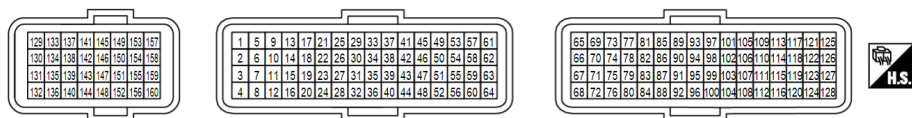


Reference Value

TERMINAL LAYOUT



PHYSICAL VALUES

note	- ECM is located in the engine room left side near battery. - Specification data are reference values and are measured between each terminal and ground. - Pulse signal is measured by M.U.T.-III SE.
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Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
1 (R)	160 (B)	Fuel injector driver power supply 1	Input	[Engine is running]	BATTERY VOLTAGE (11 – 14 V)

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
				• Engine: Warm-up condition • Idle speed	

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
2 (Y)	160 (B)	High pressure fuel pump (LO)	Output	[Engine is running] - Engine: Warm-up condition - Idle speed note The pulse cycle changes depending on rpm at idle.	2.5 V 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
					3.5 V
				[Engine is running] Engine speed: 2,500 rpm	
4 (B)	—	Fuel injector driver ground 1	—	—	—
5 (G)	160 (B)	ECM power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
6 (P)	160 (B)	A/F sensor 1 heater	Input	[Engine is running] - Engine: Warm-up condition - Idle speed (More than 260 seconds after starting engine)	5.24 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
					

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Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
7 (BR)	160 (B)	High pressure fuel pump (HI)	Output	[Engine is running] note The pulse cycle changes depending on rpm at idle. - Engine: Warm-up condition - Idle speed	3.1 V 20mSec/div  5V/div

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
				[Engine is running] Engine speed: 2,500 rpm	4.3 V
					

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
9 (W)	160 (B)	Fuel injector No. 1, 4 (HI)	Output	[Engine is running] - Engine: Warm-up condition - Idle speed note The pulse cycle changes depending on rpm at idle	100mSec/div  20V/div

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
12 (SB)	160 (B)	Fuel injector No. 2, 3 (HI)	Output	[Engine is running] - Engine: Warm-up condition - Idle speed note The pulse cycle changes depending on rpm at idle	
13 (L)	14 (W)	EGR volume control valve (-)	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] - Engine: after warming up - Idle speed	0.1 – 0.2 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
14 (W)	13 (L)	EGR volume control valve (+)	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] - Engine: after warming up - Idle speed	0.13 V
17 (G)	160 (B)	Fuel injector No. 1 (LO)	Output	[Engine is running] - Engine: Warm-up condition - Idle speed note The pulse cycle changes depending on rpm at idle.	
18 (Y)		Fuel injector No. 3 (LO)			
19 (R)		Fuel injector No. 4 (LO)			
20 (V)		Fuel injector No. 2 (LO)			
21 (LG)	—	LIN	Input/ Output	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
24 (LG)	160 (B)	ECM relay (Self shut-off)	Input	[Engine is running] [Ignition switch: OFF] A few seconds after turning ignition switch OFF	0 – 1.0 V
			Output	[Ignition switch: OFF] More than a few seconds after turning ignition switch OFF	0 V
29 (BR)	160 (B)	Fuel pump relay	Input	[Ignition switch: ON] For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0 V
30 (GR)	—	Drivetrain CAN communication - H	Input/ Output	—	—
31 (R)	—	Drivetrain CAN communication - L	Input/ Output	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
33 (P)	160 (B)	Ignition signal No. 3	Output	[Engine is running] - Engine: Warm-up condition - Idle speed	
34 (LA/L)	160 (B)	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
35 (G)	160 (B)	Ignition signal No. 1	Output	[Engine is running] • Engine: Warm-up condition • Idle speed	

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
				[Engine is running] - Engine: Warm-up condition - Engine speed: 2,500 rpm	

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
36 (V)	160 (B)	Ignition signal No. 4	Output	[Engine is running] • Engine: Warm-up condition • Idle speed	50mSec/div  2V/div

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
				[Engine is running] • Engine: Warm-up condition • Engine speed: 2,500 rpm	
41 (LA/G)	—	Sensor ground (Fuel rail pressure sensor, engine oil pressure sensor, and refrigerant pressure sensor)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
44 (LG)	160 (B)	Ignition signal No. 2	Output	[Engine is running] • Engine: Warm-up condition • Engine speed: 2,500 rpm	
45 (W/L)	—	Sensor ground (Throttle position sensor 1 and 2)	—	—	—
46 (B)	—	Sensor ground (A/F sensor 1 shield)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
47 (LA/W)	160 (B)	Mass air flow sensor	Input	[Ignition switch: ON] Engine stopped	Approx. 3,700 Hz
				[Engine is running] - Engine: Warm-up condition - Engine speed: 1,500 rpm	5,400 – 5,900 Hz
				[Engine is running] - Engine: Warm-up condition - Engine speed: 2,500 rpm	5,800 – 6,500 Hz
				[Engine is running] - Engine: Warm-up condition - Engine speed: 4,000 rpm	6,400 – 7200 Hz
49 (GR)	160 (B)	Knock sensor 1	Input	[Engine is running] Idle speed	1.97 V
50 (LA/Y)	—	Sensor ground (Mass air flow sensor and Intake air temperature sensor)	—	—	—
51 (W)	160 (B)	Knock sensor 2	Input	[Engine is running]	2 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
				- Engine: Warm-up condition - Idle speed	
52 (L/Y)	160 (B)	Throttle position sensor 2	Input	[Engine is running] - Selector lever: P - Accelerator pedal: Fully released	4.47 V
				[Engine is running] - Selector lever: P - Engine speed: 2,500 rpm	4.3 V
53 (B)	—	Sensor ground (Knock sensor 1 and 2)	—	—	—
54 (B)	—	Sensor ground (Throttle position sensor shield)	—	—	—
56 (W)	160 (B)	A/F sensor 1	Input	[Ignition switch: ON]	2.89 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
57 (L/G)	160 (B)	Throttle position sensor 1	Input	[Engine is running] • Selector lever: P • Accelerator pedal: Fully released	0.64 V
				[Engine is running] • Selector lever: P • Engine speed: 2,500 rpm	0.86 V
58 (LA/R)	160 (B)	Fuel rail pressure sensor	Input	[Engine is running] • Engine: after warming up • Idle speed	1 V
				[Engine is running] • Engine: after warming up • Revving engine from idle to 4,000 rpm	1.1 V
60 (B)	160 (B)	A/F sensor 1	Input	[Engine is running] • Engine speed: 2,500 rpm	2.53 V Output voltage varies with air fuel ratio.
61 (LA/SB)	160 (B)	Sensor power supply (Fuel rail pressure sensor and engine oil pressure sensor)	—	[Ignition switch: ON]	5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
62 (O/L)	160 (B)	Sensor power supply (Throttle position sensor 1 and 2)	—	[Ignition switch: ON]	5 V
64 (LA/R)	160 (B)	Sensor power supply (Mass air flow sensor)	—	[Ignition switch: ON]	5 V
65 (V)	160 (B)	Engine oil pressure control solenoid valve	Output	[Engine is running] - Engine: Warm-up condition - Engine speed: no more than 4,000 rpm	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] - Engine: Warm-up condition - Engine speed: 4,000 rpm or more	14.2 V
66 (W)	160 (B)	Battery power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
67 (R)	160 (B)	Throttle control motor (Open)	Output	[Ignition switch: ON] - Engine stopped - Selector lever: D - Accelerator pedal: Fully depressed	2.0 - 2.3 V
68 (G)	160 (B)	Throttle control motor (Close)	Output	[Ignition switch: ON] - Selector lever: P - Accelerator pedal: Fully released	0 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
70 (Y)	160 (B)	Heated oxygen sensor 2 heater	Output	[Engine is running] - Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	14.3 V
				[Ignition switch: ON] - Engine stopped [Engine is running] - Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
71 (BR)	160 (B)	Intake manifold tuning valve actuator (open)	Output	[Engine is running] - Engine: Warm-up condition - Idle speed	0 V
				[Engine is running] - Engine: Warm-up condition - No load - Revvng engine from idle to 5,000 rpm	Generates a voltage for a moment (11 – 14 V)
72 (Y)	160 (B)	Intake manifold tuning valve actuator (close)	Output	[Engine is running] - Engine: Warm-up condition - Idle speed	0 V
				[Engine is running] - Engine: Warm-up condition - No load - When the engine speed is decreased from 3,000 rpm to idle speed (Accelerator pedal is released)	Generates a voltage for a moment (11 – 14 V)
74 (L)	160 (B)	Refrigerant pressure sensor	Input	[Engine is running]	0.3 - 4.5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
				• Engine: Warm-up condition • Idle speed • Both air conditioner switch: ON (Compressor operates)	
77 (LA/SB)	103 (LA/G)	Sensor power supply (Engine oil pressure sensor)	—	[Ignition switch: ON]	5 V
78 (LA/R)	160 (B)	Sensor power supply (Crankshaft position sensor)	—	[Ignition switch: ON]	5 V
79 (W)	105 (R)	Sensor power supply (Refrigerant pressure sensor)	—	[Ignition switch: ON]	5 V
80 (LA/P)	160 (B)	Sensor power supply [Manifold absolute pressure (MAP) sensor]	—	[Ignition switch: ON]	5 V
84 (LA/W)	160 (B)	Sensor power supply (Intake manifold runner control valve position sensor and EGR volume control valve)	—	[Ignition switch: ON]	5 V
86 (LA/Y)	100 (LA/R)	Sensor power supply (Intake camshaft position sensor)	—	[Ignition switch: ON]	5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
88 (W)	160 (B)	Crankshaft position sensor (Electric intake valve timing control signal)	Output	[Engine is running] • Engine: after warming up • Idle speed note The pulse cycle changes depending on rpm at idle.	4.9 V 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
				[Engine is running] • Engine: after warming up • Engine speed: 2,000 rpm	3.52 V
					

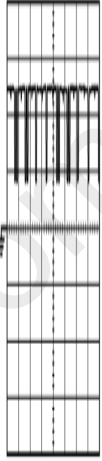
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
90 (LA/SB)	160 (B)	Exhaust camshaft position sensor	Input	[Engine is running] • Engine: after warming up • Idle speed note The pulse cycle changes depending on rpm at idle.	4.3 V 50mSec/div  20V

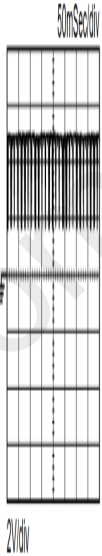
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
					5 V
				[Engine is running] • Engine: after warming up • Engine speed: 2,000 rpm	
92 (SB)	160 (B)	Heated oxygen sensor 2	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met • Engine: after warming up	0 - 1.0 V
94 (LA/G)	160 (B)	Sensor power supply (Exhaust camshaft position sensor)	—	[Ignition switch: ON]	5 V
95 (V)	160 (B)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
96 (LA/Y)	160 (B)	Crankshaft position sensor	Input	[Engine is running] • Engine: after warming up • Idle speed note The pulse cycle changes depending on rpm at idle.	4.0 V 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
					0.73 V
				[Engine is running] • Engine: after warming up • Engine speed: 2,500 rpm	
97 (BG)	—	Sensor ground (Heated oxygen sensor 2)	—	—	—
100 (LA/R)	—	Sensor ground (Intake camshaft position sensor)	—	—	—
101 (SB)	160 (B)	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with Engine coolant temperature.
102 (W)	—	Sensor ground	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
		(Engine coolant temperature sensor)			
103 (LA/G)	—	Sensor ground (Engine oil pressure sensor)	—	—	—
104 (LA/LG)	160 (B)	Intake manifold runner control valve position sensor	Input	[Key switch: ON]	0.8 V
				[Engine is running] • Engine: after warming up • Idle speed	4.3 V
105 (R)	—	Sensor ground (Refrigerant pressure sensor)	—	—	—
106 (LA/G)	160 (B)	Sensor ground [Manifold absolute pressure (MAP) sensor]	—	—	—
107 (LA/L)	—	Sensor ground (Intake manifold runner control valve position sensor and EGR volume control valve)	—	—	—
108 (LA/W)	—	Sensor ground (Crankshaft position sensor)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
109 (LA/W)	100 (LA/R)	Intake camshaft position sensor	Input	[Engine is running] • Engine: after warming up • Idle speed note The pulse cycle changes depending on rpm at idle.	4.3V 50mSec/div  2V/div

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
				[Engine is running] • Engine: after warming up • Engine speed: 2,500 rpm	4.3 V
					
110 (LA/B)	—	Sensor ground (Exhaust camshaft position sensor)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
114 (LA/R)	160 (B)	Engine oil pressure sensor	Input	[Engine is running] • Engine: after warming up • Idle speed	1.53 V 

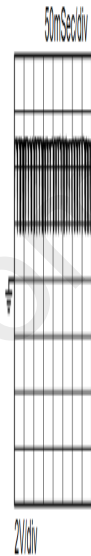
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
					1.84 V
				[Engine is running] Engine speed: 2,000 rpm	
116 (B)	107 (LA/L)	EGR volume control valve position sensor	Input	[Ignition switch: ON]	0.5 V
117 (W)	160 (B)	Exhaust valve timing intermediate lock control solenoid valve	Output	[Engine is running] - Warm-up condition ON - Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] - Cold condition [Engine coolant temperature: below 50°C (122°F)] ON - Idle speed	0.67 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
120 (LA/R)	160 (B)	Manifold absolute pressure (MAP) sensor	Input	[Ignition switch: ON]	4.28 V Output voltage varies with atmospheric pressure.
121 (LA/L)	160 (B)	Intake manifold runner control valve motor (close)	Output	[Engine is running] • Engine: after warming up • Idle speed	0 V
				[Engine is running] • Engine: after warming up • No load • When the engine speed is decreased from 3,000 rpm to idle speed (Accelerator pedal is released)	Generates a voltage for a moment (11 – 14 V)

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
122 (LA/P)	160 (B)	Intake manifold runner control valve motor (open)	Output	[Engine is running] • Engine: after warming up • Idle speed	0 V
				[Engine is running] • Engine: after warming up • No load • Revving engine from idle to 5,000 rpm	Generates a voltage for a moment (11 – 14 V)
125 (SB)	160 (B)	Exhaust valve timing control solenoid valve	Output	[Engine is running] • Engine: Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Engine: Warm-up condition • Engine speed: 2,500 rpm	9.0 - 10.5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
126 (L)	160 (B)	EVAP canister purge volume control solenoid valve	Output	[Engine is running] - Idle speed - Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] Engine speed: 2,500 rpm (More than 100 seconds after starting engine.)	Battery voltage (11 - 14 V) 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	-	Signal name	Input/Output		
127 (Y)	160 (B)	Intake camshaft position sensor (Electric intake valve timing control signal)	Input	[Engine is running] note The pulse cycle changes depending on rpm at idle. • Engine: after warming up • Idle speed	4.99 V 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
				[Engine is running] • Engine: after warming up • Engine speed: 2,000 rpm	4.07 V
					
129 (G)	160 (B)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	4.13 V
131 (R)	—	Drivetrain CAN communication - L	Input/Output	—	—
132 (GR)	—	Drivetrain CAN communication - H	Input/Output	—	—
133 (LA/SB)	160 (B)	Sensor power supply (EVAP control system pressure sensor)	—	[Ignition switch: ON]	5 V
136 (LA/BR)	160 (B)	Fuel tank temperature sensor	Input	[Engine is running]	3.3 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
141 (LG)	160 (B)	Ignition switch	Input	[Ignition switch: OFF]	0 V
				[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
142 (LA/V)	160 (B)	ASC D steering switch	Input	[Ignition switch: ON] • ASC D steering switch: OFF	4.23 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/Output		
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.19 V
				[Ignition switch: ON] • RES+ switch: Pressed	3.61 V
				[Ignition switch: ON] • SET- switch: Pressed	2.93 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
		ACC steering switch	Input	[Ignition switch: ON] • ACC steering switch: OFF	4.23 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.19 V
				[Ignition switch: ON] • DISTANCE switch: Pressed	2.15 V
				[Ignition switch: ON] • SET- switch: Pressed	2.93 V
				[Ignition switch: ON] • RES+ switch: Pressed	3.61 V
143 (LA/BR)	—	Sensor ground (ASCD/ACC steering switch)	—	—	—
145 (P)	—	Engine CAN communication - L	Input/ Output	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
146 (GR)	—	Engine CAN communication - H	Input/ Output	—	—
148 (GR)	160 (B)	Stop light switch	Input	[Ignition switch: OFF] Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: OFF] Brake pedal: Fully released	0 V
149 (LA/V)	160 (B)	EVAP canister vent control valve	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
150 (LA/P)	160 (B)	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5 V
151 (LA/G)	160 (B)	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] - Engine stopped - Accelerator pedal: Fully depressed	2.0 - 2.5 V
				[Ignition switch: ON] - Engine stopped - Accelerator pedal: Fully released	0.25- 0.5 V
152 (LA/Y)	—	Sensor ground (Accelerator pedal position sensor 2)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/Output		
153 (V)	160 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
154 (LG)	160 (B)	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5 V
155 (V)	—	Sensor ground (EVAP control system pressure sensor and fuel tank temperature sensor)	—	—	—
156 (B)	—	ECM ground	—	—	—
157 (B)	—	ECM ground	—	—	—
158 (L)	160 (B)	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.5 - 1.0 V
				[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	4.2 - 4.8 V
159 (Y)	—	Sensor ground (Accelerator pedal position sensor 1)	—	—	—
160 (B)	—	ECM ground	—	—	—

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

*1: With ACC/ASCD models

*2: Without ACC/ASCD models

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