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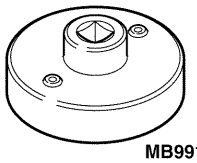
GENERAL

OUTLINE OF CHANGES

Due to the addition of MITSUBISHI Active Stability & Traction Control System (M-ASTC) and MITSUBISHI Active Traction Control System (M-ATC), the following service procedures have been established. Operation must be carried out in the same manner as before except for the items described below.

SPECIAL TOOL

Tool	Number	Name	Use
 MB991926	MB991926	Accumulator wrench	Removal and installation of accumulator <Vehicles with M-ASTC and M-ATC>

TROUBLESHOOTING <VEHICLES WITH M-ASTC AND M-ATC>

DIAGNOSTIC FUNCTION

How to read diagnosis code:

Use MUT-II to read the diagnosis code.

NOTE:
Connect MUT-II to the 16-pin diagnosis connector.

How to erase diagnosis code:

Connect MUT-II to the 16-pin diagnosis connector and erase the diagnosis code.

CAUTION:
Connection and disconnection of MUT-II must be carried out after the ignition switch is turned to the LOCK (OFF) position.

INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Diagnosis item	Reference page
16	M-ASTC-ECU or M-ATC-ECU power supply system (extreme voltage drop or rise)	35A-4
31	M-ASTC-ECU or M-ATC-ECU power supply system (open circuit or short circuit)	35A-4
53	Pump motor system (clogging of pump motor*, or electric current detecting circuit failure of M-ASTC-ECU or M-ATC-ECU)	35A-5
54	Motor relay system (open circuit, short circuit or motor relay coil defect)	35A-6
55	Pump motor system (motor energized too long)	35A-7
56	Pressure switch system <open circuit or short circuit (low pressure warning)>	35A-8
57	Accumulator system (motor energized too long or accumulator pressure too low)	35A-9
58	M-ASTC-ECU or M-ATC-ECU system	Replace M-ASTC-ECU or M-ATC-ECU (Refer to Group 35C).

NOTE

*: Code No. 16 is erased when the ignition switch is turned to the OFF position.

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INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

Code No.16 M-ASTC-ECU or M-ATC-ECU power supply system (extreme voltage drop or rise)	Possible cause
This code is set when the power-supply voltage of M-ASTC-ECU or M-ATC-ECU exceeds the lower or upper limit. Code No. 16 is erased when the ignition switch is turned to the OFF position.	● Malfunction of the battery ● Malfunction of alternator ● Malfunction of the M-ASTC-ECU or the M-ATC-ECU

CAUTION:
When the battery voltage decreases or increases during inspection, Code No. 16 is set as a current failure. In this case, correct troubleshooting cannot be performed. Before the following inspection, check the battery status, and if necessary, charge the battery.

Reinspection of Diagnosis Code
- Erase the diagnosis code.
- Check if the diagnosis code is set again.

NG → Replace M-ASTC-ECU or M-ATC-ECU (Refer to GROUP 35C).

Code No. 31: M-ASTC-ECU or M-ATC-ECU power supply system (open circuit or short circuit)	Possible cause
This code is set when the power supply circuit of M-ASTC-ECU or M-ATC-ECU is open circuit, short circuit, or its internal circuit is defective.	● Malfunction of harness or connector ● Malfunction of the M-ASTC-ECU or the M-ATC-ECU

Check the following connector: E-120 <Vehicles with M-ATC>, E-124 <Vehicles with M-ASTC>
- NG → **Repair**
- OK ↓

Measure at M-ASTC-ECU connector E-124 or M-ATC-ECU connector E-120.
- Disconnect the connector, and measure at the harness side.
- Start the engine, and check the voltage between 9 and body earth.

OK: Battery voltage
- NG → **Check the following connectors:** E-13, E-120 <Vehicles with M-ATC>, E-124 <Vehicles with M-ASTC>
  - OK → Check trouble symptoms.
    - NG → Check harness, and repair if necessary.
      - From M-ASTC-ECU or M-ATC-ECU to multi-purpose fuse No. 24
  - NG → **Repair**
- OK ↓

Check trouble symptoms.
- NG → Replace M-ASTC-ECU or M-ATC-ECU (Refer to GROUP 35C).

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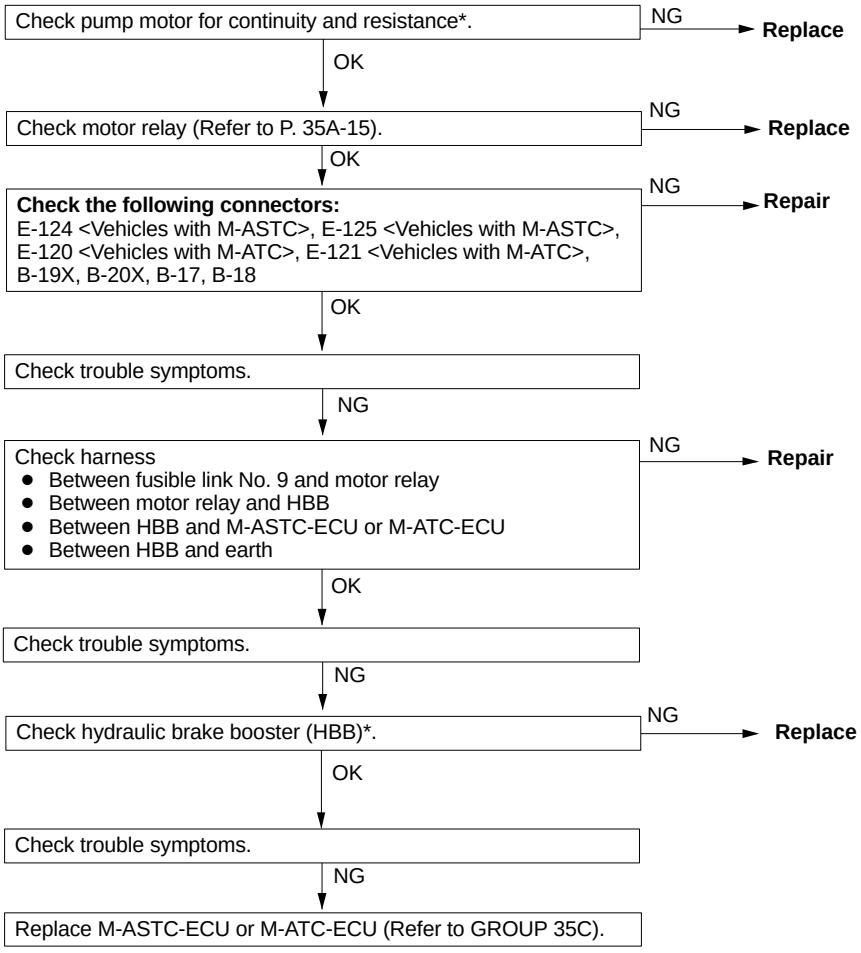
Code No. 53: Pump motor system (clogging of pump motor*, or electric current detecting circuit failure of M-ASTC-ECU or M-ATC-ECU)	Possible cause
This code is set when the drive circuit of the pump motor is open/short-circuited, or motor relay is defective, or internal circuit of M-ASTC-ECU or M-ATC-ECU is defective, or pump motor of the hydraulic brake booster (HBB) or the master cylinder & hydraulic unit assembly is defective.	● Malfunction of harness or connector ● Malfunction of motor relay ● Malfunction of the M-ASTC-ECU or the M-ATC-ECU ● Malfunction of HBB (pump motor or master cylinder & hydraulic unit assembly)

<Vehicles with M-ASTC>



NOTE

*: Refer to 2001 PAJERO Workshop Manual [Pub. No. PWJE0005(2/2)].

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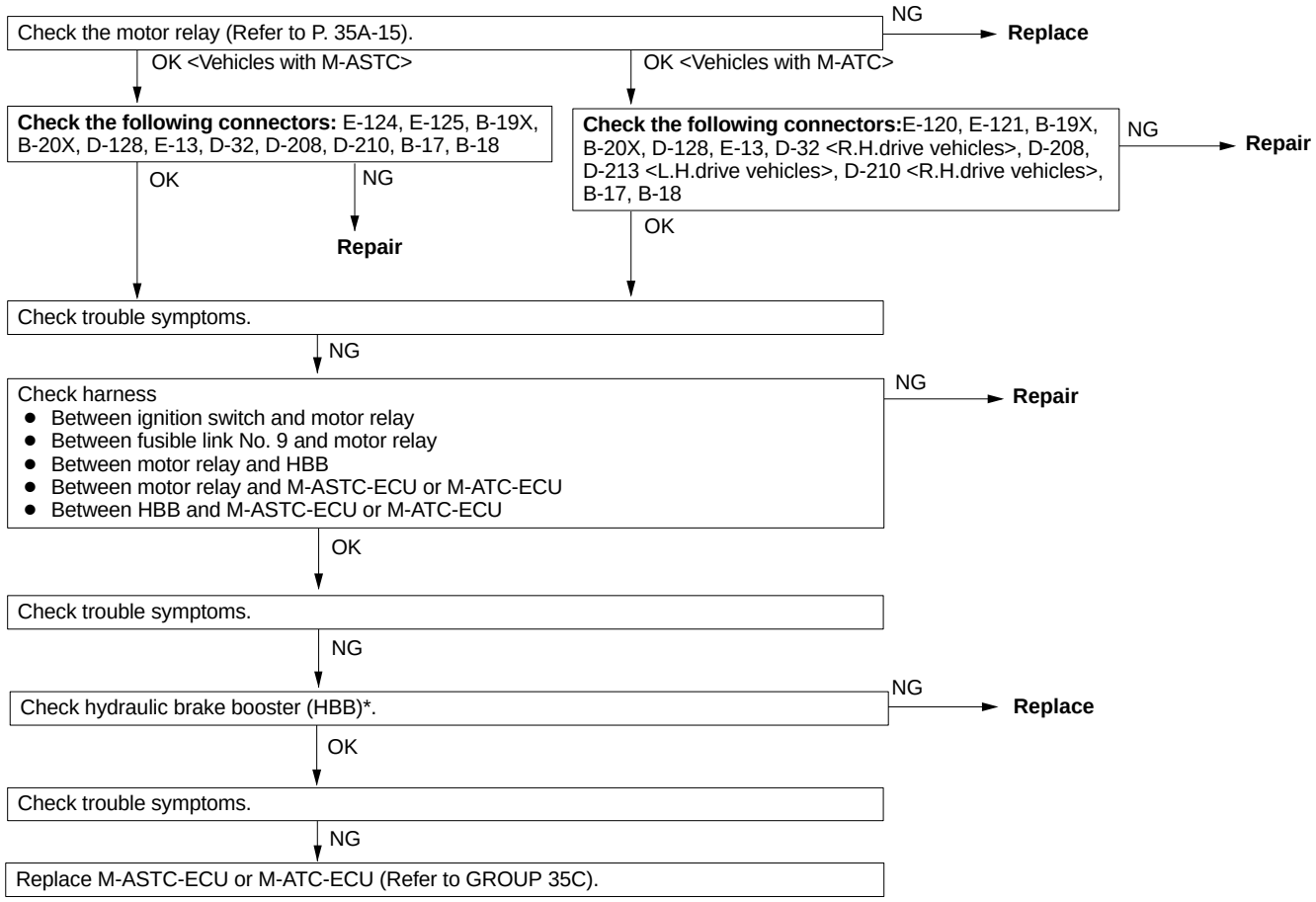
Code No. 54: Motor relay system (open circuit, short circuit or motor relay coil defect)	Possible cause
This code is set when the motor relay circuit is open/short-circuited, or internal circuit of M-ASTC-ECU or M-ATC-ECU is defective, or master cylinder & hydraulic unit assembly of hydraulic brake booster (HBB) is defective.	● Malfunction of harness or connector ● Malfunction of motor relay ● Malfunction of the M-ASTC-ECU or the M-ATC-ECU ● Malfunction of HBB (Master cylinder & hydraulic unit assembly)



NOTE

*: Refer to 2001 PAJERO Workshop Manual [Pub. No. PWJE0005(2/2)].

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Code No. 55: Pump motor system (motor energized too long)	Possible cause
This code is set when the pump motor continuously operates for 300 seconds.	● Malfunction of motor relay ● Malfunction of harness or connector ● Malfunction of the M-ASTC-ECU or the M-ATC-ECU ● Malfunction of HBB (pressure switch)

When the motor relay 1 is removed, does the pump motor stop?
- Yes → Replace motor relay 1.
- No → When the motor relay 2 is removed, does the pump motor stop?
  - Yes → Replace motor relay 2
  - No → Measure at HBB connector B-18 .
    - ● Disconnect the connector, and measure at the harness side.
    - ● Voltage between 31 and body earth

    OK: 0 V
    - NG → **Check the following connectors:** B-18, B-19X
      - OK → Check harness, and repair if necessary.
        - ● From HBB to motor relay 2
      - NG → **Repair**
    - OK → Measure at B-17 HBB connector
      - ● Disconnect the connector, and measure at the harness side.
      - ● Voltage between 2 and body earth

      OK: 0 V
      - NG → **Check the following connectors:** B-17, B-20X
        - OK → Check harness, and repair if necessary.
          - ● Between HBB and motor relay 1
        - NG → **Repair**
      - OK → **Check the following connectors:** B-19X, B-20X, E-124, E-125
        - NG → **Repair**
        - OK → Check harness
          - ● Between M-ASTC-ECU and motor relay 1
          - ● Between M-ASTC-ECU and motor relay 2

          - NG → **Repair**
          - OK → Measure at M-ASTC-ECU connector E-124 or M-ATC-ECU connector E-120 .
            - ● Disconnect the connector, and measure at the harness side.
            - ● Continuity between 11 and body earth

            OK: Continuity
            - NG → Check pressure switch (Measure at HBB connector B-18)
              - ● Depress the brake pedal 40 times firmly.
              - ● Disconnect the connector, and measure at HBB side.
              - ● Resistance between 33 and 35

              OK: approx. 1 kΩ
              - OK → **Check the following connectors:** B-18, E-124 <Vehicles with M-ASTC>, E-120 <Vehicles with M-ATC>
                - OK → Check harness, and repair if necessary.
                  - ● Between HBB and M-ASTC-ECU or M-ATC-ECU
                  - ● Between M-ASTC-ECU and earth
                - NG → **Repair**
              - NG → Replace master cylinder & hydraulic unit assembly.
            - OK → Check trouble symptoms.
              - NG → Replace M-ASTC-ECU or M-ATC-ECU (Refer to GROUP 35C).

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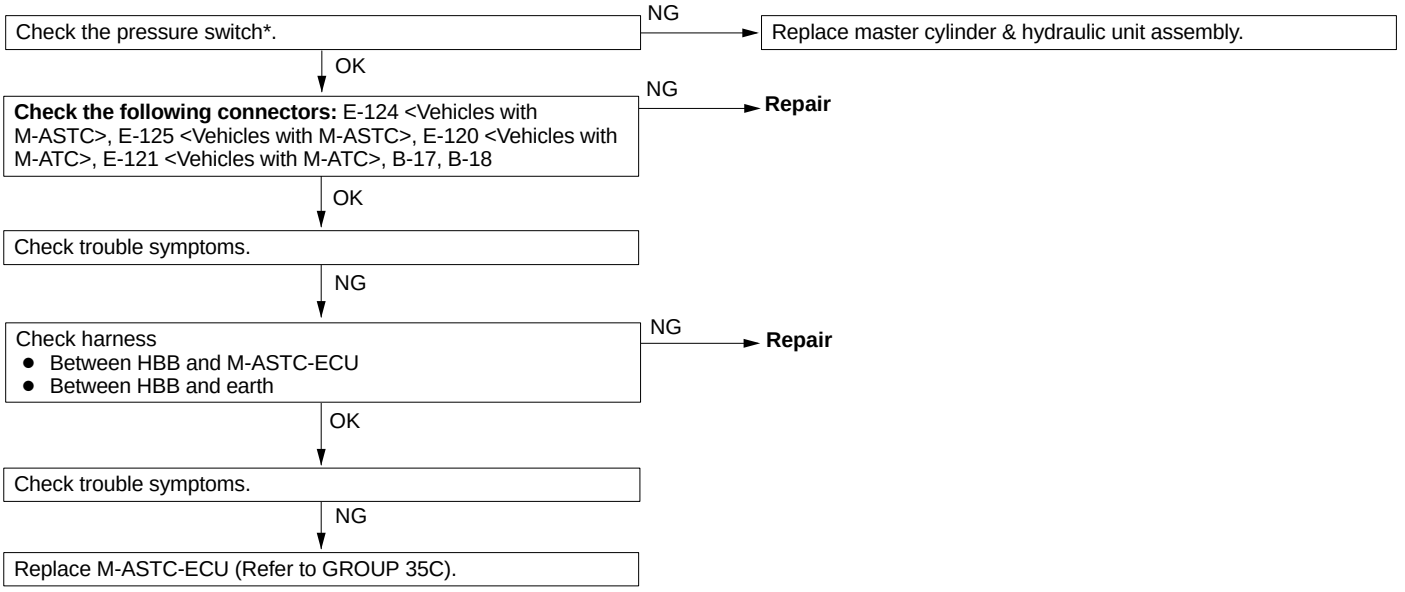
Code No.56: Pressure switch system <open circuit or short circuit>	Possible cause
This code is set when the pressure switch circuit (for low pressure warning) is open/short circuit, or pressure switch circuit (for pump control) is open circuit.	● Malfunction of harness or connector ● Malfunction of the M-ASTC-ECU or the M-ATC-ECU ● Malfunction of HBB (pressure switch)



NOTE

*:Refer to 2001 PAJERO Workshop Manual [Pub. No. PWJE0005(2/2)]

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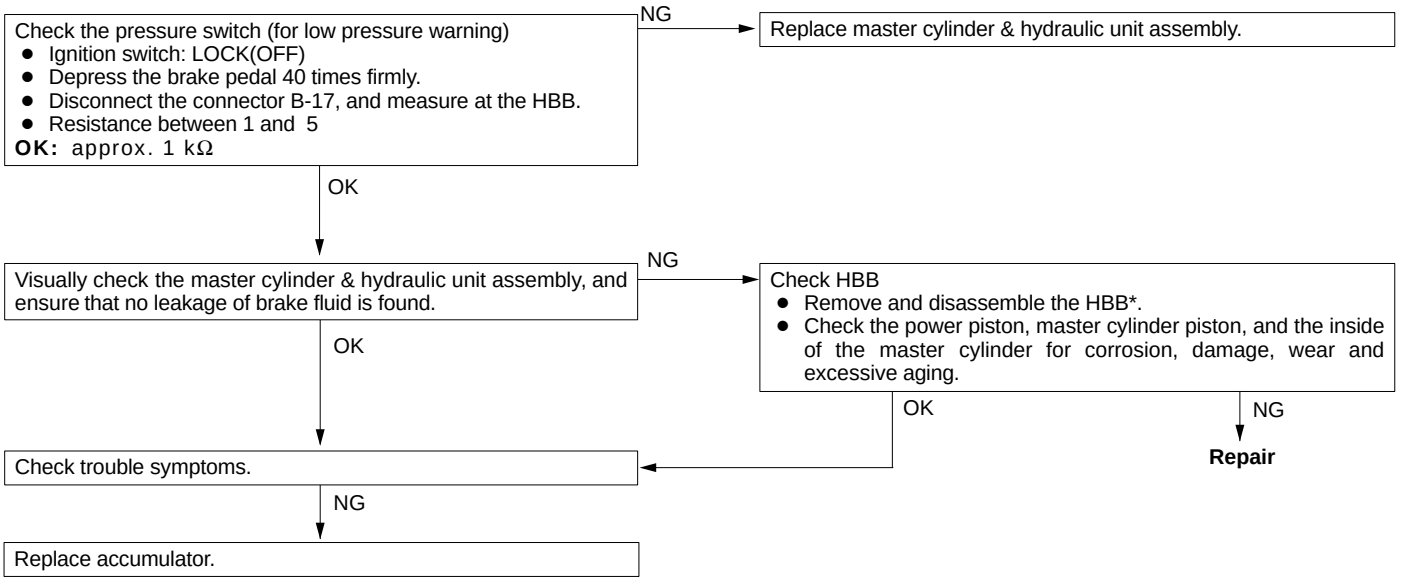
Code No. 57: Accumulator system (accumulator pressure too low)	Possible cause
This code is set when the HBB buzzer starts sounding and the brake warning lamp illuminates since the brake fluid pressure is lowered, and the pressure switch (for low pressure warning) is activated.	● Leakage of brake fluid in hydraulic brake booster (HBB) ● Malfunction of HBB (accumulator, pressure switch)



NOTE

*:Refer to 2001 PAJERO Workshop Manual [Pub. No. PWJE0005(2/2)]

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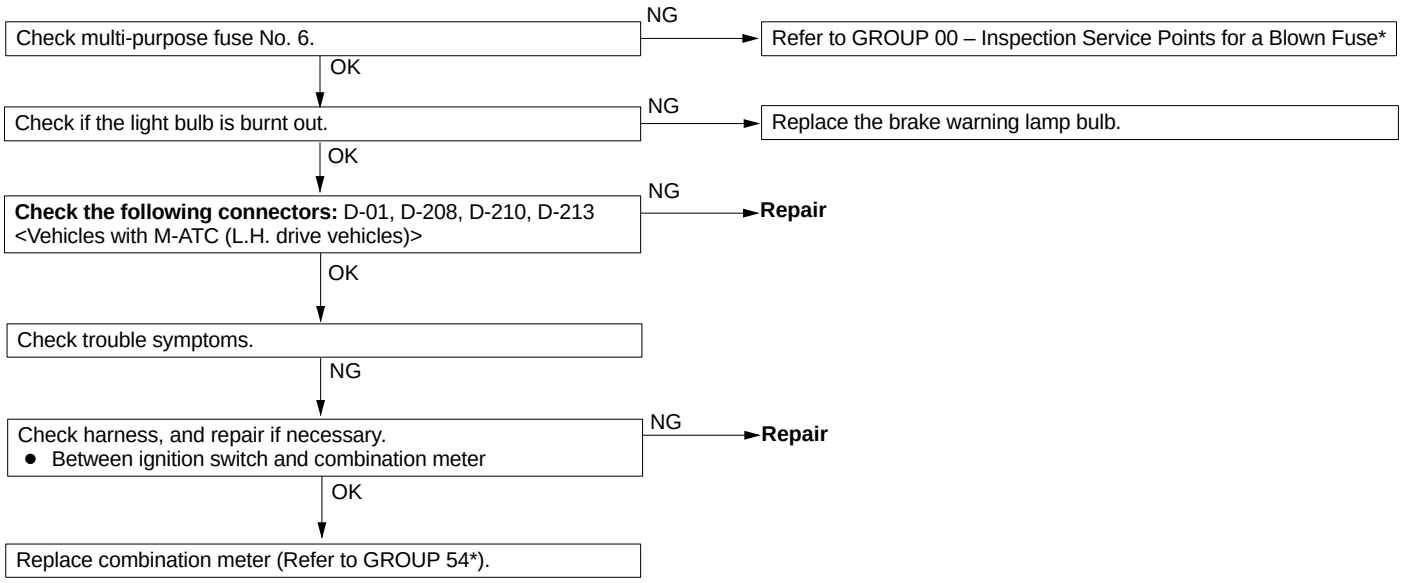
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection Procedure No.	Refer to Page
MUT-II cannot communicate with other systems.	–	Refer to GROUP 13A.
Communication between MUT-II and M-ASTC-ECU or M-ATC-ECU cannot be achieved.	–	Refer to GROUP 35B.
When the ignition switch is turned to the ON position (engine stopped), the brake warning lamp does not illuminate.	1	35A-10
After starting the engine, the brake warning lamp remains ON.	2	35A-11
Diagnosis code No. 53 (Pump motor clogging), or No. 55 or No.57 is set, but no sound comes from HBB buzzer.	3	35A-12
HBB buzzer does not stop sounding.	4	35A-13

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

When the ignition switch is turned to the ON position (engine stopped), the brake warning lamp does not illuminate.	**Possible cause**
Open circuit in the lamp power supply circuit, burnt out light bulb, or open circuit between ignition switch and brake warning lamp may be the cause.	• Blown fuse • Burnt out brake warning lamp bulb • Malfunction of combination meter • Malfunction of harness or connector



NOTE

*: Refer to 2001 PAJERO Workshop Manual [Pub. No. PWJE0005(2/2)].

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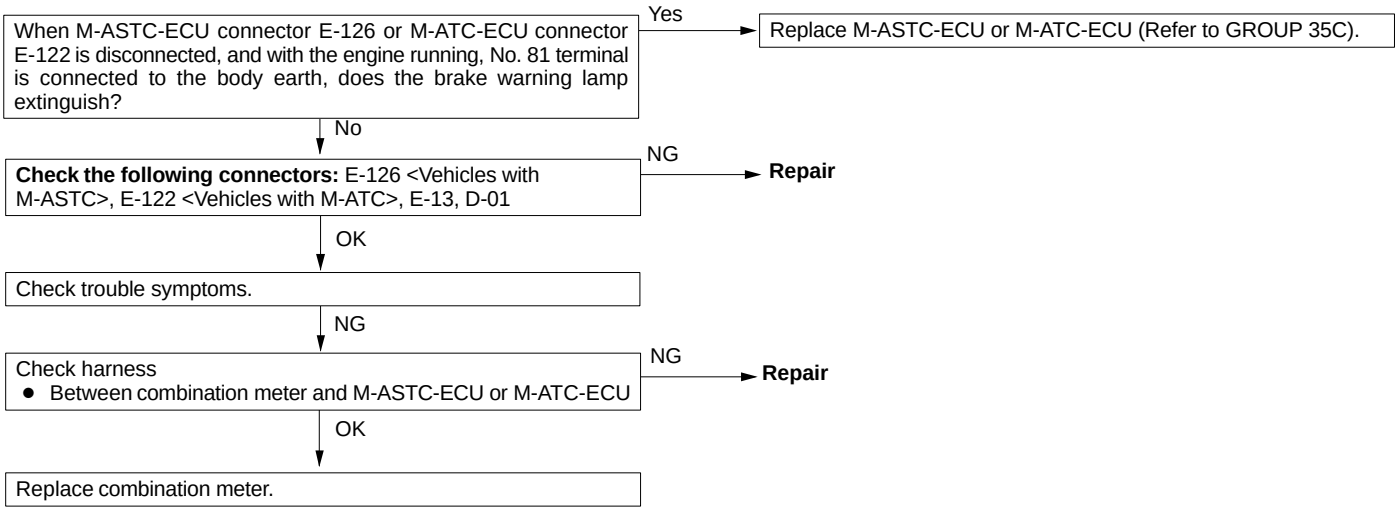
INSPECTION PROCEDURE 2

After starting the engine, the brake warning lamp remains ON.	Possible cause
Lamp drive transistor in M-ASTC-ECU or M-ATC-ECU is defective, or the circuit between the brake warning lamp and M-ASTC-ECU or M-ATC-ECU may be open circuit.	● Malfunction of the combination meter ● Malfunction of harness or connector ● Malfunction of the M-ASTC-ECU or M-ATC-ECU (lamp drive transistor)

NOTE:
This fault symptom occurs only when the system can be communicated with MUT-II (i.e. power appropriately supplied to M-ASTC-ECU or M-ATC-ECU) and the diagnostic code is correct.



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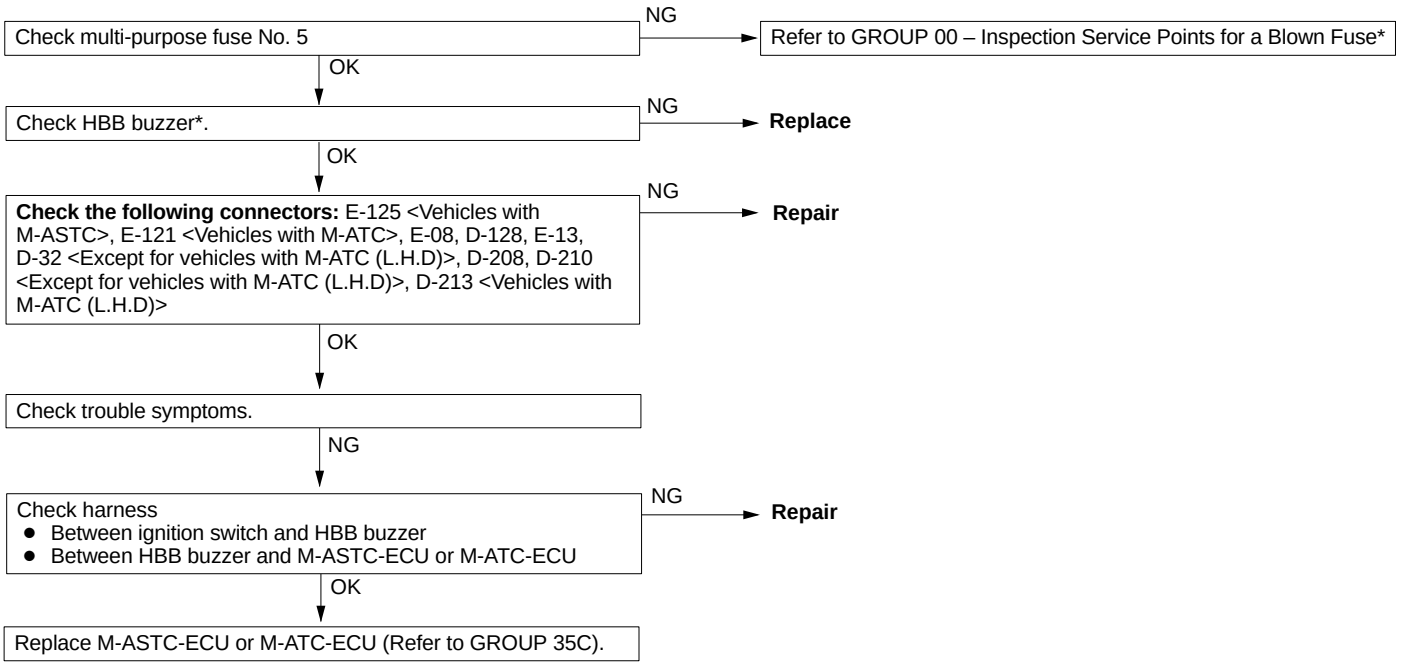
INSPECTION PROCEDURE 3

When hydraulic brake booster (HBB) does not operate normally, no sound comes from HBB buzzer.(The brake waring lamp illuminates).	Possible cause
Open circuit in the buzzer power supply circuit, buzzer defect, buzzer drive transistor fault in M-ASTC-ECU or M-ATC-ECU, open circuit between the ignition swtich and HBB buzzer, and M-ASTC-ECU or M-ATC-ECU may be the cause.	● Blown fuse ● Malfunction of HBB buzzer ● Malfunction of harness or connector ● Malfunction of the M-ASTC-ECU or M-ATC-ECU (buzzer drive transistor)



NOTE

*: Refer to 2001 PAJERO Workshop Manual [Pub. No. PWJE0005(2/2)].

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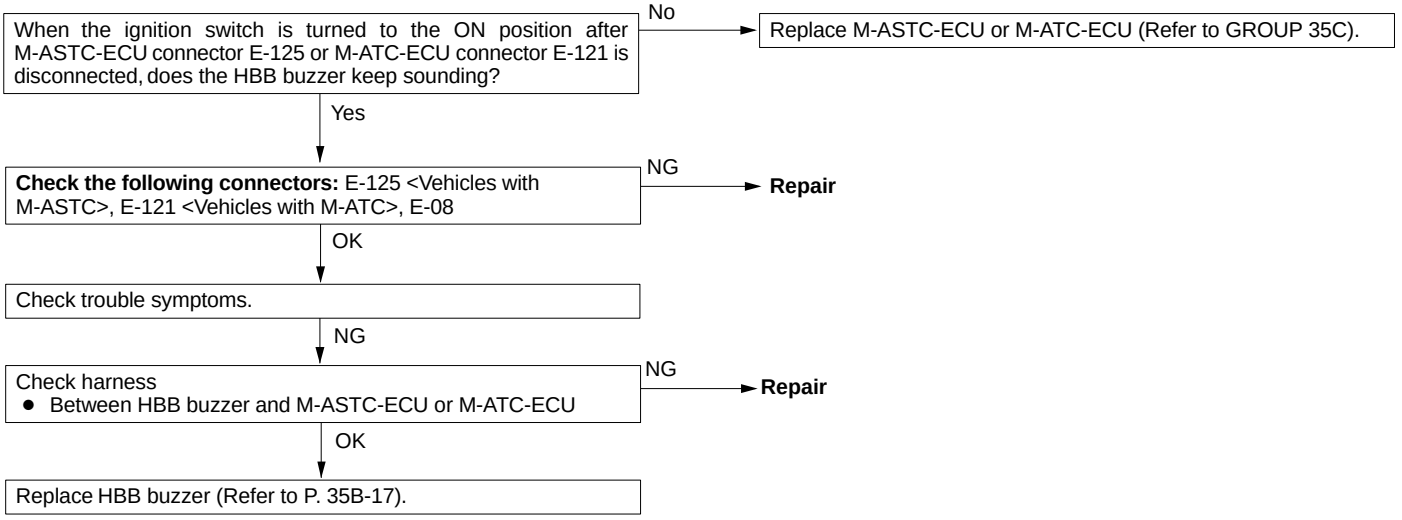
INSPECTION PROCEDURE 4

HBB buzzer does not stop sounding.	Possible cause
HBB buzzer circuit may be short circuited.	● Malfunction of HBB buzzer ● Malfunction of Harness (short-circuit) ● Malfunction pf teh M-ASTC-ECU or M-ATC-ECU (buzzer drive transistor)

NOTE:
This fault symptom occurs only when the system can be communicated with MUT-II (i.e. power appropriately supplied to M-ASTC-ECU or M-ATC-ECU) and the diagnostic code is correct.



ACTUATOR TEST REFERENCE TABLE

By using MUT-II, the actuators below can be driven forcibly.

NOTE
1. When M-ASTC-ECU or M-ATC-ECU is deactivated by the fail safe function, the actuator test cannot be performed.
2. Actuator test can be performed only when the vehicle is stationed.

ACTUATOR TEST SPECIFICATIONS

Item No.	Inspection Item	Drive Contents
11	HBB Pump Motor	Drives pump motor for one second.
12	HBB buzzer	Operates HBB buzzer for 3 seconds.
23	Brake warning lamp	Makes the brake warning lamp flash twice.

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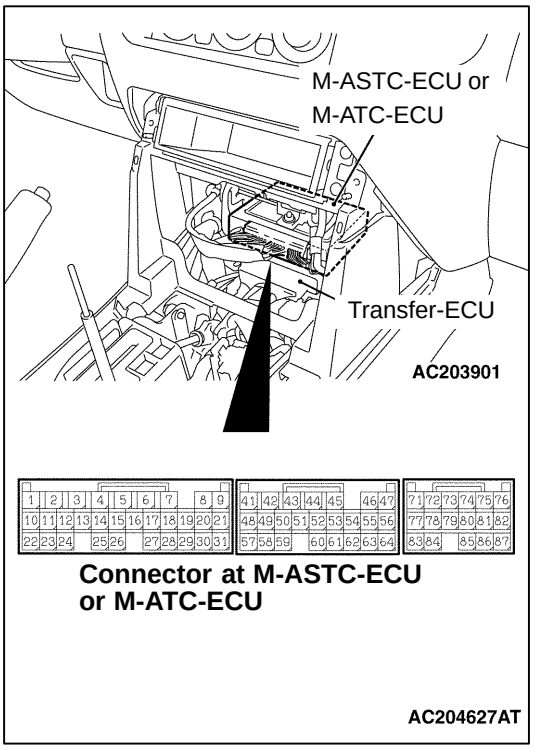

CHECK AT M-ASTC-ECU TERMINAL OR M-ATC-ECU TERMINAL

NOTE:
ECU's with the same profile are located at the upper and lower of the floor console. Upper ECU is M-ASTC-ECU or M-ATC-ECU, while the lower ECU is transfer-ECU.

TERMINAL VOLTAGE CHECK CHART

1. Voltage is measured between individual terminals and earth terminals.
2. Individual terminals are arranged as shown in the figure.

Terminal No.	Inspection Item	Inspection Conditions		Normal State
9	Power Supply of M-ASTC-ECU or M-ATC-ECU	Ignition switch: ON		Battery Voltage
11	Pressure switch (for pump control) output	Ignition switch: ON	Low brake fluid pressure (when pump motor is ON)	Approx. 6 V
			High brake fluid pressure (when pump motor is OFF)	2 V or less
12	Pump motor current detection (–) input	Ignition switch: ON		2 V or less
14	Pump motor current detection (+) input	Ignition switch: ON	When pump motor is deactivated	2 V or less
			When pump motor is activated	Battery Voltage
24	Motor relay 2 output	Ignition switch: ON	When pump motor is deactivated	Battery Voltage
			When pump motor is activated	2 V or less
25	Pump motor voltage detection (–) input	Ignition switch: ON		2 V or less
48	Motor relay 1 output	Ignition switch: ON	When pump motor is deactivated	Batter Voltage
			When pump motor is activated	2 V or less
54	HBB buzzer output	Ignition switch: ON	When HBB buzzer is not sounding	Battery Voltage
			When HBB buzzer is sounding	2 V or less
57	Pressure switch (for low pressure warning) output	Ignition switch: ON	Low brake fluid pressure (when HBB buzzer is sounding)	Approx. 9 V
			Proper brake fluid pressure (when HBB buzzer is not sounding)	Approx. 4 V
63	Power Supply to M-ASTC-ECU or M-ATC-ECU	Ignition switch: ON		Battery Voltage
		Ignition switch: START		0 V
81	Brake warning lamp	Engine: idle	When lamp is off	2 V or less
			When lamp is on	Battery Voltage

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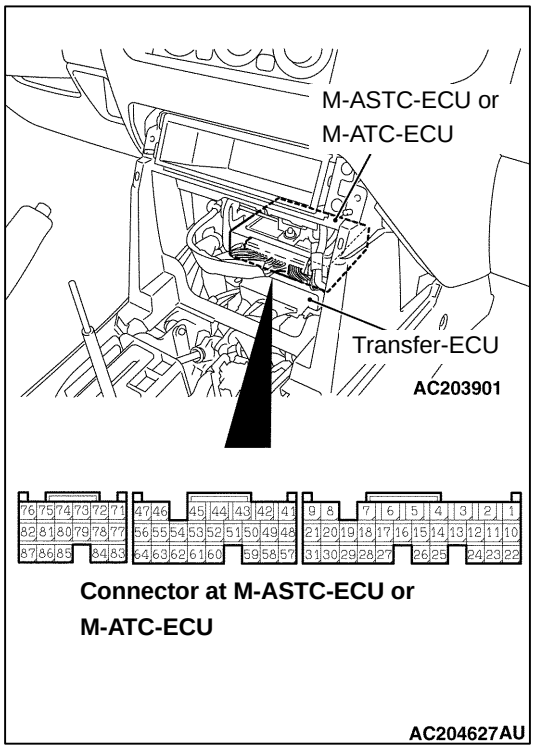
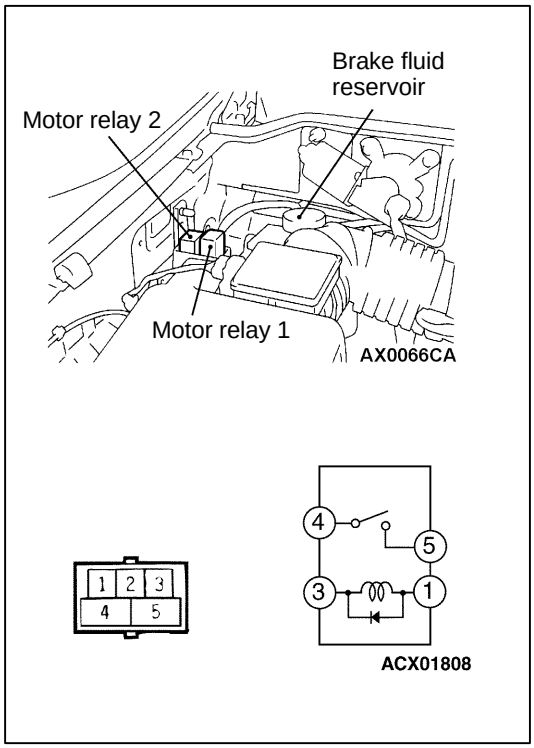


CONTINUITY BETWEEN HARNESS SIDE CONNECTOR TERMINALS

NOTE:
ECU's with the same profile are located at the upper and lower rear of the floor console. Upper ECU is M-ASTC-ECU or M-ATC-ECU, while the lower ECU is transfer-ECU.

1. Turn the ignition switch to the LOCK (OFF) position.
2. Continuity inspection must be performed after M-ASTC-ECU or M-ATC-ECU connector is disconnected.
3. Continuity inspection is performed between the terminals shown in the following table.
4. Terminals are arranged as shown in the figure:

Terminal No.	Signal Name	Normal State
22 – body earth	Earth	Continuity
4 – body earth	Earth	
56 – body earth	Earth	
64 – body earth	Earth	



ON-VEHICLE SERVICE <VEHICLES WITH M-ASTC AND M-ATC>

MOTOR RELAY CONTINUITY CHECK

Motor relay 1, 2

Battery Voltage	Terminal No.			
	1	3	4	5
De-energized	○	○		
Energized	⊖	⊕	○	○

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HYDRAULIC BRAKE BOOSTER (HBB) <VEHICLES WITH M-ASTC AND M-ATC>

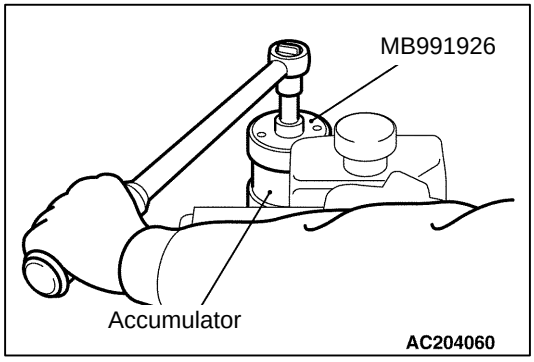
REMOVAL AND INSTALLATION

Operation must be carried out in the same manner as before.

ACCUMULATOR REPLACEMENT

1. After the ignition switch is turned to the LOCK (OFF) position, depress the brake pedal 40 times or more until the pedal force is felt heavy so that pressure in HBB supply system can be released.
2. Drain the brake fluid.

   CAUTION:
   Never turn the ignition switch to the ON position since driving the pump motor without brake fluid would cause the pump motor to get damaged.



3. Use the special tools shown in the figure to remove the accumulator.
4. Remove O-ring between HBB and the accumulator.
5. Install a new O-ring on the accumulator.
6. Use the special tool to install the accumulator.

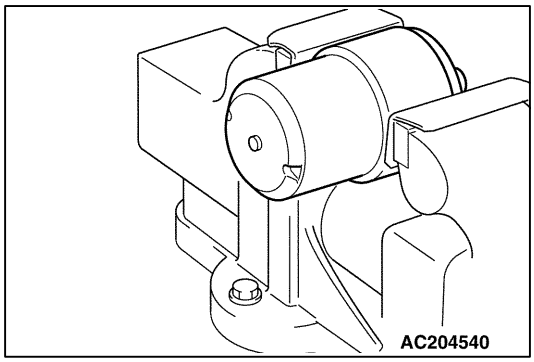
   Standard value: 54 ± 5 Nm

7. Refill brake fluid for air bleeding.
8. Check the power supply system and its operation.
9. Erase the diagnosis code.
10. Discard the old accumulator.

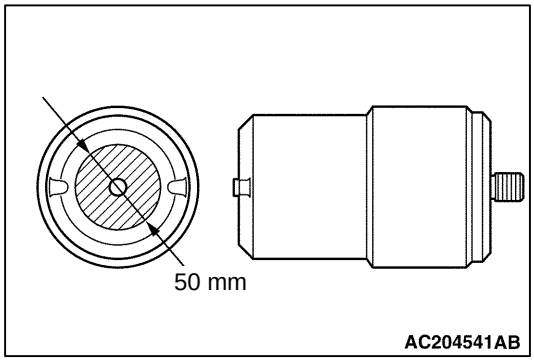
ACCUMULATOR DISPOSAL

CAUTION:
While sealed gas still remains in the accumulator, never disassemble the accumulator, throw it into fire, cut, weld, drop, or give any impact on it.

1. As shown in the figure, fix the accumulator on a vise.



2. Use a punch to provide a drilling point within the shaded area shown in the figure.
3. Place the bit (diameter: 4 mm) on a drill.



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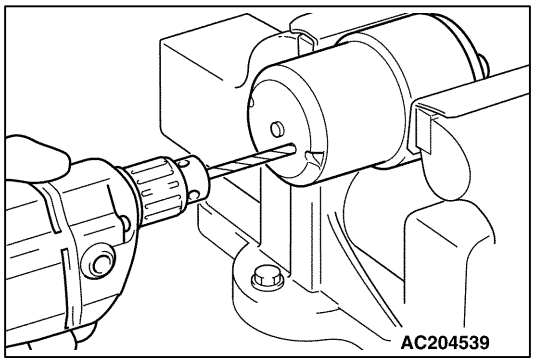

4. Use the drill to make a hole on the accumulator, and then extract the sealed gas.

CAUTION:
Since chips are spattered by spouting gas in the gas extracting operation, wear the protective goggles. While sealed gas still remains in the accumulator, never disassemble the accumulator, throw it into fire, cut, weld, drop, or give any impact on it.

NOTE

- Drilling never damages accumulator container, nor expose the operator to danger.
- When the accumulator is drilled, the sealed gas is released to the air with discharging noise.
- The gas is colorless, odorless, and nonhazardous (nitrogen gas).

HBB BUZZER <VEHICLES WITH M-ASTC AND M-ATC>

REMOVAL AND INSTALLATION

Pre-removal Operation
Remove indicator panel and lower center panel (Refer to Group 52A – Floor Console)

Post-installation Operation
- Install indicator panel and lower center panel (Refer to Group 52A – Floor Console)
- Check HBB buzzer operation