

ENGINE CONTROL

SYSTEM OUTLINE

THIS SYSTEM UTILIZES AN ECU AND MAINTAINS OVERALL CONTROL OF THE ENGINE, TRANSMISSION AND SO ON. AN OUTLINE OF THE ENGINE CONTROL IS EXPLAINED HERE.

1. INPUT SIGNALS

- (1) WATER TEMP. SIGNAL CIRCUIT
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. THE WATER TEMP. IS INPUT INTO **TERMINAL THW** OF ENGINE CONTROL ECU 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 ENGINE CONTROL ECU.
- (3) OXYGEN SENSOR SIGNAL CIRCUIT
THE OXYGEN DENSITY IN THE EXHAUST EMISSIONS IS DETECTED AND INPUT AS A CONTROL SIGNAL FROM THE OXYGEN SENSOR MAIN (FOR LEFT AND RIGHT BANK) TO **TERMINALS OXL1, OXR1** OF THE ECU AND FROM THE OXYGEN SENSOR SUB (FOR LEFT AND RIGHT BANK) TO **TERMINAL OXL2, OXR2** OF THE ECU.
TO STABILIZE DETECTION PERFORMANCE BY THE OXYGEN SENSOR (MAIN), THE OXYGEN SENSOR (MAIN) IS WARMED. THIS HEATER IS ALSO CONTROLLED BY THE ECU (HT1, HT2).
- (4) RPM SIGNAL CIRCUIT
CAM SHAFT POSITION IS DETECTED BY THE CAM POSITION SENSOR (FOR LEFT AND RIGHT BANK) INSTALLED IN THE DISTRIBUTOR HOUSING AND ITS SIGNAL IS INPUT TO **TERMINALS G1+, G2+** OF ECU AS A CONTROL SIGNAL. ALSO, THE ENGINE RPM IS DETECTED BY THE ENGINE SPEED SENSOR INSTALLED IN THE CYLINDER BLOCK AND THE SIGNAL IS INPUT INTO **TERMINAL NE+** OF ECU AS A CONTROL SIGNAL.
- (5) THROTTLE SIGNAL CIRCUIT
THE THROTTLE POSITION SENSOR DETECTS THE THROTTLE VALVE OPENING ANGLE AS A CONTROL SIGNAL, WHICH IS INPUT INTO **TERMINAL VTA 1** OF THE ECU. WHEN THE VALVE IS COMPLETELY CLOSED, THE CONTROL SIGNAL IS INPUT INTO **TERMINAL IDL 1**.
- (6) VEHICLE SPEED CIRCUIT
THE VEHICLE SPEED IS DETECTED BY SPEED SENSOR NO.1 INSTALLED IN THE TRANSMISSION AND THE SIGNAL IS INPUT TO **TERMINAL SPD** OF THE ECU VIA THE COMB. METER.
- (7) NEUTRAL START SIGNAL CIRCUIT
THE NEUTRAL START SW DETECTS WHETHER THE SHIFT POSITION IS IN NEUTRAL OR NOT, AND THE SIGNAL IS INPUT INTO **TERMINAL NSW** OF THE ECU.
- (8) AIR CONDITIONER SW SIGNAL CIRCUIT
THE OPERATING VOLTAGE OF THE A/C MAGNET CLUTCH IS DETECTED AND THE SIGNAL IS INPUT INTO **TERMINAL ACMG** OF ECU AS A CONTROL SIGNAL.
- (9) BATTERY SIGNAL CIRCUIT
VOLTAGE IS CONSTANTLY APPLIED TO **TERMINAL BATT** OF THE ECU. WITH THE IGNITION SW TURNED ON, THE VOLTAGE FOR ECU START-UP POWER SUPPLY IS APPLIED TO **TERMINAL +B** AND **+B1** OF ECU VIA ECU MAIN RELAY.
THE CURRENT FLOWING THROUGH THE IGN FUSE FLOWS TO **TERMINAL IGSW** OF THE ECU.
- (10) INTAKE AIR VOLUME SIGNAL CIRCUIT
INTAKE AIR VOLUME IS DETECTED BY THE AIR FLOW METER AND THE SIGNAL IS INPUT TO **TERMINAL KS** OF THE ECU AS A CONTROL SIGNAL.
- (11) STOP LIGHT SW SIGNAL CIRCUIT
THE STOP LIGHT SW IS USED TO DETECT WHETHER OR NOT THAT THE VEHICLE IS BRAKING AND THE SIGNAL IS INPUT INTO **TERMINAL BK** OF THE ECU AS A CONTROL SIGNAL.
- (12) STA SIGNAL CIRCUIT
TO CONFIRM WHETHER THE ENGINE IS CRANKING, THE VOLTAGE APPLIED TO THE STARTER MOTOR DURING CRANKING IS DETECTED AND THE SIGNAL IS INPUT INTO **TERMINAL STA** OF THE ECU AS A CONTROL SIGNAL.
- (13) ENGINE KNOCK SIGNAL CIRCUIT
ENGINE KNOCKING IS DETECTED BY KNOCK SENSOR NO.1 AND NO.2 AND THE SIGNAL IS INPUT INTO **TERMINALS KNK1** AND **KNK2** AS A CONTROL SIGNAL.

2. CONTROL SYSTEM

* EFI (ELECTRONIC FUEL INJECTION) SYSTEM

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

* ESA (ELECTRONIC SPARK ADVANCE) SYSTEM

THE ESA SYSTEM MONITORS THE ENGINE RPM THROUGH THE SIGNALS INPUT TO THE 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 ECU AND THE CONTROL SIGNAL IS OUTPUT TO **TERMINAL IGT1 AND IGT2**. THIS SIGNAL CONTROLS THE IGNITER TO PROVIDE THE BEST IGNITION TIMING FOR THE DRIVING CONDITIONS.

* FUEL PRESSURE-UP SYSTEM

THE FUEL PRESSURE-UP SYSTEM CAUSED THE VSV (FOR FUEL PRESSURE-UP) TO COME ON FOR HIGH TEMP. STARTING AND INCREASED THE FUEL PRESSURE TO IMPROVE STARTABILITY AT HIGH TEMPERATURES AND TO PROVIDE STABLE IDLING. THE ECU EVALUATES THE INPUT SIGNALS FROM EACH SENSOR ((1), (2), (4), (9) AND (10) ETC.), AND OUTPUTS CURRENT TO **TERMINAL PR** OF ECU TO CONTROL THE VSV.

* OXYGEN SENSOR HEATER CONTROL SYSTEM

THE 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 (FOR LEFT AND RIGHT BANK) TO IMPROVE DETECTION PERFORMANCE OF THE SENSOR.

THE ECU EVALUATES THE SIGNALS FROM EACH SENSOR (INPUT SIGNALS FROM (1), (2), (4), (9) TO (11) ETC.), OUTPUTS CURRENT TO **TERMINAL HT1, HT2** TO CONTROL THE HEATER.

* ISC (IDLE SPEED CONTROL) SYSTEM

THE ISC SYSTEM (STEP MOTOR 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 AND SO ON. THE 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 ISC VALVE.

* EGR CONTROL SYSTEM

THE EGR CONTROL SYSTEM DETECTS THE SIGNAL FROM EACH SENSOR (INPUT SIGNALS FROM (1), (4), (9), (10) ETC.), AND OUTPUTS CURRENT TO **TERMINAL EGR** TO CONTROL THE EGR VALVE.

* FUEL PUMP CONTROL SYSTEM

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

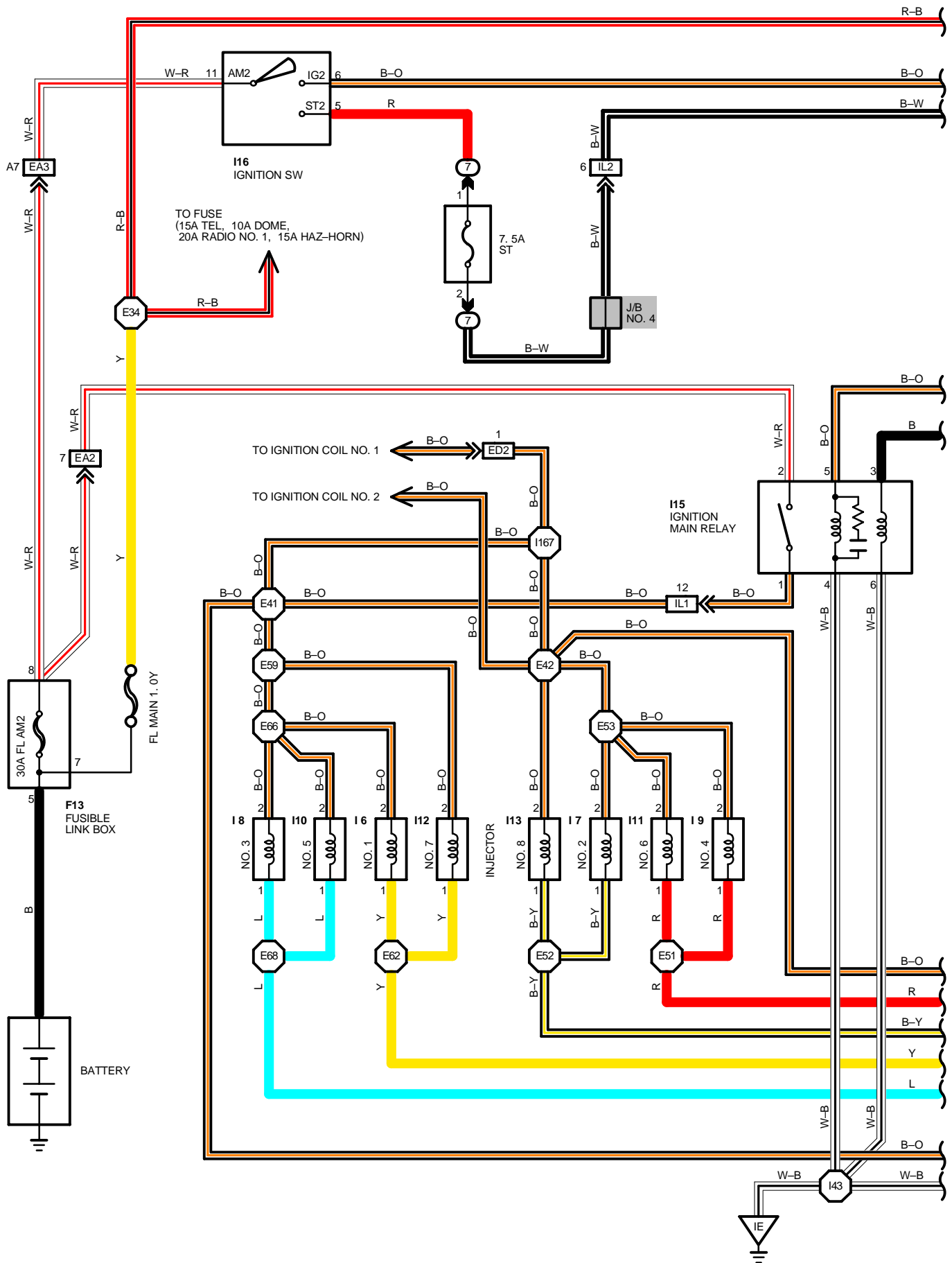
3. DIAGNOSIS SYSTEM

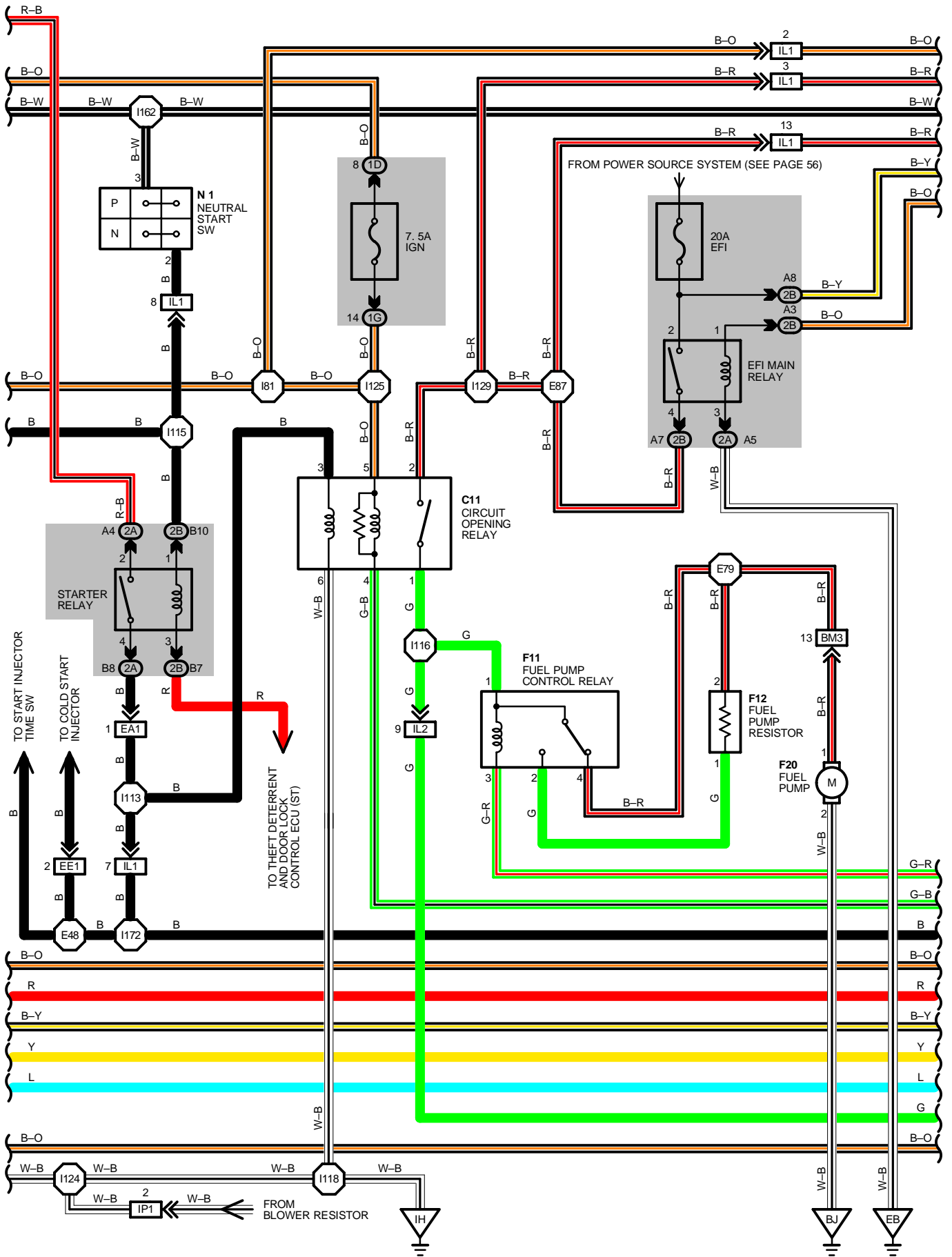
WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTION IN THE ECU SIGNAL SYSTEM, THE MALFUNCTIONING SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN BE FOUND BY THE READING THE CODE DISPLAYED BY THE CHECKING ENGINE WARNING LIGHT.

4. FAIL-SAFE SYSTEM

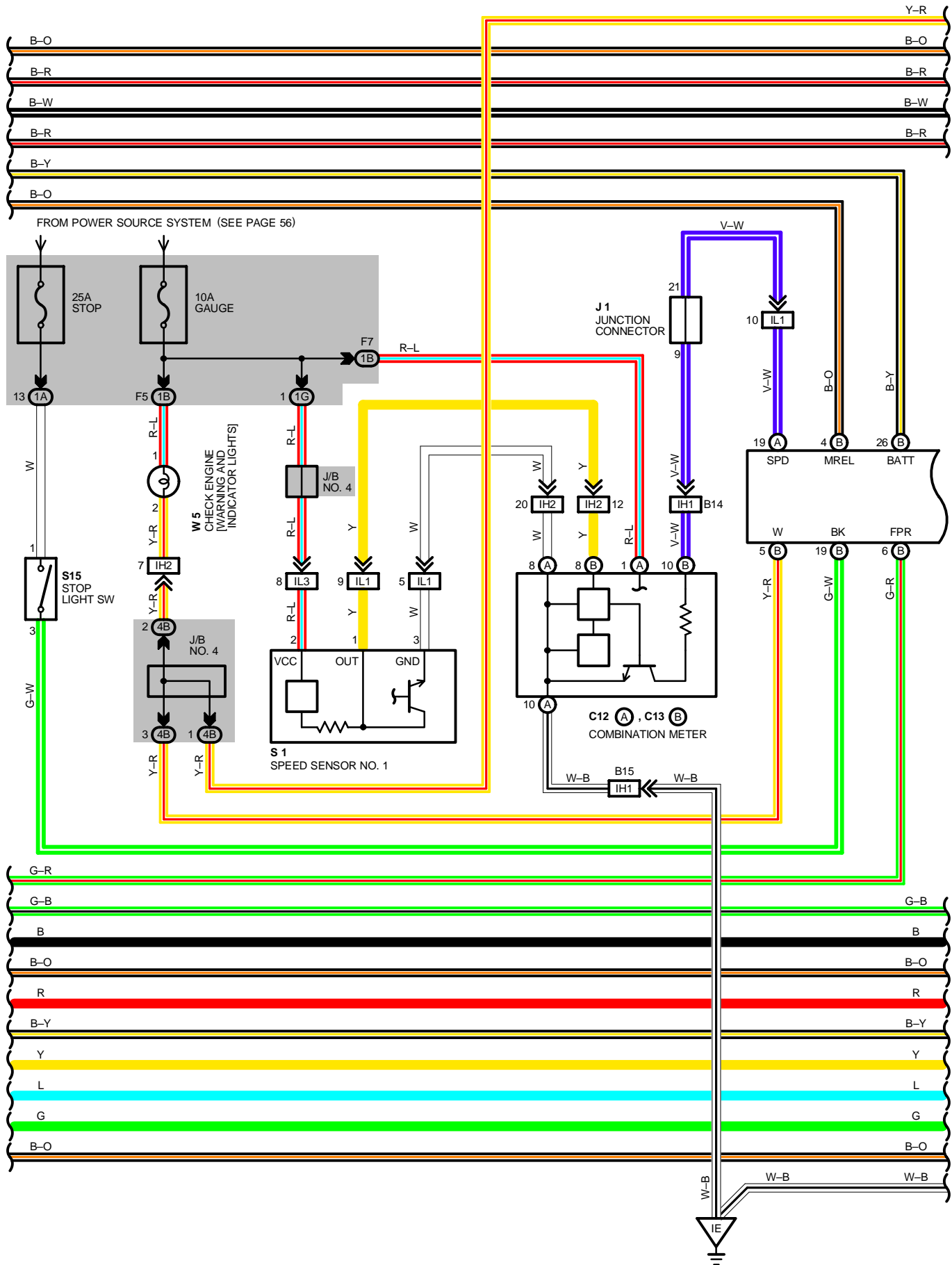
WHEN A MALFUNCTION HAS OCCURRED IN ANY SYSTEM. IF THERE IS A POSSIBILITY OF ENGINE TROUBLE BEING CAUSED BY CONTINUED CONTROL BASED ON THE SIGNALS FROM THAT SYSTEM. THE FAIL-SAFE SYSTEM EITHER CONTROLS THE SYSTEM BY USING DATA (STANDARD VALUES) RECORDED IN THE ECU MEMORY OR ELSE STOPS THE ENGINE.

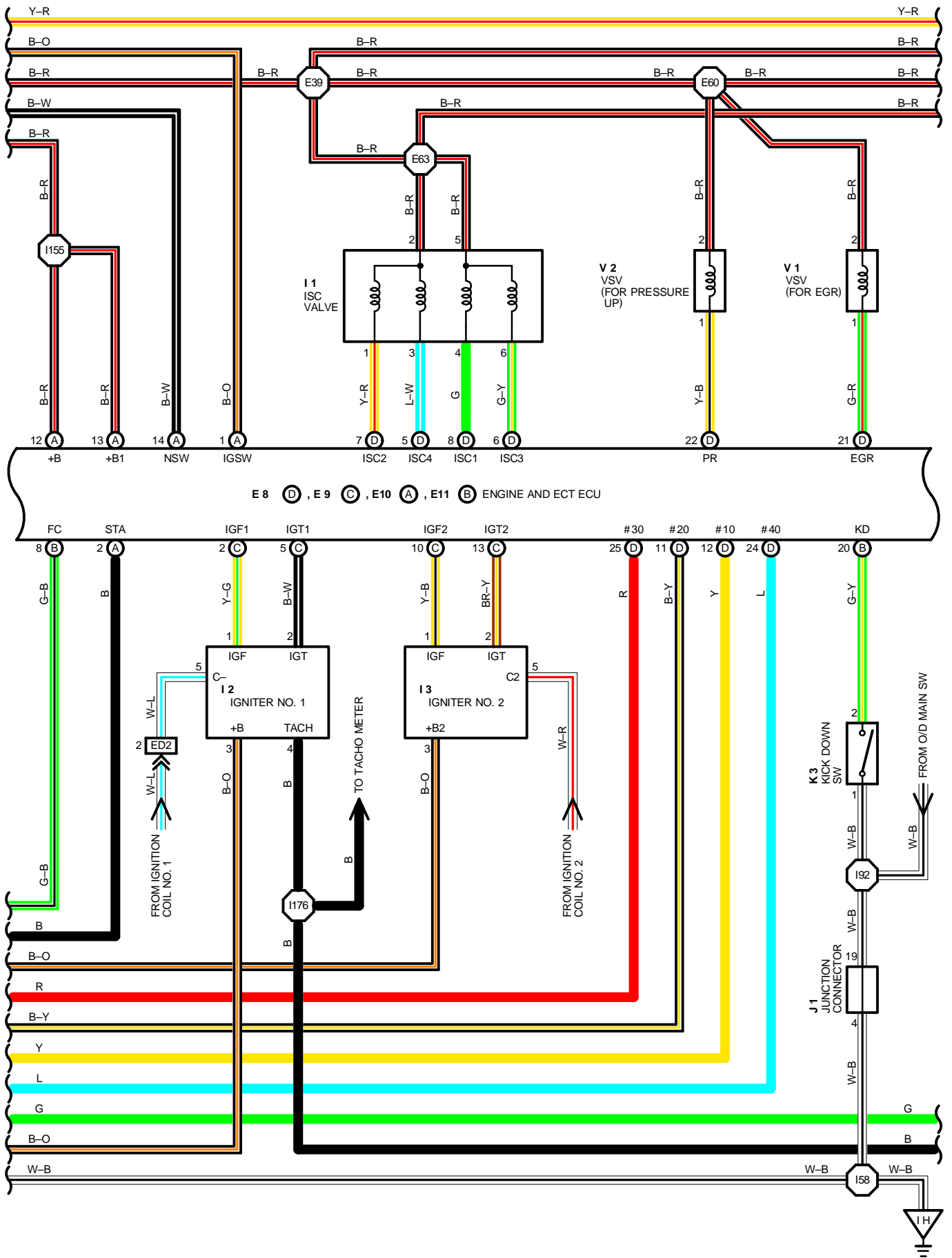
ENGINE CONTROL



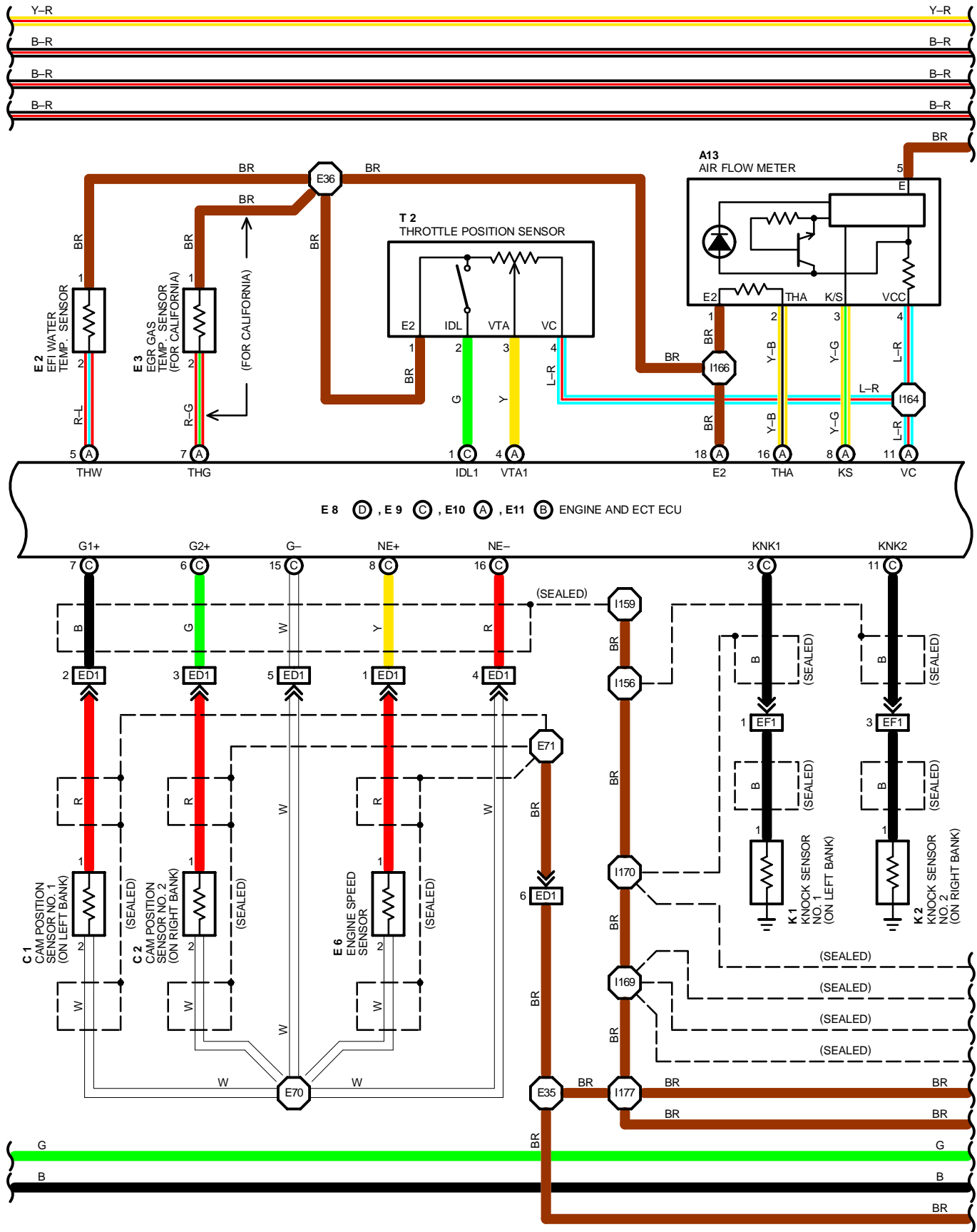


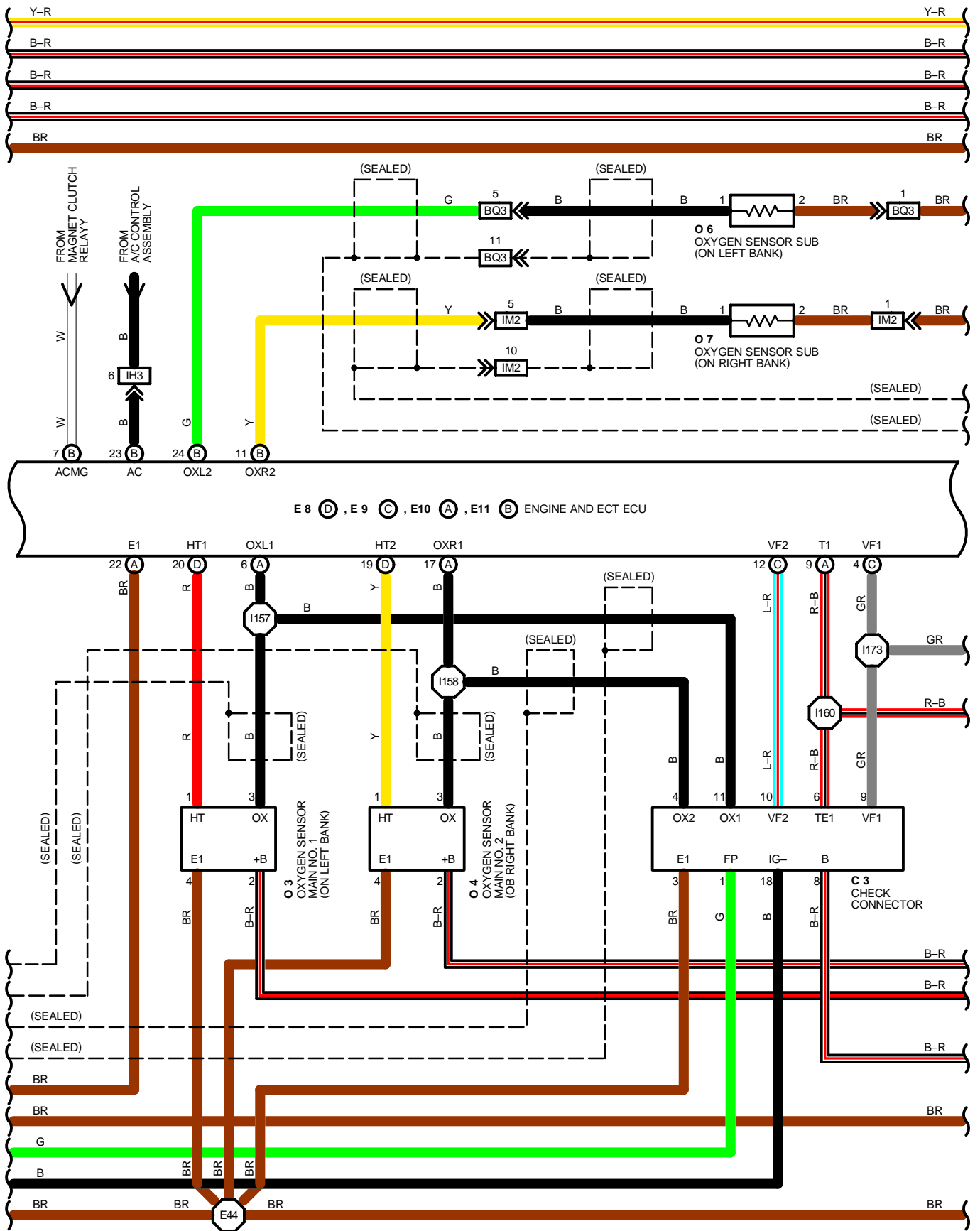
ENGINE CONTROL



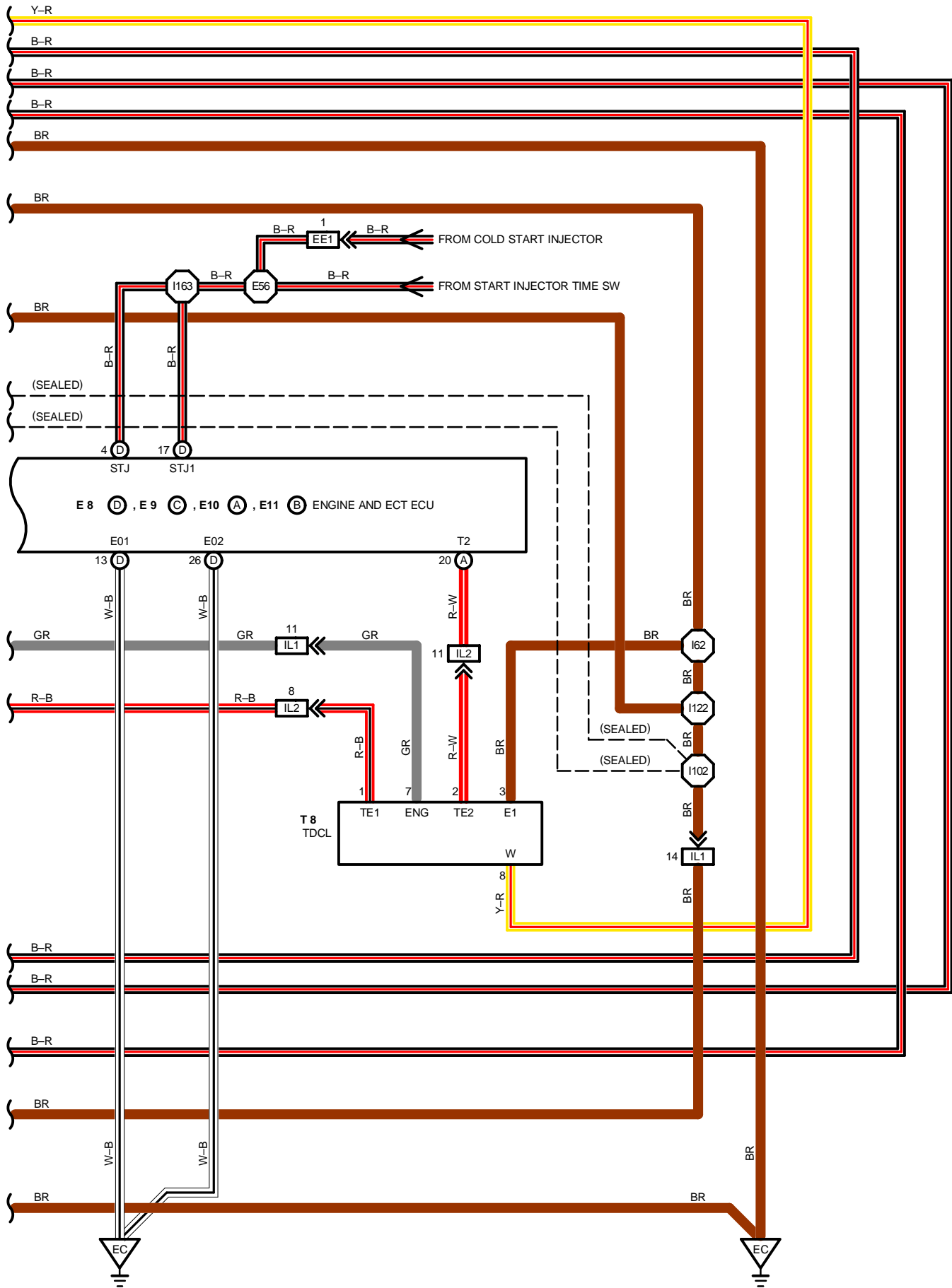


ENGINE CONTROL





ENGINE CONTROL



SERVICE HINTS

EFI MAIN RELAY

1-3 : CLOSED WITH IGNITION SW AT **ON** OR **ST** POSITION

C11 CIRCUIT OPENING RELAY

1-2 : CLOSED WITH STARTER RUNNING OR MEASURING PLATE (AIR FLOW METER) OPEN

E 2 EFI WATER TEMP. SENSOR

1-2 : APPROX. **16.2K Ω** (**-20°C**, **-4°F**)

APPROX. **2.45K Ω** (**20°C**, **68°F**)

APPROX. **0.32K Ω** (**80°C**, **176°F**)

E 3 EGR GAS TEMP. SENSOR (FOR CALIFORNIA)

1-2 : APPROX. **78.30K Ω** (**50°C**, **122°F**)

APPROX. **13.06K Ω** (**100°C**, **212°F**)

APPROX. **3.16K Ω** (**150°C**, **302°F**)

E 8, E 9, E10, E11 ENGINE AND ECT ECU

(VOLTAGE AT ENGINE AND ECT ECU WARNING CONNECTORS)

BATT-E1 : ALWAYS APPROX. **12 VOLTS**

IGSW-E1 : APPROX. **12 VOLTS** WITH IGNITION SW ON

+B, +B1-E1 : APPROX. **12 VOLTS** WITH IGNITION SW ON

IDL-E2 : APPROX. **5 VOLTS** WITH IGNITION SW ON AND THROTTLE VALVE OPEN

VC-E2 : APPROX. **5 VOLTS** WITH IGNITION SW ON

VTA-E2 : **0.1-1.0 VOLTS** WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED

3-5 VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY OPEN

KS-GROUND : APPROX. **5 VOLTS** WITH IGNITION SW ON

VC-GROUND : APPROX. **5 VOLTS** WITH IGNITION SW ON

THA-E2 : **1-3 VOLTS** WITH IGNITION SW ON AND INTAKE AIR TEMP. **20°C (68°F)**

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

#10, #20, #30, #40

-E01 : APPROX. **12 VOLTS** WITH IGNITION SW ON

STA-E1 : **6-14 VOLTS** WITH ENGINE CRANKING

ISC1, ISC2, ISC3, ISC4

-E1 : **9-14 VOLTS** WITH IGNITION SW ON

IGT-E1 : **0.7-1.0 VOLTS** WITH ENGINE IDLING

W-E1 : **8-14 VOLTS** WITH NO TROUBLE (CHECK ENGINE WARNING LIGHT OFF) AND ENGINE RUNNING

A/C-E1 : **0-2 VOLTS** WITH AIR CONDITIONER ON

TE1-E1 : **4-6 VOLTS** WITH IGNITION SW ON AND CHECK CONNECTOR TERMINALS TE1-E1 NO CONNECT

0-1 VOLTS WITH IGNITION SW ON AND CHECK CONNECTOR TERMINALS TE1-E1 CONNECT

NSW-E1 : **0-1 VOLTS** WITH IGNITION SW ON AND SHIFT LEVER **P** OR **N** RANGE

10-14 VOLTS WITH IGNITION SW ON AND SHIFT LEVER EXCEPT **P** OR **N** RANGE

BK-GROUND : APPROX. **12 VOLTS** WITH STOP LIGHT SW ON (BRAKE PEDAL DEPRESSED)

(RESISTANCE OF ENGINE AND ECT ECU WIRING CONNECTORS)

+B, +B1-#10,

#20, #30, #40 : **0.05-1.78 Ω**

+B, B1-PR : **30-50 Ω**

+B,+B1-EGR : **30-50 Ω**

+B, +B1-HT1,

HT2 : **5.1-6.3 Ω**

+B, +B1-BK : INFINITY

STJ-STA : **25-45 Ω** WITH WATER TEMP. BELOW APPROX. **15°C (59°F)**

65-85 Ω WITH WATER TEMP. ABOVE APPROX. **30°C (86°F)**

IDL1-E2 : INFINITY WITH THROTTLE VALVE OPEN

0-2.3K Ω WITH THROTTLE VALVE FULLY CLOSED

THG-E2 : **69.4-88.5K Ω** WITH EGR GAS TEMP. **50°C (122°F)**

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

THA-E2 : **200-300 Ω** WITH INTAKE AIR TEMP. **20°C (68°F)**

VTA1-E2 : **2.8-8K Ω** WITH THROTTLE VALVE FULLY OPEN

200-800 Ω WITH THROTTLE VALVE FULLY CLOSED

ENGINE CONTROL

F12 FUEL PUMP RESISTOR

1-2 : APPROX. 0.7Ω

I1 ISC VALVE

4, 6-5 : APPROX. 21.3Ω

1, 3-2 : APPROX. 21.3Ω

I6, I7, I8, I9, I10, I11, I12, I13 INJECTOR

1-2 : APPROX. 13.8Ω

O3, O4 OXYGEN SENSOR MAIN

1-2 : APPROX. 5.6Ω (20°C, 68°F)

T2 THROTTLE POSITION SENSOR

1-4 : APPROX. 4-9KΩ

1-3 : 3.3-10.0KΩ WITH THROTTLE VALVE FULLY OPENED POSITION

0.2-1.2KΩ WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0MM (0IN.)

1-2 : LESS THAN 2.3KΩ WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0.4MM (0.0157IN.)

INFINITY WITH CLEARANCE BETWEEN LEVER AND STOP SCREW 0.85MM (0.0335IN.)

V2 VSV (FOR FUEL PRESSURE UP)

1-2 : APPROX. 40Ω (20°C, 68°F)

○ : PARTS LOCATION

CODE	SEE PAGE	CODE	SEE PAGE	CODE	SEE PAGE
A13	24	F13	24	K 1	25
C 1	24	F20	28	K 2	25
C 2	24	I 1	25	K 3	27
C 3	24	I 2	25	N 1	25
C11	26	I 3	25	O 3	25
C12	A 26	I 6	25	O 4	25
C13	B 26	I 7	25	O 6	29
E 2	24	I 8	25	O 7	29
E 3	24	I 9	25	S 1	25
E 6	24	I10	25	S15	27
E 8	D 26	I11	25	T 2	25
E 9	C 26	I12	25	T 8	27
E10	A 26	I13	25	V 1	25
E11	B 26	I15	26	V 2	25
F11	24	I16	26	W 5	27
F12	24	J 1	27		

○ : RELAY BLOCKS

CODE	SEE PAGE	RELAY BLOCKS (RELAY BLOCK LOCATION)
7	18	R/B NO.7 (RIGHT SIDE OF J/B NO.1)

○ : 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 SIDE OF STEERING COLUMN TUBE)
1B	18	INSTRUMENT PANEL WIRE AND J/B NO.1 (LEFT SIDE OF STEERING COLUMN TUBE)
1D	18	COWL WIRE AND J/B NO.1 (LEFT SIDE OF STEERING COLUMN TUBE)
1G		
2A	20	ENGINE ROOM MAIN WIRE AND J/B NO.2 (ENGINE COMPARTMENT LEFT)
2B	20	COWL WIRE AND J/B NO.2 (ENGINE COMPARTMENT LEFT)
4B	23	COWL WIRE AND J/B NO.4 (BEHIND THE COMBINATION METER)

 : CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

CODE	SEE PAGE	JOINING WIRE HARNESS AND WIRE HARNESS (CONNECTOR LOCATION)
EA1	32	COWL WIRE AND ENGINE ROOM MAIN WIRE (FRONT SIDE OF RIGHT FENDER)
EA2		
EA3		
ED1	32	ENGINE WIRE AND ENGINE NO.4 WIRE (FRONT SIDE OF CYLINDER HEAD COVER LH)
ED2		
EE1	32	ENGINE WIRE AND ENGINE NO.4 WIRE, FOR COLD START INJECTOR (REAR SIDE OF AIR INTAKE CHAMBER)
EF1	32	ENGINE NO.2 WIRE AND ENGINE WIRE (REAR SIDE OF AIR INTAKE CHAMBER)
IH1	34	INSTRUMENT PANEL WIRE AND COWL WIRE (J/B NO.1)
IH2	34	INSTRUMENT PANEL WIRE AND COWL WIRE (BEHIND GLOVE BOX)
IH3		
IL1		
IL2	36	ENGINE WIRE AND COWL WIRE (UNDER THE GLOVE BOX)
IL3		
IM2	36	FLOOR NO.1 WIRE AND COWL WIRE (UNDER THE GLOVE BOX)
IP1	36	COWL WIRE AND A/C NO.2 WIRE (BEHIND GLOVE BOX)
BM3	38	COWL WIRE AND FLOOR NO.1 WIRE (RIGHT KICK PANEL)
BQ3	38	COWL WIRE AND FLOOR NO.2 WIRE (LEFT KICK PANEL)

 : GROUND POINTS

CODE	SEE PAGE	GROUND POINTS LOCATION
EB	32	FRONT SIDE OF LEFT FENDER
EC	32	REAR SIDE OF CYLINDER HEAD RH
IE	34	LEFT KICK PANEL
IH	34	RIGHT KICK PANEL
BJ	38	UNDER THE RIGHT REAR PILLAR

 : SPLICE POINTS

CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS	CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS
E 34	32	ENGINE WIRE	I102	36	COWL WIRE
E 35			I113		
E 36			I115		
E 39			I116		
E 41			I118		
E 42			I122		
E 44			I124		
E 48			I125		
E 51			I129		
E 52			I155		
E 53			I156		
E 56			I157		
E 59			I158		
E 60			I159		
E 62			I160		
E 63			I162		
E 66			I163		
E 68			I164		
E 70	I166				
E 71	32	ENGINE NO.4 WIRE	I167		
E 79			I169		
E 87	36	COWL WIRE	I170		
I 43			I172		
I 58			I173		
I 62			I176		
I 81			I177		
I 92					

ENGINE CONTROL

A13 BLACK



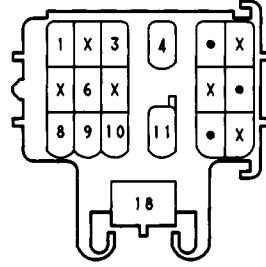
C 1 DARK GRAY



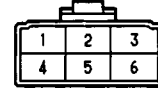
C 2 DARK GRAY



C 3 DARK GRAY



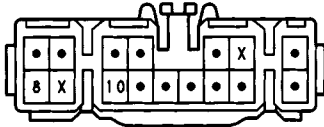
C11 DARK GRAY



C12 (A)



C13 (B) ORANGE



E 2 GREEN



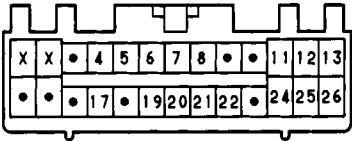
E 3 DARK GRAY



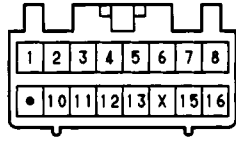
E 6 DARK GRAY



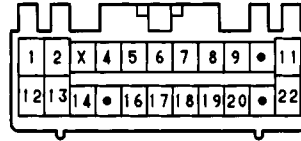
E 8 (D) DARK GRAY



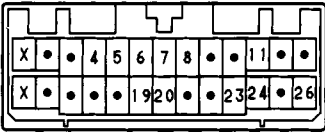
E 9 (C) DARK GRAY



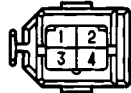
E10 (A) DARK GRAY



E11 (B) DARK GRAY



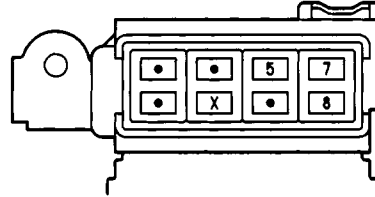
F11 BLACK



F12 DARK GRAY



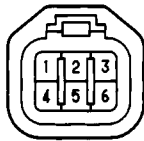
F13



F20 DARK GRAY



I 1 DARK GRAY



I 2 BLACK



I 3 BLACK



I 6 DARK GRAY



I 7 DARK GRAY



I 8 DARK GRAY



I 9 DARK GRAY



I10 DARK GRAY



I11 DARK GRAY



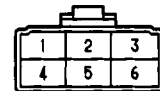
I12 DARK GRAY



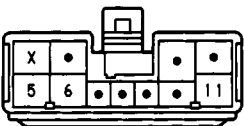
I13 DARK GRAY



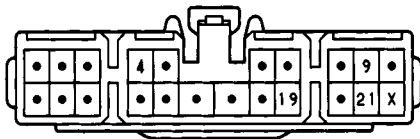
I15 DARK GRAY



I16 BLACK



J 1



K 1 DARK GRAY



K 2 DARK GRAY



K 3 BLACK



N 1 GRAY



O 3 DARK GRAY



O 4 DARK GRAY



O 6 DARK GRAY



O 7 DARK GRAY



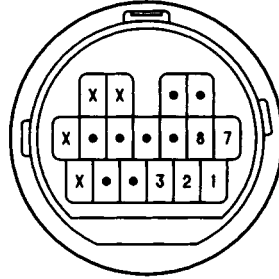
S 1 GRAY



T 2 BLACK



T 8 DARK GRAY



V 1 DARK GRAY



V 2 BLACK



W 5

