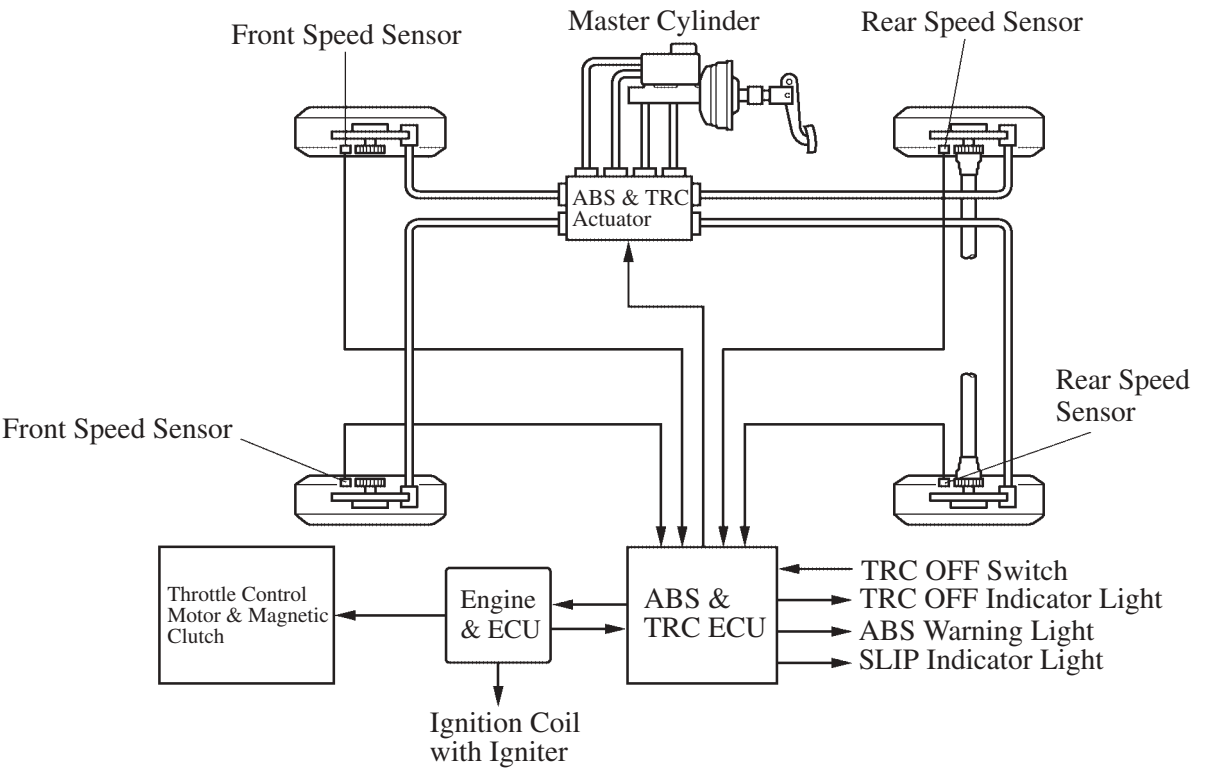
## ■ ABS AND TRC

### 1. General

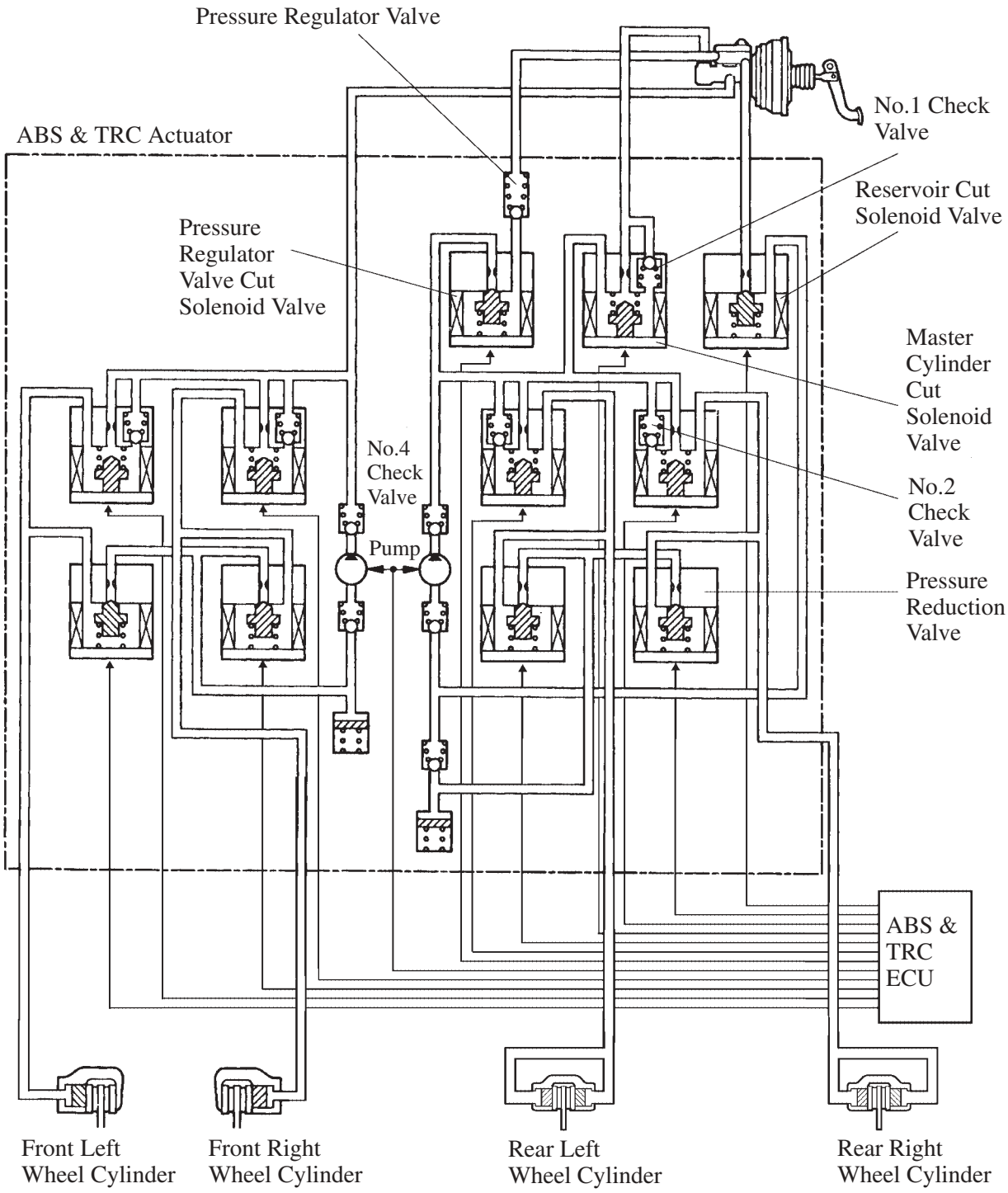
The IS200 uses an ABS that independently controls the front right and left wheels and simultaneously controls the rear wheels. It also uses a TRC that effects total engine torque control through ignition timing control, throttle control, and the braking of the driving (rear) wheels.

### 2. System Diagram




163CH47

### 3. Hydraulic Circuit




CH

## 4. Construction and Operation of Components

### TRC OFF Switch, Indicator Light and Warning Light

#### 1) TRC OFF Switch

When pressing, this switch turns the TRC to be inoperative. Pressing it again changes it to be operative. When turning the ignition switch from "OFF" to "ON", the TRC always becomes operative.

#### 2) TRC OFF Indicator Light

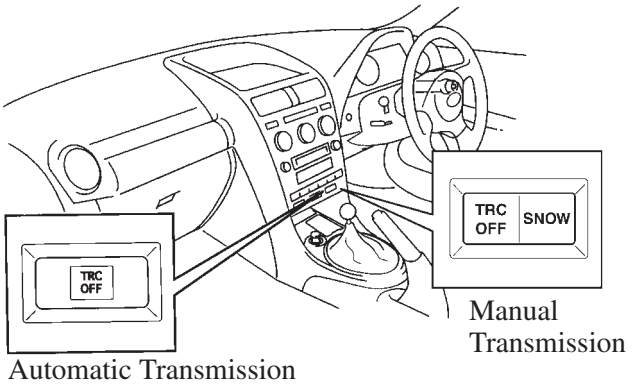
When the TRC is set inoperative by the TRC OFF switch and a malfunction has occurred in the engine and TRC, the light blinks on and informs the driver accordingly.

#### 3) Slip Indicator Light

When the TRC is operative, this light blinks and informs the driver accordingly.

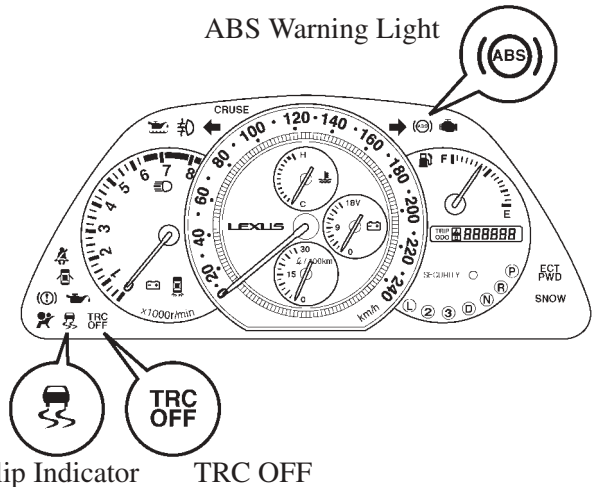
#### 4) ABS Warning Light

This light goes on when a malfunction has occurred in the ABS, and informs the driver accordingly.




**TRC OFF Switch**

163CH49




163CH50

### ABS & TRC Actuator

#### 1) Construction

The ABS & TRC actuator consists of 11 two-position solenoid valves, 1 motor, 2 pumps, 2 reservoirs and 1 pressure regulator valve.
The 11 two-position solenoid valves consist of 1 master cut solenoid valve, 1 reservoir cut solenoid valve, 1 pressure regulator valve cut solenoid valve, 4 pressure holding valves, and 4 pressure reduction valves.
Pressure regulator valve is assembled into the pressure regulator valve cut solenoid valve.

##### a. Master Cut Solenoid Valve

When the TRC is active, a signal from the ABS & TRC ECU causes the master cut solenoid valve to turn ON in order to shut off the circuit between the master cylinder and the rear brake wheel cylinder.
The basic construction and operation are the same as those of the pressure holding valve.

##### b. Reservoir Cut Solenoid Valve

When the TRC is active, a signal from the ABS & TRC ECU causes the reservoir cut solenoid valve to turn ON in order to open the circuit from the master cylinder to the pump.
The basic construction and operation are the same as those of the pressure reduction valve.

**c. Pressure Regulator Valve Cut Solenoid Valve**

When the TRC is active, a signal from the ABS & TRC ECU cause the pressure regulator cut valve solenoid valve to turn ON in order to open the circuit from the pump to the pressure regulator valve. The basic construction and operation are the same as those of the pressure reduction valve.

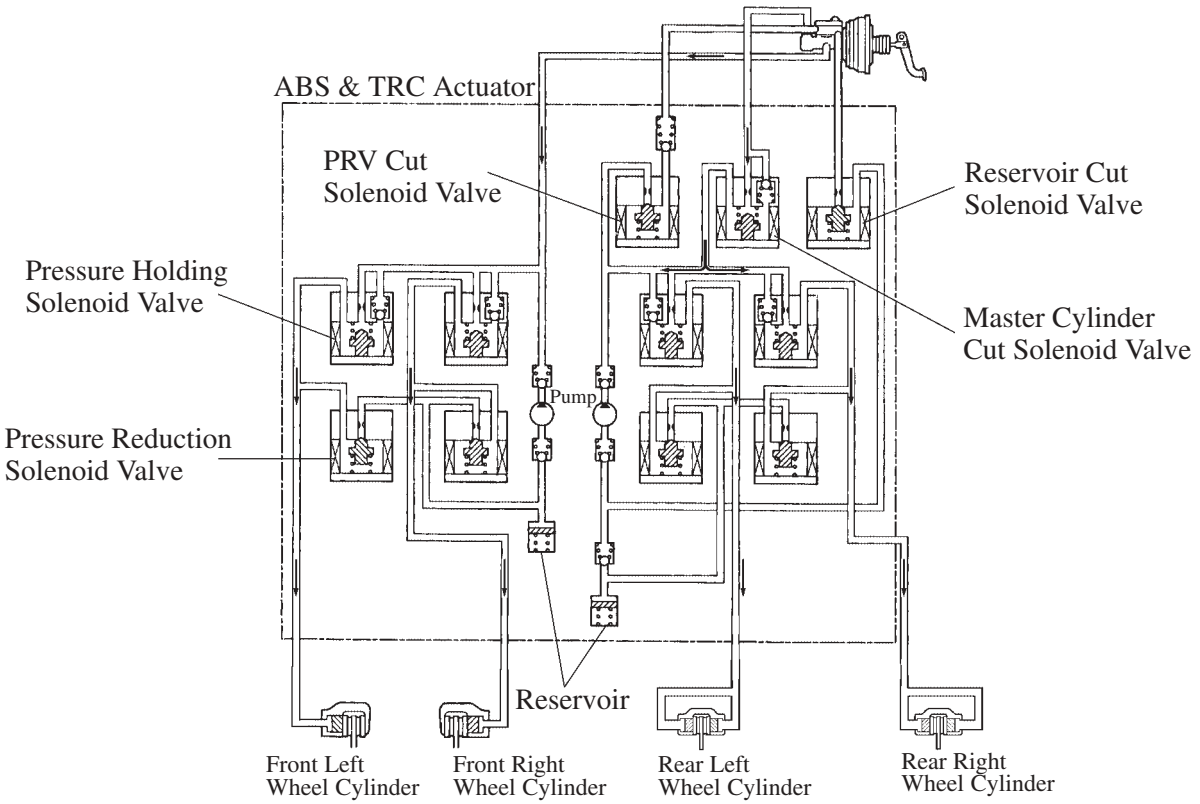
**d. Pressure Regulator Valve**

Regulates the brake fluid pressure generated by the pump to a pressure level needed for TRC control.

**2) Operation**

**a. ABS Operation**

The hydraulic system of the ABS consists of 4 circuits. The diagram below illustrates the normal braking mode or the pressure increase mode.
The front left and right wheels are controlled the fluid pressure independently while the fluid pressure of the rear left and right wheels are controlled simultaneously for vehicle stability.



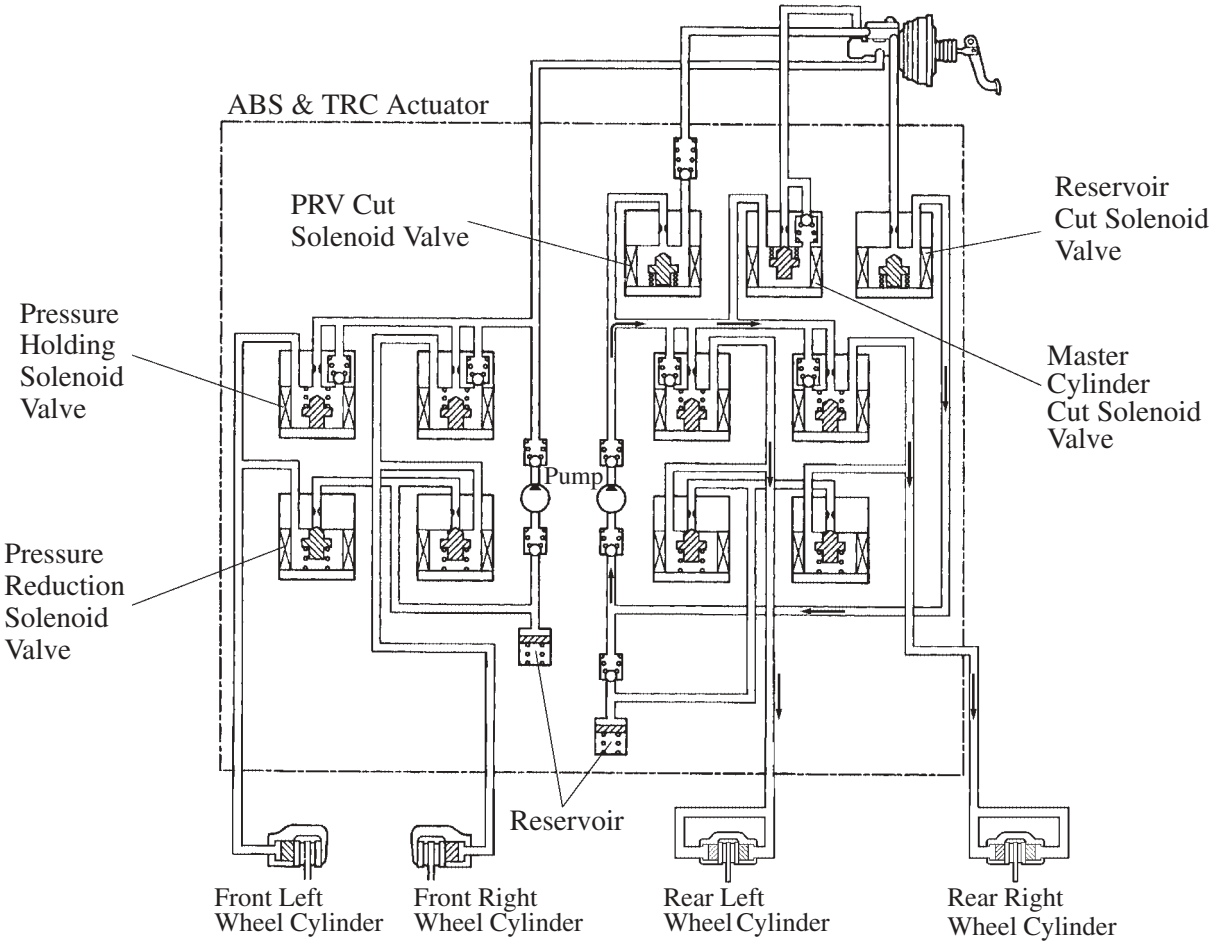

163CH51

| Part Name | During Normal Braking | ABS Activated | | |
|---|---|---|---|---|
| | | Pressure Increase Mode | Pressure Holding Mode | Pressure Reduction Mode |
| Master Cylinder Cut Solenoid Valve | OFF (Open) | ← | ← | ← |
| Pressure Regulator Valve Cut Solenoid Valve | OFF (Close) | ← | ← | ← |
| Reservoir Cut Solenoid Valve | OFF (Close) | ← | ← | ← |
| Pressure Holding Valve | OFF (Open) | ← | ON (Close) | ← |
| Pressure Reduction Valve | OFF (Close) | ← | ← | ON (Open) |
| Pump Motor | Stop | Rotating | ← | ← |
| Wheel Pressure Cylinder | Increase | ← | Hold | Reduction |

CH

### b. TRC Operation

The hydraulic system of the TRC consists of the following 2 circuits: the rear right and rear left. The diagram below illustrates the pressure increase mode during the operation of the TRC.




| Part Name | TRC not Activated (During Normal Braking) | TRC Activated | | |
|---|---|---|---|---|
| | | Pressure Increase Mode | Pressure Holding Mode | Pressure Reduction Mode |
| Master Cylinder Cut Solenoid Valve | OFF (Open) | ON (Close) | ← | ← |
| Pressure Regulator Valve Cut Solenoid Valve | OFF (Close) | ON (Open) | ← | ← |
| Reservoir Cut Solenoid Valve | OFF (Close) | ON (Open) | ← | ← |
| Pressure Holding Valve | OFF (Open) | ← | ON (Close) | ← |
| Pressure Reduction Valve | OFF (Close) | ← | ← | ON (Open) |
| Pump Motor | Stop | Rotating | ← | ← |
| Wheel Pressure Cylinder | – | Increase | Hold | Reduction |

## ABS & TRC ECU

### 1) ABS Control

The ABS & TRC ECU constantly receives signals from the 4 speed sensors and estimates the vehicle speed by calculating the speed and deceleration rate of each wheel.
If any of the wheels seems about to lock, the ABS & TRC ECU controls the fluid pressure inside the brake wheel cylinder of that wheel according to its wheel speed and the deceleration rates of the other wheels which vary due to the road conditions.
The ABS & TRC ECU controls the fluid pressure of each of front left and right wheels independently while the fluid pressure of the rear left and right wheels are controlled simultaneously for vehicle stability. If one of the rear wheels is about to lock, then the fluid pressure of both rear wheels is controlled to suit the wheel which is about to lock.

### 2) TRC Control

The ABS & TRC ECU constantly receives signals from the 4 speed sensors and calculates the speed of each wheel and vehicle speed.
During sudden acceleration or driving on a slippery surface, if the drive wheels (rear wheels) start to slip, the difference in speed between the drive wheels and the non-drive wheels (front wheels) becomes greater, causing the ECU to determine that the drive wheels are spinning.
Then, the ABS & TRC ECU executes the right and left independent control of the rear wheel brakes, and the engine torque control through ignition timing control and throttle control, according to the extent of the spin.



### 3) Initial Check

After the ignition is turned ON, and the vehicle attains and approximate speed of 6 km/h (4 mph) or more only at initial time, the ABS & TRC ECU performs an initial check.
The functions of each solenoid valve and pump motor in the actuator are checked in order.

### 4) Self-Diagnosis

If the ABS & TRC ECU detects a malfunction in the engine, ABS or TRC, it blinks the TRC OFF indicator light to alert the driver of the malfunction. At the same time, the ABS & TRC ECU turns the ABS warning light on. The ECU will also store the codes of the malfunctions. See the LEXUS IS200 Repair Manual (Pub. No. RM684E1) for the diagnostic code check method, diagnostic code and diagnostic code clearance.

### 5) Fail-Safe

In the event of a malfunction in the engine, ABS or TRC system, the ABS & TRC ECU prohibits the TRC. Thus, the brake and engine controls will operate in the same conditions as those without the ABS and TRC.