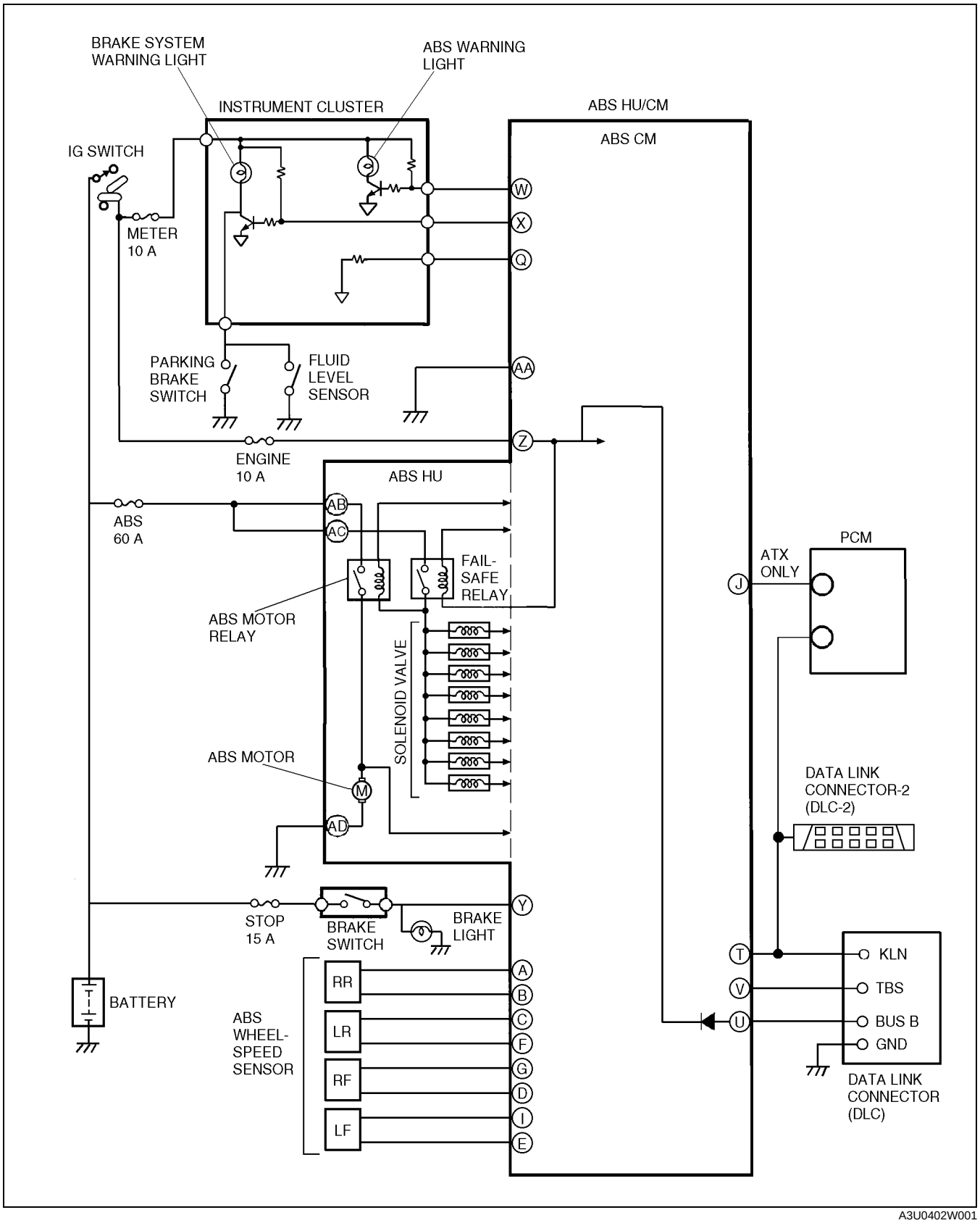
BRAKES

04
SECTION

04–02 ON-BOARD DIAGNOSTIC

ABS SYSTEM DIAGRAM

A3U040243000W01



A3U0402W001

ABS ON-BOARD DIAGNOSTIC

A3U040243000W02

On-Board Diagnostic (OBD) Test Description

- The OBD test inspects the integrity and function of the ABS and outputs the results when requested by the specific tests.
- On-board diagnostic test also:
  - — Provides a quick inspection of the ABS.
  - — Is usually performed at the start of each diagnostic procedure.
  - — Provides verification after repairs to ensure that no other faults occurred during service.
- The OBD test is divided into 3 tests:
  - — Read/clear diagnostic results, PID monitor and record and active command modes.

Read/clear diagnostic results

- This function allows you to read or clear DTCs in the ABS HU/CM memory.

PID/data monitor and record

- This function allows you to access certain data values, input signals, calculated values, and system status information.

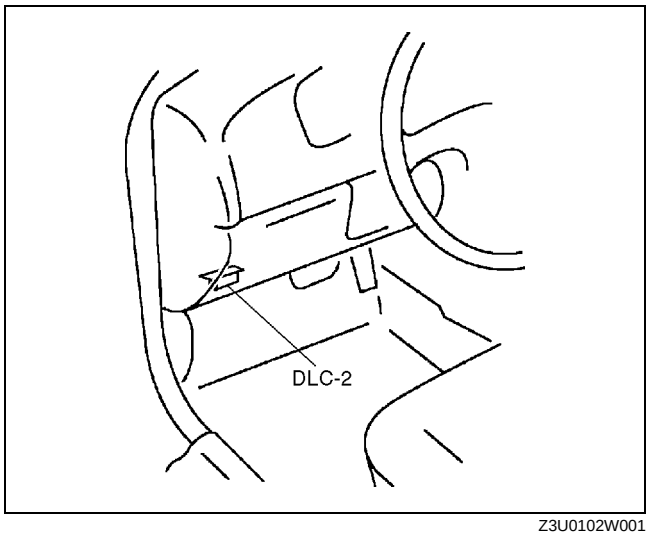
Active command modes

- This function allows you to control devices through the **SST** (WDS or equivalent).

DTCs Retrieving Procedure

Using SST (WDS or equivalent)

1. Connect WDS or equivalent to the vehicle DLC-2 16-pin connector located the left side of the steering column.
2. Retrieve DTC by WDS or equivalent.



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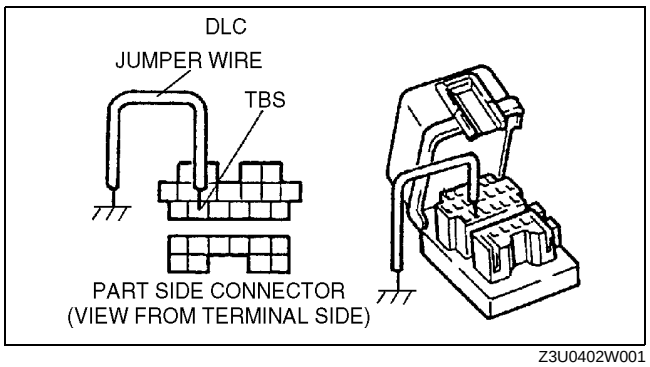
Without using SST (WDS or equivalent)

Caution

- **Connecting the wrong DLC terminal may possibly cause a malfunction. Carefully connect the specified terminal only.**

1. Connect the TBS terminal at DLC to body ground using a jumper wire.
2. Turn the ignition key to ON (engine OFF).



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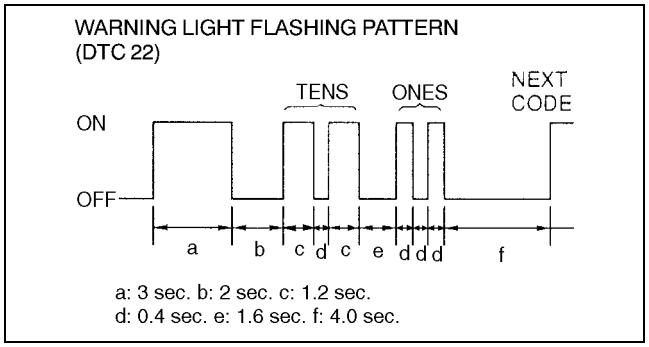
3. After the ABS warning light illuminates for **3 sec**, the ABS warning light indicates DTCs.
4. After completion of repairs, clear DTCs.



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DTCs Clearing Procedure
Using SST (WDS or equivalent)

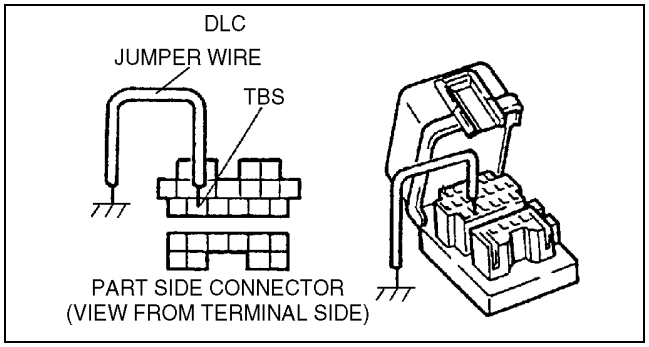
1. After repairs have been made, perform the **DTCs retrieving procedure**.
2. Erase DTC by WDS or equivalent.
3. Ensure that the customer's concern has been resolved.

Note
- After repairing the ABS wheel-speed sensor or replacing ABS HU/CM, the ABS and/or BRAKE system warning light may not go off when ignition key is turned ON. In this case, start engine and drive the vehicle at a speed of more than **10 km/h {6.2 mph}** until the ABS and/or BRAKE system warning light goes off.

Without using SST (WDS or equivalent)

Caution
- **Connecting the wrong DLC terminal may possibly cause a malfunction. Carefully connect the specified terminal only.**

1. Connect the TBS terminal at the DLC to body ground using a jumper wire.
2. Turn the ignition key to ON (engine OFF).
3. Output all stored DTCs.
4. After verifying that the first code is repeated, depress the brake pedal **10 times** at intervals of less than **1 second**.
5. Turn the ignition key to OFF and disconnect the jumper wire.
6. Turn the ignition key to ON and verify the ABS warning light turns off after **3 seconds**.



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Note
- DTCs cannot be cleared if the following conditions occur:
  — If intervals of depressing the brake pedal exceed **1 second**.
  — The brake switch has failed.
- After repairing the ABS wheel-speed sensor or replacing ABS HU/CM, the ABS and/or BRAKE system warning light may not go off when ignition key is turned ON. In this case, start engine and drive the vehicle at a speed of more than **10 km/h {6.2 mph}** until the ABS and/or BRAKE system warning light goes off.

PID/Data Monitor and Record Procedure

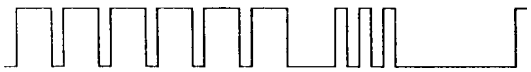
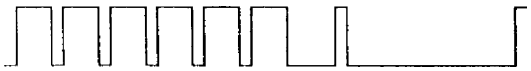
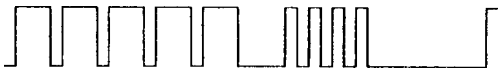
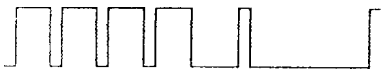
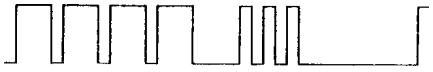
1. Connect WDS or equivalent to the vehicle DLC-2 16-pin connector located the left side of the steering column.
2. Access and monitor PIDs by WDS or equivalent.

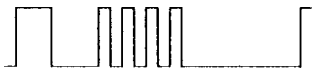
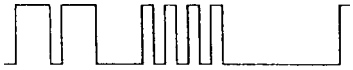
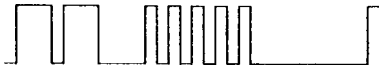
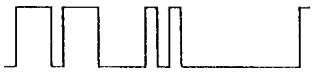
Active Command Modes Procedure

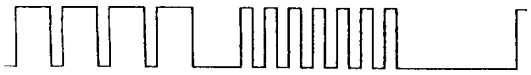
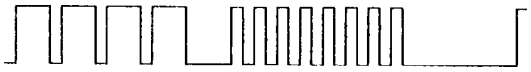
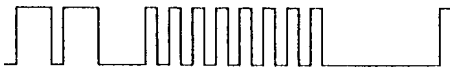
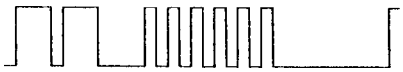
Note
- When driving, the ABS motor and each valve forcibly turn ABS_POWER on, and then each command on. ABS_POWER regulates the power supply for the ABS motor and 8 valves.

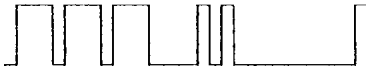
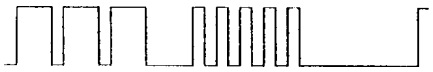
1. Connect WDS or equivalent to the vehicle DLC-2 16-pin connector located the left side of the steering column.
2. Turn the ignition key to ON (Engine OFF) or start engine.
3. Activate active command modes by WDS or equivalent.

DTC Table

DTC		ABS warning light flashing pattern	DTC definition	Diagnosis system component	Page
WDS or equivalent	ABS warning light				
B1318	63		Battery low voltage	ABS HU/CM power supply	(See 04–02–18 DTC B1318 (63).)
B1342	61		Defecive ABS CM	ABS HU/CM (CM)	(See 04–02–18 DTC B1342 (61).)
C1095	54		Circuit failure of ABS motor and/or motor relay	ABS motor, motor relay	(See 04–02–17 DTC C1095 (54), C1096 (53).)
C1096	53		Open circuit of ABS motor and/or motor relay	ABS motor, motor relay	(See 04–02–17 DTC C1095 (54), C1096 (53).)
C1140	30		ABS HU failure	ABS HU/CM (pump)	(See 04–02–14 DTC C1140 (30).)
C1145	11		Circuit failure of RF ABS wheel-speed sensor	Right front ABS wheel-speed sensor	(See 04–02–11 DTC C1145 (11), C1155 (12), C1165 (13), C1175 (14).)
C1148	41		RF ABS wheel-speed sensor and/or sensor rotor malfunction	Right front ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)
C1155	12		Circuit failure of LF ABS wheel-speed sensor	Left front ABS wheel-speed sensor	(See 04–02–11 DTC C1145 (11), C1155 (12), C1165 (13), C1175 (14).)
C1158	42		LF ABS wheel-speed sensor and/or sensor rotor malfunction	Left front ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)
C1165	13		Circuit failure of RR ABS wheel-speed sensor	Right rear ABS wheel-speed sensor	(See 04–02–11 DTC C1145 (11), C1155 (12), C1165 (13), C1175 (14).)
C1168	43		RR ABS wheel-speed sensor and/or sensor rotor malfunction	Right rear ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)

DTC		ABS warning light flashing pattern	DTC definition	Diagnosis system component	Page
WDS or equivalent	ABS warning light				
C1175	14		Circuit failure of LR ABS wheel-speed sensor	Left rear wheel-speed sensor	(See 04–02–11 DTC C1145 (11), C1155 (12), C1165 (13), C1175 (14).)
C1178	44		LR ABS wheel-speed sensor and/or sensor rotor malfunction	Left rear ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)
C1186	51		Open circuit of fail-safe relay	Fail-safe relay	(See 04–02–16 DTC C1186 (51), C1266 (52).)
C1194	24		LF pressure reduction solenoid valve malfunction	Left front ABS pressure reduction solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1198	25		LF pressure retention solenoid valve malfunction	Left front ABS pressure retention solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1210	22		RF pressure reduction solenoid valve malfunction	Right front ABS pressure reduction solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1214	23		RF pressure retention solenoid valve malfunction	Right front ABS pressure retention solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1233	46		LF ABS wheel-speed sensor input signal missing	Left front ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)

DTC		ABS warning light flashing pattern	DTC definition	Diagnosis system component	Page
WDS or equivalent	ABS warning light				
C1234	45		RF ABS wheel-speed sensor input signal missing	Right front ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)
C1235	47		RR ABS wheel-speed sensor input signal missing	Right rear ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)
C1236	48		LR ABS wheel-speed sensor input signal missing	Left rear ABS wheel-speed sensor/sensor rotor	(See 04–02–12 DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48).)
C1242	28		LR pressure reduction solenoid valve malfunction	Left rear ABS pressure reduction solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1246	26		RR pressure reduction solenoid valve malfunction	Right rear ABS pressure reduction solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1250	29		LR pressure retention solenoid valve malfunction	Left rear ABS pressure retention solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)
C1254	27		RR pressure retention solenoid valve malfunction	Right rear ABS pressure retention solenoid valve	(See 04–02–14 DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27).)

DTC		ABS warning light flashing pattern	DTC definition	Diagnosis system component	Page
WDS or equivalent	ABS warning light				
C1266	52		Circuit failure of fail-safe relay	Fail-safe relay	(See 04–02–16 DTC C1186 (51), C1266 (52).)
C1510	32		RF ABS wheel-speed sensor and/or ABS HU malfunction	Right front solenoid valve, ABS motor, right front ABS wheel-speed sensor/sensor rotor	(See 04–02–15 DTC C1510 (32), C1511 (33), C1512 (34), C1513 (35).)
C1511	33		LF ABS wheel-speed sensor and/or ABS HU malfunction	Left front solenoid valve, ABS motor, left front ABS wheel-speed sensor/sensor rotor	(See 04–02–15 DTC C1510 (32), C1511 (33), C1512 (34), C1513 (35).)
C1512	34		RR ABS wheel-speed sensor and/or ABS HU malfunction	Right rear solenoid valve, ABS motor, right rear ABS wheel-speed sensor/sensor rotor	(See 04–02–15 DTC C1510 (32), C1511 (33), C1512 (34), C1513 (35).)
C1513	35		LR ABS wheel-speed sensor and/or ABS HU malfunction	Left rear solenoid valve, ABS motor, left rear ABS wheel-speed sensor/sensor rotor	(See 04–02–15 DTC C1510 (32), C1511 (33), C1512 (34), C1513 (35).)

PID/DATA Monitor Table

PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS HU/CM terminal
ABS_LAMP (ABS warning light output state)	ON/OFF	• ABS warning light is illuminated: ON • ABS warning light is not illuminated: OFF	Inspect ABS warning light (See 09–22–3 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION)	W
ABSLF_I (Left front ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—
ABSLF_O (Left front ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—
ABSLR_I (Left rear ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—

PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS HU/CM terminal
ABSLR_O (Left rear ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—
ABSRF_I (Right front ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—
ABSRF_O (Right front ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/INSTALLATION	—
ABSRR_I (Right rear ABS pressure retention solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—
ABSRR_O (Right rear ABS pressure reduction solenoid valve output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (solenoid valve is activated/deactivated) • Not ABS and/or EBD control: OFF (solenoid valve is deactivated)	Internal fault of ABS HU/CM. Replace ABS HU/CM (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION)	—
ABS_VOLT (System battery voltage value)	V	• Ignition key at ON: B+ • Idle: 14—16V	Inspect power supply circuit (See 04–13–6 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) INSPECTION)	—
BOO_ABS (Brake pedal switch input)	ON/OFF	• Brake pedal is depressed: ON • Brake pedal is released: OFF	Inspect brake switch (See 04–11–5 BRAKE SWITCH INSPECTION)	Y
BRAKE_LMP (BRAKE system warning light output state)	ON/OFF	• BRAKE system warning light is illuminated: ON • BRAKE system warning light is not illuminated: OFF	Inspect BRAKE system warning light (See 09–22–3 INSTRUMENT CLUSTER REMOVAL/ INSTALLATION)	X
CCNTABS (Number of continuous DTC)	—	• DTC is detected: 1—255 • DTC is not detected: 0	Perform inspection using appropriate DTC (See 04–02–3 ABS ON-BOARD DIAGNOSTIC)	—
LF_WSPD (Left front ABS wheel-speed sensor input)	KPH/MPH	• Vehicle is stopped: 0KPH {0MPH} • Indicates vehicle speed	Inspect ABS wheel-speed sensor/sensor rotor. (See 04–13–9 FRONT/ REAR ABS WHEEL-SPEED SENSOR INSPECTION)	I, E

PID Name (Definition)	Unit/Condition	Condition/Specification	Action	ABS HU/CM terminal
LR_WSPD (Left rear ABS wheel-speed sensor input)	KPH/MPH	• Vehicle is stopped: 0KPH {0MPH} • Indicates vehicle speed	Inspect ABS wheel-speed sensor/sensor rotor. (See 04–13–9 FRONT/ REAR ABS WHEEL-SPEED SENSOR INSPECTION)	C, F
PMP MTR (ABS motor relay output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (ABS motor is activated/ deactivated) • Not ABS and/or EBD control: OFF (ABS motor is deactivated)	Inspect ABS HU/CM connector and ABS HU/CM (See 04–13–3 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) SYSTEM INSPECTION)	—
PMPSTAT (ABS motor output state)	ON/OFF	• During ABS and/or EBD control: ON/OFF (ABS motor is activated/ deactivated) • Not ABS and/or EBD control: OFF (ABS motor is deactivated)	Inspect ABS HU/CM connector and ABS HU/CM (See 04–13–3 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) SYSTEM INSPECTION)	—
RF_WSPD (Right front ABS wheel-speed sensor input)	KPH/MPH	• Vehicle is stopped: 0KPH {0MPH} • indicates vehicle speed	Inspect ABS wheel-speed sensor/sensor rotor. (See 04–13–9 FRONT/ REAR ABS WHEEL-SPEED SENSOR INSPECTION)	D, G
RR_WSPD (Right rear ABS wheel-speed sensor input)	KPH/MPH	• Vehicle is stopped: 0KPH {0MPH} • indicates vehicle speed	Inspect ABS wheel-speed sensor/sensor rotor. (See 04–13–9 FRONT/ REAR ABS WHEEL-SPEED SENSOR INSPECTION)	A, B
ABSVLVRLY (Fail-safe relay output state)	ON/OFF	• Ignition key at ON: ON • Other condition (Power supply circuit is open): OFF	Inspect ABS HU/CM connector and ABS HU/CM (See 04–13–3 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) SYSTEM INSPECTION)	—

Active Command Modes Table

Command Name	Definition	Operation	Note
PMP_MOTOR	ABS motor	ON/OFF	Ignition key at ON (engine OFF), and driving
RF_OUTLET	Right front ABS pressure reduction solenoid valve	ON/OFF	
RF_INLET	Right front ABS pressure retention solenoid valve	ON/OFF	
LF_OUTLET	Left front ABS pressure reduction solenoid valve	ON/OFF	
LF_INLET	Left front ABS pressure retention solenoid valve	ON/OFF	
RR_OUTLET	Right rear ABS pressure reduction solenoid valve	ON/OFF	
RR_INLET	Right rear ABS pressure retention solenoid valve	ON/OFF	
LR_OUTLET	Left rear ABS pressure reduction solenoid valve	ON/OFF	
LR_INLET	Left rear ABS pressure retention solenoid valve	ON/OFF	
ABS_POWER	Fail-safe relay	ON/OFF	
VS_OUTPUT	Vehicle speed signal	KPH/MPH	

Note

- When operating, the ABS motor and each valve forcibly turn ABS_POWER on, and then each command on. ABS_POWER regulates the power supply for the ABS motor and 8 valves.

DTC C1145 (11), C1155 (12), C1165 (13), C1175 (14)

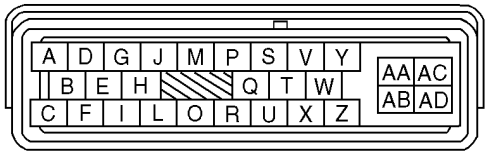
A3U040243000W03

Caution

- **When attaching the tester lead to the ABS HU/CM or the ABS HU/CM harness connector the SST (49 G066 001) must be used. (See 04–13–6 ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION.)**

DTC	**C1145 (11)** **C1155 (12)** **C1165 (13)** **C1175 (14)**	**RF ABS wheel-speed sensor** **LF ABS wheel-speed sensor** **RR ABS wheel-speed sensor** **LR ABS wheel-speed sensor**
DETECTION CONDITION	• When open or short circuit is detected.	
POSSIBLE CAUSE	• Open circuit or short to power circuit of ABS wheel-speed sensor(s) circuit • ABS wheel-speed sensor(s) malfunction	

ABS HU/CM



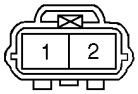
HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR

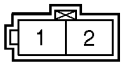
(VIEW FROM TERMINAL SIDE)

ABS WHEEL-SENSOR

LF, RF



LR, RR



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Diagnostic procedure

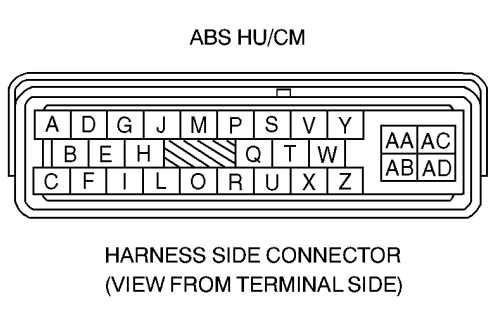
STEP	INSPECTION		ACTION
1	**INSPECT ABS WHEEL-SPEED SENSOR CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Disconnect ABS HU/CM connector. • Connect **SST** (adapter harness) to ABS HU/CM connector (harness side) with ABS HU/CM disconnected. • Measure resistance between suspected sensor terminals of **SST**. — RF ABS wheel-speed sensor: G—D — LF ABS wheel-speed sensor: E—I — RR ABS wheel-speed sensor: A—B — LR ABS wheel-speed sensor: C—F • Is resistance **within 1.3—1.7 kilohm**?	Yes	Go to next step.
		No	Go to Step 3.
2	**INSPECT ABS WHEEL-SPEED SENSOR CIRCUIT FOR SHORT TO POWER** • Turn ignition key to ON (engine OFF). • Inspect voltage between suspected sensor terminal(s) of **SST** (adapter harness) and ground(s). — RF ABS wheel-speed sensor: G, D — LF ABS wheel-speed sensor: I, E — RR ABS wheel-speed sensor: A, B — LR ABS wheel-speed sensor: C, F • Is there any **B+**?	Yes	Repair or replace harness for short to power circuit between ABS HU/CM and ABS wheel-speed sensor(s), then go to Step 5.
		No	Go to Step 5.
3	**INSPECT ABS WHEEL-SPEED SENSOR** • Turn ignition key to OFF. • Disconnect suspected sensor connector(s) and inspect resistance between sensor terminals (part side). • Is resistance **within 1.3—1.7 kilohm**?	Yes	Go to next step.
		No	Replace ABS wheel-speed sensor, then go to Step 5.

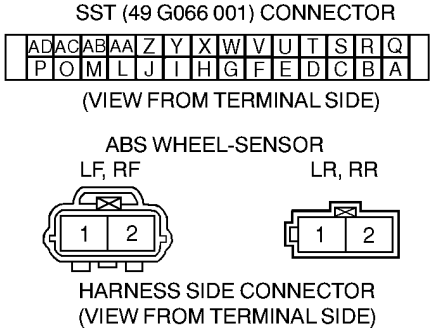
STEP	INSPECTION		ACTION
4	**INSPECT ABS HU/CM TO ABS WHEEL-SPEED SENSOR CIRCUIT FOR OPEN CIRCUIT** • Inspect continuity between suspected sensor terminal(s) of **SST** and ABS wheel-speed sensor connector. (vehicle harness side) — RF ABS wheel-speed sensor (+): G-1 — RF ABS wheel-speed sensor (–): D-2 — LF ABS wheel-speed sensor (+): I-1 — LF ABS wheel-speed sensor (–): E-2 — RR ABS wheel-speed sensor (+): A-1 — RR ABS wheel-speed sensor (–): B-2 — LR ABS wheel-speed sensor (+): C-1 — LR ABS wheel-speed sensor (–): F-2 • Is there continuity?	Yes	Repair or replace poor connections of ABS HU/CM connector and/or ABS wheel-speed sensor connector(s), then go to next step.
		No	Repair or replace harness for open circuits between ABS HU/CM and ABS wheel-speed sensor(s), then go to next step.
5	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnect all disconnected connectors. • Clear DTC from memory (See 04–02–4 DTCs Clearing Procedure) • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC C1148 (41), C1158 (42), C1168 (43), C1178 (44), C1233 (46), C1234 (45), C1235 (47), C1236 (48)
A3U040243000W04

Caution
- **When attaching the tester lead to the ABS HU/CM or the ABS HU/CM harness connector the SST (49 G066 001) must be used. (See 04–13–6 ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION.)**

DTC	**C1148 (41), C1234 (45)** **C1158 (42), C1233 (46)** **C1168 (43), C1235 (47)** **C1178 (44), C1236 (48)**	**RF ABS wheel-speed sensor/sensor rotor** **LF ABS wheel-speed sensor/sensor rotor** **RR ABS wheel-speed sensor/sensor rotor** **LR ABS wheel-speed sensor/sensor rotor**
DETECTION CONDITION	• C1148 (41), C1158 (42), C1168 (43), C1178 (44): ABS wheel-speed signal is out of specification when just after vehicle has started to move. • C1234 (45), C1233 (46), C1235 (47), C1236 (48): ABS wheel-speed signal malfunction (distortion/ sudden change) is detected during driving.	
POSSIBLE CAUSE	• Short to ground circuit of ABS wheel-speed sensor(s) circuit • ABS wheel-speed sensor(s) malfunction • Damaged ABS sensor rotor(s) • Incorrect clearance between ABS sensor and sensor rotor	





Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY CURRENT INPUT SIGNAL STATUS OF CONCERN IS INTERMITTENT OR CONSTANT** • Turn ignition key to OFF. • Connect **SST** (WDS or equivalent) to DLC-2. • Start engine and drive vehicle. • Access LF_WSPD, LR_WSPD, RF_WSPD and RR_WSPD PID using **SST** (WDS or equivalent) • Are PIDs display vehicle speed and 4 PIDs equal?	Yes	Go to Step 5.
		No	Go to next step.
2	**INSPECT ABS WHEEL-SPEED SENSOR CIRCUIT FOR SHORT TO GROUND** • Turn ignition key to OFF. • Disconnect ABS HU/CM connector. • Connect **SST** (adapter harness) to ABS HU/CM connector (harness side) with ABS HU/CM disconnected. • Inspect continuity between suspected sensor terminal(s) of **SST** (adapter harness) and ground(s). — RF ABS wheel-speed sensor: G — LF ABS wheel-speed sensor: I — RR ABS wheel-speed sensor: A — LR ABS wheel-speed sensor: C • Is there continuity?	Yes	Go to next step.
		No	Go to Step 4.
3	**INSPECT ABS WHEEL-SPEED SENSOR FOR SHORT TO GROUND** • With ignition key at OFF, disconnected suspected sensor connector(s), inspect continuity between suspected sensor terminal(s) 1 (part side) and ground(s). • Is there continuity?	Yes	Replace ABS wheel-speed sensor(s), then go to Step 8.
		No	Repair or replace harness (short to ground) between ABS HU/CM and ABS wheel-speed sensor connector(s), then go to Step 8.
4	**INSPECT SENSOR ROTOR CLEARANCE** • Jack-up vehicle and support it with safety stands. • Remove suspected wheel(s). • Inspect clearance between sensor and rotor. • Is clearance **within 0.3—1.1 mm {0.012—0.043 in}**?	Yes	Go to Step 8.
		No	Replace ABS wheel-speed sensor(s), then go to Step 8.
5	**INSPECT ABS WHEEL-SPEED SENSOR OUTPUT PULSE** • Start engine and drive vehicle. • Inspect output voltage pattern using an oscilloscope. (See 04–13–10 Voltage Pattern Inspection) • Is output voltage pattern okay?	Yes	Go to Step 8.
		No	Go to next step.
6	**INSPECT SENSOR ROTOR FOR DAMAGE** • Jack-up vehicle and support it with safety stands. • Remove suspected wheel(s). • Visually inspect sensor rotor for missing, deformed and obstructed teeth. **Number of teeth: 44** • Is sensor rotor okay?	Yes	Go to next step.
		No	Replace rotor, then go to Step 8.
7	**INSPECT SENSOR ROTOR CLEARANCE** • Inspect clearance between sensor and rotor. • Is clearance **within 0.3—1.1 mm {0.012—0.043 in}**?	Yes	Go to next step.
		No	Replace ABS wheel-speed sensor, then go to next step.

STEP	INSPECTION		ACTION
8	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnected all disconnected connectors. • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Start engine and drive vehicle at **10 km/h {6.2 mph}** or above. • Gradually slow down vehicle and stop. • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
9	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC C1194 (24), C1198 (25), C1210 (22), C1214 (23), C1242 (28), C1246 (26), C1250 (29), C1254 (27)

A3U040243000W05

DTC	**C 1210 (22)** **C 1214 (23)** **C 1194 (24)** **C 1198 (25)** **C 1246 (26)** **C 1254 (27)** **C 1242 (28)** **C 1250 (29)**	**RF pressure reduction solenoid valve** **RF pressure retention solenoid valve** **LF pressure reduction solenoid valve** **LF pressure retention solenoid valve** **RR pressure reduction solenoid valve** **RR pressure retention solenoid valve** **LR pressure reduction solenoid valve** **LR solenoid pressure retention valve**
DETECTION CONDITION	Solenoid monitor signal does not track in response to solenoid ON/OFF command.	
POSSIBLE CAUSE	• Open circuit, short to power or short to ground of solenoid valve circuit in ABS HU/CM • Stuck solenoid valve in ABS HU/CM	

Diagnostic Procedure

STEP	INSPECTION		ACTION
1	**VERIFY CURRENT STATUS OF MALFUNCTION** • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Start engine and drive vehicle at **10 km/h {6.2 mph}** or **above at least 1 minute**. • Gradually slow down and stop vehicle. • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
2	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC C1140 (30)

A3U040243000W06

DTC C1140 (30)		**ABS HU/CM (pump)**
DETECTION CONDITION	Right front and left rear wheels, or left front and right rear wheels lock is detected during ABS operation.	
POSSIBLE CAUSE	Stuck ABS pump in ABS HU/CM	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ABS HU/CM OPERATION** • Perform ABS HU/CM system inspection. (See 04–13–3 System Inspection) • Is it okay?	Yes	Go to next step.
		No	Replace ABS HU/CM, then go to Step 4.
2	**INSPECT CONVENTIONAL BRAKE OPERATION** • Inspect brake fluid level. • Start engine. • Perform a road test to verify conventional vehicle braking performance. • Is there any concern?	Yes	Inspect conventional brake line, then go to Step 4.
		No	Go to next step.

STEP	INSPECTION		ACTION
3	**INSPECT REAR BRAKE DRAGGING** • Turn ignition key to OFF. • Jack-up vehicle and support it with safety stand. • Release parking brake. • Turn rear wheel by hand and inspect for rear brake drag. • Is rear brake dragging?	Yes	Repair parking brake system, then go to next step.
		No	Go to next step.
4	**VERIFY TROUBLESHOOTING COMPLETED** • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Start engine and drive vehicle at **10 km/h {6.2 mph}** or **above at least 1 minute**. • Gradually slow down vehicle and stop. • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
5	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC C1510 (32), C1511 (33), C1512 (34), C1513 (35)

A3U040243000W07

DTC	**C1510 (32)** **C1511 (33)** **C1512 (34)** **C1513 (35)**	**RF solenoid valve, ABS motor or RF ABS wheel-speed sensor/sensor rotor** **LF solenoid valve, ABS motor or LF ABS wheel-speed sensor/sensor rotor** **RR solenoid valve, ABS motor or RR ABS wheel-speed sensor/sensor rotor** **LR solenoid valve, ABS motor or LR ABS wheel-speed sensor/sensor rotor**
DETECTION CONDITION	• Wheel lock is detected during ABS operation (pressure reduction inoperative).	
POSSIBLE CAUSE	• Low electrical power supply • Malfunction of solenoid valve in ABS HU/CM • Malfunction of ABS wheel-speed sensor • Damaged ABS sensor rotor • Stuck ABS motor in ABS HU/CM • Malfunction of hydraulic unit of ABS HU/CM	

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY OTHER DTC HAS RECORDED** • Is DTC B1318 (63) also stored?	Yes	Go to DTC B1318 (63) inspection.
		No	Go to next step.
2	**VERIFY OTHER DTC HAS RECORDED** • Is any of DTC C1214 (22), C1210 (23), C1198 (24), C1194 (25), C1254 (26), C1246 (27), C1250 (28) and/or C1242 (29) also stored?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
3	**VERIFY OTHER DTC HAS RECORDED** • Is any of DTC C1145 (11), C1148 (41), C1155 (12) C1158 (42), C1165 (13), C1168 (43), C1175 (14), C1178 (44), C1233 (46), C1234 (45), C1235 (47) and/or C1236 (48) also stored?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
4	**VERIFY OTHER DTC HAS RECORDER** • Is any of DTC C1095 (59) and/or C1096 (53) also stored?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
5	**INSPECT ABS HU/CM OPERATION** • Perform ABS HU/CM system inspection.(See 04–13–3 System Inspection) • Is it okay?	Yes	Go to next step.
		No	Replace ABS HU/CM, then go to next step.
6	**VERIFY CURRENT STATUS OF MALFUNCTION** • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Start engine and drive vehicle at **10 km/h {6.2 mph}** or **above at least 1 minute**. • Gradually slow down and stop vehicle. • Is same DTC present?	Yes	Replace ABS HU/CM.
		No	Go to next step.
7	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC C1186 (51), C1266 (52)

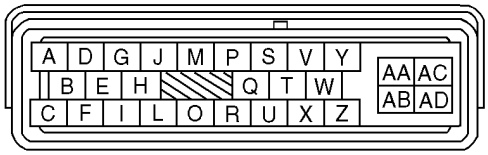
A3U040243000W08

Caution

- **When attaching the tester lead to the ABS HU/CM or the ABS HU/CM harness connector the SST (49 G066 001) must be used. (See 04–13–6 ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION.)**

DTC C1186 (51), C1266 (52)	Fail-safe relay
DETECTION CONDITION	• C1186 (51): Fail-safe relay in ABS HU/CM stuck OFF when ignition switch is turned ON, fail-safe relay ON is commanded. • C1266 (52): Fail-safe relay in ABS HU/CM stuck ON when ignition switch is turned ON, fail-safe relay OFF is commanded.
POSSIBLE CAUSE	• Open circuit, short to power or short to ground circuit of fail-safe relay in ABS HU/CM • Stuck ON or OFF of fail-safe relay in ABS HU/CM • Open circuit of fail-safe relay power supply circuit

ABS HU/CM



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR

(VIEW FROM TERMINAL SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ABS FUSE CONDITION** • Is ABS fuse (**60 A**) okay?	Yes	Go to next step.
		No	Replace fuse, then go to Step 3.
2	**INSPECT FAIL-SAFE RELAY POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Disconnect ABS HU/CM connector. • Connect **SST** (adapter harness) to ABS HU/CM connector (harness side) with ABS HU/CM disconnected. • Turn ignition key to ON (engine OFF). • Measure voltage between terminal AC of **SST** (adapter harness) and ground. • Is voltage **B+**?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between battery positive terminal and ABS HU/CM terminal AC, then go to next step.
3	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnected all disconnected connectors. • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
4	**VERIFY AFTER REPAIR PROCEDURE** • Is there any DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC C1095 (54), C1096 (53)

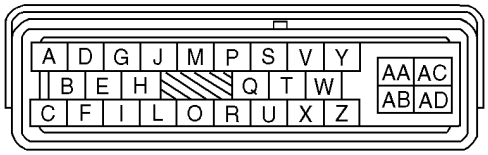
A3U040243000W09

Caution

- **When attaching the tester lead to the ABS HU/CM or the ABS HU/CM harnesses connector the SST (49 G066 001) must be used. (See 04–13–6 ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION.)**

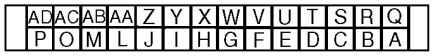
DTC C1095 (53), C1096 (54)	Motor relay, ABS Motor
DETECTION CONDITION	• C1095 (53): ABS motor stuck OFF when vehicle is started or during ABS operation, ABS motor ON is commanded. • C1096 (54): ABS motor stuck ON when vehicle is started or during ABS operation, ABS motor OFF is commanded.
POSSIBLE CAUSE	• Open circuit, or short power or short to ground of motor relay and/or ABS motor in ABS HU/CM • Stuck motor relay and/or ABS motor • Open circuit of ABS motor power supply • Open circuit of ABS motor ground

ABS HU/CM



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR



(VIEW FROM TERMINAL SIDE)

04–02

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY OTHER DTC HAS RECORDED** • If any of DTC C1186 (51) and/or C1266 (52) also stored?	Yes	Go to applicable DTC inspection.
		No	Go to next step.
2	**INSPECT ABS FUSE CONDITION** • Is ABS fuse (**60 A**) okay?	Yes	Go to next step.
		No	Replace fuse, then go to Step 5.
3	**INSPECT MOTOR RELAY POWER SUPPLY CIRCUIT FOR OPEN** • Turn ignition key to OFF. • Disconnect ABS HU/CM connector. • Connect **SST** (adapter harness) to ABS HU/CM connector (harness side) with HU/CM disconnected. • Turn ignition key to ON (engine OFF). • Measure voltage between ABS HU/CM terminal AB (harness side) and ground. • Is voltage **B+**?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between battery positive terminal and ABS HU/CM terminal AB, then go to Step 5.
4	**INSPECT ABS HU/CM GROUND CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Inspect continuity between ABS HU/CM terminal AD of **SST** and ground. • Is there continuity?	Yes	Go to next step.
		No	Repair or replace harness for open circuit between ABS HU/CM terminal AD and ground, then go to next step.
5	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnected all disconnected connectors. • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Start engine and drive vehicle at **10 km/h {6.2 mph}** or above. • Gradually slow down and stop vehicle. • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC B1342 (61)

A3U040243000W10

DTC B1342 (61)	ABS HU/CM (CM)
DETECTION CONDITION	The on-board diagnostic function detects computer malfunction.
POSSIBLE CAUSE	• Malfunction of ABS HU/CM

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**VERIFY CURRENT STATUS OF MALFUNCTION** • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Start engine and drive vehicle at **10 km/h {6.2 mph}** or above. • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
2	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

DTC B1318 (63)

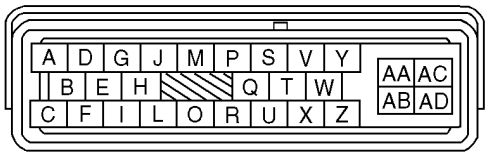
A3U040243000W11

Caution

- **When attaching the tester lead to the ABS HU/CM or the ABS HU/CM harnesses connector the SST (49 G066 001) must be used. (See 04–13–6 ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION.)**

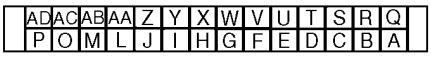
DTC B1318 (63)	ABS HU/CM power supply
DETECTION CONDITION	• Voltage at Z terminal of ABS HU/CM drops **below 10 V** when driving vehicle.
POSSIBLE CAUSE	• Low power supply • Battery and/or generator malfunction • Poor ground or open circuit of ground

ABS HU/CM



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR



(VIEW FROM TERMINAL SIDE)

Diagnostic procedure

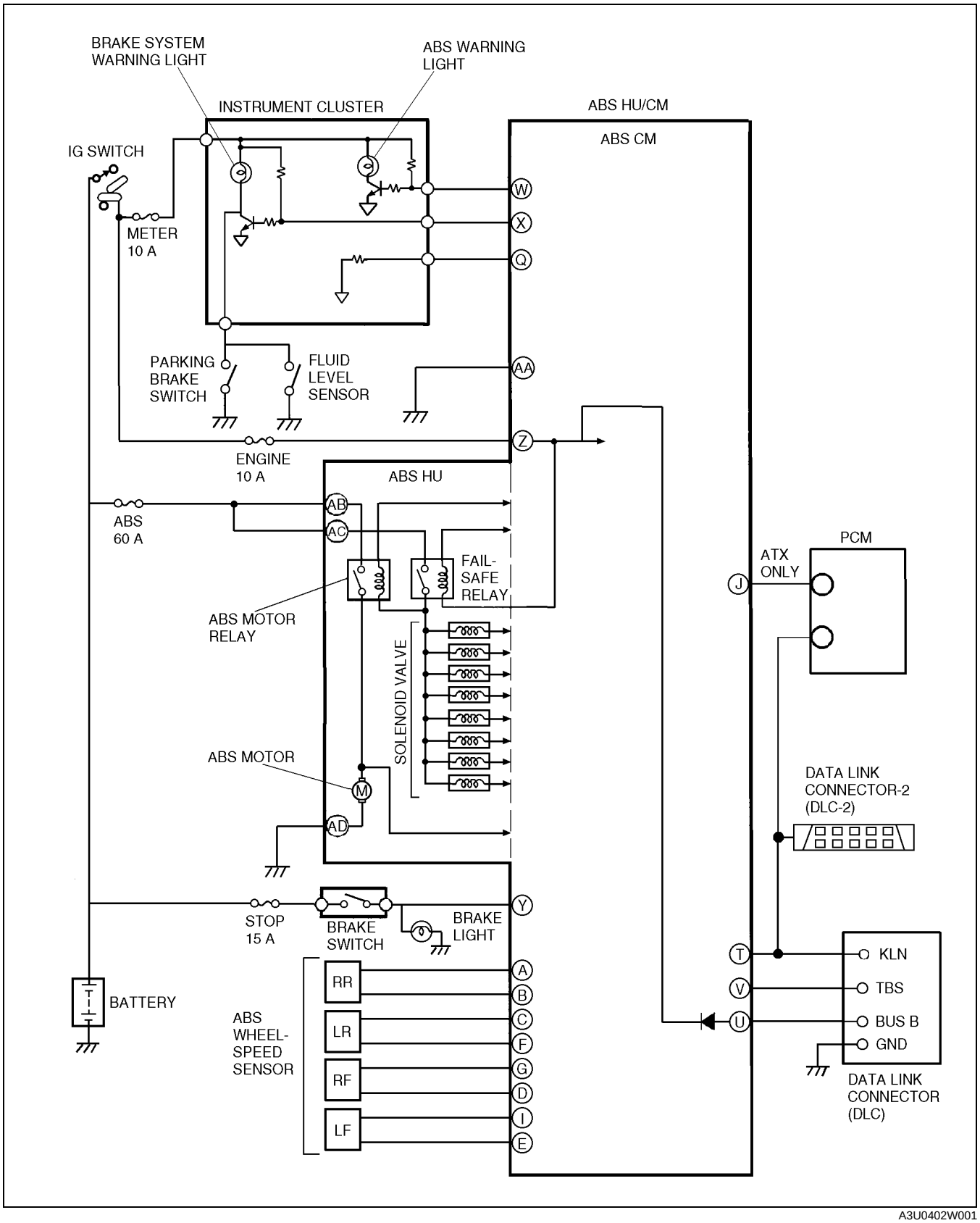
STEP	INSPECTION		ACTION
1	**INSPECT ABS HU/CM POWER SUPPLY CIRCUIT FOR OPEN CIRCUIT** • Turn ignition key to OFF. • Disconnect ABS HU/CM connector. • Connect **SST** (adapter harness) to ABS HU/CM connector (harness side) with ABS HU/CM disconnected. • Start engine. • Measure voltage between terminal Z of **SST** (harness side) and ground. • Is voltage **above 10 V**?	Yes	Go to next step.
		No	Go to Step 3.

STEP	INSPECTION		ACTION
2	**INSPECT ABS HU/CM GROUND CIRCUIT FOR POOR GROUND AND OPEN CIRCUIT** • Turn ignition key to OFF. • Measure resistance between terminal AA of **SST** and ground. • Is resistance **within 0—1 ohm**?	Yes	Go to Step 5.
		No	If there is no continuity: • Repair or replace harness for open between ABS HU/CM and ground, then go to Step 5. If resistance is not **within 0—1 ohm**: • Repair or replace harness for poor ground then go to Step 5.
3	**INSPECT BATTERY POWER** • Inspect battery. (See 01–50–1 ENGINE TECHNICAL DATA) • Is it okay?	Yes	Go to next step.
		No	Replace battery, then go to Step 5.
4	**INSPECT GENERATOR** • Inspect generator. (See 01–17–3 GENERATOR INSPECTION) • Is it okay?	Yes	Go to next step.
		No	Repair or replace generator, then go to Step 5.
5	**VERIFY TROUBLESHOOTING COMPLETED** • Make sure to reconnected all disconnected connectors. • Clear DTC from memory. (See 04–02–4 DTCs Clearing Procedure) • Is same DTC present?	Yes	Replace ABS HU/CM, then go to next step.
		No	Go to next step.
6	**VERIFY AFTER REPAIR PROCEDURE** • Is there any other DTC present?	Yes	Go to applicable DTC inspection.
		No	Troubleshooting completed.

04–03 SYMPTOM TROUBLESHOOTING

ABS SYSTEM DIAGRAM

A3U040343000W01



A3U0402W001

FOREWORD

A3U040343000W02

- Before performing the steps in Symptom Troubleshooting, perform the On-board Diagnostic Test. To check the DTC, follow the OBD TEST steps.

ABS

A3U040343000W03

Foreword

- Before performing the steps in Symptom Troubleshooting, perform the On-board Diagnostic Inspection. To check the DTC, follow the DTC Inspection steps.

Precaution

When inspecting or servicing the ABS, note the following points:

1. The ABS warning light and/or BRAKE system warning light illuminate even when the system is normal.

Warning lights that may illuminate	Cases in which the light may illuminate	Condition in which the light will go out	ABS and EBD control
• ABS warning light • BRAKE system warning light (*1)	Under any of the following conditions: • When the front wheels are jacked up, stuck, or placed on a chassis roller, and only the front wheel ABS wheel speed sensors are spun for **more than 20 seconds**.	After turning ignition switch OFF, vehicle is driven at speed **greater than 10 km/h {6.2 mph}** and normal operation is confirmed.	• ABS: Cuts control. • EBD: 1. Cuts control, in cases where the light may illuminate, only when ABS HU/CM detects that a wheel speed sensor determines that more than 2 rear wheels are malfunctioning. 2. Operates control, if wheel speed sensor determines that more than 3 wheels are functioning correctly.
	Parking brake is not fully released while driving.		
	Brake drag.		
	Sudden acceleration/ deceleration.		
	Left/ right or front/ rear tires are different. (Size, radius, tire pressure, or wear is other than that listed on tire label.)		
• ABS warning light	Battery voltage at ABS HU/ CM ignition terminal Z drops **below about 9 to 10 V**. (*2)	Battery voltage rises **above about 10 V**.	ABS: Operates control. EBD: Operates control.
• ABS warning light • BRAKE system warning light	Battery voltage at ABS HU/ CM ignition terminal Z drops **below about 9 to 10 V**. (*2)	Battery voltage rises **above about 10 V**. (Only BRAKE system warning light goes out.) Battery voltage rises **above about 10 V**. (Both warning lights go out)	ABS: Operates control. EBD: Operates control.

*1 : In cases where the light may illuminate, only when ABS HU/CM detects that a rear wheel's speed sensor is malfunctioning.

*2 : If battery voltage drops **below about 9 to 10 V** while vehicle speed is **greater than 6 km/h {3.7 mph}**, ABS HU/CM records **DTC B1318 (DTC 63)**.

2. Precautions during servicing of ABS
   The ABS is composed of electrical and mechanical parts. It is necessary to categorize malfunctions as being either electrical or hydraulic when performing troubleshooting.
   (1) Malfunctions in electrical system
   - The ABS hydraulic unit and control module (ABS HU/CM) has an on-board diagnostic function. With this function, the ABS warning light and/or BRAKE system warning light will come on when there is a problem in the electrical system. Also, past and present malfunctions are recorded in the ABS HU/CM. This function can find malfunctions that do not occur during periodic inspections. Turn the ignition switch on by connecting the **SST** (WDS or equivalent) to the DLC-2 inside the Passenger comportment. **Approximately 5 seconds** later the stored malfunctions will be displayed in order of occurrence. To find out the causes of ABS malfunctions, use these on-board diagnostic results.
   - If a malfunction occurred in the past but is now normal, the cause is likely a temporary poor connection of the harness. The ABS HU/CM usually operates normally. Be careful when searching for the cause of malfunction.
   - After repair, it is necessary to erase the DTC from the ABS HU/CM memory. Also, if the ABS related parts have been replaced, verify that the no DTC has been displayed after repairs.

- After repairing the ABS wheel-speed sensor or ABS sensor rotor, or after replacing the ABS HU/CM (ABS motor or ABS motor relay or solenoid valve), the ABS warning light may not go off even when the ignition switch is turned on. In this case, drive the vehicle at a speed of **more than 10 km/h {6.2 mph}**, make sure the ABS warning light goes off, and then erase the DTC.
- When repairing, if the ABS related connectors are disconnected and the ignition switch is turned on, the ABS HU/CM will mistakenly detect a fault and record it as a malfunction.
- To protect the ABS HU/CM, make sure the ignition is off before connecting or disconnecting the ABS HU/CM connector.
- To protect the terminal, use the **SST** (49 G066 001) when connecting the tester lead to the ABS HU/CM connector.

(2) Malfunctions in hydraulic system

- Symptoms in a hydraulic system malfunction are similar to those in a conventional brake malfunction. However, it is necessary to determine if the malfunction is in an ABS component or the conventional brake system.
- The ABS hydraulic unit contains delicate mechanical parts. If foreign materials get into the component, the ABS may fail to operate. Also, it will likely become extremely difficult to find the location of the malfunction in the event that the brakes operate but the ABS does not. Make sure foreign materials do not get inside when servicing the ABS (e.g. brake fluid replacement, pipe removal).

SYMPTOM TROUBLESHOOTING

A3U040343000W04

ABS Symptom Troubleshooting

- Verify the symptom, and perform troubleshooting according to the appropriate number.

No.	TROUBLESHOOTING ITEM	DESCRIPTION	PAGE
1	Neither ABS warning light nor BRAKE system warning light illuminate	Neither ABS warning light nor BRAKE system warning light illuminate with ignition switch on.	(See 04–03–5 NO.1 NEITHER ABS WARNING LIGHT NOR BRAKE SYSTEM WARNING LIGHT ILLUMINATE)
2	ABS warning light does not illuminate	ABS warning light does not illuminate with ignition switch on.	(See 04–03–6 NO.2 ABS WARNING LIGHT DOES NOT ILLUMINATE)
3	BRAKE system warning light does not illuminate	BRAKE system warning light does not illuminate with ignition switch on.	(See 04–03–7 NO.3 BRAKE SYSTEM WARNING LIGHT DOES NOT ILLUMINATE)
4	ABS warning light and BRAKE system warning light stay ON	Both ABS warning light BRAKE system warning light stay on **more than 4 seconds** with ignition switch on.	(See 04–03–8 NO.4 ABS WARNING LIGHT AND BRAKE SYSTEM WARNING LIGHT STAY ON)
5	ABS warning light stays ON	ABS warning light stays on **more than 4 seconds** with ignition switch on.	(See 04–03–10 NO.5 ABS WARNING LIGHT STAYS ON)
6	BRAKE system warning light stays ON	BRAKE system warning light stays on **more than 4 seconds** with ignition switch on. (Parking brake is released)	(See 04–03–12 NO.6 BRAKE SYSTEM WARNING LIGHT STAYS ON)
7	BRAKE system malfunction	There is a malfunction in system even though ABS warning light and BRAKE system warning light does not illuminate.	(See 04–03–13 NO.7 BRAKE SYSTEM MALFUNCTION)

Quick Diagnosis Chart
Vehicles with ABS

×: Applicable

Troubleshooting item	Possible factor	ABS HU/CM	Instrument cluster	ABS warning light circuit	BRAKE system warning light circuit	Battery	Brake fluid	Brake fluid level sensor	Parking brake switch	Charging system	ABS HU/CM power supply (terminal Z)	ABS HU/CM GND 1 (terminal AA)	Instrument cluster power supply (terminal 1J)	Instrument cluster GND (terminal 1D)	Conventional brakes	Brake pipe routing
1	Neither ABS warning light nor BRAKE system warning light illuminate		×										×	×		
2	ABS warning light does not illuminate	×	×	×												
3	BRAKE system warning light does not illuminate	×	×		×											
4	ABS warning light and BRAKE system warning light stay ON	×	×	×	×	×				×	×	×				
5	ABS warning light stays ON	×	×	×		×				×						
6	BRAKE system warning light stays ON	×	×		×		×	×	×							
7	BRAKE system malfunction	×													×	×

Y3U403WA1

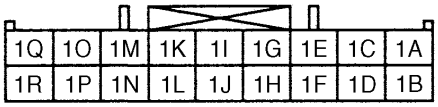
NO.1 NEITHER ABS WARNING LIGHT NOR BRAKE SYSTEM WARNING LIGHT ILLUMINATE

A3U040343000W05

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

1	Neither ABS warning light nor BRAKE system warning light illuminate
DESCRIPTION	• Neither ABS warning light nor BRAKE system warning light illuminate with ignition switch on.
POSSIBLE CAUSE	• Warning light circuit and indicator light circuits open circuit or shorted to ground.

INSTRUMENT CLUSTER CONNECTOR (18-PIN)



(VIEW FROM HARNESS SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**CHECK TO SEE WHETHER MALFUNCTION IS IN WARNING LIGHTS' COMMON POWER SUPPLY OR OTHER WARNING LIGHTS AND INDICATOR LIGHTS** • Do other warning and indicator lights illuminate when IG switch is turned ON?	Yes	Replace instrument cluster (open circuit in instrument cluster).
		No	Go to next step.

STEP	INSPECTION		ACTION
2	**CHECK TO SEE WHETHER MALFUNCTION IS IN WARNING LIGHTS' COMMON GROUND OR TURN SIGNAL INDICATOR LIGHT** • Turn ignition switch ON. • Turn signal switch ON. • Does turn signal indicator light in instrument cluster illuminate?	Yes	Replace instrument cluster (open circuit in instrument cluster).
		No	Go to next step.
3	**INSPECT INSTRUMENT CLUSTER POWER SUPPLY FUSE** • Is instrument cluster ignition power supply fuse okay?	Yes	Go to next step.
		No	Check for a short to ground on blown fuse's circuit. Repair or replace as necessary. Install appropriate amperage fuse.
*4	**INSPECT WIRING HARNESS BETWEEN INSTRUMENT CLUSTER POWER SUPPLY AND INSTRUMENT CLUSTER FOR CONTINUITY** • Turn ignition switch ON. • Measure voltage at instrument cluster connector (18-pin) terminal 1J. • Is voltage **approximately 12V**?	Yes	Go to next step
		No	Repair wiring harness between fuse block and instrument cluster.
*5	**CHECK TO SEE WHETHER MALFUNCTION (LACK OF CONTINUTY) IS IN WIRING HARNESS (BETWEEN INSTRUMENT CLUSTER AND GROUND) OR INSTRUMENT CLUSTER** • Turn ignition switch to LOCK. • Disconnect instrument cluster connector. • Is there continuity between instrument cluster connector (18-pin) terminal 1D and ground?	Yes	Replace instrument cluster (open circuit in instrument cluster).
		No	Repair wiring harness between instrument cluster and ground.

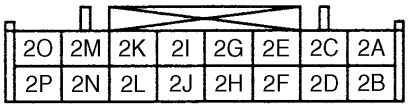
NO.2 ABS WARNING LIGHT DOES NOT ILLUMINATE

A3U040343000W06

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

2	**ABS warning light does not illuminate**
DESCRIPTION	• ABS warning light does not illuminate with ignition switch on.
POSSIBLE CAUSE	• ABS warning light circuit open circuit or shorted to ground.

INSTRUMENT CLUSTER CONNECTOR (16-PIN)



(VIEW FROM HARNESS SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**CHECK FOR SHORT TO GROUND IN ABS HU/CM** • Disconnect ABS HU/CM connector and turn ignition switch on. • Does ABS warning light illuminate?	Yes	Replace ABS HU/CM (short to ground in ABS HU/CM).
		No	Go to next step.
2	**INSPECT ABS WARNING LIGHT BULB** • Remove instrument cluster. • Inspect ABS warning light bulb. • Is it okay?	Yes	Go to next step.
		No	Replace ABS warning light bulb.

STEP	INSPECTION		ACTION
*3	**CHECK TO SEE WHETHER MALFUNCTION IS IN WIRING HARNESS (SHORT TO GROUND BETWEEN INSTRUMENT CLUSTER AND ABS HU/CM) OR INSTRUMENT CLUSTER (OPEN CIRCUIT OR SHORT TO GROUND)** • Is there continuity between instrument cluster connector (16-pin) terminal 2B and ground?	Yes	Repair wiring harness between instrument cluster and ABS HU/CM.
		No	Replace instrument cluster (open circuit or short to ground in ABS HU/CM).

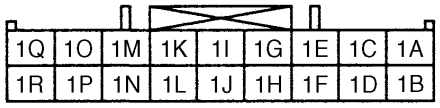
NO.3 BRAKE SYSTEM WARNING LIGHT DOES NOT ILLUMINATE

A3U040343000W07

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

3	BRAKE system warning light does not illuminate
DESCRIPTION	• BRAKE system warning light does not illuminate with ignition switch on.
POSSIBLE CAUSE	• Open circuit or short to ground in BRAKE system warning light circuit.

INSTRUMENT CLUSTER CONNECTOR (18-PIN)



(VIEW FROM HARNESS SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**CHECK FOR SHORT TO GROUND IN ABS HU/CM** • Disconnect ABS HU/CM connector and turn ignition switch on. • Does BRAKE system warning light illuminate?	Yes	Replace ABS HU/CM (short to ground in ABS HU/CM).
		No	Go to next step.
2	**INSPECT BRAKE SYSTEM WARNING LIGHT BULB** • Remove instrument cluster. • Inspect BRAKE system warning light bulb. • Is it okay?	Yes	Go to next step.
		No	Replace BRAKE system warning light bulb.
*3	**CHECK TO SEE WHETHER MALFUNCTION IS IN WIRING HARNESS (SHORT TO GROUND BETWEEN INSTRUMENT CLUSTER AND ABS HU/CM) OR INSTRUMENT CLUSTER (OPEN OR SHORT TO GROUND)** • Is there continuity between instrument cluster connector (18-pin) terminal 1G and ground?	Yes	Repair wiring harness between instrument cluster and ABS HU/CM.
		No	Replace instrument cluster (open circuit or short to ground in ABS HU/CM).

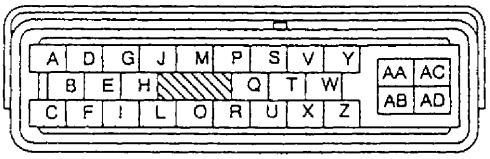
NO.4 ABS WARNING LIGHT AND BRAKE SYSTEM WARNING LIGHT STAY ON

A3U040343000W08

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

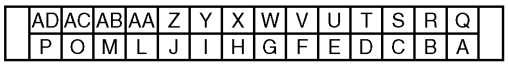
4	**ABS warning light and BRAKE system warning light stay ON**
DESCRIPTION	• Both ABS warning light and BRAKE system warning light stay on **more than 4 seconds** with ignition switch on.
POSSIBLE CAUSE	• ABS HU/CM detects ABS proportioning system malfunction • ABS HU/CM detects low voltage in power supply (ABS HU/CM ignition terminal Z voltage is **below about 8 to 9 V**) • ABS HU/CM does not operate • Both warning light circuits (ABS and BRAKE system) open circuit or shorted to ground

ABS HU/CM HARNESS SIDE CONNECTOR



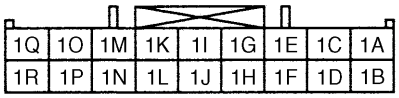
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR



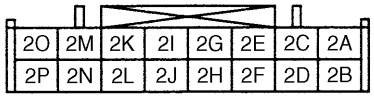
(VIEW FROM TERMINAL SIDE)

INSTRUMENT CLUSTER CONNECTOR (18-PIN)



(VIEW FROM HARNESS SIDE)

INSTRUMENT CLUSTER CONNECTOR (16-PIN)



(VIEW FROM HARNESS SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT ABS HU/CM POWER SUPPLY FUSE** • Is ABS HU/CM ignition power supply fuse okay?	Yes	Go to next step.
		No	Check for a short to ground on blown fuse's circuit. Repair or replace as necessary. Install appropriate amperage fuse.
2	**INSPECT WIRING HARNESS BETWEEN ABS CM AND DLC-2 FOR CONTINUITY OR SHORTS** • Perform DTC inspection. • Is error message displayed regarding communication between ABS HU/CM and WDS or equivalent?	Yes	If a communication error message is displayed even after inspecting according to procedures displayed on the WDS or equivalent, go to Step 8.
		No	Go to next step.
3	**CHECK FOR DTCS IN ABS HU/CM** • Have DTCs been recorded in memory?	Yes	Perform inspection using appropriate DTC.
		No	Go to next step.
4	**INSPECT PID/DATA IN ABS HU/CM** • Inspect the following items using WDS or equivalent. — **ABS_LAMP** (ABS warning light) — **BRAKE_LMP** (BRAKE system warning light) — **ABS_VOLT** (power supply voltage) • Is **ABS_LAMP** and **BRAKE_LMP** ON after **more than 4 seconds** with ignition switch on?	Yes	Go to Step 7.
		No	Go to next step.
5	**CHECK FOR OPEN CIRCUITS IN ABS HU/CM** • Disconnect ABS HU/CM. Connect the **SST** (49 G066 001) (vehicle harness side only). • Use the **SST** connector to ground the warning light terminal (ABS: terminal W, BRAKE system: terminal X) to body ground. • Do both ABS warning light and BRAKE system warning light go out with ignition switch on?	Yes	Replace ABS HU/CM (open circuit in ABS HU/CM).
		No	Go to next step.

STEP	INSPECTION		ACTION
*6	**CHECK TO SEE WHETHER MALFUNCTION IS IN WIRING HARNESS (LACK OF CONTINUITY BETWEEN INSTRUMENT CLUSTER AND ABS HU/CM) OR INSTRUMENT CLUSTER (OPEN CIRCUIT OR SHORT TO GROUND)** • Disconnect instrument cluster connector. • Is there continuity between following ABS HU/CM connector terminals and instrument cluster connector terminals? — Terminal W and terminal 2B (16-pin) — Terminal X and terminal 1G (18-pin)	Yes	Replace instrument cluster (open circuit or short to ground in instrument cluster).
		No	Repair wiring harness between ABS HU/CM (ABS: terminal W, BRAKE system: terminal X) and instrument cluster.
7	**INSPECT ABS HU/CM IGNITION POWER SUPPLY SYSTEM (TERMINAL Z)** • Check the voltage for PID/DATA monitor **ABS_VOLT** item. **Specification: above 10 V** • Is voltage within specification?	Yes	Replace ABS HU/CM (open circuit or short in ground circuit in ABS HU/CM).
		No	Go to next step.
8	**INSPECT BATTERY** • Is battery voltage normal?	Yes	Go to next step.
		No	Inspect battery and charging system.
9	**INSPECT CHARGING SYSTEM** • Is battery voltage normal with electrical load (A/C, headlights, etc.) on and engine idling?	Yes	Go to next step.
		No	Inspect charging system (drive belt tension, generator, etc.).
10	**VERIFY THAT ABS HU/CM CONNECTOR IS CONNECTED WITH ABS HU/CM** • Is ABS HU/CM securely connected?	Yes	Go to Step 12.
		No	Connect ABS HU/CM connector securely, then go to next step.
11	**CONFIRM THAT MALFUNCTION SYMPTOM DO NOT REOCCUR AFTER ABS HU/CM IS CONNECTED** • Do both ABS warning light and BRAKE system warning lights go out after **more than 4 seconds** with ignition switch on?	Yes	Temporary poor connection in ABS HU/CM connector. Inspect connector and terminal.
		No	Go to next step.
12	**VERIFY THAT ABS HU/CM CONNECTOR TERMINALS Z AND AA ARE CONNECTED** • Does malfunction symptom happen again when ABS HU/CM connector terminals Z and AA are shaken while the ignition switch is ON?	Yes	Connect ABS HU/CM connector terminals Z and AA securely, then go to next step.
		No	Go to Step 14.
13	**CONFIRM THAT MALFUNCTION SYMPTOM DO NOT REOCCUR AFTER ABS HU/CM CONNECTOR TERMINALS Z AND AA ARE CONNECTED** • Do both ABS warning light and BRAKE system warning lights go out after **more than 4 seconds** with ignition switch on?	Yes	Temporary poor connection at terminal. Inspect ABS HU/CM connector and terminal.
		No	Go to next step.
*14	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM POWER SUPPLY AND ABS HU/CM FOR CONTINUITY** • Disconnect ABS HU/CM connector. Connect the **SST** (49 G066 001) (vehicle harness side only). • Is voltage **approximately 12 V** at **SST** connector terminal Z?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and ABS HU/CM.
*15	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND GROUND FOR CONTINUITY** • Turn ignition switch to LOCK. • Is there continuity between **SST** connector terminal AA and ground?	Yes	If a communication error message is displayed on WDS or equivalent in Step 1 inspection, go to next step. If a communication error message is not displayed on WDS or equivalent in Step 1 inspection, troubleshooting is completed.
		No	Repair wiring harness between ABS HU/CM and ground.
*16	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR CONTINUITY** • Is there continuity between **SST** connector terminal T and DLC-2?	Yes	Go to next step.
		No	Repair wiring harness between ABS HU/CM and DLC-2.

STEP	INSPECTION		ACTION
*17	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR SHORT TO B+** • Is voltage **approximately 12 V** at **SST** connector terminal T?	Yes	Repair wiring harness between ABS HU/CM and DLC-2.
		No	Go to next step.
*18	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR SHORT TO GROUND** • Is there continuity between **SST** connector terminal T and ground?	Yes	Repair wiring harness between ABS HU/CM and DLC-2.
		No	Replace ABS HU/CM (communication circuit malfunction in ABS HU/CM).

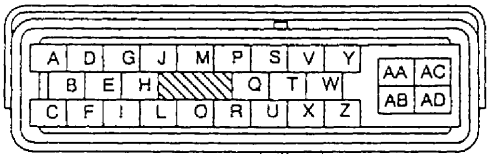
NO.5 ABS WARNING LIGHT STAYS ON

A3U040343000W09

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

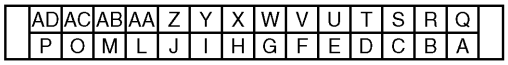
5	ABS warning light stays ON
DESCRIPTION	• ABS warning light stays on **more than 4 seconds** with ignition switch on.
POSSIBLE CAUSE	• ABS HU/CM detects ABS system malfunction • ABS HU/CM detects low voltage in power supply (ABS HU/CM ignition terminal Z voltage is **below about 8 to 9 V**) • Warning light circuit open or shorted to ground

ABS HU/CM HARNESS SIDE CONNECTOR



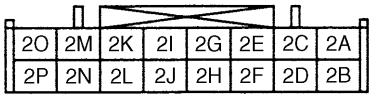
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR



(VIEW FROM TERMINAL SIDE)

INSTRUMENT CLUSTER CONNECTOR (16-PIN)



(VIEW FROM HARNESS SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR CONTINUITY AND SHORTS** • Perform DTC inspection. • Is error message displayed regarding communication between ABS HU/CM and WDS or equivalent?	Yes	If the communication error message is displayed even after inspecting according to procedures displayed on the WDS or equivalent, go to Step 8.
		No	Go to next step.
2	**CHECK FOR DTCS IN ABS HU/CM** • Have DTCs been recorded in memory?	Yes	Perform inspection using appropriate DTC.
		No	Go to next step.
3	**INSPECT PID/DATA IN ABS HU/CM** • Inspect the following items using WDS or equivalent. — **ABS_LAMP** (ABS warning light) • Is **ABS_LAMP** ON after **more than 4 seconds** with ignition switch on?	Yes	Go to Step 8.
		No	Go to next step.
4	**VERIFY THAT ABS HU/CM CONNECTOR TERMINAL W IS CONNECTED** • Does malfunction symptom happen again when ABS HU/CM connector terminal W is shaken while the ignition switch is ON?	Yes	Connect ABS HU/CM connector terminal W securely, then go to next step.
		No	Go to Step 6.

STEP	INSPECTION		ACTION
5	**CONFIRM THAT MALFUNCTION SYMPTOM DO NOT REOCCUR AFTER ABS HU/CM CONNECTOR TERMINAL W IS CONNECTED** • Do ABS warning light go out after **more than 4 seconds** with ignition switch on?	Yes	Temporary poor connection at terminal. Inspect ABS HU/CM connector and terminal.
		No	Go to next step.
6	**CHECK FOR OPEN CIRCUITS IN ABS HU/CM** • Disconnect ABS HU/CM. Connect the **SST** (49 G066 001) (vehicle harness side only). • Use the **SST** connector to ground ABS warning light terminal W to body ground. Does ABS warning light go out with ignition switch on?	Yes	Replace ABS HU/CM (open circuit in ABS HU/CM).
		No	Go to next step.
*7	**CHECK TO SEE WHETHER MALFUNCTION IS IN WIRING HARNESS (LACK OF CONTINUITY BETWEEN INSTRUMENT CLUSTER AND ABS HU/CM) OR INSTRUMENT CLUSTER (OPEN CIRCUIT OR SHORT TO GROUND)** • Disconnect instrument cluster. • Is there continuity between following **SST** connector terminal W and instrument cluster connector (16-pin) terminal 2B?	Yes	Replace instrument cluster (open circuit or ground to short in instrument cluster).
		No	Repair wiring harness between ABS HU/CM (terminal W) and instrument cluster.
8	**INSPECT ABS HU/CM IGINITION POWER SUPPLY SYSTEM (TERMINAL Z)** • Check the voltage for PID/DATA monitor **ABS_VOLT** item. **Specification: above 10V** • Is voltage within specification?	Yes	Replace ABS HU/CM (open circuit or short in ground circuit in ABS HU/CM).
		No	Go to next step.
9	**INSPECT BATTERY** • Is battery voltage normal?	Yes	Go to next step
		No	Inspect battery and charging system
10	**INSPECT CHARGING SYSTEM** • Is battery voltage normal with electrical load (A/C, headlights, etc) on and engine idling?	Yes	Go to next step
		No	Inspect charging system (drive belt tension, generator, etc).
*11	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM POWER SUPPLY AND ABS HU/CM FOR CONTINUITY** • Disconnect ABS HU/CM. Connect **SST** (49 G066 001) (vehicle harness side only). • Is voltage **approximately 12V** at **SST** connector terminal Z?	Yes	Go to next step.
		No	Repair wiring harness between fuse block and ABS HU/CM
*12	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND GROUND FOR CONTINUITY** • Turn ignition switch to LOCK • Is there continuity between **SST** connector terminal AA and ground?	Yes	If a communication error message is displayed on WDS or equivalent in Step 1 inspection, go to next step. If a communication error message is not displayed on WDS or equivalent in Step 1 inspection, trouble shooting is completed.
		No	Repair wiring harness between ABS HU/CM and ground.
*13	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR CONTINUITY** • Disconnect ABS HU/CM. Connect the **SST** (49 G066 001) (vehicle harness side only). • Is there continuity between **SST** connector terminal T and DLC-2?	Yes	Go to next step.
		No	Repair wiring harness between ABS HU/CM and DLC-2.
*14	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR SHORT TO B+** • Is voltage **approximately 12 V** at **SST** connector terminal T?	Yes	Repair wiring harness between ABS HU/CM and DLC-2.
		No	Go to next step.
*15	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR SHORT TO GROUND** • Is there continuity between **SST** connector terminal T and ground?	Yes	Repair wiring harness between ABS HU/CM and DLC-2.
		No	Replace ABS HU/CM (communication circuit malfunction in ABS HU/CM).

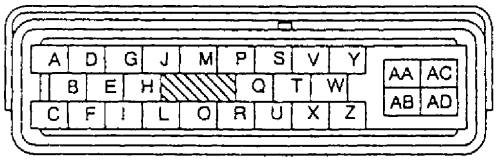
NO.6 BRAKE SYSTEM WARNING LIGHT STAYS ON

A3U040343000W10

- When performing an asterisked (*) troubleshooting inspection, shake the wiring harness and connectors while performing the inspection to discover whether poor contact points are the cause of any intermittent malfunctions. If there is a problem, check to make sure connectors, terminals and wiring harness are connected correctly and undamaged.

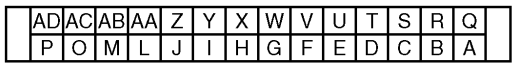
6	**BRAKE system warning light stays ON**
DESCRIPTION	• Brake system warning light stays on **more than 4 seconds** with ignition switch on. (Parking brake is released.)
POSSIBLE CAUSE	• Warning light circuit open or shorted to ground in ABS HU/CM • Short to ground in circuit in parking brake switch and/or brake fluid level sensor

ABS HU/CM HARNESS SIDE CONNECTOR



(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR



(VIEW FROM TERMINAL SIDE)

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**INSPECT BRAKE FLUID LEVEL** • Is brake fluid level okay?	Yes	Go to next step.
		No	Add brake fluid.
2	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR CONTINUITY AND SHORTS** • Inspect the following items using WDS or equivalent. — **BRAKE_LMP** (BRAKE system warning light) • Is error message displayed regarding communication between ABS HU/CM and WDS or equivalent?	Yes	If a communication error message is displayed even after inspecting according to procedures displayed on the WDS or equivalent, go to Step 8.
		No	Go to next step.
3	**INSPECT PID/DATA IN ABS HU/CM** • Inspect **BRAKE_LMP** (BRAKE system warning light) using WDS or equivalent. • Is **BRAKE_LMP** is ON after **more than 4 seconds** with ignition switch on?	Yes	Replace ABS HU/CM (open circuit or short to ground in ABS HU/CM).
		No	Go to next step.
4	**VERIFY THAT ABS HU/CM CONNECTOR TERMINAL X IS CONNECTED** • Does malfunction symptom happen again when ABS HU/CM connector terminal X is shaken while the ignition switch is ON?.	Yes	Connect ABS HU/CM connector terminal X securely, then go to next step.
		No	Go to Step 6.
5	**CONFIRM THAT MALFUNCTION SYMPTOMS DO NOT RECCUR AFTER ABS HU/CM CONNECTOR TERMINAL X IS CONNECTED** • Does BRAKE system warning light go out after **more than 4 seconds** with ignition switch on?	Yes	Temporary poor connection at terminal. Inspect ABS HU/CM connector and terminal.
		No	Go to next step.
*6	**CHECK FOR OPEN CIRCUITS IN ABS HU/CM** • Disconnect ABS HU/CM. Connect the **SST** (49 G066 001) (vehicle harness side only). • Use the **SST** connector to ground BRAKE system warning light terminal X to body ground. • Does BRAKE system warning light go out with ignition switch on?	Yes	Replace ABS HU/CM (open circuit in ABS HU/CM).
		No	Go to next step.

STEP	INSPECTION		ACTION
7	**CHECK TO SEE WHETHER MALFUNCTION IS IN PARKING BRAKE SWITCH OR BRAKE FLUID LEVEL SENSOR, OR IN SOME OTHER PART** • Disconnect the following in order: 1. Parking brake switch connector 2. Brake fluid level sensor connector • Does BRAKE system warning light go out with ignition switch on?	Yes	Replace parking brake switch and/or brake fluid level sensor (shorted on some internal part).
		No	Perform the following inspections. Repair if necessary. • Open circuit in wiring harness between ABS HU/CM (terminal X) and instrument cluster (BRAKE system warning light) • Short to ground in wiring harness between instrument cluster (BRAKE system warning light) and parking brake switch. • Short to ground in wiring harness between instrument cluster (BRAKE system warning light) and brake fluid level sensor. If above inspections are okay, replace instrument cluster (open or ground to short in instrument cluster).
*8	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR CONTINUITY** • Disconnect ABS HU/CM. Connect the **SST** (49 G066 001) (vehicle harness side only). • Is there continuity between **SST** connector terminal T and DLC-2?	Yes	Go to next step.
		No	Repair wiring harness between ABS HU/CM and DLC-2.
*9	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR SHORT TO B+** • Is voltage **approximately 12 V** at **SST** connector terminal T?	Yes	Repair wiring harness between ABS HU/CM and DLC-2.
		No	Go to next step.
*10	**INSPECT WIRING HARNESS BETWEEN ABS HU/CM AND DLC-2 FOR SHORT TO GROUND** • Is there continuity between **SST** connector terminal T and ground?	Yes	Repair wiring harness between ABS HU/CM and DLC-2.
		No	Replace ABS HU/CM (communication circuit malfunction in ABS HU/CM).

NO.7 BRAKE SYSTEM MALFUNCTION

A3U040343000W11

7	**BRAKE system malfunction**
DESCRIPTION	• There is a malfunction in system even though ABS warning light and BRAKE system warning light does not illuminate.
POSSIBLE CAUSE	• There is a mechanical malfunction in system

Diagnostic procedure

STEP	INSPECTION		ACTION
1	**CHECK FOR DTCS IN ABS HU/CM** • Have DTCs been recorded in memory?	Yes	Perform inspection using appropriate DTC.
		No	Go to next step.
2	**INSPECT ABS HYDRAULIC UNIT** • Perform “ABS hydraulic unit system inspection”. • Is system okay?	Yes	Inspect conventional brake system.
		No	**If wheels do not rotate:** • Replace ABS HU/CM. **If wheels rotate but order in which wheels rotate is incorrect:** • Inspect brake pipe passage to ABS HU/CM.

04–10 GENERAL PROCEDURES

PRECAUTION (BRAKES)

A3U041001020W01

Wheels and Tires Removal/Installation

1. The removal and installation procedures for the wheels and tires are not mentioned in this section. When a wheel is removed, tighten it to **89—117 N·m {9.0—12.0 kgf·m, 65.1—86.7 ft·lbf}**.

Brake Lines Disconnection/Connection

Caution
- **Brake fluid will damage painted surfaces. If brake fluid does get on a painted surface, wipe it off immediately.**

1. Tighten the brake pipe flare nut using the **SST** (49 0259 770B). Be sure to modify the brake pipe flare nut tightening torque to allow for use of a torque wrench-**SST** combination. (See 00–00–15 Torque Formulas.)
   - If any brake line has been disconnected anytime during the procedure, add brake fluid, bleed the brakes, and inspect for leakage after the procedure has been completed.

Connectors Disconnection

1. Disconnect the negative battery cable before doing any work that requires handling of connectors. Reconnect the negative battery cable only after the work is completed.

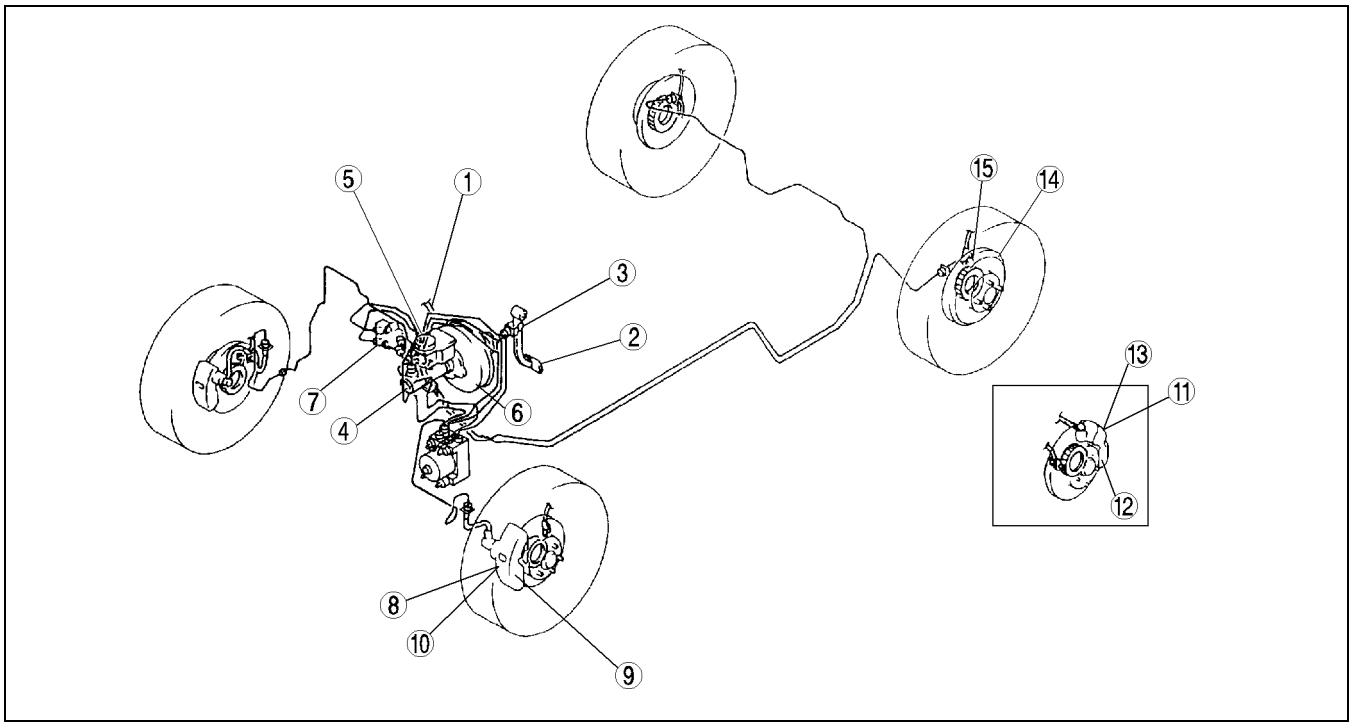
ABS Components Operations

1. Make sure that there are no DTCs in the ABS memory after working on ABS components.
   - If there are any DTCs in the memory, clear them.

04–11 CONVENTIONAL BRAKE SYSTEM

CONVENTIONAL BRAKE SYSTEM LOCATION INDEX

A3U041101020W01



Z3U0411W101

1	Vacuum line (See 04–11–3 VACUUM HOSE CHECK VALVE INSPECTION (POWER BRAKE UNIT))
2	Brake pedal (See 04–11–3 BRAKE PEDAL INSPECTION) (See 04–11–5 BRAKE PEDAL REMOVAL/ INSTALLATION)
3	Brake switch (See 04–11–5 BRAKE SWITCH INSPECTION)
4	Master cylinder (See 04–11–6 MASTER CYLINDER REMOVAL/ INSTALLATION) (See 04–11–10 MASTER CYLINDER DISASSEMBLY/ASSEMBLY)
5	Brake fluid level sensor (See 04–11–9 FLUID LEVEL SENSOR INSPECTION)
6	Power brake unit (See 04–11–11 POWER BRAKE UNIT INSPECTION) (See 04–11–13 POWER BRAKE UNIT REMOVAL/ INSTALLATION)
7	Dual proportioning valve (without ABS) or brake pipe joint (with ABS) (See 04–11–13 DUAL PROPORTIONING VALVE (WITHOUT ABS) INSPECTION) (See 04–11–14 DUAL PROPORTIONING VALVE (WITHOUT ABS) AND BRAKE PIPE JOINT (WITH ABS) REPLACEMENT)

8	Front brake (disc) (See 04–11–14 FRONT BRAKE (DISC) INSPECTION) (See 04–11–17 FRONT BRAKE (DISC) REMOVAL/ INSTALLATION)
9	Front disc pad (See 04–11–19 DISC PAD (FRONT) REPLACEMENT)
10	Front caliper (See 04–11–20 CALIPER (FRONT) DISASSEMBLY/ASSEMBLY)
11	Rear brake (disc) (See 04–11–21 REAR BRAKE (DISC) INSPECTION) (See 04–11–22 REAR BRAKE (DISC) REMOVAL/ INSTALLATION)
12	Rear disc pad (See 04–11–23 DISC PAD (REAR) REPLACEMENT)
13	Rear caliper (See 04–11–24 CALIPER (REAR) DISASSEMBLY/ ASSEMBLY)
14	Rear brake (drum) (See 04–11–25 REAR BRAKE (DRUM) INSPECTION) (See 04–11–26 REAR BRAKE (DRUM) REMOVAL/ INSTALLATION)
15	Wheel cylinder (See 04–11–27 WHEEL CYLINDER DISASSEMBLY/ASSEMBLY)

AIR BLEEDING

A3U041143001W01

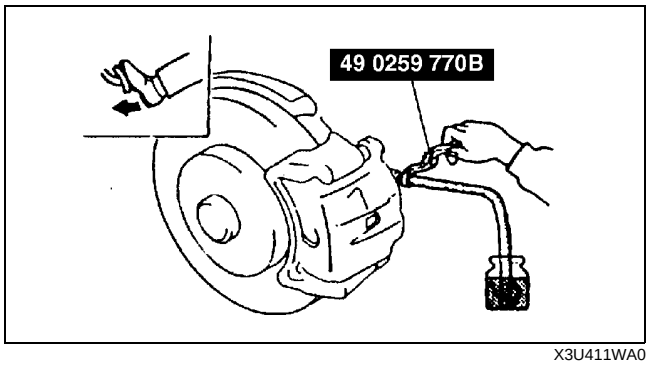
Note
- The brakes should be bled whenever a brake line is disconnected. If a hydraulic line is disconnected at the master cylinder, start at the slave cylinder farthest from the brake master cylinder, and move to the next farthest slave cylinder until all 4 cylinders have been bled. If the disconnection point is anywhere except the master cylinder, start at the point closest to the disconnection, and move to the next closest slave cylinder until all 4 cylinders have been bled.

Specified fluid
SAEJ1703 or FMVSS 116 DOT-3

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Remove the bleeder cap and attach a vinyl tube to the bleeder screw.
3. Place the other end of the vinyl tube in a clear, fluid filled container.
4. The first person depresses the brake pedal a few times, and then holds it in the depressed position.
5. The second person loosens the bleeder screw, drains out the fluid and closes the screw using the **SST**.
6. Repeat Steps 4 and 5 until no air bubbles are seen. The reservoir should be kept **about 3/4** full during bleeding to prevent air from reentering the lines.

Tightening torque
5.9—8.8 N·m {60—90 kgf·cm, 53—78 in·lbf}

7. Inspect for correct brake operation.
8. Verify that there is no fluid leakage. Wipe off any spilled fluid immediately.
9. After bleeding the brakes, add brake fluid to the maximum level.

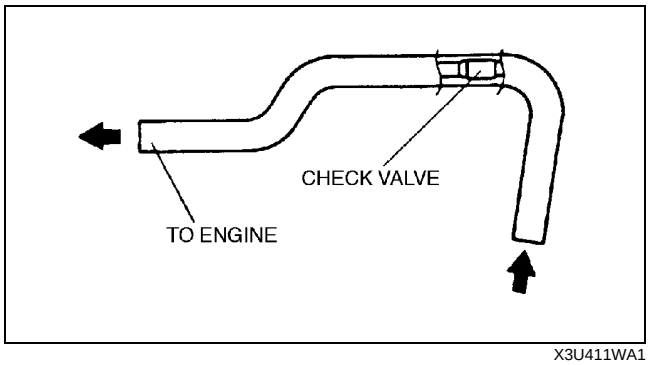


X3U411WA0

VACUUM HOSE CHECK VALVE INSPECTION (POWER BRAKE UNIT)

A3U041143980W01

1. Remove the clamps and vacuum hose.
2. Apply both suction and pressure to the engine-side hose, and verify that air blows only toward that side.
   - If air flows in both directions or not at all, replace the vacuum hose.



X3U411WA1

BRAKE PEDAL INSPECTION

A3U041143300W01

Brake Pedal Height Inspection

1. Verify that the distance from the carpet to the center of the upper surface of the pedal pad is as specified.

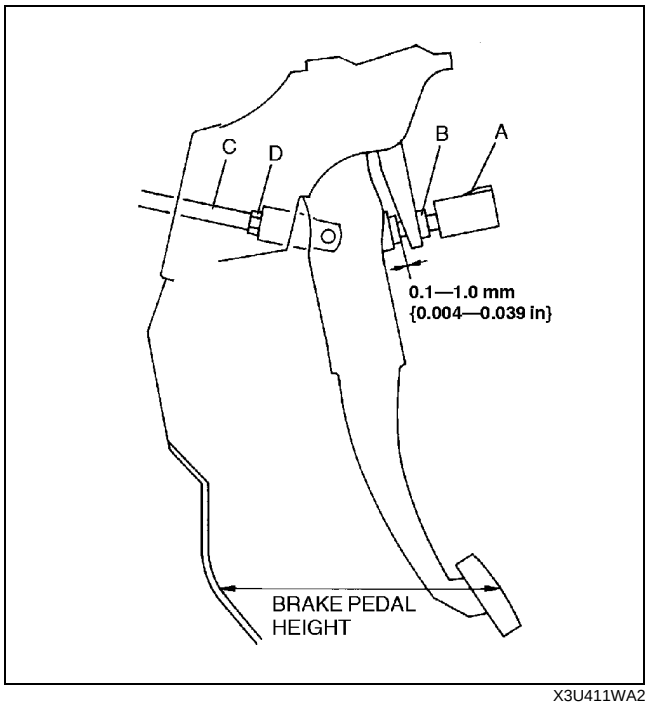
Pedal height (reference value)
185 mm {7.28 in}

Brake Pedal Height Adjustment

1. Disconnect the brake switch connector.
2. Loosen locknut B and turn switch A until it does not contact the pedal.
3. Loosen locknut D and turn rod C to adjust the height.
4. Tighten the bolt with locknut B so that clearance between the bolt for brake light switch A and pedal stopper is within the specification.

   Specification
   0.1—1.0 mm {0.004—0.039 in}
   Tightening torque
   13.8—17.6 N·m {140—180 kgf·cm, 122—156 in·lbf}

5. Connect the brake switch connector.
6. After adjustment, inspect the pedal play and the brake light operation.

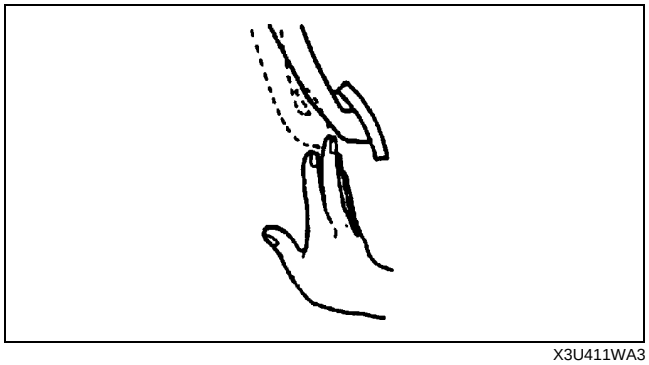


X3U411WA2

Brake Pedal Play Inspection

1. Depress the pedal a few times to eliminate the vacuum in the system.
2. Remove the spring pin, verify that the holes in the fork and in the pedal are aligned, and reinstall the pin. (See 04–11–5 BRAKE PEDAL REMOVAL/INSTALLATION.)
3. Gently depress the pedal by hand until resistance is felt, and check the pedal play.

   Pedal play
   4—12 mm {0.16—0.47 in}

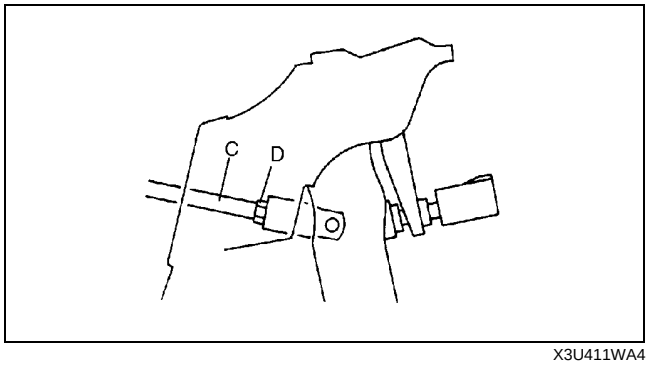

X3U411WA3

Brake Pedal Play Adjustment

1. Remove the spring pin and clevis pin. (See 04–11–5 BRAKE PEDAL REMOVAL/INSTALLATION.)
2. Loosen locknut D and turn rod C to align the holes in the fork and in the pedal.
3. Install the clevis pin and the spring pin.
4. Tighten locknut D.

   Tightening torque
   24—34 N·m {2.4—3.5 kgf·m, 18—25 ft·lbf}

5. Check the pedal height and the brake light operation.



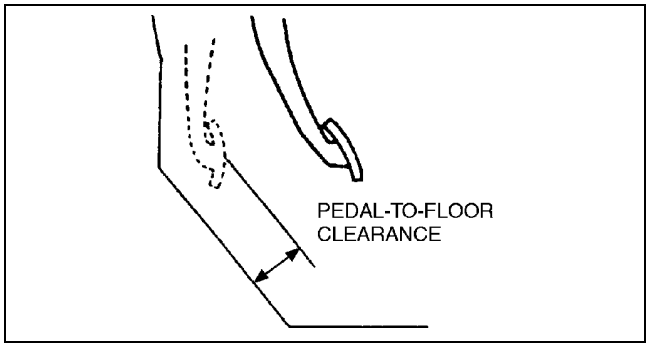
X3U411WA4

Pedal-to-floor Clearance Inspection

1. Start the engine and depress the brake pedal with a force of **588 N {60 kgf, 132 lbf}**
2. Verify that the distance from the floor panel to the pedal pad center is as specified when the pedal is depressed.
   - If the distance is less than specified, check for the air in brake system.

Specification

ZM : 88 mm {3.5 in} min.
FS : 84 mm {3.3 in} min.



X3U411WA5

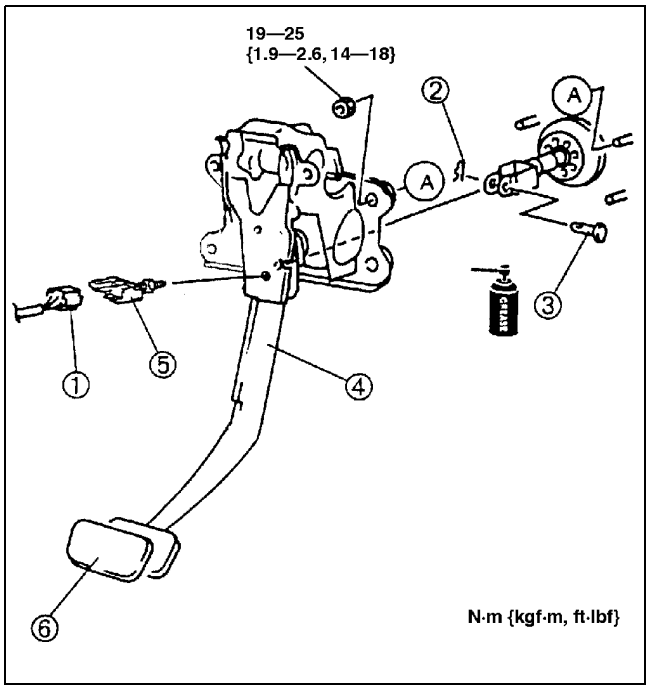
BRAKE PEDAL REMOVAL/INSTALLATION

1. Remove in the order indicated in the table.

1	Brake switch connector
2	Spring pin
3	Clevis pin
4	Brake pedal
5	Brake switch
6	Pedal pad

2. Install in the reverse order of removal.

A3U041143300W02



X3U411WA6

BRAKE SWITCH INSPECTION

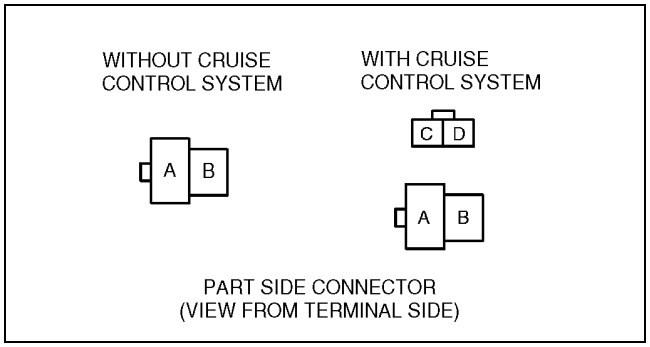
1. Disconnect the brake switch connector.
2. Inspect for continuity between the terminals of the brake switch connector using the ohmmeter.
   - If not as specified, replace the brake switch.

○—○ : Continuity

Condition	Terminal			
	A	B	C	D
Brake pedal is depressed	○	○		
Brake pedal is not depressed			○	○

Y3U411WA8

A3U041166490W01



A3U0411W001

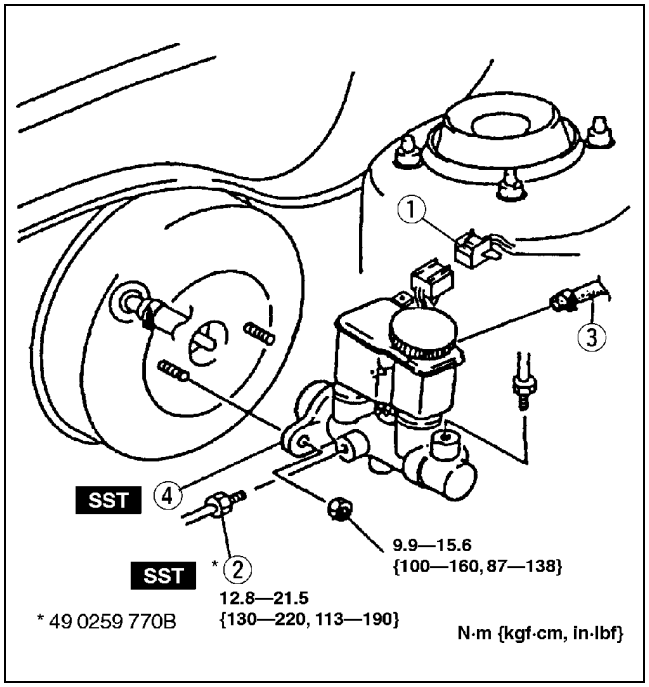
MASTER CYLINDER REMOVAL/INSTALLATION

A3U041143400W01

1. Remove in the order indicated in the table.

1	Brake fluid level sensor connector
2	Brake pipe
3	Hose (MTX)
4	Master cylinder (See 04–11–6 Master Cylinder Installation Note

2. Install in the reverse order of removal.



X3U411WA9

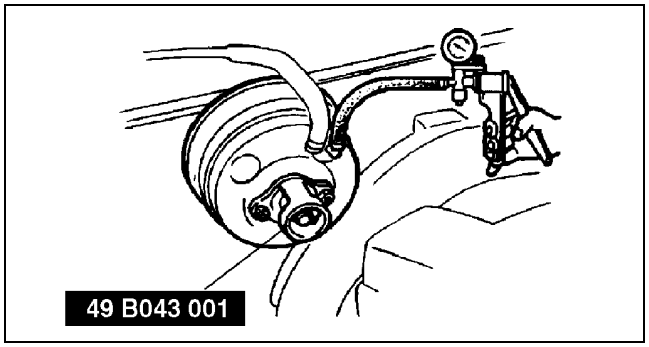
Master Cylinder Installation Note

FS

1. Turn the nut of the **SST** clockwise to fully retract the **SST** gauge rod. Attach the **SST** to the power brake unit.

   Tightening torque
   9.9—15 N·m {1.0—1.6 kgf·m, 7.3—11 ft·lbf}

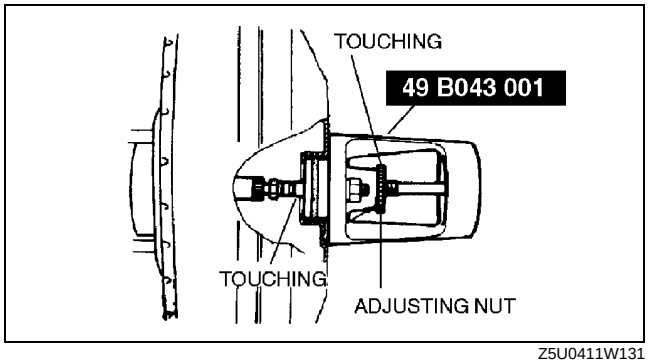
2. Apply a **66.7 kPa {500 mmHg, 19.7 inHg}** vacuum by using a vacuum pump.



Z5U0411W130

3. Turn the adjusting nut of the **SST** counterclockwise until the gauge rod just contacts the push rod end of the power brake unit. Push lightly on the end of the gauge rod to be sure it is seated. Verify that there is no gap between the adjusting nut and **SST** body.
4. Remove the **SST** from the power brake unit without disturbing the adjusting nut. Set the **SST** onto the master cylinder as shown in the figure.

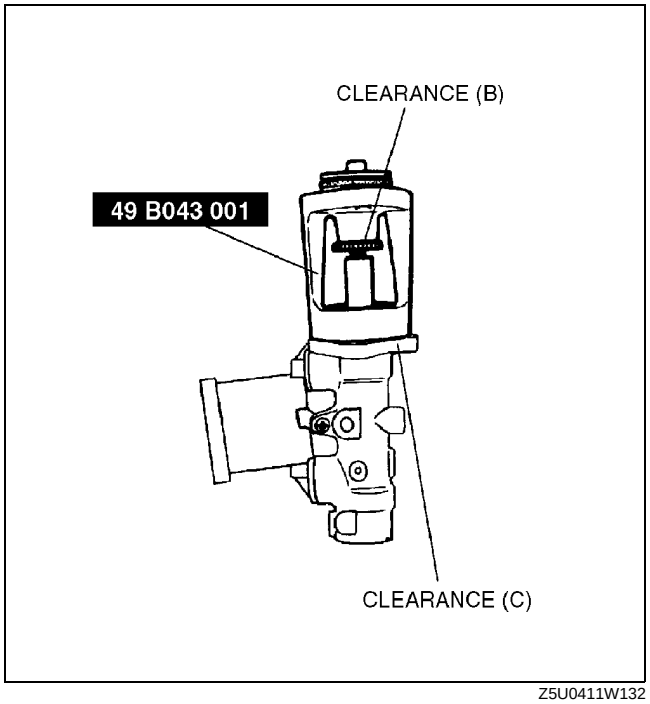
   Caution
   - **When pushing the SST gauge rod into the master cylinder piston, only use enough pressure to push the rod to the bottom of the piston. If too much pressure is applied, a false reading will occur.**



Z5U0411W131

5. Push lightly on the end of the **SST** gauge rod to be sure it has contacted the bottom of the master cylinder piston, but do not push so hard that the piston moves. Note any clearance between the **SST** body and the adjusting nut (clearance B) or between the body and the master cylinder (clearance C).

Measurement	Push rod
Clearance at (B)	Too short
Clearance at (C)	Too long
No clearance at (B) or (C)	

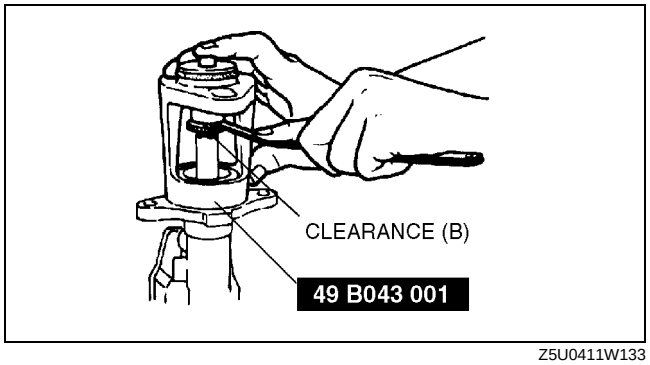


Z5U0411W132

Adjusting the push rod clearance at B

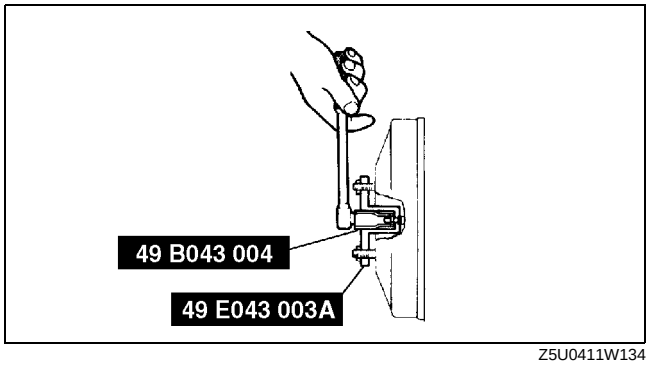
Note
- The threads of the push rod are specially designed so that the bolt becomes harder to turn past a certain point. This is to prevent the bolt from coming loose. Turn the bolt only within this range when adjusting.

1. Push lightly on the end of the **SST** gauge rod, and measure the clearance between the adjusting nut and the **SST** body.



Z5U0411W133

2. Using the **SST**, turn the nut to lengthen the power brake unit push rod an amount equal to the sum substracting **0.1—0.4 mm {0.004—0.016 in}** from the clearance measured at B.

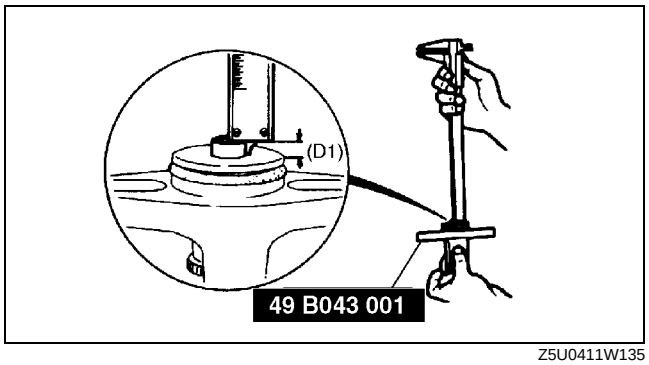


Z5U0411W134

Adjusting the push rod clearance at C or no clearance at B or C

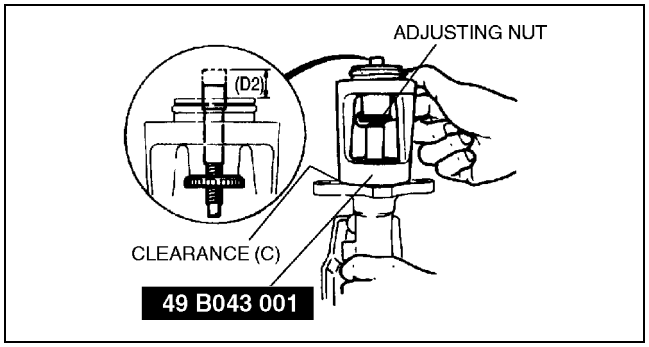
Note
- The threads of the push rod are specially designed so that the bolt becomes harder to turn past a certain point. This is to prevent the bolt from coming loose. Turn the bolt only within this range when adjusting.

1. Measure and record height D1 of the gauge rod.
2. Turn the adjusting nut until the **SST** body sets evenly on the master cylinder. (Turn only enough for the body to touch.)



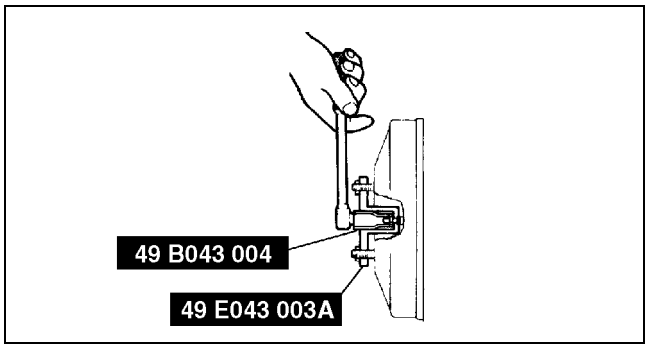
Z5U0411W135

3. Measure and record height D2 of the gauge rod.



Z5U0411W136

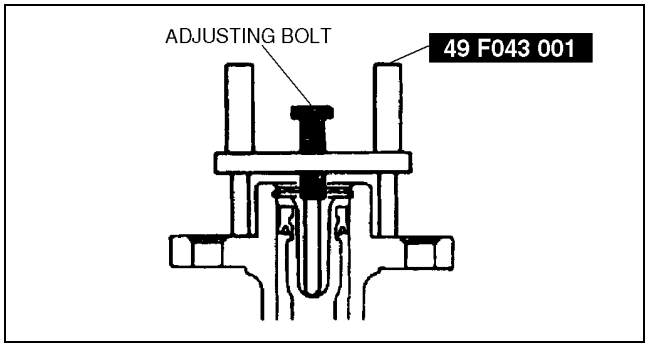
4. Subtract D1 from D2 and add **0.1—0.4 mm {0.004—0.016 in}**. Using the **SST**, turn the nut to shorten the power booster push rod an amount equal to the sum.



Z5U0411W134

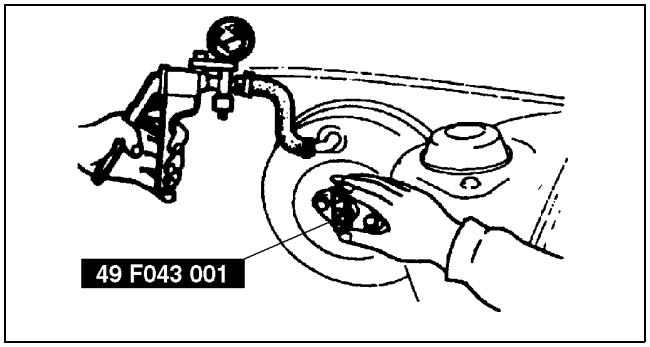
ZM

1. Place the **SST** atop the master cylinder. Turn the adjusting bolt until it touches the bottom of the push rod hole in the piston.
2. Apply **66.7 kPa {500 mmHg, 19.7 inHg}** vacuum to the power brake unit using a vacuum pump.

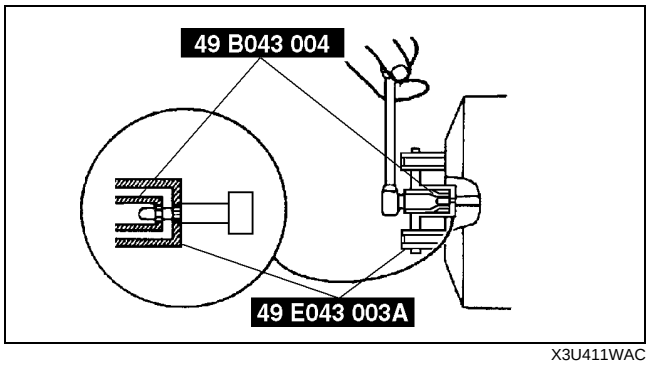


X3U411WAA

3. Invert the **SST** used in Step 1 and place it on the power brake unit.
4. Measure the clearance between the end of the **SST** and the push rod of the power brake unit.
   - If it is not **0.1—0.4 mm {0.004—0.016 in}**, loosen the push rod locknut and turn the push rod to adjust it using the **SSTs**.



X3U411WAB

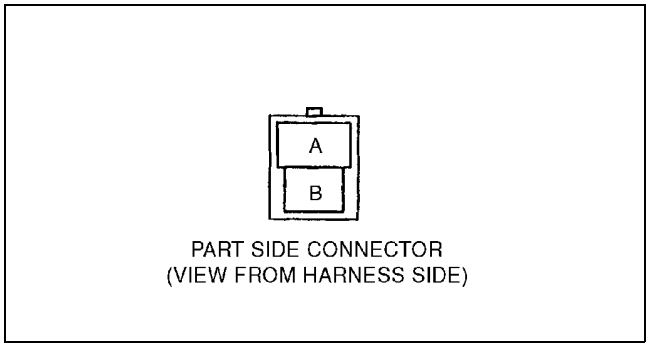


X3U411WAC

FLUID LEVEL SENSOR INSPECTION

A3U041143540W01

1. Disconnect the sensor connector.
2. Connect an ohmmeter to the connector.
3. Starting with the fluid level above MIN, verify that there is no continuity.
4. Remove the brake fluid and verify that there is continuity when the level is below MIN.
   - If not as specified, replace the sensor.



Y3U411WA1

○——○ : Continuity

Fluid level	Terminal	
	A	B
Below MIN	○	○
Above MIN		

X3U411WAD

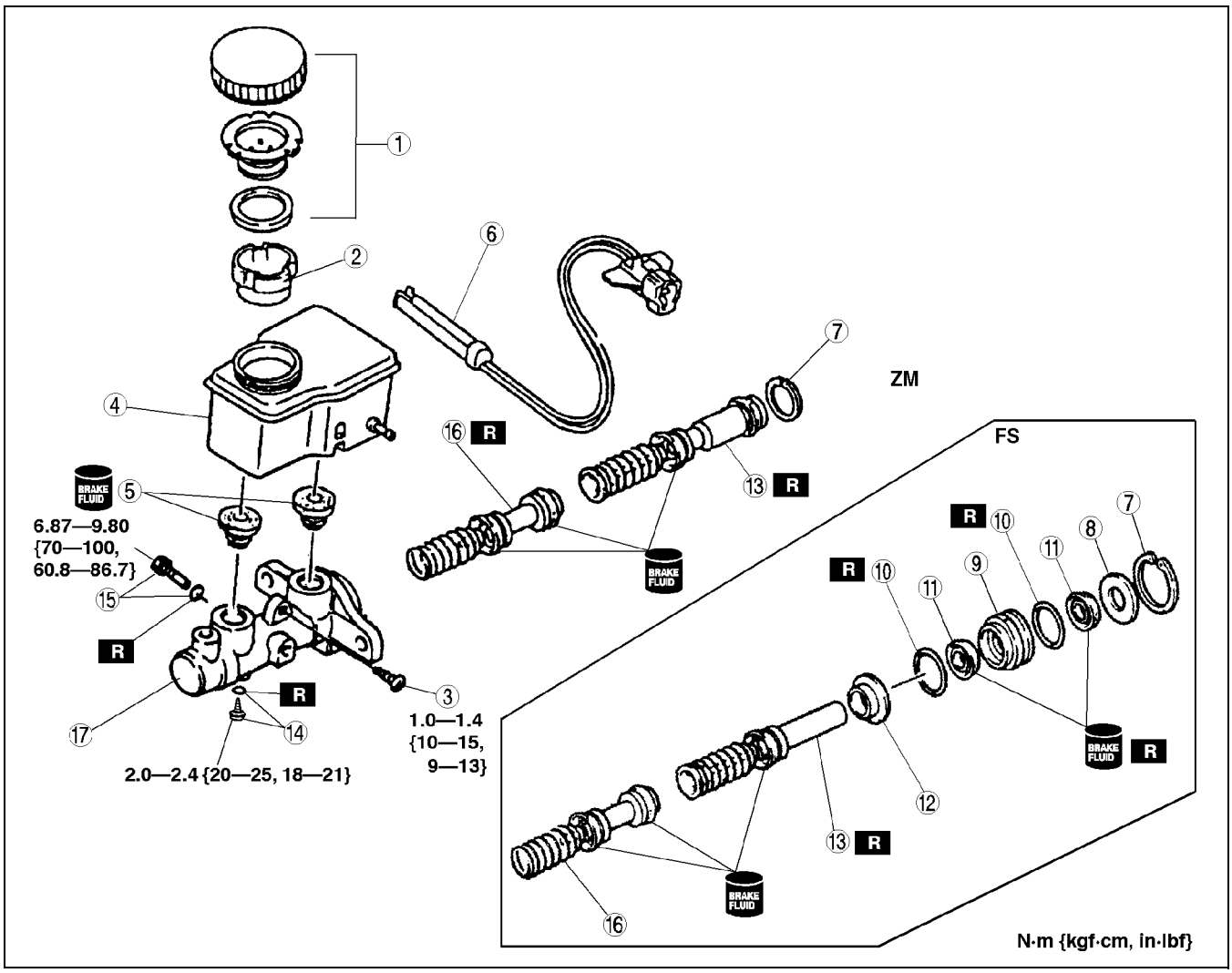
MASTER CYLINDER DISASSEMBLY/ASSEMBLY

A3U041143400W02

Caution

- **If the master cylinder body is damaged, replace the unit as an assembly. When securing the master cylinder in a vise, tighten only the flange of the master cylinder.**

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



Z3U0411W011

1	Cap set
2	Float
3	Screw
4	Reservoir
5	Joint bushing
6	Fluid level sensor
7	Snap ring
8	Spacer
9	Piston guide
10	O-ring

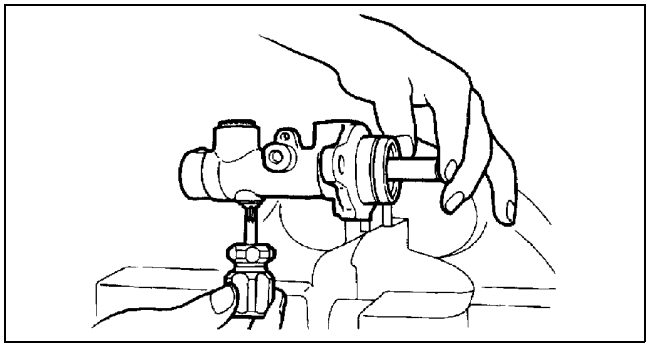
11	Cup
12	Primary piston stopper
13	Primary piston
14	Stop screw and O-ring (without ABS) (See04–11–11 Stop Screw and O-ring (without ABS) Assembly Note)
15	Stop pin and O-ring (with ABS) (See 04–11–11 Stop Pin and O-ring (with ABS) Assembly Note)
16	Secondary piston
17	Master cylinder body

Stop Screw and O-ring (without ABS) Assembly Note

1. Install the secondary piston and primary piston.
2. Install the new O-ring onto the stop screw.
3. Push the primary piston assembly in full.
4. Install and tighten the stop screw.

Tightening torque
2.0—2.4 N·m {20—25 kgf·cm, 18—21 in·lbf}

5. Push and release the secondary piston component to verify that it is held properly by the stop screw.



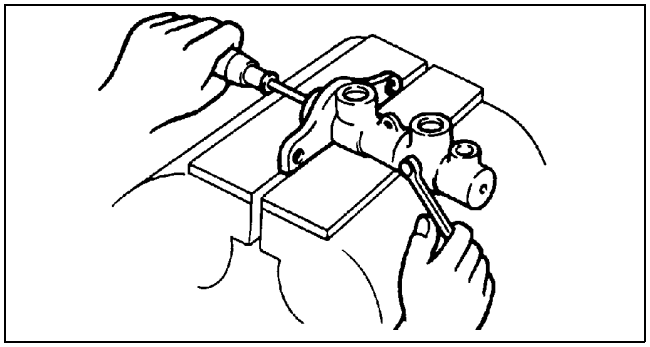
X3U411WAG

Stop Pin and O-ring (with ABS) Assembly Note

1. Install the secondary piston with the piston hole facing the stop pin and primary piston.
2. Install the new O-ring onto the stop pin.
3. Push the primary piston assembly in full.
4. Install and tighten the stop pin.

Tightening torque
6.87—9.80 N·m {70—100 kgf·cm, 60.8—86.7 in·lbf}

5. Push and release the secondary piston component to verify that it is held properly by the stop pin.



X3U411WAH

POWER BRAKE UNIT INSPECTION

A3U041143800W01

Power Brake Unit Function Check
Simple method

Note
- Replace power brake unit component if necessary.

Step 1

1. With engine stopped, depress the pedal a few times.
2. With pedal depressed, start the engine.
   - If the pedal moves down slightly, immediately after engine starts, the unit is operating.
   - If not as specified, inspect for damage on the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it again.

Step 2

1. Start the engine.
2. Stop the engine after it has run for **1 or 2 minutes**.
3. Depress the pedal with usual force.
   - If the first pedal stroke is long and becomes shorter with subsequent strokes, the unit is operating.
   - If not as specified, inspect for damage on the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it again.

Step 3

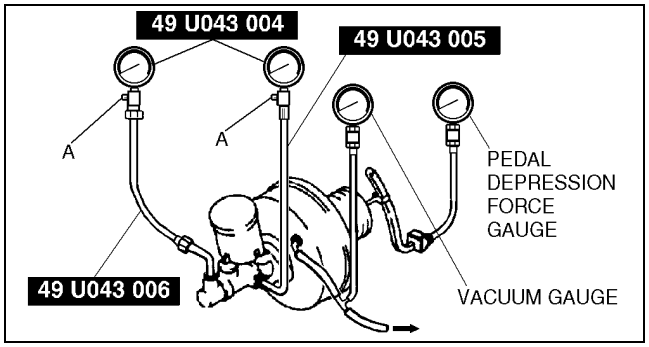
1. Start the engine.
2. Depress the pedal with usual force.
3. Stop the engine with the pedal held depressed.
4. Hold the pedal down for **about 30 seconds**.
   - If the pedal height does not change, the unit is operating.
   - If not as specified, inspect for damage on the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it again.

Inspection using the testers

1. Connect the **SSTs**, vacuum gauge, and pedal depression force gauge as shown in the figure.

   Note
   - Use commercially available gauges and pedal depression force gauge.
   - Bleed the air from the **SST** at gauge A.

2. After bleeding the air from the **SST**, conduct the test as described in the following steps.



A3U0411W002

Checking for vacuum loss
(unloaded condition)

1. Start the engine.
2. Stop the engine when the vacuum gauge reading reaches **66.7 kPa {500 mmHg, 19.7 inHg}**.
3. Observe the vacuum gauge for **15 seconds**.
   - If the gauge shows **63.4—66.6 kPa {475—500 mmHg, 18.8—19.6 inHg}**, the unit is operating.
   - If a problem is found, inspect for damage on the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it again.

(loaded condition)

1. Start the engine.
2. Depress the brake pedal with a force of **200 N {20 kgf, 44 lbf}**.
3. With the brake pedal depressed, stop the engine when the vacuum gauge reading reaches **66.7 kPa {500 mmHg, 19.7 inHg}**.
4. Observe the vacuum gauge for **15 seconds**.
   - If the gauge shows **63.4—66.6 kPa {475—500 mmHg, 18.8—19.6 inHg}**, the unit is operating.
   - If a problem is found, inspect for damage on the check valve or vacuum hose, and examine the installation. Repair if necessary, and inspect it again.

Checking for hydraulic pressure

1. When the engine is stopped (vacuum **0 kPa {0 mmHg, 0 inHg}**) and the fluid pressure is within the specification, the unit is operating.

Engine type	Pedal force	Fluid pressure
ZM	200 N {20 kgf, 44 lbf}	650 kPa {7 kgf/cm^2, 94 psi} min.
FS		600 kPa {6 kgf/cm^2, 87 psi} min.

2. Start the engine. Depress the brake pedal when the vacuum reaches **66.7 kPa {500 mmHg, 19.7 inHg}**.
   - If the fluid pressure is within the specification, the unit is operating.
   - If the fluid pressure is not as specified, inspect for damage on the check valve or vacuum hose, and fluid leakage of the hydraulic line. Repair as necessary, and inspect again.

Engine type	Pedal force	Fluid pressure
ZM	200 N {20 kgf, 44 lbf}	6,500 kPa {66 kgf/cm^2, 943 psi} min.
FS		7,200 kPa {73 kgf/cm^2, 1,044 psi} min.

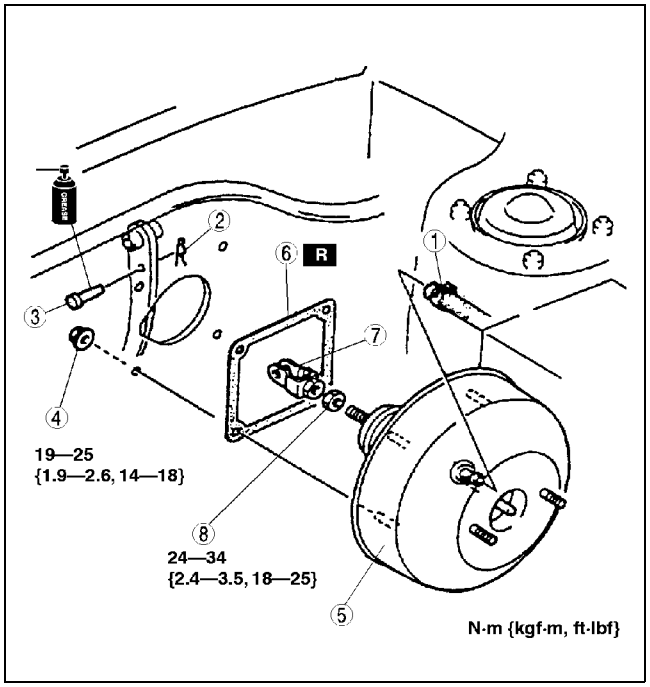
POWER BRAKE UNIT REMOVAL/INSTALLATION

1. Remove the battery and battery cover.
2. Remove the master cylinder. (See 04–11–6 MASTER CYLINDER REMOVAL/ INSTALLATION.)
3. Remove in the order indicated in the table.

1	Vacuum hose
2	Snap pin
3	Clevis pin
4	Nut
5	Power brake unit
6	Gasket
7	Fork
8	Nut

4. Install in the reverse order of removal.

A3U041143800W02

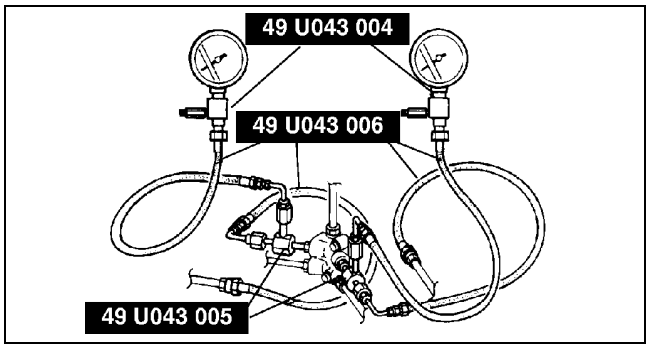


X3U411WAK

DUAL PROPORTIONING VALVE (WITHOUT ABS) INSPECTION

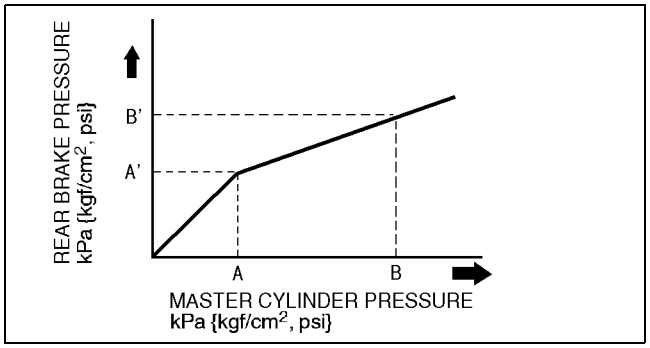
1. Connect the **SSTs** to the brake pipes as shown in the figure.
2. Bleed the air from the brake system.

A3U041143900W01



X3U411WAL

3. Measure the fluid pressure of the master cylinder and the rear brake.
   - If not within the specification, replace the dual proportioning valve.



A3U0411W003

Fluid pressure

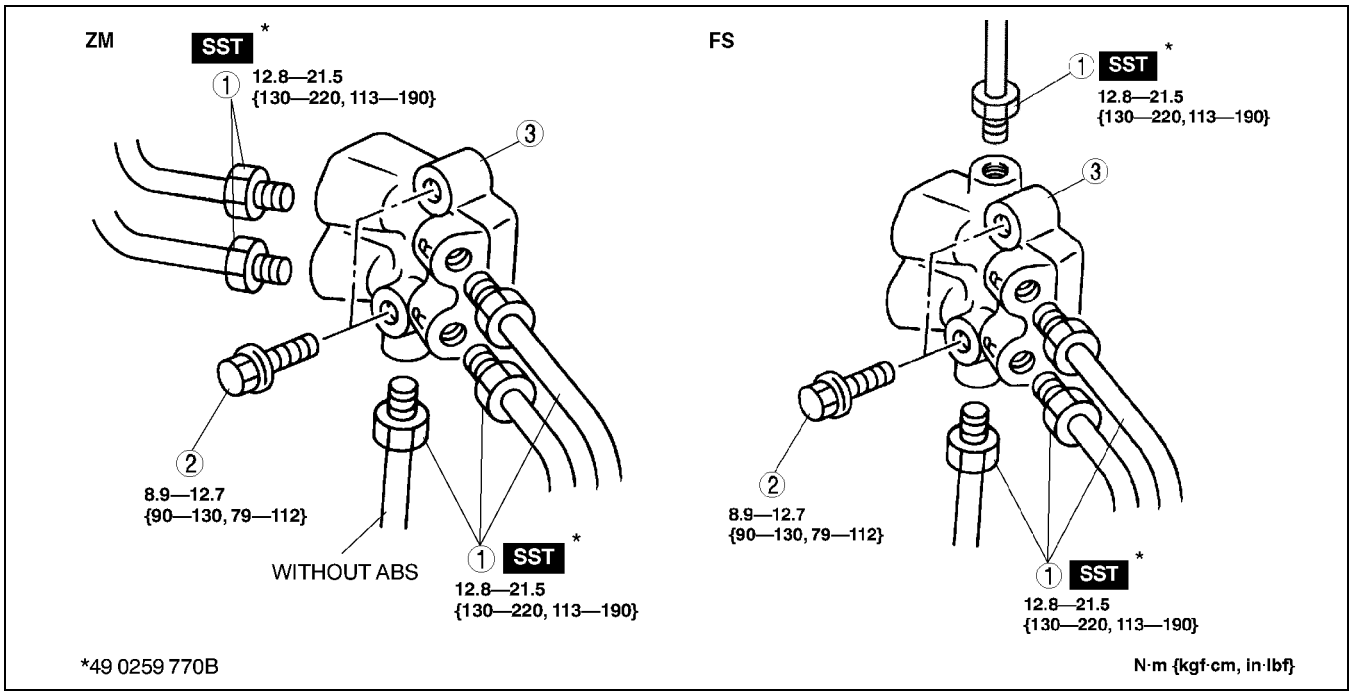
kPa {kgf/cm^2, psi}

Engine type	A	A'	B	B'
ZM	2,900 {30, 430}	2,900 {30, 430}±200 {2, 30}	5,900 {60, 850}	3,800 {39, 550}±300 {3, 40}
FS	3,400 {35, 500}	3,400 {35, 500}±300 {3, 40}	5,900 {60, 850}	4,200 {42.5, 600}±400 {4, 60}

DUAL PROPORTIONING VALVE (WITHOUT ABS) AND BRAKE PIPE JOINT (WITH ABS) REPLACEMENT

A3U041143900W02

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



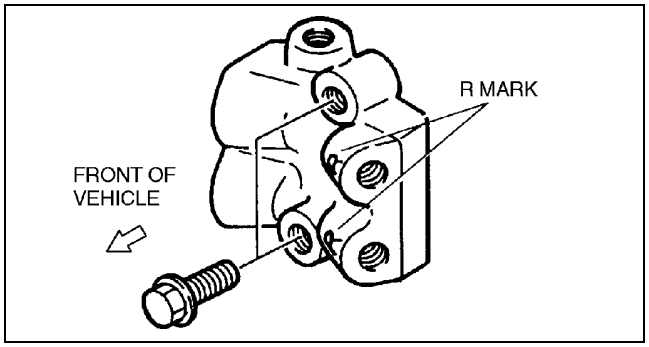
Z3U0411W001

1	Brake pipe
2	Bolt

3	Dual proportioning valve (without ABS) or brake pipe joint (with ABS) (See 04–11–14 Dual Proportioning Valve (Without ABS) or Brake Pipe Joint (With ABS) Installation Note)

Dual Proportioning Valve (Without ABS) or Brake Pipe Joint (With ABS) Installation Note

1. Install the dual proportioning valve so that the R mark faces the left side of the vehicle.



X3U411WAP

FRONT BRAKE (DISC) INSPECTION

A3U041133980W01

Brake Judder Repair Hint

Description

1. Brake judder concern has the following 3 characteristics:

Steering wheel vibration

1. Steering wheel vibrates in the direction of its rotation. This characteristic is most noticeable when applying brakes at a vehicle speed of **100—140 km/h {62.1—86.8 mph}**.

Floor vibration

1. When applying brakes, the vehicle body shakes back and forth. The seriousness of shake is not influenced by vehicle speed.

Brake pedal vibration

1. When applying brakes, a pulsating force tries to push the brake pad back occurs. The pulsation is transmitted to the brake pedal.
2. The following are the main possible causes of brake judder:

Due to an excessive runout (side-to-side wobble) of disc plate, the thickness of disc plate is uneven.

1. If the runout is **more than 0.05 mm {0.002 in} 10 mm {0.39 in}** from the disc plate edge, an uneven wear occurs on the disc plate because the pad contacts the plate unevenly.
2. If the runout is **less than 0.05 mm {0.002 in}**, uneven wear does not occur.

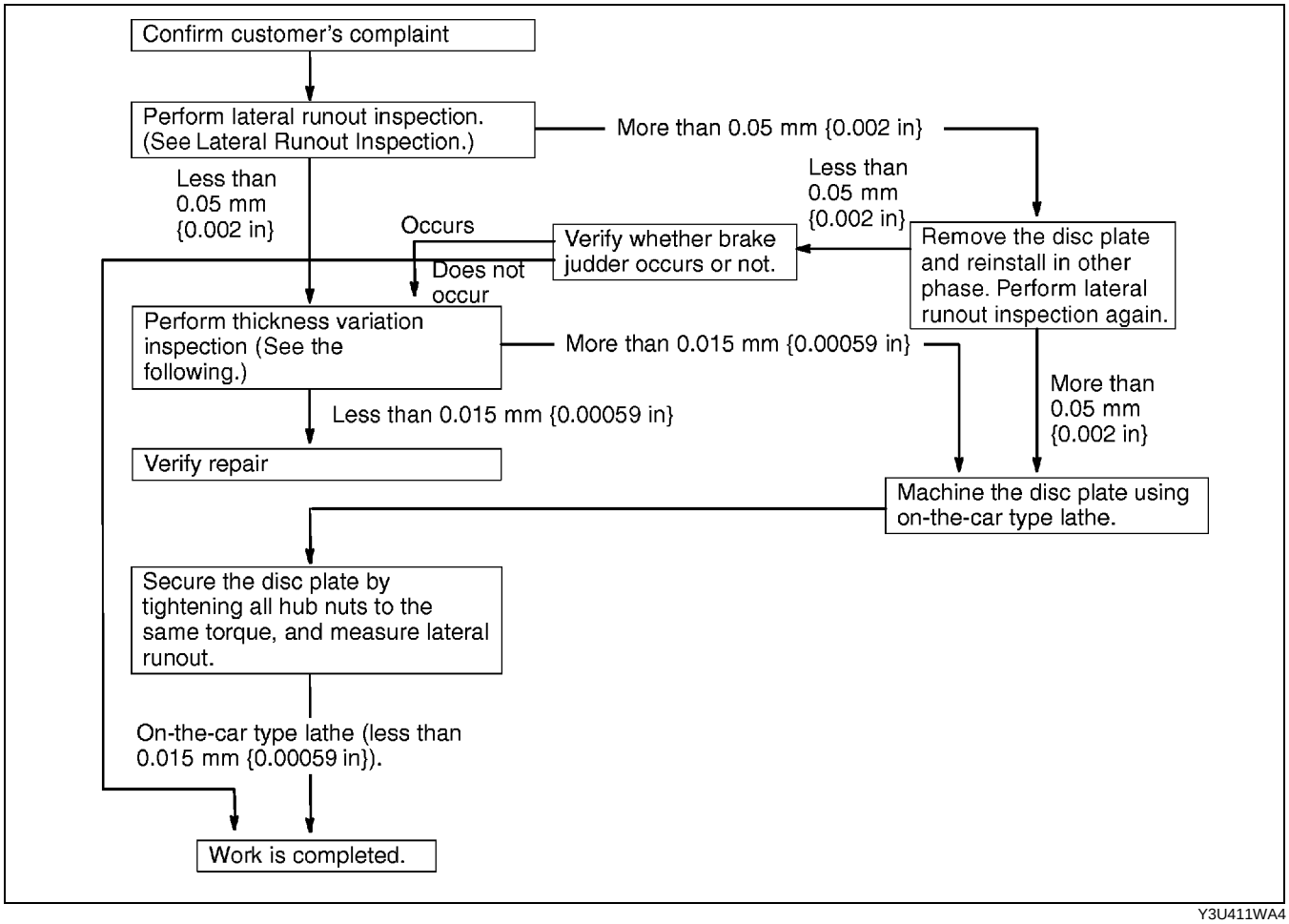
The disc plate is deformed by heat.

1. Repeated panic braking may raise the temperature in some portions of disc plate by **approximately 1,000 °C {1,832 °F}**. This results in deformed disc plate.

Due to corrosion, the thickness and friction coefficient of disc plate change.

1. If a vehicle is parked under damp conditions for a long time, corrosion occurs on the friction surface of disc plate.
2. The thickness of corrosion is uneven and sometimes appears like a wave pattern, which changes the friction coefficient and causes a reaction force.

Inspection and repair procedure



Y3U411WA4

Lateral runout inspection

1. To secure the disc plate and the hub, tighten the hub nuts upside down or insert a washer (thickness **10 mm {0.39 in}**, inner diameter **more than 12 mm {0.47 in}**) between the hub bolt and the hub nut.

   Note
   - The component parts of the **SST** (49 B017 001 or 49 G019 003) can be used as a suitable washer.

2. After tightening all the hub nuts to the same torque, put the dial gauge on the friction surface of disc plate **10 mm {0.39 in}** from the disc plate edge.
3. Rotate the disc plate one time and measure the runout.

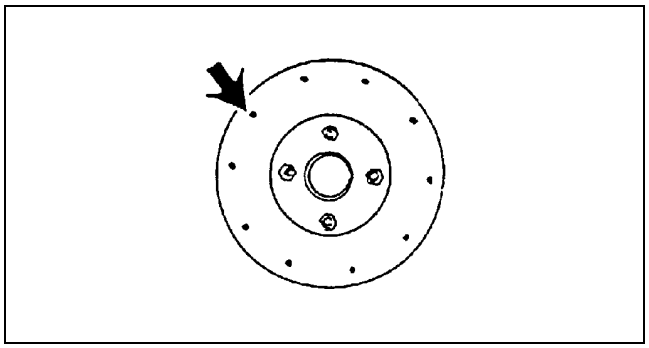
   Runout limit
   0.05 mm {0.002 in}

Thickness variation inspection

1. Clean the disc plate-to-pad friction surface using a brake cleaner.
2. Measure the points indicated in the illustration using a caliper (micrometer).
3. Subtract the minimum value from the maximum, and if the result is not within specification, machine the disc plate using a lathe.

   Thickness variation limit
   0.015 mm {0.00059 in}

   Warning
   - **Do not exceed minimum disc plate thickness.**



X3U411WAR

Disc Plate Thickness Inspection

Caution
- **Excessive runout may result if the disc plate is removed from the vehicle then machined. Machine the disc plate while installed on the vehicle.**

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.

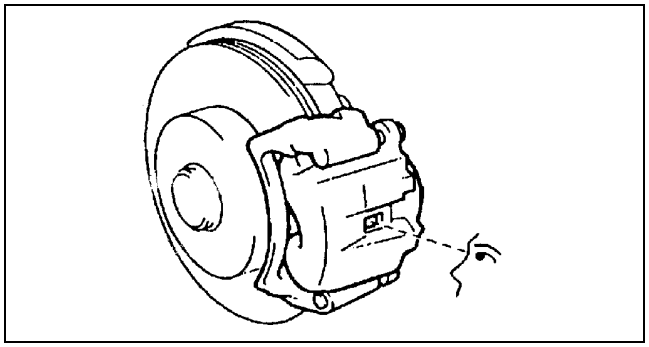
Minimum
ZM: 20 mm {0.78 in}
FS: 22 mm {0.87 in}
Minimum thickness after machining using a brake lathe on-vehicle
ZM: 20.8 mm {0.82 in}
FS: 22.8 mm {0.90 in}

Disc Pad Thickness Inspection

1. Jack up the front of the vehicle and support it with safety stands.
2. Remove the wheel and tires.
3. Verify the remaining thickness of the pads.

Minimum thickness
ZM: 1.5 mm {0.059 in} min.
FS: 2.0 mm {0.079 in} min.

4. Replace the pads as a set: right and left wheels, if either one is at or less than the minimum thickness.

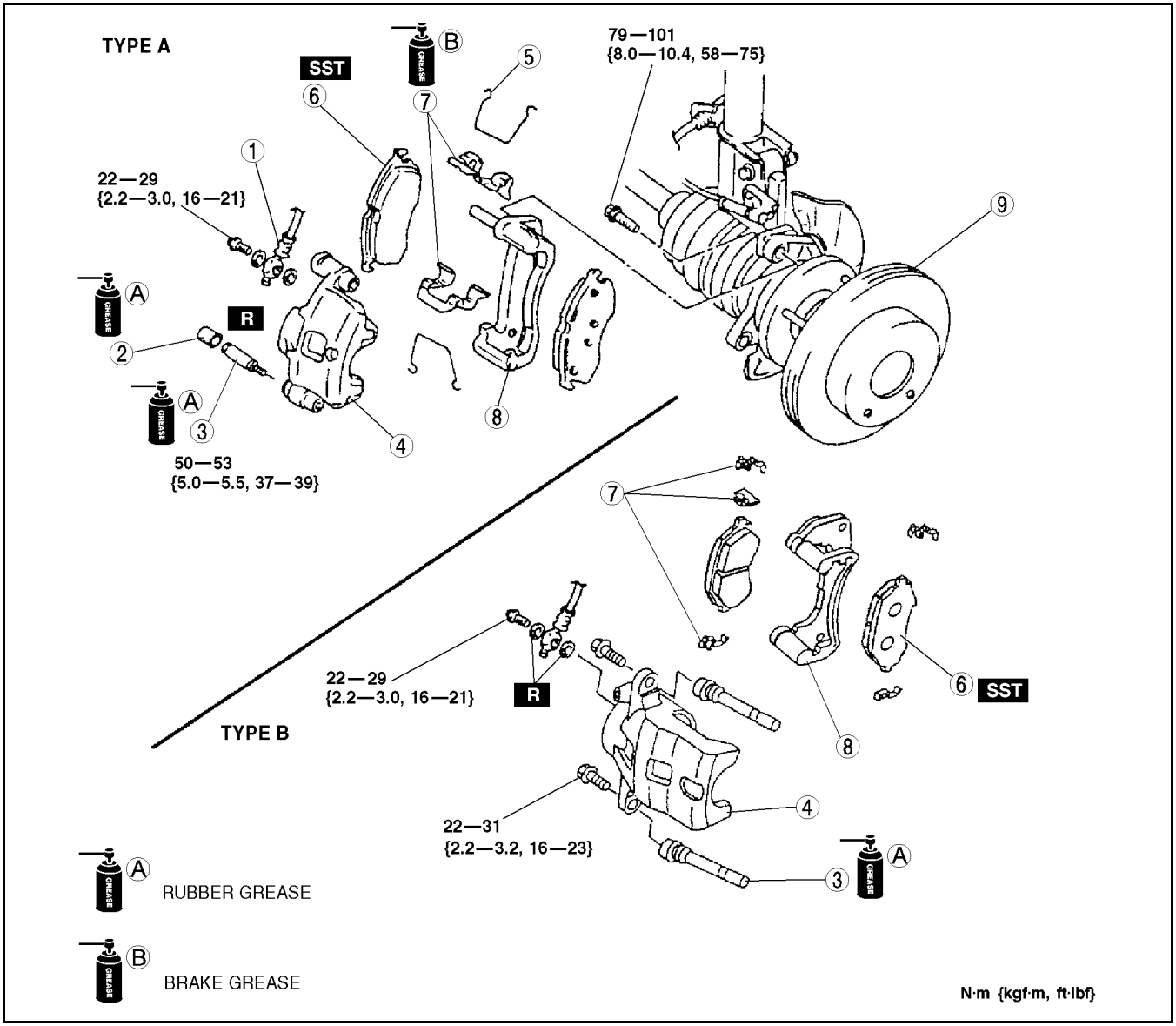


X3U411WAS

FRONT BRAKE (DISC) REMOVAL/INSTALLATION

A3U041133980W02

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, depress the pedal a few times, rotate the wheel by hand, and verify that the brake does not drag.



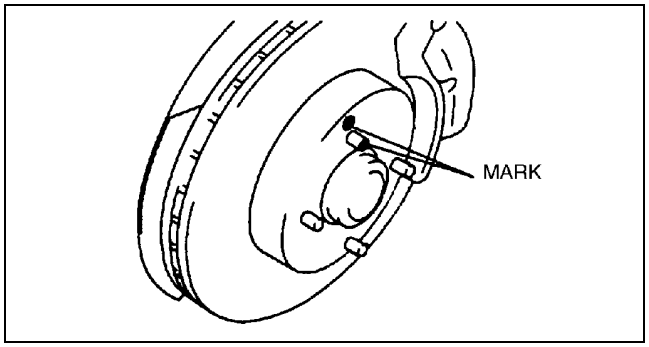
Z3U0411W003

1	Flexible hose
2	Cap (type A only)
3	Guide pin
4	Caliper
5	M-spring (type A only)

6	Disc pad (See 04–11–18 Disc Pad Installation Note)
7	Guide plate
8	Mounting support
9	Disc plate (See 04–11–18 Disc Plate Removal Note) (See 04–11–18 Disc Plate Installation Note)

Disc Plate Removal Note

1. Mark the wheel hub bolt and disc plate before removal for reference during installation.



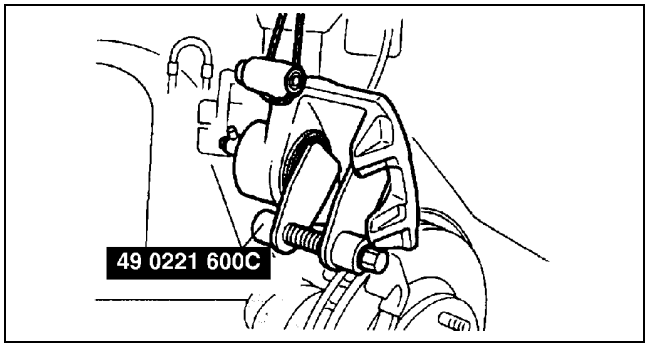
X3U411WAU

Disc Plate Installation Note

1. Remove any rust or grime on the contact face of the disc plate and wheel hub.
2. Install the disc plate and align the marks made before removal.

Disc Pad Installation Note

1. Push the piston fully inward using the **SST**.
2. Install the disc pad.

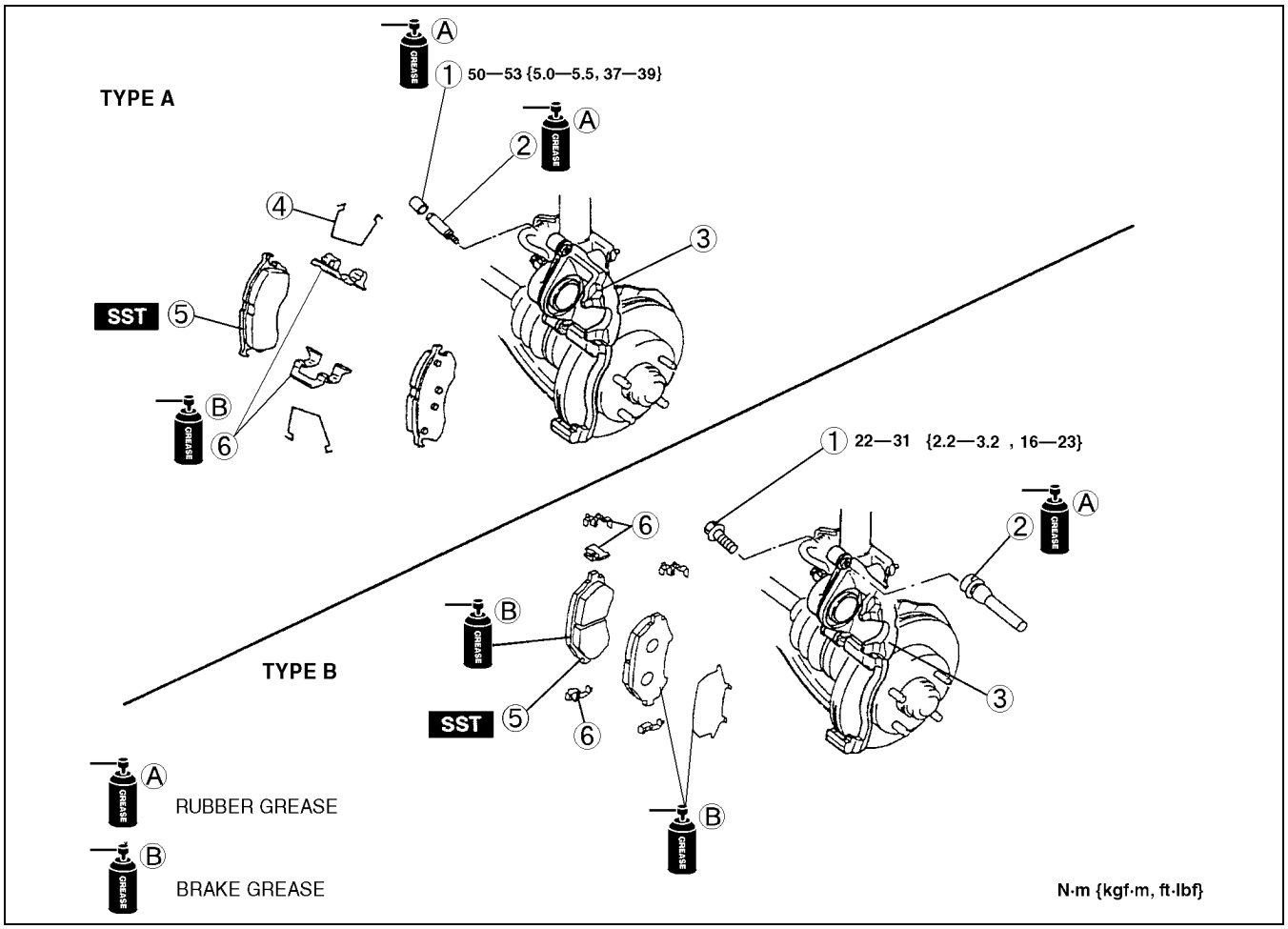


X3U411WAV

DISC PAD (FRONT) REPLACEMENT

A3U041133630W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



Z3U0411W004

1	Cap (type A), bolt (type B)
2	Guide pin
3	Caliper

4	M-spring (type A only)
5	Disc pad (See 04–11–18 Disc Pad Installation Note)
6	Guide plate

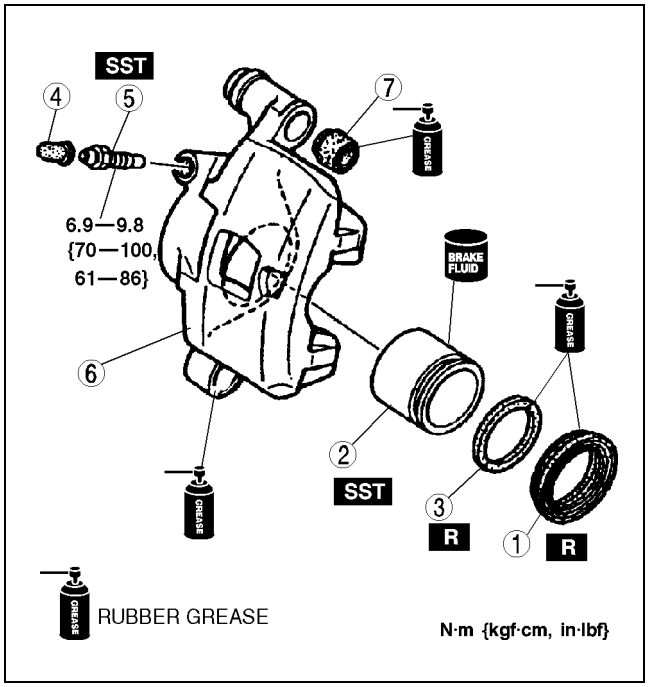
CALIPER (FRONT) DISASSEMBLY/ASSEMBLY

A3U041133990W01

1. Disassemble in the order indicated in the table.

1	Dust seal
2	Piston (See 04–11–20 Piston Disassembly Note)
3	Piston seal (See 04–11–20 Piston Seal Disassembly Note)
4	Bleeder cap
5	Bleeder screw (See 04–11–21 Bleeder Screw Assembly Note)
6	Caliper body
7	Boot

2. Assemble in the reverse order of removal.

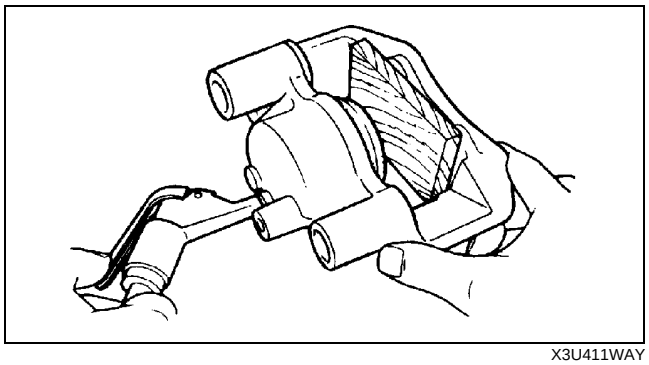


Z3U0411W005

Piston Disassembly Note

Caution
- **Blow the compressed air slowly to prevent the piston from suddenly popping out.**

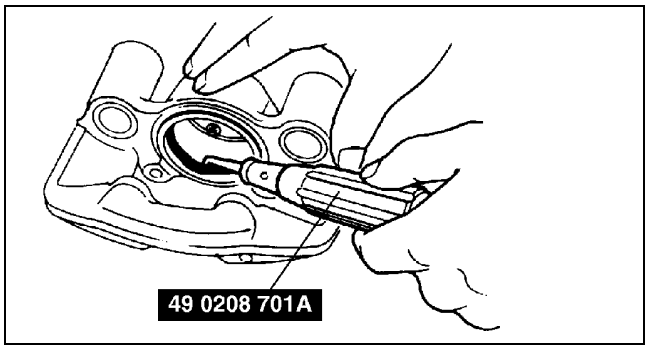
1. Place a piece of wood in the caliper, then blow compressed air through the hole to force the piston out of the caliper.



X3U411WAY

Piston Seal Disassembly Note

1. Remove the piston seal from the brake caliper using the **SST**.

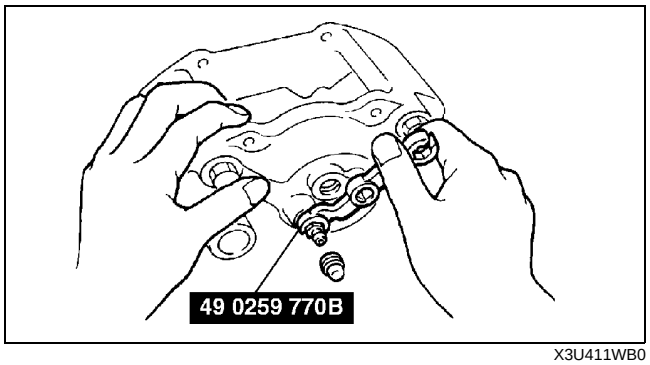


X3U411WAZ

Bleeder Screw Assembly Note

1. Assemble the bleeder screw to the caliper using the **SST**.

Tightening torque
6.9—9.8 N·m {70—100 kgf·cm, 61—86 in·lbf}



X3U411WB0

REAR BRAKE (DISC) INSPECTION

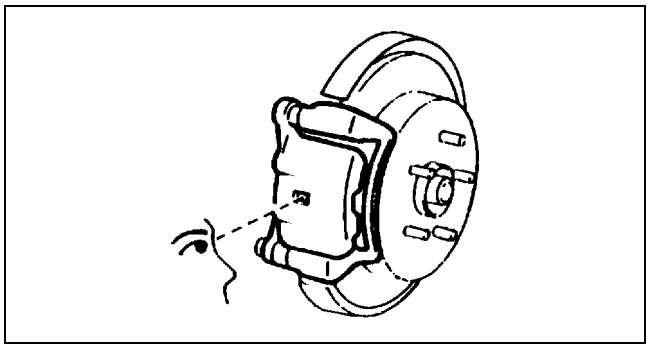
A3U041126980W01

Brake Judder Repair Hint
(See 04–11–14 Brake Judder Repair Hint.)

Disc Pad Thickness Inspection

1. Jack up the rear of the vehicle and support it on safety stands.
2. Remove the wheel and tires.
3. Look through the caliper inspection hole and inspect the remaining thickness of the pads.
   - Replace the pads as a set (right and left wheels) if either is less than the minimum thickness.

Minimum thickness
1.0 mm {0.039 in}



W6U411WB7

Disc Plate Thickness Inspection

1. Measure the thickness of the disc plate.
   - If the thickness is not within the specification, replace the disc plate.

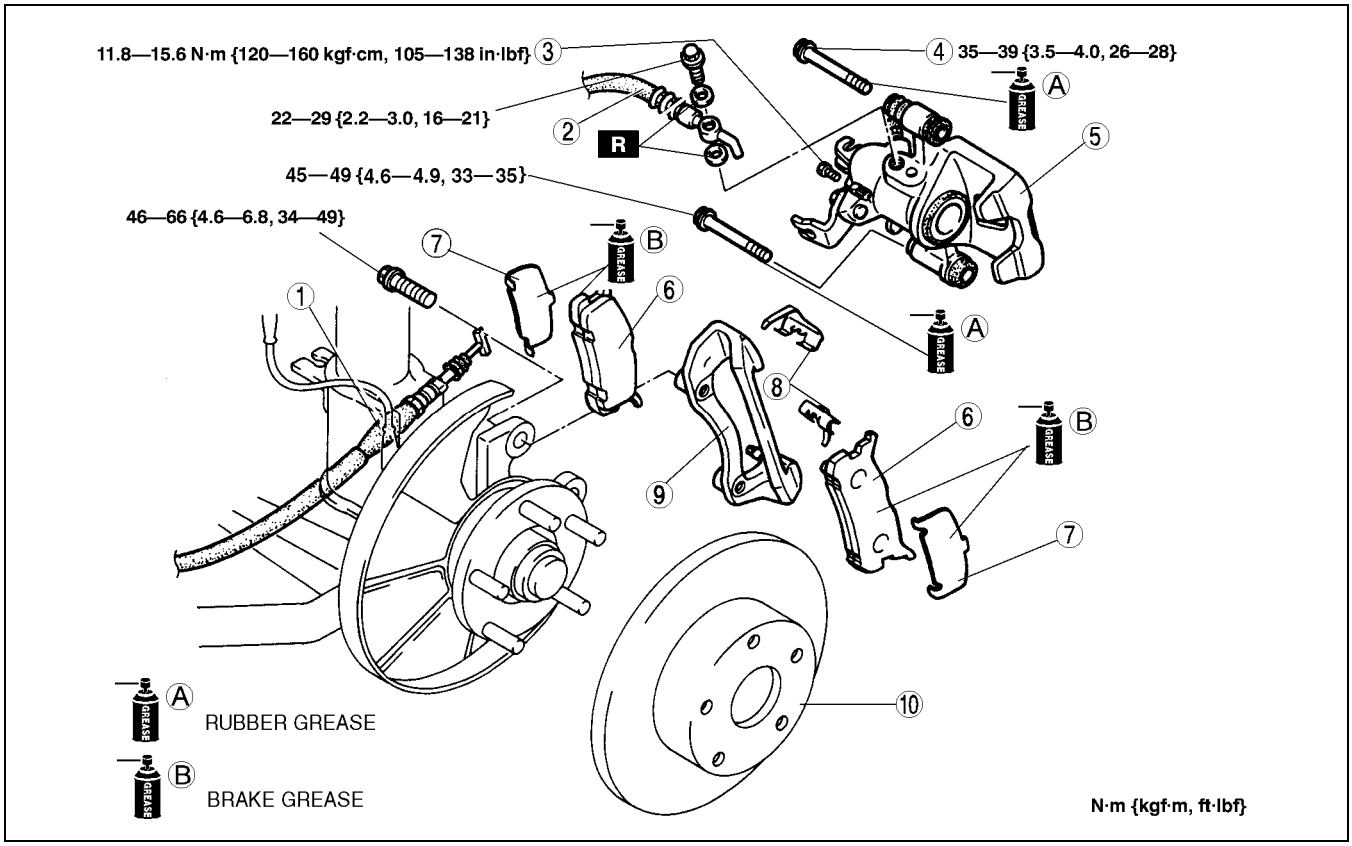
Caution
- **When it is necessary to machine the disc plate, and the disc plate is removed from the vehicle then machined, excessive runout may result. Machine the disc plate which is installed on the vehicle.**

Minimum
8 mm {0.31 in}
Minimum thickness after machining by using a brake lathe on-vehicle
8.8 mm {0.35 in}

REAR BRAKE (DISC) REMOVAL/INSTALLATION

A3U041126980W02

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. After installation, depress the pedal several times, rotate the wheel by hand, and verify that the brake does not drag.



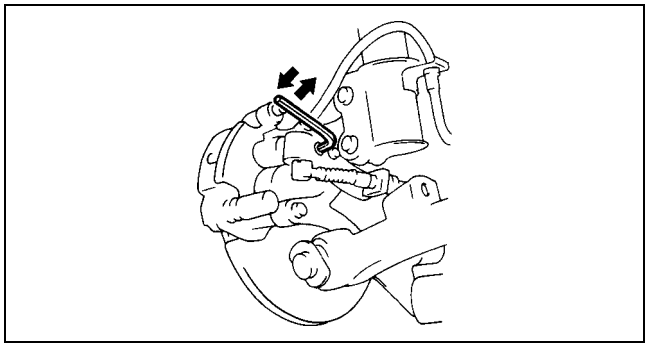
A3U0411W101

1	Parking brake cable, clip
2	Flexible hose
3	Screw plug
4	Lock bolt
5	Caliper
6	Disc pad (See 04–11–22 Disc Pad Installation Note)

7	Shim
8	Guide plate
9	Mounting support
10	Disc plate (See 04–11–18 Disc Plate Removal Note) (See 04–11–18 Disc Plate Installation Note)

Disc Pad Installation Note

1. Turn the manual adjustment gear counterclockwise with an Allen wrench to pull the brake caliper piston inward. (Turn until it stops.)
2. Install the disc pads.
3. Turn the manual adjustment gear clockwise until the brake pads just touch the disc plate. Turn the manual adjustment gear back 1/3-turn.

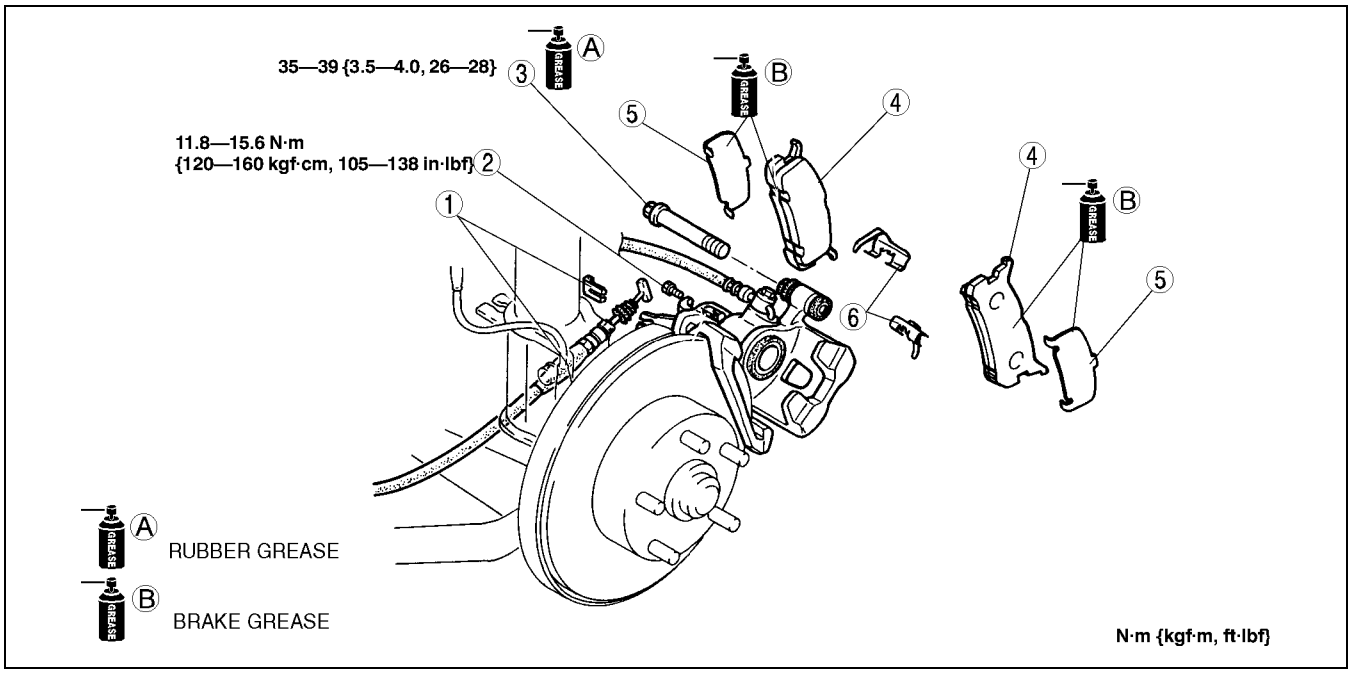


W6U411WB9

DISC PAD (REAR) REPLACEMENT

A3U041126630W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



Z3U0411W009

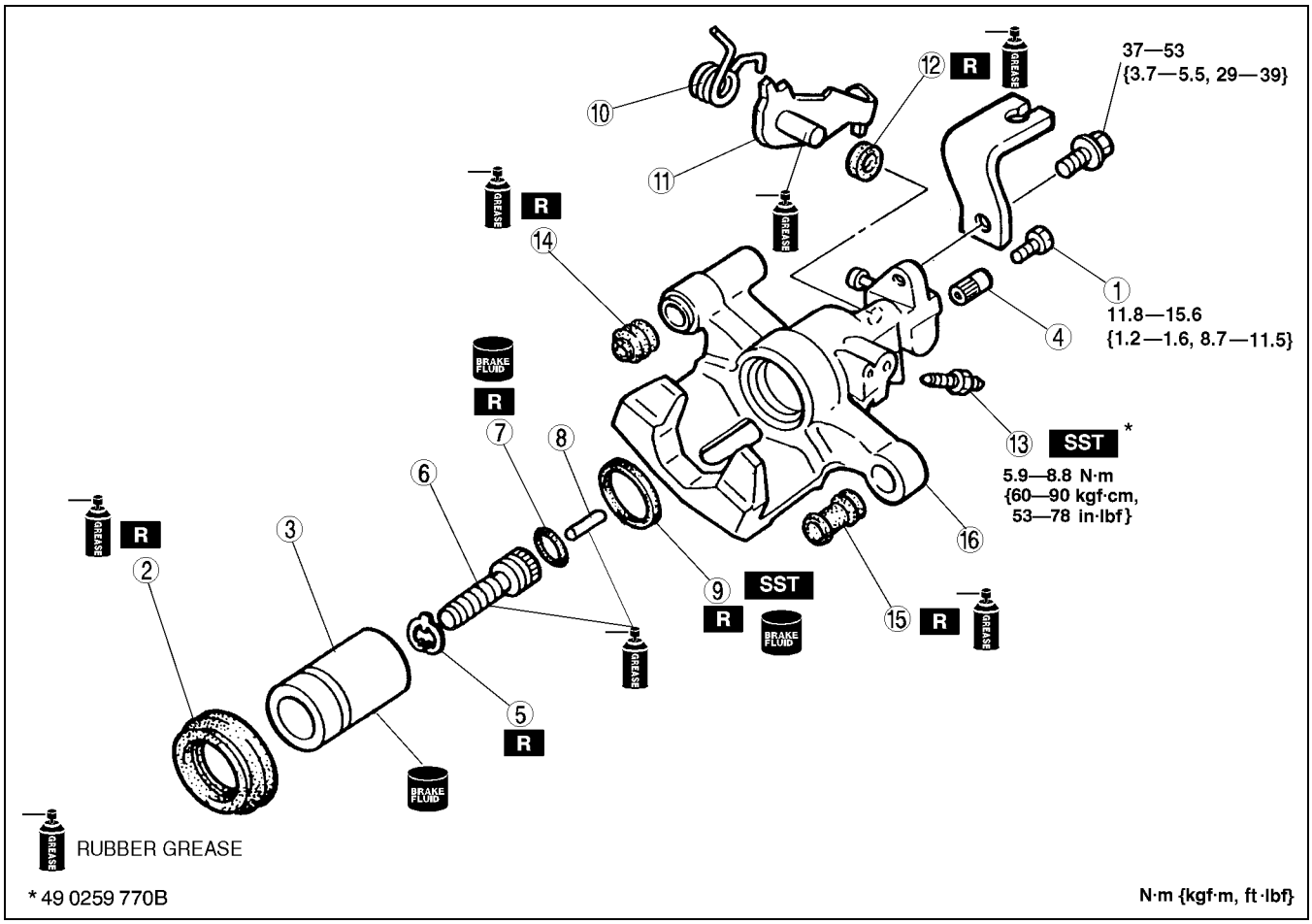
1	Parking brake cable, clip
2	Screw plug
3	Lock bolt

4	Disc pad (See 04–11–22 Disc Pad Installation Note)
5	Shim
6	Guide plate

CALIPER (REAR) DISASSEMBLY/ASSEMBLY

A3U041126990W01

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



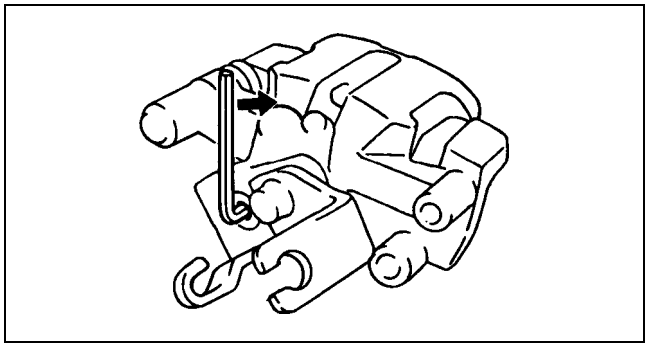
Z3U0411W010

1	Screw plug
2	Dust seal
3	Piston (See 04–11–24 Piston Disassembly Note) (See 04–11–25 Piston Assembly Note)
4	Manual adjustment gear
5	Snap ring
6	Adjusting bolt
7	O-ring
8	Connecting link

9	Piston seal (See 04–11–20 Piston Seal Disassembly Note)
10	Spring
11	Operating lever
12	Boot
13	Bleeder screw
14	Boot
15	Boot
16	Caliper body

Piston Disassembly Note

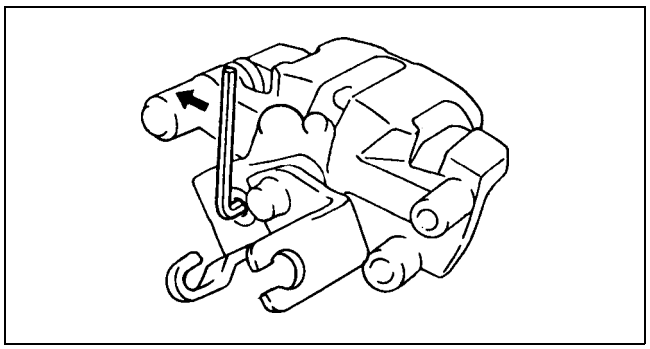
- Turn the adjustment gear clockwise with an Allen wrench to remove the piston from the adjustment gear. (Turn the adjustment gear until it becomes easy to turn.)



W6U411WBC

Piston Assembly Note

- Insert the piston into the caliper and turn the adjustment gear counterclockwise with an Allen wrench to pull the piston inward. (Turn until it stops.)



W6U411WBD

REAR BRAKE (DRUM) INSPECTION

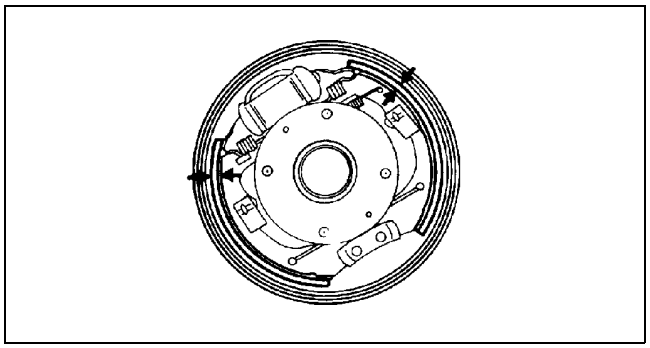
A3U041126250W01

Brake Lining Thickness Inspection

1. Remove the brake drum.
2. Inspect the remaining thickness of the lining.

   Thickness
   1.0 mm {0.039 in} min.

3. Replace both left and right brake shoes if either is at or less than the minimum thickness.



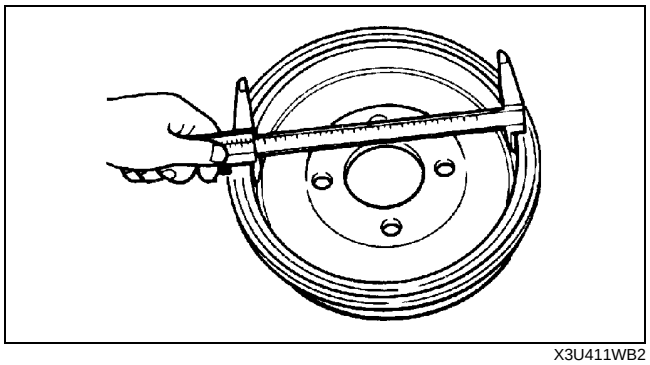
X3U411WB1

Brake Drum Inspection

1. Measure the inner diameter of the drum.

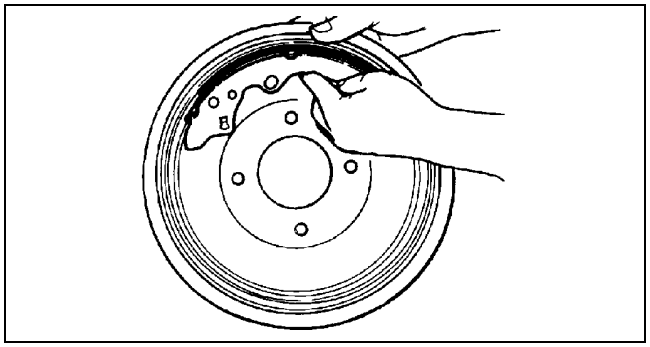
   Maximum diameter
   201.5 mm {7.933 in}

2. Inspect for scratches and uneven or abnormal wear inside the drum.
3. Repair or replace the drum if necessary.



X3U411WB2

4. When repairing or replacing the drum, inspect the contact with the shoes.

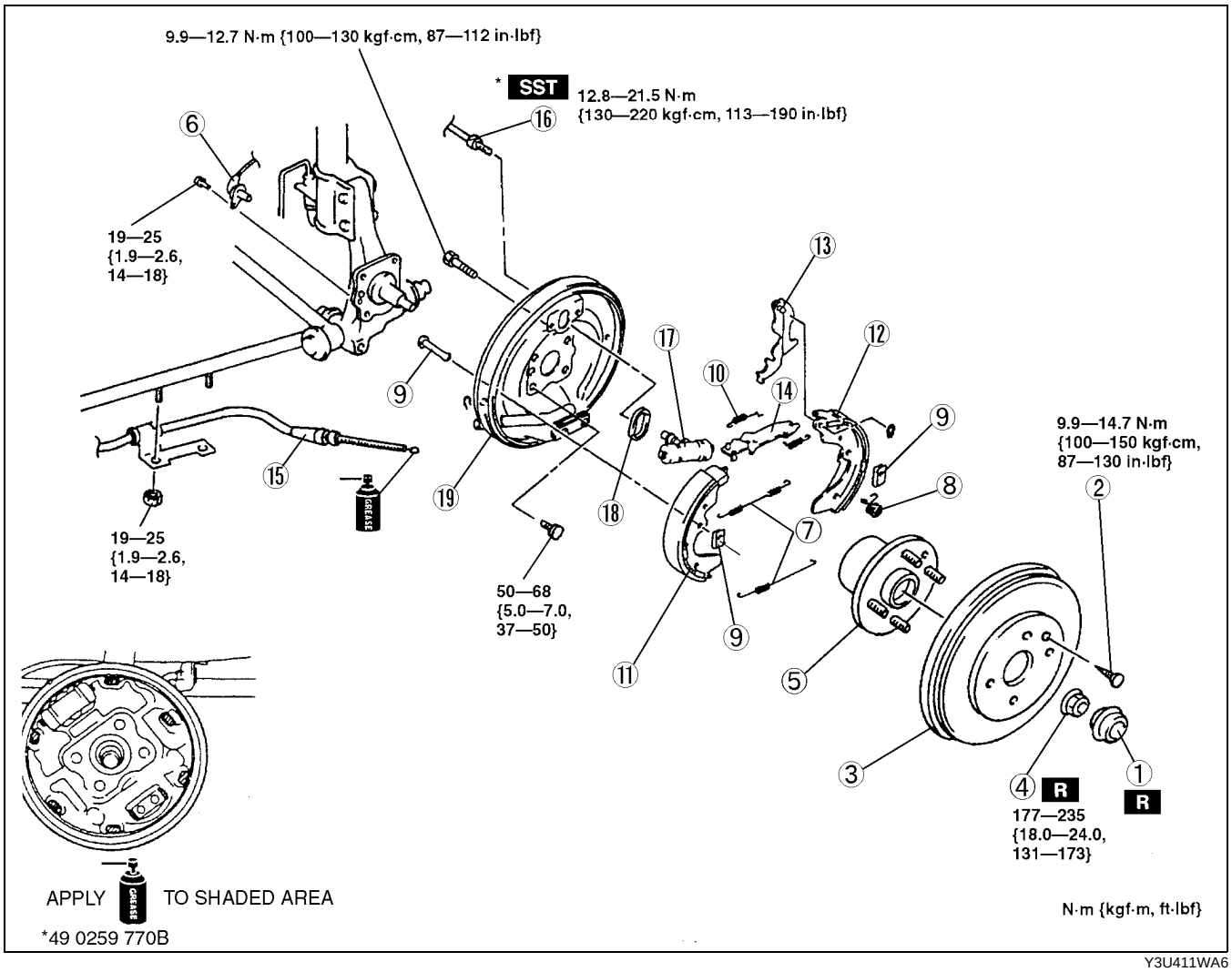


X3U411WB3

REAR BRAKE (DRUM) REMOVAL/INSTALLATION

A3U041126250W02

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.
3. Perform the following.
   (1) Depress the brake pedal a few times. Then verify that the brakes do not drag.
   (2) Inspect the pedal-to-floor clearance.
   (3) Inspect the parking brake lever stroke.



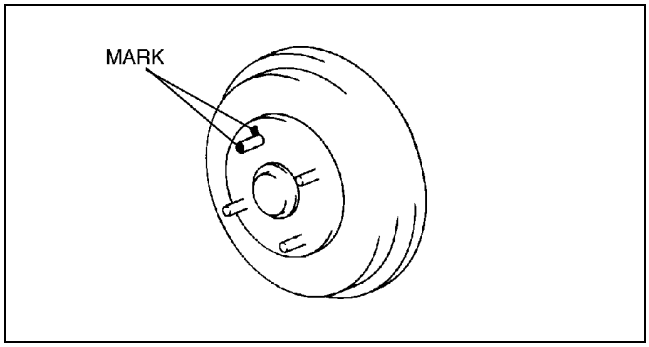
Y3U411WA6

1	Hub cap
2	Screw
3	Brake drum (See 04–11–27 Brake Drum Removal Note) (See 04–11–27 Brake Drum Installation Note)
4	Locknut (See 03–11–4 Locknut Removal Note) (See 03–11–7 Locknut Installation Note)
5	Wheel hub
6	ABS wheel-speed sensor (if equipped)
7	Return spring
8	Lever spring

9	Hold pin and hold spring
10	Anti-rattle spring
11	Leading shoe
12	Trailing shoe
13	Operating lever
14	Adjuster
15	Parking brake cable
16	Brake pipe
17	Wheel cylinder
18	O-ring
19	Backing plate

Brake Drum Removal Note

1. Mark the wheel hub bolt and brake drum before removal for reference during installation.



X3U411WB5

Brake Drum Installation Note

1. Remove any rust or grime on the contact face of the drum brake.
2. Install the brake drum and align the marks made before removal.

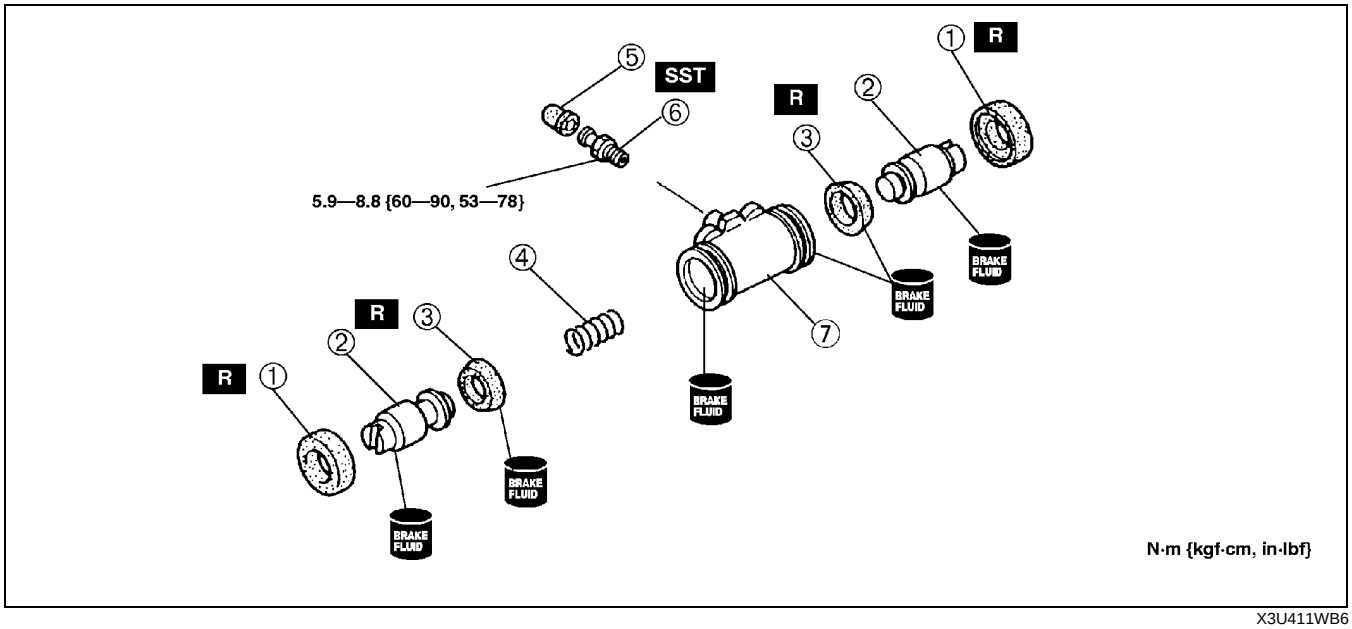
WHEEL CYLINDER DISASSEMBLY/ASSEMBLY

A3U041126610W01

Caution

- **Replace the wheel cylinder component if a problem is found.**

1. Disassemble in the order indicated in the table.
2. Assemble in the reverse order of disassembly.



X3U411WB6

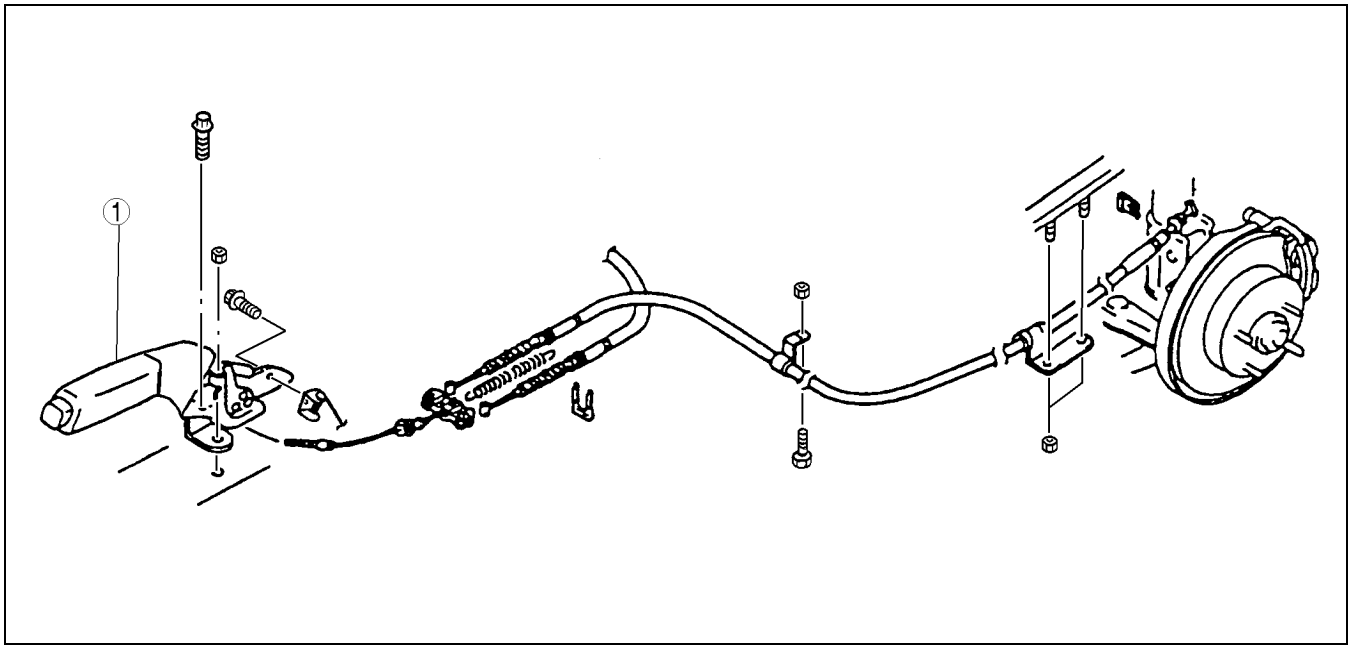
1	Boot
2	Wheel cylinder piston
3	Piston cup
4	Wheel cylinder spring

5	Bleeder cap
6	Bleeder screw (See 04–11–21 Bleeder Screw Assembly Note)
7	Wheel cylinder body

04–12 PARKING BRAKE SYSTEM

PARKING BRAKE SYSTEM LOCATION INDEX

A3U041244000W01



A3U0412W001

1	Parking brake (See 04–12–1 PARKING BRAKE (LEVER TYPE) INSPECTION) (See 04–12–1 PARKING BRAKE (LEVER TYPE) ADJUSTMENT) (See 04–12–2 PARKING BRAKE (LEVER TYPE) REMOVAL/INSTALLATION)

PARKING BRAKE (LEVER TYPE) INSPECTION

A3U041244000W02

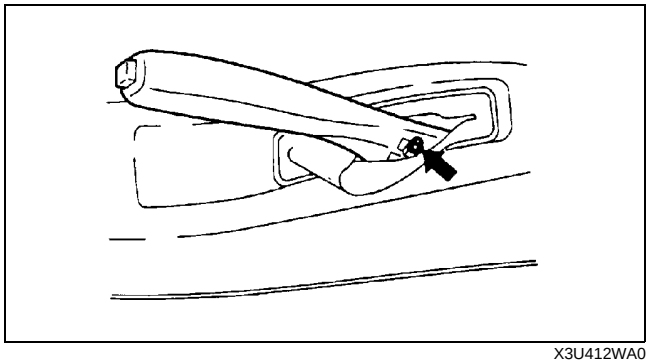
1. Pull the parking brake lever a few times.
2. Depress the brake pedal a few times.
3. Inspect the parking brake stroke by pulling the parking brake lever with a force of **98 N {10 kgf, 22 lbf}**.

Stroke
5—7 notches

PARKING BRAKE (LEVER TYPE) ADJUSTMENT

A3U041244000W03

1. Start the engine and depress the brake pedal several times.
2. Stop the engine.
3. Turn the adjusting nut at the front of the parking cable.
4. After adjustment, inspect the following points:
   (1) Turn the ignition switch to ON, pull the parking brake lever one notch, and verify that the parking brake warning light illuminates.
   (2) Verify that the rear brakes do not drag.

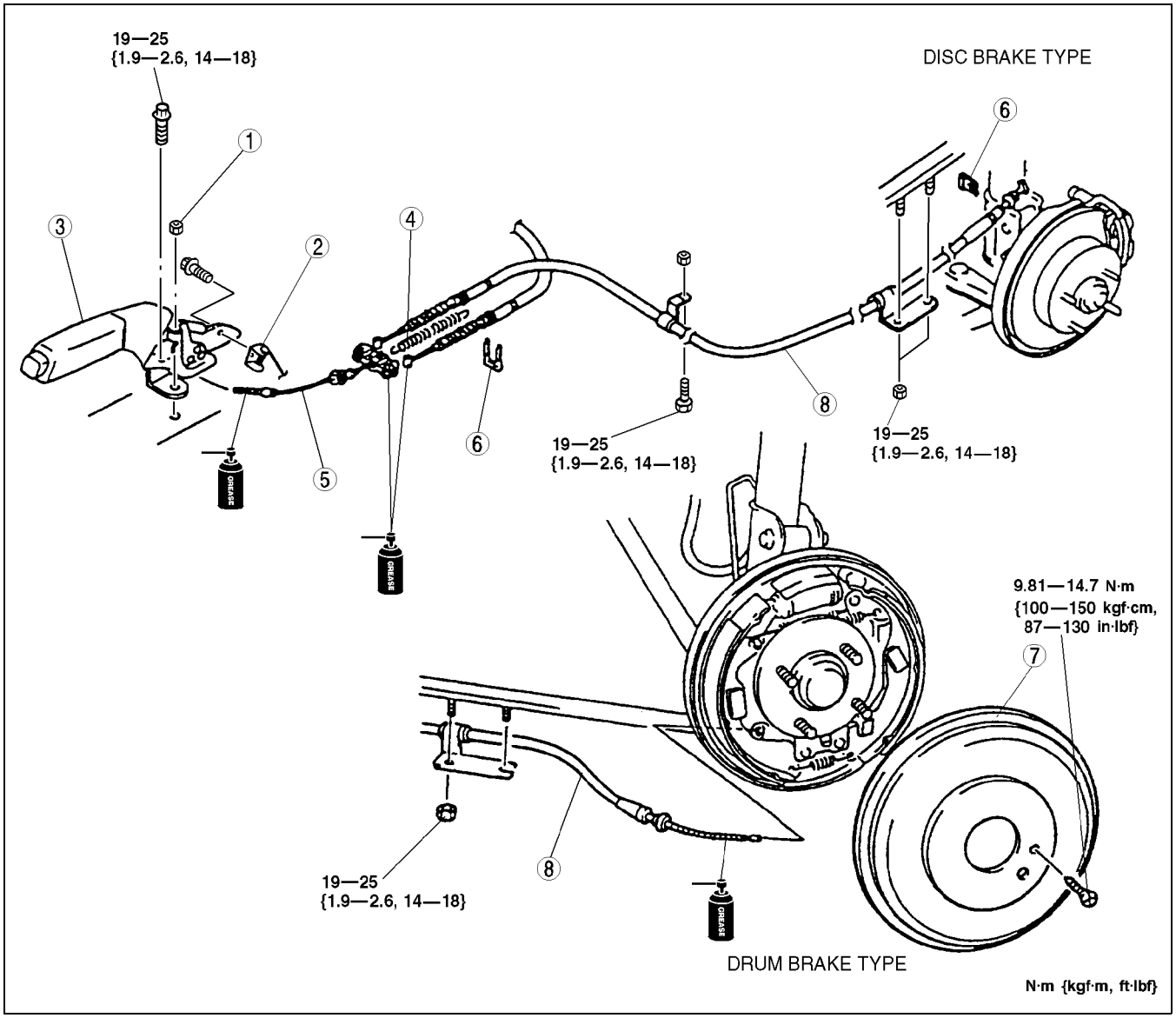


X3U412WA0

PARKING BRAKE (LEVER TYPE) REMOVAL/INSTALLATION

A3U041244000W04

1. Remove the rear console. (See 09–17–5 CONSOLE REMOVAL/INSTALLATION.)
2. Remove the exhaust pipe insulator bolts.
3. Remove in the order indicated in the table.
4. Install in the reverse order of removal.
5. Adjust the parking brake stroke. (See 04–12–1 PARKING BRAKE (LEVER TYPE) ADJUSTMENT.)



A3U0412W002

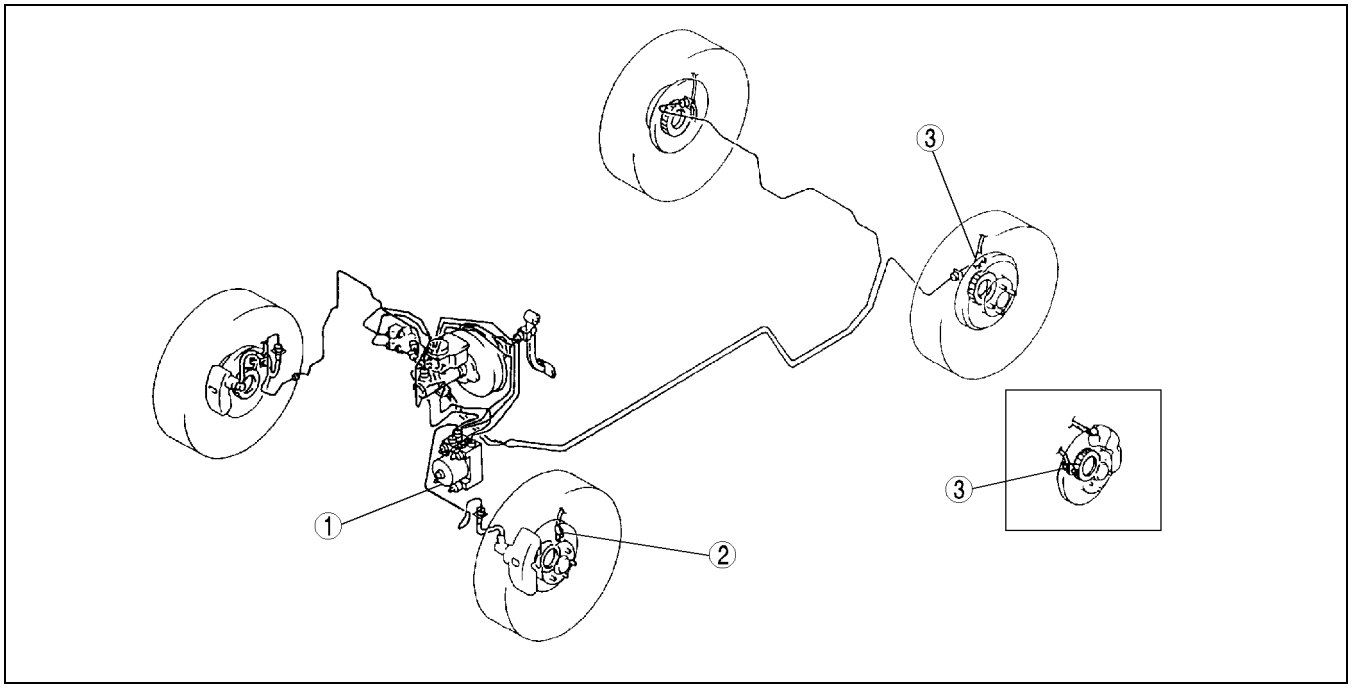
1	Adjusting nut
2	Parking brake switch
3	Parking brake lever
4	Return spring

5	Front cable and equalizer
6	Clip
7	Brake drum
8	Parking brake cable

04–13 ANTILOCK BRAKE SYSTEM

ABS LOCATION INDEX

A3U041343000W01



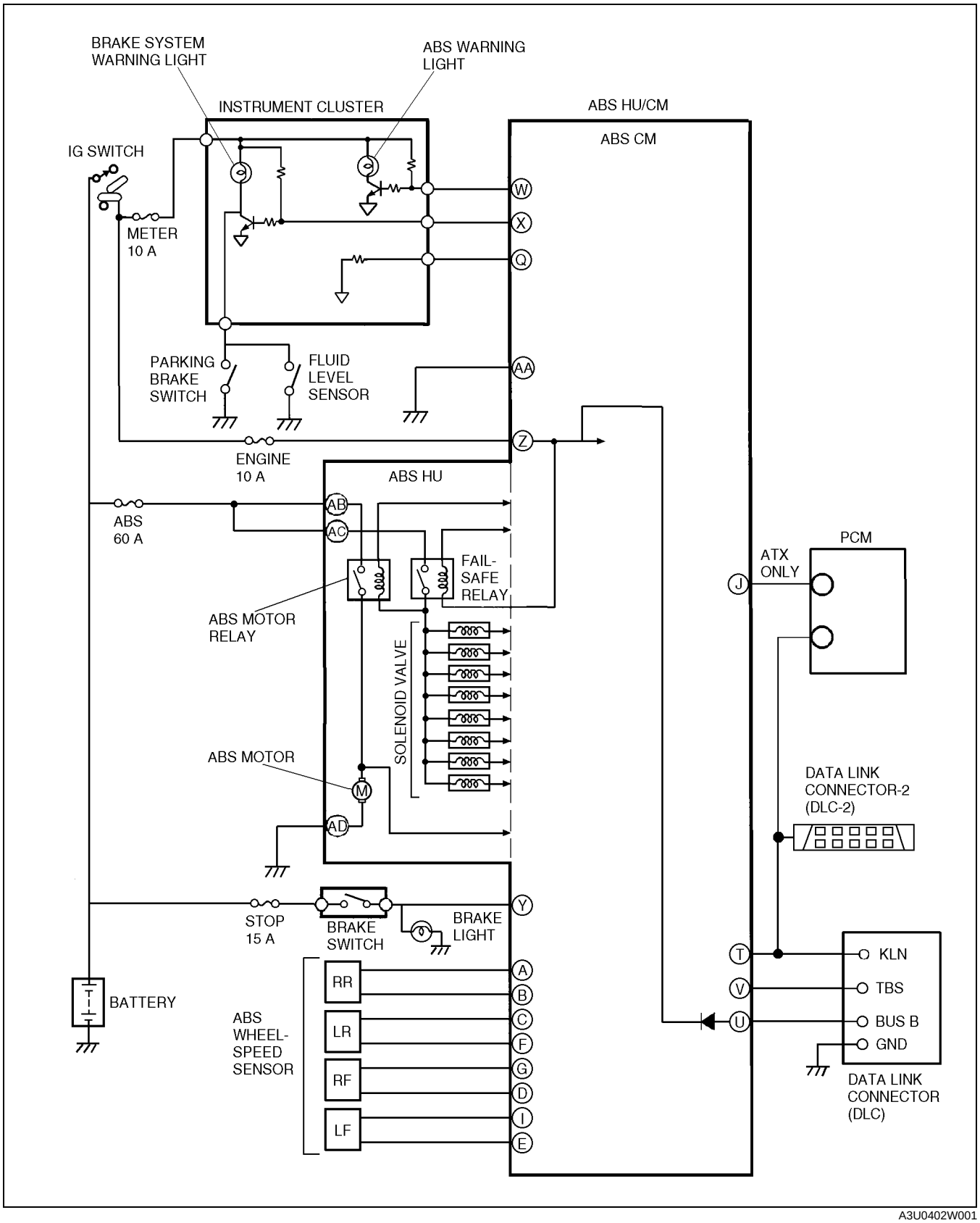
Z3U0413W101

1	ABS HU/CM (See 04–13–3 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) SYSTEM INSPECTION) (See 04–13–5 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) REMOVAL/ INSTALLATION) (See 04–13–6 ABS HYDRAULIC UNIT (HU)/ CONTROL MODULE (CM) INSPECTION)

2	ABS wheel-speed sensor (front) (See 04–13–9 FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION) (See 04–13–9 FRONT/REAR ABS WHEEL-SPEED SENSOR INSPECTION)
3	ABS wheel-speed sensor (rear) (See 04–13–10 REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION) (See 04–13–9 FRONT/REAR ABS WHEEL-SPEED SENSOR INSPECTION)

ABS SYSTEM DIAGRAM

A3U041343000W02



A3U0402W001

ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) SYSTEM INSPECTION

A3U041343780W01

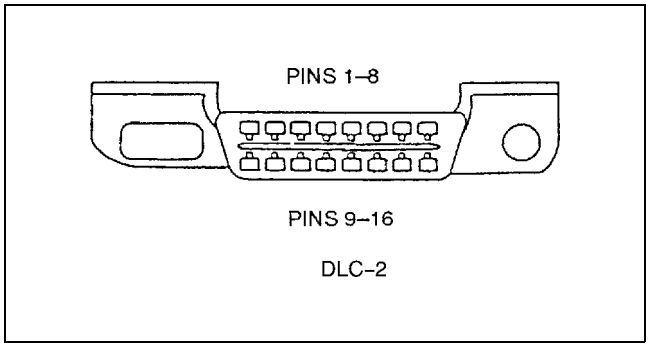
System Inspection

Preparation

1. Verify that the battery is fully charged. With the ignition switch on, verify that the ABS and BRAKE system warning lights goes out after **3 seconds**.
2. If the lights stays on after **3 seconds**, the ABS HU/CM detects a failure. Follow the troubleshooting procedures.
3. Turn the ignition switch off.
4. On level ground, jack up the vehicle and support it evenly on safety stands. Shift the transaxle to N position.
5. Release the parking brake.
6. Rotate the wheels by hand, and inspect for brake drag.

Using the SSTs

1. Perform the “Preparation.”
2. Connect the **SSTs** (WDS or equivalent) to the data link connector-2 (DLC-2).
3. Set up an active command mode inspection according to the combination of commands below. (See 04–02–3 ABS ON-BOARD DIAGNOSTIC.)



X3U101WA1

OPERATION	COMMAND NAME				COMMAND TYPE
	PMP_MOTOR	RF_OUTLET	RF_INLET	ABS_POWER	
Pressure retention	OFF	OFF	ON	ON	Manual
Pressure reduction	ON	ON	ON	ON	

The chart above shows an example of a right wheel inspection.

Note

- When working with two people, one should press on the brake pedal, the other should attempt to rotate the wheel being inspected.

4. Send the command while pressing on the brake pedal and attempting to rotate the wheel being inspected.
5. When pressure is being maintained, and click sound indicating the solenoid is operating comes from the ABS HU/CM, confirm that the wheel does not rotate. When pressure is being reduced, and click sound indicating the solenoid is operating comes from the ABS HU/CM, confirm that the wheel rotates, even though the brake pedal is being depressed.

Note

- To protect the ABS HU/CM, the solenoid valve used for simulations and the ABS motor stay on for **10 seconds** each time they are switched on.
- Performing the inspections above determines the following.
  - — The ABS HU/CM brake lines are normal.
  - — The ABS HU/CM hydraulic system is not significantly abnormal.
  - — The ABS HU/CM wiring is normal.
- However, the following items cannot be checked.
  - — ABS HU/CM input system harness and parts
  - — Extremely small leaks in the ABS HU/CM internal hydraulic system
  - — Unusual intermittent occurrences in the above items

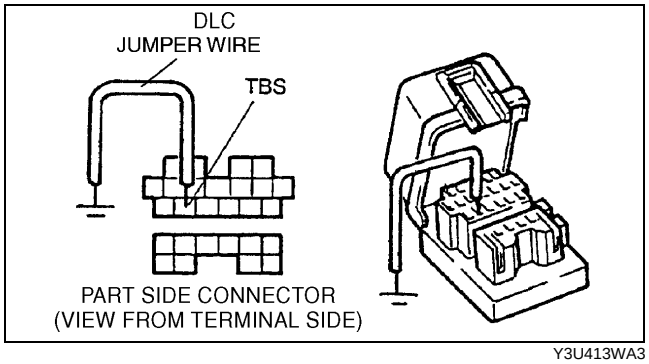
Without using the SSTs

1. Perform the “Preparation.”

Caution

- **Connecting the wrong data link connector (DLC) terminal may possibly cause a malfunction. Carefully connect the specified terminal only.**

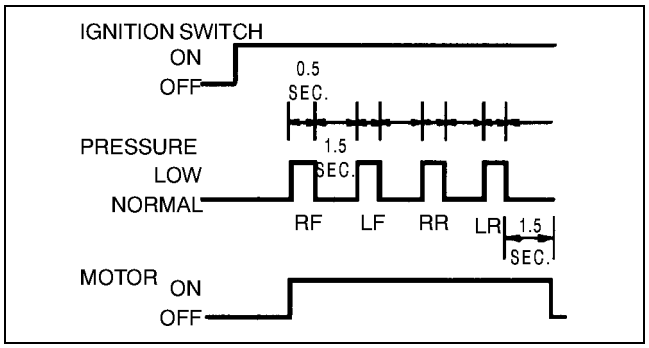
2. Use a jumper wire to short terminal TBS of the DLC to body GND.
3. Depress the brake pedal, and have an assistant verify that the right front wheel does not turn.
4. With the brake pedal still depressed, turn the ignition switch on and verify that the brake is released momentarily (**approx. 0.5 sec.**) and that the wheel turns when pressure-reduction operates.
5. Inspect the operation of the remaining wheels in order: right front, left front, right rear, left rear.
   - Replace the ABS HU/CM if wheels do not rotate.
   - Inspect brake piping to ABS HU/CM if operation of the remaining wheel order is not within specified.



Y3U413WA3

Note

- If Steps 4 and 5 show correct operation, the following systems are okay:
  - — Brake piping to ABS HU/CM
  - — Braking system, including ABS HU/CM
  - — Electrical system in ABS HU/CM (solenoid, ABS motor, etc.)
- The following are not inspected with above steps:
  - — Input system and harness of ABS HU/CM
  - — Intermittent failure
  - — Fluid leakage from brake including the ABS HU/CM and master cylinder



YMU413WA7

6. Turn the ignition switch off and remove the jumper wire.

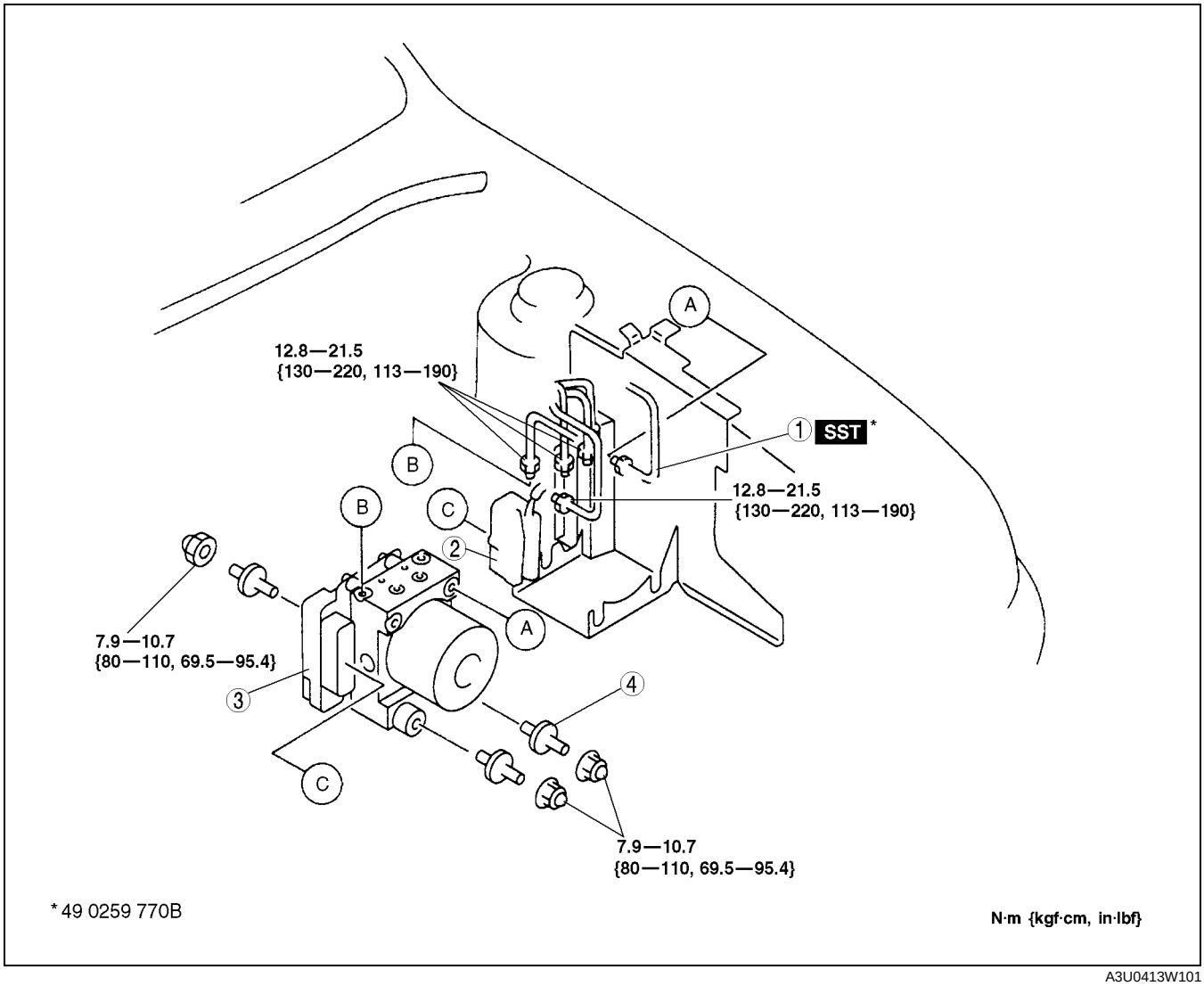
ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) REMOVAL/INSTALLATION

A3U041343700W01

Caution

- **Do not drop the ABS hydraulic unit (HU) /control module (CM). Replace it if it is subjected to an impact.**

1. Remove the battery and battery tray.
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



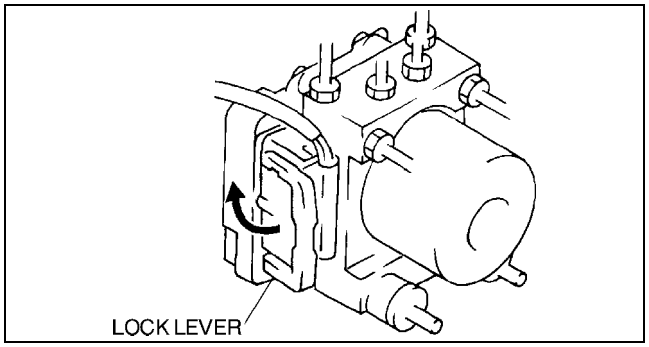
A3U0413W101

1	Brake pipe
2	Connector (See 04–13–6 Connector Removal Note) (See 04–13–6 Connector Installation Note

3	ABS HU/CM (See 04–13–6 ABS HU/CM Removal/Installation Note)
4	stud

Connector Removal Note

1. Pull the lock lever up and make it unlock.
2. Remove the connector.



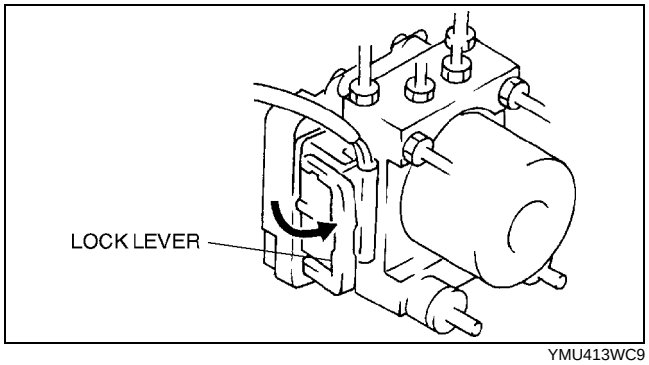
YMU413WC8

ABS HU/CM Removal/Installation Note

1. When removing/installing the ABS HU/CM from/to the vehicle, attach a strip of protective tape on the ABS HU/CM connector to prevent brake fluid from entering.

Connector Installation Note

1. Verify that the lock lever of the harness connector is completely pulled up.

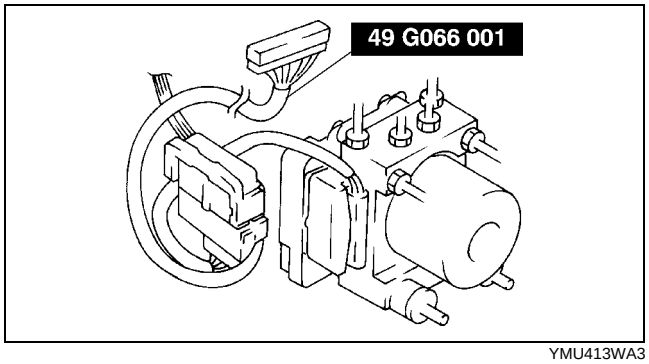


YMU413WC9

ABS HYDRAULIC UNIT (HU)/CONTROL MODULE (CM) INSPECTION

A3U041367650W01

1. Disconnect the negative battery cable.
2. Connect the **SST** between the ABS HU/CM and harness connector with the ignition switch off.
3. Attach the tester leads to the **SST** and inspect voltage referring the table below.

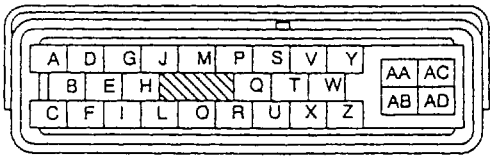


YMU413WA3

Terminal Voltage Table (Reference)

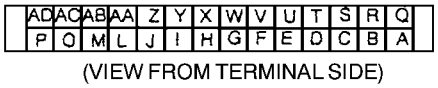
(Engine is idling, and connector is connected unless otherwise indicated)

ABS HU/CM



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

SST (49 G066 001) CONNECTOR



(VIEW FROM TERMINAL SIDE)

Y3U402WA8

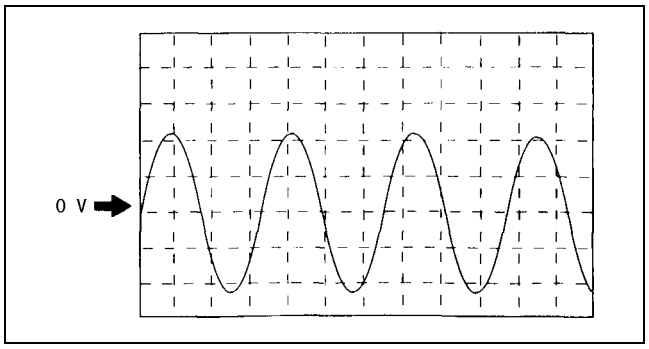
Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
A B	RR wheel-speed	RR wheel-speed sensor	Vehicle is stopped	0 (AC)	• Inspect related harness • Inspect ABS wheel-speed sensor
			• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))		
C F	LR wheel-speed	LR wheel-speed sensor	Vehicle is stopped	0 (AC)	
			• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))		
D G	RF wheel-speed	RF wheel-speed sensor	Vehicle is stopped	0 (AC)	
			• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))		
E I	LF wheel-speed	LF wheel-speed sensor	Vehicle is stopped	0 (AC)	
			• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))		
H	—	—	—	—	—
J*1	Vehicle speed output	PCM	Vehicle is stopped	0	• Inspect related harness • Inspect ABS wheel-speed sensor
			• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))		
L	—	—	—	—	—
M	—	—	—	—	—
O	—	—	—	—	—
P	—	—	—	—	—
Q	Vehicle speed output	Instrument cluster	Vehicle is stopped	0	• Inspect related harness • Inspect ABS wheel-speed sensor
			• Inspect by using the wave profile. (See 04–13–8 Inspection Using An Oscilloscope (Reference))		
R	—	—	—	—	—
S	—	—	—	—	—
T	On-board diagnosis	KLN terminal of DLC and DLC-2	—	No need to check	—
U*2	—	DLC	—	No need to check	—
V	On-board diagnosis	TBS terminal of DLC	—	10—14	• Inspect related harness
W	ABS warning light	ABS warning light	Illuminated	Below 0.5	• Inspect related harness
			Not illuminated	Above 1.5	
X	Brake system warning light	Brake system warning light	Illuminated	Below 0.5	• Inspect related harness
			Not illuminated	Above 1.5	
Y	Brake switch	Brake switch	Brake pedal is depressed	10—14	• Inspect related harness
			Brake pedal is released	Below 0.5	
Z	Power supply	Ignition switch	—	B+	• Inspect related harness
AA	Ground	Ground	—	0	• Inspect related harness
AB	Power supply (ABS motor)	Battery	—	B+	• Inspect related harness
AC	Power supply (Solenoid valve)	Battery	—	B+	
AD	Ground	Ground	—	0	• Inspect related harness

*1 : ATX only
*2 : Use this terminal at factory only, not used for inspection and repair at field

Inspection Using An Oscilloscope (Reference)
Wheel speed

- ABS HU/CM terminal:
  RR : A (+) — B (-)
  LR : C (+) — F (-)
  RF : D (+) — G (-)
  LF : E (+) — I (-)
- Oscilloscope setting:
  1 V/DIV (Y), 2 ms/DIV (X), AC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.
- If there is malfunctioning in the sensor rotor, wave profile warps.

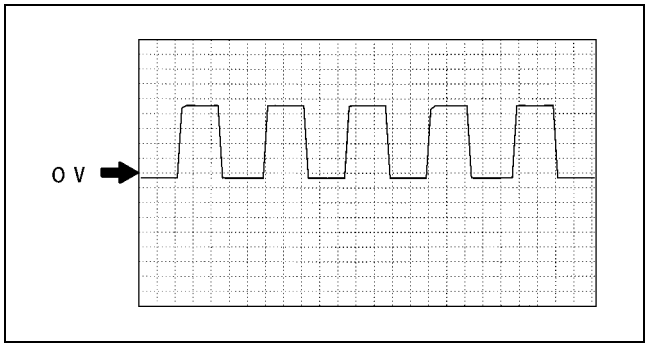


Z3U0413W201

Vehicle speed output (to PCM) (ATX only)

- ABS HU/CM terminal: J (+) — AA (-)
- Oscilloscope setting:
  1 V/DIV (Y), 5 ms/DIV (X), DC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.

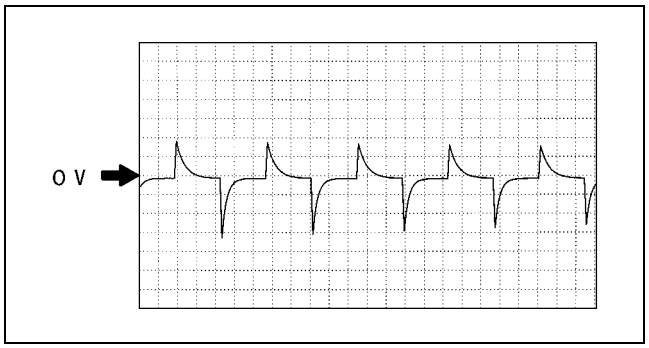


Z3U0413W202

Vehicle speed output (to instrument cluster)

- ABS HU/CM terminal: Q (+) — AA (-)
- Oscilloscope setting:
  1 V/DIV (Y), 5 ms/DIV (X), DC range
- Vehicle condition: Driving 30 km/h (18.6 mph)

Note
- As vehicle speed increases, period of wave shortens.

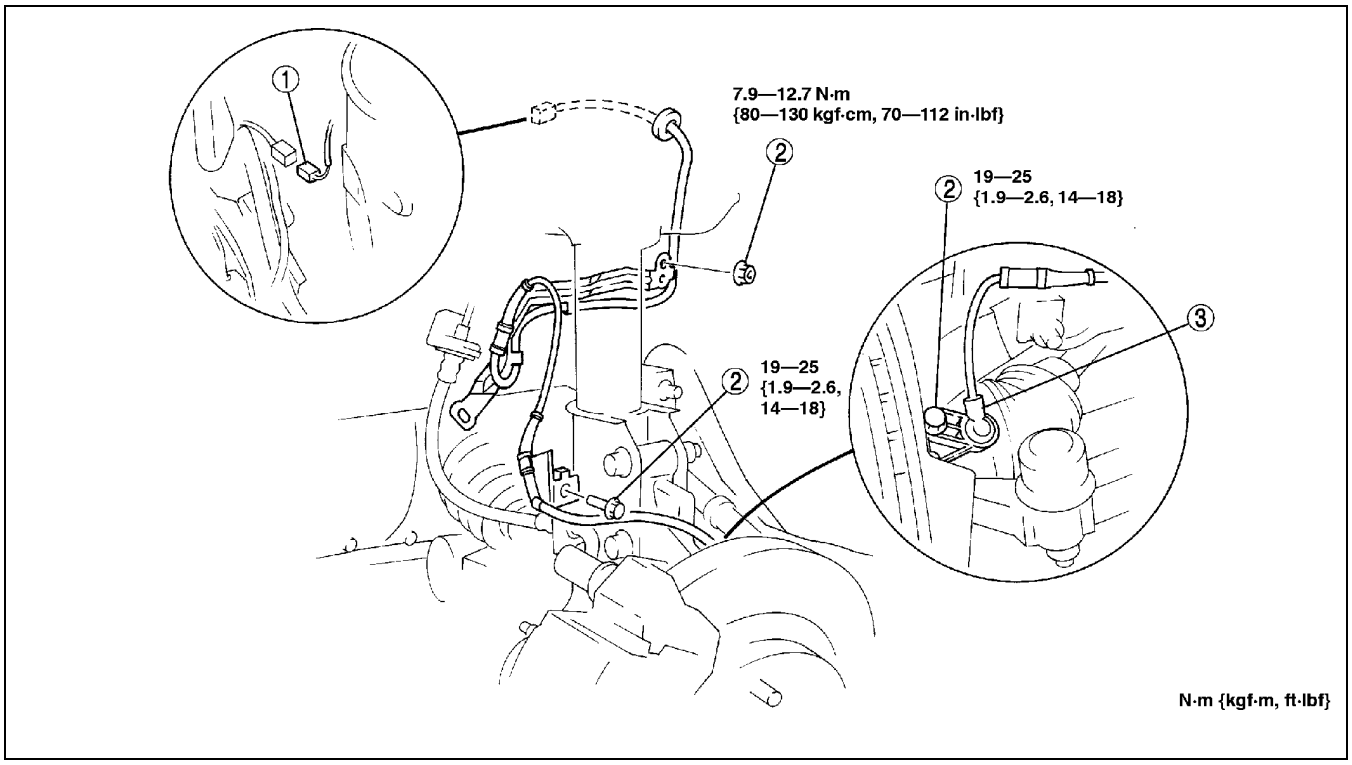


Z3U0413W203

FRONT ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION

A3U041343720W01

1. Remove in the order indicated in the table.
2. Install in the reverse order of removal.



X3U413WAB

1	Connector
2	Bolt, nut
3	Front ABS wheel-speed sensor

FRONT/REAR ABS WHEEL-SPEED SENSOR INSPECTION

A3U041343720W02

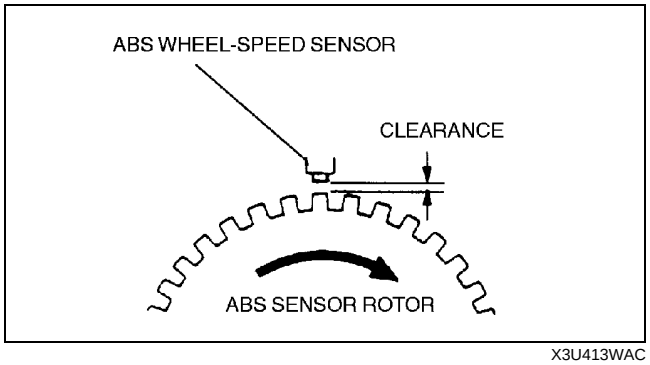
Visual Inspection

1. Remove the wheel and tire, and inspect the sensor for looseness and damage. Replace the sensor if necessary.

Clearance Inspection

1. Inspect the clearance between the wheel-speed sensor and the sensor rotor.

Clearance
0.3—1.1 mm {0.012—0.043 in}



X3U413WAC

Resistance Inspection

1. Disconnect the ABS wheel-speed sensor connector.
2. Inspect the resistance at the ABS wheel-speed sensor.
   - If not as specified, replace the ABS wheel-speed sensor.

Resistance
1.3—1.7 kilohm

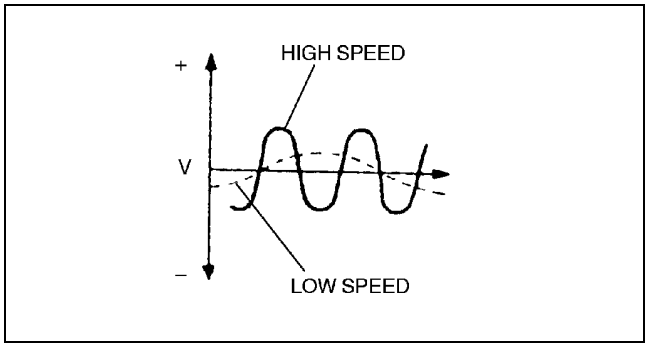
Voltage Inspection

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Inspect each sensor by rotating each wheel one revolution per second.
   - If not as specified, replace the ABS wheel-speed sensor.

Voltage
0.25—1.2 V (AC)

Voltage Pattern Inspection

1. On level ground, jack up the vehicle and support it evenly on safety stands.
2. Disconnect the ABS wheel-speed sensor connector.
3. Using an oscilloscope, inspect voltage pattern for distortion and noise by rotating each wheel.
   - If there is distortion or noise, inspect the ABS sensor rotor.

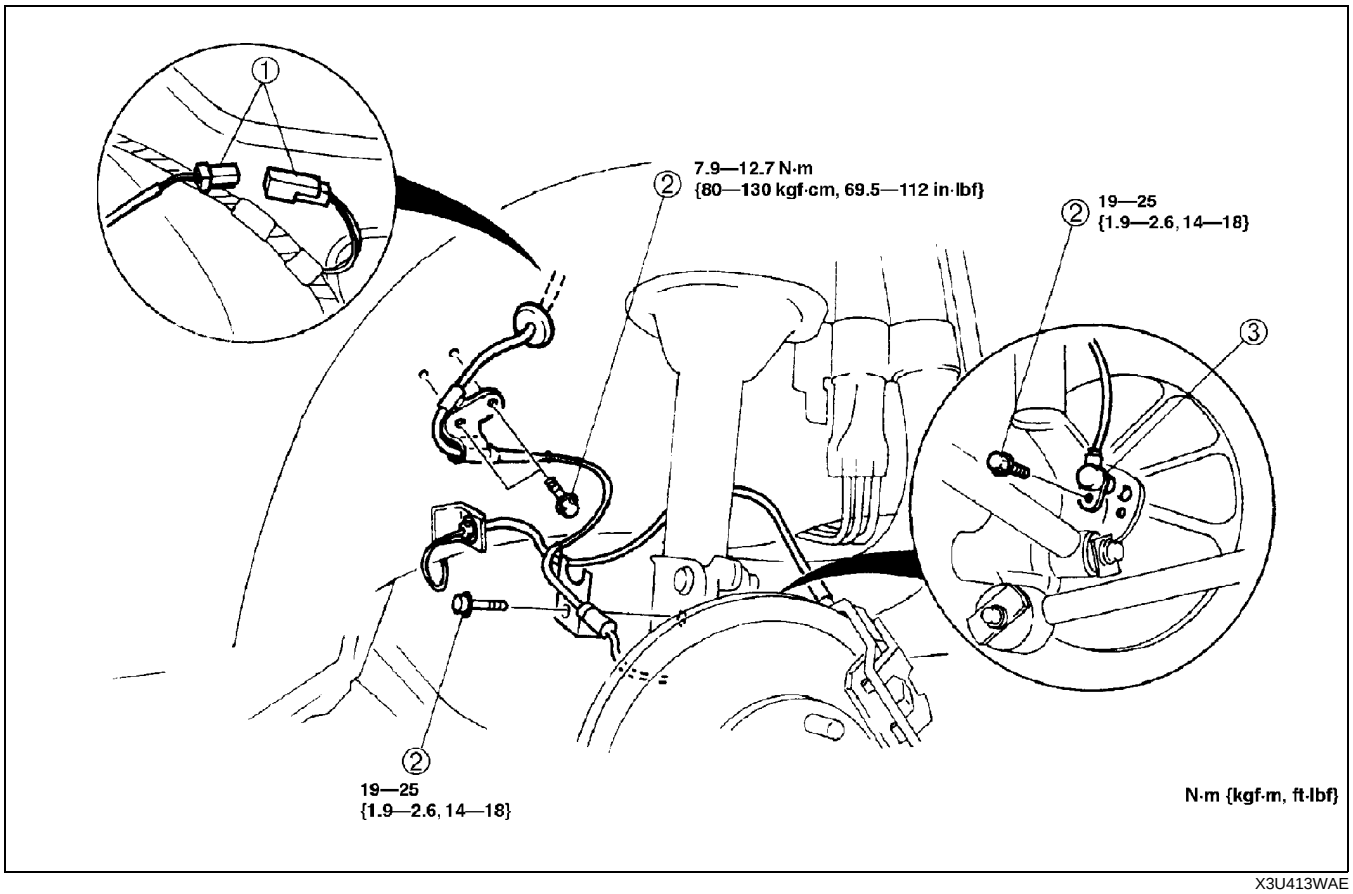


X3U413WAD

REAR ABS WHEEL-SPEED SENSOR REMOVAL/INSTALLATION

A3U041343710W01

1. For 4SD, remove the rear seat back. (See 09–13–5 REAR SEAT REMOVAL/INSTALLATION.)
   For 5HB, remove the trunk side trim. (See 09–17–15 5HB.)
2. Remove in the order indicated in the table.
3. Install in the reverse order of removal.



X3U413WAE

1	Connector
2	Bolt

3	Rear ABS wheel-speed sensor

04–50 TECHNICAL DATA

BRAKES TECHNICAL DATA

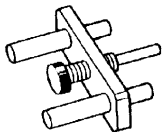
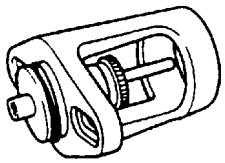
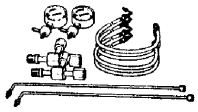
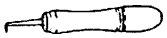
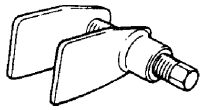
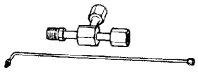
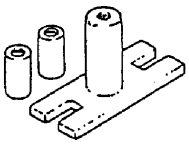
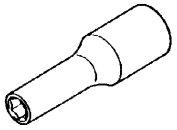
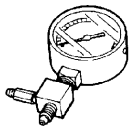
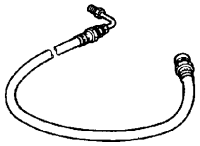
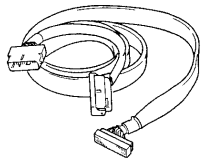
A3U045001020W01

Item			ZM engine	FS engine
CONVENTIONAL BRAKE SYSTEM				
Brake pedal	Brake pedal height (mm {in})		185 {7.28} (reference value)	
	Brake pedal play (mm {in})		4—12 {0.16—0.47}	
	Pedal-to-floor clearance (Brake pedal when depressed at 588 N {60 kgf, 132 lbf}) (mm {in})		88 {3.5} min.	84 {3.3} min.
Power brake unit	Fluid pressure (kPa {kgf/cm^2, psi})	At 0 kPa {0 mmHg, 0 inHg}	650 {7, 94} min.	600 {6, 87} min.
		At 66.7 kPa {500 mmHg, 19.7 inHg}	6,500 {66, 943} min.	7,200 {73, 1,044} min.
Dual proportioning valve (without ABS)	Switching point (kPa {kgf/cm^2, psi})		2,900 {30, 430} ±200 {2, 30}	3,400 {35, 500} ±300 {3, 40}
	Rear wheel pressure when master cylinder pressure is 5900 kPa {60 kgf/cm^2, 850 psi} (kPa {kgf/cm^2, psi})		3,800 {39, 550} ±300 {3, 40}	4,200 {42.5, 600} ±400 {4, 60}
Front disc brake	Minimum disc pad thickness (mm {in})		1.5 {0.059}	2.0 {0.079}
	Minimum disc plate thickness (mm {in})		20 {0.78}	22 {0.87}
	Disc plate runout limit (mm {in})		0.05 {0.002}	
Rear disc brake	Minimum disc pad thickness (mm {in})		—	1.0 {0.039}
	Minimum disc plate thickness (mm {in})			8 {0.31}
	Disc plate runout limit (mm {in})			0.05 {0.002}
Rear drum brake	Maximum brake drum diameter (mm {in})		201.5 {7.933}	—
	Minimum lining thickness (mm {in})		1.0 {0.039}	
	Clearance between shoe and drum		Automatic adjuster	
Brake fluid	Type		SAE J1703 or FMVSS 116 DOT3	
PARKING BRAKE SYSTEM				
Parking brake lever	Lever stroke when pulled at 98 N {10 kgf, 22 lbf} (notches)		5—7	

04–60 SERVICE TOOLS

BRAKES SST

A3U046001020W01

49 0259 770B Flare nut wrench 	49 F043 001 Adjust gauge 	49 B043 001 Adjust gauge 
49 U043 0A0A Oil pressure gauge set 	49 0208 701A Boot air-out tool 	49 0221 600C Disc brake expand tool 
49 U043 005 Joint (Part of 49 U043 0A0A) 	49 E043 003A Turning lock tool 	49 B043 004 Socket wrench 
49 U043 004 Oil pressure gauge (Part of 49 U043 0A0A) 	49 U043 006 Hose (Part of 49 U043 0A0A) 	49 G066 001 Adapter harness 
418FS475 WDS 	—	—