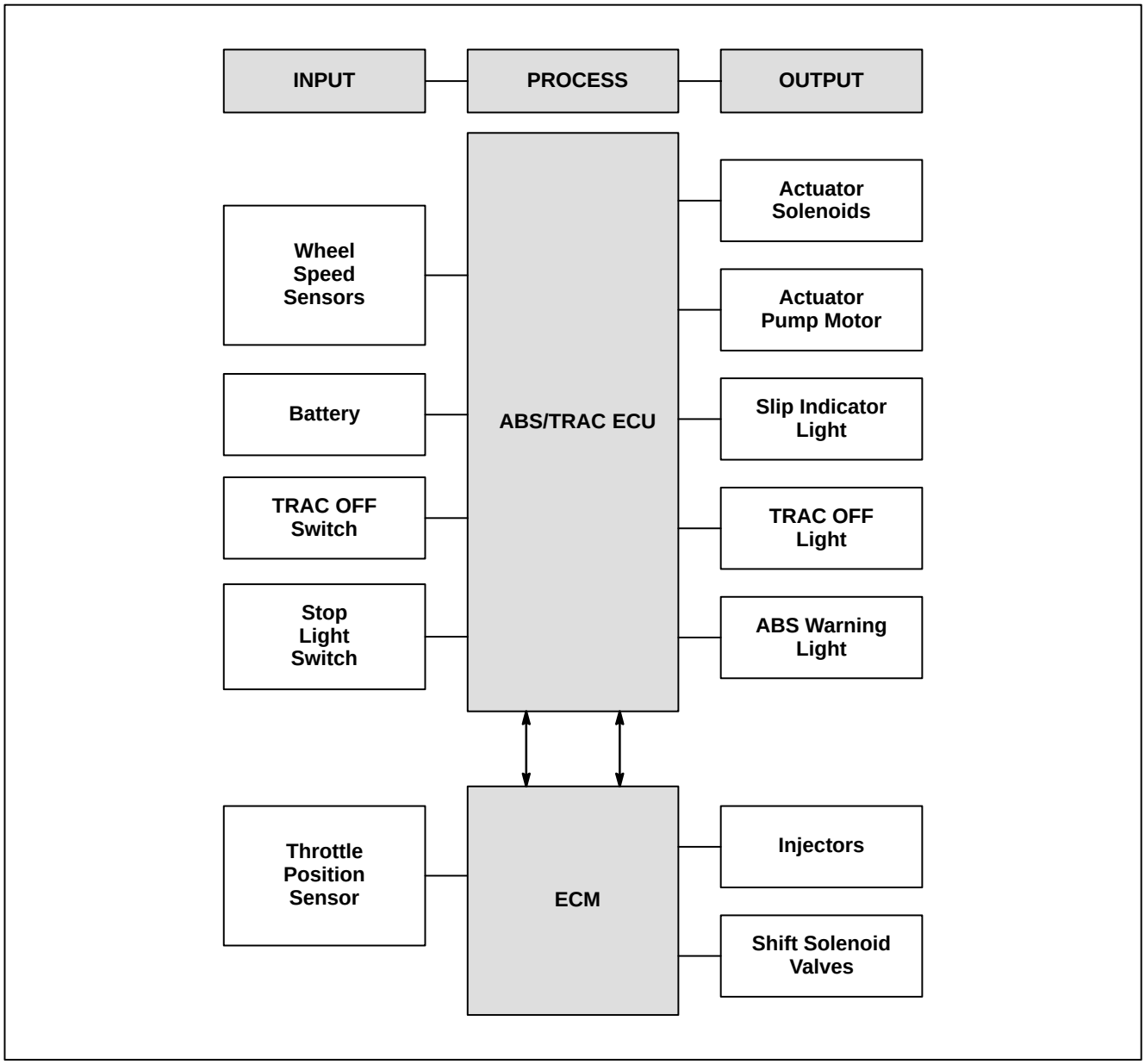
Section 12

TRACTION CONTROL SYSTEM (TRAC)



Lesson Objectives

1. Identify the main components of the TRAC systems.
2. Describe the function of components in the TRAC system.
3. Describe the engine torque control system used on the Camry and Avalon.
4. Describe the fail-safe function of the Camry and Avalon actuator.
5. Describe the primary differences between Camry /Avalon and the Supra TRAC systems.

Traction Control System

Traction Control was first introduced on the 1994 Turbo Supra and expanded to include the six cylinder Camry and Avalon models in 1997.

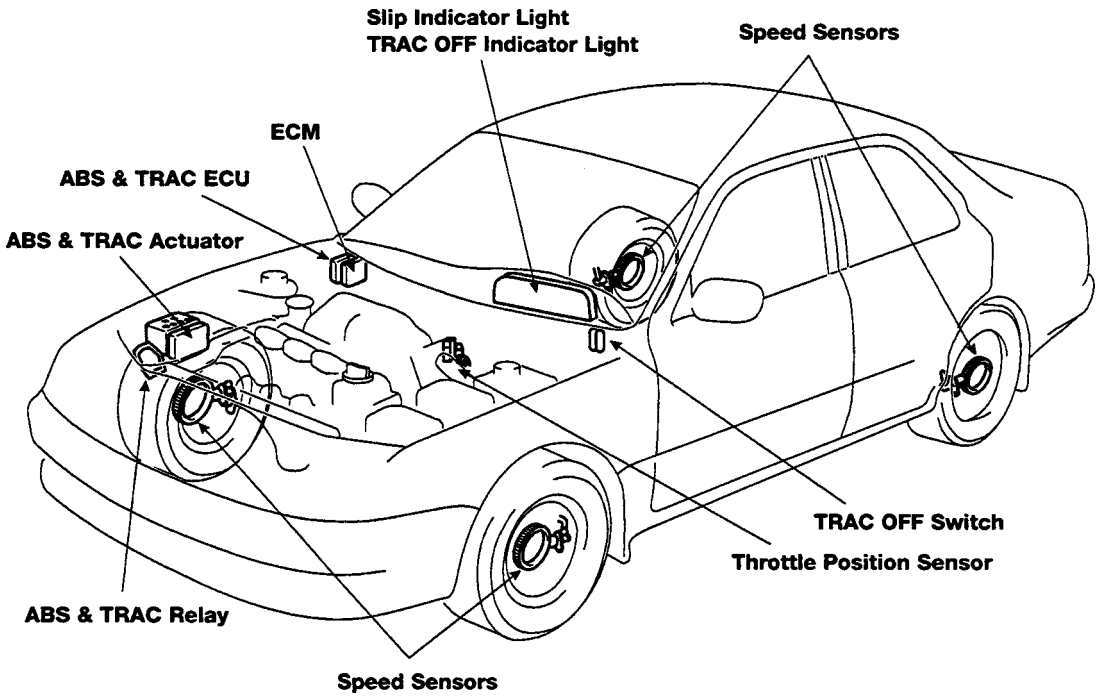
The purpose of the Traction Control System is to prevent wheel spin from occurring due to acceleration. The maximum torque that can be transmitted to the wheels is determined by the coefficient of friction generated between the road and the tires. If torque exceeds that level, the wheels are likely to spin. Conditions for TRAC operation may include: loose gravel, slippery road surfaces, acceleration while cornering and hard acceleration.

Once activated, the TRAC System reduces engine torque and drive wheel speed as necessary to bring the vehicle under control which improves vehicle stability when starting, accelerating or turning on slippery roads.

Although the Supra and Camry/Avalon TRAC system both control engine torque and drive wheel braking, how that is accomplished varies and therefore the two systems are covered separately in this section.

Camry TRAC Component Locations

The TRAC Systems share some ABS components to control traction control functions.

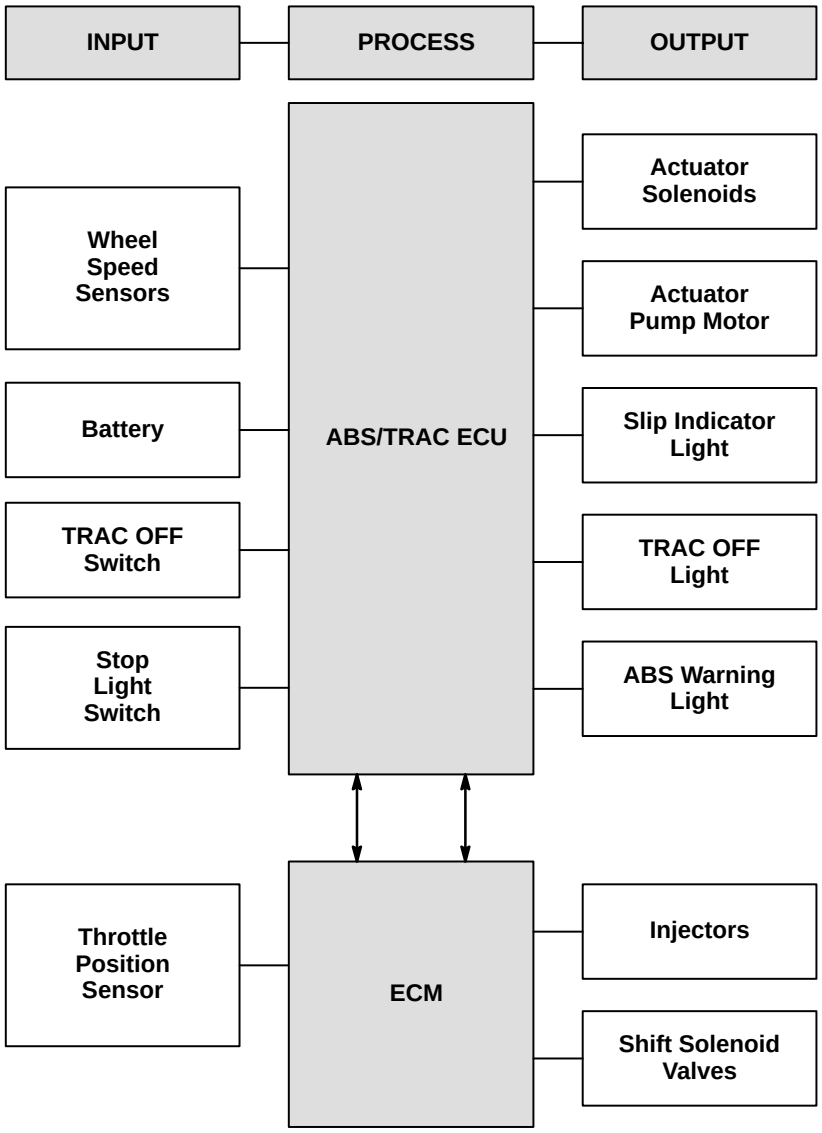


Camry/Avalon TRAC

The ABS/TRAC ECU and ECM work together to provide traction control. The ABS/TRAC/ECU monitor signals from the four speed sensors to determine the speed of each wheel and vehicle speed. When slippage is determined:

- The ABS/TRAC ECU activates the actuator solenoids and pump motor which applies hydraulic pressure to the brakes at the drive wheels.
- The ECM monitors the throttle position sensor and denies fuel injection on up to five cylinders to limit engine torque.
- The ECM prohibits shifting of the automatic transaxle.
- The slip indicator light is turned ON to notify the driver of TRAC operation and a signal is sent to the ECM.

Typical ABS/TRAC Control System



Wheel Speed Control

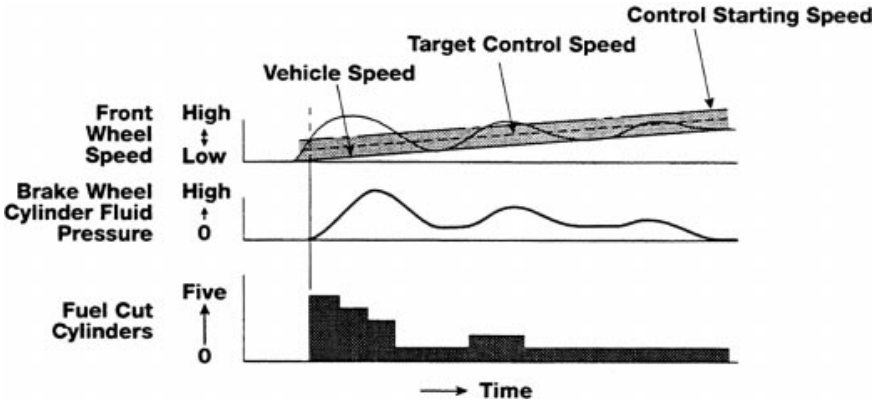
Wheel speed control is accomplished by two means:

- Brake application through the TRAC & ABS actuator.
- Reduce engine torque by temporarily disabling from one to five injectors.

Fuel injector control is performed through the ECM. In the example below, speed of the front wheel exceeds the Control Starting Speed. The ECM initially shuts off five injectors and turns some injectors back ON as wheel speed decreases. As wheel speed approaches Target Control Speed, an additional injector is shut off temporarily to prevent over-shooting the Control Starting Speed.

Wheel Speed Control

Brake pressure and control of injectors reduce wheel speed when slippage occurs.



Operation of Components

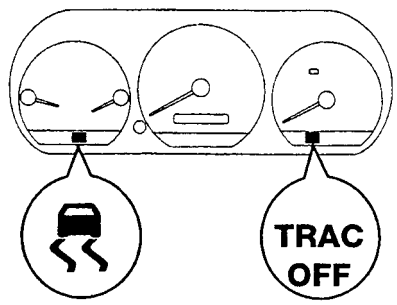
The TRAC OFF switch located on the instrument panel allows the driver to activate or deactivate the TRAC system. The system defaults to ON when the ignition switch is cycled.

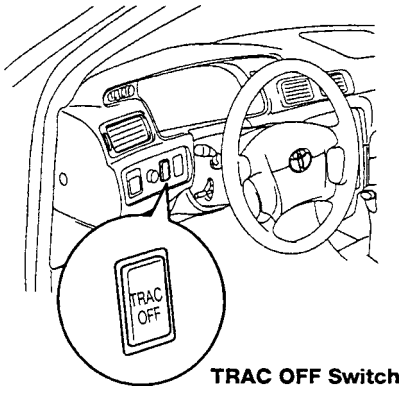
The TRAC OFF Indicator Light goes on when the TRAC system is turned OFF. Additionally, it blinks when a malfunction has occurred in the engine or the TRAC system.

The Slip Indicator Light blinks when the TRAC system is operating to inform the driver.

TRAC OFF Switch and Indicator Lights

The TRAC OFF switch allows the driver to control the TRAC system operation.





ABS & TRAC Actuator

The ABS & TRAC actuator is contained in one housing and has twelve 2-position solenoid valves which control hydraulic pressure to the brake calipers. In addition there are two pumps controlled by one motor, two reservoirs and two regulator valves.

Of the twelve solenoid valves there are:

- Two Master Cut Solenoid Valves.
- Two Reservoir Cut Solenoid Valves.
- Four Pressure Holding Valves.
- Four Pressure Reduction Valves.

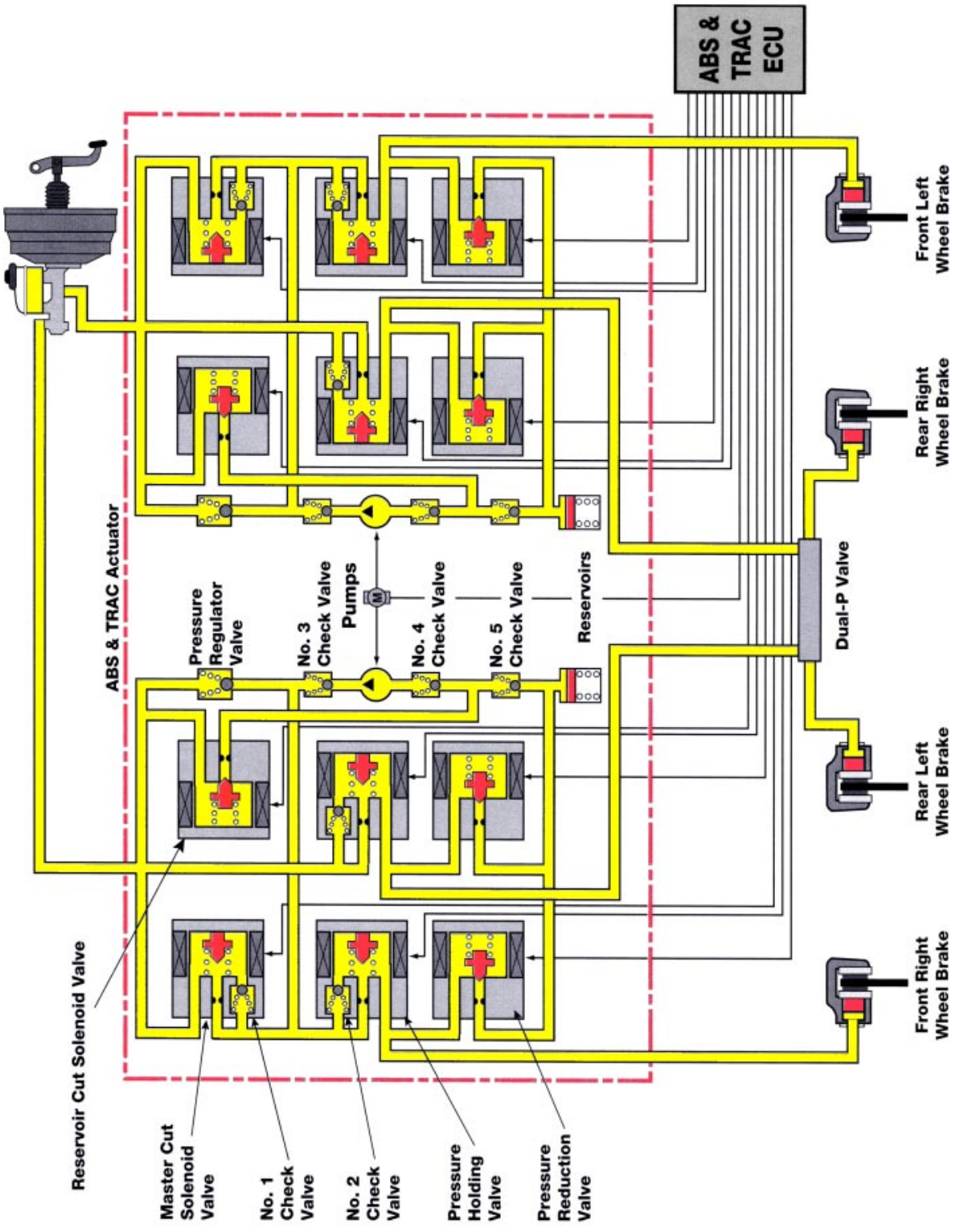
The **Master Cut Solenoid Valve** opens and closes the hydraulic circuit between the master cylinder and the ABS pressure holding valve 2-position solenoid and on to the front brake caliper. Its normal position is spring loaded in the **open** position. Its construction and operation are the same as the pressure holding valve.

The **Reservoir Cut Solenoid Valve** opens and closes the hydraulic circuit from the master cylinder to the actuator pump. Its normal position is spring loaded in the **closed** position. Its construction and operation are the same as the pressure reduction valve.

The **Pressure Regulator Valve** regulates brake fluid pressure generated by the actuator pump.

When the TRAC system is activated the Master Cut Solenoid Valve and Reservoir Cut Solenoid Valve control the brake system to the drive wheels while the Pressure Holding Valve and Pressure Reduction Valves of the ABS system modulate the pressure in three phases: Pressure Increase, Pressure Holding and Pressure Reduction.

ABS & TRAC Actuator

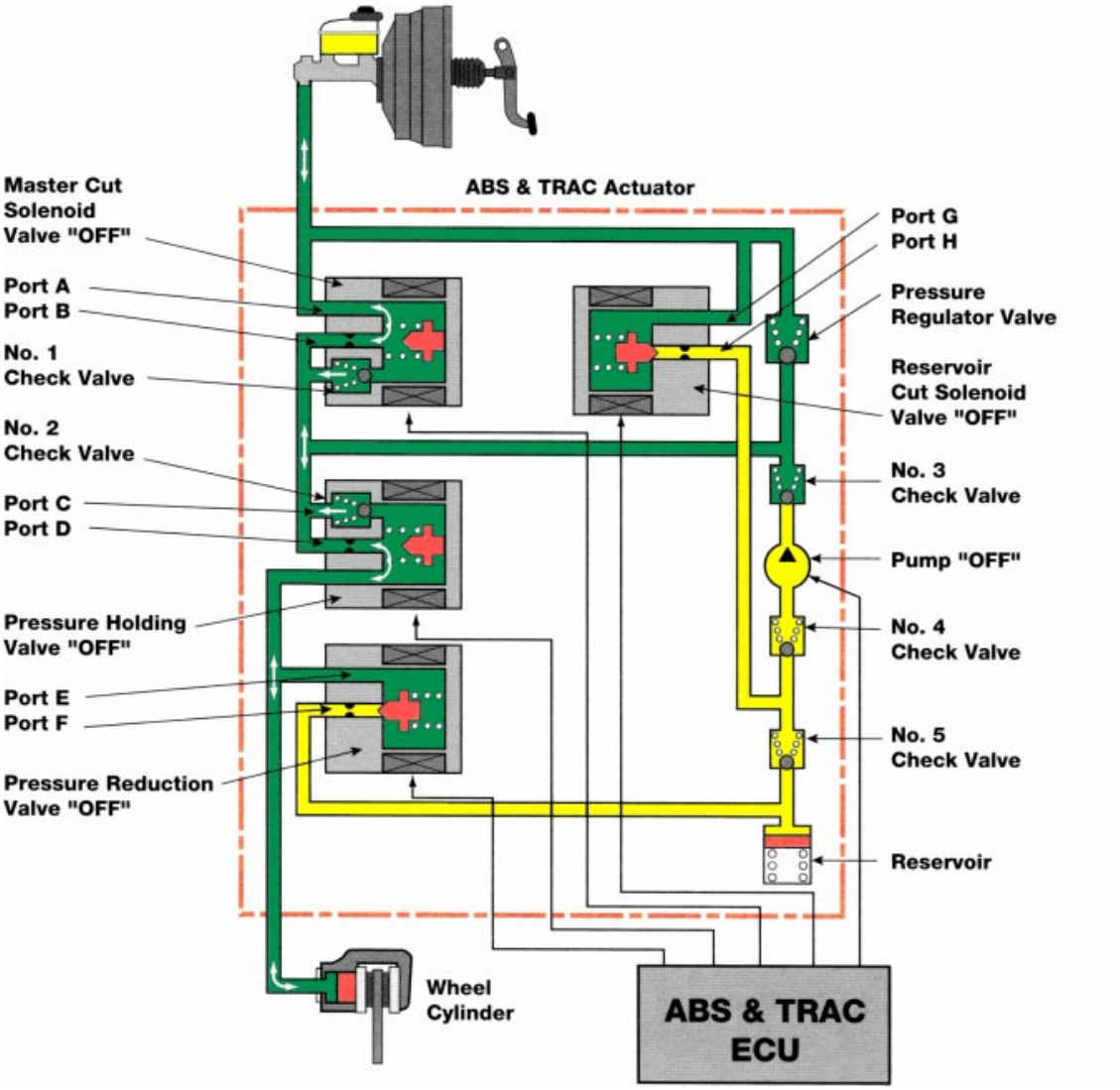


Normal Operation Mode

During normal operation when the TRAC system is not activated all actuator valves are OFF. The Master Cut Solenoid Valve is open allowing fluid from the master cylinder to flow through the Pressure Holding Valve to the wheel cylinder. In this mode the brakes function just like a system without ABS or TRAC.

Normal Operation Mode

Part Name	Signal from ABS & TRAC ECU	Operation	
Master Cut Solenoid Valve	OFF	Port (B)	Open
Resorvoir Cut Solenoid Valve	OFF	Port (H)	Closed
Pressure Holding Valve	OFF	Port (C)	Open
Pressure Reduction Valve	OFF	Port (F)	Closed
Pump	OFF	Stop	



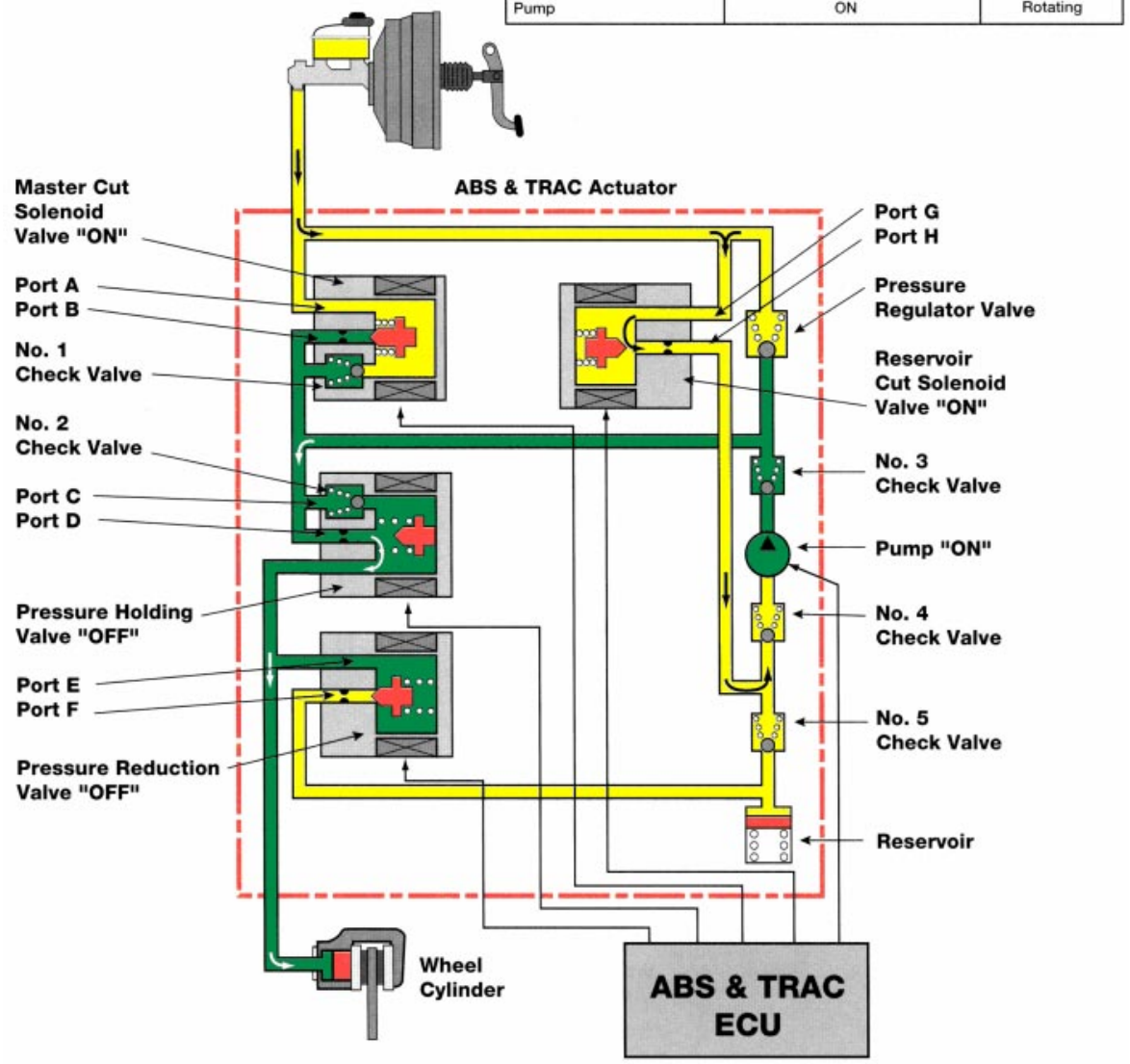
Pressure Increase Mode

During sudden acceleration or driving on a slippery surface, if the drive wheels start to slip the ABS & TRAC ECU causes the actuator to go into pressure increase mode.

- The Master Cut Solenoid is ON blocking the brake circuit to the master cylinder.
- The Reservoir Cut Solenoid Valve is ON opening the master cylinder to the pump.
- The pump is turned ON generating pressure and sending it through the Pressure Holding Valve and on to the wheel cylinder.

Pressure Increase Mode

Part Name	Signal from ABS & TRAC ECU	Operation	
Master Cut Solenoid Valve	ON	Port Ⓑ	Closed
Resorvoir Cut Solenoid Valve	ON	Port Ⓗ	Open
Pressure Holding Valve	OFF	Port Ⓒ	Open
Pressure Reduction Valve	OFF	Port Ⓕ	Closed
Pump	ON	Rotating	



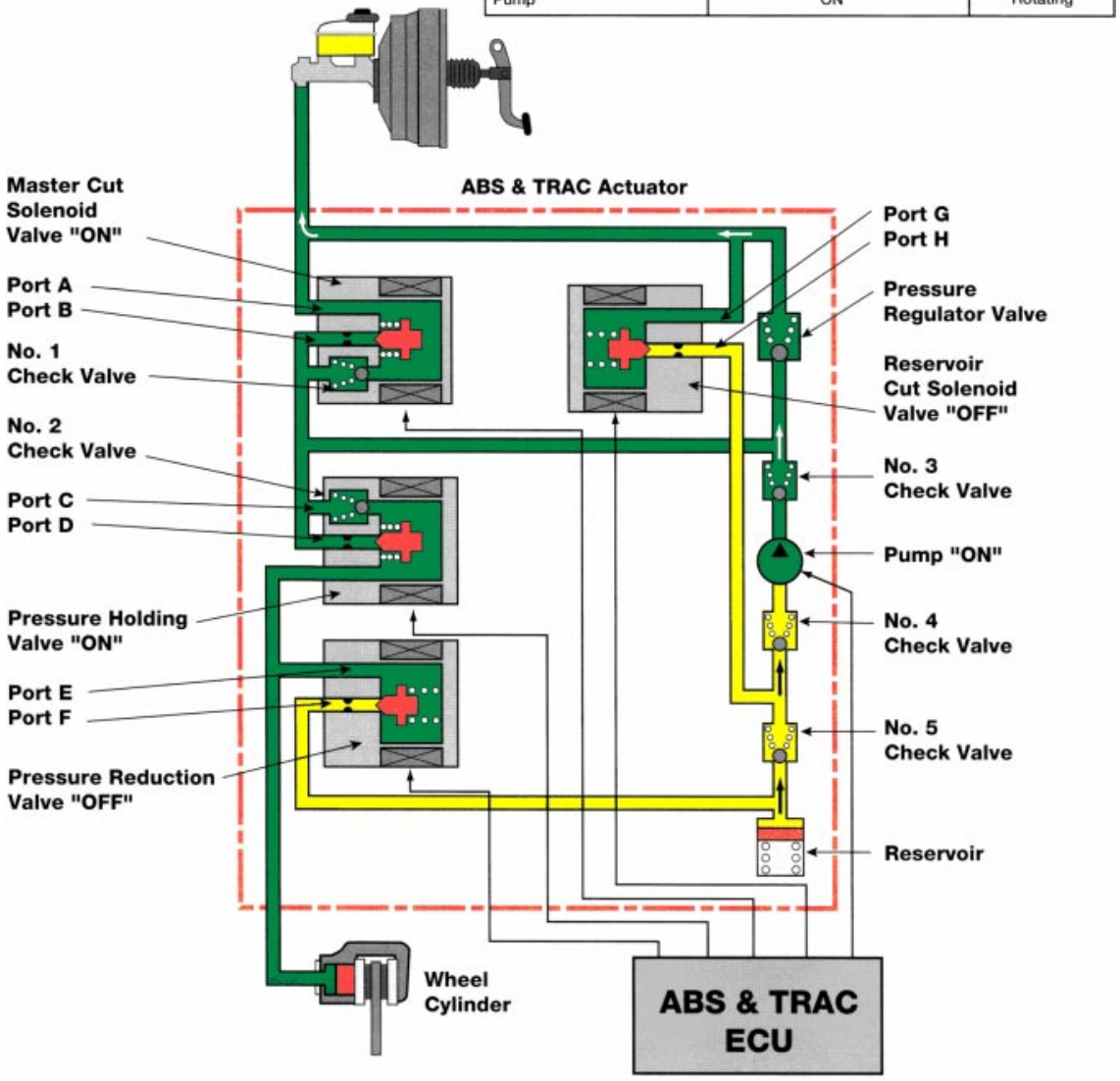
Pressure Holding Mode

When fluid pressure in the wheel cylinder circuit is optimized by an increase or decrease in pressure, the ABS & TRAC ECU controls the system as follows:

- The Pressure Holding Valve is turned ON blocking pressure from the pump.
- The Reservoir Cut Solenoid Valve is turned OFF, blocking additional fluid from the master cylinder
- The pump continues to rotate.

Pressure Holding Mode

Part Name	Signal from ABS & TRAC ECU	Operation	
Master Cut Solenoid Valve	ON	Port Ⓑ	Closed
Resorvoir Cut Solenoid Valve	OFF	Port Ⓗ	Closed
Pressure Holding Valve	ON	Port Ⓒ	Closed
Pressure Reduction Valve	OFF	Port Ⓕ	Closed
Pump	ON	Rotating	



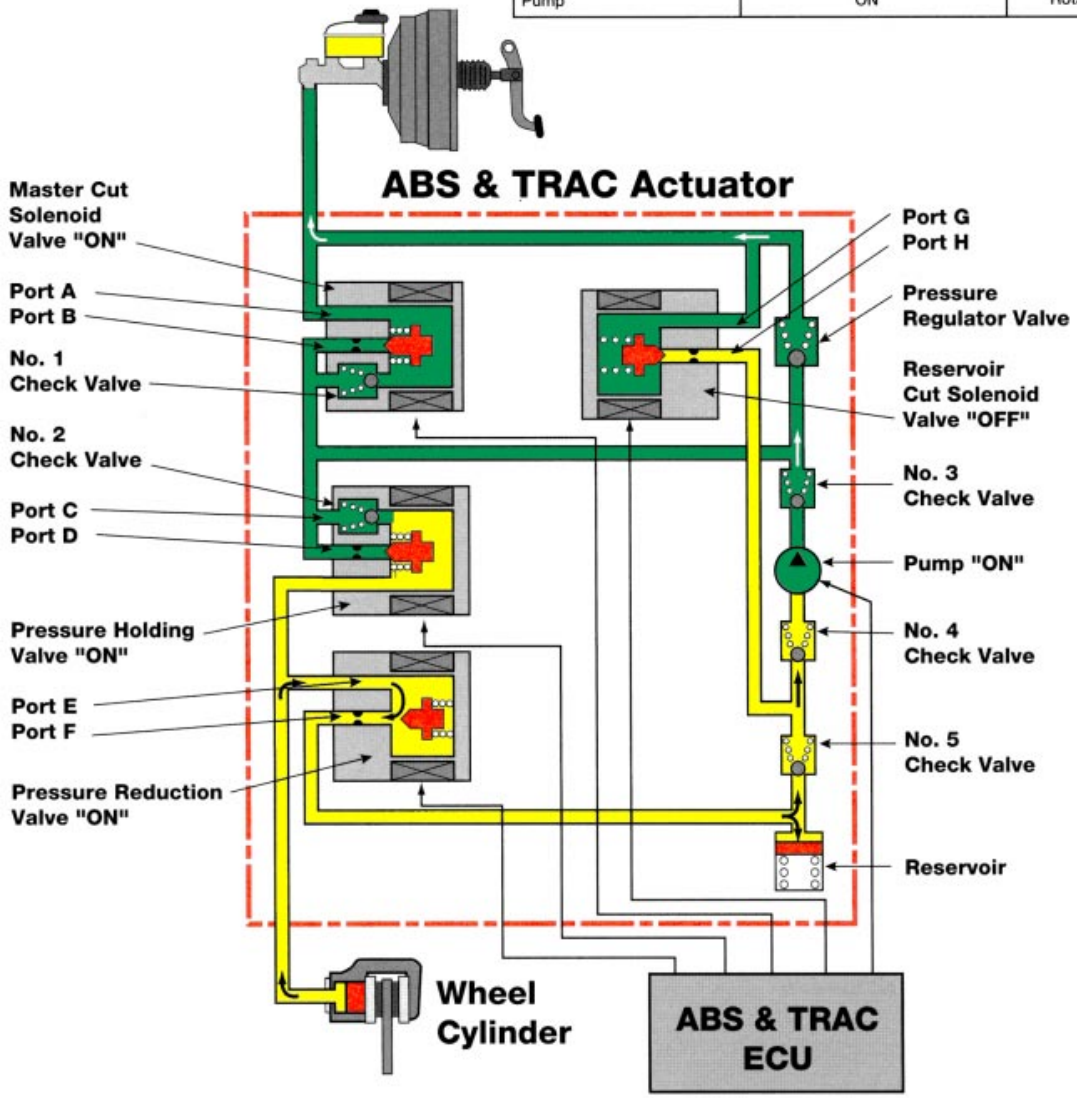
Pressure Reduction Mode

When fluid pressure in the wheel cylinder needs to be reduced:

- Reservoir Cut Solenoid Valve is OFF and spring loaded in the closed position blocking fluid from the Master Cylinder to the Pump.
- Master Cut Solenoid is ON, blocking the master cylinder from the wheel cylinder.
- Pressure Reduction Valve is turned ON, allowing fluid pressure to flow to the reservoir and pump, and allowing the wheel to turn.

Pressure Reduction Mode

Part Name	Signal from ABS & TRAC ECU	Operation	
Master Cut Solenoid Valve	ON	Port Ⓑ	Closed
Resorvoir Cut Solenoid Valve	OFF	Port Ⓗ	Closed
Pressure Holding Valve	ON	Port Ⓒ	Closed
Pressure Reduction Valve	ON	Port Ⓕ	Open
Pump	ON	Rotating	



Supra TRAC

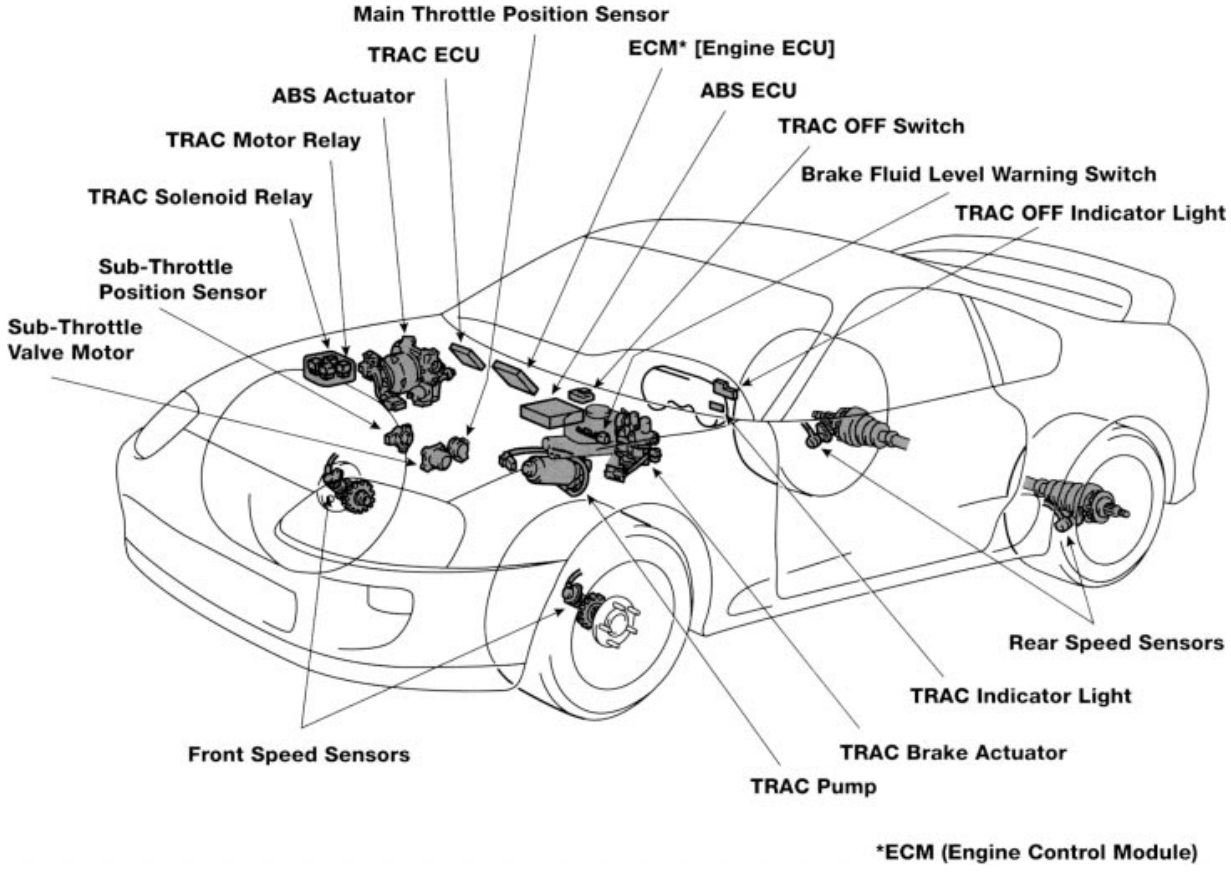
The operation of the TRAC system on the Supra is similar to the Camry and Avalon however there are distinct differences between the two systems:

- Most notable is the separate TRAC actuator and ABS actuator in 1993.5 through 1995.
- Engine torque is controlled via a sub-throttle actuator which controls the sub-throttle ahead of the valve in the throttle body.
- Beginning with 1996 production, brake actuation is no longer utilized for Supra traction control.

Once activated, the TRAC System reduces engine torque and rear wheel speed as necessary to bring the vehicle under control. The ABS ECU, TRAC ECU and ECM all work together to provide traction control. ABS speed sensors are monitored by the TRAC ECU which in turn controls a sub-throttle plate and applies the rear brakes. The ECM also retards engine timing while the ABS modulates pressure at the rear brakes.

Supra TRAC Component Locations

The TRAC System shares some ABS components to control braking functions.



Operation Of Components

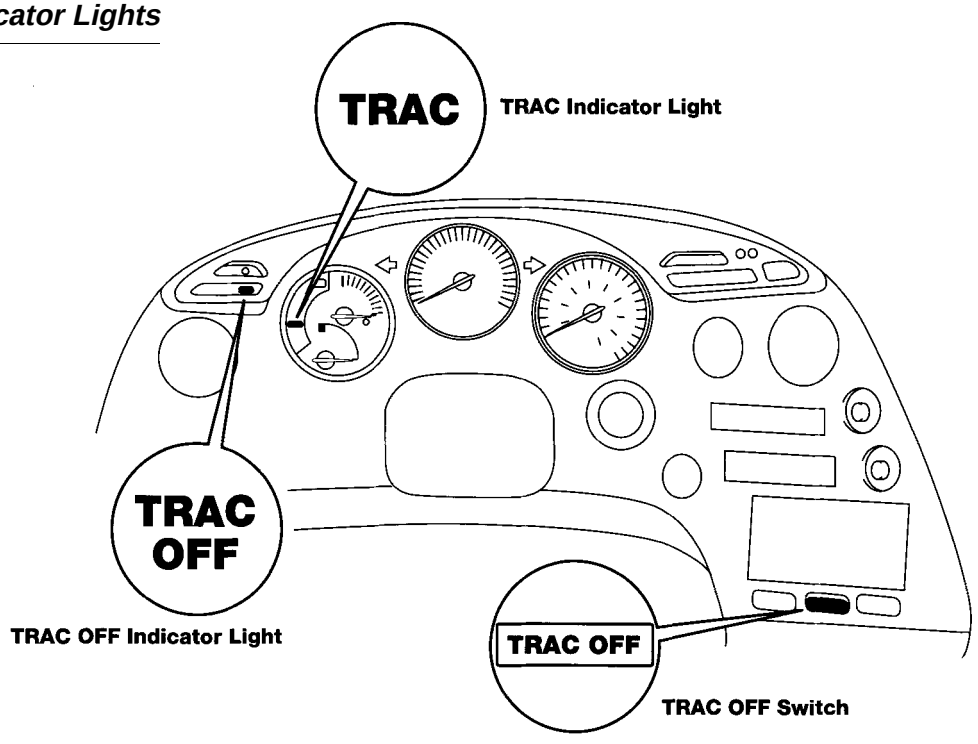
The TRAC OFF switch is located on the instrument panel above the center console. It allows the driver to activate or deactivate the TRAC system when the switch is depressed. The system defaults to ON when the ignition switch is cycled.

The TRAC OFF indicator light goes on when any one of the following occur:

- the TRAC system is deactivated by the TRAC OFF switch.
- a TRAC related problem is detected with the engine.
- an ABS related problem is detected. The TRAC indicator light indicates when:
- the system is operating.
- a malfunction occurs in the system (it remains illuminated to warn the driver).
- the TRAC ECU is set to the diagnostic mode (the light blinks the trouble code).

A change in January of 1996 included a SNOW feature which modifies the engine torque control when selected. This feature ensures reduced engine torque in anticipation of a lower coefficient of friction between the tire and the road surface. The driver selects this feature by pressing the SNOW button. Like the TRAC OFF switch, cycling the ignition switch defaults the system to normal operation.

TRAC OFF Switch and Indicator Lights

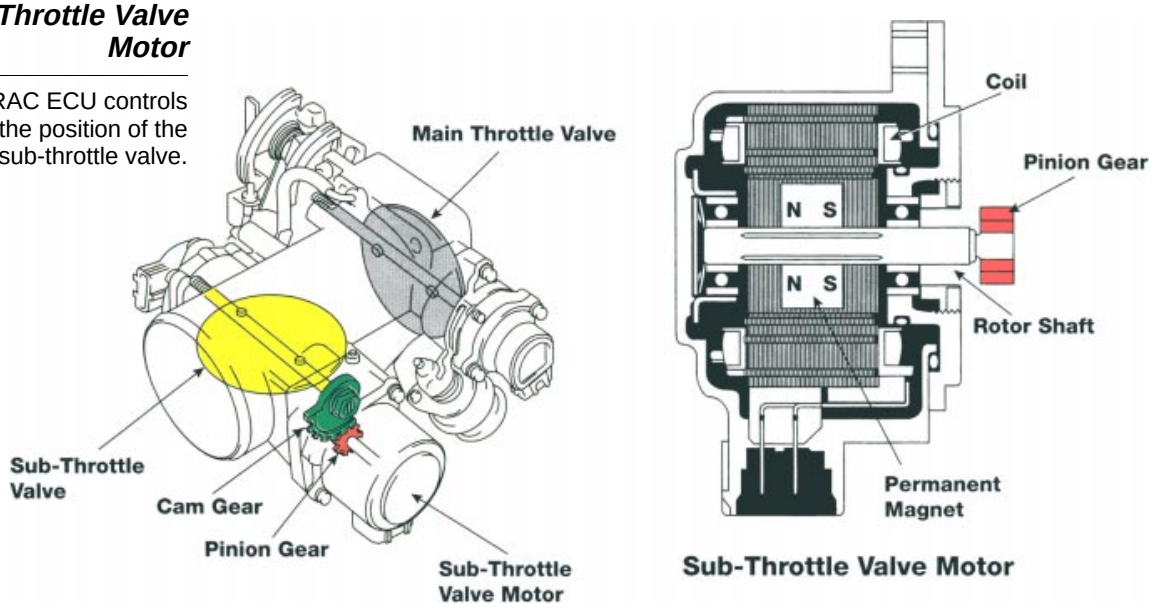


Sub-Throttle Valve Motor

The Sub-Throttle Actuator uses a step motor located between the main throttle valve and air cleaner. It is fitted on the throttle body and controls the position of the sub-throttle valve based on commands made by the TRAC ECU thus controlling the engine output. By controlling the sub-throttle plate, engine management controls engine torque reducing wheel spin.

Sub-Throttle Valve Motor

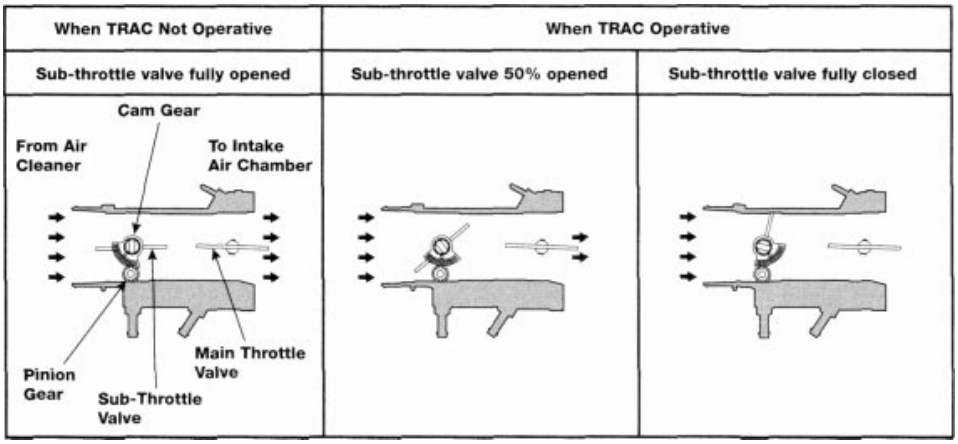
The TRAC ECU controls the position of the sub-throttle valve.



The sub-throttle valve motor consists of a permanent magnet, a coil, a rotor shaft and pinion gear. It is a step motor that is rotated by a signal from the ABS & TRAC ECU. The pinion gear rotates a cam gear, fitted on the sub-throttle valve shaft end, controlling the sub-throttle valve opening angle.

Sub-Throttle Actuator Operation

The position of the sub-throttle valve controls the incoming volume of air to control engine torque.

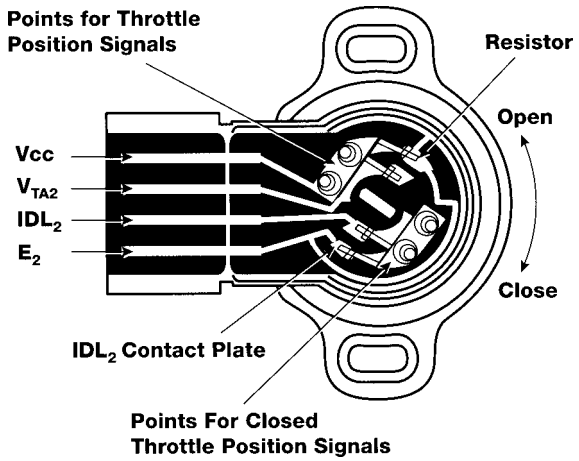


Sub-Throttle Position Sensor

This sensor is fitted to the sub-throttle valve shaft. It converts the sub-throttle valve opening angle to a voltage signal and sends this signal to the TRAC ECU via the ECM (Engine ECU). The sensor is built and operates in the same way as the main Throttle Position Sensor.

Sub-Throttle Position Sensor

Converts the sub-throttle valve opening angle to a voltage signal and sends this signal to the ECM and TRAC ECU.

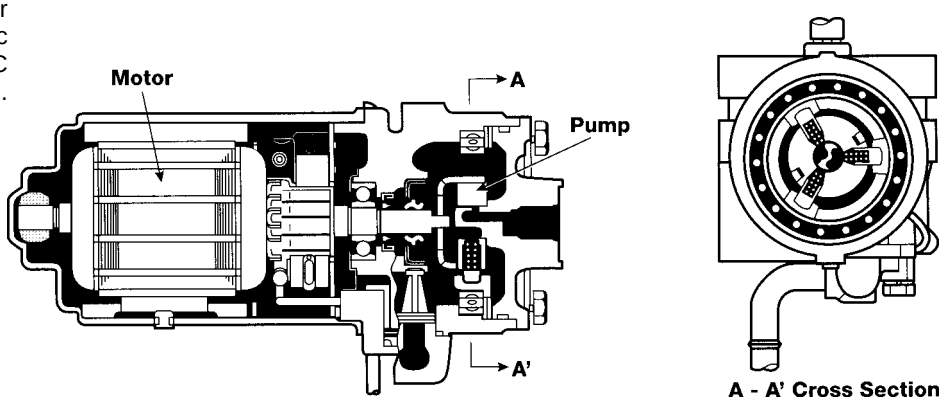


TRAC Pump

The function of the TRAC Pump is to generate brake fluid pressure necessary for applying the rear disc brakes when the TRAC system is operating. It draws brake fluid from the master cylinder reservoir, pressurizes and directs it to the TRAC brake actuator. It is a motor-driven, three chamber radial pump.

TRAC Pump

Generates brake fluid pressure necessary for applying the rear disc brakes when the TRAC system is operating.



TRAC Brake Actuator

The **TRAC Brake Actuator** consists of two cut solenoid valves and three spring loaded valves which regulate the brake fluid pressure in the right and left rear wheels. The rear wheels are controlled independently through the ABS actuator based on signals from the ABS ECU.

The **Master Cylinder Cut Solenoid Valve** opens and closes the hydraulic circuit from the master cylinder or TRAC pump to the ABS actuator. When the TRAC system is operating, it supplies the brake fluid pressure from the TRAC pump to the disc brake cylinders via the ABS actuator. It also prevents the fluid from flowing out of the ABS actuator pump to the master cylinder.

The **Reservoir Cut Solenoid Valve** is located between the return side of the ABS 3-position solenoid and the master cylinder. It returns the fluid from the disc brake cylinders back to the master cylinder reservoir.

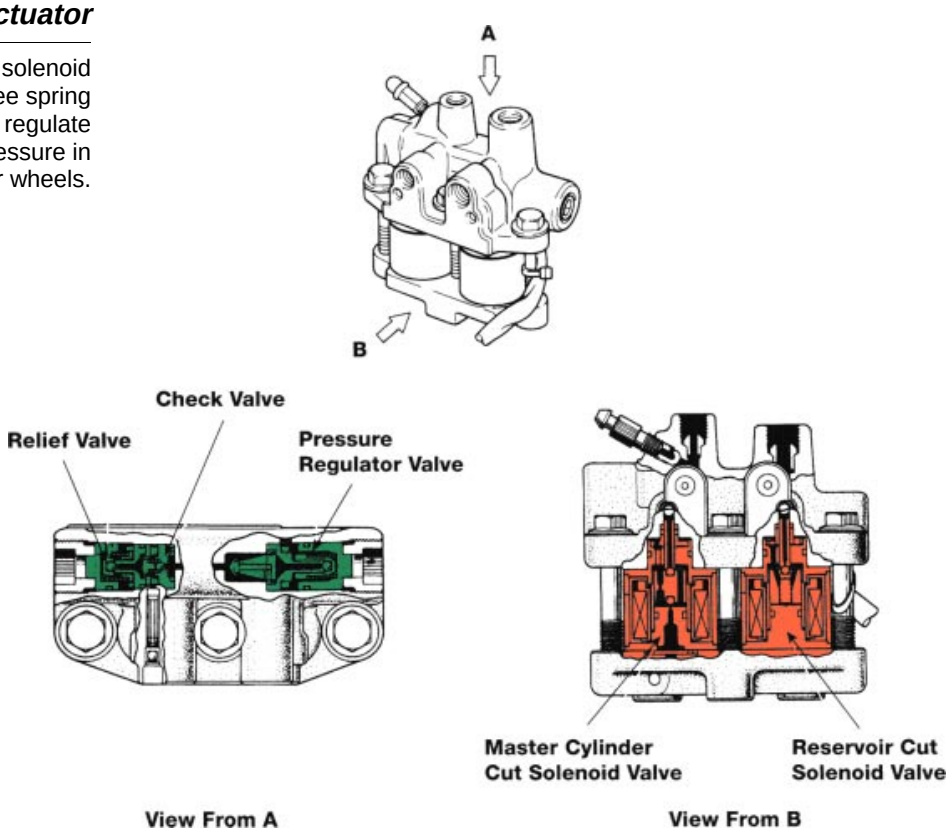
The **Pressure Regulator Valve** controls the brake fluid pressure generated by the TRAC pump.

The **Relief Valve** relieves the systems highest pressure should a malfunction occur.

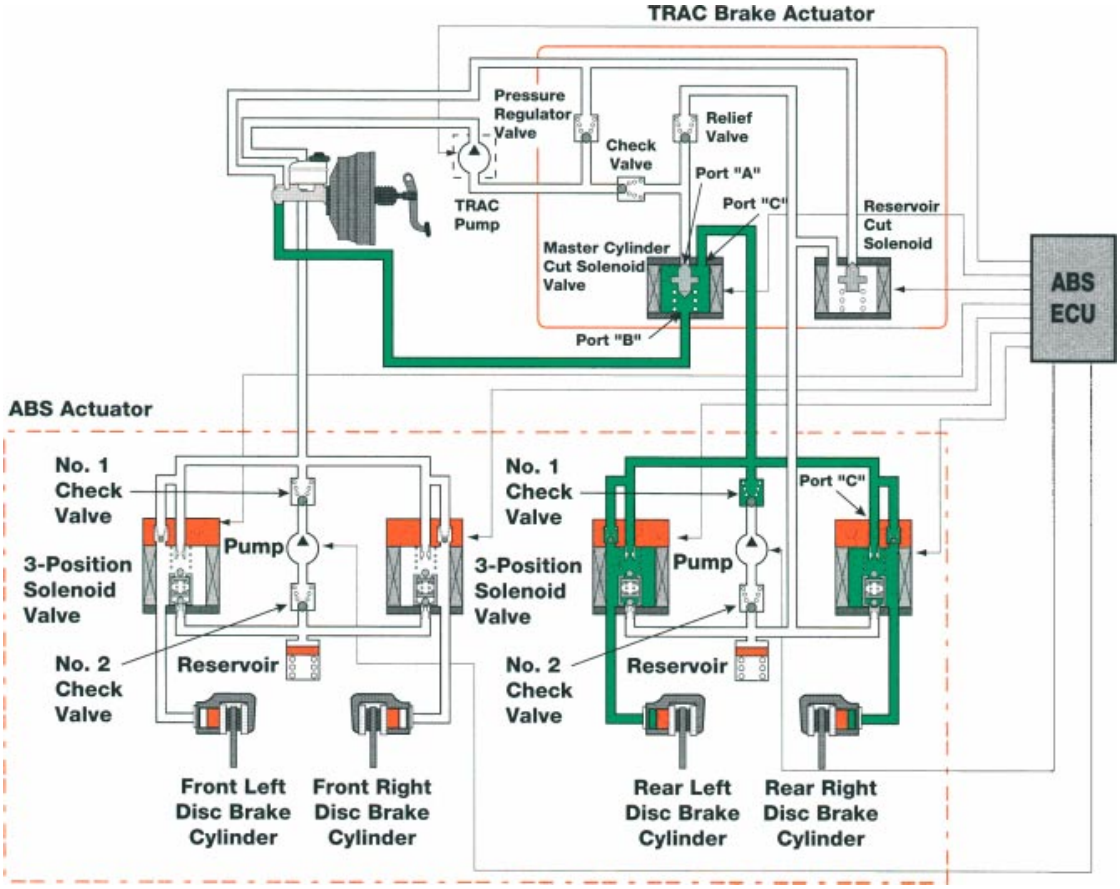
The **Check Valve** prevents fluid from flowing out of the disc brake cylinder to the TRAC pump.

TRAC Brake Actuator

Consists of two cut solenoid valves and three spring loaded valves which regulate the brake fluid pressure in the right and left rear wheels.



TRAC System Hydraulic Circuit



TRAC Operation

Dialing normal operation (TRAC not activated) all solenoid valves of the TRAC brake actuator remain inactive when the brakes are applied. As the brake pedal is depressed, brake fluid pressure generated by the master cylinder is applied to the disc brake cylinders, via the master cylinder cut solenoid valve, and the 3-position solenoid valves in the ABS actuator. When the brake pedal is released, fluid pressure returns from the disc brake cylinders to the master cylinder.

During vehicle acceleration (TRAC operative) when a rear wheel slips the TRAC system controls the engine output and braking of the rear wheels to help prevent wheel slippage.

The brake fluid pressure applied to the right and left rear wheels is controlled separately according to 3 control modes:

- Pressure Increase.
- Pressure Holding.
- Pressure Reduction.

Pressure Increase Mode

When a rear wheel starts to slip, just as the accelerator pedal is being depressed:

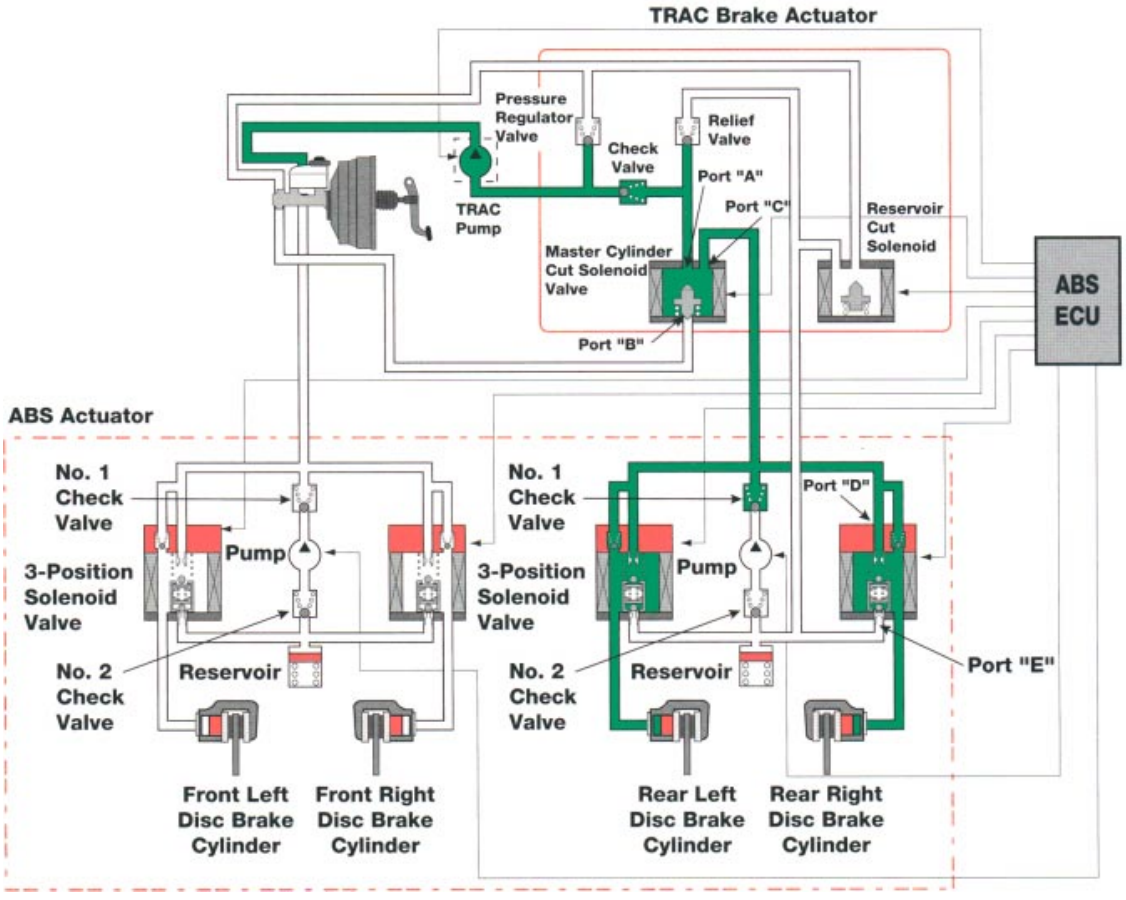
- All the solenoid valves in the TRAC Brake Actuator are activated by signals received from the ABS ECU.
- The 3-Position Solenoid Valves in the ABS actuator are engaged in the pressure increase mode.
- The Master Cylinder Cut Solenoid Valve is activated (ports “A” and “C” open), and brake fluid pressure generated by the TRAC pump is applied to the disc brake cylinders via the Master Cylinder Cut Solenoid Valve and the 3-Position Solenoid Valves in the ABS actuator.
- The Reservoir Cut Solenoid Valve is also activated (open) allowing fluid to flow back to the master cylinder reservoir.
- The TRAC pump discharge pressure is maintained constant by the Pressure Regulator Valve.

Pressure Increase Mode

Brake fluid pressure generated by the TRAC pump is applied to the disc brake cylinders via the master cylinder cut solenoid valve and the 3-position solenoid valves in the ABS actuator.

▶ Condition of Each Component ◀

Components			Operation
TRAC Pump			ON
TRAC Brake Actuator	Master Cylinder Cut Solenoid Valve	Port "A"	Open
		Port "B"	Close
	Reservoir Cut Solenoid Valve		Open
ABS Actuator	3-Position Solenoid Valve	Port "D"	Open
		Port "E"	Close



Pressure Holding Mode

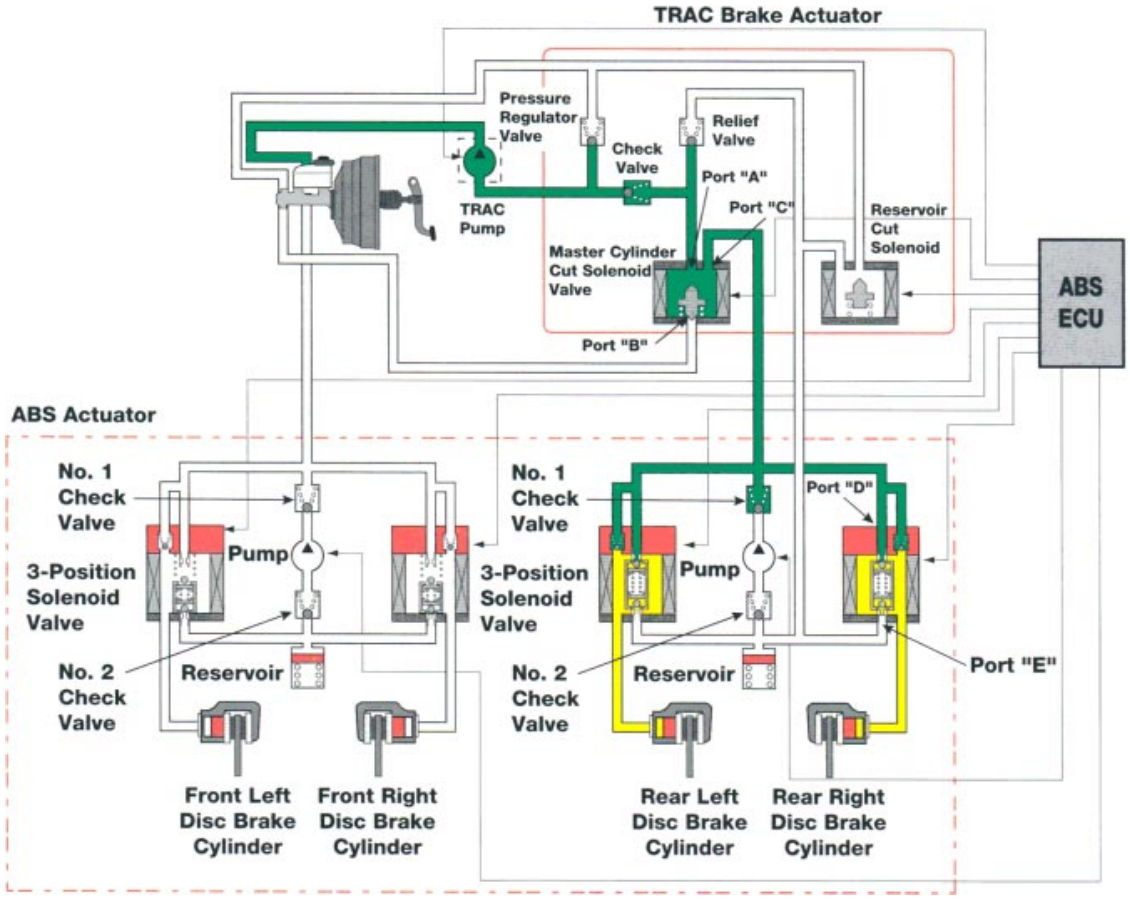
When the brake fluid pressure for the rear brake cylinders is increased or decreased as required, the system switches to the holding mode. This mode change is performed by engaging the 3-position solenoid valve in the ABS actuator to the holding mode. This results in blocking the TRAC pump pressure from flowing to the disc brake cylinder through port D.

Pressure Holding Mode

This mode change is performed by engaging the 3-position solenoid valve in the ABS actuator to the holding mode closing port D.

▶ Condition of Each Component ◀

Components			Operation
TRAC Pump			ON
TRAC Brake Actuator	Master Cylinder Cut Solenoid Valve	Port "A"	Open
		Port "B"	Close
	Reservoir Cut Solenoid Valve		Open
ABS Actuator	3-Position Solenoid Valve	Port "D"	Close
		Port "E"	Close



Pressure Reduction Mode

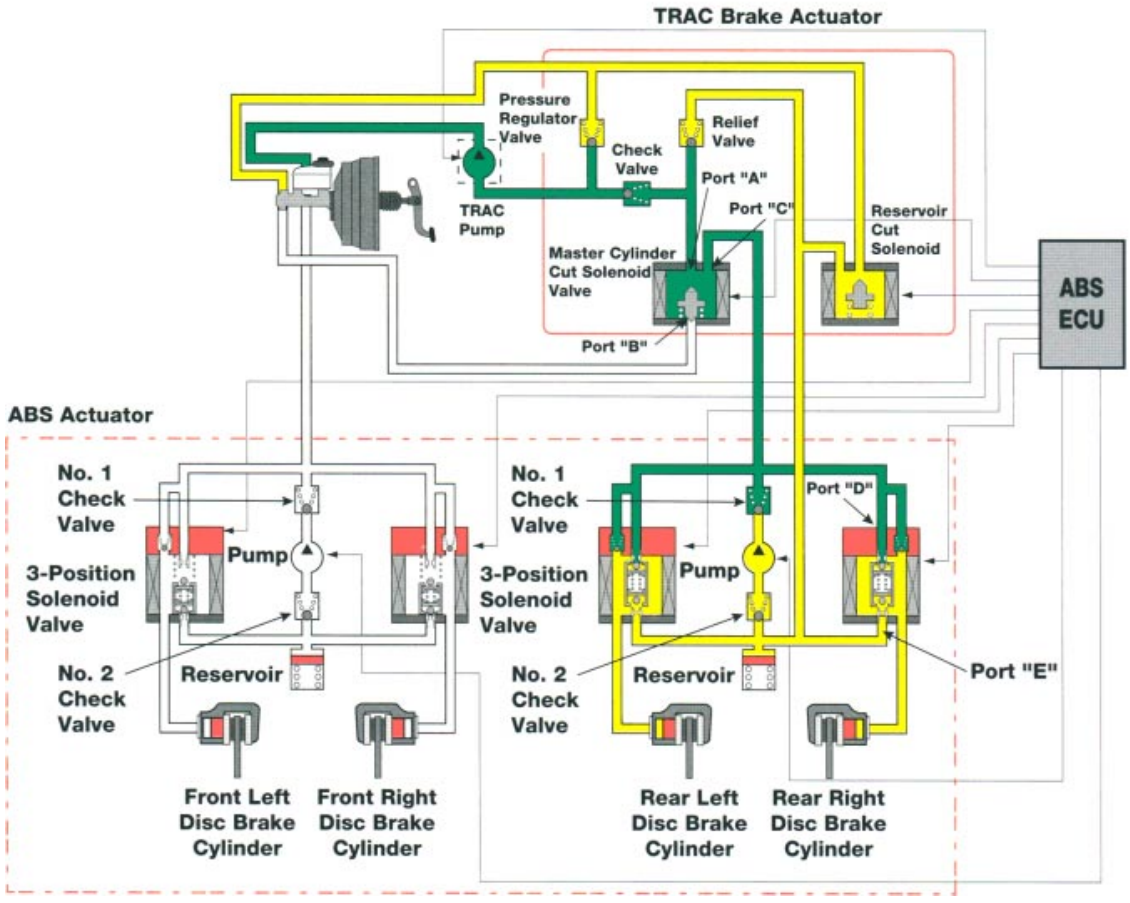
When decreasing pressure applied to the rear brake cylinders, the ABS ECU engages the 3-position solenoid valve in the ABS actuator to the pressure reduction mode. Fluid pressure applied to the brake cylinder returns to the master cylinder reservoir from the 3-position solenoid valve and reservoir in the ABS actuator to the Reservoir Cut Solenoid Valve, thus alleviating the brake fluid pressure.

Pressure Reduction Mode

The ABS ECU engages the 3-position solenoid valve in the ABS actuator in the pressure reduction mode.

▶ Condition of Each Component ◀

Components			Operation
TRAC Pump			ON
TRAC Brake Actuator	Master Cylinder Cut Solenoid Valve	Port "A"	Open
		Port "B"	Close
	Reservoir Cut Solenoid Valve		Open
ABS Actuator	3-Position Solenoid Valve	Port "D"	Close
		Port "E"	Open



Wheel Speed Control

The TRAC ECU constantly receives signals from the 4 speed sensors and calculates the speed of each wheel. At the same time, it estimates the vehicle speed based on the speed of the 2 front wheels and sets a target control speed.

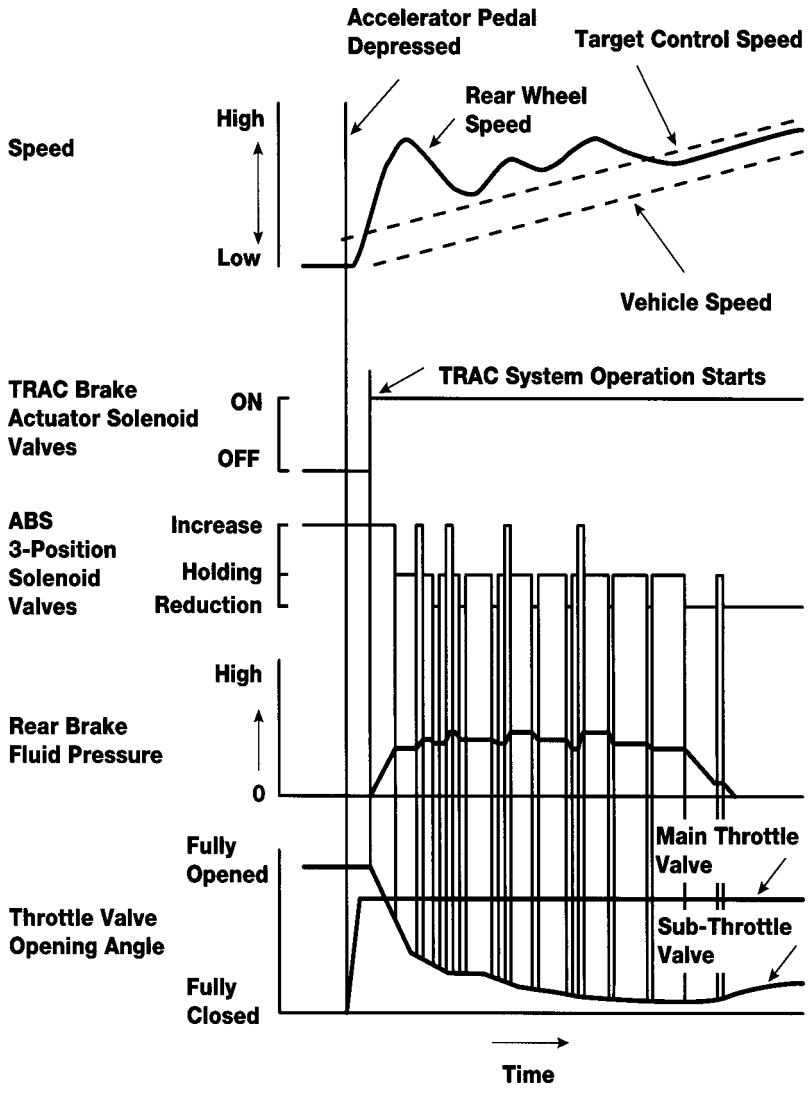
When the accelerator pedal is depressed on a slippery road, the rear wheels (driving wheels) begin to slip and the rear wheel speed exceeds the target control speed. The TRAC ECU then sends a close signal to the sub-throttle valve motor.

At the same time, ABS ECU sends a signal to the TRAC brake actuator and causes it to supply brake fluid pressure to rear disc brake cylinders, changing the rear disc brakes in the TRAC mode.

The 3-position solenoid valves of the ABS actuator are modulated to control rear brake fluid pressure to prevent wheel slippage.

TRAC Wheel Speed Control

When the rear wheels begin to slip, the TRAC ECU sends a sub-throttle valve close signal. The ABS ECU sends a signal to the TRAC brake actuator to supply brake fluid pressure to the rear disc brake.



Initial Check Function

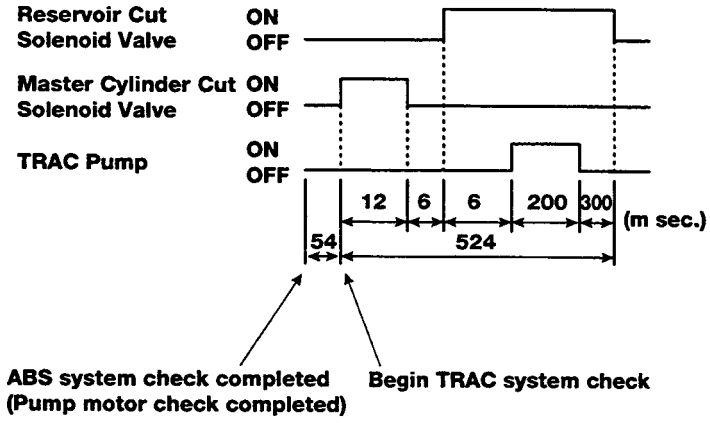
After completing the Initial Check of the ABS system, the ABS ECU cycles the solenoid valves of the TRAC actuator and operates the TRAC pump.

When the shift lever is in park or neutral range with the main throttle valve fully closed and the ignition key is turned from ACC to the ON position, the TRAC ECU drives the sub-throttle valve motor to fully close the sub-throttle valve.

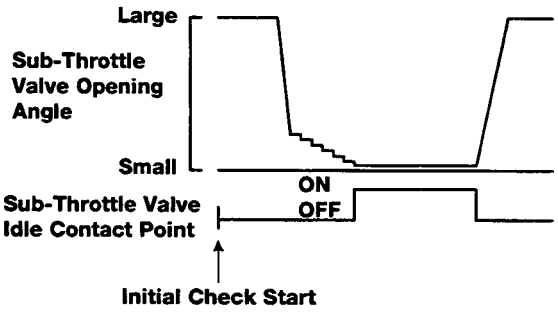
This Initial Check occurs once per key cycle.

TRAC Actuator and Pump Check

The ABS ECU checks the TRAC actuator and the TRAC pump. The TRAC ECU drives the sub-throttle valve motor to fully close the sub-throttle valve.



TRAC Actuator and TRAC Pump



Sub-Throttle Valve Motor

Self-Diagnosis

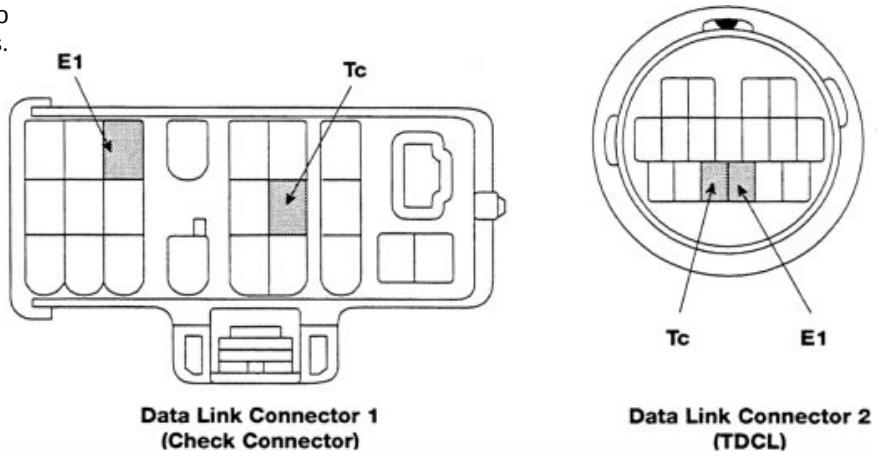
If a malfunction occurs in any of the signal systems, the TRAC indicator light in the Combination Meter will light and alert the driver that a malfunction has occurred. The TRAC ECU will also store codes for each of the malfunctions.

Diagnostic trouble codes are accessed when the following conditions are met:

- Ignition switch is turned on.
- Tc and E1 terminals in the Data Link Connector 1 or 2 [Check Connector or TDCL] are jumpered.

Data Link Connectors

Jumper connectors E1 and TC to access diagnostic codes.

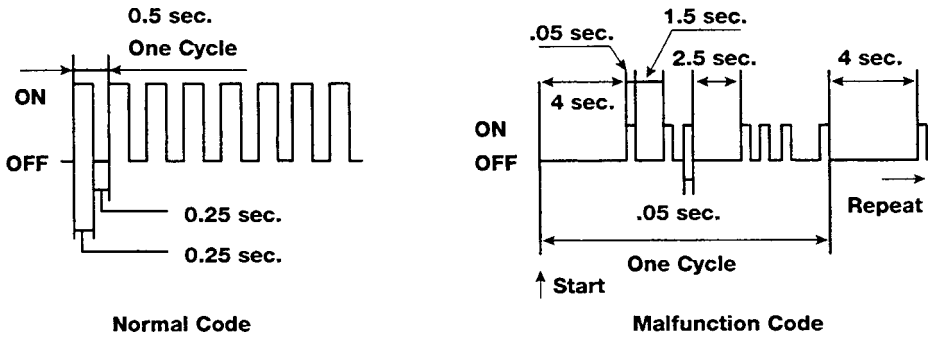


Diagnostic Trouble Codes

Diagnostic trouble code(s) are indicated in the same fashion as ABS codes. The light blinking pattern code for 12 and 31 are shown in the example below. If two or more malfunctions are indicated at the same time, the lowest numbered diagnostic trouble code will be displayed first. There is a 2.5 second pause between codes and a longer 4 second pause before the codes are repeated.

Diagnostic Trouble Codes

Diagnostic trouble code(s) are indicated in the same fashion as ABS codes.



ABS and TRAC Related Diagnostic Codes

The diagnostic chart on the following page shows the ABS diagnostic codes on the left and a general description of components and related circuits on the right. Following the diagnostic code, the indicator lights identify whether the ABS or TRAC systems monitor the specific component. Additionally, the TRAC OFF light will illuminate if the fault causes the TRAC system to be turned OFF.

For example, code 11 (open circuit in the solenoid relay circuit) will cause the ABS indicator light to turn ON. The ABS solenoid is not monitored by the TRAC ECU so it will not illuminate however, it will cause the TRAC system to be switched OFF and therefore the TRAC OFF light will illuminate.

If any of the diagnostic codes 31 through 34 and 41 are detected by both ABS and TRAC systems, the TRAC light will flash.

ABS/TRAC Related Diagnostic Code Chart

This chart identifies diagnostic codes common to ABS and TRAC Systems.

Code No.	Indicator Lights			Code No. at TRAC ECU*2	Diagnosis
	ABS	TRAC	TRAC OFF		
11*1	○		○	43	Open circuit in solenoid relay circuit.
12*1	○	-	○		Short circuit in solenoid relay circuit.
13*1	○	-	○		Open circuit in pump motor relay circuit.
14*1	○	-	○		Short circuit in pump motor relay circuit.
15	○	○	○		Open circuit in TRAC solenoid relay circuit.
16	○	○	-		Short circuit in TRAC solenoid relay circuit.
17	-	○	○		Open circuit in TRAC motor relay circuit.
18	-	○	○		Short circuit in TRAC motor relay circuit.
21*1	○	-	○		Open or short circuit in 3-position solenoid of front right wheel.
22*1	○	-	○		Open or short circuit in 3-position solenoid of front left wheel.
23*1	○	-	○		Open or short circuit in 3-position solenoid of rear right wheel.
24*1	○	-	○		Open or short circuit in 3-position solenoid of rear left wheel.
25	○	○	○		Open or short circuit in master cylinder cut solenoid valve circuit of TRAC brake actuator.
27	○	○	○		Open or short circuit in reservoir cut solenoid valve circuit of TRAC brake actuator.
31*1	○	○*3	○	31, 43	Front right wheel speed sensor signal malfunction.
32*1	○	○*3	○	32, 43	Front left wheel speed sensor signal malfunction.
33*1	○	○*3	○	33, 43	Rear right wheel speed sensor signal malfunction.
34*1	○	○*3	○	34, 43	Rear left wheel speed sensor signal malfunction.
35*1	○	-	○	43	Open circuit in front left and rear right speed sensors.
36*1	○	-	○		Open circuit in front right and rear left speed sensors.
41*1	○	○*3	○	41, 43	Low battery voltage (9.5 V or lower) or abnormally high battery voltage (17 V or higher).
44*1	○	-	○	-	Lateral acceleration sensor signal malfunction.
51*1	○	-	○	43	Pump motor locked or open circuit.
55	-	○	○		Fluid level of brake master cylinder reservoir dropped causing master cylinder reservoir level warning switch to go on.
58	-	○	○		Open circuit in TRAC motor.
61	-	○	○		Open or short circuit in circuit which inputs TRAC system operation to ABS ECU.
62*4	-	○	○		Malfunction in ABS ECU (Involving vehicle speed signal input inside ABS ECU).
Always ON*1	○	○	○		Malfunction in ABS ECU.

○ Diagnostic trouble code indicated
- Not applicable
*1 Both the code number and description of diagnosis are identical to those of the ABS ECU without the TRAC system (2JZ-GE engine model).
*2 To find out which of the indicator lights the TRAC ECU uses to output the codes shown in the chart, refer to the chart for the diagnostic items of TRAC ECU shown on page 194.
*3 The indicator light flashes only if the same diagnosis is also detected by the TRAC ECU.
*4 The ABS ECU deletes the stored code No.62 when it detects the malfunctions numbered from No.31 to No.36 (wheel speed sensor signal malfunction).

TRAC Related Diagnostic Codes

The diagnostic codes in the chart below are specifically TRAC related. The speed sensor codes are similar to ABS codes. If both indicator lights are ON however, begin your diagnosis in the Repair Manual ABS section first. In addition, codes 44 through 48 which identify the main throttle position sensor and the sub-throttle position sensor, begin your diagnosis in the engine control system to determine whether the ECM has the same diagnostic codes stored first before pursuing diagnosis of the TRAC system.

TRAC Related Diagnostic Code Chart

The diagnostic codes in the chart are specifically TRAC related.

Code No.	Indicator Lights			Code No. at TRAC ECU*1	Diagnosis
	ABS	TRAC	TRAC OFF		
24	-	○	-	-	Open or short circuit in step motor circuit of sub-throttle actuator
25	-	○	-	-	Step motor does not move to a position decided by TRAC ECU.
26	-	○	-	-	Leak at sub-throttle position sensor or stuck sub-throttle valve.
31	○*2	○	○*2	31	Front right wheel speed sensor signal malfunction.
32	○*2	○	○*2	32	Front left wheel speed sensor signal malfunction.
33	○*2	○	○*2	33	Rear right wheel speed sensor signal malfunction.
34	○*2	○	○*2	34	Rear left wheel speed sensor signal malfunction.
41	-	○	-	-	Low battery voltage (9.5 V or lower) or abnormally high battery voltage (17 V or higher).
43	○	○	○	-	Malfunction in ABS ECU.
44	-	○	-	-	Engine speed signal (NE) is not input from the ECM* [Engine ECU] during TRAC control.
45	-	○	-	-	Short circuit in 1DL signal circuit of the main throttle position sensor.
46	-	-	-	-	Open or short circuit in VTA1 signal circuit of the main throttle position sensor.
47	-	○	-	-	Open or short circuit in IDL signal circuit of the sub-throttle position sensor.
48	-	○	-	-	Open or short circuit in VTA2 signal circuit of the sub-throttle position sensor.
51	-	-	○	-	Malfunction in engine control system causes malfunction indicator lamp [CHECK ENGINE warning lamp] to go on.
53	-	○	-	-	Malfunction in communication circuit to ECM* [Engine ECU].
61	-	○	-	-	Malfunction in communication circuit to ABS ECU.
Always ON	-	○	○	-	Malfunction in TRAC ECU.

○ Diagnostic trouble code indicated
- Not applicate
*1 To find out which of the indicator lights the ABS ECU uses to output the codes shown in the chart, refer to the chart for the diagnosis of ABS ECU shown on page 193.
*2 The indicator light flashes only if the same diagnosis is also detected by the ABS ECU.
*3 ECM (Engine Control Module)

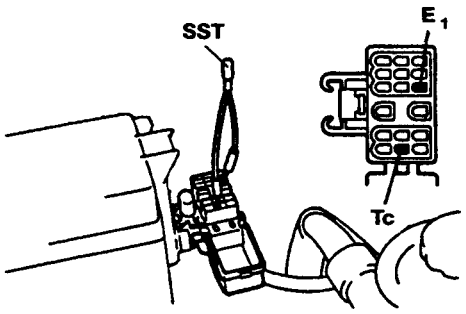
Clearing Diagnostic Codes

Diagnostic trouble codes in the TRAC ECU can be cleared after repairs are completed with the following steps:

1. Jumper terminals Tc and E1 in the DLC1 or DLC2 [Check Connector or TDCL].
2. Turn ignition switch ON.
3. Depressing the brake pedal 8 or more times within 3 seconds.
4. Check that the warning light shows the normal code.
5. Remove the jumper wire.

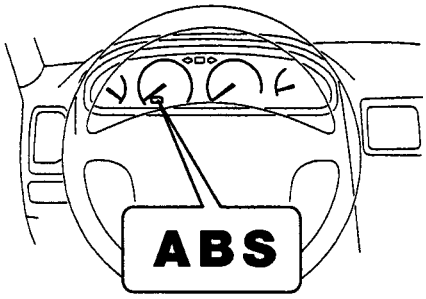
Clearing Diagnostic Trouble Codes

1. Jumper Tc and E1 in DLC1

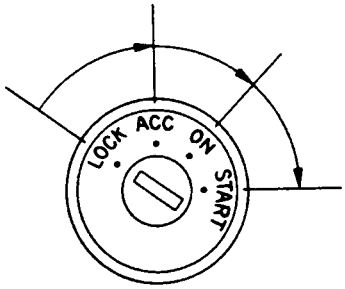


5. Remove the jumper wire

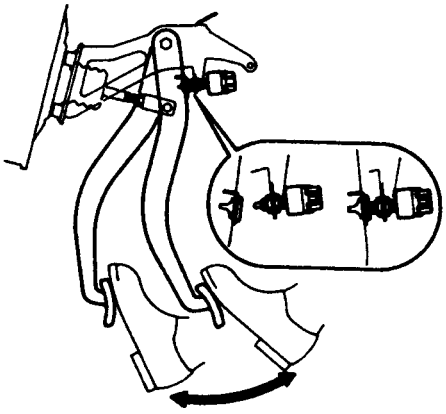
4. Check for Normal Code at Warning Light



2. Turn Ignition Switch ON



3. Depress the brake pedal 8 or more times within 3 seconds



Fail-Safe

When a malfunction occurs while the TRAC system is inoperative, the TRAC ECU immediately turns OFF the TRAC motor relay and TRAC solenoid relay, and stops TRAC system operation.

When the TRAC system is operative, the TRAC ECU continues control, stops the control, or fully opens the sub-throttle valve depending on the type of malfunction.

After the TRAC system becomes inoperative, the engine and brake system operates in the same way as models without the TRAC system.

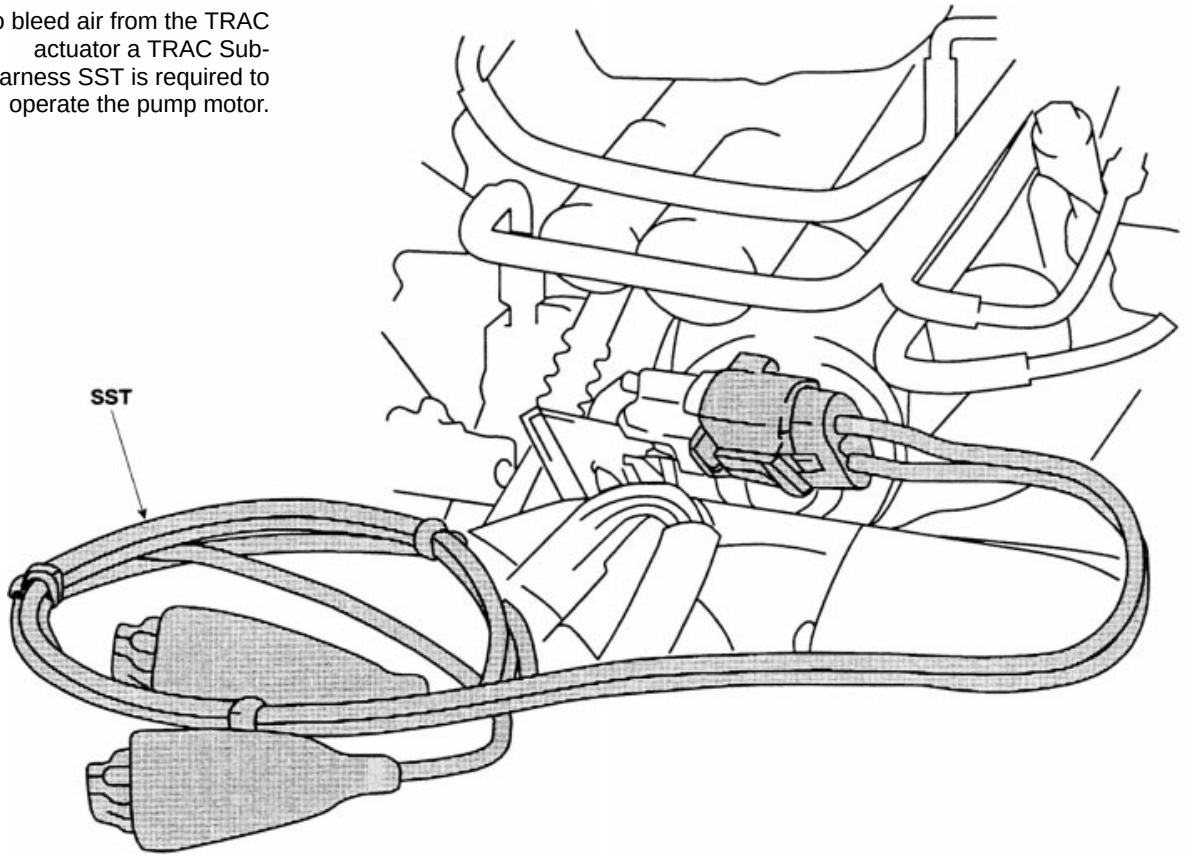
Bleeding Procedure

In order to bleed air from the TRAC actuator a new TRAC Sub-Harness SST (09990-00330) is required to operate the pump motor. The harness is connected to the TRAC pump connector and the other end is connected to the battery to power the pump motor.

1. Disconnect the connector from the TRAC pump.
2. Connect the harness to the pump connector.
3. Connect a vinyl tube to the bleeder plug of the TRAC actuator and loosen the bleeder.
4. Start the engine.
5. Connect the harness leads to the battery terminals.
   - Allow the pump to run for 60 seconds.
   - Close the bleeder plug.
   - Allow the pump to run for 30 additional seconds.
6. Check fluid level.
7. Reconnect the TRAC pump to the vehicle harness.

TRAC Bleeding Harness

To bleed air from the TRAC actuator a TRAC Sub-Harness SST is required to operate the pump motor.



WORKSHEET 12-1 (ON-CAR)
TRAC and ABS Diagnostic System

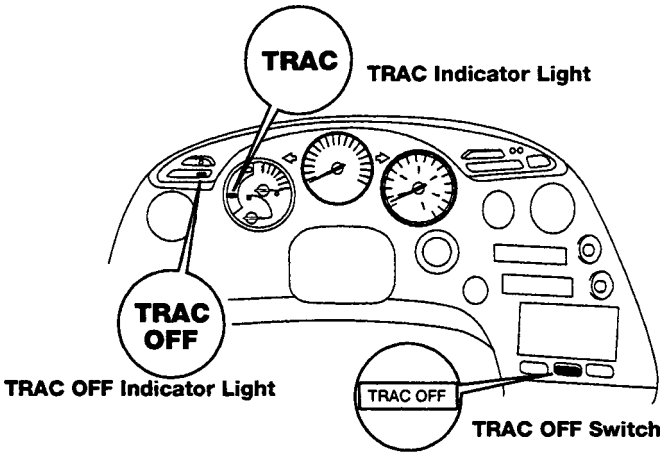
Vehicle	Year/Prod. Date	Engine	Transmission

Worksheet Objectives

In this Worksheet you will practice the use of the ABS and TRAC warning lights.

Tools and Equipment:

- Repair Manual.
- Jumper Wire SST.



Procedure:

1. Disconnect the sub-throttle actuator connector (S4) and the TRAC actuator connector (T3).

2. Start the engine and note the condition of the ABS warning and TRAC indicator lights in the following chart.

ABS Warning Light	TRAC Indicator Light	TRAC OFF Light	Master Warning Light

3. Next, output diagnostic codes by turning the ignition switch ON, pulling short pin from DLC1, and connecting terminals Tc to E1 at DLC1 or DLC2.

4. Record the codes in the chart below and indicate which light outputs each code.

5. Refer to the Repair Manual and record the malfunction condition indicated by each code.

ABS Warning Light	TRAC Indicator Light	ABS Code No.	TRAC Code No.	Malfunction Condition

6. Which TRAC conditions (codes) were output by the ABS Diagnostic system?

_____

7. Why do you think a TRAC related problem would output an ABS code?

_____

_____

8. Erase codes by connecting terminals Tc to E1 at DLC1 or DLC2, turn ignition switch ON, and press the brake pedal at least 8 times in 3 seconds.

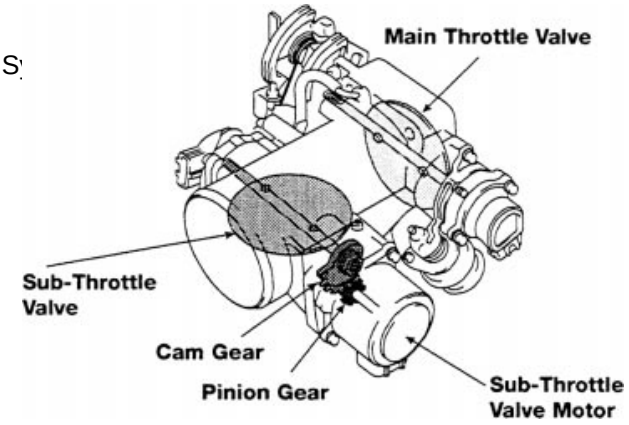
9. Reinstall short pin to DLC1.

WORKSHEET 12-2 (ON-CAR)
Traction Control System Operation

Vehicle	Year/Prod. Date	Engine	Transmission

Worksheet Objectives

In this Worksheet you will verify the operation of the TRAC S



Tools and Equipment:

- Vehicle Lift or Floor Jack.
- Jack Stands.

Preparation:

- Mount the vehicle on a lift and raise the wheels six inches from the floor.
- For safety considerations make sure no one is standing to the front or rear of the vehicle.
- Make sure that the lift does not interfere with the rotating wheels.
- Make sure that the TRAC OFF switch is in the enabled position.

Procedure:

1. Start engine and place the transmission in Drive Range.
2. From idle, quickly depress the throttle and hold momentarily.

   a. What immediately happened to engine RPM?

   _____

   b. What was the maximum engine RPM achieved?

   _____

3. From idle, depress the throttle and hold momentarily a second time. What immediately happened to the drive wheel speed?

   _____

4. How were both of these TRAC functions accomplished?

   _____

   _____

5. During TRAC operation what happened to the TRAC Indicator?

   _____

WORKSHEET 12-3 (ON-CAR)
TRAC Control System Bleeding

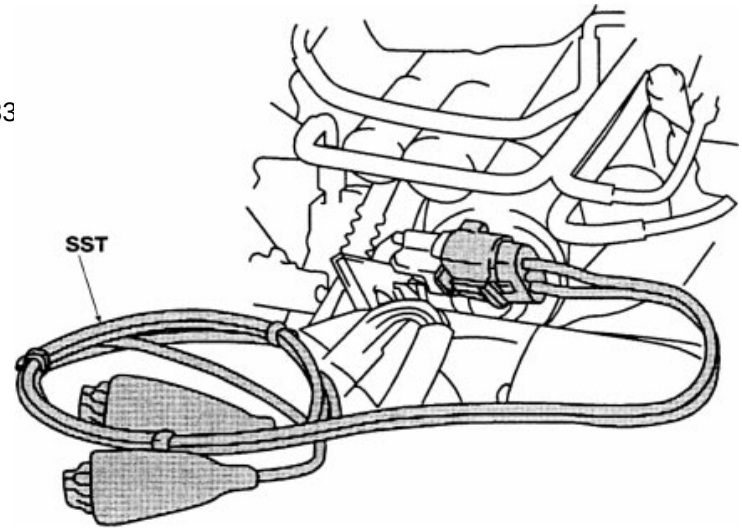
Vehicle	Year/Prod. Date	Engine	Transmission

Worksheet Objectives

In this Worksheet you will practice the use of the ABS and TRAC warning lights.

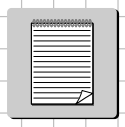
Tools and Equipment:

- Repair Manual.
- TRAC Sub-Harness SST (09990-0033



Procedure:

1. Disconnect the TRAC pump connector and attach the TRAC sub-harness to the pump.
2. Connect a vinyl tube to the bleeder plug of the TRAC actuator, then loosen the bleeder plug.
3. Start the engine.
4. Connect the sub-harness leads directly to the battery terminals to operate the TRAC pump.
5. Close the bleeder screw after 60 seconds.
6. Allow the pump to run for 30 seconds after tightening the bleeder screw.
7. Listen for pump operation.



Notes