
GROUP 23

AUTOMATIC TRANSMISSION

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AUTOMATIC TRANSMISSION

GENERAL INFORMATION

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The F4A4B type automatic transmission has been used. Although the transmission is basically the same as the F4A42 type adopted for SPACE WAGON, the following modifications have been made:

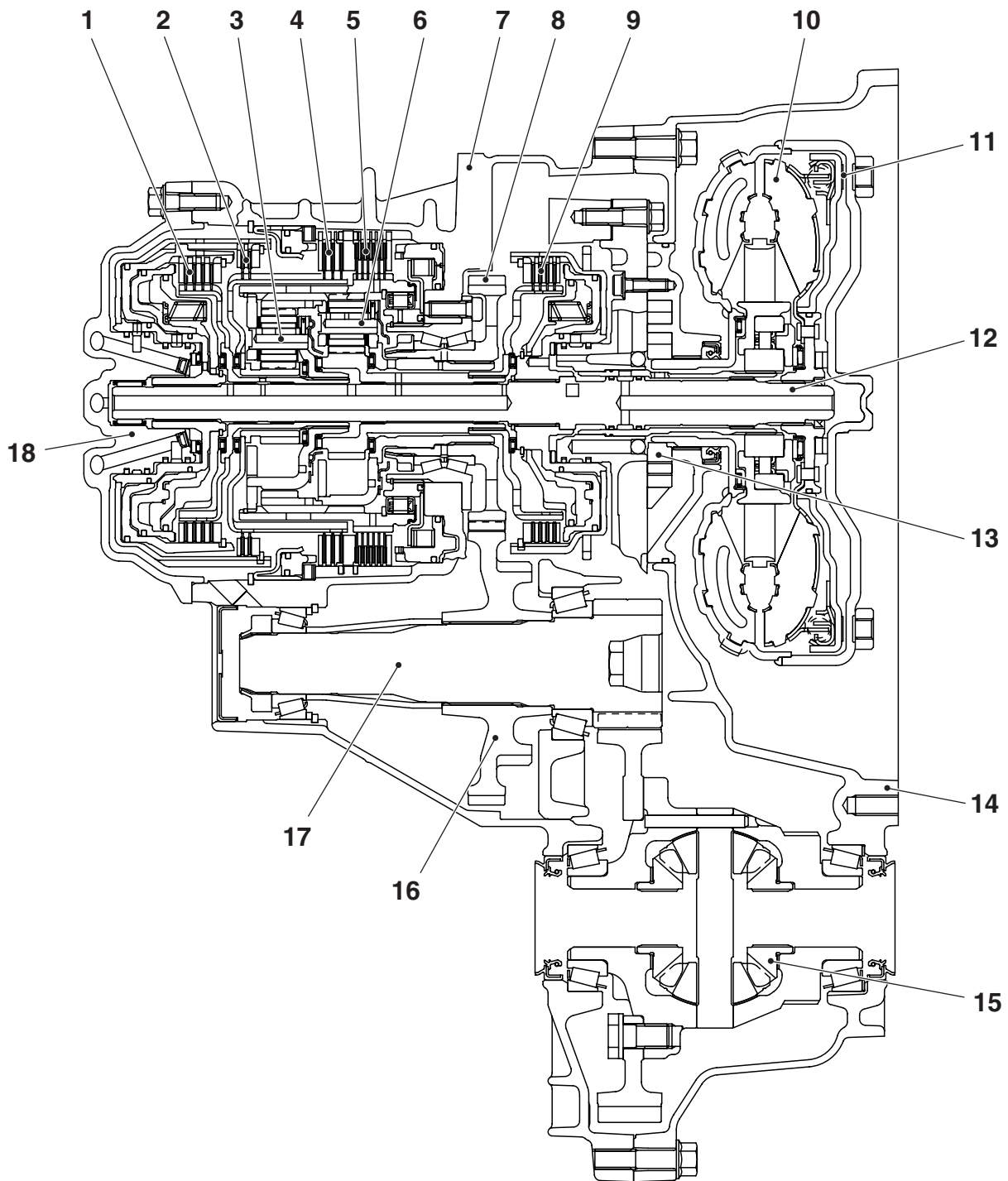
- Optimisation of the final drive ratio
- The electronic control system has been modified for GRANDIS.
- An ATF warmer (A/T fluid cooler) has been used.
<Vehicles for Hong Kong and Singapore>

SPECIFICATIONS

Item		Specification
Transmission model		F4A4B
Torque converter	Type	3-element, 1-stage, 2-phase type
	Lock-up	Provided
	Stall torque ratio	2.01
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 drive ratio		4.406
Clutch		Multi-disc type (3 sets)
Brake		Multi-disc type (2 sets)
Manual control system		P-R-N-D (4 positions) + sport mode
Shift pattern control		Electronic control (INVECS-II)
Hydraulic control during shifting		Electronic control (Each clutch hydraulically independently controlled)
Lock-up clutch control		Electronic control
Transmission fluid	Specified lubricants	DIA QUEEN ATF SP III
	Quantity L	7.7

SECTIONAL VIEW

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1. Overdrive clutch
2. Reverse clutch
3. Overdrive planetary gear set
4. Second brake
5. Low-reverse brake
6. Output planetary gear set
7. Transmission case
8. Transfer drive gear
9. Underdrive clutch

10. Torque converter
11. Damper clutch
12. Input shaft
13. Oil pump
14. Converter housing
15. Differential
16. Transfer driven gear
17. Output shaft
18. Rear cover

ELECTRONIC CONTROL SYSTEM

EEPROM

Because EEPROM has been used, even if the battery terminals or control unit connectors are disconnected, the necessary learned values are stored in the engine-A/T-ECU to prevent a loss of shift quality. (Initialisation is available by M.U.T.-III).

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CONTROLLER AREA NETWORK (CAN)
COMMUNICATION

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CAN* communication has been adopted for communication with other ECUs in order to decrease the number of wires and ensure information transmission. For A/T control, the engine A/T-ECU receives the following signals.

CAN COMMUNICATION INPUT SIGNAL TABLE

Input signal	Transmitter ECU
Compressor signal	A/C-ECU
Shifting gear assignment signal <Vehicles with ASC>	ASC-ECU

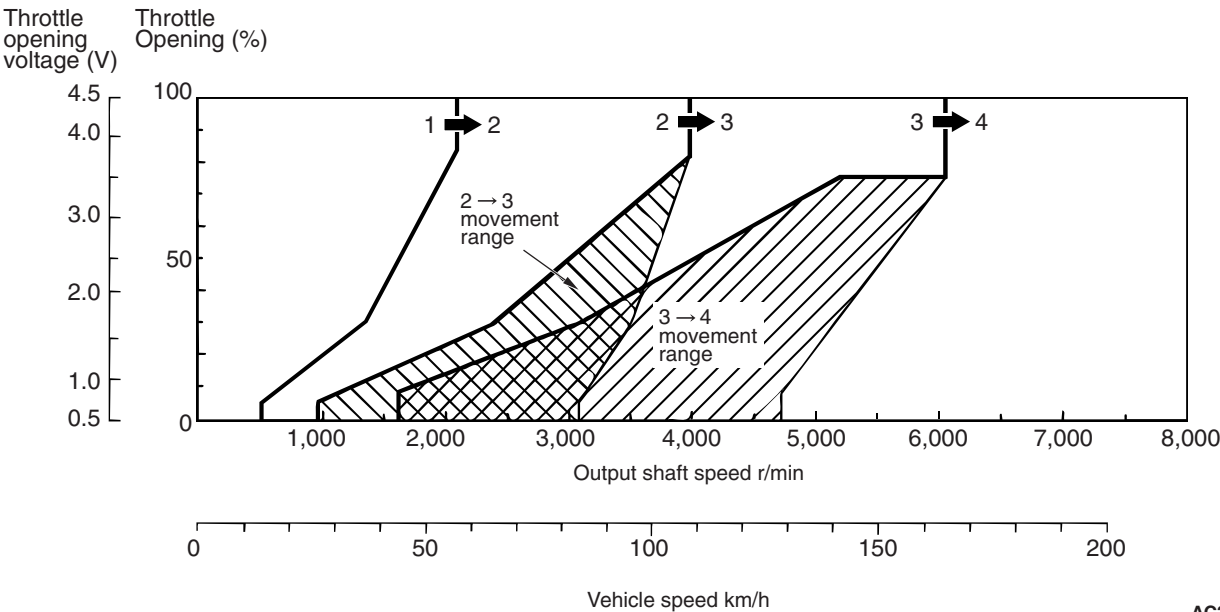
NOTE: *: For more information about CAN (Controller Area Network), refer to GROUP 54C P.54C-2.

SHIFT PATTERN CONTROL

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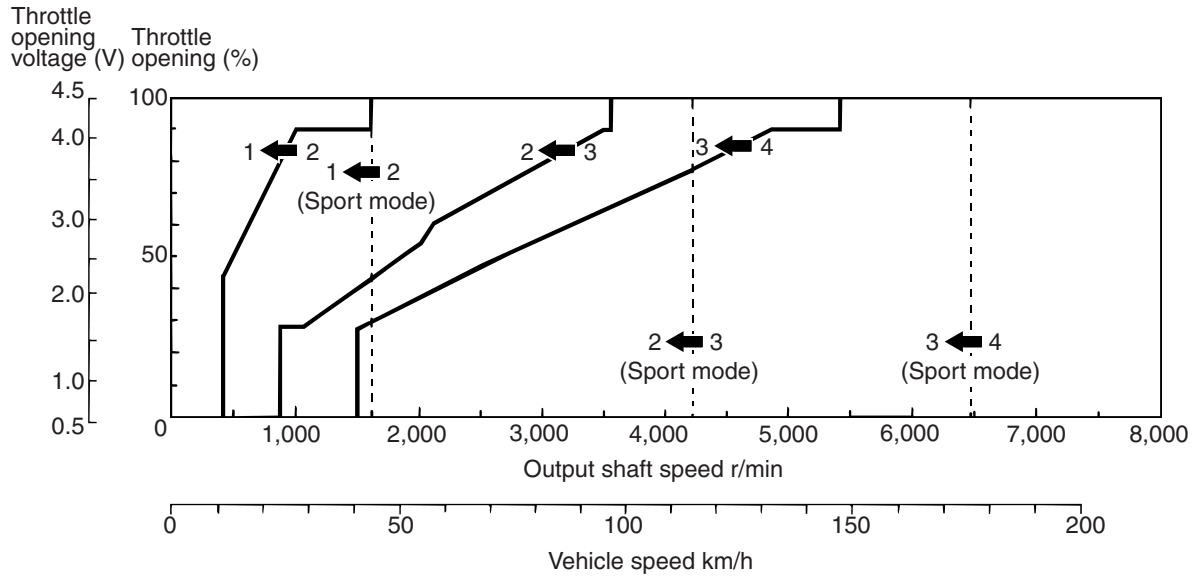
<EXCEPT FOR HONG KONG AND SINGAPORE>

UPSHIFT PATTERN



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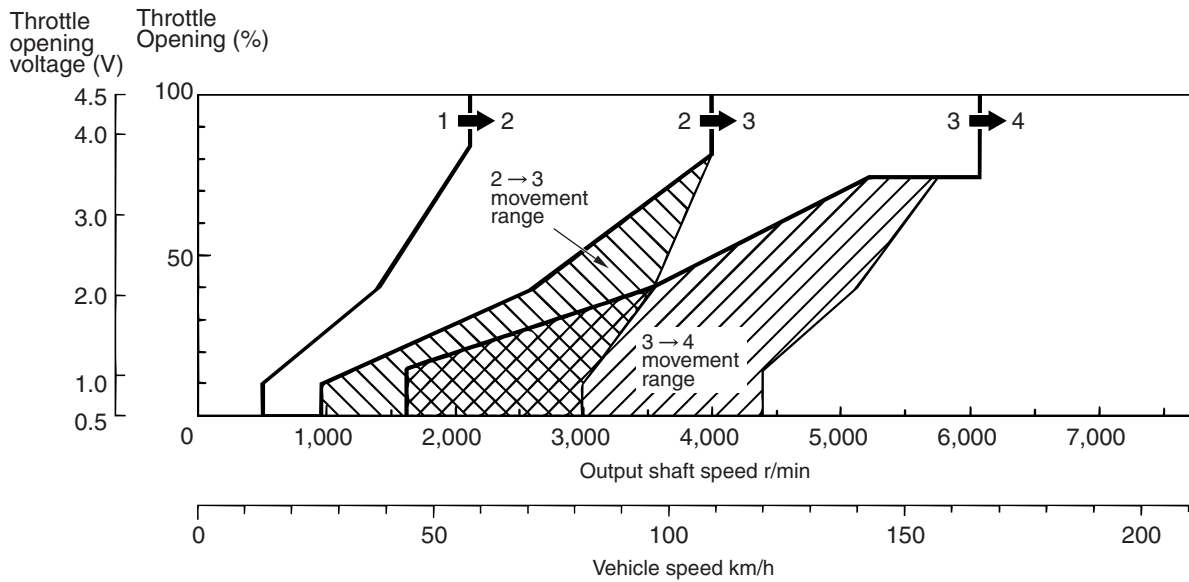
DOWNSHIFT PATTERN



AC311758AB

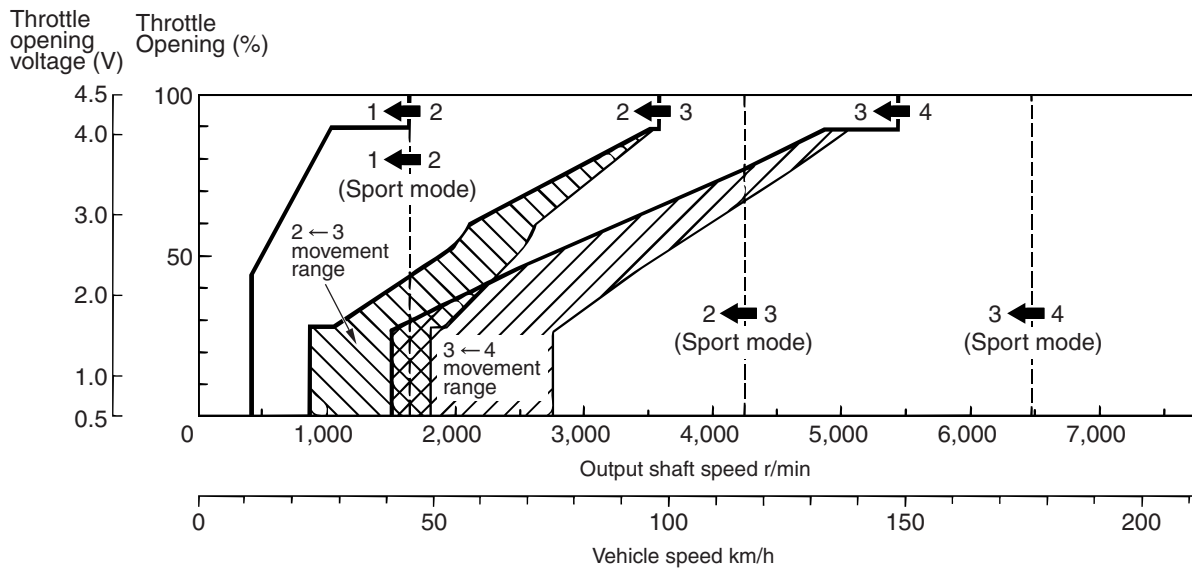
<VEHICLES FOR HONG KONG AND SINGAPORE>

UPSHIFT PATTERN



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DOWNSHIFT PATTERN



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DIAGNOSIS CLASSIFICATION TABLE

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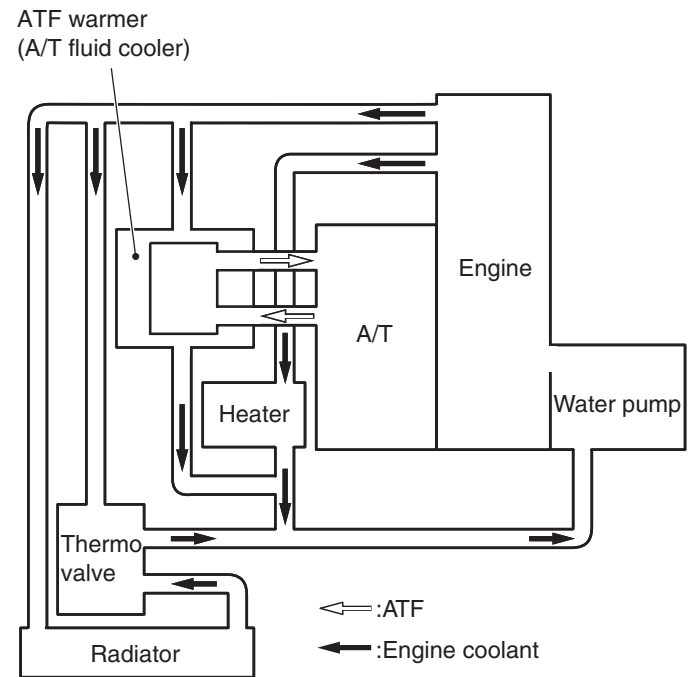
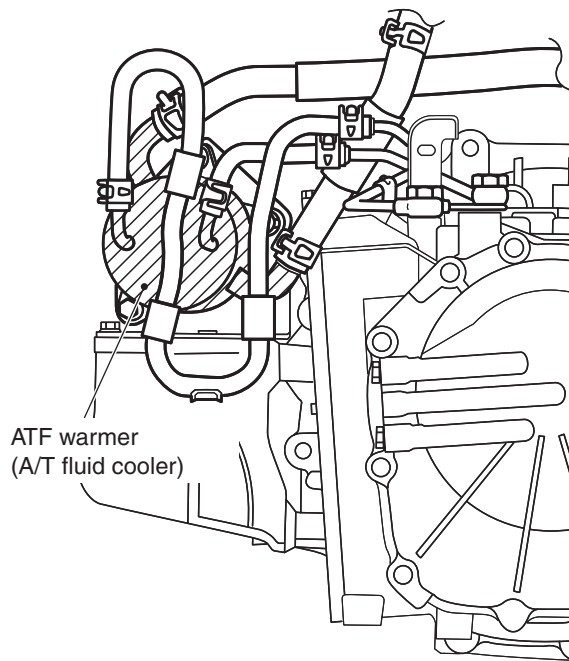
Item		Diagnosis code No.	Data list		Actuator test
			Item No.	Display	
Throttle position sensor (TPS)		—	11	mV	—
A/T fluid temperature sensor	Open circuit	15	15	°C	—
	Short circuit	16 <Vehicles for Australia and New Zealand>			
Crank angle sensor	Open circuit	21	0000	r/min	—
Input shaft speed sensor	Short circuit/open circuit	22	0001	r/min	—
Output shaft speed sensor	Short circuit/open circuit	23	0002	r/min	—
Stop lamp switch	Short circuit	26	26	ON/OFF	—
Inhibitor switch	Open circuit	27 <Vehicles for Australia and New Zealand>	61	P, R, N, D	—
	Short circuit	28 <Vehicles for Australia and New Zealand>			—
Vehicle speed signal		—	29	km/h	—

Item		Diagnosis code No.	Data list		Actuator test
			Item No.	Display	
LR solenoid valve	Short circuit/open circuit	31	31	%	01
UD solenoid valve	Short circuit/open circuit	32	32	%	02
2ND solenoid valve	Short circuit/open circuit	33	33	%	03
OD solenoid valve	Short circuit/open circuit	34	34	%	04
DCC solenoid valve	Short circuit/open circuit	36	36	%	06
Gear shift incomplete	1st	41	—	—	—
	2nd	42	—	—	—
	3rd	43	—	—	—
	4th	44	—	—	—
	Reverse	46	—	—	—
Damper clutch system	System defect	52	52	r/min	—
A/T control relay	Earth short circuit/open circuit	54	54	V	12
INVECS-II cancel command		—	40 <Vehicles for Australia and New Zealand>	ON/OFF	14
Engine intake manifold negative pressure		—	58	kPa	—
Shift position		—	63	4th, 3rd, 2nd, 1st, REV, NP	—
A/C relay		—	65	ON/OFF	—
Auto-cruise engaged signal		—	66	ON/OFF	—
Select switch		—	67	ON/OFF	—
Shift switch (Up)		—	68	ON/OFF	—
Shift switch (Down)		—	69	ON/OFF	—
Shift indicator	1st	—	—	—	07
	2nd	—	—	—	08
	3rd	—	—	—	09
	4th	—	—	—	10

ATF WARMER (A/T FLUID COOLER)

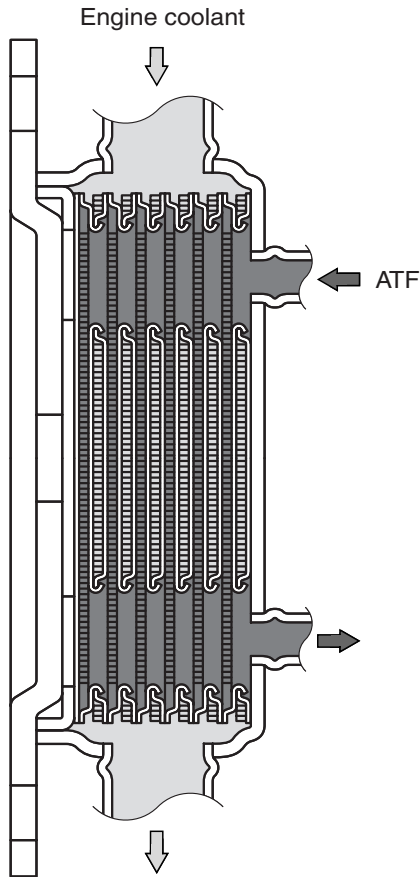
<Vehicles for Hong Kong and Singapore>

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Sectional view



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The ATF warmer utilises this characteristics to raise the ATF temperature as early as possible to an appropriate level (70-80° C), reducing the loss of A/T operation efficiency. After the ATF temperature has reached appropriate level, the ATF warmer stabilises the ATF temperature.

The A/T oil cooler installed in the radiator lower tank of the conventional A/T models has been eliminated, and the ATF warmer (A/T oil cooler) has been adopted. At the start of running, the temperature of the engine coolant rises earlier than that of the ATF.

TRANSMISSION CONTROL

GENERAL INFORMATION

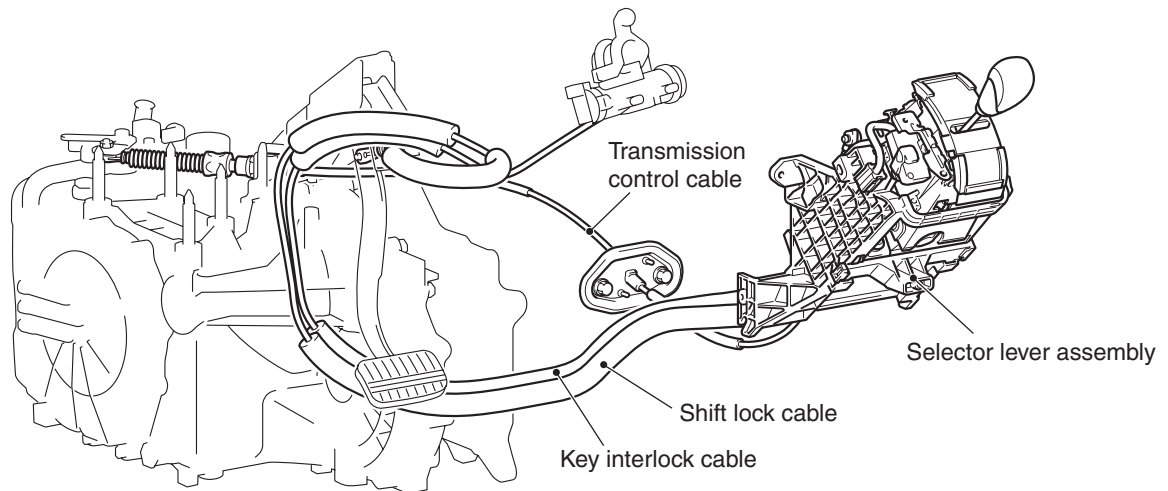
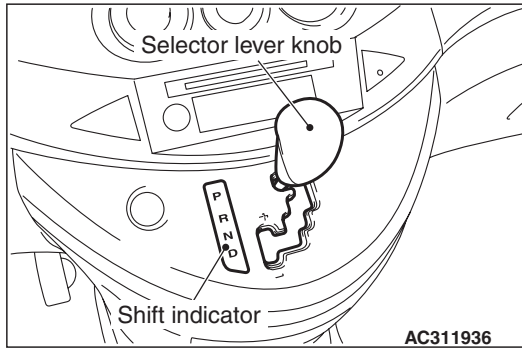
M2232000100373

A selector lever of an instrument panel type has been adopted in order to facilitate walkthrough between the seats, and has the following features:

- A selector lever with a gate type sport mode has been adopted.
- A selector lever knob of quick fitting type has been adopted in order to prevent the rotational displacement of the selector lever knob and its looseness.
- An instrument panel shock-absorbing mechanism for secondary collision has been adopted in order to ensure safety.

- For the shift indicator (P, R, N, D) next to the selector lever, a bulb and an optical wave guide mechanism have been adopted in order to ensure night-time visibility.
- The lever and the mounting bracket made of resins have been adopted in order to reduce weight and improve the rigidity.
- In order to prevent abrupt start by selector lever misoperation, an A/T erroneous operation prevention mechanism (the shiftlock cable and key interlock cable mechanism) has been adopted.
- For the installation of the shiftlock and key interlock cables, a one-touch structure that requires no bolt or nut has been adopted.

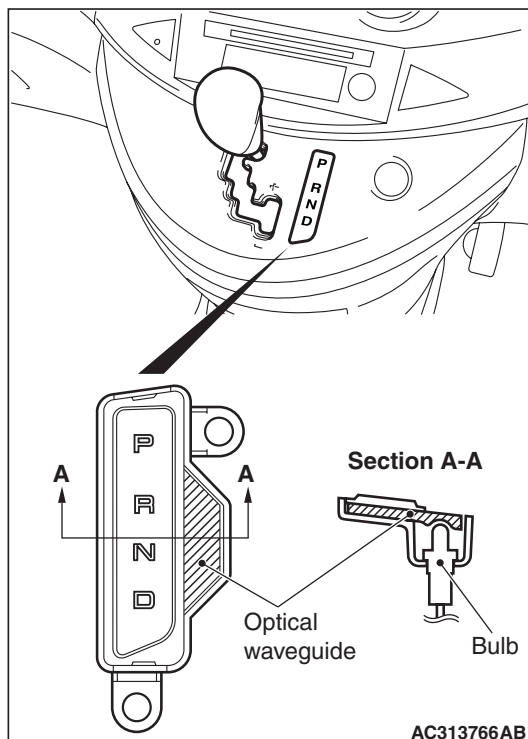
COMPONENT VIEW



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SHIFT INDICATOR

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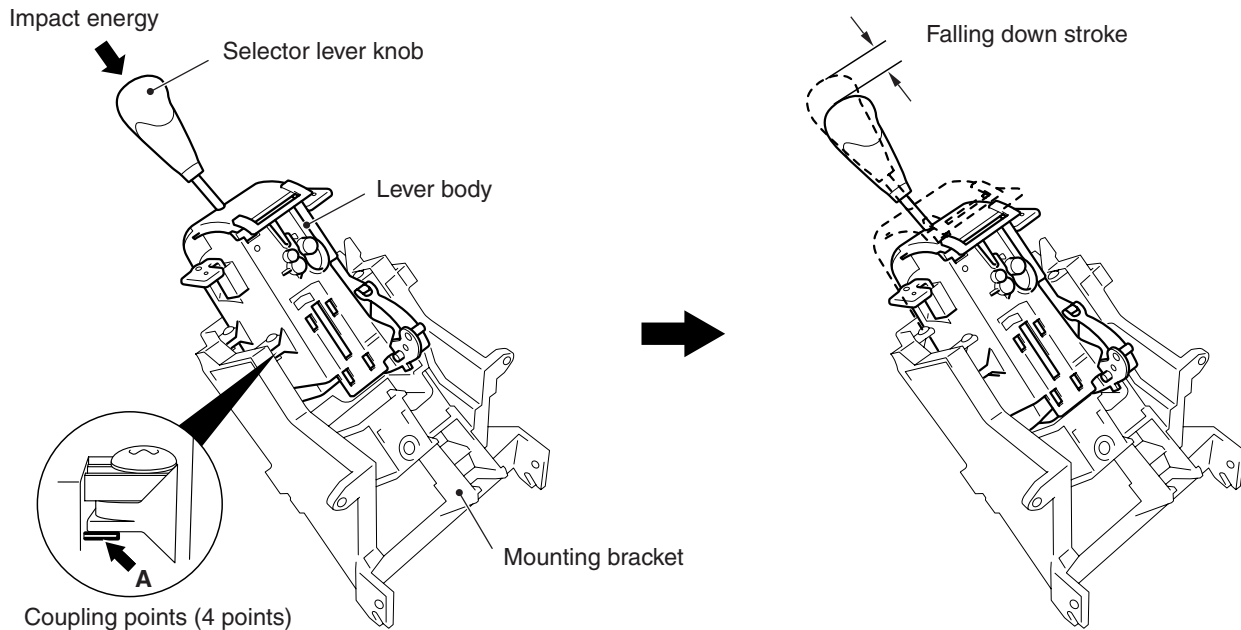


For the shift indicator (P, R, N, D) next to the selector lever, a bulb and an optical wave guide mechanism are adopted.

All indicator position (P, R, N, D) are illuminated by one bulb in order to ensure night-time visibility.

SHOCK-ABSORBING MECHANISM

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If the selector lever knob is impacted, section A of four points which couple the lever to the mounting bracket brakes, and the lever falls off in order to absorb the impact.

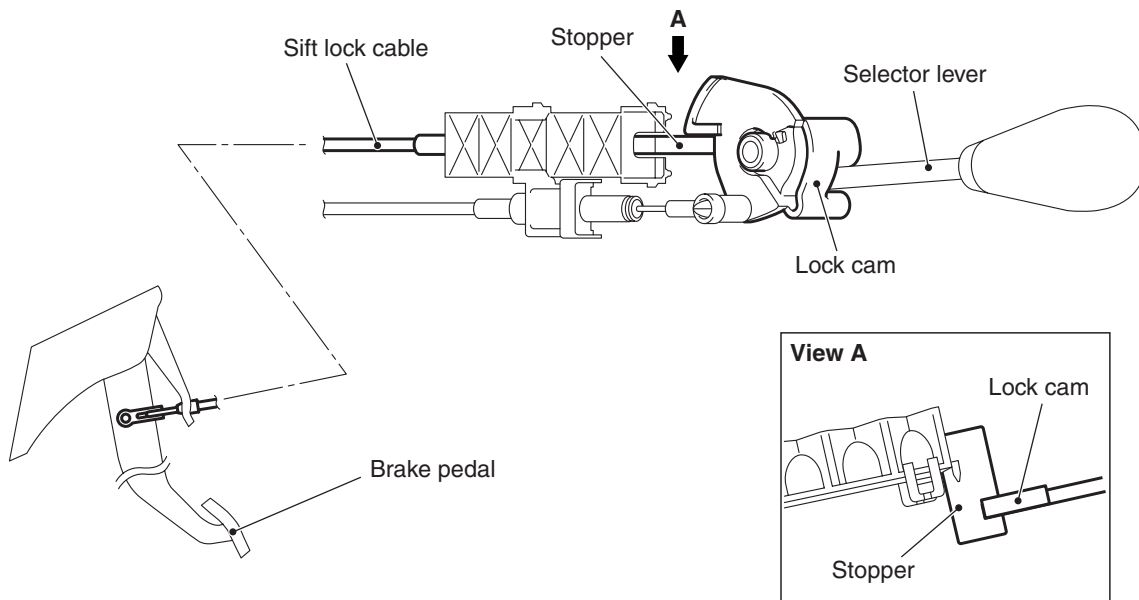
A/T ERRONEOUS OPERATION PREVENTION MECHANISMS

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SHIFT LOCK MECHANISM

Only when the following two conditions are satisfied, the selector lever can be shifted from the P position to another position:

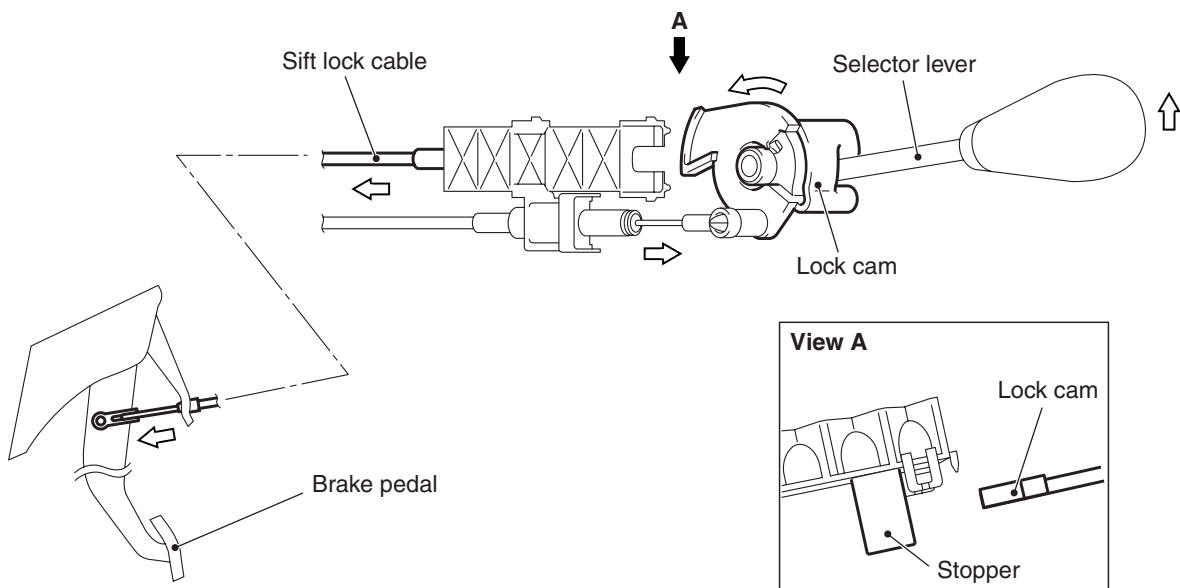
- When the brake pedal is depressed
- When the ignition key is in other than the LOCK (OFF) position

When the brake pedal is not depressed

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When the selector lever is in the P position without depressing the brake pedal, the shift lock cable stopper keeps the lock cam locked so that the selector lever does not move.

Therefore, the selector lever cannot be shifted from the P position to another position.

When the brake pedal is depressed

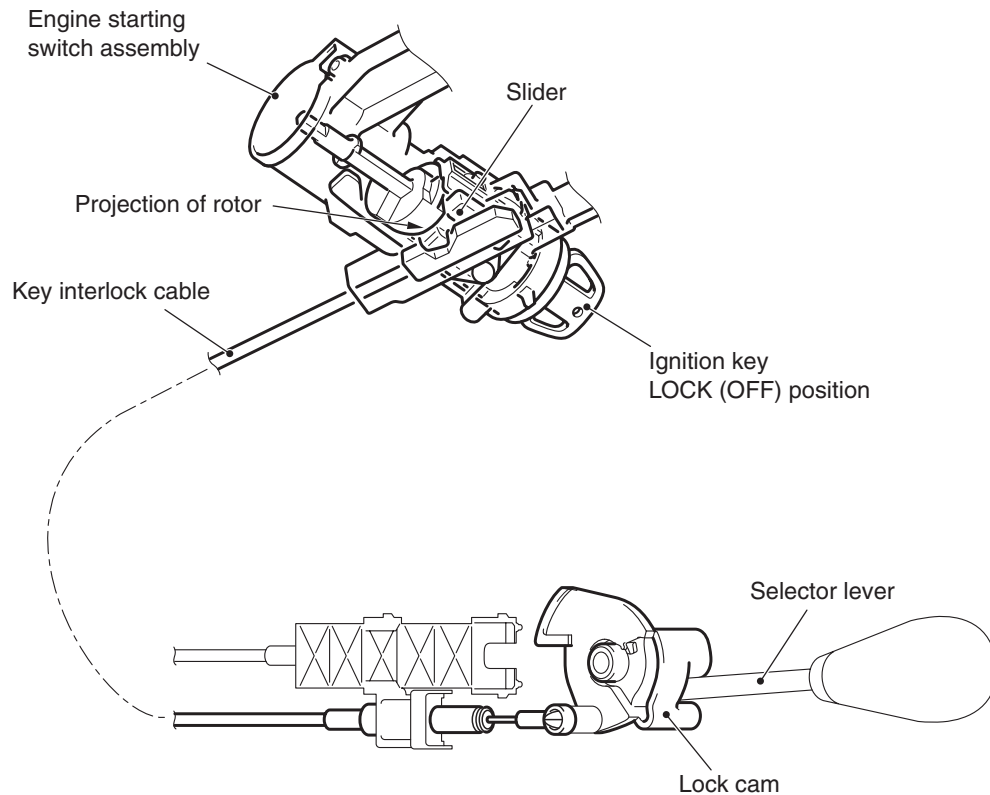
AC311187AB

When the brake pedal is depressed, the stopper is pulled by the shift lock cable so that the lock cam becomes unlocked.

As a result of this, the selector lever can be shifted from the P position to another position.

NOTE: When the brake pedal is depressed with the ignition key in the LOCK (OFF) position, the selector lever cannot be shifted from the P position to another position.

When the ignition key is in the LOCK (OFF) position (With the selector lever in the P position)

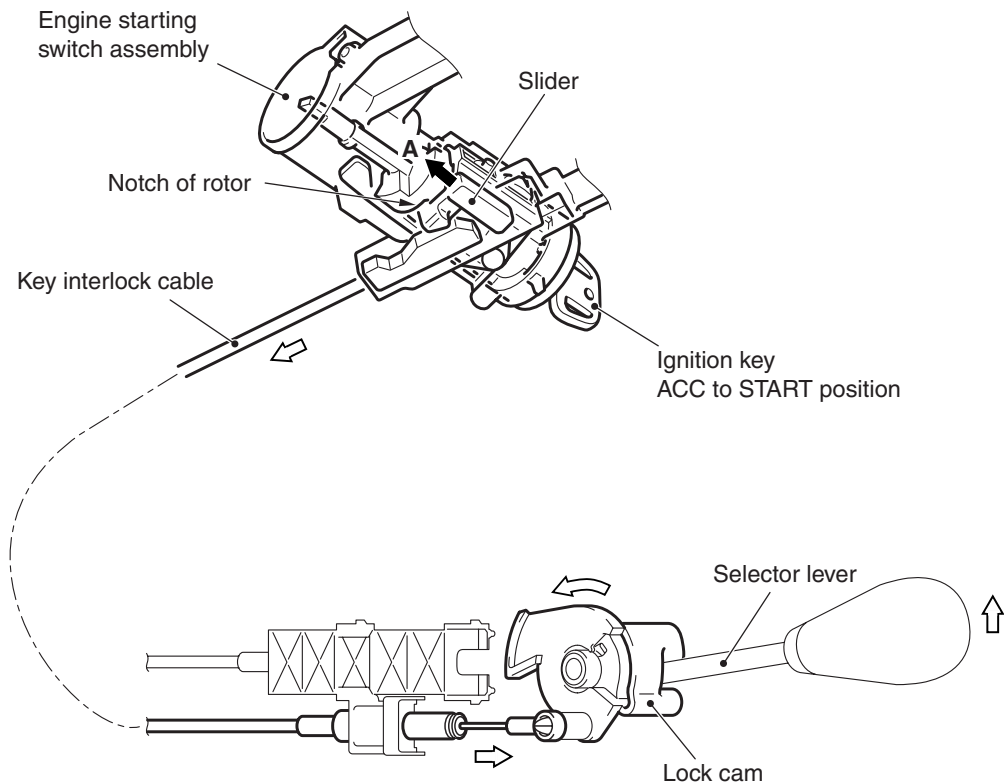


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In the engine starting switch assembly, the slider is engaged with the notch of the key interlock cable, and the slider is locked by the projection of the rotor so that the key interlock cable does not move and the lock cam does not move either.

As a result of this, any attempt to shift the selector lever from the P position to another position is prevented because the lock cam does not rotate.

When the ignition key is in any position between START and ACC positions (With the selector lever in the P position)



AC311189AB

The rotor in the engine starting switch assembly is synchronized with the movement of the ignition key. Because the notch of the rotor exists in range between ACC and START positions, the slider is unlocked in this range.

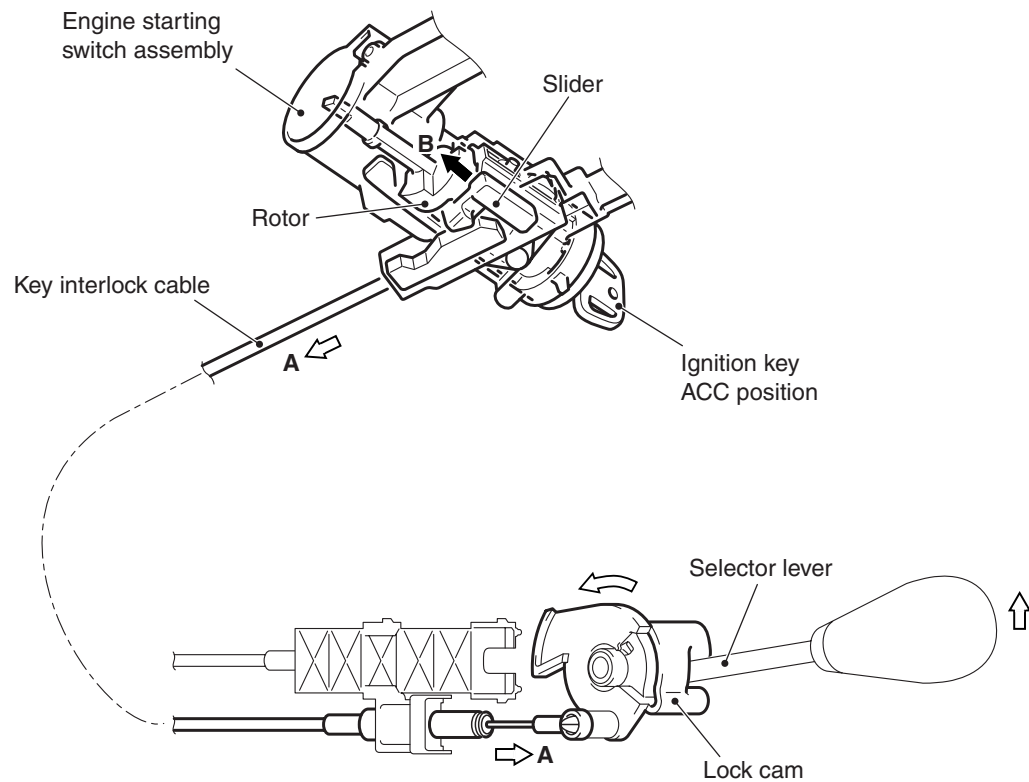
When the key interlock cable is pulled, the slider moves in direction A as illustrated in the figure so that the lock cam can turn and the selector lever can be shifted from the P position to another position.

NOTE: When the ignition key is in any position between START and ACC positions without depressing the brake pedal, the selector lever cannot be shifted from the P position to another position.

KEY INTERLOCK MECHANISM

When the selector lever is not in the P position, the ignition key cannot be turned to the LOCK (OFF) position and pulled out.

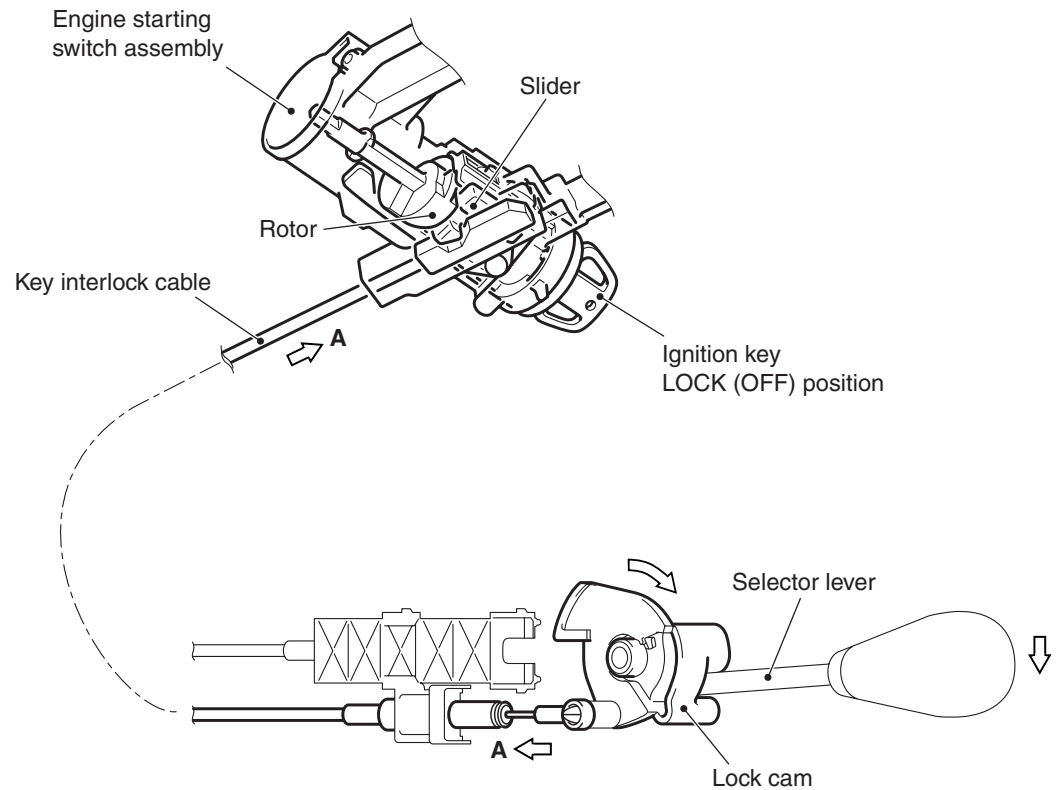
When pulling out the key with the selector lever in other than the P position



AC311190AB

When the selector lever is not in the P position, the lock cam is kept in a rotated condition, and the key interlock cable is kept pulled in direction A as illustrated in the figure. In this state, the slider in the engine starting switch assembly is locked, moved in direction B as illustrated in the figure.

The rotor in the engine starting switch assembly is synchronized with the movement of the ignition key. When the ignition key is turned toward the LOCK (OFF) position, the slider prevents the rotor from turning. Therefore, the ignition key can only be turned to the ACC position, so that it cannot be pulled out.

When pulling out the key with the selector lever in the P position

AC311191AB

When the selector lever is shifted to the P position, the lock cam turns. Then the key interlock cable is moved by the lock cam in direction A as illustrated in the figure.

As a result of this, the slider in the engine starting switch assembly is unlocked. The rotor can then turn, and the ignition key can be pulled out by turning it to the LOCK (OFF) position.