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) Engine coolant temp. signal circuit

The water temp. sensor detects the engine coolant temp. and has a built–in thermister with a resistance, which varies according to the engine coolant temp.. The engine coolant temp. which is input into TERMINAL THW of the engine ECU (M/T) or engine and ECT ECU (A/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 ECU (M/T) or engine and ECT ECU (A/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 OX1A, OX2A and OX1B of the engine ECU (M/T) or engine and ECT ECU (A/T).

(4) RPM signal circuit

Camshaft position is detected by the camshaft position sensor and its signal is input to TERMINAL G2 of the engine ECU (M/T) or engine and ECT ECU (A/T) as a control signal.

Also,engine RPM is detected by the crankshaft position sensor and is input as a control signal to 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 ECU (M/T) or engine and ECT ECU (A/T).

(6) Vehicle speed circuit

The speed sensor (Combination meter) detects the vehicle speed and inputs a control signal to TERMINAL SPD of the engine ECU (M/T).

(7) Battery signal circuit

Voltage is constantly applied to TERMINAL BATT of the engine ECU (M/T) or engine and ECT ECU (A/T). With the ignition SW turned on, the voltage for engine ECU (M/T) or engine and ECT ECU (A/T) start–up power supply is applied to TERMINALS B, B2 of the engine ECU (M/T) or engine and ECT ECU (A/T) via the EFI relay.

The current flowing through the IGN fuse flows to TERMINAL IGSW of the engine ECU (M/T) or engine and ECT ECU (A/T).

Voltage is constantly applied to TERMINAL BM of the engine ECU (M/T) or engine and ECT ECU (A/T).

(8) Intake air vacuum signal circuit

Intake air vacuum is detected by the vacuum sensor and the signal is input to TERMINAL PIM of the engine ECU (M/T) or engine and ECT ECU (A/T) as a control signal.

(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 ECU (M/T) or engine and ECT ECU (A/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 ECU (M/T) or engine and ECT ECU (A/T) as a control signal.

(11) Engine knock signal circuit

Engine knocking is detected by knock sensors and the signal is input into TERMINALS KNK1 and KNK2 as a control signal.

2. CONTROL SYSTEM

* EFI system
  The EFI system monitors the engine condition through the signals input from each sensor (Input signals from (1) to (11) etc.) to the engine ECU (M/T) or engine and ECT ECU (A/T). And the control signal is output to TERMINALS #10, #20, #30, #40, #50 and #60 of the engine ECU (M/T) or engine and ECT ECU (A/T) to operate the injector (Inject the fuel). The EFI system controls the fuel injection operation by the engine ECU (M/T) or engine and ECT ECU (A/T) in response to the driving conditions.
* ESA system
  The ESA system monitors the engine condition through the signals input to the engine ECU (M/T) or engine and ECT ECU (A/T) from each sensor (Input signals from (1), (2), (4), to (11) etc.). The best ignition timing is decided according to this data and the memorized data in the engine ECU (M/T) or engine and ECT ECU (A/T) and the control signal is output to TERMINALS IGT, IGT2, IGT3, IGT4, IGT5 and IGT6. 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 ECU (M/T) or engine and ECT ECU (A/T) evaluates the signals from each sensor (Input signals from (1), (2), (4), (7), to (9) etc.), and outputs current to TERMINALS HT1A, HT2A and HT1B to control the heater.
* ACIS
  ACIS includes a valve in the bulkhead separating the surge tank into two parts. This valve is opened and closed in accordance with the driving conditions to control the intake manifold length in two stages for increased engine output in all ranges from low to high speeds.
* ETCS–i
  The ETCS–i controls the engine output at its optimal level corresponding to the opening of the accel. pedal under all driving conditions.
* MPX
  The MPX communicates with the combination meter, A/C control assembly, as well as body ECU of the multiplex communication system

3. DIAGNOSIS SYSTEM

With the diagnosis system, when there is a malfunction in the engine ECU (M/T) or engine and ECT ECU (A/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 ECU (M/T) or engine and ECT ECU (A/T) memory or else stops the engine.

SERVICE HINTS

EFI RELAY

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

E8 ENGINE OIL LEVEL SENSOR

1–2 : Closed with float up and engine oil temp. at below approx. **50**˚C
Open with float down and engine oil temp. at above approx. **60**˚C

E9 ENGINE OIL PRESSURE SW

1–GROUND : With oil pressure below approx. **0.2** kgf/cm^2 (**2.8** psi, **20** kpa)

W2 WATER TEMP. SENSOR

1–2 : Approx. **15.0** kΩ (**–20**˚C)
Approx. **2.45** kΩ (**20**˚C)
Approx. **0.32** kΩ (**80**˚C)
Approx. **0.14** kΩ (**110**˚C)

E2 (A), E3 (B), E5 (D), E6 (E) ENGINE ECU (M/T) OR ENGINE AND ECT ECU (A/T)

BATT–GROUND : Always approx. **12** volts
BM–GROUND : Always approx. **12** volts
IGSW–GROUND : Approx. **12** volts with ignition SW at **ON** or **ST** position
B, B2–GROUND : Approx. **12** volts with ignition SW at **ON** or **ST** position
VC–GROUND : **4.5**–**5.5** volts with ignition SW on
VTA2–GROUND : **2.0**–**2.9** volts with ignition SW on and throttle valve fully closed
4.6–**5.0** volts with ignition SW on and throttle valve fully opened
VTA–GROUND : **0.4**–**1.0** volts with ignition SW on and throttle valve fully closed
3.2–**4.8** volts with ignition SW on and throttle valve fully opened
VPA–GROUND : **0.25**–**0.9** volts with ignition SW at on and accelerator fully closed
3.2–**4.8** volts with ignition SW at on and accelerator fully opened
VPA2–GROUND : **1.8**–**2.7** volts with ignition SW at on and accelerator fully closed
4.7–**5.0** volts with ignition SW at on and accelerator fully opened
THA–GROUND : **0.5**–**3.4** volts with idling, intake air temp. **20**˚C
THW–GROUND : **0.2**–**1.0** volts with idling, coolant temp. **80**˚C
STA–GROUND : **6.0** volts or more with cranking
TC–GROUND : **9.0**–**14.0** volts with ignition SW on
W–GROUND : **9.0**–**14.0** volts with idling
0–**3.0** volts with ignition SW on
ACMG–GROUND : **0**–**1.5** volts with A/C SW on (at idling)
7.5–**14.0** volts with A/C SW off and throttle valve fully open
#10, #20, #30, #40, #50, #60–GROUND : **9.0**–**14.0** volts with ignition SW on pulse generation with idling

I7, I8, I9, I10, I11, I12 INJECTOR NO.1, NO.2, NO.3, NO.4, NO.5, NO.6

1–2 : **13.4**–**14.2** Ω

: PARTS LOCATION

Code	See Page	Code	See Page	Code	See Page
A9	96 (LHD)	H9	97 (LHD)	J3 B	97 (LHD)
A14 A	98 (LHD)	H10	97 (LHD)	J4	97 (LHD)
A15 B	98 (LHD)	H15	100 (LHD)	J9	99 (LHD)
A22	98 (LHD)	I1	97 (LHD)	J11	99 (LHD)
B6 A	98 (LHD)	I2	97 (LHD)	J17	100 (LHD)
C1	96 (LHD)	I3	97 (LHD)	K1	97 (LHD)
C2	96 (LHD)	I4	97 (LHD)	K2	97 (LHD)
C3	96 (LHD)	I5	97 (LHD)	N1	97 (LHD)
C4	96 (LHD)	I6	97 (LHD)	P1	97 (LHD)
C10 A	98 (LHD)	I7	97 (LHD)	S11	99 (LHD)
C11 B	98 (LHD)	I8	97 (LHD)	T1	97 (LHD)
D4	98 (LHD)	I9	97 (LHD)	T2	97 (LHD)
E2 A	96 (LHD)	I10	97 (LHD)	T7	99 (LHD)
E3 B	96 (LHD)	I11	97 (LHD)	U1	99 (LHD)
E5 D	96 (LHD)	I12	97 (LHD)	V1	97 (LHD)
E6 E	96 (LHD)	I13	97 (LHD)	V2	97 (LHD)
E8	96 (LHD)	I15	99 (LHD)	V3	97 (LHD)
E9	96 (LHD)	J1	97 (LHD)	W2	97 (LHD)
F15	100 (LHD)	J2 A	97 (LHD)		

: RELAY BLOCKS

Code	See Page	Relay Blocks (Relay Block Location)
1	80 (LHD)	Engine Room No.1 R/B (Engine Compartment Right)
2	80 (LHD)	Engine Room No.2 R/B (Engine Compartment Right)

: JUNCTION BLOCK AND WIRE HARNESS CONNECTOR

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	82 (LHD)	Instrument Panel Wire and Driver Side J/B (Left Kick Panel)
1E		
1G	82 (LHD)	Engine Room Main Wire and Driver Side J/B (Left Kick Panel)
1H	82 (LHD)	Instrument Panel Wire and Driver Side J/B (Left Kick Panel)
1I	82 (LHD)	Floor No.2 Wire and Driver Side J/B (Left Kick Panel)
1K	82 (LHD)	Engine Room Main Wire and Driver Side J/B (Left Kick Panel)
2A	84 (LHD)	Engine Room Main Wire and Passenger Side J/B (Right Kick Panel)
2B		
2D	84 (LHD)	Instrument Panel Wire and Passenger Side J/B (Right Kick Panel)
2E		
2G		
2H		
2I		
2L	84 (LHD)	Floor Wire and Passenger Side J/B (Right Kick Panel)
2M	84 (LHD)	Engine Room Main Wire and Passenger Side J/B (Right Kick Panel)

: CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA1	112 (LHD)	Engine Wire and Engine Room Main Wire (Inside of the ECU Box)
IA2	114 (LHD)	Instrument Panel Wire and Engine Room Main Wire (Near the Driver Side J/B)
IA3		
IB1	114 (LHD)	Instrument Panel Wire and Floor No.2 Wire (Near the Driver Side J/B)
IB2		

ENGINE CONTROL (LHD)

: GROUND POINTS

Code	See Page	Ground Points Location
EA	112 (LHD)	Front Side of Cylinder Head
EB	112 (LHD)	Rear Side of Cylinder Head
EC	112 (LHD)	Left Fender Apron
ID	114 (LHD)	Cowl Side Panel LH
IH	114 (LHD)	Front Floor Panel Center LH
BK	118 (LHD)	Left Quarter Panel LH
BL	118 (LHD)	Front Floor Panel RH

: SPLICE POINTS

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E3	112 (LHD)	Engine Wire	E7	112 (LHD)	Engine Wire
E4			E8		
E5			E9		
E6			E10	112 (LHD)	Engine Room Main Wire