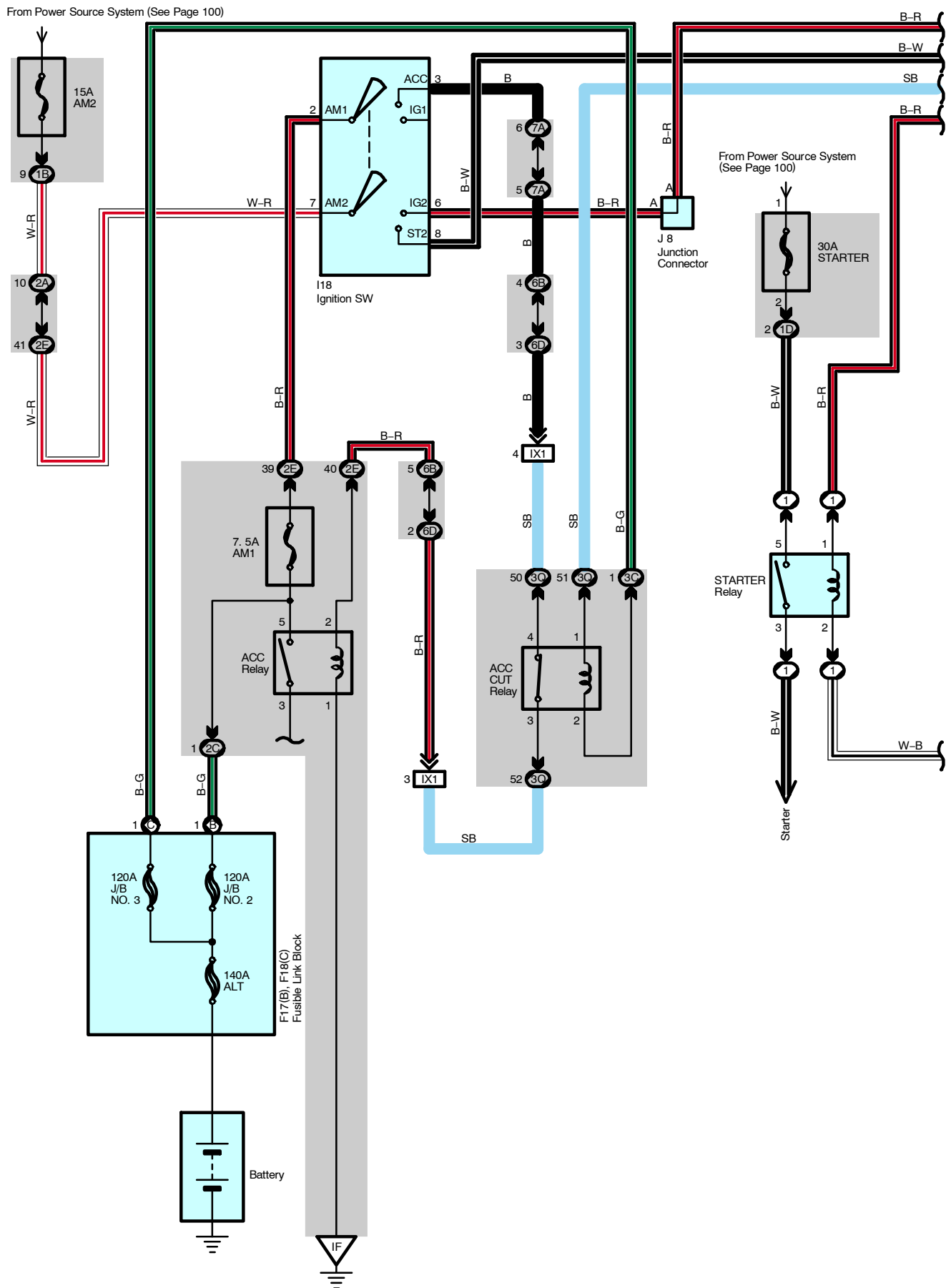
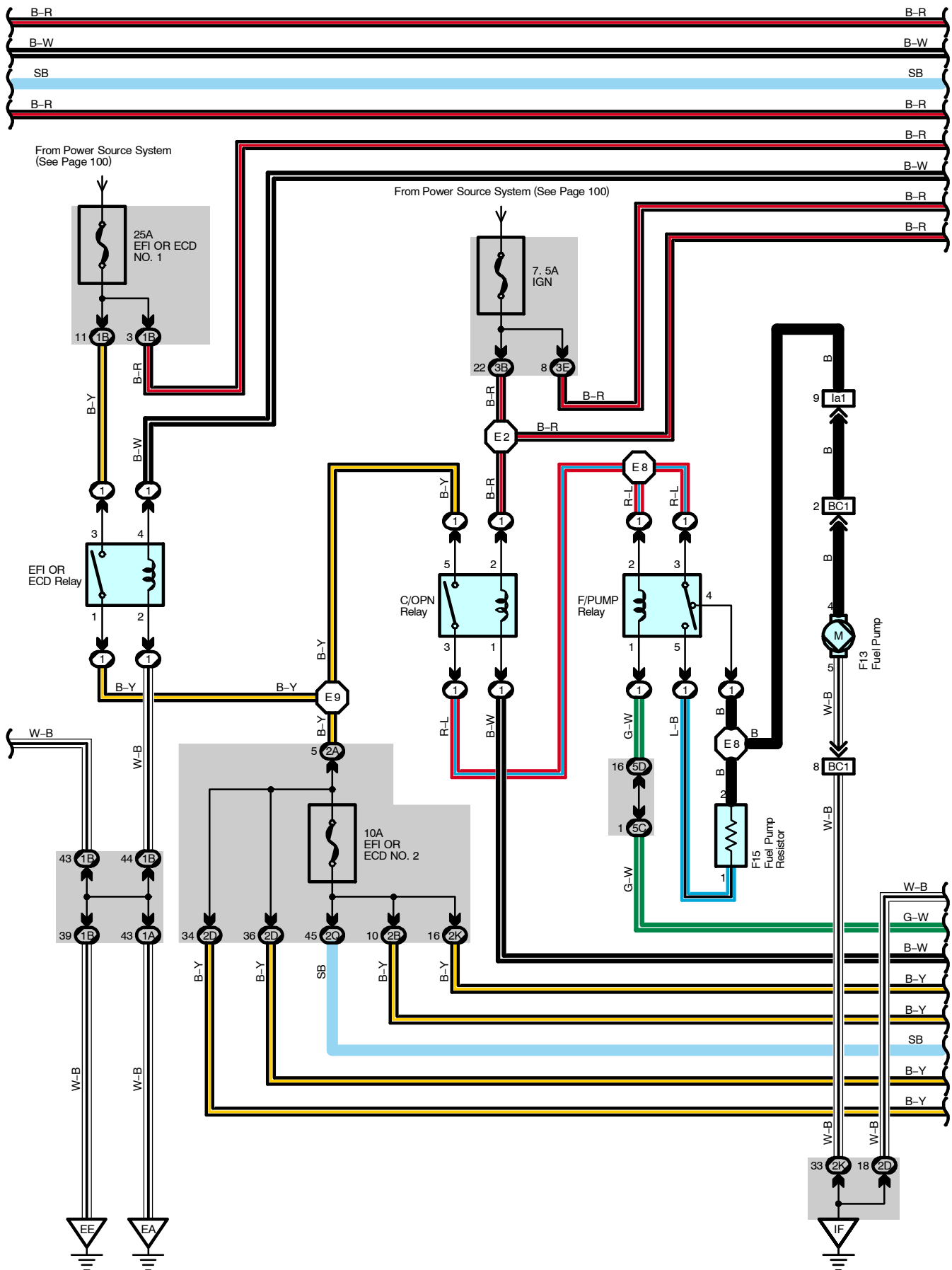
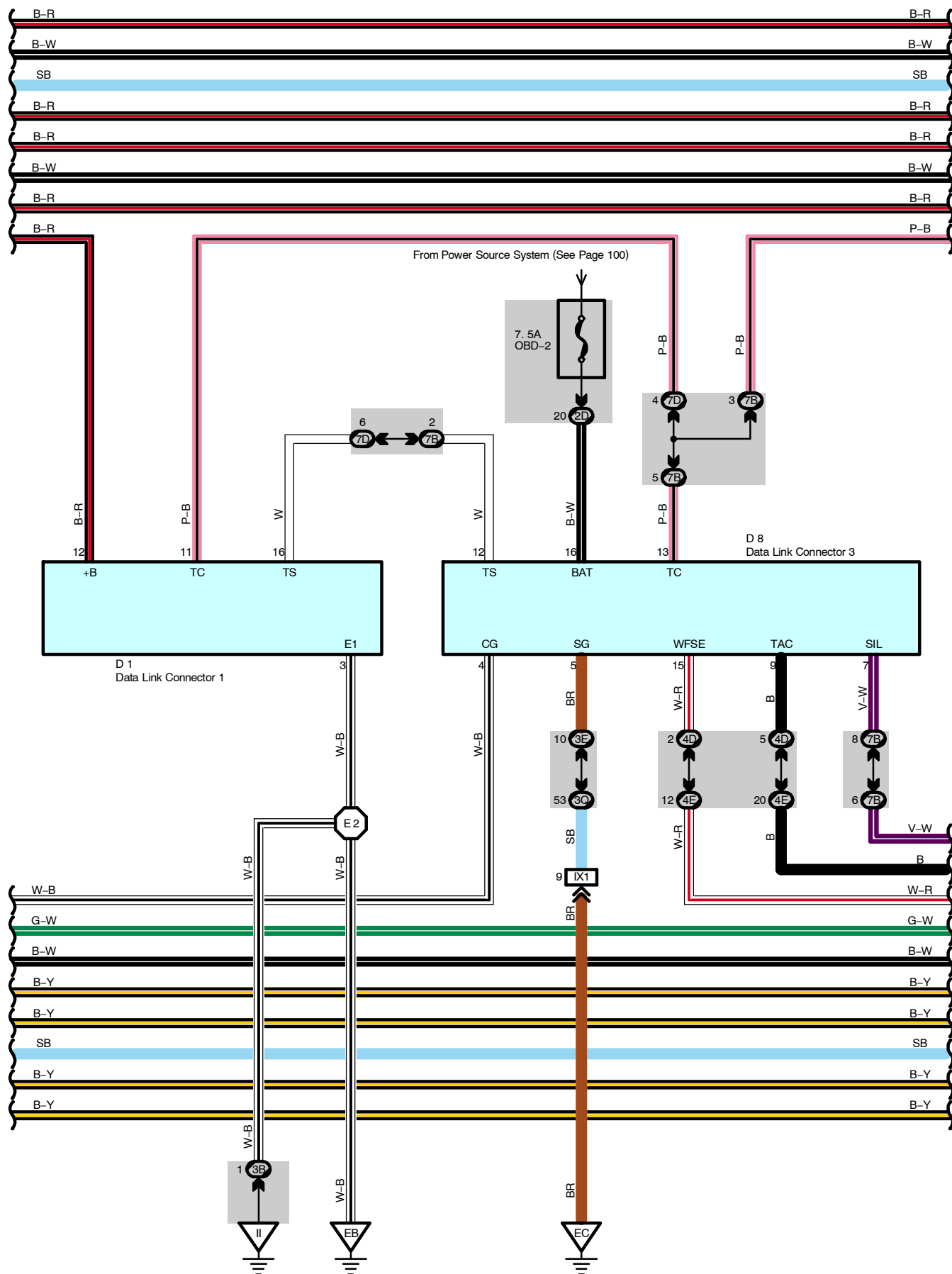


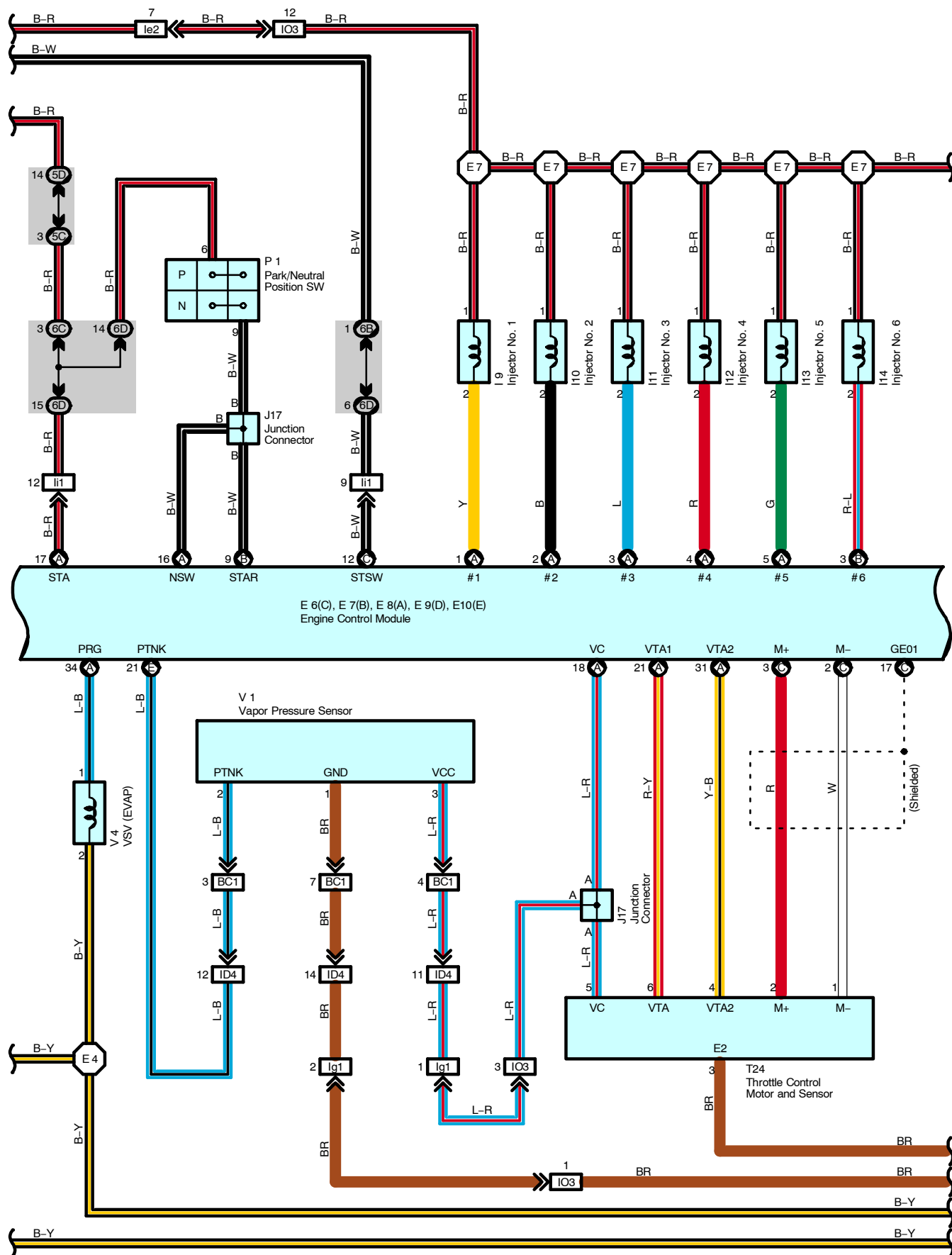
Engine Control

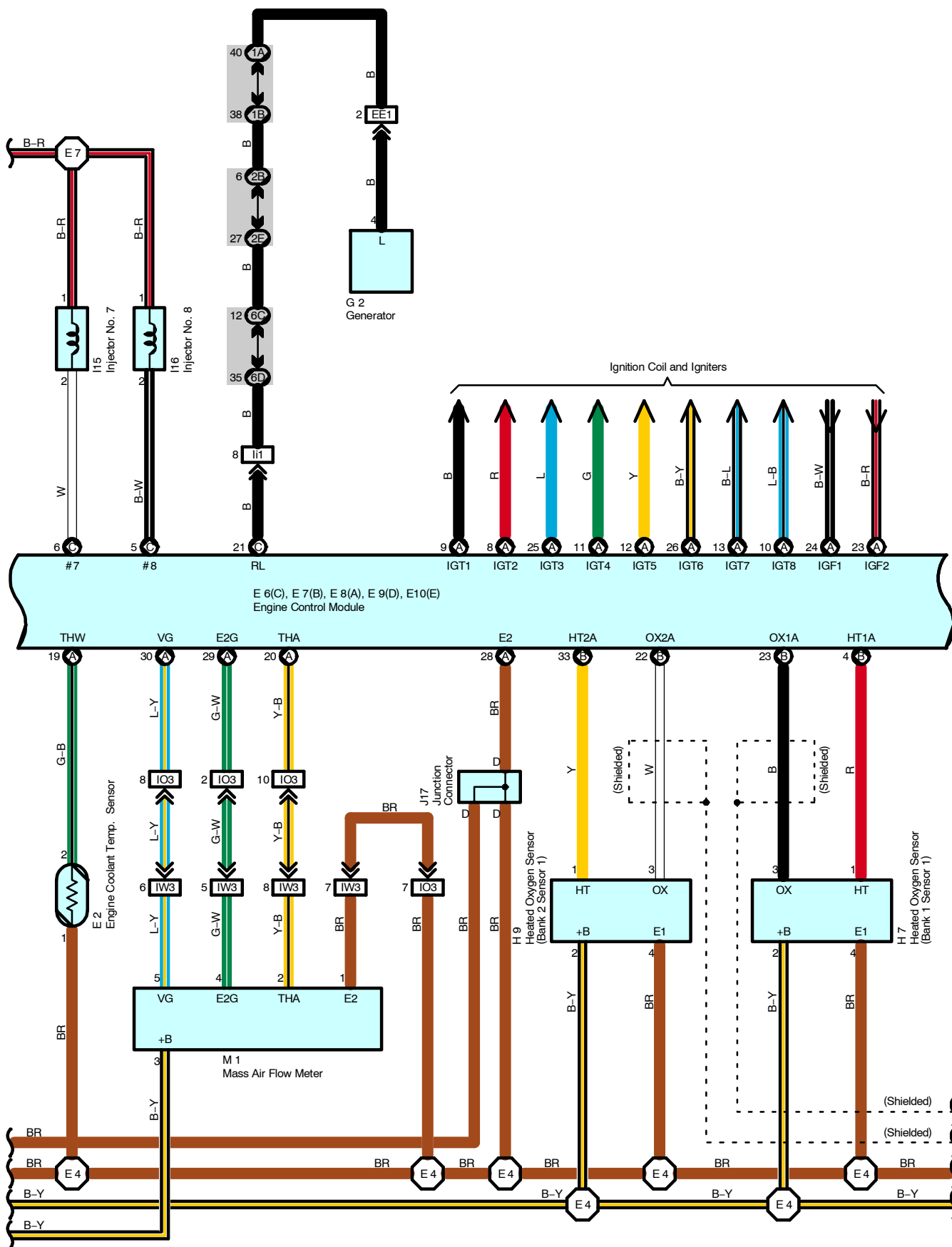


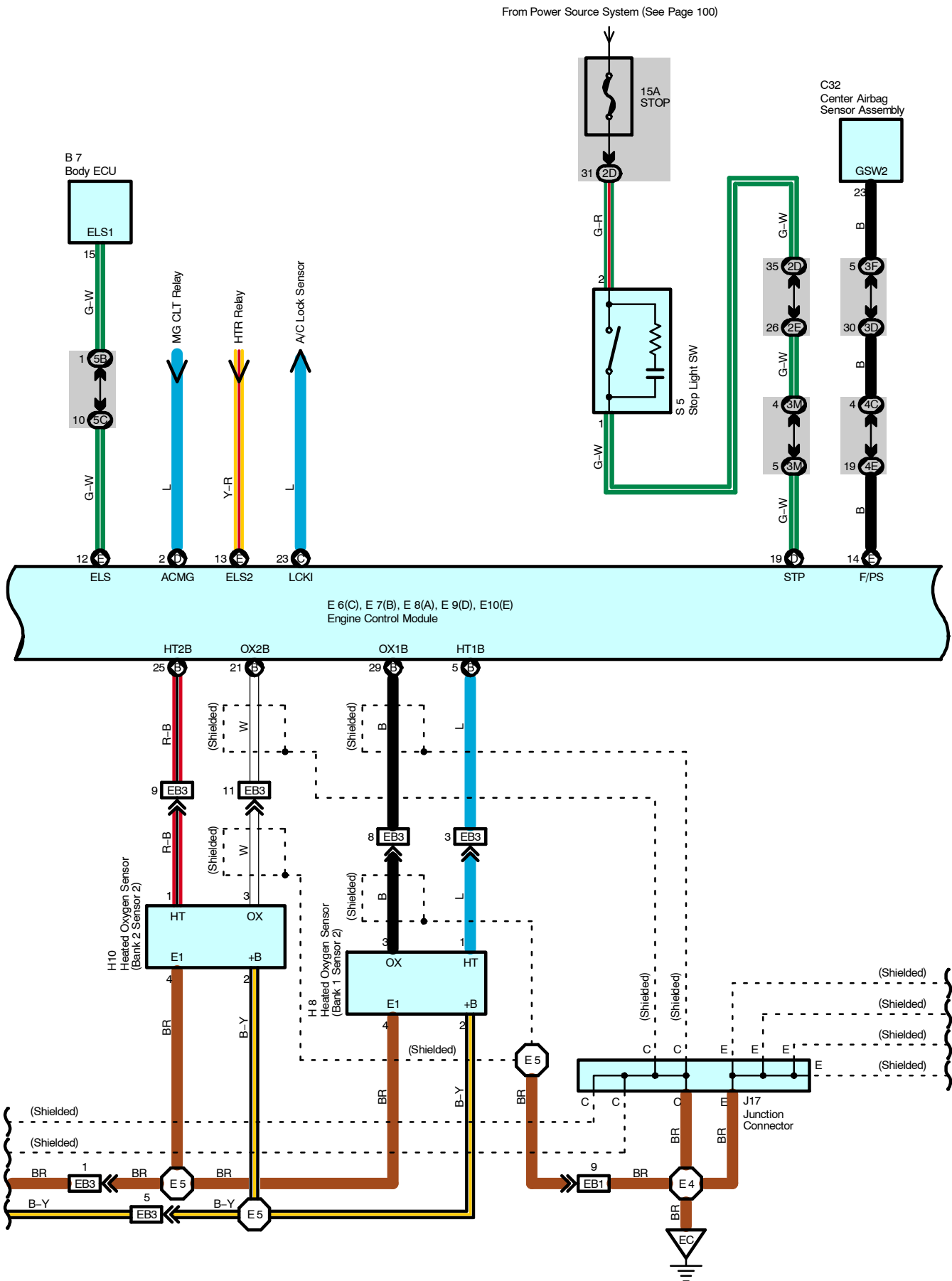


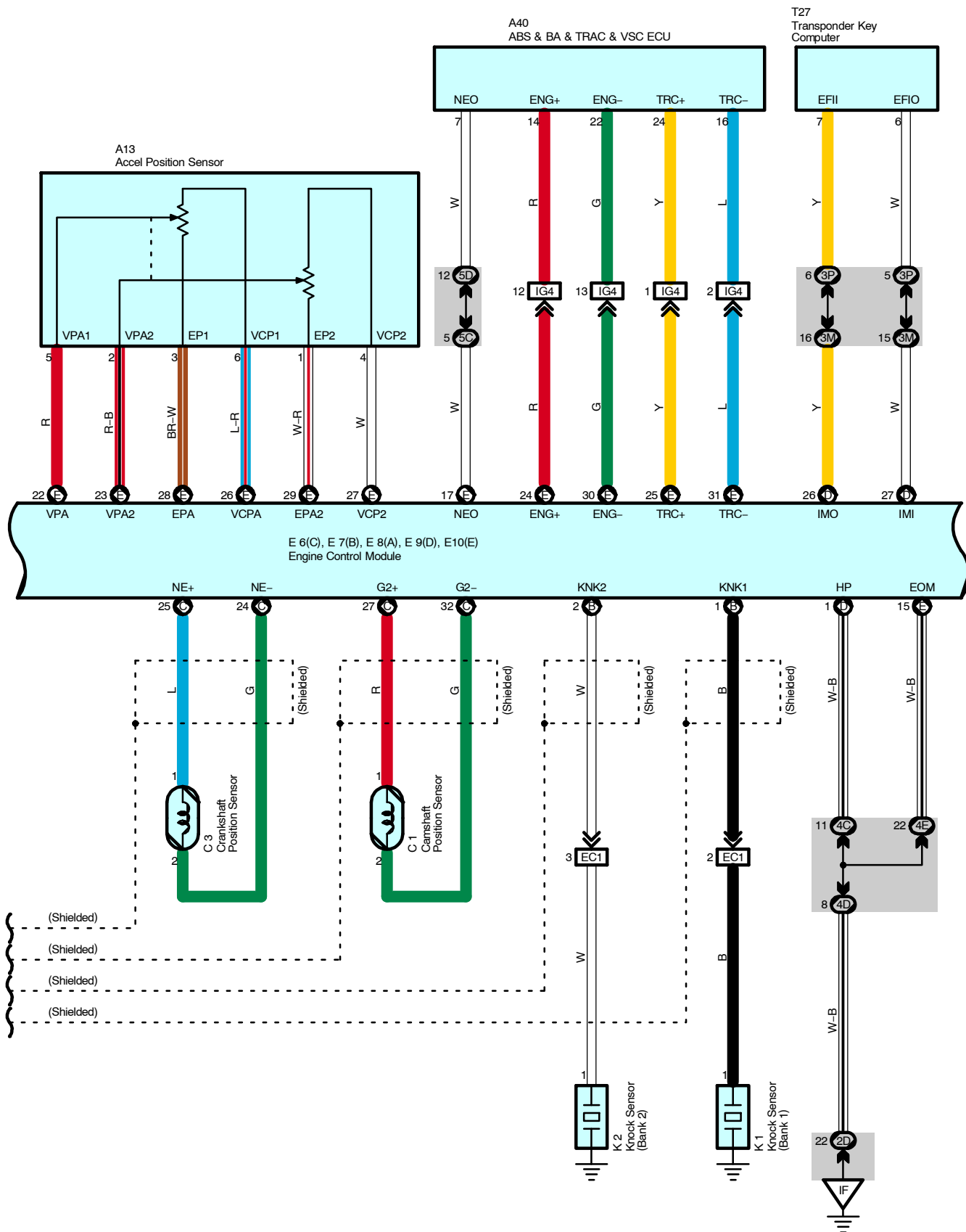


Engine Control

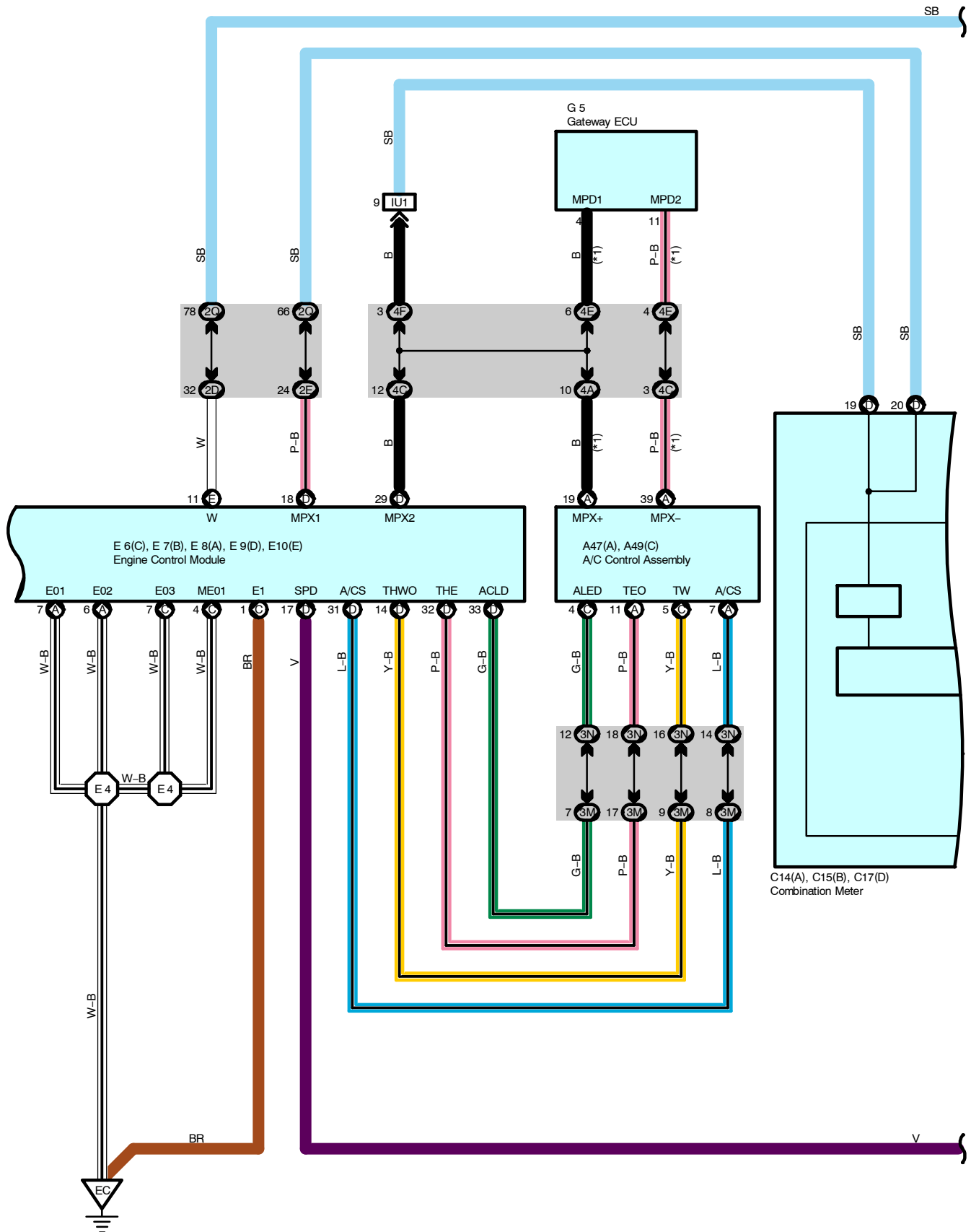


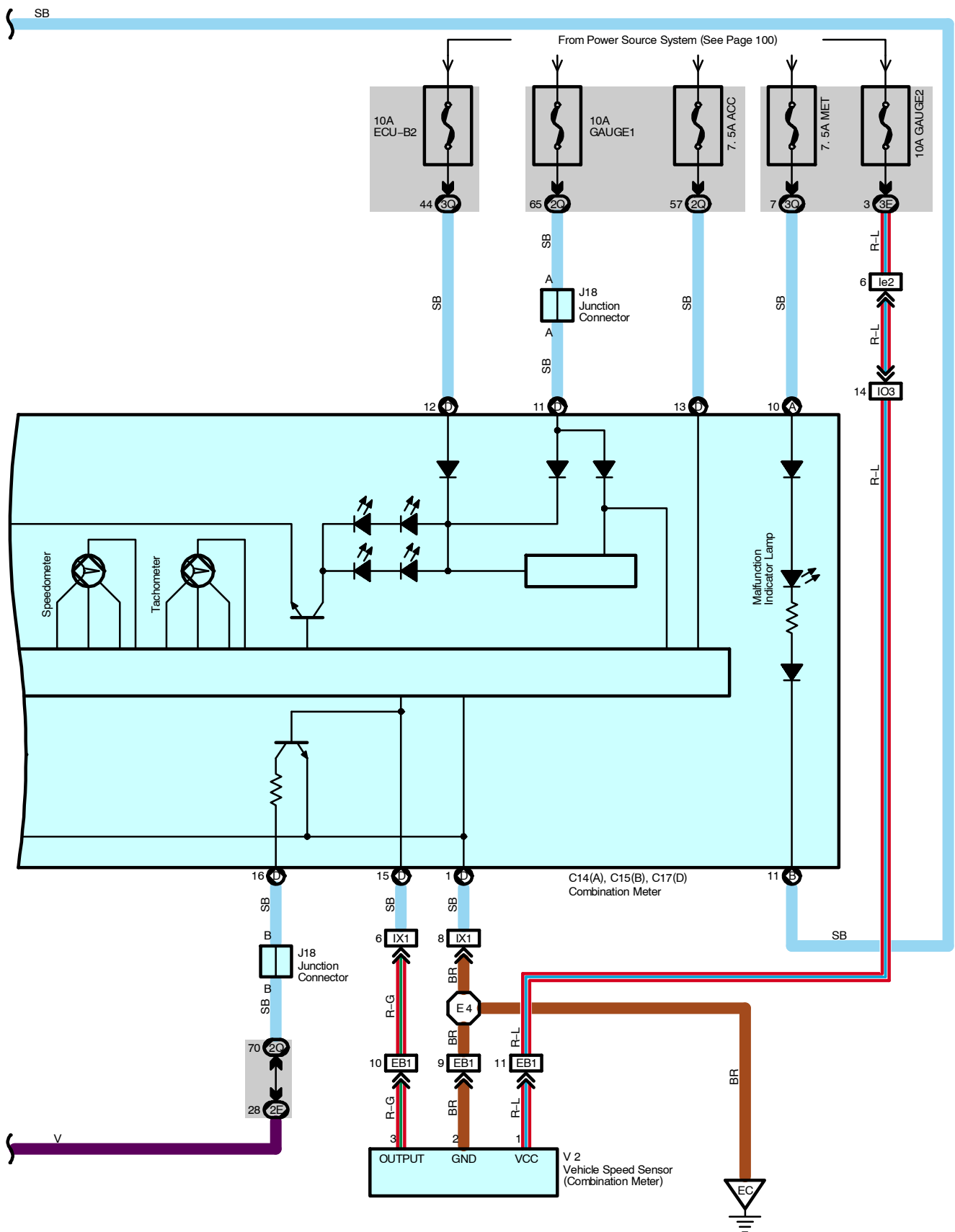






* 1 : w/ LEXUS Navigation System





System Outline

The engine control system utilizes a microcomputer and maintains overall control of the engine, transmission 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 engine coolant temp. The engine coolant 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 meter and detects the intake air temp., which is input as a control signal to TERMINAL THA of the engine control module.

(3) Oxygen sensor signal circuit

The oxygen density in the exhaust emission is detected and is input as a control signal from the heated oxygen sensors to TERMINALS OX1A, OX1B, OX2A, OX2B of the engine control module.

(4) RPM signal circuit

The camshaft position is detected by the camshaft position sensor and is input into TERMINAL G2+ of the engine control module as a control signal. Also, the engine RPM is detected by the crankshaft position sensor and the signal is input into TERMINAL NE+ of the engine control module.

(5) Throttle position sensor signal circuit

The throttle position sensor detects the throttle valve opening angle as a control signal, which is input into TERMINALS VTA1, VTA2 of the engine control module.

(6) Vehicle speed circuit

The vehicle speed sensor (Combination meter) detects the vehicle speed, and the signal is input into TERMINAL SPD of the engine control module via the combination meter.

(7) Battery signal circuit

Voltage is constantly applied to TERMINAL BATT of the engine control module. When the ignition SW is turned on, the voltage for engine control module start up power supply is applied through the EFI OR ECD relay, to TERMINALS +B, +B2 of the engine control module. The current from the IGN fuse flows to TERMINAL IGSW of the engine control module, and voltage is constantly applied to TERMINAL +BM.

(8) Intake air volume signal circuit

The intake air volume is detected by the mass air flow meter, and is input as a control signal to TERMINAL VG of the engine control module.

(9) 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.

(10) Starter signal circuit

To confirm whether the engine is cranking, the voltage applied to the starter motor when the engine is cranking is detected, and is input into TERMINAL STA of the engine control module as a control signal.

(11) Engine knock signal circuit

Engine knocking is detected by the knock sensors, and is input into TERMINALS KNK1, KNK2 of the engine control module as a control signal.

2. Control System

* SFI system

The SFI system monitors the engine condition through the signals input from each sensors to the engine control module. The control signal is sent to the engine control module TERMINALS #1, #2, #3, #4, #5, #6, #7, #8 to operate the injector (Fuel injection). The SFI system controls the fuel injection by the engine control module in response to the driving conditions.

* ESA system

The ESA system monitors the engine condition through the signals input from each sensors to the engine control module. The best ignition timing is decided according to this data and the data memorized in the engine control module. The control signal is output to TERMINALS IGT1, IGT2, IGT3, IGT4, IGT5, IGT6, IGT7, IGT8, and these signals control the igniter to provide the best ignition timing.

* 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 emission is low), and warms up the heated oxygen sensors to improve their detection performance. The engine control module evaluates the signals from each sensors, and outputs current to TERMINALS HT1A, HT1B, HT2A, HT2B to control the heater.

* Fuel pump control system

The engine control module supplies current to TERMINAL FPR, and controls the operation speed of the fuel pump by the F/PUMP relay.

* ACIS

The ACIS includes a valve in the bulkhead separating the surge tank into two parts. This valve is opened and closed in accordance with the driving conditions to control the intake manifold length in two stages, for increased engine output in all ranges from low to high speeds.

* ETCS-i

The ETCS-i controls the engine output at its optimal level in accordance with the opening of the accelerator pedal, under all driving conditions.

3. 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 on the malfunction indicator lamp.

4. Fail-Safe System

When a malfunction has occurred in any system, there is a possibility of causing engine trouble due to continued control based on that system. In that case, the fail-safe system either controls the system using the data (Standard values) recorded in the engine control module memory, or else stops the engine.

Service Hints

E2 Engine Coolant Temp. Sensor

- 1-2 : Approx. 15.0 k Ω (-20°C, -4°F)
- : Approx. 2.45 k Ω (20°C, 68°F)
- : Approx. 0.32 k Ω (80°C, 176°F)

E6 (C), E8 (A), E9 (D), E10 (E) Engine Control Module

- BATT-E1 : Always 9.0-14.0 volts
- +BM-E1 : Always 9.0-14.0 volts
- IGSW-E1 : 9.0-14.0 volts with ignition SW at ON or ST position
- +B, +B2-E1 : 9.0-14.0 volts with ignition SW at ON or ST position
- VC-E2 : 4.5-5.5 volts with ignition SW on
- VTA2-E2 : 2.0-2.9 volts with ignition SW on and accelerator pedal released
- : 4.6-5.1 volts with ignition SW on and accelerator pedal depressed
- VTA1-E2 : 0.4-1.0 volts with ignition SW on and accelerator pedal released
- : 3.2-4.8 volts with ignition SW on and accelerator pedal depressed
- THA-E2 : 0.5-3.4 volts with idling, intake air temp. 20°C (68°F)
- THW-E2 : 0.2-1.0 volts with idling, engine coolant temp. 80°C (176°F)
- W-E1 : 9.0-14.0 volts with idling
- : Below 3.0 volts with ignition SW on

Engine Control

○ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A13	70	E10 E	71	I16	69
A40	70	F13	74	I18	71
A47 A	70	F15	68	J8	72
A49 C	70	F17 B	68	J17	72
B7	70	F18 C	68	J18	72
C1	68	G2	68	K1	69
C3	68	G5	71	K2	69
C14 A	71	H7	69	M1	69
C15 B	71	H8	69	P1	69
C17 D	71	H9	69	S5	73
C32	71	H10	69	T24	69
D1	68	I9	69	T27	73
D8	71	I10	69	V1	75
E2	68	I11	69	V2	69
E6 C	71	I12	69	V4	69
E7 B	71	I13	69	V9	69
E8 A	71	I14	69	V12	75
E9 D	71	I15	69		

○ : Relay Blocks

Code	See Page	Relay Blocks (Relay Block Location)
1	22	Engine Room R/B (Engine Compartment Left)

**: Junction Block and Wire Harness Connector**

Code	See Page	Junction Block and Wire Harness (Connector Location)
1A	24	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
1B	24	Engine Room No.2 Wire and Engine Room J/B (Engine Compartment Left)
1D		
2A	28	Engine Room No.2 Wire and Cowl Side J/B LH (Left Kick Panel)
2B		
2C		
2D	28	Dash Wire and Cowl Side J/B LH (Left Kick Panel)
2E		
2K	28	Floor No.1 Wire and Cowl Side J/B LH (Left Kick Panel)
2Q	30	Instrument Panel Integration Wire and Cowl Side J/B LH (Left Kick Panel)
3B	40	Engine Room No.2 Wire and Cowl Side J/B RH (Right Kick Panel)
3C		
3D	40	Dash Wire and Cowl Side J/B RH (Right Kick Panel)
3E		
3F		
3M	43	Dash Wire and Cowl Side J/B RH (Right Kick Panel)
3N		
3P		
3Q	42	Instrument Panel Integration Wire and Cowl Side J/B RH (Right Kick Panel)
4A	52	Dash Wire and J/B No.4 (Instrument Panel Center)
4C		
4D		
4E		
4F		
5B	56	Dash Wire and J/B No.5 (Behind the Combination Meter)
5C		
5D	56	Engine Room No.2 Wire and J/B No.5 (Behind the Combination Meter)
6B	60	Dash Wire and J/B No.6 (Behind the Grove Box)
6C		
6D	60	Engine Wire and J/B No.6 (Behind the Grove Box)
7A	64	Dash Wire and J/B No.7 (Behind the Grove Box)
7B		
7D	64	Engine Room No.2 Wire and J/B No.7 (Behind the Grove Box)

Engine Control

: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB1	78	Engine Wire and Transmission Wire (On the Transmission)
EB3		
EC1	78	Engine No.2 Wire and Engine Wire (On the Transmission)
EE1	78	Engine Room Main Wire and Alternator Wire (Near the Battery)
ID4	80	Dash Wire and Floor No.1 Wire (Left Kick Panel)
IG1	82	Engine Room No.2 Wire and Dash Wire (Behind the Combination Meter)
IG4		
IO3	82	Engine Wire and Dash Wire (Behind the Glove Box)
IU1	84	Instrument Panel Integration Wire and Dash Wire (Behind the Glove Box)
IW3	86	Engine Room No.2 Wire and Dash Wire (Behind the Glove Box)
IX1	86	Instrument Panel Integration Wire and Engine Wire (Behind the Glove Box)
IX2		
Ia1	86	Engine Room No.2 Wire and Floor No.1 Wire (Left Kick Panel)
Ie2	86	Dash Wire and Dash Wire (Behind the Combination Meter)
Ig1	88	Dash Wire and Dash Wire (Instrument Panel Center)
Ig3		
Ii1	88	Engine Wire and Engine Wire (Behind the Glove Box)
BC1	90	Floor No.1 Wire and Fuel Tank Wire (Near the Fuel Tank)
BF4	90	Floor No.3 Wire and Floor No.1 Wire (Left Rear Side Quarter Panel)

: Ground Points

Code	See Page	Ground Points Location
EA	78	Front Right Side of Fender Apron
EB		
EC	78	Rear Bank of Right Cylinder Head
EE	78	Front Left Side of Fender Apron
IF	80	Set Bolt of Cowl Side J/B LH
II	80	Set Bolt of Cowl Side J/B RH

: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E2	78	Engine Room No.2 Wire	E7	78	Engine Wire
E4	78	Engine Wire	E8	78	Engine Room No.2 Wire
E5	78	Transmission Wire	E9		

