

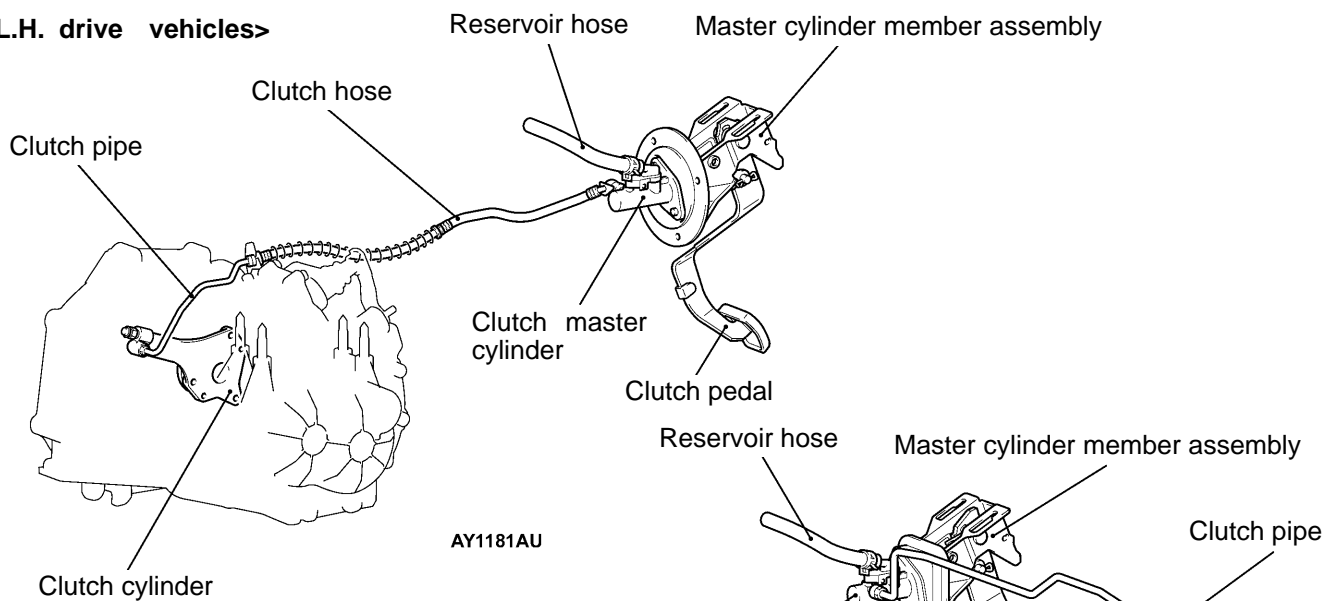
CLUTCH

SPECIFICATIONS

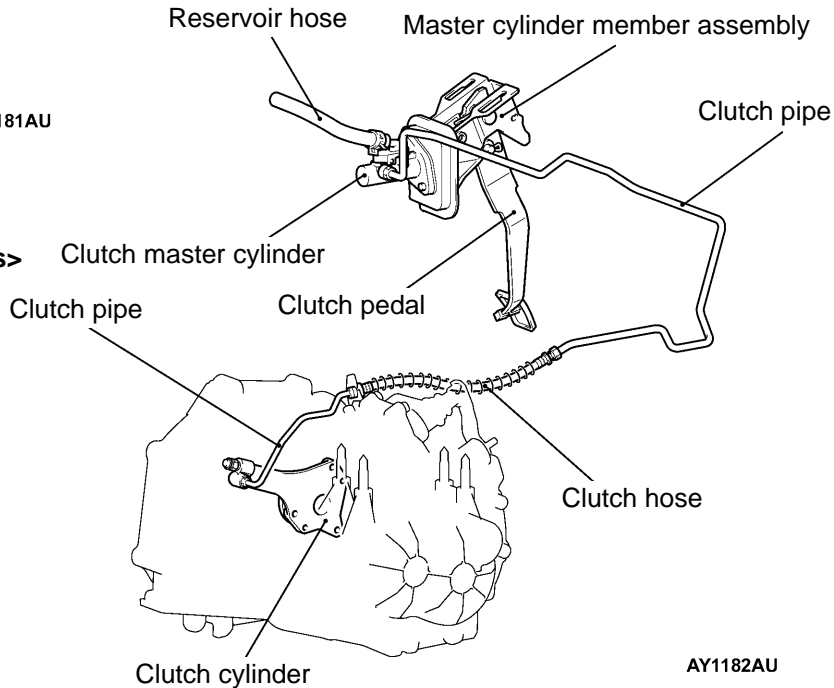
Items	2001MY	2000MY
Engine model	4G13, 4G18	4G13, 4G15, 4G92
Clutch disc type	Dry single plate type	
Clutch disc facing diameter O.D. I.D. mm	200 130	
Clutch cover type	Diaphragm spring type	
Clutch cover set load N	4,170	4,168
Control system	Hydraulic type	
Release cylinder I.D. mm	–	20.64
Master cylinder I.D. mm	15.87	
Clutch fluid	Brake fluid DOT 3 or DOT 4	

CLUTCH CONTROL CONFIGURATION

<L.H. drive vehicles>



<R.H. drive vehicles>



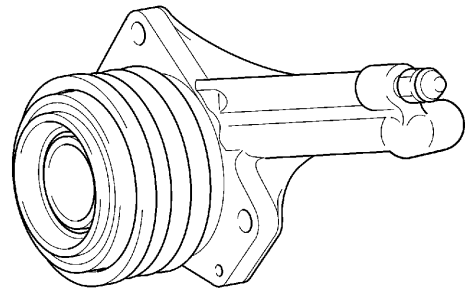
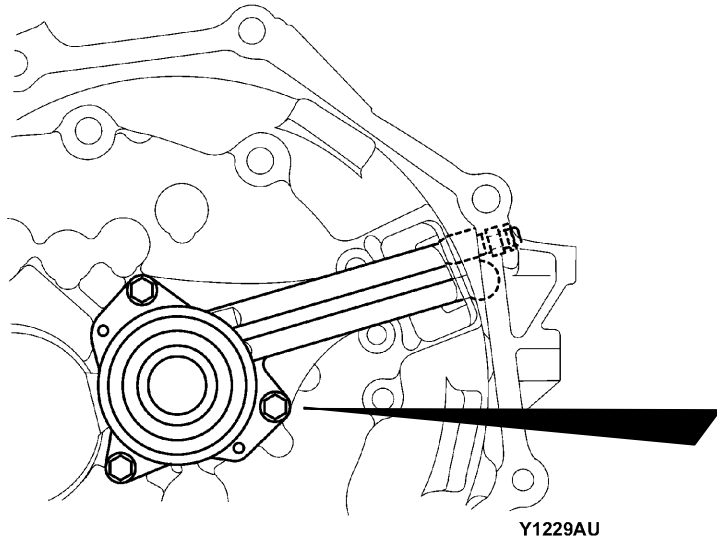
Clutch Cylinder

The clutch on the F5M41 is completely hydraulically manoeuvred. Through the clutch pedal you control a valve bringing the oil to the clutch cylinder.

Consequently the clutch cylinder inactivates the clutch so that the engine rpm disconnects from the transmission and allows the changing of gear.

NOTE

When carry out the air-bleeding, always observe precautions by referring to Workshop Manual GROUP 21 – On-vehicle Service.



MANUAL TRANSMISSION

F5M41 transmission has been adopted for manual transmission. Although this transmission is basically the same as the manual transmission used in previous COLT/LANCER models, the specifications have been adjusted to a new LANCER model.

NOTE: Refer to 1996 COLT/LANCER Technical Information Manual (Pub. No. PYME9502) for more information regarding the description of structure and operations of F5M41.

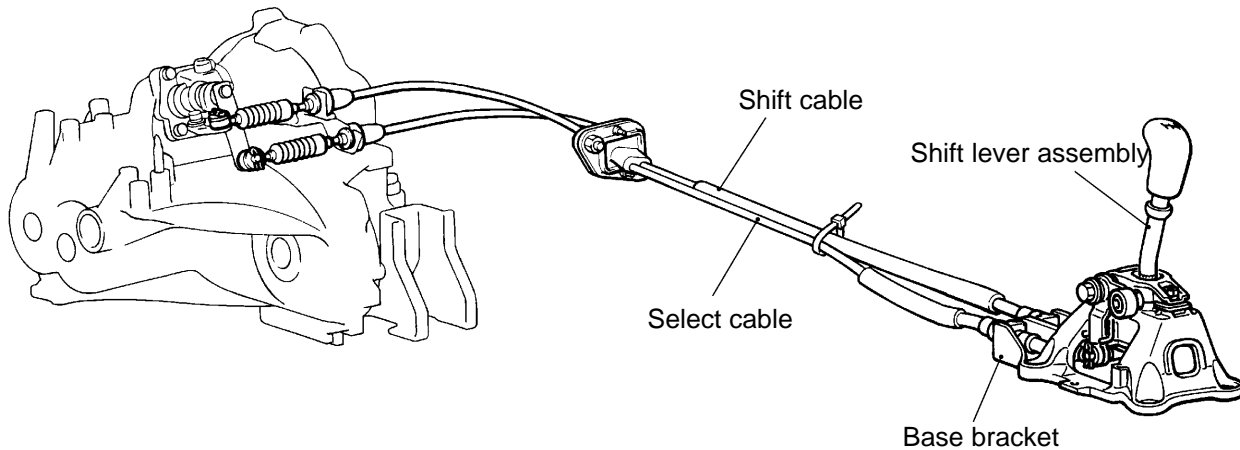
SPECIFICATIONS

Items		Specifications	
Transmission model		F5M41-1-R7B	F5M41-1-R8B
Engine model		4G13	4G18
Transmission type		5-speed, floor-shift	
Transmission gear ratio	1st	3.583	
	2nd	1.947	
	3rd	1.343	
	4th	0.976	
	5th	0.804	
	Reverse	3.416	
Final reduction ratio (Differential gear ratio)		4.052	
Transmission oil	Specified lubricants	Gear oil SAE 75W-90 or 75W-85W conforming to API GL-4	
	Quantity L	2.1	

TRANSMISSION CONTROL

- The shift lever construction adopted the spherical rotary shaft fulcrum type to assure a non-rickety.
- The base bracket material adopted a synthetic resin for the weight reduction.
- The shift and select cable securing portions have been elastically supported to reduce contained sound.
- A mass-filled shift knob has been adopted to minimize the binding touch at the time of a shift.

CONSTRUCTION DIAGRAM



B0910027

CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

GENERAL

F1C1 series T/M is an automatic continuously variable transmission device newly developed by Mitsubishi Motors combining torque converter, steel belt and pulley. The device has realized outstanding economic efficiency and power performance by obtaining continuously variable gear ratios corresponding to the driving conditions.

- The torque converter with lock-up function has been adopted like A/T models to secure the starting performance by the creep phenomenon and to improve fuel efficiency by the expanding the lock-up area.
- The forward/reverse switching mechanism consists of a planetary gear, hydraulic multi-plate clutch and brake.
- The high efficient external gear pump has been adopted for an oil pump.
- The engine and CVT are totally controlled by the latest 1-chip 32-bit microcomputer.
- ATF SP III has been adopted for CVT fluid. Given the consideration for the convenience in the market, it has been commonly used for ATF.

Revolution sensor (Secondary revolution speed detection and vehicle speed detection)

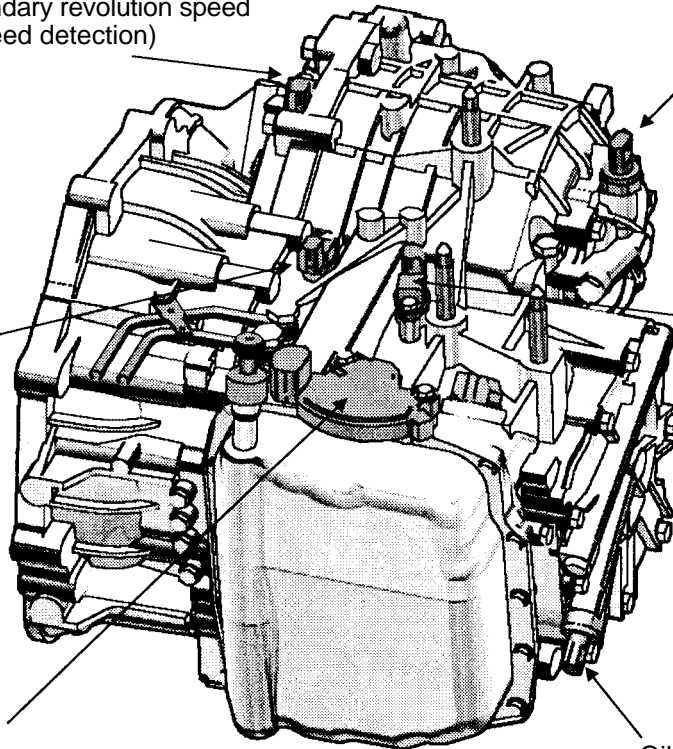
Oil pressure sensor (Line pressure detection)

Revolution sensor (Turbine revolution speed detection)

Revolution sensor (Primary revolution speed detection)

Inhibitor switch (Selector lever position detection)

Oil pressure sensor (Primary pressure detection)
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SPECIFICATIONS

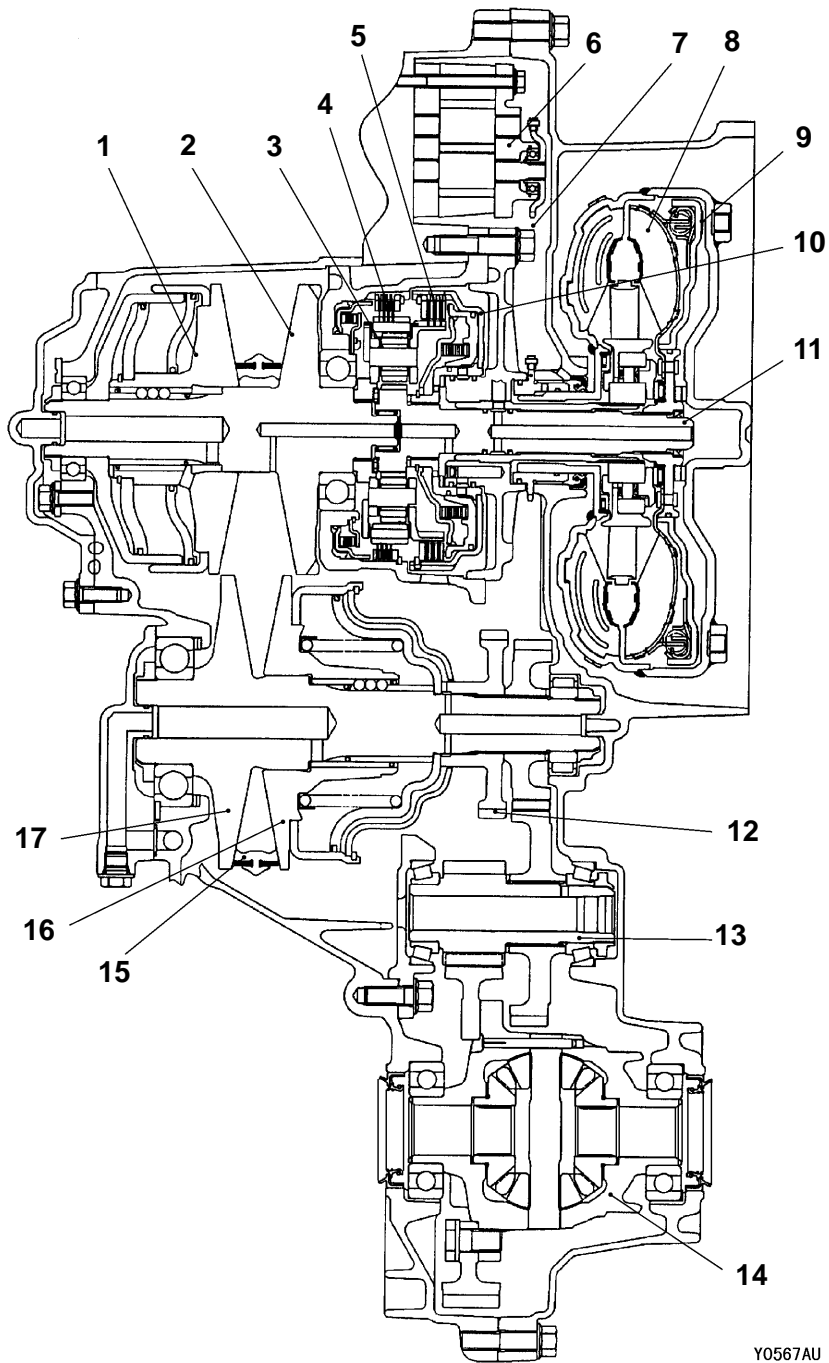
Item		Specifications	
Transmission model		F1C1A-1-J4Z	F1C1A-2-F2Z
Engine model		4G1	4G9
Torque converter	Type	3-element, 1-stage, 2-phase type	
	Lock-up	Provided	
	Stall torque ratio	2.0	
Transmission type		Forward automatic continuously variable (steel belt type), 1st in reverse	
Gear ratio		2.316 – 0.445	
Reverse		2.588	
Final reduction ratio (Differential gear ratio)		5.686	5.219
Clutch		A pair of multi-plate system	
Brake		A pair of multi-plate system	
Manual control system		P-R-N-D-Ds-L	P-R-N-D-Ds + sport mode
Function	Variable speed control	Yes	
	Line pressure control	Yes	
	Direct engagement control	Yes	
	N-D/N-R control	Yes	
	Shift pattern control	Yes	
	Self-diagnosis	Yes	
	Failsafe	Yes	
Oil pump	Type	External gear pump	
	Configuration	Built-in (chain drive)	
Control method		Electronic control	
Control actuator		3-point duty solenoid	
Transmission oil	Specified lubricants	DIA QUEEN ATF SP III	
	Quantity L	8.1	

SECTIONAL VIEW

<F1C1>

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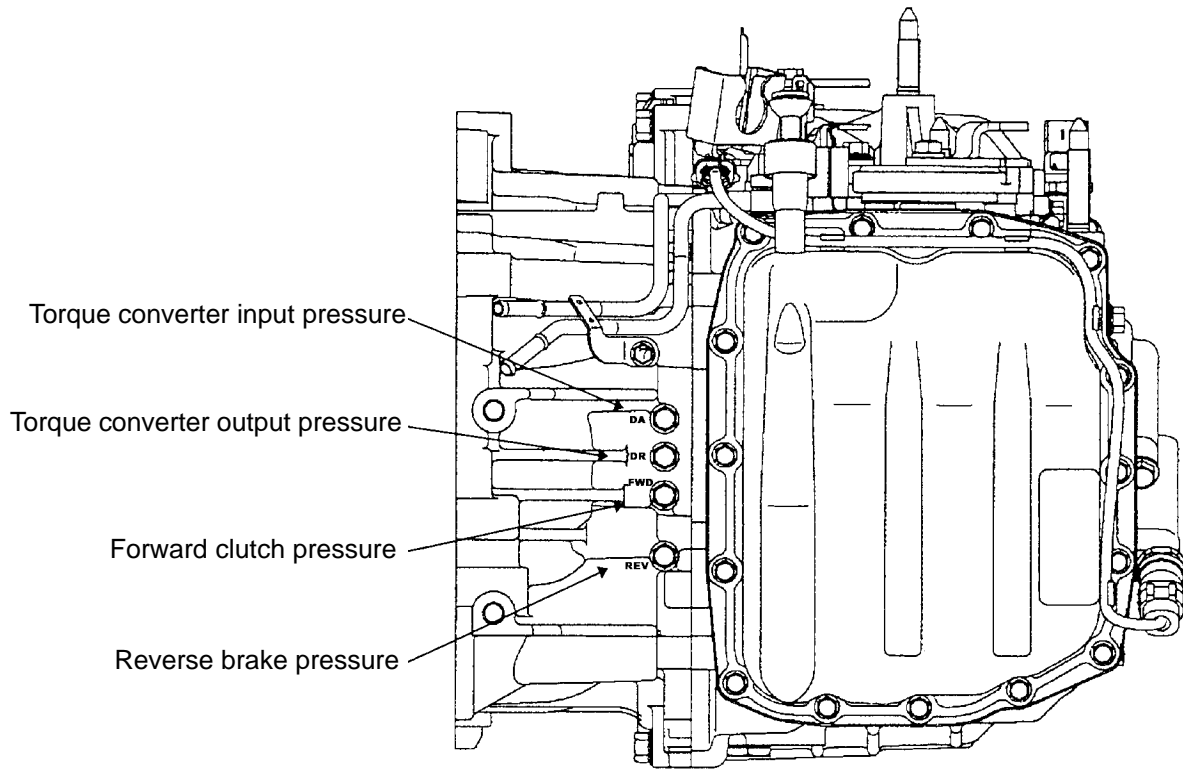
Group
TOC



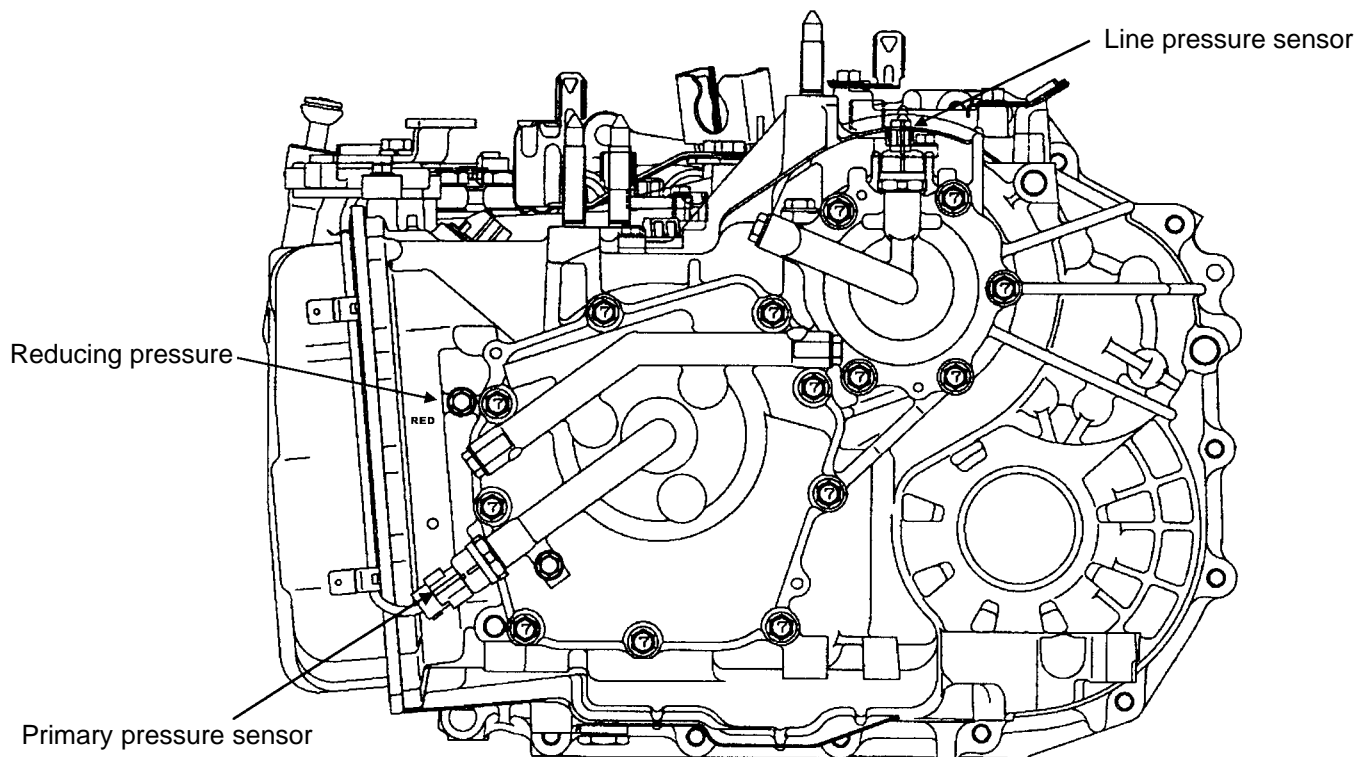
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- | | |
|-------------------------|-----------------------------|
| 1. Primary sleeve | 10. Forward clutch retainer |
| 2. Primary shaft | 11. Input shaft |
| 3. Planetary gear | 12. Parking gear |
| 4. Reverse brake | 13. Output shaft |
| 5. Forward clutch | 14. Differential |
| 6. Oil pump | 15. Steel belt |
| 7. Oil pump drive chain | 16. Secondary sleeve |
| 8. Torque converter | 17. Secondary shaft |
| 9. Damper clutch | |

OIL PRESSURE PORT & OIL PRESSURE SENSOR POSITION



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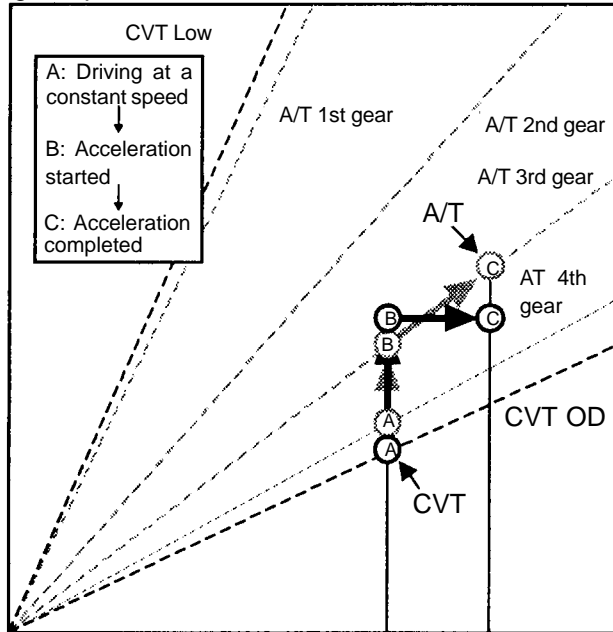
FUEL EFFICIENCY-PERFORMANCE IMPROVEMENT THEORY BY CVT

The general concept of CVT is described in the following:

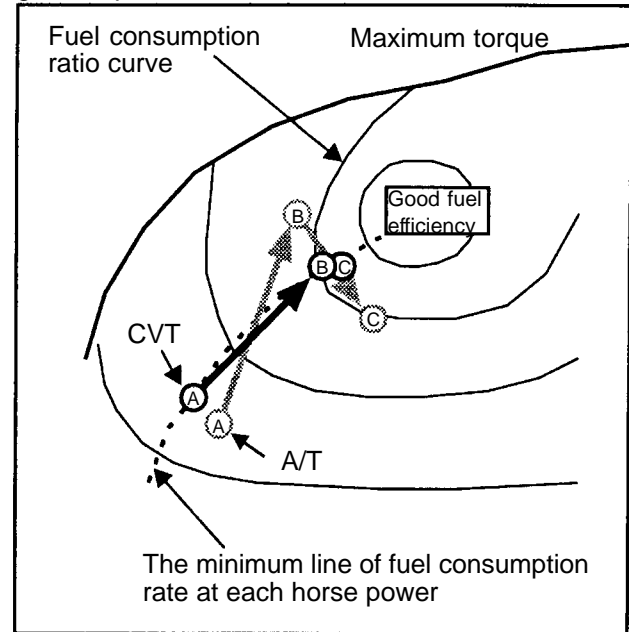
FUEL EFFICIENCY IMPROVEMENT THEORY

Since CVT allows the gear ratio to change continuously variable, the engine can be operated closely to the most optimized fuel consumption ratio at any time. Thus, it can economize fuel consumption.

Engine speed



Engine torque



Vehicle speed

Engine speed

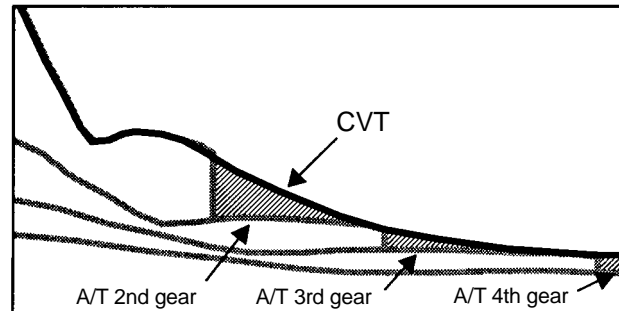
When the vehicle is accelerated from driving at a constant speed

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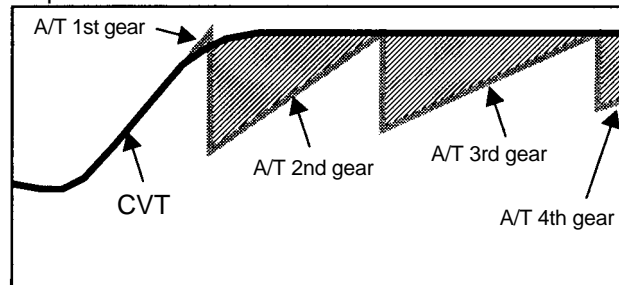
POWER PERFORMANCE IMPROVEMENT THEORY

When the vehicle requires a large torque such as acceleration, power performance can be improved by operating the engine closely to the maximum output point.

Torque



Engine speed



Vehicle speed

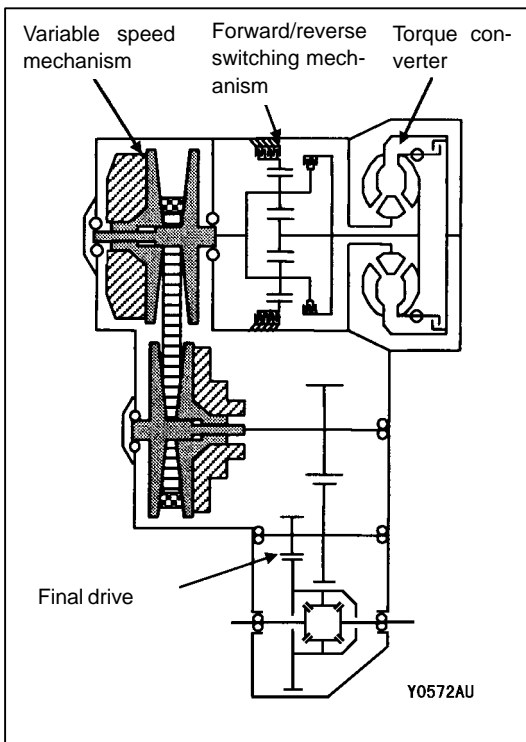
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When the state of the vehicle is changed from stationed to fully accelerated

DESCRIPTION OF STRUCTURE AND OPERATIONS

POWER TRAIN

F1C1 series T/M consists of torque converter, forward/reverse switching mechanism to switch the forward and reverse movements, variable speed mechanism to control the gear ratio corresponding to the driving conditions, and the final drive.

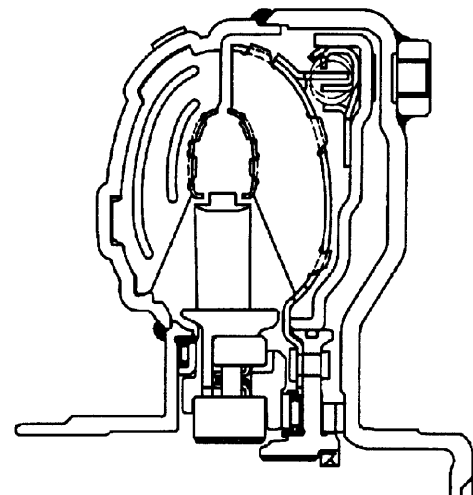


TRANSMISSION CASE

An aluminum die-cast transmission case with light weight and high rigidity has been adopted. The shape, thickness, rib layout of the case have been optimized by CAE analysis to suppress deformation when heavy load is applied.

TORQUE CONVERTER

The torque converter with lock-up mechanism sharing main parts with F4A4 system transmission has been adopted. The optimization of the torque converter characteristics makes it possible to make improvements in fuel efficiency of the vehicle at idle as well as to make improvements in starting and acceleration performance. Reduction of rigidity of the 1st stage of the damper spring allows the vehicle to become noiseless and to operate lock-up function at a low speed.

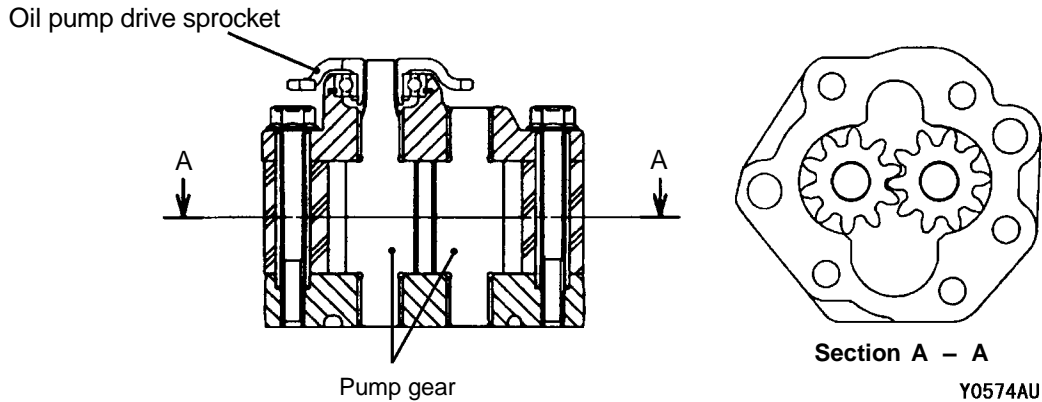


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OIL PUMP

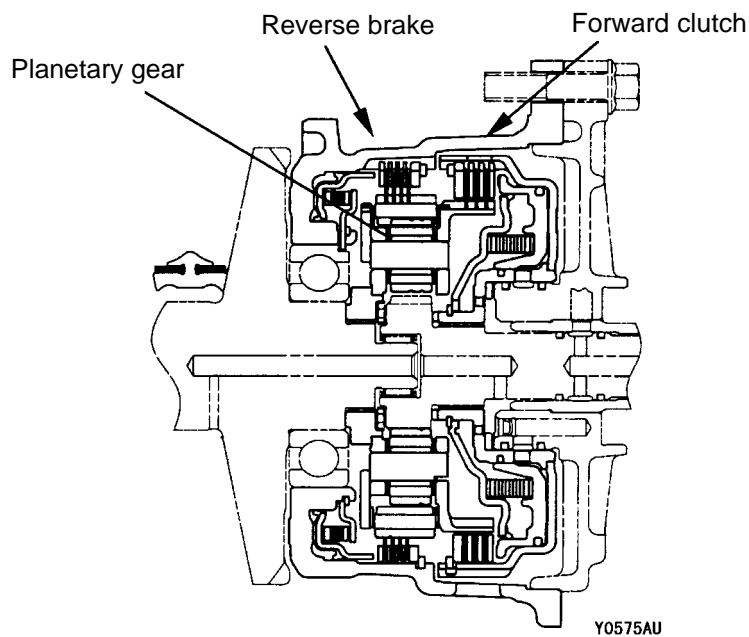
The external gear pump with high efficiency has been adopted to obtain sufficient belt clamping force. The oil pump is not placed on the input shaft but is discretely placed in the T/M case to be driven with an increased speed by the oil pump drive sprocket connected to the torque converter via chain. Therefore, the oil pump always generates oil pressure while the engine is running and supplies operation oil pressure to the primary and secondary pulleys and to the clutch as well as lubrication oil pressure to related parts.

<Pump Assembly>



FORWARD/REVERSE SWITCHING MECHANISM

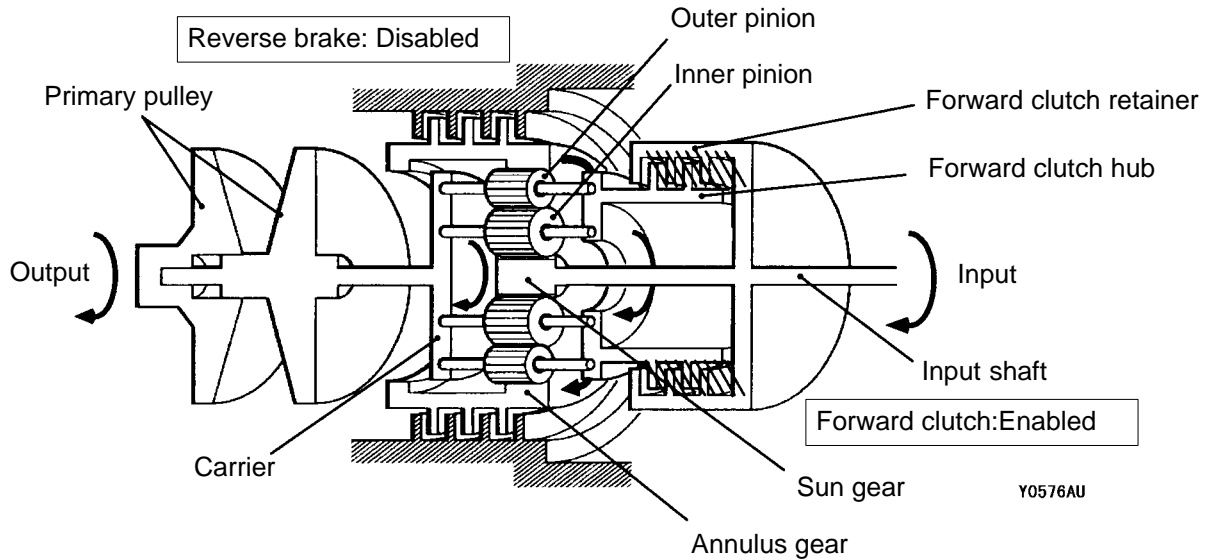
The forward/reverse switching mechanism has been placed between the torque converter and the primary pulley. The forward/reverse switching mechanism consists of the planetary gear and the oil pressure servo (forward clutch and reverse brake) and switches the direction of movement by engaging and disengaging them.



POWER FLOW

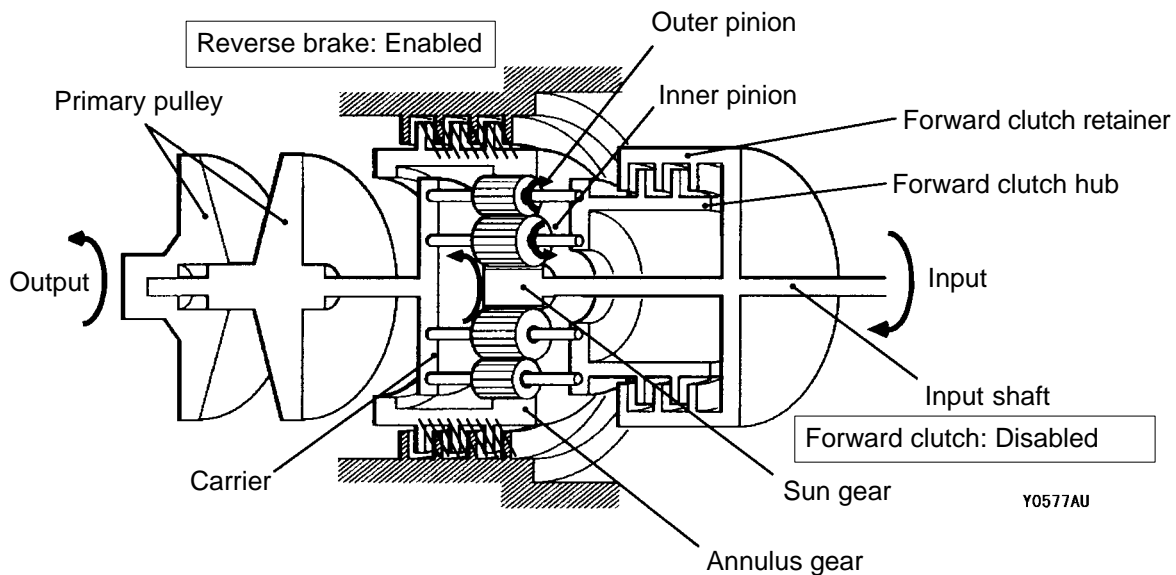
<Forward>

When the vehicle moves forward, the forward clutch is operated to engage the forward clutch retainer and the forward clutch hub. Thus, the planetary gear set rotates as a unit and the torque from the input shaft is directly transmitted to the primary pulley.



<Reverse>

When the vehicle moves backward, the reverse brake is enabled to secure the annulus gear. The torque from the sun gear (input shaft) is transmitted to the inner pinion and the outer pinion. Since the annulus gear is secured by the reverse brake, generated reaction rotates the carrier (primary pulley) in the reverse direction of the input shaft.

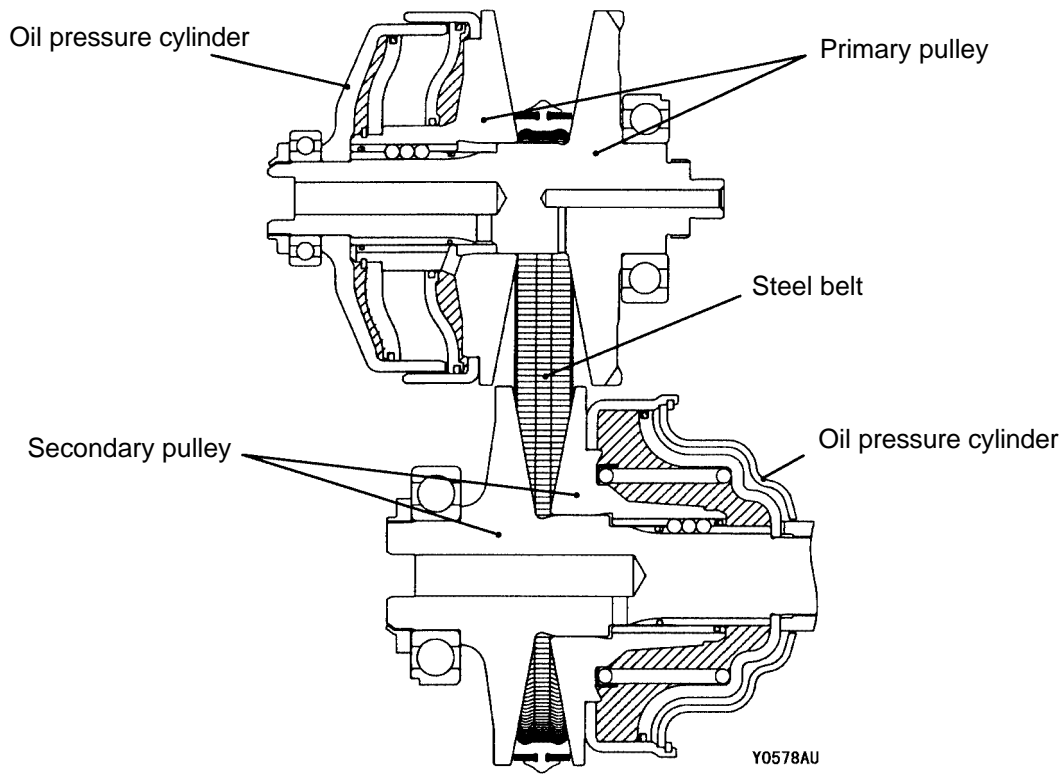


<P range & N range>

When the lever is the parking or the neutral position, the forward clutch and the reverse brake are disengaged. Therefore, the torque from the input shaft is not transmitted to the primary pulley.

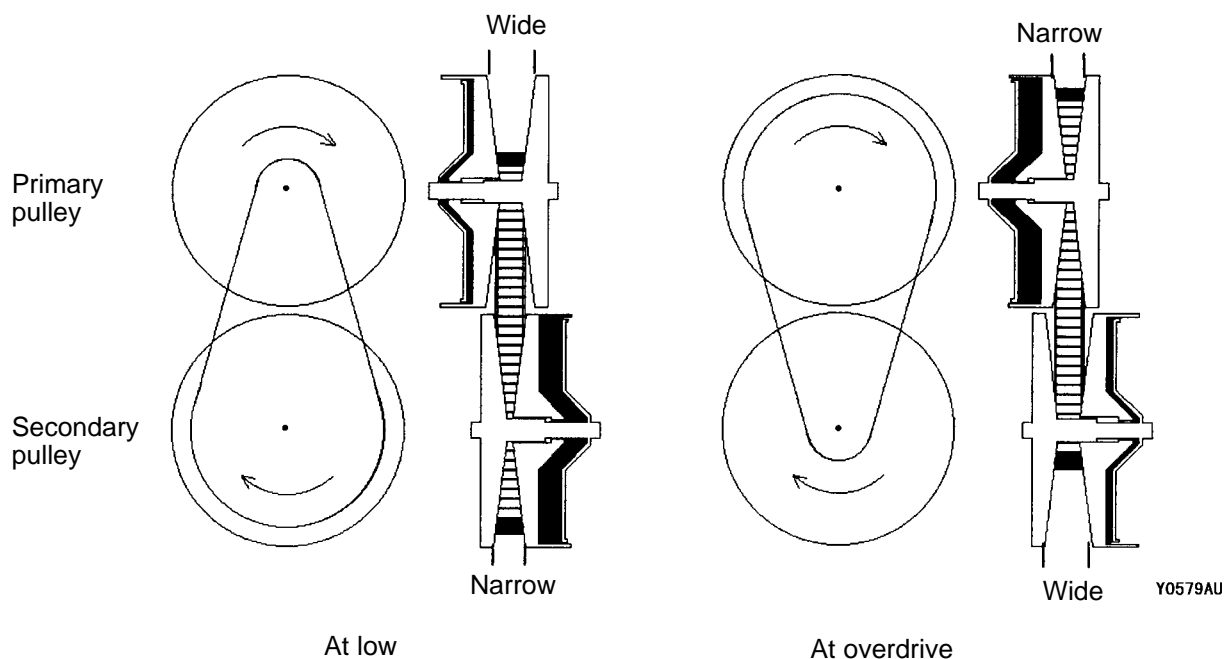
TRANSMISSION MECHANISM

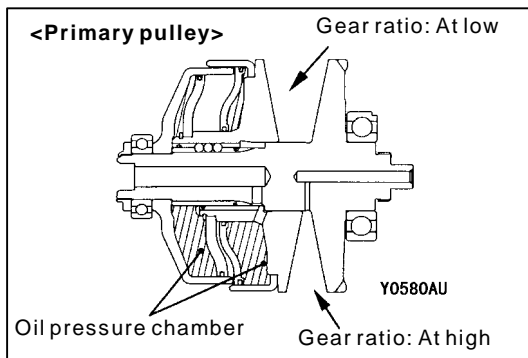
The transmission mechanism consists of two pulleys (primary pulley and secondary pulley) which can change the steel belt and the groove width in the shaft direction. The mechanism changes the groove width corresponding to the driving conditions to obtain continuously variable gear ratios from low to overdrive.



Gear change mechanism

Each of primary and secondary pulleys consists of shaft (fixed conical surface), sheave (conical surface to be movable on the shaft direction), and the oil pressure cylinder. Pulley width varies according to the oil pressure of each cylinder, and the winding radius of the belt also changes. The ratio of winding radius of the primary and secondary pulleys is a gear ratio.



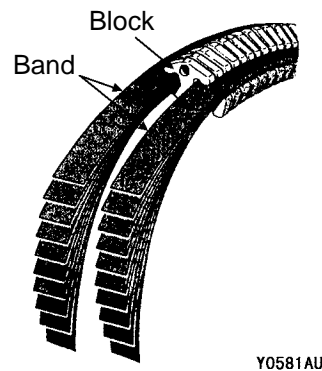
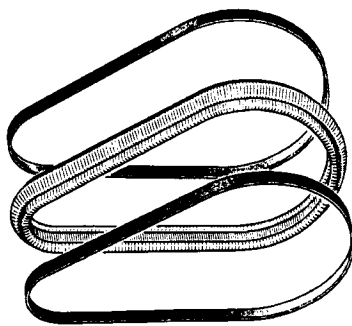


PULLEY

- The double piston system has been adopted for the primary pulley to secure sufficient belt clamp force at a low oil pressure.
- The single piston system has been adopted for the secondary pulley.

STEEL BELT

The steel belt consists of two pairs of band piling up approximately 450 steel blocks and 12 thin steel plates (for 4G1: 9 plates). The basic structure is made for 4G1. Without changing its basic form, the steel belt is fortified by increasing the number of plates to meet the requirement for 4G9.



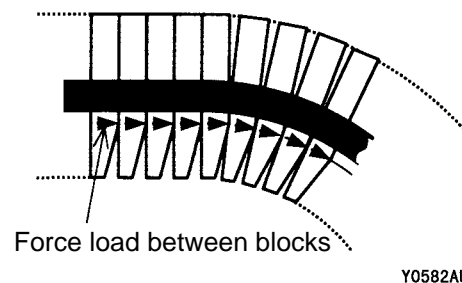
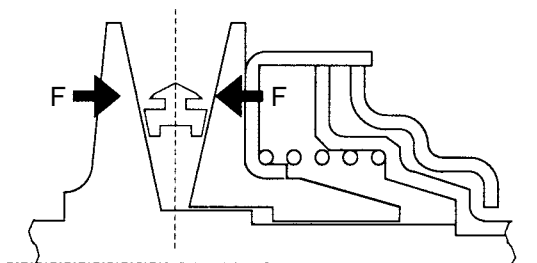
Torque transmission theory

The steel belt mainly transmits the power with the forced load by the block.

Transmission theory

The steel belt contacts the slope of the pulley and generates the friction by being compressed from both sides. The friction generates the forced load between blocks and the torque is transmitted from the primary pulley to the secondary pulley.

The band mainly receives restitution and centrifugal force.



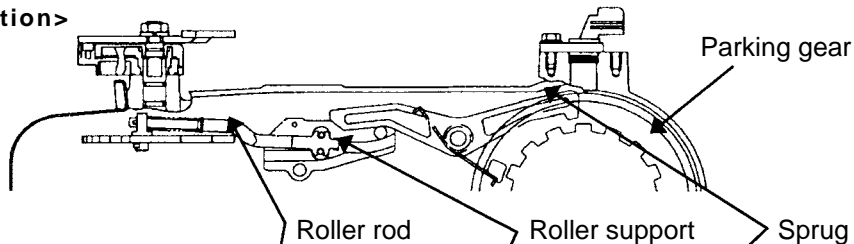
MANUAL CONTROL LEVER

The manual control lever is installed to the upper part of the valve body connected with the parking roller rod and the manual control valve pin. The lever has detent mechanism to enhance the feeling of selecting the manual mode.

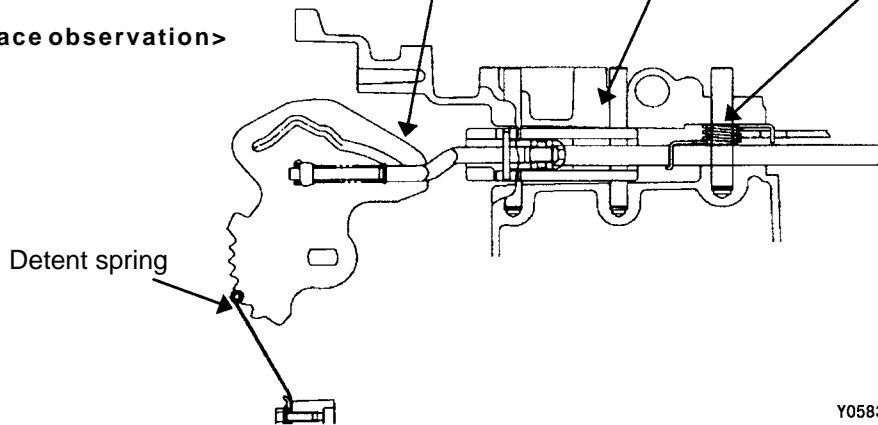
Parking mechanism

The parking mechanism consists of the parking roller rod, the roller support, the sprug, and the parking gear. When the selector lever is shifted in P range, the parking roller rod moves along the roller support and pushes the sprug down to fix the parking gear. (The same structure used in the previous A/T models)

<Side surface observation>



<Flat surface observation>



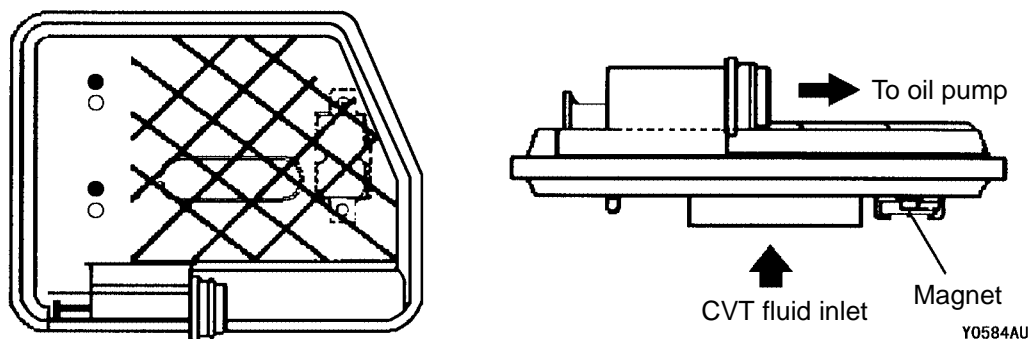
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CVT FLUID

ATF SP III is used. The improvements have been made in durability compared with the previously used ATF SP II and control stability in the direct clutch and forward clutch. Given the consideration for the convenience in the market, it is also used for ATF.

OIL FILTER

A high dense nonwoven fabric has been adopted for the filter and a magnet has been placed near the fluid inlet. The reliability of the oil pressure valve has been improved by increasing the catching rate of floating particles in fluid more than twice as much as that of the previous filters used in A/T models.



OIL PRESSURE CONTROL SYSTEM

The oil pressure control device consists of the oil pump to generate the oil pressure, the solenoid valve to adjust the oil pressure based on the electric signals from the CVT control unit, the control valve to be operated based on the control oil pressure from the solenoid valve, and the various valves to regulate the line pressure to a certain level, and the valve body containing those parts. CVT control unit drives 4 solenoid valves based on the signal information from each sensor to control corresponding to driving conditions.

Outline of solenoid valve functions

Name	Function
Line pressure control solenoid valve	The operations of regulator valve are controlled to regulate pressure to the secondary pulley.
Shift control solenoid valve	The operations of shift control valve are controlled to regulate the gear ratio.
Clutch pressure control solenoid valve	The operations of clutch pressure control valve are controlled to regulate pressure to the forward clutch and the reverse brake.
Damper clutch control solenoid valve	The operations of damper clutch control valve are controlled to non-direct engagement, slip engagement, and direct engagement.

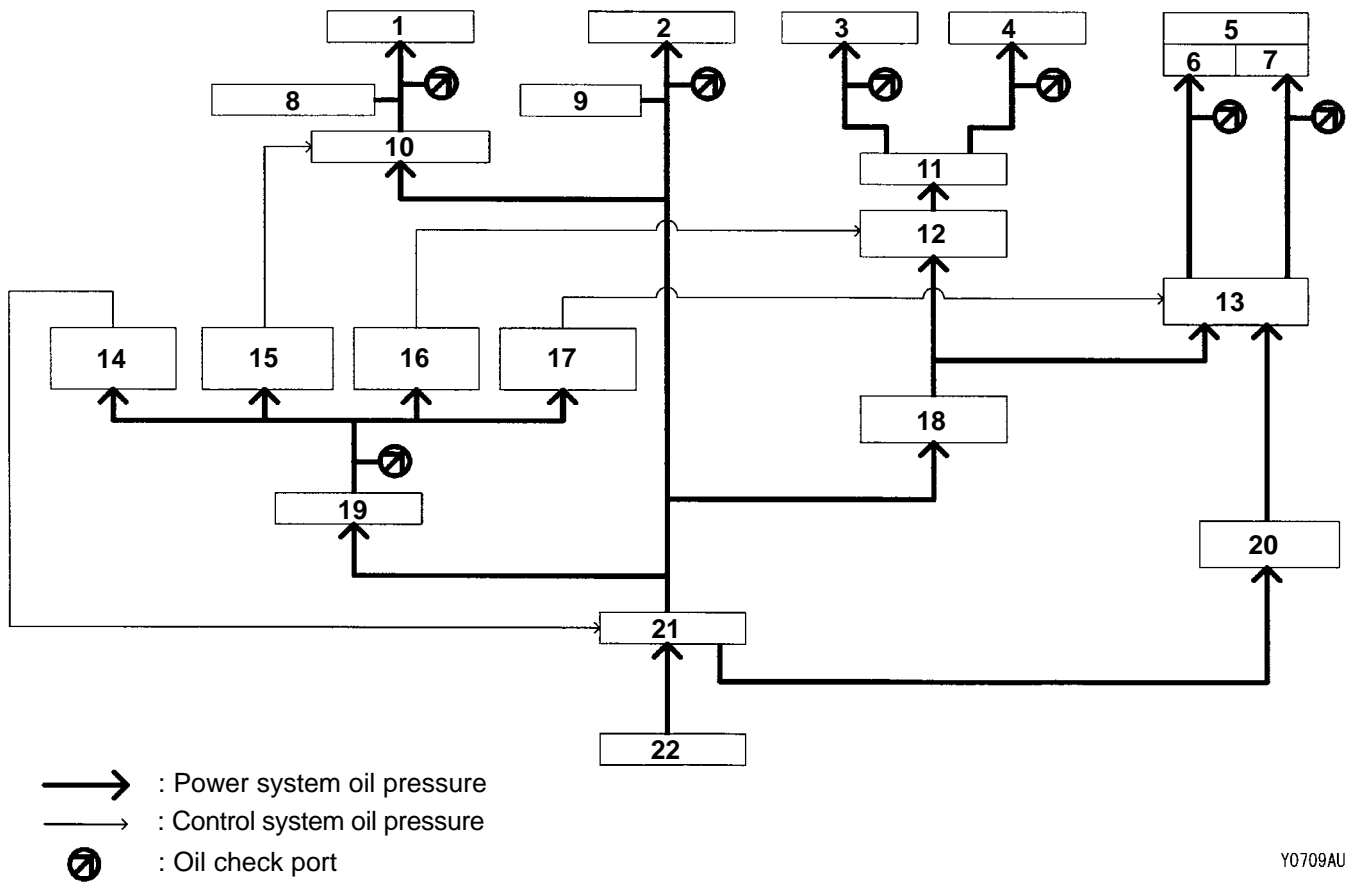
Outline of control valve functions

Name	Function
Regulator valve	Line pressure is regulated to an optimized pressure corresponding to the driving conditions.
Shift control valve	Applying and relieving the oil pressure to the primary pulley are controlled.
Clutch pressure control valve	Operation pressure of the forward clutch and the reverse brake are regulated.
Manual valve	The selector lever is jointed attached to switch the oil channel corresponding to each position.
Damper clutch control valve	Operation pressure to the damper clutch is regulated.

Oil pressure control system diagram

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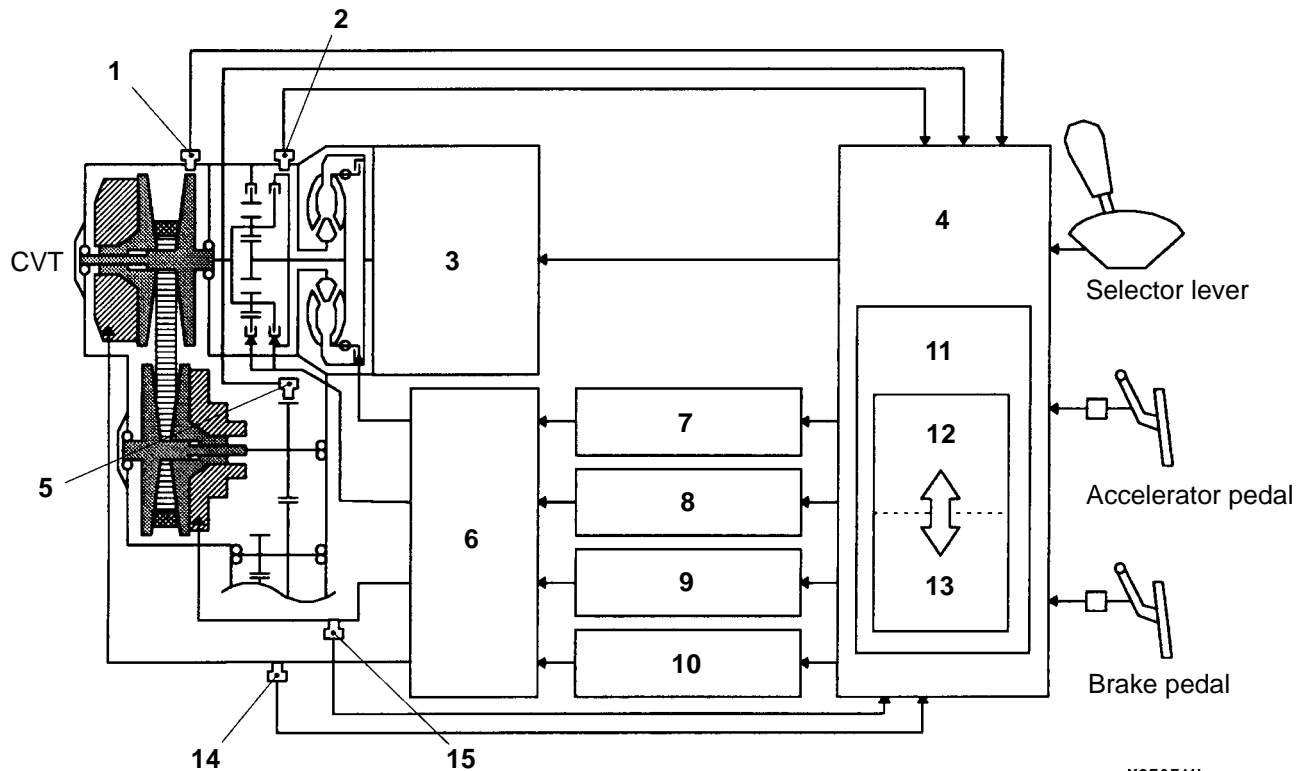
- | | |
|----------------------------|---|
| 1. Primary pulley | 12. Clutch pressure control valve |
| 2. Secondary pulley | 13. Damper clutch control valve |
| 3. Forward clutch | 14. Line pressure control solenoid valve |
| 4. Reverse brake | 15. Shift control solenoid valve |
| 5. Damper clutch | 16. Clutch pressure control solenoid valve |
| 6. Apply | 17. Damper clutch control solenoid valve |
| 7. Release | 18. Clutch pressure reducing valve |
| 8. Primary pressure sensor | 19. Reducing valve |
| 9. Line pressure sensor | 20. Torque converter pressure control valve |
| 10. Shift control valve | 21. Regulator valve |
| 11. Manual valve | 22. Oil pump |

ELECTRONIC CONTROL SYSTEM

The electronic control mechanism consists of various sensor actuators and the CVT control unit to regulate those devices. The control unit calculates the vehicle status based on the various sensor information and drives various control valves to control the following items:

- (1) Line pressure control
- (2) Gear ratio control
 - INVECS-III
 - Sports mode
- (3) N-D/N-R control
- (4) Direct engagement control
- (5) Engine-CVT integrated control
- (6) Self-diagnosis function

Control system diagram

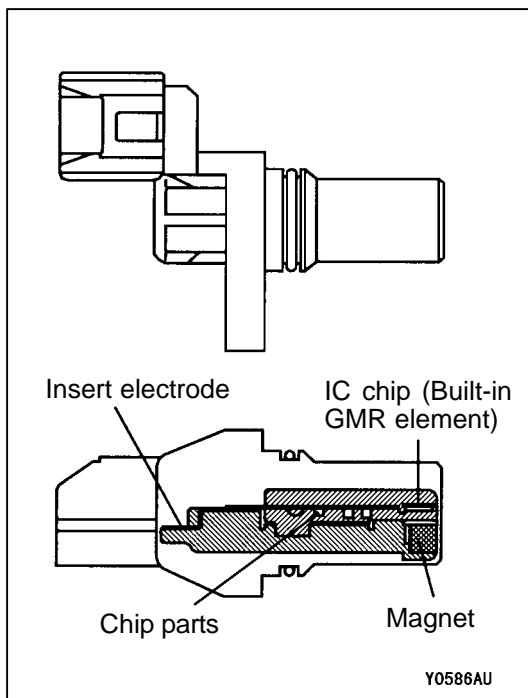


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- | | |
|---|---|
| 1. Primary revolution sensor | 9. Line pressure control solenoid valve |
| 2. Turbine revolution sensor | 10. Shift control solenoid valve |
| 3. Engine | 11. 1-chip micro computer |
| 4. Engine-CVT-ECU | 12. Engine control |
| 5. Secondary revolution sensor | 13. CVT control |
| 6. Oil pressure circuit | 14. Primary oil pressure sensor |
| 7. Damper clutch control solenoid valve | 15. Secondary oil pressure sensor |
| 8. Clutch pressure control solenoid valve | |

SENSOR AND ACTUATORS

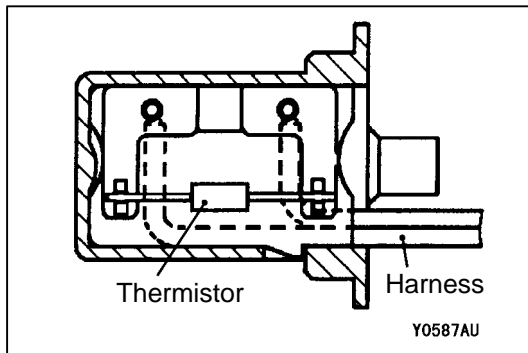
Name		Function
Sensor	Primary revolution speed sensor	Primary pulley revolution detected
	Secondary revolution speed sensor	Secondary pulley = transfer drive gear revolution detected at the transfer driven gear
	Turbine speed sensor	Forward clutch retainer revolution detected
	CVT fluid temperature sensor	Fluid temperature of ATF detected by the thermistor
	Primary pressure sensor	Pressure to the primary pulley detected
	Secondary pressure sensor	Pressure to the secondary pulley detected
	Crank angle sensor	Engine speed detected at the crankshaft sprocket
	Throttle position sensor	Degree of pressure applied to the accelerator pedal detected by the potentiometer
	Inhibitor switch	Selector lever position detected by the contact switch
	Stop lamp switch	Brake status detected by the contact switch at the brake pedal
	Select switch	Selection of sports mode detected by the contact switch at the selector lever
	Upshift switch	Upshift request in sports mode detected by the contact switch at the selector lever
	Downshift switch	Downshift request in sports mode detected by the contact switch at the selector lever
Actuator	CVT control relay	Solenoid valve power supply circuit ON/OFF
	Damper clutch control solenoid valve	Damper clutch controlled
	Clutch pressure control solenoid valve	Pressure to the forward clutch and the reverse brake controlled
	Line pressure control solenoid valve	Pressure to the secondary pulley controlled
	Shift control solenoid valve	Gear ratio controlled
	Sports mode shift indicator (meter) <Vehicle with sports mode only>	Shift position in sports mode displayed in the indicator of the meter
	N range lamp	Fluid temperature warning, failsafe enabled, and diagnosis are displayed slowly.



Primary/secondary/turbine rotation sensor

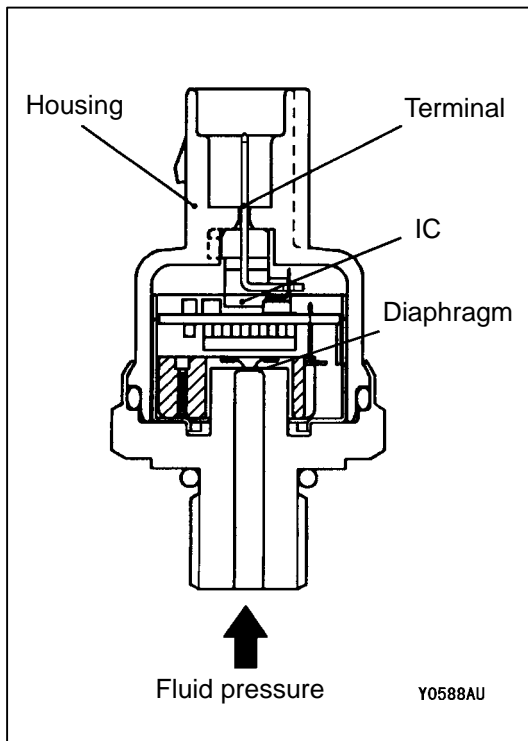
A newly developed GMR* type revolution sensor has been adopted. GMR revolution sensor is not affected by variance of gap in detection teeth and temperature changes and can gain stable output.

- * Giant Magnetoregistance
Magnetoregistance with giant magnetism



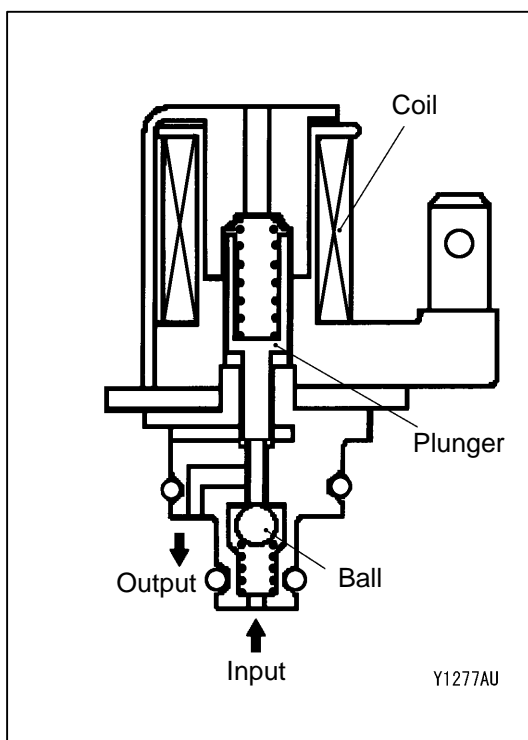
CVT fluid temperature sensor

The sensor is a variable resistance type using the thermistor. Simplified fixing method, improved mounting operations, and weight reduction have realized better response.



Oil pressure sensor (primary/secondary pressure sensor)

The semi-conductor distortion gauge with better response and precision has been adopted.



Solenoid valve (line pressure control, shift control, clutch pressure control, damper clutch control solenoid valve)

Small and low noise type solenoid valves have been adopted. Since the electromagnetic force and spring force applied to the solenoid operation part can be relatively small, the impact energy during the operation is reduced and durability has been considerably increased.

CONTROL UNIT

The Engine-CVT-ECU use a 119-pin connector. The terminals of this connector are arranged as shown below.

1	2	3	4		5	6	7	8	41	42	43		44	45	46	71	72	73	74		75	76	77	101	102	103	104		105	106	107																				
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		47	48	49	50	51	52	53	54	55	56	57	78	79	80	81	82	83	84	85	86	87	88	89	108	109	110	111	112	113	114	115	116	117	118	119	120
24	25	26	27	28	29	30	31	32	33	34	35		58	59	60	61	62	63	64	65	66		90	91	92	93	94	95	96	97	98		121	122	123	124	125	126	127	128	129	130									

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- | | |
|---|---|
| 1 to 35. Engine use | 107. Damper clutch control solenoid valve |
| 41 to 49. Engine use | 108. Inhibitor switch R |
| 50. CVT control relay | 109. Inhibitor switch Ds <4G1> |
| 51 to 58. Engine use | Select switch <4G9> |
| 59. Communication with ABS-ECU | 110. Down shift switch <4G9> |
| 60 to 66. Engine use | 111. – |
| 71 to 74. Engine use | 112. Primary speed sensor |
| 75. – | 113. – |
| 76. Earth | 114. Line pressure sensor <MPI> |
| 77. Solenoid valve power supply | 115. – |
| 78. Engine use | 116. Primary speed sensor |
| 79. – | 117. Shift indicator A <4G9> |
| 80. Vehicle speed output | 118. Shift indicator B <4G9> |
| 81 to 87. Engine use | 119. – |
| 88. Earth | 120. Clutch pressure control solenoid valve |
| 89. Solenoid valve power supply | 121. Inhibitor switch N |
| 90 to 91. Engine use | 122. Inhibitor switch L <4G1> |
| 92. Line pressure sensor <GDI> | Upshift switch <4G9> |
| 93 to 96. Engine use | 123. Stop lamp switch |
| 97. Earth | 124. CVT fluid temperature sensor |
| 98. Engine use | 125. – |
| 101. Inhibitor switch P | 126. Inhibitor switch Ds <4G9> |
| 102. Inhibitor switch D | 127. – |
| 103. Turbine speed sensor | 128. – |
| 104. Secondary speed sensor | 129. – |
| 105. Shift indicator C <4G9> | 130. Shift control solenoid valve |
| 106. Line pressure control solenoid valve | |

OUTLINE OF CONTROL

Line pressure control

Line pressure is controlled to be most optimized corresponding to the gear ratio and the engine torque.

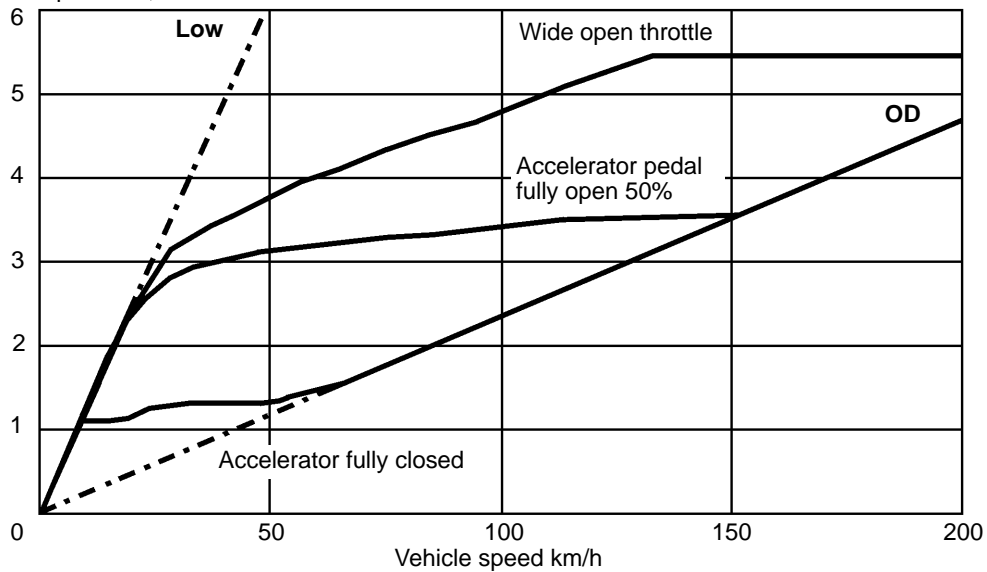
Gear ratio control

Gear ratio is controlled based on the preset ratio pattern to make the gear ratio most optimized corresponding to the driver's intention and the driving conditions.

D range ratio pattern

<4G1-MPI> (Except for CHINA)

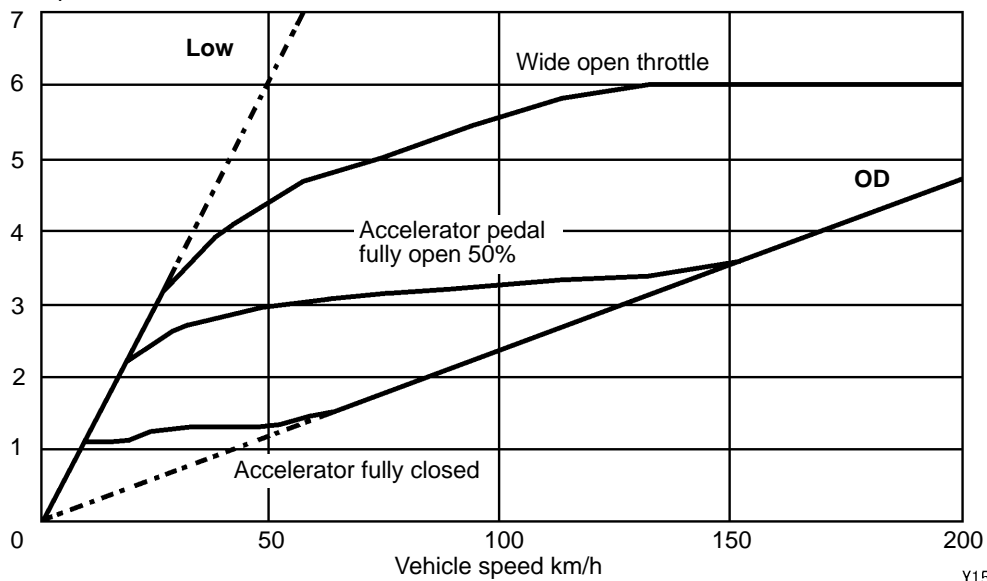
Target primary rotation speed $\times 1,000$ r/min



Y0982AU

<4G1-MPI> (For CHINA)

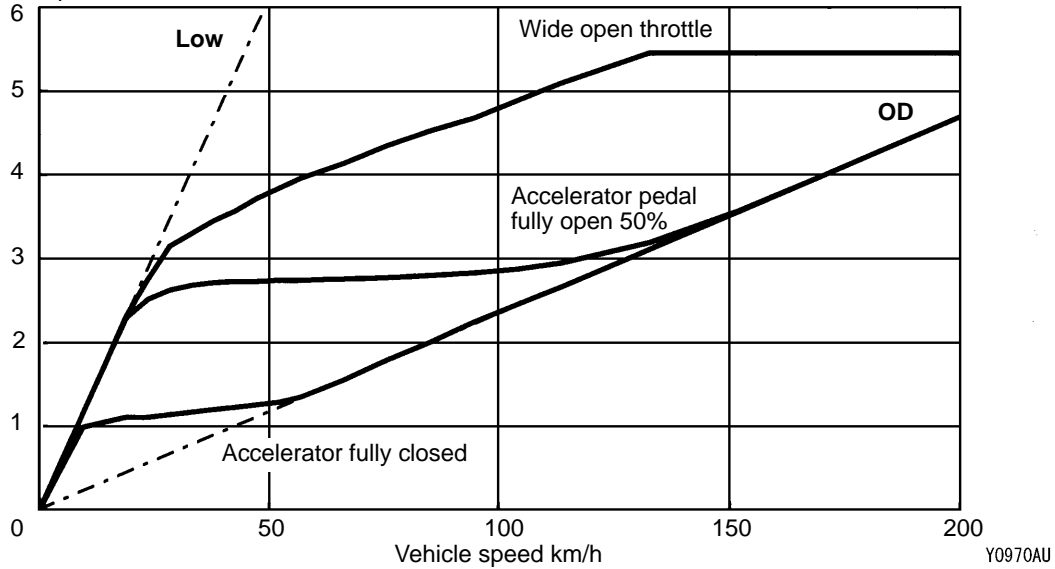
Target primary rotation speed $\times 1,000$ r/min



Y1569AU

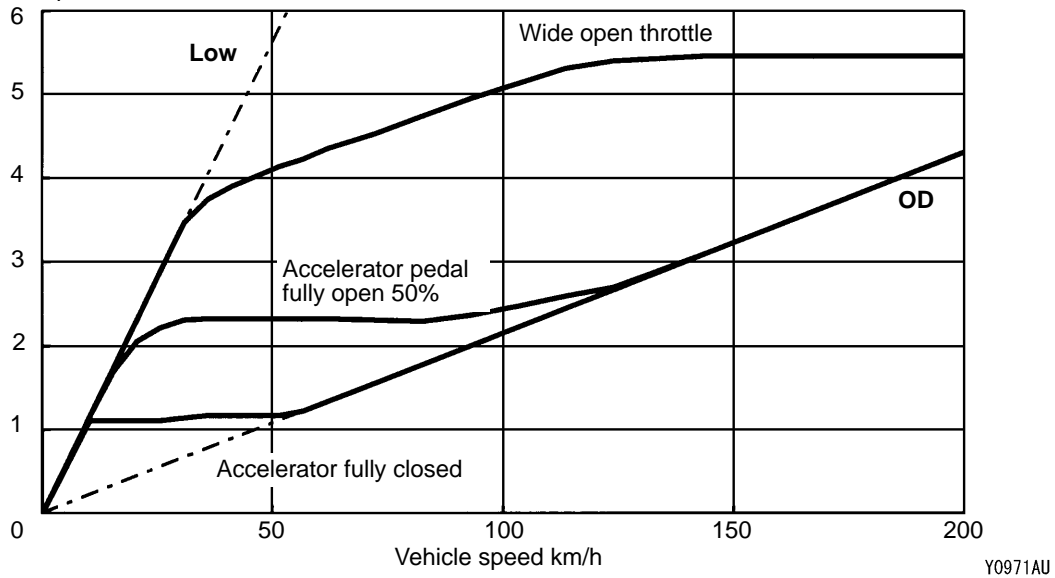
<4G1-GDI>

Target primary rotation speed $\times 1,000$ r/min



<4G9-GDI>

Target primary rotation speed $\times 1,000$ r/min



INVECS-III CONTROL

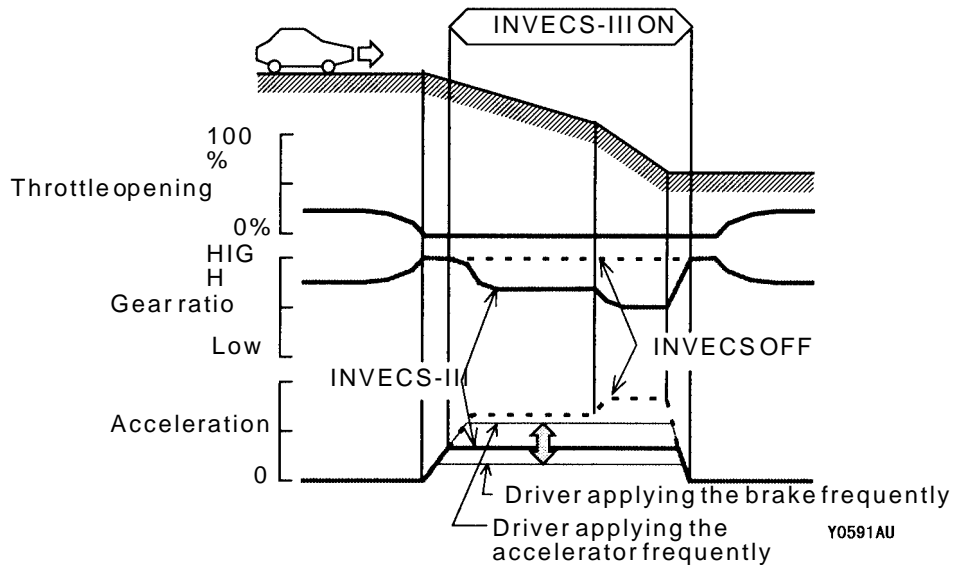
INVECS-III has been newly developed based on INVECS-II utilizing continuous variable characteristics of CVT. Main features are shown in the following:

(1) Engine brake feature on the descending slope

Gear ratio is controlled to obtain the engine brake suitable for the driver's feelings.

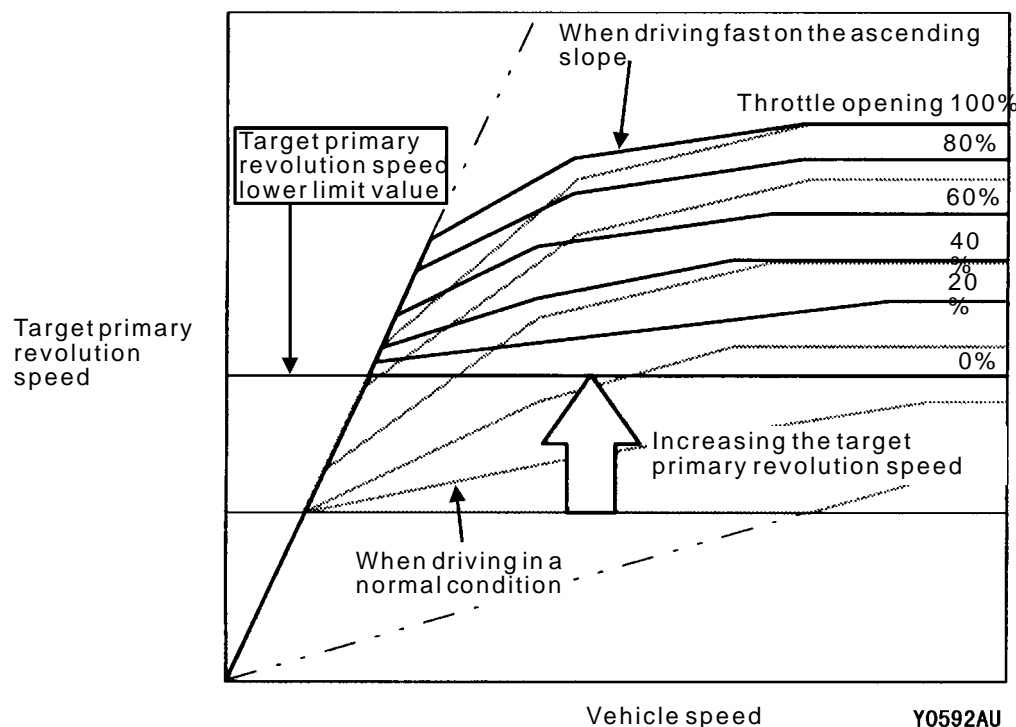
(2) Engine brake learning feature on the descending slope

Learning compensation is made to meet the tastes of a driver by judging the amount of the engine brake from the application of the accelerator or the brake.



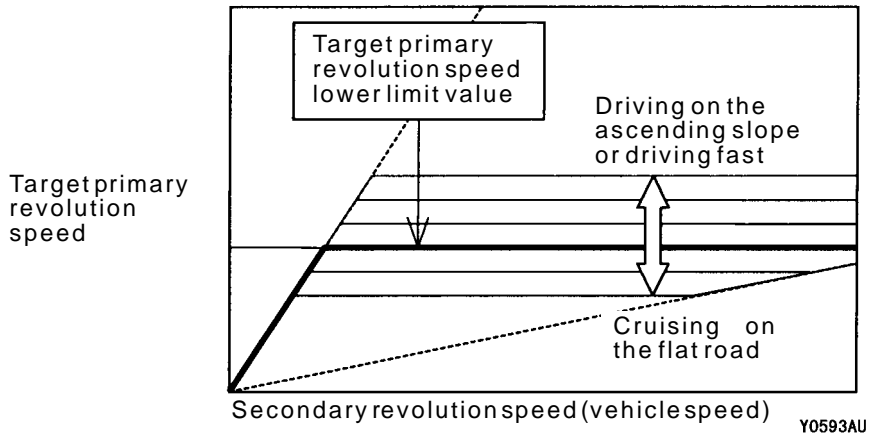
(3) Driving feature on the ascending slope

If the foot leaves the accelerator pedal during driving on the ascending slope (called lift foot), driving capability is secured by preventing excessive upshifting.



(4) Learning feature corresponding to tastes and habits of drivers

Gear patterns are continuously switched according to the driving method of a driver.



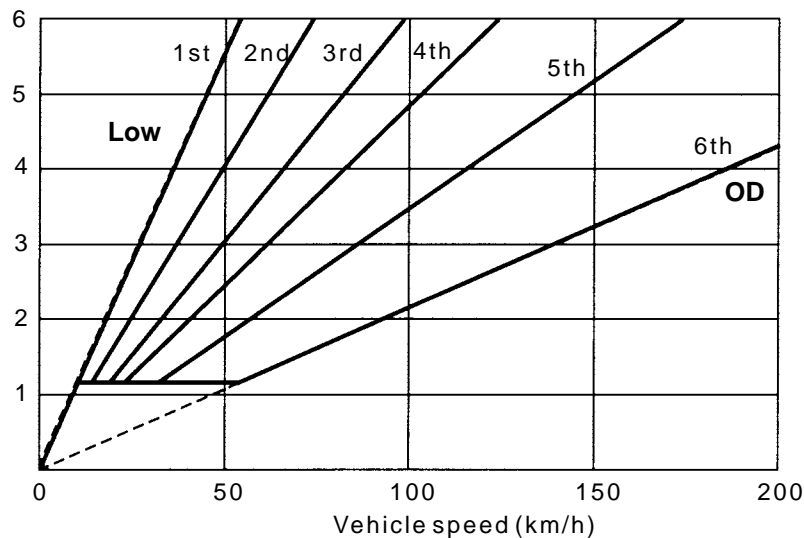
Sport mode

Sports mode has been established to respond to users' request for Fun to Drive which is completely different from easy driving in addition to D range to realize easy driving by INVECS-III control. If the selector lever is moved from D range to manual mode, the gear ratio can be switched to a pre-set fixed gear ratio manually. The number of gears is 6, which is suitable for sporty driving.

<Features of sports mode>

- A quick up-and-down shift can be obtained by moving the selector lever forward and backward.
- Gears can be changed while the accelerator pedal is being depressed. Since the power is not wasted, active and high-performance drive can be expected.
- The desirable gear ratio can be freely and easily selected when driving on winding and hilly roads. Easy downshift right before the start of cornering and right after the start of the engine can be obtained to enjoy a dynamic feeling of sporty driving.
- The current gear ratio is displayed by the sports mode shift indicator to assist the lever operation in sports mode.

Target primary revolution speed ($\times 1000$ r/min)

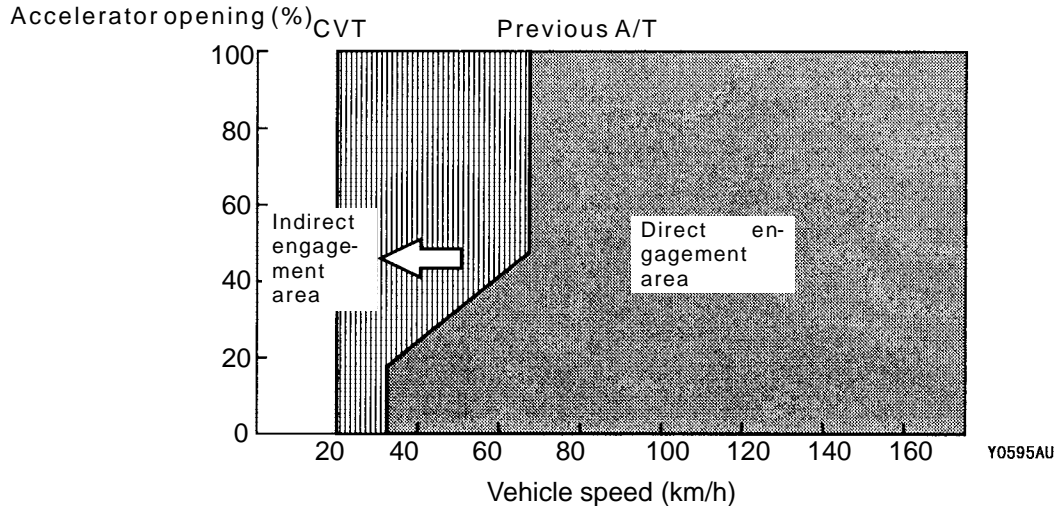


N-D/N-R shift control

Supplied pressure to the forward clutch or the reverse brake can be controlled. However, if the vehicle is moving forward at 7 km or more, the lever cannot be switched from forward to reverse.

Directly engaged control (Damper clutch control)

- Directly engaged operation from low speed to shock free can be obtained by carefully controlling the directly engaged operation pressure corresponding to driving conditions.
- Furthermore, the adoption of the newly developed CVT fluid has secured friction characteristics at a low fluid temperature to enable directly engaged operation from the early timing after the start of driving.



Engine-CVT integrated control

Power transmission is carried out by a belt in CVT. The belt clamp force is controlled by adjusting the oil pressure applied to the pulley corresponding to the input torque. Integrated control with GDI engine controls the force to meet the minimum standard not to have a large mechanical loss.

(1) Precise input torque calculation

GDI engine is capable of torque control with high precision. Belt clamp force is controlled to the minimum based on the correct torque information.

(2) High response control

Some margins in the belt clamp force to respond to the system are considered. The engine and CVT are controlled by 1-chip large capacity with RISC (Reduced Instruction Set Computer) microcomputer to eliminate the communication delays between the engine control and the CVT control. The adoption of a newly developed oil pressure sensor with an outstanding response and high precision can minimize the margin.

Self-diagnosis function

Diagnosis

CVT control unit has a diagnosis function in which input signals from each sensor and output signals from the actuator are monitored and the abnormal phenomena are memorized if an abnormality occurs in the signal system.

Freeze frame data

Various kinds of sensor information are memorized when diagnosis code is memorized. Analysis of the data helps to carry out troubleshooting more effectively. Refer to Workshop Manual for more information regarding data items.

Failsafe

The failsafe function is featured to control safety of passengers and the vehicle in case of failures in CVT control unit, sensors, and actuators.

- While the failsafe function is activated, the N range lamp slowly flashes.
- If the ATF temperature increases excessively because of extremely harsh driving, the N range lamp quickly flashes.
- Even if there are abnormalities in sensors, switches, and solenoids, the systems makes a vehicle drive to a minimum condition. (Except when diagnosis code 44 or 46 is set)

Diagnosis Classification Table

Code No.	Diagnosis item	Trouble symptoms
15	CVT fluid temperature sensor system	Open circuit
16		Short-circuit
18	Line pressure sensor system	Open circuit
19		Short-circuit
22	Turbine speed sensor system	Open circuit
23	Primary speed sensor system	Open circuit
26		System failure
24	Secondary speed sensor system	Open circuit
25		System failure
27	Primary pressure sensor system	Open circuit
28		Short-circuit
31	Line pressure control solenoid valve system	Open circuit/short-circuit
32	Shift control solenoid valve system	Open circuit
36		Short-circuit
33	Damper clutch control solenoid valve system	Open circuit
37		Short-circuit
34	Clutch pressure control solenoid valve system	Open circuit
38		Short-circuit
42	Variable speed system failure system	System failure
44	Damper clutch system failure system	System failure
45		System failure
46	Clutch system failure system	System failure
48		System failure
53	Stop lamp switch system	Open circuit
54		Short-circuit
55	N range lamp system	Open circuit
56	CVT Control relay system	Open circuit
57	Line pressure system failure system	System failure
61	ABS-ECU communication line system	Short-circuit
62		Open circuit

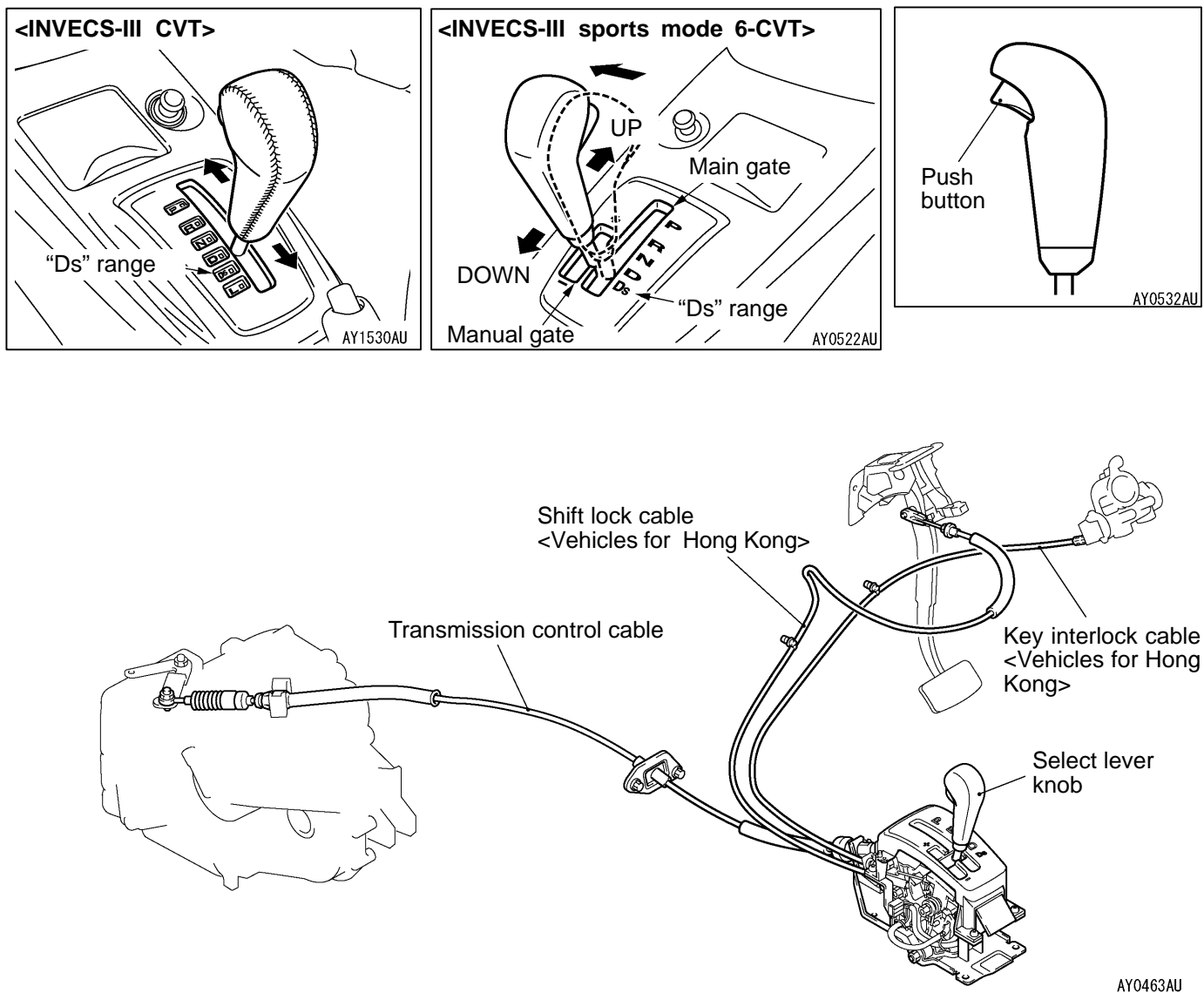
TRANSMISSION CONTROL

- Six-position lever with “P - R - N - D - D_S - L” has been adopted for the INVECS-III CVT vehicle.
- The selector lever with the two operation gates of the main gate and the manual gate has been adopted in INVECS-III sports mode of the 6-CVT vehicle. <Vehicles for Hong Kong>
- In “D” range driving, gear ratios are changed automatically from the start to the high-speed driving in continuous levels so that engine brake can be applied automatically corresponding to the road conditions.
- In “Ds (slope & sporty drive)” range driving, powerful sporty drive and light engine brake can be materialized.
- In order to increase operability, the selector lever knob with the push button to prevent the misguided operation located below the knob has been adopted.
- In order to prevent the sudden start cause by the misguided lever operation, CVT prevention misguided operation mechanisms (consisting of shift lock mechanism, key interlock mechanism, and reverse “R” position sound alarm) has been adopted. <Vehicles for Hong Kong>

NOTE

Refer to GROUP 7 – SWS for detail information on Reverse Position Sound Alarm.

Component view



IGNITION CYLINDER, SELECTOR LEVER ASSEMBLY <VEHICLES FOR HONG KONG>

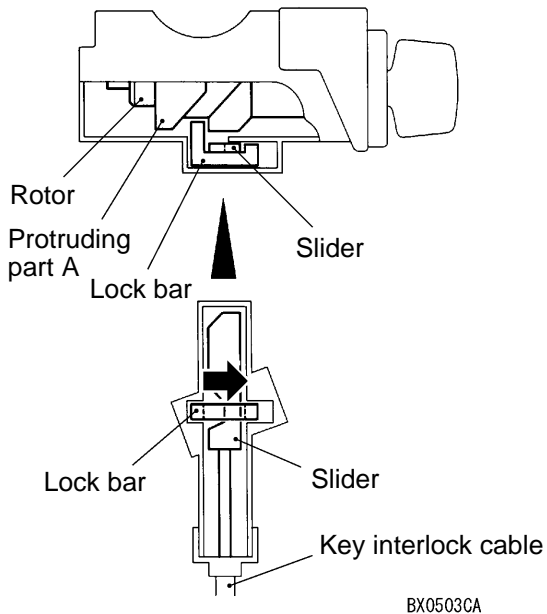
Structure and Operations

Ignition key cylinder

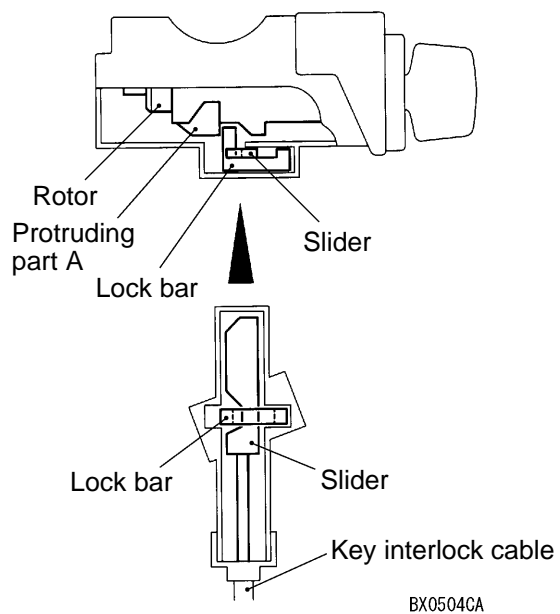
The ignition key cylinder and the lock bar are linked with each other at protruding part A of the rotor. Also, the key interlock cable is connected to the slider. The other end of the cable is connected to the lock cam of the selector lever assembly.

If the ignition key is turned from the “ACC” position to the “LOCK” position, the lock bar is pushed towards the direction of the arrow shown in the illustration to get engaged in the groove of the slider to restrict the key interlock cable.

“ACC” position



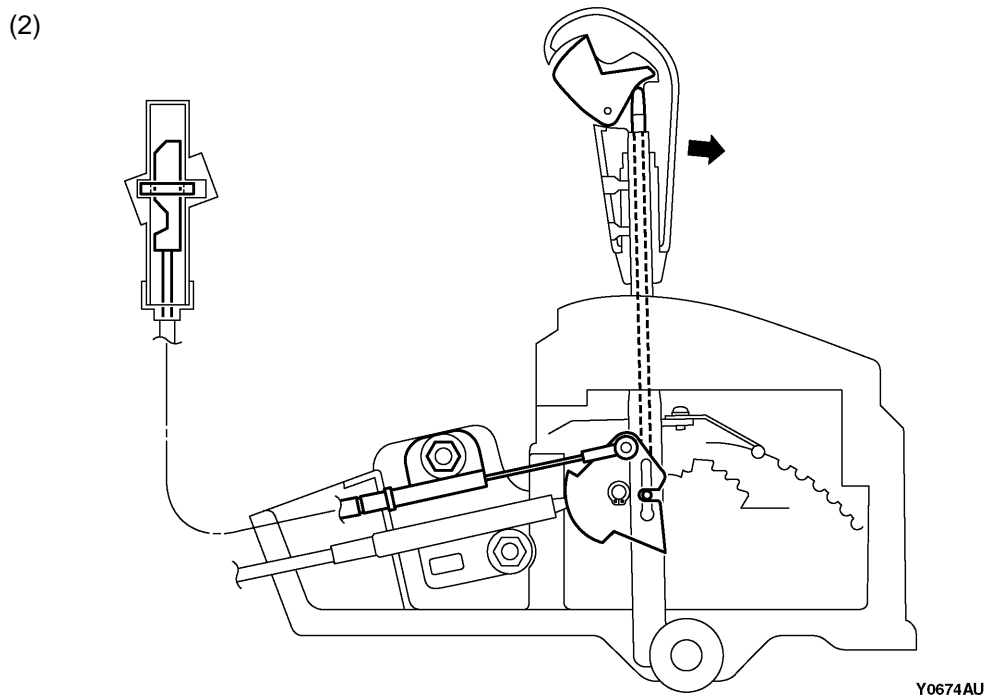
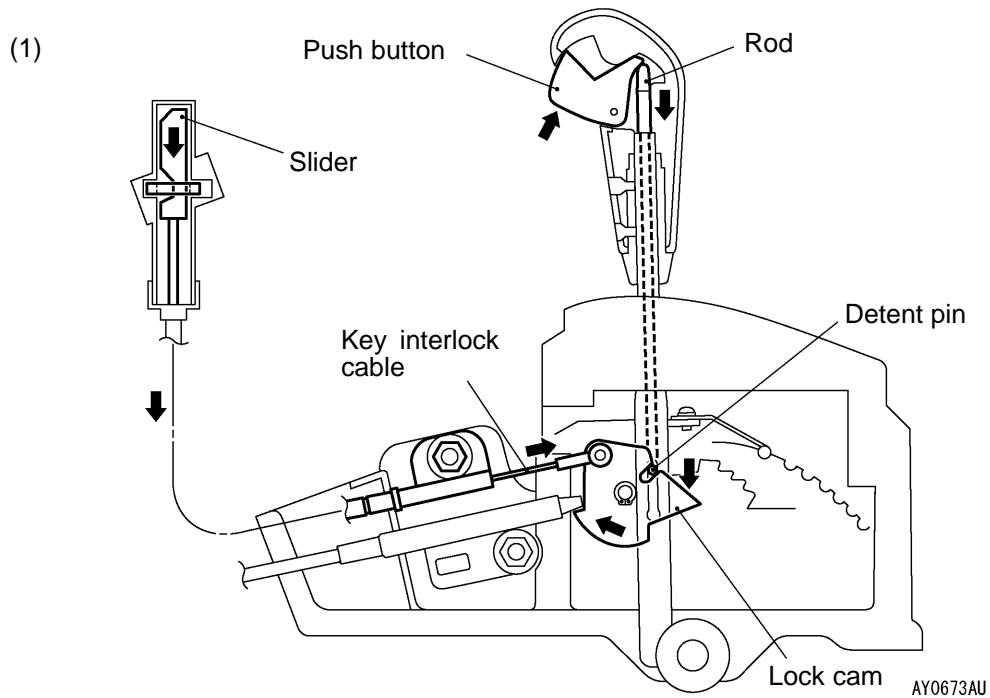
“LOCK” position



Selector lever assembly

The push button and the detent pin are linked with the rod. Therefore, press the push button to slide the detent pin in the lower direction shown in the illustration. The lock cam is connected to the key interlock cable, and the ends of the cable are connected with the slider.

- (1) Since the detent pin and the lock cam are engaged when the selector lever is in “P” position, depress the brake pedal and press the push button to rotate the lock cam clockwise, pull the key interlock cable, and slide the slider to the direction indicated by an arrow.
- (2) The detent pin and the lock cam can be disengaged so that the selector lever can be shifted to any other positions than “P” position.



CVT ERRONEOUS OPERATION PREVENTION MECHANISMS <VEHICLES FOR HONG KONG>

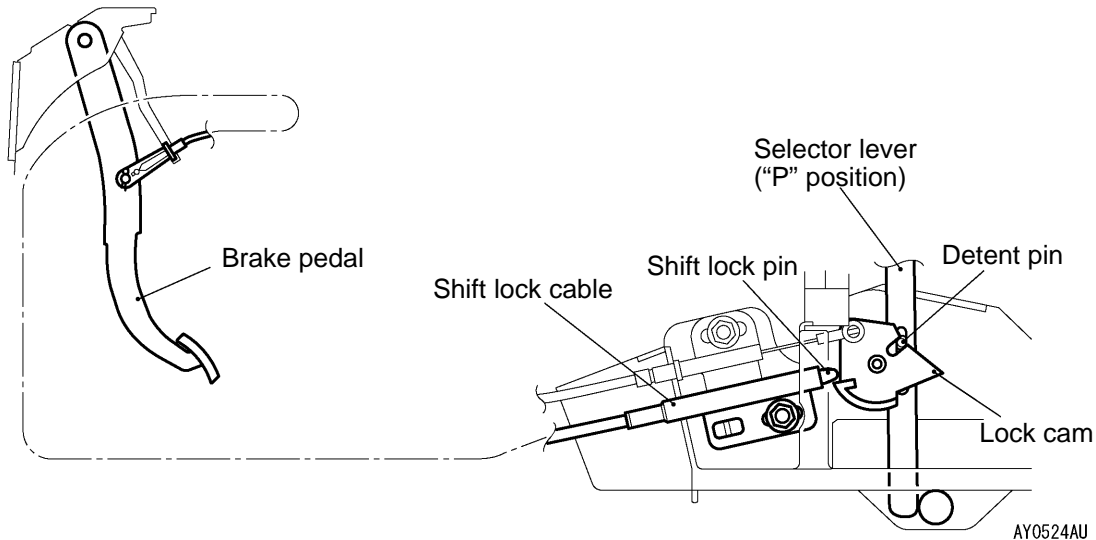
Shiftlock mechanism

Only if the following two conditions are met, the selector lever can be shifted from “P” position to any other positions.

- When the brake pedal is depressed
- When the ignition key is not in “LOCK” position

1. When the brake pedal is not depressed

Since the movement of the lock cam is restricted by the shift lock pin located at the end of the shift lock cable when the selector lever is in “P” position, the lock cam cannot be moved. Thus, since the push button on the selector lever linked with the detent pin cannot be depressed, the lever cannot be moved to any other positions than “P” position.

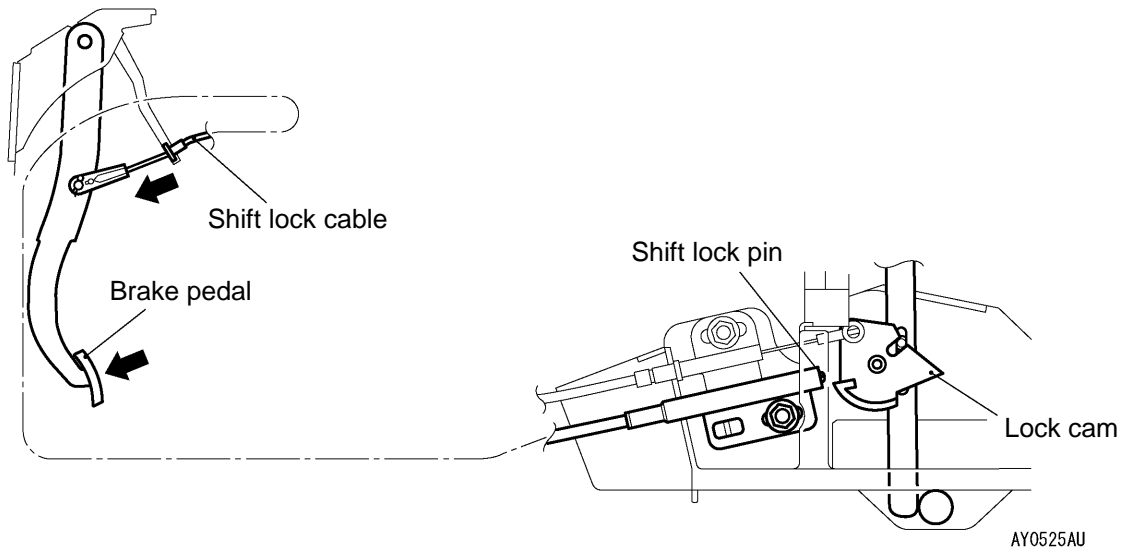


2. When the brake pedal is depressed

If the brake pedal is depressed at the above-mentioned (1) condition, the shift lock cable is pulled to move the shift lock pin and remove the restriction of the lock cam so that the lock cam can rotate. Thus, since the push button can be depressed, the lever can be moved to any other positions than “P” position.

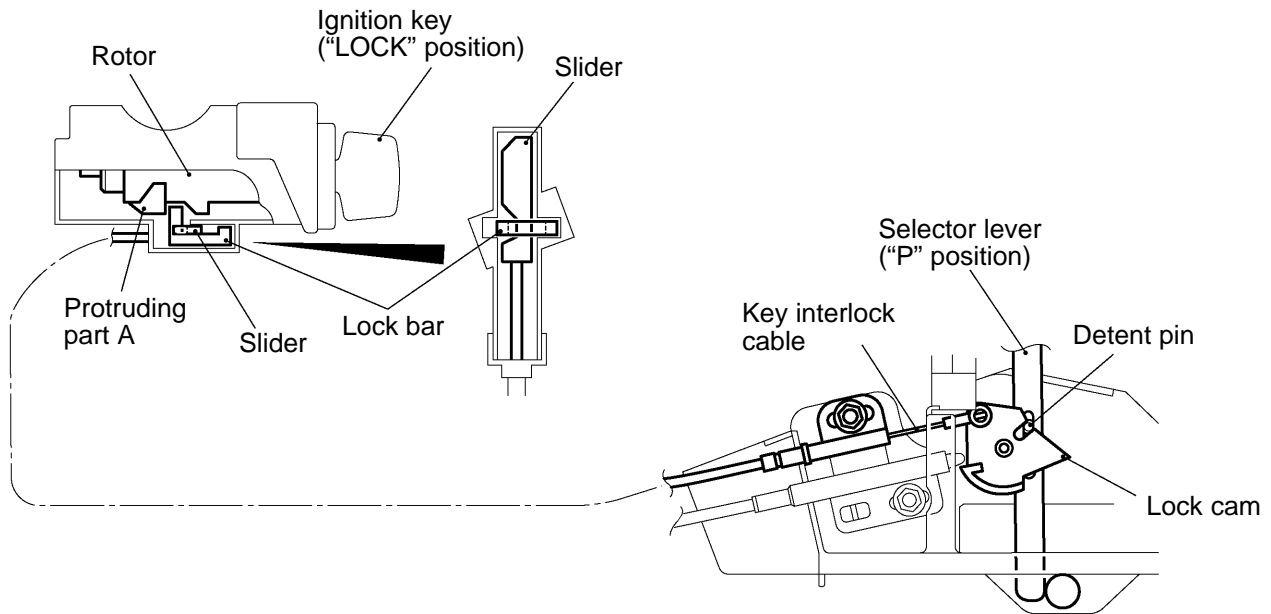
NOTE

Even if the brake pedal is depressed when the ignition key is in “LOCK” position, the selector lever cannot be moved from “P” position to any other positions.



3. When the ignition key is in LOCK position or is removed (Selector lever is in P position)

Since the lock bar is restricted by the protruding part A when the lock bar is engaged in the grooves of the slider inside the ignition key cylinder, neither the interlock cable nor the lock cam can be moved. When the lock cam rotation is prevented, the restricted movement of the detent pin prevents the push button of the lever from being depressed. Therefore, the selector lever cannot be shifted to any other positions than "P" position.



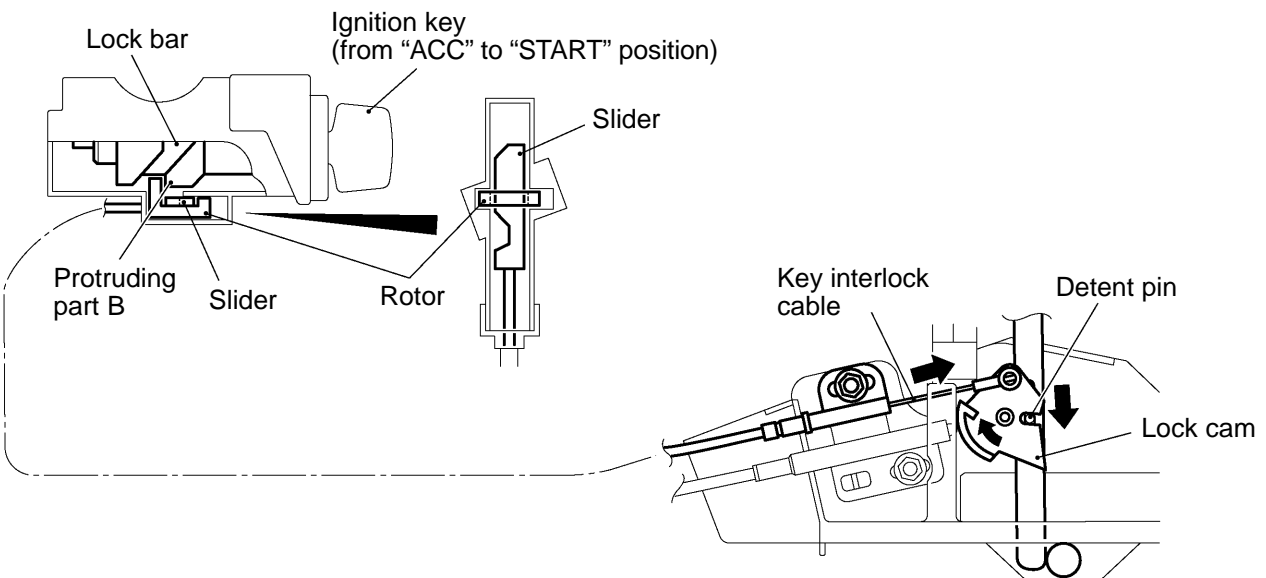
AY0527AU

4. When the ignition key is not in LOCK position (Selector lever is in P position)

Since the protruding part B of the rotor disengages the lock bar and the slider between "ACC" and "START" within the ignition key cylinder, the key interlock cable can be moved. Therefore, the lock cam can rotate. If the push button at the selector lever is pressed to move the detent pin in the lower direction, the lock cam rotates clockwise. Due to rotation of the lock cam, the key interlock cable can make the slider move. Thus, the selector lever can be shifted from "P" position to any other positions.

NOTE

Even if the brake pedal is not depressed when the ignition key is not in "LOCK" position, the selector lever cannot be moved from "P" position to any other positions.

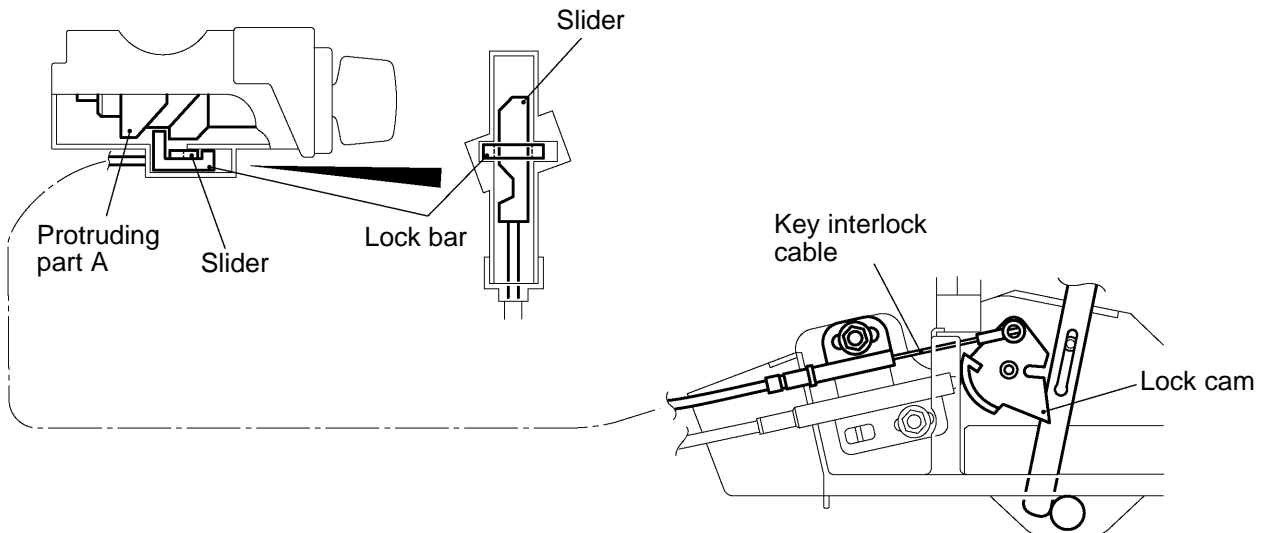


AY0528AU

Only when the shift lever is not in “P” position, the ignition key cannot be turned to “LOCK” position to prevent the key from being removed.

1. When the ignition key is being removed (Selector lever is in not in “P” position)

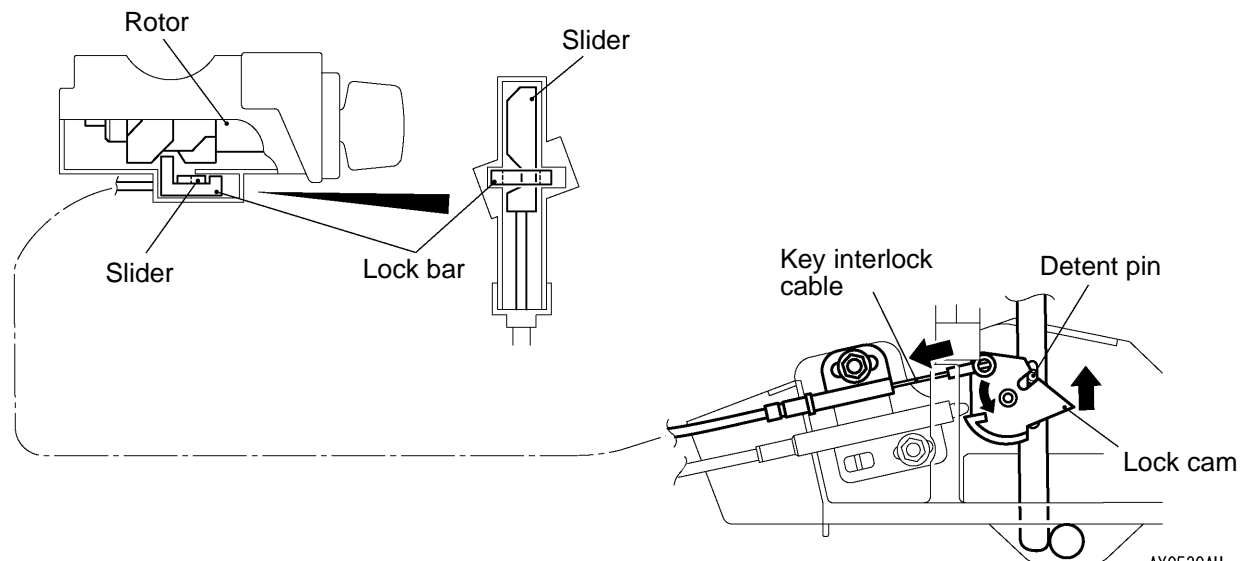
The lock cam is held in the condition after rotated clockwise shown in the illustration and the key interlock cable is pulled to the lock cam side. Because of this, the movement of the slider and the lock bar inside the ignition key cylinder is restricted while they are disengaged with each other. Thus, even if the ignition key is being turned to “LOCK” position, the ignition key can only be turned to “ACC” because the lock bar holds the protruding part A of the rotor. The key cannot be removed.



AY0529AU

2. When the ignition key is being removed (Selector lever is in “P” position)

When the push button is released from a finger with the selector lever in “P” position, the detent pin moves upward to rotate the lock cam anti-clockwise. The key interlock cable presses the slider inside the ignition key cylinder in the direction indicated by an arrow. Since the slider has been moved, the lock can be moved to rotate the rotor freely. Therefore, the key can be removed by turning the ignition key to the “LOCK” position.



AY0530AU

AUTOMATIC TRANSMISSION

F4A41 transmission has been adopted for automatic transmission. Although this transmission is basically the same as the automatic transmission used in previous COLT/LANCER models, the electronic control system has been changed.

NOTE: Refer to 1996 COLT/LANCER Technical Information Manual (Pub. No. PYME9502) for more information regarding the description of structure and operations of F4A41.

SPECIFICATIONS

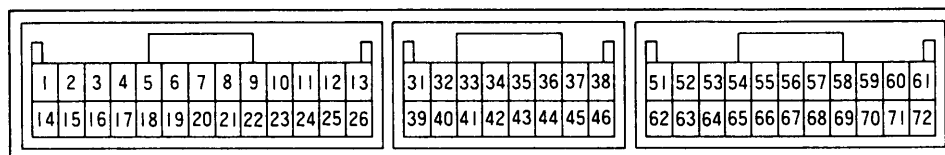
Items		Specifications	
Transmission model		F4A41-1-NZB2	F4A41-1-NZB1
Engine model		4G13	4G18
Torque converter	Type	3-element, 1-stage, 2-phase type	
	Lock-up	Provided	
	Stall torque ratio	2.1	2.0
Transmission type		4 forward speeds, 1 reverse speed, fully automatic	
Transmission gear ratio	1st	2.842	
	2nd	1.529	
	3rd	1.000	
	4th	0.712	
	Reverse	2.480	
Final reduction ratio (Differential gear ratio)		4.406	
Clutch		Multi-disk type × 4 sets	
Brake		Multi-disk type × 2 sets	
Manual control system		P-R-N-D-3-2-L (7 positions)	
Shift pattern control		Electronic control	
Hydraulic control during shifting		Electronic control (Each clutch hydraulically independently controlled)	
Lock-up clutch control		Electronic control	
Transmission oil	Specified lubricants	DIA QUEEN ATF SP II M, ATF SP III or equivalent	
	Quantity L	7.7	

ELECTRONIC CONTROL SYSTEM

CONTROL UNIT

The ECU uses a 64-pin connector <CARBURETTOR>, 119-pin connector <MPI>. The terminals of this connector are arranged as shown below.

<CARBURETTOR>



9FA0133

- | | |
|--|------------------------------------|
| 1. Underdrive solenoid valve | 37. – |
| 2. Solenoid valve power supply | 38. Back-up power supply |
| 3. Solenoid valve power supply | 39. – |
| 4. – | 40. – |
| 5. – | 41. – |
| 6. – | 42. – |
| 7. – | 43. Sensor earth |
| 8. – | 44. A/T fluid temperature sensor |
| 9. – | 45. Throttle position sensor (TPS) |
| 10. A/C compressor load signal | 46. – |
| 11. Power supply | 51. – |
| 12. Earth | 52. – |
| 13. Earth | 53. – |
| 14. Overdrive solenoid valve | 54. – |
| 15. Damper clutch control solenoid valve | 55. Inhibitor switch P |
| 16. Second solenoid valve | 56. Inhibitor switch N |
| 17. – | 57. Inhibitor switch 3 |
| 18. – | 58. Inhibitor switch L |
| 19. – | 59. Stop lamp switch |
| 20. – | 60. Ignition coil |
| 21. – | 61. – |
| 22. – | 62. Low-reverse solenoid valve |
| 23. Diagnosis control | 63. Diagnosis output |
| 24. Power supply | 64. – |
| 25. Earth | 65. – |
| 26. Earth | 66. Inhibitor switch R |
| 31. Input shaft speed sensor | 67. Inhibitor switch D |
| 32. Output shaft speed sensor | 68. Inhibitor switch 2 |
| 33. – | 69. Vehicle speed output |
| 34. – | 70. – |
| 35. Sensor power supply | 71. A/T control relay |
| 36. – | 72. Earth |

<MPI>

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24	25	26	27	28	29	30	31	32	33	34	35		58	59	60	61	62	63	64	65	66		90	91	92	93	94	95	96	97	98		121	122	123	124	125	126	127	128	129	130									

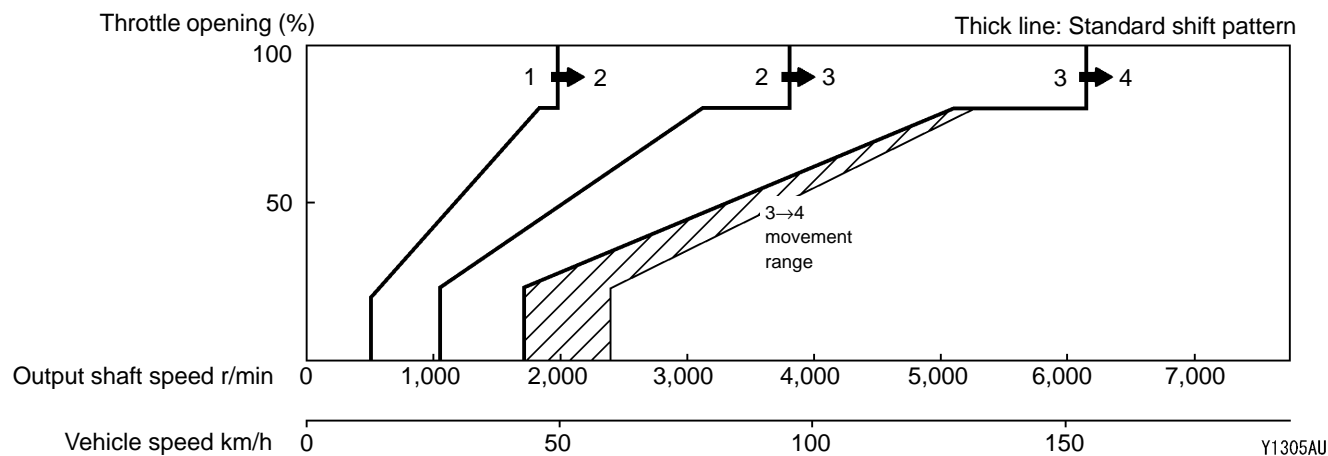
9FA0253

- | | |
|------------------------------------|---|
| 1 to 35. Engine use | 107. Damper clutch control solenoid valve |
| 41 to 49. Engine use | 108. Inhibitor switch R |
| 50. A/T control relay | 109. Inhibitor switch 3 |
| 51 to 66. Engine use | 110. Inhibitor switch L |
| 71 to 74. Engine use | 111. – |
| 75. – | 112. – |
| 76. Earth | 113. – |
| 77. Solenoid valve power supply | 114. – |
| 78. Throttle position sensor (TPS) | 115. – |
| 79. – | 116. – |
| 80. Vehicle speed output | 117. – |
| 81 to 87. Engine use | 118. – |
| 88. Earth | 119. – |
| 89. Solenoid valve power supply | 120. Underdrive solenoid valve |
| 90 to 94. Engine use | 121. Inhibitor switch N |
| 95. – | 122. Inhibitor switch 2 |
| 96. – | 123. Stop lamp switch |
| 97. Earth | 124. A/T fluid temperature sensor |
| 98. Engine use | 125. – |
| 101. Inhibitor switch P | 126. – |
| 102. Inhibitor switch D | 127. – |
| 103. Input shaft speed sensor | 128. – |
| 104. Output shaft speed sensor | 129. Low-reverse solenoid valve |
| 105. – | 130. Overdrive solenoid valve |
| 106. Second solenoid valve | |

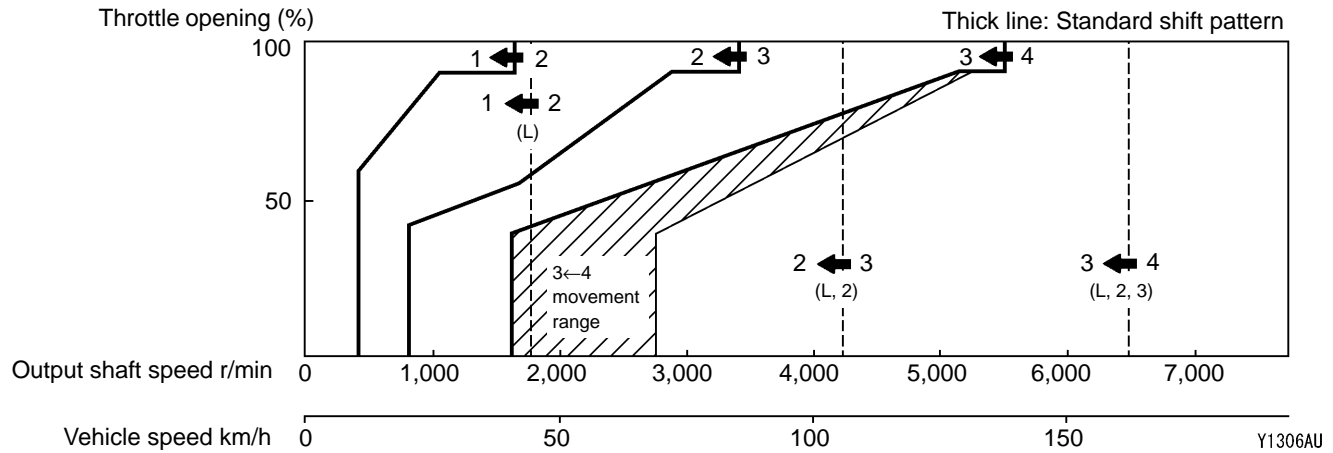
(1) Shift Pattern Control

<CARBURETTOR>

UPSHIFT PATTERN

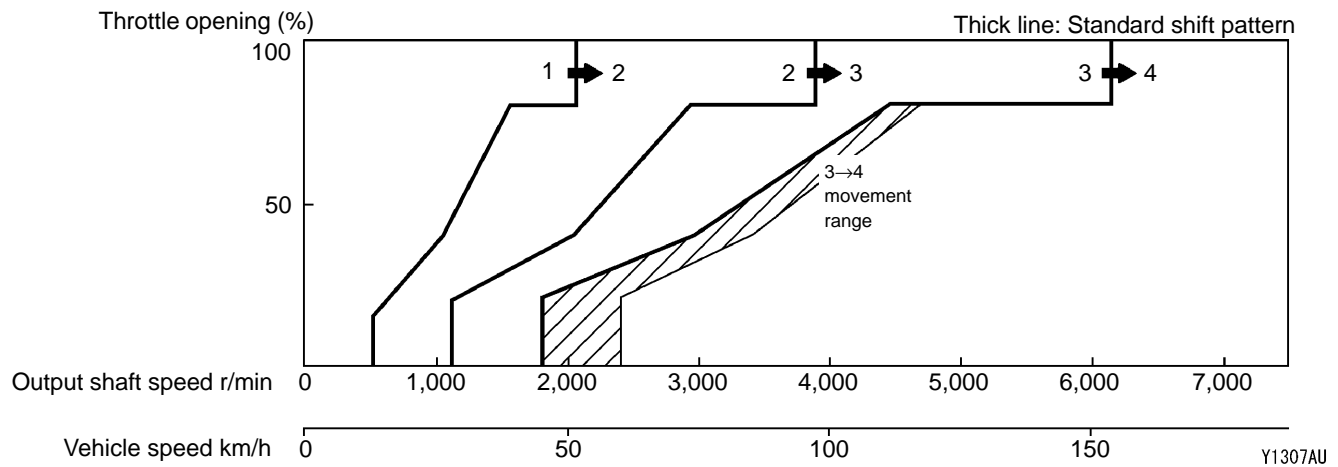


DOWNSHIFT PATTERN

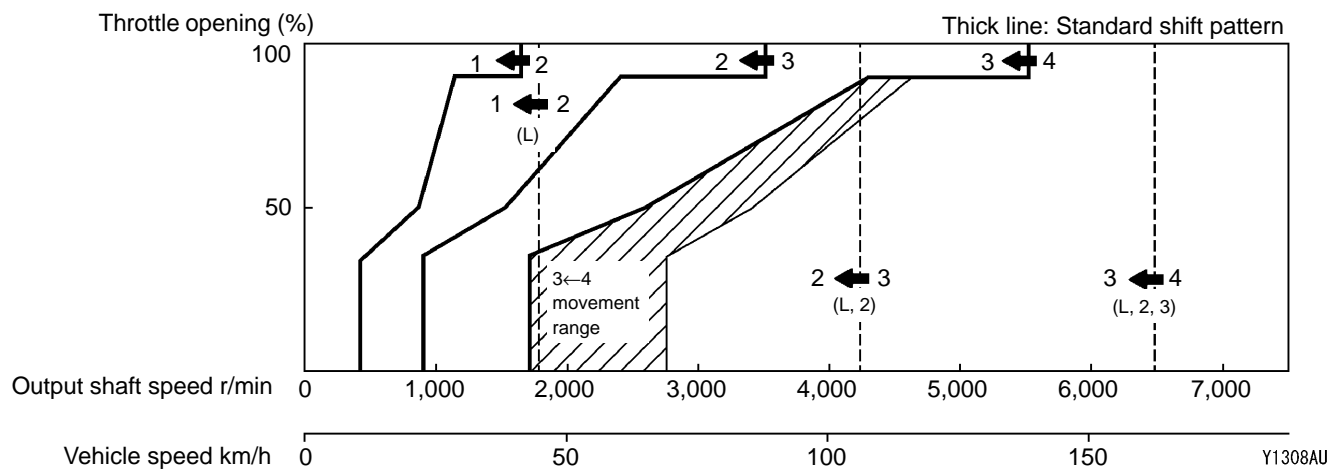


<MPI>

UPSHIFT PATTERN

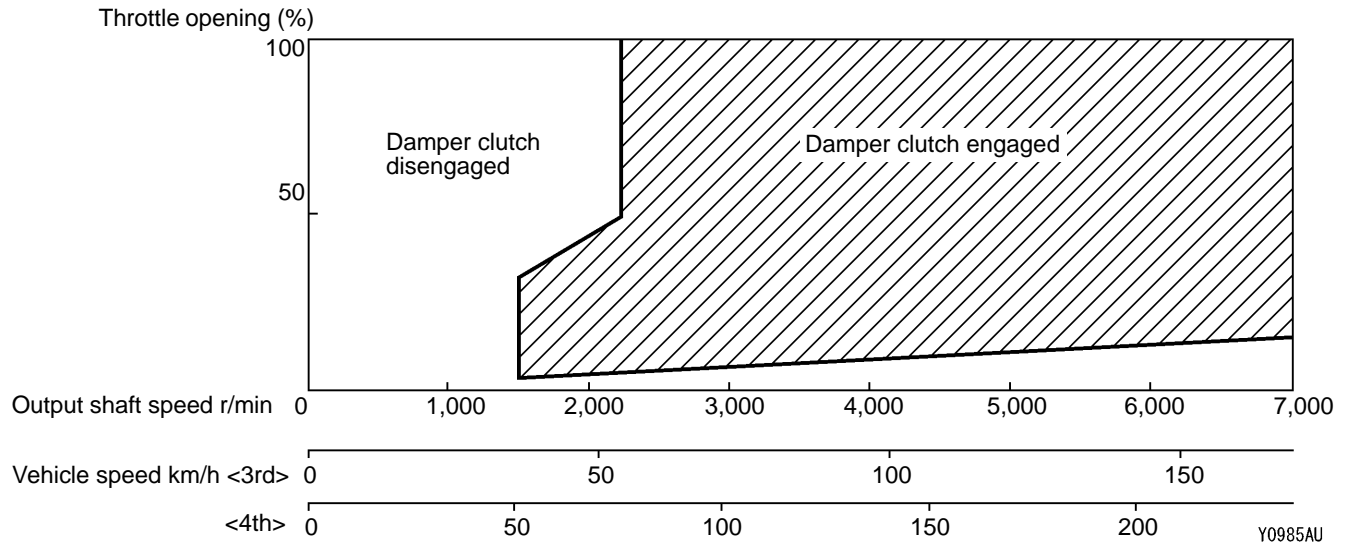


DOWNSHIFT PATTERN

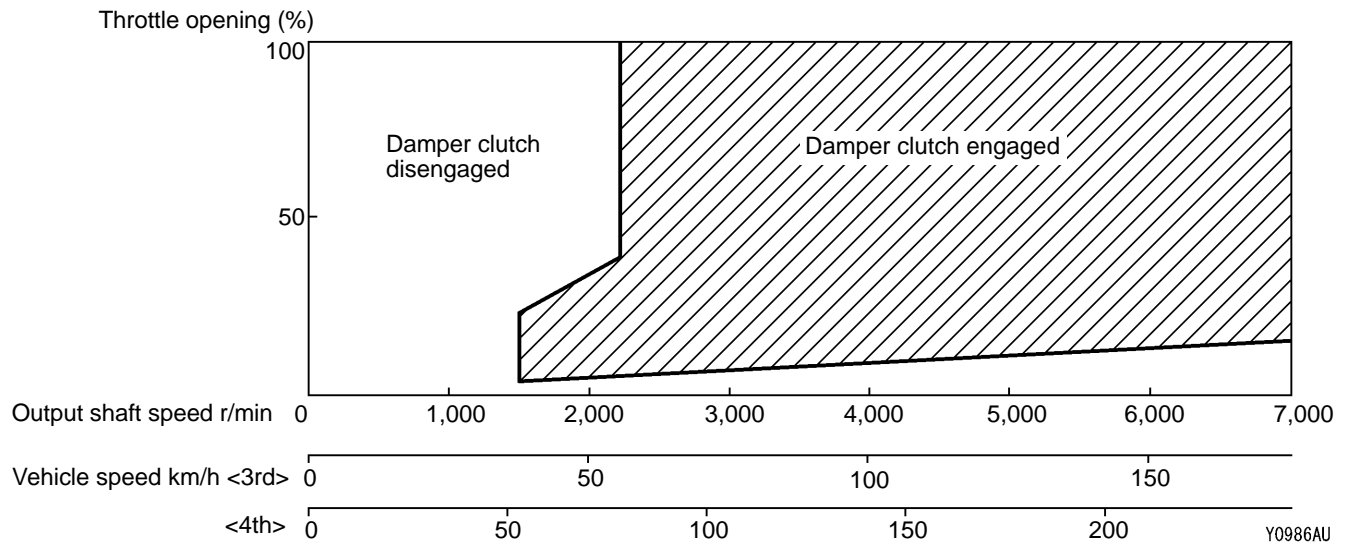


(2) Damper Clutch Control

<CARBURETTOR>



<MPI>



POWER TRAIN – Automatic Transmission

Diagnosis Classification Table

Item		Diagnosis code No.	Data list		Actuator test
			Item No.	Display	
Throttle position sensor (TPS)	Short circuit	11	11	mV	—
	Open circuit	12			—
	Sensor maladjustment	14			—
A/T fluid temperature sensor	Open circuit	15	15	°C	—
Ignition coil <CARBURETTOR>	Open circuit	21	21	r/min	—
Crank position sensor <MPI>	Open circuit				—
Input shaft speed sensor	Short circuit/open circuit	22	22	r/min	—
Output shaft speed sensor	Short circuit/open circuit	23	23	r/min	—
Stop lamp switch	Short circuit	26	26	ON/OFF	—
Vehicle speed output		—	29	km/h	—
LR solenoid valve	Short circuit/open circuit	31	31	%	1
UD solenoid valve	Short circuit/open circuit	32	32	%	2
2ND solenoid valve	Short circuit/open circuit	33	33	%	3
OD solenoid valve	Short circuit/open circuit	34	34	%	4
DCC solenoid valve	Short circuit/open circuit	36	36	%	6
Gear shift incomplete	1st	41	—	—	—
	2nd	42	—	—	—
	3rd	43	—	—	—
	4th	44	—	—	—
	Reverse	46	—	—	—
DCC solenoid valve	System defect	52	52	r/min	—
A/T control relay	Earth short circuit/open circuit	54	54	V	12
N range lamp		56	—	—	—
Inhibitor switch		—	61	P/R/ N/D/3/2/L	—
Shift position		—	63	4th/3rd/2nd/1st/ REV./N/P	—
A/C compressor switch		—	65	ON/OFF	—
A/T-ECU error <CARBURETTOR>		71	—	—	—
INVECS-II cancel command		—	—	—	14

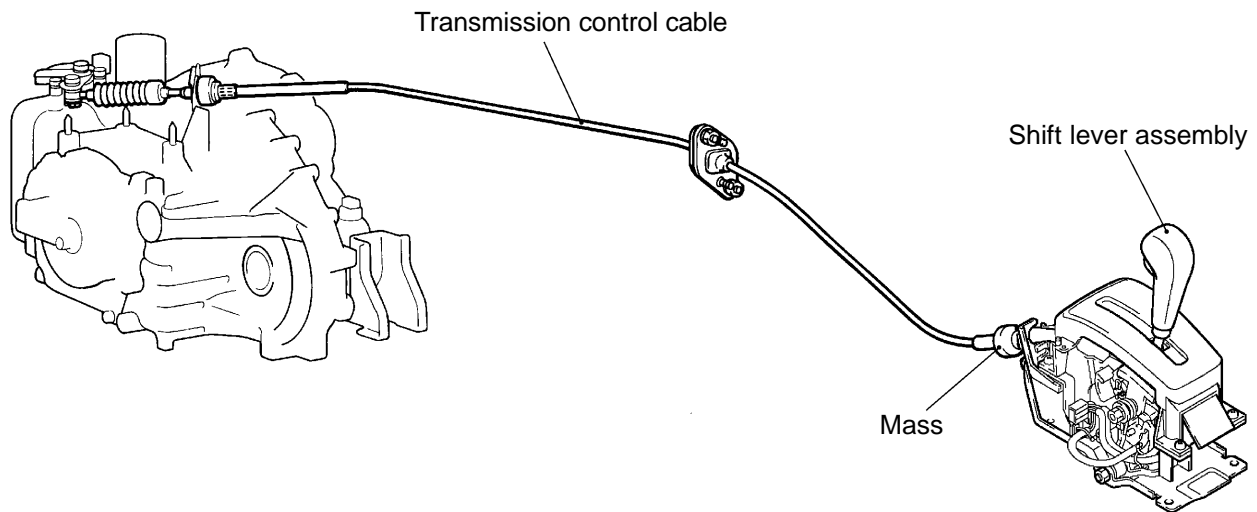
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TRANSMISSION CONTROL

- The transmission is controlled via a cable. The selector lever assembly has seven gear ranges: P, R, N, D, 3, 2, and L.
- A mass is fitted to the transmission cable to minimize gear noise.

CONSTRUCTION DIAGRAM



AY1532AU

FRONT AXLE

The front axle consists of front hubs, knuckles, wheel bearings and drive shafts, and it has the following features.

- The wheel bearing is a double-row angular contact ball bearing which incorporates the oil seals and is highly resistant to a thrust load.
- The drive shaft incorporates R.J.-T.J. type constant velocity joints with high transmission efficiency and low vibration and noise.

- The dynamic dampers have been mounted on the right and left drive shafts to reduce vibration.
- ABS rotors for detecting the wheel speeds are press-fitted to the R.J. outer wheels in vehicles with ABS.

NOTE

1. R.J.: Rzeppa Joint
2. T.J.: Tripod Joint

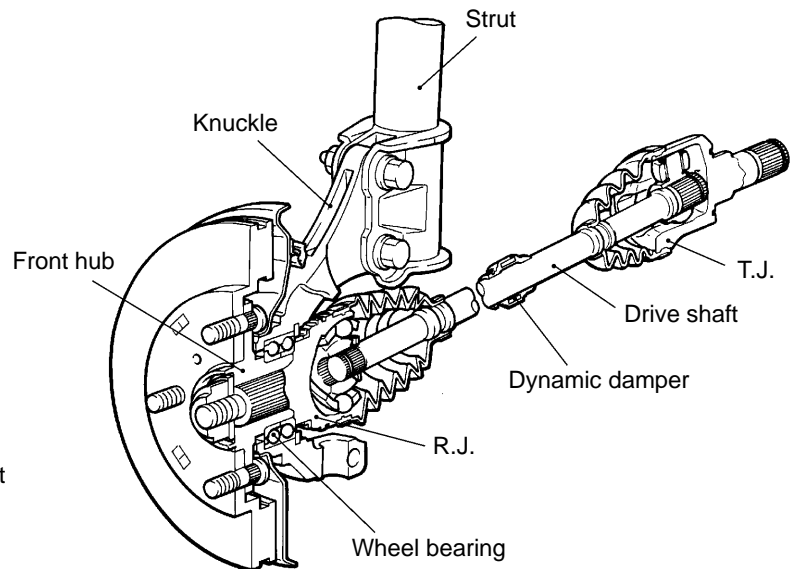
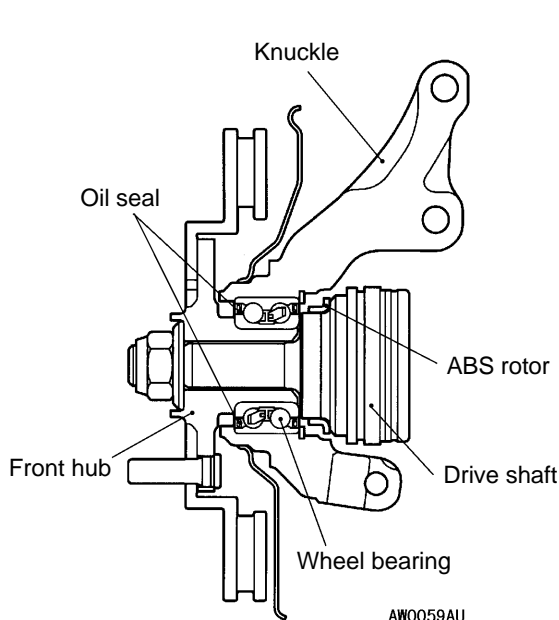
SPECIFICATIONS

Item				2001MY	2000MY
Wheel bearings	Wheel bearing type			Double-row angular contact ball bearing	
	Bearing (outside diameter × inside diameter) mm			74 × 40	
Drive shaft	Joint type		Outside	R.J.	
			Inside	T.J.	
	Shaft length*1 × Shaft diameter mm	Vehicles without CVT	Left	379 × 26	371 × 26
			Right	700 × 26	692 × 26
		Vehicles with CVT	Left	363 × 26	—
			Right	716 × 26	—

NOTE

*1: The shaft length indicates the length between the center points of each joint.

STRUCTURAL DIAGRAM



BW0060AU

REAR AXLE

The rear axle has the following features.

- The wheel bearing is a unit bearing (double-row angular contact ball bearing).
- ABS rotors for detecting the wheel speeds are press-fitted to the rear hub in vehicles with ABS.

STRUCTURAL DIAGRAM

