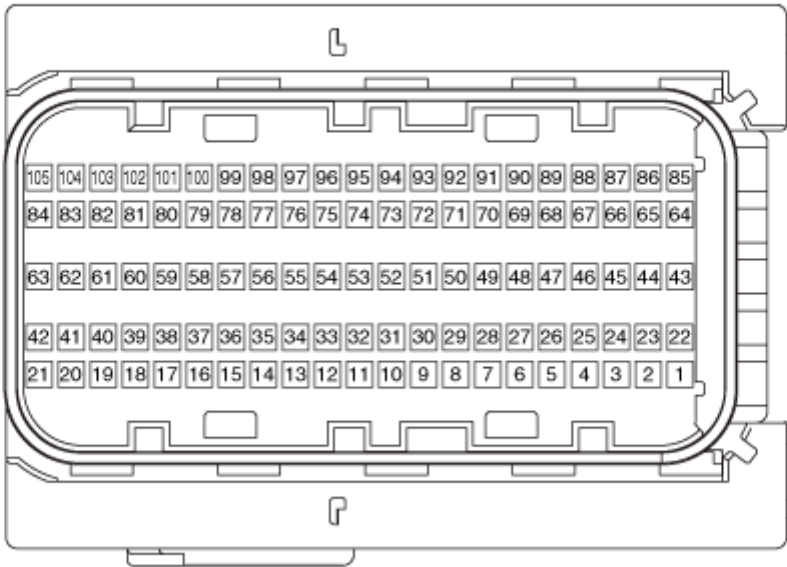
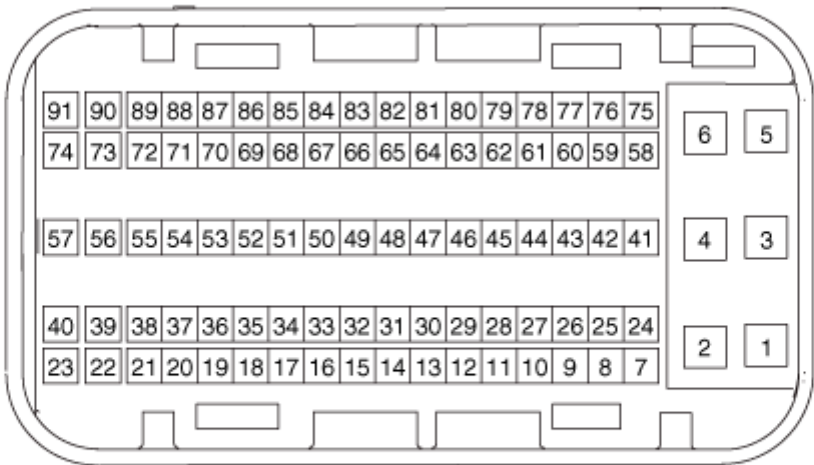


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ECM TERMINAL AND INPUT/OUTPUT SIGNAL



Connector [A]



Connector [K]

ECM Terminal Input/ Output signal

Connector [A]

Pin No.	Description	Condition	Type	Level
1	Ignition Coil (Cylinder #4) control output	Idle	Pulse	Vpeak = 400V Frequency: 0 - 58.3 Hz
2	Injector (Cylinder #3) [High] control output	IG OFF	Pulse	0V

		IG ON		Battery Voltage - 65V
3	Injector (Cylinder #5) [High] control output	IG OFF	Pulse	0V
		IG ON		Battery Voltage - 65V
4	Injector (Cylinder #1) [High] control output	IG OFF	Pulse	0 V
		IG ON		Battery Voltage - 65V
5	Camshaft Position Sensor (CMPS) [Bank 2/Exhaust] signal input	Idle	Pulse	High: 3.2 - Vcc
				Low: Max 0.7V
				Frequency: 0 - 350 Hz
6	Camshaft Position Sensor (CMPS) [Bank 2/Intake] signal input	Idle	Pulse	High: 3.2 - Vcc
				Low: Max 0.7V
				Frequency: 0 - 350 Hz
7	Throttle Position Sensor (TPS) 2 signal input	C.T	Analog	Min 4.0V
		W.O.T		0.25 - 0.9V
8	-			
9	Rail Pressure Sensor (RPS) signal input	Idle	DC Voltage	1.0 - 2.0V
10	CVVT Oil Temperature Sensor (OTS) signal input	IG ON	Analog	3.2V (-40°C)
				0.1V (150°C)
11	-			
12	-			
13	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.75 - 5.25V
14				
15				
16	-			
17	-			
18	-			
19	ETC Motor [-] control output	Idle	PWM	High: Battery power
				Low: Max 1.0V
				Frequency: 1,500 - 2,400 Hz
				Duty: 0 - 98%
20	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 1] Heater control output	Idle	PWM	High: Battery power
				Low: Max 1.15V
				Duty: 0 - 100%
21	Heated Oxygen Sensor (HO2S) [Bank 2/Sensor 1] Heater control output	Idle	PWM	High: Battery power
				Low: Max 1.15V
				Duty: 0 - 100%
22	Ignition Coil (Cylinder #5) control output	Idle	Pulse	Vpeak = 400V
				Frequency: 0 - 58.3 Hz
23	Injector (Cylinder #6) [High] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		0V
24	Injector (Cylinder #2) [High] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		0V
25	Injector (Cylinder #2) [High] control output	IG OFF	Pulse	Battery Voltage - 65V

		IG ON		English
26	Camshaft Position Sensor (CMPS) [Bank 1/Intake] signal input	Idle	Pulse	High: 3.2 - Vcc
				Low: Max 0.7V
				Frequency: 0 - 350 Hz
27	Camshaft Position Sensor (CMPS) [Bank 1/Intake] signal input	Idle	Pulse	High: 3.2 - Vcc
				Low: Max 0.7V
				Frequency: 0 - 350 Hz
28	Intake Air Temperature Sensor (IATS) signal input	IG ON	Analog	3.2V (-40°C)
				0.05V (125°C)
29	Sensor (MAPS) signal input	IG ON	Analog	Approximately 4.44 V
		Idle		Approximately 0.75 V
30	-			
31	-			
32	-			
33				
34	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.75 - 5.25V
35	-			
36	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.75 - 5.25V
37	-			
38	Purge Control Solenoid Valve (PCSV) control output	Idle	PWM	High: Battery power
				Low: Max 1.0V
39	-			
40	ETC Motor [+] control output	Idle	PWM	High: Battery power
				Low: Max 1.0V
				Frequency: 1,500 - 2,400 Hz
				Duty: 0 - 98%
41	-			
42	-			
43	Ignition Coil (Cylinder #1) control output	Idle	Pulse	Vpeak = 400V
				Frequency: 0 - 58.3 Hz
44	Injector (Cylinder #6) [Low] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		Max 5.0V
45	Injector (Cylinder #3) [Low] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		Max 5.0V
46	Injector (Cylinder #2) [Low] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		Max 5.0V
47	Sensor ground	Idle	DC	Max 0.1V
48	Sensor ground	Idle	DC	Max 0.1V
49	Sensor ground	Idle	DC	Max 0.1V
50	-			
51	-			

52	-			English
53	-			
54	Engine Coolant Temperature Sensor (ECTS) signal input	IG ON	Analog	3.22V (-40°C)
				0.29V (125°C)
55	Sensor Shield	Idle	DC	Max 0.1V
56	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.9 - 5.1V
57	-			
58	Sensor ground	Idle	DC	Max 0.1V
59	Sensor ground	Idle	DC	Max 0.1V
60	Variable Intake Solenoid (VIS) Valve 1 control output	Idle	PWM	High: Battery power
				Low: Max 1.1V
61	Variable Intake Solenoid (VIS) Valve 2 control output	Idle	PWM	High: Battery power
				Low: Max 1.1V
62	-			
63	-			
64	Ignition Coil (Cylinder #2) control output	Engine running	Pulse	Vpeak = 360 - 440V
				Frequency: 125 - 1,000 Hz (Idle: 333 Hz)
65	Injector (Cylinder #1) [Low] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		Max 5.0V
66	Injector (Cylinder #4) [Low] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		Max 5.0V
67	Injector (Cylinder #5) [Low] control output	IG OFF	Pulse	Battery Voltage - 65V
		IG ON		Max 5.0V
68	Crankshaft Position Sensor (CKPS) [High] signal input	Idle	SINE WAVE	Vp_p: 0.4 - 200 V
				Frequency: 55 - 7,000 Hz
69	Crankshaft Position Sensor (CKPS) [Low] signal input	Idle	SINE WAVE	Vp_p: 0.4 - 200 V
				Frequency: 55 - 7,000 Hz
70	-			
71	-			
72	Oil pressure switch signal input			
73	-			
74	-			
75	Throttle Position Sensor (TPS) 1 signal input	C.T	Analog	0.25 - 0.9V
		W.O.T		Min 4.0V
76	Knock Sensor (KS) [Bank 1] [Low] signal input	Knocking	Variable Frequency	-0.3 to 0.3V
		Normal		0V
77	Knock Sensor (KS) [Bank 2] [Low] signal input	Knocking	Variable Frequency	-0.3 to 0.3V
		Normal		0V
78	Sensor ground	Idle	DC	Max 0.1V

79	Rc/Rp (Pump Cell Voltage)	Idle	Analog	Normal: 450±50 mV
				Rich: Max Normal+150 mV
				Lean: Min Normal-150 mV
80	VS+ (NERNST Cell Voltage)	Idle	Analog	Normal: 450±50 mV
				Rich: Max Normal+150 mV
				Lean: Min Normal-150 mV
81	Heated Oxygen Sensor (HO2S) [Bank 2/Sensor 2] signal input	Rich	Analog	Min 0.8V
		Lean		Max 0.1V
82	VS+ (NERNST Cell Voltage)	Idle	Analog	Normal: 450±50 mV
				Rich: Max Normal+150 mV
				Lean: Min Normal-150 mV
83	Rc (Compensative Resistance)	Idle	Analog	Rc-Rc/Rp : Below ± 0.1V
84	Oil Pressure Solenoid Valve control output			
85	Ignition Coil (Cylinder #6) control output	Idle	Pulse	Vpeak = 400V
				Frequency: 0 - 58.3 Hz
86	Ignition Coil (Cylinder #3) control output	Idle	Pulse	Vpeak = 400V
				Frequency: 0 - 58.3 Hz
87	Fuel Pressure Control Valve (FPCV) [High] control output	Idle	DC Voltage	Battery Voltage
				Max 1.0V
88	Fuel Pressure Control Valve (FPCV) [Low] control output	Idle	DC Voltage	Battery Voltage
				Max 1.0V
89	Heated Oxygen Sensor (HO2S) [Bank 2/Sensor 2] Heater control output	Idle	PWM	High: Battery power
				Low: Max 1.15V
				Duty: 0 - 100%
90	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] Heater control output	Idle	PWM	High: Battery power
				Low: Max 1.15V
				Duty: 0 - 100%
91	CVVT Oil Control Valve (OCV) [Bank 2/Exhaust] control output	Idle	PWM	High: Battery power
				Low: Max 1.0V
				Frequency = 128Hz
				Duty: 0 - 100%
92	CVVT Oil Control Valve (OCV) [Bank 1/Exhaust] control output	Idle	PWM	High: Battery power
				Low: Max 1.0V
				Frequency = 128Hz
				Duty: 0 - 100%
93	Variable Force Solenoid (VFS) [Bank 2/Intake] control output	Idle	PWM	High: Battery power
				Low: Max 1.0V
				Frequency = 128Hz
94	Variable Force Solenoid (VFS) [Bank 1/Intake]	Idle	PWM	High: Battery power

	control output			Low: N English 
				Frequency = 128Hz
95	-			
96	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.75 - 5.25V
97	Knock Sensor (KS) [Bank 1] [High] signal input	Knocking	Variable Frequency	-0.3 to 0.3V
		Normal		0V
98	Knock Sensor (KS) [Bank 2] [High] signal input	Knocking	Variable Frequency	-0.3 to 0.3V
		Normal		0V
99	Sensor ground	Idle	DC	Max 0.1V
100	-			
101	Rc (Compensative Resistance)	Idle		Rc-Rc/Rp : Below $\pm$ 0.1V
102	VS-/IP- (Common ground)	Idle	Analog	Reference for V_IP, V_N
103	Heated Oxygen Sensor (HO2S) [Bank 1/Sensor 2] signal input	Idle	DC	Rich: 0.6 - 1.0V
				Lean: Max 0.4V
104	VS-/IP- (Common ground)	Idle	Analog	Reference for V_IP, V_N
105	Rc/Rp (Pump Cell Voltage)	Idle	Analog	Normal: 450 $\pm$ 50 mV
				Rich: Max Normal+150 mV
				Lean: Min Normal-150 mV

Connector [K]

Pin No.	Description	Condition	Type	Level
1	ECM ground	Idle	DC	-0.3 to 0.5V
2	ECM ground	Idle	DC	-0.3 to 0.5V
3	Battery power (B+)	IG OFF	DC	Max 1.0V
		IG ON		Battery Voltage (B+)
4	ECM ground	Idle	DC	-0.3 to 0.5V
5	Battery power (B+)	IG OFF	DC	Max 1.0V
		IG ON		Battery Voltage (B+)
6	Battery power (B+)	IG OFF	DC	Max 1.0V
		IG ON		Battery Voltage (B+)
7	-			
8	-			
9	-			
10	-			
11	-			
12	-			
13	Sensor ground	Idle	DC	Max 0.1V
14	Immobilizer communication line	Transmitting	DC	High: Min Vbatt X 80%

				Low: Max Vbatt X 100% English High: Min Vbatt X 70% Low: Max Vbatt X 30%
		Receiving		
15	Fuel Level Sender (FLS) signal input [Fuel Pump]			
16	-			
17	-			
18	-			
19	-			
20	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.9 - 5.1V
21	Main Relay control output	Relay OFF	DC	Battery power
		Relay ON		Max 1.7V
22	-			
23	-			
24	-			
25	-			
26	-			
27	-			
28	Accelerator Position Sensor (APS) 2 signal input	C.T	Analog	0.29 - 0.46V
		W.O.T		1.93 - 2.18V
29	-			
30	-			
31	-			
32	Fuel Level Sender (FLS) signal input [Sub Fuel Sender]			
33	Fuel Pump Relay control output	Relay OFF	DC Voltage	Battery Voltage
		Relay ON		Max 1.0V
34	-			
35	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.9 - 5.1V
36	Sensor power (+5V)	IG OFF	DC	Max 0.5V
		IG ON		4.9 - 5.1V
37	-			
38	Vehicle speed signal input	Vehicle Running	Pulse	High: Battery power Low: Max 0.5V Frequency: 0.7 (1 km/h) - 200 Hz (240 km/h) Duty: 44 - 56%
39	-			
40	-			
41	Start Relay control output	Relay OFF	DC	Battery Voltage (B+)
		Relay ON		-0.3 to 1.2V
42	-			

43	-			English 
44	-			
45	-			
46	-			
47	Sensor ground	Idle	DC	Max 0.1V
48	-			
49	Brake Switch [Test] signal input	Brake OFF	DC	Battery Voltage (B+)
		Brake ON		Max 0.5V
50	-			
51	-			
52	Sensor ground	Idle	DC	Max 0.1V
53	-			
54	-			
55	-			
56	-			
57	-			
58	-			
59	-			
60	P-CAN [Low]	Recessive	Pulse	2.0 - 3.0V
		Dominant		0.5 - 2.25V
61	-			
62	-			
63	-			
64	A/C Pressure Transducer (APT) signal input	A/C ON	Analog	0.5 - 4.5V
65	-			
66	-			
67	-			
68	-			
69	LIN (Local Interconnect Network) Serial Bus Line	Transmitting	DC	High: Min Vbatt X 80%
				Low: Max Vbatt X 20%
		Receiving		High: Min Vbatt X 70%
				Low: Max Vbatt X 30%
70	-			
71	Cooling fan Relay control output	A/C ON	Pulse	High: Battery power
				Low: Max 1.1V
72	Engine speed signal output	Idle	Pulse	High: Battery power
				Low: Max 1.1V
				Frequency: 0 - 350 Hz
				Duty: 47.5 - 52.5%
73	-			
74	-			
75	-			
76	-			

77	P-CAN [High]	Recessive	Pulse	2.0 ~ 2.5V
		Dominant		2.75 ~ 4.5V
78	-			
79	Start Relay control output	Relay OFF	DC	Battery power
		Relay ON		Max 1.1V
80	-			
81	-			
82	Accelerator Position Sensor (APS) 1 signal input	C.T	Analog	0.7 ~ 0.8V
		W.O.T		3.85 ~ 4.35V
83	Brake Switch 1 signal input	Brake OFF	DC	Max 0.5V
		Brake ON		Battery power
84	-			
85	-			
86	-			
87	-			
88	-			
89	-			
90	-			
91	-			

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