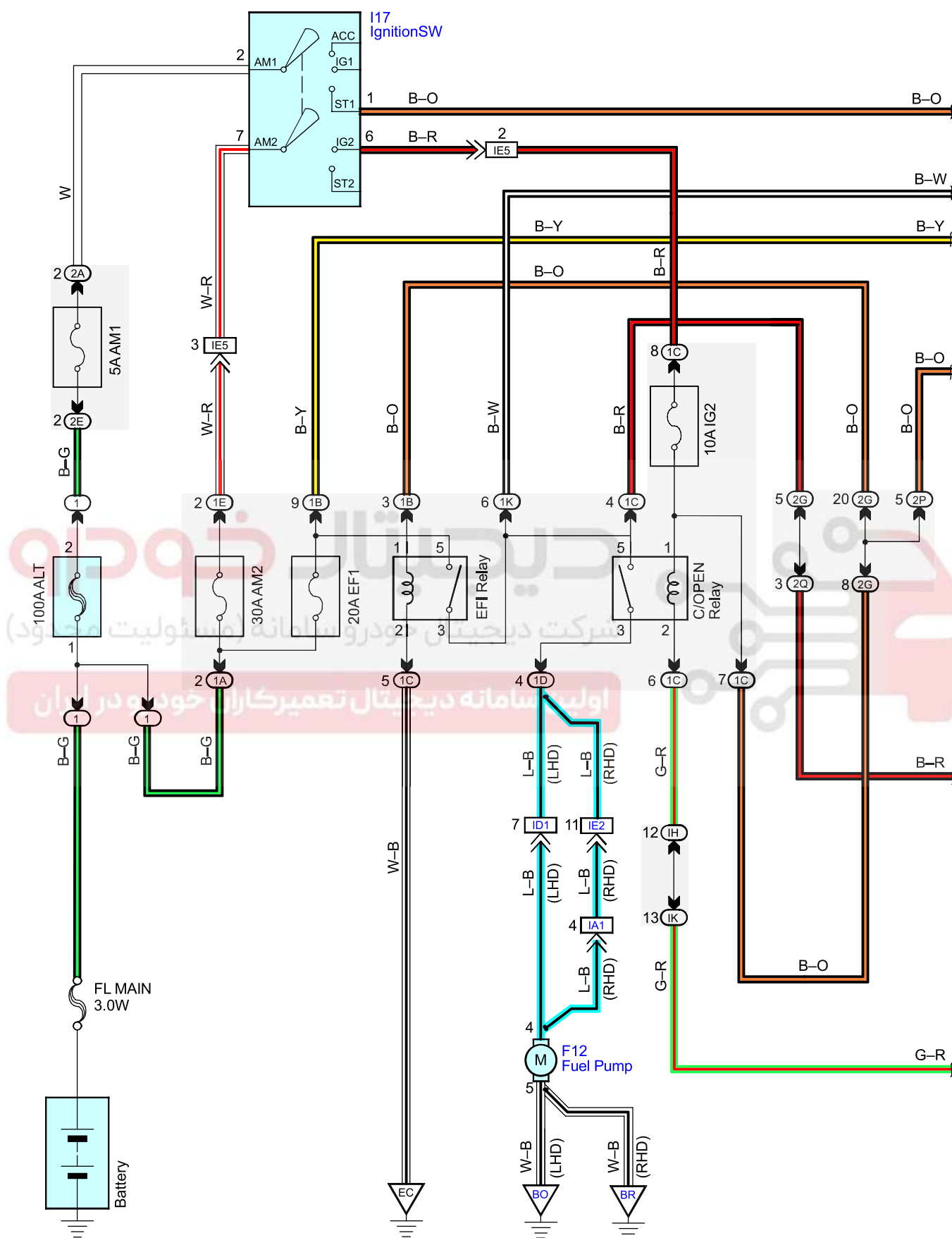
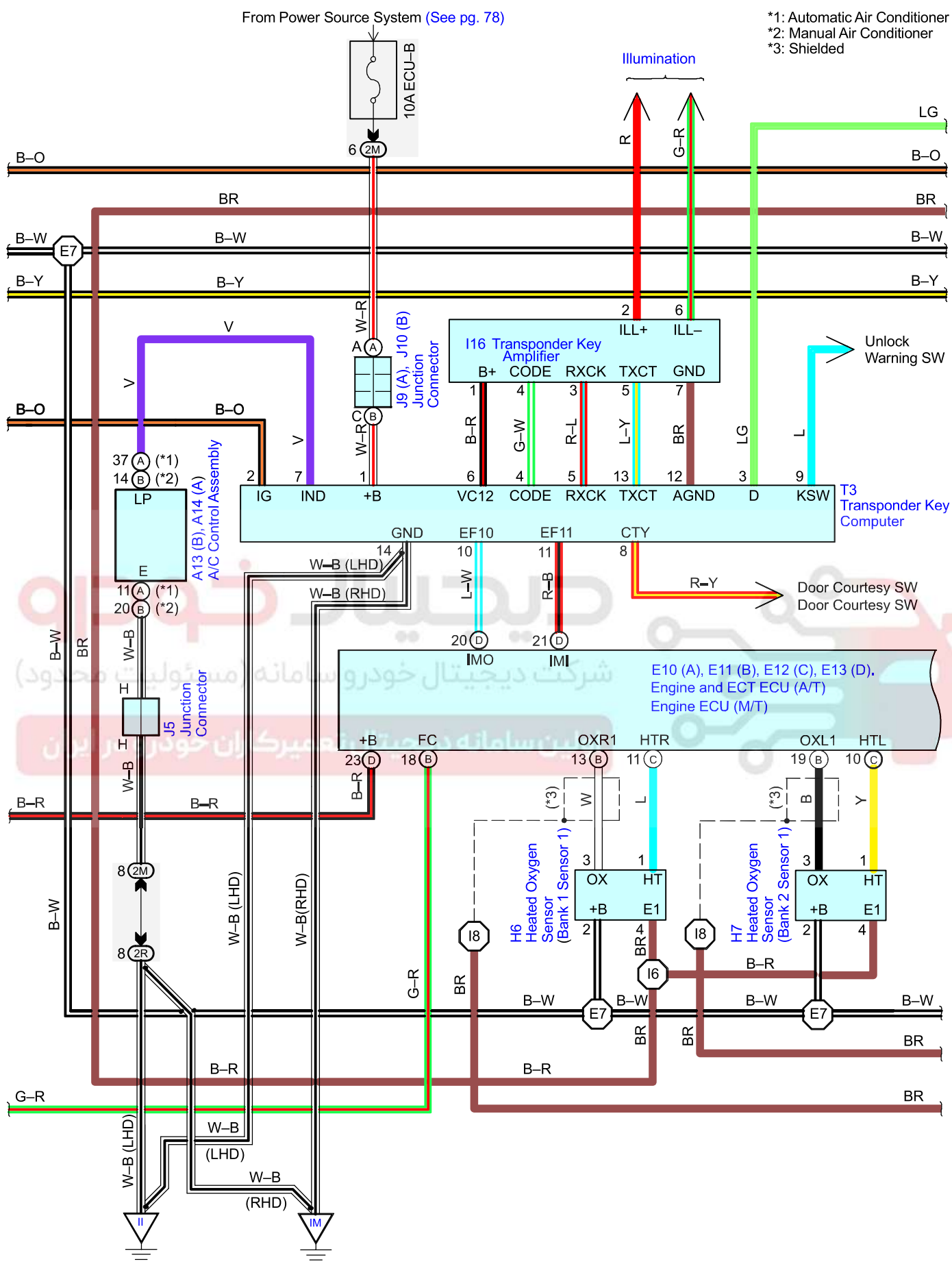


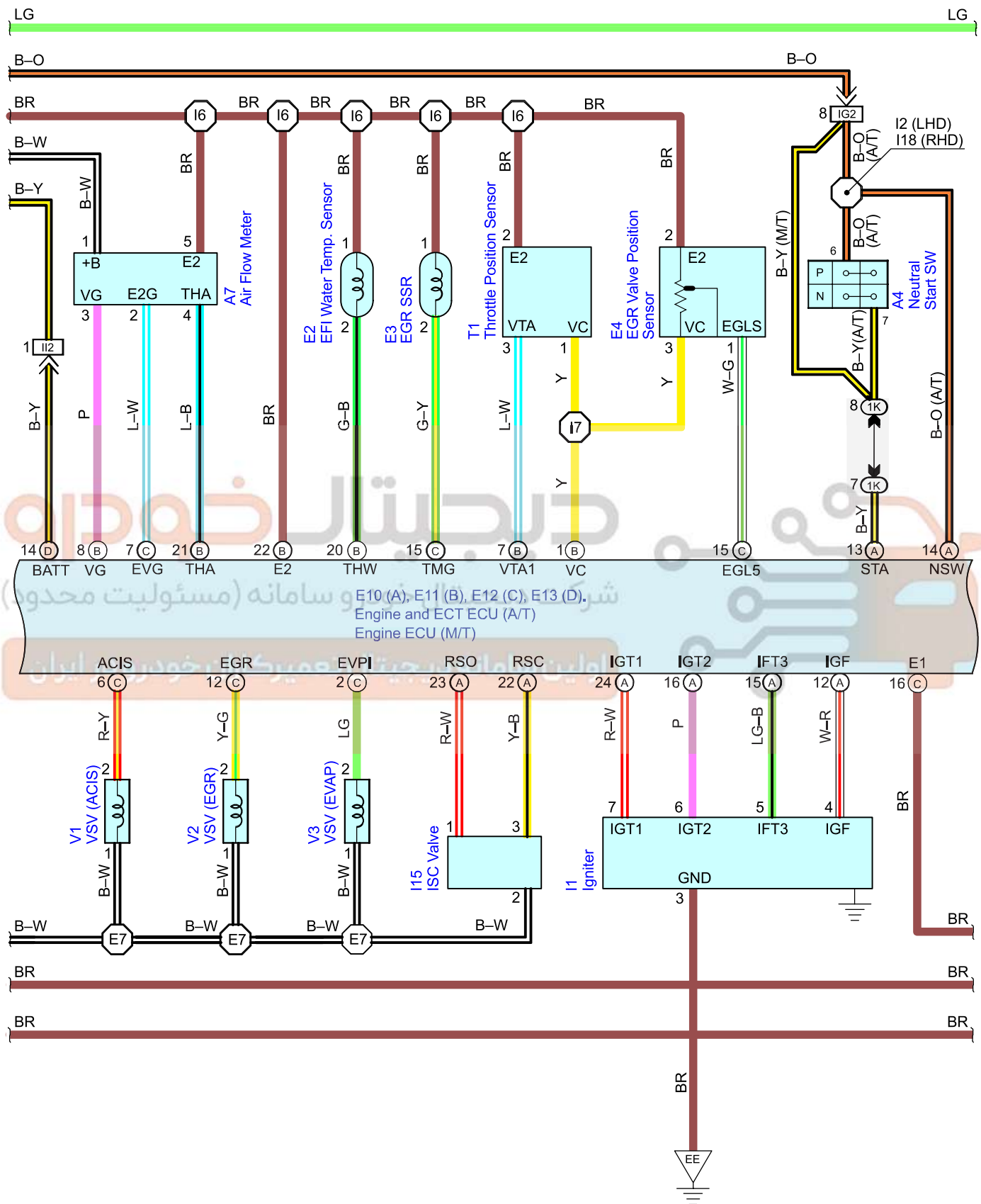


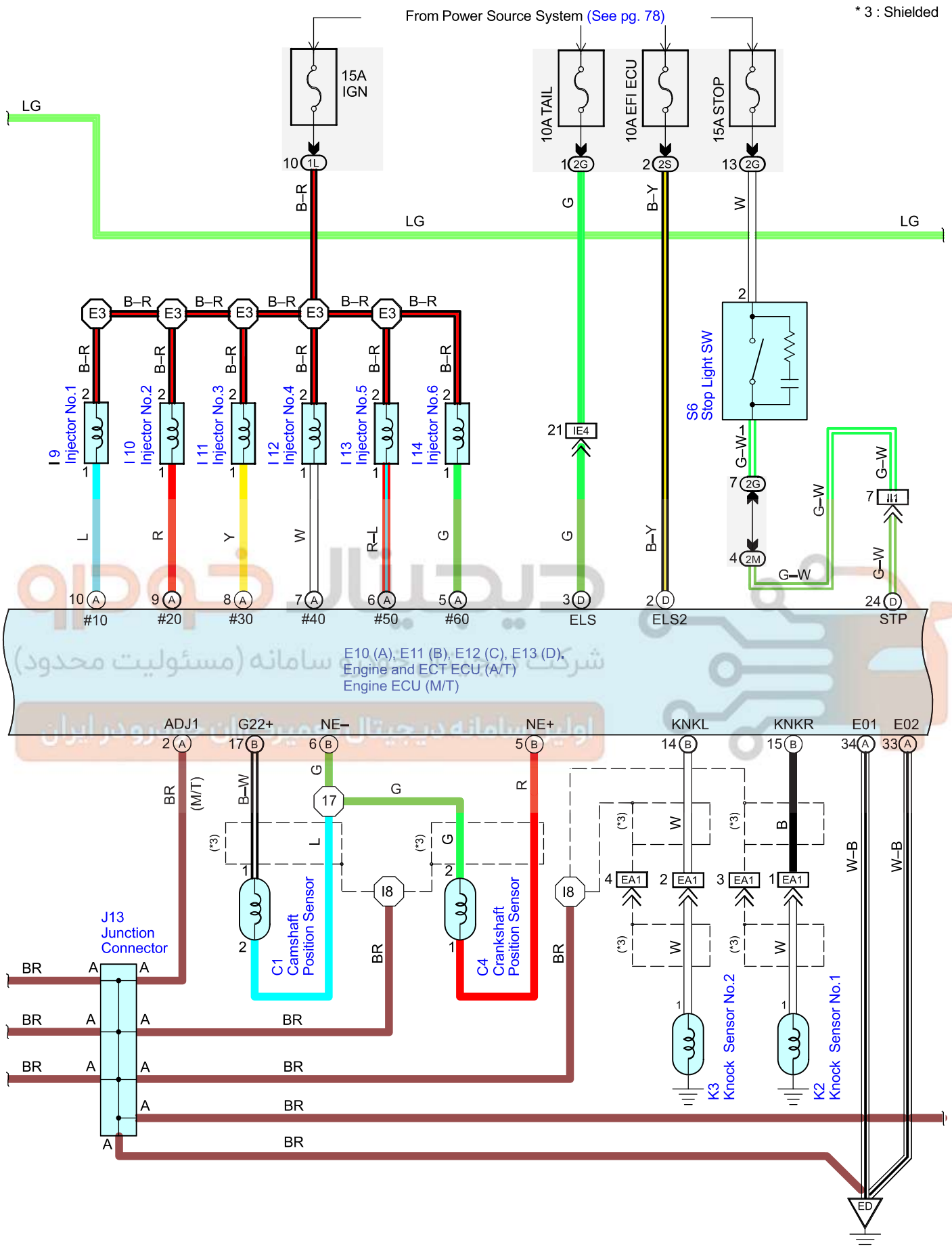


Engine Control (1MZ-FE)

System Outline

Service Hints



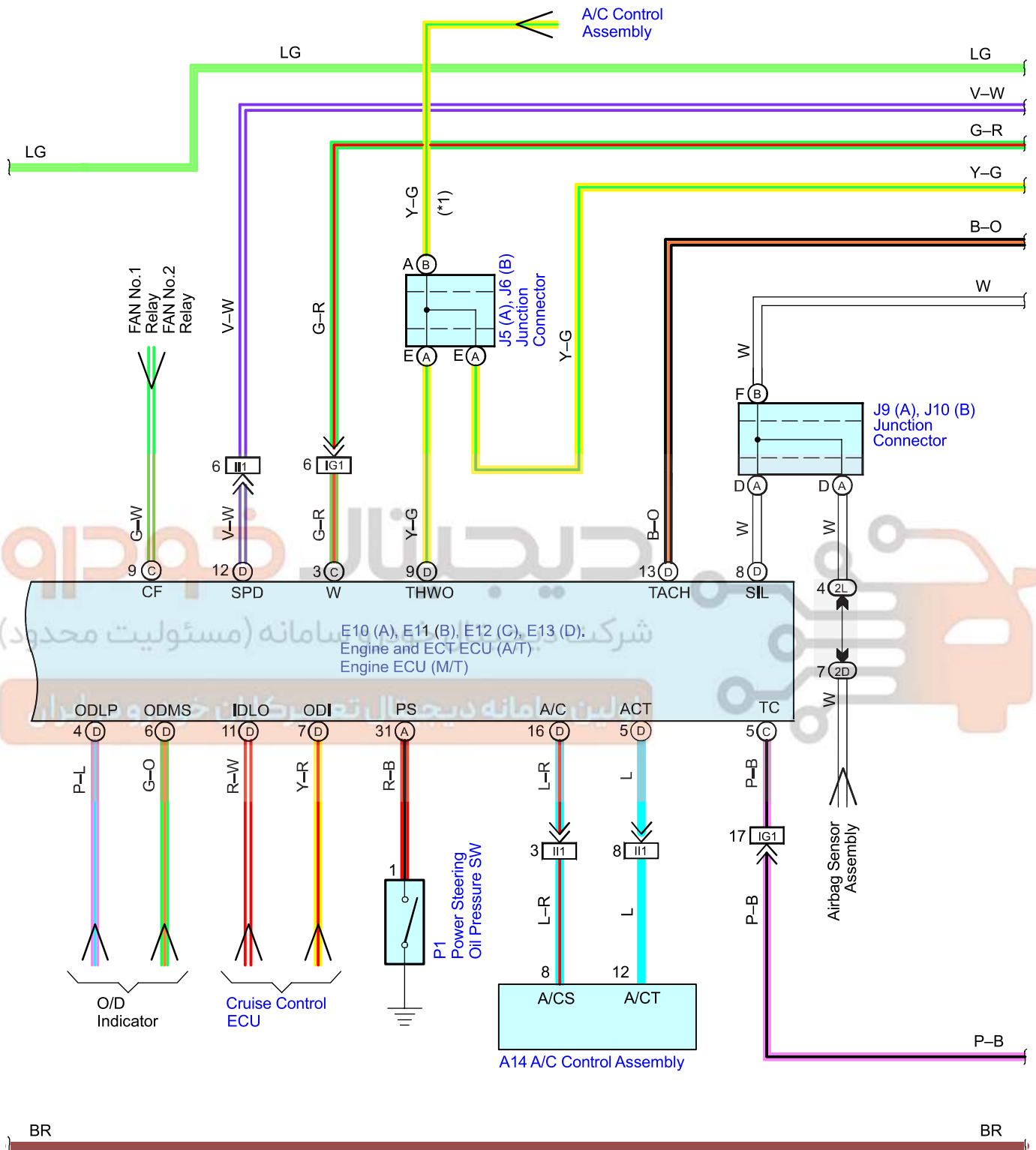


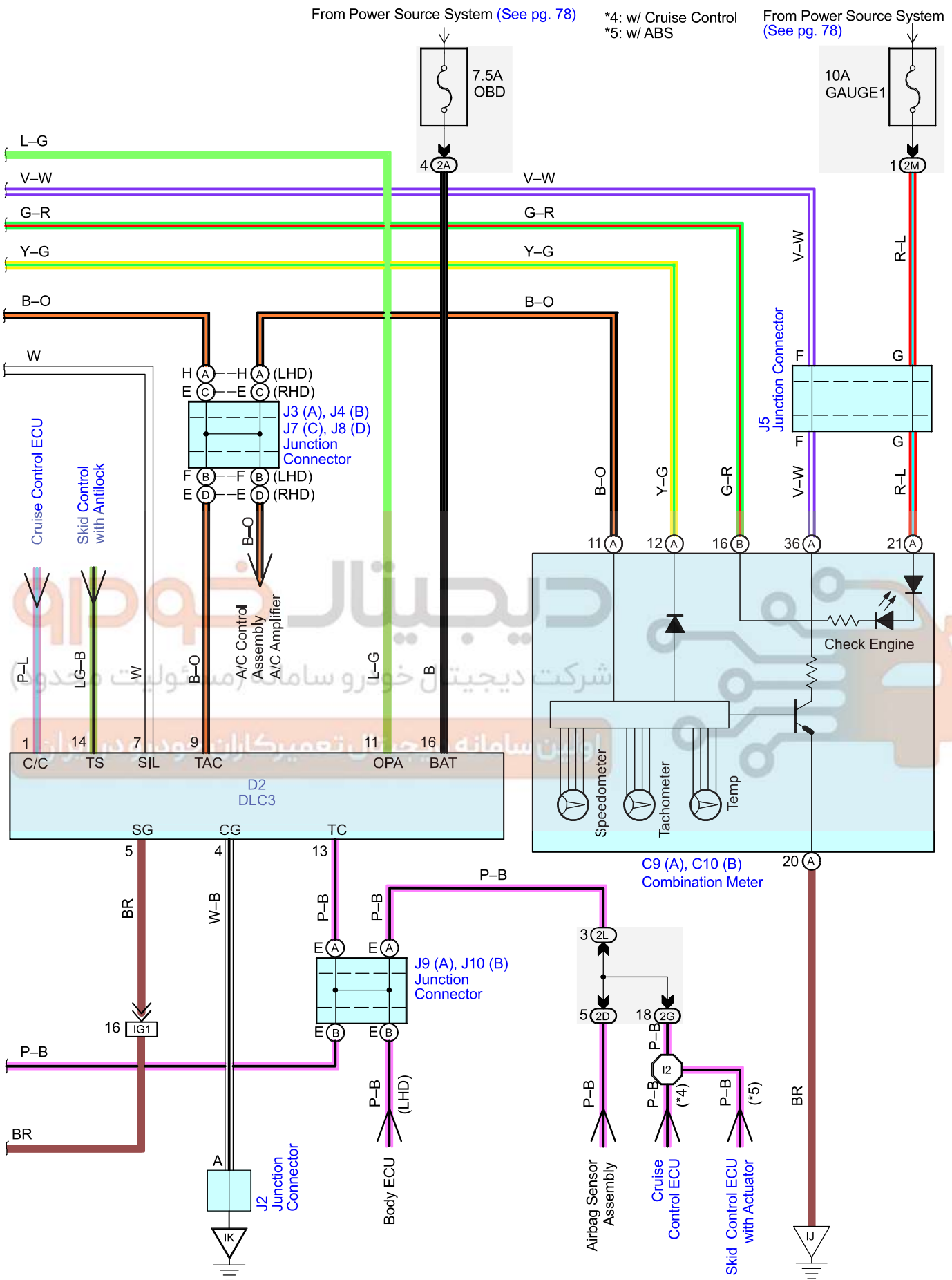
Engine Control (1MZ-FE)

System Outline

Service Hints

* 1 : Automatic Air Conditioner





Engine Control (1MZ-FE)

System Outline

This system utilizes an engine and ECT ECU and maintains overall control of components such as the engine and transmission. An outline of the engine control is explained here.

1. Input Signals

(1) Engine coolant temp. signal circuit

The EFI water 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 and ECT 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 into TERMINAL THA of the engine and ECT ECU.

(3) Oxygen sensor signal circuit

The oxygen density in the exhaust gases is detected and input as a control signal into TERMINALS OX1B and OX2B of the engine and ECT ECU. 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 and ECT ECU (HT1B and HT2B).

(4) RPM signal circuit

Camshaft position and crankshaft position are detected by the camshaft position sensor and crankshaft position sensor. The camshaft position is input as a control signal to TERMINAL G22+ of the engine and ECT ECU, 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 and ECT ECU.

(6) Vehicle speed signal circuit

The vehicle speed sensor, detects the vehicle speed and input to ABS speed sensor of the skid control ECU, from skid control ECU to TERMINAL SPD of the engine and ECT ECU, Via combination meter.

(7) Neutral start SW signal circuit

The neutral start SW detects whether the shift position is in neutral, parking or not, and inputs a control signal into TERMINAL NSW of the engine and ECT ECU.

(8) A/C SW signal circuit

The A/C control assembly inputs the A/C operations into TERMINAL A/CS of the engine and ECT ECU as a control signal.

(9) Battery signal circuit

Voltage is always supplies to TERMINAL BATT of the engine and ECT ECU.

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

(10) Intake air volume signal circuit

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

(13) Air fuel ratio signal circuit

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

2. Control System

* EFI system

The EFI system monitors the engine condition through the signals which are input from each sensor to engine and ECT ECU. The best fuel injection volume is decided based on this data and the program memorized by the engine and ECT ECU, and the control signal is output to TERMINALS #10, #20, #30, #40, #50 and #60 of the engine and ECT ECU to operate the injector (Inject the fuel). The EFI system produces control of fuel injection operation by the engine and ECT ECU in response to the driving conditions.

* ESA system

The ESA system monitors the engine condition through the signals which are input to the engine and ECT ECU from each sensor. The best ignition timing is decided according to this data and the memorized data in the engine and ECT ECU, and the control signal is output to TERMINALS IGT1, IGT2 and IGT3. 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 and ECT ECU evaluates the signals from each sensor, current is output to TERMINALS HT1B and HT2B, controlling the heater.

* EGR control system

The EGR control system detects the signals from each sensor, and outputs current to TERMINAL EGR to control the VSV (EGR).

The EGR valve position sensor is mounted on the EGR valve. this sensor converts the EGR valve opening height into a voltage and sends it to the engine and ECT ECU as the EGR valve position signal.

* 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 and ECT ECU judges the engine speed by the signals from each sensor and outputs current to the TERMINAL ACIS to control the VSV (ACIS).

3. Diagnosis System

With the diagnosis system, when there is a malfunction in the engine and ECT ECU 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 and ECT ECU memory or else stops the engine.

Engine Control (1MZ-FE)

Service Hints

E2 EFI Water Temp. Sensor

- 1-2 : Approx. 15.04 k Ω (-20°C, -4°F)
- Approx. 5.74 k Ω (0°C, 32°F)
- Approx. 2.45 k Ω (20°C, 68°F)
- Approx. 1.15 k Ω (40°C, 104°F)
- Approx. 0.584 k Ω (60°C, 140°F)
- Approx. 0.318 k Ω (80°C, 176°F)

E10 (A), E11 (B), E12 (C), E13 (D) Engine and ECT ECU

Voltage at engine and ECT ECU 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 position)
- 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 engine coolant temp. 80°C, 176°F)
- IGF-E1 : 4.5-5.5 volts (Ignition SW at ON position)
- Pulse generation (Engine idling)
- G22+-NE- : Pulse generation (Engine idling)
- NE+-NE- : Pulse generation (Engine idling)
- NSW-E1 : 9.0-14.0 volts (Ignition SW on and other shift position in P or N position)
- Below 3.0 volts (Ignition SW on and shift position in P or N position)
- SPD-E1 : Pulse generation (Ignition SW on and rotate driving wheel slowly)
- W-E1 : Below 3.0 volts
- A/C-E1 : Below 2.0 volts (Engine idling and A/C SW on)
- 9.0-14.0 volts (A/C SW off)
- A/CS-E1 : 9.0-14.0 volts (Engine idling and A/C SW on)
- Below 2.0 volts (A/C SW off)
- ACIS-E01 : 9.0-14.0 volts (Ignition SW at ON position)
- STA-E1 : 6.0 volts or more (Engine cranking)
- ELS-E1 : 7.5-14.0 volts (Taillight SW at ON position)
- 0-1.5 volts (Taillight SW at OFF position)
- ELS2-E1 : 7.5-14.0 volts (Defogger SW at ON position)
- 0-1.5 volts (Defogger SW at OFF position)
- FC-E1 : 9.0-14.0 volts (Ignition SW at ON position)
- 0-3.0 volts (Engine idling)
- EVP1-E01 : 9.0-14.0 volts (Ignition SW at ON position)
- CF-E1 : 9.0-14.0 volts (Electric cooling fan is operating on high speed)
- 0-2.0 volts (Electric cooling fan is operating on low speed or off)
- TACH-E1 : Pulse generation (Engine idling)
- 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 (15.0 mmHg, 0.6 in.Hg)
- STP-E1 : 7.5-14.0 volts (Ignition SW on and brake pedal depressed)
- Below 1.5 volts (Ignition SW on and brake pedal released)
- SIL-E1 : Pulse generation (During transmission)
- KNK1, KNK2-E1 : Pulse generation (Engine idling)
- HTL, HTR-E03 : 9.0-14.0 volts (Ignition SW at ON position)
- 0-3.0 volts (Engine idling)
- OXR1, OXL1-E1 : Pulse generation (Maintain engine speed at 2500 rpm for two minutes after warning up)
- IGT1, IGT2, IGT3-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)

I9, I10, I11, I12, I13, I14 Injector

- 2-1 : Approx. 13.8 Ω

C/OPN Relay

- 3-5 : Closed with starter running

EFI Relay

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



☐ : Parts Location

Code	See Page	Code	See Page	Code	See Page
A4	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	H6	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	J6	B
A7	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	H7	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	J7	C
A13	36 (LHD) 46 (RHD)	I1	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	J8	D
A14	36 (LHD) 46 (RHD)	I9	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	J9	A
C1	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	I10	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	J10	B
C4	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	I11	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	J13	
C9	A 36 (LHD) 46 (RHD)	I12	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	K2	
C10	B 36 (LHD) 46 (RHD)	I13	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	K3	
D2	36 (LHD) 46 (RHD)	I14	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	P1	
E2	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	I15	33 (LHD 1MZ-FE) 43 (RHD 1MZ-FE)	S6	
E3	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	I16	37 (LHD) 47 (RHD)	T1	
E4	32 (LHD 1MZ-FE) 42 (RHD 1MZ-FE)	I17	37 (LHD) 47 (RHD)	T3	
E10	A 37 (LHD) 47 (RHD)	J2	37 (LHD) 47 (RHD)	V1	
E11	B 37 (LHD) 47 (RHD)	J3	A 37 (LHD) 47 (RHD)	V2	
E12	C 37 (LHD) 47 (RHD)	J4	B 37 (LHD) 47 (RHD)	V3	
E13	D 37 (LHD) 47 (RHD)	J5			
F12	38 (LHD) 48 (RHD)	J5	A 37 (LHD) 47 (RHD)		

☐ : Relay Blocks

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

Engine Control (1MZ-FE)



: 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
1B		
1C		
1D		
1E		
1H	24	Engine Wire and Engine Room J/B
1K		
1L	26	Instrument Panel Wire and Engine Room J/B
2A		
2D	26	Engine Room Main Wire and Driver Side J/B
2E		
2G	26	Instrument Panel Wire and Driver Side J/B
2L		
2M		
2P		
2Q		
2R		
2S		



: Connector Joining Wire Harness and Wire Harness

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA1	52 (LHD 1MZ-FE)	Engine Wire and Sensor Wire (Left Fender)
	64 (RHD 1MZ-FE)	
IA1	55 (LHD)	Instrument Panel Wire and Floor Wire (Left Kick Panel)
	67 (RHD)	Instrument Panel Wire and Floor Wire (Right Kick Panel)
IE2	67 (RHD)	Engine Room Main Wire and Instrument Panel Wire (Left Side of Steering Column)
IE4	55 (LHD)	Engine Room Main Wire and Instrument Panel Wire (Right Side of Steering Column)
	67 (RHD)	Engine Room Main Wire and Instrument Panel Wire (Left Side of Steering Column)
IE5	55 (LHD)	Engine Room Main Wire and Instrument Panel Wire (Right Side of Steering Column)
	67 (RHD)	Engine Room Main Wire and Instrument Panel Wire (Left Side of Steering Column)
ID1	55 (LHD)	Engine Room Main Wire and Floor Wire (Left Kick Panel)
IG1	58 (LHD)	Engine Wire and Instrument Panel Wire (Behind Glove Box)
	70 (RHD)	Engine Wire and Instrument Panel Wire (Behind Glove Box)
IG2	58 (LHD)	Engine Wire and Instrument Panel Wire (Behind Glove Box)
	70 (RHD)	Engine Wire and Instrument Panel Wire (Behind Glove Box)
II1	58 (LHD)	Engine Room Main Wire and Instrument Panel (Right Kick Panel)
	70 (RHD)	Engine Room Main Wire and Instrument Panel (Left Kick Panel)
II2	58 (LHD)	Engine Room Main Wire and Instrument Panel (Right Kick Panel)
	70 (RHD)	Engine Room Main Wire and Instrument Panel (Left Kick Panel)



: Ground Points

Code	See Page	Ground Points Location
BO	60 (LHD)	Front Side of Rear Quarter Wheel House LH
BR	72 (RHD)	Front Side of Rear Quarter Wheel House RH
EC	52 (LHD 1MZ-FE)	Left Fender
	64 (RHD 1MZ-FE)	
	54 (LHD 2AZ-FE)	
	66 (RHD 2AZ-FE)	
EE	52 (LHD 1MZ-FE)	Rear Side of Surge Tank
	64 (RHD 1MZ-FE)	
	54 (LHD 2AZ-FE)	
	66 (RHD 2AZ-FE)	
ED	52 (LHD 1MZ-FE)	Surge Tank RH
	64 (RHD 1MZ-FE)	
	54 (LHD 2AZ-FE)	
	66 (RHD 2AZ-FE)	
II	55 (LHD)	Instrument Panel Reinforcement LH
	67 (RHD)	
IJ	55 (LHD)	Instrument Panel Brace LH
	67 (RHD)	Instrument Panel Brace RH
IK	55 (LHD)	Instrument Panel Brace LH
	67 (RHD)	Instrument Panel Brace RH
IM	55 (LHD)	Instrument Panel Reinforcement RH
	67 (RHD)	



: Splice Points

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E3	54 (LHD)	Engine Wire	I2	58 (LHD)	Instrument Panel
	66 (RHD)			70 (RHD)	
E7	54 (LHD)	Instrument Panel	I18	58 (LHD)	
	66 (RHD)			70 (RHD)	
I7	58 (LHD)				
	70 (RHD)				
I8	58 (LHD)				
	70 (RHD)				