

2005 Mazda MX-5 Miata

2005 ENGINE PERFORMANCE Control System - MX-5 Miata

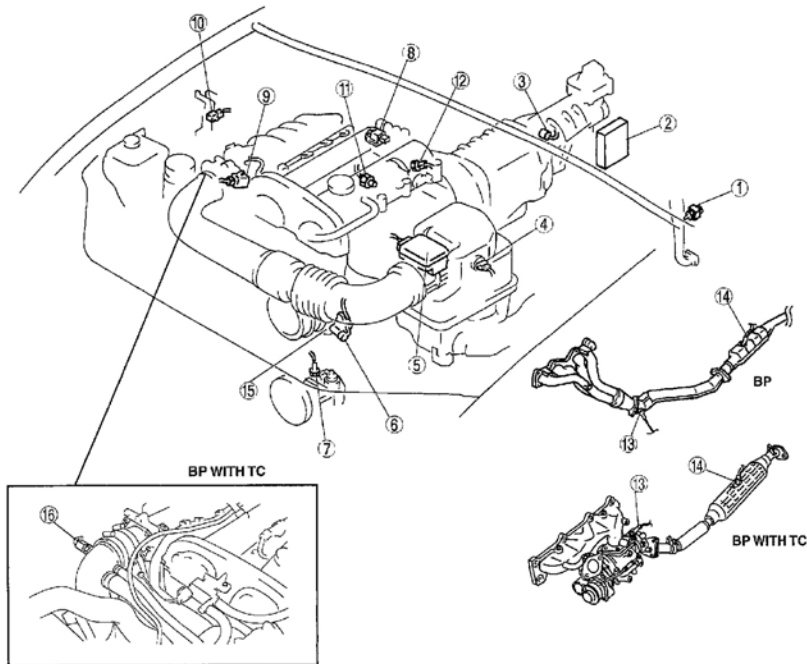
2005 ENGINE PERFORMANCE

Control System - MX-5 Miata

CONTROL SYSTEM LOCATION INDEX (BP, BP WITH TC)

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1	Clutch switch (MT) (See CLUTCH PEDAL POSITION SWITCH INSPECTION [BP, BP WITH TC].)
2	PCM (See PCM REMOVAL/INSTALLATION [BP, BP WITH TC].) (See PCM INSPECTION [BP, BP WITH TC].)
3	Neutral switch (MT) (See NEUTRAL SWITCH INSPECTION [BP, BP WITH TC].)
4	Intake air temperature (IAT) sensor (BP) Intake air temperature (IAT) sensor No.1 (BP WITH TC) (See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION [BP, BP WITH TC].)
5	Mass air flow (MAF) sensor (See MASS AIR FLOW (MAF) SENSOR INSPECTION [BP, BP WITH TC].)
6	Crankshaft position (CKP) sensor (See CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION [BP, BP WITH TC].) (See CRANKSHAFT POSITION (CKP) SENSOR ADJUSTMENT [BP, BP WITH TC].) (See CRANKSHAFT POSITION (CKP) SENSOR INSPECTION [BP, BP WITH TC].)
7	Power steering position (PSP) switch (See POWER STEERING PRESSURE (PSP) SWITCH INSPECTION [BP, BP WITH TC].)
8	Camshaft position (CMP) sensor (See CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION [BP, BP WITH TC].) (See CAMSHAFT POSITION (CMP) SENSOR INSPECTION [BP, BP WITH TC].)
9	Throttle position (TP) sensor (See THROTTLE POSITION (TP) SENSOR REPLACEMENT [BP, BP WITH TC].) (See THROTTLE POSITION (TP) SENSOR INSPECTION [BP, BP WITH TC].)

10	EGR boost sensor (BP) Barometric pressure (BARO)/manifold absolute pressure (MAP) sensor (BP WITH TC) (See EGR BOOST SENSOR (BP), BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH TC) INSPECTION [BP, BP WITH TC].)
11	Knock sensor (KS) (See KNOCK SENSOR (KS) REMOVAL/INSTALLATION [BP, BP WITH TC].) (See KNOCK SENSOR (KS) INSPECTION [BP, BP WITH TC].)
12	Engine coolant temperature (ECT) sensor (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION [BP, BP WITH TC].)
13	Heated oxygen sensor (HO2S) (Front) (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [BP, BP WITH TC].)
14	Heated oxygen sensor (HO2S) (Rear) (See HEATED OXYGEN SENSOR (HO2S) INSPECTION [BP, BP WITH TC].)
15	Plate (See PLATE REMOVAL/INSTALLATION [BP, BP WITH TC].)
16	Intake air temperature (IAT) sensor No. 2 (See INTAKE AIR TEMPERATURE (IAT) SENSOR NO. 2 INSPECTION [BP WITH TC].)

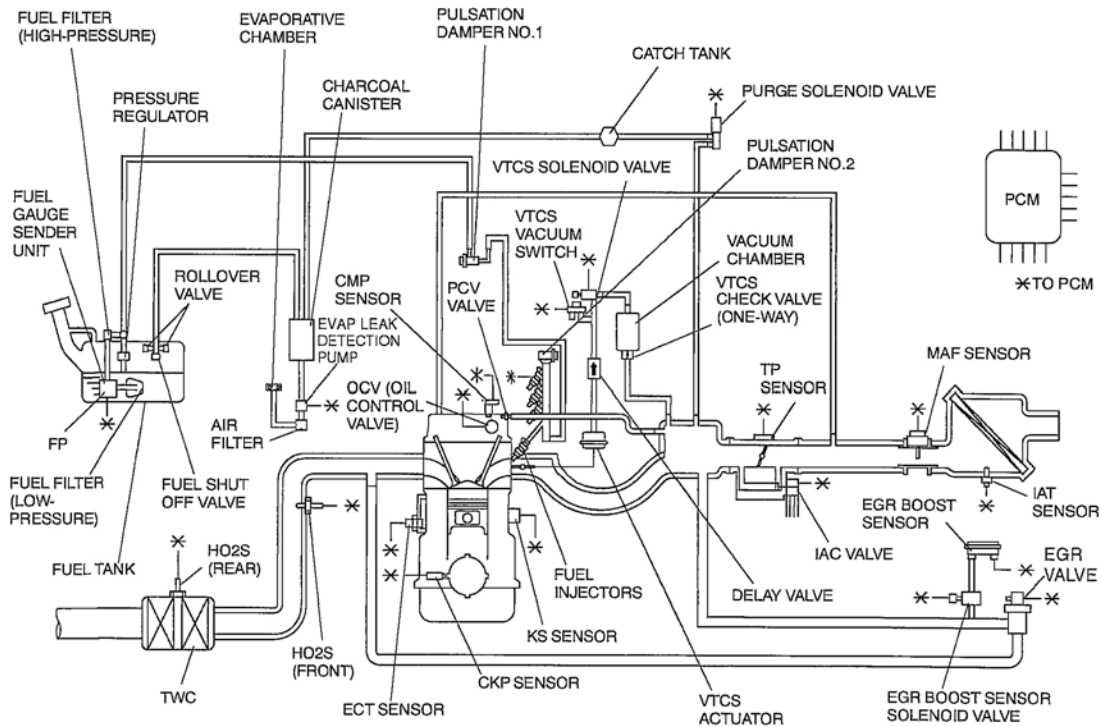
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Fig. 1: Locating Components Of Control System (BP, BP With TC)
Courtesy of MAZDA MOTORS CORP.

CONTROL SYSTEM DIAGRAM (BP)

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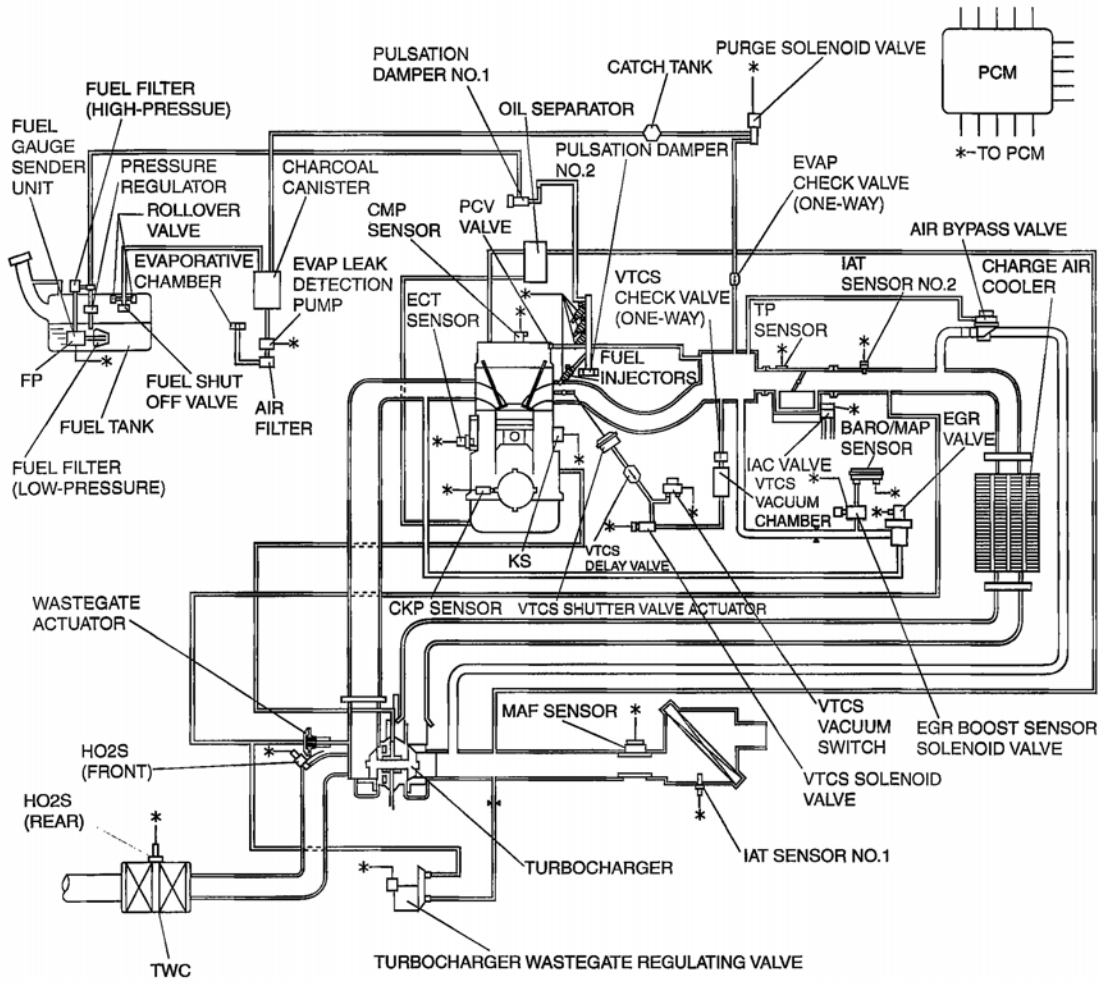
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Fig. 2: Identifying Control System Diagram (BP)
Courtesy of MAZDA MOTORS CORP.

CONTROL SYSTEM DIAGRAM (BP WITH TC)

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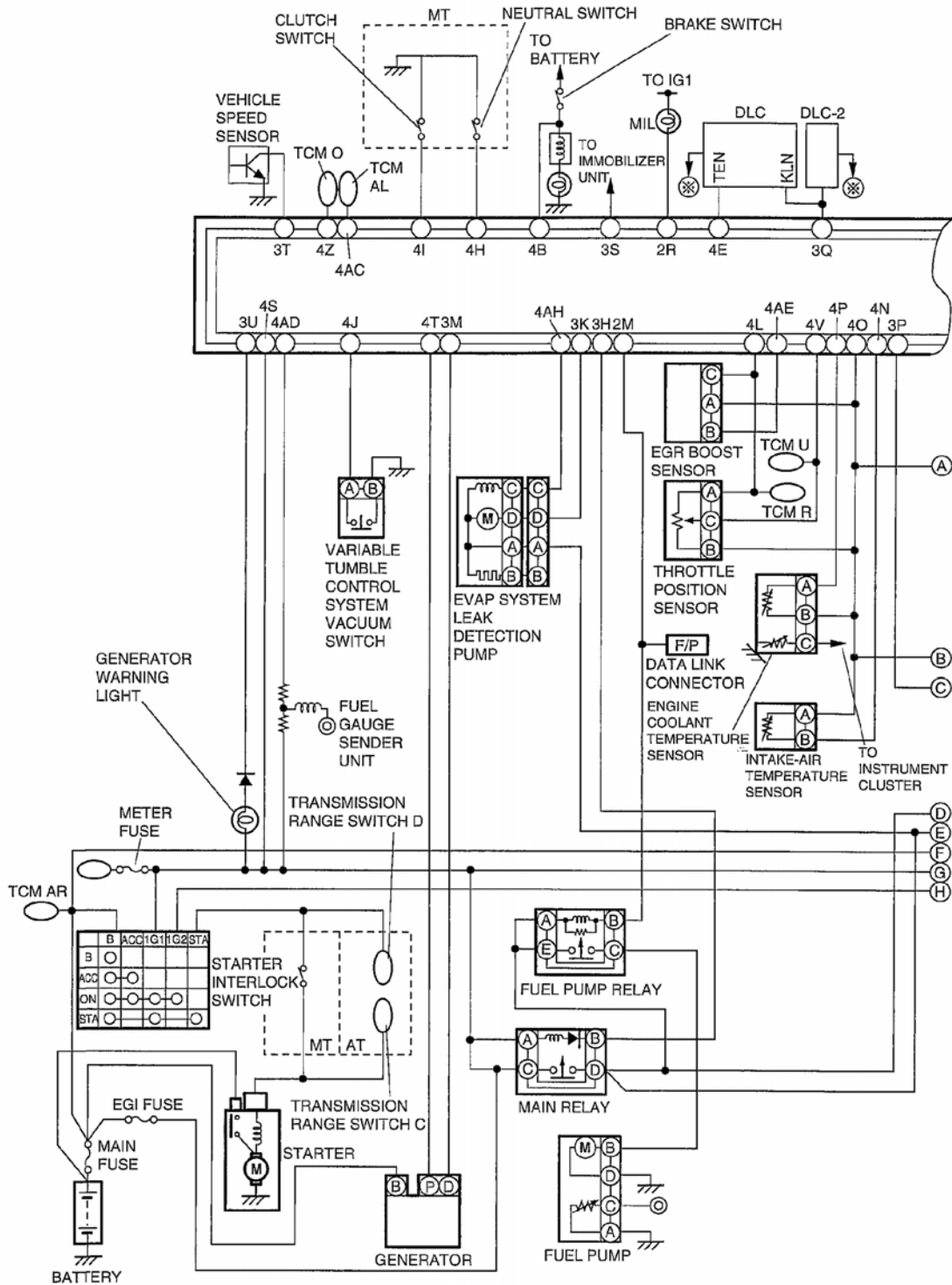
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Fig. 3: Identifying Control System Diagram (BP With TC)
Courtesy of MAZDA MOTORS CORP.

CONTROL SYSTEM WIRING DIAGRAM (BP)

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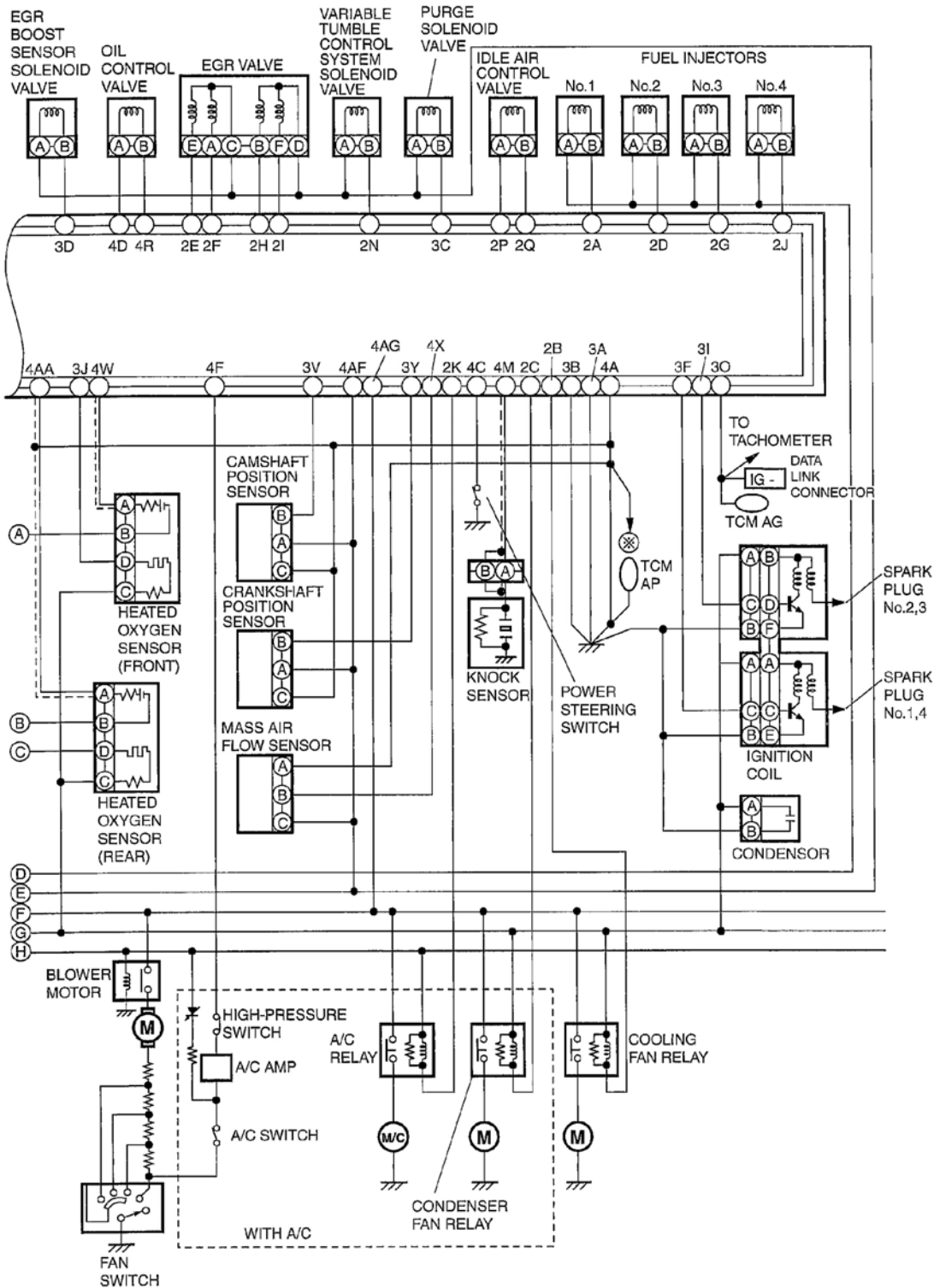


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Fig. 4: Identifying Control System Wiring Diagram (BP) (1 Of 2)
 Courtesy of MAZDA MOTORS CORP.

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Fig. 5: Identifying Control System Wiring Diagram (BP) (2 Of 2)
 Courtesy of MAZDA MOTORS CORP.

CONTROL SYSTEM WIRING DIAGRAM (BP WITH TC)

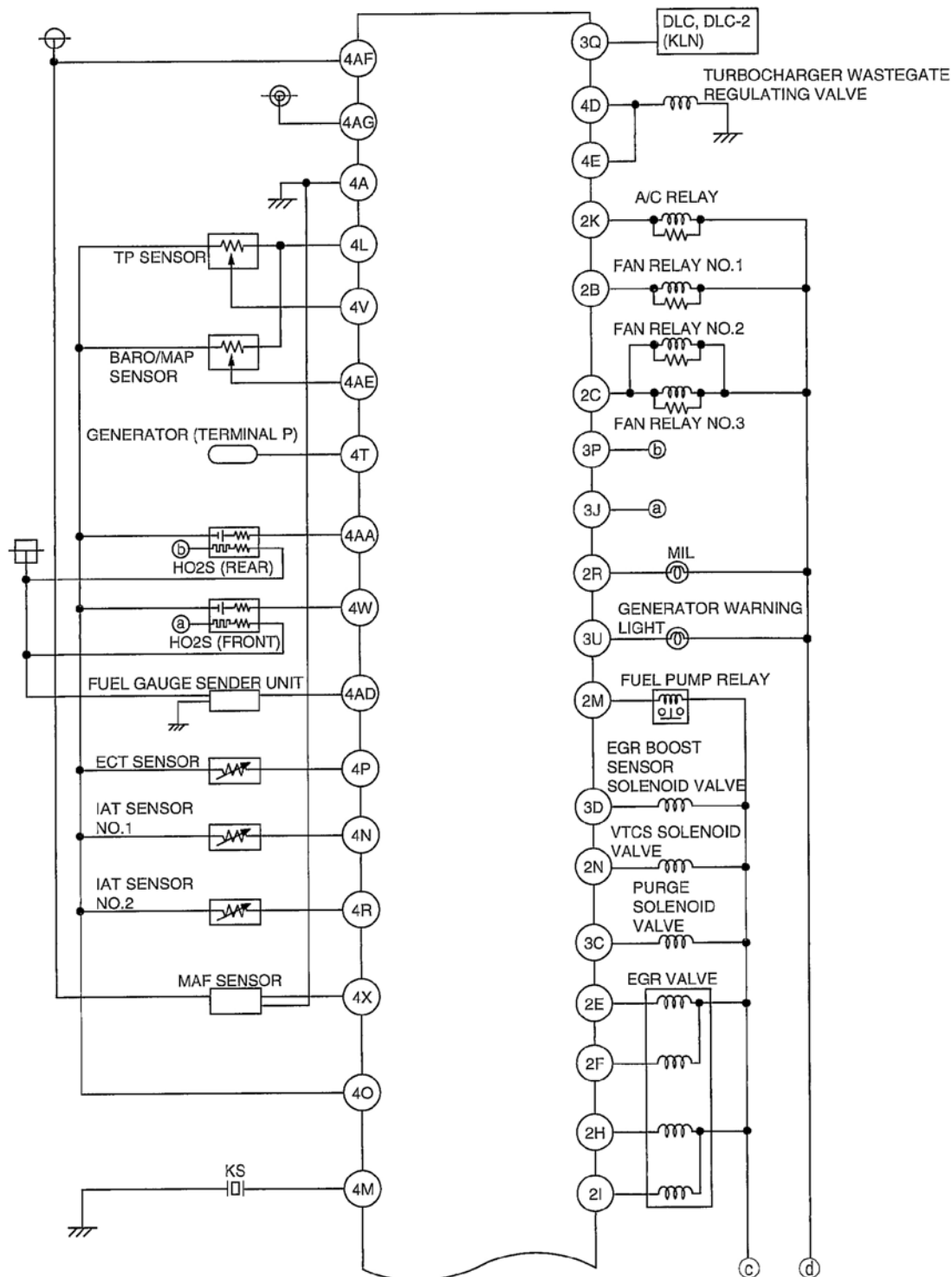
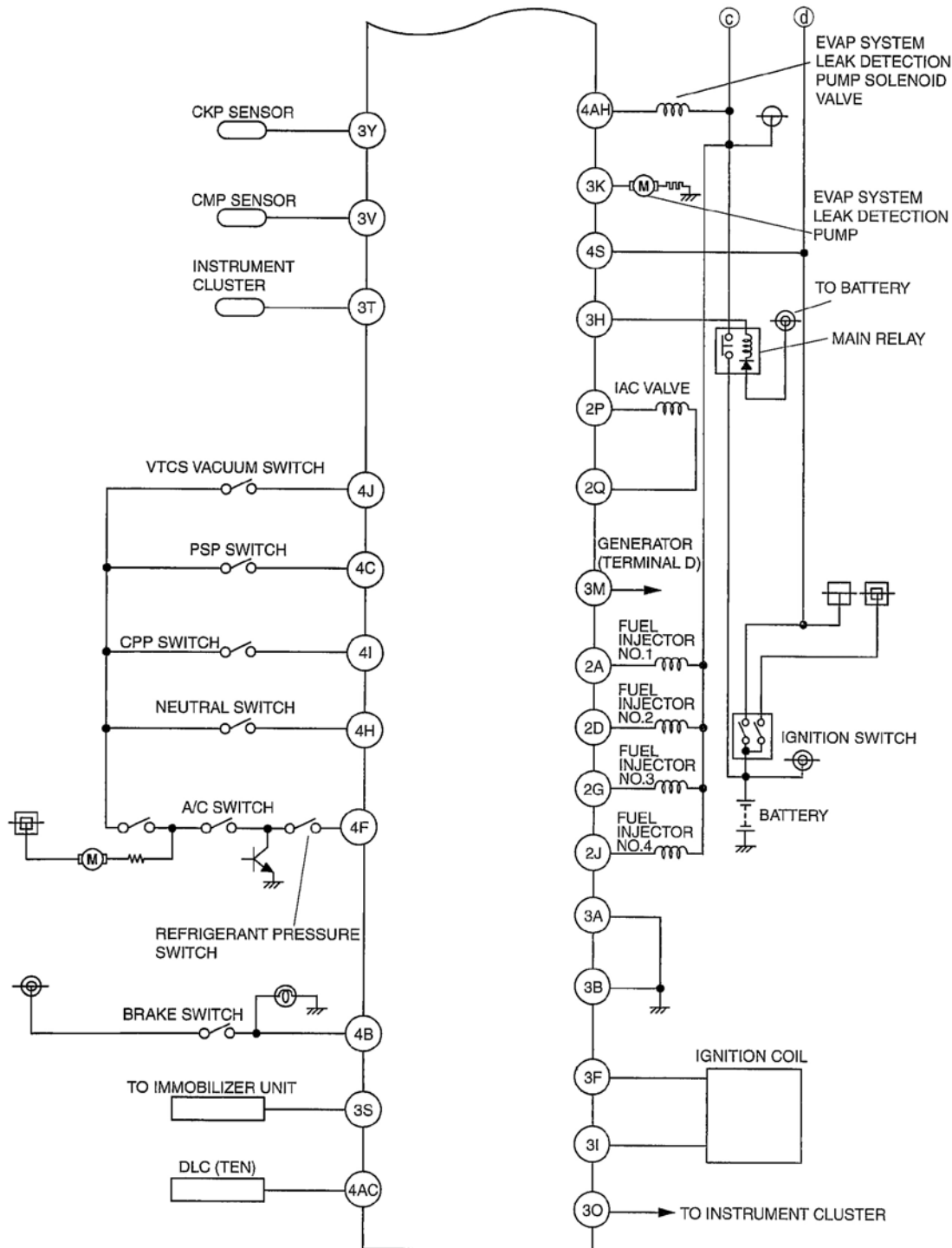


Fig. 6: Identifying Control System Wiring Diagram (BP With TC) (1 Of 2)
 Courtesy of MAZDA MOTORS CORP.



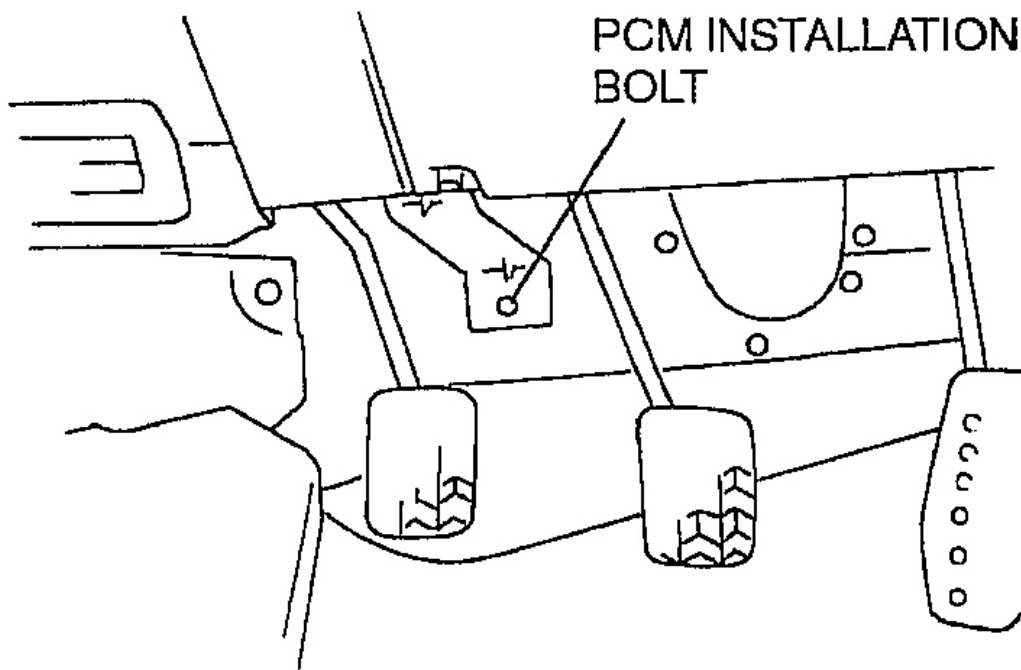
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Fig. 7: Identifying Control System Wiring Diagram (BP With TC) (2 Of 2)

Courtesy of MAZDA MOTORS CORP.

PCM REMOVAL/INSTALLATION (BP, BP WITH TC)

1. Disconnect the negative battery cable.
2. Disconnect the connector from the PCM installed on the upper part of the brake pedal.
3. Remove the bolt and nut holding the PCM.



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Fig. 8: Locating PCM Installation Bolt
Courtesy of MAZDA MOTORS CORP.

1. Push the harness (PCM harness) installed to the brake pedal bracket in the opposite direction of the brake pedal bracket.
2. While pushing the harness, push the stay until it comes apart from the stud with the PCM installation nut.

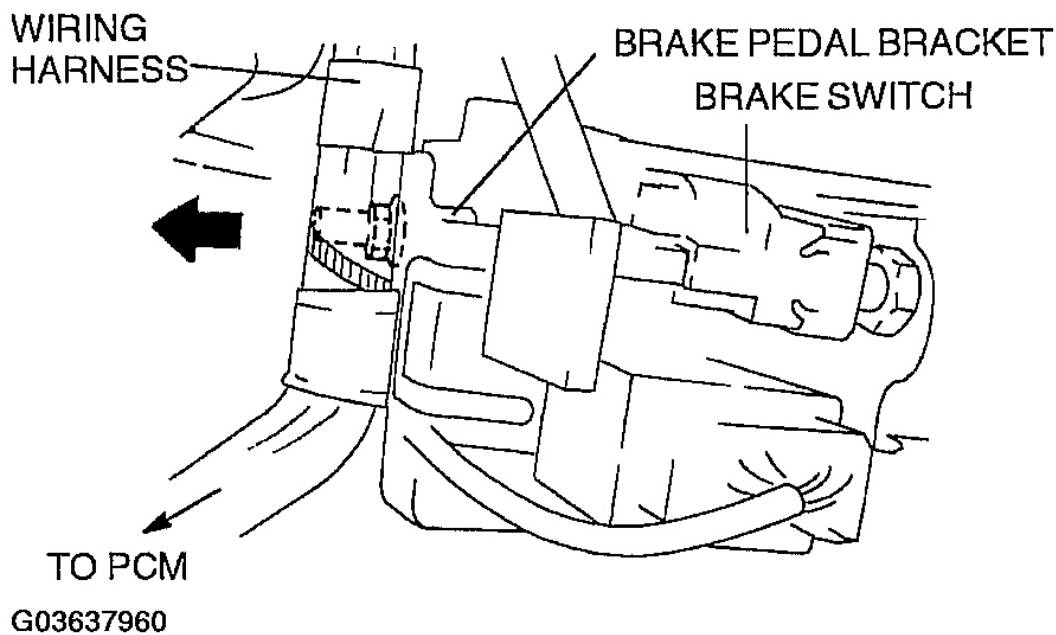
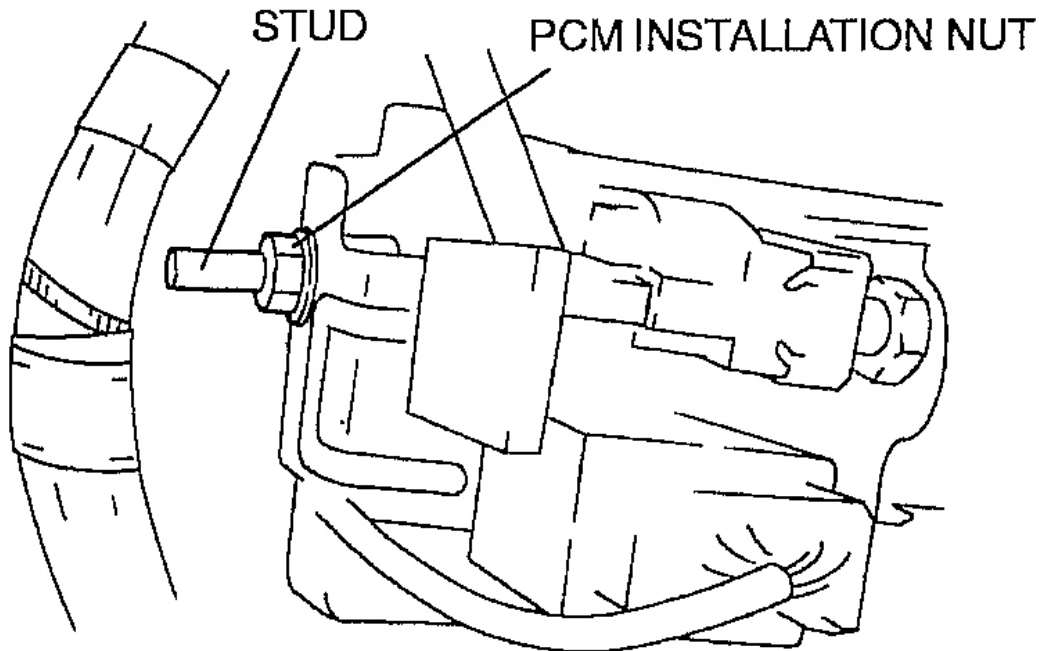


Fig. 9: Removing PCM Wiring Harness
Courtesy of MAZDA MOTORS CORP.

3. Remove the PCM installation nut.
4. Install in the reverse order of removal.

Tightening torque

Bolt, nut: 7.9-10.7 N.m {80-110 kgf.cm, 70-95.4 in.lbf}



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Fig. 10: Tightening PCM Installation Nut
Courtesy of MAZDA MOTORS CORP.

PCM INSPECTION (BP, BP WITH TC)

USING SST (WDS OR EQUIVALENT)

Procedure

NOTE:

- PIDs for the following parts are not available on this model. Go to the appropriate part inspection page.
- ECT sensor (Water temperature sender unit). (See ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION (BP, BP WITH TC).)
- Camshaft position sensor. (See CAMSHAFT POSITION (CMP) SENSOR INSPECTION (BP, BP WITH TC).)
- Main relay. (See RELAY INSPECTION .)

1. Connect the WDS or equivalent to the DLC-2.
2. Turn the ignition switch to the ON position.

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3. Measure the value.

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

BP

PCM TERMINALS REFERENCE (BP)

Monitor item (Definition)	Unit/Condition		Condition/Specification (Reference)	ACTION	PCM terminal
ACCS (A/C relay)	ON/OFF		A/C operating: ON Ignition switch ON: OFF	<ul style="list-style-type: none"> • Inspect following PIDs: RPM, TP, ECT, ACSW. • Inspect A/C relay <p>(See RELAY INSPECTION)</p>	2K
ACSW (Refrigerant pressure switch)	ON/OFF		Refrigerant pressure switch and fan switch ON: ON Refrigerant pressure switch OFF: OFF	<ul style="list-style-type: none"> • Inspect refrigerant pressure switch <p>(See REFRIGERANT PRESSURE SWITCH INSPECTION)</p>	4F
ALTF (Generator field coil control duty value)	%		Ignition switch ON: 0% Idle: 0-100% Generator operating --> E/L ON: Duty value rise	<ul style="list-style-type: none"> • Inspect following PIDs: IAT, RPM, ALTT V. • Inspect generator <p>(See GENERATOR INSPECTION)</p>	3M
ALTT V (Generator output voltage)	V		Ignition switch ON: 1.0 V or less Idle: Approx.14V	<ul style="list-style-type: none"> • Inspect following PIDs: IAT, RPM, ALTF. • Inspect generator <p>(See GENERATOR INSPECTION)</p>	4T
ARPMDES (Target engine speed)	RPM		Idle (after warm up and no load): 750-850 rpm	<ul style="list-style-type: none"> • Perform "ON-BOARD DIAGNOSTIC TEST" (See ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)) 	--
BARO (Barometric pressure)	kPa	Hg	Below 400 m {0.25 mile} above sea level: 99-103 kPa {29-30 inHg}	<ul style="list-style-type: none"> • Inspect EGR boost sensor <p>(See EGR BOOST SENSOR (BP), BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH</p>	4AE

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			<u>TC) INSPECTION (BP, BP WITH TC)</u>		
	V	Below 400 m {0.25 mile} above sea level: 4.1-4.3 V With pressure gauge: <ul style="list-style-type: none"> • Vacuum reading - 26.6 kPa {-200 mmHg, -7.85 inHg}: 3.0-3.4 V 	<ul style="list-style-type: none"> • Inspect EGR boost sensor <p>(See <u>EGR BOOST SENSOR (BP), BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH TC) INSPECTION (BP, BP WITH TC)</u>)</p>	4AE	
BOO (Brake switch)	ON/OFF	Brake pedal depressed: ON Brake pedal released: OFF	<ul style="list-style-type: none"> • Inspect brake switch <p>(See <u>BRAKE SWITCH INSPECTION)</u>)</p>	4B	
CDCV (EVAP leak detection pump)	ON/OFF	Ignition switch ON: OFF Idle: OFF	<ul style="list-style-type: none"> • Inspect EVAP leak detection pump. <p>(See <u>EVAPORATIVE EMISSION (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION (BP, BP WITH TC))</u>)</p>	4AH	
CHRGLP (Generator warning light)	ON/OFF	Ignition switch ON: ON Idle: OFF	<ul style="list-style-type: none"> • Inspect generator warning light <p>(See <u>WARNING AND INDICATOR LIGHT BULB REMOVAL/INSTALLATION)</u>)</p>	3U	
CPP (Clutch switch)	ON/OFF	Clutch pedal depressed: ON Clutch pedal released: OFF	<ul style="list-style-type: none"> • Inspect clutch pedal position switch <p>(See <u>CLUTCH PEDAL POSITION SWITCH INSPECTION (BP, BP WITH TC)</u>)</p>	4I	
CPP/PNP (MT) (Neutral switch)	Neutral/Drive	Shift position at neutral: Neutral Others: Drive	<ul style="list-style-type: none"> • Inspect neutral switch <p>(See <u>NEUTRAL SWITCH INSPECTION (BP, BP WITH TC.)</u>)</p>	4H	
ECT (Engine coolant temperature)	°C	°F	ECT 20°C {68°F}: 20°C {68°F} ECT 60°C {140°F}: 60°	<ul style="list-style-type: none"> • Inspect ECT sensor <p>(See <u>ENGINE COOLANT</u>)</p>	4P

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		C {140°F}	<u>TEMPERATURE (ECT) SENSOR INSPECTION (BP, BP WITH TC)</u>	
	V	ECT 20°C {68°F}: 3.0-3.1 V After warm up: Below 1.0 V	<ul style="list-style-type: none"> Inspect ECT sensor <p>(See <u>ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p>	4P
EGRCHK (EGR boost sensor solenoid valve)	ON/OFF	Ignition switch ON: OFF Idle: OFF	<ul style="list-style-type: none"> Inspect EGR boost sensor solenoid valve <p>(See <u>EGR BOOST SENSOR SOLENOID VALVE INSPECTION (BP, BP WITH TC)</u>)</p>	3D
EVAPCP (Purge solenoid valve duty value)	%	Ignition switch ON: 0%	<ul style="list-style-type: none"> Inspect following PIDs: IAT, RPM, ECT, MAR TP, BARO, O2S11. Inspect purge solenoid valve <p>(See <u>PURGE SOLENOID VALVE INSPECTION (BP, BP WITH TC)</u>)</p>	3C
FAN2 (Condenser fan control)	ON/OFF	Condenser fan operating (ECT above 108°C {226°F}) or terminal TEN grounded and throttle valve open or A/C relay ON: ON Others: OFF	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, ACSW, TEST. Inspect condenser fan relay <p>(See <u>RELAY INSPECTION</u>)</p>	2C
FAN3 (Cooling fan control)	ON/OFF	Cooling fan operating (ECT above 97°C {207°F}) or terminal TEN grounded and throttle valve open or A/C relay ON: ON Others: OFF	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, ACSW. Inspect cooling fan relay <p>(See <u>RELAY INSPECTION</u>)</p>	2B
FP (Fuel pump relay)	ON/OFF	Idle: ON Cranking: ON	<ul style="list-style-type: none"> Inspect following PID: RPM. Inspect FP relay <p>(See <u>RELAY INSPECTION</u>)</p>	2M
FTL V (Fuel tank level)	V	Idle condition	<ul style="list-style-type: none"> Inspect fuel gauge sender unit 	4AD

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signal voltage)		<ul style="list-style-type: none"> Fuel tank full: 0.2-0.5 V Fuel tank empty: 3.4-4.4 V Fuel tank half: 1.8-2.8 V <p>NOTE:</p> <ul style="list-style-type: none"> The voltages above will be measured when the battery voltage is between 12 V and 14 V. 	(See FUEL GAUGE SENDER UNIT INSPECTION)	
FUELPW1 (Fuel injection duration)	ms	Ignition switch ON: 0 ms Idle: 1.5-4.0 ms	<ul style="list-style-type: none"> Inspect following PIDs: MAF, IAT, RPM, TP, ECT, PNP, CPP, O2S11, PSP, BOO, ACSW, CMP sensor <p>(See CAMSHAFT POSITION (CMP) SENSOR INSPECTION (BP, BP WITH TC))</p>	2A, 2D, 2G, 2J
HTR11 (Heated oxygen sensor heater (Front))	ON/OFF	Always: ON	<ul style="list-style-type: none"> Inspect following PIDs: ECT, MAF. Inspect HO2S heater <p>(See HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC))</p>	3J
HTR12 (Heated oxygen sensor heater (Rear))	ON/OFF	ECT above 70°C {158°F}: ON ECT below 70°C {158°F}: OFF	<ul style="list-style-type: none"> Inspect following PIDs: ECT, MAF. Inspect HO2S heater <p>(See HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC))</p>	3P
IAC (Idle air control valve)	%	Idle: Approx.30%	<ul style="list-style-type: none"> Inspect following PIDs: IAT, RPM, ECT, MAF, TP, PNP, CPP, PSP, ACSW, TEST. Inspect IAC valve 	2P, 2Q

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			(See IDLE AIR CONTROL (IAC) VALVE INSPECTION (BP, BP WITH TC))		
IAT (Intake air temperature)	°C	°F	IAT 20°C {68°F}: 20°C {68°F}	<ul style="list-style-type: none"> Inspect IAT sensor <p>(See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION (BP, BP WITH TC))</p>	4N
	V		IAT 20°C {68°F}: 2.3-2.4 V IAT 30°C {86°F}: 1.9 V	<ul style="list-style-type: none"> Inspect IAT sensor <p>(See INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION (BP, BP WITH TC))</p>	4N
IMRC (VTCS solenoid valve)	ON/OFF		ECT below 60°C {140°F} while idling: ON	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, Inspect VTCS solenoid valve. <p>(See VARIABLE TUMBLE CONTROL SYSTEM (VTCS) SOLENOID VALVE INSPECTION (BP, BP WITH TC))</p> <ul style="list-style-type: none"> Inspect the vacuum hose for improper routing, kinks or leaks 	2N
IMRCM (VTCS vacuum switch)	ON/OFF		ECT below 60°C {140°F} while idling: ON	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT. Inspect VTCS vacuum switch. <p>(See VARIABLE TUMBLE CONTROL SYSTEM (VTCS) VACUUM SWITCH INSPECTION (BP, BP WITH TC))</p> <ul style="list-style-type: none"> Inspect the vacuum hose for improper routing, kinks or leaks 	4J
KNOCKR (Knocking retard)	°		Ignition switch ON: 0° Idle: 0°	<ul style="list-style-type: none"> Inspect KS <p>(See KNOCK SENSOR (KS) INSPECTION (BP, BP WITH TC))</p>	4M

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LOAD (Calculated engine load)	%	Idle: 15.0-23.0% (MT), 14.0-23.0 (AT) Indicator engine load	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
LONGFT1 (Current long term fuel trim adjustment)	%	Idle: -20-20%	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
MAF (Intake MAF)	g/s lb/min	Idle: 2.6-3.3 g/s {0.3-0.4 lb/min} (MT), 2.4-3.4 g/s {0.3-0.4 lb/min} (AT)	<ul style="list-style-type: none"> Inspect MAF sensor (See <u>MASS AIR FLOW (MAF) SENSOR INSPECTION (BP, BP WITH TC)</u>) 	4X
	V	Ignition switch ON: 0.9-2.0 V Idle: 1.7-2.4 V	<ul style="list-style-type: none"> Inspect MAF sensor (See <u>MASS AIR FLOW (MAF) SENSOR INSPECTION (BP, BP WITH TC)</u>) 	4X
MIL (Malfunction indicator lamp)	ON/OFF	Ignition switch ON: ON DTC output: ON No DTC output: OFF	<ul style="list-style-type: none"> Inspect MIL (See <u>WARNING AND INDICATOR LIGHT BULB REMOVAL/INSTALLATION</u>) 	2R
MTSW (MA/AT discrimination signal)	1/0	MT: 1 AT: 0	--	4I
O2S11 (Heated oxygen sensor (Front))	V	Ignition switch ON: 0-1.0 V After warm up: 0-1.0 V Acceleration: 0.5-1.0 V Deceleration: 0-0.5 V	<ul style="list-style-type: none"> Inspect HO2S (Front) (See <u>HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC)</u>) 	4W
O2S12 (Heated oxygen sensor (Rear))	V	Ignition switch ON: 0-1.0 V Idle (After warm up): 0-1.0 V Idle (Engine cold): 0-0.5 V Accelerate: 0.5-1.0 V Decelerate: 0-0.5 V	<ul style="list-style-type: none"> Inspect HO2S (Rear) (See <u>HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC)</u>) 	4AA
PSP (PSP switch)	High/Low	Steering wheel is at straight ahead position: Low Steering wheel is fully	<ul style="list-style-type: none"> Inspect PSP switch (See <u>POWER STEERING PRESSURE (PSP) SWITCH</u>) 	4C

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		turned: High	<u>INSPECTION (BP, BP WITH TC)</u>	
RFCFLAG (Fuel learning correction set flag)	ON/OFF	Adaptive memory exists: ON No adaptive memory: OFF	--	--
RPM (Engine speed)	RPM	Idle (After warm up and no load): 750-850 rpm	<ul style="list-style-type: none"> Inspect CKP sensor <p>(See <u>CRANKSHAFT POSITION (CKP) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p>	3Y
SEGRP (EGR valve (stepping motor) position)	step	Ignition switch ON: 0 step Idle: 0 step Cranking: 0-60 steps	<ul style="list-style-type: none"> Inspect following PIDs: ECT, TP. Inspect EGR valve <p>(See <u>EGR VALVE INSPECTION (BP, BP WITH TC)</u>)</p>	2E, 2F, 2H, 2I
SHRTFT1 (Short term trim)	%	Idle: -25-25%	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
SORK TIME (Engine sork time)	MIN	--	--	--
SPARKADV (Ignition timing)	°	Idle: BTDC 6-18° Idle (Terminal TEN GND): BTDC 9-11° Cranking: Approx.6°	<ul style="list-style-type: none"> Inspect following PIDs: MAF, IAT, RPM, TP, ECT, PSP, PNP, CPP, ACSW, TEST, CMP sensor. Perform engine tune-up <p>(See <u>ENGINE TUNE-UP</u>)</p>	3V
Test (TEN terminal (DLC))	ON/OFF	Open terminal TEN: OFF Shorted terminal TEN: ON	<ul style="list-style-type: none"> Inspect the DLC TEN terminal and PCM connector terminal 4E 	4E
TP (Throttle position sensor signal voltage)	V	Closed TP: 0.1-1.1 V WOT: 3.0-4.6 V	<ul style="list-style-type: none"> Inspect TP sensor <p>(See <u>THROTTLE POSITION (TP) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p>	4V
VPWR (Battery positive voltage)	V	Ignition switch ON: B+	<ul style="list-style-type: none"> Inspect main relay <p>(See <u>RELAY INSPECTION</u>)</p>	4AF

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				<ul style="list-style-type: none"> Inspect battery <p>(See <u>BATTERY INSPECTION</u>)</p>	
VSS (Vehicle speed)	KPH	MPH	Vehicle speed 20 km/h { 12.5 mph } : 20 km/h { 12.5 mph } Vehicle speed 40 km/h { 25 mph } : 40 km/h { 25 mph }	<ul style="list-style-type: none"> Inspect VSS. <p>(See <u>VEHICLE SPEEDOMETER SENSOR INSPECTION (M15M-D)</u>)</p>	3T
VT ACT (Actual valve timing)		°	4,500-5,000 rpm: 20° - 15°	<ul style="list-style-type: none"> Inspect CMP sensor. <p>(See <u>CAMSHAFT POSITION (CMP) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p> <ul style="list-style-type: none"> Inspect oil control valve (OCV). <p>(See <u>OIL CONTROL VALVE (OCV) INSPECTION (BP)</u>)</p>	4D, 4R
VT TGT (Target valve timing)		°	4,500-5,000 rpm: 20° - 15°	<ul style="list-style-type: none"> Inspect CMP sensor. <p>(See <u>CAMSHAFT POSITION (CMP) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p> <ul style="list-style-type: none"> Inspect oil control valve (OCV). <p>(See <u>OIL CONTROL VALVE (OCV) INSPECTION (BP)</u>)</p>	--

BP WITH TC

PCM TERMINALS REFERENCE (BP WITH TC)

Monitor item (Definition)	Unit/Condition	Condition/Specification (Reference)	ACTION	PCM terminal
ACCS (A/C relay)	ON/OFF	A/C operating: ON Ignition switch ON: OFF	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, ACSW. Inspect A/C relay <p>(See <u>RELAY INSPECTION</u>)</p>	2K
ACSW (Refrigerant)	ON/OFF	Refrigerant pressure switch and fan switch	<ul style="list-style-type: none"> Inspect refrigerant pressure switch 	4F

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pressure switch)		ON: ON Refrigerant pressure switch OFF: OFF	(See <u>REFRIGERANT PRESSURE SWITCH INSPECTION</u>)	
ALTF (Generator field coil control duty value)	%	Ignition switch ON: 0% Idle: 0-100% Generator operating --> E/L ON: Duty value rise	<ul style="list-style-type: none"> Inspect following PIDs: IAT, RPM, ALTT V. Inspect generator (See <u>GENERATOR INSPECTION</u>)	3M
ALTT V (Generator output voltage)	V	Ignition switch ON: 1.0 V or less Idle: Approx.14 V	<ul style="list-style-type: none"> Inspect following PIDs: IAT, RPM, ALTF. Inspect generator (See <u>GENERATOR INSPECTION</u>)	4T
ARPMDES (Target engine speed)	RPM	Indicate the target engine speed	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
BOO (Brake switch)	ON/OFF	Brake pedal depressed: ON Brake pedal released: OFF	<ul style="list-style-type: none"> Inspect brake switch (See <u>BRAKE SWITCH INSPECTION</u>)	4B
CDCV (EVAP leak detection pump)	ON/OFF	Ignition switch ON: OFF Idle: OFF	<ul style="list-style-type: none"> Inspect EVAP leak detection pump. (See <u>EVAPORATIVE EMISSION (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION (BP, BP WITH TC)</u>)	4AH
CHRGLP (Generator warning light)	ON/OFF	Ignition switch ON: ON Idle: OFF	<ul style="list-style-type: none"> Inspect generator warning light (See <u>WARNING AND INDICATOR LIGHT BULB REMOVAL/INSTALLATION</u>)	3U
CPP (Clutch switch)	ON/OFF	Clutch pedal depressed: ON Clutch pedal released: OFF	<ul style="list-style-type: none"> Inspect clutch pedal position switch (See <u>CLUTCH PEDAL POSITION SWITCH INSPECTION (BP, BP WITH TC)</u>)	4I

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CPP/PNP (Neutral switch)	Neutral/Drive		Shift position at neutral: Neutral Others: Drive	<ul style="list-style-type: none"> Inspect neutral switch <p>(See <u>NEUTRAL SWITCH INSPECTION (BP, BP WITH TC)</u>)</p>	4H
ECT (Engine coolant temperature)	°C	°F	Ignition switch is turned to the ON position: Indicate the engine coolant temperature	<ul style="list-style-type: none"> Inspect ECT sensor <p>(See <u>ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p>	4P
	V		ECT 20°C {68°F}: Approx.3.0 V ECT 80°C {176°F}: Approx.0.9 V		
EGRCHK (EGR boost sensor solenoid valve)	ON/OFF		Ignition switch ON: OFF Idle: ON	<ul style="list-style-type: none"> Inspect EGR boost sensor solenoid valve <p>(See <u>EGR BOOST SENSOR SOLENOID VALVE INSPECTION (BP, BP WITH TC)</u>)</p>	3D
EVAPCP (Purge solenoid valve duty value)	%		Ignition switch ON: 0%	<ul style="list-style-type: none"> Inspect following PIDs: IAT, RPM, ECT, MAF, TP, MAP, O2S11. Inspect purge solenoid valve <p>(See <u>PURGE SOLENOID VALVE REMOVAL/INSTALLATION (BP, BP WITH TC)</u>)</p>	3C
FAN2 (Fan control)	ON/OFF		Terminal TEN grounded and throttle valve open: ON Others: OFF	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, ACSW, TEST. Inspect fan relay No.2 <p>Inspect fan relay No.3</p> <p>(See <u>RELAY INSPECTION</u>)</p>	2C
FAN3 (Fan control)	ON/OFF		Terminal TEN grounded and throttle valve open: ON Others: OFF	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, ACSW. Inspect fan relay No.1 <p>(See <u>RELAY INSPECTION</u>)</p>	2B
FP (Fuel pump relay)	ON/OFF		Idle: ON Cranking: ON	<ul style="list-style-type: none"> Inspect following PID: RPM. Inspect FP relay 	2M

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			(See RELAY INSPECTION)	
FTL V (Fuel tank level signal voltage)	V	<p>Idle condition</p> <ul style="list-style-type: none"> • Fuel tank full: 0.2-0.5 V • Fuel tank empty: 3.4-4.4 V • Fuel tank half: 1.8-2.8 V <p>NOTE:</p> <ul style="list-style-type: none"> • The voltages above will be measured when the battery voltage is between 12 V and 14 V. 	<ul style="list-style-type: none"> • Inspect fuel gauge sender unit <p>(See FUEL GAUGE SENDER UNIT INSPECTION)</p>	4AD
FUELPW1 (Fuel injection duration)	ms	Idle: Approx.1.7 ms	<ul style="list-style-type: none"> • Inspect following PIDs: MAF, IAT, RPM, TP, ECT, PNP, CPP, O2S11, PSP, BOO, ACSW, CMP sensor <p>(See CAMSHAFT POSITION (CMP) SENSOR INSPECTION (BP, BP WITH TC))</p>	2A, 2D, 2GN, 2J
HTR11 (Heated oxygen sensor heater (Front))	ON/OFF	Always: ON	<ul style="list-style-type: none"> • Inspect following PIDs: ECT, MAF. • Inspect HO2S heater <p>(See HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC))</p>	3J
HTR12 (Heated oxygen sensor heater (Rear))	ON/OFF	ECT above 70°C {158°F}: ON ECT below 70°C {158°F}: OFF	<ul style="list-style-type: none"> • Inspect following PIDs: ECT, MAF. • Inspect HO2S heater <p>(See HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC))</p>	3P
IAC (Idle air control)	%	Idle: Approx.18%	<ul style="list-style-type: none"> • Inspect following PIDs: IAT, 	2P, 2Q

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valve)			<p>RPM, ECT, MAF, TP, PNP, CPP, PSP, ACSW, TEST.</p> <ul style="list-style-type: none"> Inspect IAC valve <p>(See <u>IDLE AIR CONTROL (IAC) VALVE INSPECTION (BP, BP WITH TC)</u>)</p>		
IAT (Intake air temperature)	°C	°F	Indicate the intake air temperature	<ul style="list-style-type: none"> Inspect IAT sensor No.1 <p>(See <u>INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p>	4N
	V		<p>IAT 20°C {68°F}: 2.3-2.4 V IAT 30°C {86°F}: Approx.1.9 V</p>		
IAT2 (Intake air temperature)	°C	°F	Indicate the intake air temperature	<ul style="list-style-type: none"> Inspect IAT sensor No.2 <p>(See <u>INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION (BP WITH TC)</u>)</p>	4R
	V		<p>IAT 25°C {77°F}: Approx.2.7 V IAT 85°C {185°F}: Approx.0.6 V</p>		
IMRC (VTCS solenoid valve)	ON/OFF		ECT below 65°C{149°F} while idling: ON	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT, Inspect VTCS solenoid valve. <p>(See <u>VARIABLE TUMBLE CONTROL SYSTEM (VTCS) SOLENOID VALVE INSPECTION (BP, BP WITH TC)</u>)</p> <ul style="list-style-type: none"> Inspect the vacuum hose for improper routing, kinks or leaks 	2N
IMRCM (VTCS vacuum switch)	ON/OFF		ECT below 65°C {149°F} while idling: ON	<ul style="list-style-type: none"> Inspect following PIDs: RPM, TP, ECT. Inspect VTCS vacuum switch. <p>(See <u>VARIABLE TUMBLE CONTROL SYSTEM (VTCS) VACUUM SWITCH INSPECTION (BP, BP WITH TC)</u>)</p> <ul style="list-style-type: none"> Inspect the vacuum hose for improper routing, kinks or leaks 	4J
KNOCKR	°		Ignition switch ON: 0°	<ul style="list-style-type: none"> Inspect KS 	4M

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(Knocking retard)		Idle: 0°	(See <u>KNOCK SENSOR (KS) INSPECTION (BP, BP WITH TC)</u>)	
LOAD (Calculated engine load)	%	Idle: Approx.20%	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
LONGFT1 (Current long term fuel trim adjustment)	%	Idle: Approx.10%	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
MAF (Intake MAF)	g/s lb/min	Idle: 2.6-3.3 g/s {0.3-0.4 lb/min}	<ul style="list-style-type: none"> Inspect MAF sensor (See <u>MASS AIR FLOW (MAF) SENSOR INSPECTION (BP, BP WITH TC)</u>) 	4X
	V	Idle: Approx.2.0 V		
MAP (Boost pressure)	kPa Bar psi	Indicate the boost pressure	<ul style="list-style-type: none"> Inspect BARO/MAP sensor (See <u>EGR BOOST SENSOR (BP), BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH TC) INSPECTION (BP, BP WITH TC)</u>) 	4AE
	V	Ignition switch is turned to the ON position: Approx.2.6 V ⁽¹⁾		
MIL (Malfunction indicator lamp)	ON/OFF	Ignition switch ON: ON DTC output: ON No DTC output: OFF	<ul style="list-style-type: none"> Inspect MIL <p>(See <u>WARNING AND INDICATOR LIGHT BULB REMOVAL/INSTALLATION</u>)</p>	2R
O2S11 (Heated oxygen sensor (Front))	V	Ignition switch ON: 0-1.0 V After warm up: 0-1.0 V Acceleration: 0.5-1.0 V Deceleration: 0-0.5 V	<ul style="list-style-type: none"> Inspect HO2S (Front) <p>(See <u>HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC)</u>)</p>	4W
O2S12 (Heated oxygen sensor (Rear))	V	Ignition switch ON: 0-1.0 V Idle (After warm up): 0-1.0 V Idle (Engine cold): 0-0.5 V Accelerate: 0.5-1.0 V Decelerate: 0-0.5 V	<ul style="list-style-type: none"> Inspect HO2S (Rear) <p>(See <u>HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC)</u>)</p>	4AA
PSP (PSP)	High/Low	Steering wheel is at		4C

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switch)		straight ahead position: Low Steering wheel is fully turned: High	<ul style="list-style-type: none"> Inspect PSP switch <p>(See <u>POWER STEERING PRESSURE (PSP) SWITCH INSPECTION (BP, BP WITH TC)</u>)</p>	
RFCFLAG (Fuel learning correction set flag)	ON/OFF	Adaptive memory exists: ON No adaptive memory: OFF	--	--
RPM (Engine speed)	RPM	Indicate the engine speed	<ul style="list-style-type: none"> Inspect CKP sensor <p>(See <u>CRANKSHAFT POSITION (CKP) SENSOR INSPECTION (BP, BP WITH TC)</u>)</p>	3Y
SEGRP (EGR valve (stepping motor) position)	step	Ignition switch ON: 0 step Idle: 0 step Cranking: 0-60 steps	<ul style="list-style-type: none"> Inspect following PIDs: ECT, TP. Inspect EGR valve <p>(See <u>EGR VALVE INSPECTION (BP, BP WITH TC)</u>)</p>	2E, 2F, 2H, 2I
SHRTFT1 (Short term trim)	%	Idle: -25-25%	<ul style="list-style-type: none"> Perform "ON-BOARD DIAGNOSTIC TEST" (See <u>ON-BOARD DIAGNOSTIC TEST (BP, BP WITH TC)</u>) 	--
SORK TIME (Engine sork time)	MIN	--	--	--
SPARKADV (Ignition timing)	°	Indicate the ignition timing	<ul style="list-style-type: none"> Inspect following PIDs: MAF, IAT, RPM, TP, ECT, PSP, PNP, CPP, ACSW, TEST, CMP sensor. Perform engine tune-up <p>(See <u>ENGINE TUNE-UP</u>)</p>	3V
Test (TEN terminal (DLC))	ON/OFF	Open terminal TEN: OFF Shorted terminal TEN: ON	<ul style="list-style-type: none"> Inspect the DLC TEN terminal and PCM connector terminal 4AC 	4AC
TP (Throttle position sensor signal voltage)	V	Closed TP: 0.1-1.1 V WOT: 3.0-4.6 V	<ul style="list-style-type: none"> Inspect TP sensor <p>(See <u>THROTTLE POSITION</u>)</p>	4V

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			<u>(TP) SENSOR INSPECTION (BP, BP WITH TC)</u>		
VPWR (Battery positive voltage)	V		Ignition switch ON: B+	<ul style="list-style-type: none"> • Inspect main relay (See <u>RELAY INSPECTION</u>) • Inspect battery (See <u>BATTERY INSPECTION</u>) 	4AF, 4AG
VSS (Vehicle speed)	KPH	MPH	Indicate the vehicle speed	<ul style="list-style-type: none"> • Inspect VSS. (See <u>VEHICLE SPEEDOMETER SENSOR INSPECTION (M15M-D)</u>) 	3T
(1) The voltage may vary excessively depending on the weather conditions.					

BARO PID inspection procedure

1. Confirm the ignition switch is turned to ON.
2. Confirm that the following PIDs are within the specifications:

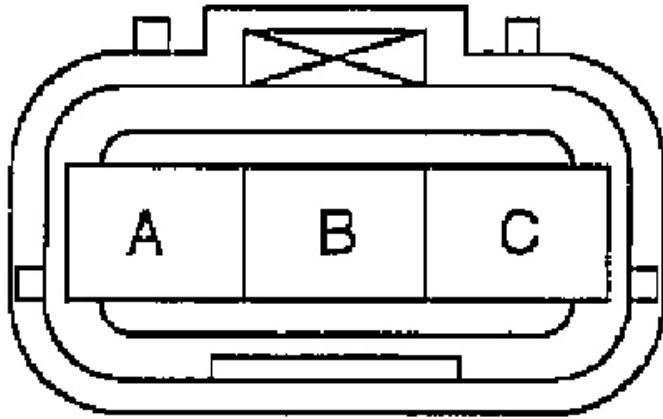
BARO

101.3 kPa {760 mmHg, 29.9 inHg} (Absolute pressure)

IAT

10-50°C {50-122°F}

3. Disconnect the EGR boost sensor connector and measure the voltage at EGR boost sensor connector terminal C.



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

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Fig. 11: Identifying EGR Boost Sensor Harness Side Connector
Courtesy of MAZDA MOTORS CORP.

Voltage

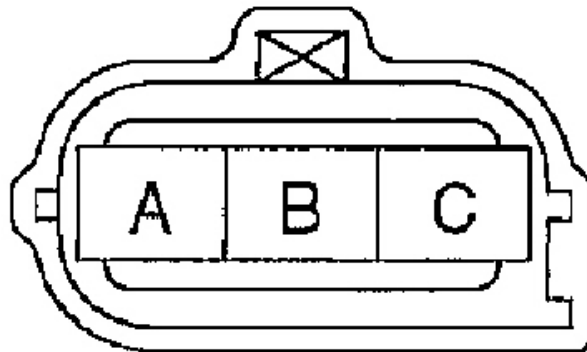
4.5-5.5 V

4. Reconnect the connector.
5. Disconnect the vacuum hose from the EGR boost sensor.
6. Connect the vacuum pump to the EGR boost sensor.
7. Select BARO PID on the WDS or equivalent.
8. Apply the vacuum and verify that the BARO PID is as specified on the table.

VREF terminal circuit inspection

1. Turn the ignition switch to the ON position.
2. Measure the voltage between the TP sensor connector (vehicle side) terminal A and body GND using a voltmeter.
 1. Measurement voltage is 0 V.
 1. Turn the ignition switch to the LOCK position.

2. Disconnect the TP sensor connector, EGR boost sensor (BP), and BARO/MAP sensor (BP WITH TC) connector (to which VREF is applied).
3. Verify there is no continuity between the TP sensor connector (vehicle side) terminal A and body GND using an ohmmeter.
 - If there is continuity, repair the related harness for short to circuit.



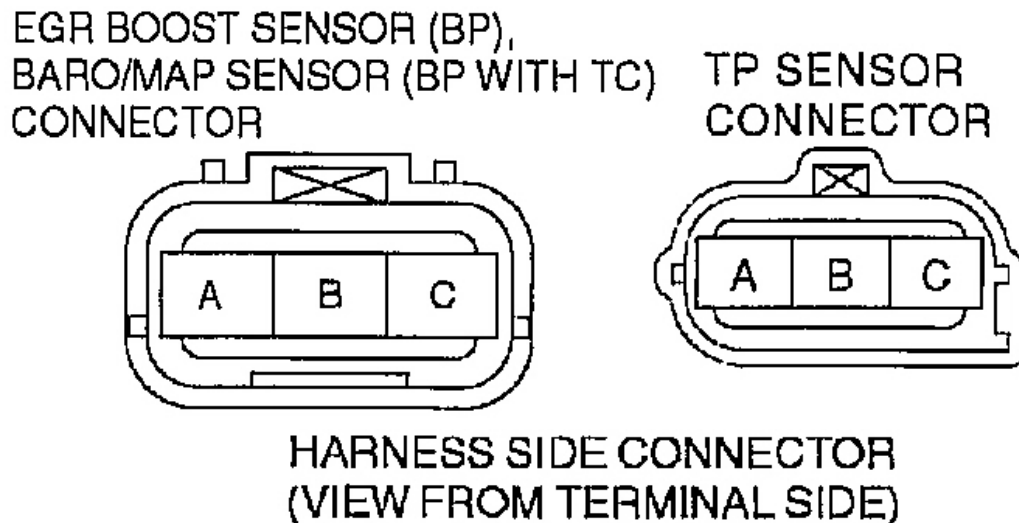
HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03637963

Fig. 12: Identifying TP Sensor Harness Side Connector
Courtesy of MAZDA MOTORS CORP.

4. Inspect for continuity between the PCM connector (vehicle side) terminal 4L and each sensor connector (vehicle side) terminals to which VREF is applied using an ohmmeter.
 - If there is continuity, repair the related harnesses.

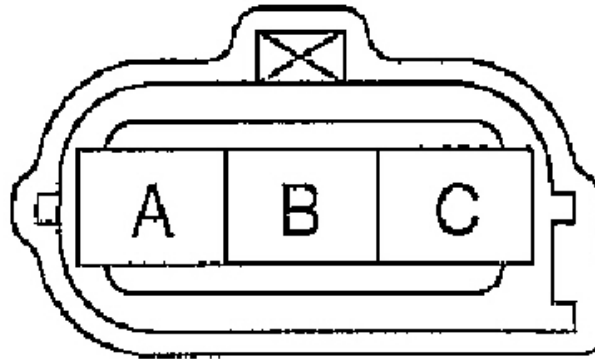
PCM terminal	Connector (vehicle side)	Terminal
4L	TP sensor	A
	EGR boost sensor (BP)	C
	BARO/MAP sensor (BP WITH TC)	



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Fig. 13: Identifying EGR Boost Sensor And TP Sensor Harness Side Connector
Courtesy of MAZDA MOTORS CORP.

2. Measurement voltage is B+.
 1. Turn the ignition switch to the LOCK position.
 2. Disconnect the battery positive harness and battery negative harness.
 3. Verify there is no continuity between the TP sensor connector (vehicle side) terminal A and battery positive harness using an ohmmeter.
 - If there is continuity, repair the related harnesses for short to B+ circuit.
3. Measurement voltage is approx.5 V.
 - VREF terminal of PCM is okay.



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03637965

Fig. 14: Identifying TP Sensor Harness Side Connector
Courtesy of MAZDA MOTORS CORP.

GND circuit inspection

1. Turn the ignition switch to the LOCK position.
2. Disconnect the PCM connectors.
3. Inspect for continuity between the PCM GND terminals and body GND using an ohmmeter.
 - If not as specified, repair the related harnesses for open circuit.

PCM GND terminal
3A
3B
4A

Power supply circuit inspection

1. Turn the ignition switch to the LOCK position.
2. Disconnect the PCM connectors.
3. Measure the voltage between the PCM battery power terminal and body GND using a voltmeter.
 - If not as specified, repair the related harnesses and fuses.

Power supply terminal
4AG
4AF (Ignition switch: ON)

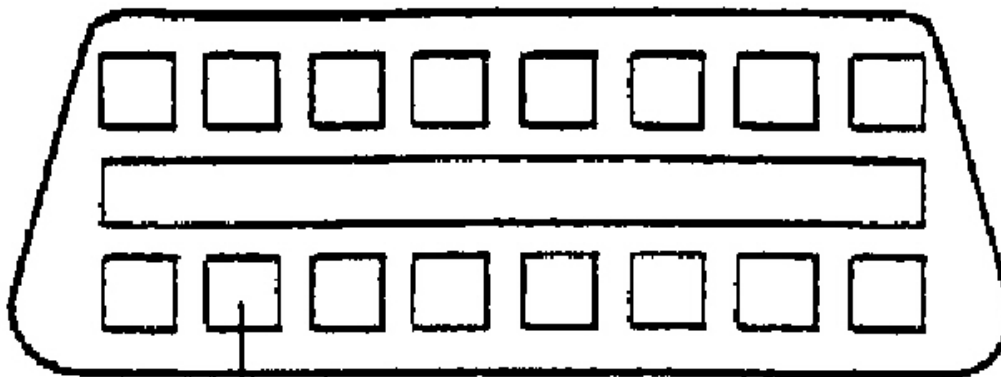
Power supply terminal voltage

B+

Serial communication terminal inspection

1. Turn the ignition switch to the LOCK position.
2. Disconnect PCM connectors.
3. Verify there is continuity between PCM connector terminal 3Q and DLC-2 KLN terminal.

DLC-2 CONNECTOR



KLN TERMINAL

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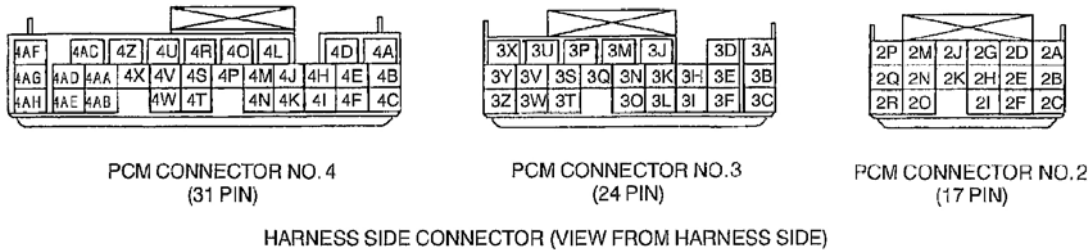
Fig. 15: Identifying DLC-2 KLN Terminal
Courtesy of MAZDA MOTORS CORP.

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- If not as specified, repair the related harnesses.

PCM TERMINAL VOLTAGE TABLE (REFERENCE)



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Fig. 16: Identifying PCM Terminal
Courtesy of MAZDA MOTORS CORP.

BP

PCM TERMINAL VOLTAGE REFERENCE (BP)

Terminal	Signal	Connected to	Test condition		Voltage (V)	Action
2A	Fuel injector control	Fuel injector No.1	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE)⁽¹⁾)			<ul style="list-style-type: none"> • Inspect fuel injector. (See FUEL INJECTOR INSPECTION BP WITH TC) • Inspect related harness.
2B	Cooling fan control	Cooling fan relay	Idle	ECT above 97°C {207°F}. A/C operating. Throttle valve fully open with terminal TEN (DLC) shorted to GND	Below 1.0	<ul style="list-style-type: none"> • Inspect cooling fan relay. (See RELAY INSPECTION) • Inspect related harness.
				Others	B+	
2C	Condenser fan control	Condenser fan relay	Idle	ECT above 108°C {226°F}, A/C operating, Throttle valve fully open with	Below 1.0	<ul style="list-style-type: none"> • Inspect condenser fan relay. (See RELAY INSPECTION) • Inspect related harness.

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			terminal TEN (DLC) shorted to ground			
			Others		B+	
2D	Fuel injector control	Fuel injector No.2	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)		<ul style="list-style-type: none"> Inspect fuel injector, (See <u>FU INJECTOR INSPECTION BP WITH TC</u>)) Inspect related harness. 	
2E	EGR valve #1 coil control	EGR valve (terminal E)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect EGR valve. (See <u>EGI VALVE INSPECTION (BP WITH TC)</u>)) Inspect related harness. 	
			Idle			
2F	EGR valve #2 coil control	EGR valve (terminal A)	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EGR valve. (See <u>EGI VALVE INSPECTION (BP WITH TC)</u>)) Inspect related harness. 	
			Idle			
2G	Fuel injector control	Fuel injector No. 3	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)		<ul style="list-style-type: none"> Inspect fuel injector (See <u>FUI INJECTOR INSPECTION BP WITH TC</u>)) Inspect related harness. 	
2H	EGR valve #3 coil control	EGR valve (terminal B)	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EGR valve. (See <u>EGI VALVE INSPECTION (BP WITH TC)</u>)) Inspect related harness. 	
			Idle			
2I	EGR valve #4 coil control	EGR valve (terminal F)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect EGR valve. (See <u>EGI VALVE INSPECTION (BP WITH TC)</u>)) Inspect related harness. 	
			Idle			
2J	Fuel injector control	Fuel injector No.4	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)		<ul style="list-style-type: none"> Inspect fuel injector. (See <u>FU INJECTOR INSPECTION BP WITH TC</u>)) Inspect related harness. 	
2K	A/C control	A/C relay	Idle	A/C and fan switches are on.	Below 1.0	<ul style="list-style-type: none"> Inspect A/C relay. (See <u>RELA INSPECTION</u>)) Inspect related harness.
				Others	B+	
2L	-	-	-	-	-	
2M	FP control	FP relay	Cranking	Below 1.0	<ul style="list-style-type: none"> Inspect FP relay. (See <u>RELA INSPECTION</u>)) Inspect related harness. 	
			Idle			

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2N	VTCS control	VTCS solenoid valve	ECT above 60°C {140°F} while idling	B+	<ul style="list-style-type: none"> Inspect VTCS solenoid valve. (See VARIABLE TUMBLE CONTROL SYSTEM (VTC SOLENOID VALVE INSPECTION (BP, BP WITH TC))) Inspect related harness.
			ECT below 60°C {140°F} and engine speed at 3,500 rpm	Below 1.0	
2O	-	-	-	-	-
2P	IAC (positive)	IAC valve	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect IAC valve inspection. (See IDLE AIR CONTROL (IAC) VALVE INSPECTION (BP, BP WITH TC))) Inspect related harness.
2Q	IAC (negative)	IAC valve	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect IAC valve inspection. (See IDLE AIR CONTROL (IAC) VALVE INSPECTION (BP, BP WITH TC))) Inspect related harness.
2R	MIL control	MIL (in instrument cluster)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect MIL. Inspect related harness.
			Idle (MIL OFF)	B+	
3A	Fuel injector GND	GND	Under any condition	Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
3B	PCM GND	GND	Under any condition	Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
3C	Purge control	Purge solenoid valve	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect purge solenoid valve. PURGE SOLENOID VALVE INSPECTION (BP, BP WITH TC)) Inspect related harness.
3D	EGR boost sensor switching control	EGR boost sensor solenoid valve	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EGR boost sensor solenoid valve. (See EGR BOOST SENSOR SOLENOID VALVE INSPECTION (BP, WITH TC))) Inspect related harness.
			Idle		
3E	-	-	-	-	-
3F	IGT control (No. 1, No.4 cylinders)	Ignition coil	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect ignition coil. (See IGNITION COIL INSPECTION)) Inspect related harness.
3G	-	-	-	-	-

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3H	Main relay control	Main relay	Ignition switch off	B+	<ul style="list-style-type: none"> Inspect main relay. (See REL INSPECTION) Inspect related harness.
			Ignition switch on	Below 1.0	
3I	IGT control (No.2, No.3 cylinders)	Ignition coil	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect ignition coil. (See IGNITION COIL INSPECTION) Inspect related harness.
3J	HO2S heater (Front) control	HO2S (Front)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect HO2S heater (Front). HEATED OXYGEN SENS (HO2S) INSPECTION (BP, WITH TC) Inspect related harness.
			Idle		
3K	EVAP system leak detection pump (pump)	EVAP system leak detection pump	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EVAP system leak detection pump. (See EVAPORATIVE EMISSION (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION (BP, BP WITH TC)) Inspect related harness.
			Idle	B+	
3L	-	-	-	-	-
3M	Generator field coil control	Generator (terminal D)	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect generator. (See GENERATOR INSPECTION) Inspect related harness.
			Verify that voltage is raised when electrical load (headlight, A/C) is turned on at idle.		
3N	-	-	-	-	-
3O	Engine speed	DLC terminal IG-TCM (AT), tachometer	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect related harness.
3P	HO2S heater (Rear) control	HO2S (Rear)	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect HO2S heater (Rear). (HEATED OXYGEN SENS (HO2S) INSPECTION (BP, WITH TC)) Inspect related harness.
			Idle (Heater operating)	Below 1.0	
3Q	K-LINE (Serial communication)	DLC terminal KLN DLC 2	Carry out inspection according to DTC DTC output is a part of serial communication		<ul style="list-style-type: none"> Inspect related harness.

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			Judgement by terminal voltage is not possible			
3R	-	-	-	-	-	
3S	Immobilizer communication	Immobilizer unit	Because of this terminal for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to diagnostic trouble codes.		<ul style="list-style-type: none"> Inspect Immobilizer unit. (See IMMOBILIZER UNIT INSPECTION) Inspect related harness. 	
3T	Vehicle speed	VSS	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect vehicle speedometer sensor. (See VEHICLE SPEEDOMETER SENSOR INSPECTION (M15M-D)) Inspect related harness. 	
3U	Generator warning light control	Generator warning light (in instrument cluster)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect generator warning light inspection. (See WARNING AND INDICATOR LIGHT BULB REMOVAL/INSTALLATION) Inspect related harness. 	
			Idle (DTC P0111, P0112, P1631, P1633 or P1634 is not stored.)	B+		
3V	SGC	CMP sensor	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect CMP sensor. (See CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC)) Inspect related harness. 	
3W	-	-	-	-	-	
3X	-	-	-	-	-	
3Y	NE	CKP sensor	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect CKP sensor. (See CRANKSHAFT POSITION (CKP) SENSOR INSPECTION (BP, BP WITH TC)) Inspect related harness. 	
3Z	-	-	-	-	-	
4A	Device GND	GND	Under any condition	Below 1.0	<ul style="list-style-type: none"> Inspect related harness. 	
4B	Brake	Brake switch	Brake pedal released	Below 1.0	<ul style="list-style-type: none"> Inspect brake switch. (See BRAKE SWITCH INSPECTION) Inspect related harness. 	
			Brake pedal depressed	B+		
4C	PSP	PSP switch	Idle	Steering wheel	B+	<ul style="list-style-type: none"> Inspect PSP switch. (See POWER STEERING)

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				straight ahead position		PRESSURE (PSP) SWITCH INSPECTION (BP, BP WITC)) <ul style="list-style-type: none"> Inspect related harness.
				Steering wheel fully turned	Below 1.0	
4D	Oil control valve (OCV) control (positive)	Oil control valve (OCV)	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))			<ul style="list-style-type: none"> Inspect oil control valve (OCV) (See OIL CONTROL VALVE (OCV) INSPECTION (BP)) Inspect related harness.
4E	DTM switching	DLC terminal TEN	Ignition switch on	Open Terminal TEN	B+	<ul style="list-style-type: none"> Inspect related harness.
				Short to GND terminal TEN	Below	
4F	A/C	Refrigerant pressure switch	Ignition switch on	A/C and fan switches are on.	Below 1.0	<ul style="list-style-type: none"> Inspect refrigerant pressure switch. (See REFRIGERANT PRESSURE SWITCH INSPECTION) Inspect related harness.
				Others	B+	
4G	-	-	-			-
4H	Load/no load distinction	Neutral switch (MT)	Ignition switch on	Transmission in neutral position	Below 1.0	<ul style="list-style-type: none"> Inspect neutral switch. (See NEUTRAL SWITCH INSPECTION (BP, BP WITC)) Inspect related harness.
			Others			
4I	Load/no load distinction	Clutch switch (MT)	Ignition switch on	Clutch pedal depressed	B+	<ul style="list-style-type: none"> Inspect clutch pedal position switch. (See CLUTCH PEDAL POSITION SWITCH INSPECTION (BP, BP WITC)) Inspect related harness.
				Clutch pedal released	Below 1.0	
4J	VTCS vacuum switch	VTCS vacuum switch	Ignition switch on		B+	<ul style="list-style-type: none"> Inspect VTCS vacuum switch (See VARIABLE TUMBLE CONTROL SYSTEM (VTCS) VACUUM SWITCH INSPECTION (BP, BP WITC)) Inspect related harness.
			ECT Above 60°C {140°F} while idling		B+	
			ECT below 60°C {140°F} and engine speed at 3,500 rpm		Below 1.0	
4K	-	-	-			-
4L	Constant	TP sensor,	Ignition switch on		Approx.	

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	voltage (VREF)	EGR boost sensor			5.0	<ul style="list-style-type: none"> Inspect related harness.
4M	Knocking	KS	Ignition switch on (Using digital type voltmeter, because measurement voltage is less than true voltage when using analog type voltmeter.)		Approx. 2.4	<ul style="list-style-type: none"> Inspect KS. (See <u>KNOCK SENSOR (KS) INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
4N	IAT	IAT sensor	Ignition switch on	IAT 20°C {68°F}	2.3-2.4	<ul style="list-style-type: none"> Inspect IAT sensor. (See <u>INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION (BP WITH TC)</u>) Inspect related harness.
				IAT 30°C {86°F}	1.9	
4O	Analogue sensor GND	GND, EGR boost sensor, TP sensor, ECT sensor, IAT sensor, HO2S (Front), HO2S (Rear)	Under any condition		Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
4P	ECT	ECT sensor	Ignition switch on	ECT 20°C {68°F}	Approx. 3.0	<ul style="list-style-type: none"> Inspect ECT sensor. (See <u>ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION (BP WITH TC)</u>) Inspect related harness.
				ECT 80°C {176°F}	Approx. 0.9	
4Q	-	-	-		-	-
4R	Oil control valve (OCV) control (negative)	Oil control valve (OCV)	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)			<ul style="list-style-type: none"> Inspect oil control valve (OCV) (See <u>OIL CONTROL VALVE (OCV) INSPECTION (BP)</u>) Inspect related harness.
4S	Ignition switch (IG1)	Ignition switch	Ignition switch off		Below 1.0	<ul style="list-style-type: none"> Inspect ignition switch. Inspect related harness.
			Ignition switch on		B+	
4T	Generator output voltage	Generator (terminal P)	Ignition switch on		Below 1.0	<ul style="list-style-type: none"> Inspect generator. (See <u>GENERATOR INSPECTION (BP WITH TC)</u>) Inspect related harness.
			Idle (No electrical load)		3-8	
4U	-	-	-		-	-
4V	TP	TP sensor	Ignition	Closed TP	0.1-1.1	<ul style="list-style-type: none"> Inspect TP sensor. (See

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		switch on		(AP released)		THROTTLE POSITION (T SENSOR INSPECTION (BP WITH TC))
				WOT (AP fully depressed)	3.0-4.6	
4W	HO2S (Front)	HO2S (Front)	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))			<ul style="list-style-type: none"> Inspect related harness.
4X	MAF	MAF sensor	Ignition switch on	0.9-2.0		<ul style="list-style-type: none"> Inspect MAP sensor. (See MAP (MAF) SENSOR INSPECTION (BP, BP WITH TC)) Inspect related harness.
			Idle (After warm up)	1.7-2.4		
4Y	-	-	-	-		-
4Z	PCM-TCM communication (From PCM to TCM) (AT)	TCM (terminal O)	Because this terminal is for serial communication, good/no good judgement by terminal voltage is not possible. Carry out inspection according to DTC.			<ul style="list-style-type: none"> Inspect related harness.
			NOTE: <ul style="list-style-type: none"> If PCM/TCM communication is not correct, DTC P1601 is stored. 			
4AA	HO2S (Rear)	HO2S (Rear)	Ignition switch on	0-1.0		<ul style="list-style-type: none"> Inspect HO2S heater (Rear). (See HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, WITH TC)) Inspect related harness.
			Idle	Engine cold	0-0.5	
				After warm up	0-1.0	
			Acceleration	0.5-1.0		
			Deceleration	0-0.5		
4AB	-	-	-	-		-
4AC	PCM- TCM communication (From TCM to PCM) (AT)	TCM (terminal AL)	Because this terminal is for serial communication, good/no good judgement by terminal voltage is not possible. Carry out inspection according to DTC.			<ul style="list-style-type: none"> Inspect related harness.
			NOTE: <ul style="list-style-type: none"> If PCM/TCM communication is not correct, DTC P1601 is stored. 			

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4AD	Fuel tank level	Fuel gauge sender unit	Ignition switch on	Fuel tank full	0.2-0.5 (1)	<ul style="list-style-type: none"> Inspect fuel gauge sender unit (See FUEL GAUGE SENDER UNIT INSPECTION) Inspect related harness.
				Fuel tank empty	3.4-4.4 (1)	
				Fuel tank half	1.8-2.8 (1)	
4AE	BARO/EGR boost	EGR boost sensor	Ignition switch on, Idle	Below 400 m {0.25 mile} above sea level	4.1-4.3	<ul style="list-style-type: none"> Inspect EGR boost sensor. (See EGR BOOST SENSOR (BP BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH TC) INSPECTION (BP, BP WITH TC)) Inspect related harness.
				With pressure gauge: Vacuum reading -26.6 kPa {-200 mmHg, -7.85 inHg}	3.0-3.4	
4AF	Power supply	Main relay	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect main relay. (See REL INSPECTION) Inspect related harness. 	
			Ignition switch off	Below 1.0		
4AG	Back-up power supply	Battery	Under any condition	B+	<ul style="list-style-type: none"> Inspect related harness. 	
4AH	EVAP system leak detection pump (solenoid)	EVAP system leak detection pump solenoid valve	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EVAP system leak detection pump. (See EVAPORATIVE EMISSIONS (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION (BP, BP WITH TC)) Inspect related harness. 	
			Idle	B+		

(1) The voltages above will be measured when the battery voltage is 12-14V.

BP WITH TC

PCM TERMINAL VOLTAGE REFERENCE (BP WITH TC)

Terminal	Signal	Connected to	Test condition	Voltage (V)	Action
2A	Fuel injector control	Fuel injector No.1	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect fuel injector. (See FUEL INJECTOR INSPECTION (BP WITH TC)) Inspect related harness.

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2B	Fan control	Fan relay No.1	Idle	Throttle valve fully open with terminal TEN (DLC) shorted to GND	Below 1.0	<ul style="list-style-type: none"> Inspect cooling fan relay. (See RELAY INSPECTION) Inspect related harness.
				Others	B+	
2C	Fan control	Fan relay No.2 and No.3	Idle	Throttle valve fully open with terminal TEN (DLC) shorted to ground	Below 1.0	<ul style="list-style-type: none"> Inspect condenser fan relay. RELAY INSPECTION) Inspect related harness.
				Others	B+	
2D	Fuel injector control	Fuel injector No.2	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))			<ul style="list-style-type: none"> Inspect fuel injector. (See FI INJECTOR INSPECTION BP WITH TC) Inspect related harness.
2E	EGR valve #1 coil control	EGR valve (terminal E)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect EGR valve. (See EG VALVE INSPECTION (BI WITH TC)) Inspect related harness. 	
			Idle			
2F	EGR valve #2 coil control	EGR valve (terminal A)	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EGR valve. (See EG VALVE INSPECTION (BI WITH TC)) Inspect related harness. 	
			Idle			
2G	Fuel injector control	Fuel injector No.3	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))			<ul style="list-style-type: none"> Inspect fuel injector (See FU INJECTOR INSPECTION BP WITH TC) Inspect related harness.
2H	EGR valve #3 coil control	EGR valve (terminal B)	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EGR valve. (See EG VALVE INSPECTION (BI WITH TC)) Inspect related harness. 	
			Idle			
2I	EGR valve #4 coil control	EGR valve (terminal F)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect EGR valve. (See EG VALVE INSPECTION (BI WITH TC)) Inspect related harness. 	
			Idle			
	Fuel injector	Fuel injector	Inspect using the wave profile. (See INSPECTION USING AN			<ul style="list-style-type: none"> Inspect fuel injector. (See FI INJECTOR INSPECTION

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2J	control	No.4	<u>OSCILLOSCOPE</u> <u>(REFERENCE)</u>		<u>BP WITH TC</u>)	
2K	A/C control	A/C relay	Idle	A/C and fan switches are on. Others	Below 1.0 B+	<ul style="list-style-type: none"> Inspect related harness. Inspect A/C relay. (See <u>REL INSPECTION</u>) Inspect related harness.
2L	-	-	-	-	-	-
2M	FP control	FP relay	Cranking Idle	Turn the ignition switch to ON position without do it immediately.	Below 1.0 B+	<ul style="list-style-type: none"> Inspect FP relay. (See <u>REL INSPECTION</u>) Inspect related harness.
2N	VTCS control	VTCS solenoid valve	ECT above 65°C {149°F} while idling	ECT below 65°C {149°F} and engine speed below 3,250 rpm	B+ Below 1.0	<ul style="list-style-type: none"> Inspect VTCS solenoid valve (See <u>VARIABLE TUMBL CONTROL SYSTEM (VT SOLENOID VALVE INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
2O	-	-	-	-	-	-
2P	IAC (positive)	IAC valve	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)		Below 1.0	<ul style="list-style-type: none"> Inspect IAC valve inspector (See <u>IDLE AIR CONTROL (IAC) VALVE INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
2Q	IAC (negative)	IAC valve	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)		Below 1.0	<ul style="list-style-type: none"> Inspect IAC valve inspector (See <u>IDLE AIR CONTROL (IAC) VALVE INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
2R	MIL control	MIL (in instrument cluster)	Ignition switch on	Idle (MIL OFF)	Below 1.0 B+	<ul style="list-style-type: none"> Inspect MIL. Inspect related harness.
3A	Fuel injector.GND	GND	Under any condition		Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
3B	PCM GND	GND	Under any condition		Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
3C	Purge control	Purge solenoid valve	Inspect using the wave profile. (See <u>INSPECTION USING AN OSCILLOSCOPE (REFERENCE)</u>)		Below 1.0	<ul style="list-style-type: none"> Inspect purge solenoid valve (<u>PURGE SOLENOID VAL INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.

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3D	BARO/MAP sensor switching control	EGR boost sensor solenoid valve	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EGR boost sensor solenoid valve. (See EGR BOOST SENSOR SOLENOID VALVE INSPECTION (B)) Inspect related harness.
			Idle	1.0 or less	
3E	-	-	-	-	-
3F	IGT control (No.1, No.4 cylinders)	Ignition coil	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect ignition coil. (See IGNITION COIL INSPECTION) Inspect related harness.
3G	-	-	-	-	-
3H	Main relay control	Main relay	Ignition switch off	B+	<ul style="list-style-type: none"> Inspect main relay. (See RELAY INSPECTION) Inspect related harness.
			Ignition switch on	Below 1.0	
3I	IGT control (No.2, No.3 cylinders)	Ignition coil	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect ignition coil. (See IGNITION COIL INSPECTION) Inspect related harness.
3J	HO2S heater (Front) control	HO2S (Front)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect HO2S heater (Front) HEATED OXYGEN SENSOR (HO2S) INSPECTION (B) WITH TC) Inspect related harness.
			Idle		
3K	EVAP system leak detection pump (pump)	EVAP system leak detection pump	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EVAP system leak detection pump. (See EVAPORATIVE EMISSIONS (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION (BP, BP WITH TC)) Inspect related harness.
			Idle	B+	
3L	-	-	-	-	-
3M	Generator field coil control	Generator (terminal D)	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect generator. (See GENERATOR INSPECTION) Inspect related harness.
			Verify that voltage is raised when electrical load (headlight, A/C) is turned on at idle.		
3N	-	-	-	-	-
			Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE))		

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3O	Engine speed	Tachometer	OSCILLOSCOPE (REFERENCE))		<ul style="list-style-type: none"> Inspect related harness.
3P	HO2S heater (Rear) control	HO2S (Rear)	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect HO2S heater (Rear). HEATED OXYGEN SENS (HO2S) INSPECTION (BF WITH TC)) Inspect related harness.
			Idle (Heater operating)	Below 1.0	
3Q	K-LINE (Serial communication)	DLC terminal KLN DLC 2	Carry out inspection according to DTC output is a part of serial communication Judgement by terminal voltage is not possible	-	<ul style="list-style-type: none"> Inspect related harness.
3R	-	-	-	-	-
3S	Immobilizer communication	Immobilizer unit	Because of this terminal for serial communication, good/no good judgment by terminal voltage is not possible. Carry out inspection according to diagnostic trouble codes.		<ul style="list-style-type: none"> Inspect Immobilizer unit. (See IMMOBILIZER UNIT INSPECTION) Inspect related harness.
3T	Vehicle speed	Instrument cluster	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE)))		<ul style="list-style-type: none"> Inspect instrument cluster. (See INSTRUMENT CLUSTER INSPECTION) Inspect related harness.
3U	Generator warning light control	Generator warning light (in instrument cluster)	Ignition switch on	Below 1.0	<ul style="list-style-type: none"> Inspect generator warning light inspection. (See WARNING AND INDICATOR LIGHT BULB REMOVAL/INSTALLATION) Inspect related harness.
			Idle (DTC P0111, P0112, P1631, P1633 or P1634 is not stored.)	B+	
3V	SGC	CMP sensor	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE)))		<ul style="list-style-type: none"> Inspect CMP sensor. (See CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC)) Inspect related harness.
3W	-	-	-	-	-
3X	-	-	-	-	-
3Y	NE	CKP sensor	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE)))		<ul style="list-style-type: none"> Inspect CKP sensor. (See CRANKSHAFT POSITION (CKP) SENSOR INSPECTION (BP, BP WITH TC)) Inspect related harness.

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3Z	-	-	-	-	-	
4A	Device GND	GND	Under any condition		Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
4B	Brake	Brake switch	Brake pedal released		Below 1.0	<ul style="list-style-type: none"> Inspect brake switch. (See <u>BRAKE SWITCH INSPECTION</u>) Inspect related harness.
			Brake pedal depressed		B+	
4C	PSP	PSP switch	Idle	Steering wheel straight ahead position	B+	<ul style="list-style-type: none"> Inspect PSP switch. (See <u>POWER STEERING PRESSURE (PSP) SWITCH INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
				Steering wheel fully turned	Below 1.0	
4D	Turbocharger wastegate control	Turbocharger wastegate regulating valve	Idle		Below 1.0	<ul style="list-style-type: none"> Turbocharger wastegate regulating valve (See <u>TURBOCHARGER WASTEGATE REGULATING VALVE INSPECTION (BP WITH TC)</u>) Related wiring harness
			Turbocharger wastegate regulating valve on		B+	
			Turbocharger wastegate regulating valve OFF		Below 1.0	
4E	Turbocharger wastegate control monitor	Turbocharger wastegate regulating valve	Idle		Below 1.0	<ul style="list-style-type: none"> Turbocharger wastegate regulating valve (See <u>TURBOCHARGER WASTEGATE REGULATING VALVE INSPECTION (BP WITH TC)</u>) Related wiring harness
			Turbocharger wastegate regulating valve on		B+	
			Turbocharger wastegate regulating valve off		Below 1.0	
4F	A/C request	Refrigerant pressure switch	Ignition switch on	A/C and fan switches are on.	Below 1.0	<ul style="list-style-type: none"> Inspect refrigerant pressure switch. (See <u>REFRIGERANT PRESSURE SWITCH INSPECTION</u>) Inspect related harness.
				Others	B+	
4G	-	-	-		-	-
4H	PNP	Neutral switch	Ignition switch on	Transmission in neutral position	Below 1.0	<ul style="list-style-type: none"> Inspect neutral switch. (See <u>NEUTRAL SWITCH INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
				Others	B+	
		Clutch	Ignition	Clutch pedal released	B+	<ul style="list-style-type: none"> Inspect clutch pedal position switch. (See <u>CLUTCH PEDAL POSITION SWITCH</u>)

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4I	CPP	switch	switch on	Clutch pedal depressed	Below 1.0	<p><u>INSPECTION (BP, BP WITH TC)</u></p> <ul style="list-style-type: none"> Inspect related harness.
4J	VTCS vacuum switch	VTCS vacuum switch	Ignition switch on		B+	<p>• Inspect VTCS vacuum switch (See <u>VARIABLE TUMBLER CONTROL SYSTEM (VTCS VACUUM SWITCH INSPECTION (BP, BP WITH TC))</u>)</p> <ul style="list-style-type: none"> Inspect related harness.
			ECT above 60°C {140°F} while idling		B+	
			ECT above 60°C {140°F} and engine speed at 3,500 rpm		Below 1.0	
4K	-	-	-	-	-	-
4L	Constant voltage (VREF)	TP sensor, EGR boost sensor	Ignition switch on		Approx. 5.0	<ul style="list-style-type: none"> Inspect related harness.
4M	Knocking	KS	Ignition switch on (Using digital type voltmeter, because measurement voltage is less than true voltage when using analog type voltmeter.)		Approx. 2.4	<ul style="list-style-type: none"> Inspect KS. (See <u>KNOCK SENSOR (KS) INSPECTION (BP, BP WITH TC)</u>) Inspect related harness.
4N	IAT	IAT sensor No.1	Ignition switch on	IAT 20°C {68°F}	2.3-2.4	<ul style="list-style-type: none"> Inspect IAT sensor No.1. (See <u>INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION (BP WITH TC)</u>) Inspect related harness.
				IAT 30°C {86°F}	Approx. 1.9	
4O	Analogue sensor GND	GND, BARO/MAP sensor, TP sensor, ECT sensor, IAT sensor No.1, IAT sensor No.2, HO2S (Front), HO2S (Rear)	Under any condition		Below 1.0	<ul style="list-style-type: none"> Inspect related harness.
4P	ECT	ECT sensor	Ignition switch on	ECT 20°C {68°F}	Approx. 3.0	<ul style="list-style-type: none"> Inspect ECT sensor. (See <u>ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION (BP WITH TC)</u>) Inspect related harness.
				ECT 80°C {176°F}	Approx. 0.9	
4Q	-	-	-	-	-	-
						<ul style="list-style-type: none"> Inspect IAT sensor No.2. (See

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4R	IAT	IAT sensor No.2	Ignition switch on	IAT 25°C {77°F}	Approx. 2.7	INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTI (BP WITH TC)) <ul style="list-style-type: none"> Inspect related harness.
				IAT 85°C {185°F}	Approx. 0.6	
4S	Ignition switch (IG1)	Ignition switch	Ignition switch off		Below 1.0	<ul style="list-style-type: none"> Inspect ignition switch. Inspect related harness.
			Ignition switch on		B+	
4T	Generator output voltage	Generator (terminal P)	Ignition switch on		Below 1.0	<ul style="list-style-type: none"> Inspect generator. (See GENERATOR INSPECTI Inspect related harness.
			Idle (No electrical load)		3-8	
4U	-	-	-		-	-
4V	TP	TP sensor	Ignition switch on	Closed TP (AP released)	0.1-1.1	<ul style="list-style-type: none"> Inspect TP sensor. (See THROTTLE POSITION (SENSOR INSPECTION (I BP WITH TC)) Inspect related harness.
				WOT (AP fully depressed)	3.0-4.6	
4W	HO2S (Front)	HO2S (Front)	Inspect using the wave profile. (See INSPECTION USING AN OSCILLOSCOPE (REFERENCE)))			<ul style="list-style-type: none"> Inspect HO2S (Front). (See HEATED OXYGEN SENS (HO2S) INSPECTION (BI WITH TC)) Inspect related harness.
4X	MAP	MAF sensor	Idle (After warm up)		Approx. 2.0	<ul style="list-style-type: none"> Inspect MAF sensor. (See M AIR FLOW (MAF) SENS (INSPECTION (BP, BP WI TC)) Inspect related harness.
4Y	-	-	-		-	-
4Z	-	-	-		-	-
4AA	HO2S (Rear)	HO2S (Rear)	Ignition switch on		0-1.0	<ul style="list-style-type: none"> Inspect HO2S heater (Rear). HEATED OXYGEN SENS (HO2S) INSPECTION (BI WITH TC)) Inspect related harness.
			Idle	Engine cold	0-0.5	
				After warm up	0-1.0	
			Acceleration		0.5-1.0	
Deceleration	0-0.5					
4AB	-	-	-		-	-
4AC	Test mode	DLC terminal TEN	Ignition switch on	Open terminal TEN	B+	<ul style="list-style-type: none"> Inspect related harness.
				Short to GND terminal	Below	

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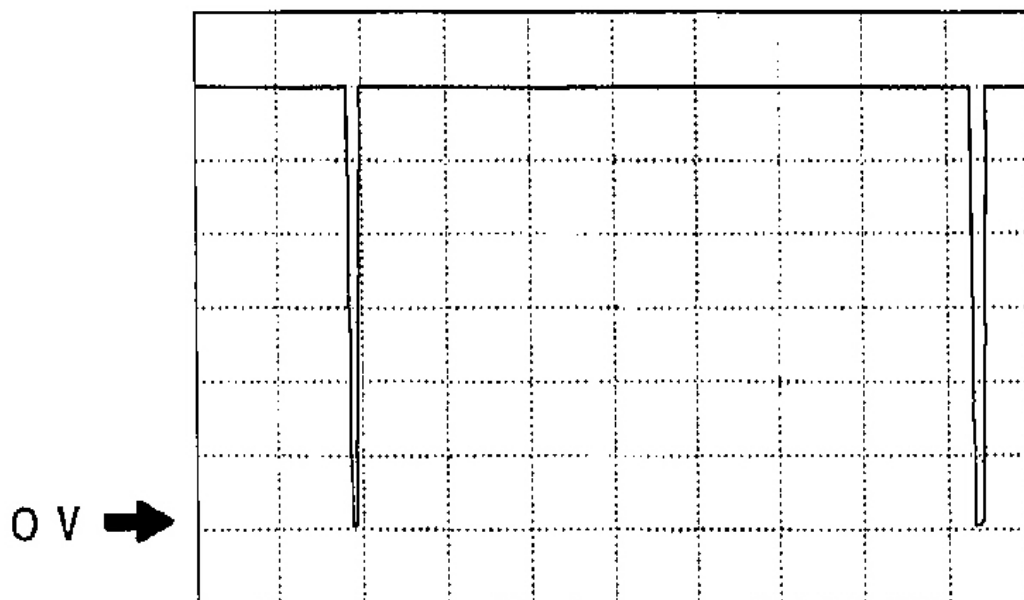
					TEN	
4AD	Fuel tank level	Fuel gauge sender unit	Ignition switch on	Fuel tank full	0.2-0.5 (1)	<ul style="list-style-type: none"> Inspect fuel gauge sender unit (See <u>FUEL GAUGE SENSOR UNIT INSPECTION</u>) Inspect related harness.
				Fuel tank empty	3.4-4.4 (1)	
				Fuel tank half	1.8-2.8 (1)	
4AE	BARO/EGR boost	BARO/MAP sensor	Ignition switch on		Approx. 2.6 ⁽²⁾	<ul style="list-style-type: none"> Inspect BARO/MAP sensor. <u>EGR BOOST SENSOR (BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH TC) INSPECTION (BP, BP WITH TC)</u> Inspect related harness.
4AF	Power supply	Main relay	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect main relay. (See <u>RELAY INSPECTION</u>) Inspect related harness. 	
			Ignition switch off	Below 1.0		
4AG	Back-up power supply	Battery	Under any condition	B+	<ul style="list-style-type: none"> Inspect related harness. 	
4AH	EVAP system leak detection pump (solenoid)	EVAP system leak detection pump solenoid valve	Ignition switch on	B+	<ul style="list-style-type: none"> Inspect EVAP system leak detection pump. (See <u>EVAPORATIVE EMISSIONS (EVAP) SYSTEM LEAK DETECTION PUMP INSPECTION (BP, BP WITH TC)</u>) Inspect related harness. 	
			Idle	B+		

(1) The voltages above will be measured when the battery voltage is 12-14V.

(2) The voltage may vary excessively depending on the weather conditions.

INSPECTION USING AN OSCILLOSCOPE (REFERENCE)

Fuel injection control signal

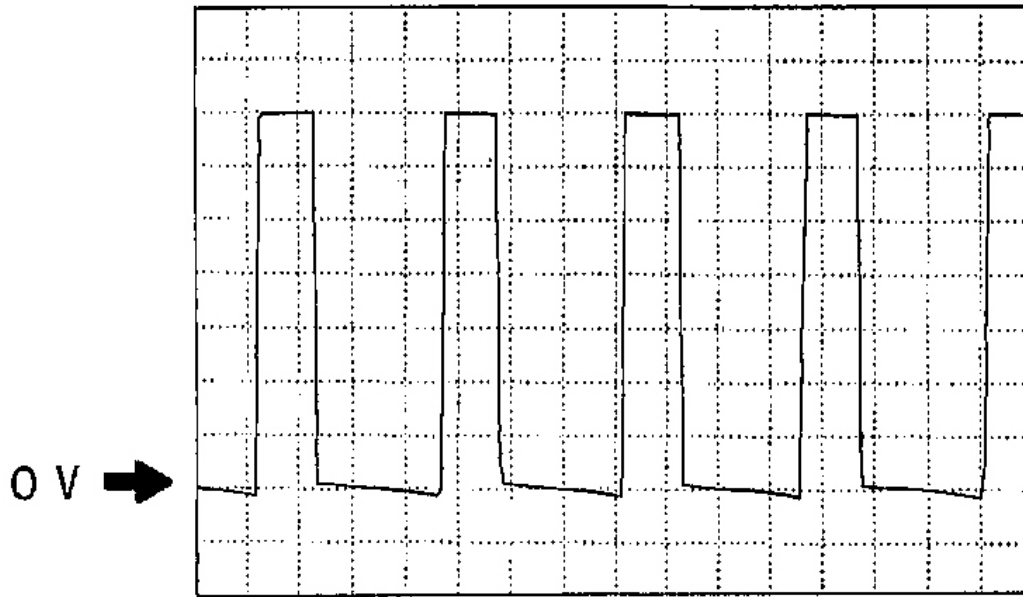


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Fig. 17: Fuel Injection Control Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal
 - No.1: 2A (+) <--> 3A (-)
 - No.2: 2D (+) <--> 3A (-)
 - No.3: 2G (+) <--> 3A (-)
 - No.4: 2J (+) <--> 3A (-)
- Oscilloscope setting: 2.0 V/DIV (Y), 20 ms/DIV (X), DC range
- Vehicle condition: Idling after warm-up

IAC control signal

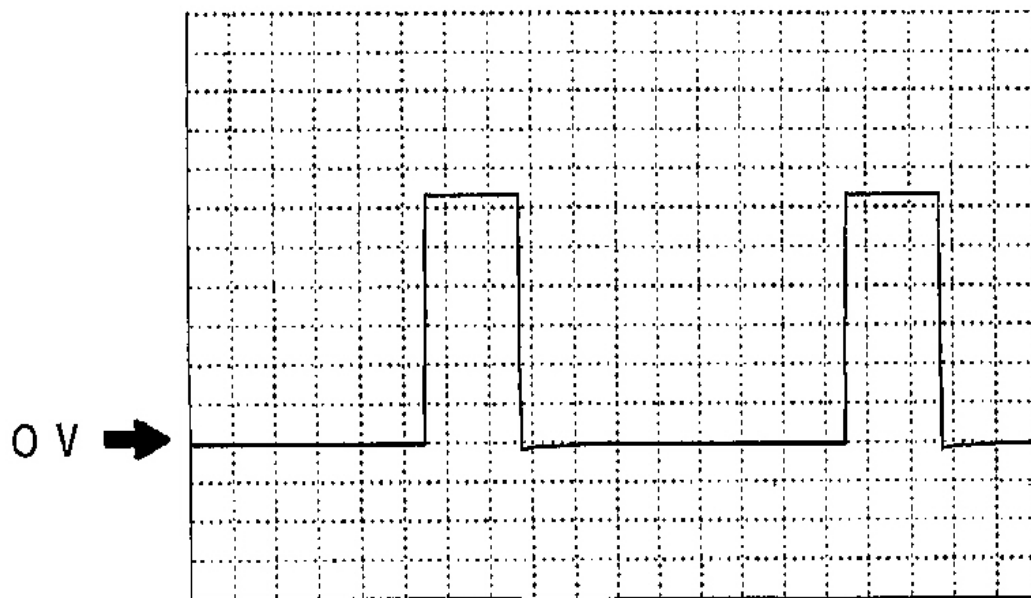


G03637980

Fig. 18: IAC Control Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 2P(+) <--> 2Q(-)
- Oscilloscope setting: 2.0 V/DIV (Y), 25 ms/DIV (X), DC range
- Vehicle condition: Idling after warm-up (no electrical load)

Purge control signal

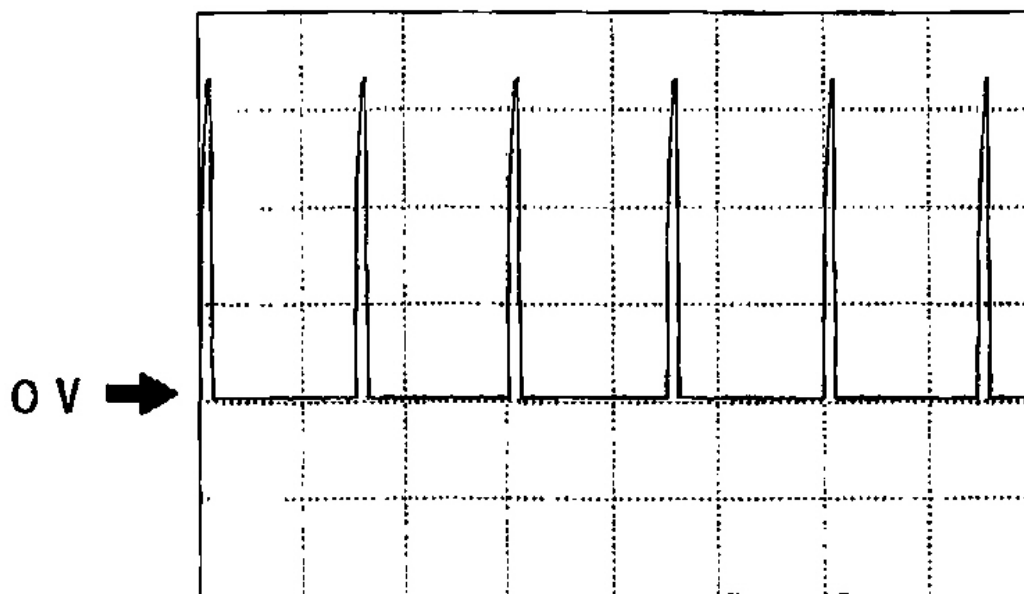


G03637981

Fig. 19: Purge Control Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 3C(+) <--> 4A(-)
- Oscilloscope setting: 2.0 V/DIV (Y), 10 ms/DIV (X), DC range
- Vehicle condition:
 - ECT: above 80°C {176°F}
 - D range and 7.5 km/h {5 mph} or below

IGT control signal

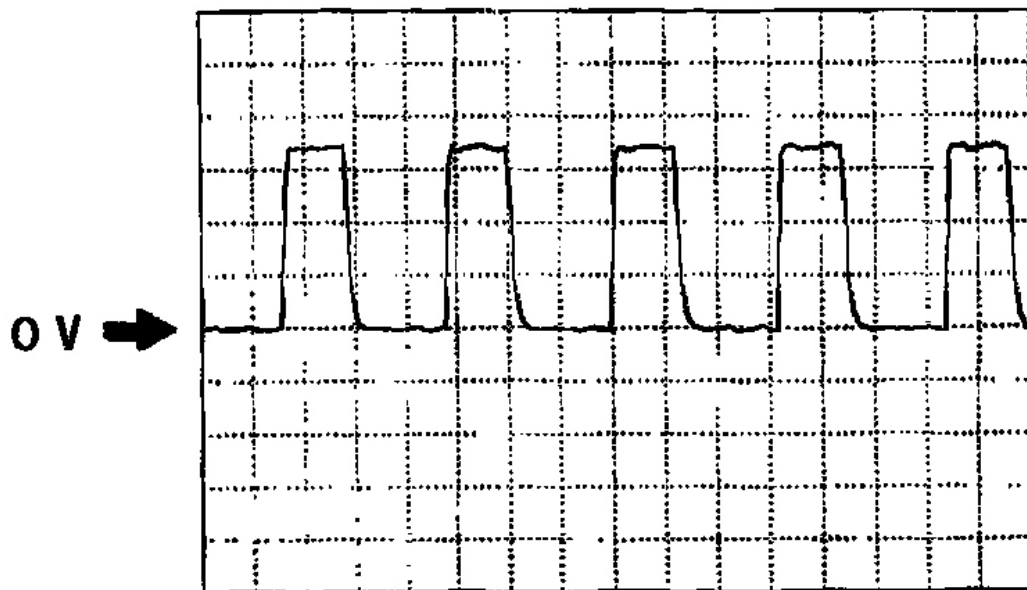


G03637982

Fig. 20: IGT Control Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal:
 - 3F (+) <--> 4A (-)
 - 3I (+) <--> 4A (-)
- Oscilloscope setting: 1.0 V/DIV (Y), 50 ms/DIV (X), DC range
- Vehicle condition: Idling after warm-up

Generator field coil signal



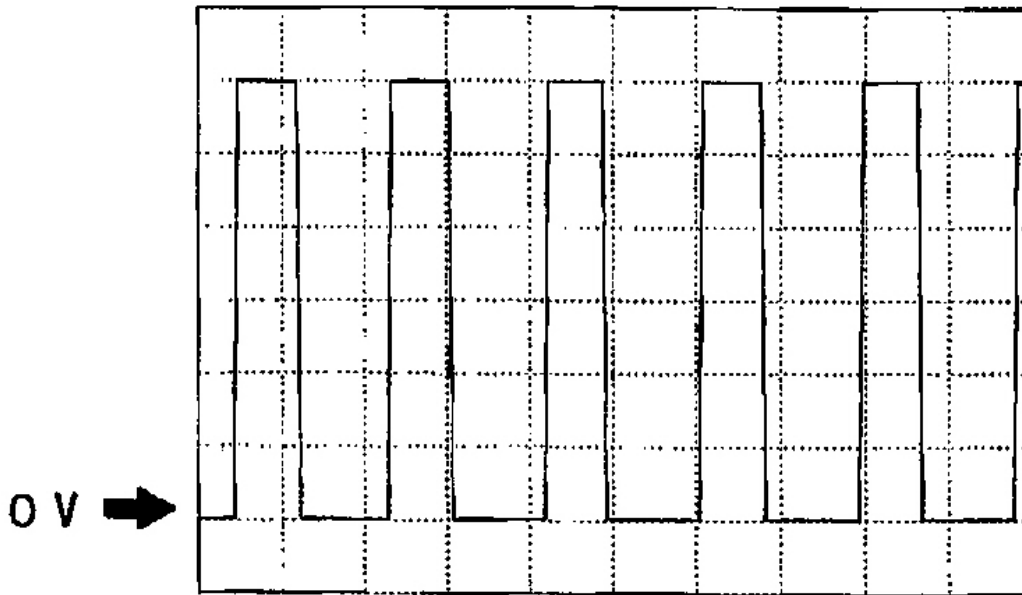
G03637983

Fig. 21: Generator Field Coil Signal - Oscilloscope Graph

Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 3M(+) <--> 4A(-)
- Oscilloscope setting: 0.5 V/DIV (Y), 2.5 ms/DIV (X), DC range
- Vehicle condition: Idling after warm-up (no electrical load)

Engine speed signal

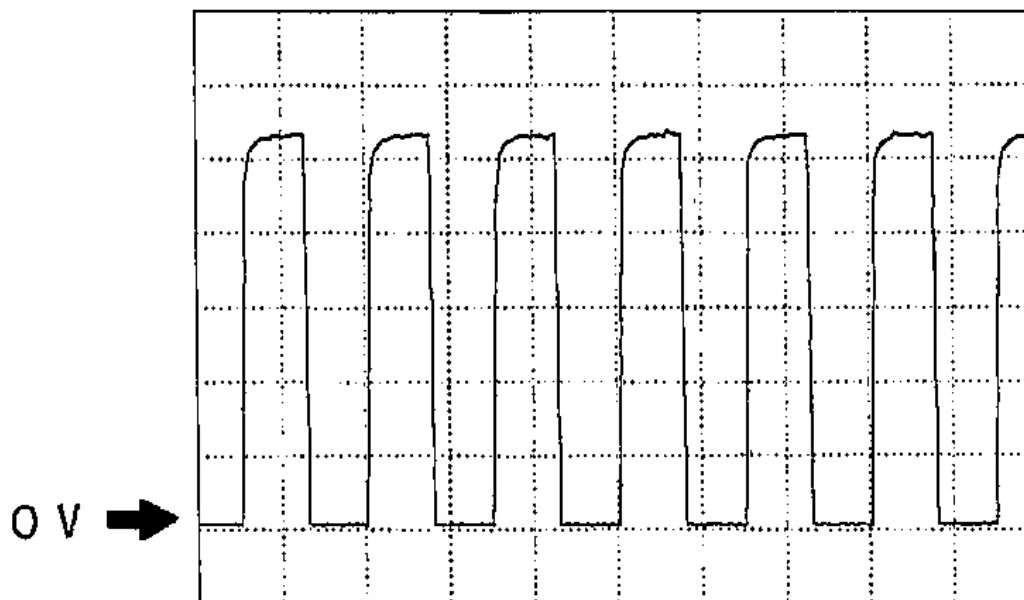


G03637984

Fig. 22: Engine Speed Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 3O(+) <--> 4A(-)
- Oscilloscope setting: 2.0 V/DIV (Y), 20 ms/DIV (X), DC range
- Vehicle condition: Idling

Vehicle speed signal



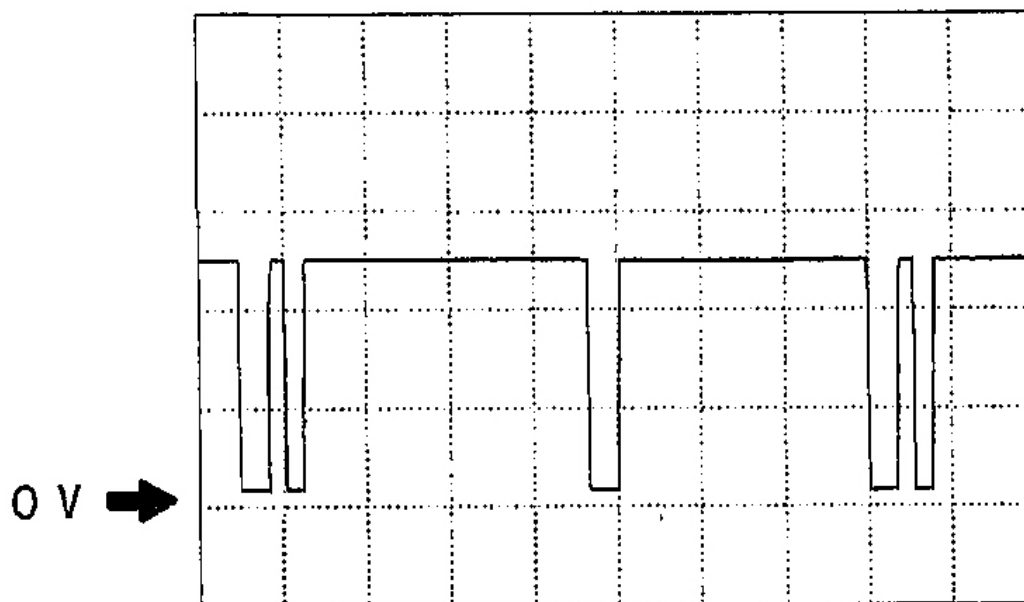
G03637985

Fig. 23: Vehicle Speed Signal - Oscilloscope Graph

Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 3T(+) <--> 4A(-)
- Oscilloscope setting: 1.0 V/DIV (Y), 10 ms/DIV (X), DC range
- Vehicle condition: Driving 50 km/h (31 mph)

SGC signal

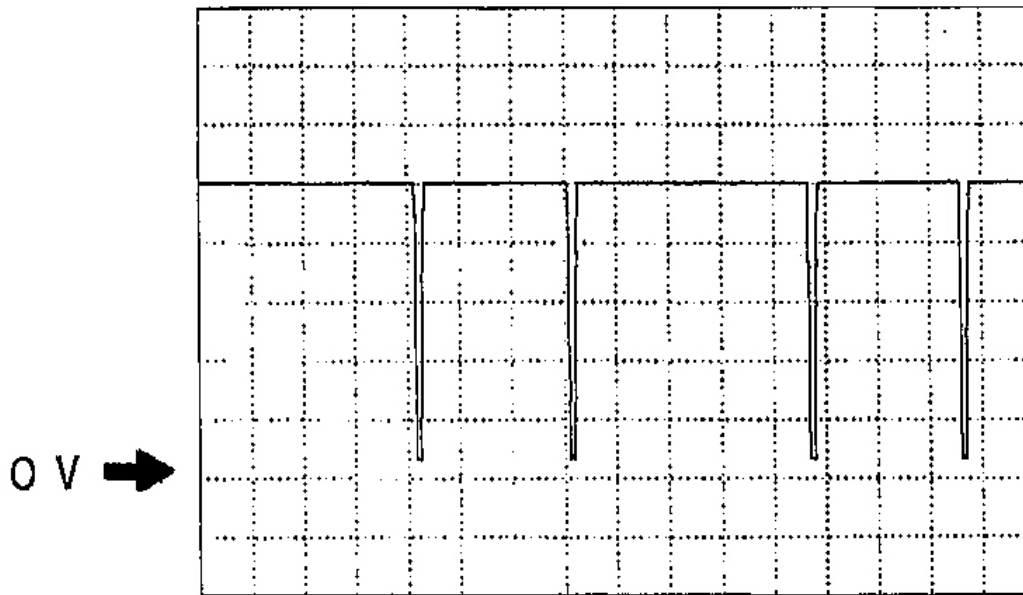


G03637986

Fig. 24: SGC Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 3V(+) <--> 4A(-)
- Oscilloscope setting: 2.0 V/DIV (Y), 20 ms/DIV (X), DC range
- Vehicle condition: Idling

NE signal



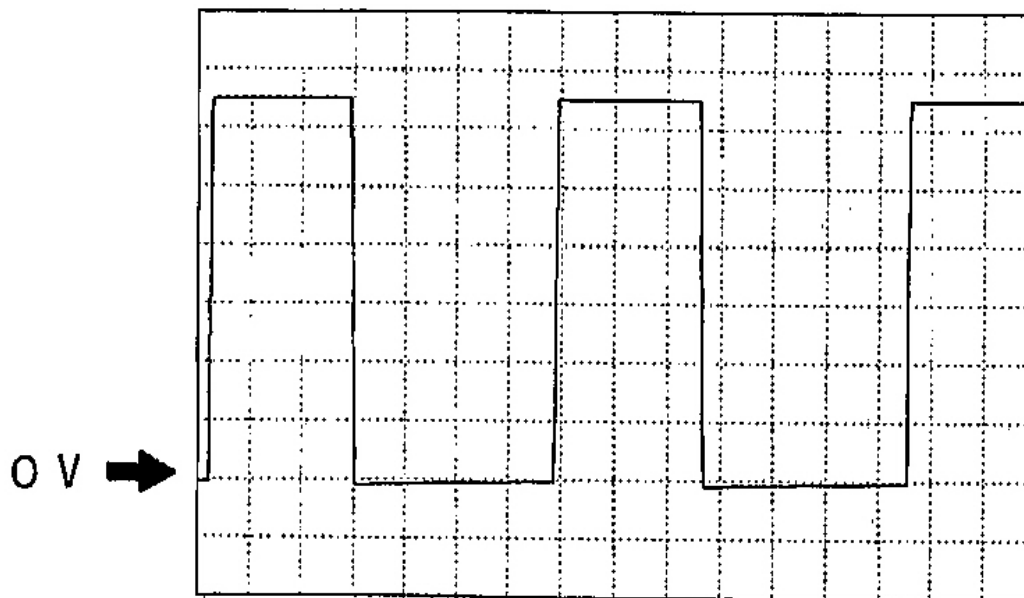
G03637987

Fig. 25: NE Signal - Oscilloscope Graph

Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 3Y(+) <--> 4A(-)
- Oscilloscope setting: 1,0 V/DIV (Y), 5.0 ms/DIV (X), DC range
- Vehicle condition: Idling

Oil control valve (OCV) signal

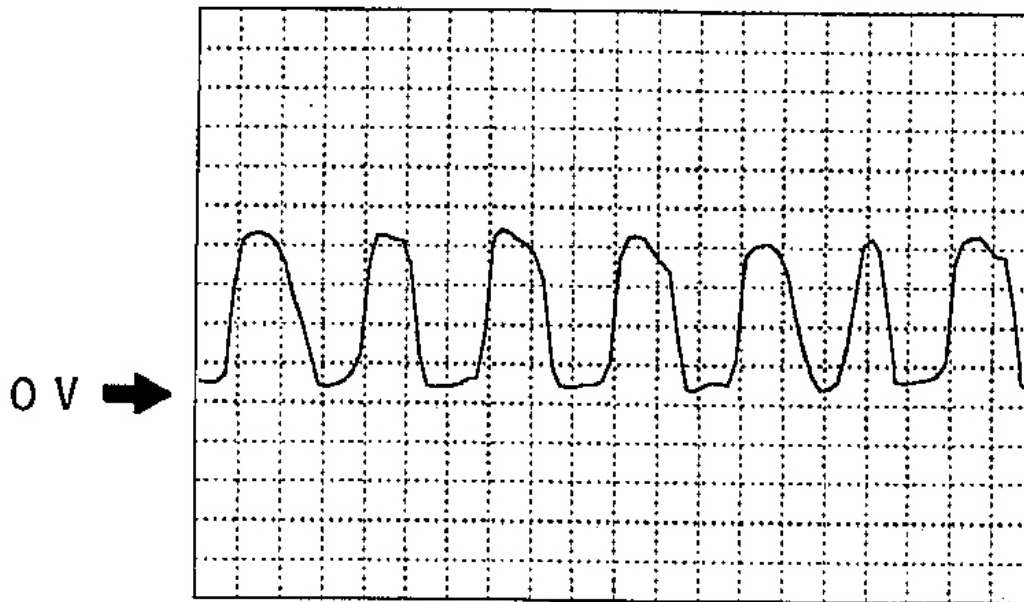


G03637988

Fig. 26: Oil Control Valve Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 4D(+) <--> 4A(-)
- Oscilloscope setting: 2.0 V/DIV (Y), 0.5 ms/DIV (X), DC range
- Vehicle condition: Idling after warm-up (no electrical load)

HO2S (front) signal



G03637989

Fig. 27: HO2S (Front) Signal - Oscilloscope Graph
Courtesy of MAZDA MOTORS CORP.

- PCM terminal: 4W(+) <--> 4A(-)
- Oscilloscope setting: 0.2 V/DIV (Y), 2.0 ms/DIV (X), DC range
- Vehicle condition: Idling after warm-up

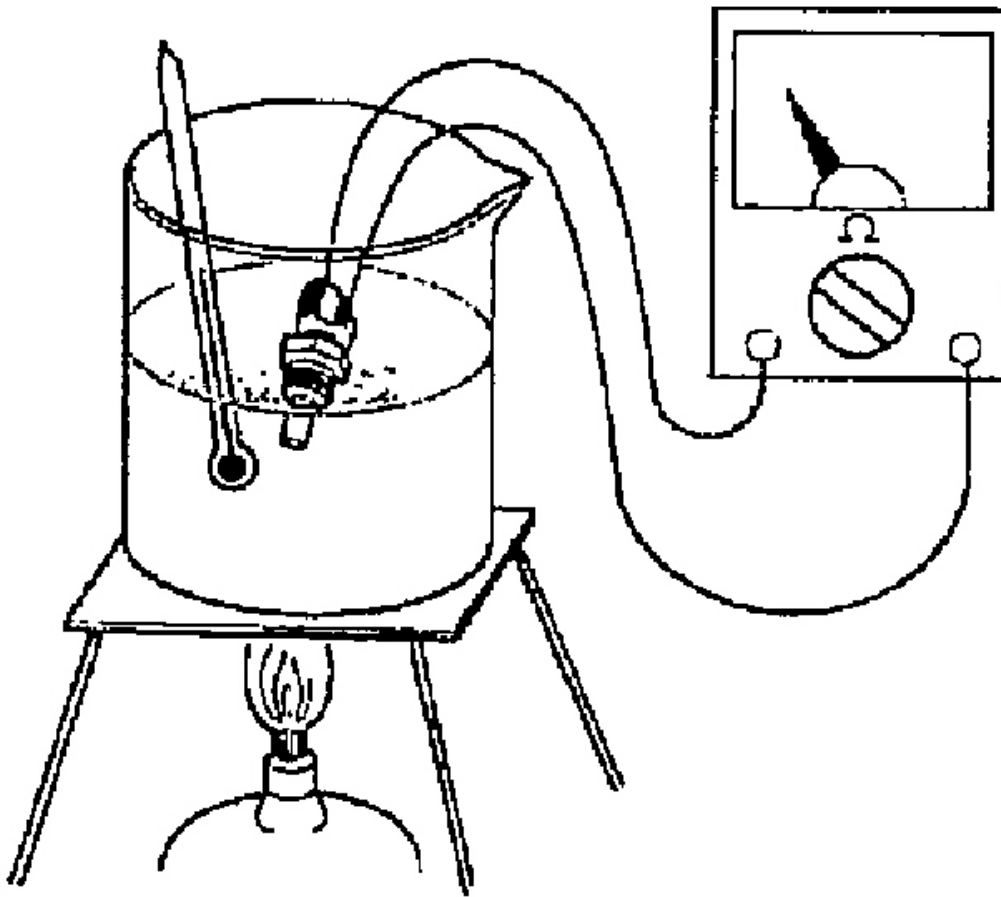
INTAKE AIR TEMPERATURE (IAT) SENSOR INSPECTION (BP, BP WITH TC)

INSPECTION OF RESISTANCE

NOTE:

- Perform the following test only when directed.

1. Disconnect the IAT sensor connector.
2. Remove the IAT sensor.
3. Place the IAT sensor in water with a thermometer, and heat the water gradually.



G03637990

Fig. 28: Measuring Resistance Of IAT Sensor
 Courtesy of MAZDA MOTORS CORP.

4. Measure the resistance of the IAT sensor using an ohmmeter.
 - If IAT sensor is okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.
 - If not as specified, replace the IAT sensor.

Specification

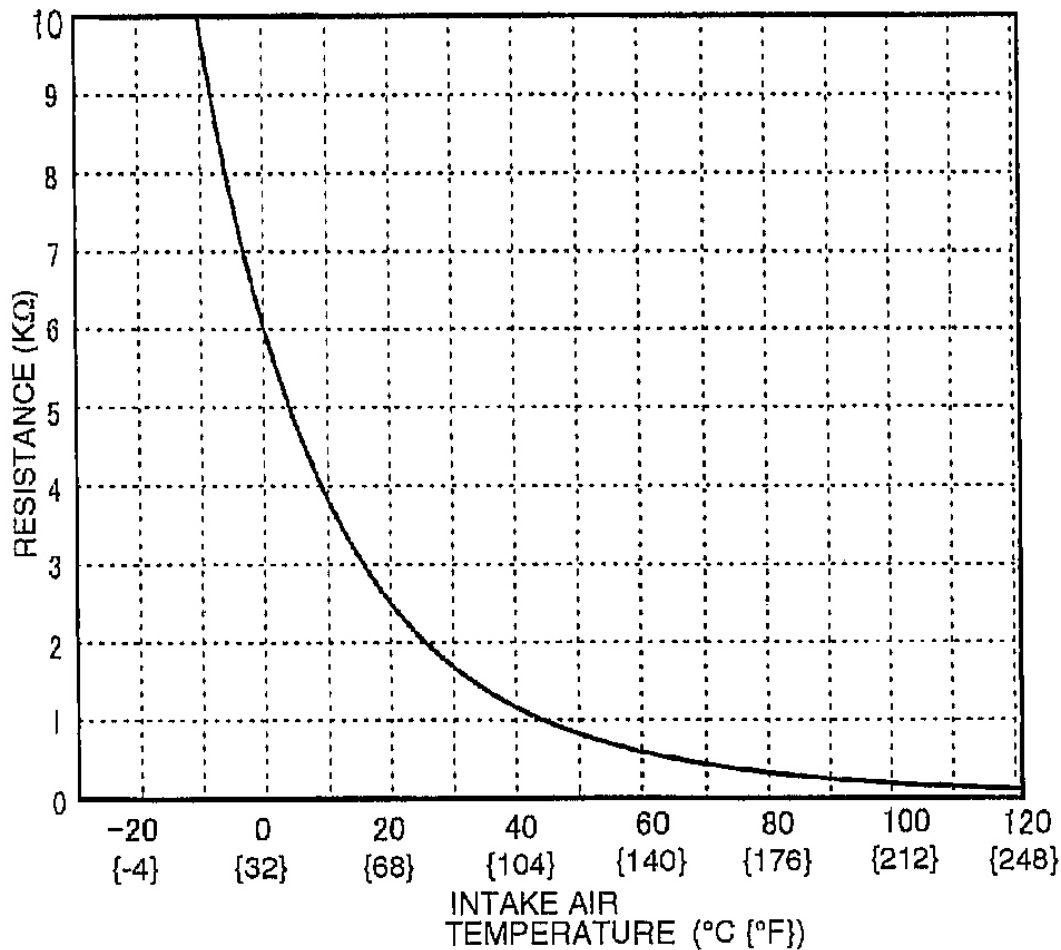
Water temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.21-2.69

80 (176)

0.29-0.354

5. Reconnect the IAT sensor connector.

IAT SENSOR SIGNAL CHARACTERISTIC (REFERENCE)



G03637991

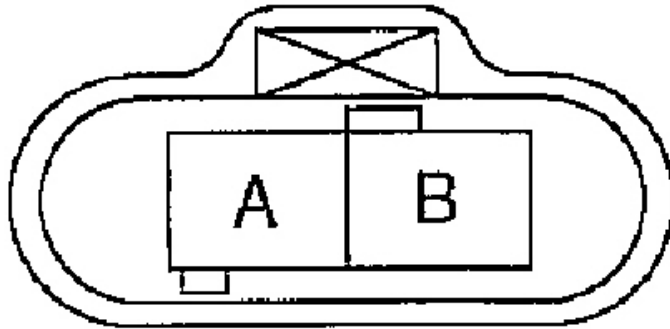
Fig. 29: IAT Sensor Signal Graph
Courtesy of MAZDA MOTORS CORP.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.

- Reference voltage circuit (IAT sensor connector terminal B and PCM connector terminal 4N.)
- GND circuit (IAT sensor connector terminal A and PCM connector terminal 4O.)



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03637992

Fig. 30: Identifying IAT Sensor Connector Terminal
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - IAT sensor connector terminal B and PCM connector terminal 4N to GND.

INTAKE AIR TEMPERATURE (IAT) SENSOR NO.2 INSPECTION (BP WITH TC)

NOTE:

- Before performing the following inspection, make sure to follow the procedure as indicated in the troubleshooting flowchart.

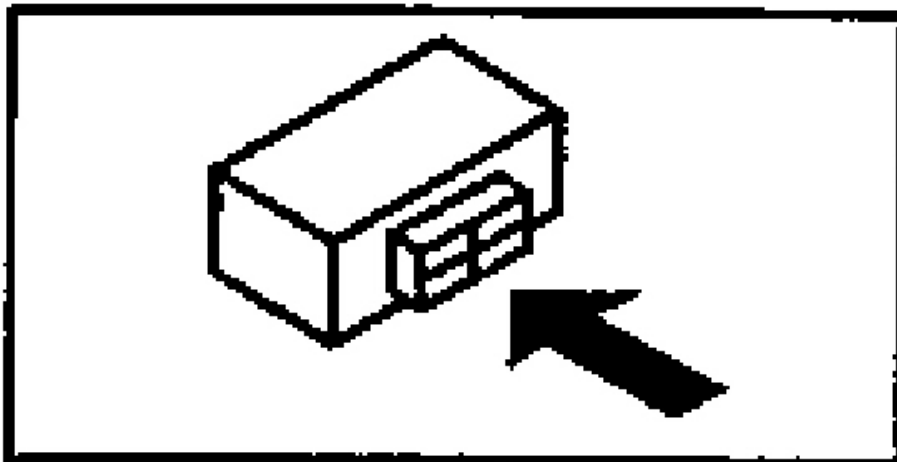
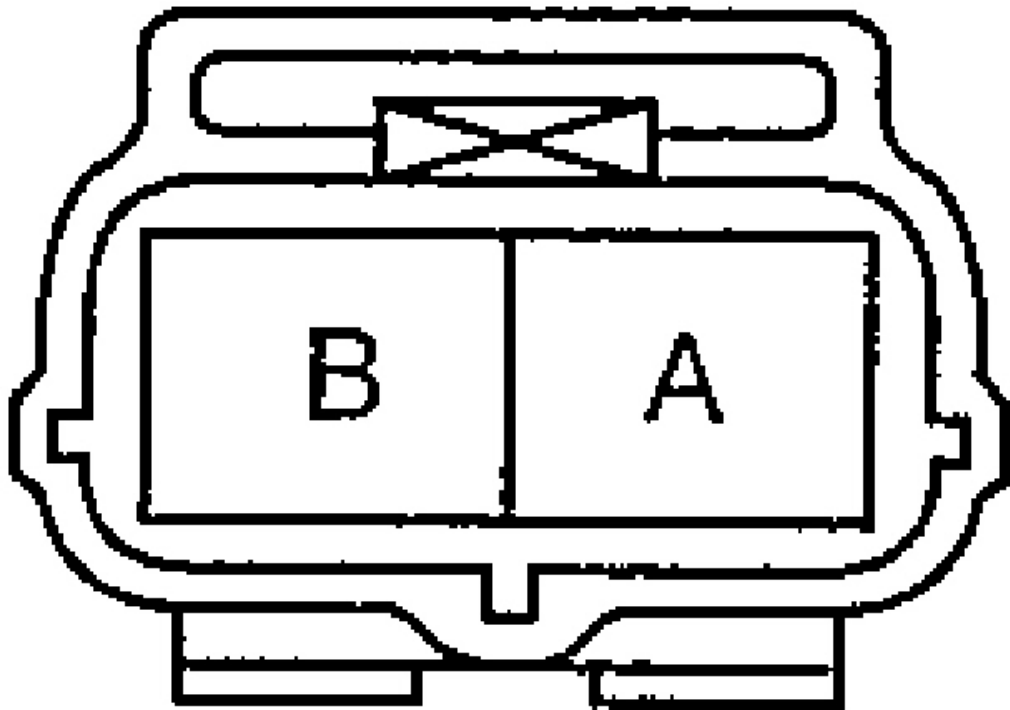
RESISTANCE INSPECTION

1. Disconnect the IAT sensor No.2 connector.
2. Verify that the resistance between terminals A and B is within the specification.

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- If not within the specification, replace the IAT sensor No.2. (See **INTAKE-AIR SYSTEM REMOVAL/INSTALLATION (BP WITH TC)** .)
- If the monitor item condition/specification (reference) is not within the specification, even though there is no malfunction, perform the **CIRCUIT OPEN/SHORT INSPECTION**.



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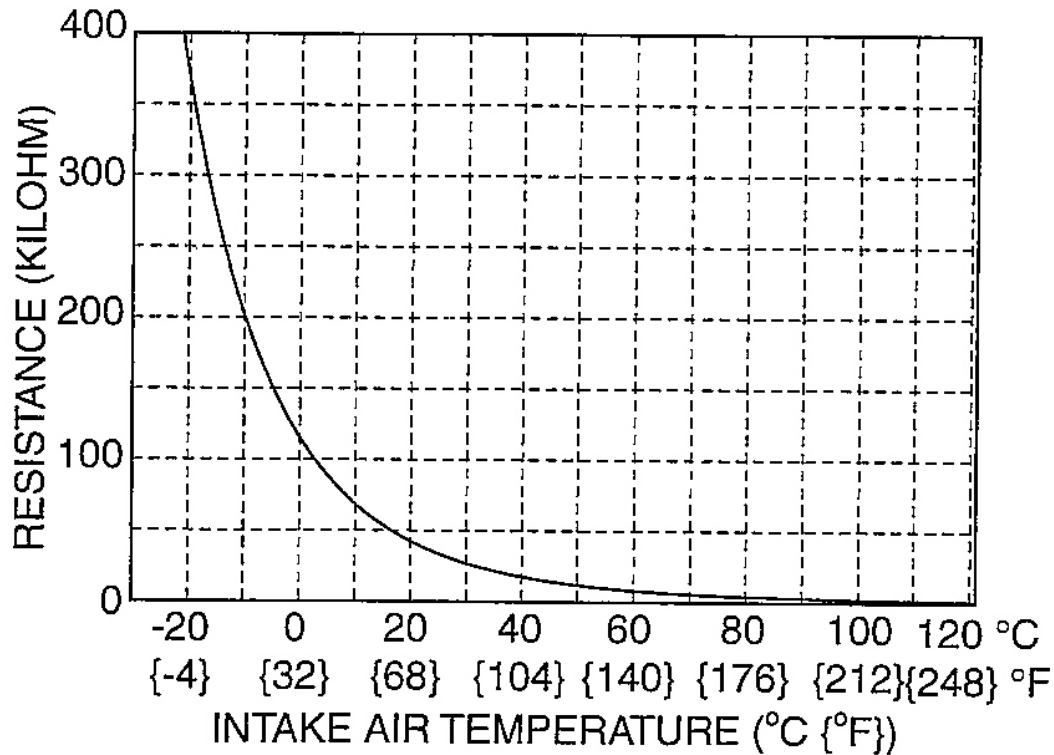
Fig. 31: Identifying IAT Sensor No.2 Connector Terminal
Courtesy of MAZDA MOTORS CORP.

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IAT SENSOR RESISTANCE SPECIFICATION

Ambient temperature (°C {°F})	Resistance (kilohm)
25 {77}	Approx.33
85 (185)	Approx.3.5



G03637994

Fig. 32: IAT Sensor Characteristics Graph
Courtesy of MAZDA MOTORS CORP.

IAT SENSOR CHARACTERISTICS REFERENCE

Ambient temperature (°C {°F})	-20 {-4}	0 (32)	20 {68}	40 {104}	60 {140}
Resistance (kilohm)	Approx.357	Approx.112	Approx.41	Approx.17	Approx.8
Voltage (V)	Approx.4.6	Approx.4.0	Approx.3.0	Approx.2.0	Approx.1.2

CIRCUIT OPEN/SHORT INSPECTION

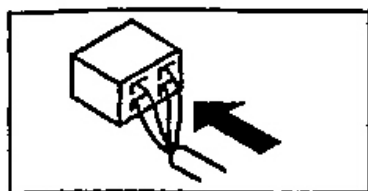
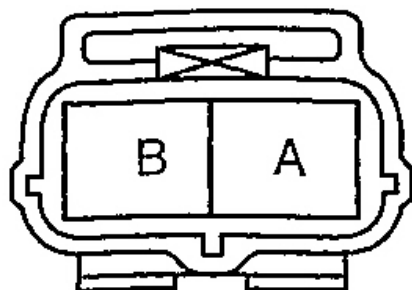
1. Remove the PCM connector cover.
2. Disconnect the PCM connector.

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3. Inspect the following wiring harness for open or short circuit (continuity check).

IAT NO.2 SENSOR WIRING HARNESS-SIDE CONNECTOR



PCM WIRING HARNESS-SIDE CONNECTOR

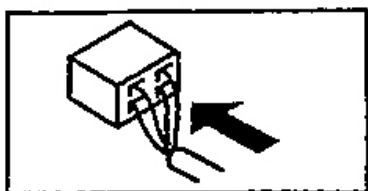
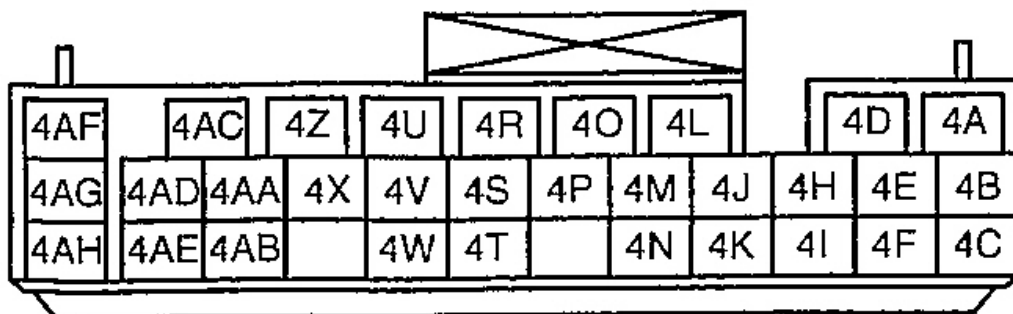


Fig. 33: Identifying PCM Connector Terminal
 Courtesy of MAZDA MOTORS CORP.

Open circuit

- If there is no continuity, there is an open circuit. Repair or replace the wiring harness.
 - IAT sensor No.2 terminal A and PCM terminal 4O
 - IAT sensor No.2 terminal B and PCM terminal 4R

Short circuit

- If there is continuity, there is a short circuit. Repair or replace the wiring harness.
 - IAT sensor No.2 terminal A and power supply
 - IAT sensor No.2 terminal B and power supply
 - IAT sensor No.2 terminal B and body GND

MASS AIR FLOW (MAF) SENSOR INSPECTION (BP, BP WITH TC)

NOTE: • **Perform the following test only when directed.**

1. Visually check for the following on the MAF sensor.
 - Damage
 - Cracks
 - Terminal bends
 - Terminal rust
 - If any of the above are found, replace the MAF sensor.
 - If the above are found okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.
2. Reconnect the MAF sensor connector.

NOTE: • **The scan tool shows the MAF rate and load value.**

Specification

Intake MAF (g/s)			Engine load calculated value (%)	
MT	AT	MT	AT	
Idle [○]	2.6-3.3	2.4-3.4	16.0-23.0	15.0-23.0
Engine speed 2,500 rpm [○]	7.1-9.3	8.3-9.6	16.0-21.0	16.0-21.0
○ 750-850 rpm				
○ No load, neutral or P position				

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - MAF circuit (MAF sensor connector terminal B and PCM connector terminal 4X.)
 - Power circuit (MAF sensor connector terminal C and main relay terminal D through common connector.)
 - GND circuit (MAF sensor connector terminal A and PCM connector terminal 4A through common connector.)

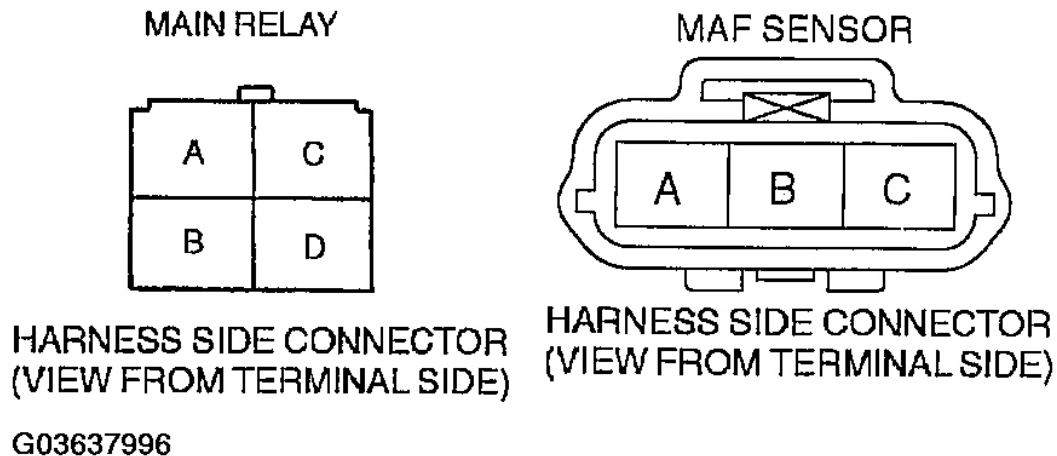


Fig. 34: Identifying Main Relay And MAF Sensor Connector Terminals
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - MAF sensor connector terminal B and PCM connector terminal 4X to GND.
 - MAF sensor connector terminal C and main relay terminal D through common connector to GND.

THROTTLE POSITION (TP) SENSOR INSPECTION (BP, BP WITH TC)

NOTE:

- The TP sensor on this type of vehicle is maintenance-free.
- Perform the following test only when directed.

1. Measure the PID value.

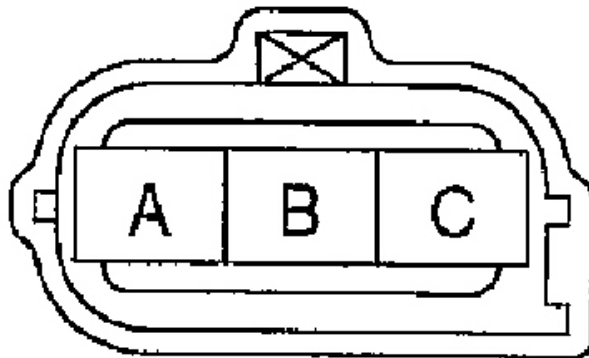
- If PID value is not as specified, inspect as follows:

- Verify that the throttle valve is fully closed.
 - Accelerator cable free play (See **ACCELERATOR CABLE INSPECTION/ADJUSTMENT (BP, BP WITH TC)**)
 - Throttle cable free play (See **ACCELERATOR CABLE INSPECTION/ADJUSTMENT (BP, BP WITH TC)**)
 - If the above are okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.
2. Reconnect the TP sensor connector.
- If the above open or short circuit are correct, replace TP sensor.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - Reference voltage circuit (TP sensor connector terminal A and PCM connector terminal 4L.)
 - TP circuit (TP sensor connector terminal C and PCM connector terminal 4V.)
 - GND circuit (TP sensor connector terminal B and PCM connector terminal 4O.)



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

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Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - TP sensor connector terminal A and PCM connector terminal 4L to GND.
 - TP sensor connector terminal C and PCM connector terminal 4V to GND.

THROTTLE POSITION (TP) SENSOR REPLACEMENT (BP, BP WITH TC)

1. Disconnect the TP sensor connector.
2. Remove the attaching screws.
3. Remove the TP sensor.
4. Verify that the throttle valve is fully closed.
5. Catch the tang of the TB on the TP sensor plastic rotor.
6. Position the TP sensor on the TB so that the mounting holes align.
7. Install the attaching screws.

Tightening torque

1.6-2.3 N.m {16-24 kgf.cm, 14-20 in.lbf}

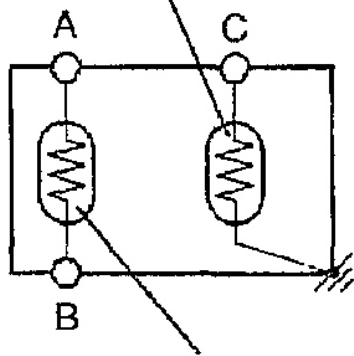
8. Release the throttle.
9. Verify the TP sensor PID value. (See **PCM INSPECTION (BP, BP WITH TC)**.)
 - If the PID value is not as specified, inspect the TP sensor. (See **THROTTLE POSITION (TP) SENSOR INSPECTION (BP, BP WITH TC)**)
 - If the PID (TP) condition is not as specified, replace the TB.

ENGINE COOLANT TEMPERATURE (ECT) SENSOR INSPECTION (BP, BP WITH TC)**INSPECTION OF RESISTANCE****NOTE:**

- Perform the following test only when directed.

1. Drain the engine coolant. (See **COOLING SYSTEM SERVICE WARNINGS** .) (See **ENGINE COOLANT REPLACEMENT** .)
2. Disconnect the ECT sensor connector.
3. Remove the ECT sensor.

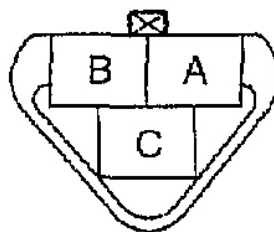
WATER TEMPERATURE
SENDER UNIT



ECT SENSOR

G03637998

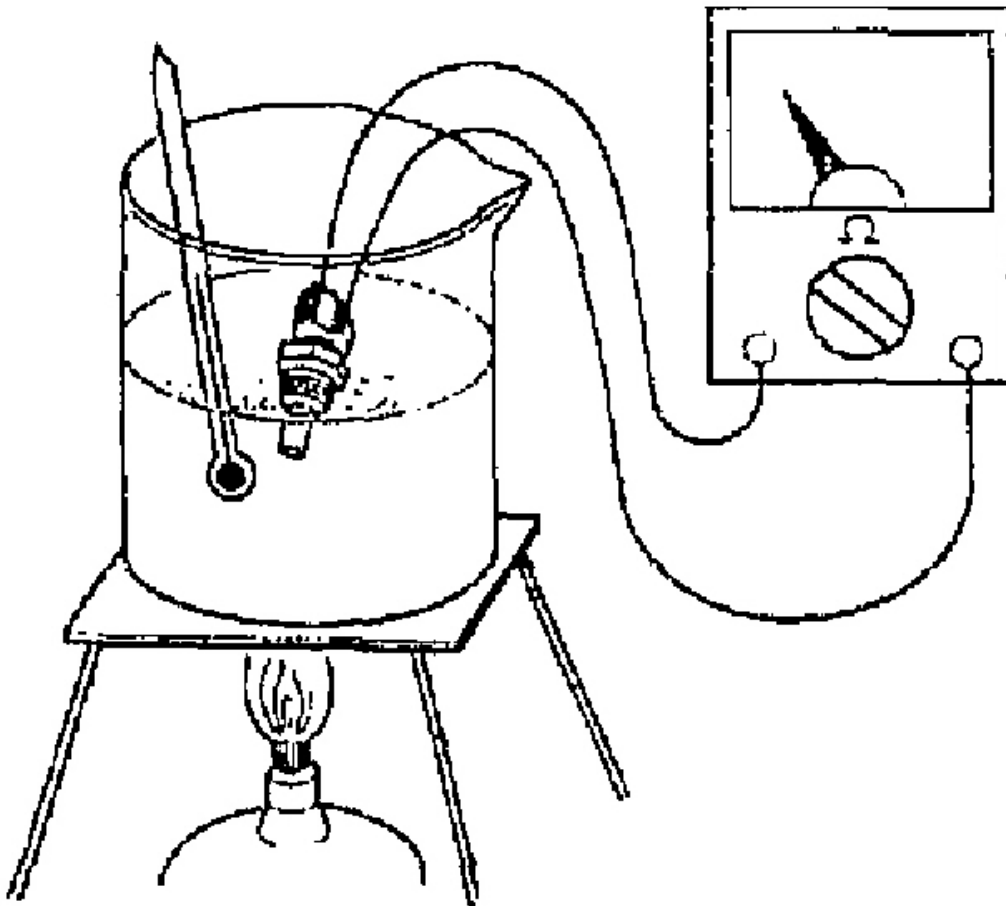
ECT SENSOR
CONNECTOR



PART SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

Fig. 36: Identifying ECT Sensor Connector
Courtesy of MAZDA MOTORS CORP.

4. Place the sensor in water with a thermometer, and heat the water gradually.



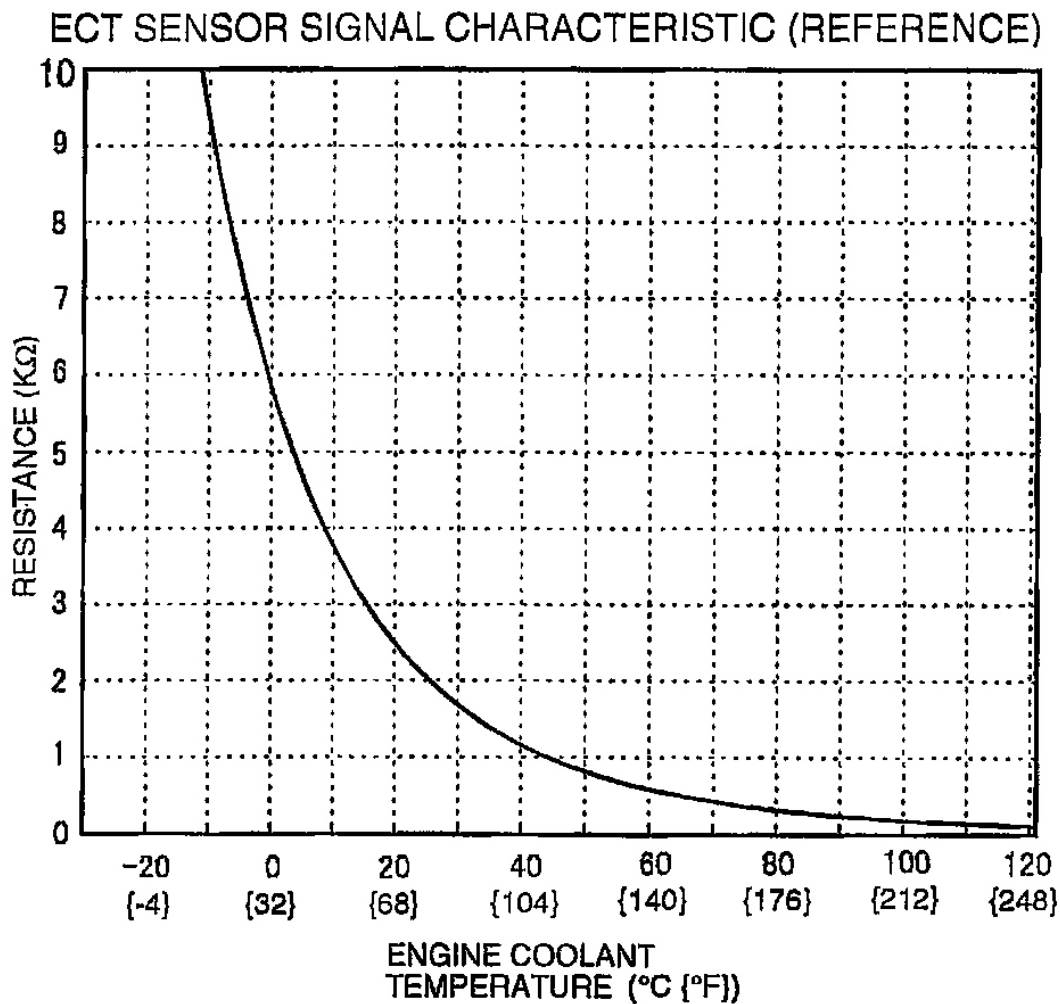
G03637999

Fig. 37: Identifying ECT Sensor Connector Terminals
 Courtesy of MAZDA MOTORS CORP.

5. Measure the resistance between the ECT sensor terminals using an ohmmeter.
 - If not as specified, replace the ECT sensor.
 - If ECT sensor is okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.

Temperature (°C {°F})	Resistance (kilohm)
20 {68}	2.27-2.74
80 (176)	0.29-0.34

6. Reconnect the ECT sensor connector.



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Fig. 38: Identifying ECT Sensor Signal Reference Graph
Courtesy of MAZDA MOTORS CORP.

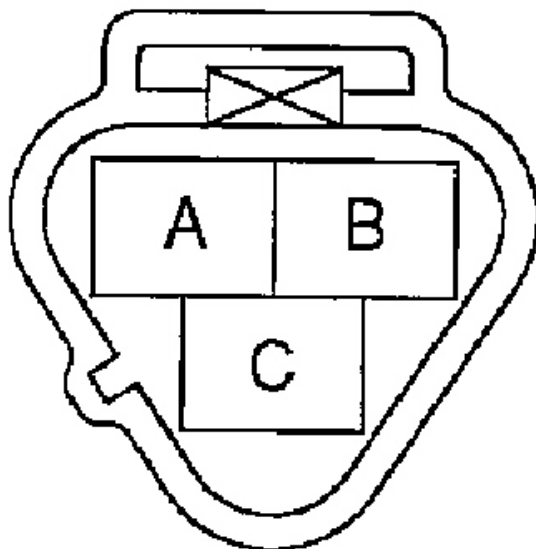
CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - Reference voltage circuit (ECT sensor connector terminal A and PCM connector terminal 4P through common connector.)

- GND circuit (ECT sensor connector terminal B and PCM connector terminal 4O through common connector.)

ECT SENSOR



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03638001

Fig. 39: Identifying ECT Sensor Connector Terminals
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - ECT sensor connector terminal A and PCM connector terminal 4P through common connector to GND.

WATER TEMPERATURE SENDER UNIT INSPECTION

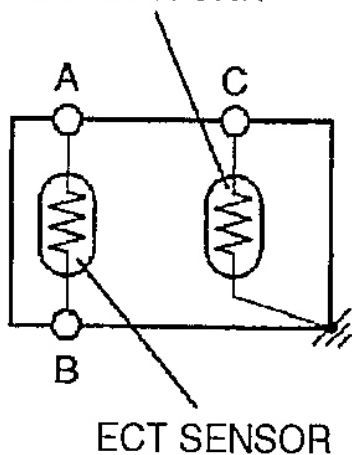
1. Drain the engine coolant. (See **COOLING SYSTEM SERVICE WARNINGS** .) (See **ENGINE**

COOLANT REPLACEMENT .)

2. Remove the ECT sensor.
3. Place the sensor in water with a thermometer, and heat the water gradually.
4. Measure the resistance between ECT sensor terminal C and body GND using an ohmmeter.
 - If not as specified, replace the ECT sensor.

Specification

Water temperature (°C {°F})	Resistance (ohm)
50 {122}	160-230

**WATER TEMPERATURE
SENDER UNIT**

G03638002

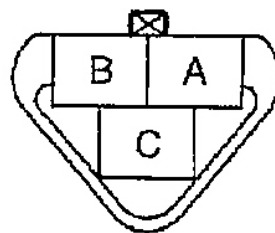
**ECT SENSOR
CONNECTOR****PART SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)**

Fig. 40: Identifying ETC Sensor Connector
Courtesy of MAZDA MOTORS CORP.

CRANKSHAFT POSITION (CKP) SENSOR INSPECTION (BP, BP WITH TC)**INSPECTION OF AIR GAP****NOTE:**

- Perform the following test only when directed.

1. Measure the air gap between each four projections of the plate behind the crankshaft pulley and the CKP sensor using a feeler gauge.

- If not as specified, adjust the CKP sensor air gap and inspect as follows:
 - Is any of the four projections of the plate behind the crankshaft pulley twisted or bent.
 - If not adjusted, replace the plate behind the crankshaft pulley (See **PLATE REMOVAL/INSTALLATION (BP, BP WITH TC)**.) or CKP sensor. (See **CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC)**)
 - If CKP sensor PID value is out of specification, perform the "**CIRCUIT OPEN/SHORT INSPECTION**".

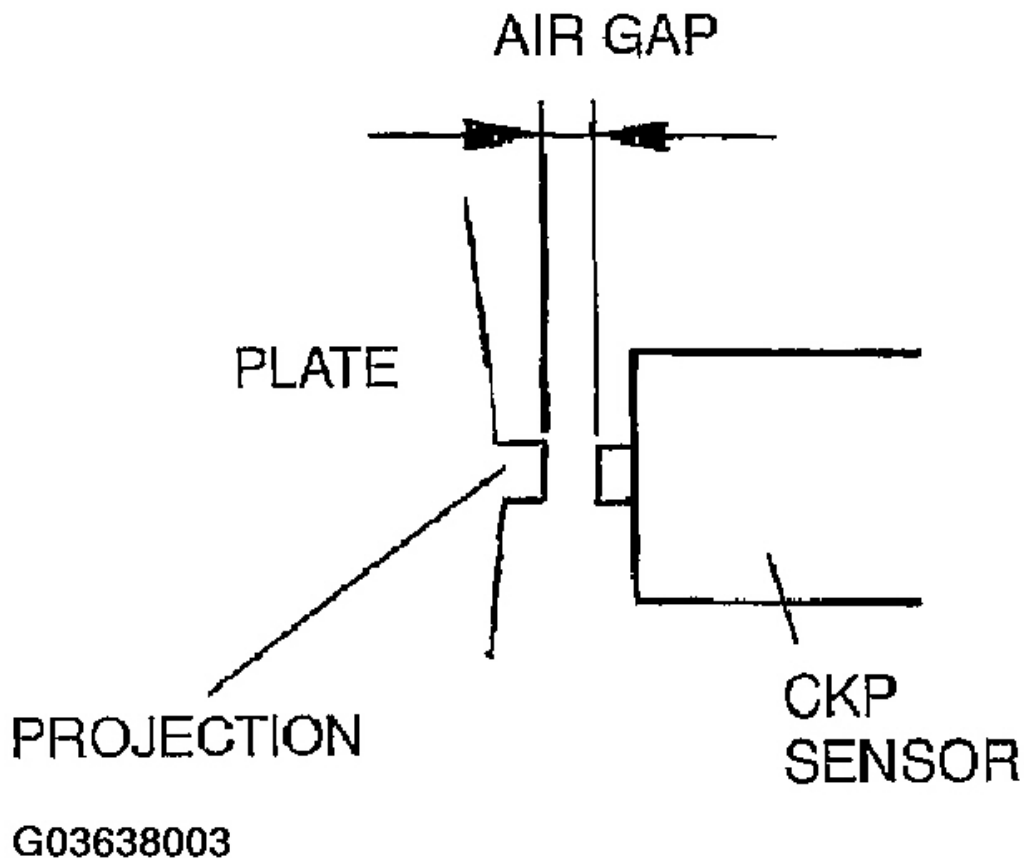


Fig. 41: Measuring Air Gap Between Projections Of Plate Behind Crankshaft Pulley And CKP Sensor

Courtesy of MAZDA MOTORS CORP.

Specification

0.5-1.5 mm {0.020-0.059 in}

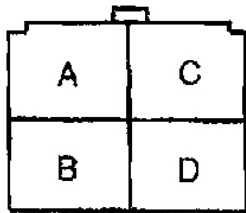
2. Reconnect the CKP sensor connector.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - CKP circuit (CKP sensor connector terminal B and PCM connector terminal 3Y.)
 - Power circuit (CKP sensor connector terminal A and main relay terminal D through common connector.)
 - GND circuit (CKP sensor connector terminal C and PCM connector terminal 4A through common connector.)

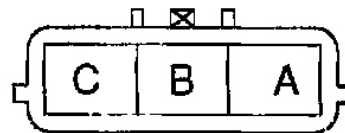
MAIN RELAY



**HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)**

G03638004

CKP SENSOR



**HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)**

Fig. 42: Identifying Main Relay
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - CKP sensor connector terminal B and PCM connector terminal 3Y circuit through common connector to GND.
 - CKP sensor connector terminal A and main relay terminal D through common connector to GND.

CRANKSHAFT POSITION (CKP) SENSOR ADJUSTMENT (BP, BP WITH TC)

1. Loosen the CKP sensor installation bolt.

2. While moving the CKP sensor, adjust the air gap between the CKP sensor and the four projections on the plate using a feeler gauge.

Specification

0.5-1.5 mm {0.020-0.059 in}

3. Tighten the CKP sensor installation bolt.
 - If not adjusted, replace the plate behind the crankshaft pulley or the CKP sensor. (See **PLATE REMOVAL/INSTALLATION (BP, BP WITH TC).**) (See **CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC).**)

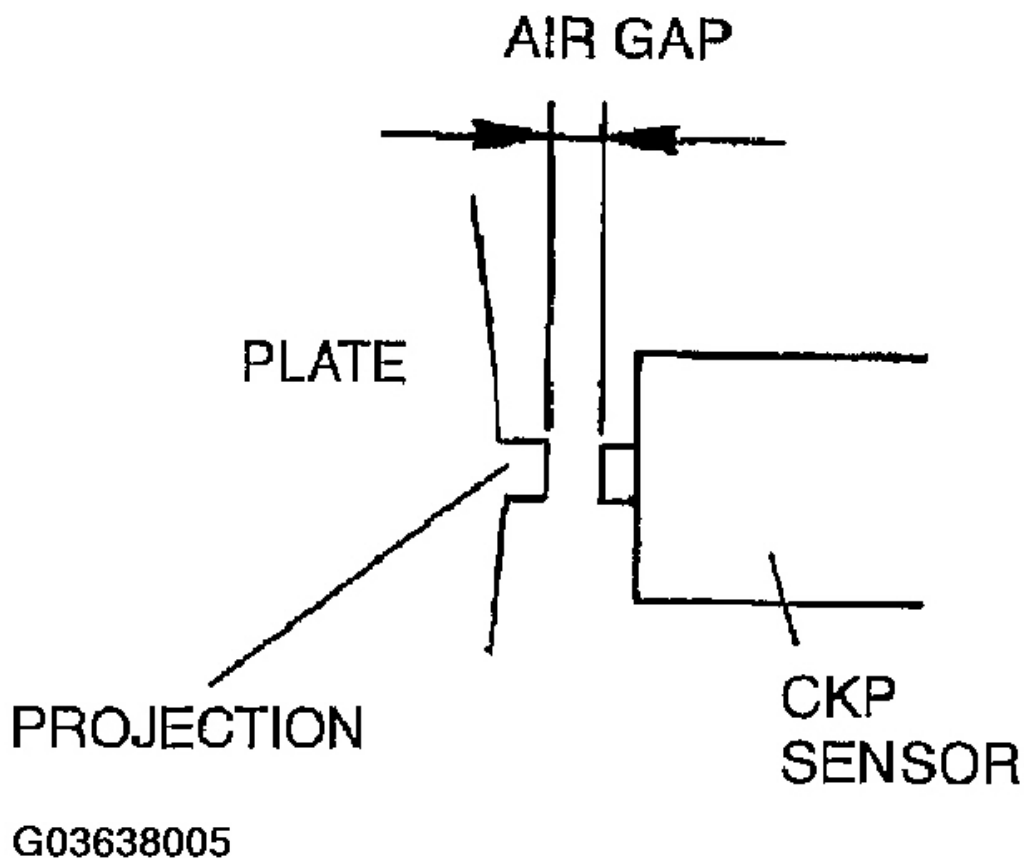


Fig. 43: Adjusting Air Gap Between CKP Sensor And Four Projections On Plate
Courtesy of MAZDA MOTORS CORP.

Tightening torque

7.9-10.7 N.m {80-110 kgf.cm, 69.5-95.4 in.lbf}

CRANKSHAFT POSITION (CKP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC)

1. Disconnect the CKP sensor connector.
2. Remove the undercover.
3. Remove the CKP sensor installation bolt.
4. Install in the reverse order of removal.

Tightening torque

7.9-10.7 N.m {80-110 kgf.cm, 69.5-95.4 in.lbf}

5. Reconnect the CKP sensor connector.

NOTE:

- Do not forcefully pull the wiring harness of the CKP sensor.

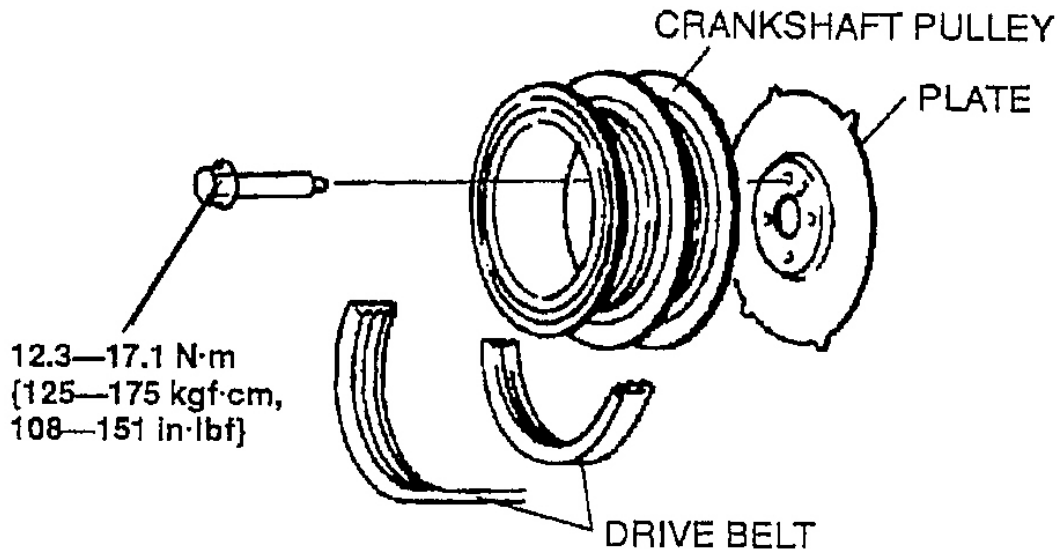
6. Adjust the air gap. (See CRANKSHAFT POSITION (CKP) SENSOR ADJUSTMENT (BP, BP WITH TC).)

PLATE REMOVAL/INSTALLATION (BP, BP WITH TC)

1. Remove the drive belt.
2. Remove the crankshaft pulley.
3. Remove the plate.
4. Install in the reverse order of removal.

NOTE:

- Adjust the drive belt when installing the drive belt. (See DRIVE BELT ADJUSTMENT .)



G03638006

Fig. 44: Removing Crankshaft Pulley & Torque Specifications
Courtesy of MAZDA MOTORS CORP.

CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC)

1. Disconnect the negative battery cable.
2. Disconnect the CMP sensor connector.
3. Remove the CMP sensor installation bolt.
4. Remove the CMP sensor.
5. Make sure that the CMP sensor is free of any metallic shavings or particles.
 - If metallic shavings or particles are found on the sensor, clean them off.
6. Install the CMP sensor in the reverse order of removal.

Tightening torque

7.9-10.7 N.m {80-110 kgf cm, 69.5-95.4 in.lbf}

CAMSHAFT POSITION (CMP) SENSOR INSPECTION (BP, BP WITH TC)

VISUAL INSPECTION

1. Remove the CMP sensor. (See **CAMSHAFT POSITION (CMP) SENSOR**

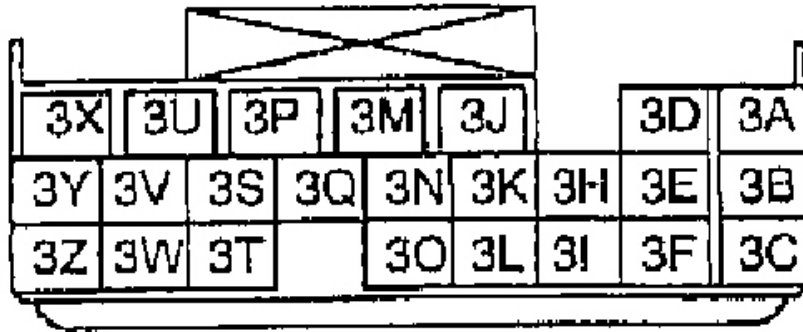
REMOVAL/INSTALLATION (BP, BP WITH TC).

2. Make sure that the CMP sensor is free of any metallic shavings or particles.
 - If metallic shavings or particles are found on the sensor, clean them off.
3. Install the CMP sensor. (See **CAMSHAFT POSITION (CMP) SENSOR REMOVAL/INSTALLATION (BP, BP WITH TC).**)

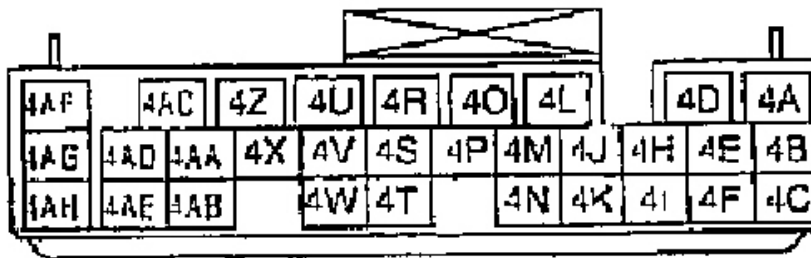
WAVE PROFILE INSPECTION

1. Remove the PCM. (See **PCM REMOVAL/INSTALLATION (BP, BP WITH TC).**)
2. Connect WDS or equivalent to DLC-2 connector.
3. Connect oscilloscope test leads to the following PCM connector terminals.
 - (+) lead: PCM terminal 3V
 - (-) lead: PCM terminal 4A
4. Start the engine.
5. Monitor RPM PID.

PCM (24PIN)



PCM (31PIN)



HARNESS SIDE CONNECTOR (VIEW FROM HARNESS SIDE)

G03638007

Fig. 45: Identifying PCM Connector Terminal
Courtesy of MAZDA MOTORS CORP.

6. Inspect wave profile when idling engine.
 - If wave profile or voltage are out of specifications, carry out the "Circuit Open/Short Inspection".
 - PCM terminal: 3V(+) <--> 4A(-)
 - Oscilloscope setting: 2.0V/DIV(Y), 20ms/DIV(X), DC range

- Vehicle condition: Idling

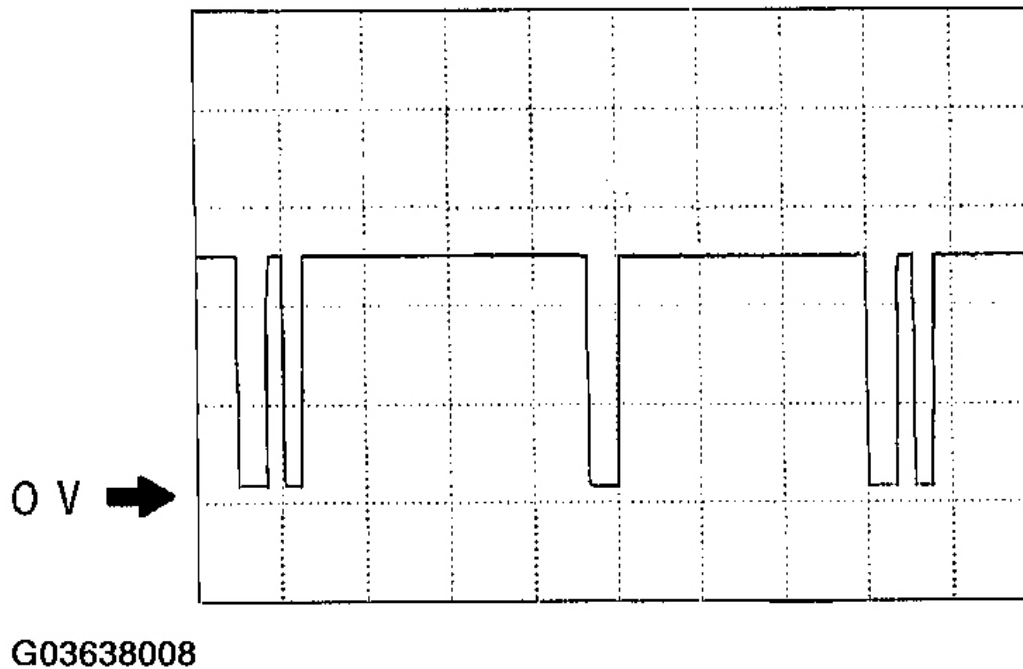


Fig. 46: Identifying Waveform Graph
Courtesy of MAZDA MOTORS CORP.

CIRCUIT OPEN/SHORT INSPECTION

1. Remove the PCM. (See **PCM REMOVAL/INSTALLATION (BP, BP WITH TC)**.)
2. Inspect the following wiring harnesses for an open or short circuit by probing the applicable sensor and PCM terminals with ohmmeter leads.
 - If there is an open or short circuit, repair or replace wiring harnesses.
 - If there is no open or short circuit, replace the CMP sensor.

Open circuit

- CMP signal circuit (CMP sensor connector terminal B and PCM connector terminal 3V)
- Power circuit (CMP sensor connector terminal A and main relay terminal D through common connector)
- GND circuit (CMP sensor connector terminal C and PCM connector terminal 4A)

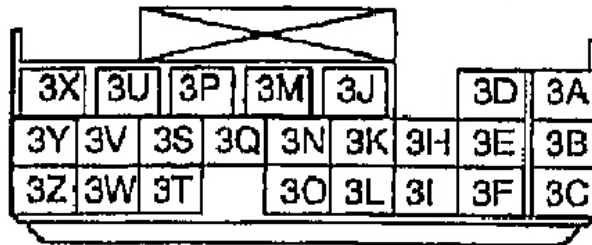
Short circuit

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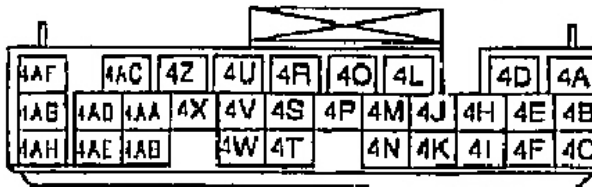
2005 ENGINE PERFORMANCE Control System - MX-5 Miata

- CMP signal circuit (CMP sensor connector terminal B and PCM connector terminal 3V to GND)
 - Power circuit (CMP sensor connector terminal A and main relay terminal D through common connector to GND)
3. Reconnect the CMP sensor connector.
 4. Inspect the protrusion of camshaft (intake side) for damage and cracks.

PCM (24PIN)



PCM (31PIN)

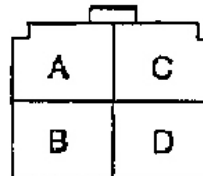


HARNESS SIDE CONNECTOR
(VIEW FROM HARNESS SIDE)

CMP SENSOR



MAIN RELAY



HARNESS SIDE CONNECTOR
(VIEW FROM TERMINAL SIDE)

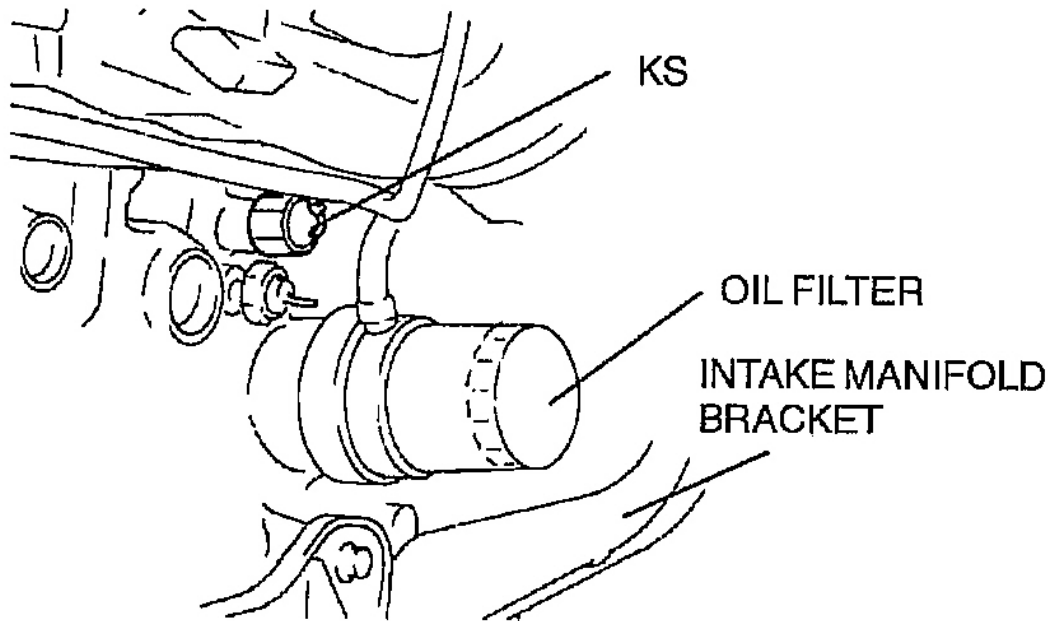
G03638009

Fig. 47: Identifying CMP Sensor Connector Terminal
Courtesy of MAZDA MOTORS CORP.

1. Disconnect the negative battery cable.
2. Remove the intake manifold bracket.
3. Remove the KS using the SST (49 H018 001).
4. Install in the reverse order of removal.

Tightening torque

19.6-34.3 N.m {2.0-3.5 kgf.m, 14.5-25.3 ft.lbf}



G03638010

Fig. 48: Identifying Knock Sensor Location
Courtesy of MAZDA MOTORS CORP.

KNOCK SENSOR (KS) INSPECTION (BP, BP WITH TC)

INSPECTION OF RESISTANCE

NOTE: • Perform the following test only when directed.

1. Verify that the ignition switch is at LOCK.
2. Disconnect KS connector.

3. Measure the resistance between KS terminal A and the KS body using an ohmmeter.
 - If not as specified, replace the KS.
 - If knock sensor is okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**. (See **KNOCK SENSOR (KS) REMOVAL/INSTALLATION (BP, BP WITH TC)**.)



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03638011

Fig. 49: Identifying Knock Sensor Harness Side Connector Terminals
Courtesy of MAZDA MOTORS CORP.

Specification

Approx.560 kilohms (20°C {68°F})

4. Reconnect the KS connector.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - KS circuit (KS connector terminal A and PCM connector terminal 4M through common connector.)

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - KS connector terminal A and PCM connector terminal 4M through common connector to GND.

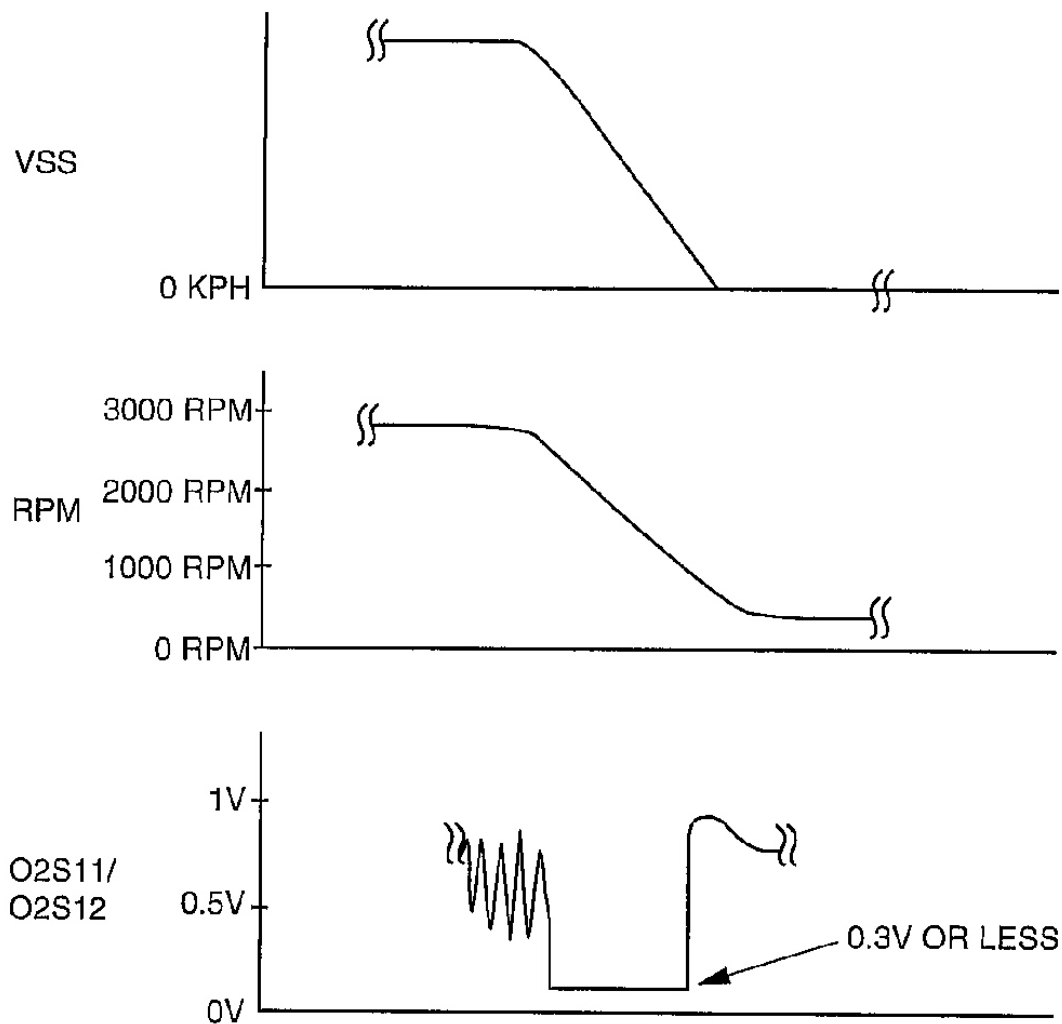
HEATED OXYGEN SENSOR (HO2S) INSPECTION (BP, BP WITH TC)

NOTE:

- Before performing the following inspection, make sure to follow the procedure as indicated in the troubleshooting flowchart.

HO2S VOLTAGE INSPECTION

1. Warm up the engine to normal operating temperature.
2. Using the WDS or equivalent, monitor the following:
 - Vehicle speed (PID: VSS)
 - Engine speed (PID: RPM)
 - Front/rear HO2S voltage (PID: O2S11/O2S12)
3. Drive the vehicle and decelerate the engine speed by releasing the accelerator pedal fully when the engine speed is **3,000 rpm or more**.
4. Verify that the front/rear HO2S outputs a voltage of **0.6 V or more**, one time or more, then verify that the front/rear HO2S voltage (PID: O2S11/O2S12) is **0.3 V or less** while decelerating as shown in **Fig. 50**.



G03638012

Fig. 50: HO2S Voltage Graph
 Courtesy of MAZDA MOTORS CORP.

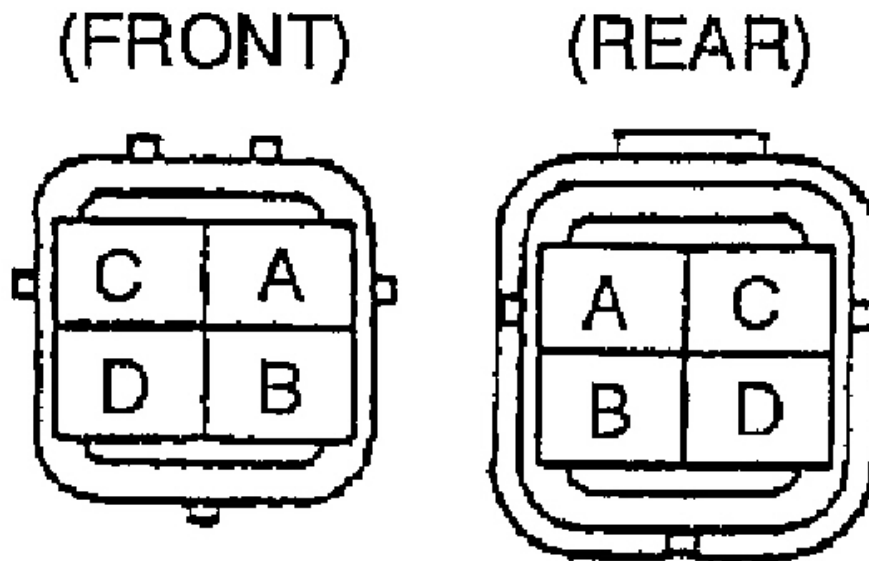
- If not within the specification, inspect the HO2S for an open or short circuit. (See **HO2S Voltage inspection**.) Then if there is no malfunction in the wiring harness, replace the HO2S.

HO2S CIRCUIT OPEN/SHORT INSPECTION (SENSOR)

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - Heated oxygen circuit (HO2S connector terminal A and PCM connector terminal 4W (Front).)

- GND circuit (HO2S connector terminal B and PCM connector terminal 4O through common connector (Front).)
- Heated oxygen circuit (HO2S connector terminal A and PCM connector terminal 4AA (Rear).)
- GND circuit (HO2S connector terminal B and PCM connector terminal 4O through common connector (Rear).)



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03638013

Fig. 51: Identifying HO2S Harness Side Connector
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - HO2S connector terminal A and PCM connector terminal 4W to GND (Front).
 - HO2S connector terminal A and PCM connector terminal 4AA to GND (Rear).

HO2S HEATER RESISTANCE INSPECTION**NOTE:**

- Perform the following test only when directed.

1. Disconnect the HO2S connector.
2. Measure the resistance between HO2S terminals C and D using an ohmmeter.
 - If not as specified, replace the HO2S.
 - If HO2S heater is okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.

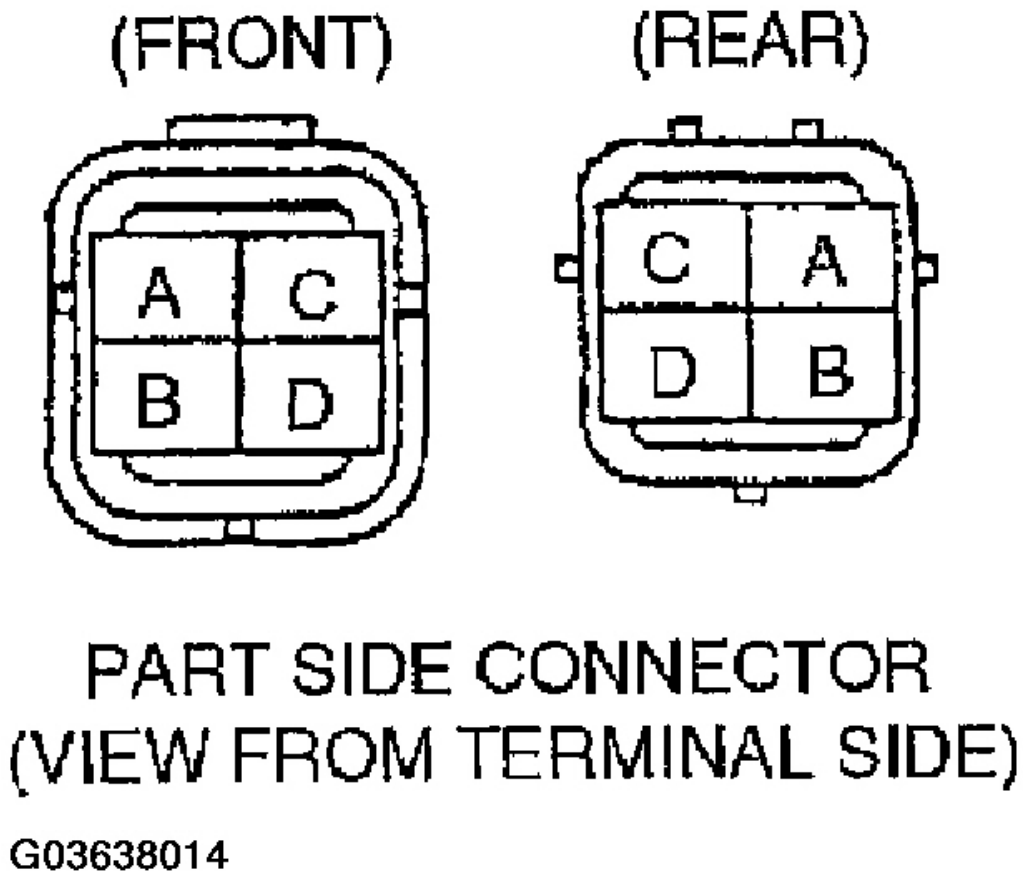


Fig. 52: Identifying HO2S Part Side Connector
Courtesy of MAZDA MOTORS CORP.

HO2S heater resistance

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Front: 2-20 ohms

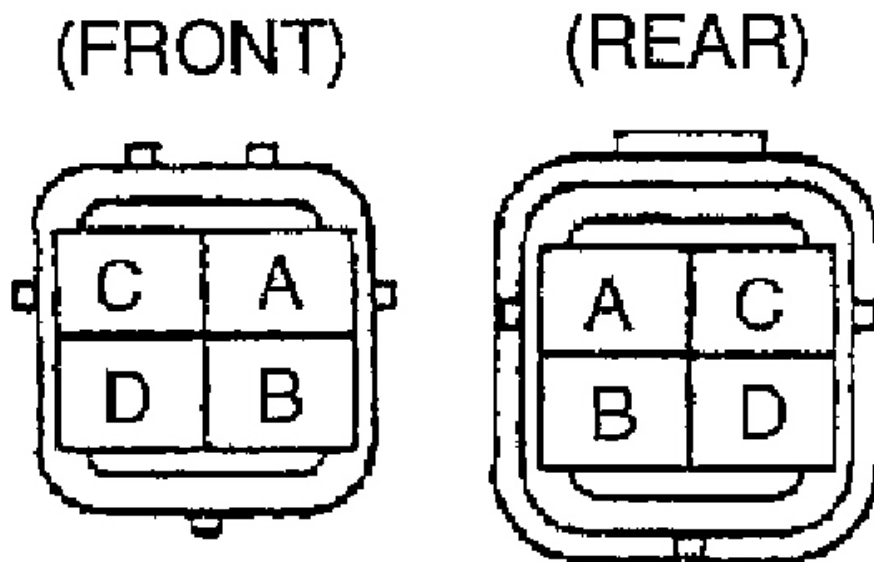
Rear: 2-50 ohms

3. Reconnect the HO2S connector.

HO2S CIRCUIT OPEN/SHORT INSPECTION (HEATER)

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - GND circuit (HO2S connector D and PCM connector terminal 3J through common connector (Front).)
 - Power circuit (HO2S connector terminal C and ignition switch (IG1) circuit through common connector (Front).)
 - GND circuit (HO2S connector terminal D and PCM connector terminal 3P (Rear).)
 - Power circuit (HO2S connector terminal C and ignition switch (IG1) circuit through common connector (Rear).)



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03638015

Fig. 53: Identifying HO2S Harness Side Connector
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - HO2S connector terminal C and ignition switch (IG1) through common connector to GND (Front).
 - HO2S connector terminal D and PCM connector terminal 3J through common connector to GND, (Front).
 - HO2S connector terminal D and PCM connector terminal 3P to GND (Rear).

EGR BOOST SENSOR (BP), BAROMETRIC PRESSURE (BARO)/MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR (BP WITH TC) INSPECTION (BP, BP WITH TC)

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NOTE:

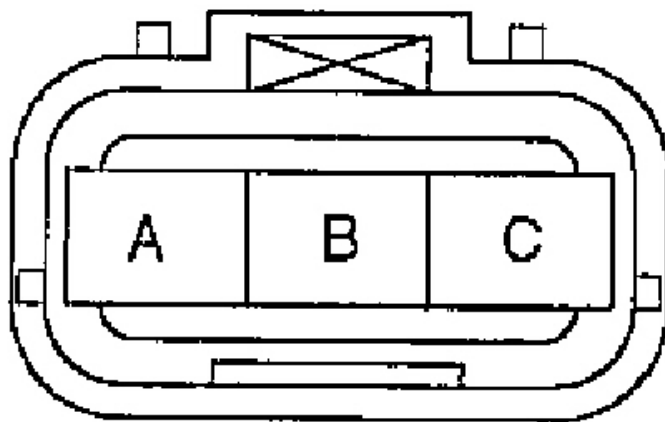
- **Perform the following test only when directed.**

1. Inspect the EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) for damage and cracks.
2. Inspect the vacuum hose for improper routing, kinks or leaks.
 - If the above are okay, perform the **CIRCUIT OPEN/SHORT INSPECTION**.
3. Reconnect the EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) connector.
 - If the above open or short circuit are correct, replace EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC).

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - EGR boost circuit (EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) connector terminal B and PCM connector terminal 4AE.)
 - Reference voltage circuit (EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) connector terminal C and PCM connector terminal 4L)
 - GND circuit (EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) connector terminal A and PCM connector terminal 4O through common connector.)



HARNESS SIDE CONNECTOR (VIEW FROM TERMINAL SIDE)

G03638016

Fig. 54: Identifying EGR Boost Sensor Harness Side Connector Terminals
Courtesy of MAZDA MOTORS CORP.

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) connector terminal C and PCM connector terminal 4L through common connector to GND.
 - EGR boost sensor (BP), BARO/MAP sensor (BP WITH TC) connector terminal B and PCM connector 4AE through common connector to GND.

CLUTCH PEDAL POSITION SWITCH INSPECTION (BP, BP WITH TC)

INSPECTION OF CONTINUITY

NOTE:

- Perform the following test only when directed.

1. Verify that the clutch pedal position switch is installed properly. (See CLUTCH PEDAL REMOVAL/INSTALLATION .)

2. Disconnect the negative battery cable.
3. Remove the clutch pedal position switch. (See **CLUTCH PEDAL REMOVAL/INSTALLATION** .)
4. Inspect continuity between the clutch pedal position switch terminals using an ohmmeter.
 - If not as specified, replace the clutch pedal position switch.
 - If clutch pedal position switch is okay, but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.

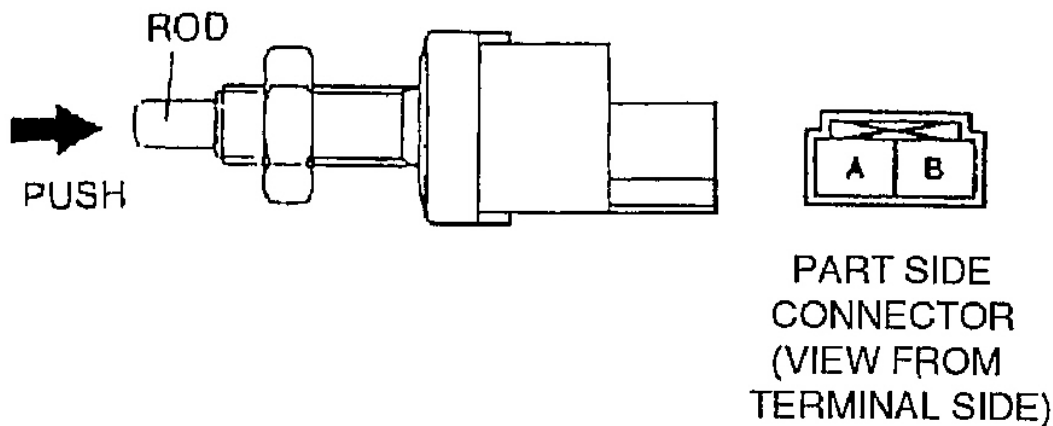
Specification

○—○ : Continuity

Condition	Terminal	
	A	B
Push the rod		
Except above	○—○	○—○

G03638017

Fig. 55: Identifying Clutch Pedal Position Switch Terminal Continuity
 Courtesy of MAZDA MOTORS CORP.



G03638018

Fig. 56: Identifying Clutch Pedal Position Switch Part Side Connector
Courtesy of MAZDA MOTORS CORP.

5. Reconnect the clutch pedal position switch connector.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - Power circuit (Clutch switch connector terminal A and PCM connector terminal 4I through common connector.)
 - GND circuit (Clutch switch connector terminal B and GND.)

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - Clutch switch connector terminal A and PCM connector terminal 4I through common connector to GND.

NEUTRAL SWITCH INSPECTION (BP, BP WITH TC)

INSPECTION OF CONTINUITY

NOTE:

- **Perform the following test only when directed.**

1. Disconnect the negative battery cable.
2. Remove the neutral switch.
3. Inspect for continuity between the neutral switch terminals using an ohmmeter.
 - If not as specified, replace the neutral switch.
 - If neutral switch is okay but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.

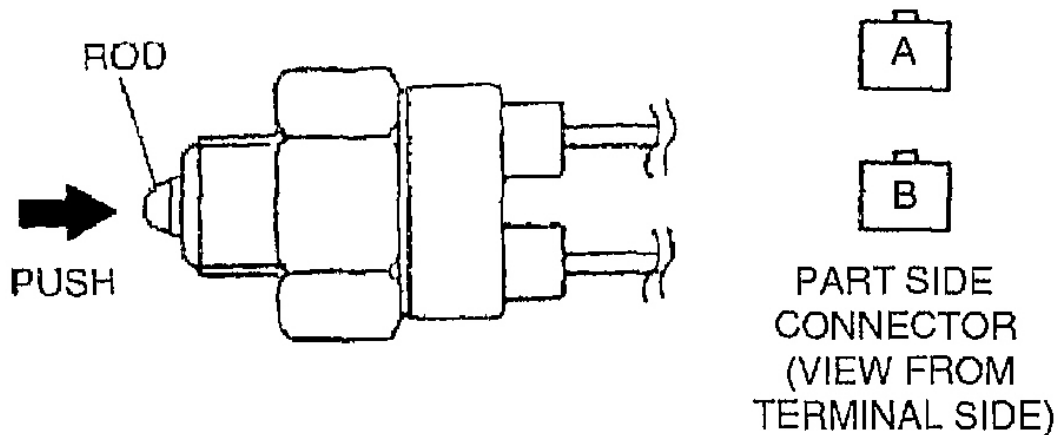
Specification

○—○ : Continuity

Measuring Condition	Terminal	
	A	B
Push the rod	○—○	○—○
Except above		

G03638019

Fig. 57: Identifying Neutral Switch Terminal Continuity
 Courtesy of MAZDA MOTORS CORP.



G03638020

Fig. 58: Identifying Neutral Switch Part Side Connector
 Courtesy of MAZDA MOTORS CORP.

4. Reconnect the neutral switch connector.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.

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- Power circuit (Neutral switch connector terminal A and PCM connector terminal 4H through common connector.)
- GND circuit (Neutral switch connector terminal B and GND through common connector.)

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - Neutral switch connector terminal A and PCM connector terminal 4H through common connector to GND.

POWER STEERING PRESSURE (PSP) SWITCH INSPECTION (BP, BP WITH TC)

INSPECTION OF CONTINUITY

NOTE:

- Perform the following test only when directed.

1. Inspect as follows if power steering is inoperative:
 - POWER STEERING FLUID INSPECTION (See **POWER STEERING FLUID INSPECTION**)
2. Disconnect the PSP switch connector.
3. Start the engine.
4. Inspect for continuity between PSP switch terminal and GND using an ohmmeter.
 - If not as specified, replace the PSP switch.
 - If PSP switch is okay but PID value is out of specification, perform the **CIRCUIT OPEN/SHORT INSPECTION**.

Specification

○—○ : Continuity

Condition	Terminal	
	A	Ground
Steering wheel not turned		
Steering wheel being turned	○—○	○—○

Fig. 59: Identifying PSP Switch Terminal Continuity
Courtesy of MAZDA MOTORS CORP.

5. Reconnect the PSP switch connector.

CIRCUIT OPEN/SHORT INSPECTION

Open circuit

- If there is no continuity, the circuit is open. Repair or replace the harness.
 - Power circuit (PSP switch connector terminal and PCM connector terminal 4C through common connector.)
 - GND circuit (PSP switch GND circuit.)

Short circuit

- If there is continuity, the circuit is shorted. Repair or replace the harness.
 - PSP switch connector terminal and PCM connector terminal 4C through common connector to GND.