

GROUP 35A

BASIC BRAKE SYSTEM

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GENERAL DESCRIPTION

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The brake system has been designed to give greater reliability and durability and to provide excellent braking performance.

FEATURES

Improved Braking Performance

- Adoption of a hydraulic brake booster (HBB) which maintains a high brake-assisting force even in high deceleration ranges.
- 16-inch ventilated disc brakes have been adopted to provide stable braking force and improved braking feel.

Improved Stability

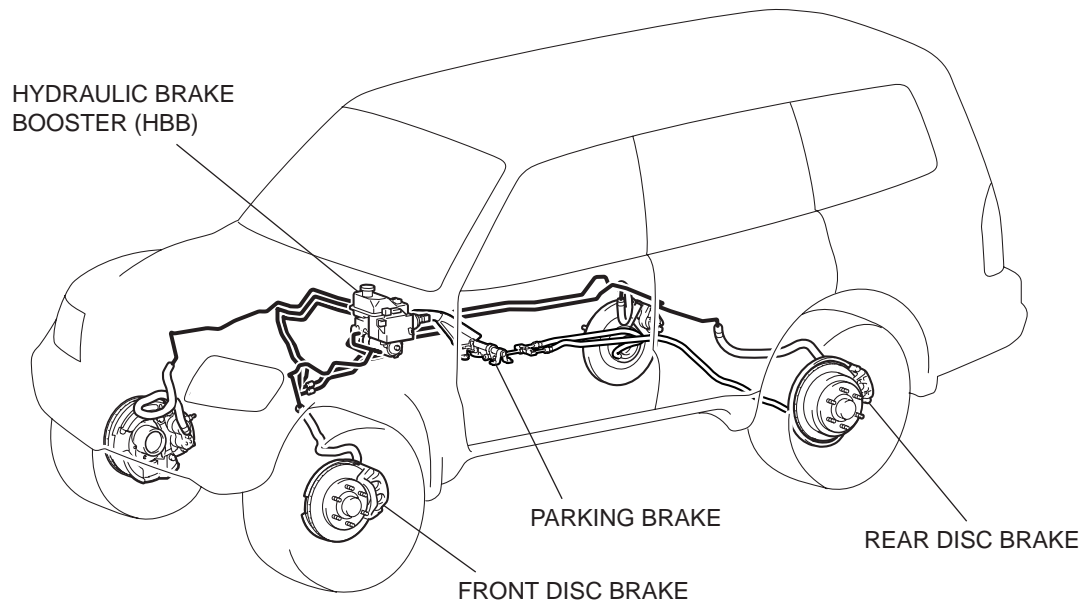
- Adoption of an electronic brake-force distribution (EBD) which makes it possible to maintain the maximum amount of braking force even when the vehicle's load is unevenly distributed.

- Adoption of independent front and rear wheel brake lines (H piping).
- Ventilated discs have been adopted for front wheel and rear wheel in order to improve anti-fading performance.

Improved Serviceability

- A diagnosis function has been adopted for the HBB system in order to make inspection easier.
- For the front and rear disc brakes, an outer disc method separated hub and rotor has been adopted to make removal and installation easier.
- The HBB reservoir tank cap has been colored white to make identification easier.

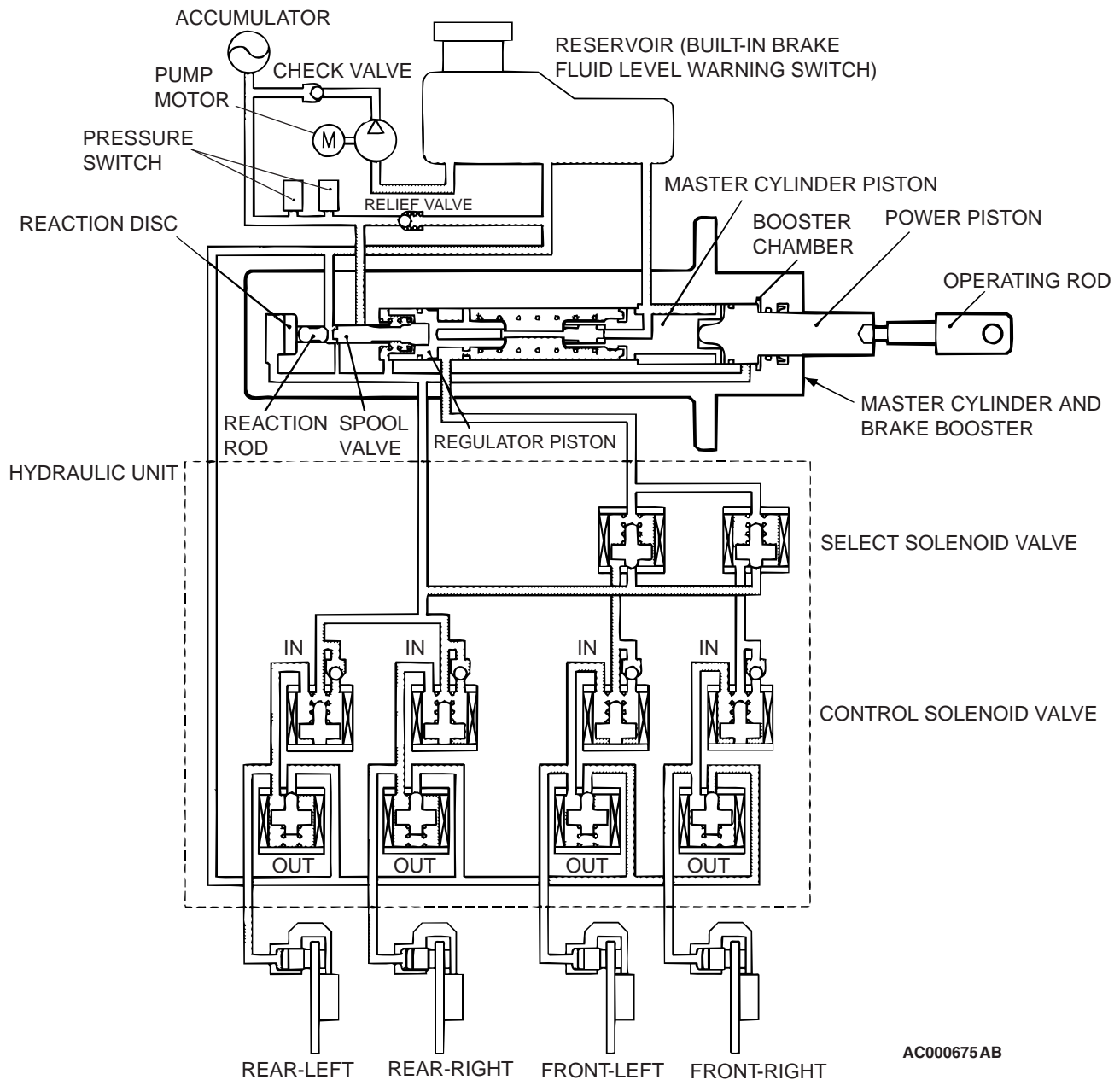
CONFIGURATION DIAGRAM



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HYDRAULIC BRAKE BOOSTER (HBB)

The master cylinder hydraulic pressure for the front brakes is assisted by a brake booster which utilizes accumulator pressure; the hydraulic pressure generated by the accumulator is introduced directly to the rear brakes.

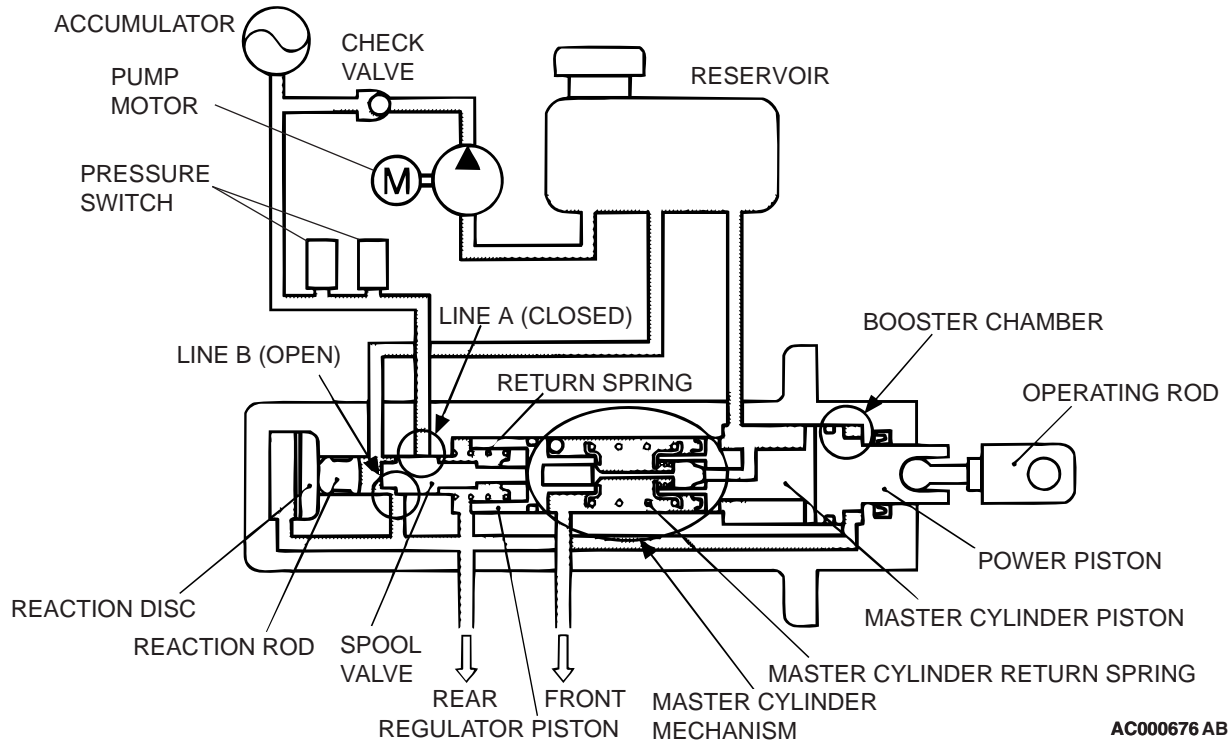


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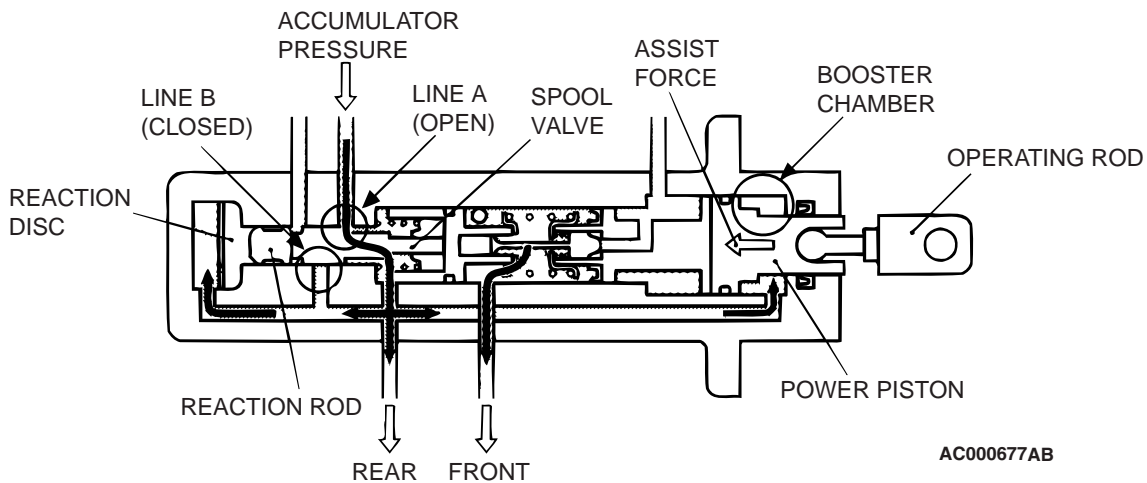
HYDRAULIC BRAKE BOOSTER (HBB) OPERATION

1. When the pedal operating force is transmitted in turn by the operating rod, the power piston and the master cylinder piston, the regulator piston and the spool valve move to the left.
2. When the spool valve opens line A and closes line B, the accumulator pressure is supplied to the rear brakes. This pressure is introduced to the booster chamber and provides power assistance to move the master cylinder piston to the left.
3. Then, when the pressure in the booster chamber increases, the pressure which is applied to the rear (left side) of the reaction disc also increases, and the reaction disc starts to change shape. The reaction disc contacts the reaction rod, and the reaction rod in turn contacts the spool valve, so that the master cylinder pressure being applied towards the left and the booster pressure being applied to the right are brought into balance by the reaction disc. This allows the power-assist hydraulic pressure generated by the pedal operating force to be kept at an equilibrium.

<When booster is not operating>



<When booster is operating>



<When a loss of accumulator pressure occurs>

If a loss of accumulator pressure occurs because of a problem such as a pump motor problem, the power assist force and rear brake pressure cannot increase in response to the input from the brake pedal. Accordingly, the front brakes can be operated directly by depressing the brake pedal, but the rear brakes do not operate at all.

BASIC BRAKE SYSTEM DIAGNOSIS

INTRODUCTION

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The hydraulic brake system consists of the brake pedal, the hydraulic brake booster (HBB), and the disc brakes. Insufficient braking power or noise may occur due to wear, damage or incorrect adjustment of these parts.

DIAGNOSTIC TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find a basic brake system fault.

1. Gather information from the customer.

2. Verify that the condition described by the customer exists.
3. Find the malfunction by following the symptom chart.
4. Verify malfunction is eliminated.

SYMPTOM CHART

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SYMPTOM	INSPECTION PROCEDURE	REFERENCE PAGE
Vehicle pulls to one side when brakes are applied	1	P.35A-6
Insufficient braking power	2	P.35A-7
Increased pedal stroke (Reduced pedal-to-floor board clearance)	3	P.35A-8
Brake drag	4	P.35A-8
Scraping or grinding noise when brake are applied	5	P.35A-9
Squealing, groaning or chattering noise when brake are applied	6	P.35A-10
Squealing noise when brakes are not applied	7	P.35A-10
Groaning, clicking or rattling noise when brakes are not applied	8	P.35A-11

SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: Vehicle Pulls to One Side when Brakes are Applied

DIAGNOSIS

STEP 1. Check for oil, water, etc., on the pad contact surface of all brakes.

Q: Is oil, water, etc., on the pad contact surface?

YES : Replace the pads on both left and right wheels as a set and determine the source/ cause of foreign material. Then go to Step 5.

NO : Go to Step 2.

STEP 2. Check disc brake pistons for smooth operation.

- (1) Depress the brake pedal repeatedly more than 40 times with the ignition switch at the "LOCK" (OFF) position to release the pressure in the HBB power supply system.
- (2) Test each disc brake assembly one at a time.
 - a. Remove the lower caliper bolt, then remove caliper from mount.
 - b. Have an assistant slowly depress the brake pedal. Confirm piston(s) extend slowly and smoothly with no jumpiness. Repeat for each disc brake assembly.

Q: Do (does) the piston(s) move correctly?**YES :** Go to Step 3.**NO :** Disassemble and inspect brake assembly (Front: Refer to [P.35A-144](#)/Rear: Refer to [P.35A-150](#)). Then go to Step 5.

STEP 3. Check brake disc(s) for run-out.Refer to [P.35A-133](#).**Q: Is run-out outside of specifications?****YES :** Repair or replace as necessary. Then go to Step 5.**NO :** Go to Step 4.

STEP 4. Check brake discs for correct thickness.Refer to [P.35A-132](#).**Q: Is the thickness outside of specifications?****YES :** Repair or replace as necessary. Then go to Step 5.**NO :** Go to Step 5.

STEP 5. Retest the system.**Q: Is the symptom eliminated?****YES :** The procedure is complete.**NO :** Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart ([P.35A-6](#)).

INSPECTION PROCEDURE 2: Insufficient Braking Power

DIAGNOSIS

STEP 1. Check whether the brake fluid is low, is the correct fluid (transmission fluid, engine oil, etc.), or is contaminated (debris, sand, etc.).**Q: Is there fault?****YES :** Refill or replace with the specified brake fluid DOT 3 or DOT 4. Bleed the brakes if necessary (Refer to [P.35A-124](#)). Then go to Step 6.**NO :** Go to Step 2.

STEP 2. Check for spongy (not firm brakes).

- (1) Depress the brake pedal repeatedly more than 40 times with the ignition switch at the "LOCK" (OFF) position to release the pressure in the HBB power supply system.
- (2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
- (3) With a measuring stick (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?**YES :** Bleed the brakes to remove air in the fluid (Refer to [P.35A-124](#)). Then go to Step 6.**NO :** Go to Step 3.

STEP 3. Check the HBB function.Refer to [P.35A-119](#).**Q: Is the HBB malfunctioning?****YES :** Check the HBB (Refer to [P.35A-139](#)) and replace the faulty part as necessary. Then go to Step 6.**NO :** Go to Step 4.

STEP 4. Check for pinched or restricted brake tube or hose.**Q: Is there a pinched or restricted brake tube or hose?****YES :** Replace that complete section of brake tube or brake hose. Then go to Step 6.**NO :** Go to Step 5.

STEP 5. Check for oil, water, etc., on the pad contact surfaces of all brakes.**Q: Is oil, water, etc., on the pad contact surface?****YES :** Replace the pads on both left and right wheels as a set and determine the source/ cause of foreign material. Then go to Step 6.**NO :** Go to Step 6.

STEP 6. Retest the system.**Q: Is the symptom eliminated?****YES :** The procedure is complete.**NO :** Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart (P.35A-6).**INSPECTION PROCEDURE 3: Increased Pedal Stroke (Reduced Pedal-to-floor Board Clearance)****DIAGNOSIS****STEP 1. Check for spongy (not firm brakes).**

- (1) Depress the brake pedal repeatedly more than 40 times with the ignition switch at the "LOCK" (OFF) position to release the pressure in the HBB power supply system.
- (2) With the brake pedal fully released, depress the brake pedal slowly until it stops.
- (3) With a measuring stick (ruler, etc.) next to the brake pedal, depress the pedal firmly and measure the distance the pedal traveled.

Q: Is the distance greater than 20 mm (0.8 inch)?**YES :** Bleed the brakes to remove air in the fluid (Refer to P.35A-124). Then go to Step 5.**NO :** Go to Step 2.**STEP 2. Check the pad for wear.**

Refer to P.35A-130.

Q: Is the pad thickness outside of specifications?**YES :** Replace the pads on both left and right wheels as a set. Then go to Step 5.**NO :** Go to Step 3.**STEP 3. Check for brake fluid leaks.****Q: Are there brake fluid leaks?****YES :** Check the connection for looseness, corrosion, etc. Clean and repair as necessary. If there is a leak in any tube or hose section, replace the complete tube or hose. Then go to Step 5.**NO :** Go to Step 4.**STEP 4. Check the HBB's master cylinder pistons.**

- (1) Remove the HBB (Refer to P.35A-136).
- (2) Check the power piston assembly and the master cylinder piston assembly (Refer to P.35A-139).

Q: Are the HBB master cylinder pistons malfunctioning?**YES :** Replace the faulty part. Then go to Step 5.**NO :** Go to Step 5.**STEP 5. Retest the system.****Q: Is the symptom eliminated?****YES :** The procedure is complete.**NO :** Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart (P.35A-6).**INSPECTION PROCEDURE 4: Brake Drag****DIAGNOSIS****STEP 1. Check the parking brake lever return.****Q: Does the lever return abnormally?****YES :** When a foreign matter is caught in the parking brake lever assembly, remove it. When the foreign matter is not found, replace the lever assembly (Refer to GROUP 36, Parking Brake Lever P.36-6). Then go to Step 8.**NO :** Go to Step 2.**STEP 2. Check the parking brake pull amount.**

Refer to GROUP 36, On-vehicle Service – Parking Brake Lever Stroke Check and Adjustment P.36-4.

Q: Is the parking brake lever stroke out of specification?**YES :** Adjust it. Then go to Step 8.**NO :** Go to Step 3.

STEP 3. Inspect the brake pedal return spring for deterioration.

Q: Is there deterioration?

YES : Replace the spring. Then go to Step 8.

NO : Go to Step 4.

STEP 4. Inspect the brake shoe springs for breakage.

Refer to GROUP 36, Parking Brake Drum [P.36-8](#).

Q: Are the brake shoe springs broken?

YES : Replace the springs. Then go to Step 8.

NO : Go to Step 5.

STEP 5. Check the amount of grease at each sliding section.

Refer to GROUP 36, Parking Brake Drum [P.36-8](#).

Q: Is the grease amount insufficient?

YES : Apply grease. Then go to Step 8.

NO : Go to Step 6.

STEP 6. Check disc brake pistons for sticking.

Depress the brake pedal, then release. Confirm each wheel spins freely. If any wheel is stuck, inspect that brake assembly. Then go to Step 8.

Q: Are all wheels stuck?

YES : Re-start from Step 1.

NO : Go to Step 7.

STEP 7. Inspect the HBB's master cylinder pistons.

(1) Remove the HBB (Refer to [P.35A-136](#)).

(2) Inspect the power piston assembly and the master cylinder piston assembly (Refer to [P.35A-139](#)).

Q: Is there fault?

YES : Replace the faulty part. Then go to Step 8.

NO : Go to Step 8.

STEP 8. Retest the system.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart ([P.35A-6](#)).

INSPECTION PROCEDURE 5: Scraping or Grinding Noise when Brakes are Applied

DIAGNOSIS

STEP 1. Check the front brakes, then rear brakes, for metal-to-metal condition.

Q: Is the metal-to-metal contact evident?

YES : Repair or replace the components. Then go to Step 6.

NO : Go to Step 2.

STEP 2. Check for interference between the caliper and wheel.

Q: Is there interference?

YES : Repair or replace the part. Then go to Step 6.

NO : Go to Step 3.

STEP 3. Check for interference between the dust cover and brake disc.

Q: Is there interference?

YES : Repair or replace the part. Then go to Step 6.

NO : Go to Step 4.

STEP 4. Check the brake discs for cracks.

Q: Are there cracks?

YES : Repair or replace the part. Then go to Step 6.

NO : Go to Step 5.

STEP 5. Check for bent backing plate(s).

Q: Is (Are) the backing plate(s) bent?

YES : Repair or replace the part. Then go to Step 6.

NO : Go to Step 6.

STEP 6. Retest the system.**Q: Is the symptom eliminated?****YES :** The procedure is complete.**NO :** Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart (P.35A-6).**INSPECTION PROCEDURE 6: Squealing, Groaning or Chattering Noise when Brakes are Applied****DIAGNOSIS****STEP 1. Check the brake disc and pads for wear or cutting.****Q: Is there wear or cutting?****YES :** Repair or replace the part. Then go to Step 4.**NO :** Go to Step 2.**STEP 2. Check the calipers for rust.****Q: Is there rust?****YES :** Remove the rust. Then go to Step 4.**NO :** Go to Step 3.**STEP 3. Check the brake pedal.**

Check the brake pedal height, brake pedal free play and clearance between brake pedal and floorboard (Refer to P.35A-116).

Q: Is the brake pedal adjusted correctly?**YES :** Go to Step 4.**NO :** Adjust the brake pedal (Refer to P.35A-116). Then go to Step 4.**STEP 4. Retest the system.****Q: Is the symptom eliminated?****YES :** The procedure is complete.**NO :** Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart (P.35A-6).**INSPECTION PROCEDURE 7: Squealing Noise when Brakes are not Applied****DIAGNOSIS****STEP 1. Check the brake discs for rust.****Q: Are the brake discs rusted?****YES :** Remove the rust by using sand paper. If still rusted, turn the rotors with an on-car brake lathe. Then go to Step 6.**NO :** Go to Step 2.**STEP 2. Check the brake pads for correct installation.****Q: Are the pads installed incorrectly?****YES :** Repair the pads. Then go to Step 6.**NO :** Go to Step 3.**STEP 3. Check the calipers for correct installation.****Q: Are the calipers installed incorrectly?****YES :** Repair the calipers. Then go to Step 6.**NO :** Go to Step 4.**STEP 4. Check the wheel bearings for deterioration or damage. Also check the grease quality and quantity.**

For front wheel, refer to GROUP 26, Hub and Knuckle Assembly P.26-19. For rear wheel, refer to GROUP 27, Rear Hub Assembly P.27-14.

Q: Are the wheel bearings damaged or out of grease?**YES :** Apply grease or replace the wheel bearings. Then go to Step 6.**NO :** Go to Step 5.**STEP 5. Check the brake pedal.**

Check the brake pedal height, brake pedal free play, and clearance between brake pedal and floorboard (Refer to P.35A-116).

Q: Is the brake pedal adjusted correctly?**YES :** Go to Step 6.**NO :** Adjust the brake pedal (Refer to P.35A-116). Then go to Step 6.

STEP 6. Retest the system.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart (P.35A-6).

INSPECTION PROCEDURE 8: Groaning, Clicking or Rattling Noise when Brakes are not Applied.

DIAGNOSIS

STEP 1. Check for looseness of the wheel nuts.

Q: Are the wheel nuts loose?

YES : Tighten to 108 ± 10 N·m (80 ± 7 ft-lb). Then go to Step 4.

NO : Go to Step 2.

STEP 2. Check for looseness of the caliper installation bolt.

Q: Is the caliper installation bolt loose?

YES : Tighten to 113 ± 9 N·m (83 ± 7 ft-lb) for the front caliper, or 100 ± 10 N·m (74 ± 7 ft-lb) for the rear caliper. Then go to Step 4.

NO : Go to Step 3.

STEP 3. Check the wheel bearings for wear, damage or dryness.

For front wheel, refer to GROUP 26, Hub and Knuckle Assembly P.26-19. For rear wheel, refer to GROUP 27, Rear Hub Assembly P.27-14.

Q: Is there fault?

YES : Apply grease or replace the wheel bearings. Then go to Step 4.

NO : Go to Step 4.

STEP 4. Retest the system.

Q: Is the symptom eliminated?

YES : The procedure is complete.

NO : Start over at Step 1. If a new symptom appears, refer to the appropriate symptom chart (P.35A-6).

HYDRAULIC BRAKE BOOSTER (HBB) DIAGNOSIS

INTRODUCTION

The hydraulic brake booster (HBB) accumulates the high-pressure brake fluid in the accumulator by operating the pump motor. Even though the working sound of the pump motor can be heard during operation, this sound is usually generated at normal operation of the HBB and is not an indication of a malfunction.

HBB Diagnostic Trouble Code Detection Conditions

HBB diagnostic trouble codes (HBB DTCs) are set under different conditions, depending on the malfunction detected. Most HBB DTCs will only be set during vehicle operation. Some HBB DTCs will also be set during the HBB self-check immediately after the engine is started.

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After erasing an HBB DTC, duplicate the HBB DTC set conditions to see if it resets. Depending on the detection timing and set conditions for the specific HBB DTC, you must either drive the vehicle or turn the engine off and restart it. To set the proper conditions for that DTC again, refer to "HBB DTC SET CONDITIONS" for each HBB DTC that you are trying to reset.

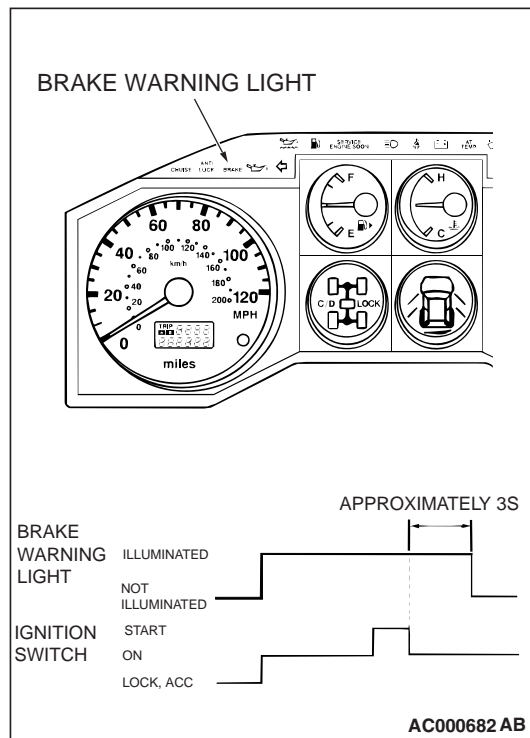
DIAGNOSTIC TROUBLESHOOTING STRATEGY

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Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure that you have exhausted most of the possible ways to find an HBB fault.

1. Gather information about the problem from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any HBB DTC.
4. If you cannot verify the condition and no HBB DTC sets, it can be assumed that the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.
5. If you can verify the condition but no HBB DTC sets, or the system cannot communicate with the scan tool, check that the basic brake system is operating properly.
 - If the basic brake system is not operating properly, refer to "Basic Brake System Diagnosis" (P.35A-6).
 - If the basic brake system is operating properly, refer to "Symptom Chart" (P.35A-81).

6. If an HBB DTC sets, record the number of the DTC, then erase the DTC from the memory using the scan tool.
7. Duplicate the HBB DTC set conditions to see if the same HBB DTC will set again.
 - If the same HBB DTC sets again, perform the diagnostic procedures for the DTC. Refer to P.35A-16.
 - If you cannot make the same HBB DTC set again, it can be assumed that the malfunction is intermittent. Refer to GROUP 00, How to use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.



BRAKE WARNING LIGHT CHECK

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Check that the brake warning light illuminates as follows:

1. Check that the brake fluid level in the reservoir is between the "MIN" and the "MAX" lines.
2. Choke the wheels and release the parking brake.
3. When the ignition switch is turned to the "ON" position, the brake warning light illuminates.
4. When the ignition switch is turned from the "START" position back to the "ON" position, the brake warning light illuminates for approximately 3 seconds and then switches off.
5. If the illumination is other than the above, check the diagnostic trouble codes.

TROUBLE CODE DIAGNOSIS

Retrieving HBB Diagnostic Trouble Codes

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

CAUTION

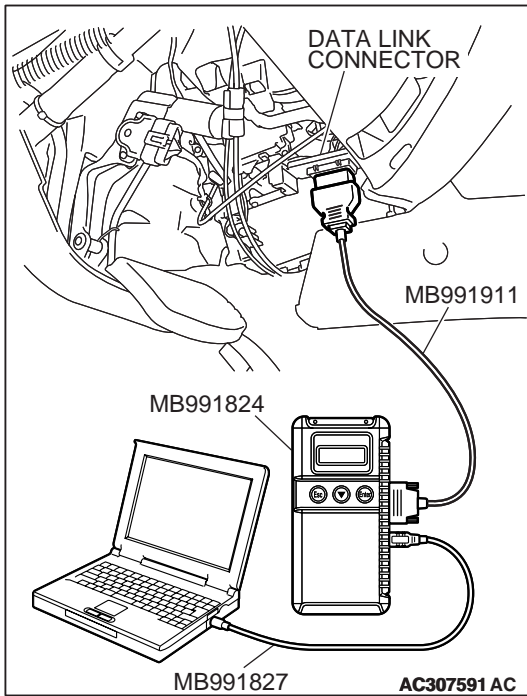
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991911 to special tool MB991824.
5. Connect special tool MB991911 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.

7. Start the MUT-III system on the personal computer.

NOTE: Disconnecting scan tool MB991958 is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.



Erasing HBB Diagnostic Trouble Codes

NOTE: If the M-ASTC-ECU functions have stopped due to the fail-safe function, the HBB diagnostic trouble code cannot be erased.

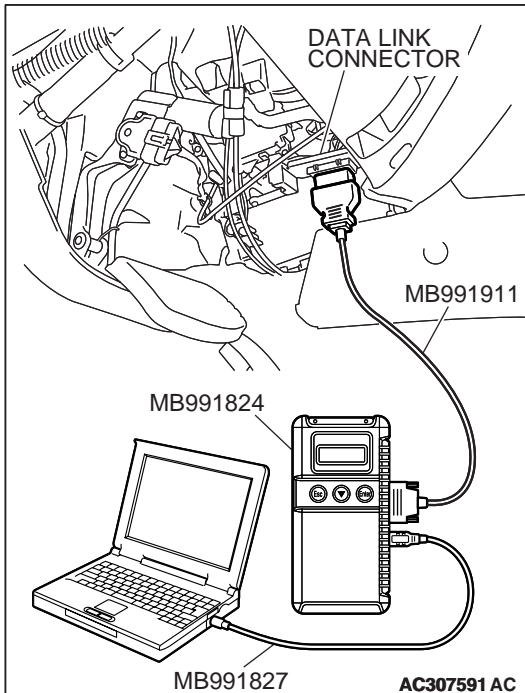
Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

NOTE: If the battery voltage is low, diagnostic trouble codes will not be set. Check the battery if scan tool MB991958 does not display.



1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "HBB" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Diagnostic Trouble Code."
8. If a DTC is set, it is shown.
9. Choose "Erase DTCs" to erase the DTC.

HOW TO READ DATA LIST

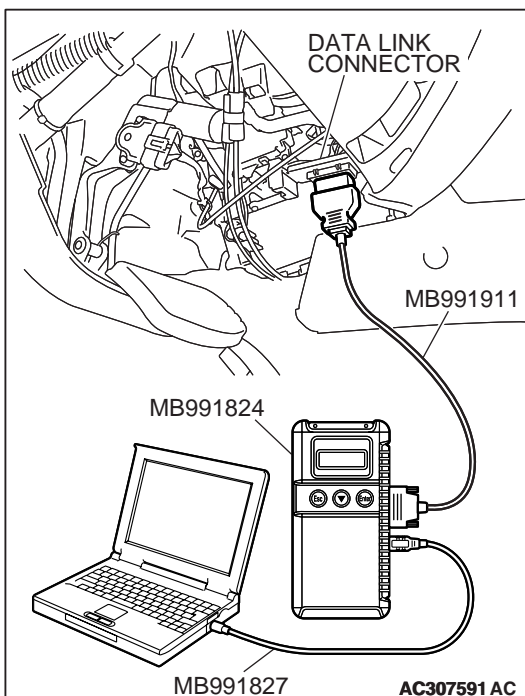
Required Special Tools:

- MB991958 : Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "HBB" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.



HOW TO PERFORM ACTUATOR TEST

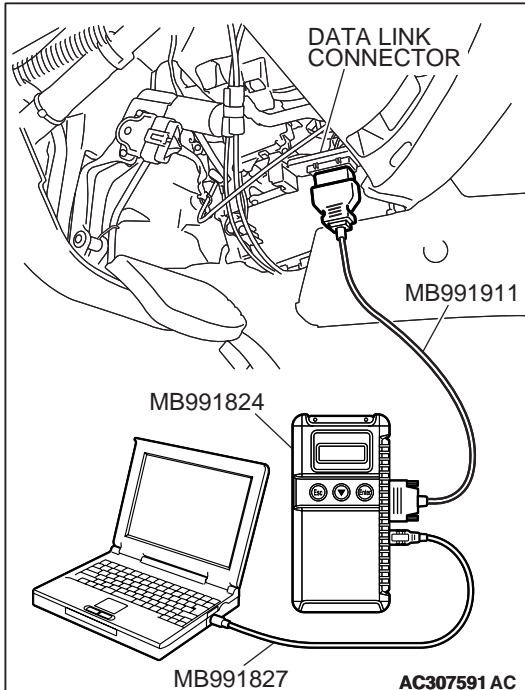
Required Special Tools:

- MB991958 : Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "Interactive Diagnosis" from the start-up screen.
4. Select "System select."
5. Choose "HBB" from the "CHASSIS" tab.
6. Select "MITSUBISHI."
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.



DIAGNOSTIC TROUBLE CODE CHART

M1351013700130

Follow the inspection chart that is appropriate for the diagnostic trouble code.

DTC	INSPECTION ITEM	DIAGNOSTIC CONTENT	REFERENCE PAGE
16	Battery positive voltage	M-ASTC-ECU power supply voltage is extremely low or high	P.35A-17
31	Ignition switch B circuit	Open circuit at the HBB power supply sub circuit	P.35A-19
53	Pump motor	<ul style="list-style-type: none"> • Seizure of the pump motor* • Abnormality at the current detection circuit of the M-ASTC-ECU 	P.35A-24
54	Motor relay	Open circuit, short circuit or failure of the motor relay coil	P.35A-32
55	Pump motor circuit	Pump motor energized abnormally for long period*	P.35A-57
56	Pressure switch	<ul style="list-style-type: none"> • Open circuit at the pressure switch (for pump motor control) • Open circuit or short circuit at the pressure switch (for low-pressure warning) 	P.35A-70
57	Accumulator	Accumulator low-pressure abnormality*	P.35A-78
58	M-ASTC-ECU (Power supply drive circuit)	Pump motor drive circuit in the M-ASTC-ECU abnormality	Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU P.35C-207).

*NOTE: If the trouble marked by * has occurred, the M-ASTC-ECU sounds the buzzer continuously to inform the trouble of the driver and protects the pump motor by activating the pump motor intermittently.*

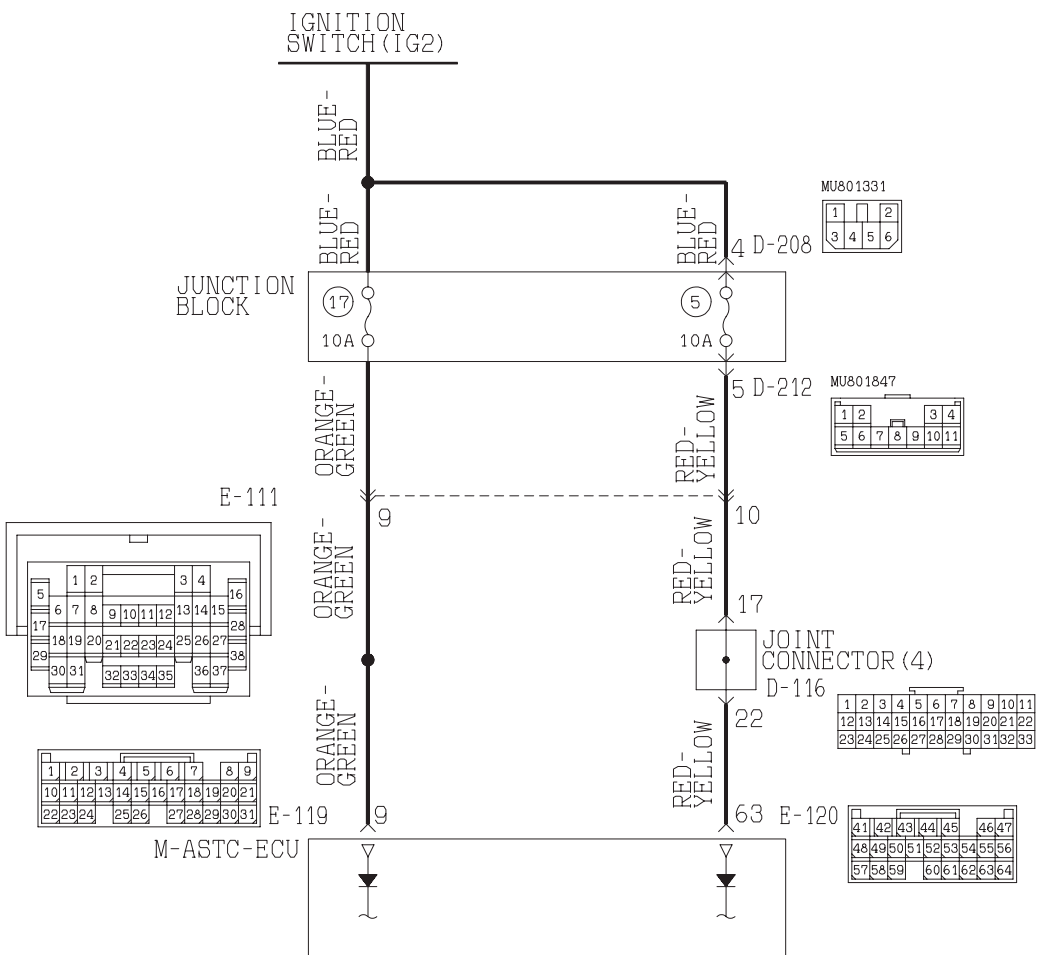
HBB DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC 16: Battery Positive Voltage (M-ASTC-ECU Power Supply Voltage is Extremely Low or High)

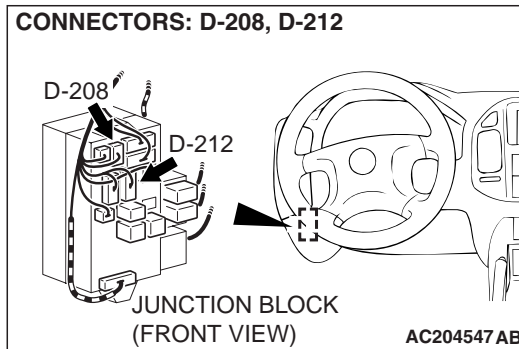
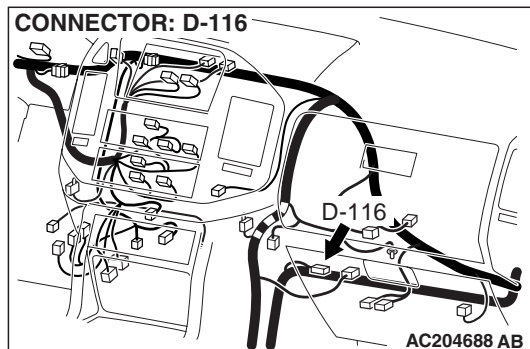
CAUTION

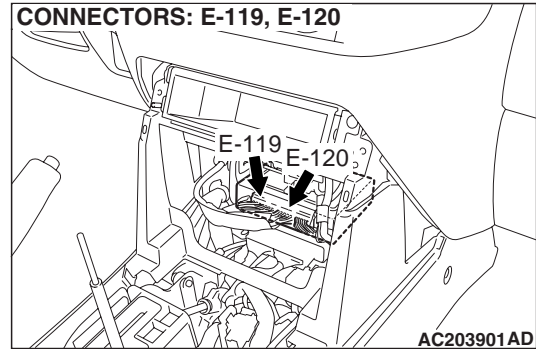
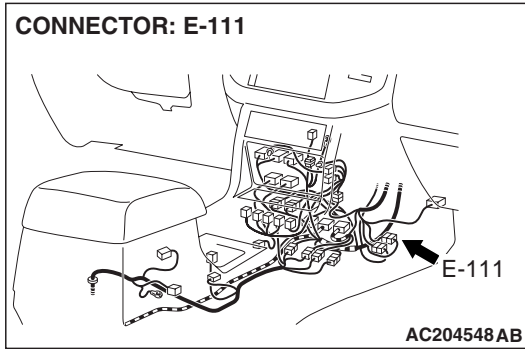
If the battery voltage drops or rises while making this check, DTC 16 is set as an existing problem, making it impossible to perform correct trouble diagnosis. Before carrying out the following diagnosis, test the battery and charge it if necessary.

ASC-ECU Power Supply Circuit



W3905M01AA
AC204492AC





CIRCUIT OPERATION

The M-ASTC-ECU has two power supply lines. An M-ASTC-ECU power is supplied to the M-ASTC-ECU (terminal 9) from the ignition switch (IG2) through the multi-purpose fuse number 17 in the junction block. The other M-ASTC-ECU power is supplied to the M-ASTC-ECU (terminal 63) from the ignition switch (IG2) through the multi-purpose fuse number 5 in the junction block and through the joint connector number 4.

HBB DTC SET CONDITIONS

DTC16 is set if the voltage at both of the power line is extremely low or high.

TROUBLESHOOTING HINTS

- Malfunction of the battery
- Malfunction of the charging system
- Malfunction of the M-ASTC-ECU

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

STEP 1. Check the battery.

Refer to GROUP 54A, Battery – On-vehicle Service – Battery Testing Procedure [P.54A-6](#).

Q: Is the battery damaged?

YES : Charge or replace the battery and then go to Step 4.

NO : Go to Step 2.

STEP 2. Check the charging system.

Refer to GROUP 16, Charging System – Diagnosis [P.16-3](#).

Q: Is the charging system damaged?

YES : Repair the Charging System and then go to Step 4.

NO : Go to Step 3.

STEP 3. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 16 set?

YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 4. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

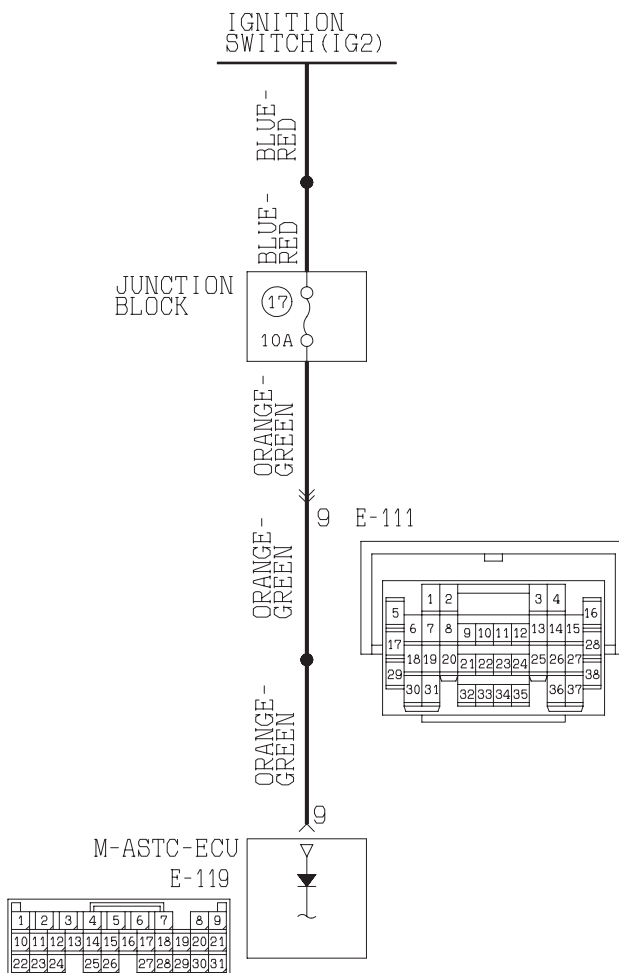
Q: Is DTC 16 set?

YES : Start over at Step 1.

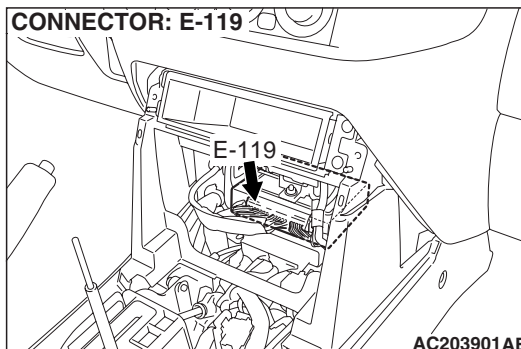
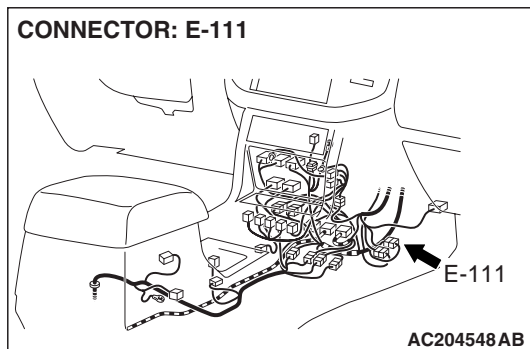
NO : The procedure is complete.

DTC 31: Ignition Switch B Circuit (Open Circuit at the HBB Power Supply Sub Circuit)

HBB Power Supply Sub Circuit



W3Q05M02AA
AC204493 AB



CIRCUIT OPERATION

In the ignition switch B circuit, the M-ASTC-ECU power is supplied to the M-ASTC-ECU (terminal 9) from the ignition switch (IG2) through the multi-purpose fuse number 17 in the junction block.

HBB DTC SET CONDITIONS

DTC31 is set if the ignition switch B circuit is open or the internal circuit of the M-ASTC-ECU is defective.

TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

STEP 1. Check the following connector.

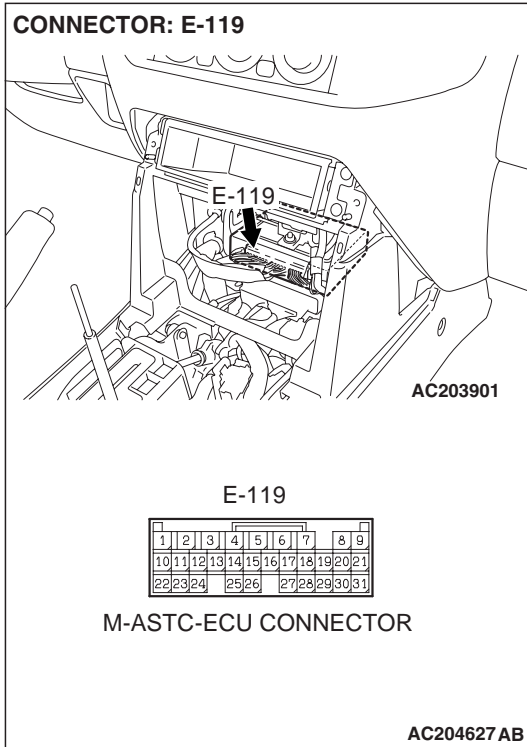
- M-ASTC-ECU connector E-119

Check connector, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

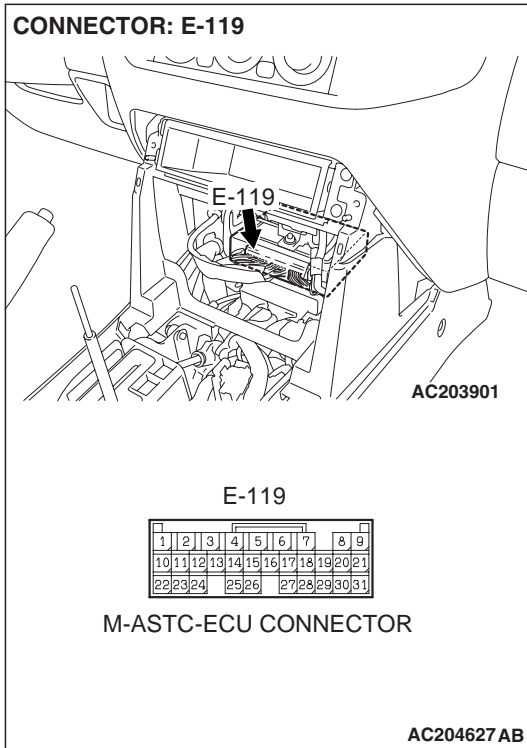
YES : Go to Step 2.

NO : Repair it and then go to Step 5.



STEP 2. Check the power supply circuit at M-ASTC-ECU harness connector E-119.

- (1) Disconnect M-ASTC-ECU connector E-119 and measure at the harness connector (component side).
- (2) Start the engine.

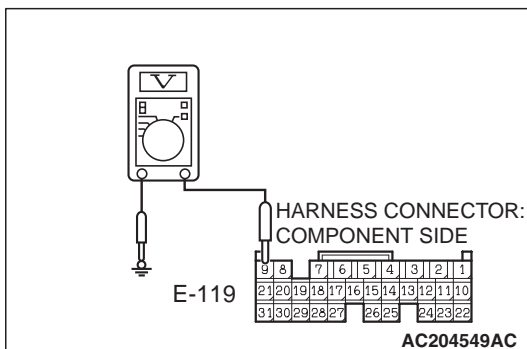


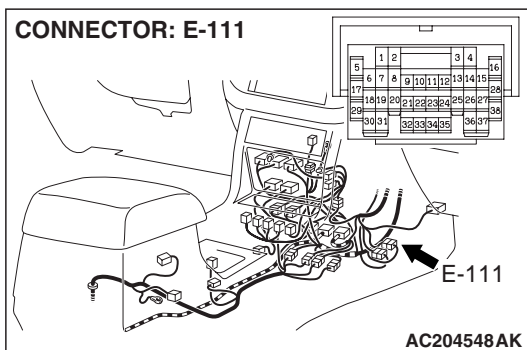
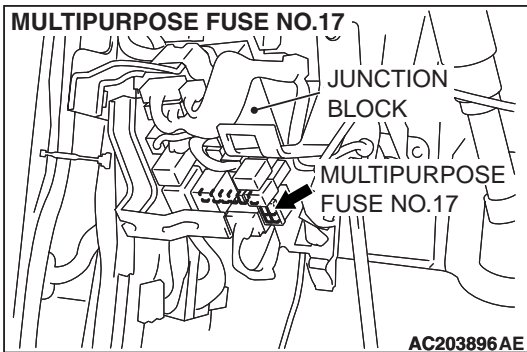
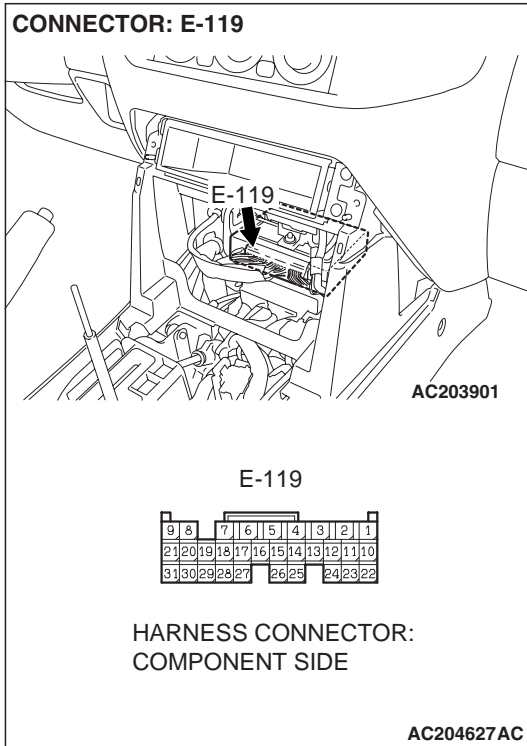
- (3) Measure the voltage between terminal 9 and ground. It should measure approximately 12 volts (battery positive voltage).

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

NO : Go to Step 3.





STEP 3. Check the following harness wire.

- The wire between M-ASTC-ECU connector E-119 (terminal 9) and multi-purpose fuse number 17 (junction block)

NOTE:

Also check intermediate connector E-111 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector E-111 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 5.

NO : Go to Step 5.

STEP 4. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 31 set?

YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 5.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 5. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

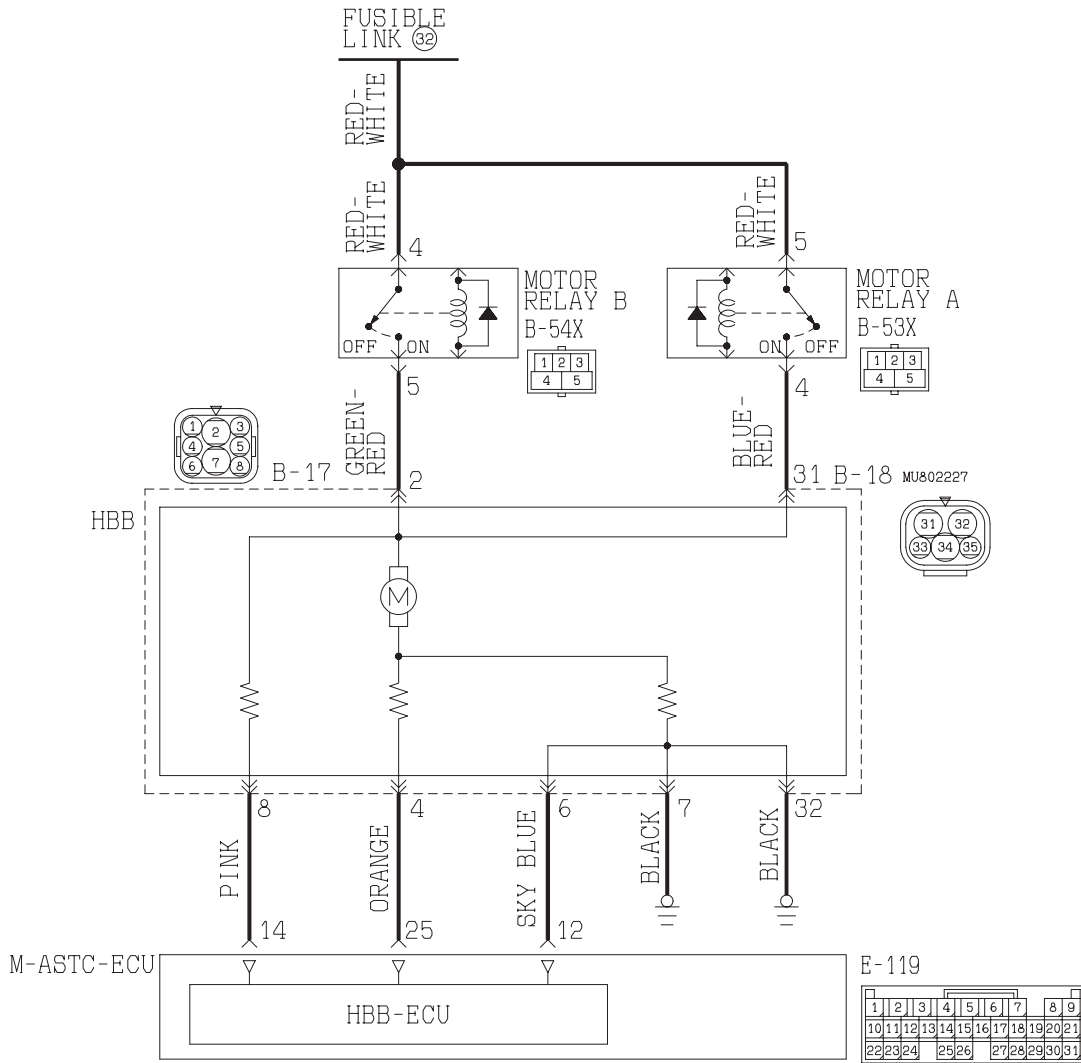
Q: Is DTC 31 set?

YES : Start over at Step 1.

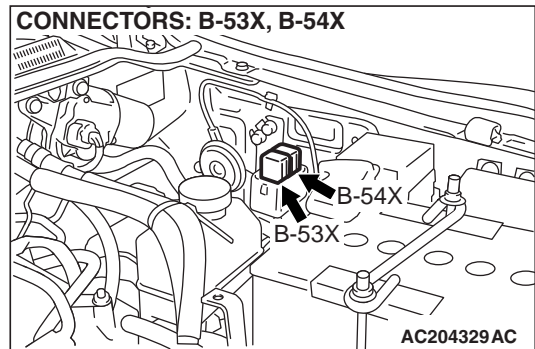
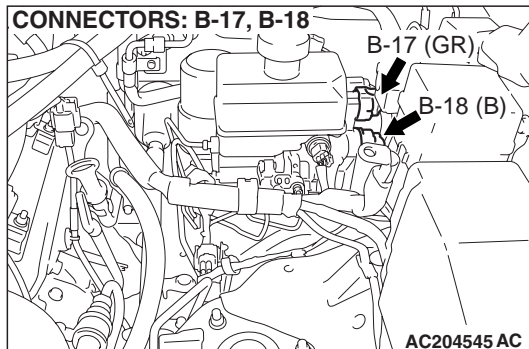
NO : The procedure is complete.

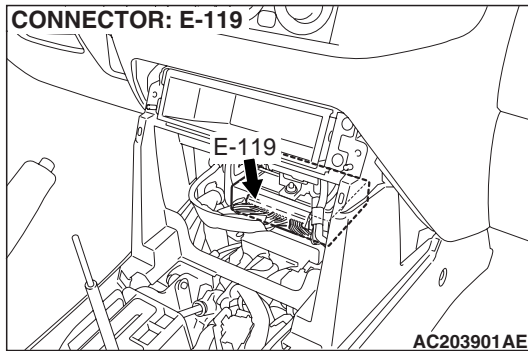
DTC 53: Pump Motor (Seizure of the Pump Motor or Abnormality at the Current Detecting Circuit of the M-ASTC-ECU)

Pump Motor Circuit



W3Q05M03AA
AC204494 AB





CIRCUIT OPERATION

- The pump motor operates if the motor relay A or motor relay B turn to ON.
- The M-ASTC-ECU monitors the pump motor (at 25 terminal).
- The M-ASTC-ECU monitors the power supply current for the pump motor at 14 terminal, and ground current at 12 terminal, respectively, to know whether the pump motor is locked or not.

HBB DTC SET CONDITIONS

DTC 53 will be set when the pump motor is locked, two ground lines are open circuit or poorly grounded, or the current monitoring circuit is defective. If the pump motor has been locked, the M-ASTC-ECU sounds the buzzer continuously to inform the trouble of the driver and protects the pump motor by activating it intermittently.

TROUBLESHOOTING HINTS

- Malfunction of the pump motor [Integrated with the hydraulic brake booster (HBB)]
- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU
- Malfunction of the master cylinder and hydraulic unit assembly [Integrated with the hydraulic brake booster (HBB)]

DIAGNOSIS

Required Special Tools:

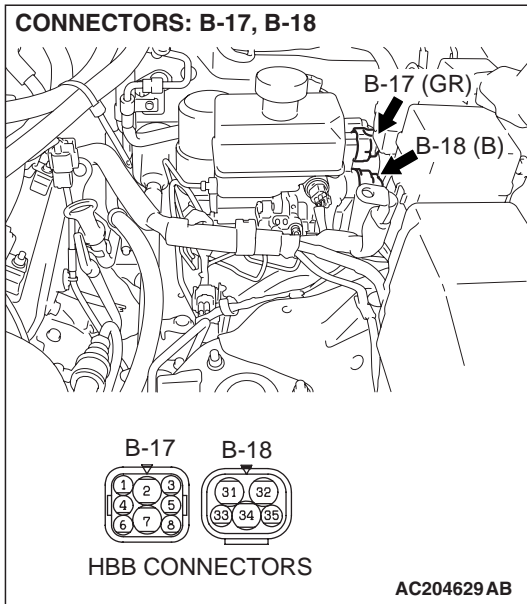
- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

STEP 1. Check the sound of the HBB buzzer.

Q: Does the HBB buzzer sound?

YES : Check the pump motor for seizure, and replace the pump motor if necessary. Then go to Step 10.

NO : Go to Step 2.



STEP 2. Check the following connectors.

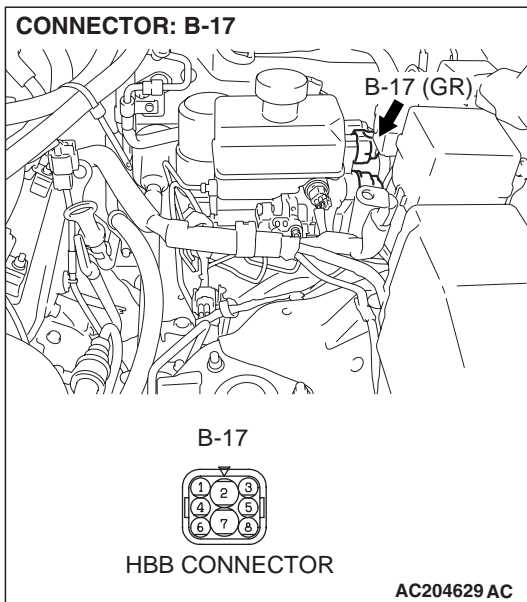
- HBB connector B-17 and B-18

Check connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

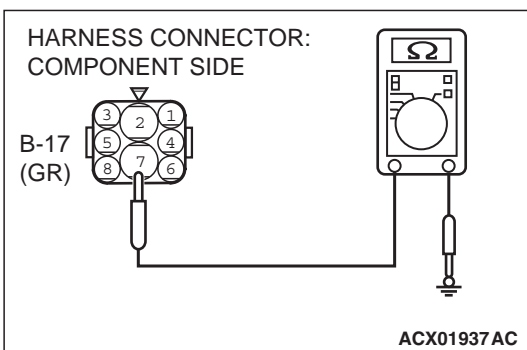
YES : Go to Step 3.

NO : Repair the faulty connector or terminal and then go to Step 10.



STEP 3. Check the HBB ground circuit at HBB harness connector B-17.

- (1) Disconnect HBB connector B-17 and measure at the harness connector (component side).



- (2) Measure the resistance between terminal 7 and ground. The resistance should measure less than 2 ohms.

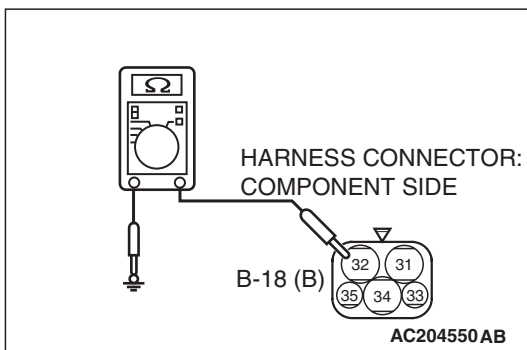
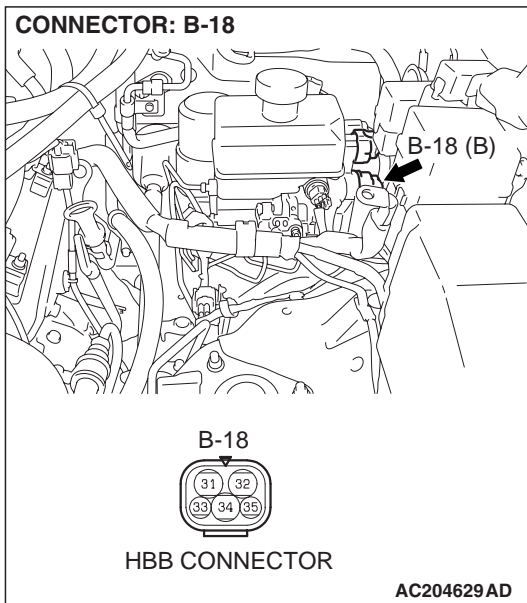
Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 4.

NO : Repair the harness wire between HBB connector B-17 (terminal 7) and ground. Then go to Step 10.

STEP 4. Check the HBB ground circuit at HBB harness connector B-18.

- (1) Disconnect HBB connector B-18 and measure at the harness connector (component side).



- (2) Measure the resistance between terminal 32 and ground.
The resistance should measure less than 2 ohms.

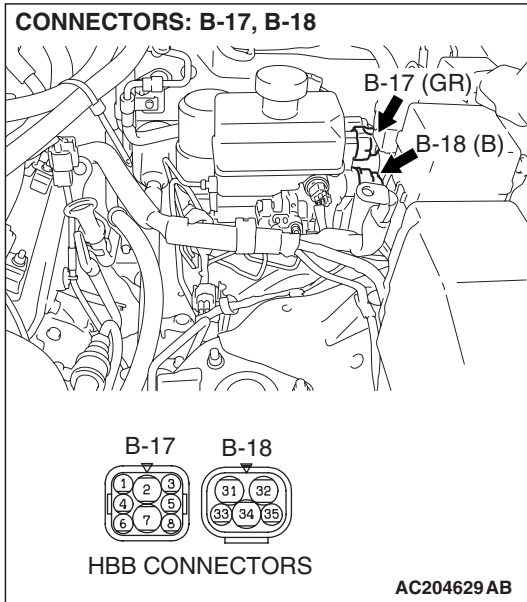
Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 5.

NO : Repair the harness wire between HBB connector B-18 (terminal 32) and ground. Then go to Step 10.

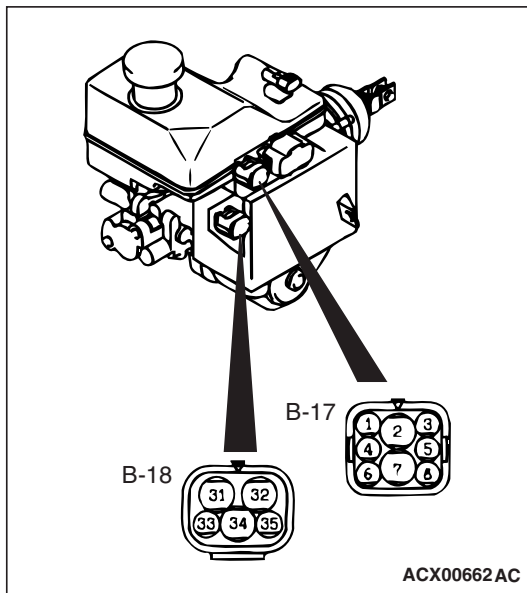
STEP 5. Check the HBB (continuity and resistance test of the pump motor).

(1) Disconnect HBB connectors B-17 and B-18.



(2) Check for continuity and measure the resistance between terminals at the HBB connectors.

TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE Ω (REFERENCE VALUE)
2 – 7	Continuity	10 or less
2 – 8	Continuity	Approximately 33
2 – 31	Continuity	Less than 2
4 – 6	Continuity	Approximately 33
4 – 32	Continuity	Approximately 33
6 – 7	Continuity	Less than 2
6 – 32	Continuity	Less than 2
7 – 32	Continuity	Less than 2
8 – 31	Continuity	Approximately 33
31 – 32	Continuity	10 or less



Q: Does continuity exist between above terminals?

YES : Go to Step 7.

NO : Go to Step 6.

STEP 6. Check the pump motor and lead wire.

- (1) Remove the HBB (Refer to [P.35A-136](#)).
- (2) Remove the pump motor and the lead wire from the HBB (Refer to [P.35A-139](#)).
- (3) Check the following items:
 - Confirm that the pump motor operates when the battery voltage is imposed at the pump motor terminal.
 - Confirm the continuity of the lead wire.

Q: Are both of the pump motor and the lead wire in good condition?

YES : Replace the master cylinder and hydraulic unit assembly (Refer to [P.35A-139](#)). Then go to Step 10.

NO : Replace the pump motor or the lead wire (Refer to [P.35A-139](#)). Then go to Step 10.

STEP 7. Check the following connector.

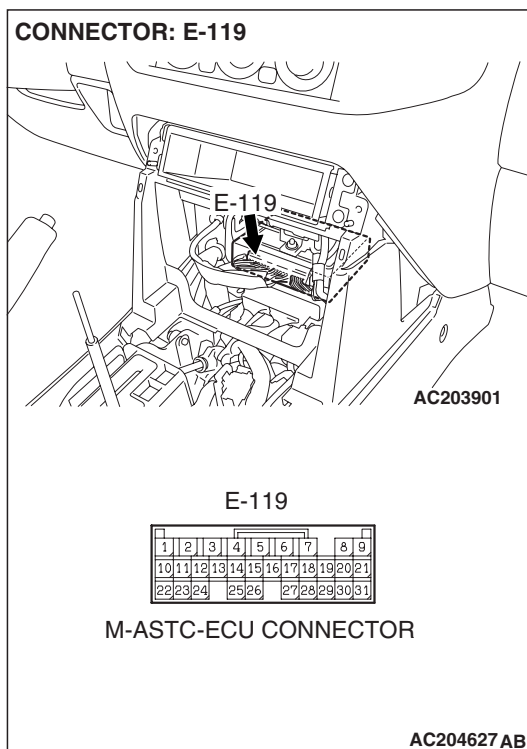
- M-ASTC-ECU connector E-119

Check connector, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

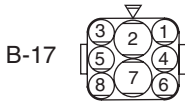
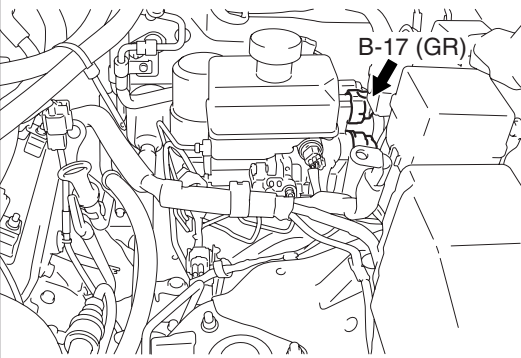
Q: Are the connector and terminals in good condition?

YES : Go to Step 8.

NO : Repair the faulty connector or terminal and then go to Step 10.



CONNECTOR: B-17



B-17
HARNESS CONNECTOR:
COMPONENT SIDE

AC204629AE

STEP 8. Check the following harness wires.

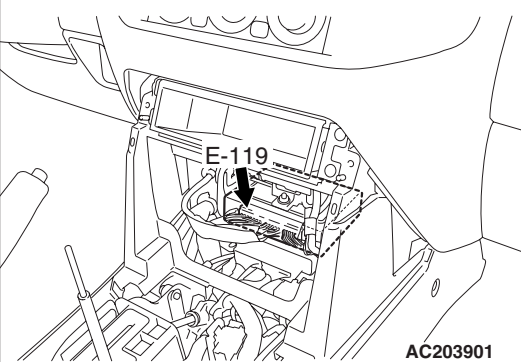
- The wire between HBB connector B-17 (terminal 4) and M-ASTC-ECU connector E-119 (terminal 25)
- The wire between HBB connector B-17 (terminal 6) and M-ASTC-ECU connector E-119 (terminal 12)
- The wire between HBB connector B-17 (terminal 8) and M-ASTC-ECU connector E-119 (terminal 14)

Q: Is any harness wire damaged?

YES : Repair it and then go to Step 10.

NO : Go to Step 9.

CONNECTOR: E-119



E-119
HARNESS CONNECTOR:
COMPONENT SIDE

AC204627AC

STEP 9. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 53 set?

YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 10.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 10. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

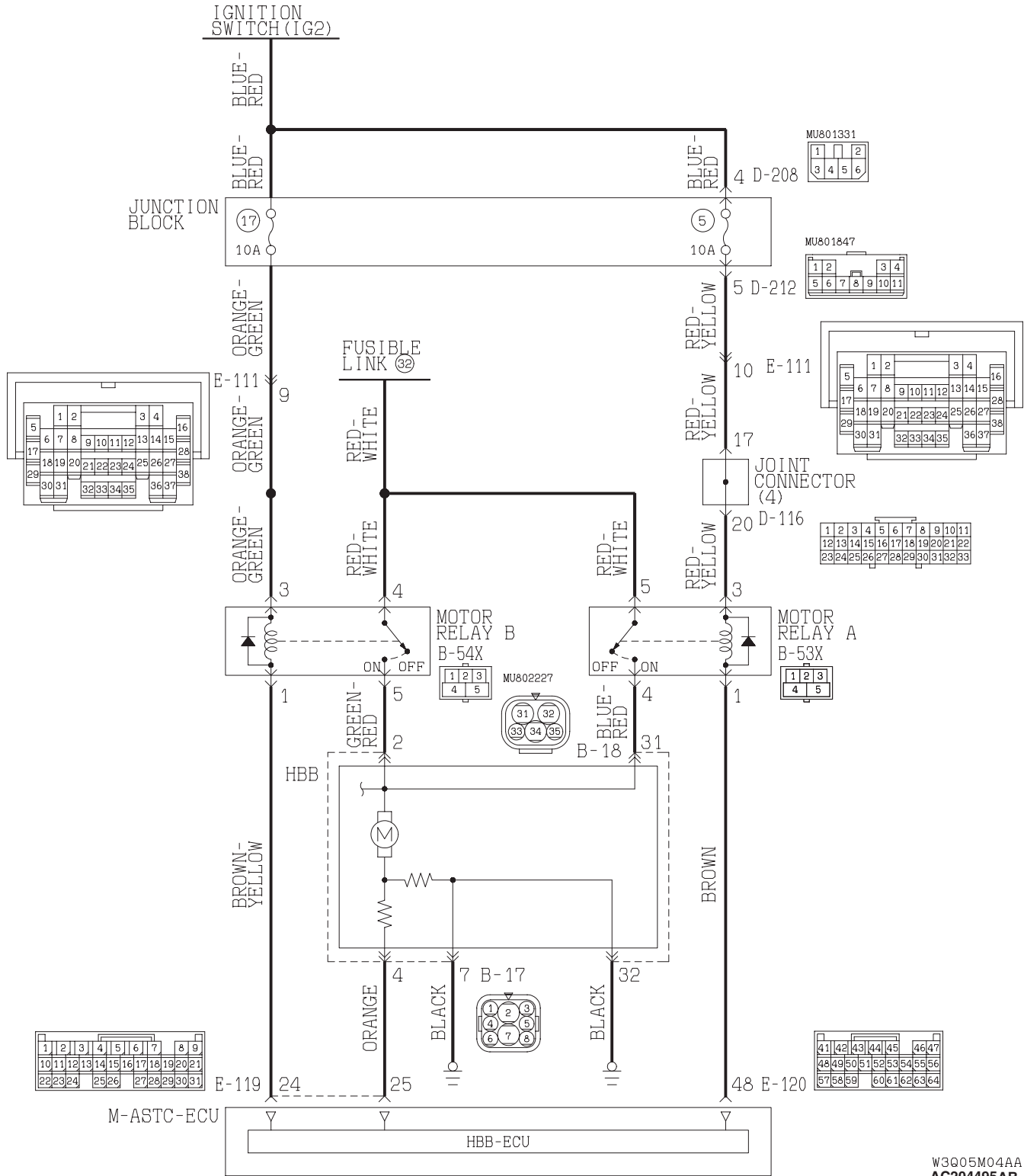
Q: Is DTC 53 set?

YES : Start over at Step 1.

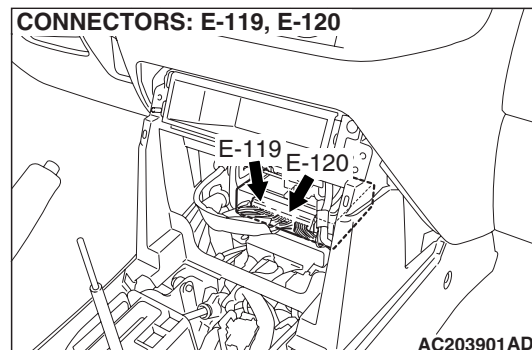
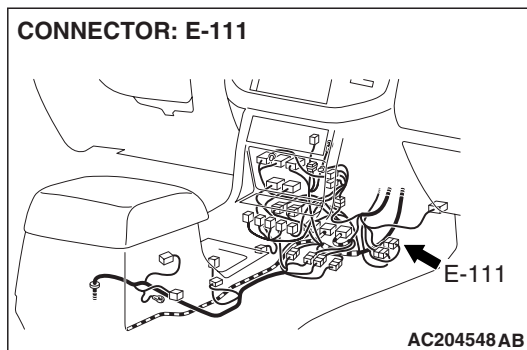
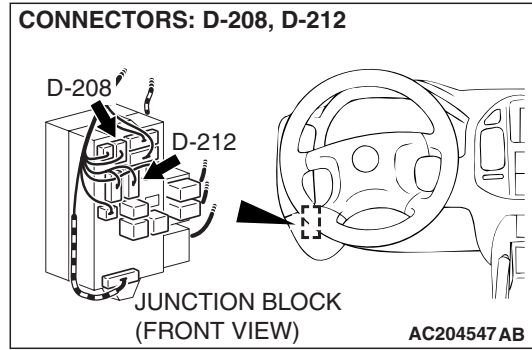
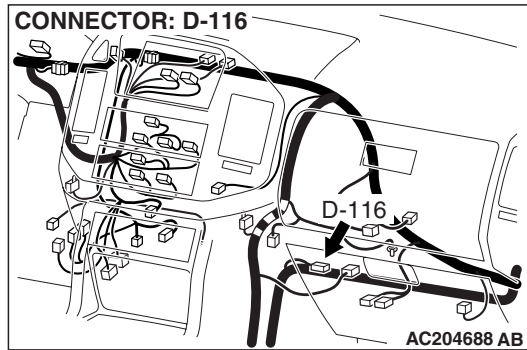
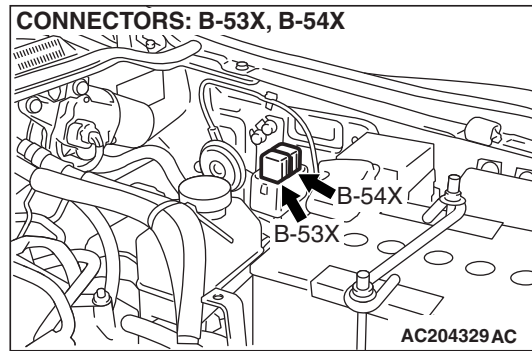
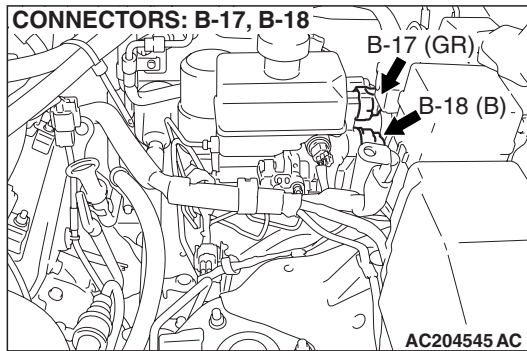
NO : The procedure is complete.

DTC 54: Motor Relay (Open Circuit, Short Circuit or Failure of the Motor Relay Coil)

Motor Relay Circuit



W3905M04AA
AC204495AB



CIRCUIT OPERATION

- The motor relay A and the motor relay B are controlled by the M-ASTC-ECU.
- If the brake fluid pressure in the hydraulic brake booster (HBB) becomes low, the M-ASTC-ECU outputs the motor relay actuating signal to the motor relay A and the motor relay B and then the pump motor operates.
- The M-ASTC-ECU monitors the pump motor (at 25 terminal).

HBB DTC SET CONDITION

DTC 54 is set if the motor relay circuit is open or short, the motor relay A or the motor relay B is defective, or the internal circuit of the M-ASTC-ECU is defective.

TROUBLESHOOTING HINTS

- Malfunction of the motor relay A or the motor relay B
- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

DIAGNOSIS**Required Special Tools:**

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

STEP 1. Using scan tool MB991958, read the diagnostic trouble code.

⚠ CAUTION

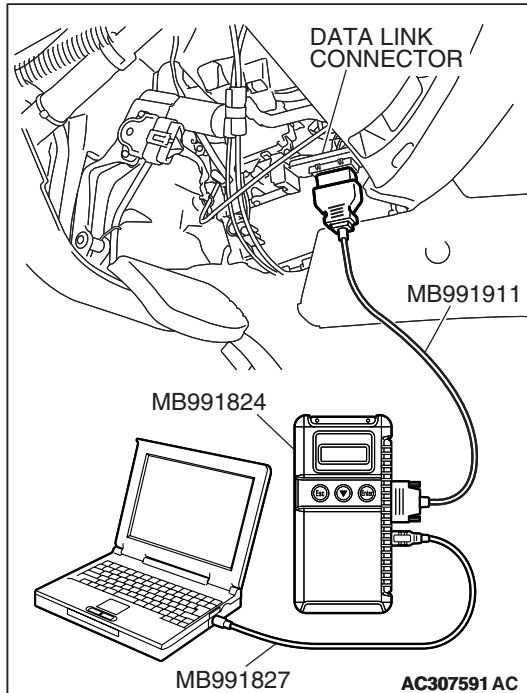
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Turn the ignition switch to the "ON" position.
- (2) Erase the DTC.
- (3) Turn the ignition switch to the "LOCK" (OFF) position.
- (4) Turn the ignition switch to the "ON" position.
- (5) Check if the DTC is set.
- (6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC 55 set?

YES : Carry out the troubleshooting for DTC 55 (Refer to [P.35A-57](#)). Then go to Step 25.

NO : Go to Step 2.

**STEP 2. Check the pump motor operation.**

- (1) Depress the pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position.
- (2) Turn the ignition switch to the "ON" position.

Q: Does the pump motor operate?

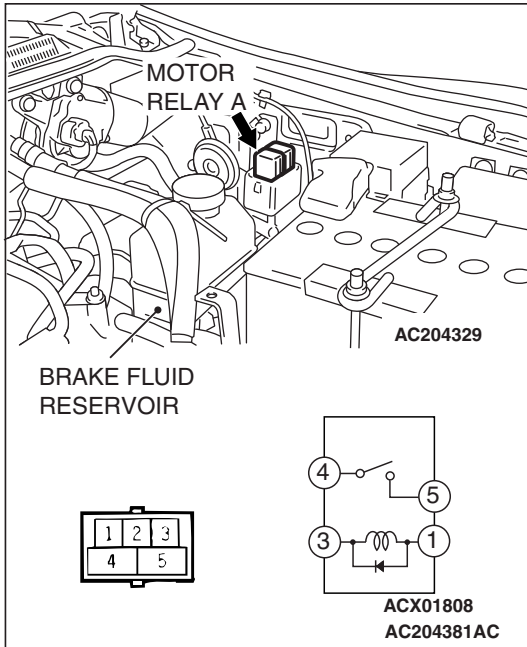
YES : Go to Step 22.

NO : Go to Step 3.

STEP 3. Check the motor relay A.

⚠ CAUTION

Apply battery voltage according to the table below. Never confuse the positive and negative battery terminals, or the diode inside the relay will be damaged.



BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
-	4 - 5	Open circuit
<ul style="list-style-type: none"> Connect battery terminal (+) to terminal 3 Connect battery terminal (-) to terminal 1 	4 - 5	Less than 2 ohms

Q: Is the relay damaged?

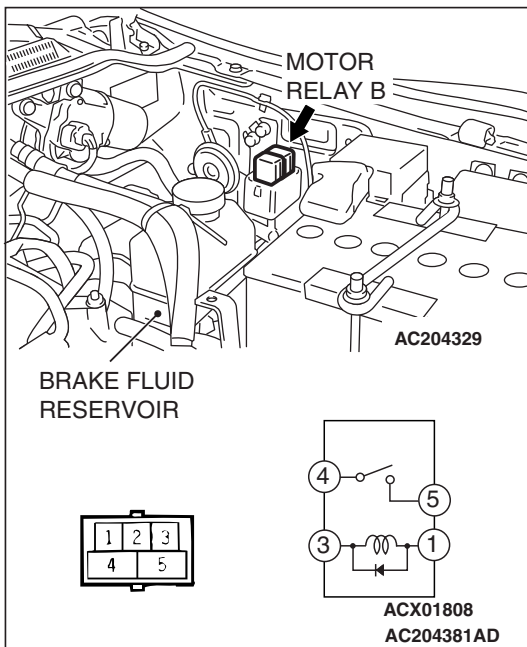
YES : Replace the relay. Then go to Step 25.

NO : Go to Step 4.

STEP 4. Check the motor relay B.

⚠ CAUTION

Apply battery voltage according to the table below. Never confuse the positive and negative battery terminals, or the diode inside the relay will be damaged.



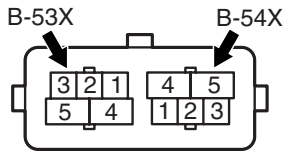
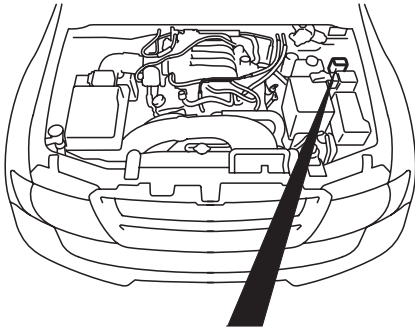
BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
-	4 - 5	Open circuit
<ul style="list-style-type: none"> Connect battery terminal (+) to terminal 3 Connect battery terminal (-) to terminal 1 	4 - 5	Less than 2 ohms

Q: Is the relay damaged?

YES : Replace the relay. Then go to Step 25.

NO : Go to Step 5.

CONNECTORS: B-53X, B-54X



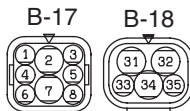
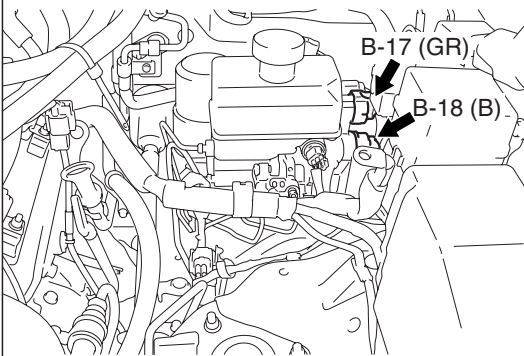
RELAY BOX CONNECTOR

AC204551AB

STEP 5. Check the following connectors.

- Motor relay A connector B-53X
- Motor relay B connector B-54X

CONNECTORS: B-17, B-18



HBB CONNECTORS

AC204629AB

- HBB connectors B-17 and B-18
- Check connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

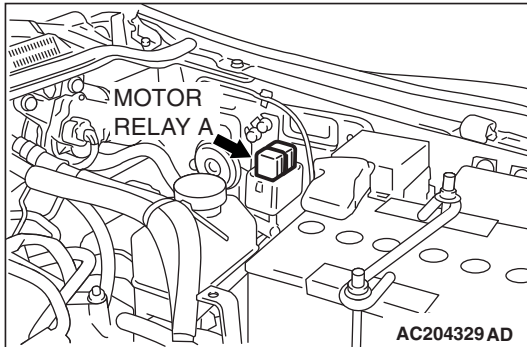
Q: Are the connectors and terminals in good condition?

YES : Go to Step 6.

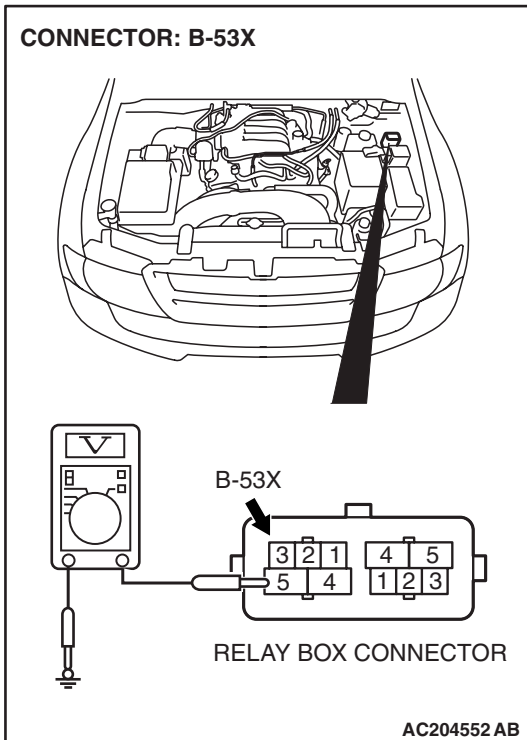
NO : Repair the faulty connector or terminal. Then go to Step 25.

STEP 6. Check the power supply circuit at motor relay A harness connector B-53X.

(1) Remove the motor relay A.



CONNECTOR: B-53X



(2) Measure the voltage between terminal 5 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

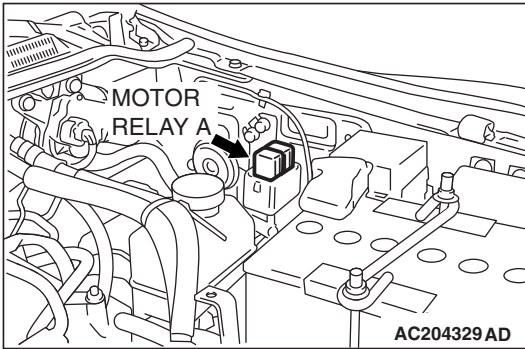
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.

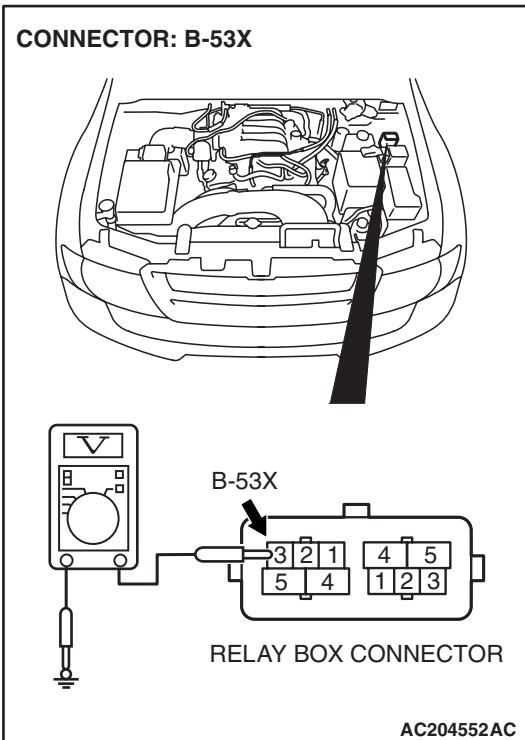
NO : Go to Step 10.

STEP 7. Check the ignition switch (IG2) circuit at motor relay A harness connector B-53X.

- (1) Remove the motor relay A.
- (2) Turn the ignition switch to the "ON" position.



CONNECTOR: B-53X



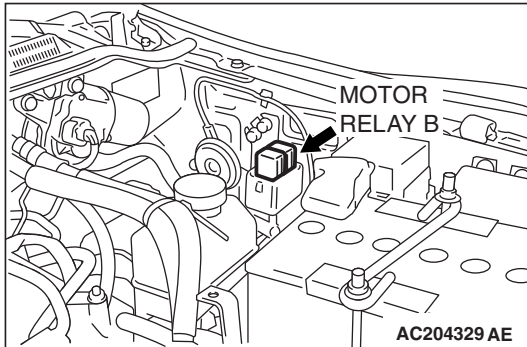
- (3) Measure the voltage between terminal 3 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

Q: Is battery positive voltage (approximately 12 volts) present?

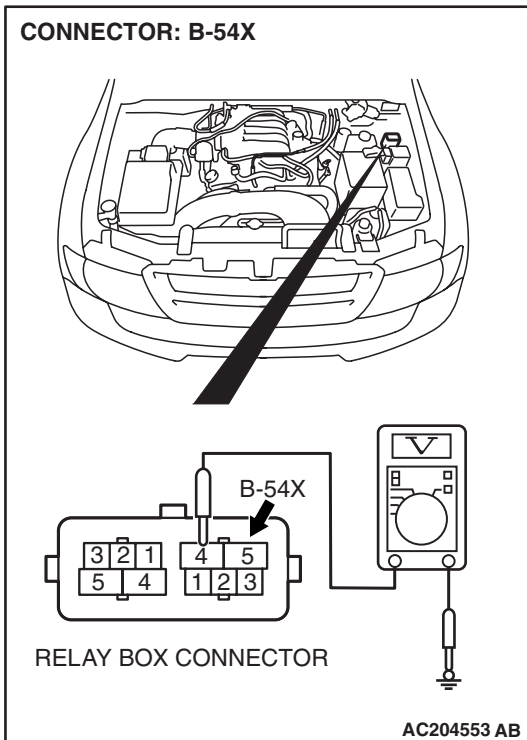
- YES :** Go to Step 8.
NO : Go to Step 11.

STEP 8. Check the power supply circuit at motor relay B harness connector B-54X.

(1) Remove the motor relay B.



CONNECTOR: B-54X



(2) Measure the voltage between terminal 4 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

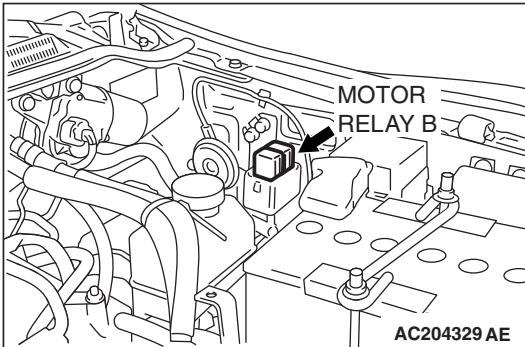
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.

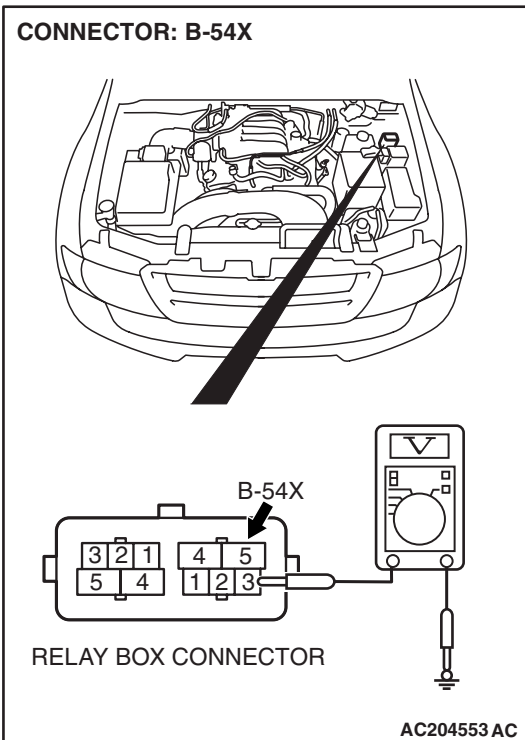
NO : Go to Step 12.

STEP 9. Check the ignition switch (IG2) circuit at motor relay B harness connector B-54X.

- (1) Remove the motor relay B.
- (2) Turn the ignition switch to the "ON" position.



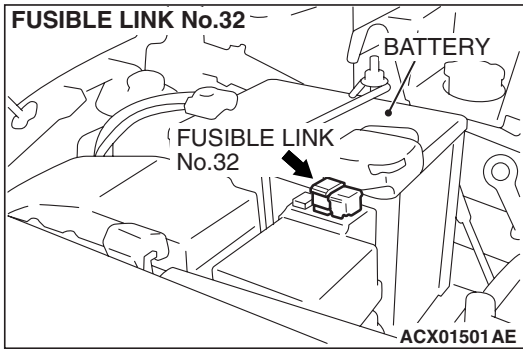
CONNECTOR: B-54X



- (3) Measure the voltage between terminal 3 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

Q: Is battery positive voltage (approximately 12 volts) present?

- YES :** Go to Step 14.
NO : Go to Step 13.

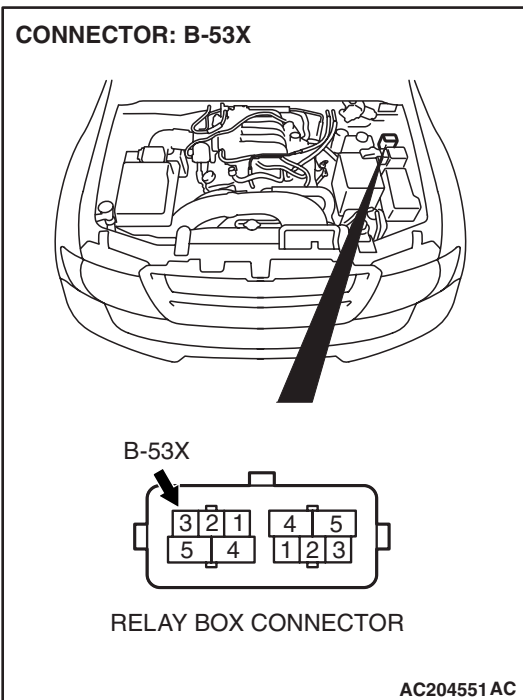


STEP 10. Check the following harness wire.

- The wire between fusible link number 32 and motor relay A connector B-53X (terminal 5)

Q: Is the harness wire damaged?

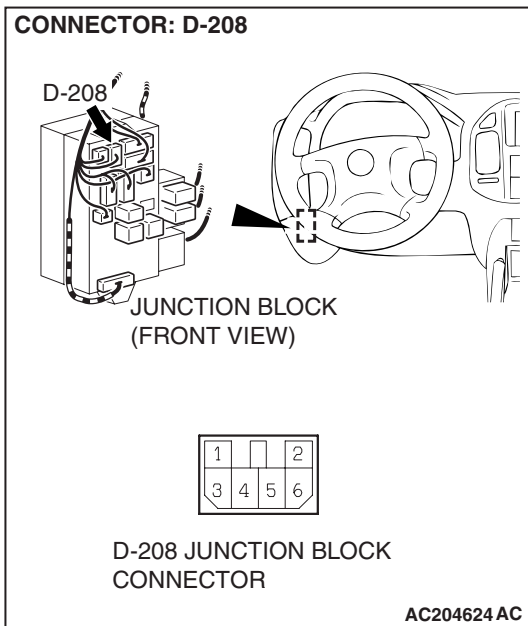
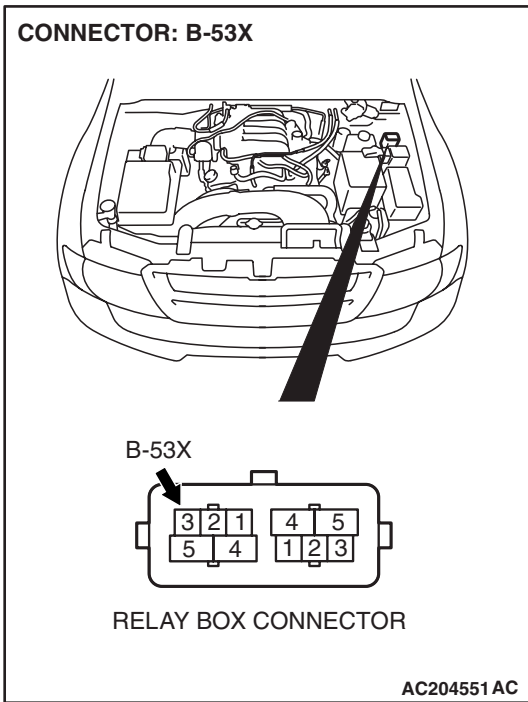
- YES** : Repair or replace it and then go to Step 25.
NO : Go to Step 25.

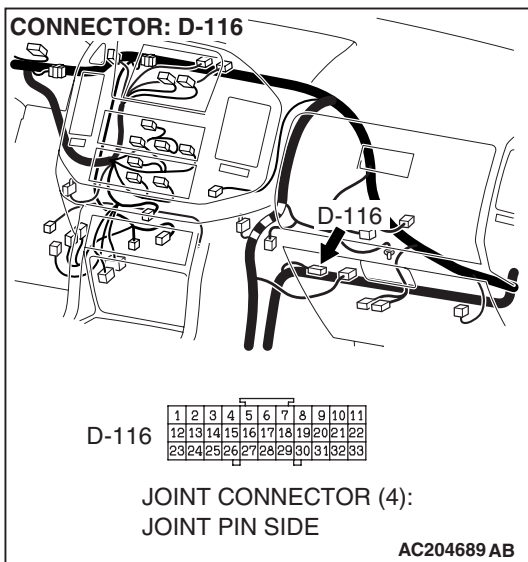


STEP 11. Check the following harness wire.

- The wire between motor relay A connector B-53X (terminal 3) and junction block connector D-208 (terminal 4)

NOTE:



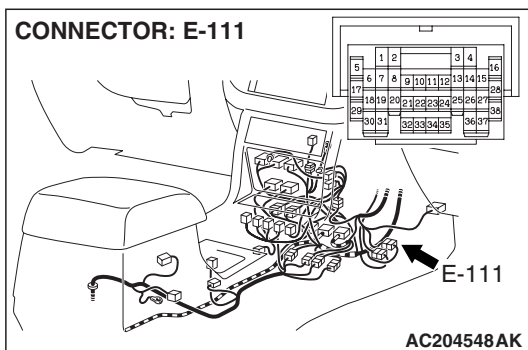
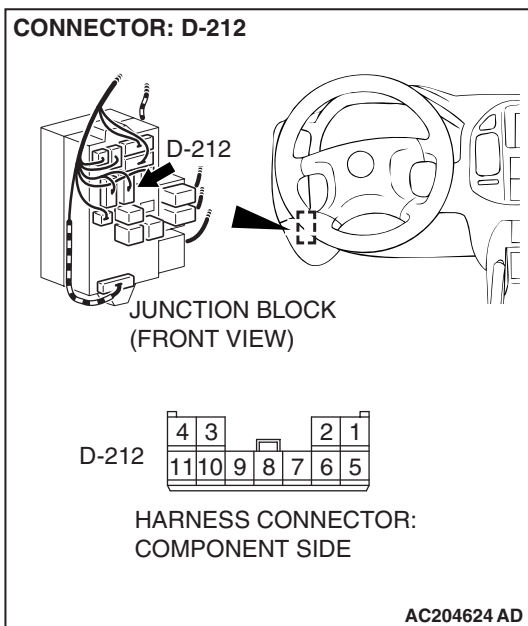


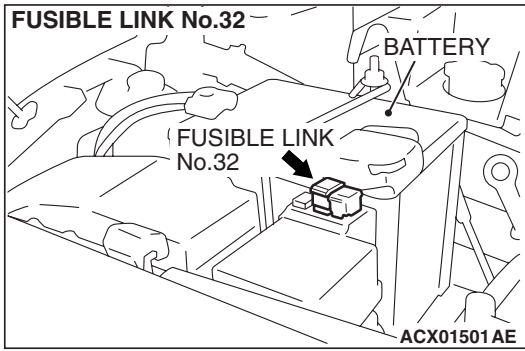
Also check intermediate connectors D-116, D-212 and E-111 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector D-116, D-212 or E-111 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 25.

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 25.

NO : Go to Step 25.



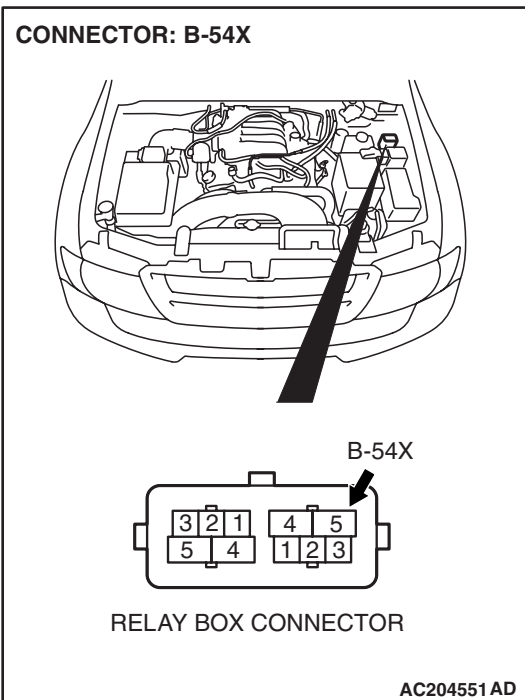


STEP 12. Check the following harness wire.

- The wire between fusible link number 32 and motor relay B connector B-54X (terminal 4)

Q: Is the harness wire damaged?

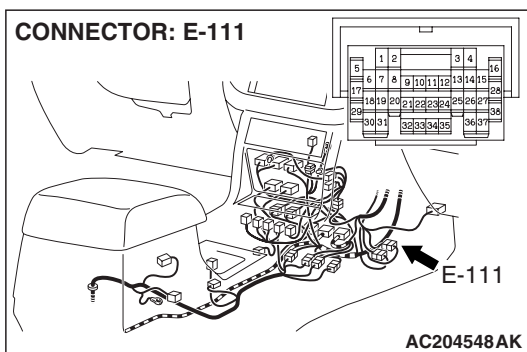
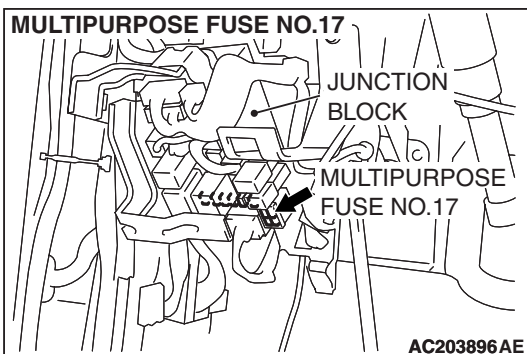
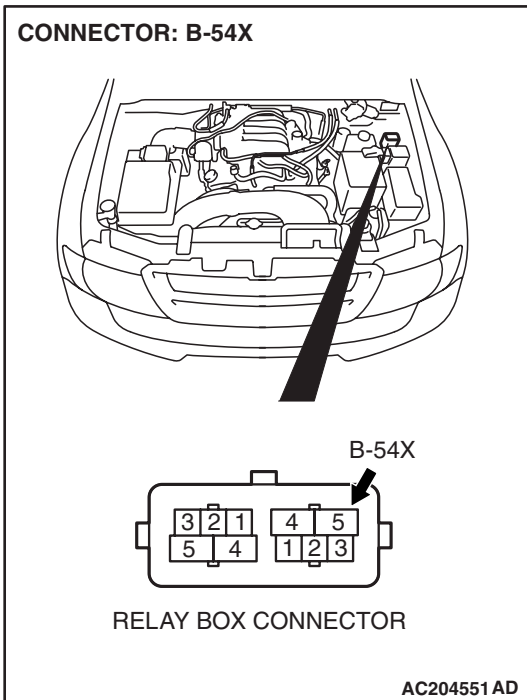
- YES** : Repair or replace it and then go to Step 25.
NO : Go to Step 25.



STEP 13. Check the following harness wire.

- The wire between motor relay B connector B-54X (terminal 3) and multi-purpose fuse number 17 (junction block)

NOTE:



Also check intermediate connector E-111 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector E-111 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 25.

Q: Is the harness wire damaged?

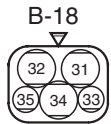
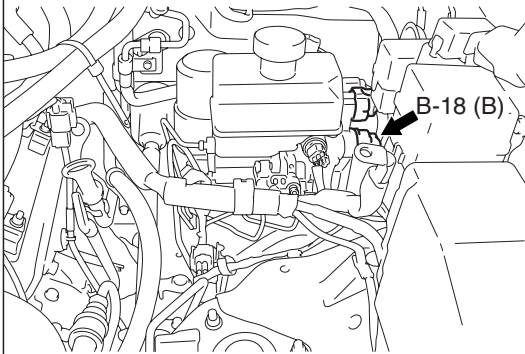
YES : Repair or replace it and then go to Step 25.

NO : Go to Step 25.

STEP 14. Check the following harness wires.

- The wire between HBB connector B-18 (terminal 31) and motor relay A connector B-53X (terminal 4)

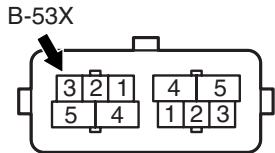
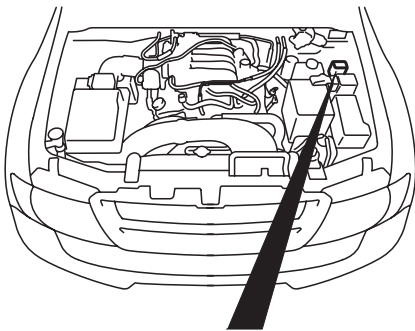
CONNECTOR: B-18



HARNESS CONNECTOR :
COMPONENT SIDE

AC204626 AB

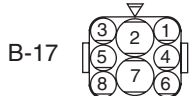
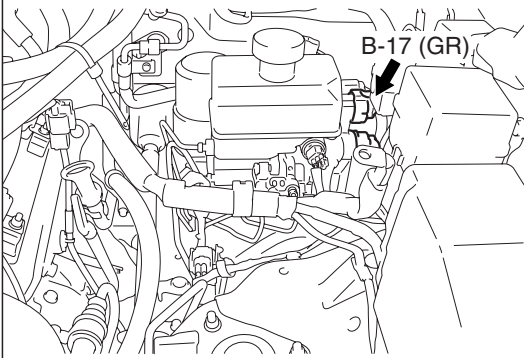
CONNECTOR: B-53X



RELAY BOX CONNECTOR

AC204551 AC

CONNECTOR: B-17



B-17
HARNESS CONNECTOR:
COMPONENT SIDE

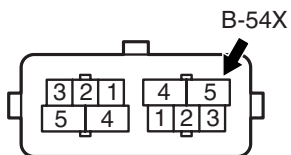
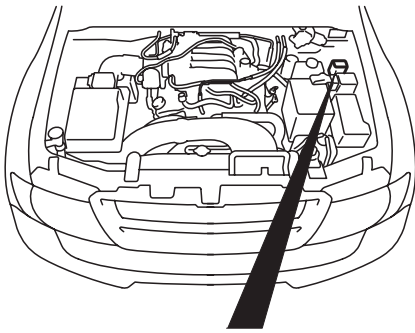
AC204629 AE

- The wire between HBB connector B-17 (terminal 2) and motor relay B connector B-54X (terminal 5)

Q: Is any harness wire damaged?

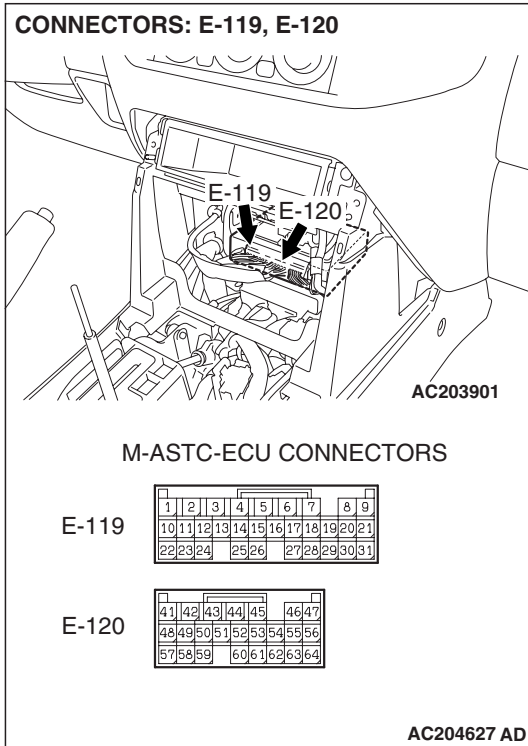
- YES :** Repair or replace the faulty harness wire and then go to Step 25.
NO : Go to Step 15.

CONNECTOR: B-54X



B-54X
RELAY BOX CONNECTOR

AC204551 AD



STEP 15. Check the following connectors.

- M-ASTC-ECU connectors E-119 and E-120
- Check connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

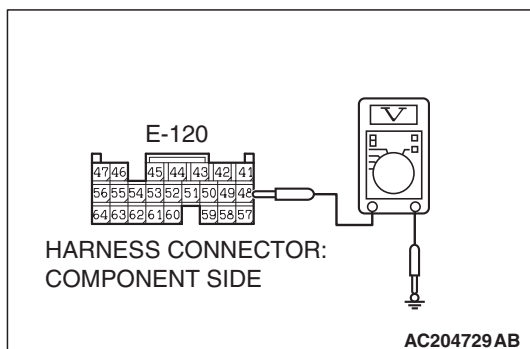
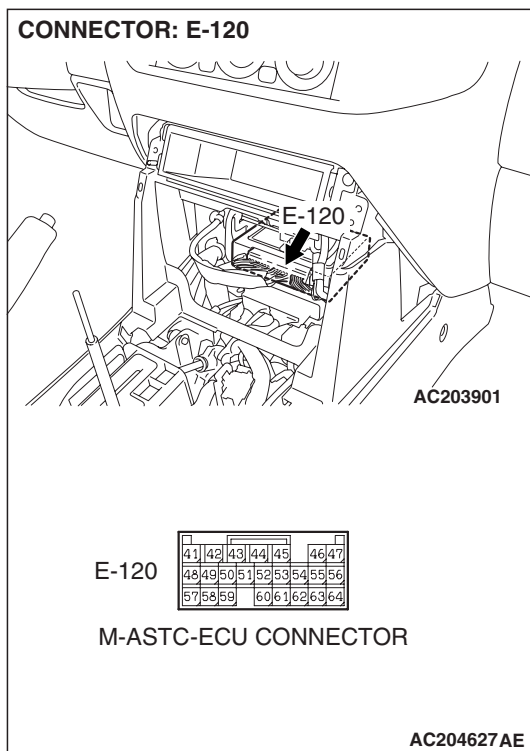
Q: Are the connectors and terminals in good condition?

YES : Go to Step 16.

NO : Repair the faulty connector or terminal. Then go to Step 25.

STEP 16. Check the ignition switch (IG2) circuit at M-ASTC-ECU harness connector E-120.

- (1) Disconnect M-ASTC-ECU connector E-120.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between terminal 48 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

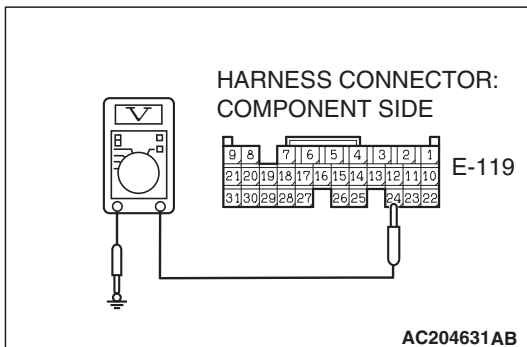
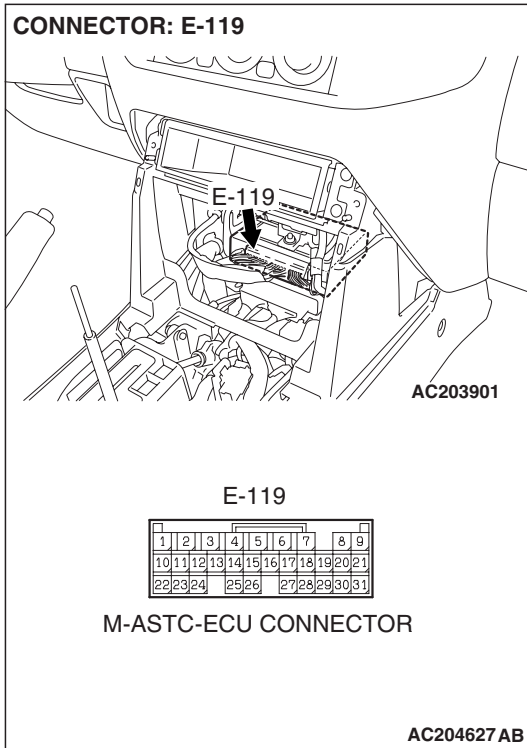
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 17.

NO : Go to Step 18.

STEP 17. Check the ignition switch (IG2) circuit at M-ASTC-ECU harness connector E-119.

- (1) Disconnect M-ASTC-ECU connector E-119.
- (2) Turn the ignition switch to the "ON" position.



- (3) Measure the voltage between terminal 24 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

Q: Is battery positive voltage (approximately 12 volts) present?

- YES :** Go to Step 20.
- NO :** Go to Step 19.

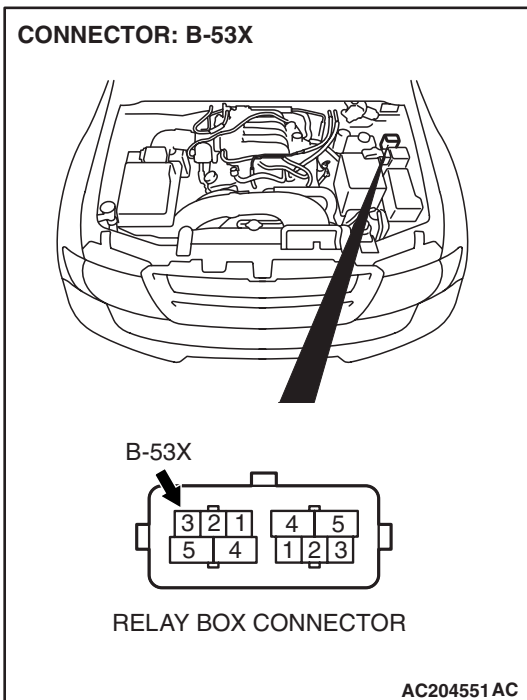
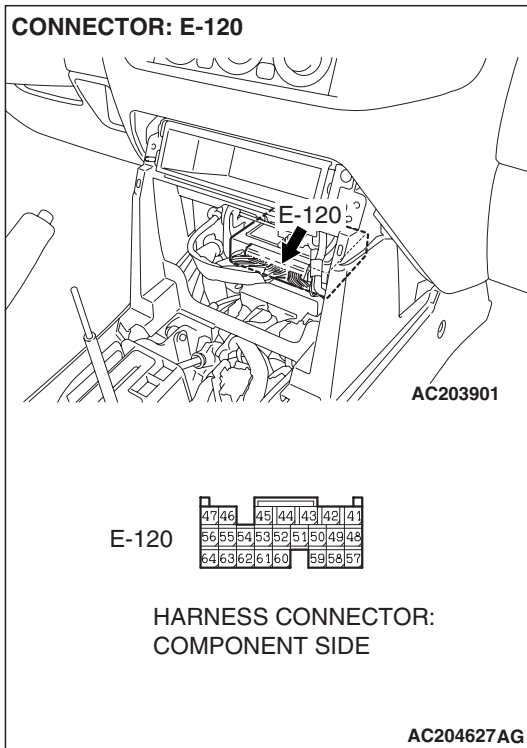
STEP 18. Check the following harness wire.

- The wire between M-ASTC-ECU connector E-120 (terminal 48) and motor relay A connector B-53X (terminal 1)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 25.

NO : Go to Step 25.

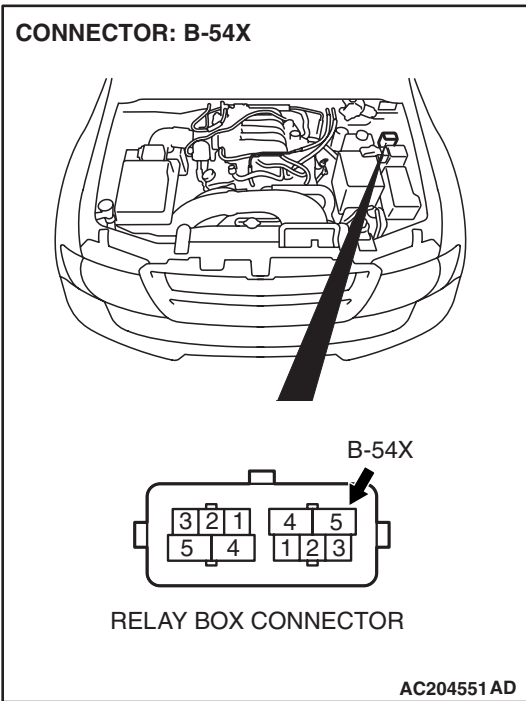
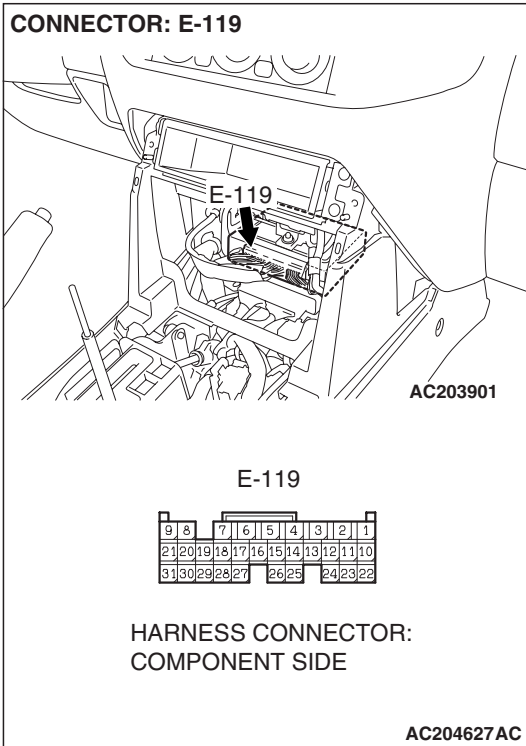


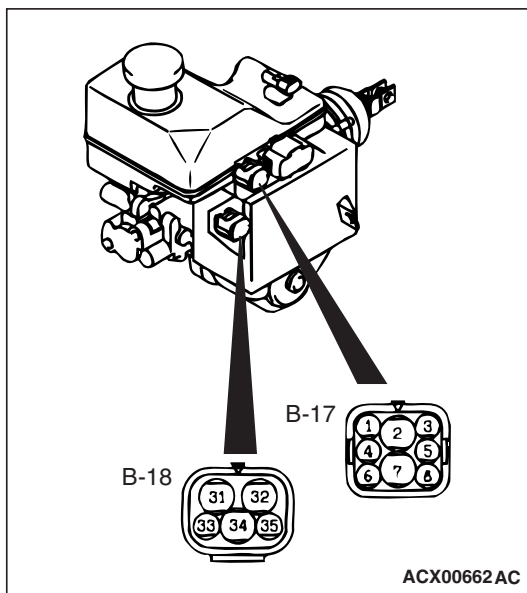
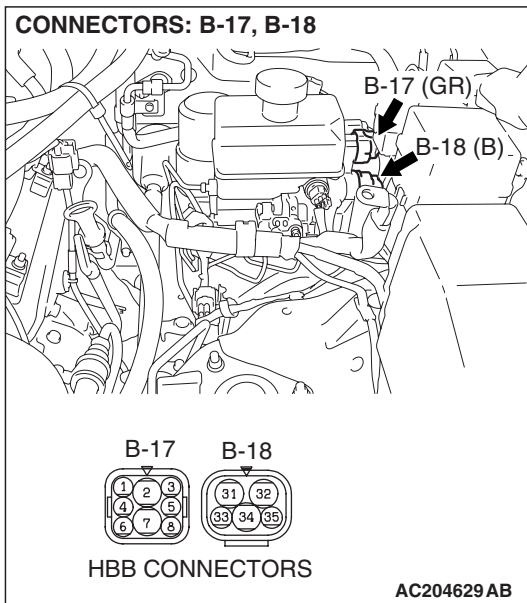
STEP 19. Check the following harness wire.

- The wire between M-ASTC-ECU connector E-119 (terminal 24) and motor relay B connector B-54X (terminal 1)

Q: Is the harness wire damaged?

- YES** : Repair or replace it and then go to Step 25.
NO : Go to Step 25.





STEP 20. Check the HBB (continuity and resistance test of the pump motor).

(1) Disconnect HBB connectors B-17 and B-18.

(2) Check for continuity and measure the resistance between terminals at the HBB connectors.

TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE Ω (REFERENCE VALUE)
2 – 7	Continuity	10 or less
2 – 31	Continuity	Less than 2
4 – 32	Continuity	Approximately 33
7 – 32	Continuity	Less than 2
31 – 32	Continuity	10 or less

Q: Does continuity exist between above terminals?

YES : Go to Step 22.

NO : Go to Step 21.

STEP 21. Check the pump motor and lead wire.

(1) Remove the HBB (Refer to [P.35A-136](#)).

(2) Remove the pump motor and the lead wire from the HBB (Refer to [P.35A-139](#)).

(3) Check the following items:

- Confirm that the pump motor operates when the battery voltage is imposed at the pump motor terminal.
- Confirm the continuity of the lead wire.

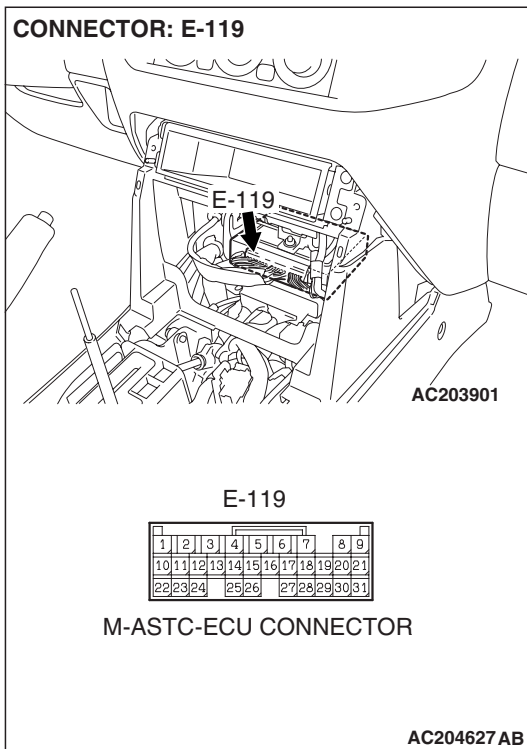
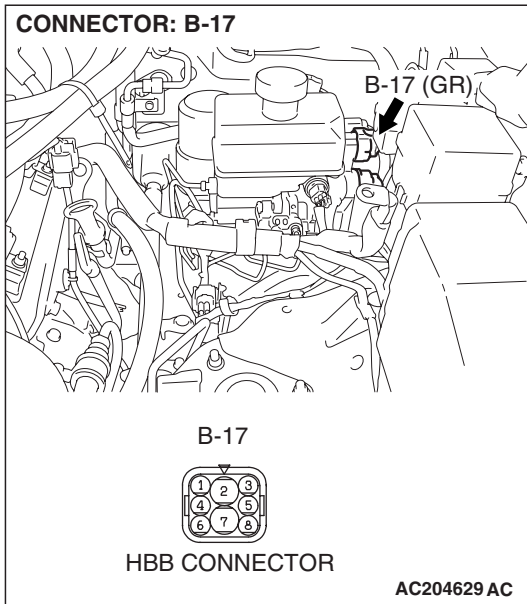
Q: Are both of the pump motor and the lead wire in good condition?

YES : Replace the master cylinder and hydraulic unit assembly (Refer to [P.35A-139](#)). Then go to Step 25.

NO : Replace the pump motor or the lead wire (Refer to [P.35A-139](#)). Then go to Step 25.

STEP 22. Check the following connectors.

- HBB connector B-17



- M-ASTC-ECU connector E-119
- Check connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 23.

NO : Repair the faulty connector or terminal. Then go to Step 25.

STEP 23. Check the following harness wire.

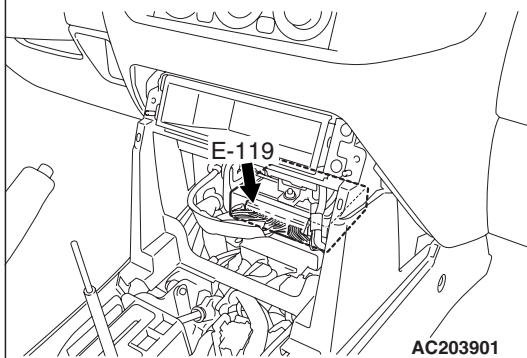
- The wire between M-ASTC-ECU connector E-119 (terminal 25) and HBB connector B-17 (terminal 4)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 25.

NO : Go to Step 24.

CONNECTOR: E-119



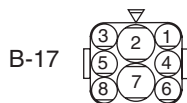
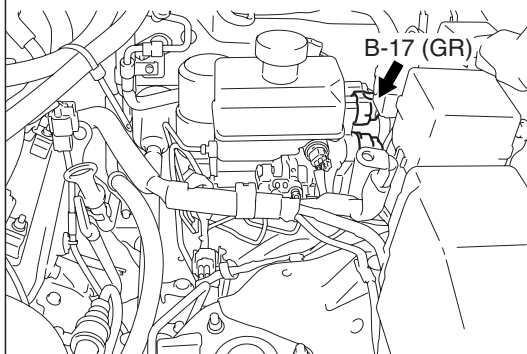
E-119



**HARNESS CONNECTOR:
COMPONENT SIDE**

AC204627AC

CONNECTOR: B-17



**HARNESS CONNECTOR:
COMPONENT SIDE**

AC204629AE

STEP 24. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 54 set?

YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 25.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 25. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

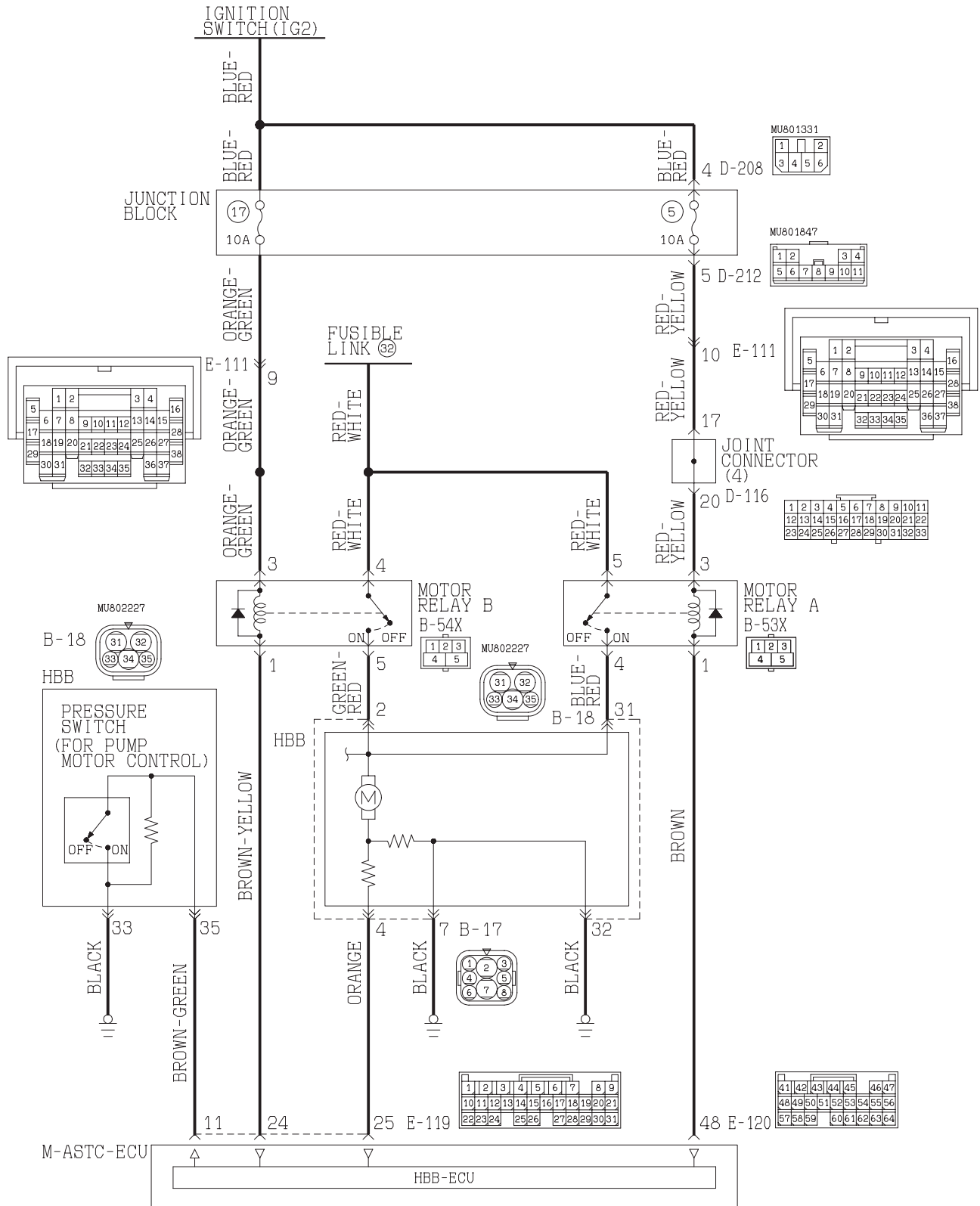
Q: Is DTC 54 set?

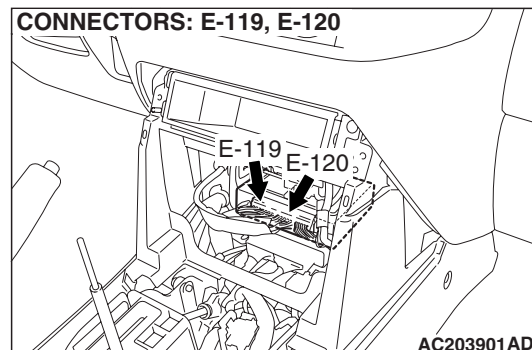
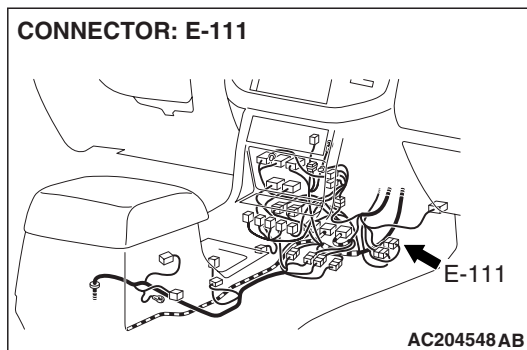
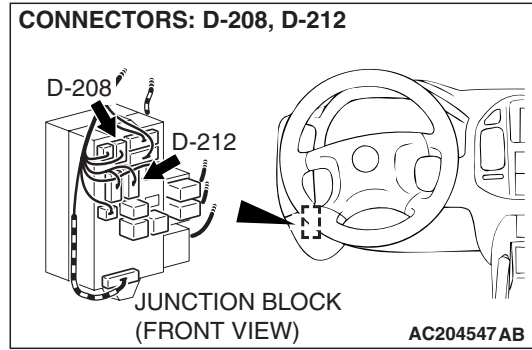
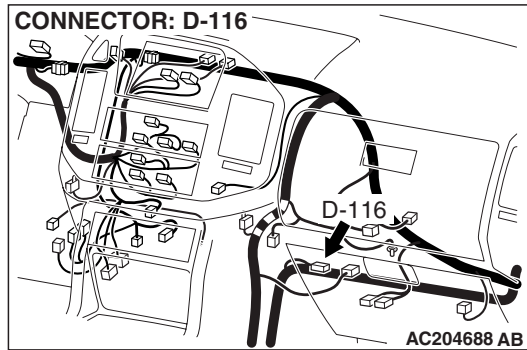
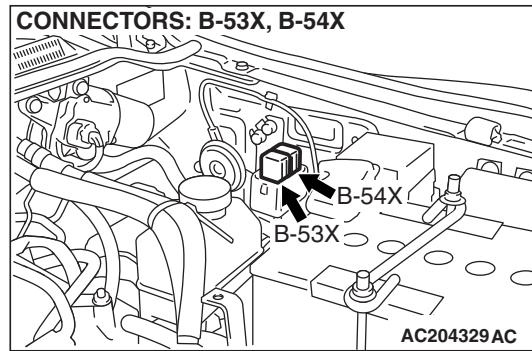
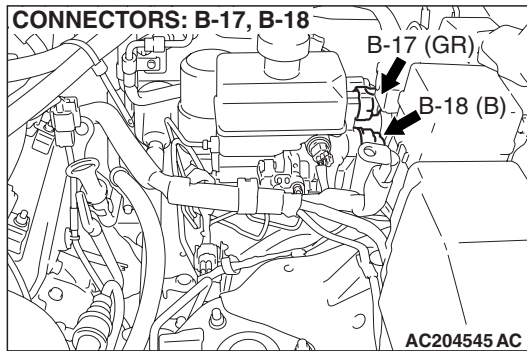
YES : Start over at Step 1.

NO : The procedure is complete.

DTC 55 : Pump Motor Circuit (Pump Motor Energized Abnormally for Long Period)

Pump Motor Control Circuit





CIRCUIT OPERATION

- The pump motor operates if the motor relay A or motor relay B turn to ON.
- The M-ASTC-ECU monitors the pump motor (at 25 terminal).

HBB DTC SET CONDITIONS

DTC 55 will be set when the pump motor has been energized too long. The M-ASTC-ECU sounds the buzzer continuously to inform the trouble of the driver and protects the pump motor by activating the pump motor intermittently.

TROUBLESHOOTING HINTS

- Malfunction of the motor relay A or the motor relay B
- Malfunction of the pressure switch (for pump motor control) [Integrated with the hydraulic brake booster (HBB)]
- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

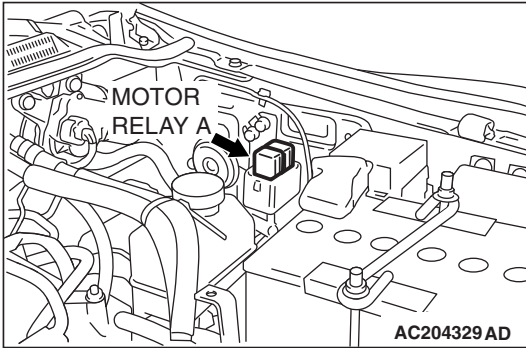
STEP 1. Check the pump motor operation.

Remove the motor relay A.

Q: Does the pump motor stop?

YES : Remove the motor relay A. Then go to Step 15.

NO : Go to Step 2.



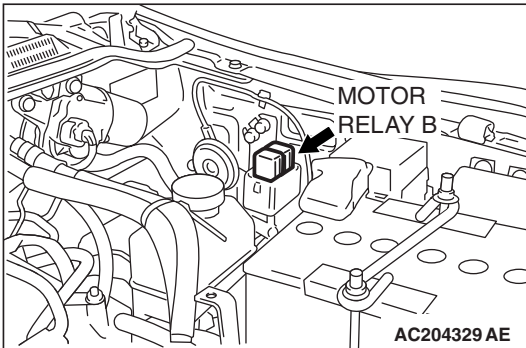
STEP 2. Check the pump motor operation.

Remove the motor relay B.

Q: Does the pump motor stop?

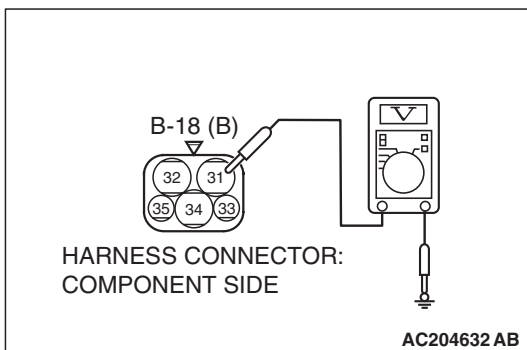
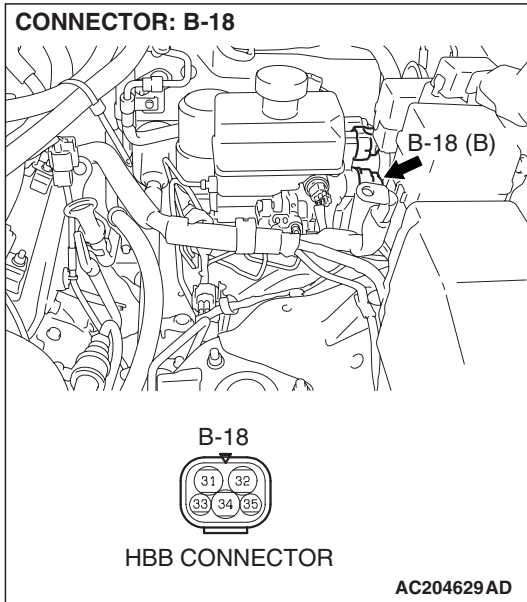
YES : Remove the motor relay B. Then go to Step 15.

NO : Go to Step 3.



STEP 3. Check the power supply circuit at HBB harness connector B-18.

(1) Disconnect HBB connector B-18.



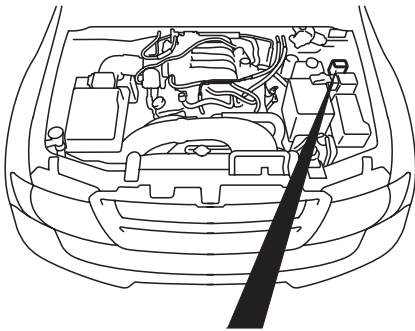
(2) Measure the voltage between terminal 31 and ground. The voltage should measure 0 volt.

Q: Is the measured voltage 0 volt?

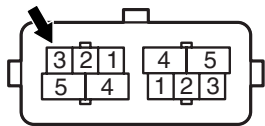
YES : Go to Step 5.

NO : Go to Step 4.

CONNECTOR: B-53X



B-53X



RELAY BOX CONNECTOR

AC204551 AC

STEP 4. Check the following harness wire.

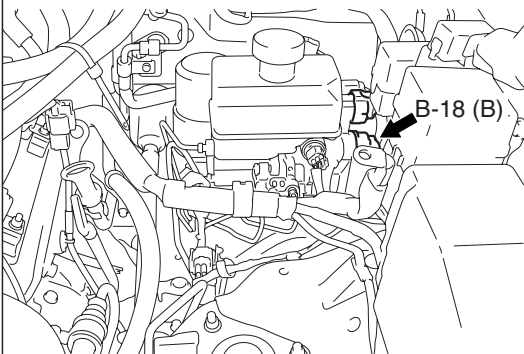
- The wire between motor relay A connector B-53X (terminal 4) and HBB connector B-18 (terminal 31)

Q: Is the harness wire damaged?

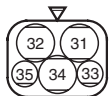
YES : Repair or replace it and then go to Step 15.

NO : Go to Step 15.

CONNECTOR: B-18



B-18

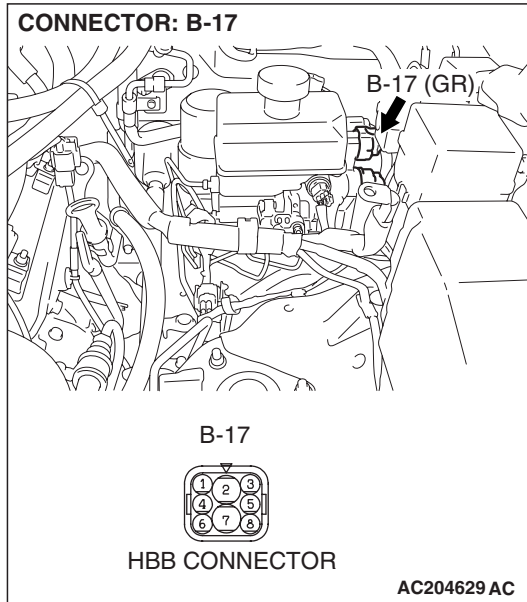


HARNESS CONNECTOR :
COMPONENT SIDE

AC204626 AB

STEP 5. Check the power supply circuit at HBB harness connector B-17.

(1) Disconnect HBB connector B-17.

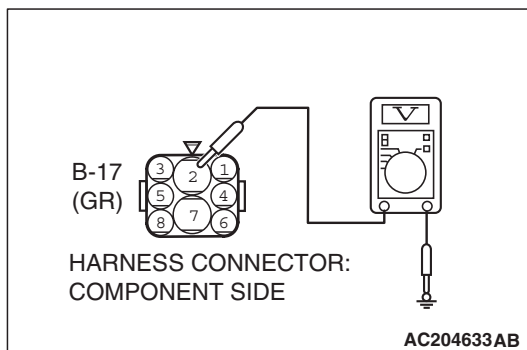


(2) Measure the voltage between terminal 2 and ground. The voltage should measure 0 volt.

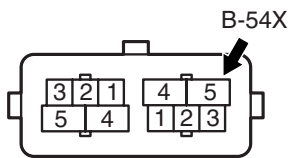
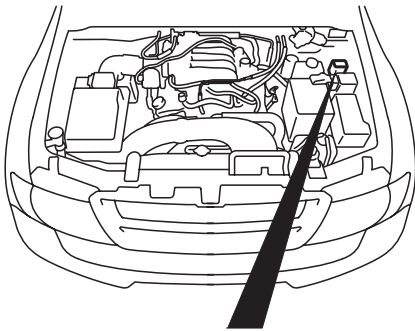
Q: Is the measured voltage 0 volt?

YES : Go to Step 7.

NO : Go to Step 6.



CONNECTOR: B-54X



RELAY BOX CONNECTOR

AC204551 AD

STEP 6. Check the following harness wire.

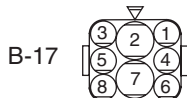
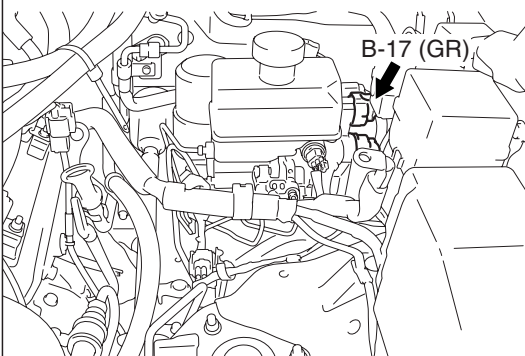
- The wire between motor relay B connector B-54X (terminal 5) and HBB connector B-17 (terminal 2)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 15.

NO : Go to Step 15.

CONNECTOR: B-17

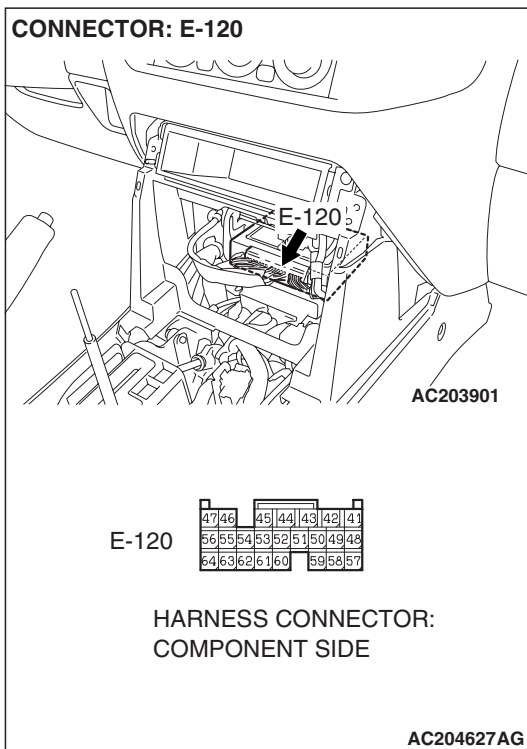
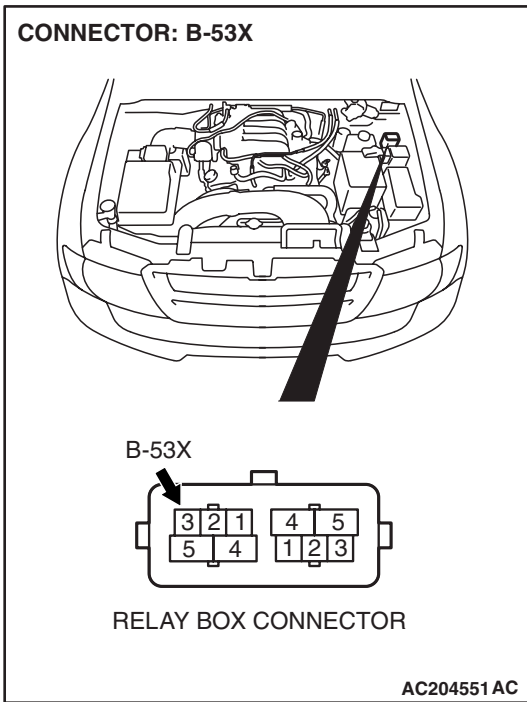


HARNESS CONNECTOR:
COMPONENT SIDE

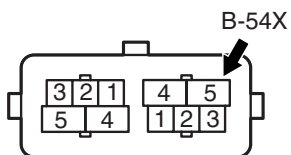
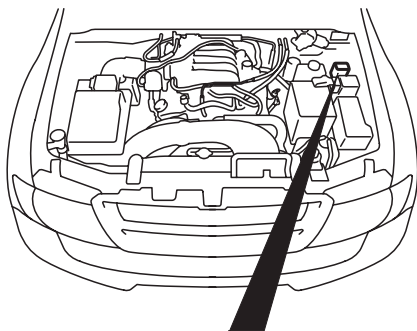
AC204629 AE

STEP 7. Check the following harness wires.

- The wire between motor relay A connector B-53X (terminal 1) and M-ASTC-ECU connector E-120 (terminal 1)



CONNECTOR: B-54X



RELAY BOX CONNECTOR

AC204551 AD

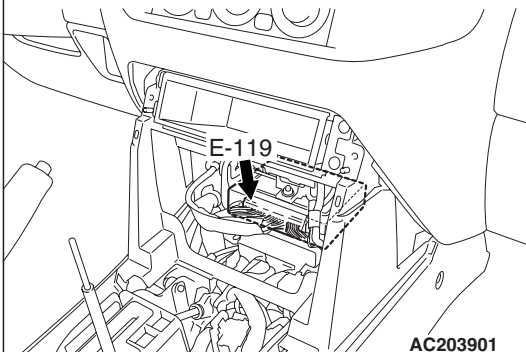
- The wire between motor relay B connector B-54X (terminal 1) and M-ASTC-ECU connector E-119 (terminal 24)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 15.

NO : Go to Step 8.

CONNECTOR: E-119



AC203901

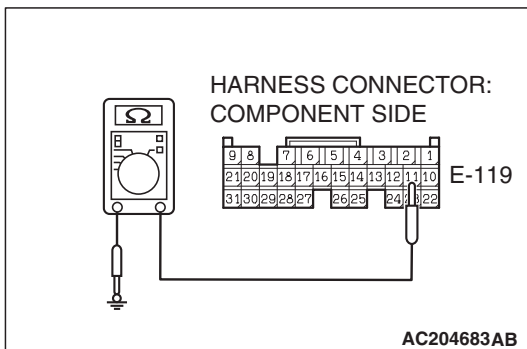
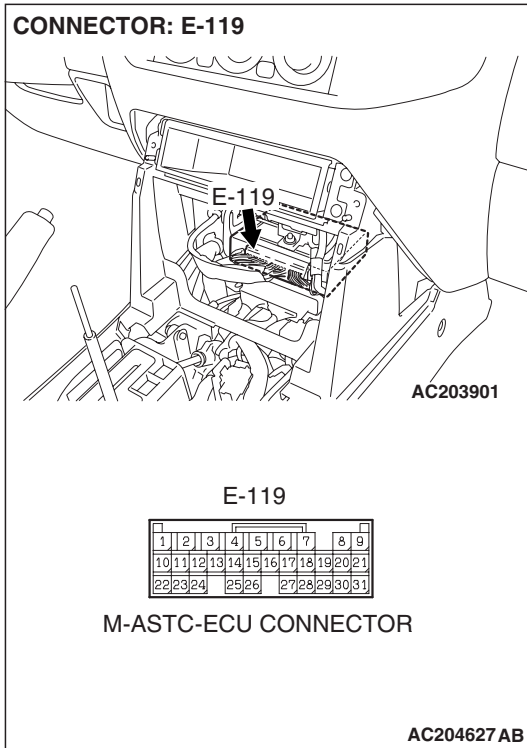
E-119



HARNESS CONNECTOR:
COMPONENT SIDE

AC204627 AC

STEP 8. Check the pressure switch (for pump motor control) circuit at M-ASTC-ECU harness connector E-119.
(1) Disconnect M-ASTC-ECU connector E-119 and measure at the harness connector (component side).



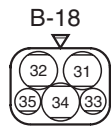
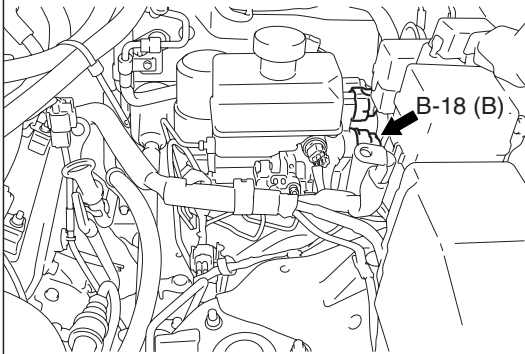
(2) Measure the resistance between terminal 11 and ground. The resistance should not measure less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 9.

NO : Go to Step 12.

CONNECTOR: B-18



HARNESS CONNECTOR :
COMPONENT SIDE

AC204626 AB

STEP 9. Check the following harness wire.

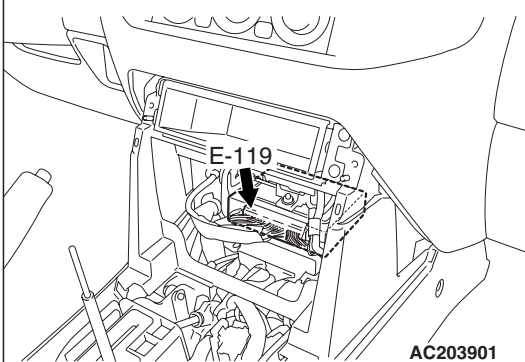
- The wire between HBB connector B-18 (terminal 35) and M-ASTC-ECU connector E-119 (terminal 11)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 15.

NO : Go to Step 10.

CONNECTOR: E-119



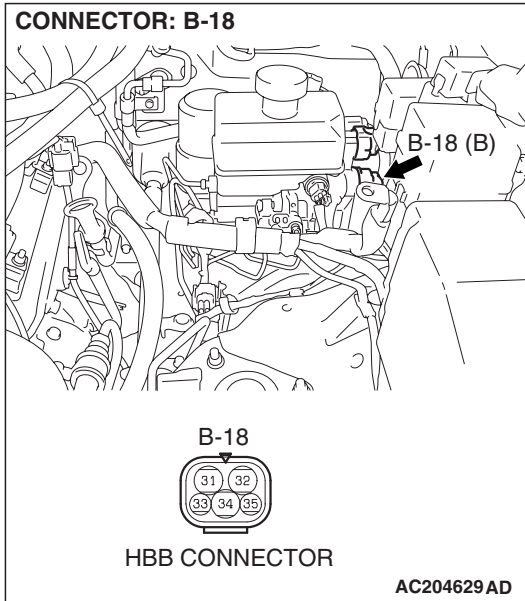
HARNESS CONNECTOR:
COMPONENT SIDE

AC204627 AC

STEP 10. Check the pressure switch (for pump motor control).

(1) Depress the pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.

(2) Disconnect HBB connector B-18.

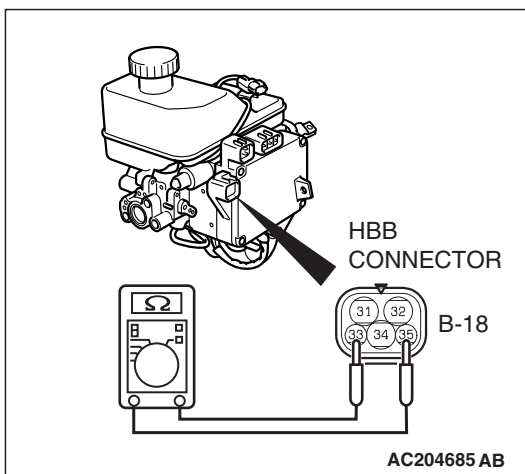


(3) Measure the resistance between the terminals 33 and 35 at the HBB. The resistance should measure approximately 1 k Ω .

Q: Is the resistance approximately 1 k Ω ?

YES : Go to Step 11.

NO : Replace the master cylinder and hydraulic unit assembly (Refer to [P.35A-139](#)). Then go to Step 15.



STEP 11. Check the pump motor operation.

Q: Does the pump motor operate?

YES : Go to Step 14.

NO : Go to Step 12.

STEP 12. Recheck for diagnostic trouble code.

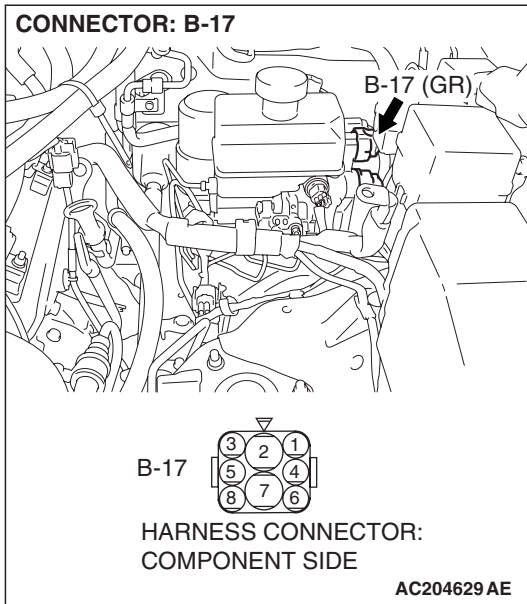
(1) Erase the DTC memory.

(2) Recheck for diagnostic trouble code.

Q: Is DTC 55 reset?

YES : Go to Step 13.

NO : The procedure is complete.

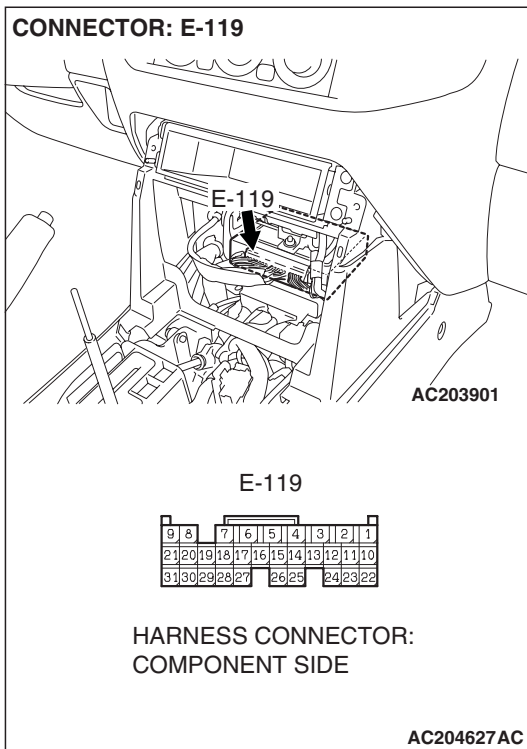


STEP 13. Check the following harness wire.

- The wire between HBB connector B-17 (terminal 4) and M-ASTC-ECU connector E-119 (terminal 25)

Q: Is the harness wire damaged?

- YES** : Repair or replace it and then go to Step 15.
NO : Go to Step 14.



STEP 14. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 55 set?

- YES** : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 15.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 15. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

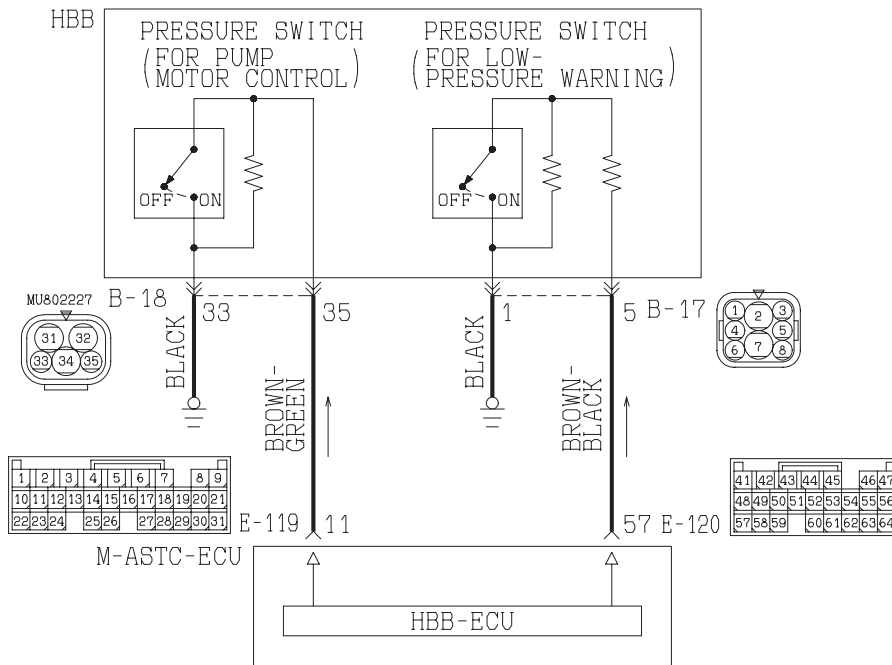
Q: Is DTC 55 set?

YES : Start over at Step 1.

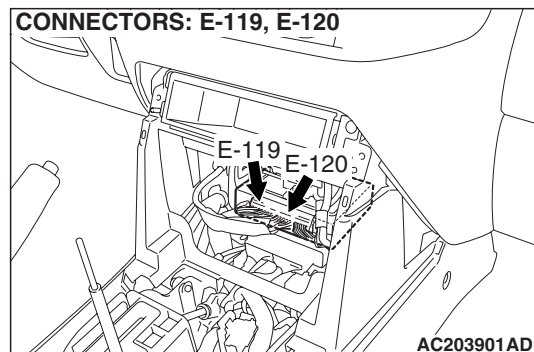
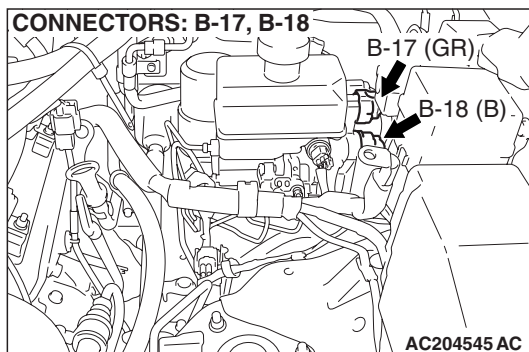
NO : The procedure is complete.

DTC 56 : Pressure Switch (Open or Short Circuit at the Pressure Switch)

Pressure Switch Circuit



W3Q05M06AA
AC204497AB



CIRCUIT OPERATION

- The pressure switch (for low-pressure warning) monitors brake fluid pressure inside of the hydraulic brake booster (HBB). When the brake fluid pressure decreases abnormally, the pressure switch (for low-pressure warning) is turned off and the brake fluid low-pressure warning signal is sent to the M-ASTC-ECU.
- The pressure switch (for pump motor control) monitors brake fluid pressure inside of the hydraulic brake booster (HBB). When the brake fluid pressure decreases lower than the specified value, the pressure switch (for pump motor control) is turned on and outputs the pump motor drive signal to the M-ASTC-ECU.
- The M-ASTC-ECU monitors an open circuit of the pressure switch (for pump motor control) (at 11 terminal).

- The M-ASTC-ECU monitors an open circuit or short circuit of the pressure switch (for low-pressure warning) (at 57 terminal).

HBB DTC SET CONDITIONS

DTC 56 is set if the pressure switch (for low-pressure warning) circuit is open or short, or the pressure switch (for pump motor control) circuit is open.

NOTE:

- *DTC 55 will be set if the pressure switch (for pump motor control) is stuck on.*
- *DTC 57 will be set if the pressure switch (for low-pressure warning) is stuck off.*

TROUBLESHOOTING HINTS

- Malfunction of the master cylinder and hydraulic unit assembly [Integrated with the hydraulic brake booster (HBB)]
- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

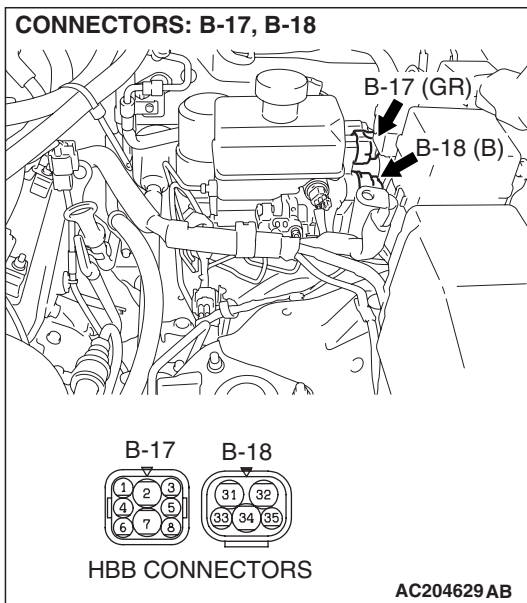
STEP 1. Check the following connectors.

- HBB connector B-17 and B-18
- Check connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 2.

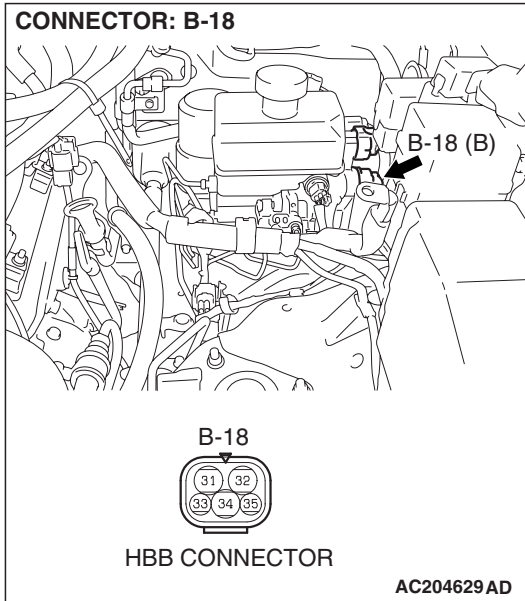
NO : Repair the faulty connector or terminal and then go to Step 8.



STEP 2. Check the pressure switch (for pump motor control) circuit inside the HBB.

(1) Depress the pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.

(2) Disconnect HBB connector B-18.

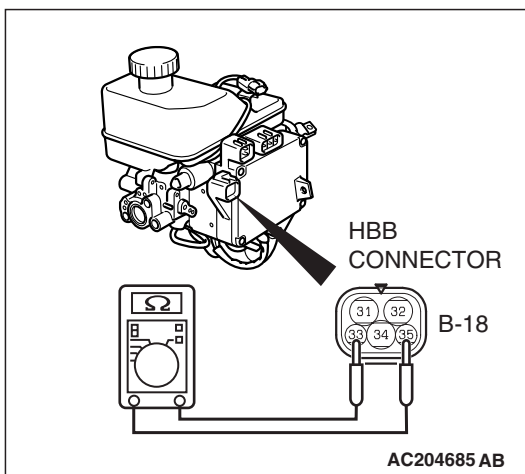


(3) Measure the resistance between the terminals 33 and 35 at the HBB. The resistance should measure approximately 1 k Ω .

Q: Is the resistance approximately 1 k Ω ?

YES : Go to Step 3.

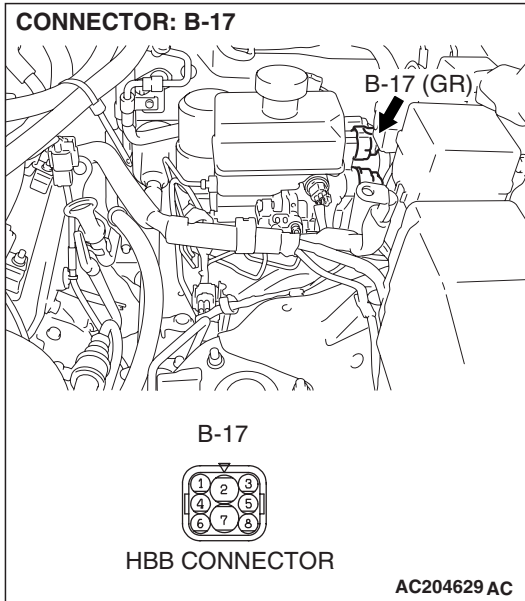
NO : Replace the master cylinder and hydraulic unit assembly (Refer to [P.35A-139](#)). Then go to Step 8.



STEP 3. Check the pressure switch (for low-pressure warning) circuit inside the HBB.

(1) Depress the pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.

(2) Disconnect HBB connector B-17.

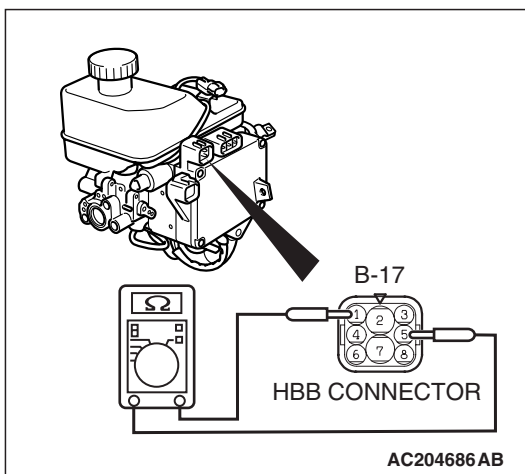


(3) Measure the resistance between the terminals 1 and 5 at the HBB. The resistance should measure approximately 5.7 k Ω .

Q: Is the resistance approximately 5.7 k Ω ?

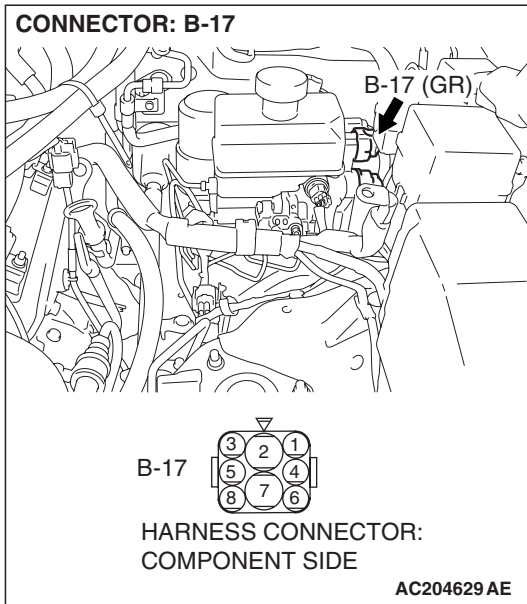
YES : Go to Step 4.

NO : Replace the master cylinder and hydraulic unit assembly (Refer to [P.35A-139](#)). Then go to Step 8.



STEP 4. Check the following harness wires.

- The wire between HBB connector B-17 (terminal 1) and ground

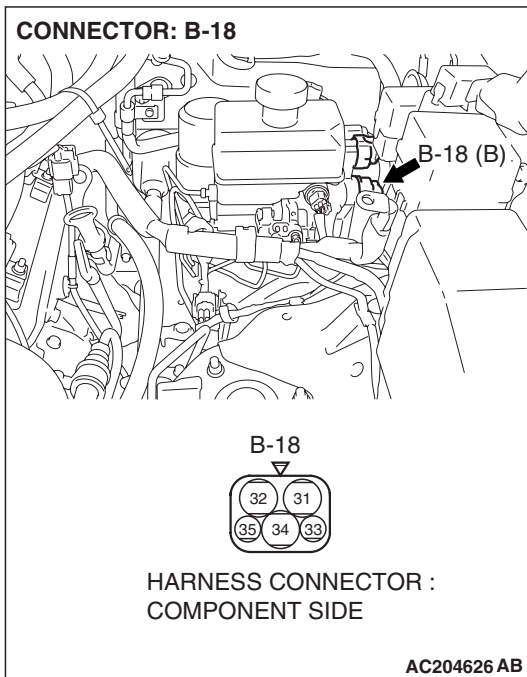


- The wire between HBB connector B-18 (terminal 33) and ground

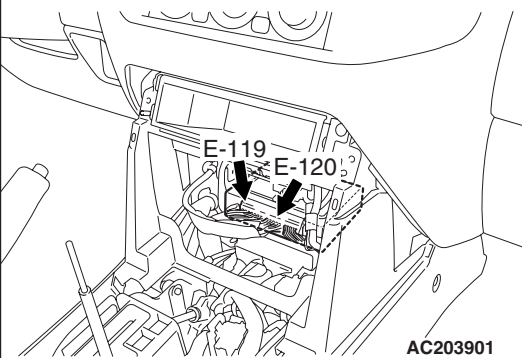
Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 8.

NO : Go to Step 5.



CONNECTORS: E-119, E-120



M-ASTC-ECU CONNECTORS

E-119

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31		

E-120

41	42	43	44	45	46	47		
48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	

AC204627 AD

STEP 5. Check the following connectors.

- M-ASTC-ECU connector E-119 and E-120

Check connectors, for loose, corroded or damaged terminals, or terminals pushed back in the connector.

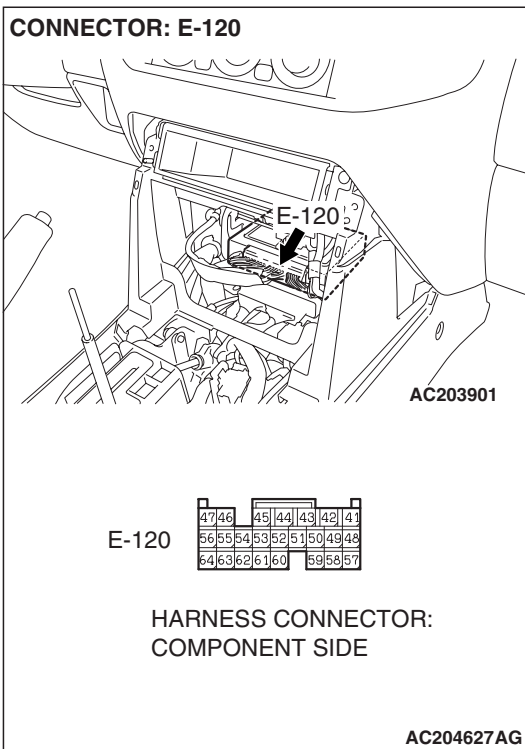
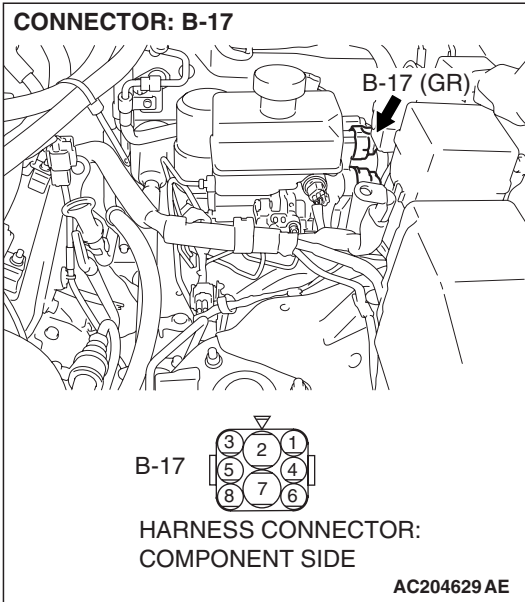
Q: Are the connectors and terminals in good condition?

YES : Go to Step 6.

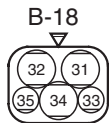
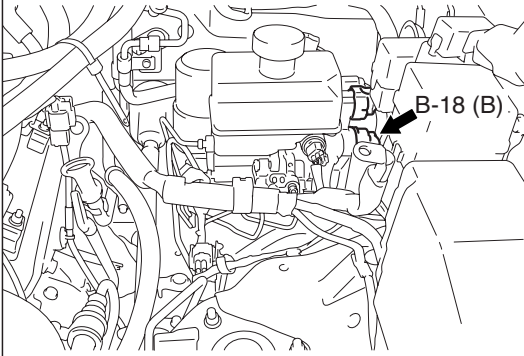
NO : Repair the faulty connector or terminal and then go to Step 8.

STEP 6. Check the following harness wires.

- The wire between HBB connector B-17 (terminal 5) and M-ASTC-ECU connector E-120 (terminal 57)



CONNECTOR: B-18



HARNESS CONNECTOR :
COMPONENT SIDE

AC204626 AB

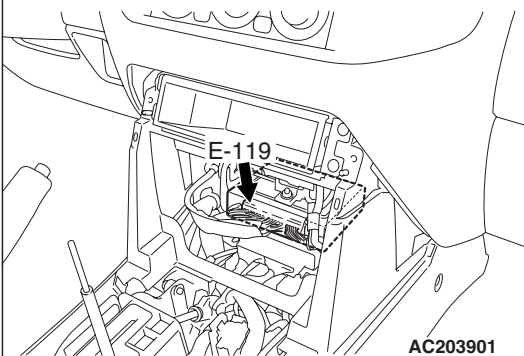
- The wire between HBB connector B-18 (terminal 35) and M-ASTC-ECU connector E-119 (terminal 11)

Q: Is any harness wire damaged?

YES : Repair or replace it and then go to Step 8.

NO : Go to Step 7.

CONNECTOR: E-119



HARNESS CONNECTOR:
COMPONENT SIDE

AC204627 AC

STEP 7. Recheck for diagnostic trouble code.

- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 56 set?

YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 8. Recheck for diagnostic trouble code.

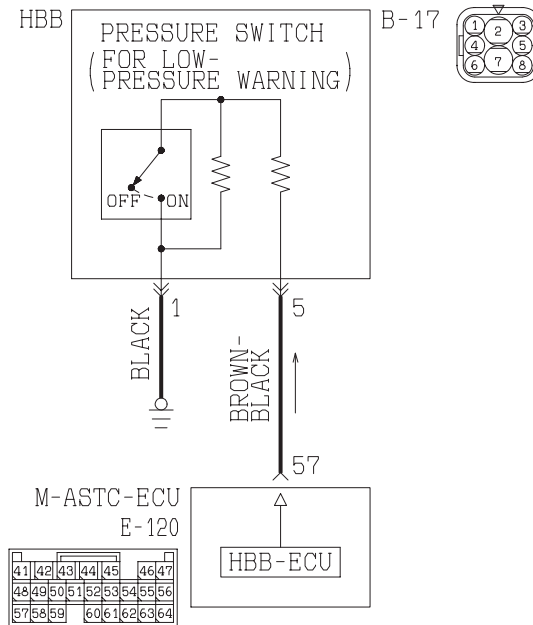
- (1) Erase the DTC memory.
- (2) Recheck for diagnostic trouble code.

Q: Is DTC 56 set?

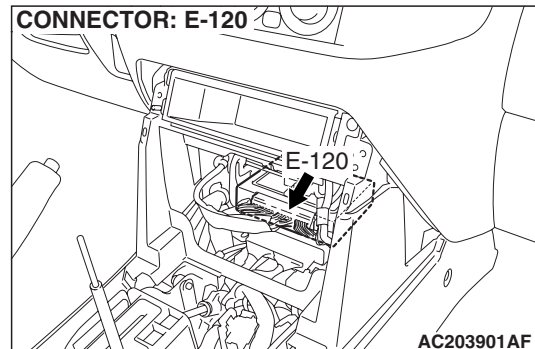
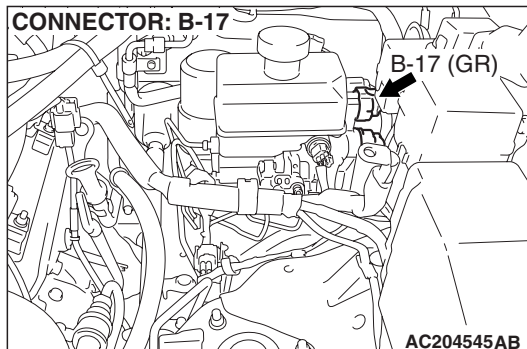
- YES** : Start over at Step 1.
- NO** : The procedure is complete.

DTC 57: Accumulator (Accumulator Low-Pressure Abnormality)

Pressure Switch (for Low-Pressure Warning) Circuit



W3Q05M07AA
AC204498AB



CIRCUIT OPERATION

The pressure switch (for low-pressure warning) monitors brake fluid pressure inside of the hydraulic brake booster (HBB). When the brake fluid pressure decreases abnormally, the pressure switch (for low-pressure warning) is turned off and the brake fluid low-pressure warning signal is output to the M-ASTC-ECU.

HBB DTC SET CONDITIONS

DTC 57 is set if the brake fluid pressure decreases, or the pressure switch (for low-pressure warning) OFF seize-up occurs. In this case, the M-ASTC-ECU sounds the buzzer continuously to inform the trouble of the driver and protects the pump motor by activating the pump motor intermittently.

TROUBLESHOOTING HINTS

- Brake fluid leakage in the hydraulic brake booster (HBB)
- Malfunction of the accumulator [Integrated with the hydraulic brake booster (HBB)]
- Malfunction of the pressure switch (for low-pressure warning) [Integrated with the hydraulic brake booster (HBB)]

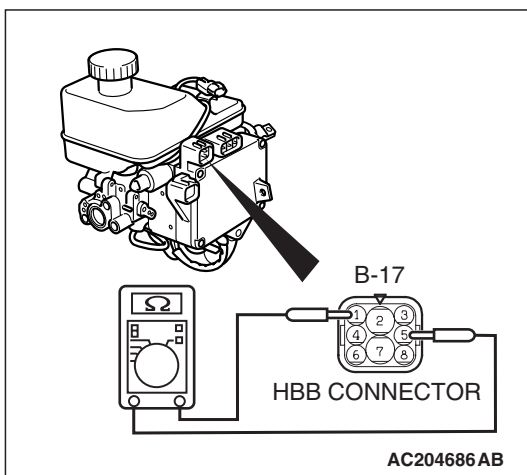
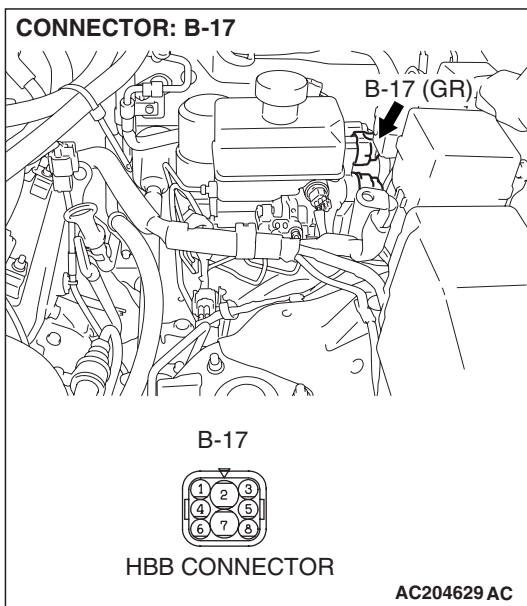
DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
- MB991223: Harness Set

STEP 1. Check the pressure switch (for low-pressure warning) circuit inside the HBB.

- (1) Depress the pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.
- (2) Disconnect HBB connector B-17.



- (3) Measure the resistance between the terminals 1 and 5 at the HBB. The resistance should measure approximately 1 kΩ.

Q: Is the resistance approximately 1 kΩ?

YES : Go to Step 2.

NO : Replace the master cylinder and hydraulic unit assembly (Refer to [P.35A-139](#)). Then go to Step 5.

STEP 2. Check the leakage of brake fluid from the HBB visually.

Q: Is there leakage of brake fluid from the HBB?

YES : Go to Step 3.

NO : Go to Step 4.

STEP 3. Disassemble and check the HBB.

(1) Remove the HBB (Refer to [P.35A-136](#)).

(2) Disassemble the HBB (Refer to [P.35A-139](#)).

(3) Check the HBB for the following points.

- Power piston assembly for rust, damage, wear and deterioration
- Master cylinder piston assembly for rust, damage, wear and deterioration
- Inside of the hydraulic unit assembly cylinder for rust and damage

Q: Are all of the checked items in good condition?

YES : Assemble the HBB (Refer to [P.35A-139](#)), install the HBB (Refer to [P.35A-136](#)), refill the brake fluid, and bleed the brake line (Refer to [P.35A-124](#)). Then go to Step 4.

NO : Replace the deficient parts, assemble the HBB (Refer to [P.35A-139](#)), install the HBB (Refer to [P.35A-136](#)), refill the brake fluid, and bleed the brake line (Refer to [P.35A-124](#)). Then go to Step 5.

STEP 4. Recheck for diagnostic trouble code.

(1) Erase the DTC memory.

(2) Recheck for diagnostic trouble code.

Q: Is DTC 57 set?

YES : Replace the accumulator (Refer to [P.35A-137](#)). Then go to Step 5.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points – How to Cope with Intermittent Malfunction [P.00-13](#).

STEP 5. Recheck for diagnostic trouble code.

(1) Erase the DTC memory.

(2) Recheck for diagnostic trouble code.

Q: Is DTC 57 set?

YES : Start over at Step 1.

NO : The procedure is complete.

SYMPTOM CHART

M1351013200050

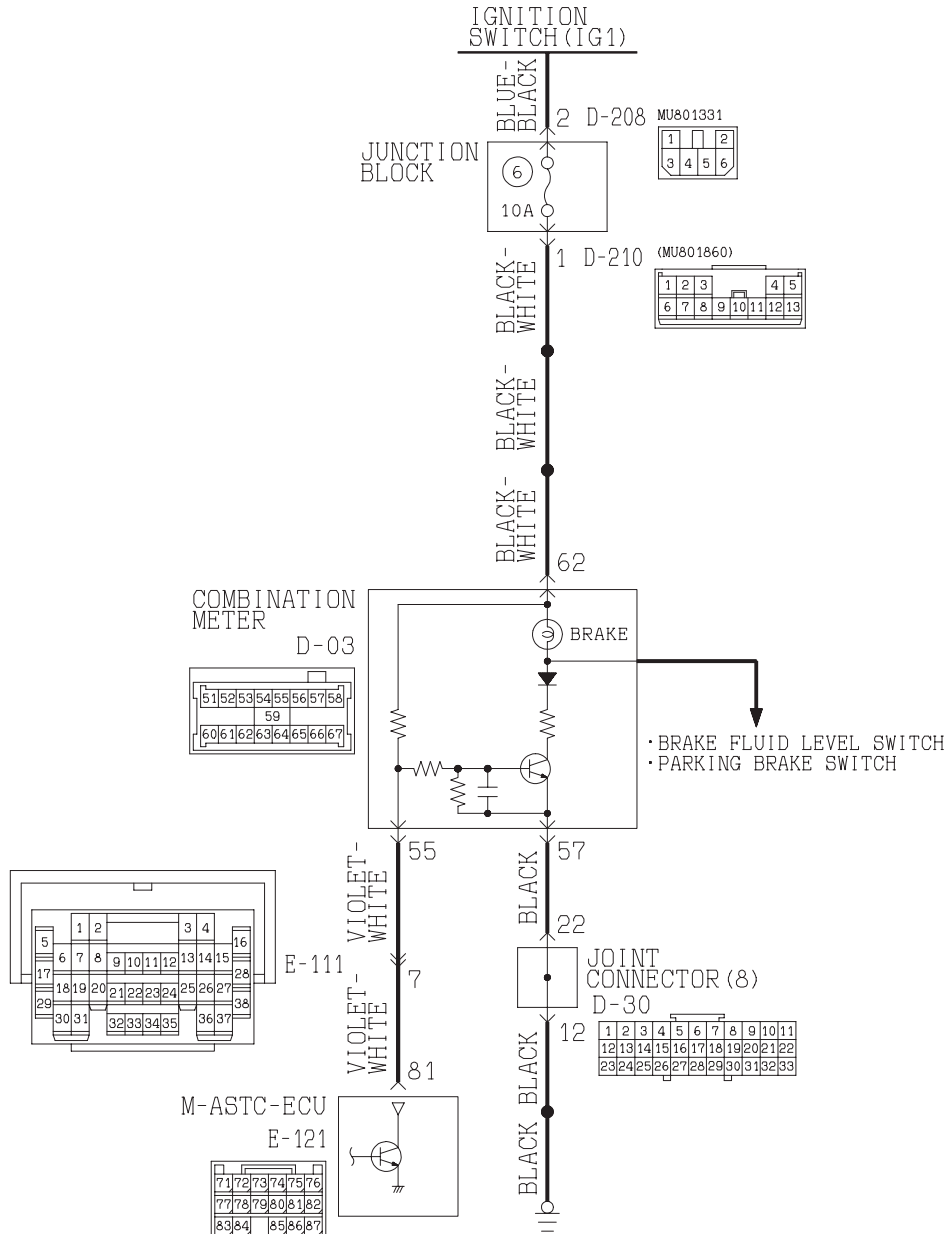
NOTE: The hydraulic brake booster (HBB) accumulates the high-pressure oil in the accumulator by the activation of the pump motor to assist the brake power. Even though the working sound of the pump motor can be heard during operation, this sound is usually generated at normal operation of the HBB and is not an indication of a malfunction.

SYMPTOM	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Communication between the scan tool and the whole system is not possible.	–	Refer to GROUP 13A, Diagnosis P.13A-888 .
Communication between the scan tool and the M-ASTC-ECU is not possible.	–	Refer to GROUP 35B, Diagnosis P.35B-4 .
The brake warning light does not illuminate when the ignition switch is turned to the "ON" position just after the engine start.	1	P.35A-82
The brake warning light remains illuminated after the engine is started.	2	P.35A-90
DTC 53 <seizure of the pump motor>, DTC 55 or DTC57 is set, but the buzzer does not sound.	3	P.35A-96
The buzzer does not stop sounding.	4	P.35A-104

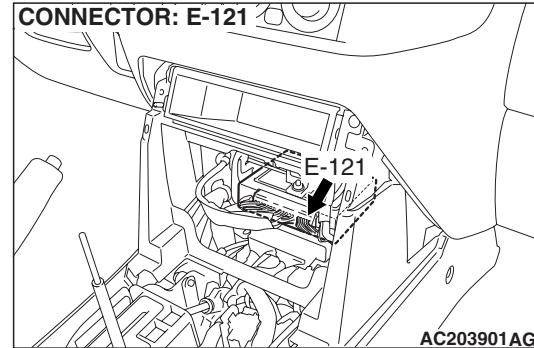
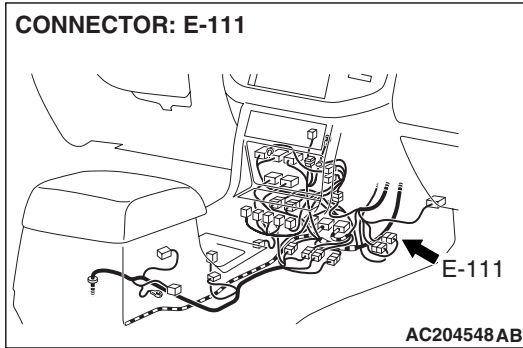
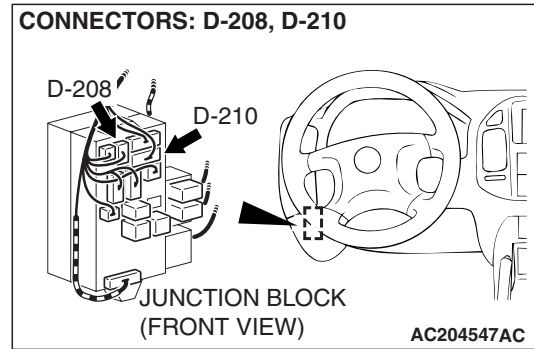
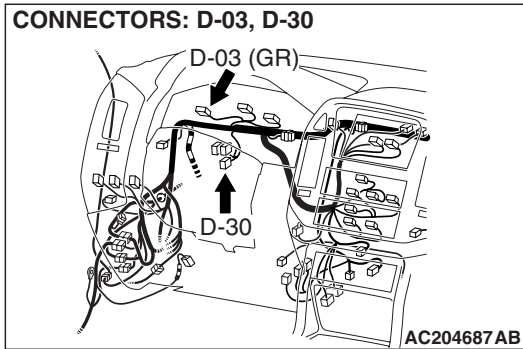
HBB SYMPTOM PROCEDURES

INSPECTION PROCEDURE 1: The Brake Warning Light does not Illuminate when the Ignition Switch is Turned to the "ON" Position just after the Engine Start.

Brake Warning Light Circuit



W3Q05M09AA
AC204500AB



CIRCUIT OPERATION

- The brake warning light power is supplied from the ignition switch (IG1). The M-ASTC-ECU grounds the circuit to illuminate the brake warning light.
- The M-ASTC-ECU illuminates the brake warning light for 3 seconds while running its self-check. The brake warning light can be illuminated for 3 seconds upon start-up or with the ignition switch in the "ON" position, and the engine stopped.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably an open circuit at the brake warning light circuit, or malfunction of the M-ASTC-ECU.

TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Blown fuse
- Malfunction of the combination meter
- Malfunction of the M-ASTC-ECU

DIAGNOSIS**Required Special Tool:**

- MB991223: Harness Set

STEP 1. Check whether the brake warning light illuminates.

Q: Does the brake warning light illuminate at the condition that the ignition switch is turned to the "ON" position and the engine is stopped.

YES : Go to Step 2.

NO : Go to Step 5.

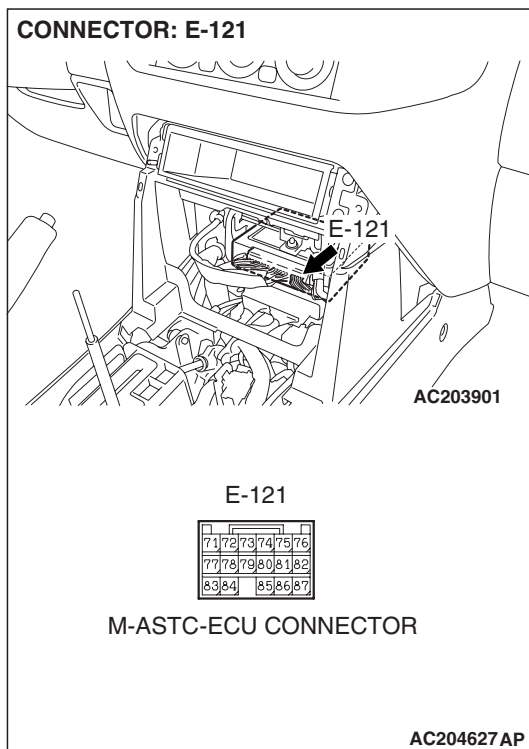
STEP 2. Check the brake warning light circuit at M-ASTC-ECU connector E-121.

- (1) Disconnect M-ASTC-ECU connector E-121.
- (2) Turn the ignition switch to the "ON" position.
- (3) Check whether the brake warning light is illuminated. The brake warning light should illuminate.

Q: Does the brake warning light illuminate?

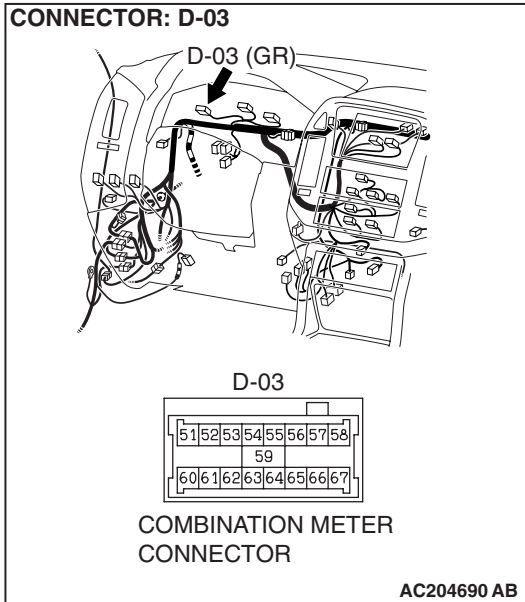
YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). and then go to Step 9.

NO : Go to Step 3.



STEP 3. Check the following connectors.

- Combination meter connector D-03

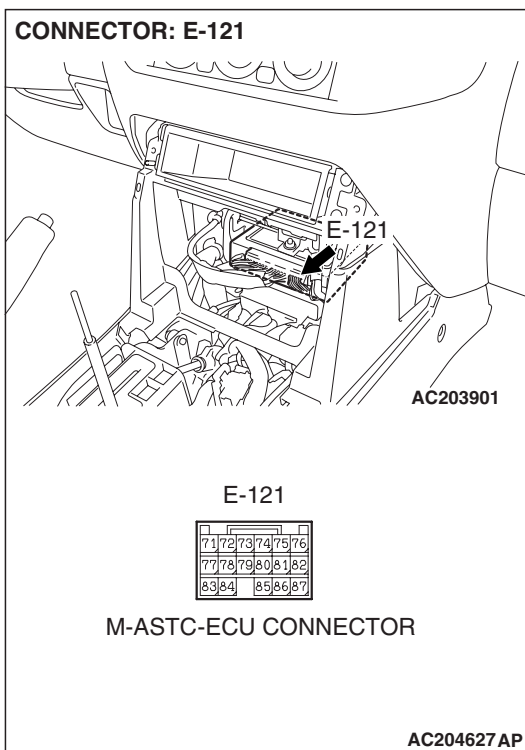


- M-ASTC-ECU connector E-121
- Check connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Is any of the connector damaged?

YES : Repair the faulty connector or terminal and then go to Step 9.

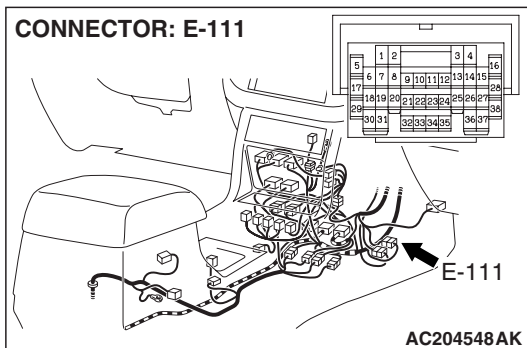
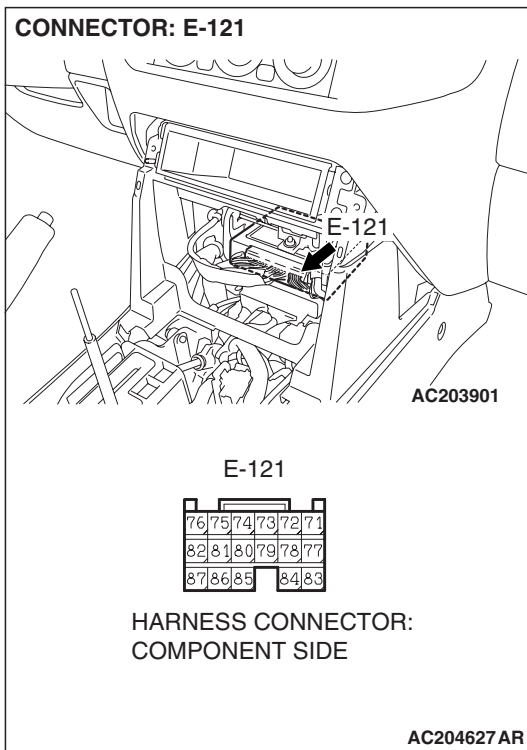
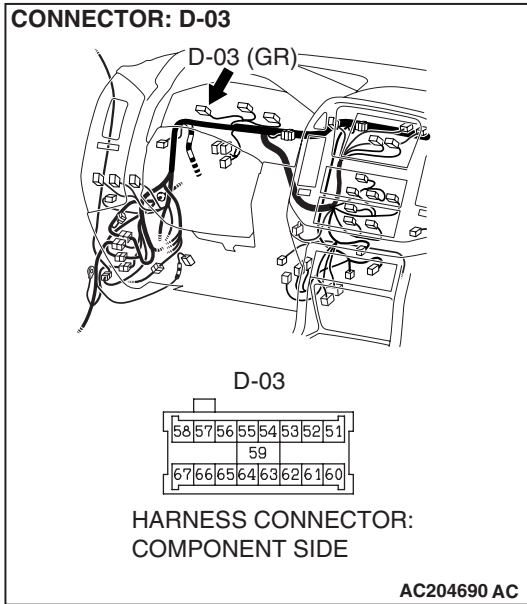
NO : Go to Step 4.



STEP 4. Check the following harness wire.

- The wire between combination meter connector D-03 (terminal 55) and M-ASTC-ECU connector E-121 (terminal 81)

NOTE:

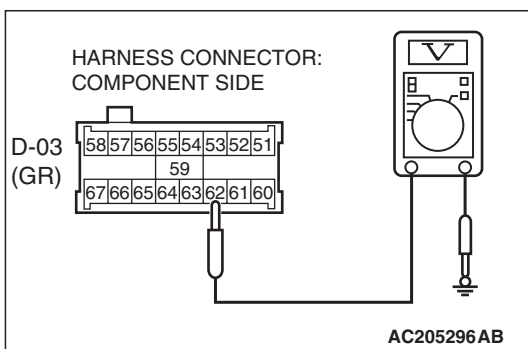
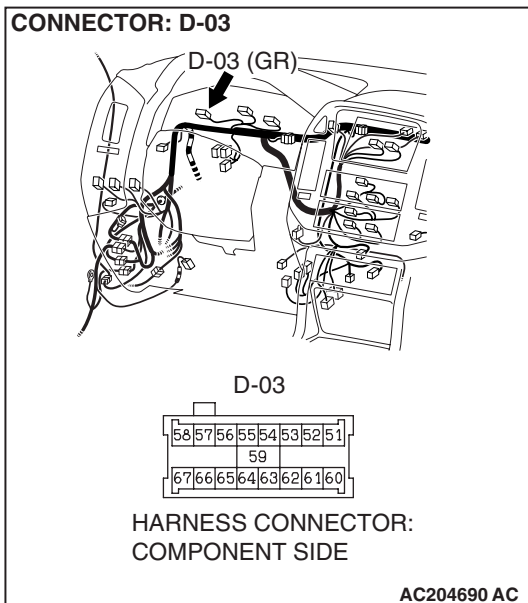


Also check intermediate connector E-111 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector E-111 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 9.

Q: Is the harness wire damaged?

YES : Repair it and then go to Step 9.

NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter and Vehicle Speed Sensor P.54A-74) and then go to Step 9.



STEP 5. Check the combination meter power supply circuit at combination meter harness connector D-03.

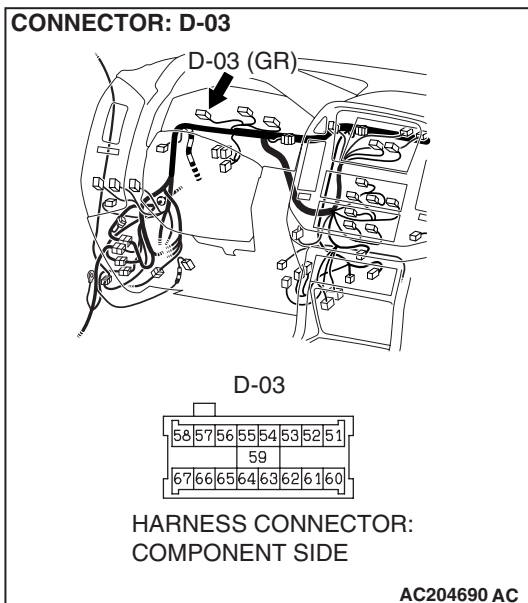
- (1) Disconnect combination meter connector D-03, and measure at the harness connector (component side).
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal 62 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the combination meter (Refer to GROUP 54A, Combination Meter and Vehicle Speed Sensor [P.54A-74](#)) and then go to Step 9.

NO : Go to Step 6.



STEP 6. Check the following connector.

- Combination meter connector D-03

Check connector for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connector and terminals in good condition?

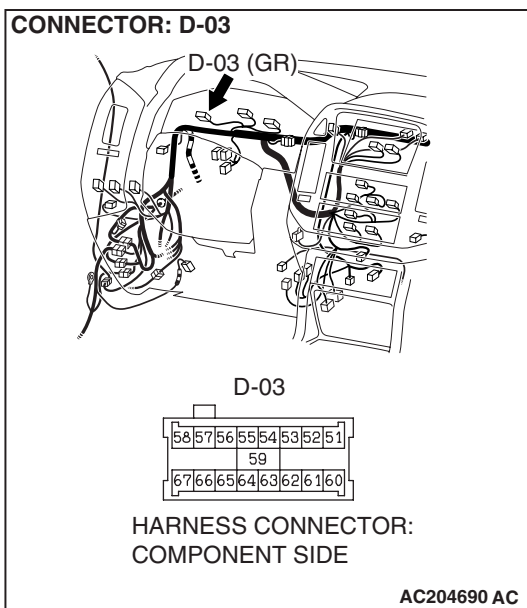
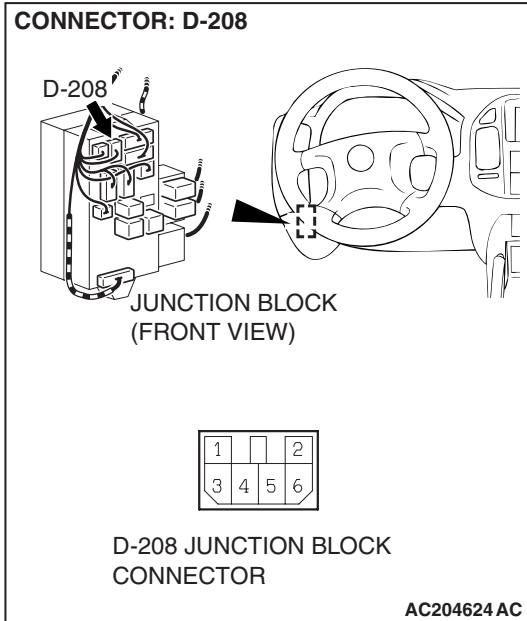
YES : Go to Step 7.

NO : Repair the faulty connector or terminal and then go to Step 9.

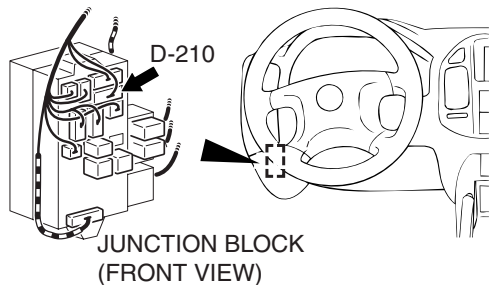
STEP 7. Check the following harness wire.

- The wire between junction block connector D-208 (terminal 2) and combination meter connector D-03 (terminal 62)

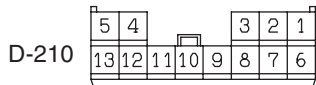
NOTE:



CONNECTOR: D-210



JUNCTION BLOCK
(FRONT VIEW)



HARNESS CONNECTOR:
COMPONENT SIDE

AC204624 AE

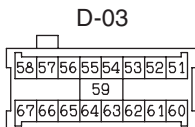
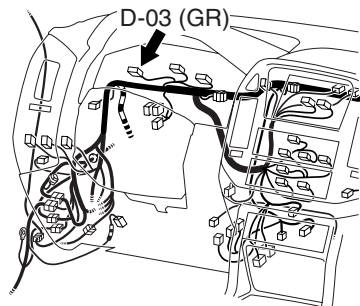
Also check intermediate connector D-210 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector D-210 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 9.

Q: Is the harness wire damaged?

YES : Repair it and then go to Step 8.

NO : Go to Step 9.

CONNECTOR: D-03

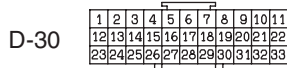
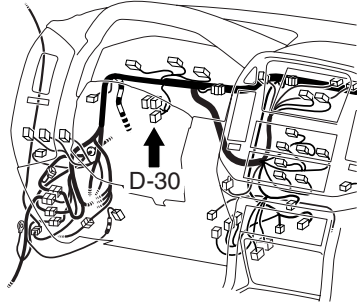


HARNESS CONNECTOR:
COMPONENT SIDE

AC204690 AC

STEP 8. Check the following harness wire.

- The wire between combination meter connector D-03 (terminal 57) and ground

CONNECTOR: D-30

JOINT CONNECTOR (8):
JOINT PIN SIDE

AC204690 AD

NOTE: Also check joint connector (8) D-30 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If joint connector (8) D-30 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 9.

Q: Is the harness wire damaged?

YES : Repair it and then go to Step 9.

NO : Go to Step 9.

STEP 9. Retest the system.

Q: Does the brake warning light illuminate for three seconds when the ignition switch is turned to the "ON" position with engine stopped?

YES : The procedure is complete.

NO : Start over at Step 1.

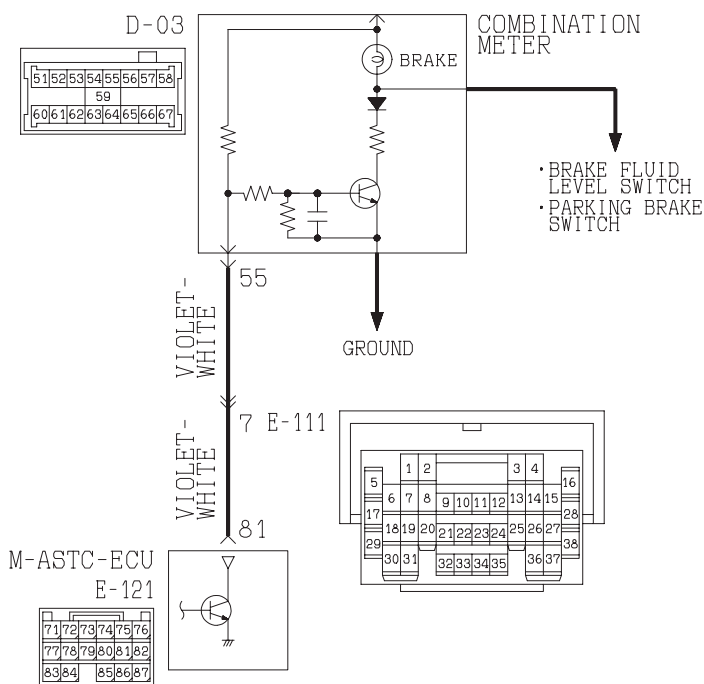
INSPECTION PROCEDURE 2: The Brake Warning Light Remains Illuminated after the Engine is Started.

⚠ CAUTION

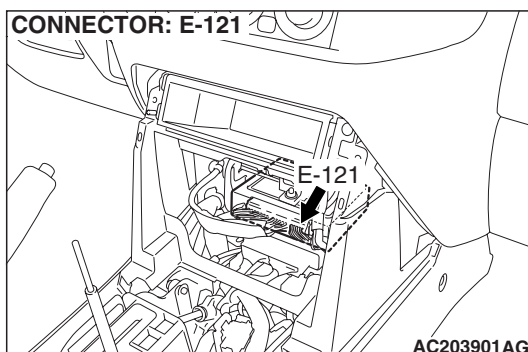
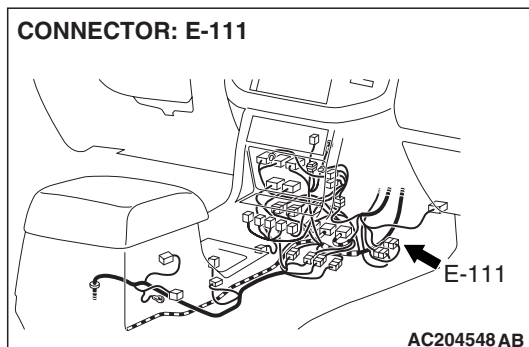
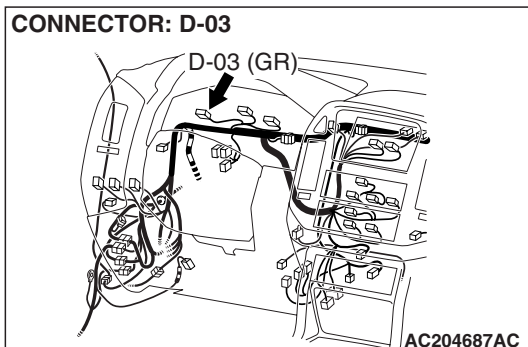
First of all, check the parking brake switch circuit and the brake fluid level switch circuit.

NOTE: This diagnosis procedure is limited to cases where communication with the scan tool is possible (M-ASTC-ECU power supply is normal) and no DTC sets.

Brake Warning Light Circuit



W3Q05M10AA
AC204501AB



CIRCUIT OPERATION

When the power transistor in the M-ASTC-ECU is off or the circuit between the M-ASTC-ECU and the combination meter is open, the power transistor in the combination meter will turn on to illuminate the brake warning light.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably the M-ASTC-ECU malfunction or open circuit at the M-ASTC-ECU's brake warning light drive circuit.

TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU
- Malfunction of the combination meter

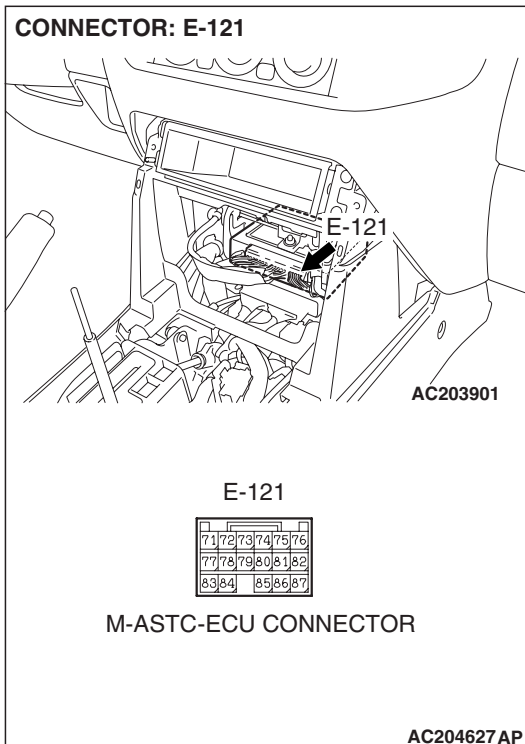
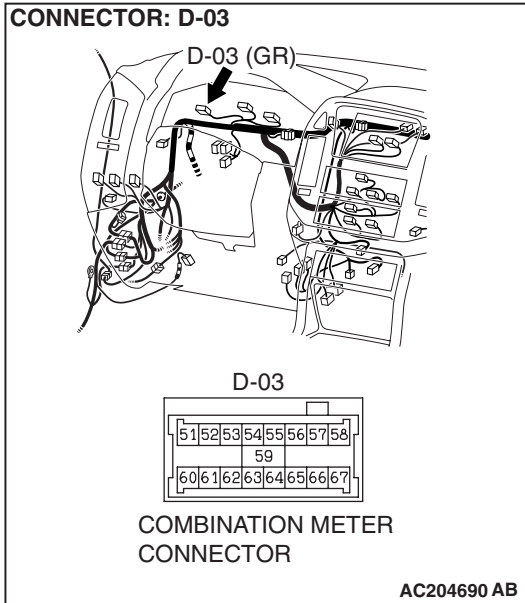
DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

STEP 1. Check the following connectors.

- Combination meter connector D-03



- M-ASTC-ECU connector E-121
- Check connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

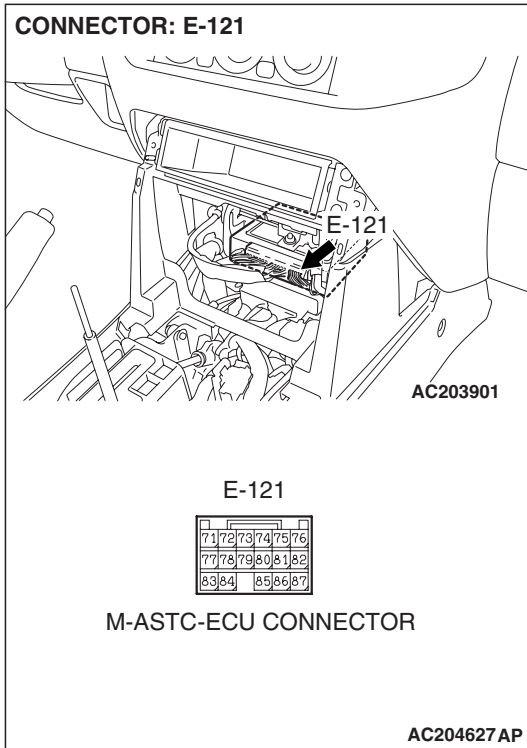
Q: Are the connectors and terminals in good condition?

YES : Go to Step 2.

NO : Repair the faulty connector or terminal and then go to Step 4.

STEP 2. Check the brake warning light drive circuit at M-ASTC-ECU harness connector E-121.

- (1) Disconnect M-ASTC-ECU connector E-121 and check at the harness connector (component side).
- (2) Turn the ignition switch to the "ON" position.

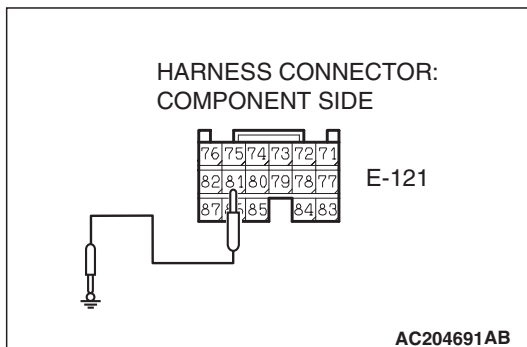


- (3) Connect terminal 81 to a body ground.

Q: Does the brake warning light turn off?

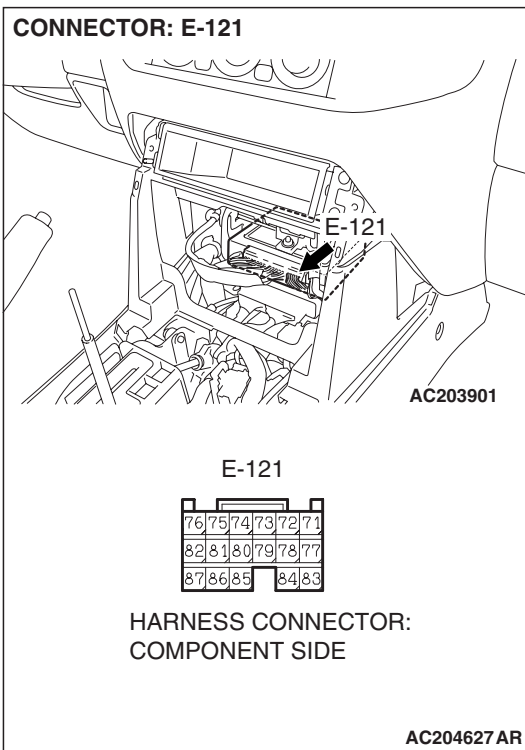
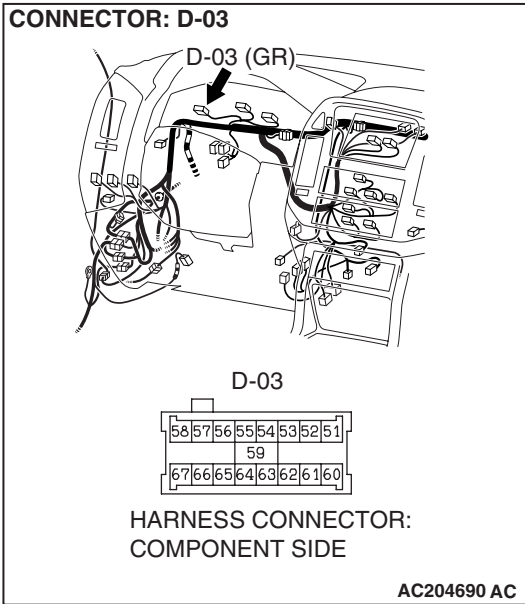
YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 4.

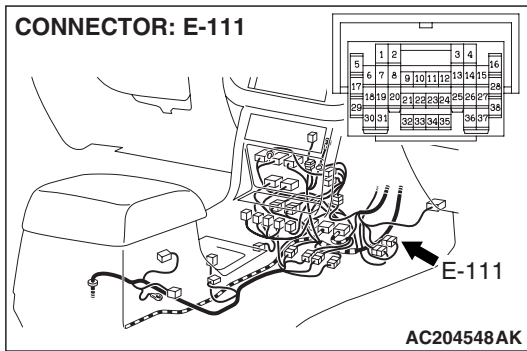
NO : Go to Step 3.



STEP 3. Check the following harness wire.

- The wire between combination meter connector D-03 (terminal 55) and M-ASTC-ECU connector E-121 (terminal 81)





NOTE: Also check intermediate connector E-111 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector E-111 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 4.

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 4.

NO : Replace the combination meter (Refer to GROUP 54A, Combination Meter and Vehicle Speed Sensor P.54A-74) and then go to Step 4.

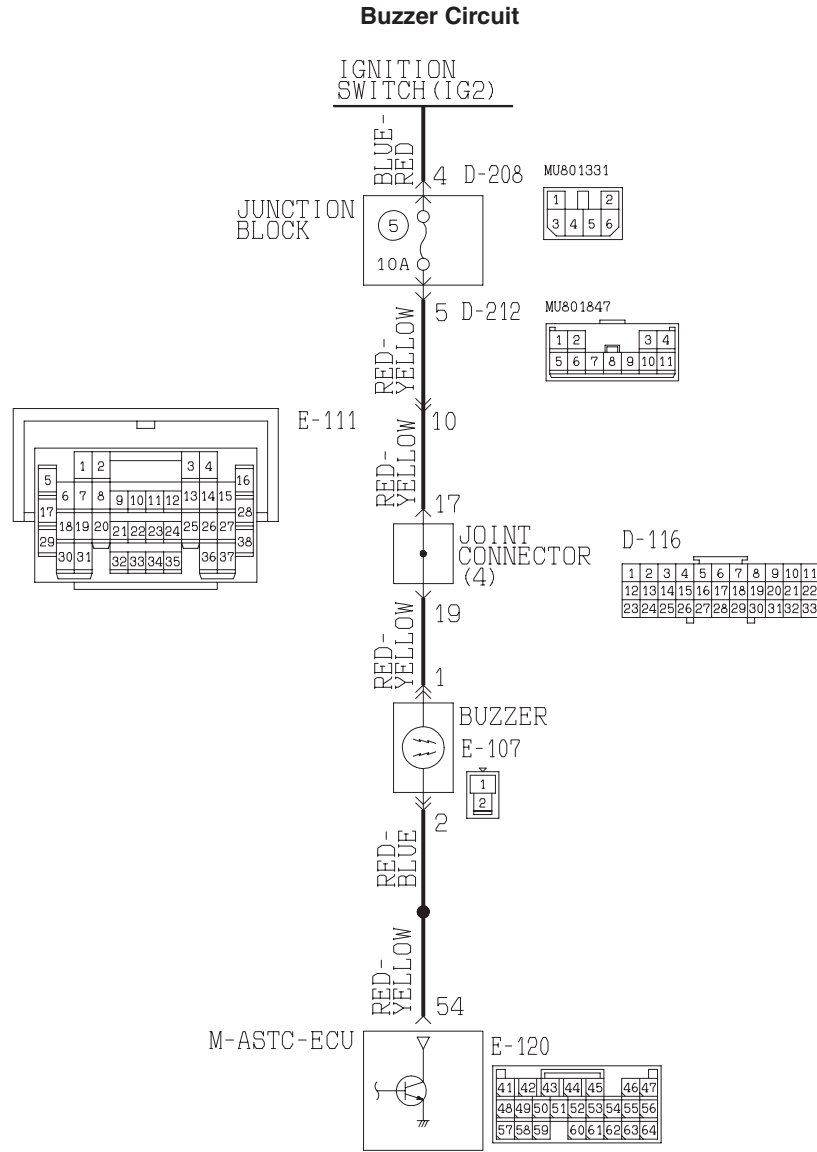
STEP 4. Retest the system.

Q: Does the brake warning light turn on for three seconds and then turn off on start-up?

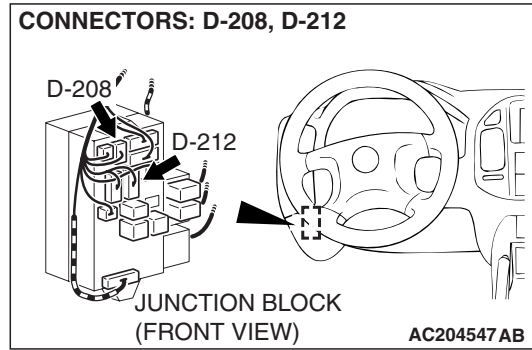
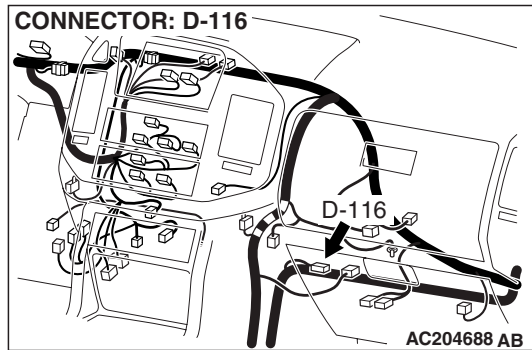
YES : The procedure is complete.

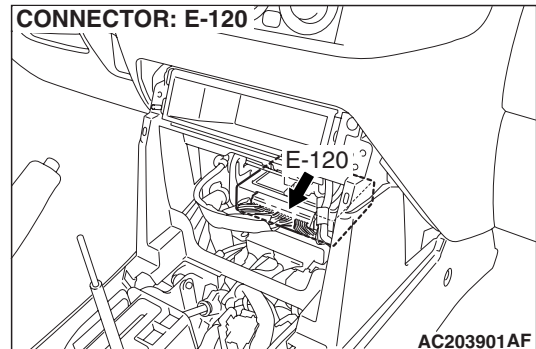
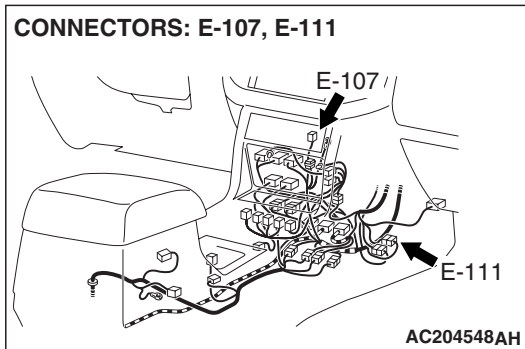
NO : Start over at Step 1.

INSPECTION PROCEDURE 3: DTC 53 <Seizure of the Pump Motor>, DTC55 or DTC57 is set, but the Buzzer does not Sound.



W3Q05M11AA
AC204502AB





CIRCUIT OPERATION

- The M-ASTC-ECU controls the buzzer by turning the power transistor in the M-ASTC-ECU ON and OFF.
- The M-ASTC-ECU outputs the buzzer-sounding signal at the malfunction of the hydraulic brake booster (HBB). (Also the M-ASTC-ECU turns on the brake warning light at the same time.)
- The buzzer will sound under the following cases:
 - a. When the pump motor is locked (DTC 53 is set).
 - b. When the pump motor is energized abnormally for long period (DTC 55 is set).

- c. When the accumulator pressure is abnormally low (DTC 57 is set).
- d. When the solenoid valve temperature in the M-ASTC-ECU is abnormally high (DTC is not set).

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably an open circuit at the buzzer circuit, a malfunction of the buzzer or a failure of buzzer drive transistor in the M-ASTC-ECU.

TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the buzzer
- Malfunction of the M-ASTC-ECU

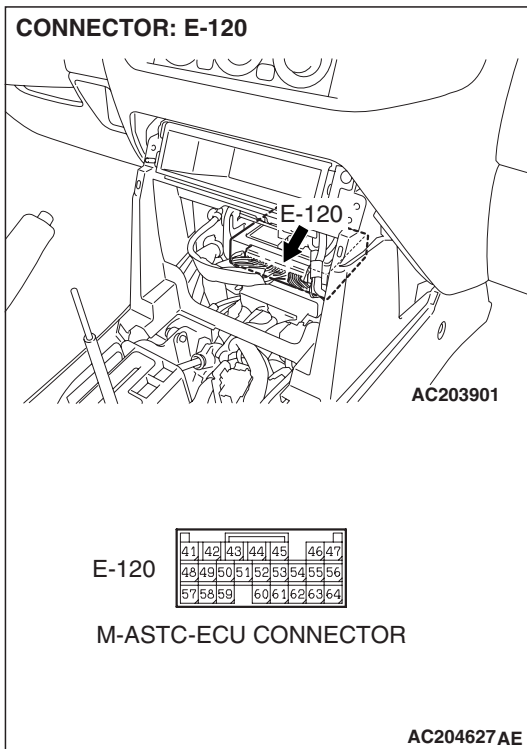
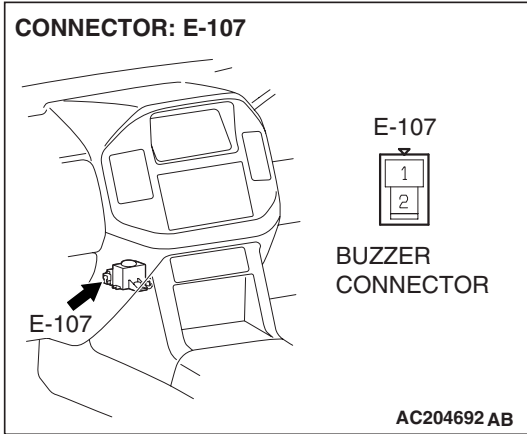
DIAGNOSIS

Required Special Tool:

- MB991223: Harness Set

STEP 1. Check the following connectors.

- Buzzer connector E-107



- M-ASTC-ECU connector E-120

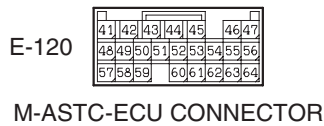
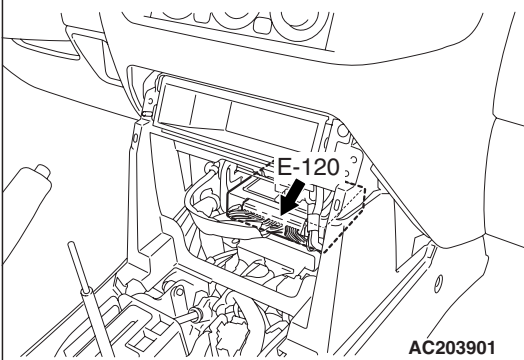
Check connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

Q: Are the connectors and terminals in good condition?

YES : Go to Step 2.

NO : Repair the faulty connector or terminal and then go to Step 7.

CONNECTOR: E-120



AC204627 AE

STEP 2. Check the buzzer circuit at M-ASTC-ECU harness connector E-120.

- (1) Disconnect M-ASTC-ECU connector E-120 and check at the harness connector (component side).
- (2) Turn the ignition switch to the "ON" position.

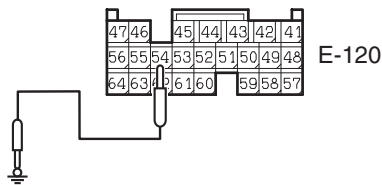
- (3) Connect terminal 54 to body ground.

Q: Does the buzzer sound?

YES : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU P.35C-207). Then go to Step 7.

NO : Go to Step 3.

**HARNESS CONNECTOR:
COMPONENT SIDE**



AC204726 AB

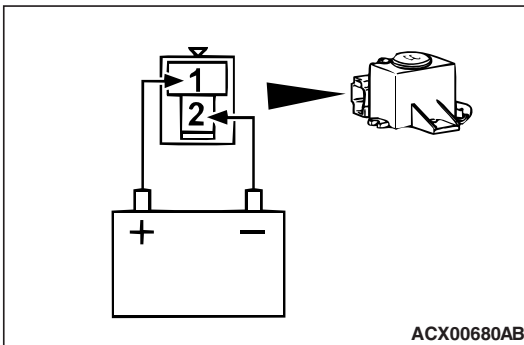
STEP 3. Check the buzzer.

- (1) Remove the buzzer (Refer to P.35A-141).
- (2) Connect the battery to the buzzer as shown on the illustration.

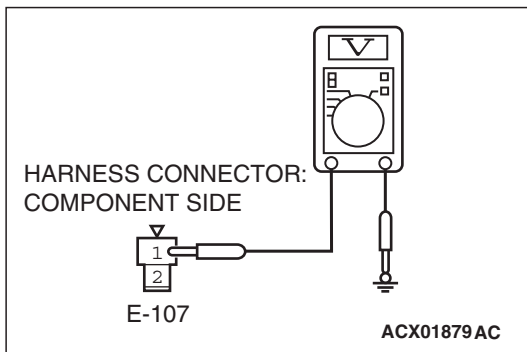
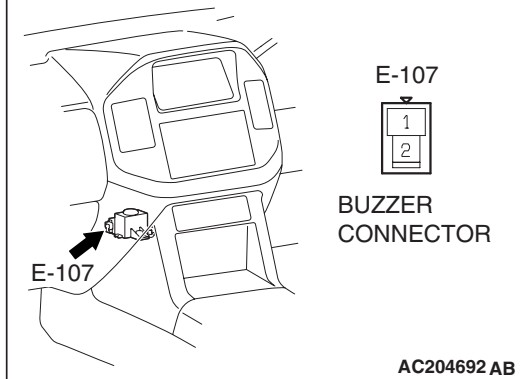
Q: Does the buzzer sound?

YES : Go to Step 4.

NO : Replace the buzzer (Refer to P.35A-141). Then go to Step 7.



ACX00680AB

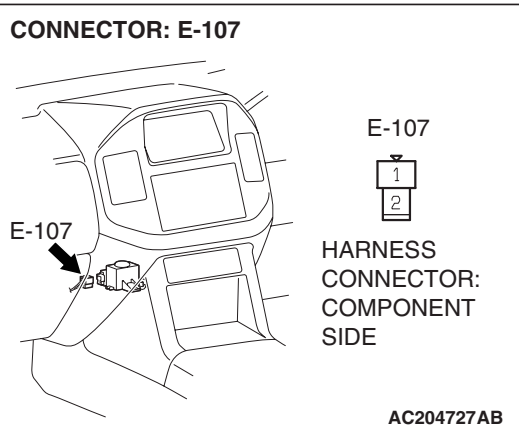
CONNECTOR: E-107**STEP 4. Check the buzzer power supply circuit at buzzer harness connector E-107.**

- (1) Disconnect buzzer connector E-107, and measure at the harness connector (component side).
- (2) Turn the ignition switch to the "ON" position.

- (3) Measure the voltage between terminal 1 and ground. The voltage should measure approximately 12 volts (battery positive voltage).

Q: Is battery positive voltage (approximately 12 volts) present?

- YES :** Go to Step 5.
NO : Go to Step 6.



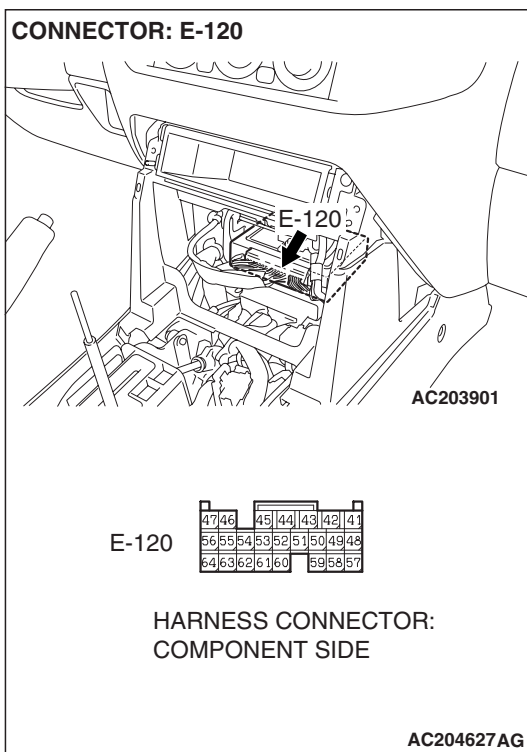
STEP 5. Check the following harness wire.

- The wire between buzzer connector E-107 (terminal 2) and M-ASTC-ECU connector E-120 (terminal 54)

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 7.

NO : Go to Step 7.

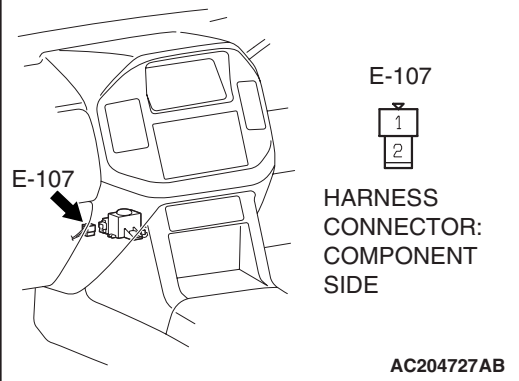


STEP 6. Check the following harness wire.

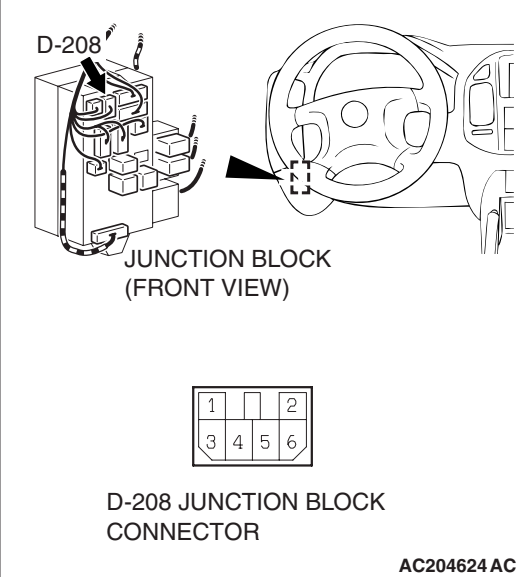
- The wire between buzzer connector E-107 (terminal 1) and junction block connector D-208 (terminal 4)

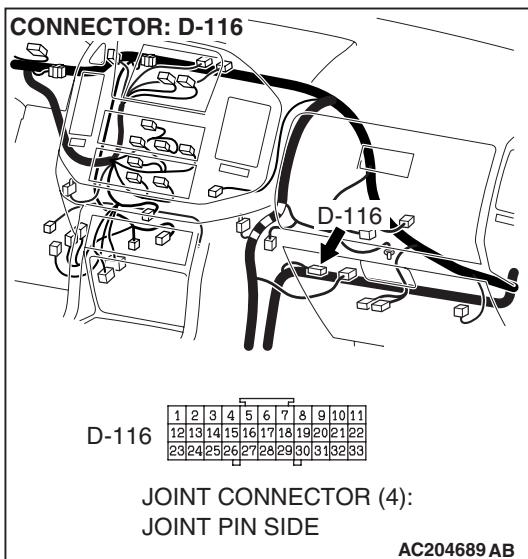
NOTE:

CONNECTOR: E-107



CONNECTOR: D-208



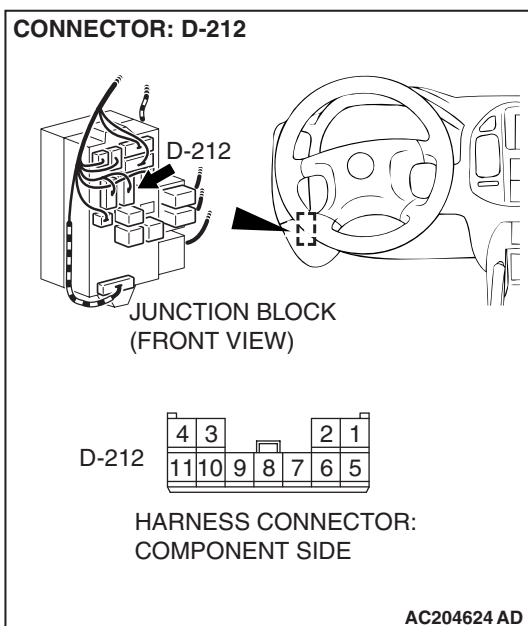
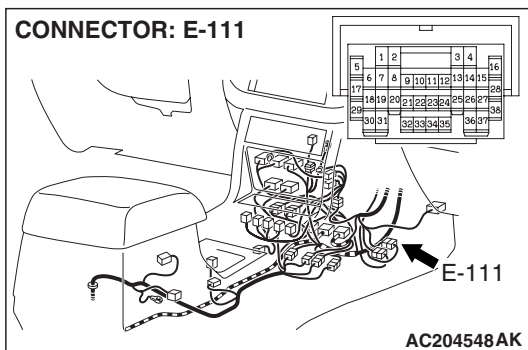


Also check joint connector D-116, intermediate connector E-111 and junction block connector D-212 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If joint connector D-116, intermediate connector E-111 or junction block connector D-212 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 7.

Q: Is the harness wire damaged?

YES : Repair it and then go to Step 7.

NO : Go to Step 7.



STEP 7. Retest the system.

- (1) Apply a chock to the wheel.
- (2) Start the engine.
- (3) When 120 seconds or more have been elapsed since the engine was started, release the parking brake lever and fully depress the brake pedal repeatedly 15 to 20 times within 10 seconds.

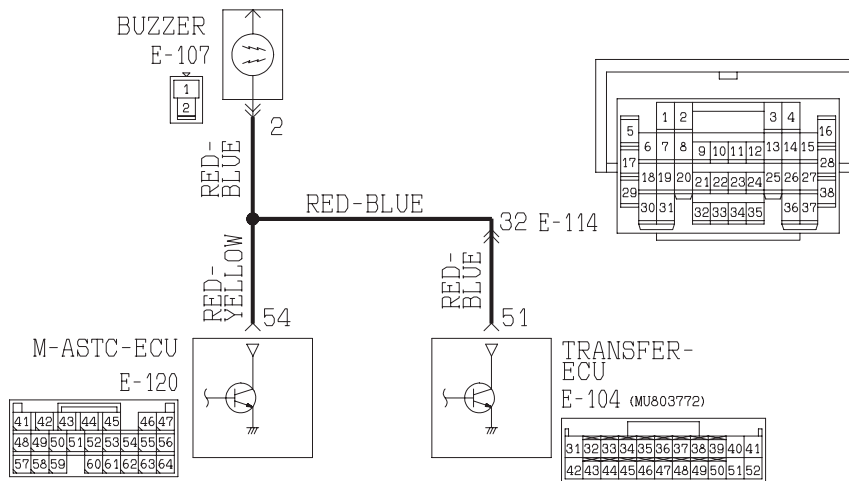
Q: Does the buzzer sound?

- YES :** The procedure is complete.
NO : Start over at Step 1.

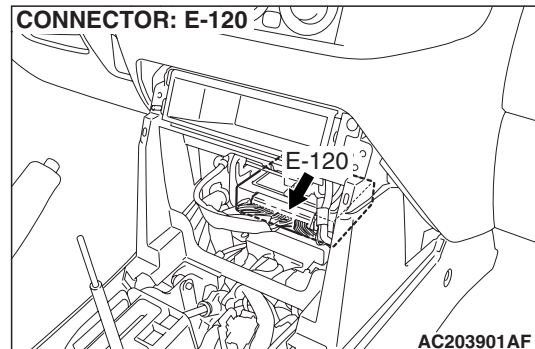
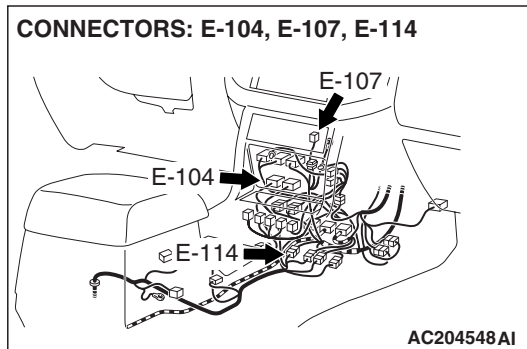
INSPECTION PROCEDURE 4: The Buzzer does not Stop Sounding.

NOTE: This diagnosis procedure is limited to cases where communication with the scan tool is possible (M-ASTC-ECU power supply is normal) and no DTC sets.

Brake Warning Light Circuit



W3Q05M12AA
AC204503AB



CIRCUIT OPERATION

- The M-ASTC-ECU and the transfer-ECU controls the buzzer by turning the power transistor in the ECU ON and OFF.
- The M-ASTC-ECU outputs the buzzer-sounding signal when an abnormality occurs on the hydraulic brake booster (At the same time, the M-ASTC-ECU turns on the brake warning light).

- The transfer-ECU outputs the buzzer-sounding signal when an abnormality occurs on the active trac 4WD II system.

TECHNICAL DESCRIPTION (COMMENT)

The cause is probably an M-ASTC-ECU or transfer-ECU malfunction.

TROUBLESHOOTING HINTS

- Damaged wiring harness or connector
- Malfunction of the M-ASTC-ECU
- Malfunction of the transfer-ECU
- Malfunction of the buzzer

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B

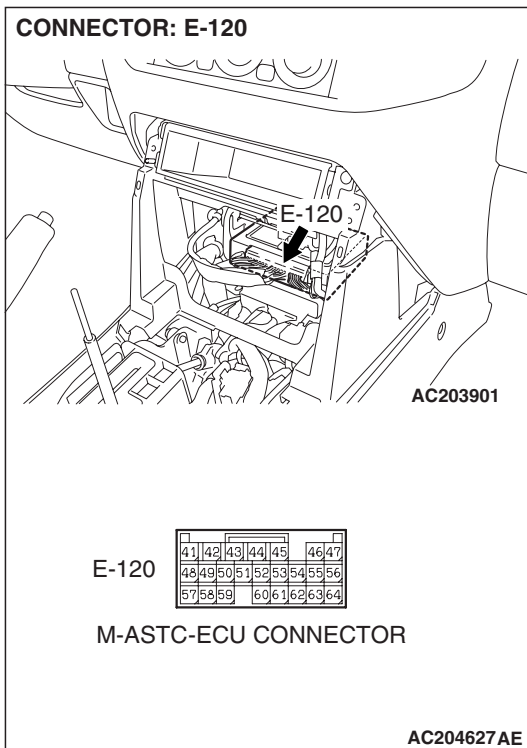
STEP 1. Check the buzzer circuit at M-ASTC-ECU connector E-120.

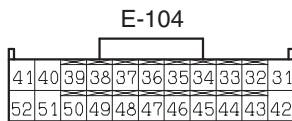
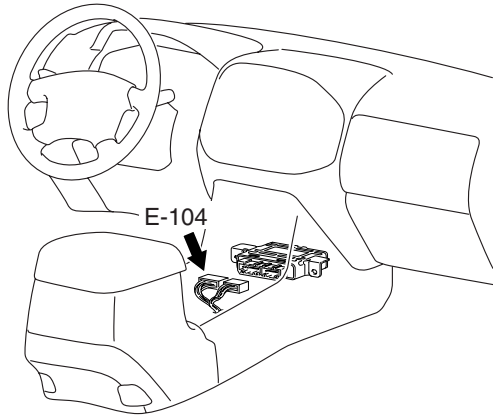
Disconnect M-ASTC-ECU connector E-120.

Q: Does the buzzer still keep on sounding?

YES : Go to Step 2.

NO : Replace the M-ASTC-ECU (Refer to GROUP 35C, M-ASTC-ECU [P.35C-207](#)). Then go to Step 5.



CONNECTOR: E-104

HARNESS CONNECTOR:
COMPONENT SIDE

AC204728 AB

STEP 2. Check the buzzer circuit at transfer-ECU connector E-104.

Disconnect transfer-ECU connector E-104.

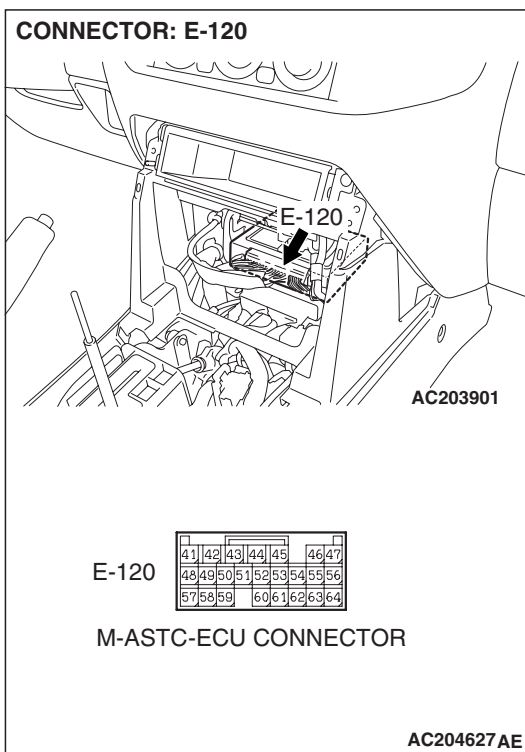
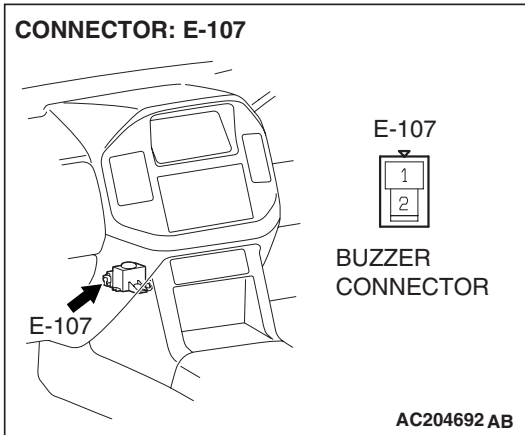
Q: Does the buzzer still keep on sounding?

YES : Go to Step 3.

NO : Replace the transfer-ECU (Refer to GROUP 23A, Transfer-ECU [P.23A-574](#)). Then go to Step 5.

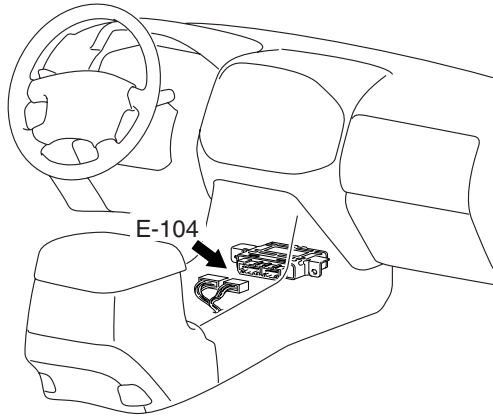
STEP 3. Check the following connectors.

- Buzzer connector E-107



- M-ASTC-ECU connector E-120

CONNECTOR: E-104



E-104

31	32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51	52

TRANSFER-ECU CONNECTOR

AC204728 AC

- Transfer-ECU connector E-104

Check connectors for loose, corroded or damaged terminals, or terminals pushed back in the connector.

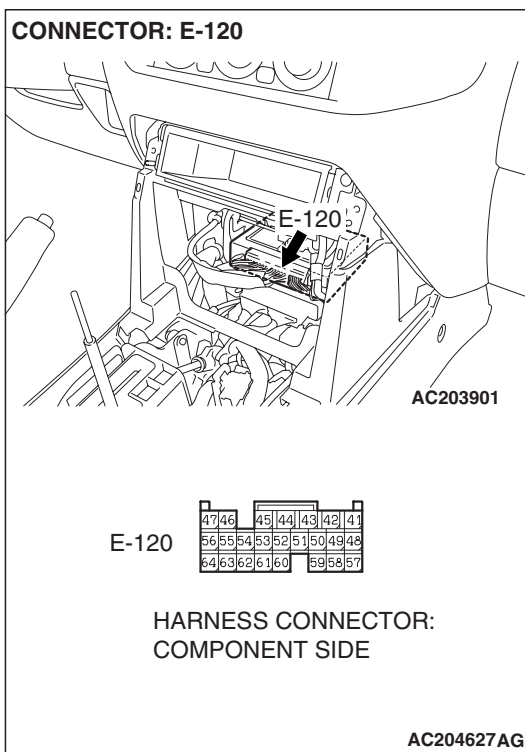
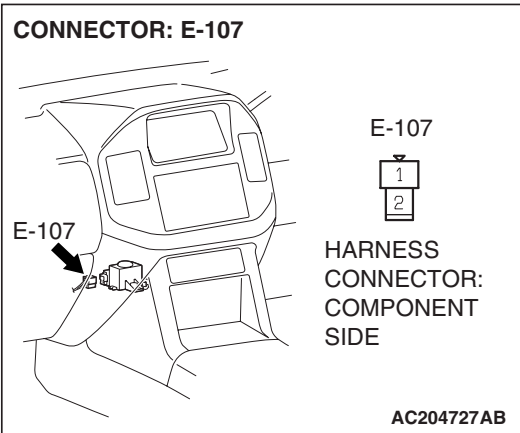
Q: Are the connectors and terminals in good condition?

YES : Go to Step 4.

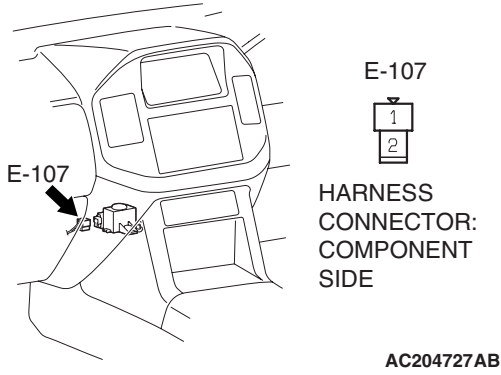
NO : Repair the faulty connector or terminal and then go to Step 5.

STEP 4. Check the following harness wires.

- The wire between buzzer connector E-107 (terminal 2) and M-ASTC-ECU connector E-120 (terminal 54)

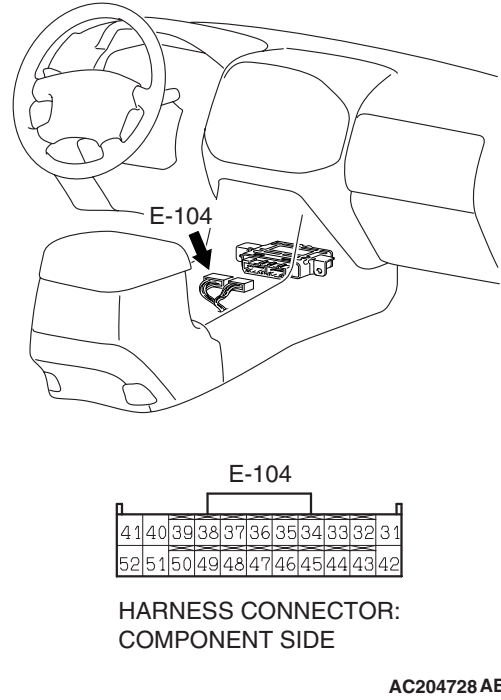


CONNECTOR: E-107

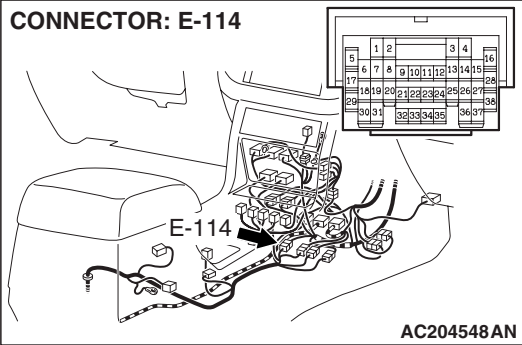


- The wire between buzzer connector E-107 (terminal 2) and transfer-ECU connector E-104 (terminal 51)

CONNECTOR: E-104



CONNECTOR: E-114



NOTE: Also check intermediate connector E-114 for loose, corroded, or damaged terminals, or terminals pushed back in the connector. If intermediate connector E-114 is damaged, repair or replace the damaged component(s) as described in GROUP 00E, Harness Connector Inspection P.00E-2. If the connector has been repaired or replaced, go to Step 5.

Q: Is the harness wire damaged?

YES : Repair or replace it and then go to Step 5.

NO : Replace the buzzer (Refer to P.35A-141). Then go to Step 5 .

STEP 5. Retest the system.

⚠ CAUTION

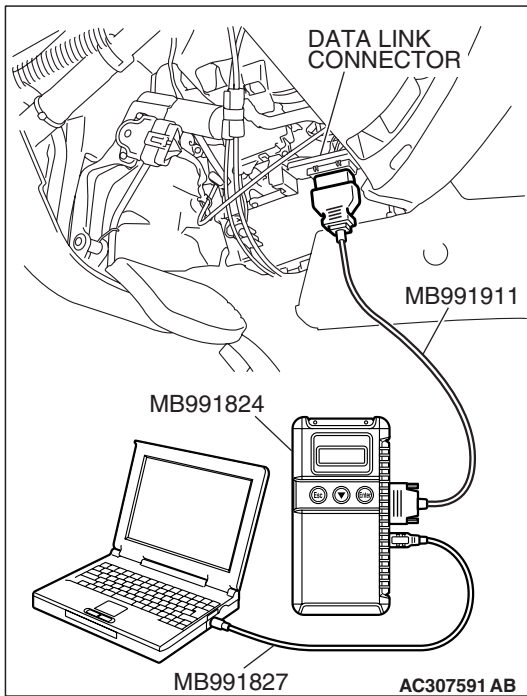
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

- (1) Connect scan tool MB991958 to the data link connector.
- (2) Turn the ignition switch to the "ON" position.
- (3) Using scan tool MB991958, check actuator test and sound the buzzer.

Q: Does the buzzer sound for three seconds and then stop?

YES : The procedure is complete.

NO : Start over at Step 1.



DATA LIST REFERENCE TABLE

M1352011500683

The following items can be read by the scan tool from the M-ASTC-ECU input data.

MUT-III SCAN TOOL DISPLAY	ITEM NO.	CHECK ITEM	CHECKING REQUIREMENT	NORMAL CONDITION	
BATT. VOLTAGE	31	M-ASTC-ECU power supply voltage	Ignition switch: ON	6.5 – 22.3 V	
ACCUM SW (PL)	76	Pressure switch (for low-pressure warning)	Ignition switch: ON	ON	
ACCUM SW (PH)	77	Pressure switch (for pump motor control)	Ignition switch: ON	When the pump motor is not operating.	OFF
				When the pump motor is operating.	ON
MOTOR RLY	79	Motor relay A, B	Ignition switch: ON	When the pump motor is not operating.	OFF
				When the pump motor is operating.	ON

ACTUATOR TEST REFERENCE TABLE

M1351013500103

The scan tool activates the following actuators for testing.

NOTE:

- If the M-ASTC-ECU is inoperative, actuator testing cannot be carried out.
- Actuator testing is only possible when the vehicle is stationary.

MUT-III SCAN TOOL DISPLAY	NO.	ITEM	DRIVE CONTENT	Activation when the system fails
HBB MOTOR	11	Pump motor	Drives the pump motor for one second.	Disabled
HBB BUZZER	12	Buzzer	Drives the buzzer for three seconds.	Disabled
BRKE WARN LMP	23	Brake warning light	Illuminates the brake warning light.	Enabled (However, disabled when the brake warning light can not be activated)

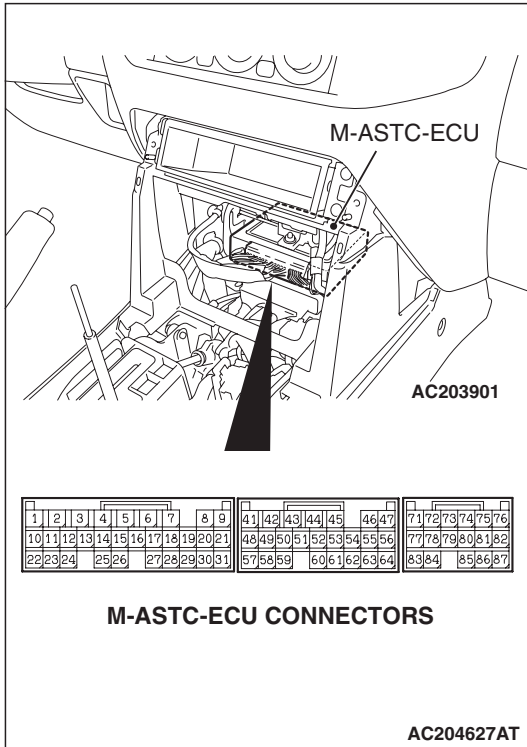
CHECK AT M-ASTC-ECU

M1351013600069

Terminal Voltage Check Chart

NOTE: Do not measure terminal voltage during the approximately three seconds after the ignition switch is turned to the "ON" position. The M-ASTC-ECU performs the initial check during that period.

Measure the voltage between terminal (4), (22), (56) or (64) (ground terminals) and each respective terminal by backprobing.



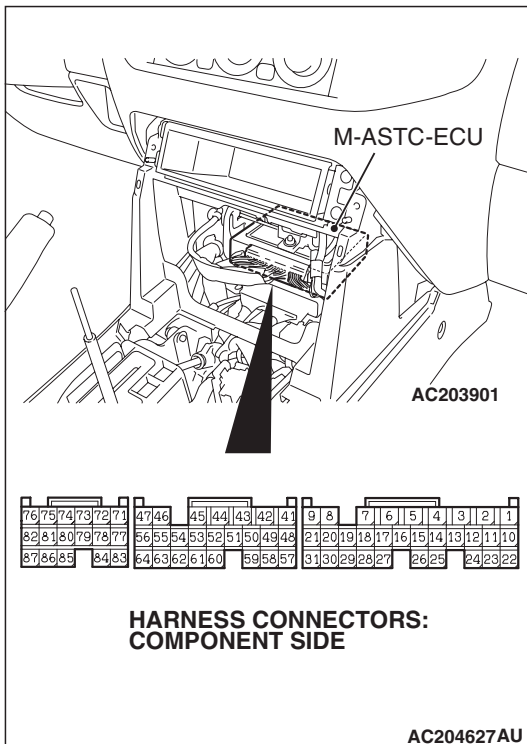
TERMINAL NO.	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
9	M-ASTC-ECU power supply	Ignition switch: ON		Battery positive voltage
11	Pressure switch (Pump motor control)	Ignition switch: ON	Brake fluid pressure: LOW (Pump motor operates.)	Approximately 6V
			Brake fluid pressure: HIGH (Pump motor does not operate.)	Less than 2V
12	Pump motor current detection (-)	Ignition switch: ON		Less than 2V
14	Pump motor current detection (+)	Ignition switch: ON	Pump motor does not operate.	Less than 2V
			Pump motor operates.	Battery positive voltage
24	Motor relay B	Ignition switch: ON	Pump motor does not operate.	Battery positive voltage
			Pump motor operates.	Less than 2V
25	Pump motor monitor	Ignition switch: ON		Less than 2V

TERMINAL NO.	SIGNAL	CHECKING REQUIREMENT		NORMAL CONDITION
48	Motor relay A	Ignition switch: ON	Pump motor does not operate.	Battery positive voltage
			Pump motor operates.	Less than 2V
54	Buzzer	Ignition switch: ON	Buzzer does not sound.	Battery positive voltage
			Buzzer sounds.	Less than 2V
57	Pressure switch (low-pressure warning)	Ignition switch: ON	Brake fluid pressure: EXTRA LOW (Buzzer sounds.)	Approximately 9V
			Brake fluid pressure: NORMAL (Buzzer does not sound.)	Approximately 4V
63	M-ASTC-ECU power supply	Ignition switch: ON		Battery positive voltage
81	Brake warning light	Engine: Idling	The warning light does not illuminate.	Less than 2V
			The warning light illuminates.	Battery positive voltage

Resistance and Continuity between Harness Connector Terminals

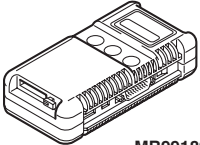


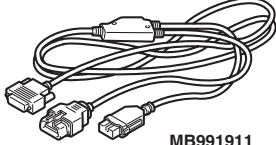
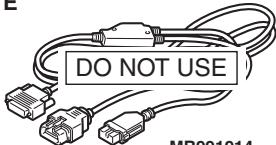
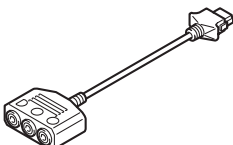
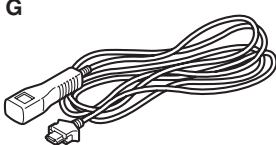
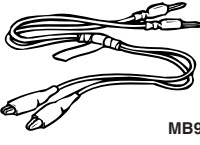
1. Turn the ignition switch to the "LOCK" (OFF) position and disconnect the M-ASTC-ECU connectors.
2. Measure the resistance between the terminals of the harness connector (component side). The terminals to be checked are indicated in the table below.

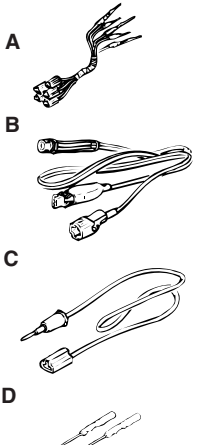
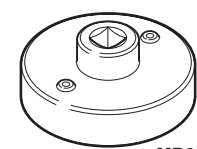
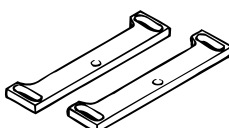
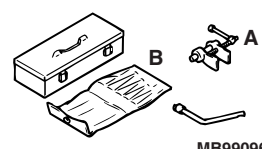
TERMINAL NO.	SIGNAL	NORMAL CONDITION
22 – body ground	Ground 1	Less than 2 ohms
4 – body ground	Ground 2	Less than 2 ohms
56 – body ground	Ground 3	Less than 2 ohms
64 – body ground	Ground 4	Less than 2 ohms



SPECIAL TOOLS

M135100600382

TOOL	TOOL NUMBER AND NAME	SUPERSESSON	APPLICATION
<p>A</p>  <p>MB991824</p> <p>B</p>  <p>MB991827</p> <p>C</p>  <p>MB991910</p> <p>D</p>  <p>MB991911</p> <p>E</p>  <p>MB991914</p> <p>F</p>  <p>MB991825</p> <p>G</p>  <p>MB991826 MB991958</p>	<p>MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826</p> <p>MUT-III Sub Assembly A: Vehicle communication interface (V.C.I.) B: MUT-III USB cable C: MUT-III main harness A (Vehicles with CAN communication system) D: MUT-III main harness B (Vehicles without CAN communication system) E: MUT-III main harness C (for Daimler Chrysler models only) F: MUT-III measurement adapter G: MUT-III trigger harness</p>	<p>MB991824-KIT <i>NOTE: G: MB991826 MUT-III trigger harness is not necessary when pushing V.C.I. ENTER key</i></p>	<ul style="list-style-type: none"> For checking of HBB [Diagnostic trouble code display when using the scan tool (MUT-II)] Air bleeding of ABS system in HBB system <p>CAUTION MUT-III main harness B (MB991911) should be used. MUT-III main harness A and C should not be used for this vehicle.</p>
 <p>MB991529</p>	<p>MB991529 Diagnostic trouble code check harness</p>	<p>Tool not necessary if scan tool (MUT-III) is available.</p>	<p>For checking of HBB [Diagnostic trouble code display when using the brake warning light]</p>

TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
 <p>MB991223AB</p>	<p>MB991223 Harness set A: MB991219 Inspection harness</p>	<p>MB991223 MB991709-01</p>	<p>For hydraulic brake booster (HBB) diagnosis</p>
 <p>MB991926</p>	<p>MB991926 Accumulator wrench</p>	<p>–</p>	<p>Accumulator removal and installation</p>
 <p>MB991620</p>	<p>MB991620 Valve spring compressor adapter</p>	<p>–</p>	<p>Fixing of HBB</p>
 <p>MB990964</p>	<p>MB990964 Brake tool set A: MB990520 Disc brake piston expander</p>	<p>General service tool</p>	<p>Pushing-in of the disc brake piston</p>

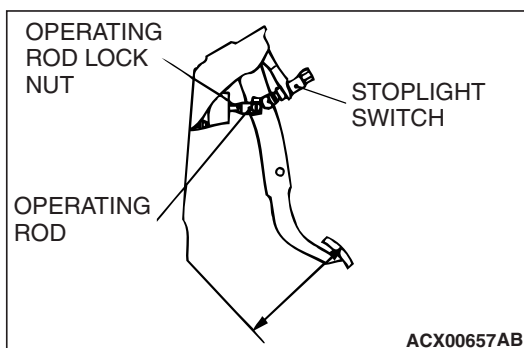
ON-VEHICLE SERVICE

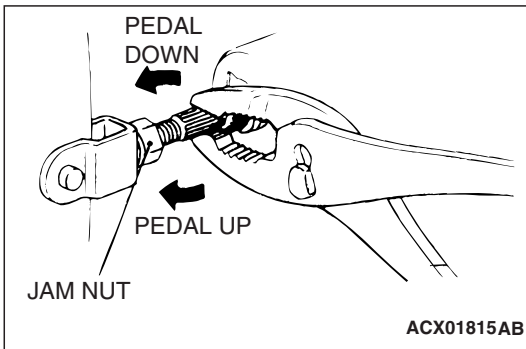
BRAKE PEDAL CHECK AND ADJUSTMENT

M1351000900297

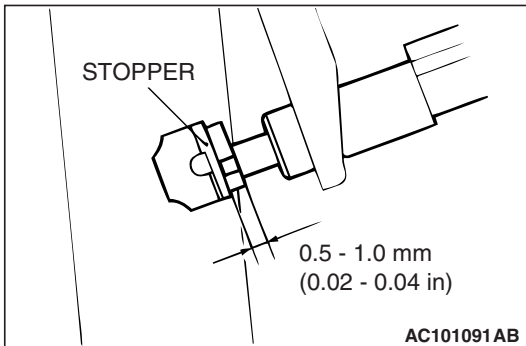
Brake Pedal Height

1. Turn up the carpet etc. under the brake pedal.
2. Measure the brake pedal height as illustrated.
Standard value: 192 – 195 mm (7.6 – 7.7 inches)
3. If the brake pedal height is not within the standard value, adjust as follows.
 - (1) Disconnect the stoplight switch connector.
 - (2) Rotate the stoplight switch 1/4 turn counterclockwise to loosen.





- (3) Loosen the operating rod jam nut. Turn the serrations of the operation rod with pliers to adjust the brake pedal height to the standard value.



- (4) Turn the stoplight switch until it contacts the stopper. During this step, secure the pedal by moving it forward by hand.
- (5) Turn the stoplight switch 1/4 turn clockwise to secure, and confirm that the clearance between the switch plunger and the stopper is as shown.
- (6) Connect the connector of the stoplight switch.
- (7) Check to be sure that the stoplight does not illuminate with the brake pedal released.

4. Check the key interlock and shift lock mechanisms (Refer to GROUP 23A, On-vehicle Service – Key Interlock and Shift Lock Mechanism Check P.23A-554).
5. Return the carpet etc. to its original position.

Brake Pedal Free Play

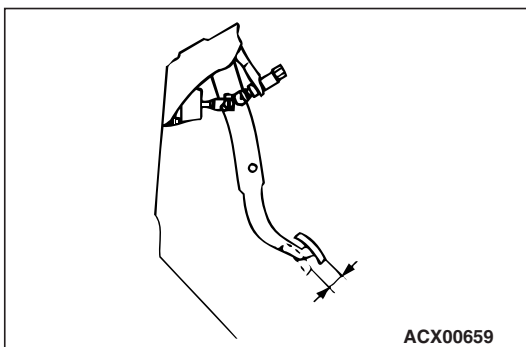
1. Turn the ignition switch to the "ON" position, and wait until the HBB pump motor stops.

NOTE: If the brake fluid inside the accumulator is not pressurized to a predetermined value, the pump motor will start to run. Once the pump motor has stopped, the brake fluid inside the accumulator is pressurized to the predetermined value. If the brake fluid inside the accumulator is pressurized to a predetermined value, the pump motor will not start to run.

2. Operate the pedal by hand, and check that the pedal stroke (free play) meets the standard value at the point where resistance is felt.

Standard value: 3 mm (0.1 inch) or less

3. If the brake pedal play is not within the standard value, check the following, and adjust or replace if necessary:
 - Excessive play between the brake pedal and the clevis pin, or between the clevis pin and the brake booster operating rod
 - Brake pedal height
 - Installation position of the stoplight switch, etc.

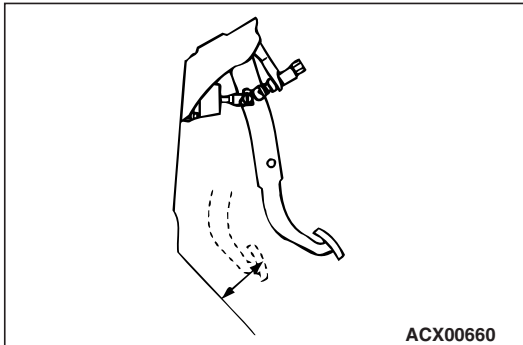


Clearance between Brake Pedal and Floorboard

1. Turn up the carpet etc. under the brake pedal.
2. Start the engine, depress the brake pedal with approximately 500 N (112 pounds) of force, and measure the clearance between the brake pedal and the floorboard.

Standard value: 90 mm (3.5 inches) or more

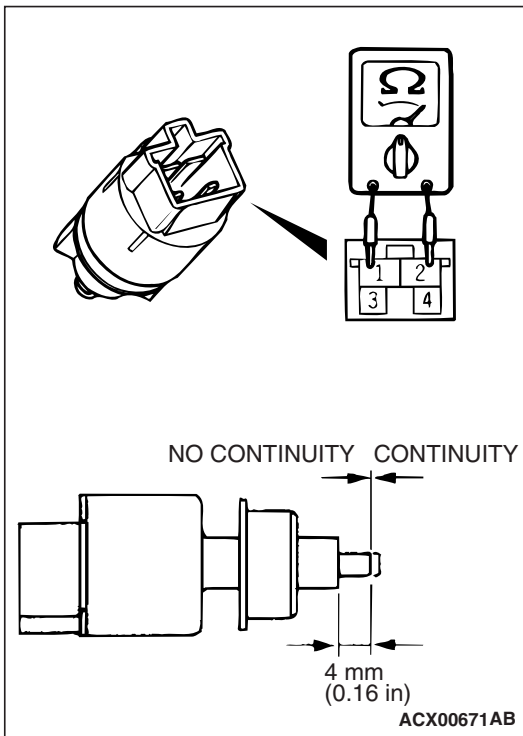
3. If the clearance is outside the standard value, check for air trapped in the brake line and thickness of the disc brake pad. And then adjust and replace defective parts as required.
4. Return the carpet etc. to its original position.



STOPLIGHT SWITCH CHECK

M1351008900213

1. Connect an ohmmeter between the stoplight switch connector terminals.
2. There should be no continuity between the terminals when the plunger is pushed in as shown. There should be continuity when it is released.



TESTER CONNECTION	PLUNGER	SPECIFIED CONDITION
1 – 2	IN	Open circuit
	OUT	Less than 2 ohms

HBB OPERATING CHECK

M1351010400107

CAUTION

If the diagnostic trouble code is stored in the M-ASTC-ECU memory, erase it after diagnosis is completed.

FUNCTION AND OPERATION CHECK OF POWER SUPPLY SYSTEM

1. Depress the brake pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.
2. Check that the fluid level in the reservoir is at the "MAX" line.
3. Chock the wheels and release the parking brake.
4. Turn the ignition switch to the "ON" position and measure how long it takes for the pump motor to start, then stop.

Standard value: 20 – 80 seconds

5. After the pump motor stops, start the engine to confirm that the brake warning light does not come on.
6. Stop the engine and turn the ignition switch to the "ON" position again.
7. Confirm that the pump motor operates, then stops when the brake pedal is depressed repeatedly 4 to 5 times.
8. Depress the brake pedal repeatedly 4 to 5 times again to measure how long it takes for the pump motor to start, then stop.

Standard value: 2 – 11 seconds

9. Check and confirm the following items 120 seconds or more after turning ON the ignition switch.

CAUTION

Check and confirm the following items 120 seconds or more after turning the ignition switch to the "ON" position.

10. Confirm that the buzzer sounds and the brake warning light illuminates when the brake pedal is fully depressed 15 to 20 times within 10 seconds.

HBB SIMPLE CHECK

1. Depress the brake pedal repeatedly for more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.
2. Check the change of pedal height by turning the ignition switch to the "ON" position while depressing the brake pedal. It is normal if the pedal is lowered at this time. If it is not lowered, the system is defective.

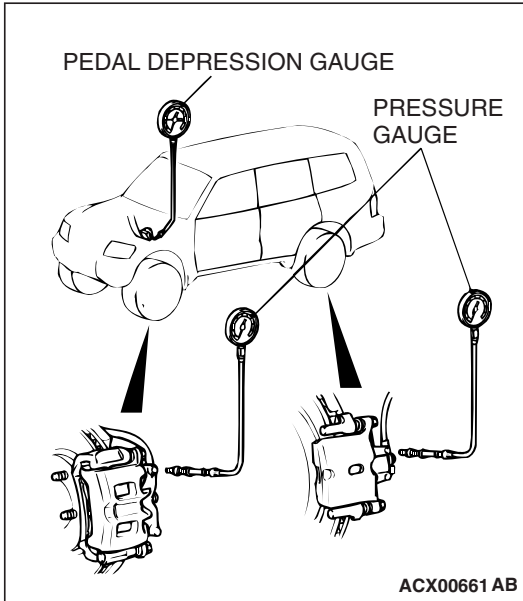
CHECK USING SIMPLE TESTER

1. Depress the brake pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.
2. Connect a pressure gauge and a pedal depression gauge as shown in the illustration and bleed air from the pressure gauge.
3. Perform the operation test without booster according to the following method.

Depress the brake pedal repeatedly more than 40 times with the ignition switch at "LOCK" (OFF) position to bleed pressure from the HBB power supply system. Measure the relation between the brake pedal depressing force and the hydraulic pressure.

Standard value:

BRAKE PEDAL DEPRESSING FORCE N (lb)	HYDRAULIC PRESSURE kPa (psi)	
	FRONT BRAKE	REAR BRAKE
100 (22)	600 (87) or more	0 (0)
500 (112)	4,500 (653) or more	0 (0)



4. Perform the operation test with booster according to the following method.

Turn the ignition switch to the "ON" position and measure the relation between the brake pedal depressing force and the hydraulic pressure after pump motor was stopped.

Standard value:

BRAKE PEDAL DEPRESSING FORCE N (lb)	HYDRAULIC PRESSURE kPa (psi)	
	FRONT BRAKE	REAR BRAKE
100 (22)	3,000 – 4,000 (435 – 580)	3,300 – 4,300 (479 – 624)
200 (45)	8,000 – 10,000 (1,160 – 1,450)	8,000 – 10,000 (1,160 – 1,450)
400 (90)	14,000 – 18,000 (2,030 – 2,611)	14,000 – 18,000 (2,030 – 2,611)
500 (112)	15,000 – 19,000 (2,175 – 2,756)	15,000 – 19,000 (2,175 – 2,756)

BRAKE WARNING LIGHT AND BUZZER OPERATION CHECK

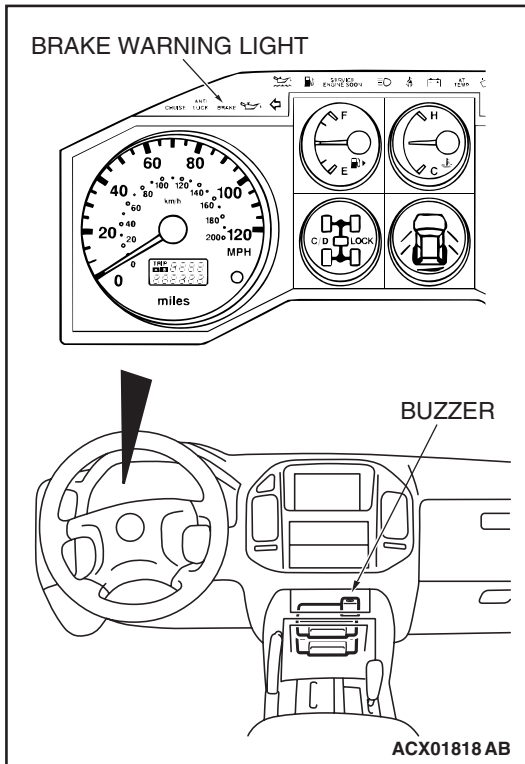
1. Chock the wheel and start the engine.

2. Hold the engine at the idling condition for more than 120 seconds.

⚠ CAUTION

Perform the check 120 seconds or more after turning the ignition switch to the "ON" position.

3. Release the parking brake and fully depress the brake pedal repeatedly 15 to 20 times in 10 seconds. Confirm that the warning light comes on and the buzzer sounds.

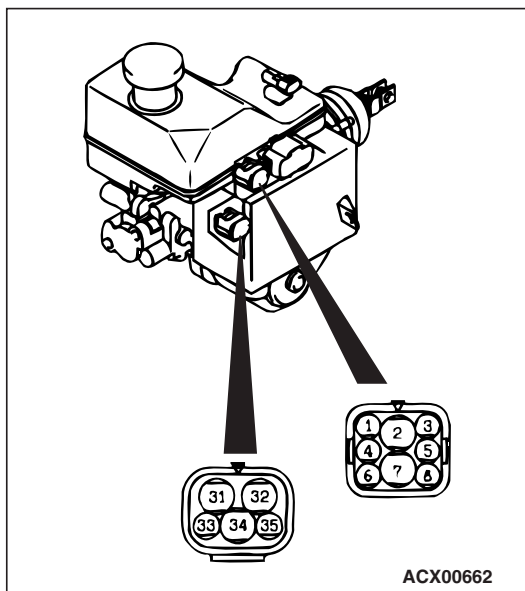


HBB CHECK

M1351010500115

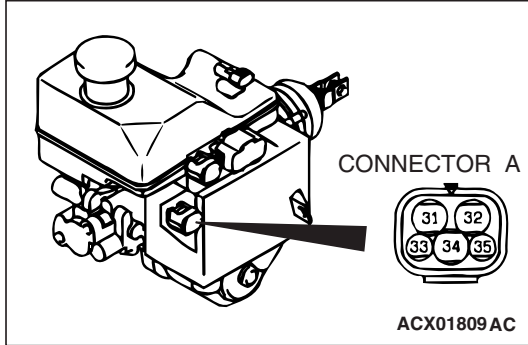
CONTINUITY AND RESISTANCE TEST OF PUMP MOTOR

1. Disconnect the HBB connectors.
2. Measure the resistance between the terminals at the HBB.



TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE VALUE Ω (REFERENCE VALUE)
2 – 7	Continuity	10 or less
2 – 8	Continuity	Approximately 33
2 – 31	Continuity	Less than 2
4 – 6	Continuity	Approximately 33
4 – 32	Continuity	Approximately 33
6 – 7	Continuity	Less than 2
6 – 32	Continuity	Less than 2
7 – 32	Continuity	Less than 2
8 – 31	Continuity	Approximately 33
31 – 32	Continuity	10 or less

PRESSURE SWITCH (FOR PUMP CONTROL) CHECK



1. Depress the brake pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.
2. Disconnect the HBB connector "A".
3. Measure the resistance between terminals No. 33 and No. 35 at the HBB connector "A".

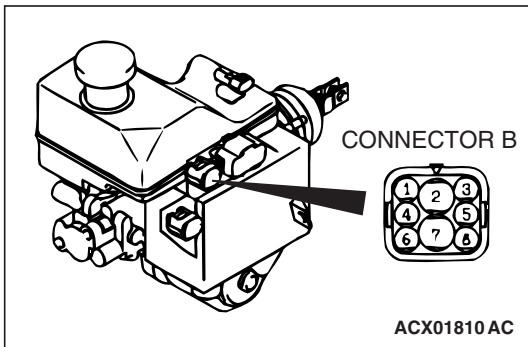
TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE VALUE kΩ
33 – 35	Continuity	Approximately 1

4. If the resistance value exceeds the specified value, replace the HBB master cylinder and hydraulic unit assembly.
5. With the HBB connector "A" disconnected, turn "ON" the ignition switch to operate the pump motor. Then measure the resistance between terminals No. 33 and No. 35 at the HBB connector "A" while the pump motor is operating.

TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE VALUE Ω
33 – 35	Continuity	Less than 2

6. If the resistance value exceeds the specified value, replace the HBB master cylinder and hydraulic unit assembly.
7. Connect the HBB connector "A".
8. Erase HBB diagnostic trouble codes (Refer to [P.35A-13](#)).

PRESSURE SWITCH (FOR LOW-PRESSURE WARNING) CHECK



1. Depress the brake pedal repeatedly more than 40 times until the pedal depressing force is felt heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of HBB power supply system.
2. Disconnect the HBB connector "B".
3. Measure the resistance between terminals No. 1 and No. 5 at the HBB connector "B".

TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE VALUE kΩ
1 – 5	Continuity	Approximately 5.7

4. If the resistance value exceeds the specified value, replace the HBB master cylinder and hydraulic unit assembly.
5. Next, turn the ignition switch to the "ON" position to operate the pump motor. Then confirm that the pump motor is stopped.

6. Measure the resistance between terminals No. 1 and No. 5 at the HBB connector "B".

TESTER CONNECTION	SPECIFIED CONDITION	RESISTANCE VALUE kΩ
1 – 5	Continuity	Approximately 1

7. If the resistance value exceeds the specified value, replace the HBB master cylinder and hydraulic unit assembly.
8. Connect the HBB connector "B".
9. Erase HBB diagnostic trouble codes (Refer to [P.35A-13](#)).

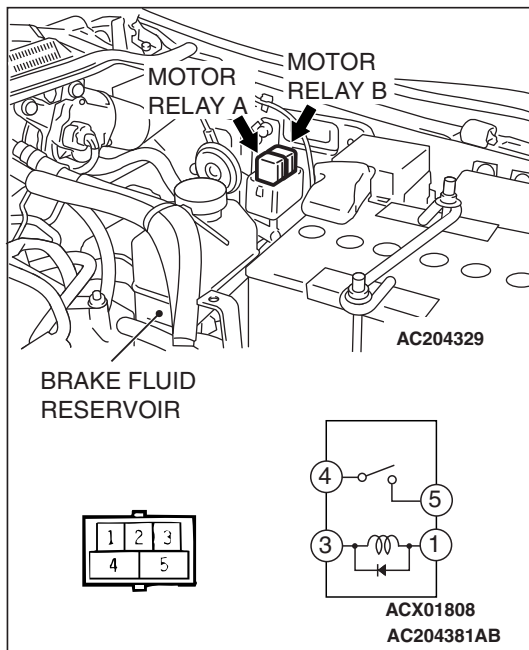
HBB MOTOR RELAY CHECK

M1351010600059

Motor Relay A, B

⚠ CAUTION

Apply battery voltage according to the table below. Never confuse the positive and negative battery terminals, or the diode inside the relay will be damaged.



BATTERY CONNECTION	TESTER CONNECTION	SPECIFIED CONDITION
–	4 – 5	Open circuit
<ul style="list-style-type: none"> • Connect battery terminal (+) to terminal 3 • Connect battery terminal (–) to terminal 1 	4 – 5	Less than 2 ohms

BRAKE FLUID LEVEL INSPECTION AND BLEEDING

M1351001400477

⚠ CAUTION

- Use only brake fluid DOT3 or DOT4. Never mix the specified brake fluid with other brake fluid, as it will significantly decrease braking performance.
- Depress the brake pedal slowly. If the brake pedal is pressed too quickly, the pump motor will activate frequently and a large volume of high-pressure brake fluid may flow from the brake caliper quickly, depleting the HBB reservoir contents and possibly introducing air into the HBB system.
- Depending upon the quantity of brake fluid in the reservoir, if the brake pedal is pressed with the reservoir cap removed, the brake fluid in the reservoir may overflow.
- Use suitable protection to prevent brake fluid from contacting underhood components and body paint.

HBB System Bleeding**⚠ WARNING**

The HBB system bleeding must be done in the following cases.

- *If brake fluid is drained after removing or installing the HBB*
- *if there is excessive brake fluid loss during normal brake system bleeding*
- *if you suspect that air has entered the HBB system*

NOTE: The HBB brake system bleeding procedure requires two persons working together.

HBB system bleeding must be done in the following order:

HBB SYSTEM BLEEDING STEPS	
1.	FRONT BRAKE LINES (FILLING)
2.	ACCUMULATOR (HBB)
3.	REAR BRAKE LINES (FILLING)
4.	POWER SUPPLY (HBB)
5.	ABS (HBB)
6.	REAR BRAKE LINES (BLEEDING)
7.	FRONT BRAKE LINES (BLEEDING)

⚠ CAUTION

- Keep the brake fluid reservoir level just above the "MIN" line. Monitor the fluid level during this procedure to ensure the fluid does not reach below the "MIN" line, to prevent air from entering the system.
- If a large quantity of brake fluid is drained during the bleeding procedure, the accumulator pressure will decrease abnormally. Do not bleed more than 0.1 dm³ (0.11quart) from each wheel at a time.
- Confirm that the pump motor stops after each air-bleeding step. If not, proceed to the troubleshooting the HBB System section.

NOTE: The buzzer may sound during this procedure due to low pressure in the system. The buzzer will stop when normal HBB pressure is restored.

Required Special Tools:

- MB991958: Scan Tool (MUT-III Sub Assembly)
 - MB991824: Vehicle Communication Interface (V.C.I.)
 - MB991827: MUT-III USB Cable
 - MB991911: MUT-III Main Harness B
1. Fill the front brake system with brake fluid as follows (RH first, LH second):
 - (1) Attach a clear hose to the RH caliper bleeder valve. This helps to monitor air/fluid flow.
 - (2) Be sure the fluid level is between the "MIN" and "MAX" lines.
 - (3) Turn the ignition switch to the "LOCK" (OFF) position. Pump the brake pedal 3 – 4 times and hold it depressed.
 - (4) Open the RH caliper bleeder valve 1/4 turn.
 - (5) With the bleeder valve still open, pump the brake pedal repeatedly to fill the line with fluid until no obvious air bubbles are seen. When no more obvious air bubbles are seen, and while the brake pedal is still being pumped, close the bleeder valve.
 - (6) Repeat steps (1) – (5) for the LH caliper.
 - (7) Release the brake pedal when both sides are filled.
 2. Fill the pump motor as follows:
 - (1) Turn the ignition switch to the "ON" position to operate the pump motor.
 - a. If the pump motor operates normally (normal operation sound), go to step 3.
 - b. If the pump motor operation sound is dry and high-pitched, depress the brake pedal 3 or 4 times to introduce fluid into the pump motor. Then go to step 3.
 3. Fill the accumulator system with brake fluid as follows:
 - (1) Wait for the pump motor to stop from step 2.

- (2) Depress the brake pedal slowly 3 or 4 times with the ignition switch at the "ON" position. Observe the condition of the brake fluid in the reservoir.
 - a. If the fluid is cloudy, leave it for 2 or 3 minutes until it becomes clear.
 - b. Repeat the above procedure (a) until no bubbles appear while pumping the brake pedal.

NOTE: OK to fill the reservoir to the "MAX" line during this process. Brake fluid level around the "MIN" line may cause bubbles to appear from the jet flow of brake fluid while pumping the brake pedal.

4. Fill the rear brake system with brake fluid as follows (RH first, LH second):

 **CAUTION**

- If a large quantity of brake fluid is drained during the bleeding procedure, the accumulator pressure will decrease abnormally. Do not bleed more than 0.1 dm³ (0.11 quart) from each wheel at a time.
- Confirm that the pump motor stops after each air-bleeding step.

NOTE: A high-pressure hydraulic noise (hissing) is normal during this procedure.

- (1) Attach a clear hose to the RH caliper bleeder valve. This helps to monitor air/fluid flow.
 - (2) Be sure the fluid level is between the "MIN" and "MAX" lines.
 - (3) Turn the ignition switch to the "LOCK" (OFF) position. Pump the brake pedal 3 – 4 times and hold it depressed.
 - (4) Open the RH caliper bleeder valve 1/4 turn.
 - (5) With the bleeder valve still open, pump the brake pedal repeatedly to fill the line with fluid until no obvious air bubbles are seen. When no more obvious air bubbles are seen, and while the brake pedal is still being pumped, close the bleeder valve.
 - (6) Repeat steps (1) – (5) for the LH caliper.
 - (7) Release the brake pedal when both sides are filled.
5. Supply brake fluid into the power supply system as follows:

 **CAUTION**

Keep the brake fluid reservoir level just above the "MIN" line at this time. Monitor the fluid level during this procedure to ensure it does not reach below the "MIN" line.

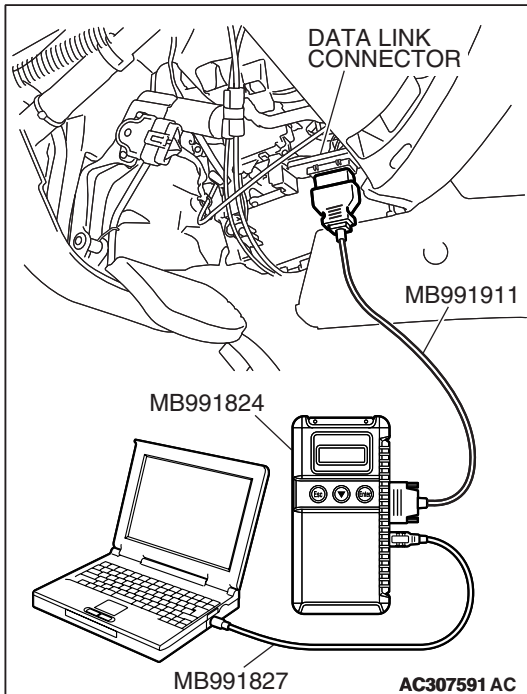
- (1) To release the pressure in the HBB power supply system, turn the ignition switch to the "LOCK" (OFF) position and depress the brake pedal repeatedly until its depressing force suddenly feels heavy (no pedal travel).
- (2) Turn the ignition switch to the "ON" position and at the same time quickly depress the brake pedal approximately 20 times. Then confirm that the pump motor has stopped. This can take up to 2 minutes.

- (3) Turn the ignition switch to the "LOCK" (OFF) position and depress the brake pedal repeatedly until its depressing force suddenly feels heavy (no pedal travel).
- (4) Turn the ignition switch to the "ON" position to operate the pump motor. Confirm that the pump motor stops within 25 seconds. If the pump motor does not stop, repeat steps (1) through (3) above.

6. Supply fluid into the ABS system as follows:

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



- (1) Ensure that the ignition switch is at the "LOCK" (OFF) position.
- (2) Start up the personal computer.
- (3) Connect special tool MB991827 to special tool MB991824 and the personal computer.
- (4) Connect special tool MB991911 to special tool MB991824.
- (5) Connect special tool MB991911 to the data link connector.
- (6) Turn the power switch of special tool MB991824 to the "ON" position.

NOTE: When special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.

- (7) Start the MUT-III system on the personal computer.
- (8) Turn the ignition switch to the "ON" position. Select from scan tool menu screen as follows:
[SYSTEM SELECT → ABS → ACTUATOR TEST → AIR BLEED]
- (9) Depress and hold the brake pedal.
- (10) Activate the actuator test [AIR BLEED (1)]. When the scan tool flashes confirmation that the AIR BLEED (1) operation is completed, proceed with AIR BLEED (2).
- (11) Depress and hold the brake pedal.
- (12) Select and activate [AIR BLEED (2)] on the scan tool screen. When the scan tool flashes confirmation that the AIR BLEED (2) operation is completed, go to step 7.

7. Bleed the rear brake system as follows (RH first, LH second):

⚠ CAUTION

- **Keep the brake fluid reservoir level just above the "MIN" line at this time. Monitor the fluid level during this procedure to ensure it does not reach below the "MIN" line.**
 - **If a large quantity of brake fluid is drained during the bleeding procedure, the accumulator pressure will decrease abnormally. Do not bleed more than 0.1 dm³ (0.11quart) from each wheel at a time.**
 - **Confirm that the pump motor stops after each air-bleeding step.**
- (1) Attach the clear hose to the RH caliper to monitor air/fluid flow.
 - (2) Turn the ignition switch to the "ON" position.
 - (3) Open bleeder valve 1/4 turn.
 - (4) With the bleeder valve open, pump the brake pedal 3 times and hold.
 - (5) Close the bleeder valve.
 - (6) Pump the brake pedal 3 times and hold.
 - (7) Open the bleeder valve 1/8 turn briefly to allow any remaining air to escape, then close the bleeder valve.
 - (8) Repeat steps (6) and (7) as many times as necessary to eliminate all air in the line.
 - (9) Repeat steps (1) – (8) at the LH caliper.

8. Bleed the front brake system as follows (RH first, LH second):

⚠ CAUTION

- **Keep the brake fluid reservoir level just above the "MIN" line at this time. Monitor the fluid level during this procedure to ensure it does not reach below the "MIN" line.**
 - **If a large quantity of brake fluid is drained during the bleeding procedure, the accumulator pressure will decrease abnormally. Do not bleed more than 0.1 dm³ (0.11quart) from each wheel at a time.**
 - **Confirm that the pump motor stops after each air-bleeding step.**
- (1) Attach the clear hose to the RH caliper to monitor air/fluid flow.
 - (2) Turn the ignition switch to the "ON" position.
 - (3) Open bleeder valve 1/4 turn.
 - (4) With the bleeder valve open, pump the brake pedal 3 times and hold.
 - (5) Close the bleeder valve.
 - (6) Pump the brake pedal 3 times and hold.
 - (7) Open the bleeder valve 1/8 turn briefly to allow any remaining air to escape, then close the bleeder valve.

- (8) Repeat steps (6) and (7) as many times as necessary to eliminate all air in the line.
- (9) Repeat steps (1) – (8) at the LH caliper.
9. Adjust the brake fluid level as follows:
 - (1) Turn the ignition switch to the "LOCK" (OFF) position.
 - (2) Depress the brake pedal repeatedly (up to 40 times or more) until its depressing force suddenly feels very heavy (no pedal travel).
 - (3) Release the brake pedal.
 - (4) Adjust the brake fluid level between the "MIN" and "MAX" lines on the reservoir.

Normal Brake System Air Bleeding

If the brake fluid level in the HBB reservoir is between the "MIN" and "MAX" lines after any brake servicing at the wheels (such as calipers, rotors, etc.), perform the following steps:

1. Bleed the rear brake system as follows (RH first, LH second):

CAUTION

- **Keep the brake fluid reservoir level just above the "MIN" line at this time. Monitor the fluid level during this procedure to ensure it does not reach below the "MIN" line.**
 - **If a large quantity of brake fluid is drained during the bleeding procedure, the accumulator pressure will decrease abnormally. Do not bleed more than 0.1 dm³ (0.11quart) from each wheel at a time.**
 - **Confirm that the pump motor stops after each air-bleeding step.**
 - (1) Attach the clear hose to the RH caliper to monitor air/fluid flow.
 - (2) Turn the ignition switch to the "ON" position.
 - (3) Open bleeder valve 1/4 turn.
 - (4) With the bleeder valve open, pump the brake pedal 3 times and hold.
 - (5) Close the bleeder valve.
 - (6) Pump the brake pedal 3 times and hold.
 - (7) Open the bleeder valve 1/8 turn briefly to allow any remaining air to escape, then close the bleeder valve.
 - (8) Repeat steps (6) and (7) as many times as necessary to eliminate all air in the line.
 - (9) Repeat steps (1) – (8) at the LH caliper.
2. Bleed the front brake system as follows (RH first, LH second):

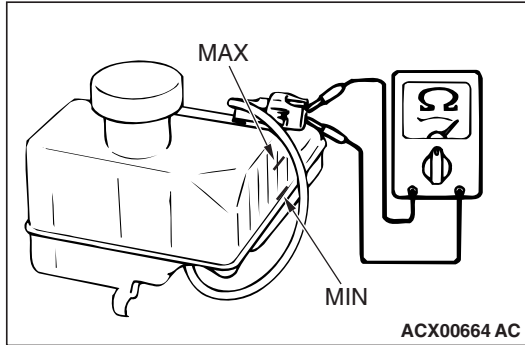
CAUTION

- **Keep the brake fluid reservoir level just above the "MIN" line at this time. Monitor the fluid level during this procedure to ensure it does not reach below the "MIN" line.**
 - **If a large quantity of brake fluid is drained during the bleeding procedure, the accumulator pressure will decrease abnormally. Do not bleed more than 0.1 dm³ (0.11quart) from each wheel at a time.**
 - **Confirm that the pump motor stops after each air-bleeding step.**
 - (1) Attach the clear hose to the RH caliper to monitor air/fluid flow.
 - (2) Turn the ignition switch to the "ON" position.
 - (3) Open bleeder valve 1/4 turn.
 - (4) With the bleeder valve open, pump the brake pedal 3 times and hold.
 - (5) Close the bleeder valve.
 - (6) Pump the brake pedal 3 times and hold.
 - (7) Open the bleeder valve 1/8 turn briefly to allow any remaining air to escape, then close the bleeder valve.
 - (8) Repeat steps (6) and (7) as many times as necessary to eliminate all air in the line.
 - (9) Repeat steps (1) – (8) at the LH caliper.
3. Adjust the brake fluid level as follows:
 - (1) Turn the ignition switch to the "LOCK" (OFF) position.
 - (2) Depress the brake pedal repeatedly (up to 40 times or more) until its depressing force suddenly feels very heavy (no pedal travel).
 - (3) Release the brake pedal.
 - (4) Adjust the brake fluid level between the "MIN" and "MAX" lines on the reservoir.

BRAKE FLUID LEVEL SWITCH CHECK

M1351009100254

The brake fluid level switch is in good condition if there is no continuity when the float surface is above the "MIN" line and if there is continuity when the float surface is below the "MIN" line.



DISC BRAKE PAD CHECK AND REPLACEMENT

M1351002300246

NOTE: The brake pads have indicators that contact the brake disc when the brake pad thickness becomes 2 mm (0.08 inch), and emit a squealing sound to warn the driver.

⚠ CAUTION

- Whenever a pad must be replaced, replace both LH and RH wheel pads as a set to prevent the vehicle from pulling to one side when braking.

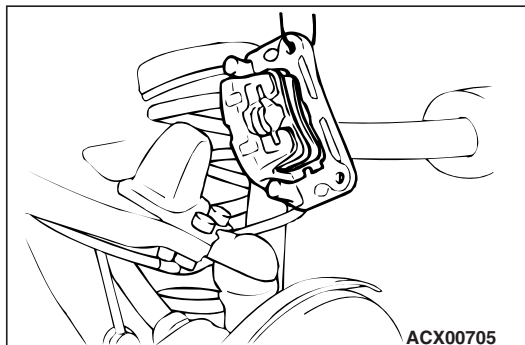
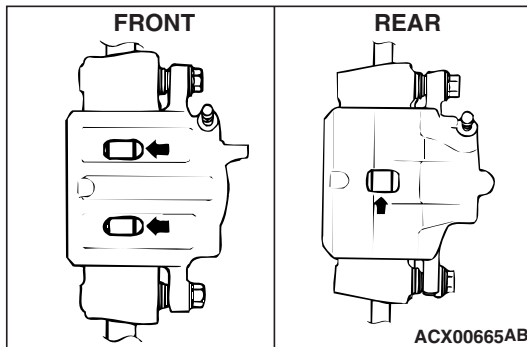
⚠ CAUTION

If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.

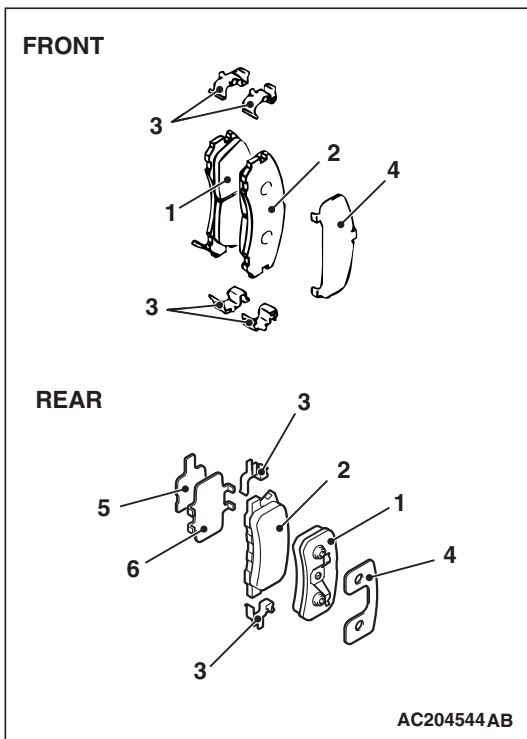
1. Check the brake pad thickness through the caliper body check port.

Standard value: 10.0 mm (0.39 inch)

Minimum limit: 2.0 mm (0.08 inch)



2. Remove the guide pin lock bolt. Lift the caliper assembly and secure it with a wire.

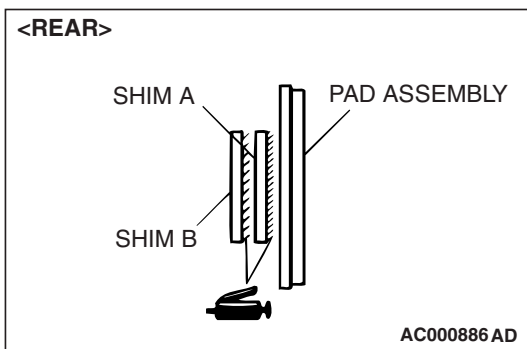


3. Remove the following parts from caliper support.
 - (1) Pad and wear indicator assembly <FRONT>
Pad and clip assembly <REAR>
 - (2) Pad assembly
 - (3) Clip
 - (4) Shim
 - (5) Shim B <REAR>
 - (6) Shim A <REAR>
4. Measure the hub torque before and after pad installation. Follow the procedure:
 - FRONT: Refer to [P.35A-142](#).
 - REAR: Refer to [P.35A-148](#).

⚠ CAUTION

Do not apply excessive grease. Excessive grease may cause brake performance to become poor.

5. For rear disc brake, apply brake grease SAE J310, NLGI number 1 to the following positions before installing the pad.
 - Pad assembly and shim A contact surface
 - Inner shim A and shim B contact surface



6. Install the pad and caliper assembly, and check the brake drag force.
 - FRONT: Refer to [P.35A-142](#).
 - REAR: Refer to [P.35A-148](#).

DISC BRAKE ROTOR CHECK

M1351002900215

⚠ CAUTION

Disc brakes must be kept within the allowable service values in order to maintain normal brake operation.

Before turning the brake disc, the following conditions should be checked:

INSPECTION ITEM	REMARK
Scratches, rust, saturated lining materials and wear	<ul style="list-style-type: none"> If the vehicle is not driven for a long period of time, sections of the discs that are not in contact with the pads will become rusty, causing noise and shuddering. If grooves and scratches resulting from excessive disc wear are not removed prior to installing a new pad assembly, there will be inadequate contact between the disc and the lining (pad) until the pads conform to the disc.
Run-out	Excessive run-out of the discs will increase the pedal depression resistance due to piston kickback.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Warping (flatness) or distortion	Overheating and improper handling while servicing will cause warping or distortion.

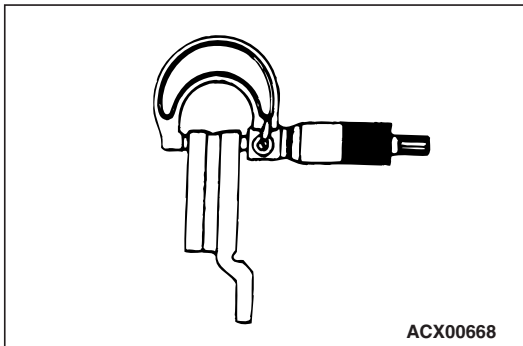
BRAKE DISC THICKNESS CHECK

M1351002400254

1. Remove dirt and rust from the brake disc surface.
2. Using a micrometer, measure disc thickness at eight positions, approximately 45 degrees apart and 10 mm (0.4 inch) in from the outer edge of the disc.

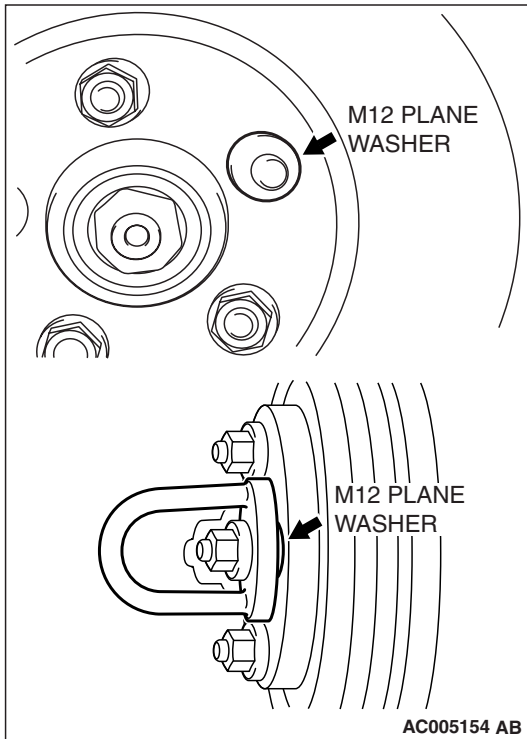
FRONT BRAKE DISC**Standard value: 26.0 mm (1.02 inch)****Minimum limit: 24.4 mm (0.96 inch)****REAR BRAKE DISC****Standard value: 22.0 mm (0.87 inch)****Minimum limit: 20.4 mm (0.80 inch)**

NOTE: Thickness variation (at least 8 positions) should not be more than 0.015 mm (0.0006 inch).



⚠ CAUTION

- After a new brake disc is installed, always grind the brake disc with a on-car type brake lathe. If this step is not carried out, the brake disc run-out will exceed the specified value, resulting in judder.
- When the on-car type lathe is used, first install a M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed without a M12 flat washer, the brake disc rotor may be deformed, resulting in inaccurate grinding.
- Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft·lb). When all numbers of wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.



3. If the disc thickness is less than the limits, replace it with a new one. If thickness variation exceeds the specification, turn rotor with an on-car type brake lathe ("Accuturn-8750" or equivalent).
If the calculated final thickness after turning the rotor is less than the standard value, replace the disc.

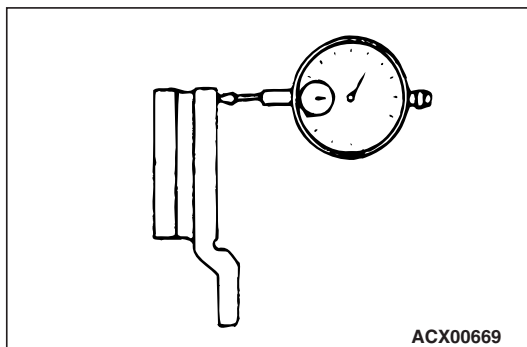
BRAKE DISC RUN-OUT CHECK AND CORRECTION

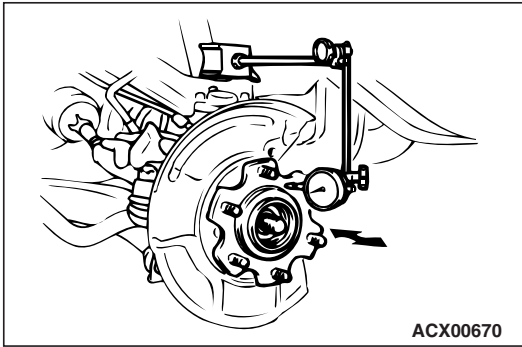
M1351009400404

1. Remove the caliper support; then raise the caliper assembly upward and secure it with a wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.
3. Fix the disc with a hub nut temporarily.
4. Place a dial gauge approximately 5 mm (0.2 inch) from the outer circumference of the brake disc, and measure the run-out of the disc.

Limit: 0.06 mm (0.002 inch)

5. If the run-out of the brake disc is limit value or more, correct it as follows:
 - (1) Place a mating mark on both the wheel stud and disc with chalk where the run-out is greatest.





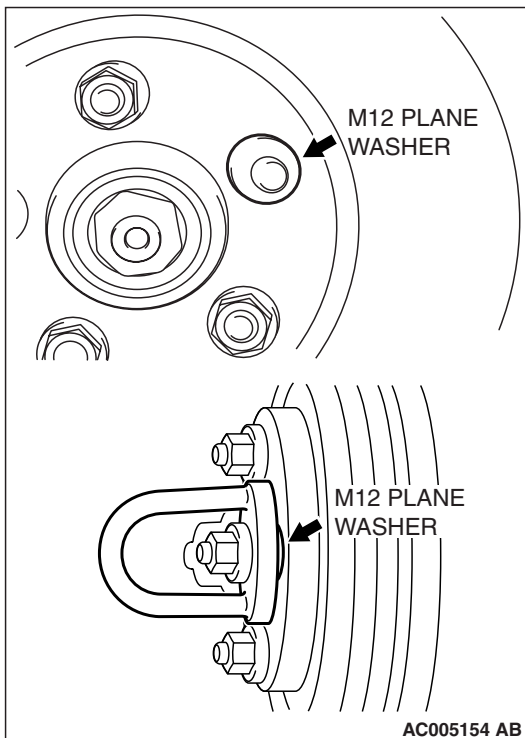
- (2) Remove the brake disc. Then place a dial gauge as shown in the illustration, and then move the hub in the axial direction and measure the play.

Limit: 0 mm (0 inch)

- (3) If the play exceeds the limit, disassemble the hub and knuckle assembly to check each part.
- (4) If the play does not exceed the limit, install the brake disc at a different phase, and then check the run-out of the brake disc again.

⚠ CAUTION

- After a new brake disc is installed, always grind the brake disc with a on-car type brake lathe. If this step is not carried out, the brake disc run-out will exceed the specified value, resulting in judder.
 - When the on-car type lathe is used, first install a M12 flat washer on the stud bolt in the brake disc side according to the figure, and then install the adapter. If the adapter is installed without a M12 flat washer, the brake disc rotor may be deformed, resulting in inaccurate grinding.
 - Grind the brake disc with all wheel nuts diagonally and equally tightened to the specified torque 100 N·m (74 ft·lb). When all numbers of wheel nuts are not used, or the tightening torque is excessive or not equal, the brake disc rotor or drum may be deformed, resulting in judder.
6. If the run-out cannot be corrected by changing the phase of the brake disc, replace the brake disc or turn rotor with an on-car type brake lathe ("Accuturn-8750" or equivalent).



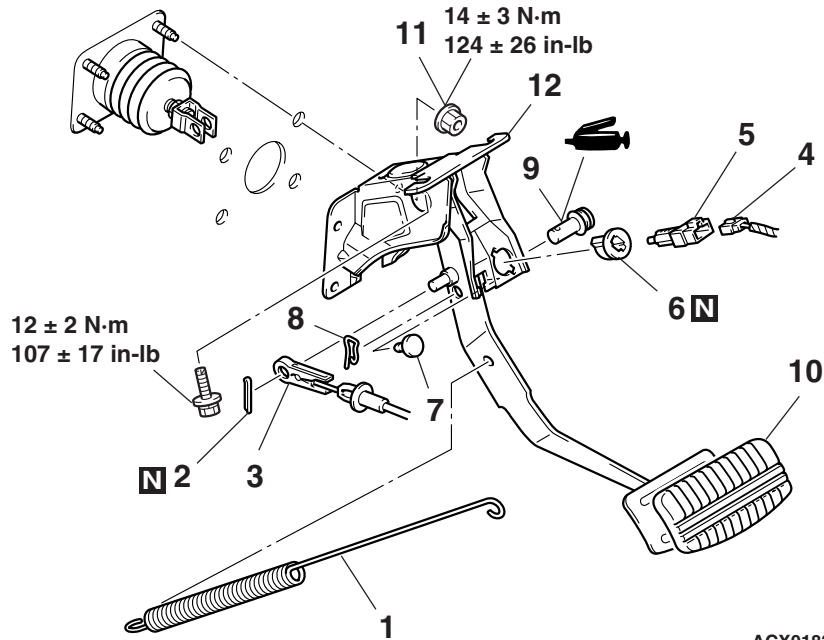
BRAKE PEDAL

REMOVAL AND INSTALLATION

M1351003400257

Post-installation Operation

- Brake Pedal Adjustment (Refer to P.35A-116.)



ACX01838 AB

REMOVAL STEPS

- INSTRUMENT PANEL LOWER PANEL (REFER TO GROUP 52A, INSTRUMENT PANEL P.52A-3.)
1. RETURN SPRING
 2. COTTER PIN
 3. SHIFT LOCK CABLE CONNECTION
 4. HARNESS CONNECTOR
 5. STOPLIGHT SWITCH

REMOVAL STEPS (Continued)

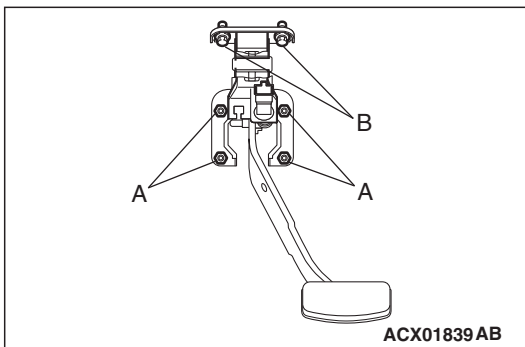
6. ADJUSTER
 7. PEDAL STOPPER
 8. SNAP PIN
 9. CLEVIS PIN
 10. PEDAL PAD
 11. BRAKE BOOSTER MOUNTING NUT
- >>A<< 12. BRAKE PEDAL AND PEDAL SUPPORT MEMBER ASSEMBLY

INSTALLATION SERVICE POINT

>>A<< BRAKE PEDAL AND PEDAL SUPPORT MEMBER ASSEMBLY INSTALLATION

Tighten the brake booster mounting nut ("A" in the illustration) first, then tighten the brake pedal mounting bolt ("B" in the illustration).

NOTE: Because the mounting hole of the pedal mounting bolt ("B" in the illustration) is a slotted hole, if the pedal mounting bolt ("B" in the illustration) is mounted first, positioning becomes impossible.



ACX01839 AB

HYDRAULIC BRAKE BOOSTER (HBB)

REMOVAL AND INSTALLATION

M1351010700056

CAUTION

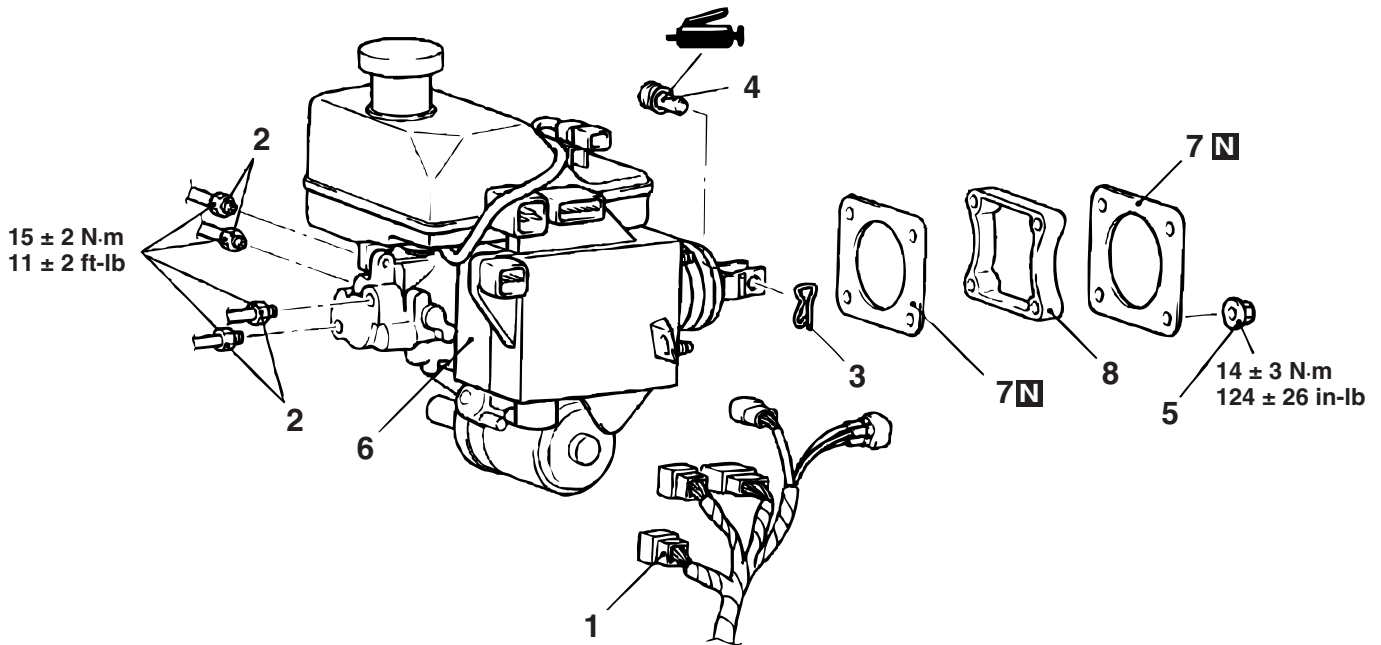
To prevent damaging the HBB pump motor, do not turn the ignition switch to the "ON" position until installation is completed and brake fluid is replenished.

Pre-removal Operation

- Bleeding of the brake fluid power supply system (Depress the brake pedal repeatedly more than 40 times with the ignition switch at the LOCK (OFF) position.)
- Brake Fluid Draining

Post-installation Operation

- Brake Pedal Adjustment (Refer to P.35A-116.)
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-124.)
- HBB Operating Check (Refer to P.35A-119.)



ACX00672 AB

REMOVAL STEPS

- BATTERY
- 1. HARNESS CONNECTORS
- 2. BRAKE TUBE CONNECTION
- 3. SNAP PIN

<<A>> >>A<<

REMOVAL STEPS (Continued)

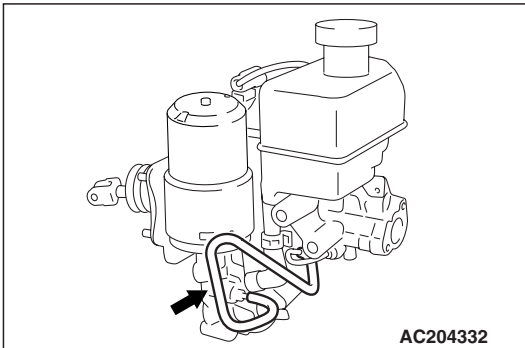
- 4. CLEVIS PIN
- 5. HBB MOUNTING NUT
- 6. HBB
- 7. SEAL
- 8. SPACER

REMOVAL SERVICE POINT

<<A>> HBB REMOVAL

⚠ CAUTION

Since high-pressure is applied to the tube shown in the illustration, do not bend it.

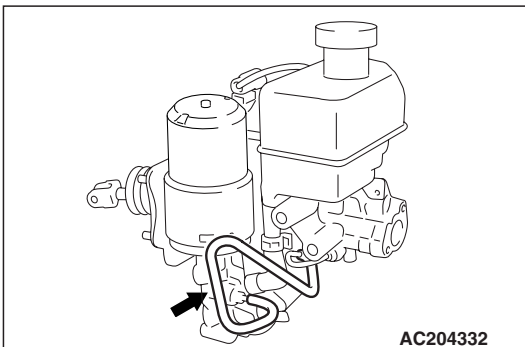


INSTALLATION SERVICE POINT

>>A<< HBB INSTALLATION

⚠ CAUTION

Since high-pressure is applied to the tube shown in the illustration, do not bend it.



ACCUMULATOR REPLACEMENT

M1351015800014

Required Special Tool:

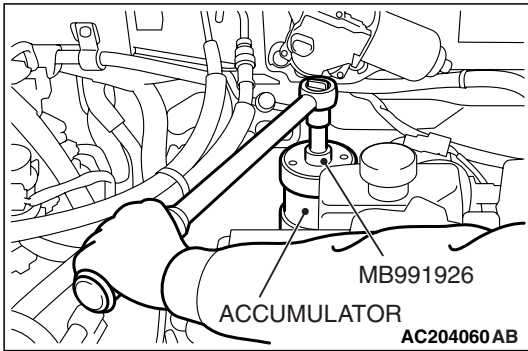
- MB991926: Accumulator Wrench

1. Depress the brake pedal repeatedly more than 40 times until the pedal depressing force feels heavy with the ignition switch at the "LOCK" (OFF) position to release the pressure of the HBB power supply system.

⚠ CAUTION

To prevent damaging the pump motor, do not turn the ignition switch to the "ON" position until brake fluid is replenished.

2. Drain the brake fluid.



3. Using special tool MB991926, remove the accumulator.
4. Remove the o-ring installed between the accumulator and the HBB.
5. Install a new o-ring to a new accumulator.
6. Using special tool MB991926, install the new accumulator to the HBB. The tightening torque of the accumulator is 54 ± 5 N·m (40 ± 4 ft-lb).
7. Fill the HBB brake system with brake fluid and bleed the HBB brake system (Refer to [P.35A-124](#)).
8. Carry out the function and operation check of power supply system (Refer to [P.35A-119](#)).
9. Erase HBB diagnostic trouble code (Refer to [P.35A-13](#)).
10. Dispose of the removed accumulator (Refer to [P.35A-138](#)).

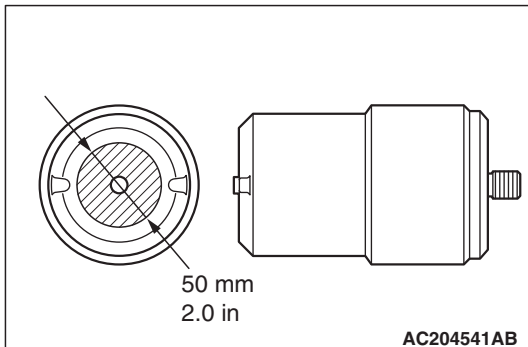
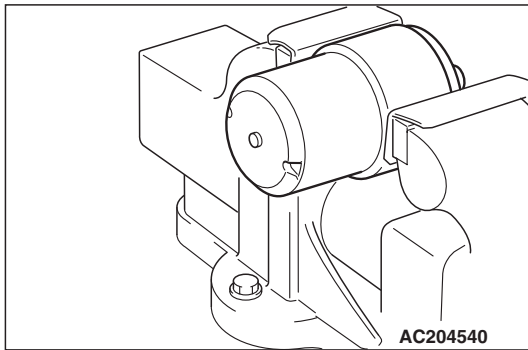
ACCUMULATOR DISPOSAL

M1351015900011

⚠ WARNING

Do not disassemble, throw into fire, cut, weld, drop, or shock the accumulator without purging filled gas.

1. Fix the accumulator on a vice as illustrated.



2. Punch in the area shown in the illustration to fix the drilling position.
3. Set a drill [diameter ϕ 4 mm (ϕ 0.16 in)] on the drill motor.

⚠ WARNING

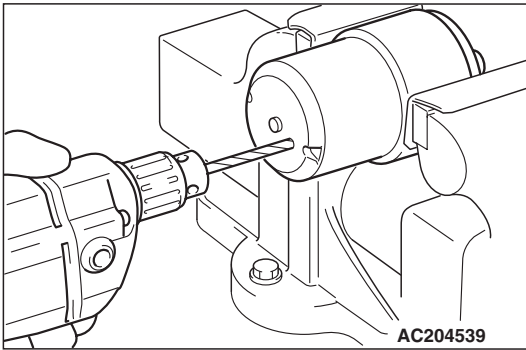
Wear protective glasses during drilling to protect you from scattered chips caused by spouting gas.

4. Using a drill motor, drill a hole on the accumulator to purge filled gas.

NOTE:

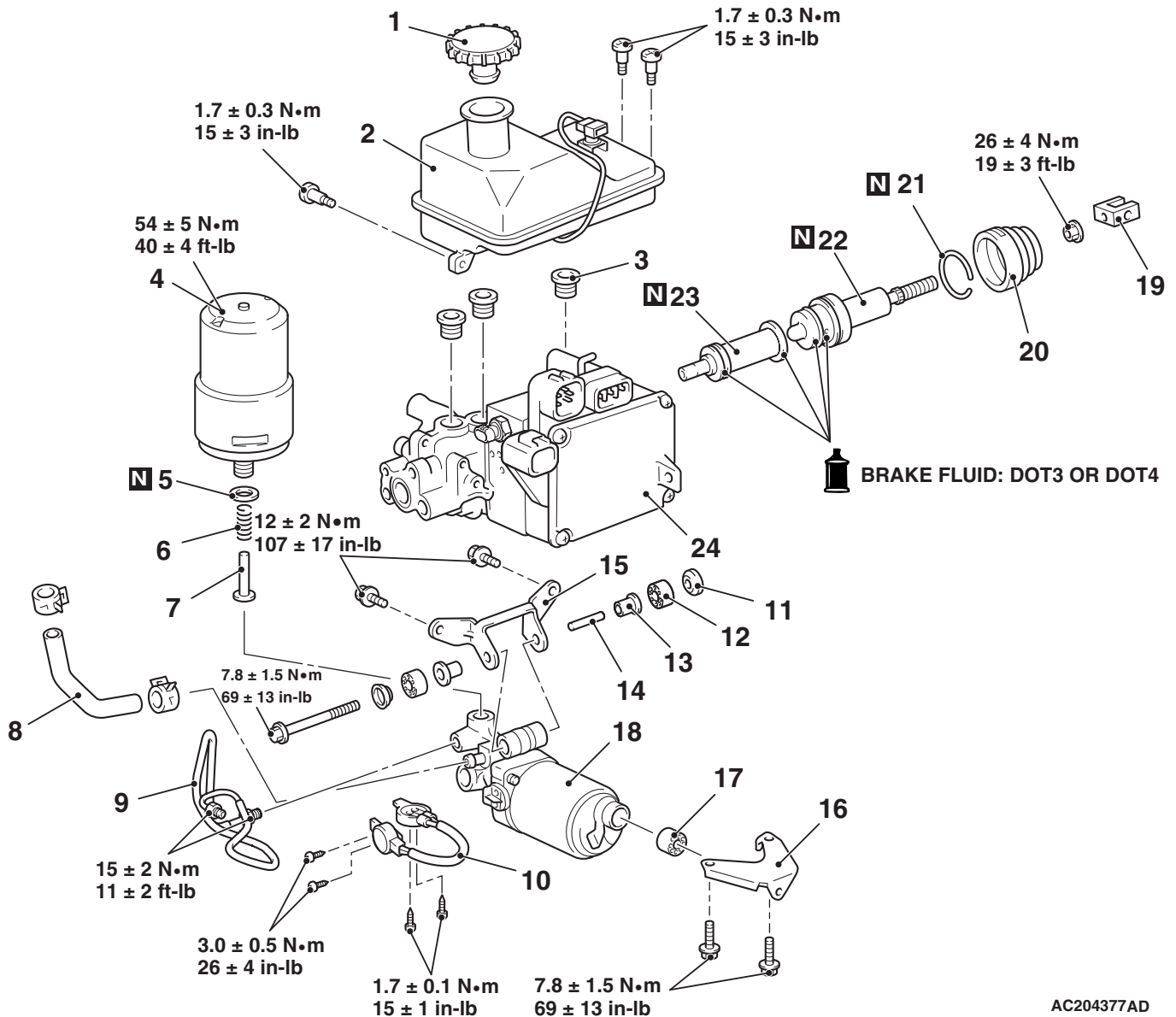
- There is no danger of accumulator burst due to drilling work.
- You can hear purging sound of gas as soon as a hole is made on the accumulator.
- The filled gas is nitrogen, which is colorless, odorless and harmless.

5. Dispose of the accumulator in compliance with Federal, state, and local laws.



DISASSEMBLY AND ASSEMBLY

M1351010800161



AC204377AD

DISASSEMBLY STEPS

<<A>>

1. RESERVOIR CAP
2. RESERVOIR ASSEMBLY
3. GROMMET
4. ACCUMULATOR
5. O-RING
6. SPRING
7. SILENT TUBE
8. HOSE
9. HBB BRAKE TUBE
10. LEAD WIRE
11. WASHER
12. BUSHING
13. COLLAR
14. PIN
15. BRACKET
16. BRACKET

DISASSEMBLY STEPS (Continued)

<>

<<C>>

<<C>>

<<C>>

17. BUSHING
18. PUMP MOTOR
19. CLEVIS
20. BOOT
- SECURING THE HBB
21. SNAP RING
22. POWER PISTON ASSEMBLY
23. MASTER CYLINDER PISTON ASSEMBLY
24. MASTER CYLINDER AND HYDRAULIC UNIT ASSEMBLY

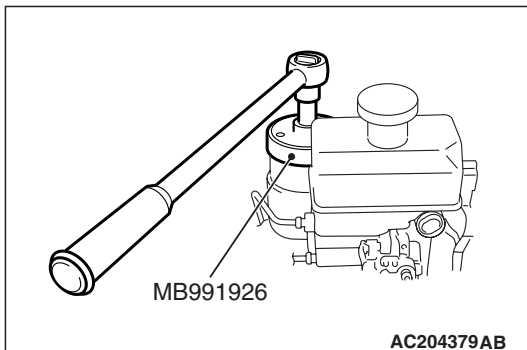
Required Special Tools:

- MB991926: Accumulator Wrench
- MB991620: Valve Spring Compressor Adapter

DISASSEMBLY SERVICE POINTS

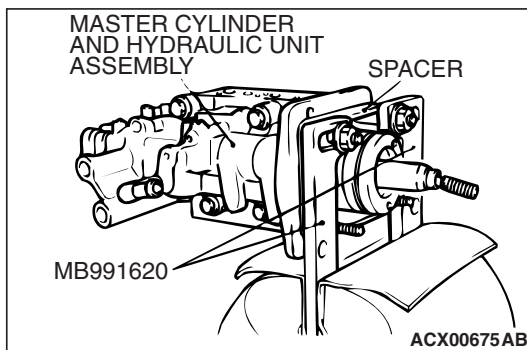
<<A>> ACCUMULATOR REMOVAL

Using special tool MB991926, remove the accumulator. For disposing of the accumulator, refer to [P.35A-138](#).



<> SECURING THE HBB

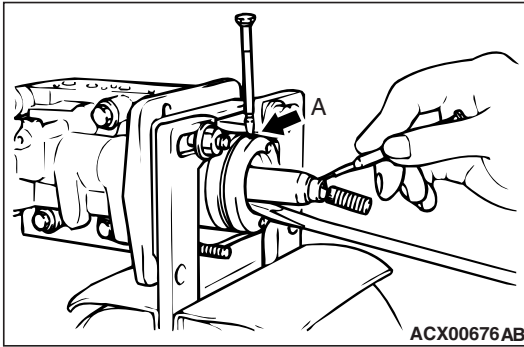
Secure the HBB on a vice as shown in the illustration, using spacers and special tool MB991620.



<<C>> SNAP RING/POWER PISTON ASSEMBLY/MASTER CYLINDER PISTON ASSEMBLY REMOVAL

1. Press-in the push rod of the power piston assembly, and remove the snap ring using a precision minus-slot screwdriver or similar tool.

NOTE: If it is difficult to remove the snap ring, push the snap ring from the hole ("A" in the illustration) on the cylinder body.

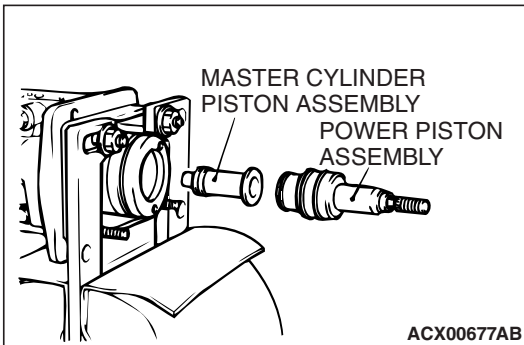


ACX00676 AB

CAUTION

Pull out the cylinder carefully so that the inner diameter of the cylinder is not damaged.

2. Pull to remove the power piston assembly and the master cylinder piston assembly straight from the body.



ACX00677 AB

BUZZER

REMOVAL AND INSTALLATION

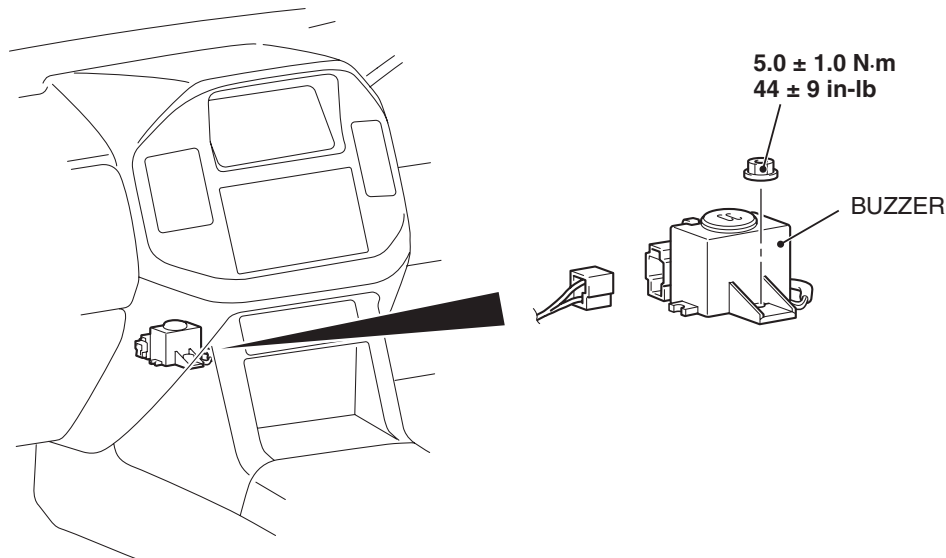
M1351016100018

Pre-removal Operation

- Indicator Panel, Lower Center Panel Removal (Refer to GROUP 52A, Floor Console [P.52A-7.](#))

Post-installation Operation

- Indicator Panel, Lower Center Panel Installation (Refer to GROUP 52A, Floor Console [P.52A-7.](#))
- Buzzer Operation Check (Refer to [P.35A-119.](#))

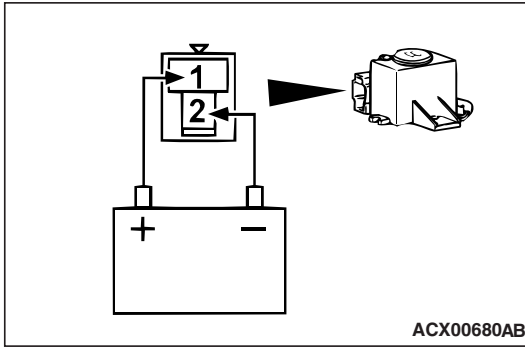


AC204378 AB

BUZZER CHECK

M1351016200015

Check that the buzzer sounds when a battery is connected to the buzzer as shown in the illustration.

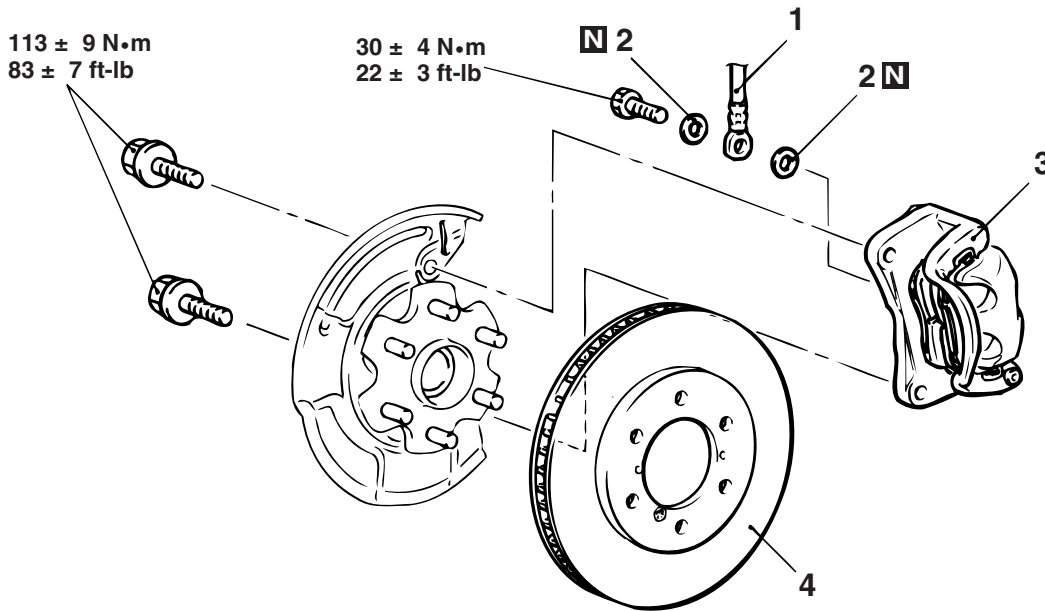


FRONT DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

M1351006000269

<p>Pre-removal Operation</p> <ul style="list-style-type: none"> • Brake Fluid Draining 	<p>Post-installation Operation</p> <ul style="list-style-type: none"> • Brake Fluid Supplying and Air Bleeding (Refer to P.35A-124.)
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ACX00681AB

REMOVAL STEPS

1. BRAKE HOSE CONNECTION
2. GASKET
- >>A<< 3. DISC BRAKE ASSEMBLY
4. BRAKE DISC

Required Special Tool:

- MB990520: Disc Brake Piston Expander

INSTALLATION SERVICE POINT

>>A<< DISC BRAKE ASSEMBLY INSTALLATION

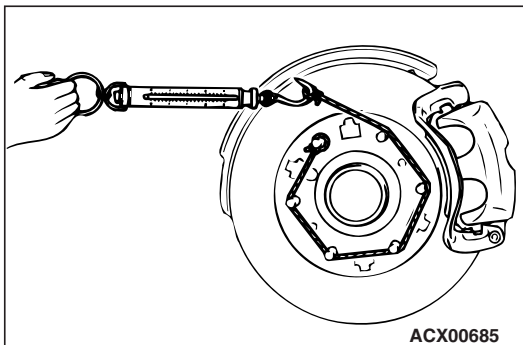
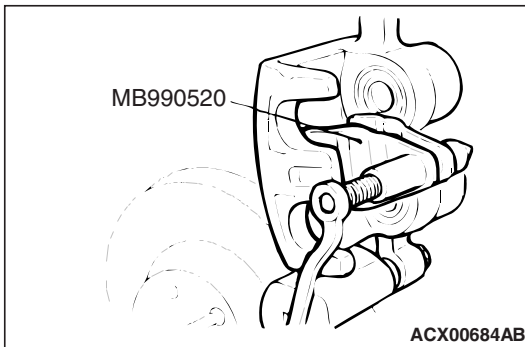
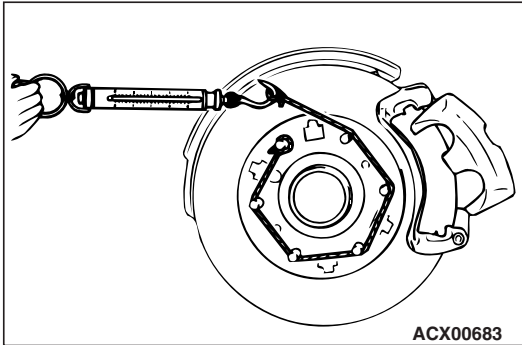
1. To check the brake drag force after mounting the pad, measure the hub torque in the advancing direction using a spring scale with the pad is removed.

⚠ CAUTION

Do not allow any oil, grease or other contamination to contact the friction surfaces of the pads and brake discs.

2. After re-installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.
3. Clean the piston, and insert into cylinder with special tool MB990520.
4. Be careful that the piston boot does not become caught when lowering the caliper assembly and installing the guide pin.
5. Check the brake drag force as follows:
 - (1) Start the engine and hold the brake pedal down for five seconds. [Pedal depression force: approximately 196 N (44 pound)]
 - (2) Stop the engine.
 - (3) Turn the brake disc forward 10 times.
 - (4) Use a spring scale to measure the hub torque with pads installed in the same direction as earlier.
 - (5) Calculate the drag force of the disc brake [difference between hub torque with pads installed and hub torque with pads removed].

Standard value: 55 N (12 pound)
6. If the brake drag force exceeds the standard value, disassemble and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.



INSPECTION

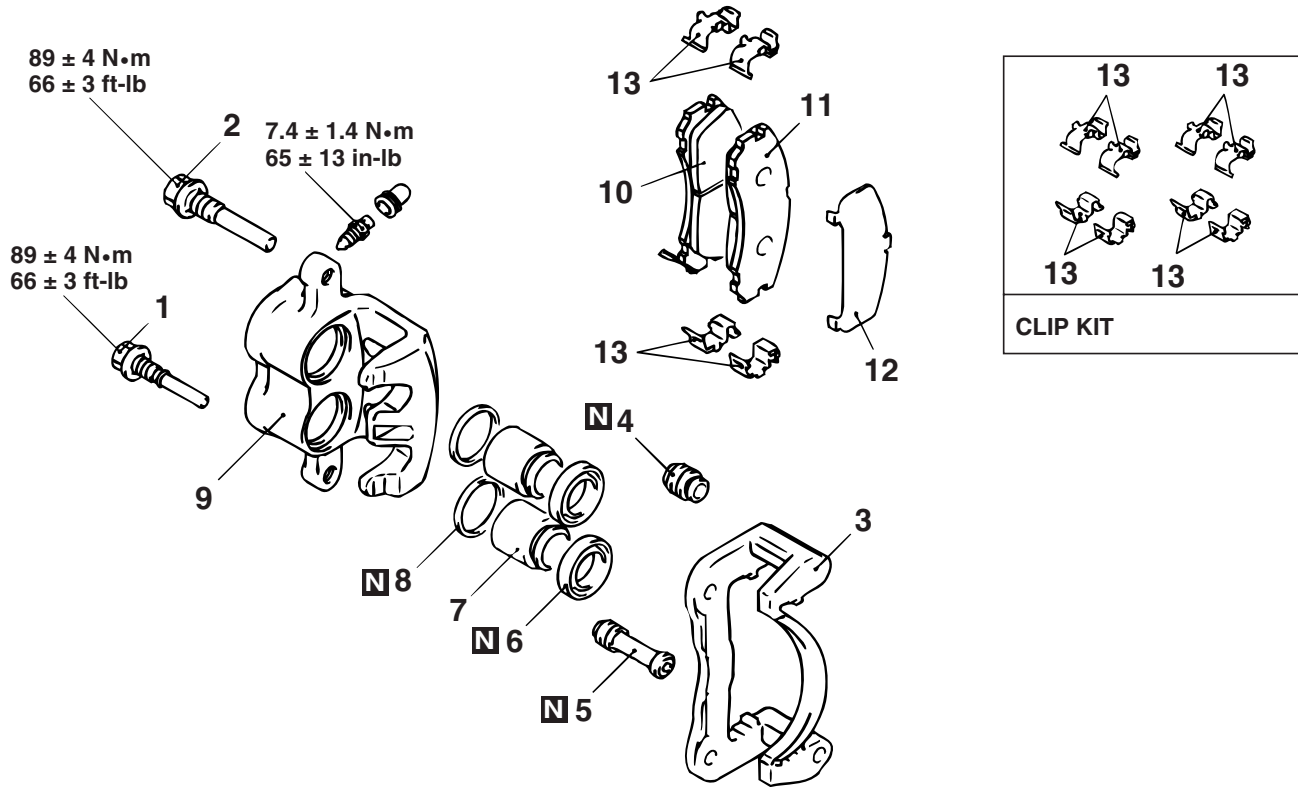
M1351006100181

Brake Disc Check

- Disc wear (Refer to [P.35A-132.](#))
- Disc run-out (Refer to [P.35A-133.](#))

DISASSEMBLY AND ASSEMBLY

M1351006200810



<p>BRAKE CALIPER KIT</p>	<p>PAD SET</p>	<p>SHIM KIT</p>	<p>SEAL AND BOOT KIT</p>

AC500839AB

DISASSEMBLY STEPS

1. GUIDE PIN LOCK BOLT
2. GUIDE PIN
3. CALIPER SUPPORT, PAD, CLIP AND SHIM ASSEMBLY
4. BOOT
5. BUSHING
6. PISTON BOOT
7. PISTON

<<A>>

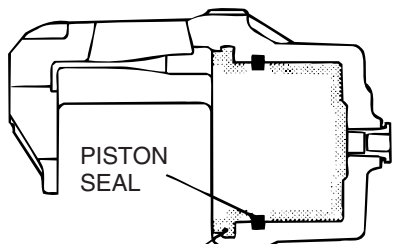
<<A>>

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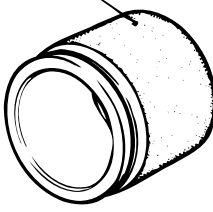
DISASSEMBLY STEPS (Continued)

8. PISTON SEAL
9. CALIPER BODY
10. PAD AND WEAR INDICATOR ASSEMBLY
11. PAD ASSEMBLY
12. SHIM
13. CLIP

LUBRICATION POINTS

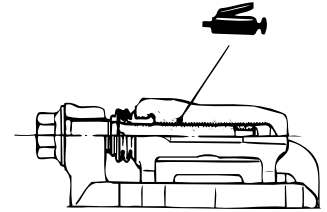


PISTON SEAL

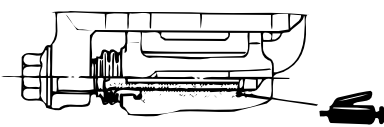


CAUTION
THE PISTON SEAL INSIDE THE SEAL AND BOOT KIT IS COATED WITH SPECIAL GREASE DO NOT WIPE THIS GREASE OFF.

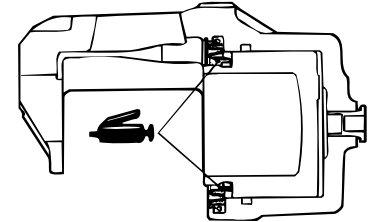
BRAKE FLUID: DOT3 OR DOT4



GREASE: REPAIR KIT GREASE



GREASE: REPAIR KIT GREASE



GREASE: REPAIR KIT GREASE

ACX00687AC

DISASSEMBLY SERVICE POINTS

⚠ CAUTION

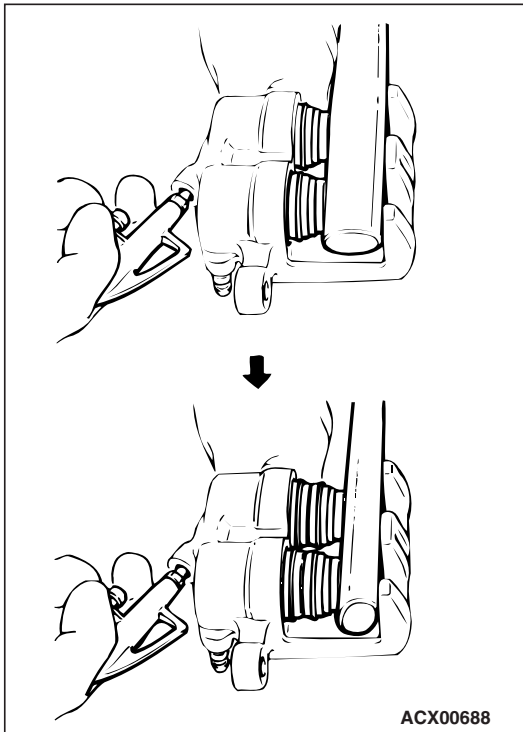
When disassembling the front disc brakes, disassemble both sides (left and right wheels) as a set.

<<A>> PISTON BOOT/PISTON REMOVAL

⚠ CAUTION

- When removing the pistons, be sure to use the handle of a plastic hammer and adjust the height of the two pistons while pumping in air slowly so that the pistons protrude evenly.
- Do not remove one piston completely before trying to remove the other piston, because it will become impossible to remove the second piston.
- Blow air little by little to remove the piston. The piston will rush out if a force of air is applied suddenly.

Blow compressed air slowly from the connecting portion of the brake hose to pull out the piston and the piston boots.

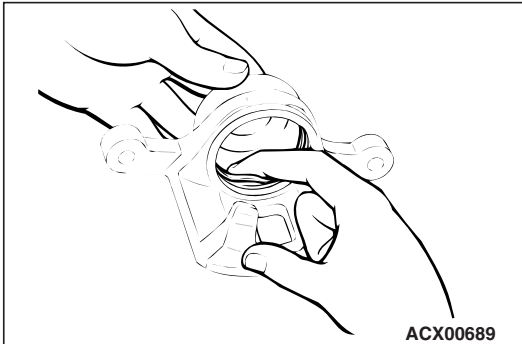


<> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.

1. Remove the piston seal with your finger tip.
2. Clean the piston surface and inner cylinder with alcohol brake fluid DOT 3 or DOT 4.



INSPECTION

M1351006300549

- Check the cylinder for wear, damage or rust.
- Check the piston surface for wear, damage or rust.
- Check the caliper body or sleeve for wear.
- Check the pad for damage or adhesion of grease.
- Check the backing metal for damage.

PAD WEAR CHECK

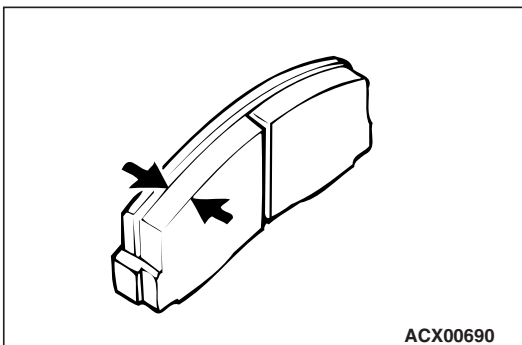
⚠ WARNING

- ***Always replace both brake pads on each wheel as a set (both front wheels or both rear wheels). Failure to do so will result in uneven braking, which may cause unreliable brake operation.***
- ***If there is significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.***

Measure thickness at the thinnest and most worn area of the pad. Replace the pad assembly if pad thickness is less than the limit value.

Standard value: 10.0 mm (0.39 inch)

Minimum limit: 2.0 mm (0.08 inch)



REAR DISC BRAKE ASSEMBLY

REMOVAL AND INSTALLATION

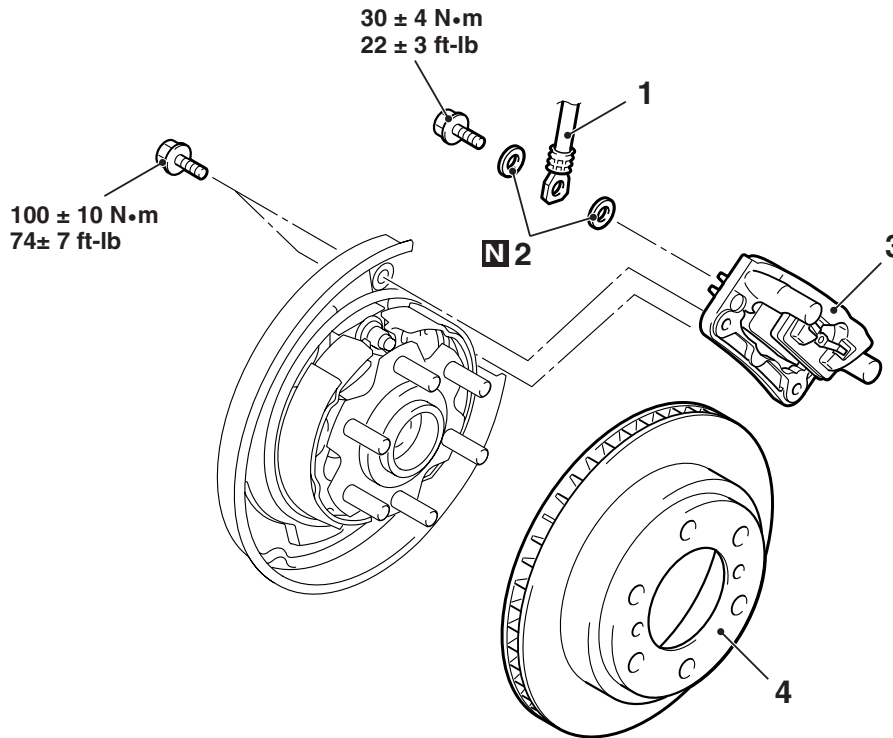
M1351007000187

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying and Air Bleeding (Refer to P.35A-124.)



AC204328 AB

REMOVAL STEPS

1. BRAKE HOSE CONNECTION
2. GASKET
- >>A<< 3. DISC BRAKE ASSEMBLY
4. BRAKE DISC

Required Special Tool:

- MB990520: Disc Brake Piston Expander

INSTALLATION SERVICE POINT

>>A<< DISC BRAKE ASSEMBLY INSTALLATION

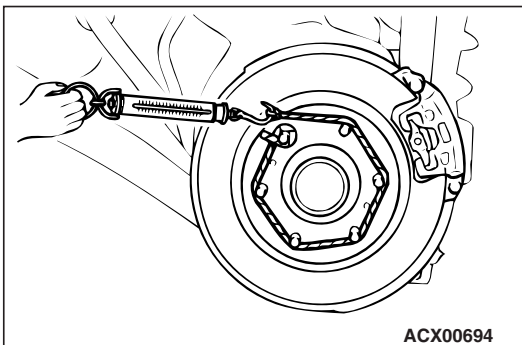
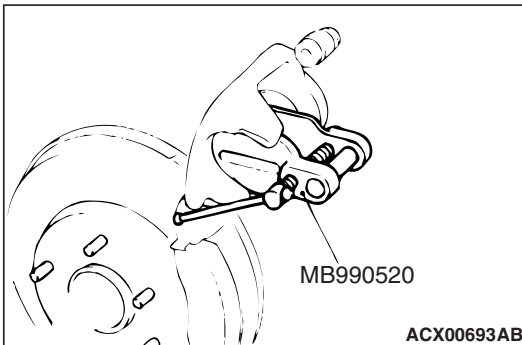
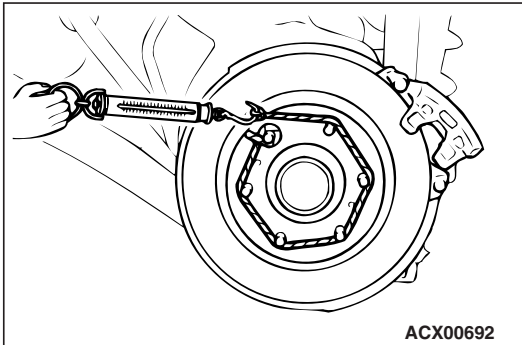
1. In order to measure brake drag torque after pad installation, measure hub torque with the pads removed.

Use a spring scale to measure hub torque in the direction shown. Record the value.

⚠ CAUTION

Do not allow any oil, grease or other contamination to contact the friction surfaces of the pads and brake discs.

2. After re-installing the caliper support, install the pad clips and pads to the caliper support.
 3. Clean the piston, and insert it into the cylinder with special tool MB990520.
 4. Be careful that the piston boot does not become caught when lowering the caliper assembly and installing the guide pin.
 5. Check brake drag force as follows:
 - (1) Start the engine and hold the brake pedal down for five seconds. [Pedal depression force: approximately 196 N (44 pounds)]
 - (2) Stop the engine.
 - (3) Turn the brake disc forward ten times.
 - (4) Use a spring scale to measure the hub torque with pads installed in the same direction as earlier.
 - (5) Calculate the drag force of the disc brake [difference between hub torque with pads installed and hub torque with pads removed].
- Standard value: 55 N (12 pounds)**
6. If the drag torque exceeds the standard value, disassemble and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.



INSPECTION

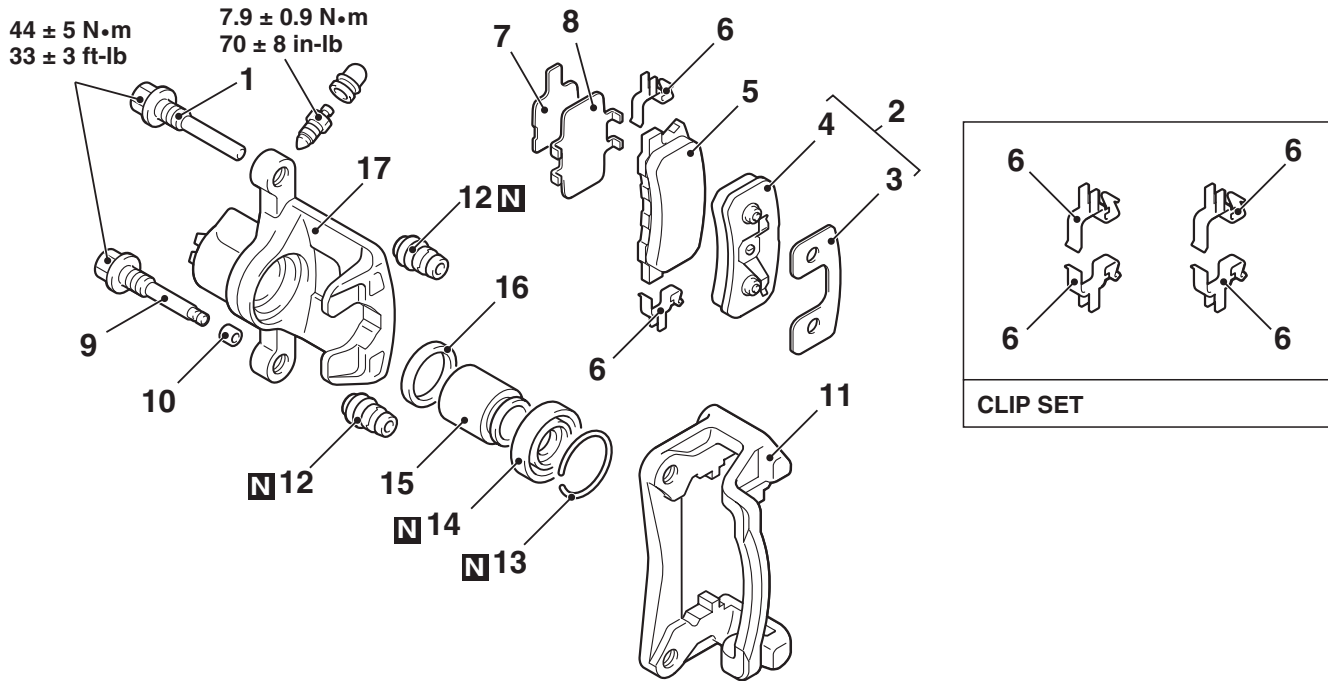
M1351007100184

Brake Disc Check

- Disc wear (Refer to [P.35A-132.](#))
- Disc run-out (Refer to [P.35A-133.](#))

DISASSEMBLY AND ASSEMBLY

M1351007200493



BRAKE CALIPER KIT	PAD SET	SHIM SET	SEAL AND BOOTS KIT

AC500842AB

DISASSEMBLY STEPS

- >>A<< 1. GUIDE PIN
- 2. PAD AND CLIP ASSEMBLY AND SHIM
- 3. SHIM
- 4. PAD AND CLIP ASSEMBLY
- 5. PAD ASSEMBLY
- 6. PAD CLIP
- 7. SHIM B
- 8. SHIM A
- >>A<< 9. LOCK PIN

DISASSEMBLY STEPS (Continued)

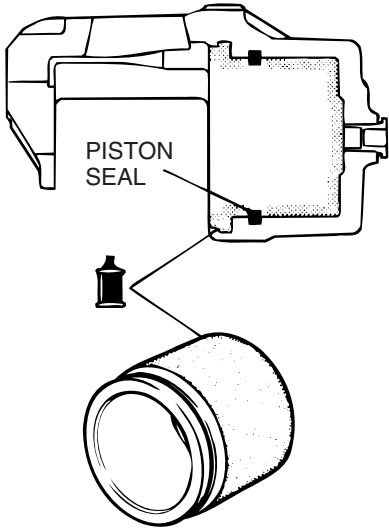
- 10. BUSHING
- 11. CALIPER SUPPORT
- 12. PIN BOOT
- 13. BOOT RING
- 14. PISTON BOOT
- 15. PISTON
- 16. PISTON SEAL
- 17. CALIPER BODY

<<A>>

<<A>>

<>

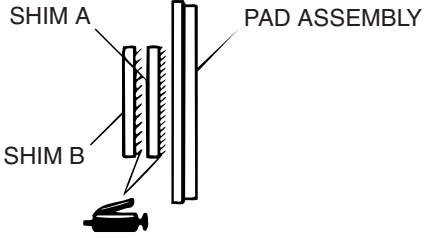
LUBRICATION POINTS



PISTON SEAL

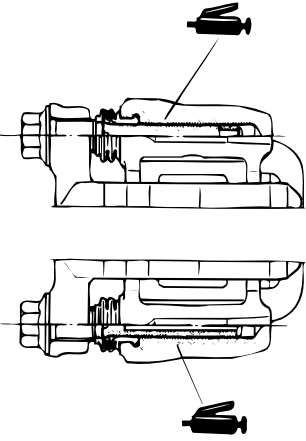
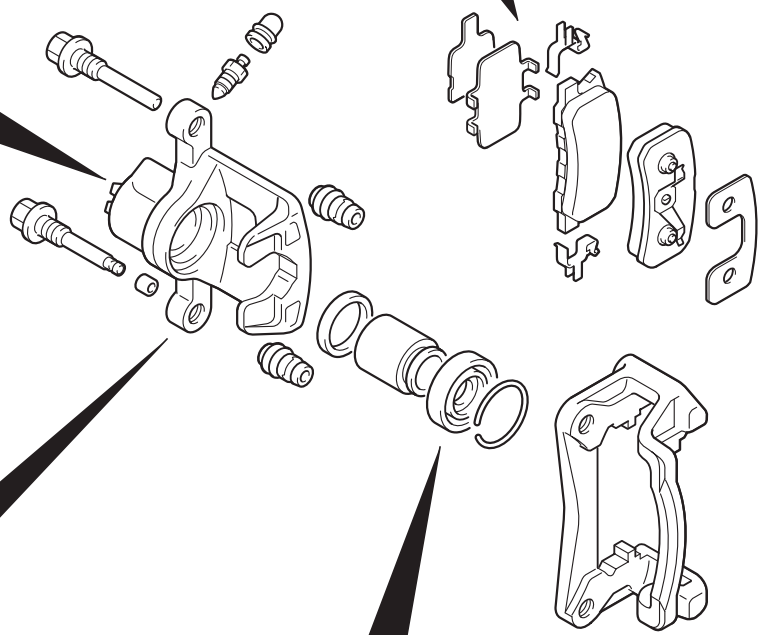
CAUTION
THE PISTON SEAL INSIDE THE SEAL AND BOOT KIT IS COATED WITH SPECIAL GREASE. DO NOT WIPE THIS GREASE OFF.

BRAKE FLUID: DOT3 OR DOT4

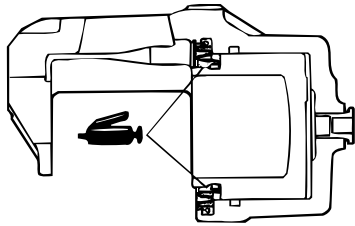


SHIM A
SHIM B
PAD ASSEMBLY

GREASE: BRAKE GREASE J310, NLGI NO.1



GREASE: REPAIR KIT GREASE



GREASE: REPAIR KIT GREASE

AC205297AB

DISASSEMBLY SERVICE POINTS

⚠ CAUTION

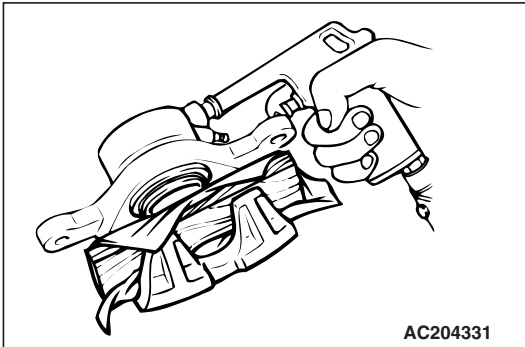
When disassembling the disc brakes, disassemble both sides (left and right) as a set.

<<A>> PISTON BOOT/PISTON REMOVAL

⚠ CAUTION

Blow air little by little to remove the piston. The piston will rush out if a force of air is applied suddenly.

Place a piece of wood, etc. against the caliper body as shown. Blow compressed air through the brake hose connection hole to remove the piston boot and piston.

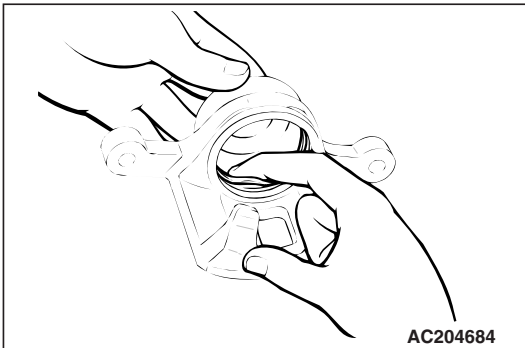


<> PISTON SEAL REMOVAL

⚠ CAUTION

Do not use a flat-tipped screwdriver or similar tool to remove piston seal. These may damage the inner side of the cylinder.

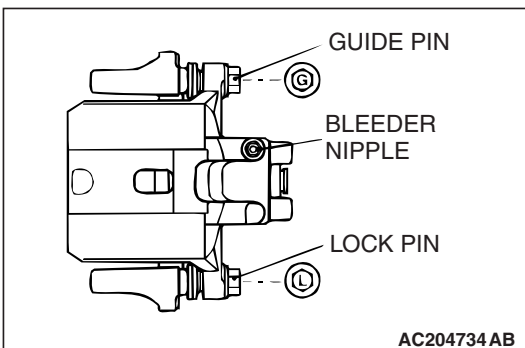
1. Remove the piston seal with your finger tip.
2. Clean piston surface and inner cylinder with alcohol or brake fluid DOT 3 or DOT 4.



ASSEMBLY SERVICE POINT

>>A<< LOCK PIN/GUIDE PIN INSTALLATION

Attach a guide pin at the bleeder nipple side of the caliper body and a lock pin at the opposite side.



INSPECTION

M1351007300360

- Check the cylinder for wear, damage or rust.
- Check the piston surface for wear, damage or rust.
- Check the caliper body or sleeve for wear.
- Check the pad for damage or adhesion of grease.
- Check the backing metal for damage.

PAD WEAR CHECK

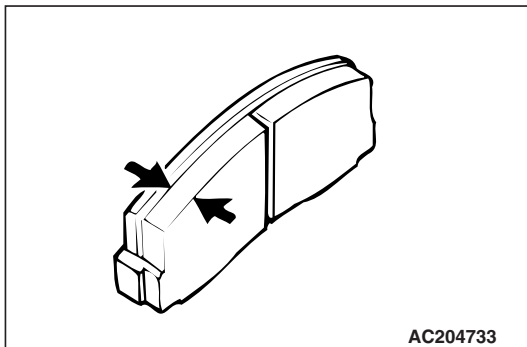
WARNING

- ***Always replace both brake pads on each wheel as a set (both front wheels or both rear wheels). Failure to do so will result in uneven braking, which may cause unreliable brake operation.***
- ***If there is significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.***

Measure thickness at the thinnest and most worn area of the pad. Replace the pad assembly if pad thickness is less than the limit value.

Standard value: 10.0 mm (0.39 inch)

Minimum limit: 2.0 mm (0.08 inch)



SPECIFICATIONS**FASTENER TIGHTENING SPECIFICATIONS**

M1351009600561

ITEM	SPECIFICATION
Brake line	
Brake tube flare nut	15 ± 2 N·m (11 ± 2 ft-lb)
Brake pedal	
Hydraulic brake booster mounting nut	14 ± 3 N·m (124 ± 26 in-lb)
Pedal support member mounting bolt	12 ± 2 N·m (107 ± 17 in-lb)
Buzzer	
Buzzer mounting nut	5.0 ± 1.0 N·m (44 ± 9 in-lb)
Hydraulic brake booster (HBB)	
Accumulator	54 ± 5 N·m (40 ± 4 ft-lb)
Clevis nut	26 ± 4 N·m (19 ± 3 ft-lb)
Hydraulic brake booster mounting nut	14 ± 3 N·m (124 ± 26 in-lb)
Lead wire screw (hydraulic unit side)	1.7 ± 0.1 N·m (15 ± 1 in-lb)
Lead wire screw (pump motor side)	3.0 ± 0.5 N·m (26 ± 4 in-lb)
Pump motor bracket mounting bolt	12 ± 2 N·m (107 ± 17 in-lb)
Pump motor mounting bolt	7.8 ± 1.5 N·m (69 ± 13 in-lb)
Reservoir assembly mounting screw	1.7 ± 0.3 N·m (15 ± 3 in-lb)
Front disc brake	
Bleeder screw	7.4 ± 1.4 N·m (65 ± 13 in-lb)
Brake hose connector bolt	30 ± 4 N·m (22 ± 3 ft-lb)
Front brake assembly mounting bolt	113 ± 9 N·m (83 ± 7 ft-lb)
Guide pin	89 ± 4 N·m (66 ± 3 ft-lb)
Guide pin lock bolt	89 ± 4 N·m (66 ± 3 ft-lb)
Rear disc brake	
Bleeder screw	7.9 ± 0.9 N·m (70 ± 8 in-lb)
Brake hose connector bolt	30 ± 4 N·m (22 ± 3 ft-lb)
Rear disc brake assembly mounting bolt	100 ± 10 N·m (74 ± 7 ft-lb)
Guide pin	44 ± 5 N·m (33 ± 3 ft-lb)
Lock pin	44 ± 5 N·m (33 ± 3 ft-lb)

GENERAL SPECIFICATIONS

M1351000200210

ITEM		SPECIFICATION
Hydraulic brake booster (HBB)	Master cylinder type	Single type (with center valve)
	Master cylinder ID mm (in)	22.22 (0.875)
	Boosting ratio	5.4
Rear wheel hydraulic pressure control type		Electronic brake-force distribution (EBD)
Front brakes	Type	Floating caliper, 2 piston, ventilated disc
	Disc effective diameter mm (in)	241 (9.5)
	Wheel cylinder ID mm (in)	45.4 (1.79)
	Pad thickness mm (in)	10.0 (0.40)
	Clearance adjustment	Automatic
Rear brakes	Type	Floating caliper, 1 piston, ventilated disc
	Disc effective diameter mm (in)	256 (10.0)
	Wheel cylinder ID mm (in)	44.5 (1.75)
	Pad thickness mm (in)	10.0 (0.40)
	Clearance adjustment	Automatic

SERVICE SPECIFICATIONS

M1351000300284

ITEM		STANDARD VALUE	LIMIT		
Brake pedal height mm (in)		192 – 195 (7.6 – 7.7)	–		
Brake pedal play mm (in)		3 (0.1) or less	–		
Brake pedal to floor board clearance when the brake pedal is depressed mm (in) <Pedal depression force: Approximately 500 N (112 lb)>		90 (3.5) or more	–		
Hydraulic brake booster (HBB)	Pump motor operating time: seconds	When brake fluid pressure is not applied to power supply system	20 – 80	–	
		With power assist	2 – 11	–	
	Hydraulic pressure generated at test without booster: kPa (psi)	Depressing force 100 N (22 lb)	Front	600 (87) or more	–
			Rear	0 (0)	–
		Depressing force 500 N (112 lb)	Front	4,500 (653) or more	–
			Rear	0 (0)	–
	Hydraulic pressure generated at test with booster: kPa (psi)	Depressing force 100 N (22 lb)	Front	3,000 – 4,000 (435 – 580)	–
			Rear	3,300 – 4,300 (479 – 624)	–
		Depressing force 200 N (45 lb)	Front	8,000 – 10,000 (1,160 – 1,450)	–
			Rear	8,000 – 10,000 (1,160 – 1,450)	–

ITEM				STANDARD VALUE	LIMIT
	Hydraulic pressure generated at test with booster: kPa (psi)	Depressing force 400 N (90 lb)	Front	14,000 – 18,000 (2,030 – 2,611)	–
			Rear	14,000 – 18,000 (2,030 – 2,611)	–
		Depressing force 500 N (112 lb)	Front	15,000 – 19,000 (2,175 – 2,756)	–
			Rear	15,000 – 19,000 (2,175 – 2,756)	–
Front disc brake	Pad thickness mm (in)			10.0 (0.39)	Minimum 2.0 (0.08)
	Disc thickness mm (in)			26.0 (1.02)	Minimum 24.4 (0.96)
	Disc run-out mm (in)			–	0.06 (0.002)
	Drag force N (lb)			55 (12)	–
Rear disc brake	Pad thickness mm (in)			10.0 (0.39)	Minimum 2.0 (0.08)
	Disc thickness mm (in)			22.0 (0.87)	Minimum 20.4 (0.80)
	Disc run-out mm (in)			–	0.06 (0.002)
	Drag force N (lb)			55 (12)	–
Front hub end play mm (in)				–	0 (0)
Rear hub end play mm (in)				–	0 (0)

LUBRICANTS

M1351000400269

ITEM	SPECIFIED LUBRICANT
Brake fluid	DOT3 or DOT4
HBB power piston assembly, HBB master cylinder piston assembly	
Brake caliper piston, caliper body piston cylinder	
Piston boot, piston seal	Repair kit grease
Guide pin lock bolt, guide pin, lock pin	
Rear disc brake pad assembly and shim A contact surface	Brake grease SAE J310, NLGI No.1
Rear disc brake shim A and shim B contact surface	