

2012 - Mazda6 - Engine

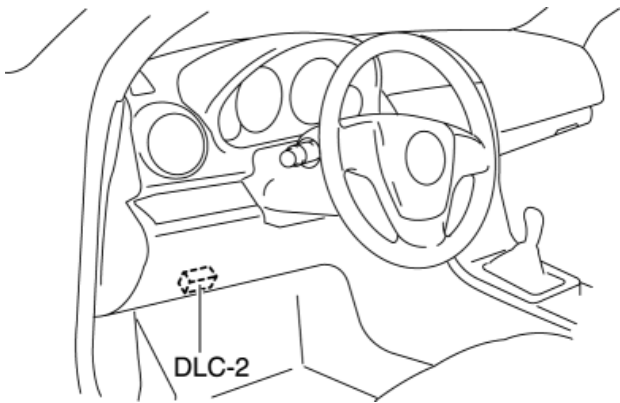
PCM INSPECTION [MZR 2.5]

Using M-MDS

NOTE:

- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
 - CMP sensor
 - Main relay

1. Connect the M-MDS to the DLC-2.



2. Switch the ignition to ON.

3. Measure the PID value.

- If PID value is not within the specification, follow the instructions in Action column.

NOTE:

- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the PCM. Therefore, an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device. If a monitored value of an output device is out of specification, inspect the monitored value of the input device related to the output control.
- For input/output signals except those of the monitoring items, use a voltmeter to measure the PCM terminal voltage.
- The simulation items that are used in the ENGINE CONTROL SYSTEM OPERATION INSPECTION are as follows.
 - ACCS, ALTF, ARPMDES, EVAPCP, EVAPCV, FAN_DUTY, FP, HTR11, IMRC, IMTV, INJ_1~4, SEGRP, Test, VT Duty1 wt

PID/ DATA monitor table (reference)

Monitor item (Definition)	Unit/Condition		Condition/Specification (Reference)	Inspection item	PCM terminal
AAT (Ambient air temperature)	°C	°F	Switch the ignition to ON: Indicates the ambient air temperature	IAT sensor	1AT
AC_REQ	OFF/ON		A/C switch OFF: OFF	Perform applicable	—

(A/C request signal)		A/C switch ON: ON	DTC troubleshooting	
ACCS (A/C relay)	OFF/ON	A/C relay OFF: OFF A/C relay ON: ON	A/C relay Inspect following PIDs: RPM, TP REL, ECT.	1I
AFR (Target air fuel ratio)	—	Target air fuel ratio is displayed	A/F sensor	2Z 2AC 2AD
AFR_ACT (Actual air fuel ratio)	—	Actual air fuel ratio is displayed	A/F sensor	2Z 2AC 2AD
ALTF (Generator field coil control duty value)	%	Just after A/C switch ON and fan switch ON at Idle (after warm up): Duty value rises	Generator Inspect following PIDs: IAT, ECT, RPM, VPWR, ALTT V.	2AA
ALTT V (Generator output voltage)	V	Switch the ignition to ON: 0 V Idle (after warm up): approx. 14 V*1 (E/L not operating)	Generator	2AF
APP (APP sensor)	%	- Accelerator pedal released: approx. 0 % - Accelerator pedal depressed: approx. 100 %	APP sensor	1AO 1AP
APP1 (APP sensor No.1)	%	- Accelerator pedal released: approx. 15 % - Accelerator pedal depressed: approx. 80 %	APP sensor No.1	1AO
	V	- Accelerator pedal released: approx. 0.8 V - Accelerator pedal depressed: approx. 4.0 V		
APP2 (APP sensor No.2)	%	- Accelerator pedal released: approx. 7.5 % - Accelerator pedal depressed: approx. 42 %	APP sensor No.2	1AP
	V	- Accelerator pedal released: approx. 0.4 V - Accelerator pedal depressed: approx. 2.0 V		
ARPMDES (Target engine speed)	RPM	Indicate the target engine speed	CKP sensor Inspect following PIDs: IAT, RPM, MAP, ECT, MAF, TP REL, INGEAR, ALTT V.	—
BARO	kPa, psi, Bar	Indicate the BARO		
			BARO sensor	—

(Barometric pressure)	V		Switch the ignition to ON (at sea level): approx. 4.1 V		
BOO (Brake switch (No.1 signal))	OFF/ON		Brake pedal depressed: ON Brake pedal released: OFF	Brake switch (No.1 signal)	1AB
BPA (Brake switch (No.2 signal))	OFF/ON		Brake pedal depressed: ON Brake pedal released: OFF	Brake switch (No.2 signal)	1AF
CATT11_DSD (Desired catalyst temperature bank one, sensor one)	°C		Indicate the estimated catalytic converter temperature	Perform applicable DTC troubleshooting.	—
CHRGLP (Generator warning light)	OFF/ON		Switch the ignition to ON: ON Idle (after warm up): OFF	Perform applicable DTC troubleshooting.	—
COLP (Refrigerant pressure sensor)	OFF/ON		Refrigerant pressure is above 1.96 Mpa {20.0kgf/cm ² , 284 psi}: ON	Refrigerant pressure sensor	1J
CPP*2 (Clutch pedal position)	OFF/ON		Clutch pedal depressed: ON Clutch pedal released: OFF	CPP switch	1BD
CPP/PNP*2 (Shift lever position)	OFF/ON		Neutral position: ON Others: OFF	Neutral switch	1BC
ECT (Engine coolant temperature)	°C	°F	Indicate the ECT	ECT sensor	2AH
	V		ECT 20 °C {68 °F}: 3.04—3.14 V ECT 80 °C {176 °F}: 0.76—0.83 V		
EQ_RAT11 (Equivalence ratio (lambda))	—		Idling after warm up: approx. 1	Perform applicable DTC troubleshooting.	2Z 2AC 2AD
EQ_RAT11_DSD (Desired equivalence ratio (lambda))	—		Idling after warm up: approx. 1	Perform applicable DTC troubleshooting.	—
ETC_ACT (Electronic throttle control actual)	°		Indicate the desired TP by angle	Perform applicable DTC troubleshooting.	2BE, 2BF
ETC_DSD (Electronic throttle control desired)	%		Indicate the desired TP by percent	TP sensor	—
	°		Indicate the desired TP by angle	Inspect following PIDs:APP1, APP2, ETC_ACT.	
EVAPCP (Purge solenoid valve)	%		Switch the ignition to ON: 0%	Inspect following PIDs: IAT, RPM, ECT, MAF, O2S11,	2C

duty value)		Idle (after warm up): 0%	INGEAR, VPWR.	
EVAPCV (Evaporative emission canister vent valve)	OFF/ON	Simulation item (EVAPCV) is ON: ON	CV solenoid valve	1M
FAN_DUTY (Fan control module)	%	- When all of following condition are met: 50% - Test mode ON - WOT	Fan control module	1R
FCL (Fuel cap warning light)	OFF/ON	- Fuel cap warning light not illuminated: OFF - Fuel cap warning light illuminated: ON	Perform applicable DTC troubleshooting.	—
FLI (Fuel level)	%	- Fuel gauge level F: approx. 100% - Fuel gauge level E: approx. 0%	Perform applicable DTC troubleshooting.	—
FP (Fuel pump relay)	OFF/ON	Switch the ignition to ON: OFF Idle (after warm up): ON Cranking: ON	Fuel pump relay Inspect following PIDs: RPM.	1BG
FTP (Fuel tank pressure sensor)	kPa, psi, Bar	Indicate the fuel tank pressure	Fuel tank pressure sensor	1AH
	V	Fuel tank pressure is equal to barometric pressure: approx. 2.625 V		
FUEL PW (Fuel injector duration)	sec	Idle (after warm up): approx. 2.2 ms	Fuel injector Inspect following PIDs: IAT, MAF, TP REL, MAP, ECT, RPM, O2S11, O2S12, INGEAR, VPWR, ALTT V.	2AZ 2BB 2BC 2BD
FUEL SYS (Fuel system status)	OL/CL/CL-Fault/OL-Fault/OL-Drive	Idle (after warm up): CL	Fuel injector Inspect following PIDs: IAT, MAF, TP REL, MAP, ECT, RPM, O2S11, O2S12, INGEAR, VPWR, ALTT V.	—
HTR11 (A/F sensor heater)	OFF/ON	Idle (after warm up): ON OFF	Inspect following PIDs: IAT, MAF, TP REL, ECT, RPM.	2A
HTR12 (HO2S heater)	OFF/ON	Idle (after warm up): ON OFF	Inspect following PIDs: IAT, MAF, ECT, RPM.	2B
IAT (Intake air temperature)	°C	Indicate the IAT	IAT sensor	1AT
	°F	IAT 20 °C {68 °F}: approx. 2.38 V IAT 60 °C {140 °F}: approx. 0.89 V		
IMRC (Variable tumble	OFF/ON	- ECT below 60 °C {140 °F} and engine speed below 3,750 rpm : On - ECT above 60 °C {140 °F} while	Variable tumble solenoid valve Inspect following PIDs: TP REL,	2I

solenoid valve)			idling.: Off	ECT, RPM.	
IMRC_POS (Variable tumble shutter valve position sensor)	V		- ECT below 60 °C {140 °F} and engine speed below 3,750 rpm : 3.408—4.432 V - ECT above 60 °C {140 °F} while idling.: 0.808—1.832 V	Variable tumble shutter valve position sensor	2R
IMTV (Variable Intake air control solenoid valve)	OFF/ON		Engine speed is below approx. 4,400 rpm: On Others: Off	Variable intake air control solenoid valve Inspect following PIDs: RPM.	2J
INGEAR (Load/no load condition)	OFF/ON		- CPP or CPP/PNP is ON: Off - Others: On	Perform applicable DTC troubleshooting.	1BC, IBD
IVS (CTP condition)	Idle/Off_Idle		- CTP: Idle - Others: Off Idle	Perform applicable DTC troubleshooting.	—
KNOCKR (Knocking retard)	°		Switch the ignition to ON: 0° Idle (after warm up): 0°	KS	2U 2V
LOAD (Engine load)	%		Switch the ignition to ON: 0% Idle (after warm up): approx.15%	MAF sensor	—
LONGFT1 (long term fuel trim)	%		Idle (after warm up): -15—20%	Perform applicable DTC troubleshooting.	—
MAF (Mass airflow)	g/sec		Indicate the MAF	MAF sensor	1AK
	V		Switch the ignition to ON: approx. 0.68 V Idle (after warm up): approx. 1.2 V		
MAP (Manifold absolute pressure)	kPa, psi, Bar		Indicate the MAP	MAP sensor	2AG
	V		- Switch the ignition to ON (at sea level): approx. 4.1 V - Idle (after warm up): approx. 1.2 V		
MIL (Malfunction indicator lamp)	OFF/ON		- DTC stored: On - DTC not stored: Off	Perform applicable DTC troubleshooting.	—
MIL_DIS (Travelled distance since the MIL illuminated)	km	miles	Indicate the travelled distance since the MIL illuminated		
O2S11 (A/F sensor)	A		Idle (After warm up): approx. 0 mA	A/F sensor	2Z 2AC 2AD
O2S12					

(HO2S)	V	Idle (After warm up): 0—1.0 V	HO2S	2Q
PSP (PSP switch)	OFF/ON	- Steering wheel in straight ahead position: OFF - Wheel turning steering wheel: ON	PSP switch	2T
RO2FT1 (HO2S fuel trim)	%	Idle (after warm up): approx. -0.03—0.03	Perform applicable DTC troubleshooting.	—
RPM (Engine speed)	RPM	Indicate the engine speed	CKP sensor	2W
SC_CANCEL* ³ (CANCEL switch)	Inactive/Active	CANCEL switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SC_OFF* ³ (ON/OFF switch)	Inactive/Active	ON/OFF switch pressed in (OFF): Active Except above: Inactive	Cruise control switch	1AQ
SC_ON* ³ (ON/OFF switch)	Inactive/Active	ON/OFF switch pressed in (ON): Active Except above: Inactive	Cruise control switch	1AQ
SC_RES* ³ (RESUME switch)	Inactive/Active	RESUME switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SC_SET-* ³ (SET(-) switch)	Inactive/Active	SET(-) switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SC_SET+* ³ (SET(+) switch)	Inactive/Active	SET(+) switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SCCS* ³ (Speed control command switch)	V	ON/OFF switch pressed in (OFF): approx. 0 V CANSEL switch pressed in: approx. 1.3 V SET(-) switch pressed in: approx. 2.4 V SET(+) switch pressed in: approx. 3.2 V RESUME switch pressed in: approx. 3.9 V ON/OFF switch pressed in (ON): approx. 4.3 V	Cruise control switch	1AQ
SEGRP (EGR valve (stepping motor) position)	—	Switch the ignition to ON: 0 Idle (after warm up): 0 step Cranking: 0—52	EGR valve Inspect following PIDs: MAF, TP REL, ECT, RPM, VSS.	2AT, 2AX, 2AW, 2BA
SEGRP DSD (Desired EGR valve position)	%	Indicate the desired EGR valve position	Inspect following PIDs: MAF, TP REL, ECT, RPM, VSS.	—
SHRTFT1 (Short term fuel trim)	%	Idle (after warm up): approx.-25—25%	Perform applicable DTC troubleshooting.	—

SPARKADV (Ignition timing)	°		Indicate the ignition timing	Inspect following PIDs: MAF, TP REL, ECT, RPM, INGEAR, VPWR.	2G, 2H, 2K, 2L
Test (Test mode)	OFF/ON		Test mode ON: On Test mode OFF: Off	—	—
TH_M (Thermostat monitor engine coolant temperature)	—		Indicates heat radiation ratio (heat radiation when thermostat is malfunctioning/heat radiation when thermostat is normal) when thermostat monitoring is finished	Thermostat	—
	°C	°F	Indicates engine coolant temperature when thermostat monitoring is finished		—
TH_M_MAX (Thermostat monitor engine coolant temperature max limit)	—		Indicates upper limit of heat radiation ratio (heat radiation when thermostat is malfunctioning/heat radiation when thermostat is normal) for thermostat monitoring execution	Thermostat	—
	°C	°F	Indicates upper limit of engine coolant temperature for thermostat monitoring execution		—
TH_M_MIN (Thermostat monitor engine coolant temperature min limit)	—		Indicates lower limit of heat radiation ratio (heat radiation when thermostat is malfunctioning/heat radiation when thermostat is normal) for thermostat monitoring execution	Thermostat	—
	°C	°F	Indicates lower limit of engine coolant temperature for thermostat monitoring execution		—
TP REL (Relative throttle position)	%		Accelerator pedal released: approx. 3% Accelerator pedal depressed: approx. 75%	TP sensor	—
TP 1 (TP sensor No.1)	%		Accelerator pedal released: approx. 12% Accelerator pedal depressed: approx. 84%	TP sensor No.1	2AK
	V		Accelerator pedal released: approx. 0.6 V Accelerator pedal depressed: approx. 4.2 V		
TP 2 (TP sensor No.2)	%		Accelerator pedal released: approx. 12% Accelerator pedal depressed: approx. 84%	TP sensor No.2	2AL
	V		Accelerator pedal released: approx. 4.4 V Accelerator pedal depressed: approx. 0.8 V		
TPCT (TP sensor voltage at CTP)	V		approx. 0.5 V	TP sensor	2AK 2AL
VPWR (Battery positive voltage)	V		Switch the ignition to ON: B+	Battery	1C

VSS (Vehicle speed)	KPH	Indicate the vehicle speed	Perform applicable DTC troubleshooting.	—
VT ACT1 (Actual valve timing)	°	Idle (after warm up): approx. 0° Racing after warm up: 0—25°	OCV Inspect following PIDs: TP REL, ECT, RPM.	2E
VT DIFF1 (Difference between target and actual valve timing)	°	Idle (after warm up): approx. 0°	OCV Inspect following PIDs: TP REL, ECT, RPM.	2E
VT DUTY1 (Oil control valve duty value)	%	Idle (after warm up): approx. 11.5%	OCV Inspect following PIDs: TP REL, ECT, RPM.	2E

*1
Calculated value; differs from terminal voltage

*2
MTX

*3
Vehicles equipped with cruise control switch

- Following PIDs are for the ATX models. If inspects for following PIDs, (See **ON-BOARD DIAGNOSTIC SYSTEM PID/ DATA MONITOR INSPECTION [FS5A-EL]**.)

Without Using the SST

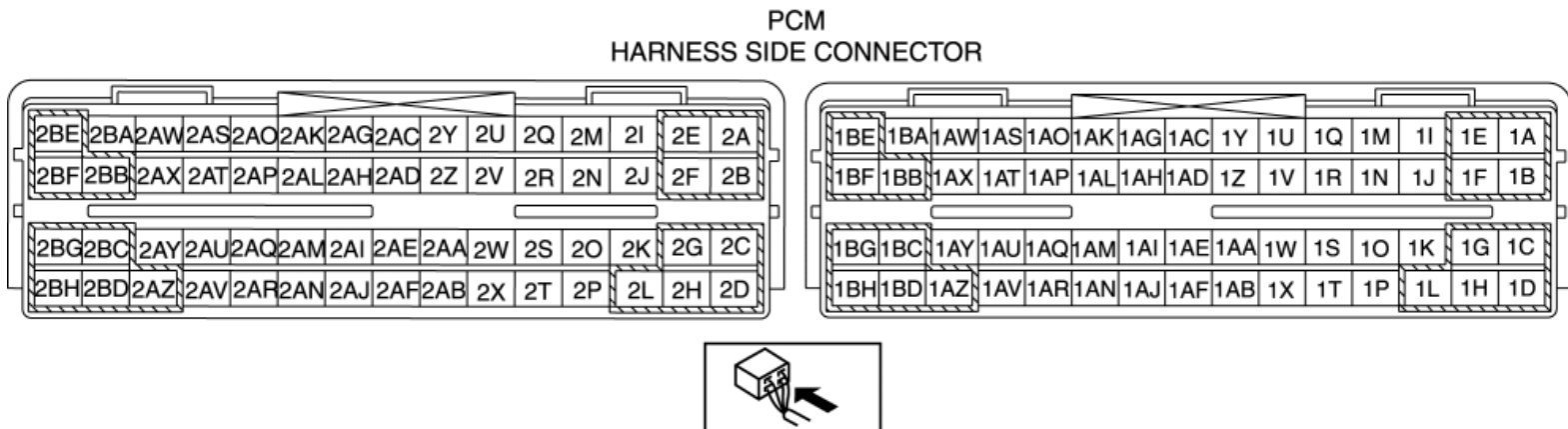
CAUTION:

- The PCM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM to determine the cause of trouble. Otherwise, a wrong diagnosis will be made.

1. Measure the voltage at each terminal.

- If any incorrect voltage is detected, inspect the related system(s), wiring harnesses and connector(s) referring to the Action column in the terminal voltage table.

Terminal voltage table (Reference)



Terminal	Signal	Connected to	Test condition	Voltage	inspection item
----------	--------	--------------	----------------	---------	-----------------

				(V)	
1A	Power supply	Main relay	Switch the ignition to off	Below 1.0	• Related wiring harness
			Switch the ignition to ON	B+	
1B	Power supply	Main relay	Switch the ignition to off	Below 1.0	• Related wiring harness
			Switch the ignition to ON	B+	
1C	Back-up power supply	Battery (positive terminal)	Under any condition	B+	• Battery • Related wiring harness
1D	—	—	—	—	—
1E	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1F	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1G	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1H	—	—	—	—	—
1I	A/C	A/C relay	A/C operating	Below 1.0	• A/C relay • Related wiring harness
			A/C not operating	B+	
1J	Refrigerant pressure	Refrigerant pressure sensor	Switch the ignition to ON	Approx. 1.2	• Refrigerant pressure sensor • Related wiring harness
			Idle (after warm up)	Approx. 1.5	
1K	—	—	—	—	—
1L	—	—	—	—	—
1M	CV solenoid control	CV solenoid valve	Switch the ignition to ON	B+	• CV solenoid valve • Related wiring harness
			Idle (CV solenoid valve not operating)	B+	
			Idle (CV solenoid valve operating)	Below 1.0	
1N	—	—	—	—	—

1O	—	—	—	—	—
1P	MAF sensor GND	MAF/IAT sensor	Under any condition	Below 1.0	Related wiring harness
1Q	Main relay control	Main relay	Switch the ignition to off	B+	- Main relay - Related wiring harness
			Switch the ignition to ON	Below 1.0	
1R	Cooling fan control	Fan control module	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fan control module - Related wiring harness
1S	—	—	—	—	—
1T	—	—	—	—	—
1U	—	—	—	—	—
1V	—	—	—	—	—
1W	Constant voltage (Vref)	APP sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
1X	—	—	—	—	—
1Y	—	—	—	—	—
1Z	—	—	—	—	—
1AA	—	—	—	—	—
1AB	Brake1	Brake switch (No.1 signal)	Brake pedal depressed	B+	- Brake switch (No.1 signal) - Related wiring harness
			Brake pedal released	Below 1.0	
1AC	—	—	—	—	—
1AD	Constant voltage (Vref)	Fuel tank pressure sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
1AE	Constant voltage (Vref)	Refrigerant pressure sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
		Brake switch	Brake pedal depressed	B+	Brake switch (No.2 signal)

1AF	Brake2	(No.2 signal)	Brake pedal released		Below 1.0	• Related wiring harness
1AG	—	—	—		—	—
1AH	Fuel tank pressure	Fuel tank pressure sensor	Fuel tank pressure is 10 kPa {0.10 kgf/cm2, 1.5 psi} lower than barometric pressure		Approx. 1.185	• Fuel tank pressure sensor • Related wiring harness
			Fuel tank pressure is equal to barometric pressure		Approx. 2.625	
			Fuel tank pressure is 6 kPa {0.06 kgf/cm2, 0.9 psi} higher than barometric pressure		Approx. 3.688	
1AI	CAN (-)	CAN system related modules	Because this terminal is for CAN, good/no good judgment by terminal voltage is not possible.			• Related wiring harness
1AJ	Fuel pump control	Fuel pump relay	Switch the ignition to ON		Below 1.0	• Fuel pump relay • Related wiring harness
			Cranking		Approx. 9.8	
			Idle (after warm up)		B+	
1AK	MAF	MAF/IAT sensor	Switch the ignition to ON		Approx. 0.7	• MAF sensor • Related wiring harness
			Idle (after warm up)		Approx. 1.2	
1AL	Constant voltage (Vref)	APP sensor	Switch the ignition to ON		Approx. 5.0	• Related wiring harness
1AM	CAN (+)	CAN system related modules	Because this terminal is for CAN, good/no good judgment by terminal voltage is not possible.			• Related wiring harness
1AN*1	Cruise control switch ground	Cruise control switch	Under any condition		Below 1.0	• Related wiring harness
1AO	APP sensor 1	APP sensor No.1	Switch the ignition to ON	Accelerator pedal released	Approx. 0.8	• APP sensor No.1 • Related wiring harness
				Accelerator pedal depressed	Approx. 4.0	
1AP	APP sensor 2	APP sensor No.2	Switch the ignition to ON	Accelerator pedal released	Approx. 0.4	• APP sensor No.2 • Related wiring harness
				Accelerator pedal depressed	Approx. 2.0	
				ON/OFF switch pressed in (OFF)	Approx. 0	

1AQ*1	Cruise control switch	Cruise control switch	Switch the ignition to ON	CANCEL switch pressed in	Approx. 1.3	• Cruise control switch • Related wiring harnesses
				SET (-) switch pressed in	Approx. 2.4	
				SET (+) switch pressed in	Approx. 3.2	
				RESUME switch pressed in	Approx. 3.9	
				ON/OFF switch pressed in (ON)	Approx. 4.3	
1AR	IAT sensor GND	MAF/IAT sensor	Under any condition		Below 1.0	• Related wiring harness
1AS	APP sensor GND	APP sensor	Under any condition		Below 1.0	• Related wiring harness
1AT	IAT	MAF/IAT sensor	Switch the ignition to ON	IAT 20 °C {68 °F}	Approx. 2.38	• IAT sensor • Related wiring harness
				IAT 60 °C {140 °F}	Approx. 0.89	
1AU	—	—	—		—	—
1AV	APP sensor GND	APP sensor	Under any condition		Below 1.0	• Related wiring harness
1AW	—	—	—		—	—
1AX	—	—	—		—	—
1AY	Ignition switch (IG1)	Ignition switch*2, Ignition relay*3	Switch the ignition to off		Below 1.0	• Ignition switch*2, Ignition relay*3 • Related wiring harness
			Switch the ignition to ON		B+	
1AZ	—	—	—		—	—
1BA	—	—	—		—	—
1BB	Starter relay control	Starter relay	Clutch pedal is not depressed*4, Shift position is not P or N range*5		Below 1.0	• Starter relay • Related wiring harness
			Clutch pedal is depressed*4, Shift position is P or N range*5		4 V or more	
					Below	• Neutral

1BC*4	Neutral position	Neutral switch	Shift lever is at neutral position	1.0	switch
			Shift lever is not at neutral position	B+	
1BD*4	Clutch operation	CPP switch	Clutch pedal depressed	Below 1.0	• CPP switch • Related wiring harness
			Clutch pedal released	B+	
1BE	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1BF	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1BG	Fuel pump control	Fuel pump relay	Switch the ignition to ON	B+	• Fuel pump relay • Related wiring harness
			Cranking	Below 1.0	
			Idle (after warm up)	Below 1.0	
1BH	—	—	—	—	—
2A	A/F sensor heater control	A/F sensor heater	• Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		• A/F sensor heater • Related wiring harness
2B	HO2S heater control	HO2S heater	• Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		• HO2S heater • Related wiring harness
2C	Purge control	Purge solenoid valve	• Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		• Purge solenoid valve • Related wiring harness
2D	—	—	—	—	—
2E	OCV control	OCV	• Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		• OCV • Related wiring harness
2F	—	—	—	—	—
		Ignition coil	• Inspect using the wave profile.		• Ignition coil No.1

2G	IGT1	No.1	(See Inspection Using An Oscilloscope (Reference) .)		Related wiring harness
2H	IGT4	Ignition coil No.4	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Ignition coil No.4 - Related wiring harness
2I	Variable tumble control	Variable tumble solenoid valve	ECT above 60 °C {140 °F} while idling.	B+	- Variable tumble solenoid valve - Related wiring harness
			ECT below 60 °C {140 °F} and engine speed below 3,750 rpm	Below 1.0	
2J	Variable intake air control	Variable intake air solenoid valve	Engine speed: above 4,400 rpm	B+	- Variable intake air solenoid valve - Related wiring harness
			Engine speed: below 4,400 rpm	Below 1.0	
2K	IGT2	Ignition coil No.2	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Ignition coil No.2 - Related wiring harness
2L	IGT3	Ignition coil No.3	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Ignition coil No.3 - Related wiring harness
2M	—	—	—	—	—
2N	—	—	—	—	—
2O	—	—	—	—	—
2P	Variable tumble shutter valve position sensor GND	Variable tumble shutter valve position sensor	Under any condition	Below 1.0	Related wiring harness
2Q	HO2S	HO2S	Idle (after warm up)	0 1.0	- HO2S - Related wiring harness
2R	Variable tumble shutter valve monitor	Variable tumble shutter valve position sensor	ECT above 60 °C {140 °F} while idling.	0.808—1.832	Variable tumble shutter valve position sensor
			ECT below 60 °C {140 °F} and engine speed below	3.408—	

			3,750 rpm		4.432	Related wiring harness
2S	CMP signal	CMP sensor	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)			- CMP sensor - Related wiring harness
2T	PSP	PSP switch	Idle (after warm up)	Steering wheel at straight ahead position	B+	- PSP switch - Related wiring harness
				While turning steering wheel	Below 1.0	
2U	Knocking (+)	KS	Switch the ignition to ON (Use digital type voltmeter, because measurement voltage will be detected less than true voltage when using analog type voltmeter)		Approx. 4.0	- KS - Related wiring harness
2V	Knocking (–)	KS	Switch the ignition to ON (Use digital type voltmeter, because measurement voltage will be detected less than true voltage when using analog type voltmeter)		Below 1.0	- KS - Related wiring harness
2W	CKP signal	CKP sensor	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)			- CKP sensor - Related wiring harness
2X	Sensor shield	A/F sensor, HO2S, KS	Under any condition		Below 1.0	Related wiring harness
2Y	—	—	—		—	—
2Z	A/F sensor	A/F sensor	Idle (after warm up)		Approx. 5.1	- A/F sensor - Related wiring harness
2AA	Generator field coil control	Generator (terminal D)	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)			- Generator - Related wiring harness
2AB	—	—	—		—	—
2AC	A/F sensor	A/F sensor	Idle (after warm up): Approx. 0 mA			- A/F sensor - Related wiring harness
2AD	A/F sensor	A/F sensor	Verify that the voltage increases when the engine speed increases.			- A/F sensor - Related wiring

						harness
2AE	—	—	—	—	—	—
2AF	Generator output voltage	Generator (terminal P)	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)			- Generator - Related wiring harness
2AG	MAP	MAP sensor	Switch the ignition to ON		Approx. 4.1	- MAP sensor - Related wiring harness
			Idle (after warm up)		Approx. 1.2	
2AH	ECT	ECT sensor	Switch the ignition to ON	ECT 20 °C {68 °F}	3.04—3.14	- ECT sensor - Related wiring harness
				ECT 80 °C {176 °F}	0.76—0.83	
2AI	—	—	—	—	—	—
2AJ	—	—	—	—	—	—
2AK	TP sensor No.1	TP sensor No.1	Switch the ignition to ON	Accelerator pedal released	Approx. 0.6	- TP sensor No.1 - Related wiring harness
				Accelerator pedal depressed	Approx. 4.2	
2AL	TP sensor No.2	TP sensor No.2	Switch the ignition to ON	Accelerator pedal released	Approx. 4.4	- TP sensor No.2 - Related wiring harness
				Accelerator pedal depressed	Approx. 0.8	
2AM	CMP power	CMP sensor	Switch the ignition to ON		B+	Related wiring harness
			Switch the ignition to off (after 10 s)		Below 1.0	
2AN	—	—	—	—	—	—
2AO	Constant voltage (Vref)	TP sensor	Switch the ignition to ON		Approx. 5.0	Related wiring harness
2AP	TP sensor GND	TP sensor	Under any condition		Below 1.0	Related wiring harness
2AQ	CKP power	CKP sensor	Switch the ignition to ON		B+	Related wiring harness
			Switch the ignition to off		Below 1.0	

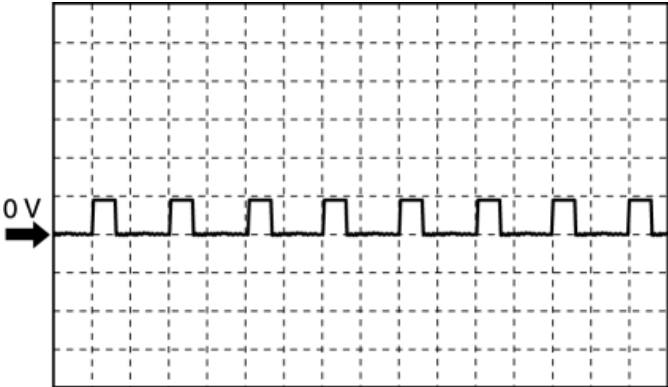
2AR	Constant voltage (Vref)	Variable tumble shutter valve position sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
2AS	HO2S GND	HO2S	Under any condition	Below 1.0	Related wiring harness
2AT	EGR valve control	EGR valve	Idle (after warm up)	B+	- EGR valve - Related wiring harness
2AU	Constant voltage (Vref)	MAP sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
2AV	MAP sensor GND	MAP sensor	Under any condition	Below 1.0	Related wiring harness
2AW	EGR valve control	EGR valve	Idle (after warm up)	Below 1.0	- EGR valve - Related wiring harness
2AX	EGR valve control	EGR valve	Idle (after warm up)	Below 1.0	- EGR valve - Related wiring harness
2AY	ECT sensor GND	ECT sensor	Under any condition	Below 1.0	Related wiring harness
2AZ	Fuel injection (#4)	Fuel injector No.4	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fuel injector No.4 - Related wiring harness
2BA	EGR valve control	EGR valve	Idle (after warm up)	B+	- EGR valve - Related wiring harness
2BB	Fuel injection (#1)	Fuel injector No.1	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fuel injector No.1 - Related wiring harness
2BC	Fuel injection (#2)	Fuel injector No.2	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fuel injector No.2 - Related wiring harness

2BD	Fuel injection (#3)	Fuel injector No.3	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Fuel injector No.3 - Related wiring harness
2BE	Throttle valve actuator control (+)	Throttle body (throttle valve actuator)	Idle (after warm up)	B+	- Throttle valve actuator - Related wiring harness
2BF	Throttle valve actuator control (-)	Throttle body (throttle valve actuator)	Idle (after warm up)	3.5—5.5	- Throttle valve actuator - Related wiring harness
2BG	OCV control	OCV	Switch the ignition to ON	B+	- OCV - Related wiring harness
2BH	—	—	—	—	—

- *1
- Vehicles equipped with cruise control switch
- *2
- Without advanced keyless entry and push button start system
- *3
- With advanced keyless entry and push button start system
- *4
- MTX
- *5
- ATX

Inspection Using An Oscilloscope (Reference)

Fan control module signal



PCM terminals

1R—body ground(—)

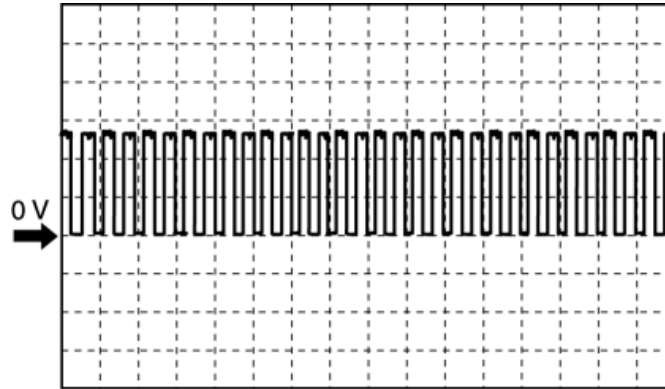
Oscilloscope setting

- 5 V/DIV (Y), 20 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

A/ F sensor heater control



PCM terminals

- 2A(+)—body ground(—)

Oscilloscope setting

- 5 V/DIV (Y), 200 ms/DIV (X), DC range

Vehicle condition

- Idle (immediately after starting the engine)

HO2S heater control



PCM terminals

- 2B(+)—body ground(—)

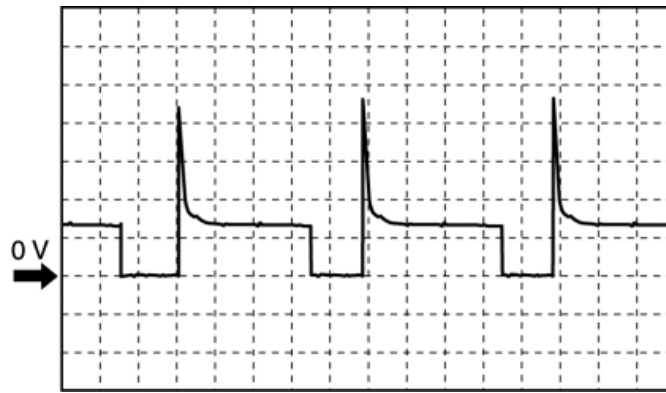
Oscilloscope setting

- 5 V/DIV (Y), 1 s/DIV (X), DC range

Vehicle condition

- Idle (immediately after starting the engine)

Purge control signal



PCM terminals

- 2C(+)—body ground(—)

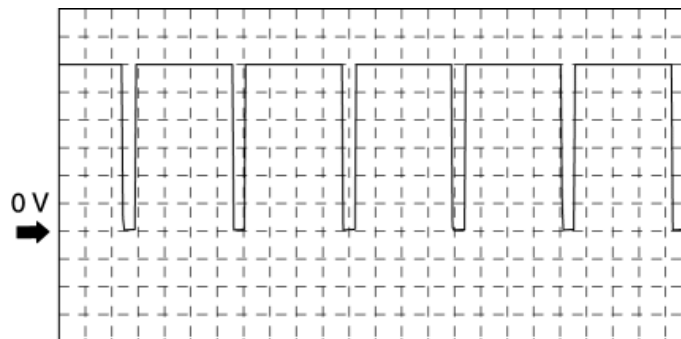
Oscilloscope setting

- 10 V/DIV (Y), 20 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

OCV control signal



PCM terminals

- 2E(+)—body ground(—)

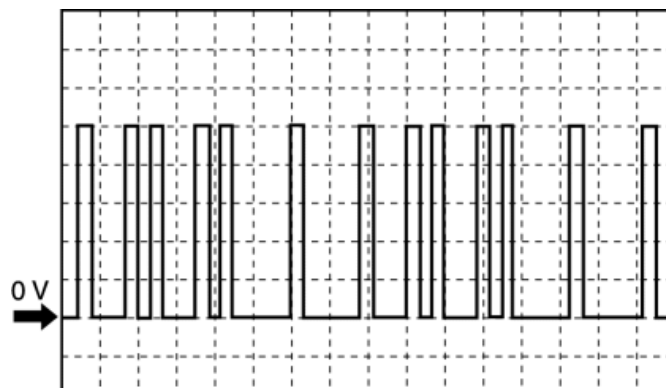
Oscilloscope setting

- 2 V/DIV (Y), 0.8 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

CMP sensor signal



PCM terminals

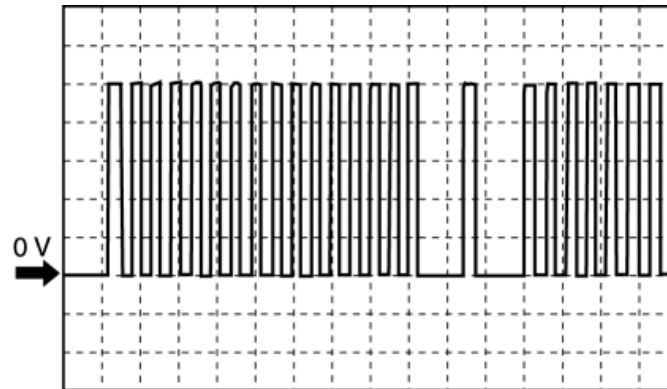
- 2S(+)—body ground(-)

Oscilloscope setting

- 1 V/DIV (Y), 25 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

CKP sensor signal**PCM terminals**

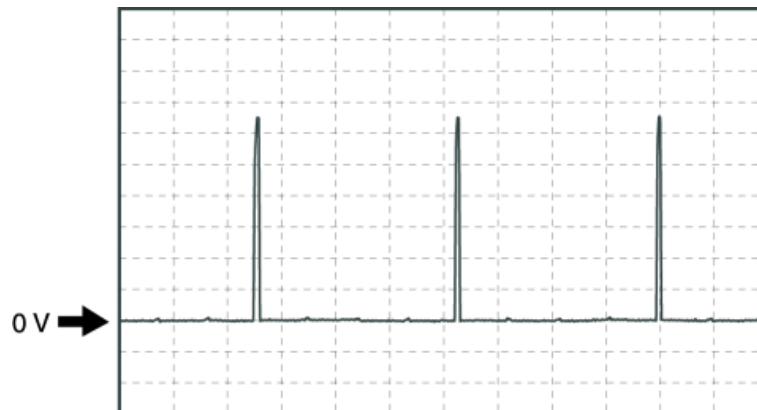
- 2W(+)—body ground(-)

Oscilloscope setting

- 1 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

IGT1, IGT2, IGT3, IGT4 control signals**PCM terminals**

- IGT1(ignition coil No.1): 2G(+)—body ground(-)
- IGT2(ignition coil No.2): 2K(+)—body ground(-)
- IGT3(ignition coil No.3): 2L(+)—body ground(-)
- IGT4(ignition coil No.4): 2H(+)—body ground(-)

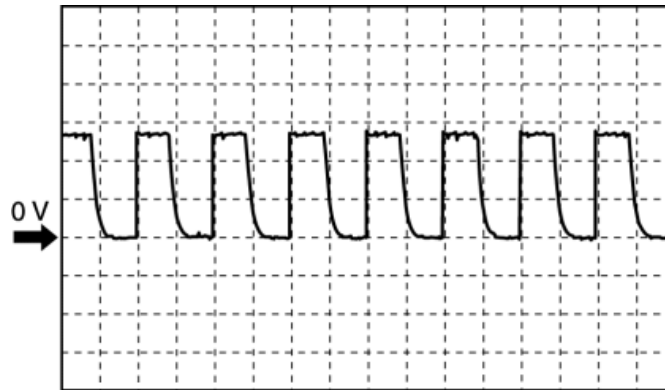
Oscilloscope setting

- 1 V/DIV (Y), 50 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

Generator field coil control signal



PCM terminals

- 2AA(+)—body ground(-)

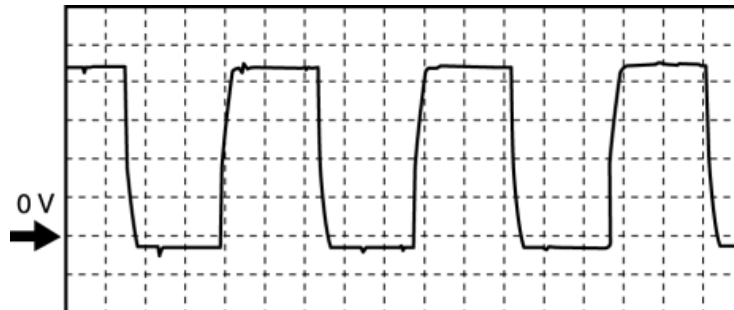
Oscilloscope setting

- 0.5 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

Generator output voltage signal



PCM terminals

- 2AF(+)—body ground(-)

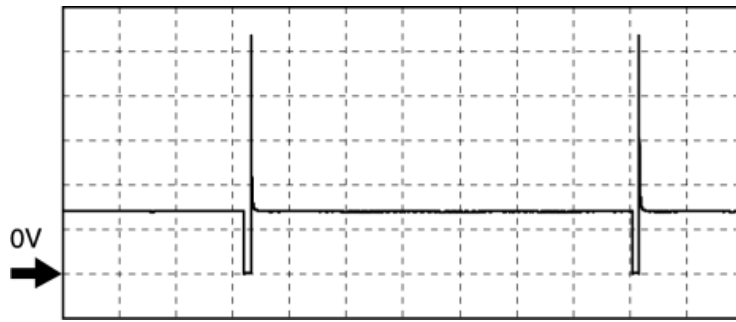
Oscilloscope setting

- 2 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

Fuel injection control

**PCM terminals**

- Fuel Injection No.1: 2BB(+)—body ground(-)
- Fuel Injection No.2: 2BC(+)—body ground(-)
- Fuel Injection No.3: 2BD(+)—body ground(-)
- Fuel Injection No.4: 2AZ(+)—body ground(-)

Oscilloscope setting

- 10 V/DIV (Y), 25 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

[< Previous](#) [Next >](#)

2012 - Mazda6 - Engine

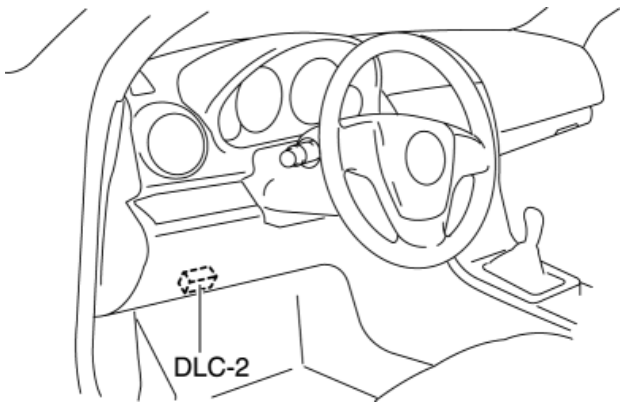
PCM INSPECTION [MZR 2.5]

Using M-MDS

NOTE:

- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
 - CMP sensor
 - Main relay

1. Connect the M-MDS to the DLC-2.



2. Switch the ignition to ON.

3. Measure the PID value.

- If PID value is not within the specification, follow the instructions in Action column.

NOTE:

- The PID/DATA MONITOR function monitors the calculated value of the input/output signals in the PCM. Therefore, an output device malfunction is not directly indicated as a malfunction of the monitored value for the output device. If a monitored value of an output device is out of specification, inspect the monitored value of the input device related to the output control.
- For input/output signals except those of the monitoring items, use a voltmeter to measure the PCM terminal voltage.
- The simulation items that are used in the ENGINE CONTROL SYSTEM OPERATION INSPECTION are as follows.
 - ACCS, ALTF, ARPMDES, EVAPCP, EVAPCV, FAN_DUTY, FP, HTR11, IMRC, IMTV, INJ_1~4, SEGRP, Test, VT Duty1 wt

PID/ DATA monitor table (reference)

Monitor item (Definition)	Unit/Condition		Condition/Specification (Reference)	Inspection item	PCM terminal
AAT (Ambient air temperature)	°C	°F	Switch the ignition to ON: Indicates the ambient air temperature	IAT sensor	1AT
AC_REQ	OFF/ON		A/C switch OFF: OFF	Perform applicable	—

(A/C request signal)		A/C switch ON: ON	DTC troubleshooting	
ACCS (A/C relay)	OFF/ON	A/C relay OFF: OFF A/C relay ON: ON	A/C relay Inspect following PIDs: RPM, TP REL, ECT.	1I
AFR (Target air fuel ratio)	—	Target air fuel ratio is displayed	A/F sensor	2Z 2AC 2AD
AFR_ACT (Actual air fuel ratio)	—	Actual air fuel ratio is displayed	A/F sensor	2Z 2AC 2AD
ALTF (Generator field coil control duty value)	%	Just after A/C switch ON and fan switch ON at Idle (after warm up): Duty value rises	Generator Inspect following PIDs: IAT, ECT, RPM, VPWR, ALTT V.	2AA
ALTT V (Generator output voltage)	V	Switch the ignition to ON: 0 V Idle (after warm up): approx. 14 V*1 (E/L not operating)	Generator	2AF
APP (APP sensor)	%	- Accelerator pedal released: approx. 0 % - Accelerator pedal depressed: approx. 100 %	APP sensor	1AO 1AP
APP1 (APP sensor No.1)	%	- Accelerator pedal released: approx. 15 % - Accelerator pedal depressed: approx. 80 %	APP sensor No.1	1AO
	V	- Accelerator pedal released: approx. 0.8 V - Accelerator pedal depressed: approx. 4.0 V		
APP2 (APP sensor No.2)	%	- Accelerator pedal released: approx. 7.5 % - Accelerator pedal depressed: approx. 42 %	APP sensor No.2	1AP
	V	- Accelerator pedal released: approx. 0.4 V - Accelerator pedal depressed: approx. 2.0 V		
ARPMDES (Target engine speed)	RPM	Indicate the target engine speed	CKP sensor Inspect following PIDs: IAT, RPM, MAP, ECT, MAF, TP REL, INGEAR, ALTT V.	—
BARO	kPa, psi, Bar	Indicate the BARO		
			BARO sensor	—

(Barometric pressure)	V		Switch the ignition to ON (at sea level): approx. 4.1 V		
BOO (Brake switch (No.1 signal))	OFF/ON		Brake pedal depressed: ON Brake pedal released: OFF	Brake switch (No.1 signal)	1AB
BPA (Brake switch (No.2 signal))	OFF/ON		Brake pedal depressed: ON Brake pedal released: OFF	Brake switch (No.2 signal)	1AF
CATT11_DSD (Desired catalyst temperature bank one, sensor one)	°C		Indicate the estimated catalytic converter temperature	Perform applicable DTC troubleshooting.	—
CHRGLP (Generator warning light)	OFF/ON		Switch the ignition to ON: ON Idle (after warm up): OFF	Perform applicable DTC troubleshooting.	—
COLP (Refrigerant pressure sensor)	OFF/ON		Refrigerant pressure is above 1.96 Mpa {20.0kgf/cm ² , 284 psi}: ON	Refrigerant pressure sensor	1J
CPP*2 (Clutch pedal position)	OFF/ON		Clutch pedal depressed: ON Clutch pedal released: OFF	CPP switch	1BD
CPP/PNP*2 (Shift lever position)	OFF/ON		Neutral position: ON Others: OFF	Neutral switch	1BC
ECT (Engine coolant temperature)	°C	°F	Indicate the ECT	ECT sensor	2AH
	V		ECT 20 °C {68 °F}: 3.04—3.14 V ECT 80 °C {176 °F}: 0.76—0.83 V		
EQ_RAT11 (Equivalence ratio (lambda))	—		Idling after warm up: approx. 1	Perform applicable DTC troubleshooting.	2Z 2AC 2AD
EQ_RAT11_DSD (Desired equivalence ratio (lambda))	—		Idling after warm up: approx. 1	Perform applicable DTC troubleshooting.	—
ETC_ACT (Electronic throttle control actual)	°		Indicate the desired TP by angle	Perform applicable DTC troubleshooting.	2BE, 2BF
ETC_DSD (Electronic throttle control desired)	%		Indicate the desired TP by percent	TP sensor	—
	°		Indicate the desired TP by angle	Inspect following PIDs:APP1, APP2, ETC_ACT.	
EVAPCP (Purge solenoid valve)	%		Switch the ignition to ON: 0%	Inspect following PIDs: IAT, RPM, ECT, MAF, O2S11,	2C

duty value)		Idle (after warm up): 0%	INGEAR, VPWR.	
EVAPCV (Evaporative emission canister vent valve)	OFF/ON	Simulation item (EVAPCV) is ON: ON	CV solenoid valve	1M
FAN_DUTY (Fan control module)	%	- When all of following condition are met: 50% - Test mode ON - WOT	Fan control module	1R
FCL (Fuel cap warning light)	OFF/ON	- Fuel cap warning light not illuminated: OFF - Fuel cap warning light illuminated: ON	Perform applicable DTC troubleshooting.	—
FLI (Fuel level)	%	- Fuel gauge level F: approx. 100% - Fuel gauge level E: approx. 0%	Perform applicable DTC troubleshooting.	—
FP (Fuel pump relay)	OFF/ON	Switch the ignition to ON: OFF Idle (after warm up): ON Cranking: ON	Fuel pump relay Inspect following PIDs: RPM.	1BG
FTP (Fuel tank pressure sensor)	kPa, psi, Bar	Indicate the fuel tank pressure	Fuel tank pressure sensor	1AH
	V	Fuel tank pressure is equal to barometric pressure: approx. 2.625 V		
FUEL PW (Fuel injector duration)	sec	Idle (after warm up): approx. 2.2 ms	Fuel injector Inspect following PIDs: IAT, MAF, TP REL, MAP, ECT, RPM, O2S11, O2S12, INGEAR, VPWR, ALTT V.	2AZ 2BB 2BC 2BD
FUEL SYS (Fuel system status)	OL/CL/CL-Fault/OL-Fault/OL-Drive	Idle (after warm up): CL	Fuel injector Inspect following PIDs: IAT, MAF, TP REL, MAP, ECT, RPM, O2S11, O2S12, INGEAR, VPWR, ALTT V.	—
HTR11 (A/F sensor heater)	OFF/ON	Idle (after warm up): ON OFF	Inspect following PIDs: IAT, MAF, TP REL, ECT, RPM.	2A
HTR12 (HO2S heater)	OFF/ON	Idle (after warm up): ON OFF	Inspect following PIDs: IAT, MAF, ECT, RPM.	2B
IAT (Intake air temperature)	°C	Indicate the IAT	IAT sensor	1AT
	°F	IAT 20 °C {68 °F}: approx. 2.38 V IAT 60 °C {140 °F}: approx. 0.89 V		
IMRC (Variable tumble	OFF/ON	- ECT below 60 °C {140 °F} and engine speed below 3,750 rpm : On - ECT above 60 °C {140 °F} while	Variable tumble solenoid valve Inspect following PIDs: TP REL,	2I

solenoid valve)			idling.: Off	ECT, RPM.	
IMRC_POS (Variable tumble shutter valve position sensor)	V		- ECT below 60 °C {140 °F} and engine speed below 3,750 rpm : 3.408—4.432 V - ECT above 60 °C {140 °F} while idling.: 0.808—1.832 V	Variable tumble shutter valve position sensor	2R
IMTV (Variable Intake air control solenoid valve)	OFF/ON		Engine speed is below approx. 4,400 rpm: On Others: Off	Variable intake air control solenoid valve Inspect following PIDs: RPM.	2J
INGEAR (Load/no load condition)	OFF/ON		- CPP or CPP/PNP is ON: Off - Others: On	Perform applicable DTC troubleshooting.	1BC, IBD
IVS (CTP condition)	Idle/Off_Idle		- CTP: Idle - Others: Off Idle	Perform applicable DTC troubleshooting.	—
KNOCKR (Knocking retard)	°		Switch the ignition to ON: 0° Idle (after warm up): 0°	KS	2U 2V
LOAD (Engine load)	%		Switch the ignition to ON: 0% Idle (after warm up): approx.15%	MAF sensor	—
LONGFT1 (long term fuel trim)	%		Idle (after warm up): -15—20%	Perform applicable DTC troubleshooting.	—
MAF (Mass airflow)	g/sec		Indicate the MAF	MAF sensor	1AK
	V		Switch the ignition to ON: approx. 0.68 V Idle (after warm up): approx. 1.2 V		
MAP (Manifold absolute pressure)	kPa, psi, Bar		Indicate the MAP	MAP sensor	2AG
	V		- Switch the ignition to ON (at sea level): approx. 4.1 V - Idle (after warm up): approx. 1.2 V		
MIL (Malfunction indicator lamp)	OFF/ON		- DTC stored: On - DTC not stored: Off	Perform applicable DTC troubleshooting.	—
MIL_DIS (Travelled distance since the MIL illuminated)	km	miles	Indicate the travelled distance since the MIL illuminated		
O2S11 (A/F sensor)	A		Idle (After warm up): approx. 0 mA	A/F sensor	2Z 2AC 2AD
O2S12					

(HO2S)	V	Idle (After warm up): 0—1.0 V	HO2S	2Q
PSP (PSP switch)	OFF/ON	- Steering wheel in straight ahead position: OFF - Wheel turning steering wheel: ON	PSP switch	2T
RO2FT1 (HO2S fuel trim)	%	Idle (after warm up): approx. -0.03—0.03	Perform applicable DTC troubleshooting.	—
RPM (Engine speed)	RPM	Indicate the engine speed	CKP sensor	2W
SC_CANCEL* ³ (CANCEL switch)	Inactive/Active	CANCEL switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SC_OFF* ³ (ON/OFF switch)	Inactive/Active	ON/OFF switch pressed in (OFF): Active Except above: Inactive	Cruise control switch	1AQ
SC_ON* ³ (ON/OFF switch)	Inactive/Active	ON/OFF switch pressed in (ON): Active Except above: Inactive	Cruise control switch	1AQ
SC_RES* ³ (RESUME switch)	Inactive/Active	RESUME switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SC_SET-* ³ (SET(-) switch)	Inactive/Active	SET(-) switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SC_SET+* ³ (SET(+) switch)	Inactive/Active	SET(+) switch pressed in: Active Except above: Inactive	Cruise control switch	1AQ
SCCS* ³ (Speed control command switch)	V	ON/OFF switch pressed in (OFF): approx. 0 V CANSEL switch pressed in: approx. 1.3 V SET(-) switch pressed in: approx. 2.4 V SET(+) switch pressed in: approx. 3.2 V RESUME switch pressed in: approx. 3.9 V ON/OFF switch pressed in (ON): approx. 4.3 V	Cruise control switch	1AQ
SEGRP (EGR valve (stepping motor) position)	—	Switch the ignition to ON: 0 Idle (after warm up): 0 step Cranking: 0—52	EGR valve Inspect following PIDs: MAF, TP REL, ECT, RPM, VSS.	2AT, 2AX, 2AW, 2BA
SEGRP DSD (Desired EGR valve position)	%	Indicate the desired EGR valve position	Inspect following PIDs: MAF, TP REL, ECT, RPM, VSS.	—
SHRTFT1 (Short term fuel trim)	%	Idle (after warm up): approx.-25—25%	Perform applicable DTC troubleshooting.	—

SPARKADV (Ignition timing)	°		Indicate the ignition timing	Inspect following PIDs: MAF, TP REL, ECT, RPM, INGEAR, VPWR.	2G, 2H, 2K, 2L
Test (Test mode)	OFF/ON		Test mode ON: On Test mode OFF: Off	—	—
TH_M (Thermostat monitor engine coolant temperature)	—		Indicates heat radiation ratio (heat radiation when thermostat is malfunctioning/heat radiation when thermostat is normal) when thermostat monitoring is finished	Thermostat	—
	°C	°F	Indicates engine coolant temperature when thermostat monitoring is finished		—
TH_M_MAX (Thermostat monitor engine coolant temperature max limit)	—		Indicates upper limit of heat radiation ratio (heat radiation when thermostat is malfunctioning/heat radiation when thermostat is normal) for thermostat monitoring execution	Thermostat	—
	°C	°F	Indicates upper limit of engine coolant temperature for thermostat monitoring execution		—
TH_M_MIN (Thermostat monitor engine coolant temperature min limit)	—		Indicates lower limit of heat radiation ratio (heat radiation when thermostat is malfunctioning/heat radiation when thermostat is normal) for thermostat monitoring execution	Thermostat	—
	°C	°F	Indicates lower limit of engine coolant temperature for thermostat monitoring execution		—
TP REL (Relative throttle position)	%		Accelerator pedal released: approx. 3% Accelerator pedal depressed: approx. 75%	TP sensor	—
TP 1 (TP sensor No.1)	%		Accelerator pedal released: approx. 12% Accelerator pedal depressed: approx. 84%	TP sensor No.1	2AK
	V		Accelerator pedal released: approx. 0.6 V Accelerator pedal depressed: approx. 4.2 V		
TP 2 (TP sensor No.2)	%		Accelerator pedal released: approx. 12% Accelerator pedal depressed: approx. 84%	TP sensor No.2	2AL
	V		Accelerator pedal released: approx. 4.4 V Accelerator pedal depressed: approx. 0.8 V		
TPCT (TP sensor voltage at CTP)	V		approx. 0.5 V	TP sensor	2AK 2AL
VPWR (Battery positive voltage)	V		Switch the ignition to ON: B+	Battery	1C

VSS (Vehicle speed)	KPH	Indicate the vehicle speed	Perform applicable DTC troubleshooting.	—
VT ACT1 (Actual valve timing)	°	Idle (after warm up): approx. 0° Racing after warm up: 0—25°	OCV Inspect following PIDs: TP REL, ECT, RPM.	2E
VT DIFF1 (Difference between target and actual valve timing)	°	Idle (after warm up): approx. 0°	OCV Inspect following PIDs: TP REL, ECT, RPM.	2E
VT DUTY1 (Oil control valve duty value)	%	Idle (after warm up): approx. 11.5%	OCV Inspect following PIDs: TP REL, ECT, RPM.	2E

*1
Calculated value; differs from terminal voltage

*2
MTX

*3
Vehicles equipped with cruise control switch

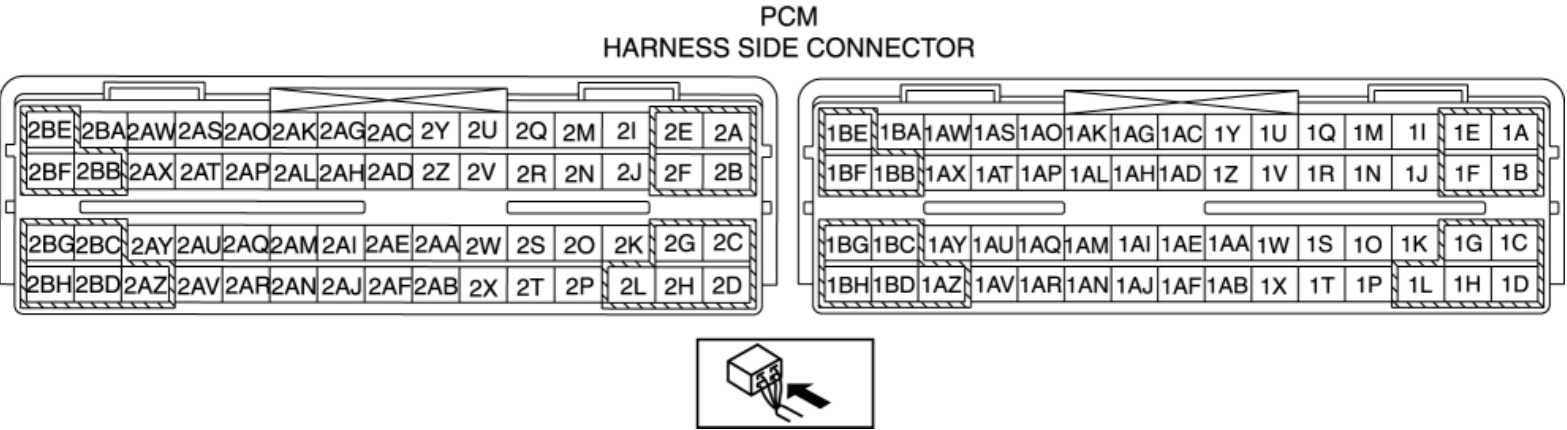
- Following PIDs are for the ATX models. If inspects for following PIDs, (See [ON-BOARD DIAGNOSTIC SYSTEM PID/ DATA MONITOR INSPECTION \[FS5A-EL\]](#).)

Without Using the SST

CAUTION:

- The PCM terminal voltages vary with change in measuring conditions and vehicle conditions. Always carry out a total inspection of the input systems, output systems, and PCM to determine the cause of trouble. Otherwise, a wrong diagnosis will be made.
- Measure the voltage at each terminal.
 - If any incorrect voltage is detected, inspect the related system(s), wiring harnesses and connector(s) referring to the Action column in the terminal voltage table.

Terminal voltage table (Reference)



Terminal	Signal	Connected to	Test condition	Voltage	inspection item
----------	--------	--------------	----------------	---------	-----------------

				(V)	
1A	Power supply	Main relay	Switch the ignition to off	Below 1.0	• Related wiring harness
			Switch the ignition to ON	B+	
1B	Power supply	Main relay	Switch the ignition to off	Below 1.0	• Related wiring harness
			Switch the ignition to ON	B+	
1C	Back-up power supply	Battery (positive terminal)	Under any condition	B+	• Battery • Related wiring harness
1D	—	—	—	—	—
1E	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1F	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1G	GND	Ground	Under any condition	Below 1.0	• Related wiring harness
1H	—	—	—	—	—
1I	A/C	A/C relay	A/C operating	Below 1.0	• A/C relay • Related wiring harness
			A/C not operating	B+	
1J	Refrigerant pressure	Refrigerant pressure sensor	Switch the ignition to ON	Approx. 1.2	• Refrigerant pressure sensor • Related wiring harness
			Idle (after warm up)	Approx. 1.5	
1K	—	—	—	—	—
1L	—	—	—	—	—
1M	CV solenoid control	CV solenoid valve	Switch the ignition to ON	B+	• CV solenoid valve • Related wiring harness
			Idle (CV solenoid valve not operating)	B+	
			Idle (CV solenoid valve operating)	Below 1.0	
1N	—	—	—	—	—

1O	—	—	—	—	—
1P	MAF sensor GND	MAF/IAT sensor	Under any condition	Below 1.0	Related wiring harness
1Q	Main relay control	Main relay	Switch the ignition to off	B+	- Main relay - Related wiring harness
			Switch the ignition to ON	Below 1.0	
1R	Cooling fan control	Fan control module	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fan control module - Related wiring harness
1S	—	—	—	—	—
1T	—	—	—	—	—
1U	—	—	—	—	—
1V	—	—	—	—	—
1W	Constant voltage (Vref)	APP sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
1X	—	—	—	—	—
1Y	—	—	—	—	—
1Z	—	—	—	—	—
1AA	—	—	—	—	—
1AB	Brake1	Brake switch (No.1 signal)	Brake pedal depressed	B+	- Brake switch (No.1 signal) - Related wiring harness
			Brake pedal released	Below 1.0	
1AC	—	—	—	—	—
1AD	Constant voltage (Vref)	Fuel tank pressure sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
1AE	Constant voltage (Vref)	Refrigerant pressure sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
		Brake switch	Brake pedal depressed	B+	Brake switch (No.2 signal)

1AF	Brake2	(No.2 signal)	Brake pedal released		Below 1.0	• Related wiring harness
1AG	—	—	—		—	—
1AH	Fuel tank pressure	Fuel tank pressure sensor	Fuel tank pressure is 10 kPa {0.10 kgf/cm2, 1.5 psi} lower than barometric pressure		Approx. 1.185	• Fuel tank pressure sensor • Related wiring harness
			Fuel tank pressure is equal to barometric pressure		Approx. 2.625	
			Fuel tank pressure is 6 kPa {0.06 kgf/cm2, 0.9 psi} higher than barometric pressure		Approx. 3.688	
1AI	CAN (-)	CAN system related modules	Because this terminal is for CAN, good/no good judgment by terminal voltage is not possible.			• Related wiring harness
1AJ	Fuel pump control	Fuel pump relay	Switch the ignition to ON		Below 1.0	• Fuel pump relay • Related wiring harness
			Cranking		Approx. 9.8	
			Idle (after warm up)		B+	
1AK	MAF	MAF/IAT sensor	Switch the ignition to ON		Approx. 0.7	• MAF sensor • Related wiring harness
			Idle (after warm up)		Approx. 1.2	
1AL	Constant voltage (Vref)	APP sensor	Switch the ignition to ON		Approx. 5.0	• Related wiring harness
1AM	CAN (+)	CAN system related modules	Because this terminal is for CAN, good/no good judgment by terminal voltage is not possible.			• Related wiring harness
1AN*1	Cruise control switch ground	Cruise control switch	Under any condition		Below 1.0	• Related wiring harness
1AO	APP sensor 1	APP sensor No.1	Switch the ignition to ON	Accelerator pedal released	Approx. 0.8	• APP sensor No.1 • Related wiring harness
				Accelerator pedal depressed	Approx. 4.0	
1AP	APP sensor 2	APP sensor No.2	Switch the ignition to ON	Accelerator pedal released	Approx. 0.4	• APP sensor No.2 • Related wiring harness
				Accelerator pedal depressed	Approx. 2.0	
				ON/OFF switch pressed in (OFF)	Approx. 0	

1AQ*1	Cruise control switch	Cruise control switch	Switch the ignition to ON	CANCEL switch pressed in	Approx. 1.3	• Cruise control switch • Related wiring harnesses
				SET (-) switch pressed in	Approx. 2.4	
				SET (+) switch pressed in	Approx. 3.2	
				RESUME switch pressed in	Approx. 3.9	
				ON/OFF switch pressed in (ON)	Approx. 4.3	
1AR	IAT sensor GND	MAF/IAT sensor	Under any condition		Below 1.0	• Related wiring harness
1AS	APP sensor GND	APP sensor	Under any condition		Below 1.0	• Related wiring harness
1AT	IAT	MAF/IAT sensor	Switch the ignition to ON	IAT 20 °C {68 °F}	Approx. 2.38	• IAT sensor • Related wiring harness
				IAT 60 °C {140 °F}	Approx. 0.89	
1AU	—	—	—		—	—
1AV	APP sensor GND	APP sensor	Under any condition		Below 1.0	• Related wiring harness
1AW	—	—	—		—	—
1AX	—	—	—		—	—
1AY	Ignition switch (IG1)	Ignition switch*2, Ignition relay*3	Switch the ignition to off		Below 1.0	• Ignition switch*2, Ignition relay*3 • Related wiring harness
			Switch the ignition to ON		B+	
1AZ	—	—	—		—	—
1BA	—	—	—		—	—
1BB	Starter relay control	Starter relay	Clutch pedal is not depressed*4, Shift position is not P or N range*5		Below 1.0	• Starter relay • Related wiring harness
			Clutch pedal is depressed*4, Shift position is P or N range*5		4 V or more	
					Below	• Neutral

1BC*4	Neutral position	Neutral switch	Shift lever is at neutral position	1.0	- switch - Related wiring harness
			Shift lever is not at neutral position	B+	
1BD*4	Clutch operation	CPP switch	Clutch pedal depressed	Below 1.0	- CPP switch - Related wiring harness
			Clutch pedal released	B+	
1BE	GND	Ground	Under any condition	Below 1.0	Related wiring harness
1BF	GND	Ground	Under any condition	Below 1.0	Related wiring harness
1BG	Fuel pump control	Fuel pump relay	Switch the ignition to ON	B+	- Fuel pump relay - Related wiring harness
			Cranking	Below 1.0	
			Idle (after warm up)	Below 1.0	
1BH	—	—	—	—	—
2A	A/F sensor heater control	A/F sensor heater	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- A/F sensor heater - Related wiring harness
2B	HO2S heater control	HO2S heater	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- HO2S heater - Related wiring harness
2C	Purge control	Purge solenoid valve	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Purge solenoid valve - Related wiring harness
2D	—	—	—	—	—
2E	OCV control	OCV	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- OCV - Related wiring harness
2F	—	—	—	—	—
		Ignition coil	Inspect using the wave profile.		Ignition coil No.1

2G	IGT1	No.1	(See Inspection Using An Oscilloscope (Reference) .)		Related wiring harness
2H	IGT4	Ignition coil No.4	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Ignition coil No.4 - Related wiring harness
2I	Variable tumble control	Variable tumble solenoid valve	ECT above 60 °C {140 °F} while idling.	B+	- Variable tumble solenoid valve - Related wiring harness
			ECT below 60 °C {140 °F} and engine speed below 3,750 rpm	Below 1.0	
2J	Variable intake air control	Variable intake air solenoid valve	Engine speed: above 4,400 rpm	B+	- Variable intake air solenoid valve - Related wiring harness
			Engine speed: below 4,400 rpm	Below 1.0	
2K	IGT2	Ignition coil No.2	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Ignition coil No.2 - Related wiring harness
2L	IGT3	Ignition coil No.3	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Ignition coil No.3 - Related wiring harness
2M	—	—	—	—	—
2N	—	—	—	—	—
2O	—	—	—	—	—
2P	Variable tumble shutter valve position sensor GND	Variable tumble shutter valve position sensor	Under any condition	Below 1.0	Related wiring harness
2Q	HO2S	HO2S	Idle (after warm up)	0 1.0	- HO2S - Related wiring harness
2R	Variable tumble shutter valve monitor	Variable tumble shutter valve position sensor	ECT above 60 °C {140 °F} while idling.	0.808—1.832	Variable tumble shutter valve position sensor
			ECT below 60 °C {140 °F} and engine speed below	3.408—	

			3,750 rpm		4.432	Related wiring harness
2S	CMP signal	CMP sensor	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)			- CMP sensor - Related wiring harness
2T	PSP	PSP switch	Idle (after warm up)	Steering wheel at straight ahead position	B+	- PSP switch - Related wiring harness
				While turning steering wheel	Below 1.0	
2U	Knocking (+)	KS	Switch the ignition to ON (Use digital type voltmeter, because measurement voltage will be detected less than true voltage when using analog type voltmeter)		Approx. 4.0	- KS - Related wiring harness
2V	Knocking (–)	KS	Switch the ignition to ON (Use digital type voltmeter, because measurement voltage will be detected less than true voltage when using analog type voltmeter)		Below 1.0	- KS - Related wiring harness
2W	CKP signal	CKP sensor	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)			- CKP sensor - Related wiring harness
2X	Sensor shield	A/F sensor, HO2S, KS	Under any condition		Below 1.0	Related wiring harness
2Y	—	—	—		—	—
2Z	A/F sensor	A/F sensor	Idle (after warm up)		Approx. 5.1	- A/F sensor - Related wiring harness
2AA	Generator field coil control	Generator (terminal D)	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)			- Generator - Related wiring harness
2AB	—	—	—		—	—
2AC	A/F sensor	A/F sensor	Idle (after warm up): Approx. 0 mA			- A/F sensor - Related wiring harness
2AD	A/F sensor	A/F sensor	Verify that the voltage increases when the engine speed increases.			- A/F sensor - Related wiring

						harness
2AE	—	—	—	—	—	—
2AF	Generator output voltage	Generator (terminal P)	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)			- Generator - Related wiring harness
2AG	MAP	MAP sensor	Switch the ignition to ON		Approx. 4.1	- MAP sensor - Related wiring harness
			Idle (after warm up)		Approx. 1.2	
2AH	ECT	ECT sensor	Switch the ignition to ON	ECT 20 °C {68 °F}	3.04—3.14	- ECT sensor - Related wiring harness
				ECT 80 °C {176 °F}	0.76—0.83	
2AI	—	—	—	—	—	—
2AJ	—	—	—	—	—	—
2AK	TP sensor No.1	TP sensor No.1	Switch the ignition to ON	Accelerator pedal released	Approx. 0.6	- TP sensor No.1 - Related wiring harness
				Accelerator pedal depressed	Approx. 4.2	
2AL	TP sensor No.2	TP sensor No.2	Switch the ignition to ON	Accelerator pedal released	Approx. 4.4	- TP sensor No.2 - Related wiring harness
				Accelerator pedal depressed	Approx. 0.8	
2AM	CMP power	CMP sensor	Switch the ignition to ON		B+	Related wiring harness
			Switch the ignition to off (after 10 s)		Below 1.0	
2AN	—	—	—	—	—	—
2AO	Constant voltage (Vref)	TP sensor	Switch the ignition to ON		Approx. 5.0	Related wiring harness
2AP	TP sensor GND	TP sensor	Under any condition		Below 1.0	Related wiring harness
2AQ	CKP power	CKP sensor	Switch the ignition to ON		B+	Related wiring harness
			Switch the ignition to off		Below 1.0	

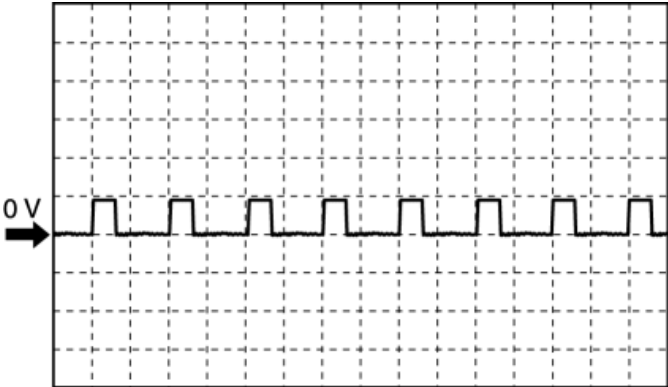
2AR	Constant voltage (Vref)	Variable tumble shutter valve position sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
2AS	HO2S GND	HO2S	Under any condition	Below 1.0	Related wiring harness
2AT	EGR valve control	EGR valve	Idle (after warm up)	B+	- EGR valve - Related wiring harness
2AU	Constant voltage (Vref)	MAP sensor	Switch the ignition to ON	Approx. 5.0	Related wiring harness
2AV	MAP sensor GND	MAP sensor	Under any condition	Below 1.0	Related wiring harness
2AW	EGR valve control	EGR valve	Idle (after warm up)	Below 1.0	- EGR valve - Related wiring harness
2AX	EGR valve control	EGR valve	Idle (after warm up)	Below 1.0	- EGR valve - Related wiring harness
2AY	ECT sensor GND	ECT sensor	Under any condition	Below 1.0	Related wiring harness
2AZ	Fuel injection (#4)	Fuel injector No.4	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fuel injector No.4 - Related wiring harness
2BA	EGR valve control	EGR valve	Idle (after warm up)	B+	- EGR valve - Related wiring harness
2BB	Fuel injection (#1)	Fuel injector No.1	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fuel injector No.1 - Related wiring harness
2BC	Fuel injection (#2)	Fuel injector No.2	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference).)		- Fuel injector No.2 - Related wiring harness

2BD	Fuel injection (#3)	Fuel injector No.3	Inspect using the wave profile. (See Inspection Using An Oscilloscope (Reference) .)		- Fuel injector No.3 - Related wiring harness
2BE	Throttle valve actuator control (+)	Throttle body (throttle valve actuator)	Idle (after warm up)	B+	- Throttle valve actuator - Related wiring harness
2BF	Throttle valve actuator control (-)	Throttle body (throttle valve actuator)	Idle (after warm up)	3.5—5.5	- Throttle valve actuator - Related wiring harness
2BG	OCV control	OCV	Switch the ignition to ON	B+	- OCV - Related wiring harness
2BH	—	—	—	—	—

- *1
- Vehicles equipped with cruise control switch
- *2
- Without advanced keyless entry and push button start system
- *3
- With advanced keyless entry and push button start system
- *4
- MTX
- *5
- ATX

Inspection Using An Oscilloscope (Reference)

Fan control module signal



PCM terminals

1R—body ground(—)

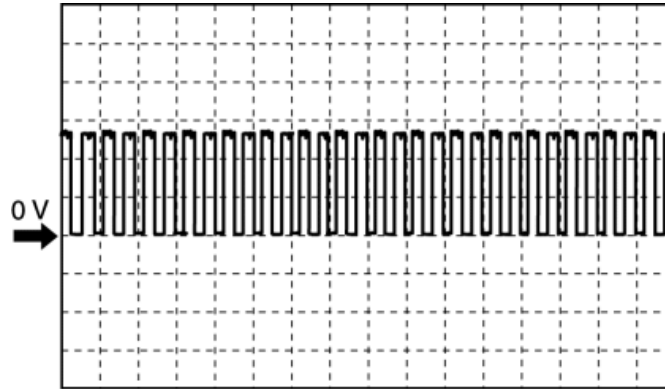
Oscilloscope setting

- 5 V/DIV (Y), 20 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

A/ F sensor heater control



PCM terminals

- 2A(+)—body ground(—)

Oscilloscope setting

- 5 V/DIV (Y), 200 ms/DIV (X), DC range

Vehicle condition

- Idle (immediately after starting the engine)

HO2S heater control



PCM terminals

- 2B(+)—body ground(—)

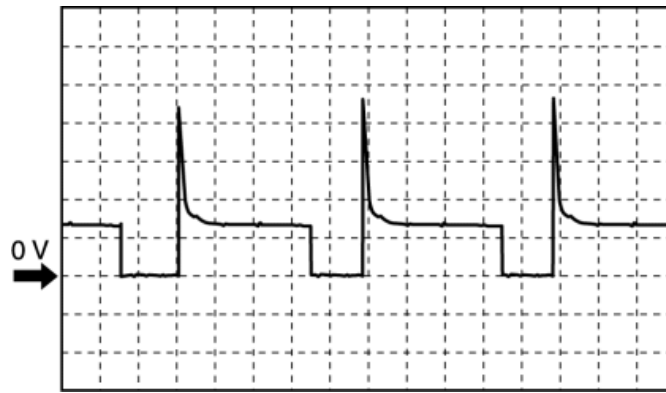
Oscilloscope setting

- 5 V/DIV (Y), 1 s/DIV (X), DC range

Vehicle condition

- Idle (immediately after starting the engine)

Purge control signal



PCM terminals

- 2C(+)—body ground(—)

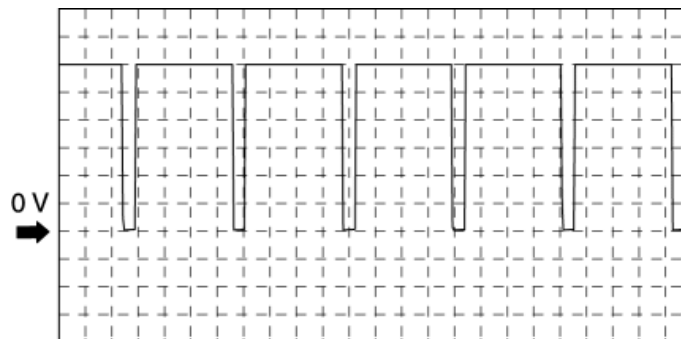
Oscilloscope setting

- 10 V/DIV (Y), 20 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

OCV control signal



PCM terminals

- 2E(+)—body ground(—)

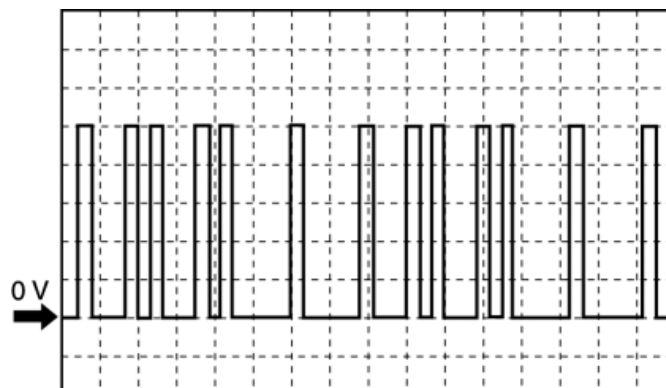
Oscilloscope setting

- 2 V/DIV (Y), 0.8 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

CMP sensor signal



PCM terminals

- 2S(+)—body ground(—)

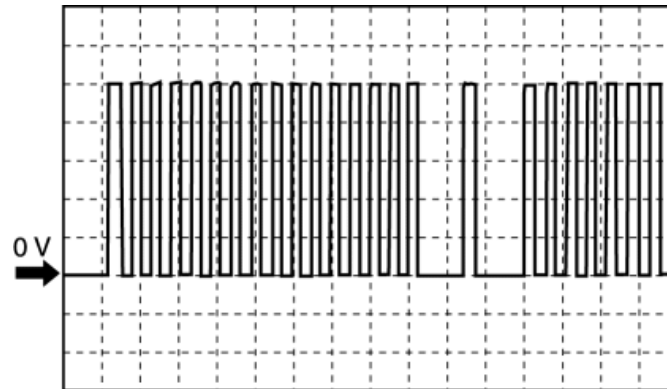
Oscilloscope setting

- 1 V/DIV (Y), 25 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

CKP sensor signal



PCM terminals

- 2W(+)—body ground(—)

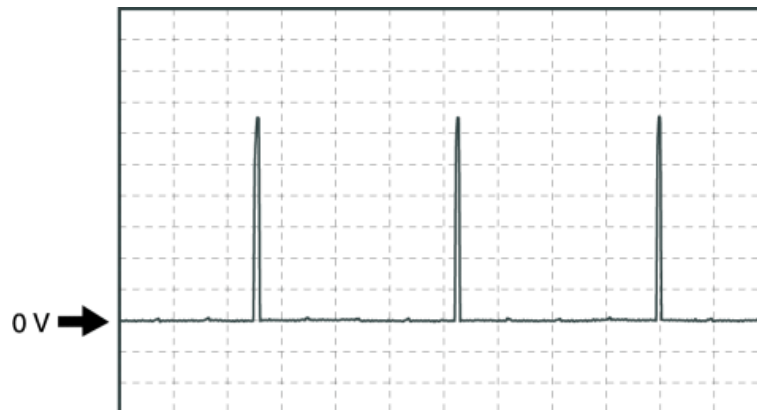
Oscilloscope setting

- 1 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

IGT1, IGT2, IGT3, IGT4 control signals



PCM terminals

- IGT1(ignition coil No.1): 2G(+)—body ground(—)
- IGT2(ignition coil No.2): 2K(+)—body ground(—)
- IGT3(ignition coil No.3): 2L(+)—body ground(—)
- IGT4(ignition coil No.4): 2H(+)—body ground(—)

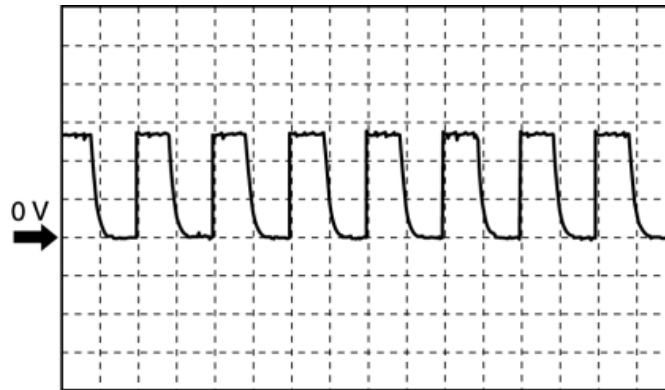
Oscilloscope setting

- 1 V/DIV (Y), 50 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

Generator field coil control signal



PCM terminals

- 2AA(+)—body ground(—)

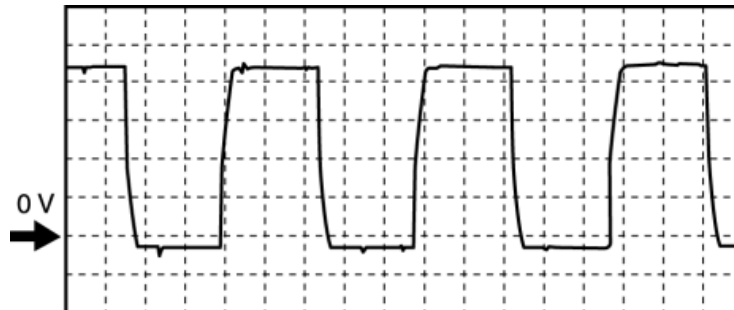
Oscilloscope setting

- 0.5 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

Generator output voltage signal



PCM terminals

- 2AF(+)—body ground(—)

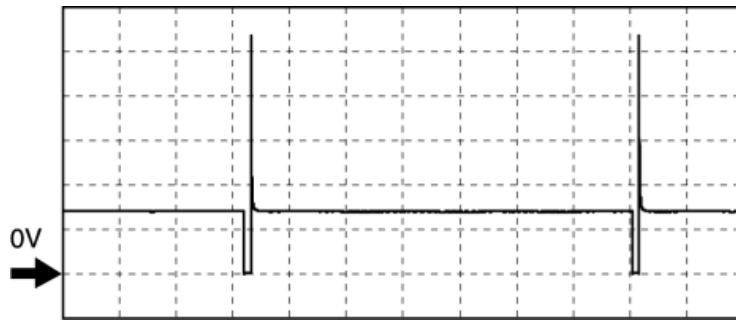
Oscilloscope setting

- 2 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

Fuel injection control

**PCM terminals**

- Fuel Injection No.1: 2BB(+)—body ground(-)
- Fuel Injection No.2: 2BC(+)—body ground(-)
- Fuel Injection No.3: 2BD(+)—body ground(-)
- Fuel Injection No.4: 2AZ(+)—body ground(-)

Oscilloscope setting

- 10 V/DIV (Y), 25 ms/DIV (X), DC range

Vehicle condition

- Idle (after warm up)

[< Previous](#) [Next >](#)