



## 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. SIGNAL CIRCUIT

THE ENGINE COOLANT TEMP. SENSOR DETECTS THE ENGINE COOLANT 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 AS A CONTROL SIGNAL.

#### (2) INTAKE AIR TEMP. SIGNAL CIRCUIT

THE INTAKE AIR TEMP. SENSOR IS INSTALLED IN THE MASS AIR FLOW AND DETECTS THE INTAKE AIR TEMP. WHICH IS INPUT AS A CONTROL SIGNAL TO **TERMINAL THA** OF THE ENGINE CONTROL MODULE.

#### (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 (BANK 1 SENSOR 1, BANK 1 SENSOR 2) TO **TERMINALS OX1, OX2** OF THE ENGINE CONTROL MODULE.

TO STABILIZE DETECTION PERFORMANCE BY THE HEATED OXYGEN SENSOR IS WARMED.

#### (4) RPM SIGNAL CIRCUIT

CRANKSHAFT POSITION IS DETECTED BY THE CRANKSHAFT POSITION SENSOR AND THE PICK-UP COIL INSTALLED INSIDE THE DISTRIBUTOR. CRANKSHAFT POSITION IS INPUT AS A CONTROL SIGNAL TO **TERMINAL NE2+** OF THE ENGINE CONTROL MODULE, 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. WHEN THE VALVE IS COMPLETELY CLOSED, THE ENGINE IDLING SIGNAL IS INPUT INTO **TERMINAL IDL**.

#### (6) VEHICLE SPEED CIRCUIT

THE VEHICLE SPEED IS DETECTED BY VEHICLE SPEED SENSOR INSTALLED IN THE TRANSMISSION, AND THE SIGNAL IS INPUT TO **TERMINAL SPD** OF THE ENGINE CONTROL MODULE VIA THE COMBINATION METER.

#### (7) NEUTRAL POSITION SIGNAL CIRCUIT

THE PARK/NEUTRAL POSITION SW DETECTS WHETHER THE SHIFT POSITION IS IN "N" AND "P" OR NOT, AND THE SIGNAL IS INPUT INTO **TERMINAL STA** OF THE ENGINE CONTROL MODULE.

#### (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 THE ENGINE CONTROL MODULE AS A CONTROL SIGNAL.

#### (9) BATTERY SIGNAL CIRCUIT

VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ENGINE CONTROL MODULE. WITH THE IGNITION SW TURNED ON, THE VOLTAGE FOR ENGINE CONTROL MODULE START-UP POWER SUPPLY IS APPLIED TO **TERMINAL +B** OF THE ENGINE CONTROL MODULE VIA THW EFI MAIN RELAY.

THE CURRENT FLOW THROUGH THE **IGN** FUSE FLOWS TO **TERMINAL IGSW** OF THE ENGINE CONTROL MODULE.

#### (10) INTAKE AIR VOLUME SIGNAL CIRCUIT

INTAKE AIR VOLUME IS DETECTED BY THE MASS AIR FLOW, AND THE SIGNAL IS INPUT TO **TERMINAL VG** OF THE ENGINE CONTROL MODULE AS A CONTROL SIGNAL.

#### (11) 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 CONTROL MODULE 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 NSW** OF THE ENGINE CONTROL MODULE AS A CONTROL SIGNAL.

#### (13) ENGINE KNOCK SIGNAL CIRCUIT

ENGINE KNOCKING IS DETECTED BY THE KNOCK SENSOR 1 AND 2, AND THE SIGNAL IS INPUT INTO **TERMINALS KNK1** AND **KNK2** AS A CONTROL SIGNAL.

## 2. CONTROL SYSTEM

### \* SFI SYSTEM

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

### \* ESA SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE CONDITION THROUGH THE SIGNALS INPUT TO THE ENGINE CONTROL MODULE 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, AND THE CONTROL SIGNAL IS OUTPUT TO **TERMINAL IGT** THIS SIGNAL, WHICH 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 SENSOR TO IMPROVE DETECTION PERFORMANCE OF THE SENSOR. THE ENGINE CONTROL MODULE EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (4), (9) TO (11) ETC.), AND OUTPUTS CURRENT TO **TERMINALS HT AND HT2** TO CONTROL THE HEATER.

### \* IDLE AIR CONTROL SYSTEM

THE IDLE AIR CONTROL 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 EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (4), (5), (8), (9), (11) ETC.) AND OUTPUTS CURRENT TO **TERMINAL ISC1, ISC2, ISC3 AND ISC4** TO CONTROL THE IDLE AIR CONTROL VALVE.

### \* EGR CUT CONTROL SYSTEM

THE EGR CUT CONTROL SYSTEM CONTROLS THE VSV (EGR) BY EVALUATING THE SIGNAL FROM EACH SENSOR (INPUT SIGNALS FROM (1), (5), (9)), AND OUTPUTS CURRENT TO **TERMINAL EGR** OF THE ENGINE CONTROL MODULE.

### \* FUEL PUMP CONTROL SYSTEM

THE ENGINE CONTROL MODULE OPERATION OUTPUTS 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 (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 EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (5), (11)), OUTPUTS CURRENT TO **TERMINAL FPU** AND CONTROLS THE VSV.

## 3. DIAGNOSIS SYSTEM

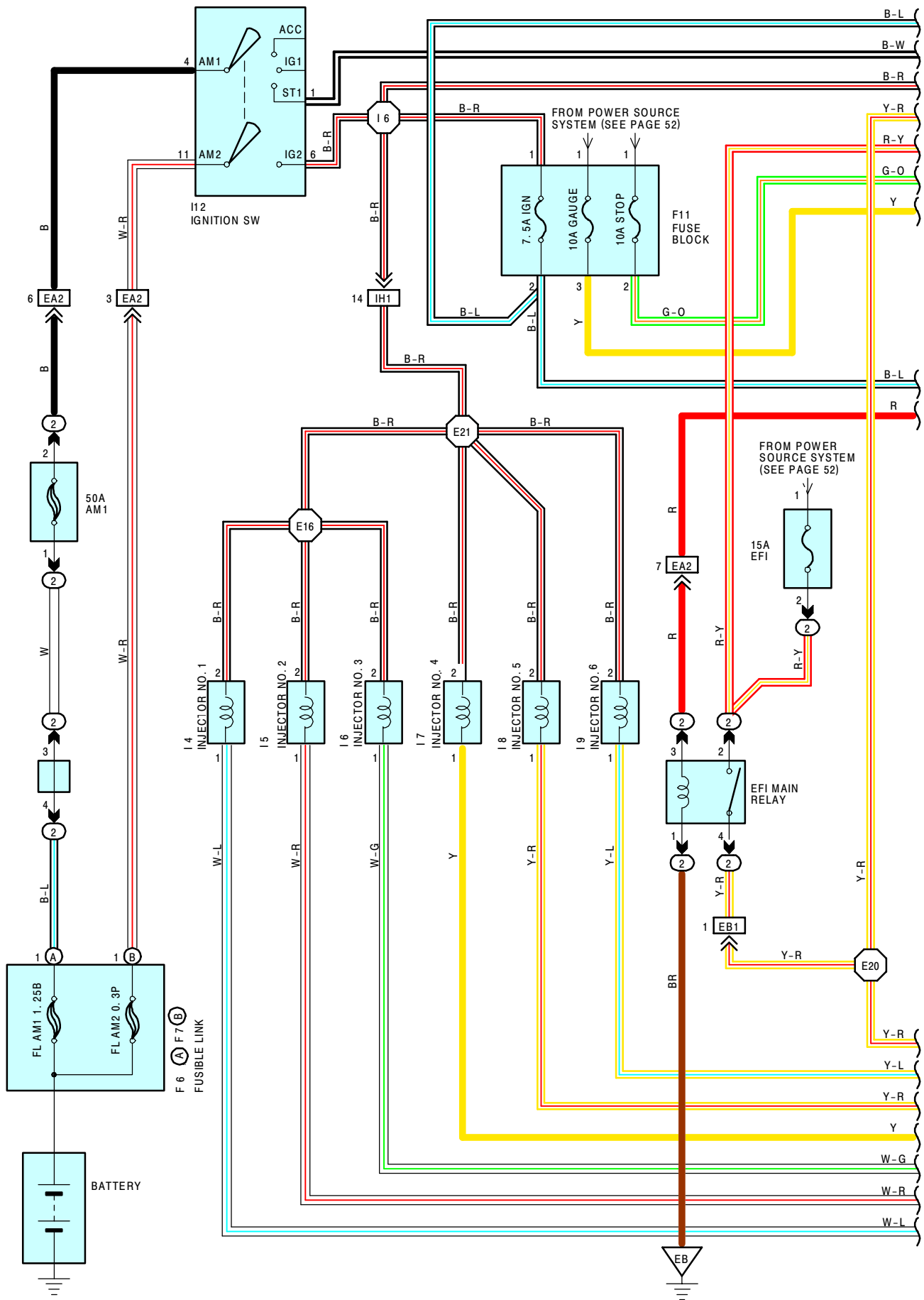
WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTION IN THE ENGINE CONTROL MODULE SIGNAL SYSTEM, THE MALFUNCTIONING SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN BE FOUND BY READING THE CODE DISPLAYED BY THE MALFUNCTION INDICATOR LAMP.

## 4. FAIL -SAFE SYSTEM

WHEN THE 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 MEMORY OR ELSE STOPS THE ENGINE.



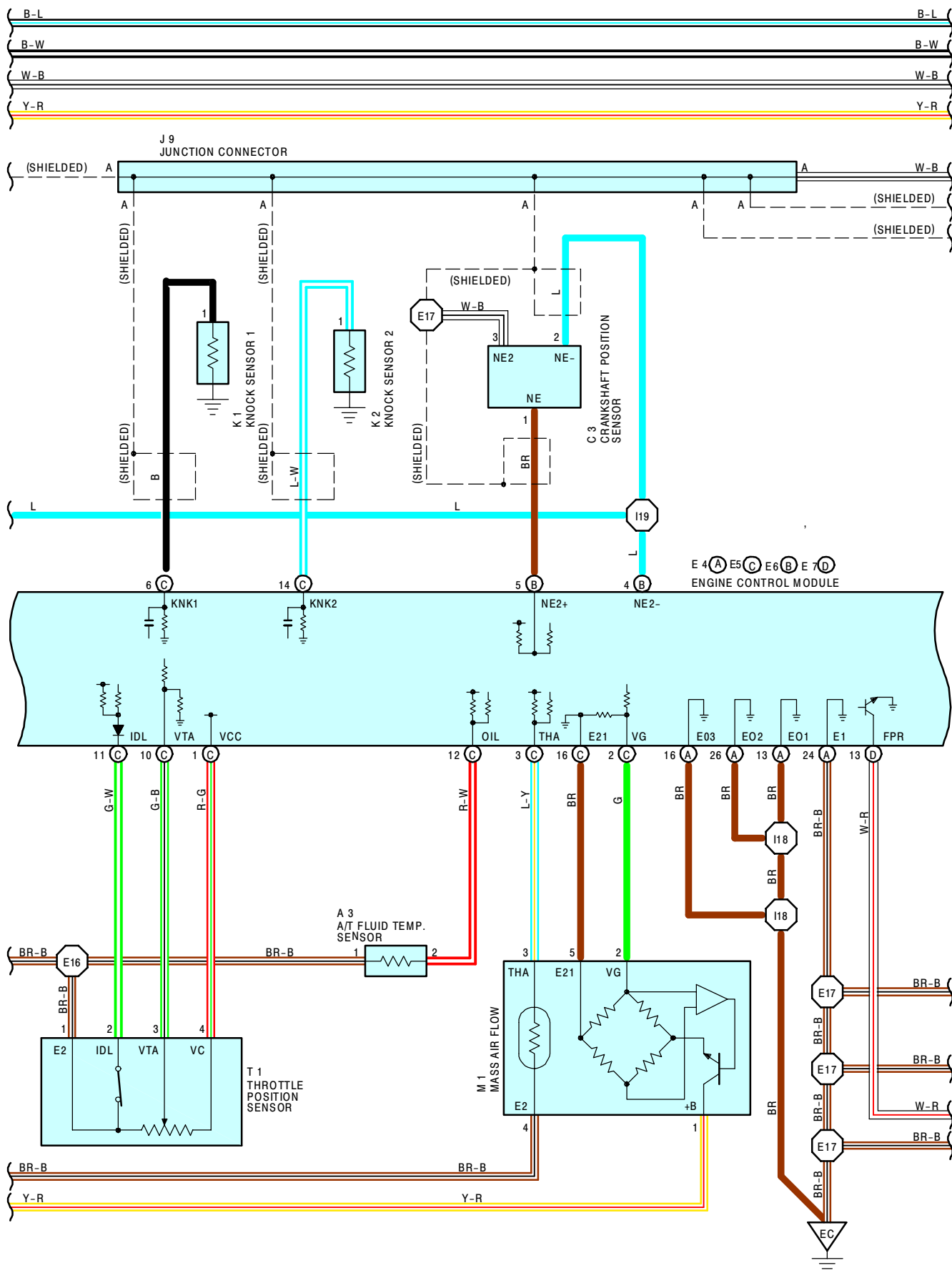
# ENGINE CONTROL

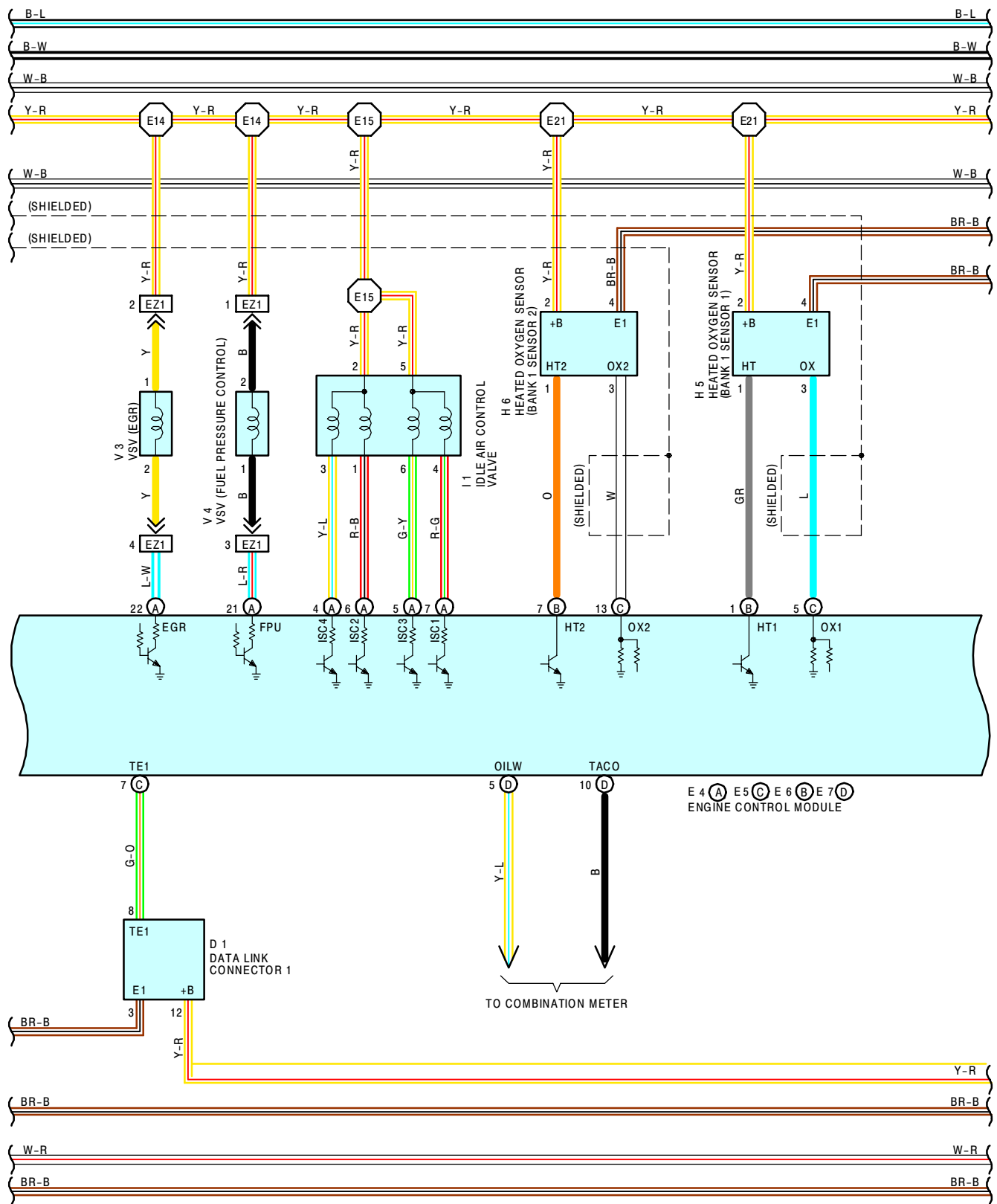






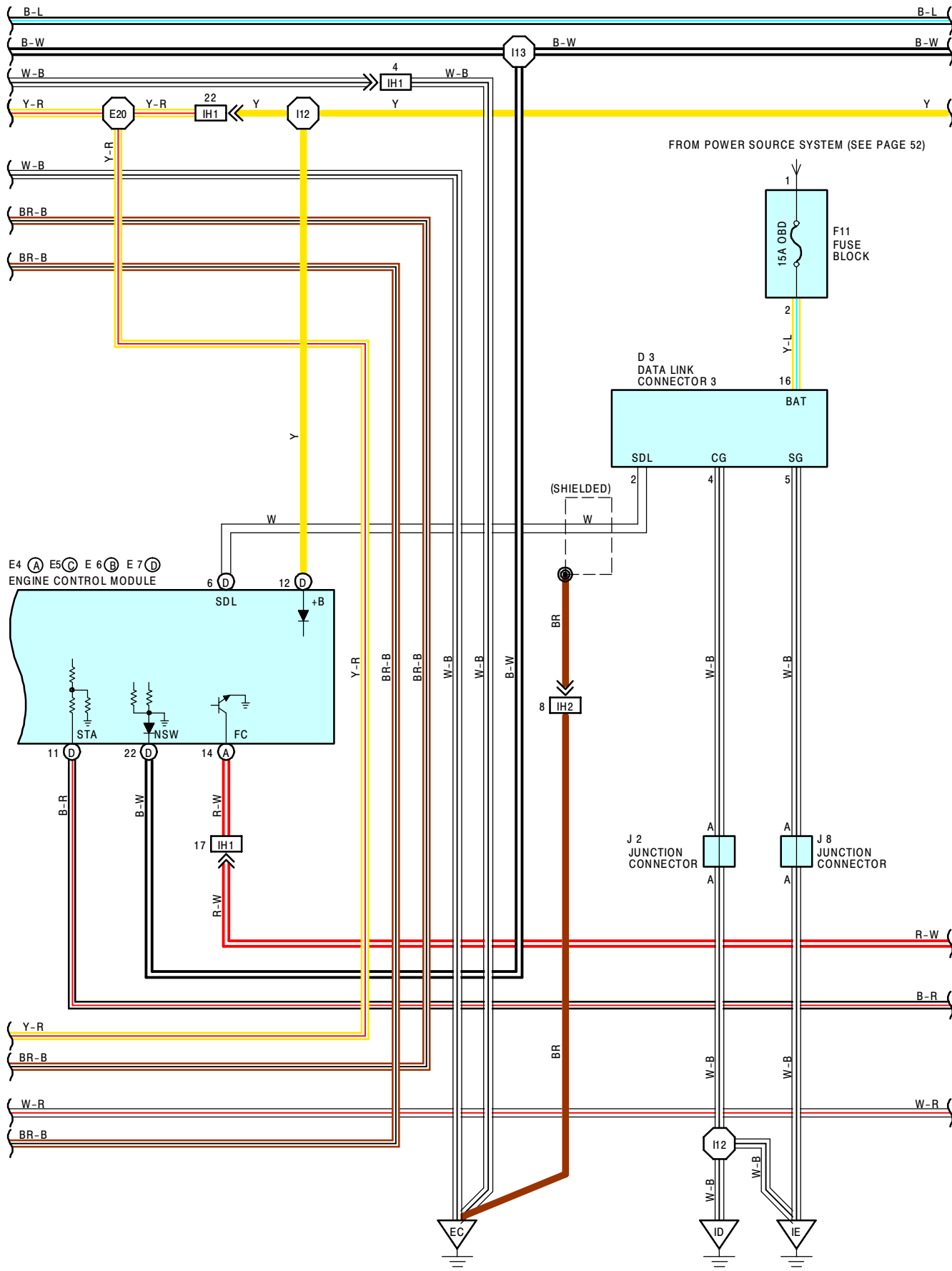
# ENGINE CONTROL

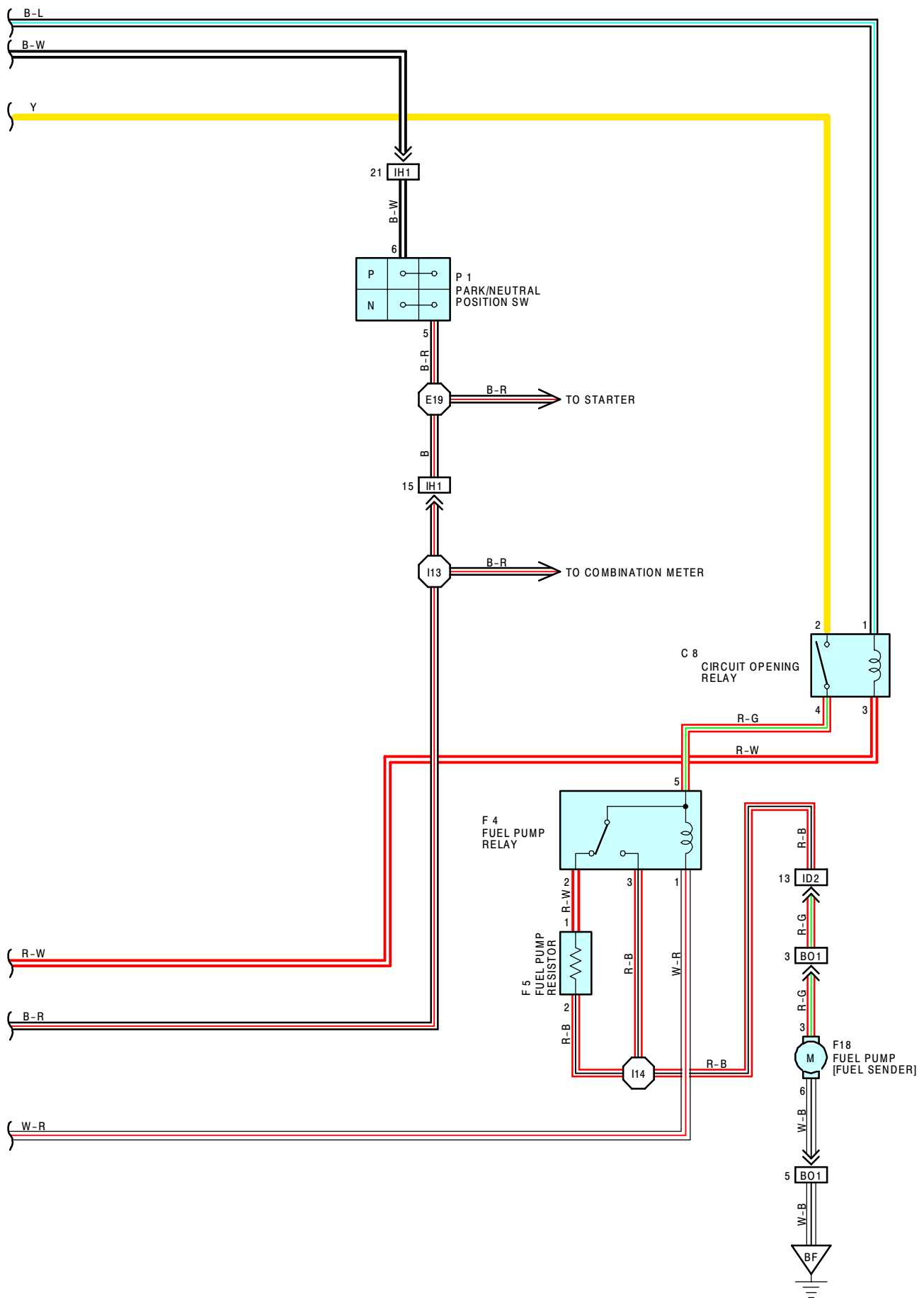






# ENGINE CONTROL









# ENGINE CONTROL

## SERVICE HINTS

### EFI MAIN RELAY

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

### E 4 **(A)**, E 5 **(C)**, E 6 **(B)**, E 7 **(D)** ENGINE CONTROL MODULE

(VOLTAGE AT THE ENGINE CONTROL MODULE)

BATT -E1 : ALWAYS **9.0-14.0** VOLTS

IGSW, +B, MRLY-E1 : **9.0-14.0** VOLTS WITH THE IGNITION SW ON

VCC -E2 : **4.5-5.5** VOLTS WITH THE IGNITION SW ON

IDL -E2 : **0-3.0** VOLTS WITH THE IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED

: **9.0-14.0** VOLTS WITH THE IGNITION SW ON AND THROTTLE VALVE FULLY OPEN

VTA -E2 : **0.3-0.8** VOLTS WITH THE IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED

: **3.2-4.9** VOLTS WITH THE IGNITION SW ON AND THROTTLE VALVE FULLY OPEN

THA -E2 : **0.5-3.4** VOLTS WITH THE IGNITION SW ON AND INTAKE AIR TEMP. **20°C (68°F)**

THW -E2 : **0.2-1.0** VOLTS WITH THE IGNITION SW ON AND ENGINE COOLANT TEMP. **80°C (176°F)**

STA -E1 : **6.0** VOLTS OR MORE WITH THE CLANKING

IGT -E1 : PULSE GENERATION WITH THE ENGINE IDLING

#10, #20, #30-E01, EO2 : **9.0-14.0** VOLTS WITH THE IGNITION SW ON

#40, #50, #60-E01, EO2 : **9.0-14.0** VOLTS WITH THE IGNITION SW ON

IGF -E1 : **2.0** VOLTS OR LESS WITH THE IGNITION SW ON

: PULSE GENERATION WITH THE ENGINE IDLING

G1, G2-G- : PULSE GENERATION WITH THE ENGINE IDLING

NE- G- : PULSE GENERATION WITH THE ENGINE IDLING

KNK1, KNK2-E1 : PULSE GENERATION WITH THE ENGINE IDLING

ISC1, ISC2, ISC3, ISC4-E1 : **9.0-14.0** VOLTS WITH THE IGNITION SW ON

STA -E1 : **9.0-14.0** VOLTS OR LESS WITH THE IGNITION SW ON AND PARK/NEUTRAL POSITION SW AT “P” OR “N” POSITION

: **3.0** VOLTS WITH THE IGNITION SW ON AND PARK/NEUTRAL POSITION SW AT OTHER THAN “P” OR “N” POSITION

SPD -E1 : PULSE GENERATION WITH THE IGNITION SW AND ROTATE DRIVING WHEEL SLOWLY

TE1 -E1 : **9.0-14.0** VOLTS WITH THE IGNITION SW ON AND DATA LINK CONNECTOR 1 TE1-E1 NOT CONNECTED

: **1.5** VOLTS OR LESS WITH THE IGNITION SW ON AND DATA LINK CONNECTOR 1 TE1-E1 CONNECTED

W -E1 : **9.0-14.0** VOLTS WITH THE ENGINE RUNNING AND NO TROUBLE (MALFUNCTION INDICATOR LAMP OFF)

A/C -E1 : **7.5-14.0** VOLTS WITH THE AIR CONDITIONING ON

: **1.5** VOLTS OR LESS WITH THE AIR CONDITIONING OFF

STP -E1 : **7.5-14.0** VOLTS WITH THE STOP LIGHT SW ON (BRAKE PEDAL DEPRESSED)

: **1.5** VOLTS OR LESS WITH THE STOP LIGHT SW OFF

### RESISTANCE AT ENGINE CONTROL MODULE CONNECTORS

(DISCONNECT WIRING CONNECTOR)

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**

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 0°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 0°C (122°F))

: **240-325 Ω** (HOT (50°C (122°F) TO 100°C (212°F))

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

### I 1 IDLE AIR CONTROL VALVE

5-4, 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**

### H 5, H 6 HEATED OXYGEN SENSOR (BANK 1 SENSOR 1, BANK 1 SENSOR 2)

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 THE THROTTLE VALVE FULLY OPEN

: **0.2-5.7 KΩ** WITH THE THROTTLE VALVE FULLY CLOSED

1-2 : INFINITY WITH THE CLEARANCE BETWEEN LEVER AND STOP SCREW **0.75 MM (0.030 IN.)**

: **2.3 KΩ** LESS WITH THE CLEARANCE BETWEEN LEVER AND STOP SCREW **0.50 MM (0.020 IN.)**

### F18 FUEL PUMP [FUEL SENDER]

3-6 : **0.2-3.0 Ω**

### F 5 FUEL PUMP RESISTOR

1-2 : APPROX. **0.73 Ω**

### 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 4 VSV (FUEL PRESSURE CONTROL)

1-2 : **37-44 Ω** (20°C (68°F))

## SERVICE HINTS

### V3 VSV (EGR)

1-2 : 30-34 Ω (20°C, 68°F)

### E3 ENGINE COOLANT 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
A 3	22	F 5	22	I12	25
C 3	22	F 6	A 22	J 1	25
C 8	24	F 7	B 22	J 2	25
C10	A 24	F11	25	J 8	25
C11	B 24	F18	26	J 9	25
C13	24	H 5	22	K 1	23
D 1	22	H 6	22	K 2	23
D 2	22	I 1	23	M 1	23
D 3	24	I 2	23	N 1	23
E 1	22	I 3	23	P 1	23
E 3	22	I 4	23	S13	25
E 4	A 24	I 5	23	T 1	23
E 5	C 24	I 6	23	V 3	23
E 6	B 24	I 7	23	V 4	23
E 7	D 24	I 8	23		
F 4	22	I 9	23		

## ○ : 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	30	COWL WIRE AND ENGINE ROOM MAIN WIRE (LEFT FENDER)
EB1	30	ENGINE ROOM MAIN WIRE AND ENGINE WIRE (NEAR THE DISTRIBUTOR)
EZ1	30	ENGINE WIRE AND VSV SUB WIRE (NEAR THE THROTTLE POSITION SENSOR)
ID2	32	COWL WIRE AND FLOOR NO. 1 WIRE (LEFT KICK PANEL)
IH1	32	ENGINE WIRE AND COWL WIRE (BEHIND GLOVE BOX)
IH2	32	ENGINE WIRE AND COWL WIRE (BEHIND GLOVE BOX)
BO1	34	FLOOR NO. 1 WIRE AND LUGGAGE ROOM NO. 2 WIRE (BESIDE THE FUEL TANK)

## ▽ : GROUND POINTS

CODE	SEE PAGE	GROUND POINTS LOCATION
EB	30	FRONT SIDE OF LEFT FENDER
EC	30	AIR INTAKE CHAMBER
ID	32	LEFT KICK PANEL
IE	32	RIGHT KICK PANEL
BF	34	UNDER THE CENTER CONSOLE BOX

## ○ : SPLICE POINTS

CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS	CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS
E14			I 6		
E15			I12	32	COWL WIRE
E16			I13		
E17	30	ENGINE WIRE	I14		
E19			I18	32	ENGINE WIRE
E20			I19		
E21					



## ENGINE CONTROL

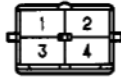
A 3



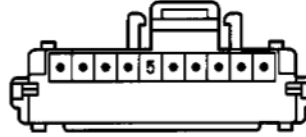
C 3 DARK GRAY



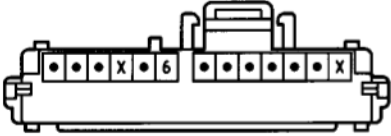
C 8



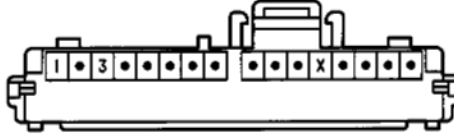
C10 (A) GRAY



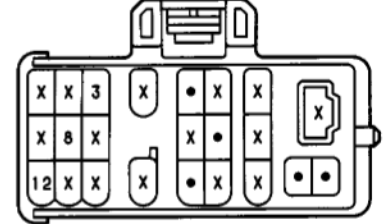
C11 (B) BLUE



C13



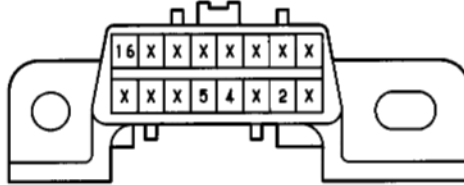
D 1 BLACK



D 2 BLACK



D 3



E 1 DARK GRAY



E 3 GREEN



E 4 (A) DARK GRAY



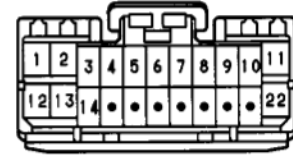
E 5 (C) DARK GRAY



E 6 (B) DARK GRAY



E 7 (D) DARK GRAY



F 4 BLACK



F 5 DARK GRAY



F 6 (A)



F 7 (B) GRAY



F11

(SEE PAGE 20)

F18 DARK GRAY



H 5 DARK GRAY



H 6 DARK GRAY



I 1 BLACK



I 2 DARK GRAY



I 3 BLACK



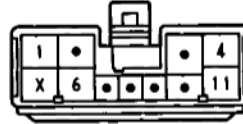
I 4, I 6, I 8 GRAY



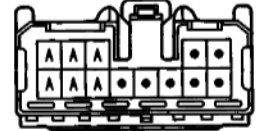
I 5, I 7, I 9 BROWN



I12 BLACK



J 1



(HINT:SEE PAGE 7)

J 2 BLUE



(HINT:SEE PAGE 7)

J 8 BLUE



(HINT:SEE PAGE 7)

J 9



(HINT:SEE PAGE 7)

K 1, K 2 DARK GRAY



M 1 BLACK



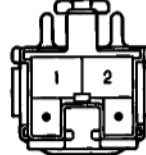
N 1 GRAY



P 1 GRAY



S13 BLACK



T 1 BLACK



V 3 BLUE



V 4 BROWN

