

GROUP 23Aa

AUTOMATIC TRANSAXLE

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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING

- *Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).*
- *Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.*
- *MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.*

NOTE

The SRS includes the following components: SRS air bag control unit, SRS warning light, front impact sensors, air bag module, clock spring, and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

GENERAL DESCRIPTION

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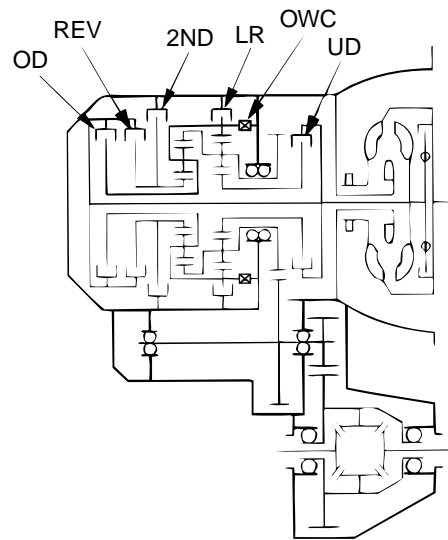
The A/T come in one model, namely, F4A42.

ITEM		SPECIFICATION
Transaxle model		F4A42
Engine model		4G94 (2.0L Engine)
Torque converter	Type	3-element, 1-stage, 2-phase
	Torque converter clutch	Provided (3rd to 4th)
	Stall torque ratio	2.0
Transaxle type		4-speed forward, 1-speed reverse fully automatic
Gear ratio	1st	2.842
	2nd	1.495
	3rd	1.000
	4th	0.731
	Reverse	2.720
Final gear ratio (Differential gear ratio)		3.735
Number of underdrive clutch discs		4
Number of overdrive clutch discs		4
Number of reverse clutch discs		2
Number of low-reverse brake discs		5
Number of second brake discs		3
Manual control type		P-R-N-D-3-2-L (7 positions)
Shift pattern control		Electronic control (INVECS-II)
Oil pressure control during shifting		Electronic control (each oil pressure independently controlled)
Torque converter clutch control		Electronic control
Speedometer gear ratio		29/36

TRANSAXLE

The transaxle is made up of the torque converter and gear train. A 3-element, 1-step, 2-phase torque converter with built-in torque converter clutch is used. The gear train is made up of three sets of multi-plate clutches, two sets of multi-plate brakes, one set of one-way clutches and two sets of planetary gears. The planetary gears are made up of sun gears, carriers, pinion gears and annulus gears.

TRANSAXLE CONFIGURATION DRAWING



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COMPONENTS AND FUNCTIONS

COMPONENT		FUNCTION
Underdrive clutch	UD	connects the input shaft to the underdrive sun gear.
Reverse clutch	REV	connects the input shaft to the reverse sun gear.
Overdrive clutch	OD	connects the input shaft to the overdrive planetary carrier.
Low-reverse brake	LR	holds the low-reverse annulus gear and the overdrive planetary carrier.
Second brake	2ND	holds the reverse sun gear.
One-way clutch	OWC	restricts the rotation direction of the low-reverse annulus gear.

FUNCTION ELEMENT TABLE

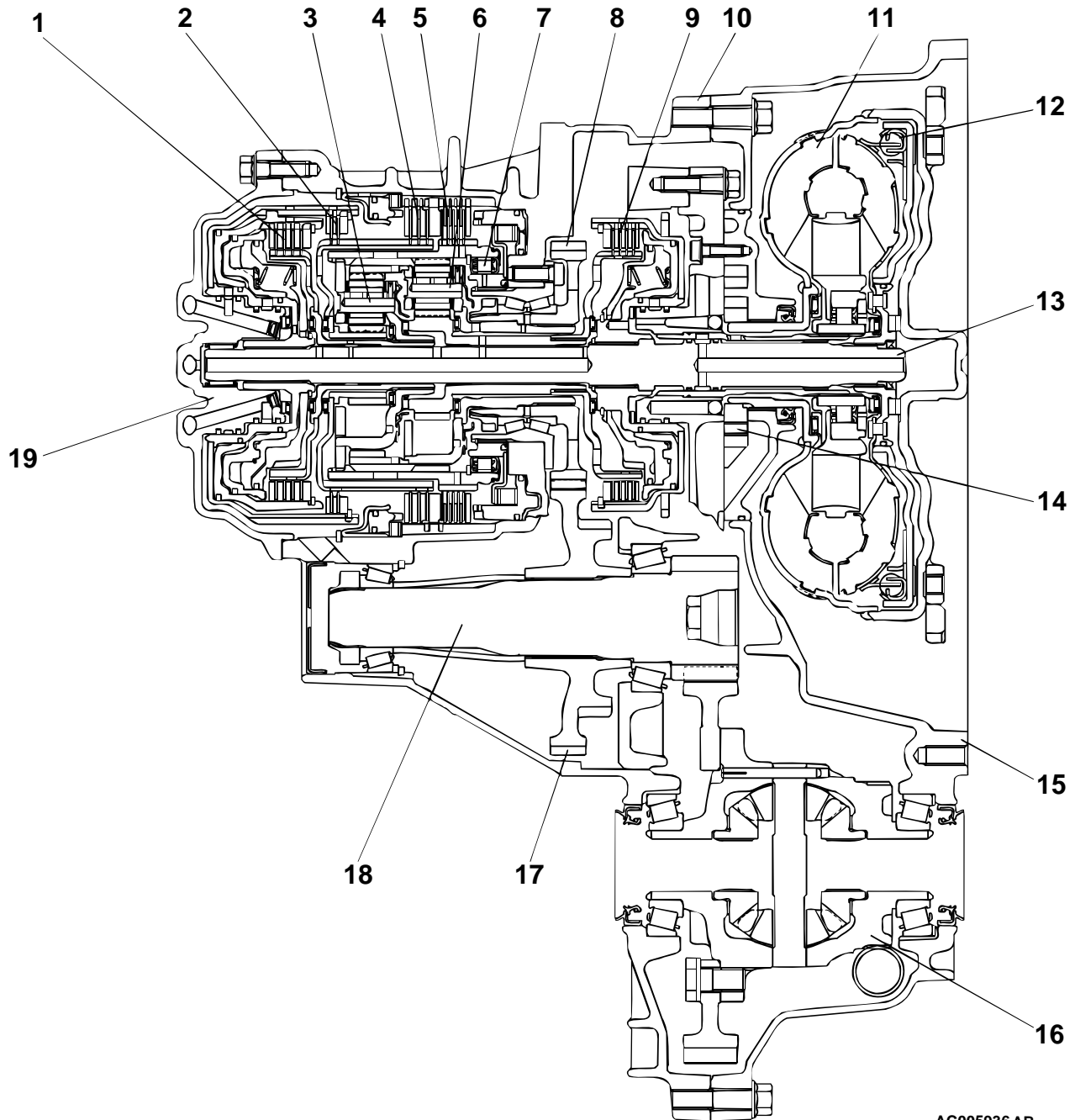
OPERATING ELEMENT SELECTOR LEVER POSITION		ENGINE START	PARKING MECHANISM	UNDERDRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)
P	Parking	OK	×	—	—	—	×	—
R	Reverse	—	—	—	×	—	×	—
N	Neutral	OK	—	—	—	—	×	—
D	1st	—	—	×	—	—	×	—
	2nd	—	—	×	—	—	—	×
	3rd	—	—	×	—	×	—	—
	4th	—	—	—	—	×	—	×
3	1st	—	—	×	—	—	×	—
	2nd	—	—	×	—	—	—	×
	3rd	—	—	×	—	×	—	—

OPERATING ELEMENT		ENGINE START	PARKING MECHANISM	UNDERDRIV E CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW- REVERSE BRAKE (LR)	SECOND BRAKE (2ND)
SELECTOR LEVER POSITION								
2	1st	—	—	×	—	—	×	—
	2nd	—	—	×	—	—	—	×
L	1st	—	—	×	—	—	×	—

×: Function element

NOTE: * operates only when the vehicle is stationary [at approximately 10 km/h (6.2 mph) or less].

SECTIONAL VIEW



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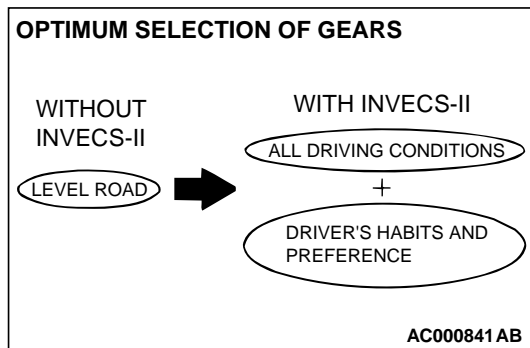
1. OVERDRIVE CLUTCH
2. REVERSE CLUTCH
3. OVERDRIVE PLANETARY CARRIER
4. SECOND BRAKE
5. LOW-REVERSE BRAKE
6. OUTPUT PLANETARY CARRIER
7. ONE-WAY CLUTCH
8. TRANSFER DRIVE GEAR
9. UNDERDRIVE CLUTCH
10. TRANSAXLE CASE

11. TORQUE CONVERTER
12. TORQUE CONVERTER CLUTCH
13. INPUT SHAFT
14. OIL PUMP
15. TORQUE CONVERTER HOUSING
16. DIFFERENTIAL
17. TRANSFER DRIVEN GEAR
18. OUTPUT SHAFT
19. REAR COVER

ELECTRONICALLY-CONTROLLED SYSTEM

INVECS-II

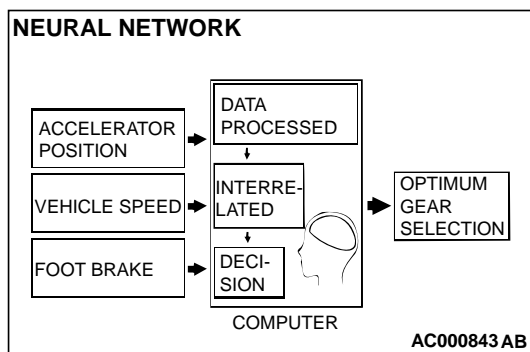
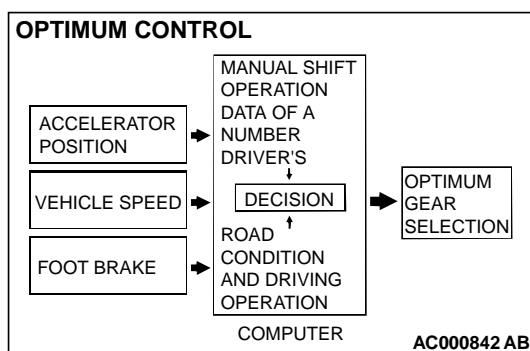
- When in drive ("D" range), the new automatic transaxle employs an innovative shift schedule to provide a high level of comfort and "easy driving style" that matches all driving conditions as well as the driver's driving style.
- INVECS-II features "Optimum Shift Control," which provides shift timing the average driver perceives to be the optimum timing under any road conditions. "Adaptive Shift Control" adjusts shift timing to match the driving habits and preferences of individual drivers.



FEATURES

OPTIMUM SHIFT CONTROL

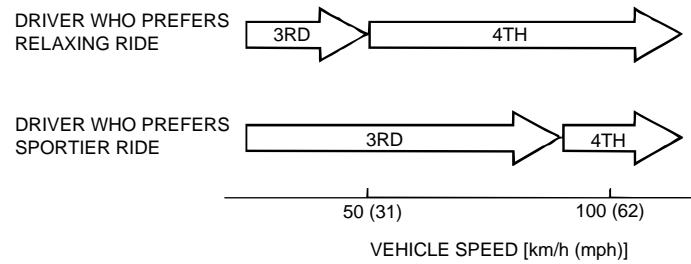
1. The shift patterns found satisfying by the typical driver for all ranges of driving are stored in the computer's memory. The computer uses this data to analyze road conditions and the driver's style of operation, and then outputs the optimal shift patterns stored in its memory to best match the conditions.
2. We introduce the latest in control technologies with an innovative new algorithm called the "neural network" that works to imitate the decision-making processes of the human brain. The neural network links a wide variety of input data regarding road and operating conditions, and instantly makes accurate shift control decisions.



ADAPTIVE SHIFT CONTROL

1. The computer learns the driving habits and preferences of each individual driver by processing driving data on engine output, tire load, foot brake operation, etc. It then uses this data to adjust shift timing to best suit the driver's style.
2. If the computer determines from the driving patterns that the driver is one who enjoys a relaxed, unhurried style, it adjusts timing to execute upshifts at a lower engine speed to provide a smooth, quiet ride. On the other hand, if the computer determines the driver to prefer a sporty ride, it adjusts timing to shift up at a higher engine speed to provide more powerful response.

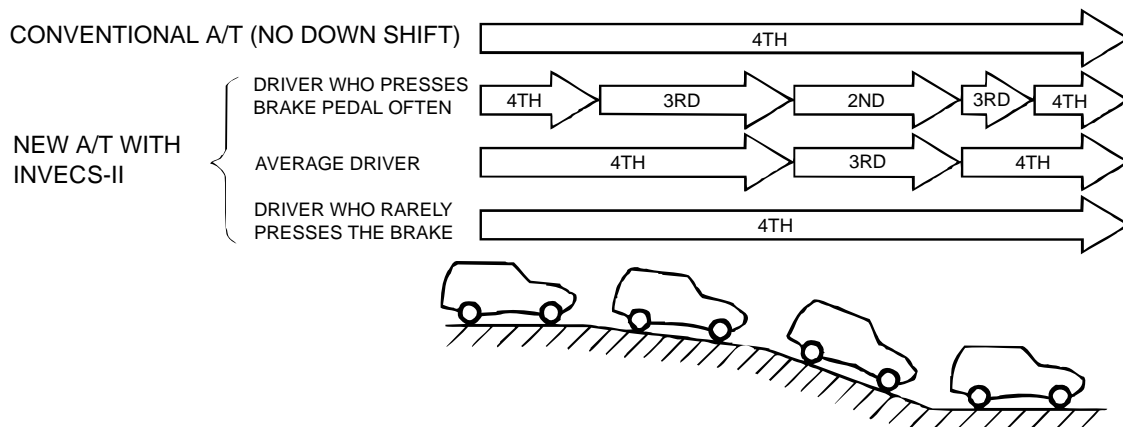
ADAPTIVE SHIFT CONTROL DURING ACCELERATION



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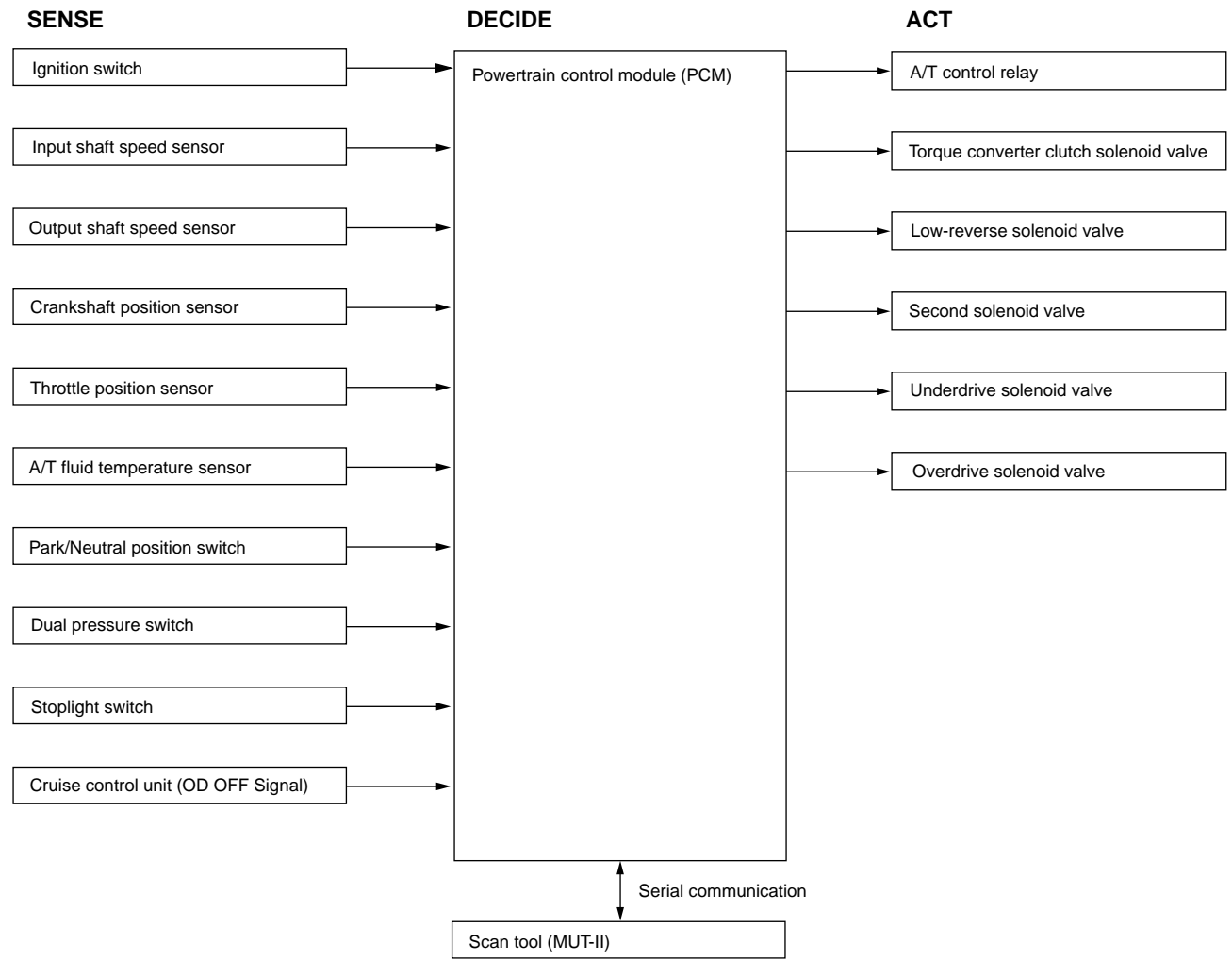
3. If the computer determines that the driver tends to apply the brakes often on a descending roadway, it adjusts timing to down shift sooner so that engine braking is more effectively applied. Conversely, if the computer determines that the driver does not brake much while driving downhill, it delays downshifting to minimize the effect of engine braking.

ADAPTIVE SHIFT CONTROL ON DOWNGRADES



AC000845 AB

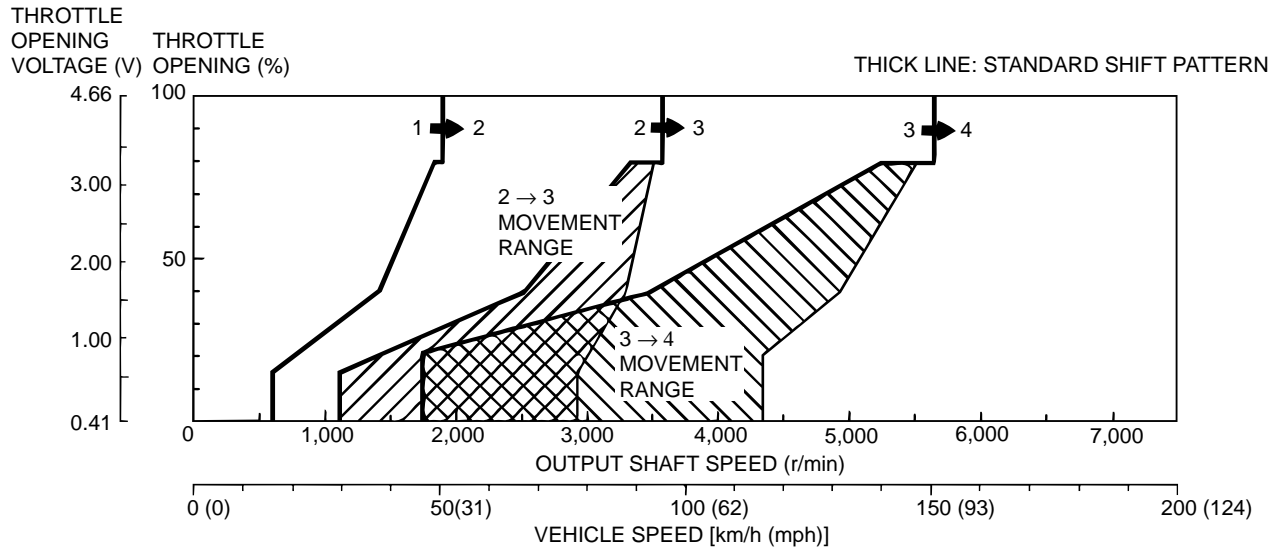
SYSTEM CONSTRUCTION DIAGRAM



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SHIFT PATTERN CONTROL

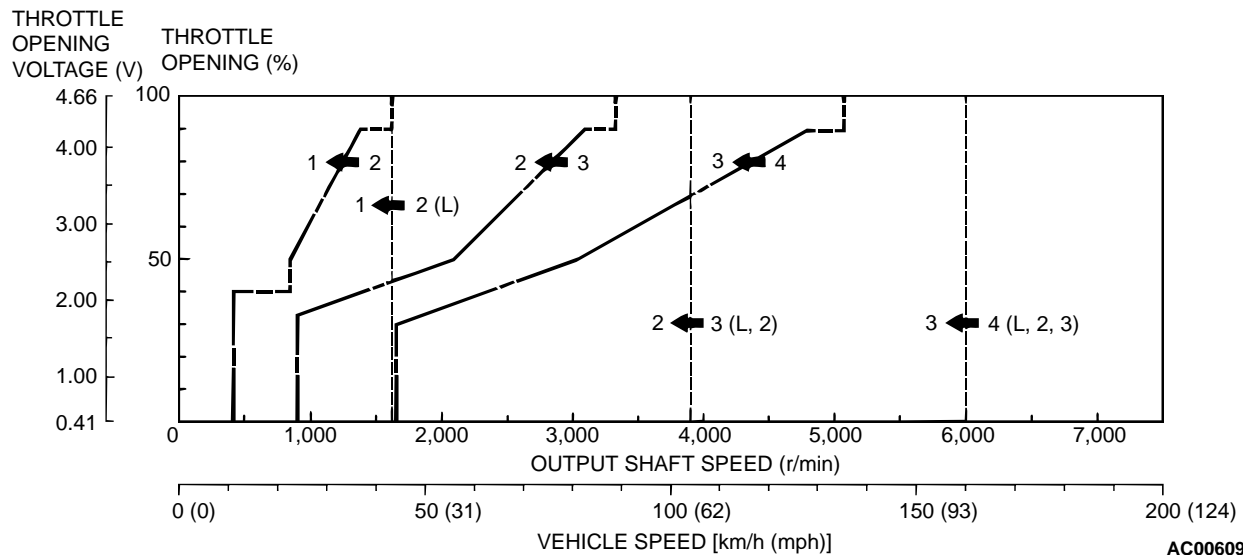
UPSHIFT PATTERN



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NOTE: Within 2 -to- 3 and 3 -to- 4 movement ranges, the PCM adjusts shift points according to the driving conditions by memorizing the accelerator pedal stroke and braking timing.

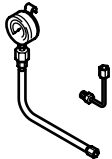
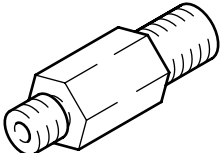

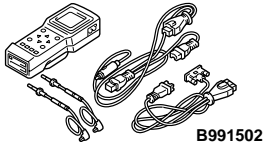

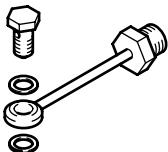
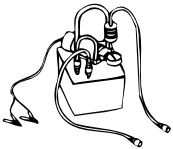
DOWNSHIFT PATTERN

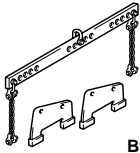
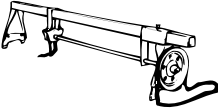
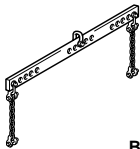
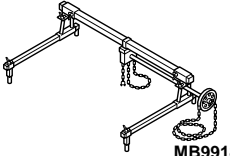
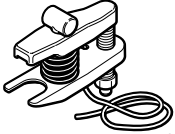
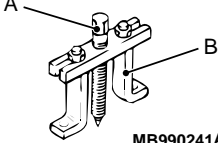
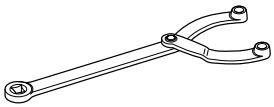
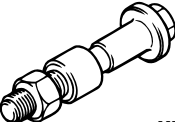


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SPECIAL TOOLS

M1231000600219

TOOL	TOOL NUMBER AND NAME	SUPERSESSSION	APPLICATION
	MD998330 (Includes MD998331) Oil pressure gauge (3.0 MPa, 427 psi)	MD998330-01	Measurement of hydraulic pressure
	MD998332 Adapter	MD998332-01	Connection for oil pressure gauge
	MD998478 Test harness (3 pin, triangle)	MD998478-01	Inspection using an oscilloscope
 B991502	MB991502 Scan tool (MUT-II)	MB991496-OD	Checking diagnostic trouble codes
	MB991709 Test harness set	Tool not available	Inspection using an oscilloscope
	MD998900 Adapter	MD998900-01	Connection for oil pressure gauge
	MB995062 Flushing tool	MLR-6906B or Equivalent	Flushing cooler and tube

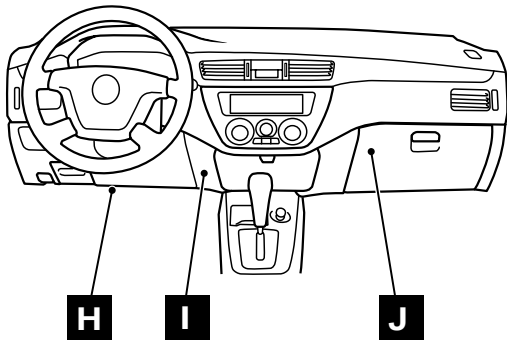
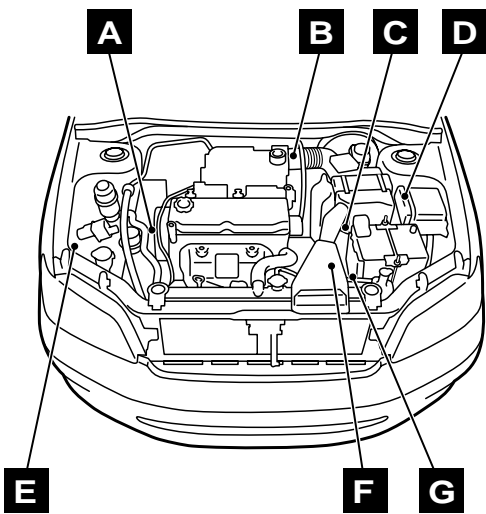
TOOL	TOOL NUMBER AND NAME	SUPERSESION	APPLICATION
 B991453	MB991453 Engine hanger assembly	MZ203827-01	When an engine lifer is used: Supporting the engine assembly during removal and installation of the transaxle
 MZ203827	GENERAL SERVICE TOOL MZ203827 Engine lifter	MZ203827-01	
 B991454	MB991454 Engine hanger balancer	MZ203827-01	When the engine hanger is used: Supporting the engine assembly during removal and installation of the transaxle assembly <i>NOTE: Special tool MB991454 is a part of engine hanger attachment set MB991453.</i>
 MB991895	MB991895 Engine hanger	—	
 AC106827	MB991897 Ball joint remover	MB991113-01, MB990635-01 or general service tool	Knuckle and tie rod end ball joint breakaway torque check <i>NOTE: Steering linkage puller(MB990635 or MB991113)is also used to disconnect knuckle and tie rod end ball joint.</i>
 MB990241AB	MB990241 Axle shaft puller A: MB990244 Puller shaft B: MB990242 Puller bar	MB990241-01 or general service tool	Removal of the drive shaft
 B990767	MB990767 End yoke holder	MB990767-01	Fixing of the hub
 MB990998	MB990998 Front hub remover and installer	MB990998-01 or general service tool	Provisional fixing of the wheel bearing

ON-VEHICLE SERVICE

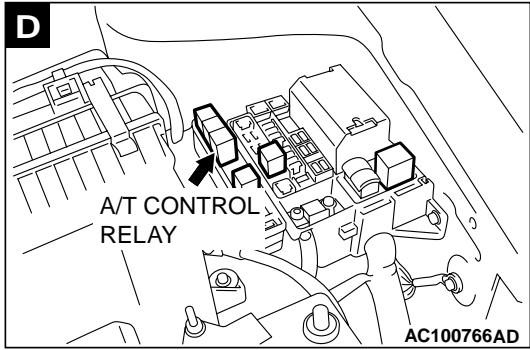
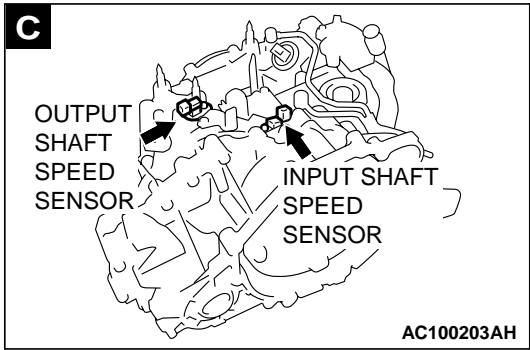
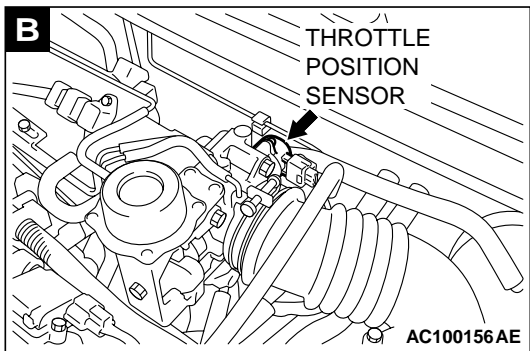
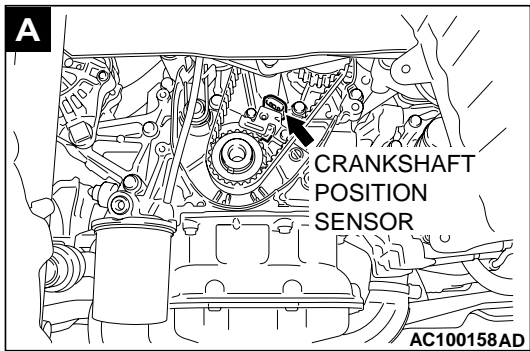
A/T CONTROL COMPONENT LAYOUT

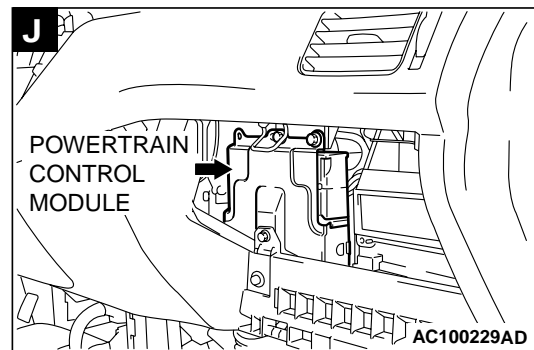
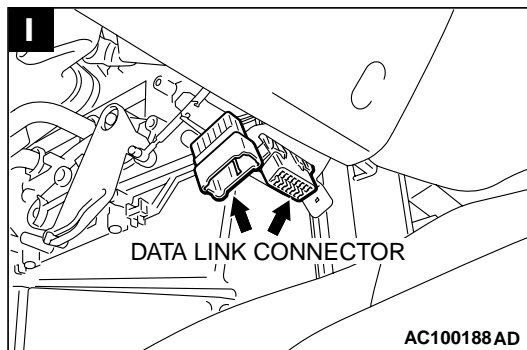
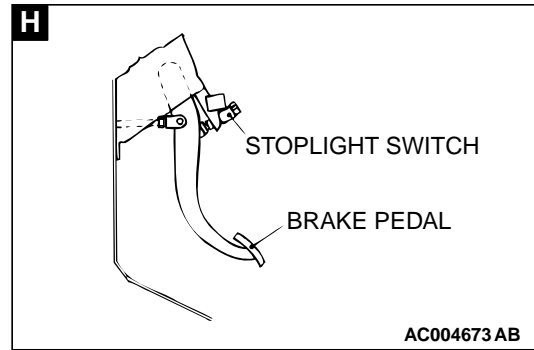
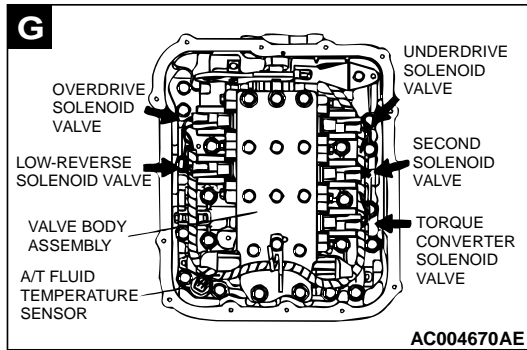
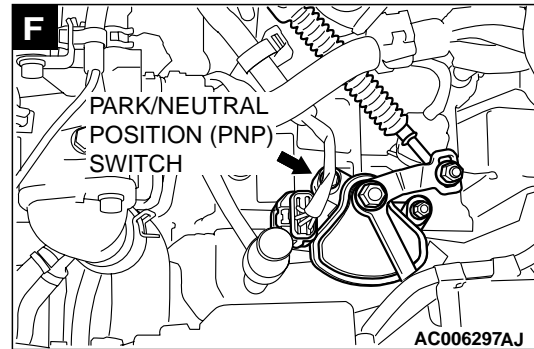
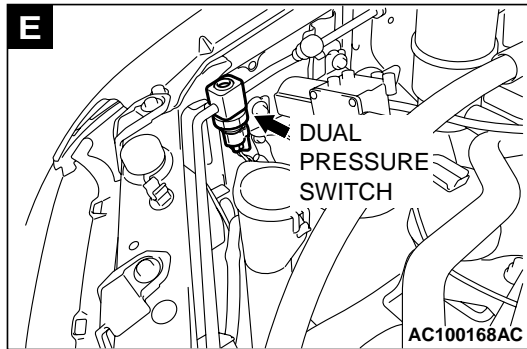
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NAME	SYMBOL	NAME	SYMBOL
A/T control relay	D	Input shaft speed sensor	C
A/T control solenoid valves	G	Output shaft speed sensor	C
A/T fluid temperature sensor	G	Park/Neutral position (PNP) switch	F
Crankshaft position sensor	A	Powertrain control module (PCM)	J
Data link connector	I	Stoplight switch	H
Dual pressure switch	E	Throttle position sensor	B



AC100144AF





ESSENTIAL SERVICE

A/T FLUID CHECK

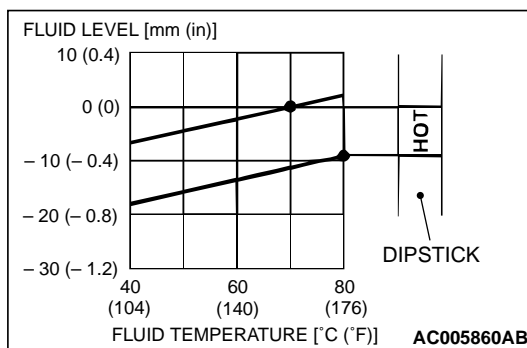
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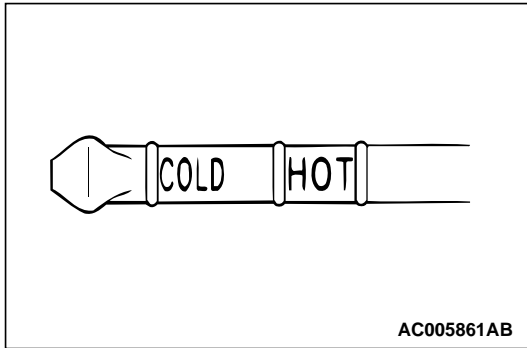
1. Drive the vehicle until the A/T fluid temperature rises to the normal temperature [70 – 80°C (158 – 176°F)].

NOTE: The A/T fluid temperature is measured with scan tool MB991502 (MUT-II).

NOTE: If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80°C (158 – 176°F)], check the A/T fluid level by referring to the left diagram.

2. Park the vehicle on a level surface.
3. Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with fluid, and then move the selector lever to the "N" position.
4. After wiping off any dirt around the dipstick, remove the dipstick and check the condition of the A/T fluid.





NOTE: If the A/T fluid smells as if it is burnt, it means that the A/T fluid has been contaminated by fine particles from the bushings and friction materials. A transaxle overhaul and cooler line flushing may be necessary.

5. Check that the A/T fluid level is at the "HOT" mark on the dipstick. If the A/T fluid level is less than this, add DIAMOND ATF SP III or equivalent A/T fluid until the level reaches the "HOT" mark.

NOTE: If the A/T fluid level is too low, the oil pump will draw in air along with the A/T fluid, which will cause bubbles to form. If the A/T fluid level is too high, rotating components inside the transaxle will churn the fluid and air into a foamy liquid. Both conditions (level too low or too high) will cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.

NOTE: In either case, air bubbles can interfere with normal valve, clutch, and brake operation. Also, foaming can cause A/T fluid to escape from the transaxle vent where it may be mistaken for a leak.

6. Securely insert the dipstick.

NOTE: The A/T fluid should always be replaced under the following conditions:

- • When troubleshooting the transaxle.
- • When overhauling the transaxle.
- • When the A/T fluid is noticeably dirty or burnt (driving under severe conditions).

A/T FLUID REPLACEMENT

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If you have an A/T fluid changer, use this changer to replace the A/T fluid. If you do not have an A/T fluid changer, replace the A/T fluid by the following procedure.

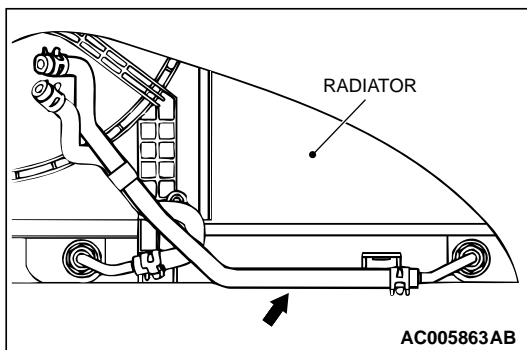
1. Disconnect the hose shown in the illustration which connects the transaxle and the oil cooler (inside the radiator). Place a container under the hose to collect the discharge.

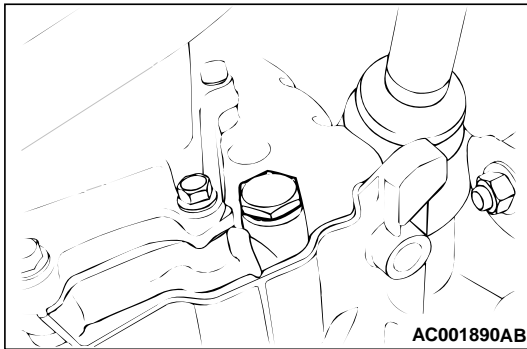
CAUTION

The engine should be stopped within one minute after it is started. If all the A/T fluid has drained out before then, the engine should be stopped at that point.

2. Start the engine and let the A/T fluid drain out.
(Running conditions: "N" range with engine idling)

Approximately 3.5 dm³ (3.7 quarts) of A/T fluid should be removed.





3. Remove the drain plug from the bottom of the transaxle case to drain the A/T fluid.

Approximately 2.0 dm³ (2.1 quarts) of A/T fluid should be removed.

4. Install the drain plug with a new gasket, and tighten it to the specified torque.

Tightening torque: 32 ± 2 N·m (24 ± 1 ft-lb)

⚠ CAUTION

Stop pouring if the full volume of A/T fluid can not be added.

5. Add new A/T fluid (DIAMOND ATF SP III or equivalent) through the oil filter tube.

Approximately 5.5 dm³ (5.8 quarts) of A/T fluid should be added.

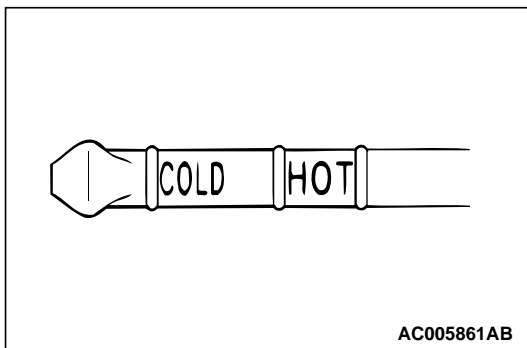
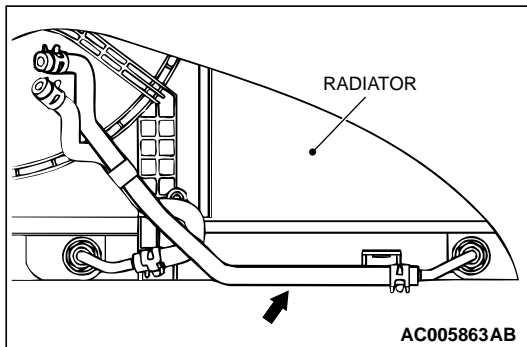
6. Repeat the procedure in Step 2. (to pump out the rest of the contaminated A/T fluid)

7. Add new A/T fluid (DIAMOND ATF SP III or equivalent) through the oil filter tube.

Approximately 3.5 dm³ (3.7 quarts) of A/T fluid should be added.

NOTE: Check for contamination or a burnt odor. If the A/T fluid is still contaminated or burnt, repeat Steps 6 and 7 before proceeding to Step 8.

8. Reconnect the hose which was disconnected in step 1 above, and firmly replace the dipstick.
9. Start the engine and run it at idle for one to two minutes.
10. Move the selector lever through all positions, and then move it to the "N" position.

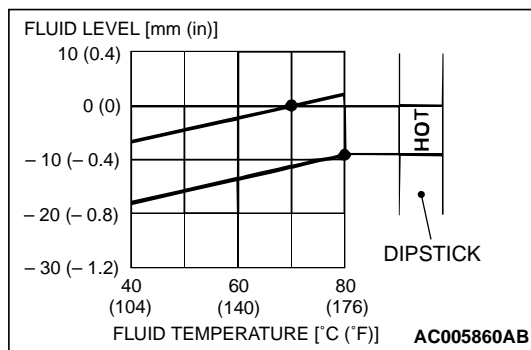


11. Check that the A/T fluid level is at the "COLD" mark on the dipstick. If the level is less than this, add A/T fluid.

12. Drive the vehicle until the A/T fluid temperature rises to the normal operating temperature [70 – 80°C (158 – 176°F)], and then check the A/T fluid level again. The A/T fluid level must be at the "HOT" mark.

NOTE: The A/T fluid temperature is measured with scan tool MB991502 (MUT-II).

NOTE: The "COLD" level is for reference only; the "HOT" level should be regarded as the standard level.



NOTE: If it takes some amount of time until the A/T fluid reaches its normal operating temperature [70 – 80 °C (158 – 176 °F)], check the A/T fluid level by referring to the left diagram.

13. When the A/T fluid is less than the specified level, add A/T fluid.

When the A/T fluid is greater than the specified level, drain the excess fluid through the drain plug to adjust the A/T fluid to the specified level.

14. Firmly insert the dipstick into the oil filler tube.

FLUSHING COOLERS AND TUBES

M1231013000176

Required Special Tool:

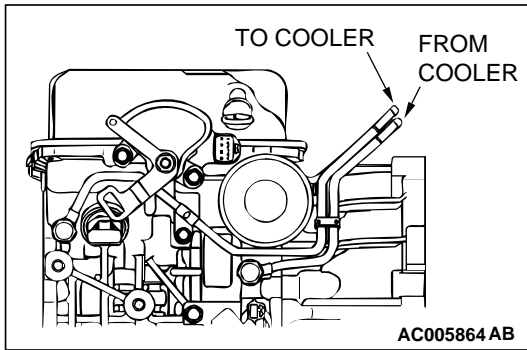
MB995062: Flushing Tool

⚠ WARNING

- **Wear protective eyewear that meets the requirements of ANSI Z87.1 – 1968 and OSHA. Wear standard industrial rubber gloves.**
- **Keep lighted cigarettes, sparks, flames, and other ignition sources away from the area to prevent the ignition of combustible liquids and gases. Keep a class B fire extinguisher in the area where the flushing tool will be used. Keep the area well ventilated. Do not let flushing solvent come in contact with eyes or skin. If it does, flush with water for 15 to 20 seconds. Remove contaminated clothing and wash affected skin with soap and water. Seek medical attention.**

When a transaxle failure has contaminated the A/T fluid, the oil cooler(s) must be flushed. The cooler by-pass valve in the transaxle must also be replaced. The torque converter must also be replaced with an exchange unit. This will ensure that metal particles or sludged A/T fluid are not later transferred back into the reconditioned (or replaced) transaxle. There are two different procedures for flushing coolers and lines. The recommended procedure is to use special tool MB995062 Flushing Tool. The other procedure is to use a hand suction gun and mineral spirits.

1. Remove the cover plate filler plug on special tool MB995062. Fill the reservoir 1/2 to 3/4 full with fresh flushing solution. Flushing solvents are petroleum based solutions generally used to clean transaxle components. Do not use solvents containing acids, water, gasoline, or any other corrosive liquids.
2. Reinstall the filler plug on special tool MB995062.
3. Verify that the pump power switch is turned "OFF." Connect the red alligator clip to the positive battery terminal. Connect the black alligator clip to a good ground.
4. Disconnect the cooler lines at the transaxle.



NOTE: When flushing the transaxle cooler and lines, always reverse flush.

5. Connect the BLUE pressure line to the OUTLET line (from cooler).
6. Connect the CLEAR return line to the INLET line (to cooler).
7. Turn the pump "ON" for two to three minutes to flush the cooler(s) and lines. Monitor the pressure readings. Clear the return lines. Pressure readings should stabilize below 138 kPa (20 psi) for vehicles equipped with a single cooler and 208 kPa (30 psi) for vehicles equipped with dual coolers. If flow is intermittent or exceeds these pressures, replace the cooler(s).
8. Turn the pump "OFF."
9. Disconnect the CLEAR suction line from the reservoir at the cover plate. Disconnect the CLEAR return line at the cover plate and place it in a drain pan.
10. Turn the pump "ON" for 30 seconds to purge flushing solution from the cooler(s) and lines. Turn the pump "OFF."
11. Place the CLEAR suction line into a one quart container of DIAMOND ATF SP III or equivalent A/T fluid.
12. Turn the pump "ON" until all A/T fluid is removed from the one quart container and lines. This purges any residual cleaning solvent from the transaxle cooler(s) and lines. Turn the pump "OFF."
13. Disconnect the alligator clips from the battery. Reconnect the flusher lines to the cover plate, and remove the flushing adapters from the cooler lines. Reconnect the cooler lines.

OIL COOLER FLOW CHECK

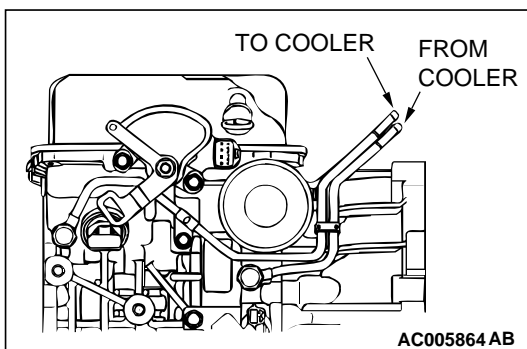
M1231013100151

After the new or repaired transaxle has been installed, fill to the proper level with DIAMOND ATF SP III or equivalent A/T fluid. The flow should be checked using the following procedure:

⚠ CAUTION

With the fluid set at the proper level, A/T fluid collection should not exceed one quart or internal damage to the transaxle may occur.

1. Disconnect the OUTLET line (from cooler) at the transaxle and place a collecting container under the disconnected line.
2. Run the engine at curb idle speed with the shift selector in neutral.
3. If A/T fluid flow is intermittent or it takes more than 20 seconds to collect one quart of A/T fluid, replace the cooler.
4. If flow is within acceptable limits, reconnect the cooler line. Then fill the transaxle to the proper level, using DIAMOND ATF SP III or equivalent A/T fluid.



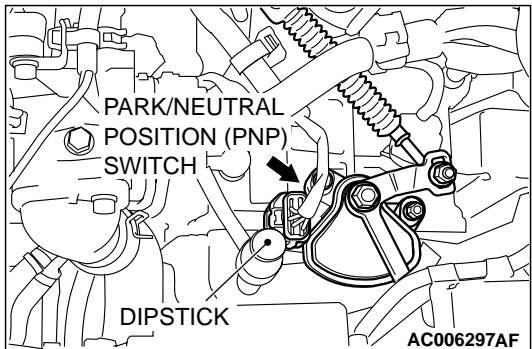
TP SENSOR ADJUSTMENT

M1231001900161

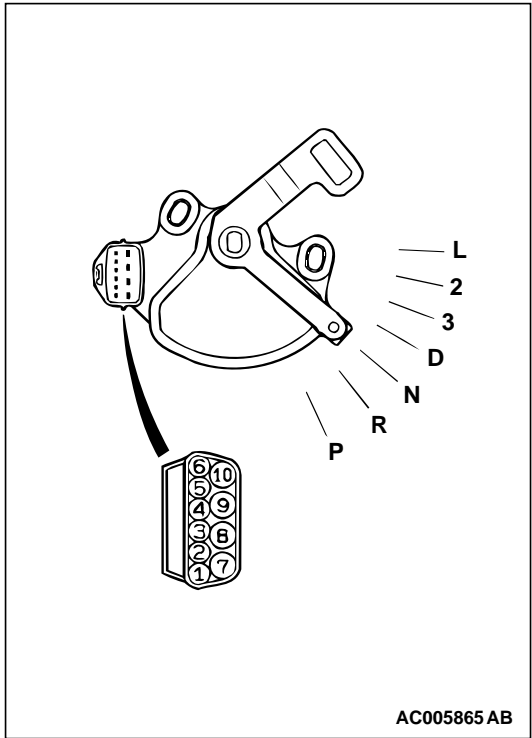
Refer to GROUP 13A, On-vehicle Service [P.13Aa-12](#).

PARK/NEUTRAL POSITION SWITCH CONTINUITY
CHECK

M1231001400304

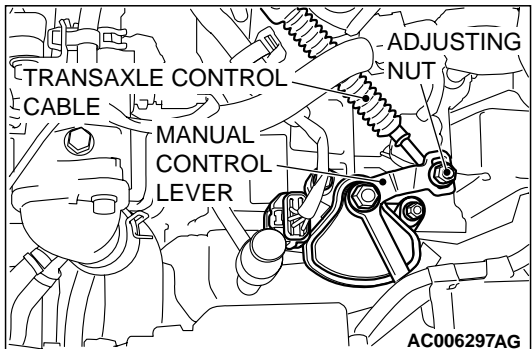


ITEM	TERMINAL CONNECTION OF TESTER	SPECIFIED CONDITION
P	3 – 8, 9 – 10	Less than 2 ohms.
R	7 – 8	
N	4 – 8, 9 – 10	
D	1 – 8	
3	5 – 8	
2	2 – 8	
L	6 – 8	

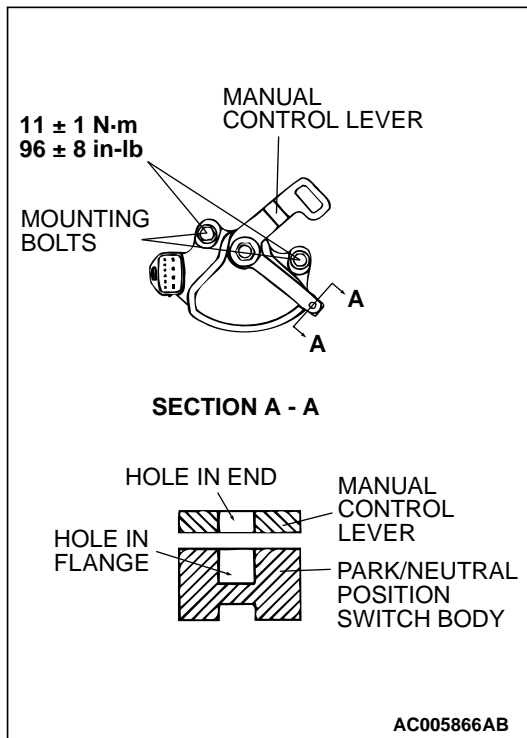


PARK/NEUTRAL POSITION SWITCH AND
CONTROL CABLE ADJUSTMENT

M1231010300156



1. Set the selector lever to the "N" position.
2. Loosen the control cable to the manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.

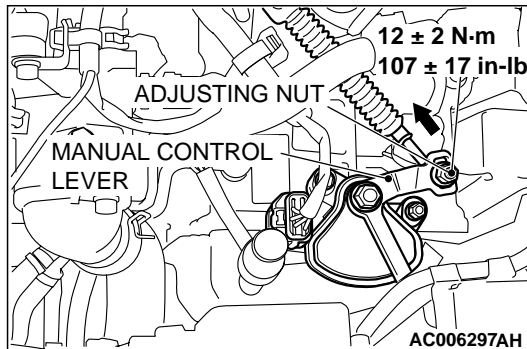


- Loosen the park/neutral position switch body mounting bolts and turn the park/neutral position switch body so the hole in the end of the manual control lever and the hole (section A – A in the figure on the left) in the flange of the park/neutral position switch body flange are aligned.

NOTE: The park/neutral position switch body can be aligned by inserting a 5-mm diameter steel bar into the end hole of the manual control lever and the flange hole of the park/neutral position switch body.

- Tighten the park/neutral position switch body mounting bolts to the specified torque. Be careful at this time that the switch body does not move.

Tightening torque: 11 ± 1 N·m (96 ± 8 in-lb)



- Gently push the transaxle control cable in the direction of the arrow, until the cable is taut. Tighten the adjusting nut.

Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

- Check that the selector lever is in the "N" position.
- Check that each position of the manual control lever matches each position of the selector lever using scan tool MB991502.

AUTOMATIC TRANSAXLE CONTROL COMPONENT CHECK

CRANKSHAFT POSITION SENSOR CHECK

M1231009000184

Refer to GROUP 13A, Diagnosis – Inspection Procedure Using an Oscilloscope [P.13Ab-41](#).

TP SENSOR CHECK

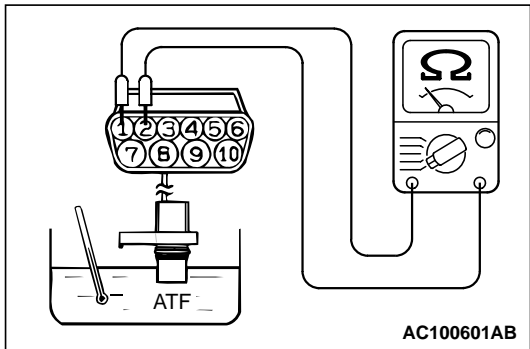
M1231003900167

Refer to GROUP 13A, On-vehicle Service – Throttle Position Sensor Check [P.13Aa-20](#).

A/T FLUID TEMPERATURE SENSOR CONTINUITY CHECK

M1231004500162

- Remove the A/T fluid temperature sensor.



2. Measure the resistance between terminals 1 and 2 of the A/T fluid temperature sensor connector.

Standard value:

A/T FLUID TEMPERATURE	RESISTANCE
0°C (32°F)	16.7 – 20.5 kΩ
20°C (68°F)	7.3 – 8.9 kΩ
40°C (104°F)	3.4 – 4.2 kΩ
60°C (140°F)	1.9 – 2.2 kΩ
80°C (176°F)	1.0 – 1.2 kΩ
100°C (212°F)	0.57 – 0.69 kΩ

3. If the A/T fluid temperature sensor resistance is outside the specified range and the "N" range indicator light is flashing, replace the A/T fluid temperature sensor.

NOTE: The "N" range indicator light on the combination meter flashes when the temperature reaches approximately 125°C (257°F) or greater, and then stops flashing when the temperature drops below approximately 115°C (238°F).

PARK/NEUTRAL POSITION SWITCH CHECK

M1231001400315

Refer to [P.23Aa-18](#).

STOPLIGHT SWITCH CHECK

M1231009100136

Refer to GROUP 35A, Brake Pedal – Brake Pedal Inspection [P.35A-28](#).

DUAL PRESSURE SWITCH CHECK

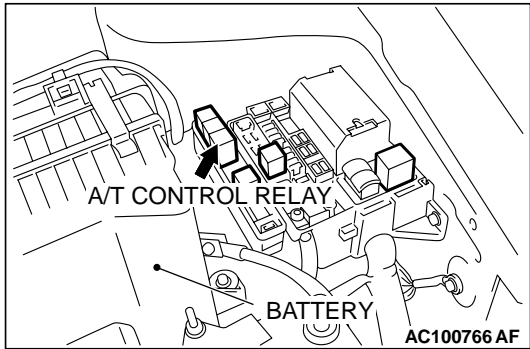
M1231004700144

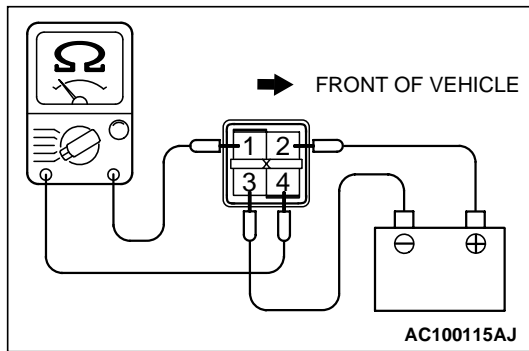
Refer to GROUP 55, On-vehicle Service – Pressure Switch Check [P.55-79](#).

A/T CONTROL RELAY CHECK

M1231009300141

1. Remove the A/T control relay.





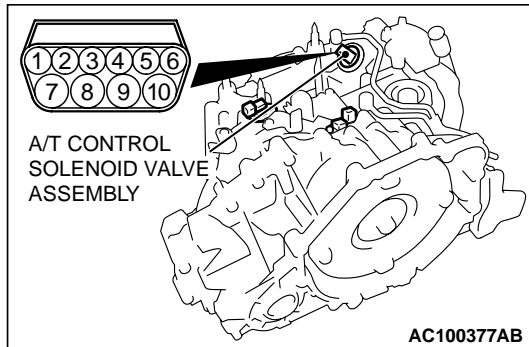
2. Use jumper wires to connect A/T control relay terminal 3 to the negative battery terminal and terminal 2 to the positive battery terminal.
3. Check for continuity between A/T control relay terminals 1 and 4 when the jumper wires are connected to and disconnected from the battery.

JUMPER WIRE	CONTINUITY BETWEEN TERMINALS NO.1 AND NO.4
Connected	Continuity
Disconnected	No continuity

4. If there is any problem with the A/T control relay, replace it.

SOLENOID VALVE CHECK

M1231009400148

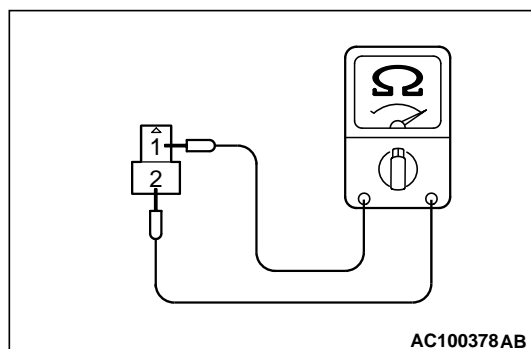
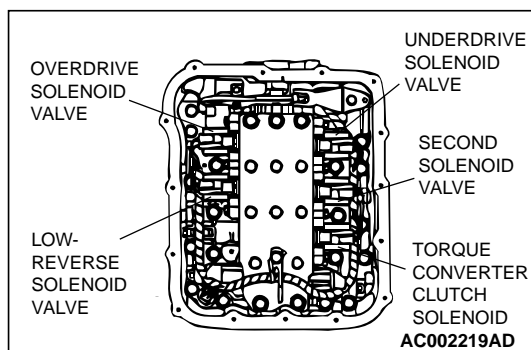


1. Use scan tool MB991502 to measure the A/T fluid temperature. The desired A/T fluid temperature setting for performing the solenoid valve checks is 20°C (68°F).
2. Remove the A/T control solenoid valve assembly connector.
3. Measure the resistance between the solenoid valve terminals.
4. The measured resistance of the solenoid valve when the A/T fluid temperature is 20°C (68°F) should match the specified resistance on the chart below.

Specified resistance:

TERMINAL NO.	NAME	RESISTANCE
No. 7 - No. 10	Torque converter clutch solenoid valve	2.7 – 3.4 Ω [at 20°C (68°F)]
No. 6 - No. 10	Low-reverse solenoid valve	
No. 4 - No. 9	Second solenoid valve	
No. 3 - No. 9	Underdrive solenoid valve	
No. 5 - No. 9	Overdrive solenoid valve	

5. If the solenoid valve resistance is within the specified range, check the power supply and the ground circuits.
6. If the solenoid valve resistance is not within the specified range, drain the A/T fluid and remove the valve body cover.



7. Disconnect the connector of any solenoid valves that are not within the specified range.

8. Measure the resistance between terminals 1 and 2 of any solenoid valve that was not within the specified range.

Specified resistance:

2.7 – 3.4 Ω [at 20°C (68°F)]

9. If the resistance is not within the specified range, replace the solenoid valve.
10. If the resistance is within the specified range, check the wiring harness between the affected A/T control solenoid valve assembly and the solenoid valve. If a problem is not found in the above steps, check the solenoid valve O-rings and replace them if necessary.

SELECTOR LEVER OPERATION CHECK

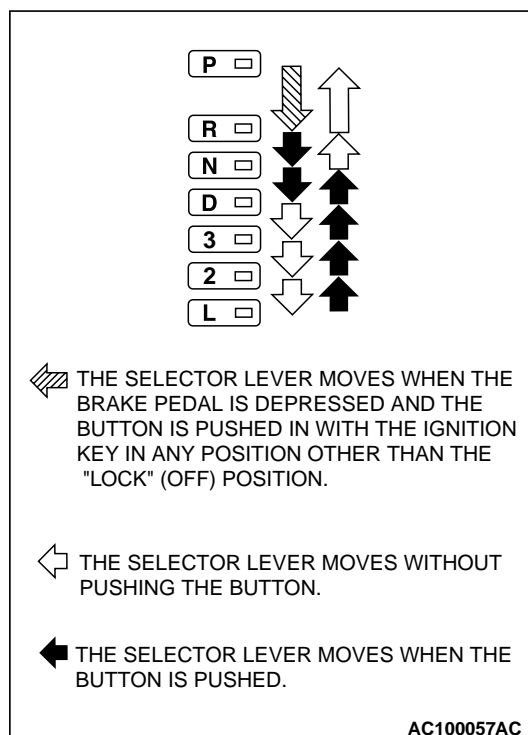
M1231001300255

1. Apply the parking brake, and check that the selector lever moves smoothly and accurately to each position.
2. Check that the engine starts when the selector lever is in the "N" or "P" position, and that it does not start when the selector lever is in any other position.
3. Start the engine, release the parking brake, and check that the vehicle moves forward when the selector lever is moved from the "N" position to the "D", "3", "2" or "L" position, and that the vehicle reverses when the selector lever is moved to the "R" position.

4. Stop the engine.

5. Turn the ignition switch to the "ON" position, and check that the backup lamp illuminates when the selector lever is shifted from the "P" to the "R" position.

NOTE: The A/T mis-operation prevention mechanism prevents movement of the selector lever from the "P" position if the ignition switch is in a position other than "LOCK" (OFF) and the brake pedal is not depressed.



KEY INTERLOCK MECHANISM CHECK

M1232000900235

1. Perform the following inspection.

INSPECTION PROCEDURE	INSPECTION REQUIREMENTS	KEY INTERLOCK (NORMAL OPERATION)	
1	Brake pedal: Depressed	Ignition key position: "LOCK" (OFF) or removed	Unable to push in the selector lever push button and move the lever out of the "P" position.
2		Ignition key position: "ACC"	Able to push in the selector lever push button, move the lever out of the "P" position, and shift to any position.
3	Brake pedal: Not depressed	Selector lever: Other than "P" position	Unable to turn the ignition key to the "LOCK" (OFF) position.
4		Selector lever: "P" position	Able to turn the ignition key to the "LOCK" (OFF) position.

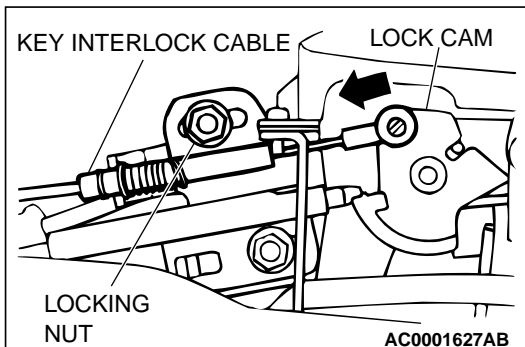
2. When any of the above checks are not normal, adjust the key interlock cable by following procedure.

- (1) Remove the floor console. (Refer to GROUP 52A – Front floor console [P.52A-7.](#))
- (2) Shift the selector lever to "P" position.
- (3) Turn the ignition key to the "LOCK" (OFF) position.
- (4) Loosen the locking nut of the key interlock cable.
- (5) Push the cable joint on the lock cam gently toward the arrow until the cable stops. Tighten the locking nut.

Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

- (6) Install the floor console. (Refer to GROUP 52A – Front floor console [P.52A-7.](#))

3. After adjusting, check the operation once more. If the operation is still incorrect, replace the key interlock cable. (Refer to [P.23Aa-28.](#))



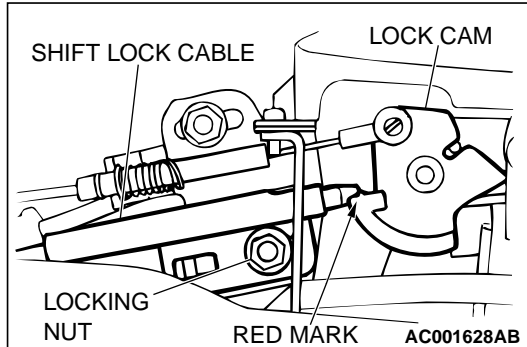
SHIFT LOCK MECHANISM CHECK

M1232001000224

1. Perform the following inspections.

INSPECTION PROCEDURE	INSPECTION REQUIREMENTS	CHECK DETAILS (NORMAL OPERATION)	
1	Brake pedal: Not depressed	Ignition key position: "ACC"	When the selector lever push button is depressed, the selector lever can not be shifted out of the "P" position.
2	Brake pedal: Depressed		When the selector lever push button is depressed, the selector lever can be shifted smoothly to other positions.
3	Brake pedal: Not depressed		When the selector lever push button is depressed, the selector lever can be shifted smoothly from the "R" position to the "P" position.

2. When any of the above shift lock inspection procedures fail, adjust the shift lock cable as follows:



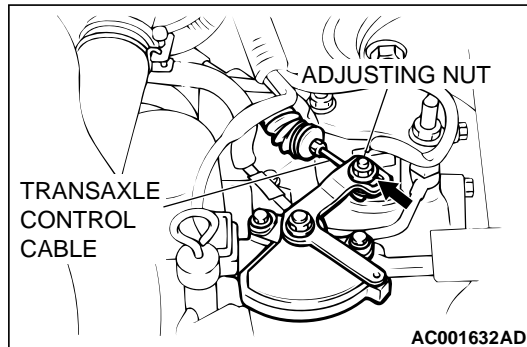
- (1) Remove the front floor console assembly. (Refer to GROUP 52A – Front Floor Console P.52A-7.)
- (2) Shift the selector lever to the "P" position.
- (3) Loosen the lock nut on the shift lock cable.
- (4) Adjust the cable so that the end of the shift lock cable is above the red line on the lock cam and tighten the locknut.

Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

- (5) After adjusting, retest the shift lock cable operation. Replace the shift lock cable if it does not operate properly. (Refer to P.23Aa-28.)
- (6) Install the front floor console assembly. (Refer to GROUP 52A – Front Floor Console P.52A-7.)

TRANSAXLE CONTROL CABLE ADJUSTMENT

M1231028000020



1. Remove the battery and battery tray.
2. Move the selector lever to the "N" position.
3. Loosen the upper control lever adjusting nut.
4. Gently push the transaxle control cable in the direction of the arrow, and then tighten the adjusting nut.

Tightening torque: 12 ± 2 N·m (107 ± 17 in-lb)

5. Check that the transaxle shifts to the correct range corresponding to the position of the selector lever, and that it functions correctly in that range.
6. Install the battery and battery tray.

TRANSAXLE CONTROL

REMOVAL AND INSTALLATION

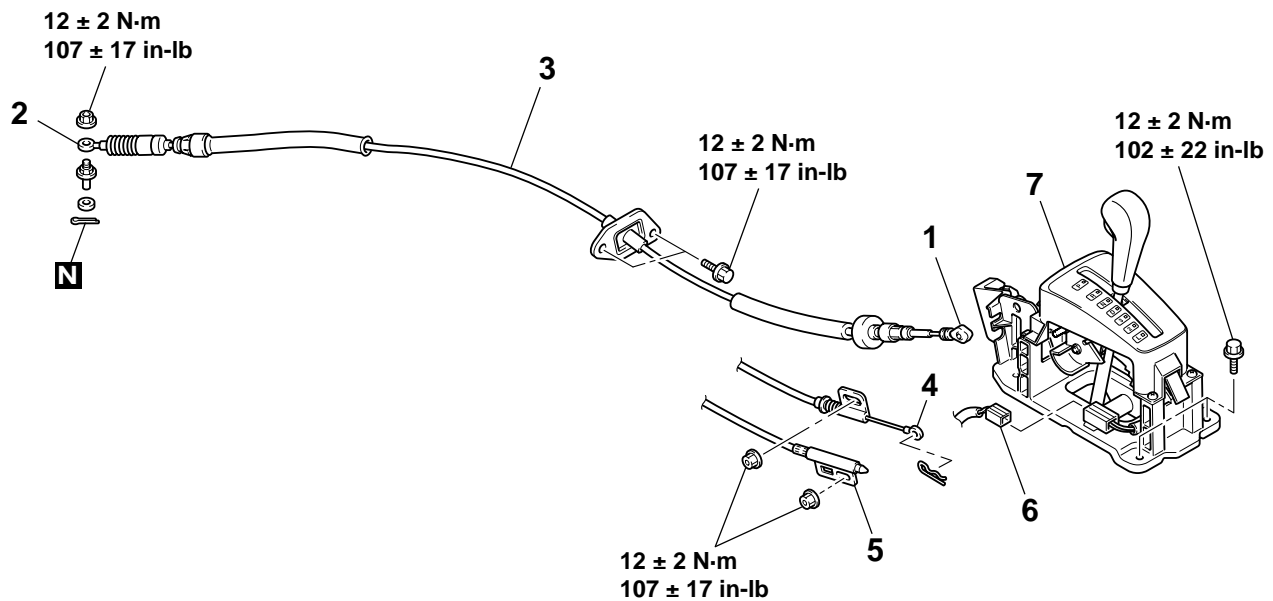
M1231006600206

⚠ CAUTION

When removing and installing the transaxle control cable and shift lock cable unit, be careful not to impact the SRS-ECU.

Pre-removal and Post-installation Operation

- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 P.15-4.)
- Battery and Battery Tray Removal and Installation.
- Front Floor Console Removal and Installation (Refer to GROUP 52A, Front Floor Console P.52A-7.)
- Selector Lever Operation Check (Refer to P.23Aa-22.)



AC100058AB

TRANSAXLE CONTROL CABLE REMOVAL STEPS

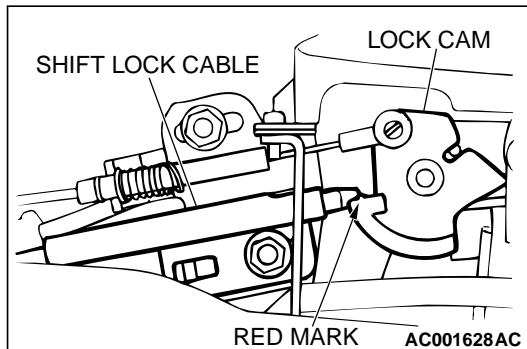
- SHIFT THE SELECTOR LEVER TO "N" POSITION.
- 1. TRANSAXLE CONTROL CABLE CONNECTION (SELECTOR LEVER ASSEMBLY SIDE)
- >>C<< 2. TRANSAXLE CONTROL CABLE CONNECTION (TRANSAXLE SIDE)
- SRS-ECU (REFER TO GROUP 52B, SRS CONTROL UNIT P.52Ba-25.)
- HEATER/COOLER UNIT (REFER TO GROUP 55, HEATER/COOLER UNIT, HEATER CORE AND EVAPORATOR P.55-88.)
- 3. TRANSAXLE CONTROL CABLE

SELECTOR LEVER ASSEMBLY REMOVAL STEPS

- 1. TRANSAXLE CONTROL CABLE CONNECTION (SELECTOR LEVER ASSEMBLY SIDE)
- >>B<< 4. KEY INTERLOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
- >>A<< 5. SHIFT LOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
- 6. A/T SELECTOR LEVER POSITION ILLUMINATION LIGHT CONNECTOR
- 7. SELECTOR LEVER ASSEMBLY

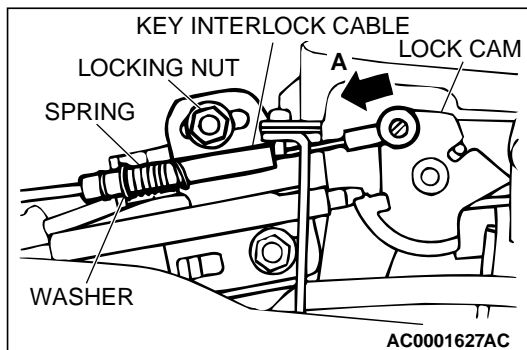
INSTALLATION SERVICE POINT**>>A<< SHIFT LOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION**

1. Shift the selector lever to the "P" position.
2. Fasten the shift lock cable at the position where the end of the shift lock cable is above the red line on the lock cam.

**>>B<< KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION**

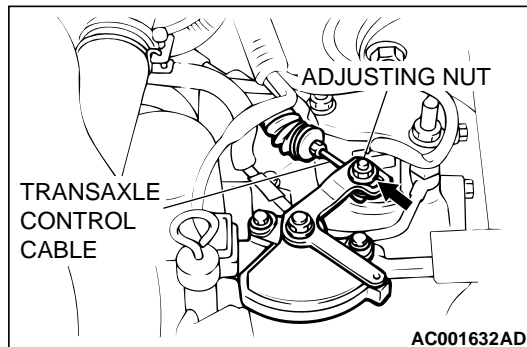
1. Shift the selector lever to the "P" position.
2. Turn the ignition key to the "LOCK" (OFF) position.
3. Slide the washer and spring toward the lock cam, insert the cable into the stand off bracket and release the spring.
4. Lightly push the key interlock cable into the key interlock cable housing toward the arrow (A) direction until the cable movement stops and the cable end eye is aligned with the shaft on the lock cam. Tighten the lock nut. Snap the cable end eye onto the shaft of the lock cam.

Tightening torque: 12 ± 2 N·m (107 ± 17 in·lb)

**>>C<< TRANSAXLE CONTROL CABLE (TRANSAXLE SIDE) INSTALLATION**

1. Place the transaxle manual control lever in the "N" position.
2. Place the selector lever in the "N" position.
3. Place the cable stud into the manual control lever slot and install the nut loosely. Gently pull the transaxle control cable into the manual control lever slot until the cable is taut. Tighten the nut to the specified torque.

Tightening torque: 12 ± 2 N·m (107 ± 17 in·lb)

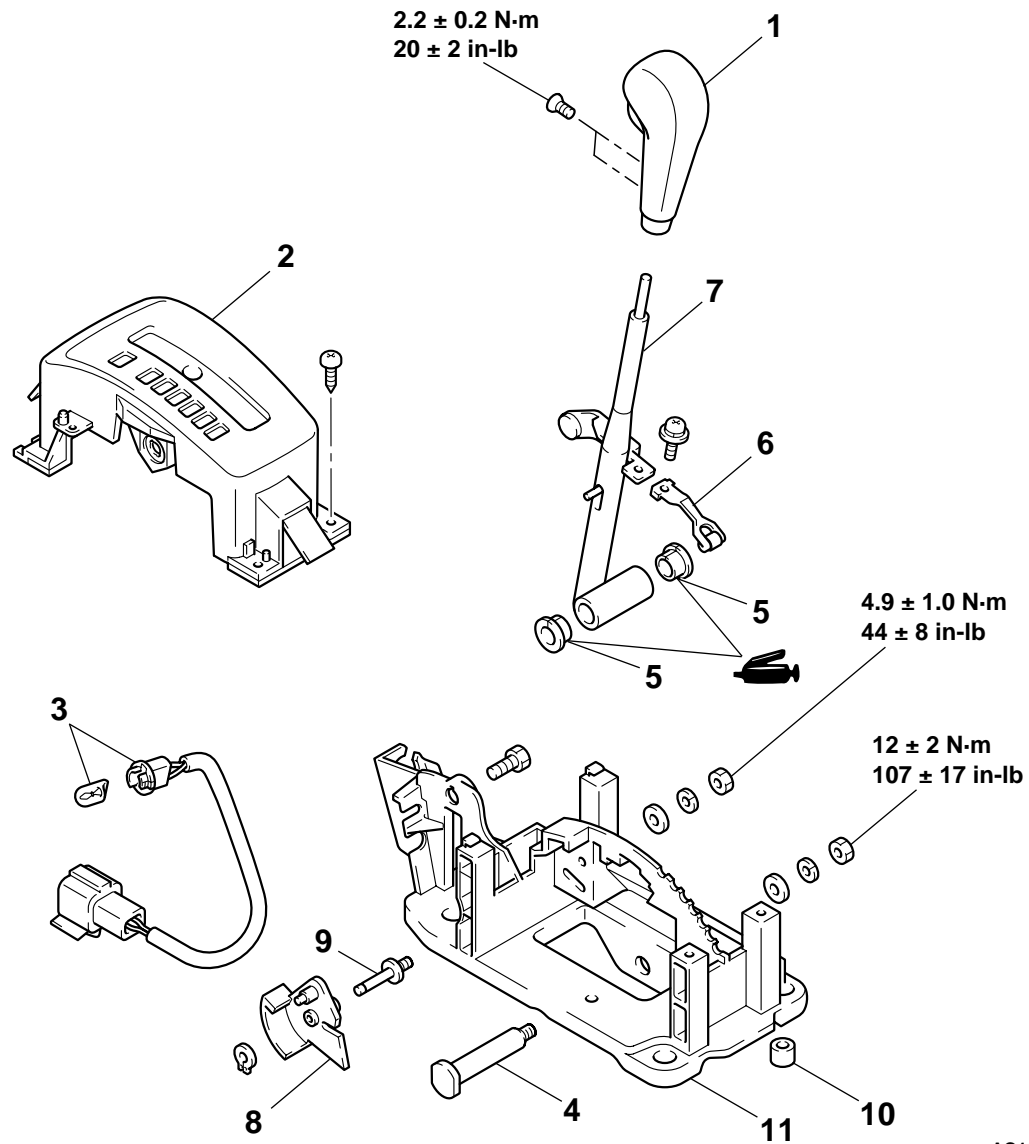
**INSPECTION**

Check the cable assembly for function and for damage.

M1231030000050

DISASSEMBLY AND ASSEMBLY

M1231006800233



AC100059AB

REMOVAL STEPS

1. SHIFT KNOB
2. INDICATOR PANEL ASSEMBLY
3. POSITION ILLUMINATION LIGHT ASSEMBLY
4. BOLT
5. BUSHING

REMOVAL STEPS (Continued)

6. DETENTE SPRING
7. LEVER SUB ASSEMBLY
8. LOCK CAM
9. LOCK CAM PIN
10. COLLAR
11. BASE BRACKET

A/T KEY INTERLOCK AND SHIFT LOCK MECHANISMS

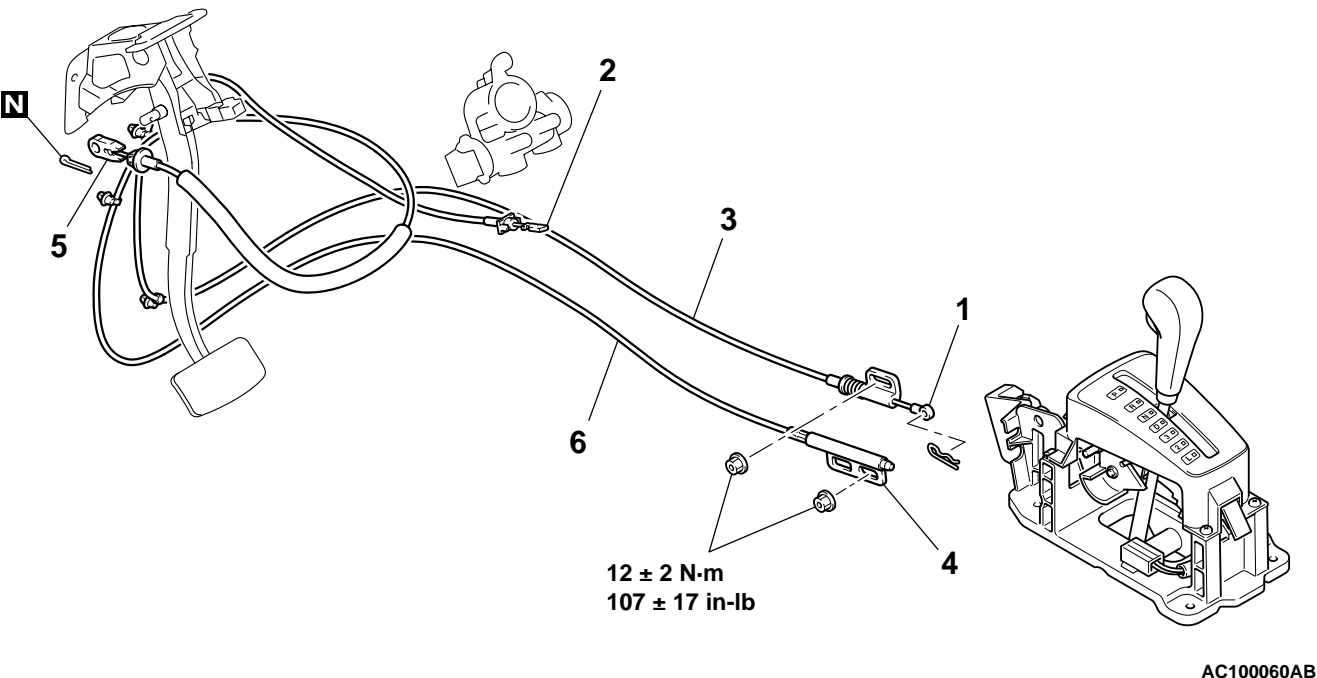
REMOVAL AND INSTALLATION

M1232001200262

CAUTION

When removing and installing the transaxle control cable and shift lock cable unit, be careful not to hit the SRS-ECU.

Pre-removal and Post-installation Operation
Floor Console Removal and Installation (Refer to GROUP 52A, Floor Console [P.52A-7.](#))



KEY INTERLOCK CABLE REMOVAL STEPS

- >>C<< 1. KEY INTERLOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
- UNDER COVER (REFER TO GROUP 52A, INSTRUMENT PANEL ASSEMBLY [P.52A-2.](#))
- <<A>> >>B<< 2. KEY INTERLOCK CABLE CONNECTION (STEERING LOCK CYLINDER SIDE)
3. KEY INTERLOCK CABLE

SHIFT LOCK CABLE REMOVAL STEPS

- >>A<< 4. SHIFT LOCK CABLE CONNECTION (SELECTOR LEVER SIDE)
- UNDER COVER (REFER TO GROUP 52A, INSTRUMENT PANEL ASSEMBLY [P.52A-2.](#))
5. SHIFT LOCK CABLE CONNECTION (BRAKE PEDAL SIDE)
6. SHIFT LOCK CABLE

REMOVAL SERVICE POINT

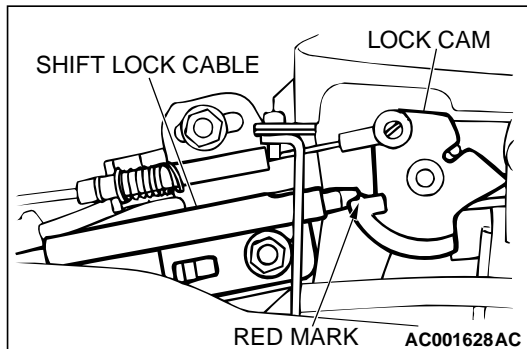
<<A>> KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

Turn the ignition key to the "LOCK" (OFF) position and pull out the key interlock cable.

INSTALLATION SERVICE POINTS

>>A<< SHIFT LOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Shift the selector lever in the "P" position.
2. Fasten the shift lock cable at the position where the end of the shift lock cable is positioned above the red marking on the lock cam.
3. Check the operation of the selector lever. (Refer to [P.23Aa-22.](#))



>>B<< KEY INTERLOCK CABLE (STEERING LOCK CYLINDER SIDE) INSTALLATION

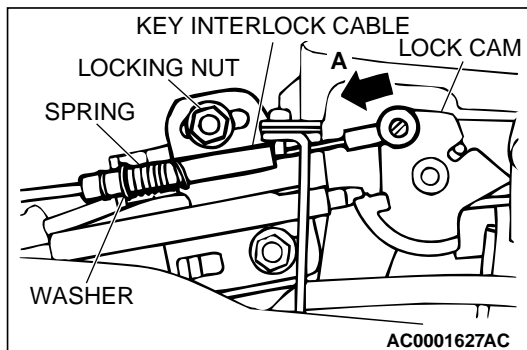
Turn the ignition key to the "LOCK" (OFF) position and install the key interlock cable.

>>C<< KEY INTERLOCK CABLE (SELECTOR LEVER SIDE) INSTALLATION

1. Shift the selector lever to the "P" position.
2. Turn the ignition key to the "LOCK" (OFF) position.
3. Slide the washer and spring toward the lock cam, insert the cable into the stand off bracket and release the spring.
4. Lightly push the key interlock cable into the key interlock cable housing toward the arrow (A) direction until the cable movement stops and the cable end eye is aligned with the shaft on the lock cam. Tighten the locking nut. Snap the cable end eye onto the shaft of the lock cam.

Tightening torque: 12 ± 2 N·m (107 ± 17 in·lb)

5. Check the operation of the selector lever. (Refer to [P.23Aa-22.](#))



INSPECTION

Check the cable assembly for function and for damage.

M1231030000061

TRANSAXLE ASSEMBLY

REMOVAL AND INSTALLATION

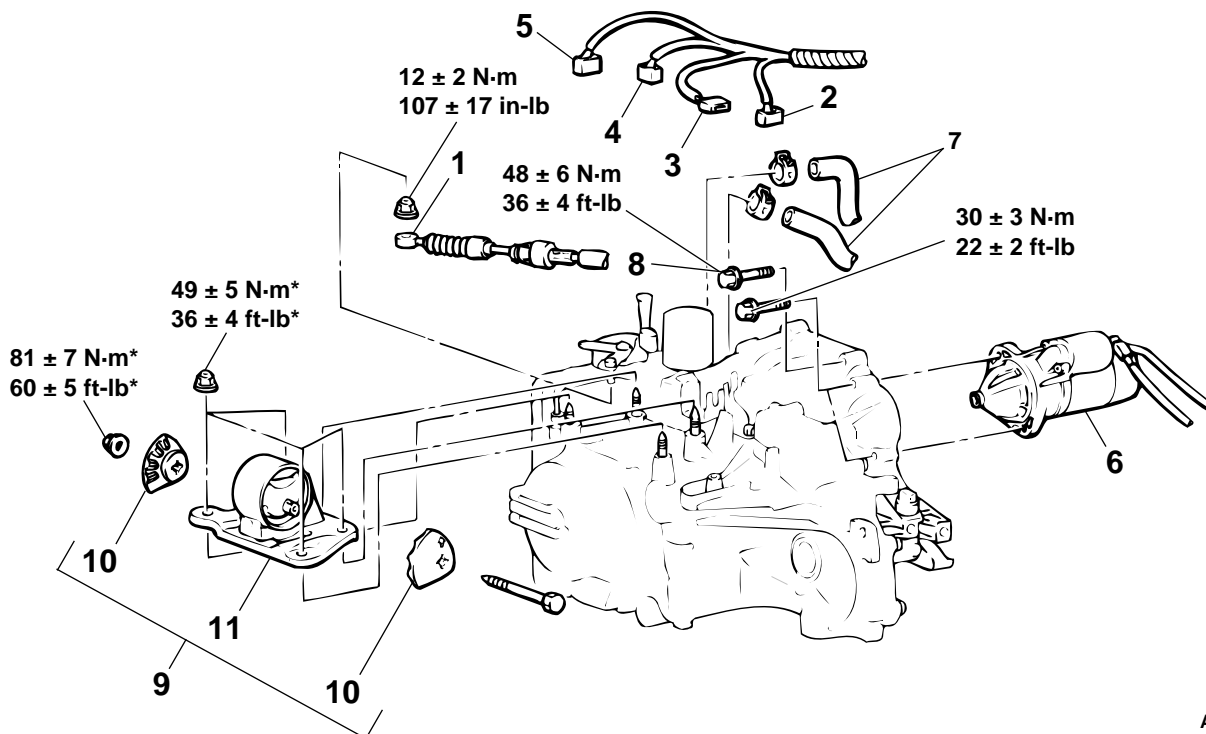
M1231005700222

CAUTION

* : Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle horizontally and loading the full weight of the engine on the vehicle body.

Pre-removal and Post-installation Operation

- Under Cover Removal and Installation
- Engine Coolant Draining and Supplying (Refer to GROUP 14, On-vehicle Service [P.14-22.](#))
- A/T Fluid Draining and Supplying (Refer to GROUP 00, Maintenance Service – Automatic Transaxle [P.00-43.](#))
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15, Exhaust Pipe and Main Muffler [P.15-9.](#))
- Battery and Battery Tray Removal and Installation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15, Air Cleaner [P.15-4.](#))
- Selector Lever Operation Check <Post-installation Only> (Refer to [P.23Aa-22.](#))
- Speedometer Operation Check <Post-installation Only> (Refer to GROUP 54A, Combination Meter – On-vehicle Service – Speedometer Check [P.54A-39.](#))
- Front Wheel Alignment Check and Adjustment <Post-installation Only> (Refer to GROUP 33, On-vehicle Service – Front Wheel Alignment Check and Adjustment [P.33A-6.](#))



AC104047AB

REMOVAL STEPS

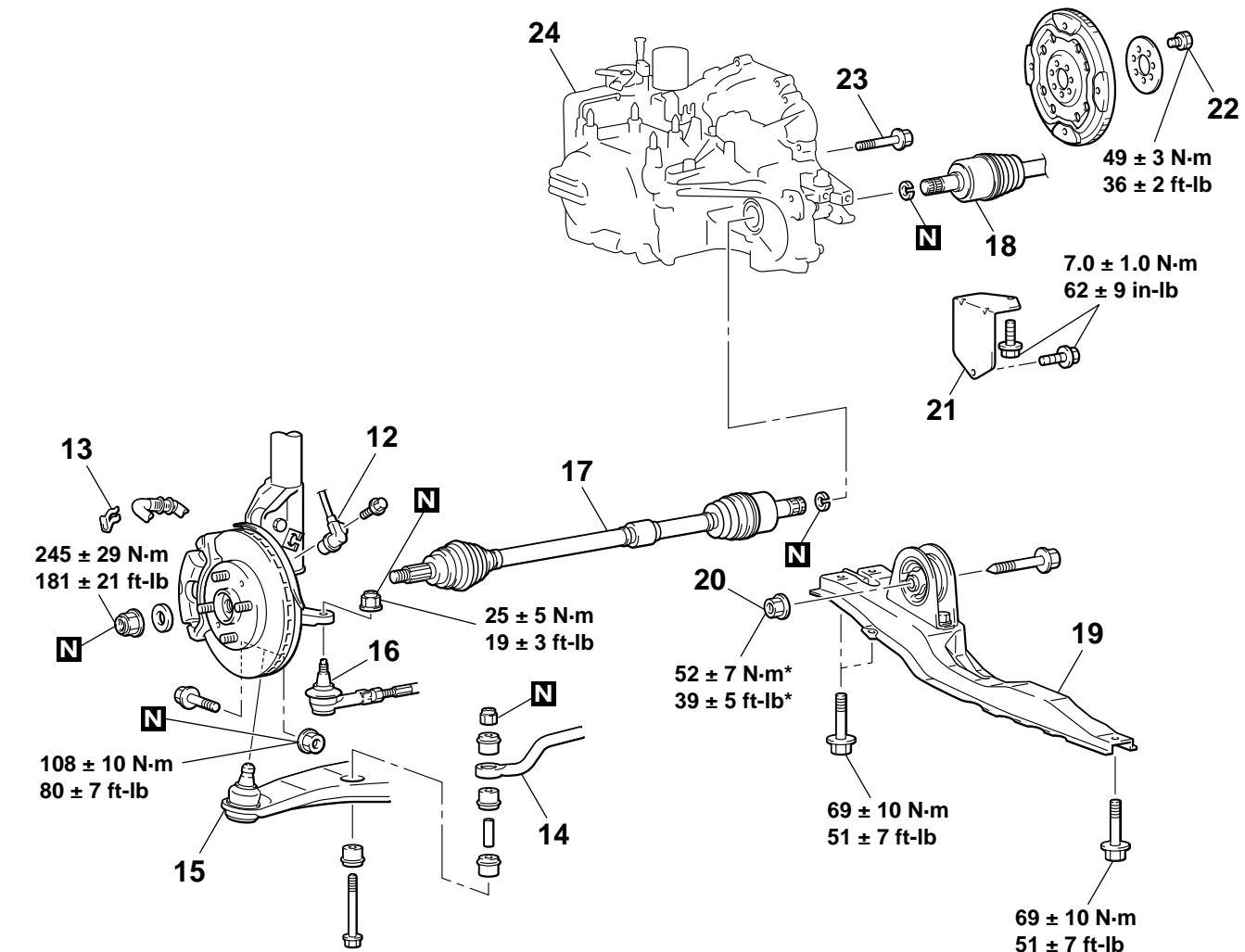
1. TRANSAXLE CONTROL CABLE CONNECTION <<A>>
2. INPUT SHAFT SPEED SENSOR CONNECTOR
3. OUTPUT SHAFT SPEED SENSOR CONNECTOR >>D<<
4. INHIBITOR SWITCH SENSOR CONNECTOR <>
5. A/T CONTROL SOLENOID VALVE ASSEMBLY CONNECTOR

REMOVAL STEPS (Continued)

6. STARTER MOTOR
7. TRANSAXLE OIL COOLER HOSE
8. TRANSAXLE ASSEMBLY UPPER PART COUPLING BOLTS
9. TRANSAXLE MOUNT ASSEMBLY
10. TRANSAXLE MOUNT STOPPER
11. TRANSAXLE MOUNT BRACKET
- ENGINE ASSEMBLY SUPPORT

⚠ CAUTION

*: Indicates parts which should be temporarily tightened, and then fully tightened after placing the vehicle on the ground and loading the full weight of the engine on the vehicle body.



AC100062AC

REMOVAL STEPS

- LIFTING UP OF THE VEHICLE
- 12. SPEED SENSOR
- 13. BRAKE HOSE CLAMP
- >>C<< 14. STABILIZER BAR
- 15. LOWER ARM
- <<C>> 16. TIE ROD END
- <<D>> >>B<< 17. DRIVESHAFT <LH>
- <<D>> >>B<< 18. DRIVESHAFT <RH>
- 19. CENTERMEMBER ASSEMBLY

REMOVAL STEPS (Continued)

- 20. FRONT ROLL STOPPER INSTALLATION BOLT
- 21. COVER
- SUPPORT THE TRANSAXLE WITH A TRANSAXLE JACK
- 22. DRIVE PLATE BOLTS
- 23. TRANSAXLE ASSEMBLY LOWER PART COUPLING BOLTS
- >>A<< 24. TRANSAXLE ASSEMBLY

Required Special Tools:

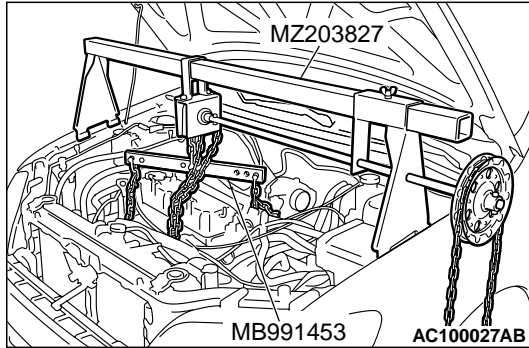
- MB990241: Axle shaft puller (MB990244: Puller shaft, MB990242: Puller bar)
- MB990767: End yoke holder
- MB990998: Front hub remover and installer
- MB991453: Engine Hanger Assembly
- MB991454: Engine Hanger Balancer (a part of MB991453 Engine Hanger Assembly)
- MB991895: Engine Hanger
- MB991897: Ball Joint Remover
- MZ203827: Engine Lifter

REMOVAL SERVICE POINTS**<<A>> STARTER MOTOR REMOVAL**

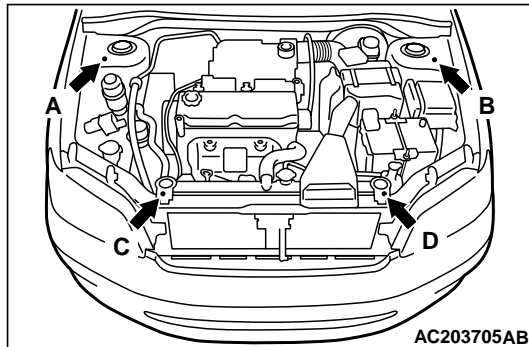
Remove the starter motor with the starter motor harness still connected, and secure it inside the engine compartment away from the engine.

<> ENGINE ASSEMBLY SUPPORTING**1. <Engine lifter MZ2073827 is used>**

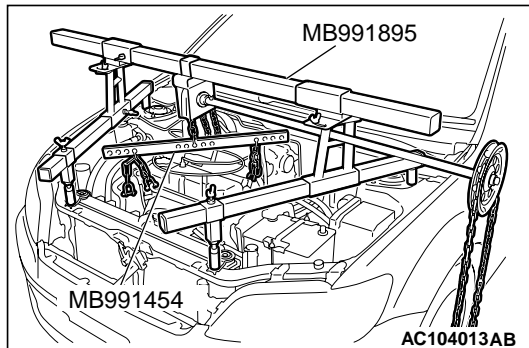
Set special tools MB991453 and MZ203827 to the vehicle to support the engine assembly.

**2. <Engine hanger MB991895 is used>**

(1) Set special tool MB991895 to the strut assembly mounting nuts (A and B) and the radiator support upper insulator mounting bolts (C and D), which are located in the engine compartment, as shown.



(2) Set special tool MB991454 to hold the engine/transaxle assembly.

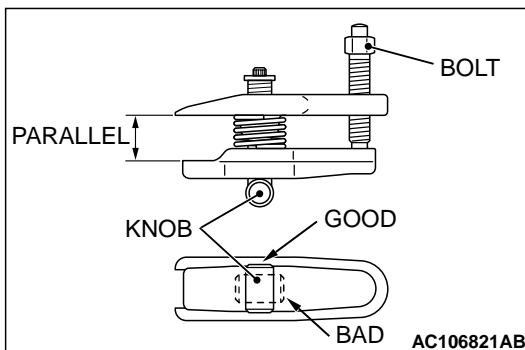
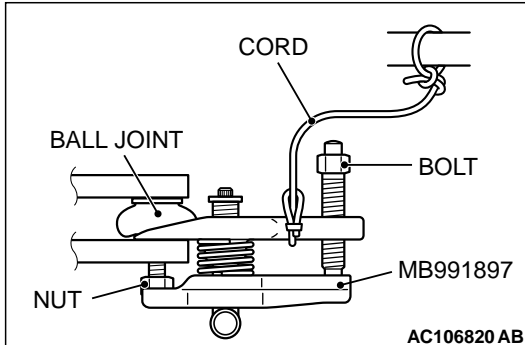


<<C>> TIE ROD END/LOWER ARM DISCONNECTION

⚠ CAUTION

- Do not remove the nut from ball joint. Loosen it and use special tool MB991897 to avoid possible damage to ball joint threads.
- Hang special tool MB991897 with cord to prevent them from falling.

1. Install the special tool MB991897 as shown in the figure.

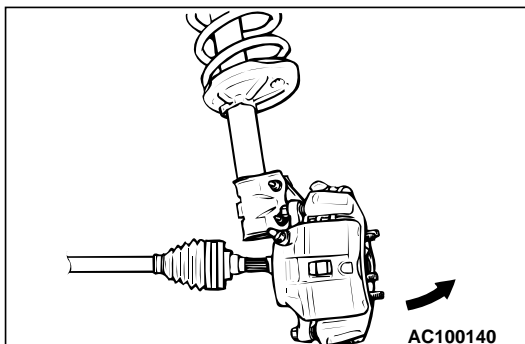
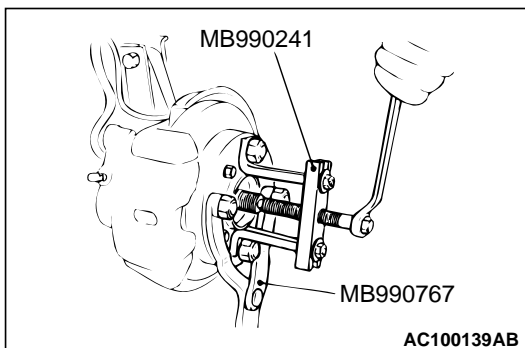


2. After turning the bolt and knob to adjust the insert arms of the special tool MB991897 in parallel, tighten the bolt by hand and confirm that the insert arms are parallel.

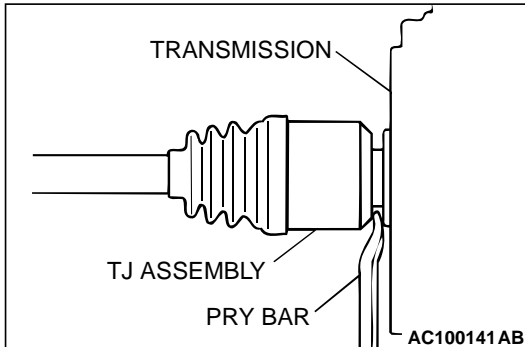
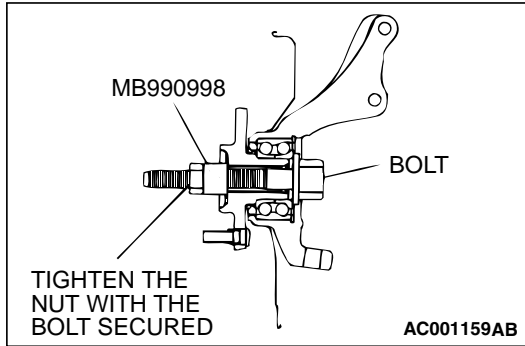
NOTE: When adjusting the insert arms in parallel, turn the knob in the direction shown in the figure.

<<D>> DRIVESHAFT REMOVAL

1. Use special tools MB990241 and MB990767 to push out the driveshaft from the hub.



2. While pulling the lower side of the rotor toward you, remove the driveshaft from the hub.



⚠ CAUTION

- Always use a lever when pulling out the driveshaft from RJ assembly as tugging may damage the TJ assembly.
- Care must be taken to ensure that the oil seal of the transaxle is not damaged by the spline part of the driveshaft.
- Do not apply the vehicle weight to the wheel bearing while loosening the driveshaft nut. If, however, the vehicle weight must be applied to the bearing (in order to move the vehicle), temporarily secure the wheel bearing by using special tool MB990998.

3. Insert a pry bar between the transaxle case and the driveshaft, and then pry the driveshaft from the transaxle.

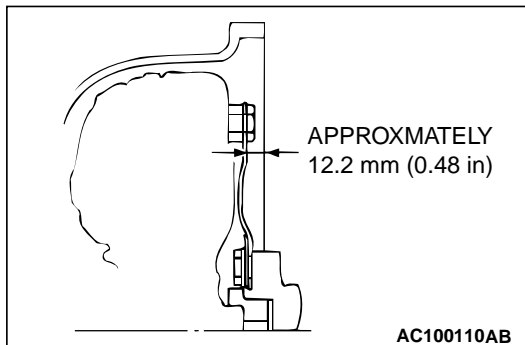
<<E>> DRIVE PLATE COUPLING BOLTS REMOVAL

1. Remove the drive plate coupling bolts while turning the crank shaft.
2. Pry the torque converter towards the transaxle side. Remove the torque converter with the transaxle.

INSTALLATION SERVICE POINTS

>>A<< TRANSAXLE ASSEMBLY INSTALLATION

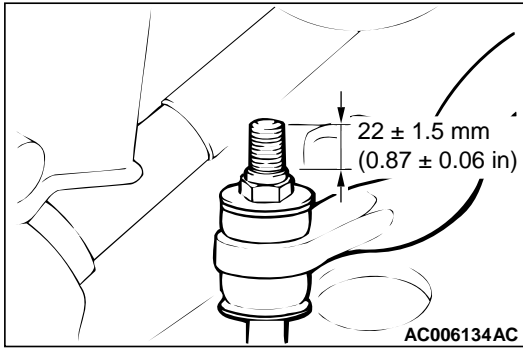
Inserting the torque converter into the transaxle oil pump so that the shown dimension is approximately 12.2 mm (0.48 inch). Install the transaxle assembly to the engine.



>>B<< DRIVESHAFT INSTALLATION

⚠ CAUTION

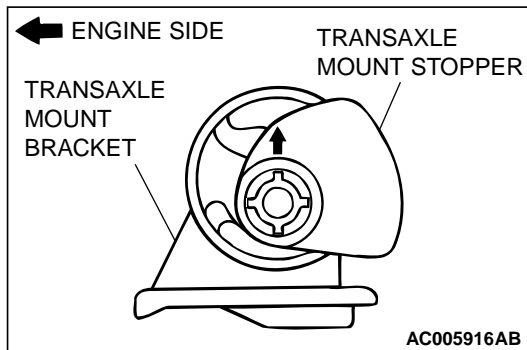
Care must be taken to ensure that the oil seal of the transaxle is not damaged by the spline part of the driveshaft.



>>C<< TRANSAXLE MOUNT STOPPER INSTALLATION

Tighten the self-locking nut so that the stabilizer bar mounting bolt protrudes as shown.

Standard value: 22 ± 1.5 mm (0.87 ± 0.06 inch)



>>D<< TRANSAXLE MOUNT STOPPER INSTALLATION

Install the transaxle mount stopper so that the arrow mark points as shown in the illustration.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

M1231012400171

ITEM	SPECIFICATION
Key interlock and shift lock mechanisms	
Key interlock cable attaching nut	12 ± 2 N·m (107 ± 17 in-lb)
Shift lock cable attaching nut	12 ± 2 N·m (107 ± 17 in-lb)
Transaxle assembly	
Automatic transmission fluid drain plug	32 ± 2 N·m (24 ± 1 ft-lb)
Cover attaching bolt	7.0 ± 1.0 N·m (62 ± 9 in-lb)
Center member attaching bolt	69 ± 10 N·m (51 ± 7 ft-lb)
Drive plate bolt	49 ± 3 N·m (36 ± 2 ft-lb)
Driveshaft connecting nut	245 ± 29 N·m (181 ± 21 ft-lb)
Front roll stopper bracket retainer nut	52 ± 7 N·m (39 ± 5 ft-lb)
Lower arm nut connecting nut	108 ± 10 N·m (80 ± 7 ft-lb)
Starter motor attaching bolt	30 ± 3 N·m (22 ± 2 ft-lb)
Tie rod end nut connecting bolt	25 ± 5 N·m (19 ± 3 ft-lb)
Transaxle assembly upper part coupling bolt	48 ± 6 N·m (36 ± 4 ft-lb)
Transaxle control cable connecting nut	12 ± 2 N·m (107 ± 17 in-lb)
Transaxle mount bracket attaching nut	49 ± 5 N·m (36 ± 4 ft-lb)
Transaxle mount stopper attaching nut	81 ± 7 N·m (60 ± 5 ft-lb)

ITEM	SPECIFICATION
Transaxle control	
Bolt attaching nut	12 ± 2 N·m (107 ± 17 in-lb)
Key inter lock cable attaching nut	12 ± 2 N·m (107 ± 17 in-lb)
Lock cam pin attaching nut	4.9 ± 1.0 N·m (44 ± 8 in-lb)
Park/Neutral position switch mounting bolt	11 ± 1 N·m (96 ± 8 in-lb)
Shift knob attaching screw	2.2 ± 0.2 N·m (20 ± 2 in-lb)
Selector lever assembly attaching bolt	12 ± 2 N·m (102 ± 22 in-lb)
Shift lock cable attaching nut	12 ± 2 N·m (107 ± 17 in-lb)
Transaxle control cable attaching bolt	12 ± 2 N·m (107 ± 17 in-lb)
Transaxle control cable connecting nut	12 ± 2 N·m (107 ± 17 in-lb)

SERVICE SPECIFICATIONS

M1231000300177

ITEM	STANDARD VALUE
A/T fluid temperature sensor k Ω	at 0°C (32°F)
	at 20°C (68°F)
	at 40°C (104°F)
	at 60°C (140°F)
	at 80°C (176°F)
	at 100°C (212°F)
Line pressure MPa (psi)	1.01 – 1.05 (147 – 152)
Protruding length of stabilizer bar mounting bolt mm (in)	22 ± 1.5 (0.87 ± 0.06)
Resistance of torque converter clutch control solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of low-reverse solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of overdrive solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of second solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Resistance of underdrive solenoid valve coil [at 20°C (68°F)] Ω	2.7 – 3.4
Stall speed r/min	2,100 – 2,600

LUBRICANT

M1231000400237

ITEM	SPECIFIED LUBRICANT	QUANTITY
A/T fluid dm ³ (qt)	DIAMOND ATF SP III or equivalent	7.7 (8.1)