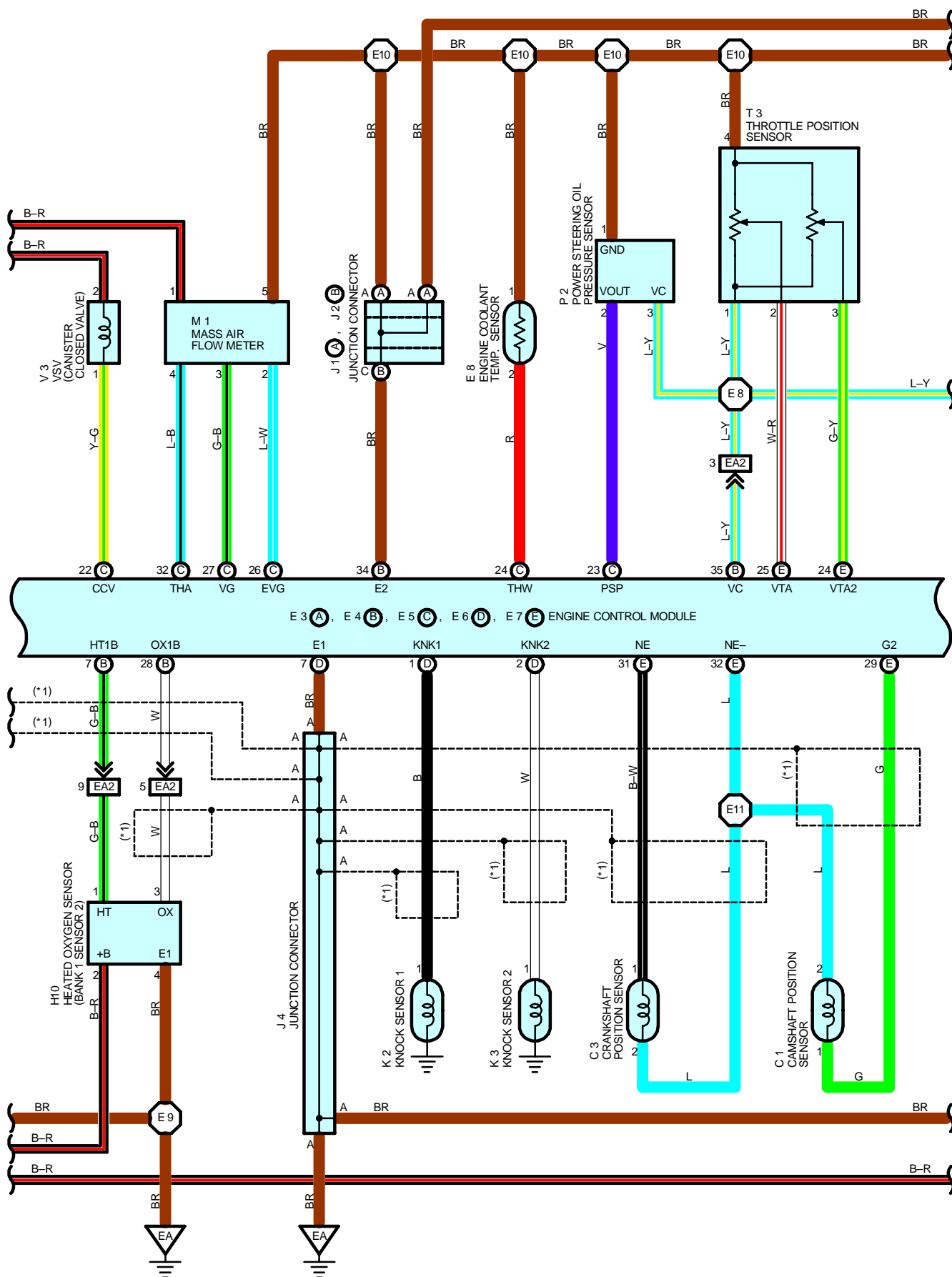
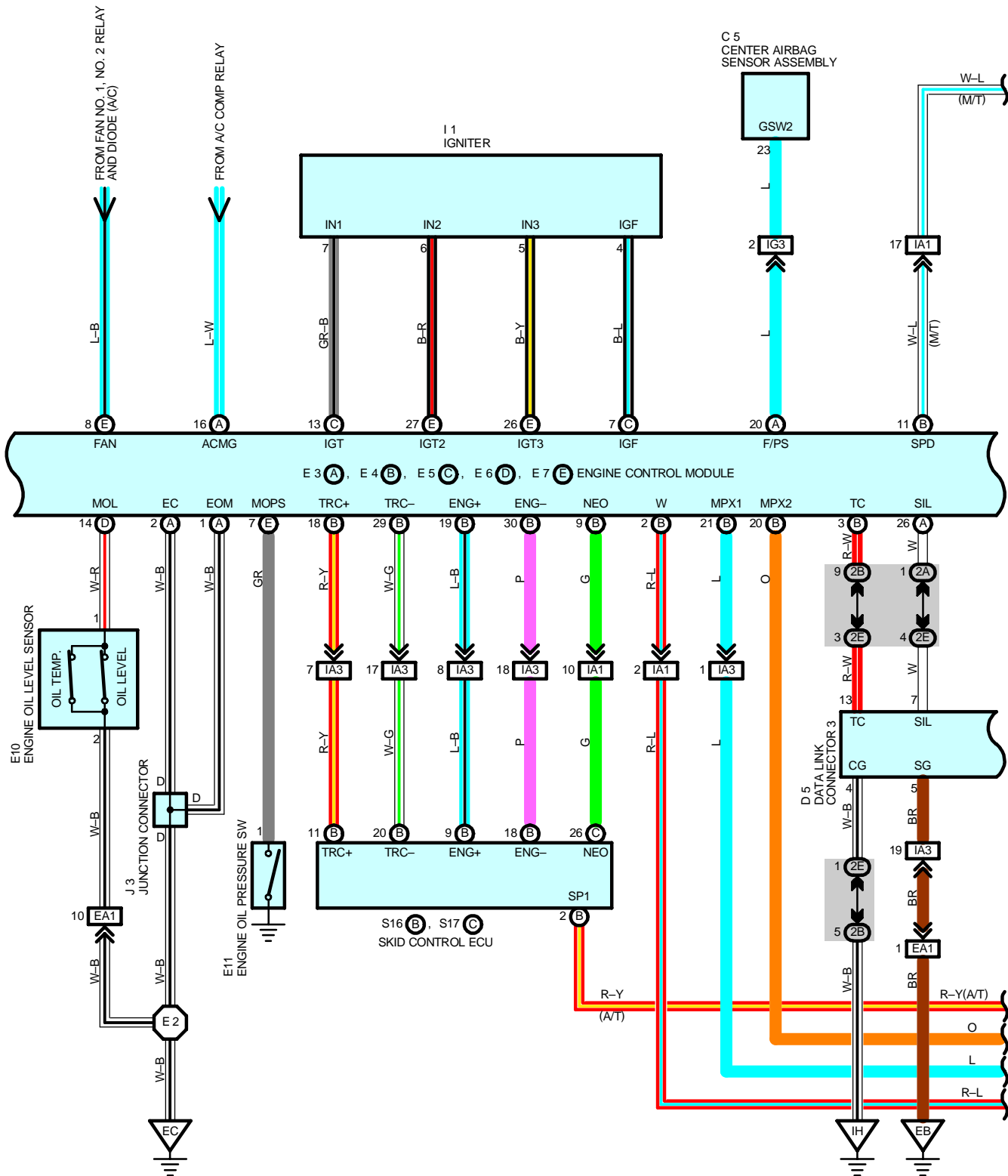
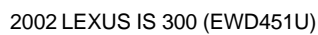


ENGINE CONTROL



ENGINE CONTROL





ENGINE CONTROL

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. which 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 density signal circuit
The oxygen density in the exhaust emission is detected by the heated oxygen sensors and input as a control signal to TERMINALS OX1A, OX2A, OX1B and OX2B of the engine control module.
- (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, engine RPM is detected by the crankshaft position sensor and is input as a control signal to TERMINAL NE.
- (5) Throttle position 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
(A/T)
Signals detected by ABS speed sensors are input into the combination meter through skid control ECU. Then it is delivered to the engine control module through MPX communication.
(M/T)
The vehicle speed sensor (Combination meter) detects the vehicle speed and inputs a control signal to TERMINAL SPD of the engine control module.
- (7) Battery signal circuit
Voltage is constantly applied to TERMINALS BATT and +BM 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 relay and put on the relay, and the voltage related to the engine control module operation is supplied to TERMINALS +B and +B2 of the engine control module through the EFI relay.
The current flowing through the IGN fuse flows to TERMINAL IGSW of the engine control module.
- (8) 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.
- (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 is 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.
- (11) Engine knock signal circuit
Engine knocking is detected by knock sensors and the signal is input into TERMINALS KNK1 and 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 sensor to 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 controls the 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 input to the engine control module from each sensor. 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 IGT, 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 oxygen sensors to improve detection performance of the sensors. The engine control module evaluates the signals from each sensor, and outputs current to TERMINALS HT1A, HT2A, HT1B and HT2B 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 from each sensor and outputs signal to the TERMINAL ACIS of the engine control module and controls 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.

- * Fuel pump control system

The engine control module operation outputs to TERMINAL FPR and controls the FUEL PMP relay. Thus controls the fuel pump drive speed in response to 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 check 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 engine control module memory or else stops the engine.

ENGINE CONTROL

SERVICE HINTS

EFI RELAY

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

E10 ENGINE OIL LEVEL SENSOR

1-2 : Closed with the float up and the engine oil temp. below **40°C–49°C (104.0°F–120.2°F)**
Open with the float down and the engine oil temp. above **50°C–60°C (122.0°F–140.0°F)**

E11 ENGINE OIL PRESSURE SW

1-GROUND : Closed with the oil pressure below approx. **0.2 kgf/cm² (2.8 psi, 19.6 kpa)**

E8 ENGINE COOLANT TEMP. SENSOR

1-2 : Approx. **15.04 kΩ** at **-20°C (-4°F)**
Approx. **2.45 kΩ** at **20°C (68°F)**
Approx. **0.32 kΩ** at **80°C (176°F)**
Approx. **0.14 kΩ** at **110°C (230°F)**

E3 (A), E4 (B), E5 (C), E6 (D), E7 (E) ENGINE CONTROL MODULE

BATT-GROUND : Always approx. **12 volts**

+BM-GROUND : Always approx. **12 volts**

IGSW-GROUND : Approx. **12 volts** with the ignition SW at **ON** position

+B, +B2-GROUND : Approx. **12 volts** with the ignition SW at **ON** position

VC-GROUND : **4.5–5.5 volts** with the ignition SW on

VTA2-GROUND : **2.0–2.9 volts** with the ignition SW on and the throttle valve fully closed

4.6–5.0 volts with the ignition SW on and the throttle valve fully opened

VTA-GROUND : **0.4–1.0 volts** with the ignition SW on and the throttle valve fully closed

3.2–4.8 volts with the ignition SW on and the throttle valve fully opened

VPA-GROUND : **0.25–0.9 volts** with the ignition SW at on and the accelerator fully closed

3.2–4.8 volts with the ignition SW at on and the accelerator fully opened

VPA2-GROUND : **1.8–2.7 volts** with the ignition SW at on and the accelerator fully closed

4.7–5.0 volts with the ignition SW at on and the accelerator fully opened

THA-GROUND : **0.5–3.4 volts** with the engine idling and the intake air temp. **20°C (68°F)**

THW-GROUND : **0.2–1.0 volts** with the engine idling and the coolant temp. **80°C (176°F)**

STA-GROUND : **6.0 volts** or more with the engine cranking

TC-GROUND : **9.0–14.0 volts** with the ignition SW on

W-GROUND : **9.0–14.0 volts** with the engine idling

0–3.0 volts with the ignition SW on

ACMG-GROUND : **0–1.5 volts** with the A/C SW on (at the engine idling)

7.5–14.0 volts with the A/C SW off and the throttle valve fully open

#10, #20, #30, #40, #50, #60-GROUND : Pulse generation with the engine idling

E01, E02, E03, E1, EC, ME01, EOM-GROUND : Always continuity

○ : PARTS LOCATION

Code	See Page	Code	See Page	Code	See Page
A9	32	F15	38 (W/G)	J16	38 (W/G)
A12	A 34	H9	33	J19	35
A13	B 34	H10	33	K2	33
B6	B 34	H11	33	K3	33
C1	32	H17	36 (S/D)	M1	33
C2	32		38 (W/G)	P1	33
C3	32	I1	33	P2	33
C5	34	I5	33	S8	35
C9	A 34	I6	33	S16	B 35
C10	B 34	I7	33	S17	C 35
C14	34	I8	33	T2	33
D5	34	I9	33	T3	33
E3	A 32	I10	33	T6	35
E4	B 32	I12	35	V2	33
E5	C 32	J1	A 33	V3	33
E6	D 32	J2	B 33	V4	33
E7	E 32	J3	33	V7	37 (S/D)
E8	32	J4	33		39 (W/G)
E10	32	J7	35	V8	37 (S/D)
E11	32	J15	36 (S/D)		39 (W/G)
F12	32		38 (W/G)	V9	33
F15	36 (S/D)	J16	36 (S/D)		

○ : RELAY BLOCKS

Code	See Page	Relay Blocks (Relay Block Location)
1	22	Engine Room No.1 R/B (Engine Compartment Right)
2	22	Engine Room No.2 R/B (Engine Compartment Right)
3	23	Engine Room No.3 R/B (Engine Compartment Left)

○ : JUNCTION BLOCK AND WIRE HARNESS CONNECTOR

Code	See Page	Junction Block and Wire Harness (Connector Location)
1D	24	Instrument Panel Wire and Driver Side J/B (Left Kick Panel)
1E		
1G	24	Engine Room Main Wire and Driver Side J/B (Left Kick Panel)
1H	24	Instrument Panel Wire and Driver Side J/B (Left Kick Panel)
1I	24	Floor No.2 Wire and Driver Side J/B (Left Kick Panel)
1K	24	Engine Room Main Wire and Driver Side J/B (Left Kick Panel)
2A	26	Engine Room Main Wire and Passenger Side J/B (Right Kick Panel)
2B		
2E	26	Instrument Panel Wire and Passenger Side J/B (Right Kick Panel)
2G		
2H		
2I		
2M	26	Engine Room Main Wire and Passenger Side J/B (Right Kick Panel)

ENGINE CONTROL

: CONNECTOR JOINING WIRE HARNESS AND WIRE HARNESS

Code	See Page	Joining Wire Harness and Wire Harness (Connector Location)
EA1	42	Engine Wire and Engine Room Main Wire (Inside of the ECU Box)
EA2		
EA3		
IA1	44	Instrument Panel Wire and Engine Room Main Wire (Near the Driver Side J/B)
IA3		
IC1	44	Engine Room Main Wire and Floor No.2 Wire (Near the Driver Side J/B)
IG1	46	Instrument Panel Wire and Engine Room Main Wire (Near the Passenger Side J/B)
IG3		
IH1	46	Instrument Panel Wire and Floor Wire (Near the Passenger Side J/B)
IH4		
BC2	48 (S/D)	Floor No.2 Wire and Floor Wire (Rear Floor Partition Panel RH)
	50 (W/G)	Floor No.2 Wire and Floor Wire (Rear Floor Partition Panel Center)

: GROUND POINTS

Code	See Page	Ground Points Location
EA	42	Front Side of the Intake Manifold
EB	42	Center Side of the Intake Manifold
EC	42	Left Fender Apron
IE	44	Front Floor Panel Center LH
IH	44	Cowl Side Panel RH
BL	48 (S/D)	Left Quarter Panel LH
	50 (W/G)	

: SPLICE POINTS

Code	See Page	Wire Harness with Splice Points	Code	See Page	Wire Harness with Splice Points
E2	42	Engine Room Main Wire	E8	42	Engine Wire
E4			E9		
E6	42	Engine Wire	E10		
E7			E11		

