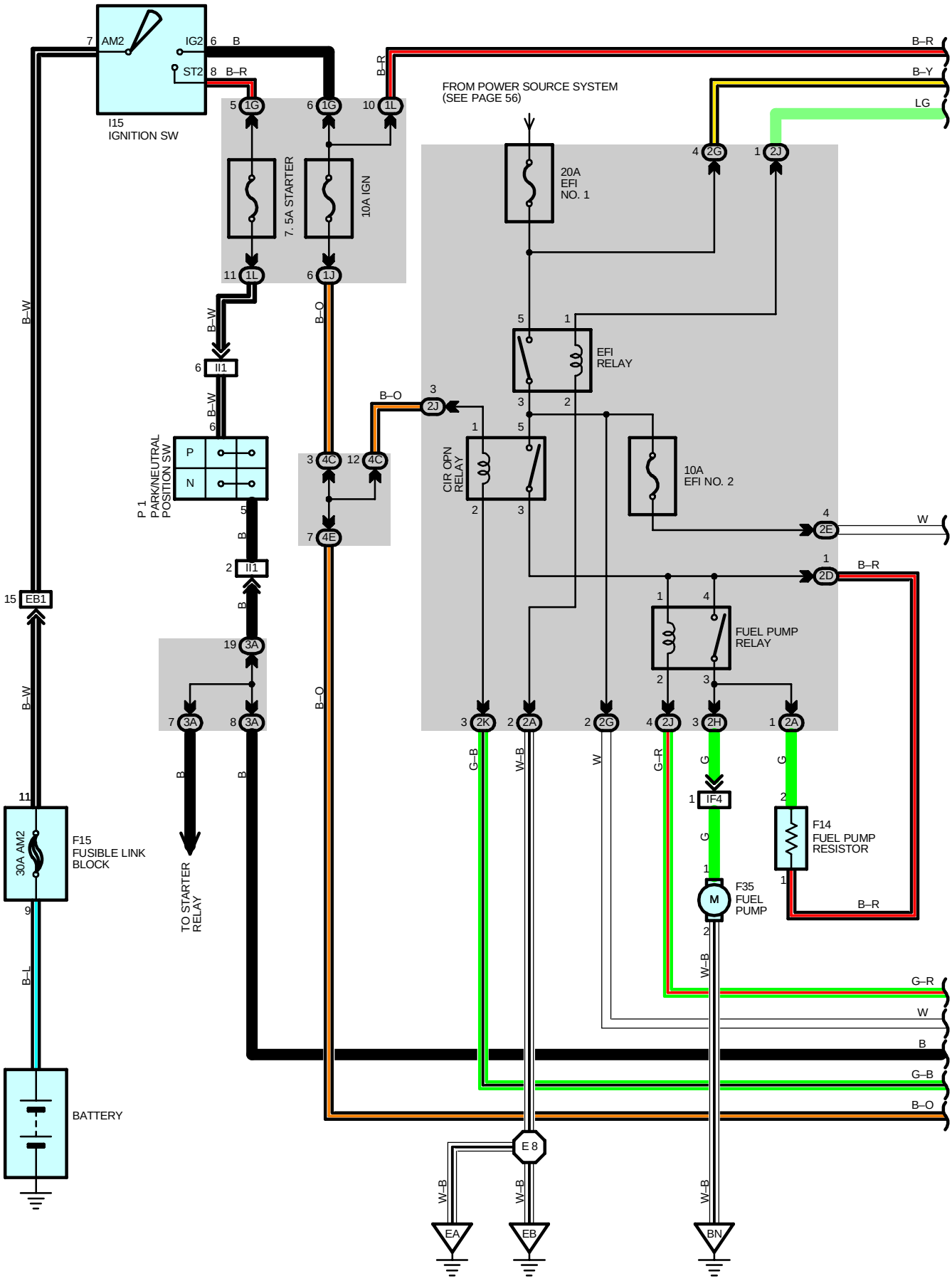
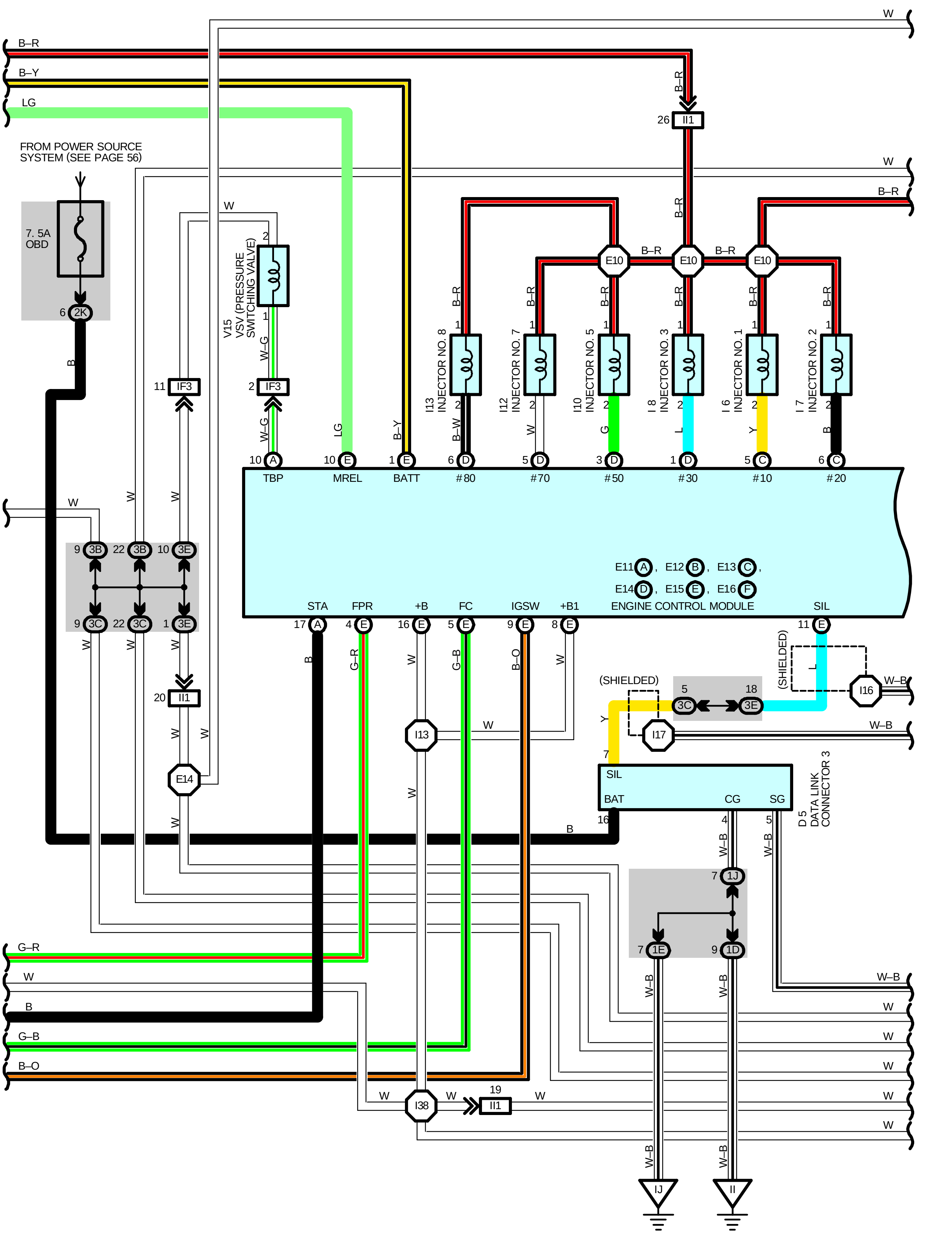
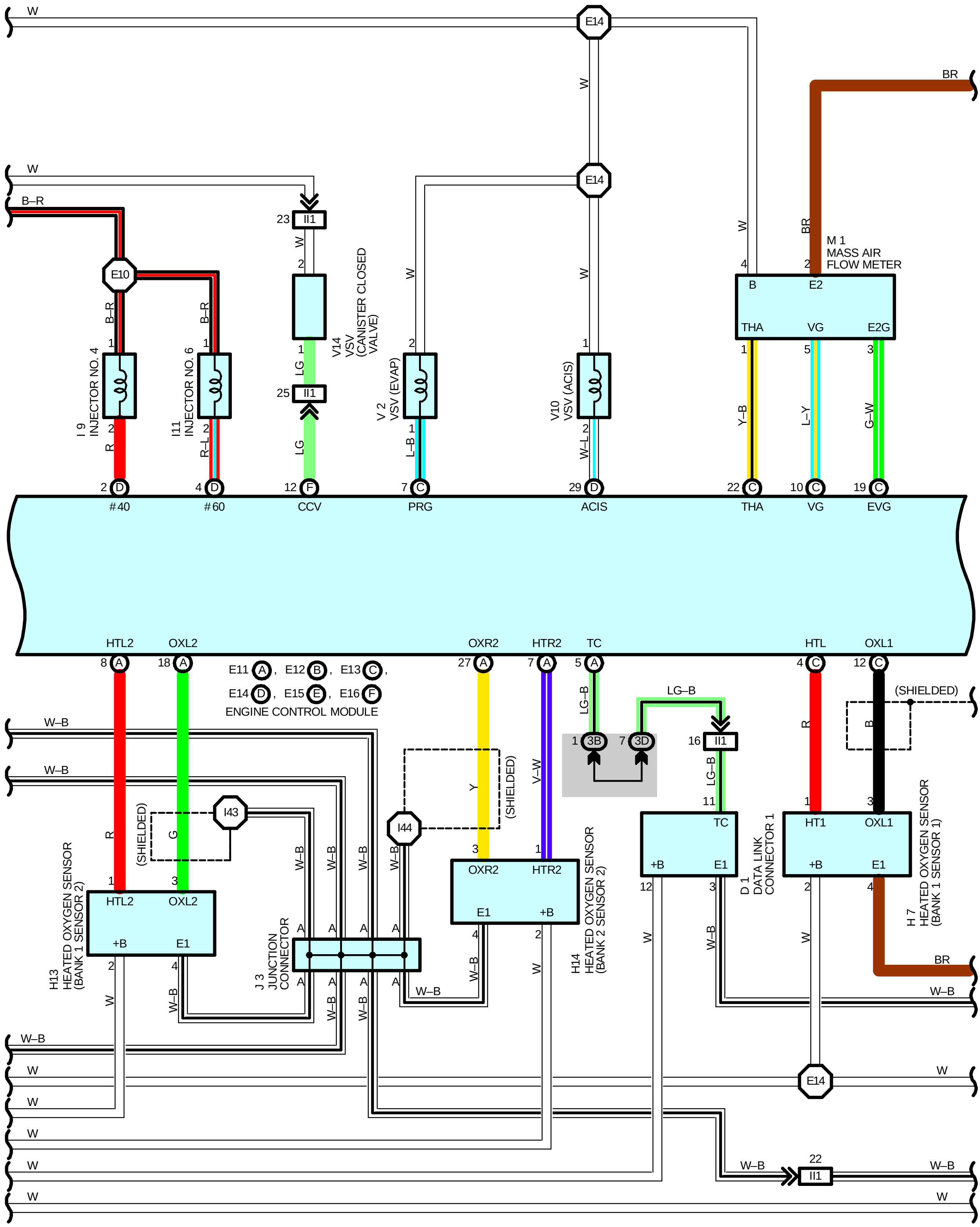
ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM

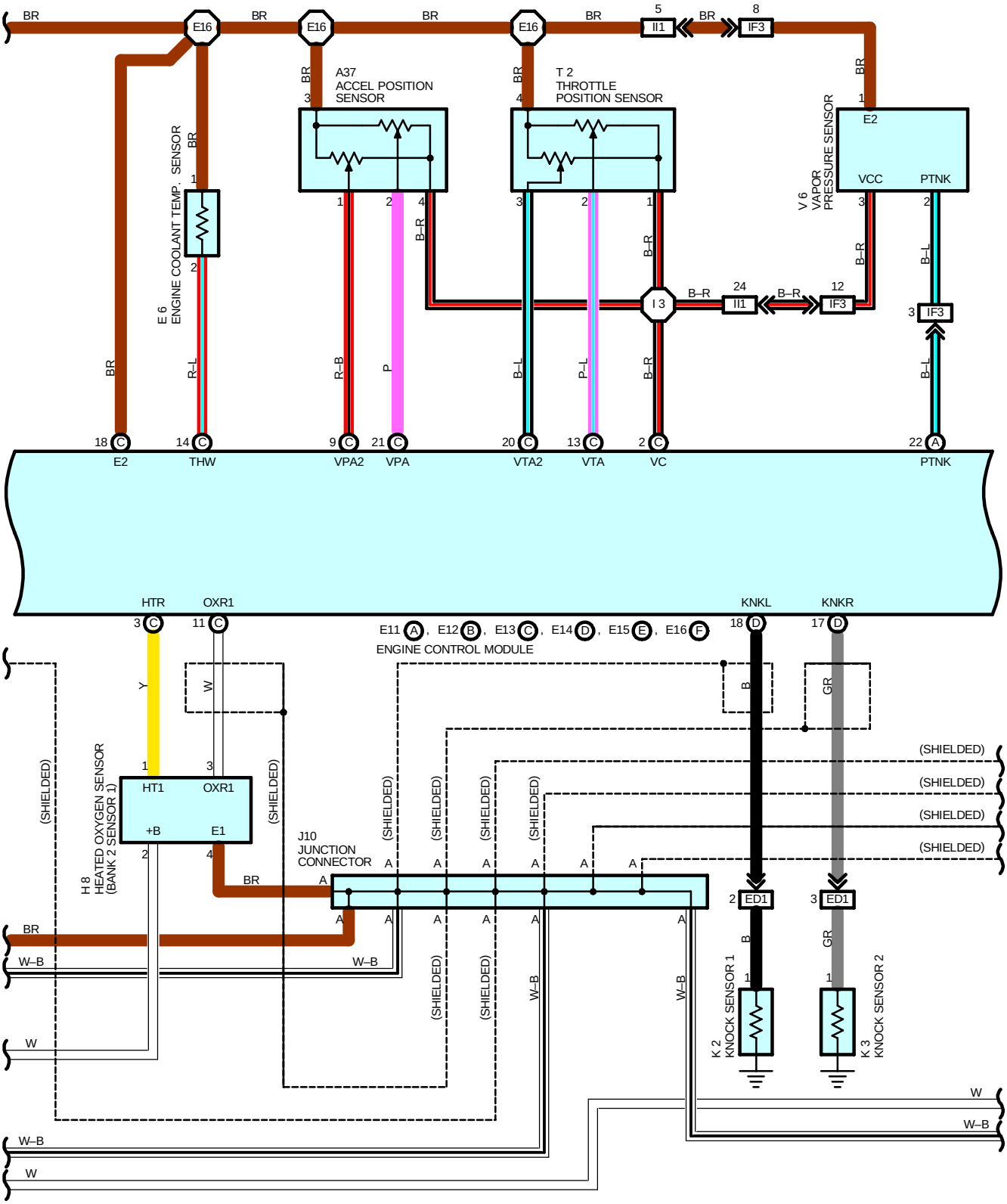




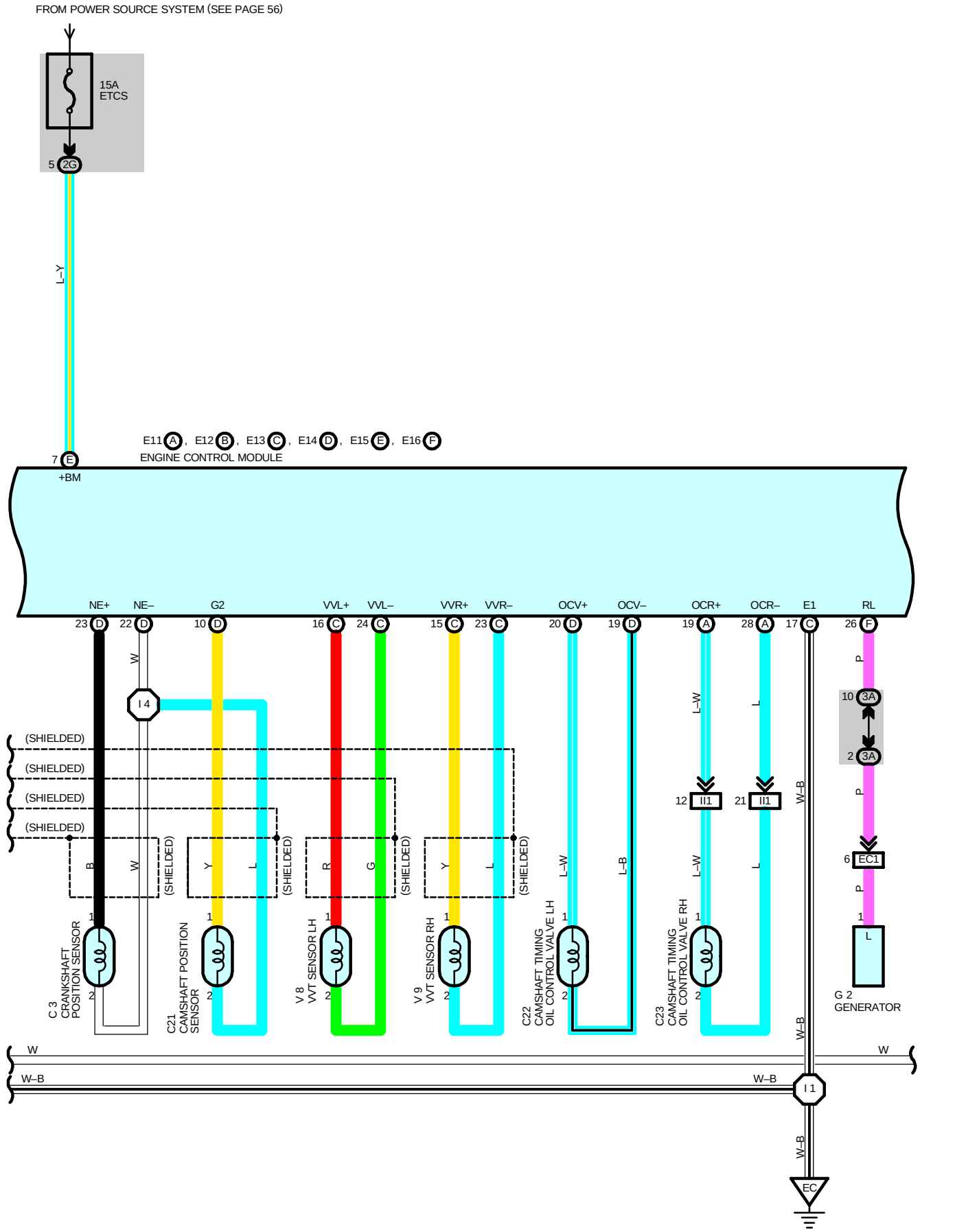
FROM POWER SOURCE SYSTEM (SEE PAGE 56)
7. 5A OBD
V15 VSV (PRESSURE SWITCHING VALVE)
I13 INJECTOR NO. 8
I12 INJECTOR NO. 7
I10 INJECTOR NO. 5
I 8 INJECTOR NO. 3
I 6 INJECTOR NO. 1
I 7 INJECTOR NO. 2
TBP
MREL
BATT
#80
#70
#50
#30
#10
#20
E11 A, E12 B, E13 C,
E14 D, E15 E, E16 F
ENGINE CONTROL MODULE
STA
FPR
+B
FC
IGSW
+B1
SIL
(SHIELDED)
SIL
BAT
CG
SG
D 5 DATA LINK CONNECTOR 3

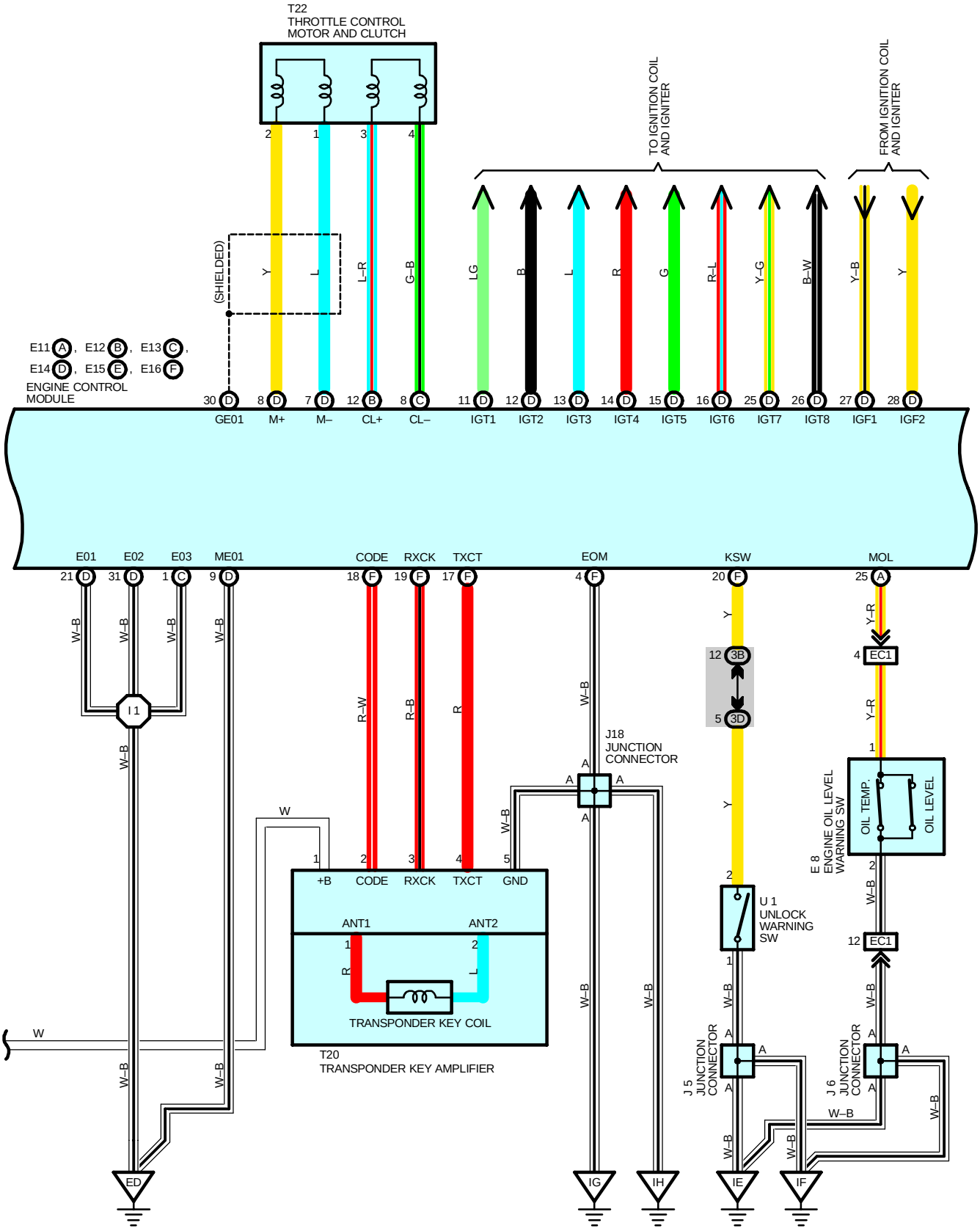
ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM



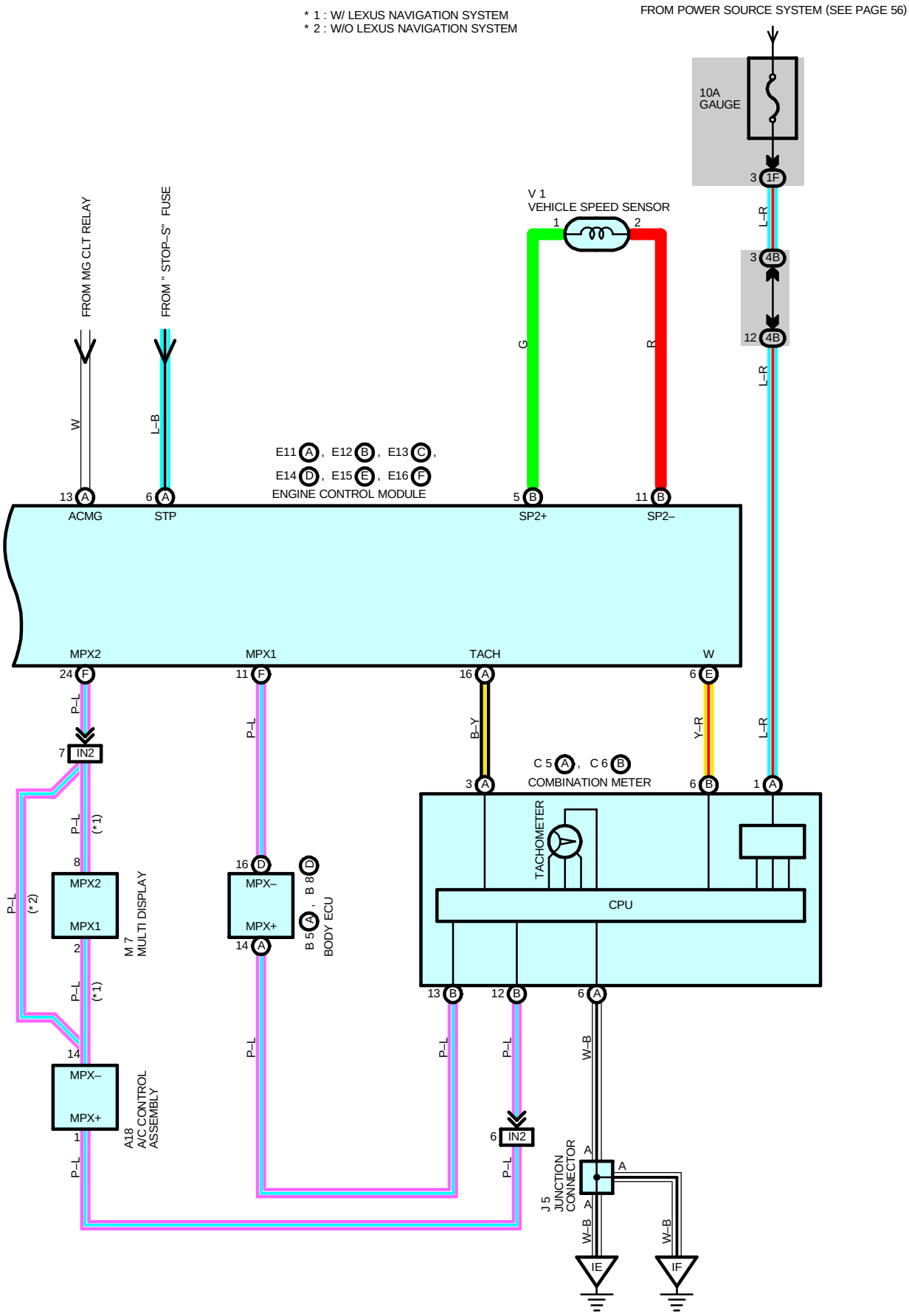

BR
E16
BR
E16
BR
E16
BR
5
II1
BR
8
IF3
A37
ACCEL POSITION
SENSOR
T 2
THROTTLE
POSITION SENSOR
E2
VCC
PTNK
V 6
VAPOR
PRESSURE SENSOR
E 6
ENGINE COOLANT TEMP. SENSOR
I 3
24
12
B–R
R–L
R–B
P
B–L
P–L
18 E2
14 THW
9 VPA2
21 VPA
20 VTA2
13 VTA
2 VC
22 PTNK
HTR
OXR1
KNKL
KNKR
E11 A, E12 B, E13 C, E14 D, E15 E, E16 F
ENGINE CONTROL MODULE
Y
W
B
GR
(SHIELDED)
H 8
HEATED OXYGEN SENSOR
(BANK 2 SENSOR 1)
HT1
+B
E1
J10
JUNCTION
CONNECTOR
ED1
K 2
KNOCK SENSOR 1
K 3
KNOCK SENSOR 2
W–B
W

ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM




T22
THROTTLE CONTROL
MOTOR AND CLUTCH
TO IGNITION COIL
AND IGNITER
FROM IGNITION COIL
AND IGNITER
(SHIELDED)
E11 A, E12 B, E13 C,
E14 D, E15 E, E16 F
ENGINE CONTROL
MODULE
GE01
M+
M–
CL+
CL–
IGT1
IGT2
IGT3
IGT4
IGT5
IGT6
IGT7
IGT8
IGF1
IGF2
E01
E02
E03
ME01
CODE
RXCK
TXCT
EOM
KSW
MOL
I 1
J18
JUNCTION
CONNECTOR
+B
CODE
RXCK
TXCT
GND
ANT1
ANT2
TRANSPONDER KEY COIL
T20
TRANSPONDER KEY AMPLIFIER
U 1
UNLOCK
WARNING
SW
E 8
ENGINE OIL LEVEL
WARNING SW
OIL TEMP.
OIL LEVEL
J 5
JUNCTION
CONNECTOR
J 6
JUNCTION
CONNECTOR
ED
IG
IH
IE
IF

ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM



SYSTEM OUTLINE

This system utilizes an engine control module and maintains overall control of the engine, transmission 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 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 (Bank 1 sensor 1, bank 2 sensor 1, bank 1 sensor 2 and bank 2 sensor 2) to TERMINALS OXL1, OXR1, OXL2 and OXR2 of the engine control module.

To stabilize detection performance by the heated oxygen sensors, the heated oxygen sensors are warmed. This heater is also controlled by the engine control module (HTL, HTR, HTL2 and HTR2).

(4) RPM signal circuit

Camshaft position is detected by the camshaft position sensor and its signal is input to TERMINAL G2 of the engine control module as a control signal. Also, the engine RPM is detected by the crankshaft position sensor installed in the cylinder block and the signal is input into TERMINAL NE+ of the engine control module 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 TERMINALS VTA and VTA2 of the engine control module.

(6) Vehicle speed circuit

Signals detected by ABS speed sensors are input into the combination meter through ABS, TRAC, and VSC ECU. Then it is delivered to the engine ECU through MPX communication.

(7) A/C SW signal circuit

The operating voltage of the A/C magnetic clutch is detected and the signal is input into TERMINAL ACMG of the engine control module as a control signal.

(8) Battery signal circuit

Voltage is constantly applied to the battery terminal of the engine control module. When the ignition SW is turned to ON, voltage for engine control module operation is applied via the EFI relay to TERMINALS +B and +B1 of the engine control module.

(9) Intake air volume signal circuit

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

(10) 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 engine control module as a control signal.

(11) Starter 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 engine control module as a control signal.

(12) Engine knock signal circuit

Engine knocking is detected by knock sensor 1 and 2 and the signal is input into TERMINALS KNKL and KNKR as a control signal.

2. CONTROL SYSTEM

- Sequential multiport fuel injection (Electronic fuel injection) system
  The sequential multiport fuel injection (Electronic fuel injection) system monitors the engine condition through the signals input from each sensor (Input signals from (1) to (12) 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, #60, #70 and #80 of the engine control module to operate the injector (Inject the fuel). The sequential multiport fuel injection (Electronic fuel injection) system controls the fuel injection operation by the engine control module in response to the driving conditions.
- ESA (Electronic Spark Advance) 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 (12) 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 IGT1, IGT2, IGT3, IGT4, IGT5, IGT6, IGT7 and IGT8. This signal controls the ignition coil and 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 sensors (Bank 1 sensor 1, bank 2 sensor 1, bank 1 sensor 2 and bank 2 sensor 2) to improve detection performance of the sensors.
  The engine control module evaluates the signals from each sensor (Input signals from (1), (2), (4), (8) to (10) etc.), and outputs current to TERMINALS HTL, HTR, HTL2 and HTR2 to control the heater.
- 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 (ACIS).
- ETCS–i
  The ETCS–i controls the engine output at its optimal level corresponding to the opening of the accel. pedal under all driving conditions.
- MPX
  The MPX communicates with the combination meter, A/C control assembly, as well as body ECU of the multiplex communication system

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 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 engine control module memory or else stops the engine.

SERVICE HINTS

EFI RELAY [ENGINE ROOM J/B]

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

E6 ENGINE COOLANT TEMP. SENSOR

1–2 : Approx. **15.0** kΩ (**–20**˚C, **–4**˚F)
Approx. **2.45** kΩ (**20**˚C, **68**˚F)
Approx. **0.32** kΩ (**80**˚C, **176**˚F)
Approx. **0.14** kΩ (**110**˚C, **230**˚F)

E11 (A), E12 (B), E13(C), E14 (D), E15 (E), E16 (F) ENGINE CONTROL MODULE

Voltage at engine control module wiring connector

BATT–GROUND : Always approx. **12** volts
+BM–GROUND : Always approx. **12** volts
VC–GROUND : **4.5**–**5.5** volts with ignition SW on
VTA2–GROUND : **2.0**–**2.9** volts with ignition SW on and throttle valve fully closed
4.7–**5.1** volts with ignition SW on and throttle valve fully open
VTA–GROUND : **0.4**–**1.0** volts with ignition SW on and throttle valve fully closed
3.2–**4.8** volts with ignition SW on and throttle valve fully open
VPA–GROUND : **0.25**–**0.9** volts with ignition SW at on and accelerator fully closed
3.2–**4.8** volts with ignition SW at on and accelerator fully opened
VPA2–GROUND : **1.8**–**2.7** volts with ignition SW at on and accelerator fully closed
4.7–**5.0** volts with ignition SW at on and accelerator fully opened
THA–GROUND : **0.5**–**3.4** volts with idling, intake air temp. **20**˚C (**68**˚F)
THW–GROUND : **0.2**–**1.0** volts with idling, water temp. **80**˚C (**176**˚F)
STA–GROUND : **6.0** volts or more with cranking
TC–GROUND : **9.0**–**14.0** volts with ignition SW on
W–GROUND : **9.0**–**14.0** volts with idling
0–**3.0** volts with ignition SW on
ACMG–GROUND : **0**–**1.5** volts with A/C SW on (at idling)
7.5–**14.0** volts with A/C SW off and throttle valve fully open
#10, #20, #30, #40, #50, #60, #70, #80–GROUND : **9.0**–**14.0** volts with ignition SW on pulse generation with idling

I6, I7, I8, I9, I10, I11, I12, I13 INJECTOR NO. 1, NO. 2, NO. 3, NO. 4, NO. 5, NO. 6, NO. 7, NO. 8

1–2 : **13.4**–**14.2** Ω

○ : PARTS LOCATION

Code	See Page	Code	See Page	Code	See Page
A18	36	F14	32	J10	35
A37	32	F15	32	J18	35
B5 A	34	F35	38	K2	33
B8 D	34	G2	32	K3	33
C3	32	H7	32	M1	33
C5 A	34	H8	32	M7	37
C6 B	34	H13	34	P1	33
C21	32	H14	34	T2	33
C22	32	I6	33	T20	35
C23	32	I7	33	T22	33
D1	32	I8	33	U1	35
D5	34	I9	33	V1	33
E6	32	I10	33	V2	33
E8	32	I11	33	V6	39
E11 A	34	I12	33	V8	33
E12 B	34	I13	33	V9	33
E13 C	34	I15	35	V10	33
E14 D	34	J3	35	V14	33

○ : **PARTS LOCATION**

Code		See Page	Code	See Page	Code	See Page
E15	E	34	J5	35	V15	39
E16	F	34	J6	35		

ENGINE CONTROL AND ENGINE IMMOBILISER SYSTEM

: JUNCTION BLOCK AND WIRE HARNESS CONNECTOR

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	22	Instrument Panel Wire and Instrument Panel J/B (Rear of Parking Brake Release Lever)
1E		
1F	22	Cowl Wire and Instrument Panel J/B (Rear of Parking Brake Release Lever)
1G		
1J		
1L		
2A	24	Engine Room Main Wire and Engine Room J/B (Engine Compartment Left)
2D		
2E	24	Cowl Wire and Engine Room J/B (Engine Compartment Left)
2G		
2H		
2J		
2K		
3A	26	Cowl Wire and Center J/B (Behind the Combination Meter)
3B		
3C		
3D		
3E		
4B	28	Cowl Wire and Driver Side J/B (Left Kick Panel)
4C		
4E		

: CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EB1	42	Cowl Wire and Engine Room Main Wire (Under the Engine Room J/B)
EC1	42	Engine No.3 Wire and Cowl Wire (Front Side of Left Fender)
ED1	42	Engine No.2 Wire and Engine Wire (Rear Side of Air Intake Chamber)
IF3	44	Floor No.2 Wire and Cowl Wire (Left Kick Panel)
IF4		
II1	46	Engine Wire and Cowl Wire (Left Side of Blower Unit)
IN2	48	Instrument Panel Wire and Cowl Wire (Behind the Radio and Player)

: GROUND POINTS

Code	See Page	Ground Points Location
EA	42	Front Side of Right Fender
EB	42	Front Side of Left Fender
EC	42	Rear Side of Cylinder Head RH
ED	42	Rear Side of Cylinder Head LH
IE	44	Left Side of Instrument Panel J/B
IF	44	Behind the Combination Meter
IG	44	Instrument Panel Brace RH
IH	44	Right Side of Instrument Panel
II	48	Instrument Panel Brace LH
IJ	48	Instrument Panel Brace RH
BN	50	Back Panel Right

: **SPLICE POINTS**

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E8	42	Engine Room Main Wire	I13	46	Cowl Wire
E10	42	Engine Wire	I16		
E14			I17		
E16			I38		
I1	46		I43		
I3			I44		
I4					