## ■ AUTOMATIC TRANSAXLE CONTROL SYSTEM

### 1. General

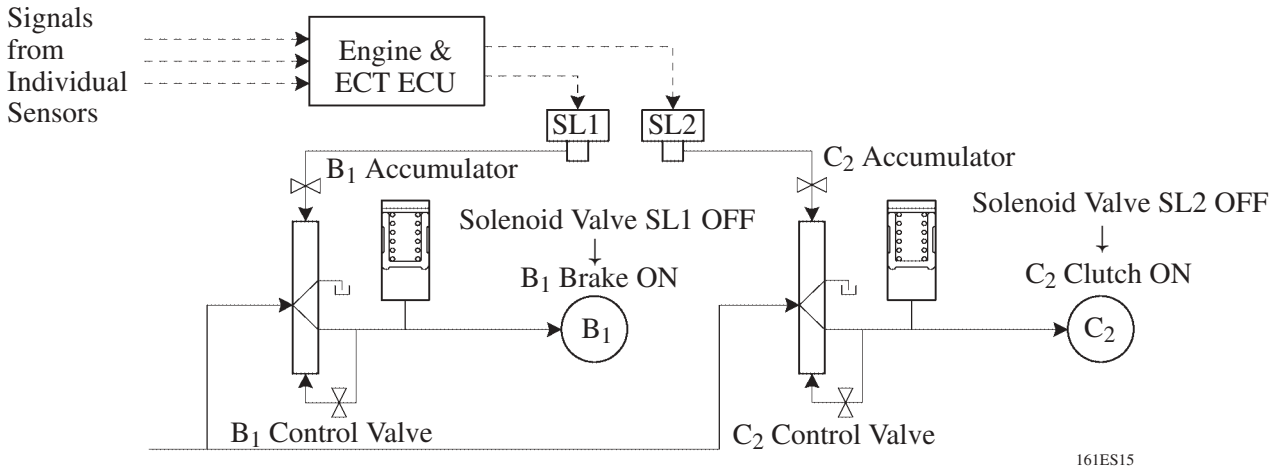
The automatic transaxle control system of the U240E automatic transaxle consists of the control listed below.

| System | Function |
|---|---|
| Clutch Pressure Control | ● Controls the pressure that is applied directly to $B_1$ brake and $C_2$ clutch by actuating the shift solenoid valve in accordance with the engine ECU signals.<br>● The solenoid valves SL1 and SL2 minutely controls the clutch pressure in accordance with the engine output and driving conditions. |
| Apply Orifice Control | The apply orifice control valve varies the apply orifice to control the flow volume supplied to the $B_3$ brake. |
| Centrifugal Fluid Pressure Cancelling Mechanism | Applies an equal pressure from the opposite side to cancel the influence of the pressure that is created by centrifugal force. |
| Line Pressure Optimal Control | Actuates the solenoid valve SLT to control the line pressure in accordance with information from the engine & ECT ECU and the operating conditions of the transaxle. |
| Engine Torque Control | Retards the engine ignition timing temporarily to improve shift feeling during up or down shifting. |
| Shifting Control in Uphill Traveling | Controls to restrict the 4th upshift by using the engine & ECT ECU to determine whether the vehicle is traveling uphill. |
| High Response Shift Control | The shift time lag has been reduced to half by the centrifugal fluid pressure cancelling mechanism and clutch pressure optimal control. |
| Shift Timing Control | The engine & ECT ECU sends current to the solenoid valve SL1 and/or SL2 based on signals from each sensor and shifts the gear. |
| Lock-Up Timing Control | The engine & ECT ECU sends current to the shift solenoid valve based on signals from each sensor and engages or disengages the lock-up clutch. |
| “N” to “D” Squat Control | When the shift lever is shifted from “N” to “D” range, the gear is temporarily shifted to 3rd and then to 1st to reduce vehicle squat. |

## 2. Clutch Pressure Control

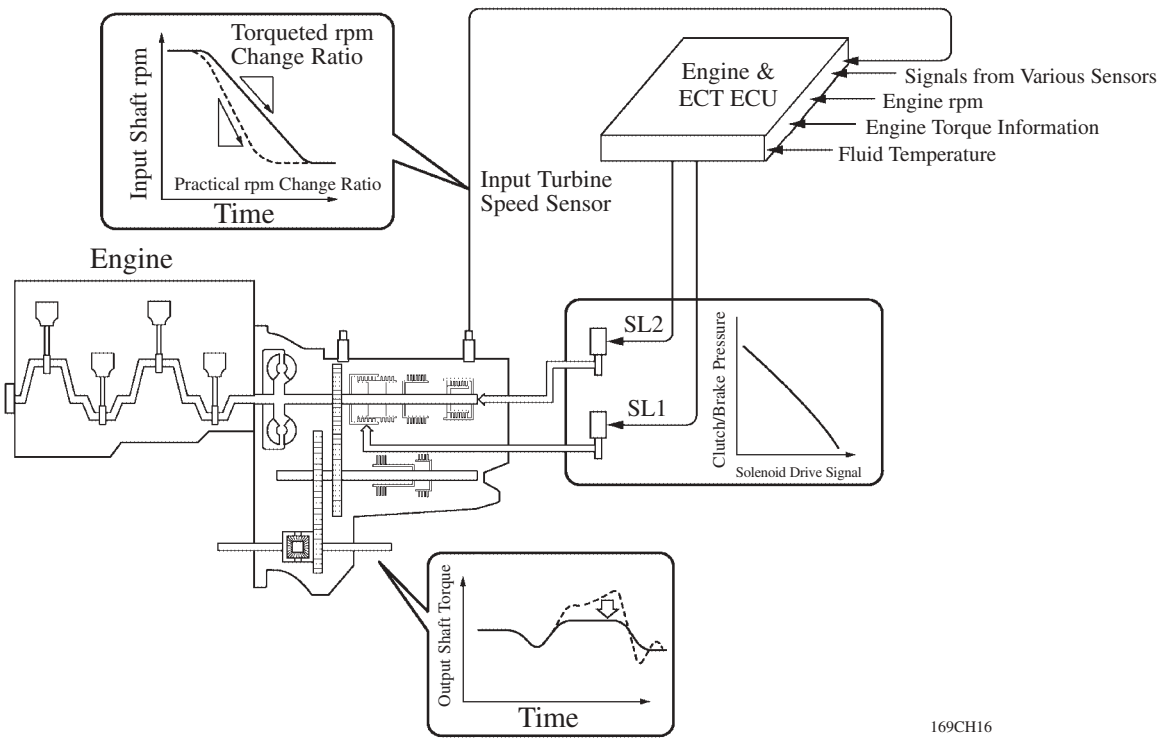
### Clutch to Clutch Pressure Control

A direct clutch pressure control has been adopted for shifting from the 1st to 2nd gear, and from the 2nd to 3rd gear. Actuates solenoid valves SL1 and SL2 in accordance with the signals from the engine & ECT ECU, and guides this output pressure directly to control valves $B_1$ and $C_2$ in order to regulate the line pressure that acts on the $B_1$ brake and $C_2$ clutch . As a result, compact $B_1$ and $C_2$ accumulators without a back pressure chamber have been realized.




### Clutch Pressure Optimal Control

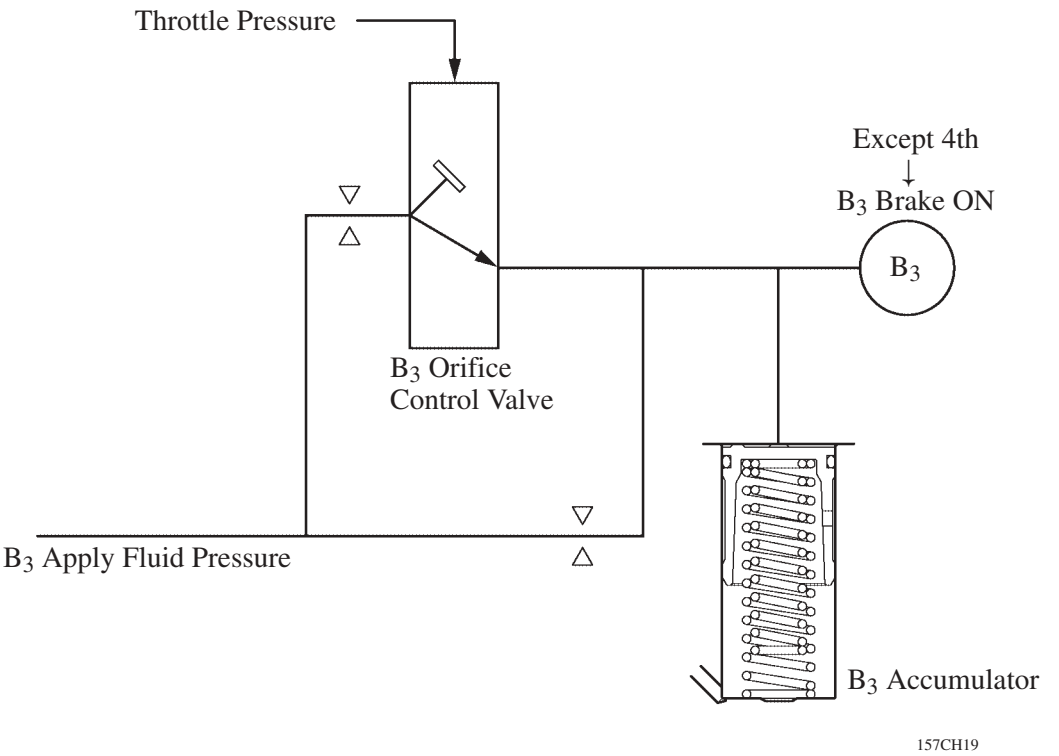
Solenoid valves SL1 and SL2 are used for optimal control of clutch pressure. The engine & ECT ECU monitors the signals from various types of sensors such as the input turbine speed sensor, allowing shift solenoid valves SL1 and SL2 to minutely control the clutch pressure in accordance with engine output and driving conditions. As a result, smooth shift characteristics have been realized.




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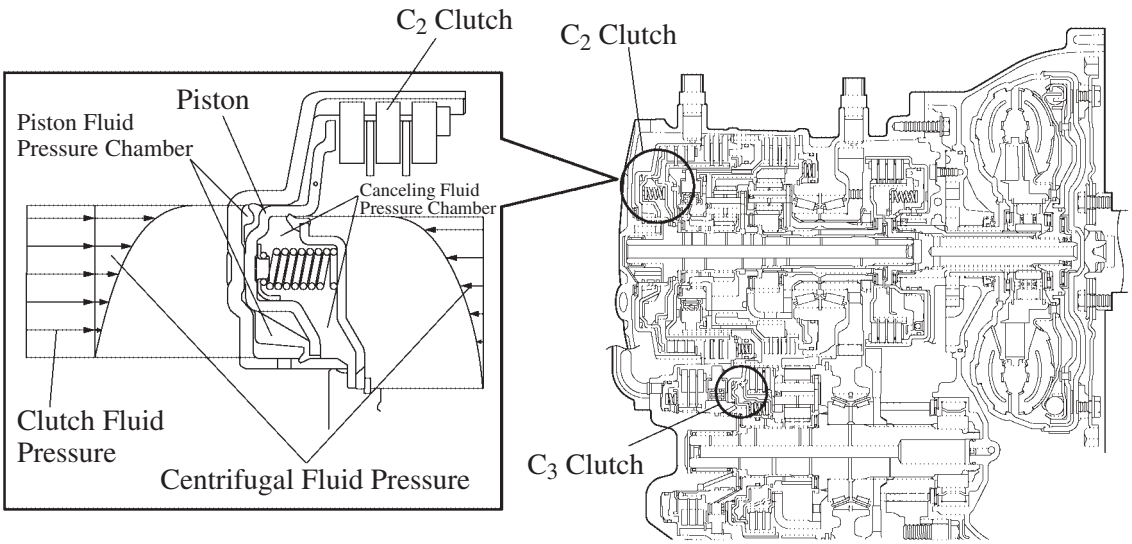
## 3. Apply Orifice Control

The $B_3$ orifice control valve has been provided for the $B_3$ brake, which is applied when shifting from 4th to 3rd. The $B_3$ orifice control valve is controlled by the amount of the throttle pressure in accordance with shifting conditions, and the flow volume of the fluid that is supplied to the $B_3$ brake is controlled by varying the size of the control valve's apply orifice.

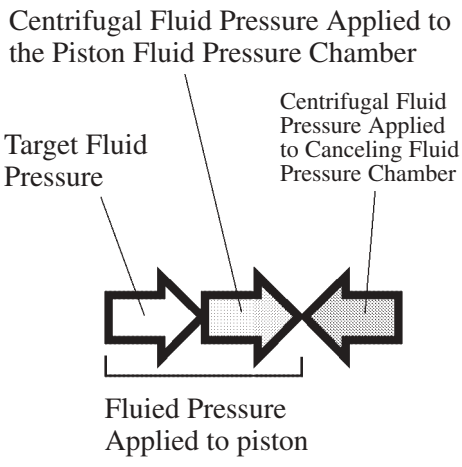


## 4. Centrifugal Fluid Pressure Canceling Mechanism

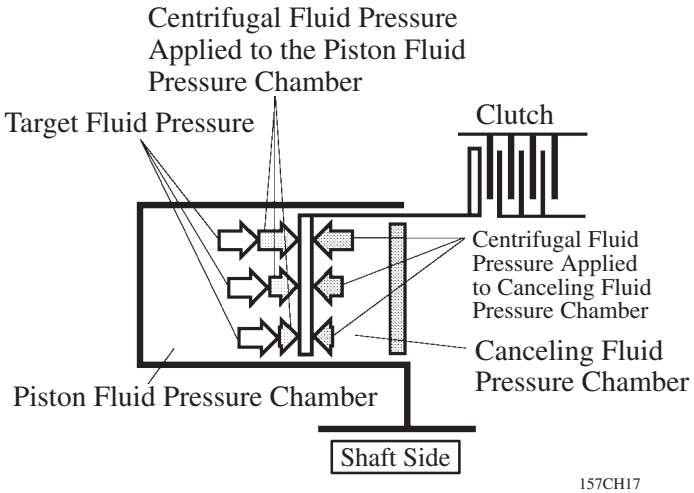
A centrifugal fluid pressure canceling mechanism has been adopted in the C1, C2 and C3 clutches that are applied when shifting from 2nd to 3rd and from 3rd to 4th. In the conventional clutch mechanism, to prevent the generation of pressure by the centrifugal force that is applied to the fluid in the piston fluid pressure chamber when the clutch is released, a check ball is provided to discharge the fluid. Therefore, before the clutch can be subsequently applied, it took time for the fluid to fill the piston fluid pressure chamber. During shifting, in addition to the pressure that is controlled by the valve body, the pressure that acts on the fluid in the piston fluid pressure chamber also exerts influence, which is dependent upon rpm fluctuations. In order to eliminate this influence, a canceling fluid pressure chamber is provided opposite to the piston fluid pressure chamber. By utilizing the lubrication fluid such as that of the shaft, the same amount of centrifugal force is applied, thus canceling the centrifugal force that is applied to the piston itself. Accordingly, it is not necessary to discharge the fluid through the use of a check ball, and a highly responsive and smooth shifting characteristic has been achieved.




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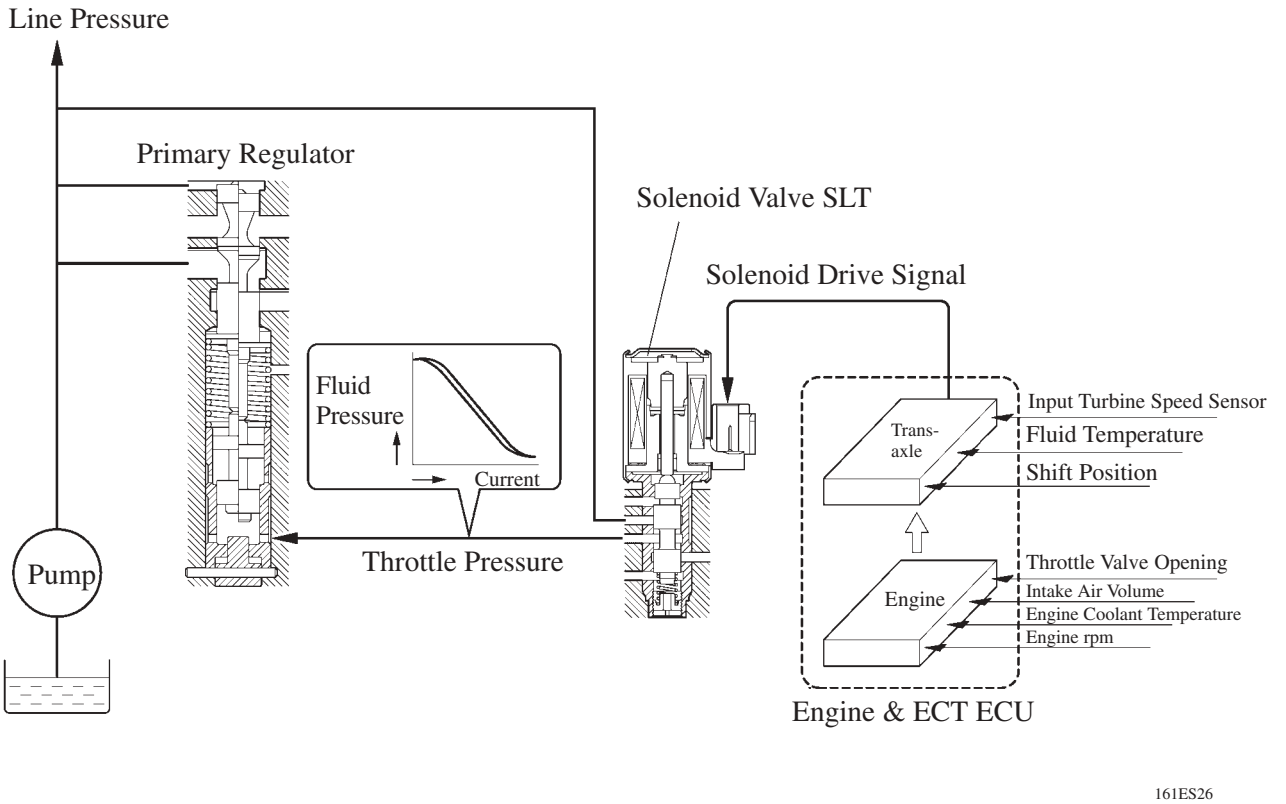

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|---|---|---|---|---|
| Fluid pressure applied to piston | – | Centrifugal fluid pressure applied to canceling fluid pressure chamber | = | Target fluid pressure (original clutch pressure) |

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## 5. Line Pressure Optimal Control

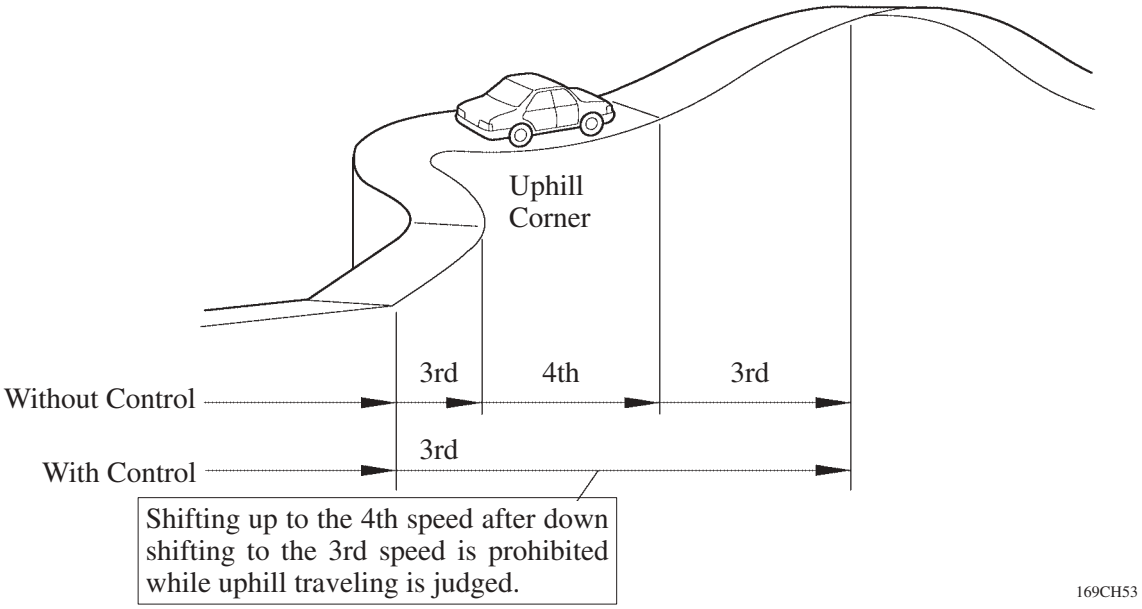
The line pressure is controlled by using a solenoid valve SLT. Through the use of the solenoid valve SLT, the line pressure is optimally controlled in accordance with the engine torque information, as well as with the internal operating conditions of the torque converter and the transaxle. Accordingly, the line pressure can be controlled minutely in accordance with the engine output, traveling condition, and the ATF temperature, thus realizing smooth shift characteristics and optimizing the workload on the oil pump.



## 6. Shifting Control in Uphill Traveling

### General

With shifting control in uphill traveling, the engine & ECT ECU calculates the throttle opening angle and the acceleration rate to determine whether the vehicle is in the uphill. While driving uphill on a winding road with ups and downs, the 4th upshift is restricted to ensure a smooth drive.




## 7. High Response Shift Control

Due to the use of the previously mentioned centrifugal fluid pressure canceling mechanism and the clutch pressure optimal control, not only smooth shifting has been achieved, but the shift time lag has been halved to realize excellent response.