearing	Replace socket pin bearings.
	Tire pressure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

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Front axle system)	Worn front axle shaft spline.	Replace.
	Worn hub bearings.	Replace.
	Loose hub bearings.	Adjust bearing preload.
	Loose differential case tightening bolts.	Tighten bolts.
	Loose socket pin bearings.	Adjust bearing preload.
Abnormal noise (Oil system, etc.)	Insufficient oil.	Add oil; check for leakage.
	Insufficient grease.	Add grease.
	Poor oil quality.	Change oil.
	Poor grease quality.	Change grease.
	Abnormal noise of propeller shaft.	Refer to Chapter PROPELLER SHAFT.

SPECIAL TOOL

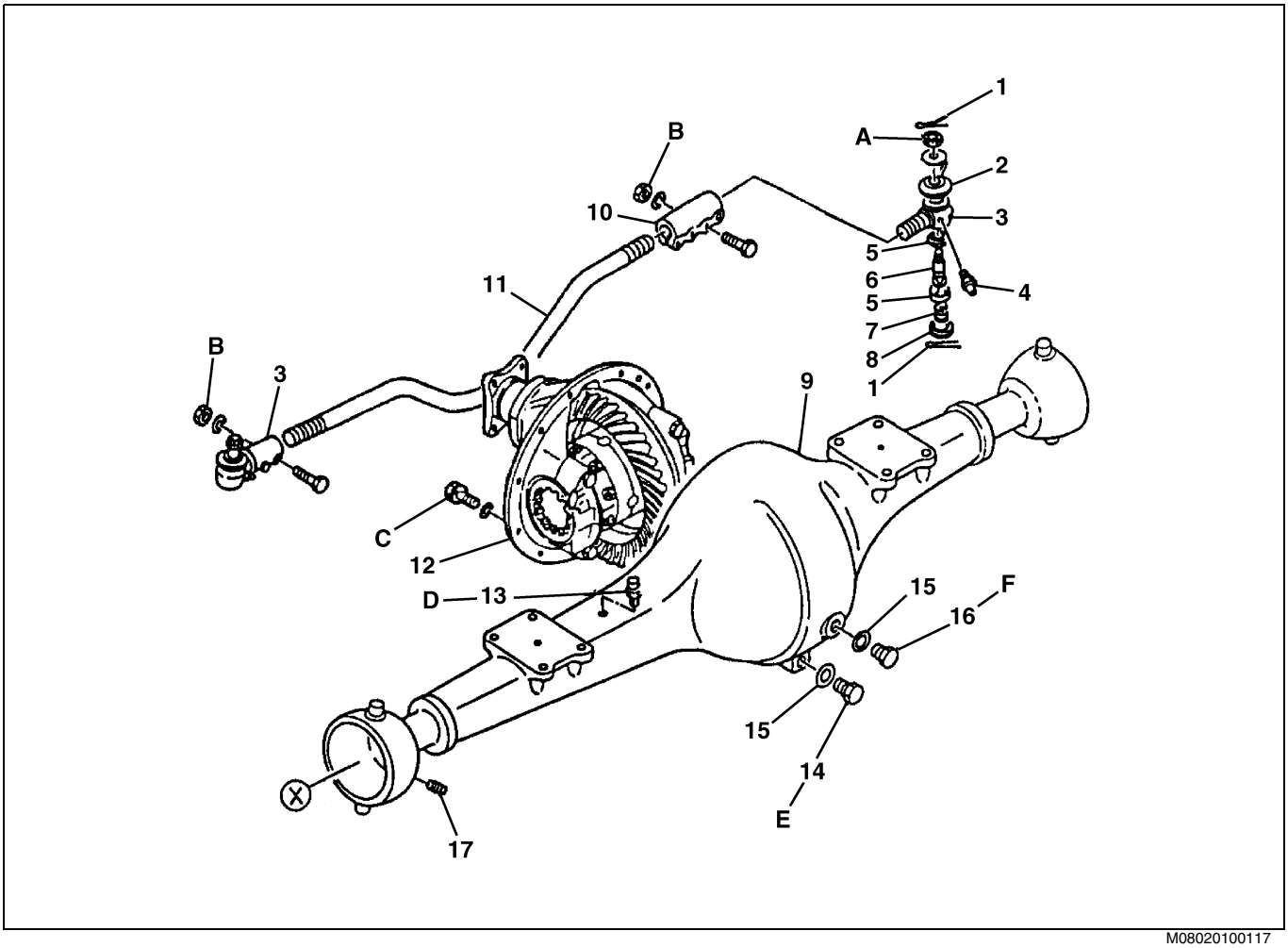
M08020119BEK1001

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

Illustration	Part number	Tool name	Remarks
	09839-0101	SOCKET WRENCH	
	09849-2001	HANDLE	
	09650-1790	WHEEL HUB PULLER	
	09650-1310	HUB BEARING PULLER	

COMPONENT LOCATOR

M08020119BED1001

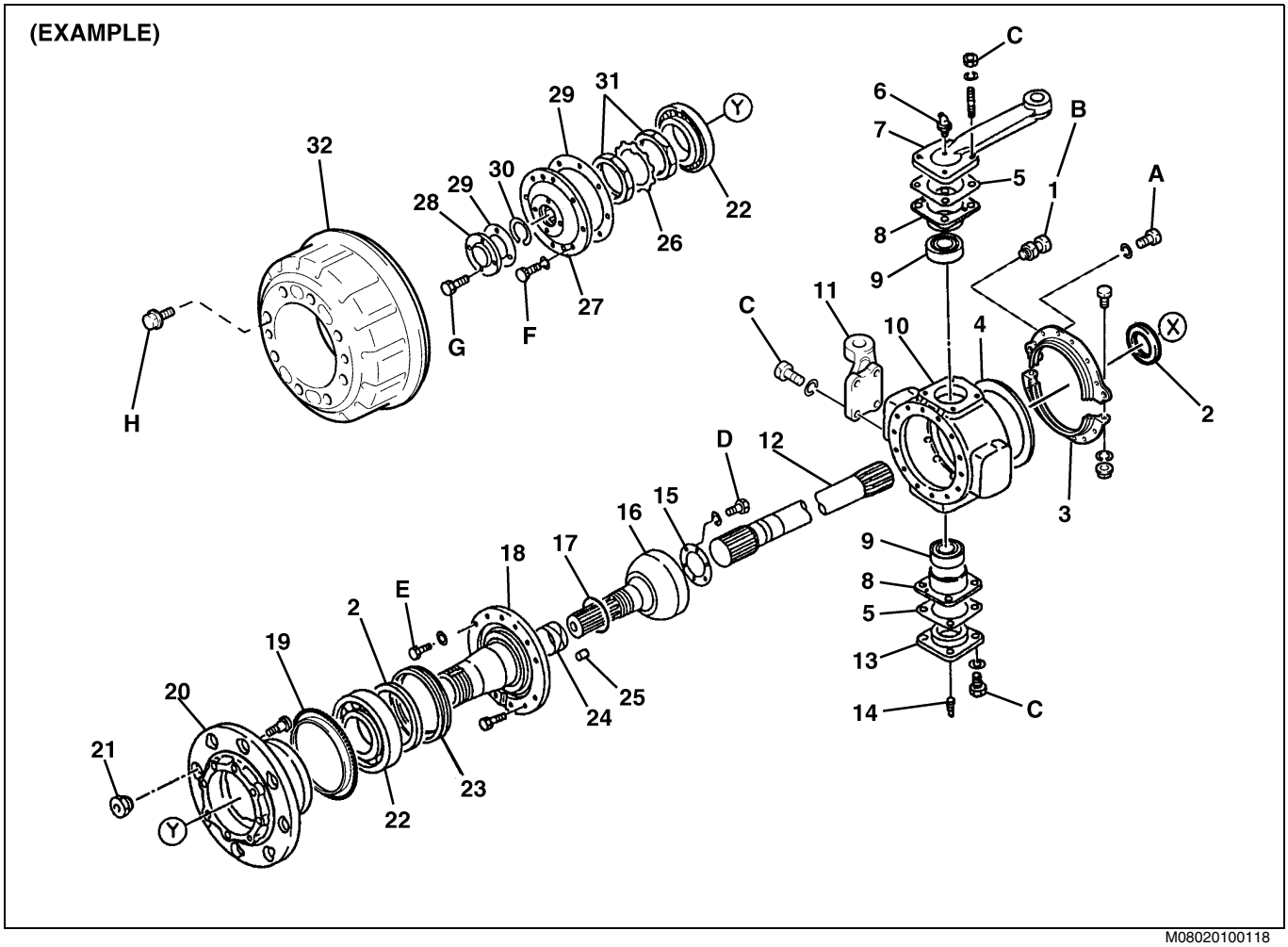


M08020100117

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

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

A	147-343 {1,500-3,500, 109-253}	D	9.8-19.6 {100-200, 7.3-14.4}
B	85.5-114.5 {872-1,167, 63-84}	E	39.2-68.6 {400-700, 29-50}
C	85.4-107.8 {871-1,100, 63-79}	F	78.5-117.5 {800-1,200, 58-86}



M08020100118

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

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

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

OVERHAUL

M08020119BEH2001

IMPORTANT POINTS - DISMOUNTING

1. REMOVAL OF THE WHEELS

(1) Refer to chapter WHEEL AND TIRE.

2. REMOVAL OF THE BRAKE DRUM

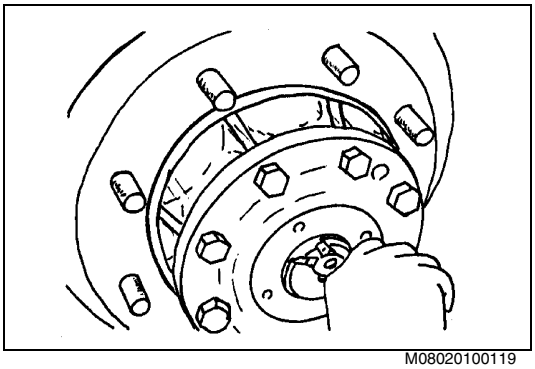
(1) Loosen the drum set screws and remove the brake drum.

NOTICE:

- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**
- **Make aligning mark to the wheel hub and brake drum.**

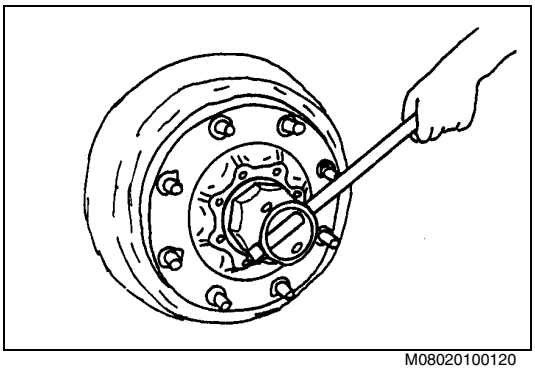
3. DISMOUNTING OF THE WHEEL HUB

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



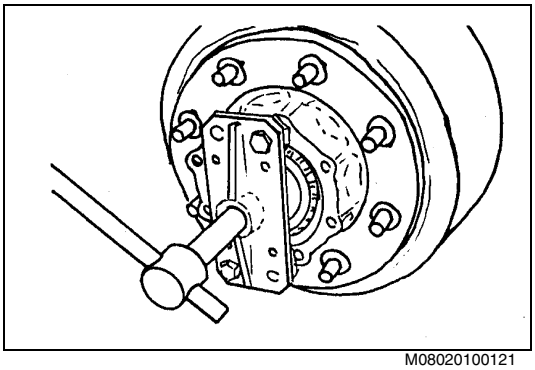
M08020100119

(2) Flatten the pawl of lock washer and remove the two lock nuts.
SST:
Socket Wrench (09839-0101)
Handle (09849-2001)

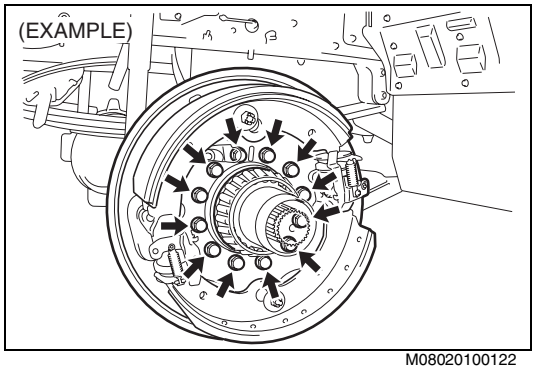


M08020100120

(3) Remove the wheel hub together with the brake drum.
SST:
Wheel Hub Puller (09650-1790)
Handle (09849-2001)



M08020100121

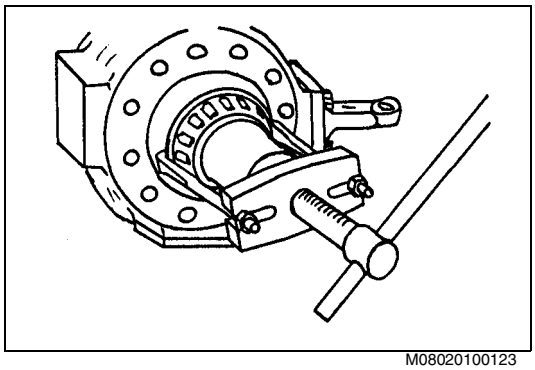


M08020100122

4. DISMOUNTING OF THE WHEEL BRAKE

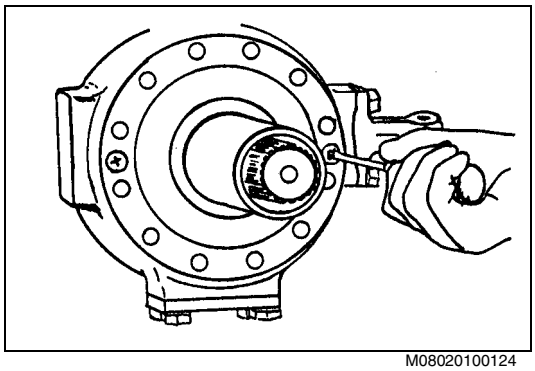
(1) Disconnect the brake hose and the harness.
(2) Remove the oil seal.
(3) Remove the bolts and then remove the wheel brake.

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


M08020100123

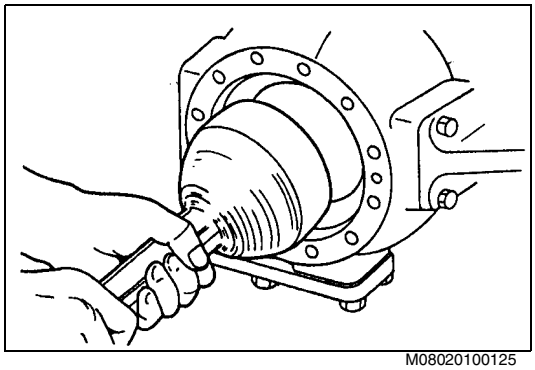
5. DISMOUNTING OF THE KNUCKLE SPINDLE

(1) Remove the inner bearing and oil seal guide from the knuckle spindle.
SST:
Hub Bearing Puller (09650-1310)
Handle (09849-2001)


M08020100124

(2) Remove the knuckle spindle.

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

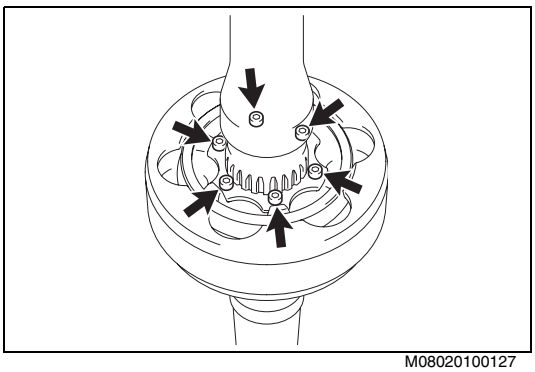

M08020100125

6. REMOVAL OF THE AXLE SHAFT ASSEMBLY

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

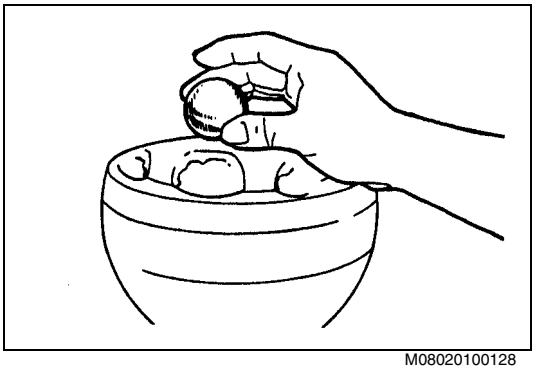
NOTICE:
When removing the birfield joint, be careful not to damage the oil seal fitted in the axle housing tube.

IMPORTANT POINTS - DISASSEMBLY

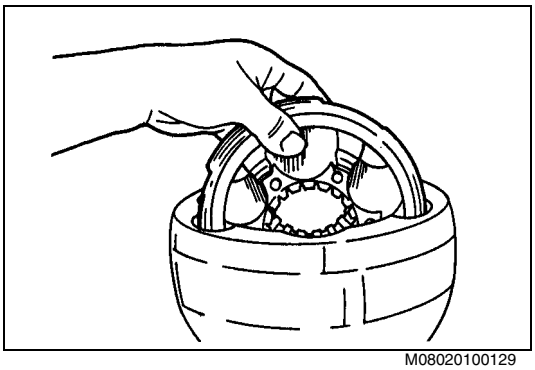

M08020100127

1. DISASSEMBLY OF THE AXLE SHAFT ASSEMBLY

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

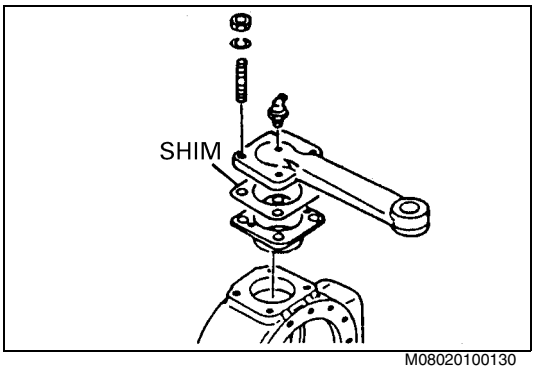

M08020100128

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


M08020100129

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

IMPORTANT POINTS - ASSEMBLY



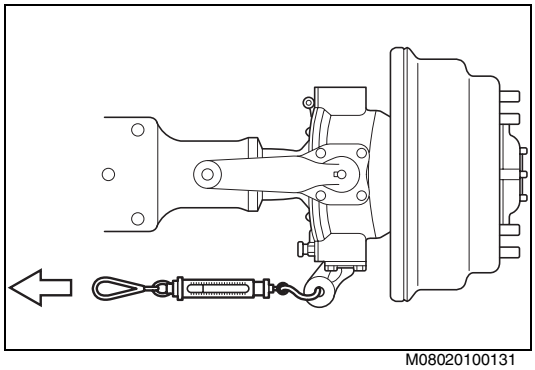
M08020100130

1. ASSEMBLY AND ADJUSTMENT OF THE KNUCKLE

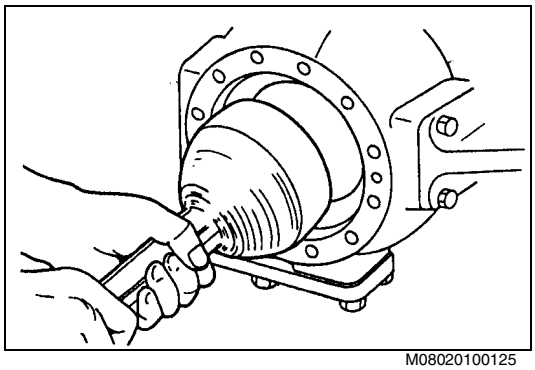
(1) Adjust the turning force of knuckle body with shims.

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

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

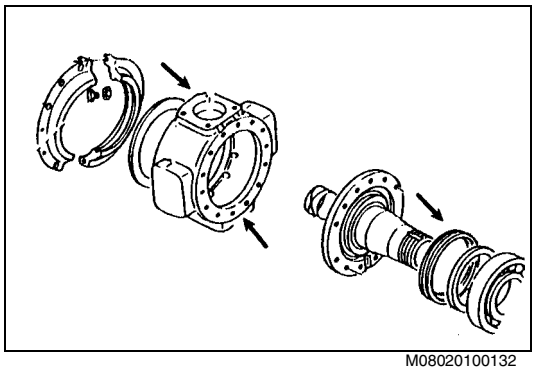

M08020100131

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

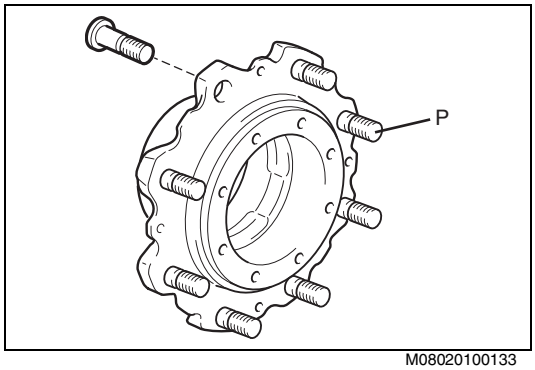

M08020100125

(2) Insert the birfield joint with axle shaft.

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


M08020100132

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



M08020100133

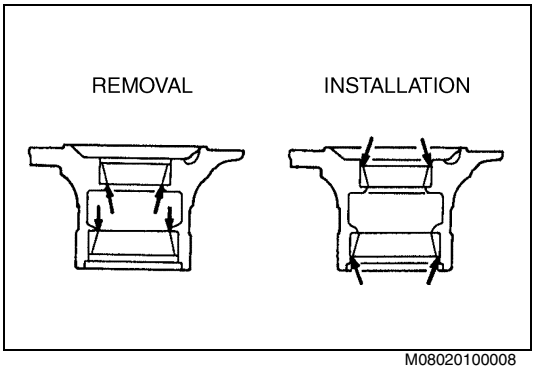
2. REPLACEMENT OF THE HUB BOLT

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

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

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

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



M08020100008

3. 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.

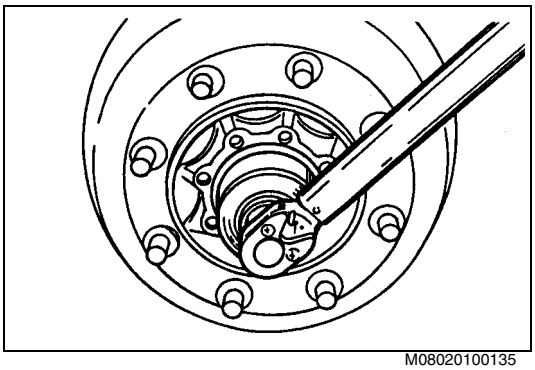
(2) To install the outer race, use a tapping rod and a hammer, or a press.

4. INSTALLATION OF THE BRAKE DRUMS

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

NOTICE:

Align the aligning mark when installing.


M08020100135

5. ADJUSTMENT OF THE WHEEL BEARING PRELOAD

NOTICE:

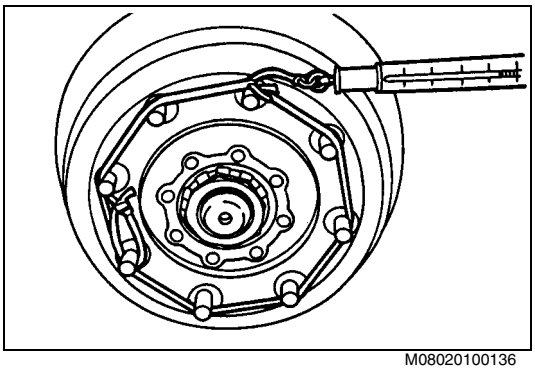
- **Before mounting the wheel hub, lubricate inside of wheel hub with bearing grease sufficiently.**
  Volume of grease: 500 g {18 oz) / wheel
- **While assembling of the hub bearing, take care not to contaminate the hub inside and grease with chips and dust.**
- **Apply grease to the inner surface of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

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

SST: Socket Wrench (09839-0101)

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

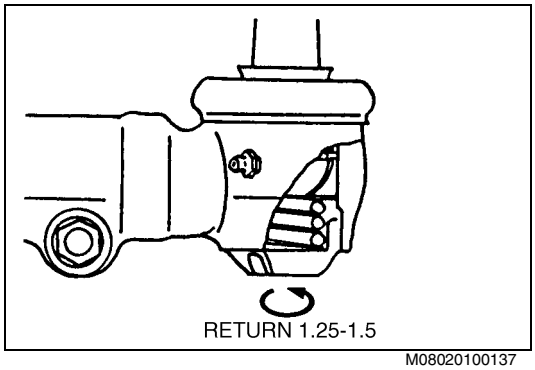
SST: Socket Wrench (09839-0101)


M08020100136

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

Assembly standard:

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



M08020100137

6. ASSEMBLY OF THE TIE ROD END

NOTICE:

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

7. LUBRICATION FOR KNUCKLE AND BIRFIELD JOINT

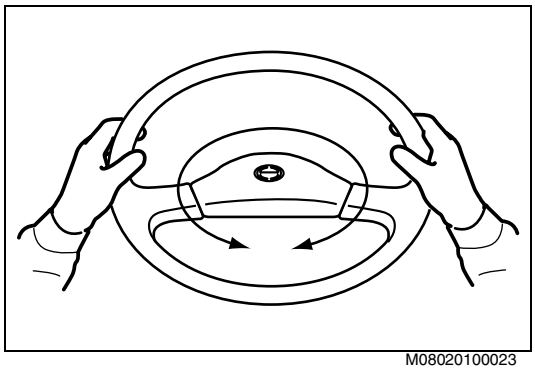
(1) On completion of front axle and related parts reassembly, lubricate the knuckle and birfield joint with bearing grease by inducting from lubrication fitting on the knuckle body until grease comes out from plug holes.

NOTICE:

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

8. INSTALLATION OF THE WHEELS

(1) Refer to chapter WHEEL AND TIRE.


M08020100023

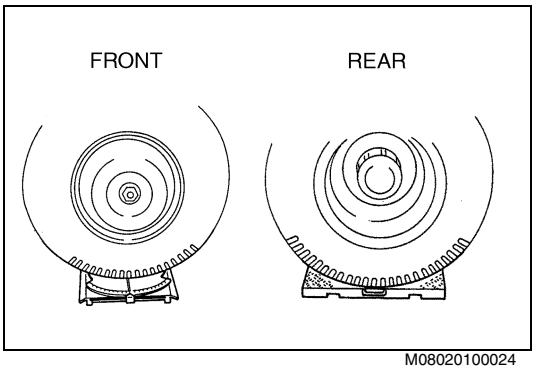
9. TURN THE STEERING WHEEL TO THE FULL RANGE TO THE RIGHT AND THE LEFT, AND CONFIRM THAT ALL STEERING LINKAGES MOVE FREELY (ESPECIALLY THE BALL JOINTS).

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

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

INSPECTION AND ADJUSTMENT

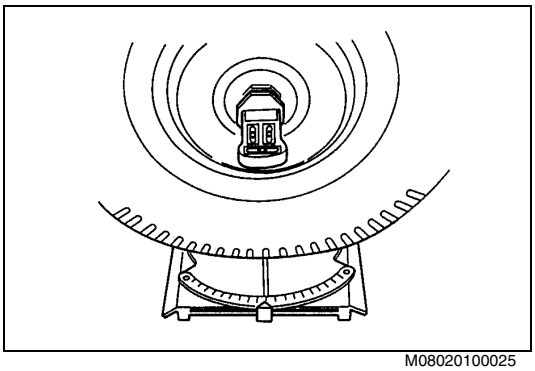
M08020119BEH3001



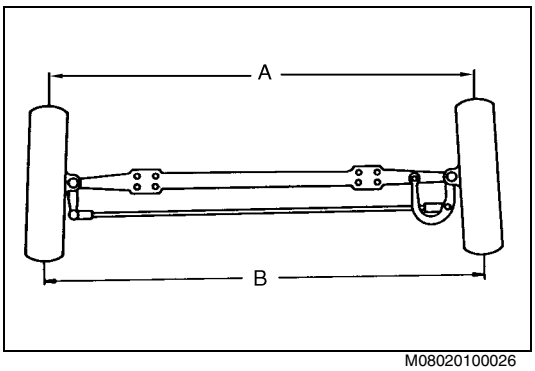
M08020100024

1. INSPECTION OF THE WHEEL ALIGNMENT

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


M08020100025

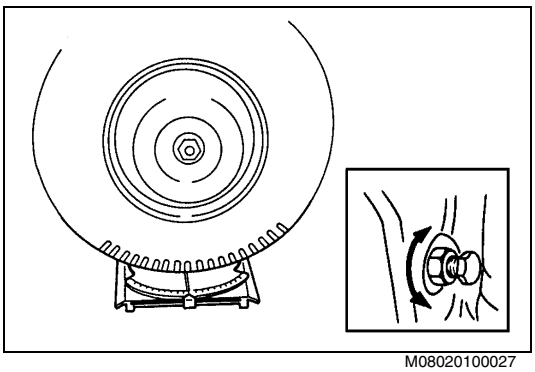
(2) Adjust the king pin inclination, caster, and camber.
Refer to DATA AND SPECIFICATIONS.



M08020100026

(3) Check the toe-in.

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


M08020100027

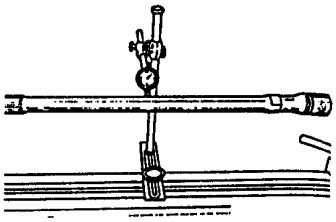
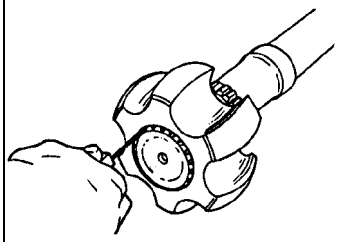
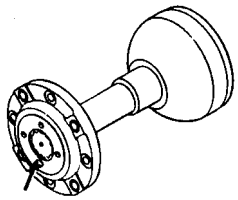
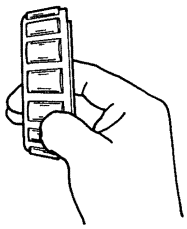
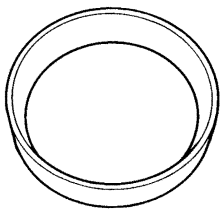
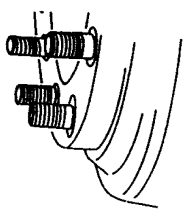
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

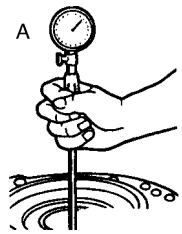
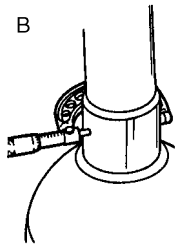
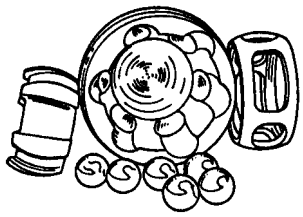
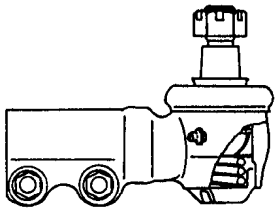
(1) Refer to DATA AND SPECIFICATIONS.

INSPECTION AND REPAIR

M08020119BEH3002

Unit: mm {in.}

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

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

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS15) AX02-002

FRONT AXLE (DIFFERENTIAL GEAR SERIES: SS15)

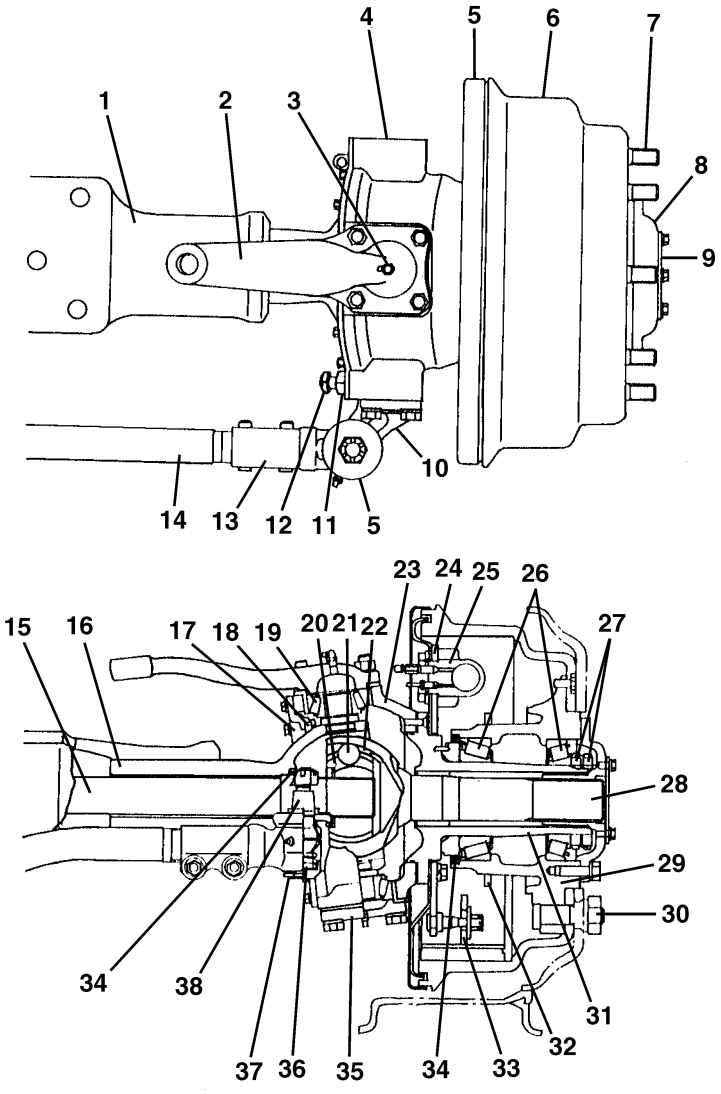
DATA AND SPECIFICATIONS

M08020120BEI2001

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

DESCRIPTION

M08020120BEC1001



M08020100116

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

TROUBLESHOOTING

M08020120BEF3001

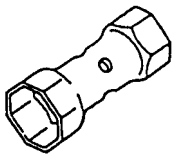
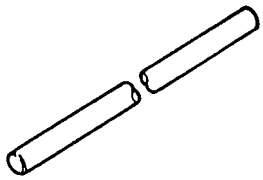
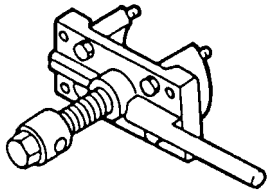
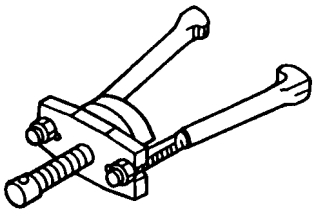
Symptom	Possible cause	Remedy/Prevention
Hard steering or poor return of steering wheel to center	Lack of lubrication in steering linkage	Lubricate.
	Incorrect front wheel alignment	Adjust or replace parts if necessary.
	Worn out or damaged socket pin bearing	Replace socket pin bearings.
	Tire pressure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

Symptom	Possible cause	Remedy/Prevention
Abnormal noise (Front axle system)	Worn front axle shaft spline.	Replace.
	Worn hub bearings.	Replace.
	Loose hub bearings.	Adjust bearing preload.
	Loose differential case tightening bolts.	Tighten bolts.
	Loose socket pin bearings.	Adjust bearing preload.
Abnormal noise (Oil system, etc.)	Insufficient oil.	Add oil; check for leakage.
	Insufficient grease.	Add grease.
	Poor oil quality.	Change oil.
	Poor grease quality.	Change grease.
	Abnormal noise of propeller shaft.	Refer to Chapter PROPELLER SHAFT.

SPECIAL TOOL

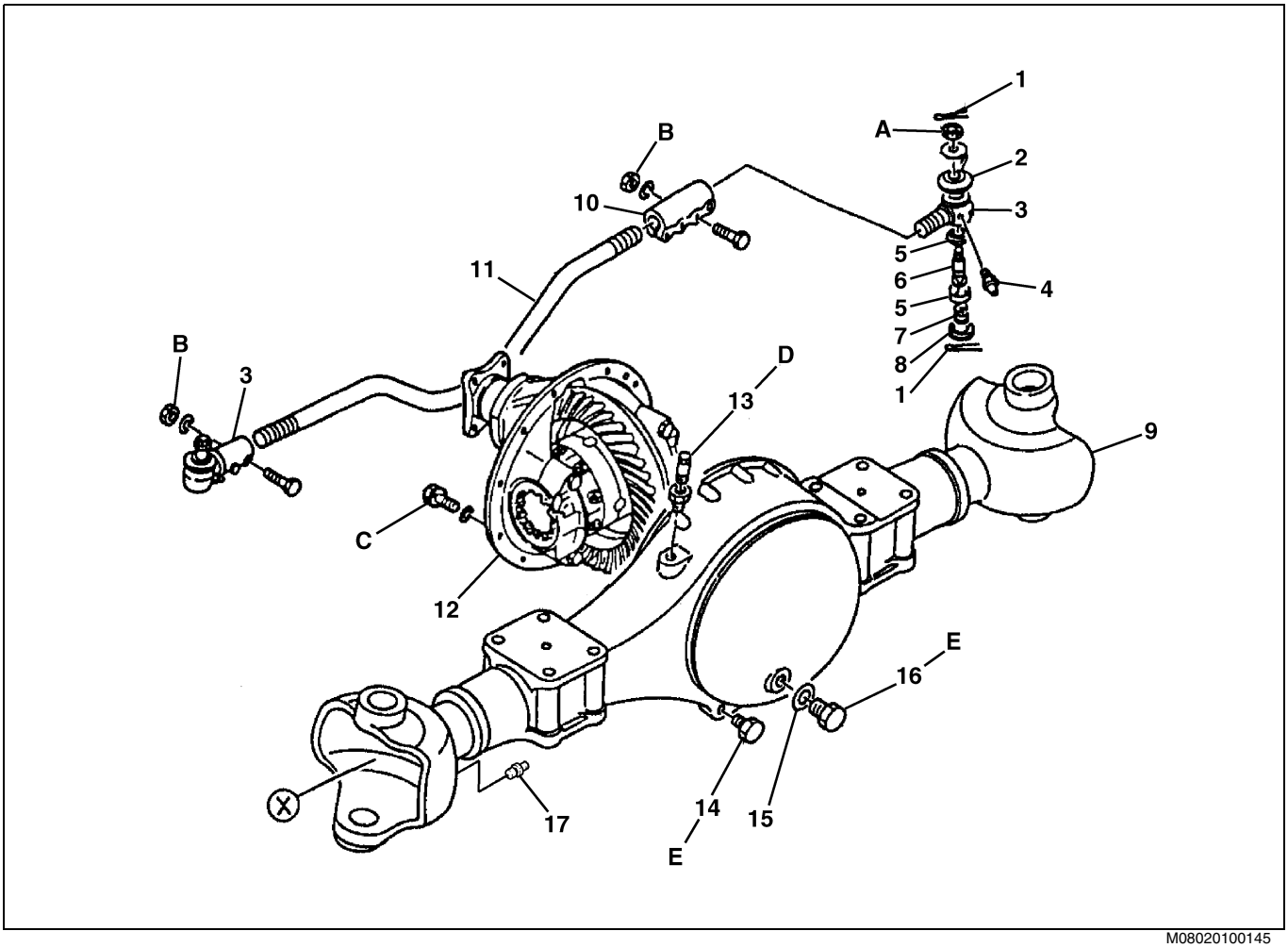
M08020120BEK1001

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

Illustration	Part number	Tool name	Remarks
	09839-0101	SOCKET WRENCH	
	09849-2001	HANDLE	
	09650-1790	WHEEL HUB PULLER	
	09650-1310	HUB BEARING PULLER	

COMPONENT LOCATOR

M08020120BED1001

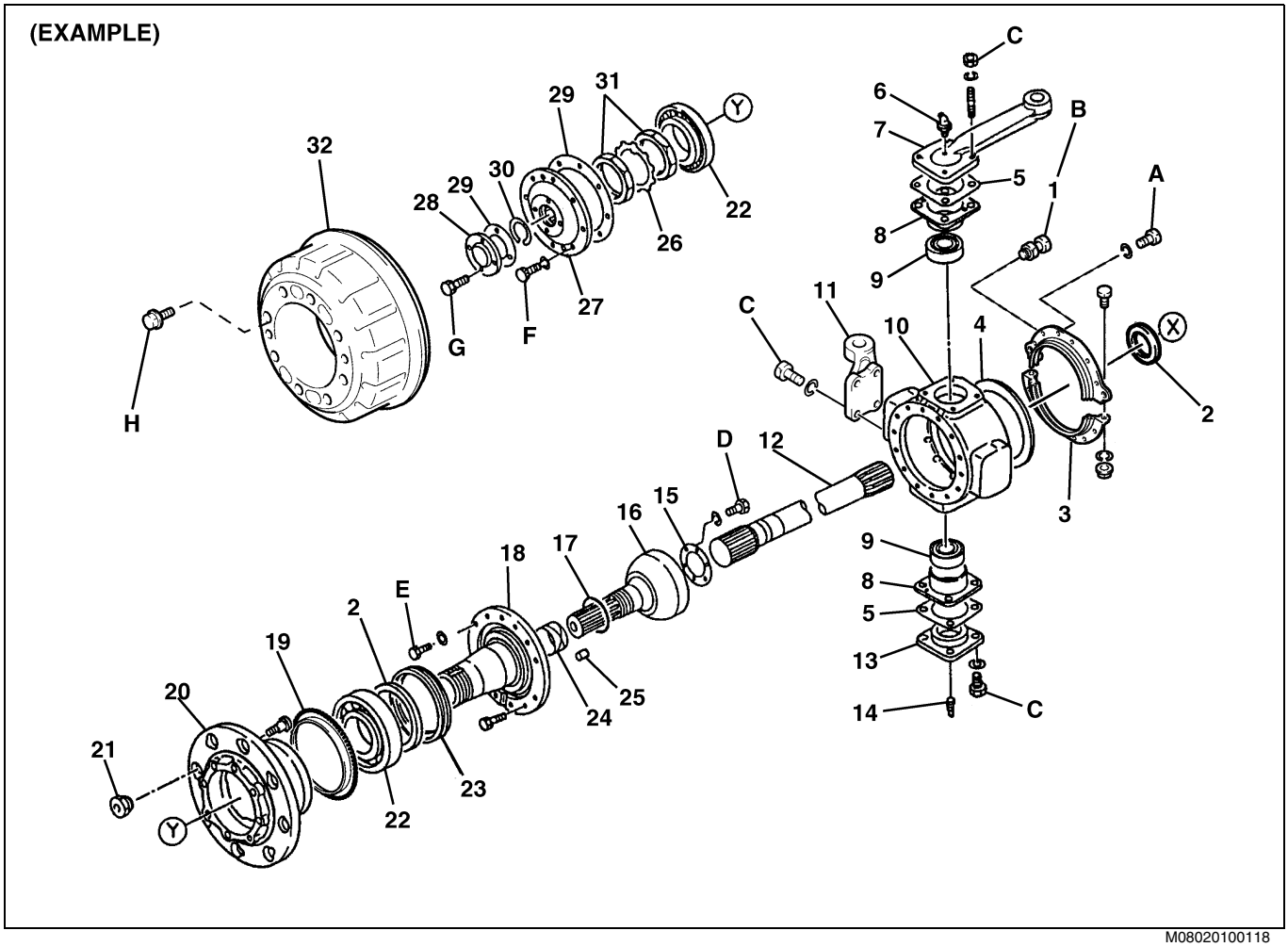


M08020100145

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

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

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



M08020100118

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

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

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

OVERHAUL

M08020120BEH2001

IMPORTANT POINTS - DISMOUNTING

1. REMOVAL OF THE WHEELS

(1) Refer to chapter WHEEL AND TIRE.

2. REMOVAL OF THE BRAKE DRUM

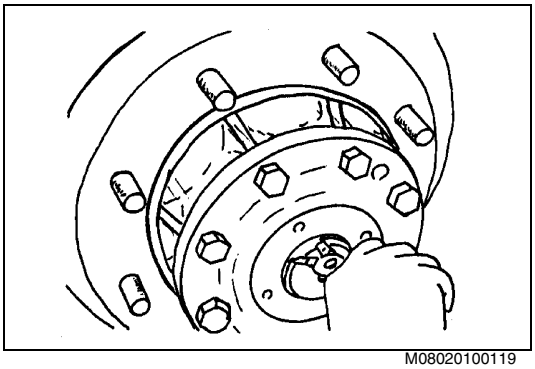
(1) Loosen the drum set screws and remove the brake drum.

NOTICE:

- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**
- **Make aligning mark to the wheel hub and brake drum.**

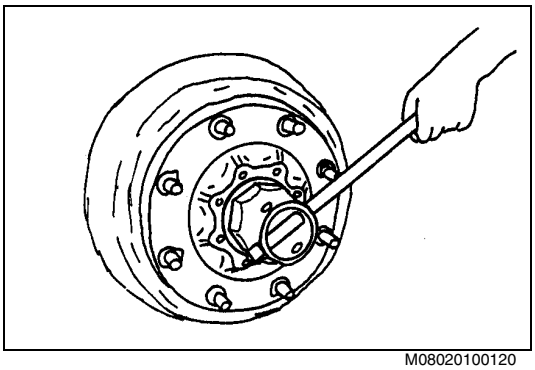
3. DISMOUNTING OF THE WHEEL HUB

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



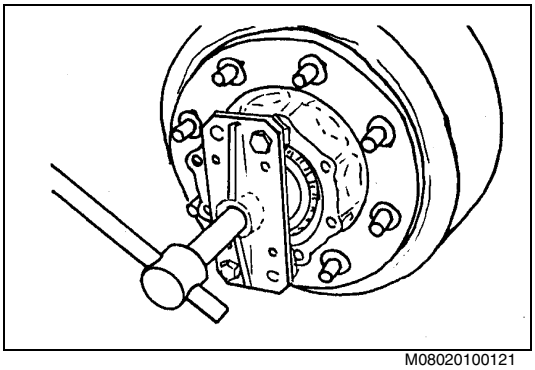
M08020100119

(2) Flatten the pawl of lock washer and remove the two lock nuts.
SST:
Socket Wrench (09839-0101)
Handle (09849-2001)

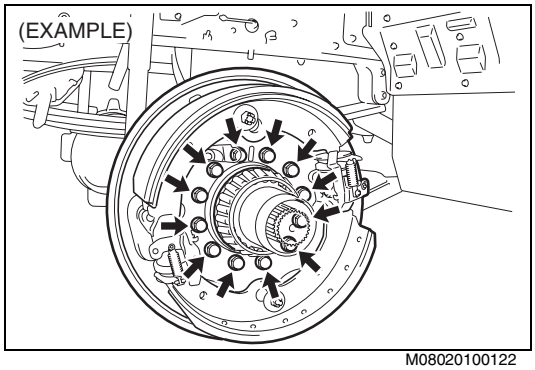


M08020100120

(3) Remove the wheel hub together with the brake drum.
SST:
Wheel Hub Puller (09650-1790)
Handle (09849-2001)



M08020100121

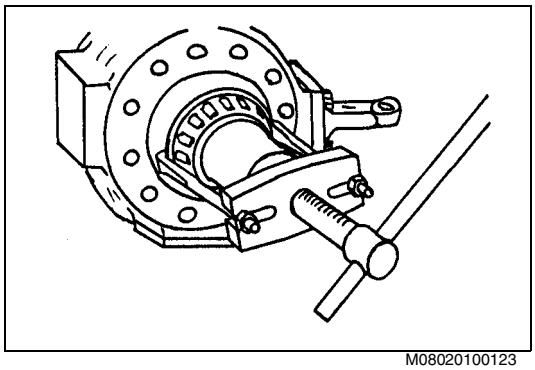


M08020100122

4. DISMOUNTING OF THE WHEEL BRAKE

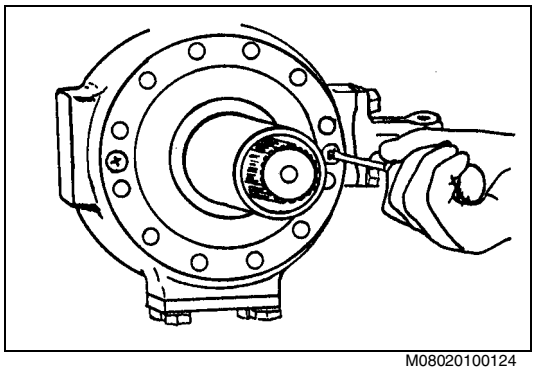
(1) Disconnect the brake hose and the harness.
(2) Remove the oil seal.
(3) Remove the bolts and then remove the wheel brake.

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


M08020100123

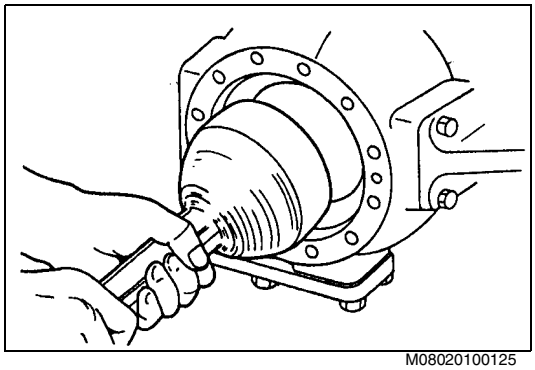
5. DISMOUNTING OF THE KNUCKLE SPINDLE

(1) Remove the inner bearing and oil seal guide from the knuckle spindle.
SST:
Hub Bearing Puller (09650-1310)
Handle (09849-2001)


M08020100124

(2) Remove the knuckle spindle.

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

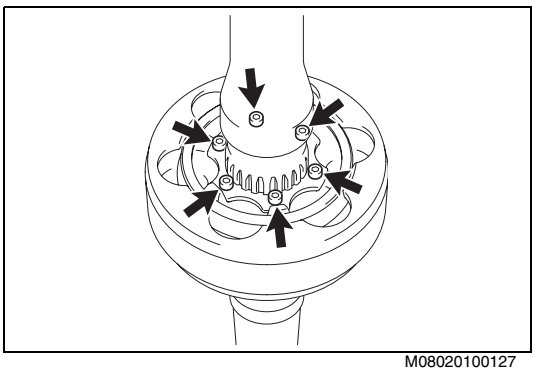

M08020100125

6. REMOVAL OF THE AXLE SHAFT ASSEMBLY

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

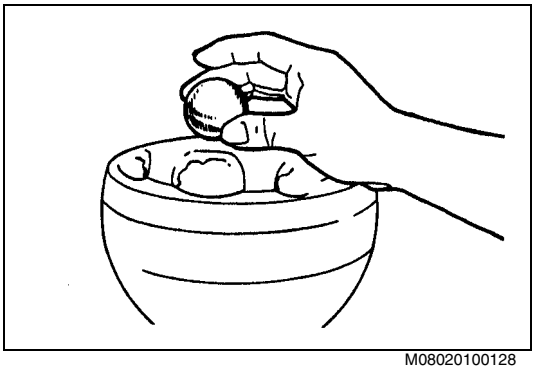
NOTICE:
When removing the birfield joint, be careful not to damage the oil seal fitted in the axle housing tube.

IMPORTANT POINTS - DISASSEMBLY

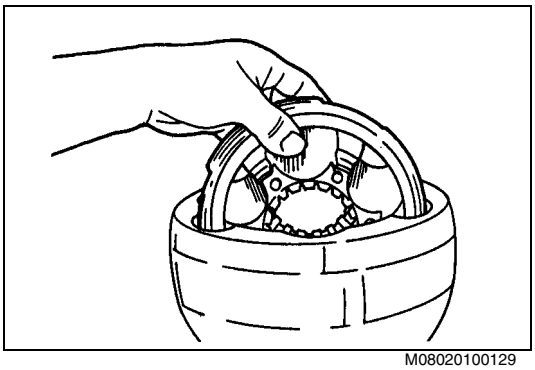

M08020100127

1. DISASSEMBLY OF THE AXLE SHAFT ASSEMBLY

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

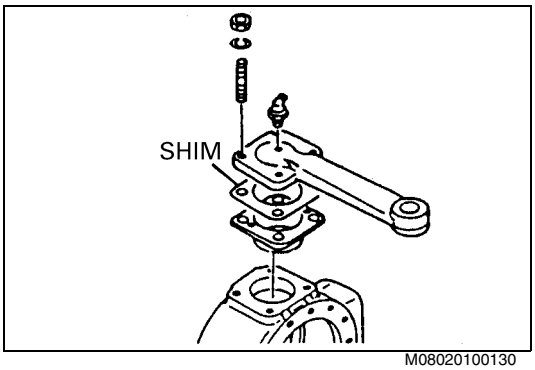

M08020100128

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


M08020100129

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

IMPORTANT POINTS - ASSEMBLY



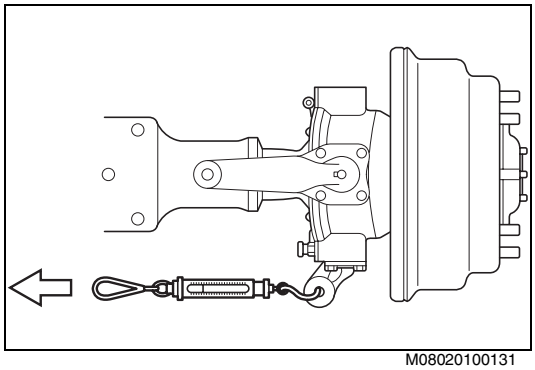
M08020100130

1. ASSEMBLY AND ADJUSTMENT OF THE KNUCKLE

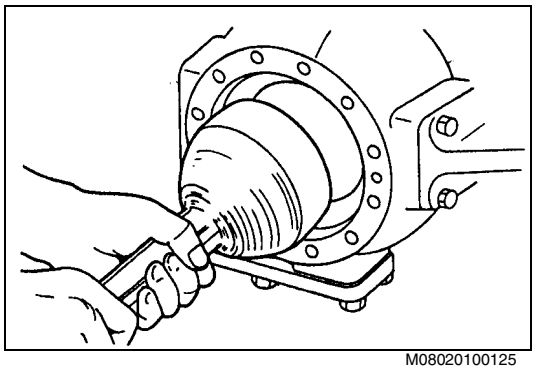
(1) Adjust the turning force of knuckle body with shims.

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

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

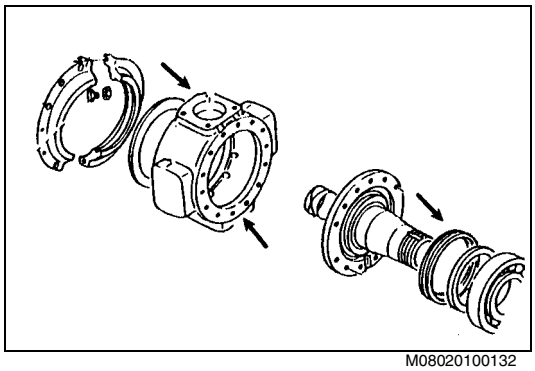

M08020100131

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

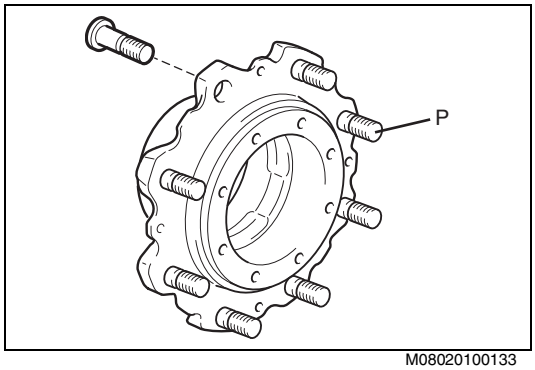

M08020100125

(2) Insert the birfield joint with axle shaft.

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


M08020100132

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



M08020100133

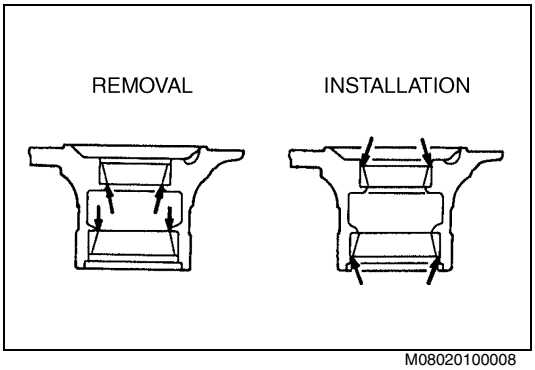
2. REPLACEMENT OF THE HUB BOLT

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

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

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

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



M08020100008

3. 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.

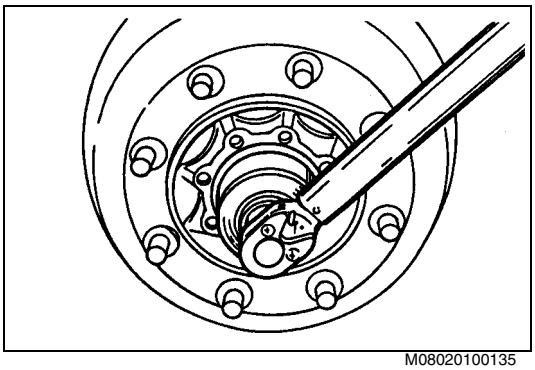
(2) To install the outer race, use a tapping rod and a hammer, or a press.

4. INSTALLATION OF THE BRAKE DRUMS

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

NOTICE:

Align the aligning mark when installing.


M08020100135

5. ADJUSTMENT OF THE WHEEL BEARING PRELOAD

NOTICE:

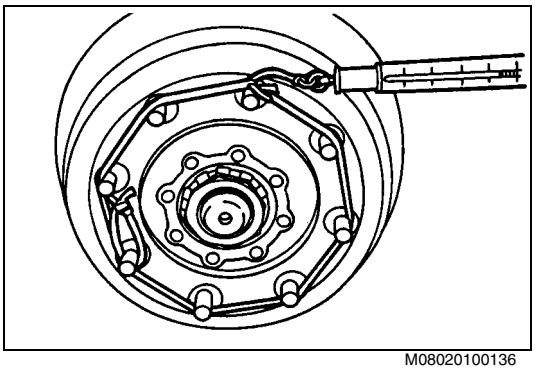
- **Before mounting the wheel hub, lubricate inside of wheel hub with bearing grease sufficiently.**
  Volume of grease: 500 g {18 oz) / wheel
- **While assembling of the hub bearing, take care not to contaminate the hub inside and grease with chips and dust.**
- **Apply grease to the inner surface of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

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

SST: Socket Wrench (09839-0101)

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

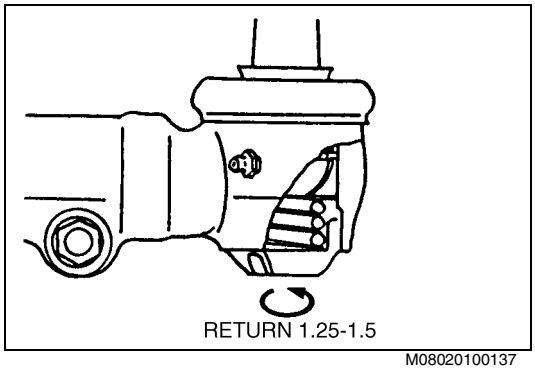
SST: Socket Wrench (09839-0101)


M08020100136

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

Assembly standard:

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



M08020100137

6. ASSEMBLY OF THE TIE ROD END

NOTICE:

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

7. LUBRICATION FOR KNUCKLE AND BIRFIELD JOINT

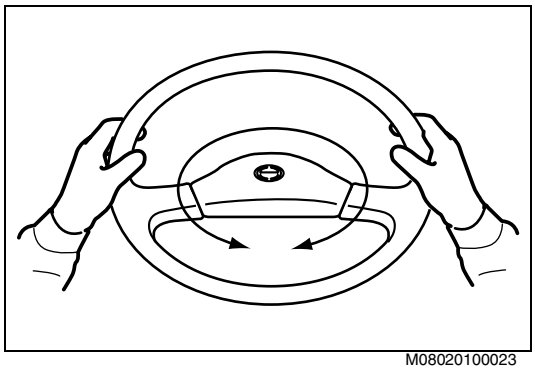
(1) On completion of front axle and related parts reassembly, lubricate the knuckle and birfield joint with bearing grease by inducting from lubrication fitting on the knuckle body until grease comes out from plug holes.

NOTICE:

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

8. INSTALLATION OF THE WHEELS

(1) Refer to chapter WHEEL AND TIRE.


M08020100023

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

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

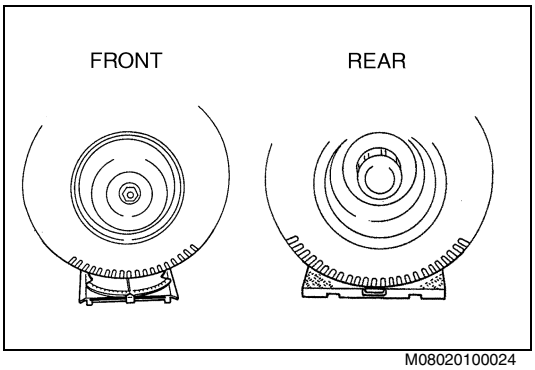
(1) On completion of the front axle overhaul, conduct the followings:

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

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

INSPECTION AND ADJUSTMENT

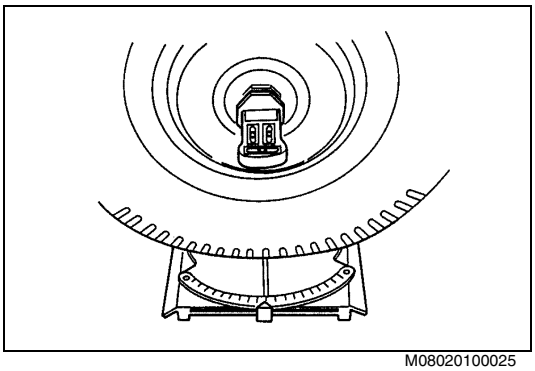
M08020120BEH3001



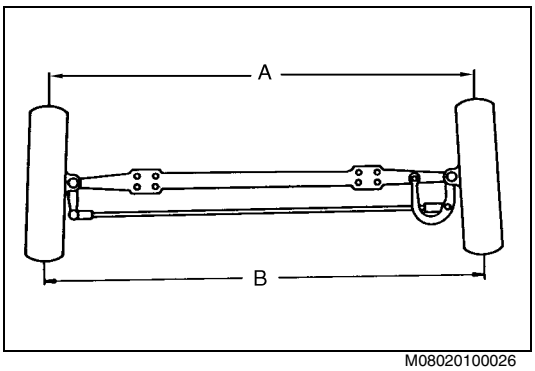
M08020100024

1. INSPECTION OF THE WHEEL ALIGNMENT

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


M08020100025

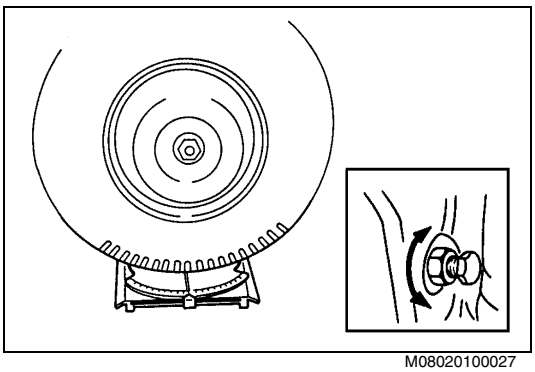
(2) Adjust the king pin inclination, caster, and camber.
Refer to DATA AND SPECIFICATIONS.



M08020100026

(3) Check the toe-in.

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


M08020100027

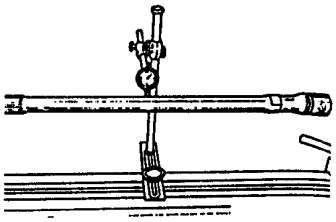
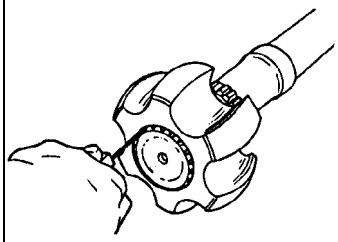
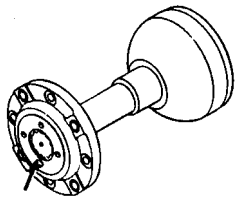
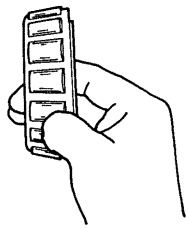
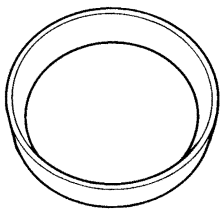
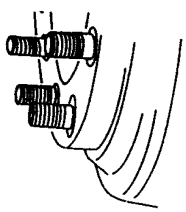
2. ADJUSTMENT OF THE WHEEL TURNING ANGLE WITH STOPPER BOLT

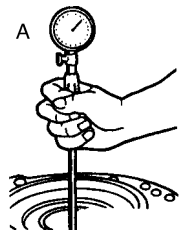
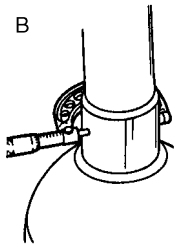
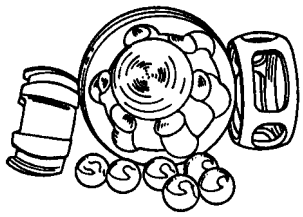
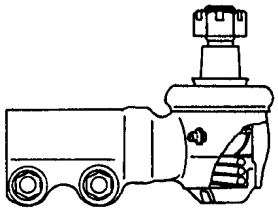
(1) Refer to DATA AND SPECIFICATIONS.

INSPECTION AND REPAIR

M08020120BEH3002

Unit: mm {in.}

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

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

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

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH13)

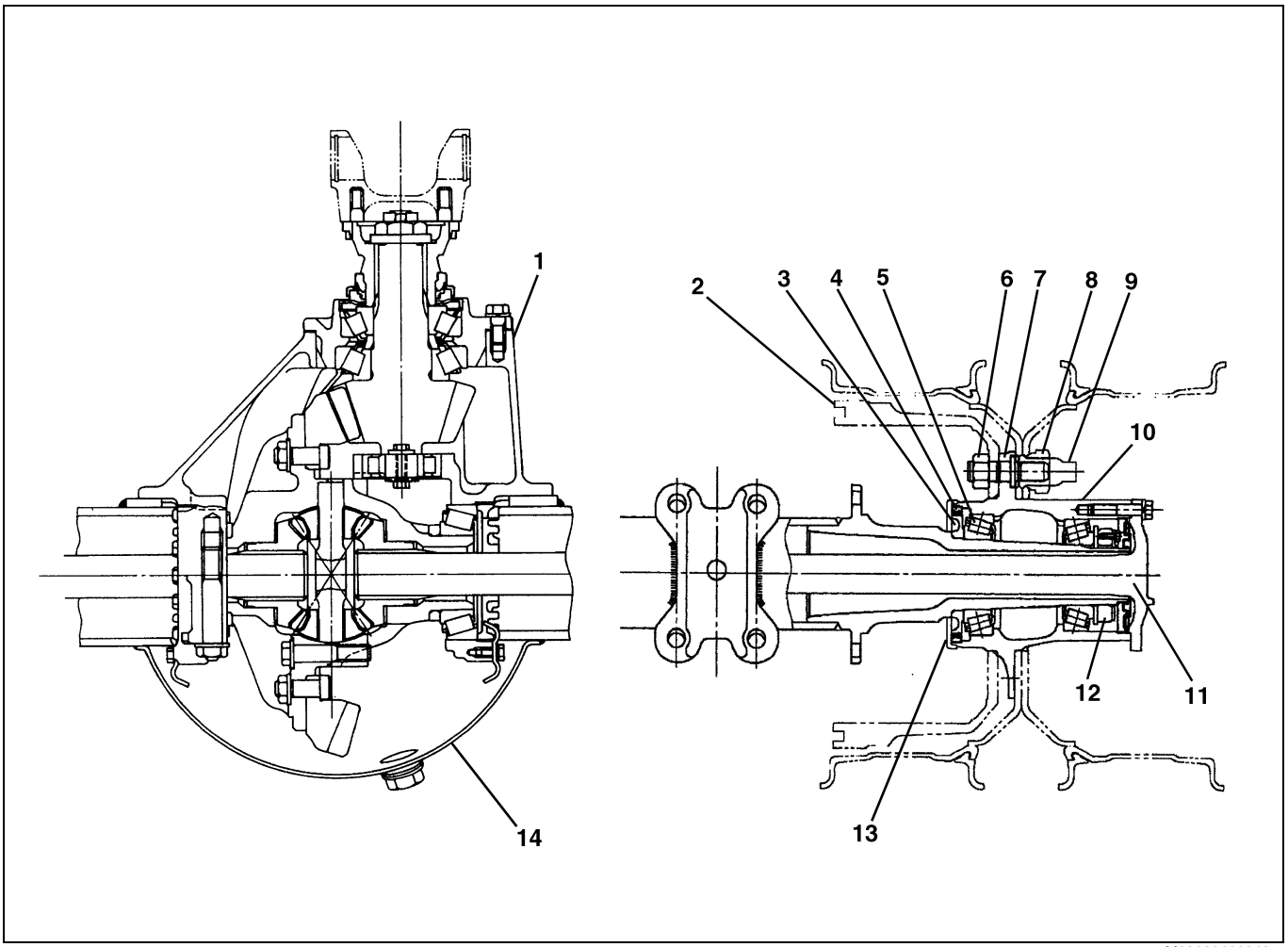
DATA AND SPECIFICATIONS

M08030101BEI2001

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

DESCRIPTION

M08030101BEC1002



M08030100043

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	ABS sensor ring (If so equipped)
7	Hub bolt	14	Axle housing

TROUBLESHOOTING

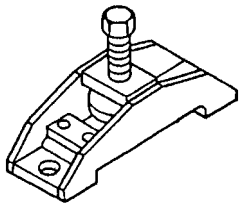
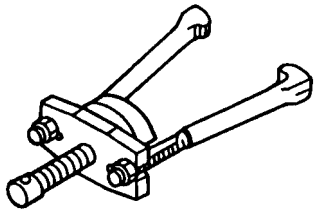
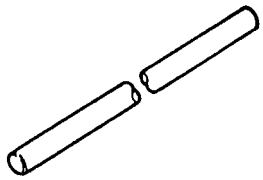
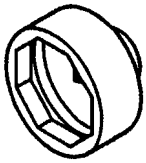
M08030101BEF3001

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

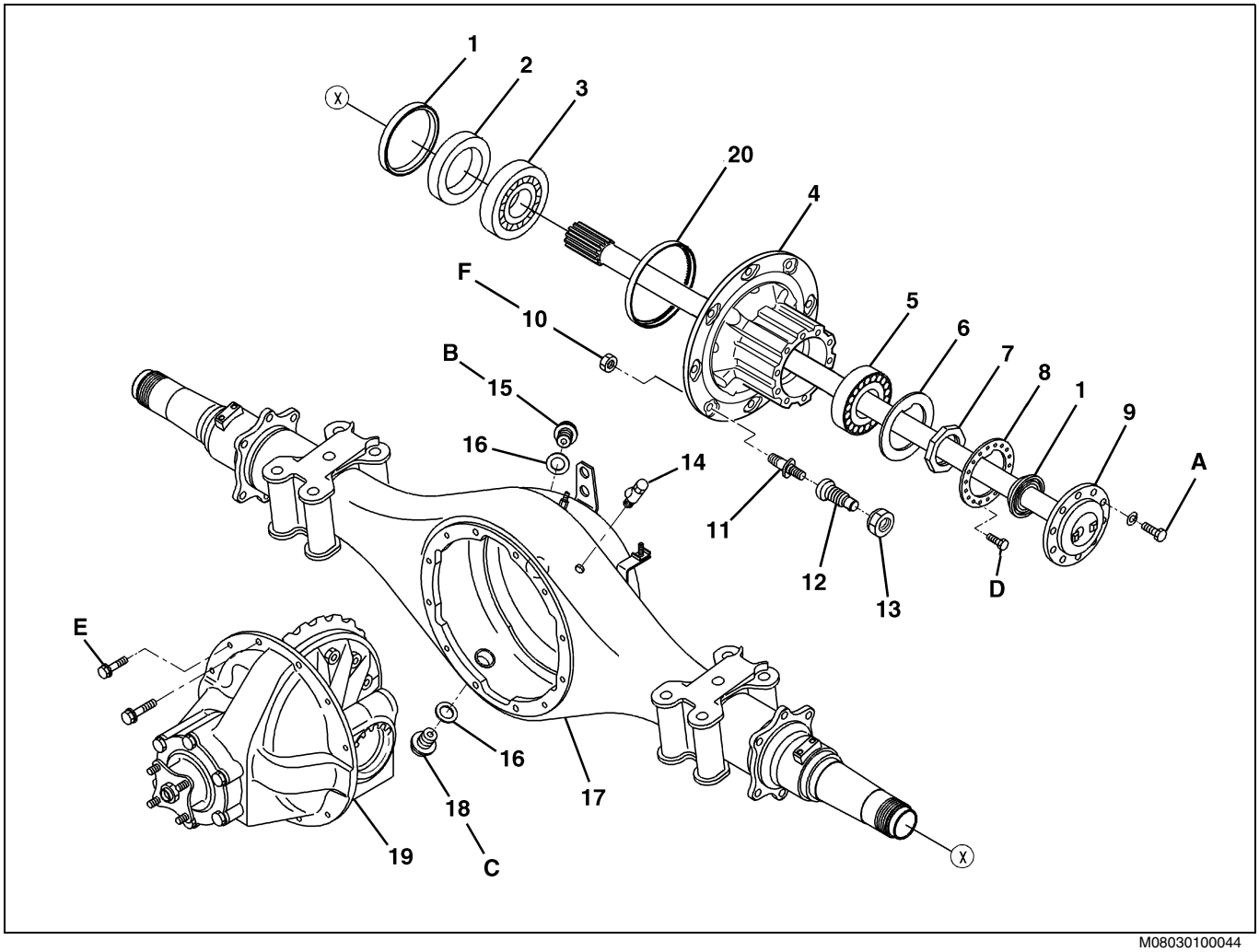
M08030101BEK1001

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

M08030101BED1003



M08030100044

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}**

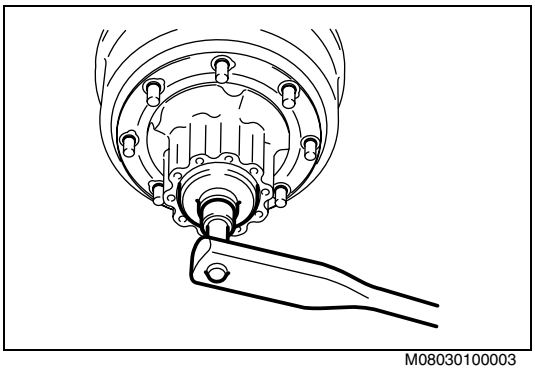
A	84.5-107.5 {862-1,097, 63-79}	E	ϕ12 bolt: 84.5-107.5 {862-1,097, 63-79}
B	78.4-117.6 {800-1,200, 58-86}		ϕ14 bolt: 113-147 {1,152-1,499, 83-108}
C	39.2-68.6 {400-700, 29-50}	F	392-470 {4,000-4,800, 290-347}
D	8.33-10.79 {85-110, 6.2-8.0}		

OVERHAUL

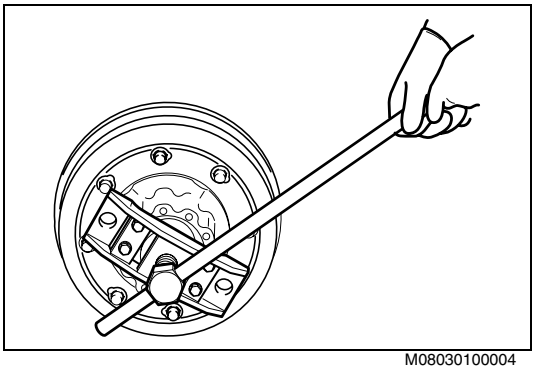
M08030101BEH2003

IMPORTANT POINTS - DISASSEMBLY

1. REMOVAL OF THE WHEELS
(1) Refer to chapter WHEEL AND TIRE.

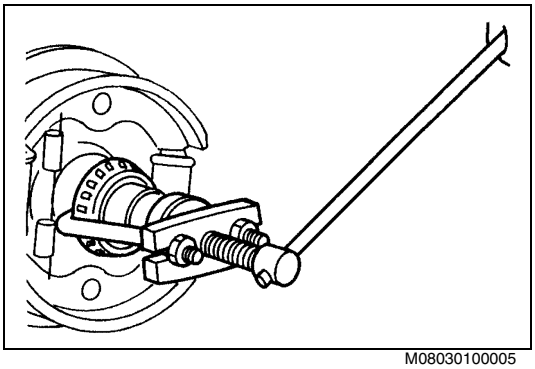

M08030100003

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.

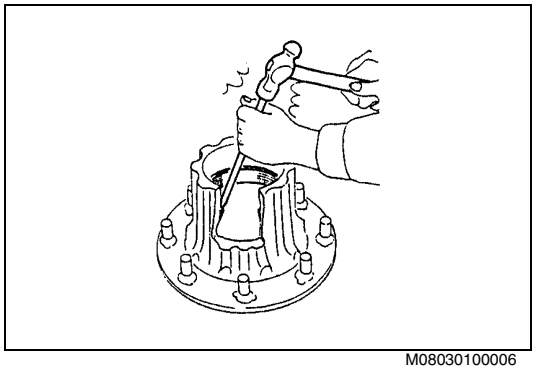

M08030100005

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.

6. DISMOUNTING THE WHEEL BOLT
(1) Remove the nuts.
(2) Separate the wheel hub and brake drum. (If necessary)
(3) Knock through the wheel bolt using blass bar and hammer.

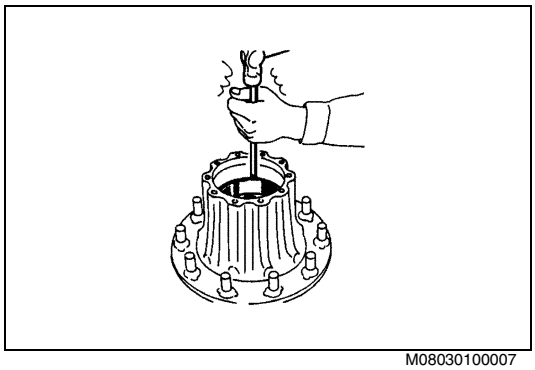
NOTICE:
- **Put aligned marks on the wheel hub and brake drum.**


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.

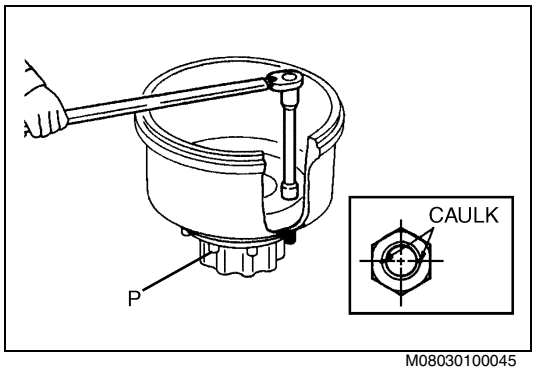

M08030100007

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

2. REPLACEMENT OF THE HUB BOLTS

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

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



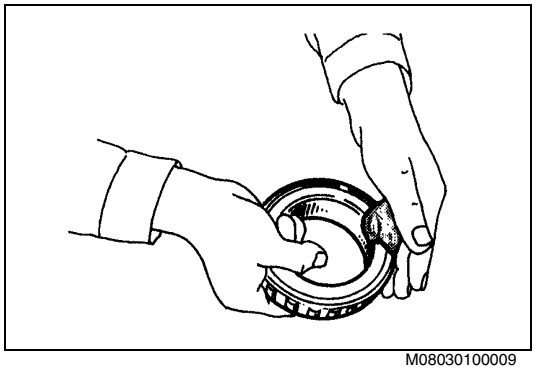
M08030100045

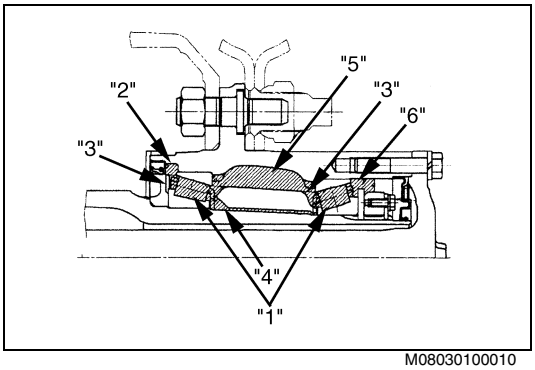
NOTICE:
Caulk the lock nuts at two points after tightening to the specified torque.

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.

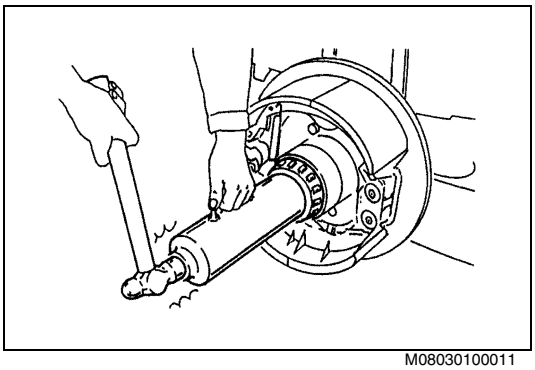

M08030100009



M08030100010

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

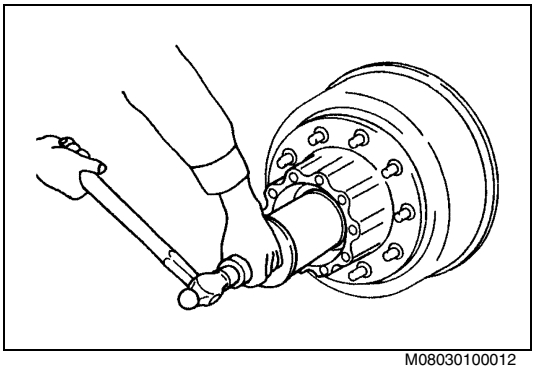
NOTICE:
- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the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


M08030100011

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

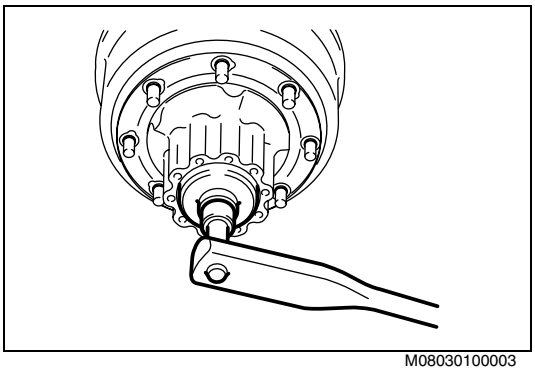
(1) Install the oil seal and the inner wheel hub bearing.

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.

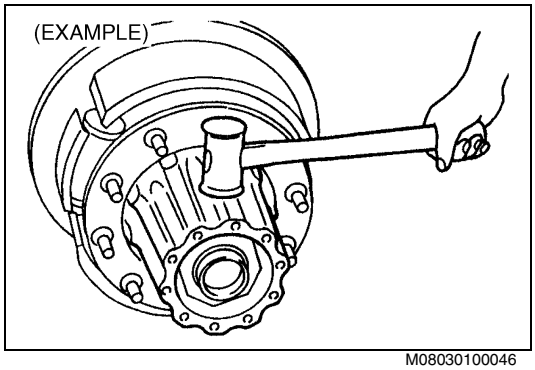
NOTICE:
- **Using a tool as shown simplifies installation.**
- **The wheel hub assembly is heavy, therefore be careful when handling it.**


M08030100003

5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

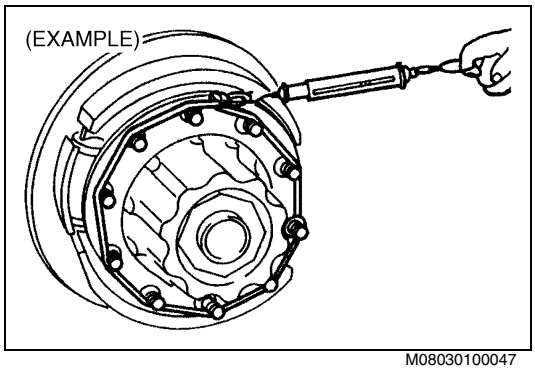
(1) Tighten the wheel hub bearing lock nut with the specified torque then loosen the nut by 1/3 - 1/4 turn.
SST: Socket Wrench (09839-9401)

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



M08030100046

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

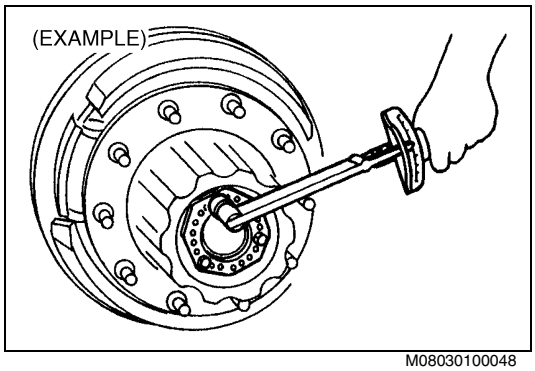


M08030100047

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

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**3.9-5.9 {40-60, 2.9-4.3}**
Spring balancer reading N {kgf, lbf}	**28.5-41.1 {2.9-4.2, 6.4-9.2}**



M08030100048

6. INSTALLATION OF THE LOCK PLATE

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

NOTICE:

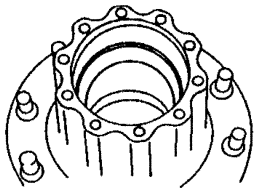
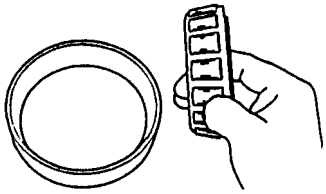
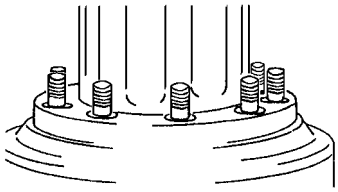
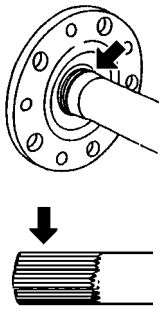
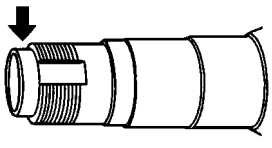
- **If the holes of the plate are not aligned with screw holes of the nut, turn over the plate.**
- **If alignment is still unattainable, turn the lock nut further within the limits of wheel hub bearing preload.**

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

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

INSPECTION AND 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** 

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH16) AX03-002

REAR AXLE (DIFFERENTIAL GEAR SERIES: SH16)

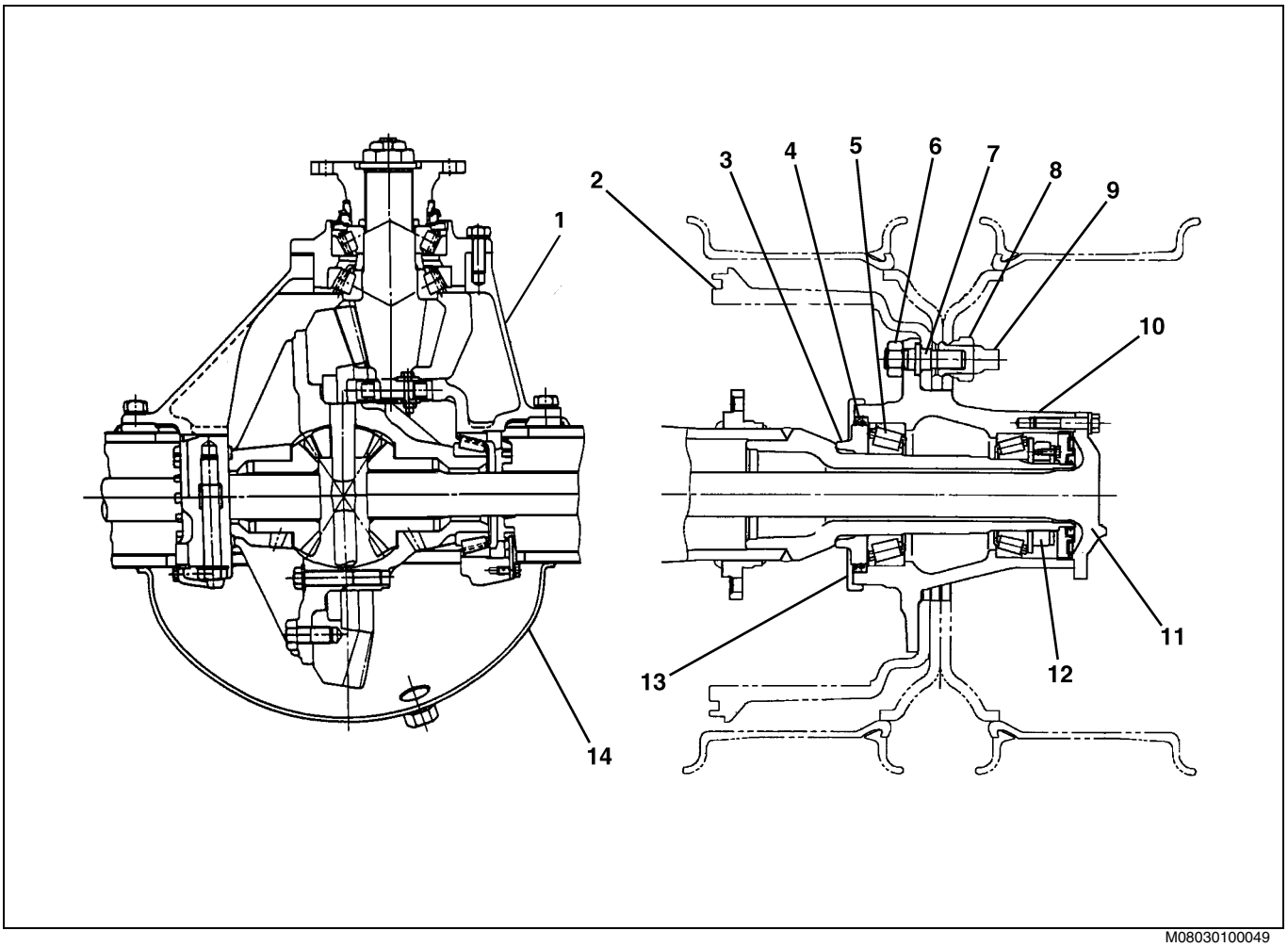
DATA AND SPECIFICATION

M08030101BEI2001

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

DESCRIPTION

M08030103BEC1002



M08030100049

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	ABS sensor ring (If so equipped)
7	Hub bolt	14	Axle housing

TROUBLESHOOTING

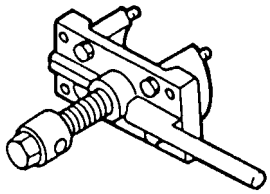
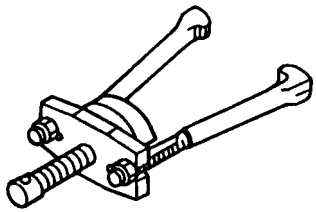
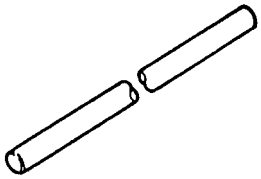
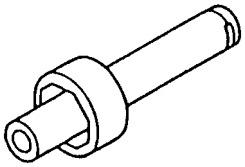
M08030101BEF3001

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

SPECIAL TOOL

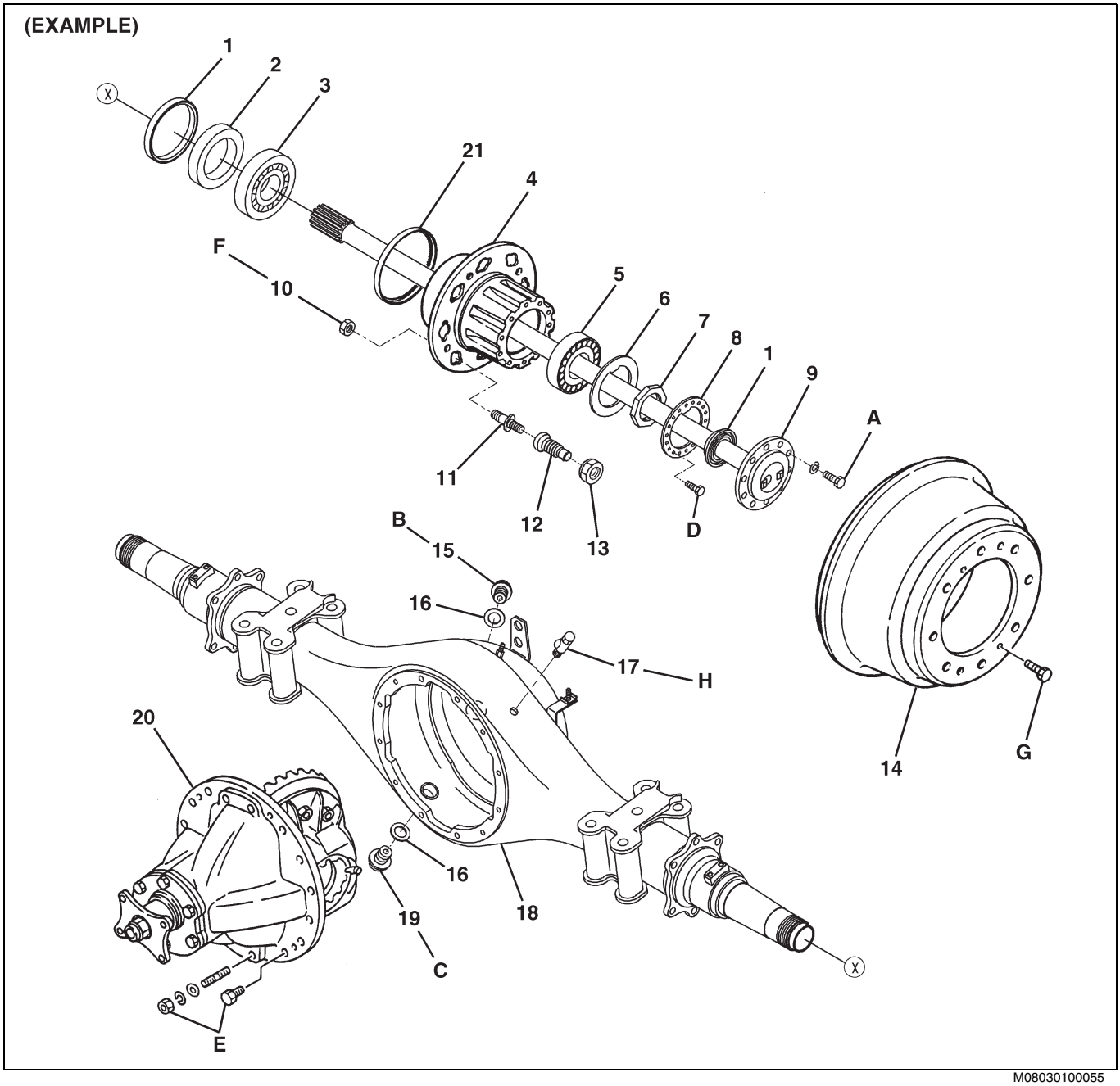
M08030103BEK1002

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

Illustration	Part number	Tool name	Remarks
	09650-1292	WHEEL HUB PULLER	
	09650-2090	HUB BEARING PULLER	
	09849-1601 09849-2001	HANDLE	
	09603-1360	SOCKET WRENCH	

COMPONENT LOCATOR

M08030103BED1002



M08030100055

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

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

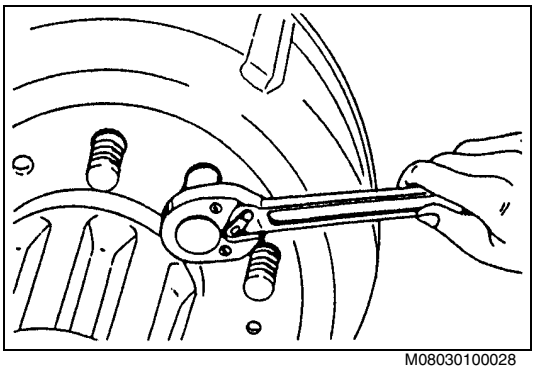
A	84.5-107.5 {862-1,097, 63-79}	E	113-147 {1,150-1,500, 83-108}
B	78.4-117.6 {800-1,200, 58-86}	F	392-470 {4,000-4,800, 290-347}
C	39.2-68.6 {400-700, 29-50}	G	20.5-39.5 {210-400, 16-28}
D	8.33-10.79 {85-110, 6.2-8.0}	H	9.8-19.6 {100-200, 7.3-14.4}

OVERHAUL

M08030103BEH2003

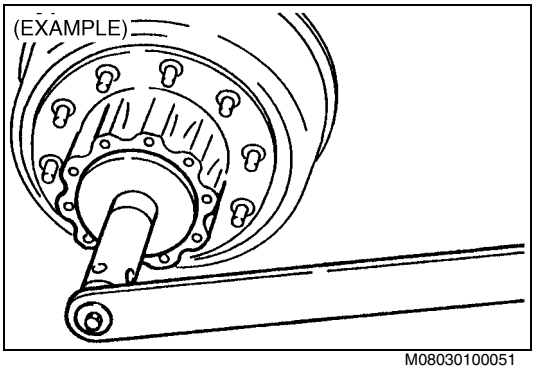
IMPORTANT POINTS - DISASSEMBLY

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


M08030100028

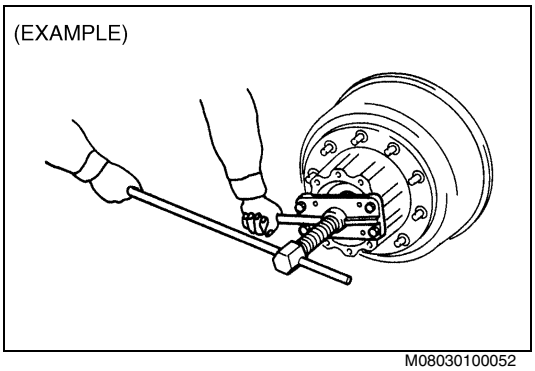
2. REMOVAL OF THE BRAKE DRUMS
(1) Loosen the drum set screws and remove the brake drums.

NOTICE:
- **If the drum does not easily come out, screw the set screws into the drum removing hole.**
- **Brake drum is heavy, therefore be careful when handling it.**
- **Make aligning mark to the wheel hub and brake drum.**



M08030100051

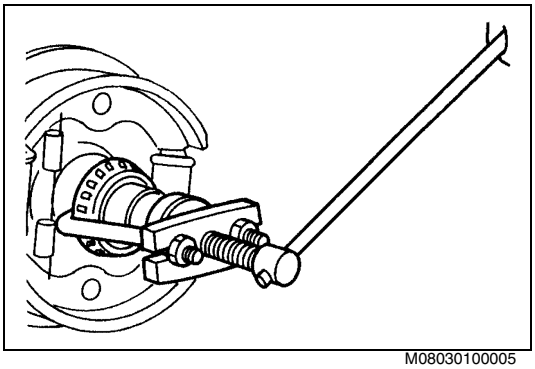
3. REMOVAL OF THE WHEEL HUB BEARING LOCK NUT
SST:
Socket Wrench (09603-1360)
Handle (09849-1601)
Handle (09849-2001)



M08030100052

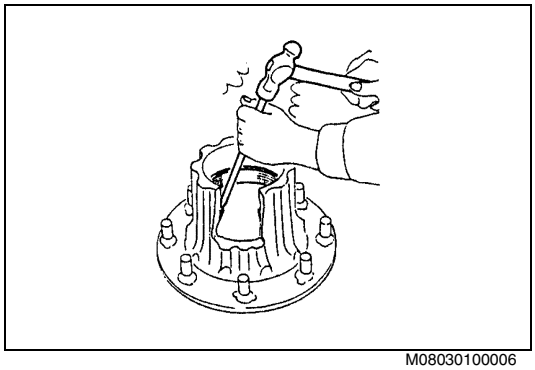
4. REMOVAL OF THE WHEEL HUB AND THE OUTER WHEEL HUB BEARING
SST:
Wheel Hub Puller (09650-1292)
Handle (09849-1601)
Handle (09849-2001)

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


M08030100005

5. REMOVAL OF THE INNER WHEEL HUB BEARING TOGETHER WITH OIL SEAL COLLAR
SST:
Hub Bearing Puller (09650-2090)
Handle (09849-1601)
Handle (09849-2001)

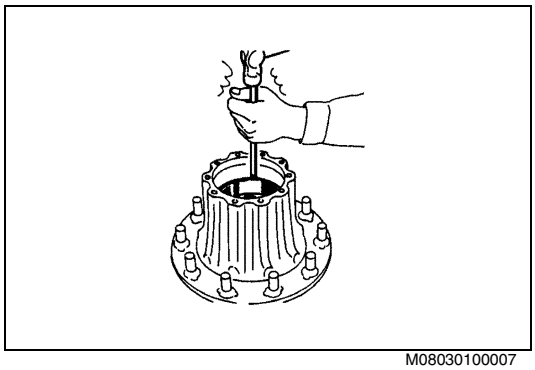
6. REMOVAL OF THE WHEEL BRAKE
(1) Refer to chapter SERVICE BRAKE.


M08030100006

IMPORTANT POINTS - ASSEMBLY

1. REPLACEMENT OF THE WHEEL HUB BEARING RACE

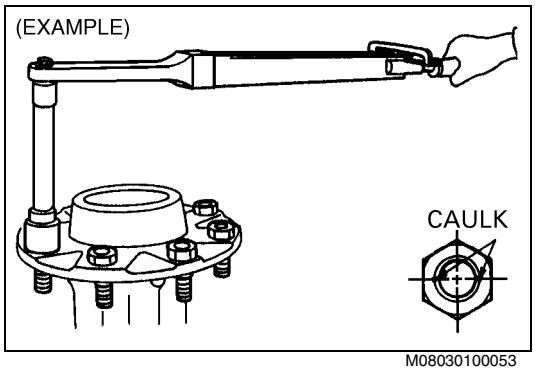
(1) Remove the outer race of bearing by striking the race lightly and evenly through the 4 access holes in the wheel hub, using a tapping rod.


M08030100007

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

2. REPLACEMENT OF THE HUB BOLTS

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



M08030100053

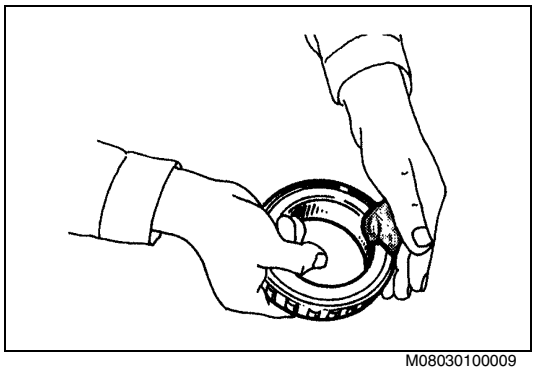
	Marks at "P"	Color
RIGHT	R	Gold
LEFT	L	Silver

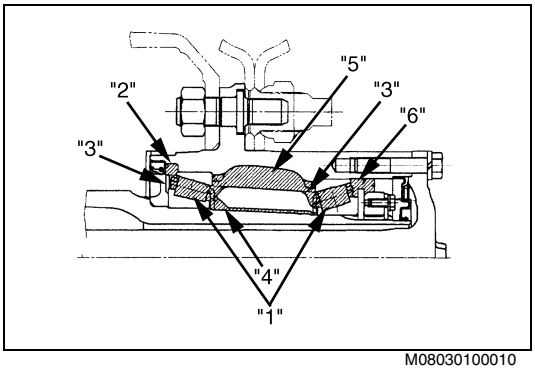
NOTICE:
Caulk the lock nuts at two points after tightening to the specified torque.

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.

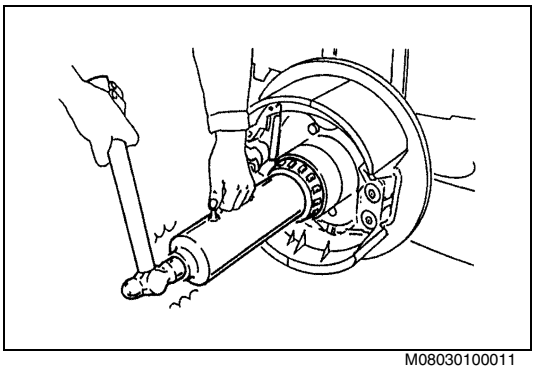

M08030100009



M08030100010

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

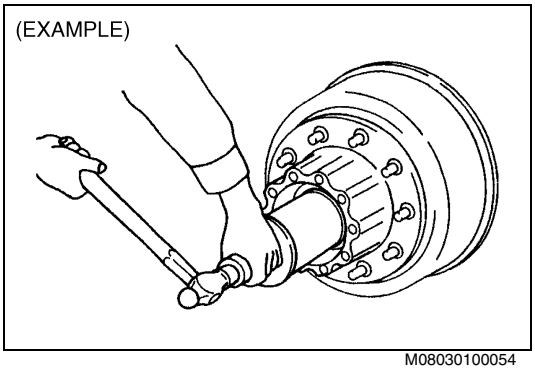
NOTICE:
- **"2": Fill the grease between the oil seal and inner bearing, and at this time some grease may flow out to the oil seal.**
- **"3": The grease has to ooze out to the extent that the retainer is buried.**
- **"4": After pressing in the inner race of the inner bearing, apply the grease to the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


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.

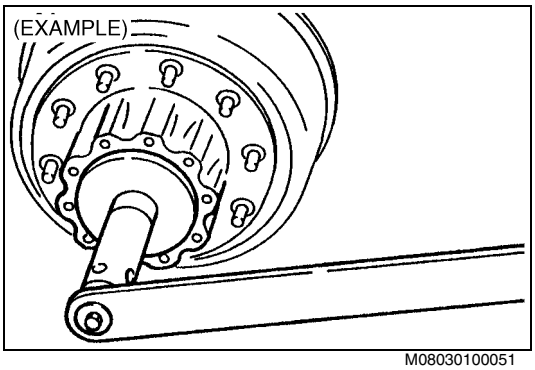
NOTICE:
- **If the collar is warmed up with hot water, it can easily be installed.**



M08030100054

(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.**

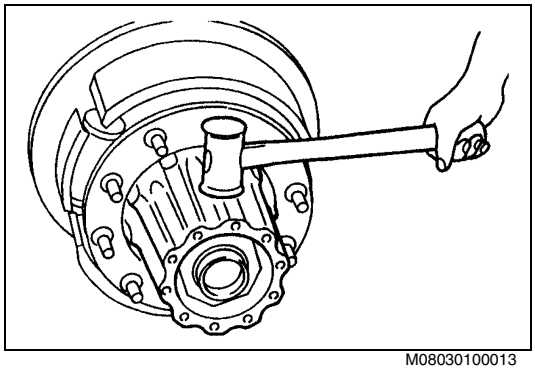


M08030100051

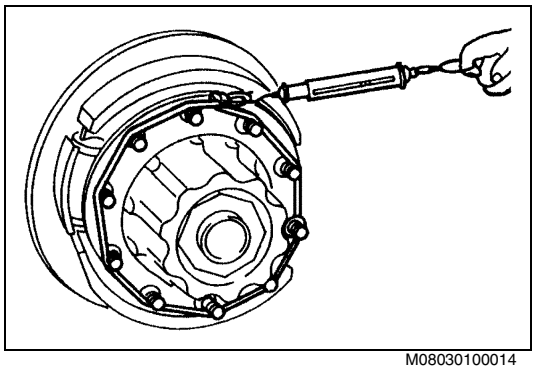
5. ADJUSTMENT OF THE WHEEL HUB BEARING PRELOAD

(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 (09603-1360)

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


M08030100013

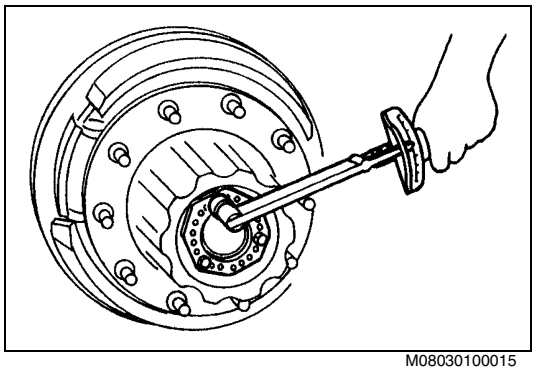
(2) Strike the wheel hub with a copper hammer to properly seat the wheel hub.


M08030100014

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

Assembly standard:

Turning Torque N·m {kgf·cm, lbf·ft}	**4.9-8.9 {50-90, 3.7-6.5}**
Spring balancer reading N {kgf, lbf}	**35.4-61.7 {3.6-6.3, 8.0-13.8}**

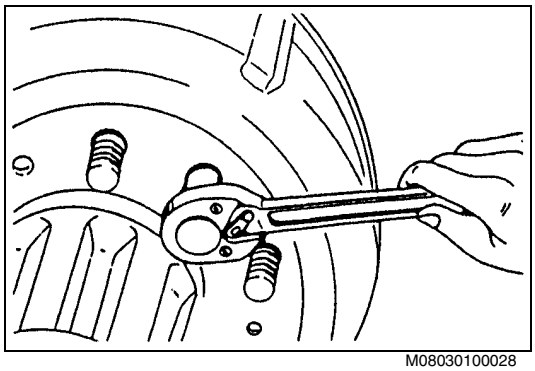

M08030100015

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.**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7. INSTALLATION OF THE BRAKE DRUMS

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

NOTICE:

Align the aligning mark when installing.

8. INSTALLATION OF THE WHEELS

(1) Refer to chapter WHEEL & TIRE.

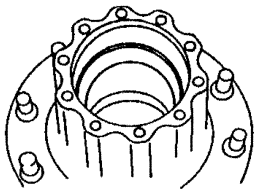
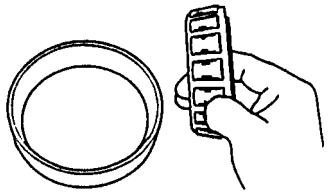
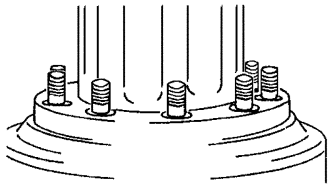
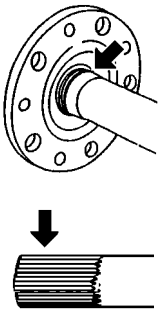
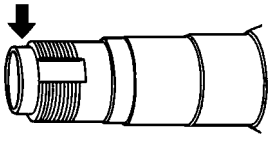
9. BRAKE SYSTEM AIR BLEEDING AND BRAKE SHOE CLEARANCE ADJUSTMENT

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

a. Adjust the brake chamber rod stroke according to the section WHEEL BRAKE ADJUSTMENT 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

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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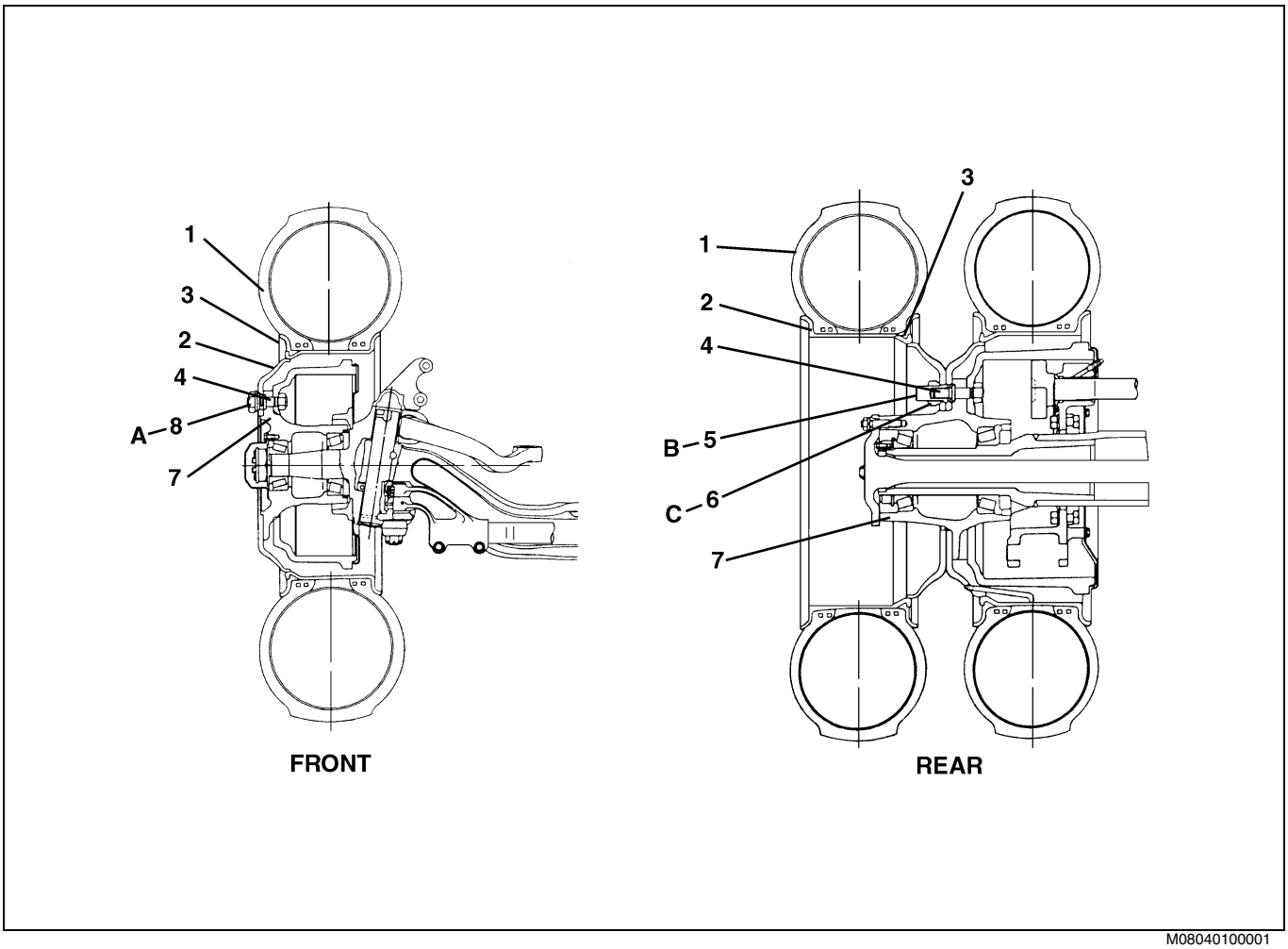

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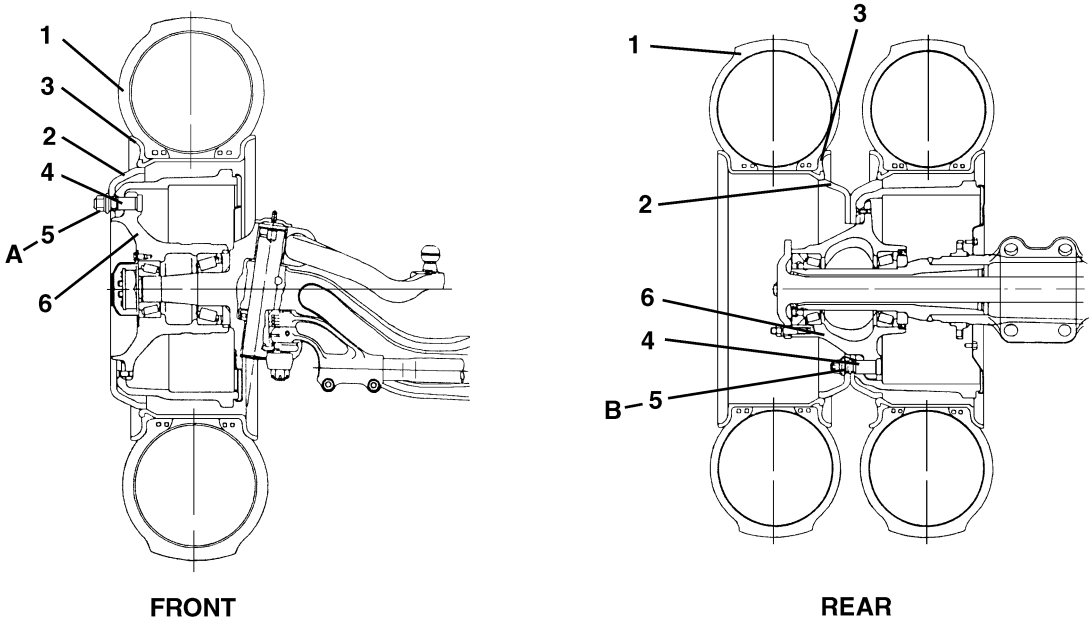
SAE AND JIS TYPE

1	Tire	5	Inner wheel nut
2	Disc wheel	6	Outer wheel nut
3	Side ring	7	Hub
4	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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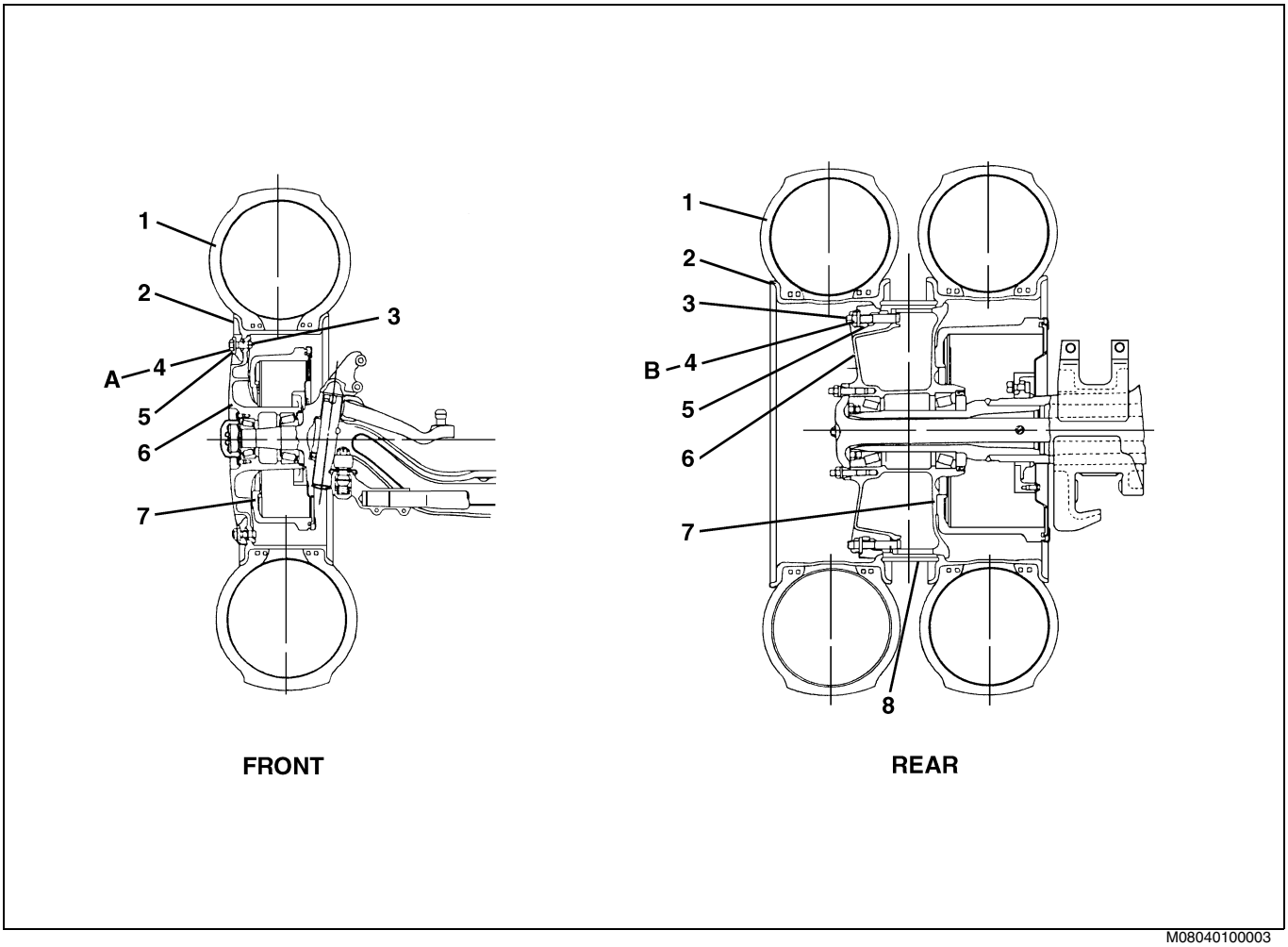
DIN AND JIS TYPE

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}

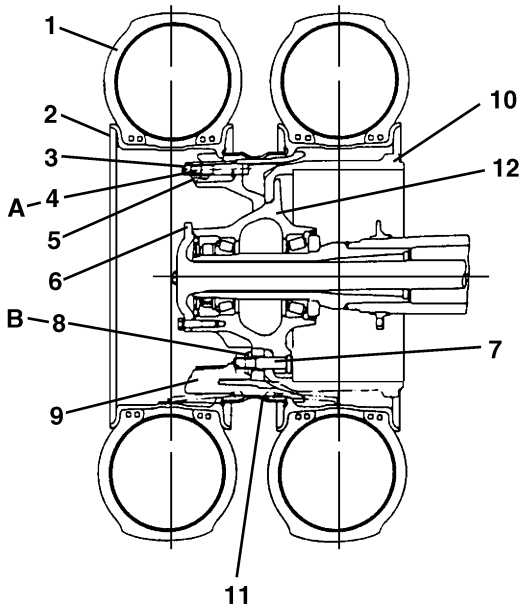


M08040100003

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}

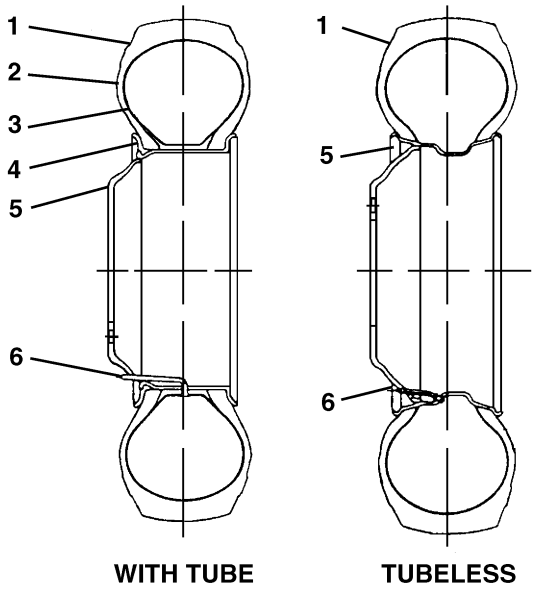


M08040100004

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

M08040101BEF3001

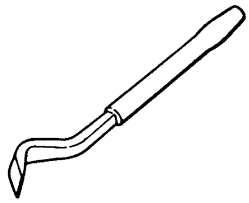
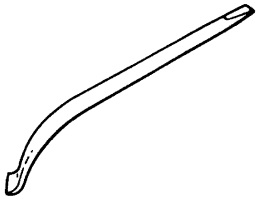
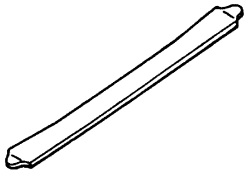
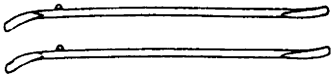
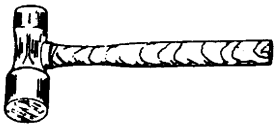
Symptom	Possible cause	Remedy/Prevention
Excessive wear on edges of tread	Under inflated tires	Properly inflate with the recommended pressure.
	Vehicle overloading	Correct as required by Factory spec.
	High speed cornering	Correct as required by Factory spec.
	Incorrect wheel alignment	Set to the correct specifications.
Tires show excessive wear in center of tread	Tires overinflated	Properly inflate with the recommended pressure.
Excessive tire wear	Improper tire pressure	Properly inflate with the recommended pressure.
	Incorrect tire wheel usage	Install the correct tire wheel combination.
	Bent wheel	Repair or replace.
	Front end out of alignment	Align front end.
	Loose, worn or damaged steering linkage, joints, suspension components, bushing or ball joints	Inspect, repair or replace as required
Wheel hopping (vehicle vibration and rough steering) (Disc wheels)	Rocks or debris wedged between dual disc wheels	Remove the rocks and the debris.
	Out-of-balance tire and/or hub and drum	Determine the out-of-balance component and balance or replace.
	Improper positioning of the side ring split	Reassemble with ring split, opposite (180 degrees) to the valve opening to improve the balance.
Wheel hopping (vehicle vibration and rough steering) (Vehicle)	Loose or worn drive line or suspension	Identify the location of vibration carefully. Then repair or replace the 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.

Symptom	Possible cause	Remedy/Prevention
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 (Re-torque 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.
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

M08040101BEK1001

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

M08040101BEC1002

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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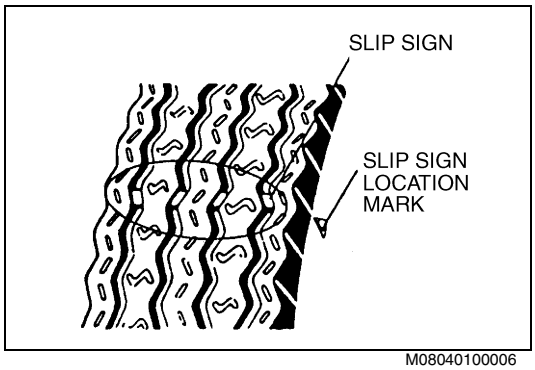
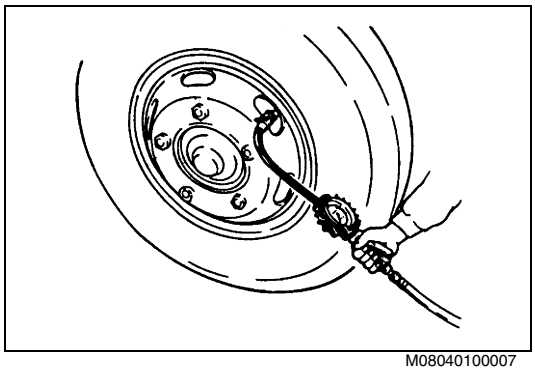


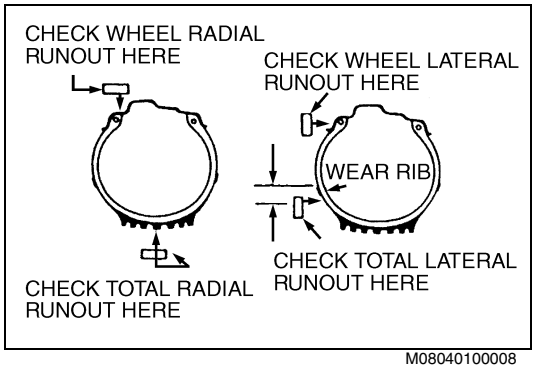
M08040100006

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.}


M08040100007

(2) Check the air pressure.
If improper, inflate the tire to the proper pressure as previously described in this chapter.



M08040100008

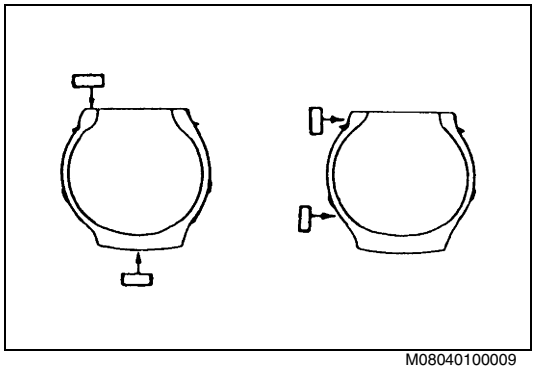
2. CHECK RUNOUT IN THE TIRE AND WHEEL RIM.

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.

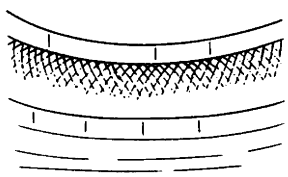
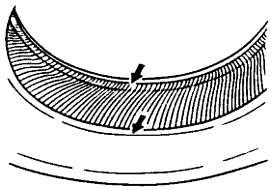
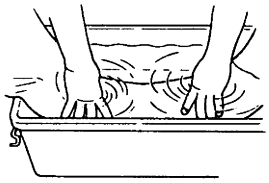
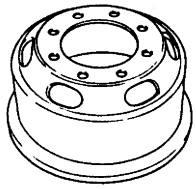
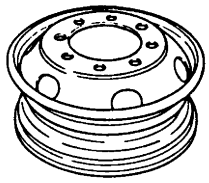
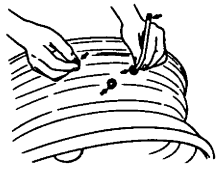
(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- 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

M08040101BEH3002

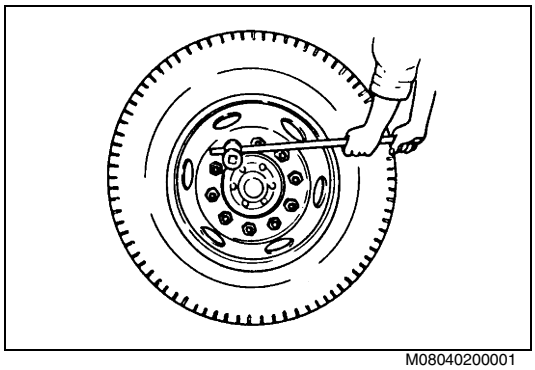
Unit: mm {in.}

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

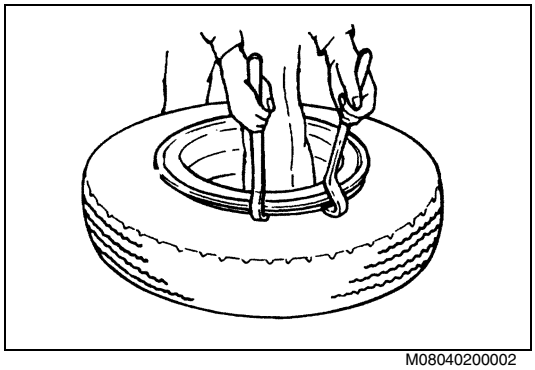
M08040201BEH2001


M08040200001

IMPORTANT POINT– REMOVAL

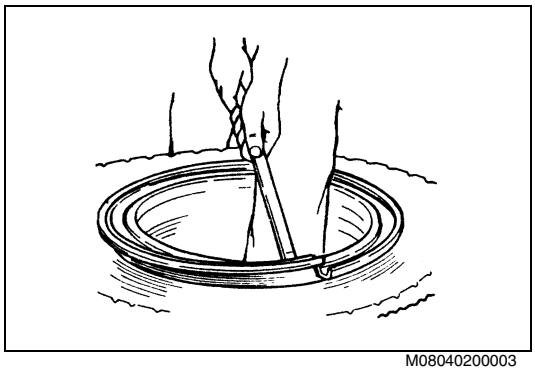
1. REMOVE THE WHEEL AND TIRE.
(1) Loosen the wheel nuts, but do not remove them.
(2) Raise the vehicle until the tire clear the floor.
(3) Remove the wheel nuts and tire from the hub and drum.
On dual tires, the inner wheel nuts will also have to be removed for the inner tire to be removed.

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.**

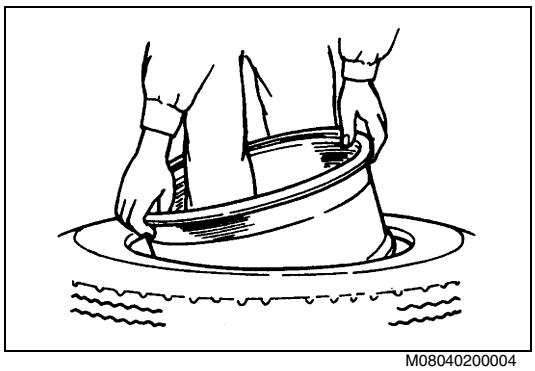

M08040200002

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)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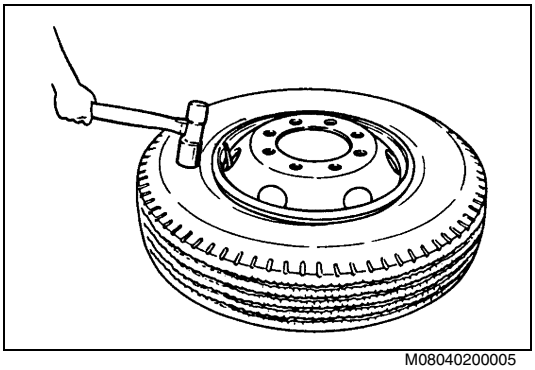
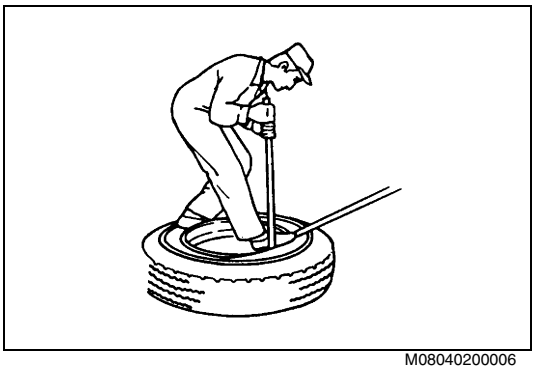
(6) Turn the assembly over and unseat the second tire bead from the rim. Lift the rim from the tire.
Remove the tube and flap, if any, from the tire.


M08040200005

2. DISASSEMBLE THE WHEEL AND TIRE (TUBELESS).

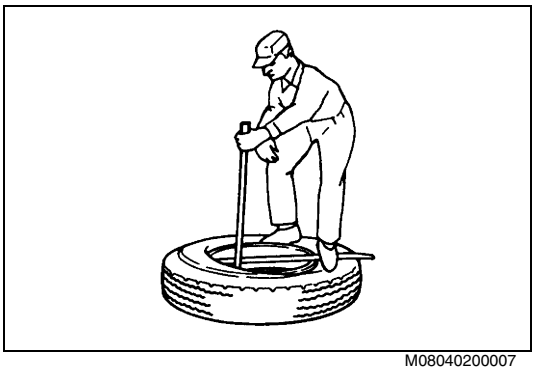
(1) Make certain the tire completely deflated with the valve core removed.

(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)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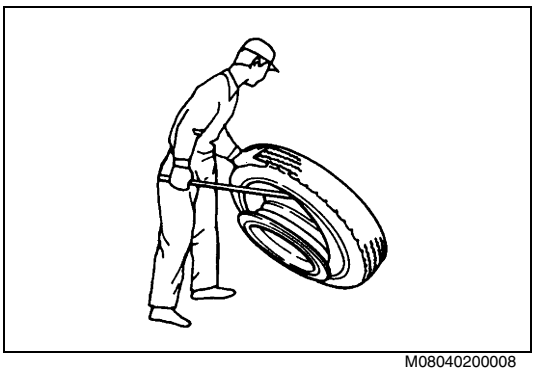
(5) Hold the tool in position with one foot and pull the second tool toward the center of the rim. Progressively work the bead off the rim, taking additional bites with the tools as necessary.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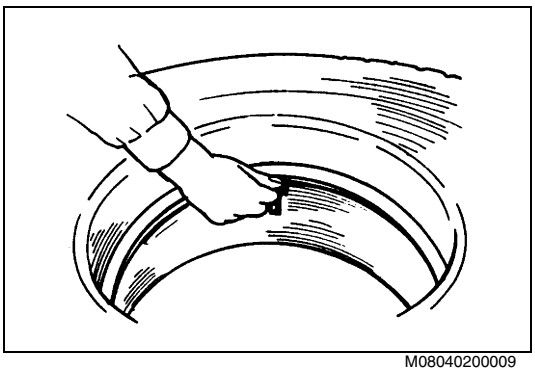
(6) Stand the assembly in a vertical position.
Lubricate the second bead.

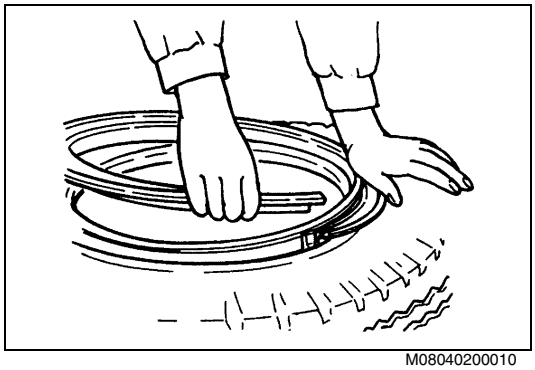
(7) At the top of the assembly, insert the straight end of the tool between the bead and back the flange of the rim at about 45 degrees angle.
Turn the tool so that it is perpendicular to the rim. Pry the second bead off.

IMPORTANT POINTS – ASSEMBLY

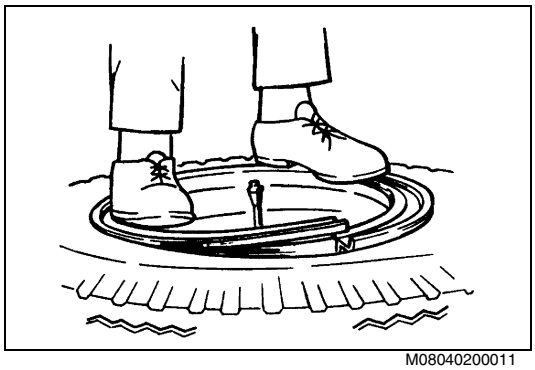

M08040200009

1. ASSEMBLY THE WHEEL AND TIRE (WITH TUBE).

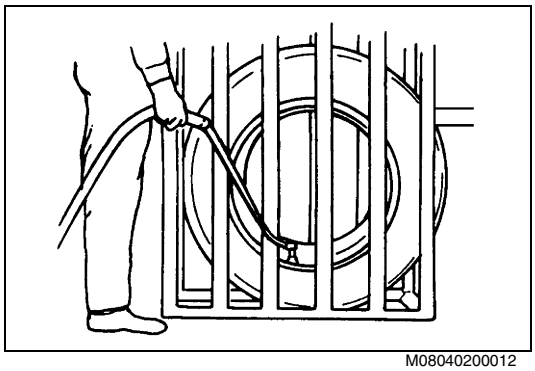
(1) Insert the tube and the flap into the tire and partially inflate to round out the tube. Apply the rubber lubricant to the inside and outside surfaces of both beads and to that portion of the tube and flap that appears between the beads. Lay the rim flat on the floor with the valve slot up. Align the valve with the rim valve slot, and place the tire onto the rim, and insert the valve through the valve slot.


M08040200010

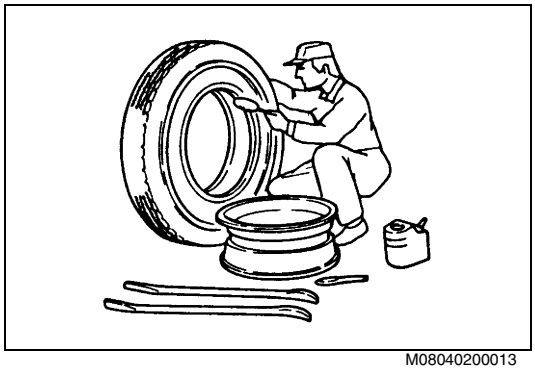
(2) Place the side-ring on the rim base so that the ring split is opposite to the valve stem. Place the leading end of the ring into the groove in the rim as shown.


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.

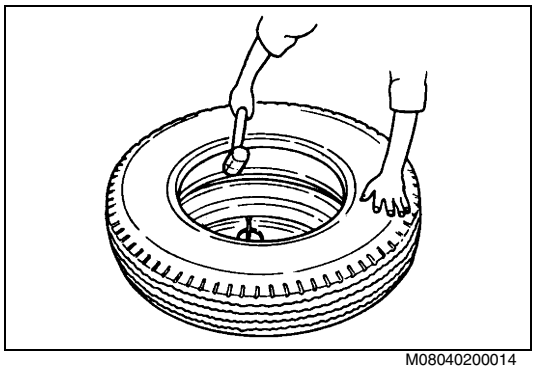

M08040200013

2. ASSEMBLY THE WHEEL AND TIRE (TUBELESS).

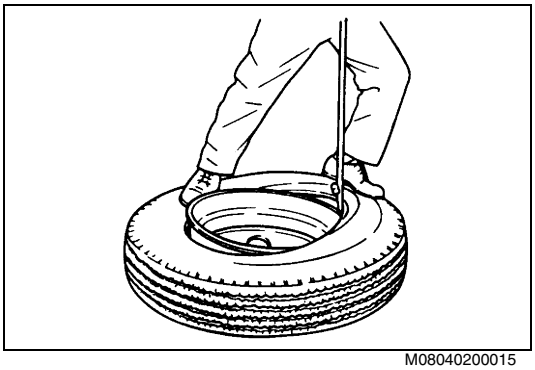
(1) Be sure that the right valve is used and is properly installed in the rim.
Valve nut tightening torque: 12.7 N·m {130 kgf·cm, 9.4 lbf·ft}

(2) Inspect the rim to ensure that the bead seats are clean and smooth.

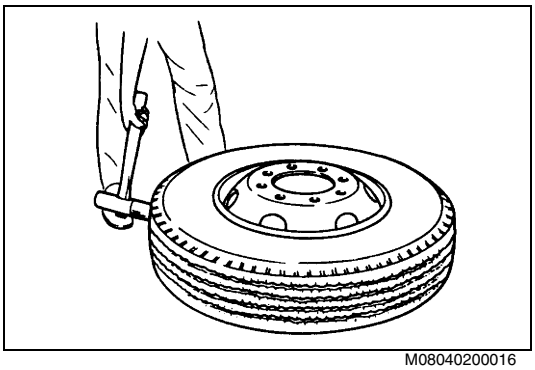
(3) Place the rim on the floor with the wide side down and lubricate the first bead of the tire and upper bead seat of the rim.


M08040200014

(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)


M08040200015

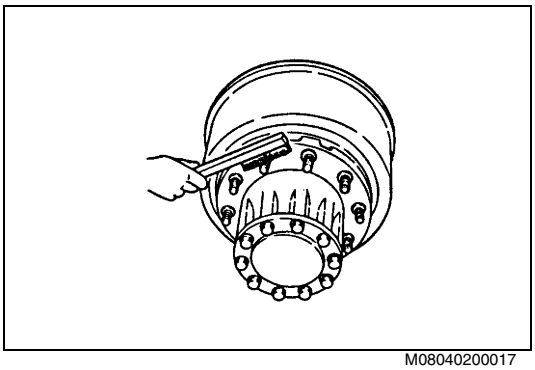
(5) Insert the lever between the rim flange and the tire bead and then raise the lever so that the bead gets over the rim flange.
SST: Lever (09609-1210)


M08040200016

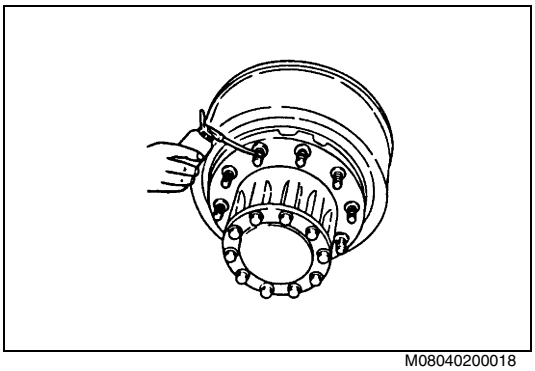
(6) With the special tool, hammer the tire tread so that the bead and the rim will be seated.
SST: Rubber hammer (09609-1220)

(7) Inflate the tire as described in this chapter, making certain that all the safety precautions are followed. Check for the leakage.

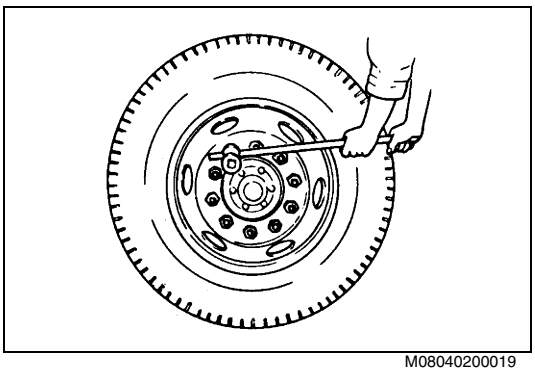
IMPORTANT POINT – INSTALLATION


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.

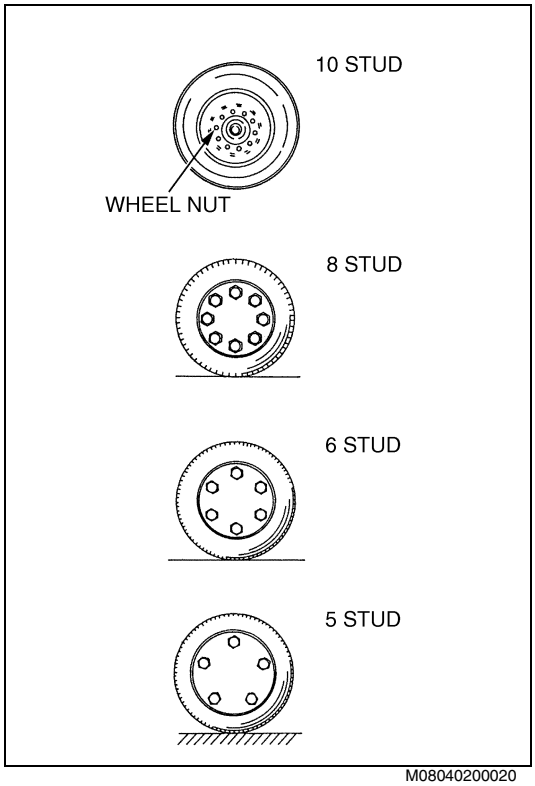

M08040200018

(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

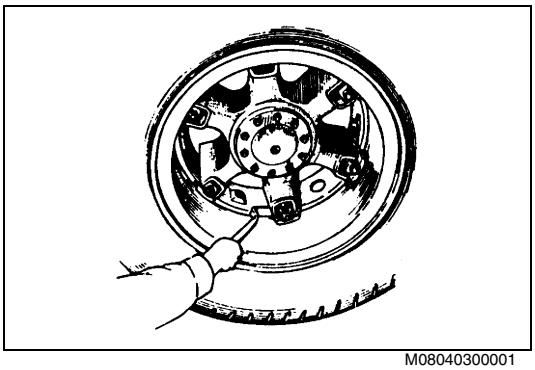
(1) Driving with a rim or tire that is unbalanced may cause the vehicle and steering wheel to shimmy, and will produce an abnormal tire wear.
In this situation, we recommend that you should balance the wheels.

- 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

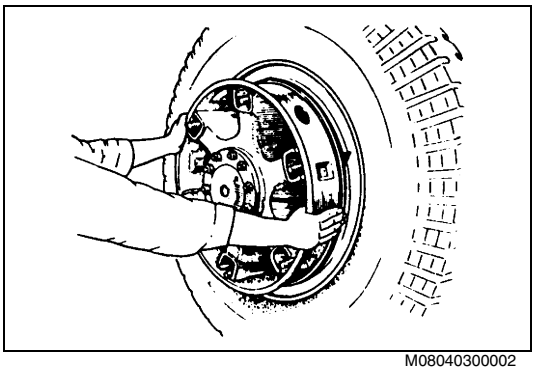
M08040301BEH2001


M08040300001

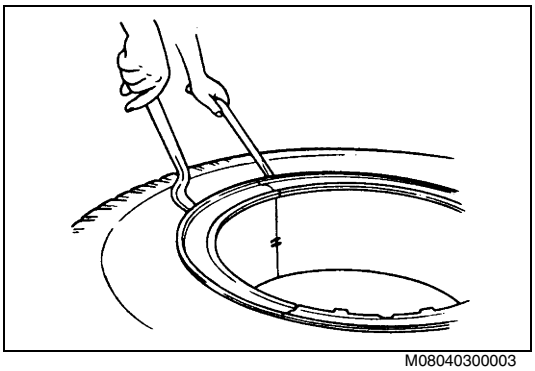
IMPORTANT POINT – REMOVAL

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.

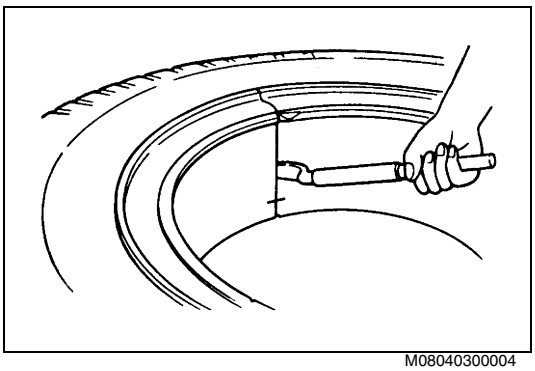

M08040300002

(4) On the dual tires, the band spacer will also have to be removed and then remove the inner wheel.


M08040300003

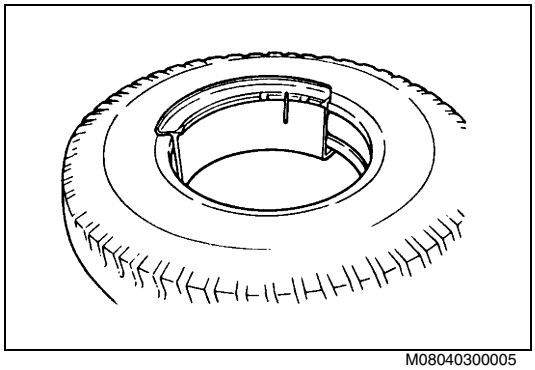
IMPORTANT POINT – DISASSEMBLY

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)

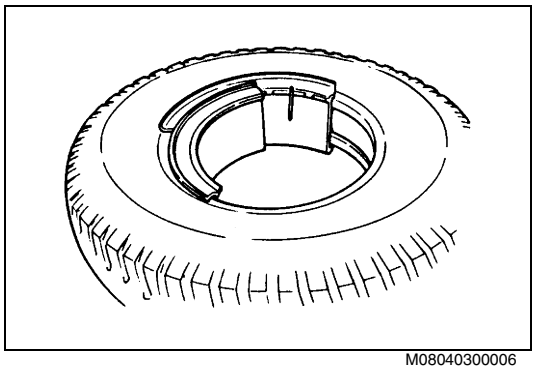
(7) Remove the rim segments.


M08040300005

IMPORTANT POINT – ASSEMBLY

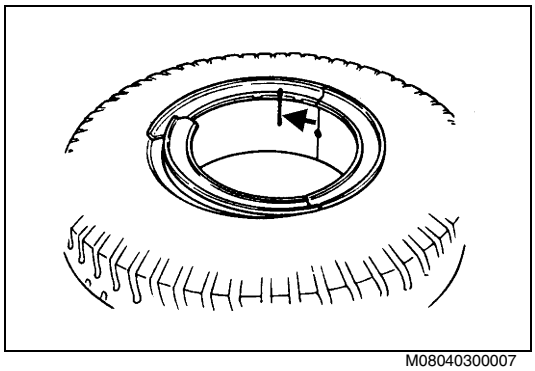
1. ASSEMBLE THE RIM AND TIRE.

(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.

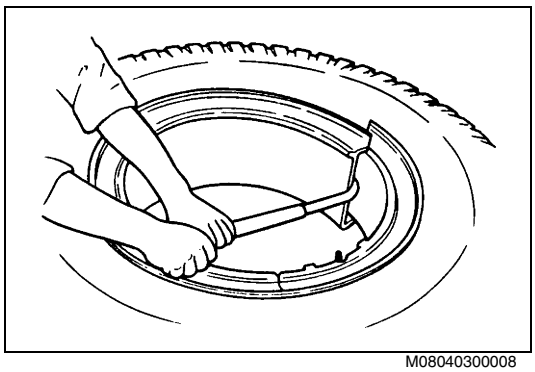

M08040300006

(4) Place the other segment on the first one as shown in the figure.

NOTICE:
Align the matching marks on the segments.


M08040300007

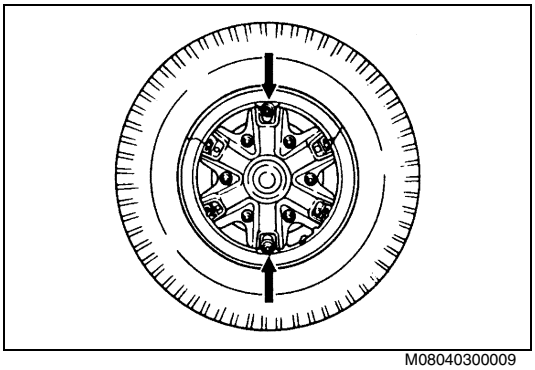
(5) Place the other segment together with the first one.
Fit the segment so that the valve lies against the side of the hole marked with an arrow.


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.

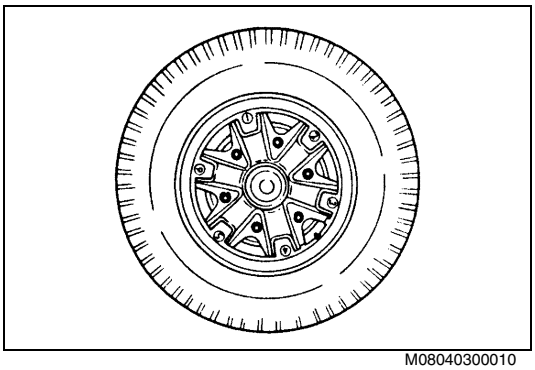
(7) Install the valve core and then inflate the tire as previously described in this chapter, making sure that all the safety precautions are followed. Check for the leakage.


M08040300009

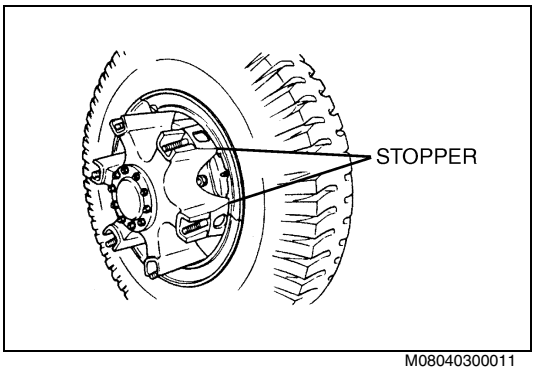
IMPORTANT POINTS – INSTALLATION

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

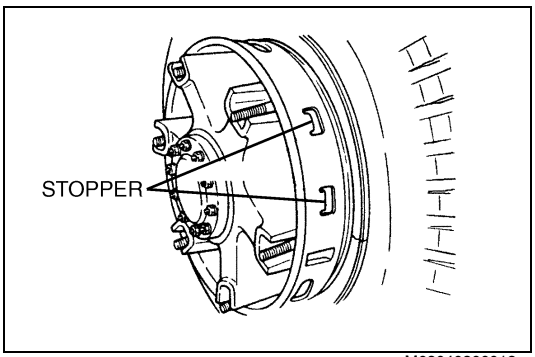
(5) Install the remaining clamps and nuts.
Tighten the nuts in sequence round the rim edge to sufficient torque as described in this chapter.
(6) Check and retighten the nuts after driving the vehicle in a distance.



M08040300011

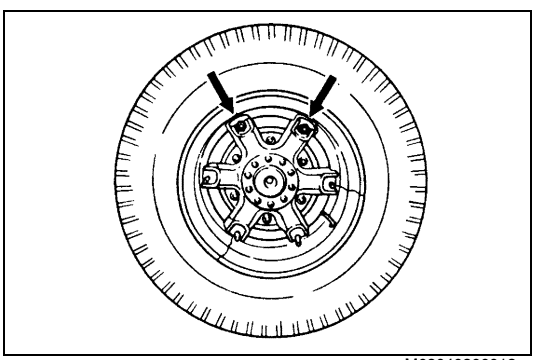
2. INSTALL THE DUAL WHEEL.

(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.

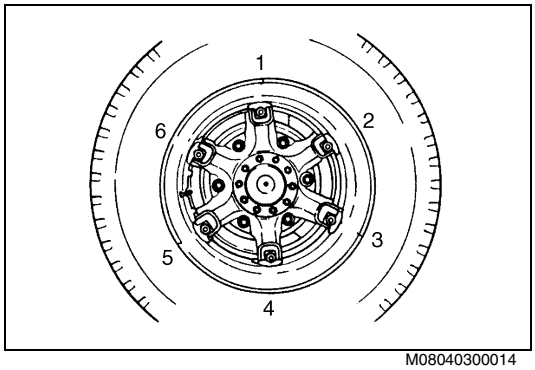


M08040300012

(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

DATA AND SPECIFICATIONS

M09020101BEI2005

FRONT SUSPENSION

Unit: mm {in.}

MODEL		FT	GT
Type		Semi-elliptic leaf springs with shock absorber	
Dimensions of leaf springs:	Span	1,300 {51.18}	1,400 {55.12}
	Width	70 {2.76}	80 {3.15}
	Thickness of leaves	10 {0.39}	9 {0.35}
			10 {0.39}
			11 {0.43}
Shock absorbers:	Type	Double acting	
	Stroke	240 {9.45}	259 {10.20}
	Min. length	335 {13.19}	391 {15.39}
	Max. length	575 {22.64}	650 {25.60}

REAR SUSPENSION

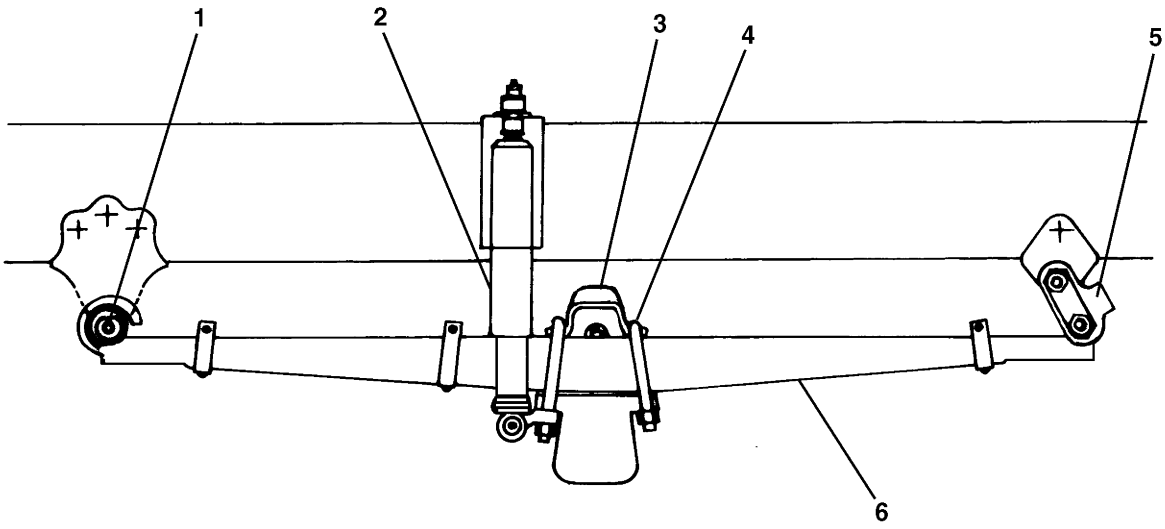
Unit: mm {in.}

MODEL		FT	GT
Type		Semi-elliptic main and auxiliary leaf springs	
Dimensions of main leaf springs:	Span	1,300 {51.18}	1,600 {62.99}
	Width	70 {2.76}	80 {3.15}
	Thickness of leaves	11 {0.43}	12 {0.47}
			13 {0.51}
Dimensions of auxiliary leaf springs:	Span	900 {35.43}	1,050 {41.34}
	Width	70 {2.76}	80 {3.15}
	Thickness of leaves	10 {0.39}	
		11 {0.43}	

DESCRIPTION

M09020101BEC1004

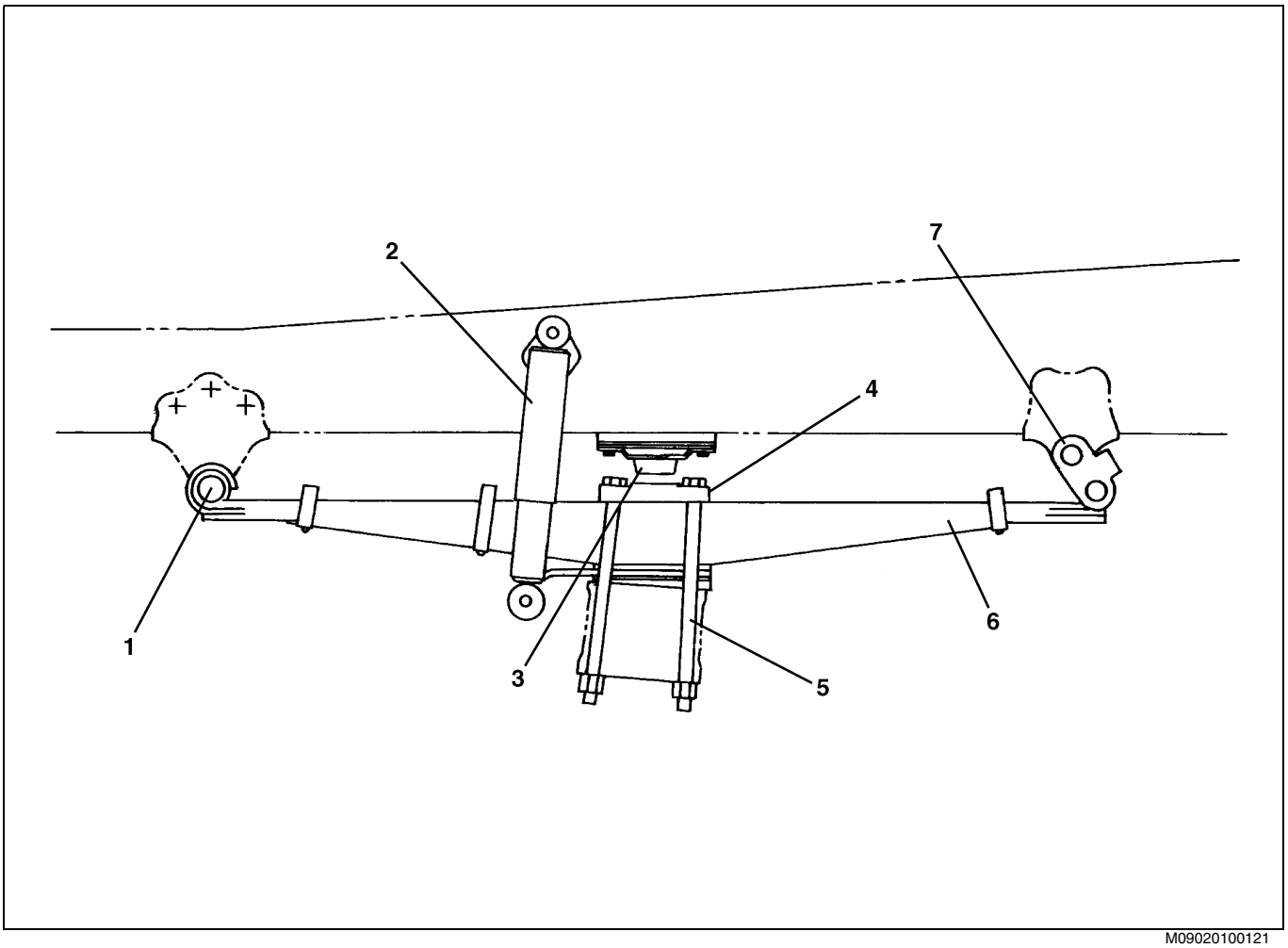
FRONT (MODEL: FT)



M09020100120

1	Spring pin	4	U-bolt
2	Shock absorber	5	Shackle
3	Spring bumper	6	Leaf spring assembly

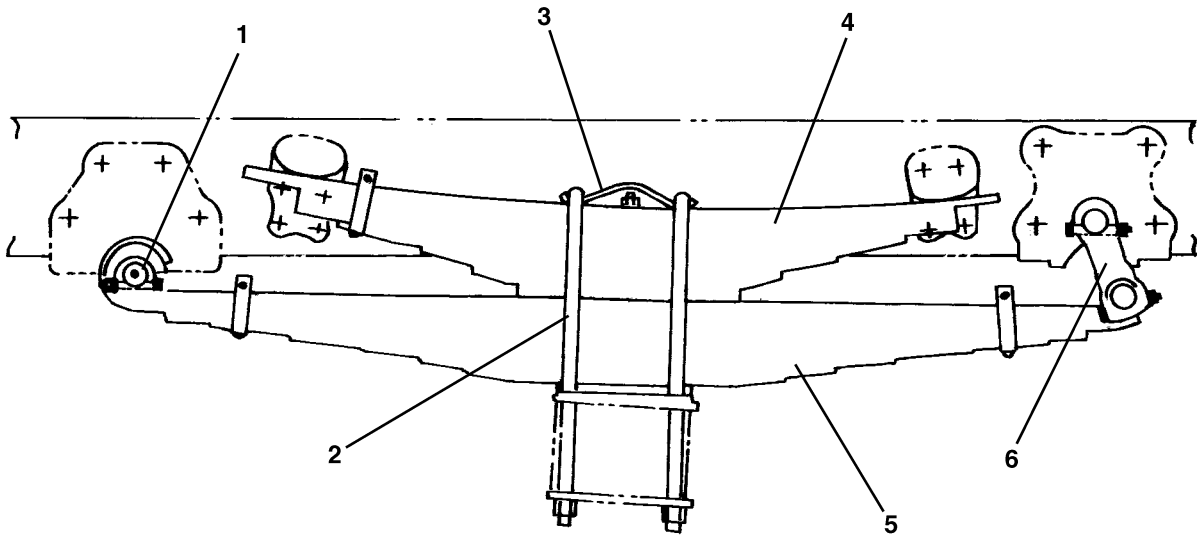
FRONT (MODEL: GT)



M09020100121

1	Spring pin	5	Front axle fixing bolt
2	Shock absorber	6	Leaf spring assembly
3	Spring bumper	7	Shackle
4	Spring pad		

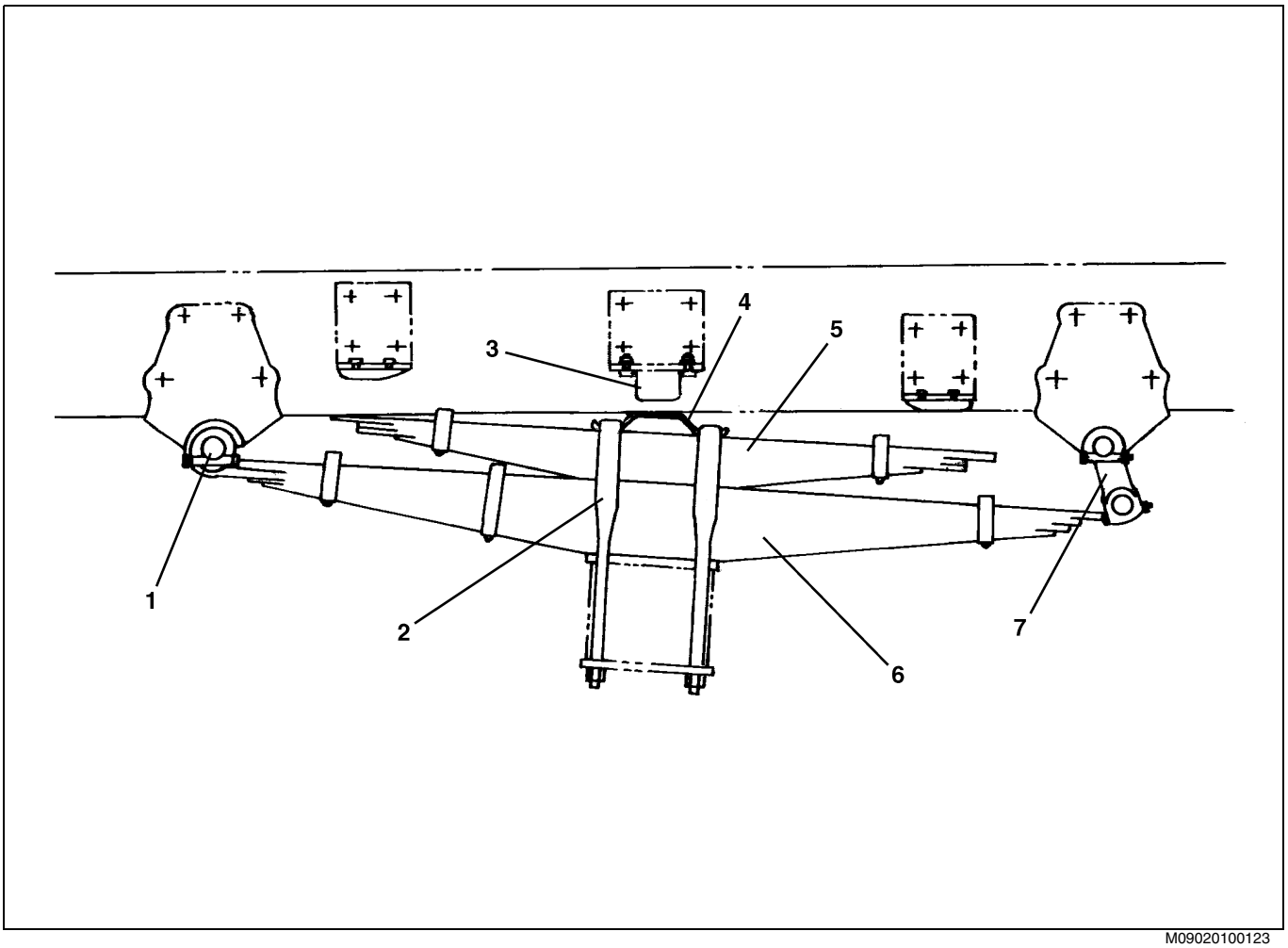
REAR (MODEL: FT)



M09020100122

1	Spring pin	4	Auxiliary leaf spring assembly
2	U-bolt	5	Main leaf spring assembly
3	Spring pad	6	Shackle

REAR (MODEL: GT)



M09020100123

1	Spring pin	5	Auxiliary leaf spring assembly
2	U-bolt	6	Main leaf spring assembly
3	Spring bumper	7	Shackle
4	Spring pad		

TROUBLESHOOTING

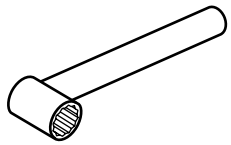
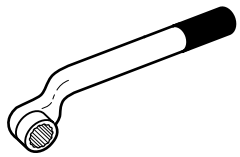
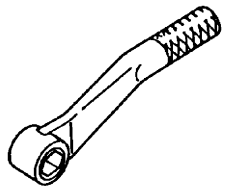
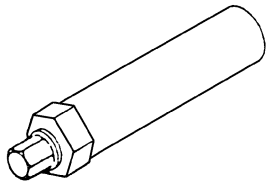
M09020101BEF3002

Symptom	Possible cause	Remedy/Prevention
Rough ride	Broken leaves	Replace the leaves. Check the load capacity rating.
	Cracked or damaged	Replace the leaves. Check the load capacity rating.
	Overloading	Decrease the load.
Heavy sway	Inoperative shock absorber	Replace the shock absorber.
Leaves broken at the center bolt hole	Loosen U-bolts	Tighten to specified torque.
Squeaking of the leaves	Friction between the leaves	Replace the silencers and/or apply chassis grease between leaves.

SPECIAL TOOL

M09020101BEK1003

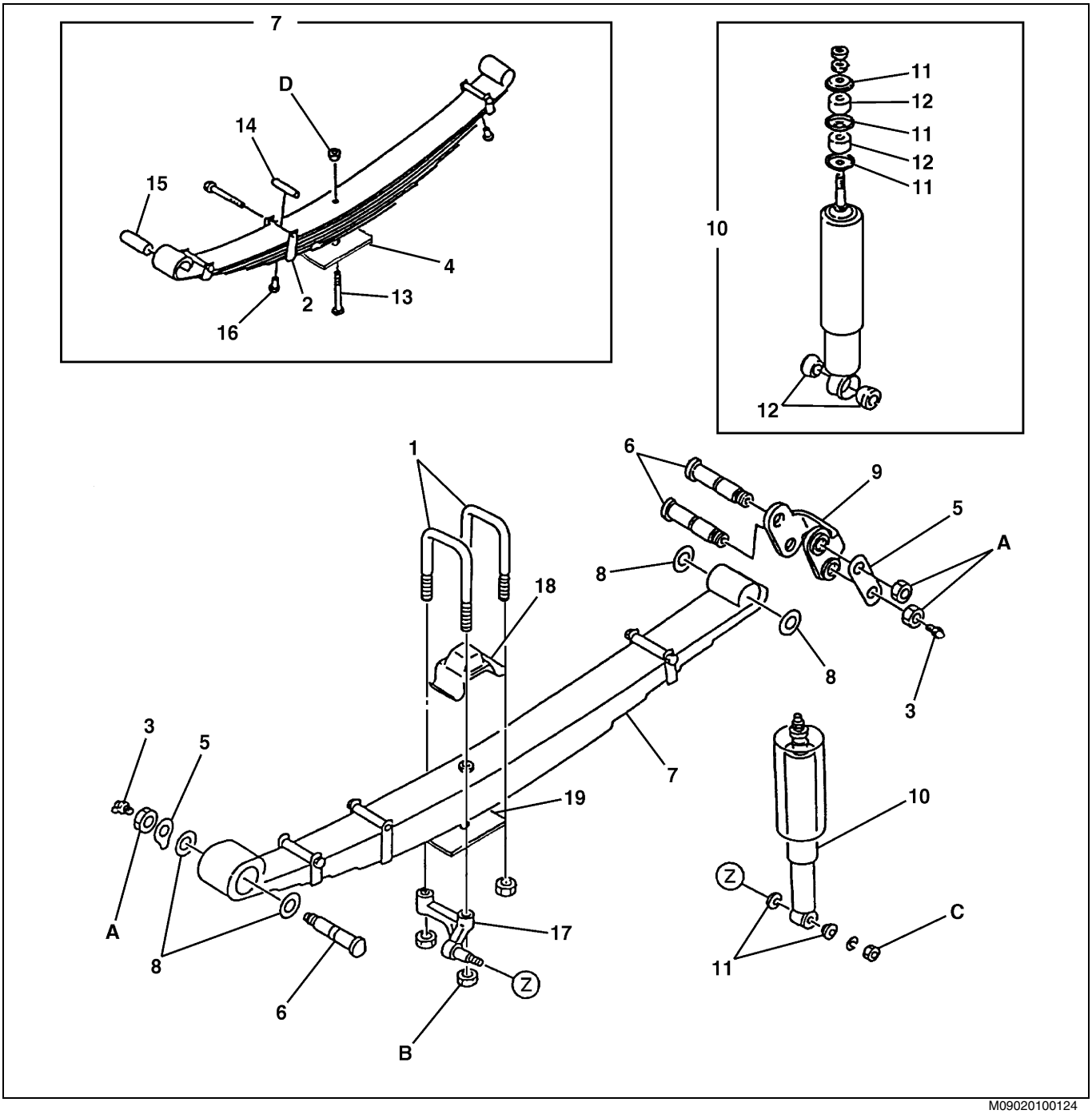
Prior to starting a suspension overhaul, it is necessary to have these special tools.

Illustration	Part number	Tool name	Remarks
	09839-2204	SOCKET WRENCH	FOR FRONT SPRING U-BOLT (MODEL: FT)
	09603-1160	SOCKET WRENCH	FOR REAR SPRING U-BOLT (MODEL: FT)
	09603-1140	SOCKET WRENCH	FOR FRONT AND REAR SPRING U-BOLT (MODEL: GT)
	09650-1200	PULLER	

COMPONENT LOCATOR

M09020101BED1004

FRONT (MODEL: FT)



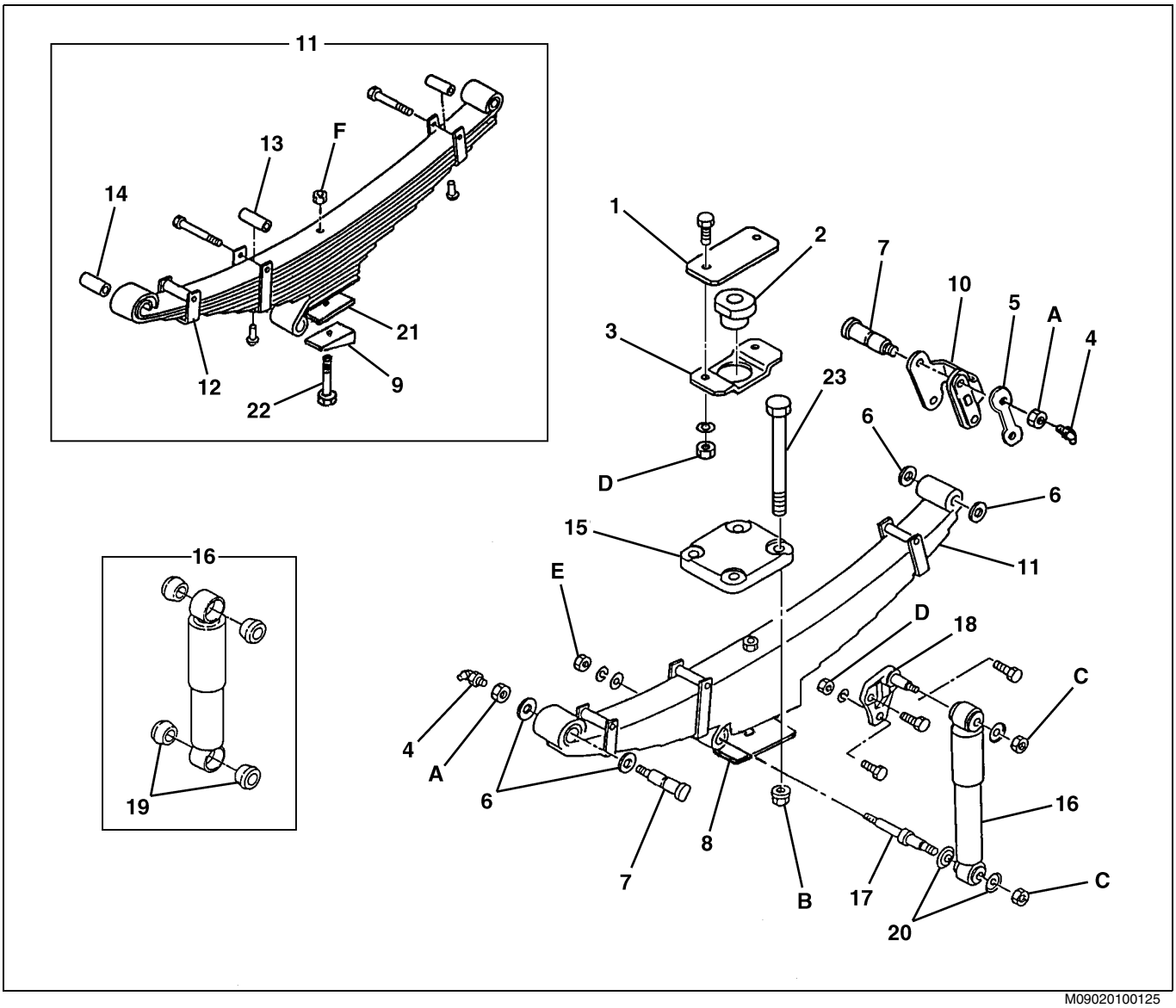
M09020100124

1	U-bolt	11	Cushion washer
2	Clip	12	Cushion
3	Lubrication fitting	13	Center bolt
4	Spacer	14	Collar
5	Lock plate	15	Bushing
6	Spring pin	16	Rivet
7	Leaf spring assembly	17	Shock absorber bracket
8	Thrust washer	18	Spring bumper
9	Shackle	19	Spacer (If so equipped)
10	Shock absorber		

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

A	**64-93 {653-948, 48-68}**	**C**	**73-109 {745-1,111, 54-80}**
B	**200-280 {2,040-2,855, 148-206}**	**D**	**49-62 {500-630, 37-45}**

FRONT (MODEL: GT)



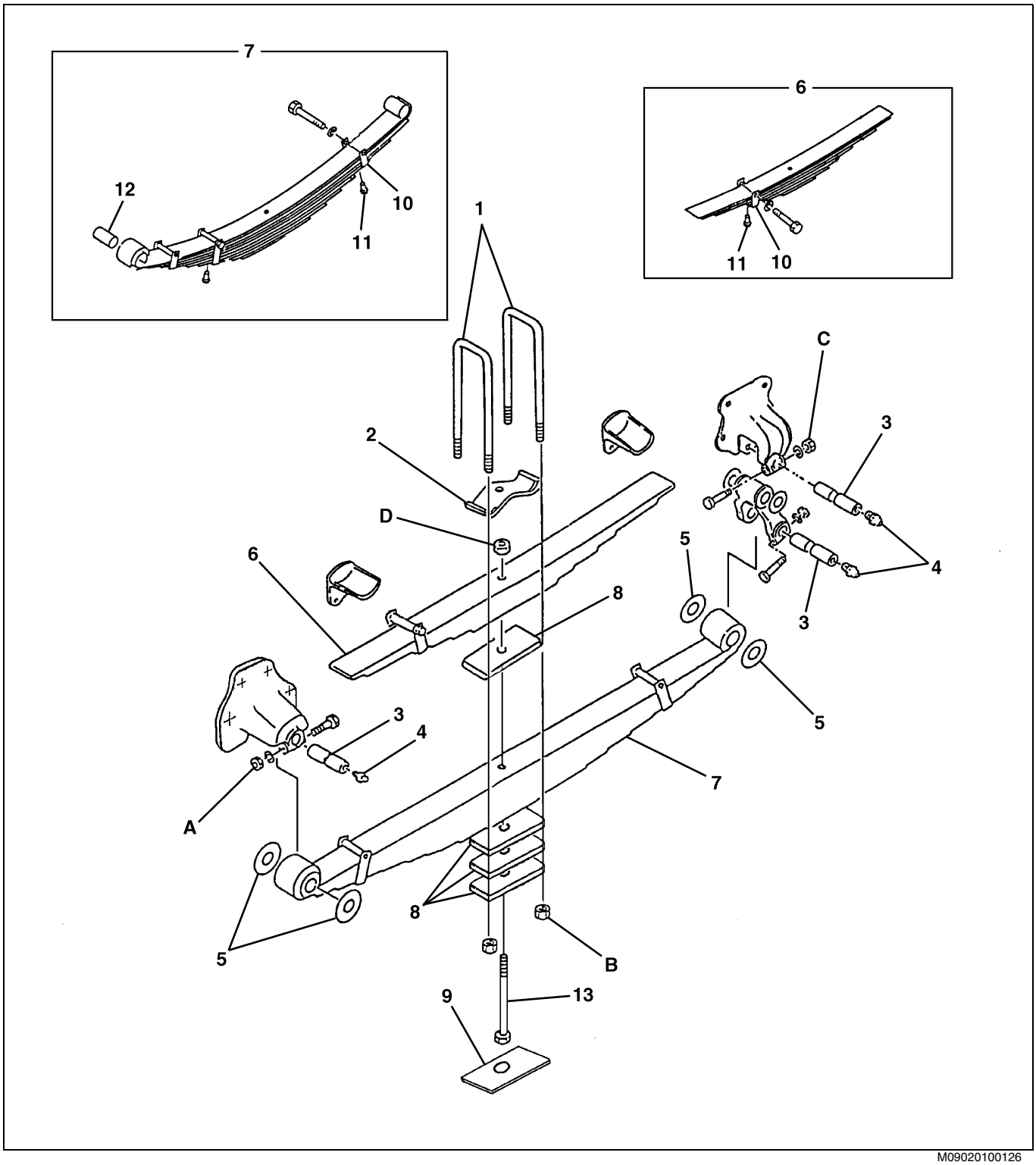
M09020100125

1	Bumper seat	13	Collar
2	Spring bumper	14	Bushing
3	Bumper support	15	Spring pad
4	Lubrication fitting	16	Shock absorber
5	Lock plate	17	Shock absorber pin
6	Thrust washer	18	Shock absorber bracket
7	Spring pin	19	Cushion
8	Spacer (If so equipped)	20	Cushion washer
9	Caster shim	21	Spacer
10	Shackle	22	Center bolt
11	Leaf spring assembly	23	Front axle fixing bolt
12	Clip		

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

A	64-93 {653-948, 48-68}	D	73-109 {745-1,111, 54-80}
B	490-590 {5,000-6,000, 361-434}	E	236-324 {2,407-3,303, 174-238}
C	167-225 {1,704-2,294, 123-165}	F	85-108 {870-1,100, 63-79}

REAR (MODEL: FT)



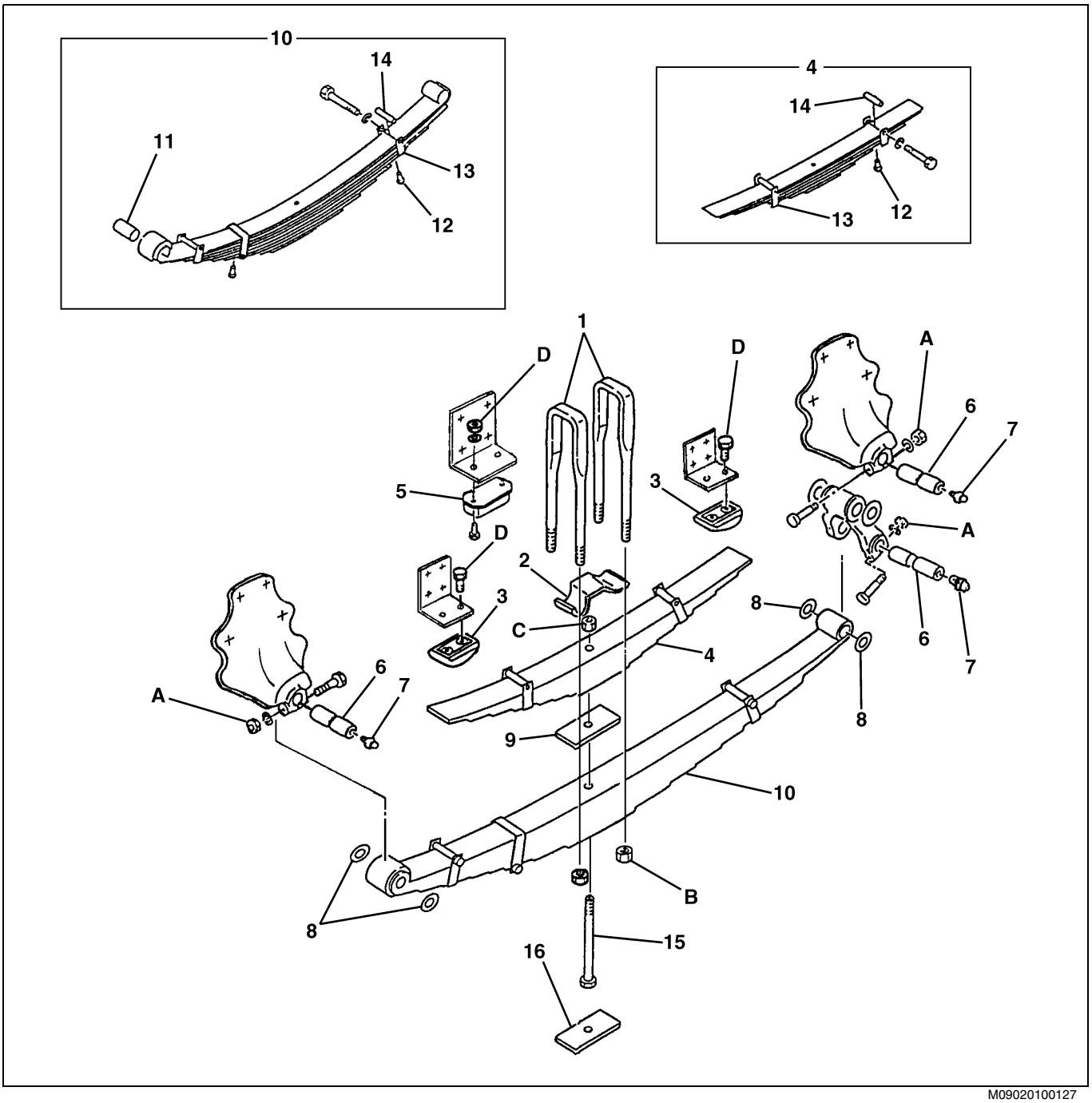
M09020100126

1	U-bolt	8	Spacer
2	Spring bumper	9	Spacer (If so equipped)
3	Spring pin	10	Clip
4	Lubrication fitting	11	Rivet
5	Thrust washer	12	Bushing
6	Auxiliary leaf spring assembly	13	Center bolt
7	Main leaf spring assembly		

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

A	110-150 {1,122-1,529, 81-110}	C	73-109 {745-1,111, 54-80}
B	265-315 {2,703-3,212, 196-232}	D	85-108 {870-1,100, 63-79}

REAR (MODEL: GT)



M09020100127

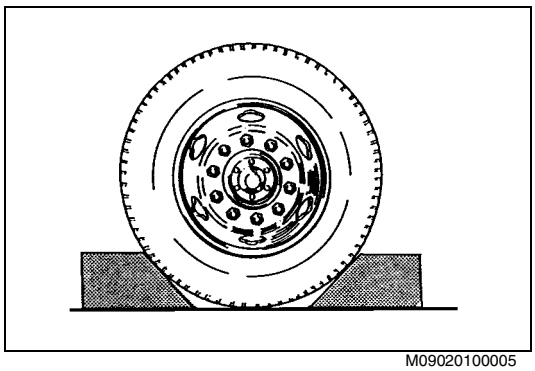
1	U-bolt	9	Spacer
2	Spring pad	10	Main leaf spring assembly
3	Slide seat	11	Bushing
4	Auxiliary leaf spring assembly	12	Rivet
5	Spring bumper	13	Clip
6	Spring pin	14	Collar
7	Lubrication fitting	15	Center bolt
8	Thrust washer	16	Spacer (If so equipped)

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

A	73-109 {745-1,111, 54-80}	C	226-284 {2,300-2,900, 167-209}
B	490-590 {5,000-6,600, 361-434}	D	64-86 {653-876, 47-63}

OVERHAUL

M09020101BEH2004



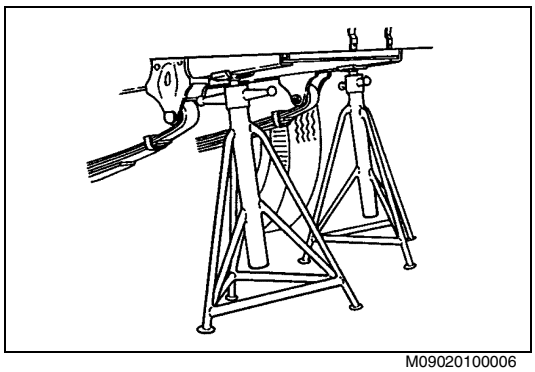
M09020100005

IMPORTANT POINTS - DISMOUNTING

1. SUPPORT OF THE FRAME WITH STANDS

(1) Park the vehicle on level ground.

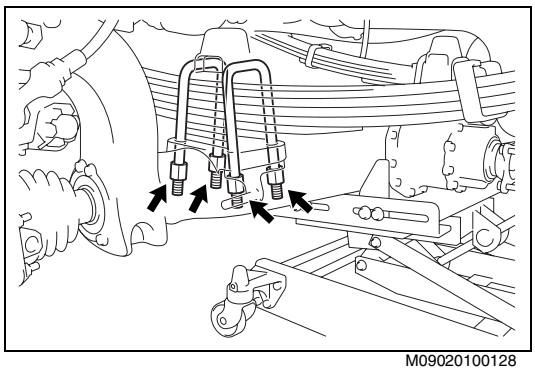
(2) Be sure to block the wheels before dismounting.



M09020100006

(3) Jack up the axle, and support the frame with stands.

(4) Remove the tires.



M09020100128

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:

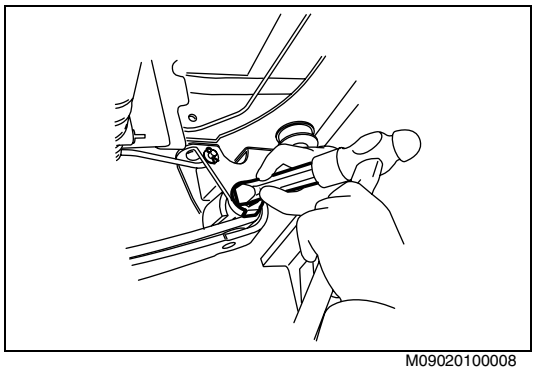
When cutting off the U-bolts (Due to rusted threads) with a torch, never direct the flame toward the leaves or allow sparks to come in contact with the leaves.

SST:

Socket Wrench for Front spring U-bolt (For FT) (09839-2204)

Socket Wrench for Rear spring U-bolt (For FT) (09603-1160)

Socket Wrench for Front and rear spring U-bolt (For GT) (09603-1140)

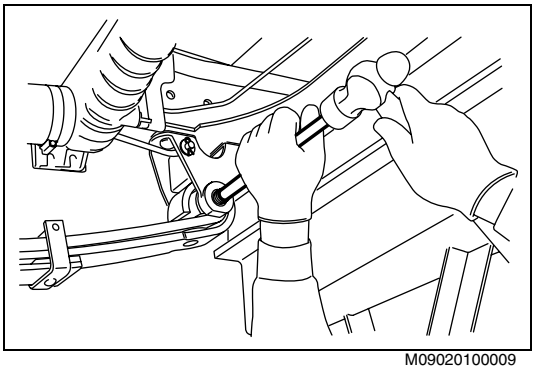


M09020100008

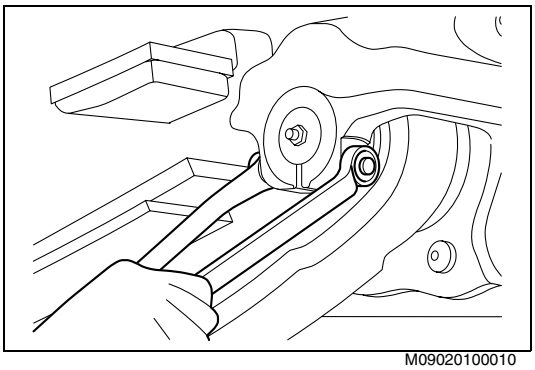
3. REMOVAL OF THE SPRING PIN (FRONT SUSPENSION)

(1) Remove the lubrication fitting.

(2) Uncaulk the lock plate with a chisel, then loosen the nut.

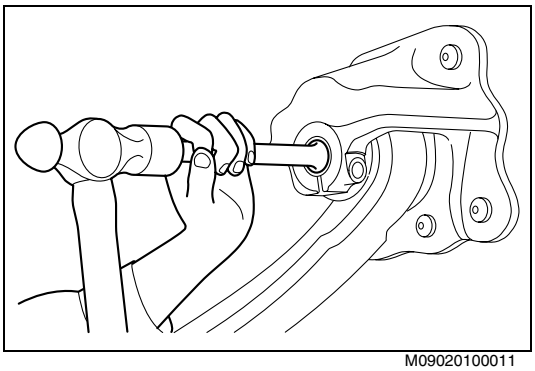

M09020100009

(3) Use a brass rod to remove the spring pins from the shackle and spring bracket.


M09020100010

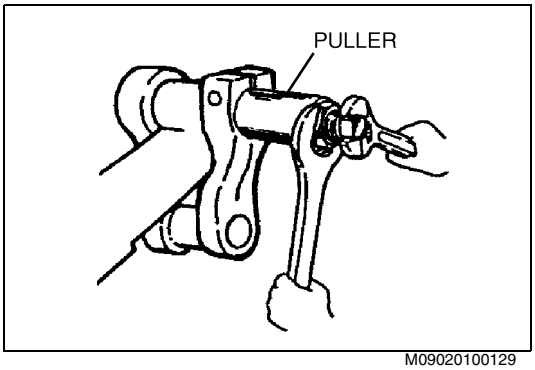
4. REMOVAL OF THE SPRING PIN (REAR SUSPENSION)

(1) Remove the lubrication fitting and spring pin lock bolt.

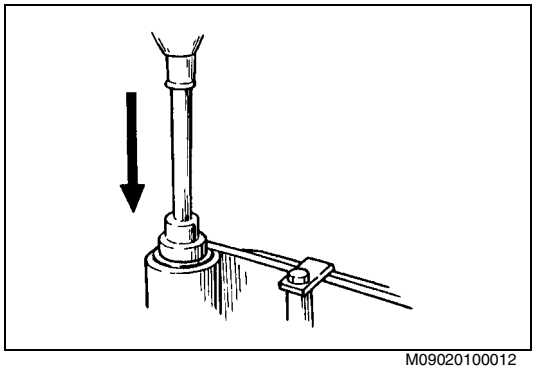

M09020100011

(2) Remove the spring pins from the shackle and spring bracket.

SST: Puller (For GT) (09650-1200)



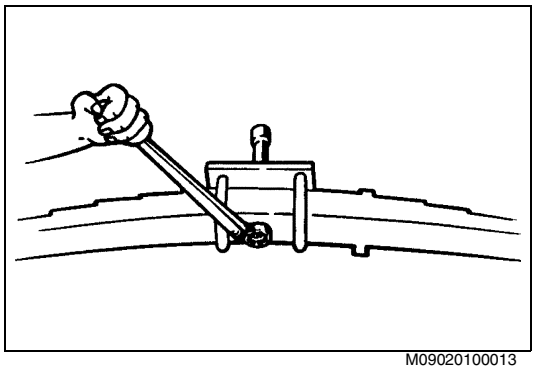
M09020100129


M09020100012

IMPORTANT POINTS - DISASSEMBLY

1. REPLACEMENT OF THE EYE BUSHING

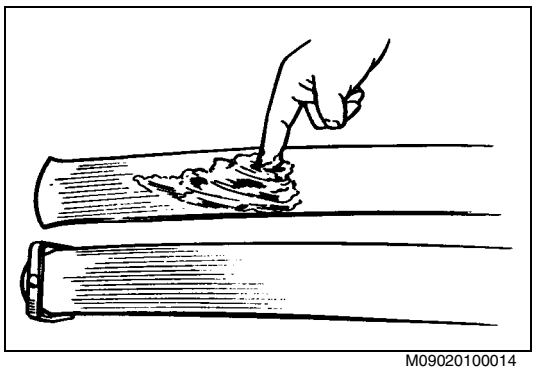
(1) Use a suitable tool to press out the old eye bushing.
(2) Use a suitable tool to press in the new eye bushing.


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.

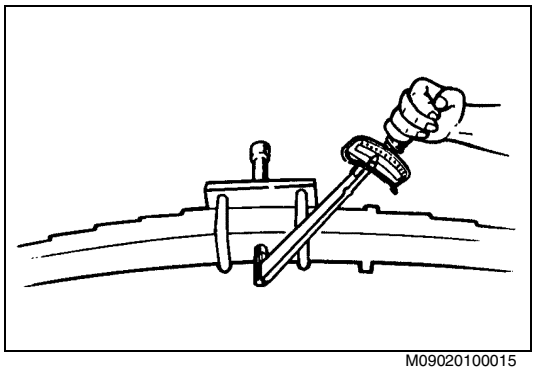

M09020100014

IMPORTANT POINTS - ASSEMBLY

1. ASSEMBLY OF THE LEAF SPRING

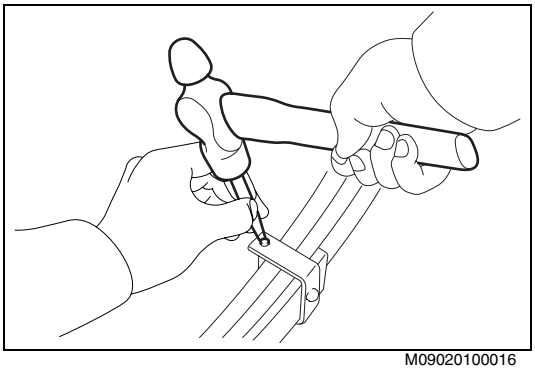
CAUTION:
When clamping the spring leaves, they may jump. Care should be taken to avoid possible personal injury.

(1) Apply coating on the leaf after removing rust, and apply chassis grease on both surface at leaves.


M09020100015

(2) Align the leaf holes and secure the leaves with a vise or an arbor press.
(3) Insert the center bolt and tighten the lock nut.

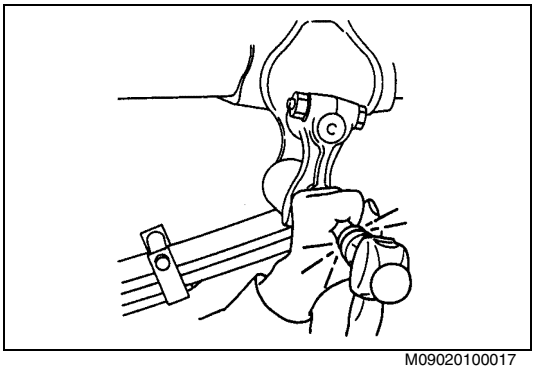
NOTICE:
When reassembling the leaf spring, replace the center bolt with a new one.


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

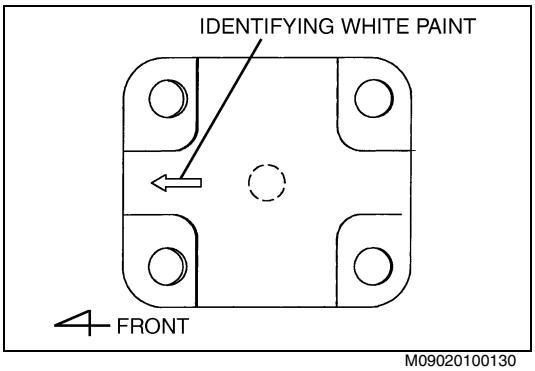
IMPORTANT POINTS - MOUNTING

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) Bend the lock plate securely (Front suspension).
(3) Install the spring pin lock bolt (Rear suspension).



M09020100130

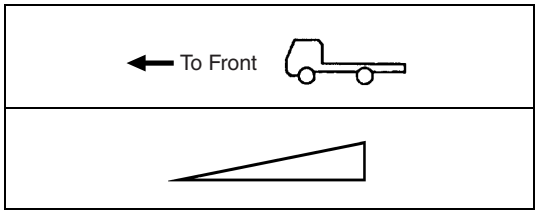
2. INSTALLATION OF THE SPRING PAD

(1) Install the spring pad as shown in the figure (For GT front suspension).

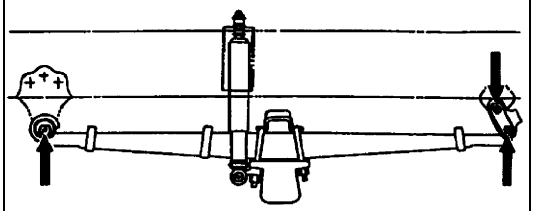
3. INSTALLATION OF THE CASTER SHIM (MODEL: FT)

(1) Place the caster shim between the spring seat and leaf spring.

NOTICE:
When installing the caster shim, the thick end should face the rear of the vehicle.

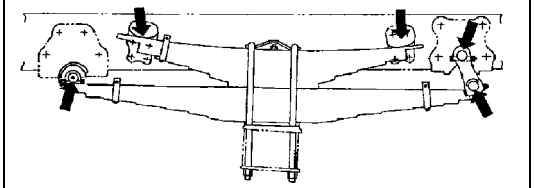


(REPRESENTATIVE TYPE)
FRONT SUSPENSION



M09020100132

(REPRESENTATIVE TYPE)
REAR SUSPENSION

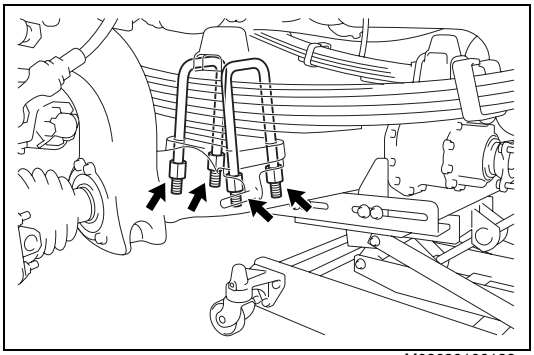


M09020100133

4. LUBRICATION

(1) Lubricate the following parts with chassis grease.
   a. Spring pins

   b. Auxiliary spring slide seats



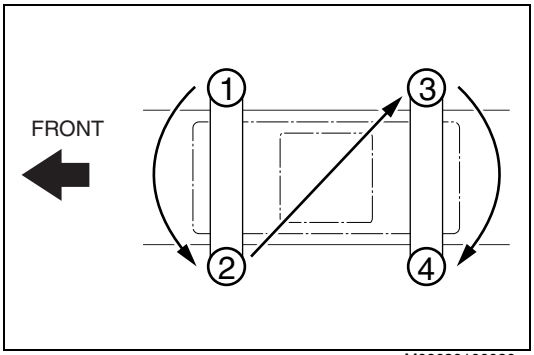
M09020100128

5. INSTALLATION OF THE U-BOLT

(1) Put the spacer on the front axle of the driver's seat side. (For FT front suspension)
(2) Lift the axle using a jack and align the hole of the leaf spring center bolt and the hole of the axle.

NOTICE:
Axle and suspension assembly are heavy, therefore be careful when handling them.

(3) Put the spring pads on the leaf springs.
(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 spring U-bolt (For FT) (09839-2204)
   Socket Wrench for Rear spring U-bolt (For FT) (09603-1160)
   Socket Wrench for Front and rear spring U-bolt (For GT) (09603-1140)

6. ADJUSTMENT OF THE SUSPENSION AFTER ASSEMBLING

(1) If the vehicle inclination is observed after assembling suspension, correct it by inserting the following spacer between the spring and the axle.

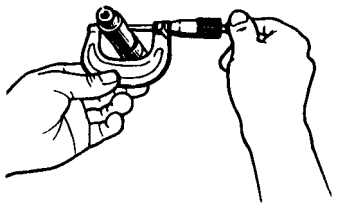
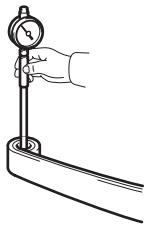
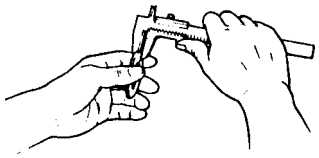
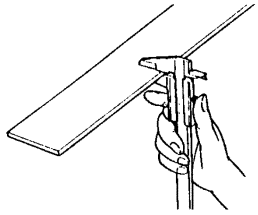
Spacer:

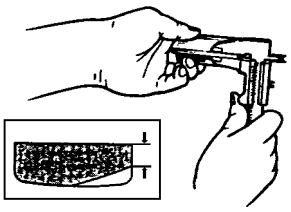
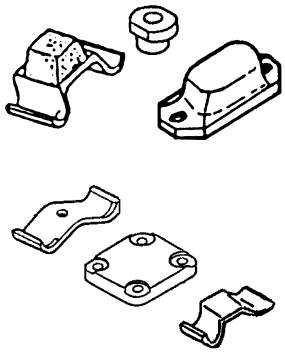
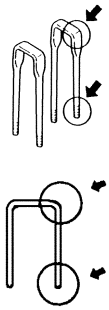
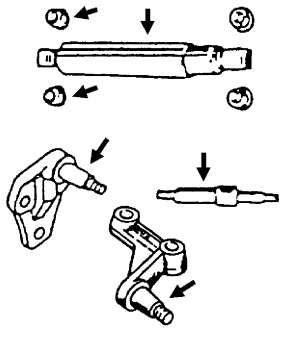
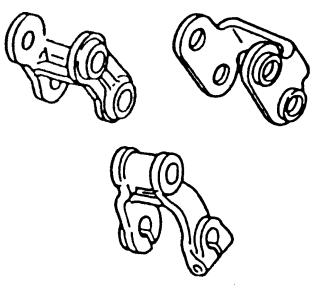
	MODEL	Part No.	Thickness (mm)
Front suspension	FT	9004-85206	3.2
	GT	9004-85253	6.0
Rear suspension	FT	9004-85267	6.0
	GT	9004-85125	6.0

INSPECTION AND REPAIR

M09020101BEH3004

Unit: mm {in.}

Inspection item		Standard	Limit	Remedy	Inspection procedure
Spring pin: Outside diameter	Front	MODEL: FT 25 {0.984}	24.7 {0.972}	Replace.	Measure 
		MODEL: GT 30 {1.181}	29.7 {1.170}		
	Rear	MODEL: FT 30 {1.181}	29.7 {1.170}		
		MODEL: GT 38 {1.496}	37.7 {1.485}		
Clearance between spring pin and eye bushing		0.02-0.13 {0.0008-0.0051}	0.5 {0.0296}	Replace the pin and/or bushing.	Measure 
Thrust washer: Wear	Front	3.0 {0.118}	2.5 {0.098}	Replace.	Measure 
	Rear	MODELS: FT Shackle side 3.0 {0.118}	2.5 {0.098}		
		MODELS: FT Pivot side 9.0 {0354}	8.5 {0.334}		
		MODELS:GT Shackle side (Frame side) 6.5 {0.256}	6.0 {0.236}		
		MODELS:GT Shackle side (Opposite side) 11.5 {0.453}	11.0 {0.433}		
		MODELS:GT Pivot side (Frame side) 4.5 {0.177}	4.0 {0.157}		
		MODELS:GT Pivot side (Opposite side) 9.5 {0.374}	9.0 {0.354}		
Leaf: Damage and wear		—	More than 15%	Replace.	Measure 

Inspection item	Standard	Limit	Remedy	Inspection procedure
Slide seat: Wear	**—**	**5.0 {0.197}**	**Replace.**	**Visual check** 
Spring bumper and spring pad: Damage and wear	**—**	**—**	**Replace, if necessary.**	**Visual check** 
U-Bolt: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Shock absorber: Operation, oil leak and damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 
Cushion: Damage and wear	**—**	**—**		
Shock absorber pin and bracket: Damage and wear	**—**	**—**		
Shackle: Damage	**—**	**—**	**Replace, if necessary.**	**Visual check** 

CHASSIS FRAME

FC02-001

CHASSIS FRAME

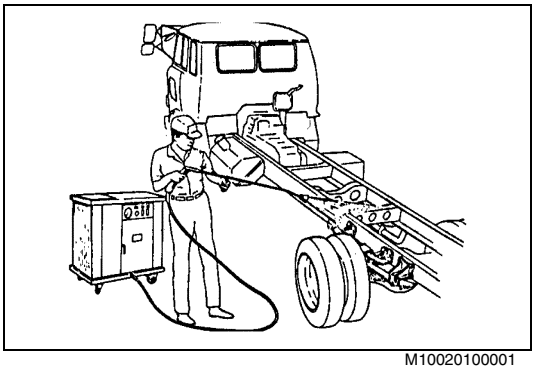
TROUBLESHOOTING

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



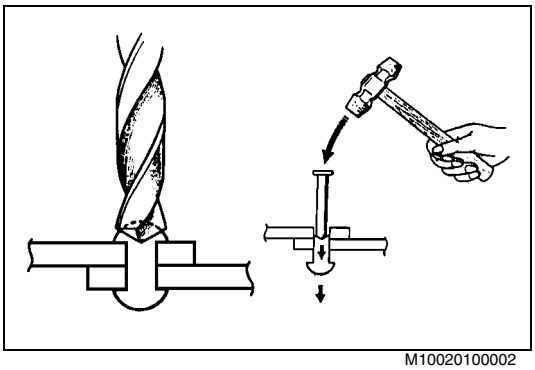
M10020100001

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.

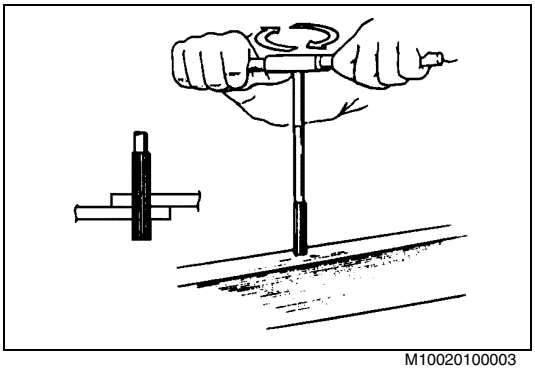


M10020100002

(2) Drill out the head of the loosened rivets with a drill or grind.

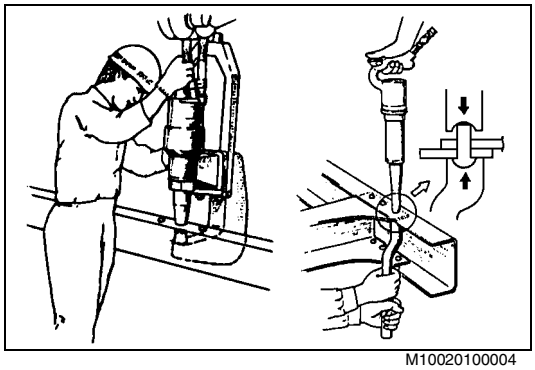
NOTICE:

When drilling, do not use the gloves. They can get caught up in the drill.



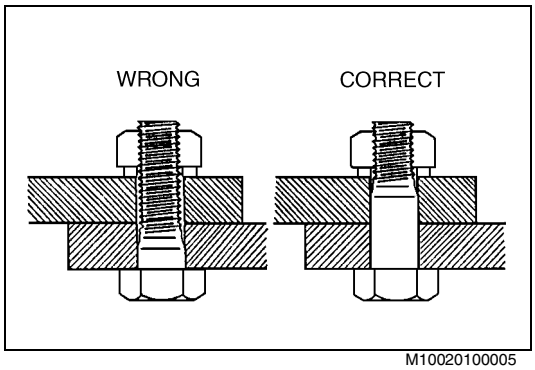
M10020100003

(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.}

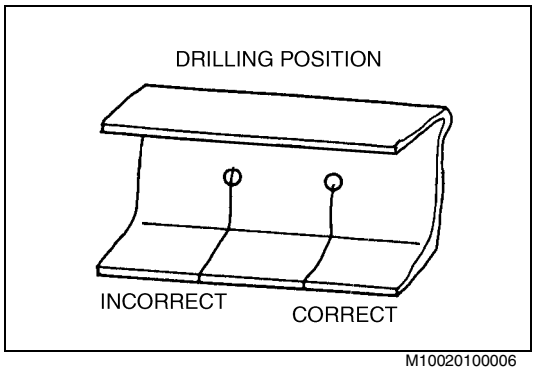


M10020100005

(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}

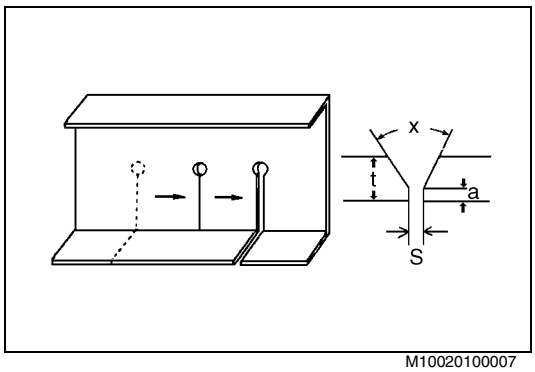


M10020100006

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.

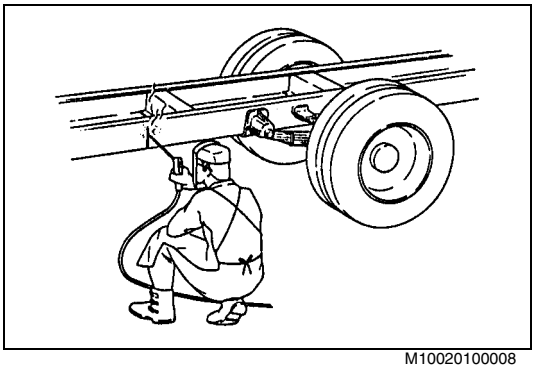


M10020100007

(2) Make the V-shape groove with a grinder along the frame crack according the following table.

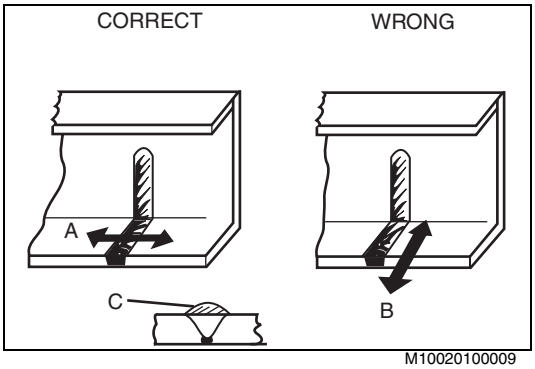
Unit: mm {in.}

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

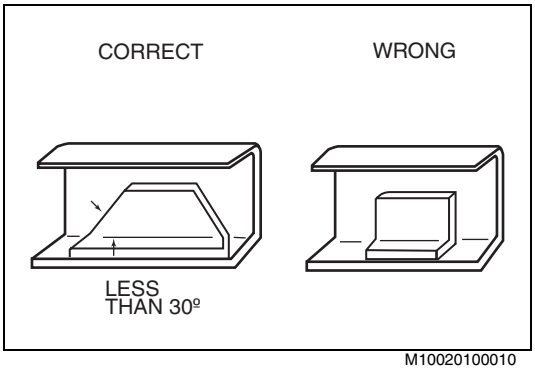
(3) Use an electric welder.
Refer to page FC02-7 for WELDING CONDITION (WHEN WELDING ROD IS USED).

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.**



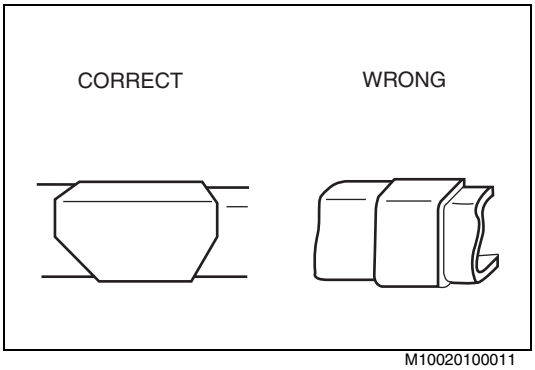
M10020100009

(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.



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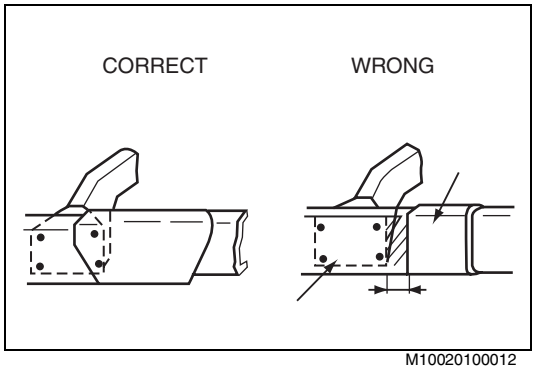
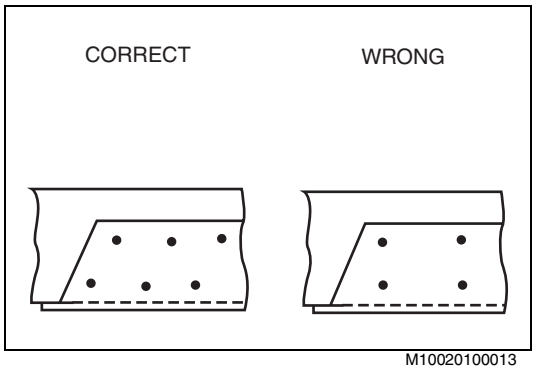


M10020100012

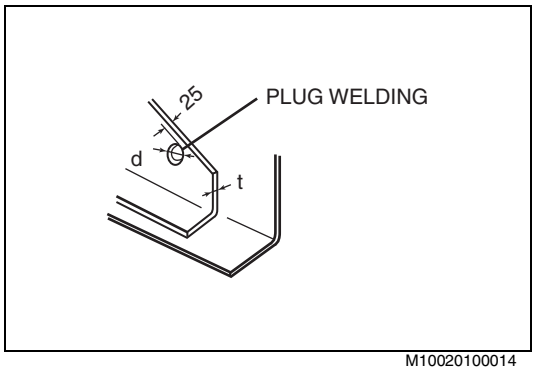
(6) Be sure to fasten the bolts at the hole locations of ups and downs (use rivets or perform the plug welding).



M10020100013

(7) Diameter of plug welding hole.

NOTICE:
Prohibit plug welding on the flange.

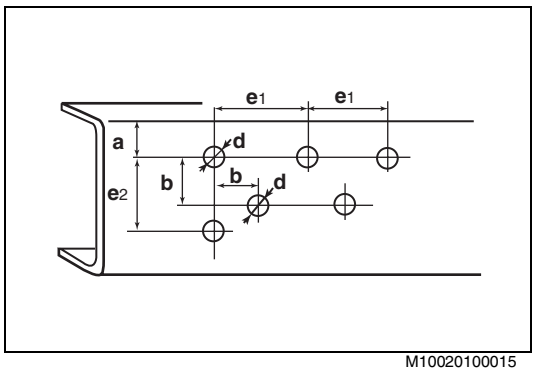


M10020100014

t	dϕ
3.2	15
4.5	15
6	18

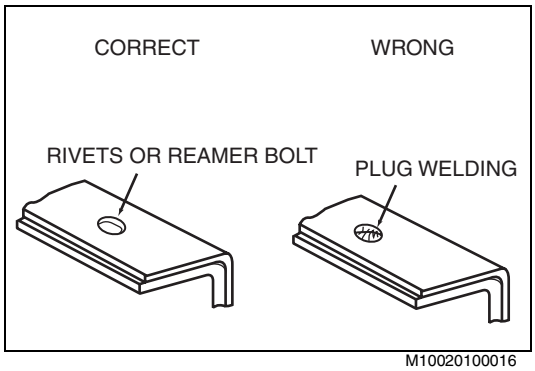
(8) Interval of the holes

a ≥50+d/2
b≥ 3d
e1e2≥701+a
dϕ: 20 or less



M10020100015

(9) Method of fixing on the flange.



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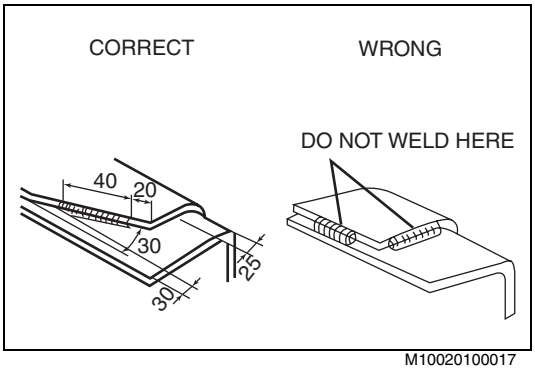

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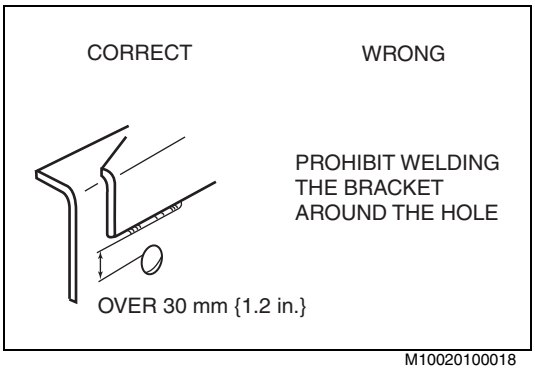

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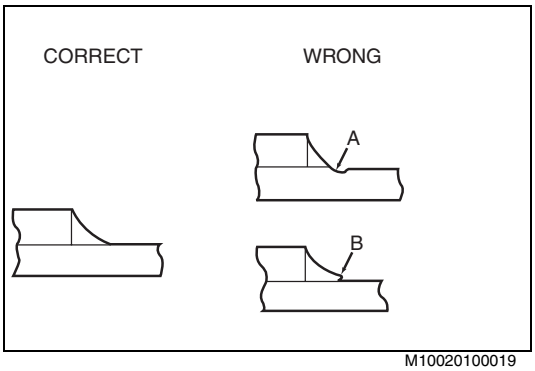


M10020100019

(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)

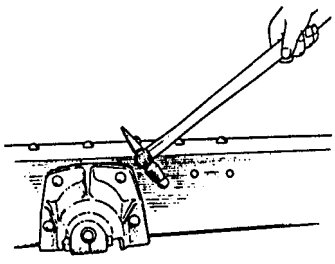
		Electric current (Unit: A)					
	Rod dia ϕ	3.2 mm {0.126 in.}		4mm {0.157 in.}		5 mm {0.197 in.}	
	Welding position	Flat	Vertical overhead	Flat	Vertical overhead	Flat	Vertical overhead
Mechanical property of weld metal & rod	Weld Metal (Hot roll plate) Tensile strength; 441 MPa {45 kgf/mm^2, 64.004 lbf/in.^{2}} 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

DATA AND SPECIFICATIONS

M11020101BEI2003

CAB

	Except for double cab	Double cab
Type	All steel welded construction, safety glass fitted to all windows	
Tilt system	Torsion bar	Oil jack
Tilt angle	44° ("Over-tilt" position: 50°)	39°

TILT PUMP (If so equipped)

PUMP	Type		Single plunger type
	Relief valve pressure		34.3-37.2 MPa {350-380 kgf/cm^2, 4,977-5,404 lbf/in^2.}
	Discharge pressure and discharge quantity	Rating pressure	19.6 MPa {200 kgf/cm^2, 2,844 lbf/in^2.}
		Electric drive	460 cm^3/min.
		Manual operate	19 cm^3/30 stroke or more
MOTOR	Type		Compound winding type
	Nominal output		0.3kW
	Voltage		24V
	Rotating		Clockwise (seen from output shaft)
	Ground type		Body earth

TILT CYLINDER (If so equipped)

Type		Double action type
Max. length		630.2-633.1 mm {24.82-24.92 in.}
Min. length		387.6-389.2 mm {15.26-15.32 in.}
Max stroke		241.9-244.4 mm {9.53-9.62 in.}
Output	Extension	39,700 N {4,050 kgf, 8,925 lbf} or more
	Retraction	17,000 N {1,730 kgf, 3,822 lbf} or more

TROUBLESHOOTING

M11020101BEF3003

CAB TILT (EXCEPT FOR DOUBLE CAB)

Symptom	Possible cause	Remedy/Prevention
Cab does not tilt up.	Cab mounting hook does not release.	Inspection of cab mounting hook mechanism.
	Safety rod does not release.	Inspection of safety rod mechanism.
	Damaged torsion bar	Replace torsion bar.
Cab tilting is difficult.	Heavy items in or attached to cab	Adjustment of shim for anchor lever or removal of the heavy items.
	Tilt up force is weak.	Adjustment of shim for anchor lever.
		Replace torsion bar.
Cab does not lock to cab mounting member.	Mounting hook does not operate.	Adjustment of mounting hook mechanism.
	Cab mounting cushion is not correctly installed.	Correct installation of cab mounting.

NOTICE:
As for cab tilt troubleshooting for models with double cab, refer to section "CAB TILT MECHANISM".

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

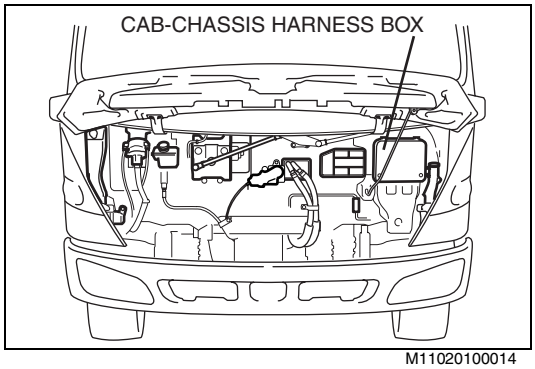
Symptom	Possible cause	Remedy/Prevention
Malfunction of blower when power is ON.	Blown fuse	Change fuse or check for short circuit.
	Malfunction in heater relay	Inspect relay.
	Malfunction of heater blower switch	Inspect power switch.
	Malfunction of register	Check register.
	Blower motor malfunction	Replace motor.
	Damaged electrical wiring or poor grounding	Repair as necessary.

DISMOUNTING AND MOUNTING

M11020101BEH1002

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.

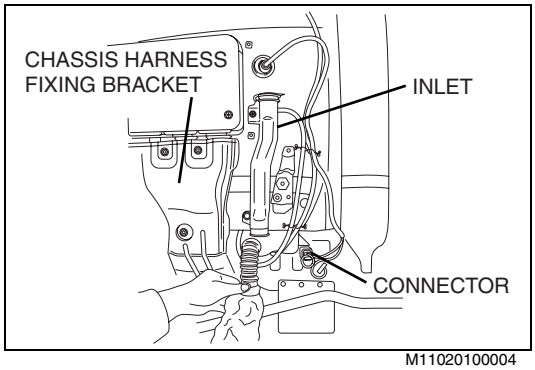


M11020100014

2. 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.



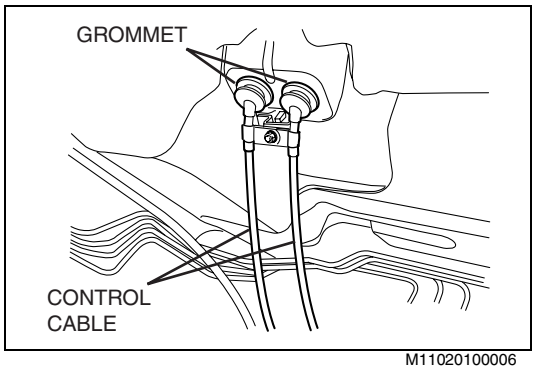
M11020100004

(3) Disconnect the inlet hose from washer tank.

3. AFTER TILTING THE CAB

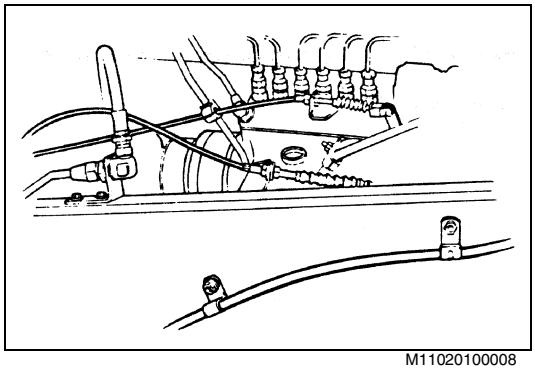
(1) Disconnect the transmission control cables.

(2) Remove the harness clips located under the floor of the cab. Disconnect the air brake hoses and clutch hose.



M11020100006

(3) Remove the engine control cable and engine stop cable with clips. Remove the cab stopper release cable.



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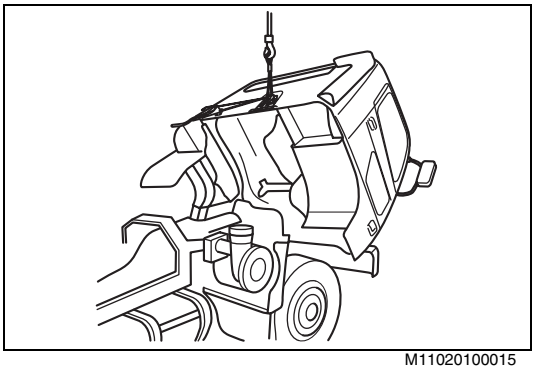
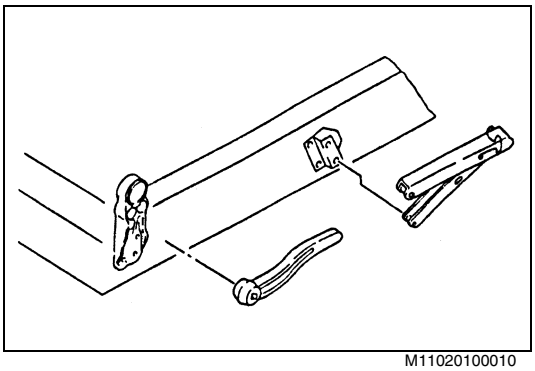

M11020100015

4. REMOVE ANCHOR LEVER

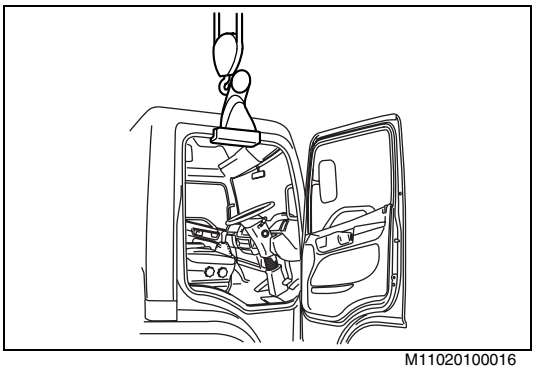
(1) Raise the cab to OVER-TILT position.
Refer to CAB TILT OPERATING TENSION ADJUSTMENT (1) OVER-TILT.
Suspend the cab with crane or hoist as shown in figure.

NOTICE:
Do not raise cab excessively, because the cab will fall forward.


M11020100010

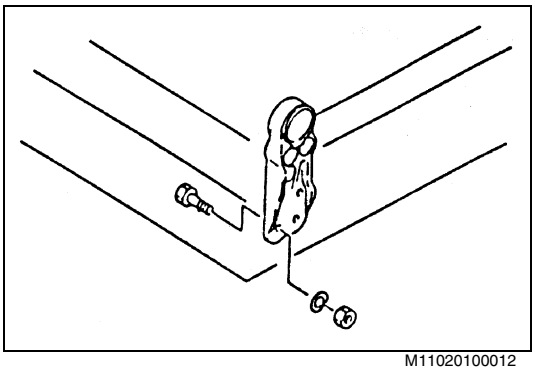
(2) Remove the set screws of the anchor lever, and pull out the anchor levers.
Remove the cab stopper stay.
Slowly lower the cab with crane or hoist.

CAUTION:
Never go under the cab when lowering the cab. It is very dangerous.

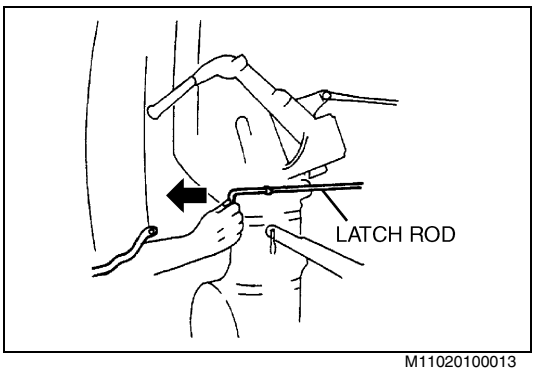

M11020100016

5. 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.

6. 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

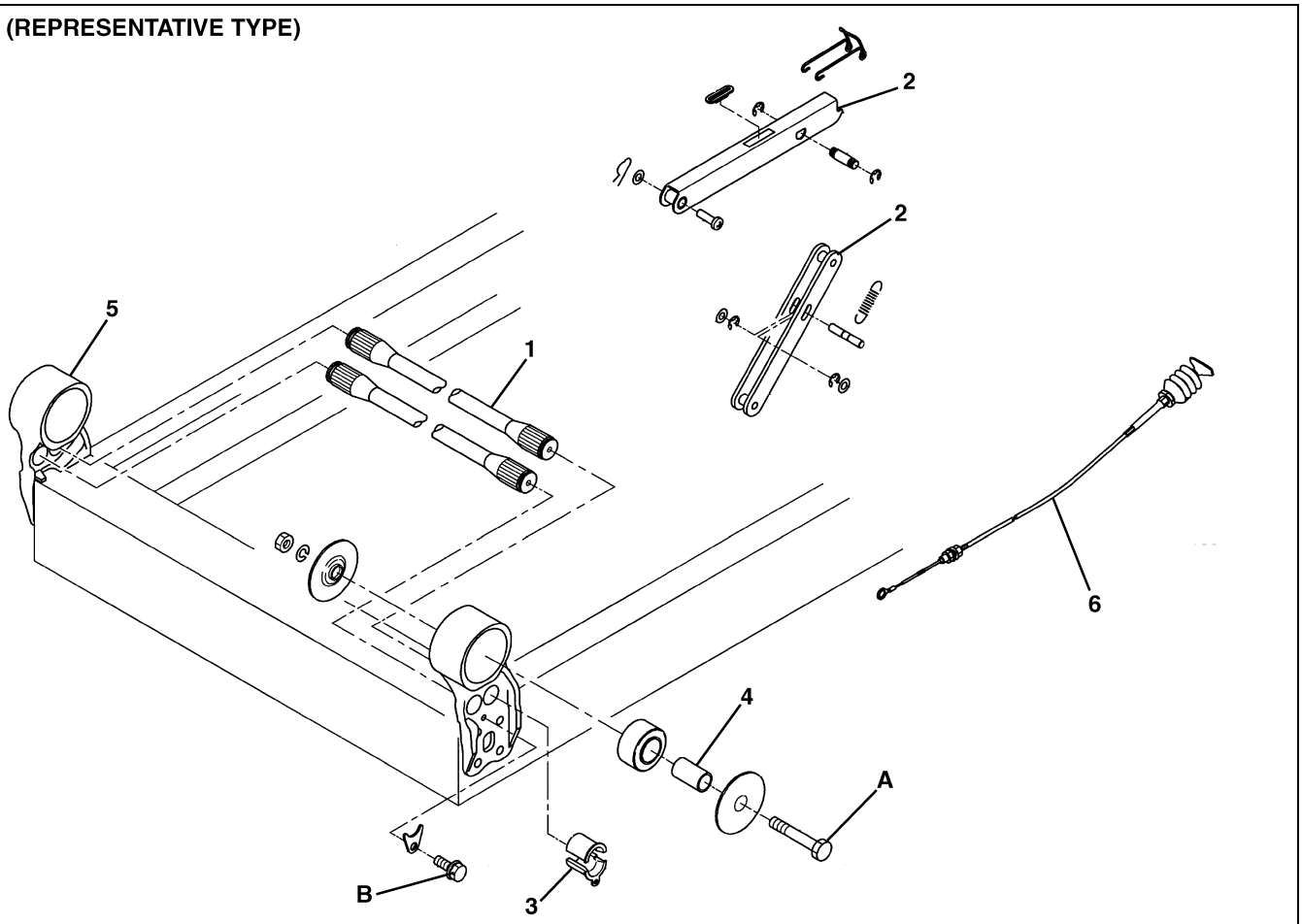
CAB MOUNTING PARTS

COMPONENT LOCATOR

M11020201BED1003

FRONT SIDE

(REPRESENTATIVE TYPE)



M11020200023

1	Torsion bar (If so equipped)	4	Collar
2	Cab stopper stay (If so equipped)	5	Tilt hinge bracket
3	Fitting collar (If so equipped)	6	Cab stopper release cable (If so equipped)

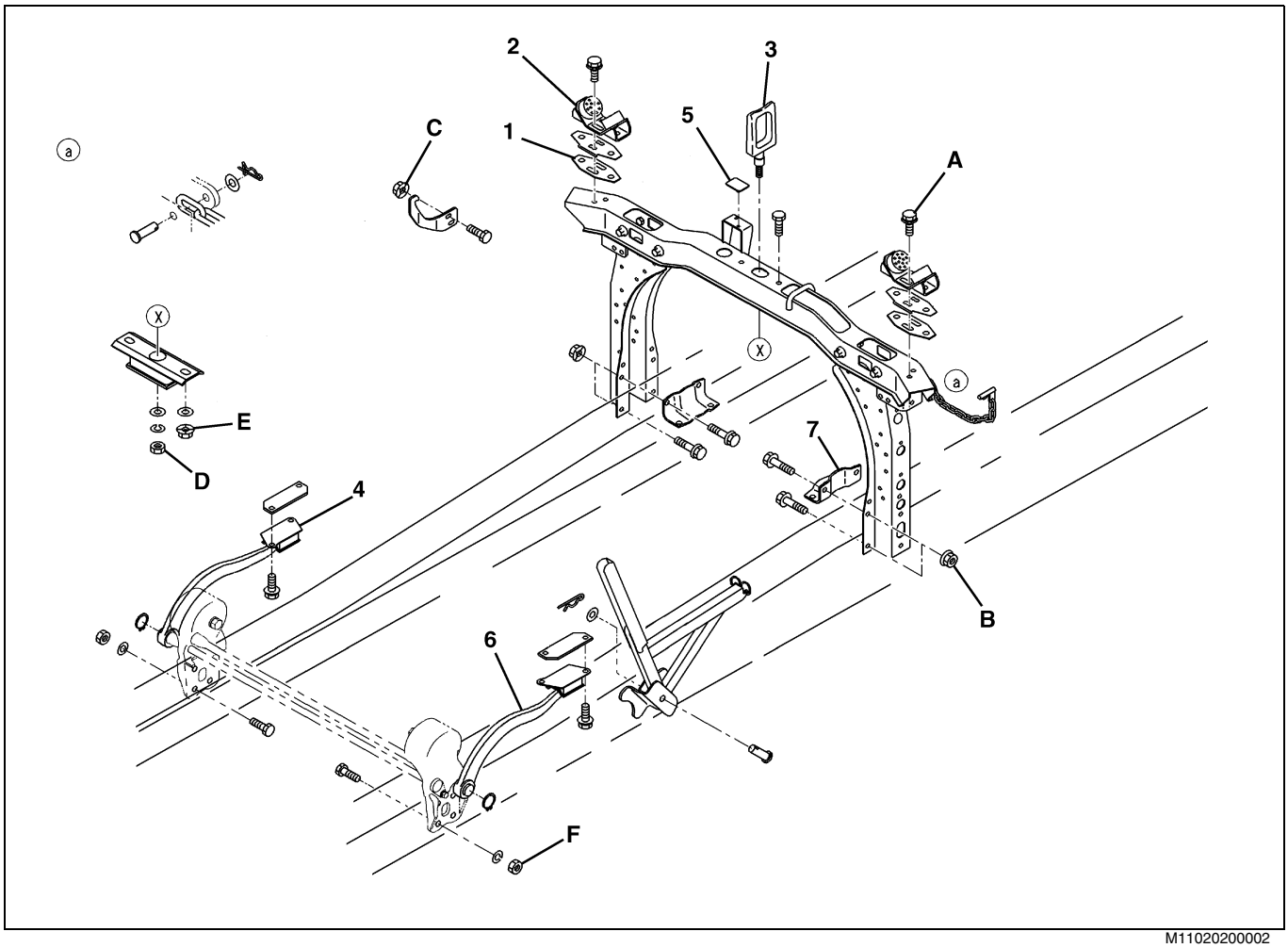
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	156-244 {1,591-2,488, 116-179}	B	34.5-51.5 {352-525, 26-37}

NOTICE:
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

REAR SIDE (EXCEPT FOR DOUBLE CAB)



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}**

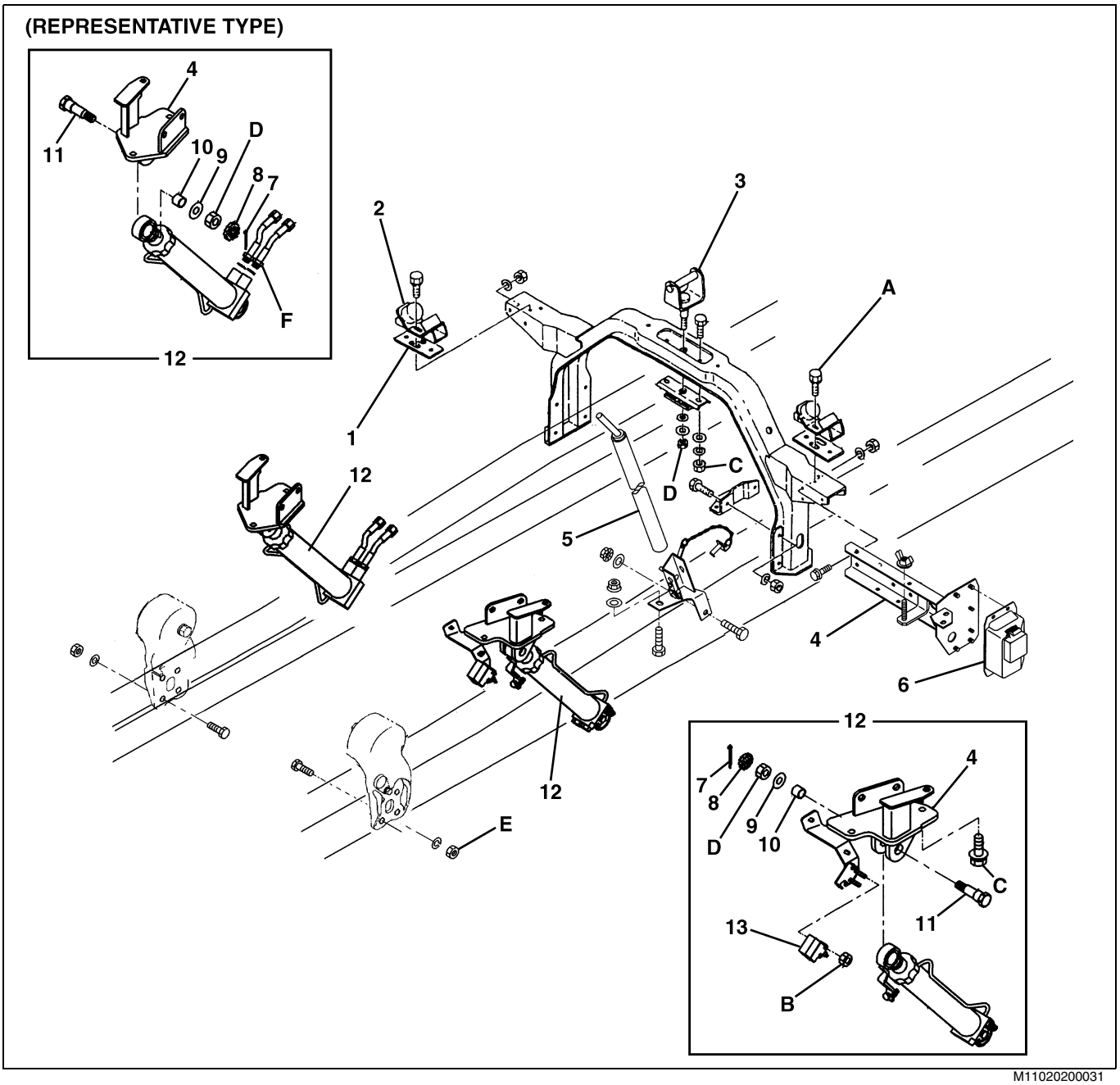
A	34.5-51.5 {352-525, 26-37}	D	110-150 {1,122-1,529, 82-110}
B	55.0-82.0 {561-836, 41-60}	E	34.5-51.5 {352-525, 26-37}
C	55.0-82.0 {561-836, 41-60}	F	150-180 {1,530-1,835, 111-132}

NOTICE:
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

REAR SIDE (DOUBLE CAB)

(REPRESENTATIVE TYPE)



M11020200031

1	Adjusting shim	8	Slotted adjusting lock cap
2	Cab mounting cushion	9	Washer
3	Stopper pin	10	Collar
4	Bracket	11	Pin
5	Safety support	12	Tilt cylinder assembly
6	Tilt switch	13	Cab stopper switch
7	Cotter pin		

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

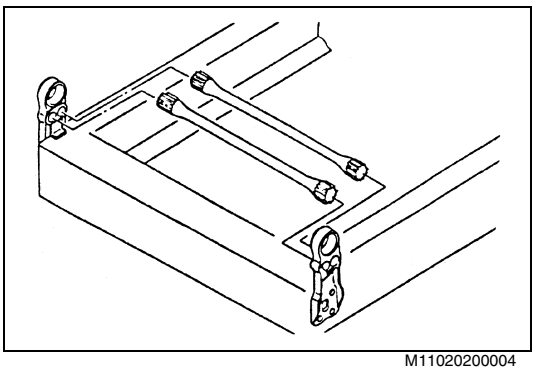
A	34.5-51.5 {352-525, 26-37}	D	110-150 {1,122-1,529, 82-110}
B	5.7-7.7 {58-78, 4.2-5.6}	E	150-180 {1,530-1,835, 111-132}
C	34.5-51.5 {352-525, 26-37}	F	24.5-31.3 {250-319, 18-23}

NOTICE:
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

OVERHAUL

M11020201BEH2004


M11020200004

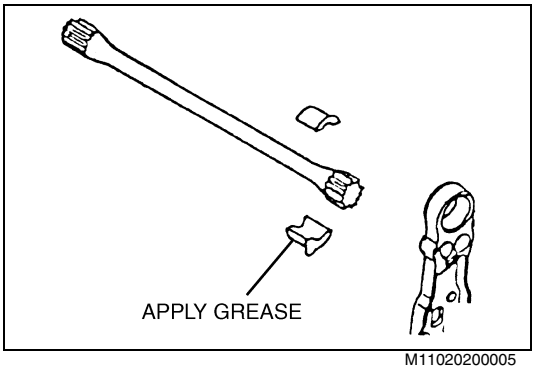
EXCEPT FOR DOUBLE CAB

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.**



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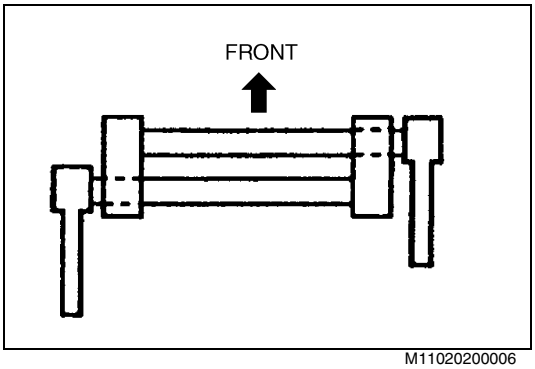


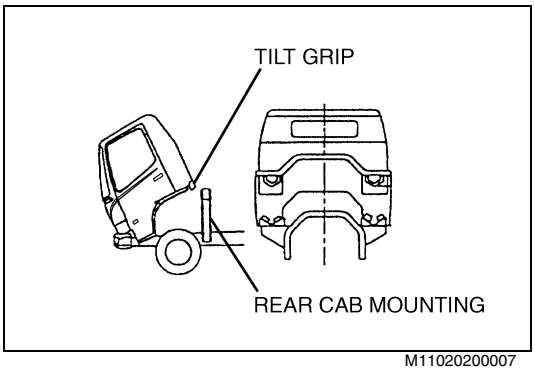
M11020200006

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 lose strength drastically.**
  Replace the torsion bars with new ones.

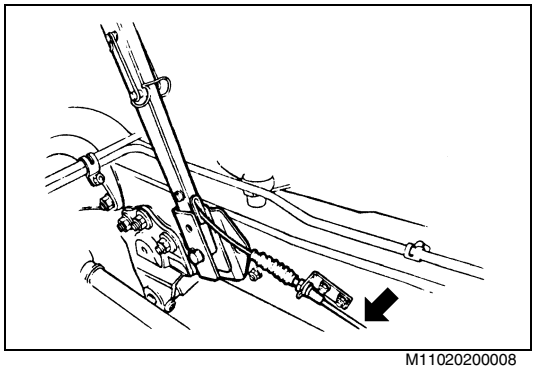


M11020200007

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**

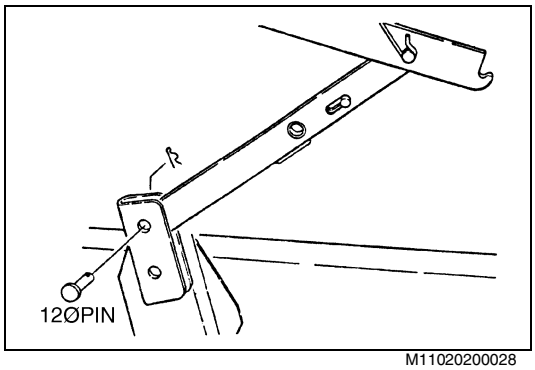

M11020200008

4. CAB TILT OPERATING TENSION ADJUSTMENT

(1) OVER-TILT

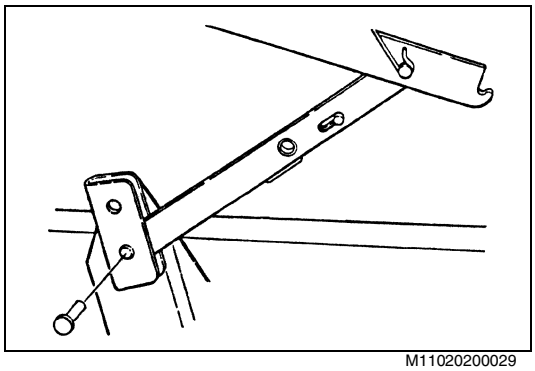
a. Remove the radiator grille.

b. Tilt up the cab and remove the cab stopper release cable (if so equipped) from the brackets.



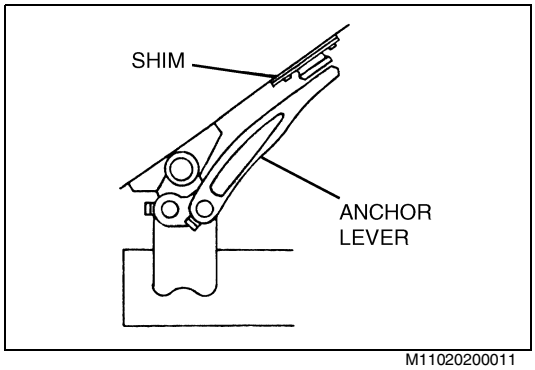
M11020200028

c. Pull out the pin at the lower part of cab stopper stay bracket.


M11020200029

d. Align the hole on the cab stopper stay with the hole for OVER-TILT at the upper part of the cab stopper stay bracket and insert 12 mm {0.47 in.} pin.
Use a cotter pin so that the pin does not come out.

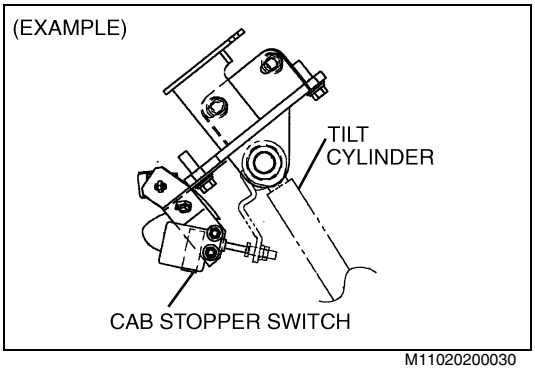
CAUTION:
Make sure that the cab stopper pin is locked. If it is not properly locked, the cab may fall.



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 4 shims (Maximum 4 shims).
When more than 5 shims are needed, or the torsion bar sage, replace the torsion bar.
If the clearance between the stopper rubber and the anchor lever is too narrow to insert the spacers, tilt the cab for 3-5 times to obtain the clearance.



M11020200030

DOUBLE CAB

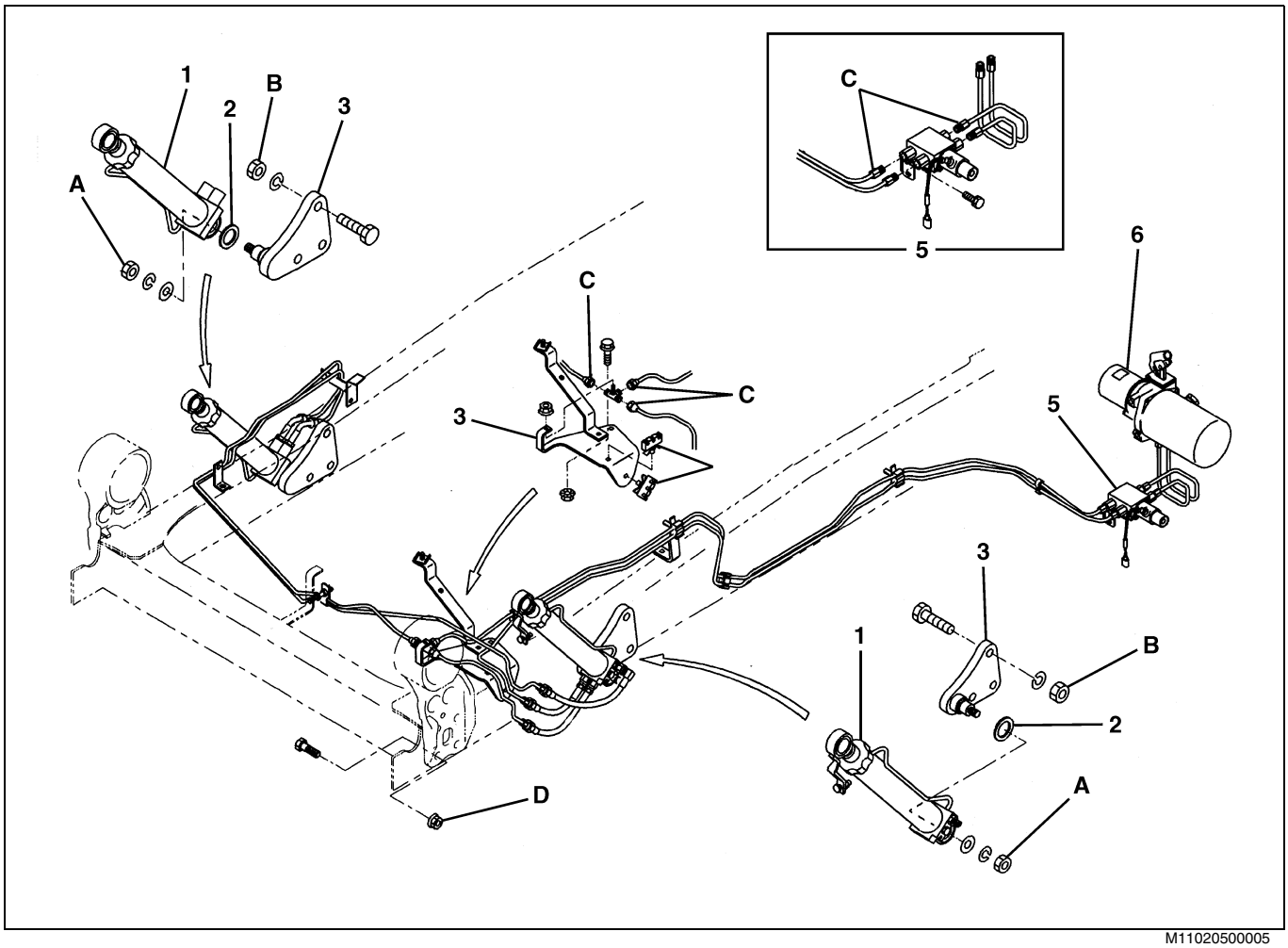
1. CAB STOPPER SWITCH ADJUSTMENT

(1) The bolt has to be adjusted so that the limit switch functions, namely cab tilting stops, at the position that the safety support can be completely stood up.

CAB TILT MECHAMISM (MODELS WITH DOUBLE CAB)

COMPONENT LOCATOR

M11020501BED1002



M11020500005

1	Tilt cylinder	4	Clamp
2	Plain washer	5	Solenoid valve
3	Bracket	6	Tilt pump

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

A	110-150 {1,100-1,500, 80-108}	C	20-30 {204-305, 15-22}
B	170-230 {1,734-2,345, 125-169}	D	150-180 {1,530-1,835, 111-132}

NOTICE:
Tighten the bolts to the following torque unless otherwise specified.

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	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

TROUBLESHOOTING

M11020501BEF3001

(A) The cab fails to tilt (fail to rise).

Trouble (Check points)	Possible Causes	Remedy
(1) The motor runs but fails to raise the cab. — (1) The cab scarcely moves. — (1) Low motor noise	(i) Air is drawn into the pump.	Check the oil level.
	(ii) Poor sealing in pump and valve	Disassemble and check (replace the O-ring, etc.)
(1) The cab scarcely moves. — (2) High motor noise — (1)	(i) Crushed or clogged pipe	Replace with a new part.
	(ii) Clogged cylinder orifice	Disassemble and check.
	(iii) Other troubles in the pump, cylinder and solenoid valve	Check.
(1) The cab scarcely moves. — (2) High motor noise — (2) Abnormally heavy load	(i) Excessive weight imposed on the cab	Check.
	(ii) Clinging snow and ice	Check.
	(iii) Seizure of the tilt hinge and pin etc.	Check.
(1) The motor runs but fails to raise the cab. — (2) The cab tilting begins but stops halfway or near the point where the lock is released.	(i) The same as in (1)–(1)–(2)–(2).	
	(ii) Excessively low setting of the pump relief pressure	Check and adjust the relief pressure.
	(iii) Pump abnormalities (Pressure fails to reach the relief level.)	Disassemble and check (piston assembly or check valve).
	(iv) The cab lock fails to be released.	Check the cab lock.
	(v) Excessive lateral projection of the cab lock	Check the horizontal sliding of the cab. Check the vehicle horizontality (Particularly check the left side running on the curb etc.). Grease the pin.
(1) The motor runs but fails to raise the cab. — (3) The cab stops halfway (tilted halfway)	(i) Excessive oil feeding	Check the oil level.
	(ii) Poor oil feeding (air drawn-in).	Adjust the cap position.
	(iii) Others (Cylinder bites, bend, contact, etc.)	Add oil,bleed air. Check, disassemble and repair.
(2) The motor fails to run. — (1) The buzzer fails to sound. — (1) The cab lock switch fails to function.	Blown fuse and poor contact in the connector:	Check the circuit or replace the fuse.
	(i) Poor installation adjustment	Adjust the switch.
	(ii) Part failure	Replace the switch.
(1) The buzzer fails to sound. — (2) The cab stopper switch fails to function.	(i) Poor installation adjustment	Adjust the switch.
	(ii) Parts failure	Replace the switch.
(2) Battery depleted (the starter fails)		Check and charge the battery.
(2) The motor fails to run. — (3) The power relay produces no operating noise. — (1) Voltage not applied to the (+) side of the operating switch terminal.	The motor terminal relay actuated (Motor overheated)	Resume the operation after allowing to stand for 30 minutes (to cool).
	Thermal relay failure	Check and adjust the motor.
(2) The motor fails to run. — (3) The power relay produces no operating noise. — (2) Pressing the operating switch fails to apply voltage to the relay exciting circuit (+) side.	Operation switch failure	Replace the switch.
	Relay failure	Replace the relay.
(2) The motor fails to run. — (4) Abnormally hot motor — The motor is overheated.	Motor thermal relay actuated.	Resume the operation after allowing to stand for 30 minutes (to cool).

M11020500002

(B) The fails to tilt (fails to lower)

Trouble (Check points)	Possible causes	Remedy
(1) The motor runs but fails to lower the cab. — (1) The cab scarcely moves. — (1) Low motor noise	(i) The same as in (A)–(1)–(1)–(1) (ii)	
(1) The motor runs but fails to lower the cab. — (1) The cab scarcely moves. — (2) High motor noise	(i) Inversely installed piping. Normal "rise" is assured. (ii) The same as in (A)–(1)–(1)–(2)–(2)	Correct the piping.
(1) The motor runs but fails to lower the cab.	(iii) Other troubles in the pump, cylinder and solenoid valve	Check.
(1) The motor runs but fails to lower the cab. — (2) The cab stops halfway. — (1) The cab stopper is actuated.	(i) Poor stroke of the mechanical stopper	Adjust the stroke.
(2) The motor fails to run.	(i) The same as in (A)–(2)–(1)~(4)	
(2) The motor fails to run.	(i) The cab lock switch actuated (locked when the cab is raised).	Restore the cab lock to lock-standby position.

(C) The cab sags after being tilted.

Trouble (Check points)	Possible causes	Remedy
(1) Releasing the operation switch makes the cab to sag visibly.	(i) Simultaneous occurrence of: (Cylinder..... Check valve failure) (Pump..... Switch valve failure)	Replace the O-ring in the cylinder check valve or the pilot and the pump switch valve.
(1) Releasing the operation switch makes the cab to sag visibly.	(ii) Air is drawn in:	Bleed air out of the cylinder piping.
(1) Releasing the operation switch makes the cab to sag visibly.	(iii) Cylinder malfunction: • Defective check valve seal • Defective pilot piston • Defective piston seal	Disassemble and check the cylinder and inpipe cylinder.
(2) The cab sags when allowed to stand for a long time (at 50°).	(i)The same as in (1)	Check and repair.

M11020500003

(D) Other abnormalities

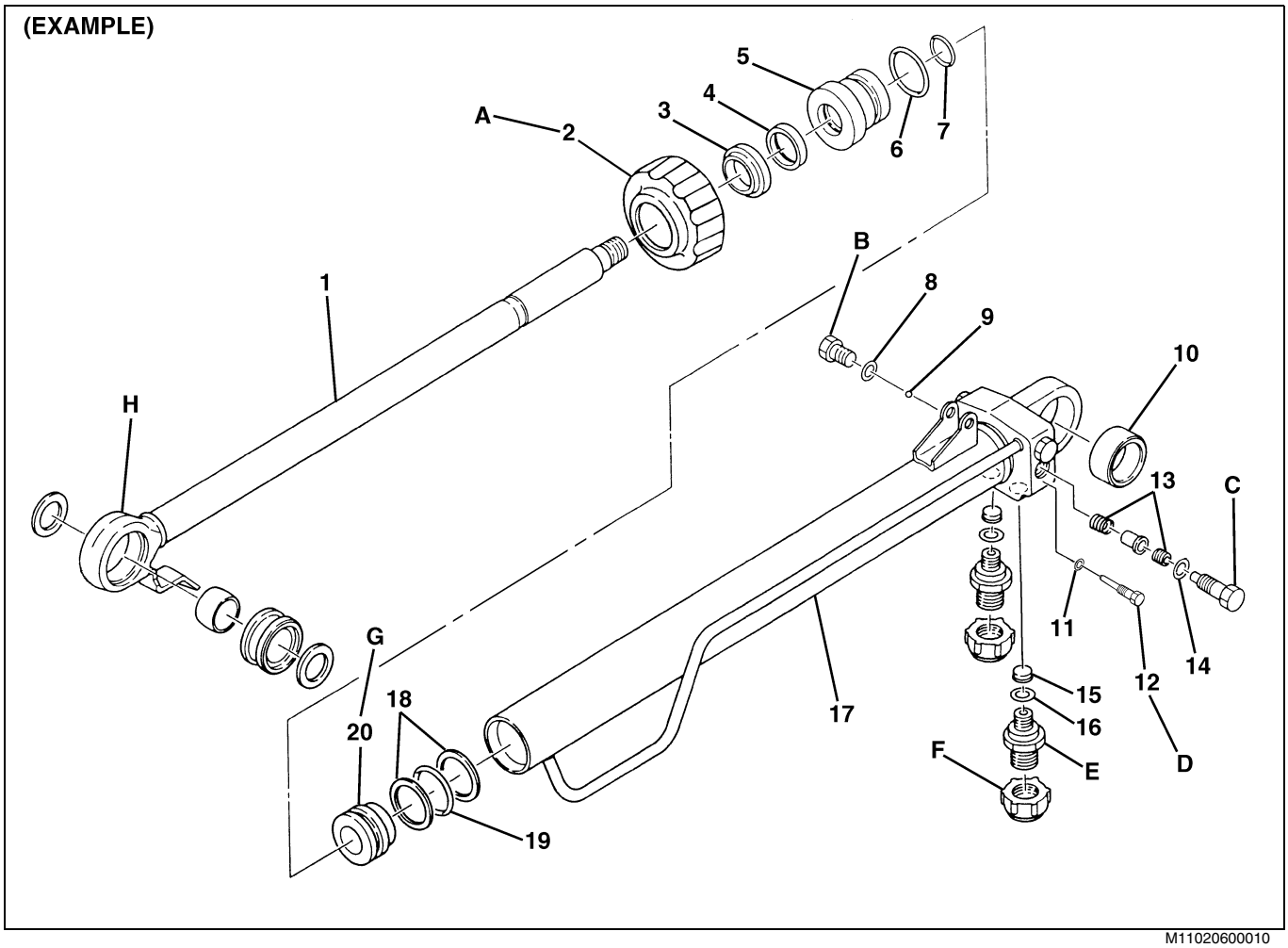
Trouble (Check points)	Possible causes	Remedy
(1) Tilting speed differs from normal rate. — (1) Long "raising" time	(i) The same as in (A)–(1)–(1)–(2)–(2) and(A)–(1)–(2)	
	(ii) Drop of battery voltage	Check and charge the battery.
	(iii) Motor performance deteriorated.	Charge and adjust the battery.
	(iv) Increased resistance due to oil of irrelevant type (low temperature, high viscosity, etc.)	Check and adjust the motor.
(1) Tilting speed differs from normal rate. — (2) Short "lowering" time	(i) Poor sealing in the cylinder, check valve, or piston	Disassemble and inspect the cylinder.
(2) Oil leak — (1) Pipe hose joints	(i) Poor fitting of pipes and joints	Retighten or replace the pipe.
	(ii) Impairment of the hose and the O-ring	Replace the O-ring.
(2) Oil leak — (2) Cylinder	(i) Defects in the U-cup sealing, end tube and the O-ring	Replace the seal (U cup).
	(ii) Impairment of the outer cylinder O-ring	Replace the cylinder body and assembly.
(2) Oil leak — (3) Pump or motor	(i) Impairment of the O-ring (pump) and the oil seal (motor)	Replace the O-ring (pump) and the oil seal (motor).
(3) The buzzer does not stop sounding.	(i) Poor adjustment or failure of the switches (cab stopper or cab lock)	Inspect and adjust.
	(ii) Cab lock failure	Inspect the cab lock and replace with a new part.
	(iii) Cab stopper failure	Inspect and adjust.
(4) The cab tilts but the buzzer does not sound.	(i) Bad contact in the terminal	Inspect the connector.
	(ii) Defective buzzer	Replace the buzzer.
(5) Abnormal noise — (1) Noise from the under-carriage beneath the cab front	(i) Play in the cylinder pin	Inspect, repair or replace.
(5) Abnormal noise — (2) Noise from the panel in the cab rear	(i) Slapping of the cab lock pin due to damaged rubber piece	Inspect, repair or replace.
	(ii) Cab lock failure (the cab lock was applied with the cab being tilted)	Restore the cab lock to the normal position (lift and release).

M11020500004

TILT CYLINDER (MODELS WITH DOUBLE CAB)

COMPONENT LOCATOR

M11020601BED1001



M11020600010

1	Piston rod	8	O-ring	15	Filter
2	Stop ring	9	Check valve ball	16	O-ring
3	Dust seal	10	Bearing	17	Cylinder
4	Oil seal ring	11	O-ring	18	Oil seal ring
5	Tube end	12	Plug	19	O-ring
6	O-ring	13	Spring	20	Piston
7	O-ring	14	O-ring		

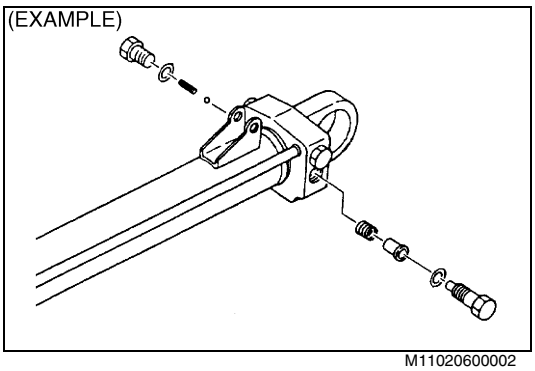
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	176.3-215.9 {1,800-2,200, 131-159}	E	17.7-26.5 {180-270, 14-19}
B	17.7-26.5 {180-270, 14-19}	F	1.0-2.0 {11-20, 0.8-1.4}
C	17.7-26.5 {180-270, 14-19}	G	44.1-58.9 {450-600, 33-43}
D	1.99-2.43 {21-24, 1.6-1.7}	H	44.1-58.9 {450-600, 33-43}

OVERHAUL

M11020601BEH2002

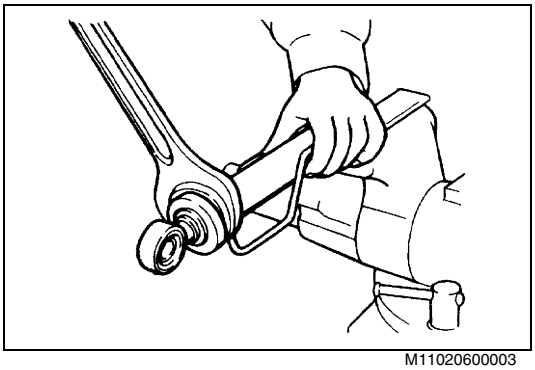
IMPORTANT POINT - DISASSEMBLY



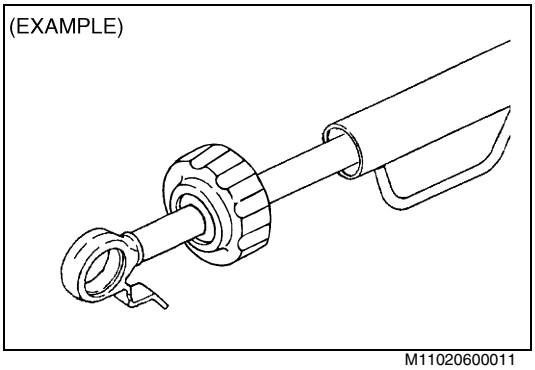
M11020600002

1. TILT CYLINDER

(1) Remove the check valve.


M11020600003

(2) Loosen the stop ring.



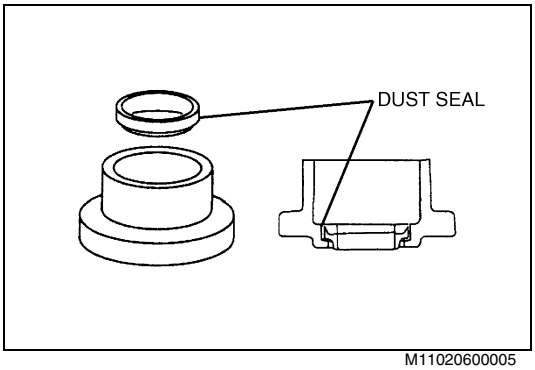
M11020600011

(3) Pull out the piston rod assembly.

NOTICE:

Take care not to damage the piston rod, and remove the rod over an oil pan, as oil will leak out.

IMPORTANT POINTS - ASSEMBLY



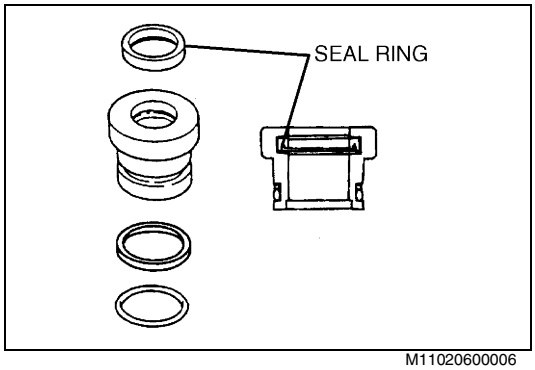
M11020600005

1. TILT CYLINDER STOP RING

(1) Use a press to install the dust seal into the stop ring.

NOTICE:

Before assembling the dust seal, fill the inside with lithium grease. Afterward, apply lithium grease to O-rings and seal rings.



M11020600006

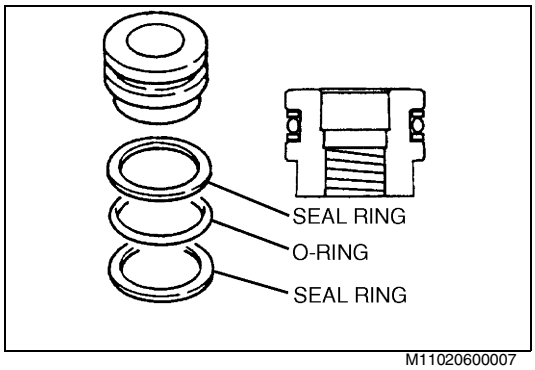
2. TILT CYLINDER TUBE END

(1) Assemble the seal ring and O-rings to the tube end.

NOTICE:

Pay attention to the seal ring direction.

When assembling the seal ring, use the new one.



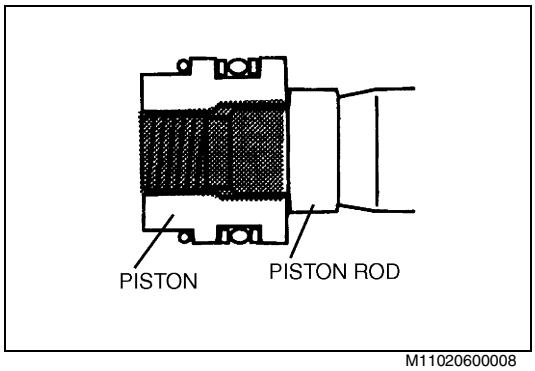
M11020600007

3. TILT CYLINDER PISTON

(1) Assemble seal rings and O-ring to piston.

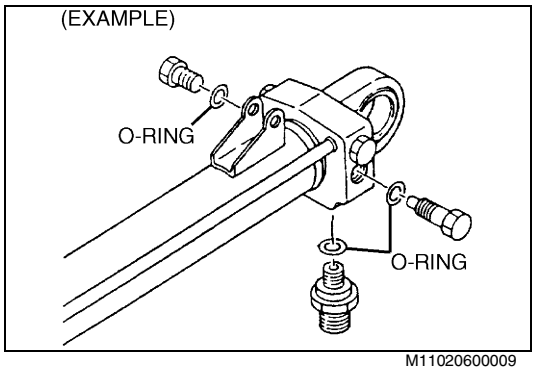
NOTICE:

When assembling the seal rings and O-ring, use the new ones.



M11020600008

(2) Apply adhesive (ThreeBond No.1374 or equivalent) between the piston and the piston rod.



M11020600009

4. CHECK VALVE

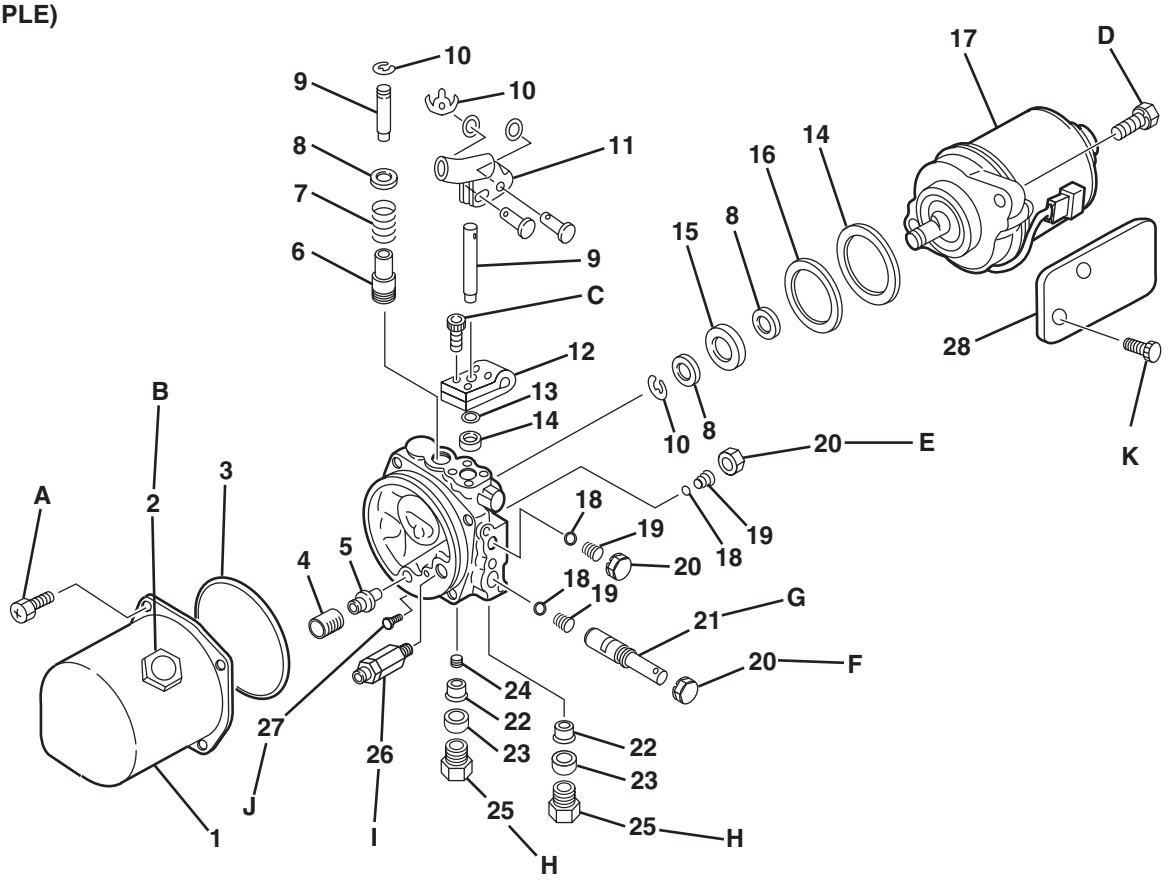
(1) Apply lithium grease to the O-rings.

TILT PUMP (MODELS WITH DOUBLE CAB)

COMPONENT LOCATOR

M11020701BED1002

(EXAMPLE)



M11020700011

1	Reservoir tank	15	Bearing
2	Filler cap	16	Spacer
3	O-ring	17	Tilt motor
4	Filter	18	Check valve ball
5	Pipe	19	Spring
6	Pump cylinder	20	Plug
7	Spring	21	Plug
8	Plain washer	22	Filter
9	Piston	23	Seat
10	Retainer	24	Plug
11	Manual pump lever	25	Plug
12	Case	26	Relief valve
13	Back up ring	27	Bolt
14	Gasket	28	Bracket

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

A	**2.4-3.4 {25-35, 1.9-2.5}**	**G**	**7.8-10.8 {80-110, 5.7-7.9}**
B	**44.2-54.0 {450-550, 32-39}**	**H**	**0.98-1.48 {10-15, 0.72-1.09}**
C	**4.9-6.9 {50-70, 3.7-5.0}**	**I**	**11.8-19.6 {120-200, 8.7-14.4}**
D	**7.4-9.8 {76-100, 5.5-7.2}**	**J**	**4.9-6.9 {50-70, 3.7-5.0}**
E	**11.7-14.7 {120-150, 9-10}**	**K**	**5.0-7.4 {51-75, 3.7-5.4}**
F	**19.6-29.4 {200-300, 15-21}**		

OVERHAUL

M11020701BEH2002

IMPORTANT POINT - DISMOUNTING

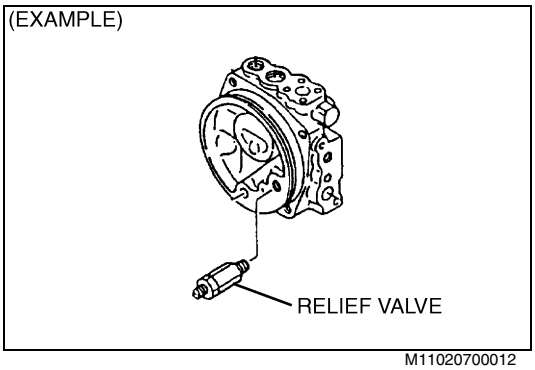
1. TILT PUMP

(1) Disconnect the oil pipes between the pump and the cylinder at the pump side.

NOTICE:

- **Before disconnection of the pipes, clean the connection parts.**
- **Seal the removed pump and the pipe connector parts with tape etc.**

IMPORTANT POINTS - DISASSEMBLY



M11020700012

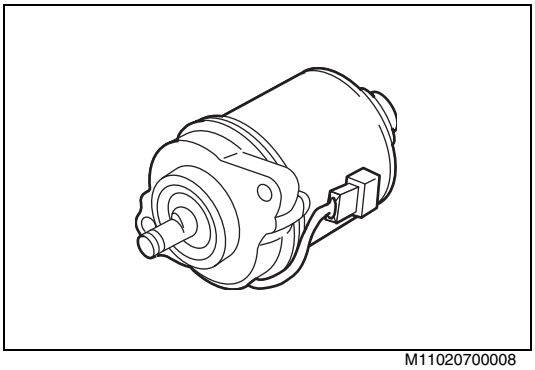
1. RELIEF VALVE

(1) Never disassemble the relief valve when removing it.

NOTICE:

Adjust the valve opening pressure of relief valve to the specified value.

VALVE OPENING PRESSURE:
34.3-37.2 MPa {350-379 kgf/cm^2, 4,979-5,390 lbf/in.}



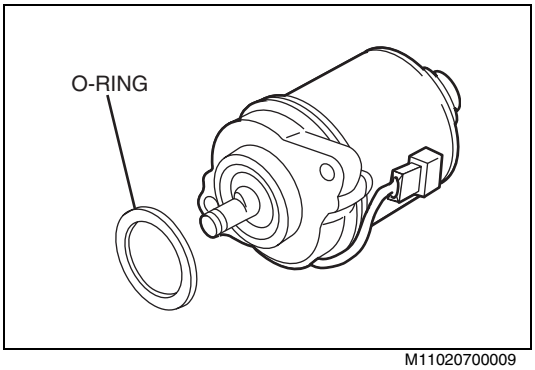
M11020700008

2. TILT MOTOR

(1) Never open the tilt motor cover.

If the motor is faulty, replace the motor assembly.

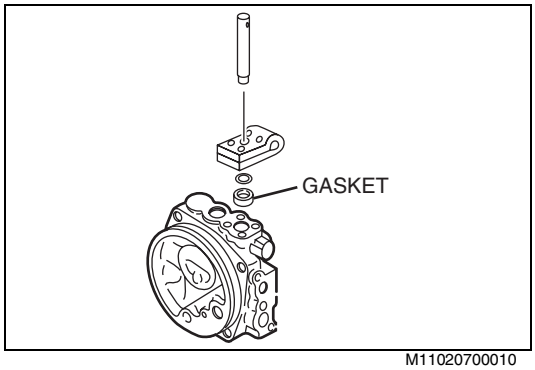
IMPORTANT POINTS - ASSEMBLY



M11020700009

1. TILT MOTOR

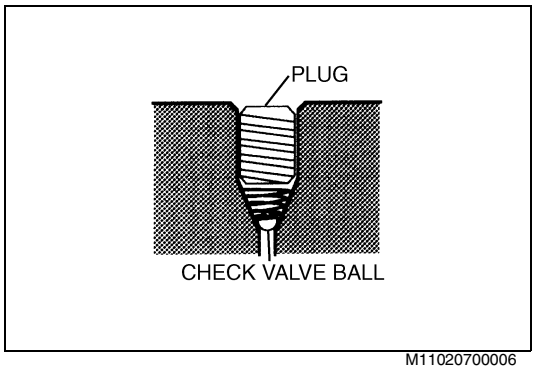
(1) Apply lithium grease to the O-ring.



M11020700010

2. MANUAL TILT PUMP

(1) Apply lithium grease to the gasket.



M11020700006

3. CHECK VALVES

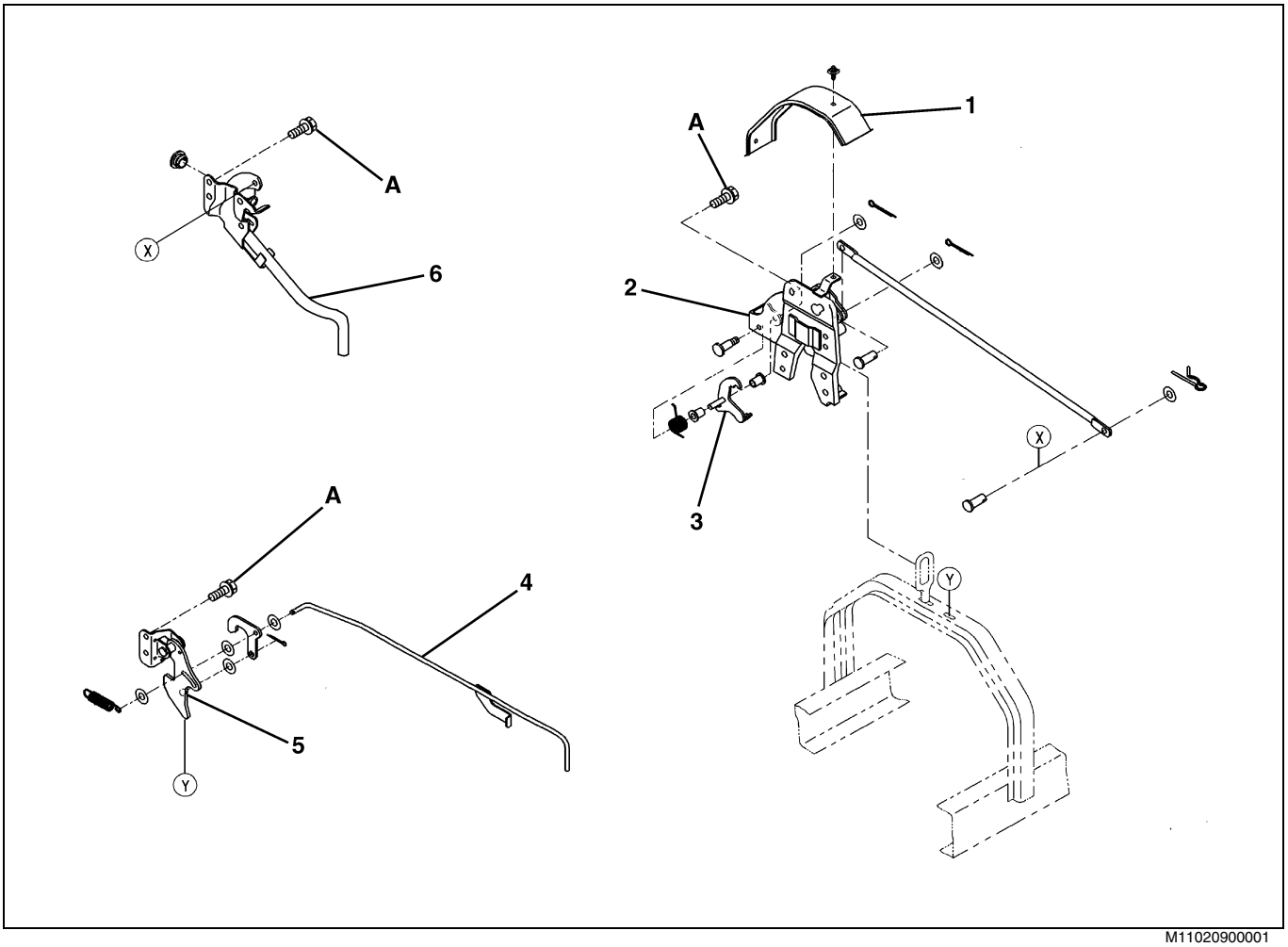
(1) Coat the plug with seal tape when installing the check valves.

CAB LOCK MECHANISM

COMPONENT LOCATOR

M11020901BED1002

EXCEPT FOR DOUBLE CAB



M11020900001

1	Dust cover	4	Tilt latch rod
2	Cab lock	5	Tilt latch
3	Release latch	6	Cab lock lever

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

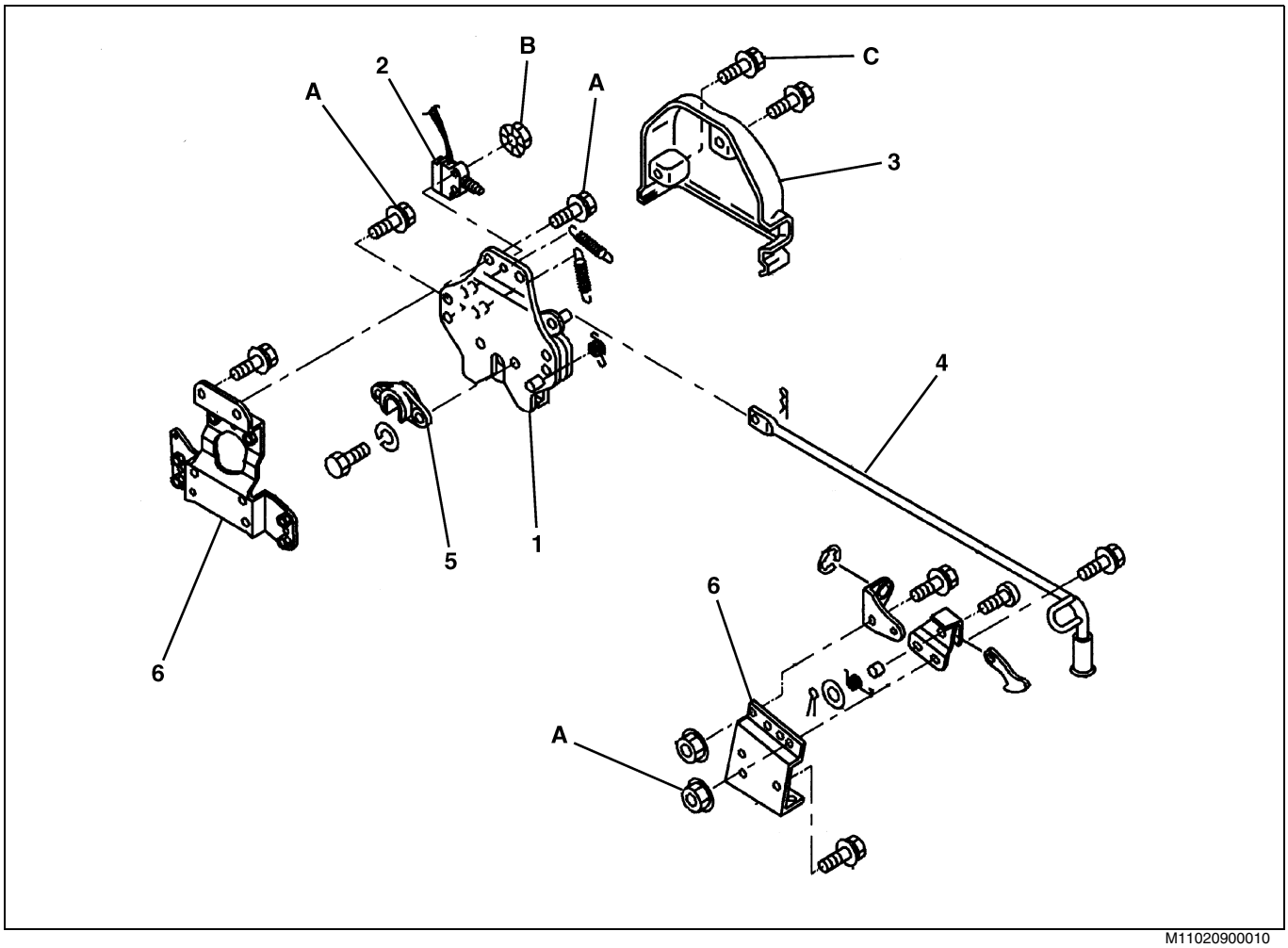
A	34.5-51.5 {352-525, 26-37}	

NOTICE:

- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

DOUBLE CAB



M11020900010

1	Cab lock	4	Cab lock rod
2	Cab lock switch	5	Stopper
3	Dust cover	6	Bracket

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

A	34.5-51.5 {352-525, 26-37}	C	5.0-13.0 {51-132, 3.7-9.5}
B	5.7-7.7 {58-78, 4.2-5.6}		

NOTICE:
- **Apply chassis grease between moving parts.**
- **Tighten the bolts to the following torque unless otherwise specified.**

	Bolt diameter (mm)	8	10	12	14	16
HEXAGON SPOTTED PORTION	N·m	18-26	34.5-51.5	61.0-91.0	96.0-144.0	152.0-228.0
	kgf·cm	184-265	352-525	622-927	979-1,468	1,550-2,325
	lbf·ft	13-19	26-37	45-67	71-106	112-168
FLANGED SPOTTED PORTION	N·m	21.5-31.5	41.5-61.5	73.0-108.0	144.0-216.0	228.0-342.0
	kgf·cm	220-321	423-627	745-1,100	1,468-2,202	2,325-3,487
	lbf·ft	16-23	31-45	54-80	106-159	168-252

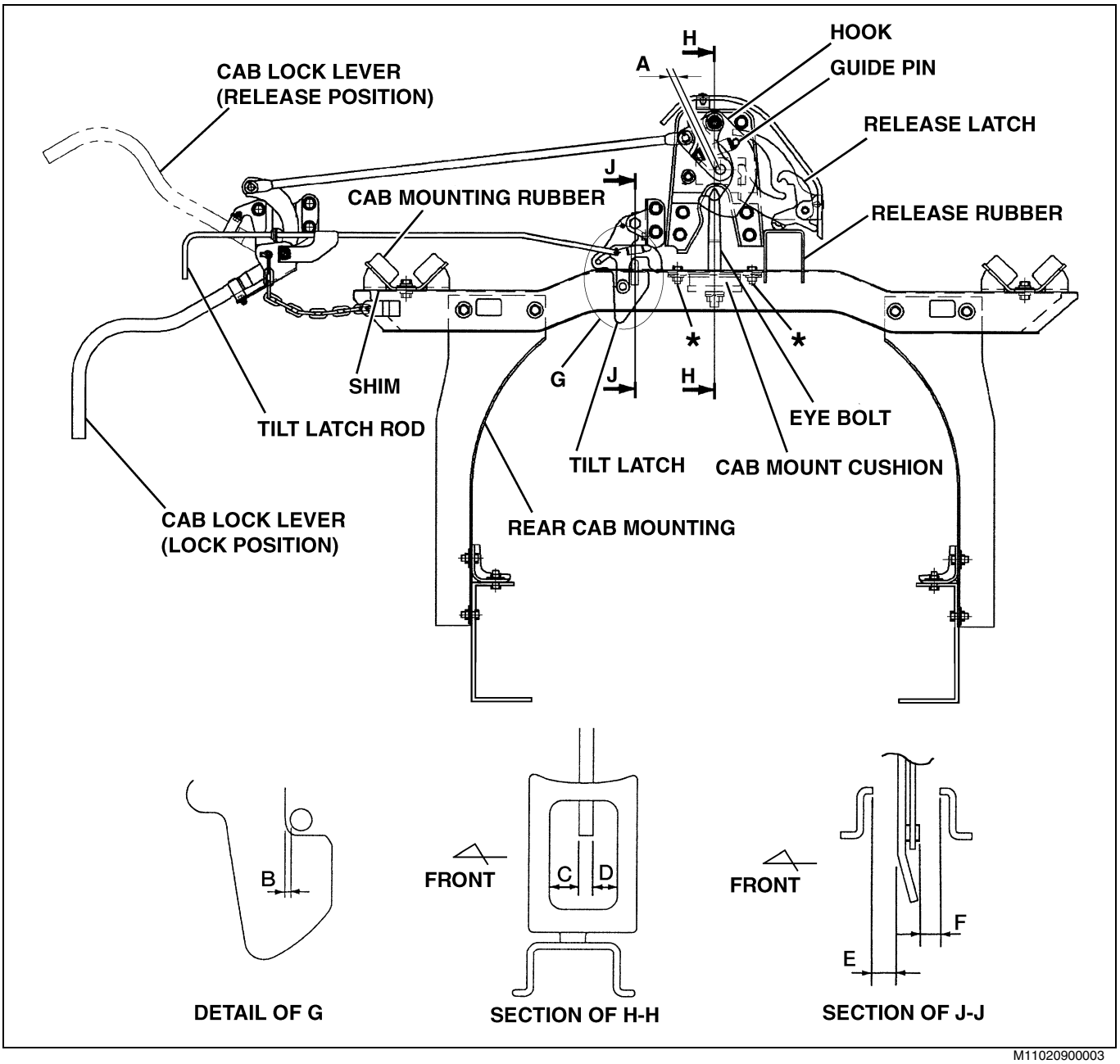
OVERHAUL

M11020901BEH2001

EXCEPT FOR DOUBLE CAB

1. CAB LOCK MECHANISM ADJUSTMENT

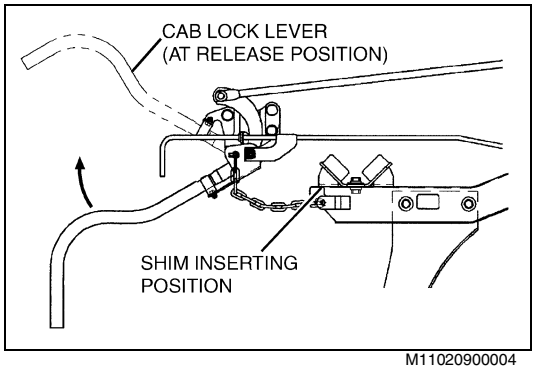
(1) Adjust dimension A, B, C, D, E and F as follows:



M11020900003

Unit: mm {in.}

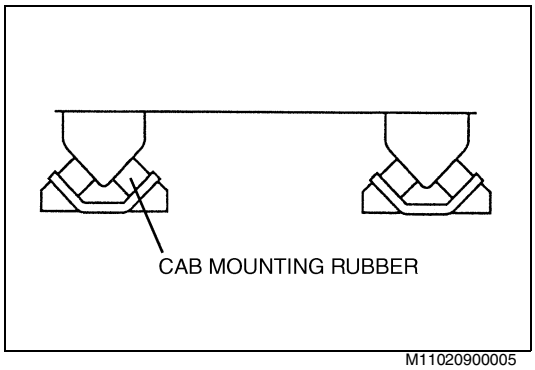
Position	Related parts	Dimensions
A: Eye bolt, crank pin off set	* Mark bolts	9-13 {0.36-0.51}
B: Tilt latch, pin clearance	Tilt latch adjusting bolt	3-6 {0.12-0.23}
C: Hook, eye bolt clearance	Mounting member attaching bolt	12-22 {0.48-0.86}
D: Hook, eye bolt clearance	Mounting member attaching bolt	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}



M11020900004

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.

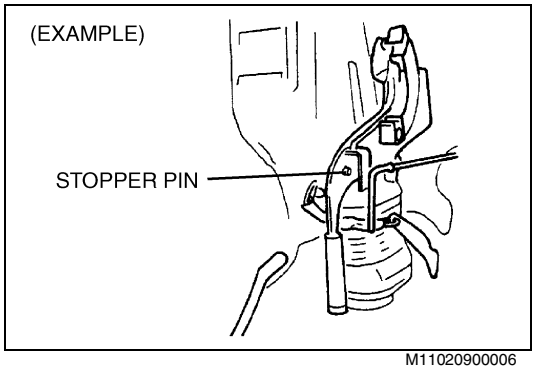


M11020900005

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.

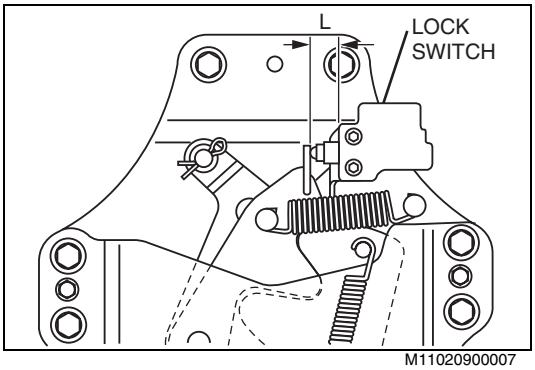


M11020900006

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.

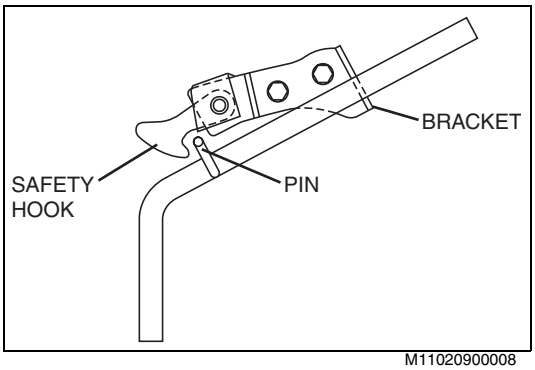


M11020900007

DOUBLE CAB

1. CAB LOCK SWITCH ADJUSTMENT

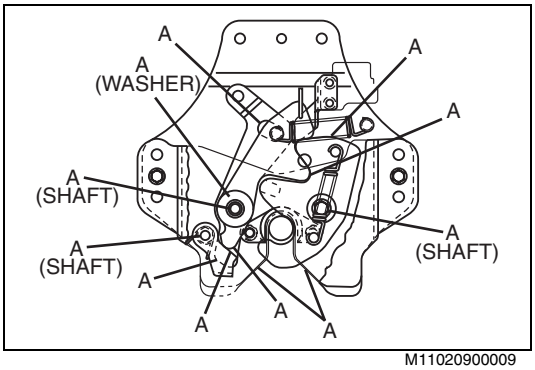
(1) Adjust the dimension L in the elongated hole of the switch, when the cab is locked position.
Tighten the installing nuts to the specified torque.
Dimension L: 19-21 mm {0.748-0.826 in.}



M11020900008

2. SAFETY HOOK ADJUSTMENT

(1) The lock position of the safety hook shall be adjusted so that the cab lock switch can not become "ON" with the safety hook and the pin in a free play state.



M11020900009

3. LUBRICATION

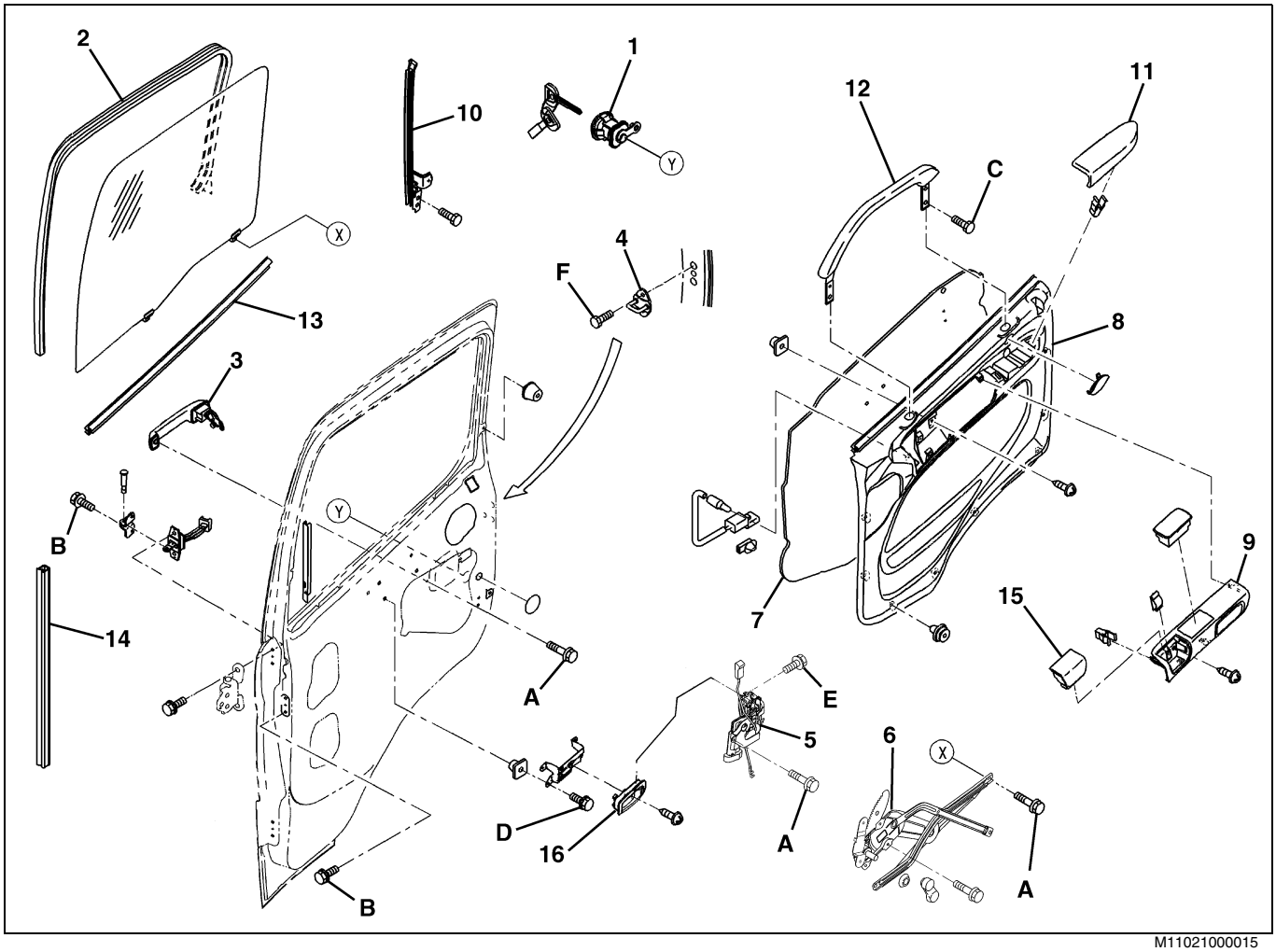
(1) Apply chassis grease to "A" position.

DOOR

COMPONENT LOCATOR

M11021001BED1002

(FRONT DOOR)



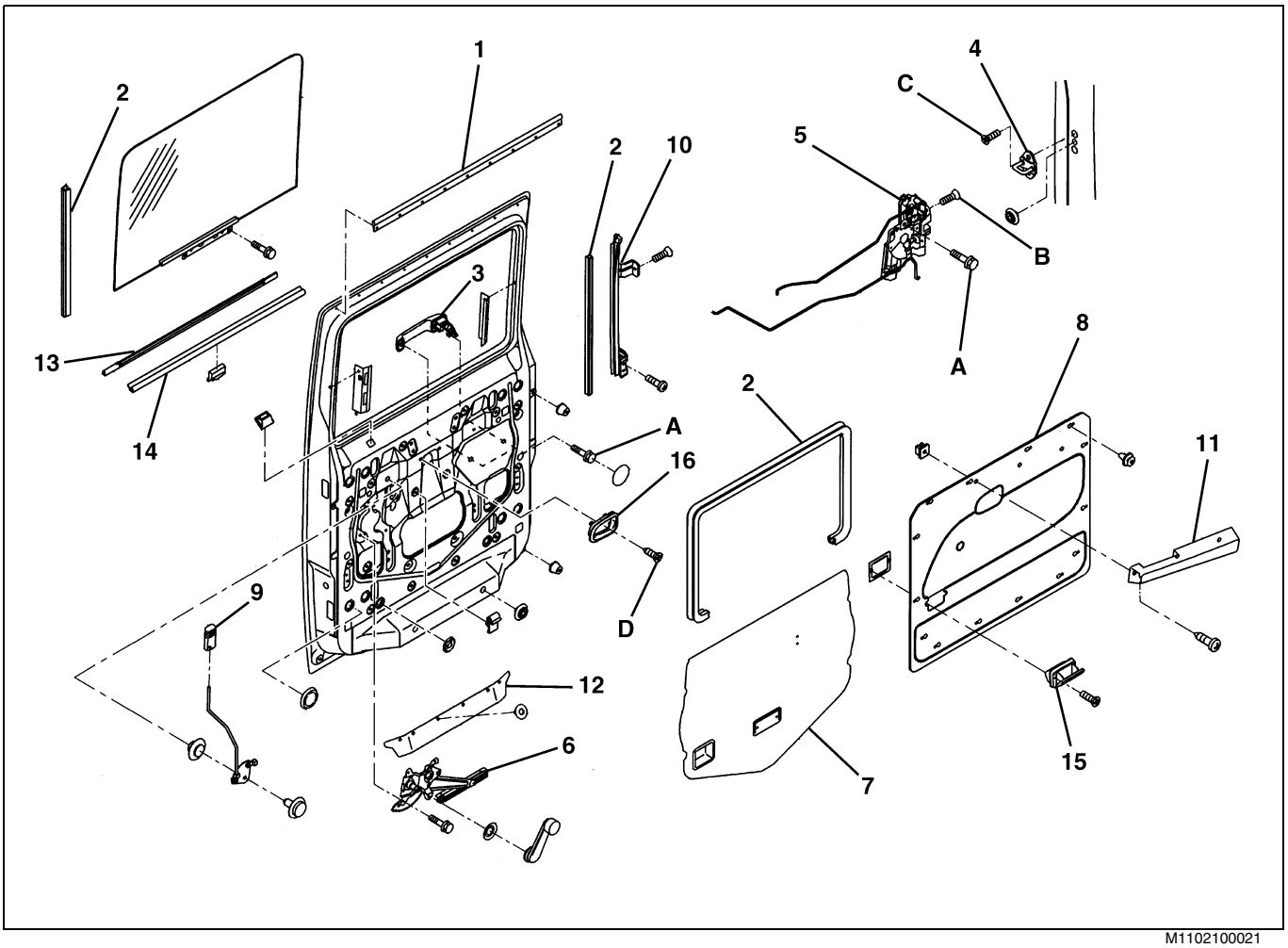
M11021000015

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

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

A	4.4-6.6 {45-67, 3.3-4.8}	D	2.0-3.0 {20-30, 1.5-2.1}
B	7.2-10.8 {74-110, 5.4-7.9}	E	7.2-10.8 {74-110, 5.4-7.9}
C	10.8-20.2 {110-206, 8.0-14.8}	F	18-26 {184-264, 13.3-19.0}

(REAR DOOR)



M1102100021

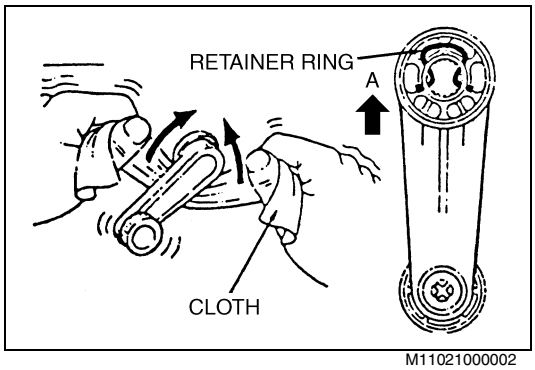
1	Roof side weather strip	9	Knob
2	Grass run weather strip	10	Door frame
3	Outside handle	11	Armrest
4	Striker	12	Splash board
5	Door lock	13	Outer oscillate-proof
6	Regulator	14	Inner oscillate-proof
7	Inside hole cover	15	Ashtray
8	Inside trim	16	Inside handle

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

A	4.4-6.6 {45-67, 3.3-4.8}	C	18-26 {184-264, 13.3-19.0}
B	7.2-10.8 {74-110, 5.4-7.9}	D	2.0-3.0 {20-30, 1.5-2.1}

OVERHAUL

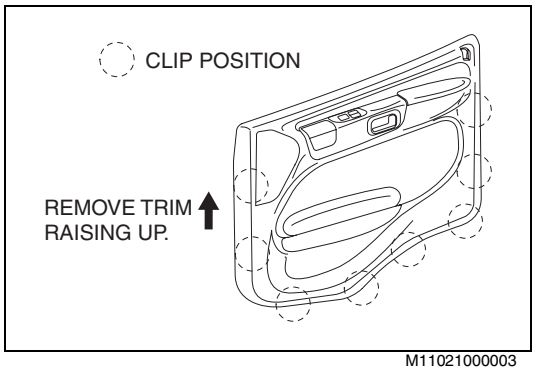
M11021001BEH2002



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.

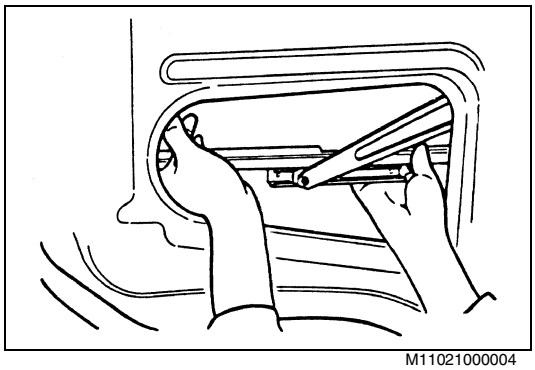


M11021000003

2. REMOVE INSIDE TRIM.

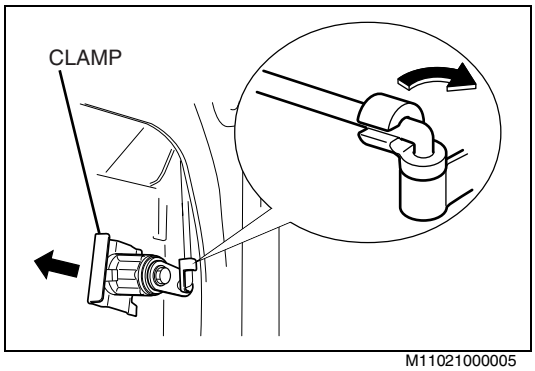
(1) Remove the parts below in the listed.
(Refer to the DOOR COMPONENT LOCATOR)
   a. Ashtray
   b. Armrest
   c. Inside upper trim
   d. Inside handle case

(2) Pull off the inside trim.


M11021000004

3. REMOVE WINDOW.

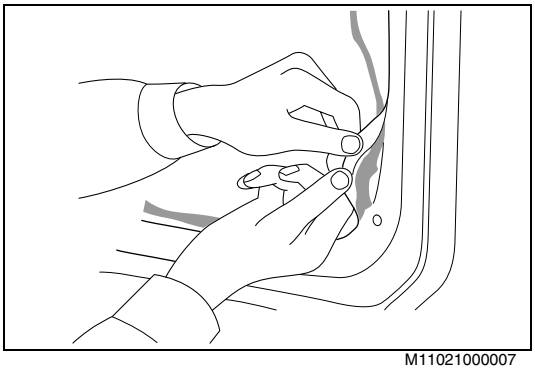
(1) Disconnect regulator from window channel.



M11021000005

4. REMOVE DOOR LOCK.

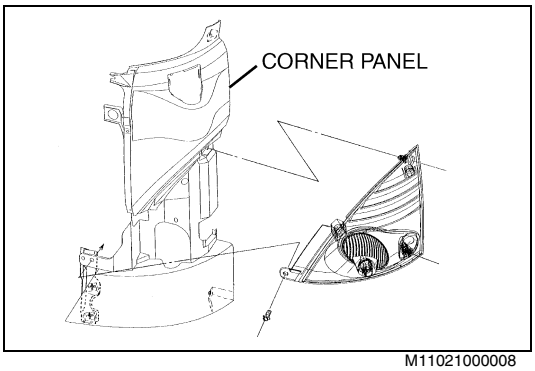
(1) Disconnect the lock cylinder from the door lock.
(2) Remove the lock cylinder.
(3) Remove the door lock with rods.


M11021000007

5. SERVICE HOLE COVER AND REGULATOR INSTALLING

(1) Stick butyl rubber tape along lower tangent line of the drain hole of the door.

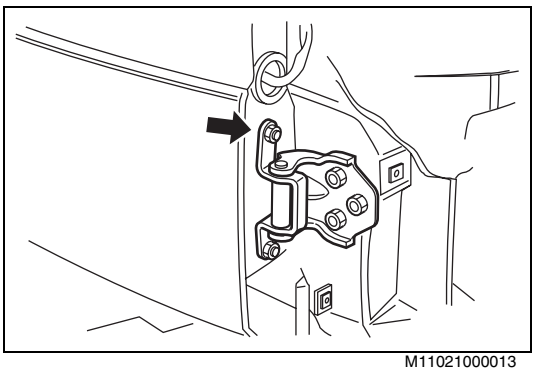
(2) Insert the regulator handle with retainer ring into the regulator.



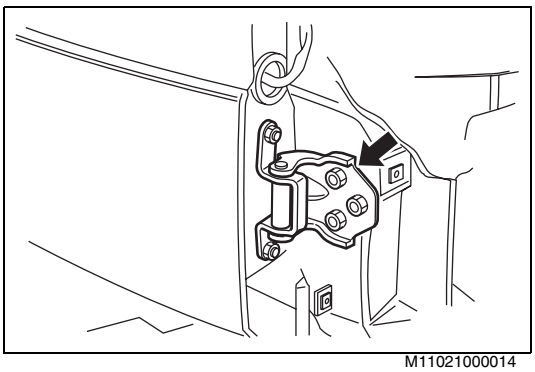
M11021000008

6. DOOR HINGE ADJUSTMENT

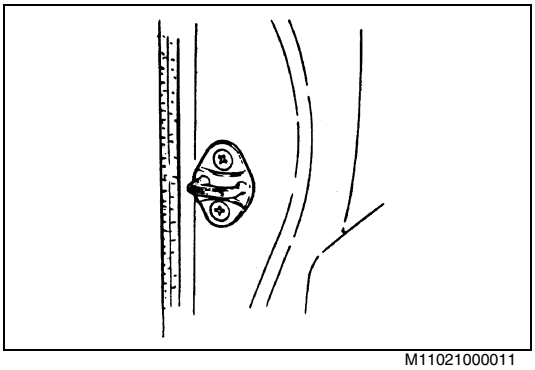
(1) Remove the corner panel.


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

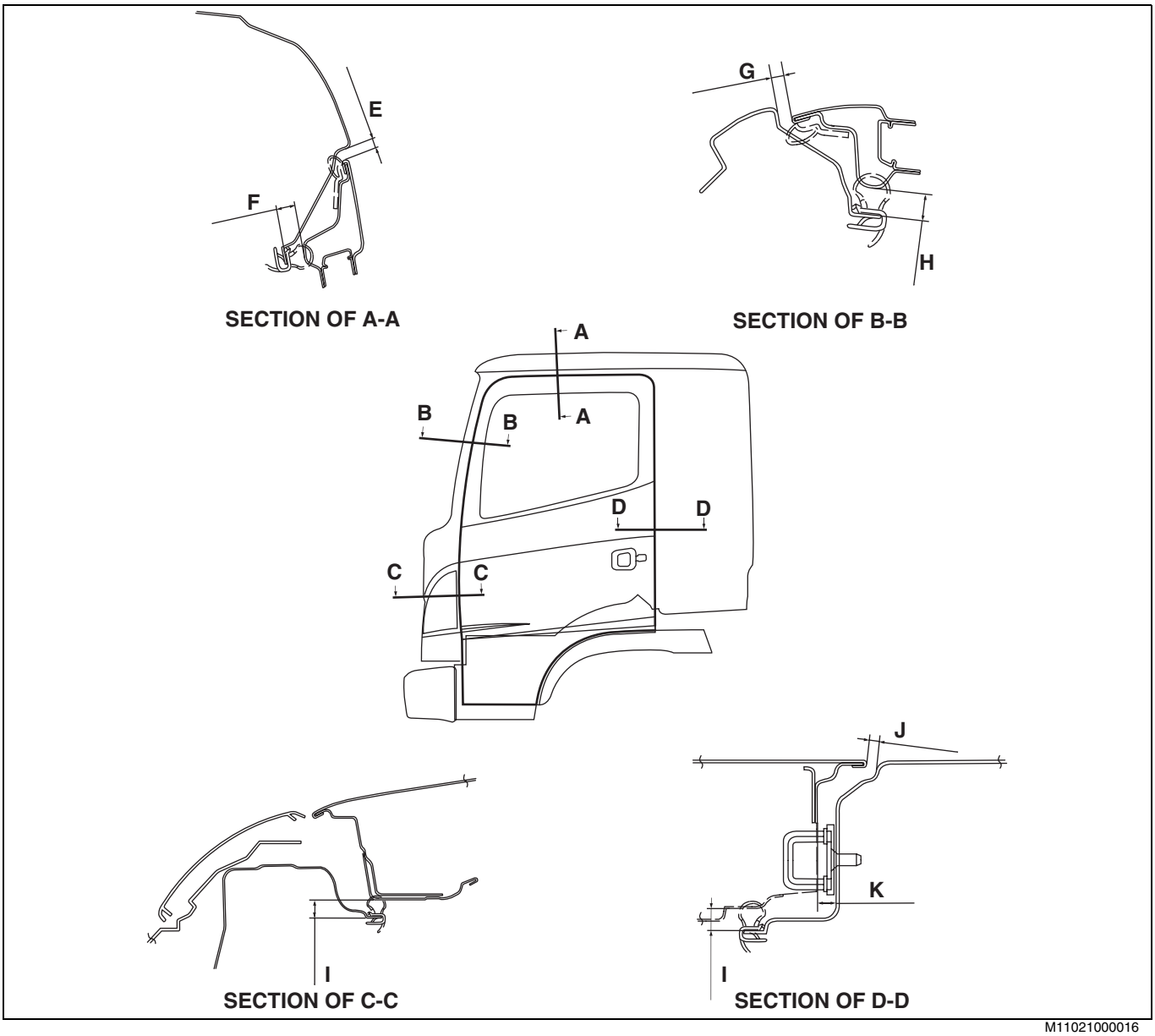
7. STRIKER ADJUSTMENT

(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.

CLEARANCES BETWEEN BODY AND FRONT DOOR

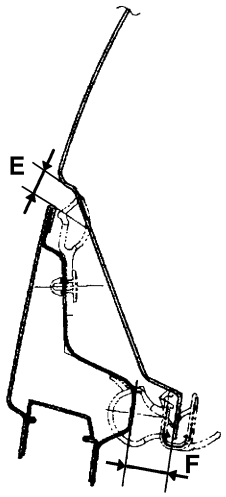


M11021000016

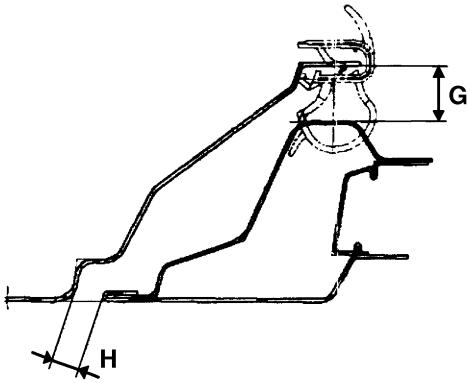
Unit: mm {in.}

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}		

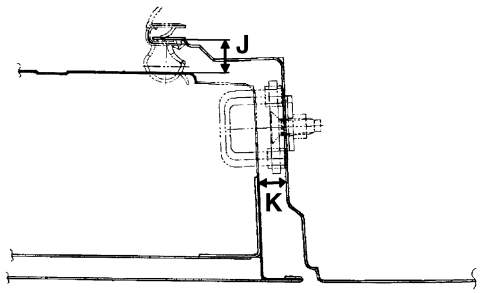
CLEARANCES BETWEEN BODY AND REAR DOOR



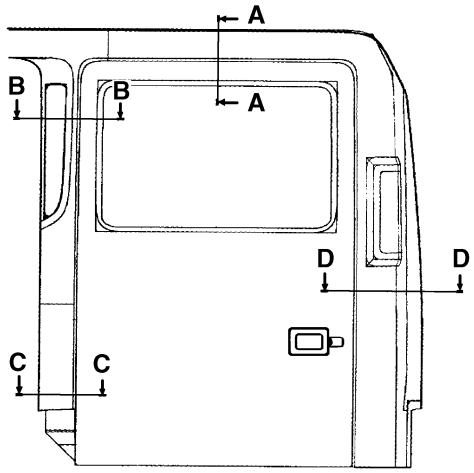
SECTION OF A-A

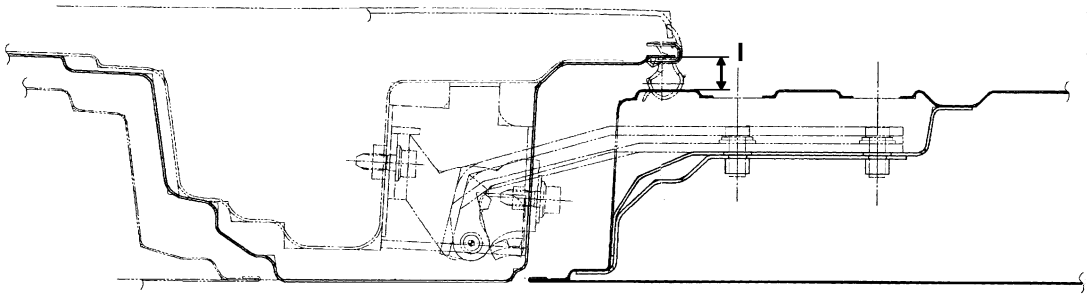


SECTION OF B-B



SECTION OF D-D





SECTION OF C-C

M11021000020

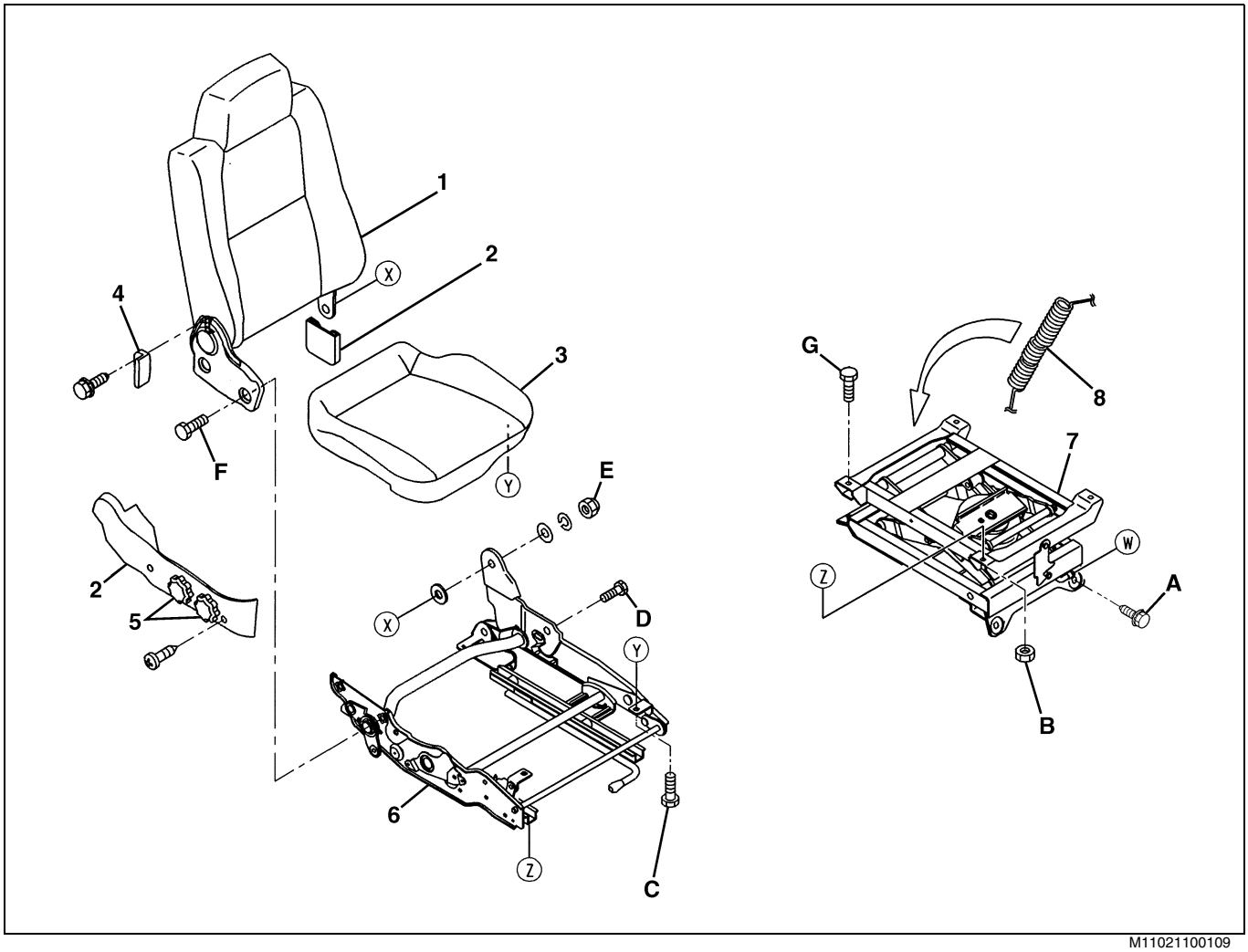
E	7.8 {0.31}	I	14.4-18.4 {0.57-0.72}
F	12.5-16.5 {0.50-0.64}	J	14.5-18.5 {0.58-0.72}
G	12.5-16.5 {0.50-0.64}	K	11.2-15.2 {0.45-0.59}
H	7.4 {0.29}	L	5.6-8.6 {0.23-0.33}

SEAT

COMPONENT LOCATOR

M11021101BED1004

DRIVER'S SEAT



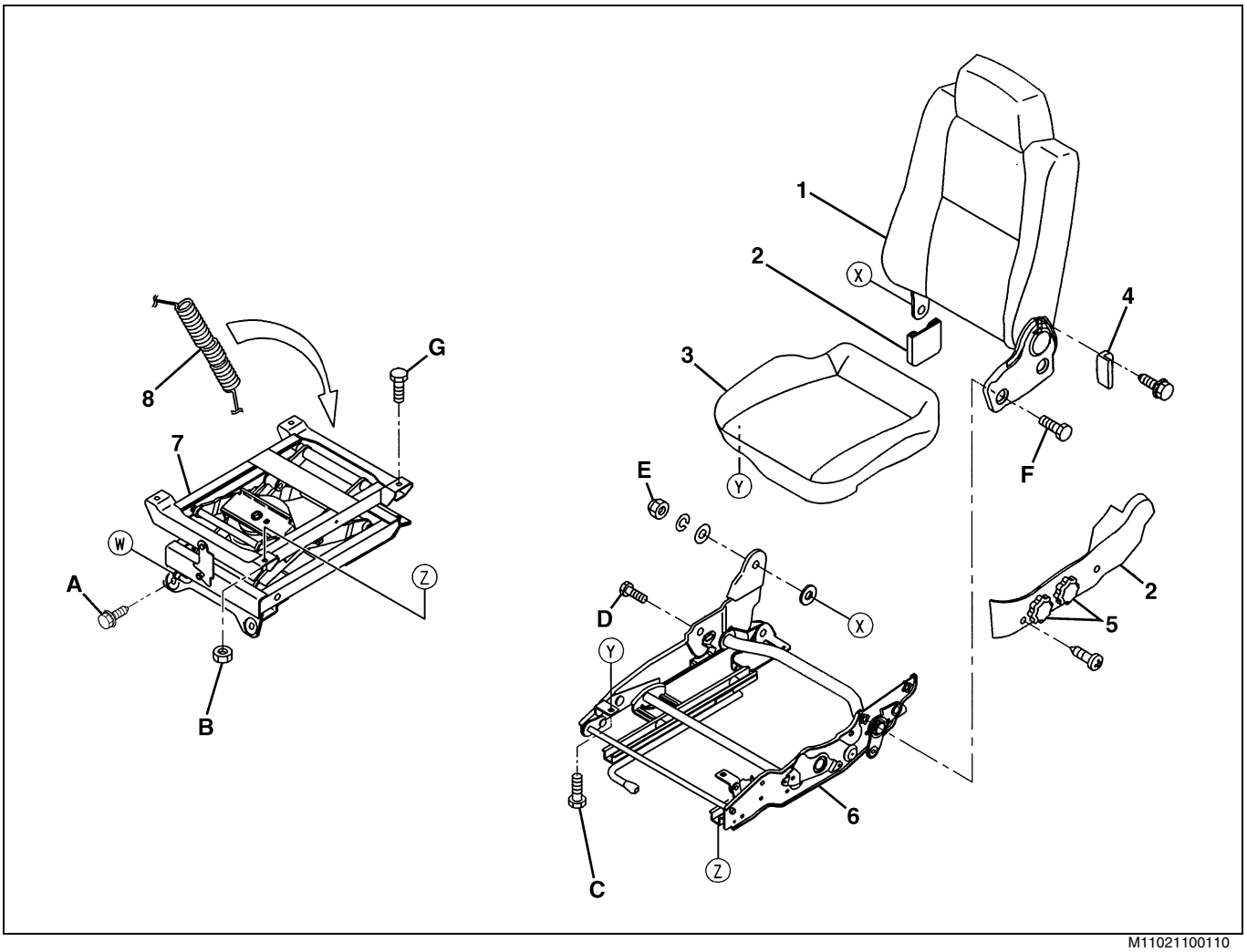
M11021100109

1	Seat back	5	Seat tilt adjuster handle
2	Seat back cover	6	Seat adjuster (If so equipped)
3	Seat cushion	7	Seat suspension (If so equipped)
4	Seat reclining lever	8	Wire (If so equipped)

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

A	17.5-32.5 {179-331, 13-23}	E	11.8-14.7 {120-150, 9-11}
B	27.1-41.0 {280-420, 20-30}	F	40.1-53.9 {410-550, 30-40}
C	20.5-34.3 {210-350, 15-25}	G	40.1-53.9 {410-550, 30-40}
D	20.5-34.3 {210-350, 15-25}		

ASSISTANT'S SEAT



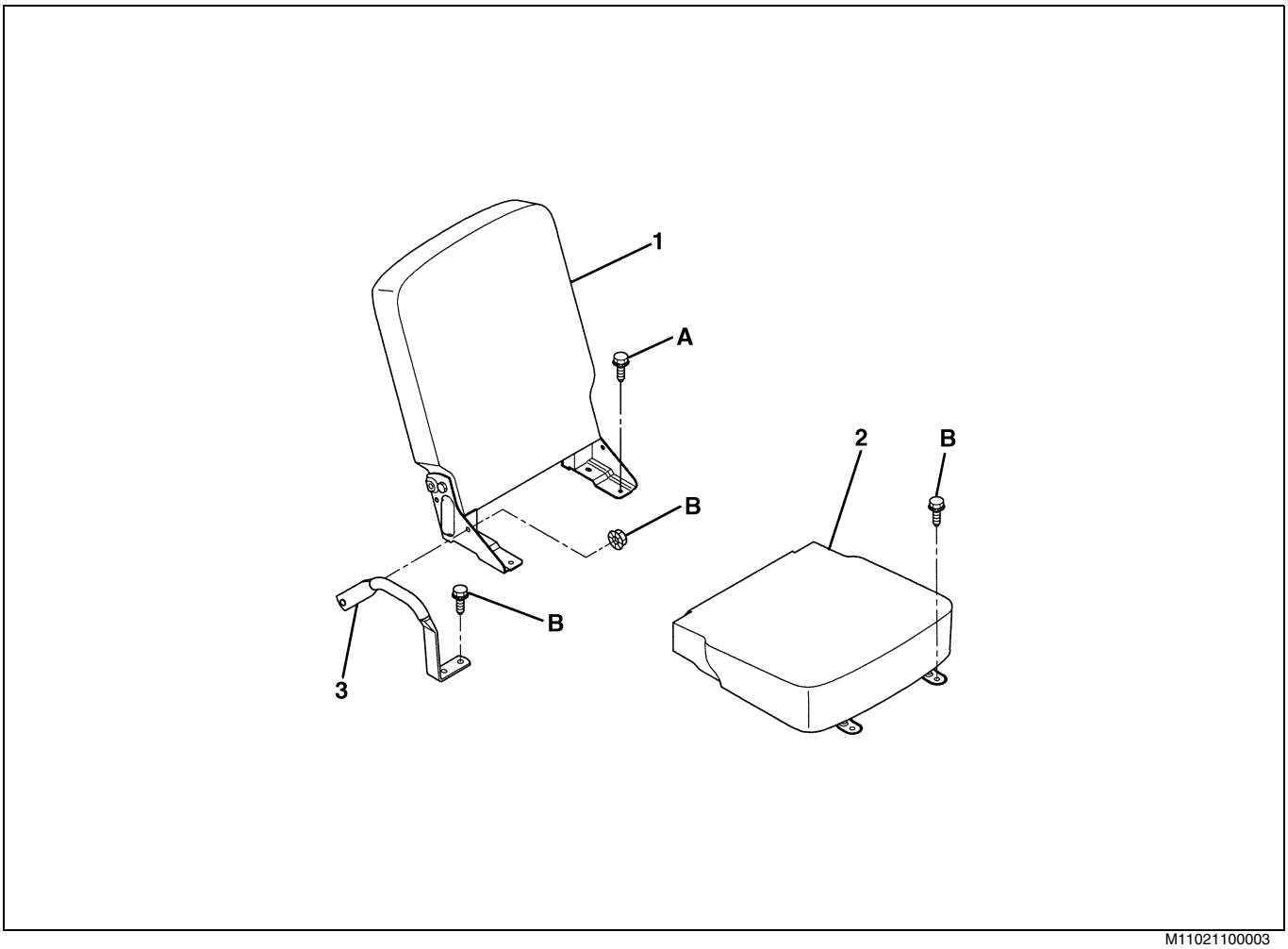
M11021100110

1	Seat back	5	Seat tilt adjuster handle
2	Seat back cover	6	Seat adjuster (If so equipped)
3	Seat cushion	7	Seat suspension (If so equipped)
4	Seat reclining lever	8	Wire (If so equipped)

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

A	17.5-32.5 {179-331, 13-23}	E	11.8-14.7 {120-150, 9-11}
B	27.1-41.0 {280-420, 20-30}	F	40.1-53.9 {410-550, 30-40}
C	20.5-34.3 {210-350, 15-25}	G	40.1-53.9 {410-550, 30-40}
D	20.5-34.3 {210-350, 15-25}		

CENTER SEAT (IF SO EQUIPPED)



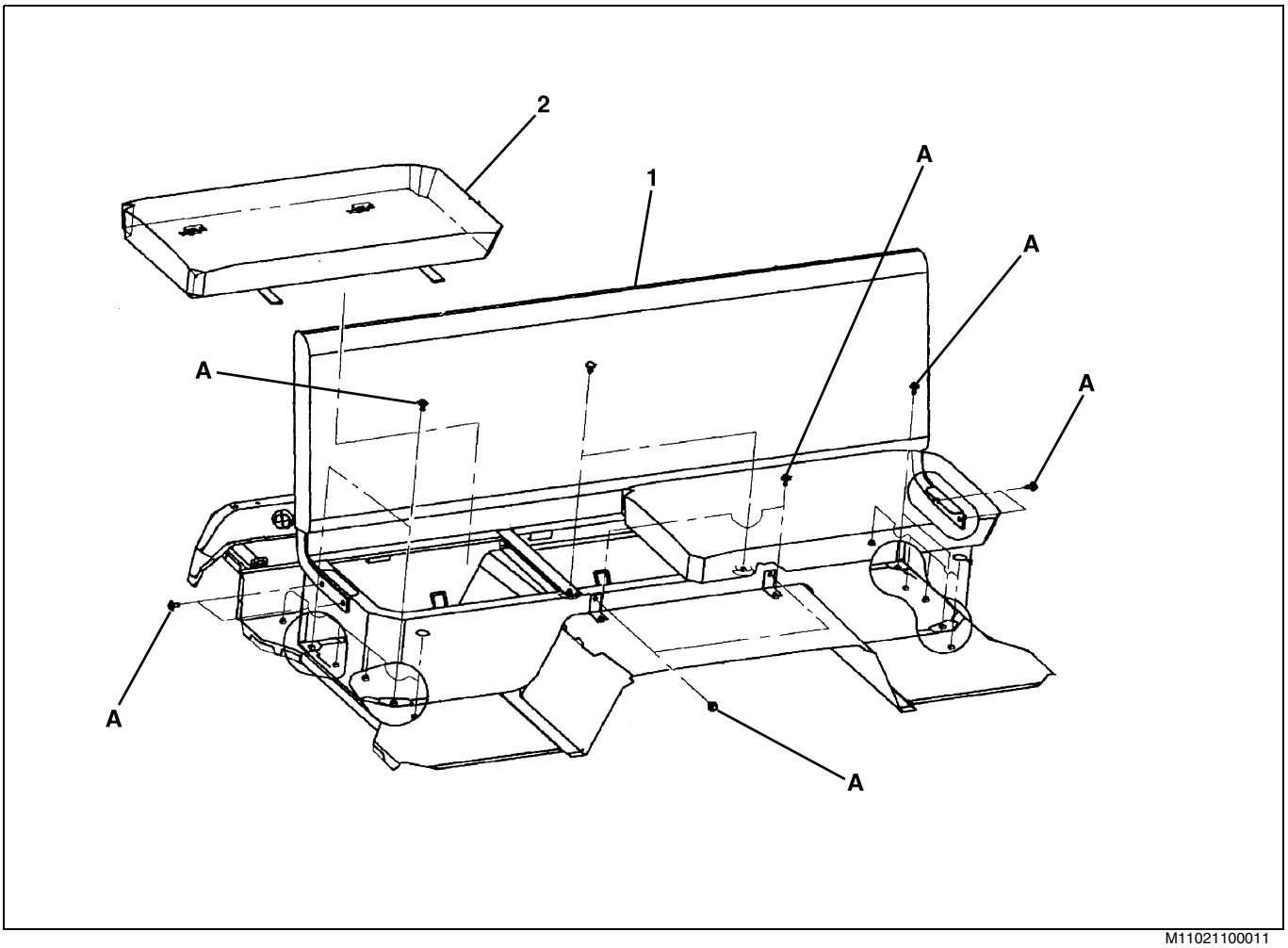
M11021100003

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}

REAR SEAT (IF SO EQUIPPED)



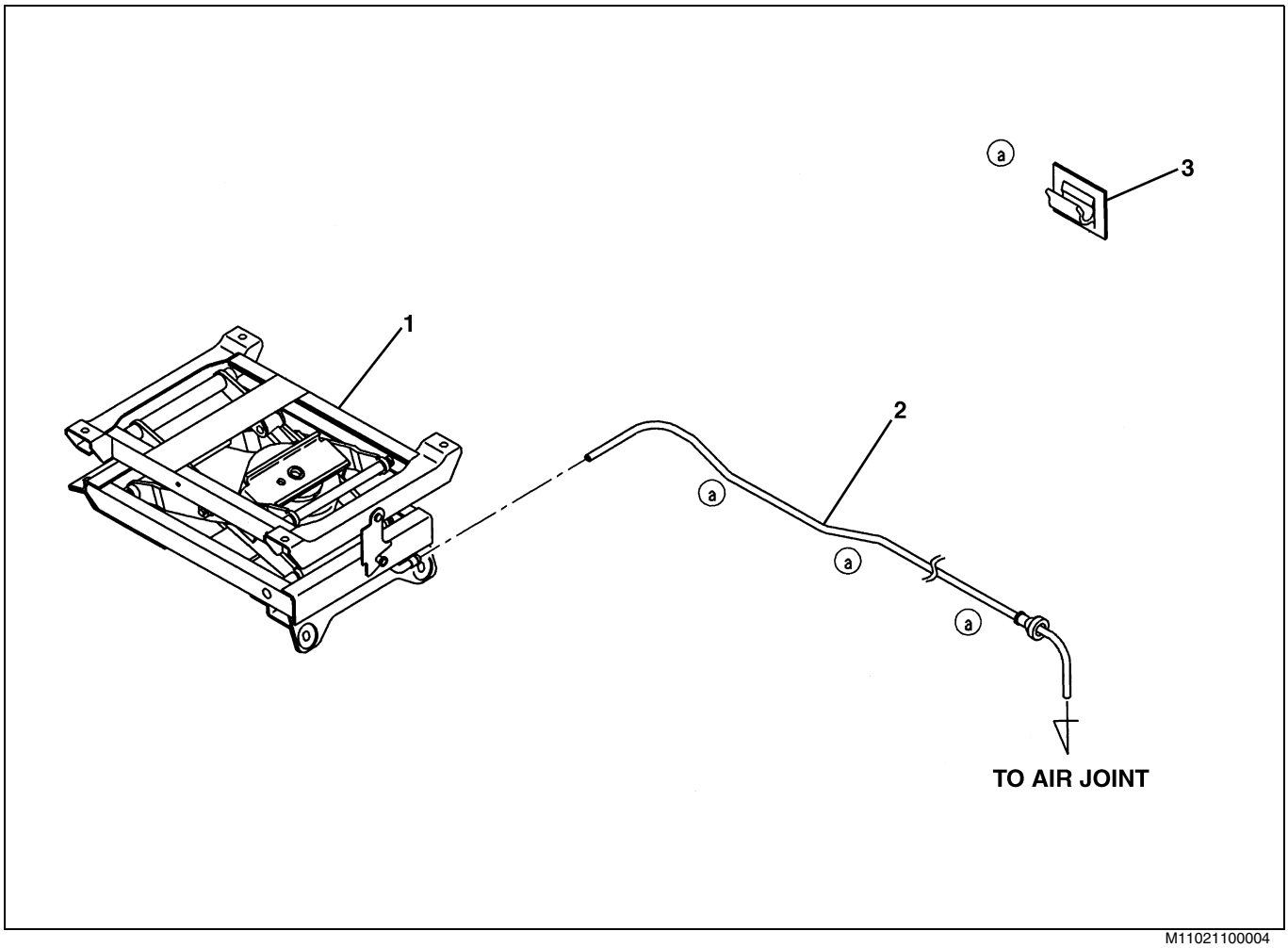
M11021100011

1 Seat back	2 Cushion

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

A 17.5-32.5 {179-331, 13-23}	

AIR SUSPENSION SEAT (IF SO EQUIPPED)

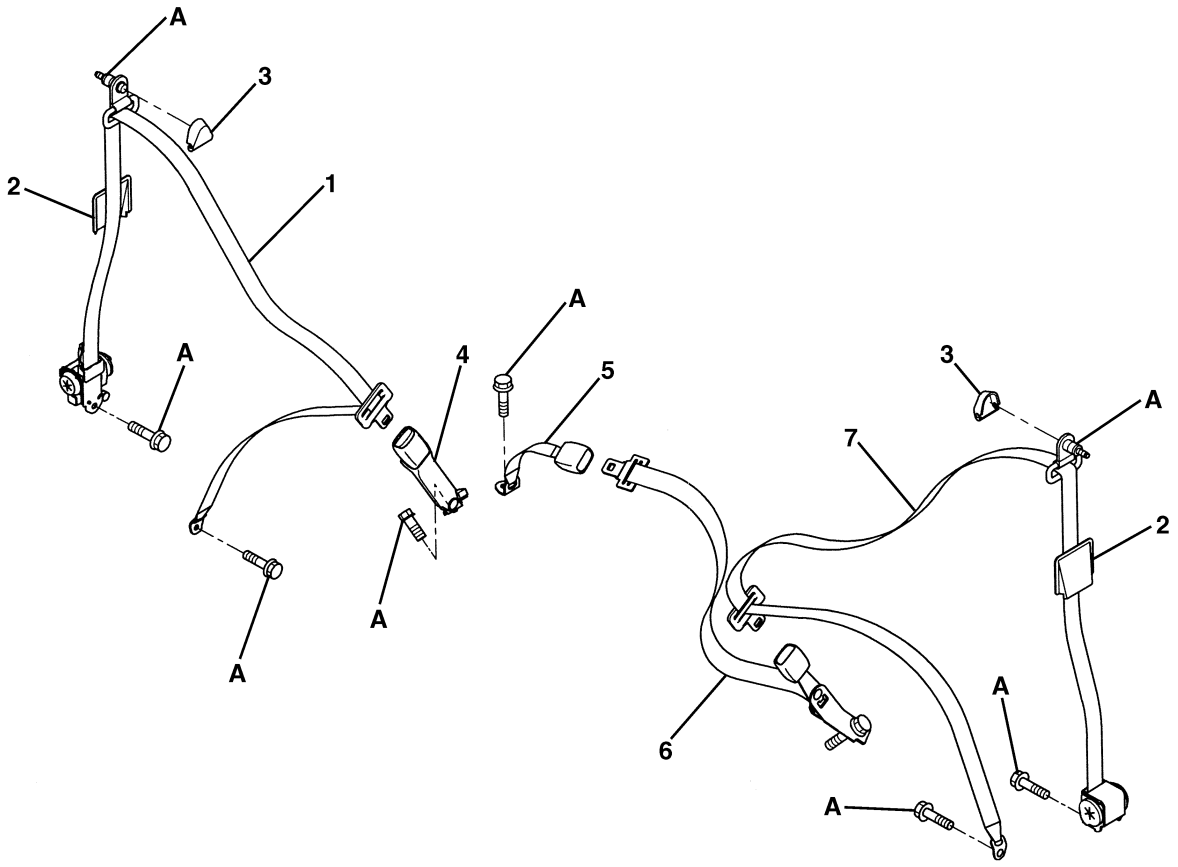


M11021100004

1	Seat suspension	3	Clip
2	Air hose		

SEAT BELT (FRONT)

(REPRESENTATIVE TYPE)



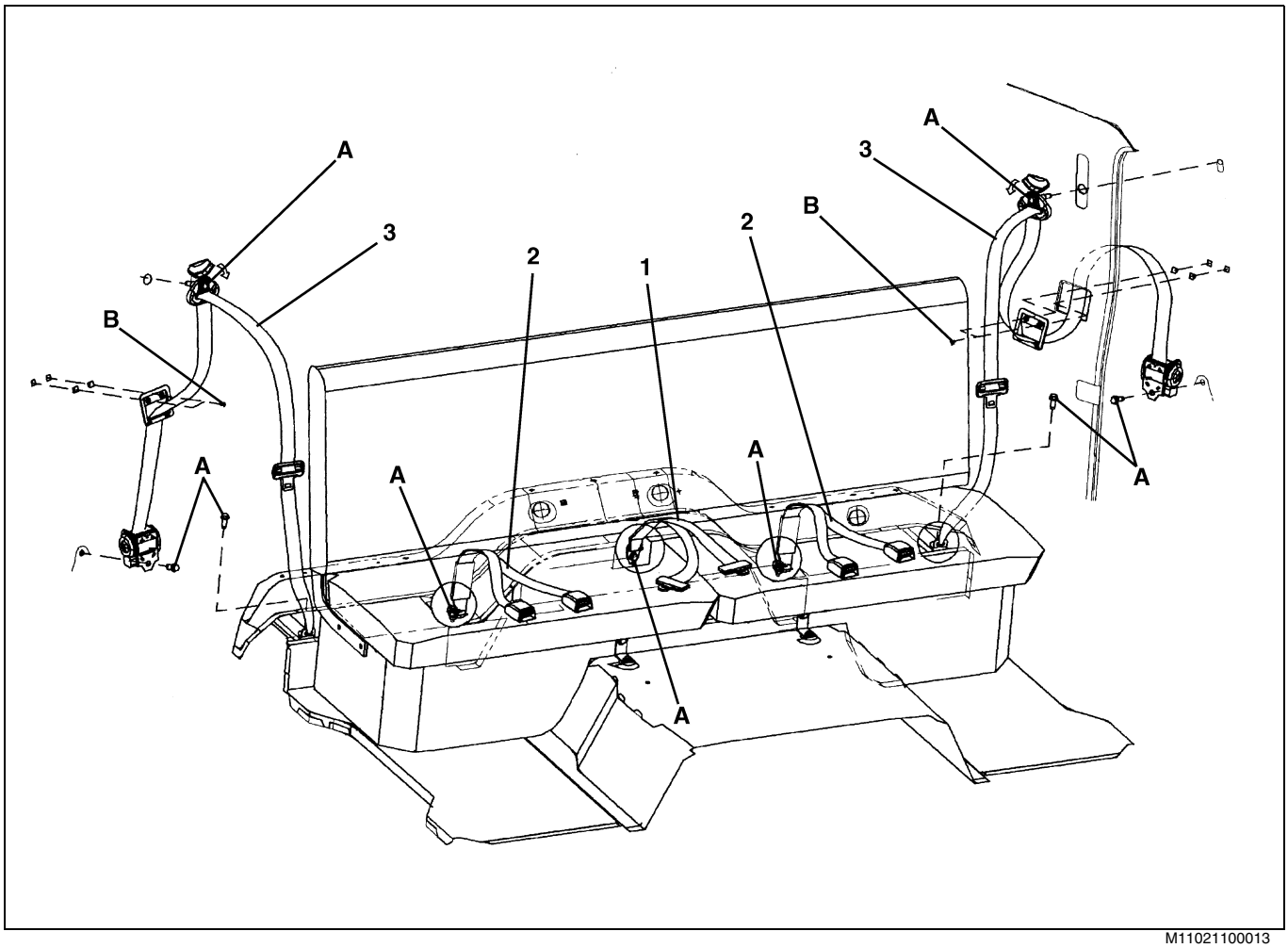
M11021100012

1	Outer seat belt (Driver's seat)	5	Center seat belt
2	Seat belt guide	6	Inner seat belt (Assistant's seat)
3	Seat belt cover	7	Outer seat belt (Assistant's seat)
4	Inner seat belt (Driver's seat)		

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

A	29-55 {296-560, 22-40}		

SEAT BELT (REAR)



M11021100013

1	Center seat belt	3	Outside seat belt
2	Middle seat belt		

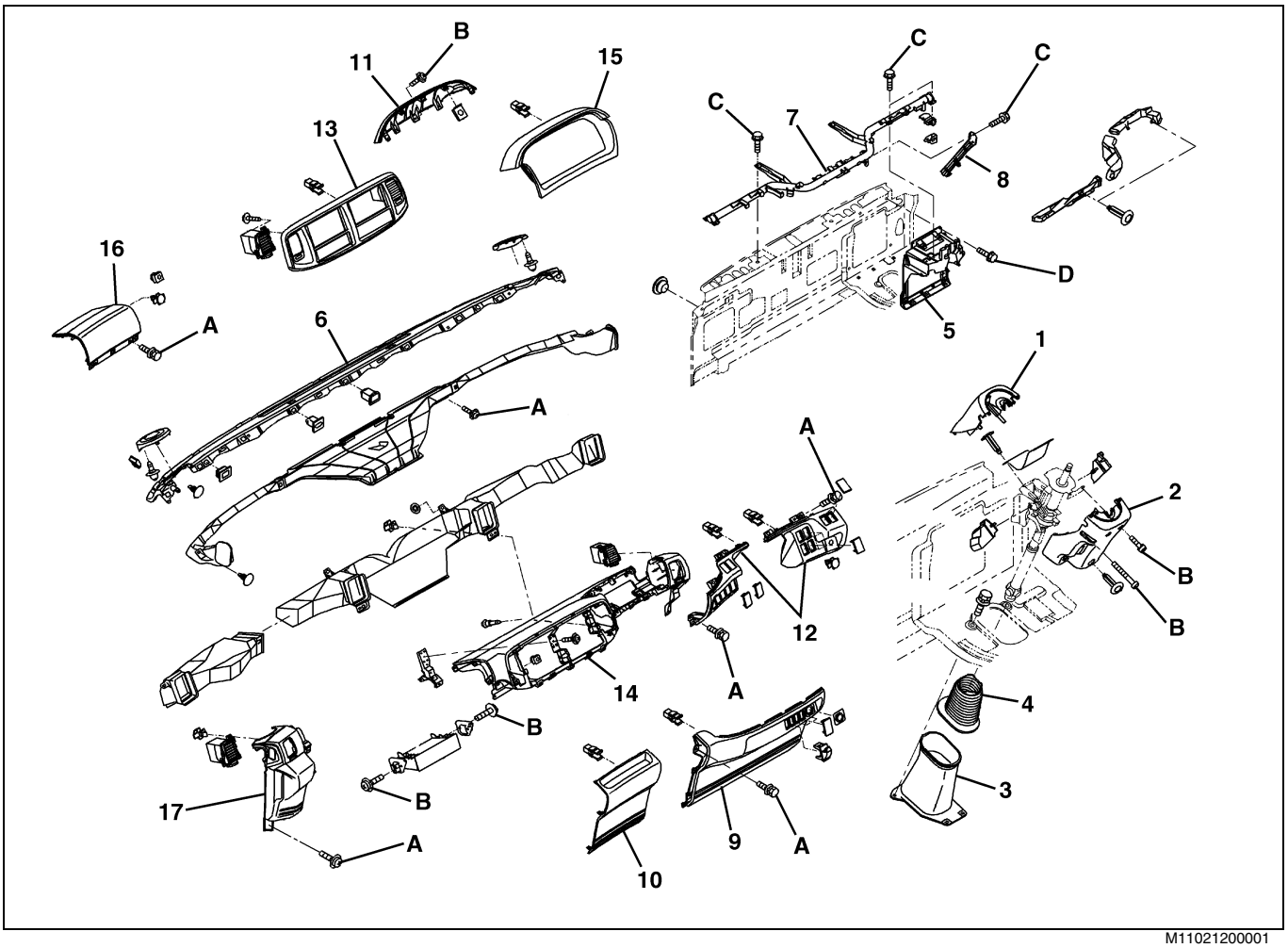
Tightening torque **Unit: N·m {kgf·cm, lbf·ft}**

A	29-55 {296-560, 22-40}	B	4.5-10.5 {46-107, 3.3-7.7}

INSTRUMENT PANEL

COMPONENT LOCATOR

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}**

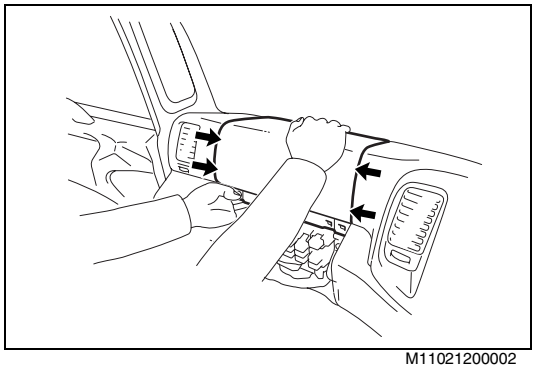
A	2.8-3.2 {29-32, 2.1-2.3}	C	7.5-16.5 {77-168, 5.6-12.1}
B	1.5-2.5 {16-25, 1.2-1.8}	D	9.5-16.5 {96-168, 7.0-12.1}

DISMOUNTING AND MOUNTING

M11021201BEH1001

1. BEFORE REMOVE THE INSTRUMENT PANEL.

(1) Disconnect the battery cable from the battery ground terminal.



M11021200002

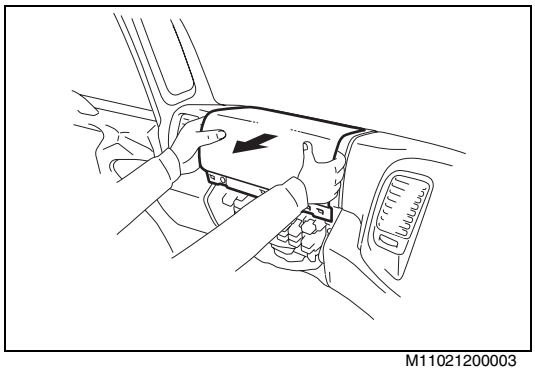
2. REMOVE THE UPPER LEFT COVER.

(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.

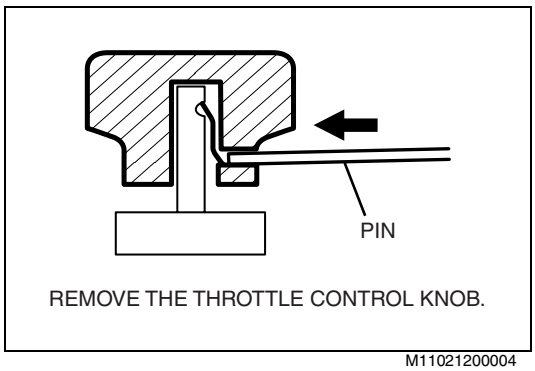
CAUTION:

- **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.

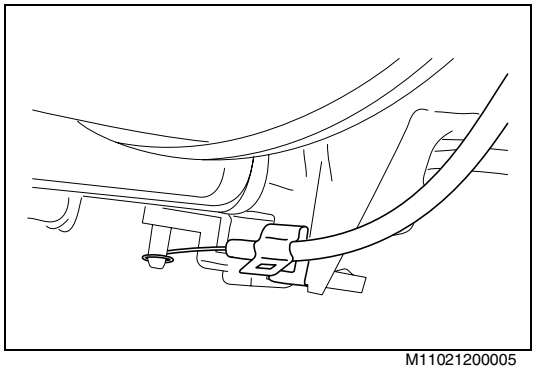
M11021200004

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.

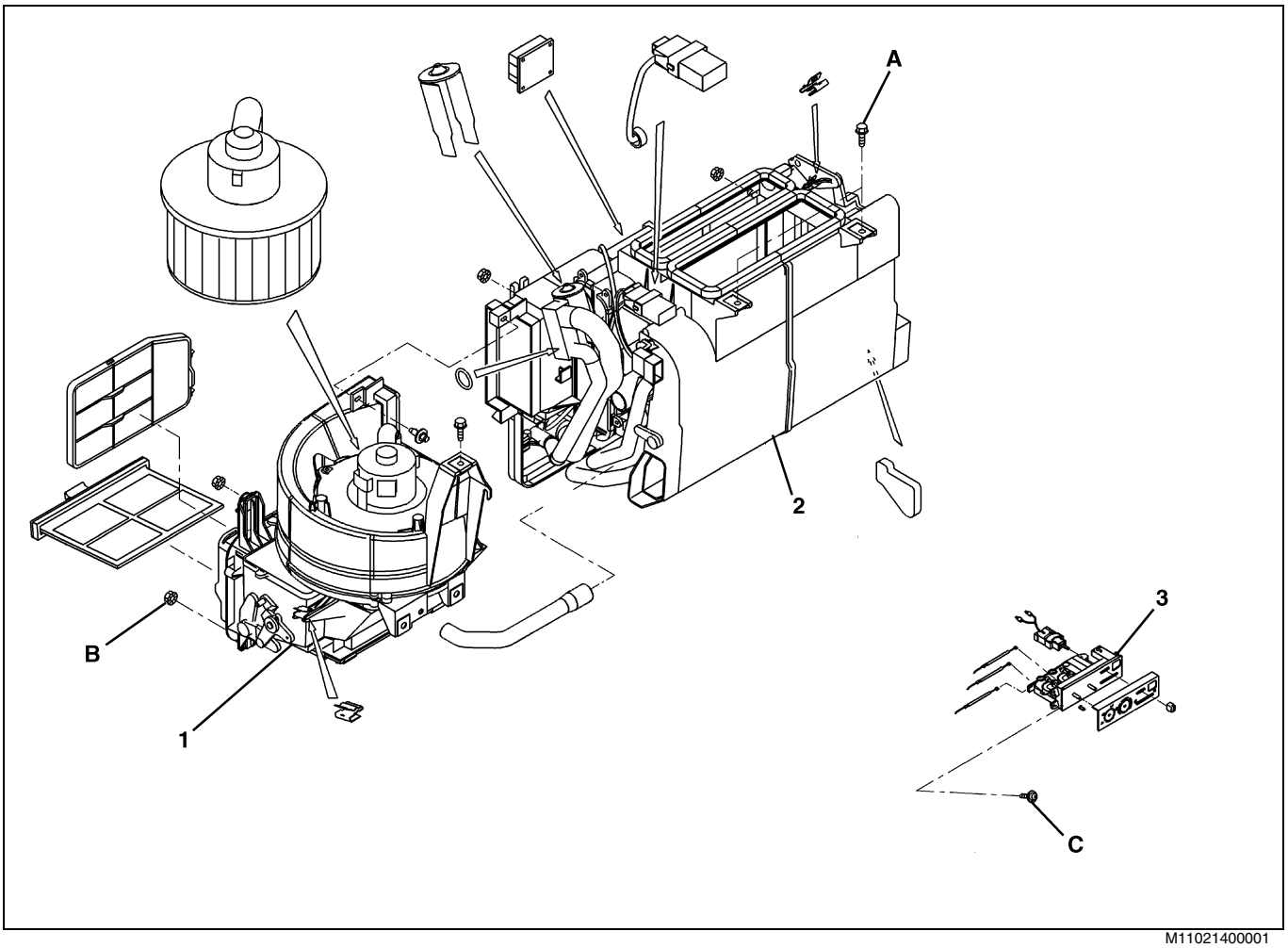
(1) Remove the cable of the blower part.

(2) Loosen the bolt to remove the instrument panel cluster.

HEATER AND AIR CONDITIONER

COMPONENT LOCATOR

M11021301BED1001



M11021400001

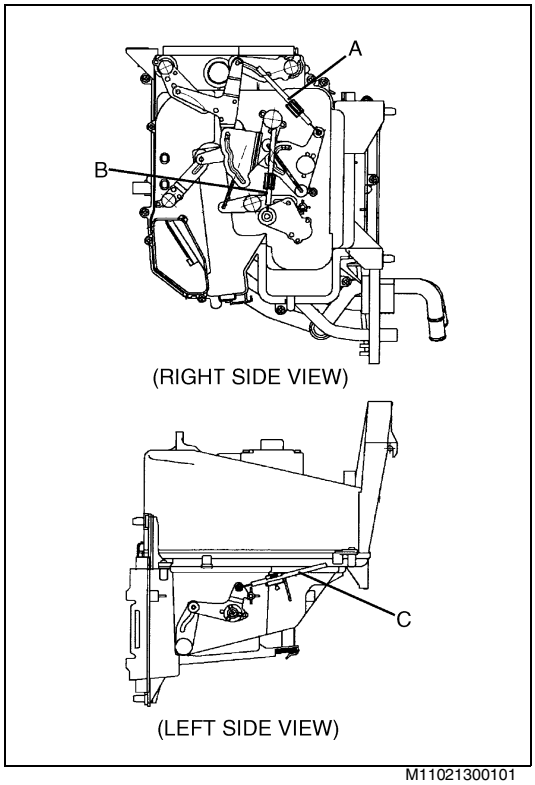
1	Blower assembly	3	Control panel assembly
2	Air conditioner assembly		

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



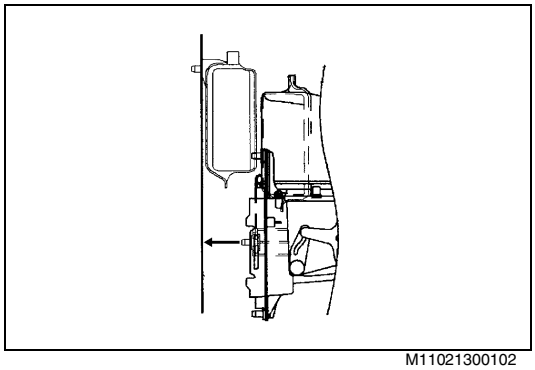
M11021300101

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.**

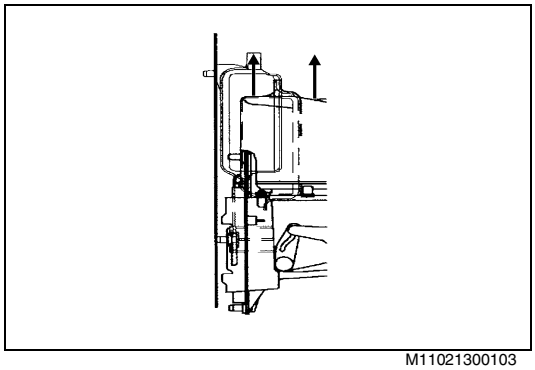
Cable	Color	Position
A: Mode switch	GRAY	FACE
B: Temperature control	BLACK	MAX COOL
C: Inside and outside air switch	NATURAL	INSIDE



M11021300102

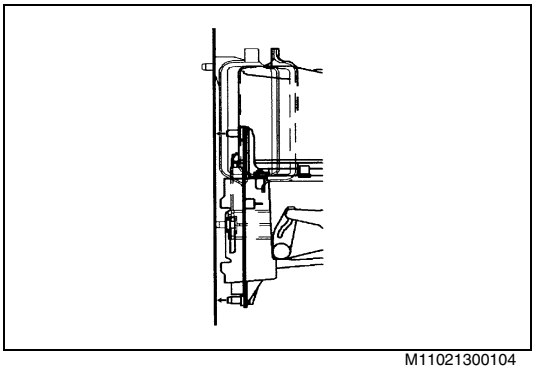
1. MOUNTING BLOWER ASSEMBLY.

(1) Blower assembly lower than installation hole, 15 mm and hold to dash panel.



M11021300103

(2) Blower assembly lift 15 mm.



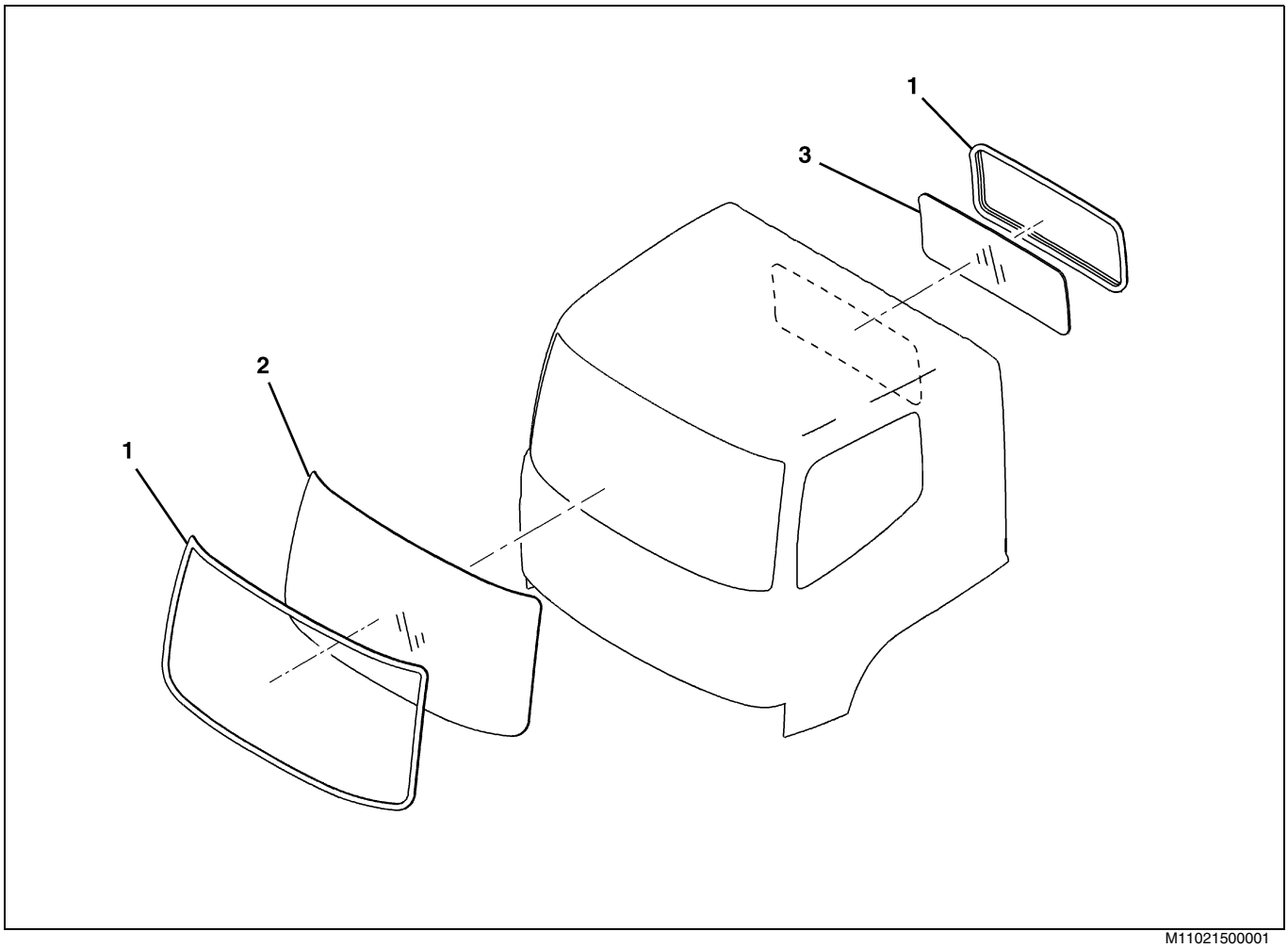
M11021300104

(3) Blower assembly shift to vehicle front way and fit with installation hole.

WINDSHIELD

COMPONENT LOCATOR

M11021501BED1001



M11021500001

1	Weatherstrip	3	Back wind
2	Windshield glass		

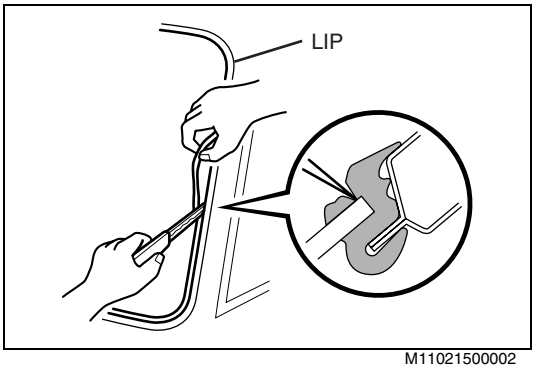
REPLACEMENT

M11021501BEH1001

1. BEFORE REPLACE THE WINDSHIELD.

(1) Remove the windshield wiper.

2. REMOVE THE WINDSHIELD.

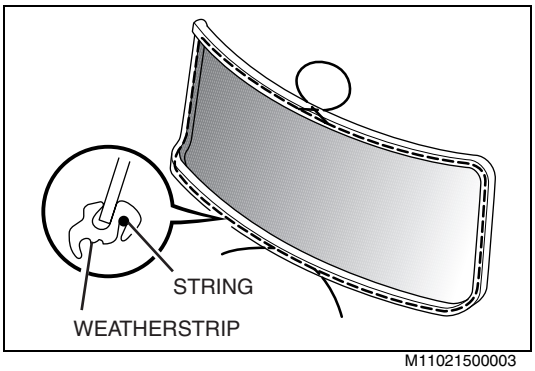


M11021500002

(1) Cut the lip of the weatherstrip with a knife.

(2) The windshield is heavy so remove it using at least two persons.

3. MOUNTING THE WINDSHIELD.

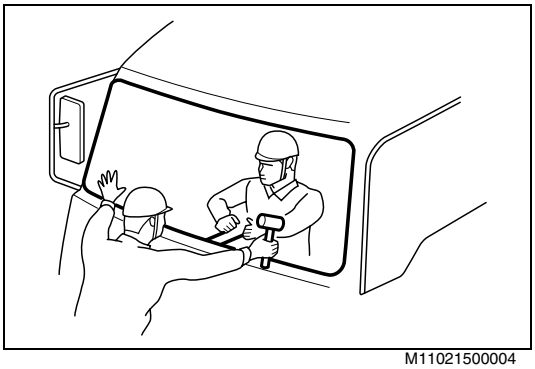


M11021500003

(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.

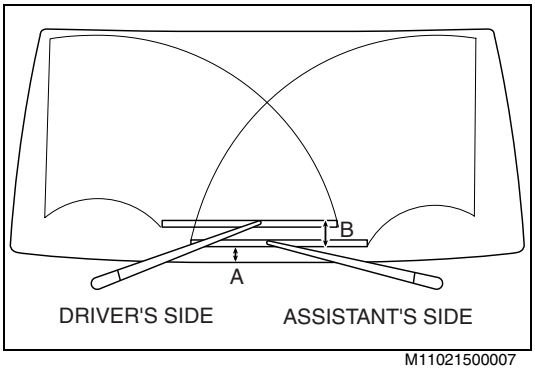
(6) After install the glass properly, knock the glass from inside and outside.

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}



M11021500007

ELECTRICAL EQUIPMEMT

EL01-001

ELECTRICAL PARTS

DATA AND SPECIFICATIONS

M12010101BEI2001

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	25/10W
Back up lamp	21W
License plate lamp	5W
Roof marker lamp	5W

GAUGE TYPE

Fuel	Coil type
Coolant temperature	Coil type
Tachometer	Coil type
Speedometer	Coil type
Air pressure	Coil type

COMPONENT LOCATOR

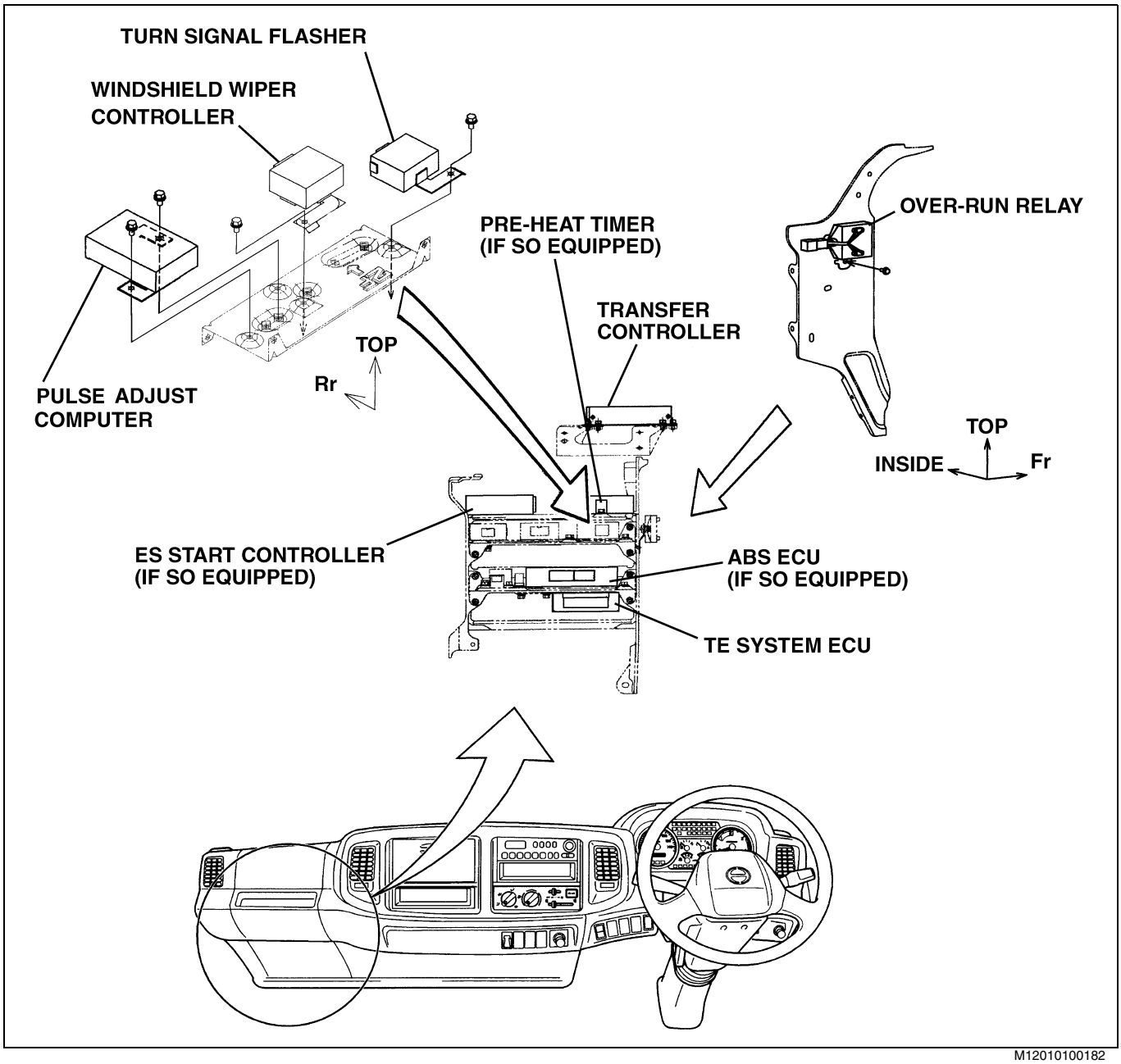
M12010101BED1001

PARTS INSTALLED POSITION

PARTS	INSTALLED POSITION	PARTS	INSTALLED POSITION
HEAD LAMP RELAY (HIGH,LOW)	RELAY PANEL	DC-DC CONVERTER (FOR SPARE POWER SOURCE)	INSTRUMENT PANEL CENTER
POWER RELAY No.1,2,3,4		DC-DC CONVERTER (MODELS EQUIPPED WITH HEAD LAMP LEVELING CONTROL SWITCH)	
TAIL LAMP RELAY No.1,2		DOOR LOCK CONTROLLER (IF SO EQUIPPED)	
LAMP CHECK RELAY		TURN SIGNAL FLASHER	ECU RACK
ACTUATOR POWER RELAY		OVER-RUN RELAY	
ENGINE STOP MOTOR RELAY		WINDSHIELD WIPER CONTROLLER	
STOP LAMP RELAY		PULSE ADJUST COMPUTER	
FOG LAMP RELAY (IF SO EQUIPPED)		ABS ECU (IF SO EQUIPPED)	
HORN RELAY		ES START CONTROLLER (IF SO EQUIPPED)	
HEATER RELAY		TE SYSTEM ECU	
AIR CONDITIONER RELAY (IF SO EQUIPPED)		PRE-HEAT TIMER (IF SO EQUIPPED)	
AIR CONDITIONER CONDENSER RELAY (IF SO EQUIPPED)		TRANSFER CONTROLLER	
POWER ACCESSORY RELAY		ENGINE STOP ELECTRIC MOTOR	FRONT PANEL
ECU MAIN RELAY		WINDSHIELD WIPER MOTOR	
ABS WARNING LAMP RELAY (IF SO EQUIPPED)		WINDSHIELD WASHER MOTOR (WASHER JAR)	
ABS CONTROL VALVE RELAY (IF SO EQUIPPED)		ACCELERATOR PEDAL SWITCH	PEDAL BRACKET
EXHAUST BRAKE CUT RELAY (FOR ABS) (IF SO EQUIPPED)		CLUTCH PEDAL SWITCH	
CAB TILT UP RELAY (IF SO EQUIPPED)		CLUTCH STROKE SENSOR (IF SO EQUIPPED)	
CAB TILT DOWN RELAY (IF SO EQUIPPED)		STOP LAMP SWITCH	
TRANSMISSION P.T.O. RELAY (IF SO EQUIPPED)		COOLANT TEMPERATURE GAUGE SENDER UNIT	ENGINE
LO-HI INDICATOR LAMP RELAY (IF SO EQUIPPED)		OIL PRESSURE SWITCH	
REAR POWER WINDOW RELAY (IF SO EQUIPPED)		REVOLUTION SENSOR	

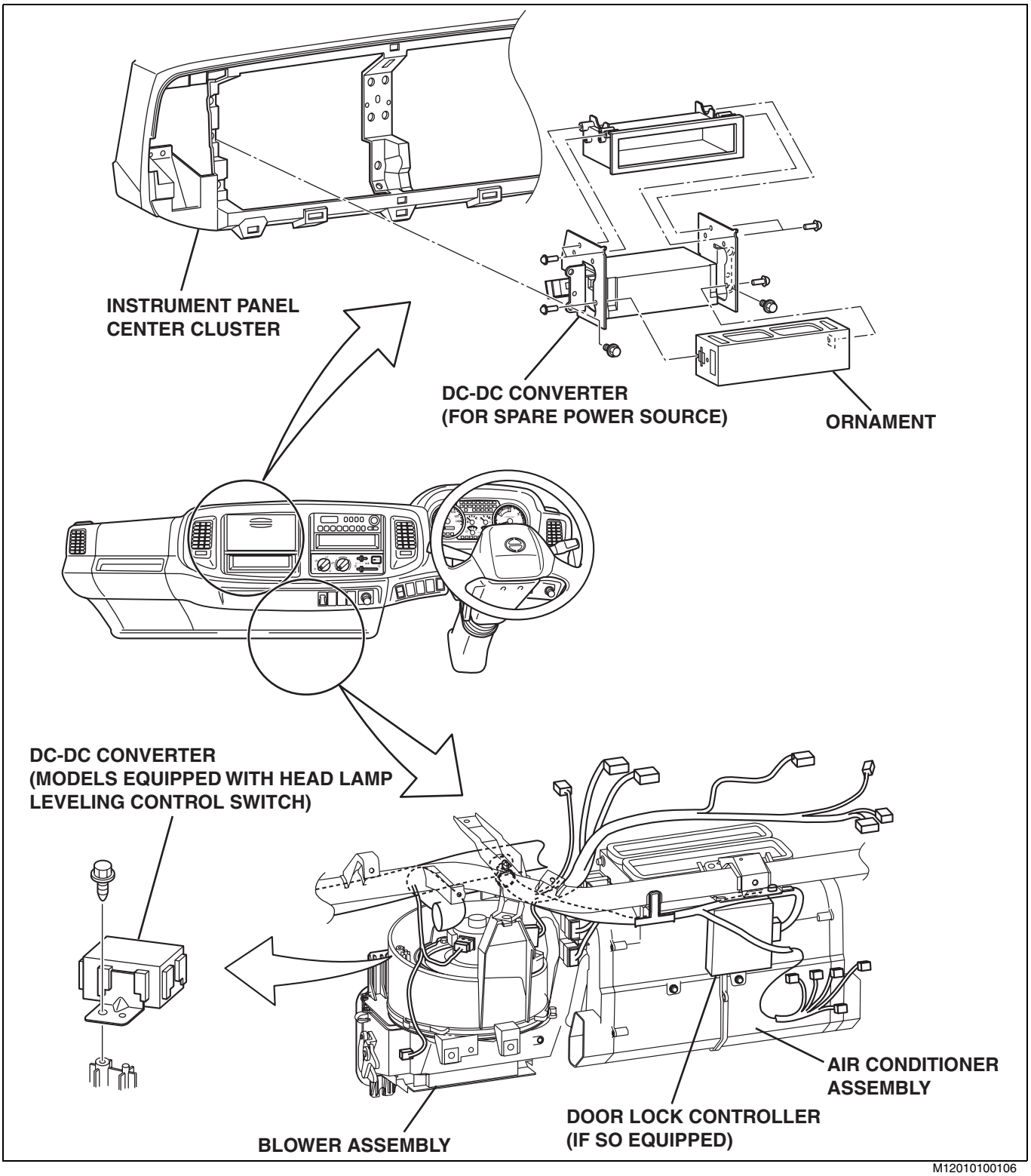
PARTS	INSTALLED POSITION
STARTER RELAY	REAR CAB MOUNTING
PRE-HEATER RELAY (IF SO EQUIPPED)	
FUSIBLE LINK	
CAB TILT LOCK SWITCH (IF SO EQUIPPED)	
CAB TILT STOPPER SWITCH (IF SO EQUIPPED)	CAB TILT CYLINDER
BRAKE STROKE WARNING SWITCH	BRAKE AIR BOOSTER
FUEL GAUGE SENDER UNIT	FUEL TANK
NEUTRAL SWITCH	TRANSMIS-SION
BACK-UP LAMP SWITCH	

ECU RACK



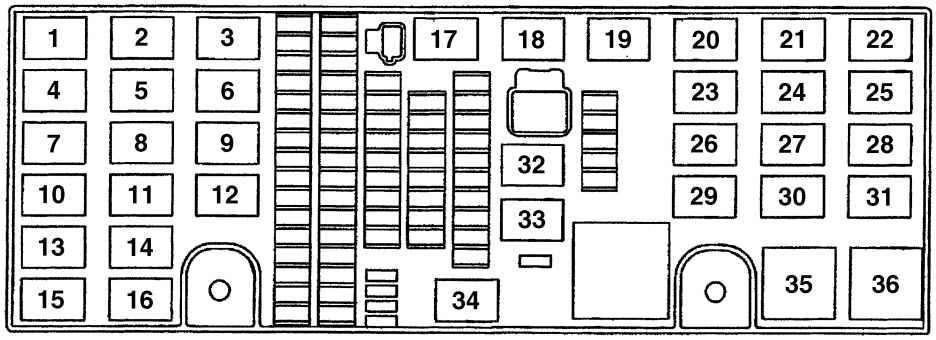
M12010100182

INSTRUMENT PANEL



M12010100106

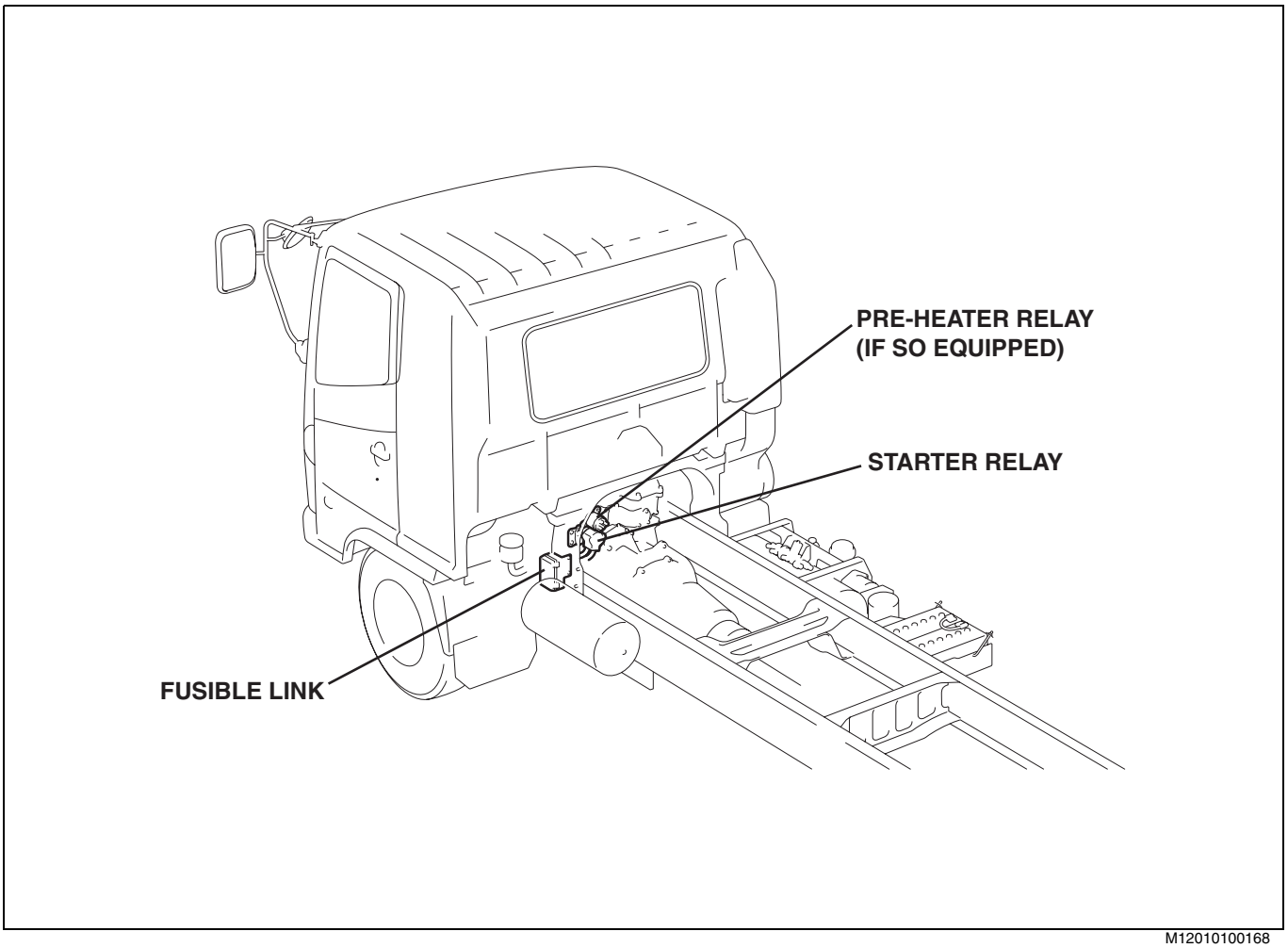
RELAY PANEL



M12010100107

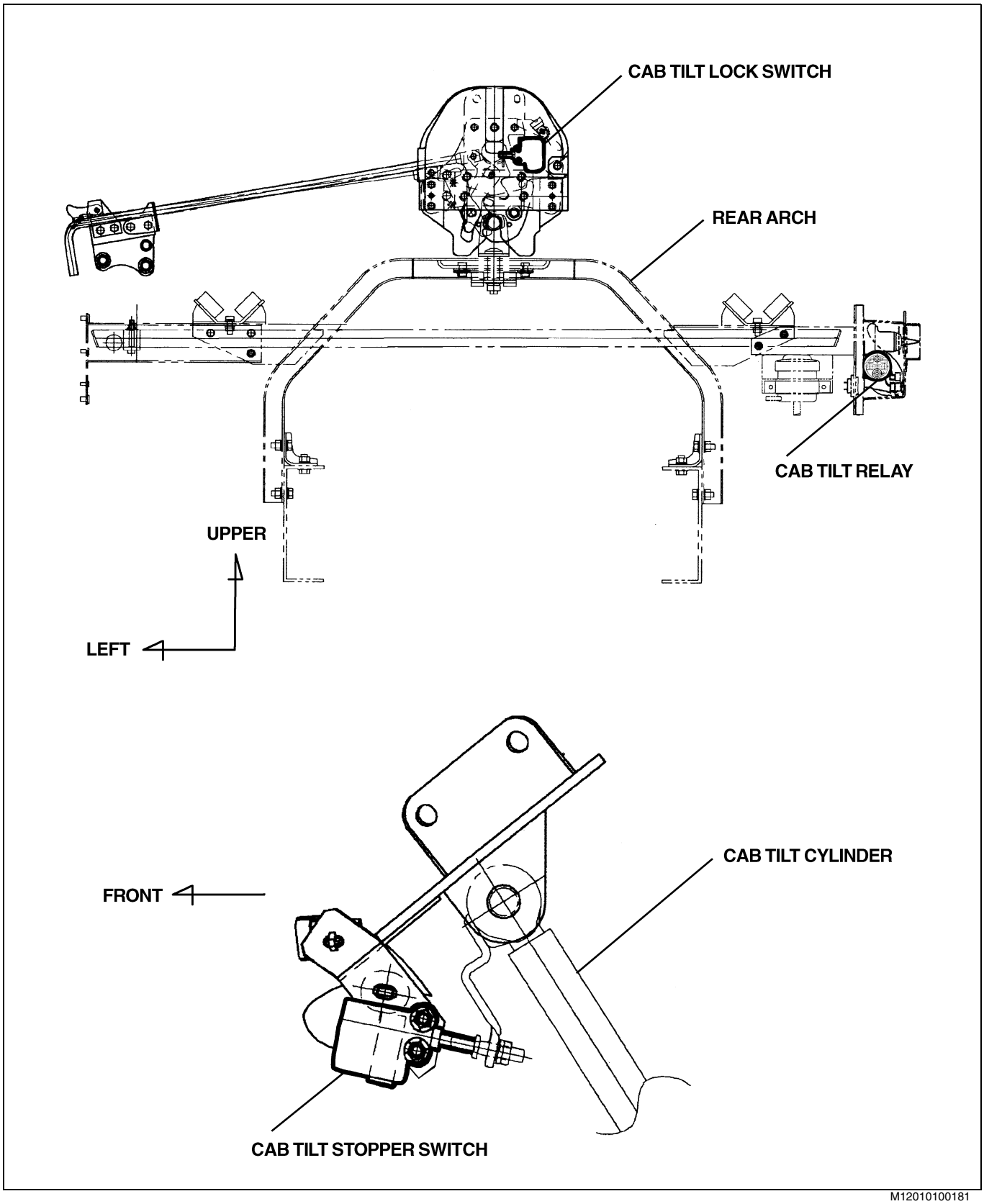
1	Exhaust brake cut relay (For ABS) (If so equipped)	19	Power relay No.2
2	ABS warning lamp relay (If so equipped)	20	Power relay No.4
3	ABS control valve relay (If so equipped)	21	Power accessory relay
4	Disengaged	22	ECU main relay
5	Disengaged	23	Air conditioner relay (If so equipped)
6	Disengaged	24	Air conditioner condenser relay (If so equipped)
7	Disengaged	25	Heater relay
8	Disengaged	26	Disengaged
9	Disengaged	27	Lamp check relay
10	Cab tilt down relay (If so equipped)	28	Horn relay
11	Cab tilt up relay (If so equipped)	29	Fog lamp relay (If so equipped)
12	Disengaged	30	Head lamp relay (Low)
13	Transmission P.T.O. relay (If so equipped)	31	Head lamp relay (High)
14	Lo-Hi indicator lamp relay (If so equipped)	32	Tail lamp relay No.1
15	Rear power window relay (If so equipped)	33	Tail lamp relay No.2
16	Disengaged	34	Actuator power relay
17	Power relay No.1	35	Engine stop motor relay
18	Power relay No.3	36	Stop lamp relay

REAR CAB MOUNTING



M12010100168

REAR CAB MOUNTING (DOUBLE CAB ONLY)



M12010100181

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.

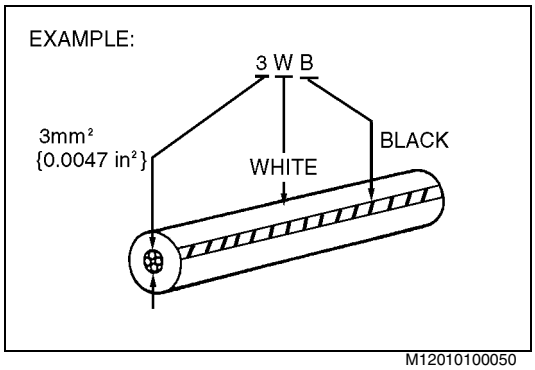
TAIL AND LICENSE PLATE LAMP CIRCUIT

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

M12010101BEC1001

CAUTION:
Be sure to disconnect the ground cable before servicing the electrical circuits except for testing on-vehicle.



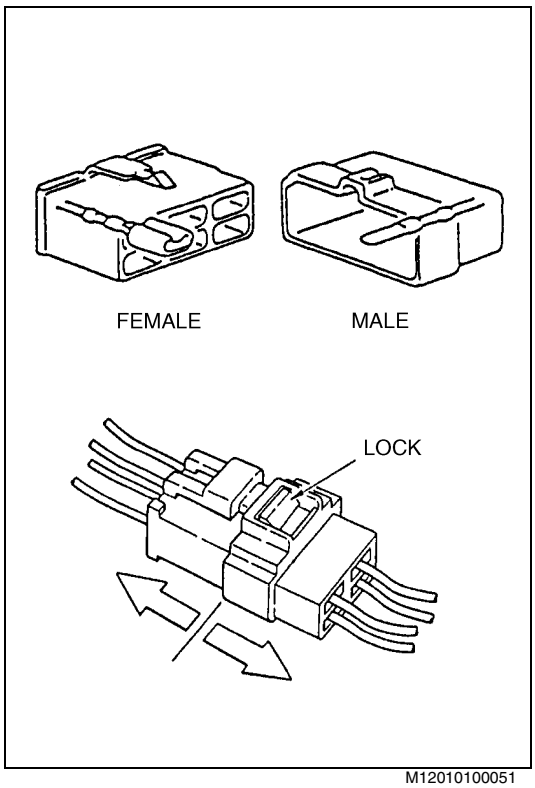
M12010100050

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}

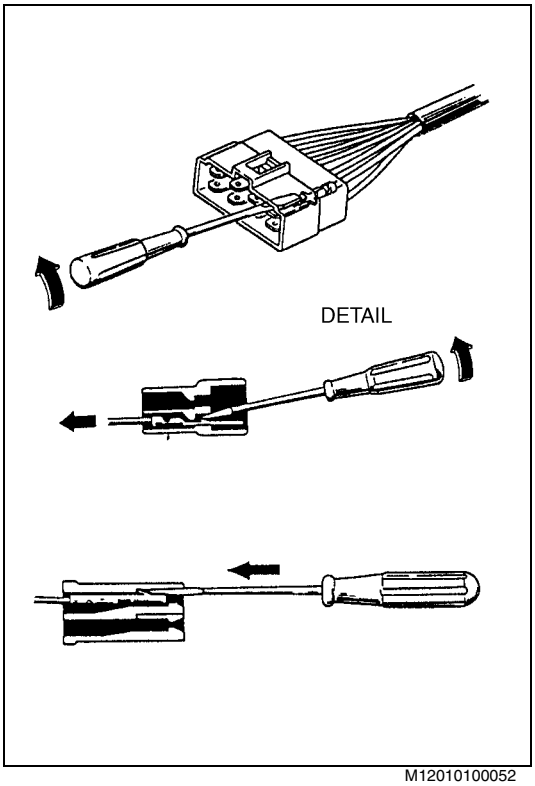


M12010100051

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.

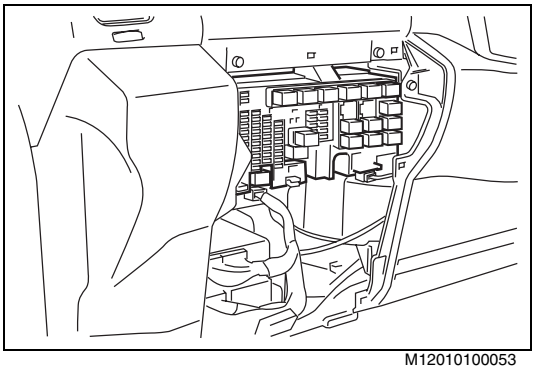
NOTICE:
When the connector is disconnected by pulling the wires, the connection between the terminals and the wires will be damaged.



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.

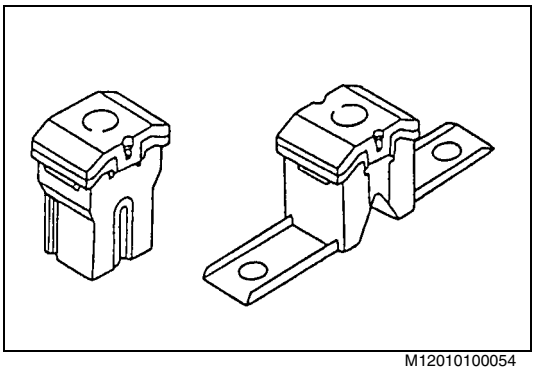
(3) Installing the terminal in the connector.
   a. Insert the terminal into the connector until it clicks.
   b. Pull the wire to confirm correct lock engagement.


M12010100053

3. FUSE

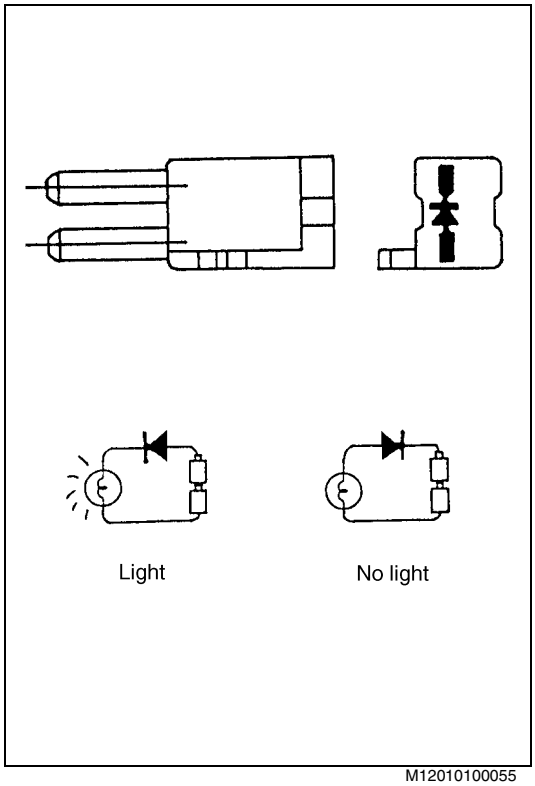
(1) The power supply must be switched off for fuse replacement.
Use a proper amperage fuse.

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

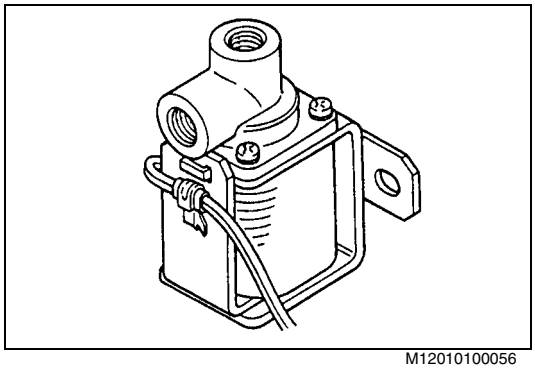
(1) The cause of an overload current should be determined and corrected before a melted fusible link is replaced.
A melted fusible link can be determined swollen or melted insulation of the link.



M12010100055

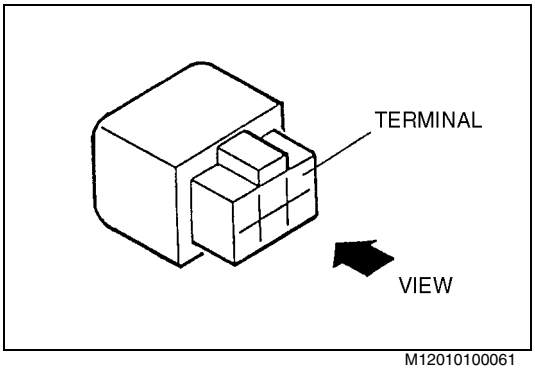
5. DIODE

(1) Diode allows the flow of electric current in only one direction.


M12010100056

6. SOLENOID VALVE

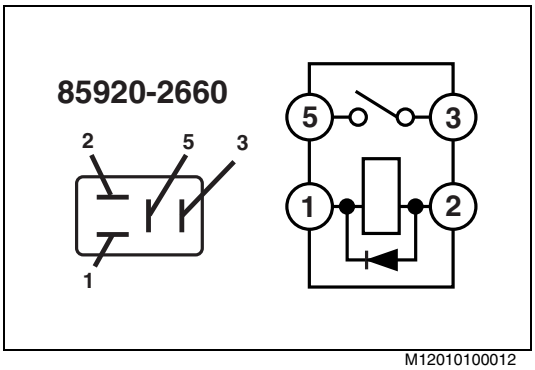
(1) Solenoid valve controls the current of compressed air by electric. Check the continuity between terminals. If there is no continuity, replace the solenoid valve.



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) Cab tilt up relay (If so equipped) Cab tilt down relay (If so equipped) Rear power window relay (If so equipped) Transmission P.T.O. 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
TYPE-6:	Exhaust brake cut relay (For ABS) (If so equipped) ABS warning lamp relay (If so equipped) Lo-Hi indicator lamp relay (If so equipped)

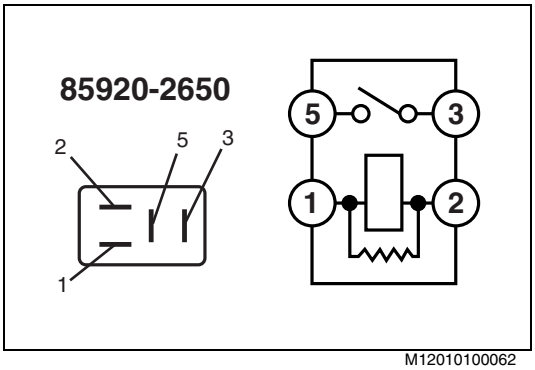


M12010100012

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.

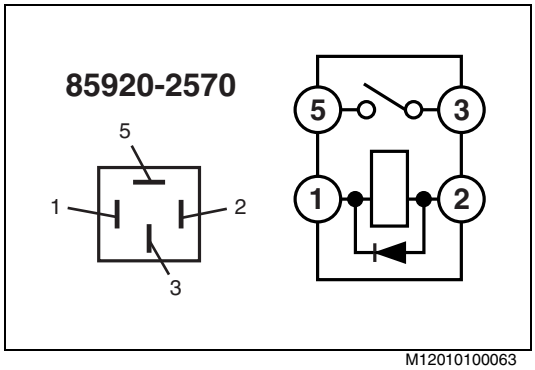


M12010100062

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.

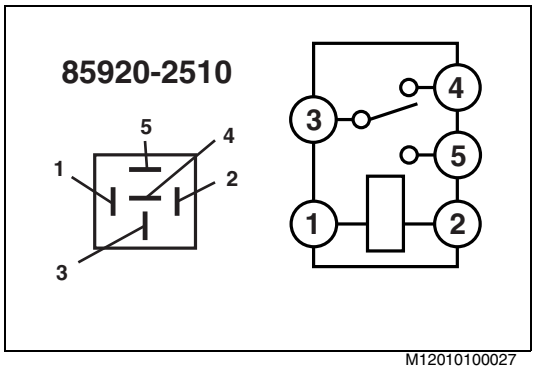


M12010100063

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.

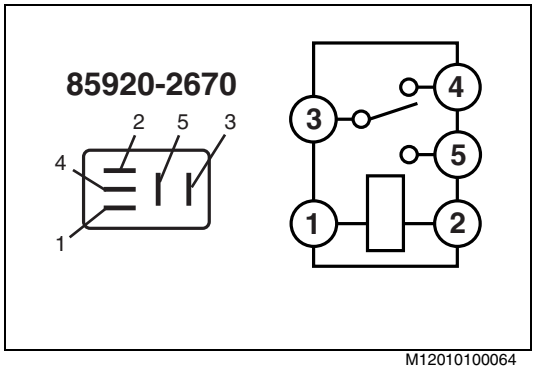


M12010100027

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.

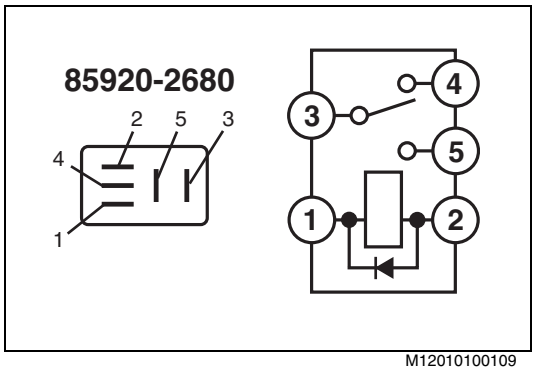


M12010100064

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

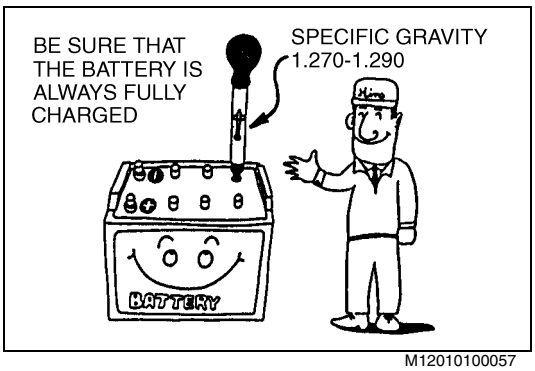
6. TYPE-6 INSPECTION

(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

M12010113BEC1002



M12010100057

BATTERY

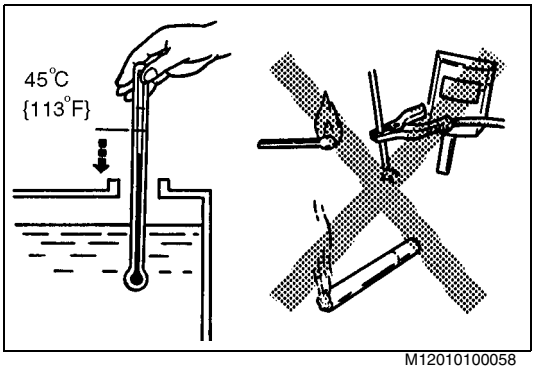
1. CONVERSION FORMULA FOR SPECIFIC GRAVITY

(1) The specific gravity of the electrolyte changes according to the temperature of the electrolyte itself, therefore a temperature of 20°C {68°F} is used as reference temperature.
Consequently, if the temperature is not 20°C when the specific gravity is measured, it is necessary to convent the measured value to value calculated under the following conversion formula at 20°C.
Temperature conversion formula: S20=St+0.0007(t-20)

(2) Where,

- "S20" is the specific gravity at 20°C (Reference temperature)
- "St" is the specific gravity at the measuring temperature
- "t" is the temperature during measurement
- "0.0007" is the temperature coefficient of the electrolyte

NOTICE:
As a rough guide, if the temperature of the electrolyte rises or falls by 15°C (59°F), the specific gravity of the electrolyte will vary by about 0.01.



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

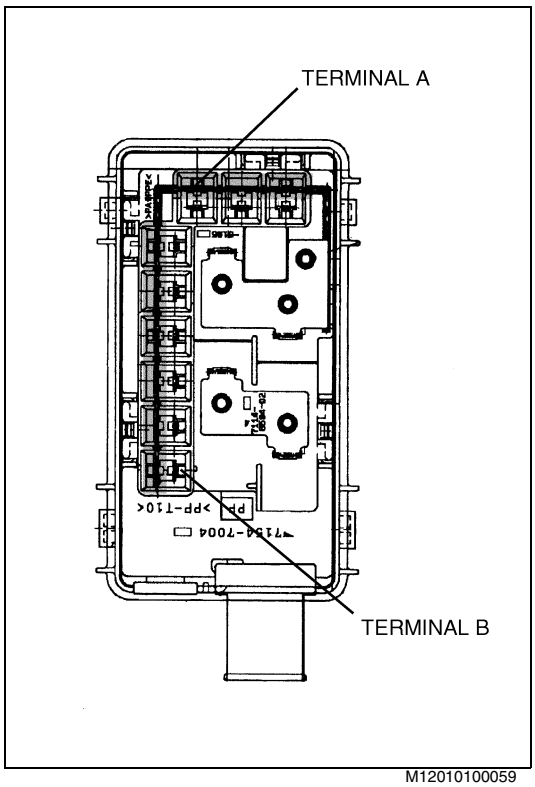
- If the terminals at the top of the battery are dirty, clean them with cold water or lukewarm water.
- Apply a light coating of grease to the terminals to prevent them from rusting so as to prevent faulty contact.

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

M12010101BEH3001



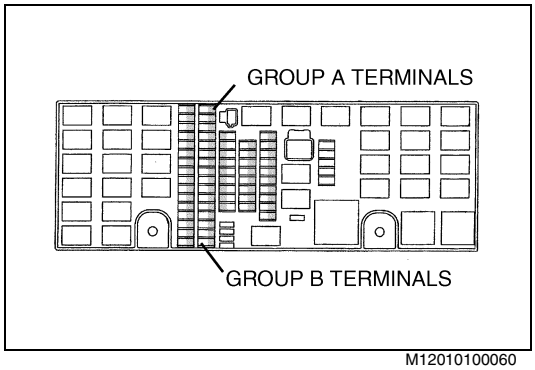
M12010100059

POWER SUPPLY CIRCUIT

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)



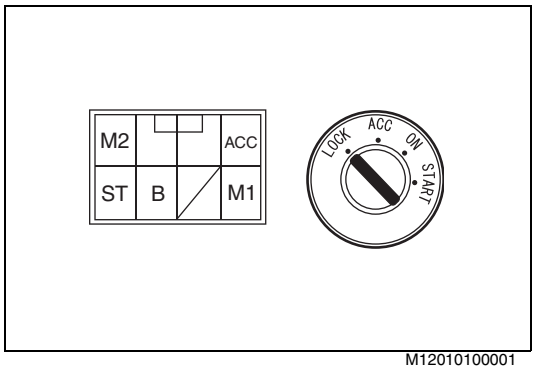
M12010100060

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



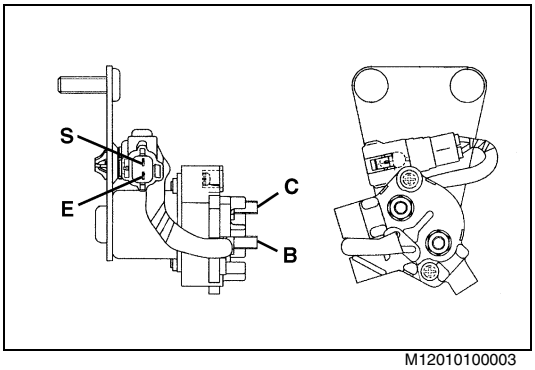
M12010100001

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	○		○	○	○

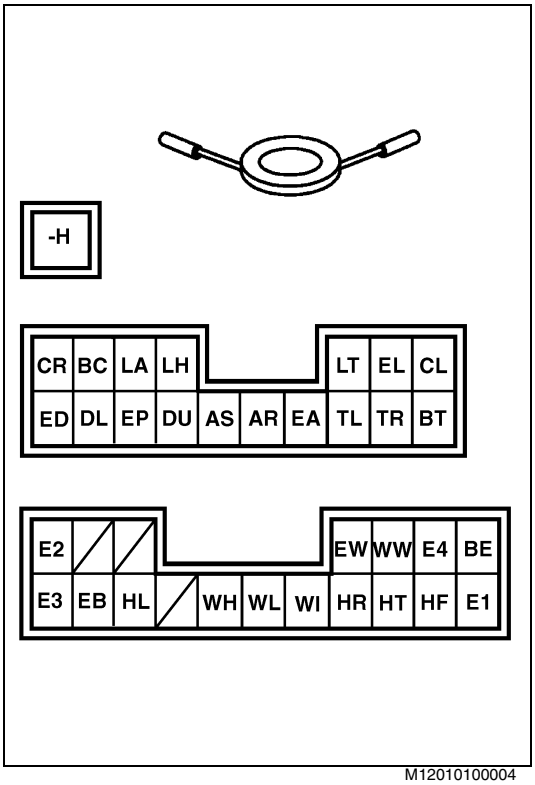


M12010100003

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):

Switch position \ Terminals	EL	LT	LH
OFF			
TAIL	○——	——○	
TAIL AND HEAD	○——	——○	——○

Lighting (HIGH, LOW):

Switch position \ Terminals	ED	DL	DU	EP
PASSING	○——	——○	○——	——○
LOW BEAM	○——	——○		
HIGH BEAM	○——		——○	

Turn signal:

Switch position \ Terminals	BT	TL	TR
LEFT	○——	——○	
OFF			
RIGHT	○——		——○

Hazard warning:

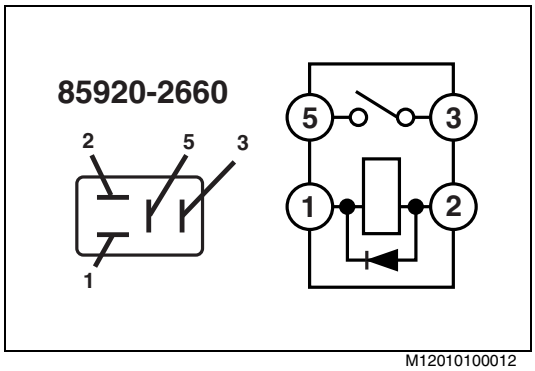
Switch position \ Terminals	HF	HL	HR	HT
OFF				
ON	○——	——○	——○	——○

Exhaust brake:

Terminals / Switch position	EB	E1
OFF		
ON	○———	———○

Windshield wiper and washer:

Terminals / Switch position	WW	EW	WI	WL	WH
OFF					
WIPER: INT		○——○			
MEDIUM		○———		○	
HIGH		○———		○	○
WASHER: ON	○——○				

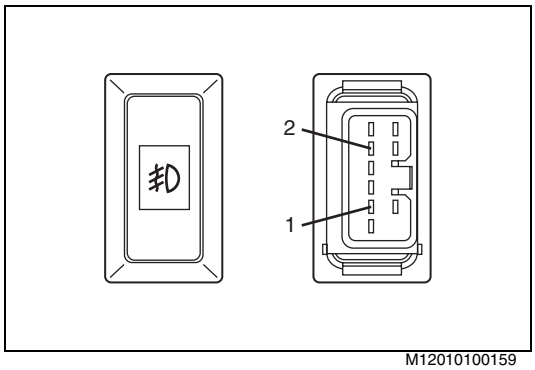


M12010100012

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.



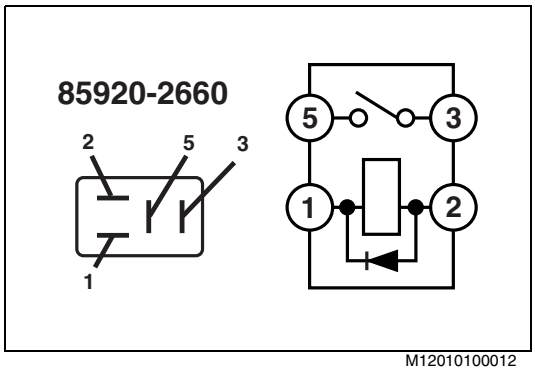
M12010100159

FOG LAMP CIRCUIT (IF SO EQUIPPED)

1. FOG LAMP SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2
OFF		
ON	○———	———○

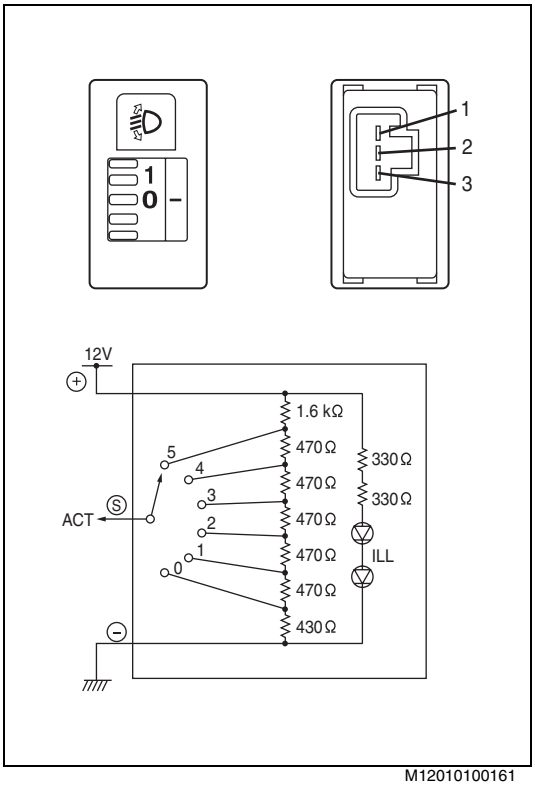


M12010100012

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.



M12010100161

HEAD LAMP CONTROL CIRCUIT (IF SO EQUIPPED)

1. HEAD LAMP LEVELING CONTROL SWITCH INSPECTION

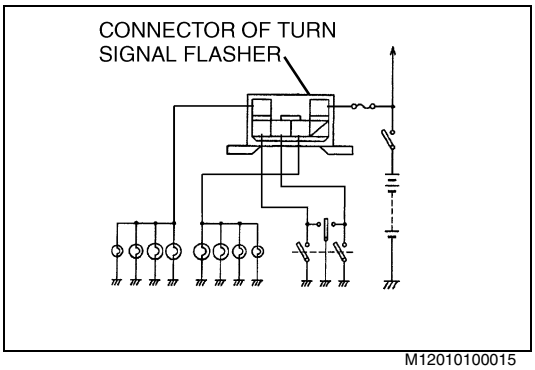
(1) Measure resistance between terminals.

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

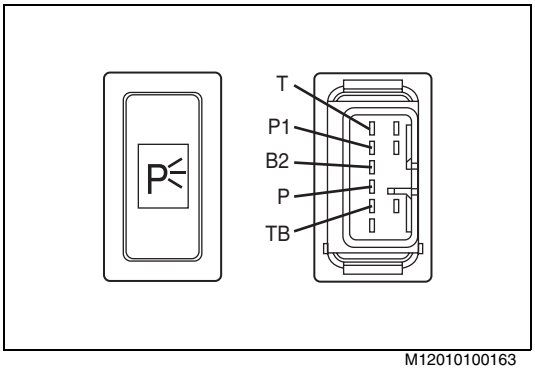
(1) Wire the turn signal flasher, bulbs, battery and fuse as shown in figure.

(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**

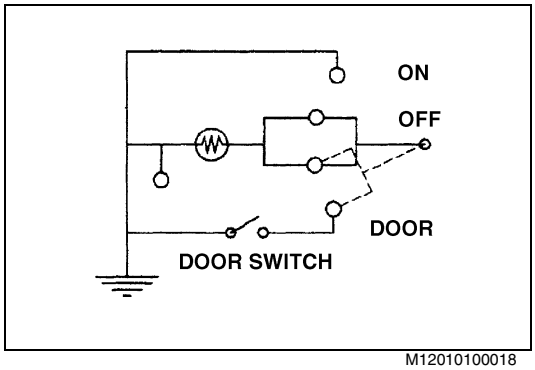


M12010100163

2. PARKING LAMP SWITCH INSPECTION (IF SO EQUIPPED)

(1) Check the continuity between terminals.

Terminals / Switch position	T	P	B2	TB	P1
OFF	○—○				
ON		○—○	○—○	○—○	

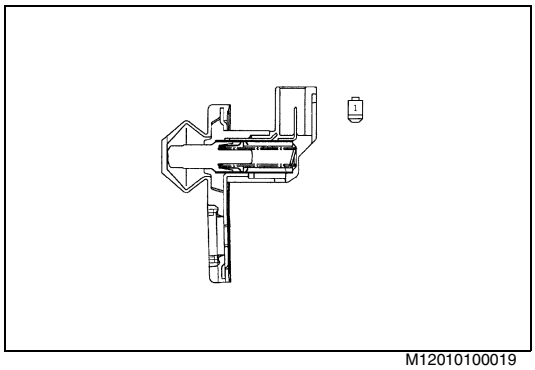


M12010100018

DOME LAMP CIRCUIT

1. DOME LAMP INSPECTION

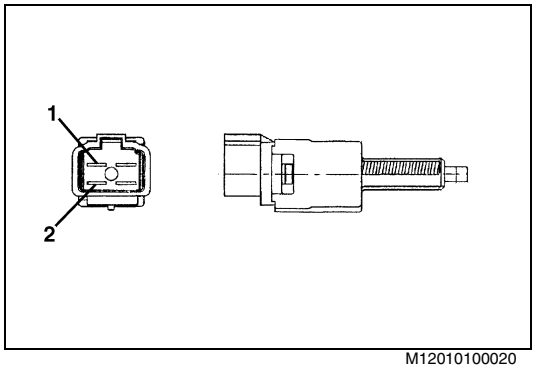
(1) Apply voltage to terminals and check the bulbs lighting.


M12010100019

2. COURTESY SWITCH INSPECTION

(1) Check the continuity between terminal and body ground.

	Between terminals
PUSH	No continuity
FREE	Continuity



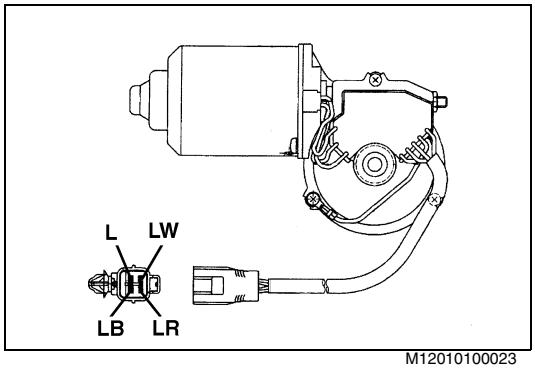
M12010100020

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

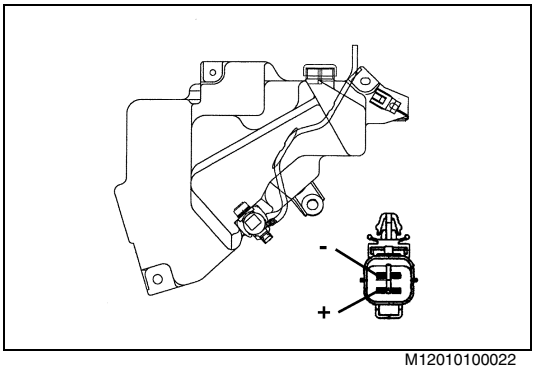
1. WIPER MOTOR INSPECTION

(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			○———	———○

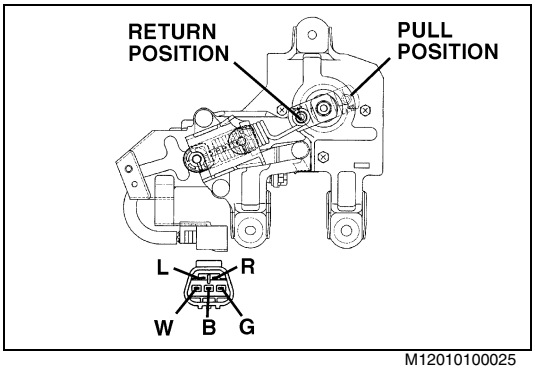


M12010100022

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

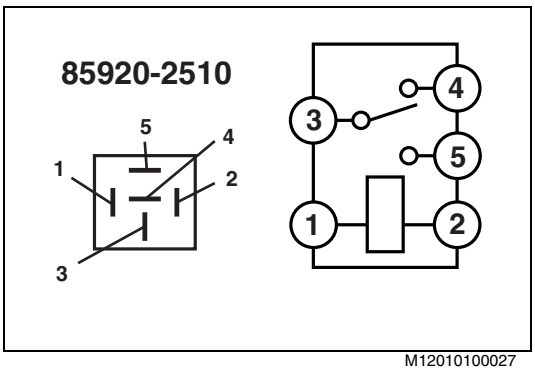
ENGINE STOP CIRCUIT

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

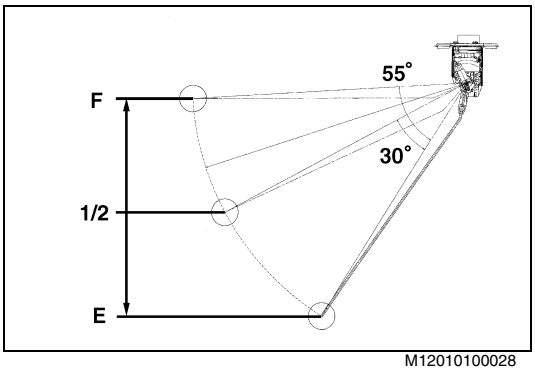
NOTICE:
Connect a 10A fuse between the terminal and the 24V power source. If the fuse is burned out or the motor does not operate, replace the motor.



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.



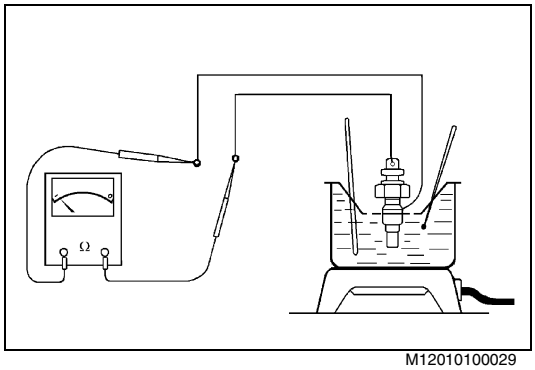
M12010100028

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

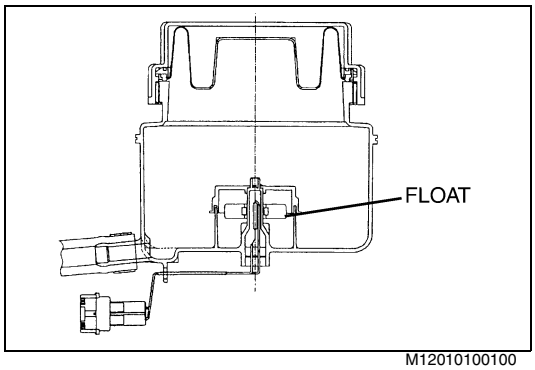


M12010100029

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

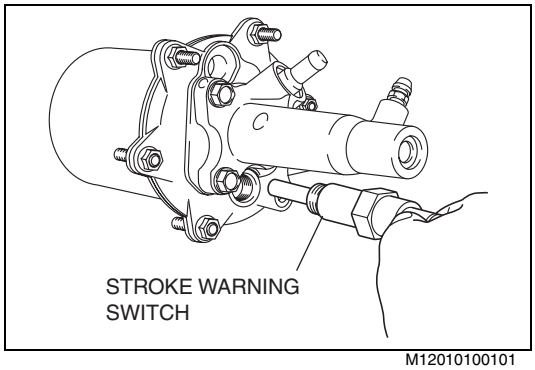


M12010100100

3. BRAKE FLUID LEVEL SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
Float position UP	No continuity
Float position DOWN	Continuity



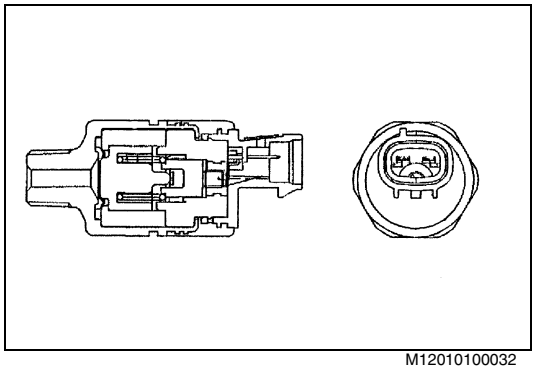
M12010100101

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

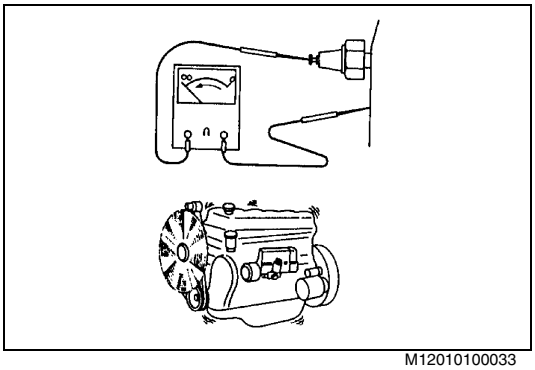
NOTICE:
When the head of the detector is depressed, the warning lamp goes on to indicate brake shoe needs adjustment or lining replacement.


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

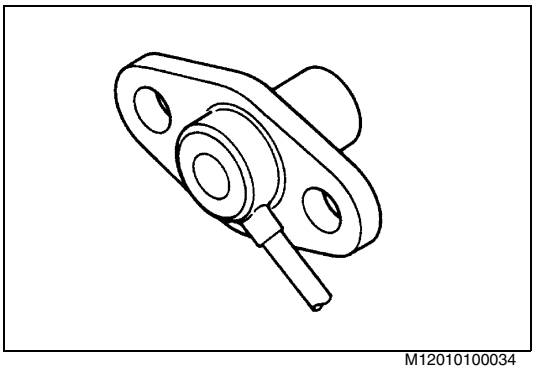


M12010100033

6. OIL PRESSURE SWITCH INSPECTION

(1) Start engine and disconnect the coupler.
(2) Check the continuity between terminal and engine ground.

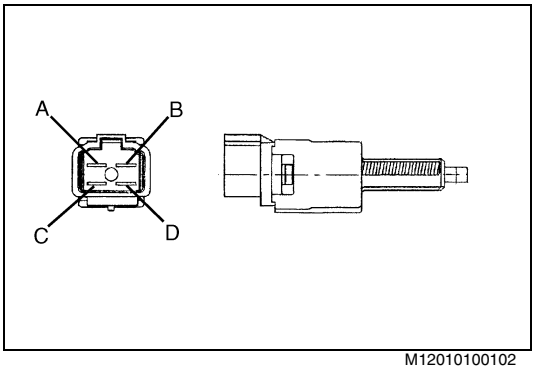
	Terminal	Engine ground
Engine stop	○	○
Engine running		



M12010100034

7. REVOLUTION SENSOR INSPECTION

(1) Check the continuity between terminals.
If the revolution sensor is normal, there will be continuity between the terminals.



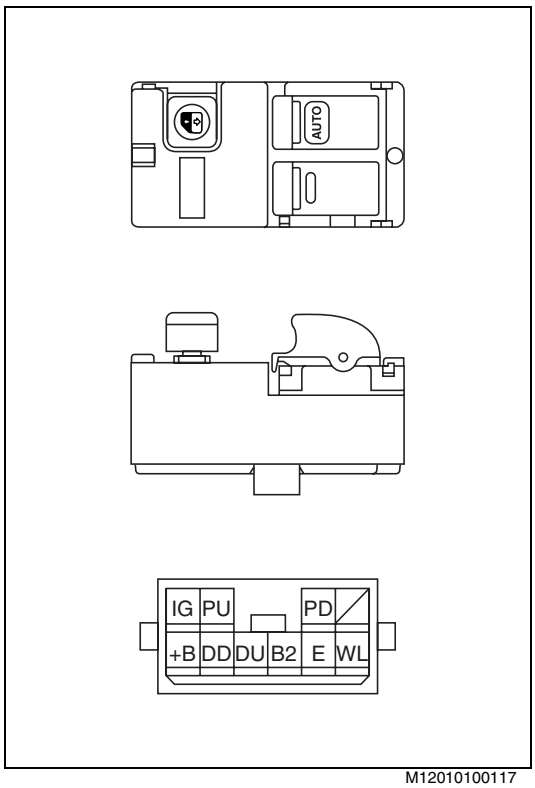
M12010100102

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 (FOR FRONT WINDOW)

(1) Check the continuity between terminals.

DRIVER'S SIDE:

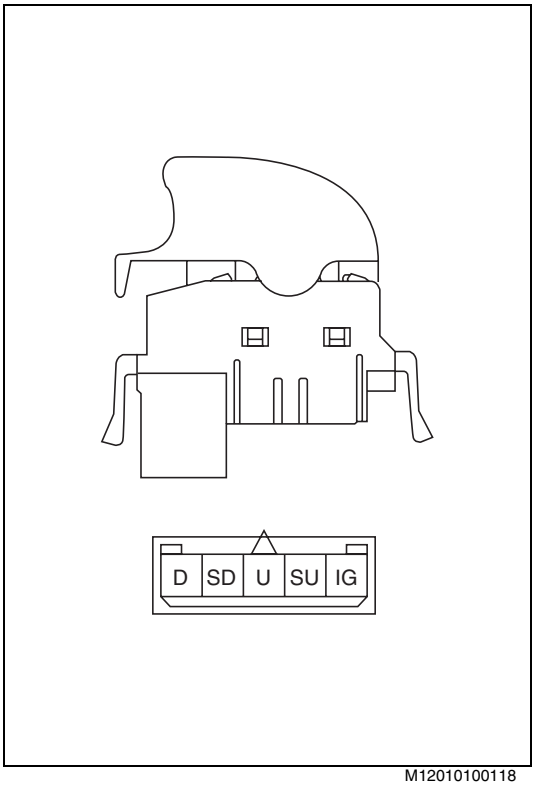
Terminals / Switch position	+B	DU	DD	E
AUTO CLOSE	○—○		○—○	
CLOSE	○—○		○—○	
↕	×			×
OFF		○—○	○—○	
↕	×			×
OPEN	○—○	○—○		
AUTO OPEN	○—○	○—○		

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	○—○			×—×	

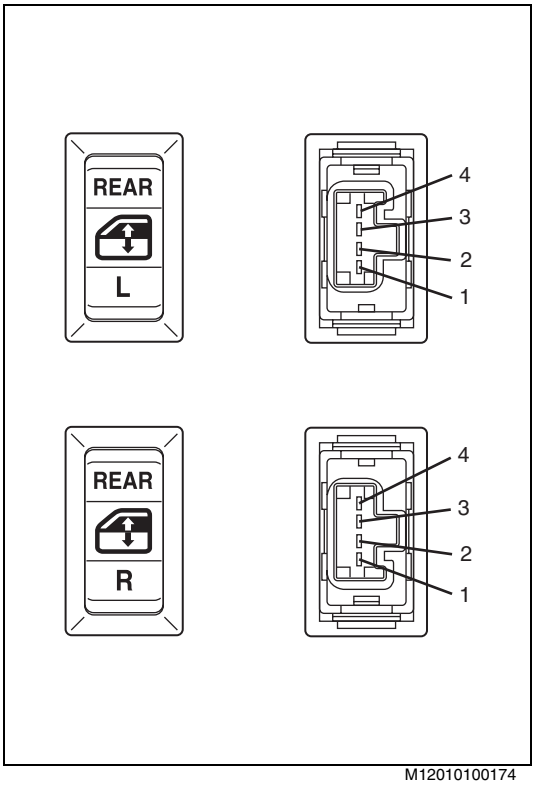


M12010100118

2. ASSISTANT'S SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	SU	U	IG	D	SD
CLOSE		○——	——○	○——	——○
↕	×	——	——	×	——
OFF	○——	——○		○——	——○
↕		——	×	——	——
OPEN	○——	——○	○——	——○	

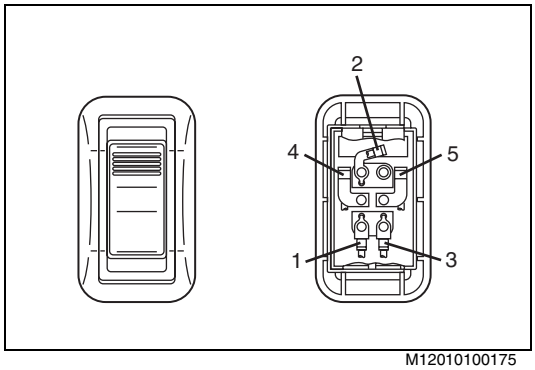


M12010100174

3. DRIVER'S SIDE SWITCH INSPECTION (FOR REAR WINDOW)

(1) Check the continuity between terminals.

Terminals / Switch position	1	2	3	4
CLOSE	○——	——○	○——	——○
↕	×	——	——	×
OFF	○——	——○	——○	
↕	×	——	——	×
OPEN	——	○——	——	——○
	○——	——	——○	



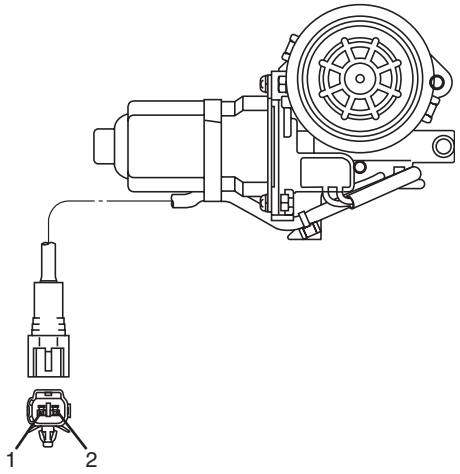
M12010100175

4. REAR SEAT SIDE SWITCH INSPECTION

(1) Check the continuity between terminals.

Switch position \ Terminals	1	2	3	4	5
CLOSE	○		○	○	○
↕	×	×			
OFF		○	○	○	○
↕	×		×		
OPEN	○	○		○	○

(EXAMPLE)



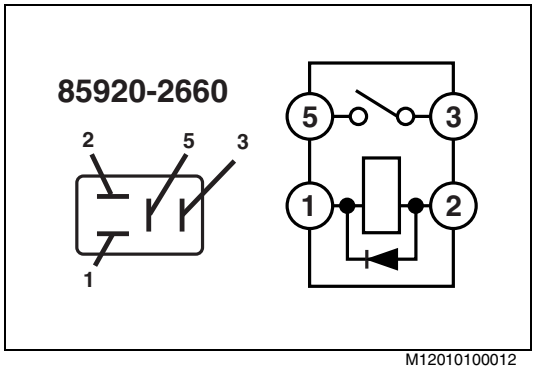
M12010100180

5. POWER WINDOW MOTOR INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the motor.

(2) Apply 24V to terminals, inspect the motor operation as below.

Direction of rotation (View from out put shaft) \ Terminals	1	2
CLOCKWISE	+	−
COUNTERCLOCKWISE	−	+

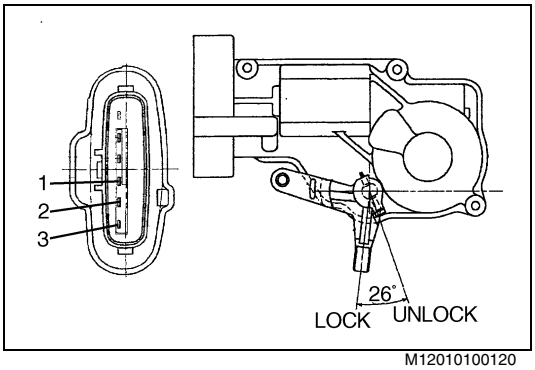


M12010100012

6. REAR POWER WINDOW RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.



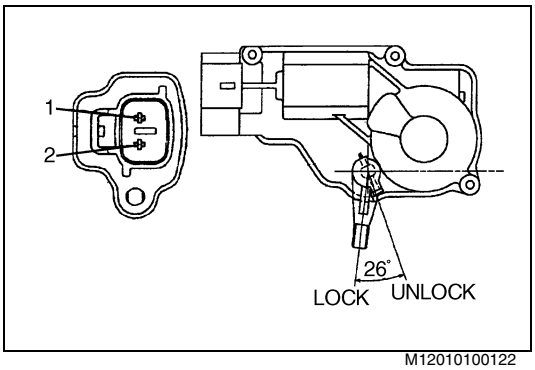
M12010100120

POWER DOOR LOCK CIRCUIT (IF SO EQUIPPED)

1. DRIVER'S SIDE DOOR LOCK SWITCH INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the switch.

Terminals / Lever position	1	2	3
LOCK	○		○
UNLOCK		○	○

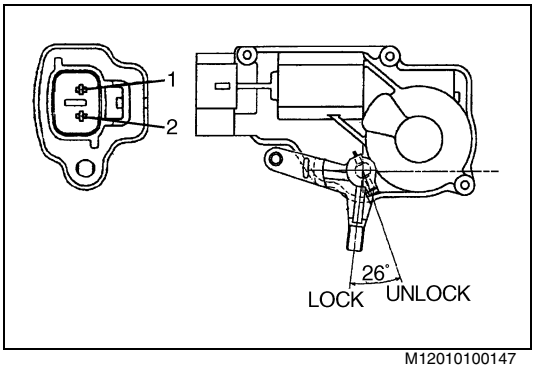


M12010100122

2. ASSISTANT'S SIDE AND REAR LEFT SIDE DOOR LOCK ACTUATOR INSPECTION

(1) Check the continuity between terminals. If there is no continuity, replace the actuator.

Terminals / Lever position	1	2
LOCK	+	−
UNLOCK	−	+

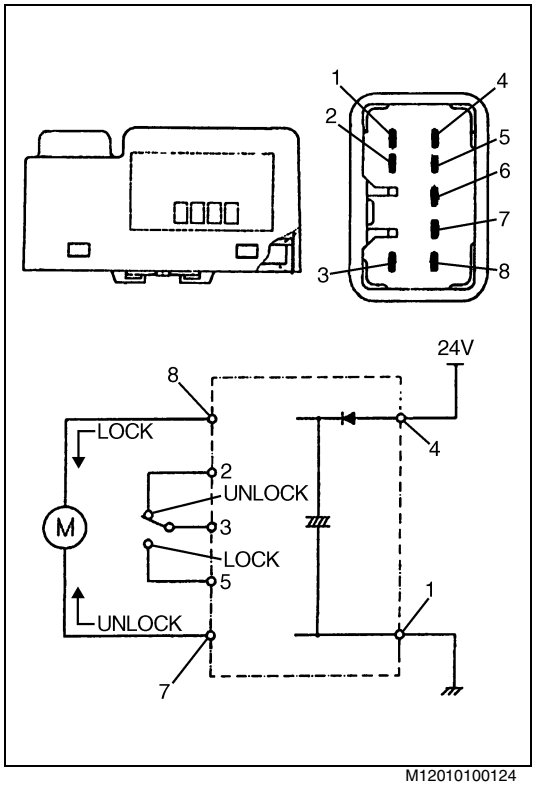


M12010100147

3. REAR RIGHT 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	+	−

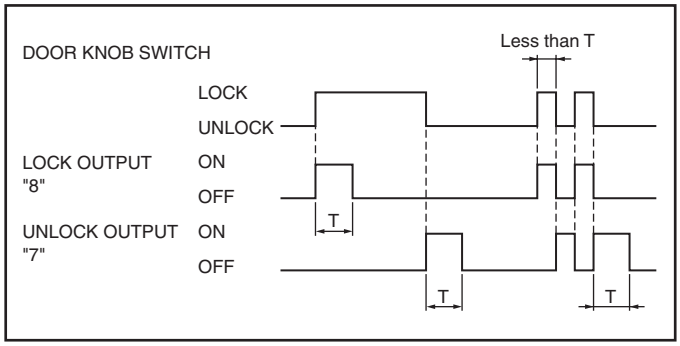


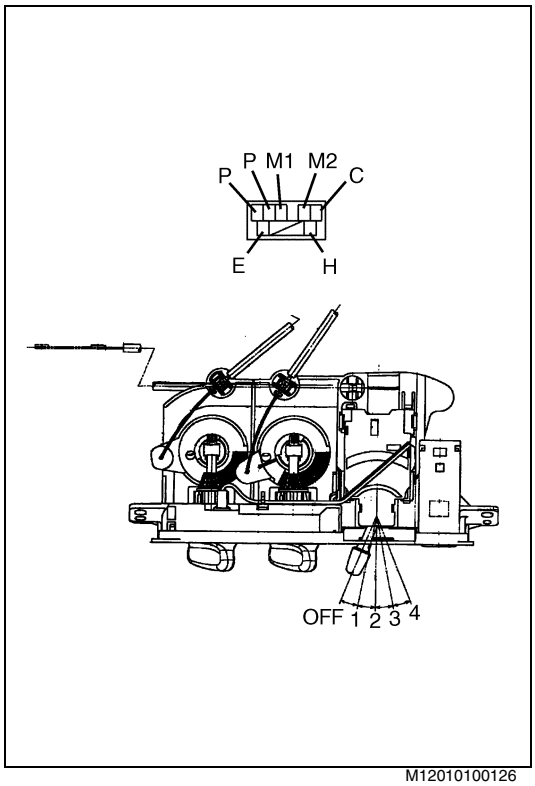
M12010100124

4. DOOR LOCK CONTROLLER INSPECTION

(1) Wire the door lock controller as shown in the figure.

(2) Check the function.





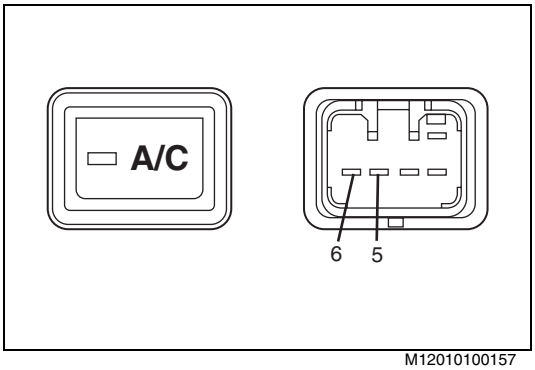
M12010100126

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	○	○			○		

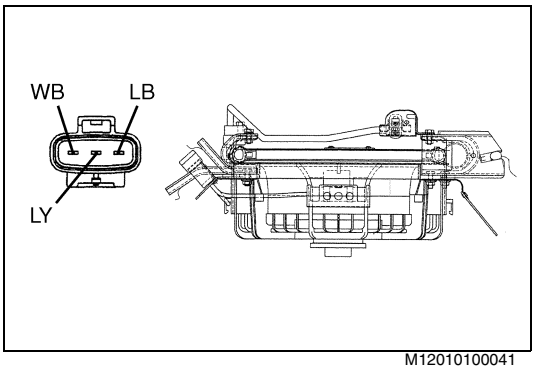


M12010100157

2. COOLER CONTROL SWITCH

(1) Check the continuity between terminals.

Switch position \ Terminals	5	6
OFF		
ON	○	○

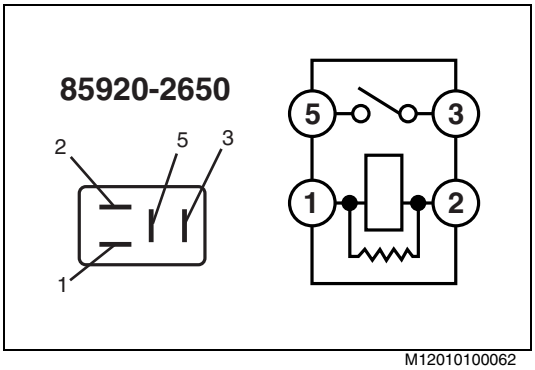


M12010100041

3. CONDENSER ASSEMBLY INSPECTION

(1) Check continuity between terminals.

Switch position \ Terminal	LB	WB	LY
OFF			
LO	○	○	
HIGH	○		○

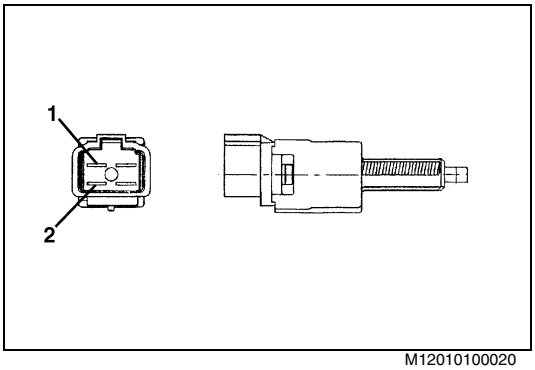


M12010100062

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.



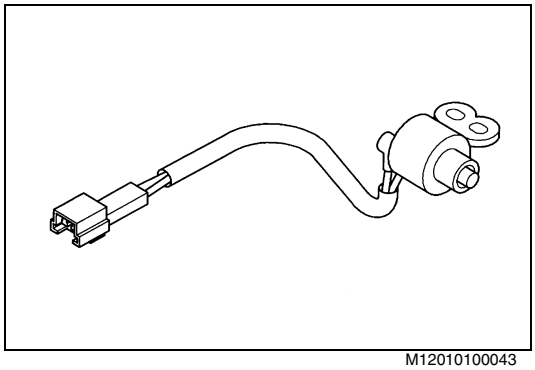
M12010100020

EXHAUST BRAKE CIRCUIT

1. CLUTCH PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

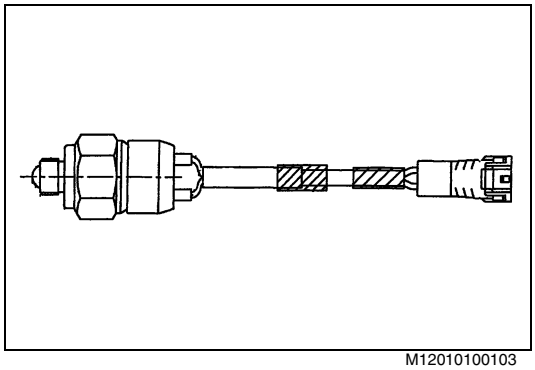
Switch position \ Terminals	1	2
PUSH		
FREE	○	○


M12010100043

2. ACCELERATOR PEDAL SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity

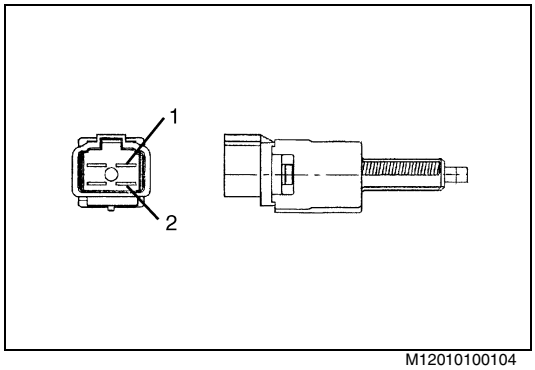

M12010100103

BACK UP LAMP CIRCUIT

1. BACK UP LAMP SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity



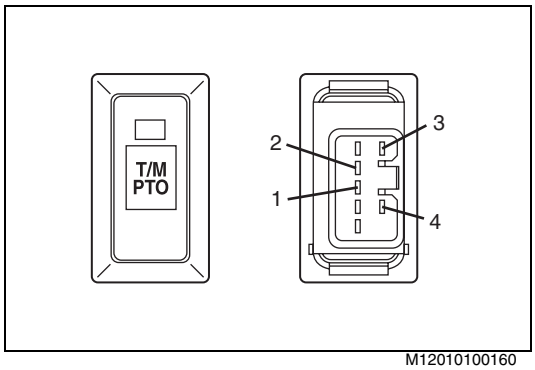
M12010100104

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	○	○

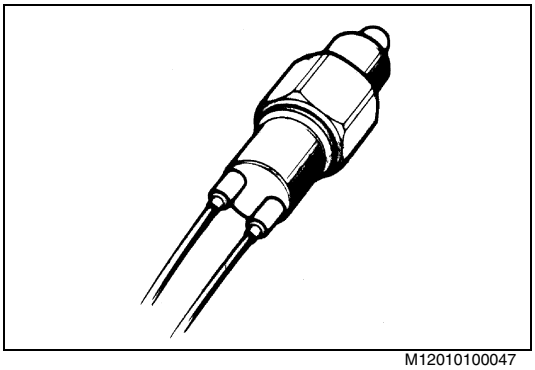


M12010100160

2. TRANSMISSION P.T.O. SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminal / Switch position	1	2	3	4
OFF			∩	
ON	○	○		

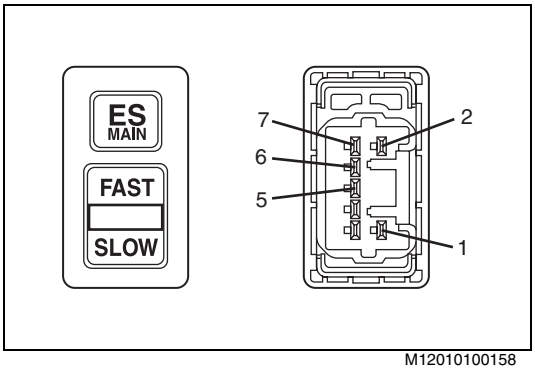


M12010100047

3. P.T.O. POSITION SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	Continuity
FREE	No continuity



M12010100158

ES START CIRCUIT (IF SO EQUIPPED)

1. ES MAIN SWITCH INSPECTION

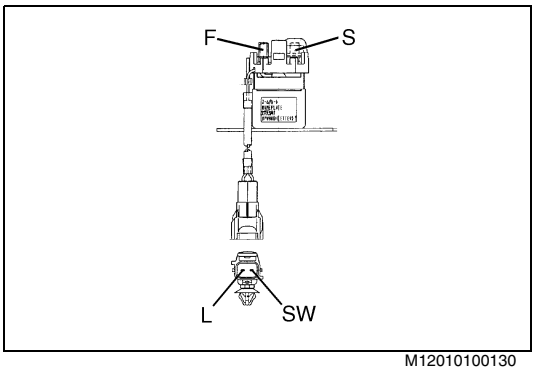
(1) Check the continuity between terminals.

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	○		○



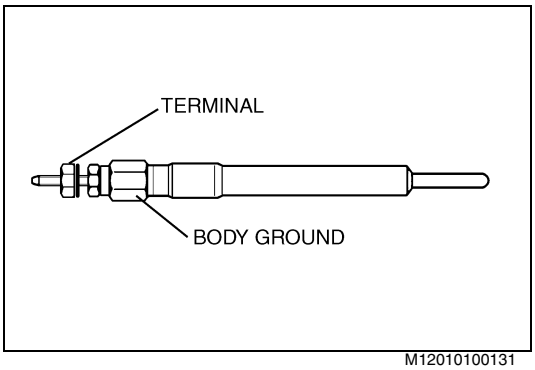
M12010100130

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.

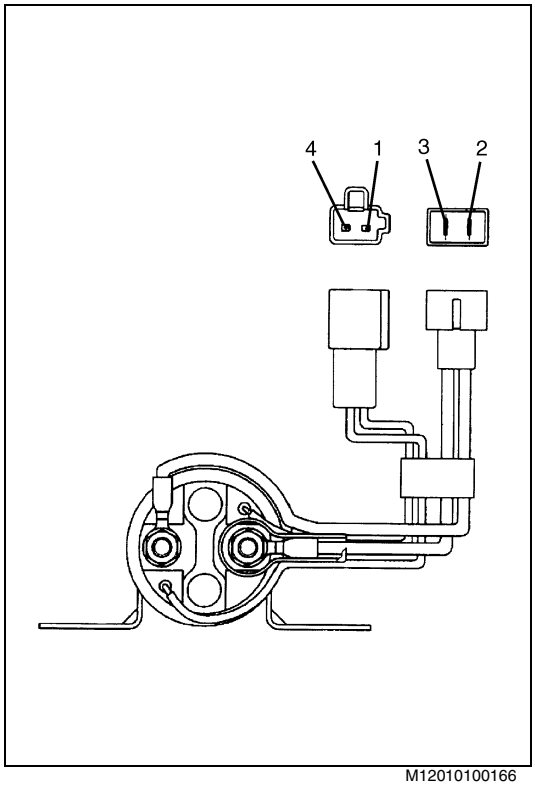


M12010100131

2. GLOW PLUG INSPECTION

(1) Check continuity between terminal and body ground.

(2) Under normal condition, the terminal and body ground is continuity.

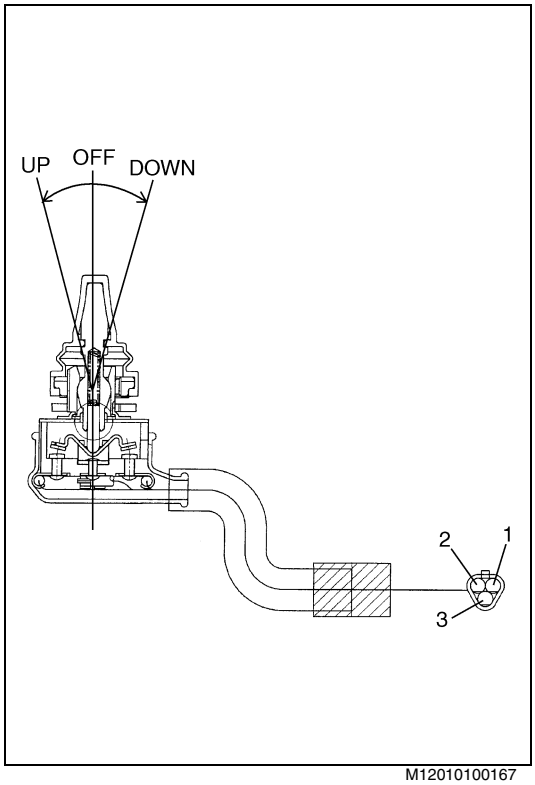


M12010100166

CAB TILT CIRCUIT (IF SO EQUIPPED)

1. CAB TILT RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 4.
(2) Under normal condition, terminals 2 and 3 switch on.

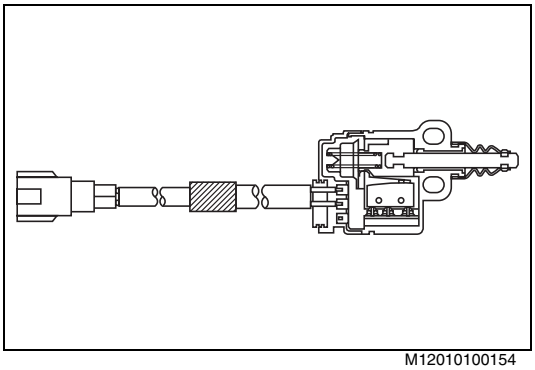


M12010100167

2. CAB TILT SWITCH INSPECTION

(1) Check the continuity between terminals.

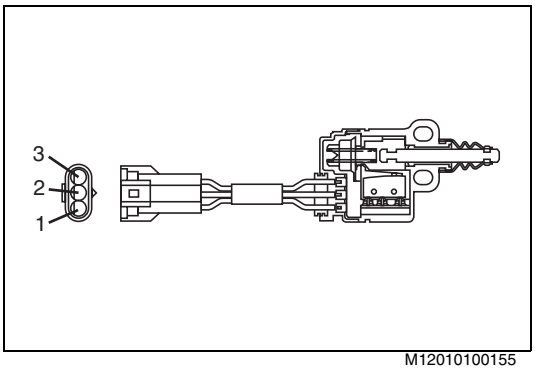
Terminals / Position	1	2	3
UP	○——	——○	
OFF			
DOWN		○——	——○


M12010100154

3. CAB TILT STOPPER SWITCH INSPECTION

(1) Check the continuity between terminals.

	Between terminals
PUSH	No continuity
FREE	Continuity

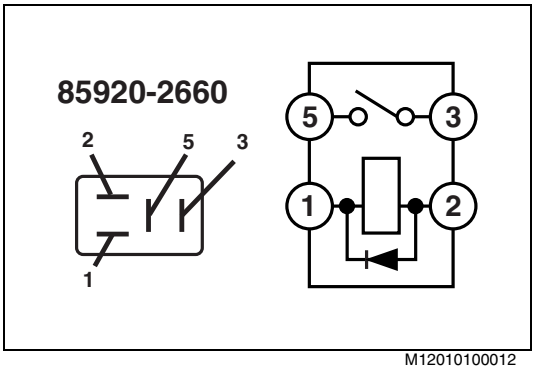


M12010100155

4. CAB TILT LOCK SWITCH INSPECTION

(1) Check the continuity between terminals.

Terminals / Switch position	1	2	3
PUSH	○		○
FREE		○	○



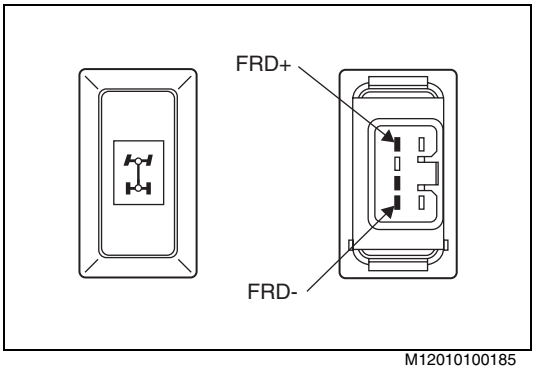
M12010100012

5. CAB TILT UP RELAY AND CAB TILT DOWN RELAY INSPECTION

(1) Apply voltage to terminals;
24V to terminal 1,
Ground to terminal 2.

(2) Under normal condition, terminals 3 and 5 switch on.

TRANSFER CONTROL CIRCUIT

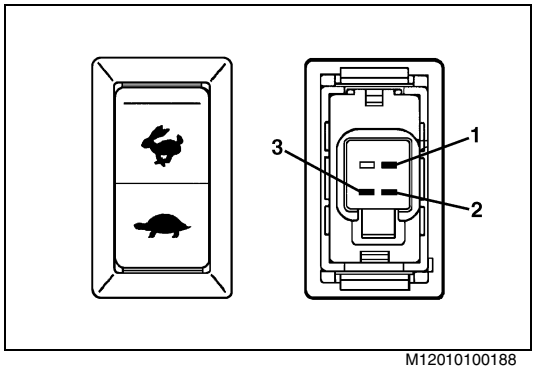


M12010100185

1. 4WD SELECTOR SWITCH

(1) Check the continuity between terminals.

Terminals / Switch position	FRD+	FRD-
FREE		
PUSH	○	○



M12010100188

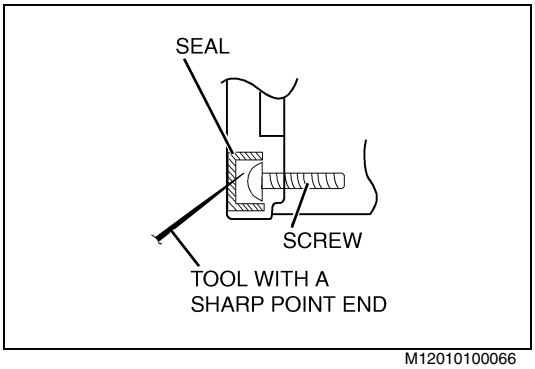
2. TRANSFER LOW-HIGH SELECTOR SWITCH

(1) Check the continuity between teriminals.

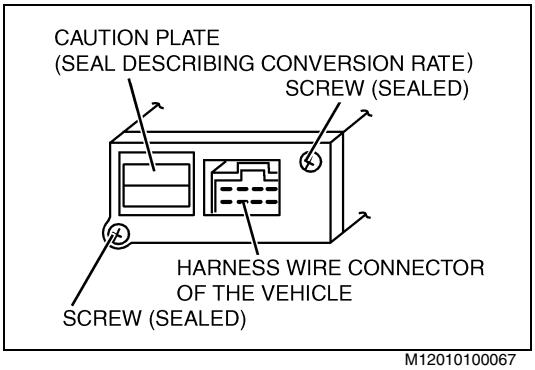
Terminals / Switch position	1	2	3
LO	○——	——○	
↕	×	×	×
HI	○		○

INSPECTION AND ADJUSTMENT

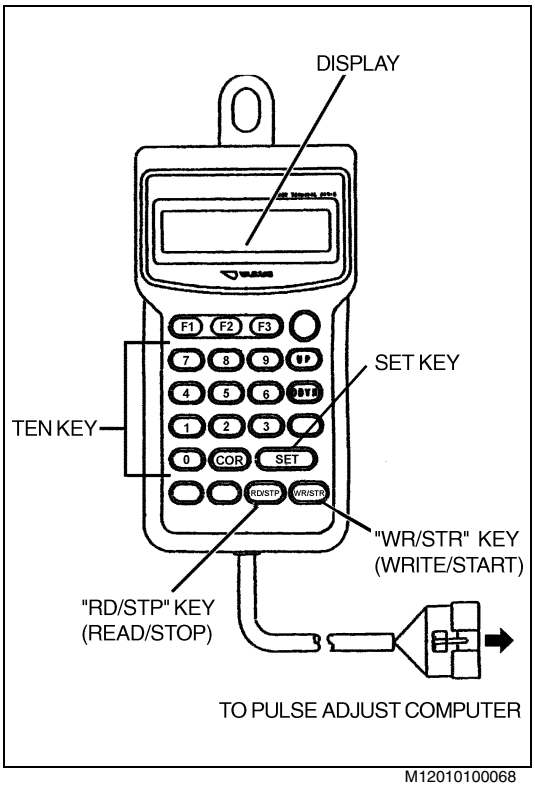
M12010113BEH3002



M12010100066



M12010100067



M12010100068

ADJUSTMENT OF PULSE ADJUST COMPUTER

HINT:

This is a device that enables a fine-tuning of compensating ratio of speedometer without modifying the speedometer driven gear of the transmission.

1. CONNECTING INPUT TOOL

(1) Remove the instrument panel cover of assistant seat side in the cabin.

(2) Remove the seal around the screws by using a tool with a sharp point end.

(3) Remove the screws and then the cover of pulse adjust computer.

(4) If you disconnected the wire harness connector of the vehicle when removing the cover of pulse adjust computer, connect again the wire harness connector.

(5) Connect the input tool connector.
SST: Input tool (09630-2400)

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.

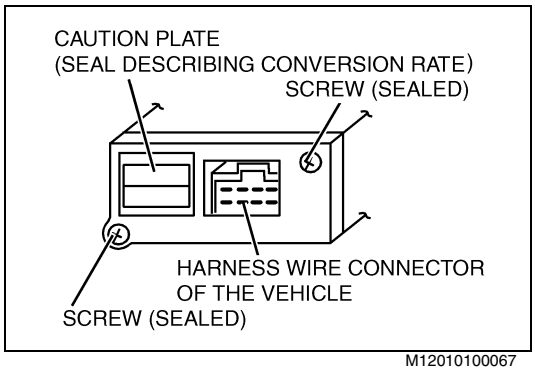
(2) Writing in the conversion rate.
   a. While the condition of inputting the conversion rate (" *.****" indication), the conversion rate is inputted to push the ten key or [UP] [DOWN] key.
   If the conversion rate is inputted, omit a decimal point.
   EX.) When you want to input the conversion rate "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

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		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

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		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

M12010100075

		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	0.448	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	0.436	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

M12010100078

		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	0.889	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	0.996	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

M12010100081

		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	0.764	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

M12010100082

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									1.161	1.104	1.078	1.071

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TIRE SIZE	RADIUS	REAR AXLE GEAR RATIO					
		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	0.718
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

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 Circuit name		b Specification symbol	c Specifications	d Remarks	e 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.

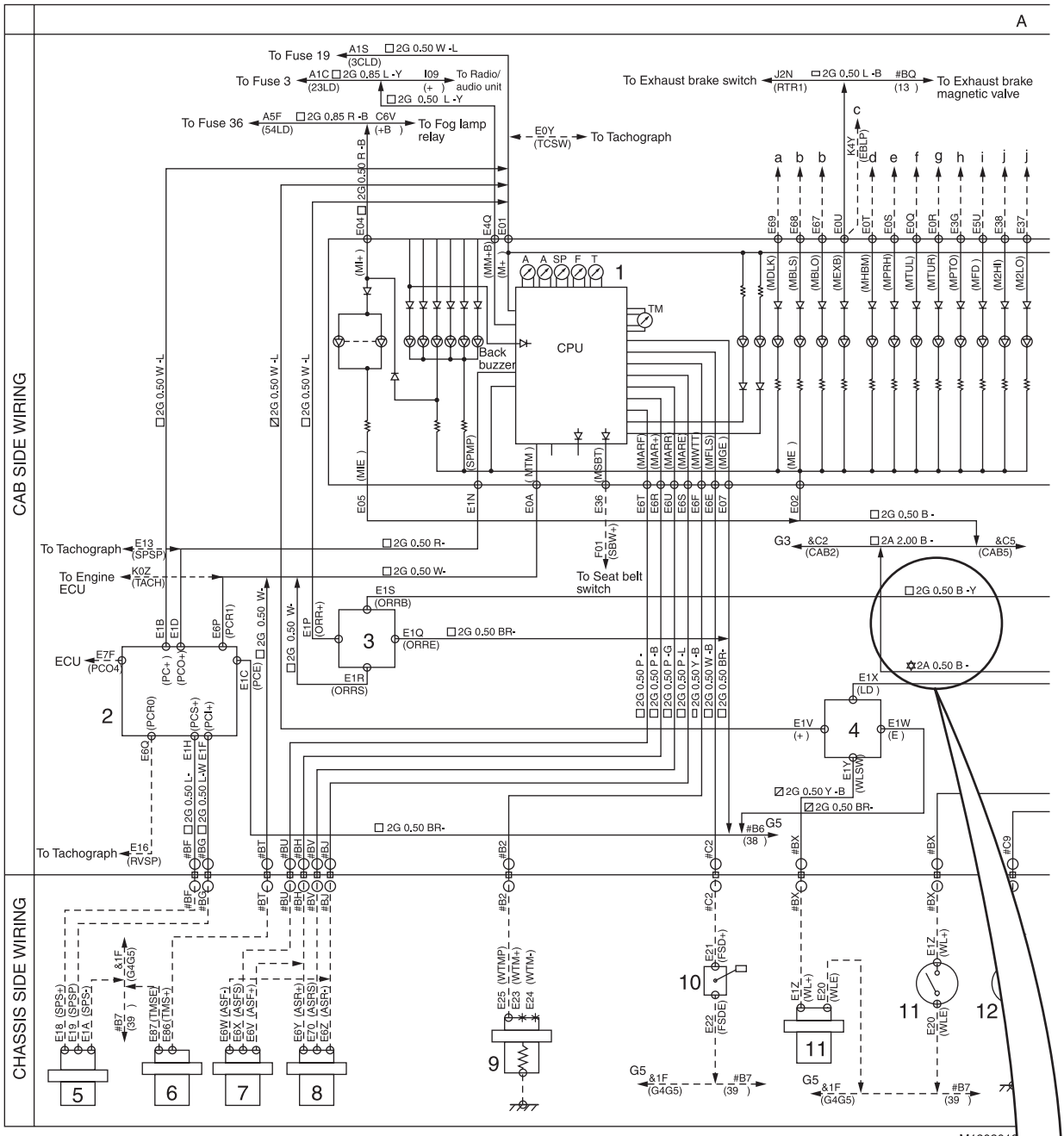
b. Specification symbol
This is the symbol of the specification listed on the "Specifications" column. On the wiring diagram, this symbol is prefixed to all the wiring type mark (example: 2G 0.50 W-L).
Each wiring is installed only on the vehicles of the specifications that the relevant specification 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	○	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		

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)	O	
		◐	Models FT, GT (for tractor models)		
		△	Models with J08C-TI engine	O	
		⊕	Model FC4J		
		⊠	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	O	
		⋈	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	O	
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		
		⊟	Models FT, GT	O	
		△	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		
		○	Models FT, GT	O	
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	O	
			Except models FT, GT		
			Models for mixer models		
			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	O	
			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	O	

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	O	
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 LEFT-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		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	O	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	O	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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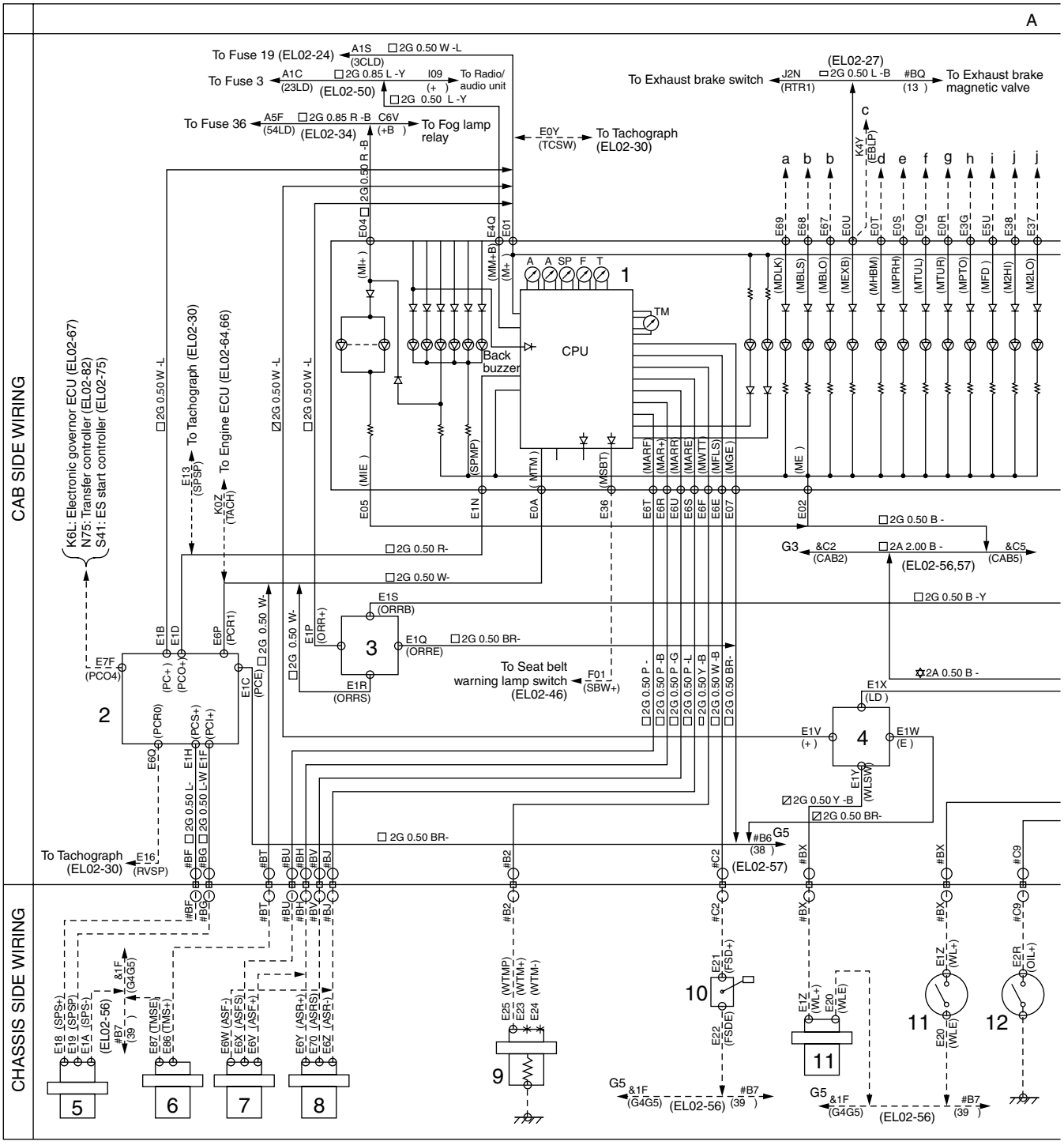
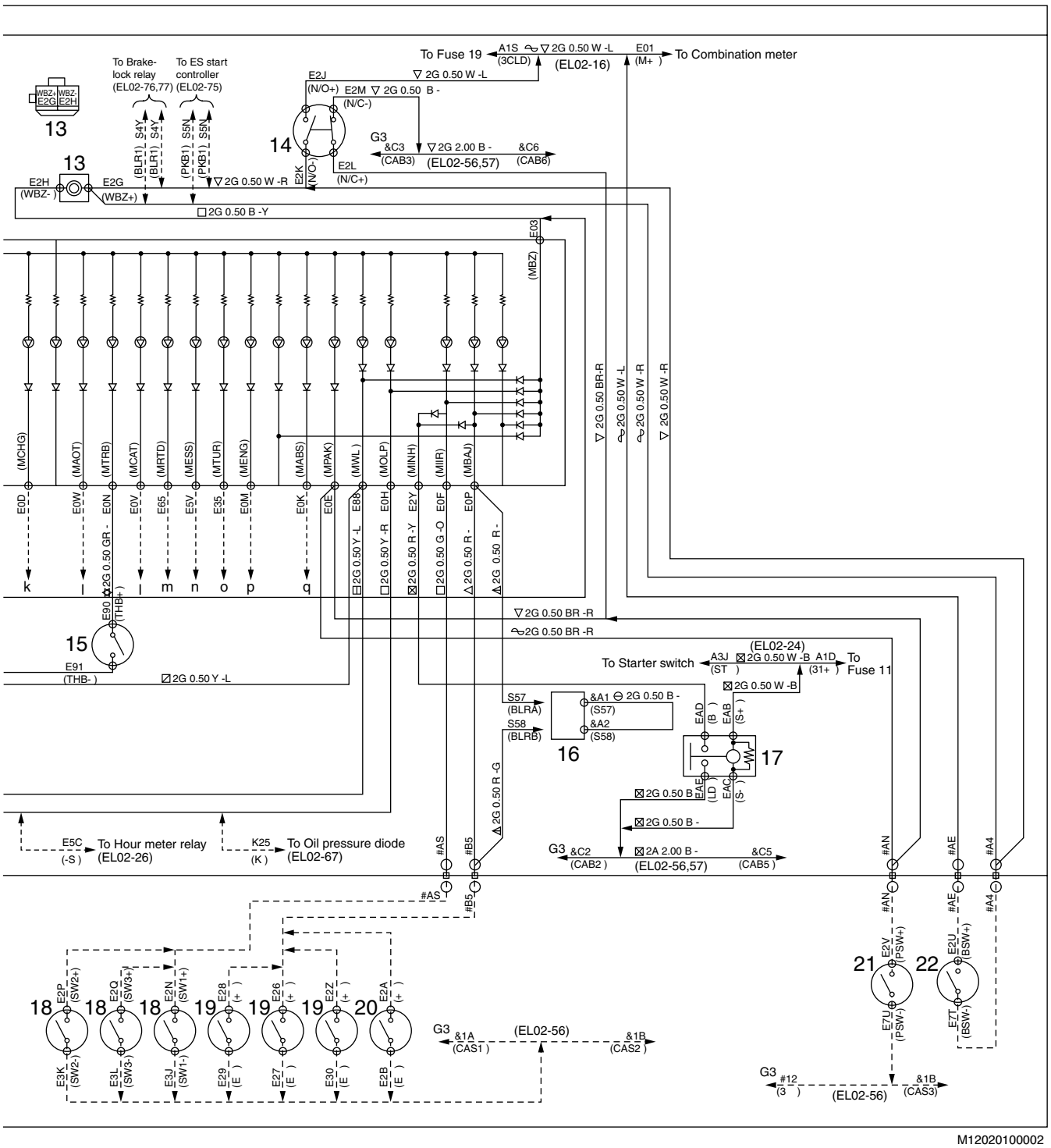


M12020100001

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

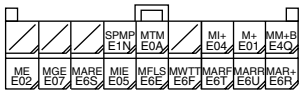


M12020100002

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

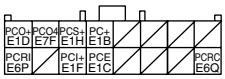


1

1
(For Automatic transmission)

1

1
(For Manual transmission)

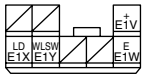


2

CHASSIS SIDE WIRING

M12020100003

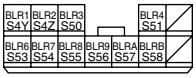
3



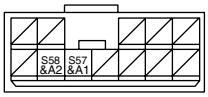
4

14

15

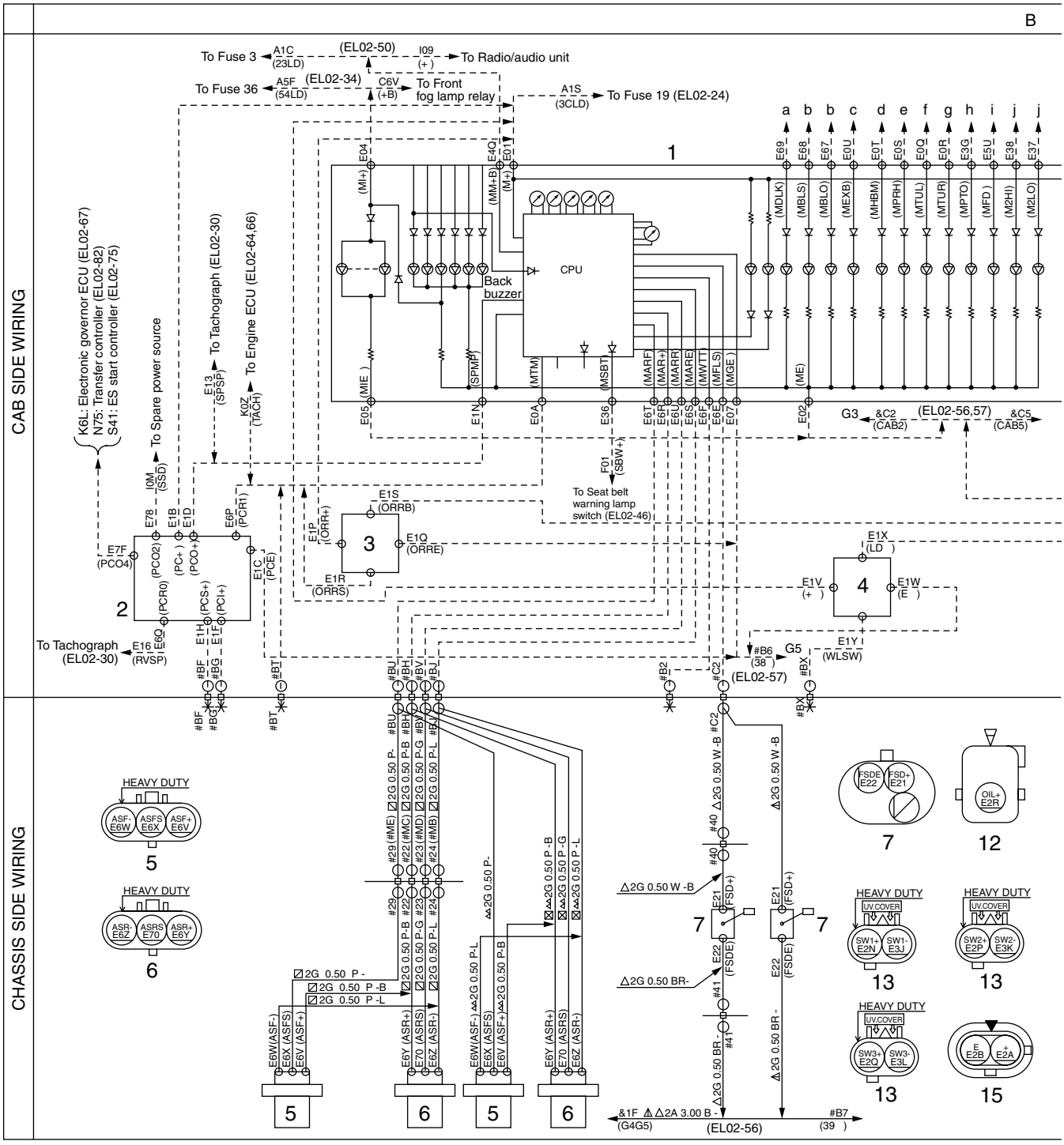


16
(With brake-lock control)



16
(Without brake-lock control)

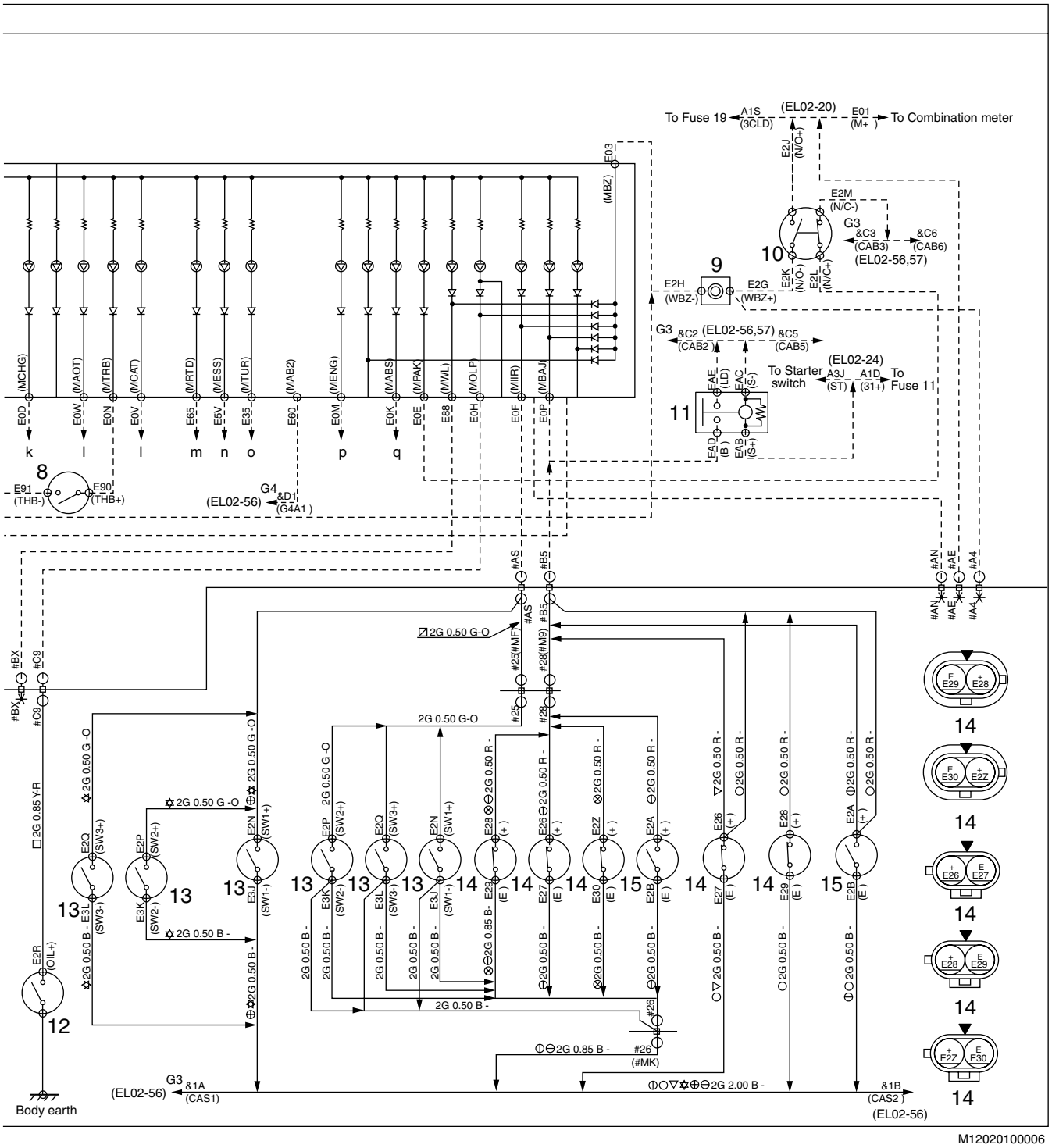
M12020100004



M12020100005

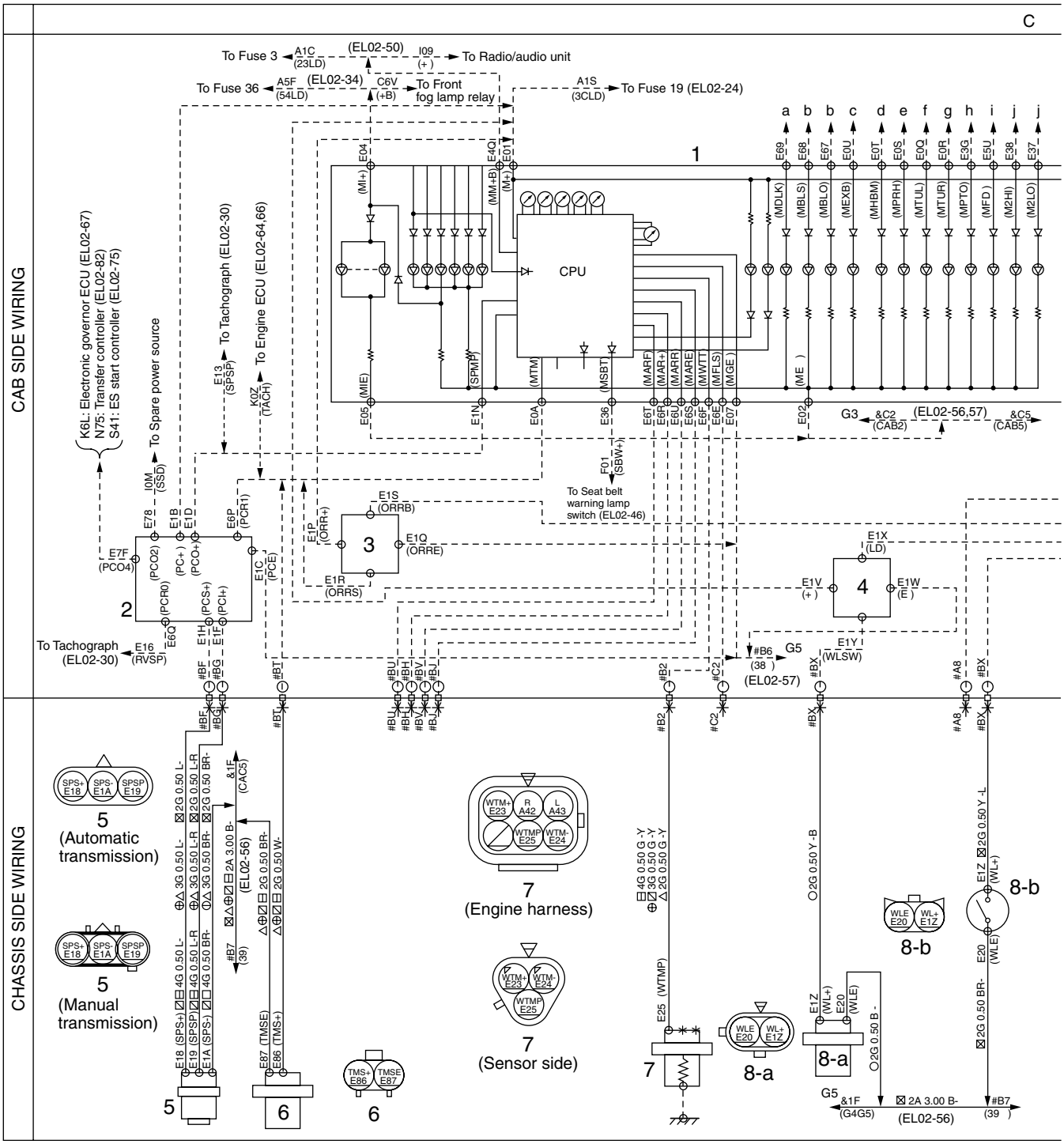
B. METER CIRCUIT (CHASSIS SIDE 1)

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)



M12020100006

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)

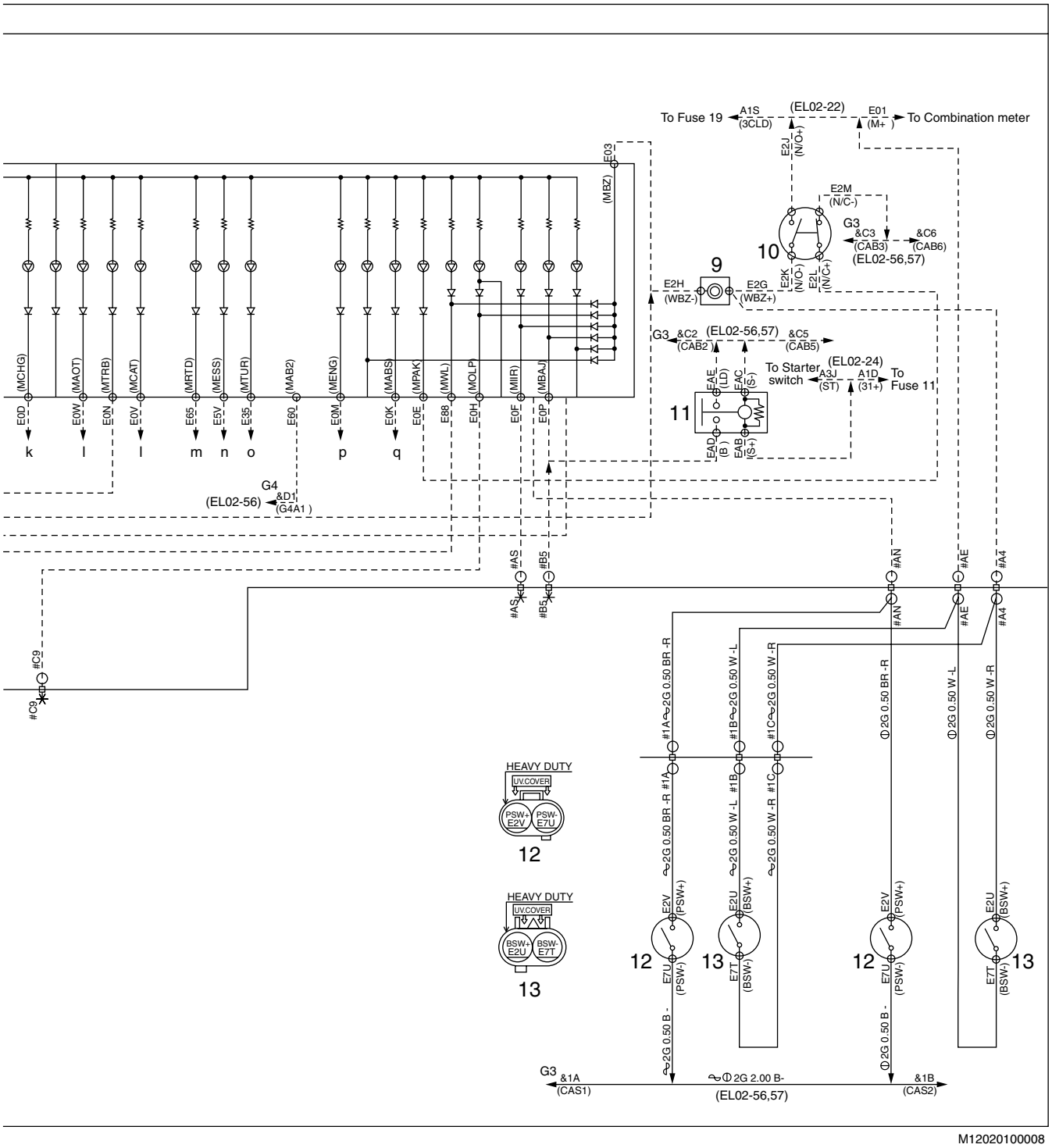


M12020100007

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)

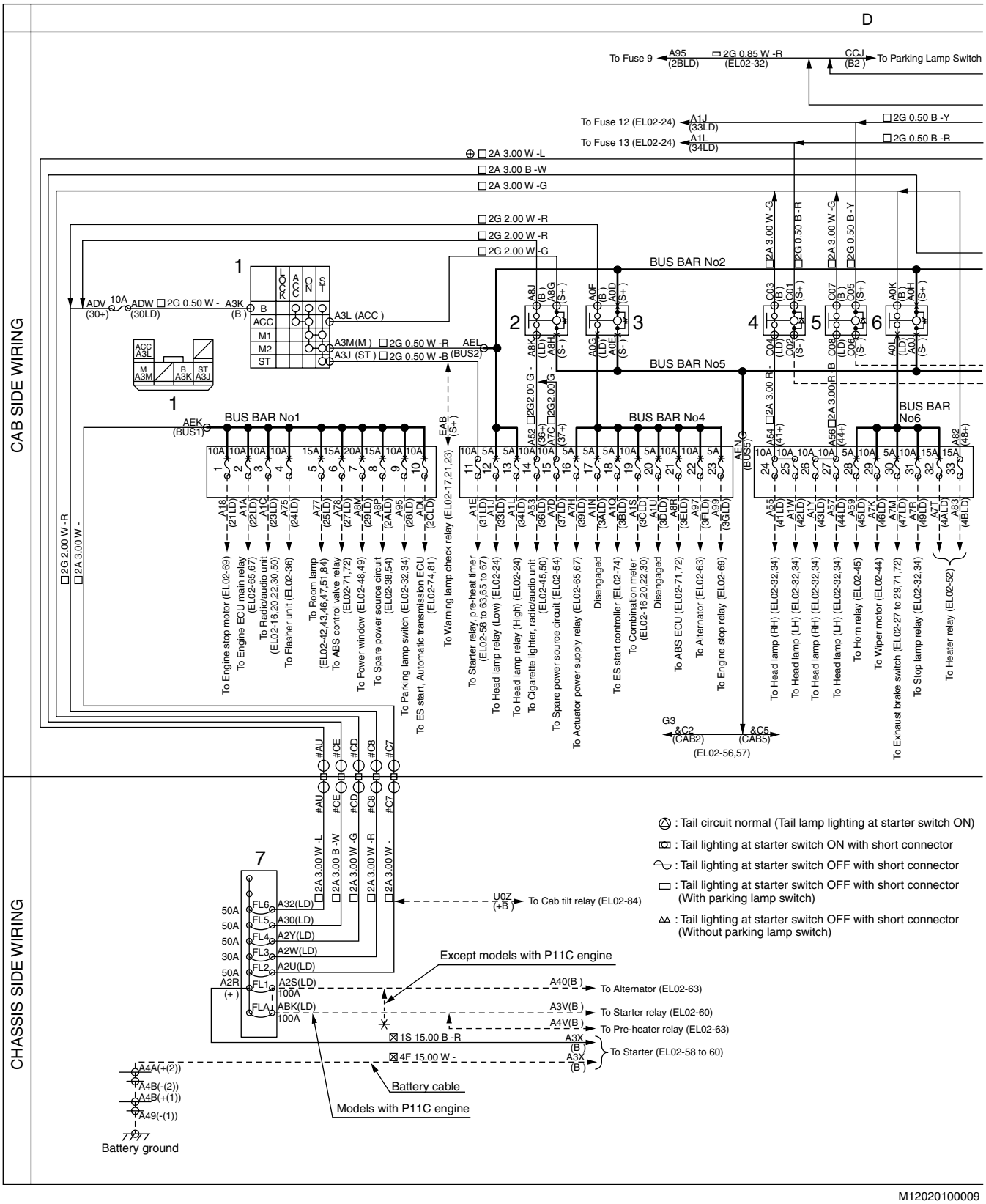
m. To Electromagnetic retarder control unit (EL02-78)

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)

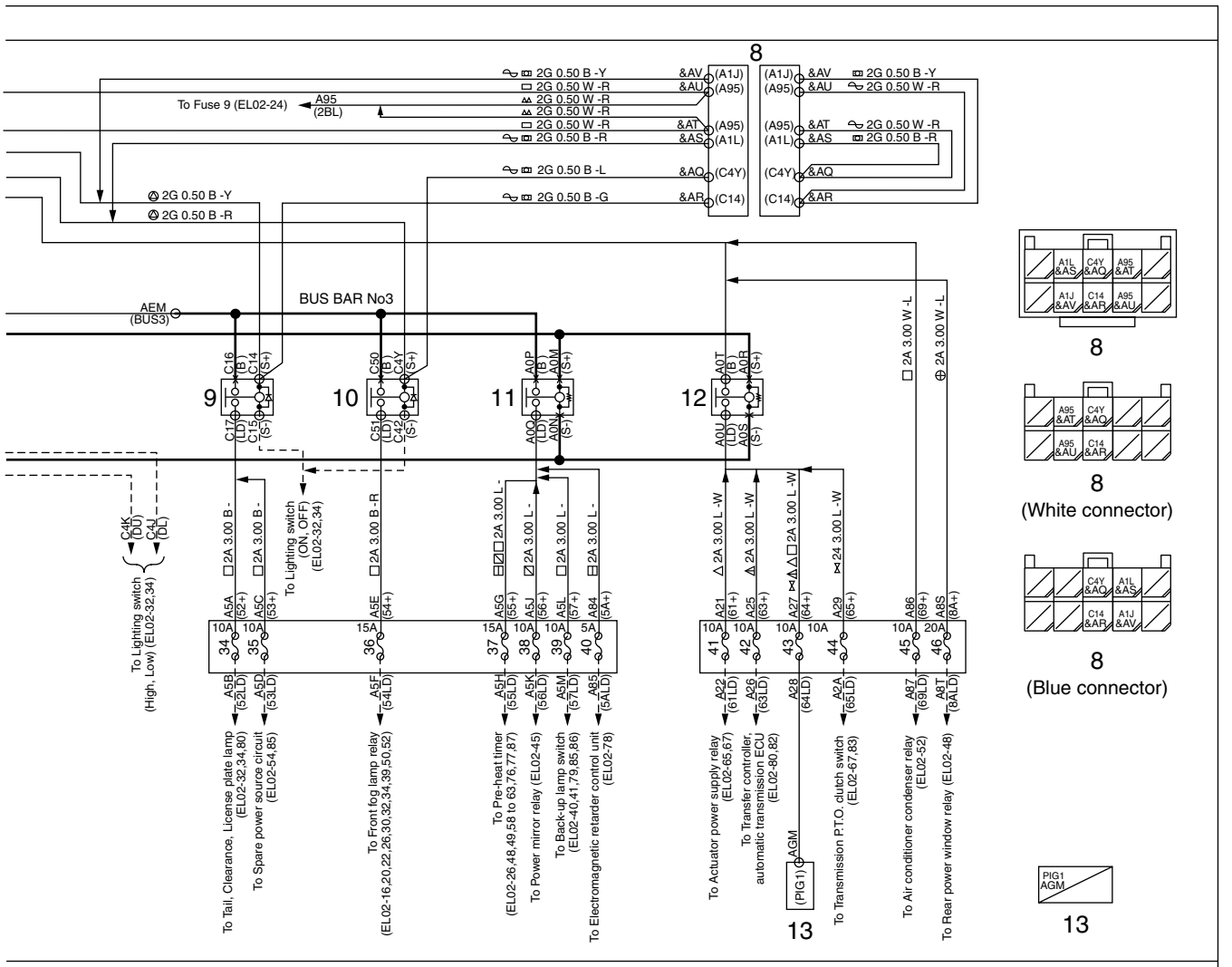
q. To ABS ECU (EL02-71,72)

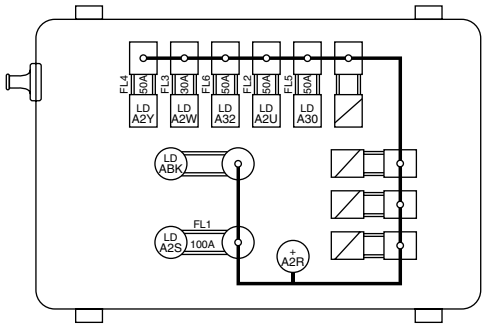


M12020100009

D. POWER SUPPLY CIRCUIT

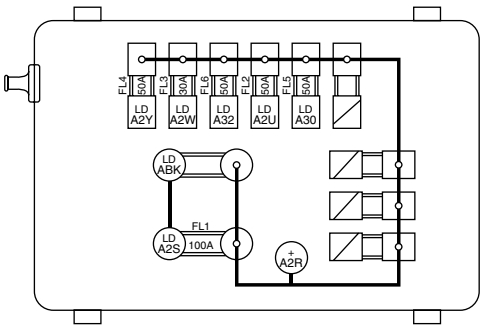
1. Starter switch
2. Power accessory relay
3. Power relay No.1
4. Head lamp relay (High)
5. Head lamp relay (Low)
6. Power relay No.2
7. Fusible link block 1
8. Short connector (If so equipped)
9. Tail lamp relay No.1
10. Tail lamp relay No.2
11. Power relay No.3
12. Power relay No.4
13. Spare power source connector





7

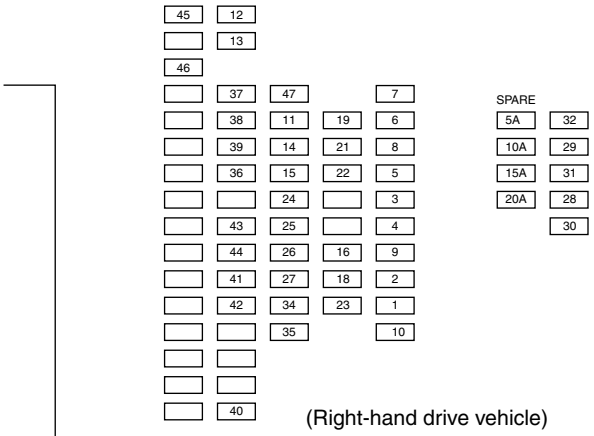
(Except P11C engine with 80A alternator)



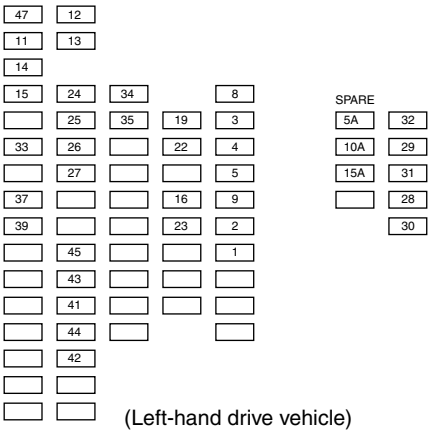
7

(For P11C engine with 80A alternator)

FUSE LAYOUT

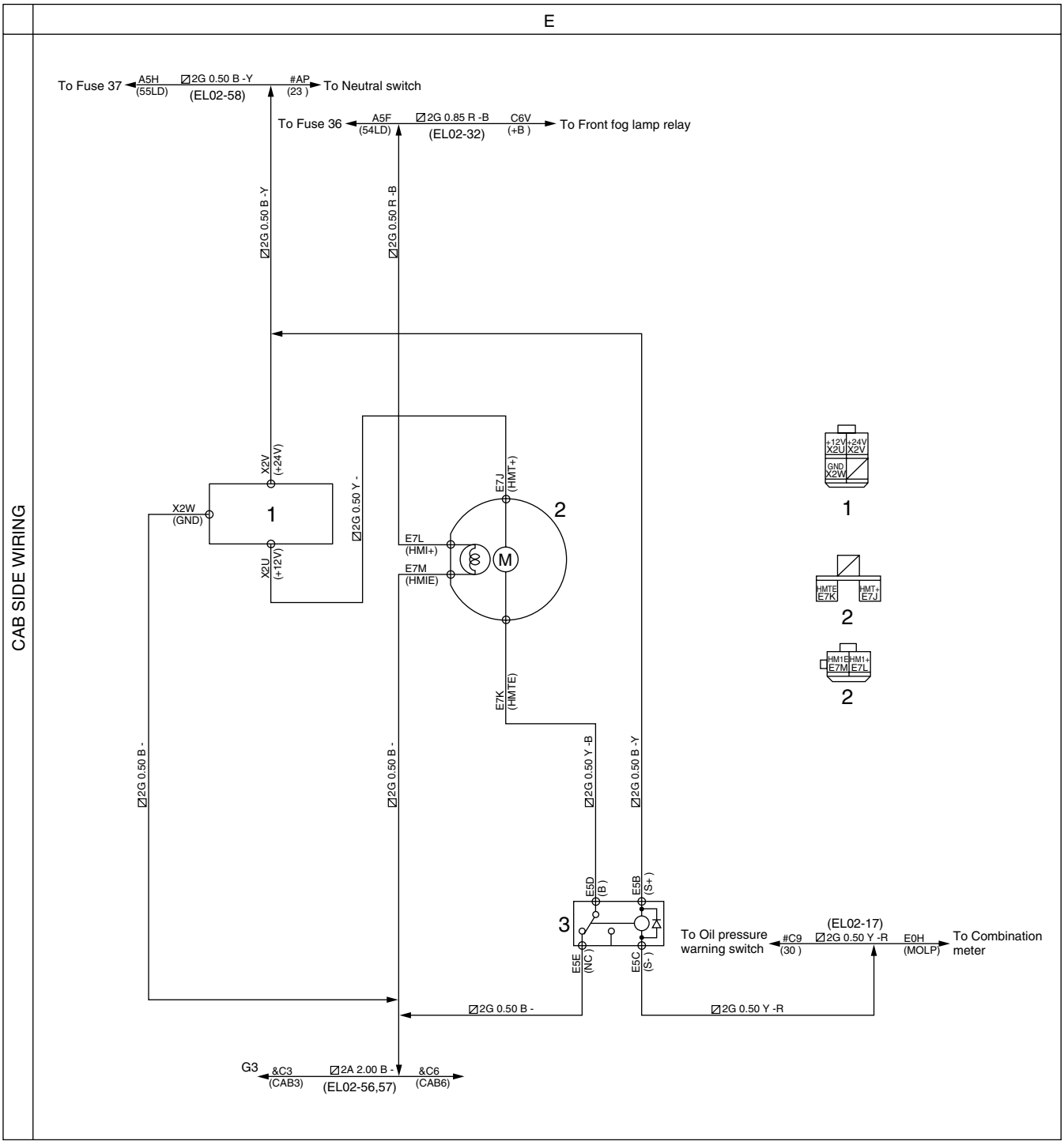


(Right-hand drive vehicle)



(Left-hand drive vehicle)

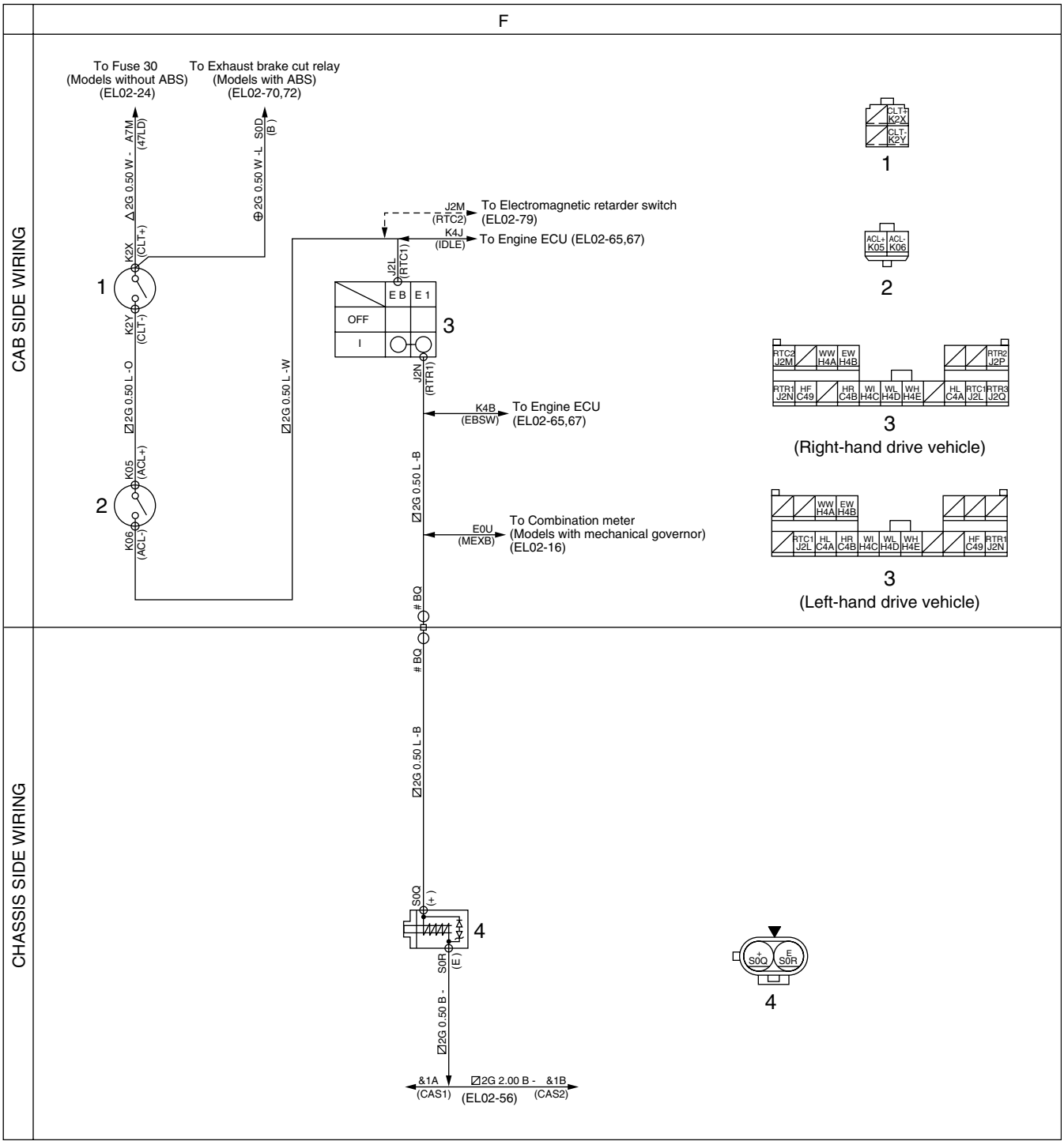
M12020100010



M12020100011

E. HOUR METER CIRCUIT

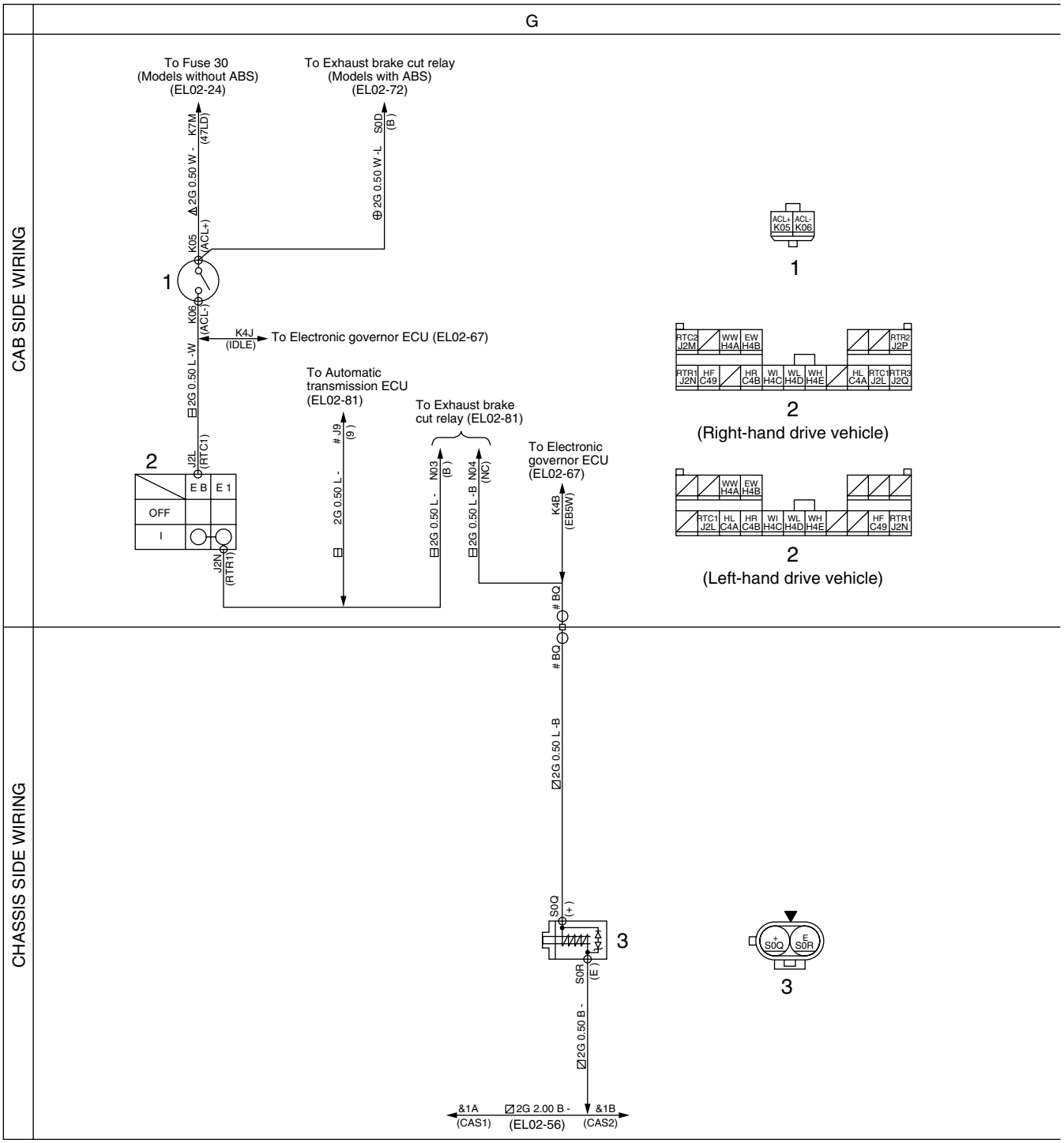
1. DC-DC converter
2. Hour meter
3. Hour meter relay



M12020100012

F. EXHAUST BRAKE CIRCUIT
(EXCEPT FOR MODELS WITH AUTOMATIC TRANSMISSION AND ALL MODELS OF P11C ENGINE)

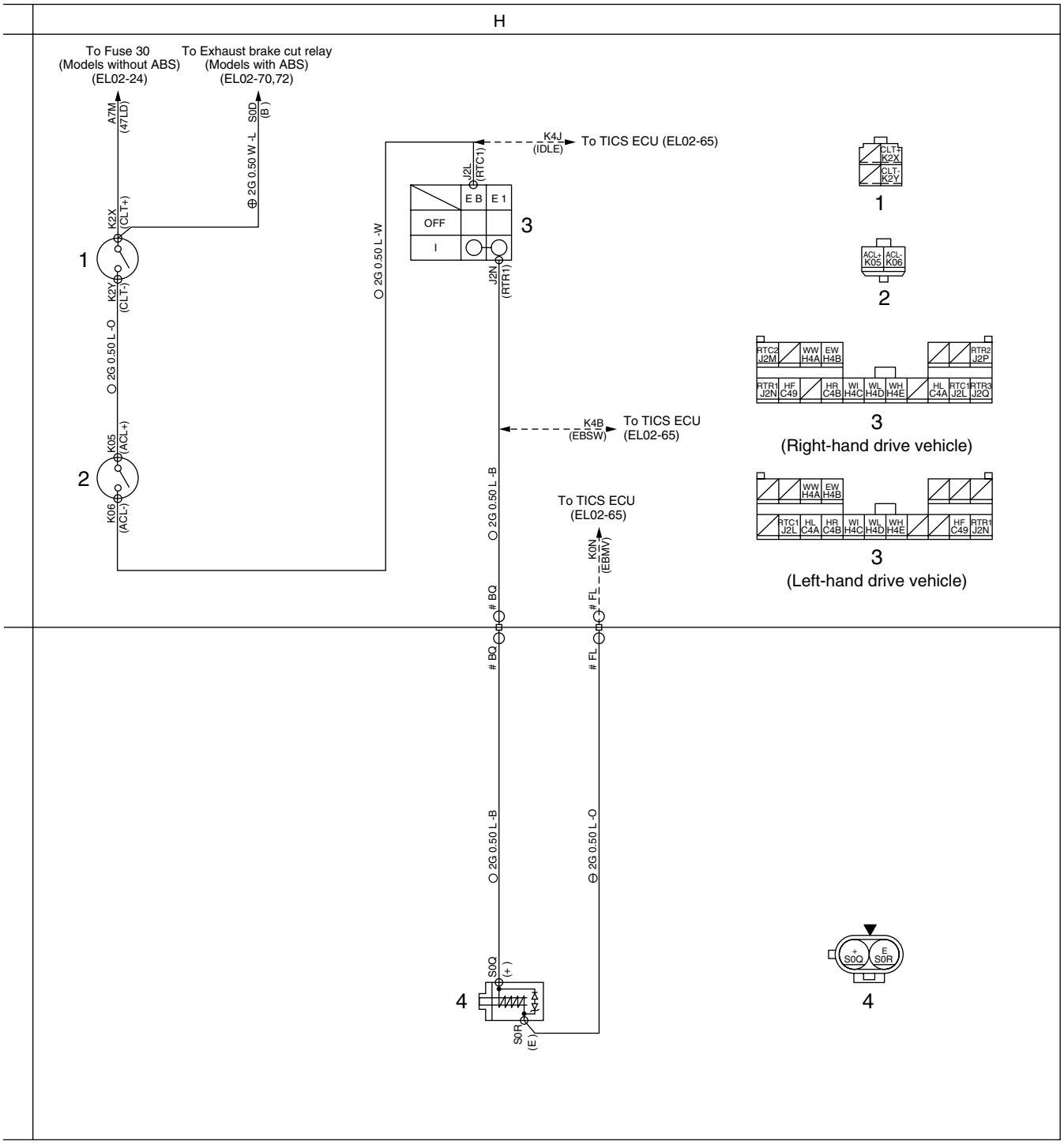
1. Clutch pedal switch
2. Accelerator pedal switch
3. Exhaust brake switch
4. Exhaust brake magnetic valve



M12020100013

G. EXHAUST BRAKE CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

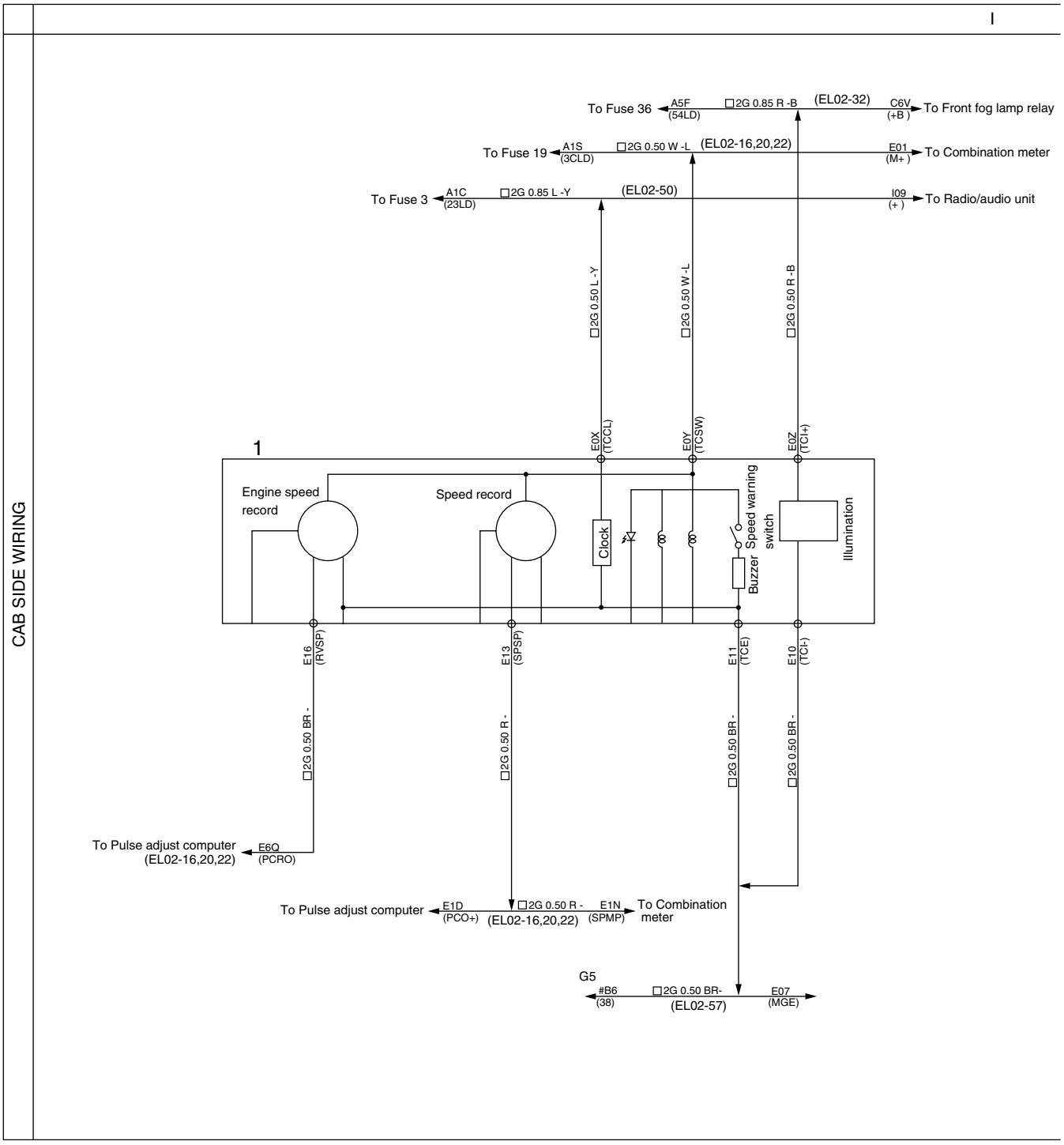
1. Accelerator pedal switch
2. Exhaust brake switch
3. Exhaust brake magnetic valve



M12020100014

H. EXHAUST BRAKE CIRCUIT (MODELS WITH P11C ENGINE)

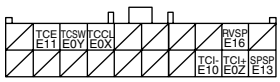
1. Clutch pedal switch
2. Accelerator pedal switch
3. Exhaust brake switch
4. Exhaust brake magnetic valve



M12020100015

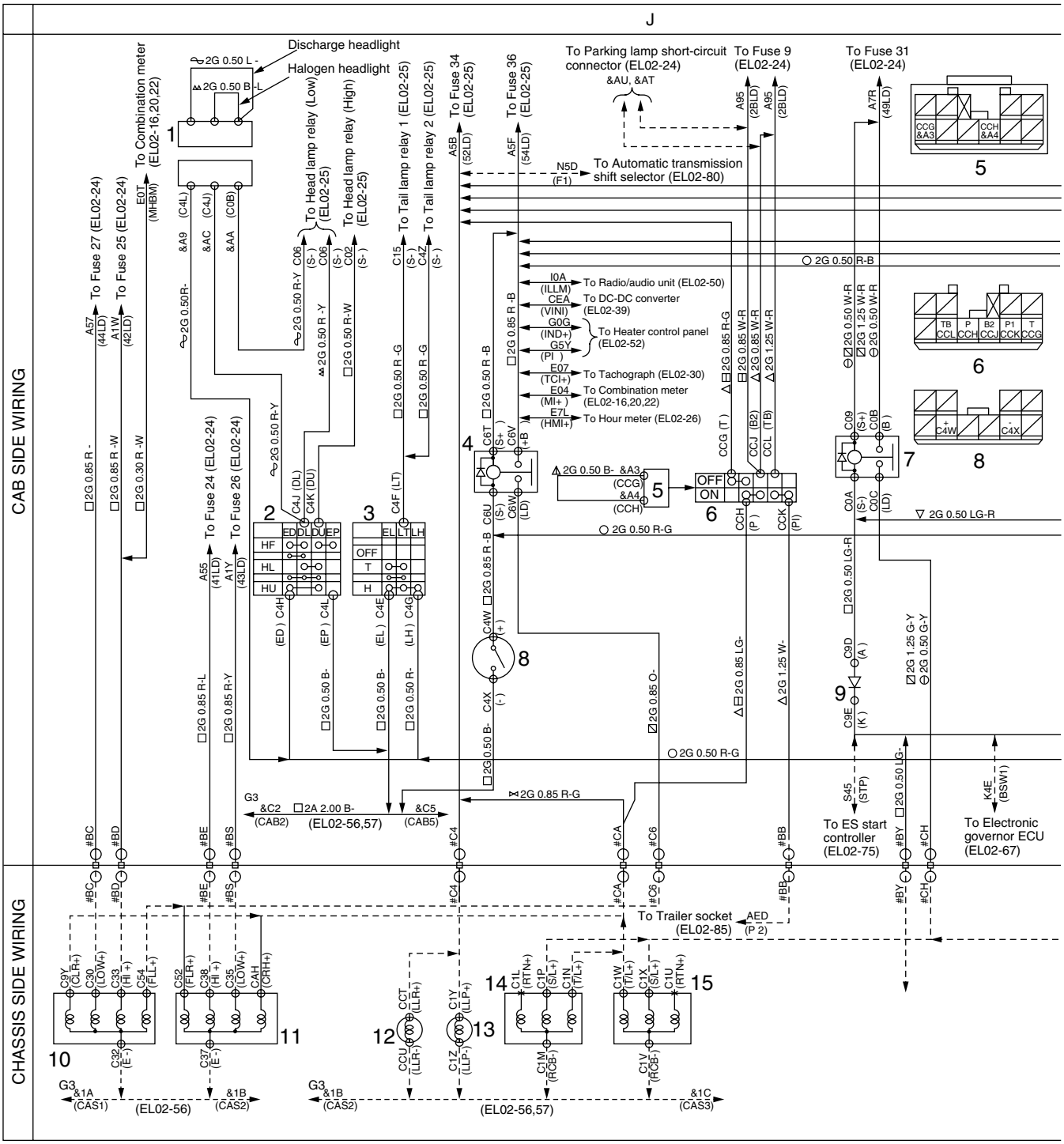
I. TACHOGRAPH CIRCUIT

1. Electric tachograph



1

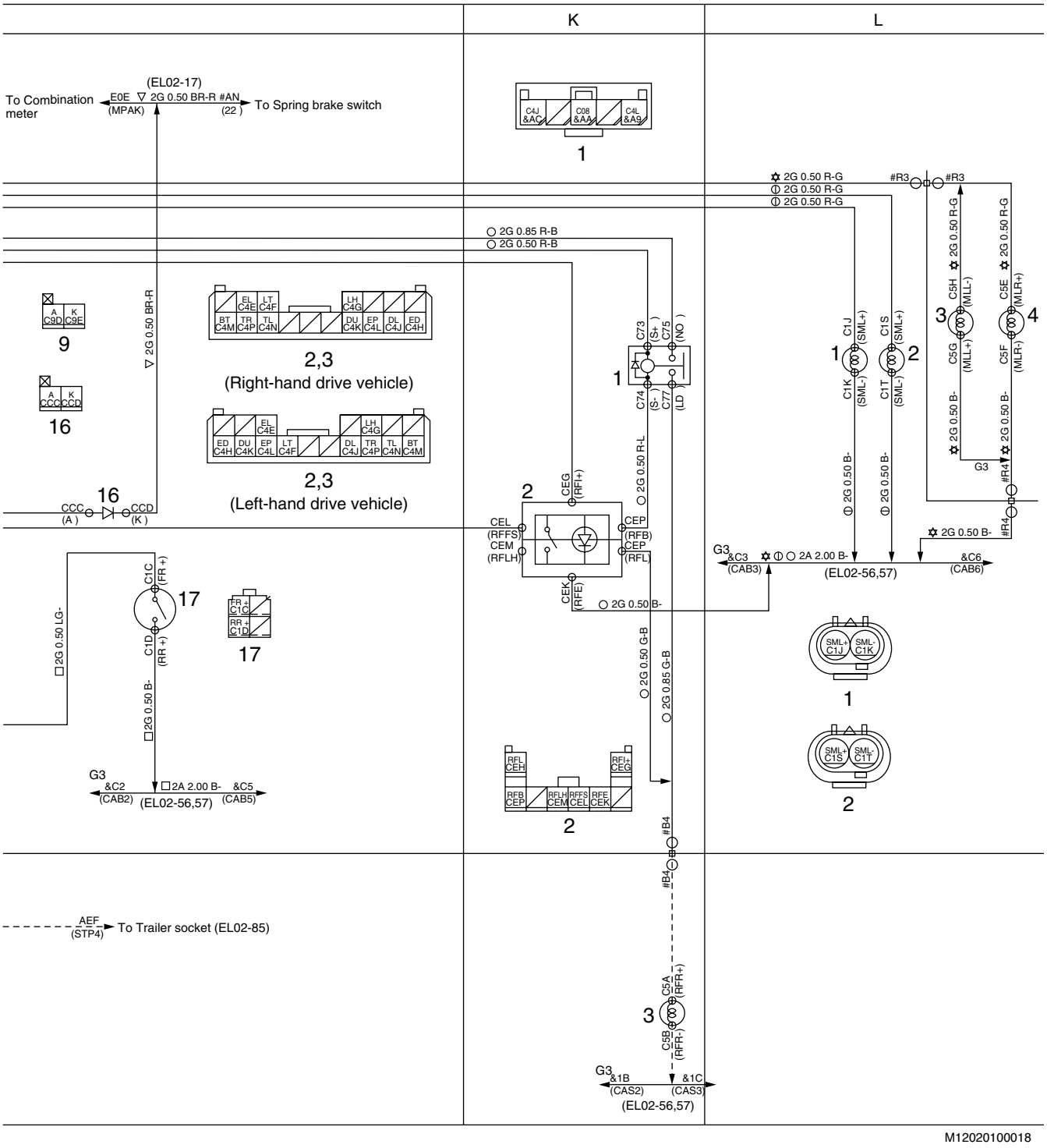
M12020100016



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



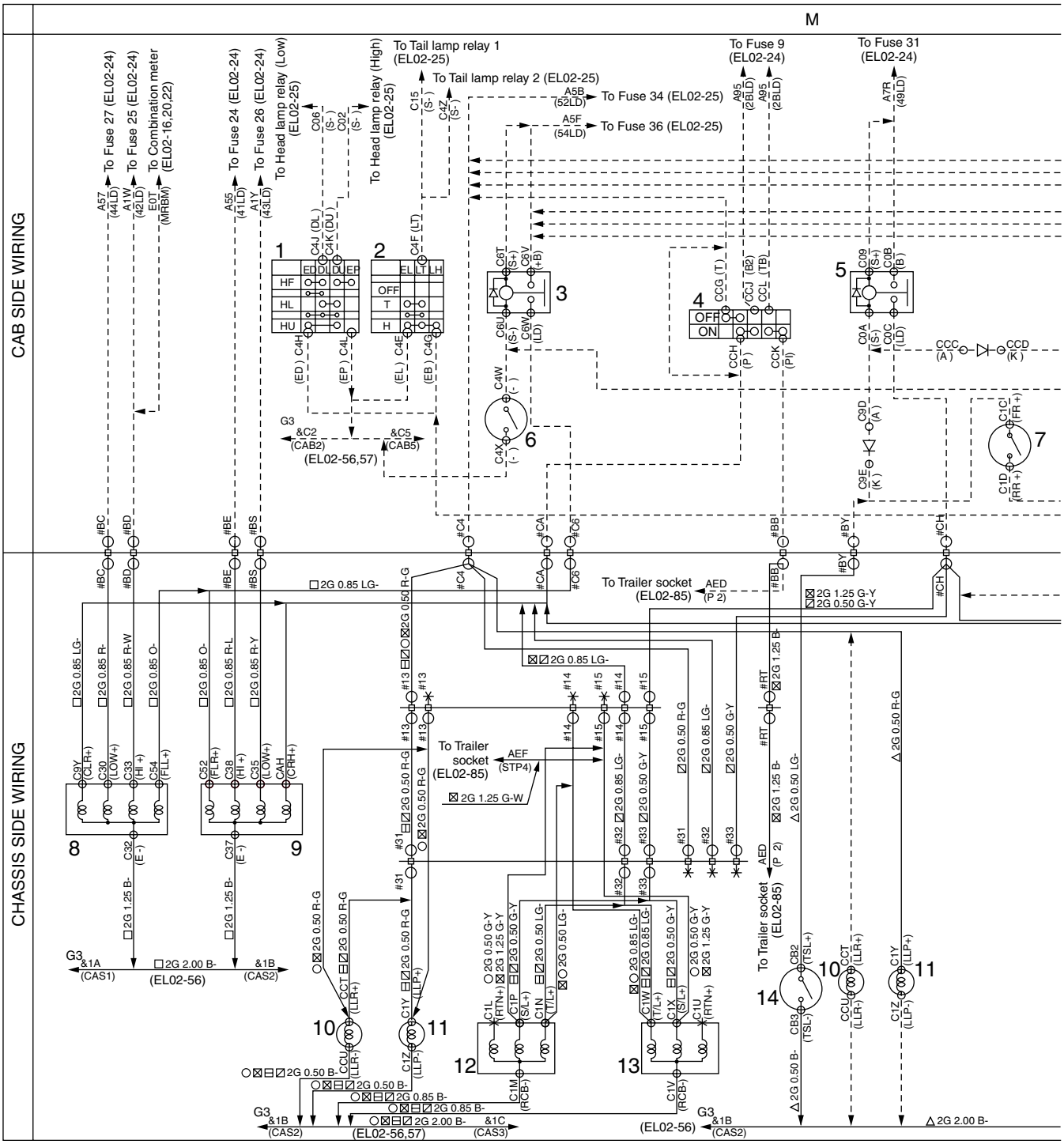
M12020100018

K. REAR FOG LAMP CIRCUIT (CAB SIDE)

1. Rear fog lamp relay
2. Rear fog lamp switch
3. Rear fog lamp

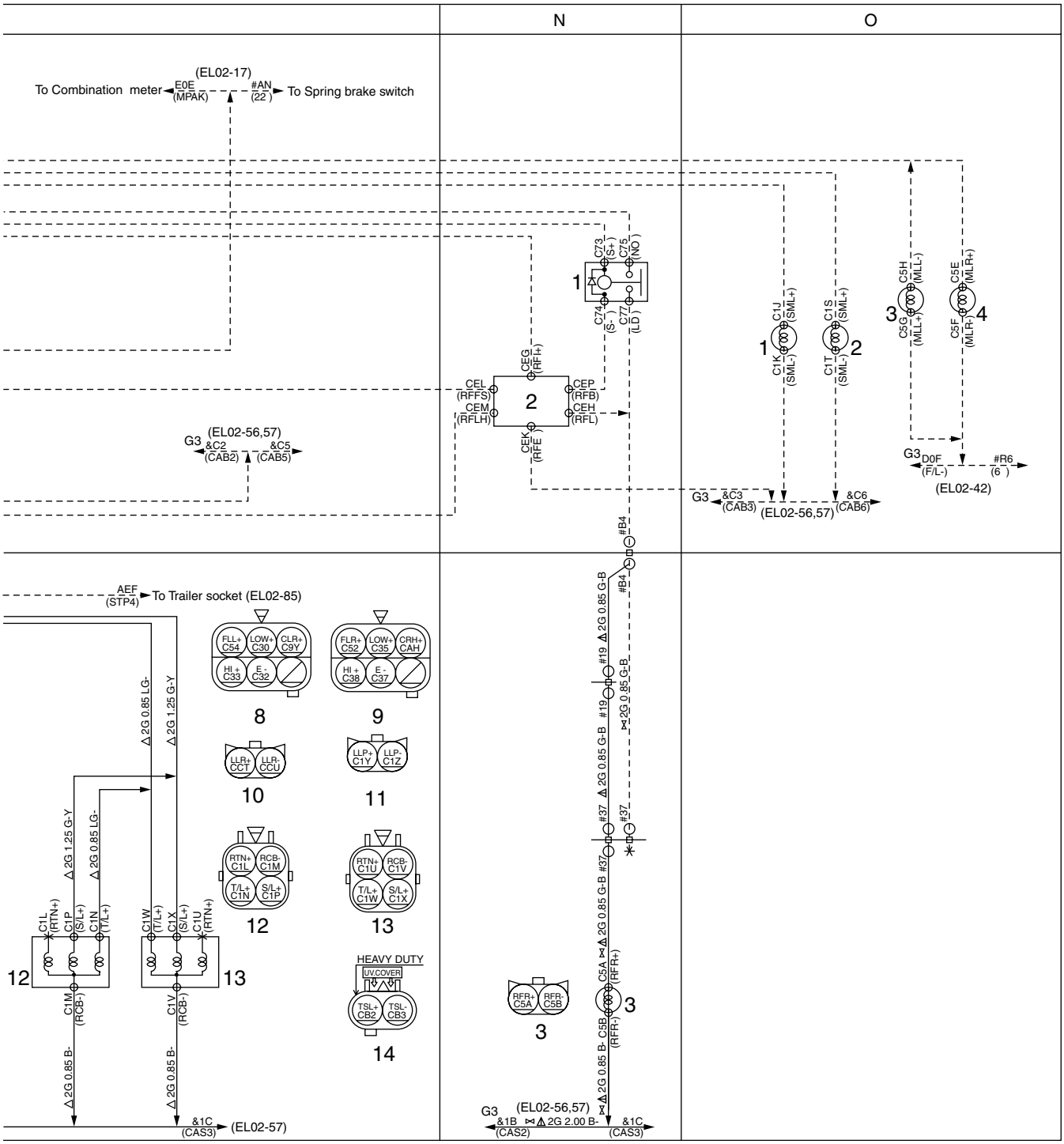
L. MARKER LAMP CIRCUIT (CAB SIDE)

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



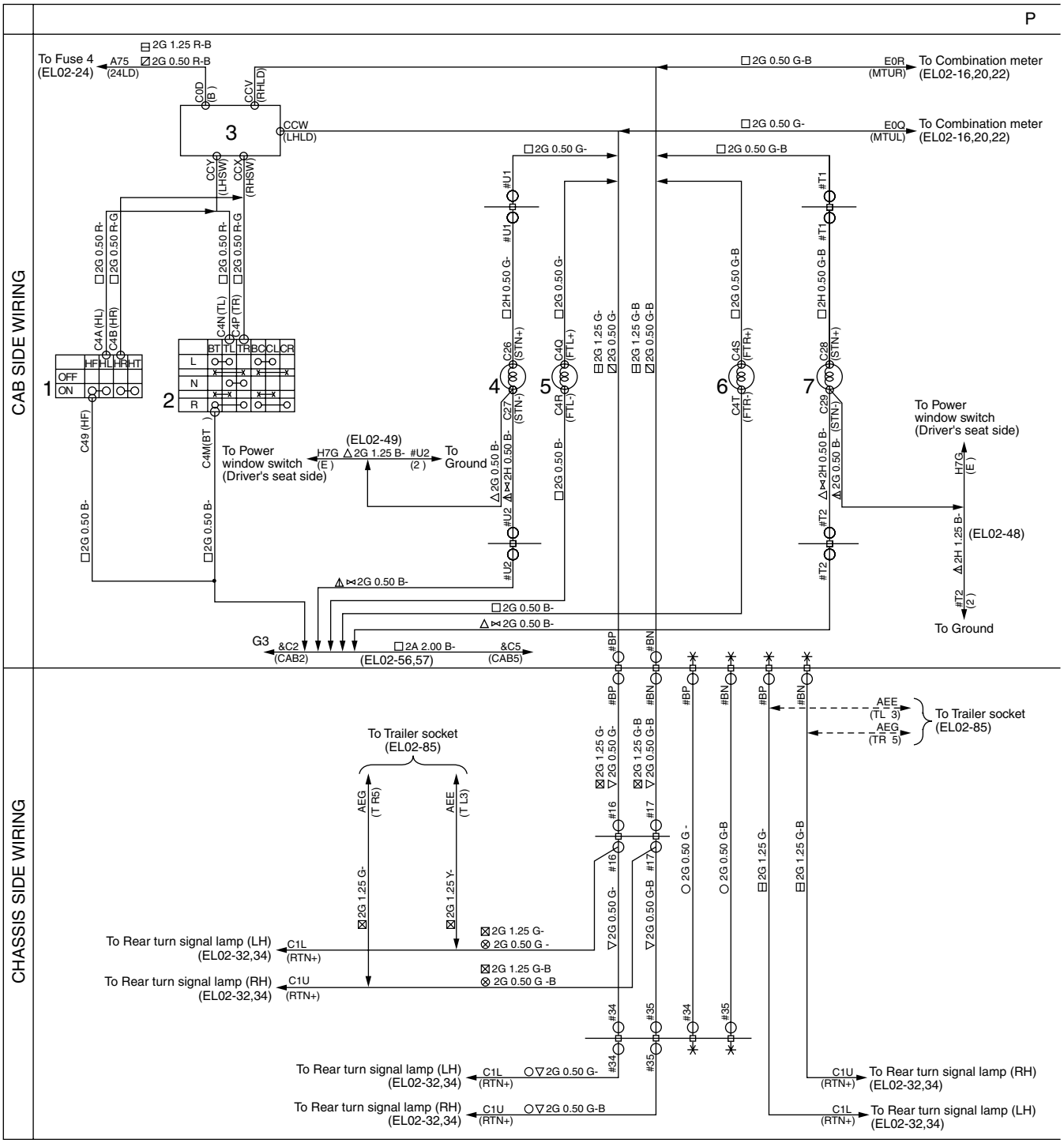
M12020100020

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)

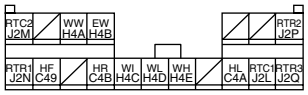
1. Side marker lamp (LH)
2. Side marker lamp (RH)
3. Roof marker lamp (LH)
4. Roof marker lamp (RH)



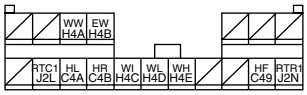
M12020100021

P. TURN SIGNAL AND HAZARD LAMP CIRCUIT

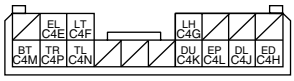
1. Hazard lamp switch
2. Turn signal lamp switch
3. Flasher unit
4. Side turn signal lamp (LH)
5. Front turn signal lamp (LH)
6. Front turn signal lamp (RH)
7. Side turn signal lamp (RH)



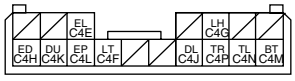
1
(Right-hand drive vehicle)



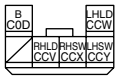
1
(Left-hand drive vehicle)



2
(Right-hand drive vehicle)



2
(Left-hand drive vehicle)



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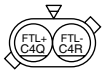

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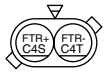
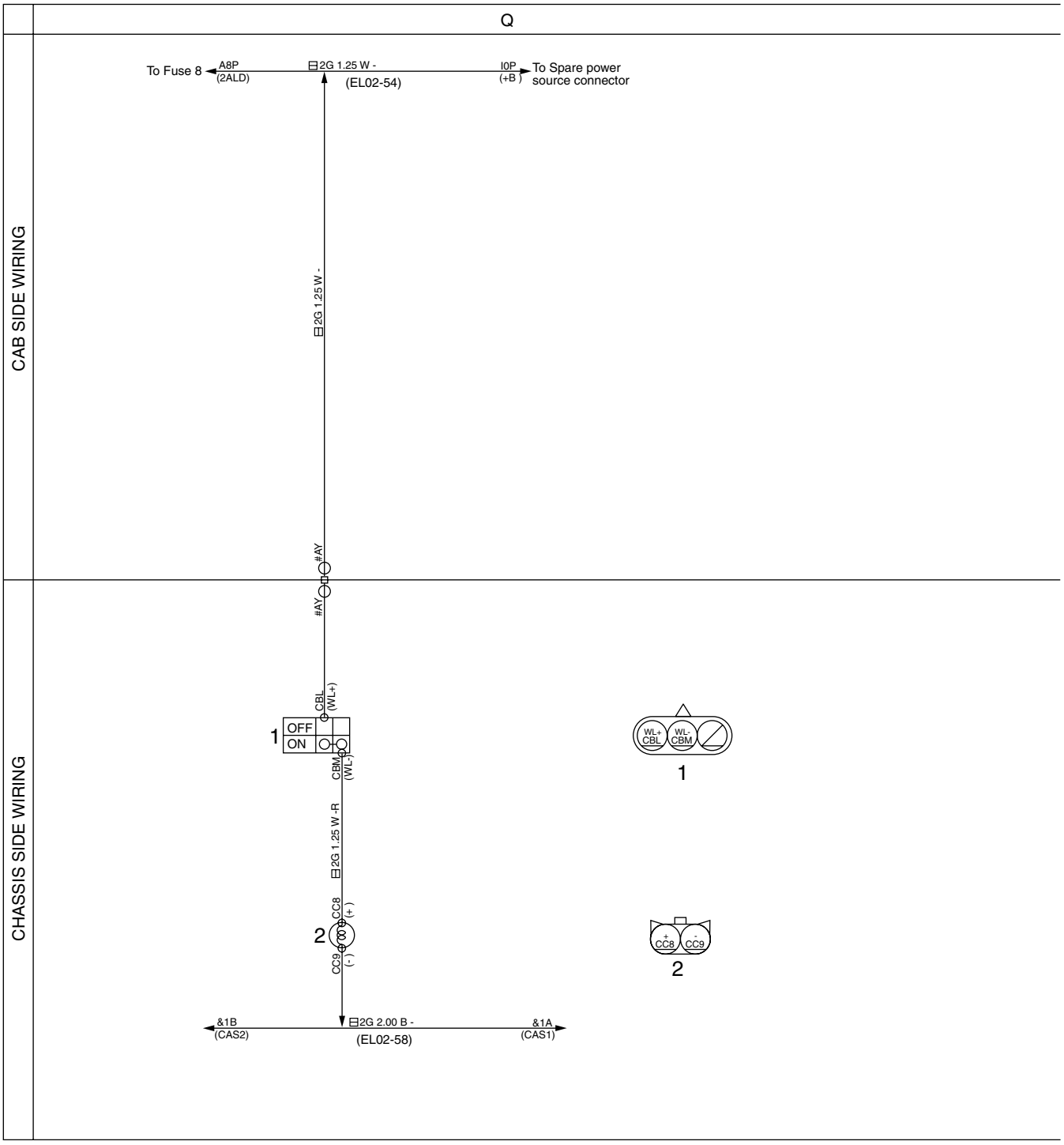


6

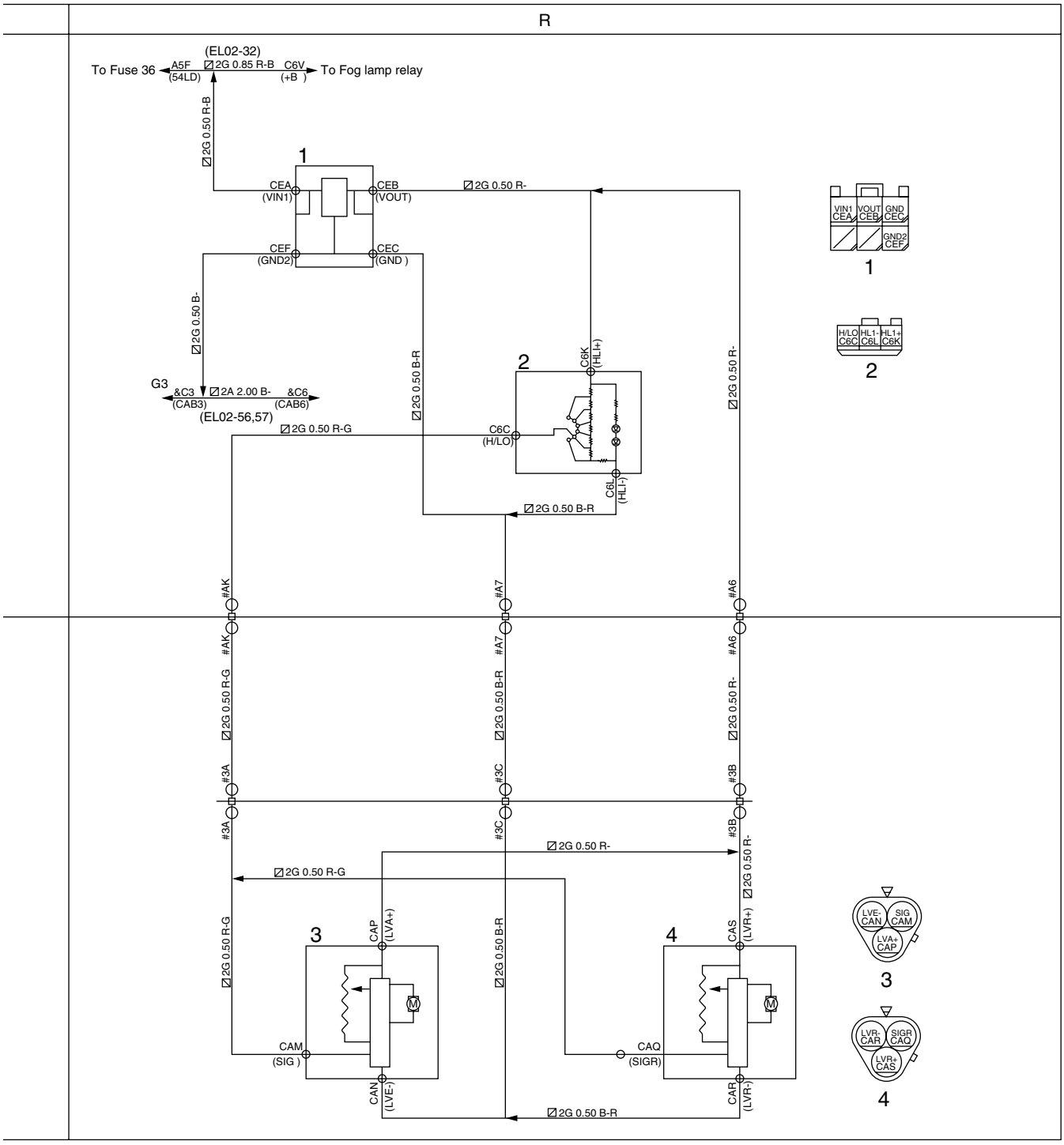
M12020100022



M12020100023

Q. SPOT LAMP CIRCUIT

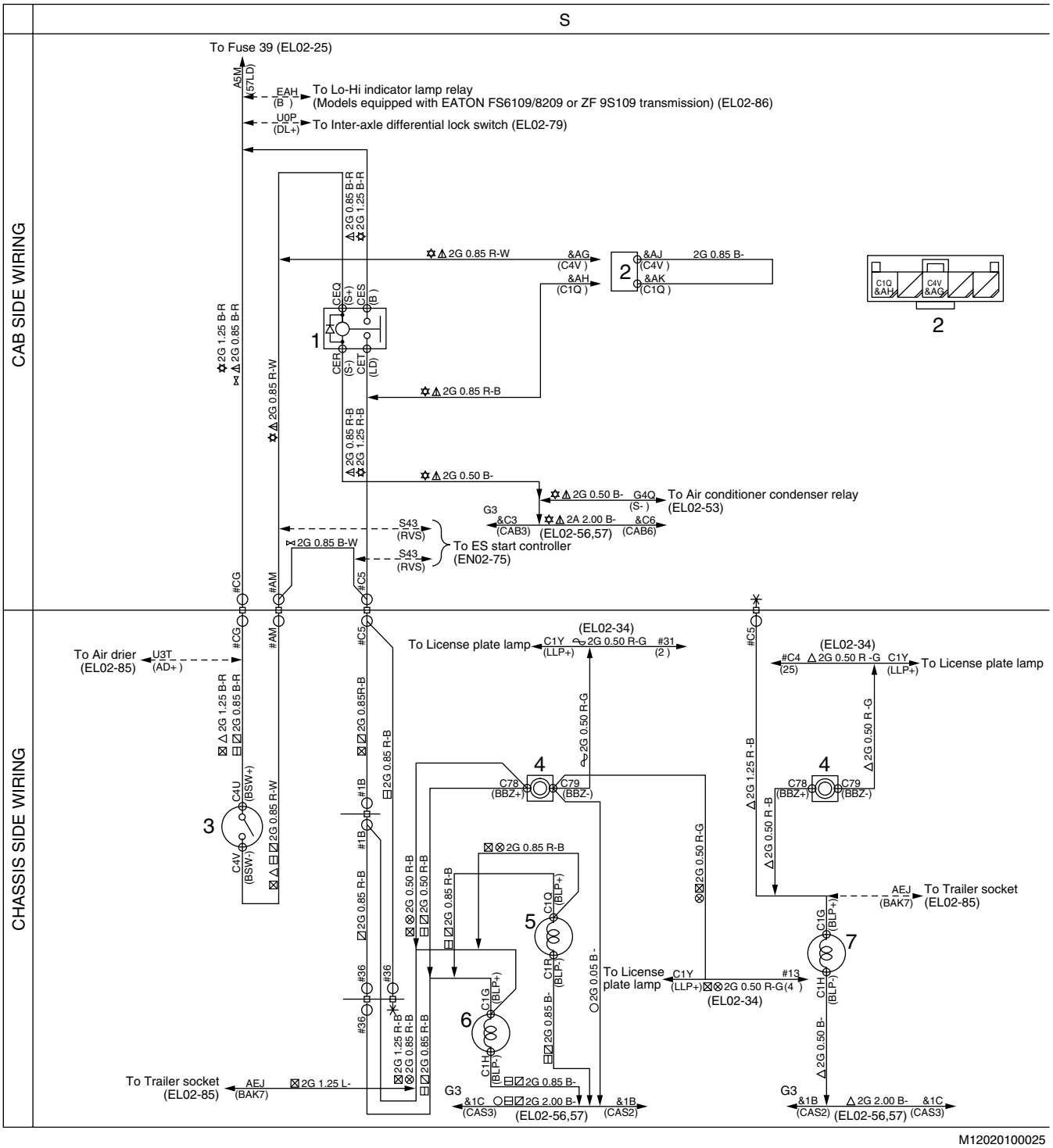
1. Spot lamp switch
2. Spot lamp



M12020100024

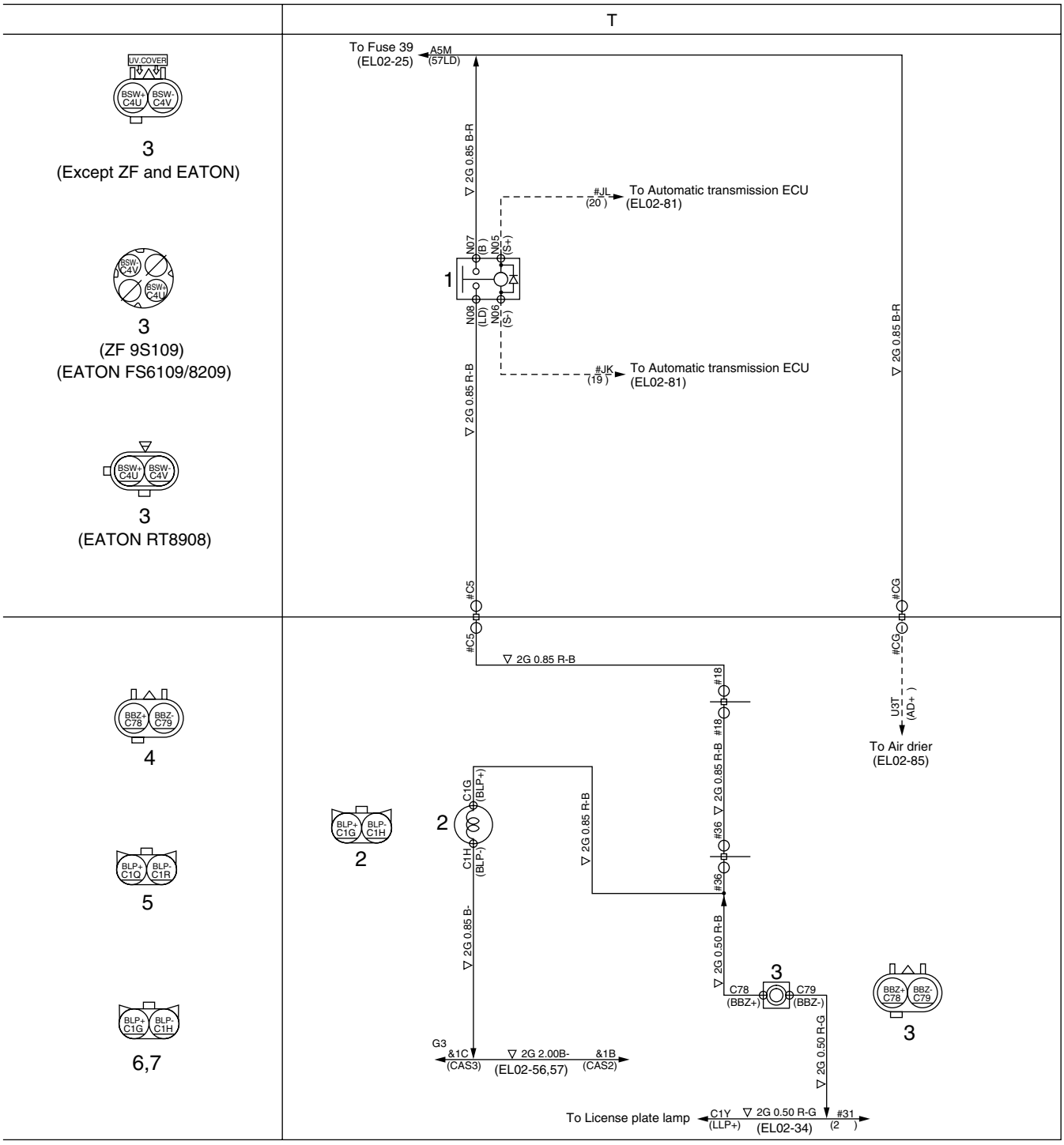
R. HEAD LAMP CONTROL CIRCUIT

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)

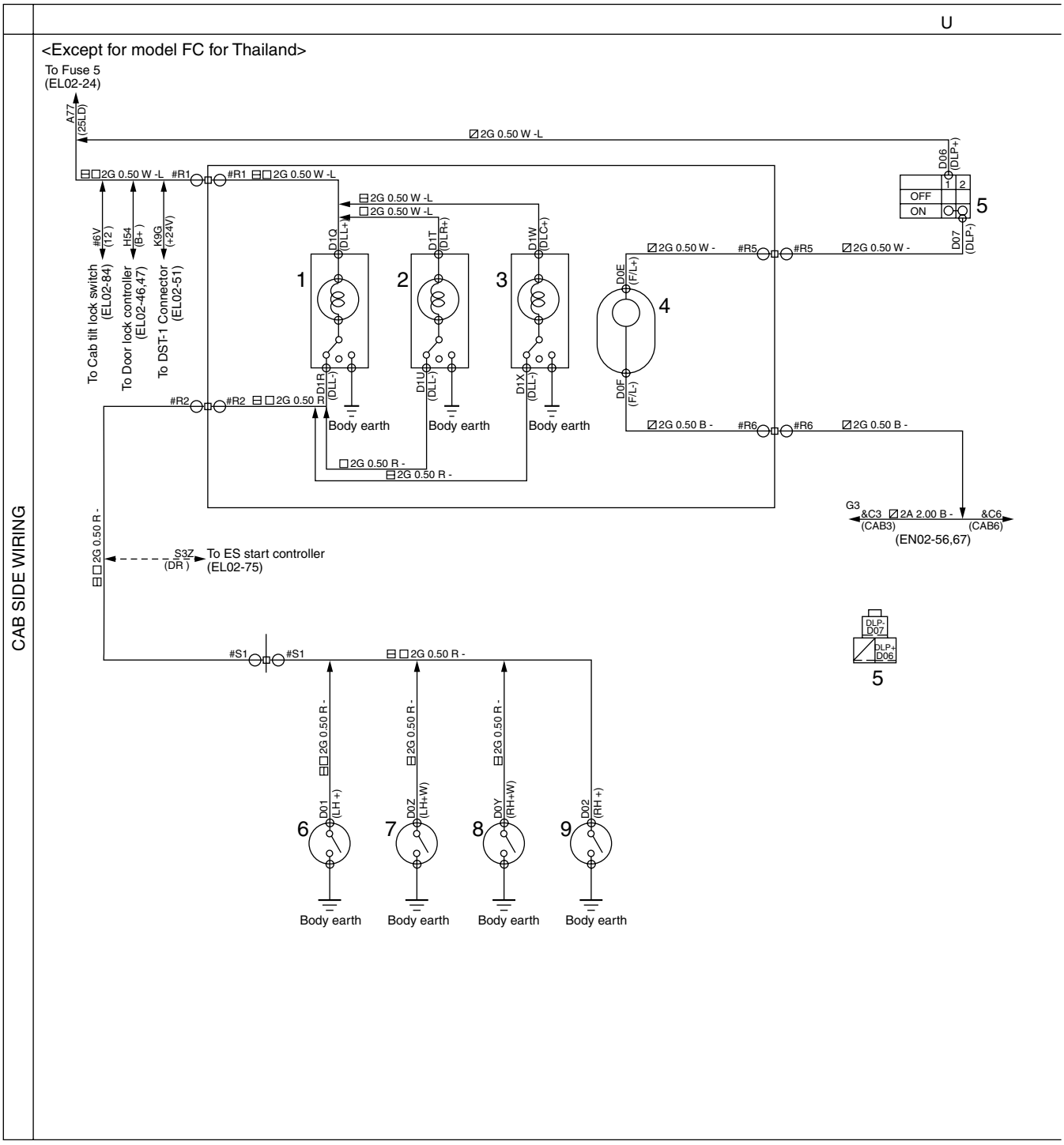
1. Back-up lamp relay
2. Back-up lamp short-circuit connector
3. Back-up lamp switch
4. Back-up buzzer
5. Back-up lamp (RH)
6. Back-up lamp (LH)
7. Back-up lamp



M12020100026

T. BACK-UP LAMP CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

1. Back-up lamp relay
2. Back-up lamp
3. Back-up buzzer

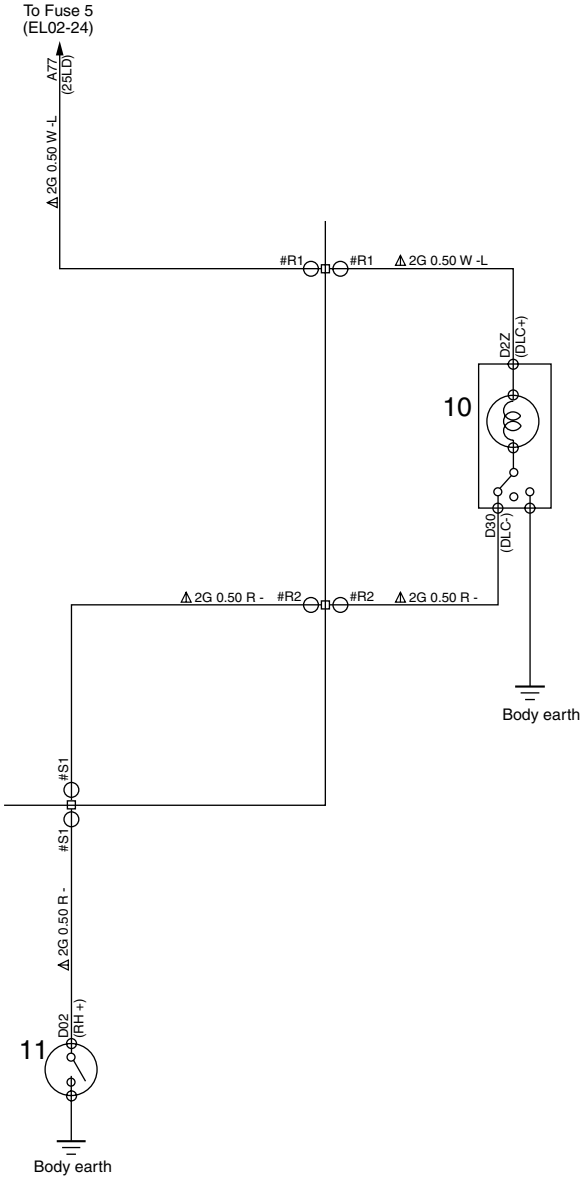


M12020100027

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>



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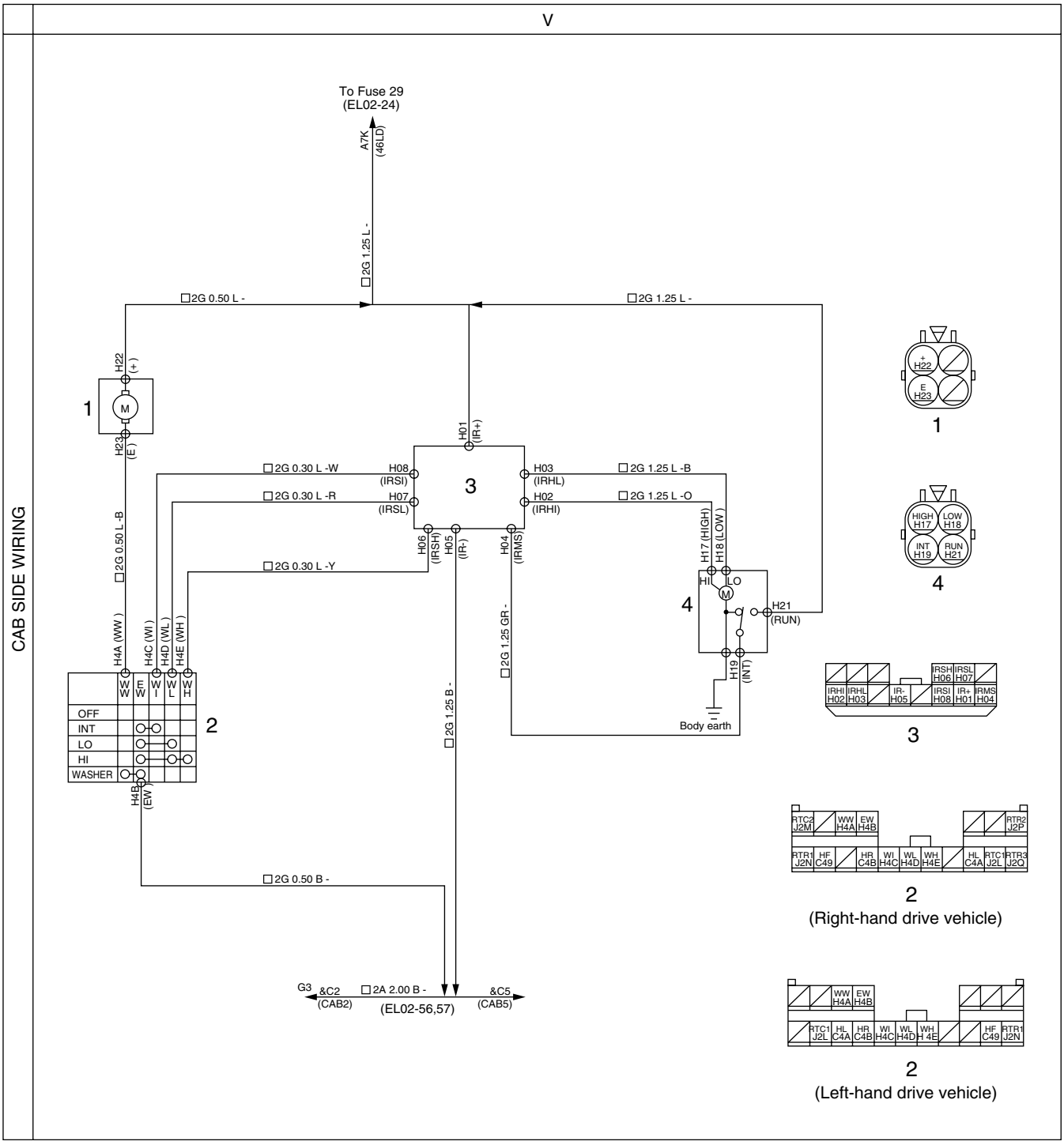
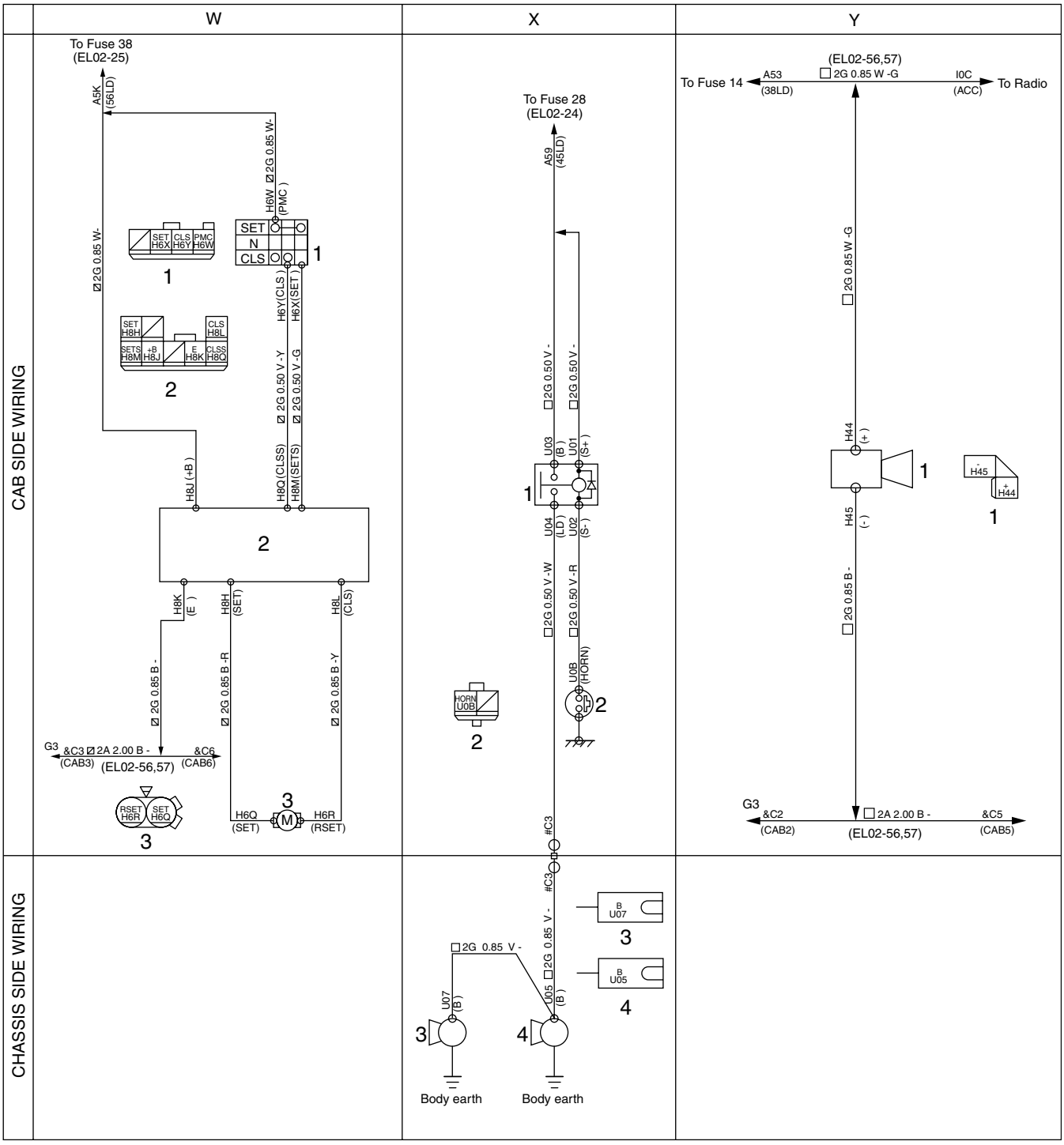


M12020100029

V. WIPER AND WASHER CIRCUIT

1. Washer motor
2. Wiper switch
3. Intermittent wiper relay
4. Wiper motor



M12020100030

W. POWER MIRROR CIRCUIT

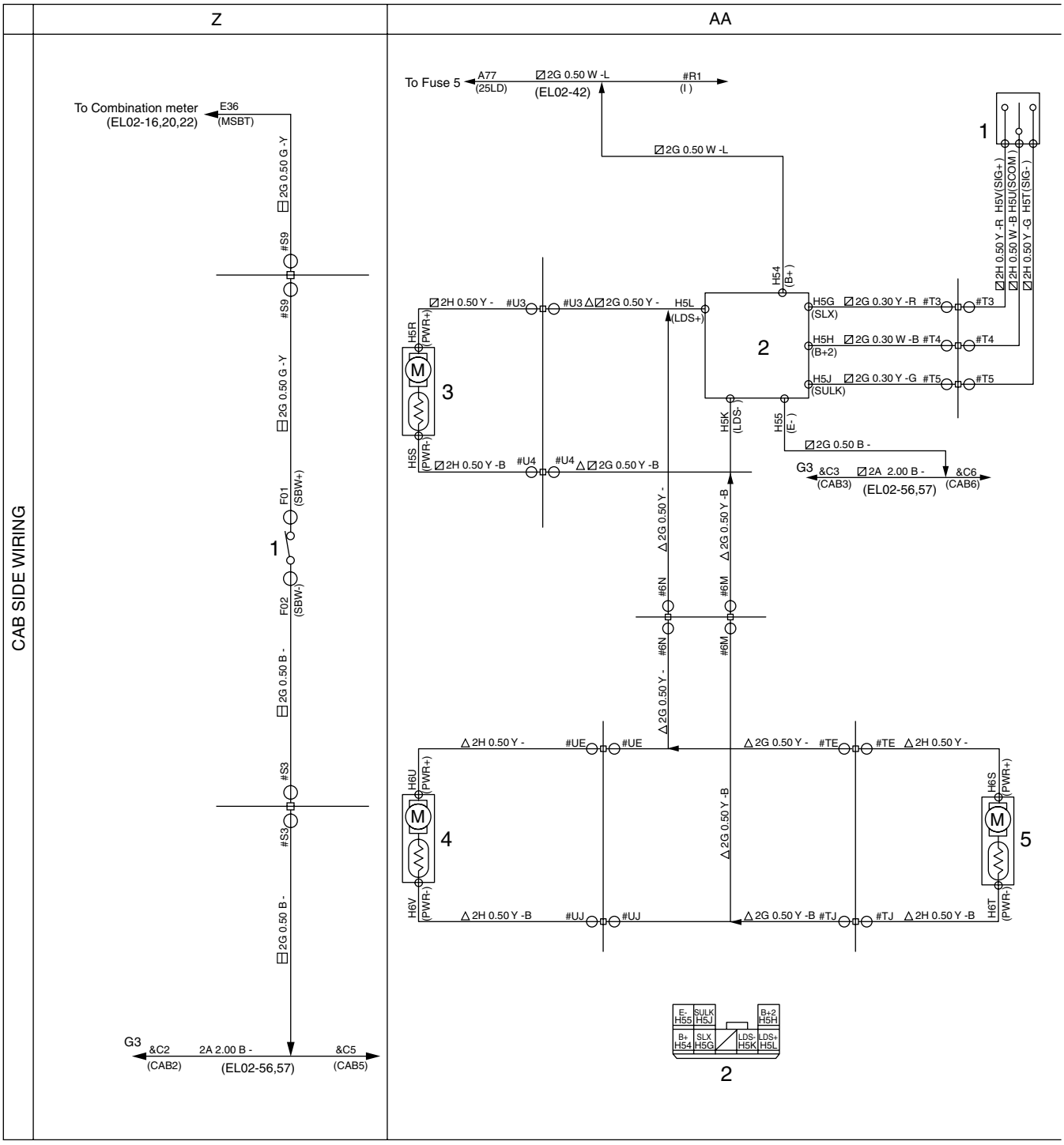
1. Power mirror switch
2. Power mirror relay
3. Power mirror motor

X. HORN CIRCUIT

1. Horn relay
2. Horn switch
3. Horn (Low)
4. Horn (High)

Y. CIGARETTE LIGHTER CIRCUIT

1. Cigarette lighter



M12020100031

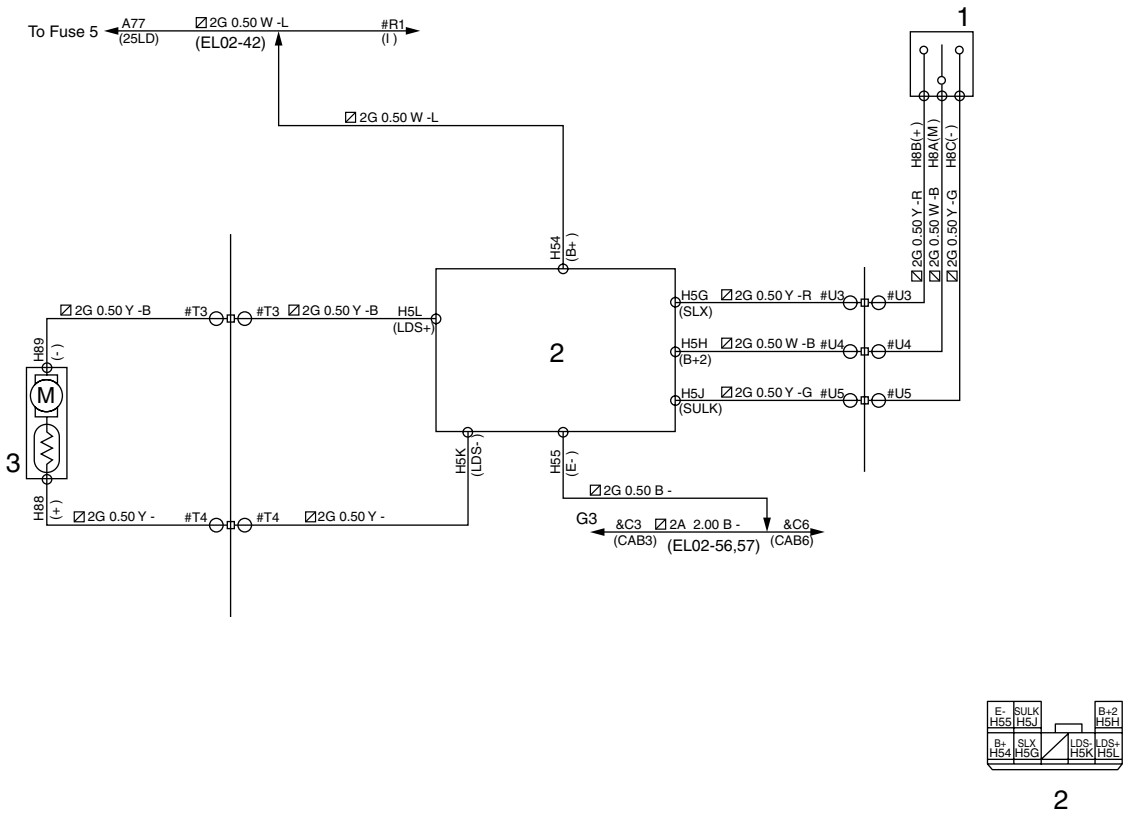
Z. SEAT BELT WARNING LAMP CIRCUIT

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)

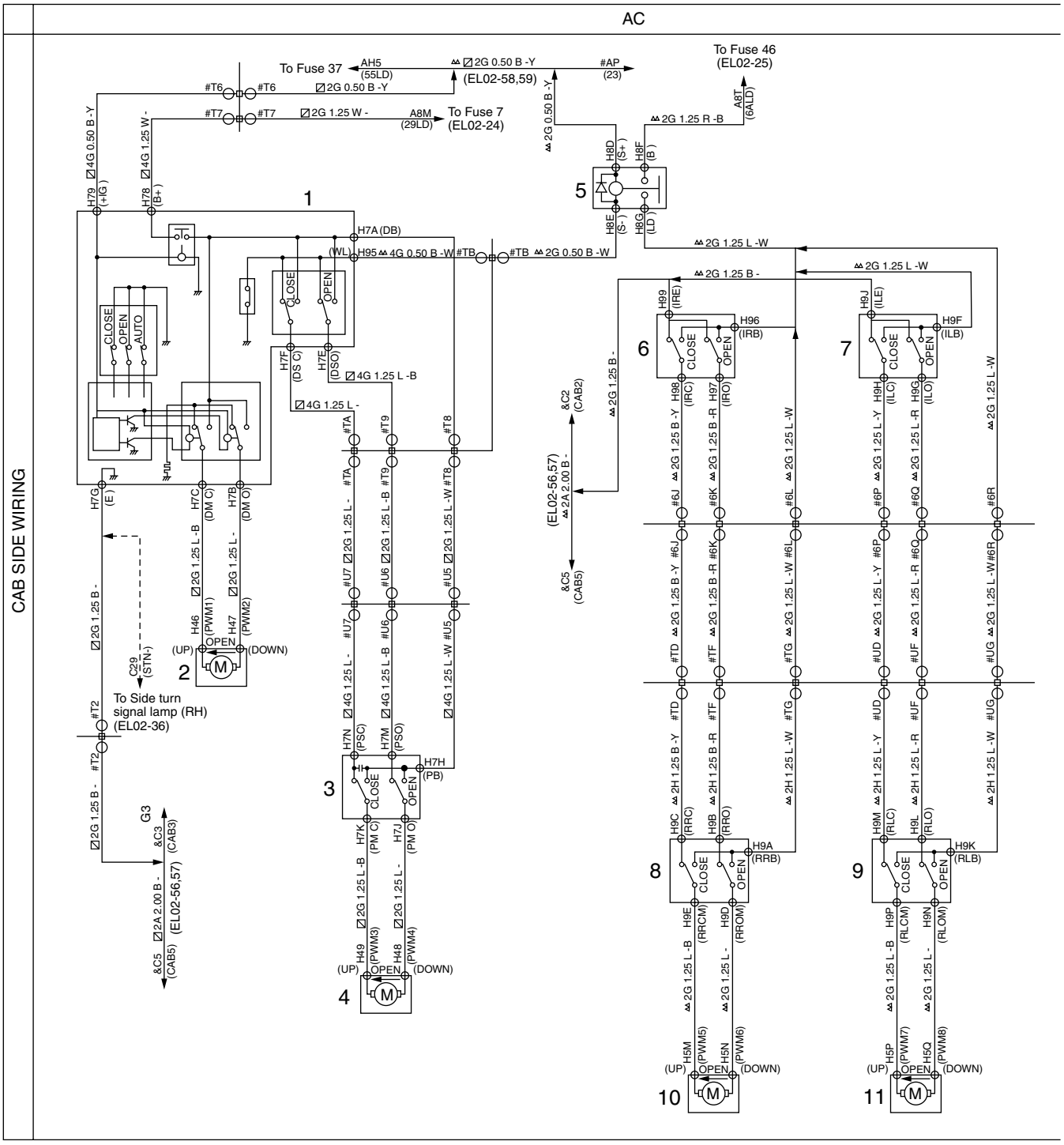
AB



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)

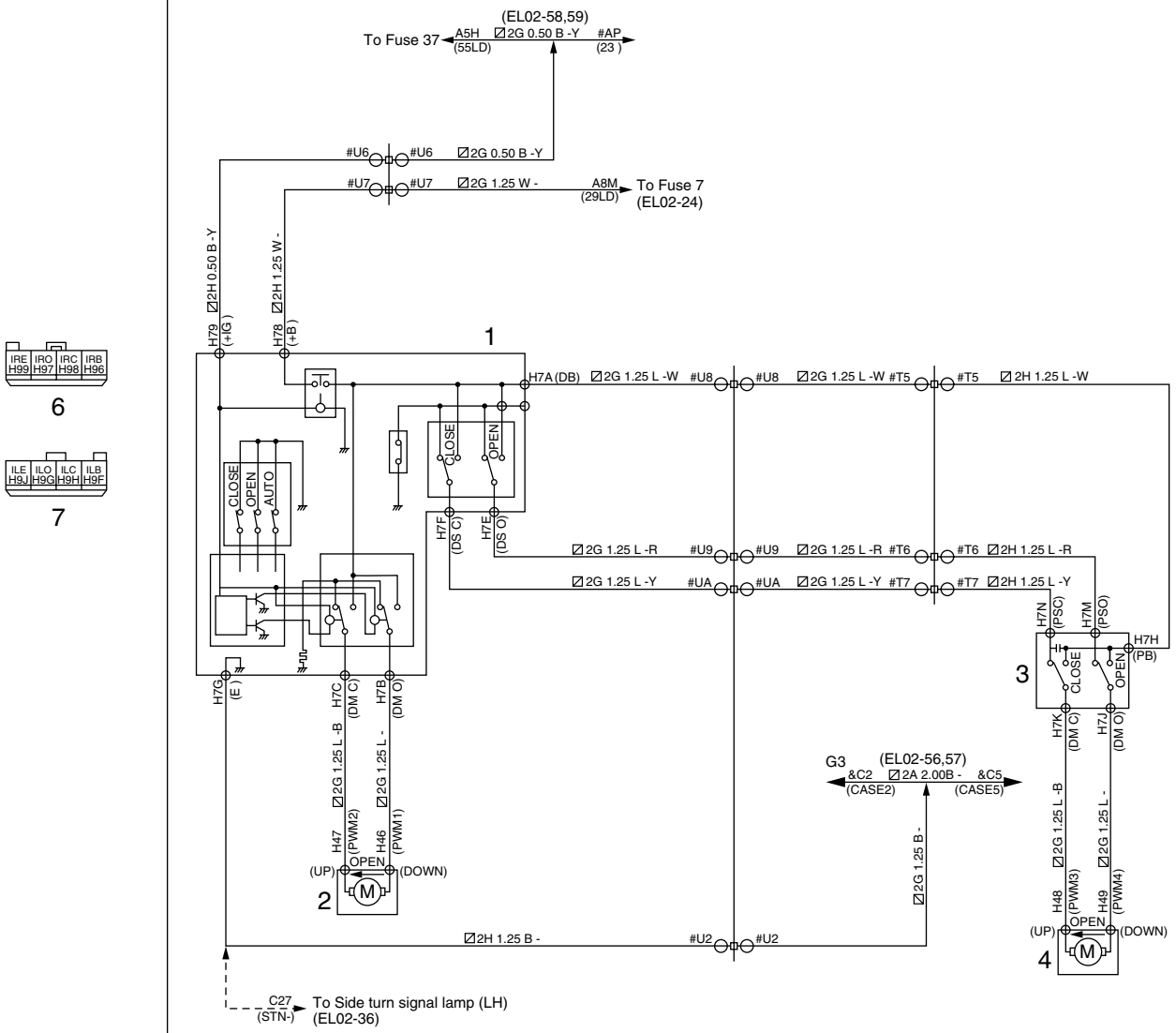


M12020100033

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)

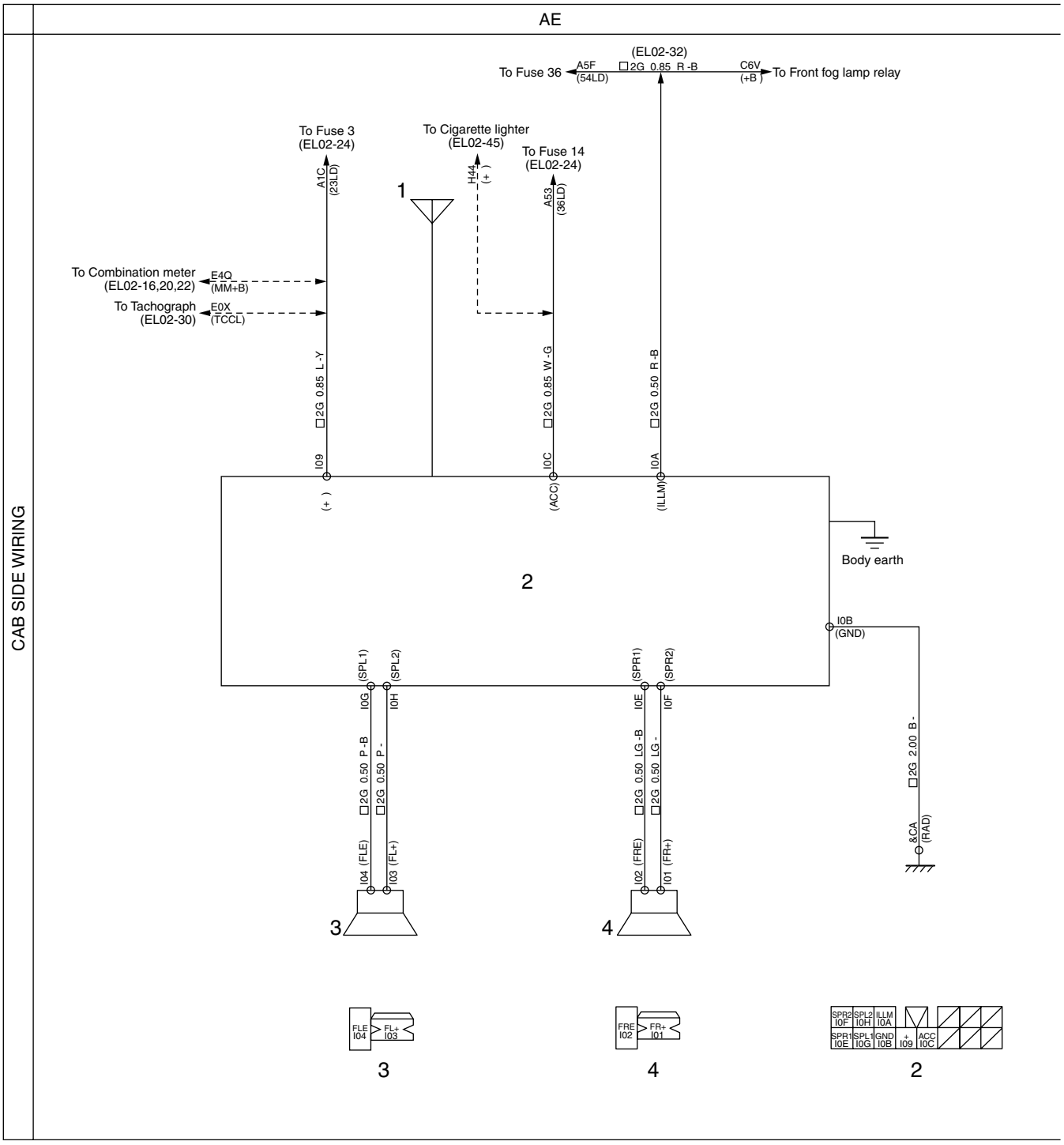
AD



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)

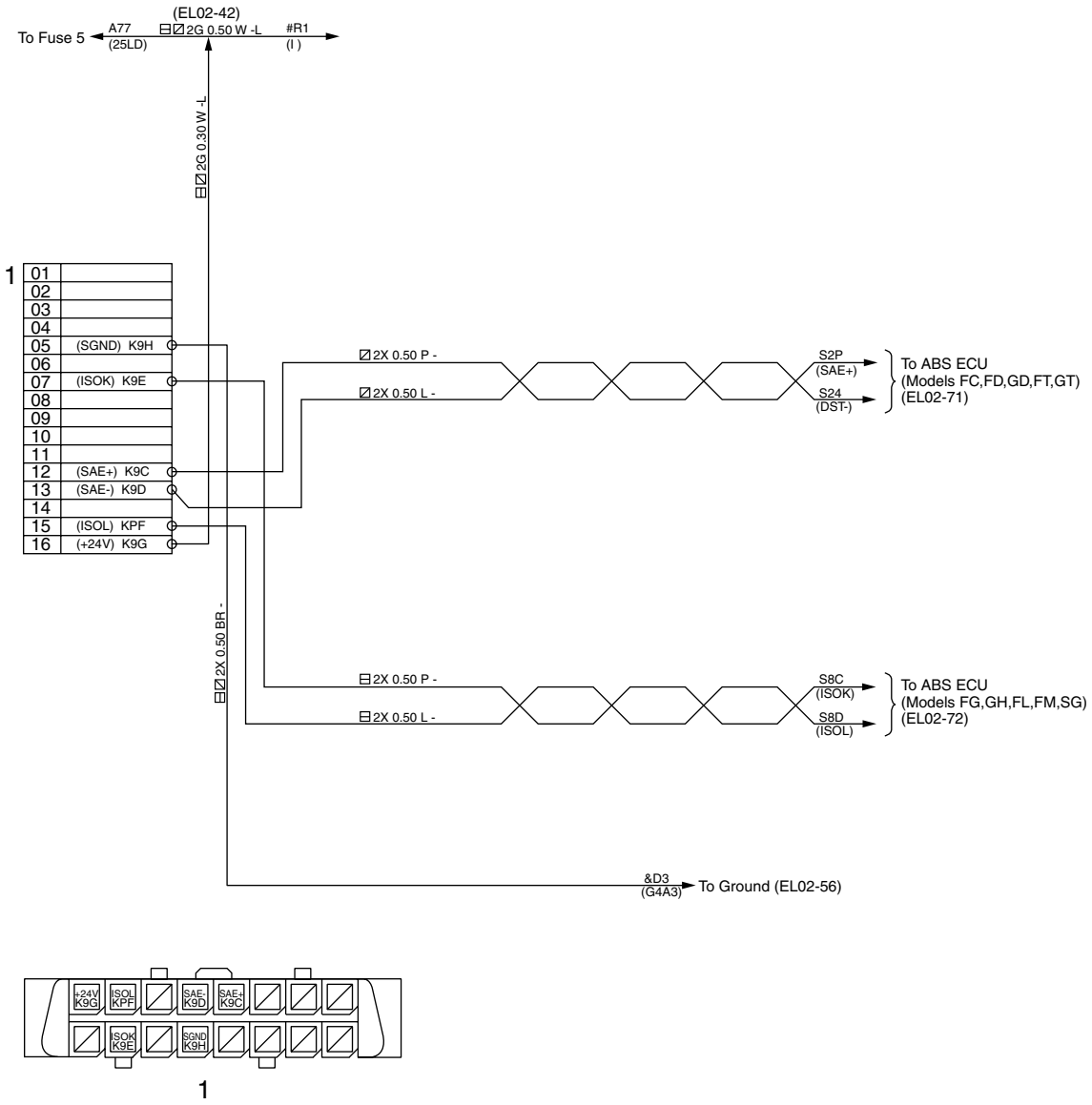


M12020100035

AE. RADIO/AUDIO CIRCUIT

1. Antenna
2. Radio/audio unit
3. Front speaker (LH)
4. Front speaker (RH)

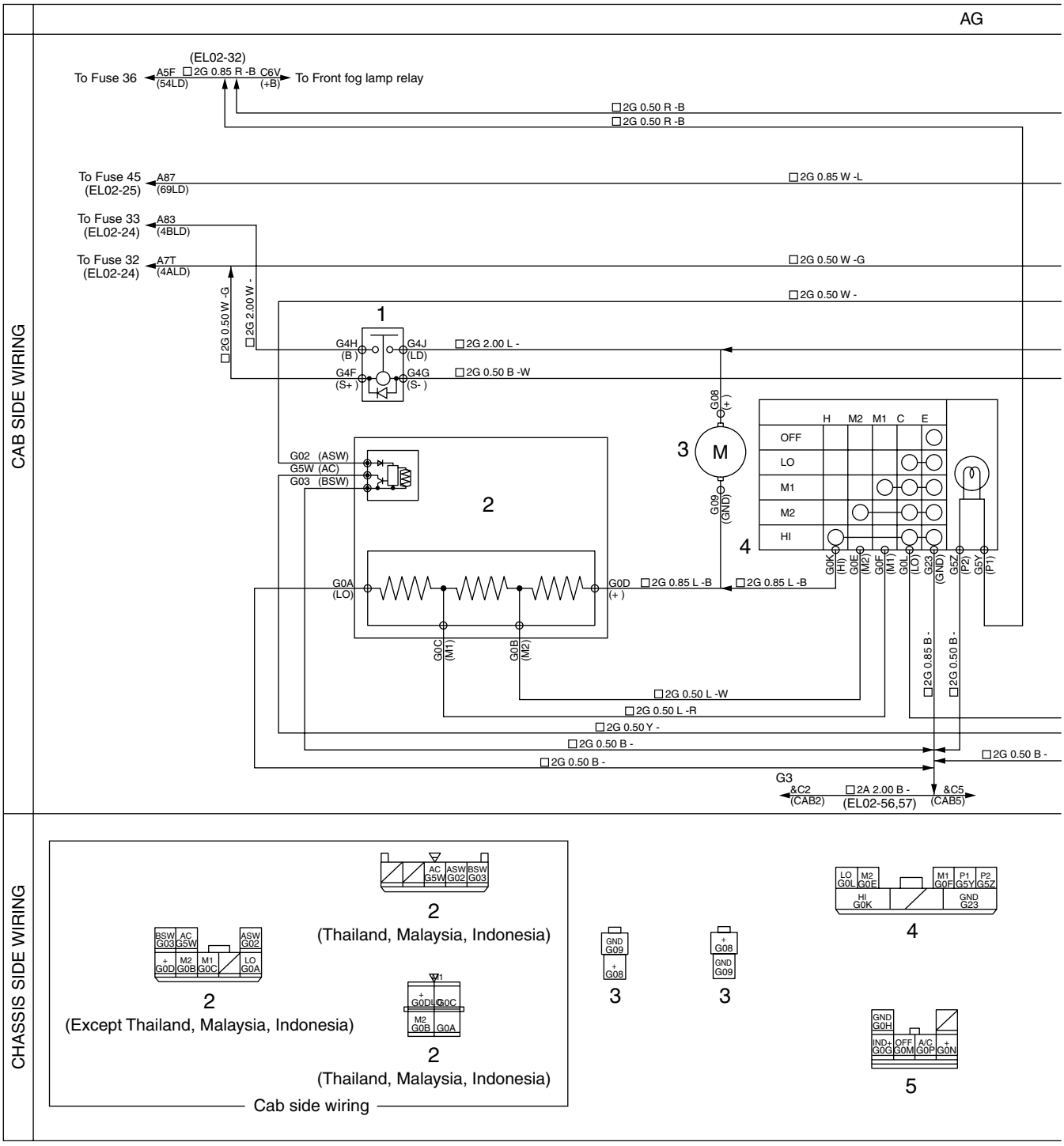
AF



M12020100036

AF. DST-1 CIRCUIT

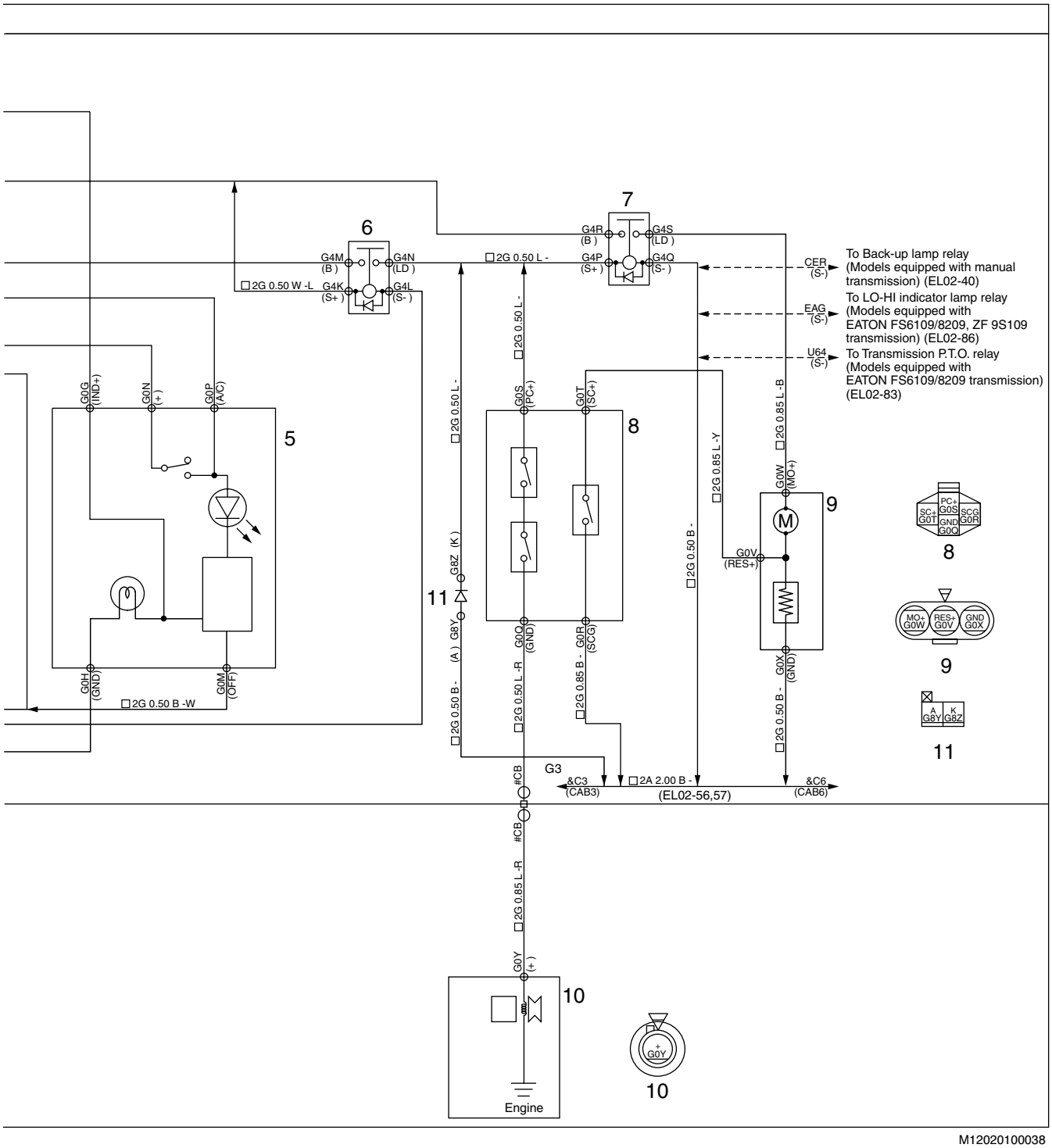
1. DST-1 connector



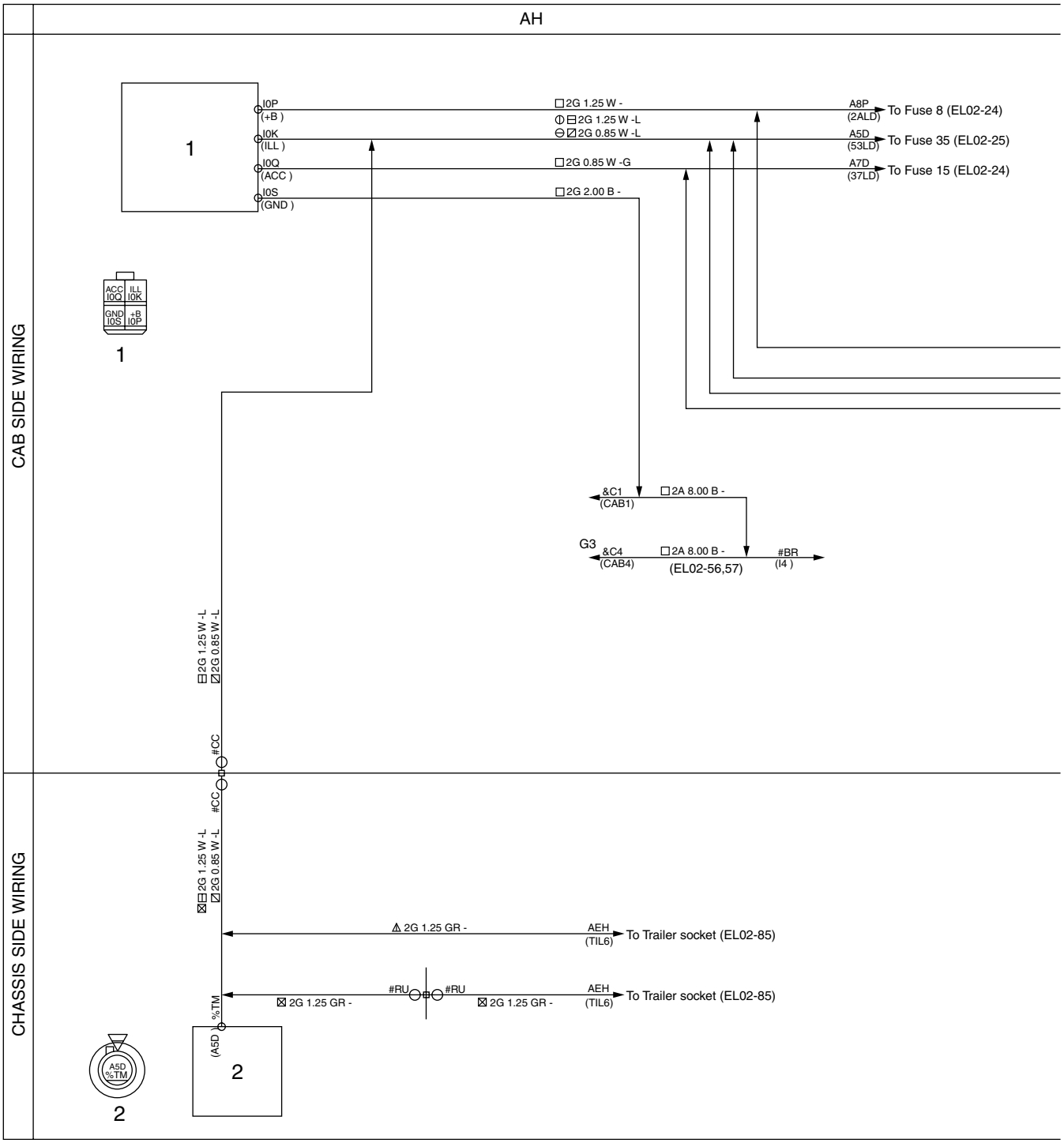
M12020100037

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



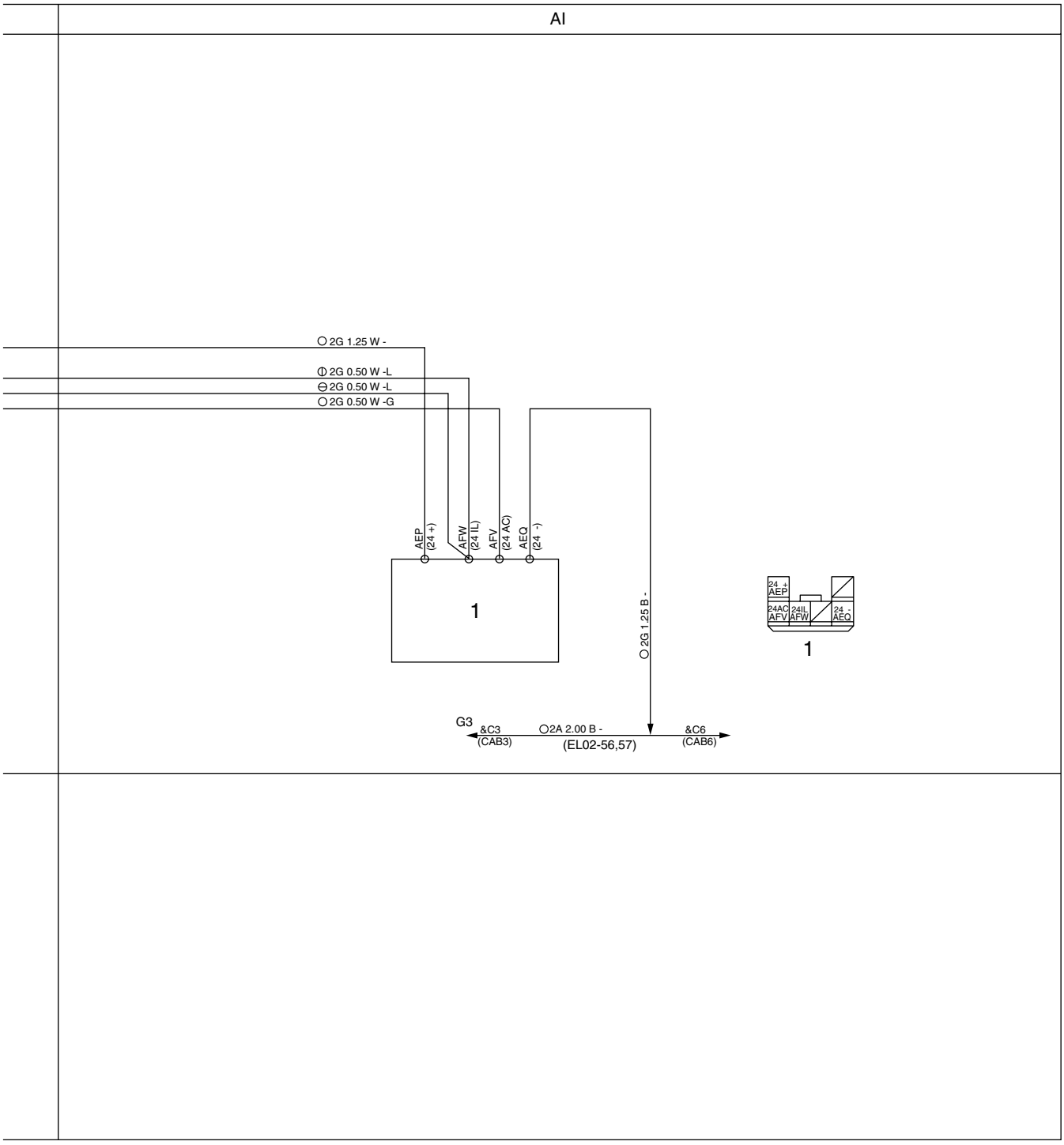
M12020100038



M12020100039

AH. SPARE POWER SOURCE CIRCUIT

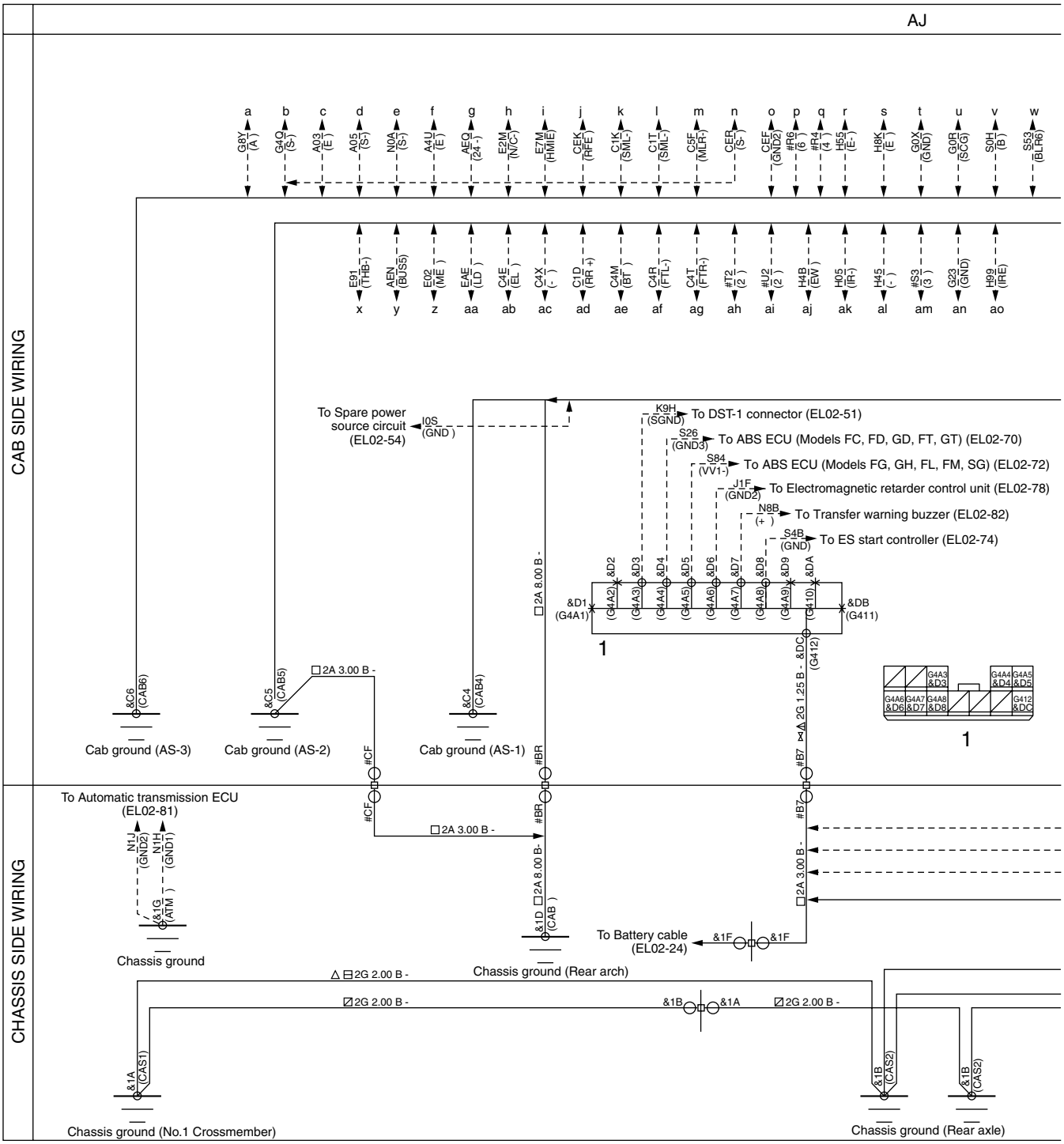
1. Spare power source connector
2. Spare power source connector



M12020100040

AI. 12V SPARE POWER SOURCE CIRCUIT

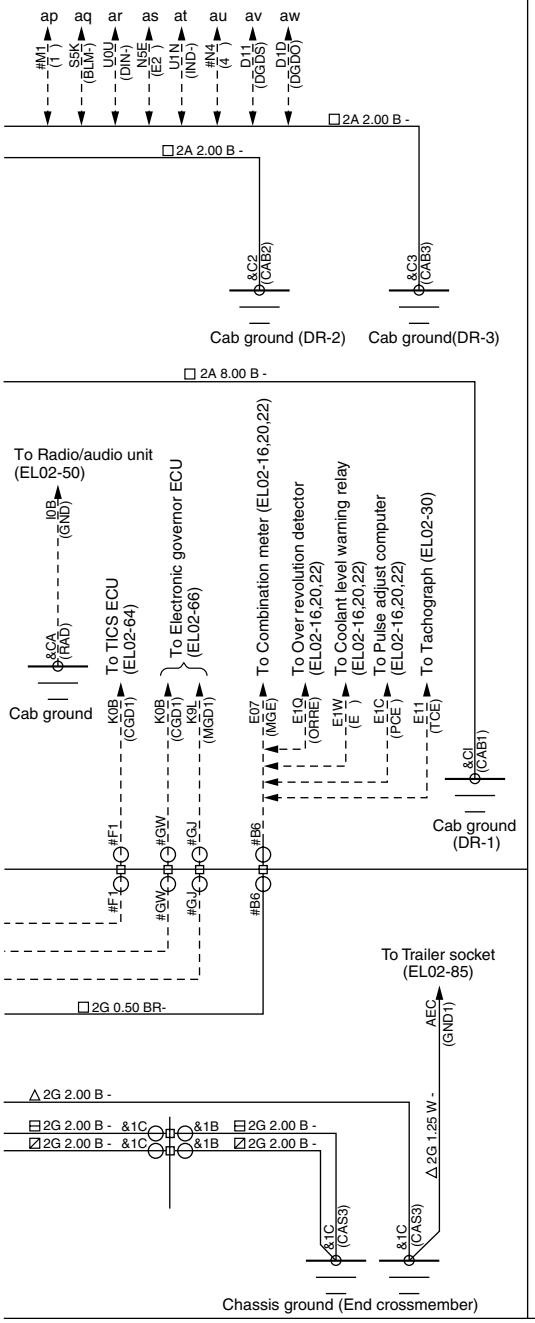
1 DC-DC converter



M12020100041

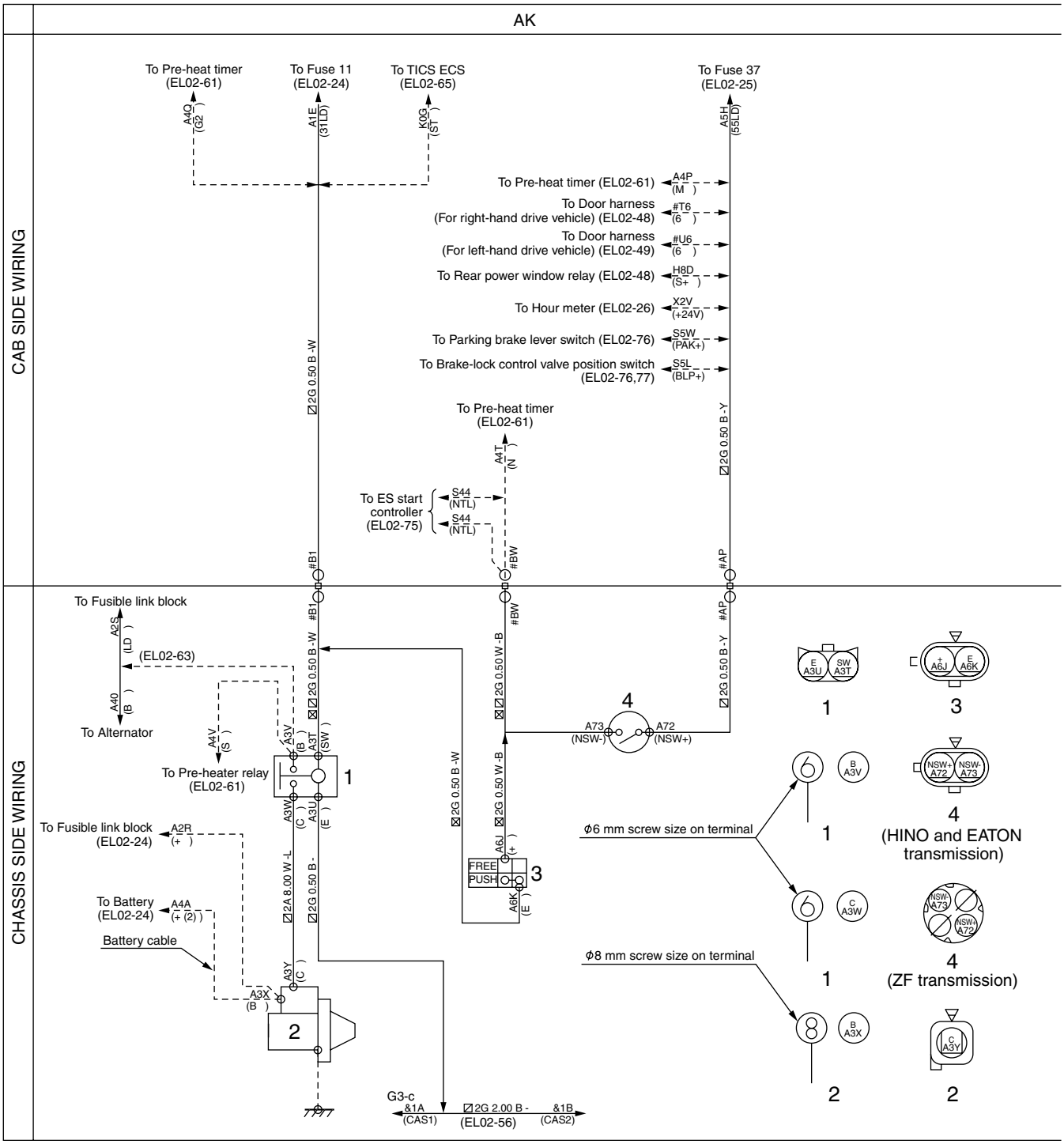
AJ. GROUND CIRCUIT

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)

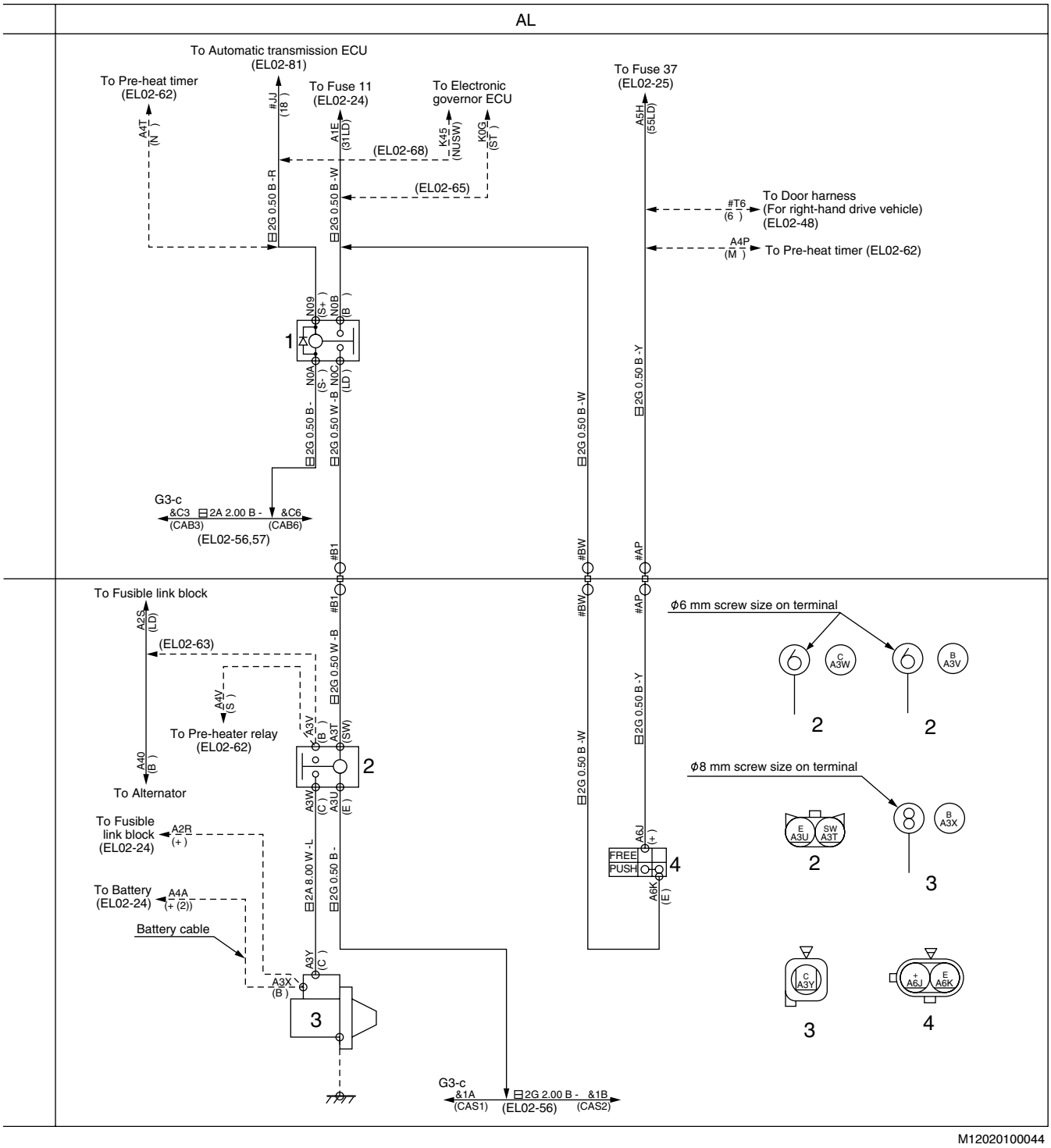
M12020100042



M12020100043

AK. ENGINE STARTING CIRCUIT (MODELS WITH MANUAL TRANSMISSION)

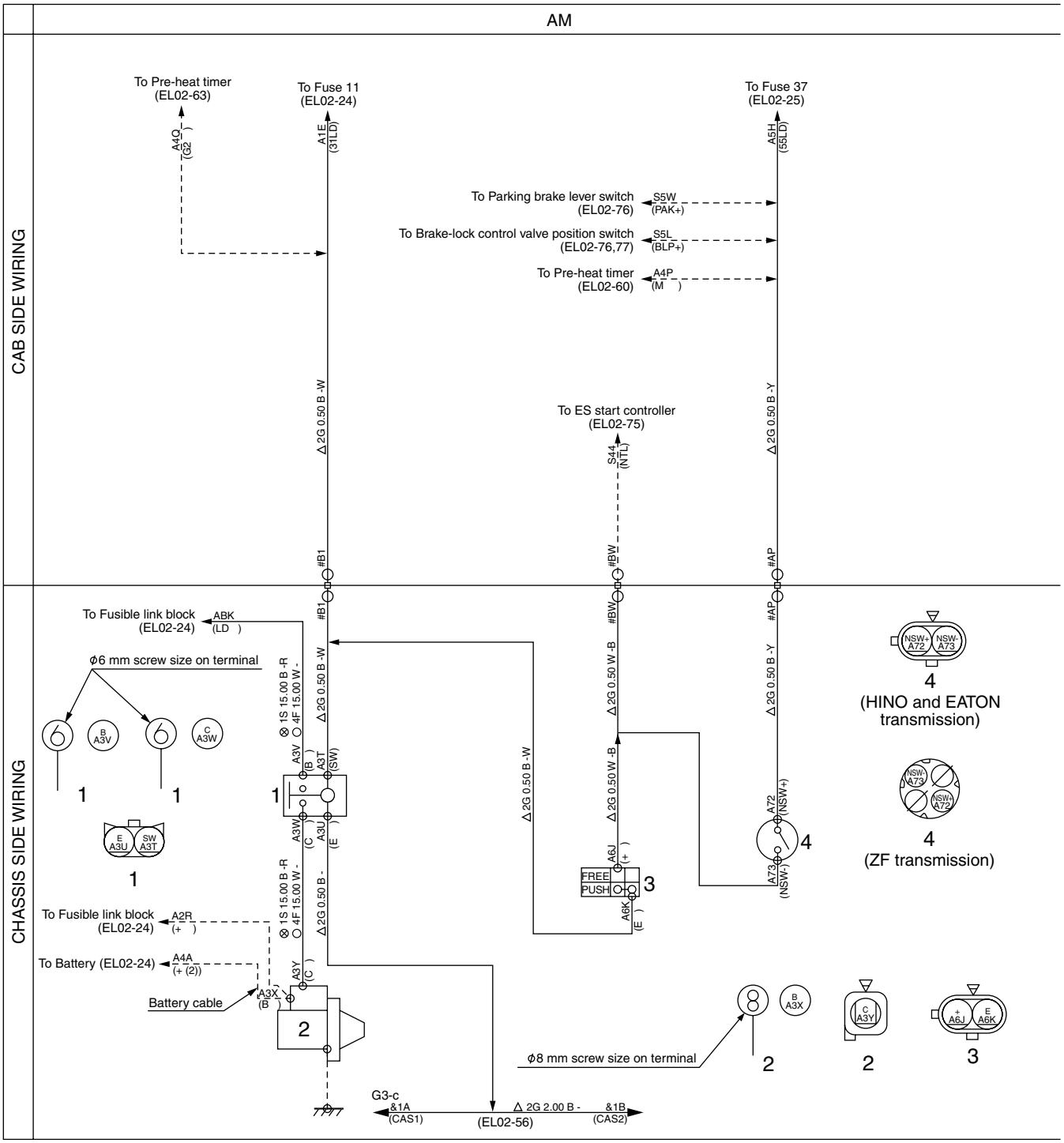
1. Starter relay
2. Starter
3. Sub-starter switch
4. Neutral switch



M12020100044

AL. ENGINE STARTING CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

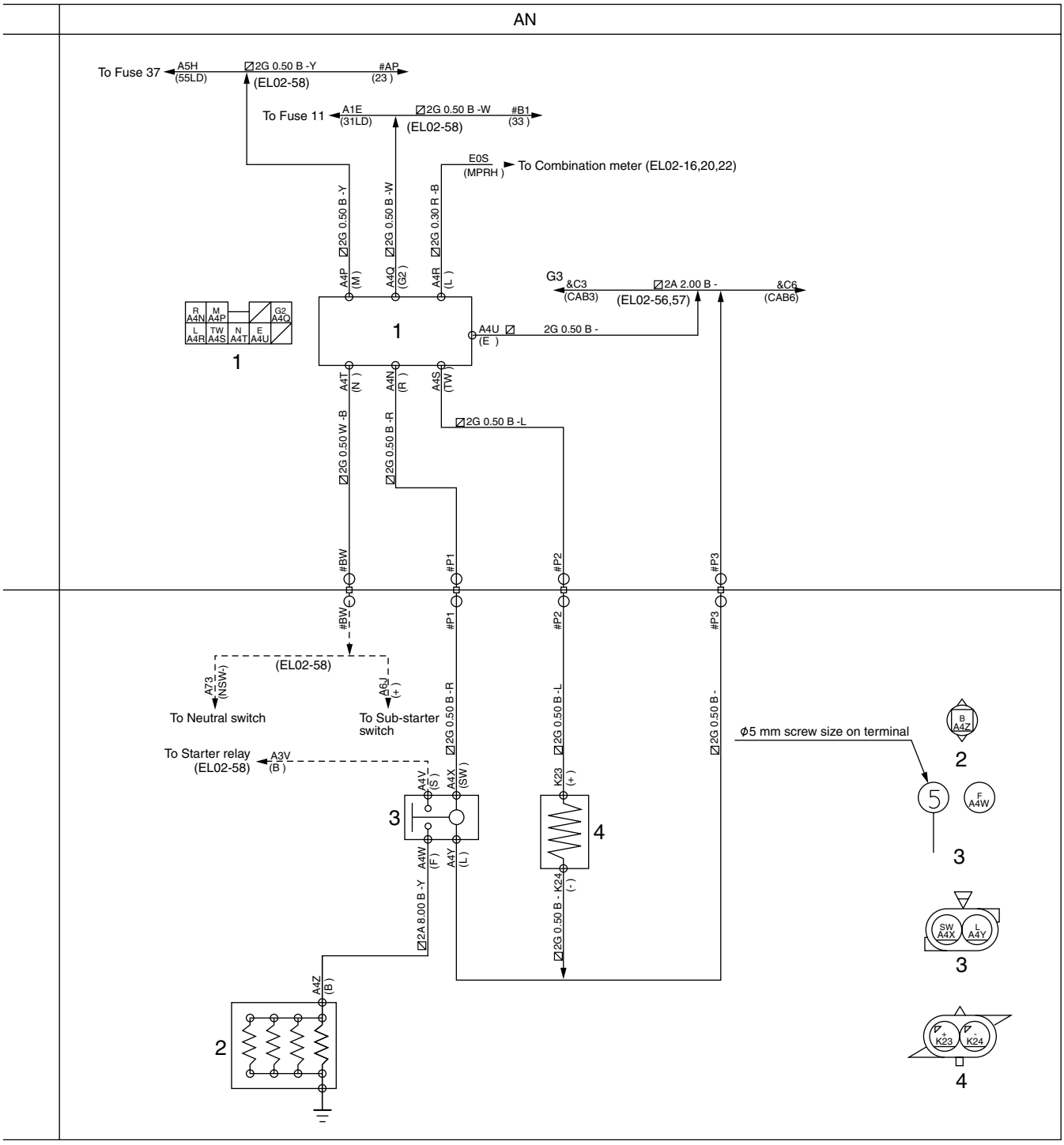
1. Automatic transmission neutral relay
2. Starter relay
3. Starter
4. Sub-starter switch



M12020100045

AM. ENGINE STARTING CIRCUIT (MODELS WITH P11C ENGINE)

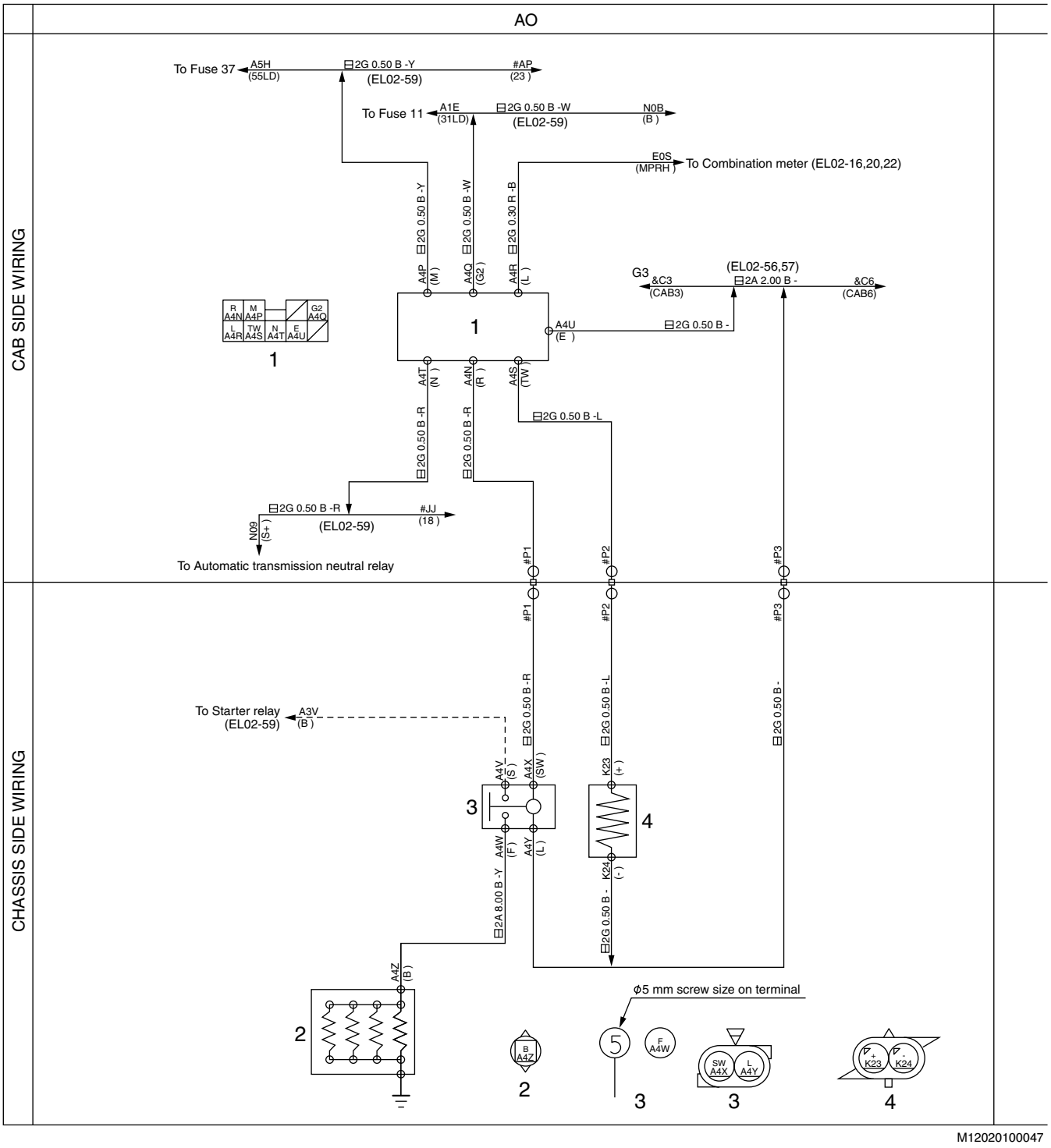
1. Starter relay
2. Starter
3. Sub-starter switch
4. Neutral switch



M12020100046

AN. PRE-HEATER CIRCUIT (MODELS WITH MANUAL TRANSMISSION)

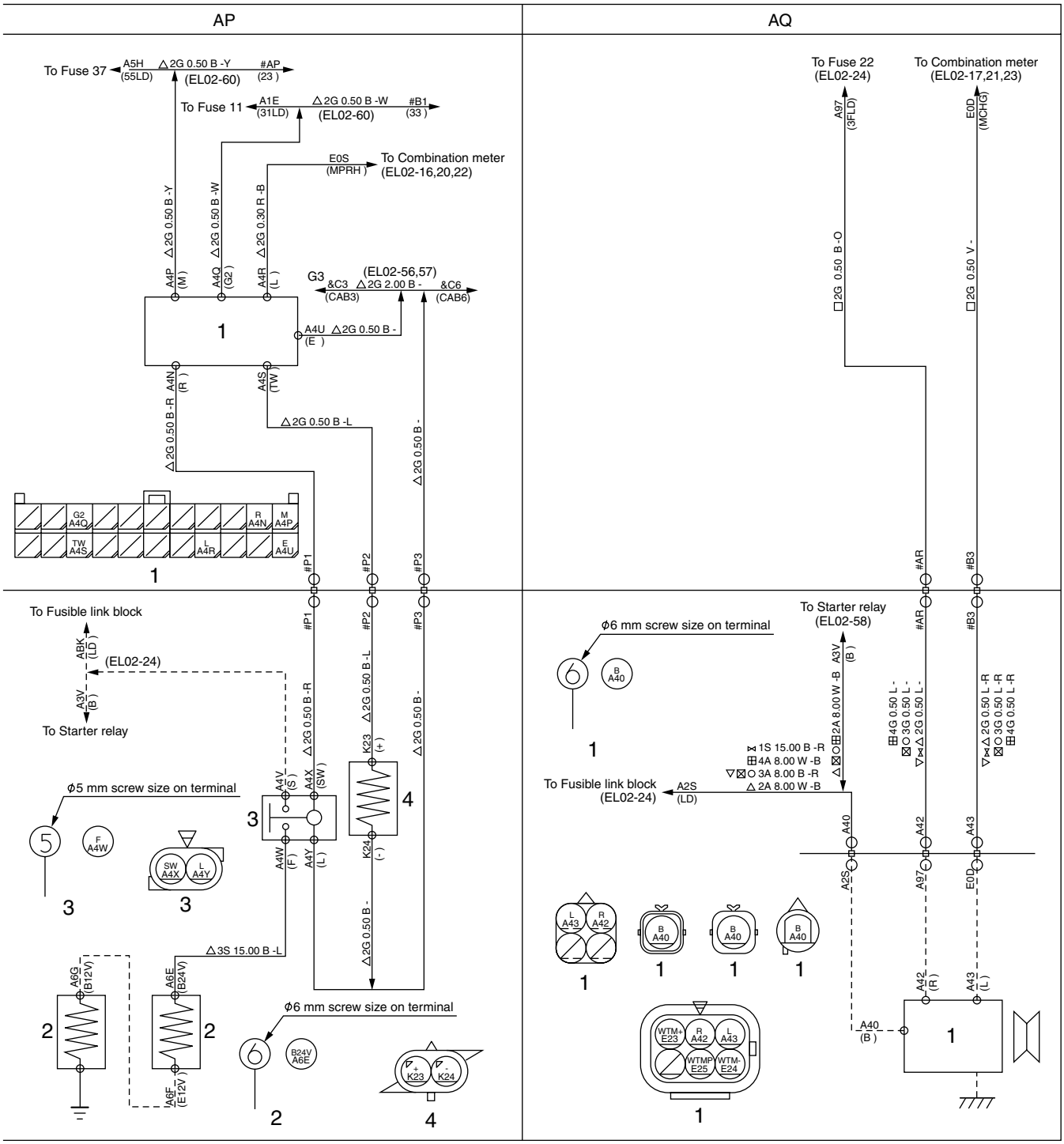
1. Pre-heat timer
2. Grow plug
3. Pre-heater relay
4. Coolant temperature sensor



M12020100047

AO. PRE-HEATER CIRCUIT (MODELS WITH AUTOMATIC TRANSMISSION)

1. Pre-heat timer
2. Grow plug
3. Pre-heater relay
4. Coolant temperature sensor



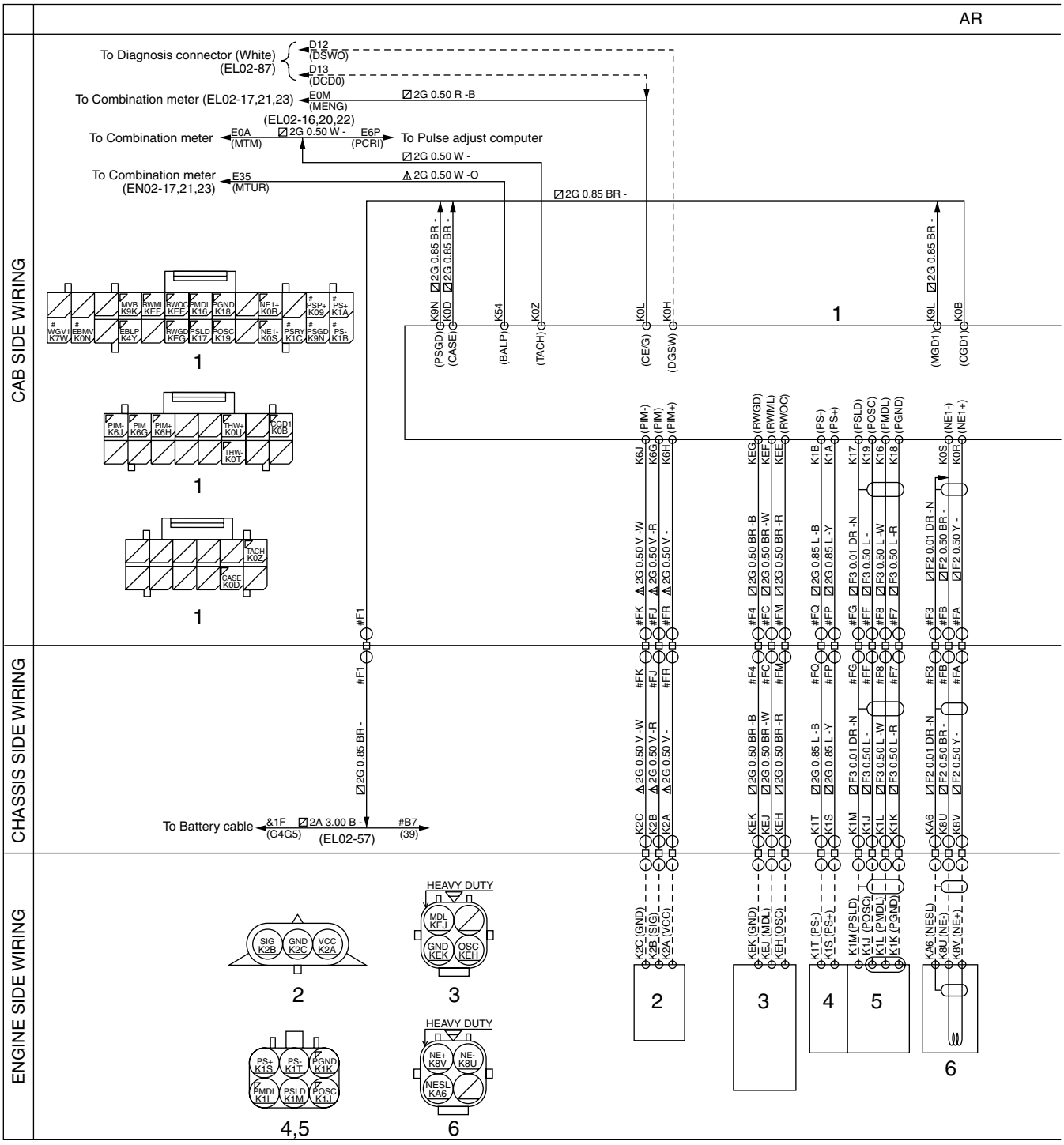
M12020100048

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

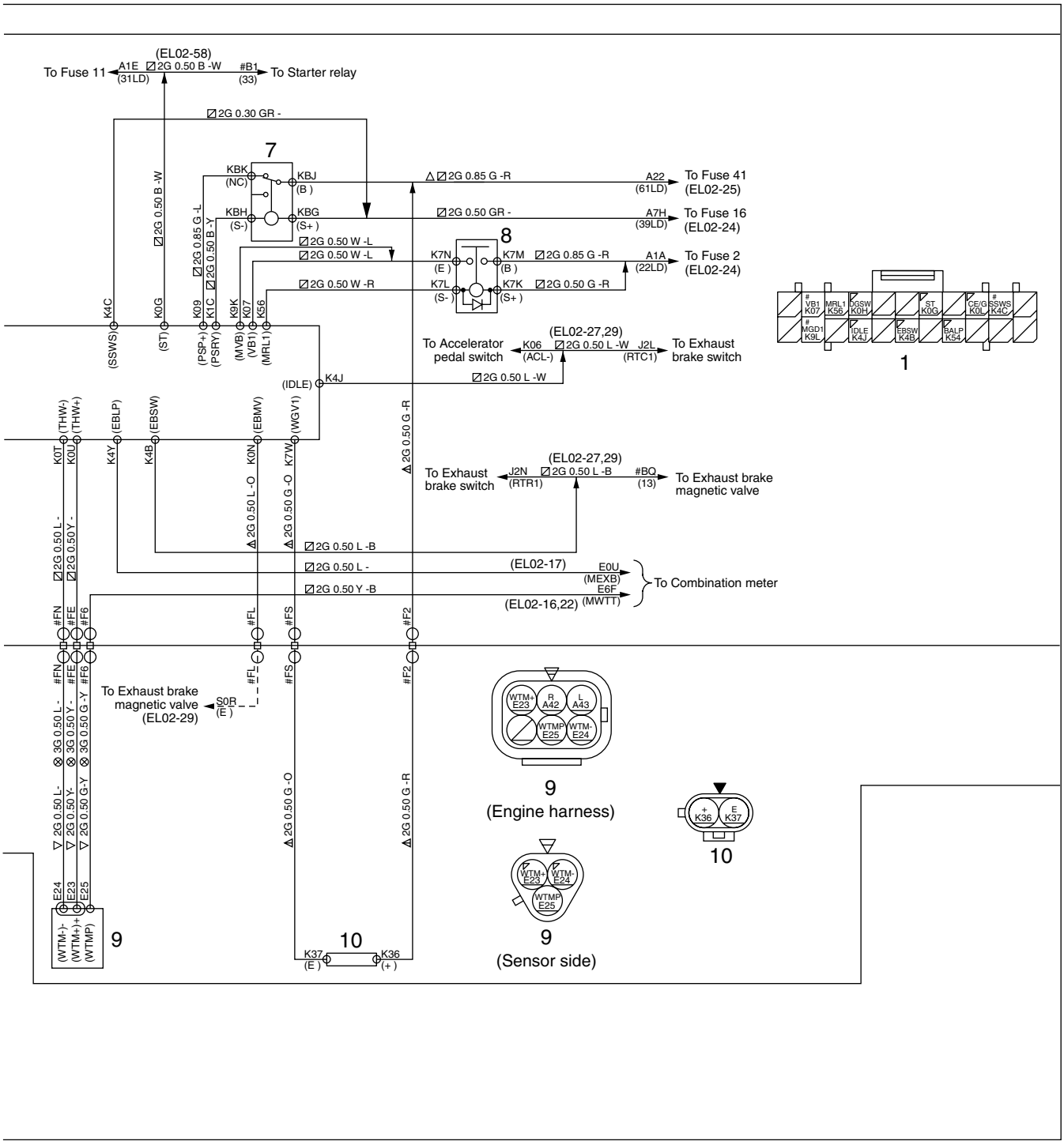
1. Alternator



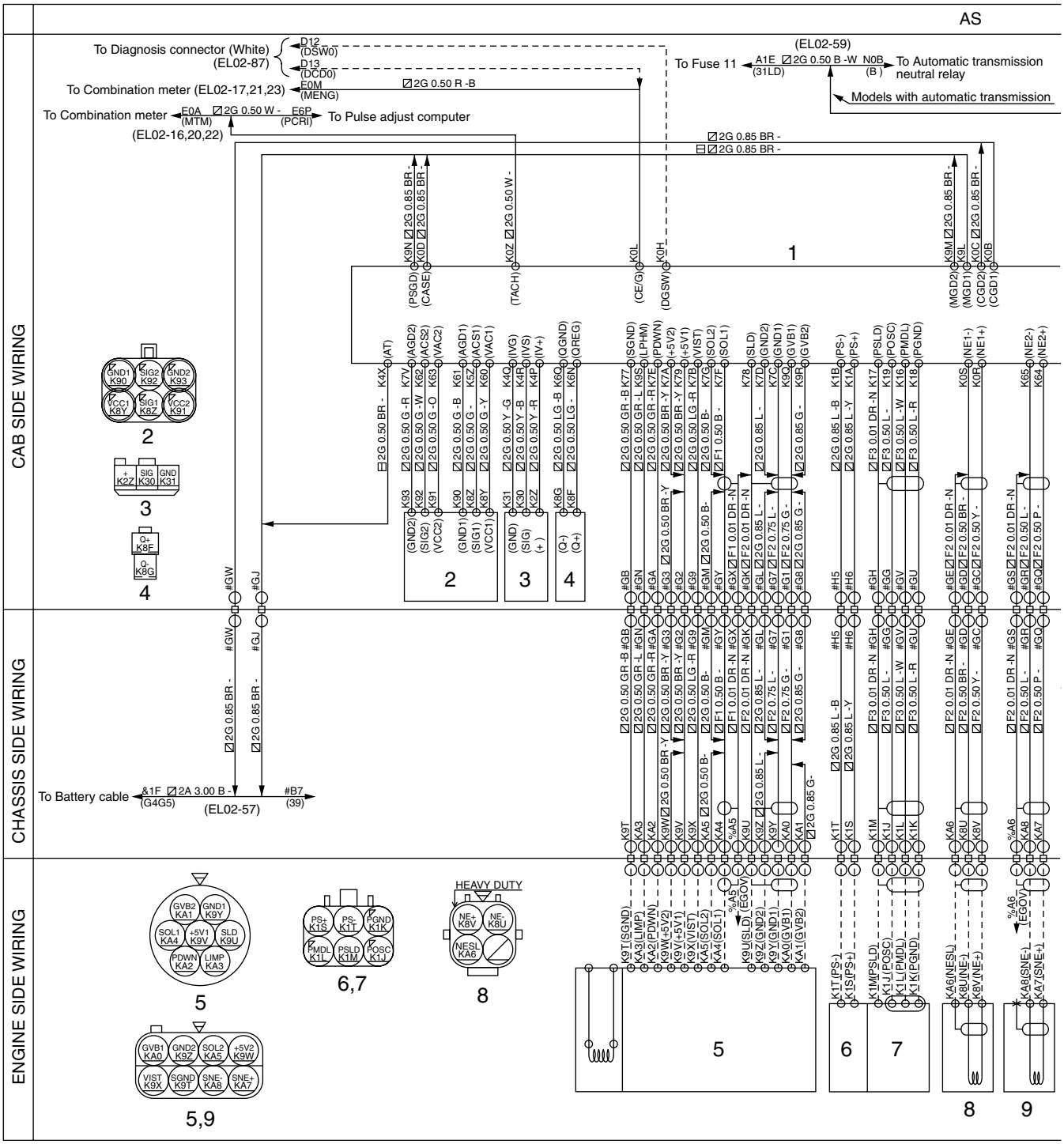
M12020100049

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

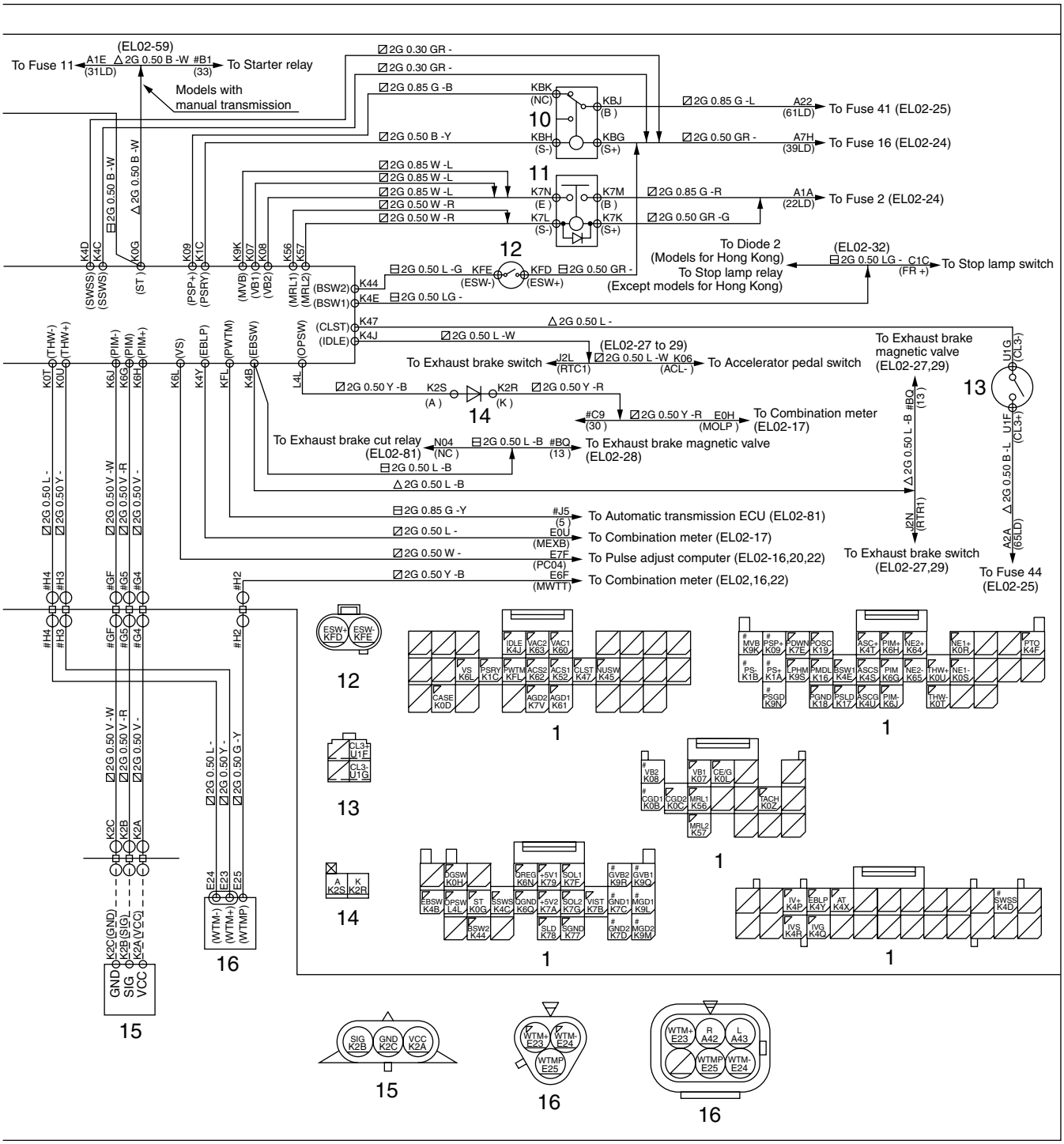


M12020100050

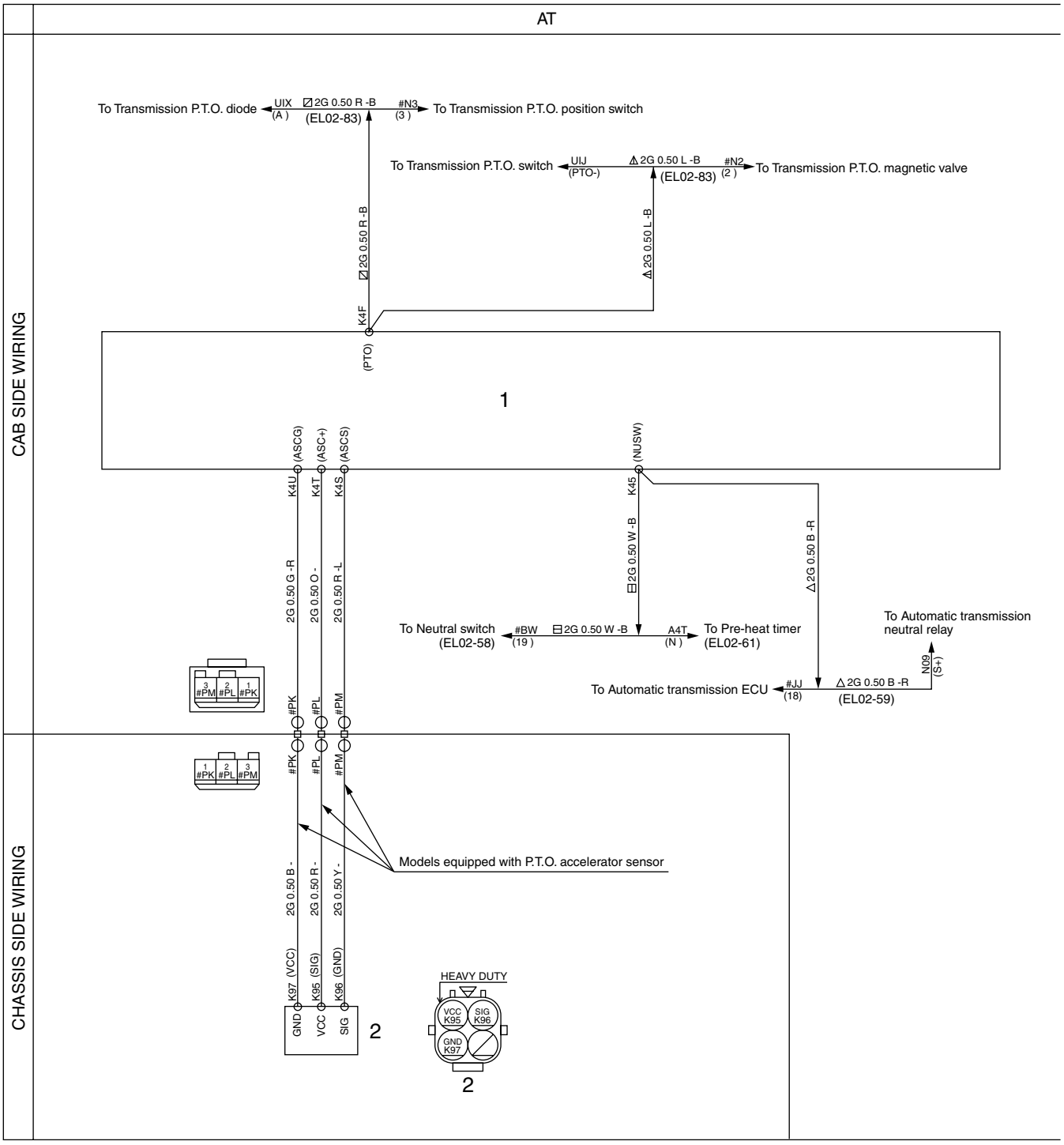


AS. TE SYSTEM (ELECTRONIC GOVERNOR) CIRCUIT

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



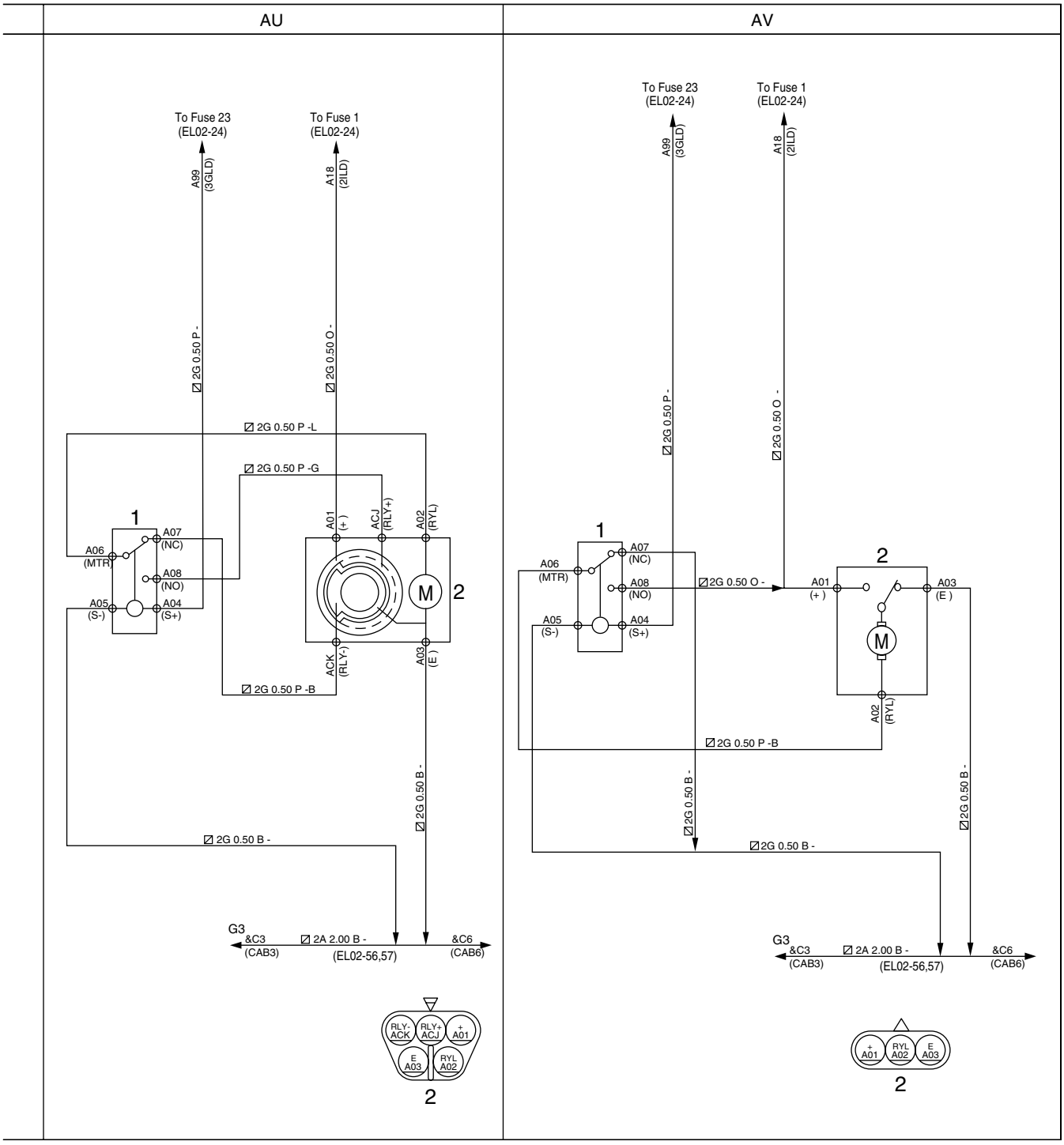
M12020100052



M12020100053

AT. TE SYSTEM (ELECTRONIC GOVERNOR) POWER TAKE-OFF CIRCUIT

1. Electronic governor ECU



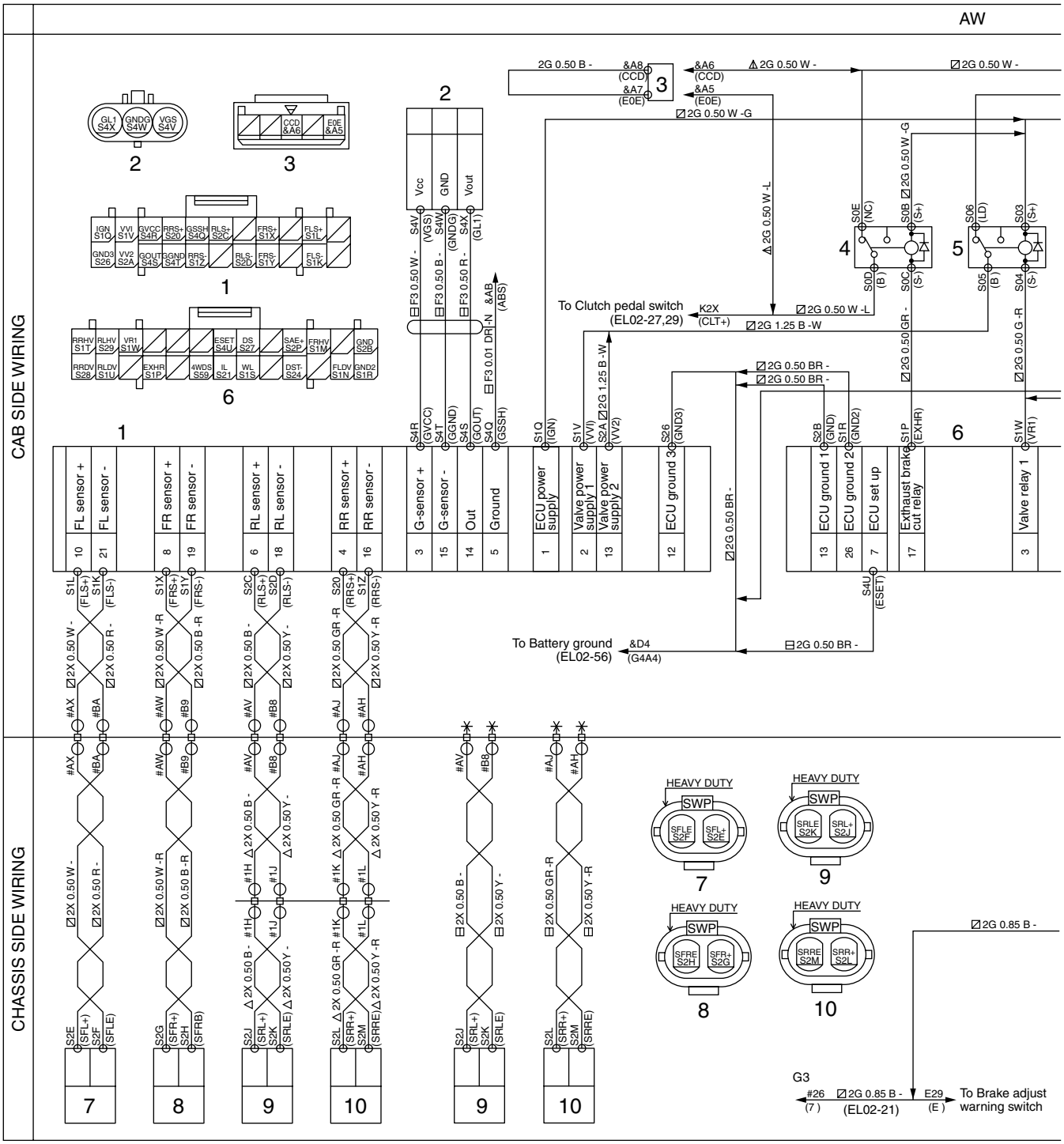
M12020100054

AU. ENGINE STOP CIRCUIT (FOR RIGHT-HAND DRIVE VEHICLE)

1. Engine stop relay
2. Engine stop electric motor

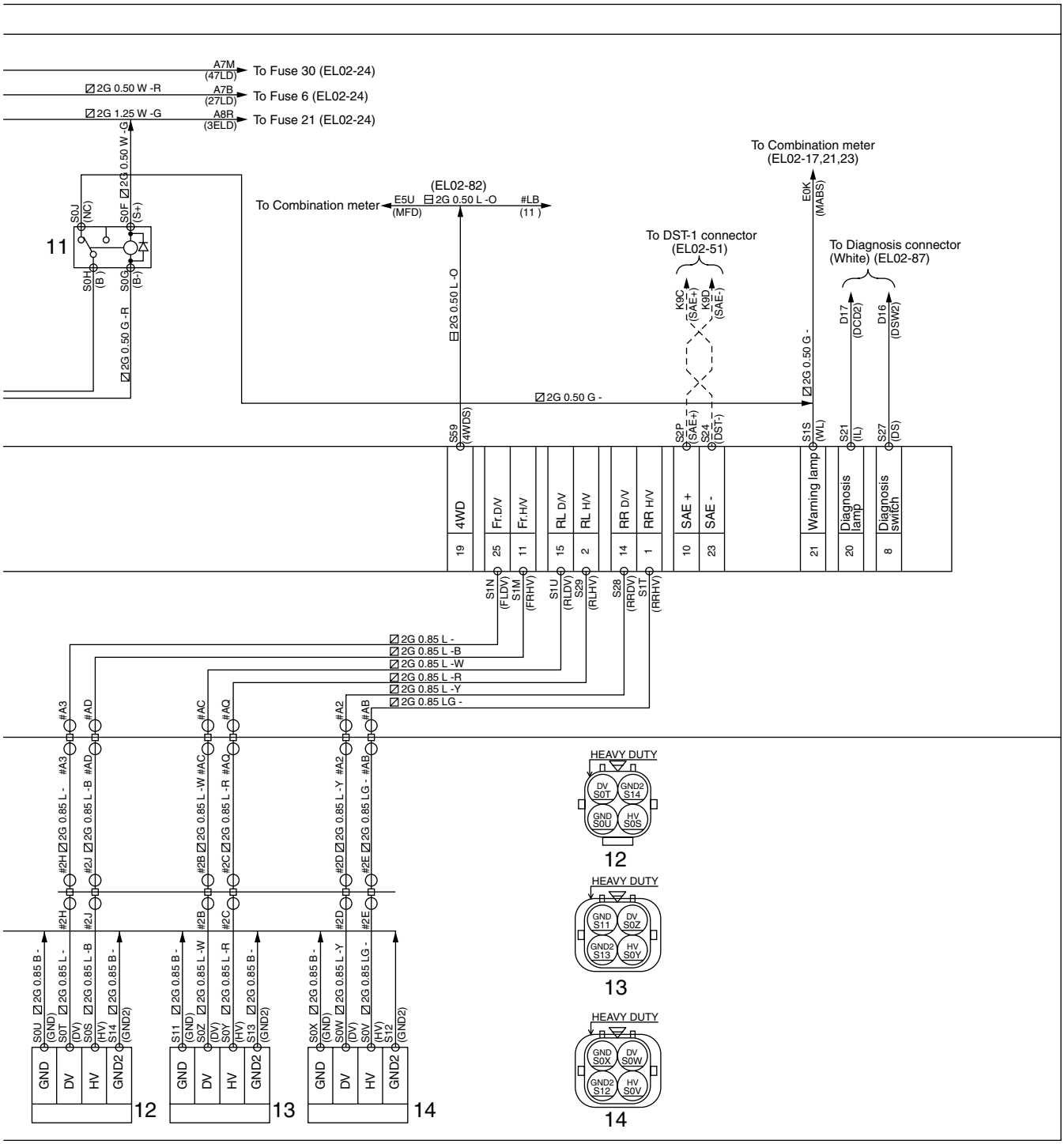
AV. ENGINE STOP CIRCUIT (FOR LEFT-HAND DRIVE VEHICLE)

1. Engine stop relay
2. Engine stop electric motor

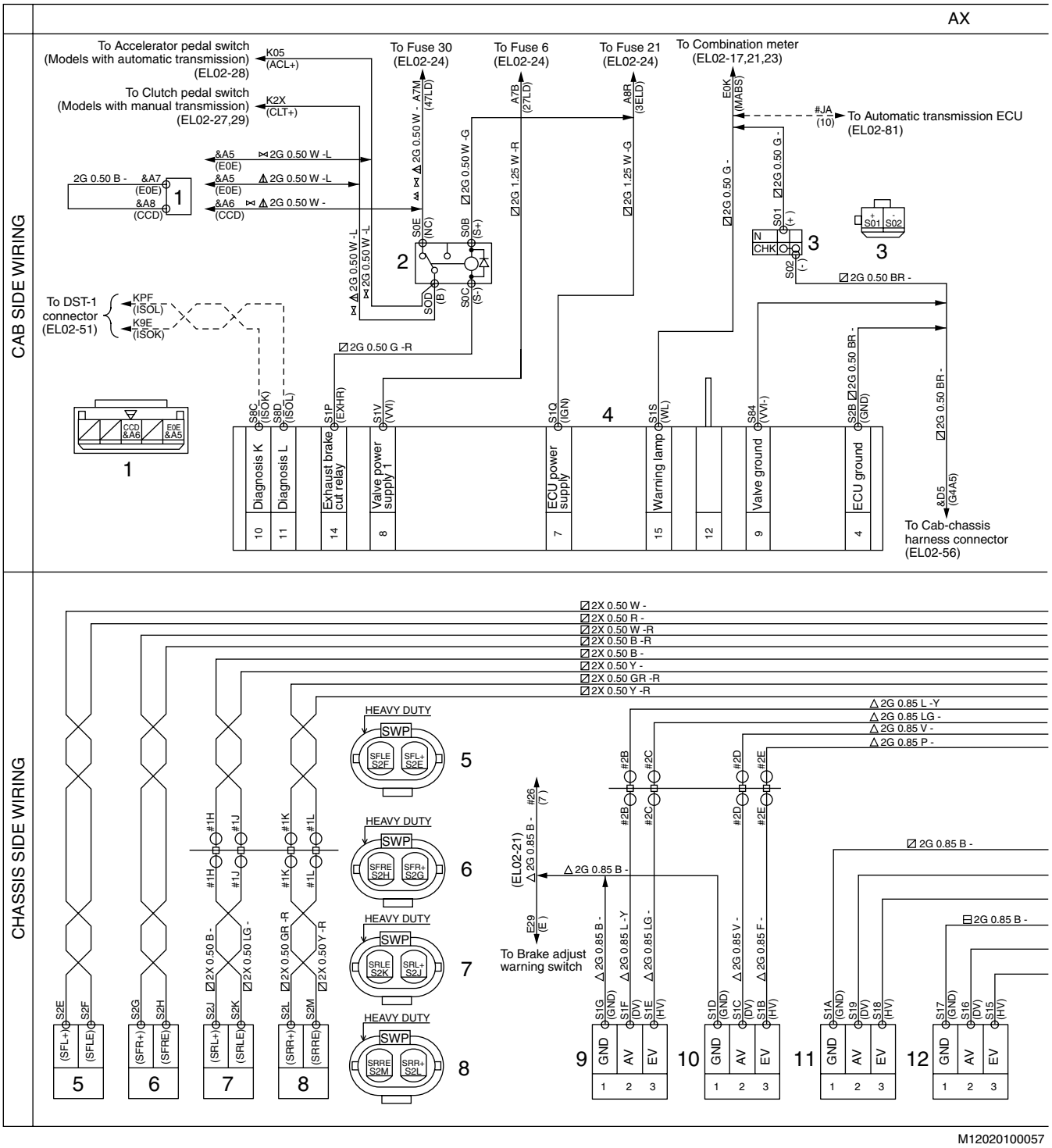


AW. ABS CIRCUIT (MODELS FC, FD, GD, FT, GT)

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)



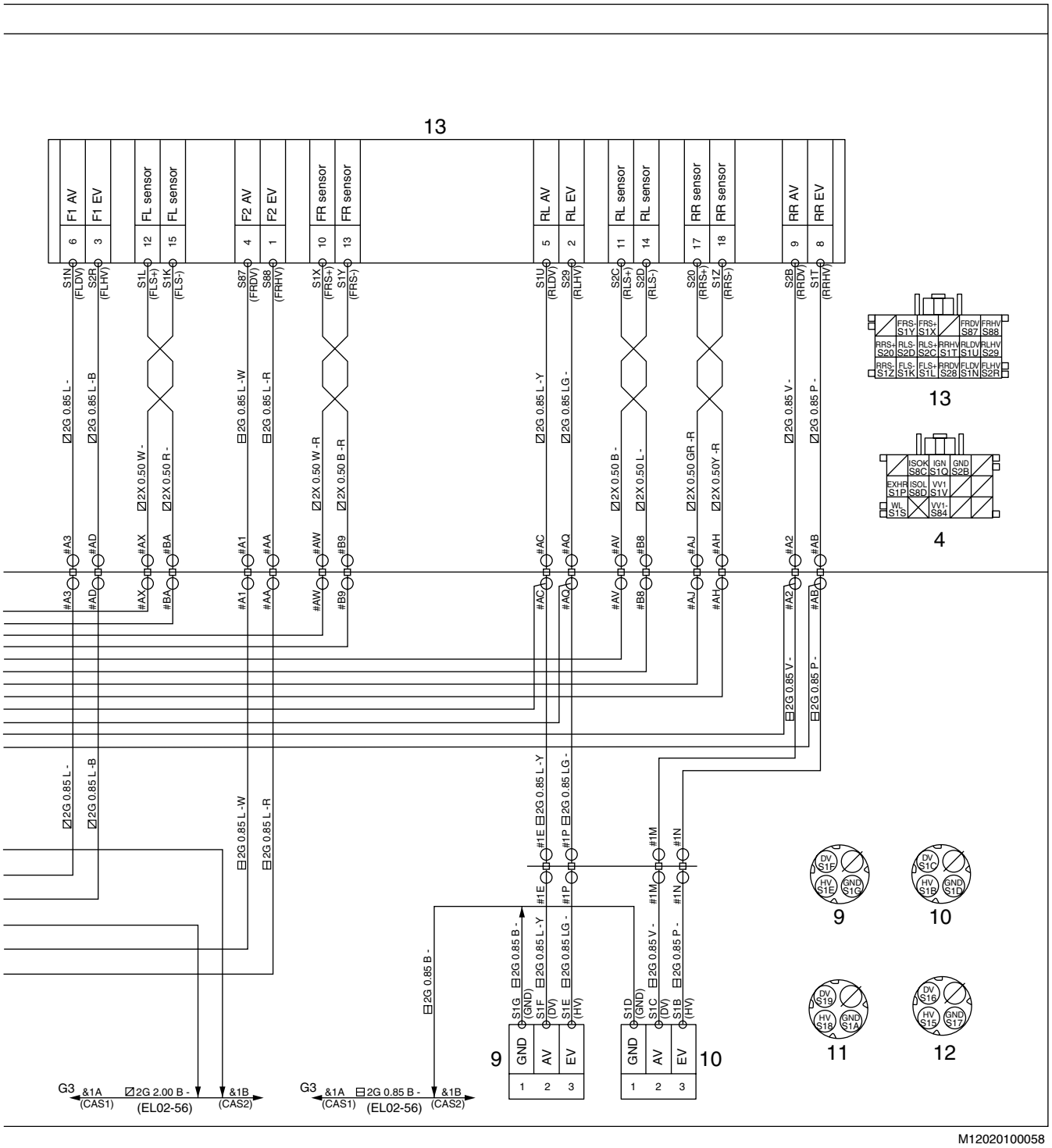
M12020100056



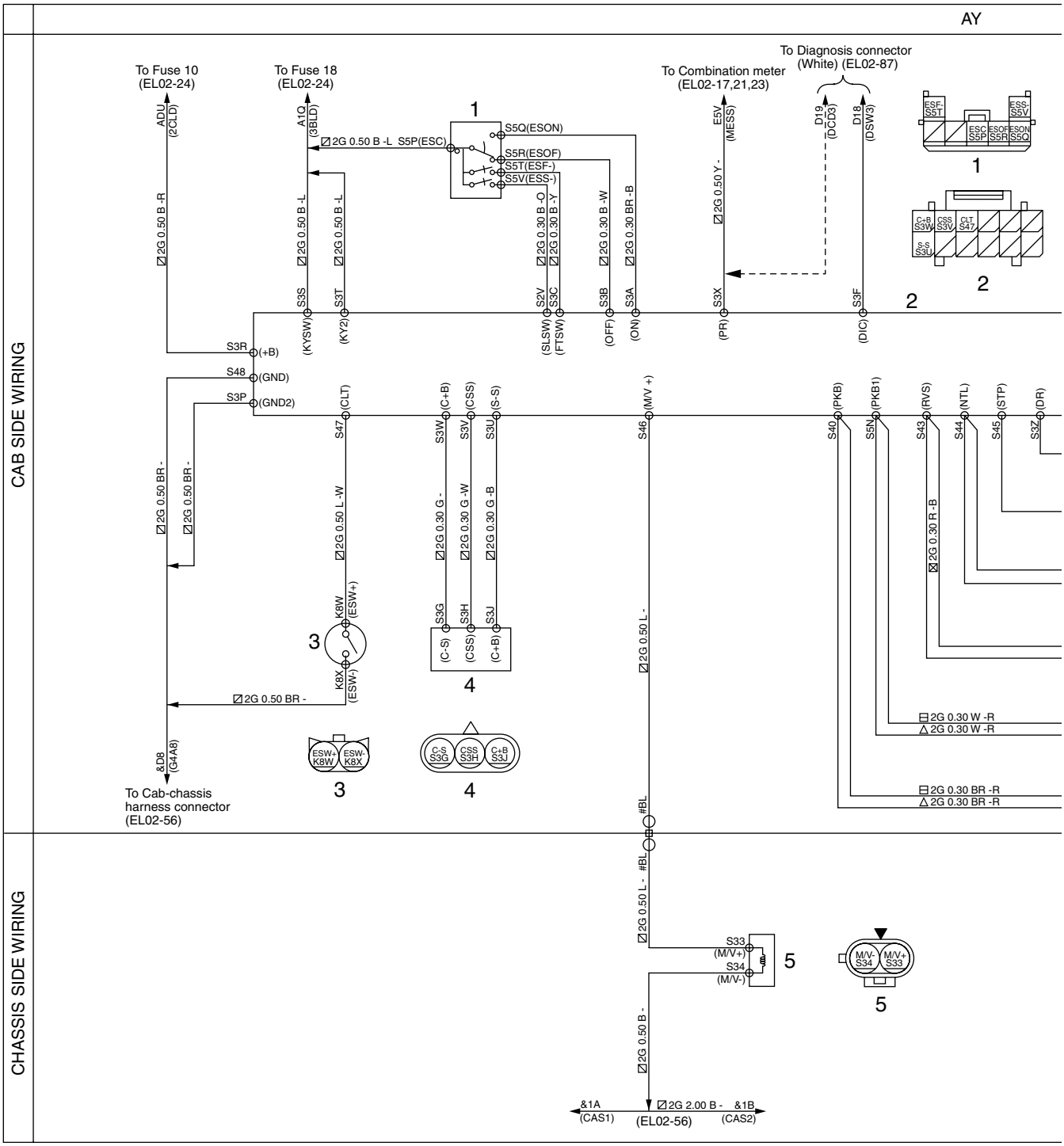
M12020100057

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



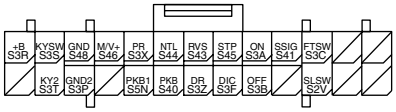
M12020100058

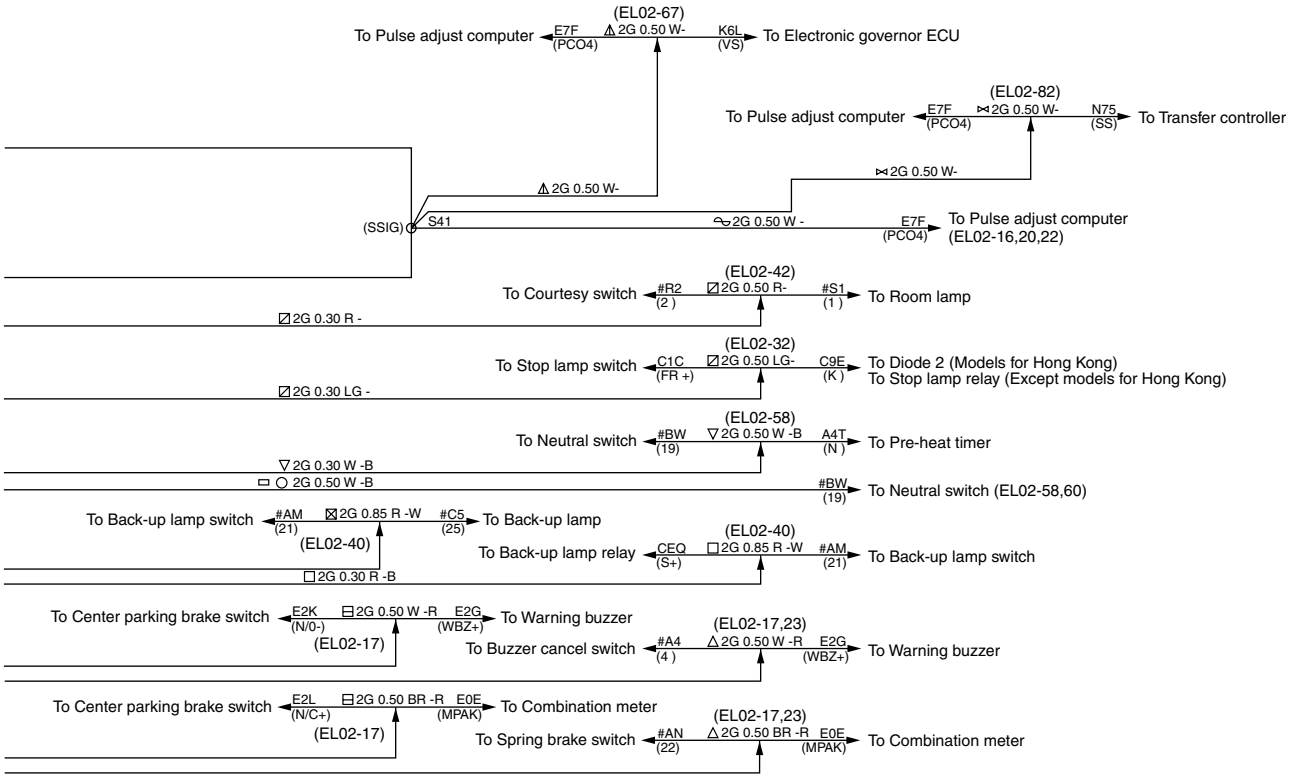


M12020100059

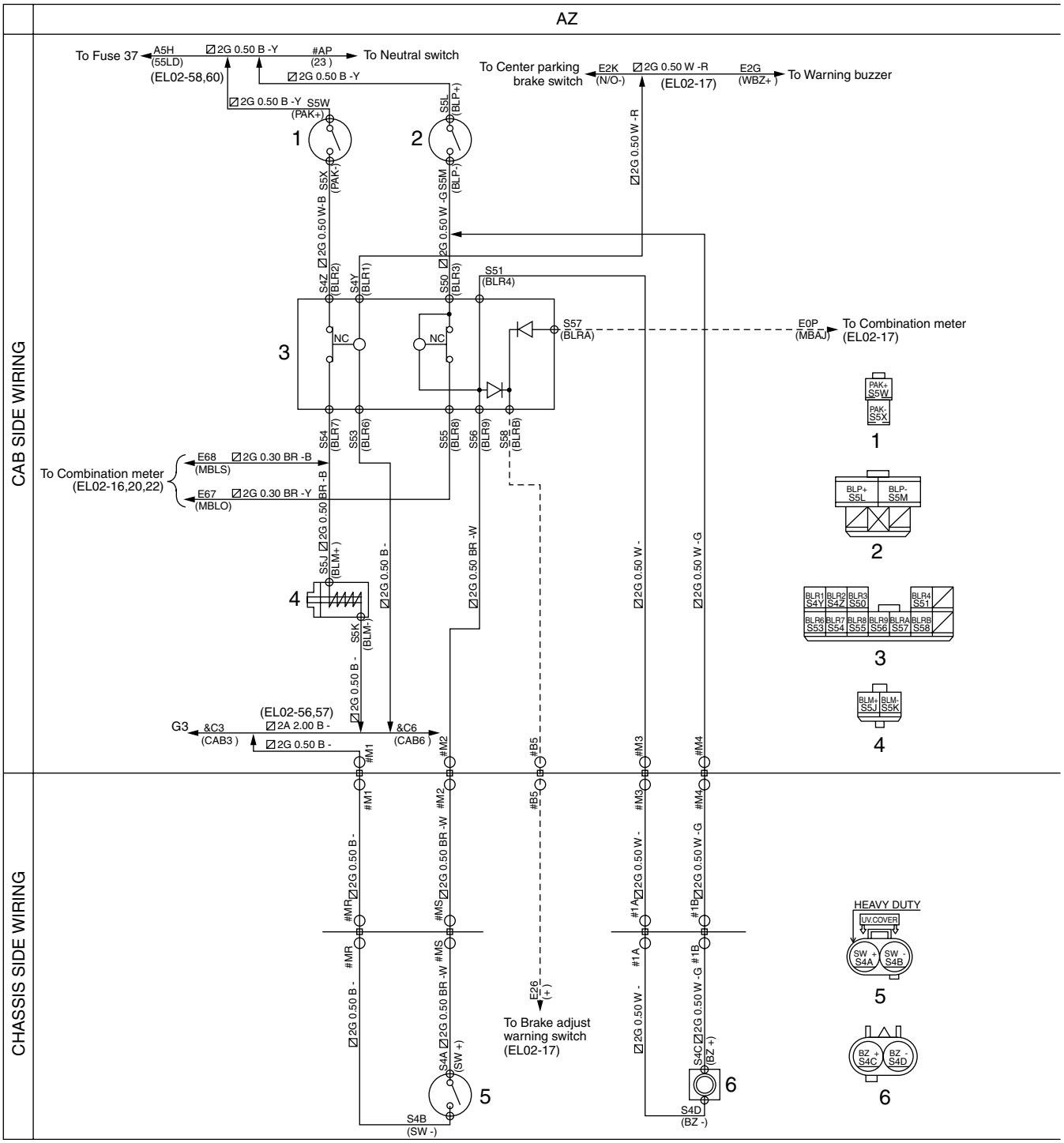
AY. ES START SYSTEM CIRCUIT

1. ES main switch
2. ES start controller
3. Clutch fluid pressure switch
4. Clutch pedal stroke sensor
5. ES start control valve





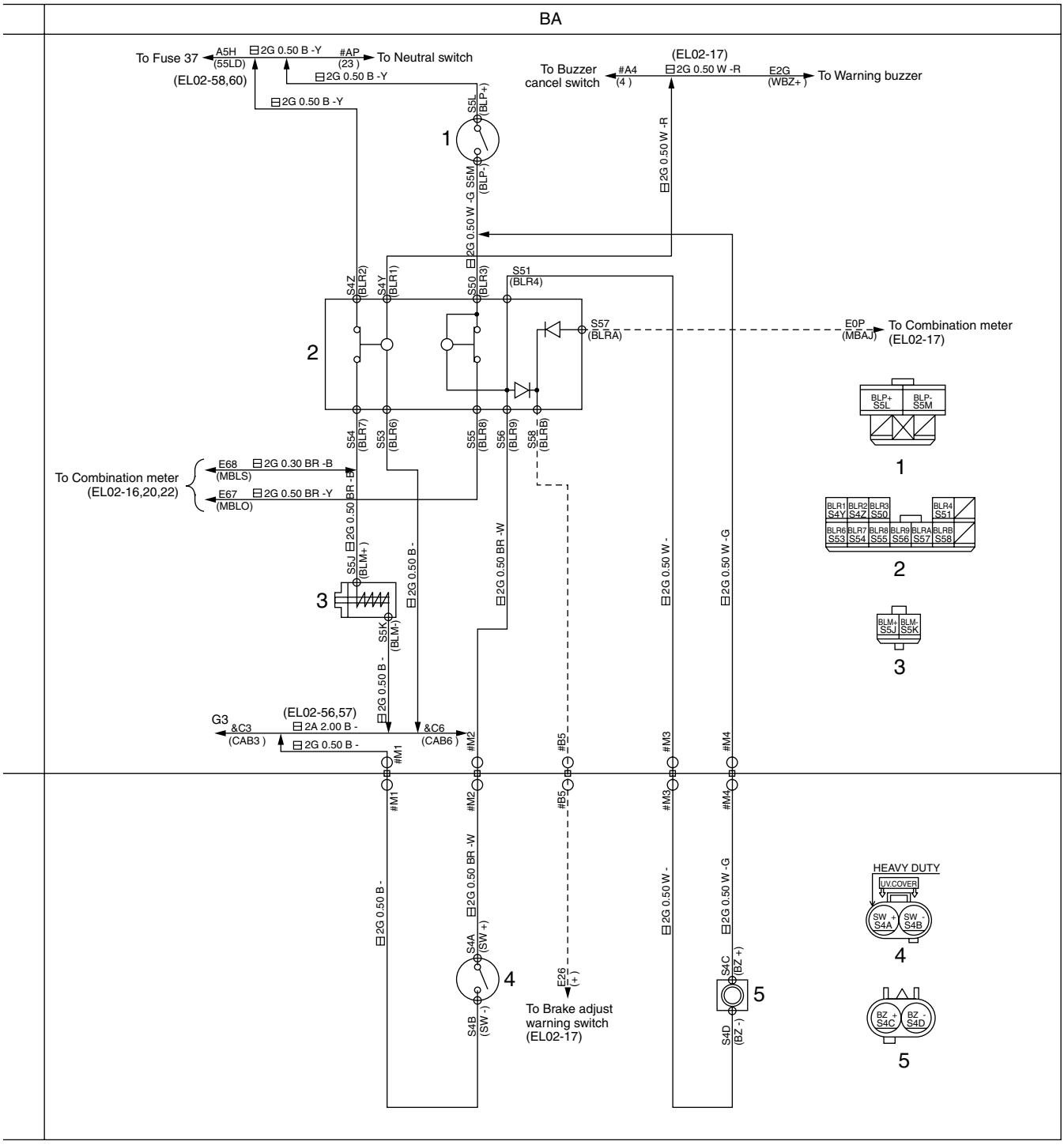
M12020100060



M12020100061

AZ. BRAKE-LOCK CIRCUIT (MODELS EQUIPPED WITH CENTER PARKING BRAKE)

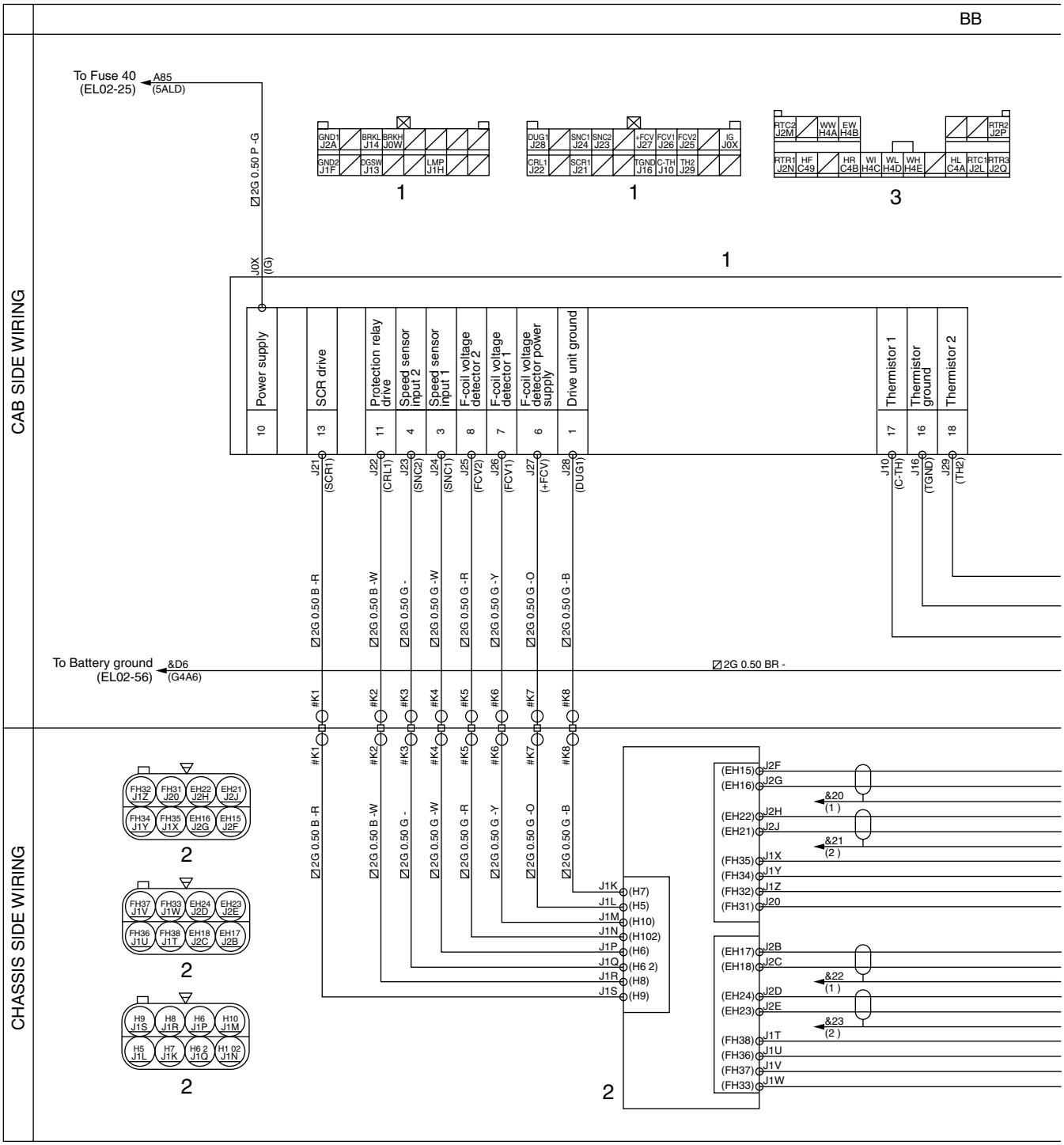
1. Parking brake lever switch
2. Brake-lock control valve position switch
3. Brake-lock relay
4. Brake-lock control magnetic valve
5. Brake-lock pressure switch
6. Brake-lock warning buzzer



M12020100062

BA. BRAKE-LOCK CIRCUIT (MODELS EQUIPPED WITH WHEEL PARKING BRAKE)

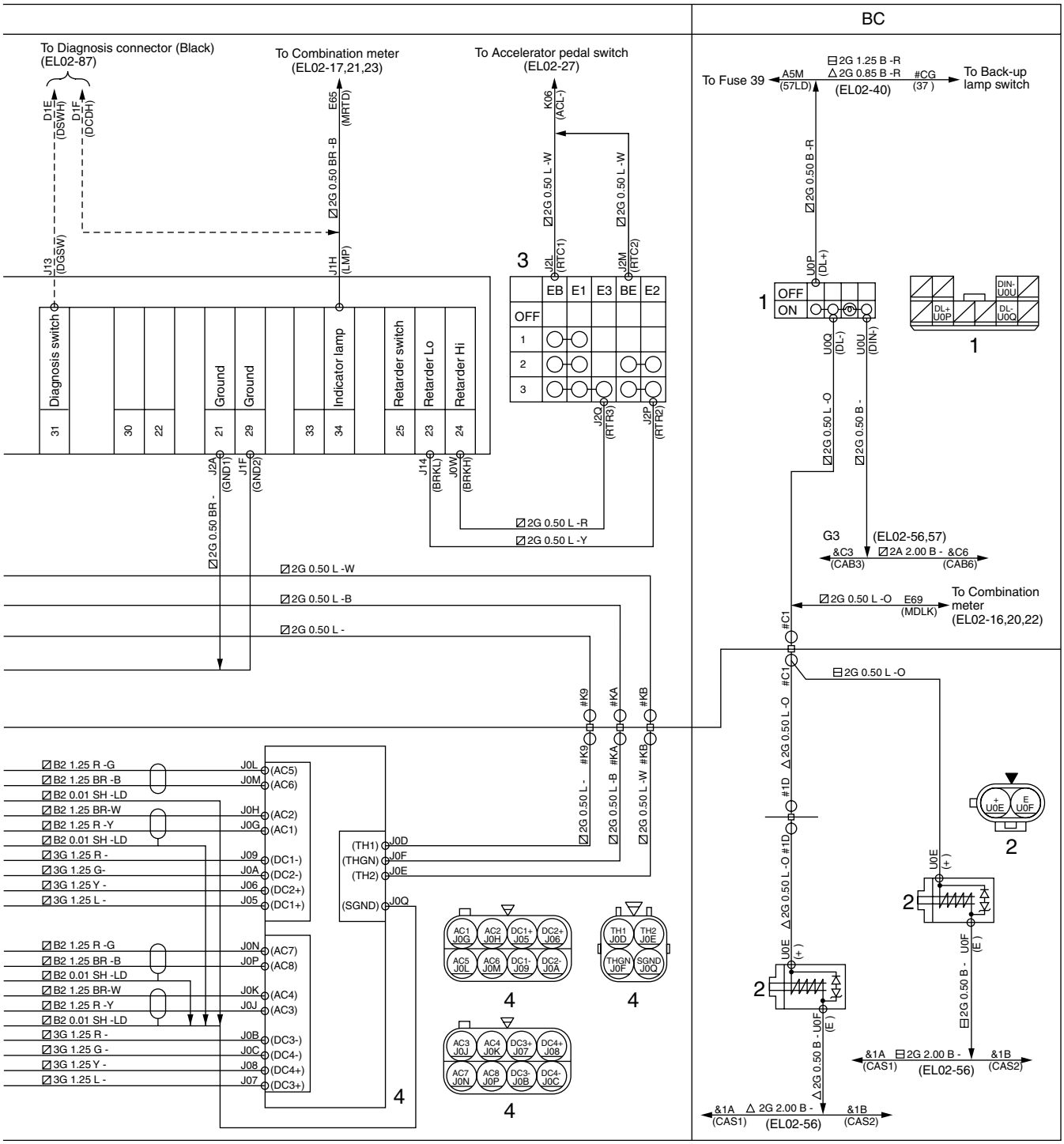
1. Brake-lock control valve position switch
2. Brake-lock relay
3. Brake-lock control magnetic valve
4. Brake-lock pressure switch
5. Brake-lock warning buzzer



M12020100063

BB. ELECTROMAGNETIC RETARDER CIRCUIT

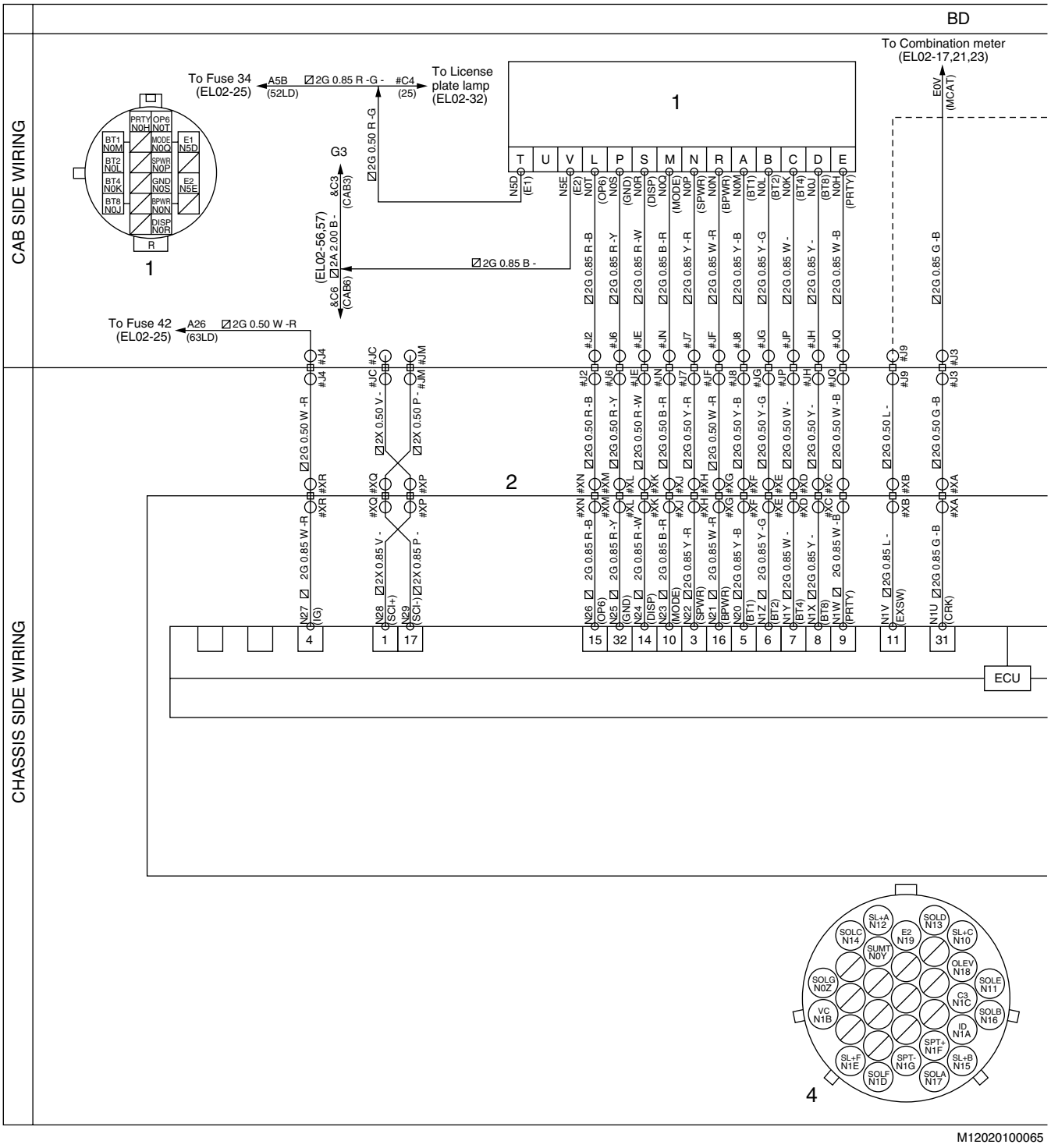
1. Electromagnetic retarder control unit
2. Electromagnetic retarder drive unit
3. Electromagnetic retarder switch
4. Electromagnetic retarder main unit



M12020100064

BC. INTER-AXLE DIFFERENTIAL LOCK CIRCUIT

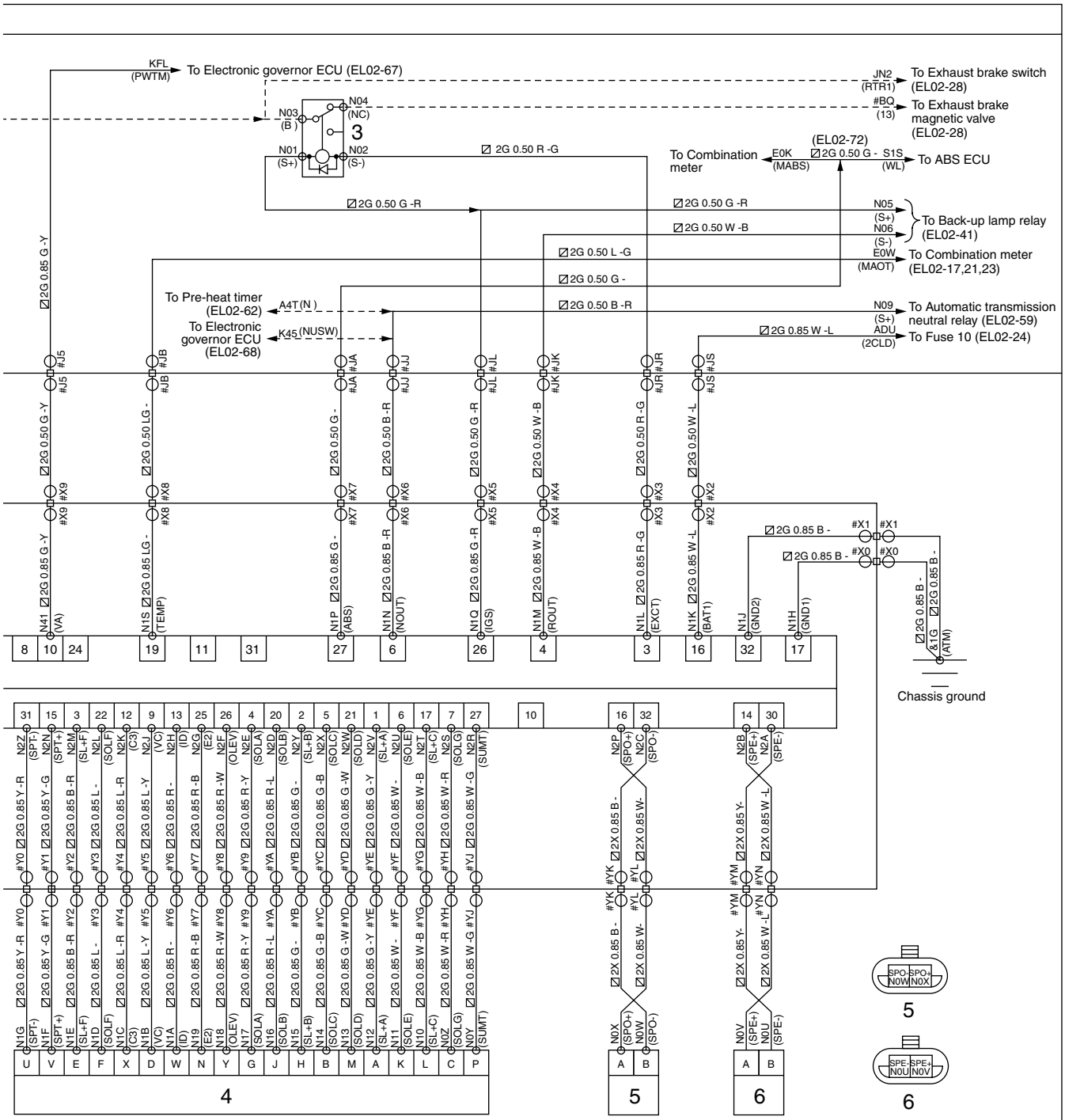
1. Differential lock switch
2. Differential lock magnetic valve



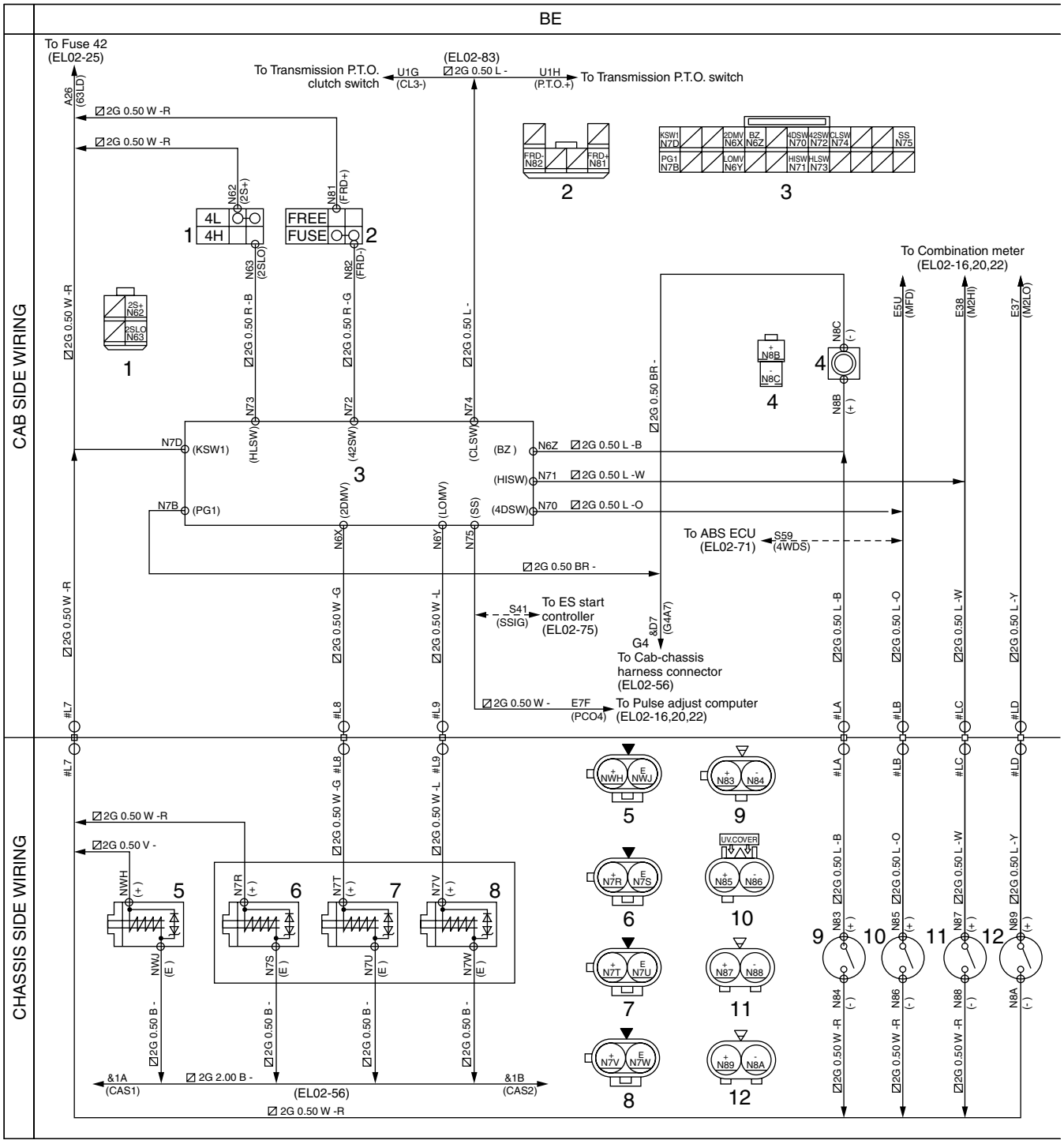
M12020100065

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



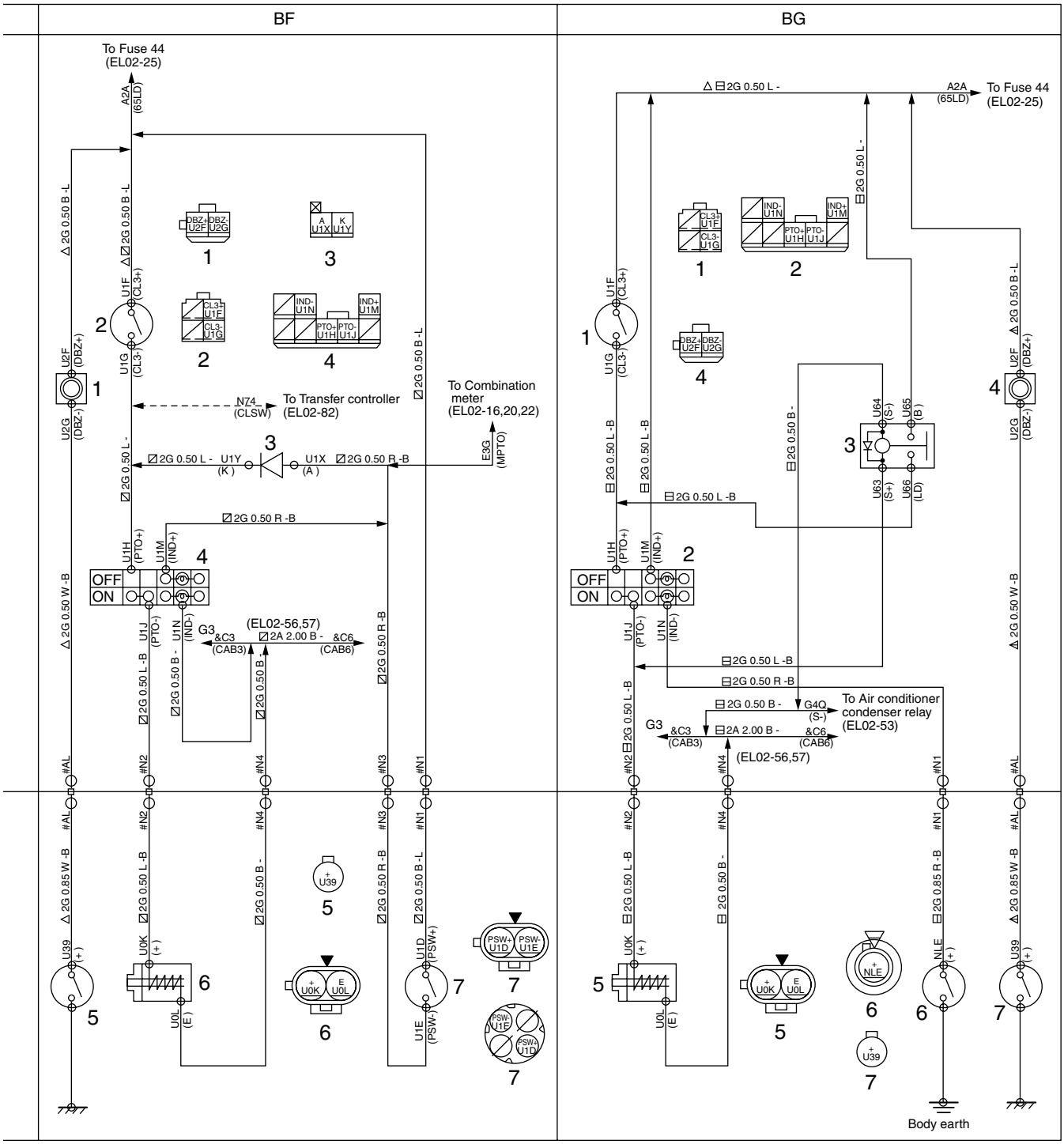
M12020100066



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

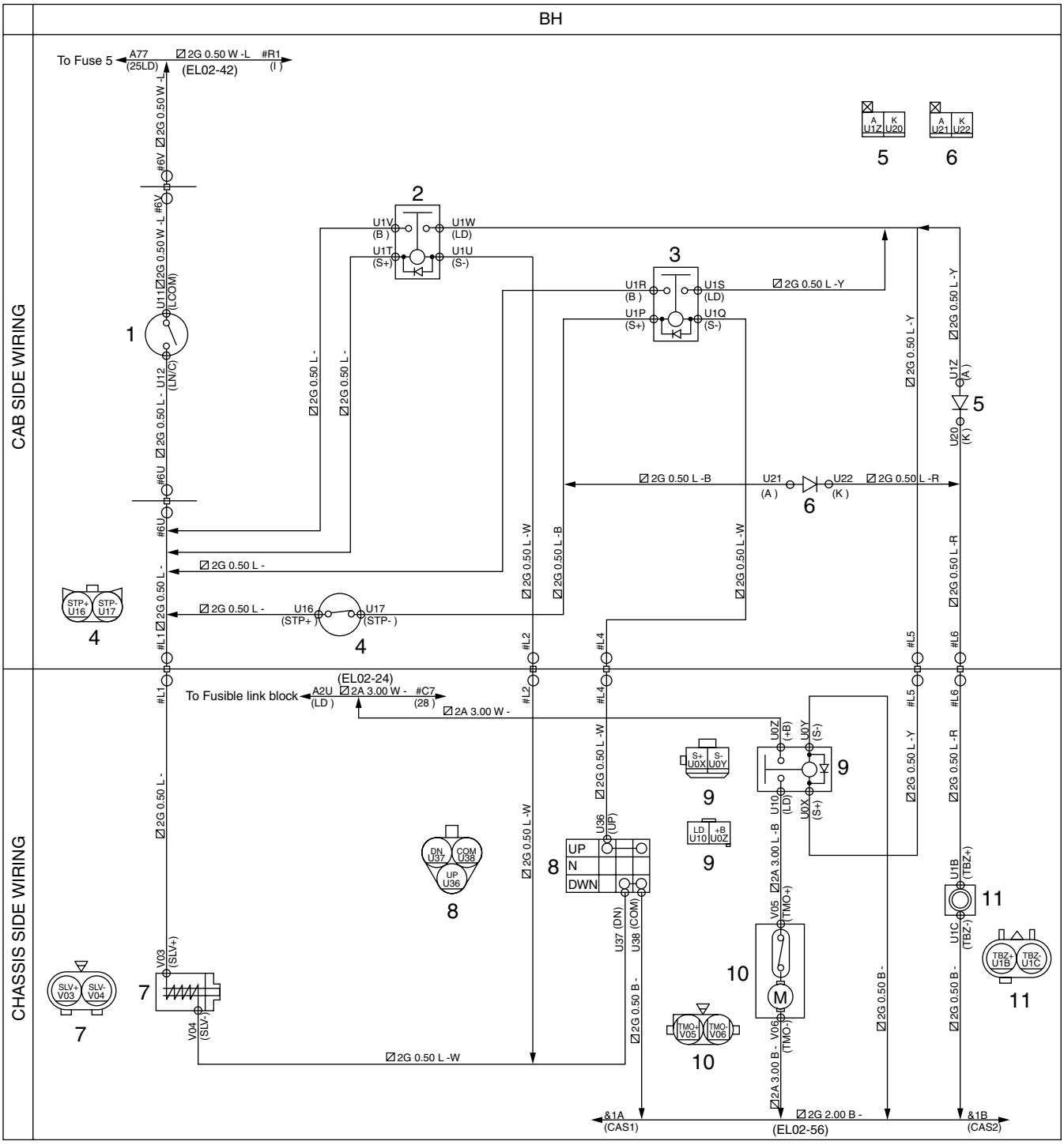


BF. TRANSMISSION P.T.O. CONTROL CIRCUIT (EXCEPT FOR MODELS WITH EATON FS6109/8209 TRANSMISSION)

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

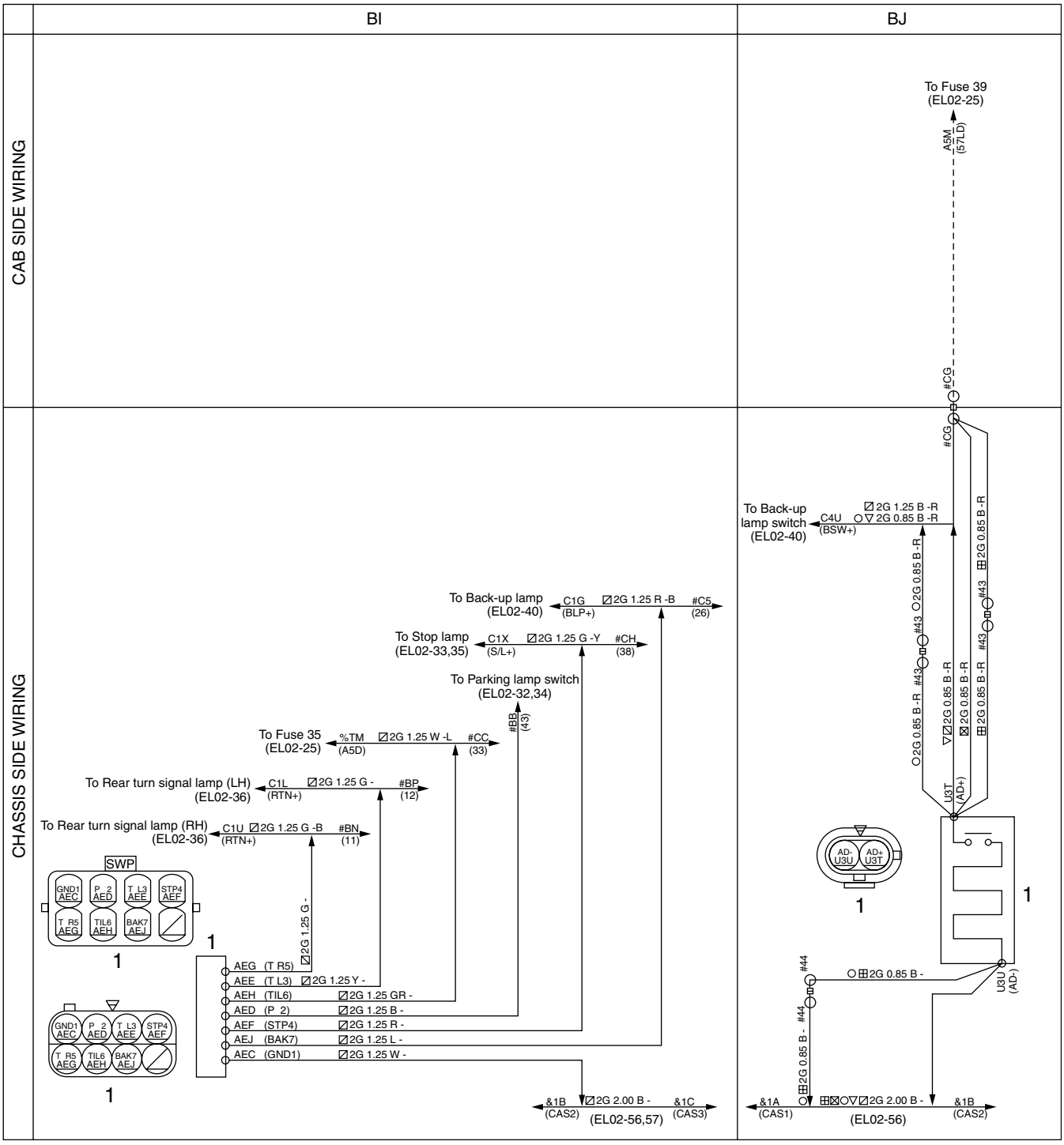
BG. TRANSMISSION P.T.O. CONTROL CIRCUIT (MODELS WITH EATON FS6109/8209 TRANSMISSION)

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



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



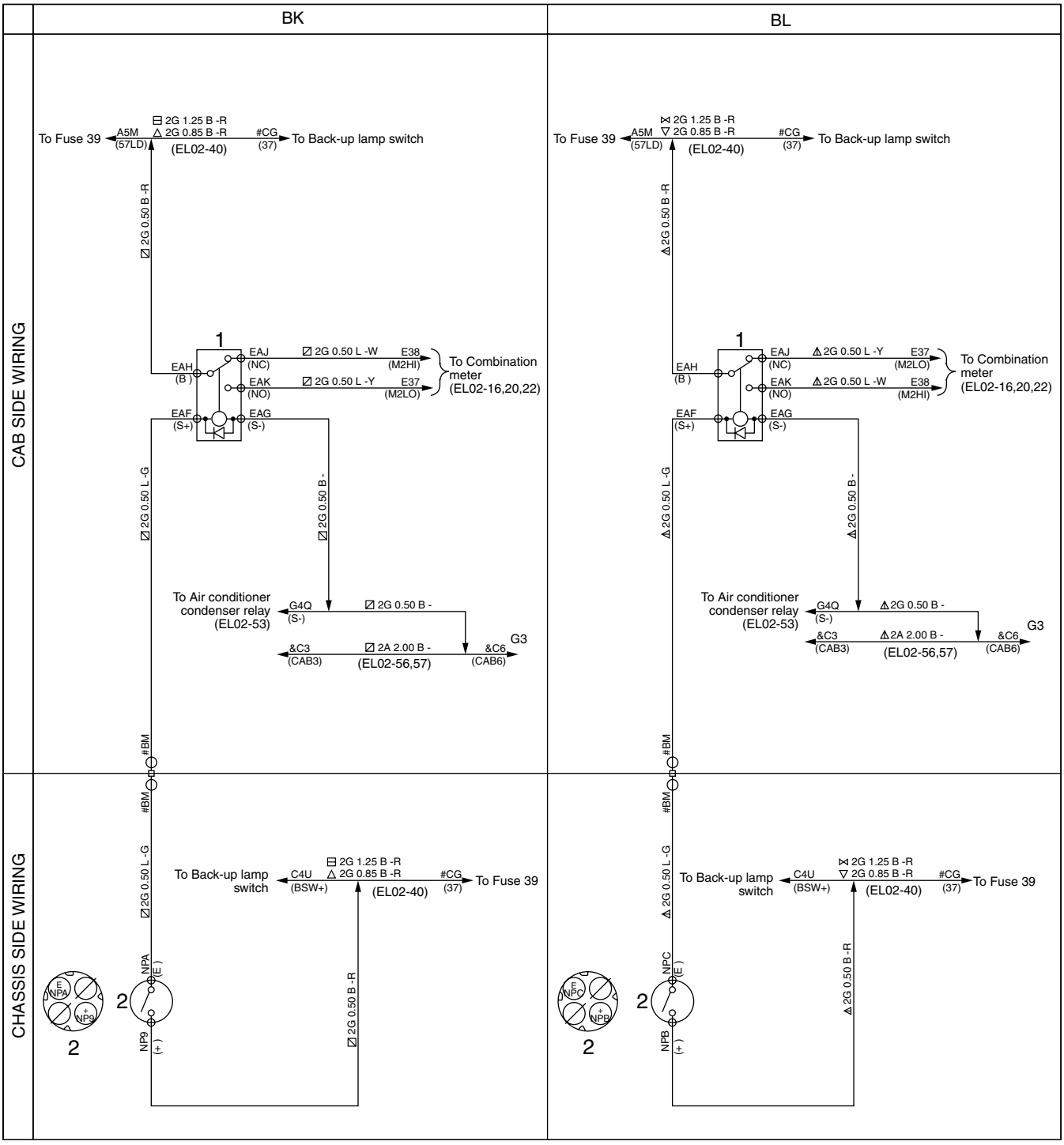
M12020100070

BI. TRAILER CONNECTOR CIRCUIT

1. Trailer socket

BJ. AIR DRIER CIRCUIT

1. Air drier



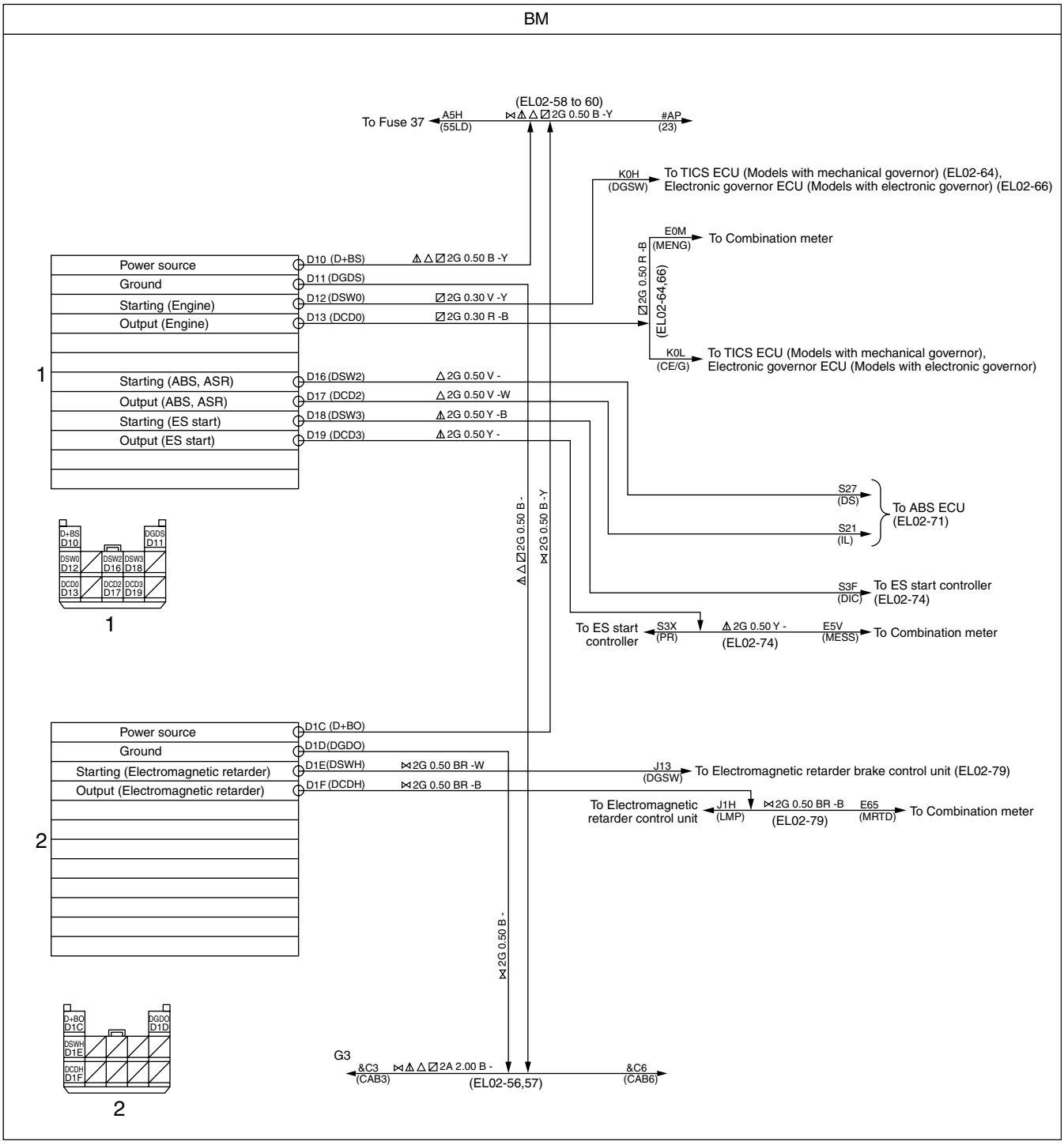
M12020100071

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

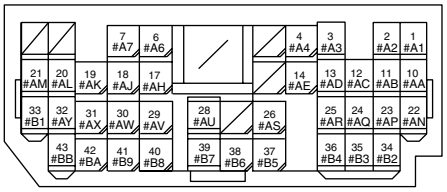
BM. DIAGNOSIS MONITOR CIRCUIT

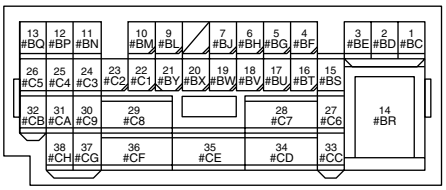
1. Diagnosis connector (White)
2. Diagnosis connector (Black)

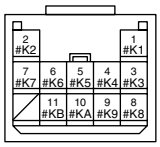
WIRE TO WIRE CONNECTOR

M12020101BEJ1004

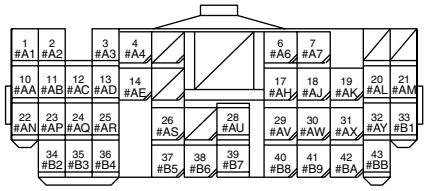
CAB HARNESS

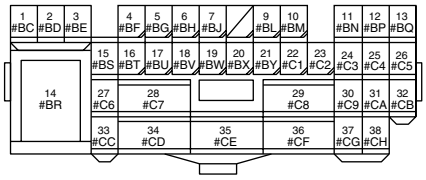


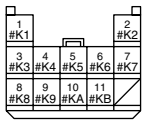




CHASSIS HARNESS







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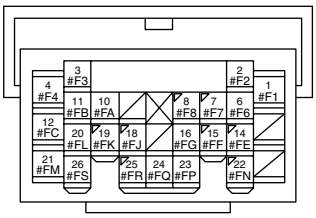
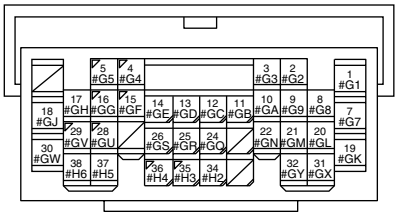
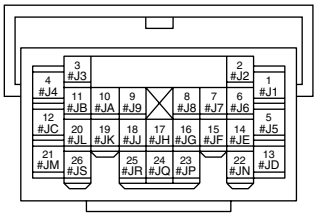
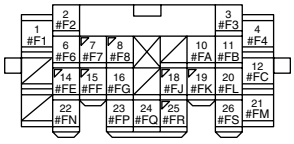
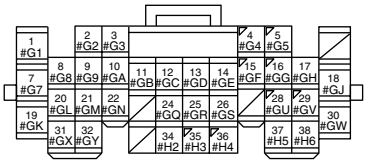
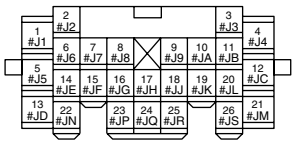






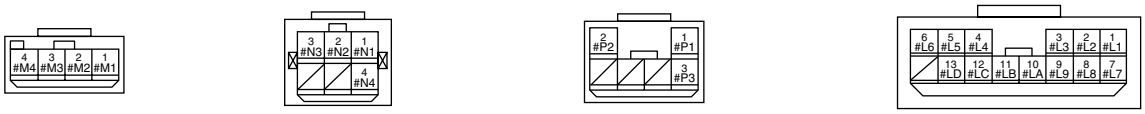




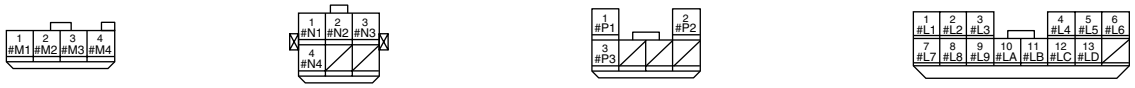


M12020100107

CAB HARNESS

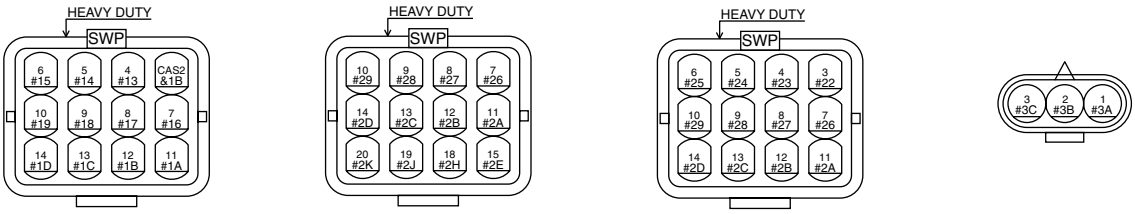


CHASSIS HARNESS

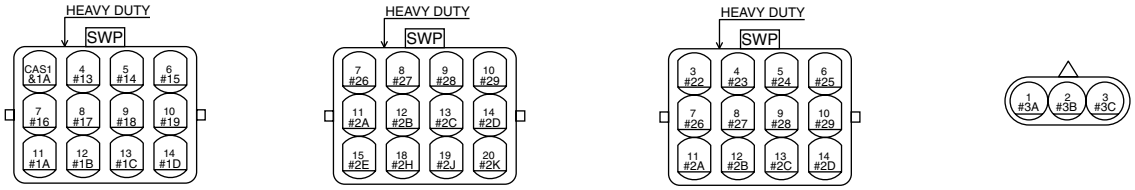


M12020100108

CHASSIS HARNESS



FRONT HARNESS



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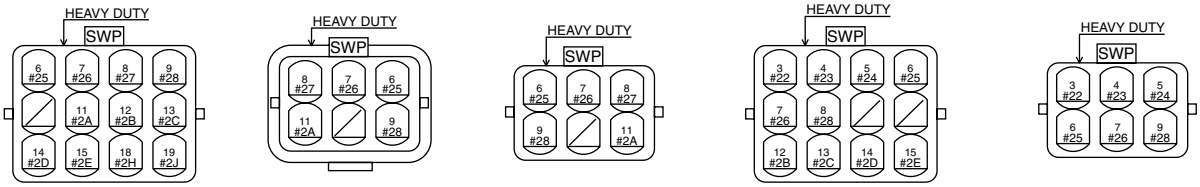
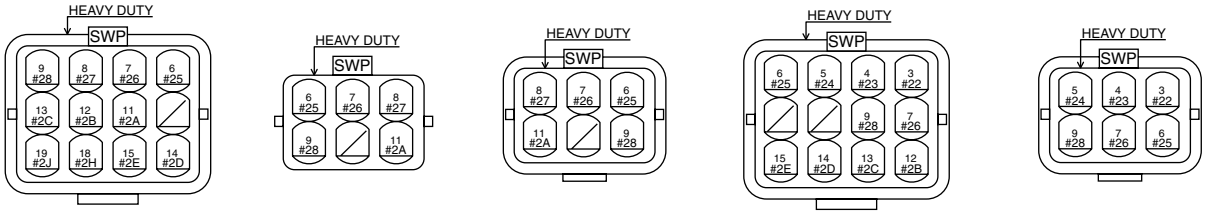
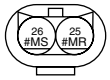
CHASSIS HARNESS



FRONT HARNESS



M12020100110

FRONT HARNESS	
AUTOMATIC TRANSMISSION HARNESS	

M12020100111

BRAKE CONTROL (AKEBONO BRAKE MAKE)

DN03-001

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.

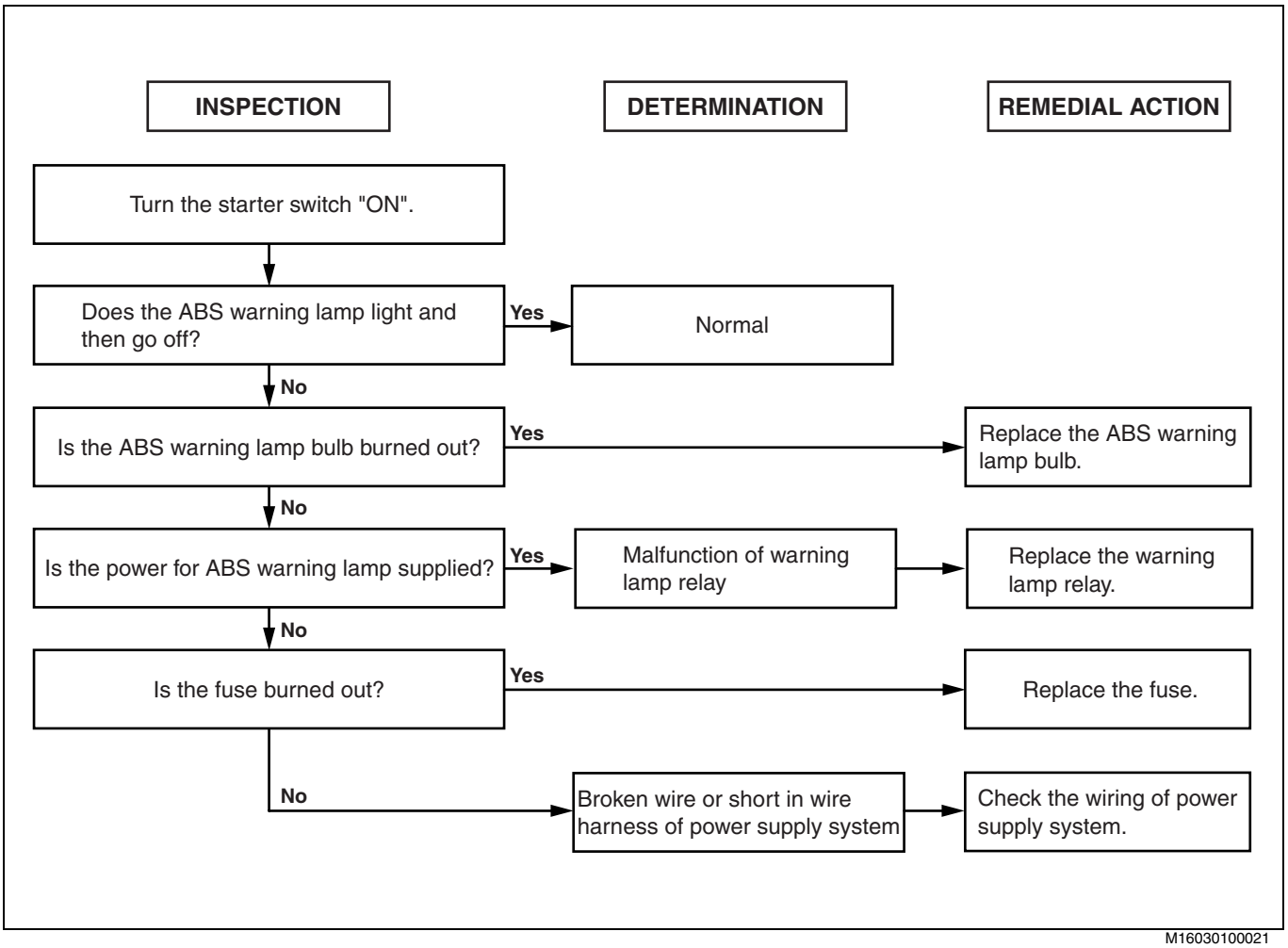
FAILURE DIAGNOSTICS BASED ON ILLUMINATION OF WARNING LAMPS

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.

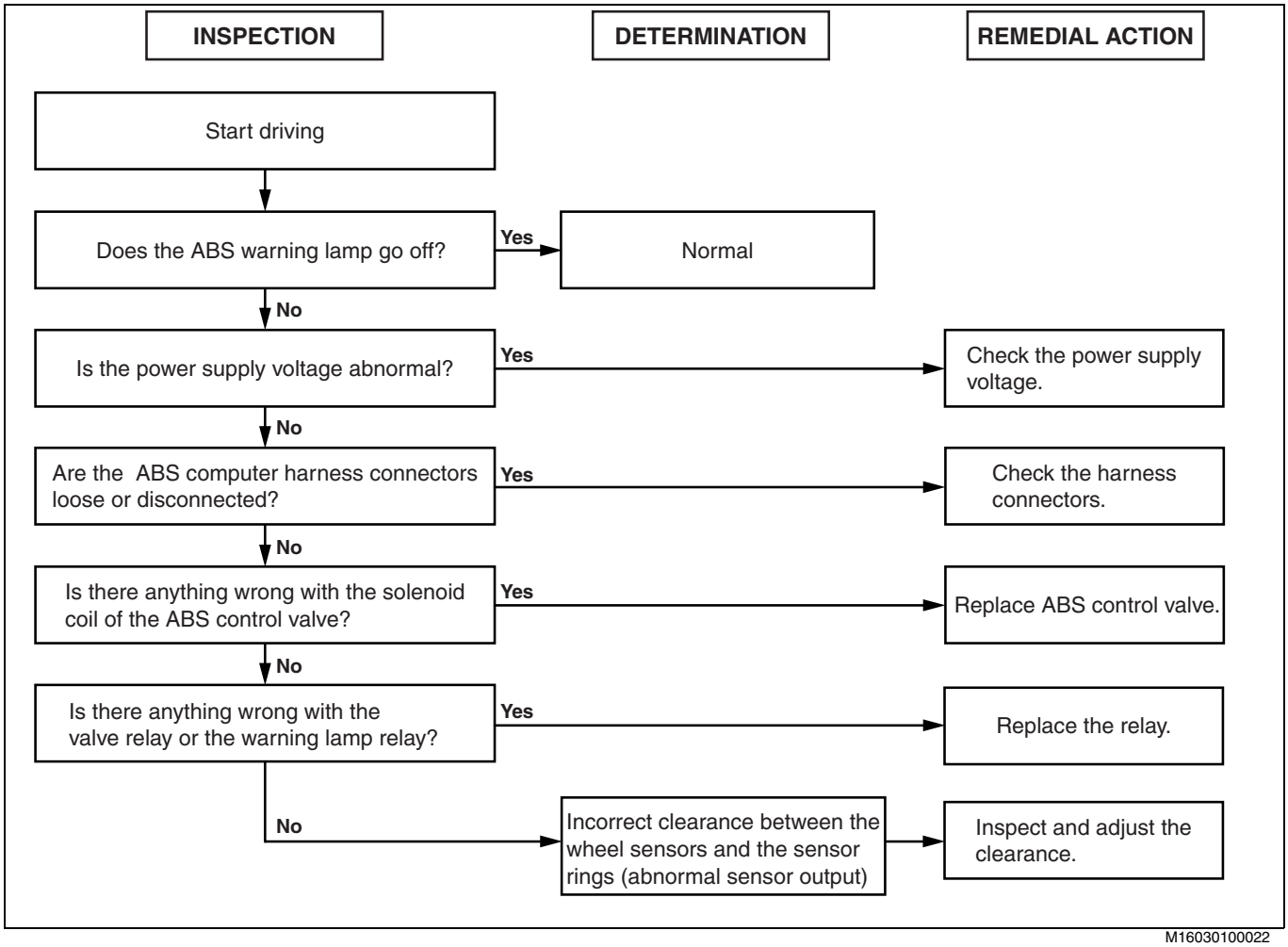
ABS SYSTEM FAILURE DIAGNOSTICS FLOWCHART

1. WHEN THE ENGINE IS STARTED UP



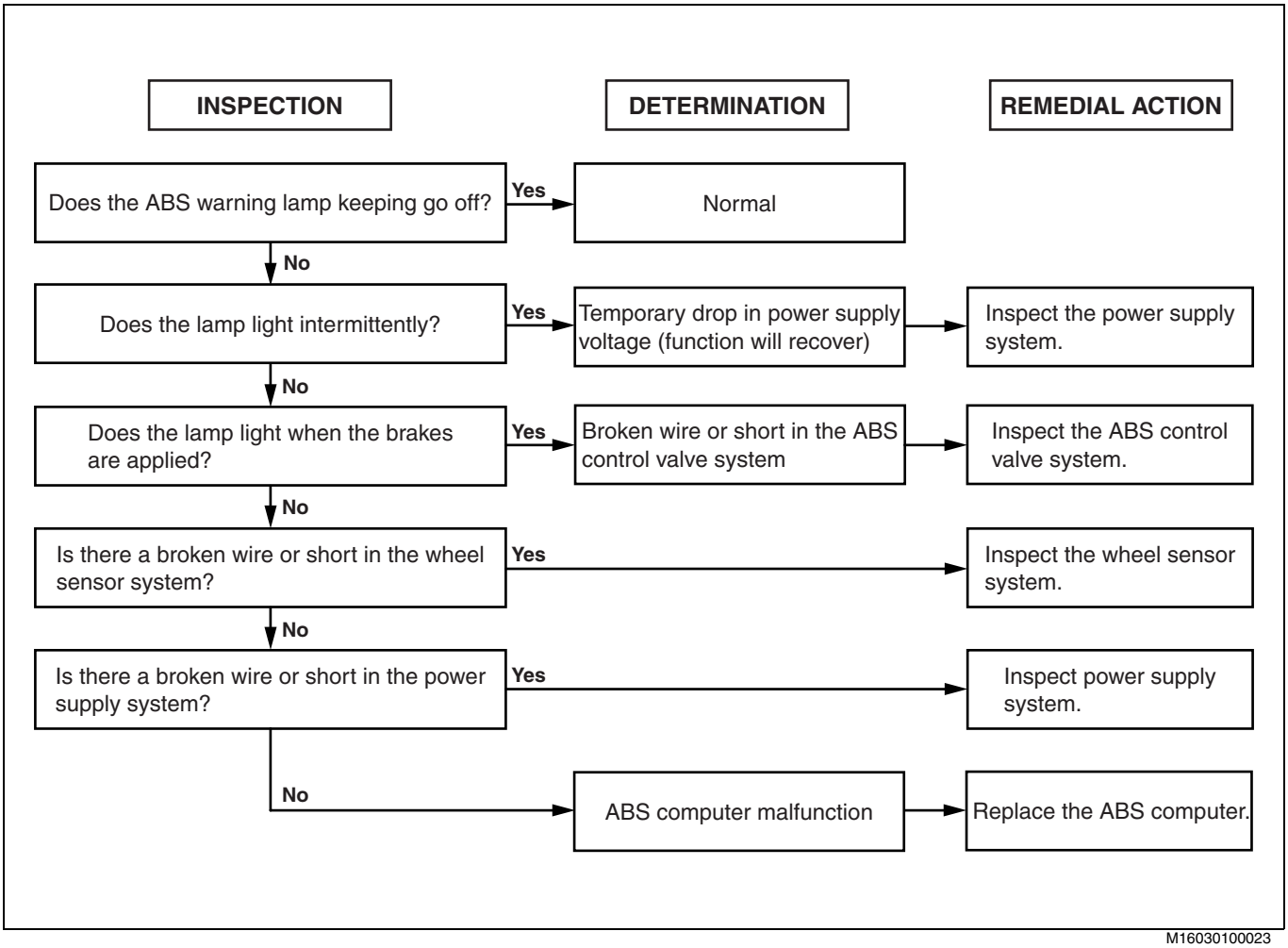
M16030100021

2. WHEN STARTING TO DRIVE



M16030100022

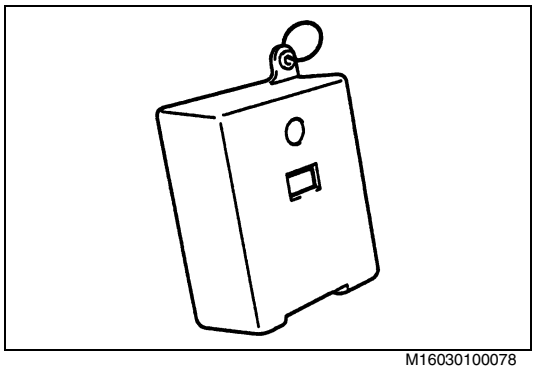
3. WHILE DRIVING AND BRAKING



M16030100023

DIAGNOSIS USING THE DIAGNOSIS MONITOR

M16030101BEF2043

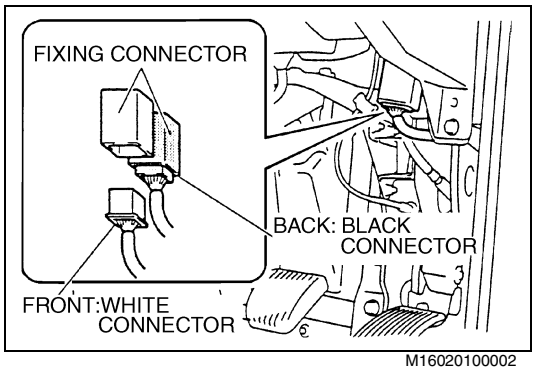


M16030100078

1. CONNECT THE DIAGNOSIS MONITOR.
SST: Diagnosis monitor (09630-1370)

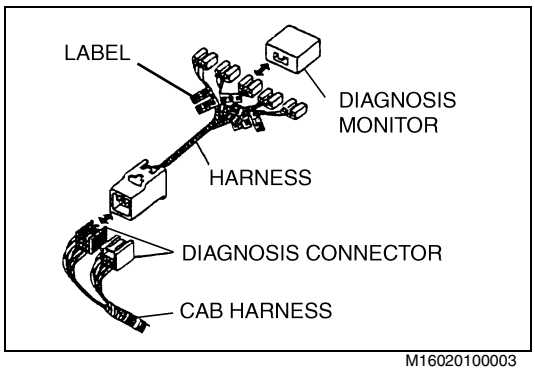
NOTICE:
Trouble diagnosis can be performed using the diagnosis monitor. The malfunction codes are indicated by sound and light.

(1) Turn the starter switch to the "ON".



M16020100002

(2) Connect the harness to the diagnosis connector.
SST: Harness (09630-2300)



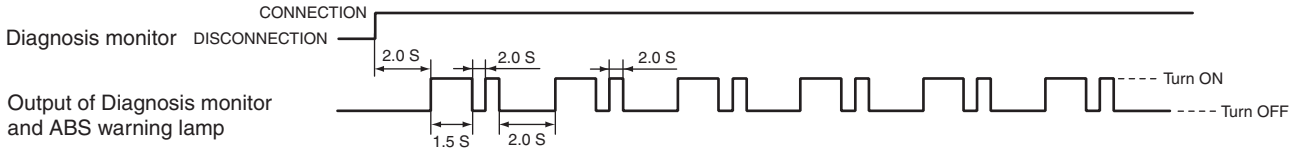
M16020100003

(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.

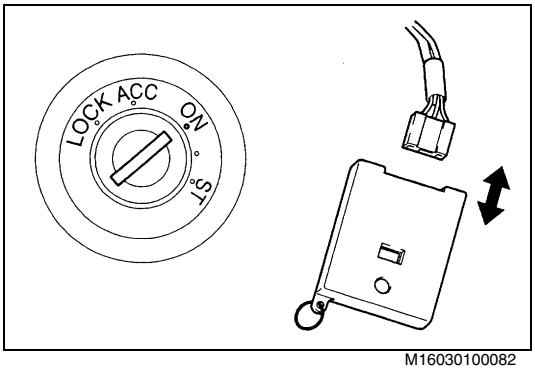
MALFUNCTION CODE DISPLAY PATTERN



S: Second

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	—

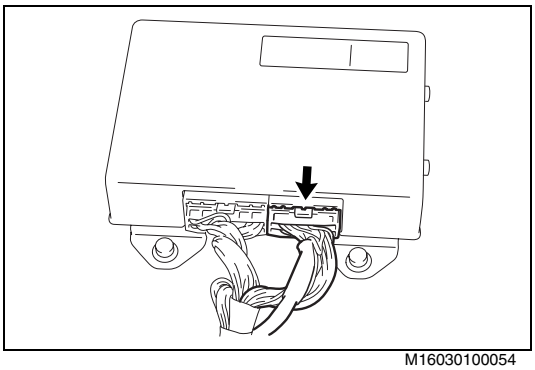
ABNORMALITY OF ABS COMPUTER INTERNAL (DIAGNOSIS CODE 2)

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

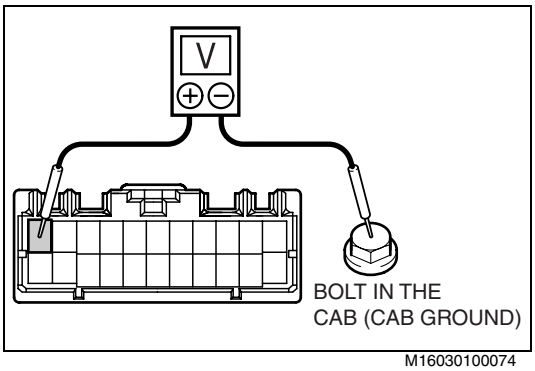


M16030100054

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".

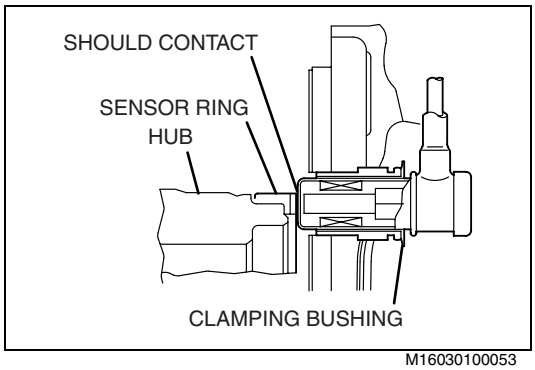
WRONG SENSOR RING OR WRONG TIRE SIZE (DIAGNOSIS CODE 4)

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

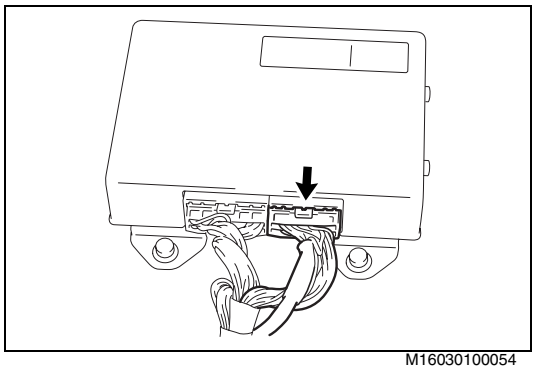
1. CHECK THE WHEEL SENSOR.

(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)

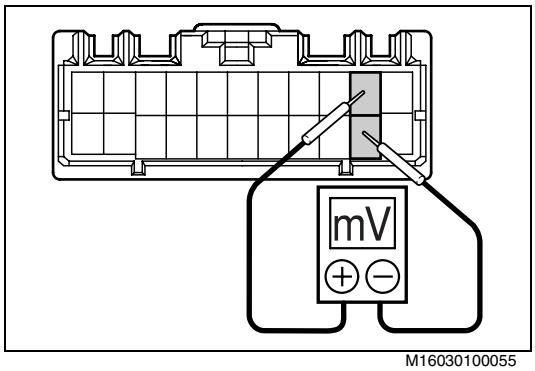
M16030101BEF2007


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

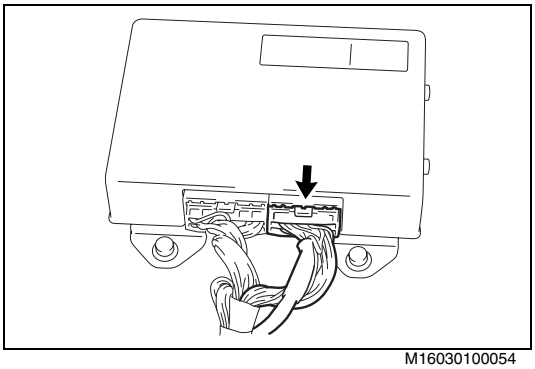
NG → Abnormality of harness or wheel sensor

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

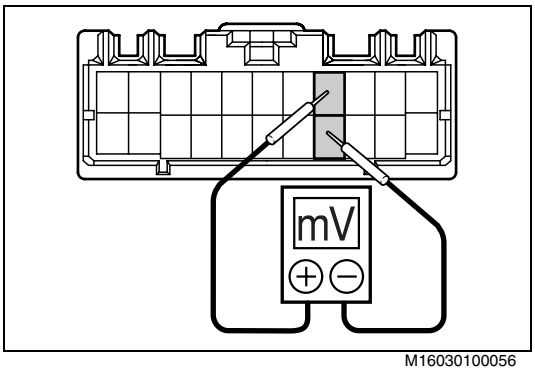


M16030100054

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

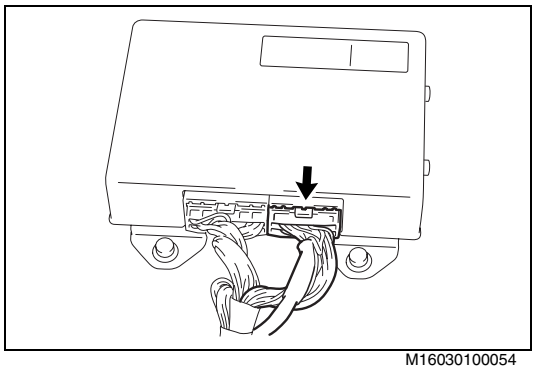
NG → Abnormality of harness or wheel sensor

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

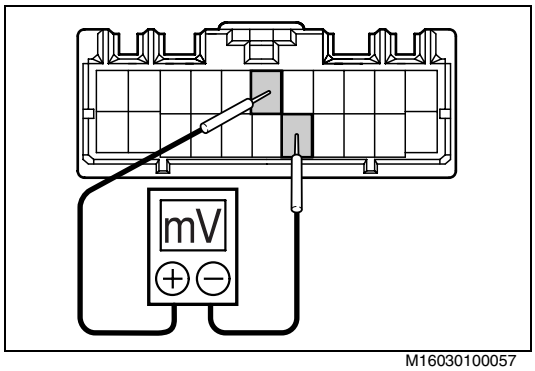


M16030100054

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

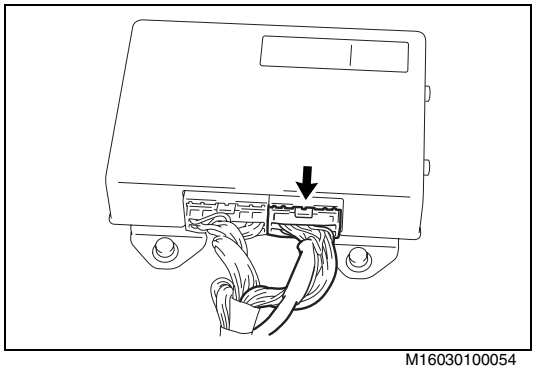
NG → Abnormality of harness or wheel sensor

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

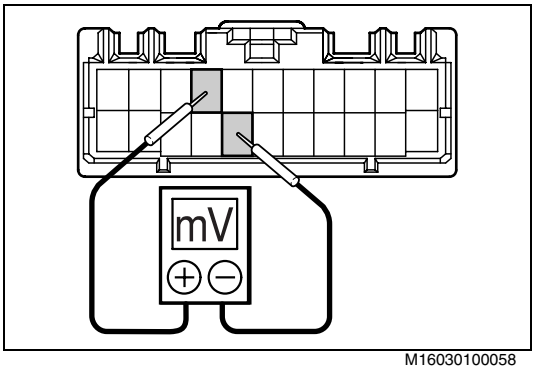


M16030100054

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

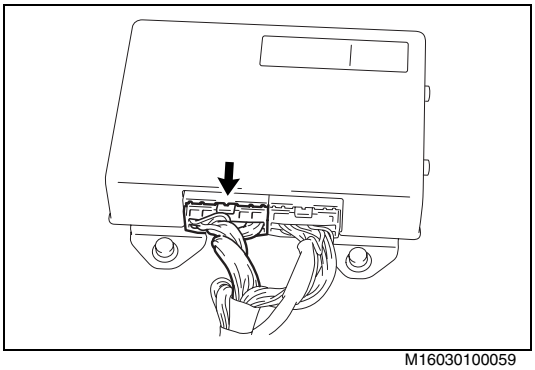
NG → Abnormality of harness or wheel sensor

OK

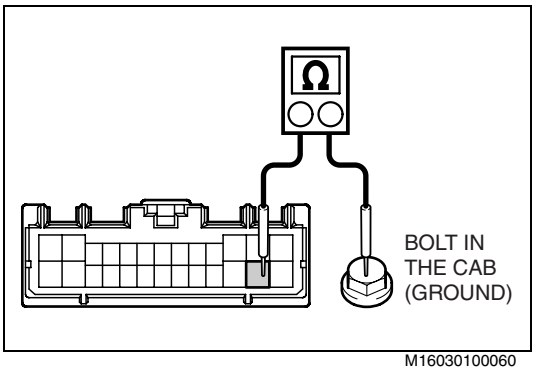
- Temporary malfunction because of abnormality of harness connector
- Abnormality of ABS computer

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.

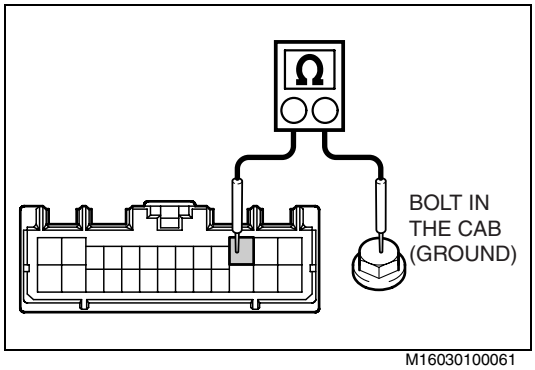


M16030100060

(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

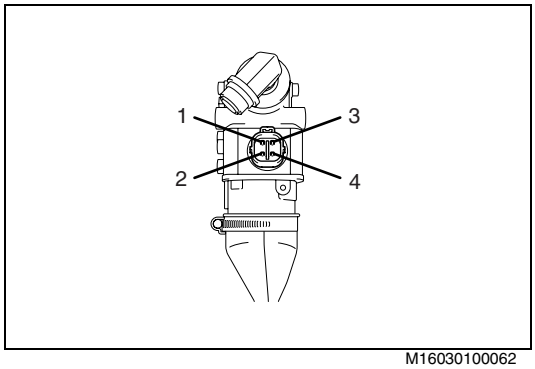
2. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(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**

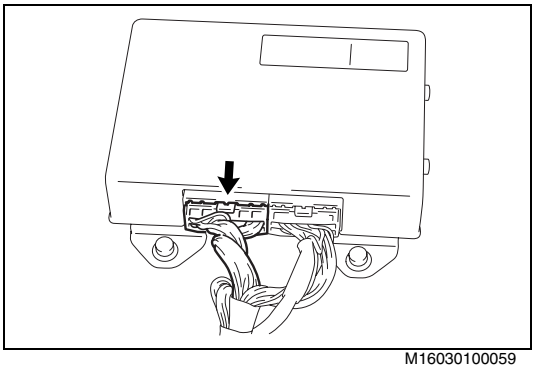
NG → Abnormality of control valve

OK →

Abnormality of harness

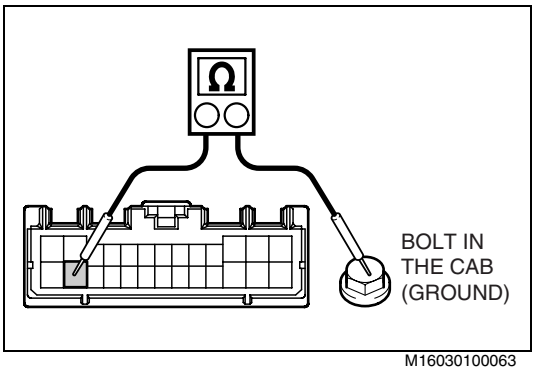
ABNORMALITY OF ABS CONTROL VALVE, LH ON REAR AXLE (DIAGNOSIS CODE 18)

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.



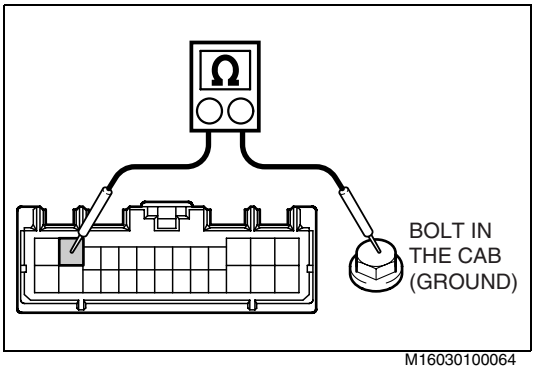
M16030100063

(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.



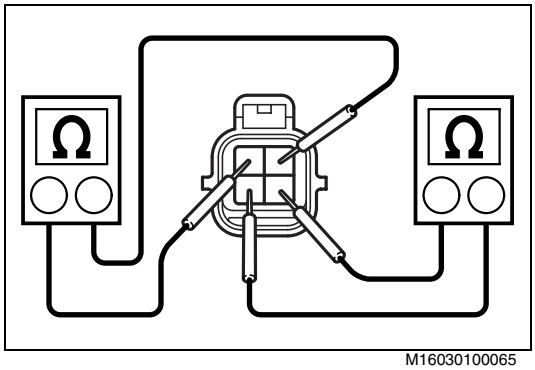
M16030100064

(1) Measure the resistance between 2nd 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


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:

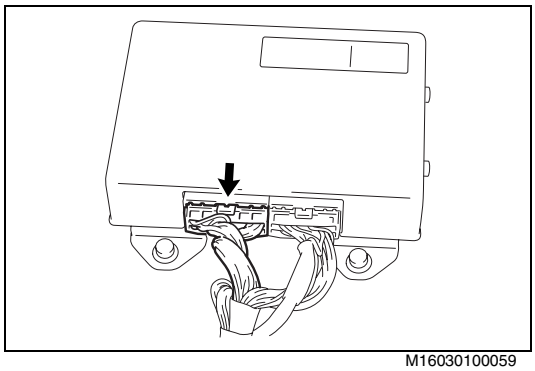
Terminals	Resistance
Between 1st-2nd	**9-25 Ω**
Between 3rd-4th	**9-25 Ω**

NG → Abnormality of control valve

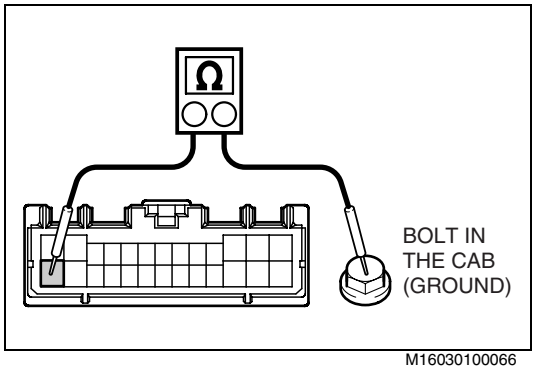
OK → Abnormality of harness

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.

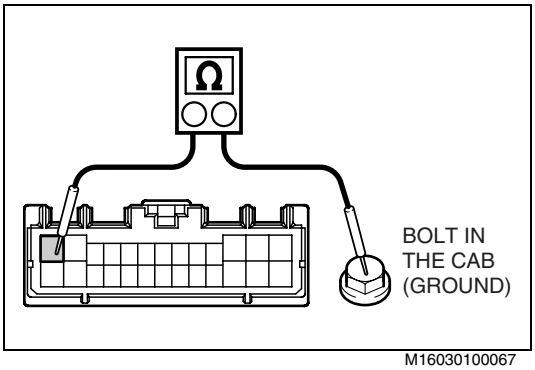


M16030100066

(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

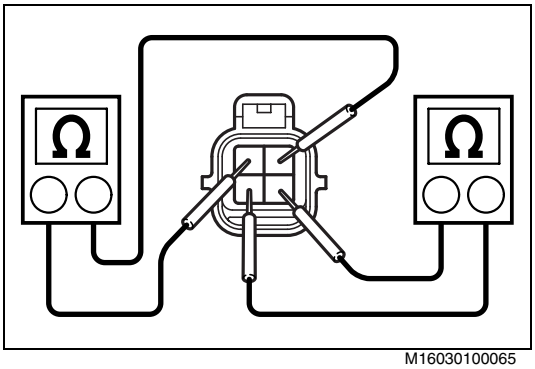
2. CHECK THE RESISTANCE BETWEEN TERMINAL AND GROUND.

(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**

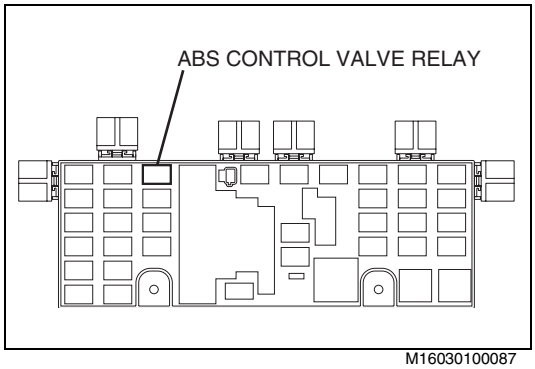
NG → Abnormality of control valve

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



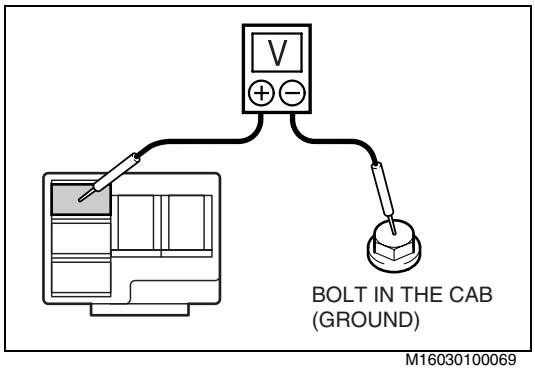
M16030100087

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).



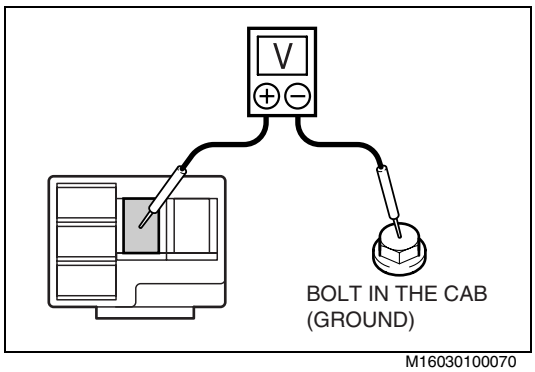
M16030100069

(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

OK

- Burn out Fuse
- Harness disconnection



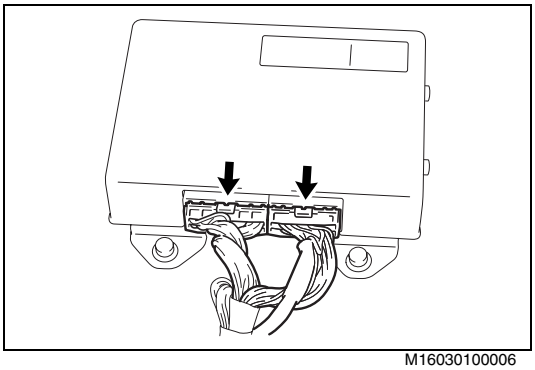
M16030100070

(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

OK

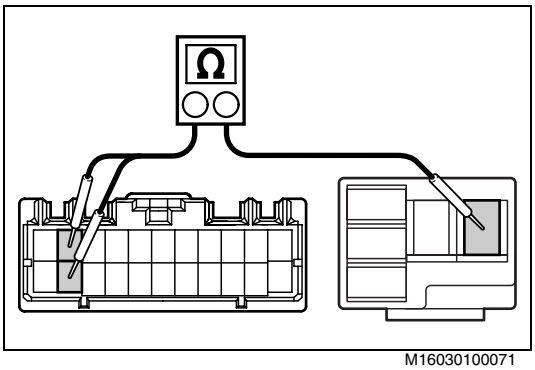
- Burn out Fuse
- Harness disconnection


M16030100006

2. CHECK THE CONTINUITY BETWEEN TERMINALS.

(1) Set the starter switch to "LOCK".

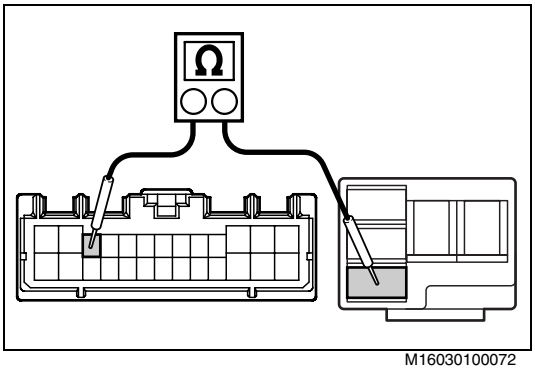
(2) Disconnect the 22 pin and 26 pin connectors of ABS computer.


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

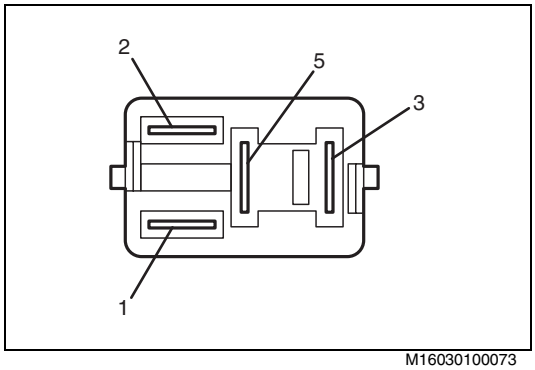
OK


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

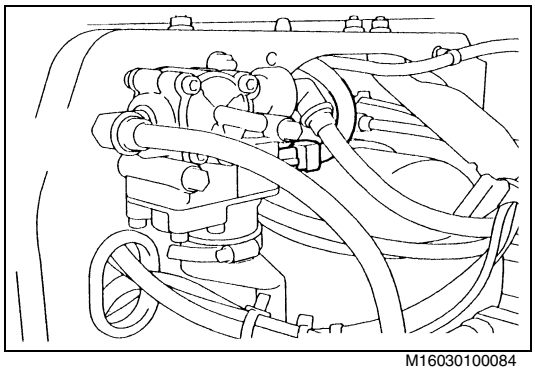
NG → Abnormality of ABS control valve relay

OK

Abnormality of ABS computer

LEAKAGE OF ABS CONTROL VALVE POWER SUPPLY (DIAGNOSIS CODE 23)

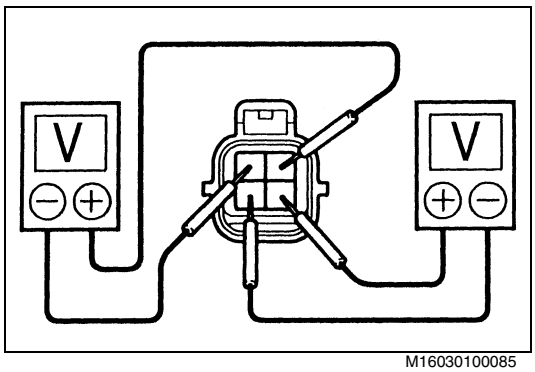
M16030101BEF2041


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

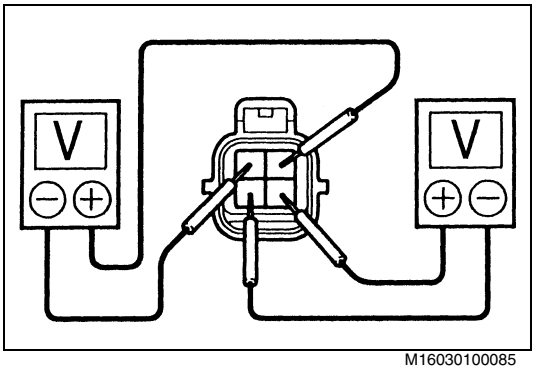
NG

- 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

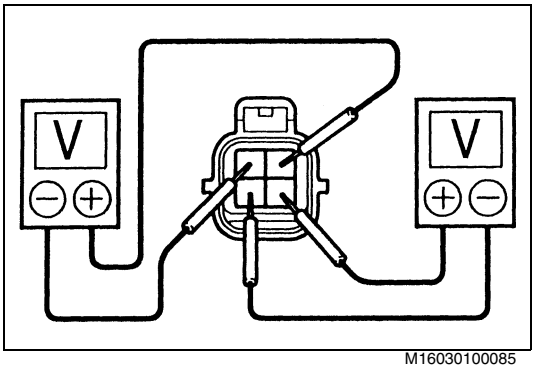
NG

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

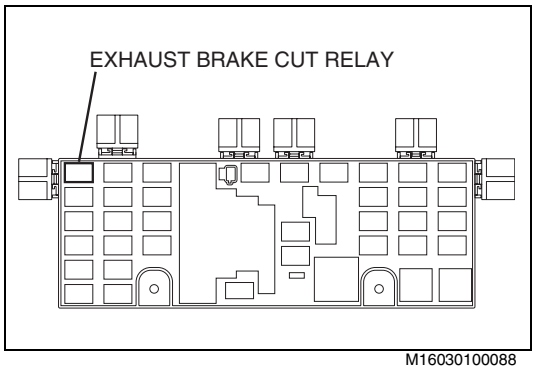
OK

- 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

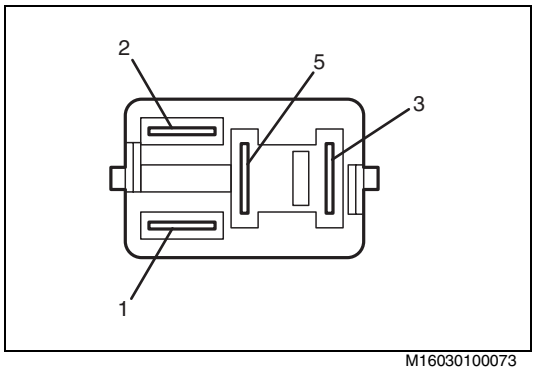


M16030100088

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

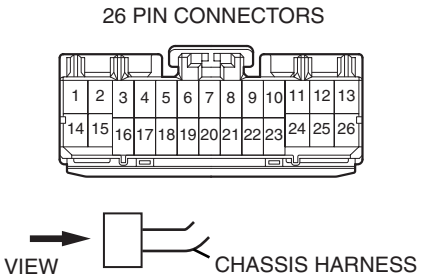
WRONG ABS COMPUTER (DIAGNOSIS CODE 29)

M16030101BEF2044

If this code is output, check the parts number of ABS computer.

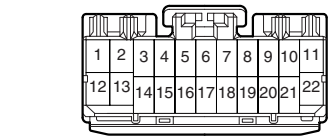
ABS COMPUTER CHASSIS SIDE CONNECTOR PIN ASSIGNMENT

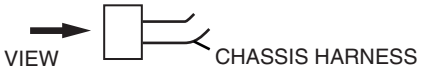
M16030101BEF2015



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	4WDS	4WD
7	ESET	ECU set up	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	ECU ground 1	26	GND2	ECU ground 2

22 PIN CONNECTORS





No.	SIGNAL	CONNECTING DESTINETION	No.	SIGNAL	CONNECTING DESTINETION
1	IGN	ECU power supply (Fuse)	12	GND3	ECU ground 3
2	VV1	ABS control valve relay	13	VV2	ABS control valve relay
3	GVCC	G-sensor power	14	GOUT	G-sensor signal
4	RRS+	Wheel sensor for rear right wheel	15	GGND	G-sensor ground
5	GSSH	Ground	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	—	—

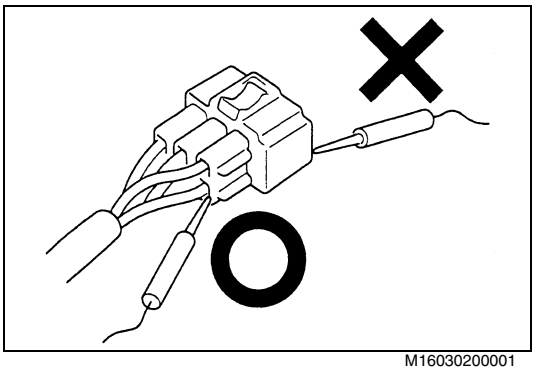
BRAKE CONTROL (ES START)

DN03-002

ES START (EASY & SMOOTH START) SYSTEM

HANDLING PRECAUTIONS

M16030201BEF2001



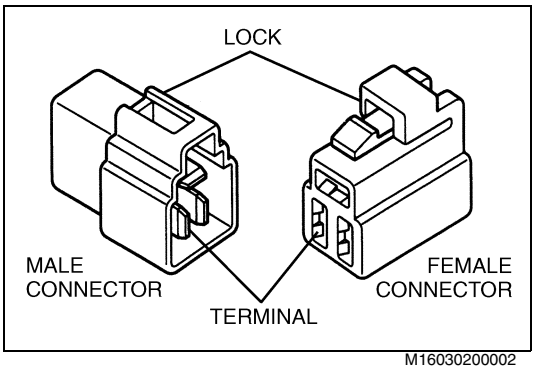
M16030200001

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.

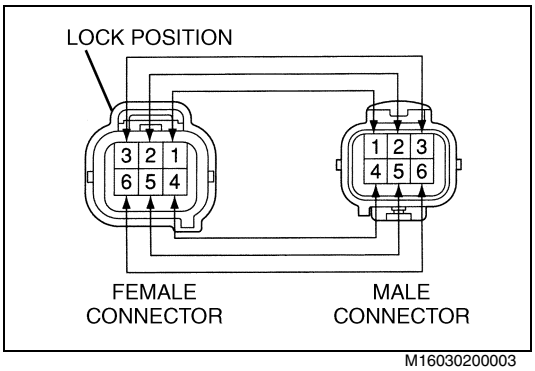


M16030200002

(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".

Continued on next page

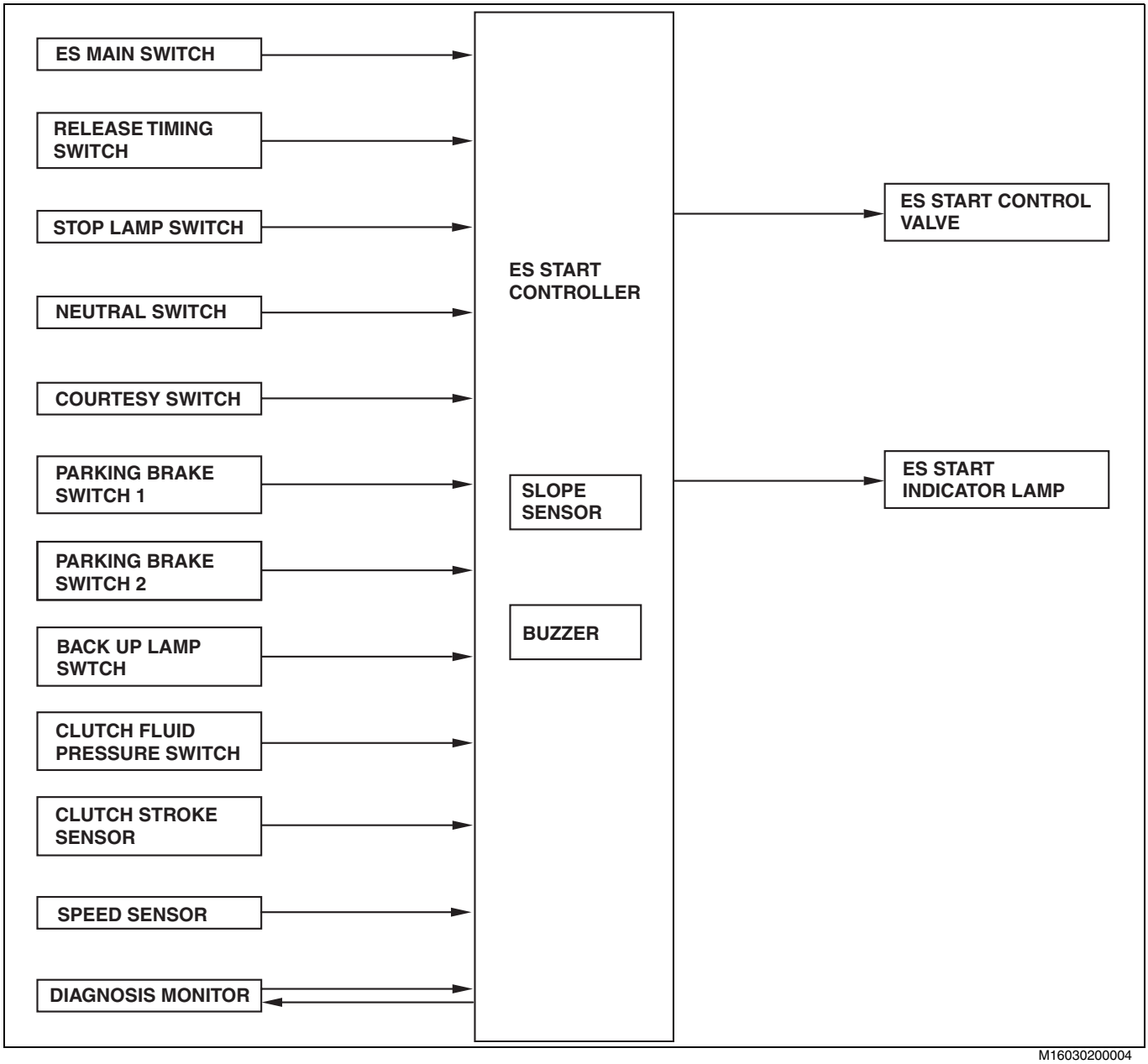
2. ABOUT DIAGNOSIS MONITOR

(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



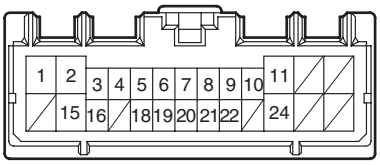
M16030200004

ARRANGEMENT OF CONNECTOR PIN

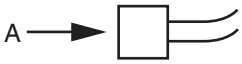
M16030201BEF2019

ES START CONTROLLER

26-PIN CONNECTOR



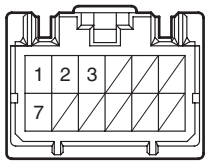
VIEW A



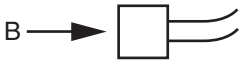
CAB SIDE HARNESS

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



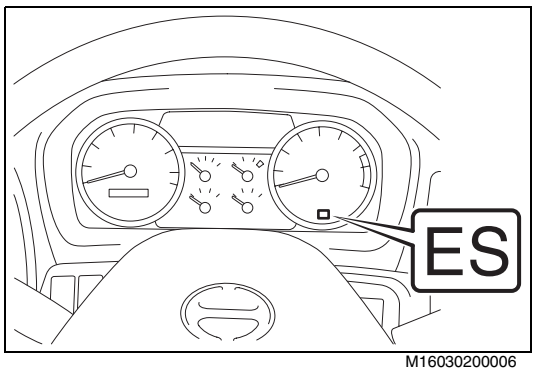
CAB SIDE HARNESS

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

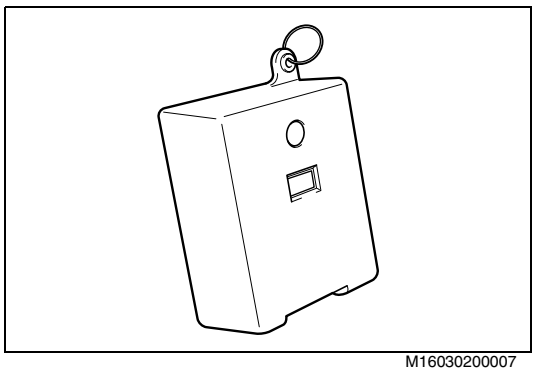
THE BRAKE IS NOT RELEASED WHEN THE CANCELLATION IS PERFORMED. (OR VEHICLE SLIDES DOWN.)

Adjust the release timing.

M16030200064

FAILURE DIAGNOSIS BY USING DIAGNOSIS MONITOR

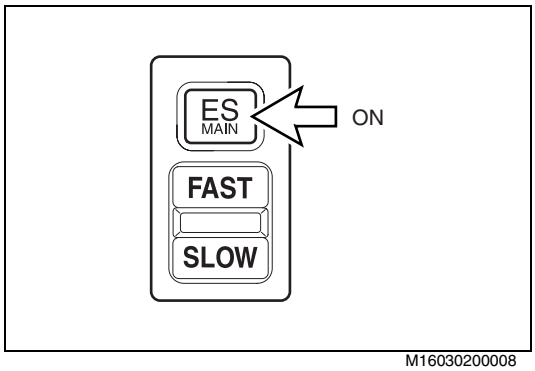
M16030201BEF2020



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.

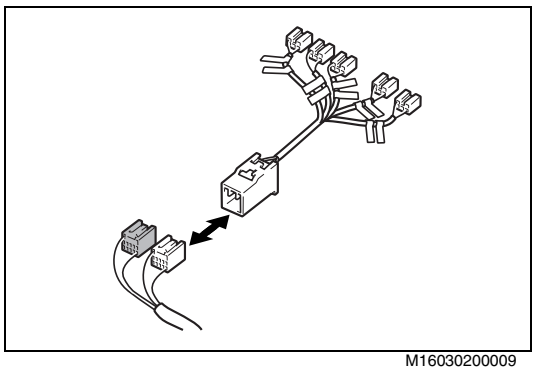


M16030200008

2. CONNECTION OF THE DIAGNOSIS MONITOR

(1) Set the ES main switch to [ON].

(2) Set the starter switch to [ON].



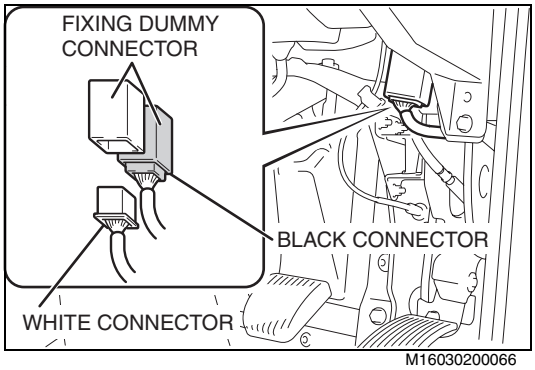
M16030200009

(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)

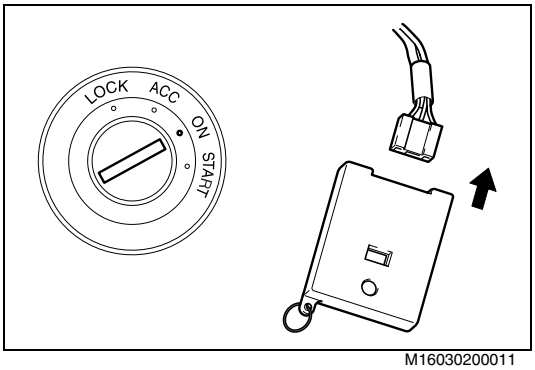
Diagnosis monitor (09630-1370)



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.

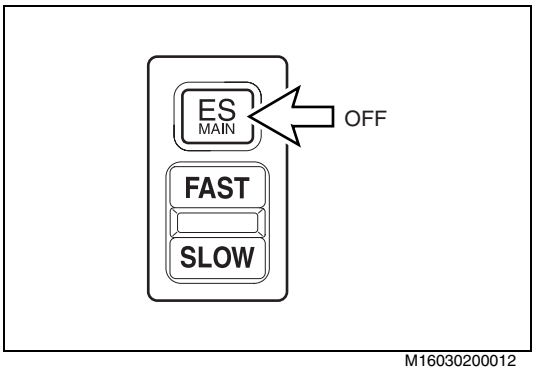
(1) Record the first diagnosis code output.
(2) Disconnect the diagnosis monitor while keeping the starter key at "ON" position.

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



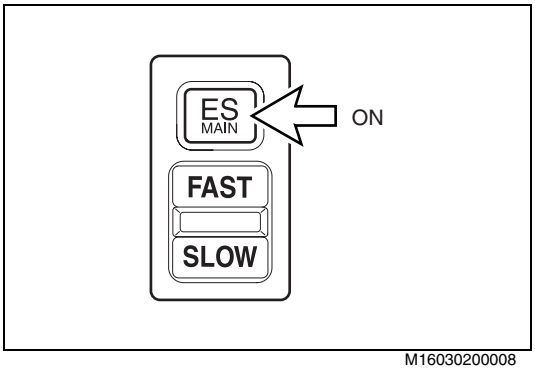
M16030200012

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.

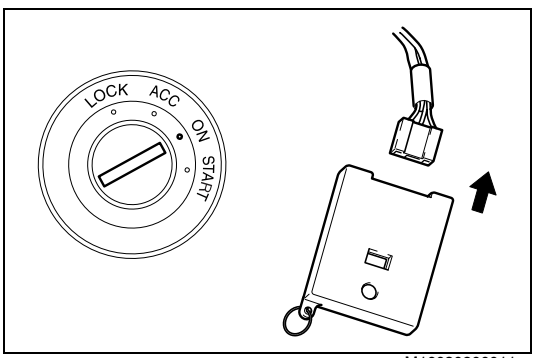
HINT:
Until the controller recognizes the ON/OFF of hydraulic switch, the diagnosis code cannot be deleted.



M16030200008

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 8 is output.



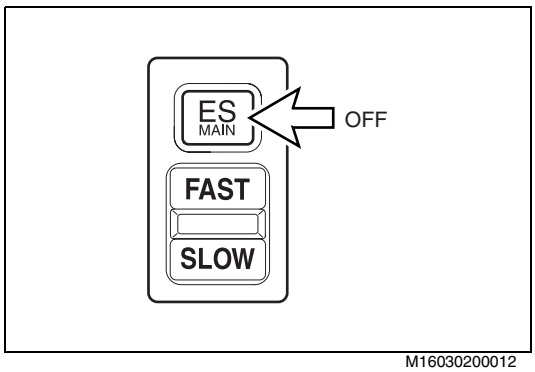
M16030200011

(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



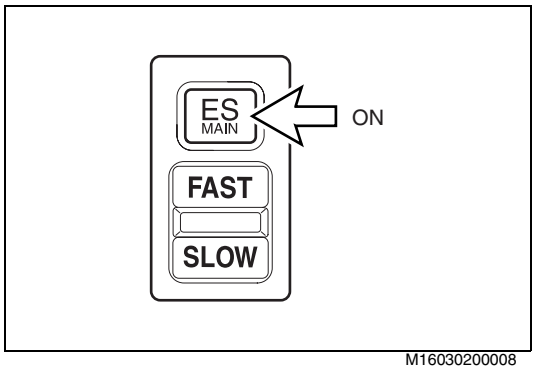
M16030200012

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.

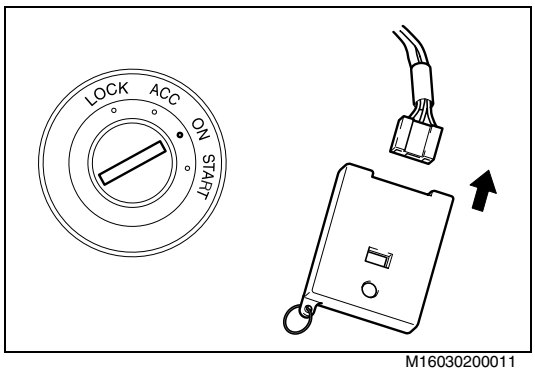
HINT:
Until the controller recognizes the ON/OFF of neutral switch, the diagnosis code cannot be deleted.



M16030200008

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 12 is output.



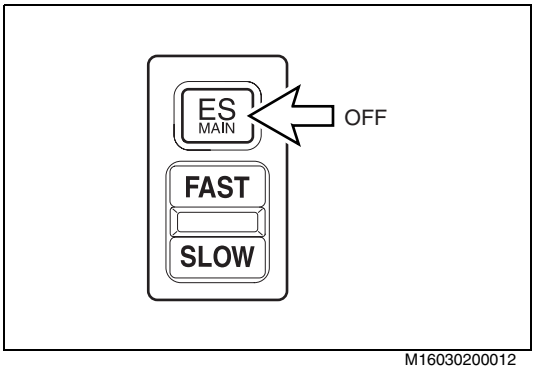
M16030200011

(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



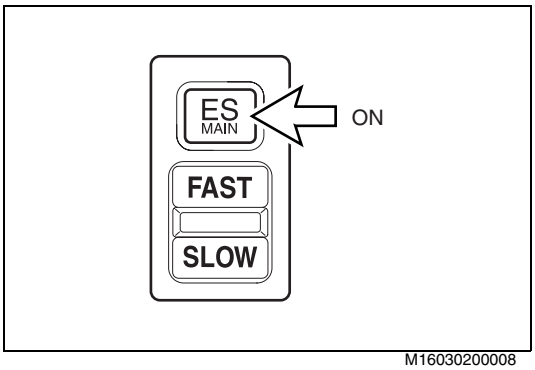
M16030200012

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.

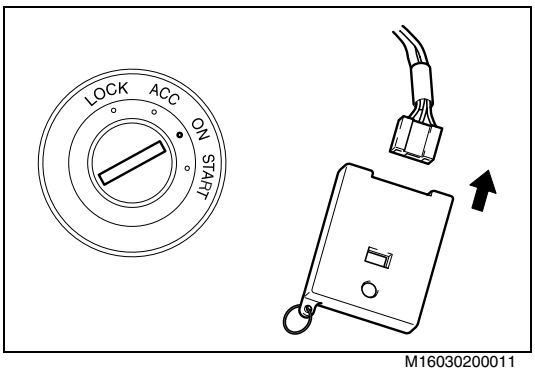
HINT:
Until the controller recognizes the ON/OFF of stop lamp switch, the diagnosis code cannot be deleted.



M16030200008

(3) Turn ES main switch "ON".

(4) Connect the diagnosis monitor and check that the diagnosis code 13 is output.

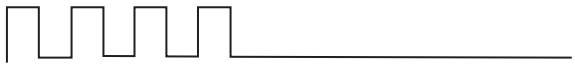
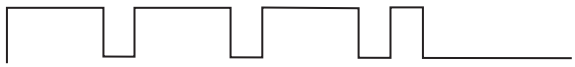
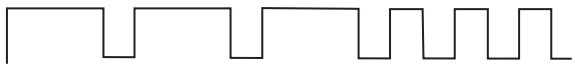
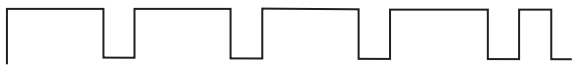


M16030200011

(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

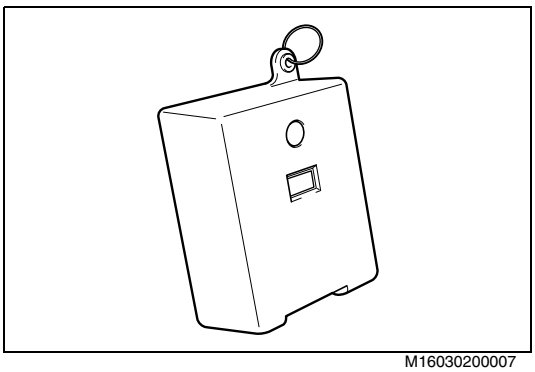
M16030201BEF2005

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.

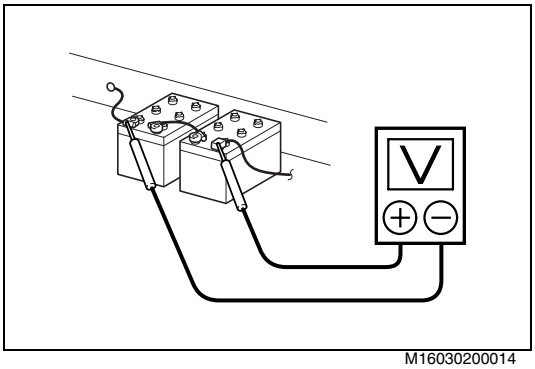
2. CHECK THE OPERATION OF THE ES START SYSTEM.
Standard: Normal operation

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

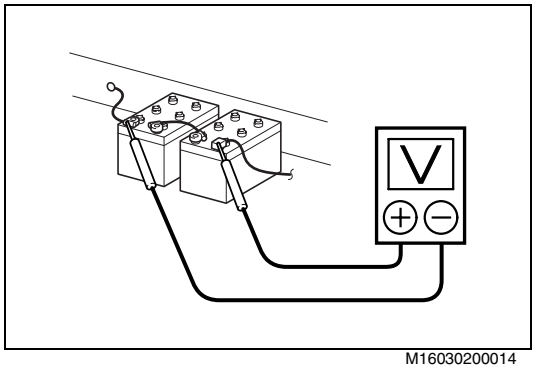
Power supply harness contact failure or disconnection

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

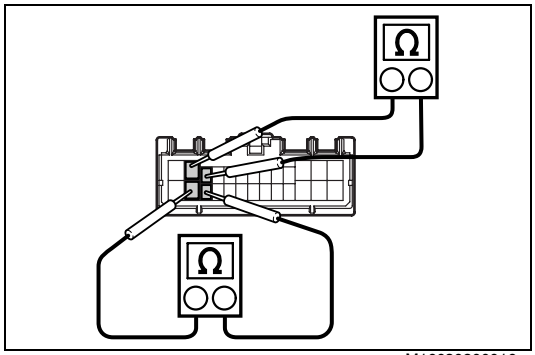
6. RECHECK THE ES START FUSE.

(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

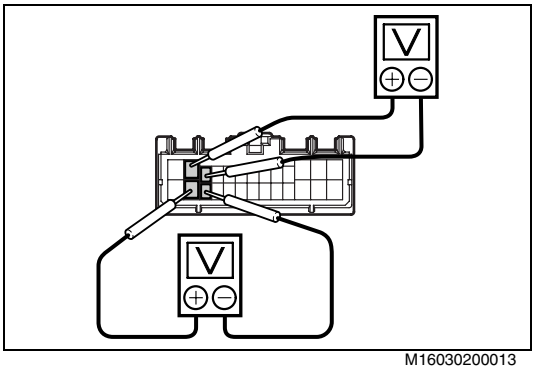
NG → ES start controller malfunction

OK

ES start controller connector contact failure, faulty harness contact failure

POWER SUPPLY VOLTAGE MALFUNCTION (DIAGNOSIS CODE 2)

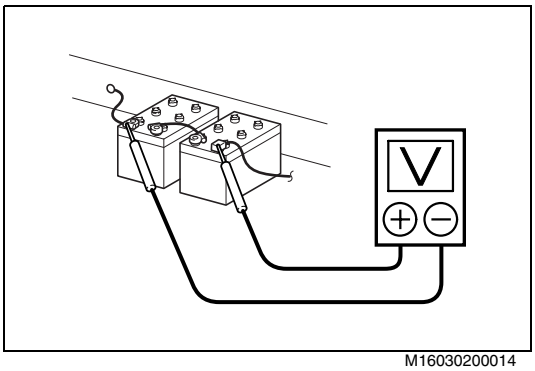
M16030201BEF2007


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

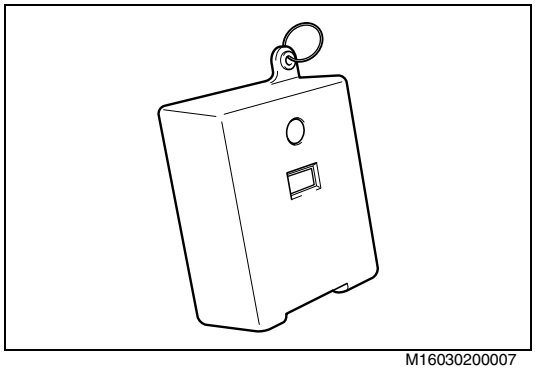

M16030200014

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

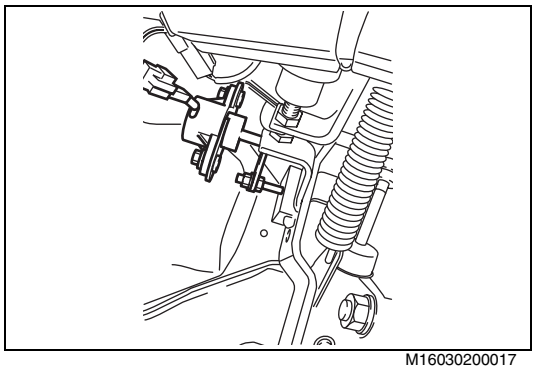
NG → ES start controller malfunction

OK

- Harness contact failure
- Charging system malfunction

CLUTCH STROKE SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 3)

M16030201BEF2008


M16030200017

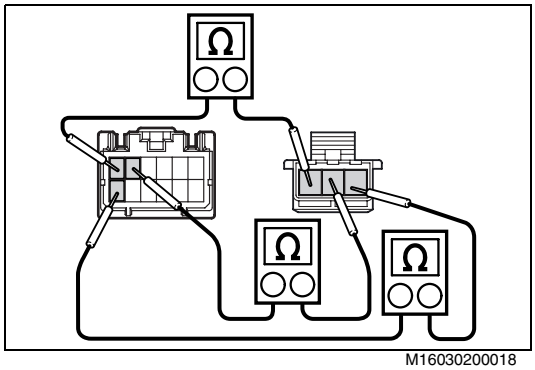
1. CHECK THE CLUTCH STROKE SENSOR.

(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

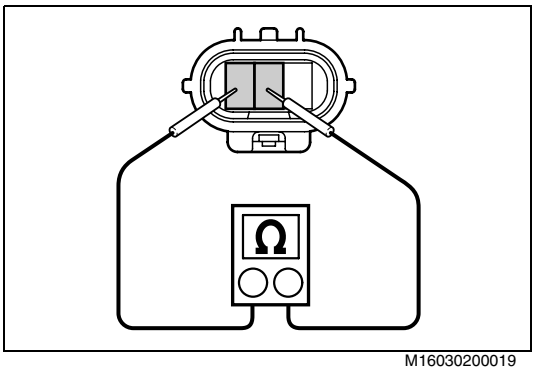

M16030200018

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

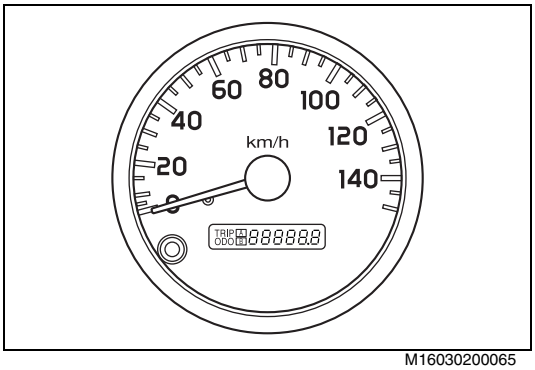
NG → Clutch stroke sensor damage

OK

Go to diagnosis code 9.

SPEED SENSOR SYSTEM DAMAGE (DIAGNOSIS CODE 4)

M16030201BEF2009



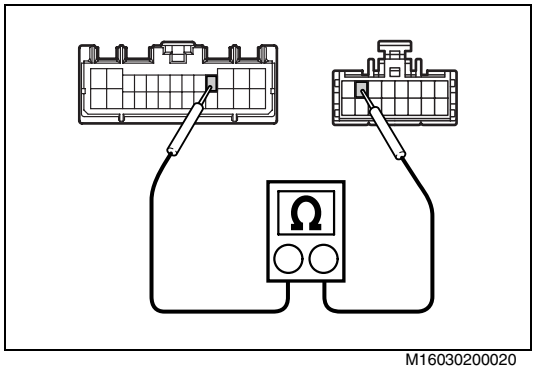
M16030200065

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

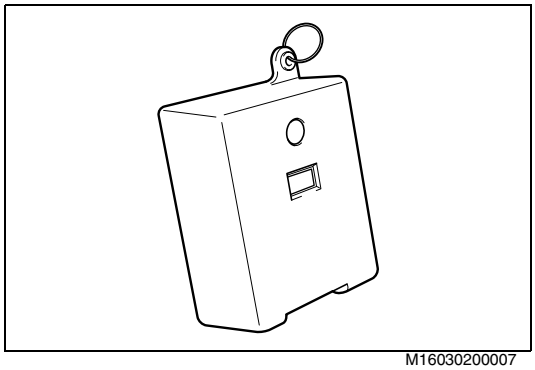
2. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(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

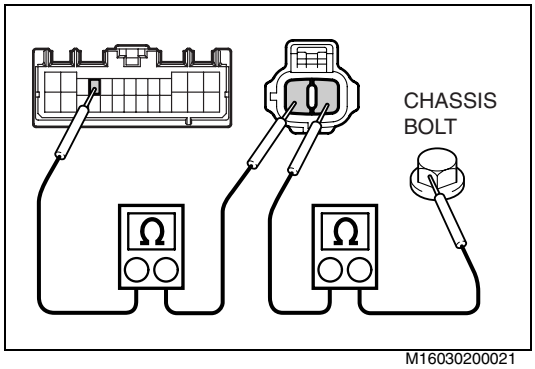
NG → Connector or harness contact failure

OK

ES start controller malfunction

ES START CONTROL VALVE DAMAGE (DIAGNOSIS CODE 7)

M16030201BEF2010



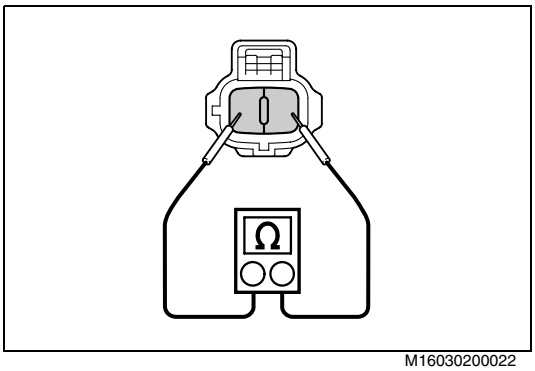
M16030200021

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

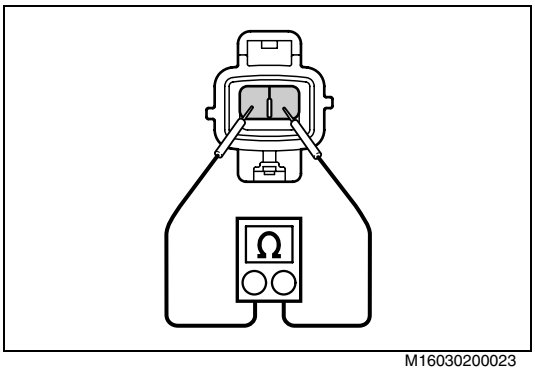

M16030200022

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

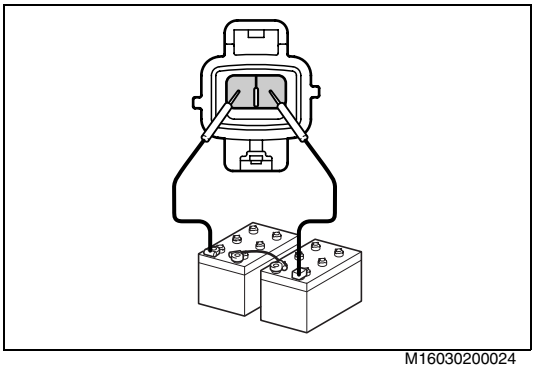

M16030200023

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

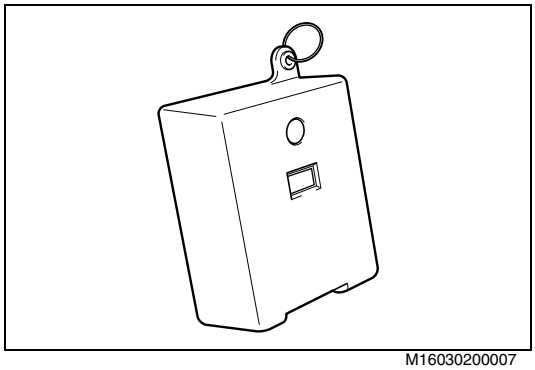

M16030200024

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

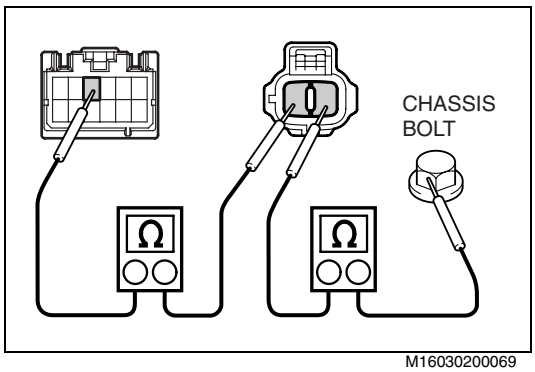
5. RECHECK THE DIAGNOSIS CODE.
(1) Erase the diagnosis code and output the diagnosis code again.
Standard: Diagnosis code: 7

NG → Faulty contact in harness or connector

OK → ES start controller malfunction

CLUTCH FLUID PRESSURE SWITCH DAMAGE (DIAGNOSIS CODE 8)

M16030201BEF2011

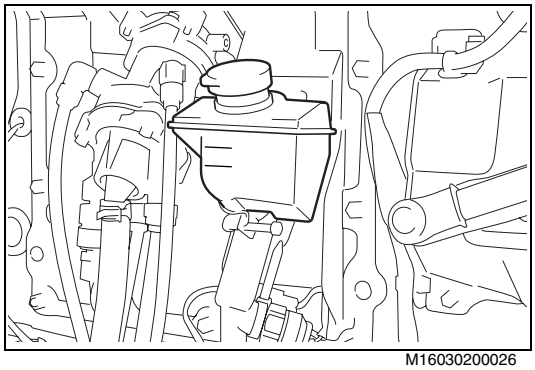


M16030200069

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

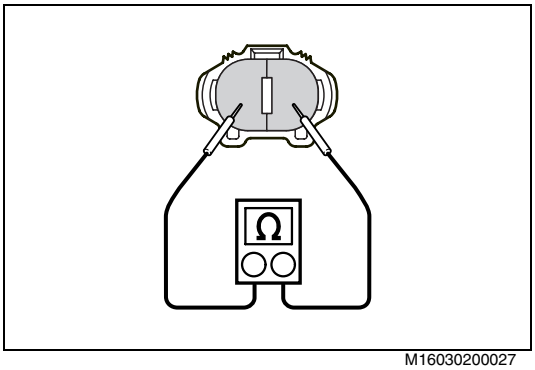
OK


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

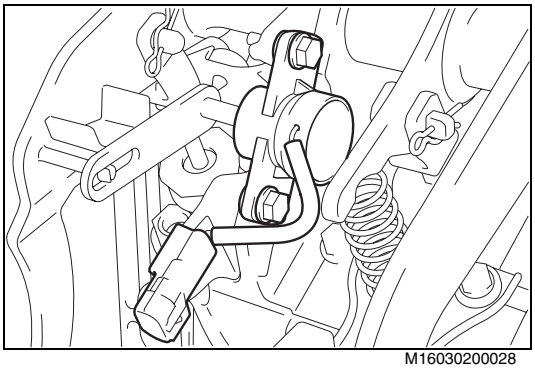
3. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(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

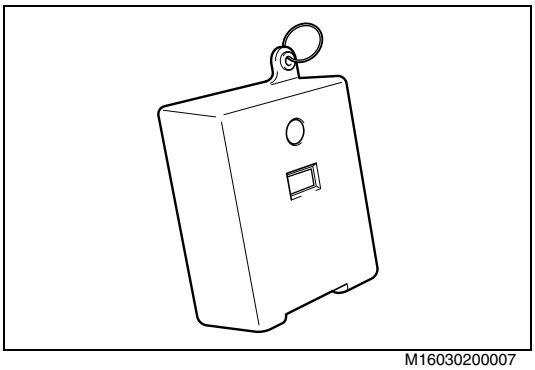
4. CHECK THE CLUTCH STROKE SENSOR.

(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

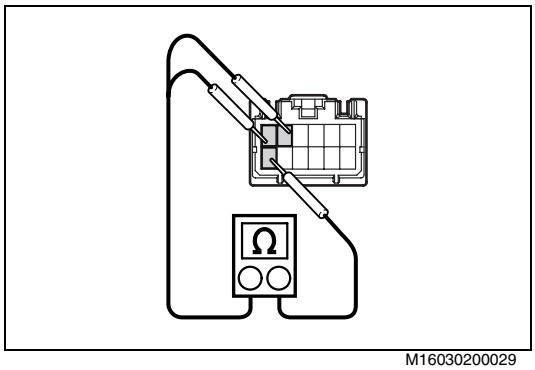
NG → Faulty contact in connector or harness

OK

Clutch fluid pressure switch malfunction

CLUTCH STROKE SENSOR POWER SYSTEM MALFUNCTION (DIAGNOSIS CODE 9)

M16030201BEF2012



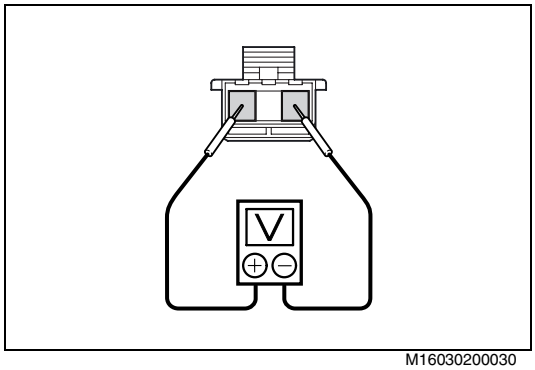
M16030200029

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).

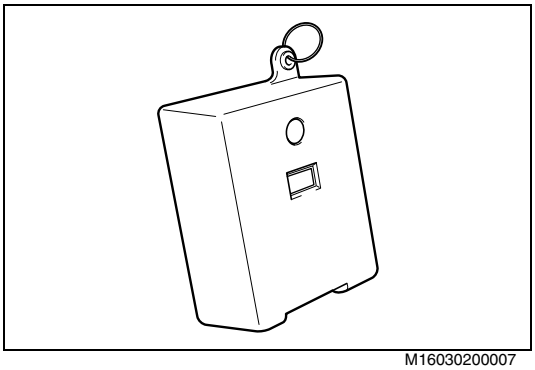
NOTICE:
Be careful not to make a short-circuit.

Standard value: 4-6V

NG → Go to the item 3.

OK

Clutch stroke sensor malfunction


M16030200007

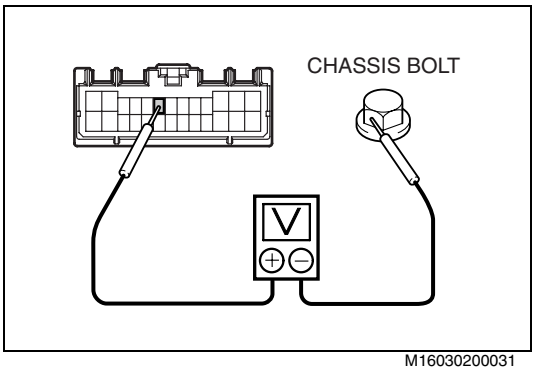
3. RECHECK THE DIAGNOSIS CODE.
(1) Erase the diagnosis code. Output the diagnosis code again.
Standard: Diagnosis code: 9

NG → Connector or harness contact failure.

OK → ES start controller malfunction

NEUTRAL SWITCH AND BACK-UP LAMP SWITCH MALFUNCTION (DIAGNOSIS CODE 11)

M16030201BEF2013

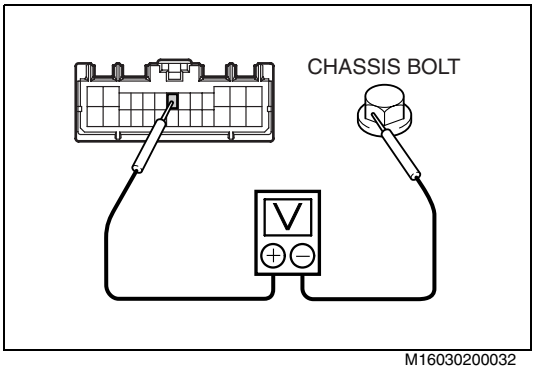


M16030200031

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

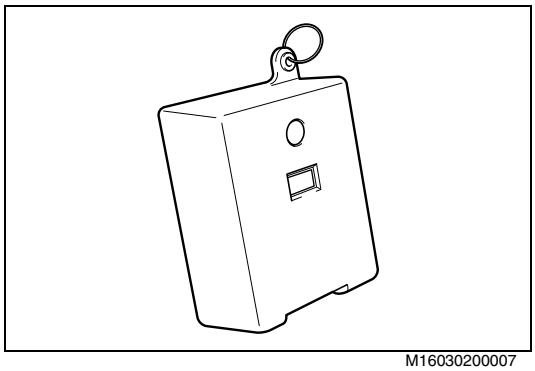


M16030200032

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

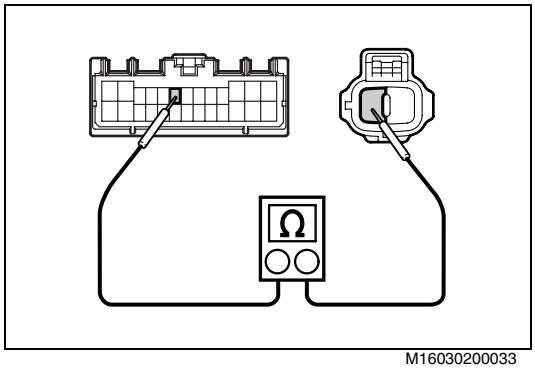
NG → Connector or harness contact failure.

OK

ES start controller malfunction

NEUTRAL SWITCH SYSTEM OR SPEED SENSOR SYSTEM MALFUNCTION (DIAGNOSIS CODE 12)

M16030201BEF2014



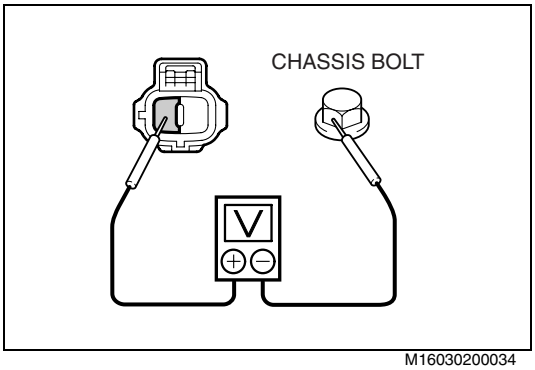
M16030200033

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



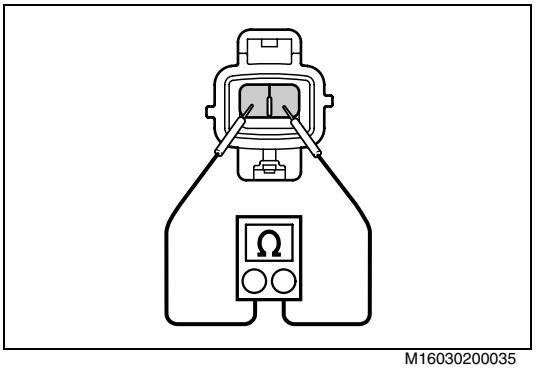
M16030200034

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.

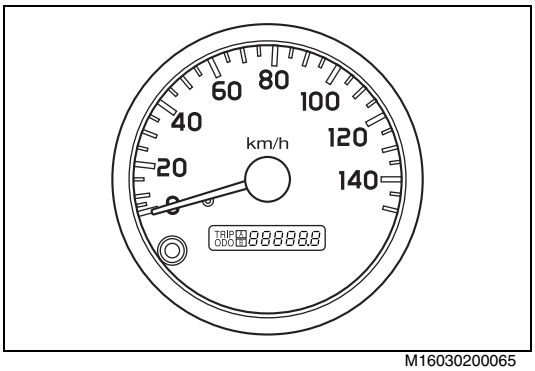
(1) Check the conductivity between connector terminal 1 and 2 of the part side.

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

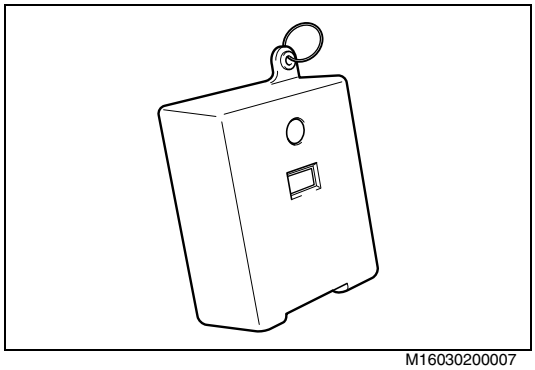
4. CHECK THE SPEEDOMETER OPERATION.

(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".

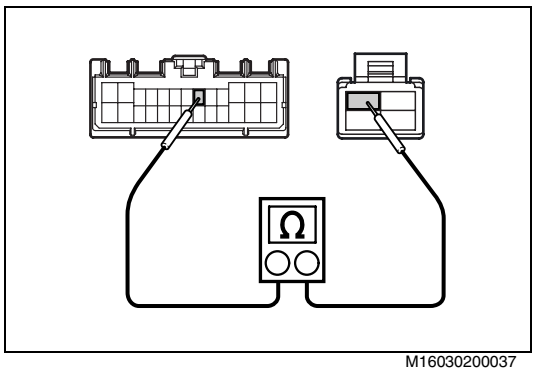
Standard: Diagnosis code: 12

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.

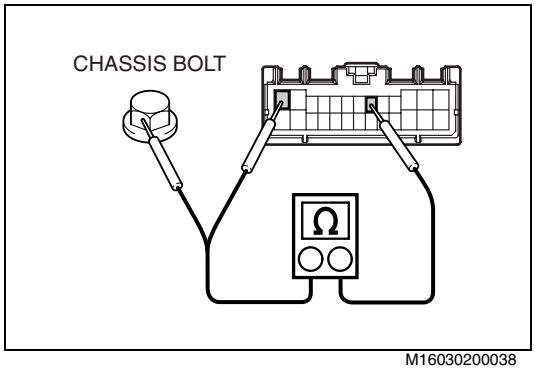
(1) Set the starter switch to [LOCK], remove the 26-pin connector of the ES start controller and the connector of the stop lamp switch.

(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

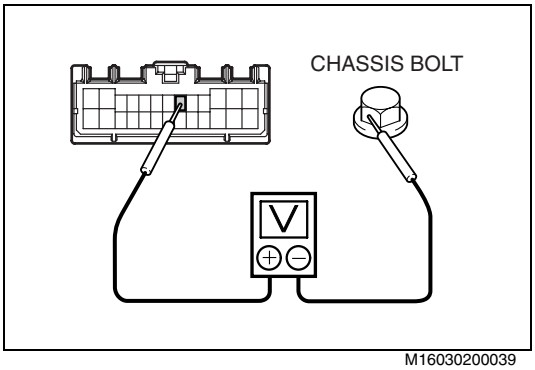
2. CHECK A SHORT-CIRCUIT BETWEEN TERMINALS.

(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.

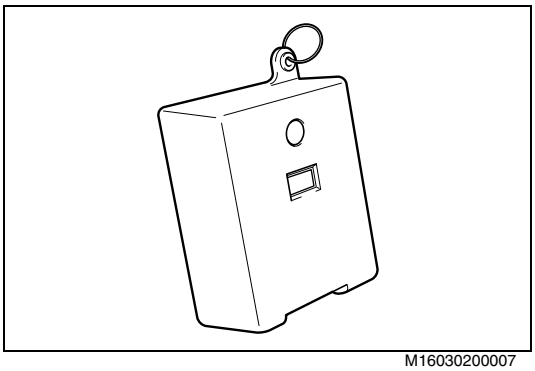
OK → Go to the item 5.

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.

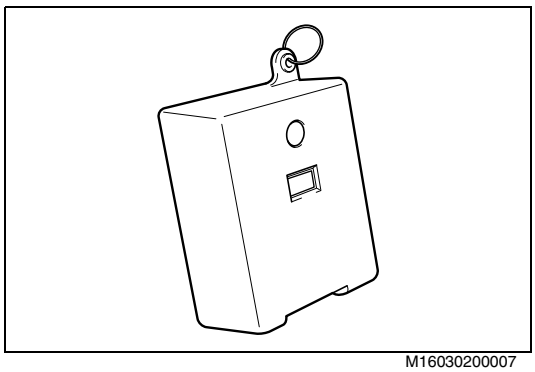
Refer to the section of the "How to delete the diagnosis code 13".
Standard: Diagnosis code: 13

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

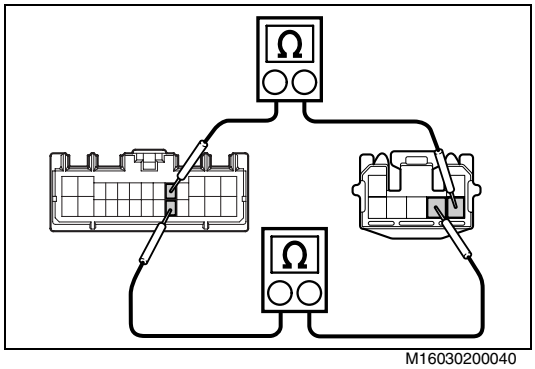
NG → ES start controller malfunction

OK

Normal

ES MAIN SWITCH DAMAGE (DIAGNOSIS CODE 18)

M16030201BEF2017



M16030200040

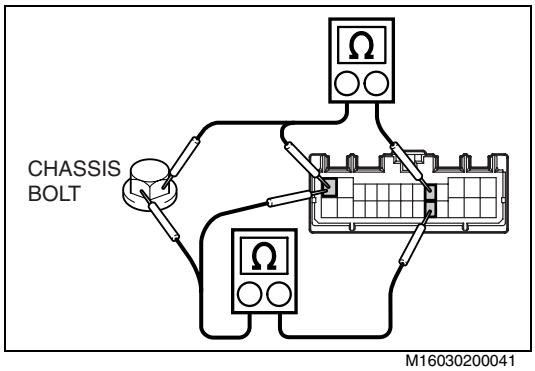
1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(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 → Harness disconnection

OK



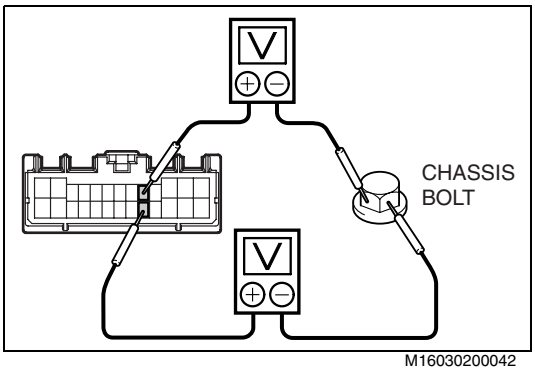
M16030200041

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 → Short-circuit in the harness

OK



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 → Go to the item 4.

OK

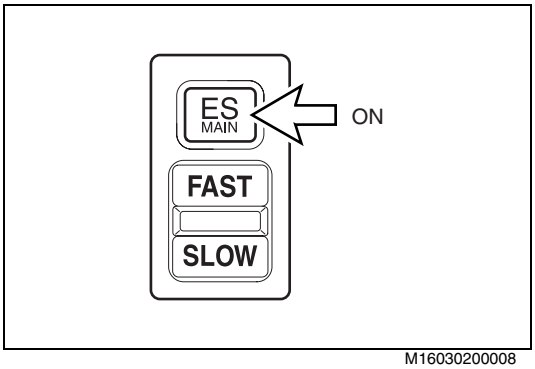
Go to the item 5.

4. CHECK THE ES MAIN SWITCH.

(1) Check the ES main switch.
Standard: Normal

NG → ES main switch malfunction

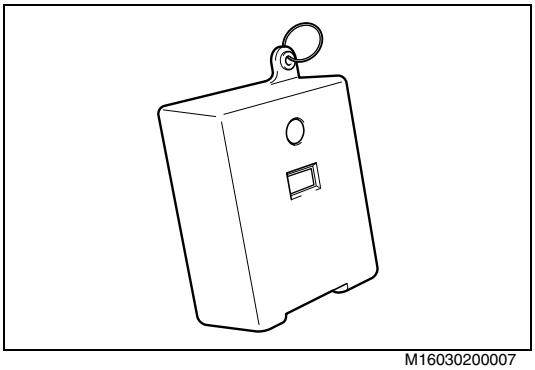
OK



M16030200008

5. RECHECK THE DIAGNOSIS CODE.

(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

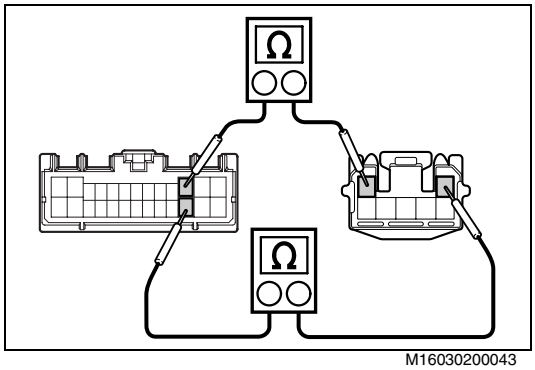
NG → Connector or harness contact failure

OK

ES start controller malfunction

ES START RELEASE TIMING SWITCH (DIAGNOSIS CODE 21)

M16030201BEF2018



M16030200043

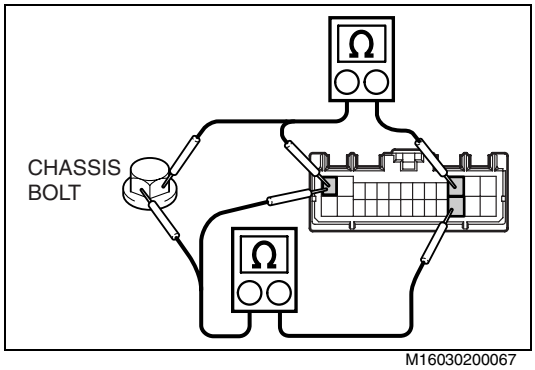
1. CHECK THE CONDUCTIVITY BETWEEN TERMINALS.

(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



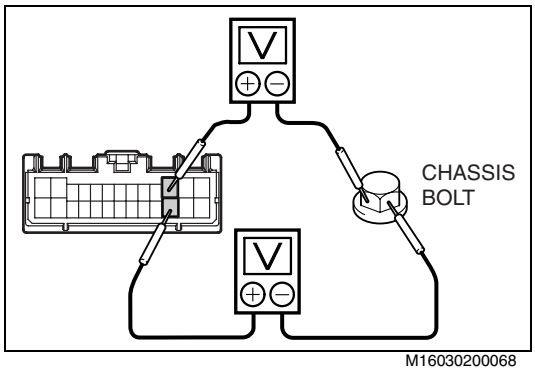
M16030200067

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.

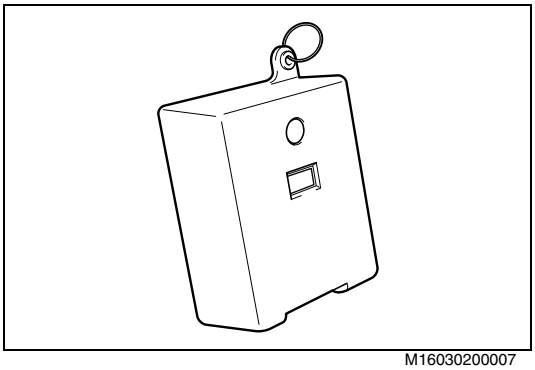
OK → Go to the item 5.

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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