

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 EMISSION 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, THE OXYGEN SENSOR IS WARMED. THIS HEATER IS ALSO CONTROLLED BY THE ECU (HT1, HT2).

(4) RPM SIGNAL CIRCUIT

CAMSHAFT POSITION IS DETECTED BY THE CAM POSITION SENSOR (FOR LEFT AND RIGHT BANK) INSTALLED IN THE DISTRIBUTOR HOUSING AND IT'S 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 VTA1** OF THE ECU. WHEN THE VALVE IS COMPLETELY CLOSED, THE CONTROL SIGNAL IS INPUT INTO **TERMINAL IDL1**.

(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) AIRCONDITIONING SW SIGNAL CIRCUIT

THE OPERATING VOLTAGE OF THE A/C MAGNETIC 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 **TERMINALS +B AND +B1** OF ECU VIA EFI 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 THE VEHICLE IS BRAKING AND THE SIGNAL IS INPUT INTO **TERMINAL STP** 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 CONDITION 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 **TERMINALS 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 CONDITION 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 CAUSES 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 FPU** 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.) AND OUTPUTS CURRENT TO **TERMINAL HTL1, HTR2** 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** (EX. CALIFORNIA), **EGR1, EGR2, EGR3 AND EGR4** (FOR CALIFORNIA) TO CONTROL THE EGR VALVE.

* FUEL PUMP CONTROL SYSTEM

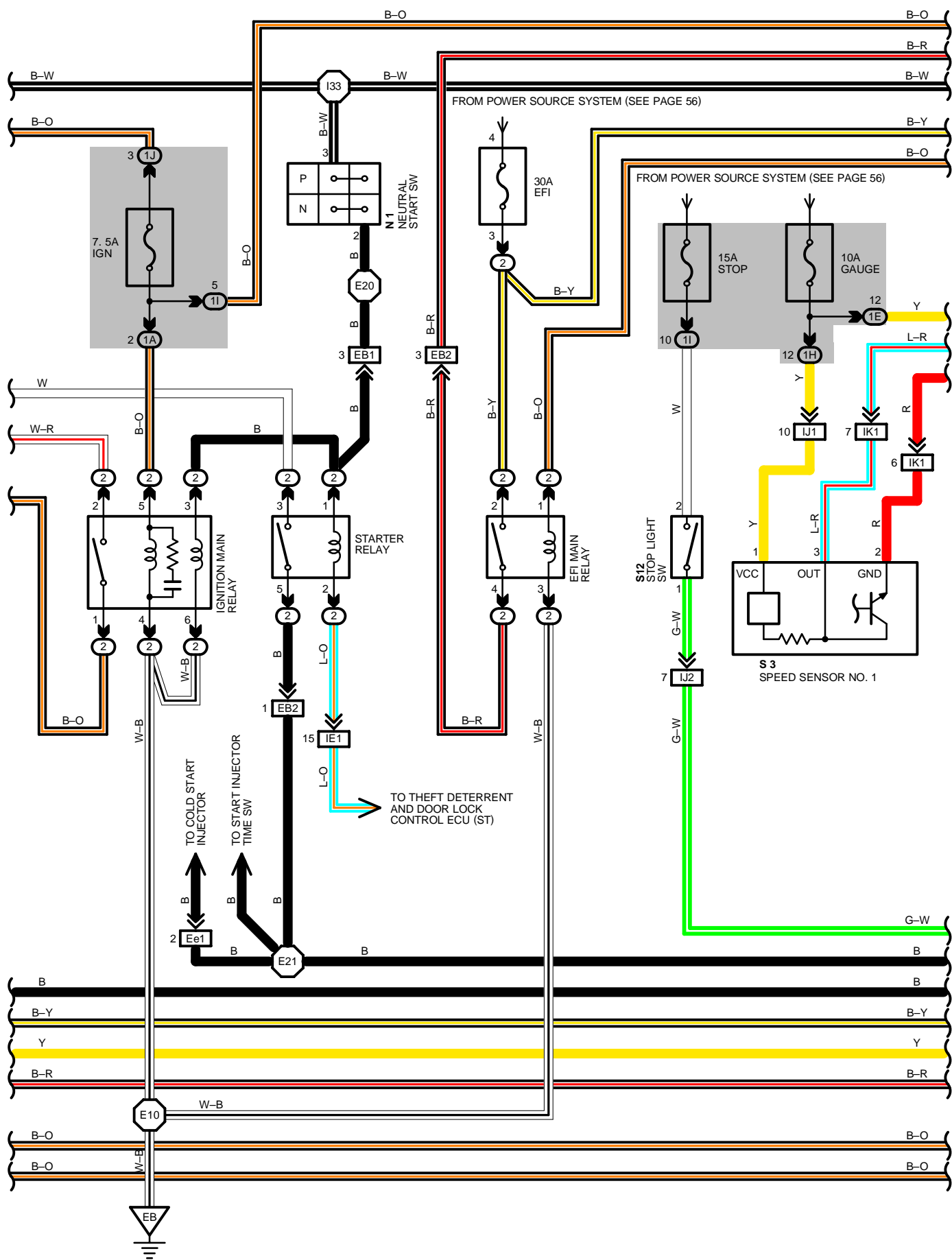
THE COMPUTER OUTPUTS CURRENT TO **TERMINAL FPC** AND CONTROLS THE FUEL PUMP ECU AND FUEL PUMP DRIVE SPEED IN RESPONSE TO CONDITIONS.

3. DIAGNOSIS SYSTEM

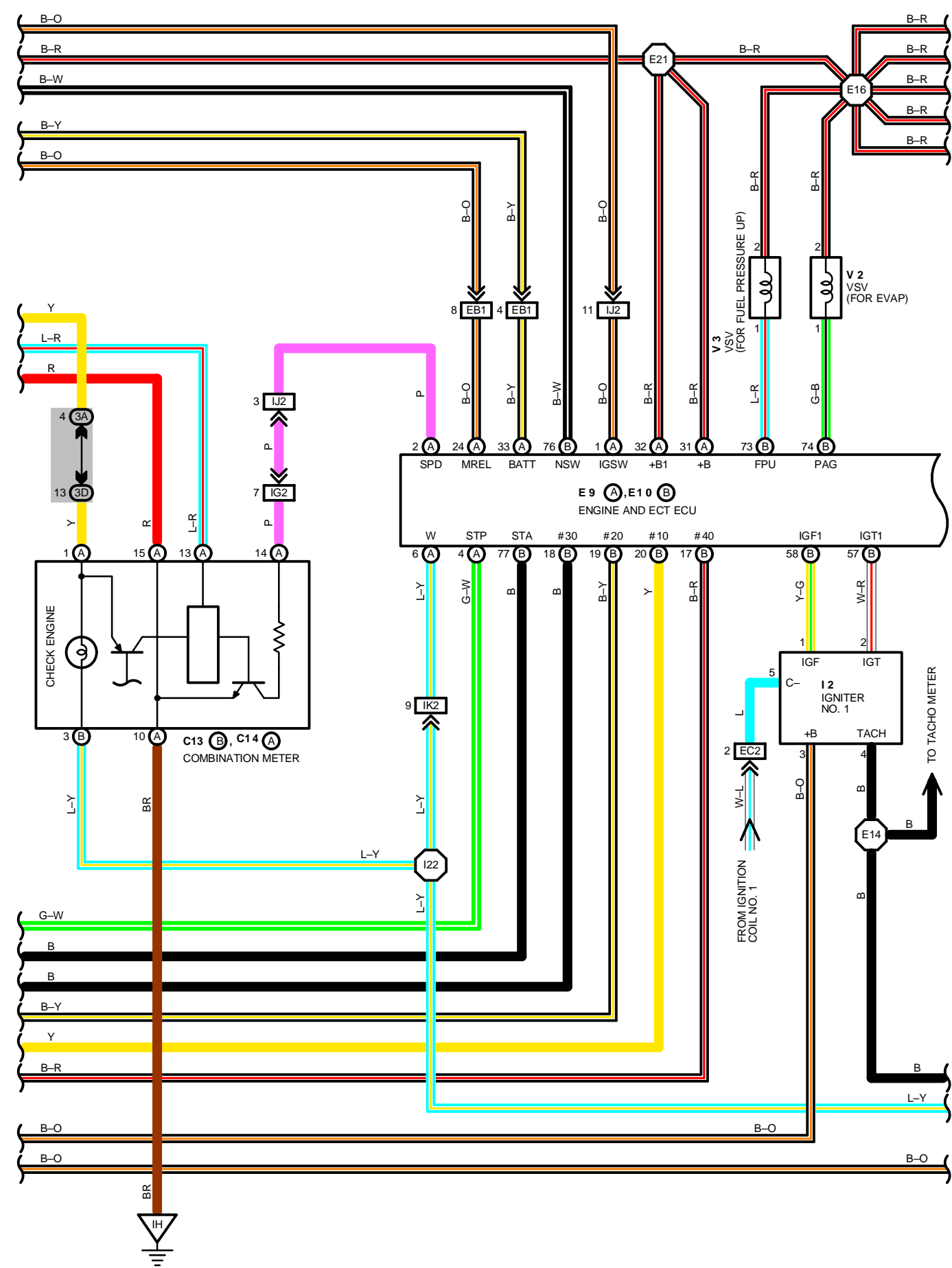
WITH THE DIAGNOSIS SYSTEM, WHEN THERE IS A MALFUNCTION IN THE ECU SIGNAL SYSTEM, THE MALFUNCTIONING SYSTEM IS RECORDED IN THE MEMORY. THE MALFUNCTIONING SYSTEM CAN BE FOUND BY READING THE CODE DISPLAYED BY THE CHECKING ENGINE WARNING LIGHT.

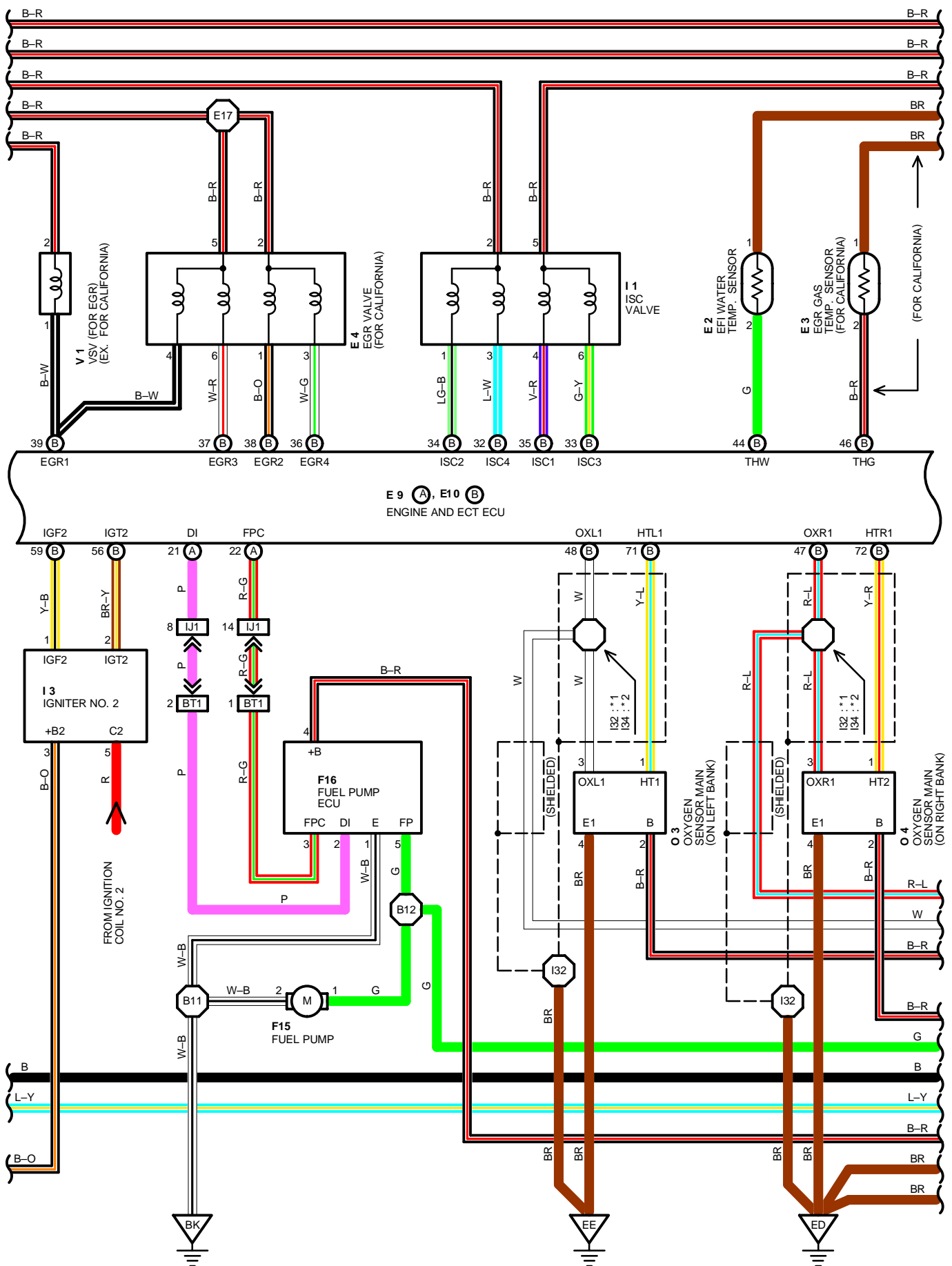
4. FAIL-SAFE SYSTEM

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.

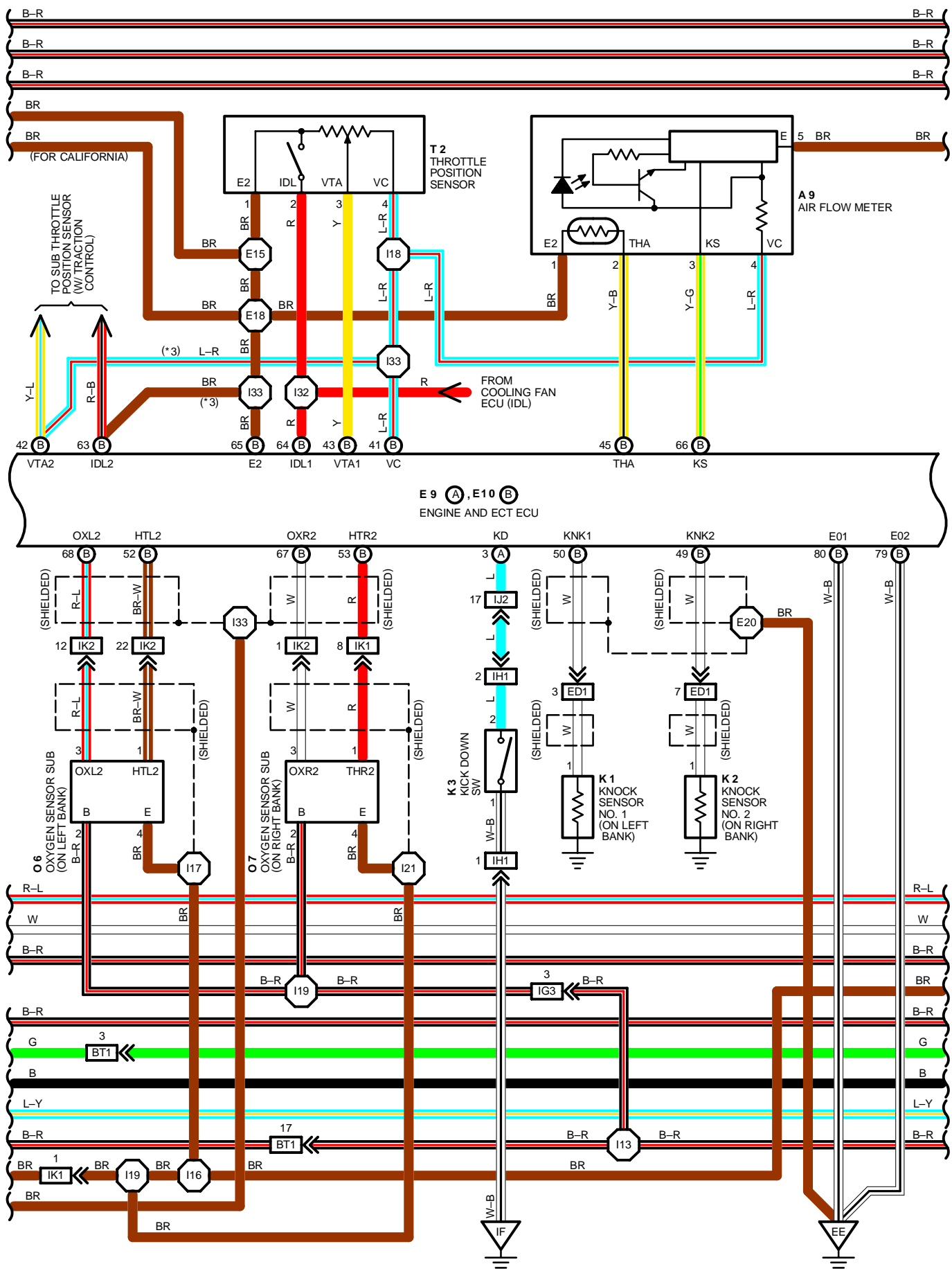


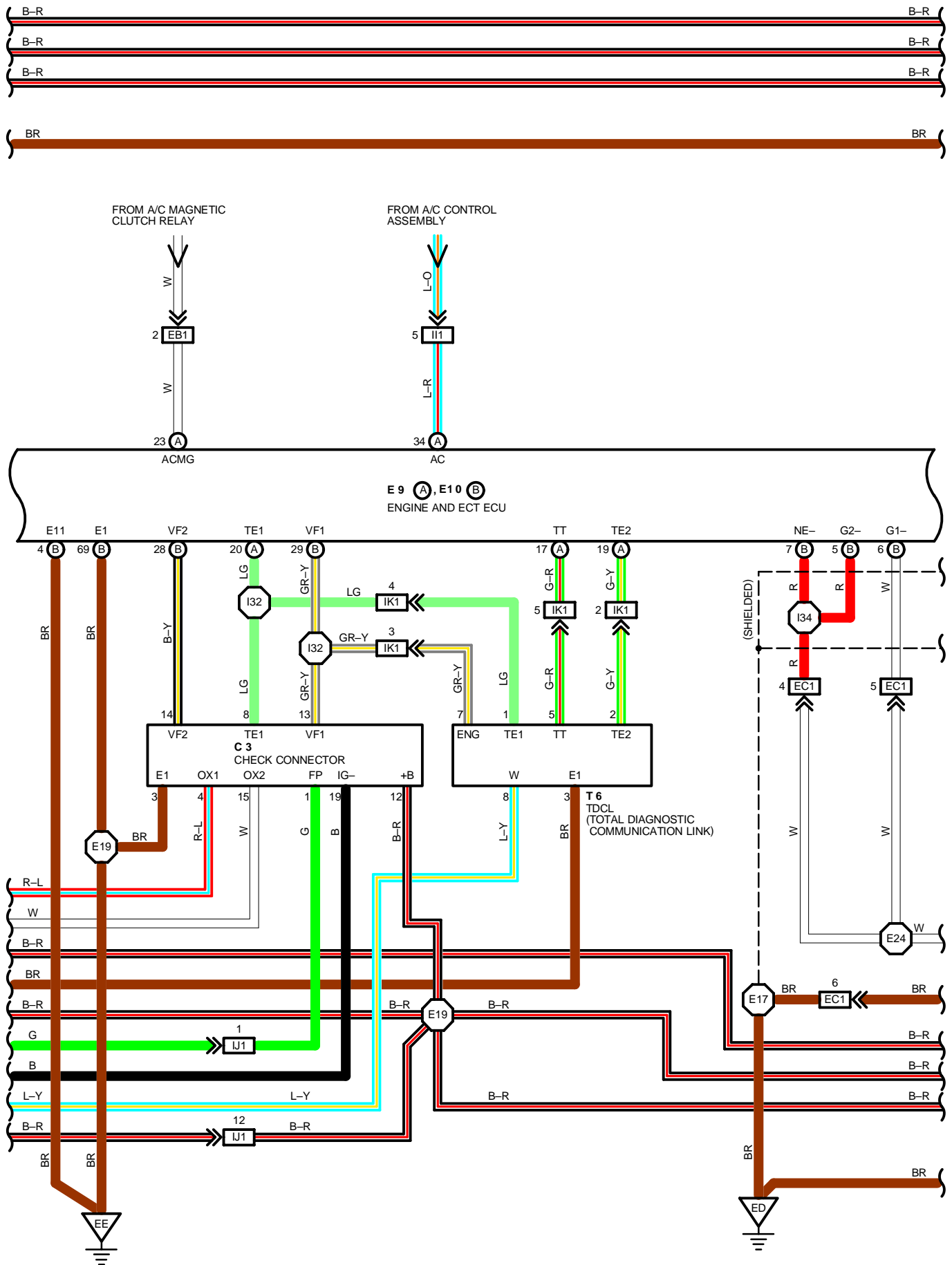
ENGINE CONTROL



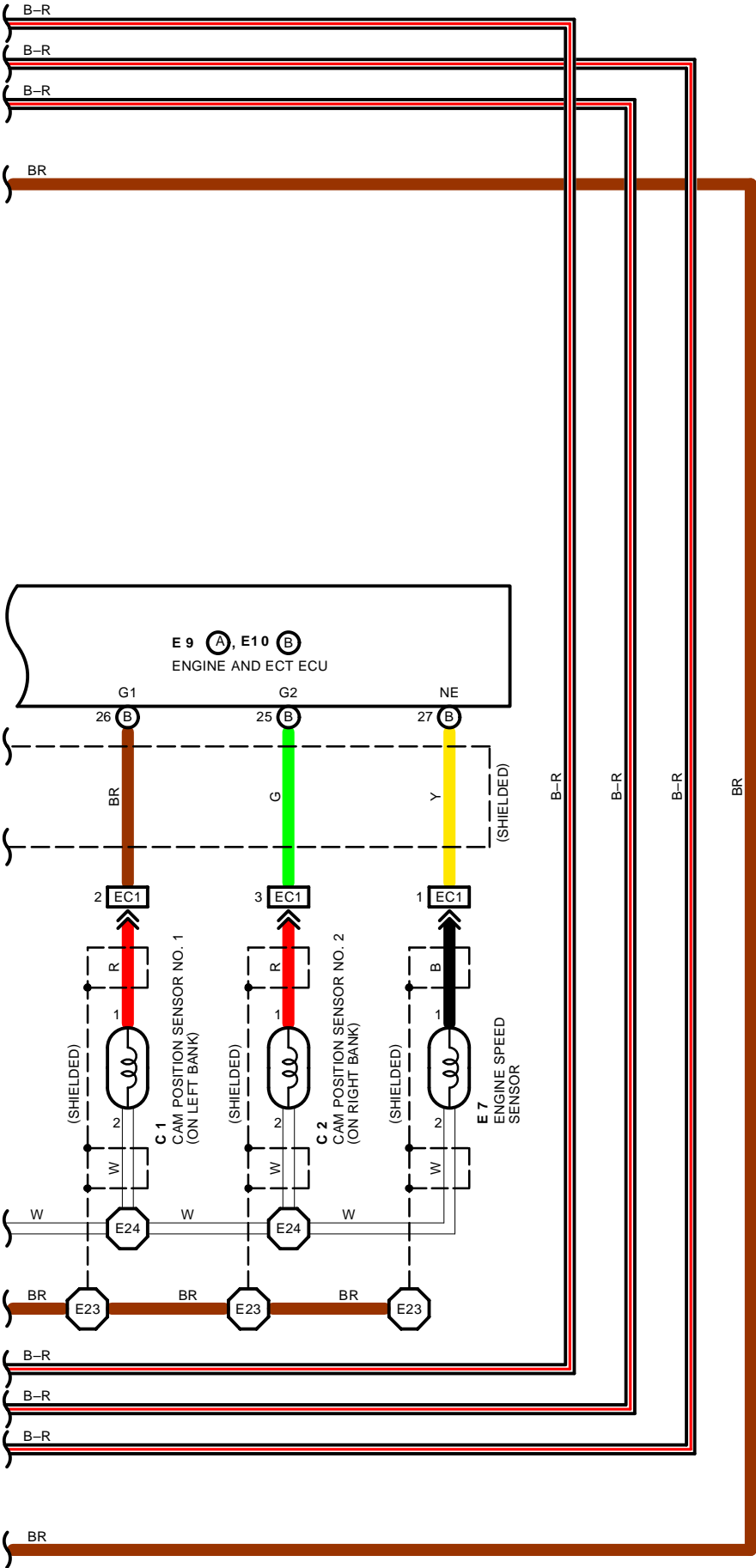


ENGINE CONTROL





ENGINE CONTROL



SERVICE HINTS

EFI MAIN RELAY

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

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 9, E10 ENGINE AND ECT ECU

(VOLTAGE AT ENGINE AND ECT ECU WIRING 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
VC – E2 : **4–6** VOLTS WITH IGNITION SW ON
IDL1, IDL2 – E2 : **0–1** VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED
: **10–14** VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY OPEN
VTA1, VTA2 – E2 : **0.1–1.0** VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED
: **3–6** VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY OPEN
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)**
STA – E1 : **6–14** VOLTS WITH ENGINE CRANKING
#10, #20, #30, #40 – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
IGF1, IGF2 – E1 : **0–1** VOLTS WITH ENGINE IDLING
MREL – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
DI – E1 : **7.5–14** VOLTS WITH ENGINE IDLING
FPU – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
PAG – E1 : APPROX. **12** VOLTS WITH ENGINE IDLING
ISC1, ISC2, ISC3, ISC4 – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
HTL1, HTR1, HTL2, HTR2 – E01: **0–2** VOLTS WITH ENGINE IDLING
EGR1, EGR2, EGR3, EGR4 – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
EGR – E1 : **12** VOLTS WITH ENGINE IDLING
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 EXCEPT **P** OR **N** RANGE
TE1 – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
TE2 – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
W – E1 : APPROX. **12** VOLTS WITH ENGINE IDLING
: **0–2** VOLTS WITH IGNITION SW ON
A/C – E1 : **0–2** VOLTS WITH AIR CONDITIONER ON
: **10–14** VOLTS WITH AIR CONDITIONER OFF
ACMG – E1 : **0–2** VOLTS WITH AIR CONDITIONER ON
: **10–14** VOLTS WITH AIR CONDITIONER OFF
TR – E1 : APPROX. **12** VOLTS WITH IGNITION SW ON
VTA1, VTA2 – E2 : **0–1** VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY CLOSED
: **3–5.5** VOLTS WITH IGNITION SW ON AND THROTTLE VALVE FULLY OPEN
NEO – E1 : **4–6** VOLTS WITH IGNITION SW ON

ENGINE CONTROL

(RESISTANCE OF ENGINE AND ECT ECU WIRING CONNECTORS)

+B, +B1 – #10, #20, #30, #40 : **13.2–14.2Ω**

+B, +B1 –STJ: **2–4Ω**

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

+B, +B1 –FPU: **37–44Ω**

+B, +B1 – EGR1, EGR2, EGR3, EGR4: **19.9–23.4Ω**

+B, +B1 – EGR : **33–39Ω**

+B, +B1, HTR1, HTR2 : **5.1–6.3Ω**

+B, +B1 – PAG : **30–34Ω**

IDL1, IDL2 – E2 :INFINITY WITH THROTTLE VALVE OPEN

0–2.3Ω WITH THROTTLE VALVE FULLY CLOSED

VTA1, VTA2 – E2 :**3.3–10Ω** WITH THROTTLE VALVE FULLY OPEN

200–800Ω WITH THROTTLE VALVE FULLY CLOSED

VC – E2 : **4–9KΩ**

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

THA – E2 : **2–3KΩ** WITH INTAKE AIR TEMP. **20°C (68°F)**

THG – E2 : **69.4–88.5KΩ** WITH EGR GAS TEMP. **50°C (112°F)**

G1, G2 –G– : **0.835–13.5KΩ**

NE– NE– : **0.835–13.5KΩ**

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 SUB

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 (0 IN.)**

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

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

○ : PARTS LOCATION

CODE	SEE PAGE	CODE	SEE PAGE	CODE	SEE PAGE
A 9	26	I 1	27	N 1	27
C 1	26	I 2	27	O 3	27
C 2	26	I 3	27	O 4	27
C 3	26	I 6	27	O 6	29
C13 B	28	I 7	27	O 7	29
C14 A	28	I 8	27	S 1	27
E 2	26	I 9	27	S 3	27
E3	26	I10	27	S12	29
E4	26	I11	27	T 2	27
E 7	26	I12	27	T 6	29
E 9 A	28	I13	27	V 1	27
E10 B	28	I15	29	V 2	27
F 9	26	K 1	27	V 3	27
F15	30	K 2	27		
F16	30	K 3	29		

○ : RELAY BLOCKS

CODE	SEE PAGE	RELAY BLOCKS (RELAY BLOCK LOCATION)
2	19	ENGINE COMPARTMENT LEFT

**: JUNCTION BLOCK AND WIRE HARNESS CONNECTOR**

CODE	SEE PAGE	JUNCTION BLOCK AND WIRE HARNESS (CONNECTOR LOCATION)
1A	20	ENGINE ROOM MAIN WIRE
1B		
1E	20	INSTRUMENT PANEL WIRE
1H	20	COWL WIRE
1I		
1J		
1K		
3A	23	INSTRUMENT PANEL WIRE
3D		

**: CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS**

CODE	SEE PAGE	JOINING WIRE HARNESS AND WIRE HARNESS (CONNECTOR LOCATION)
EB1	34	ENGINE WIRE AND ENGINE ROOM MAIN WIRE (FRONT SIDE OF R/B NO.2)
EB2		
EC1	34	ENGINE WIRE AND ENGINE ROOM NO. 4 WIRE (FRONT SIDE OF CYLINDER HEAD COVER LH)
EC2		
ED1	34	ENGINE NO. 2 WIRE AND ENGINE WIRE (REAR SIDE OF AIR INTAKE CHAMBER)
Ee1	34	ENGINE WIRE AND ENGINE NO. 4 WIRE (REAR SIDE OF AIR INTAKE CHAMBER)
IE1	36	ENGINE WIRE AND COWL WIRE (R/B NO. 4)
IG2	36	INSTRUMENT PANEL WIRE AND COWL WIRE (R/B NO. 5)
IG3	38	INSTRUMENT PANEL WIRE AND COWL WIRE (RIGHT KICK PANEL)
IH1	36	COWL NO. 2 WIRE AND COWL WIRE (BEHIND COMBINATION METER)
II1	36	ENGINE WIRE AND A/C WIRE (BEHIND GLOVE BOX)
IJ1	36	ENGINE WIRE AND COWL WIRE (RIGHT KICK PANEL)
IJ2		
IK1	36	ENGINE WIRE AND INSTRUMENT PANEL WIRE (RIGHT KICK PANEL)
IK2		
BT1	40	FLOOR WIRE AND COWL WIRE (LEFT KICK PANEL)

**: GROUND POINTS**

CODE	SEE PAGE	GROUND POINTS LOCATION
EB	34	FRONT SIDE OF LEFT FENDER
ED	34	REAR SIDE OF CYLINDER HEAD RH
EE	34	REAR SIDE OF CYLINDER HEAD LH
IF	36	LEFT KICK PANEL
IH	36	UNDER THE ASHTRAY LH
BK	40	UNDER THE CENTER PILLAR LH

**: SPLICE POINTS**

CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS	CODE	SEE PAGE	WIRE HARNESS WITH SPLICE POINTS
E10	34	ENGINE ROOM MAIN WIRE	I16	38	INSTRUMENT PANEL WIRE
E14			I17		
E15	34	ENGINE WIRE	I18		
E16			I19		
E17			I21		
E18			I22		
E19			I32	38	ENGINE WIRE
E20			I33		
E21			I34		
E23	34	ENGINE NO. 4 WIRE	B11	40	FLOOR MAIN WIRE
E24			B12		
I13	38	COWL WIRE			

ENGINE CONTROL

A 9 BLACK



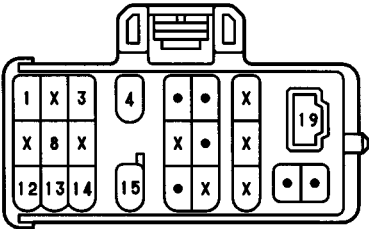
C 1 DARK GRAY



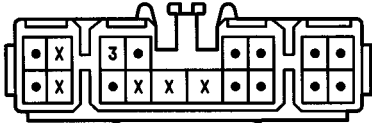
C 2 DARK GRAY



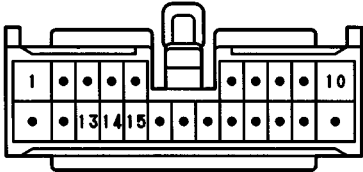
C 3 BLACK



C13 Ⓑ



C14 Ⓐ



E 2 DARK GREEN



E 3 DARK GRAY



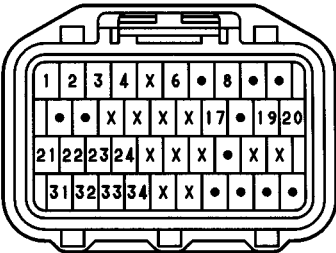
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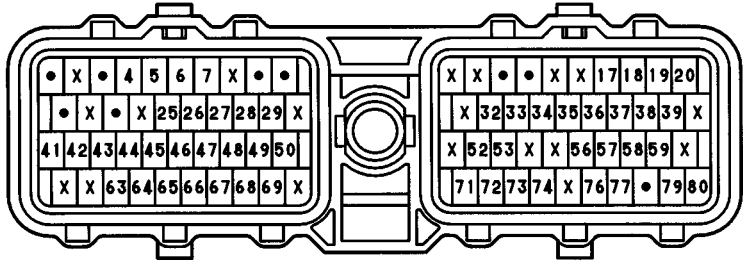
E 7 DARK GRAY



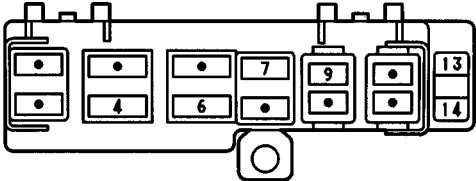
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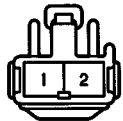
E10 Ⓑ DARK GRAY



F 9 BLACK



F15 DARK GRAY



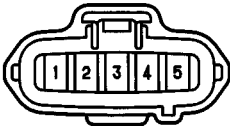
F16 BLACK



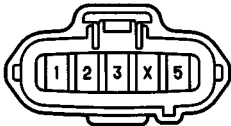
I 1 DARK GRAY



I 2 BLACK



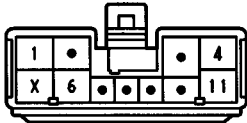
I 3 BLACK



I 6, I 7, I 8, I 9, I 10, I 11, I 12, I 13 DARK GRAY



I15 BLACK



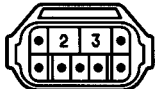
K 1, K 2 DARK GRAY



K 3 BLACK



N 1 GRAY



0 3, 0 4 DARK GRAY



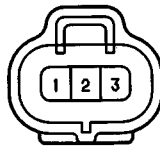
0 6, 0 7 DARK GRAY



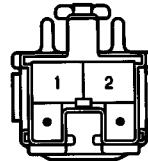
S 1 GRAY



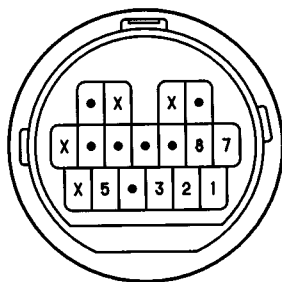
S 3 GRAY



S12



T 6 DARK GRAY



V 1 BLUE



V 2 BLACK



V 3 BLACK

