

## System Outline

The engine control system utilizes a microcomputer and maintains overall control of the engine, transmission etc. An outline of the engine control is given here.

### 1. Input Signals

- (1) Water temp. signal circuit  
The water temp. sensor detects the engine coolant temp. and has a built-in thermistor with a resistance, which varies according to the engine coolant temp.. The engine coolant temp. which is input into TERMINAL THW of the engine and ECT ECU (A/T) or engine ECU (M/T) as a control signal.
- (2) Intake air temp. signal circuit  
The intake air temp. sensor is installed in the air flow meter and detects the intake air temp. which is input as a control signal to TERMINAL THA of the engine and ECT ECU (A/T) or engine ECU (M/T).
- (3) Oxygen density signal circuit  
The oxygen density in the exhaust emission is detected by the heated oxygen sensors and input as a control signal to TERMINALS OX1B and OX2B of the engine and ECT ECU (A/T) or engine ECU (M/T).
- (4) RPM signal circuit  
Camshaft position and crankshaft position are detected by the camshaft position sensor and crankshaft position sensor. Camshaft position is input as a control signal to TERMINAL G22+ of the engine and ECT ECU (A/T) or engine ECU (M/T), and engine RPM is input into TERMINAL NE+.
- (5) Throttle position signal circuit  
The throttle position sensor detects the throttle valve opening angle as a control signal, which is input into TERMINAL VTA of the engine and ECT ECU (A/T) or engine ECU (M/T).
- (6) Vehicle speed circuit  
The speed sensor detects the vehicle speed and inputs a control signal to TERMINAL SPD of the engine and ECT ECU (A/T) or engine ECU (M/T).
- (7) Battery signal circuit  
Voltage is constantly applied to TERMINAL BATT of the engine and ECT ECU (A/T) or engine ECU (M/T). With the ignition SW turned on, the voltage for engine and ECT ECU (A/T) or engine ECU (M/T) start-up power supply is applied to TERMINAL +B of the engine and ECT ECU (A/T) or engine ECU (M/T) via the EFI relay.
- (8) A/C SW signal circuit  
The A/C amplifier inputs the A/C operations into TERMINAL AC1 of the engine and ECT ECU (A/T) or engine ECU (M/T).
- (9) Stop light SW signal circuit  
The stop light SW is used to detect whether the vehicle is braking or not and the signal is input into TERMINAL STP of the engine and ECT ECU (A/T) or engine ECU (M/T) as a control signal.
- (10) Starter signal circuit  
To confirm whether the engine is cranking, the voltage is applied to the starter motor during cranking is detected and the signal is input into TERMINAL STA of the engine and ECT ECU (A/T) or engine ECU (M/T) as a control signal.
- (11) Engine knock signal circuit  
Engine knocking is detected by knock sensor and the signal is input into TERMINAL KNK1 as a control signal.
- (12) Air fuel ratio signal system  
The air fuel ratio is detected and input as a control signal into TERMINALS AF1A+, AF2A+ of the engine and ECT ECU (A/T) or engine ECU (M/T).
- (13) Fuel cut in a collision  
The system receives the collision signal from airbag sensor assembly in the vehicle has a collision and stops the fuel pump operation on the side of the engine and ECT ECU (A/T) or engine ECU (M/T).

### 2. Control System

#### \* EFI system

The EFI system monitors the engine condition through the signals input from each sensor (Input signals from (1) to (12) etc.) to the engine and ECT ECU (A/T) or engine ECU (M/T). And the control signal is output to TERMINALS #10, #20, #30, #40 of the engine and ECT ECU (A/T) or engine ECU (M/T) to operate the injector (Inject the fuel). The EFI system controls the fuel injection operation by the engine and ECT ECU (A/T) or engine ECU (M/T) in response to the driving conditions.

#### \* ESA system

The ESA system monitors the engine condition through the signals input to the engine and ECT ECU (A/T) or engine ECU (M/T) from each sensor (Input signals from (1) to (12) etc.). The best ignition timing is decided according to this data and the memorized data in the engine and ECT ECU (A/T) or engine ECU (M/T) and the control signal is output to TERMINALS IGT1, IGT2, IGT3 and IGT4. This signal controls the igniter to provide the best ignition timing for the driving conditions.

#### \* Heated oxygen sensor heater control system

The heated oxygen sensor heater control system turns the heater on when the intake air volume is low (Temp. of exhaust emissions is low), and warms up the oxygen sensors to improve detection performance of the sensors. The engine and ECT ECU (A/T) or engine ECU (M/T) evaluates the signals from each sensor, and outputs current to TERMINALS HT1B and HT2B to control the heater.

#### \* ISC system

The ISC system (Rotary solenoid type) increases the RPM and provides idling stability for fast idle-up when the engine is cold and when the idle speed has dropped due to electrical load, etc. The engine and ECT ECU (A/T) or engine ECU (M/T) evaluates the signals from each sensor (Input signals (1), (4) to (6), (8) and (11) etc.), outputs current to TERMINAL RSD, and controls the ISC valve.

### 3. Diagnosis System

With the diagnosis system, when there is a malfunction in the engine and ECT ECU (A/T) or engine ECU (M/T) signal system, the malfunctioning system is recorded in the memory. The malfunctioning system can be found by reading the code displayed by the check engine warning light.

### 4. Fail-safe System

When a malfunction has occurred in any system, if there is a possibility of engine trouble being caused by continued control based on the signals from that system, the fail-safe system either controls the system by using data (Standard values) recorded in the engine and ECT ECU (A/T) or engine ECU (M/T) memory or else stops the engine.

## Service Hints

### EFI Relay

5-3 : Closed with the ignition SW at **ON** or **ST** position

### E7 (A), E8 (B), E9 (C), E10 (D), E11 (E) Engine and ECT ECU (A/T) or Engine ECU (M/T)

Voltage at engine and ECT ECU (A/T) or engine ECU (M/T) wiring connector

BATT-E1 : Always **9.0-14.0** volts

+B-E1 : **9.0-14.0** volts (Ignition SW at **ON** position)

VC-E2 : **4.5-5.5** volts (Ignition SW at **ON** position)

VTA-E2 : **0.3-1.0** volts (Ignition SW on and throttle valve fully closed)

**3.2-4.9** volts (Ignition SW on and throttle valve fully open)

VG-E2G : **1.1-1.5** volts (Engine idling and A/C SW off)

THA-E2 : **0.5-3.4** volts (Engine idling and intake air temp. **20°C, 68°F**)

THW-E2 : **0.2-1.0** volts (Engine idling and coolant temp. **80°C, 176°F**)

IGF-E1 : **4.5-5.5** volts (Ignition SW at **ON** position)

Pulse generation (Engine idling)

SIL-E1 : Pulse generation (During transmission)

TACH-E1 : Pulse generation (Engine idling)

STA-E1 : **6.0** volts or more (Engine cranking)

FC-E01 : **9.0-14.0** volts (Ignition SW at **ON** position)

**0-3.0** volts (Engine idling)

SPD-E1 : Pulse generation (Ignition SW on and rotate driving wheel slowly)

W-E01 : Below **3.0** volts (Ignition SW at **ON** position)

NSW-E1 : **9.0-14.0** volts (Ignition SW on and other shift position in **P** or **N** position)

**0-3.0** volts (Ignition SW on and shift position in **P** or **N** position)

STP-E1 : **7.5-14.0** volts (Ignition SW on and brake pedal depressed)

Below **1.5** volts (Ignition SW on and brake pedal released)

KNK1-E1 : Pulse generation (Engine idling)

PSW-E1 : **9.0-14.0** volts (Ignition SW at **ON** position)

HAF1A-E04 : Below **4.0** volts (Engine idling)

**9.0-14.0** volts (Ignition SW at **ON** position)

HAF2A-E05 : Below **4.0** volts (Engine idling)

**9.0-14.0** volts (Ignition SW at **ON** position)

IGSW-E1 : **9.0-14.0** volts (Ignition SW at **ON** position)

MREL-E1 : **9.0-14.0** volts (Ignition SW at **ON** position)

G22+, NE+ -NE- : Pulse generation (Engine idling)

OCV+ -OCV- : Pulse generation (Ignition SW at **ON** position)

HT1B, HT2B-E1 : **9.0-14.0** volts (Engine idling)

Below **3.0** volts (Ignition SW at **ON** position)

AF1A+, AF2A+ -E1 : **3.3** volts (Ignition SW at **ON** position)

AF1A-, AF2A- -E1 : **3.0** volts (Ignition SW at **ON** position)

OX1B, OX2B-E1 : Pulse generation (Maintain engine speed at **2500** rpm for 90 sec. after warming up)

IGT1, IGT2, IGT3, IGT4-E1 : Pulse generation (Engine idling)

#10, #20, #30, #40-E01 : **9.0-14.0** volts (Ignition SW at **ON** position)

Pulse generation (Engine idling)

# Engine Control (LHD 1AZ-FE)

## : Parts Location

Code	See Page	Code	See Page	Code	See Page
A2	32 (LHD 1AZ-FE)	F19	37 (LHD)	J23	A 38 (LHD)
A3	32 (LHD 1AZ-FE)	H9	33 (LHD 1AZ-FE)	J24	B 38 (LHD)
A4	32 (LHD 1AZ-FE)	H10	33 (LHD 1AZ-FE)	J32	40 (LHD)
A5	32 (LHD 1AZ-FE)	I5	33 (LHD 1AZ-FE)	K1	33 (LHD 1AZ-FE)
C1	32 (LHD 1AZ-FE)	I6	33 (LHD 1AZ-FE)	P1	33 (LHD 1AZ-FE)
C2	32 (LHD 1AZ-FE)	I7	33 (LHD 1AZ-FE)	S16	A 39 (LHD)
C5	32 (LHD 1AZ-FE)	I8	33 (LHD 1AZ-FE)	S17	B 39 (LHD)
C7	36 (LHD)	I10	33 (LHD 1AZ-FE)	S20	A 39 (LHD)
C8	A 36 (LHD)	I11	37 (LHD)	S21	B 39 (LHD)
D6	37 (LHD)	J5	A 38 (LHD)	S38	39 (LHD)
E7	A 37 (LHD)	J6	B 38 (LHD)	S43	A 39 (LHD)
E8	B 37 (LHD)	J13	A 38 (LHD)	S44	B 39 (LHD)
E9	C 37 (LHD)	J14	B 38 (LHD)	T1	33 (LHD 1AZ-FE)
E10	D 37 (LHD)	J16	38 (LHD)	V2	33 (LHD 1AZ-FE)
E11	E 37 (LHD)	J17	38 (LHD)	W1	33 (LHD 1AZ-FE)
F18	40 (LHD)	J19	38 (LHD)		

## : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
2	22	Engine Room R/B (Front Side of Left Suspension Tower)
7	23	Engine Room R/B No.2 (Front Side of Left Suspension Tower)

## : Junction Block and Wire Harness Connector

Code	See Page	Junction Block and Wire Harness (Connector Location)
IA	24 (LHD)	Instrument Panel J/B and Instrument Panel Wire (Lower Finish Panel)
IB		
IC		
IL	25 (LHD)	Instrument Panel J/B and Engine Room Main Wire (Lower Finish Panel)
3D	28 (LHD)	Center J/B and Instrument Panel Wire (Right Side of Grove Box)
3F		
3H		
3K		

## : Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA1	52 (LHD 1AZ-FE)	Engine Wire and Engine Room Main Wire (Near The Engine Room R/B)
IC2	56 (LHD)	Instrument Panel Wire and Floor Wire (Upper Part of Front Body Pillar LH)
ID2	56 (LHD)	Instrument Panel Wire and Engine Room Main Wire (Upper Part of Front Body Pillar LH)
IE1	56 (LHD)	Engine Room Main Wire and Floor Wire (Upper Part of Front Body Pillar LH)
IL2	58 (LHD)	Engine Wire and Instrument Panel Wire (Right Kick Panel)
IL3		

## : Ground Points

Code	See Page	Ground Points Location
EA	52 (LHD 1AZ-FE)	Left Radiator Side Support
EC	52 (LHD 1AZ-FE)	Intake Side of Cylinder Block
ED	52 (LHD 1AZ-FE)	Left Side of Cylinder Block
IC	56 (LHD)	Right Kick Panel
BB	60 (LHD)	Front Side of the Left Quarter Panel
BC	60 (LHD)	Left Quarter Panel



: **Splice Points**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E2	52 (LHD 1AZ-FE)	Engine Wire	E7	52 (LHD 1AZ-FE)	Engine Room Main Wire
E3			I3	58 (LHD)	Engine Wire