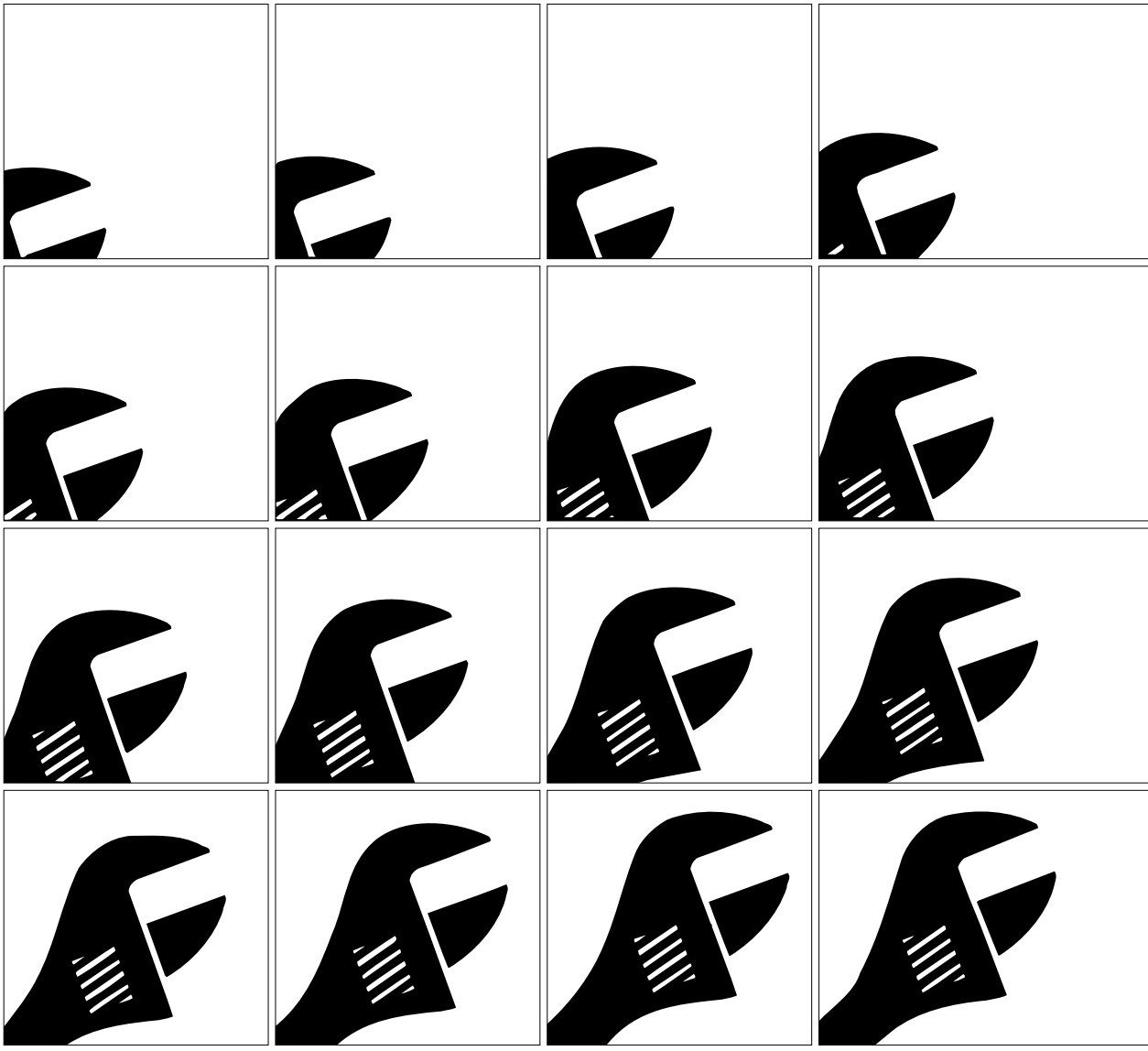
MITSUBISHI
FUSO

Service Manual

FK/FM 2000
Model Year Changes



Pub. No. TWME9503-4

● **Disassembly sequence**

1 Ashtray
2 Power window switch Gr 54
3 Inside handle cover
4 Door lock knob cover
5 Door lock knob
6 Bolt
7 Door bar
8 Screw
9 Door trim assembly
10 Front side turn signal lamp Gr 54
11 Step lamp cover
12 Weather strip
13 Door panel assembly
14 Waterproof cover
15 Inside handle
16 Bolt
17 Door glass assembly
18 Glass holder
19 Door glass
20 Door belt line molding
21 Bolt
22 Power window motor Gr 54
23 Regulator & rail assembly
24 Screw
25 Screw
26 Door lock actuator Gr 54
27 Nut
28 Outside handle
29 Clip
30 Door lock cylinder
31 Lower sash
32 Run channel
33 Cushion rubber
34 Door panel

CAUTION ⚠

Do not remove weather strip 12, glass holder 18 and cushion rubber 33 unless abnormalities are found.

● **Assembly sequence**

Follow the disassembly sequence in reverse.

Ⓣ Tightening torque

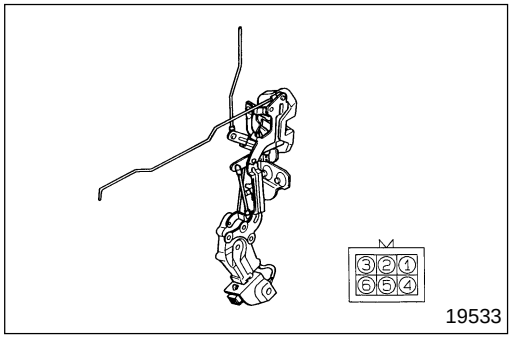
Unit : N·m {lbf.ft, kgf·m}

Location	Parts to be tightened	Tightening torque	Remarks
6	Bolt (Door cover mounting)	9 to 14 {65 to 100, 0.9 to 1.4}	—
16	Bolt (Door glass assembly mounting)	4 to 6 {29 to 43, 0.4 to 0.6}	—
21	Bolt (Regulator & rail assembly mounting)	4 to 6 {29 to 43, 0.4 to 0.6}	—
24	Screw (Door lock actuator mounting)	4 to 6 {29 to 43, 0.4 to 0.6}	—
25	Screw (Door lock actuator mounting)	4 to 6 {29 to 43, 0.4 to 0.6}	—
27	Nut (Outside handle mounting)	4 to 6 {29 to 43, 0.4 to 0.6}	—

◆ Service procedure

2 **Inspection of power window switch & controller**

- Since the units alone cannot be readily checked in the off-vehicle state, check the harness, switch and other related parts in each system.
- If any fault is not found in the related parts, and the problem still remains in the system, replace the control unit or other units.



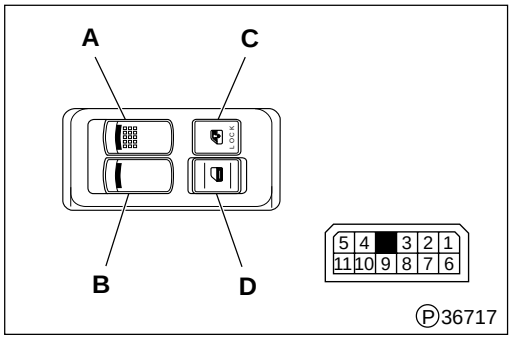
3 **Inspection of door lock actuator (driver's seat side)**

- Follow the table below to check for continuity and operation.

	①	③	②	④	⑤
LOCK		○—○		⊖—⊕	
UNLOCK	○—○			⊕—⊖	

○—○ : There is continuity between terminals.
⊕—⊖ : Indicates the terminals where 12 volts DC is to be applied.

- If any fault is found, replace door lock actuator (driver's seat side) **3**. Gr 42



4 **Inspection of power window switch (driver's seat side)**

- Follow the table below to check for operation.

			①	②	⑤	⑥	⑦	⑧	⑨	⑩	⑪
A	UP	Manual		○	———	▶|				○	
		Auto		○	▶|——	——○				○	
	NEUTRAL										
	DOWN	Manual		○	———	▶|					○
		Auto		○	▶|——	——○					○
B	UP			○	———	———	———	○			
	NEUTRAL										
	DOWN			○	———	———	———	———	○		
C	UNLOCK		○	———	———	———	———	○			
			○	———	———	———	———	———	○		
	LOCK										
D	UNLOCK		○	———	———	○					
	LOCK		○	———	———	———	○				

○—○ : There is continuity between terminals.

- If any fault is found, replace the power window and auto door lock switch **4**.

Tightening torques

Unit: N·m {ft.lbs, kgf·m}

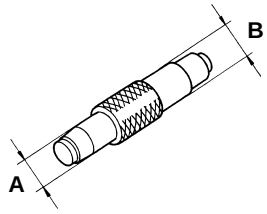
Location	Parts to be tightened	Tightening torque	Remarks
1	Bolt (No. 1 idler shaft installation)	135 to 165 {100 to 120, 14 to 17}	—

Lubricant

Location	Points of application	Specified lubricant	Quantity
2	Entire periphery of O-ring	Engine oil	As required

Special tools

Unit: mm

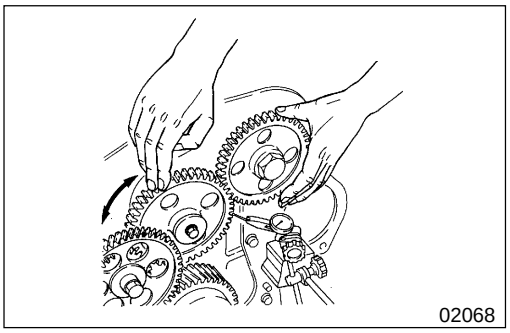
Location	Tool name and shape	Part No.	Application
3, 7	Idler Gear Bushing Remover/Installer A: ϕ 40 {1.57} (No. 1 idler gear bushing), ϕ 32 {1.26} (No. 2 idler gear bushing) B: ϕ 44 {1.73} (No. 1 idler gear bushing), ϕ 35 {1.38} (No. 2 idler gear bushing)  02066	<No. 1> MH061228 <No. 2> MH061779	Removing and fitting idler gear bushings

◆ Service procedure

● **Pre-disassembly inspection**

(1) Gear backlash

For each gear pair, measure backlash at three or more points. If any measurement exceeds the specified limit, replace the defective part(s).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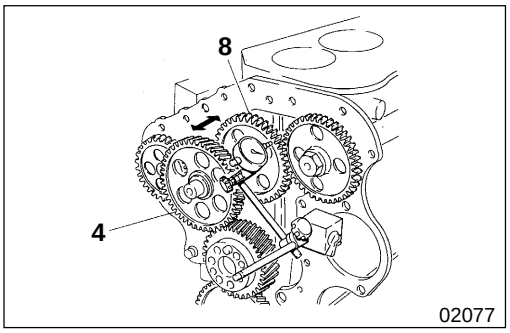
(2) No. 2 idler gear end play

If the measurement exceeds the specified value, replace the defective part(s).



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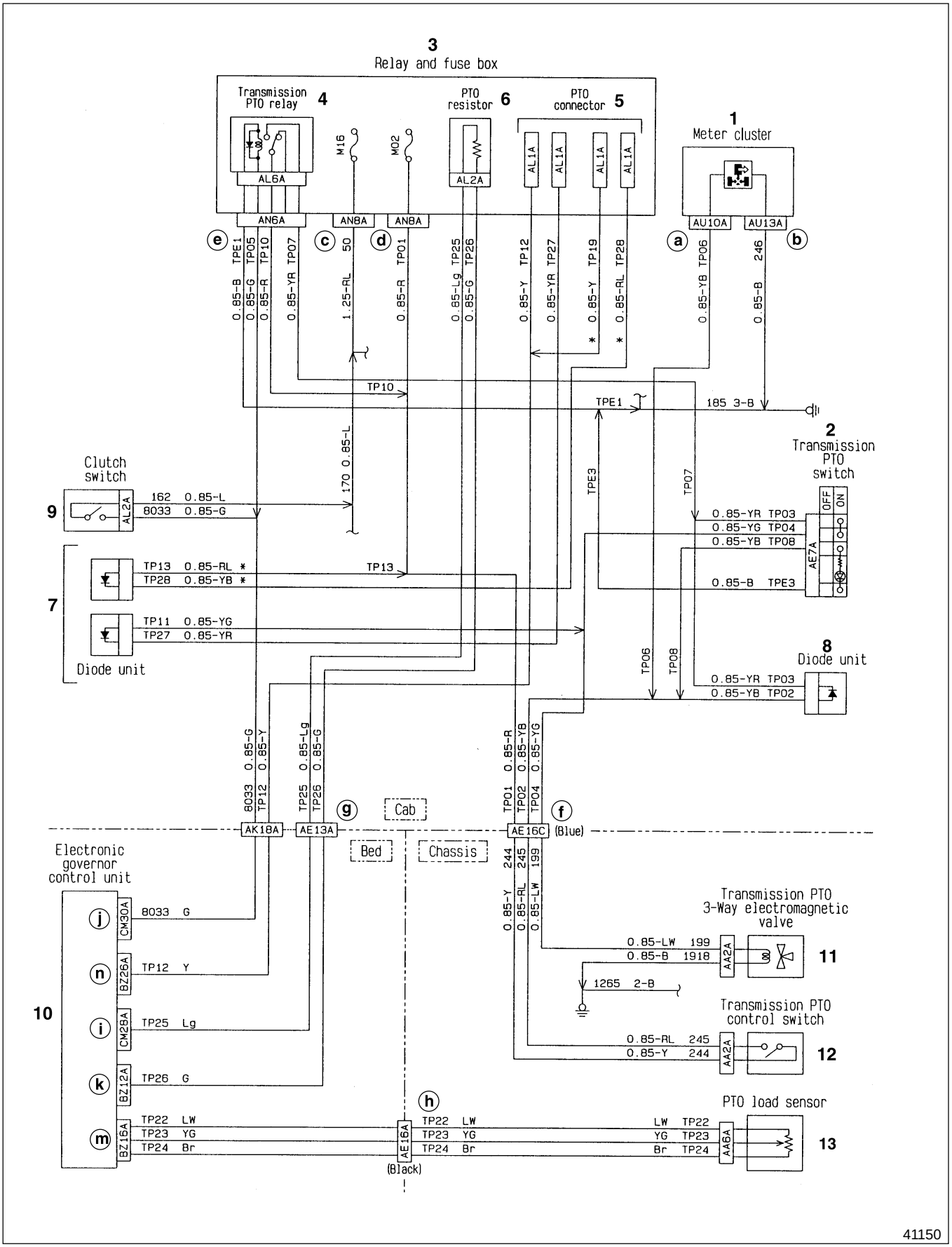
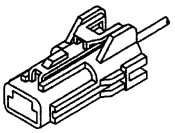
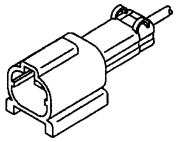
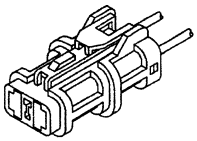
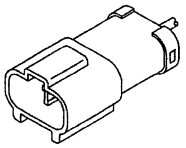
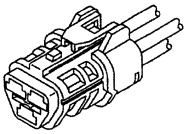
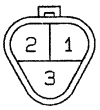
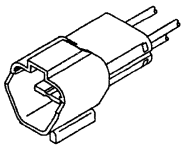
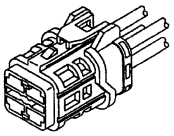
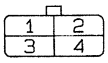
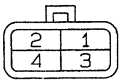
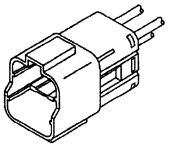
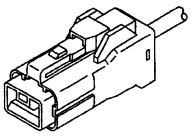
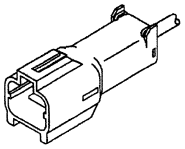
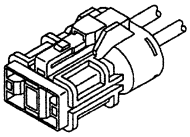
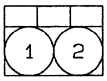
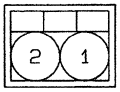
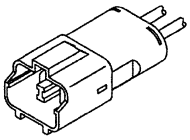
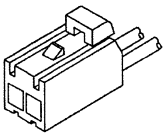
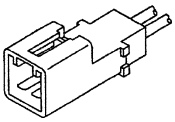
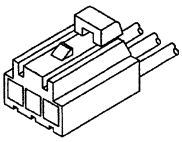
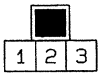
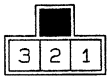
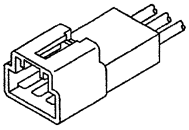
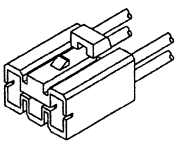
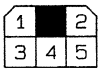
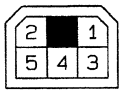
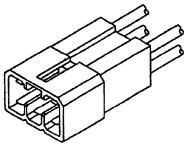
850 TRANSMISSION POWER TAKE-OFF CIRCUIT

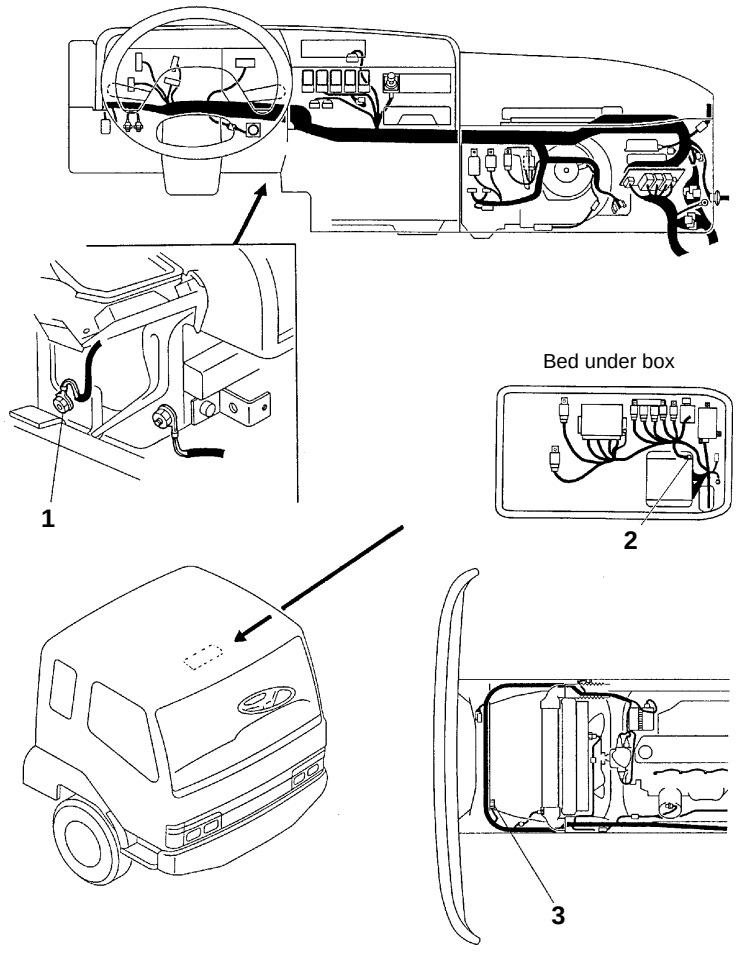


CONNECTOR CONFIGURATION CHART

Model (Number shows number of pins)		Connection			
AC	AC 1 A				
	AC 2 A				
	AC 3 A				
	AC 4 A				
AD	AD 1 A				
	AD 2 A				
AE	AE 2 A				
	AE 3 A				
	AE 5 A				

Item	’00 Model ⇦ ’99 Model
• Grounding wire has been added.	

	Ground	Circuit No.	Wire diameter-wire color
1	Cab ground	PWE 1	2-B
2		EGE 1	0.85-B
3	Chassis ground	1265	2-B



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③ **LIGHTING** • Daytime running light system is added.	(313) DAYTIME RUNNING LIGHT CIRCUIT 🕮 P54-16
④ **METER** • Meter cluster has been changed, including addition of indicator.	(401) METER CLUSTER 🕮 P54-20
⑥ **CAB SIDE ELECTRICAL** • Power window and auto door lock circuit is added.	(622) POWER WINDOW AND AUTO DOOR LOCK CIRCUIT 🕮 P54-22

Main high-current fuse

Fuse No.	Main load	Capacity
—	High-current fuse box	★ 140 A

High-current fuse box

Fuse No.	Main load	Capacity
FH1	Starter switch (Terminal M)	50 A
FH2	Fuse box (B07 to 16)	40 A
FH3	Fuse box (B18 to 24)	40 A
FH4	Fuse box (B01 to 04)	40 A
FH5	Glow relay (Terminal B)	50 A
FH6	Alternator (Terminal B)	★ 140 A
FH7	Fuse box (B6)	40 A
FH8	★ ABS	★ 40 A

Fuse box

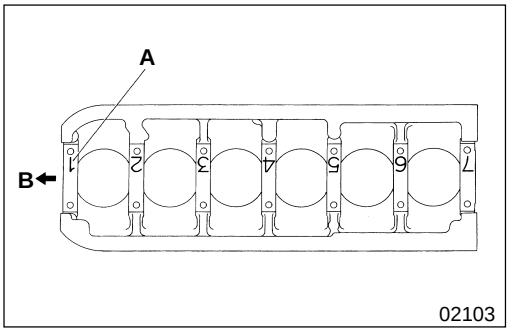
Fuse No.	Main load	Capacity
A01	Audio	10 A
A02	Cigarette lighter	15 A
B01	Reserve power (BATT)	10 A
B02	★ Reserve power (ACC)	★ 10 A
B03	Van body dome light relay	15 A
B04	Socket connector	20 A
B05	★ Power window	★ 25 A
B06	Glow heater	20 A
B07	Stop lamp	10 A
B08	Turn/hazard	15 A
B09	Tail lamp	★ 20 A
B10	Headlamp relay	★ 10 A
B11	—	—
B12	★ Headlamp RH	★ 15 A
B13	★ —	★ —
B14	—	—
B15	★ Headlamp LH	15 A
B16	★ —	★ —
B17	Spare	—
B18	* Air-conditioner	20 A
B19	—	—
B20	ABS	30 A
B21	—	—
B22	Cab lamp	10 A
B23	—	—
B24	—	—
B25	Horn	15 A
M01	Automatic transmission	10 A
M02	Transmission power take-off	10 A
M03	—	—
M04	Reserve power (MAIN)	10 A
M05	Neutral switch	10 A
M06	Automatic transmission	20 A
M07	—	—
M08	Pre-stroke cut relay	10 A
M09	Air conditioner	20 A
M10	—	—
M11	Control unit	10 A
M12	ABS electronic control unit	★ 10 A
M13	Turn/hazard	10 A
M14	Air dryer	15 A
M15	Meter, speed indicator, ★ DRL	10 A
M16	Backup lamp	10 A
M17	Wiper	15 A
S01	Safety relay	10 A

★ marks indicate changed parts or added parts.

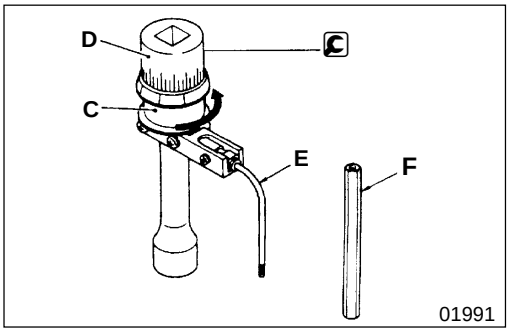
* Fuses are provided for these pieces of equipment only where they are installed.

ABS: Anti-lock brake system
DRL: Daytime running light

GROUP 00 GENERAL

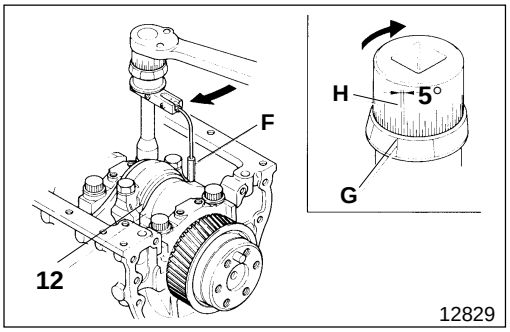


- Starting at the front of the engine **B**, fit the main bearing caps **10** in the order of the numbers **A** embossed on them and such that the numbers are in the positions illustrated.



- Tighten the bolts **8** to the specified torque. Then, turn the bolts further in accordance with the following procedure:
- Turn the holder **C** of the C Socket Wrench counter-clockwise to tension the built-in spring.

  D: Socket
  E: Rod
  F: Rod (extension)

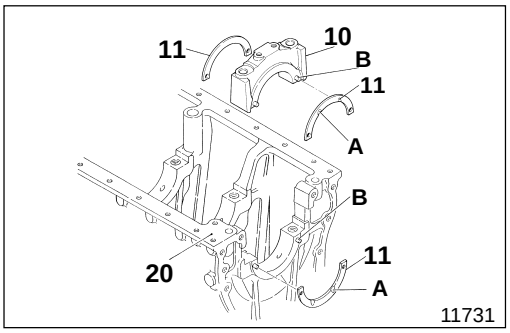


- Set the socket wrench such that the built-in spring forces the rod (extension) **F** against the crankshaft assembly **12**.
- Align any inscribed line **G** on the holder **C** with any inscribed line **H** on the socket. (Use this point as reference 0° position.)
- From the above reference position, turn the socket **D** by 90° clockwise. (One gradation on the scale represents 5°.)

CAUTION ⚠

By performing the above procedure, the bolt 8 is tightened to the plastic area. Do no attempt to tighten further after turning specified angle.

- After tightening, perform the following checks:
  - Turn the crankshaft by hand to check for smooth rotation.
  - Measure the crankshaft end play.



11 **Installing thrust plates**

Fit a thrust plate **11** on each side of the main bearing caps **10** and at the rear end of the crankcase **20** such that the oil grooves **A** are on the outside.

B: Locating pin

CAUTION ⚠

If any oversize thrust plates 11 are to be used, make sure that the upper and lower thrust plates installed at the rear end of the crankcase 20 are of the same size. However, the thrust plates installed on both sides of the main bearing cap 10 may be different in size.

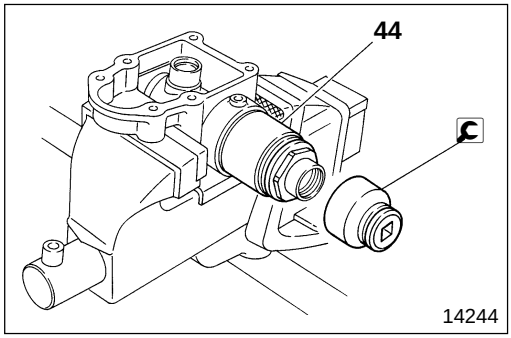
Service standards

Unit : mm {in.}

Location	Maintenance item			Standard value	Limit	Remedy
8	Flywheel assembly < Manual transmission >	Distortion of friction surface		0.05 {0.0020} or less	0.2 {0.0079}	Correct or replace
		Height from bolt mounting surface to friction surface	C6	20 {0.79}	19 {0.75}	Replace
			C6(AR350)	19 {0.75}	18 {0.71}	Replace
			C7	26.5 {1.04}	25.5 {1.00}	Replace
		Wobble of friction surface when installed		—	0.2 {0.0079}	Correct or replace
19	Eccentricity of spigot when installed			—	0.2 {0.0079}	Inspect or replace

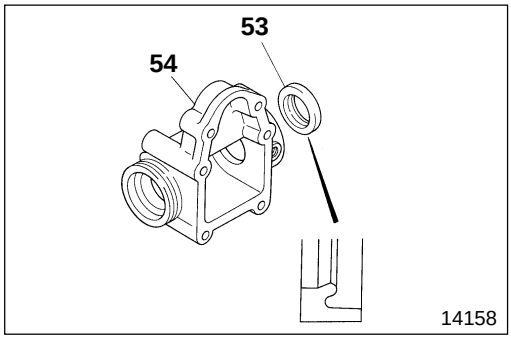
('96 model) → *11-41*

POWER SHIFT ASSEMBLY : ’98 MODEL



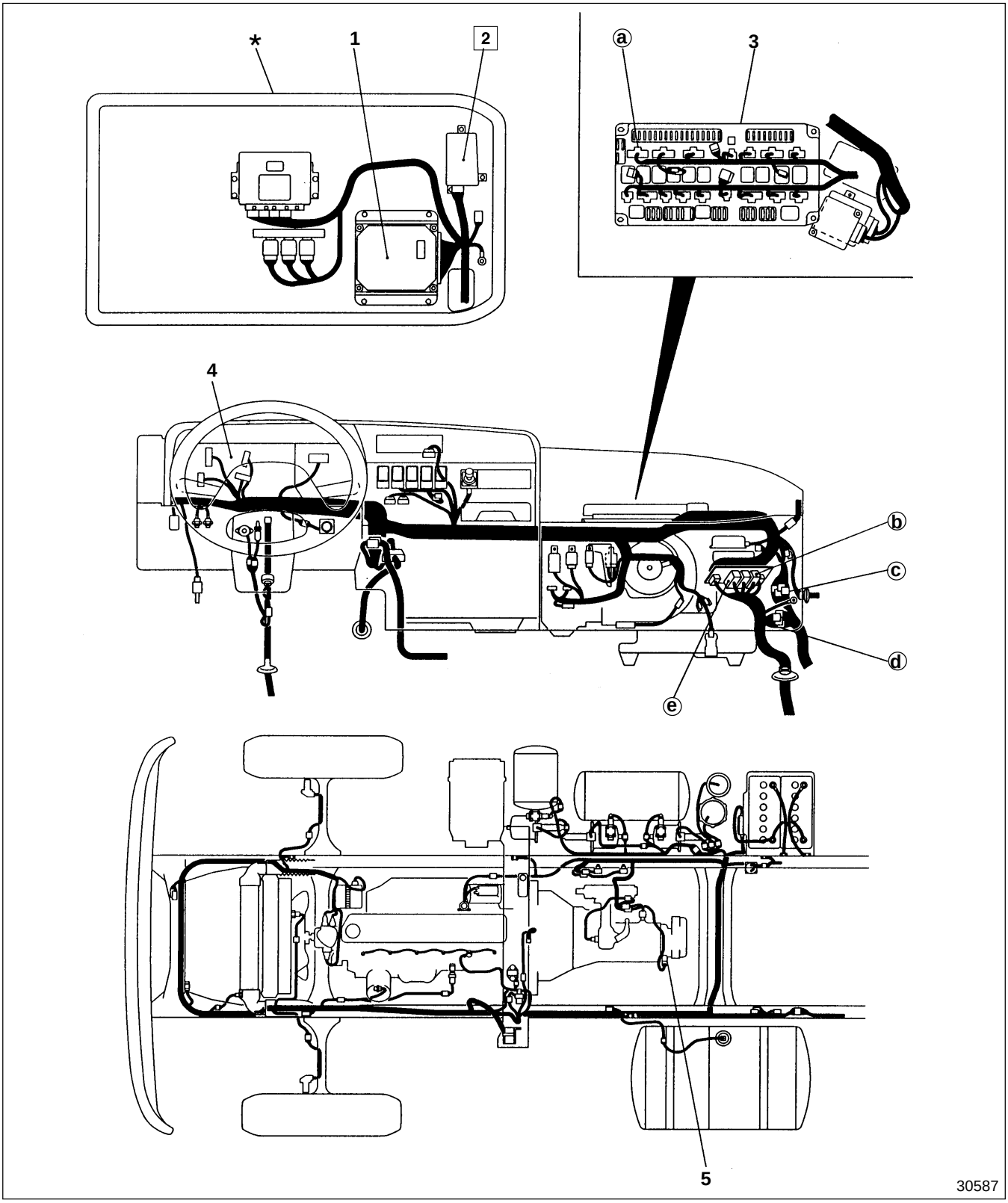
44 **Installation and Removal of the Cylinder**

: Socket



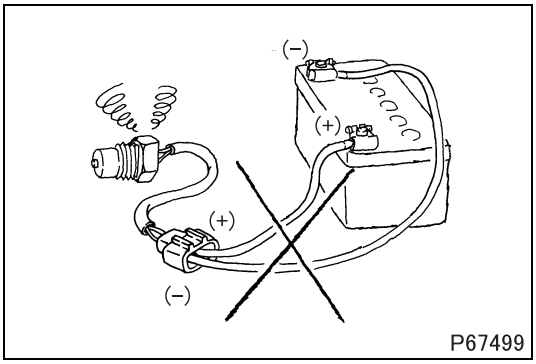
53 **Installing cup packing**

GROUP 00 GENERAL



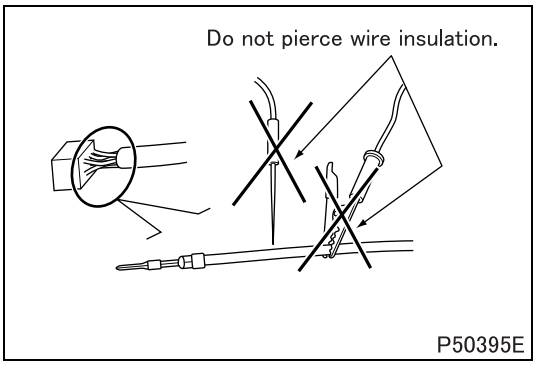
1 Electronic governor control unit 🗀 Gr 13
2 Pulse divider
3 Relay and fuse box 🗀 1 (104)
4 Meter cluster 🗀 1 (401)
5 Vehicle speed sensor 🗀 Outline of changes

***** : Bed under box
(behind assistant driver's seat side)
🗀 1: '96 Model Gr 54 (Pub No. TWME 9503-54)



- When applying a voltage to a part for inspection purposes, check that the (+) and (–) cables are connected properly then gradually increase the voltage from zero. Do not exceed the specified voltage.
  Remember that control units and sensors do not necessarily operate on the battery voltage.

1. Handling Precautions for Electric Circuits



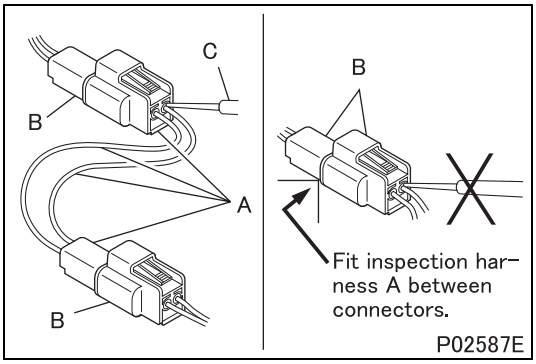
CAUTION ⚠

- **Do not pierce wire insulation with test probes or alligator clips when performing electrical inspections. Doing so can, particularly with the chassis harness, hasten corrosion.**

1.1 Inspection of harnesses

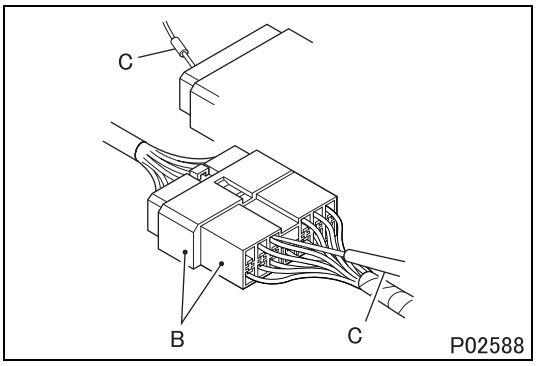
(1) Inspections with connectors fitted together

(1.1) Waterproof connectors



- Connect an inspection harness and connector A between the connectors B of the circuit to be inspected. Perform the inspection by applying a test probe C to the connectors of the inspection harness. Do not insert the test probe C into the wire-entry sides of the waterproof connectors since this would damage their waterproof seals and lead to rust.

(1.2) Non-waterproof connectors

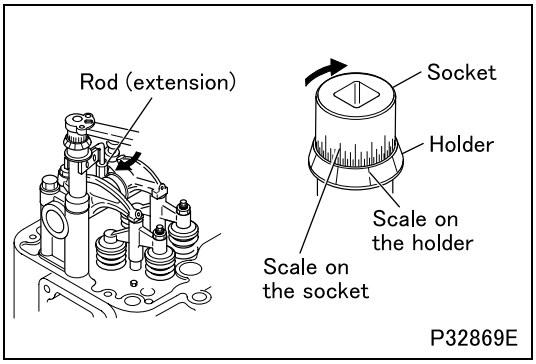


- Perform the inspection by inserting a test probe C into the wire-entry sides of the connectors. An extra-narrow probe is required for control unit connectors, which are smaller than other types of connector. Do not force a regular-size probe into control unit connectors since this would cause damage.

MAINTENANCE SCHEDULE TABLES

Item	Time of inspection and maintenance					Working procedures	Reference Gr
	Pre-operational checks	New vehicle at 4,000 km/ 2,500 miles	Inspection interval				
			Every 10,000 km/ 6,000 miles	Every 30,000 km/ 18,000 miles *1	Every 60,000 km/ 36,000 miles *2		
Manual transmission gearshift control looseness				×		In NEUTRAL position, check gearshift lever for looseness. With gearshift lever in each gear position, check all gears engage smoothly without excessive looseness. Also check that control cable is not damaged.	Gr22
Automatic transmission range selector linkage condition *6				×		Shifting to each position must be correct and secure.	Gr23A
Propeller shaft couplings and bearings looseness		×	×			Check flange yoke bolts and center bearing bolts for looseness.	Gr25
			×			• Turn propeller shaft manually to check for loose spline coupling. • Check for looseness between spider and needle roller bearing.	
FRONT AND REAR AXLES							
Axle shaft torsion and cracks					×	Remove axle shaft and check for torsion, bend, and cracks.	Gr27
Front wheel hub bearing looseness				×		With front axle jacked up, move wheel up and down by holding tire's top and bottom to check for bearing looseness.	Gr26
Rear wheel hub bearing damage					×	Disassemble rear wheel and check for hub bearing wear and damage.	Gr27
Retightening wheel nuts		×	×			Check wheel nuts for looseness.	P01-10
Disc wheel damage			×			Check disc wheel for corrosion, deformation and cracks.	Gr31
Tire inflation pressure, cracking, tread groove depth, abnormal wear, etc.	×		×			• Measure inflation pressure with a tire pressure gauge, and check that tire tread groove is deep enough. • Check tire tread and side walls for cracks, damage, uneven, ridgy, and other abnormal wear.	P01-10
Tire rotation			×			Rotate all tires.	P01-10
SUSPENSION SYSTEM							
Looseness, play and damage of suspension system				×		Check suspension system for looseness, play and damage.	Gr33, 34
Damage and looseness of leaf springs	×			×		Check leaf springs for damage and looseness.	Gr33, 34
Retightening U-bolts		×		×		Check U-bolts for looseness.	Gr33, 34
Air leak and damage of air spring *5			×			Check air spring for air leak and damage of diaphragm. Check the air spring height.	Gr34B
Air spring diaphragm replacement *5			Every 36 months			Check diaphragm and replace if necessary.	Gr34B
Oil leaks and damage of shock absorbers				×		Check for oil leaks from and damage of cylinders and other parts.	Gr33, 34

Possible causes \ Symptoms		Low power output	Abnormal engine noise	Reference Gr
Cylinder head and valve mechanism	Incorrect valve clearance	O	O	
	Defective cylinder head gasket	O	O	
	Worn valve and valve seat; carbon deposits	O	O	
	Weakened valve spring	O	O	
	Defective rocker shaft and bracket		O	
	Poor lubrication of rocker shaft bracket		O	
Timing gears	Incorrect backlash in timing gears		O	
	Poor lubrication of timing gears and idler shaft		O	
Camshaft	Excessive end play in camshaft		O	
	Worn camshaft		O	
Pistons and connecting rods	Worn/damaged piston ring groove(s)	O	O	
	Worn/damaged piston ring(s)	O	O	
	Worn piston pin and connecting rod small end		O	
Crankshaft	Excessive end play in crankshaft		O	
	Incorrectly fitted crankshaft pulley		O	
	Worn/damaged crankshaft pins and connecting rod bearings		O	
	Worn/damaged crankshaft journals and main bearings		O	
Fuel system	Supply pump faulty	O	O	Gr13EA
	Defective injector	O	O	
	Air trapped in fuel system	O		Gr13A
Cooling system	Malfunctioning cooling system components	O		Gr14
	Loose/damaged belts		O	
Intake and exhaust system	Clogged air cleaner	O	O	Gr15
	Clogged muffler	O	O	
	Malfunctioning turbochargers	O	O	
Incorrect oil viscosity		O		Gr12
Improper fuel		O		
Incorrectly fitted piping and hoses			O	
Defective/incorrectly fitted alternator and other auxiliaries			O	

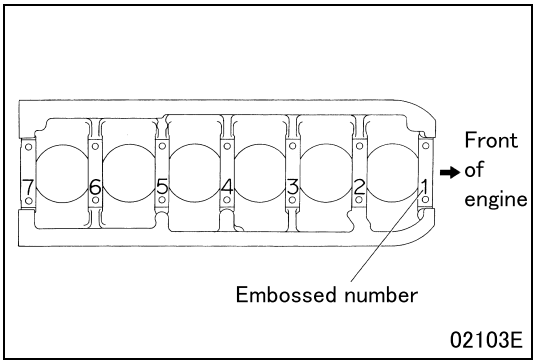


- Set [Ca] such that the rod (extension) is pressed against the rocker shaft bracket by the force of the spring.
- Align any line on the holder scale with any line on the socket scale. (This will be used as the reference point = 0°.)
- From the reference point, turn the socket by $90° \, {}^{+5°}_{0}$ in the direction shown. Each division on the holder scale represents 5°.
- Further turn the socket by $90° \, {}^{+5°}_{0}$.
- After tightening the cylinder head bolts within the plastic region, punch a mark on the bolt heads to record the number of times that they have been tightened.

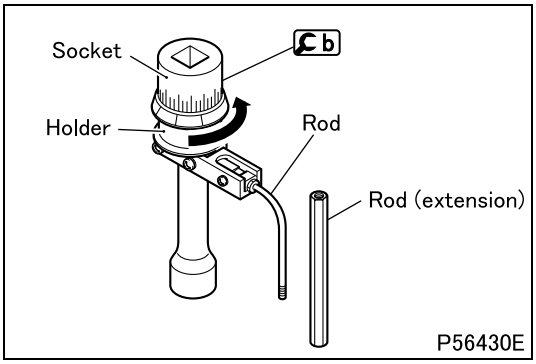
CAUTION ⚠

- **Cylinder head bolts that have been tightened using the torque-turn method must never be additionally tightened after the final angular tightening.**

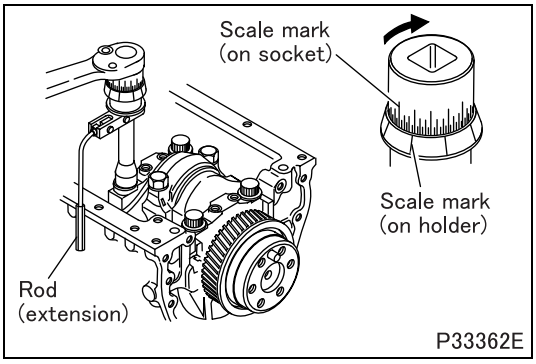
M E M O



- Starting at the front of the engine, fit the main bearing caps in the order of the embossed numbers facing the illustrated direction.



- Tighten all the bolts to 78 N·m {58 ft.lbs, 8 kgf·m}, then additionally tighten them according to the following procedure.
- Turn the holder of b counterclockwise to pretension the internal spring.

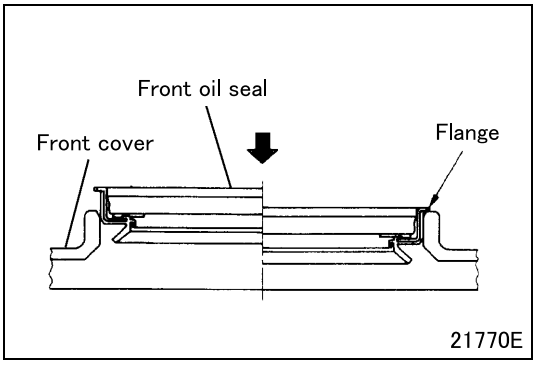


- Set b such that the rod (extension) is pressed against the crankshaft by the force of the spring.
- Align a scale mark on the socket with a scale mark on the holder. (This point will be the point of reference, or the 0° point.)
- Starting with this point of reference, turn the socket with a wrench in the illustrated direction until the scale on the socket indicates 90°.
  One graduation on the socket-side scale represents 5°.
- After tightening the bolts using the above torque-turn tightening method, make a punch mark on the head of each bolt to indicate the number of times that it has been used.

CAUTION ⚠

- **The bolts that have been tightened using the torque-turn method must never be additionally tightened after the final angular tightening.**

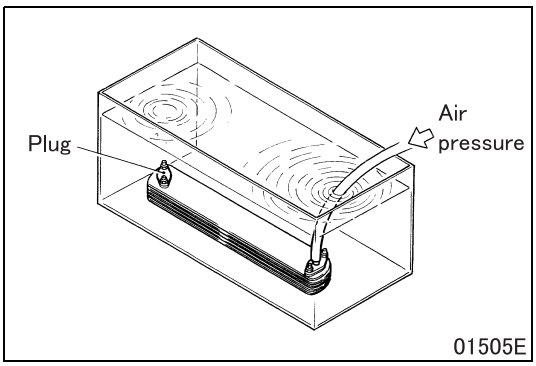
- After installing the main bearing cap, rotate the crankshaft by hand. If it cannot be rotated smoothly, inspect the main bearing caps for correct installation.



■ Installation: Front oil seal

- Install the front oil seal onto the front cover while pressing the seal's entire periphery evenly to prevent it from tilting.
- Install the front oil seal until its flange comes into positive contact with the front cover.

◆Inspection procedure◆



■ Inspection: Oil cooler element

- Plug the outlet of the oil cooler element and connect a hose to the engine oil inlet port. Then, immerse the oil cooler element in a tank of water.
- Apply a specified air pressure for 15 seconds through the hose, and check for any air leaks.
- Replace the element if it leaks air.

CAUTION ⚠

- **If the supply pump has been replaced, perform the "initialization of supply pump unit difference learning value" using Multi-Use Tester in order to clear the correction data (learned pump unit difference) from the engine electronic control unit. (See Gr13EA.)**

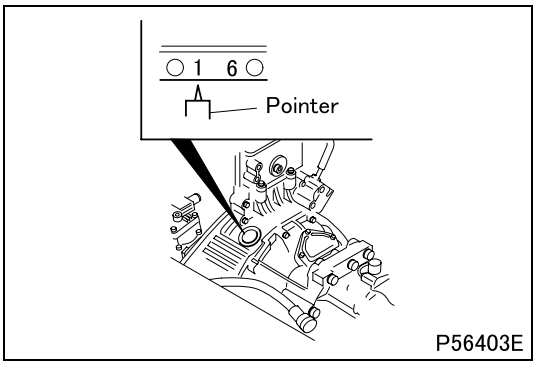
Tightening torque (Unit: N·m {ft.lbs, kgf·m})

Mark	Parts to be tightened	Tightening torque	Remarks
Ta	Fuel pipe	39.2 to 49 {29 to 36, 4.0 to 5.0}	–
Tb	Eyebolt (for fuel return pipe mounting)	7.9 to 12.7 {5.8 to 9.4, 0.8 to 1.3}	–
Tc	Eyebolt (for fuel suction pipe mounting)	14.8 to 19.6 {11 to 14, 1.5 to 2.0}	–

Lubricant and/or sealant

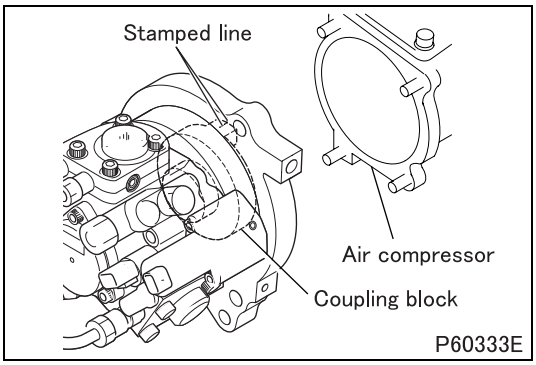
Mark	Points of application	Specified lubricant and/or sealant	Quantity
a	O-ring	Engine oil	As required

◆Installation procedure◆

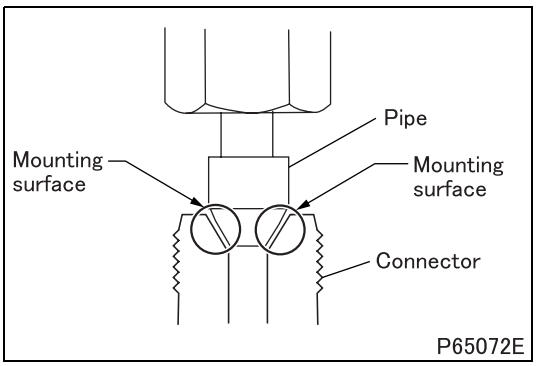


■ Installation: Supply pump

- Position the No. 1 piston to the top dead center in the compression stroke in the following manner.
  - Crank the engine to align the pointer with the "1 6" mark on the flywheel.
  - This will bring either the No. 1 piston or the No. 6 piston to the top dead center in the compression stroke. If both the inlet and exhaust rockers can be moved by hand by the amount of valve clearance, that cylinder is at the top dead center in the compression stroke. From that position, every turn of the crankshaft will alternately bring the No. 1 and No. 6 pistons to the top dead center in the compression stroke. (See Gr11.)

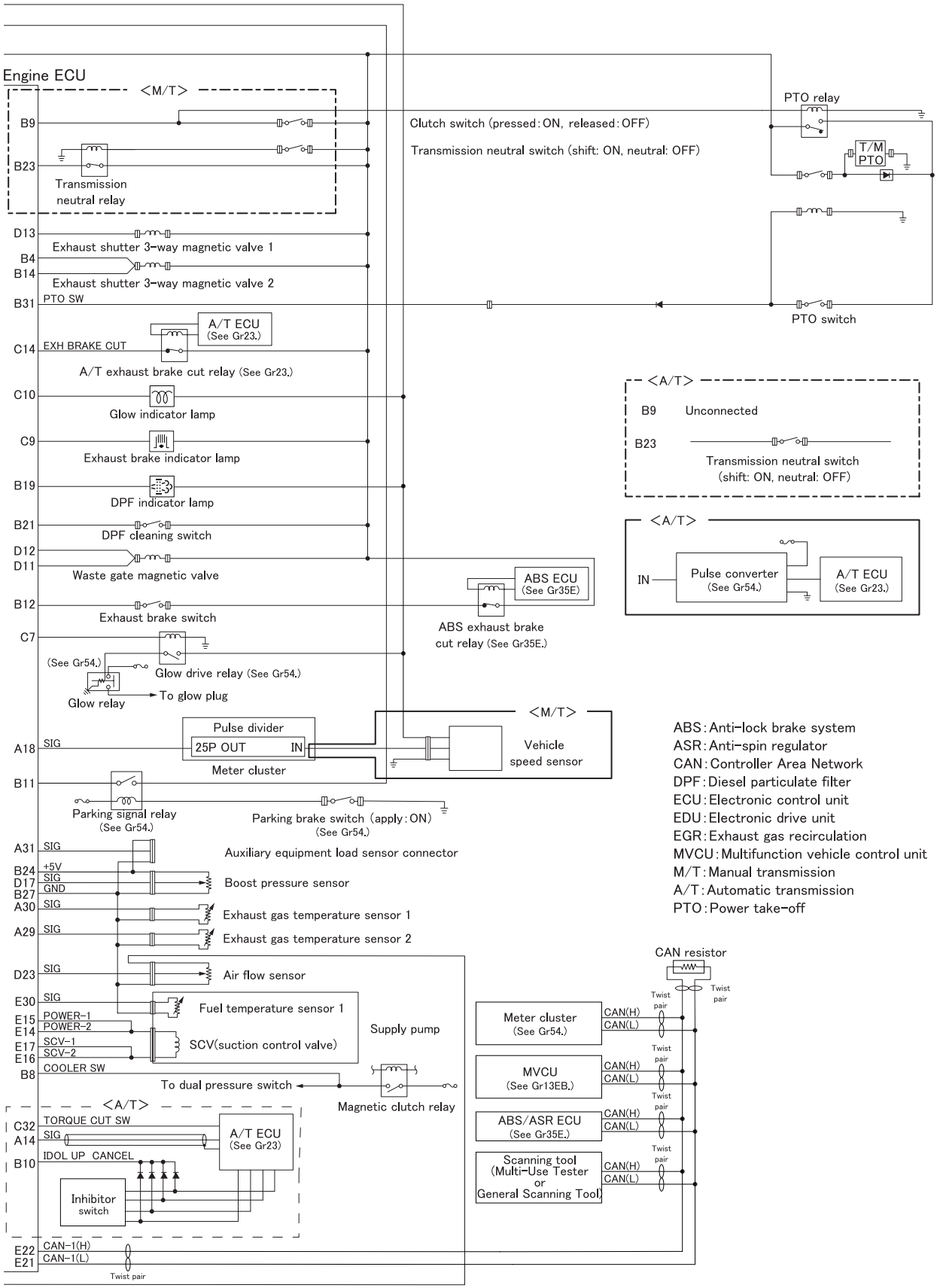


- Install the supply pump while ensuring that the stamped line on the supply pump timing cover is aligned with the stamped line on the coupling block.



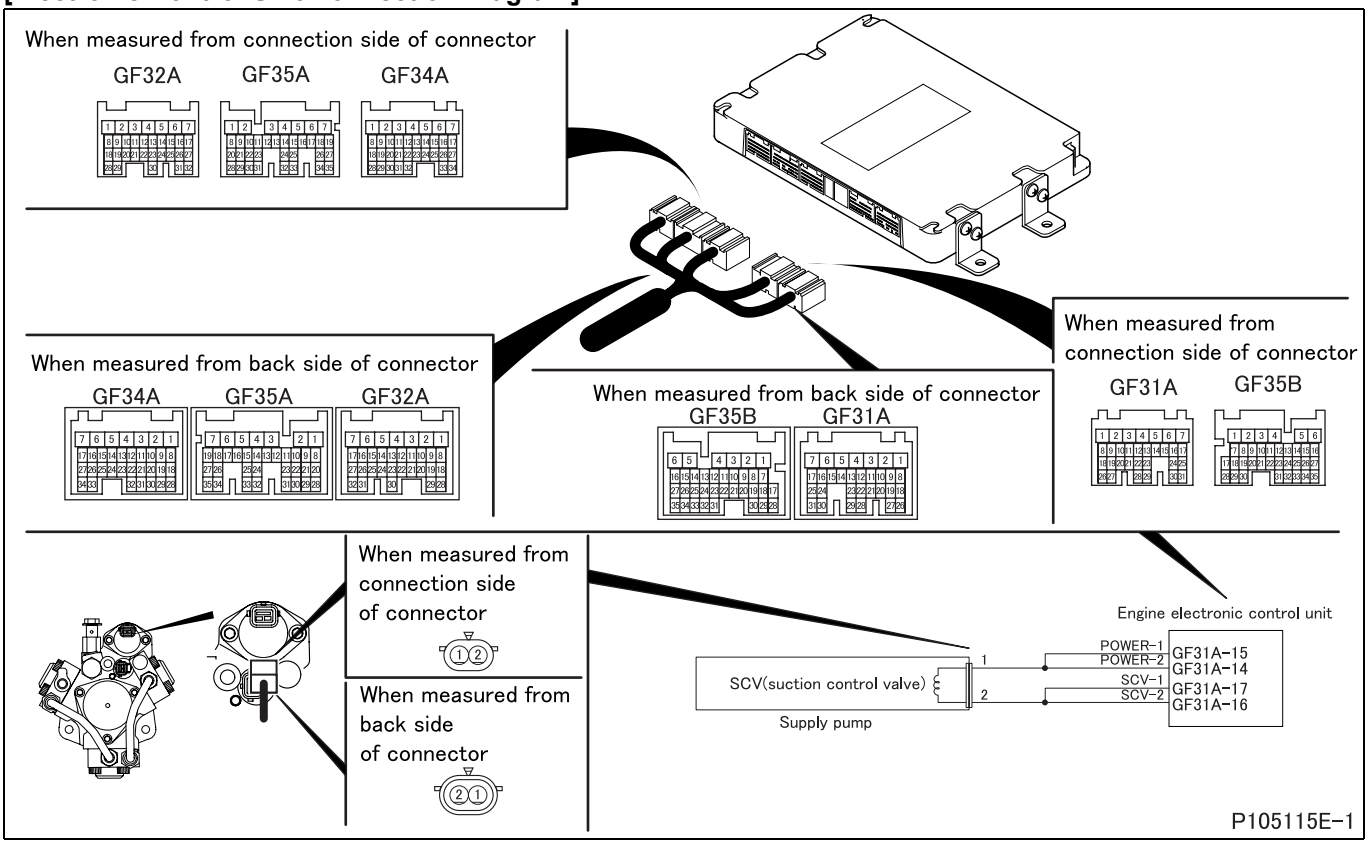
■ Installation: Fuel pipe

- Ensure that the pipe and mounting surfaces of the connector are flat and free from damage.
- Bring the pipe into intimate contact with mounting surfaces of the connector evenly, and temporarily tighten it without applying an excessive force.
- Tighten it to the specified torque after temporary tightening.


Engine ECU
<M/T>
B9
B23
Transmission neutral relay
Clutch switch (pressed: ON, released: OFF)
Transmission neutral switch (shift: ON, neutral: OFF)
PTO relay
T/M PTO
PTO switch
D13
Exhaust shutter 3-way magnetic valve 1
B4
B14
Exhaust shutter 3-way magnetic valve 2
B31
PTO SW
A/T ECU (See Gr23.)
C14
EXH BRAKE CUT
A/T exhaust brake cut relay (See Gr23.)
C10
Glow indicator lamp
C9
Exhaust brake indicator lamp
B19
DPF indicator lamp
B21
DPF cleaning switch
D12
D11
Waste gate magnetic valve
ABS ECU (See Gr35E)
B12
Exhaust brake switch
ABS exhaust brake cut relay (See Gr35E.)
C7
(See Gr54.)
Glow drive relay (See Gr54.)
Glow relay
To glow plug
<A/T>
B9 Unconnected
B23
Transmission neutral switch (shift: ON, neutral: OFF)
<A/T>
IN
Pulse converter (See Gr54.)
A/T ECU (See Gr23.)
<M/T>
Pulse divider
A18
SIG
25P OUT IN
Meter cluster
Vehicle speed sensor
B11
Parking signal relay (See Gr54.)
Parking brake switch (apply: ON) (See Gr54.)
A31
SIG
Auxiliary equipment load sensor connector
B24
+5V
D17
SIG
B27
GND
Boost pressure sensor
A30
SIG
Exhaust gas temperature sensor 1
A29
SIG
Exhaust gas temperature sensor 2
D23
SIG
Air flow sensor
E30
SIG
Fuel temperature sensor 1
E15
POWER-1
E14
POWER-2
E17
SCV-1
E16
SCV-2
SCV(suction control valve)
Supply pump
B8
COOLER SW
To dual pressure switch
Magnetic clutch relay
<A/T>
C32
TORQUE CUT SW
A14
SIG
A/T ECU (See Gr23)
B10
IDOL UP CANCEL
Inhibitor switch
E22
CAN-1(H)
E21
CAN-1(L)
Twist pair
CAN resistor
Twist pair
Meter cluster (See Gr54.)
CAN(H)
CAN(L)
MVCU (See Gr13EB.)
ABS/ASR ECU (See Gr35E.)
Scanning tool (Multi-Use Tester or General Scanning Tool)
ABS: Anti-lock brake system
ASR: Anti-spin regulator
CAN: Controller Area Network
DPF: Diesel particulate filter
ECU: Electronic control unit
EDU: Electronic drive unit
EGR: Exhaust gas recirculation
MVCU: Multifunction vehicle control unit
M/T: Manual transmission
A/T: Automatic transmission
PTO: Power take-off

P107257E-2

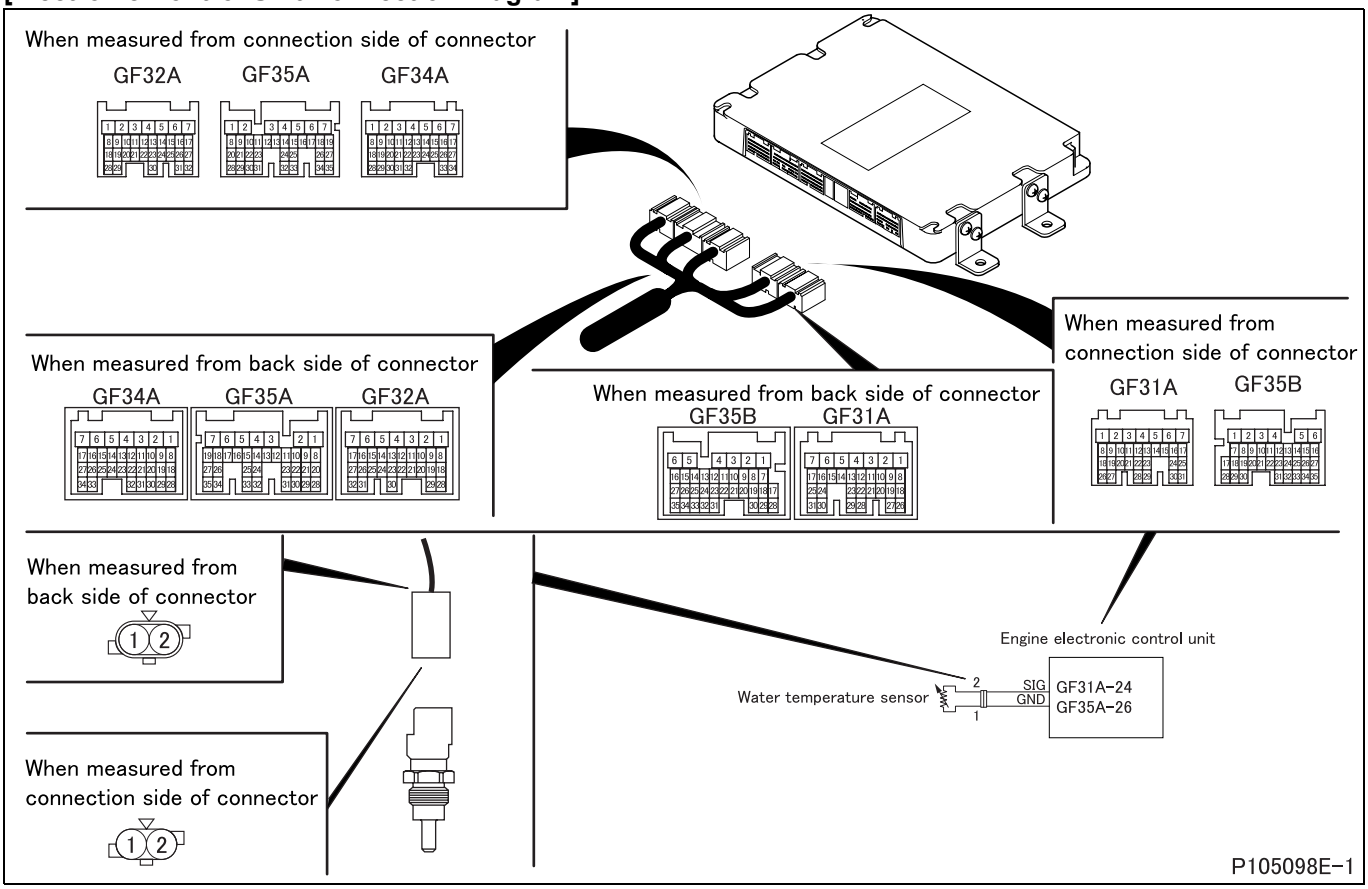
[Electronic Control Unit Connection Diagram]



Step 7	Inspection items		Inspection of harness between electronic control unit and sensor (ground)
	Maintenance item		Check circuit between sensor connector terminal No. 2 and electronic control unit connector (GF35A) terminal No. 26.
	Inspection condition		Disconnect each device from harness and measure from connection side of harness connector.
	Requirements		There is continuity.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Modify harness.

Step 8	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 28 “Intake Air Temperature (EGR)” of Service Data.
	Inspection condition		–
	Requirements		When engine is cold: Temperature is equivalent to outside temperature.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Replacement of electronic control unit

[Electronic Control Unit Connection Diagram]



Step 2	Inspection items		Checking of engine appearance
	Maintenance item		Check fuel system for fuel leak.
	Inspection condition		Starter switch: OFF
	Requirements		There is no fuel leak.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Go to step 6.

Step 3	Inspection items		Inspection of low pressure piping (fuel tank – supply pump)
	Maintenance item		Check suction pipe or hose for blocking.
	Inspection condition		Starter switch: OFF
	Requirements		There is no blocking on pipe or hose.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Correct and replace suction pipe or hose.

Step 4	Inspection items		Checking of air bleeding
	Maintenance item		Bleed air from fuel filter.
	Inspection condition		Starter switch: OFF
	Requirements		Problem is solved by bleeding air.
	Inspection result (Is the judging standard satisfied?)	YES	–
		NO	Go to step 5.

Step 5	Inspection items		Inspection of fuel filter
	Maintenance item		Fuel filter clogged
	Inspection condition		Starter switch: OFF
	Requirements		Problem is solved by replacing fuel filter.
	Inspection result (Is the judging standard satisfied?)	YES	–
		NO	Go to step 6.

Step 6	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. B9 “Fuel Leak Check”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Engine start: At idle
	Requirements		There is no leak from supply pump.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Inspection of supply pump (contact DENSO Service Station) or replace.

Step 7	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. B9 “Fuel Leak Check”.
	Inspection condition		• Vehicle: stationary (vehicle speed 0 km/h {0 MPH}) • Transmission: neutral • Engine start: At idle
	Requirements		There is no leak from fuel pipe between supply pump and rail.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Replacement of fuel pipe

[Recoverability]

Condition for recovery differs according to warning lamp colors.

<Control during fault>

[Warning lamp: MIL (Orange)]

- Recovered if signal becomes normal with starter switch in ON position.

[Warning lamp: Red]

- Recovered if signal becomes normal when starter switch is turned OFF to ON (power supply resumed to electronic control unit).

<Warning lamp>

[Warning lamp: MIL (Orange)]

- Extinguished at 4th driving cycle after normal signal is input.

[Warning lamp: Red]

- Extinguished on input of normal signal.

<Fault code>

[Warning lamp: MIL (Orange)]

- Automatically cleared at 40th warm up cycle after warning lamp is extinguished. (To clear as desired, erase from the memory.)

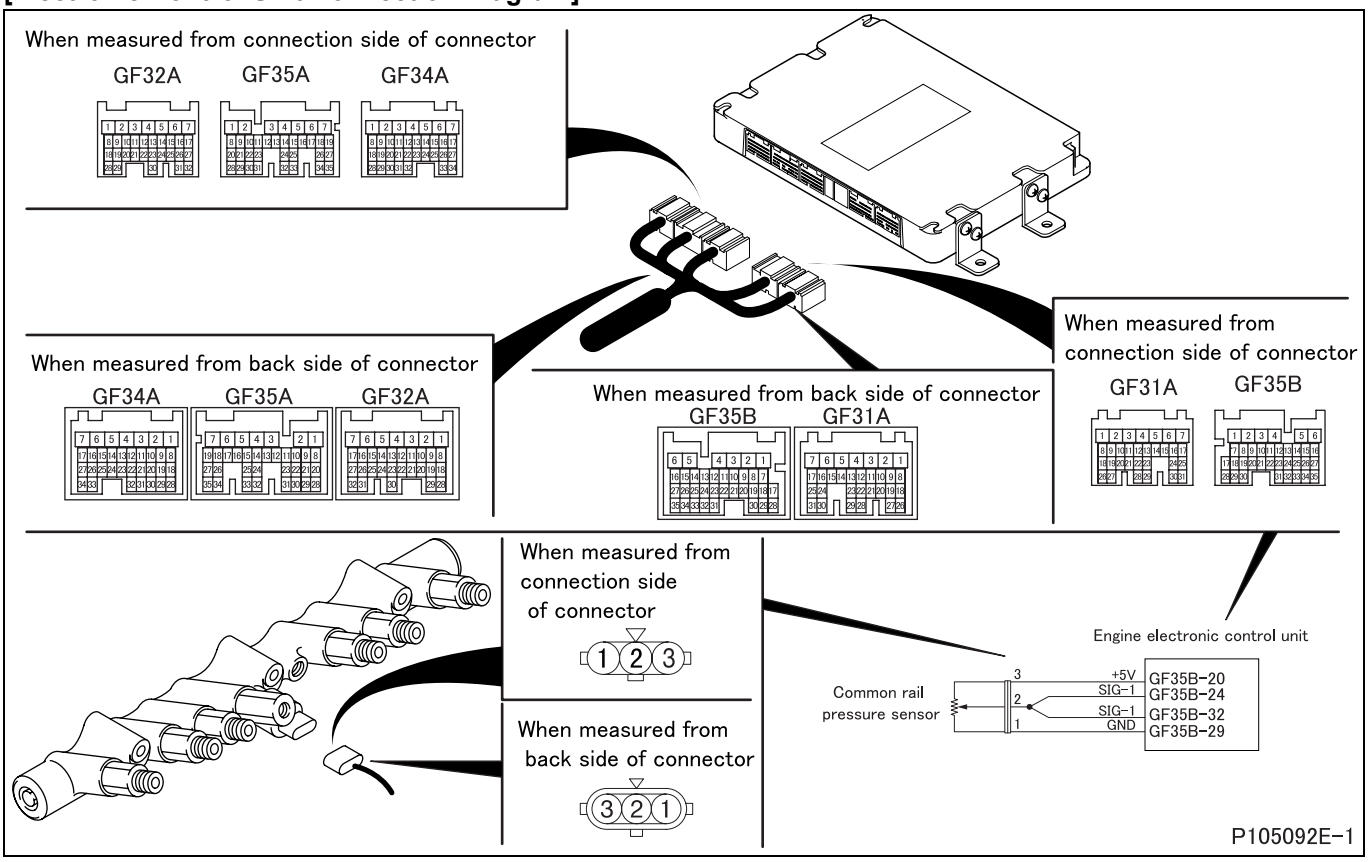
[Warning lamp: Red]

- Automatically cleared after warning lamp is extinguished. (To clear as desired, erase from the memory.)

Driving cycle : “Starter switch ON to start engine till starter switch OFF” constitutes 1 driving cycle.

Warm up cycle : “Starter switch ON to start engine till starter switch OFF after coolant temperature increased and engine warmed up” constitutes 1 warm up cycle.

[Electronic Control Unit Connection Diagram]

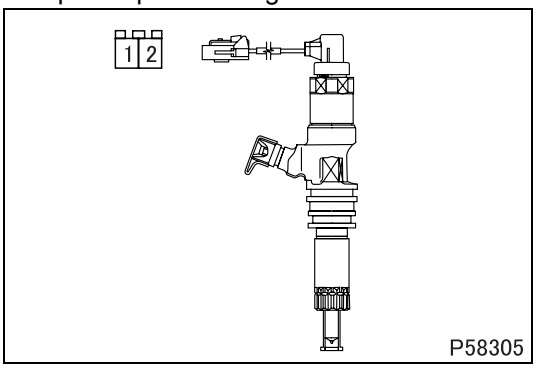


Step 3	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Modify connector.

Step 4	Inspection items		Inspection of injector magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Modify connector.

Step 5	Inspection items		Inspection of injector magnetic valve unit
	Maintenance item		Measure value of resistance between connector terminal No. 1 and 2.
	Inspection condition		–
	Requirements		0.45 ± 0.1 Ω (20°C {68°F})
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of injector

<Step 5 inspection diagram>



Step 6	Inspection items		Inspection of harness between injector magnetic valve and electronic control unit (power supply)
	Maintenance item		Check circuit between injector magnetic valve connector terminal No. 2 and electronic control unit connector (GF35B) terminal No. 1 or 2.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		There is continuity.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify harness.

Step 5	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 12.
		NO	Modify connector.

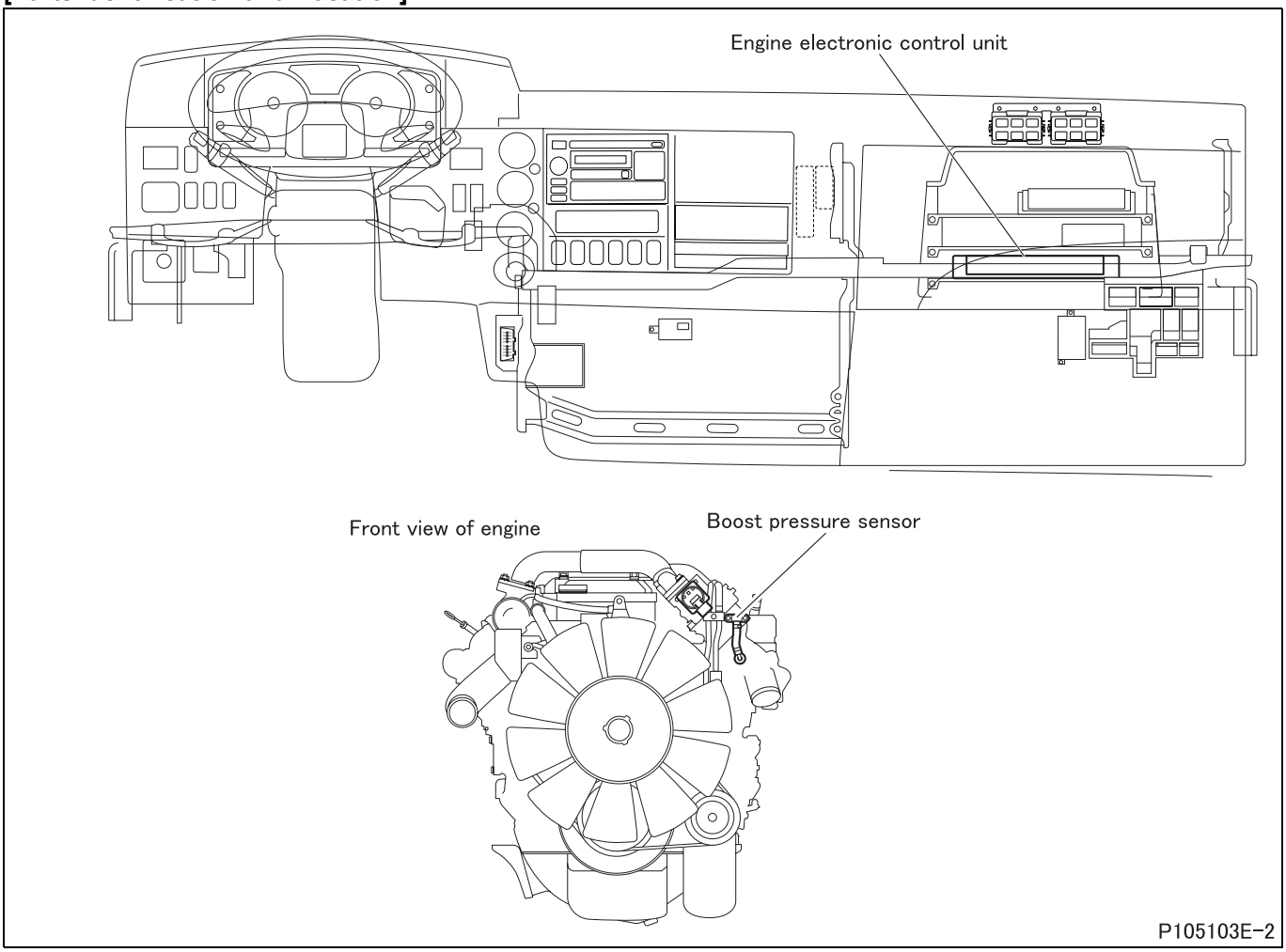
Step 6	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 7.
		NO	Modify connector.

Step 7	Inspection items		Inspection of accelerator pedal position sensor 2 unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 3 (–).
	Inspection condition		Apply voltage DC 5 V across connector terminals No. 1 (+) and 3 (–).

	Requirements		• Idle position A: 0.85 ± 0.1 V
			• Accelerator pedal switch operating position B: 1.0 ± 0.2 V
			• Full load position C: 4.15 ± 0.1 V
			  • A: When accelerator lever fully presses accelerator pedal switch.
			  • B: When accelerator pedal is pressed until there is no continuity between accelerator pedal switch connector terminals 1 and 2.
			  • C: When accelerator lever is in contact with full load stopper bolt.

	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Adjustment of sensor (If the measurement deviates from the standard value after adjustment, replace the sensor.) (See “INSPECTION OF ELECTRICAL EQUIPMENT” – “Inspection of accelerator pedal position sensor”.)

[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Intake MAP”. **<Multi-Use Tester used>** • Measure item No. 26 “Boost Pressure” of Service Data.
	Inspection condition		Starter switch ON (engine stationary) → After engine has started, press accelerator pedal.
	Requirements		Coincides with atmospheric pressure → Gradually increases
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

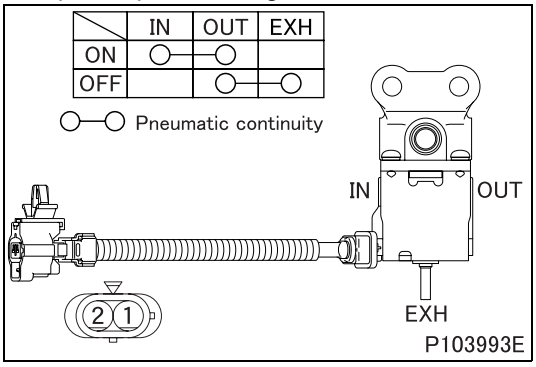
Step 2	Inspection items		Inspection by electronic control unit connector (signal)
	Maintenance item		Measure value of voltage between connector (GF35B) terminal No. 17 (+) and (GF35A) terminal No. 27 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Engine started
	Requirements		0.5 to 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 3.

Step 2	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Modify connector.

Step 3	Inspection items		Inspection of waste gate magnetic valve connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 4.
		NO	Modify connector.

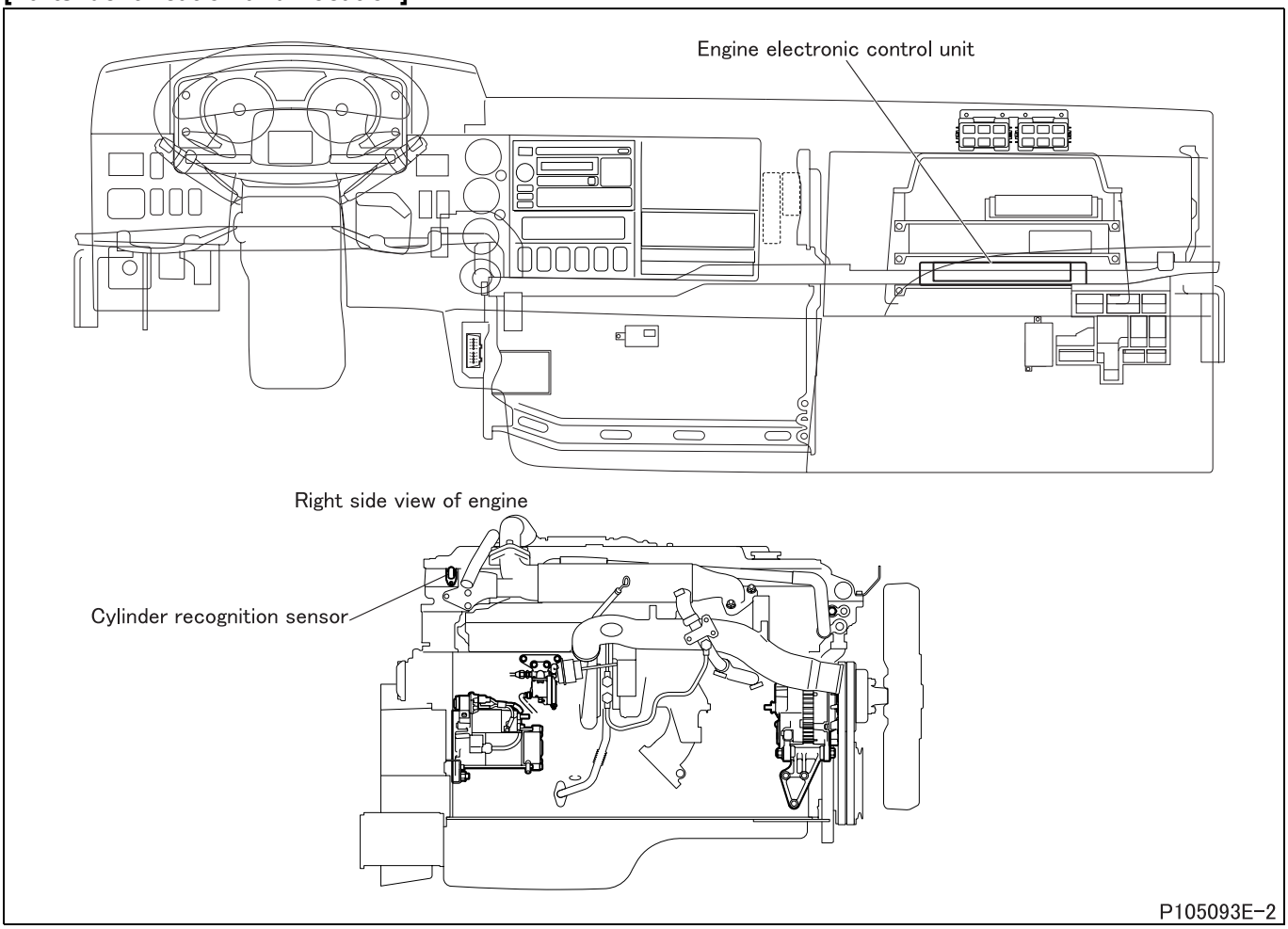
Step 4	Inspection items		Inspection of waste gate magnetic valve unit
	Maintenance item		Measure minimum operating voltage when waste gate magnetic valve operates (judge by operation sound).
	Inspection condition		Gradually increase from zero the voltage applied to terminals No. 1 (+) and 2 (–).
	Requirements		9 V or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Replacement of waste gate magnetic valve

<Step 4 inspection diagram>



Step 5	Inspection items		Inspection of harness between waste gate magnetic valve and fuse
	Maintenance item		Check circuit between waste gate magnetic valve connector terminal No. 1 and fuse (M11).
	Inspection condition		Disconnect each device from harness and measure from connection side of harness connector.
	Requirements		There is continuity.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Modify harness.

[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps

Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Ne”. **<Multi-Use Tester used>** • Measure item No. 01 “Engine Revolution” of Service Data.
	Inspection condition		–
	Requirements		Same indication as tachometer is given.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

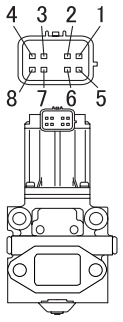
Step 2	Inspection items		Inspection by electronic control unit connector (signal)
	Maintenance item		Measure value of voltage between connector (GF35B) terminal No. 25 (+) and 33 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		1 V or more
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 3.

Step 10	Inspection items		Inspection of electronic drive unit connector (motor)
	Maintenance item		Measure value of resistance between following connector terminals. • Between U - V: 10 - 11 • Between U - W: 10 - 12 • Between V - W: 11 - 12
	Inspection condition		–
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	Go to step 11.

Step 11	Inspection items		Inspection of harness between electronic drive unit and exhaust gas recirculation valve (motor)
	Maintenance item		Check circuit between following connector terminals. • Motor (U): electronic drive unit connector terminal No. 10 - exhaust gas recirculation valve connector terminal No. 8 • Motor (V): electronic drive unit connector terminal No. 11 - exhaust gas recirculation valve connector terminal No. 7 • Motor (W): electronic drive unit connector terminal No. 12 - exhaust gas recirculation valve connector terminal No. 6
	Inspection condition		Disconnect each device from harness and measure from connection side of harness connector.
	Requirements		There is continuity.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 12.
		NO	Modify harness.

Step 12	Inspection items		Inspection of exhaust gas recirculation valve unit (motor)
	Maintenance item		Measure value of resistance between following exhaust gas recirculation valve connector terminals. • Between U - V: 8 - 7 • Between U - W: 8 - 6 • Between V - W: 7 - 6
	Inspection condition		• Keep exhaust gas recirculation valve installed on vehicle. • Remove harness connector, and measure exhaust gas recirculation valve side.
	Requirements		2.1 ± 0.3 Ω
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 13.
		NO	Replacement of exhaust gas recirculation valve

<Step 12 inspection diagram>



P104214

[Fault diagnosis]

- Perform checks in the sequence of the following steps.

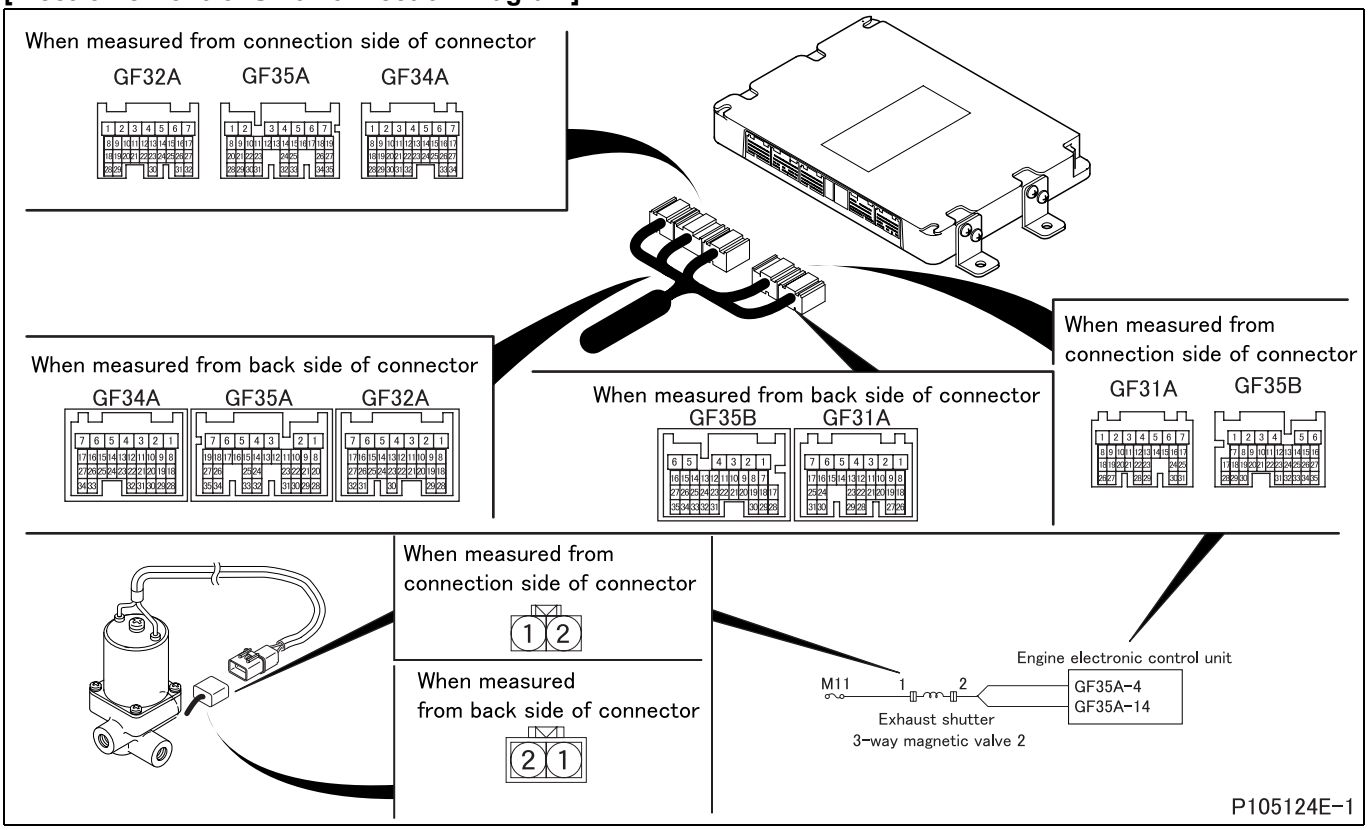
Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “OXI CAT Temperature”. **<Multi-Use Tester used>** • Measure item No. 58 “Exhaust Gas Temperature” of Service Data.
	Inspection condition		While engine is warmed up
	Requirements		Temperature gradually rises up.
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of voltage between connector (GF34A) terminal No. 20 and (GF35A) terminal No. 26.
	Inspection condition		• Starter switch: OFF • Disconnect electronic control unit from harness and measure at vehicle-side connector half.
	Requirements		• 20°C {68°F} : 241.8 kΩ • 50°C {122°F} : 106.2 $^{+74.3}_{-41.8}$ kΩ • 100°C {212°F} : 33.56 $^{+17.60}_{-10.60}$ kΩ • 150°C {302°F} : 13.90 $^{+5.36}_{-3.60}$ kΩ • 200°C {392°F} : 6.896 $^{+2.064}_{-1.252}$ kΩ
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Go to step 4.

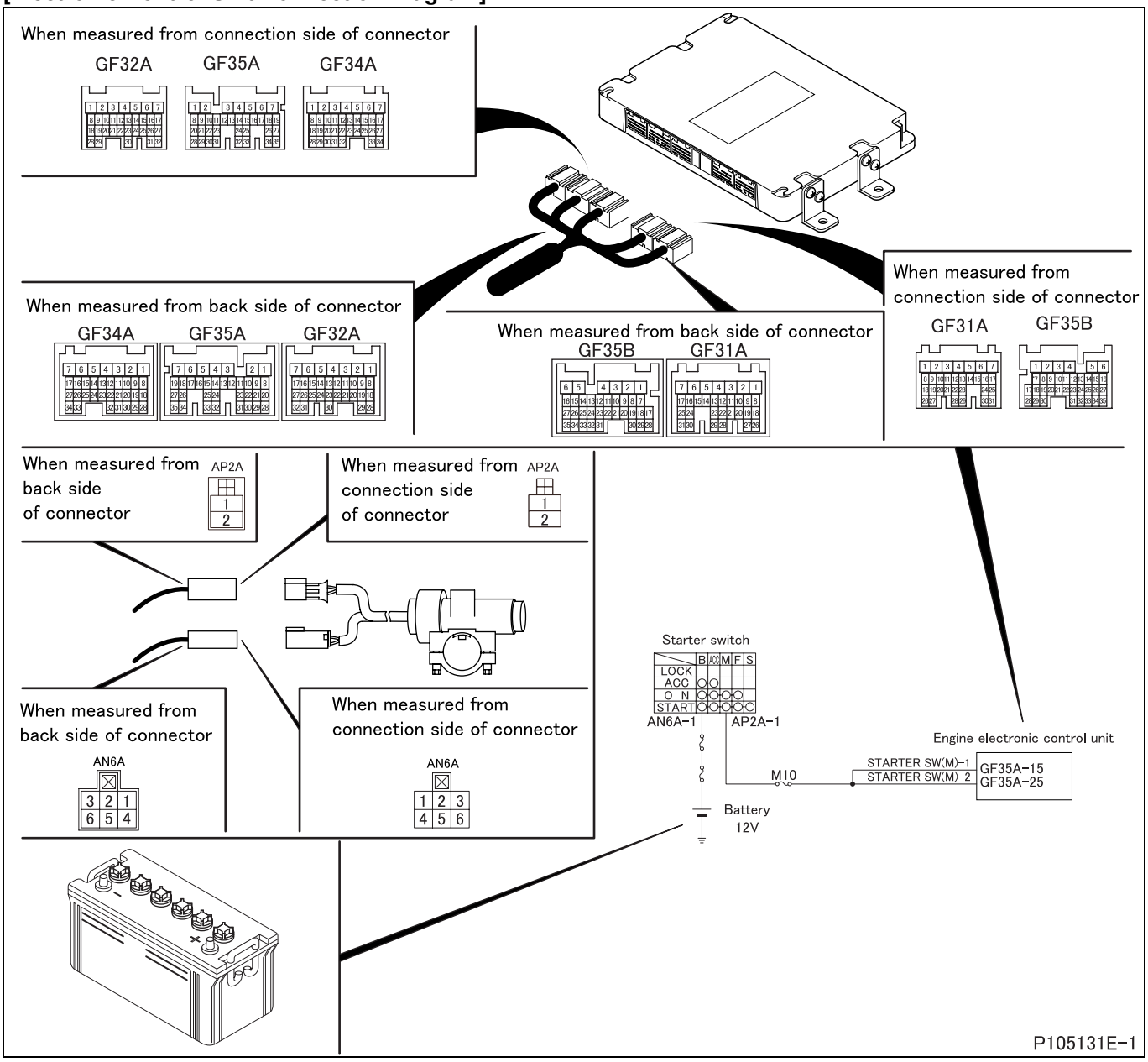
Step 3	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Modify connector.

Step 4	Inspection items		Inspection of sensor connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Modify connector.

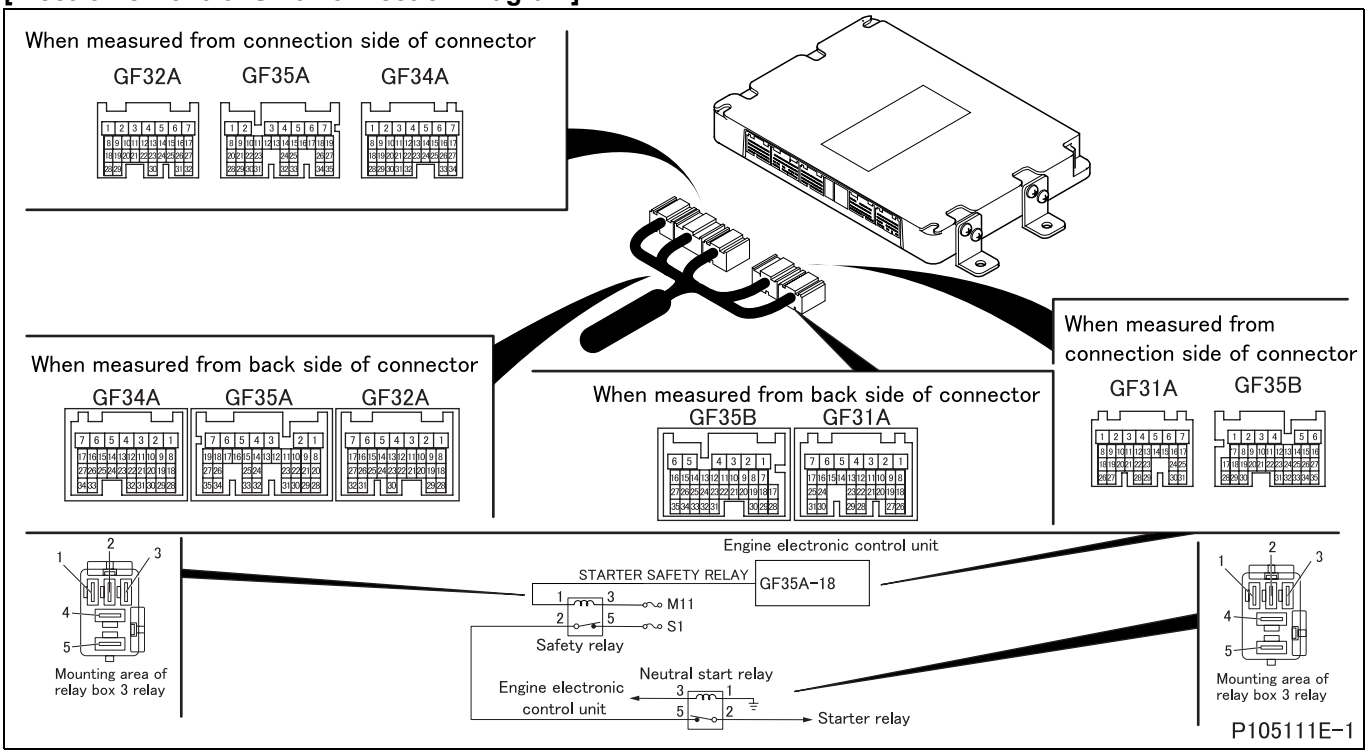
[Electronic Control Unit Connection Diagram]



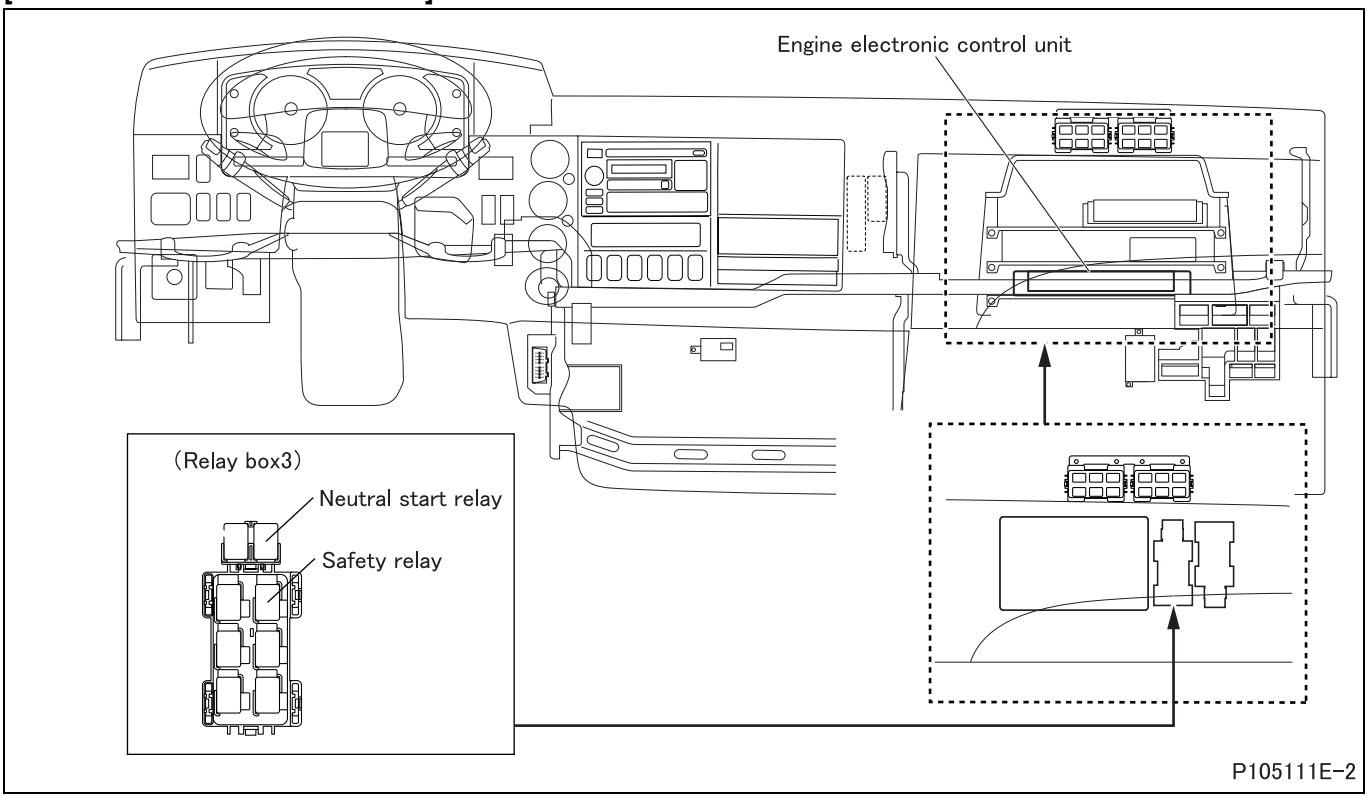
[Electronic Control Unit Connection Diagram]



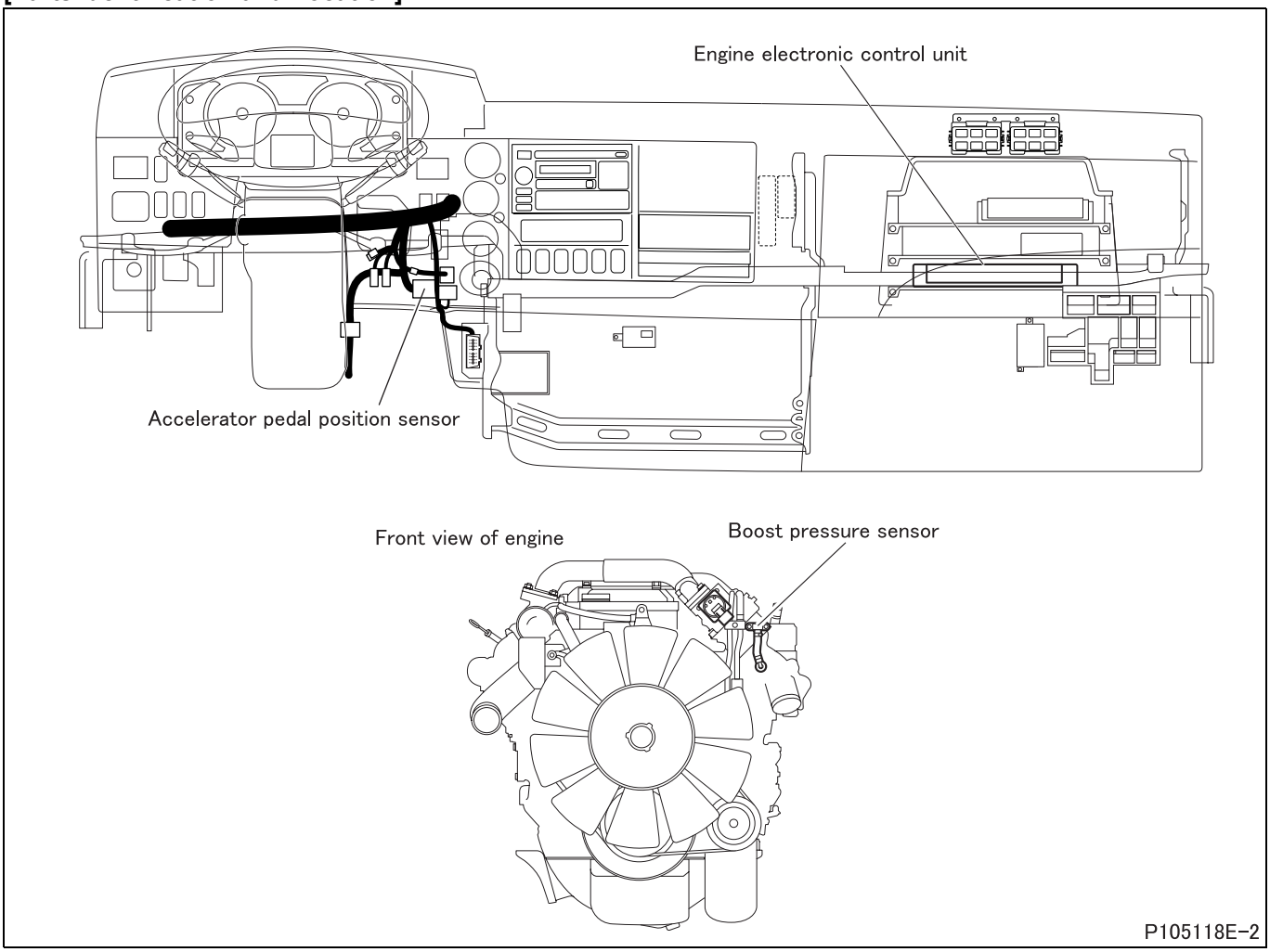
[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



[Parts Identification and Location]



[Fault diagnosis]

- Perform checks in the sequence of the following steps.

Step 1	Inspection items		Inspection of electronic control unit connector
	Maintenance item		Inspection of connector
	Inspection condition		–
	Requirements		• Connector is properly connected. • No trace of water entry is found. • No corrosion is found in terminal. • Connection to terminal is appropriate.
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 2.
		NO	Modify connector.

Step 2	Inspection items		Inspection by electronic control unit connector (power supply): accelerator pedal position sensor (sensor 2)
	Maintenance item		Measure value of voltage between connector (GF35B) terminal No. 22 (+) and No. 28 (–).
	Inspection condition		• Measure from back side of connector of harness with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Go to step 3.

[Fault code]
Diagnosis code: P1242/Flash code: 73
[Monitor]
Abnormality of flow damper (No. 3 cylinder)
[Fault (outline)]
Faulty flow damper check
[Diagnosis check]
- Operation of flow damper is monitored.

[Code generation condition]
- Fuel control cylinder balance (FCCB) and engine speed variation time remain more than specified for approx. 1 minute.
  (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

[Diagnosis check timing]
- When code generation condition is established after starter switch ON

[Diagnostic requirement]
- Engine in operation
- 2 seconds passed after starter switch ON
- 2 seconds passed after cranking
- Battery voltage: normal
- Engine speed sensor: normal in signal
- Post injection: none

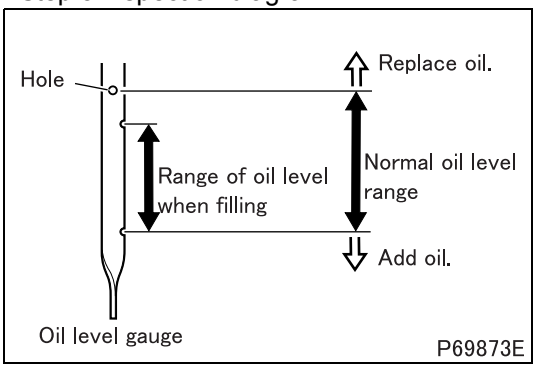
[Control effected by electronic control unit during fault]
- Learning of FCCB (fuel control cylinder balance) is inhibited.

[Probable cause of trouble]
- Leakage and air are found in fuel system.
- Abnormality of flow damper (No. 3 cylinder)
- Abnormality of electronic control unit
- Abnormality of injector (No. 3 cylinder)

[Recoverability]
<Control during fault>
- Recovered if signal becomes normal with starter switch in ON position.

<Fault code>
- To erase, execute Memory Clear.

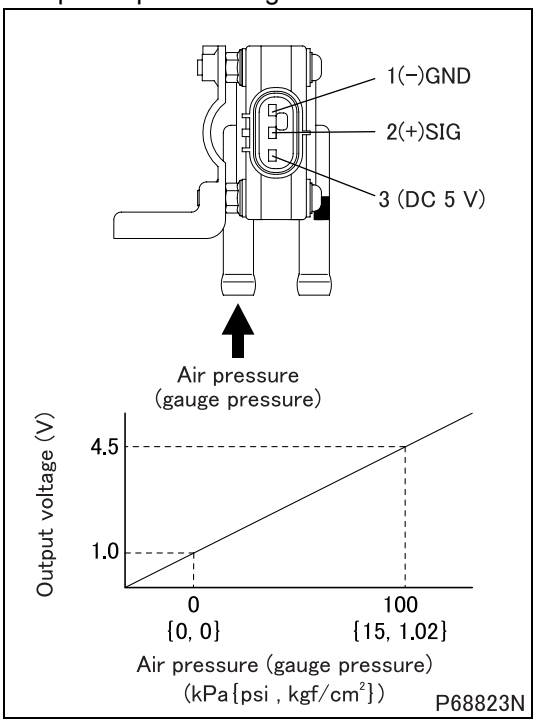
<Step 3 inspection diagram>



Step 4	Inspection items		Inspection of pressure hose
	Maintenance item		Check pressure hose of DPF absolute pressure sensor and DPF pressure sensor (DIFF) for connection and cracks.
	Inspection condition		–
	Requirements		Nothing abnormal detected
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 5.
		NO	Correction and replacement of hose

Step 5	Inspection items		Inspection of DPF pressure sensor (DIFF) unit
	Maintenance item		Measure value of voltage between connector terminal No. 2 (+) and 1 (–).
	Inspection condition		• Apply voltage DC 5 V across terminals No. 3 (+) and 1 (–). • Gradually increase applied air pressure.
	Requirements		• 0 ± 3.5 kPa {0 ± 0.5 psi, 0 ± 0.04 kgf/cm^2}: 1 V • 100 ± 3.5 kPa {15 ± 0.5 psi, 1.02 ± 0.04 kgf/cm^2}: 4.5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 6.
		NO	Replacement of sensor

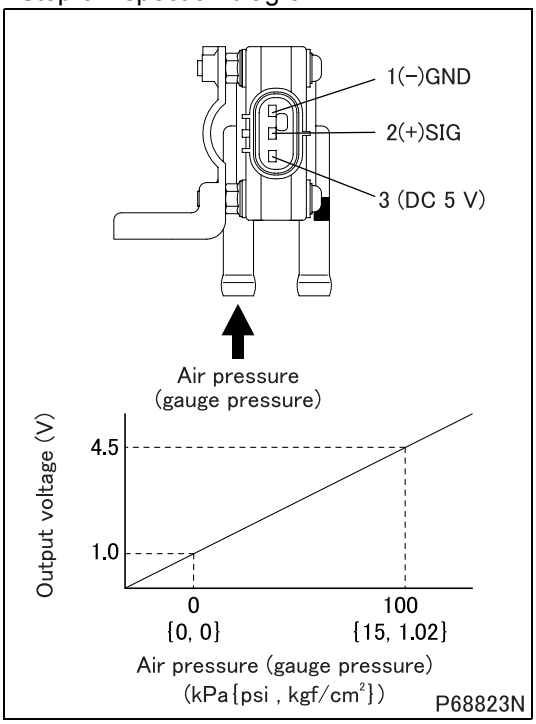
<Step 5 inspection diagram>



Step 8	Inspection items		Inspection of sensor unit
	Maintenance item		Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “Service data”. **<General Scanning Tool used>** • Engine speed: “Ne” (rpm) • Intake air flow rate: “Air Flow Rate from MAFS” (g/s) **<Multi-Use Tester used>** • Engine speed: 01 “Engine Revolution” (rpm) • Intake air flow rate: 3A “Air Flow Sensor Output” (g/hr) **(3) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	Inspection condition		–
	Requirements		10% or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 9.
		NO	Replacement of sensor

Step 9	Inspection items		Inspection by control data
	Maintenance item		Perform actuator test item No. B9 “Fuel Leak Check”.
	Inspection condition		Engine start: At idle
	Requirements		There is no leak from injectors (six).
	Inspection result (Is the judging standard satisfied?)	YES	Replacement of diesel particulate filter
		NO	Replacement of injector

<Step 6 inspection diagram>



Step 7	Inspection items		Inspection of air flow sensor unit
	Maintenance item		Since inspection of single part is not easy, whether characteristics are deteriorated or not must be checked for the sensor mounted on the current vehicle by measuring and comparing the amount of sensor intake air of the sensor currently mounted on vehicle and that replaced with new one by the service data. **(1) Prepare for inspection** • Clean or replace air cleaner element. • Prepare a new air flow sensor. • Warm up the engine fully. **(2) Measure the intake air of current sensor** • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure the following items from among “Service data”. **<General Scanning Tool used>** • Engine speed: “Ne” (rpm) • Intake air flow rate: “Air Flow Rate from MAFS” (g/s) **<Multi-Use Tester used>** • Engine speed: 01 “Engine Revolution” (rpm) • Intake air flow rate: 3A “Air Flow Sensor Output” (g/hr) **(3) Measure the intake air of new sensor** • Replace the currently mounted sensor with a new sensor. • Keep pressing the accelerator pedal until it bottom the stopper bolt from the idling state. (no load maximum rotation) • Measure intake air flow at the same rpm as that of engine revolution in item (2) of “Service data”. **(4) Comparison whether characteristics are deteriorated** • Calculate the characteristics deterioration factor (%) by the following equation. • Characteristics deterioration factor (%) = (intake air of new item – current intake air) × 100/intake air of new item.
	Inspection condition		–
	Requirements		10% or less
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 8.
		NO	Replacement of air flow sensor

[Fault code]
Diagnosis code: P1635/Flash code: 96
[Monitor]
Abnormality in controller area network 2 communication (intake throttle)
[Fault (outline)]
Message timeout
[Diagnosis check]
- Controller area network communication between engine electronic control unit and throttle electronic drive unit is monitored for abnormality.

[Code generation condition]
- No controller area network signals from exhaust gas recirculation electronic drive unit are received for more than 6 seconds.
  (Warning lamp is lit and diagnosis code is displayed on first establishment of code generation condition.)

[Diagnosis check timing]
- When code generation condition is established after starter switch ON

[Diagnostic requirement]
- 2 seconds passed after starter switch ON
- 2 seconds passed after cranking
- Battery voltage: normal
- Controller area network 2 communication in order

[Control effected by electronic control unit during fault]
- Injection quantity is limited.
- Exhaust gas recirculation control is stopped.
- Throttle control is stopped.
- Diesel particulate filter regeneration (manual or automatic) is stopped.
- Fault detection for controller area network communication is stopped.

[Probable cause of trouble]
- Open-circuit or short-circuit of harness between engine electronic control unit and throttle electronic drive unit
- Abnormality of each connector
- Abnormality of engine electronic control unit
- Abnormality of throttle electronic drive unit
- Abnormality of controller area network resistor

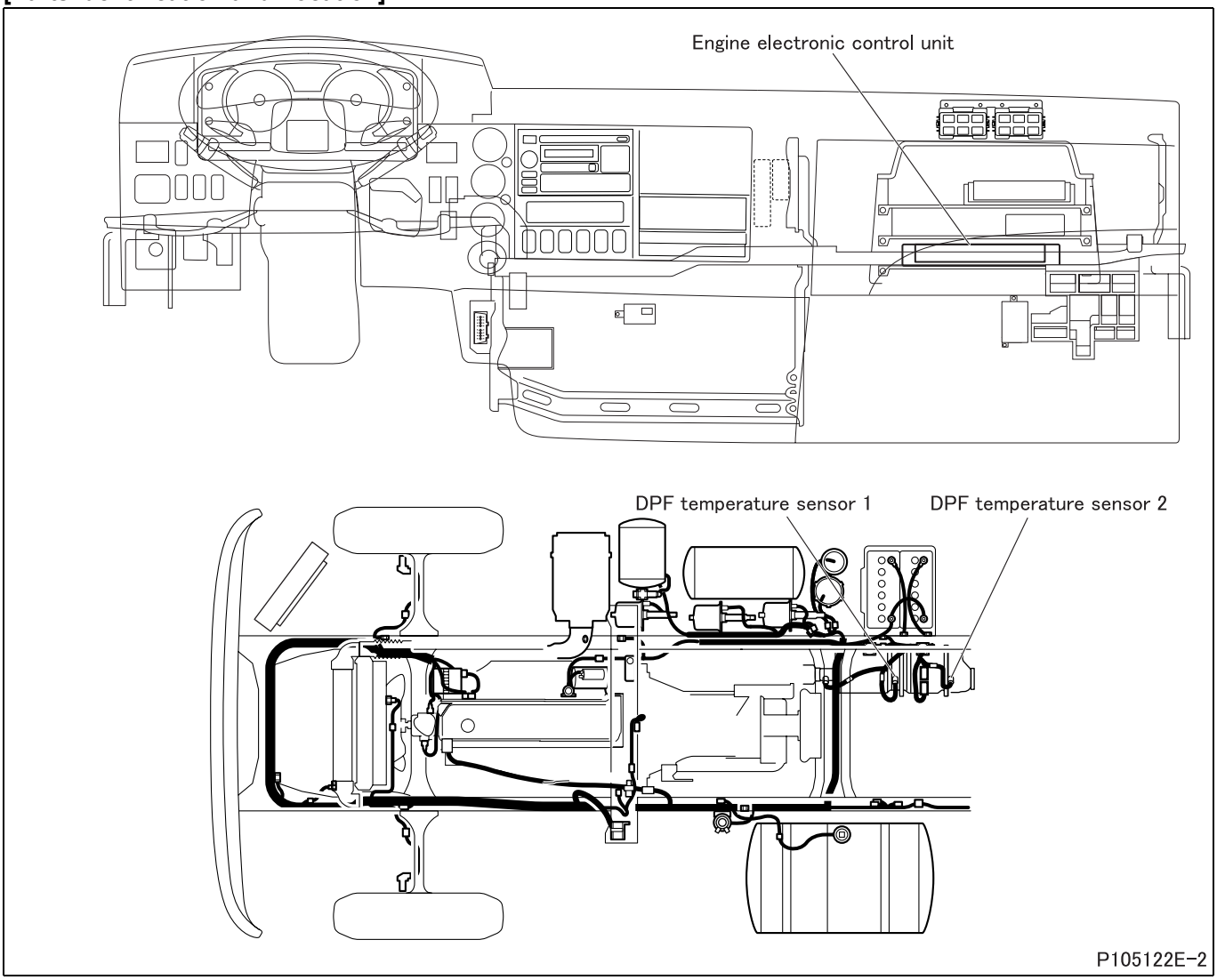
[Recoverability]
<Control during fault>
- Recovered if signal becomes normal with starter switch in ON position.

<Warning lamp>
- Extinguished at 4th driving cycle after normal signal is input.

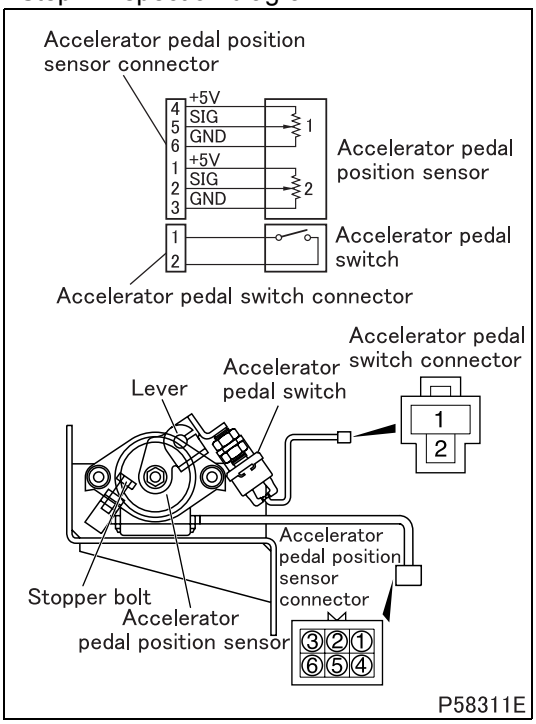
<Fault code>
- Automatically cleared at 40th warm up cycle after warning lamp is extinguished.
  (To clear as desired, erase from the memory.)

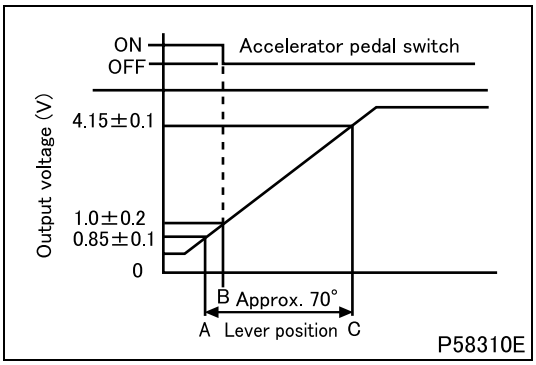
Driving cycle : “Starter switch ON to start engine till starter switch OFF” constitutes 1 driving cycle.
Warm up cycle : “Starter switch ON to start engine till starter switch OFF after coolant temperature increased and engine warmed up” constitutes 1 warm up cycle.

[Parts Identification and Location]



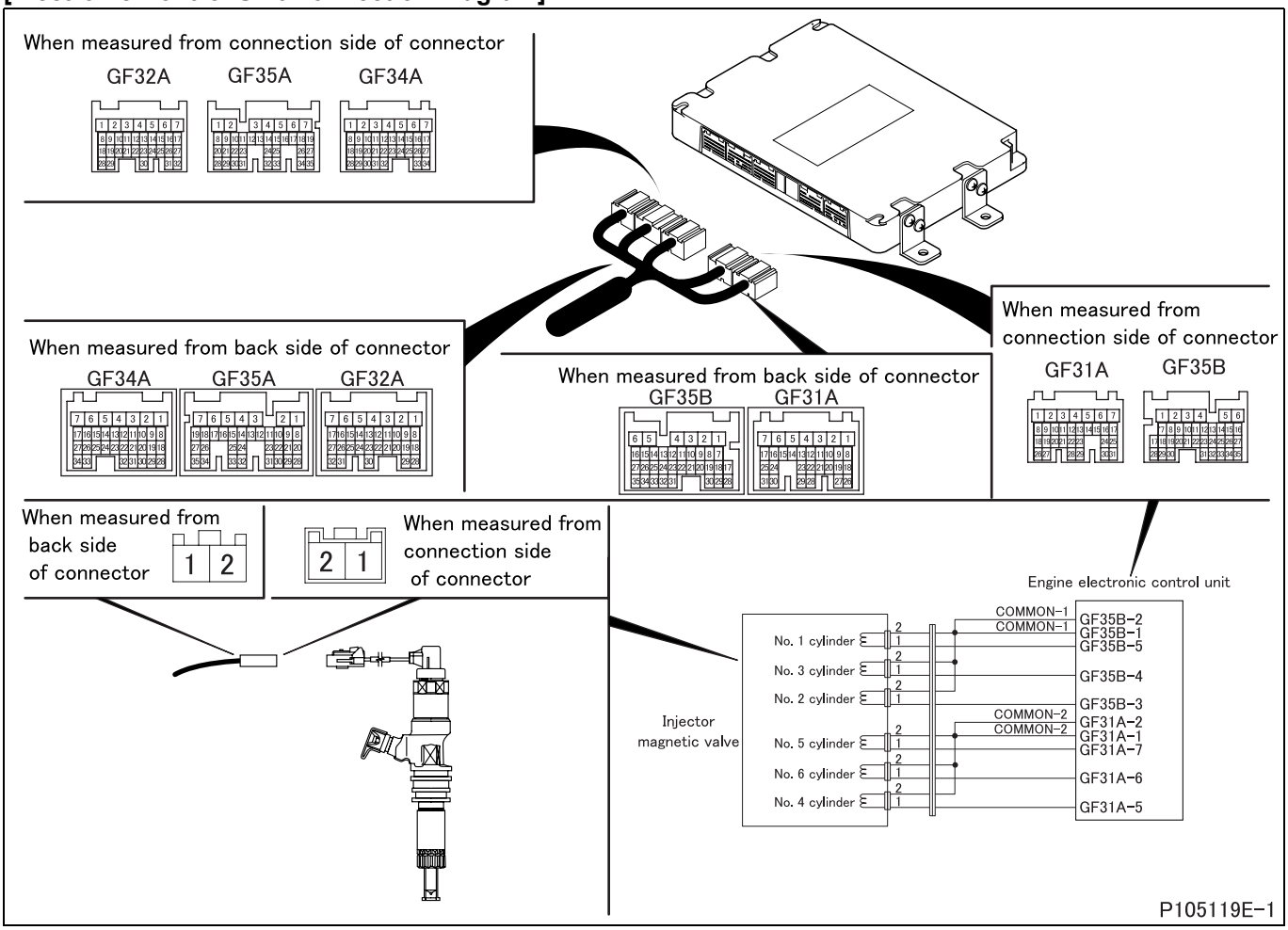
<Step 7 inspection diagram>



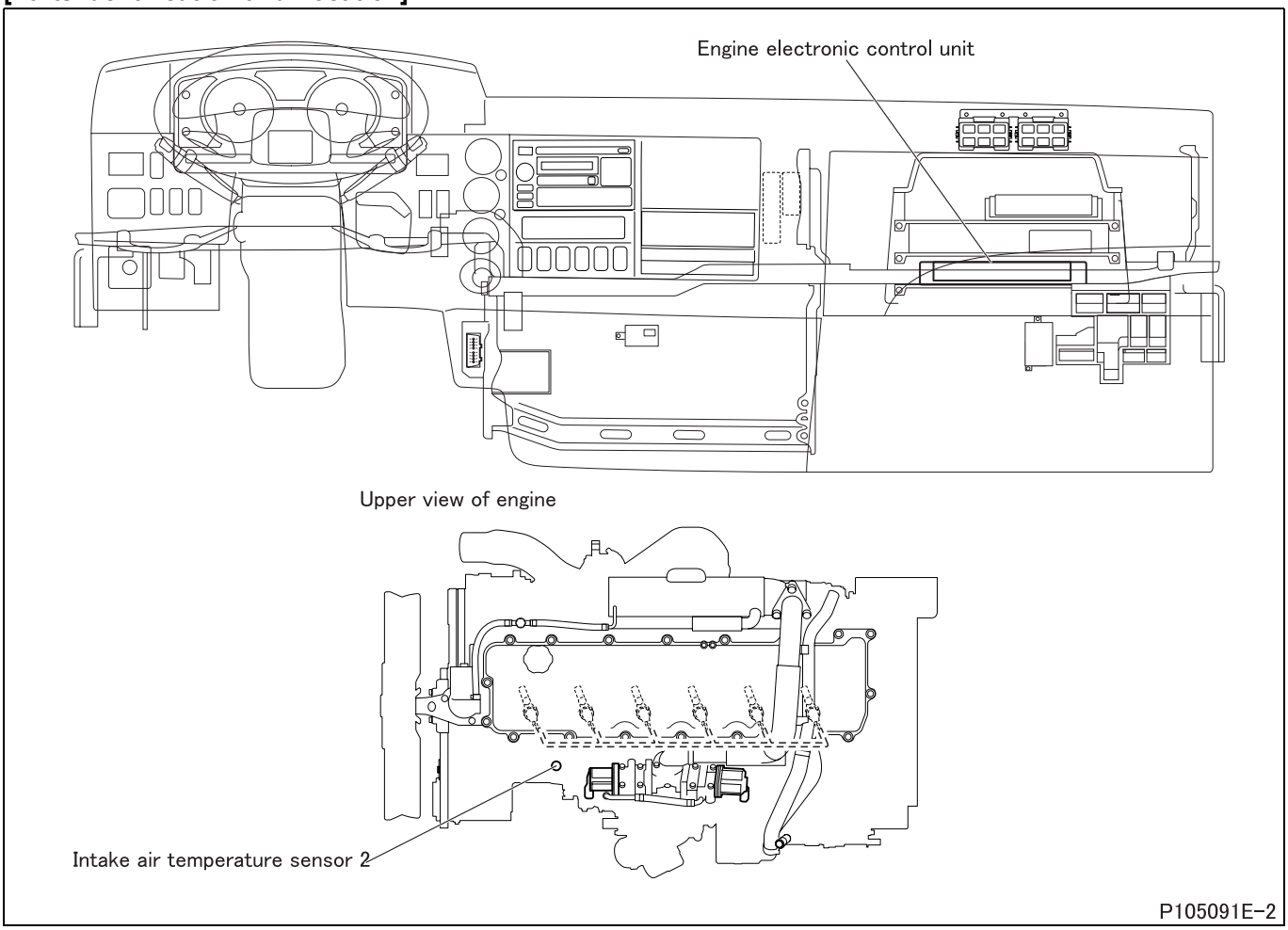


Step 8	Inspection items		Inspection of harness between electronic control unit and sensor (power supply)
	Maintenance item		Measure values of voltage between the following connector terminals • Sensor 1: 4 (+) - 6 (–) • Sensor 2: 1 (+) - 3 (–)
	Inspection condition		• Measure from back side of harness connector with each device connected to harness. • Starter switch: ON
	Requirements		5 V
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 10.
		NO	Go to step 9.

[Electronic Control Unit Connection Diagram]



[Parts Identification and Location]



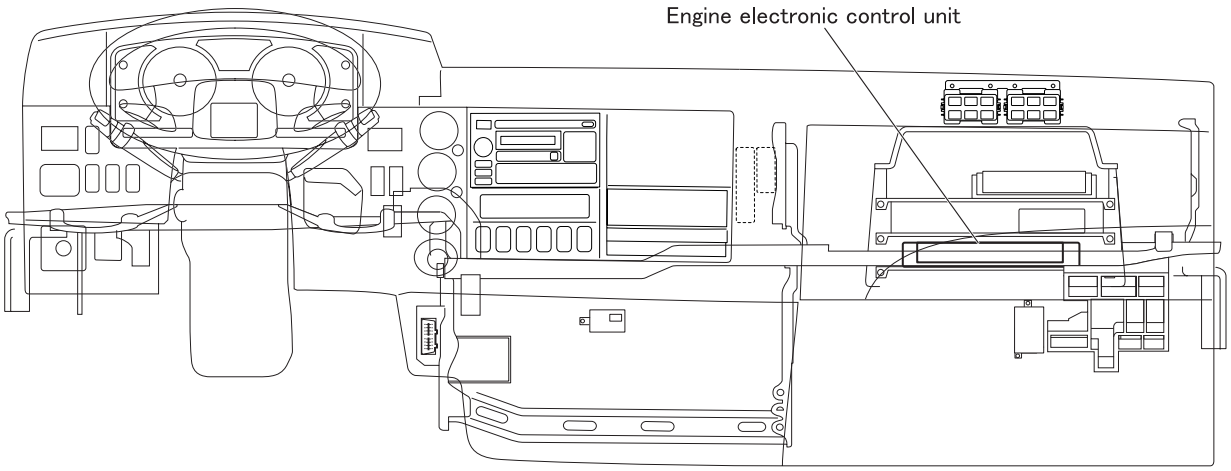
[Fault diagnosis]

- Perform checks in the sequence of the following steps.

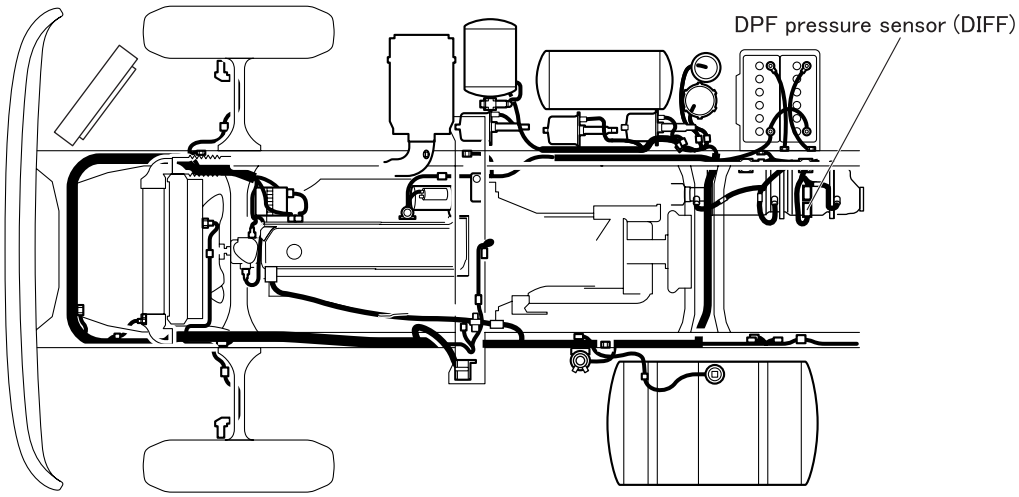
Step 1	Inspection items		Inspection by control data
	Maintenance item		**<General Scanning Tool used>** • Measure item “Intake Air Temperature”. **<Multi-Use Tester used>** • Measure item No. 28 “Intake Air Temperature (EGR)” of Service Data.
	Inspection condition		–
	Requirements		Cold engine: Proportionate to outside air temperature
	Inspection result (Is the judging standard satisfied?)	YES	Go to transient fault (See Gr00.).
		NO	Go to step 2.

Step 2	Inspection items		Inspection by electronic control unit connector
	Maintenance item		Measure value of resistance between connector (GF34A) terminal No. 26 and 28.
	Inspection condition		Disconnect electronic control unit from harness and measure from connection side of harness connector.
	Requirements		• 0°C {32°F}: 162.3 $^{+48.8}_{-36.5}$ kΩ • 20°C {68°F}: 61.47 $^{+15.99}_{-12.35}$ kΩ • 80°C {176°F}: 6.120 $^{+1.095}_{-0.907}$ kΩ
	Inspection result (Is the judging standard satisfied?)	YES	Go to step 3.
		NO	Go to step 4.

[Parts Identification and Location]



<FK>



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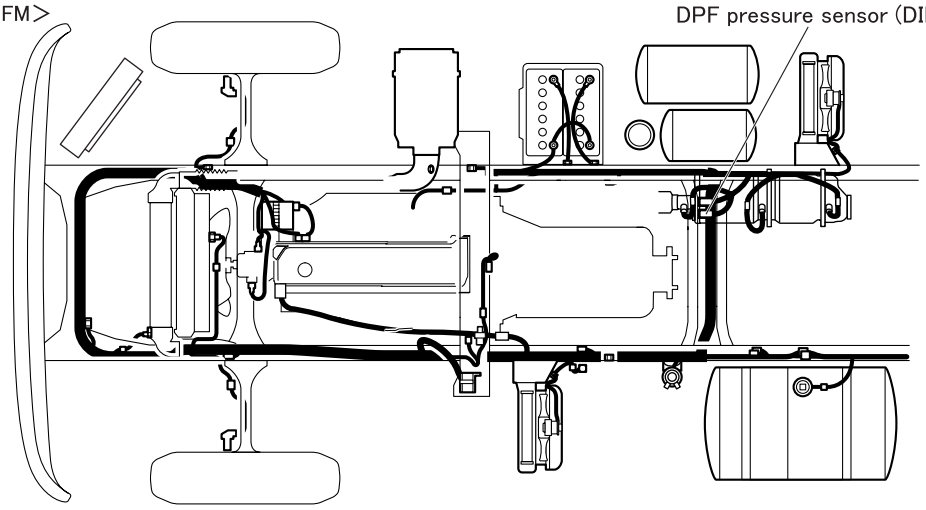


P105127E-2

6. Registration and Alteration of Data in Engine Electronic Control Unit

6.1 Operation at electronic control unit replacement

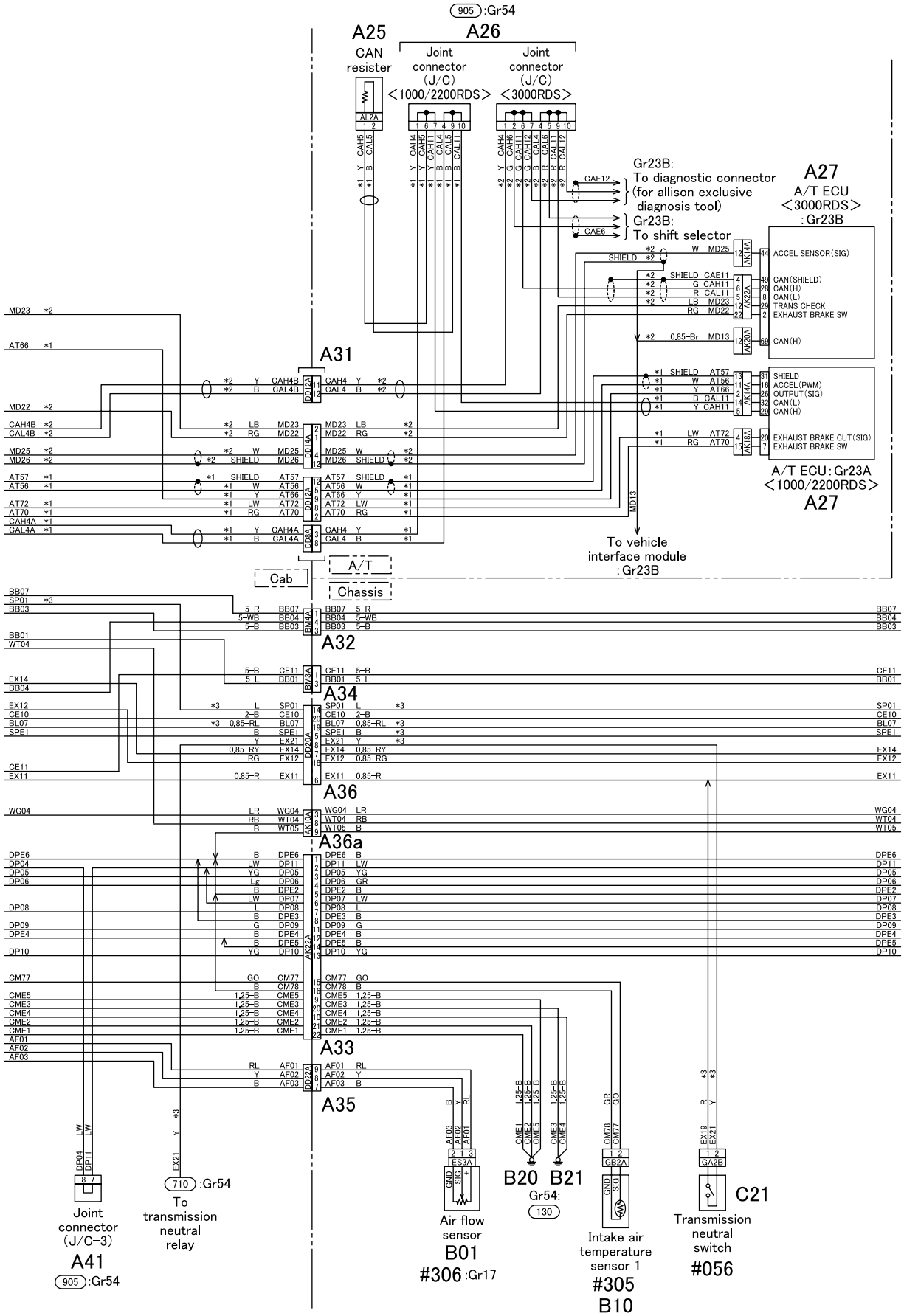
- Vehicle information and equipment specifications are registered in each engine electronic control unit as coded data (coding data).
- Given in the chart below are the items on which registered data in the engine electronic control unit are necessary to alter or new data are necessary to register with the disposition of equipment.
- If the electronic control unit is left initialized with no necessary data registered, it is not capable of proper engine control.
- For data alteration/registration and data write operation, contact your nearest MITSUBISHI FUSO dealer or MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

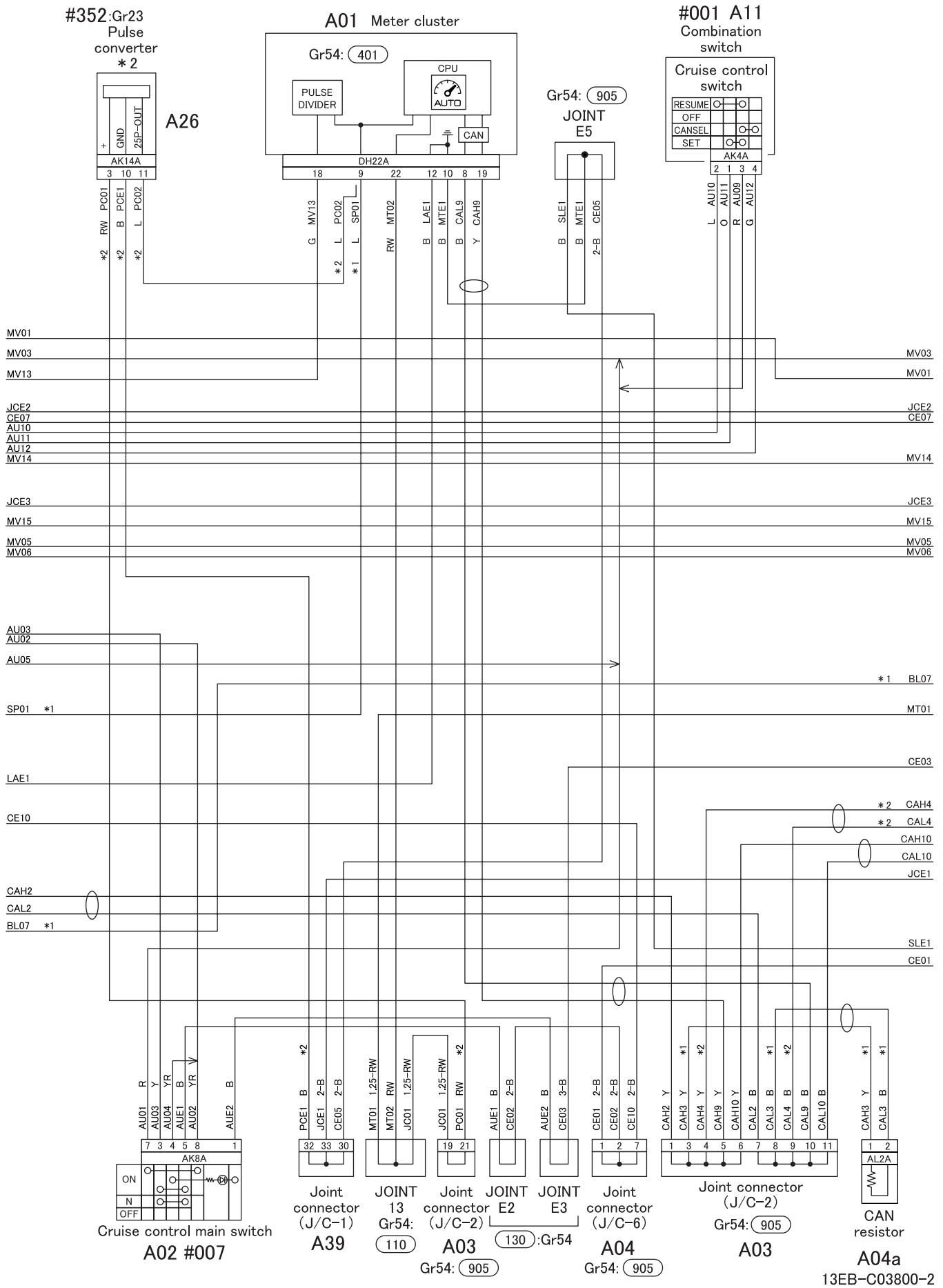
Disposition of equipment \ Engine electronic control unit data		VIN (Vehicle Identification Number)	Injector correction	Injection quantity correction	PTO idling speed	Remarks
Engine electronic control unit	Replaced with new unit	O	O	O	O	
	Relocated from other vehicle	O	O	O	O	
	Erasure of diagnosis codes					No action is required.
Replacement of injector			O			Data code differs from injector to injector and is necessary to change.
Replacement of air flow sensor						Data is not necessary to change if the replacement is identical.
Change of PTO idling speed					O	

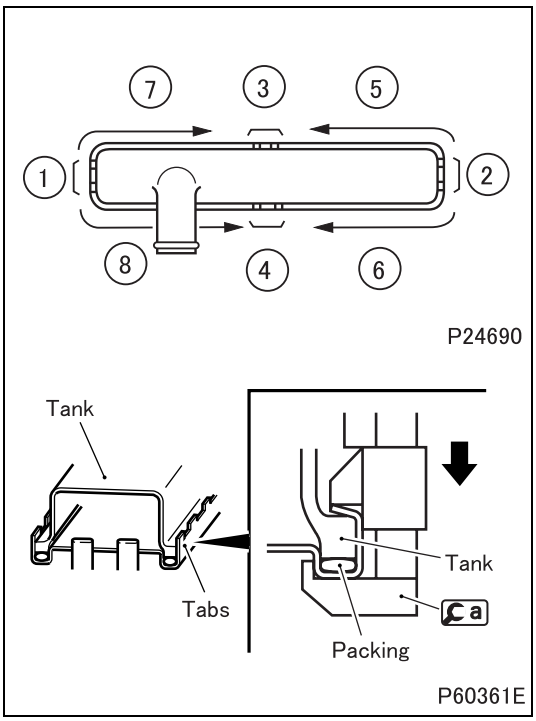
O : Denotes the necessity of data being updated or registered.

6.2 Resetting the diesel particulate filter related information (resetting electronic control unit)

- On the regeneration control type as diesel particulate filter system, the engine electronic control unit stores many diesel particulate filter related information to control the diesel particulate filter regeneration as diesel particulate filter history.
- If the ceramic filter is replaced or cleaned without regeneration, reset the history of diesel particulate filter using Multi-Use Tester. (For reset procedure, see Gr15.)
- In the case of diesel particulate filter regeneration by use of the diesel particulate filter cleaning switch, however, history reset with a Multi-Use Tester is not required because the history is automatically reset by engine electronic control unit.


905 :Gr54
A25
CAN resister
A26
Joint connector (J/C) <1000/2200RDS>
Joint connector (J/C) <3000RDS>
Gr23B: To diagnostic connector (for allison exclusive diagnosis tool)
Gr23B: To shift selector
A27
A/T ECU <3000RDS> : Gr23B
ACCEL SENSOR(SIG)
CAN(SHIELD)
CAN(H)
CAN(L)
TRANS CHECK
EXHAUST BRAKE SW
CAN(H)
SHIELD
ACCEL(PWM)
OUTPUT(SIG)
CAN(L)
CAN(H)
EXHAUST BRAKE CUT(SIG)
EXHAUST BRAKE SW
A/T ECU : Gr23A <1000/2200RDS>
A27
A31
A32
A34
A36
A36a
A33
A35
To vehicle interface module : Gr23B
Cab
A/T
Chassis
Joint connector (J/C-3)
A41
905 :Gr54
710 :Gr54
To transmission neutral relay
Air flow sensor
B01
#306 :Gr17
B20 B21
Gr54: 130
Intake air temperature sensor 1
#305
B10
Transmission neutral switch
#056
C21


#352:Gr23
Pulse converter
*2
A26
AK14A
3 10 11
+
GND
25P-OUT
A01 Meter cluster
Gr54: 401
PULSE DIVIDER
CPU
AUTO
CAN
DH22A
18 9 22 12 10 8 19
Gr54: 905
JOINT E5
#001 A11
Combination switch
Cruise control switch
RESUME
OFF
CANSEL
SET
AK4A
2 1 3 4
PC01 RW *2
PCE1 B *2
PC02 L *2
MV13 G
PC02 L *2
SP01 L *1
MT02 RW
LAE1 B
MTE1 B
CAL9 B
CAH9 Y
SLE1 B
MTE1 B
CE05 2-B
AU10 L
AU11 O
AU09 R
AU12 G
MV01
MV03
MV13
JCE2
CE07
AU10
AU11
AU12
MV14
JCE3
MV15
MV05
MV06
AU03
AU02
AU05
SP01 *1
LAE1
CE10
CAH2
CAL2
BL07 *1
*1 BL07
MT01
CE03
*2 CAH4
*2 CAL4
CAH10
CAL10
JCE1
SLE1
CE01
AU01 R
AU03 Y
AU04 YR
AUE1 B
AU02 YR
AUE2 B
7 3 4 5 8 1
AK8A
ON
N
OFF
Cruise control main switch
A02 #007
PCE1 B *2
JCE1 2-B
CE05 2-B
32 33 30
Joint connector (J/C-1)
A39
MT01 1.25-RW
MT02 RW
JC01 1.25-RW
19 21
JOINT 13
Gr54: 110
JC01 1.25-RW
PC01 RW *2
Joint connector (J/C-2)
A03
Gr54: 905
AUE1 B
CE02 2-B
AUE2 B
CE03 3-B
JOINT E2
JOINT E3
130 :Gr54
CE01 2-B
CE02 2-B
CE10 2-B
1 2 7
Joint connector (J/C-6)
A04
Gr54: 905
CAH2 Y *1
CAH3 Y *2
CAH4 Y
CAH9 Y
CAH10 Y
CAL2 B
CAL3 B *1
CAL4 B *2
CAL9 B
CAL10 B
1 3 4 5 6 7 8 9 10 11
Joint connector (J/C-2)
Gr54: 905
A03
CAH3 Y *1
CAL3 B *1
1 2
AL2A
CAN resistor
A04a
13EB-C03800-2

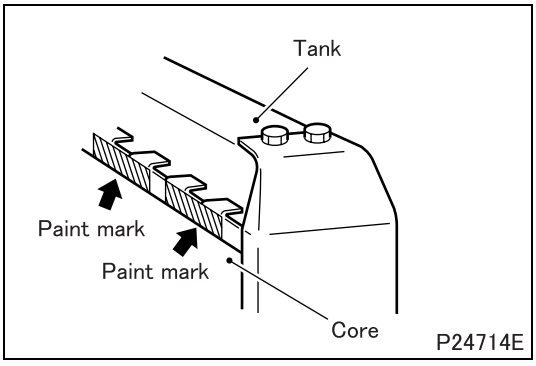


- Following the sequence shown in the diagram, bend tabs for caulking tank.
  1 to 4: Bend two tabs at the center.
  5 to 8: Bend other tabs following the direction of the arrow.

NOTE

- **Since [a] cannot be used to caulk sides 1 and 2, use pliers with the tips wrapped in vinyl tape.**

- After crimping the tabs onto the tank, check for coolant leakage.



- Paint a mark on the core where it can be easily noticed to indicate that the core has been crimped.

CAUTION ⚠

- **Paint a mark for each repair performed on either the upper or lower tank.**

3. Diesel Particulate Filter Unit Inspection for Clogging and Cleaning the Diesel Particulate Filter Unit

CAUTION ⚠

- **Diesel particulate filter has become very hot after the operation of engine. Cool down the diesel particulate filter sufficiently so as not to get burnt.**
- **The ceramic filter must be cleaned at first 320,000 km {200,000 miles} of driving, and then every 240,000 km {150,000 miles} of driving. Otherwise, ash will accumulate in the filter and the filter may be damaged.**

Service standards

Location	Maintenance item	Standard value	Limit	Remedy
–	Diesel particulate filter differential pressure (after regeneration and cleaning, at no-load max. speed)	Less than 10 kPa {1.5 psi, 0.1 kgf/cm^2}	10 kPa or higher {1.5 psi, 0.1 kgf/cm^2}	Replace

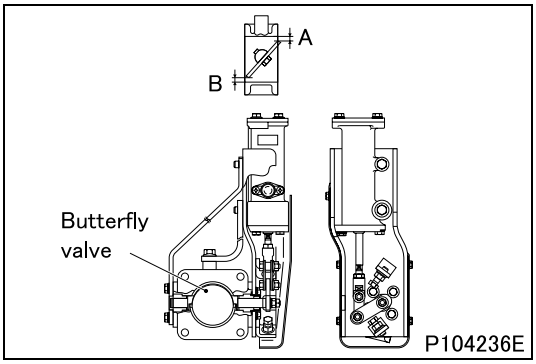
Special tools

Mark	Tool name and shape	Part No.	Application
a	*Pulse cleaner	(*X007954)	Washing of ceramic filter
b	Flange nut (M10) (not used by Donaldson)	MF434105	
c	Drain plug (M12 × 1.25)	MF665003	
d	Drain plug (M14 × 1.5)	MF665004	
e	Gasket (M12)	MF665004	
f	Gasket (M14)	MF660065	

*: Recommend Donaldson “Heavy Duty Diesel Engine DPF Pulse Cleaner” to cleaning the DPF filter soot.
( ): reference No.

3.1 Preparation

- Place the transmission to neutral position.
- Turn the steering wheel in neutral position. Apply the parking brake securely.
- Turn off the air conditioner not to increase the engine speed.
- Connect the Multi-Use Tester. (See Gr00.)
- Check if there is any diagnosis code stored in the memories of the electronic control units. Repair if any fault is found.
- Warm up the engine until the coolant temperature becomes 70°C {158°F}. (Check this by Multi-Use Tester service data “35: coolant temperature”.)



(3) When butterfly valve is half closed

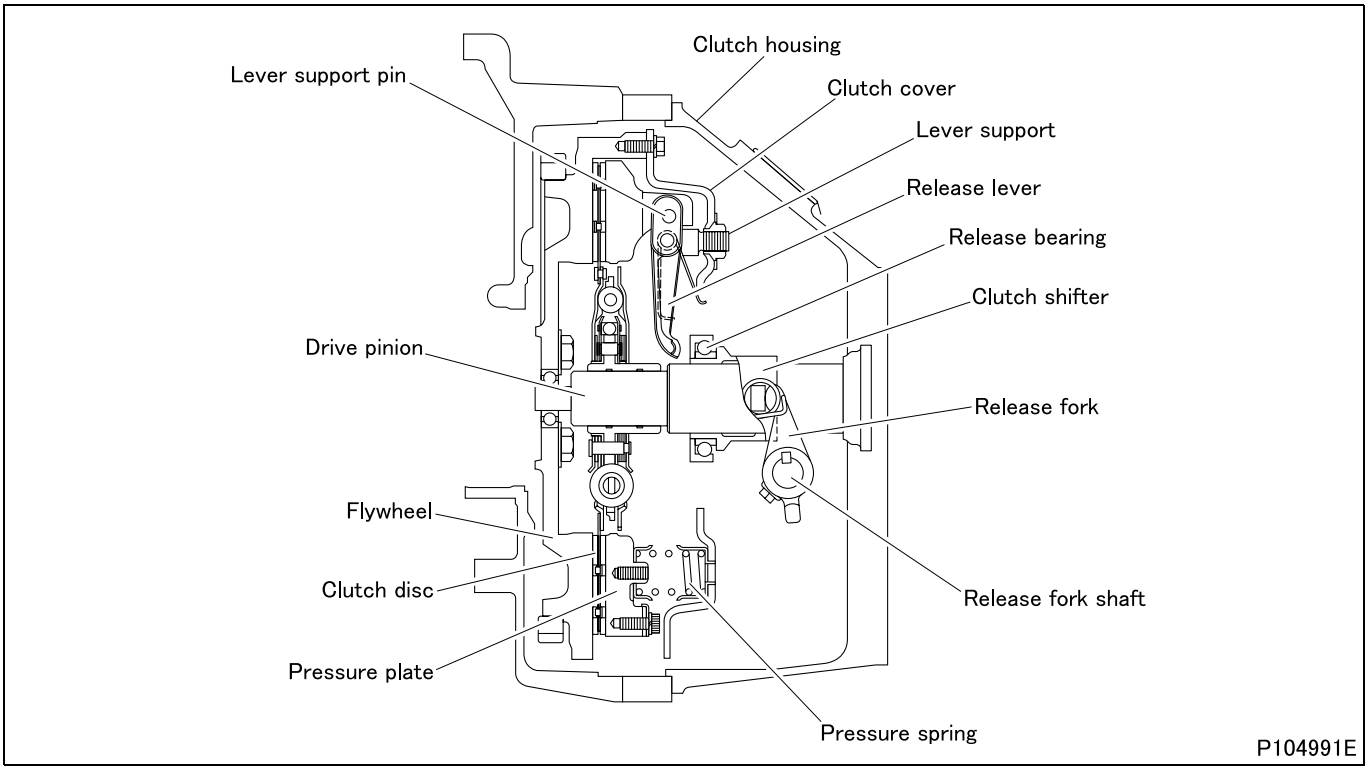
- Apply a specified level of air pressure to the ports 1 and 2 of the control cylinder. With the butterfly valve half closed, measure upper clearance A and lower clearance B between the butterfly valve and body. Average the measured vales to obtain the butterfly valve-to-body clearance for service.

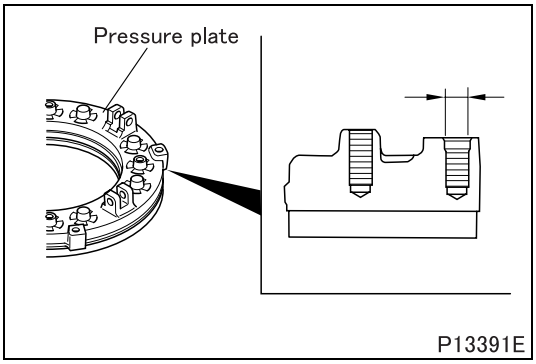
  Average clearance = $\frac{(A + B)}{2}$

CAUTION ⚠

- **When inspecting the butterfly valve, be sure to operate the butterfly valve not from its fully closed state but from its fully open state to half closed state.**

3. Clutch Proper

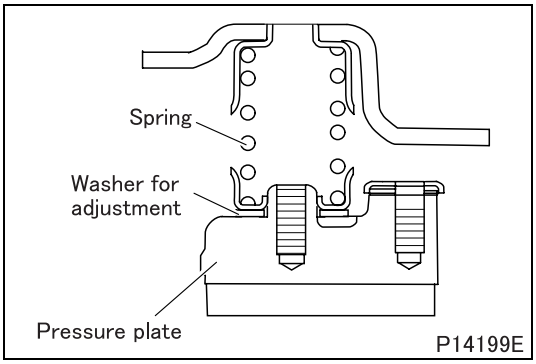




(3) Inside diameter of strap bolt fitting hole

- If the measured value exceeds the specified limit, replace the pressure plate.

◆Installation procedure◆



■ Installation: Pressure spring

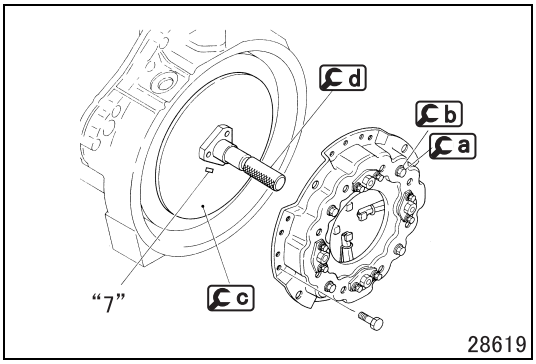
- If the pressure plate is corrected by grinding, assemble between the pressure plate and pressure spring a washer for adjustment equivalent to the correction amount by grinding.

Amount of correction made by grinding	Thickness of adjusting washer
Less than 1 mm {0.039 in.}	Not required
1 to 2 mm {0.039 to 0.079 in.}	1.2 mm {0.047 in.} × 1
2 to 3 mm {0.079 in. to 0.12 in.}	1.2 mm {0.047 in.} × 2 or, 2.3 mm {0.091 in.} × 1

■ Installation: Clutch cover

- To install, follow the removal sequence in reverse. (See "■ **Removal: Clutch cover**".)

◆Work after installation◆



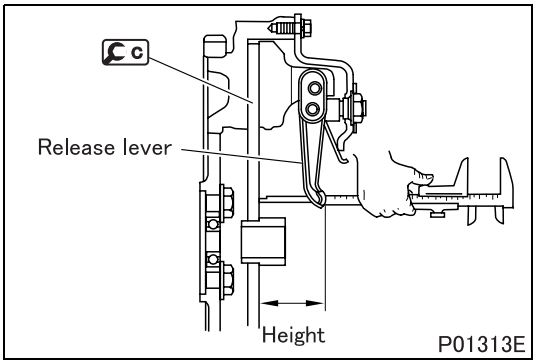
■ Inspection: Height of release lever

[Inspection]

- Install the pressure plate and lever using c and d instead of the clutch disc.
- Install c so that identification mark "7" can be seen.

CAUTION ⚠

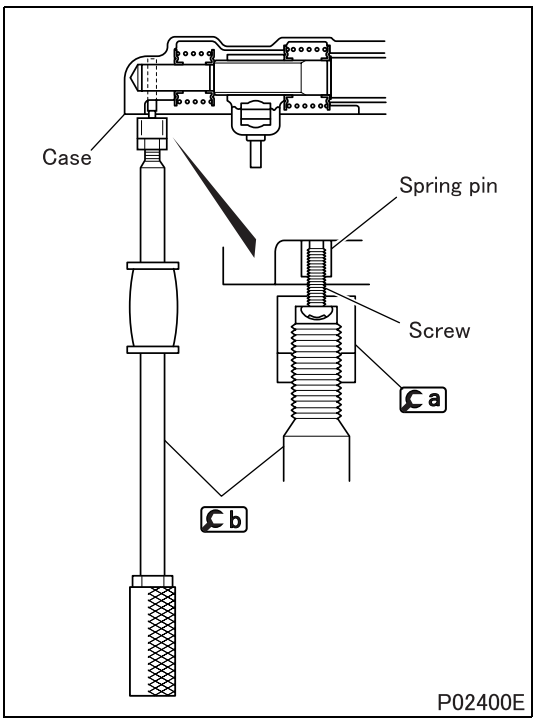
- **After installing the pressure plate and lever, be sure to remove a and b (4 locations) to perform inspection and adjustment.**



- Measure the height from c to the top surface of each release lever (4 locations).
- If the measured value deviates from the standard value, make adjustment in the following procedure. Even if the measured value is within the standard value, make adjustment when the mutual difference between each measured value is 0.5 mm or more.

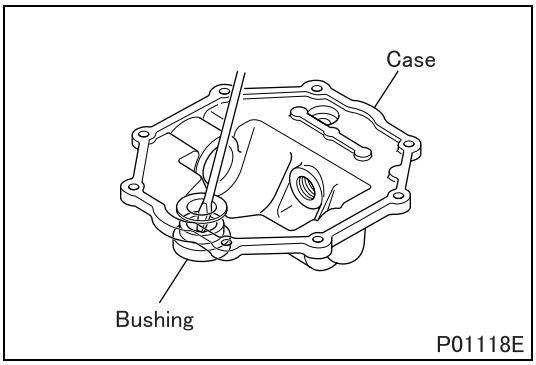
GEAR SHIFTER UPPER AND INTERLOCK PLATE

◆Removal procedure◆



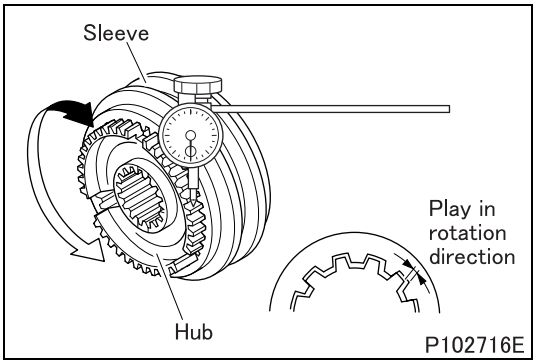
■ **Removal: Spring pin**

- Tap the spring pin using an M4 tap.
- Insert a with an M4 screw of appropriate length into the spring pin, and remove the spring pin using b.



■ **Removal: Bushing**

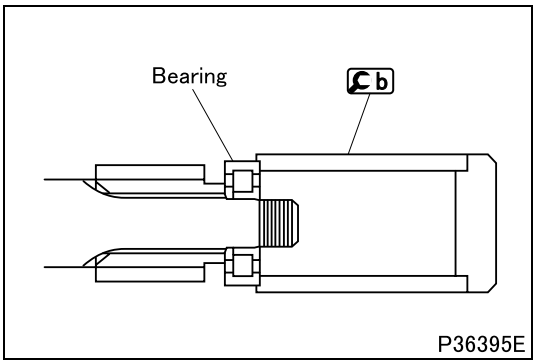
- Remove the bushing with a screwdriver while taking care not to damage the gear select lever case.



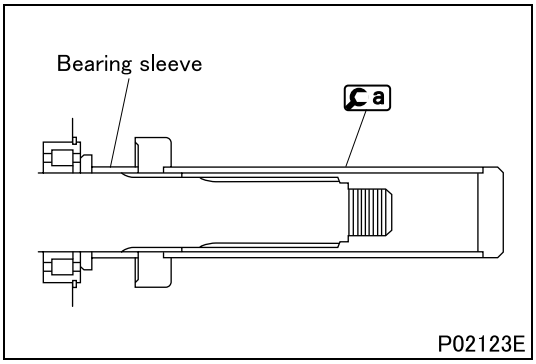
■ **Inspection: Play of synchronizer sleeve and synchronizer hub in rotation direction**

- Hold the synchronizer sleeve and measure the play with rotating the synchronizer hub.
- If the measurement exceeds the limit, replace defective parts.

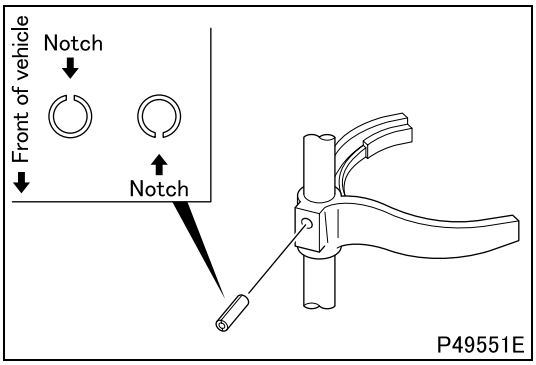
◆Installation procedure◆



■ **Installation: Countershaft rear bearing**



■ **Installation: Mainshaft and reverse gear bearing sleeve**

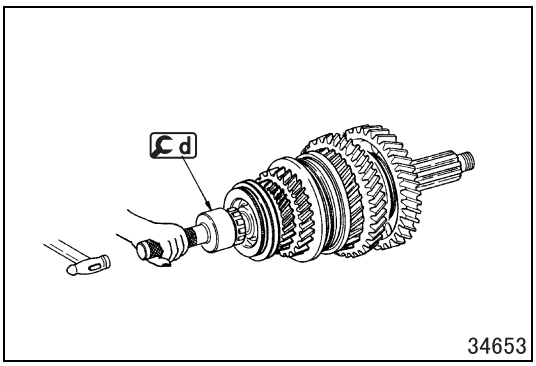


■ **Installation: Spring pin**

- Install the spring pin in the illustrated direction (with the notch of the spring pin facing the front or rear of the vehicle). Install so that the spring pin protrudes from the reverse gear shift fork by 0 to 0.5 mm. {0 to 0.020 in.}

CAUTION ⚠

- **When installing, do not apply load to the shift rail of the transmission body.**



■ **Installation: Pilot bearing**

Group 23A

Automatic Transmission <M065A5 (Allison 1000RDS, 2200RDS)>

MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

Pub.No.PWME0806-23A

10. Road Test

Service standards (Unit: km/h {mph})

Location	Maintenance item			Standard value	Limit	Remedy
–	Shifting point (D range) [Economy mode/ Power mode]	At half throttle Accelerator opening: 4/8	1st → 2nd	10 to 13 {6 to 8}/ 12 to 15 {7 to 9}	–	Ask for repair.
			2nd → 3rd	23 to 26 {14 to 16}/ 26 to 29 {16 to 18}	–	
			3rd → 4th	33 to 36 {21 to 22}/ 34 to 37 {21 to 23}	–	
			4th → 5th	48 to 51 {30 to 32}/ 48 to 51 {30 to 32}	–	
		At full throttle Accelerator opening: 8/8	1st → 2nd	16 to 19 {10 to 12}/ 21 to 24 {13 to 15}	–	
			2nd → 3rd	37 to 40 {23 to 44}/ 45 to 48 {28 to 30}	–	
			3rd → 4th	48 to 51 {30 to 32}/ 59 to 62 {37 to 39}	–	
			4th → 5th	68 to 71 {42 to 44}/ 84 to 87 {52 to 54}	–	
		At closed throttle Accelerator opening: 0/8	5th → 4th	45 to 48 {28 to 30}/ 45 to 48 {28 to 30}	–	
			4th → 3rd	32 to 35 {20 to 22}/ 32 to 35 {20 to 22}	–	
			3rd → 2nd	22 to 25 {14 to 16}/ 22 to 25 {14 to 16}	–	
			2nd → 1st	5 to 8 {3 to 5}/ 5 to 8 {3 to 5}	–	
–	Lock-up point [Economy mode/ Power mode] (reference)	At half throttle Accelerator opening: 4/8	OFF → ON	17 to 21 {11 to 13}/ 20 to 23 {12 to 14}	–	Ask for repair.
		At full throttle Accelerator opening: 8/8	OFF → ON	31 to 34 {19 to 21}/ 38 to 41 {24 to 26}	–	
		At closed throttle Accelerator opening: 0/8	ON → OFF	16 to 19 {10 to 12}/ 16 to 19 {10 to 12}	–	

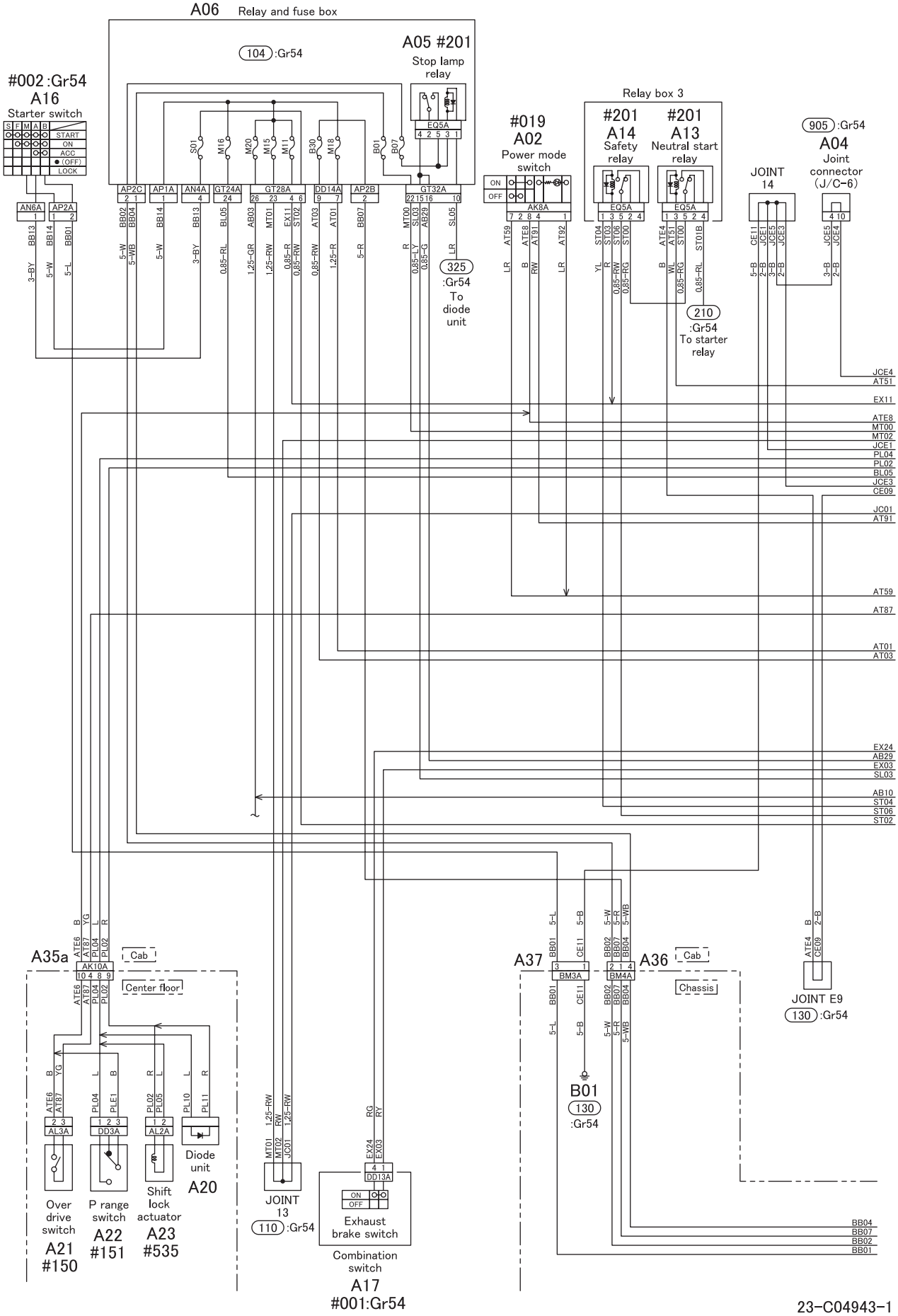
10.1 Measuring procedure

- Before starting the road test, make sure that the transmission fluid level has been checked, the fluid has been inspected and the selector cable has been adjusted.
- During the road test, operate the automatic transmission with gears shifted into different positions and check for the feeling of a gear slip and any other abnormalities.
- Check for too hard or too soft feeling of gear shift.
- Check for shift-up and shift-down points.
- The value shown in the table is calculated under the following condition.
  For the vehicle with different differential ratio or tire size, the vehicle speed varies from the value in the table. In such case, the value should be converted based on such deviation.

Differential ratio	Tire size (radius)
6.166	10R22.5 (0.492)

- If the measurement is out of specification, contact the Allison service station for repair.

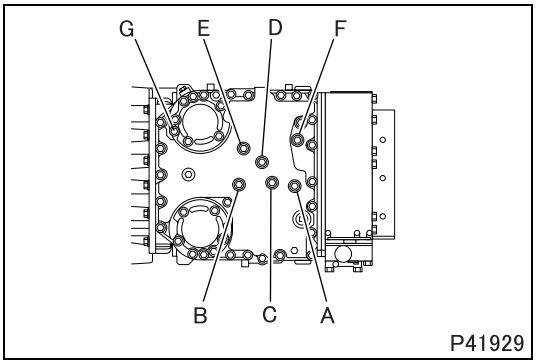
ELECTRICAL CIRCUIT DIAGRAM



10. Line Pressure Test

Tightening torque (Unit: N·m {ft.lbs, kgf·m})

Mark	Parts to be tightened	Tightening torque	Remarks
–	Plug	10 to 13 {7.2 to 9.4, 1.0 to 1.3}	Ask for repair.



10.1 Purpose

- "Line pressure test" checks the performance of oil pump, function of control valve, and the oil leaking of each component.

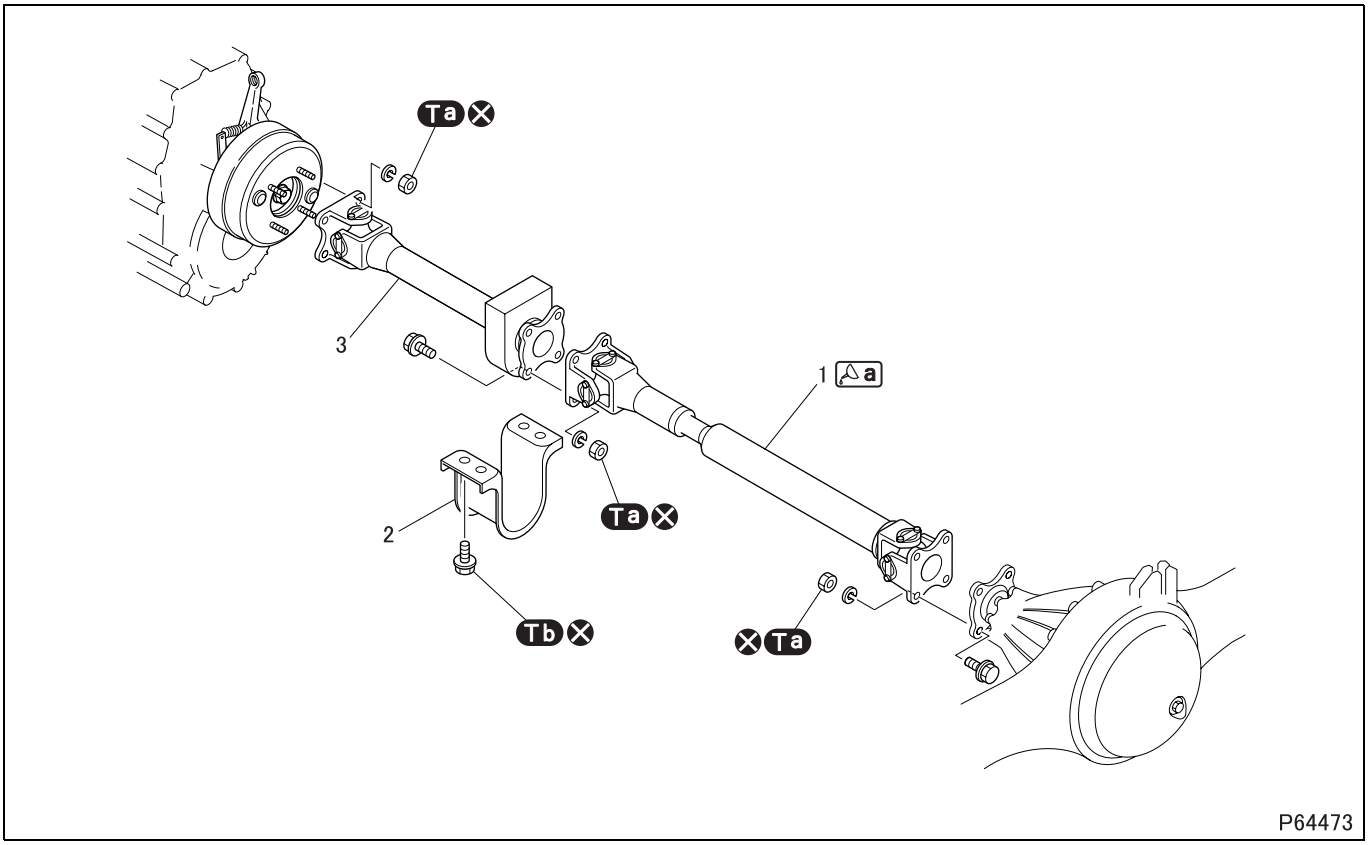
10.2 Measurement procedure

- Decide the pressure item to check according to the content of troubles, and measure the line pressure based on the following procedure.
- Remove the plug from the pressure detecting port of the gearbox casing, and install the pressure gauge.
  - A: Main oil pressure
  - B: C1 clutch oil pressure
  - C: C2 clutch oil pressure
  - D: C3 clutch oil pressure
  - E: C4 clutch oil pressure
  - F: C5 clutch oil pressure
  - G: Lock-up oil pressure
- Conduct a sufficient warm-up operation, and raise oil temperature to 60 to 80°C {140 to176°F}.
- Remove the propeller shaft to simulate the running condition.
- Measure the main oil pressure, clutch oil pressures and lock-up clutch pressure at idling condition and simulated running condition. Make sure the following conditions are satisfied.
  - Measured main oil pressure and lock-up clutch oil pressure are within the standard value.
  - The difference between the measured clutch oil pressure and the main oil pressure is 75 kPa {11 psi, 0.8 kgf/cm^2} or lower and also satisfies the standard value.
- After measurement, remove dust and dirt around the pressure detecting ports and tighten the plugs to the specified torque.

CAUTION ⚠

- **Be sure to prevent foreign particles from entering the pressure detecting port.**

REMOVAL AND INSTALLATION OF PROPELLER SHAFT



- Shown above is a tandem propeller shaft. The same service procedure applies to other propeller shafts.

● Removal sequence

1 Propeller shaft <Without center bearing> (See later section.)
2 Center bearing bracket
3 Propeller shaft <With center bearing> (See later section.)

⊗: Non-reusable parts

CAUTION ⚠

- **Securely chock the wheels so that the vehicle does not move.**
- **Do not remove the chocks until the entire operation is completed.**

● Installation sequence

Follow the removal sequence in reverse.

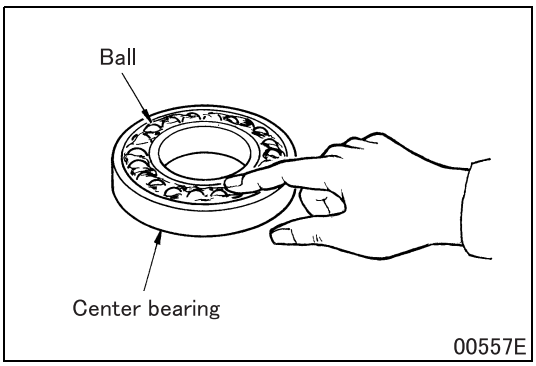
Tightening torque (Unit: N·m {ft.lbs, kgf·m})

Mark	Parts to be tightened		Tightening torque	Remarks
Ta	Nut (propeller shaft mounting)	P8	70 to 100 {51 to 72, 7 to 10}	–
		P10	120 to 180 {87 to 130, 12 to 18}	–
Tb	Bolt (center bearing bracket mounting)		70 to 95 {51 to 69, 7.0 to 9.5}	–

Lubricant and/or sealant

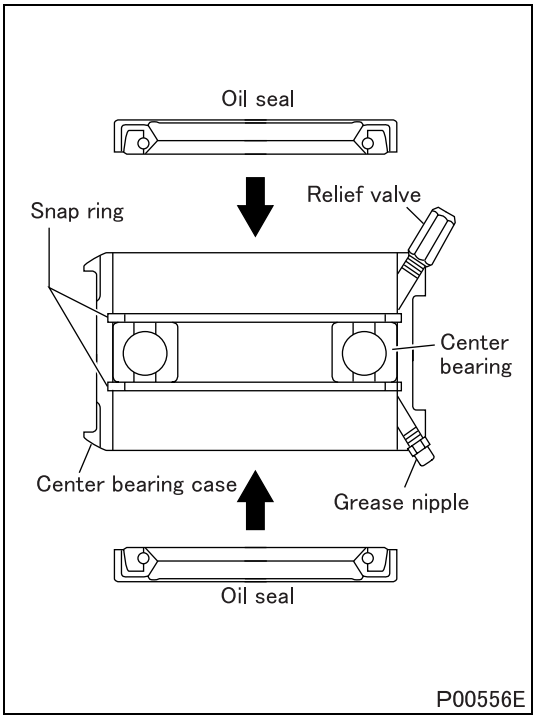
Mark	Points of application	Specified lubricant and/or sealant	Quantity
a	Supply through grease nipple of propeller shaft	Wheel bearing grease [NLGI No. 2 (Li soap)]	As required

◆Installation procedure◆



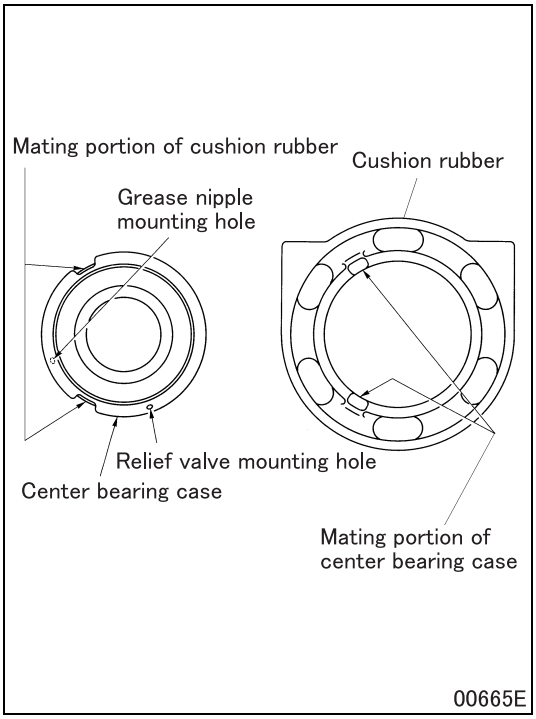
■ **Installation: Center bearing**

- Fill space between balls of the center bearing with grease.



■ **Installation: Oil seal**

- Apply grease to the oil seal lip.
- Install the oil seal in the illustrated direction, aligning it with the end face of the center bearing case.



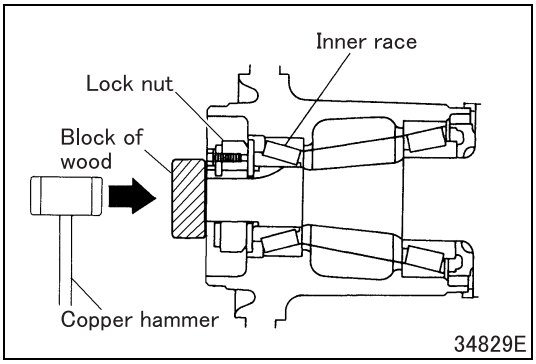
■ **Installation: Cushion rubber**

- Fit the illustrated portion of the cushion rubber in the illustrated portion of the center bearing case by aligning them. If it is difficult to fit it in, apply soapy water for smooth fitting.

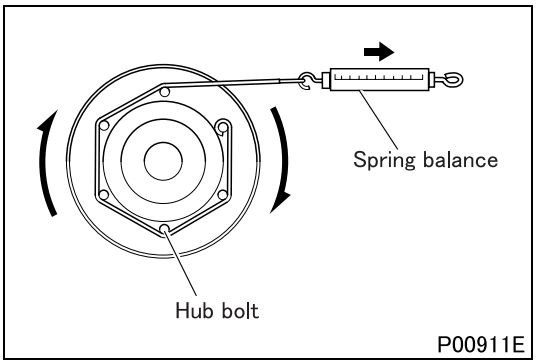
CAUTION ⚠

- **Grease deteriorates cushion rubber. Be sure to use soapy water.**

- Assemble the cushion rubber so that grease nipple mounting holes face downward.

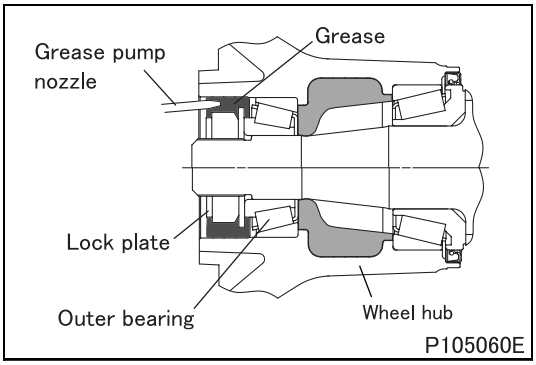


- Perform the following work to pull the outer bearing inner race toward the lock nut side again.
- Apply a block of wood to the end face of the axle housing, and tap it two or three times while turning the wheel hub and brake drum.
- Make sure that there is no looseness in the axial direction.
- Perform a measurement again after adjustment. If the measured value is out of the standard value, repeat the work from the item marked with ★, since adjustment of the lock nut may be insufficient.
- If the result is found to be abnormal, replace the outer and inner bearings.



[Inspection]

- After assembly of the lock nut, fasten a spring balance to hub bolt and measure tangential force.
- If the tangential force meets the specified value, the starting torque will become the standard value.
- If the measurement deviates from the specified value, repeat the work from the item marked with ★, since adjustment of the lock nut may be insufficient.
- If the result is found to be abnormal, replace outer and inner bearings.



■ Installation: Packing of grease in outside of wheel hub

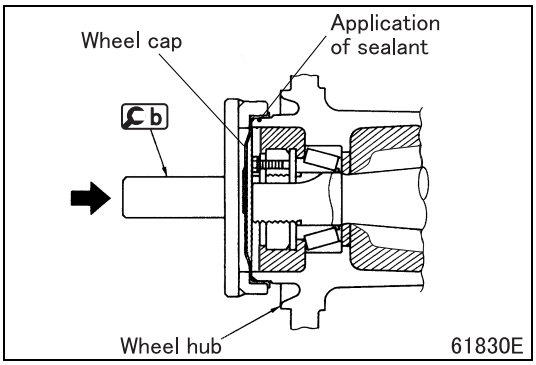
CAUTION ⚠

- **Unless this packing procedure is performed, seizure of the wheel hub bearing can be caused.**
- **For a grease amount, pack the specified amount using a measuring cup.**

- Pack grease up to the lock plate using a grease pump nozzle so that a wall is formed outside the outer bearing as shown in the illustration.

CAUTION ⚠

- **Do not pile grease in the wheel hub cap. Otherwise, grease does not reach the outer bearing, causing poor lubrication of the bearing.**



■ Installation: Wheel hub cap

- Apply sealant to the wheel hub cap fitting surface with the wheel hub, and press the wheel hub cap in the wheel hub using b.

CAUTION ⚠

- **Adhesion of grease to the fitting surface with the wheel hub causes water entry and grease leakage.**
- **If the wheel hub cap is tapped with a hammer for installation, the fitting surface is deformed, impairing waterproof effect.**

WHEEL HUB AND BRAKE DRUM

Tightening torque (Unit: N·m {ft.lbs, kgf·m})

Mark	Parts to be tightened		Tightening torque	Remarks
Ta	Brake hose (frame side)		41.7 ± 2.5 {31 ± 1.8, 4.25 ± 0.25}	–
Tb	Bolt (lock plate mounting)		9 ± 2 {6.5 ± 1.4, 0.9 ± 0.2}	–
Tc	Lock nut	FK	200 {145, 20}	Back-off angle 30° (1/12 of a turn)
		FM	200 {145, 20}	Back-off angle 22.5° (1/16 of a turn)
Td	Nut (brake drum and wheel hub mounting)		322 {235, 32.8}	–
Te	Nut (front drum brake mounting) <FM>		515 ± 123 {380 ± 90, 52.5 ± 12.5}	Wet
Tf	Nut (front drum brake mounting)	FK	300 ± 40 {220 ± 30, 30.6 ± 4.1}	–
		FM	216 ± 32 {160 ± 24, 22 ± 3.3}	
Tg	Bolt (wheel hub cover mounting)		23 ± 4 {17 ± 3.3, 2.35 ± 0.45}	–

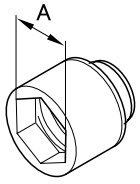
Lubricant and/or sealant

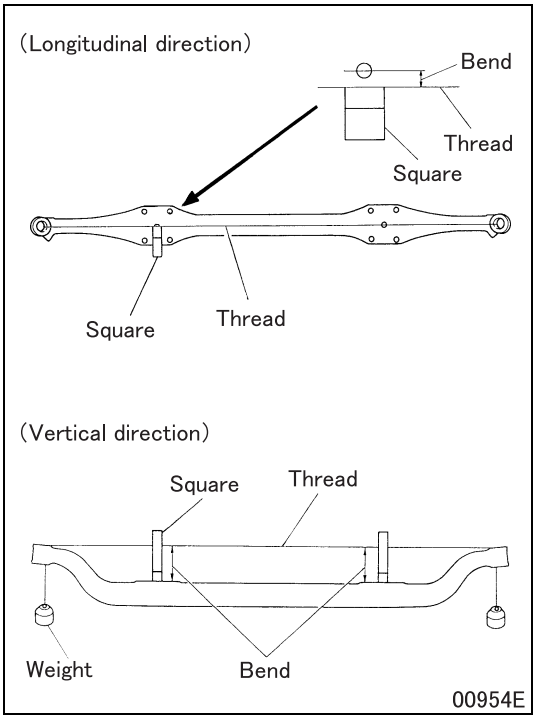
Mark	Points of application		Specified lubricant and/or sealant	Quantity	
a	Pack space between rollers of bearing inner race		Wheel bearing grease [NLGI No. 2 (Li soap)]	As required	
	Lip area of oil seal				
	Pack inside of wheel hub <FK>	Wheel hub body		500 g {17.6 oz} ※1	Total 665 ± 20 g {23.1 ± 0.71 oz} ※1
		Around outer bearing		165 g {5.82 oz} ※2	
	Spindle of knuckle <FK>			165 g {5.82 oz} ※2	
	Pack inside of wheel hub <FM>	Wheel hub body		570 g {20.1 oz} ※1	Total 660 ± 20 g {23.6 ± 0.71 oz} ※1
		Around outer bearing		90 g {3.17 oz} ※2	
	Spindle of knuckle <FM>			90 g {3.17 oz} ※2	
	Pack outside of wheel hub			150 ± 10 g {5.29 ± 0.35 oz} ※1	
	Nut thread			As required	

※1: For a wheel

※2: For a wheel, either outer bearing neighborhood or knuckle spindle part

Special tools (Unit: mm {in.})

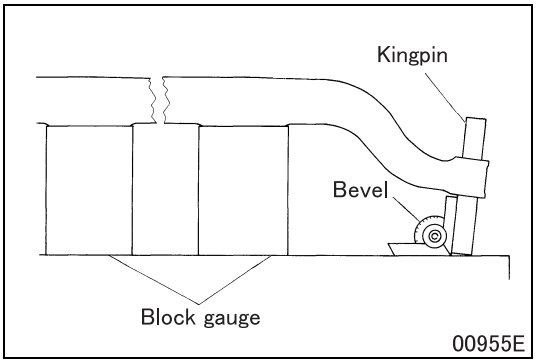
Mark	Tool name and shape	Part No.	Application
a	Socket wrench A: FK 70 {2.76}, FM 75 {2.95}  P00900	<FK> MH061528 <FM> MH061530	Removal and installation of lock nut



■ **Inspection: Front axle**

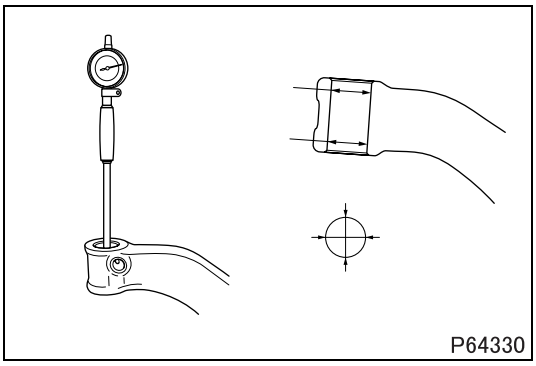
(1) Bend of front axle in the longitudinal direction and vertical direction

- Put a piece of thread through kingpin holes of the front axle and hang weights at both ends.
- Use a square to find bend to each of longitudinal and vertical directions.
- If the measured value exceeds the limit, replace the front axle.



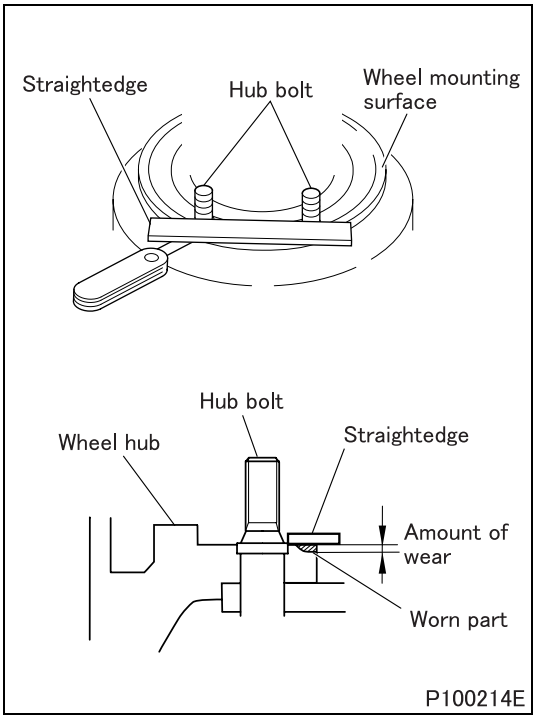
(2) Kingpin inclination angle

- Set the kingpin on the front axle as illustrated to measure the angle.
- If the measured value deviates from the standard value, replace the front axle.



(3) Clearance between kingpin and front axle

- Measure the inner diameter of the axle's hole where the kingpin is inserted using a cylinder gauge and calculate the clearance deducting the outer diameter of the kingpin from the inner diameter.
  If the clearance exceeds the limit, replace the axle or the kingpin with a new one.



■ **Inspection: Wheel hub**

(1) Visual inspection

- Check the disc wheel mounting surface of the wheel hub by watching and touching. If there is damage or crack on it, replace the wheel hub.
- Make sure that there is not rust, dust, paint or foreign body on the disc wheel mounting surface of the wheel hub to prevent the wheel nut to loosen.
- If any abnormality is found, remove it with sandpaper.

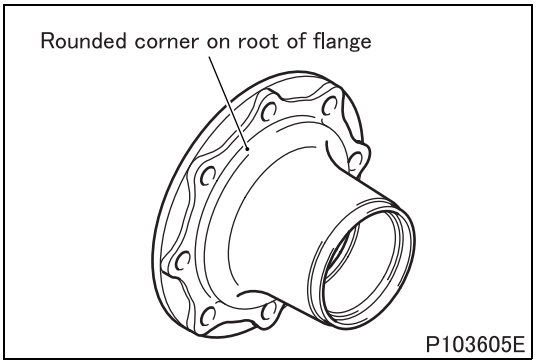
(2) Wear in disc wheel mounting part of wheel hub

- Clean the wheel mounting surface of the wheel hub before inspection.
- Place a straight edge on the hub so as to contact to the two hub bolts on the disc wheel mounting surface.

CAUTION ⚠

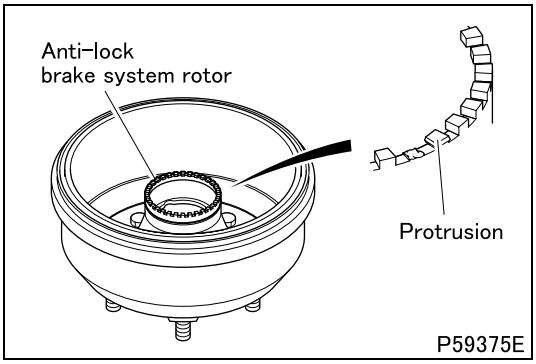
- **Make sure that the straight edge does not run onto the hub bolt.**

- Using feeler gauges to measure the amount of wear at the outer periphery of the wheel hub.
  Measure the amount of wear in the area of every hub bolt.
- If the amount of wear at any point exceeds the following standard value, inspect the crack check of wheel hub.
  Wear standard value: 0.8 mm {0.031 in.}



(3) Crack check

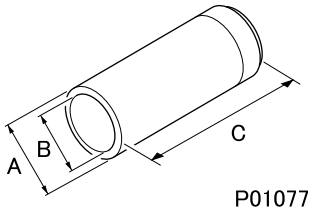
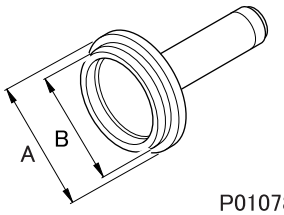
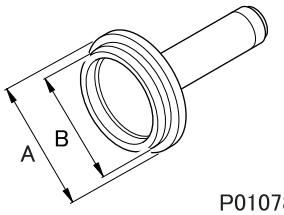
- Check if there is not crack on the entire rounded corner on the root of flange of the wheel hub by magnetic particle or liquid penetrant testing. If crack is found, replace the wheel hub.
- If crack is found on the wheel hub bolt, replace it.
- If there is crack or stepped wear on the wheel hub mounting surface of wheel disc, replace it. (See Gr31.)



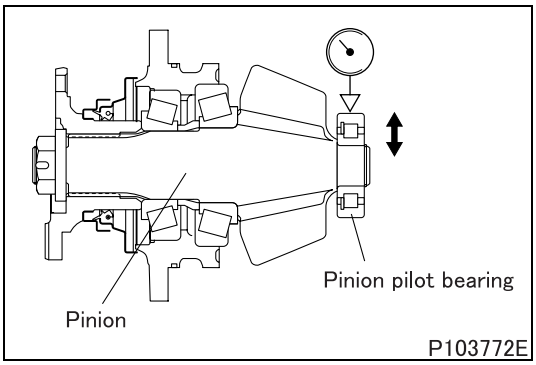
■ **Inspection: Anti-lock brake system rotor**

[Inspection]

- Check the protrusions of the anti-lock brake system rotor for chipping and flattening.
- If any abnormality is found, replace the anti-lock brake system rotor.

<table>
<tr><th>Mark</th><th>Tool name and shape</th><th>Part No.</th><th>Application</th></tr>
<tr><td>c</td><td>Pinion inner bearing installer
<table><tr><th></th><th>A</th><th>B</th><th>C</th></tr><tr><td>D050H, D052H</td><td>ϕ70 {2.76}</td><td>ϕ58 {2.28}</td><td>170 {6.69}</td></tr><tr><td>D8H</td><td>ϕ85 {3.35}</td><td>ϕ65 {2.56}</td><td>180 {7.09}</td></tr></table> 
P01077</td><td><D050H, D052H>
MH061004
<D8H>
03724-51000</td><td>Installation of inner and outer bearing inner race</td></tr>
<tr><td>d</td><td>Pinion outer bearing installer
<table><tr><th></th><th>A</th><th>B</th></tr><tr><td>D050H, D052H</td><td>ϕ108 {4.25}</td><td>ϕ102.5 {4.04}</td></tr><tr><td>D8H</td><td>ϕ118 {4.65}</td><td>ϕ103 {4.06}</td></tr></table> 
P01078</td><td><D050H, D052H>
MH061007
<D8H>
MH061006</td><td>Installation of outer bearing outer race</td></tr>
<tr><td>e</td><td>Pinion inner bearing installer
<table><tr><th></th><th>A</th><th>B</th></tr><tr><td>D050H</td><td>ϕ118 {4.65}</td><td>ϕ103 {4.06}</td></tr><tr><td>D8H, D052H</td><td>ϕ129 {5.08}</td><td>ϕ123 {4.84}</td></tr></table> 
P01078</td><td><D050H>
MH061006
<D8H, D052H>
03724-55000</td><td>Installation of inner bearing outer race</td></tr>
</table>

◆Inspection before removal◆

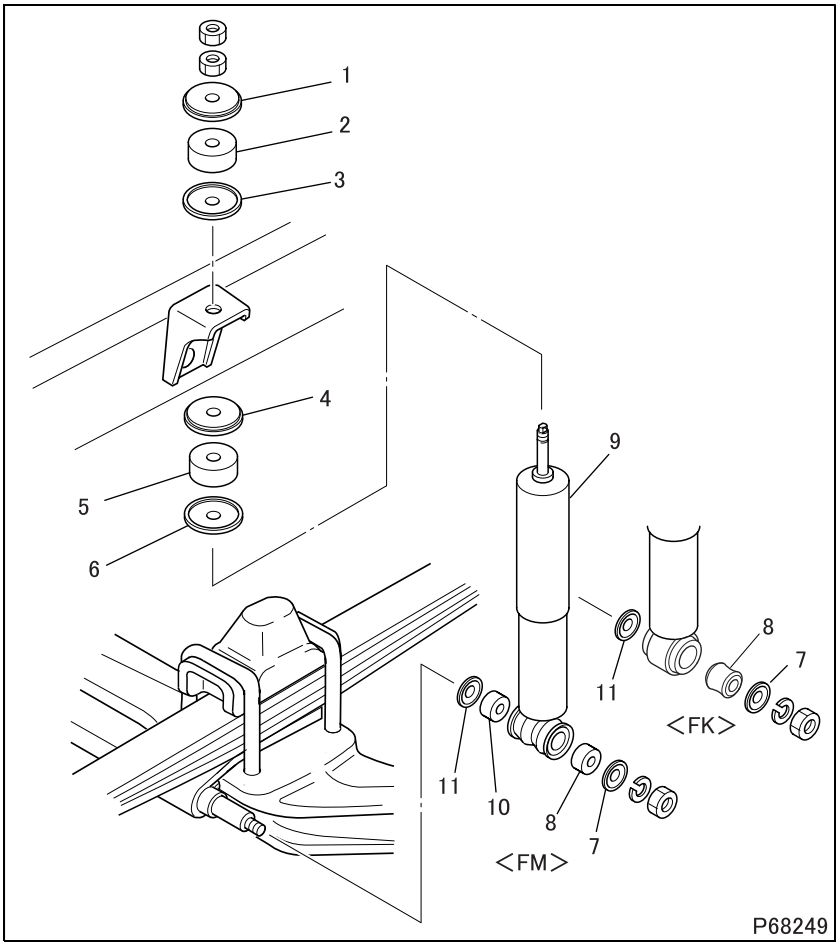


P103772E

■ Inspection: Play in radial direction of pinion bearing

- Hold the pinion and measure the play with moving the pinion pilot bearing in radial direction.
- If the measured value exceeds the limit, replace the pinion pilot bearing.

SHOCK ABSORBER



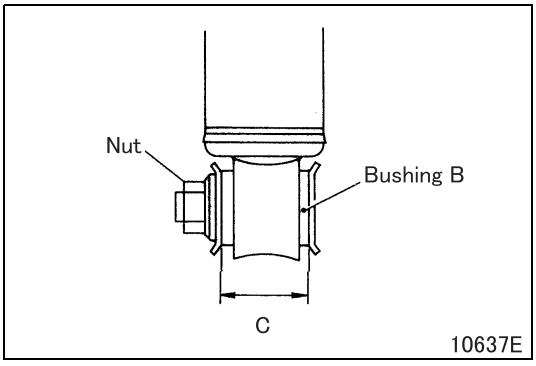
●Removal sequence

1 Washer
2 Rubber bushing A
3 Centering washer
4 Centering washer <FM>
5 Rubber bushing A
6 Washer
7 Washer
8 Rubber bushing B
9 Shock absorber
10 Rubber bushing B <FM>
11 Washer

●Installation sequence

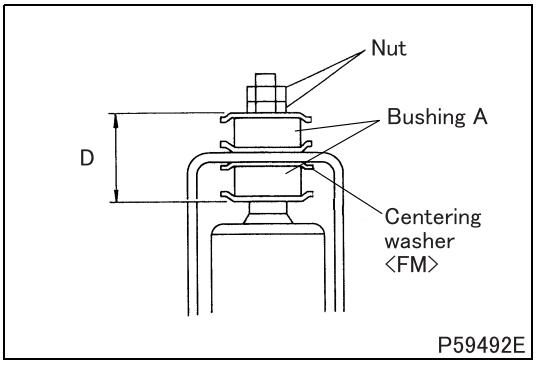
Follow the removal sequence in reverse.

◆Installation procedure◆



■ Installation: Rubber bushing B

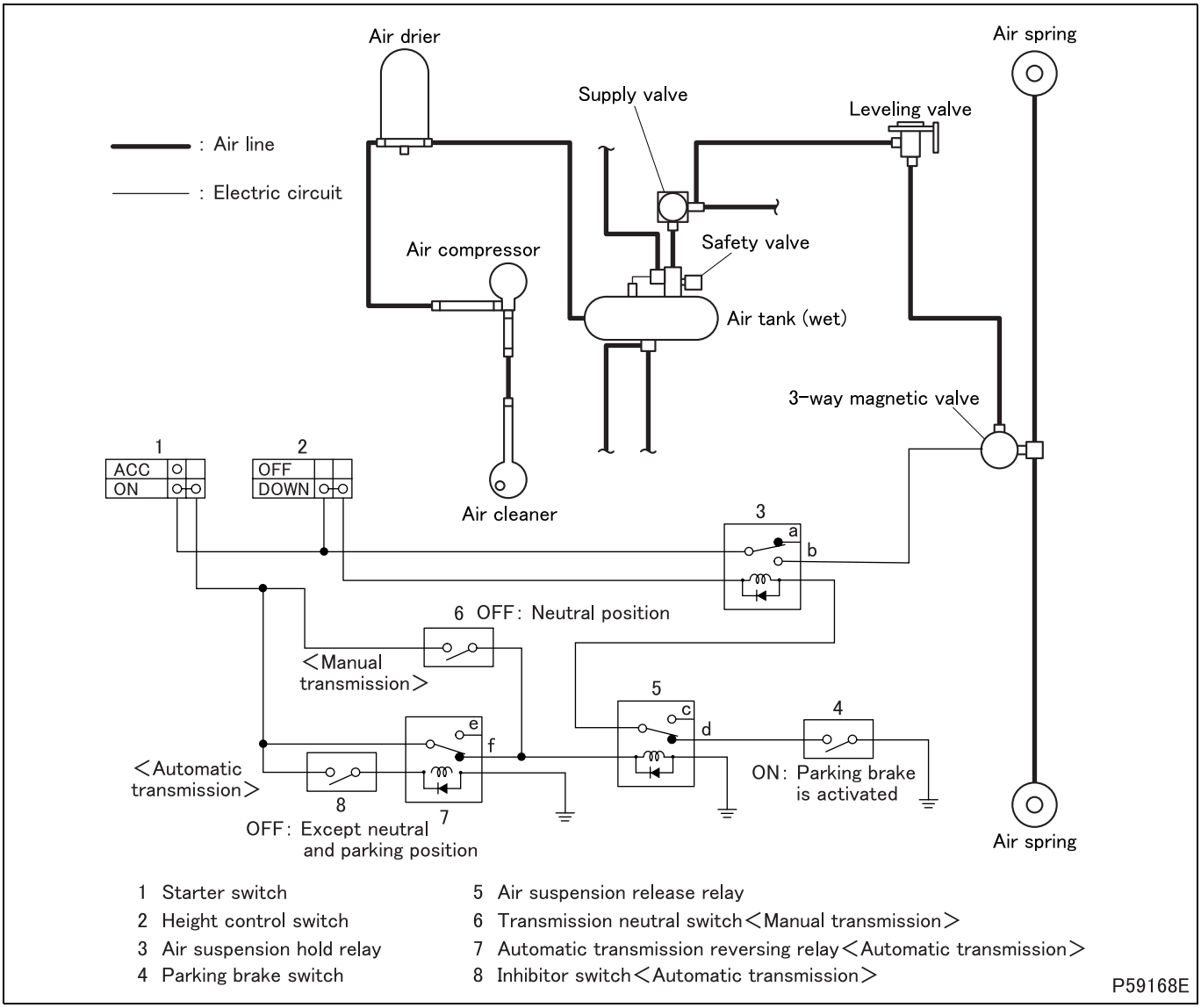
- Tighten the nut for the dimension C as indicated below.
  C : 32 mm {1.26 in.} <FK>
  45 mm {1.77 in.} <FM>



■ Installation: Rubber bushing A

- Tighten the nut for the dimension D as indicated below.
  D : 34.5 mm {1.36 in.} <FK>
  48 mm {1.89 in.} <FM>

2. Air Suspension System



- The air suspension circuit operates 3-way magnetic valve to adjust the height of air spring. (Diagram shows air suspension circuit without current supply.)

2.1 Operable condition

If the following conditions are satisfied when height control switch is DOWN, 3-way magnetic valve operates.
In case of starter switch “ACC”

- The parking brake lever is activated. (Parking brake switch is ON.)

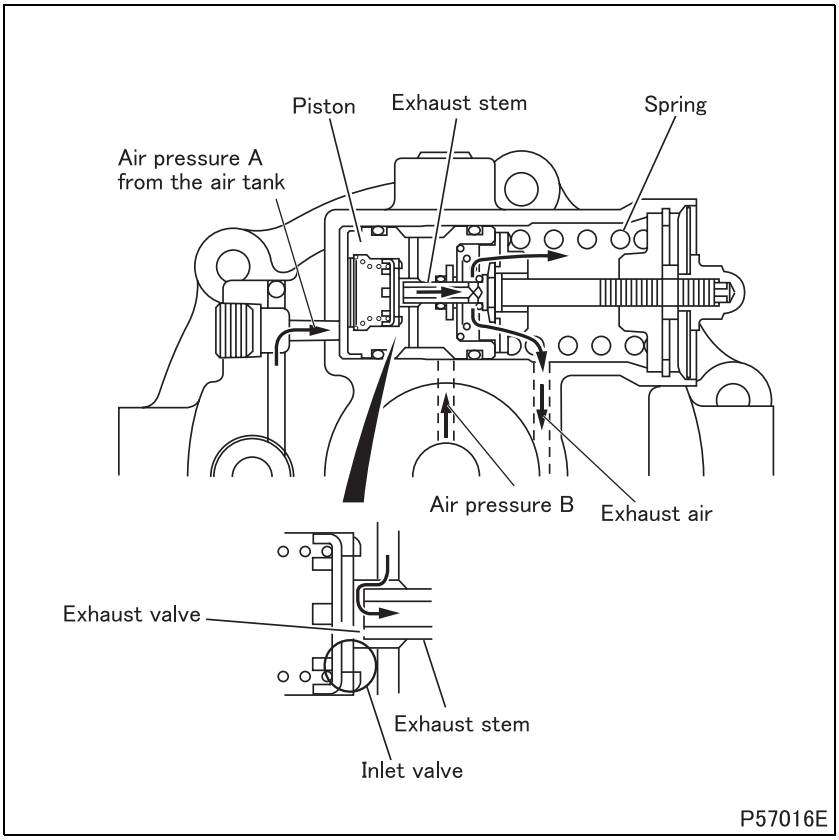
In case of starter switch “ON”

- The parking brake lever is activated. (Parking brake switch is ON.)
- The transmission is in the neutral position. (Transmission neutral switch is OFF or inhibitor switch is ON.)

The current flows as indicated below to operate 3-way magnetic valve.
1 → **2** (DOWN) → **3** (contact b) → **5** (ON) → **4** (ON) → GND

2.2 Non-operable condition

- With the transmission in the neutral position, when the parking brake is not engaged, air suspension hold relay is not activated. Therefore, operating current to 3-way magnetic valve is cut off and the 3-way magnetic valve does not operate. When the transmission is not in neutral position, air suspension hold relay is not activated as well.

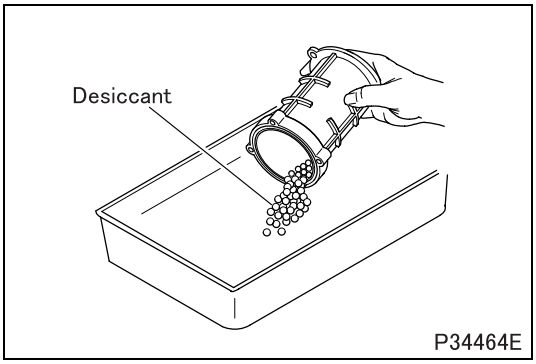


3.4 Operation when tank pressure reaches lower threshold level

- When the air pressure A from the air tank drops below the lower threshold level, the piston is pushed downward by the spring such that the inlet valve closes and the exhaust valve opens. As a result, air pressure flows through the exhaust stem and escapes to the atmosphere.

8. Maintenance and Inspection of Air Dryer

Perform maintenance and inspections at each of the indicated intervals or distances.

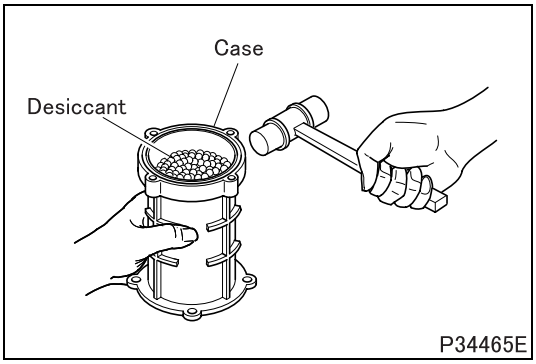


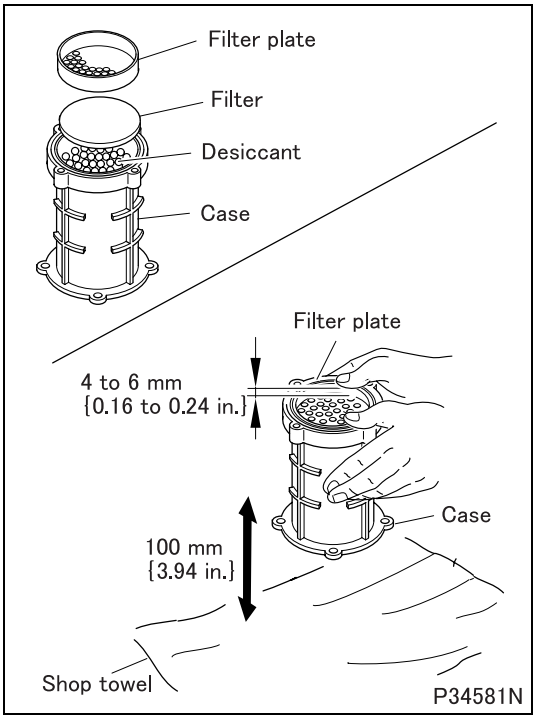
8.1 Every 10,000 km (6,000 miles)

- Check whether the air dryer is functioning properly by opening the drain cock on the air tank and checking whether water flows out.
- If a small amount of water flows out, check whether the desiccant has changed color. If one fifth or more of the desiccant has changed in color from white to brown, replace the desiccant. (See ‘‘AIR DRYER’’.)

NOTE

- **A small amount of moisture may collect whenever the temperature in the vicinity of the air tank drops by more than 16°C {61°F}.**
- Place the desiccant in the case, then settle the desiccant by tapping gently and evenly around the case with a plastic hammer.





- Place the soft layer side of the filter on the desiccant, and place the filter plate on the case, then tap the desiccant down.

<Tapping>

- Before tapping the case against the work surface, lay two or three layers of shop towel on the work surface to protect the bottom of the case from scratches.
- Holding down the filter plate with both hands, lift the case to a height of about 100 mm {3.94 in.} and tap it gently against the work surface.
- Tap the case about 30 more times. Make sure the filter plate drops by 4 to 6 mm {0.16 to 0.24 in.} from its original position.

WARNING ⚠

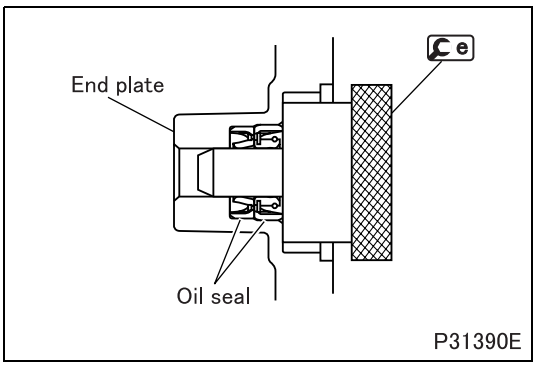
- **Unless the tapping procedure is performed, particles of desiccant may escape and create blockages in brake lines, thus preventing normal brake operation.**

- Look carefully at the water that flows out of the air dryer’s exhaust port. If the water is contaminated with oil, inspect the air compressor. (See ‘‘AIR COMPRESSOR’’.)

8.2 Every year or every 60,000 km {36,000 miles}

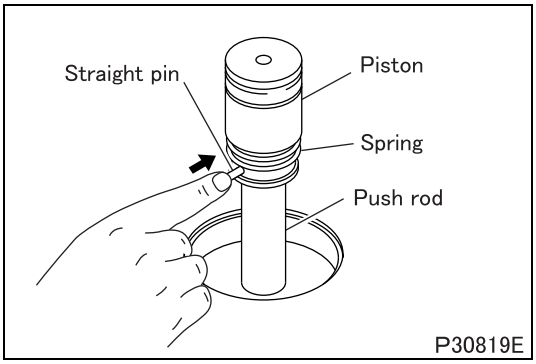
Disassemble the air dryer and replace the desiccant, oil filter, and replated rubber parts with repair kit A. (See ‘‘AIR DRYER’’.)

◆Installation procedure◆



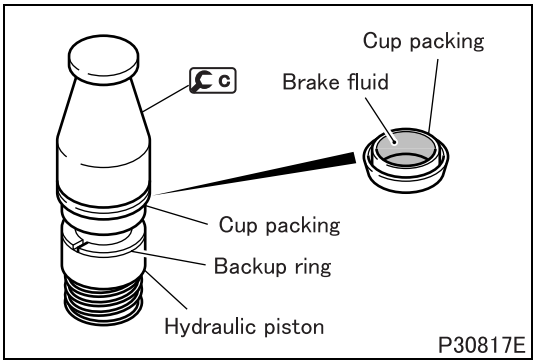
■ **Installation: Oil seal**

- Install each oil seal on the end plate in the illustrated direction.

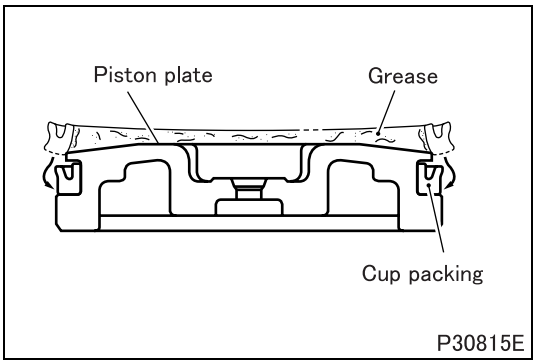


■ **Installation: Hydraulic piston**

- Align the holes of the hydraulic piston, valve seal and push rod before inserting the straight pin.
- After inserting the straight pin, make sure that the hydraulic piston spring is hanging over the straight pin and working as a stopper.



■ **Installation: Cup packing**



■ **Installation: Cup packing**

- Apply grease to the entire surface of the cup packing before installing it as shown in the illustration.

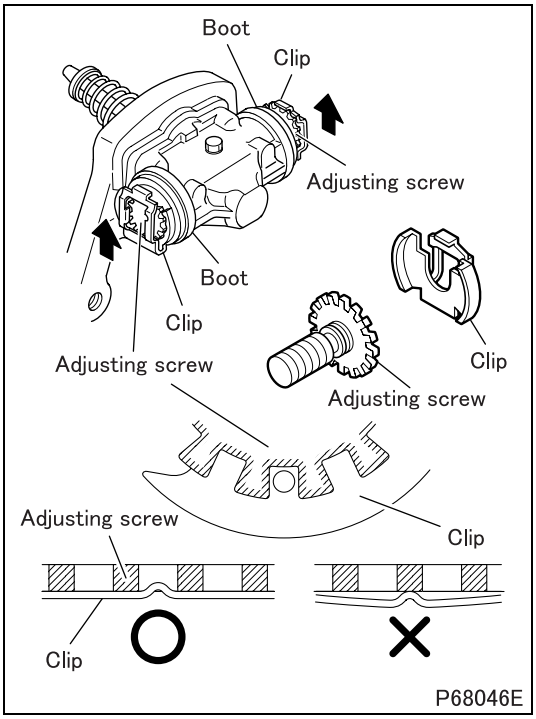
Group 35B

Brake

<FULL AIR BRAKE>

MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

Pub.No.TWME0709-35B



■ **Installation: Brake shoe**

- Turn adjusting screw of expander assembly fully clockwise by hand.
  (Return of a screwing portion of adjusting screw)
- Confirm whether the open part of clip is in the drum side; if it is not in the drum side, turn adjusting screw further clockwise to match the position. (This rotation is due to the rotation sleeve assembly)

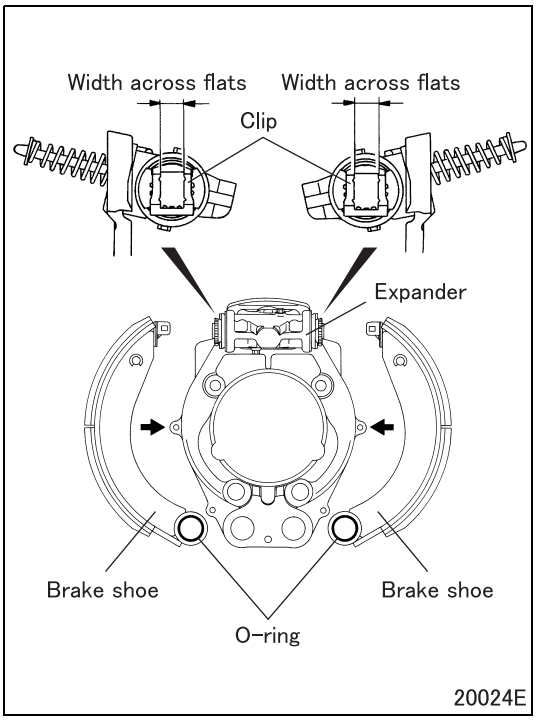
WARNING ⚠

- **Be sure to apply grease appropriately on the contact part of adjusting screw in boot; otherwise auto adjuster may be caused the malfunctioning due to breakage of boot.**

CAUTION ⚠

- **Turn is slowly so that boot may not be jammed.**
- **Be sure to keep the convex part of clip between teeth of adjusting screw (2 points).**

- Take care whether clip is misaligned, and return adjusting screw anticlockwise by two revolutions. (Only if the lining is replaced.)



- Install brake shoes such that their end may accurately fall within the width across flats of clip.

CAUTION ⚠

- **When installing brake shoes, be careful not to damage clips and O-rings.**

FUSO

Group 35E

Anti-lock Brake System (ABS)

MITSUBISHI FUSO TRUCK OF AMERICA, Inc.

Pub.No.TWME0709-35E

8A: FR WSS Loss of Sensor Signal (Warning lamp: 3-5)

Code generation condition		Abnormal deceleration is determined from wheel speed sensor (front-axle right-wheel) when vehicle is running.
Resettability		System resets if normal signal is received with starter switch set OFF → ON and vehicle runs at a speed over 10km/h (electronic control unit reactivated).
Electronic control unit control		Anti-lock brake system of front-axle right wheel disabled
Inspection item	Service data	02: Wheel speed FR
	Electronic control unit connector	03: Wheel speed sensor
	Electrical part	#329: Wheel speed sensor
	Wiring diagram	Wheel speed sensor (front-axle right-wheel) circuit
	Other	Rotor and wheel hub bearing (See Gr26.)

91: Fr Inlet Valve Broken Wire (Warning lamp: 9-7)

Code generation condition		“Control valve (front-axle right-wheel) open-circuited” is detected.
Resettability		System resets if normal signal is received with starter switch set OFF → ON (electronic control unit reactivated).
Electronic control unit control		Anti-lock brake control limited to front-axle right wheel
Inspection item	Actuator test	07: Inlet Valve Fr
	Electronic control unit connector	04: Control valve
	Electrical part	#589: Control valve
	Wiring diagram	Control valve (front-axle right-wheel; pressure holding side) circuit

92: Fr Inlet Valve Short LO (Warning lamp: 9-6)

Code generation condition		“Control valve (front-axle right-wheel; pressure holding side) short-circuited to – side” is detected.
Resettability		System resets if normal signal is received with starter switch set OFF → ON (electronic control unit reactivated).
Electronic control unit control		Anti-lock brake control limited to front-axle right wheel
Inspection item	Actuator test	07: Inlet Valve Fr
	Electronic control unit connector	04: Control valve
	Electrical part	#589: Control valve
	Wiring diagram	Control valve (front-axle right-wheel; pressure holding side) circuit

93: Fr Inlet Valve Short HI (Warning lamp: 9-5)

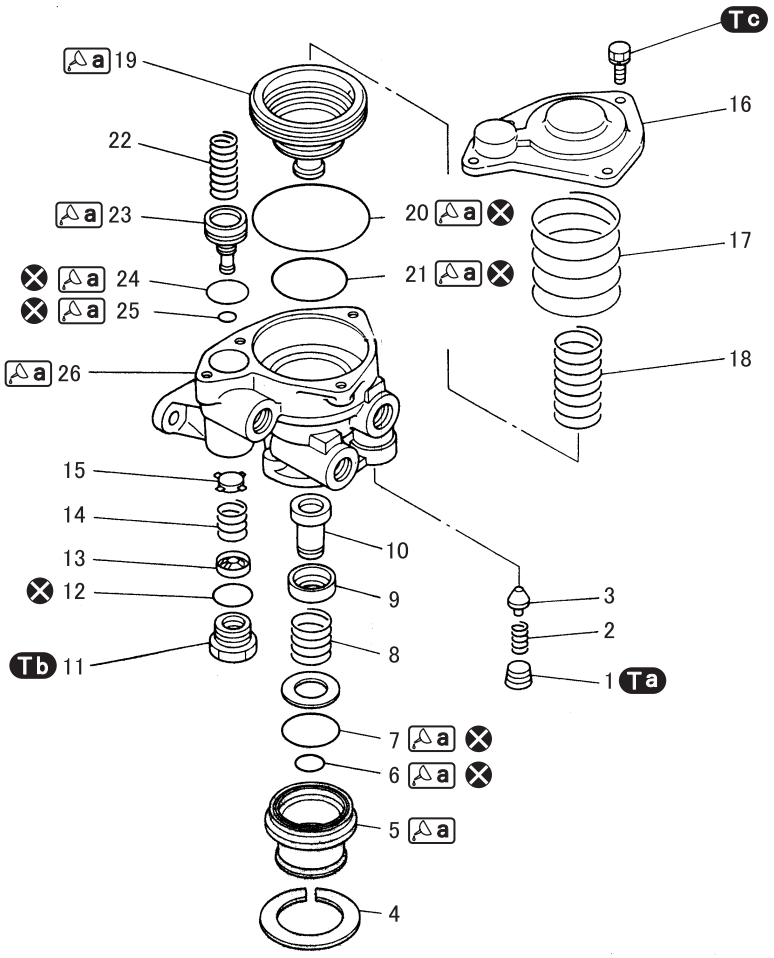
Code generation condition		“Control valve (front-axle right-wheel; pressure holding side) short-circuited to + side” is detected.
Resettability		System resets if normal signal is received with starter switch set OFF → ON (electronic control unit reactivated).
Electronic control unit control		Anti-lock brake system totally disabled
Inspection item	Actuator test	07: Inlet Valve Fr
	Electronic control unit connector	04: Control valve
	Electrical part	#589: Control valve
	Wiring diagram	Control valve (front-axle right-wheel; pressure holding side) circuit

9D: FR Valve Config Error (Warning lamp: 9-8)

Code generation condition		Electronic control unit error in recognition of appropriate control valve
Resettability		System resets if normal signal is received with starter switch set OFF → ON (electronic control unit reactivated).
Electronic control unit control		None
Inspection item	Other	Check to see if control valve is correctly connected.

INDEX

SPRING BRAKE VALVE



● Disassembly sequence

1 Plug
2 Spring
3 Check valve
4 Retaining ring
5 Exhaust cover
6 O-ring
7 O-ring
8 Valve spring
9 Valve retainer
10 Inlet and exhaust valve
11 Cap nut
12 O-ring
13 Valve stop
14 Valve spring
15 Valve
16 Cover
17 Piston spring
18 Piston spring
19 Piston
20 O-ring
21 O-ring
22 Piston spring
23 Piston
24 O-ring
25 O-ring
26 Body

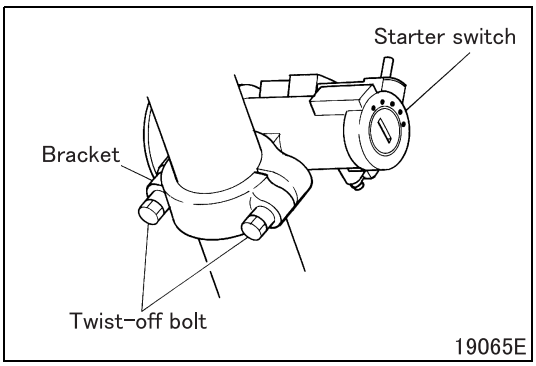
⊗: Non-reusable parts

● Assembly sequence

Follow the disassembly sequence in reverse.

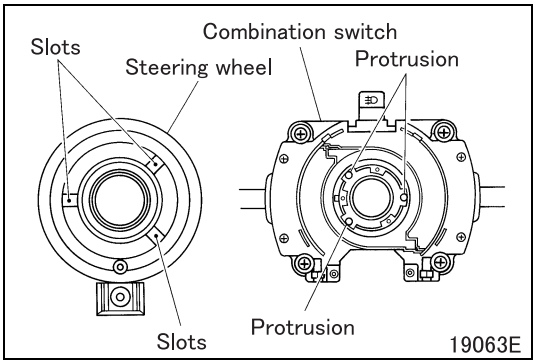
Repair kit: Spring brake valve kit

◆Installation procedure◆



■ **Installation: Starter switch**

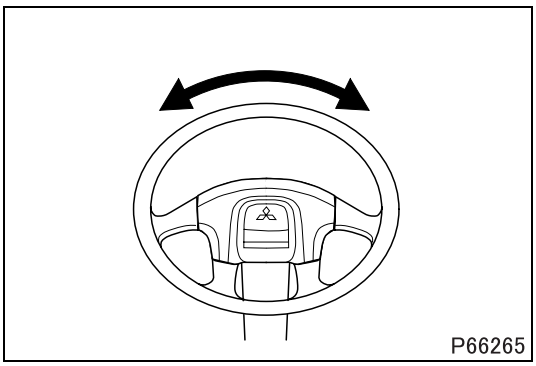
- Install the starter switch using new twist-off bolts.
- Twist off the bolt head of the twist-off bolt.
- Check for operation of the steering lock function of the starter switch.



■ **Installation: Steering wheel**

- Align slots in steering wheel with cancel cam protrusions of combination switch.

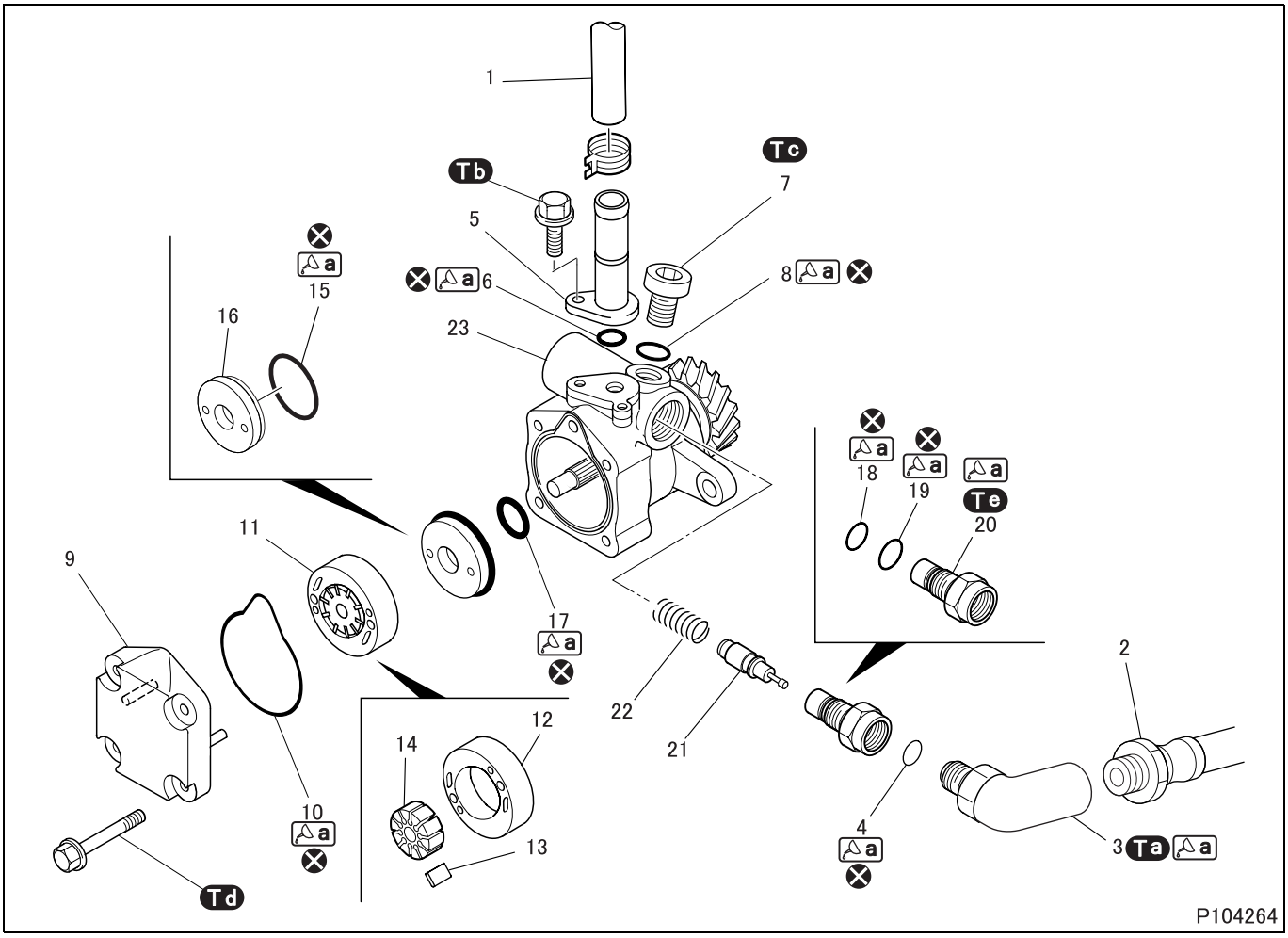
◆Inspection after installation◆



■ **Inspection: Noise from steering wheel**

- Lightly turn the steering wheel left and right and check for noise and other abnormalities.
- If any abnormality is found, disassemble the steering wheel, remove the cause and reinstall.

POWER STEERING OIL PUMP <FK>



● **Disassembly sequence**

1 Oil hose (intake side)
2 Oil hose (discharge side)
3 Elbow
4 O-ring
5 Suction connector
6 O-ring
7 Plug
8 O-ring
9 Cover
10 O-ring
11 Cartridge assembly
12 Cam ring
13 Vane
14 Rotor
15 O-ring
16 Side plate
17 O-ring
18 O-ring
19 O-ring
20 Connector
21 Flow control valve
22 Flow control spring
23 Body

⊗: Non-reusable parts

CAUTION ⚠

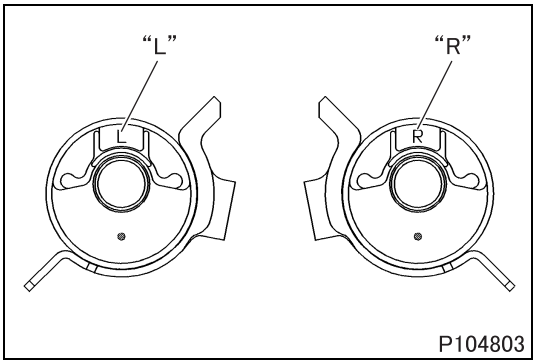
- **The flow control valve and body are of a unit construction.**
- **Do not remove the plug unless it is in an abnormal condition.**
- **See Gr11 for removal and installation of the power steering oil pump.**

● **Assembly sequence**

Follow the disassembly sequence in reverse.

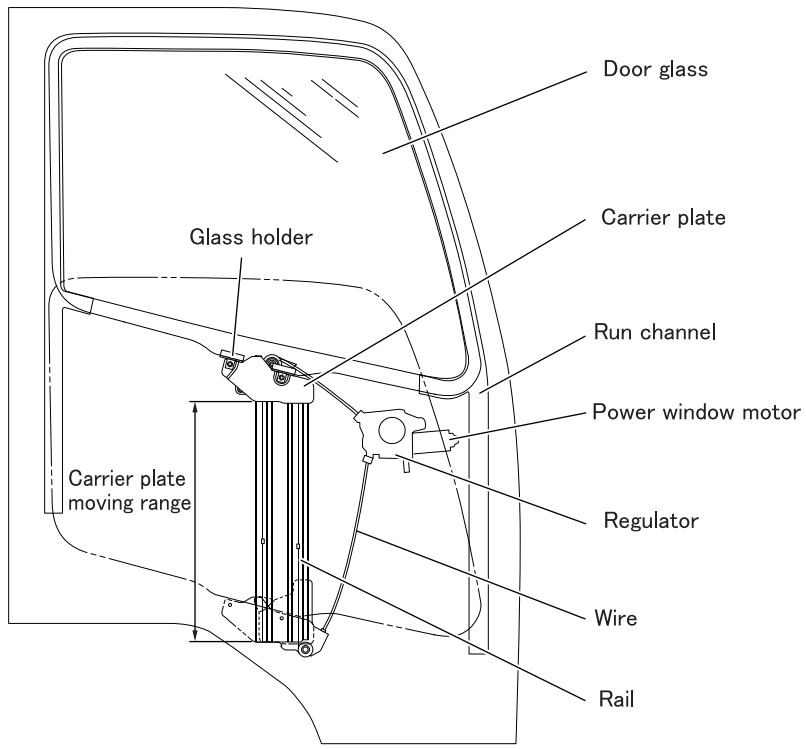
Repair kit: Seal repair kit, cartridge assembly kit

- Upper torsion bar and lower torsion bar have their particular torsional directions. To ensure that they are installed correctly, the upper and lower torsion bars have “L” or “R” indicating the direction of torsion stamped at the RH end faces.
- Upper torsion bar has alignment mark (white paint) which should be aligned with alignment mark “–” or “●” on cab hinge bracket.
- Lower torsion bar has alignment mark (white paint) which should be aligned with alignment mark “–” or “●” on gearbox bracket.



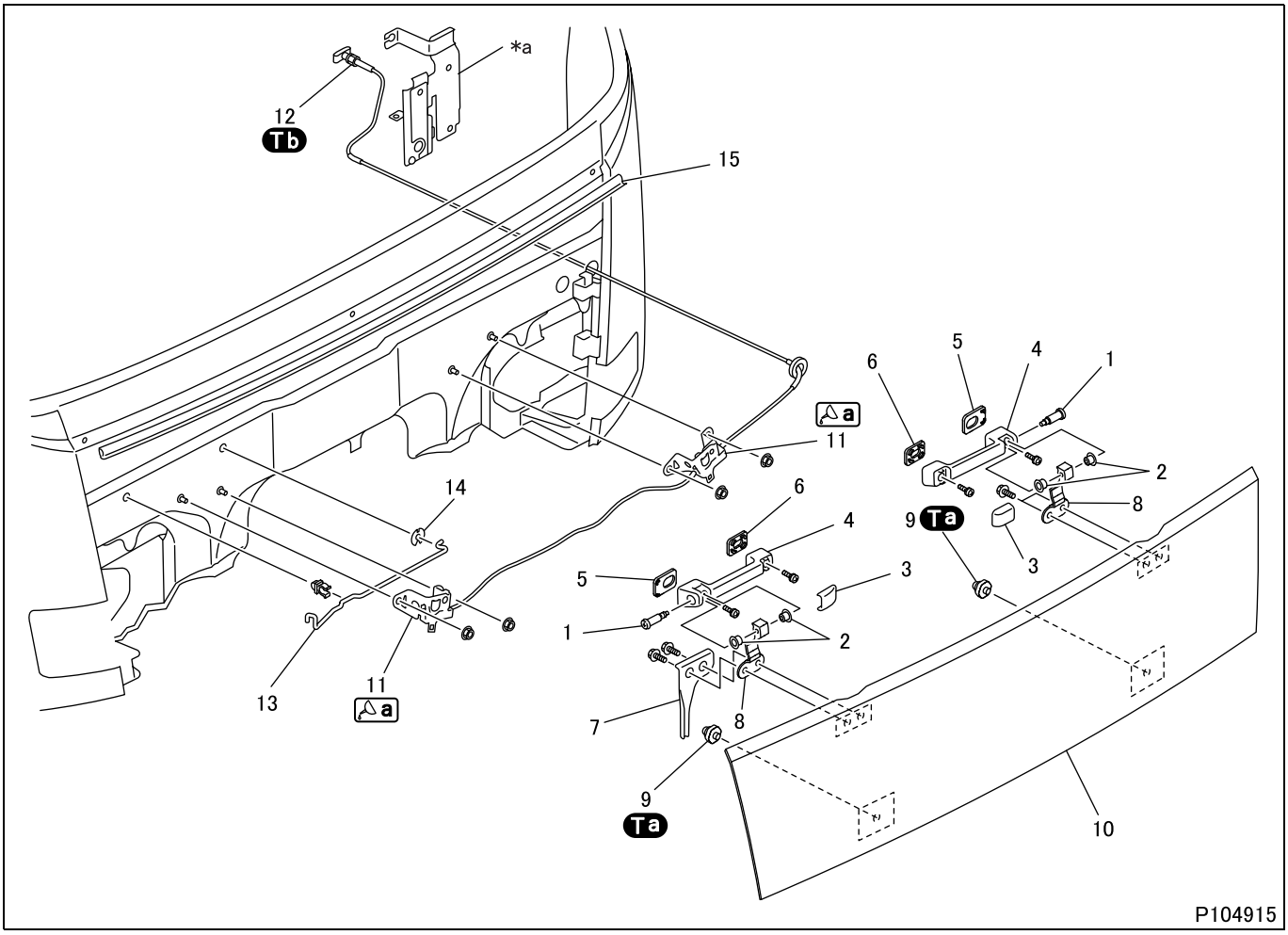
- Cab hinge cushion uses a liquid-filled rubber element.
- Cab hinge cushion has the identification mark “L” or “R”.

2. Door Glass Opening System



- Regulator is so constructed that it is interlocked with power window motor and carrier plate through wire.
- When power window motor is rotated, carrier plate is wound up or down by wire to raise or lower door glass.

FRONT PANEL



● **Removal sequence**

1 Front panel hinge pin
2 Bushing
3 Cover
4 Front grip
5 Packing
6 Packing
7 Shield plate
8 Front panel hinge
9 Striker
10 Front panel
11 Front panel latch
12 Front panel opener cable
13 Front panel support rod
14 Grommet
15 Weatherstrip

***a**: Brake pedal bracket

● **Installation sequence**

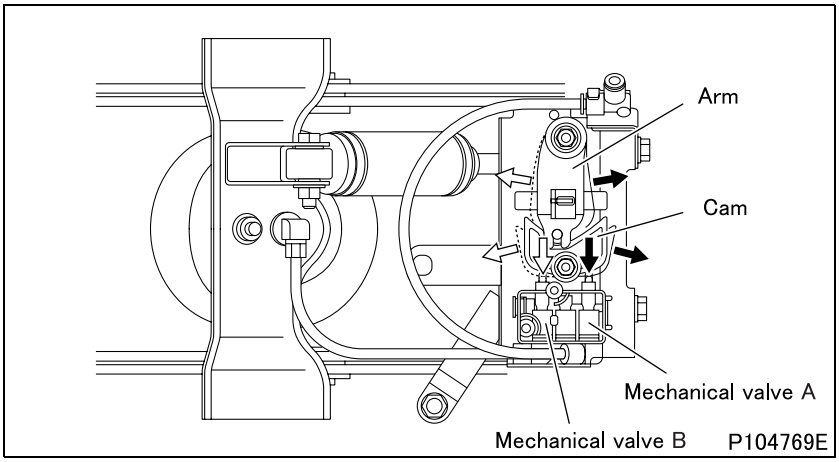
Follow the removal sequence in reverse.

Tightening torque (Unit: N·m {ft.lbs, kgf·m})

Mark	Parts to be tightened	Tightening torque	Remarks
Ta	Striker	11.2 {8.3, 1.1}	–
Tb	Resin nut of front panel opener cable	1.5 to 2.5 {11 to 1.8, 0.15 to 0.25}	–

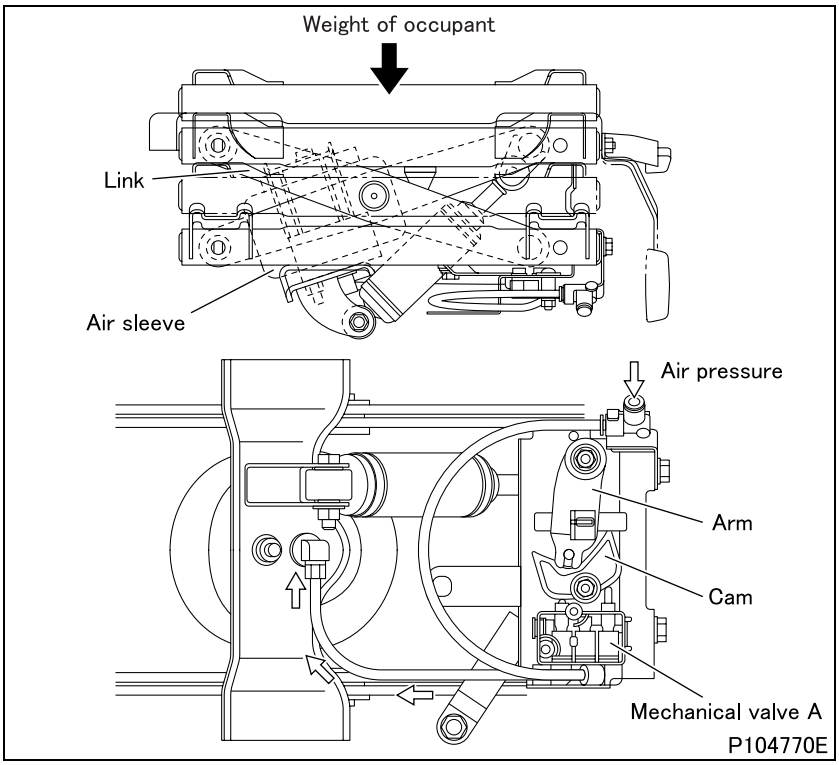
Lubricant and/or sealant

Mark	Points of application	Specified lubricant and/or sealant	Quantity
a	Striker contacting portion of front panel latch, and spring	Wheel bearing grease [NLGI No.2 (Li soap)]	As required



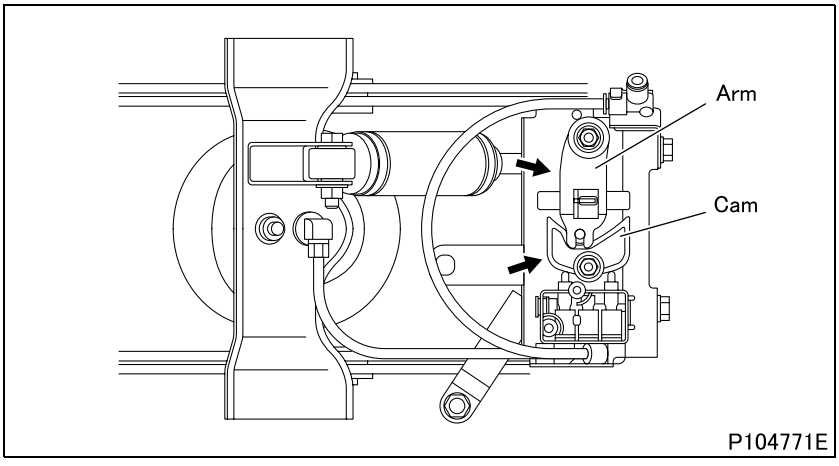
1.1 Operation of mechanical valves

- The air passage of the mechanical valves A and B opens or closes depending on the movement of the arm and the cam.

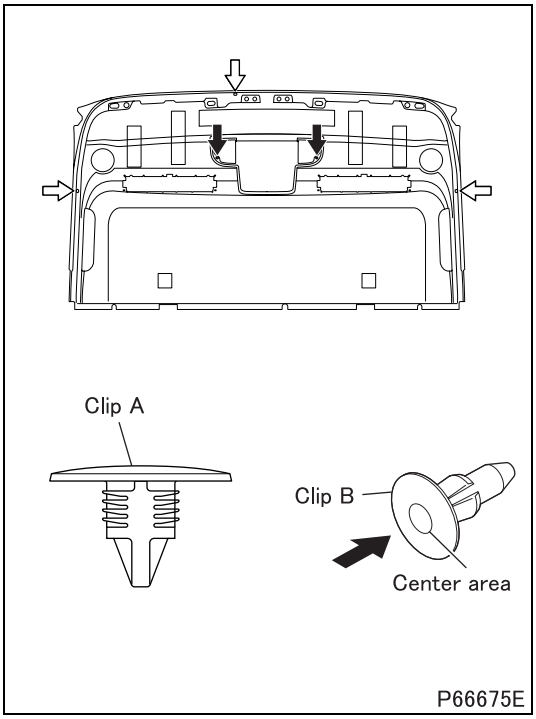


1.2 Operation of air suspension when seat is occupied

- When the weight of an occupant is applied on the seat, the link is pressed down. This allows the arm to rotate the cam slightly, opening the air passage through the valve.
- Then, air pressure is supplied and the link is raised.



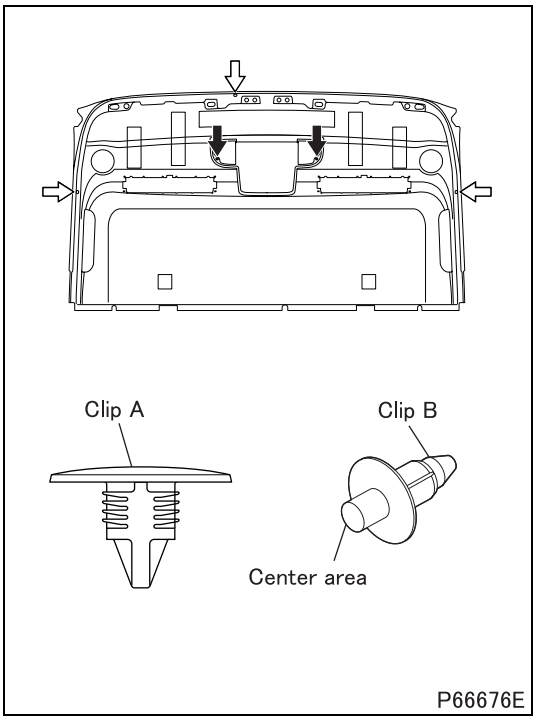
- When the link is raised, the cam is pushed back. Thus, the seat cushion returns to the original position.



■ **Removal: Front head lining**

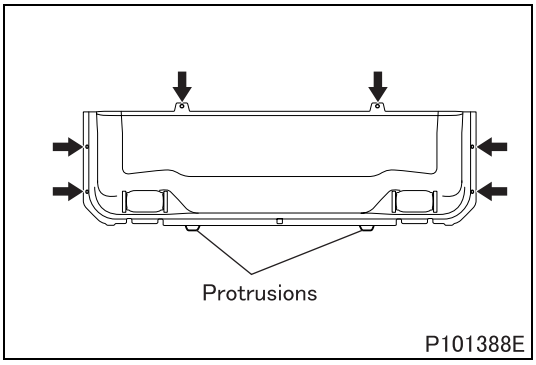
- Remove clips A (3 places marked with ⇦) to remove the front head lining.
- Remove clips B (2 places marked with ⬅) from the front head lining by pushing the center area.

◆Installation procedure◆



■ **Installation: Front head lining**

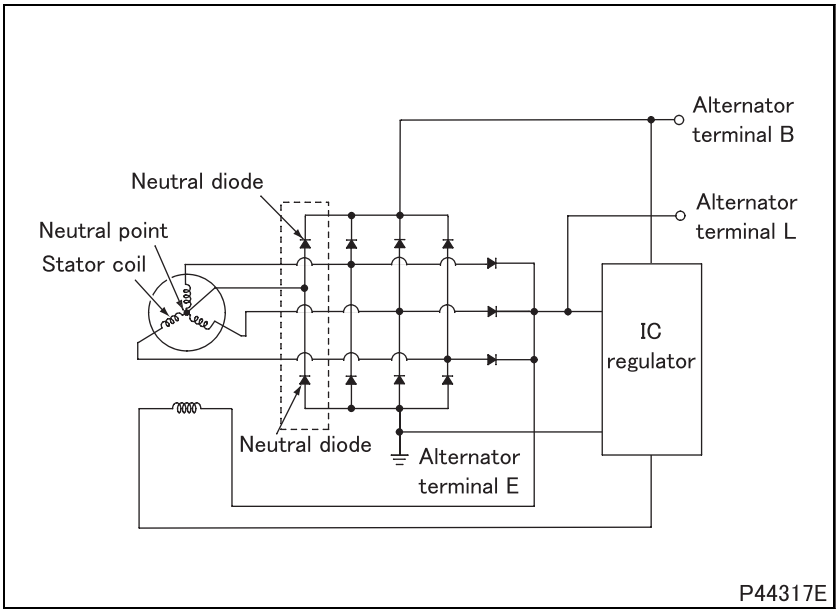
- Install clips B (2 places marked with ⬅) to the front head lining by pushing the center area as shown in the drawing.
- Install clips A (3 places marked with ⇦) to install the front head lining.



■ **Installation: Rear head lining**

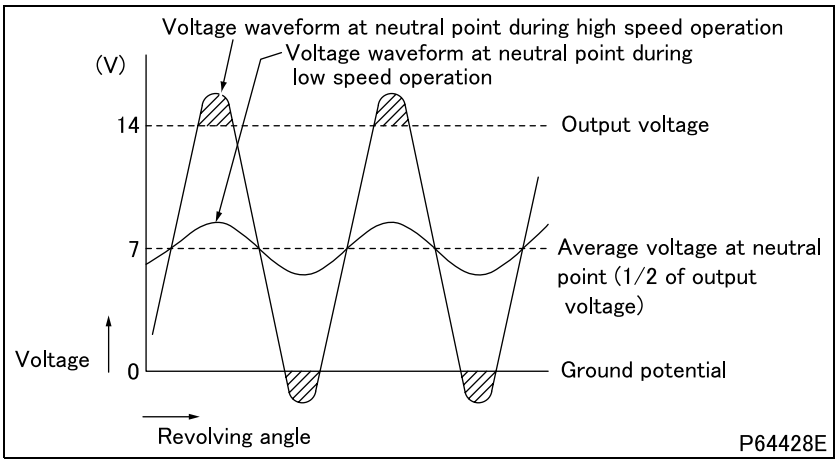
- Insert protrusions of rear head lining into the grooves of the panel on the cab side and install the rear head lining with clips (6 places).

2.1 Alternator with neutral diodes



(1) Features

- The alternator is the same as the current alternator except that neutral diodes have been added.
- These neutral diodes enable this alternator to provide higher DC output during operation at high speeds than the alternator without neutral diodes.



(2) Variations of voltage at neutral point and operation of neutral diodes

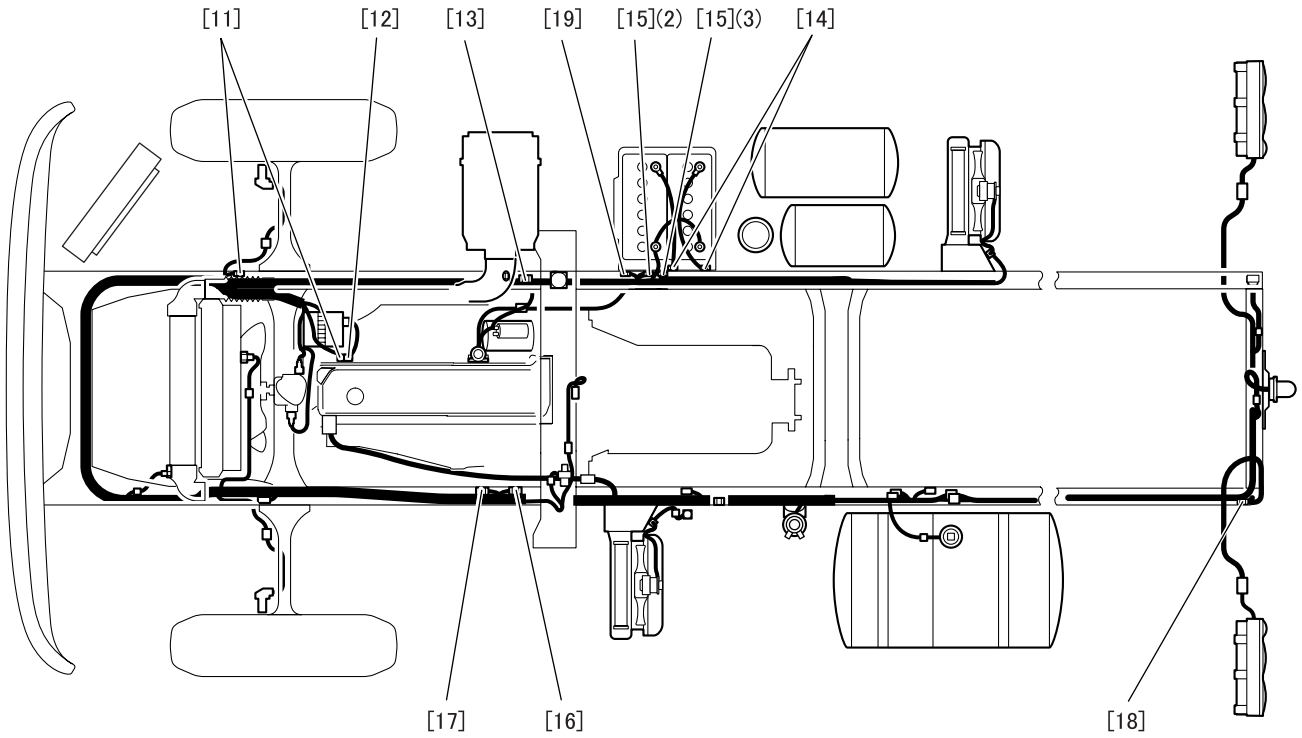
- The potential at the neutral point varies up and down with the neutral point DC voltage (1/2 of output voltage) as a center as shown.
- When the alternator is operated at high speeds, the voltage at the neutral point can increase to exceed the output voltage (14 V) and decrease to become lower than the ground voltage (0 V). To adjust these over-voltage and under-voltage (shaded portions of diagram) the current from the excess voltages is taken by neutral diodes and added to the DC output.

The operation of neutral diodes for each voltage and potential is as follows.

- When the voltage at neutral point is in the range from 0 to 14 V, the other six diodes are operated. Neutral diodes are not operated.

Symptoms / Possible causes		Turn signal lamp (serving also as hazard warning lamp)					Personal lamp does not light.	Interior illumination lamps for meters, radio system, etc. do not light.	Reference Gr
		Does not blink.	Stay ON.	Blinks too slowly.	Blinks too quickly.	Blinks irregularly.			
Connector connection faulty, harness broken, grounding faulty		O					O	O	
Fuse blown		O					O		
Battery voltage insufficient			O						
Alternator output insufficient			O						
Bulb burnt-out		O			O		O	O	
Power (wattage) of bulb is lower than specified value					O				
Power (wattage) of bulb is higher than specified value				O					
Combination switch	Lighting switch faulty							O	
	Turn signal lamp switch faulty								
	Dimmer switch faulty								
	Hazard warning lamp switch faulty	O	O						
Headlamp relay (HIGH, LOW) faulty									
Tail lamp relay faulty								O	
Stop lamp relay faulty									
Turn signal lamp relay faulty		O							
Stop lamp switch faulty									
Flasher unit faulty		O	O	O	O	O			
Backup lamp switch faulty									
Back buzzer faulty									
Personal lamp switch faulty							O		
Personal lamp faulty							O		
Door switch faulty							O		
Rheostat switch faulty								O	

[11] to [19] <FM>



Location	Circuit No.	Wire diameter –wire color	Destination	Remarks
[11]	GEE2	20–BL	Alternator	Alternator ground
[12]	–	20–B	Alternator	Alternator ground
[13]	–	60	Engine	Engine ground
[14]	–	60	Battery	Battery ground
[15](2)	CE11	5–B	JOINT (14)	
[15](3)	ABE3	2–B	ABS ECU	
	CE10	2–B	Joint connector (J/C–6)	
[16]	CME3	1.25–B	Engine ECU	
	CME4	1.25–B	Engine ECU	
	MDE5	3–B	Motor 1	A/T
[17]	CME1	1.25–B	Engine ECU	
	CME2	1.25–B	Engine ECU	
	CME5	1.25–B	Engine ECU	
[18]	RWE1	B	Parking brake switch	
	TLE5	0.85–B	Rear combination lamp, LH	
	TLE6	0.85–B	Rear combination lamp, RH	
[19]	MDE7	3–B	Motor 2	A/T

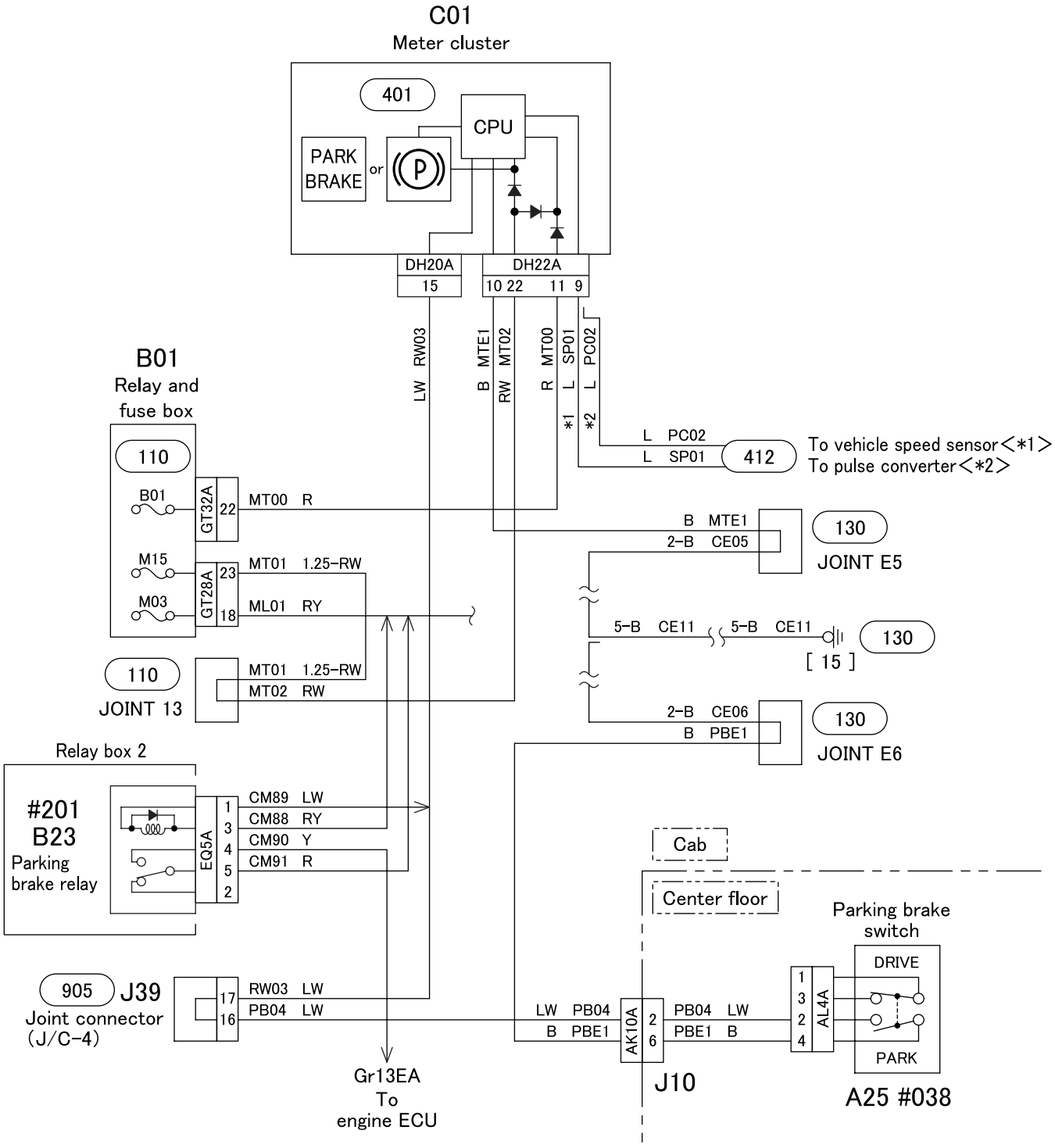
ABS : Anti–lock brake system
ECU : Electronic control unit
A/T : Automatic transmission

L02513

54-03 LIGHTING CIRCUIT

510 PARKING BRAKE INDICATOR CIRCUIT

＜Center parking brake＞

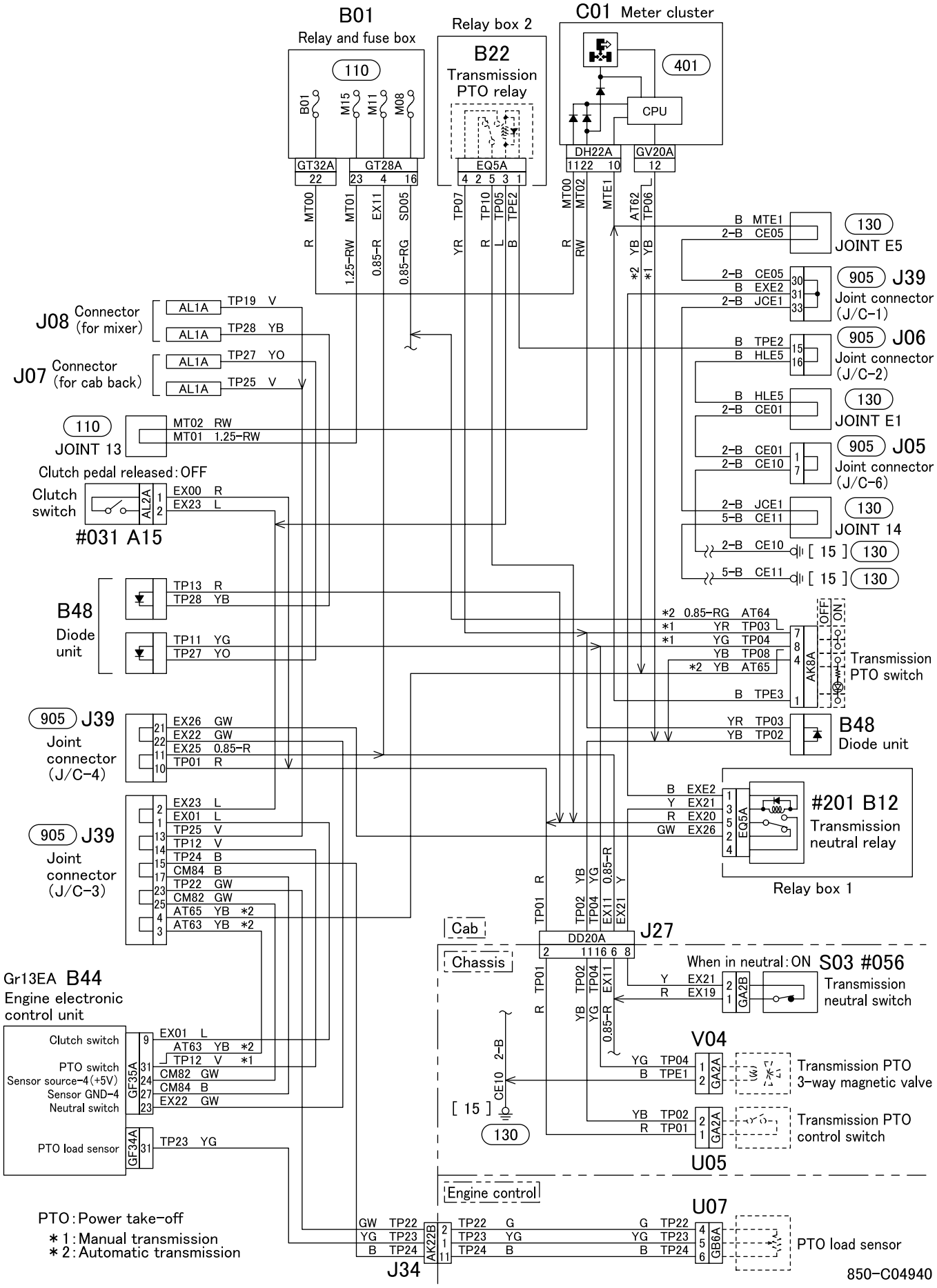


＊1：Manual transmission
＊2：Automatic transmission

ECU：Electronic control unit

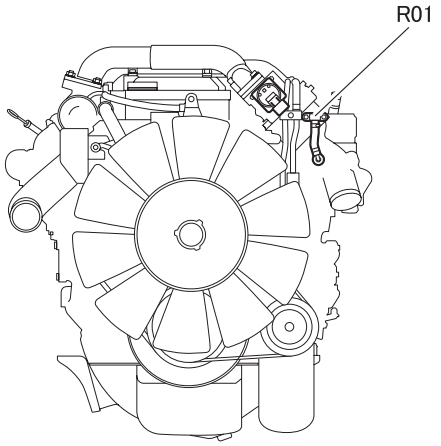
510-C04115

850 TRANSMISSION POWER TAKE-OFF CIRCUIT

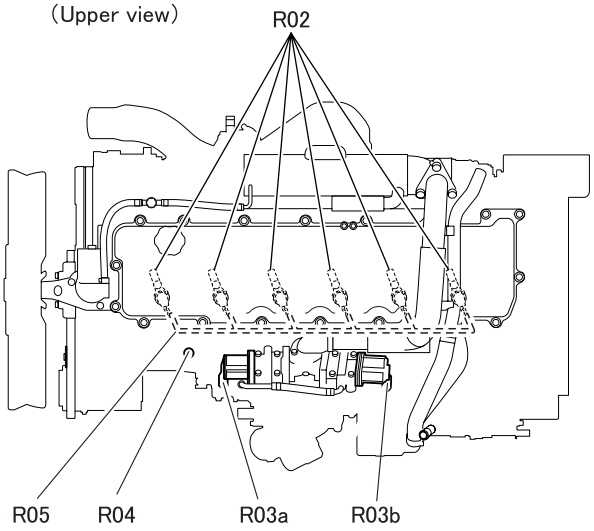


R01 to 22

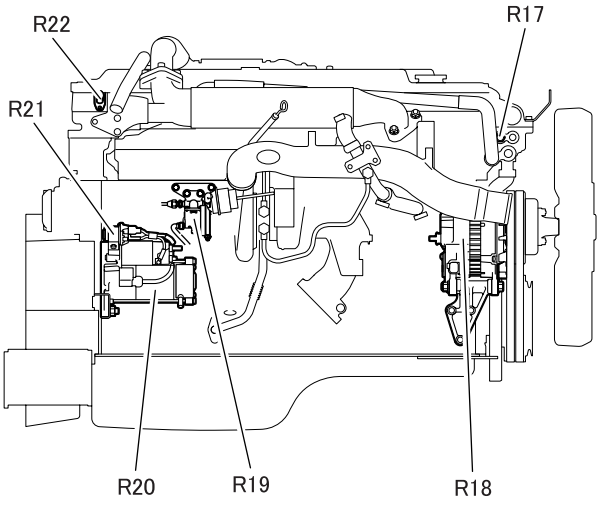
(Front view)



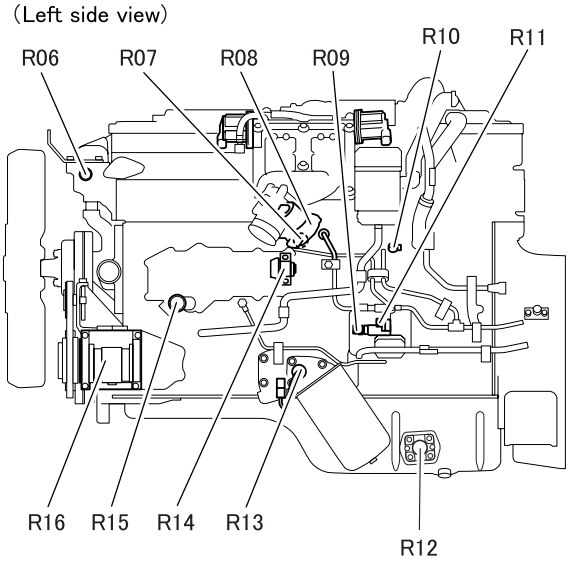
(Upper view)



(Right side view)



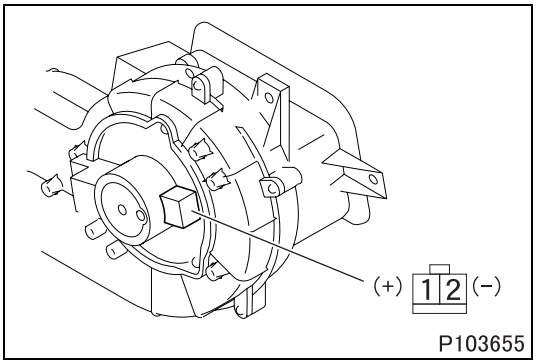
(Left side view)



R01 Boost pressure sensor
R02 Injector magnetic valve
R03a EGR valve 1
(building into motor, position sensor)
R03b EGR valve 3
(building into motor, position sensor)
R04 Boost air temperature sensor
R05 Glow plug
R06 Overheating switch
R07 Common rail pressure sensor
R08 Throttle actuator
(building into motor, position sensor)
R09 Fuel temperature sensor (Inlet)
R10 Fuel temperature sensor (Outlet)
R11 Suction control valve
R12 Engine oil level sensor
R13 Engine oil bypass alarm switch
R14 Glow relay
R15 Engine oil pressure switch
R16 Magnetic clutch
R17 Water temperature sensor
(connects to engine electronic control unit)
R18 Alternator
R19 Waste gate magnetic valve
R20 Starter
R21 Starter relay
R22 Cylinder recognition sensor

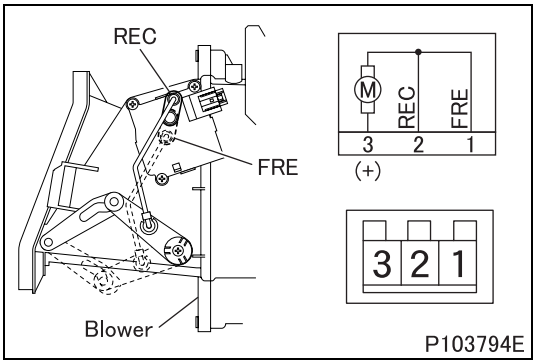
EGR : Exhaust gas recirculation

L02499



#411 Inspection of blower motor

- Make sure that the motor operates when battery voltage is applied between terminals 1 and 2.
- If any fault is found, replace the motor. (See Gr55.)



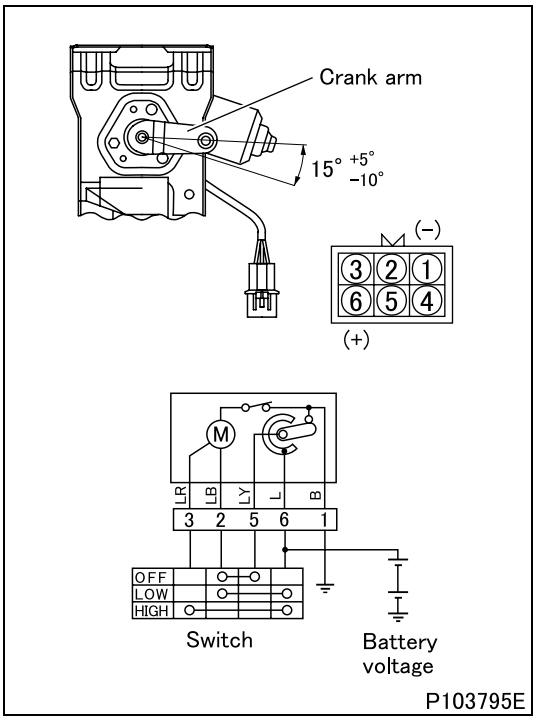
#415 Inspection of fresh/recirculation changeover motor

- Perform the following checks, and if any fault is found, replace the motor. (See Gr55.)
- Make sure that the motor operates when DC12V is applied between each terminal.

Lever position	Terminal
REC (inside air)	(+) 3–2 (–)
FRE (outside air)	(+) 3–1 (–)

CAUTION ⚠

- **Stop applying DC12V if the lever stops spontaneously at the REC or FRE position.**



#422 Inspection of wiper motor

- Connect a switch to wiper motor as shown.
- Check the motor for correct operation as follows. If any fault is found, replace the motor. (See Gr51.)

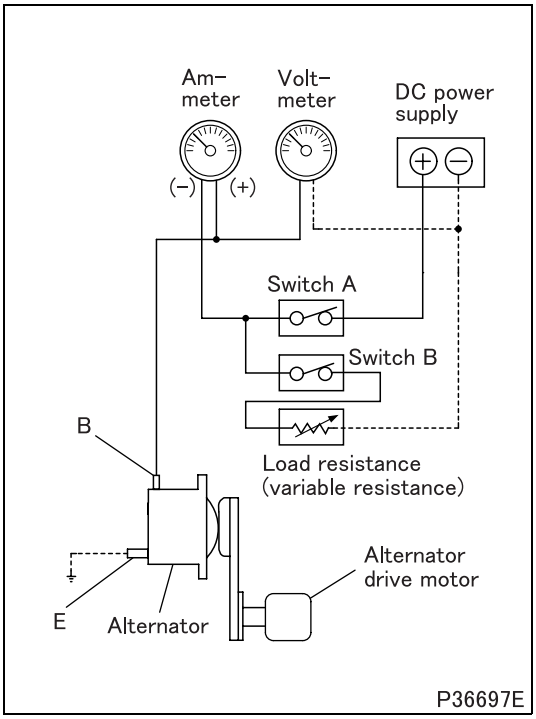
(1) Inspection of motor operation

- Set switch to HIGH position to check that the motor rotates at high speed.
- Set switch to LOW position to check that the motor rotates at low speed.

(2) Inspection of automatic stop position

- Set switch to LOW position to let the motor rotate at low speed.
- When the crank arm is in a position other than automatic stop position (outside the angles shown), set switch to OFF position.
- Check to see that the crank arm stops at the automatic stop position (within the angles range shown).

◆Inspection procedure◆



■ Inspection: Alternator

(1) Alternator output current (bench test)

- Connect the alternator as illustrated.

CAUTION ⚠

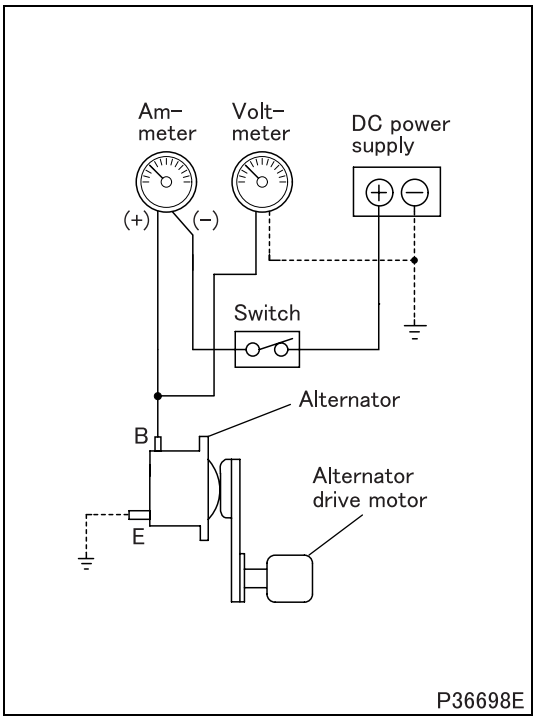
- **Wires with sufficient thickness should be used for wiring and each connection should be securely fastened.**

B: Terminal B
E: Terminal E

- Increase load resistance to the maximum (condition under which the load current hardly flows).
- Turn switch A and B ON.
- Run alternator at 5000 rpm for 30 minutes by adjusting load resistance so that electric current can conform to the following standard.
  Alternator nominal current

Current
Approx. 100 A

- Measure the current at each specified revolution of alternator.
- If the measured value is lower than the standard value, disassemble and check alternator.



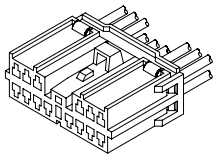
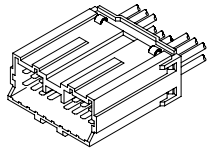
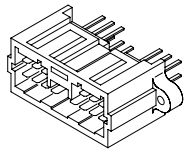
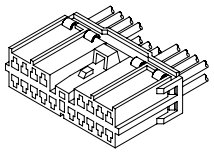
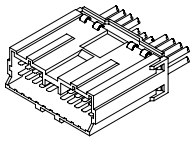
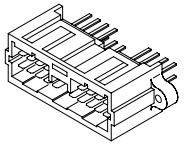
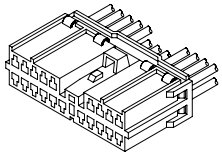
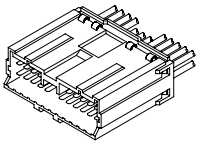
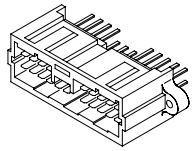
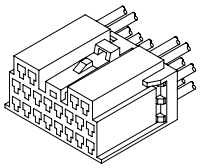
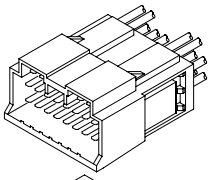
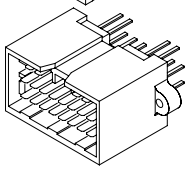
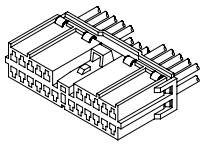
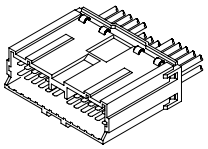
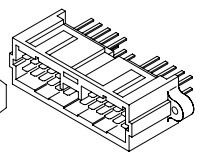
(2) Adjustment voltage of regulator (bench test)

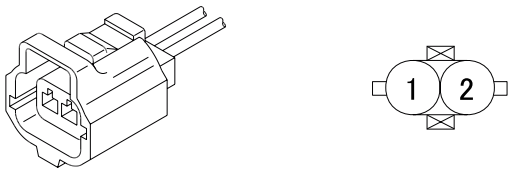
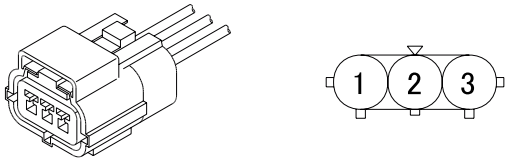
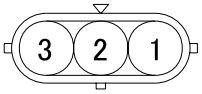
- Connect the alternator as illustrated.

B: Terminal B
E: Terminal E

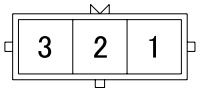
- Turn switch ON.
- Run alternator at low speeds.
- Increase the speed of alternator to 5000 rpm and measure the voltage (adjustment voltage) at this speed. At the same time, make sure that the current is 10 amperes or less at 5000 rpm.
- If the measured value deviates from the standard value, do as follows:
  - If higher than the standard value: Replace the regulator.
  - If lower than the standard value: Inspect the alternator related parts before replacing the regulator.

CONNECTOR CONFIGURATION CHART

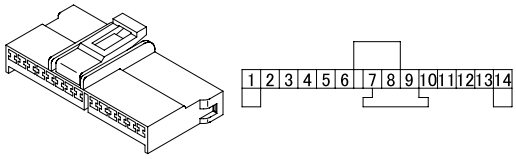
Number shows number of pins	Female connector	Male connector
AK14A	 1 2 3 ▽ 4 5 6 7 8 9 10 11 12 13 14	6 5 4 ▽ 3 2 1 14 13 12 11 10 9 8 7  6 5 4 ▽ 3 2 1 14 13 12 11 10 9 8 7 
AK18A	 1 2 3 4 ▽ 5 6 7 8 9 10 11 12 13 14 15 16 17 18	8 7 6 5 ▽ 4 3 2 1 18 17 16 15 14 13 12 11 10 9  8 7 6 5 ▽ 4 3 2 1 18 17 16 15 14 13 12 11 10 9 
AK20A	 1 2 3 4 5 ▽ 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	9 8 7 6 ▽ 5 4 3 2 1 20 19 18 17 16 15 14 13 12 11 10  9 8 7 6 ▽ 5 4 3 2 1 20 19 18 17 16 15 14 13 12 11 10 
AK20B	 1 2 ▽ 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	4 3 ▽ 2 1 12 11 10 9 8 7 6 5 20 19 18 17 16 15 14 13  4 3 ▽ 2 1 12 11 10 9 8 7 6 5 20 19 18 17 16 15 14 13 
AK22A	 1 2 3 4 5 ▽ 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	10 9 8 7 6 ▽ 5 4 3 2 1 22 21 20 19 18 17 16 15 14 13 12 11  10 9 8 7 6 ▽ 5 4 3 2 1 22 21 20 19 18 17 16 15 14 13 12 11 

Number shows number of pins	Female connector	Male connector
CH2B		
CH3A		

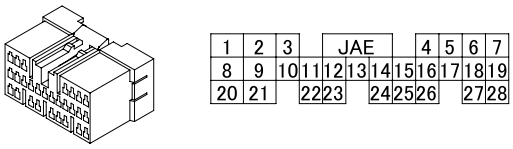
CK type

Number shows number of pins	Female connector	Male connector
CK3A		

CL type

Number shows number of pins	Female connector	Male connector
CL14A		

CM type

Number shows number of pins	Female connector	Male connector
CM28A		
CM30A