

ENGINE CONTROL

SYSTEM OUTLINE

THE ENGINE CONTROL SYSTEM UTILIZES A MICROCOMPUTER AND MAINTAINS OVERALL CONTROL OF THE ENGINE 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 INSTALLED INSIDE THE AIR FLOW METER AND 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** OF THE ECU. TO MAINTAIN STABLE DETECTION PERFORMANCE BY THE OXYGEN SENSOR, A HEATER IS USED FOR WARMING THE SENSOR. THE HEATER IS ALSO CONTROLLED BY THE ECU (HT).

(4) RPM SIGNAL SYSTEM

CRANKSHAFT POSITION IS DETECTED BY THE PICK-UP COIL INSTALLED INSIDE THE DISTRIBUTOR. CRANKSHAFT POSITION IS INPUT AS A CONTROL SIGNAL TO **TERMINALS G1** AND **G2** 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 VTA** 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) 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/C 1** OF THE ECU.

(8) 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.

(9) INTAKE AIR VOLUME SIGNAL SYSTEM

INTAKE AIR VOLUME IS DETECTED BY THE POTENTIOMETER INSTALLED INSIDE THE AIR FLOW METER AND IS INPUT AS A CONTROL SIGNAL TO **TERMINAL VS** OF THE ECU.

(10) STOP LIGHT SW SIGNAL SYSTEM

THE STOP LIGHT SW IS USED TO DETECT WHETHER OR NOT THE VEHICLE IS BRAKING AND THE INFORMATION IS INPUT AS A CONTROL SIGNAL TO **TERMINAL STP** 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) ENGINE KNOCK CONTROL SYSTEM

ENGINE KNOCKING IS DETECTED BY THE KNOCK SENSOR AND INPUT AS A CONTROL SIGNAL TO **TERMINAL KNK** OF THE ECU.

(13) ELECTRICAL IDLE-UP 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 #1, #2, #3** AND **#4** 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.

* ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE REVOLUTIONS USING THE SIGNALS (INPUT SIGNALS (1, 3, 4, 6, 7, 9, 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.

* FUEL PUMP CONTROL SYSTEM

COMPUTER OPERATION OUTPUTS TO **TERMINAL FPR** AND CONTROLS THE FUEL PUMP CONTROL RELAY AND THUS CONTROLS THE FUEL PUMP DRIVE SPEED IN RESPONSE TO CONDITIONS.

* OXYGEN SENSOR HEATER CONTROL SYSTEM

THE OXYGEN SENSOR HEATER CONTROL SYSTEM TURNS THE HEATER TO ON WHEN THE INTAKE AIR VOLUME IS LOW (TEMP. OF EXHAUST EMISSIONS LOW). AND WARMS UP THE OXYGEN SENSOR TO IMPROVE DETECTION PERFORMANCE OF THE SENSOR. THE ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS (1, 6, 8, 9, 11)), CURRENT IS OUTPUT TO **TERMINAL HT** AND CONTROLS THE HEATER.

* ISC (IDLE SPEED 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, 13)), OUTPUTS CURRENT TO **TERMINALS RSC** AND **RSO** AND CONTROLS THE ISC VALVE.

* EGR CONTROL SYSTEM

WITH THE EGR CONTROL SYSTEM, THE ECU EVALUATES THE (INPUT SIGNALS (1, 4, 10)), FROM EACH SENSOR, CURRENT IS OUTPUT TO **TERMINAL EGR** AND OPERATION OF THE EGR VALVE IS CONTROLLED.

* INTAKE AIR CONTROL SYSTEM

IN THE INTAKE AIR CONTROL SYSTEM, EACH CYLINDER IN THE INTAKE MANIFOLD IS DIVIDED INTO TWO PARTS, WITH AN INTAKE AIR CONTROL VALVE INSTALLED IN THE PASSAGE ON ONE SIDE. THE OPENING AND CLOSING OF THE VALVE PROVIDES THE MOST APPROPRIATE INTAKE AIR FLOW AND, AS WELL AS PREVENTING PERFORMANCE LOSS AT LOW SPEEDS, ALSO IMPROVES FUEL ECONOMY. THE ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS (1, 4, 5)), OUTPUTS CURRENT TO **TERMINAL T-VIS** CONTROLS THE VSV (FOR T-VIS) AND, CARRIES OUT OPENING AND CLOSING OF THE VALVE.

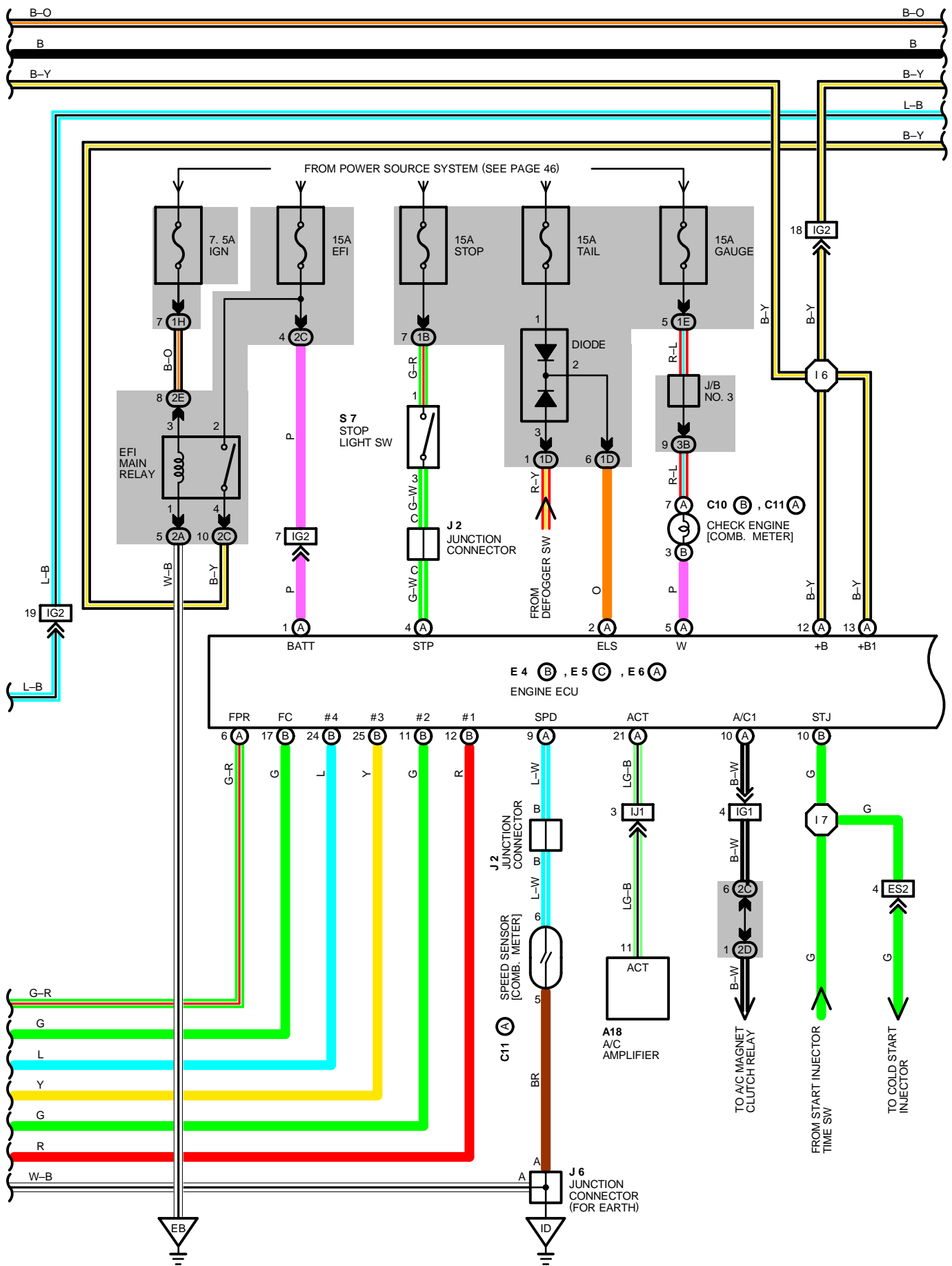
3. DIAGNOSIS SYSTEM

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

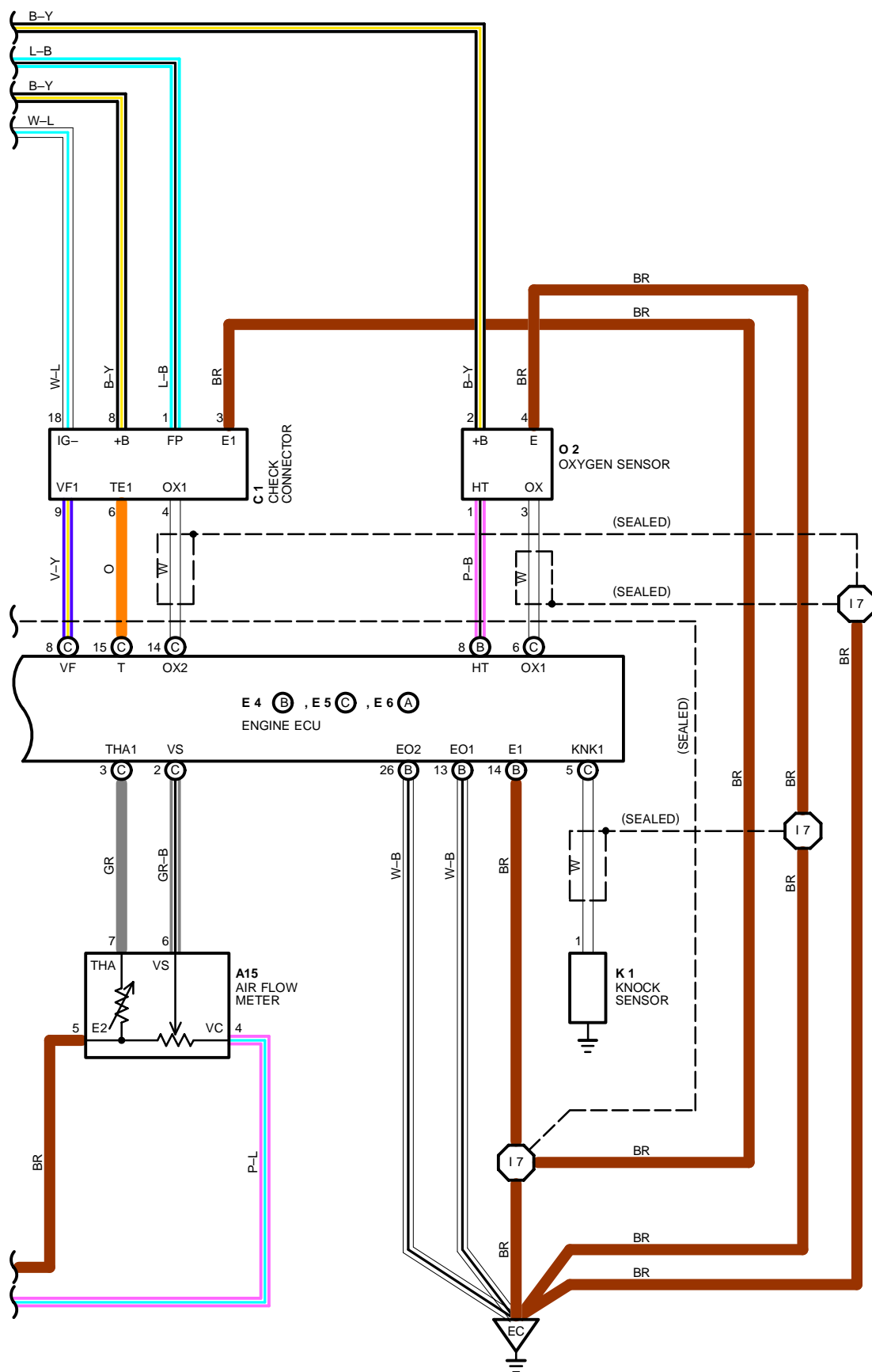
4. FAIL-SAFE SYSTEM

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.









ENGINE CONTROL

SERVICE HINTS

EFI MAIN RELAY

4-2 : CLOSED WITH IGNITION SW AT **ON** OR **ST** POSITION

E 1 EFI RESISTOR

2-1, 3, 4, 5 : 5-7 Ω

I 4, I 5, I 6, I 7 INJECTOR

1-2 : 2-4 Ω

F10 FUEL PUMP RESISTOR

1-2: APPROX. 73 Ω

A15 AIR FLOW METER

1-2 : CLOSED WITH STARTER RUNNING OR MEASURING PLATE OPEN

5-6 : 200-600 Ω (MEASURING PLATE CLOSED)

20-1000 Ω (MEASURING PLATE OPEN)

5-4 : 200-400 Ω

5-7 : 10-20 K Ω (-20°C, -4°F)

4-7 K Ω (0°C, 32°F)

2-3 K Ω (20°C, 68°F)

0.9-1.3 K Ω (40°C, 104°F)

0.4-0.7 K Ω (60°C, 140°F)

E 2 EFI WATER TEMP. SENSOR

1-2: 10-20 K Ω (-20°C, -4°F)

4-7 K Ω (0°C, 32°F)

2-7 K Ω (20°C, 68°F)

0.9-1.3 K Ω (40°C, 104°F)

0.4-0.7 K Ω (60°C, 140°F)

0.2-0.4 K Ω (80°C, 176°F)

T 1 THROTTLE POSITION SENSOR

2-4: 0.2-0.8 K Ω WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0 MM (0 IN)

3-4: LESS THAN 2.3 K Ω WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0.50 MM (0.020 IN)

∞ Ω WITH 0.7 MM (0.028 IN.)

2-4: 3.3-10 K Ω WITH THROTTLE VALVE FULLY OPEN

1-4: 3-8 K Ω

E 4, E 5, E 6 ENGINE ECU

VOLTAGE AT ECU CONNECTORS

BATT-E1 : 10-14 VOLTS

+B, +B1-E1 : 10-14 VOLTS (IGNITION SW ON)

IDL-E2 : 4-6 VOLTS (IGNITION SW ON AND THROTTLE VALVE OPEN)

VTA-E2 : 0.1-1.0 VOLTS (IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED)

3-6 VOLTS (IGNITION SW ON AND THROTTLE VALVE OPEN)

VC-E2 : 4-6 VOLTS (IGNITION SW ON)

VS-E2 : 4-6 VOLTS (IGNITION SW ON AND MEASURING PLATE FULLY CLOSED)

1.0 VOLTS OR LESS (IGNITION SW ON AND MEASURING PLATE FULLY OPEN)

2.0-4.0 VOLTS (IDLING)

1.0-2.0 VOLTS (3000 RPM)

THA1-E2 : 1.0-3.0 VOLTS (IGNITION SW ON AND INTAKE AIR TEMP. 20°C, (68°F))

THW-E2 : 0.1-1.0 VOLTS (IGNITION SW ON AND COOLANT TEMP. 80°C, (176°F))

STA-E1 : 6-14 VOLTS (CRANKING)

#1, #2, #3, #4 - E01, E02 : 10-14 VOLTS (IGNITION SW ON)

IGT-E1 : 0.7-1.0 VOLTS (CRANKING OR IDLING)

TVIS-E1 : 2.0 VOLTS OR LESS WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED

10-14 VOLTS WITH IGNITION SW ON AND THROTTLE VALVE OPEN

2.0 VOLTS OR LESS IDLING

10-14 VOLTS WITH 4200 RPM OR MORE

T-E1 : 10-14 VOLTS WITH IGNITION SW ON AND CHECK CONNECTOR T-E1 NO CONNECT

0.5 VOLTS OR LESS WITH IGNITION SW ON AND CHECK CONNECTOR T-E1 CONNECT

A/C1-E1 : 8-14 VOLTS WITH IGNITION SW ON A/C SWITCH ON

RSO, RSC -E1 : 9-14 VOLTS (IGNITION SW ON)

PIM-E2 : 2.5-4.5 VOLTS (IGNITION SW ON)

W-E1 : 10-14 VOLTS (NO TROUBLE (CHECK ENGINE WARNING LIGHT OFF) AND ENGINE RUNNING)

RESISTANCE AT ECU CONNECTORS

(DISCONNECT WIRING CONNECTOR FROM ECU)

IDL-E1 : INFINITY (THROTTLE VALVE OPEN)
LESS THAN 2300 Ω (THROTTLE VALVE FULLY CLOSED)

VTA-E2 : 3300-10000 Ω (THROTTLE VALVE OPEN)

200-800 Ω (THROTTLE VALVE FULLY CLOSED)

VS-E2 : 200-600 Ω (MEASURING PLATE FULLY CLOSED)

20-1200 Ω (MEASURING PLATE FULLY OPEN)

THA1-E2 : 2000-3000 Ω (INTAKE AIR TEMP. 20°C, 68°F)

THW-E2 : 200-400 Ω (COOLANT TEMP. 80°C, 176°F)

G1, G2-G- : 140-180 Ω

NE-G- : 180-220 Ω

RSC, RSO→B, +B1 : 17.7-23.9 Ω

○ : PARTS LOCATION

CODE	SEE PAGE	CODE	SEE PAGE	CODE	SEE PAGE
A15	25	E 6	A 26	J 2	26
A18	26	F10	25	J 6	26
C 1	25	F11	25	K 1	25
C 7	26	F17	27	O 2	25
C10	B 26	I 1	25	S 7	26
C11	A 26	I 2	25	T 1	25
D 1	25	I 3	25	T 2	25
E 1	25	I 4	25	V 1	25
E 2	25	I 5	25	V 2	25
E 3	25	I 6	25	V 3	25
E 4	B 26	I 7	25		
E 5	C 26	I 9	26		

○ : RELAY BLOCKS

CODE	SEE PAGE	RELAY BLOCKS (RELAY BLOCK LOCATION)
4	24	R/B NO. 4 (RIGHT KICK PANEL)
5	24	R/B NO. 5 (ENGINE COMPARTMENT FRONT RIGHT)

○ : JUNCTION BLOCK AND WIRE HARNESS CONNECTOR

CODE	SEE PAGE	JUNCTION BLOCK AND WIRE HARNESS (CONNECTOR LOCATION)
1A	18	COWL WIRE AND J/B NO. 1 (LEFT KICK PANEL)
1B		
1D		
1E		
1H	18	ENGINE ROOM MAIN WIRE AND J/B NO. 1 (LEFT KICK PANEL)
2A	20	ENGINE ROOM MAIN WIRE AND J/B NO. 2 (NEAR THE BATTERY)
2B	20	ENGINE WIRE AND J/B NO. 2 (NEAR THE BATTERY)
2C		
2D	20	ENGINE ROOM MAIN WIRE AND J/B NO. 2 (NEAR THE BATTERY)
2E		
3B	22	COWL WIRE AND J/B NO. 3 (BEHIND COMBINATION METER)

□ : CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

CODE	SEE PAGE	JOINING WIRE HARNESS AND WIRE HARNESS (CONNECTOR LOCATION)
EB1	28	ENGINE WIRE AND COWL WIRE (REAR SIDE OF RIGHT FRONT FENDER)
ES2	28	ENGINE WIRE AND ENGINE ROOM NO. 2 WIRE (NEAR THE DISTRIBUTOR)
IE1	30	ENGINE ROOM MAIN WIRE AND COWL WIRE (LEFT KICK PANEL)
IE2		
IF1	30	FLOOR WIRE AND COWL WIRE (LEFT KICK PANEL)
IG1	30	ENGINE WIRE AND COWL WIRE (UNDER THE ENGINE ECU)
IG2		
IJ1	32	COWL WIRE AND A/C NO. 1 WIRE (BEHIND THE GLOVE BOX)
BP1	34	FLOOR WIRE AND LUGGAGE ROOM WIRE (LEFT QUARTER PANEL CENTER)

▽ : GROUND POINTS

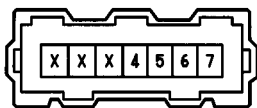
CODE	SEE PAGE	GROUND POINTS LOCATION
EB	28	FRONT LEFT FENDER
EC	28	INTAKE MANIFOLD
ID	30	LEFT KICK PANEL
BL	34	BACK PANEL CENTER

○ : SPLICE POINTS

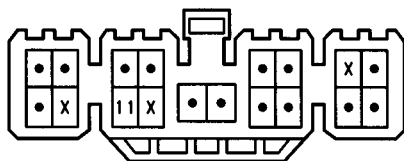
CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS	CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS
E 3	28	ENGINE ROOM MAIN WIRE	I 2	32	COWL WIRE
E 5			I 6		
E 7			I 7	32	ENGINE WIRE
E 9			I 8	32	COWL WIRE

ENGINE CONTROL

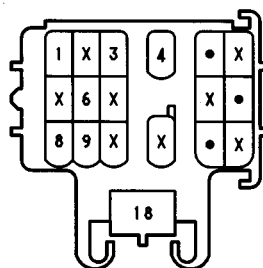
A15 BLACK



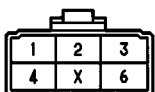
A18



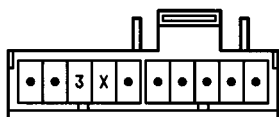
C 1 DARK GRAY



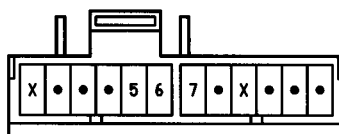
C 7 DARK GRAY



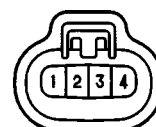
C10 (B) BROWN



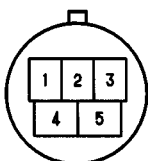
C11 (A)



D 1 BLACK



E 1 DARK GRAY



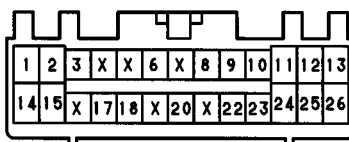
E 2 DARK GREEN



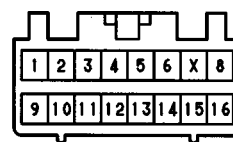
E 3 DARK GRAY



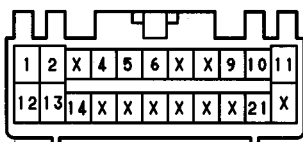
E 4 (B) DARK GRAY



E 5 (C) DARK GRAY



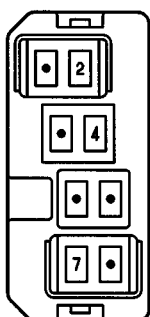
E 6 (A) DARK GRAY



F10 DARK GRAY



F11 BLACK



F17 DARK GRAY



I 1 BLACK



I 2 BLACK



I 3 BLACK



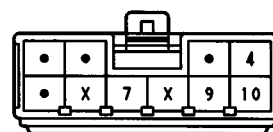
I 4, I 6 BROWN



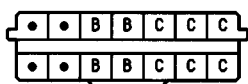
I 5, I 7 GRAY



I 9 BLACK

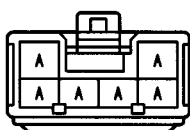


J 2



(HINT:SEE PAGE 7)

J 6



(HINT:SEE PAGE 7)

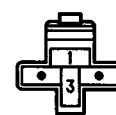
K 1 DARK GRAY



O 2 DARK GRAY



S 7



T 1 BLACK



T 2 BLACK



V 1 BROWN



V 2 BLUE



V 3 BROWN

