



FK.FM

Service Manual

Group 00
General

 MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL


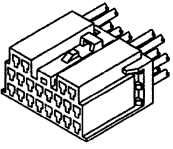
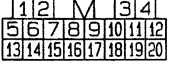
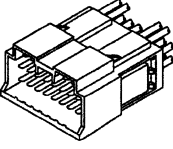
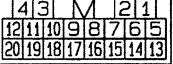
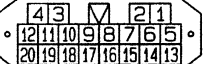
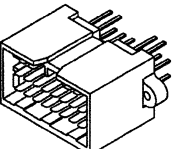
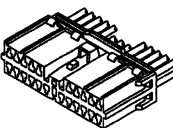
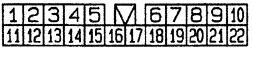
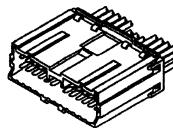
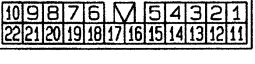
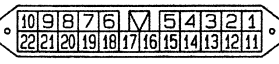
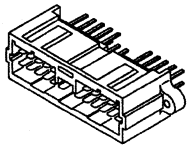
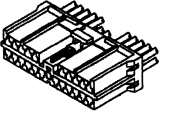
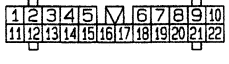
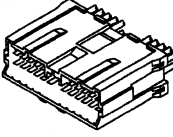
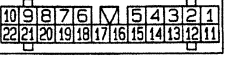
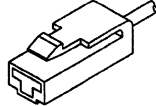
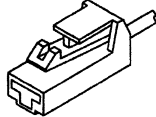

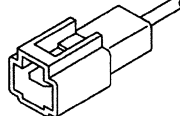
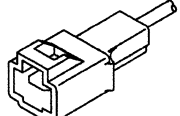
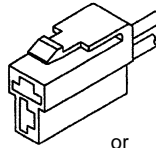
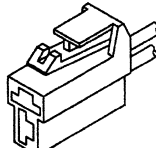

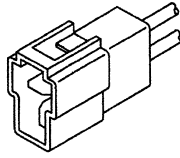
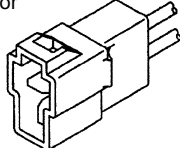
- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

CONNECTOR CONFIGURATION CHART

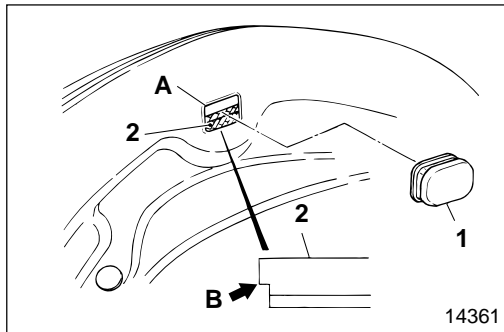
Model (Number shows number of pins)				
AK	AK20B			   
	AK22A			   
	AK22B			 
AL	AL 1 A	 or 		 or 
	AL 2 A	 or 		 or 

Inspection of Brake Lining Thickness

Service standards

Unit : mm {in.}

Location	Maintenance item	Standard value	Limit	Remedy	
2	Thickness of brake lining	FK617, FM617	—	5.5 {0.22} (Side shoulder means wear limit)	Replace
		FM657	—	6 {0.24} (Side shoulder means wear limit)	Replace



NOTE

Be sure to inspect at two points for each wheel per side.

- Remove check hole plug 1 from the backing plate.
- Inspect through check hole A whether brake lining 2 is worn to the point of side shoulder B of the brake lining (the limit).
- If the measured value is lower than the limit, replace brake lining 2 on the same axle as a unit.
- After inspection, be sure to reinstall check hole plug 1.

Battery

DANGER ⚠

- Since flammable hydrogen gas is generated by the battery, be sure to obey the following warnings :
 - Do not short-circuit the ⊕ and ⊖ terminals on the battery.
 - Keep sparks and lit cigarettes away from the battery.
 - Do not wear metal objects on your arms and lean over the battery.
- Because the battery electrolyte is diluted sulfuric acid and is corrosive, when handling the battery wear safety glasses and rubber gloves to protect the eyes and hands.

WARNING ⚠

To prevent a short-circuit be sure that disconnected the battery cables do not accidentally touch the battery terminals.

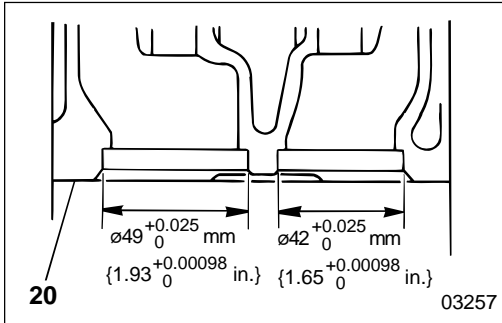
CAUTION ⚠

- Make sure that you disconnect the battery cable ⊖ first when you disconnect the battery cables.
- Make sure that all electrical switches of the vehicle are OFF before connecting the battery cables.
- Make sure that you connect the battery cable ⊕ before you connect the battery cable ⊖.

GROUP 10 REMOVAL AND INSTALLATION OF ENGINE

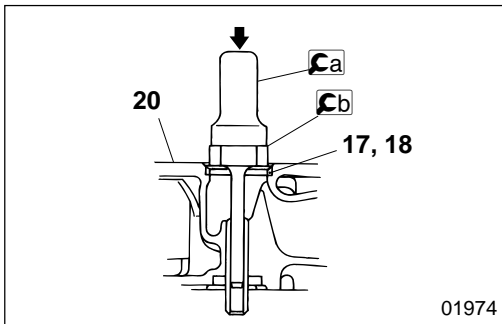
REMOVAL AND INSTALLATION OF ENGINE

- Charge and Discharge of Engine Coolant,
Removal and Installation of Hoses 2
- Removal and Installation of Engine Related Parts 4
- Removal and Installation of Engine 6

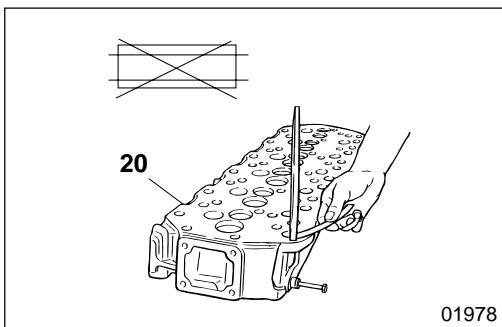


[Installation]

- Make sure that the diameter of valve seat hole of cylinder head **20** conforms to the standard value.
E : Inlet valve seat hole diameter
F : Exhaust valve seat hole diameter



- Immerse valve seats **17, 18** in liquid nitrogen and cool them substantially. Press-fit into the cylinder head using **Ca** caulking tool body and **Cb** caulking rings inlet and exhaust.
- After installation of valve seats **17, 18**, work until they contact valves **7, 8** smoothly.



20 Inspection of cylinder head

Measure the extent of distortion of the bottom of cylinder head **20**, and if the measured value is higher than the standard value, grind using a surface grinder.

CAUTION ⚠

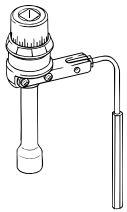
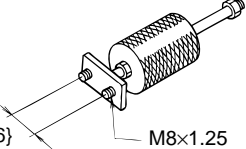
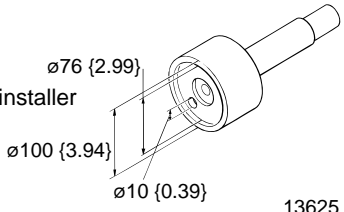
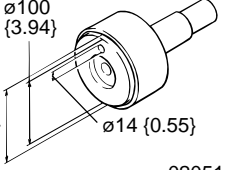
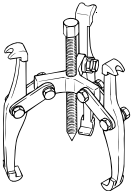
Be sure to keep the amount of grinding within the limit of the height of cylinder head **20.**

Lubricant and sealant

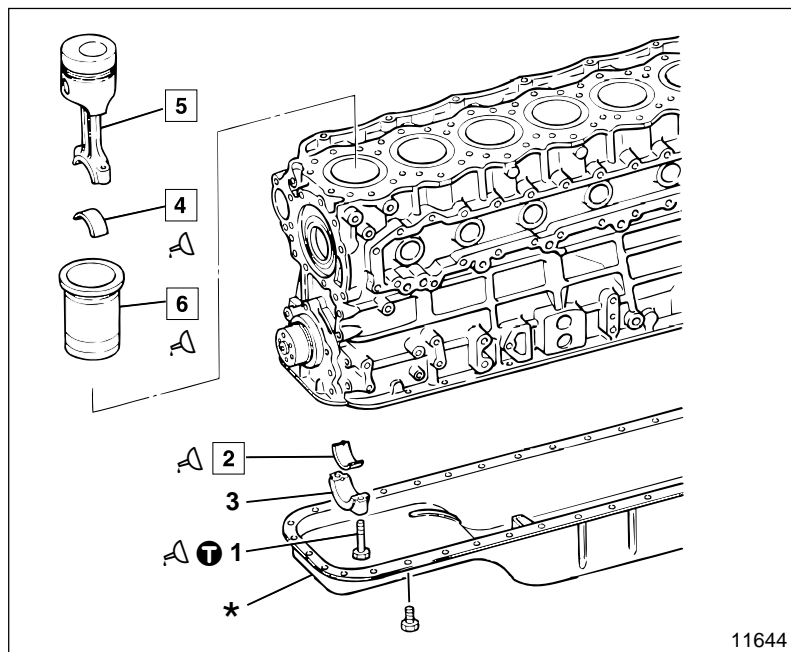
Location	Points of application	Kinds	Quantity
5	Crankcase mounting surface of front cover assembly	THREEBOND 1207C	As required
6	Lip area of front oil seal	Engine oil	As required
8	Thread area of bolt	Engine oil	As required
9, 17	Interior of bearing	Engine oil	As required

Special tools

Unit : mm {in.}

Location	Tool name and shape	Part No.	Application
10	Socket wrench  01984	MH061560	Installation of main bearing cap
	Main bearing cap extractor  32 {1.26} M8x1.25 02097	MH061189	Removal of bearing cap
13	Front oil seal slinger installer  ø76 {2.99} ø100 {3.94} ø10 {0.39} 13625	MH062710	Installation of front oil seal slinger
14	Rear oil seal slinger installer  ø100 {3.94} ø105.4 {4.15} ø14 {0.55} 02051	MH061470	Installation of rear oil seal slinger
15	Gear puller  02065	MH061326	Removal of crankshaft gear

PISTON, CONNECTING ROD AND CYLINDER SLEEVE



● Disassembly sequence

- 1 Bolt
- 2 Lower connecting rod bearing
- 3 Connecting rod cap
- 4 Upper connecting rod bearing
- 5 Piston and connecting rod assembly
- 6 Cylinder sleeve

📖 P11-34

* : Oil pan 📦 Gr 12

● Assembly sequence

Follow the disassembly sequence in reverse.

Service standards

Unit : mm {in.}

Location	Maintenance item	Standard value (Basic diameter in [])	Limit	Remedy	
—	Extent of piston protrusion	0.85 to 1.06 {0.033 to 0.042}	—	Inspect the related parts	
—	End play of connecting rod	0.15 to 0.45 {0.0059 to 0.018}	0.6 {0.024}	Replace	
2, 4	Connecting rod bearing	Oil clearance	[65] 0.04 to 0.09 [2.56] 0.0016 to 0.0035	0.2 {0.0079}	Replace
		Expansion	—	69.5 {2.74} or less	Replace
5, 6	Clearance between piston and connecting rod assembly and cylinder sleeve	[118] 0.075 to 0.105 [4, 65] 0.003 to 0.0041	—	Replace	
6	Cylinder sleeve	Extent of flange protrusion	0.03 to 0.10 {0.0012 to 0.039}	—	Replace
		Inner diameter	∅118 to 118.03 {4.646 to 4.656}	∅118.25 {4.66}	Replace
		Cylindrical accuracy	0.03 {0.0012} or less	—	Replace

ⓘ Tightening torque

Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Bolt	29 {22, 3}+90°±5°	Wet

🛢 Lubricant

Location	Points of application	Kinds	Quantity
1	Thread area of bolt	Engine oil	As required
2, 4	Connecting rod bearing inner surface	Engine oil	As required
6	Outer periphery of cylinder sleeve	Engine oil	As required

CRANKSHAFT AND CRANKCASE

◆ Service procedure

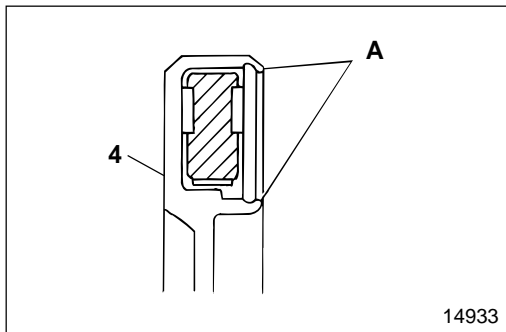
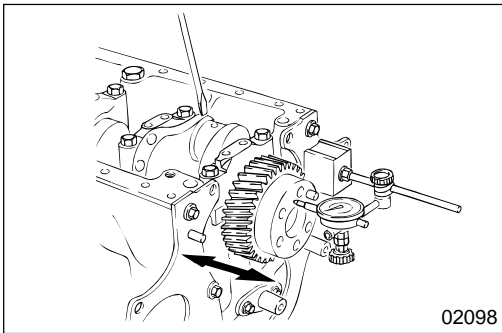
● Inspection before disassembly

Crankshaft assembly end play

If the measured value is higher than the limit, replace thrust plates 12 with oversized ones. P11-60

< Available oversize ones >

+0.15, +0.30, +0.45 mm {+0.0059, +0.012, +0.018 in.}

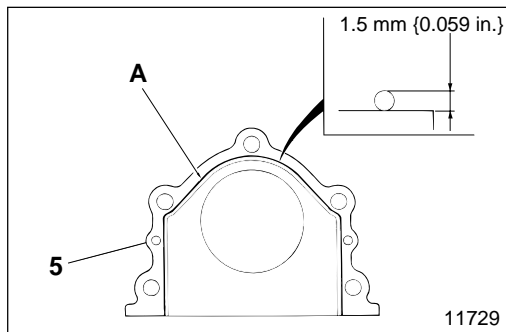


4 Torsional damper

CAUTION

Pay attention to the following because silicon oil leakage from caulked area A of viscous type torsional damper 4 might cause damage to its function.

- Make sure that there are no dents or marks caused by hammer blows in caulked area A.
- Be sure not to subject it to shock from hammer blows or by dropping it.
- Do not roll it or pile parts up on it.

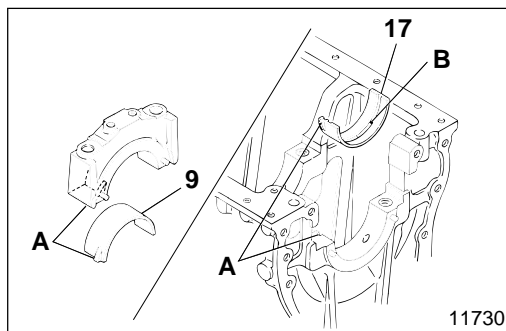


5 Installation of front cover assembly

- Apply sealant A to the mounting surface of front cover assembly 5 where the crankcase is to be installed, evenly without break .
- After applying sealant A, within 3 minutes, mount front cover assembly 5 to the crankcase.

CAUTION

- Be sure the surface of front cover assembly 5 , where the sealant is to be applied, is clean.
- Be sure not to disturb the sealant during installation.
- Do not start the engine for at least 1 hour after installing front cover assembly 5.
- Be sure to reapply sealant A if the mounting bolts of front cover assembly 5 are loosened.



9 17 Main bearing

[Installation]

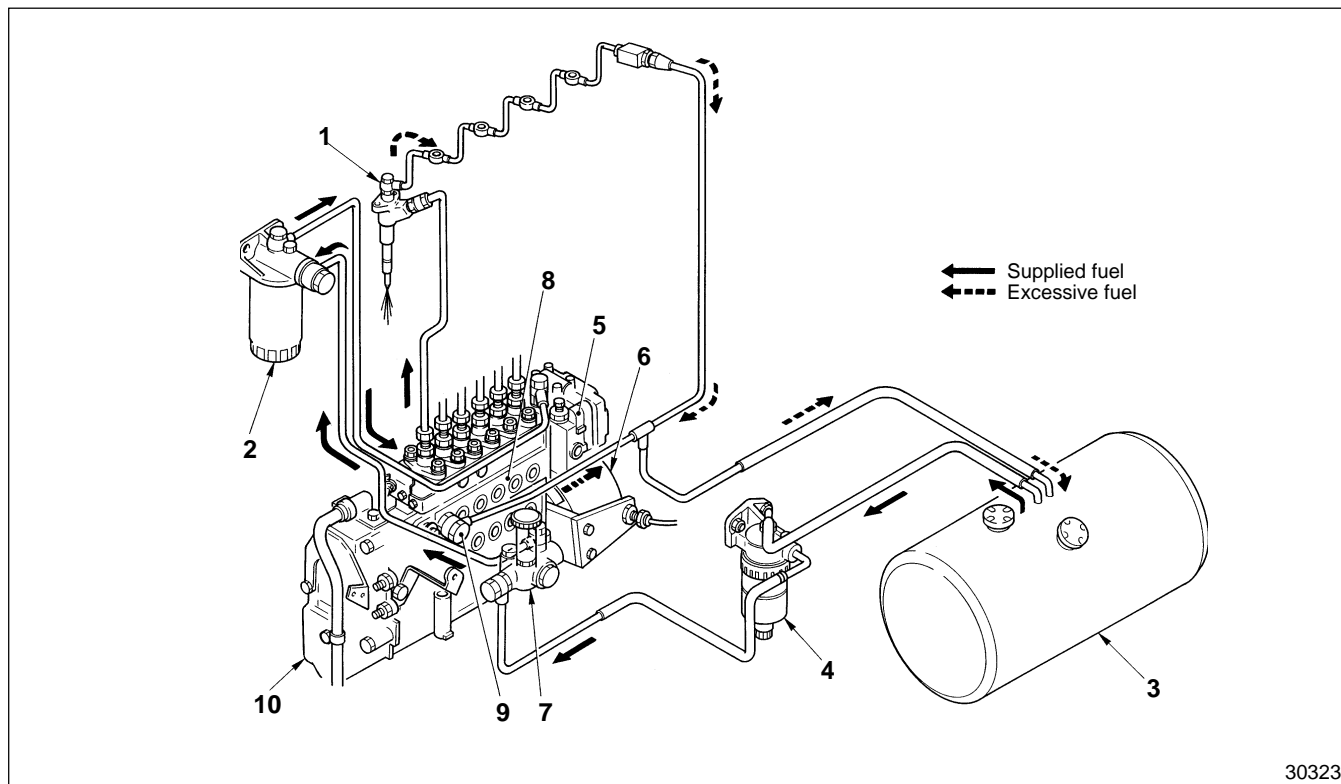
When installing main bearings 9, 17 align lugs A.

CAUTION

Be sure to distinguish between main bearings 9, 17. The upper bearing has oil opening B while the lower bearing has no oil opening.

STRUCTURE AND OPERATION

- 1 Injection nozzle
- 2 Fuel filter




- 3 Fuel tank
- 4 Water separator
- 5 Pre-stroke actuator
- 6 Automatic timer
- 7 Feed pump
- 8 Injection pump
- 9 Overflow valve
- 10 Electronic governor

Fuel in fuel tank **3** is sucked up by feed pump **7** which is driven by the cam action of injection pump **8** and is filtered through fuel filter **2** which removes dirt and other foreign particles.

Filtered fuel is sent to the injection pump where the fuel pressure is boosted and injected through injection nozzle **1** into the combustion chamber.

When fuel pressure is higher than the specified value, overflow valve **9** opens to let the fuel return to the fuel tank **3**.

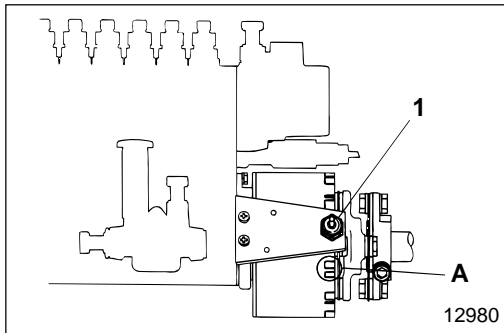
TROUBLESHOOTING

Symptoms		Possible causes													Remarks
		Engine will not start	Engine difficult to start	Engine knocks	Unstable engine output	Insufficient engine output	Engine maximum speed too high	Unstable engine idling	Engine stops soon after starting	Engine does not reach maximum speed	Engine will not stop	Accelerator pedal too stiff	Defective fuel supply	 Warning lamp illuminates	
Defective pre-stroke injection pump system														<input type="radio"/>	
Injection pump proper	Defective injection pump proper	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>				*
	Defective mounting (poorly adjusted injection timing)		<input type="radio"/>		<input type="radio"/>	<input type="radio"/>		<input type="radio"/>							
	Defective overflow valve operation	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>					<input type="radio"/>		
Defective pre-stroke actuator				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>							
Fuel feed pump	Gauze filter clogged	<input type="radio"/>	<input type="radio"/>			<input type="radio"/>		<input type="radio"/>	<input type="radio"/>				<input type="radio"/>		
	Check valve not operating	<input type="radio"/>											<input type="radio"/>		
	Sticky piston	<input type="radio"/>											<input type="radio"/>		
	Sticky push rod	<input type="radio"/>											<input type="radio"/>		
	Defective check valve operation	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>			<input type="radio"/>					<input type="radio"/>		
	Piston worn		<input type="radio"/>		<input type="radio"/>			<input type="radio"/>					<input type="radio"/>		
Defective governor				<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					*
Injection nozzles	Sticky needle valve	<input type="radio"/>													
	Valve opening pressure too low	<input type="radio"/>								<input type="radio"/>					
	Blocked injection orifice	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>					
	Poor airtightness in nozzle	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>		<input type="radio"/>					
	Valve opening pressure too high			<input type="radio"/>											
	Broken spring				<input type="radio"/>	<input type="radio"/>									
	Defective sliding action in needle valve				<input type="radio"/>										
	Defective valve opening pressure				<input type="radio"/>										
	Weakness/deterioration in spring								<input type="radio"/>						
Fuel filter	Clogged filter	<input type="radio"/>			<input type="radio"/>			<input type="radio"/>	<input type="radio"/>						
Fuel tank empty		<input type="radio"/>													
Fuel pipes blocked and/or fuel leaking from connections		<input type="radio"/>													
Air or water in fuel system		<input type="radio"/>			<input type="radio"/>			<input type="radio"/>	<input type="radio"/>						
Low-quality fuel in use			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		<input type="radio"/>							

* : Must be serviced by ZEXEL service station.

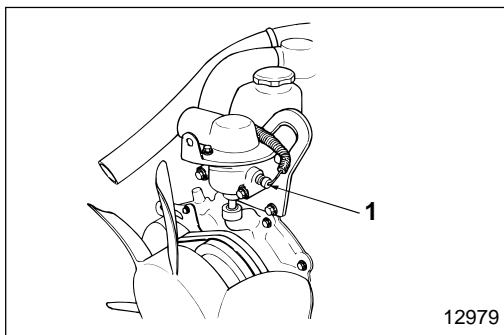
STRUCTURE AND OPERATION

Engine Revolution Sensor



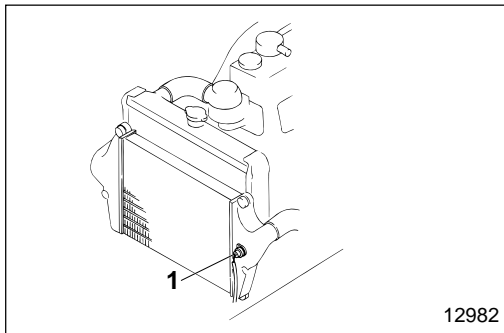
- Engine revolution sensor 1 is a pick-up type that detects the revolution of the injection pump and converts the revolution value into an electric signal.
 - This electric signal is transmitted to the pre-stroke control unit as the engine revolution signal, which is used as the correction value by the control unit to determine the desired pre-stroke position value.
- A : Timer housing protrusion

Water Temperature Sensor



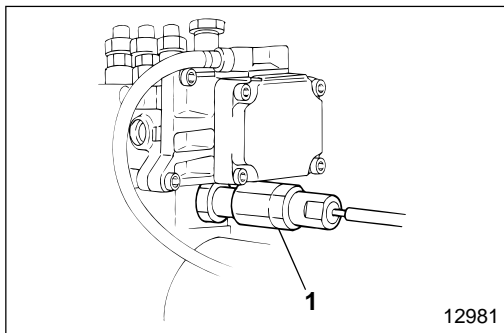
- Water temperature sensor 1 is a thermistor type that converts the coolant temperature into an electric signal.
- This electric signal is transmitted to the pre-stroke control unit as the engine coolant temperature signal, which is used as the correction value by the control unit to determine the desired pre-stroke position value.

Boost Air Temperature Sensor



- Boost air temperature sensor 1 is a thermistor type that converts the intake air temperature, immediately after its passage through the intercooler, into an electric signal.
- This electric signal is transmitted to the pre-stroke control unit as the boost air temperature signal, which is used as the correction value by the control unit to determine the desired pre-stroke position value.

Control Rod Position Sensor



- Control rod position sensor 1 is a resistor type that converts the amount of movement of the control rod into an electric signal.
- This electric signal is transmitted to the pre-stroke control unit as the control rod position signal, which is used as the correction value by the control unit to determine the desired pre-stroke position value.

Pre-stroke Position Sensor P13-10, 12

PRE-STROKE CONTROL INJECTION PUMP SYSTEM

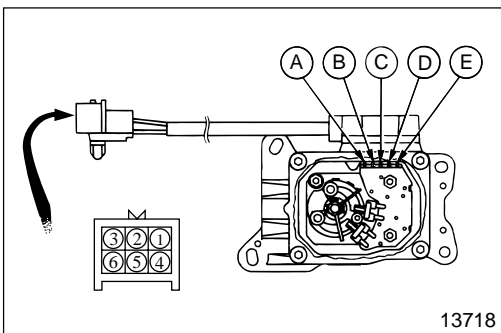
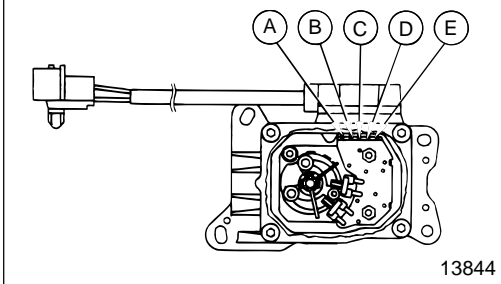
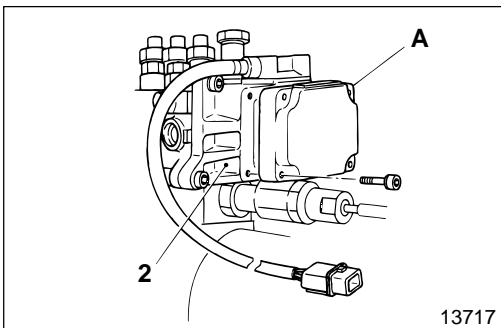
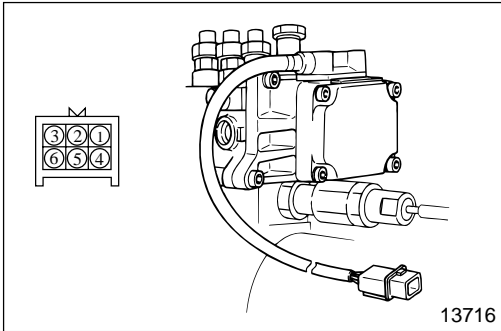
◆ Service procedure

2 Inspection of pre-stroke actuator

Inspect the following points and if any fault is found, have the unit inspected and repaired by a ZEXEL service station.

NOTE

Inspection of pre-stroke actuator 2 must be carried out when the engine is cold.



(1) Inspection at connector point

- Measure resistance between terminals ②-③, ①-③, ①-② and ④-⑤.

(2) Inspection of pre-stroke actuator body

- Remove cover A from pre-stroke actuator 2.

CAUTION ⚠

- Remove only cover A from pre-stroke actuator 2, never remove the actuator body itself. If the actuator is removed, it requires special tools to replace and adjust it.
- When removing cover A, do not exert excessive force on pre-stroke actuator 2 with your hands or by treading on it, etc.

- Measure resistance between terminals ①-A, ②-B, ③-C and ④-D.

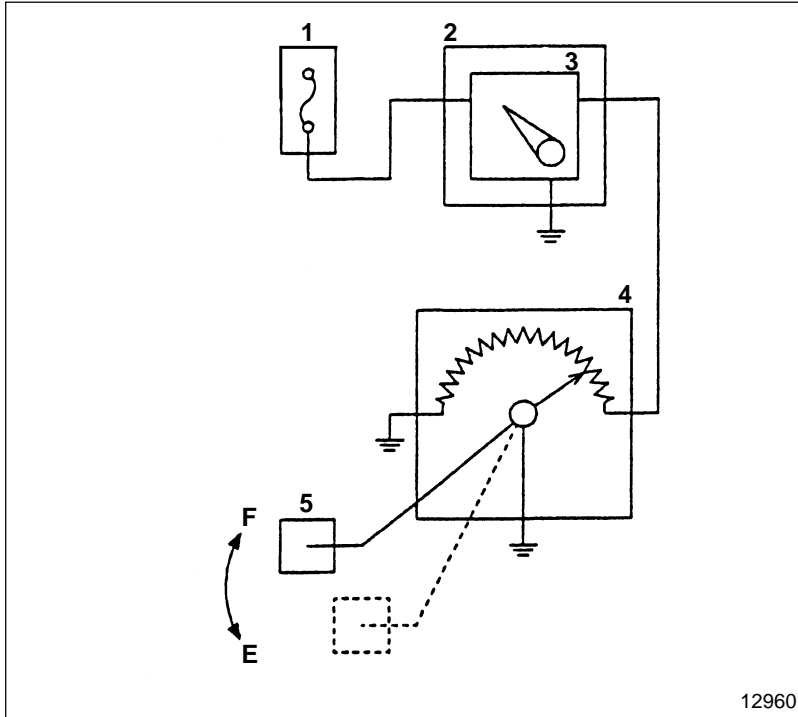
(3) Inspection of continuity between pre-stroke actuator and connector

Make sure that continuity exists between terminals as listed in the table below.

Connector terminal	Pre-stroke actuator body	Application
④	④	Pre-stroke actuator driving power source ⊖
⑤	⑤	Pre-stroke actuator driving power source ⊕
⑥	GND	Shield
①	③	Pre-stroke position sensor (GND)
②	②	Pre-stroke position sensor (MDL)
③	①	Pre-stroke position sensor (OSC)

STRUCTURE AND OPERATION

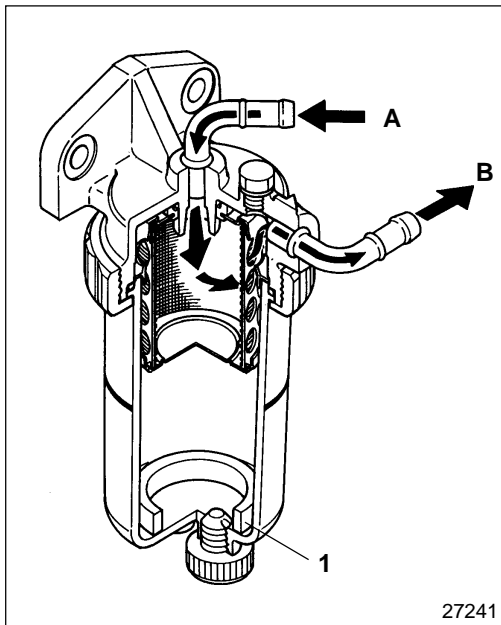
Fuel Gauge Electric Circuit



- 1 Relay and fuse box
- 2 Meter cluster
- 3 Fuel gauge
- 4 Fuel gauge sending unit
- 5 Float

The fuel gauge circuit indicates the amount of fuel remaining in the fuel tank by means of a gauge.

Water Separator




- 1 Water level ring

A : From fuel tank
B : To feed pump



The water separator is installed between the fuel tank and the feed pump. Any water present in the fuel is separated by the baffle plate and the screen assembly.

TROUBLESHOOTING

Fault Diagnosis Function

- While the starter switch is in the ON position, the fault diagnosis function continuously monitors relevant sensors for faults.
In the event that a fault is detected, the function illuminates a  warning lamp (red or orange) in the meter cluster to alert the driver, memorizes the location of the fault, and switches to a backup mode.
- The memorized fault location can be read as a diagnosis code using an MUT-II or the diagnosis switch.

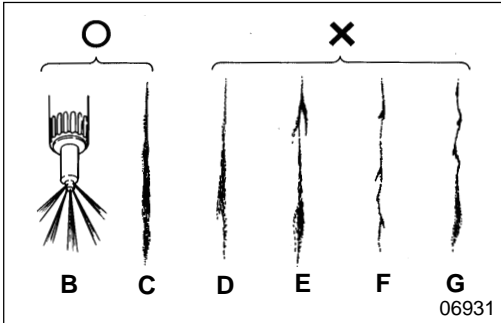
Warning lamp illumination

	 (Orange)	 (Red)
1. Safety-critical error (vehicle must not be driven)	OFF	ON
2. Non-safety-critical error (vehicle can be driven despite poor control feeling)	ON	OFF

CAUTIONS

- **The fault diagnosis function requires a battery voltage of 12 V or higher.**
 - **In the event of fault detection, check the harnesses and connectors for looseness. Before undoing any connector, turn the starter switch to the LOCK position and wait for 20 seconds.**
 - **After rectifying a fault, delete the fault code using the MUT-II or memory clear switch.**
 - **As a general rule, inspections should be performed with the starter switch in the LOCK position. If any inspection requires that the starter switch be in the ON position, be careful to avoid short circuits between connector terminals and with the vehicle body.**
 - **All component resistances shown in this manual assume a temperature range of 10 to 35°C {50 to 95°F}. In practice, component values may not comply with standard values owing to temperature effects and/or to inaccuracy in the test instrument.**
 - **After the rectification of a fault, the system's ability to return to normal operation automatically depends upon the diagnosis code, i.e., the fault location. When the system returns to normal operation, the warning lamp goes out.**
 - **When the system returns to normal operation after the rectification of a fault, the diagnosis code remains stored in electronic governor control unit.**
-

INJECTION NOZZLE



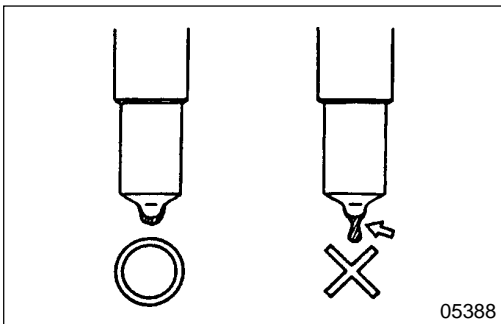
(2) Spray condition

- Spray continuously with quick lever actions of nozzle tester **A**, one to two seconds per stroke.
 - B** : Even spray from all five orifices (Good)
 - C** : Even and symmetrical spray (Good)
 - D** : Asymmetrical spray (Faulty)
 - E** : Spray direction deviates from the nozzle axis line (Faulty)
 - F** : Thin and insufficient spray (Faulty)
 - G** : Irregular spray (Faulty)

- If faulty spray cannot be corrected, disassemble injection nozzle assembly **5** and clean every part and repeat the test. If faulty spray still occurs after repeating test, replace the injection nozzle assembly.
- Make sure that there is no post-spray dripping after injection.

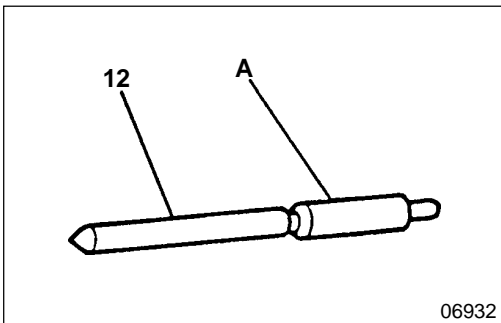
WARNING

Never touch the spray from the nozzle or let your hands get too close to the spray point during the test.



(3) Fuel air tightness and leakage at related contact points

- Raise the interior pressure of the nozzle gradually to the test pressure of 14.7 MPa {150 kgf/cm²}. Maintaining the pressure, check and see if any fuel seeps out of the nozzle tip within 10 seconds.
- If any fault is found, disassemble injection nozzle assembly **5** and clean every part and repeat the test. If any fault is still found, replace the injection nozzle assembly.

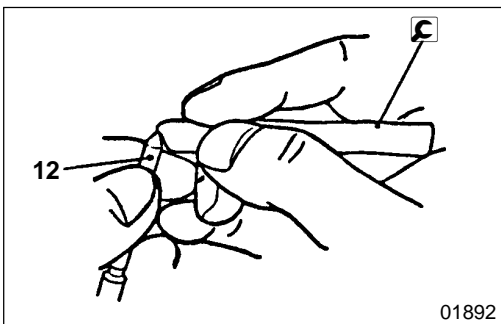


5 Injection nozzle assembly


[Disassembly]


CAUTION

- Be sure not to touch sliding part **A** of needle valve **12** with your hands.
- Never change the combination of removed needle valve **12** and nozzle **13** for each cylinder.



[Cleaning]

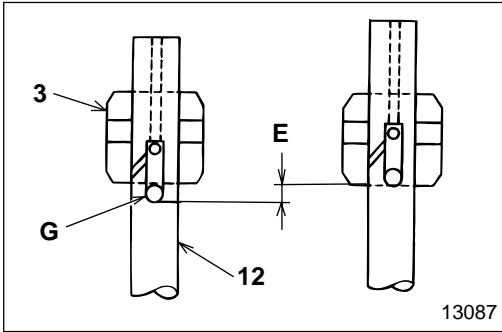
Clean needle valve **12** and nozzle **13** with diesel fuel (cleaning solvent). Remove carbon deposits with  cleaning tool in the following manner:

- Clean needle valve **12** by removing carbon deposits from its tip using the cleaning bar of  cleaning tool.

CAUTION

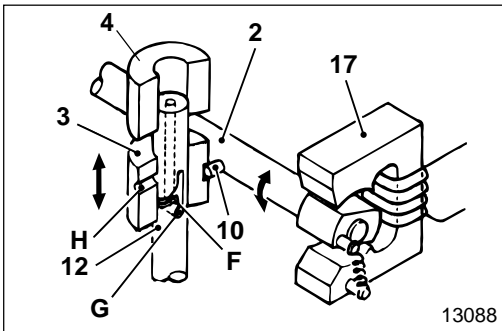
Never use a wire brush or hard steel for cleaning.

STRUCTURE AND OPERATION



Pre-stroke

Pre-stroke is stroke **E** whose range is from the bottom dead point of plunger **12** to the starting point of pressurized delivery of fuel, at which point suction port **G** is closed by timing sleeve **3**. An ordinary injection pump has a fixed stroke length.



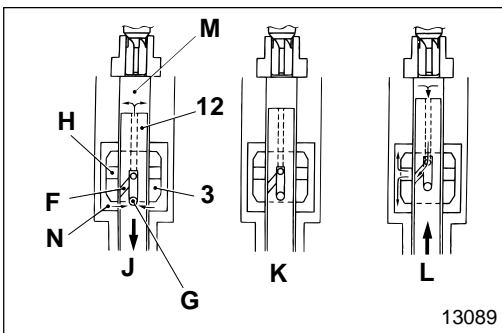
Pre-stroke variable mechanism

F : Indent

G : Suction port

H : Exhaust port

- In a conventional injection pump, plunger barrel **4** is fixed. In the pre-stroke control injection pump system, vertically movable timing sleeve **3** is fitted in the fixed plunger barrel.
- Timing rod **2**, pin **10** and drive unit **17** are installed to operate timing sleeve **3**.
- The operation of drive unit **17** rotates timing rod **2**, causing pin **10** to move timing sleeve **3** vertically.
- As timing sleeve **3** is fitted with fuel exhaust port **H**, the pre-stroke changes in accordance with the movement of the timing sleeve.



Pressurized fuel delivery

J : Ongoing suction

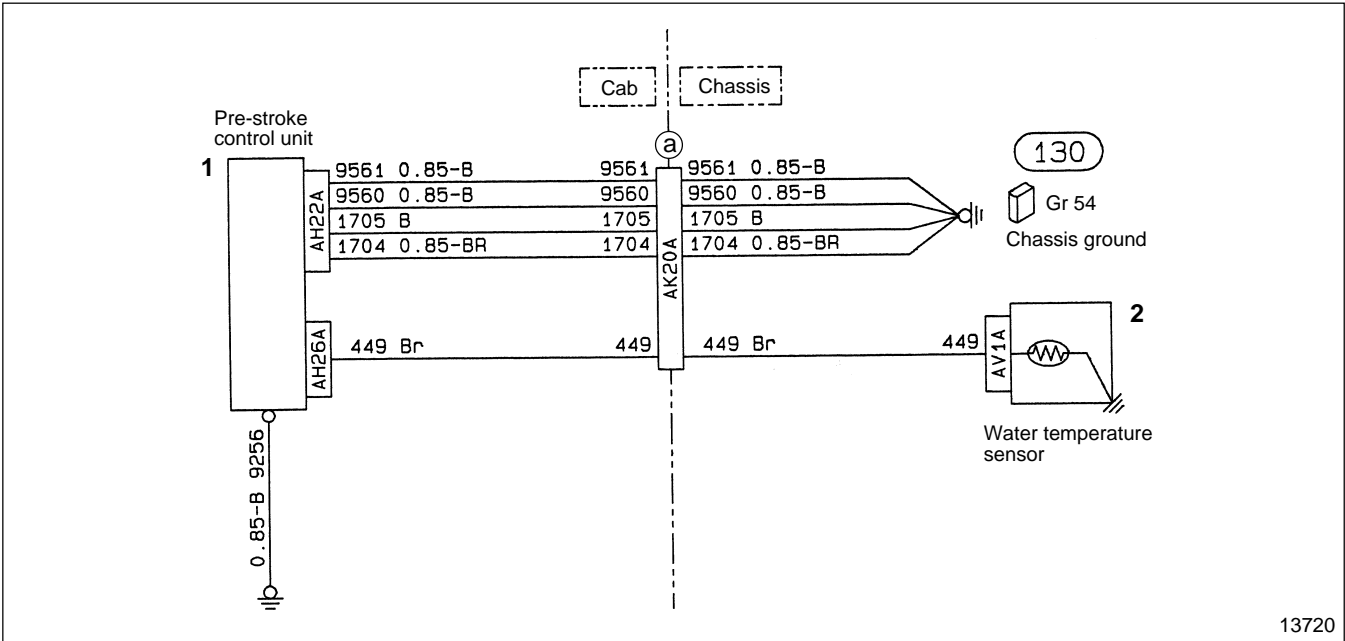
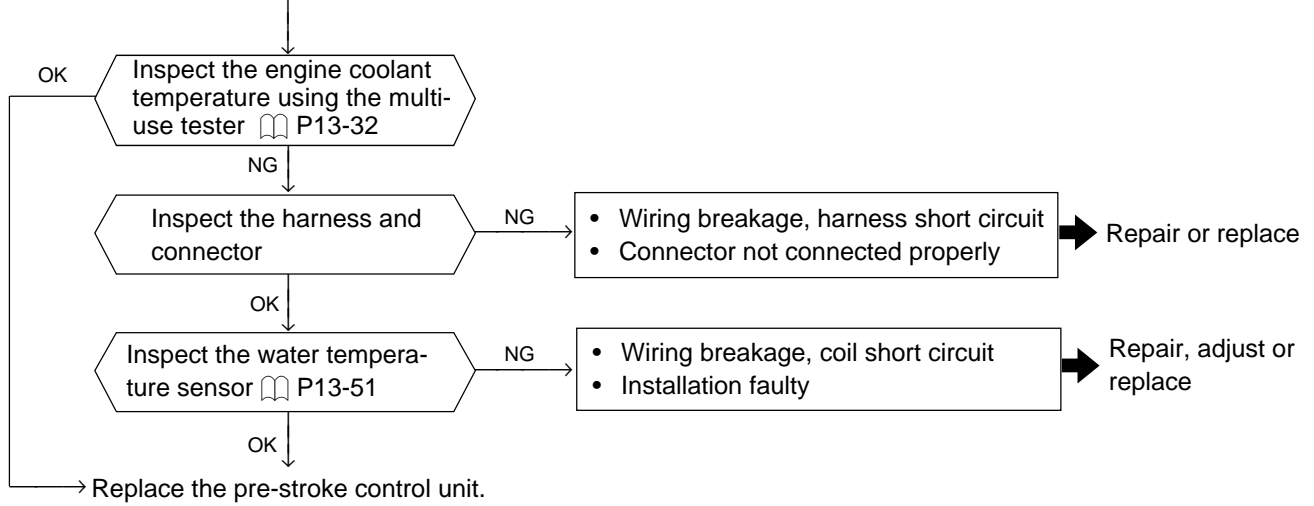
K : Start of pressurization

L : Delivery ends

- When suction port **G** opens as plunger **12** moves down from the top dead point, fuel is delivered into pressure chamber **M** by both the negative pressure caused by the downward movement of the plunger and the pressure of the fuel itself delivered by the feed pump.
- When the lift of plunger **12** is low enough, the pressure in pressure chamber **M** does not increase as the fuel in the pressure chamber flows via suction port **G** into fuel reservoir **N**, even if the plunger lifts.
- As plunger **12** lifts further and suction port **G** is closed by timing sleeve **3**, pressurization of the fuel starts. The pressure increases as the plunger lifts further, making the injection pump start pressurized fuel delivery.
- When indent **F** on plunger **12** meets exhaust port **H** of timing sleeve **3**, the fuel in pressure chamber **M** is pushed back to fuel reservoir **N**, stopping pressurized fuel delivery.
- Adjustment of the fuel quantity to be injected is made by changing the relative meeting position of exhaust port **H** of timing sleeve **3** and indent **F**, by the rotation of plunger **12**.

PRE-STROKE CONTROL INJECTION PUMP SYSTEM

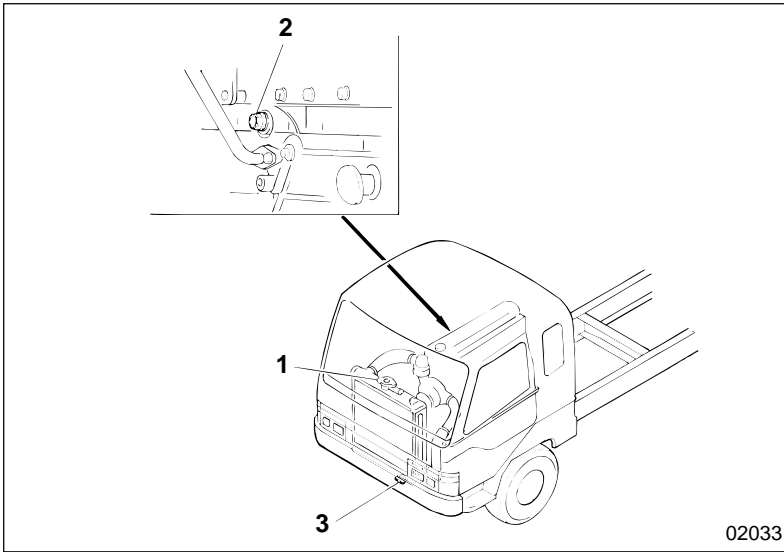
Diagnosis code 21 Water temperature sensor faulty



13720

INSPECTION AND ADJUSTMENT MOUNTED IN VEHICLE

Replacing Coolant and Cleaning Cooling System



- 1 Pressure cap
- 2 Crankcase drain plug
- 3 Radiator drain plug

Tightening torque

Unit : N·m {lb.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
2	Crankcase drain plug	115 {87, 12}	—

Using the radiator for a long period of time without cleaning it will cause overheating because rust and scale deposits will accumulate inside the cooling system. Periodical cleaning is recommended.

● Draining coolant

First loosen pressure cap 1, to lower the pressure in the cooling system, before draining coolant.

WARNING

- You must make sure that the engine coolant is cold before draining it so as not to scald yourself.
- It is dangerous to open pressure cap 1, when the coolant temperature is high, without taking due care because the hot water would spray out. Be sure to cover the pressure cap with a cloth and loosen slowly to bleed the pressure before opening fully.

● Cleaning procedure

- Keep the coolant temperature at approximately 90°C {194°F} so that the thermostat valve remains open and the coolant continues to circulate in the radiator.
- For the sake of convenience you can raise the coolant temperature quickly by covering the front of the radiator with corrugated cardboard or something similar.
- Set the temperature adjusting lever of the heater controller at maximum so that the coolant can circulate freely in the heater piping area.
- In cases where a great amount of rust has accumulated it often happens that as a result of cleaning the radiator starts leaking. Conduct a thorough check for leakage after cleaning.
- Soft water to be used should have the following properties.

CAUTION

Do not use hard water as it causes scale and rust.

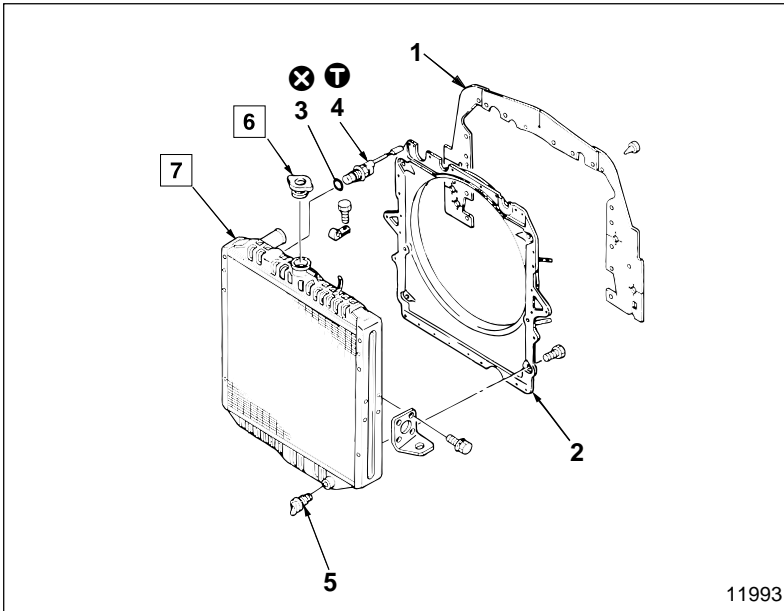
Required properties of soft water

Total hardness	300 ppm or less
Sulfate SO ₄ ⁻	100 ppm or less
Chloride Cl ⁻	100 ppm or less


Total dissolved solids	500 ppm or less
pH	6 to 8

RADIATOR AND FAN SHROUD

Radiator Assembly



● Disassembly sequence

- 1 Baffle plate
- 2 Radiator shroud
- 3 O-ring
- 4 Water level sensor  Gr 54
- 5 Drain cock
- 6 Pressure cap
- 7 Radiator

⊗ : Non-reusable parts

● Assembly sequence

Follow the disassembly sequence in reverse.

Service standards

Location	Maintenance item	Standard value	Limit	Remedy
6	Pressure cap valve opening pressure	69±15 kPa {10±2.1 lbf/in ² , 0.7±0.15 kgf/cm ² }	—	Replace
7	Radiator air leakage (Air pressure of 150 kPa {21 lbf/in ² , 1.5 kgf/cm ² })	0 cm ³ {0 cu. in.}	—	Correct or replace

Tightening torque

Unit : N·m {lbf.ft, kgf·m}

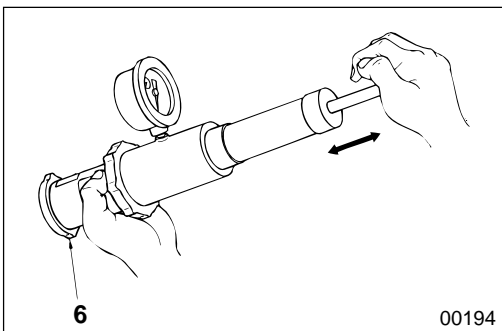
Location	Parts to be tightened	Tightening torque	Remarks
4	Water level sensor	2.9 to 3.9 {2.2 to 2.9, 0.3 to 0.4}	—

◆ Service procedure

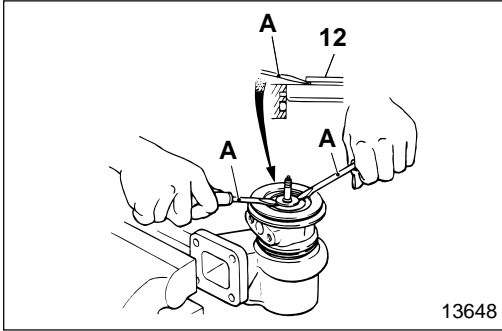
6 Inspection of pressure cap

(1) Pressure valve opening pressure

If the measured value deviates from the standard value, replace pressure cap 6.



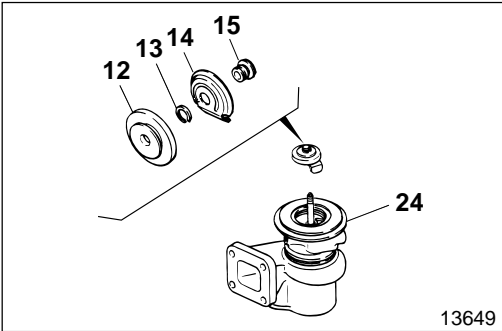
TURBOCHARGER



12 Insert

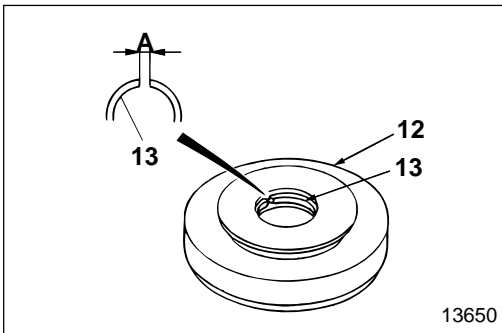
[Removal]

A : Screwdriver



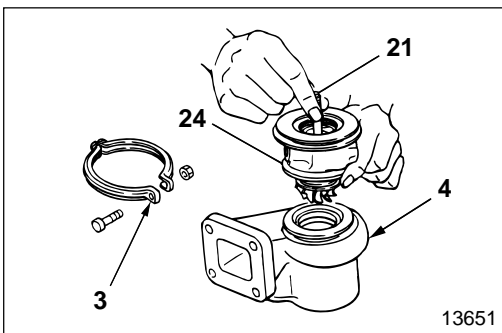
[Installation]

Install oil deflector 14 onto bearing housing 24 in the direction as illustrated.



13 Inspection of clearance of piston ring split

- Install new piston ring 13 in insert 12.
- Measure clearance A of the split of piston ring 13.
- If the measured value deviates from the standard value, replace inserter 12.

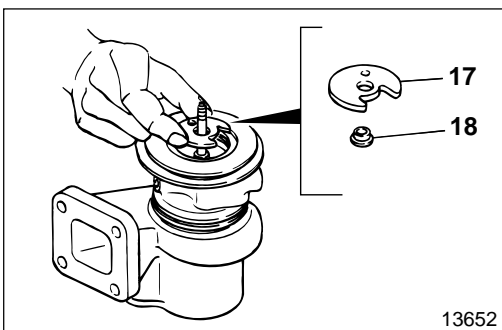


17 18 Installation of thrust bearing and thrust ring

- Install parts 19 to 23 into bearing housing 24.
- Hold shaft and turbine wheel 21 and bearing housing 24 with your hand and install them in turbine housing 4.
- Fix temporarily using coupling assembly 3.

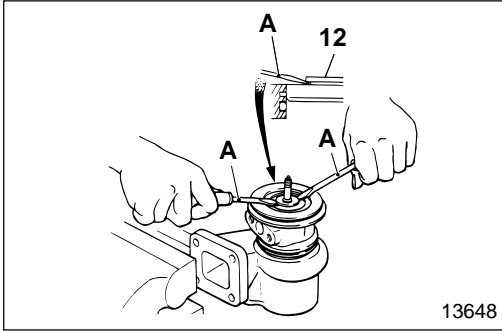
CAUTION ⚠

- Avoid hitting shaft and turbine wheel 21 near turbine housing 4, since the blade of the shaft and turbine wheel can be easily bent.
- Do not drop shaft and turbine housing 21.



- Install thrust bearing 17 and thrust ring 18 so that the thrust bearing faces the direction as illustrated.

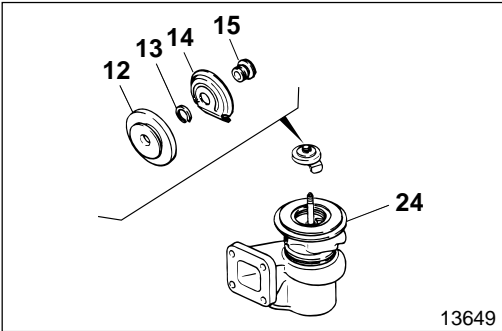
TURBOCHARGER



12 Insert

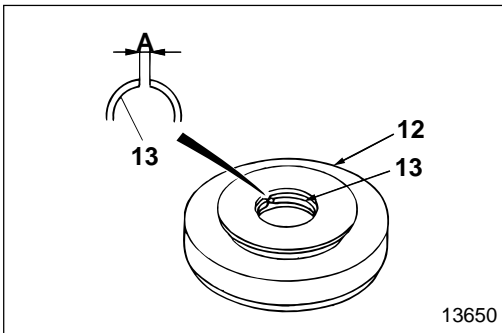
[Removal]

A : Screwdriver



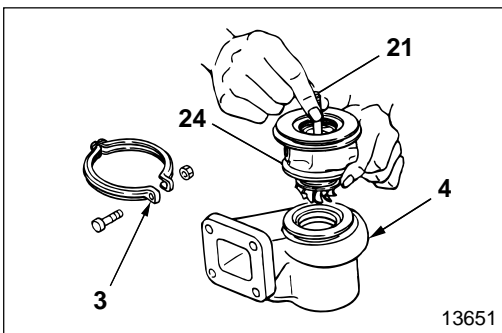
[Installation]

Install oil deflector 14 onto bearing housing 24 in the direction as illustrated.



13 Inspection of clearance of piston ring split

- Install new piston ring 13 in insert 12.
- Measure clearance A of the split of piston ring 13.
- If the measured value deviates from the standard value, replace inserter 12.

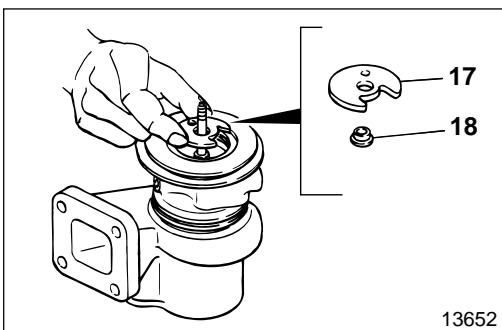


17 18 Installation of thrust bearing and thrust ring

- Install parts 19 to 23 into bearing housing 24.
- Hold shaft and turbine wheel 21 and bearing housing 24 with your hand and install them in turbine housing 4.
- Fix temporarily using coupling assembly 3.

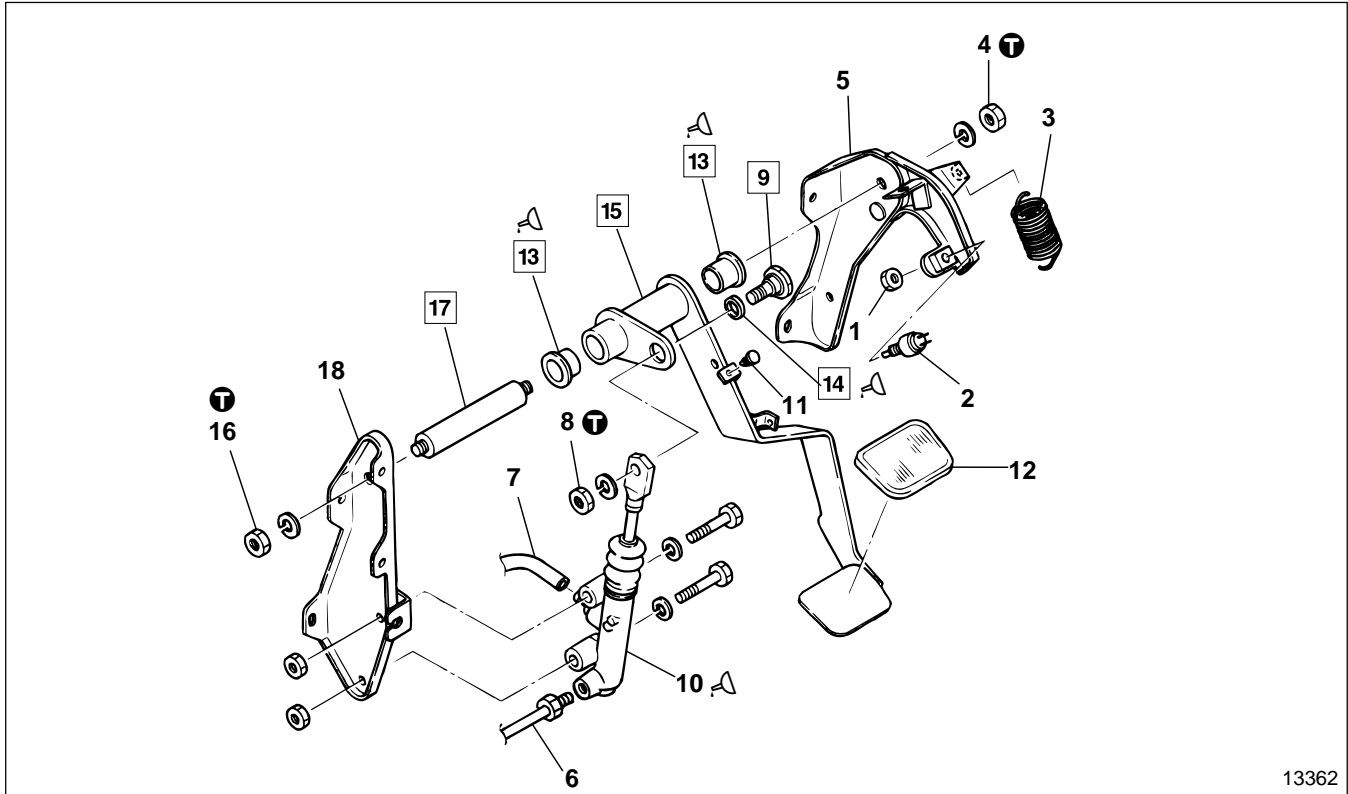
CAUTION ⚠

- Avoid hitting shaft and turbine wheel 21 near turbine housing 4, since the blade of the shaft and turbine wheel can be easily bent.
- Do not drop shaft and turbine housing 21.



- Install thrust bearing 17 and thrust ring 18 so that the thrust bearing faces the direction as illustrated.

CLUTCH PEDAL < C7 (M8S2×5) >



13362

● Disassembly sequence

- | | |
|----------------------------|-----------------------------------|
| 1 Nut | 10 Clutch master cylinder P21-24 |
| 2 Clutch switch Gr 54 | 11 Clutch switch stopper |
| 3 Return spring | 12 Pedal pad |
| 4 Nut | 13 Bushing |
| 5 Clutch pedal bracket, RH | 14 Bushing |
| 6 Clutch pipe | 15 Clutch pedal arm |
| 7 Clutch hose | 16 Nut |
| 8 Nut | 17 Pedal arm shaft |
| 9 Offset bolt | 18 Clutch pedal bracket, LH |

● Assembly sequence

Follow the disassembly sequence in reverse.

Service standards

Unit : mm {in.}

Location	Maintenance item	Standard value	Limit	Remedy
3	Installed load of return spring	91 N {21 lbf, 9.3 kgf}	—	—
9, 14	Clearance between offset bolt and bushing	0.06 to 0.36 {0.0024 to 0.014}	—	Replace
13, 17	Clearance between bushing and pedal arm shaft	0.16 to 0.24 {0.0063 to 0.0094}	—	Replace

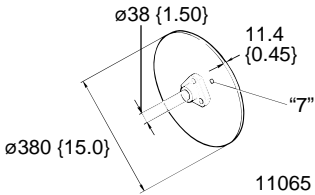
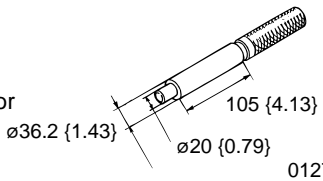
T Tightening torque

Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
4, 16	Nut (Pedal arm shaft mounting)	48.1±9.8 {35±7.2, 4.9±1}	—
8	Nut (Offset bolt mounting)	48.1±9.8 {35±7.2, 4.9±1}	—

CLUTCH BODY < C7 >

Unit : mm {in.}

Location	Tool name and shape	Part No.	Application
16	 <p>Clutch master plate</p>	MH062353	Adjusts release lever heights
	 <p>Clutch alignment arbor</p>	MH061987	




◆ Service procedure

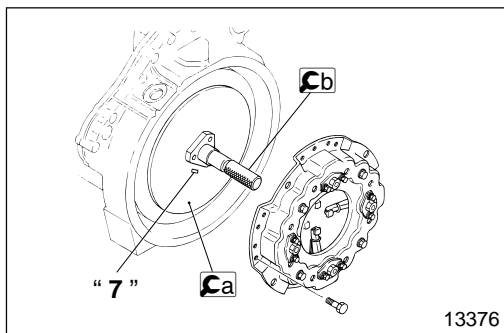
● Work before disassembly


Put alignment marks on all parts before disassembly.

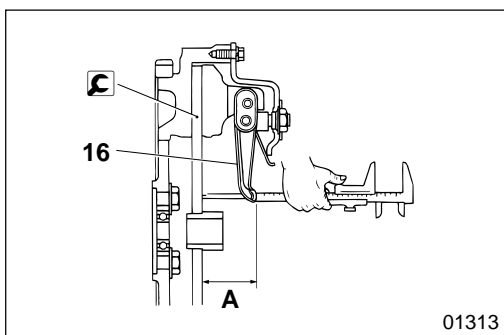
● Inspection and adjustment after assembling

(1) Measurement of release lever height

- Install the pressure plate and lever assembly using  clutch master plate and  clutch alignment arbor instead of clutch disc.
- Install  clutch master plate so that identification mark "7" can be seen.

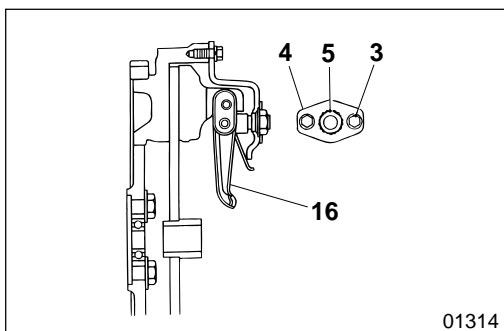


- Measure dimension **A** between  clutch master plate and each upper surface of release levers **16** (four points).
- If the measured values deviate from the standard value, adjust as follows. Even if the measured values are within the standard value, if the relative difference among each measured value is 0.5 mm {0.020 in.} or more, adjust the heights, too.

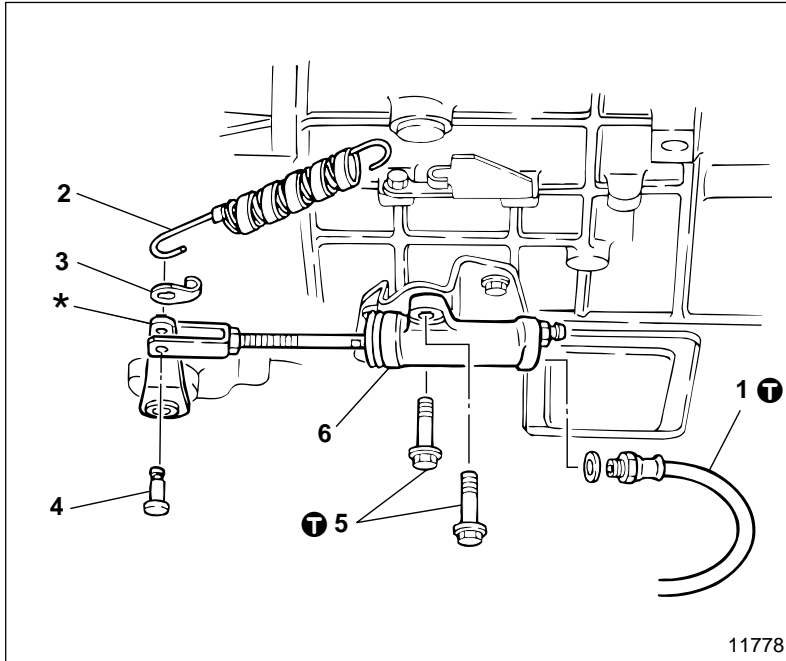


(2) Adjustment of release lever height

- Remove bolt **3** and lock plate **4**, and adjust the height by turning support nut **5**.
- After adjustment, install lock plate **4**, fasten support nut **5** and check the height of release lever **16**.



CLUTCH POWER CYLINDER < C6, C7 (M070S6) >



● Removal sequence

- 1 Fluid hose
 - 2 Return spring
 - 3 Return spring claw
 - 4 Clevis pin
 - 5 Bolt
 - 6 Clutch power cylinder assembly
- 📖 P21-27

* : Clutch release fork shaft

CAUTION ⚠

After removing fluid hose 1, fit blanking plugs into its openings to prevent fluid from flowing out.

● Installation sequence

Follow the removal sequence in reverse.

ⓘ Tightening torque

Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Fluid hose connection	21 to 31 {15 to 23, 2.1 to 3.2}	—
5	Bolt (Clutch power cylinder assembly mounting)	47 {35, 4.8}	—



FK.FM

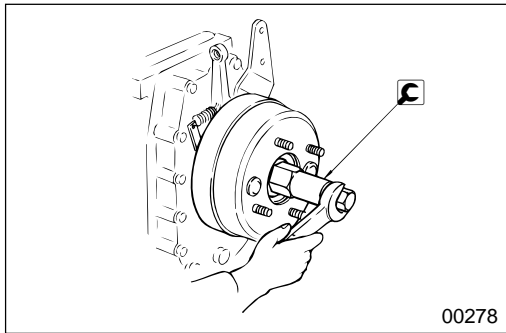
Service Manual

Group 22A
Manual Transmission
< M060S5, S6, M070S6 >

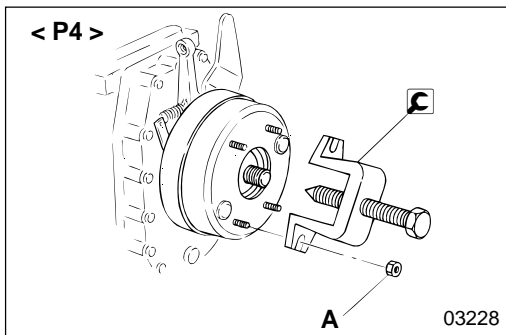
 **MITSUBISHI FUSO TRUCK OF AMERICA, Inc.**

EXTENSION HOUSING, REAR COVER AND PARKING BRAKE ASSEMBLY

◆ Service procedure

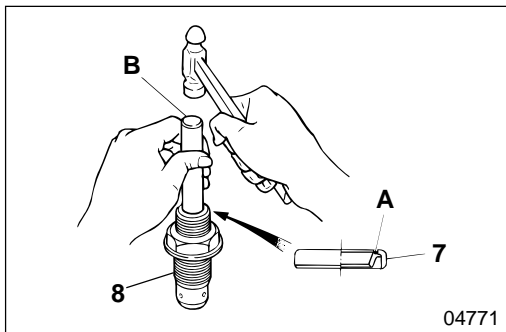
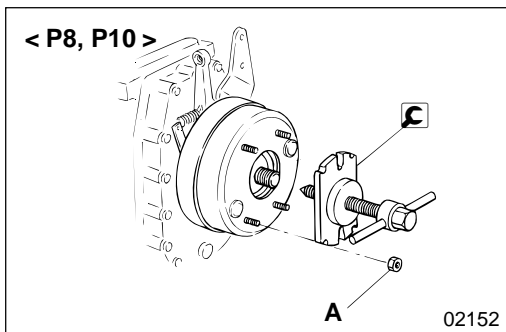


1 Removal and installation of lock nut



4 Removal of companion flange

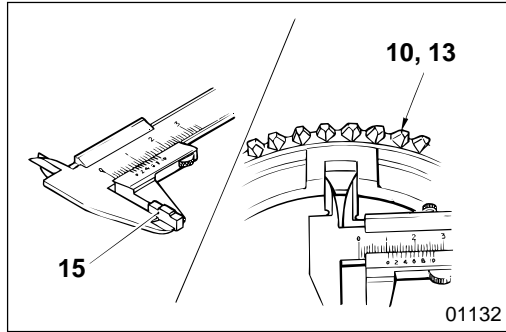
A : Propeller shaft mounting nut



7 Press-fitting of oil seal

- Apply grease to inside of oil seal 7 packing A.
- Press-fit oil seal 7 into speedometer gear bushing 8 in the direction as illustrated using bar B (approximately $\varnothing 15$ mm {0.59 in.}).

MAINSHAFT ASSEMBLY < S5 >

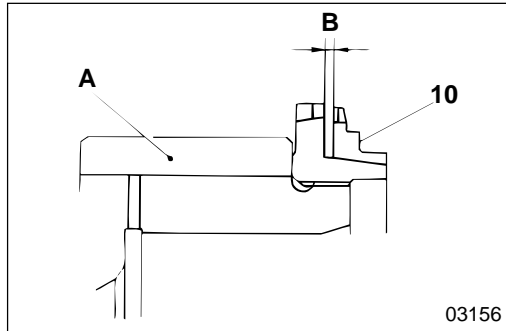


10 to 18 Synchronmesh mechanism and 4th gear

[Inspection]

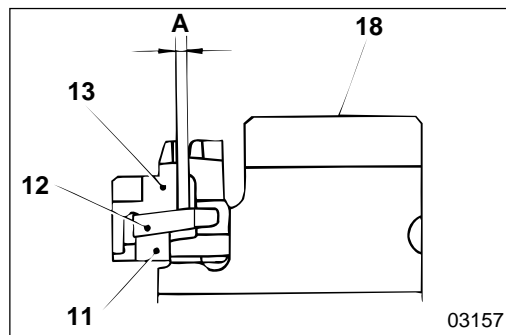
(1) Clearance between synchronizer ring 10 or outer ring 13 and shifting key 15

If the measured value is higher than the limit, replace the faulty parts.



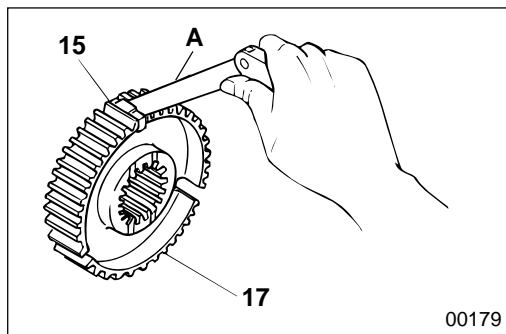
(2) Clearance between synchronizer ring 10 and drive pinion

- Measure clearance **B** between synchronizer ring **10** and the gear cone of drive pinion **A**.
- When measuring this value, press synchronizer ring **10** evenly, and measure all around the circumference.
- If the measured value is lower than the limit, replace the faulty parts.



(3) Clearance between synchronizer outer ring and 4th gear

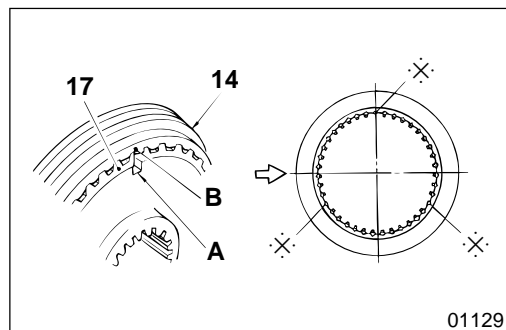
- Measure clearance **A** between synchronizer outer ring **13** and the gear cone of 4th gear **18**.
- When measuring this value, press synchronizer inner ring **11**, center cone **12**, and the outer ring evenly and measure all around the circumference.
- If the measured value is lower than the limit, replace the faulty parts.



(4) Clearance between shifting key 15 and synchronizer hub 17

If the measured value is higher than the limit, replace the faulty parts.

A : Feeler gauge



[Installation]

- Align the three keyways **A** of synchronizer hub **17** with the three stub teeth **B** (illustrated by \times mark) of synchronizer sleeve **14** to install the synchronizer hub.
- To reassemble synchronizer hub **17** and synchronizer sleeve **14**, align the alignment marks made during disassembly.

Possible causes		Symptoms				
		Gears slip out of engagement	Gears hard to engage	Noise when engine is idling	Noise while cruising	Noise when changing gear
Transmission body faulty	Mainshaft rear lock nut loose	<input type="radio"/>	<input type="radio"/>			
	Mainshaft thrust washer worn	<input type="radio"/>	<input type="radio"/>			
	Mainshaft bearing worn or damaged	<input type="radio"/>	<input type="radio"/>			
	Synchronizer ring and synchronizer sleeve spline worn	<input type="radio"/>				
	Synchronizer ring and gears taper cone area worn		<input type="radio"/>			
	Mainshaft pilot bearing worn or damaged			<input type="radio"/>	<input type="radio"/>	
	Drive pinion bearing worn or damaged			<input type="radio"/>		
	Countershaft bearing worn or damaged			<input type="radio"/>		
	Needle bearings of gears worn or damaged			<input type="radio"/>	<input type="radio"/>	
	Mainshaft and countershaft bearings worn or damaged				<input type="radio"/>	
	Mainshaft and countershaft gears backlash excessive				<input type="radio"/>	
	Spline of gears worn					<input type="radio"/>
	Gears damaged				<input type="radio"/>	
	Gear oil insufficient				<input type="radio"/>	
Control mechanisms faulty	Control cable joint play	<input type="radio"/>	<input type="radio"/>			
	Set board assembly bushings worn	<input type="radio"/>				
	Shift rail steel ball and groove worn	<input type="radio"/>				
	Shift rail poppet spring fatigued or damaged	<input type="radio"/>				
	Shift rail sliding movement faulty		<input type="radio"/>			
	Shift fork jaws worn		<input type="radio"/>			
	Shift fork bent		<input type="radio"/>			
Power shift malfunctioning	Air compressor faulty		<input type="radio"/>			
	Air leakage		<input type="radio"/>			
	Power shift assembly faulty		<input type="radio"/>			
Clutch faulty	Clutch disengagement faulty		<input type="radio"/>			<input type="radio"/>
	Clutch pedal play faulty		<input type="radio"/>			
Synchronizer faulty	Contacting surfaces of synchronizer ring and gear taper cone worn					<input type="radio"/>
	Shifting key worn					<input type="radio"/>
	Shifting key spring deteriorated or damaged					<input type="radio"/>
	Synchronizer sleeve worn or damaged			<input type="radio"/>	<input type="radio"/>	

Service standards

Unit : mm {in.}

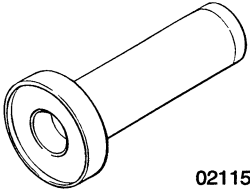
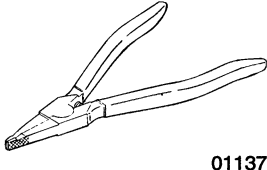
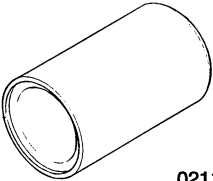
Location	Maintenance item	Standard value (Basic diameter in [])	Limit	Remedy
2	Tilt of reverse gear shift fork claw	0.1 {0.0039} or less	0.2 {0.079}	Replace
2, 3	Clearance between reverse gear shift fork and reverse gear shift sleeve	0.3 to 0.5 {0.012 to 0.020}	—	Replace
3, 5	Play in the rotating direction of reverse gear shift sleeve and hub	0.052 to 0.148 {0.0020 to 0.0058}	0.3 {0.012}	Replace
5, *	Engagement in the rotating direction of hub and mainshaft	-0.006 to 0.094 {-0.00024 to -0.0037}	0.2 {0.0079}	Replace
6	End play of mainshaft reverse gear	0.15 to 0.35 {0.0059 to 0.014}	0.5 {0.020}	Replace side washer
6, 7, 8, *	Play in the diameter direction after assembling mainshaft reverse gear	—	0.1 {0.0039}	Replace
8	Outer diameter of reverse gear bearing sleeve	[71] ^{-0.030} _{-0.040} {[2.80] ^{-0.0012} _{-0.0016} }	-0.1 {-0.0039}	Replace
14	End play of reverse idler gear	0.2 to 0.9 {0.0079 to 0.035}	1.2 {0.047}	Correct
14, 15, 19	Play in the diameter direction after assembling reverse idler gear	—	0.15 {0.0059}	Replace

Tightening torque

Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
17	Bolt (Reverse idler shaft lock piece mounting)	40 {30, 4.1}	—

Special tools

Location	Tool name and shape	Part No.	Application
8	Mainshaft bearing installer  02115	*MH062634	Installation of mainshaft reverse gear bearing sleeve
10	Snap ring expander  01137	MH061268	Removal of countershaft rear bearing snap ring
11	Countershaft bearing installer  02117	*MH062642	Installation of countershaft rear bearing

* components of puller and installer kit  P22A-92

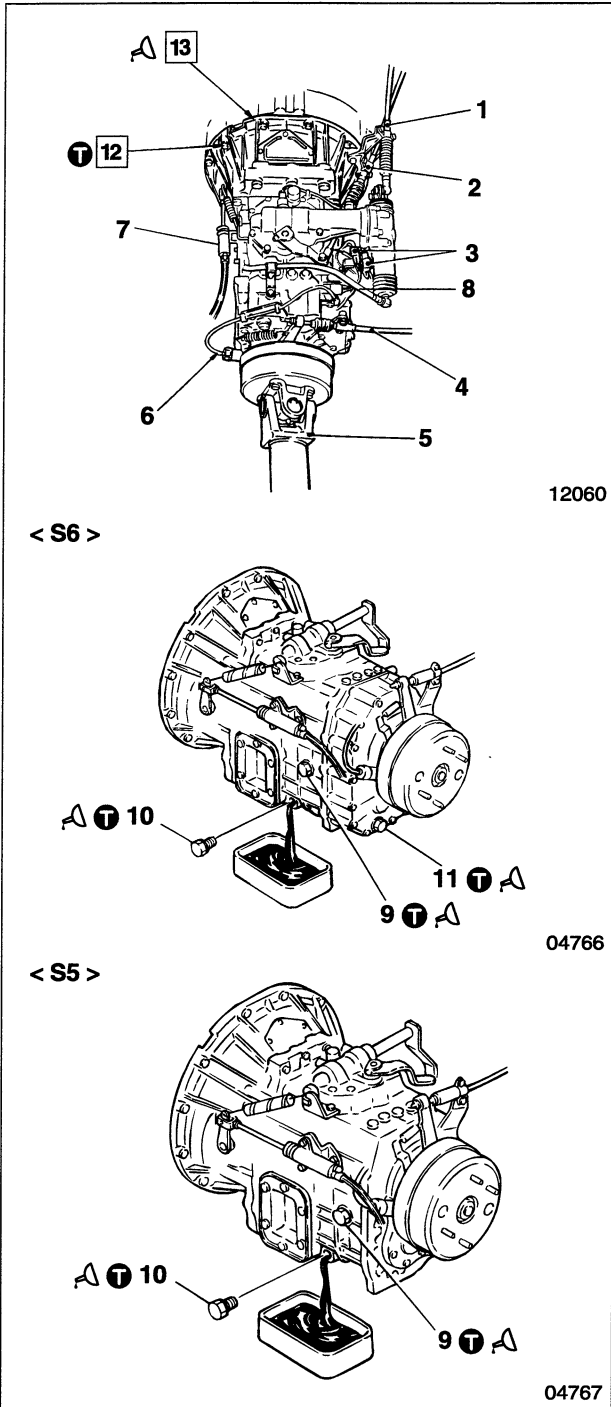
Service standards

Unit : mm {in.}

Location	Maintenance item	Standard value (Basic diameter in [])	Limit	Remedy
3	End play of 1st gear	0.35 to 0.55 {0.014 to 0.022}	0.75 {0.030}	Replace gear or thrust washer
3, 4, 5, 6, 43	Play in the diameter direction after assembling 1st gear	—	0.1 {0.0039}	Replace
6	Outer diameter of 1st gear bearing sleeve	$[96]_{-0.043}^{-0.030} \{[3.78]_{-0.0017}^{-0.0012}\}$	-0.1 {-0.0039}	Replace
7, 10	Play in the rotating direction of synchronizer sleeve and synchronizer hub	0.052 to 0.148 {0.0020 to 0.0058}	0.3 {0.012}	Replace
10, 43	Engagement in the rotating direction of synchronizer hub and mainshaft	-0.005 to 0.114 {-0.0002 to 0.0045}	0.2 {0.0079}	Replace
13, 14	Clearance between cone area of 2nd gear and synchronizer outer ring	1.21 to 1.79 {0.048 to 0.070}	0.2 {0.0079}	Replace
14	End play of 2nd gear	0.35 to 0.55 {0.014 to 0.022}	0.75 {0.030}	Replace gear or thrust washer
14, 15, 16, 43	Play in the diameter direction after assembling 2nd gear	—	0.1 {0.0039}	Replace
16	Outer diameter of 2nd gear bearing sleeve	$[95]_{-0.043}^{-0.030} \{[3.74]_{-0.0017}^{-0.012}\}$	-0.1 {-0.0039}	Replace
18, 43	Play in the diameter direction after assembling pilot bearing	—	0.12 {0.0047}	Replace
21	Clearance between synchronizer ring and cone area of drive pinion	1.49 to 1.86 {0.059 to 0.073}	0.2 {0.0079}	Replace
21, 25	Clearance between synchronizer ring and synchronizer hub groove	4.7 to 5.3 {0.19 to 0.21}	6.5 {0.26}	Replace
21, 26	Clearance between cone area of 5th gear and synchronizer ring	1.49 to 1.86 {0.059 to 0.073}	0.2 {0.0079}	Replace
22, 25	Play in the rotating direction of synchronizer sleeve and synchronizer hub	0.052 to 0.148 {0.0020 to 0.0058}	0.3 {0.012}	Replace
23, 25	Engagement in the rotating direction of synchronizer hub and mainshaft	0.05 to 0.20 {0.0020 to 0.0079}	0.5 {0.020}	Replace
25, 43	Mating part in rotating direction on synchronizer hub and mainshaft	-0.006 to -0.094 {-0.00024 to -0.0037}	0.2 {0.0079}	Replace
26	End play of 5th gear	0.25 to 0.40 {0.0098 to 0.016}	0.6 {0.024}	Replace gear or thrust washer
26, 27, 28, 43	Play in the diameter direction after assembling 5th gear	—	0.1 {0.0039}	Replace
28	Outer diameter of 5th gear bearing sleeve	$[60]_{-0.043}^{-0.030} \{[2.36]_{-0.0017}^{-0.0012}\}$	-0.1 {-0.0039}	Replace
30	End play of 4th gear	0.15 to 0.35 {0.0059 to 0.014}	0.55 {0.022}	Replace gear or thrust washer
30, 31, 32, 43	Play in the diameter direction after assembling 4th gear	—	0.1 {0.0039}	Replace

REMOVAL AND INSTALLATION OF TRANSMISSION ASSEMBLY

Removal and Installation



● Disassembly sequence

- 1 Shift cable P22A-88
- 2 Selector cable P22A-88
- 3 Harness connector
- 4 Parking brake cable < FK, FM617 > Gr 36A
- 5 Propeller shaft Gr 25
- 6 Speed sensor Gr 54
- 7 Clutch power cylinder Gr 21
- 8 Power shift hose
- 9 Inspection plug
- 10 Drain plug (on transmission case)
- 11 Drain plug (on extension housing)
- 12 Nut or bolt
- 13 Transmission assembly

● Assembly sequence

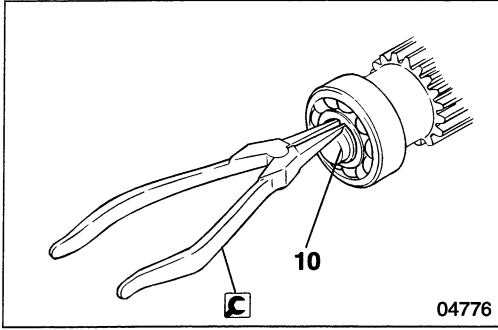
Follow the disassembly sequence in reverse.

ⓘ Tightening torque

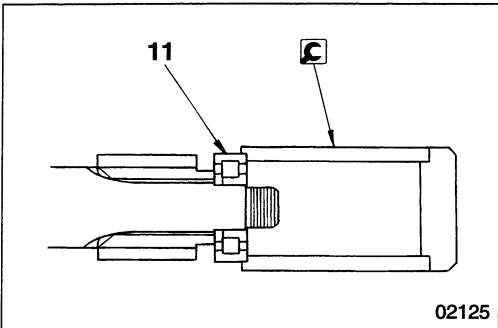
Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
8	Power shift hose connector	20 {14.8, 2}	—
9	Inspection plug	69±15 {51±11, 7±1.5}	—
10, 11	Drain plug	69±15 {51±11, 7±1.5}	—
12	Nut or bolt (Transmission mounting)	40 {30, 4.1}	—

REVERSE GEAR AND REVERSE IDLER GEAR < S6 DIRECT-DRIVE (D/D) >

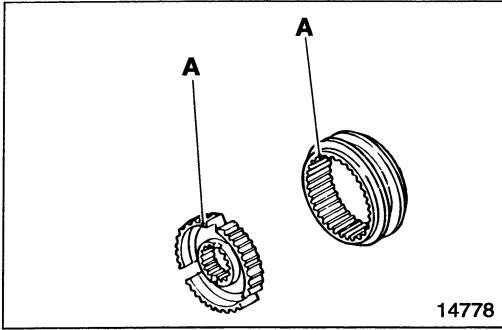


10 Removal and installation of snap ring



11 Installation of countershaft rear bearing

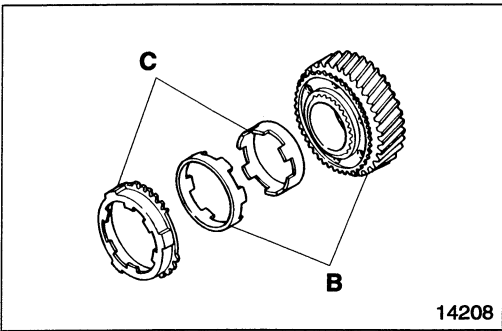
MAINSHAFT ASSEMBLY < S6 DIRECT-DRIVE (D/D) >



[Alignment marks]

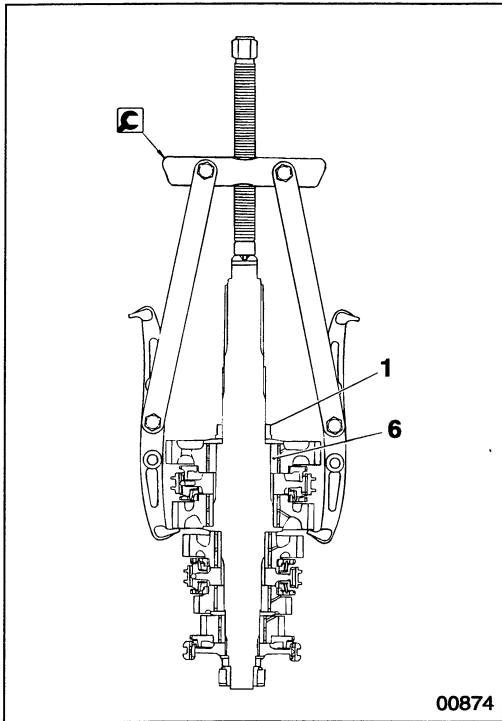
(1) Synchronizer sleeve and synchronizer hub

Before disassembling the synchronizer sleeve and the synchronizer hub, put alignment marks **A** on the places where the shifting keys are installed. When reusing parts, align the alignment marks to assemble.



(2) Ring, cone and gear assembly of double cone synchronizer

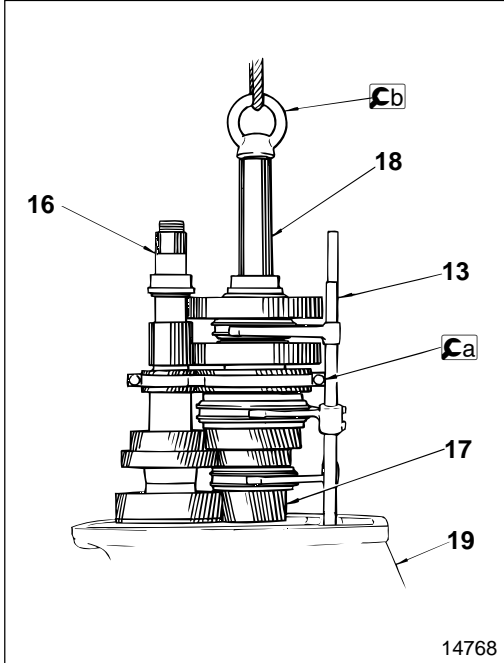
Before disassembling synchronizer center cone and gear assembly (**B**), and synchronizer center ring and synchronizer outer ring (**C**), put alignment marks on them. When reusing parts, align the alignment marks to assemble.



1 6

Removal of mainshaft rear bearing inner race and 1st gear bearing sleeve

MEMO



13 16 to 18 Shift rail and shift fork, countershaft assembly, drive pinion assembly, and mainshaft assembly

[Removal]

Remove or install shift rail and shift fork 13, countershaft assembly 16, drive pinion assembly 17, and mainshaft assembly 18 as a group.

- Before lifting, after removing the case, install **Cb** eye nut at the end of mainshaft 18, fitted with **Ca** steel lifting band.
- Fix shift rail and shift fork 13 to mainshaft assembly 18 with a rubber band.
- Fix a piece of wood to clutch housing assembly 19, and use a crane to lift the clutch housing together with drive pinion assembly 17 up, at the same time hitting them with a plastic-headed mallet to remove them.

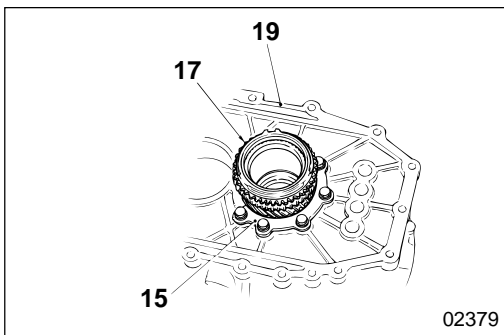
CAUTION ⚠

- Be sure to tighten **Ca** steel lifting band adequately enough to prevent it from coming undone, but not excessively, because excessive tightening would damage the gears, etc.
- Make sure, when lifting mainshaft assembly 18 or other parts, that you support drive pinion assembly 17 with your hand in order to prevent it from falling when the mainshaft assembly and countershaft assembly 16 come apart.

[Installation]

Method 1

- Follow the removal sequence in reverse.

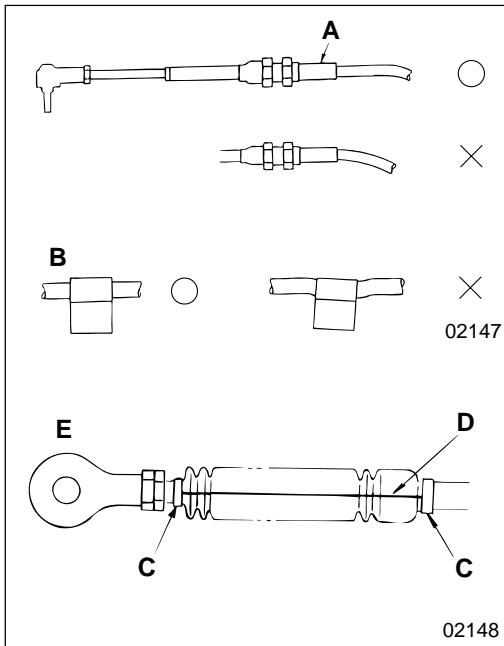


Method 2

- After installing drive pinion assembly 17 in clutch housing assembly 19, install drive pinion bearing retainer 15.

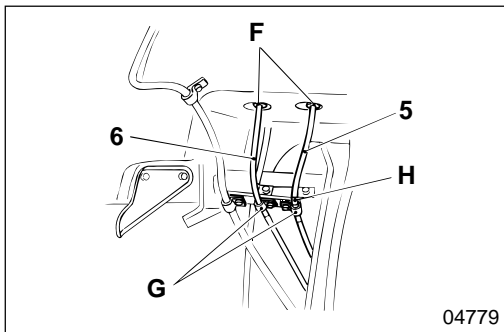
◆ Service procedure

5 6 Installation of shift cable and selector cable



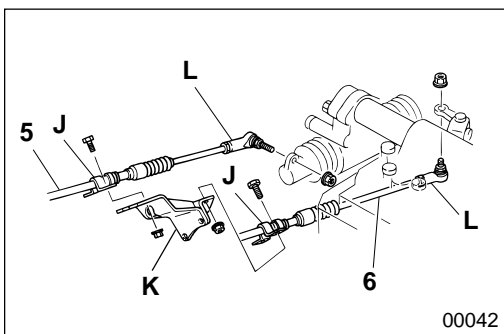
CAUTION ⚠

- Make sure the identification marks on the cable, ball joint L, and rubber damper M point in the right direction when you install the cables. Installing the cables with the identification marks in the wrong direction can remarkably reduce the durability of the cables.
- Install casing cap A lengthwise.
- Make sure the radius of the bend is 200 mm {7.87 in.} or more.
- Make sure the cable operates smoothly.
- Install the clamp vertically against the cable. (Figure B)
- Do not twist clamps C at both ends of the boot. Make sure that white line D on the boot is straight. (Figure E)



- Insert shift cable 5 and selector cable 6 under the cab floor and clamp them in the correct place by identifying identification mark H on the shift cable. (The selector cable has no identification mark.)
- F : Grommet
G : Clip

< With Power Shift >

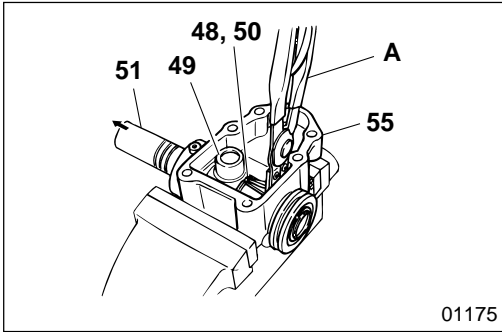


- Install cable clip J to bracket K temporarily and connect ball joint L or rubber damper M to the shift lever or selector lever.
- Arrange the cable so that it not twisted, then tighten clip J permanently.

CAUTION ⚠

Make sure that ball joint L and rubber dumper M face the correct direction.

POWER SHIFT ASSEMBLY



51 Removal and installation of shifter rod

[Removal]

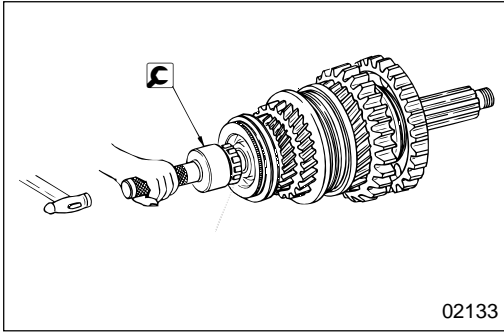
- Remove retaining rings **48, 50** from the groove of shifter rod **51** using snap ring expander **A**.
- Driving out shifter rod **51** gradually, remove it from housing **55**.
- When you remove shifter rod **51**, remove striker **49** from housing **55**.

[Installation]

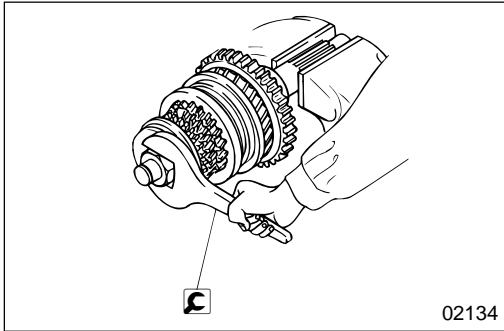
CAUTION ⚠

Make sure that retaining rings **48, 50** are securely placed in the groove of shifter rod **51**.

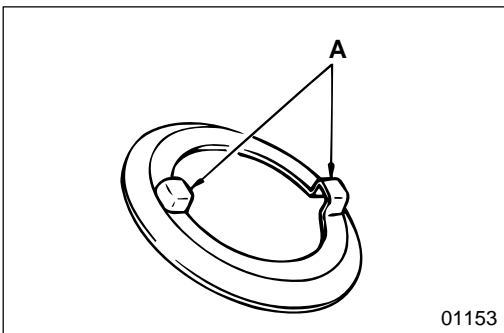
MAINSHAFT ASSEMBLY



[Installation]

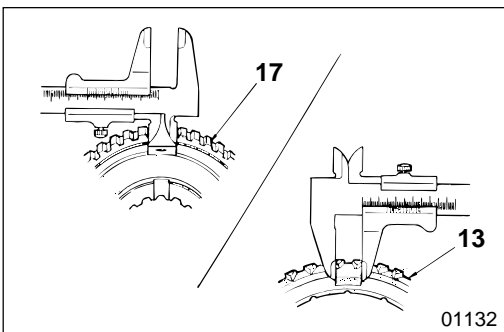


11 Removal and installation of lock nut



12 Installation of lock washer

Align protrusions **A** (two points as illustrated) with the grooves of synchronizer hub **17**.

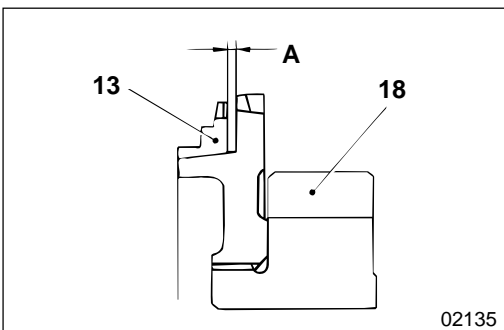


13 to 18 Synchronmesh mechanism and 4th gear

[Inspection]

(1) Clearance between the protrusion of synchronizer ring 13 and the groove of synchronizer hub 17

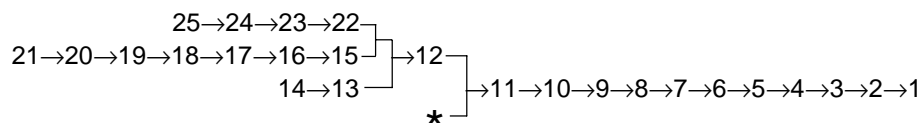
If the measured value is higher than the limit, replace the faulty parts.



(2) Clearance between synchronizer ring 13 and 4th gear assembly 18 or drive pinion

- Measure clearance **A** between synchronizer ring **13** and the gear cone of 4th gear assembly **18** or drive pinion.
- When measuring this value, press synchronizer ring **13** evenly **1** and measure all around the circumference.
- If the measured value is lower than the limit, replace the faulty parts.

● **Assembly sequence**



CAUTION ⚠

Be sure when assembling gear selector lever A 19, that you turn the lever so you do not damage the lip area of oil seal 22.

Service standards

Location	Maintenance item	Standard value	Limit	Remedy
16	4th and 5th return spring load (Installed length 37.6 {1.48})	19 N {4.2 lbf, 1.89 kgf}	15 N {3.3 lbf, 1.51 kgf}	Replace
21	1st and reverse return spring load (Installed length 27.6 {1.09})	100 N {22 lbf, 10.2 kgf}	80 N {18 lbf, 1.09 kgf}	Replace

Tightening torque

Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Air hose connector	39 to 44 {29 to 33, 4.0 to 4.5}	—
2	Bolt (Power shift assembly mounting)	40 {30, 4.1}	—
5	Neutral switch	46 to 52 {34 to 38, 4.7 to 5.3}	—
7	Nut (Gear selector lever B mounting)	17 {12, 1.7}	—
11	Bolt (Selector lever case mounting)	40 {30, 4.1}	—

Lubricant and sealant

Location	Points of application	Kinds	Quantity
5	Plunger tip of neutral switch	Chassis grease [NLGI No.1 (Ca soap)]	As required
	Thread area of neutral switch	THREEBOND 1104J	As required
10	Friction surface of washer	Chassis grease [NLGI No.1 (Ca soap)]	As required
14	Friction surface of gear shift lever	Chassis grease [NLGI No.1 (Ca soap)]	As required
22	Lip area of oil seal	Chassis grease [NLGI No.1 (Ca soap)]	As required
23	Selector lever case mounting surface of bushing	THREEBOND 1215	As required
23	Friction surfaces of bushing and axle and gear selector lever A	Chassis grease [NLGI No.1 (Ca soap)]	As required
*	Selector lever case mounting surface of gear shifter lower	THREEBOND 1104J	As required

MEMO

TROUBLESHOOTING

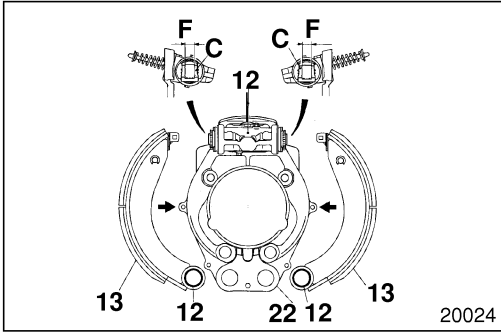
Trouble self-diagnosis Table

CAUTION

If a code No. is not listed in the table below, contact GM Allison.

Code No.		Symptoms	Inspection and adjustment
Main	Sub		
13	12 13 23	Automatic transmission control unit voltage: too low Automatic transmission control unit voltage: low Automatic transmission control unit voltage: high	1. Check: a. Battery direct ground and power connections are tight and clean. b. Vehicle batteries are charged. c. Vehicle charging system is not over- or under-charging. d. VIM fuse is good. e. VIM connections are tight, clean, and undamaged. f. Vehicle manufacturer supplied wiring is correct. g. ECU connectors are tight, clean, and undamaged. h. Contact authorized Allison Dealer.
14	12, 13	Oil level sensor	1. Check: a. Engine speed sensor, output speed sensor, temperature sensor, and oil level sensor are working correctly. b. Wiring harness has no opens, shorts to ground, or shorts to battery. c. Contact authorized Allison Dealer.
21	12, 13	Throttle position sensor	1. Check: a. TPS connector is properly connected. b. End of TPS cable is pulled out properly. c. Engine fuel lever is in idle position. d. Engine fuel lever provides proper amount of stroke on TPS cable. e. Wiring harness to TPS has no opens, shorts between wires, or shorts to ground. f. TPS for proper operation and resistance readings. g. Contact authorized Allison Dealer.
22	14, 15, 16	Speed sensor	1. Check: a. Speed sensors and connectors are tight, clean, and undamaged. b. Wiring harness to sensors has no opens, shorts between wires, or shorts to ground. c. Contact authorized Allison Dealer.
23	12, 13, 14, 15	Range selector	1. Check: a. ECU connectors are tight, clean, and undamaged. b. Shift selector connector is tight, clean, and undamaged. c. Wiring harness to sensors has no opens, shorts between wires, or shorts to ground. 2. Shift selector(s) for proper operation. 3. Contact authorized Allison Dealer.
24	12	Temperature of automatic transmission fluid: too low	1. Check: a. Air temperature is below -32°C (-25°F) 1) If yes, this is a correct response for temperature. 2) If no, check that main transmission connector is tight, clean, and undamaged. b. ECU connectors are tight, clean, and undamaged. c. Contact authorized Allison Dealer.

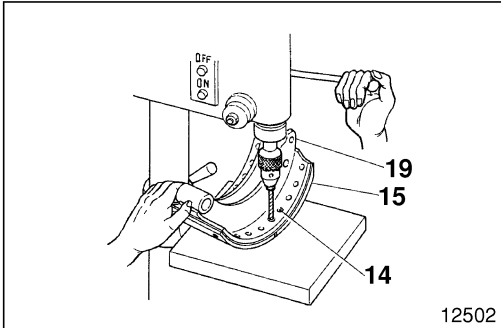
FRONT WHEEL BRAKE



- Install brake shoe assembly 13 so that it securely enters into the two-sided width F of clip C.

CAUTION

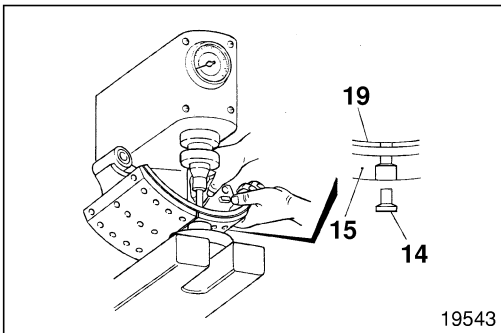
When installing brake shoe assembly 13, do not damage clip C or O-ring 12.



15 Brake lining

[Removal]

- Remove the rivets 14 by drilling, taking care not to damage the brake shoe 19. Then, remove the brake lining 15.

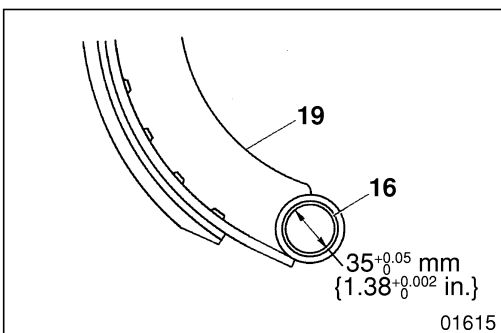


[Installation]

- Clean the surface of the brake lining 15 and brake shoe 19.
- Insert rivet 14 through brake lining 15, and stake the rivet in sequence from the center to both ends.
- Stake the rivet 14 with a load of 19.61 ± 0.98 kN { 4410 ± 2200 lbf, 2000 ± 1000 kgf}.
- Inspect brake drum * to brake lining 15 contact: correct any faulty points if they are found. Such correction must be performed in a state that the brake has been assembled.

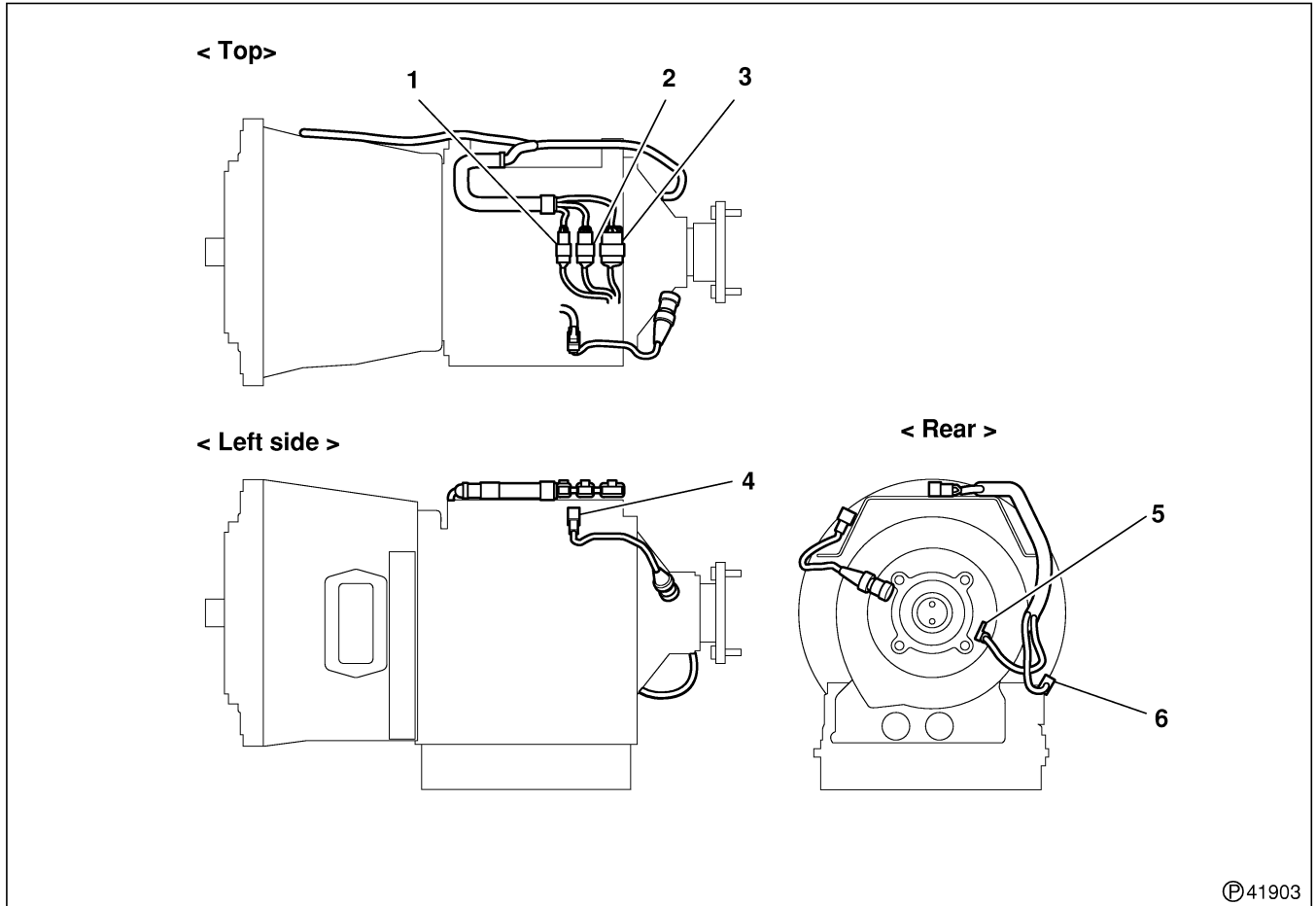
WARNING

- Be sure to replace brake lining 15 on the entire axle to prevent uneven braking.
- Do not apply oil or grease to the brake lining 15, which may cause the malfunction of the brake system.



16 Installation of bushing

- Install bushing 16 on brake shoe 19.
- Measure the inside diameter of bushing 16.
- If the inside diameter is not $35^{+0.05}$ mm { $1.38^{+0.002}$ in.}; correct by reaming to specification.

Installation Position

- 1 Connector (for fluid temperature sensor and fluid level sensor)
- 2 Connector (for engine speed sensor and vehicle speed sensor)
- 3 Connector (for transmission solenoid)
- 4 Connector (for speedometer)
- 5 Connector (for transmission output speed sensor)
- 6 Connector (for input speed sensor: engine speed)



FK.FM

Service Manual

Group 23

Automatic Transmission

 MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

GROUP 25 PROPELLER SHAFT

SPECIFICATIONS 2

STRUCTURE AND OPERATION 2

TROUBLESHOOTING..... 3

REMOVAL AND INSTALLATION OF PROPELLER SHAFT 4

REAR PROPELLER SHAFT

< P4 > 6

< P8 > 10

< P10 > 14

FRONT PROPELLER SHAFT

< P4 > 18

< P8 > 22

< P10 > 28

BALANCING PROPELLER SHAFT..... 33

Adjustment after Assembly

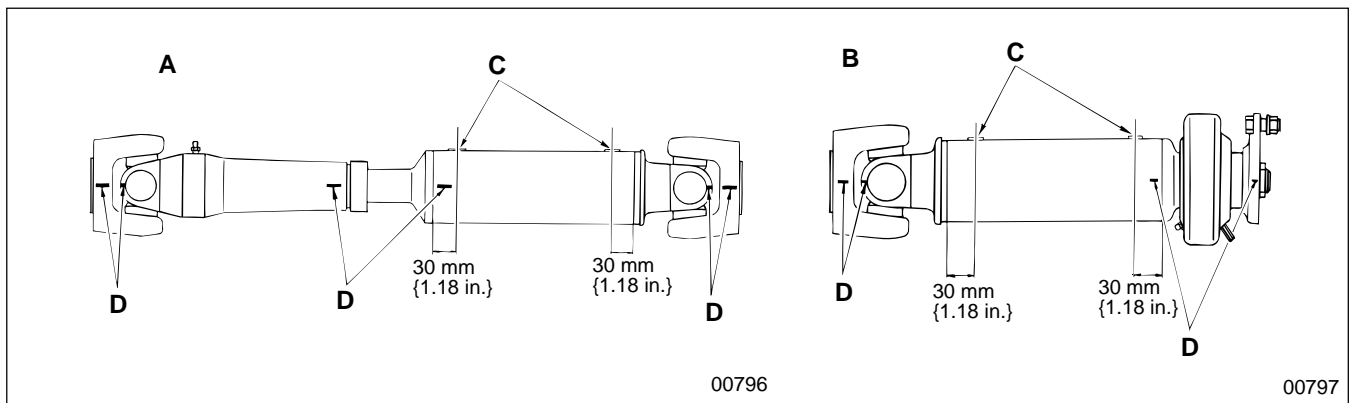
- (1) After any correction has been made of propeller shaft deflection, or replacement of flange yoke and universal joint, adjust the amount of balance of completed propeller shaft assembly on a balancing machine, and make adjustment by installing a balance piece(s) so that the amount comes within the permissible limit.
- (2) There are two methods of correcting dynamic balance: the polar coordinate system method, and the 90-degree component force method.
 - Polar coordinate system method: P4, P8, P10
 - 90-degree component force method: P10
- (3) Permissible amount of unbalance
 - 0.49 N-cm {0.0036 lbf.ft, 50 gf-cm}/1600 rpm (Pipe outer periphery)

NOTE

When adjusting a propeller shaft with a large amount of deflection, the 90-degree component force < P10 > method is preferred since this method requires a smaller number of balance pieces.

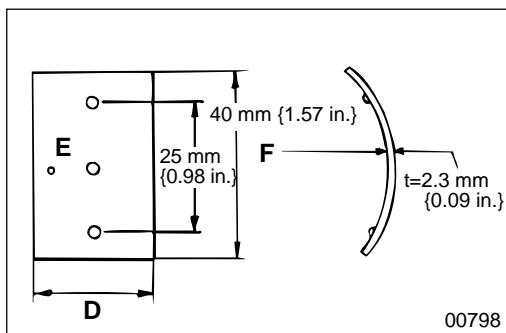
- (4) Method of correction by way of polar coordination method

- Balance piece attachment point



A : Rear propeller shaft
B : Front propeller shaft

C : Balance piece attachment point
D : Aligning mark



- Balance pieces available

Part name	P4	P8, P10	Mass g {oz}	Dimension D mm {in.}
Balance piece	G	G	10 {0.35}	14 {0.55}
Balance piece	A	A	20 {0.71}	28 {1.10}
Balance piece	B	B	40 {1.41}	55.7 {2.19}
Balance piece	C	C	60 {2.36}	83.5 {3.29}
Balance piece	H	—	30 {1.06}	42 {1.65}

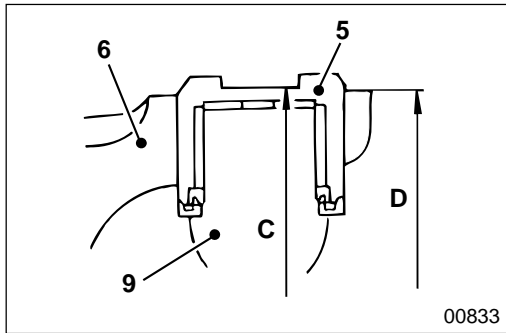
E : Piece punch mark

F : R45 mm {1.77 in.} (R41.3 mm {1.63 in.} only for P8 and P10 balance piece G)

NOTE

- Maximum balance piece allowed for one point is 120g {4.23 oz}.
- Use a combination that keeps balance pieces to the minimum.

FRONT PROPELLER SHAFT < P10 >



◆ Service procedure

● Inspection before disassembly

Clearance in axial direction for spider

Measure the clearance of needle bearing 5 (shim adjustment clearance = $D - C$). If the measured value is higher than the standard value, adjust it by changing the thickness of shim 4.

- Available shim thicknesses

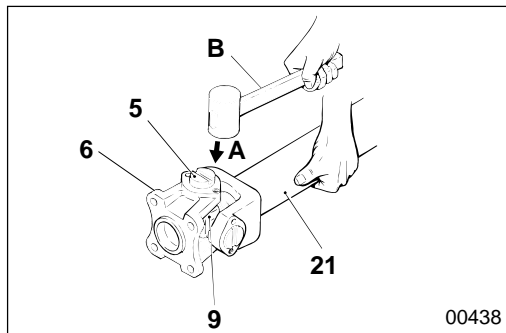
Part name	Thickness
Shim A	0.1 mm {0.0039 in.}
Shim B	0.2 mm {0.0079 in.}

CAUTION ⚠

Make sure that shim 4 does not protrude above the surface of flange yoke 6 or needle bearing 5 will seize up.

NOTE

For shim 4, it is recommended that you use shims with the same thickness on both ends to ensure balanced revolution.

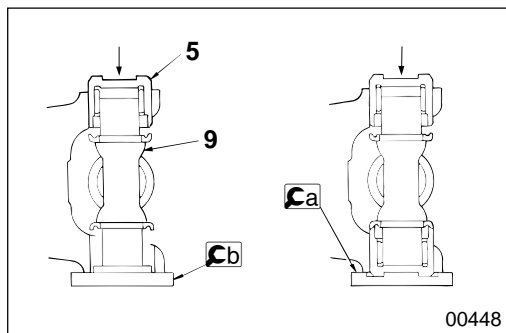


5 Needle bearing

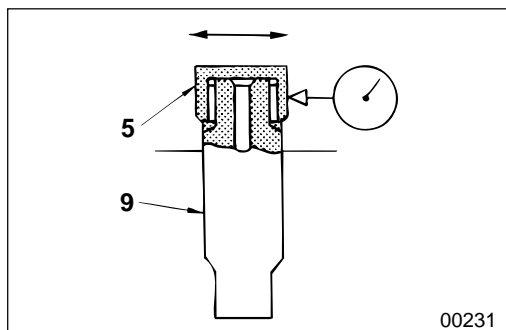
[Removal]

- Put alignment marks on needle bearing 5 and spider 9.
- Put alignment marks across flange yoke 6 and front propeller shaft 21.
- Hit the yoke lightly at shoulder area A so that needle bearing 5 bounces out due to reaction.

B : Mallet

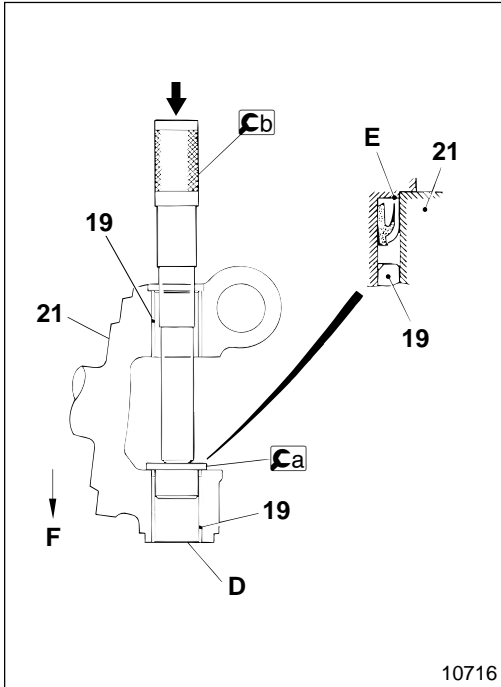


[Installation]

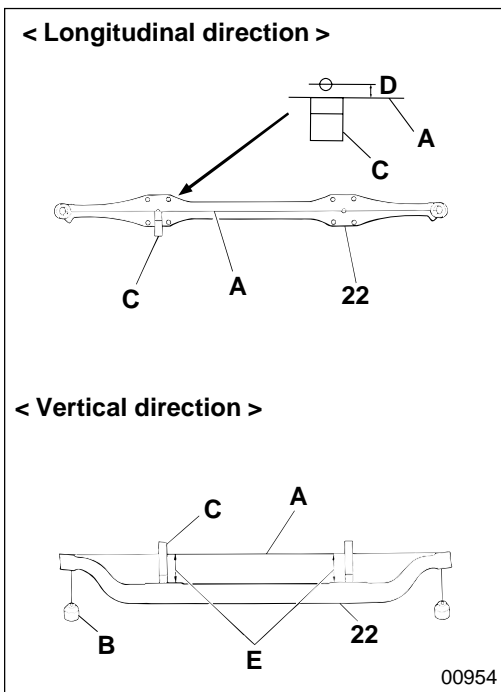


5 9 Clearance between needle bearing and spider

Measure the play towards the diameter direction between needle bearing 5 and spider 9. If the measured value is higher than the limit, replace with universal joint spider kit.



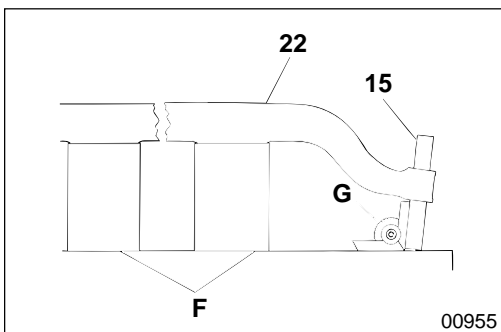
- Next, install **Ca** oil seal installer on knuckle **21** in the direction as illustrated.
 - Pass **Cb** kingpin bushing remover through the kingpin hole and position it on **Ca** oil seal installer.
 - Hit the head of **Cb** kingpin bushing remover until **Ca** oil seal installer makes contact with the knuckle.
 - Make sure that end **D** of bushing **19** makes contact with knuckle **21** on the same level.
 - Make sure that oil seal end **E** does not protrude from knuckle **21**.
- F** : Upper side of vehicle



22 Inspection of front axle

(1) Measurement of bend in front axle 22 in longitudinal and vertical directions

- Pass a piece of thread **A** through the kingpin hole of front axle **22** and hang weights **B** on both ends.
- Use square **C** to find the degree of bend in both the longitudinal direction **D** and the vertical direction **E**.
- If the measured value is higher than the limit, replace front axle **22**.



(2) Measurement of kingpin inclination angle

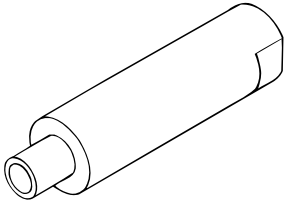
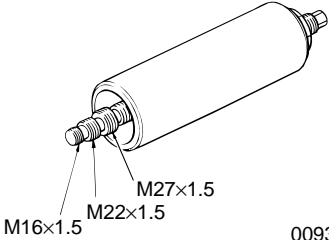
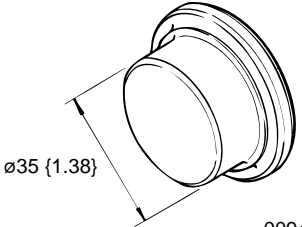
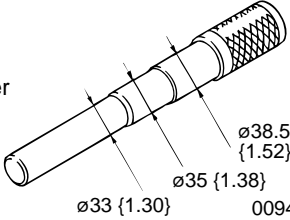
Mount kingpin **15** in front axle **22** as illustrated, and measure the kingpin inclination angle. If the measured value is higher than the limit, replace the front axle.

- F** : Block gauge
- G** : Bevel square

FRONT AXLE, KNUCKLE AND KINGPIN < FK >

Special tools

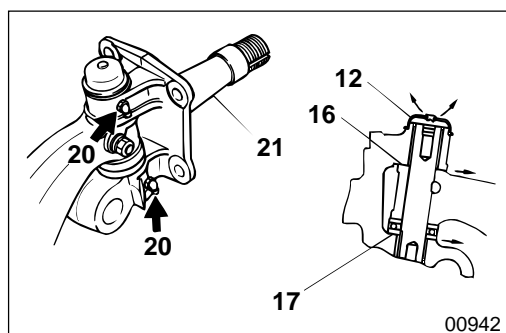
Unit : mm {in.}

Location	Tool name and shape	Part No.	Application
11	Kingpin set bolt remover  00938	MH061688	Removal of kingpin set bolt
15	Kingpin puller  00939	MH061684	Removal of kingpin
18	Oil seal installer  00940	MH062201	Press-fitting of oil seal
19	Kingpin bushing remover  00941	MH061037	Removal and installation of kingpin bushing

◆ Service procedure

● Work after assembly

Supply grease via grease nipple **20** of knuckle **21**. Supply grease until it overflows from the dust plugs of upper cap **12**, thrust washer **16**, and the press side of ball bearing **17**.



CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



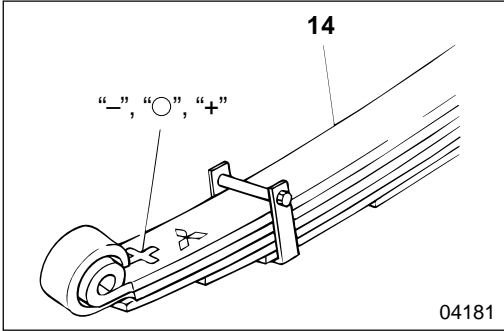
- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

MEMO

Symptoms		Oil leaking from companion flange assembly	Oil leaking from differential carrier and axle housing	Oil leaking from axle shaft	Power transmission insufficient							
					Propeller shaft turns but vehicle does not move	Noise when starting and changing speed	Continuous noise while cruising	Intermittent noise while cruising	Noise while cornering	Tires drag while cornering	Seizure	Damage
Possible causes												
Reduction and differential	Reduction pinion assembly starting torque excessive					<input type="radio"/>	<input type="radio"/>				<input type="radio"/>	
	Reduction pinion assembly starting torque insufficient					<input type="radio"/>	<input type="radio"/>					
	Reduction pinion lock nut loose					<input type="radio"/>	<input type="radio"/>					
	Reduction pinion assembly inner bearing and outer bearing seized				<input type="radio"/>		<input type="radio"/>					
	Reduction pinion assembly inner bearing or outer bearing worn						<input type="radio"/>					
	Reduction pinion assembly inner bearing or outer bearing broken							<input type="radio"/>				
	Reduction pinion pilot bearing worn						<input type="radio"/>					
	Reduction pinion pilot bearing seized or damaged							<input type="radio"/>				
	Differential pinion spider broken				<input type="radio"/>							
	Differential gear or differential pinion broken				<input type="radio"/>			<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
	Differential gear or differential pinion seized				<input type="radio"/>					<input type="radio"/>		
	Differential gear or differential pinion worn							<input type="radio"/>	<input type="radio"/>			
	Differential gear washer worn or damaged							<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
	Differential gear backlash excessive					<input type="radio"/>						<input type="radio"/>
	Differential gear backlash insufficient								<input type="radio"/>		<input type="radio"/>	
	Play between differential gear and axle shaft spline excessive					<input type="radio"/>						<input type="radio"/>

MEMO



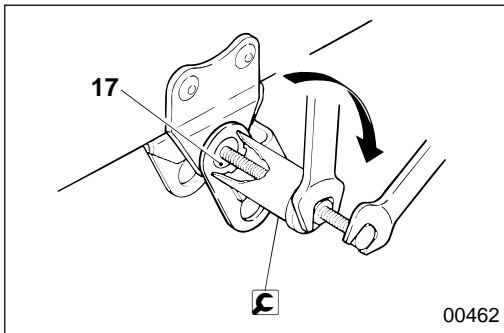
14 Leaf spring assembly left/right height combinations

When replacing leaf spring assembly 14, select the members so that the left and right height marks "+", "O" and "-" are combined as shown below.

Item	Combination				
	1	2	3	4	5
Right leaf spring assembly, passenger's side	-	-	O	O	+
Left leaf spring assembly, driver's side	-	O	O	+	+

CAUTION ⚠

Passenger's side leaf spring assembly 14 differs from the driver's side leaf spring assembly in camber (arch). Do not mix them up when mounting, or this would cause vehicle tilt.



17 Removal of shackle pin

GROUP 34 REAR SUSPENSION

STRUCTURE AND OPERATION 2

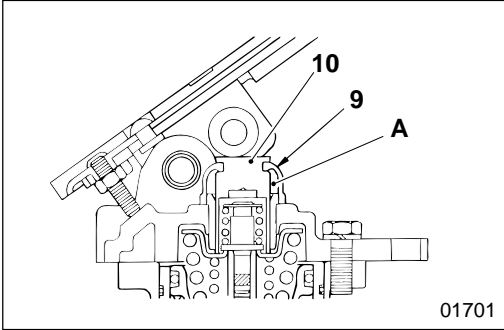
TROUBLESHOOTING 3

**WORK BEFORE REMOVAL AND INSTALLATION
OF REAR SUSPENSION 4**

REMOVAL AND INSTALLATION OF LEAF SPRING ASSEMBLY 6

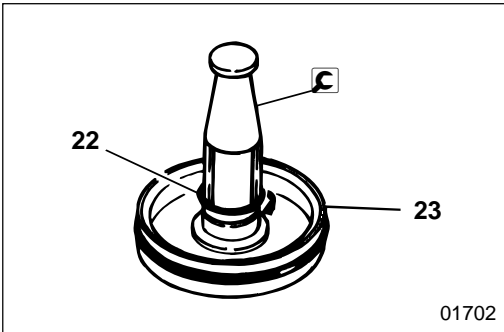
LEAF SPRING ASSEMBLY 12

MEMO

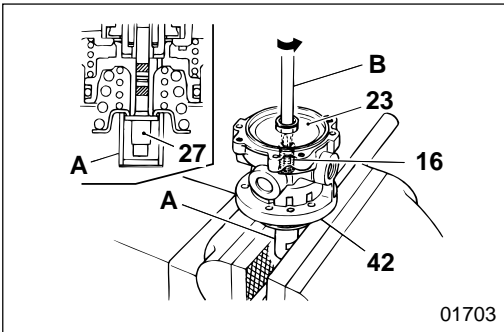


9 10 Packing grease between boot and plunger

Pack area A with 1 cm³ {0.061 cu in.} of grease.



22 Installation of O-ring

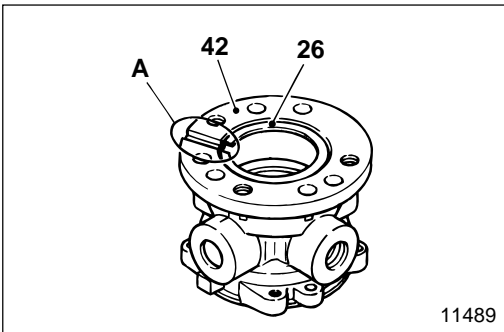


23 Removal of relay piston

- Grip (14 mm {0.55 in.}) socket wrench **A** in a vise.
- Insert the head of self-locking bolt **27** into socket wrench **A** to tighten body **42**.

WARNING ⚠ _____
 You must be careful when you loosen screw **16**, because the spring in body **42** can forcibly eject relay piston **23**. To avoid this hazard, press down on the relay piston with your hand when you carry out the above work.

- Loosen screw **16** gradually to remove relay piston **23**.
B : Phillips screwdriver



26 Installation of bushing

A : Indent

Service standards

Unit : mm {in.}

Location	Maintenance item		Standard value (Basic diameter in [])	Limit	Remedy
17	Suction valve spring load (Installed length 9 {0.35})		2.3 N {0.51 lbf, 0.23 kgf}	1.3 N {0.29 lbf, 0.13 kgf}	Replace
25	Delivery valve spring load (Installed length 10.5 {0.41})		3.2 N {0.73 lbf, 0.33 kgf}	2.4 N {0.53 lbf, 0.24 kgf }	Replace
31, 38	Clearance between piston and cylinder liner	Top	[80] 0.27 to 0.33 {[3.15] 0.011 to 0.013}	0.35 {0.014}	Replace cylinder liner
		Skirt	[80] 0.11 to 0.17 {[3.15] 0.0043 to 0.0067}	0.19 {0.0075}	
32 to 35	Clearance of piston ring gap (Measure at interior of cylinder liner)	Compression ring	—	1.0 {0.039}	Replace piston ring kit
		Oil ring	—	1.0 {0.039}	
32 to 35, 38	Clearance between piston ring and piston ring groove of piston	Compression ring	—	0.08 {0.0031}	Replace piston ring kit
		Oil ring	—	0.08 {0.0031}	
37, 38	Clearance between piston pin and piston		[16] {[0.63]}	0.08 {0.0031}	Replace piston pin
37, 44	Clearance between piston pin and connecting rod small end		[16] {[0.63]}	0.07 {0.0028}	Replace connecting rod
43, 47	Clearance between connecting rod bearing and crankshaft		[34] {[1.34]}	0.1 {0.0039}	Replace
42, 44, 47	End play of connecting rod		—	0.5 {0.020}	Replace
47, 48	End play of crankshaft		—	1.0 {0.039}	Replace

Tightening torque

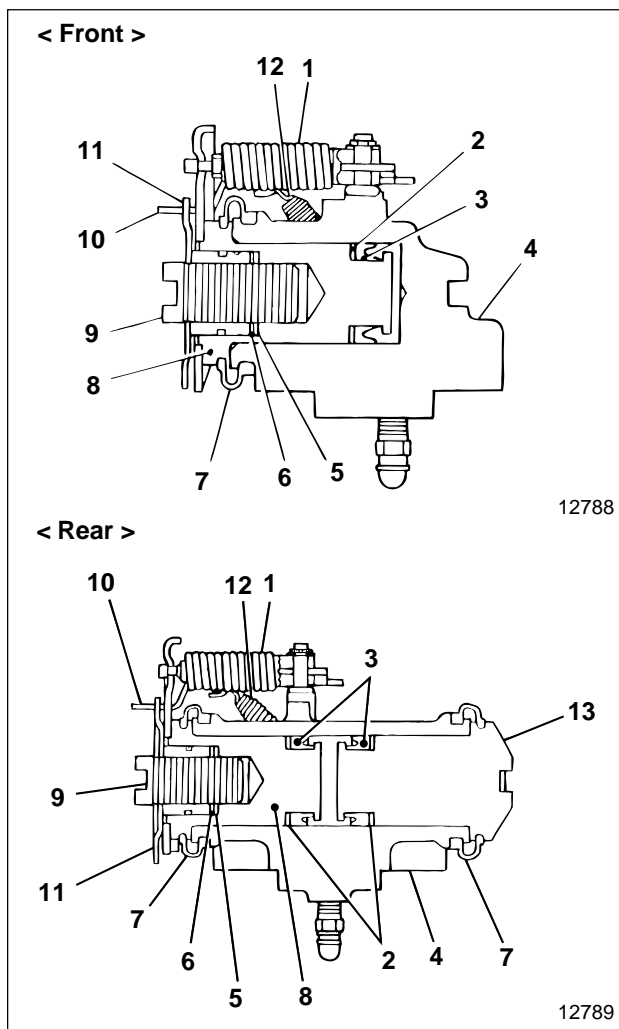
Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Nut (Drive gear mounting)	116.7 to 210.8 {120 to 155, 17.0 to 21.5}	—
5	Bolt (Bearing holder mounting)	13.7 to 17.7 {10 to 13, 1.4 to 1.8}	—
9	Bolt (Cylinder head assembly mounting)	24.5 to 29.4 {18 to 22, 2.5 to 3.0}	—
11	Connector	29.4 to 34.3 {22 to 25, 3.0 to 3.5}	—
14	Unloader valve assembly	98.1 to 117.7 {72 to 87, 10 to 12}	—
16	Suction valve holder	98.1 to 117.7 {72 to 87, 10 to 12}	—
21	Nut (Spring holder mounting)	44.1 to 58.8 {33 to 43, 4.5 to 6.0}	—
22	Delivery valve seat	98.1 to 117.7 {72 to 87, 10 to 12}	—
29	Bolt (Cylinder liner mounting)	24.5 to 29.4 {18 to 22, 2.5 to 3.0}	—
39	Nut (Connecting rod mounting)	22.6 to 25.5 {17 to 19, 2.3 to 2.6}	—

Lubricant

Location	Points of application	Kinds	Quantity
7	Oil seal lip	Engine oil	As required

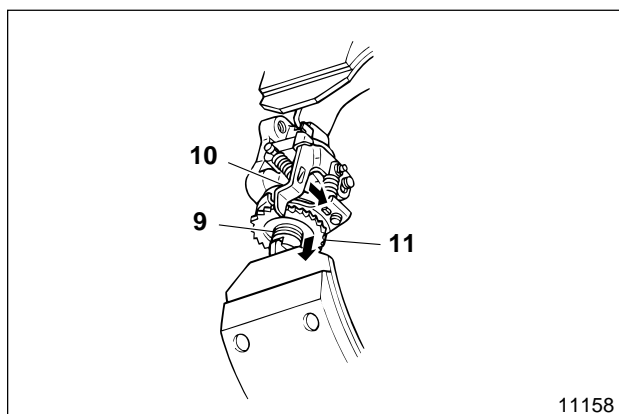
Wheel Cylinder Assembly



- 1 Spring
- 2 Backup ring
- 3 Piston cup
- 4 Cylinder body
- 5 Washer (Thick)
- 6 Washer (Thin)
- 7 Boot
- 8 Piston
- 9 Screw
- 10 Adjusting lever
- 11 Adjuster
- 12 Set spring
- 13 Piston < Rear wheel cylinder >

The automatic shoe clearance adjuster automatically adjusts the brake shoe clearance as the lining wears and the brake shoe clearance becomes higher than the specified value.

● Operation of automatic shoe clearance adjusting mechanism



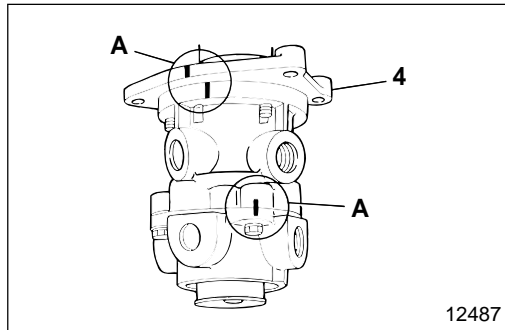
Adjusting lever **10** turns adjuster **11** to push out screw **9**, maintaining correct shoe clearance.

T Tightening torque

Unit : N·m {lbf.ft, kgf·m}

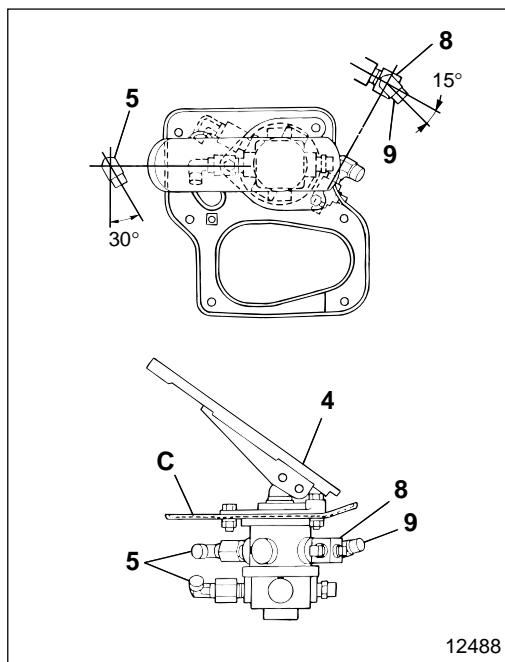
Location	Parts to be tightened	Tightening torque	Remarks
2	Bolt (Pedal assembly and valve assembly mounting)	12 to 19 {0.047 to 0.075, 1.2 to 1.9}	—
3	Bolt (Dual brake valve and valve board mounting)	12 to 19 {0.047 to 0.075, 1.2 to 1.9}	—
5, 8, 9	Connector	29.4 to 117.7 {0.12 to 0.47, 3.0 to 12}	—
6, 7	Connector	29.4 to 39.2 {0.12 to 0.16, 3 to 4}	—

◆ Service procedure



4 Dual brake valve

A : Alignment mark



5 8 9 Connector positioning

Position the connector within one turn after the lower limit tightening torque has been reached.

T Tightening torque

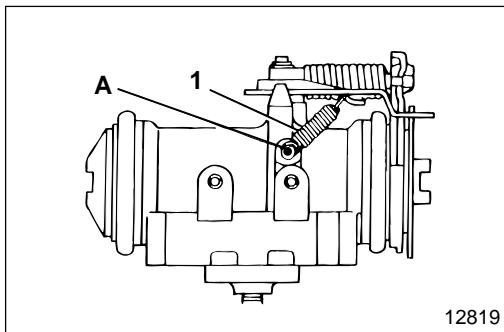
Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
18	Air bleeder	6.86 to 11.77 {5.1 to 8.7, 0.7 to 1.2}	—

L Lubricant

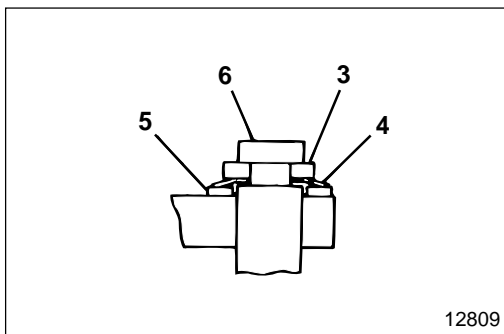
Location	Points of application	Kinds	Quantity
9	Thread area of screw	Rubber grease	As required
11	Screw mounting thread of adjuster and friction surface with piston	Rubber grease	As required
12, 13	Both sides of washer	Rubber grease	As required
14	Periphery of piston cup	Rubber grease	As required
16	Periphery and interior of piston	Rubber grease	As required
19	Boot mounting groove of cylinder body	Rubber grease	As required

◆ Service procedure



1 Installation direction of set spring

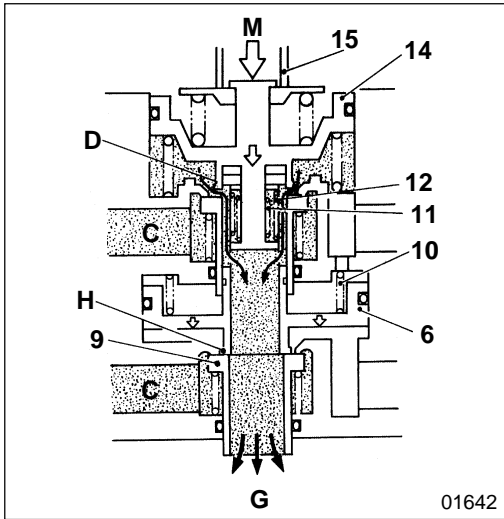
Fasten the closed end hook of set spring 1 on pin A.



4 Installation direction of wave washer

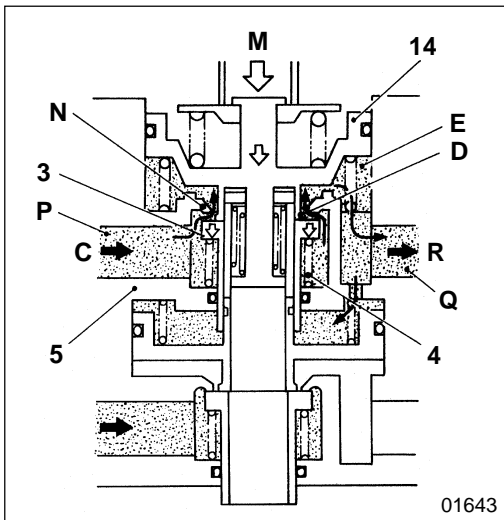
Caulk retainer 3.

● When depressing brake pedal (before braking pressure is generated)



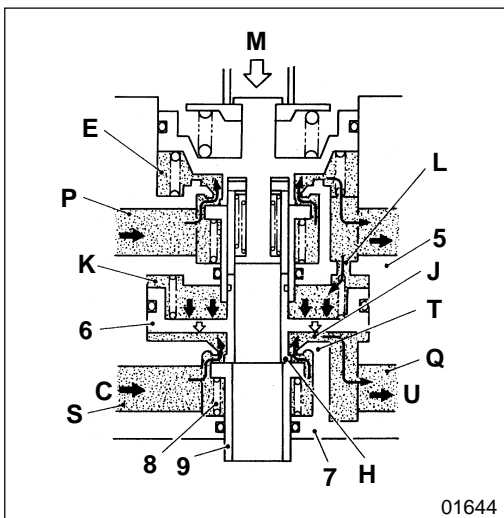
- Depressing the brake pedal (illustrated as pedal action **M**), forces down primary piston **14** via plunger **15**.
- Forcing down primary piston **14** changes the balance between the repercussive forces of inner spring **11** and outer spring **12**, and the repercussive force of relay piston spring **10**, forcing down relay piston **6**. This seats the relay piston on secondary inlet valve **9** and closes exhaust valve seat **H**.
- This closes the secondary side exhaust passage; however, primary side exhaust valve seat **D** remains open. No braking pressure is generated at either primary or secondary sides.

● When depressing brake pedal (braking pressure is generated)



Primary side

- As the brake pedal is depressed further (illustrated as brake pedal action **M**), primary piston **14** is forced down until it is seated on primary inlet valve **3**, closing exhaust valve seat **D**.
- Primary inlet valve **3** is forced down, compressing primary valve spring **4**, and supply valve seat **N** of body **5** separates from the primary inlet valve. The air in chamber **P** flows into chamber **E** and is fed to rear brake system **R** via discharge port **Q** as braking pressure.



Secondary side

- The air at the primary side flows into chamber **K** via passage port **L** of body **5**.
- The air fed into chamber **K** acts on the upper part of relay piston **6** to force down the relay piston and compress secondary valve spring **8**, forcing down secondary inlet valve **9**.
- This separates supply valve seat **T** and secondary inlet valve **9** of cover **7**.
- The air in supply port chamber **S** flows into chamber **J** and is fed to front brake system **U** via discharge port **Q** as braking pressure.

Lubricant

Location	Points of application	Kinds	Quantity
1, 3	Outer periphery of straight pin	High pressure-resistant, high abrasion-resistant grease [NLGI No.2 (Li soap)]	As required
9, 10	Pack between boot and plunger	High pressure-resistant, high abrasion-resistant grease [NLGI No.2 (Li soap)]	1 cm ³ {0.061 cu. in.}
10	Friction surfaces of plunger and other parts	High pressure-resistant, high abrasion-resistant grease [NLGI No.2 (Li soap)]	As required
—	Friction surface and groove of O-ring, friction surfaces of metals	Multipurpose grease [NLGI No.2 (Li soap)]	As required

Special tools

Location	Tool name and shape	Part No.	Application
21	Insert tool	*910-24461	Installation of O-ring
32	Retainer	*910-24590	Holding of primary piston

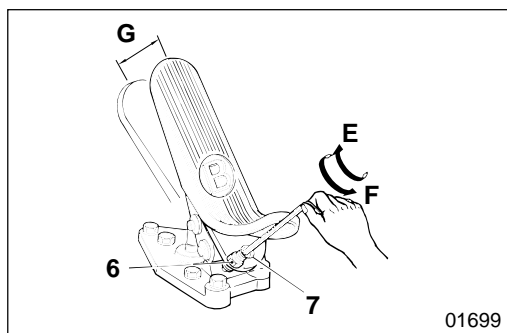
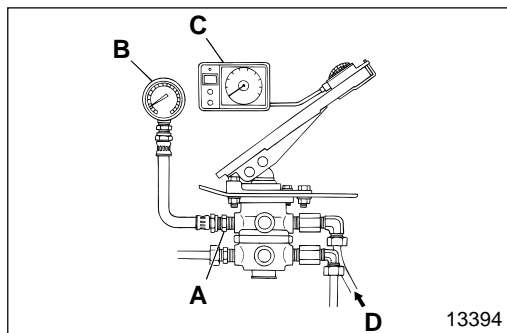
* : JIDOSHA KIKI part No.

◆ Service procedure

● Inspection of function after assembly

Check that the output air pressure, corresponding to the pedal depression angle, conforms to the specified value.

- Mount pressure gauge **B**, capable of measuring 980 kPa {142 lbf/in², 10 kgf/cm²} or more, on primary output side port **A**.
 - Mount depression gauge **C** on the brake pedal.
 - Apply air pressure of 685 kPa {100 lbf/in², 7 kgf/cm²} to primary input side port **D** and inspect related parts for air leakage.
 - If air leakage is found, do the following:
 - Tighten connectors.
 - Disassemble the dual brake valve and inspect the O-ring assemblies of all parts.
 - Turn set screw **7** and adjust brake pedal play **G** to the standard value.
 - Tighten lock nut **6** at specified torque to lock set screw **7**.
 - Read pressure gauge **B** and make sure that the primary output pressure and brake pedal depression force angle, corresponding to the brake pedal depression angle, conform to the standard values shown in the Input/Output characteristic curve diagram overleaf.
 - If the output air pressure is lower than the standard value, replace the following springs:
 - Spring **15**
 - Outer spring **29**
 - Inner spring **30**
- E** : Turning clockwise decreases the play (To decrease brake pedal depression angle)
F : Turning counterclockwise increases the play (To increase brake pedal depression angle)



T Tightening torque

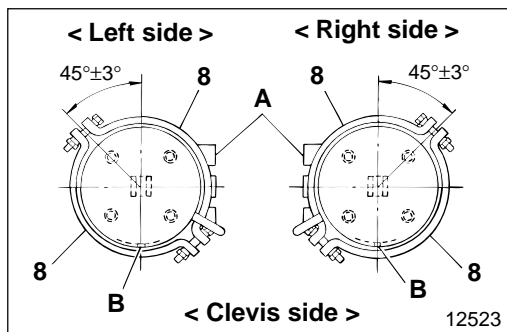
Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Screw (Holder mounting)	1.2±0.2 {0.9±0.18, 0.125±0.025}	—
6	Nut (Clevis fixing)	44±5 {33±3.6, 4.5±0.5}	—
7	Nut (Clamp tightening)	29.4±2.9 {22±2.2, 3.0±0.3}	—
17	Lock nut (Release bolt fixing)	41.7±2.5 {31±1.8, 4.25±0.25}	—
18	Bolt (Cylinder and bulkhead mounting)	13.7±3.9 {10±2.9, 1.4±0.4}	—
31	Follower	44±5 {33±3.6, 4.5±0.5}	—

L Lubricant and sealant

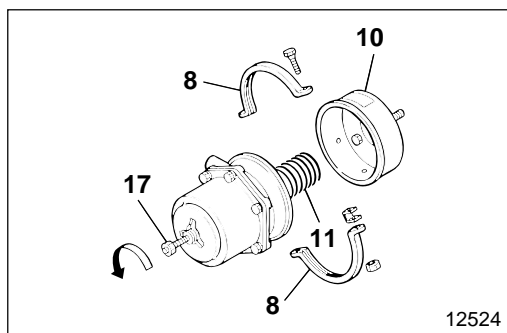
Location	Points of application	Kinds	Quantity
20	Interior of cylinder	Silicon grease	As required
24	Outer periphery of piston	Silicon grease	As required
27	Thread area of release bolt	Multipurpose grease [NLGI No.2 (Li soap)]	As required
31	Thread area of follower	LOCTITE 242	As required

◆ Service procedure



8 Points of clamp installation

- A : Service port
- B : Drain port



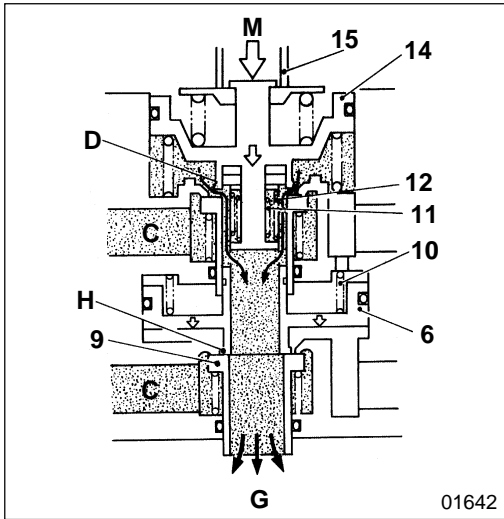
10 Removal of chamber

- Turn lock nut 17 in direction ➡ (counterclockwise) fully to compress spring 21.
- Remove clamp 8 and chamber 10.

WARNING ⚠

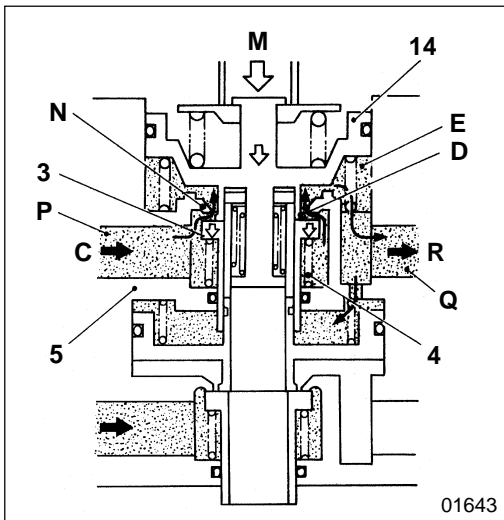
You must be careful when you remove the clamp, because spring 11 in chamber 10 can be forcibly ejected. To avoid this hazard, press down the chamber with your hand when you carry out the above work.

● When depressing brake pedal (before braking pressure is generated)



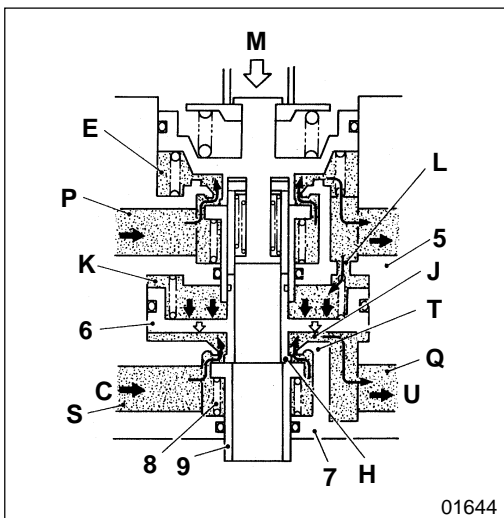
- Depressing the brake pedal (illustrated as pedal action **M**), forces down primary piston **14** via plunger **15**.
- Forcing down primary piston **14** changes the balance between the repercussive forces of inner spring **11** and outer spring **12**, and the repercussive force of relay piston spring **10**, forcing down relay piston **6**. This seats the relay piston on secondary inlet valve **9** and closes exhaust valve seat **H**.
- This closes the secondary side exhaust passage; however, primary side exhaust valve seat **D** remains open. No braking pressure is generated at either primary or secondary sides.

● When depressing brake pedal (braking pressure is generated)



Primary side

- As the brake pedal is depressed further (illustrated as brake pedal action **M**), primary piston **14** is forced down until it is seated on primary inlet valve **3**, closing exhaust valve seat **D**.
- Primary inlet valve **3** is forced down, compressing primary valve spring **4**, and supply valve seat **N** of body **5** separates from the primary inlet valve. The air in chamber **P** flows into chamber **E** and is fed to rear brake system **R** via discharge port **Q** as braking pressure.



Secondary side

- The air at the primary side flows into chamber **K** via passage port **L** of body **5**.
- The air fed into chamber **K** acts on the upper part of relay piston **6** to force down the relay piston and compress secondary valve spring **8**, forcing down secondary inlet valve **9**.
- This separates supply valve seat **T** and secondary inlet valve **9** of cover **7**.
- The air in supply port chamber **S** flows into chamber **J** and is fed to front brake system **U** via discharge port **Q** as braking pressure.

Lubricant

Location	Points of application	Kinds	Quantity
1, 3	Outer periphery of straight pin	High pressure-resistant, high abrasion-resistant grease [NLGI No.2 (Li soap)]	As required
9, 10	Pack between boot and plunger	High pressure-resistant, high abrasion-resistant grease [NLGI No.2 (Li soap)]	1 cm ³ {0.061 cu. in.}
10	Friction surfaces of plunger and other parts	High pressure-resistant, high abrasion-resistant grease [NLGI No.2 (Li soap)]	As required
—	Friction surface and groove of O-ring, friction surfaces of metals	Multipurpose grease [NLGI No.2 (Li soap)]	As required

Special tools

Location	Tool name and shape	Part No.	Application
21	Insert tool	*910-24461	Installation of O-ring
32	Retainer	*910-24590	Holding of primary piston

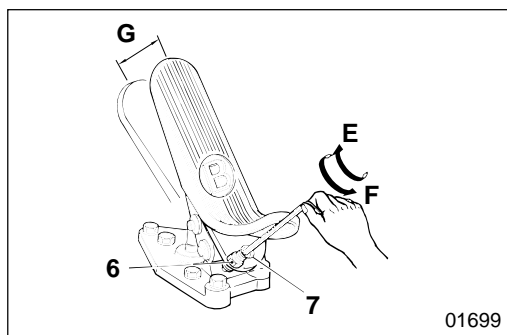
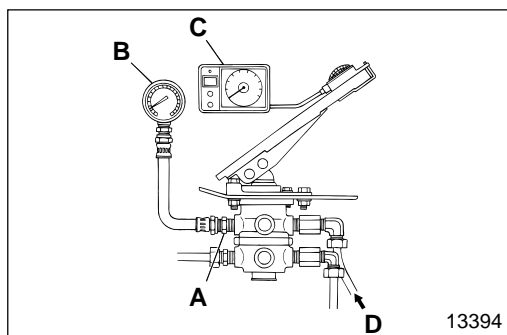
* : JIDOSHA KIKI part No.

Service procedure

Inspection of function after assembly

Check that the output air pressure, corresponding to the pedal depression angle, conforms to the specified value.

- Mount pressure gauge **B**, capable of measuring 980 kPa {142 lbf/in², 10 kgf/cm²} or more, on primary output side port **A**.
 - Mount depression gauge **C** on the brake pedal.
 - Apply air pressure of 685 kPa {100 lbf/in², 7 kgf/cm²} to primary input side port **D** and inspect related parts for air leakage.
 - If air leakage is found, do the following:
 - Tighten connectors.
 - Disassemble the dual brake valve and inspect the O-ring assemblies of all parts.
 - Turn set screw **7** and adjust brake pedal play **G** to the standard value.
 - Tighten lock nut **6** at specified torque to lock set screw **7**.
 - Read pressure gauge **B** and make sure that the primary output pressure and brake pedal depression force angle, corresponding to the brake pedal depression angle, conform to the standard values shown in the Input/Output characteristic curve diagram overleaf.
 - If the output air pressure is lower than the standard value, replace the following springs:
 - Spring **15**
 - Outer spring **29**
 - Inner spring **30**
- E** : Turning clockwise decreases the play (To decrease brake pedal depression angle)
F : Turning counterclockwise increases the play (To increase brake pedal depression angle)



T Tightening torque

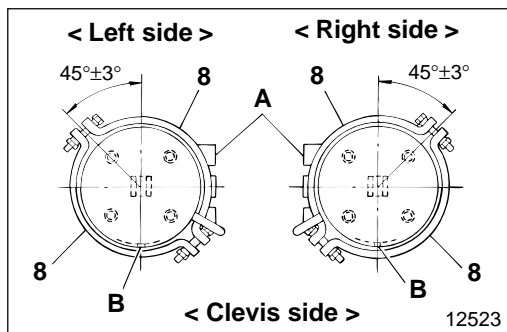
Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
1	Screw (Holder mounting)	1.2±0.2 {0.9±0.18, 0.125±0.025}	—
6	Nut (Clevis fixing)	44±5 {33±3.6, 4.5±0.5}	—
7	Nut (Clamp tightening)	29.4±2.9 {22±2.2, 3.0±0.3}	—
17	Lock nut (Release bolt fixing)	41.7±2.5 {31±1.8, 4.25±0.25}	—
18	Bolt (Cylinder and bulkhead mounting)	13.7±3.9 {10±2.9, 1.4±0.4}	—
31	Follower	44±5 {33±3.6, 4.5±0.5}	—

L Lubricant and sealant

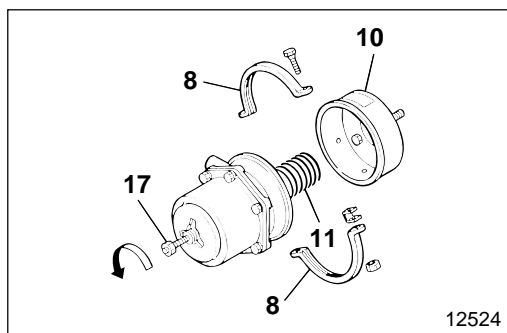
Location	Points of application	Kinds	Quantity
20	Interior of cylinder	Silicon grease	As required
24	Outer periphery of piston	Silicon grease	As required
27	Thread area of release bolt	Multipurpose grease [NLGI No.2 (Li soap)]	As required
31	Thread area of follower	LOCTITE 242	As required

◆ Service procedure



8 Points of clamp installation

- A : Service port
- B : Drain port



10 Removal of chamber

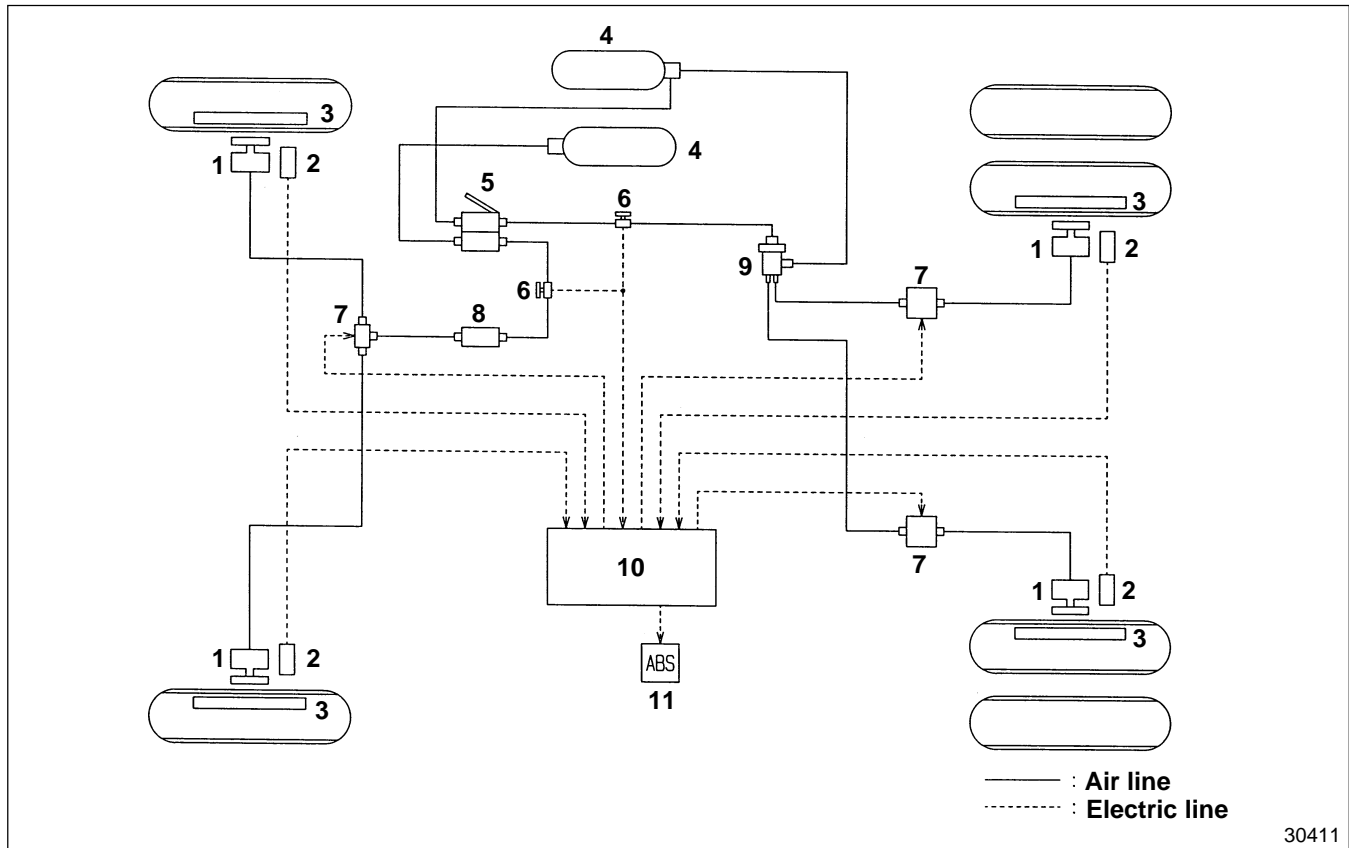
- Turn lock nut 17 in direction ➡ (counterclockwise) fully to compress spring 21.
- Remove clamp 8 and chamber 10.

WARNING ⚠

You must be careful when you remove the clamp, because spring 11 in chamber 10 can be forcibly ejected. To avoid this hazard, press down the chamber with your hand when you carry out the above work.

Schematic system diagram

<Full-air brake>



30411

- | | |
|----------------------|--|
| 1 Brake chamber | 7 Control valve |
| 2 Wheel speed sensor | 8 Quick release valve |
| 3 Rotor | 9 Relay valve |
| 4 Air tank | 10 Electronic control unit |
| 5 Dual brake valve | 11 Anti-lock brake system warning lamp |
| 6 Stop lamp switch | |

- Anti-lock brake system uses wheel speed sensors **2** and Electronic control unit **10** to monitor the rotating speed of wheels. When the wheel speed exceeds the preset deceleration speed or slip rate, the Electronic control unit detects it as a wheel lockup tendency and activates control valves **7** to reduce air pressure inside brake chambers **1**. This decreases the braking force and prevents wheel lockup. Then, when the wheel speed increases, the wheel speed sensors send signals to the control valves by way of the Electronic control unit to increase air pressure in the brake chambers to augment the braking force.
- This control cycle is repeated to prevent wheel lockup on slippery pavements and ensure the vehicle's directional stability during braking. The 4-sensor 3-channel Anti-lock brake system uses four wheel speed sensors **2**, which are located at the front and rear wheels, to control each of the four wheels. For the front wheels, the control function is integrated for the left and right wheels.

Diagnosis code	Possible cause
91	Rear-axle right-wheel control valve: Short-circuit of outlet valve to positive (+) wire
92	Rear-axle right-wheel control valve: Short-circuit of outlet valve to grounding wire
93	Rear-axle right-wheel control valve: Broken wire in outlet valve
94	Rear-axle right-wheel control valve: Broken grounding wire
95	Rear-axle right-wheel control valve: Short-circuit of holding valve to positive (+) wire
96	Rear-axle right-wheel control valve: Short-circuit of holding valve to grounding wire
97	Rear-axle right-wheel control valve: Broken wire in holding valve
99	Control valve grounding 1: Short-circuit to positive (+) wire
9A	Control valve grounding 1: Short-circuit to negative (-) wire
D1	Electronic control unit internal damage
D2	Electronic control unit internal damage
D3	Electronic control unit internal damage
D4	Electronic control unit internal damage
D5	Electronic control unit internal damage
E1	Control valve power supply voltage 1: Overvoltage
E2	Control valve power supply voltage 1: Low voltage
E3	Control valve power supply voltage 1: Broken wire
E4	Control valve grounding 1: Broken wire
E5	Control valve power supply voltage 2: Overvoltage
E6	Control valve power supply voltage 2: Low voltage
E7	Control valve power supply voltage 2: Broken wire
E8	Control valve grounding 2: Broken wire
E9	Electronic control unit power supply voltage: Overvoltage
EA	Electronic control unit power supply voltage: Low voltage
EB	Excessive voltage difference between control valve power supply voltages 1 and 2
F1	Exhaust brake cut relay: Short-circuit to positive (+) wire, broken wire
F2	Exhaust brake cut relay: Short-circuit to grounding wire
F5	Wheel arrangement error: Excessive wheel speed difference between front and rear wheels
F6	Wheel arrangement error: Wheel speed difference between front and rear wheels exceeding allowed range
FC	Wheel speed sensor abnormality generated previously. (*2)

*1: Configuration error (mismatch between vehicle system and Electronic control unit system)

*2: When a wheel speed sensor abnormality is generated in the previous driving operation, this diagnosis code is output. When this diagnosis code is generated, the **ABS** warning lamp does not turn off two seconds after the starter switch is turned on. However, if the wheel speed sensor is restored to its proper condition, the **ABS** warning lamp turns off and this diagnosis code is reset when the vehicle is operated at a speed of 10 km/h {6.2 mph} or faster.

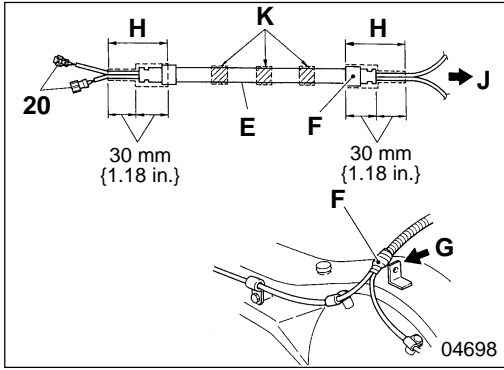
NOTE

Alphabetic letters in the diagnosis codes indicate the following lighting cycles. A: 10, B:11, C: 12, D: 13, E: 14, F: 15

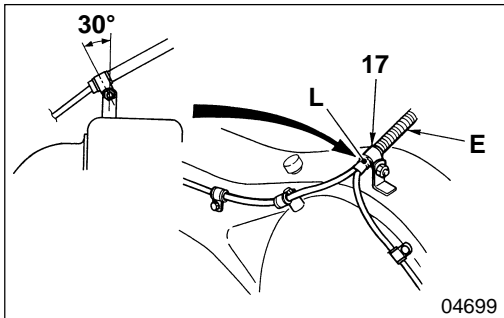
(Example) Diagnosis code: **8 A**



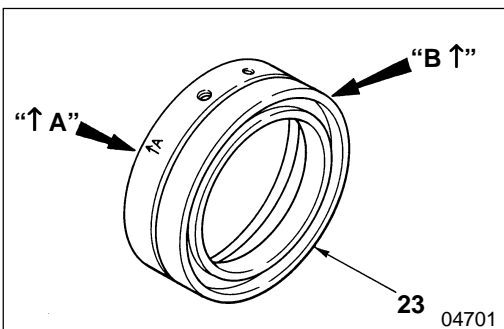
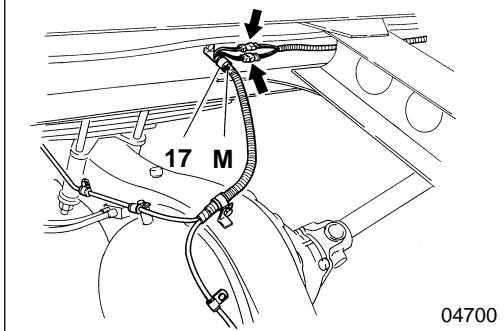
Diagnosis code 8A indicates that the indication lights eight times first, then 10 times.



- Binding of harness
 - Gather the harnesses of left and right wheel speed sensors **20**, and bind with corrugated tube **E**.
 - Adjust the position of the corrugated tube **E** so that white tape section **F** is located at clip position **G** on the rear axle housing. Then, turn the corrugated tube so that the slit faces down. Wrap black tape (electric harness tape) on both ends **H** of the corrugated tube. The tape should be placed over the tube end and harness.
 - J**: Rear axle housing side
 - Wrap tape on the harnesses of wheel speed sensors **20** at sections **K** (three locations at equal intervals).

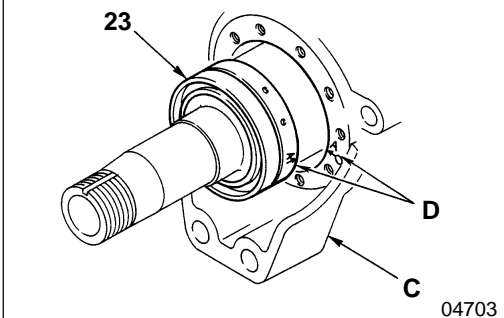


- Clamping of harness
 - Position section **L** of corrugated tube **E** so that it forms a 30° angle with clip **17**, then secure it to the rear axle housing.
 - Secure section **M** of the corrugated tube to the frame using the clip.
 - Connect the wheel speed sensor connector to the harness connector on the chassis side.



23 Installation of oil seal retainer

- Oil seal retainer **23** is stamped with identification marks "**A**", "**B**" and "↑" at the locations indicated in the diagram.
 - A**: For left wheel
 - B**: For right wheel
 - ↑: For position alignment



- Check the identification mark ("**A**" or "**B**") to select the proper part. Align the arrow mark on the oil seal retainer with arrow mark **D** of anchor bracket **C**.

(2) Operating conditions resulting from Anti-lock brake system malfunction

Lamp condition	Possible causes		Fail-safe functions (operation in the case of malfunction)
<p>[ABS] warning lamp not turn off two seconds after starter switch is turned on.</p> <p>① [ABS] warning lamp lights when starter switch is turned to ON position, does not turn off two seconds after starter switch is turned on.</p> <p>② [ABS] warning lamp lights during driving.</p> <p>③ [ABS] warning lamp lights after 30 to 60 minutes regardless of whether vehicle is driven or stationary.</p>	<p>Power supply system (Lamp condition: ①, ②)</p> <p>Wheel speed sensor system</p> <p>Control valve system (Lamp condition: ①, ②)</p> <p>Control valve</p> <p>Electronic control unit (Lamp condition: ①, ③)</p> <p>[ABS] warning lamp system (Lamp condition: ①, ②)</p>	<p>Faulty relay (for power supply) inside Electronic control unit</p> <p>Blown fuse</p> <p>Broken wire in harness, short-circuit or disconnected connector, faulty contact or faulty grounding</p> <p>Low battery voltage</p> <p>Excessive clearance between wheel speed sensor and rotor (Lamp condition: ②)</p> <p>Defective wheel speed sensor (Lamp condition: ①, ②)</p> <p>Broken wire, short-circuit or disconnected connector or faulty contact in wheel speed sensor harness (Lamp condition: ①, ②)</p> <p>Short-circuit in coil or power-supply side of harness</p> <p>Defective relay (for power supply) inside Electronic control unit</p> <p>Broken wire or short-circuit in coil or harness</p> <p>Electronic control unit internal malfunction or disconnected connector</p> <p>Short-circuit in harness</p>	<p>Anti-lock brake system control becomes inactive for all systems, and all wheels operate under normal brake system.</p> <ul style="list-style-type: none"> When malfunction occurs in one front wheel Properly operating front wheel speed sensor of the other front wheel is used for Anti-lock brake system control of the wheel with malfunctioning sensor. When malfunction occurs in both front wheels Anti-lock brake system control is deactivated for front wheels. When malfunction occurs in one rear wheel Anti-lock brake system control is provided only to the rear wheel with properly operating sensor. <p>Anti-lock brake system control becomes inactive for all systems, and all wheels operate under normal brake system.</p> <p>Only the properly operating control valves are used for Anti-lock brake system control.</p> <p>Anti-lock brake system control becomes inactive for all systems, and all wheels operate under normal brake system.</p> <p>Anti-lock brake system control operates normally.</p>

Service standards

Unit : mm {in.}

Location	Maintenance item	Standard value	Limit	Remedy	
11	Wobbling of rotor	0.1 {0.0039}	—	Replace	
17	Wheel speed sensor	Resistance between terminals	950 to 1450	—	Replace
		Insulation resistance	1M or higher	—	Replace

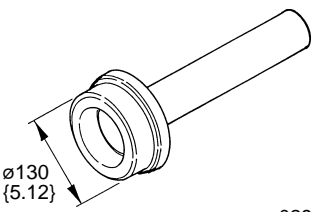
Tightening torque

Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
15	Bolt (Clip mounting)	44±9.8 {33±7.2, 4.5±1.0}	—
19	Bolt (Bracket mounting)	41.2±7.8 {30±5.8, 4.2±0.8}	—

Special tools

Unit : mm {in.}

Location	Tool name and shape	Part No.	Application
12	ABS oil seal installer 	MH062609 02968	Press-fitting of oil seal

Service procedure

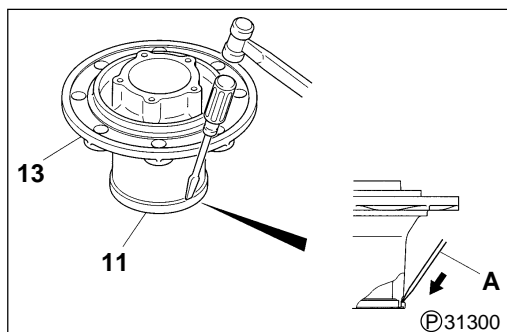
11 Rotor

[Removal]

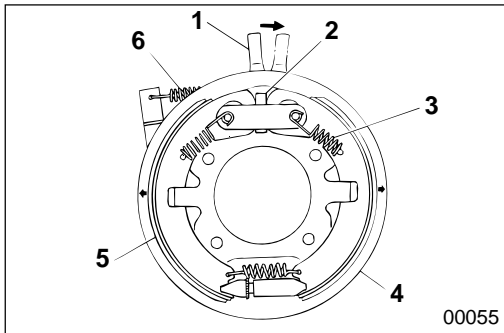
Strike the outer edge of rotor 11 evenly with flat-tip screwdriver A to remove the rotor from the wheel hub.

CAUTION ⚠

Be careful not to damage wheel hub 13.



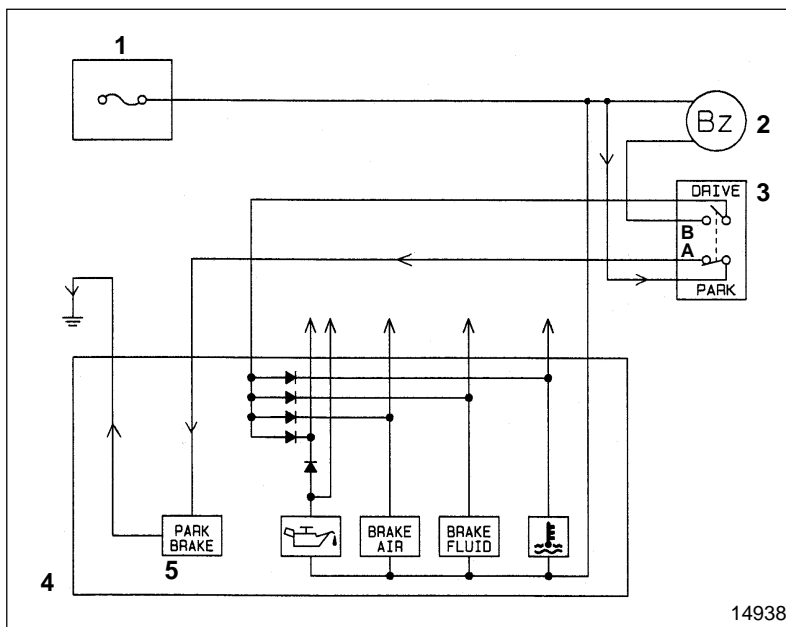
Parking Brake Assembly < Dual-servo Type >



- 1 Camshaft lever
- 2 Camshaft
- 3 Shoe return spring
- 4 Brake drum
- 5 Shoe and lining assembly
- 6 Camshaft lever return spring

Pulling the parking brake lever pulls the parking brake cable, which in turn pulls camshaft lever 1. At the same time, camshaft 2 rotates in conjunction with the camshaft lever, and expands shoe and lining assembly 5 making it press against brake drum 4. This frictional force locks the propeller shaft that is connected to the drum. When the brake lever is released, the repercussive force of shoe return spring 3 releases the brake.

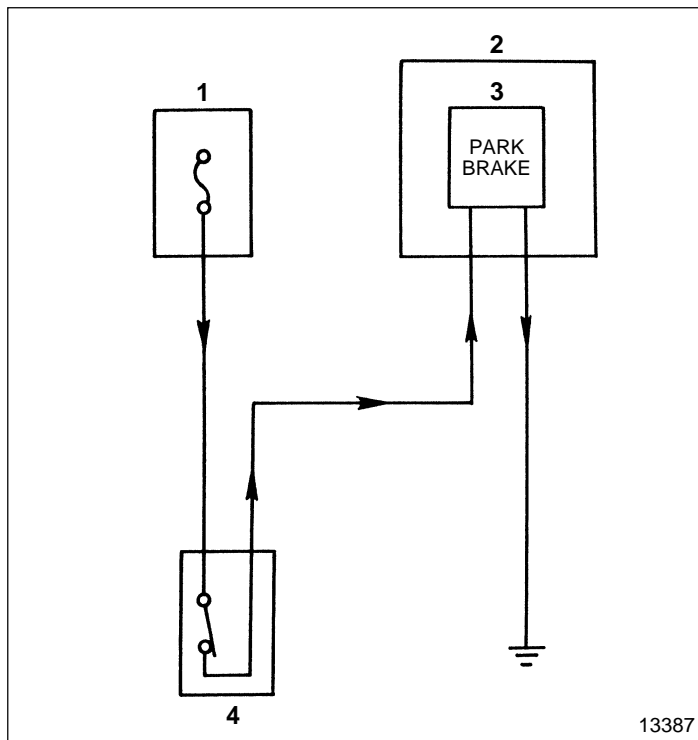
Parking Brake System Electric Circuit



- 1 Relay and fuse box
- 2 Buzzer
- 3 Parking brake switch
- 4 Meter cluster
- 5 Parking brake indicator lamp

- The parking brake system electrical circuit is provided for indicating, its detecting and indicating function is activated by pulling the parking brake lever.
- When the parking brake lever is pulled, contact point A of parking brake switch 3 closes (ON), and parking brake indicator lamp 5 is lit, indicating that the parking brake is operating.
The current flows as below:
Fuse 1 → Parking brake switch 3 → Parking brake indicator lamp 5 → Ground
- Buzzer 2 sounds and gives a warning when any fault is detected in the engine oil pressure system, brake system or cooling system. Pulling the parking brake lever opens (OFF) contact point B of parking brake switch 3 to stop the buzzer from sounding.

Parking Brake System Electric Circuit



- 1 Fuse
- 2 Meter cluster
- 3 Parking brake indicator lamp
- 4 Parking brake switch

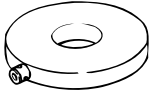
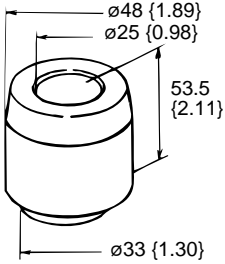
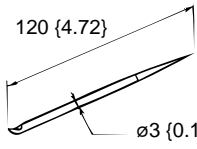
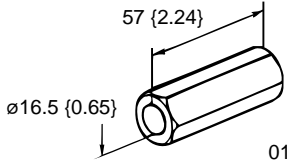
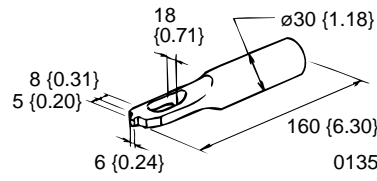
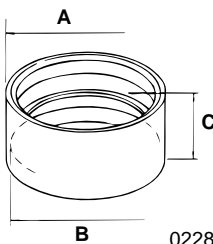
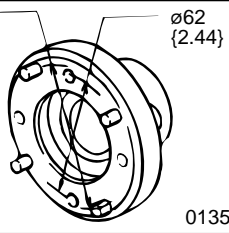

Operating the parking brake turns on parking brake switch 4 and lights parking brake indicator lamp 3. The current flows as below:

Fuse 1 → Parking brake switch 4 → Parking brake indicator lamp 3 → Ground

TROUBLESHOOTING

Possible causes		Symptoms		Remarks
		Parking brake does not work	Parking brake does not release	
Parking control valve	Malfunctioning	<input type="radio"/>	<input type="radio"/>	
Spring brake valve	Malfunctioning	<input type="radio"/>	<input type="radio"/>	
Brake chamber	Malfunctioning	<input type="radio"/>	<input type="radio"/>	Gr 35B
Wheel brake	Malfunctioning	<input type="radio"/>	<input type="radio"/>	Gr 35B
Air line	Air leaking		<input type="radio"/>	
	Air pressure low		<input type="radio"/>	

Unit : mm {in.}

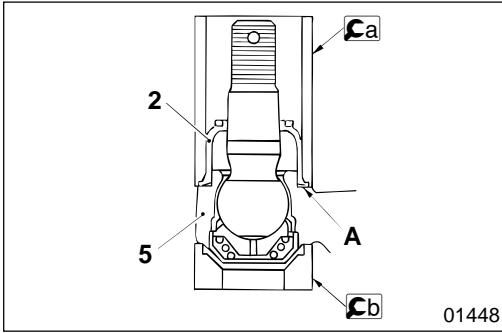
Location	Tool name and shape	Part No.	Application												
8, 15, 17	Inserting tool assembly 	MC811971 *910-11001 01356	Forming of backup ring and press-fitting of oil seal												
8, 17	Inserting tool 	MC811974 *910-21715 01358	Forming of backup ring												
10, 27, 28, 34, 40, 44, 45, 46, 47	Needle 	MC811948 *910-21200 02288	Removal of O-ring and seal ring												
12	Bar 	MC811955 *910-22811 01360	Turning of retainer												
	Squeeze tool 	MC811950 *910-21801 01359	Caulking of retainer												
27	Inserting tool <table border="1" data-bbox="300 1354 576 1501"> <thead> <tr> <th>Part No.</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>MC813516 *910-21718</td> <td>ø98 {3.86}</td> <td>ø90.05 {3.55}</td> <td>50 {1.97}</td> </tr> <tr> <td>MC811985 *910-21701</td> <td>ø110 {4.33}</td> <td>ø103 {4.06}</td> <td>37 {1.46}</td> </tr> </tbody> </table> 	Part No.	A	B	C	MC813516 *910-21718	ø98 {3.86}	ø90.05 {3.55}	50 {1.97}	MC811985 *910-21701	ø110 {4.33}	ø103 {4.06}	37 {1.46}	MC813516 *910-21718 < FK617, FM617 > MC811985 *910-21701 < FM656 > 02289	Forming of piston seal ring
Part No.	A	B	C												
MC813516 *910-21718	ø98 {3.86}	ø90.05 {3.55}	50 {1.97}												
MC811985 *910-21701	ø110 {4.33}	ø103 {4.06}	37 {1.46}												
30	Wrench assembly 	MC811970 *910-10743 01357	Removal and installation of adjusting plug assembly												
	Attachment (A : Adapter) (B : Bolt) 	MC811969 *910-10671 (A : *910-23581) (B : *910-23194) 02290	Holding down of valve housing												

* JIDOSHA KIKI part No.

TROUBLESHOOTING

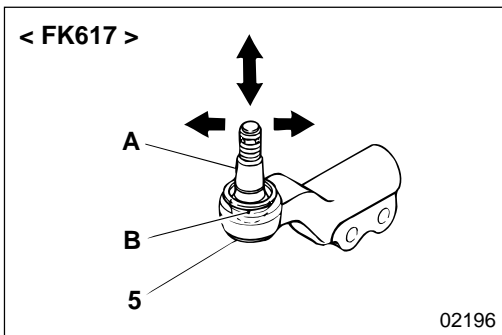
Symptoms		Possible causes											Remarks			
		Steering wheel operation heavy	Steering wheel play excessive and unstable	Steering wheel pulls to one side	Steering wheel vibration	Steering wheel self-return poor	Steering wheel does not turn	Steering angle insufficient or difference between right and left	Fluid leaking	Oil pump fluid pressure abnormal	Oil pump gurgles	Oil pump squeaks		Oil pump growls		
Other malfunctions	Load too far forward of load-carrying platform	<input type="radio"/>														
	Load too far rearward of load-carrying platform		<input type="radio"/>													
	Load too far to one side of load-carrying platform			<input type="radio"/>												
	Leaf spring fatigued or cracked			<input type="radio"/>												Gr 33
	Braking force unbalanced			<input type="radio"/>												Gr 35 A, B
	Tire wear difference between left and right excessive			<input type="radio"/>												Gr 31
	Tire outer diameter difference between left and right			<input type="radio"/>												
	Front tire radial and lateral runout, static balance or dynamic balance faulty				<input type="radio"/>											
	Wheelbase difference between left and right excessive			<input type="radio"/>												
	Propeller shaft runout excessive				<input type="radio"/>											Gr 25
	Rear axle housing bent			<input type="radio"/>												Gr 27
	Reduction pinion and gear damaged or engaged incorrectly				<input type="radio"/>											

TIE ROD ASSEMBLY



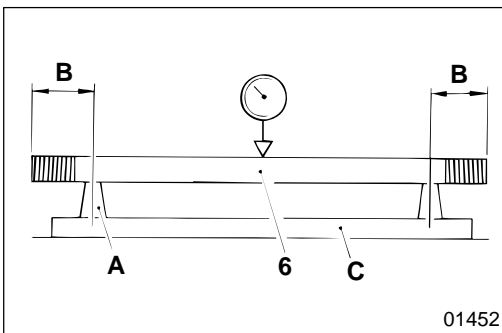
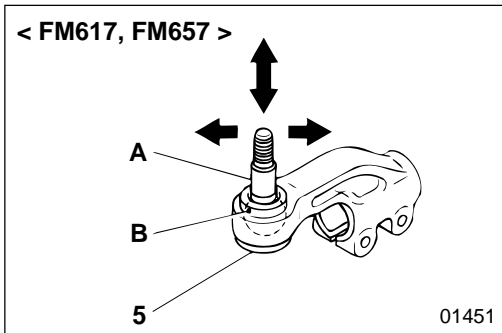
2 Installation of dust cover < FM617, FM657 >

- Place dust cover 2 on tie rod end assembly 5.
- Hold tie rod end assembly 5 between Ca dust cover installer and Cb end cover.
- Using a vise, press-fit dust cover 2 onto tie rod end assembly 5 so as the dust cover is perpendicular to the tie rod end assembly, and reinforcing ring A is in close contact with the tie rod end assembly.



5 Inspection of tie rod end assembly

Move ball stud area A of tie rod end assembly 5 vertically and horizontally to make sure that there is no play. Also, check that ball section B moves evenly. If any fault is found, replace the tie rod end assembly.



6 Bend of tie rod

Measure the bend of tie rod 6 at the center point. If the measured value exceeds the limit, correct or replace the tie rod.

NOTE

To measure the deflection of tie rod 6, turn it one full rotation and read the dial gauge indicator. The deflection is one half of the indicated value.

- A : V-block
- B : Approximately 300 mm {11.8 in.} < FK617 >
Approximately 250 mm {9.84 in.} < FM617, FM657 >
- C : Surface plate

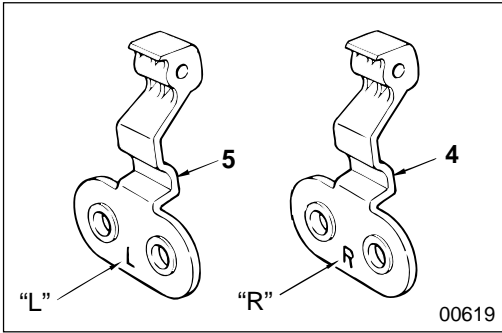
Cab as a Whole

Possible causes		Symptoms						Remarks
		Cab shimmy (pitching and rolling vibration)	Cab or steering wheel high-frequency vibration (above 20 Hz) or noise	Cab cannot be tilted up	Cab cannot be locked to rear mounting post	Cab tilt warning lamp does not light	Cab tilt warning lamp does not go out	
Cab-related	Cab mounting loose or play	○						
	Front rubber, rear rubber deteriorated		○					
	Cab mounted incorrectly		○					
	Main hook from hook pin bracket does not release			○				
	L-lever release faulty			○				
	Torsion bar damaged or fatigued			○				
	Torsion bar arm installation position incorrect			○				
	Main hook not hooked to hook pin bracket				○			
	Bottom bracket contact with cushion incorrect				○			
	Cab tilt lock switch adjusted incorrectly					○	○	
	Cab tilt lock switch faulty					○	○	
	Cab tilt warning lamp bulb burnt-out					○		
	Fuse, high-current fuse blown					○		
	Wiring broken or connection faulty					○		
Engine-related	Crossed axes angle of propeller shaft excessive due to increased tilt caused by deteriorated engine mounting		○					☞ Gr 10
	Engine installation faulty		○					
	Intake and exhaust system installation faulty		○					
Transmission-related	Transmission installation faulty		○					☞ Gr 22A, Gr 22B, Gr 23
Propeller shaft-related	Propeller shaft run-out excessive		○					☞ Gr 25
	Universal joint worn excessively		○					
	Slip yoke joint spline play		○					
	Center bearing play excessive		○					
	Crossed axes angle of mounting dimension excessive due to deteriorated center bearing cushion rubber, etc.			○				
	Crossed axes angle of propeller shaft excessive due to increased tilt of drive axis caused by overloading		○					

◆ Service procedure

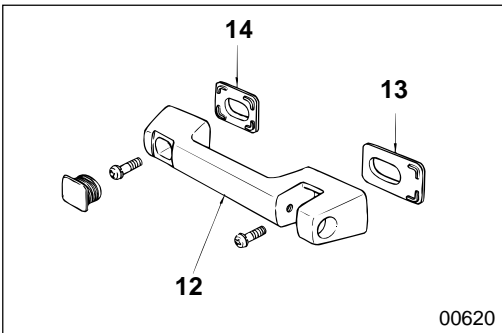
4 5 Installation of front panel hinge RH and LH

Front panel hinge RH 4, LH 5 can be distinguished by "L" and "R" identification marks.



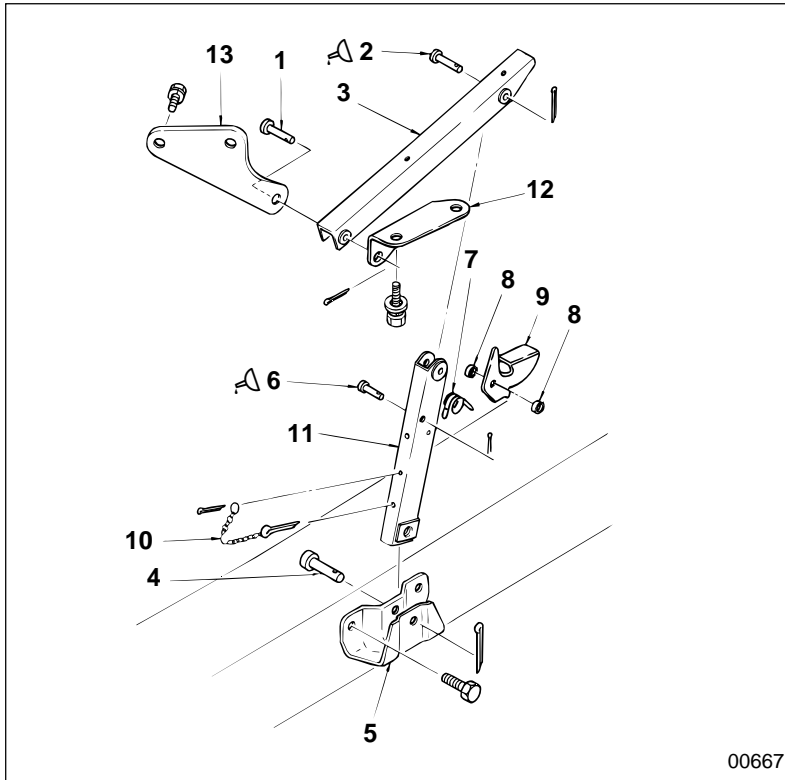
13 14 Installation of packing A and packing B

Install packing A 13 and packing B 14 on front grip 12 in the direction as illustrated.



CAB TILT LINK

Cab Stay



● Disassembly sequence

- 1 Clevis pin
- 2 Clevis pin
- 3 Stay
- 4 Clevis pin
- 5 Lower bracket
- 6 Clevis pin
- 7 Return spring
- 8 Spacer
- 9 Locking latch
- 10 Chain
- 11 Stay
- 12 Upper bracket
- 13 Upper bracket

● Assembly sequence

Follow the disassembly sequence in reverse.

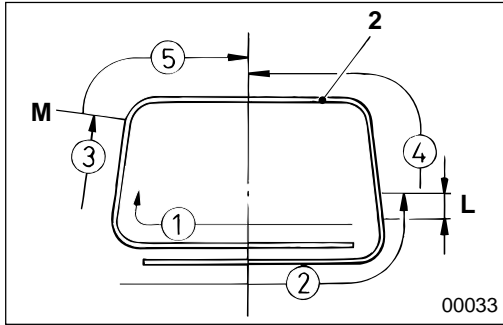
WARNING

You must use a hoist to support the cab when you remove the cab stay assembly.

Lubricant

Location	Points of application	Kinds	Quantity
2, 6	Clevis pin	Chassis grease [NLGI No. 1 (Ca soap)]	As required

WINDOW GLASS



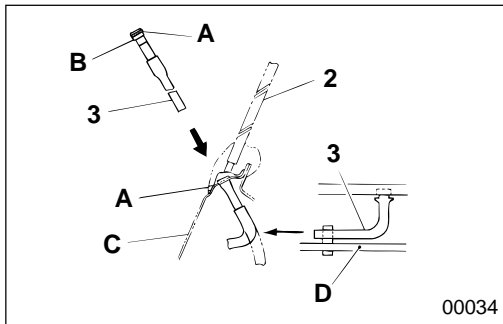
- Pull cord **F** in the numbered order as illustrated and at the same time have someone push windshield **2** into weatherstrip **1**, tapping the windshield with a rubber-headed mallet.

L : approximately 100 mm {3.94 in.} from the starting point of the straight section

M : up to the end of the straight section

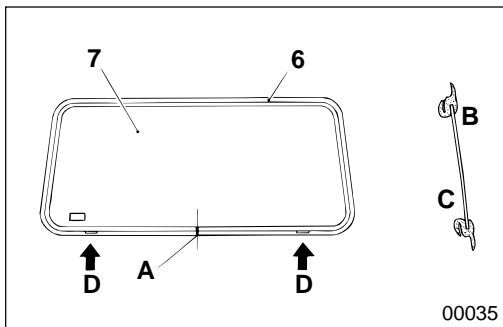
CAUTION ⚠

Make sure that windshield 2 is installed correctly into the cab before hitting the windshield with the rubber-headed mallet, otherwise the windshield might be broken.



3 Installation of drain hose

- Fill the area around the flange of drain hose **3** with sealant **A**, and press the drain hose in until its flared area **B** fits into cab **C**. Carefully smooth down excess sealant that is squeezed out so that the hose opening is not clogged.
- Secure drain hose **3** at the middle of the vehicle together with windshield washer hose **D**.



6 7 Weatherstrip and rear window glass

- Install so that joint **A** of weatherstrip **6** is at the bottom center of rear window glass **7**.

B : Outside

C : Inside

D : Drain hole

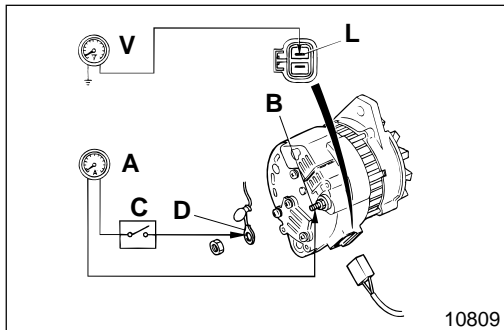
- Except for the point mentioned above, follow the same service procedure as for installation of the windshield.

📖 P42-71

Inspection of Regulator

Service standards

Location	Maintenance item	Standard value	Limit	Remedy
—	Adjustment voltage of regulator	14.7±0.3 V	—	Replace



- Connect the meters to the alternator as illustrated.
- **A** : Ammeter (100 amperes class)
- **B** : Terminal B on alternator
- **C** : Switch
- **D** : Terminal
- **L** : Terminal L on alternator
- **V** : Voltmeter

WARNING

- **Terminal D is always loaded with voltage from the battery.**
- **You must handle terminal D carefully, it will short-circuit if it touches any part other than terminal B on the alternator.**

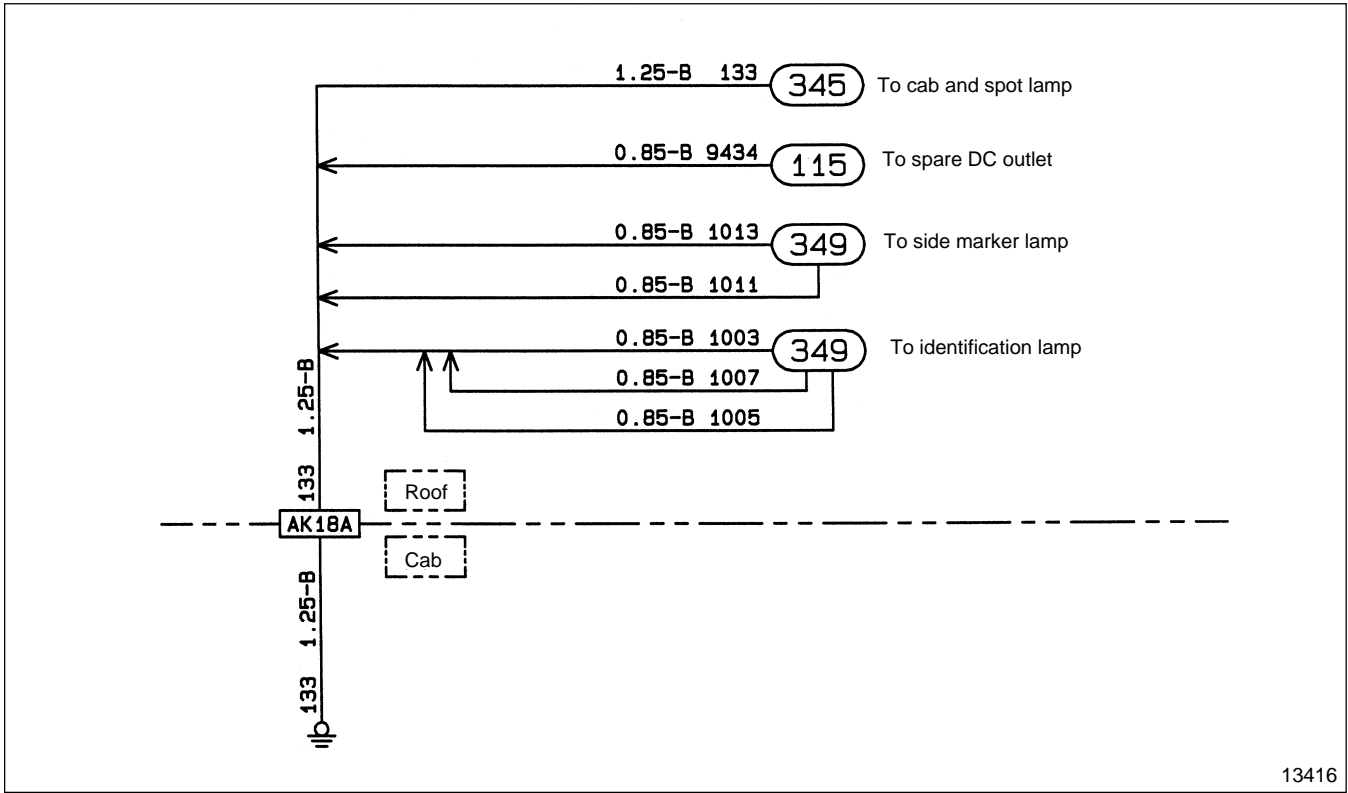
- Turn switch **C** ON and make sure that voltmeter **V** indicates 0 volt.
- If the needle of voltmeter **V** oscillates, something is wrong with the alternator or the wiring.
- Turn switch **C** OFF and start the engine.

CAUTION

Do not start the engine with switch C turned ON because the starter current will flow into ammeter A and damage it.

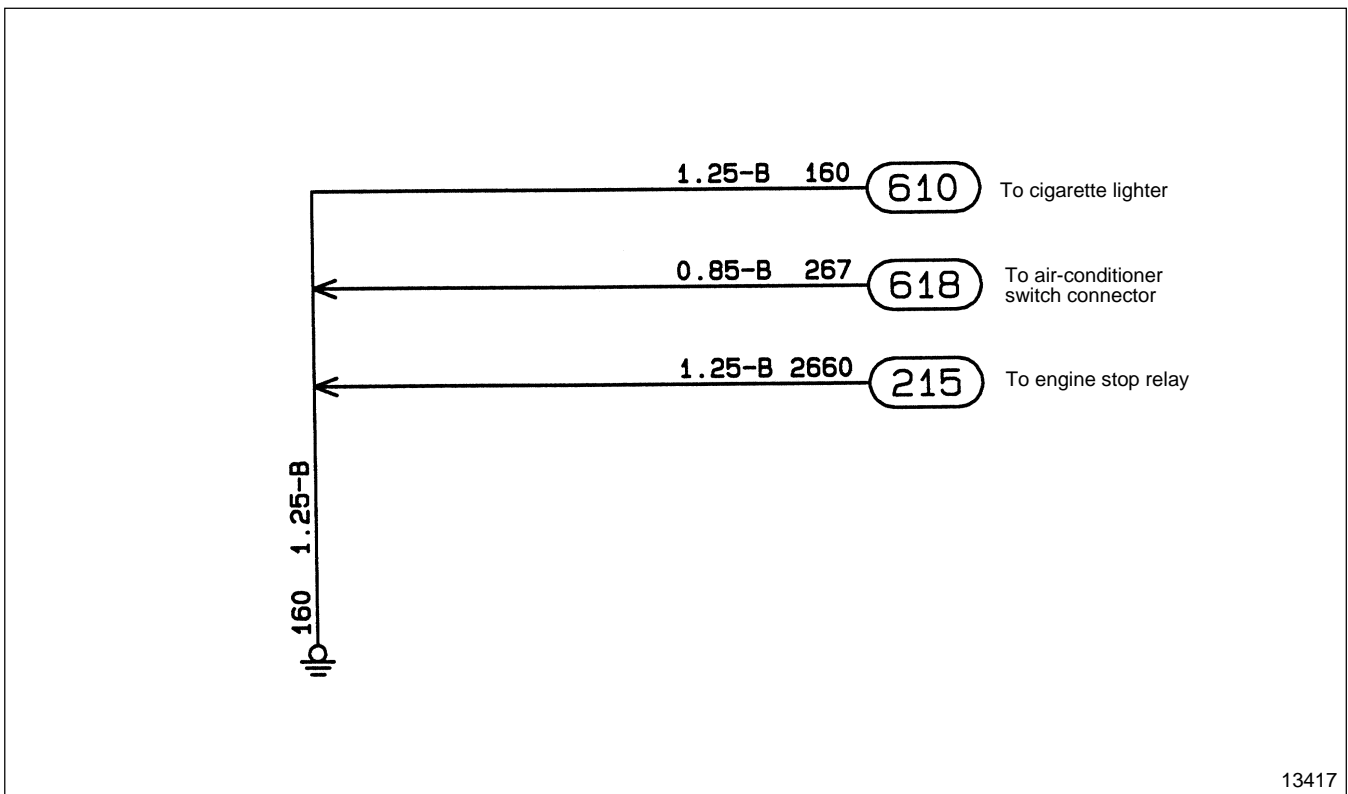
- If the charge current is five amperes or less and the engine speed is approximately 2420 rpm, measure the adjustment voltage.
- If the charge voltage is five amperes or more, do one of the following :
 - Run the engine for a while to charge the battery.
 - Replace the old battery with a fully-charged one.
 - Connect a $\frac{1}{4} \Omega$ (25 W) resistor in series with the battery to limit the charge current.
- If the measured value deviates from the standard value, change the regulators.

Circuit 133 Cab Ground



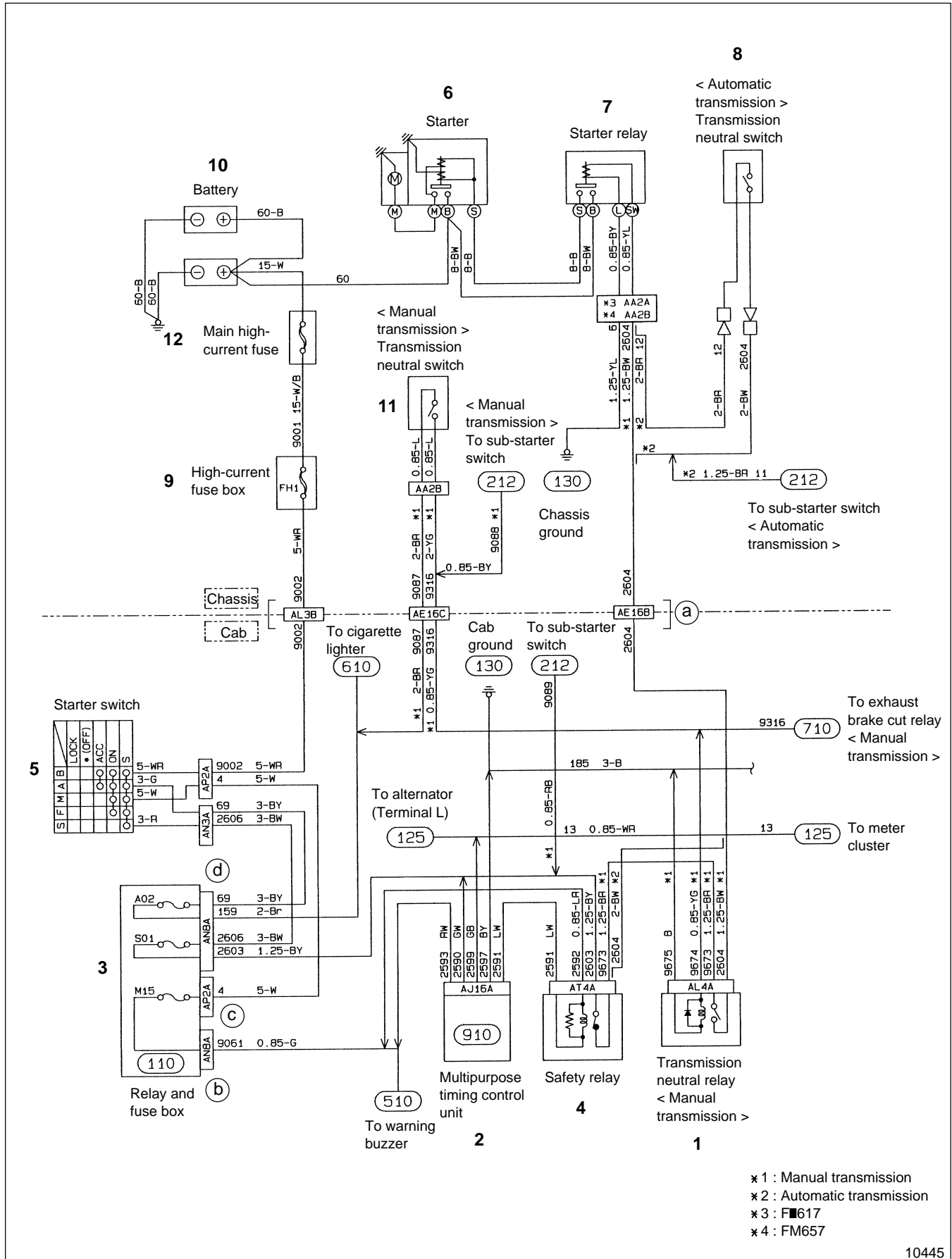
13416

Circuit 160 Cab Ground

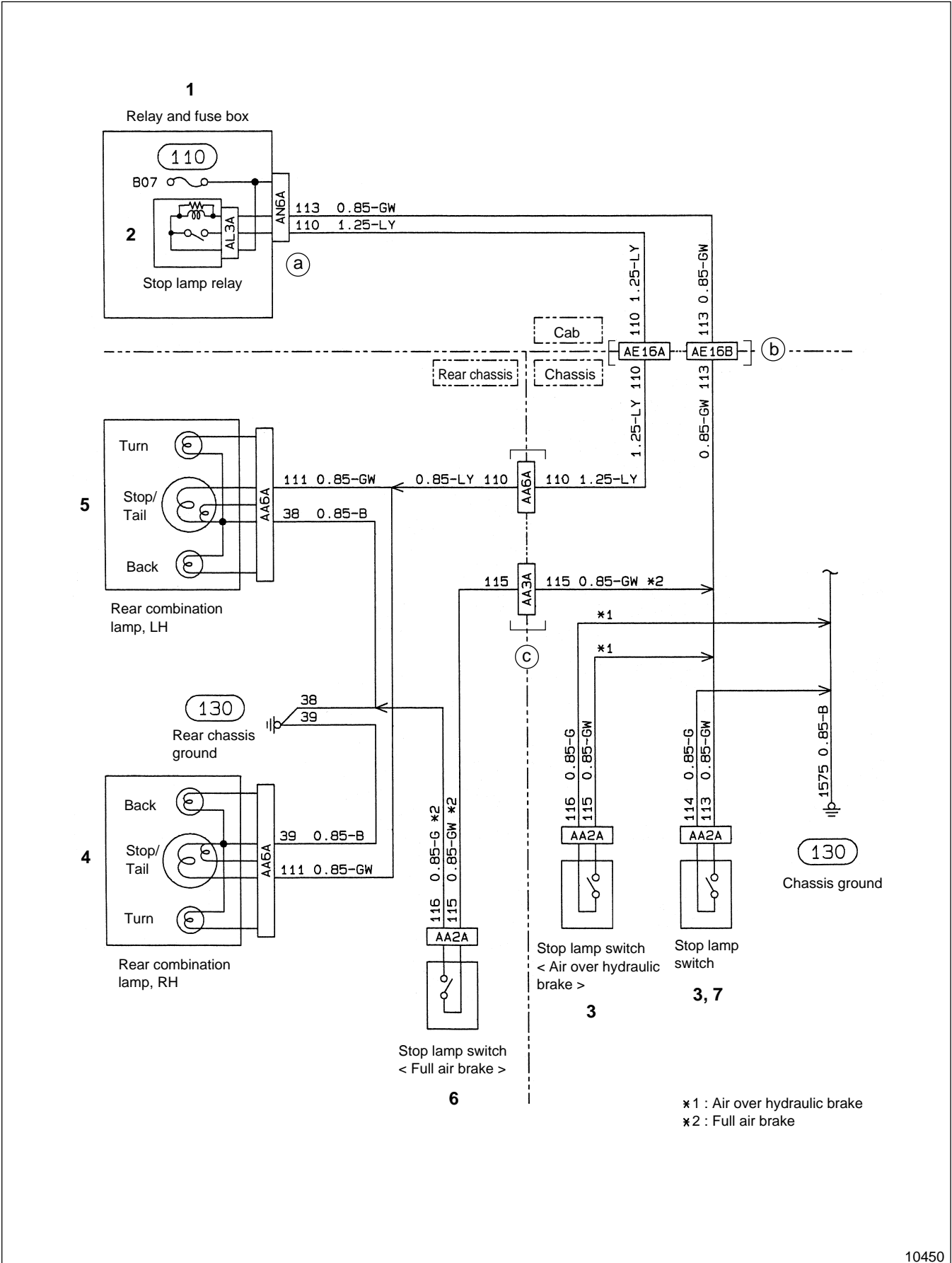


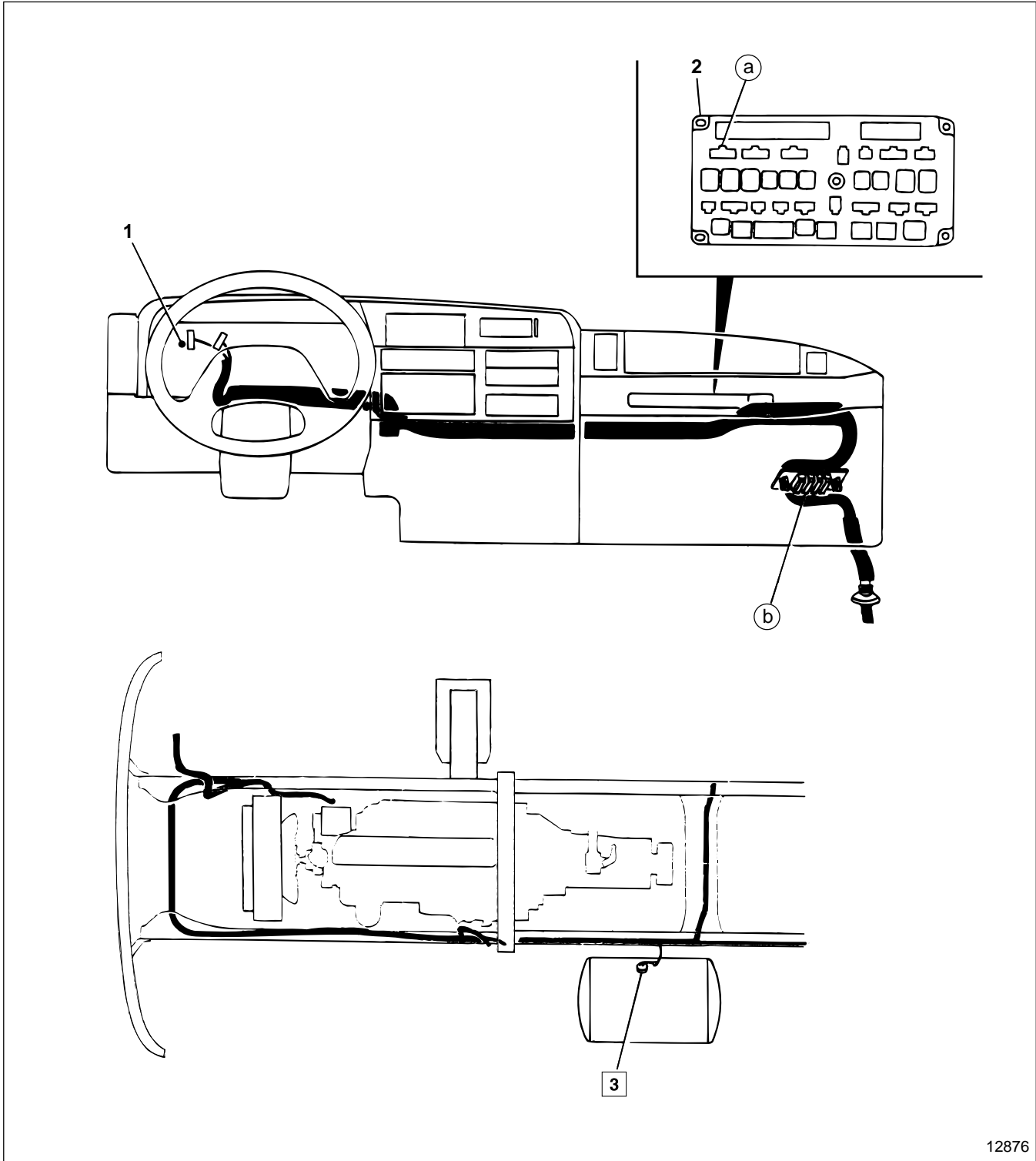
13417

210 ENGINE STARTING CIRCUIT



325 STOP LAMP CIRCUIT





12876

- 1 Meter cluster (401)
- 2 Relay and fuse box (104)
- 3 Fuel gauge unit


547 AUTOMATIC TRANSMISSION FLUID TEMPERATURE WARNING CIRCUIT

Service standards

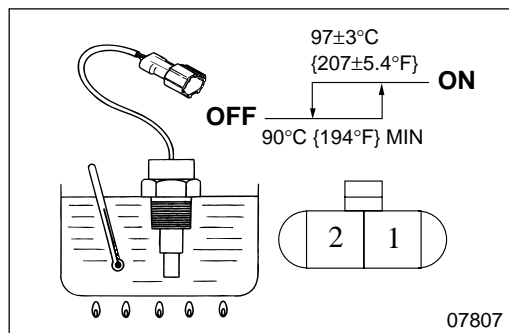
Location	Maintenance item	Standard value	Limit	Remedy	
7	Operating temperature of automatic transmission fluid thermostat switch	When increases (OFF→ON)	$97\pm 3^{\circ}\text{C}$ { $207\pm 5.4^{\circ}\text{F}$ }	—	Replace
		When decreases (ON→OFF)	90°C { 194°F } MIN		

◆ Service procedure

7 Inspection of automatic transmission fluid thermostat switch

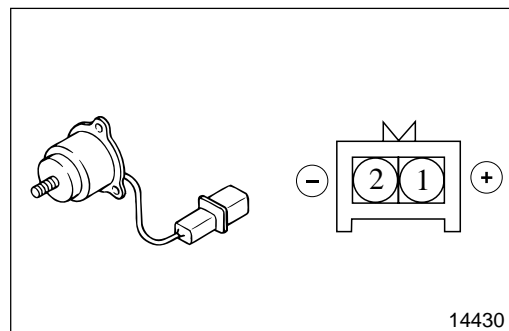
Carry out the following inspection. If any fault is found, replace automatic transmission fluid thermostat switch 7.  Gr 23

- Make sure that there is no continuity between terminals ① and ② at room temperature ($20\pm 5^{\circ}\text{C}$ { $68\pm 9^{\circ}\text{F}$ }).
- Place automatic transmission fluid thermostat switch 7 in a container filled with engine oil and raise the oil temperature while stirring the oil. Measure the temperature when there is continuity between terminals ① and ②, and make sure that the measured value conforms to the standard value.
- Lower the oil temperature and measure the temperature when continuity is lost between terminals ① and ②, and make sure that the measured value conforms to the standard value.



8 Inspection of cooler fan motor assembly

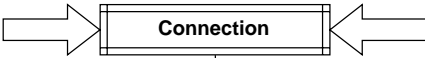
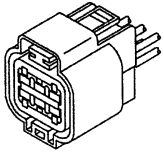

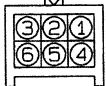
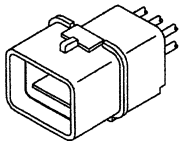
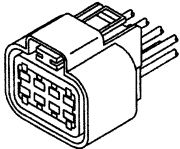
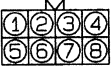
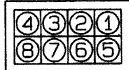
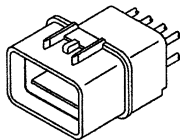
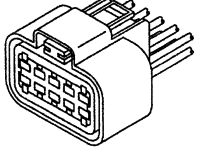
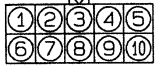
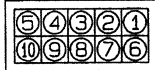
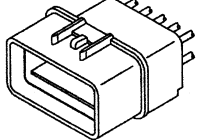
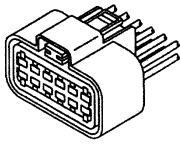
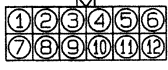

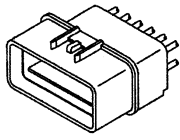
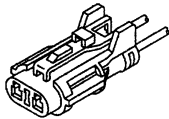
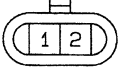
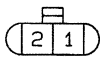
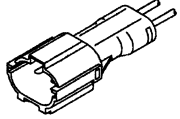
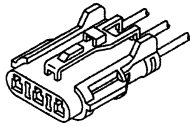
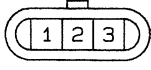
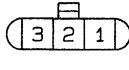
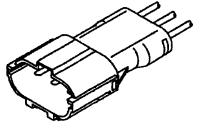
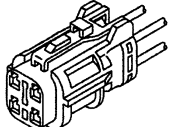
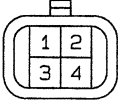
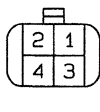
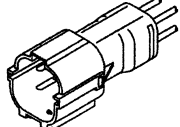
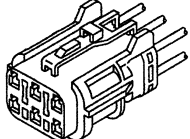
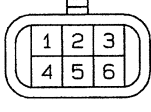
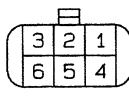
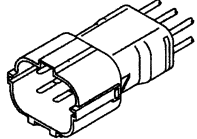
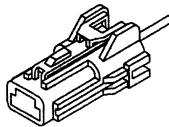


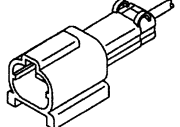
- Make sure that cooler fan motor assembly 8 activates when applying battery voltage to terminals ① and ②.
- If any fault is found, replace cooler fan motor assembly 8.



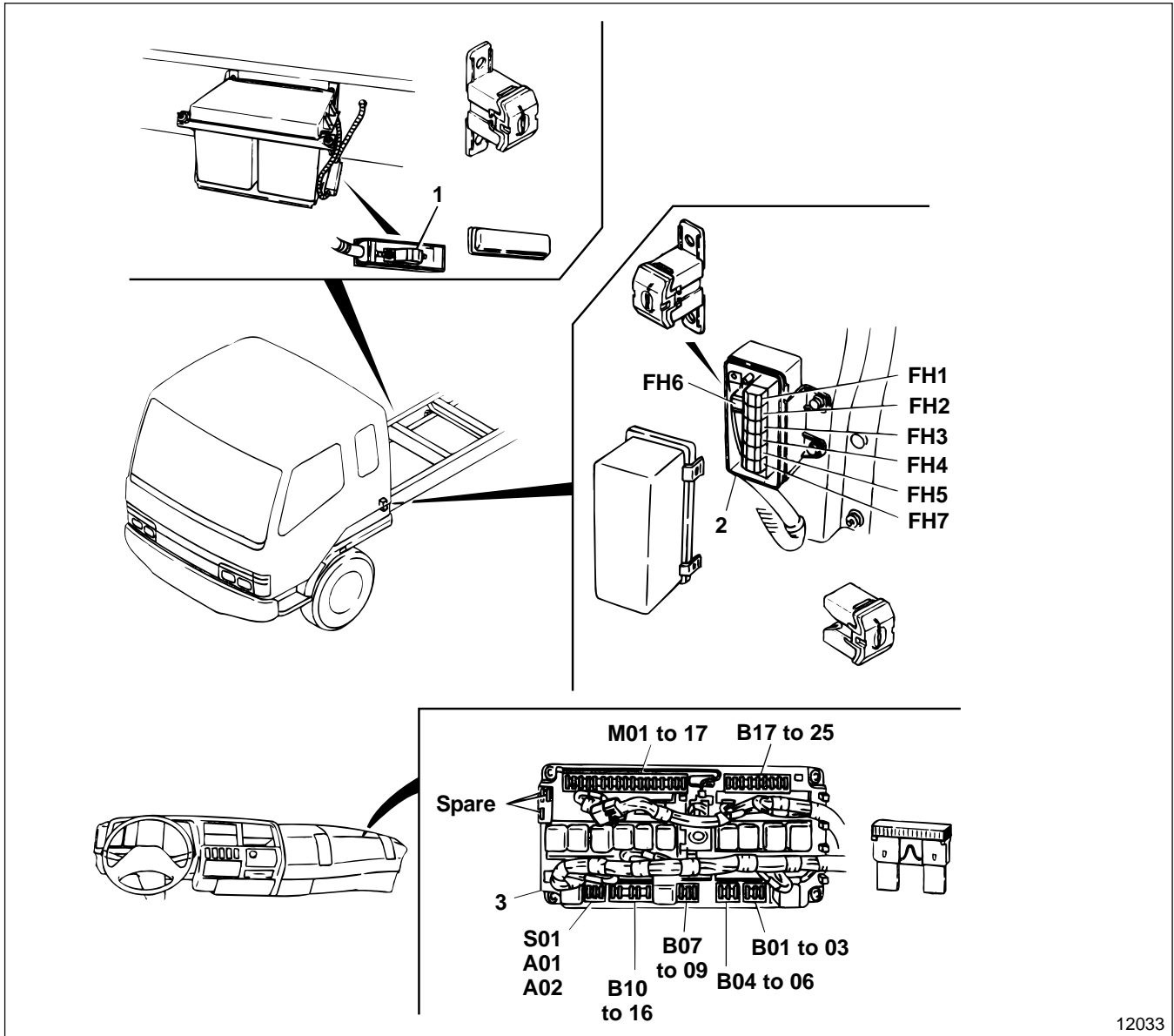
(2) Airtightness inspection

- When magnetic valve is ON :
 - Close output port **D**.
 - Apply **12** volts DC between terminals ① and ②.
 - Make sure that there is no air leaking from exhaust port **C** when air pressure (295 to 980 kPa {43 to 140 lbf/in², 3 to 10 kgf/cm²}) is applied to input port **B**.
- When magnetic valve is OFF :
 - Make sure that there is no air leaking from exhaust port **C** or output port **D** when air pressure (295 to 980 kPa {43 to 140 lbf/in², 3 to 10 kgf/cm²}) is applied to input port **B**.

CONNECTOR CONFIGURATION CHART

Model (Number shows number of pins)					
AA	AA 6 B				
	AA 8 A				
	AA10A				
	AA12A				
AB	AB 2 A				
	AB 3 A				
	AB 4 A				
	AB 6 A				
AC	AC 1 A				

Installation Position



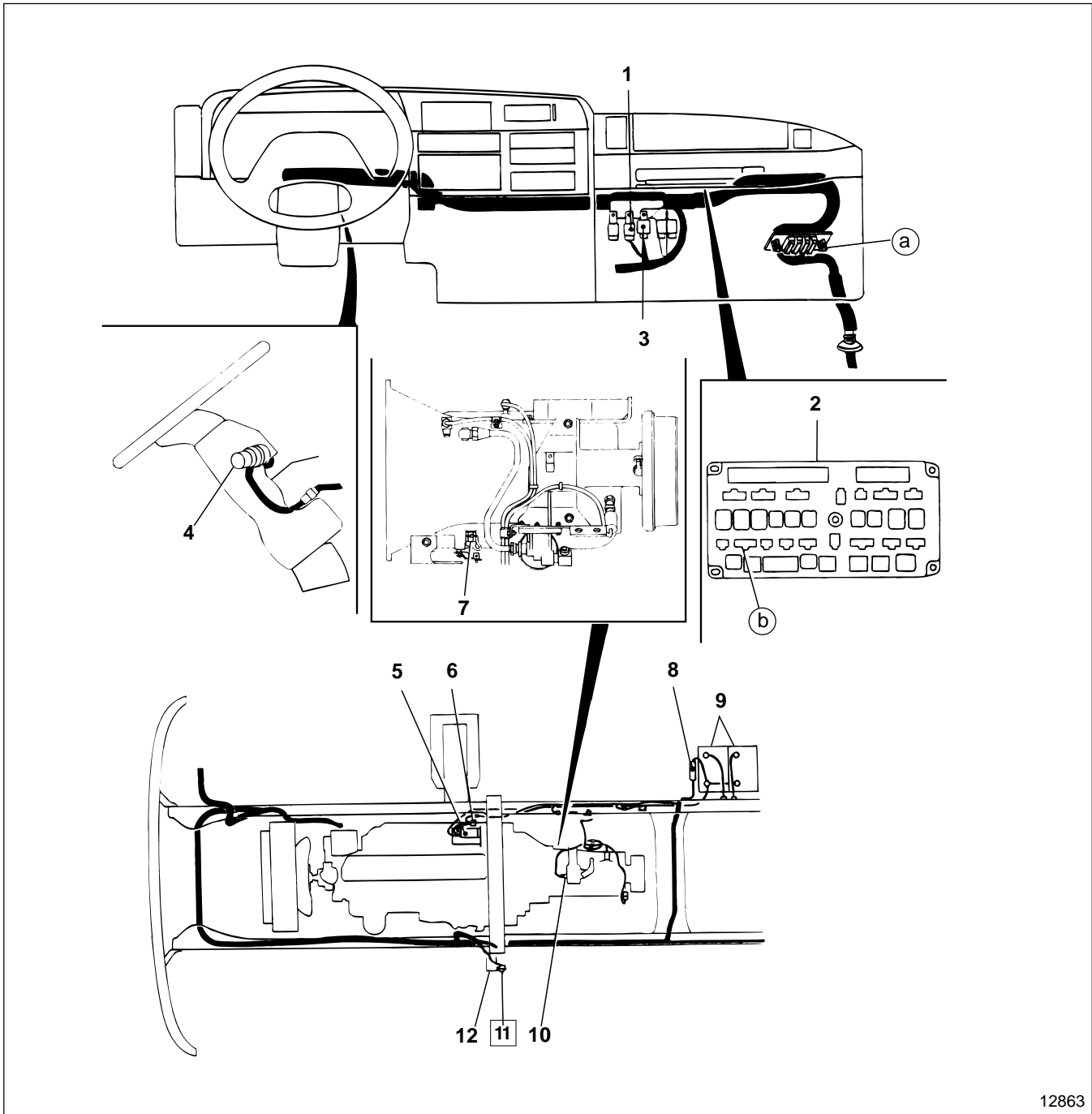
- 1 Main high-current fuse
- 2 High-current fuse box
- 3 Relay and fuse box

CAUTION ⚠

- If a fuse blows, make sure you identify and remedy the cause, then replace the fuse.
- Make sure that you replace the fuse with one having the same rating.
- Make sure that you remove the ⊖ terminal of the battery cable before removing main high-current fuse 1 and high-current fuses FH1 to 7. 📖 (101)

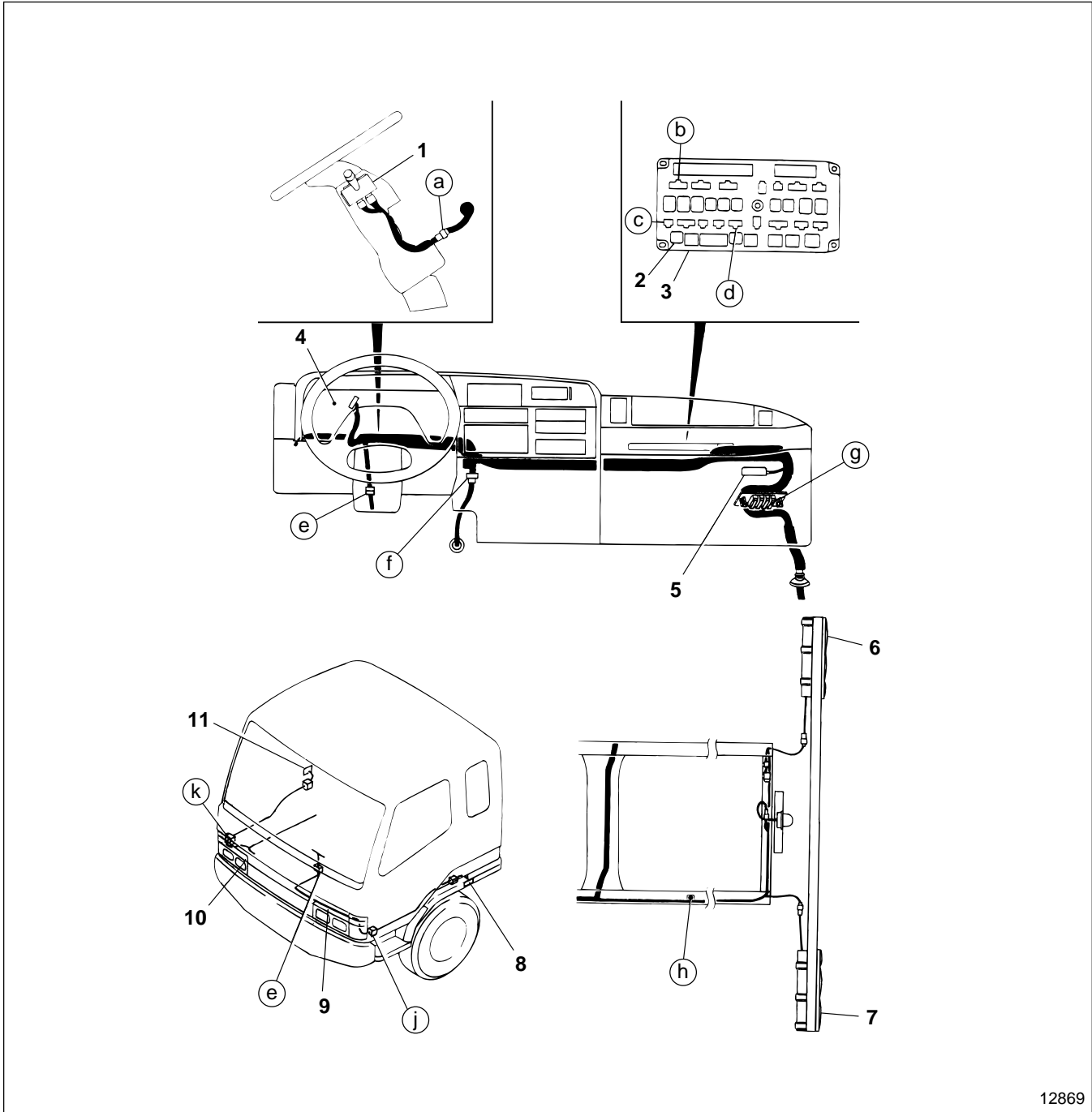
12033

MEMO



12863

- 1 Transmission neutral relay
< Manual transmission > (604)
- 2 Relay and fuse box (104)
- 3 Safety relay (604)
- 4 Starter switch (210)
- 5 Starter (201)
- 6 Starter relay (210)
- 7 Transmission neutral switch
< Automatic transmission > (802)
- 8 High-current fuse box (104)
- 9 Battery (101)
- 10 Transmission neutral switch
< Manual transmission > (802)
- 11 Sub-starter switch
- 12 Main high-current fuse box (104)



12869


- 1 Combination switch (601)
- 2 Turn signal lamp relay (604)
- 3 Relay and fuse box (104)
- 4 Meter cluster (401)
- 5 Flasher unit (604)
- 6 Rear combination lamp, RH
- 7 Rear combination lamp, LH
- 8 Front turn signal lamp, LH
- 9 Side turn signal lamp, LH
- 10 Front turn signal lamp, RH
- 11 Side turn signal lamp, RH

5 INDICATOR AND WARNING



TROUBLESHOOTING..... 54-5-2


500 INSPECTION AND ADJUSTMENT MOUNTED IN VEHICLE


- Inspection of Brake Fluid Level Switch
 < Air over hydraulic brake > 54-5-7


510 PARKING BRAKE INDICATOR CIRCUIT ..... 54-5-8


- < Center Parking Brake > 54-5-8
- < Wheel Parking Brake > 54-5-10



515 BRAKE WARNING CIRCUIT   54-5-14


530 WATER LEVEL WARNING CIRCUIT  54-5-18

536 ENGINE OIL PRESSURE WARNING CIRCUIT  54-5-22



















537 OVERHEATING WARNING CIRCUIT  54-5-24

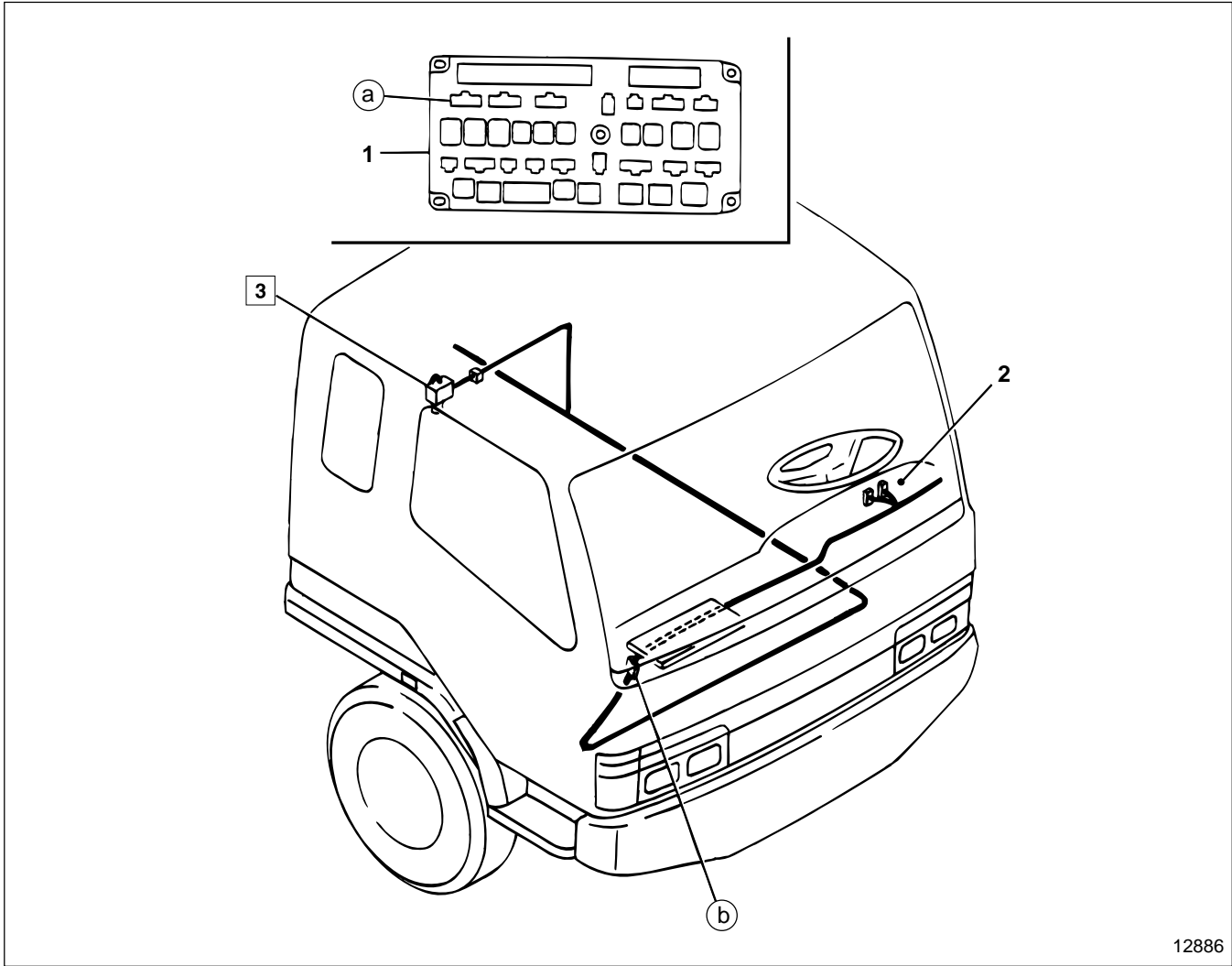
547 AUTOMATIC TRANSMISSION FLUID TEMPERATURE WARNING CIRCUIT  54-5-26

548 TRANSMISSION HIGH/LOW INDICATOR CIRCUIT < 10-speed transmission >   54-5-30

550 CAB TILT WARNING CIRCUIT  54-5-32

For details on the following indicator and warning lamps, see the relevant sections.

-   **125**
-    **220**
-   **310**
-    **330**
-   **345**
-   **710**
-   Gr 13
-   **410** < 10-speed transmission >



12886

- 1 Relay and fuse box (104)
- 2 Meter cluster (401)
- 3 Cab tilt lock switch

◆ Service procedure

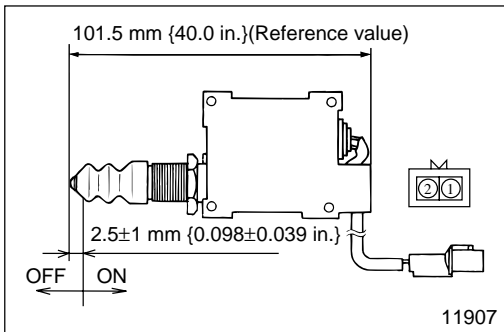
3 Inspection of cab tilt lock switch

- Follow the table below to inspect continuity:

	①	②
ON	○	○
OFF		

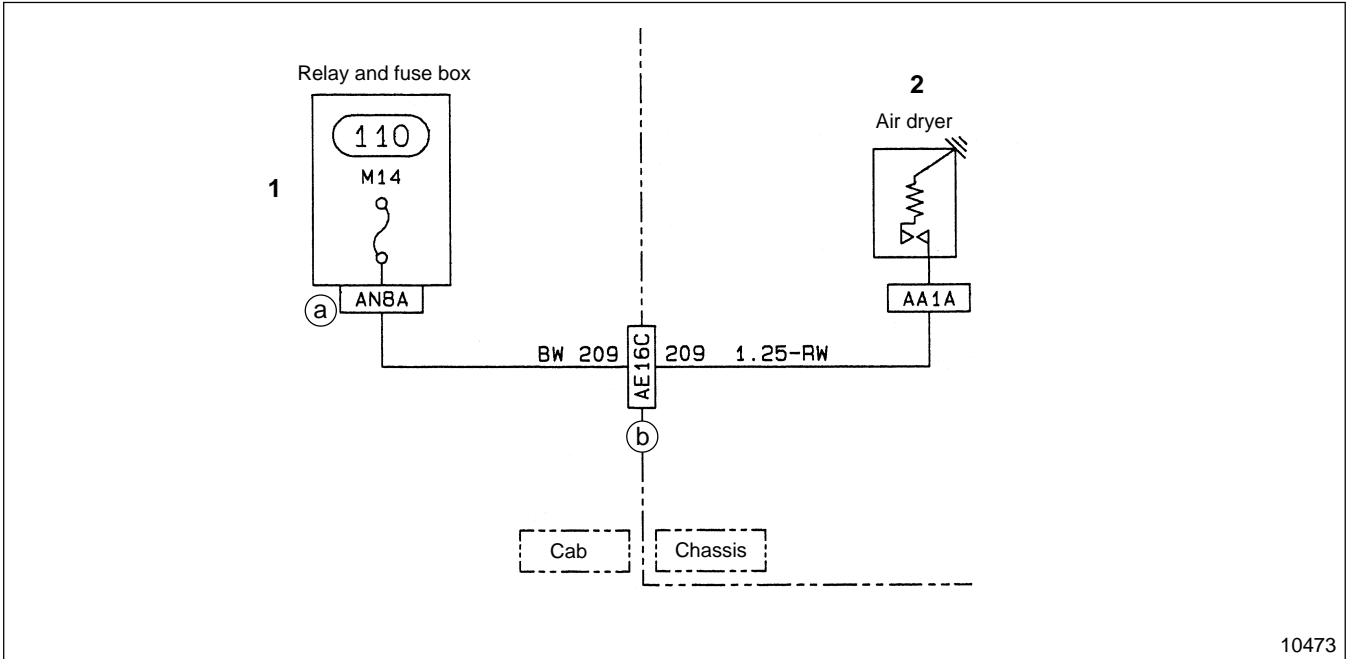
○—○ : There is continuity between terminals ○ and ○.

- If any fault is found, replace cab tilt lock switch 3. Gr 42



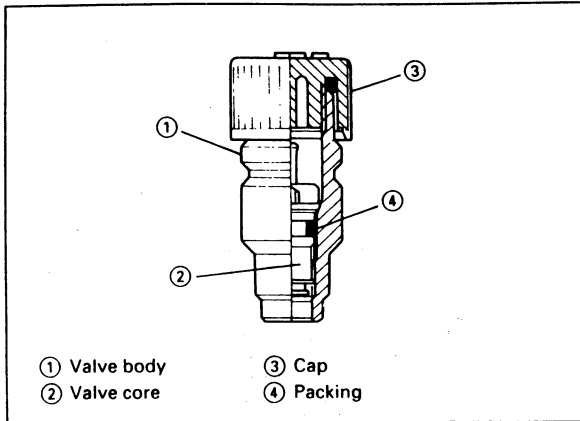
11907

718 AIR DRYER CIRCUIT



10473

3.4.2 Check valve

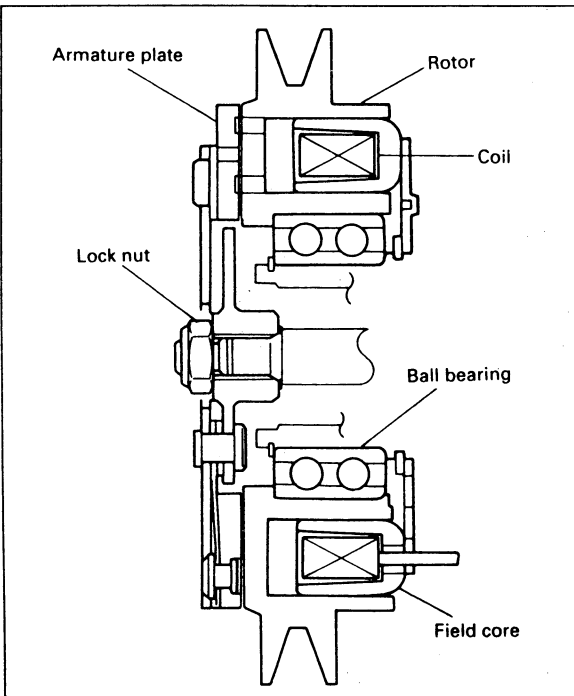


The suction hose and discharge hose are provided with check valve, and designed for gas evacuation and charging service. (shown above)

In the valves, a valve rubber tube, as in automobile tire tubes, is provided as shown in the figure.

Slackening the flare nut on the gauge manifold causes the passage to close automatically by the spring force, and tightening the flare nut causes the passage to open while pressing the compressed spring.

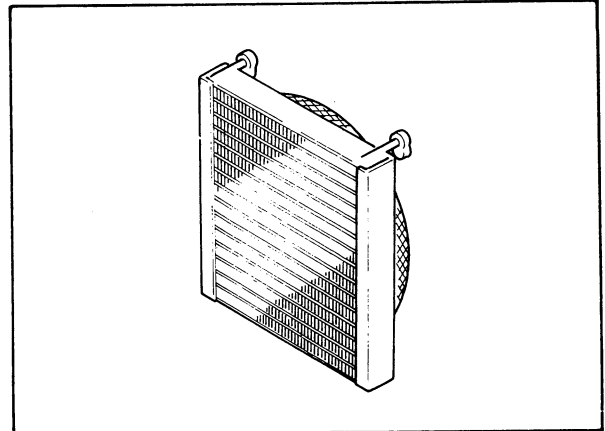
3.4.3 Magnetic clutch



The magnetic clutch is mounted on the compressor crankshaft to start and stop the compressor.

This means that the magnetic clutch is actuated to control the compressor operation electrically by the thermostat.

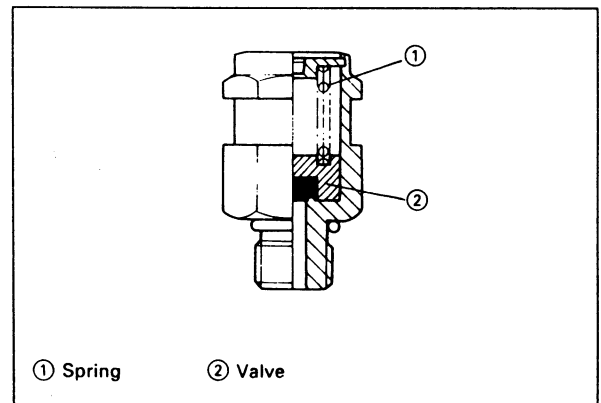
3.5 Side condenser assembly



The condenser is a means to liquefy the refrigerant gas. As the condenser is cooled by the air pulled in by the condenser fan, the refrigerant in the condenser is cooled into liquid. Therefore, when any obstacle prevents the air from flowing evenly to the condenser or the air flow is short circuited, the cooling effect is reduced, with a decrease in the performance of the condenser. When the vehicle is driven at a high speed, the air flow increases resulting in an increase of the cooling effect, and performance of the condenser.

3.6 Relief valve

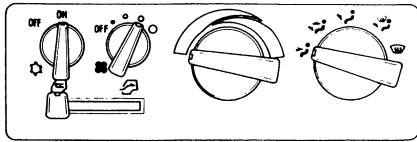
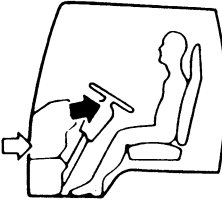

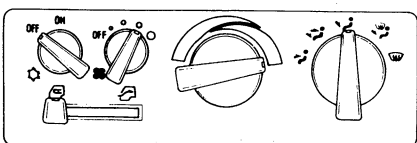
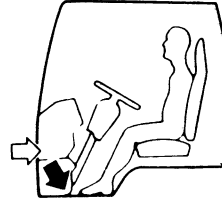

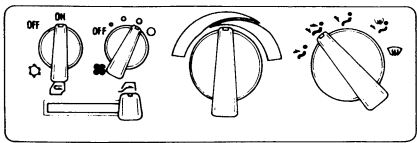
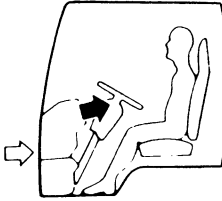

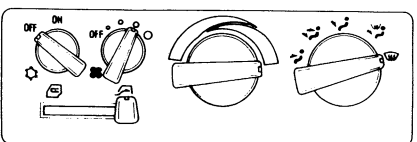
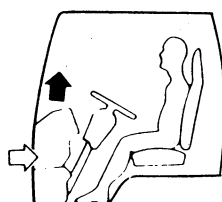
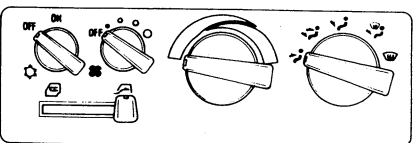
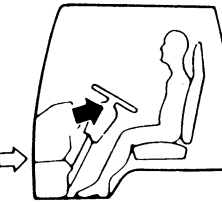
The relief valve is mounted to the compressor & clutch assembly. The relief valve is usually closed by spring. If pressure of refrigerant in air conditioner system is higher than spring pressure, refrigerant is discharged from relief valve. The pressure drop due to discharge refrigerant, and relief valve is closed again.

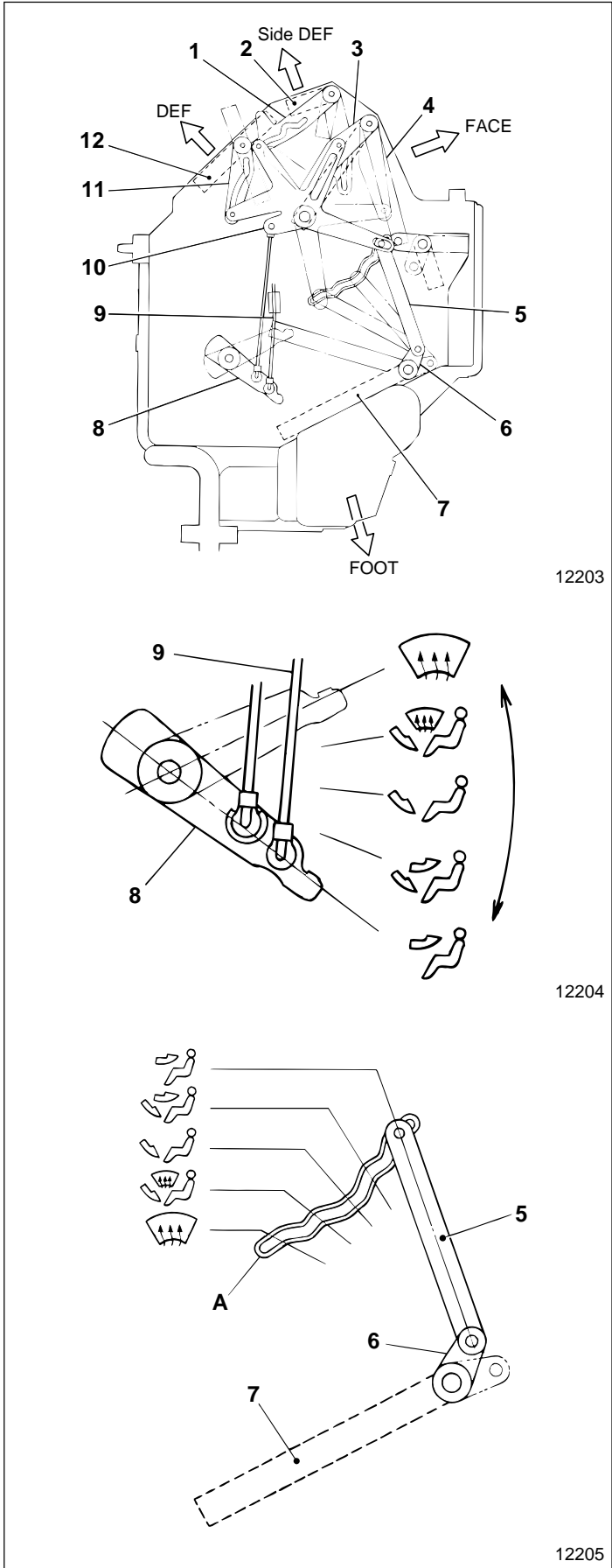


Preset : MPaG (Lb/in²G, kgf/cm²G)

Open	3.50~4.10 (508~594, 35.7~41.8)
Close	2.94 (427, 30)

(2) Operation control

Operation mode	Setting control lever	Air delivery	Remarks
COOL			<p>Earlier cooling service, or conditioning at dusty, polluted air prevailing places: Shift lever, air circulation</p> 
HEAT			<p>Earlier cooling service, or conditioning at dusty, polluted air prevailing places: Shift lever, air circulation Air outlet mode select switch</p> 
DEHUMIDIFY			<p>Wetty conditioning in head cooled, and foot warmed : Shift lever, air outlet Air outlet mode select switch</p> 
DEFROST			
VENTILATION			



● Mode changeover system

- 1 Plate
- 2 Damper (Side DEF)
- 3 Plate
- 4 Damper (FACE)
- 5 Plate
- 6 Plate
- 7 Damper (FOOT)
- 8 Lever (MODE-SUB)
- 9 Mode changeover control cable
- 10 Lever (MODE-MAIN)
- 11 Plate
- 12 Damper (DEF)

A : Rail

- The opening and closing of dampers 2, 4, 7, 12 is mechanically controlled by the movement of mode changeover control cable 9, transmitted as follows:
 - 9→8→10→11→12 (DEF)
 - 1→2 (Side DEF)
 - 3→4 (FACE)
 - 5→6→7 (FOOT)

Plates 1, 3, 5, 6, 11 move together with lever 10. Dampers 2, 4, 7, 12 move together with plates 1, 3, 5, 6, 11, but the degree of opening of the dampers is determined by the shape of the plate grooves.

- Plate 5 is connected to rail A. Since the plate moves along the groove of the rail, damper 7 (FOOT) can be opened and closed in combination with other modes to activate bi-level mode.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL

- Thank you very much for reading the preview of the manual.
- You can download the complete manual from: www.heydownloads.com by clicking the link below



- Please note: If there is no response to CLICKING the link, please download this PDF first and then click on it.

CLICK HERE TO **DOWNLOAD** THE COMPLETE MANUAL