

3. Technical Description

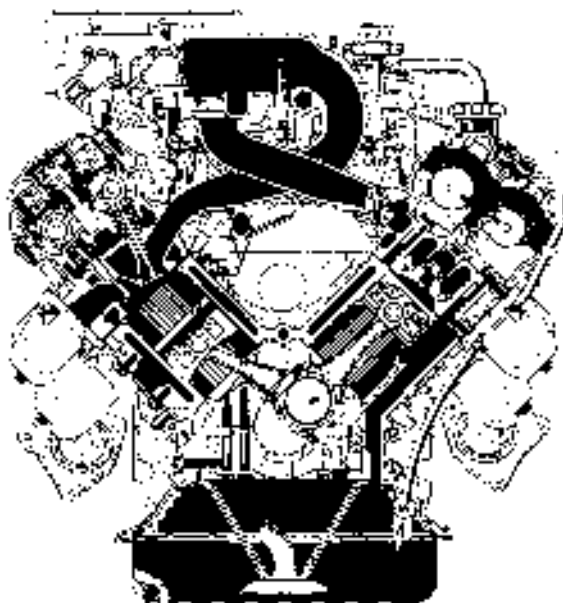
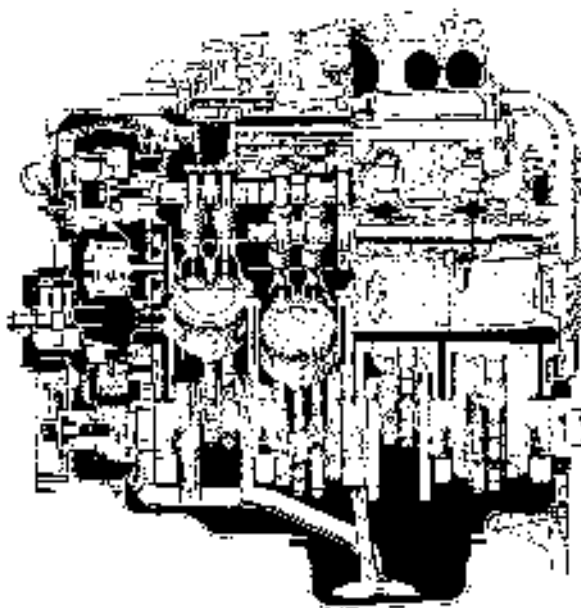
ENGINE

1UZ-FE ENGINE

■ DESCRIPTION

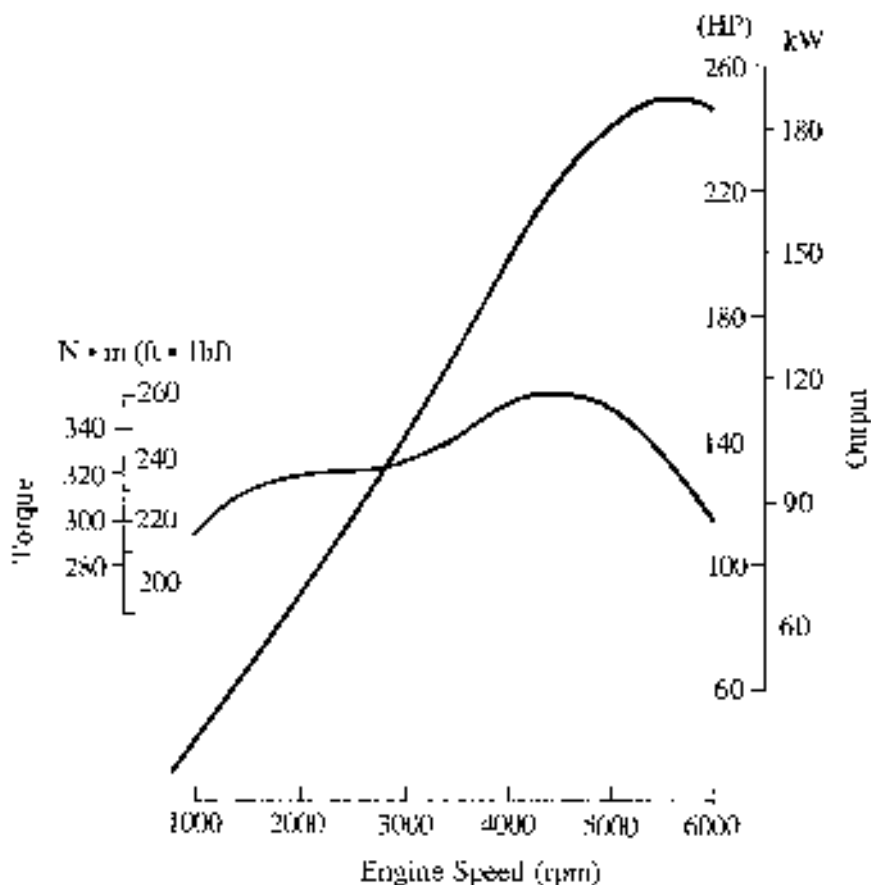
The 1UZ-FE engine in the SC400 is a V8, 4.0-liter, 32-valve DOHC engine. Its construction and operation are basically the same as those of the 1UZ-FE engine in the LS400.

However, in the SC400, this engine is equipped with an electronically controlled hydraulic cooling fan system which drives the cooling fan by hydraulic pressure, giving the engine higher performance with lower noise. This section describes the points where this engine differs from the 1UZ-FE engine in the LS400.



■ ENGINE SPECIFICATIONS AND PERFORMANCE CURVE

Engine			1UZ–FE (for SC400)
Item			
No. of Cyls. & Arrangement			8–Cylinder, V Type
Valve Mechanism			32–Valve, DOHC, Belt & Gear Drive
Combustion Chamber			Pentroof Type
Manifold			Cross–Flow
Fuel System			EFI
Displacement			



■ MAJOR DIFFERENCES

Major differences between the SC400 and the LS400 of the 1UZ-FE engine are listed below.

Item	Features
Cooling System	<ul style="list-style-type: none"> An electronically controlled hydraulic cooling fan system is used to improve cooling performance and reduce cooling fan noise.
Intake and Exhaust System	<ul style="list-style-type: none"> The air cleaner case is provided with a cap for removing the element to improve the serviceability of the element.
Engine Control System	<ul style="list-style-type: none"> A new fuel pump control system which uses a fuel pump ECU is used.
Engine Control System	<ul style="list-style-type: none"> An evaporative emission control system which is controlled by an ECU is used. A new EGR (Exhaust Gas Recirculation) system which uses a step motor type EGR valve is used in models for U.S.A. Specifications.

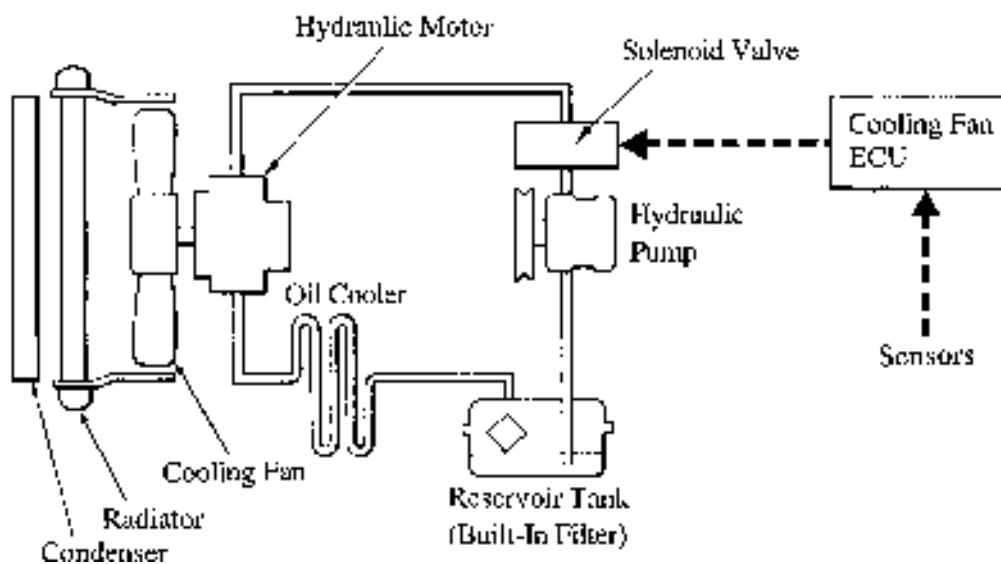
■ COOLING SYSTEM

1. Electronically Controlled Hydraulic Cooling Fan System

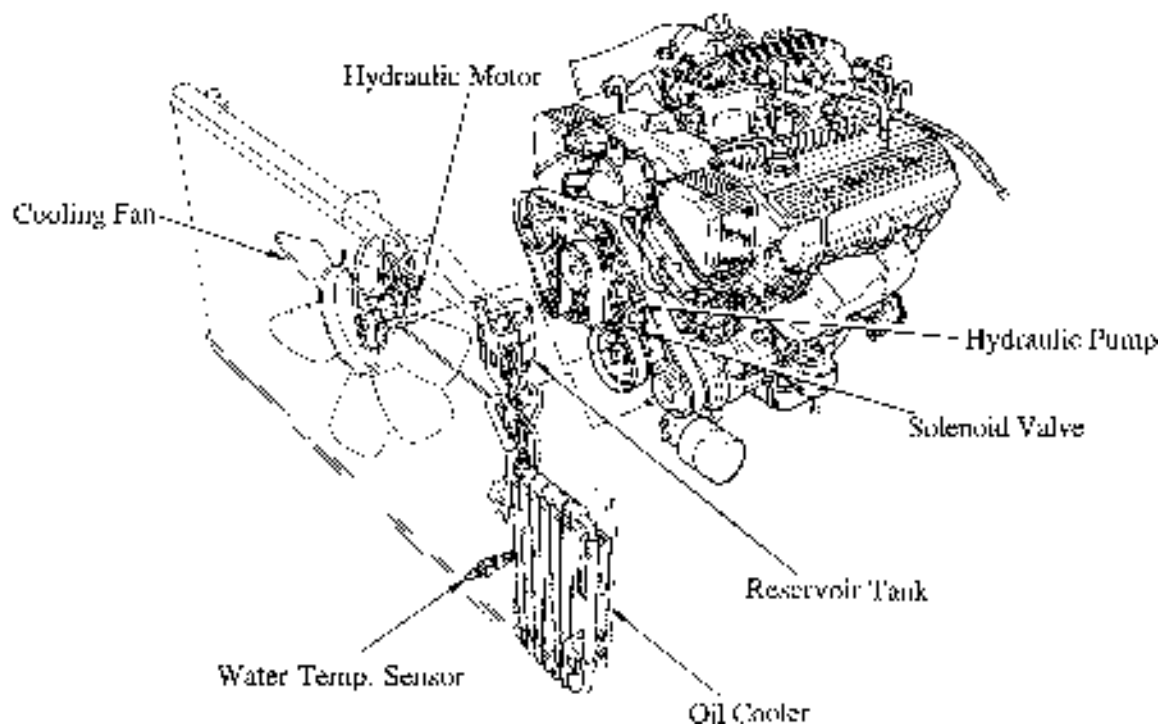
General

In this system, the cooling fan ECU controls the hydraulic pressure acting on the hydraulic motor, thus controlling the speed of the cooling fan steplessly in response to the condition of the engine and air conditioner.

In this way, the fan noise and engine load are reduced compared to the LS400.



Layout of Components



Function of Components

Component		Function
Hydraulic Pump		Generates the hydraulic pressure that turns the hydraulic motor.
Hydraulic Motor		Turns the cooling fan by hydraulic pressure from the hydraulic pump.
Oil Cooler		Cools the driving oil.
Sensors	Water Temp. Sensor (for Cooling Fan ECU)	Detects the engine coolant temperature.
	Air Conditioning Refrigerant Pressure Switch	Detects the air conditioning refrigerant pressure.
	Air Conditioner ECU	Detects the calculated required outlet air temperature.
	Igniter	Detects the engine speed.
	Throttle Position Sensor	Detects the engine idling state.
Actuator	Solenoid Valve	Controls the hydraulic pump discharge pressure in accordance with signals from the cooling fan ECU.
Cooling Fan ECU		Controls the solenoid valve in accordance with signals from the various sensors.

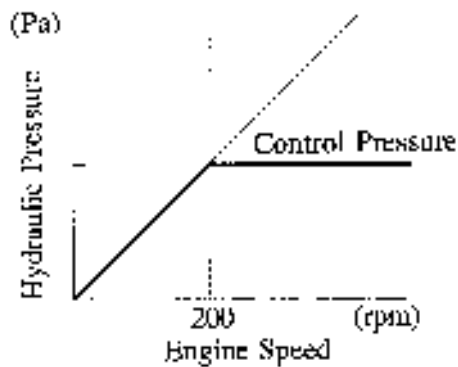
Construction and Operation

A simplified diagram of the hydraulic control circuit is shown on the right. The oil pumped out by the hydraulic pump flows to the spool valve. The solenoid valve controls the back pressure of the spool valve to control the oil return volume from Port A. This causes the hydraulic pressure to the hydraulic motor to change, thus changing the fan speed.

1) Hydraulic Pump

The hydraulic pump is a trochoid gear type pump. It is mounted on the front of the engine and is driven by a V-ribbed belt, together with the alternator and other equipment.

The pulley, turned by the V-ribbed belt, turns the trochoid gears via the shaft, and this generates hydraulic pressure.



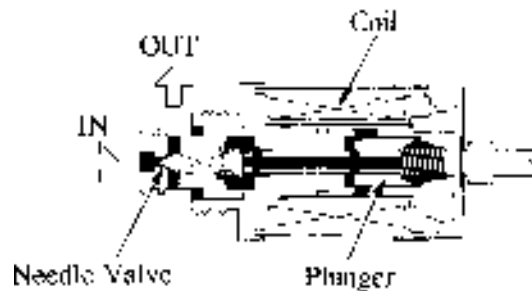
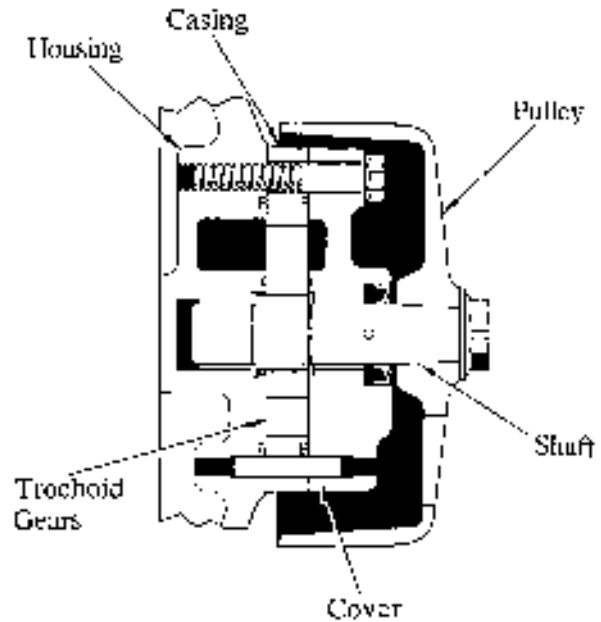
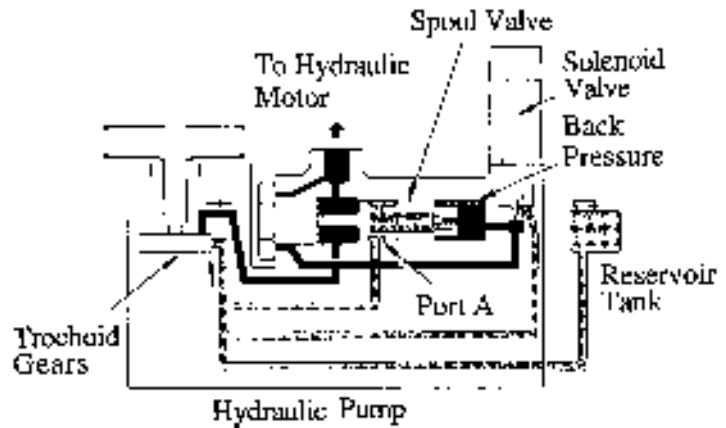
2) Solenoid Valve

The solenoid valve is positioned on the discharge side.

While current flows according to signals from the cooling fan ECU, the coil is excited and the needle valve, which is integrated with the plunger, moves.

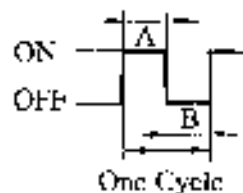
This changes the gap between the needle valve and the valve body, controlling the oil discharge pressure.

►Hydraulic Control Circuit◀



In actual operation, current to the coil is switched on and off, so the position of the needle valve is determined by the proportion of time the signal is on and the time it is off (i.e., by the duty ratio*). The valve closes further as the period of current flow to the coil increases.

*: The duty ratio is the ratio of the interval during which current flows in one cycle of a signal. The figure on the right shows one cycle during which current flows and then does not flow.

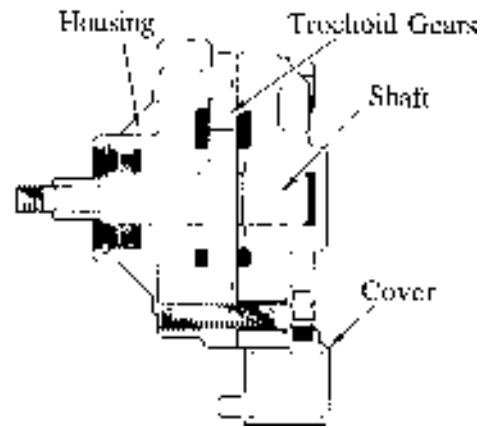


$$\text{Duty Ratio} = \frac{A}{A+B} \times 100(\%)$$

3) Hydraulic Motor

A trochoid gear type pump is also used for the hydraulic motor.

When pressure generated by the hydraulic pump acts on the trochoid gears in the hydraulic motor, the shaft is rotated. The rotation of the hydraulic motor shaft drives the cooling fan.



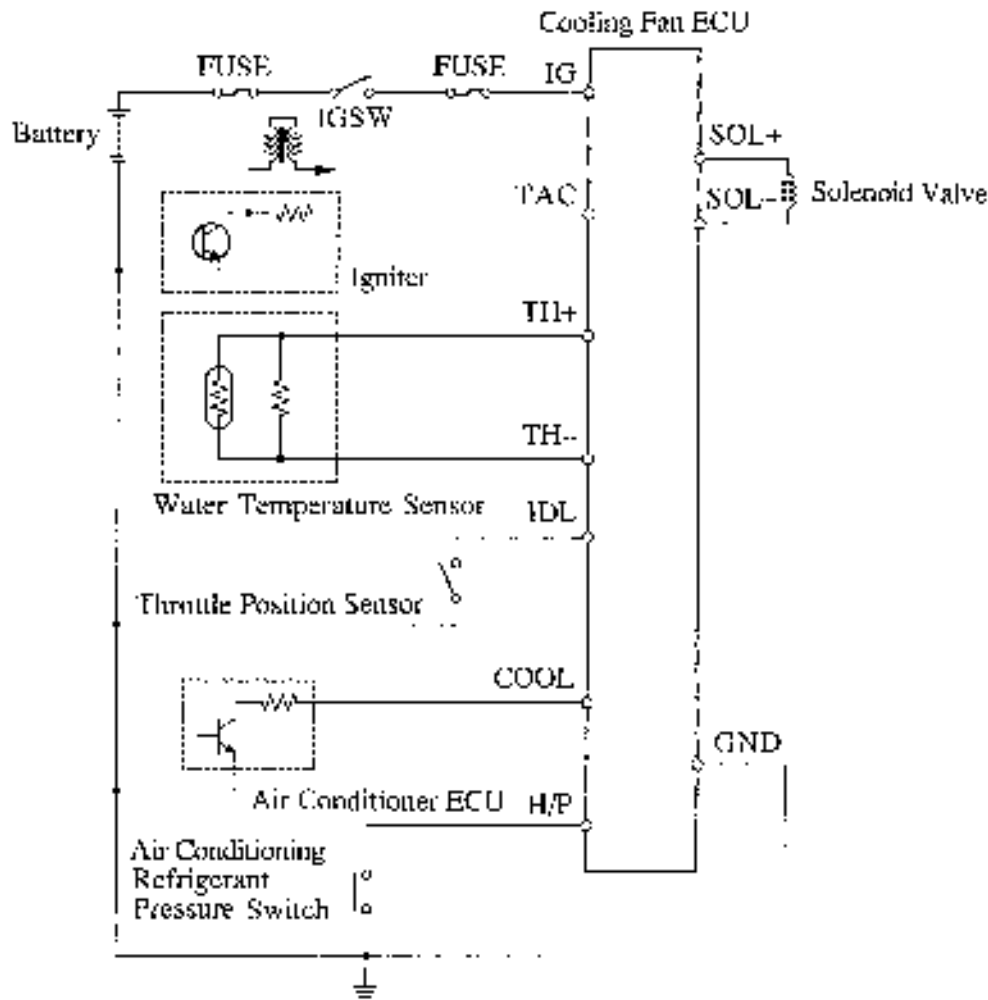
4) Oil Cooler

An air cooling type oil cooler is mounted on the left side of the radiator. This oil cooler cools the oil that drives the hydraulic motor.

5) Cooling Fan ECU

a. General

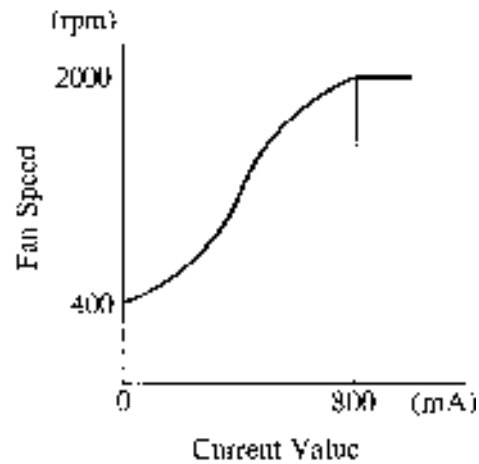
The cooling fan ECU is connected as shown in the following figure. The cooling fan ECU judges the engine and air conditioner condition based on signals from the various sensors, drives the solenoid valve and controls the speed of the cooling fan steplessly. This ECU also includes a fail-safe function in case an abnormality occurs in the input-output signal system.



b. Function

i) Cooling Fan Speed Control

The cooling fan ECU alters the speed of the cooling fan by controlling the current to the solenoid by means of duty control. The duty ratio is calculated according to the coolant temperature, air conditioner condition and engine speed, etc.

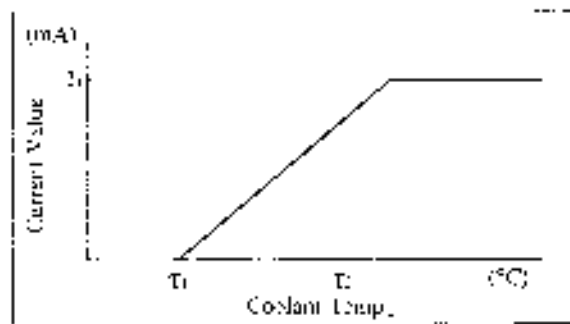


RELEVANT SIGNALS

- | | |
|---|-------------------------------------|
| • Engine coolant temperature (TH+) | • Engine idling state (IDL) |
| • Air conditioning refrigerant pressure (H/P) | • Engine speed (TAC) |
| | • Air conditioner ECU signal (COOL) |

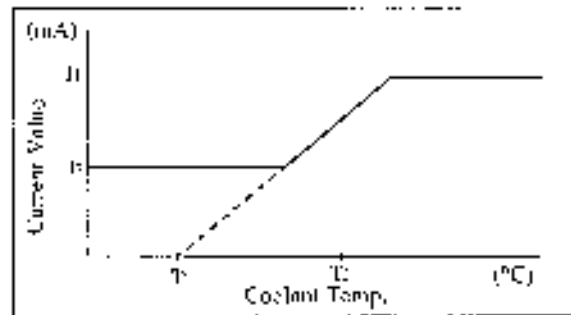
• Coolant Temperature Characteristics

The current value is calculated according to the coolant temperature as shown in the graph on the right.



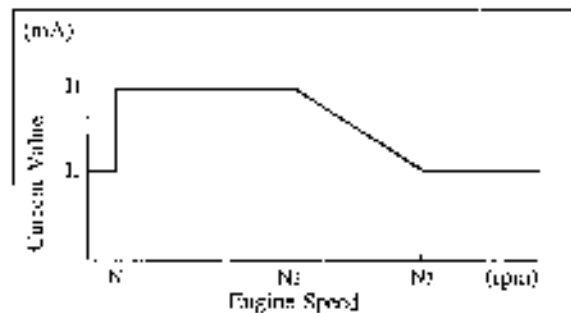
• Air Conditioning Refrigerant Pressure Switch ON (contacts OFF) Characteristics

When the air conditioning refrigerant pressure switch is ON, the current value is calculated as shown in the graph on the right.



• Engine Speed Characteristics

The upper limit of the current value is controlled according to the engine speed as shown in the graph on the right.



ii) Fail-Safe Function

When a malfunction is detected by the water temp. sensor or the solenoid valve, the fail-safe function of the cooling fan ECU relies on the data stored in its memory to allow the cooling system to continue operating.

- **Water Temp. Sensor Malfunction**

The high pressure switch-on characteristics are set so that the cooling fan ECU goes on at a temperature of 80°C (176°F) if there is an open or short circuit in the water temperature sensor's signal system.

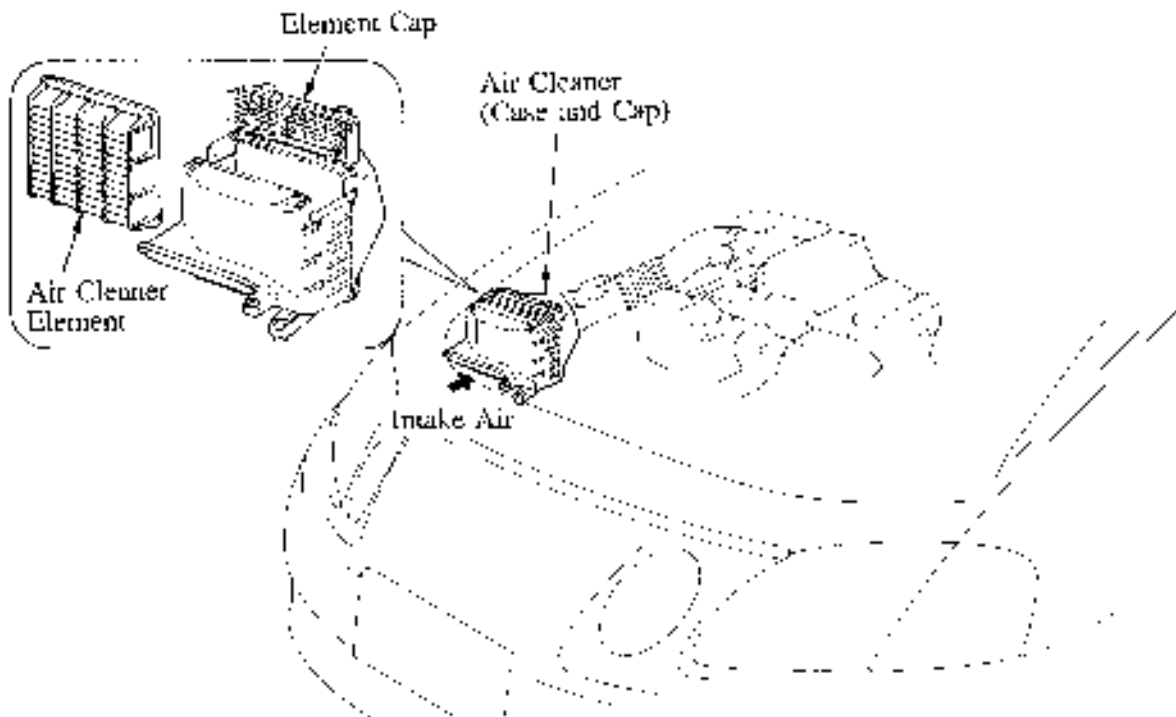
- **Solenoid Valve Malfunction**

If there is a short circuit at the solenoid valve's output terminal (SOL+) or in the monitor terminal (SOL-), the output current is limited (to 1.2 A or lower) or control is discontinued to protect the cooling fan ECU and solenoid valve.

■ INTAKE AND EXHAUST SYSTEM

1. Air Cleaner

- The air cleaner case and cap are made of plastic, as in the LS400, and its size is appropriate for the large exhaust output. In addition, the element is the linear flow type, which has low air resistance.
- To make it easier to remove and install the element, an element cap has been added to the air cleaner case.



■ ENGINE CONTROL SYSTEM

1. General

The engine control system in the 1UZ-FE engine for the SC400 has the same basic construction and operation as the system used in the LS400. However, a purge volume control function has now been added to the evaporative emission control system. For U.S.A. Specifications, an EGR control system, which controls the EGR volume in accordance with engine conditions, has also been added.

The following table is a comparison of the 1UZ-FE engine in the SC400 and the 1UZ-FE engine in the LS400.

1UZ-FE Engine		
System	for SC400	for LS400
EFI (Electronic Fuel Injection)	<ul style="list-style-type: none"> An L-type EFI system directly detects the intake air volume with an optical Karman-Vortex type air flow meter. The fuel injection system is a 4-group type and injects to 2 cylinders each. 	←
Cold Start Injector Control	When the coolant temperature is between 22°C and 60°C (71.6°F and 140.0°F), the injection duration of the cold start injector is controlled by the ECU. At 22°C (71.6°F) or lower, it is controlled by the start injector time switch and ECU.	←
ESA (Electronic Spark Advance)	<ul style="list-style-type: none"> Ignition timing is determined by the ECU based on signals from various sensors. Corrects ignition timing in response to engine knocking. 	←
ISC (Idle Speed Control)	A step motor type ISC system controls the fast idle and idle speeds.	←
EGR Cut-Off Control*	Cuts off EGR according to the engine condition to maintain drivability of the vehicle and durability of the EGR components.	←
EGR Control (Only for U.S.A. Specifications)	Drives the EGR valve with step motor, controlling the EGR volume in accordance with the engine conditions.	N.A.
Fuel Pump Control	Under light engine loads, pump speed is low to reduce electric power loss. (☞ Page 64)	←
Oxygen Sensor Heater Control	Maintains the temperature of the oxygen sensor at an appropriate level to increase accuracy of detection of the oxygen concentration in the exhaust gas. (☞ Page 64)	←
Fuel Pressure Control	In hot engine condition, the fuel pressure is increased to improve restartability.	←
Air Conditioner Cut-Off Control	By controlling the air conditioner compressor in accordance with the throttle valve opening angle and the vehicle speed, drivability is maintained.	←
Evaporative Emission Control	Controls the purge flow of evaporative emissions (HC) in the charcoal canister in accordance with engine conditions. (☞ Page 65)	N.A.
Diagnosis	When the ECU detects a malfunction, the ECU diagnoses and memorizes the failed section. (☞ Page 66)	←
Fail-Safe	When the ECU detects a malfunction, the ECU stops or controls the engine according to the data already stored in memory.	←

* Applicable only to U.S.A. (except for California) and Canadian Specifications.

3. Summary of Engine Control System

The following list summarizes each system and control composing the engine control system of the 1UZ-FE engine for SC400, and the types of related sensors, ECU and others.

CONTROL ITEM		SENSORS																OTHERS	
		NE	GE	GL	GL	GL	GL	GL	GL	GL	GL	GL	GL	GL	GL	GL	GL		
B/I	Starting Injection Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Basic Injection Duration	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	After Start Enrichment	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Warm-Up Enrichment	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Acceleration Enrichment During Warm-Up	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Power Enrichment	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Multi-Pulse Ratio Feedback Correction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Voltage Correction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Idle Cut Off	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Cold Start Injection Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
F/S	Starting Ignition Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Basic Ignition Advance Angle Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Warm-Up Correction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	ECR Correction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Knocking Correction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
T/R	Torque Control Correction	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Ignition Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Initial Set-Up	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	After-Start Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Warm-Up Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
F/S	Feedback Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	E.g. a Speed Change Estimation Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	ECR Cut Off Control ^{*1}	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	ECR Control ^{*1}	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Fuel Pressure Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Oxygen Sensor Heater Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Fuel Pressure Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Air Conditions Cut Off Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
	Exhaust Gas Recirculation Control	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
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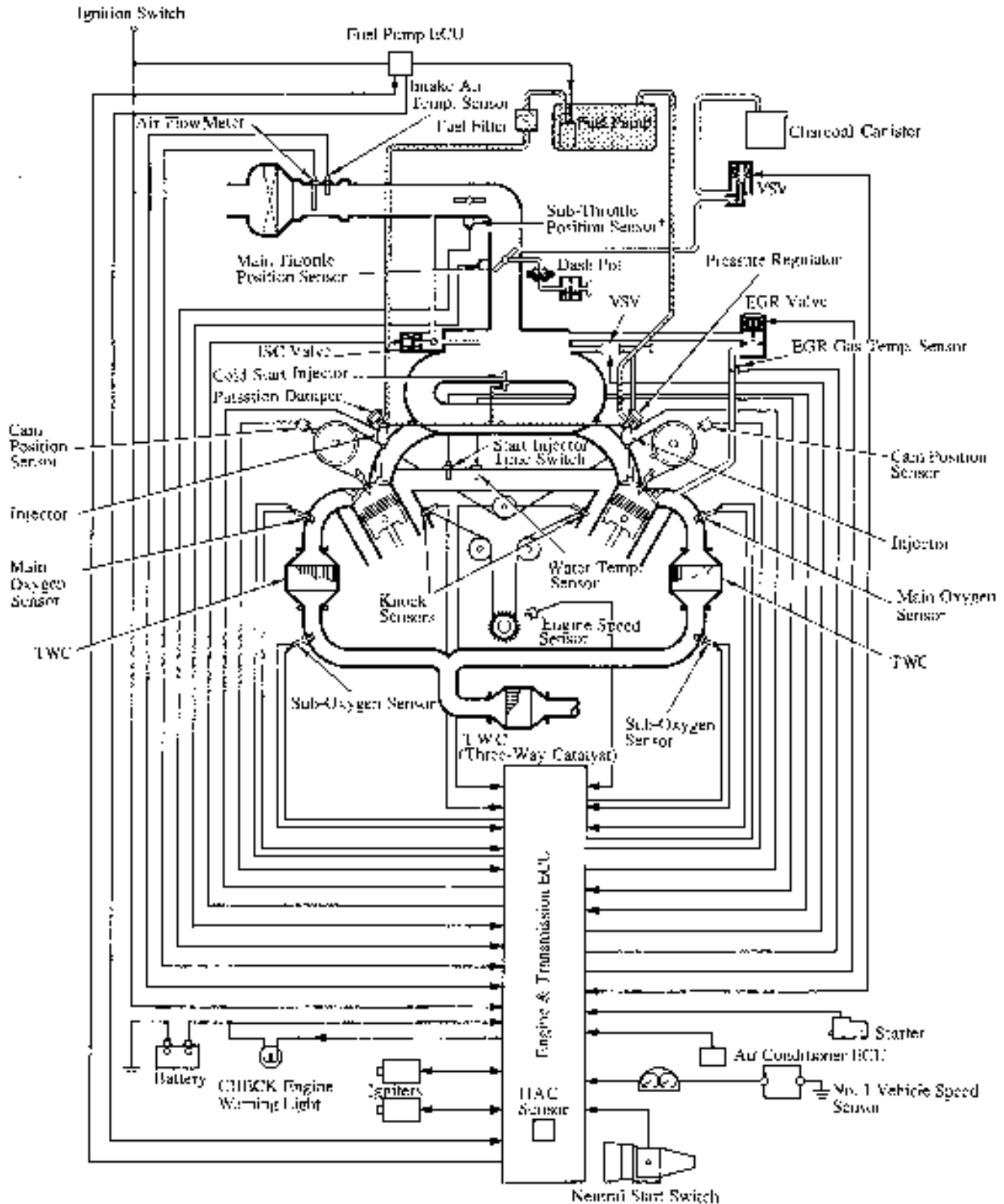
*1: Applicable only to U.S.A. Specifications.

*2: Applicable only to vehicles equipped with the optional TRAC (Traction Control) system.

*3: Applicable only to U.S.A. (except for California) and Canadian Specifications.

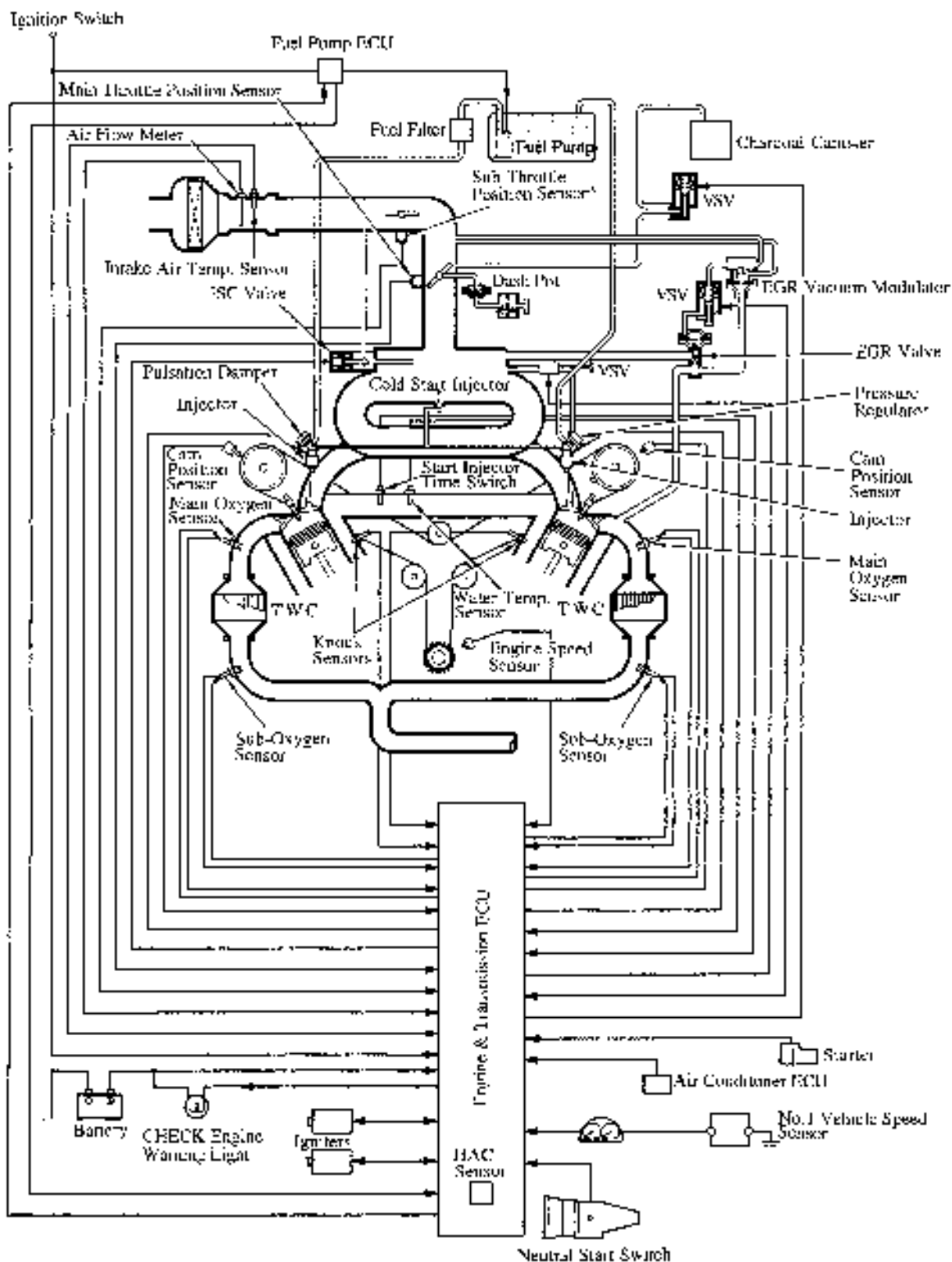
4. Engine Control System Diagram

For U.S.A. Specifications



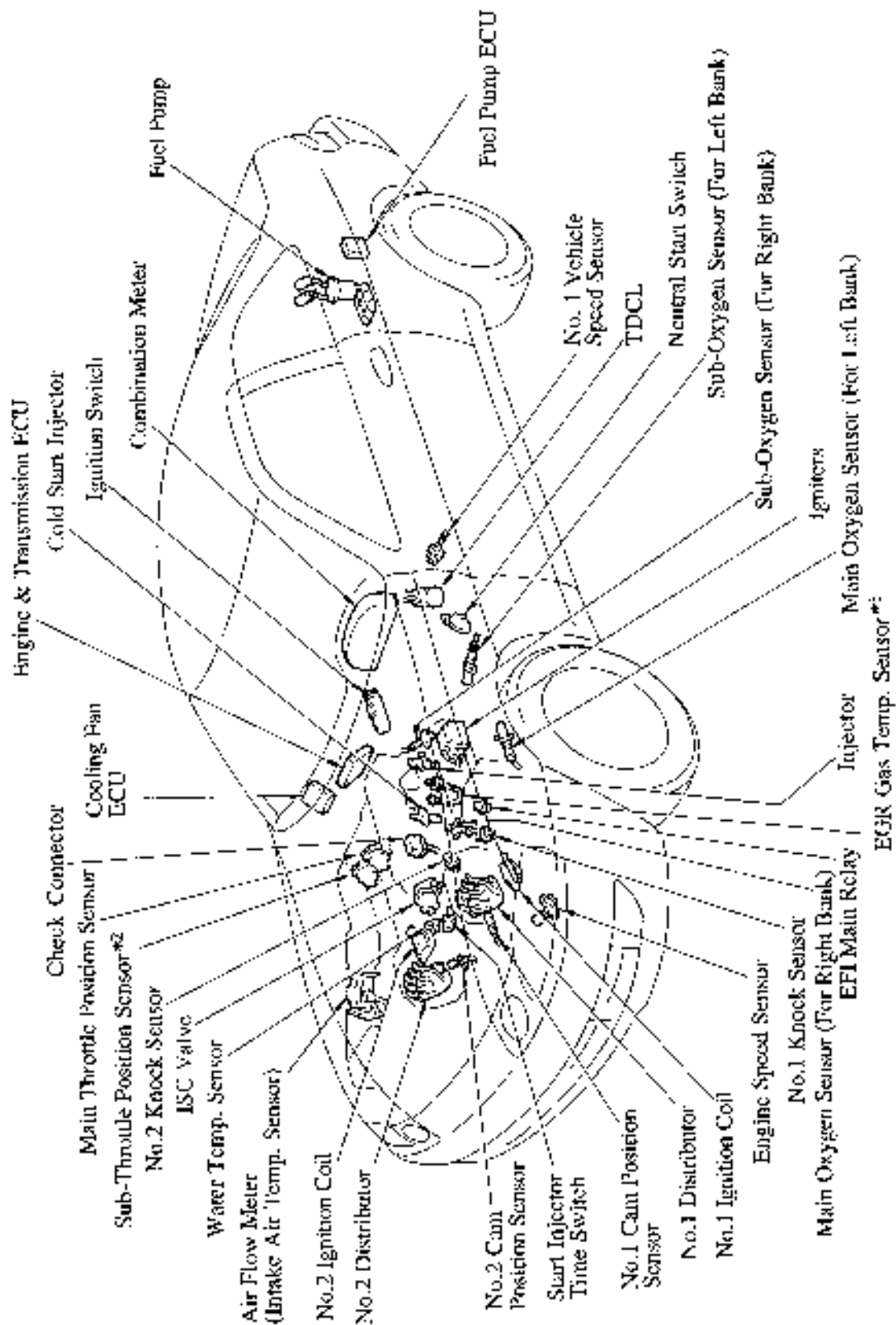
* Applicable only to vehicles equipped with the optional TRAC (Traction Control) system.

For U.S.A. (except for California) and Canadian Specifications



* Applicable only to vehicles equipped with the optional TRAC system.

5. Layout of Components



*1 Applicable only to U.S.A. Specifications.

*2 Applicable only to vehicles equipped with the optional TRAC system.

6. EGR Control

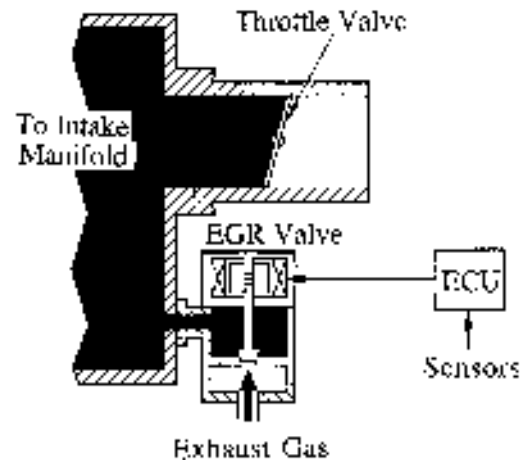
The EGR system used in the 1UZ-FE engine in SC400 U.S.A. (except for California) and Canadian Specifications is the same as the system in the LS400, but a new system has been adopted for U.S.A. Specifications.

The EGR control system used in U.S.A. Specifications is described here.

General

This system consists of an EGR valve and an ECU.

There is no EGR vacuum modulator or VSV as in the LS400's 1UZ-FE engine. In addition, the valve drive method for the EGR valve has been changed to a step motor controlled by an ECU. This provides more precise EGR volume control and improves drivability.



Operation

The basic operation theory of this EGR valve is the same as that used for the step motor type ISC (Idle Speed Control) valve used in the 1UZ-FE engine in the LS400. The EGR valve has 60 possible positions. The ECU drives the step motor within this range, controlling the opening angle of the valve and adjusting the EGR volume in accordance with the engine's condition. As in the LS400, an EGR cut-off function is included. With this function, the EGR valve is fully closed when the engine is cold, etc.

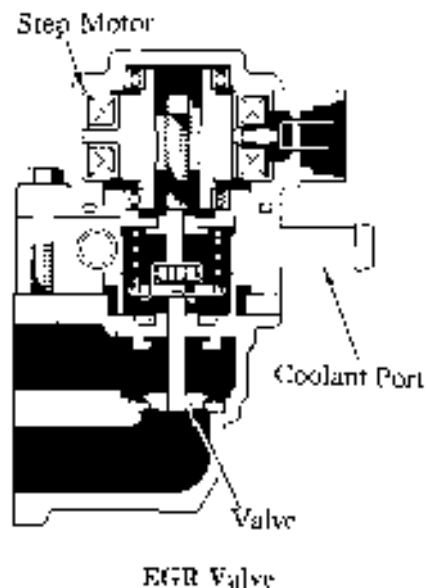
This system also outputs diagnostic code No. 71 when trouble occurs in the step motor system. For details, see page 68.

1) Initial Set-Up

When the engine is stopped, the EGR valve is fully closed to improve startability at the time the engine is restarted.

RELEVANT SIGNALS

- Engine speed (NE)



NOTE: As with the ISC system, the EGR valve operation is powered from the EFI main relay. For this reason, the ECU keeps the relay on until initial set-up is completed, even after the ignition switch is turned off.

2) EGR Cut-Off Control

If any of the following conditions exists after the engine is started, the EGR valve is closed fully to cut-off EGR and improve drivability and idle stability.

- The coolant temperature is approx. 50°C (122°F) or lower.
- During idling.
- During deceleration (throttle valve closed).
- The engine is racing (neutral start switch turned on).
- The engine speed is 1000 rpm or less, or 4000 rpm or greater.
- The engine load is small or heavy.

RELEVANT SIGNALS

- Coolant temperature (THW)
- Throttle position (IDL₁, V_{TA})
- Engine speed (NE)
- Neutral start switch (NSW)
- Intake air volume (K_S)

3) EGR Control

As with the ESA system, the ECU has a data sheet stored in its memory for calculation of control values based on the engine speed and the intake air volume per engine revolution. After the engine is started, except during EGR cut-off control, the valve opening angle (number of steps) is calculated in accordance with this data chart. This value is also corrected in accordance with the throttle valve opening angle and the atmospheric pressure.

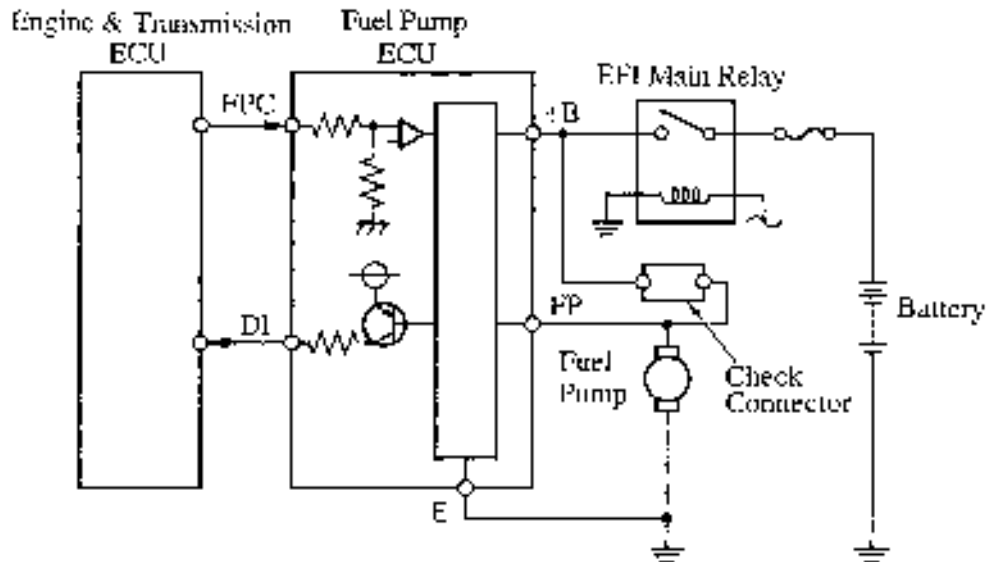
RELEVANT SIGNALS

- Engine speed (NE)
- Intake air volume (K_S)
- Throttle position (V_{TA})
- High altitude compensation (HAC)

7. Fuel Pump Control

As in the LS400, this system switches fuel pump speed between high and low speed according to engine conditions, reducing the electrical load. However, in the SC400, the fuel pump speed switching component has been changed from the fuel pump control relay and resistor of the LS400 to the fuel pump ECU.

The fuel pump ECU is wired as shown in the following diagram. Signals from this ECU are used to switch the fuel pump speed back and forth between 2 steps. In addition, the fuel pump ECU is equipped with a fuel pump system diagnosis function. When trouble is detected, signals are sent from the DI terminal to the ECU. For details, see page 68. Fuel pump speed switching conditions are basically the same as in the LS400.



8. Oxygen Sensor Heater Control

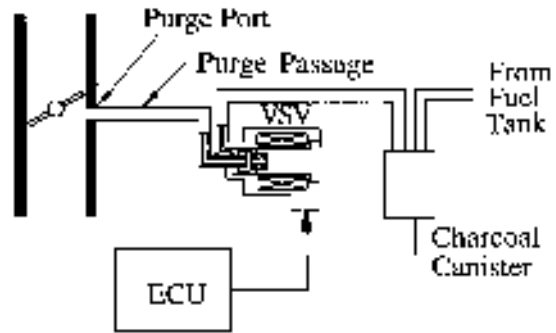
In the 1UZ-FE engine in the SC400, the sub-oxygen sensor is equipped with a heater just as the main oxygen sensor is. Furthermore, the ECU controls the main and sub-oxygen sensors independently of each other, with control conditions being the same for both the main and sub sensors.

CONDITION

When the engine load is small and the exhaust gas temperature is low.

9. Evaporative Emission Control

This system is one of the emission control systems. In the LS400's 1UZ-FE engine, evaporative emissions in the charcoal canister are controlled using a BVS (Bimetal Vacuum Switching Valve) and VCV (Vacuum Switching Valve), but in the SC400, a duty control type VSV (Vacuum Switching Valve) and ECU are used for control.



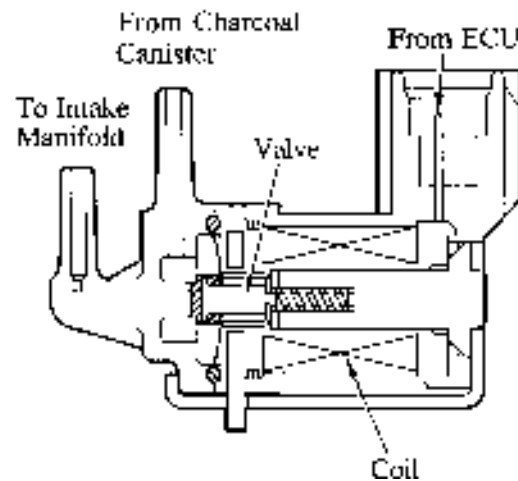
Construction and Operation

1) Construction

a. VSV

As shown in the illustration at right, the VSV in this system consists of a coil and a valve. When current flows to the coil, the valve is attracted, so the air passage is opened. When the flow of current to the coil is cut off, the valve is closed. This action of turning the coil on and off is carried out at high speeds. By changing the duty ratio* of the on and off cycle, the amount the valve is open is adjusted, thus changing the amount of air that passes through.

*Duty Ratio: See page 52



2) Operation

The purge port installed downstream of the throttle valve leads via the VSV into the charcoal canister. When driving under a light load, etc., if the engine operating condition reaches predetermined parameters, the ECU sends current to the VSV and the valve opens, thus purging the evaporative emissions.

RELEVANT SIGNALS

- Throttle position (IDL₁)
- Engine speed (NE)
- Air flow meter (K_S)
- Coolant temperature (THW)
- Intake air temperature (THA)
- High altitude compensator (HAC)

10. Diagnosis

The diagnostic system in the 1UZ-FE engine for SC400 monitors twenty-four conditions (twenty-five for U.S.A. Specifications) in the chart below. The purpose of this system is the same as for the LS400, but diagnostic items have been changed to match the SC400.

Diagnostic Items

Code No.	Item	“CHECK” Engine Warning Light* ¹		Diagnosis	Memory * ²
		Normal Mode	Test Mode		
12	RPM Signal	ON	N.A.	No “NE” or “G1” and “G2” signal to ECU within 2 sec. after cranking.	○
13	RPM Signal	ON	N.A.	No NE signal to ECU for 50 msec. or more at 1000 rpm or more.	○
		N.A.	ON	No 12 pulses of NE to ECU during the interval between G1 and G2 pulses.	
		ON	N.A.	Deviation in G (G1, G2) and NE signal continues for 1 sec. during idling (throttle fully closed) after engine warmed up.	
14	No. 1 Ignition Signal	ON	N.A.	No IGF1 signal to ECU for 8–11 consecutive IGT1 signals.	○
15	No. 2 Ignition Signal	ON	N.A.	No IGF2 signal to ECU for 8–11 consecutive IGT2 signals.	○
16	ECT Control Signal	ON	N.A.	Fault in communications between the engine CPU and ECT CPU in the ECU.	×
21	Main Oxygen Sensor Signal (on left bank)	ON	N.A.	(1) Open or short in heater circuit of main oxygen sensor for 0.5 sec. or more.	○
		ON	ON	(2) Main oxygen sensor signal voltage is reduced to between 0.35 V and 0.70V for 60 sec. under conditions (a)–(b). (2 trip detection logic)* ⁴ (a) Coolant temp. : Between 70°C and 95°C (158°F and 203°F). (b) Engine speed : 1500 rpm or more (c) Load driving (E.g. ECT in 4th speed, A/C ON, Flat road, 80 km/h [50 mph]) (d) Main oxygen sensor signal voltage : Alternating above and below 0.45V.	
22	Water Temp. Sensor Signal	ON	ON	Open or short in water temp. sensor circuit for 0.5 sec. or more.	○
24	Intake Air Temp. Sensor Signal	ON	ON	Open or short in intake air temp. sensor circuit for 0.5 sec. or more.	○

Code No.	Item	“CHECK” Engine Warning Light* ¹		Diagnosis	Memory * ²
		Normal Mode	Test Mode		
25 • 26	Air-Fuel Ratio Malfunction	ON	ON	<p>(1) Main oxygen sensor signal voltage is 0.45V or less (lean) for 90 sec. under conditions (a) and (b). (2 trip detection logic)*⁴</p> <p>(a) Coolant temp. : 60°C (140°F) or more. (b) Engine speed : 1500 rpm or more.</p> <p>(2) *²Main oxygen sensor voltage is alternating above and below 0.45V at 5Hz or more under conditions (a) and (b). (2 trip detection logic)*⁴</p> <p>(a) Engine speed : Idling (b) Coolant temp. : Between 60°C and 95°C (140°F and 203°F).</p> <p>(3) *³Difference of air-fuel ratio feedback compensation valve between right and left banks is more than 10 percent for 30 sec. or more. (2 trip detection logic)*⁴</p> <p>(a) Engine speed : 2000 rpm or more (b) Coolant temp. : Between 60°C and 95°C (140°F and 203°F).</p>	○
27	Sub-Oxygen Sensor Signal (on left bank)	ON	N.A.	(1) Open or short in heater circuit of sub-oxygen sensor for 0.5 sec. or more.	○
		ON	ON	<p>(2) Main oxygen sensor signal is 0.45V or more and sub-oxygen sensor signal is 0.45V or less under conditions (a) and (b). (2 trip detection logic)*⁴</p> <p>(a) Coolant temp. : 80°C (176°F) or more. (b) Accel pedal : Fully depressed for 2 sec. or more.</p>	
28	Main Oxygen Sensor Signal (on right bank)	ON	N.A.	Same as (1) of Code No. 21	○
		ON	ON	Same as (2) of Code No. 21	
29	Sub-Oxygen Sensor Signal (on right bank)	ON	N.A.	Same as (1) of Code No. 27	○
		ON	ON	Same as (2) of Code No. 27	
31	Air Flow Meter Signal	ON	N.A.	<p>All conditions below are detected.</p> <p>(a) No air flow meter signal to ECU for 2 sec. when engine speed is above 300 rpm. (b) Engine stall.</p>	○
35	HAC Sensor Signal	ON	ON	Open or short in HAC sensor circuit for 0.5 sec. or more.	○
41	Throttle Position Sensor Signal	ON	ON	<p>(a) or (b) is detected continuously for 0.5 sec. or more.</p> <p>(a) Open or short circuit in throttle position sensor circuit (VTA1). (b) VTA1 exceeds 4.9V.</p>	○
42	Vehicle Speed Sensor Signal	ON	ON	<p>All conditions below are detected continuously for 8 sec. or more.</p> <p>(a) Vehicle speed signal : 0 pulses. (b) Engine speed : 1500 rpm or more. (c) Neutral start switch (NSW) : OFF.</p>	○
43	Starter Signal	N.A.	OFF	No starter signal to ECU.	X

Code No.	Item	“CHECK” Engine Warning Light*1		Diagnosis	Memory *2
		Normal Mode	Test Mode		
47	Sub-Throttle Position Sensor Signal	OFF	ON	(a) or (b) is detected continuously for 0.5 sec. or more. (a) Open or short in throttle position sensor circuit (VTA2). (b) VTA2 exceeds 4.9V.	○
52	No. 1 Knock Sensor Signal	ON	N.A.	No No. 1 knock sensor signal to ECU for 3 crank revolutions with engine speed between 1600 rpm ~ 5200 rpm.	○
53	Knock Control Signal	ON	N.A.	Engine control computer (for knock control) malfunction at engine speed between 650 rpm and 5200 rpm.	X
55	No. 2 Knock Sensor Signal	ON	N.A.	No No. 2 knock sensor signal to ECU for 3 crank revolutions with engine speed between 1600 rpm ~ 5200 rpm.	○
71*3	EGR System Malfunction	ON	N.A.	Open or short in EGR step motor circuit continues for 1 sec. or longer.	○
		ON	ON	EGR gas temp. is 65°C (149°F) or below for 1 ~ 4 min. under conditions (a) and (b). (2 trip detection logic)*4 (a) Coolant temp. : 65°C (149°F) or more. (b) EGR operation possible (E.g. ECT in 3rd speed, A/C ON, 100km/h [60 mph], Flat road).	
78	Fuel Pump Control Signal	OFF	OFF	Detected if even one of following conditions is met (2 trip detection logic)*4 (a) Open or short in fuel pump drive circuit continues for 1 sec. or longer. (b) Open or short in fuel pump ECU (FPC) input circuit. (c) Open or short in diagnosis signal line (DI) of fuel pump ECU at an engine speed of 1000 rpm or lower.	○
51	Switch Condition Signal	N.A.	OFF	(1) Idle switch OFF (IDL1). (2) Neutral start switch OFF (NSW). (Shift position in “R”, “D”, “2”, or “1” ranges). (3) A/C switch ON.	X

*1: “ON” displayed in the diagnosis mode column indicates that the “CHECK” Engine Warning Light is lighted up when a malfunction is detected. “OFF” indicates that the “CHECK” does not light up during malfunction diagnosis, even if a malfunction is detected. “N.A.” indicates that the item is not included in malfunction diagnosis.

*2: “○” in the memory column mark indicates that a diagnostic code is recorded in the ECU memory when a malfunction occurs. “X” indicates that a diagnostic code is not recorded in the ECU memory even if a malfunction occurs. Accordingly, output of diagnostic results in normal or test mode is performed with the IG switch ON.

*3: Only for U.S.A. Specifications.

*4: This indicates items for which “2 trip detection logic” is used. With this logic, when a logic malfunction is first detected, the malfunction is temporarily stored in the ECU memory. If the same case is detected again during the second drive test, this second detection causes the “CHECK” Engine Warning Light to light up.

The 2 trip repeats the same mode a 2nd time. (However, the IG switch must be turned OFF between the 1st trip and 2nd trip).

In the Test Mode, the “CHECK” Engine Warning Light lights up the first trip a malfunction is detected.

■ EMISSION CONTROL SYSTEM

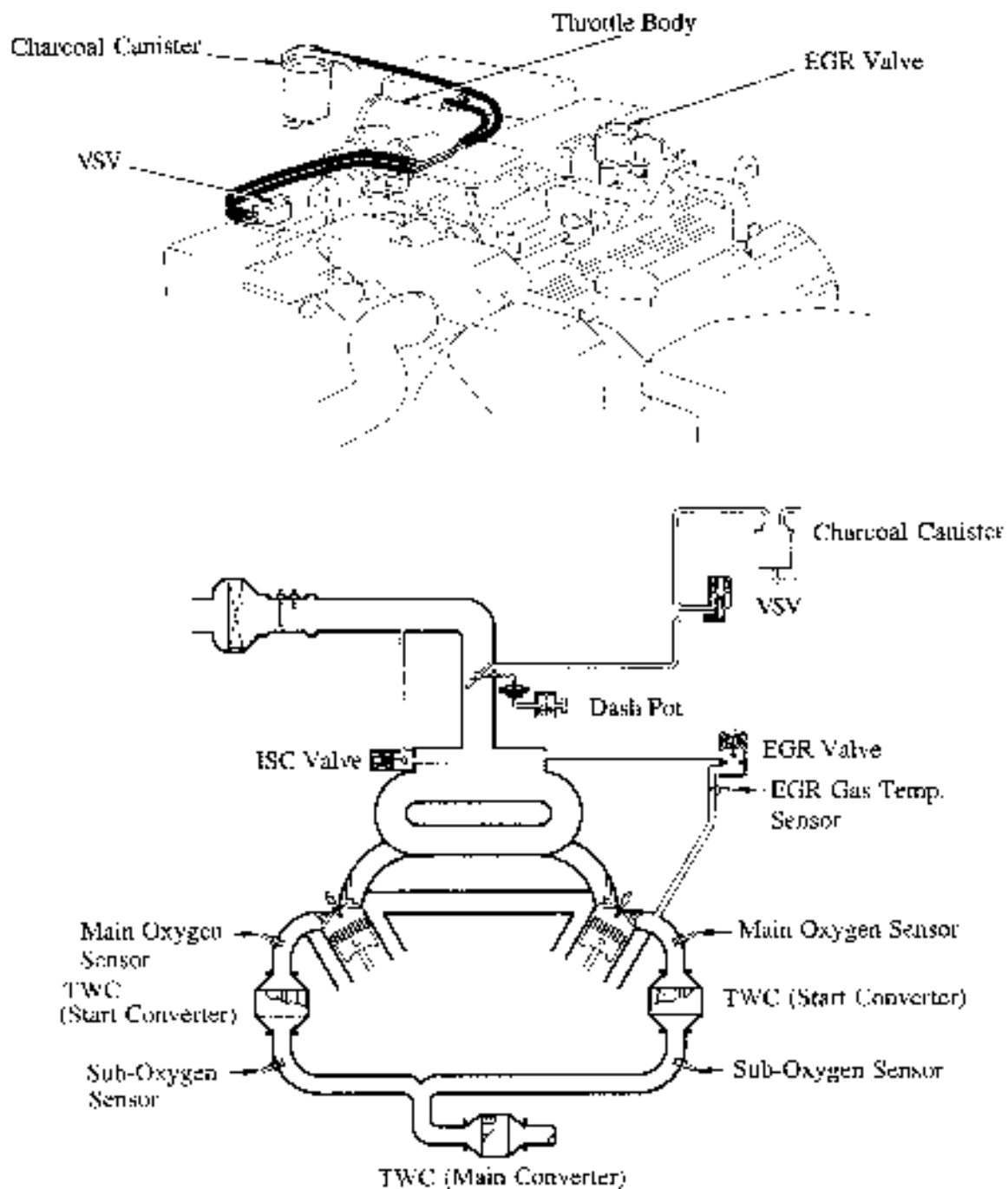
1. General

The emission control system in the SC400 is basically the same as in the LS400, but the EVAP (Evaporative emission control), and the EGR (Exhaust Gas Recirculation) system in models for U.S.A. Specifications are different.

For details, see page 62, 63 and 65.

2. Component Layout and Schematic Drawing

For U.S.A. Specifications



For U.S.A. (except for California) and Canadian Specifications

