GROUP 23

AUTOMATIC TRANSAXLE

CONTENTS

GENERAL DESCRIPTION

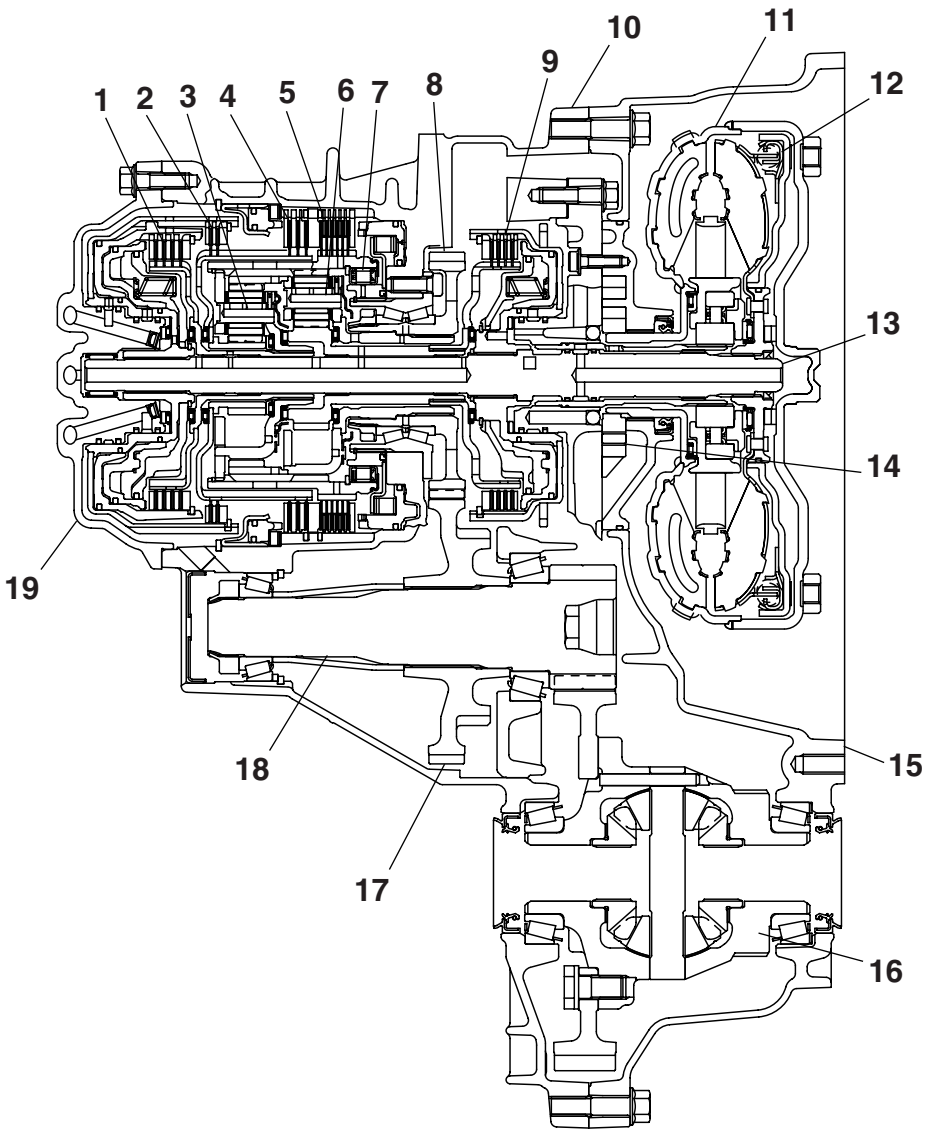
M2230000100418

For the automatic transaxles, the 4A/T F4A4B type is used for the 2.4L engine, and 5A/T F5A5A type for the 3.8L engine.

SPECIFICATIONS

ITEM		SPECIFICATION	
Transaxle model		F4A4B-4-L3Z	F5A5A-4-C1Z
Engine		2.4L engine	3.8L engine
Torque converter	Type	3-element, 1-stage, 2-phase type	
	Lock-up	Provided	
	Stall torque ratio	1.9	1.7
	Application	3rd, 4th	4th, 5th
Transaxle type		4 forward speeds, 1 reverse speed, fully automatic	5 forward speeds, 1 reverse speed, fully automatic
Transaxle gear ratio	1st	2.842	3.789
	2nd	1.573	2.162
	3rd	1.000	1.421
	4th	0.688	1.000
	5th	–	0.686
	Reverse	2.214	3.117
Final reduction ratio (Differential gear ratio)		4.212	3.325
Clutch		Multi-disc type 3 sets	Multi-disc type 4 sets
Brake		Multi-disc type 2 sets	Multi-disc type 2 sets, band type 1 set
Manual control system		P-R-N-D (4 position) + Sport mode (up, down)	
Shift pattern control		Electronic control (INVECS - II)	
Hydraulic control during shifting		Electronic control (Each clutch hydraulically independently controlled)	
Torque converter clutch control		Electronic control	
Transmission fluid	Specified lubricants	DIAMOND ATF SP III	
	Quantity dm^3 (qt)	7.7 (8.1)	8.4 (8.9)

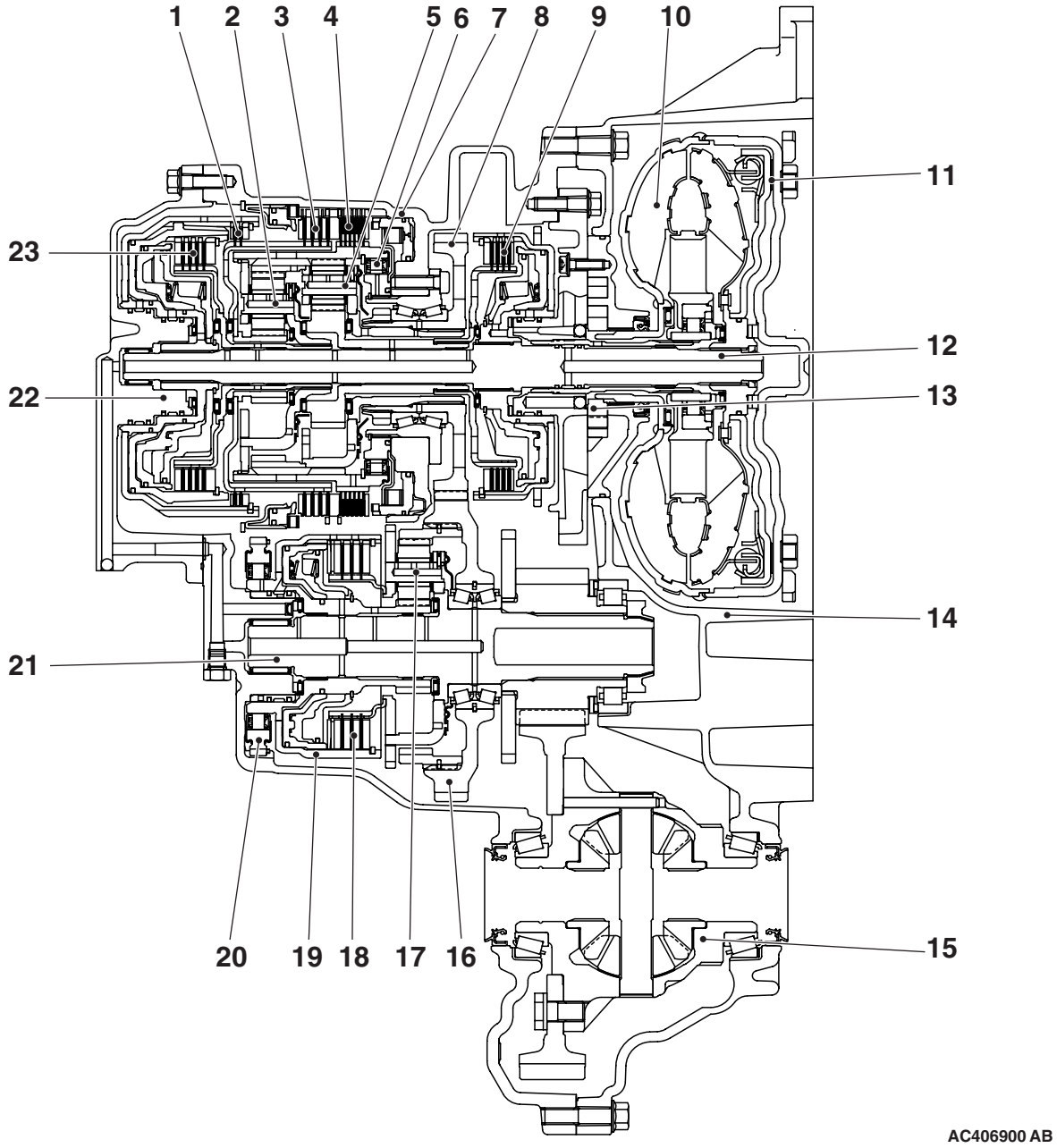
SECTIONAL VIEW <4A/T>



AC305544AC

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-L
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

SECTIONAL VIEW <5A/T>



1. REVERSE CLUTCH
2. OVERDRIVE PLANETARY CARRIER
3. SECOND BRAKE
4. LOW-REVERSE BRAKE
5. OUTPUT PLANETARY CARRIER
6. ONE-WAY CLUTCH-L
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12. INPUT SHAFT
13. OIL PUMP
14. TORQUE CONVERTER HOUSING
15. DIFFERENTIAL
16. TRANSFER DRIVEN GEAR
17. DIRECT PLANETARY CARRIER
18. DIRECT CLUTCH
19. REDUCTION BRAKE
20. ONE-WAY CLUTCH-D
21. OUTPUT SHAFT
22. REAR COVER
23. OVERDRIVE CLUTCH

CONSTRUCTION AND OPERATION

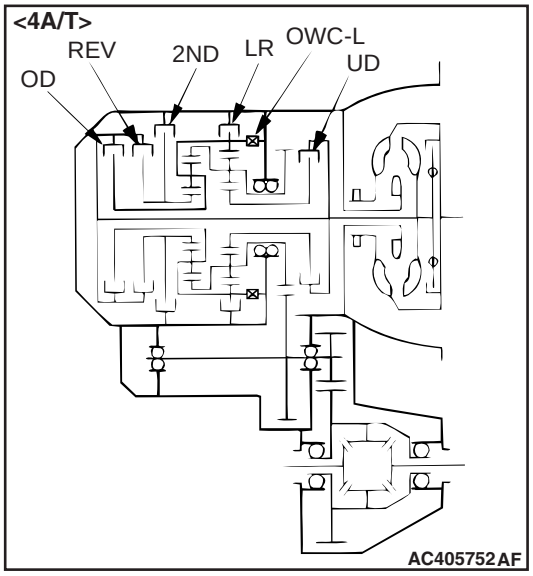
TRANSAXLE

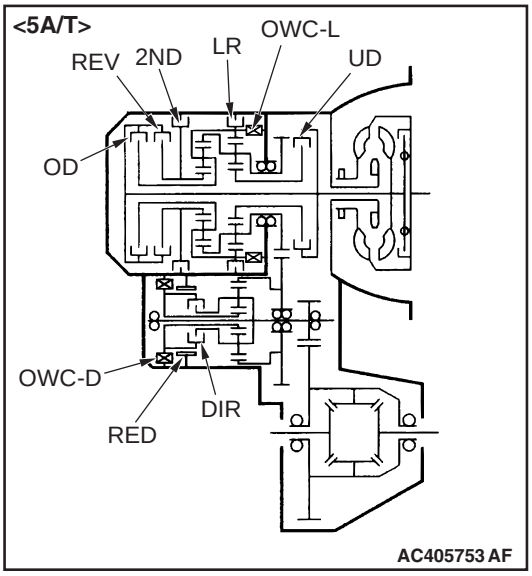
GENERAL DESCRIPTION

M2230000100430

- The transaxle consists of the torque converter and gear train.
- The three-element, one-stage, two-phase type torque converter with a built-in damper clutch has been adopted.
- The gear train of the F4A4B transaxle consists of 3 sets of multi-disc type clutches, 2 sets of multi-disc type brakes, and 2 sets of planetary gears which are composed of a sun gear, carrier, annulus gear, and pinion gear. The gear train of the F5A5A transaxle consists of 4 sets of multi-disc type clutches, 2 sets of multi-disc type brakes, 1 set of band type brake, 1 set of one-way clutch, and 3 sets of planetary gears, which consist of a sun gear, carrier, annulus gear, and pinion.

TRANSAXLE CONFIGURATION DRAWING





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.
Direct clutch <5A/T>	DIR	connects the direct sun gear to the direct 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.
Reduction brake <5A/T>	RED	holds the direct sun gear.
One-way clutch-L	OWC-L	restricts the rotation direction of the low-reverse annulus gear.
One-way clutch-D <5A/T>	OWC-D	controls rotation direction of the direct sun gear.

FUNCTION ELEMENT TABLE <4A/T>

OPERATING ELEMENT / TRANSMISSION RANGE			ENGINE START	PARKING MECHANISM	UNDERDRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	ONE-WAY CLUTCH (OWC-L)
P		Parking	OK	×	–	–	–	×	–	–
R		Reverse	–	–	–	×	–	×	–	–
N		Neutral	OK	–	–	–	–	×	–	–
D	Sport mode	1st	–	–	×	–	–	×*	–	×
		2nd	–	–	×	–	–	–	×	–
		3rd	–	–	×	–	×	–	–	–
		4th	–	–	–	–	×	–	×	–

×: Function element –: Not applicable

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

FUNCTION ELEMENT TABLE<5A/T>

OPERATING ELEMENT / SELECTOR LEVER POSITION			ENGINE START	PARKING MECHA-NISM	UNDER-DRIVE CLUTCH (UD)	REVERSE CLUTCH (REV)	OVER-DRIVE CLUTCH (OD)	DIRECT CLUTCH (DIR)	LOW-REVERSE BRAKE (LR)	SECOND BRAKE (2ND)	REDUC-TION BRAKE (RED)	ONE-WAY CLUTCH (OWC-L)	ONE-WAY CLUTCH (OWC-D)
P		Parking	OK	×	–	–	–	–	×	–	×	–	–
R		Reverse	–	–	–	×	–	–	×	–	×	–	–
N		Neutral	OK	–	–	–	–	–	×	–	×	–	–
D	Sport mode	1st	–	–	×	–	–	–	×*	–	×	×	×
		2nd	–	–	×	–	–	–	–	×	×	–	×
		3rd	–	–	×	–	×	–	–	–	×	–	×
		4th	–	–	×	–	×	×	–	–	–	–	–
		5th	–	–	–	–	×	×	–	×	–	–	–

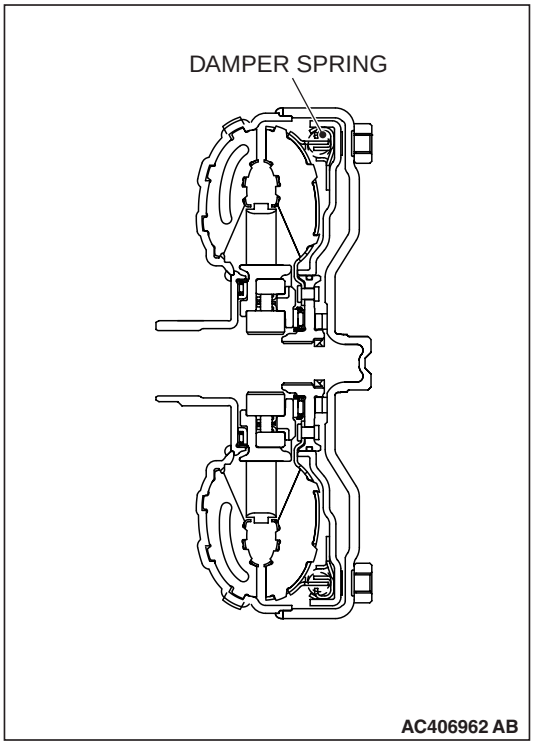
×: Function element –: Not applicable

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

TORQUE CONVERTER

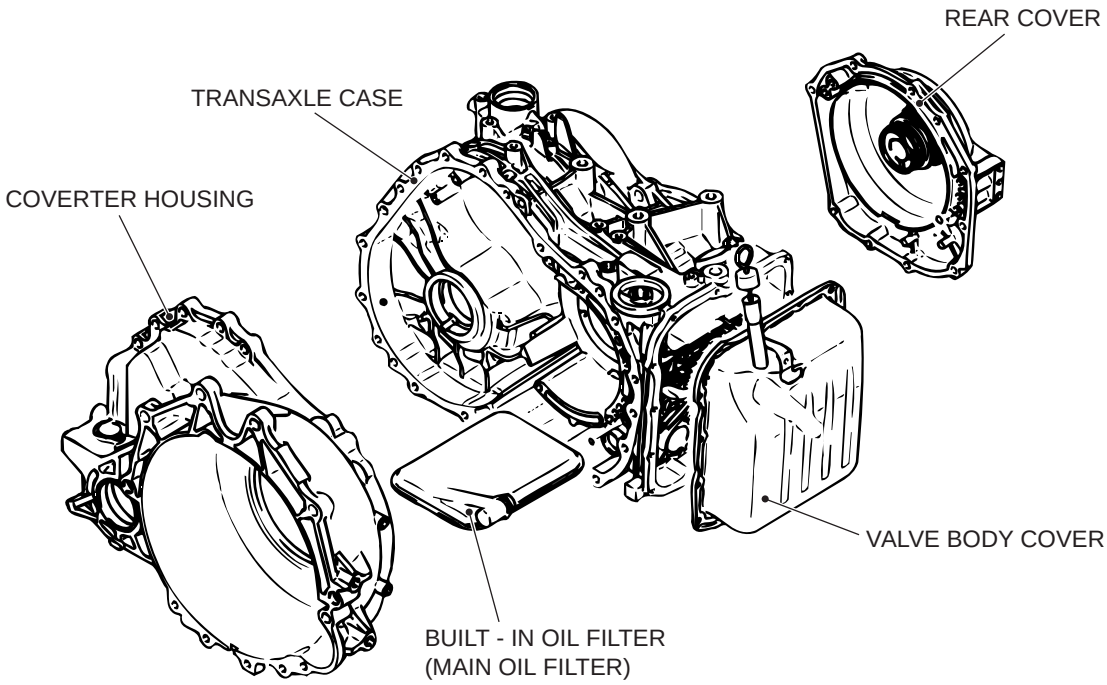
M2230001200021

The torque converter with the damper spring lockup mechanism is used.



TRANSAXLE CASE

M2230001300017



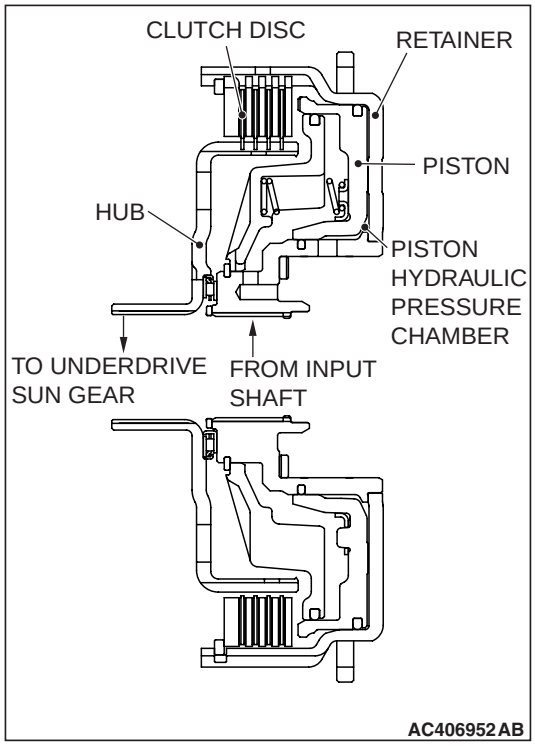
The transaxle case consists of the converter housing, transaxle case, rear cover, and valve body cover. For the converter housing, transaxle case, and rear cover, aluminum die casting reduces the weight. In addition, by reduction and arranging the minimum ribs to the optimum location, the light-weight and high-rigid case has been achieved. Liquid gasket (FIPG) is used on the case mating surfaces. For easier identification, the port name is stamped with raised lettering near the hydraulic check port.

TSB Revision

CLUTCH

M2230001400014

3 sets of multi-disk type clutches are used for the 4A/T shifting mechanism. 4 sets of multi-disk clutches and 1 set of one-way clutch are used for the 5A/T shifting mechanism. The retainer section of each clutch is of precision sheetmetal.

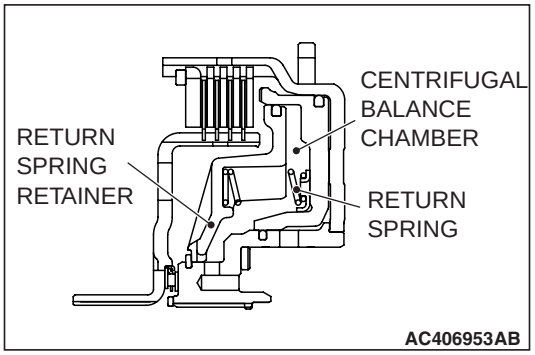


UNDERDRIVE CLUTCH

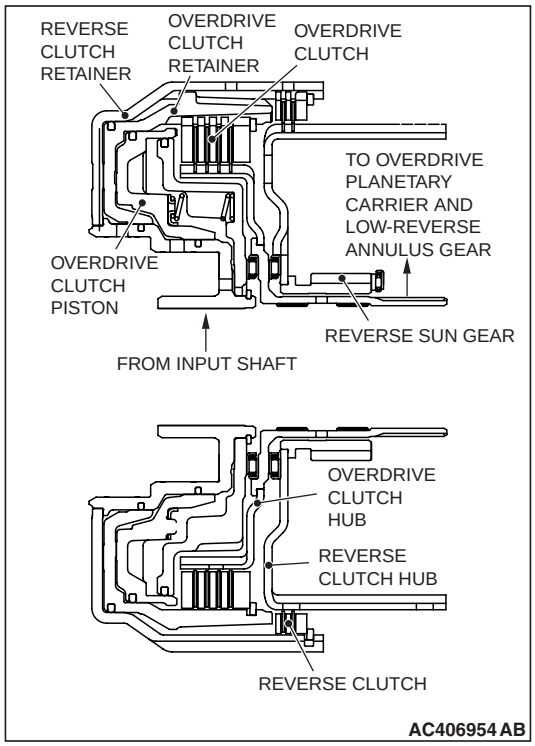
The underdrive clutch operates on 1st, 2nd, 3rd, or 4th <5A/T> gear, and transfers the driving force from the input shaft to the underdrive sun gear. The parts configuration of the underdrive clutch is shown in the figure to the left. The operating hydraulic pressure is applied to the section between the piston and retainer (piston hydraulic pressure chamber) to move the piston so that the piston presses the clutch disk. Thus, the driving force is transferred from the retainer to the hub.

NUMBER OF CLUTCHES

	F4A4B	F5A5A
UD	4	4



During high speeds, the residual oil in the piston hydraulic pressure chamber tries to push the piston because of the centrifugal force. However, because the centrifugal force is also generated to the oil filled between the piston and return spring retainer (centrifugal balance chamber), a force also pushes back the piston. Therefore, both forces are countered, and the piston will not operate.

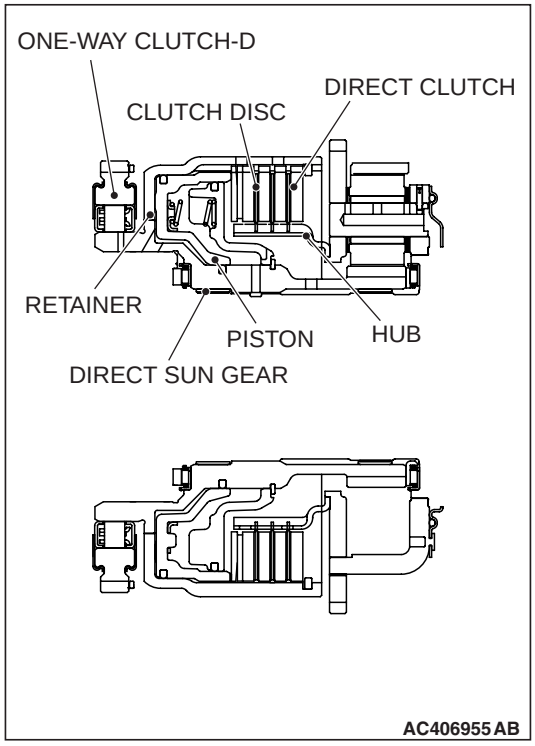


REVERSE CLUTCH, OVERDRIVE CLUTCH

The reverse clutch operates when the vehicle is moving backward, and transfers the driving force from the input shaft to the reverse sun gear. The overdrive clutch operates on 3rd, 4th, or 5th <5A/T> gear, and transfers the driving force from the input shaft to the overdrive planetary carrier and low-reverse annulus gear. The parts configurations of the reverse clutch and overdrive clutch are shown in the figure. The overdrive clutch retainer also works as a reverse clutch piston. The operating hydraulic pressure of the reverse clutch is applied to section between the reverse clutch retainer and overdrive clutch retainer to move the overdrive clutch assembly. Thus, the driving force is transferred from the reverse clutch retainer to the reverse clutch hub. Likewise, the operating hydraulic pressure of the overdrive clutch is applied to the section between the overdrive clutch piston and overdrive clutch retainer, and the driving force is transferred from the overdrive clutch retainer to the overdrive clutch hub. Also, for the both clutches, the centrifugal force influence has been eliminated by the hydraulic pressure balance mechanism.

NUMBER OF CLUTCHES

	F4A4B	F5A5A
REV	2	2
OD	4	4



DIRECT CLUTCH <5A/T>

The direct clutch operates on 4th or 5th gear, and connects the direct planetary carrier and direct sun gear. The parts configuration of the direct clutch is shown in the figure. The operating hydraulic pressure is applied to the section between the piston and retainer to move the piston, so that the piston presses the clutch disk. Thus, the driving force is transferred from the retainer to the hub.

NUMBER OF CLUTCHES

	F5A5A
DIR	3

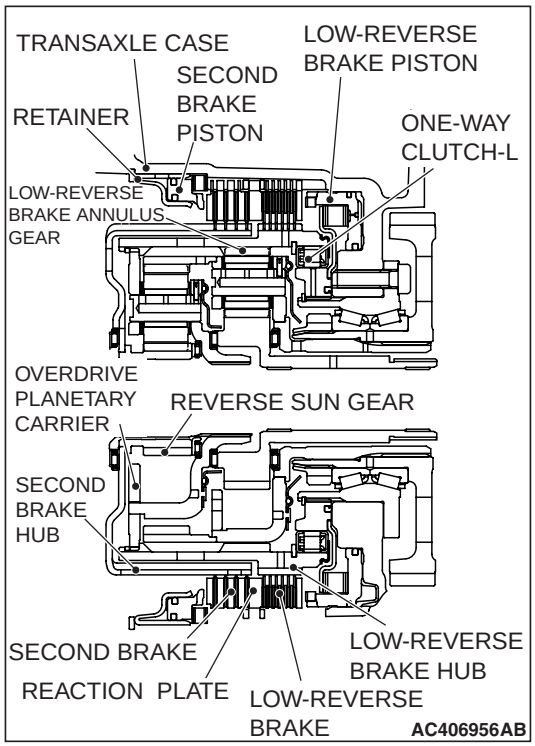
ONE-WAY CLUTCH-D <5A/T>

The one-way clutch-D operates on 1st, 2nd, or 3rd gear, and limits rotation of direct sun gear to one direction.

BRAKE

M2230001900019

For the 4A/T shifting mechanism, 2 sets of multi-disk type brakes are used. For the 5A/T, 2 sets of multi-disk brakes and 1 set of band type brake are used.



LOW-REVERSE BRAKE, SECOND BRAKE

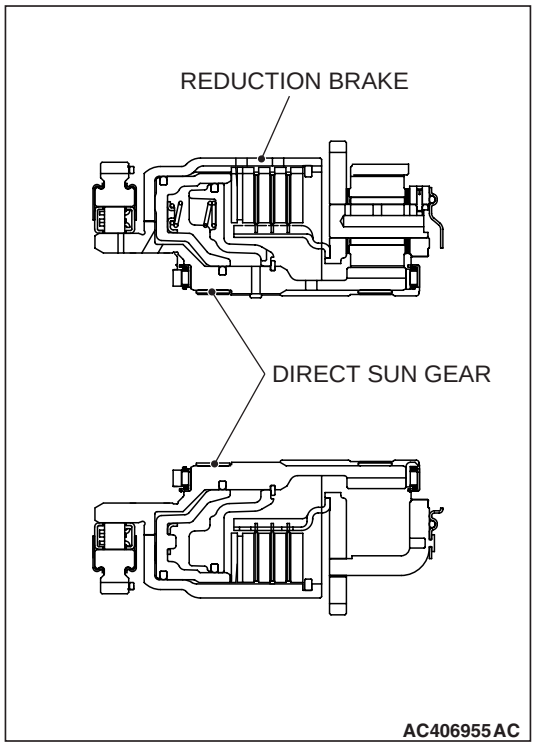
The low-reverse brake operates when the 1st, reverse, parking, or neutral gear is engaged, and fixes the low-reverse brake annulus gear and overdrive planetary carrier to the transaxle case. The second brake operates when the 2nd or 4th (for 5A/T, 2nd or 5th) is engaged, and fixes the reverse sun gear to the transaxle case. The parts configuration of the low-reverse brake is shown in the figure. Each brake disk plate has been positioned to both sides of the reaction plate fixed to the transaxle case with the snap ring. The operating hydraulic pressure of second brake is applied to the section between the retainer and second brake piston to move the second brake piston, generating the force to press the brake disk. Thus, the transaxle case and second brake hub are connected. Likewise, the operating hydraulic pressure of low-reverse brake is applied to the section between the transaxle case and low-reverse brake piston to move the low-reverse brake piston, connecting the transaxle case and low-reverse brake hub. Also, for the return spring of both brakes, the wave type coil spring is used.

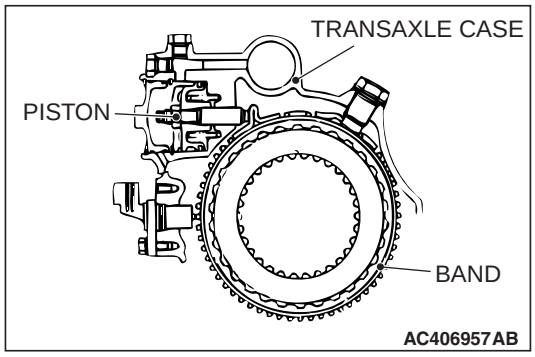
NUMBER OF DISKS

	F4A4B	F5A5A
LR	6	6
2ND	3	4

ONE-WAY CLUTCH-L

The one-way clutch-L operates on 1st gear, and limits rotation of low-reverse brake annulus gear to one direction.





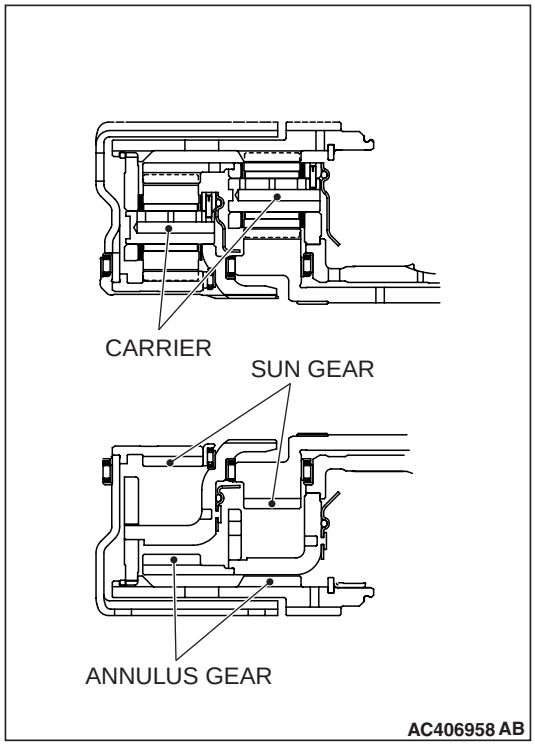
REDUCTION BRAKE <5A/T>

The reduction brake operates when the 1st, 2nd, 3rd, reverse, parking, or neutral gear is engaged, and fixes the direct sun gear to the transaxle case. The parts configuration of the reduction brake is shown in the figure. It has a structure that tightens the band by the piston.

POWER TRAIN

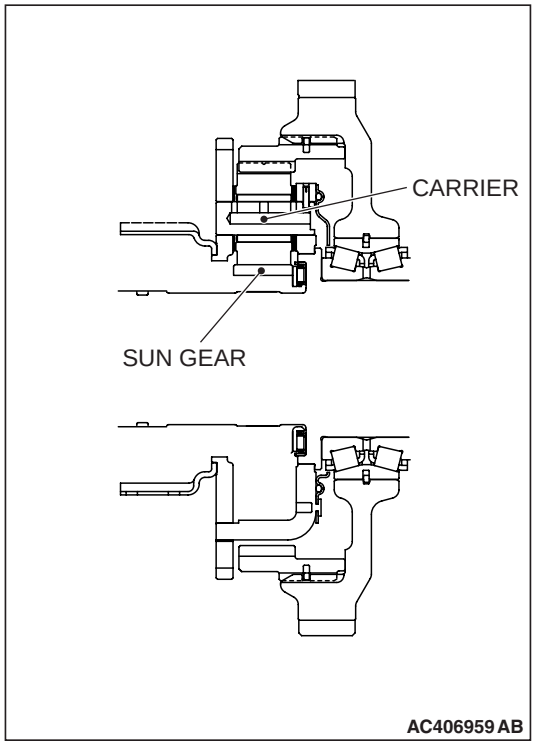
M2230002300010

PLANETARY GEAR SET



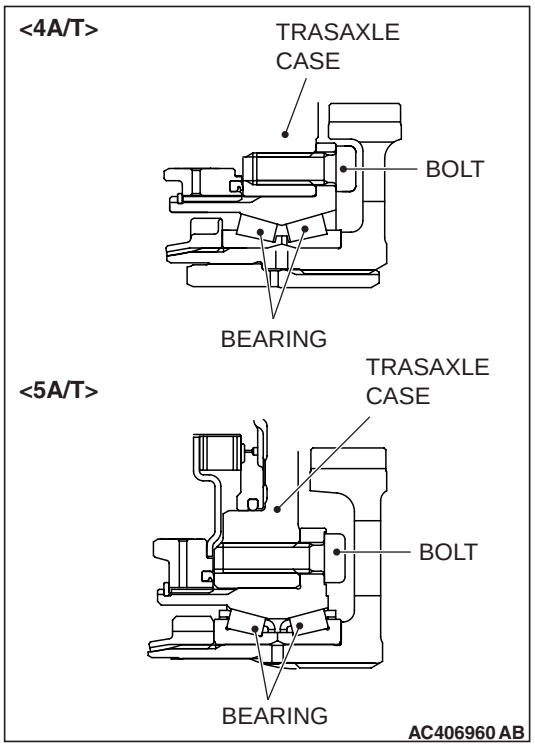
To the input shaft-side, the planetary gear set consists of 2 sets of planetary gears. Carrier and the annulus gear are mechanically connected, and by connecting and fixing the carrier and sun gear, each primary gear ratio is obtained.

DIRECT PLANETARY GEAR <5A/T>



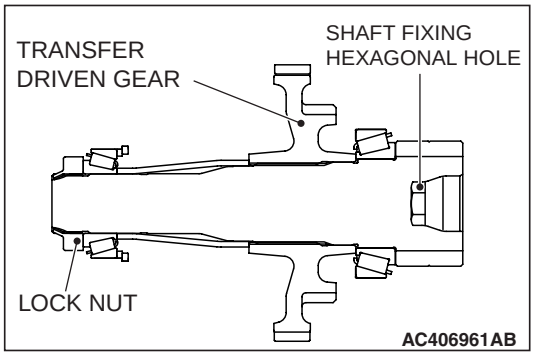
To the output shaft-side, there is 1 set of planetary gear. By connecting and fixing the carrier and sun gear, each secondary gear ratio is obtained.

TRANSFER DRIVE GEAR



The pressurized type bearing supports the transfer drive gear to eliminate looseness. By directly fixing the bearing to the transaxle case with a bolt, the supporting rigidity of gear has been increased. The double taper roller bearing type is used for both 4A/T and 5A/T.

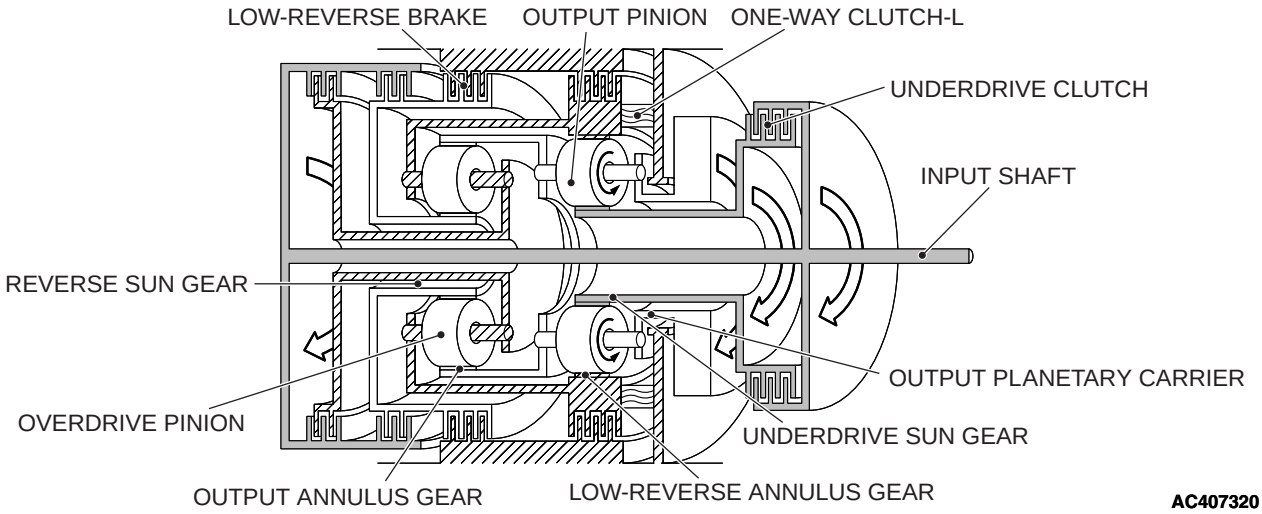
OUTPUT SHAFT/TRANSFER DRIVEN GEAR <4A/T>



As shown in the figure, the output shaft is fixed to the transaxle case by a lock nut with the transfer driven gear press-fitted. The lock nut is a left-hand screw. To hold the shaft during removal, a hexagon hole has been provided to the end face of the opposite side.

POWER FLOW <4A/T>

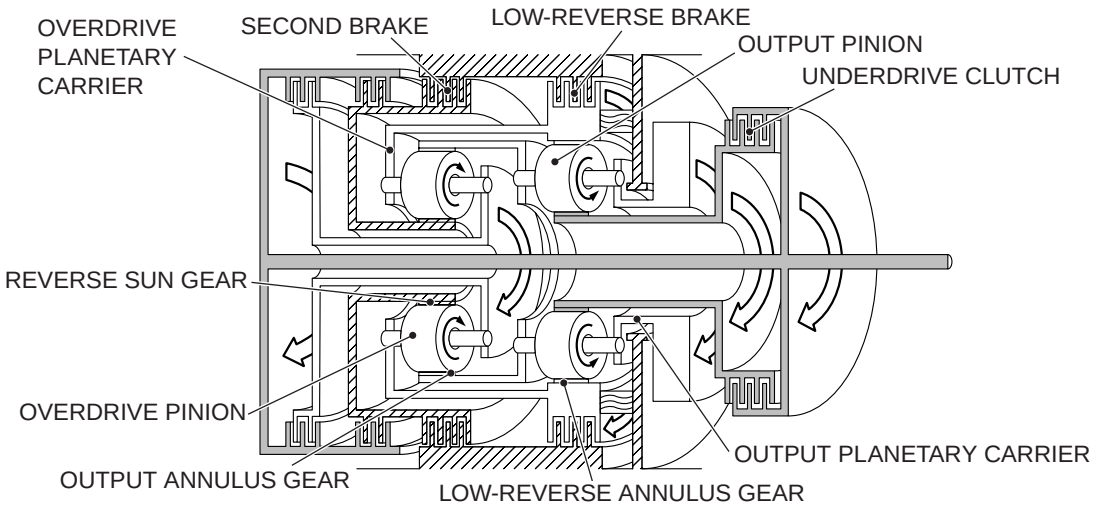
1ST



When the 1st gear is engaged, the underdrive clutch, one-way clutch-L and low-reverse brake are operated. The driving force from the input shaft is transferred to the underdrive sun gear via the underdrive clutch. The driving force transferred to the underdrive sun gear, tries to rotate the low-reverse annulus gear to the left via the output pinion. Also, it tries to rotate the output planetary carrier to the right with the output pinion revolved around the underdrive sun gear. However, because the one-way clutch-L and low-reverse brake* is also operating at this time, the low-reverse annulus gear is fixed, and only the output planetary carrier rotates to the right. Because of this, the gear ratio of 1st gear is obtained. Also, because the output planetary carrier is connected to the output annulus gear, the overdrive pinion is also driven simultaneously. However, because the reverse sun gear rotates independently, it does not affect the output planetary carrier.

*NOTE: *: It is activated only when the vehicle is stopped (vehicle speed: 7 - 8 km/h or less), or when the selector lever position is in Sport Mode.*

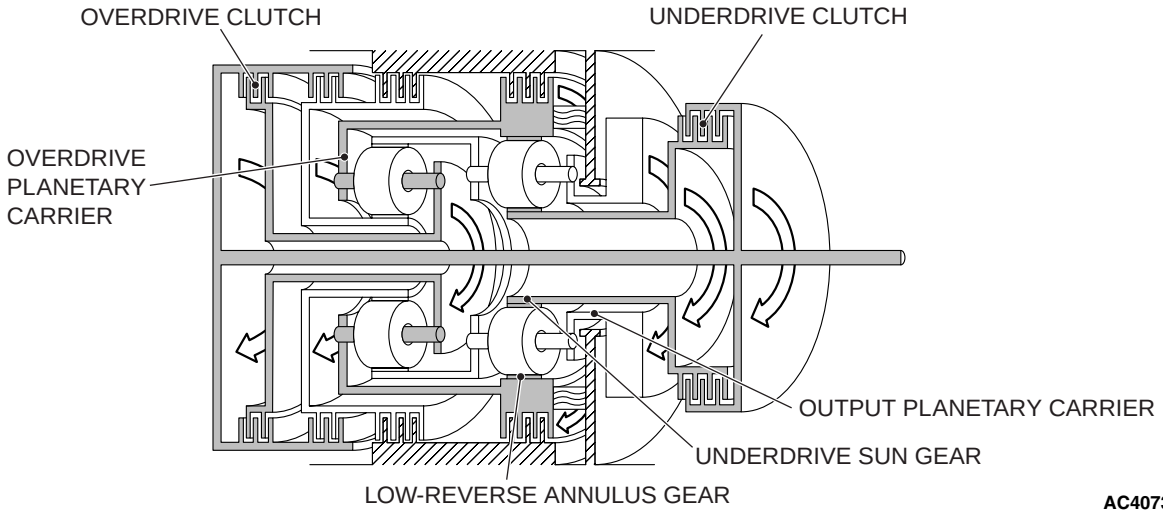
2ND



AC407321AB

When the 2nd gear is engaged, the underdrive clutch and second brake are operated. When the second brake is operated with the 1st gear engaged and the low-reverse brake is released, the reverse sun gear is fixed. Then, the driving force from the output annulus gear rotates the overdrive planetary carrier to the right with the overdrive pinion revolved around the reverse sun gear. Because the overdrive planetary carrier is connected to the low-reverse annulus gear, it also rotates the low-reverse annulus gear to the right. This rotation of low-reverse annulus gear is added to the rotation of output planetary carrier with the 1st gear engaged, and the gear ratio of 2nd gear is obtained.

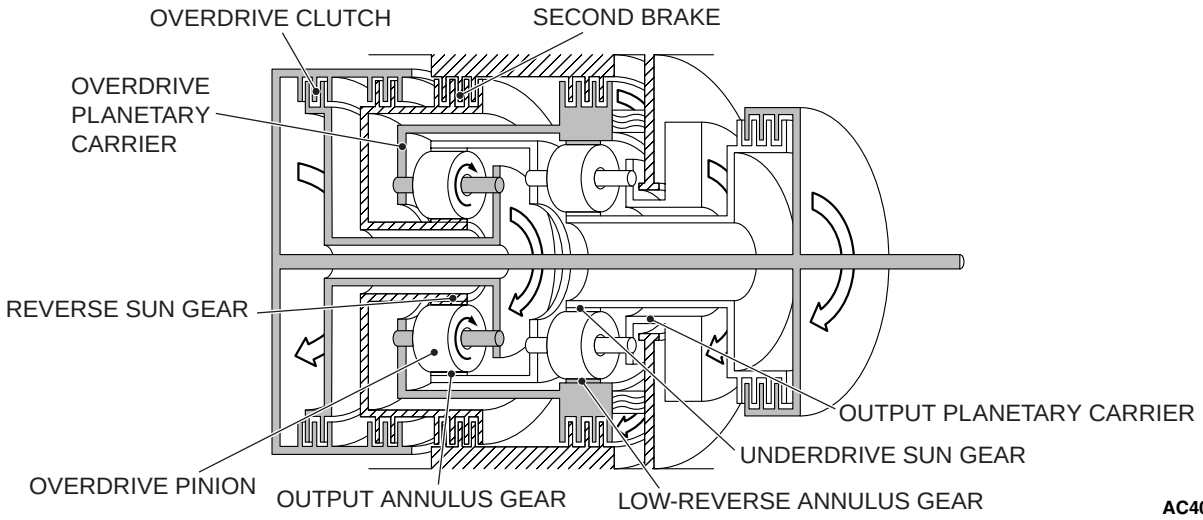
3RD



AC407322AB

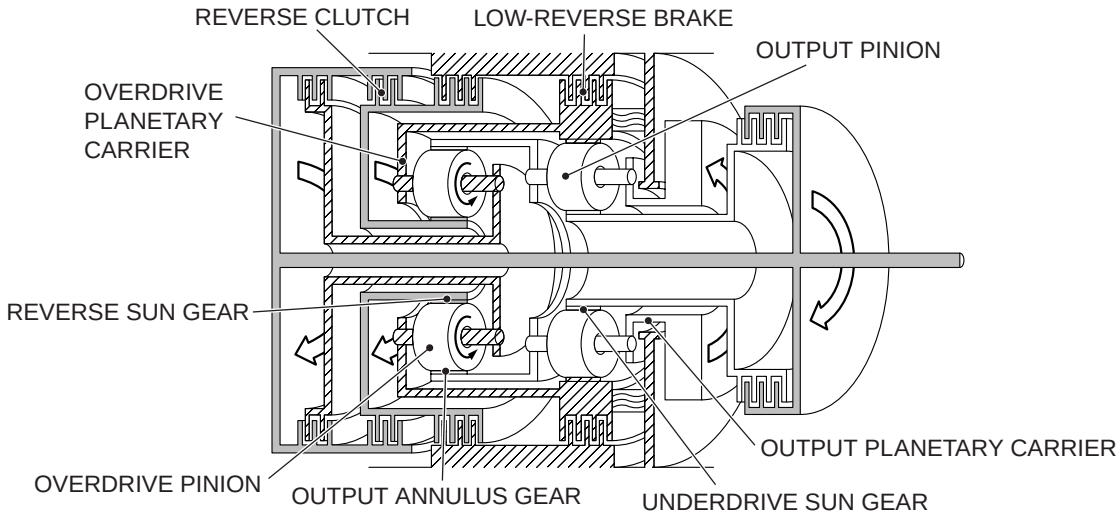
When the 3rd gear is engaged, the underdrive clutch and overdrive clutch are operated. The overdrive clutch connects the input shaft, overdrive planetary carrier, and low-reverse annulus gear. Therefore, the rotation speeds of underdrive sun gear and low-reverse annulus gear which are connected to the input shaft by the underdrive clutch become identical. Then, the planetary carrier set rotates as one locked unit, and the gear ratio of 3rd gear is obtained.

4TH



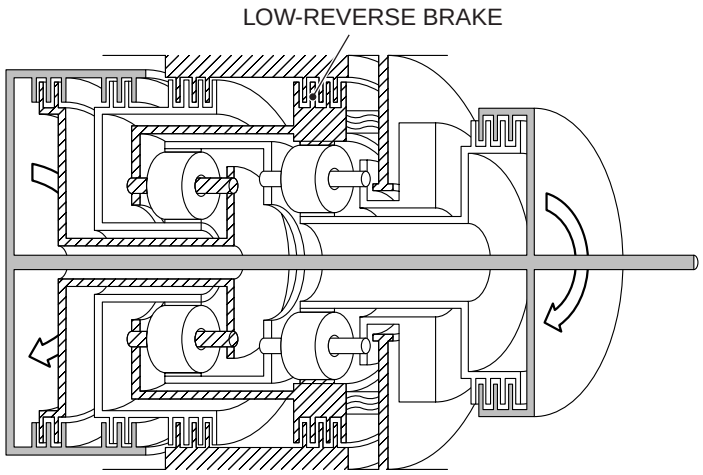
When the 4th gear is engaged, the overdrive clutch and second brake are operated. The driving force from the input shaft is transferred to the overdrive planetary carrier via the overdrive clutch. On the other hand, because the reverse sun gear is fixed by the second brake, the rotation speed transferred to the output annulus gear is the sum of the rotation speed of the overdrive planetary carrier and the number of revolutions of the overdrive pinion around the reverse sun gear. The rotation speed is transferred to the output planetary carrier, and the gear ratio of 4th gear is obtained. Also, at this time, the rotation from the input shaft is transferred to the low-reverse annulus gear. However, the underdrive sun gear rotates independently, and it does not affect the output planetary carrier rotation.

REVERSE



When the reverse gear is engaged, the reverse clutch and low-reverse brake are operated. The driving force from the input shaft is transferred to the reverse sun gear via the reverse clutch. On the other hand, because the overdrive planetary carrier is fixed by the low-reverse brake, the driving force of reverse sun gear is transferred to the output annulus gear as the rotating force to the left direction. This driving force is transferred to the output planetary carrier, and the reverse gear ratio is obtained. Also at this time, the output pinion is driven by the output planetary carrier. However, the underdrive sun gear rotates independently, and it does not affect the output planetary carrier rotation.

PARK OR NEUTRAL

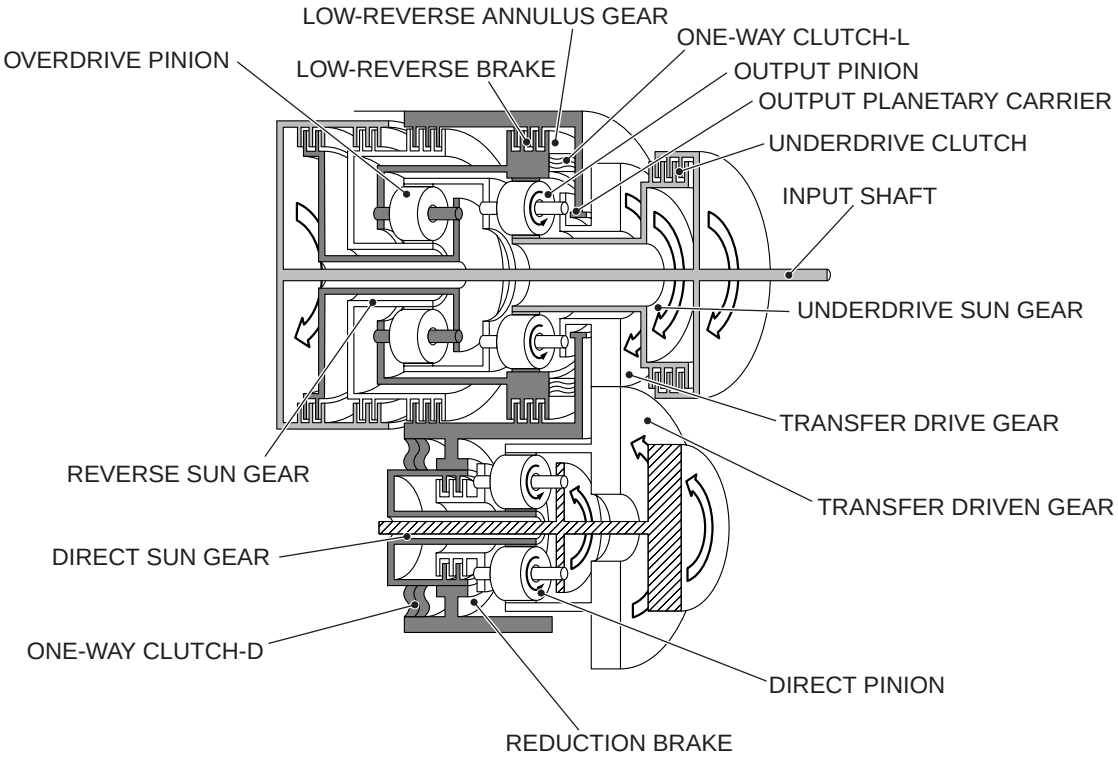


AC407325 AB

When the parking or neutral gear is engaged, all the clutches are released. Thus, the driving force from the input shaft is not transferred to the planetary carrier. However, to quickly perform the shifting to 1st and reverse gears, a shifting preparation is made by operating the low-reverse brake.

<5A/T>

1ST

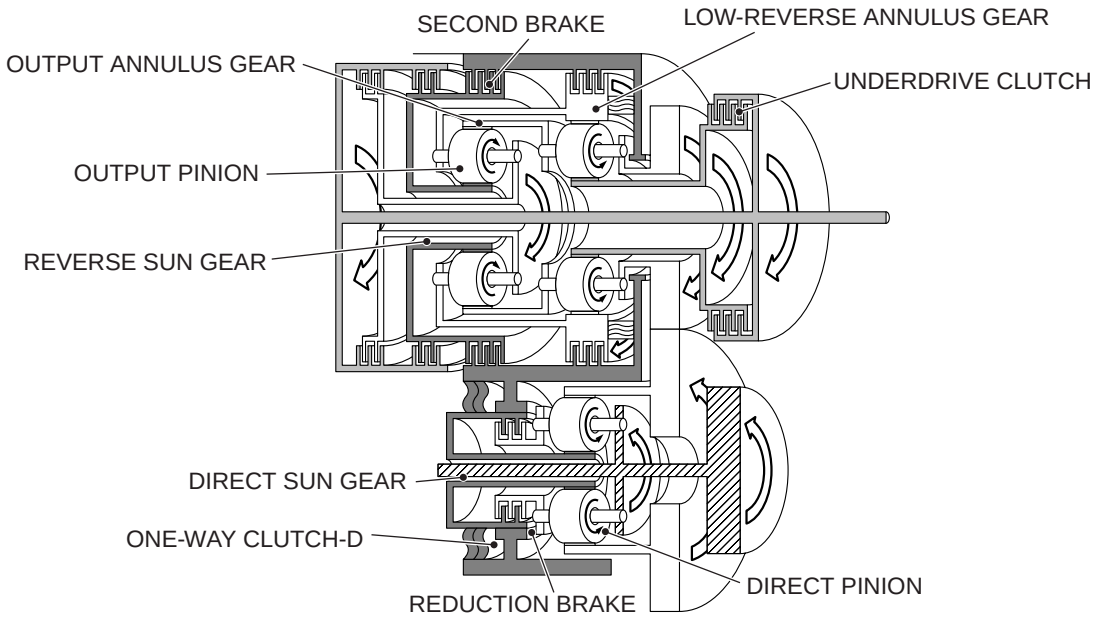


AC407328 AB

When the 1st gear is engaged, the underdrive clutch, one-way clutch-L, low-reverse brake*, reduction brake, and one-way clutch-D are operated. The driving force from the input shaft is transferred to the underdrive sun gear via the underdrive clutch. The driving force transferred to the underdrive sun gear, tries to rotate the low-reverse annulus gear to the left via the output pinion. Also, it tries to rotate the output planetary carrier to the right with the output pinion is revolved around the underdrive sun gear. However, because the one-way clutch-L and low-reverse brake* is operating at this moment, the low-reverse annulus gear is fixed, and only the output planetary carrier is rotated to the right. This driving force tries to rotate the direct pinion to the left via the transfer drive gear and transfer driven gear. Because the direct sun gear is fixed by the one-way clutch-D, the direct pinion, rotate the direct planetary carrier to the right with the direct pinion revolved around the direct sun gear. Because the direct planetary carrier is connected to the output shaft, the output shaft is rotated to the right, and the gear ratio of 1st gear is obtained. Also, because the output planetary carrier is connected to the output annulus gear, the overdrive pinion is also driven simultaneously. However, because the overdrive planetary carrier is fixed by the one-way clutch-L, and because the reverse sun gear is rotated independently, and it does not affect the output planetary carrier.

*NOTE: *: It is activated only when the vehicle is stopped (vehicle speed: 7 - 8 km/h or less), or when the selector lever position is in Sport Mode.*

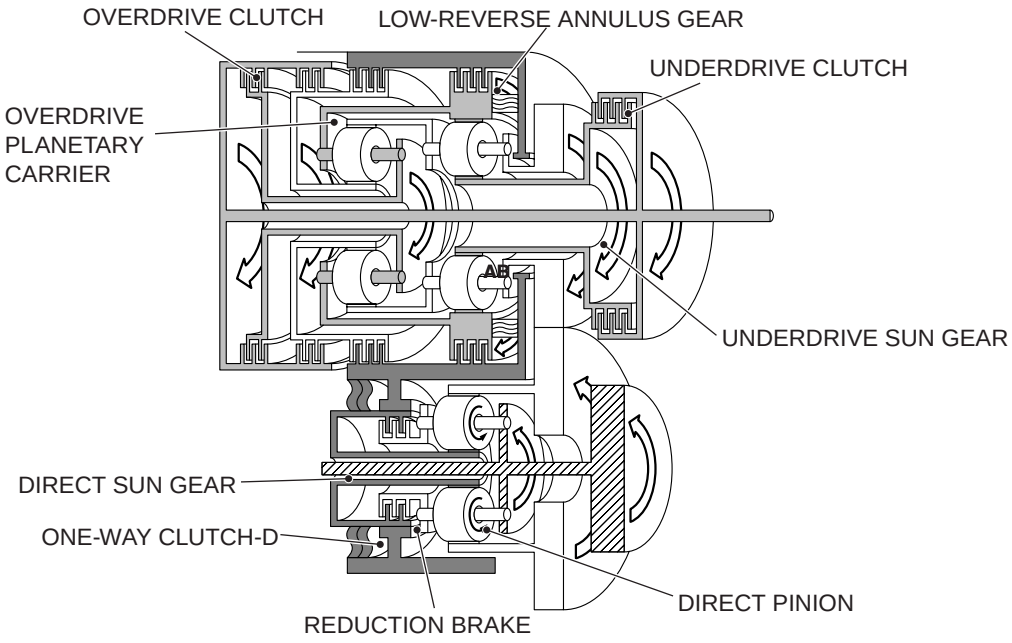
2ND



AC407329AB

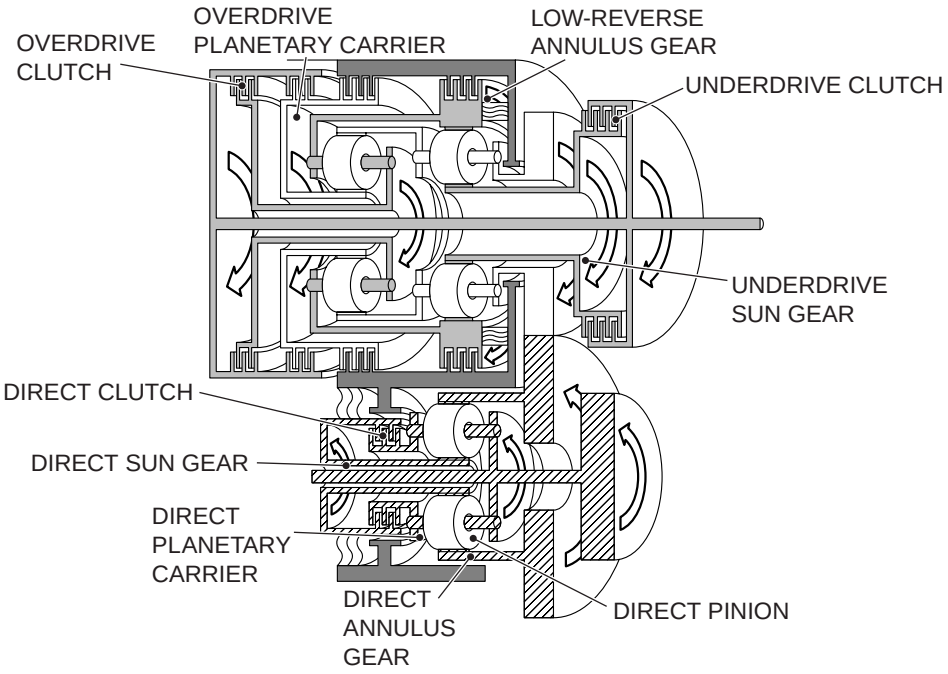
When the 2nd gear is engaged, the underdrive clutch, second brake, reduction brake, and one-way clutch-D are operated. When the second brake is operated with the 1st gear engaged and the low-reverse brake is released, the reverse sun gear is fixed. Then, the driving force from the output annulus gear rotates the overdrive planetary carrier to the right with the overdrive pinion revolved around the reverse sun gear. Because the overdrive planetary carrier is connected to the low-reverse annulus gear, it also rotates the low-reverse annulus gear to the right. The rotation of low-reverse annulus gear is transferred to the transfer drive gear and transfer driven gear via the output pinion. However, because the change from the 1st gear is not present on the output shaft, by adding the low-reverse annulus gear rotation to the output planetary carrier rotation, the gear ratio of 2nd gear is obtained.

3RD



When the 3rd gear is engaged, the underdrive clutch, overdrive clutch, reduction brake, and one-way clutch-D are operated. The overdrive clutch connects the input shaft, overdrive planetary carrier, and low-reverse annulus gear. Therefore, the rotation speeds of underdrive sun gear and low-reverse annulus gear which are connected to the input shaft by the underdrive clutch become identical. Then, the planetary gear set rotates as one locked unit, and the driving force is transferred to the transfer driven gear via the transfer drive gear. The operation on the output shaft are the same as when the 1st gear is engaged. Therefore, by rotating the planetary gear set as one locked unit, the gear ratio of 3rd gear is obtained.

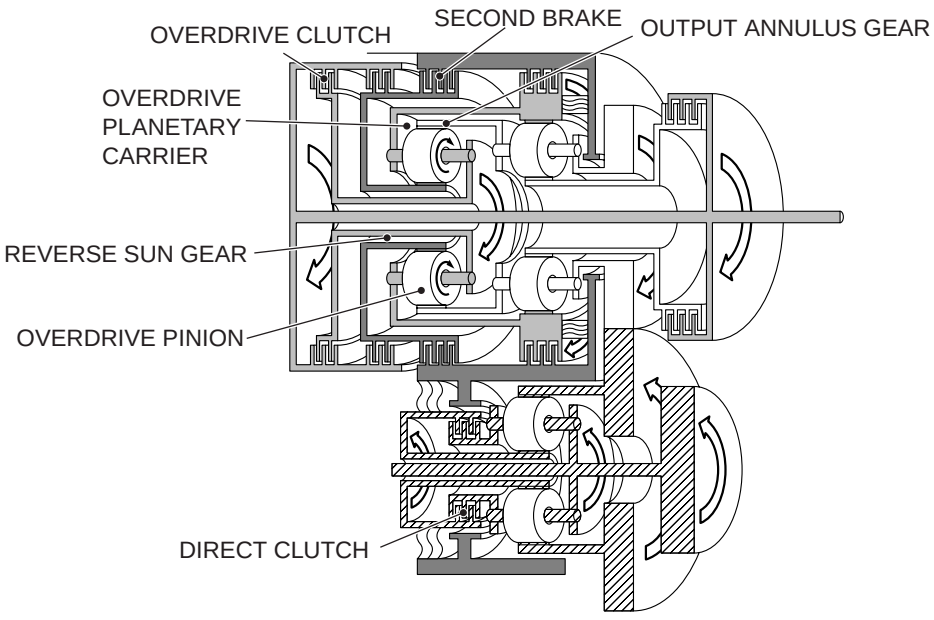
4TH



AC407331AB

When the 4th gear is engaged, the underdrive clutch, overdrive clutch, and direct clutch are operated. The operation on the input shaft is the same as when the 3rd gear is engaged, and the planetary gear set is rotated as one locked unit. The driving force that is input to the transfer driven gear goes from the connected direct annulus gear through direct pinion, and tries to rotate the direct sun gear to the left. On the other hand, because the direct sun gear is connected to the direct planetary carrier and output shaft by the direct clutch, it is rotated as one unit to the left, and the gear ratio of 4th gear is obtained.

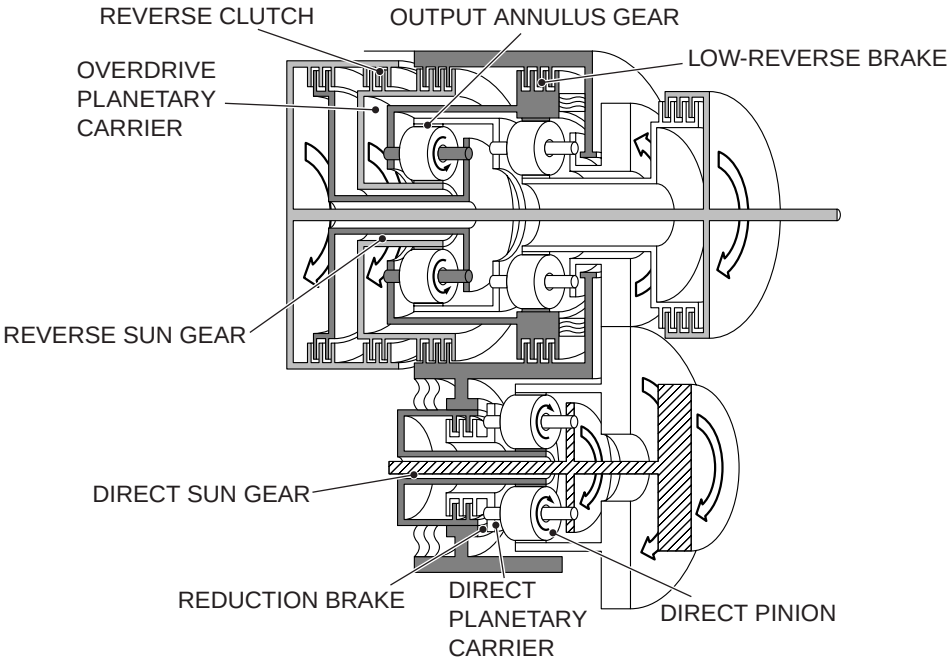
5TH



AC407332AB

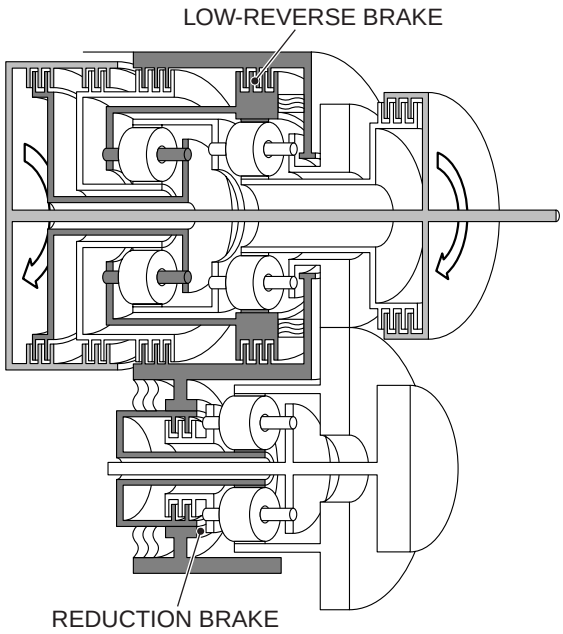
When the 5th gear is engaged, the overdrive clutch, direct clutch, and second brake are operated. The driving force from the input shaft is transferred to the overdrive planetary carrier via the reverse clutch. On the other hand, because the reverse sun gear is fixed by the second brake, the rotation speed transferred to the output annulus gear is the sum of the rotation speed of the overdrive planetary carrier and the number of revolutions of the overdrive pinion around the reverse sun gear. This driving force is routed through the output planetary carrier and transfer drive gear connected to the overdrive planetary carrier, and is transferred to the transfer driven gear. Because the operation elements on the output shaft are the same as when the 4th gear is engaged, the gear ratio of 5th gear is obtained from the overdrive pinion revolution.

REVERSE



When the reverse is engaged, the reverse clutch, low-reverse brake, and reduction brake are operated. The driving force from the input shaft is transferred to the reverse sun gear via the reverse clutch. On the other hand, because the overdrive planetary carrier is fixed by the low-reverse brake, the driving force of reverse sun gear is transferred via the overdrive pinion to the output annulus gear as the rotating force to the left direction. This driving force is routed through the output planetary carrier and transfer drive gear, and is transferred to the transfer driven gear. Because the direct sun gear is fixed by the reduction brake, the revolution of the direct pinion around the direct sun gear is added, then the direct planetary carrier is rotated to the right. With this, the gear ratio of reverse gear is obtained. Also, the output pinion is driven by the output planetary carrier at this time. However, the underdrive sun gear is rotated independently, and it does not affect the output planetary carrier rotation.

PARK OR NEUTRAL



AC407334 AB

When the parking or neutral is engaged, all the clutches are released. Thus, the driving force from the input shaft is not transferred to the planetary gear. However, to smoothly shift to 1st and reverse, a shifting preparation is made by operating the low-reverse and reduction brakes.

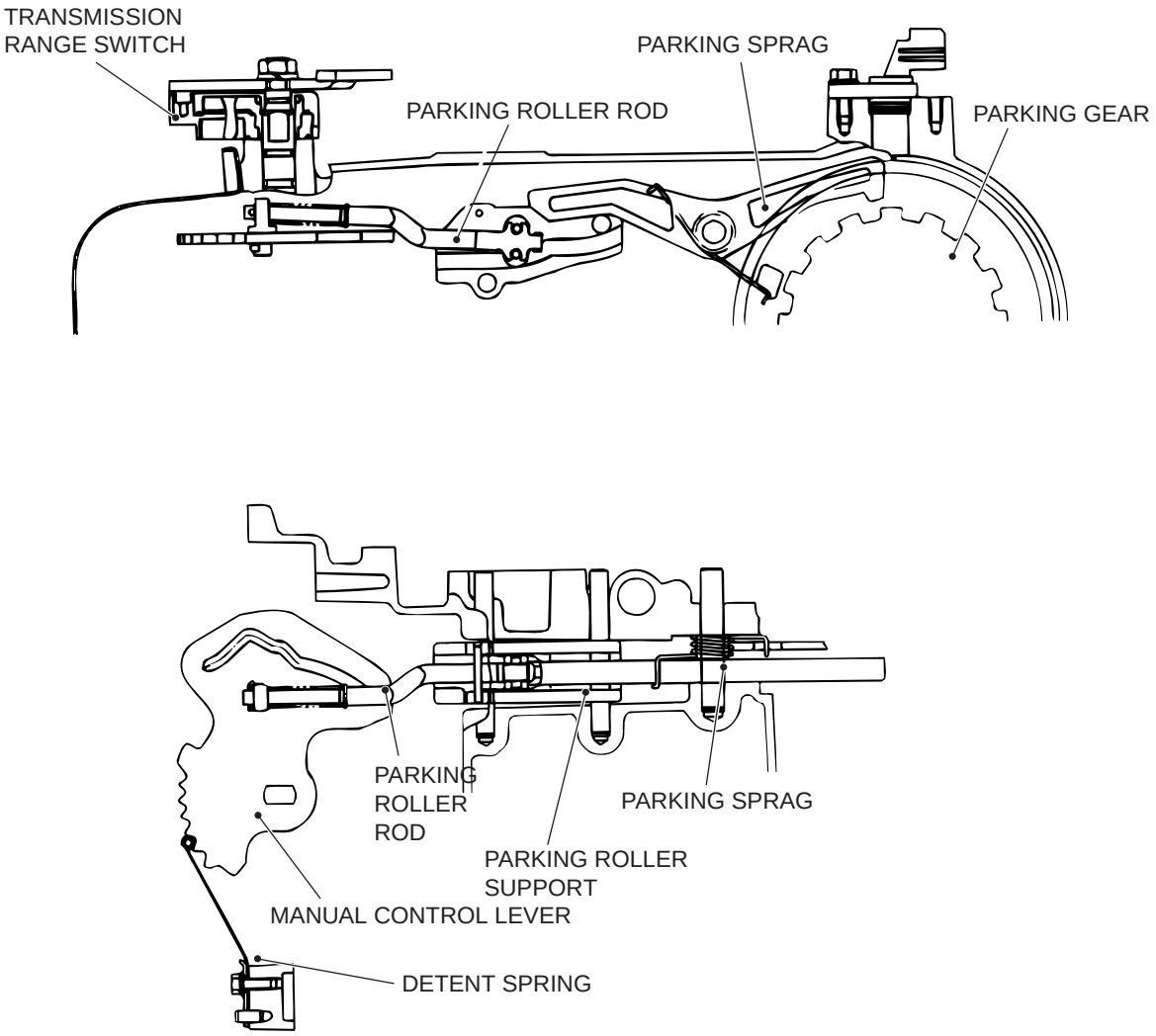
MANUAL CONTROL SYSTEM

M2230001500011

MANUAL CONTROL LEVER

The manual control lever is attached to the valve body upper side, and is linked with the parking roller rod and manual control valve pin. Also, the detent mechanism is improves shift feel during manual selection.

PARKING MECHANISM



AC407080AB

When the manual control lever is moved to the park position, the parking roller rod is moved along the parking roller support, and the parking sprag is pushed up. As a result, the parking sprag is engaged with the parking gear of transfer driven gear, and the output shaft is fixed. To reduce the lever effort, a roller is used at the tip of the rod.

OIL PRESSURE CONTROL SYSTEM

GENERAL DESCRIPTION

M2230000100441

•Oil pressure control system consists of: the oil pump that generates the hydraulic pressure; the regulator valve that controls the generated hydraulic pressure to the control hydraulic pressure; the solenoid valve that converts the PCU electrical signal to the hydraulic pressure; the pressure control valve that controls the hydraulic pressure from the solenoid valve; various valves that switch between the hydraulic passages depending on the line pressure; and the valve body that houses all of the above.

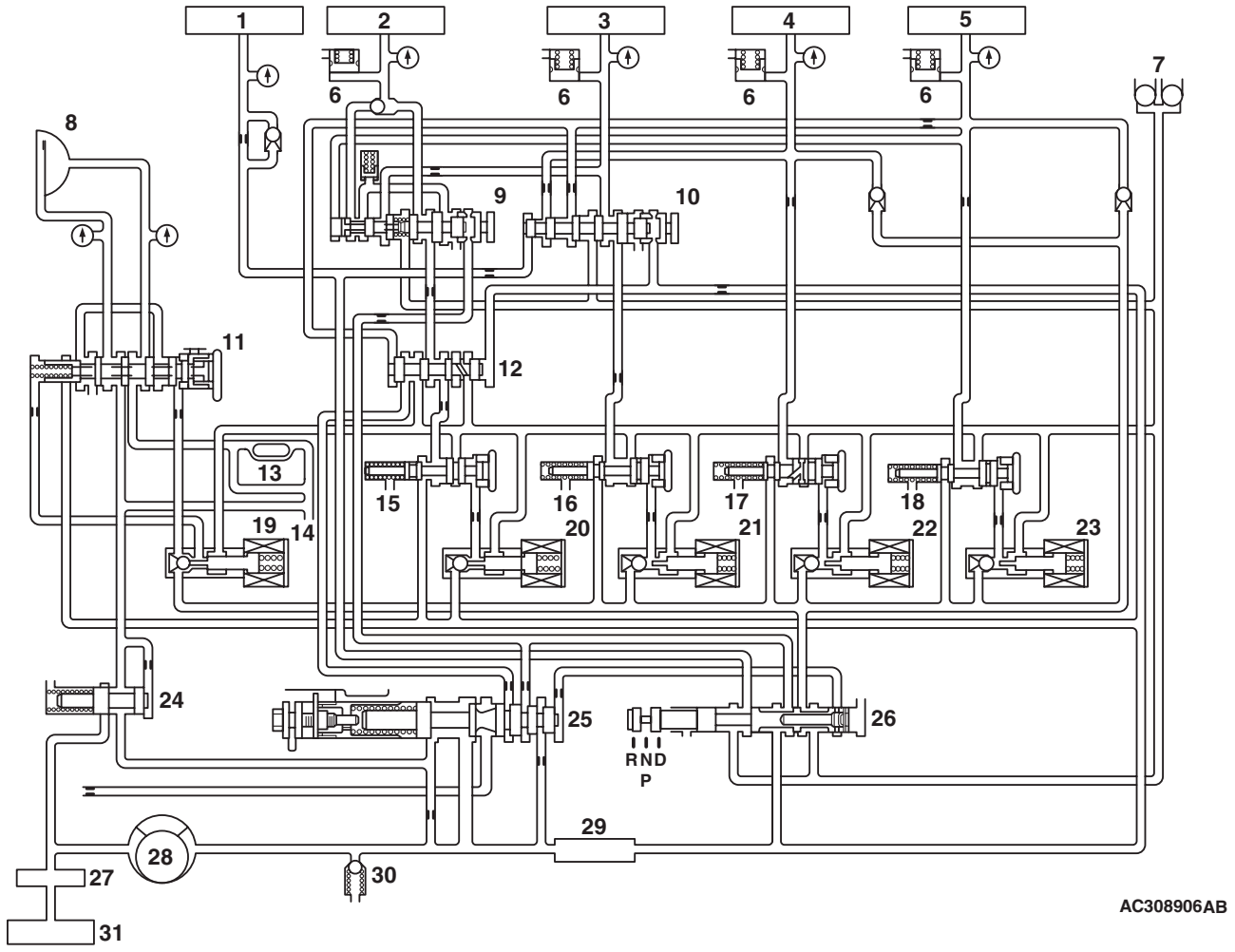
Independent electronic control of the shifting operating hydraulic pressure with the solenoid valve which is set for each element results in smooth and highly responsive shifting.

•To prevent ATF drainage from the valve body and from each element while the engine is stopped, the discharge port of each valve has been merged, and a check ball is at the rear ends of the discharge line.

•Even when a problem occurs in the electronic control system, with the operations of the switch valve and fail safe valve, driving in 3rd gear and reverse gear is possible.

HYDRAULIC CIRCUIT

PARKING AND NEUTRAL <4A/T>

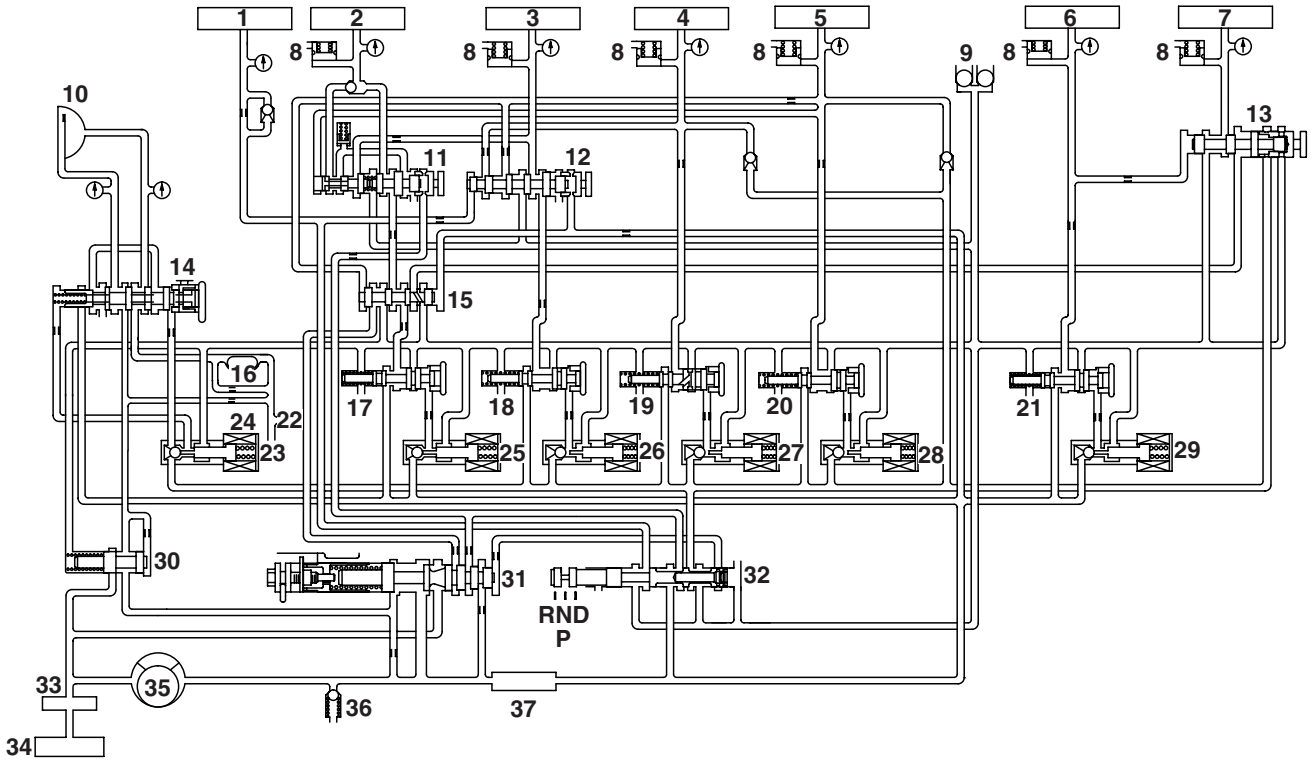


1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. ACCUMULATOR
7. CHECK BALL
8. TORQUE CONVERTER CLUTCH

TSB Revision

9. FAIL SAFE VALVE A
10. FAIL SAFE VALVE B
11. TORQUE CONVERTER CLUTCH CONTROL VALVE
12. SWITCH VALVE
13. TRANSMISSION FLUID COOLER
14. LUBRICATION
15. LOW-REVERSE PRESSURE CONTROL VALVE
16. SECOND PRESSURE CONTROL VALVE
17. UNDERDRIVE PRESSURE CONTROL VALVE
18. OVERDRIVE PRESSURE CONTROL VALVE
19. TORQUE CONVERTER CLUTCH SOLENOID VALVE
20. LOW-REVERSE SOLENOID VALVE
21. SECOND SOLENOID VALVE
22. UNDERDRIVE SOLENOID VALVE
23. OVERDRIVE SOLENOID VALVE
24. TORQUE CONVERTER PRESSURE CONTROL VALVE
25. REGULATOR VALVE
26. MANUAL VALVE
27. OIL FILTER
28. OIL PUMP
29. OIL STRAINER
30. RELIEF VALVE
31. OIL PAN

PARKING AND NEUTRAL <5A/T>



AC406938AB

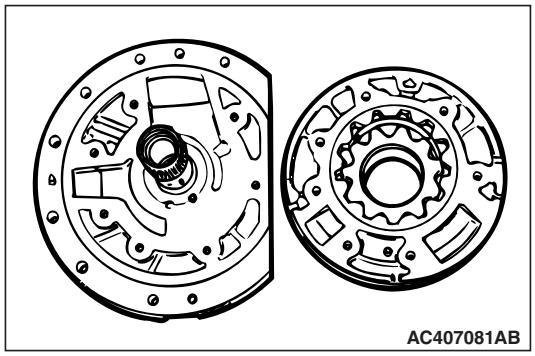
1. REVERSE CLUTCH
2. LOW-REVERSE BRAKE
3. SECOND BRAKE
4. UNDERDRIVE CLUTCH
5. OVERDRIVE CLUTCH
6. REDUCTION BRAKE
7. DIRECT CLUTCH
8. ACCUMULATOR
9. CHECK BALL
10. TORQUE CONVERTER CLUTCH
11. FAIL SAFE VALVE A
12. FAIL SAFE VALVE B
13. FAIL SAFE VALVE C
14. TORQUE CONVERTER CLUTCH CONTROL VALVE
15. SWITCH VALVE
16. A/T FLUID COOLER
17. LOW-REVERSE PRESSURE CONTROL VALVE
18. SECOND PRESSURE CONTROL VALVE
19 UNDERDRIVE PRESSURE CONTROL VALVE
20. OVERDRIVE PRESSURE CONTROL VALVE
21. REDUCTION PRESSURE CONTROL VALVE
22. LUBRICATION
23. LUBRICATION
24. TORQUE CONVERTER CLUTCH SOLENOID VALVE
25. LOW-REVERSE SOLENOID VALVE

TSB Revision

26. SECOND SOLENOID VALVE
27. UNDERDRIVE SOLENOID VALVE
28. OVERDRIVE SOLENOID VALVE
29. REDUCTION SOLENOID VALVE
30 TORQUE CONVERTER PRESSURE CONTROL VALVE
31. REGULATOR VALVE
32. MANUAL VALVE
33. OIL FILTER
34. OIL PAN
35. OIL PUMP
36. RELIEF VALVE
37. OIL STRAINER

OIL PUMP

M2230001600018

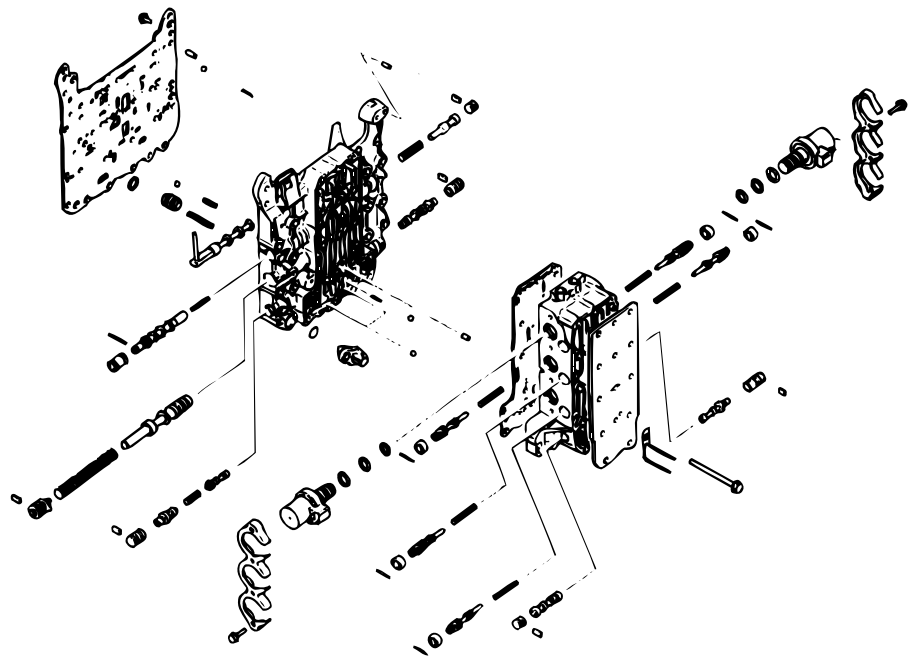

AC407081AB

The trochoid pump is used.
The oil pump housing is made of aluminum die casting.

VALVE BODY

M2230001800023

<5A/T>

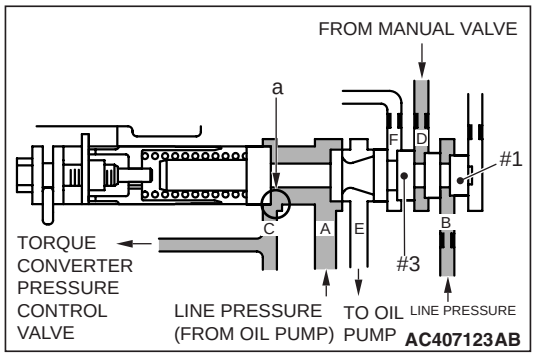

AC407082

- The valve body is installed longitudinal way to the vehicle front-side of the A/T side face.
- The main body of the valve body has been divided into two parts, inside and outside, and a part of the hydraulic circuit has been added to the A/T case-side.
- For each operation element, there is a solenoid valve and pressure control valve.
- The line pressure adjustment is performed with the regulator valve.
- Even when a problem occurs to the solenoid valve, with the operations of the fail safe valve and switch valve, driving in 3rd gear and reverse gear is possible.

TSB Revision

REGULATOR VALVE

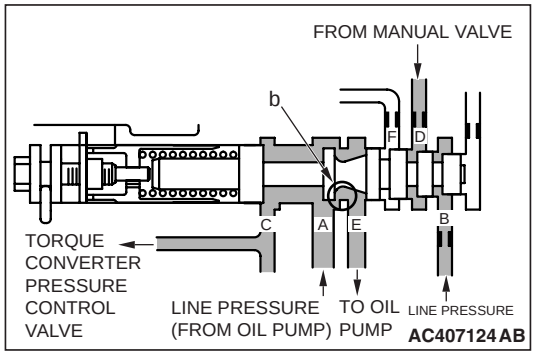
The regulator valve adjusts the pressure to the hydraulic line pressure which is generated by the oil pump. To the right side of this valve, there are three ports to which the line pressure is applied. This hydraulic pressure adjusts the line pressure to the hydraulic pressure that corresponds to each gear against the spring pressure.



[OPERATION]

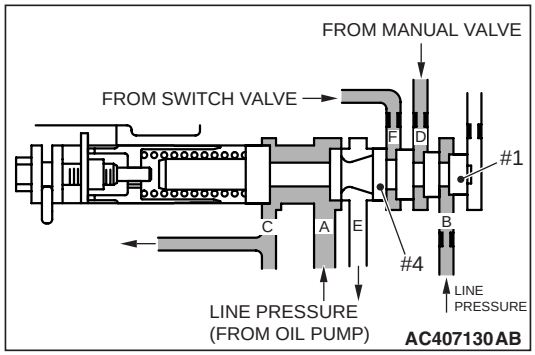
(1) Neutral & 1st & 2nd

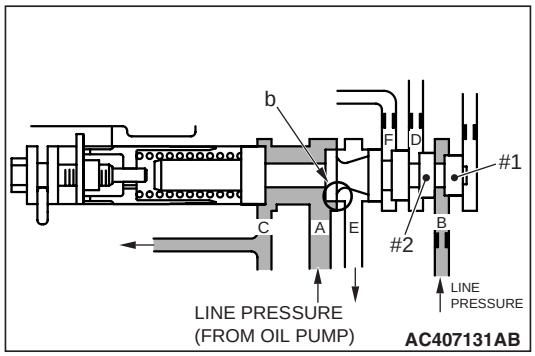
The hydraulic pressure from the oil pump is supplied from ports A and B to the regulator valve. The hydraulic pressure supplied from the port A is supplied to the torque converter through the port C. Also, the line pressure via the manual valve is supplied from the port D to the regulator valve. When the line pressure is supplied from ports B and D, the area difference of between #1 and #2 generates the force which pushes the valve to the left. This pressure, the spring pressure that pushes the valve to the right, and the line pressure are adjusted. When the engine speed, that is the oil pump rotation speed, rises and the hydraulic pressure becomes high, the hydraulic pressure applied from the ports B and D also becomes high, and overcomes the spring force, then pushes the valve to the left. Then, passage "a" to the torque converter is opened wide, and a larger amount of fluid is supplied to the torque converter. When the hydraulic pressure becomes even higher, the valve is further pushed to the left. Consequently, passage "b" to the port E is opened to discharge the pressure to the oil pump-side, and the line pressure is lowered. When the line pressure is lowered, the hydraulic pressure applied from the ports B and D is also lowered. Thus, the valve is pushed back to the right by the spring force, and the passage "b" is closed. In this way, the line pressure is regulated to the predetermined value. When the line pressure exceeds the pressure regulated by the regulator valve, the line relief valve provided in the line A opens to discharge the pressure, and protects the hydraulic circuit.



(2) 3rd & 4th & 5th <5A/T>

In addition to ports B and D, the line pressure is also supplied from the port F. As a result, the force that pushes the valve to the left is determined by the area difference of between #1 and #4. Because #4 has a larger area than #3, even when the same pressure is applied, the force that moves the valve to the left becomes larger compared to that of (1). Therefore, because passage "b" opens with a lower pressure compared to that of (1), the line pressure becomes lower comparative to that portion. The regulator valve operation when the line pressure rises is the same as that of (1).

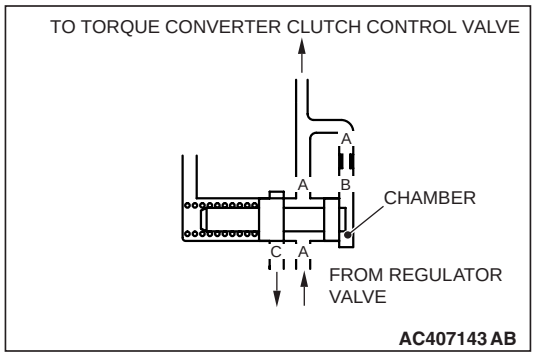




(3) Reverse
When the manual valve is in the R range, because the passage to the port D is closed, the line pressure supply from the port D is stopped. As a result, the force that pushes the valve to the left is determined by the area difference of between #1 and #2. Because #2 has a smaller area than #3, even when the same pressure is applied, the force that moves the valve to the left becomes smaller compared to that of (1). Therefore, because passage "b" does not open unless with a pressure higher than that of (1), the line pressure becomes higher comparative to that portion. In this way, the high line pressure is created which is required by the operation elements when the vehicle is moving backward. The regulator valve operation when the line pressure rises is the same as that of (1).

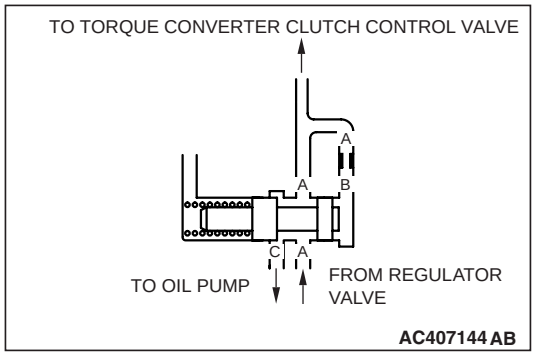
TORQUE CONVERTER PRESSURE CONTROL VALVE

The torque converter pressure control valve regulates the torque converter (with damper clutch released) and lubricant pressures at a constant pressure.



[OPERATION]

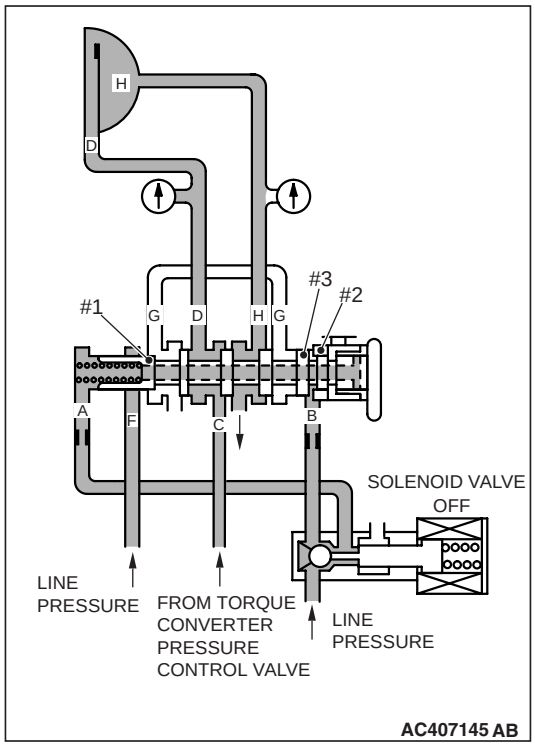
(1) The excess fluid during the line pressure regulation by the regulator valve is supplied from the torque converter pressure control valve to torque converter. At this time, the hydraulic pressure branched off from the line A is routed through the orifice, then supplied from port B to chamber on the right side of the valve. This force applied to the chamber moves the valve against the spring force, and regulates the torque converter pressure. When the force of the chamber hydraulic pressure is weaker than the spring force, the valve is being pushed to the right by the spring force, and the hydraulic pressure from the regulator valve is supplied to the torque converter.



(2) When the hydraulic pressure from regulator valve becomes higher, the hydraulic pressure applied to the chamber also becomes higher. When this hydraulic force becomes greater than the spring force, the valve is pushed to the left. As a result, port C is opened to discharge the pressure to the oil pump, then the hydraulic pressure is lowered. When the hydraulic pressure is lowered, the hydraulic pressure applied to the chamber is also lowered. Thus, the valve is pushed back to the right by the spring force, and port C is closed. In this way, the torque converter pressure is regulated so that the hydraulic pressure does not exceed the predetermined value.

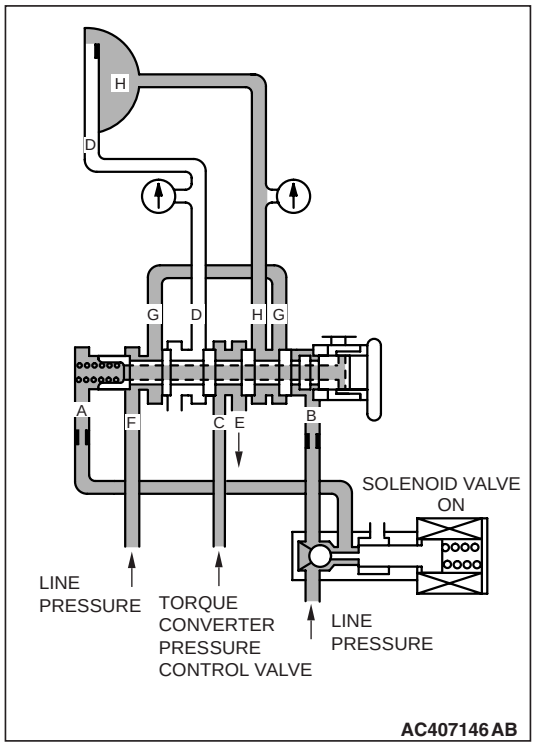
DAMPER CLUTCH CONTROL VALVE AND DAMPER CLUTCH SOLENOID VALVE

- The damper clutch control valve controls the hydraulic pressure applied to the damper clutch.
- The damper clutch solenoid valve is duty-controlled by the signal from PCU. It converts the electrical signal to hydraulic pressure.



[OPERATION]

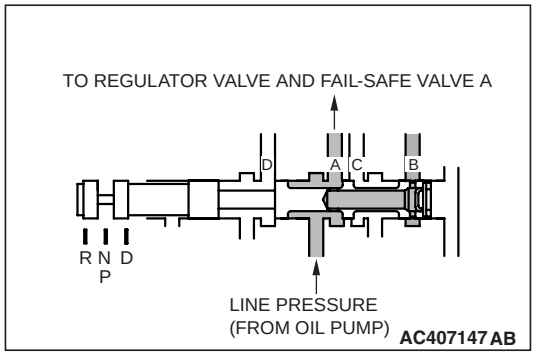
(1) When the damper clutch is released, that is when the damper clutch solenoid valve is in the OFF state, the line pressure is applied to the ports A and B. Therefore, the sum of the hydraulic force and spring force applied to #1 overcomes the hydraulic force applied to the area difference of between #2 and #3, then the valve is pushed to the right. As a result, the hydraulic pressure from the torque converter pressure control valve enters from the line C to line D, and supplies the hydraulic pressure to the section between the torque converter front cover and damper clutch. For this reason, the damper clutch does not operate, thus the system operates as a normal torque converter.



(2) When the damper clutch operation range is reached, by the command from the PCU, the damper clutch solenoid valve is duty-controlled, then the hydraulic pressure supplied to the port A is lowered. For this reason, hydraulic force is applied to the area difference between #2 and #3 overcomes the sum of the hydraulic force and spring force is applied to #1, then the valve is pushed to the left. As a result, the hydraulic pressure from the torque converter pressure control valve goes through to the fluid cooler via line C to line E. At the same time, the line pressure of line F enters from line H in the torque converter via line G. Consequently, hydraulic pressure is applied to the section between the damper clutch and turbine. Then, the damper clutch is pressed against the front cover, and the damper clutch is operated.

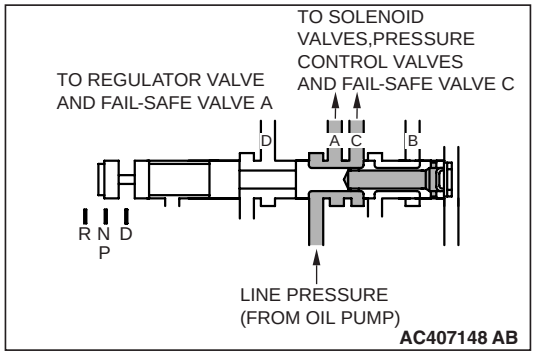
MANUAL VALVE

•The manual valve is interlocked with the selector lever of the driver's seat. It switches the oil passage depending on each selected position, and sends the line pressure to each valve.

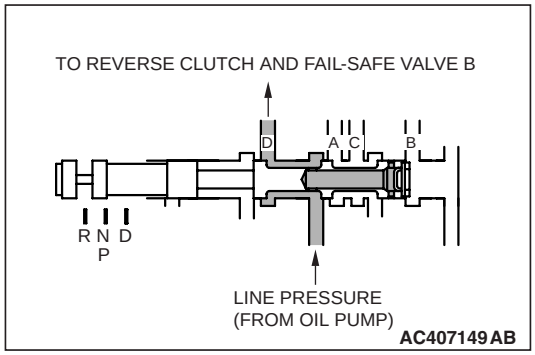


[OPERATION]

(1) When the manual valve is in the NP position, port A and B are opened, then the line pressure is supplied to the regulator valve and fail safe valve A.

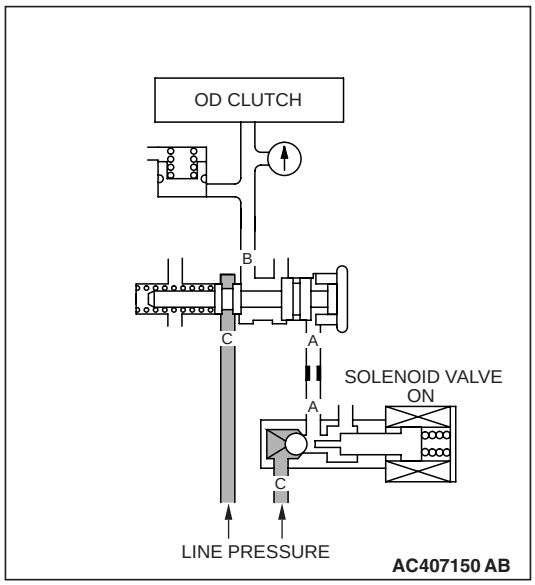


(2) When the manual valve is in the D position, port C and port A are opened. Then, in addition to the valves of (1), the line pressure is supplied to each solenoid valve and pressure control valve of the 2ND brake, UD clutch, OD clutch, damper clutch, and fail safe valve C <5A/T>.



(3) When the manual valve is in the R position, port C is opened, then the line pressure is supplied to the reverse clutch and the fail safe valve B.

PRESSURE CONTROL VALVE AND SOLENOID VALVE

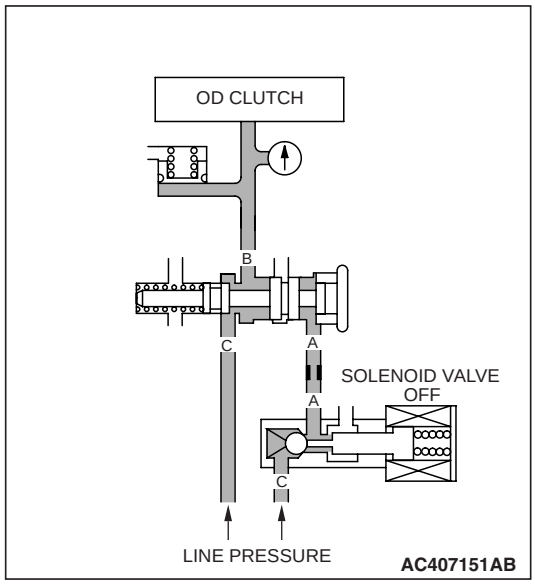


- A set of pressure control valve and solenoid valve is used for each element except for the reverse clutch and the direct clutch <5A/T>.
- The pressure control valve regulates the hydraulic pressure is applied to the element by the solenoid valve control, and prevents the shift shock occurrence.
- The solenoid valve is duty controlled by the signal from PCU. It converts the electrical signal to hydraulic pressure.

[OPERATION]

The shapes of pressure control valves differ to a certain degree for each valve, but the operation principles are the same. Here, using the OD clutch as an example, the operation is explained.

(1) When the OD clutch is not operating, that is when the solenoid valve is in the ON state, the oil passage is closed by the solenoid valve. Therefore the hydraulic pressure is not supplied to line A. At this time, because the pressure control valve is pushed to the right by the spring force, port B is closed, and the hydraulic pressure is not supplied to the OD clutch.

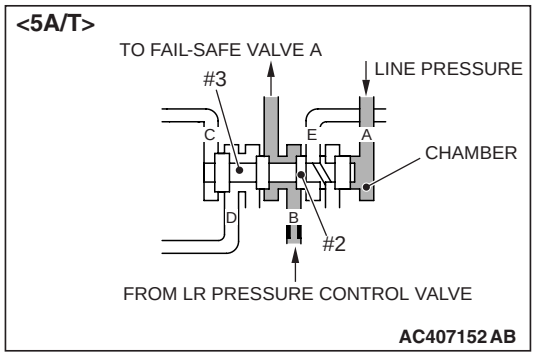


(2) When the OD clutch is operating, the solenoid valve is duty controlled by the command from PCU, and the check ball is pushed in. Then, the oil passage to the line A is opened, and the hydraulic pressure is supplied to the pressure control valve. When the hydraulic pressure is supplied from port A to pressure control valve, the force that pushes the valve to the left is generated from the area difference of between #1 and #2. Then, this force overcomes the spring force, and the valve is pushed to the left. Subsequently, because port B is opened, the line pressure of the line C is supplied to the OD clutch via the line B. When the shifting is completed, the solenoid valve is OFF. Therefore, the hydraulic pressure supplied to the OD clutch is equalized with the line pressure.

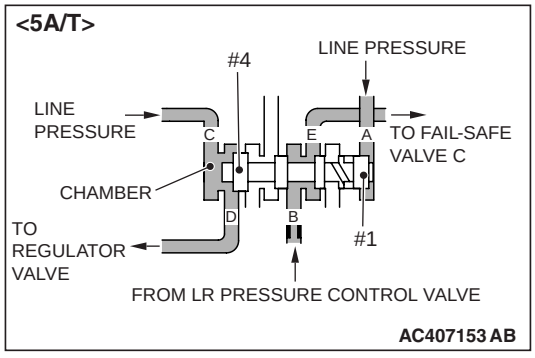
SWITCH VALVE

- During the OD clutch operation, the hydraulic pressure that is routed through the switch valve is supplied to the regulator valve. As a result, the line pressure is reduced when the 3rd, 4th, or 5th <5A/T> gear is engaged.
- During fail safe operation, (with control relay OFF), the valve blocks the LR brake hydraulic pressure supply from the LR pressure control valve.

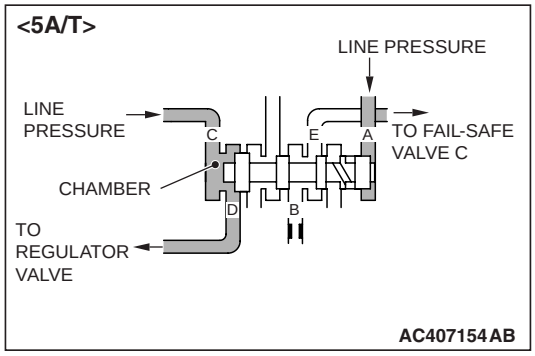
[OPERATION]



(1) When in other than 3rd, 4th, or 5th <5A/T> gear, because the line pressure is supplied from port A to the chamber on the right side of the valve, the valve is pushed to the left. Also, even when the hydraulic pressure is supplied from the LR pressure control valve to port B, the valve does not move because the areas of #2 and #3 are equal.



(2) When the 3rd, 4th, or 5th <5A/T> gear is engaged, because the hydraulic pressure is also supplied from the port C to chamber on the left side valve, the valve is pushed to the right because of the area difference of between #1 and #4. As a result, the port D is opened, and the hydraulic pressure is supplied to the regulator valve. Also, with the switch valve of 5A/T, the port E is also opened. Therefore, when the hydraulic pressure is supplied to port B, the hydraulic pressure is supplied to the direct clutch via the fail safe valve C.

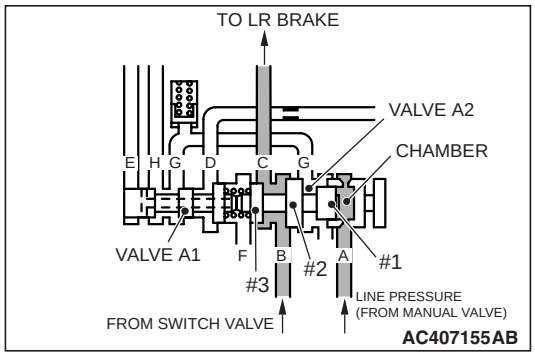


(3) Fail safe (with control relay OFF)
When the fail safe mode is activated, because each solenoid valve becomes the OFF state, the hydraulic pressure is supplied to port B via line B. However, when the 3rd gear is engaged, because the valve is being pushed to the right regardless of the LR solenoid valve state, and because the areas of #2 and #3 are equal, the valve does not move even when the hydraulic pressure is supplied to port B. Thus, with 4A/T, the hydraulic pressure from LR pressure control valve is blocked by the switch valve. With 5A/T, the hydraulic pressure is supplied to the fail safe valve C via the port E. During fail safe operation, because the fail safe valve C is being pushed to the right, the hydraulic pressure from port E is blocked.

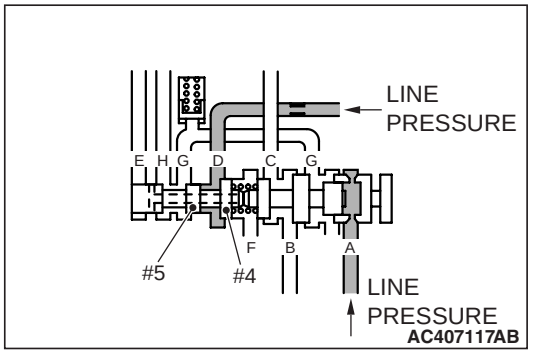
FAIL SAFE VALVE A

- The valve releases the LR brake hydraulic pressure when fail safe occurs.
- Quick shifting is achieved by changing the oil passage to LR brake when released.

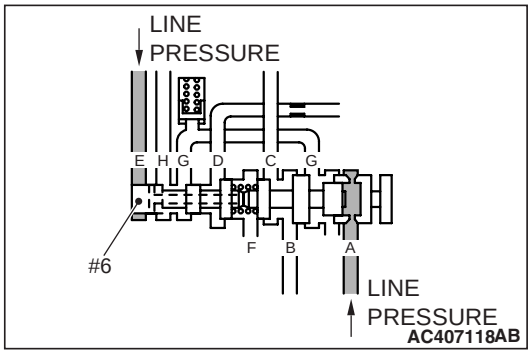
[OPERATION]



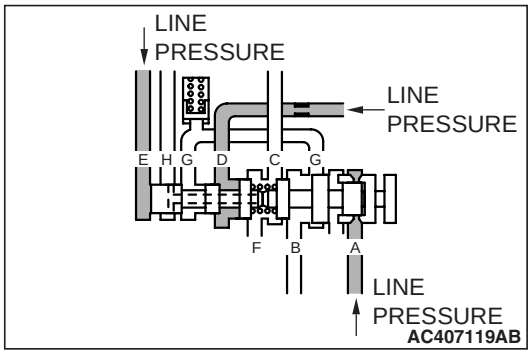
(1) Neutral and 1st
The line pressure that is routed through the manual valve is supplied from port A to the chamber to the right of the valve. Also, the hydraulic pressure from LR pressure control valve is supplied to port B via the switch valve. For this reason, the hydraulic force applied to #1 overcomes the sum of the hydraulic force and spring force applied to the area difference of between #2 and #3, then valves A1 and A2 are pushed to the left. As a result, because port C is opened, the hydraulic pressure from LR pressure control valve is supplied to the LR brake.



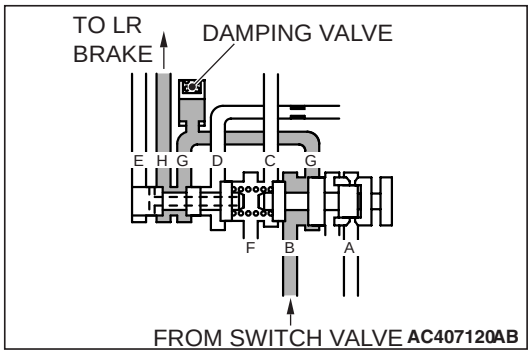
(2) 2nd
In addition to port A, the hydraulic pressure that is branched off from line D which supplies the hydraulic pressure to 2ND brake is supplied to port D. For this reason, the hydraulic force is applied to #1 overcomes the sum of the hydraulic force and spring force applied to the area difference of between #4 and #5, then valve A1 and valves 2 are pushed to the left.



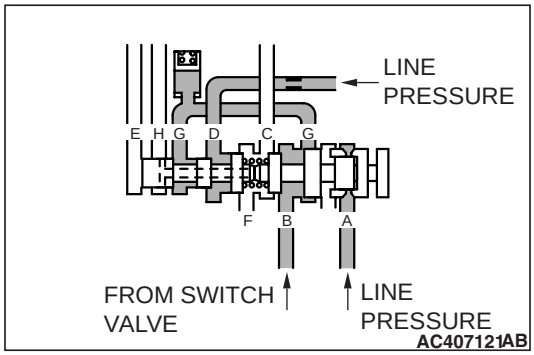
(3) 3rd, 4th <5A/T>
In addition to port A, the hydraulic pressure branched off from line E which supplies the hydraulic pressure to OD clutch is supplied to port E. For this reason, the force applied to #1 overcomes the sum of the hydraulic force and spring force applied to #6, then valve A1 and valve 2 are pushed to the left.



(4) 4th, 5th <5A/T>
In addition to port A, the hydraulic pressure is supplied to the port D and the port E. For this reason, the hydraulic force overcomes the sum of the hydraulic force applied to #6 and the hydraulic force is applied to the area difference between #4 and #5 in addition to the sum of the hydraulic force and spring force applied to #1, then valve A1 and valve A2 are pushed to the right.



(5) Reverse
When the vehicle is moving backward, because line A is opened, the hydraulic pressure is not supplied to port A. As a result, the hydraulic pressure is supplied only from port B. Valve A2 is pushed to the right by the spring force and hydraulic force is applied to the area difference between #2 and #3. On the other hand, valve A1 is pushed to the left by the spring force. Then, the LR brake pressure is quickly released from port F via port C. After this, the supplied hydraulic pressure is routed through port G and port H, then brought into communication with the LR brake. In this way, the hydraulic pressure supply line of LR brake is switched, and the supplied hydraulic pressure to LR brake is quickly released once, then resupplied. This prevents shift shock when shifting from N to P or P to R.



(6) Fail safe (with low & reverse brake solenoid valve failed)
2nd range
When the low & reverse brake solenoid valve has a problem and the hydraulic pressure is supplied, the switch valve does not move, and the hydraulic pressure is supplied from port B to fail safe valve A. Hydraulic force is applied to the area difference of between #2 and #3 of the fail safe valve, and hydraulic force is applied to the area difference between #4 and #5 of the valve A1, then valves A1 and A2 are pushed to the right. Because port C is closed, the hydraulic pressure supply of low & reverse brake is blocked.
3rd, 4th <4A/T>
Although the hydraulic pressure is supplied to the switch valve, the valve does not move, and the hydraulic pressure is blocked by the switch valve.
3rd <5A/T>

Although the hydraulic pressure is supplied to the switch valve, the valve does not move, and the hydraulic pressure is supplied to the fail safe valve C. By the hydraulic force applied to the fail safe C, the hydraulic pressure supply to the direct clutch is blocked.

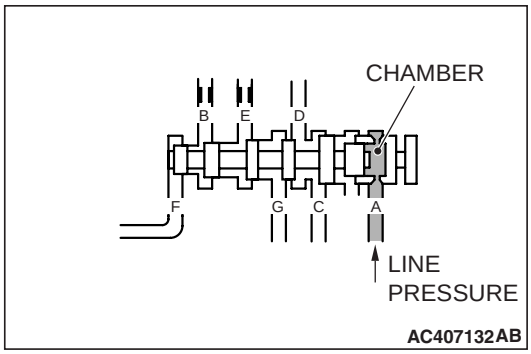
FAIL SAFE VALVE B

During fail safe operation (with control relay OFF), the valve blocks the hydraulic pressure supply from the 2ND pressure control valve to 2ND brake.

[OPERATION]

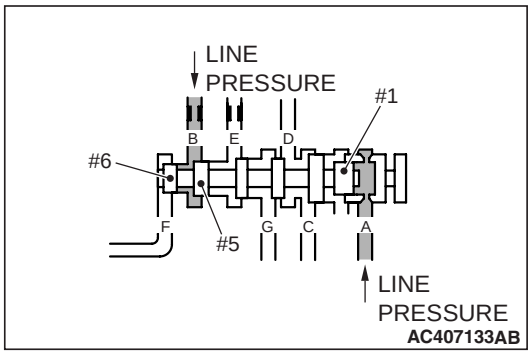
(1) Neutral

Because the line pressure is supplied from port A on the chamber to the right side of the valve, the valve is pushed to the left.



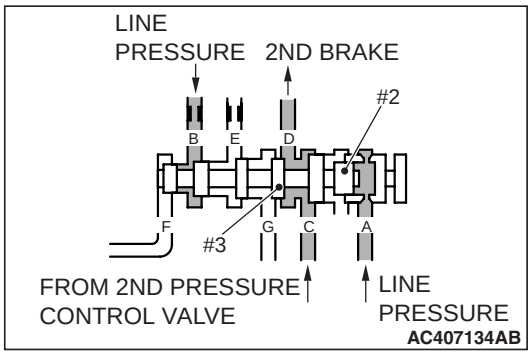
(2) 1st

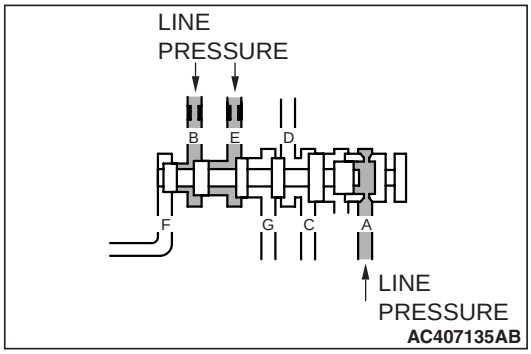
In addition to port A, the hydraulic pressure branched off from line B which supplies the hydraulic pressure to UD clutch is supplied to the port B. For this reason, the hydraulic force applied to #1 overcomes the hydraulic force applied to the area difference of between #5 and #6, then the valve is pushed to the left.



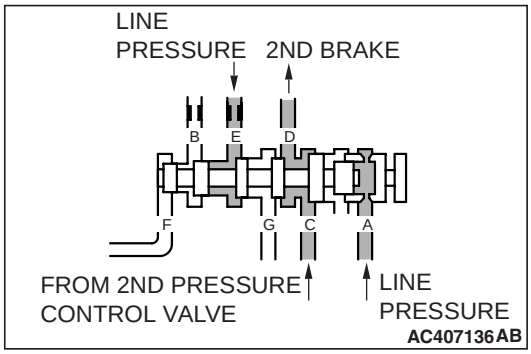
(3) 2nd

In addition to port A, the hydraulic pressure is supplied from port B and 2ND pressure control valve to port C. For this reason, the hydraulic force applied to #1 overcomes the sum of the hydraulic force applied to the area difference of between #2 and #3, and the hydraulic force is applied to the area difference of between #5 and #6, then the valve is pushed to the left. As a result, because port D is opened, the hydraulic force from the 2ND pressure control valve is supplied to the 2ND brake.

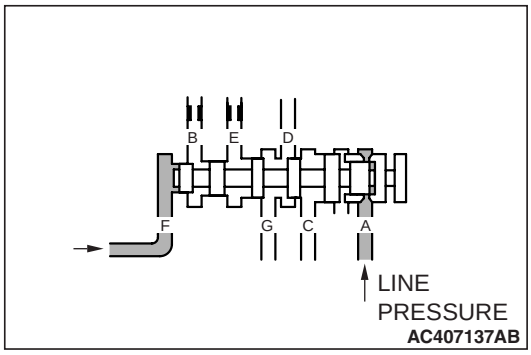




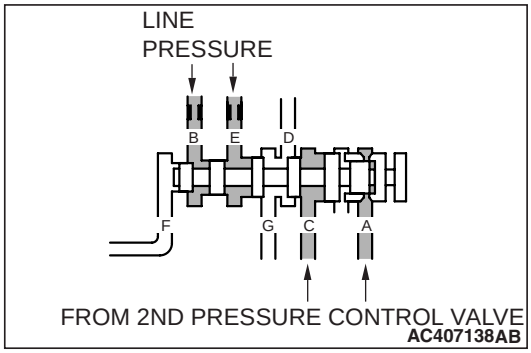
(4) 3rd, 4th <5A/T>
In addition to port A, the hydraulic pressure branched off from port B and from line E which supplies the hydraulic pressure to OD clutch is supplied to port E. For this reason, the hydraulic force applied to #1 overcomes the hydraulic force applied to the area difference of between #4 and #6, then the valve is pushed to the left.



(5) 4th, 5th <5A/T>
In addition to port A, the hydraulic pressure is supplied to port C and port E. For this reason, the hydraulic force applied to #1 overcomes the sum of the hydraulic force applied to the area difference between #2 and #3 and the hydraulic force applied to the area difference between #4 and #5, then the valve is pushed to the left. As a result, because port D is opened, the hydraulic pressure from the 2ND pressure control valve is supplied to the 2ND brake.



(6) Reverse
In addition to port A, the line pressure through the manual valve is supplied from port F to the chamber to the right of the valve. For this reason, by the area difference between #1 and #6, the valve is pushed to the right.

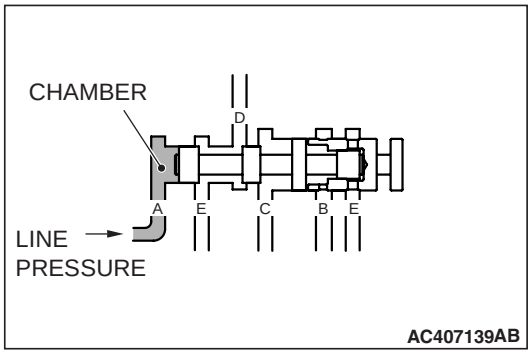


(7) Fail safe (with control relay OFF)
When the fail safe mode is activated, because each solenoid valve is OFF, hydraulic pressure is supplied to port C, port B and port E via line C. The sum of the hydraulic pressure applied to the area difference between #2 and #3 and between #4 and #6 overcomes the hydraulic pressure applied to #1, then the valve is pushed to the right. Because port D is substantially connected to port G, the hydraulic pressure is discharged. Also, the hydraulic pressure from the 2ND pressure control valve is blocked by the fail safe valve B.

FAIL SAFE VALVE C <5A/T>

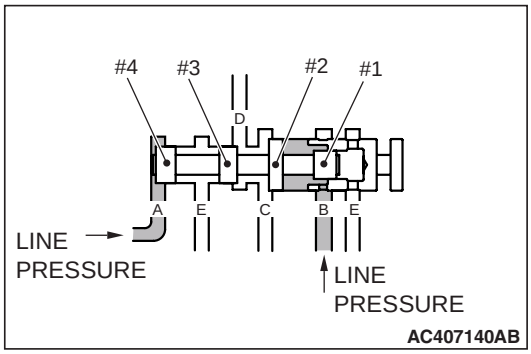
During fail safe mode (with control relay OFF), the hydraulic pressure is from switch valve supplied to the direct clutch.

[OPERATION]



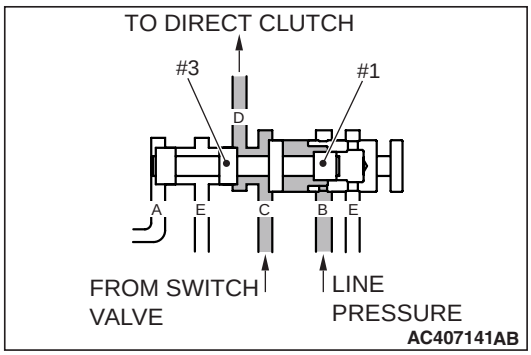
(1) Neutral, reverse

Because the line pressure is supplied from port A to chamber on the left side of the valve, the valve is pushed to the right.



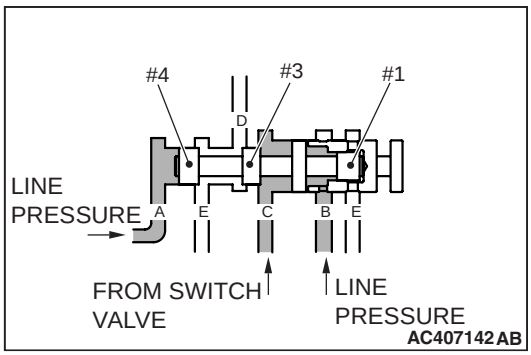
(2) 1st, 2nd, 3rd

The line pressure is also supplied, in addition to port A, from port B. For this reason, hydraulic pressure applied to the area difference between #1 and #2 overcomes the hydraulic pressure applied to #4, then the valve is pushed to the left.



(3) 4th, 5th

In addition to port B, hydraulic pressure is also supplied to port C, but is no longer supplied to port A. Therefore, hydraulic pressure is applied to the area difference between #1 and #2, then the valve is pushed to the left. For that reason, because port D is opened, the hydraulic pressure from the switch valve is supplied to the direct clutch.



(4) Fail safe (with control relay OFF)

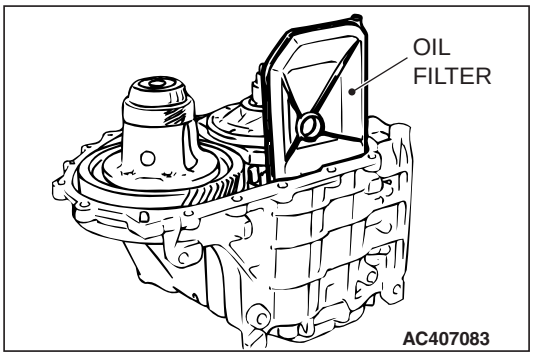
Hydraulic pressure is supplied from port B, port C, and port A, and because the areas of #3 and #4 are equal, the valve is pushed to the right by the hydraulic force applied to #1. Port D is discharged from port E, and the hydraulic pressure supply from the switch valve to the direct clutch is blocked.

ACCUMULATOR

Different accumulators are used, depending on the hydraulic pressure characteristics of each element.

OIL FILTER

M2230002200013



•An oil filter is located in the A/T as shown.

ITEM	OIL FILTER
Filtration method	Non-woven fabric

ELECTRONIC CONTROL SYSTEM

CONTROLLER AREA NETWORK (CAN) COMMUNICATION

M2230000200062

CAN communication is used for more reliable data transmission. For further details on CAN, refer to GROUP 54C, CAN P.54C-2.

EEPROM

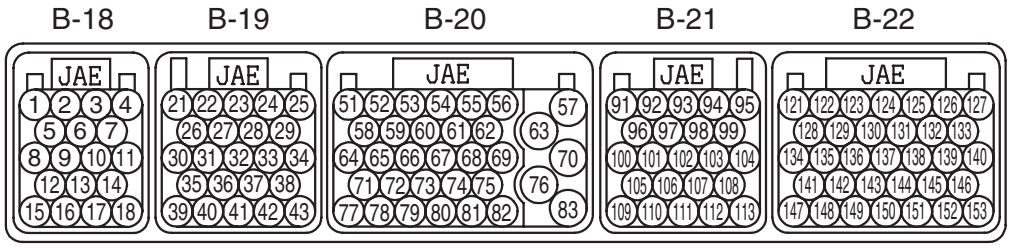
M2230000300092

Because EEPROM has been used, even if the battery terminals or control unit connectors are cut or disconnected, the necessary learned values are stored in the A/T to prevent a loss of shift quality. (Default values can be restored by using the MUT-III.)

CONTROL UNIT

M2230002000268

The PCM uses a 130-pin connector. The terminals of this connector are arranged as shown below.



AC206692AD

1 to 3.	ENGINE USE
4.	GROUND
5 to 6.	ENGINE USE
7.	GROUND
8.	ENGINE USE
9.	STOPLIGHT SWITCH
10 to 13.	ENGINE USE
14.	VEHICLE SPEED SIGNAL
15 to 16.	ENGINE USE
17.	CAN_H
18.	CAN_L
21 to 31.	ENGINE USE
32.	SHIFT SWITCH (UP)
33 to 34.	ENGINE USE
35.	–
36.	SHIFT SWITCH (DOWN)
37.	–
38.	ENGINE USE
39.	SELECT SWITCH
40.	–
41 to 52.	ENGINE USE
53.	REDUCTION SOLENOID VALVE <5A/T>
54.	TORQUE CONVERTER CLUTCH CONTROL SOLENOID VALVE

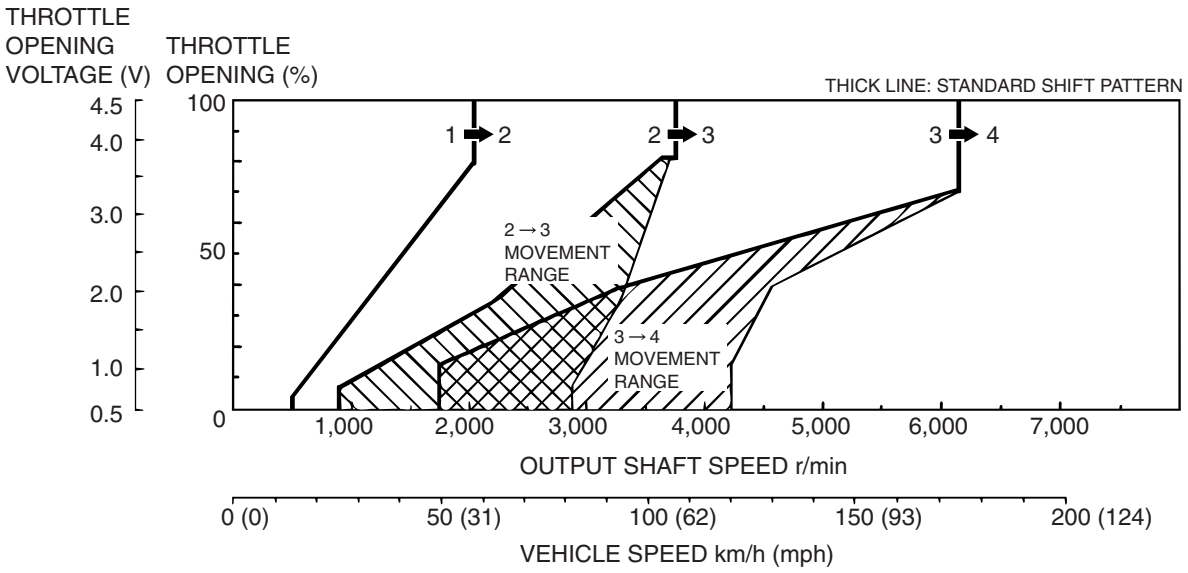
55.	OVERDRIVE SOLENOID VALVE
56.	LOW-REVERSE SOLENOID VALVE
57.	SOLENOID VALVE POWER SUPPLY
58 to 60.	ENGINE USE
61.	TRANSMISSION RANGE SWITCH: R
62.	–
63 to 64.	ENGINE USE
65.	UNDERDRIVE SOLENOID VALVE
66.	SECOND SOLENOID VALVE
67.	TRANSMISSION RANGE SWITCH: P
68 to 69.	ENGINE USE
70.	SOLENOID VALVE POWER SUPPLY
71.	ENGINE USE
72.	–
73.	TRANSMISSION RANGE SWITCH: D
74.	TRANSMISSION FLUID TEMPERATURE SENSOR
75.	–
76.	ENGINE USE
77.	TRANSMISSION RANGE SWITCH: N
78 to 79.	ENGINE USE
80.	–
81.	ENGINE USE
82.	A/T CONTROL RELAY
83 to 110.	ENGINE USE
111.	INPUT SHAFT SPEED SENSOR
112.	OUTPUT SHAFT SPEED SENSOR
113 to 153.	ENGINE USE

SHIFT PATTERN CONTROL

M2230003000313

<4A/T>

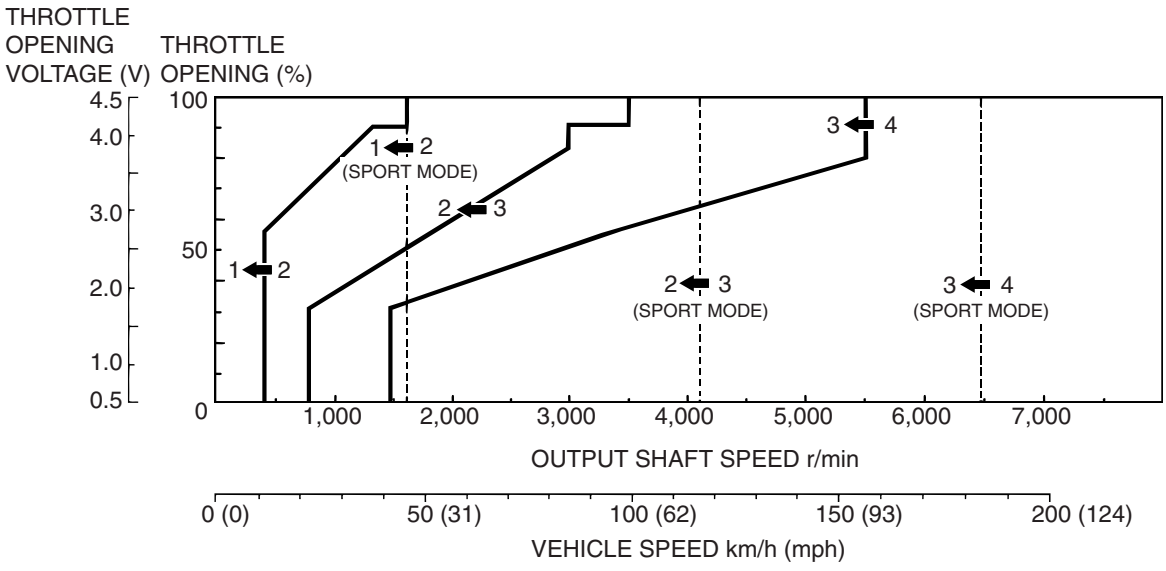
UPSHIFT PATTERN



AC500232AB

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.

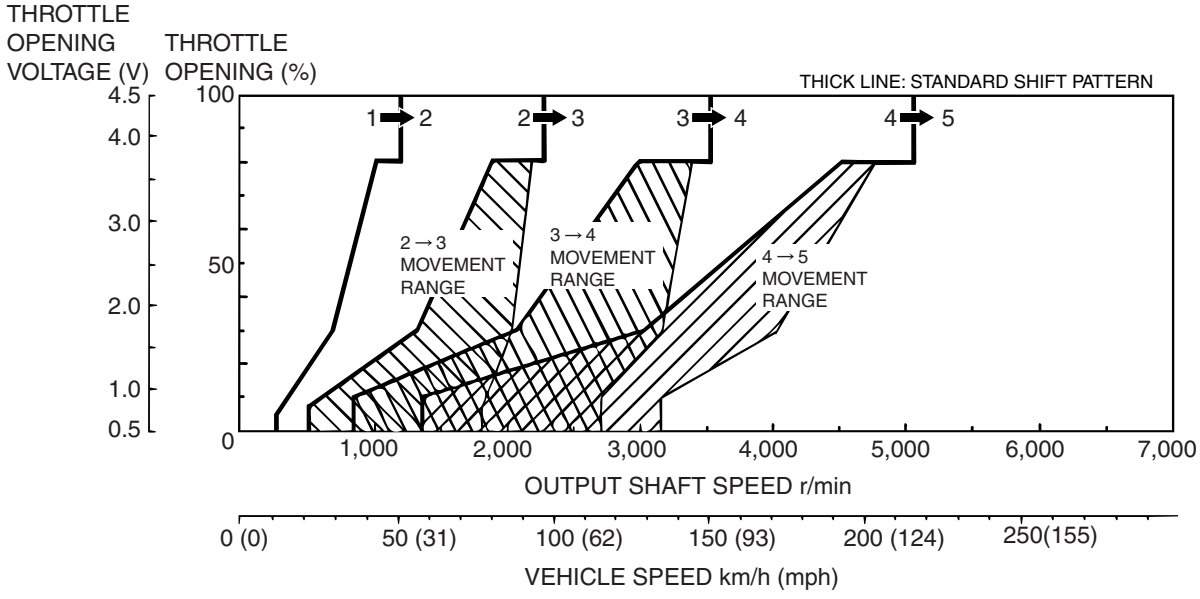
DOWNSHIFT PATTERN



AC500233AB

<5A/T>

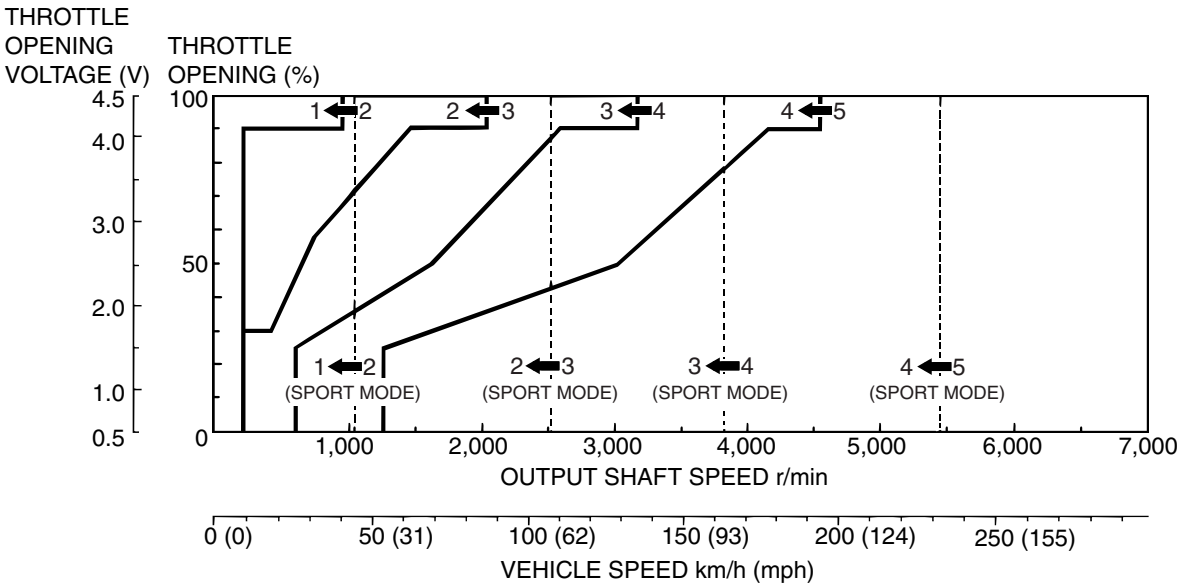
UPSHIFT PATTERN



AC500234AB

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



AC500235 AB

DIAGNOSTIC FUNCTION

M2230010000230

ITEM		DIAGNOSTIC TROUBLE CODE	SERVICE DATA		ACTUATOR TEST
			ITEM NO.	DISPLAY	
EEPROM		P1606	–	–	–
Transmission fluid temperature sensor	Open circuit	P1763	7	°C	–
	Short circuit	P1764			
Input shaft speed sensor	Short circuit/open circuit	P1766	5	r/min	–
Output shaft speed sensor	Short circuit/open circuit	P1767	6	r/min	–
Stoplight switch		P1769	19	ON/OFF	–
Transmission range switch	Open circuit	P1770	34	P/R/N/D	–
	Short circuit	P1771			
LR solenoid valve	Short circuit/open circuit	P1773	12	%	1
UD solenoid valve	Short circuit/open circuit	P1774	13	%	2
2ND solenoid valve	Short circuit/open circuit	P1775	14	%	3
OD solenoid valve	Short circuit/open circuit	P1776	15	%	4
RED solenoid valve <5A/T>	Short circuit/open circuit	P1777	16	%	5
TCC solenoid valve	Short circuit/open circuit	P1778	17	%	6
Gear shift incomplete	1st	P1779	–	–	–
	2nd	P1780	–	–	–
	3rd	P1781	–	–	–
	4th	P1782	–	–	–
	5th <5A/T>	P1783	–	–	–
	Reverse	P1784	–	–	–

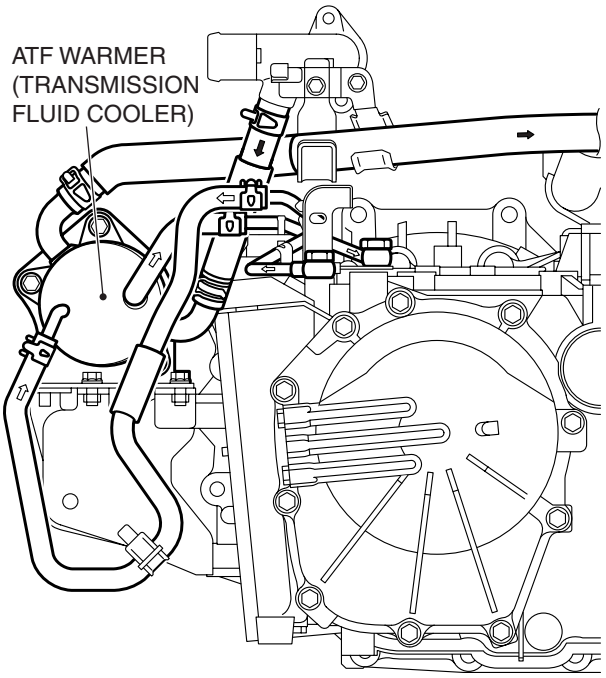
TSB Revision

ITEM		DIAGNOSTIC TROUBLE CODE	SERVICE DATA		ACTUATOR TEST
			ITEM NO.	DISPLAY	
TCC amount slippage	Stuck off	P1786	10	r/min	–
	Stuck on	P1787			–
A/T control relay	Ground short circuit/open circuit	P1788	8	V	12
Crankshaft position sensor		–	1	r/min	–
Throttle position (TP) sensor		–	2	mV	–
Engine load		–	3	%	–
Shift position		–	11	4th/3rd/ 2nd/1st/ REV./N/P	–
A/C compressor switch		–	21	ON/OFF	–
OD OFF signal		–	22	ON/OFF	–
Accelerator position		–	25	ON/OFF	–
Select switch		–	27	ON/OFF	–
Upshift switch		–	28	ON/OFF	–
Downshift switch		–	29	ON/OFF	–
Shift indicator light 1st		–	–	–	7
Shift indicator light 2nd		–	–	–	8
Shift indicator light 3rd		–	–	–	9
Shift indicator light 4th		–	–	–	10
Shift indicator light 5th <5A/T>		–	–	–	11
INVECS-II cancel command		–	33	ON/OFF	–

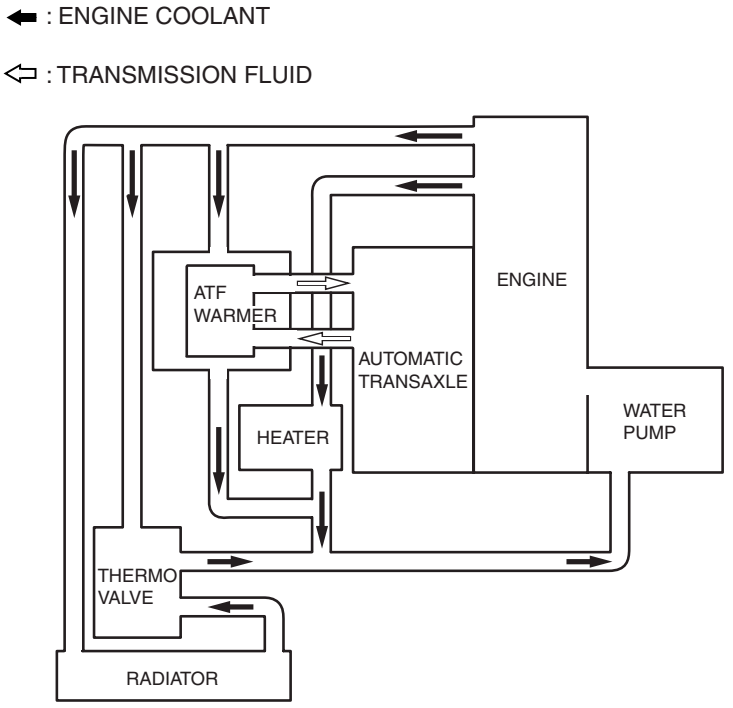
TRANSMISSION FLUID COOLER

M2233000100116

ATF WARMER (TRANSMISSION FLUID COOLER) <4A/T>



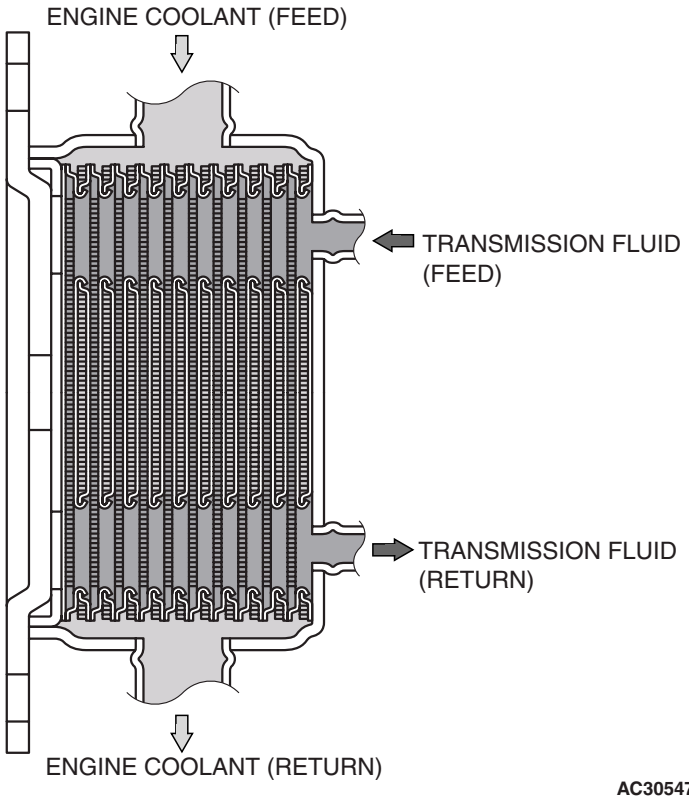
AC305476



AC305477AB

For the F4A4B transaxle on vehicles with 2.4L engine, an ATF warmer is used instead of the conventional transmission fluid cooler, which is integrated in the lower radiator tank.

CONPONENT DIAGRAM

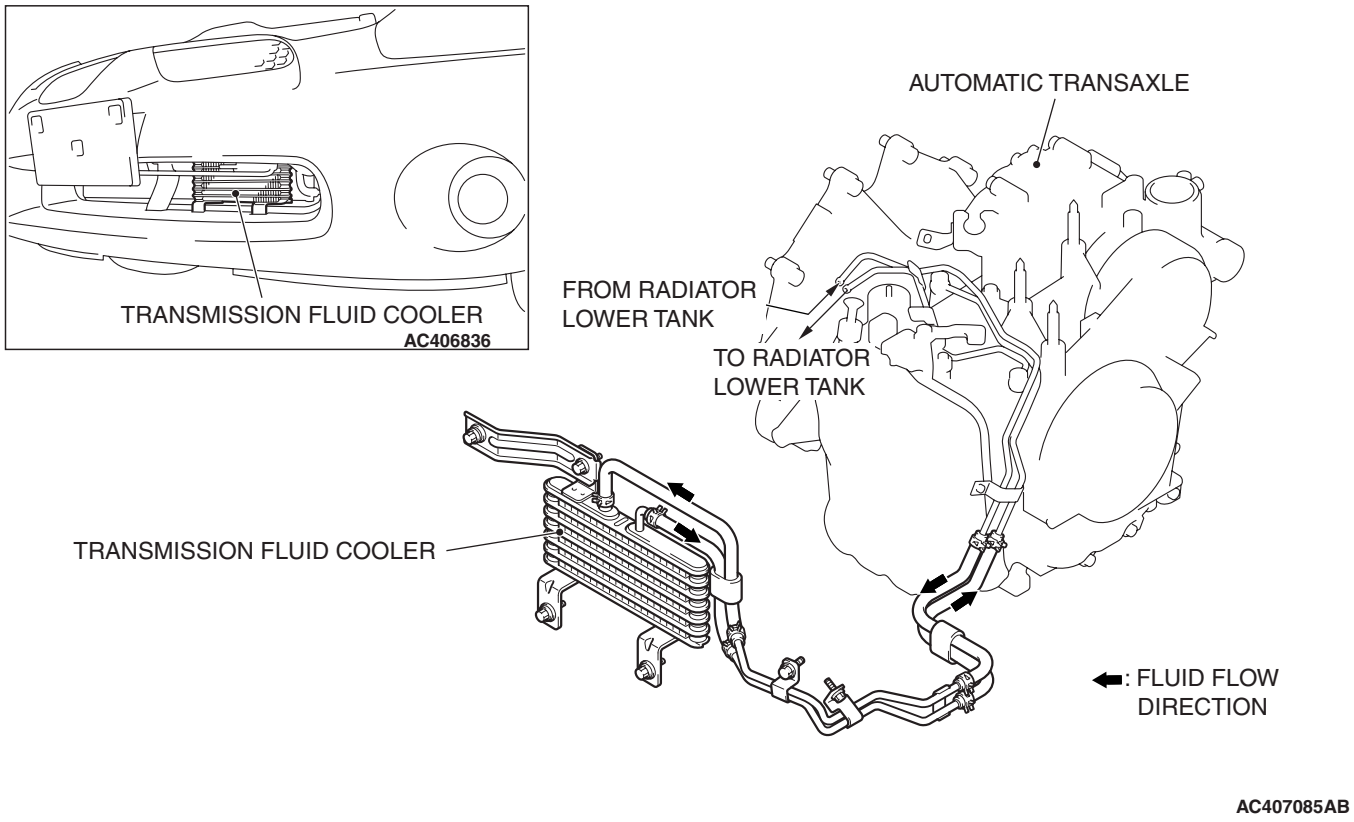


AC305478AB

The ATF warmer warms the transmission fluid up to an optimum temperature [70 – 80°C (158 – 176°F)] quickly for automatic transaxle performance right after engine start. Once the transmission fluid has reached the optimum temperature, the warmer starts cooling down the fluid to stabilize the temperature.

TRANSMISSION FLUID COOLER <5A/T>

COMPONENT DIAGRAM



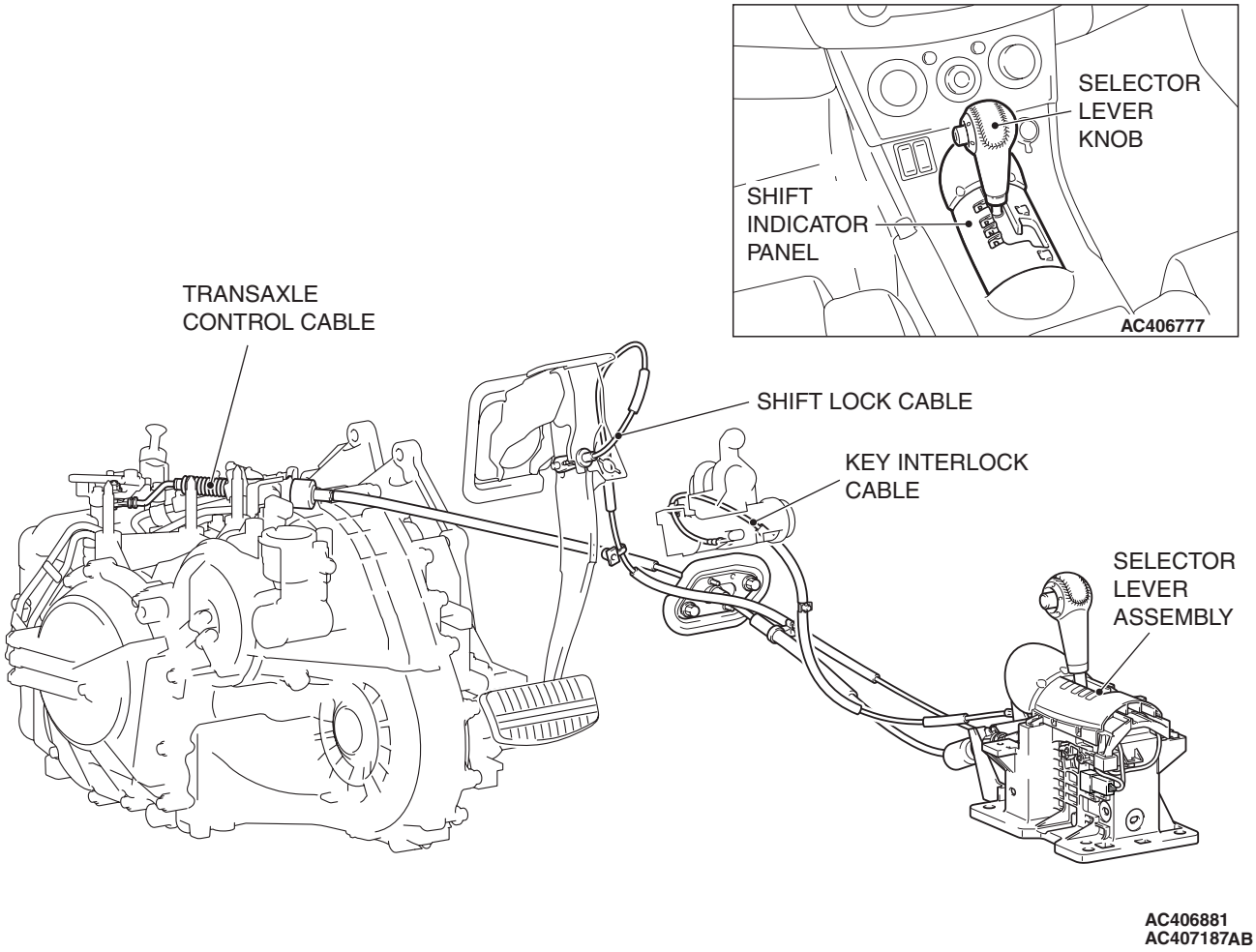
An air-cooled fluid cooler improves the cooling effect together with the water-cooler fluid cooler incorporated into the radiator lower tank.

TRANSAXLE CONTROL

GENERAL DESCRIPTION

M2232000100339

COMPONENT DIAGRAM



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- On vehicles with sport mode, the selector lever assembly has two gates; main gate and manual gate. Main gate has four shift positions (P, R, N, D), which allows the same control as the conventional A/T. The manual gate allows the driver to select gears just like a manual transaxle.
- The P, R, N, D position indicators on the indicator panel are illuminated.
- In order to prevent a sudden start caused by misguided lever operation, the system uses A/T prevention misguided operation mechanisms (consisting of shift lock mechanism and key interlock mechanism).

A/T ERRONEOUS OPERATION PREVENTION MECHANISMS

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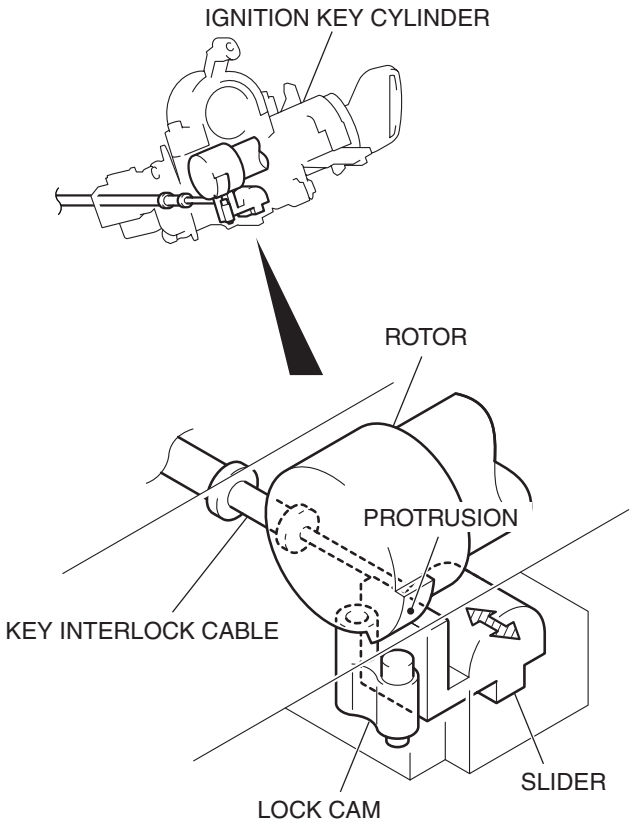
As a preventative mechanism against A/T malfunction, the same shift lock cable unit as for MONTERO is used, and part of the ignition key cylinder has been modified.

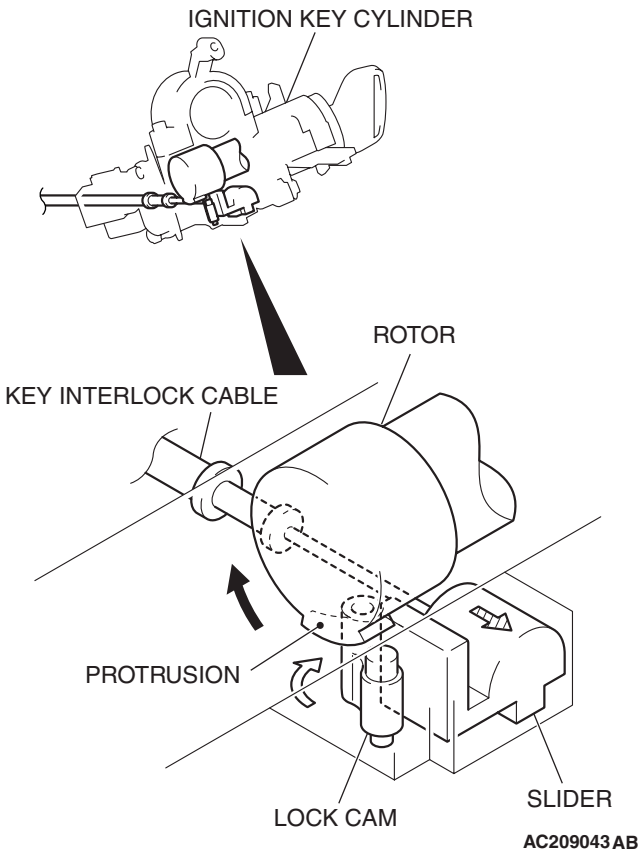
IGNITION KEY CYLINDER

OTHER THAN P POSITION



- The operation of the ignition key cylinder preventing A/T malfunction involves the protrusion of the rotor inside the ignition key cylinder, the lock cam, the slider, and the key interlock cable.
- The slider is linked to the key interlock cable, and it slides depending on the push button of the selector lever when the selector lever is in the P position.
- When the selector lever is out of the P position, the lock cam is restrained by the slider, causing the rotor protrusion to obstruct the lock cam and limit the rotation of the ignition key to the ACC position, which prevents removal of the key.

P POSITION



AC209043 AB

- When the selector lever is in the P position, the slider slides and the lock cam is unrestricted. This frees the rotor, allowing the ignition key to be turned to the LOCK position. When the ignition key is in the LOCK position, the lock cam is restrained by the rotor protrusion, which restrains the slider and prevents the selector lever from moving out of the P position.