

ENGINE CONTROL

SYSTEM OUTLINE

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

1. INPUT SIGNALS

- (1) ENGINE COOLANT TEMP. (WATER TEMP.) SIGNAL CIRCUIT
THE ENGINE COOLANT TEMP. SENSOR (WATER TEMP. SENSOR) DETECTS THE ENGINE COOLANT TEMP. (WATER TEMP.) AND HAS A BUILT-IN THERMISTOR WITH A RESISTANCE WHICH VARIES ACCORDING TO THE WATER TEMP. IS INPUT INTO **TERMINAL THW** OF THE ENGINE CONTROL MODULE (ENGINE ECU) AS A CONTROL SIGNAL.
- (2) INTAKE AIR TEMP. SIGNAL CIRCUIT
THE INTAKE AIR TEMP. SENSOR IS INSTALLED IN THE VOLUME AIR FLOW (AIR FLOW METER) AND DETECTS THE INTAKE AIR TEMP. WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL THA** OF THE ENGINE CONTROL MODULE (ENGINE ECU).
- (3) OXYGEN DENSITY SIGNAL CIRCUIT
THE OXYGEN DENSITY IN THE EXHAUST EMISSION IS DETECTED AND INPUT AS A CONTROL SIGNAL FROM THE HEATED OXYGEN SENSOR (OXYGEN SENSOR) RIGHT AND LEFT TO **TERMINALS OX1, OX2** OF THE ENGINE CONTROL MODULE (ENGINE ECU).
TO STABILIZE DETECTION PERFORMANCE BY THE HEATED OXYGEN SENSOR (OXYGEN SENSOR) IS WARMED.
- (4) RPM SIGNAL CIRCUIT
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 ENGINE CONTROL MODULE (ENGINE ECU), AND ENGINE SPEED IS INPUT 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 CONTROL MODULE (ENGINE ECU). WHEN THE VALVE IS COMPLETELY CLOSED, THE ENGINE SIGNAL IS INPUT INTO **TERMINAL IDL**.
- (6) VEHICLE SPEED CIRCUIT
THE VEHICLE SPEED IS DETECTED BY VEHICLE SPEED SENSOR (SPEED SENSOR) INSTALLED IN THE TRANSMISSION AND THE SIGNAL IS INPUT TO **TERMINAL SPD** OF THE ENGINE CONTROL MODULE (ENGINE ECU) VIA THE COMBINATION METER.
- (7) NEUTRAL POSITION SIGNAL CIRCUIT
THE PARK/NEUTRAL POSITION SW (NEUTRAL START SW) DETECTS WHETHER THE SHIFT POSITION IS IN "N" AND "P" OR NOT, AND THE SIGNAL IS INPUT INTO **TERMINAL NSW** OF THE ENGINE CONTROL MODULE (ENGINE ECU).
- (8) A/C SW SIGNAL CIRCUIT
THE OPERATING VOLTAGE OF THE A/C MAGNETIC CLUTCH IS DETECTED AND THE SIGNAL IS INPUT INTO **TERMINAL A/C** OF ENGINE CONTROL MODULE (ENGINE ECU) AS A CONTROL SIGNAL.
- (9) BATTERY SIGNAL CIRCUIT
VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ENGINE CONTROL MODULE (ENGINE ECU). WITH THE IGNITION SW TURNED ON, THE VOLTAGE FOR ENGINE CONTROL MODULE (ENGINE ECU) START-UP POWER SUPPLY IS APPLIED TO **TERMINAL +B** OF THE ENGINE CONTROL MODULE (ENGINE ECU) VIA EFI MAIN RELAY.
THE CURRENT FLOWING THROUGH THE **IGN** FUSE FLOWS TO **TERMINAL IGSW** OF THE ENGINE CONTROL MODULE (ENGINE ECU).
- (10) INTAKE AIR VOLUME SIGNAL CIRCUIT
INTAKE AIR VOLUME IS DETECTED BY THE VOLUME AIR FLOW (AIR FLOW METER) AND THE SIGNAL IS INPUT TO **TERMINAL VS** OF THE ENGINE CONTROL MODULE (ENGINE ECU) AS A CONTROL SIGNAL.
- (11) STOP LIGHT SW SIGNAL CIRCUIT
THE STOP LIGHT SW IS USED TO DETECT WHETHER OR NOT THE VEHICLE IS BRAKING AND THE SIGNAL IS INPUT INTO **TERMINAL STP** OF THE ENGINE CONTROL MODULE (ENGINE ECU) AS A CONTROL SIGNAL.
- (12) 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 CONTROL MODULE (ENGINE ECU) AS A CONTROL SIGNAL.
- (13) ENGINE KNOCK SIGNAL CIRCUIT
ENGINE KNOCKING IS DETECTED BY THE KNOCK SENSOR NO. 1 AND NO. 2 AND THE SIGNAL IS INPUT INTO **TERMINALS KNK1 AND KNK2** AS A CONTROL SIGNAL.

2. CONTROL SYSTEM

* SFI (SEQUENTIAL MULTIPOINT FUEL INJECTION) (EFI ELECTRONIC FUEL INJECTION)) SYSTEM

THE SFI (EFI) SYSTEM MONITORS THE ENGINE CONDITION THROUGH THE SIGNALS INPUT FROM EACH SENSOR (INPUT SIGNALS FROM (1) TO (13) ETC.) TO THE ENGINE CONTROL MODULE (ENGINE ECU). THE BEST FUEL INJECTION TIMING IS DECIDED BASED ON THIS DATA AND THE PROGRAM MEMORIZED BY THE ENGINE CONTROL MODULE (ENGINE ECU), AND THE CONTROL SIGNAL IS OUTPUT TO **TERMINALS #10, #20, #30, #40, #50 AND #60** OF THE ENGINE CONTROL MODULE (ENGINE ECU) TO OPERATE THE INJECTOR. (INJECT THE FUEL). THE SFI (EFI) SYSTEM PRODUCES CONTROL OF FUEL INJECTION OPERATION BY THE ENGINE CONTROL MODULE (ENGINE ECU) IN RESPONSE TO THE DRIVING CONDITIONS.

* ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE CONDITION THROUGH THE SIGNALS INPUT TO THE ENGINE CONTROL MODULE (ENGINE ECU) FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (4) TO (13) ETC.). THE BEST IGNITION TIMING IS DECIDED ACCORDING TO THIS DATA AND THE MEMORIZED DATA IN THE ENGINE CONTROL MODULE (ENGINE ECU) AND THE CONTROL SIGNAL IS OUTPUT TO **TERMINAL IGT** THIS SIGNAL CONTROLS THE IGNITER TO PROVIDE THE BEST IGNITION TIMING FOR THE DRIVING CONDITIONS.

* HEATED OXYGEN SENSOR (OXYGEN SENSOR) HEATER CONTROL SYSTEM

THE HEATED OXYGEN SENSOR (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 SENSOR TO IMPROVE DETECTION PERFORMANCE OF THE SENSOR. THE ENGINE CONTROL MODULE (ENGINE ECU) EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (4), (9) TO (11) ETC.), AND OUTPUTS CURRENT TO **TERMINALS HT1 AND HT2** TO CONTROL THE HEATER.

* IDLE AIR CONTROL (IDLE SPEED CONTROL) SYSTEM

THE IDLE AIR CONTROL (ISC) SYSTEM (STEP MOTOR TYPE) INCREASES THE ENGINE SPEED AND PROVIDES IDLING STABILITY FOR FAST IDLE-UP WHEN THE ENGINE IS COLD, AND WHEN THE IDLE SPEED HAS DROPPED DUE TO ELECTRICAL LOAD AND SO ON. THE ENGINE CONTROL MODULE (ENGINE ECU) EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (4), (5), (8), (9), (11) ETC.), OUTPUTS CURRENT TO **TERMINAL ISC1, ISC2, ISC3 AND ISC4** TO CONTROL THE IDLE AIR CONTROL VALVE (ISC VALVE).

* EGR CUT CONTROL SYSTEM

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

* FUEL PUMP CONTROL SYSTEM

THE ENGINE CONTROL MODULE (ENGINE ECU) OPERATION OUTPUT TO **TERMINAL FPR** AND CONTROLS THE FUEL PUMP RELAY AND THUS CONTROLS THE FUEL PUMP DRIVE SPEED IN RESPONSE TO CONDITIONS.

* FUEL PRESSURE CONTROL SYSTEM

THE FUEL PRESSURE UP SYSTEM CAUSES THE VSV (FOR FUEL PRESSURE CONTROL) TO COME ON FOR HIGH TEMP. STARTS AND IMMEDIATELY AFTER STARTING IN ORDER TO INCREASE THE FUEL PRESSURE, IMPROVE STARTABILITY AT HIGH TEMPERATURES AND PROVIDE STABLE IDLING. THE ENGINE CONTROL MODULE (ENGINE ECU) EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (5), (11)), OUTPUTS CURRENT TO **TERMINAL FPU** AND CONTROLS THE VSV.

* PAIR (AS) CONTROL SYSTEM

THE PAIR (AS) CONTROL SYSTEM TURNS ON THE VSV (FOR PAIR) WHEN THE ENGINE IS COLD AND DURING DECELERATION, PREVENTING OVERHEATING OF THE TWC (THREE-WAY CATALYTIC CONVERTER) AND REDUCING HC AND CO EMISSIONS. THE ENGINE CONTROL MODULE (ENGINE ECU) EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (4) TO (6), (8), (10), (12)), THEN SENDS OUTPUT TO **TERMINAL AS** AND CONTROLS THE VSV.

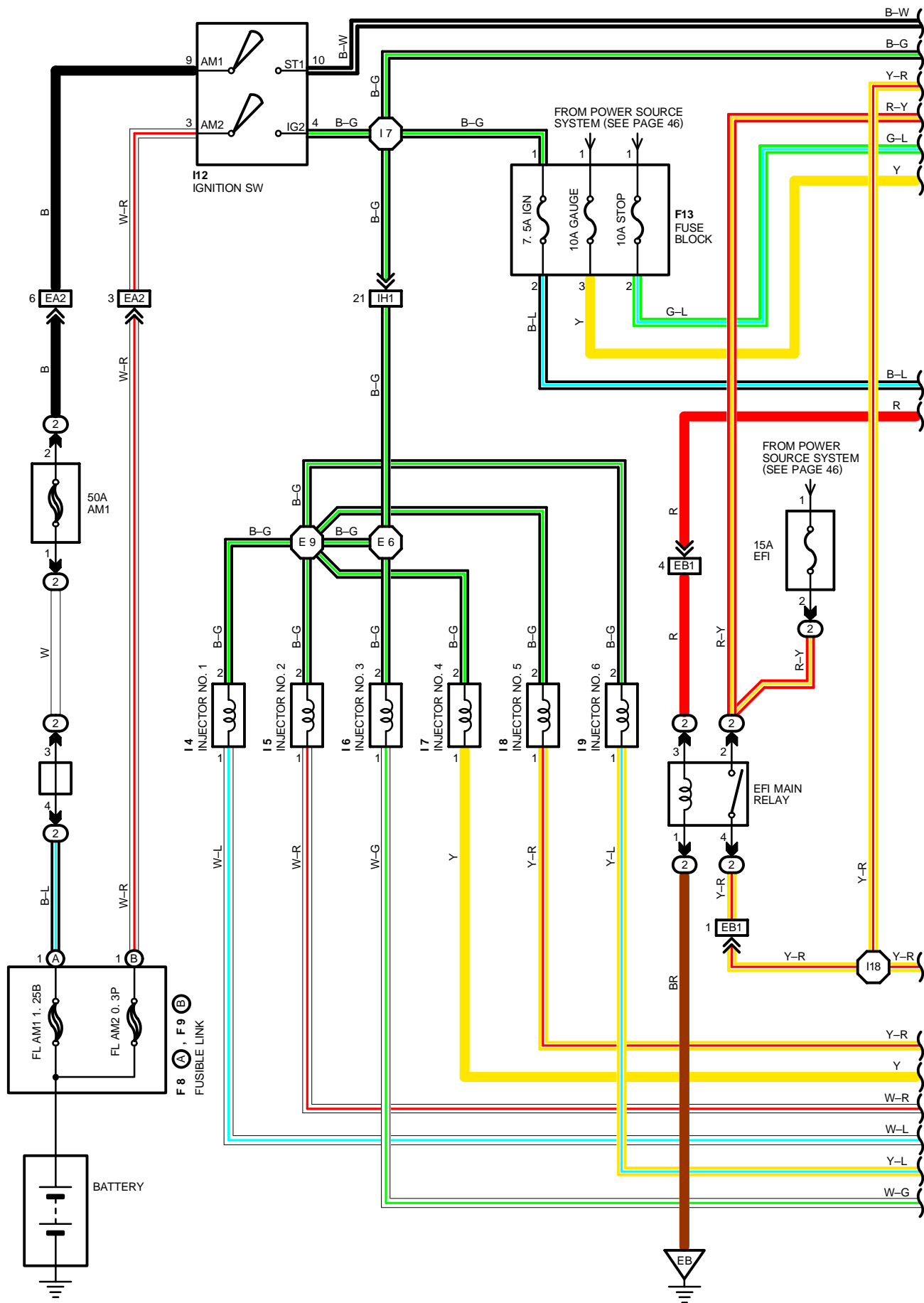
3. DIAGNOSIS SYSTEM

WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTION IN THE ENGINE CONTROL MODULE (ENGINE ECU) SIGNAL SYSTEM, THE MALFUNCTIONING SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN BE FOUND BY READING THE CODE DISPLAYED BY THE MALFUNCTION INDICATOR LAMP (CHECK ENGINE WARNING LIGHT).

4. FAIL-SAFE SYSTEM

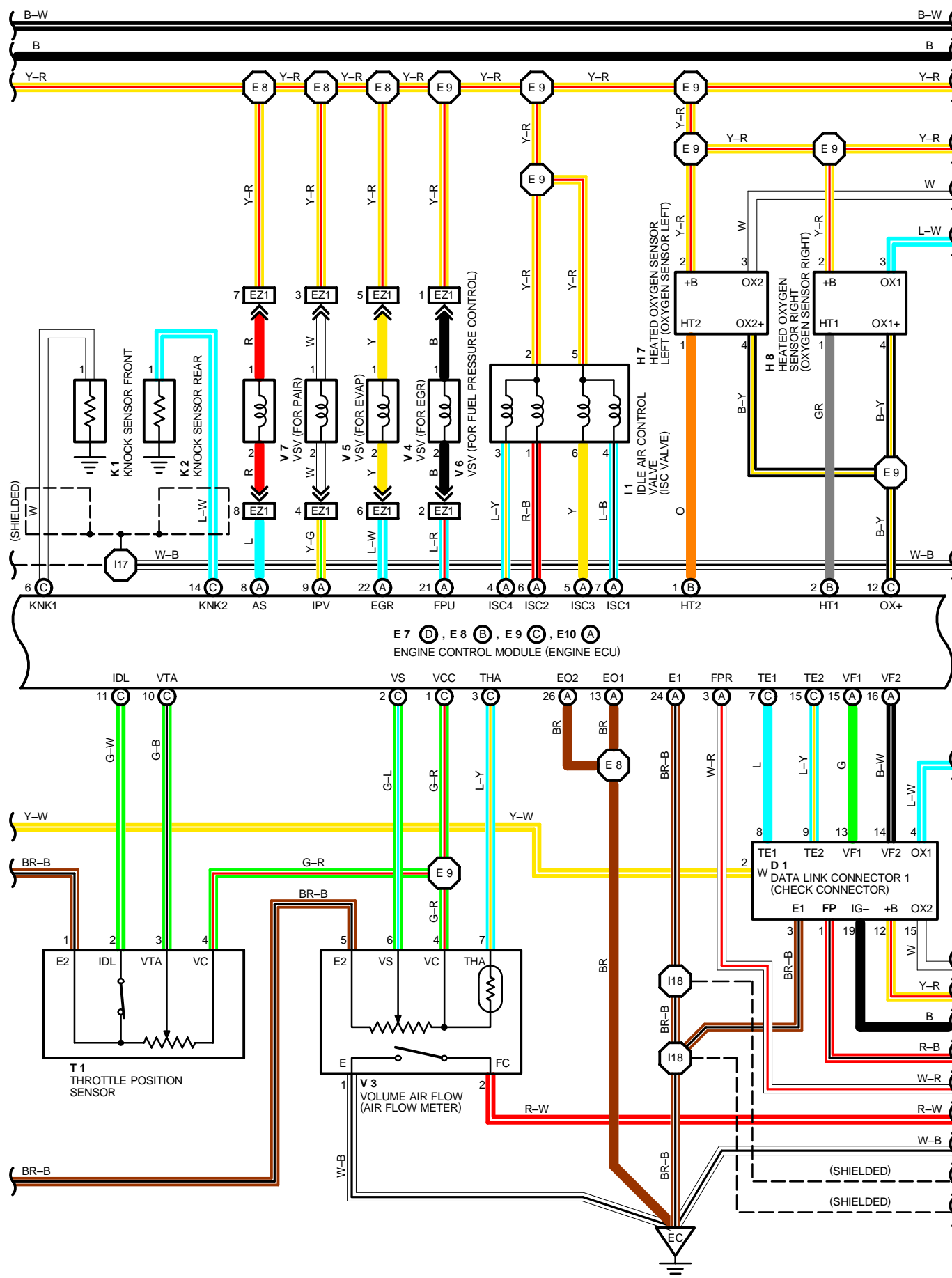
WHEN A MALFUNCTION HAS OCCURRED IN ANY SYSTEM, IF THERE IS A POSSIBILITY OF ENGINE TROUBLE BEING CAUSED BY CONTINUED CONTROL BASED ON THE SIGNALS FROM THAT SYSTEM, THE FAIL-SAFE SYSTEM EITHER CONTROLS THE SYSTEM BY USING DATA (STANDARD VALUES) RECORDED IN THE ENGINE CONTROL MODULE (ENGINE ECU) MEMORY OR ELSE STOPS THE ENGINE.

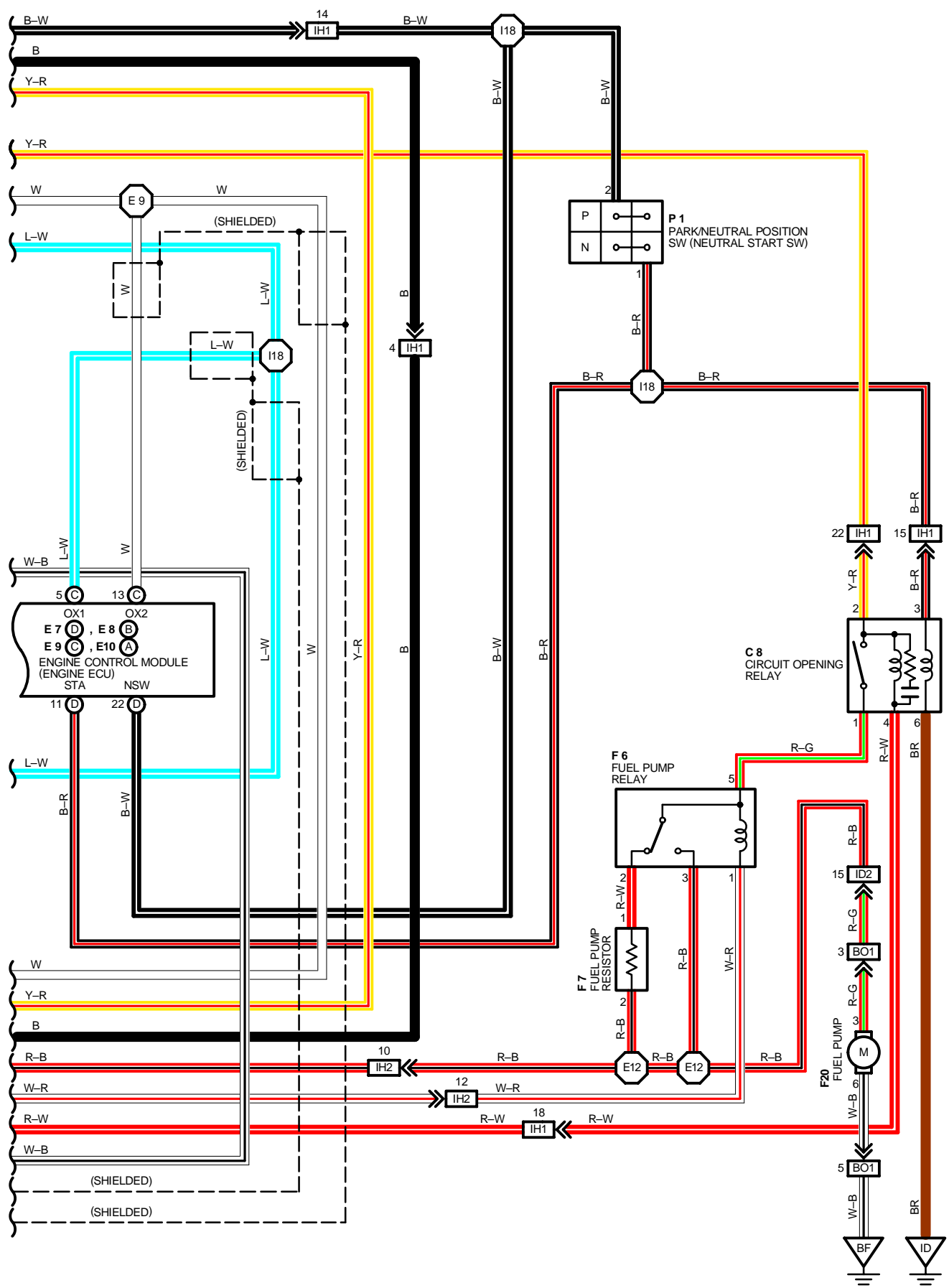
ENGINE CONTROL





ENGINE CONTROL





ENGINE CONTROL

SERVICE HINTS

EFI MAIN RELAY

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

E 4 ENGINE CONTROL MODULE (ENGINE ECU)

VOLTAGE AT ENGINE CONTROL MODULE (ENGINE ECU)

BATT - E1	: ALWAYS 9-14 VOLTS
IGSW, +B, MREL - E1	: 9-14 VOLTS WITH IGNITION SW ON
VCC - E2	: 4.5-5.5 VOLTS WITH IGNITION SW ON
IDL - E2	: 0-3 VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED 9-14 VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY OPEN
VTA - E2	: 0.3- 0.8 VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED 3.2-4.9 VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY OPEN
VS - E2	: 3.5-4.5 VOLTS WITH IGNITION SW ON AND MEASURING PLATE FULLY CLOSED 0.2-0.5 VOLTS WITH IGNITION SW ON AND MEASURING PLATE FULLY OPEN 1.2-2.4 VOLTS WITH ENGINE IDLING 0.8-1.3 VOLTS WITH ENGINE 3000RPM
THA - E2	: 0.5-3.4 VOLTS WITH IGNITION SW ON AND INTAKE AIR TEMP. 20°C (68°F)
THW - E2	: 0.2-1.0 VOLTS WITH IGNITION SW ON AND ENGINE COOLANT TEMP. 80°C (176°F)
STA - E1	: 6.0 VOLTS OR MORE WITH CLANKING
IGT - E1	: PULSE GENERATION WITH ENGINE IDLING
#10, #20, #30-E01, E02	: 9-14 VOLTS WITH IGNITION SW ON
#40, #50, #60-E01, E02	: 9-14 VOLTS WITH IGNITION SW ON
IGF - E1	: 2 VOLTS OR LESS WITH IGNITION SW ON PULSE GENERATION WITH ENGINE IDLING
G1, G2 - G-	: PULSE GENERATION WITH ENGINE IDLING
NE - G-	: PULSE GENERATION WITH ENGINE IDLING
KNK1, KNK2 - E1	: PULSE GENERATION WITH ENGINE IDLING
VF1, VF2 - E1	: 1.8-3.2 VOLTS MAINTAIN ENGINE SPEED AT 2500RPM FOR 120 SECONDS AFTER WARNING UP THEN RETURN TO IDLING
ISC1, ISC2, ISC3, ISC4 - E1	: 9-14 VOLTS WITH IGNITION SW ON
NSW - E1	: 3 VOLTS OR LESS WITH IGNITION SW ON AND SHEFT LEVER "P" OR "N" POSITION 9-14 VOLTS WITH IGNITION SW ON AND OTHER SHEFT LEVER "P" OR "N" POSITION
SPD - E1	: PULSE GENERATION WITH IGNITION SW ON AND ROTATE DRIVING WHEEL SLOWLY
TE1, TE2 - E1	: 9-14 VOLTS WITH IGNITION SW ON AND DATA LINK CONNECTOR 1 (CHECK CONNECTOR) TE1-E1 NOT CONNECTED 1.5 VOLTS OR LESS WITH IGNITION SW ON AND DATA LINK CONNECTOR 1 (CHECK CONNECTOR) TE1-E1 CONNECTED
W - E1	: 9-14 VOLTS WITH ENGINE RUNNING AND NO TROUBLE (MALFUNCTION INDICATOR LAMP (CHECK ENGINE WARNING LIGHT)) OFF
A/C - E1	: 7.5-14 VOLTS WITH AIR CONDITIONING ON 1.5 VOLTS OR LESS WITH AIR CONDITIONING OFF
STP - E1	: 7.5-14 VOLTS WITH STOP LIGHT SW ON (BRAKE PEDAL DEPRESSED) 1.5 VOLTS OR LESS WITH STOP LIGHT SW OFF

RESISTANCE AT ENGINE CONTROL MODULE (ENGINE ECU) CONNECTORS (DISCONNECT WIRING CONNECTOR FROM ENGINE CONTROL MODULE (ENGINE ECU))

IDL - E2	: INFINITY (THROTTLE VALVE FULLY OPEN) 2.3 KΩ OR LESS (THROTTLE VALVE FULLY CLOSED)
VTA - E2	: 2.0- 10.2 KΩ (THROTTLE VALVE FULLY OPEN) 0.2-5.7 KΩ (THROTTLE VALVE FULLY CLOSED)
VCC - E2	: 2.5-5.9 KΩ
VS - E2	: 0.2-0.6 KΩ (MEASURING PLATE FULLY CLOSED) 0.02-1.2KΩ (MEASURING PLATE FULLY OPEN)
THA - E2	: 2.0-3.0 KΩ (INTAKE AIR TEMP. 20°C (68°F))
THW - E2	: 200-400 Ω (ENGINE COOLANT TEMP. 80°C (176°F))
G1, G2 - G-	: 185-275 Ω (COLD (-10°C (14°F) TO 50°C (122°F)) 240-325 Ω (HOT (50°C (122°F) TO 100°C (212°F))
NE - G-	: 185-275 Ω (COLD (-10°C (14°F) TO 50°C (122°F)) 240-325 Ω (HOT (50°C (122°F) TO 100°C (212°F))

ISC1, ISC2, ISC3, ISC4 - +B, +B1 : 10-30 Ω

I 1 IDLE AIR CONTROL VALVE (ISC VALVE)

1-4, 6 : 10- 30 Ω
2-1, 3 : 10- 30 Ω

I 4, I 5, I 6, I 7, I 8, I 9 INJECTOR

1-2, : 12- 16 Ω

O 4, O 5 HEATED OXYGEN SENSOR (OXYGEN SENSOR)

1-2, : 5.0- 6.5 Ω

T 1 THROTTLE POSITION SENSOR

1-4 : 2.5- 5.9 KΩ
1-3 : 2.0- 10.2 KΩ WITH THROTTLE VALVE FULLY OPEN
: 0.2- 5.7 KΩ WITH THROTTLE VALVE FULLY CLOSED
1-2 : INFINITY WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0.75 MM (0.030 IN.)
: 2.3 KΩ LESS WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0.50 MM (0.020 IN.)

F18 FUEL PUMP

3-6, : 0.2- 3.0 Ω

F24 FUEL PUMP RESISTOR

1-2 : APPROX. 0.73 Ω

SERVICE HINTS

E 1 EGR GAS TEMP. SENSOR

1-2 : 69-89 Ω (50°C, 122°F)
 : 11-15 Ω (100°C, 212°F)
 : 2-4 Ω (150°C, 302°F)

V 3 VOLUME AIR FLOW (AIR FLOW METER)

4-5 : 200-400Ω
 5-6 : 200-600Ω WITH MEASURING PLATE FULLY CLOSED
 : 20-1200Ω WITH MEASURING PLATE FULLY OPEN
 5-7 : 10-20 KΩ (-20°C, -4°F)
 : 4-7 KΩ (0°C, 32°F)
 : 2-3 KΩ (20°C, 68°F)
 : 0.9-1.3 KΩ (40°C, 104°F)
 : 0.4-0.7 KΩ (60°C, 140°F)

V 6 VSV (FOR FUEL PRESSURE CONTROL)

1-2 : 37-44 Ω (20°C, 68°F)

V 5 VSV (FOR EVAP)

1-2 : 30-33 Ω (20°C, 68°F)

V 4 VSV (FOR EGR)

1-2 : 30-34 Ω (20°C, 68°F)

V 7 VSV (FOR PAIR)

1-2 : 37-44 Ω (20°C, 68°F)

E 3 ENGINE COOLANT TEMP. SENSOR (WATER TEMP. SENSOR)

1-2 : 10-20 KΩ (-20°C, -4°F)
 : 4-7 KΩ (0°C, 32°F)
 : 2-3 KΩ (20°C, 68°F)
 : 0.9-1.3 KΩ (40°C, 104°F)
 : 0.4-0.7 KΩ (60°C, 140°F)
 : 0.2-0.4 KΩ (80°C, 176°F)

○ : PARTS LOCATION

CODE	SEE PAGE	CODE	SEE PAGE	CODE	SEE PAGE
C 8	23	F 8	A 22	I 9	22
C10	A 23	F 9	B 22	I12	23
C11	B 23	F13	23	K 1	22
C12	C 23	F20	24	K 2	22
D 1	22	H 7	22	P 1	22
D 2	22	H 8	22	S 7	23
E 1	22	I 1	22	T 1	22
E 3	22	I 2	22	T 5	23
E 7	D 23	I 3	22	V 3	22
E 8	B 23	I 4	22	V 4	22
E 9	C 23	I 5	22	V 5	22
E10	A 23	I 6	22	V 6	22
F 6	22	I 7	22	V 7	22
F 7	22	I 8	22		

○ : RELAY BLOCKS

CODE	SEE PAGE	RELAY BLOCKS (RELAY BLOCK LOCATION)
2	18	R/B NO. 2 (FRONT SIDE OF LEFT FENDER)

□ : CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

CODE	SEE PAGE	JOINING WIRE HARNESS AND WIRE HARNESS (CONNECTOR LOCATION)
EA2	26	COWL WIRE AND ENGINE ROOM MAIN WIRE (LEFT FENDER)
EB1	26	ENGINE ROOM MAIN WIRE AND ENGINE WIRE (NEAR THE DISTRIBUTOR)
EZ1	26	ENGINE WIRE AND VSV SUB WIRE (NEAR THE THROTTLE POSITION SENSOR)
ID2	28	COWL WIRE AND FLOOR NO. 1 WIRE (LEFT KICK PANEL)
IG2	28	ENGINE WIRE AND A/C SUB WIRE (BEHIND GLOVE BOX)
IH1		
IH2	28	ENGINE WIRE AND COWL WIRE (BEHIND GLOVE BOX)
IH3		
BO1	30	FLOOR NO. 1 WIRE AND LUGGAGE ROOM NO. 2 WIRE (BESIDE THE FUEL TANK)

ENGINE CONTROL

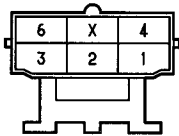
▽ : GROUND POINTS

CODE	SEE PAGE	GROUND POINTS LOCATION
EB	26	FRONT SIDE OF LEFT FENDER
EC	26	AIR INTAKE CHAMBER
ID	28	LEFT KICK PANEL
BF	30	UNDER THE CENTER CONSOLE BOX

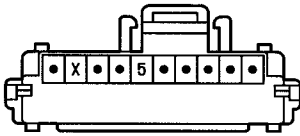
○ : SPLICE POINTS

CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS	CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS
E 6	26	ENGINE ROOM MAIN WIRE	I 6	28	COWL WIRE
E 8	26	ENGINE WIRE	I 7		
E 9			I 17		A/C SUB WIRE
E 12	26	COWL WIRE	I 18	28	ENGINE WIRE

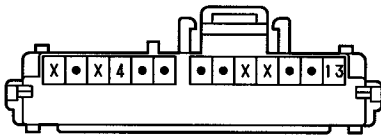
C 8 DARK GRAY



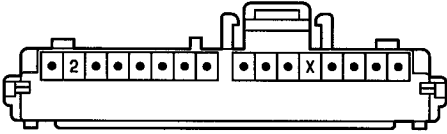
C 10 (A) GRAY



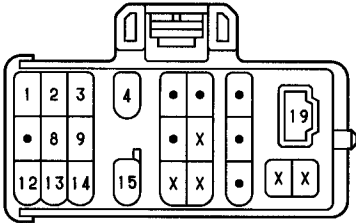
C 11 (B) BLUE



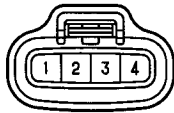
C 12 (C)



D 1 BLACK



D 2 BLACK



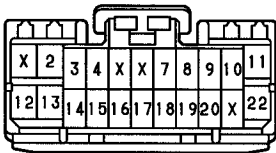
E 1 DARK GRAY



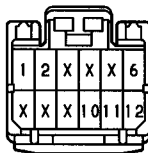
E 3 DARK GRAY



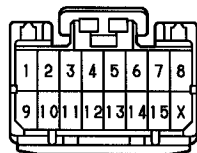
E 7 (D) DARK GRAY



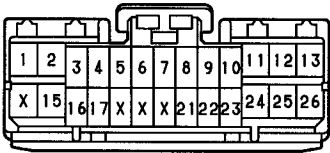
E 8 (B) DARK GRAY



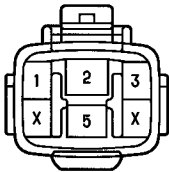
E 9 (C) DARK GRAY



E 10 (A) DARK GRAY



F 6 BLACK



F 7 DARK GRAY



F 8 (A)



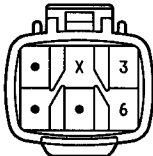
F 9 (B) GRAY



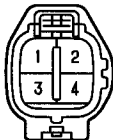
F 13

(SEE PAGE 20)

F 20 DARK GRAY



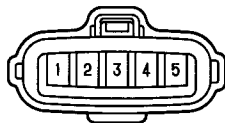
H 7.H 8 DARK GRAY



I 1 BLACK



I 2 BLACK



I 3 BLACK



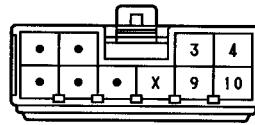
I 4, I 6, I 8 GRAY



I 5, I 7 I 9 BROWN



I12 BLACK



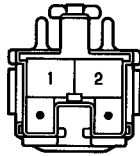
K 1, K 2 DARK GRAY



P 1 GRAY



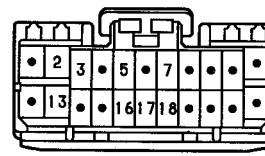
S 7 BLACK



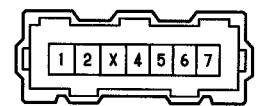
T 1 BLACK



T 5



V 3 BLACK



V 4 DARK BLUE



V 5 DARK BLUE



V 6 BROWN



V 7 GRAY

