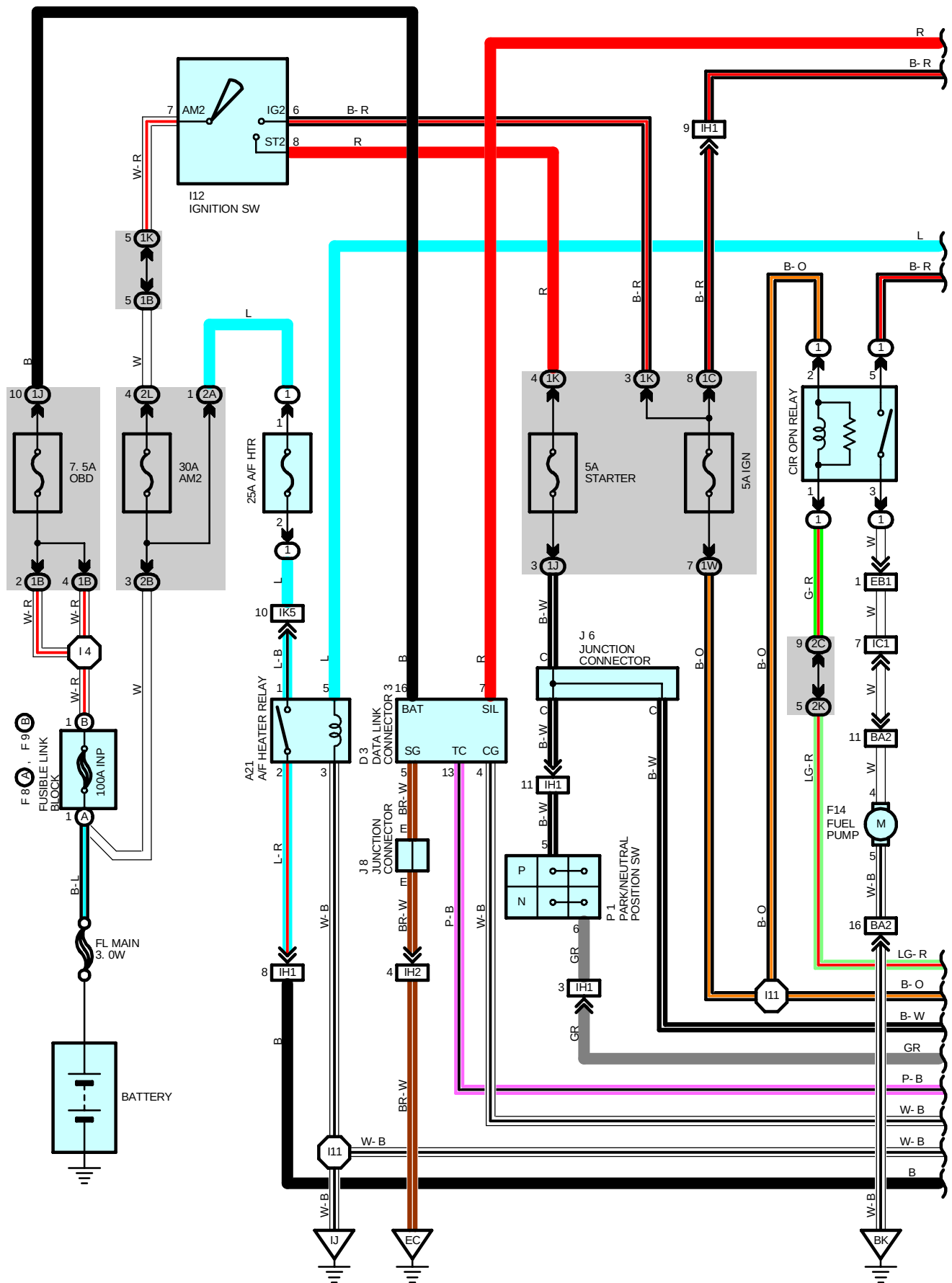
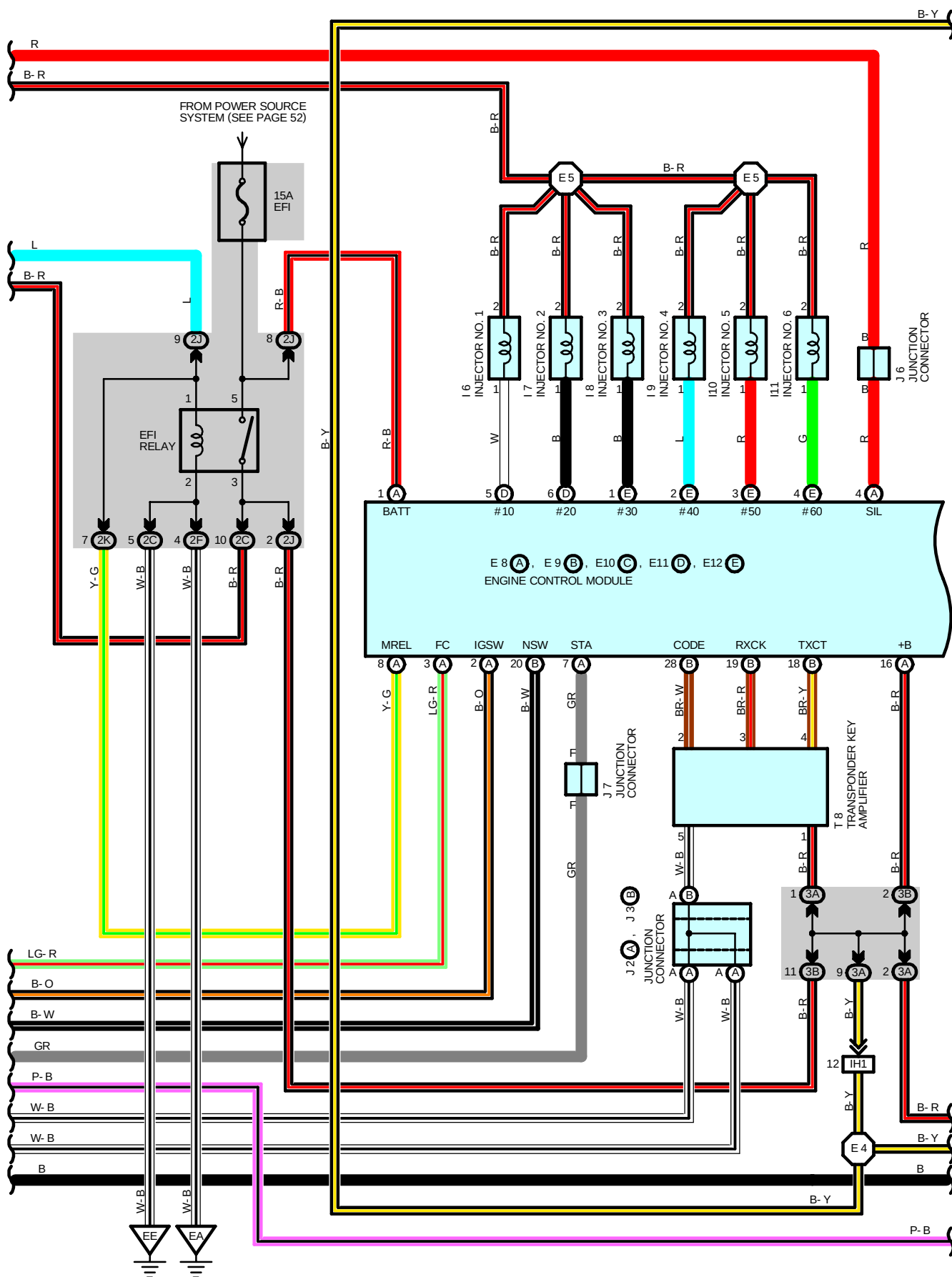
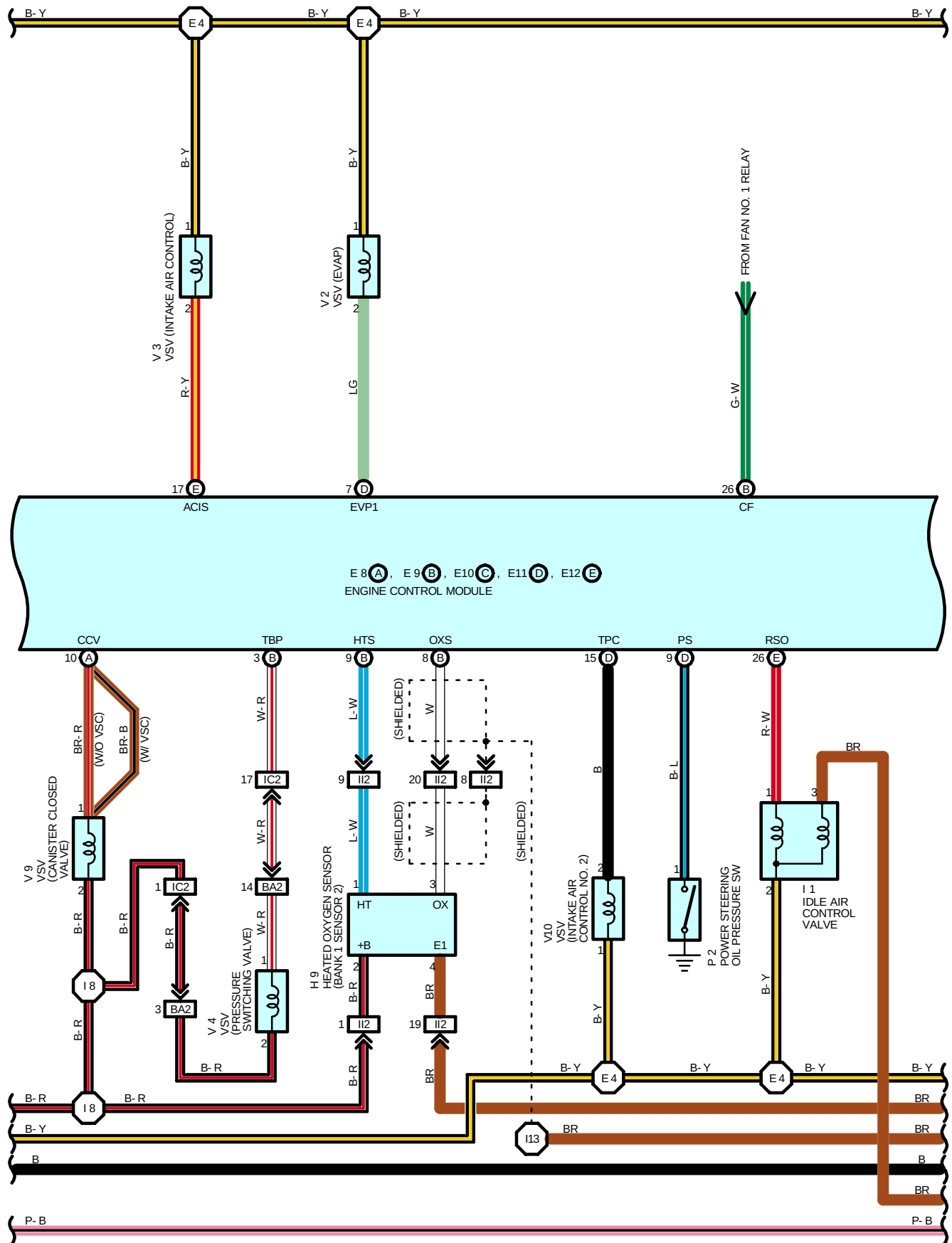


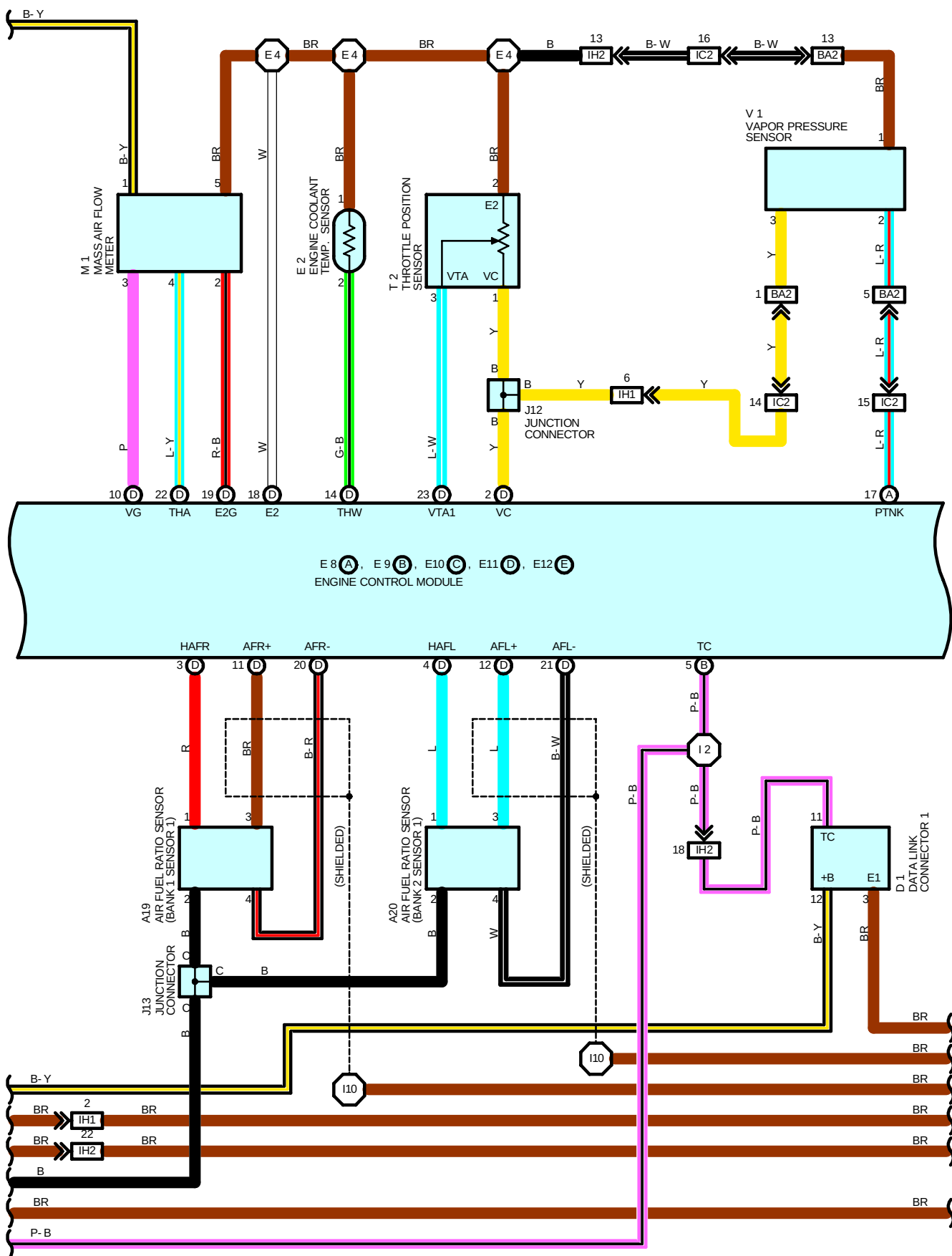
ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM



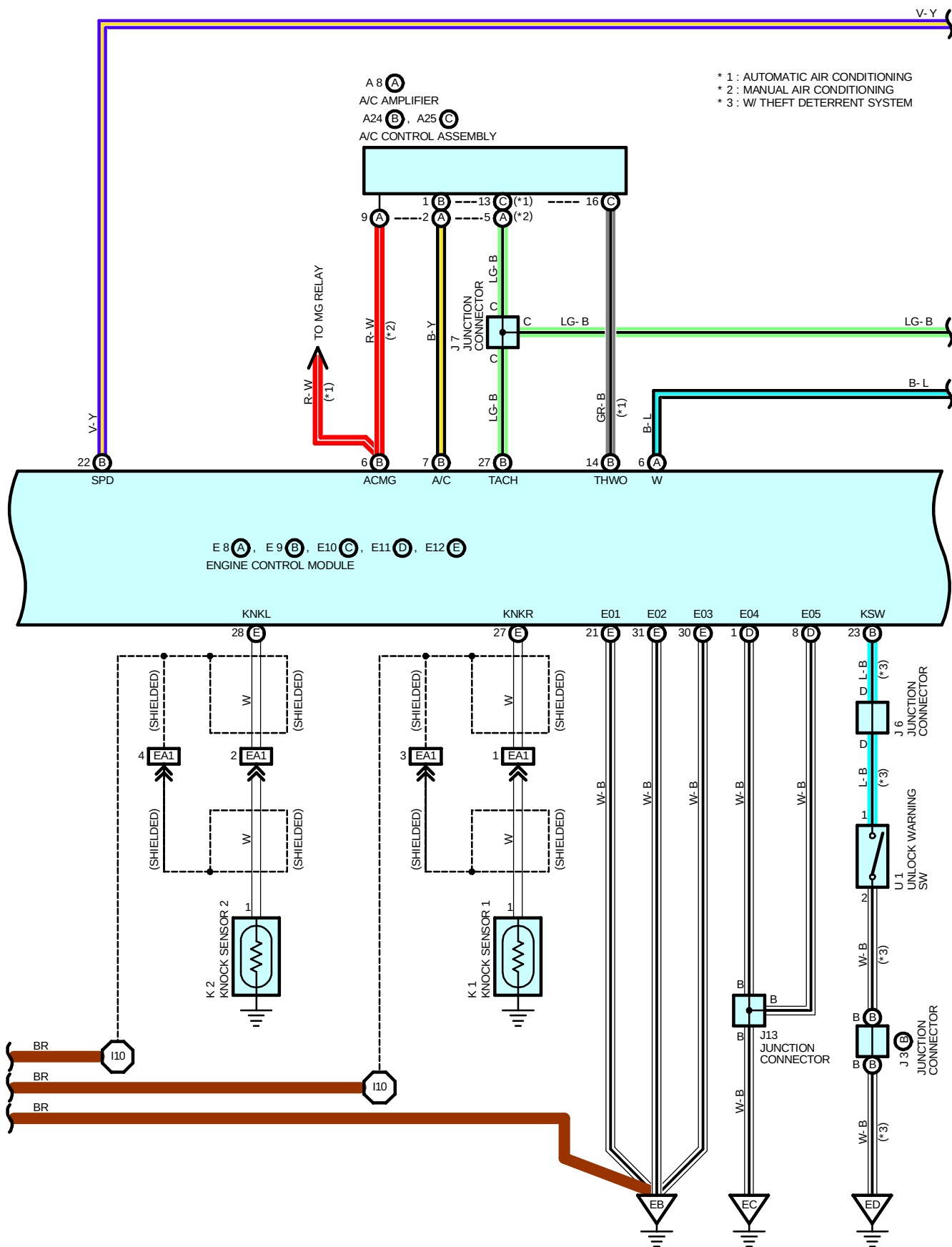


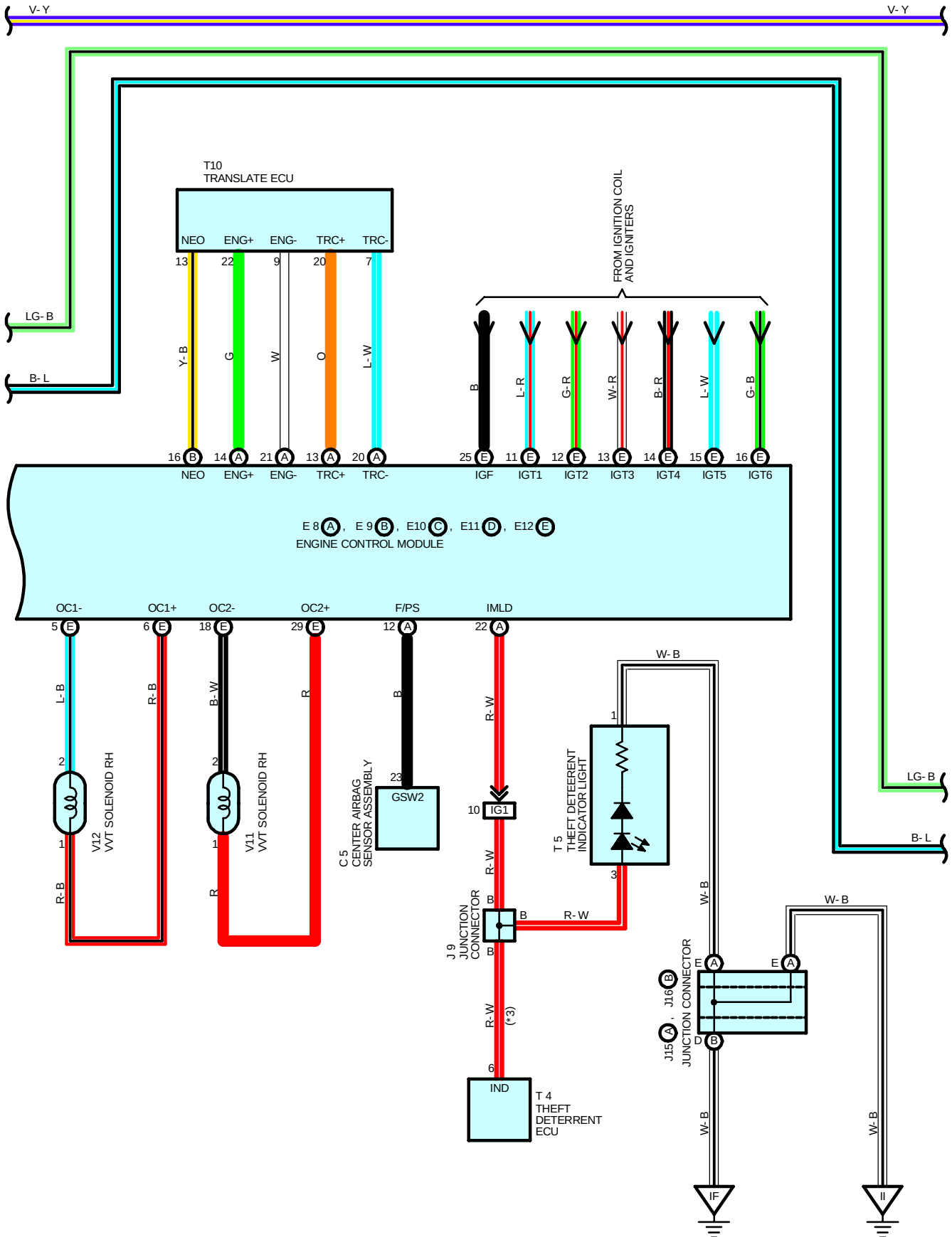
ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM



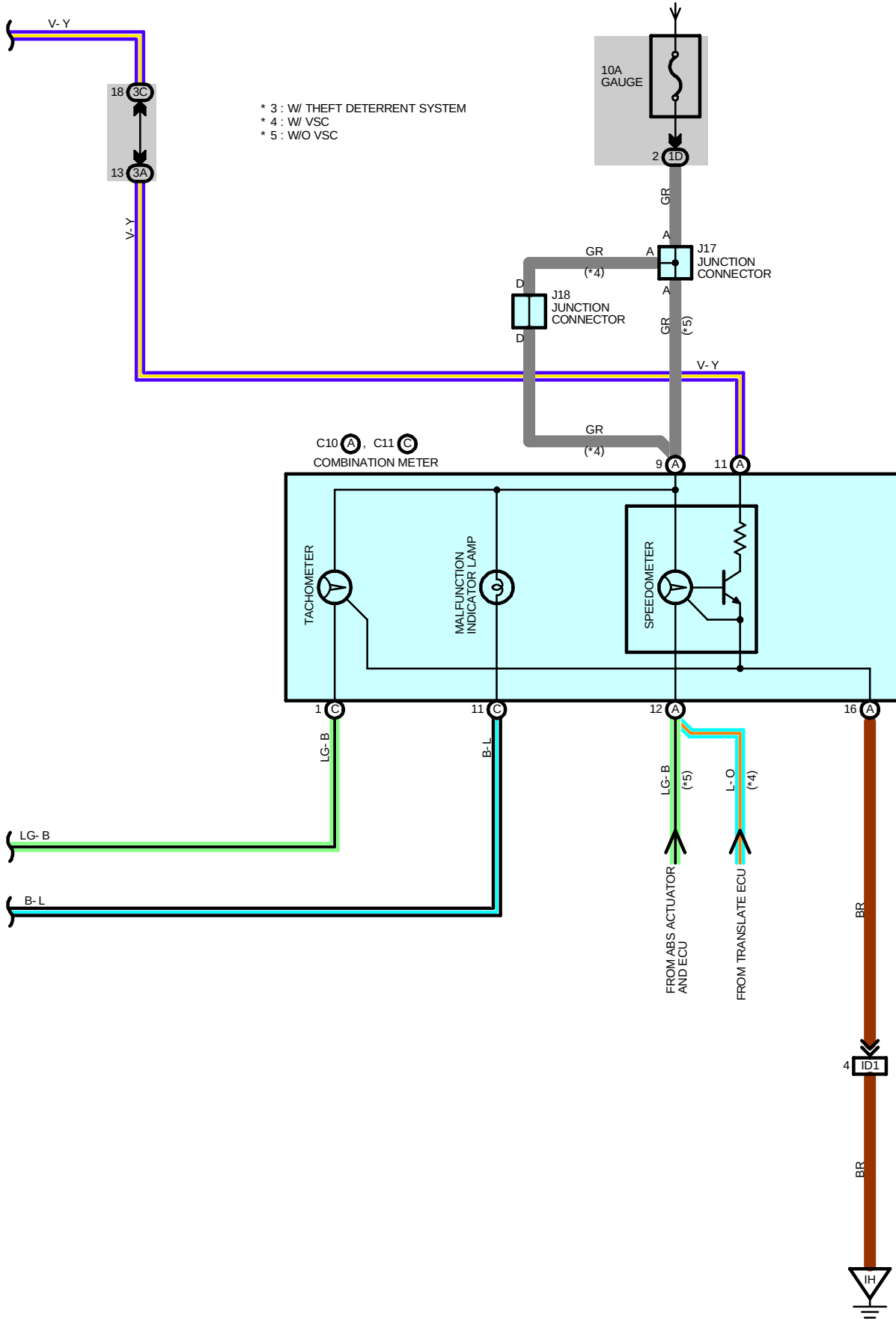








FROM POWER SOURCE SYSTEM (SEE PAGE 52)



ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM

SYSTEM OUTLINE

This system utilizes an engine control module and maintains overall control of the engine, transaxle and so on. An outline of the engine control is explained 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 meter and detects the intake air temp., which is input as a control signal into TERMINAL THA of the engine control module.

(3) Oxygen sensor signal system

The oxygen density in the exhaust gases is detected and input as a control signal into TERMINAL OXS of the engine control module. To maintain stable detection performance by the heated oxygen sensor, a heater is used for warming the sensor. The heater is also controlled by the engine control module (HTS).

(4) RPM signal system

Camshaft position and crankshaft position are detected by the camshaft timing oil control valve LH, RH and crankshaft position sensor. The camshaft position is input as a control signal to TERMINAL VV1+ and VV2+ of the engine control module, and the engine RPM is input into TERMINAL NE+.

(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 engine control module.

(6) Vehicle speed signal system

The vehicle speed sensor, installed inside the transaxle, detects the vehicle speed and inputs a control signal into TERMINAL SPD of the engine control module.

(7) Park/Neutral position SW signal system

The Park/Neutral position SW detects whether the shift position is in neutral, parking or not, and inputs a control signal into TERMINAL STA of the engine control module.

(8) A/C SW signal system

The A/C control assembly (Automatic air conditioning), A/C amplifier (Manual air conditioning) inputs the A/C operations into TERMINAL A/C of the engine control module as a control signal.

(9) Battery signal circuit

Voltage is always supplies to TERMINAL BATT of the engine control module.

If you turn on the ignition SW, the current goes from TERMINAL MREL of the engine control module to the EFI main relay and put on the relay, and the voltage related to the engine control module operation is supplied to TERMINAL +B of the engine control module through the EFI relay.

(10) Intake air volume signal circuit

Intake air volume is detected by the mass air flow meter and a signal is input into TERMINAL VG of the engine control module as a control signal.

(11) NSW 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 NSW of the engine control module as a control signal.

(12) Engine knock signal circuit

Engine knocking is detected by the knock sensor 1 and 2, then the signals are input into TERMINALS KNKR and KNKL of the engine control module as a control signal.

(13) Air fuel ratio signal system

The air fuel ratio is detected and input as a control signal into TERMINALS AFL+, AFR+ of the engine control module.

2. CONTROL SYSTEM

*** SFI system**

The SFI system monitors the engine condition through the signals, which are input from each sensor (Input signals (1) to (12)). The best fuel injection volume 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, which are input to the engine control module from each sensor (Input signals from 1, 3, 4, 12). 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 TERMINALS IGT1, IGT2, IGT3, IGT4, IGT5 and IGT6. This signal 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 heated oxygen sensor to improve detection performance of the sensor. The engine control module evaluates the signals from each sensor (Input signals from 1, 4, 9, 10), current is output to TERMINAL HTS, controlling the heater.

*** Idle air control system**

The idle air control system (Rotary solenoid type) increases the RPM and provides idle 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), current is output to TERMINAL RSO to control idle air control valve.

*** ACIS**

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.

The engine control module judges the engine speed by the signals ((4), (5)) from each sensor and outputs signals to the TERMINAL ACIS to control the VSV (Intake air control).

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.

4. FAIL-SAFE SYSTEM

When a malfunction occurs in any systems, 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 AND ENGINE IMMOBILISER SYSTEM

SERVICE HINTS

CIR OPN RELAY

5-3 : Closed with the starter running

EFI RELAY

5-3 : Closed with the ignition SW at **ON** or **ST** position

E2 ENGINE COOLANT TEMP. SENSOR

1-2 : **10.0- 20.0 kΩ (-20 °C, -4 °F)**

4.0- 7.0 kΩ (0 °C, 32 °F)

2.0- 3.0 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)

E8 (A), E9 (B), E10 (C), E11 (D), E12 (E) ENGINE CONTROL MODULE

Voltage at engine control module wiring connector

BATT-E1 : Always **9.0- 14.0** volts

+B-E1 : **9.0- 14.0** volts (Ignition SW at **ON** position)

VC-E2 : Always **4.5- 5.5** volts (Ignition SW at **ON** position)

VTA1-E2 : **0.3- 0.8** volts (Ignition SW on and throttle valve fully closed)

3.2- 4.9 volts (Ignition SW on and throttle valve fully open)

VG-E2G : **1.1- 1.5** volts (Engine idling and A/C SW off)

THA-E2 : **0.5- 3.4** volts (Engine idling and intake air temp. **20 °C, 68 °F**)

THW-E2 : **0.2- 1.0** volts (Engine idling and coolant temp. **80 °C, 176 °F**)

IGF-E1 : **4.5- 5.5** volts (Ignition SW at **ON** position)

Pulse generation (Engine idling)

NE+ -NE- : Pulse generation (Engine idling)

SIL-E1 : Pulse generation (During transmission)

TACH-E1 : Pulse generation (Engine idling)

STA-E1 : **6.0** volts or more (Engine cranking)

FC-E1 : **9.0- 14.0** volts (Ignition SW at **ON** position)

0- 3.0 volts (Engine idling)

SPD-E1 : Pulse generation (Ignition SW on and rotate driving wheel slowly)

W-E1 : Below **3.0** volts (Ignition SW at **ON** position)

A/C-E1 : Below **2.0** volts (Engine idling and A/C SW on)

9.0- 14.0 volts (A/C SW off)

ACIS-E01 : **9.0- 14.0** volts (Ignition SW at **ON** position)

NSW-E1 : **9.0- 14.0** volts (Ignition SW on and other shift position in **P** or **N** position)

0- 3.0 volts (Ignition SW on and shift position in **P** or **N** position)

EVP1-E01 : **9.0- 14.0** volts (Ignition SW at **ON** position)

TC-E1 : **9.0- 14.0** volts (Ignition SW at **ON** position)

STP-E1 : **7.5- 14.0** volts (Ignition SW on and brake pedal depressed)

0- 1.5 volts (Ignition SW on and brake pedal depressed)

CF-E1 : **9.0- 14.0** volts (Cooling fan is operating on high speed)

0- 2.0 volts (Cooling fan is operating on low speed or off)

TBP-E1 : **9.0- 14.0** volts (Ignition SW on and disconnect the vacuum hose from the vapor pressure sensor)

PTNK-E1 : **3.0- 3.6** volts (Ignition SW at **ON** position)

1.3- 2.1 volts (Ignition SW on and apply vacuum **2.0** kpa)

OXS-E1 : Pulse generation (Maintain engine speed at **2500** rpm for two minutes after warming up)

RSO-E1 : **9.0- 14.0** volts (Ignition SW at **ON** position)

HTS-E03 : **9.0- 14.0** volts (Ignition SW at **ON** position)

0- 3.0 volts (Engine idling)

KNKL, KNKR-E1 : Pulse generation (Engine idling)

IGT1, IGT2, IGT3, IGT4, IGT5, IGT6-E1 : Pulse generation (Engine idling)

#10, #20, #30, #40, #50, #60-E01 : **9.0- 14.0** volts (ignition SW at **ON** position)

Pulse generation (Engine idling)

○ : PARTS LOCATION

Code		See Page	Code		See Page	Code		See Page
A8	A	34	F14	36	J18	35		
A19		32	H9	36	K1	33		
A20		32	I1	33	K2	33		
A21		34	I6	33	M1	33		
A24	B	34	I7	33	P1	33		
A25	C	34	I8	33	P2	33		
C2		32	I9	33	S6	35		
C5		34	I10	33	T2	33		
C10	A	34	I11	33	T4	35		
C11	C	34	I12	35	T5	35		
C16		32	J2	A	T8	35		
C17		32	J3	B	T10	34		
D1		32	J6		U1	35		
D3		34	J7		V1	37		
E2		32	J8		V2	33		
E8	A	34	J9		V3	33		
E9	B	34	J12		V4	37		
E10	C	34	J13		V9	33		
E11	D	34	J14		V10	33		
E12	E	34	J15	A	V11	33		
F8	A	32	J16	B	V12	33		
F9	B	32	J17	35				

○ : RELAY BLOCKS

Code	See Page	Relay Blocks (Relay Block Location)
1	28	Engine Room R/B No.1 (Engine Compartment Left)

○ : JUNCTION BLOCK AND WIRE HARNESS CONNECTOR

Code	See Page	Junction Block and Wire Harness (Connector Location)
1B	22	Cowl Wire and Driver Side J/B No.1 (Lower Finish Panel)
1C		
1D		
1J		
1K		
1R		
1W		
2A	24	Engine Room Main Wire and Engine Room J/B No.2 (Engine Compartment Left)
2B		
2C		
2F		
2J	24	Cowl Wire and Engine Room J/B No.2 (Engine Compartment Left)
2K		
2L		
3A	26	Cowl Wire and J/B No.3 (Behind the Combination Meter)
3B		
3C		

ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM



: CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA1	40	Engine Wire and Sensor Wire (Near the Cylinder Head of the Left Bank)
EB1	40	Cowl Wire and Engine Room Main Wire (Inside the Lower Cover of Engine Room J/B No.2)
IC1	42	Cowl Wire and Floor Wire (Left Cowl Side Panel)
IC2		
ID1	42	Instrument Panel Wire and Cowl Wire (The Back Side of the Lower Finish Panel)
IG1	42	Instrument Panel Wire and Cowl Wire (Behind the Combination Meter)
IH1	44	Engine Wire and Cowl Wire (Front Side of the Blower Motor)
IH2		
II2	44	Floor No.2 Wire and Cowl Wire (Right Kick Panel)
IK5	44	Engine Room Main Wire and Cowl Wire (Right Cowl Side Panel)
BA2	46	Gauge Wire and Floor Wire (On the Left Rear Wheel House)



: GROUND POINTS

Code	See Page	Ground Points Location
EA	40	Front Side of the Right Fender Apron
EB	40	Right Side of the Surge Tank
EC	40	Rear Side of the Surge Tank
ED	40	Near the Left Front Suspension Support
EE	40	Front Side of the Left Fender Apron
IF	42	Left Kick Panel
IH	42	Right Instrument Panel Brace
II	42	Right Kick Panel
IJ	42	Right Cowl Side Panel
BK	46	Under the Left Center Pillar



: SPLICE POINTS

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E4	40	Engine Wire	I8	44	Cowl Wire
E5			I10	44	Engine Wire
I2	44	Cowl Wire	I11	44	Cowl Wire
I4			I13		

