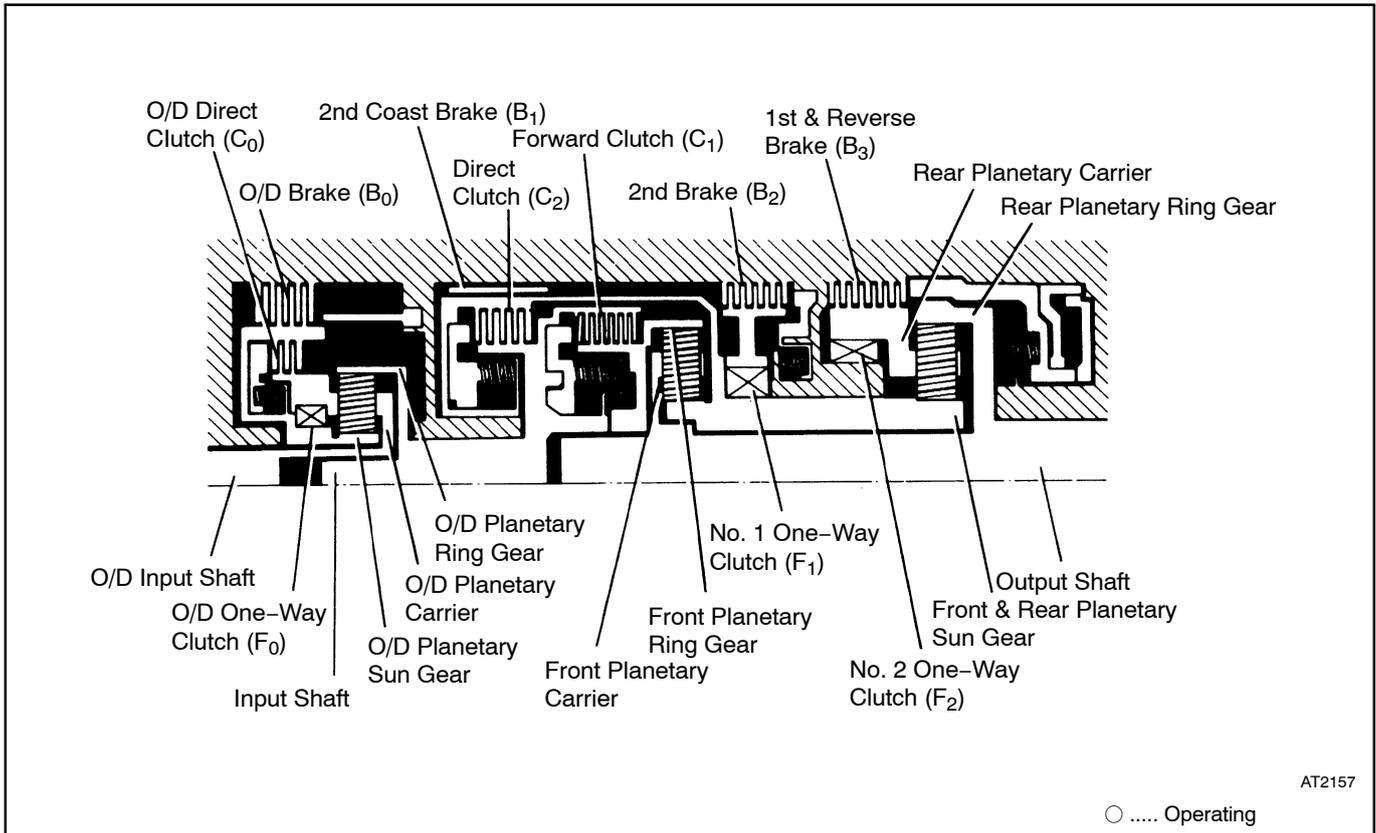


# OPERATION

## Mechanical Operation

### OPERATING CONDITIONS

(A340E, A340F)



AT2157

○ ..... Operating

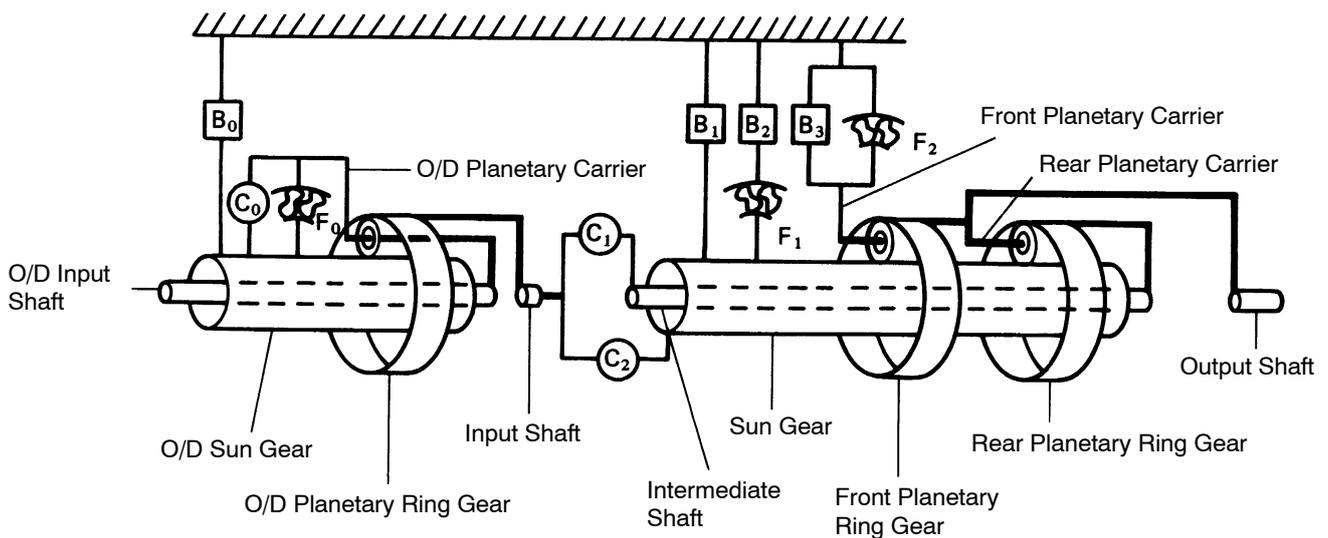
| Shift lever position | Gear position | C <sub>0</sub> | C <sub>1</sub> | C <sub>2</sub> | B <sub>0</sub> | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> | F <sub>0</sub> | F <sub>1</sub> | F <sub>2</sub> |
|----------------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| P                    | Parking       | ○              |                |                |                |                |                |                |                |                |                |
| R                    | Reverse       | ○              |                | ○              |                |                |                | ○              | ○              |                |                |
| N                    | Neutral       | ○              |                |                |                |                |                |                |                |                |                |
| D                    | 1st           | ○              | ○              |                |                |                |                |                | ○              |                | ○              |
|                      | 2nd           | ○              | ○              |                |                |                | ○              |                | ○              | ○              |                |
|                      | 3rd           | ○              | ○              | ○              |                |                | ○              |                | ○              |                |                |
|                      | O/D           |                | ○              | ○              | ○              |                | ○              |                |                |                |                |
| 2                    | 1st           | ○              | ○              |                |                |                |                |                | ○              |                | ○              |
|                      | 2nd           | ○              | ○              |                |                | ○              | ○              |                | ○              | ○              |                |
|                      | 3rd           | ○              | ○              | ○              |                |                | ○              |                | ○              |                |                |
| L                    | 1st           | ○              | ○              |                |                |                |                | ○              | ○              |                | ○              |
|                      | *2nd          | ○              | ○              |                |                | ○              | ○              |                | ○              | ○              |                |

\* Down-shift only in the L range and 2nd gear - no up-shift.

# FUNCTION OF COMPONENTS

(A340E, A340F)

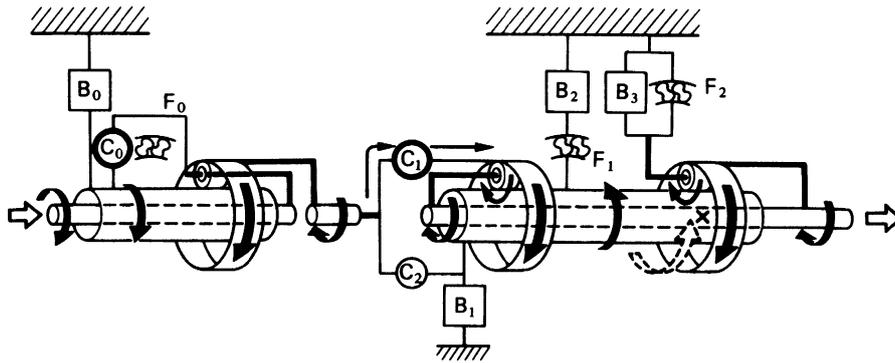
| NOMENCLATURE                           | OPERATION  |
|--|--|
| O/D Direct Clutch (C <sub>0</sub> )    | Connects overdrive sun gear and overdrive carrier  |
| O/D Brake (B <sub>0</sub> )            | Prevents overdrive sun gear from turning either clockwise or counterclockwise  |
| O/D One-Way Clutch (F <sub>0</sub> )   | When transmission is being driven by engine, connects overdrive sun gear and overdrive carrier   |
| Forward Clutch (C <sub>1</sub> )       | Connects input shaft and front planetary ring gear   |
| Direct Clutch (C <sub>2</sub> )        | Connects input shaft and front & rear planetary sun gear   |
| 2nd Coast Brake (B <sub>1</sub> )      | Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise   |
| 2nd Brake (B <sub>2</sub> )            | Prevents outer race of F <sub>1</sub> from turning either clockwise or counterclockwise, thus preventing front & rear planetary sun gear from turning counterclockwise |
| 1st & Reverse Brake (B <sub>3</sub> )  | Prevents rear planetary carrier from turning either clockwise or counterclockwise  |
| No. 1 One-Way Clutch (F <sub>1</sub> ) | When B <sub>2</sub> is operating, prevents front & rear planetary sun gear from turning counterclockwise   |
| No. 2 One-Way Clutch (F <sub>2</sub> ) | Prevents rear planetary carrier from turning counterclockwise  |



### FUNCTION OF COMPONENTS (Cont'd)

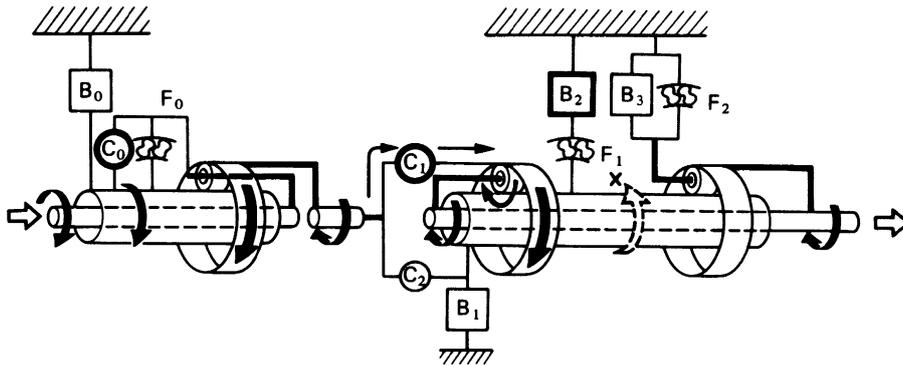
The conditions of operation for each gear position are shown in the following illustrations:

D or 2 Range 1st Gear



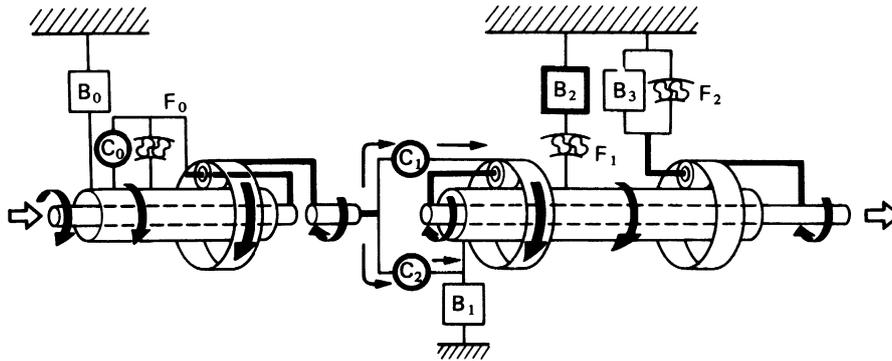
AT6675

D Range 2nd Gear



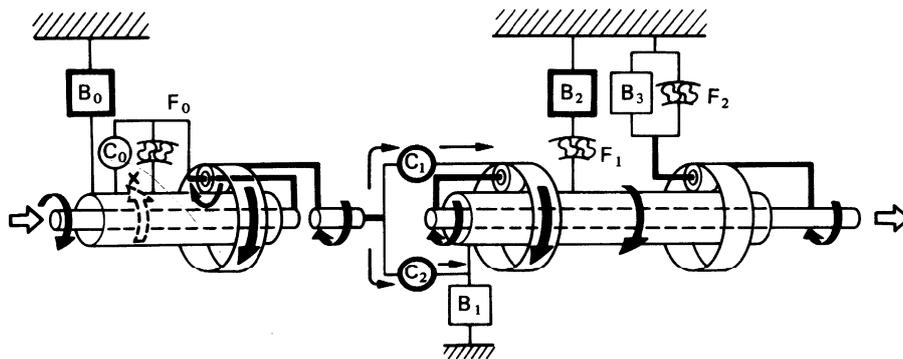
AT6676

D or 2 Range 3rd Gear



AT6677

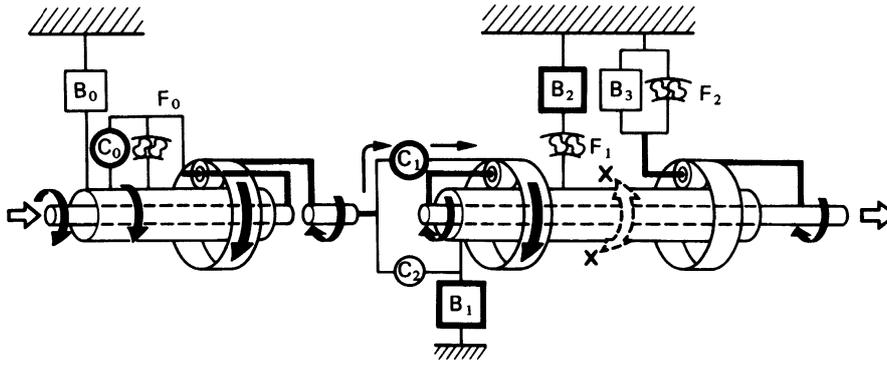
D Range O/D



AT6678

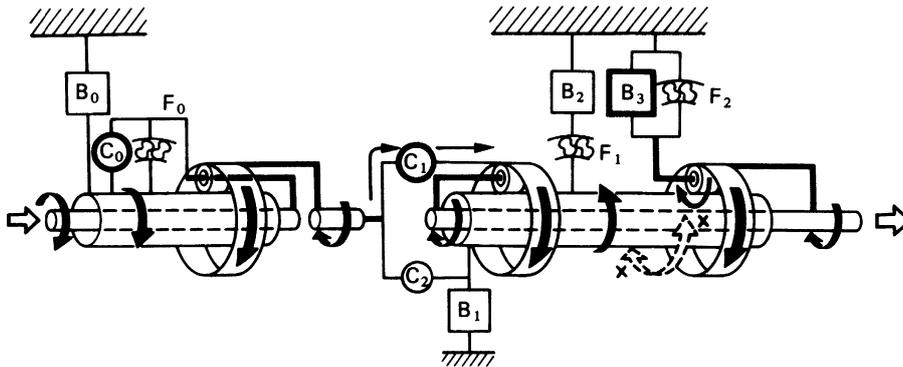
**FUNCTION OF COMPONENTS (Cont'd)**

**2 or L Range 2nd Gear**



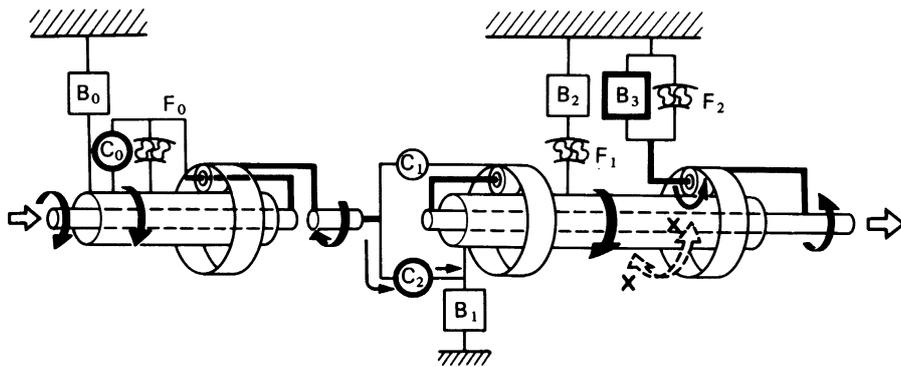
AT6679

**L Range 1st Gear**



AT6680

**R Range Reverse Gear**



AT6681

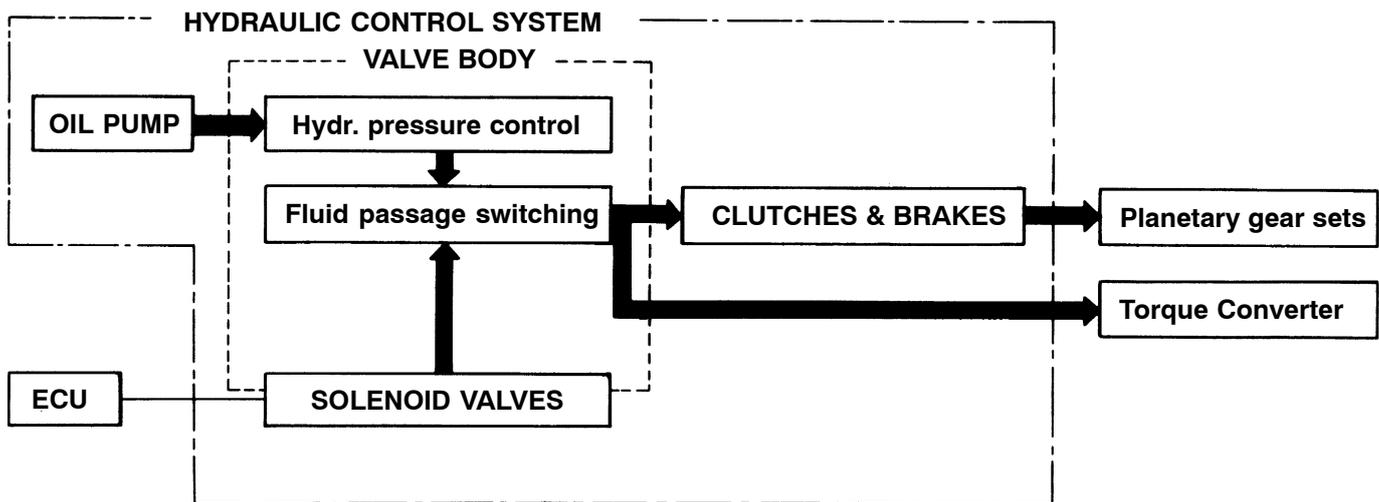
## HYDRAULIC CONTROL SYSTEM

### (A340E, A340F)

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter, clutches and brakes in accordance with the vehicle driving conditions.

There are three solenoid valves on the valve body. These solenoid valves are turned on and off by signals from the ECU to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter and planetary gear units.

(Except for the solenoid valves, the hydraulic control system of the ECT is basically the same as that of the fully hydraulic controlled automatic transmission.)



- **LINE PRESSURE**

Line pressure is the most basic and important pressure used in the automatic transmission, because it is used to operate all of the clutches and brakes in the transmission.

If the primary regulator valve does not operate correctly, line pressure will be either too high or too low. Line pressure that is too high will lead to shifting shock and consequent engine power loss due to the greater effort required of the oil pump; line pressure that is too low will cause slippage of clutches and brakes, which will, in extreme cases, prevent the vehicle from moving. Therefore, if either of these problems are noted, the line pressure should be measured to see if it is within standard.

- **THROTTLE PRESSURE**

Throttle pressure is always kept in accordance with the opening angle of the engine throttle valve.

This throttle pressure acts on the primary regulator valve and, accordingly, line pressure is regulated in response to the throttle valve opening.

In the fully hydraulic controlled automatic transmission, throttle pressure is used for regulating line pressure and as signal pressure for up-shift and down-shift of the transmission. In the ECT, however, throttle pressure is used only for regulating line pressure. Consequently, improper adjustment of the transmission throttle cable may result in a line pressure that is too high or too low. This, in turn, will lead to shifting shock or clutch and brake slippage.

## ELECTRONIC CONTROL SYSTEM

### (A340E, A340F)

The electronic control system, which controls the shift points and the operation of the lock-up clutch, is composed of the following three parts:

#### 1. Sensors

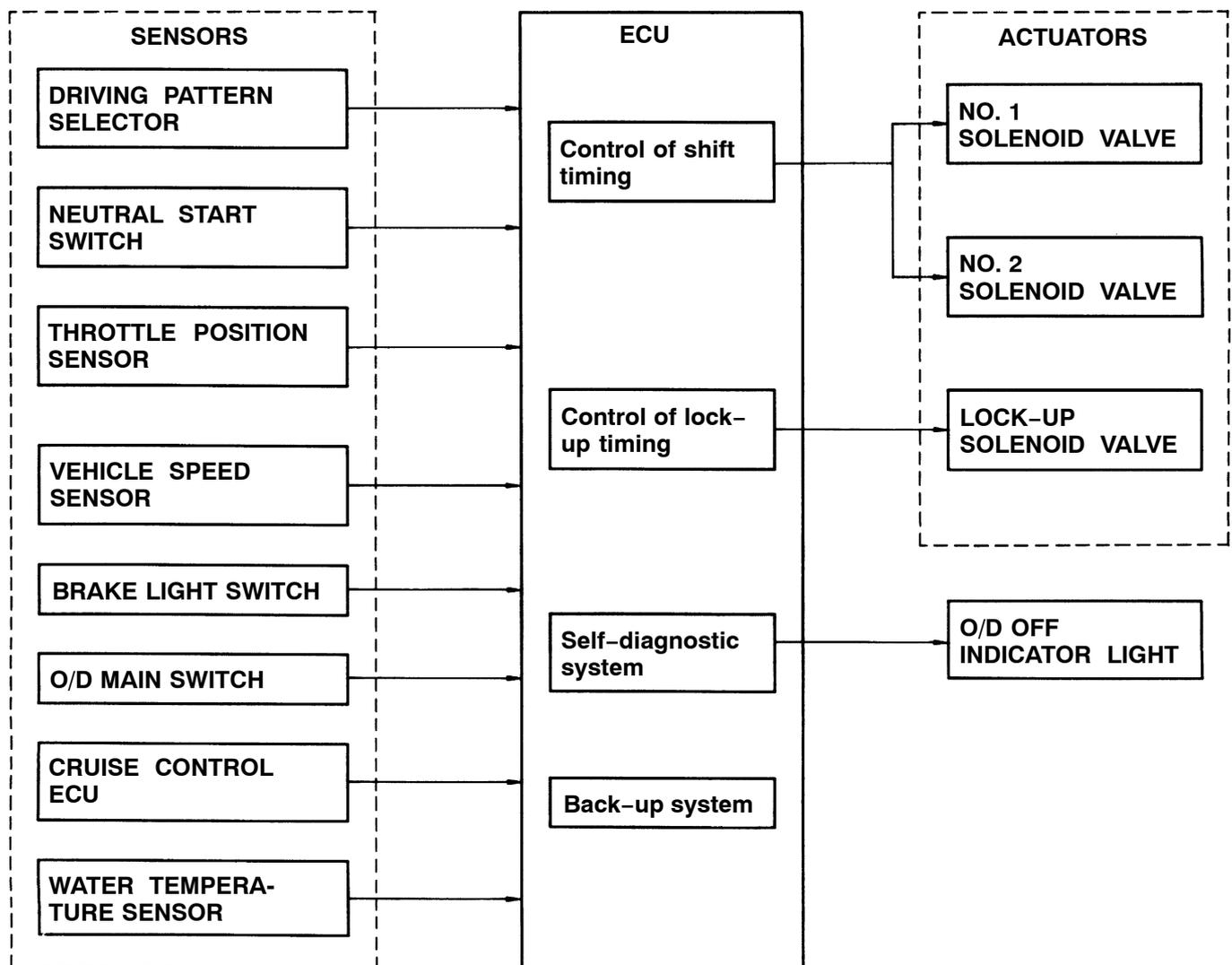
These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the ECU in the form of electrical signals.

#### 2. ECU

The ECU determines the shift and lock-up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

#### 3. Actuators

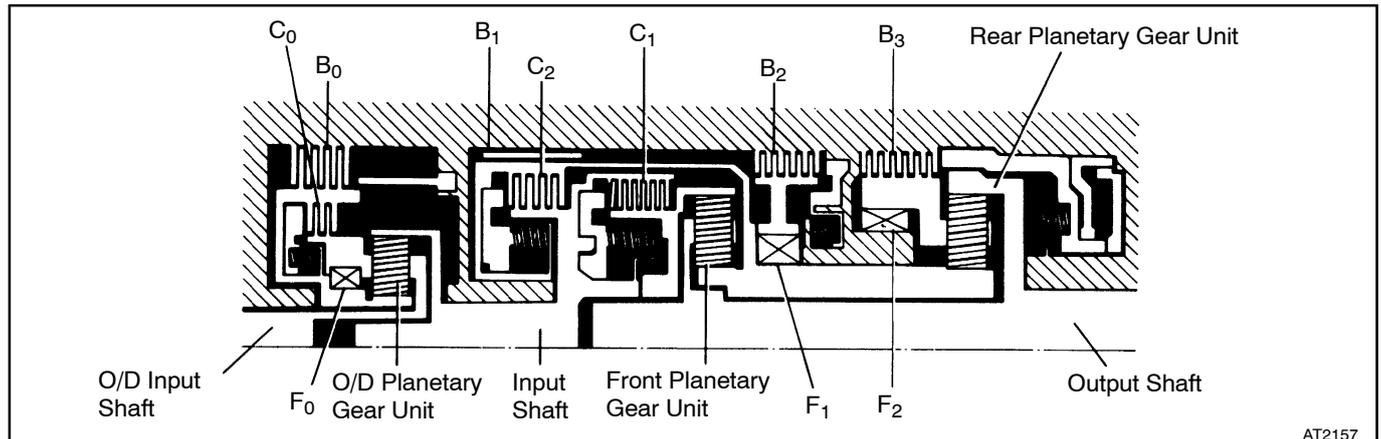
These are three solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock-up timing.



# OPERATING CONDITIONS

(A340H)

## 1. Transmission



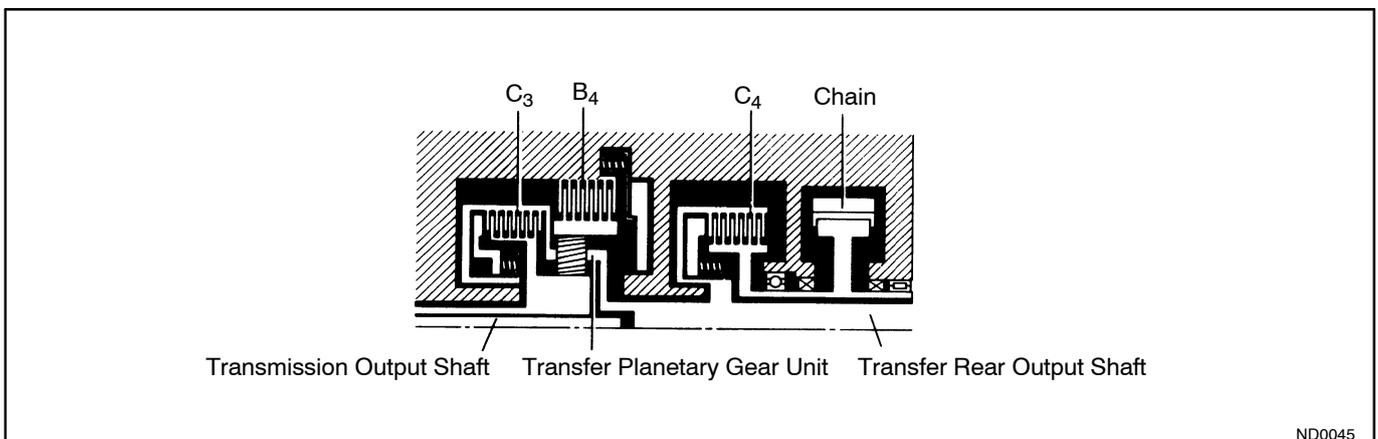
AT2157

| Range (i.e., Shift Lever Position) | Gear    | No. 1 Solenoid Valve | No. 2 Solenoid Valve | C <sub>0</sub> | C <sub>1</sub> | C <sub>2</sub> | B <sub>0</sub> | B <sub>1</sub> | B <sub>2</sub> | B <sub>3</sub> |      | F <sub>0</sub> | F <sub>1</sub> | F <sub>2</sub> |
|------------------------------------|---------|----------------------|----------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|----------------|----------------|----------------|
|                                    |         |                      |                      |                |                |                |                |                |                | I.P.           | O.P. |                |                |                |
| P                                  | Parking | ON                   | OFF                  | ●              |                |                |                |                |                |                |      |                |                |                |
| R                                  | Reverse | ON                   | OFF                  | ●              |                | ●              |                |                |                |                | ●    | ●              |                |                |
| N                                  | Neutral | ON                   | OFF                  | ●              |                |                |                |                |                |                |      | ●              |                |                |
| D                                  | 1st     | ON                   | OFF                  | ●              | ●              |                |                |                |                |                |      | ●              |                | ●              |
|                                    | 2nd     | ON                   | ON                   | ●              | ●              |                |                |                | ●              |                |      | ●              | ●              |                |
|                                    | 3rd     | OFF                  | ON                   | ●              | ●              | ●              |                |                | ●              |                |      | ●              |                |                |
|                                    | O/D     | OFF                  | OFF                  |                | ●              | ●              | ●              |                | ●              |                |      |                |                |                |
| 2                                  | 1st     | ON                   | OFF                  | ●              | ●              |                |                |                |                |                |      | ●              |                | ●              |
|                                    | 2nd     | ON                   | ON                   | ●              | ●              |                |                | ●              | ●              |                |      | ●              | ●              |                |
|                                    | 3rd     | OFF                  | ON                   | ●              | ●              | ●              |                |                | ●              |                |      | ●              |                |                |
| L                                  | 1st     | ON                   | OFF                  | ●              | ●              |                |                |                |                | ●              | ●    | ●              |                | ●              |
|                                    | *2nd    | ON                   | ON                   | ●              | ●              |                |                | ●              | ●              |                |      | ●              | ●              |                |

\* Down-shift only in the L range and 2nd gear - no up-shift.

I.P. .... Inner Piston  
O.P. .... Outer Piston

## 2. Transfer



ND0045

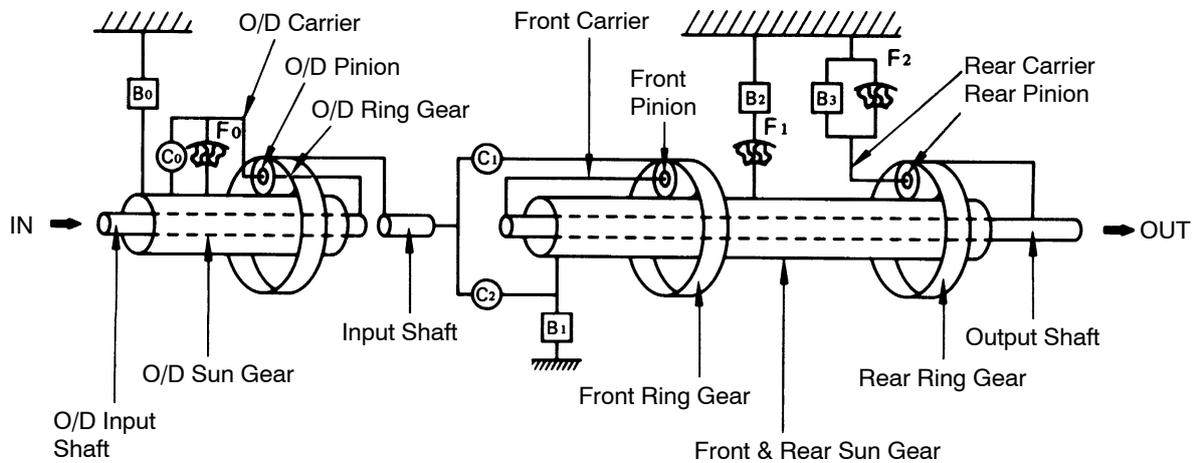
| Transfer gear position | No. 4 solenoid valve | C <sub>3</sub> | C <sub>4</sub> | B <sub>4</sub> |
|------------------------|----------------------|----------------|----------------|----------------|
| H2                     | OFF                  | ●              |                |                |
| H4                     | OFF                  | ●              | ●              |                |
| L4                     | ON                   |                | ●              | ●              |

# FUNCTION OF COMPONENTS

(A340H)

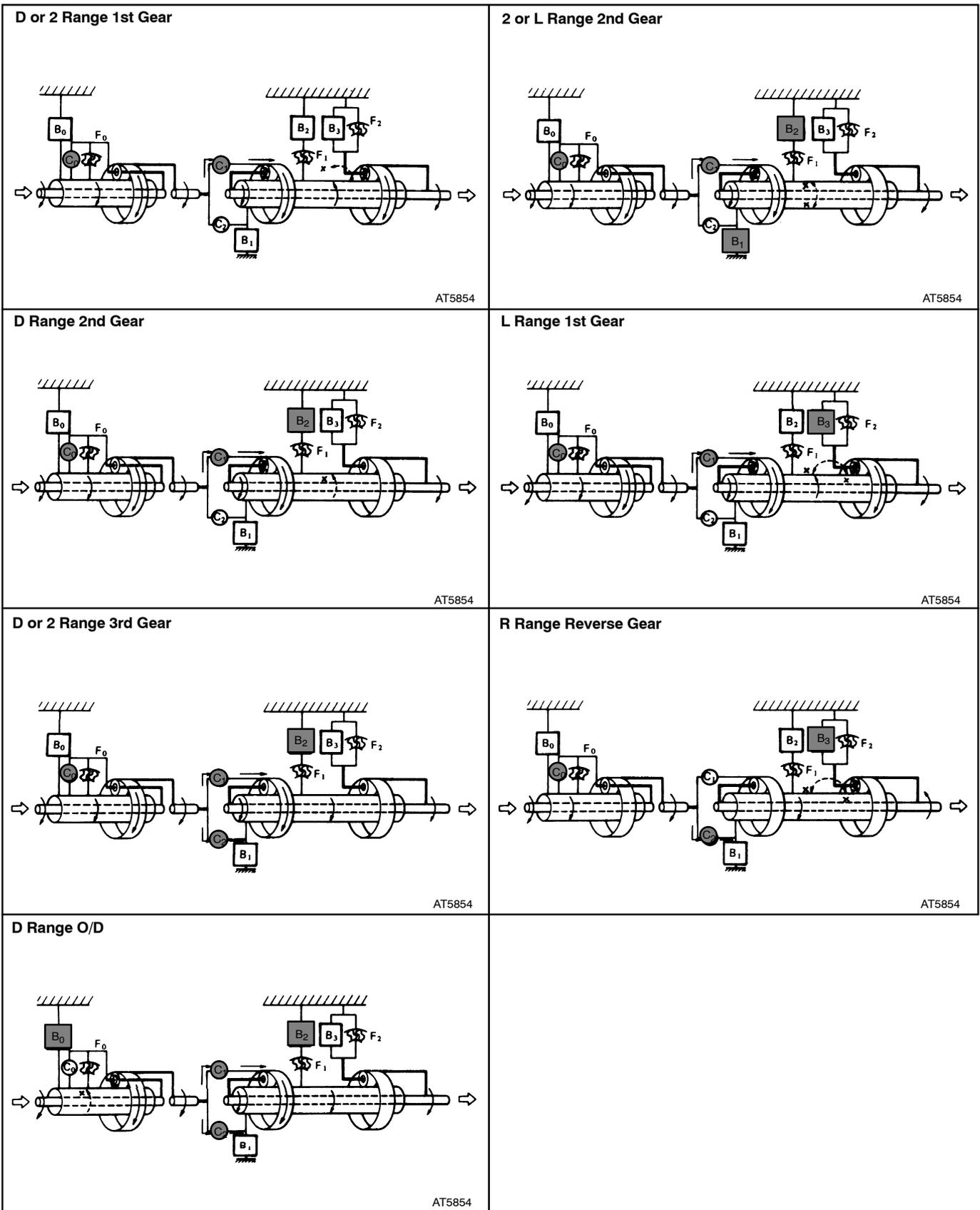
## 1. Transmission

| Component       |                      | Function   |
|-----------------|----------------------|--|
| C <sub>1</sub>  | Forward Clutch       | Connects input shaft and front planetary ring gear.  |
| C <sub>2</sub>  | Direct Clutch        | Connects input shaft and front & rear planetary sun gear.  |
| C <sub>0</sub>  | O/D Direct Clutch    | Connects overdrive sun gear and overdrive planetary carrier.   |
| B <sub>1</sub>  | 2nd Coast Brake      | Prevents front & rear planetary sun gear from turning either clockwise or counterclockwise.  |
| B <sub>2</sub>  | 2nd Brake            | Prevents outer race of F <sub>1</sub> from turning either clockwise or counterclockwise thus preventing the front & rear planetary sun gear from turning counterclockwise.                   |
| B <sub>3</sub>  | 1st & Reverse Brake  | Prevents rear planetary carrier from turning either clockwise or counterclockwise.   |
| B <sub>0</sub>  | O/D Brake            | Prevents overdrive sun gear from turning either clockwise or counterclockwise.   |
| F <sub>1</sub>  | No. 1 One-Way Clutch | When B <sub>2</sub> is operating, this clutch prevents the front & rear planetary sun gear from turning counterclockwise.  |
| F <sub>2</sub>  | No. 2 One-Way Clutch | Prevents rear planetary carrier from turning counterclockwise.   |
| F <sub>0</sub>  | O/D One-Way Clutch   | When the transmission is being driven by the engine, this clutch connects the overdrive sun gear and overdrive planetary carrier.  |
| Planetary Gears |                      | These gears change the route through which driving force is transmitted in accordance with the operation of each clutch and brake in order to increase or reduce the input and output speed. |



## FUNCTION OF COMPONENTS (Cont'd)

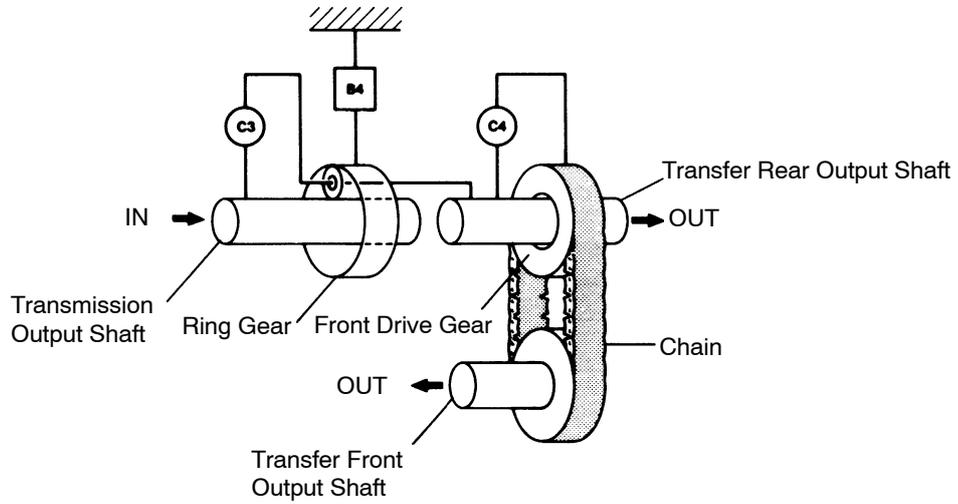
The conditions of operation for each gear position are shown in the following illustrations:



## FUNCTION OF COMPONENTS (Cont'd)

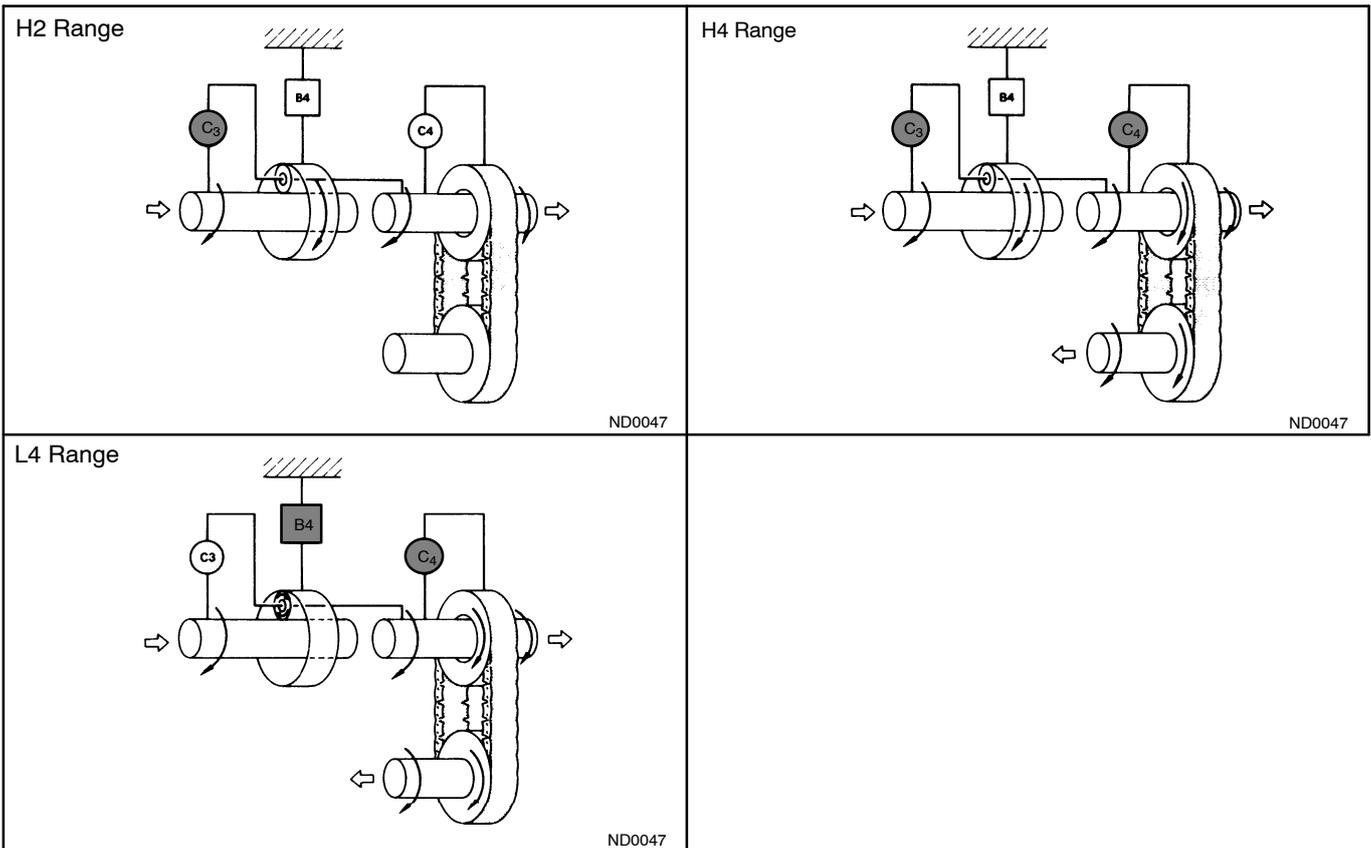
### 2. Transfer

| Component      |                   | Function   |
|----------------|-------------------|--|
| C <sub>3</sub> | Forward Clutch    | Connects transmission output shaft and transfer pinion gear.                   |
| C <sub>4</sub> | Direct Clutch     | Connects transfer rear output shaft and front drive gear.                      |
| B <sub>4</sub> | O/D Direct Clutch | Prevents transfer ring gear from turning either clockwise or counterclockwise. |



ND0047

The conditions of operation for each gear position are shown in the following illustrations:



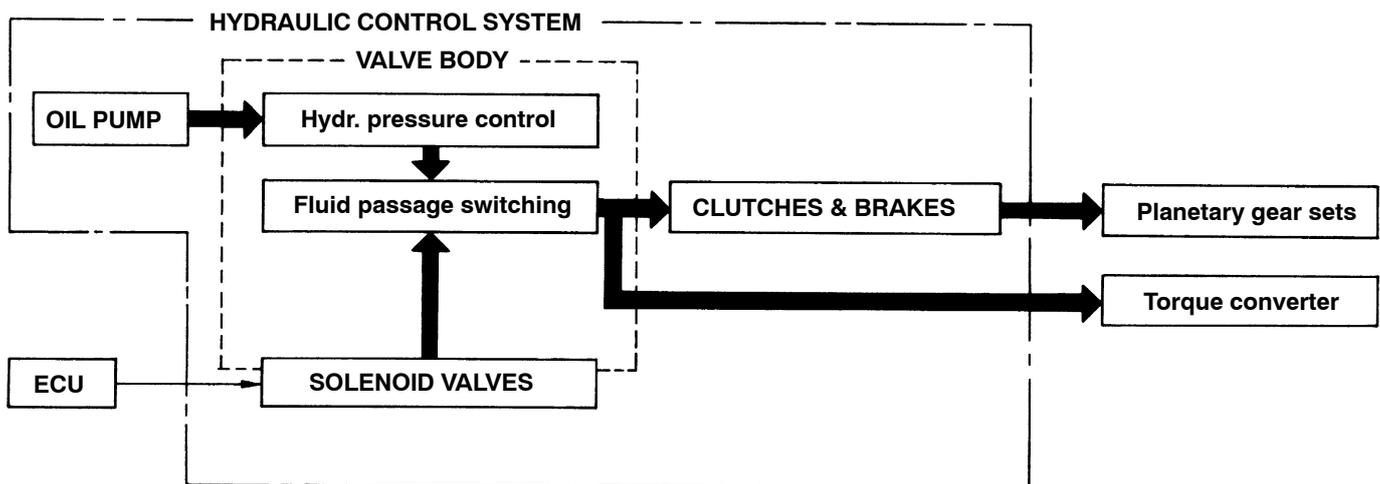
## HYDRAULIC CONTROL SYSTEM

(A340H)

### 1. Transmission

The hydraulic control system is composed of the oil pump, the valve body, the solenoid valves, and the clutches and brakes, as well as the fluid passages which connect all of these components. Based on the hydraulic pressure created by the oil pump, the hydraulic control system governs the hydraulic pressure acting on the torque converter, clutches and brakes in accordance with the vehicle driving conditions.

There are three solenoid valves on the valve body. These solenoid valves are turned on and off by signals from the Engine & ECT ECU to operate the shift valves. These shift valves then switch the fluid passages so that fluid goes to the torque converter and planetary gear units.



### 2. Transfer

The hydraulic control system consists of a valve body, No. 4 solenoid valve, a brake (B<sub>4</sub>) and two clutches (C<sub>3</sub>, C<sub>4</sub>) and passages that connect these elements. It hydraulically controls the planetary gear unit either manually, or automatically by the Engine & ECT ECU.

## ELECTRONIC CONTROL SYSTEM

### (A340H)

The electronic control system, which controls the transmission and transfer shift timing and the operation of the lock-up clutch, is composed of the following three parts:

#### 1. Sensors

These sensors sense the vehicle speed, throttle opening and other conditions and send these data to the Engine & ECT ECU in the form of electrical signals.

#### 2. Engine & ECT ECU

The Engine & ECT ECU determines the transmission and transfer shift timing and lock-up timing based upon the signals from sensors, and controls the solenoid valves of the hydraulic control unit accordingly.

#### 3. Actuators

These are four solenoid valves that control hydraulic pressure acting on the hydraulic valves to control shifting and lock-up timing.

