

ENGINE CONTROL (5S-FE)

SYSTEM OUTLINE

THE ENGINE CONTROL SYSTEM UTILIZES A MICROCOMPUTER AND MAINTAINS OVERALL CONTROL OF THE ENGINE, TRANSMISSION, ETC. AN OUTLINE OF ENGINE CONTROL IS GIVEN HERE.

1. INPUT SIGNALS

(1) WATER TEMP. SIGNAL SYSTEM

THE WATER TEMP. SENSOR DETECTS THE ENGINE COOLANT TEMP. AND HAS A BUILT-IN THERMISTOR WITH A RESISTANCE WHICH VARIES ACCORDING TO THE WATER TEMP. THUS THE WATER TEMP. IS INPUT IN THE FORM OF A CONTROL SIGNAL TO **TERMINAL THW** OF THE ECU.

(2) INTAKE AIR TEMP. SIGNAL SYSTEM

THE INTAKE AIR TEMP. SENSOR IS DETECTS THE INTAKE AIR TEMP., WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL THA** OF THE ECU.

(3) OXYGEN SENSOR SIGNAL SYSTEM

THE OXYGEN DENSITY IN THE EXHAUST EMISSIONS IS DETECTED AND INPUT AS A CONTROL SIGNAL TO **TERMINAL OX1** AND **OX2** (CALIFORNIA) OF THE ECU.

(4) RPM SIGNAL SYSTEM

CRANKSHAFT POSITION AND ENGINE RPM ARE DETECTED BY THE PICK-UP COIL INSTALLED INSIDE THE DISTRIBUTOR. CRANKSHAFT POSITION IS INPUT AS A CONTROL SIGNAL TO **TERMINAL G1**, OF THE ECU, AND RPM IS INPUT TO **TERMINAL NE**.

(5) THROTTLE SIGNAL SYSTEM

THE THROTTLE POSITION SENSOR DETECTS THE THROTTLE VALVE OPENING ANGLE, WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL PSW** OF THE ECU, OR WHEN THE VALVE IS FULLY CLOSED, TO **TERMINAL IDL**.

(6) VEHICLE SPEED SIGNAL SYSTEM

THE SPEED SENSOR, INSTALLED INSIDE THE COMBINATION METER, DETECTS THE VEHICLE SPEED AND INPUTS A CONTROL SIGNAL TO **TERMINAL SPD** OF THE ECU.

(7) NEUTRAL START SW SIGNAL SYSTEM

THE NEUTRAL START SW DETECTS WHETHER THE SHIFT POSITION IS IN NEUTRAL OR NOT, AND INPUTS A CONTROL SIGNAL TO **TERMINAL NSW** OF THE ECU.

(8) A/C SW SIGNAL SYSTEM

THE OPERATING VOLTAGE OF THE A/C MAGNET CLUTCH IS DETECTED AND INPUT IN THE FORM OF A CONTROL SIGNAL TO **TERMINAL A/C1** OF THE ECU, AND OPERATION A/C IDLE-UP VSV IS DETECTED AND INPUT IN THE FORM OF A CONTROL SIGNAL TO **TERMINAL ACA** OF THE ECU.

(9) BATTERY SIGNAL SYSTEM

VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ECU. WHEN THE IGNITION SW IS TURNED TO ON, VOLTAGE FOR ECU OPERATION IS APPLIED VIA THE EFI MAIN RELAY TO **TERMINALS +B** AND **+B1** OF THE ECU.

(10) INTAKE AIR VOLUME SIGNAL SYSTEM

INTAKE AIR VOLUME IS DETECTED BY THE VACUUM SENSOR AND IS INPUT AS A CONTROL SIGNAL TO **TERMINAL PIM** OF THE ECU.

(11) STA SIGNAL SYSTEM

TO CONFIRM THAT THE ENGINE IS CRANKING, THE VOLTAGE APPLIED TO THE STARTER MOTOR DURING CRANKING IS DETECTED AND IS INPUT AS A CONTROL SIGNAL TO **TERMINAL STA** OF THE ECU.

(12) ELECTRICAL LOAD SIGNAL SYSTEM

THE SIGNAL WHEN SYSTEMS SUCH AS THE REAR WINDOW DEFOGGER, HEADLIGHTS, ETC. WHICH CAUSE A HIGH ELECTRICAL BURDEN ARE ON IS INPUT TO **TERMINAL ELS** AS A CONTROL SIGNAL.

2. CONTROL SYSTEM

* EFI (ELECTRONIC FUEL INJECTION) SYSTEM

THE EFI SYSTEM MONITORS THE ENGINE REVOLUTIONS THROUGH THE SIGNALS EACH SENSOR (INPUT SIGNALS (1) TO (12)) INPUTS TO THE ECU. BASED ON THIS DATA AND THE PROGRAM MEMORIZED IN THE ECU, THE MOST APPROPRIATE FUEL INJECTION TIMING IS DECIDED AND CURRENT IS OUTPUT TO **TERMINALS #10** AND **#20** OF THE ECU, CAUSING THE INJECTORS TO OPERATE (TO INJECT FUEL). IT IS THIS SYSTEM WHICH, THROUGH THE WORK OF THE ECU, FINELY CONTROLS FUEL INJECTION IN RESPONSE TO DRIVING CONDITIONS.

DURING ENGINE CRANKING (SIGNAL INPUT TO **TERMINAL STA**) OR FOR APPROX. 2 SECONDS AFTER NE SIGNAL INPUT, ECU OPERATION ENERGIZES (POINT CLOSED) THE FUEL PUMP CIRCUIT INSIDE THE CIRCUIT OPENING RELAY, CAUSING THE FUEL PUMP TO OPERATE.

* ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE REVOLUTIONS USING THE SIGNALS (INPUT SIGNALS (1, 4, 5, 10, 11)) INPUT TO THE ECU FROM EACH SENSOR. BASED ON THIS DATA AND THE PROGRAM MEMORIZED IN THE ECU, THE MOST APPROPRIATE IGNITION TIMING IS DECIDED AND CURRENT IS OUTPUT TO **TERMINAL IGT** OF THE ECU. THIS OUTPUT CONTROLS THE IGNITER TO PRODUCE THE MOST APPROPRIATE IGNITION TIMING FOR THE DRIVING CONDITIONS.

* ISC (IDLE CONTROL) 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 ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS (1, 4 TO 8, 11, 12)), OUTPUTS CURRENT TO **TERMINAL TSCO** AND **ISCC**, AND CONTROLS THE ISC VALVE.

* EGR CONTROL SYSTEM

THE EGR CUT CONTROL SYSTEM CONTROLS THE VSV (FOR EGR) BY EVALUATING THE SIGNALS FROM EACH SENSOR INPUT TO THE ECU (INPUT SIGNALS (1, 5, 6, 9)) AND BY SENDING OUTPUT TO **TERMINAL EGR** OF THE ECU.

* A/C CUT CONTROL SYSTEM

WHEN THE VEHICLE SUDDENLY ACCELERATES FROM LOW ENGINE SPEED, THIS SYSTEM CUTS OFF AIR CONDITIONER OPERATION FOR A FIXED PERIOD OF TIME IN RESPONSE TO THE VEHICLE SPEED AND THROTTLE VALVE OPENING ANGLE IN ORDER TO MAINTAIN ACCELERATION PERFORMANCE.

THE ECU RECEIVES INPUT SIGNALS (5, 6), AND OUTPUTS SIGNALS TO **TERMINAL ACT**.

3. DIAGNOSIS SYSTEM

WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTIONING IN THE ECU SIGNAL SYSTEM, THE MALFUNCTION SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN THEN BE FOUND BY READING THE DISPLAY (CODE) OF THE CHECK ENGINE WARNING LIGHT.

4. FAIL-SAFE SYSTEM

WHEN A MALFUNCTION OCCURS 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 ECU MEMORY OR ELSE STOPS THE ENGINE.