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2009 MAZDA CX-7 OEM Service and Repair Workshop Manual

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Terminal	Signal	Connected to	Test condition		Voltage (V)	inspection item
1AL *2	Ion (No.1)	Ion sensor No.1	Idle (after warm up)		Approx. 4.4	• Ion sensor No.1 • Related wiring harness
1AM *2	ECT	ECT sensor No.2	Ignition switched ON (engine off)	ECT 20 °C {68 °F}	Approx. 3.10	• ECT sensor No.2 • Related wiring harness
				ECT 40 °C {104 °F}	Approx. 2.16	
				ECT 60 °C {140 °F}	Approx. 1.40	
				ECT 80 °C {176 °F}	Approx. 0.87	
				ECT 100 °C {212 °F}	Approx. 0.54	
1AN	Engine oil temperature	Engine oil temperature sensor	Ignition switched ON (engine off)		Approx. 3.21	• Engine oil temperature sensor • Related wiring harness
1AO	–	–	–		–	–
1AP	GND	CKP sensor	Under any condition		Below 1.0	• Related wiring harness
1AQ	–	–	–		–	–
1AR	–	–	–		–	–
1AS	Engine oil pressure	Engine oil pressure sensor	Ignition switched ON (engine off)		Below 1.1	• Engine oil pressure sensor • Related wiring harness
			Immediately after the engine start		Approx. 1.6	
1AT	GND	Sensor shield	Under any condition		Below 1.0	• Related wiring harness
1AU	–	–	–		–	–
1AV	–	–	–		–	–
1AW	Purge control	Purge solenoid valve	(See Purge control.)			• Purge solenoid valve • Related wiring harness
1AX	–	–	–		–	–
1AY	–	–	–		–	–
1AZ	–	–	–		–	–
1BA *1	Exhaust shutter valve position	Exhaust shutter valve position sensor	Ignition switched ON (engine off)		Approx. 4.0	• Exhaust shutter valve position sensor • Related wiring harness
1BB *1	Swirl control valve position	Swirl control valve position sensor	Ignition switched ON (engine off)		Approx. 0.6	• Swirl control valve position sensor • Related wiring harness

Terminal	Signal	Connected to	Test condition	Voltage (V)	inspection item
1CK	Engine oil control	Engine oil solenoid valve	(See Engine oil control signal.)		• Engine oil solenoid valve • Related wiring harness
1CL	–	–	–	–	–
1CM *1	EGR control valve (EGR+)	EGR control valve	Ignition switched ON (engine off)	Approx. 13.0	• EGR control valve • Related wiring harness
			Idle (after warm up)	Approx. 14.29	
1CN *1	EGR control valve (EGR-)	EGR control valve	(See EGR valve (-).)		• EGR control valve • Related wiring harness
1CO	Hydraulic variable valve timing control	OCV for hydraulic variable valve timing system	(See Hydraulic variable valve timing control signal.)		• OCV • Related wiring harness
1CP	–	–	–	–	–
1CQ	Drive-by-wire control (+)	Throttle valve actuator	(See Drive-by-wire control (+) signal.)		• Throttle valve actuator • Related wiring harness
1CR	Drive-by-wire control (-)	Throttle valve actuator	Idle (after warm up) Because the drive-by-wire control (-) terminal value varies depending on the vehicle, examination using only the ICQ terminal is not possible. When performing the inspection, perform it together with the ICR terminal. • Type A — B+ • Type B — Approx. 0		• Throttle valve actuator • Related wiring harness
1CS	Exhaust shutter valve control (+)	Exhaust shutter valve	Ignition switched ON (engine off)	B+	• Exhaust shutter valve • Related wiring harness
1CT	Exhaust shutter valve control (-)	Exhaust shutter valve	Ignition switched ON (engine off)	B+	• Exhaust shutter valve • Related wiring harness
1CU	Fuel injection control (+)	Fuel injector No.3	(See Fuel injection control (+) signal.)		• Fuel injector No.3 • Related wiring harness
1CV	Fuel injection control (-)	Fuel injector No.3	(See Fuel injection control (-) signal.)		• Fuel injector No.3 • Related wiring harness

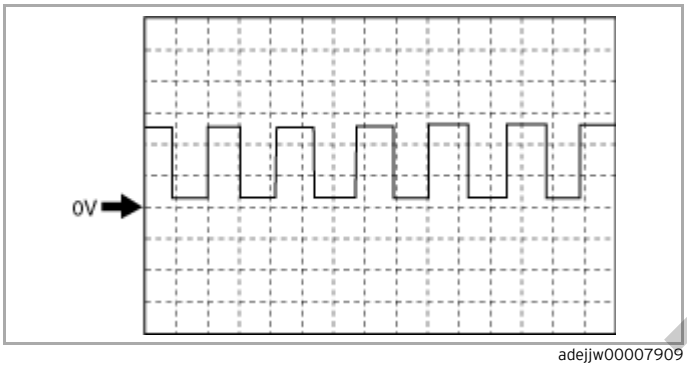
Terminal	Signal	Connected to	Test condition		Voltage (V)	inspection item
2V	–	–	–		–	–
2W	–	–	–		–	–
2X *3	Power brake unit vacuum	Power brake unit vacuum sensor	Idle (after warm up)	Brake pedal released	Approx. 0.3	• Power brake unit vacuum sensor • Related wiring harness
2Y	Active air shutter control (LIN), engine oil level sensor (LIN)	Active air shutter, engine oil level sensor	Because this terminal is for LIN, good/no good judgment by terminal voltage is not possible.			• Related wiring harness
2Z	–	–	–		–	–
2AA	–	–	–		–	–
2AB	Brake (No.1)	Brake switch (No.1 signal)	Brake pedal released		Below 1.0	• Brake switch (No.1 signal) • Related wiring harness
			Brake pedal depressed		B+	
2AC	–	–	–		–	–
2AD	–	–	–		–	–
2AE	–	–	–		–	–
2AF	A/C cut-off control	A/C relay	A/C relay OFF		B+	• A/C relay • Related wiring harness
			A/C relay ON		Below 1.0	
2AG	–	–	–		–	–
2AH	–	–	–		–	–
2AI	GND	MAF sensor, IAT sensor No.1, refrigerant pressure sensor, ambient temperature sensor, fuel tank pressure sensor, exhaust shutter valve position sensor *1, power brake unit vacuum sensor *3	Under any condition		Below 1.0	• Related wiring harness
2AJ	Fuel tank pressure	Fuel tank pressure sensor	Ignition switched ON (engine off)		2.1–2.6	• Fuel tank pressure sensor • Related wiring harness
2AK *3	DC-DC converter control	DC-DC converter	Ignition switched ON (engine off)		Below 1.0	• DC-DC converter • Related wiring harness
2AL	CV solenoid control	CV solenoid valve	Ignition switched ON (engine off)		B+	• CV solenoid valve • Related wiring harness
			Idle (CV solenoid valve not operating)		B+	
			Idle (CV solenoid valve operating)		Below 1.0	

*2:Without EGR cooler

*3:With i-stop

Inspection Using An Oscilloscope (Reference)

Electric variable valve timing motor (rotation direction) signal



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PCM terminals

• 1BN(+)−body ground(−)

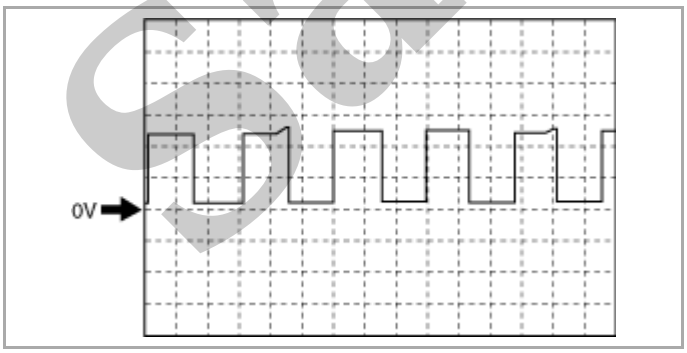
Oscilloscope setting

• 2 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition

• Idle (after warm up)

Electric variable valve timing motor (rotation pulse) signal



adejjw00007910

PCM terminals

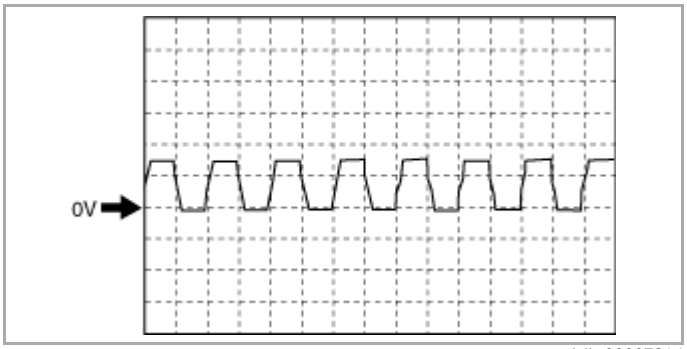
• 1BM(+)−body ground(−)

Oscilloscope setting

• 2 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition

• Idle (after warm up)



adejjw00007914

PCM terminals

• 1AG+)−body ground(-)

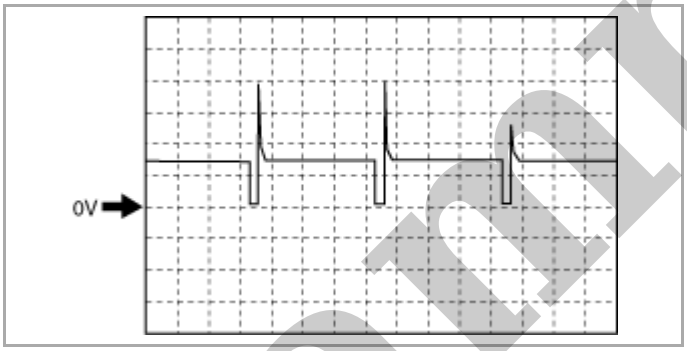
Oscilloscope setting

• 5 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

• Idle after warm up

Purge control



adejjw00007915

PCM terminals

• 1AW(+)−body ground(-)

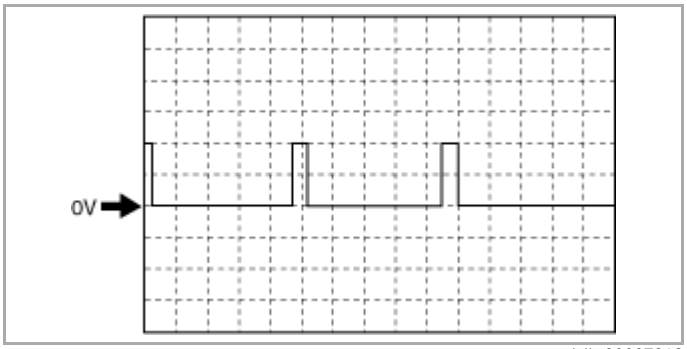
Oscilloscope setting

• 10 V/DIV (Y), 50 ms/DIV (X), DC range

Vehicle condition

• Racing (Engine speed: 2,000 rpm)

IGT1, IGT2, IGT3, IGT4 control



adejjw00007919

PCM terminals

• 1BV+)−body ground(−)

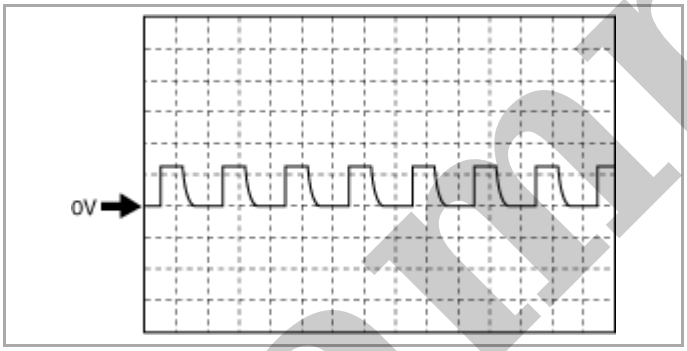
Oscilloscope setting

• 2 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

• Idle after warm up

Generator field coil control signal



adejjw00007920

PCM terminals

• 1BP(+)−body ground(−)

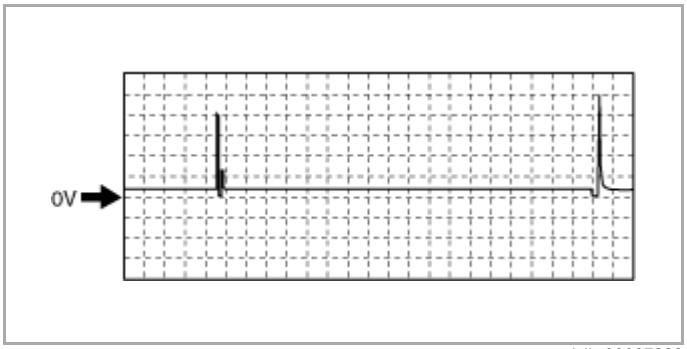
Oscilloscope setting

• 1 V/DIV (Y), 2 ms/DIV (X), DC range

Vehicle condition

• Idle after warm up

A/F sensor heater control signal



adejjw00007923

PCM terminals

• Fuel Injection No.1: 1DH(+)−body ground(-)
• Fuel Injection No.2: 1CZ(+)−body ground(-)
• Fuel Injection No.3: 1CV(+)−body ground(-)
• Fuel Injection No.4: 1DD(+)−body ground(-)

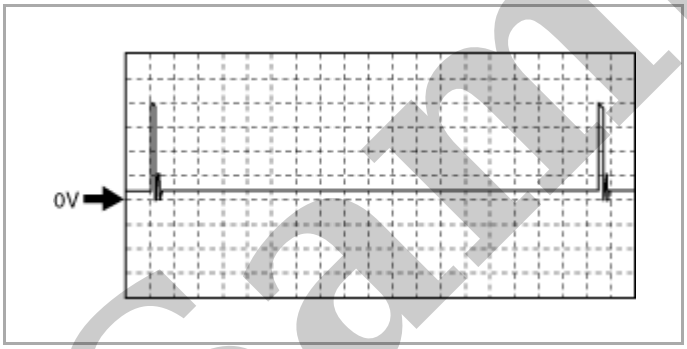
Oscilloscope setting

• 10 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition

• Idle after warm up

Fuel injection control (+) signal



adejjw00007924

PCM terminals

• Fuel Injection No.1: 1DG(+)−body ground(-)
• Fuel Injection No.2: 1CY(+)−body ground(-)
• Fuel Injection No.3: 1CU(+)−body ground(-)
• Fuel Injection No.4: 1DC(+)−body ground(-)

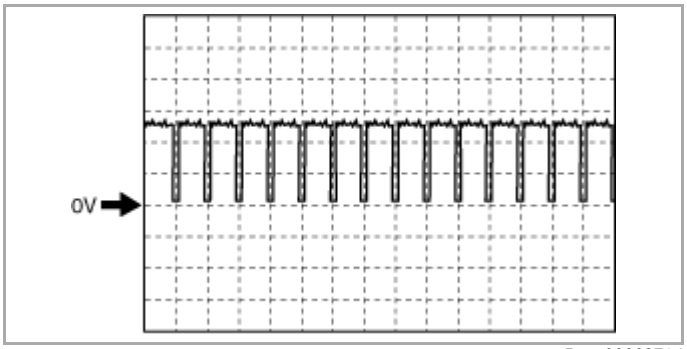
Oscilloscope setting

• 10 V/DIV (Y), 5 ms/DIV (X), DC range

Vehicle condition

• Idle after warm up

High pressure fuel pump control (+) signal



ac5uuw00009714

PCM terminals

• 2AX(+)−body ground(−)

Oscilloscope setting

• 2 V/DIV (Y), 50 ms/DIV (X), DC range

Vehicle condition

• Idle after warm up

Using The M-MDS

Note

• PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.

— Intake CMP sensor and exhaust CMP sensor (See CAMSHAFT POSITION (CMP) SENSOR INSPECTION [SKYACTIV-G 2.5 (WITH CYLINDER DEACTIVATION)].)
— Main relay (See RELAY INSPECTION.)

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

2.Switch the ignition 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.
• The simulation items that are used in the ENGINE CONTROL SYSTEM OPERATION INSPECTION are as follows.

— ACCS, AIRSHUT_DSD, ARPMDES, EVAPCP, EVAPCV, FAN1, FAN2, FP, INJ_1, INJ_2, INJ_3, INJ_4, LAFS_CM, OIL_P_SOL, Test

−: Not applicable

Item (definition)	Unit/Condition	Value type	Condition/Specification (Reference)
CSTNO1_OIDTR *3	Displays in the M-MDS but it does not operate.		
CSTNO2_OIDTR *3	Displays in the M-MDS but it does not operate.		
CSTNO3_OIDTR *3	Displays in the M-MDS but it does not operate.		
CSTNO4_OIDTR *3	Displays in the M-MDS but it does not operate.		
CSTNO5_OIDTR *3	Displays in the M-MDS but it does not operate.		
CTLY_NMHC_MN *3 (Catalyst monitoring/NMHC catalyst monitoring)	No/Yes	Calculation	• Displays catalyst monitoring/NMHC catalyst monitoring
D_IEV_CST *3 (Deactivation/Intake valve and exhaust valve control status)	Off/On	Calculation	• Displays deactivation/intake valve and exhaust valve control status
DAY_LTOIC *3	Displays in the M-MDS but it does not operate.		
DIS_EMD (Total traveled distance after EVAP monitoring is completed)	km, ft, mi	Calculation	• Displays total traveled distance after EVAP monitoring is completed
ECT (Engine coolant temperature)	°C, °F	Calculation	• Displays ECT
	V	Input	• ECT is 20 °C {68 °F}: Approx. 3.10 V • ECT is 40 °C {104 °F}: Approx. 2.16 V • ECT is 60 °C {140 °F}: Approx. 1.40 V • ECT is 80 °C {176 °F}: Approx. 0.87 V • ECT is 100 °C {212 °F}: Approx. 0.54 V
ECT2_V (ECT sensor No.2 voltage)	V	Input	• ECT is 20 °C {68 °F}: Approx. 3.10 V • ECT is 40 °C {104 °F}: Approx. 2.16 V • ECT is 60 °C {140 °F}: Approx. 1.40 V • ECT is 80 °C {176 °F}: Approx. 0.87 V • ECT is 100 °C {212 °F}: Approx. 0.54 V
EFCV_AP_C *3 (Exhaust shutter valve position desired)	° (deg)	Calculation	• Displays exhaust shutter valve position desired
EFCV_AP_M *3 (Exhaust shutter valve position actual)	° (deg)	Calculation	• Displays exhaust shutter valve position actual
EG_RUN_TIME *3 (Elapsed time since the engine was started)	Second	Calculation	• Displays the elapsed time since the engine was started.
EGR_VVT_MN_CP *3 (EGR and/or VVT system monitoring completed)	YES/NO	Calculation	• Displays EGR and/or VVT system monitoring completed
EGR_VVT_MNT *3 (EGR and/or VVT system monitoring)	No/Yes	Calculation	• Displays EGR and/or VVT system monitoring
EN_OENE_LT *3 (Engine output energy (Lifetime) (kWh))	–	Calculation	• Displays engine output energy (Lifetime) (kWh)
EN_OENE_R *3 (Engine output energy (Recent) (kWh))	–	Calculation	• Displays engine output energy (Recent) (kWh)
ENG_CL_V_POS (Coolant control valve opening angle)	° (deg)	Calculation	• Displays target coolant control valve opening angle
ENG_CL_V_POS_R (Coolant control valve opening angle raw)	° (deg)	Input	• Ignition switched ON (engine off): Approx. 114°
ENG_EXH_F_RATE *3 (Engine exhaust flow rate (kg/h))	–	Calculation	• Displays engine exhaust flow rate
ENG_FEL_RATE *3 (Engine fuel rate)	g/Sec	Calculation	• Displays engine fuel rate
ENG_EX_FLW *3 (Engine exhaust flow rate)	–	Calculation	• Displays engine exhaust flow rate
ENG_FRCTN_PER (Engine friction percent torque)	%	Calculation	• Displays engine friction percent torque
ENG_REF_TRQ *3 (Engine reference torque)	Nm	Calculation	• Displays engine reference torque