

## 1FZ-FE ENGINE

### ■ DESCRIPTION

The 1FZ-FE engine in the '95 Land Cruiser is an in-line 6-cylinder, 4.5-liter, 24-valve DOHC engine.

Its construction and operation remain basically the same as those of the '94 models. However, in addition to having its diagnosis system changed in order to conform to the OBD-II requirements, its engine control system and emission control system have been modified.

### ■ MAJOR DIFFERENCES

System	Features
Cooling System	<ul style="list-style-type: none"> <li>• An aluminum radiator core is used for weight reduction.</li> <li>• A linear control type temperature-controlled fluid coupling is used. For details, see page 29.</li> </ul>
Engine Control System	<ul style="list-style-type: none"> <li>• The hot-wire type mass air flow meter improves the accuracy of the intake air volume measurement.</li> <li>• The diagnosis system conforms to OBD-II.</li> </ul>
Emission Control System	<ul style="list-style-type: none"> <li>• The PAIR* [AS] System has been discontinued.</li> <li>• The VSV (Vacuum Switching Valve) for evaporative emission control system has been discontinued.</li> </ul>

\*: PAIR (Pulsed Secondary Air Injection)

## ENGINE CONTROL SYSTEM

### 1. General

The engine control system of the new 1FZ-FE engine is basically the same in construction and operation as that of the previous 1FZ-FE engine. However, the new 1FZ-FE engine uses a hot-wire type mass air flow meter and a diagnosis system which conforms to OBD-II. In addition, the ECM\*<sup>1</sup> [engine ECU] and the TCM\*<sup>2</sup> [transmission ECU] which were separate in the previous model have been integrated into one.

The engine control systems of the new 1FZ-FE engine and previous 1FZ-FE engine are compared below.

System	Outline	New	Previous
SFI (Sequential Multi- port Fuel Injection) [EFI]	An L-type SFI [EFI] system directly detects the intake air volume with a hot-wire type mass air flow meter.	○	—
	An L-type SFI [EFI] system directly detects the intake air volume with a vane type volume air flow meter.	—	○
	The fuel injection system is a sequential multiport fuel injection system.	○	○
ESA (Electronic Spark Advance)	Ignition timing is determined by the ECM* <sup>1</sup> [engine ECU] based on signals from various sensors. Corrects ignition timing in response to engine knocking.	○	○
	Torque control correction during gear shifting has been used to minimize the shift shock.	○	○
	2 knock sensors are used to further improve knock detection.	○	○
IAC (Idle Air Control) [ISC]	A step motor type IAC [ISC] system controls the fast idle and idle speeds.	○	○
Fuel Pump Control	The ECM* <sup>1</sup> [engine ECU] controls the operation of the fuel pump based on the engine speed signal.	○	—
Fuel Pump Speed Control	Under light engine loads the pump speed is reduced to increase pump durability.	○	○
Fuel Pressure Control	In hot engine conditions, the fuel pressure is increased to improve restartability.	○	○
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.	○	○
EGR Cut-Off Control	The EGR is cut off under light engine loads or low temperature conditions to maintain drivability.	○	○
PAIR (Pulsed Secondary Air Injection) [AS] Control	The ECM* <sup>1</sup> [engine ECU] controls pulsed secondary air injection [air suction] by means of PAIR [AS] control in accordance with engine conditions to reduce exhaust emissions.	—	○


\*1: ECM (Engine Control Module)

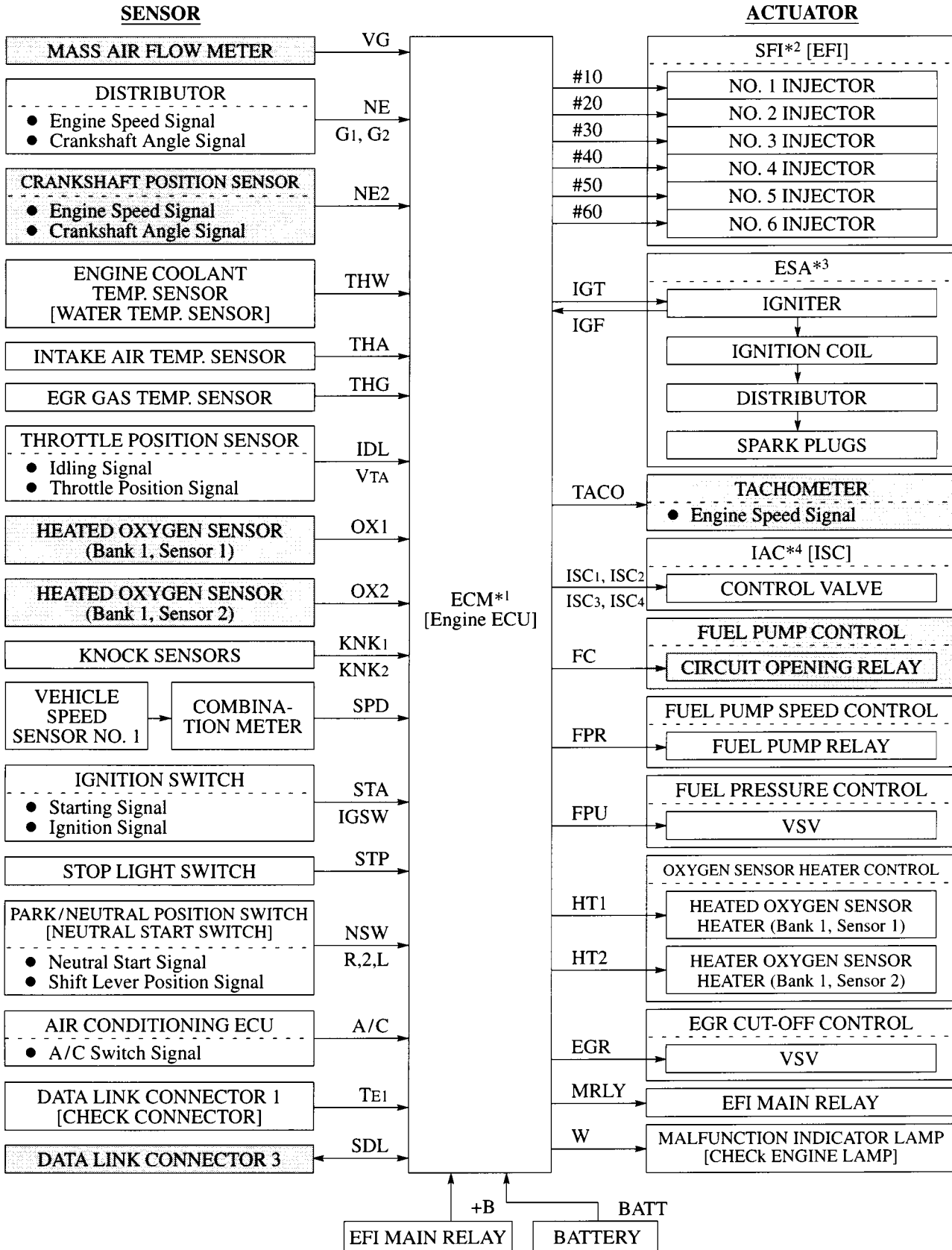
\*2: TCM (Transmission Control Module)

System	Outline	New	Previous
Evaporative Emission Control	The ECM* <sup>1</sup> [engine ECU] controls the purge flow of evaporative emissions (HC) in the charcoal canister in accordance with engine conditions.	—	○
Diagnosis	When the ECM* <sup>1</sup> [engine ECU] detects a malfunction, the ECM* <sup>1</sup> [engine ECU] diagnoses and memorizes the failed section.	○	○
	The diagnosis system complies with OBD-II. The diagnosis items (the failed sections) are discriminated by connecting the Toyota hand-held tester to the newly designed data link connector 3.	○	—
Fail-Safe	When the ECM* <sup>1</sup> [engine ECU] detects a malfunction, the ECM* <sup>1</sup> [engine ECU] stops or controls the engine according to the data already stored in memory.	○	○

\*1: ECM (Engine Control Module)

## 2. Construction

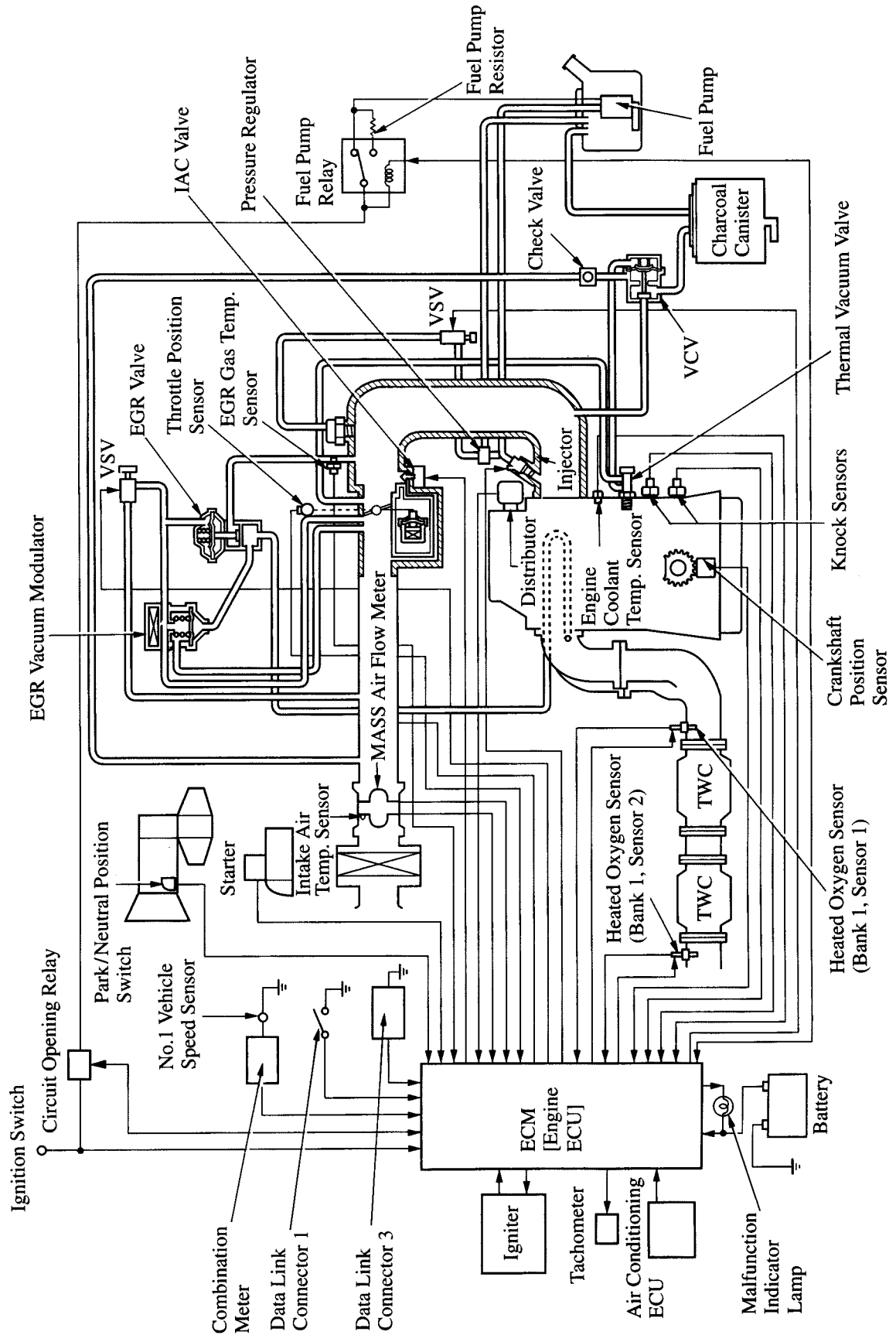
The configuration of the engine control system in the 1FZ—FE engine of the '95 Land Cruiser is as shown in the following chart. Shaded portions  differ from the 1FZ—FE engine of the previous models.



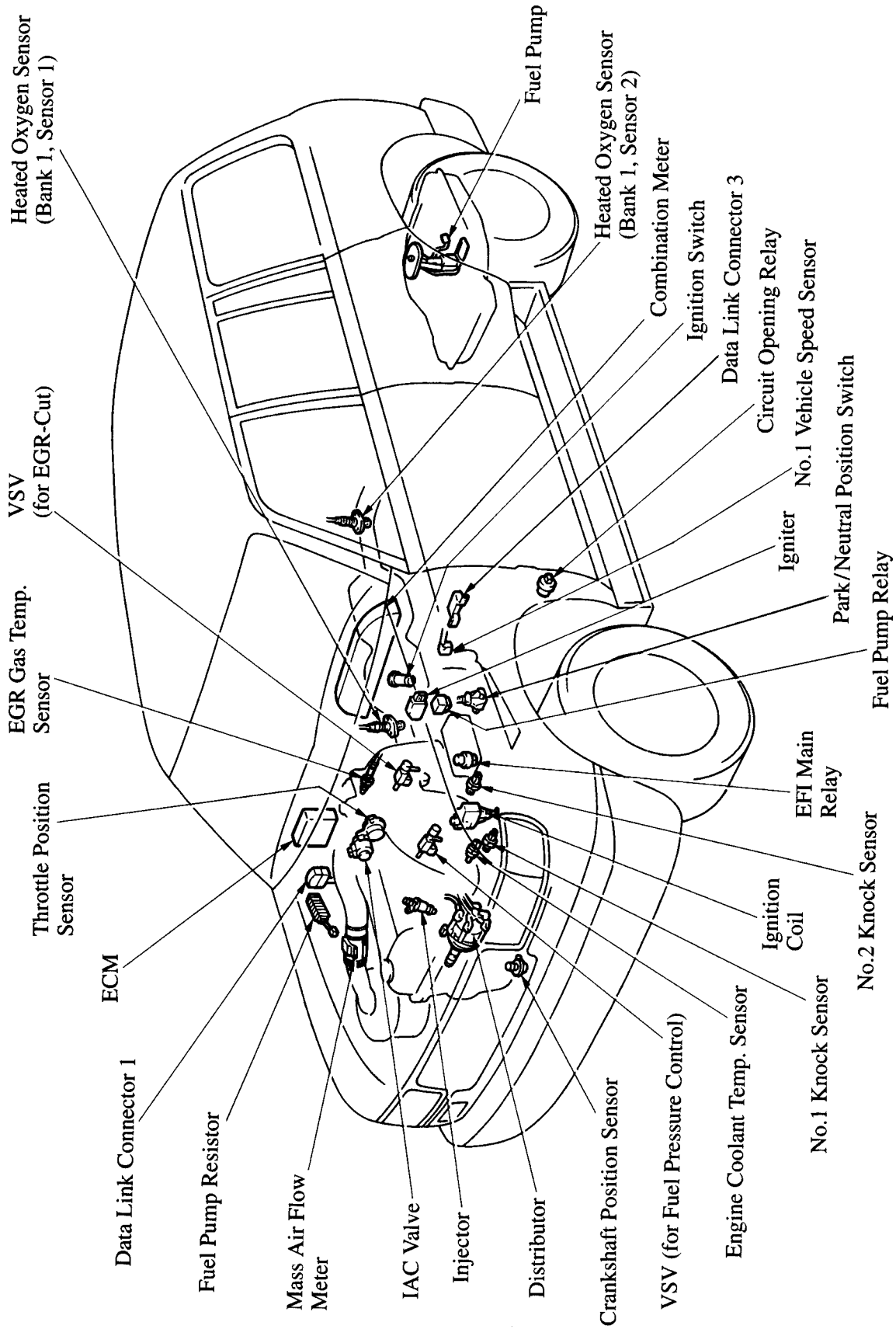
\*1: ECM (Engine Control Module)  
 \*2: SFI (Sequential Multiport Fuel Injection)

\*3: ESA (Electronic Spark Advance)  
 \*4: IAC (Idle Air Control)

### 3. Engine Control System Diagram



### 4. Layout of Components



## 5. Main Components of Engine Control System

The following table compares the main components of the new 1FZ-FE engine and previous 1FZ-FE engine.

1FZ-FE Engine		New	Previous
Component			
Mass Air Flow Meter		Hot-Wire Type	—
Volume Air Flow Meter		—	Vane Type
Distributor	Crankshaft Angle Sensor and Engine Speed Sensor	Pick-Up Coil, 3 (G <sub>1</sub> , G <sub>2</sub> and NE)	←
Crankshaft Position Sensor		Pick-Up Coil (NE2)	—
Throttle Position Sensor		Linear Type	←
Oxygen Sensor		Heated Oxygen Sensor (Bank 1, Sensor 1) (Bank 1, Sensor 2)	Main Heated Oxygen Sensors, 2
		Type	Zirconia Element Type
Knock Sensor	Type	Built-In Piezoelectric	←
	Number	2	
Fuel Injector		2-Hole Type	←
IAC [ISC] Valve		Step Motor Type	←
BARO* <sup>1</sup> [HAC] Sensor		—	Semiconductor Type (in ECM* <sup>2</sup> )

\*1: BARO (Barometric Pressure)

\*2: ECM (Engine Control Module)

### Mass Air Flow Meter

The hot-wire type mass air flow meter is designed for direct electrical measurement of the intake air mass flow. It has the following features:

- Compact and lightweight
- Ability to measure a wide intake mass air flow
- Superior response and measuring accuracy
- Having no mechanical functions, it offers superior durability.

For details of the principle and operation of the hot-wire type mass air flow meter, see the '93 1/2 Toyota Supra New Car Features (Pub. No. NCF096U), page 106.

### Crankshaft Position Sensor

The crankshaft position sensor [NE2 Signal] has been installed on the No. 1 oil pan.

The ECM\* [engine ECU] detects a misfire based on the NE2 signal received from the crankshaft position sensor. For basic operation of the crankshaft position sensor, see '94 Model New Car Features (Pub. No. NCF099U), page 58.

\*: ECM (Engine Control Module)

## 6. SFI (Sequential Multiport Fuel Injection) [EFI]

The SFI [EFI] system of the 1FZ-FE engine of the '95 Land Cruiser is basically the same as that of the '94 model. However, a hot-wire mass air flow meter is used to measure the intake air mass flow more accurately, and a heated oxygen sensor is provided at the entrance and exit (Bank 1, Sensor 1 and Bank 1, Sensor 2) of the three-way catalytic converters, improving the accuracy of the air-fuel ratio feedback correction.

## 7. Diagnosis

The diagnosis system of the 1FZ-FE engine of the '95 Land Cruiser complies with OBD-II. For OBD-II requirements, see '94 Toyota Model New Car Features (Pub. No. NCF099U), page 2.

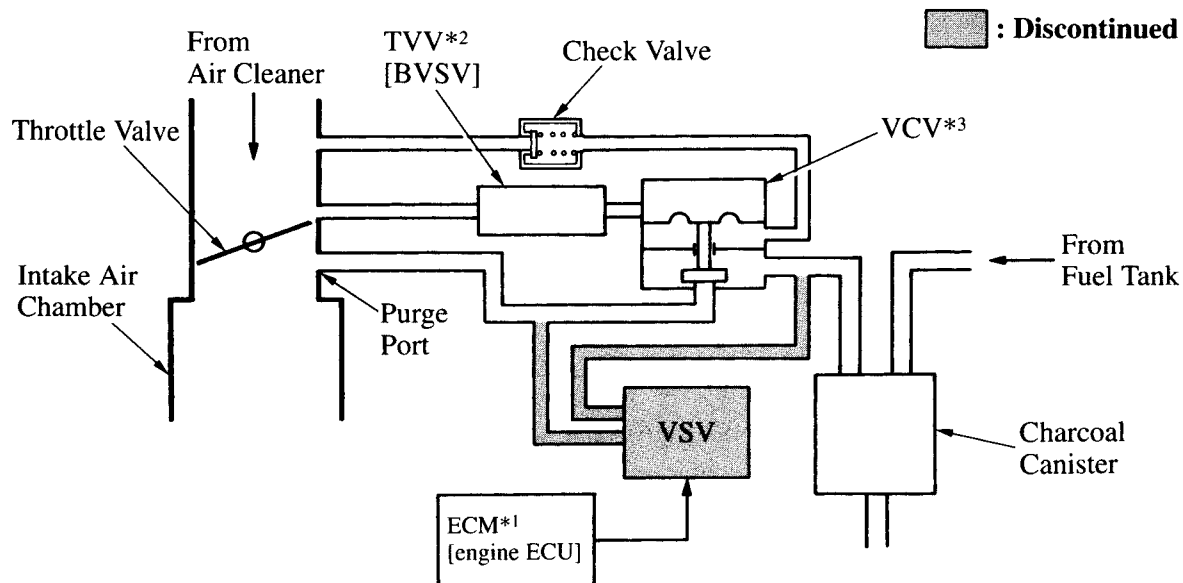
For details of the following items, refer to the '95 Land Cruiser Repair Manual (Pub. No. RM432U).

Item	Contents
Data Link Connector	Data Link Connector 3 added for OBD-II.
Diagnostic Trouble Code Check Method	Perform by connecting the Toyota hand-held tester to Data Link Connector 3.
Diagnostic Trouble Code	—
ECM* <sup>1</sup> [Engine ECU] Memory Items	Freezed frame data added.

## ■ EMISSION CONTROL SYSTEM

### 1. General

- The 2 three-way catalytic converters that were parallel to each other on the previous model are now in series.
- The PAIR (Pulsed Secondary Air Injection) [AS] system has been discontinued.
- The VSV (Vacuum Switching Valve) of the evaporative emission control system has been discontinued.



\*1: ECM (Engine Control Module)

\*2: TVV (Thermal Vacuum Valve)

\*3: VCV (Vacuum Control Valve)