ENGINE CONTROL MODULE (ECM)

1. ECM HARNESS CONNECTOR

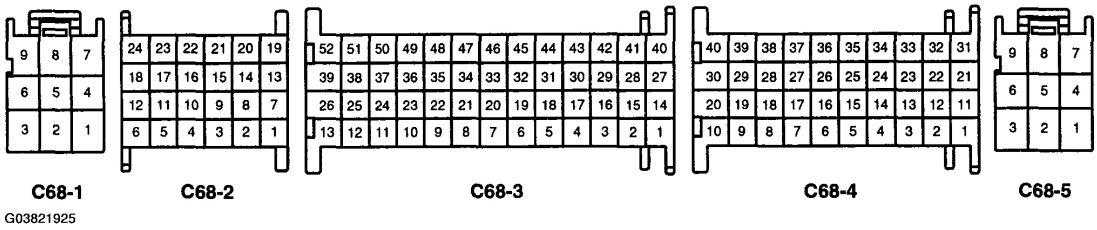


Fig. 7: Identifying Engine Control Module (ECM) Harness Connector
Courtesy of KIA MOTORS AMERICA, INC.

2. ECM TERMINAL FUNCTION

CONNECTOR [C68-1]

ECM TERMINAL FUNCTION (CONNECTOR [C68-1])

Pin No.	Description	Connected to
1	Ignition switch signal input	Ignition Switch
2	Not connected	
3	Diagnostic Data Line (k-Line)	Data Link Connector (DLC)
4	ECM ground	Chassis ground
5	Power stage ground	Chassis ground
6	Power stage ground	Chassis ground
7	Battery voltage supply	Battery
8	Battery Voltage Supply after Main Relay	Main Relay
9	Battery Voltage Supply after Main Relay	Main Relay

CONNECTOR [C68-2]

ECM TERMINAL FUNCTION (CONNECTOR [C68-2])

Pin No.	Description	Connected to
1	Heated Oxygen Sensor Heater (B1 /S1) control	Heated Oxygen Sensor (B1/S1)
2	Not connected	
3	Not connected	
4	Not connected	
5	Not connected	
6	Not connected	
7	Heated Oxygen Sensor (B1/S2) Heater control	Heated Oxygen Sensor (B1/S2)
8	Not connected	
9	Not connected	

10	Not connected	
11	Not connected	
12	Not connected	
13	Heated Oxygen Sensor (B2/S1) Heater control	Heated Oxygen Sensor (B2/S1)
14	Heated Oxygen Sensor (B1/S1) signal input	Heated Oxygen Sensor (B1/S1)
15	Heated Oxygen Sensor (B2/S1) signal input	Heated Oxygen Sensor (B2/S1)
16	Heated Oxygen Sensor (B1/S2) signal input	Heated Oxygen Sensor (B1/S2)
17	Fuel Consumption signal output	Trip Computer
18	Heated Oxygen Sensor (B2/S2) signal input	Heated Oxygen Sensor (B2/S2)
19	Heated Oxygen Sensor (B2/S2) Heater control	Heated Oxygen Sensor (B2/S2)
20	Heated Oxygen Sensor (B1/S1) ground	Heated Oxygen Sensor (B1/S1)
21	Heated Oxygen Sensor (B2/S1) ground	Heated Oxygen Sensor (B2/S1)
22	Heated Oxygen Sensor (B1/S2) ground	Heated Oxygen Sensor (B1/S2)
23	Main Relay control output	Main Relay
24	Heated Oxygen Sensor (B2/S2) ground	Heated Oxygen Sensor (B2/S2)

CONNECTOR [C68-3]

ECM TERMINAL FUNCTION (CONNECTOR [C68-3])

Pin No.	Description	Connected to
1	Mass Air Flow Sensor signal input	Mass Air Flow Sensor (MAFS)
2	Not connected	
3	Not connected	
4	Not connected	
5	Not connected	
6	Not connected	
7	Not connected	
8	Crankshaft Position Sensor signal input	Crankshaft Position Sensor (CKPS)
9	Not connected	
10	Throttle Position Sensor supply	Throttle Position Sensor (TPS)
11	Not connected	
12	Not connected	
13	Not connected	
14	Not connected	
15	Not connected	
16	Not connected	
17	Mass Air Flow Sensor ground	Mass Air Flow Sensor (MAFS)
18	Not connected	
19	Throttle Position Sensor signal input	Throttle Position Sensor (TPS)
20	Throttle Position Sensor ground	Throttle Position Sensor (TPS)
21	Crankshaft Position Sensor ground	Crankshaft Position Sensor (CKPS)
22	Intake Air Temperature Sensor signal input	Intake Air Temperature Sensor (IATS)

23	Intake Air Temperature Sensor ground	Intake Air Temperature Sensor (IATS)
24	Engine Coolant Temperature Sensor signal input	Engine Coolant Temperature Sensor (ECTS)
25	Engine Coolant Temperature Sensor ground	Engine Coolant Temperature Sensor (ECTS)
26	Power Steering Load input	Power Steering Switch
27	Not connected	
28	Not connected	
29	Knock Sensor #1 (Cyl. #1, 3, 5) signal input	Knock Sensor (KS) #1
30	Knock Sensor #1 (Cyl. #1, 3, 5) ground	Knock Sensor (KS) #1
31	Knock Sensor #2 (Cyl. #2, 4, 6) signal input	Knock Sensor (KS) #2
32	Knock Sensor #2 (Cyl. #2, 4, 6) signal input	Knock Sensor (KS) #2
33	Injector (Cyl. 1) control output	Injector (Cyl. 1)
34	Injector (Cyl. 2) control output	Injector (Cyl. 2)
35	Injector (Cyl. 3) control output	Injector (Cyl. 3)
36	Injector (Cyl. 4) control output	Injector (Cyl. 4)
37	Injector (Cyl. 5) control output	Injector (Cyl. 5)
38	Injector (Cyl. 6) control output	Injector (Cyl. 6)
39	Not connected	
40	Not connected	
41	Not connected	
42	Purge Control Solenoid Valve PWM output	Purge Control Solenoid Valve (PCSV)
43	Not connected	
44	Not connected	
45	Intake Manifold Tuning Valve #1 (Surge Tank Side) control output	Intake Manifold Tuning Valve #1 (Surge Tank Side)
46	Idle Speed Control Actuator PWM output 2 (OPEN)	Idle Speed Control Actuator (ISCA)
47	Idle Speed Control Actuator PWM output 1 (CLOSE)	Idle Speed Control Actuator (ISCA)
48	Knock Sensor Shield	Knock Sensor (KS)
49	Not connected	
50	Not connected	
51	Not connected	
52	Intake Manifold Tuning Valve #2 (In-mani Side) control output	Intake Manifold Tuning Valve #2 (In-mani Side)]

CONNECTOR [C68-4]

ECM TERMINAL FUNCTION (CONNECTOR [C68-4])

Pin No.	Description	Connected to	Remark
1	Not connected		

2	Not connected		
3	Not connected		
4	Fuel Tank Pressure Sensor Supply	Fuel Tank Pressure Sensor (FTPS)	
5	Fuel Level Sensor Supply Input	Fuel Level Sensor(FLS)	
6	Not connected		
7	Camshaft Position Sensor signal input	Camshaft Position Sensor (CMPS)	
8	Camshaft Position Sensor ground	Camshaft Position Sensor (CMPS)	
9	Not connected		
10	Fuel Pump Relay control output	Fuel Pump Relay	
11	Not connected		
12	Not connected		
13	Throttle Position PWM output	Other control modules	
14	Fuel Tank Pressure Sensor ground	Fuel Tank Pressure Sensor (FTPS)	
15	Fuel Level Sensor ground	Fuel Level Sensor(FLS)	
16	Not connected		
17	Engine Speed signal output	Tachometer	
18	Cooling Fan Relay [Low] control output	Cooling Fan Relay	
19	Not connected		
20	Malfunction Indicating Lamp (MIL) output	Malfunction Indicating Lamp (MIL)	
21	Not connected		
22	Vehicle speed signal input	ABS Control Module	- With ABS
23	Air conditioner switch [Low/High] signal input	Triple Switch	
24	Air conditioner switch signal input	Air Conditioner Switch	
25	Air conditioner switch [Middle] signal input	Triple Switch	
26	Not connected		
27	Not connected		
28	Not connected		
29	Air Conditioner Compressor Relay control output	Air Conditioner Compressor Relay	
30	Canister Close Valve Control Output	Canister Close Valve (CCV)	
31	Not connected		
32	Not connected		
33	Not connected		
	Fuel Tank Pressure Sensor Signal	Fuel Tank Pressure Sensor	

34	Input	(FTPS)	
35	Not connected		
36	CAN [HIGH]	Other control modules (TCM, ABS, etc.)	
37	CAN [LOW]	Other control modules (TCM, ABS, etc.)	
38	Wheel Speed Sensor (WSS) ground	Wheel Speed Sensor (WSS)	- Wthout ABS
39	Wheel Speed Sensor (WSS) signal input	Wheel Speed Sensor (WSS)	
40	Cooling Fan Relay [High] control output	Cooling Fan Relay	

CONNECTOR [C68-5]

ECM TERMINAL FUNCTION (CONNECTOR [C68-5])

Pin No.	Description	Connected to
1	Ignition coil #3 (Cyl. #3,6) control output	Ignition coil #3 (Cyl. #3,6)
2	Ignition coil #2 (Cyl. #2,5) control output	Ignition coil #2 (Cyl. #2,5)
3	Ignition coil #1 (Cyl. #1,4) control output	Ignition coil #1 (Cyl. #1,4)
4	Not connected	
5	Ignition Coil shield	Ignition Coil and Chassis ground
6	Not connected	
7	Not connected	
8	Not connected	
9	Not connected	

3. ECM TERMINAL INPUT/OUTPUT SIGNAL

CONNECTOR [C68-1]

ECM TERMINAL INPUT/OUTPUT SIGNAL (CONNECTOR [C68-1])

Pin	Description	Type	Vehicle State	Level	Test Result
1	Ignition switch signal input	DC	IG OFF	Max. 0.5 V	14.69V
			IG ON	Vbatt	OV
2	Not connected				
3	Diagnostic Data Line (k-Line)	Pulse	When transmitting	Hi: Min. Vbattx80% Lo: Max. Vbattx20%	High: 10.687V Low: 0.125V Vbatt: 14V
			When receiving	Hi: Min. Vbattx70% Lo: Max. Vbattx30%	
4	ECM ground	DC	Idle	Max. 50 mV	-
5	Power stage ground	DC	Idle	Max. 50 mV	-
6	Power stage ground	DC	Idle	Max. 50 mV	-

7	Battery voltage supply	DC	Always	Vbatt	14.625V
8	Battery Voltage Supply after Main Relay	DC	IGOFF	Max. 1.0 V	14.3V
			IG ON	Vbatt	0.0625V
9	Battery Voltage Supply after Main Relay	DC	IG OFF	Max. 1.0 V	14.3V
			IG ON	Vbatt	0.0625V

CONNECTOR [C68-2]

ECM TERMINAL INPUT/OUTPUT SIGNAL (CONNECTOR [C68-2])

Pin	Description	Type	Vehicle State	Level	Test Result
1	Heated Oxygen Sensor Heater (B1/S1) control	Pulse	Engine Run	High: Vbatt	14.687V
				Low: Max. 1.0V	0.25V
				Freguency: 10Hz	
2	Not connected				
3	Not connected				
4	Not connected				
5	Not connected				
6	Not connected				
7	Heated Oxygen Sensor (B1/S2) Heater control	Pulse	Engine Run	High: Vbatt	14.5V
				Low: Max. 1.0V	0.313V
				Freguency: 10Hz	
8	Not connected				
9	Not connected				
10	Not connected				
11	Not connected				
12	Not connected				
13	Heated Oxygen Sensor (B2/S1) Heater control	Pulse	Engine Run	High: Vbatt	14.562V
				Low: Max. 1.0V	0.25V
				Freguency: 10Hz	
14	Heated Oxygen Sensor (B1/S1) signal input	DC	When racing	Rich: 0.6 ~ 1.0V	0.83V
				Lean: 0 ~ 0.4V	0.37V
15	Heated Oxygen Sensor (B2/S1) signal input	DC	When racing	Rich: 0.6 ~ 1.0V	0.86V
				Lean: 0 ~ 0.4V	0.46V
16	Heated Oxygen Sensor (B1/S2) signal input	DC	When racing	Rich: 0.6 ~ 1.0V	0.95V
				Lean: 0 ~ 0.4V	0.16V
17	Fuel Consumption signal output	Pulse	Idle	High: Vbatt or Vcc	13.812V
				Low: Max. 0.5V	OV
				Freguency: 4Hz	
18	Heated Oxygen Sensor (B2/S2) signal input	DC	When racing	Rich: 0.6 ~ 1.0V	0.952V
				Lean: 0 ~ 0.4V	0.166V
19	Heated Oxygen Sensor (B2/S2) Heater control	Pulse	Engine Run	High: Vbatt	14.562V
				Low: Max. 1.0V	0.375V

				Freguency: 10Hz	
20	Heated Oxygen Sensor (B1/S1) ground	DC	Idle	Max. 50mV	15.573m V
21	Heated Oxygen Sensor (B2/S1) ground	DC	Idle	Max. 50mV	15.662mV
22	Heated Oxygen Sensor (B1/S2) ground	DC	Idle	Max. 50mV	15.525mV
23	Main Relay control output	DC	Relay ON	Max. 1.0V	0.75V
			Relay OFF	Vbatt	12.5V
24	Heated Oxygen Sensor (B2/S2) ground	DC	Idle	Max. 50mV	15.245mV

CONNECTOR [C68-3]

ECM TERMINAL INPUT/OUTPUT SIGNAL (CONNECTOR [C68-3])

Pin	Description	Type	Vehicle State	Level	Test Result
1	Mass Air Flow Sensor signal input	Analog	Idle	0 ~ 2.0V	0.788V
			3000 rpm	1.0 ~ 4.5V	1.942V
2	Not connected				
3	Not connected				
4	Not connected				
5	Not connected				
6	Not connected				
7	Not connected				
8	Crankshaft Position Sensor signal input	Pulse	Idle	High: Vcc or Vbatt	4.988V
				Low: Max. 1.0V	0.188 V
				Frequency: 524Hz	
9	Not connected				
10	Throttle Position Sensor supply	DC	IG OFF	Max. 0.5V	OV
			IG ON	4.9 ~ 5.1V	5.0375V
11	Not connected				
12	Not connected				
13	Not connected				
14	Not connected				
15	Not connected				
16	Not connected				
17	Mass Air Flow Sensor ground	DC	Idle	Max. 50 mV	31.43mV
18	Not connected				
19	Throttle Position Sensor signal input	Analog	C.T	0.25 ~ 0.9V	0.35V
			W.O.T	Min. 4.0V	4.18V
20	Throttle Position Sensor ground	DC	Idle	Max. 50 mV	21.14mV
21	Crankshaft Position Sensor ground	DC	Idle	Max. 50 mV	11.85mV

22	Intake Air Temperature Sensor signal input	Analog	Idle	0 ~ 5V	1.525V at 78 °C
23	Intake Air Temperature Sensor ground	DC	Idle	Max. 50 mV	11.93mV
24	Engine Coolant Temperature Sensor signal input	Analog	Idle	0.5 ~ 4.5V	1.09 V at 93 °C
25	Engine Coolant Temperature Sensor ground	DC	Idle	Max. 50 mV	12.27mV
26	Power Steering Load input	DC	S/WON	Max. 0.5V	OV
			S/WOFF	Vbatt	11.5V
27	Not connected				
28	Not connected				
29	Knock Sensor #1 (Cyl. #1, 3, 5) signal input	Frequency	Knocking	~0.3 ~ 0.3 V	
			Normal	0 V	
30	Knock Sensor #1 (Cyl. #1, 3, 5) ground				
31	Knock Sensor #2 (Cyl. #2, 4, 6) signal input	Frequency	Knocking	~0.3 ~ 0.3 V	
			Normal	0 V	
32	Knock Sensor #2 (Cyl. #2, 4, 6) ground				
33	Injector (Cyl. 1) control output	Pulse	Idle	High: Vbatt	14V
34	Injector (Cyl. 2) control output			Low: Max. 1.0V	0.25V
35	Injector (Cyl. 3) control output			Vpeak: Max. 70V	48.625V
36	Injector (Cyl. 4) control output			Frequency: 5.5Hz	
37	Injector (Cyl. 5) control output				
38	Injector (Cyl. 6) control output				
39	Not connected				
40	Not connected				
41	Not connected				
42	Purge Control Solenoid Valve PWM output	Pulse	Inactive Active	High: Vbatt	14.312V
				Low: Max. 1.0V	0.125V
				Vpeak: Max. 70V	48.375V
				Frequency: 20Hz	
43	Not connected				
44	Not connected				
45	Intake Manifold Tuning Valve #1 (Surge Tank Side) control output	DC (20Hz)	Inactive	Max. 1.0 V	0.0625V
			Active	Vbatt	15.125V
46	Idle Speed Control Actuator PWM output 2 (OPEN)	Pulse	Idle	High: Vbatt	15.125V
				Low: Max. 1.0V	0.125V

				Frequency: 100Hz	
47	Idle Speed Control Actuator PWM output 1 (CLOSE)	Pulse	Idle	High: Vbatt	15.187V
				Low: Max. 1.0V	0.0625V
				Frequency: 100Hz	
48	Knock Sensor Shield	DC	Idle	Max. 50 mV	11.63mV
49	Not connected				
50	Not connected				
51	Not connected				
52	Intake Manifold Tuning Valve #2 (In~mani Side) control output	DC (20Hz)	Inactive	Max. 1.0 V	OV
			Active	Vbatt	15.125V

CONNECTOR [C68-4]

ECM TERMINAL INPUT/OUTPUT SIGNAL (CONNECTOR [C68-4])

Pin	Description	Type	Vehicle State	Level	Test Result
1	Not connected				
2	Not connected				
3	Not connected				
4	Fuel Tank Pressure Sensor supply	DC	IG OFF	Max. 0.5V	OV
			IG ON	4.9 ~ 5.1V	5.05V
5	Fuel Level Sensor signal input	DC	IG ON	0V ~ Vbatt	2.93V
6	Not connected				
7	Camshaft Position Sensor signal input	Pulse	Idle	High: Vcc or Vbatt	5V
				Low: Max. 1.0V	0.625V
				Frequency: 10.99Hz	
8	Camshaft Position Sensor ground	DC	Idle	Max. 50 mV	-
9	Not connected				
10	Fuel Pump Relay control output	DC	Relay OFF	Vbatt	12.38V
			Relay ON	Max. 1.0V	0.125 V
11	Not connected				
12	Not connected				
13	Throttle Position PWM output	Pulse	Idle	High: Vbatt	11.75V
				Low. Max. 0.5V	OV
				Frequency: 100Hz	
14	Fuel Tank Pressure Sensor ground	DC	Idle	Max. 50 mV	23.78V
15	Fuel Level Sensor ground	DC	Idle	Max. 50 mV	14.92V

16	Not connected				
17	Engine Speed signal output	Pulse	Idle	High: Vbatt	14.25V
				Low: Max. 0.5V	OV
				Frequency: 38.76Hz	
18	Cooling Fan Relay [Low] control output	DC	Relay OFF	Vbatt	14.312V
			Relay ON	Max. 1.0V	0.25V
19	Not connected				
20	Malfunction Indicating Lamp (MIL) output	DC	Lamp OFF	Vbatt	13.812V
			Lamp ON	Max. LOVVbatt	0.0625V
21	Not connected				
22	Vehicle speed signal input	Pulse	Vehicle Run	High: Min. 5.0V Low. Max. 0.5V Frequency: 250Hz	252HZ
23	Air conditioner switch [Low/High] signal input	DC	A/COFF	Max. 0.5V	OV
			A/CON	Vbatt	13.812V
24	Air conditioner switch signal input	DC	A/COFF	Max. 1.0V	OV
			A/CON	Vbatt	12.937V
25	Air conditioner switch [Middle] signal input	DC	MID OFF	Max. 0.5V	12.625V
			MID ON	Vbatt	0.0625V
26	Not connected				
27	Not connected				
28	Not connected				
29	Air Conditioner Compressor Relay control output	DC	A/COFF	Vbatt	14.125V
			A/CON	Max. 1.0V	0.125V
30	Canister Close Valve control output	DC	Active Inactive	High: Vbatt	14.125V
				Low: Max. 1.0V	0.125V
				Frequency: 10Hz	
31	Not connected				
32	Not connected				
33	Not connected				
34	Fuel Tank Pressure Sensor signal input	DC	Idle	0.4 ~ 4.6V	2.501V
35	Not connected				
36	CAN [HIGH]	Pulse	Recessive	2.0 ~ 3.0 V	2.275V
			Dominant	2.75~4.5 V	2.953V
37	CAN [LOW]	Pulse	Recessive	2.0 ~ 3.0 V	2.254V
			Dominant	0.5~2.25 V	1.552V
38	Wheel Speed Sensor (WSS) ground	DC	Idle	Max. 50 mV	40.83mV
39	Wheel Speed Sensor (WSS) signal input	Sine Wave	Vehicle Run	Vp-p: Min.0.2V Frequency: 100Hz	2.625V (10 mile)
40	Cooling Fan Relay - High control output	DC	Relay OFF	Vbatt	14.625V
			Relay ON	Max. 1.0V	0.188 V

CONNECTOR [C68-5]

ECM TERMINAL INPUT/OUTPUT SIGNAL (CONNECTOR [C68-5])

Pin	Description	Type	Vehicle State	Level	Test Result
1	Ignition coil #3 (Cyl. #3,6) control output	Pulse	Idle	1st Voltage: 300-400V	362V
				ON Voltage: Max. 2.0V	1.5V
2	Ignition coil #2 (Cyl. #2,5) control output	Pulse	Idle	1st Voltage: 300-400V	363.25V
				ON Voltage: Max. 2.0V	1.5V
3	Ignition coil #1 (Cyl. #1,4) control output	Pulse	Idle	1st Voltage: 300-400V	361.75V
				ON Voltage: Max. 2.0V	1.5V
4	Not connected				
5	Ignition Coil shield	DC	Idle	Max. 50 mV	-12.575mV
6	Not connected				
7	Not connected				
8	Not connected				
9	Not connected				

ECM PROBLEM INSPECTION PROCEDURE

1. TEST ECM GROUND CIRCUIT: Measure resistance between ECM and chassis ground using the backside of ECM harness connector as ECM side check point. If the problem is found, repair it.

   Specification (Resistance): 1ohm or less

2. TEST ECM CONNECTOR: Disconnect the ECM connector and visually check the ground terminals on ECM side and harness side for bent pins or poor contact contact pressure. If the problem is found, repair it.
3. If problem is not found in Step 1 and 2 , the ECM could be faulty. If so, replace the ECM with a new one, and then check the vehicle again. If the vehicle operates normally then the problem was likely with the ECM.
4. RE-TEST THE ORIGINAL ECM: Install the original ECM (may be broken) into a known-good vehicle and check the vehicle. If the problem occurs again, replace the original ECM with a new one. If problem does not occur, this is intermittent problem (Refer to INTERMITTENT PROBLEM PROCEDURE in BASIC INSPECTION PROCEDURE).

VIN PROGRAMMING PROCEDURE

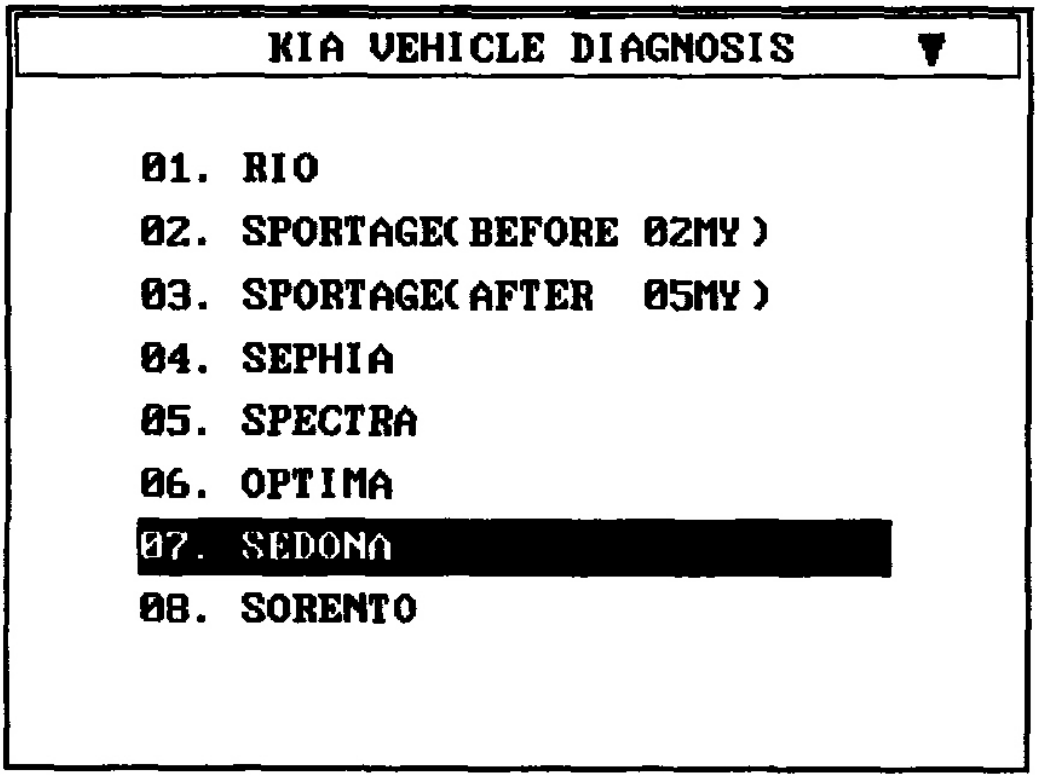
VIN (Vehicle Identification Number) is a number that has the vehicle's information (Maker, Vehicle Type, Vehicle Line/Series, Body Type, Engine Type, Transmission Type, Model Year, Plant Location and so forth. For more information, please refer to the group " " in this SERVICE MANUAL).

When replacing an ECM, the VIN must be programmed in the ECM. If there is no VIN in ECM memory, the fault code (DTC P0630) is set.

CAUTION: The programmed VIN cannot be changed. When writing the VIN, confirm

the VIN carefully.

1. Select "Vehicle" and "Engine" (For example, SE-DONA 3.5L V6).



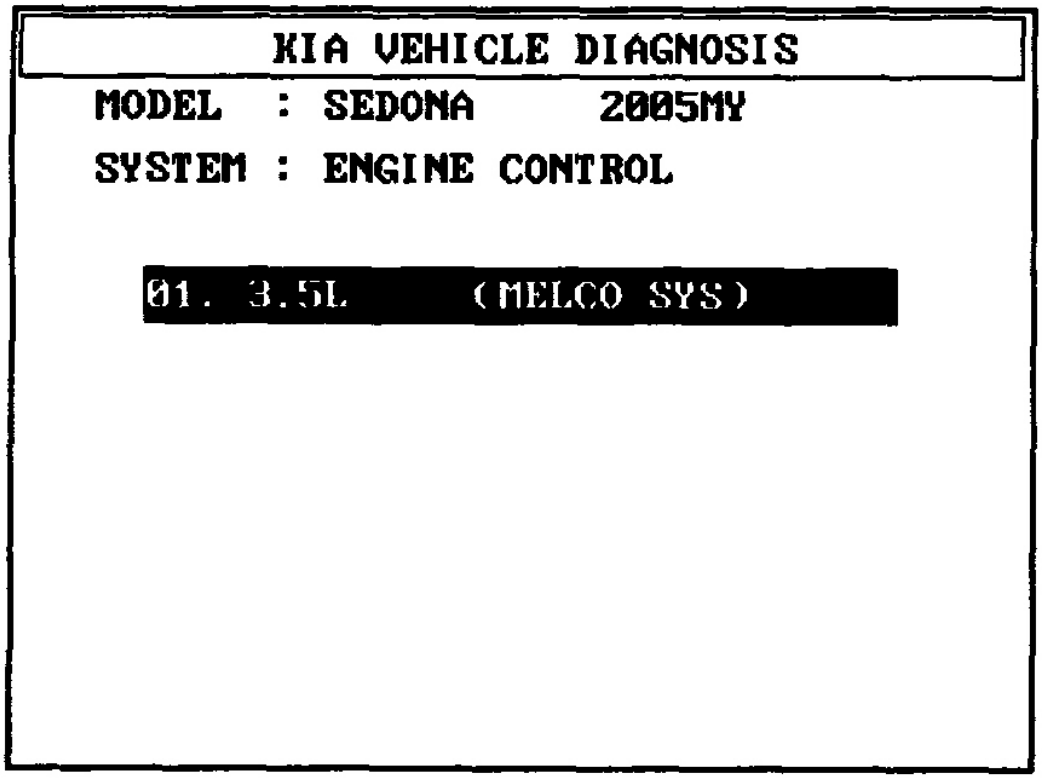


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Fig. 8: Identifying VIN Programming Procedure
Courtesy of KIA MOTORS AMERICA, INC.

2. Select "VIN WRITING"

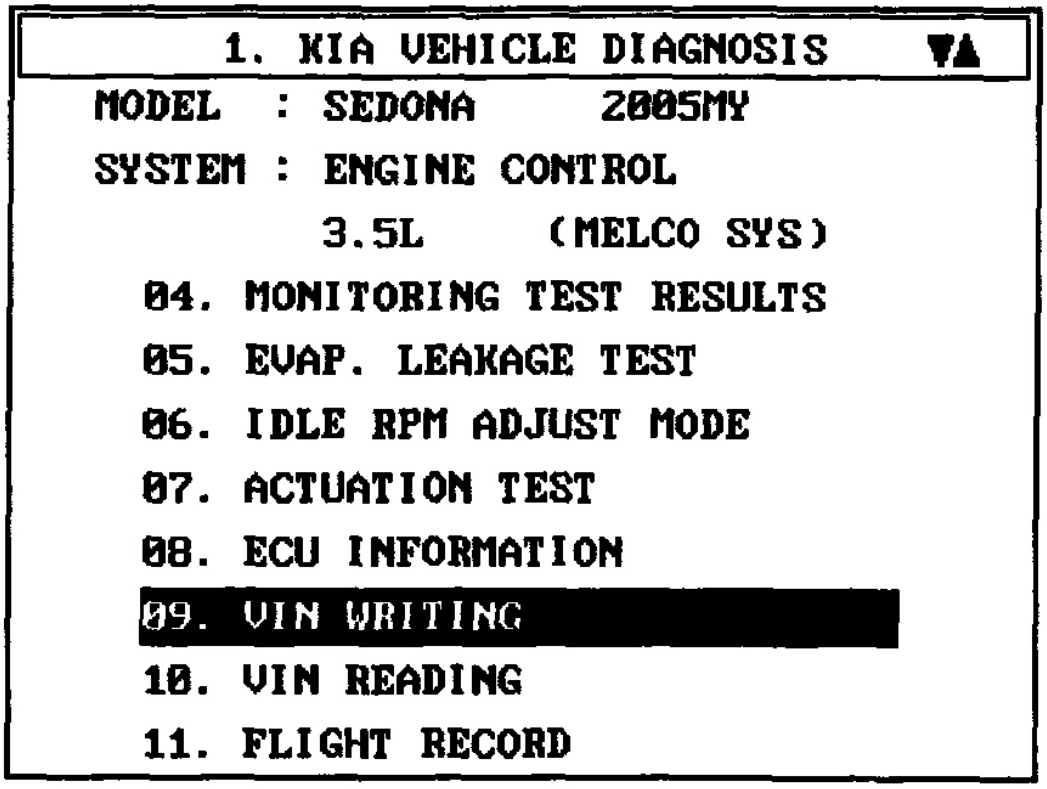

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Fig. 9: Identifying VIN Writing Display
Courtesy of KIA MOTORS AMERICA, INC.

3. Check the ECM status.

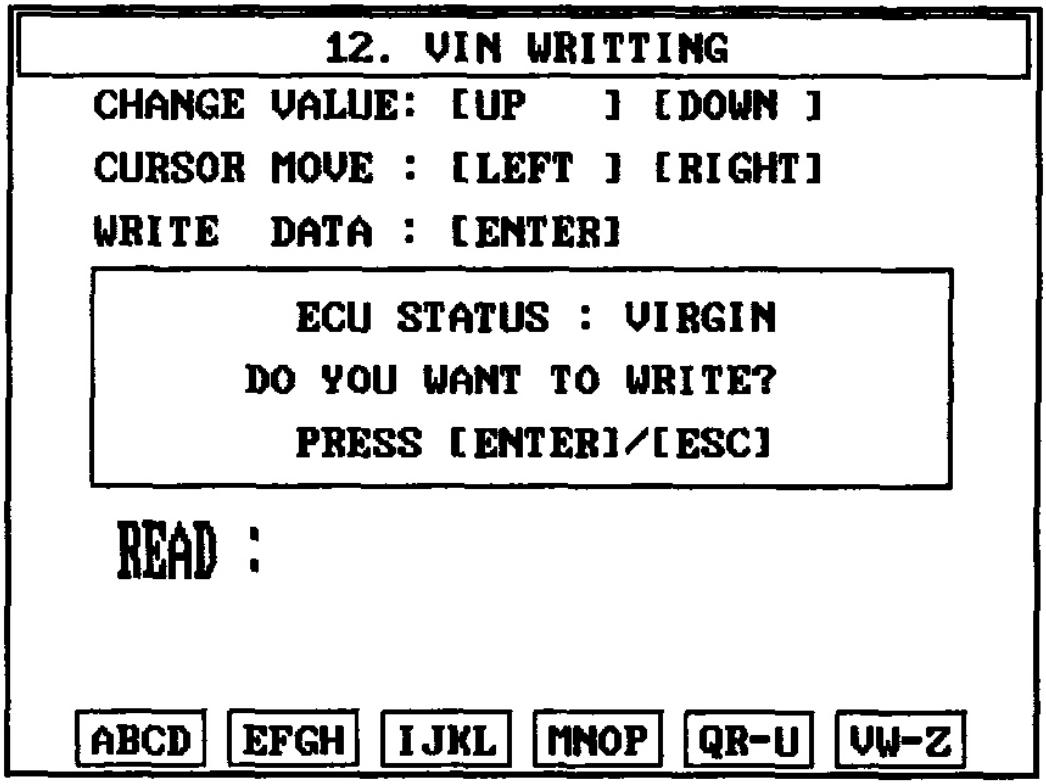

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Fig. 10: Checking ECM Status
Courtesy of KIA MOTORS AMERICA, INC.

NOTE:

- **VIRGIN: VIN is not programmed**
- **LEARNT: VIN has been already programmed**

Is the ECM status "VIRGIN"?

YES

- Go to next step 4.

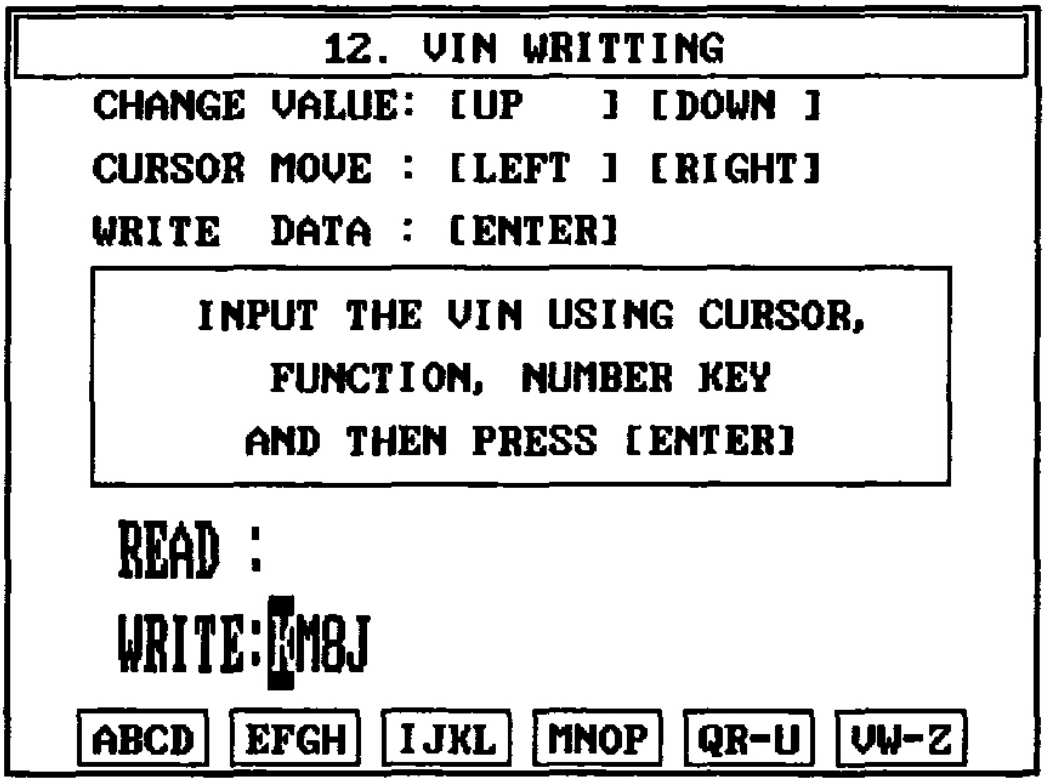
NO

- END

4. Write the VIN with cursor, function and number keys.

WARNING: Before pressing the "ENTER" key, confirm the VIN again because

the programmed VIN cannot be changed.



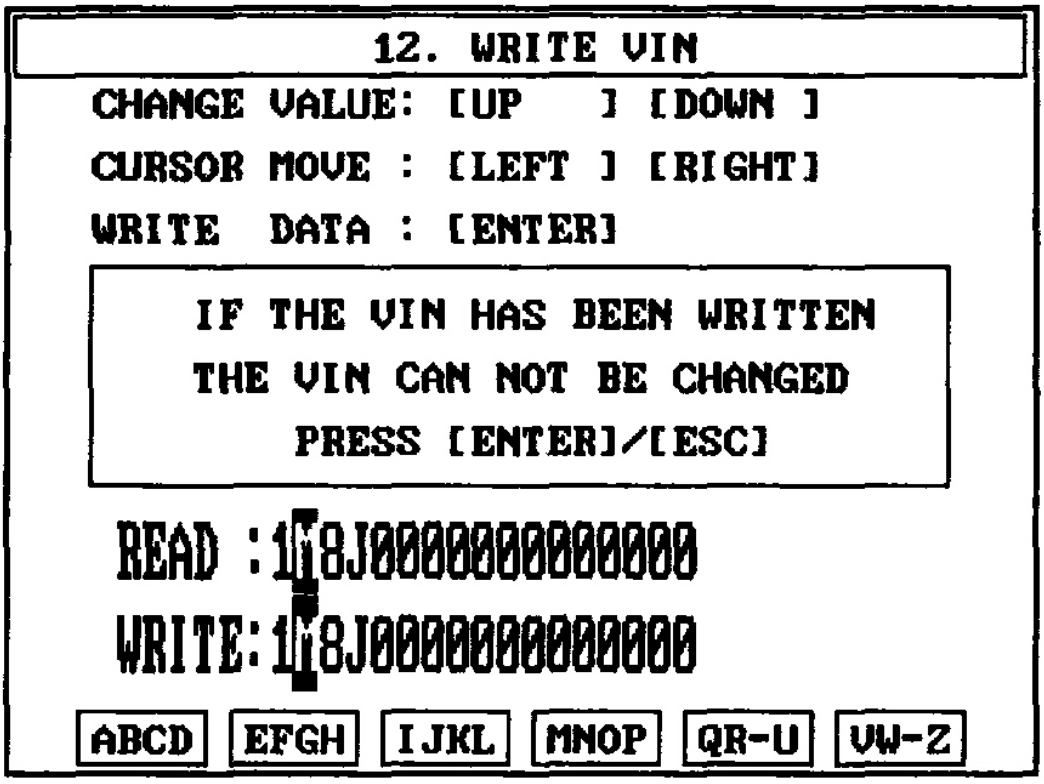


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Fig. 11: Writing VIN With Cursor
Courtesy of KIA MOTORS AMERICA, INC.

5. After verifying the written VIN, press the "ENTER" key.
6. Turn the ignition switch OFF, and then turn ON.

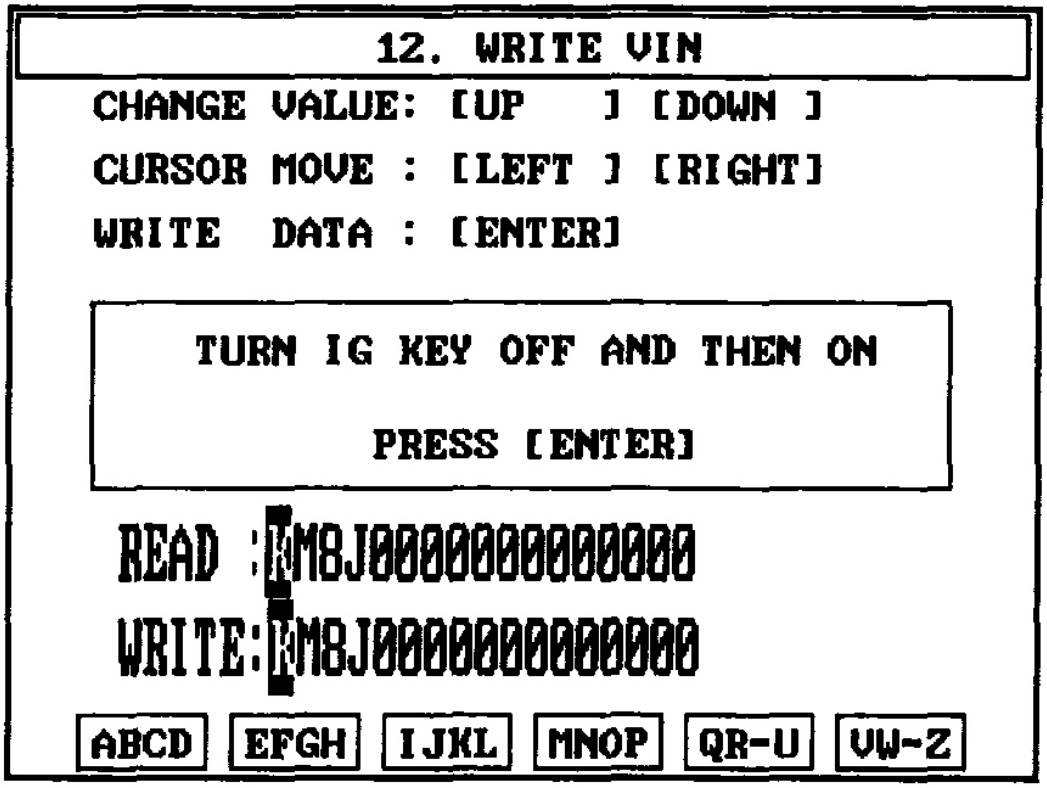

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Fig. 12: Verifying Written VIN
Courtesy of KIA MOTORS AMERICA, INC.

7. Verify the programmed VIN in the ECM memory.

