

F - BASIC TESTING

1998 Toyota Supra

1998 ENGINE PERFORMANCE

Toyota - Basic Diagnostic Procedures - 6-Cylinder

Supra

INTRODUCTION

The following diagnostic steps will help prevent overlooking a simple problem. This is also where to begin diagnosis for a no-start condition.

The first step in diagnosing any driveability problem is verifying the customer's complaint with a test drive under the conditions problem reportedly occurred.

Before entering self-diagnostics, perform a careful and complete visual inspection. Most engine control problems result from mechanical breakdowns, poor electrical connections or damaged/misrouted vacuum hoses. Before condemning the computerized system, perform each test listed in this article.

NOTE: Perform all voltage tests with a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance, unless stated otherwise in test procedure.

PRELIMINARY INSPECTION & ADJUSTMENTS

VISUAL INSPECTION

Visually inspect all electrical wiring, looking for chafed, stretched, cut or pinched wiring. Ensure electrical connectors fit tightly and are not corroded. Ensure vacuum hoses are properly routed and are not pinched or cut. See M - VACUUM DIAGRAMS article to verify routing and connections (if necessary). Inspect air induction system for possible vacuum leaks.

MECHANICAL INSPECTION

Compression

Warm engine to normal operating temperature before checking the compression. On non-turbo models, disconnect electrical connectors at fuel injectors before checking compression. On turbo models, disconnect electrical connectors at camshaft position sensors and fuel injectors before checking compression. Camshaft position sensors are located on intake manifold side of cylinder head. See Fig. 12.

On all models, remove ignition coils and spark plugs. See N - REMOVE/INSTALL/OVERHAUL article. Check engine mechanical condition with a compression gauge, vacuum gauge, or engine analyzer. See engine analyzer manual for specific instructions. See COMPRESSION SPECIFICATIONS table. Install and tighten spark plugs to 13 ft. lbs. (18 N.m).

COMPRESSION SPECIFICATIONS TABLE

Application		Specification
Normal Compression Pressure		
Non-Turbo	192 psi	(13.5 kg/cm ²)
Turbo	156 psi	(10.9 kg/cm ²)
Minimum Compression Pressure		

Non-Turbo	156 psi (10.9 kg/cm ²)
Turbo	128 psi (9.0 kg/cm ²)
Maximum Variation Between Cylinders	
All Models	14 psi (1.0 kg/cm ²)

FUEL SYSTEM

* PLEASE READ FIRST *

Basic diagnosis of fuel system should begin by checking fuel pump operation and fuel pressure.

WARNING: ALWAYS release fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

FUEL PUMP OPERATION

NOTE: Electric fuel pump operation may be checked by using scan tool or by applying battery voltage to electric fuel pump. Electric fuel pump is located in the fuel tank.

Checking Fuel Pump Operation Using Scan Tool (Non-Turbo)

1) Connect scan tool to data link connector No. 3. See Fig. 1 . Turn ignition on. DO NOT start engine.

2) Turn scan tool on. Select ACTIVE TEST MODE on scan tool. Using scan tool manufacturer's instructions, activate fuel pump.

3) Listen for operating sound at fuel pump and check that screw at center of fuel pressure pulsation damper moves upward due to the fuel pressure. See Fig. 2. Fuel pressure pulsation damper is located at driver's side rear corner of fuel rail, near valve cover.

4) Turn ignition off. Remove scan tool. If fuel pump operates, check fuel pressure. See FUEL PRESSURE (FUEL SYSTEM). If fuel pump does not operate, go to next step.

NOTE: If fuel pump operates with scan tool, but will not operate otherwise, go to step 11).

5) Remove carpet and necessary panels for access to fuel pump Electronic Control Unit (ECU). See Fig. 3. Disconnect Black 5-pin connector at fuel pump ECU.

6) Turn ignition on. Using voltmeter, check voltage between ground and terminal No. 4 (Black/Red wire) at fuel pump ECU wiring harness connector. Voltage should be 9-14 volts.

7) If voltage is within specification, go to next step. If voltage is not within specification, check for open or short in wiring harness between EFI main relay and fuel pump ECU. See appropriate wiring diagram in L - WIRING DIAGRAMS article. EFI main relay is located in fuse/relay box at driver's side front corner of engine compartment, near the battery. For explanation of EFI main relay operation, see FUEL PUMP CONTROL CIRCUIT under FUEL SYSTEM. Repair wiring as necessary. If necessary to check EFI main relay, see I - SYSTEM/COMPONENT TESTS article.

8) Using voltmeter, check voltage between terminals No. 1 (White/Black wire) and No. 3 (Violet/White wire) on fuel pump ECU wiring harness connector. Voltage should be 4.5-5.5 volts. If voltage is within specification, go to next step. If voltage is not within specification, go to step 10).

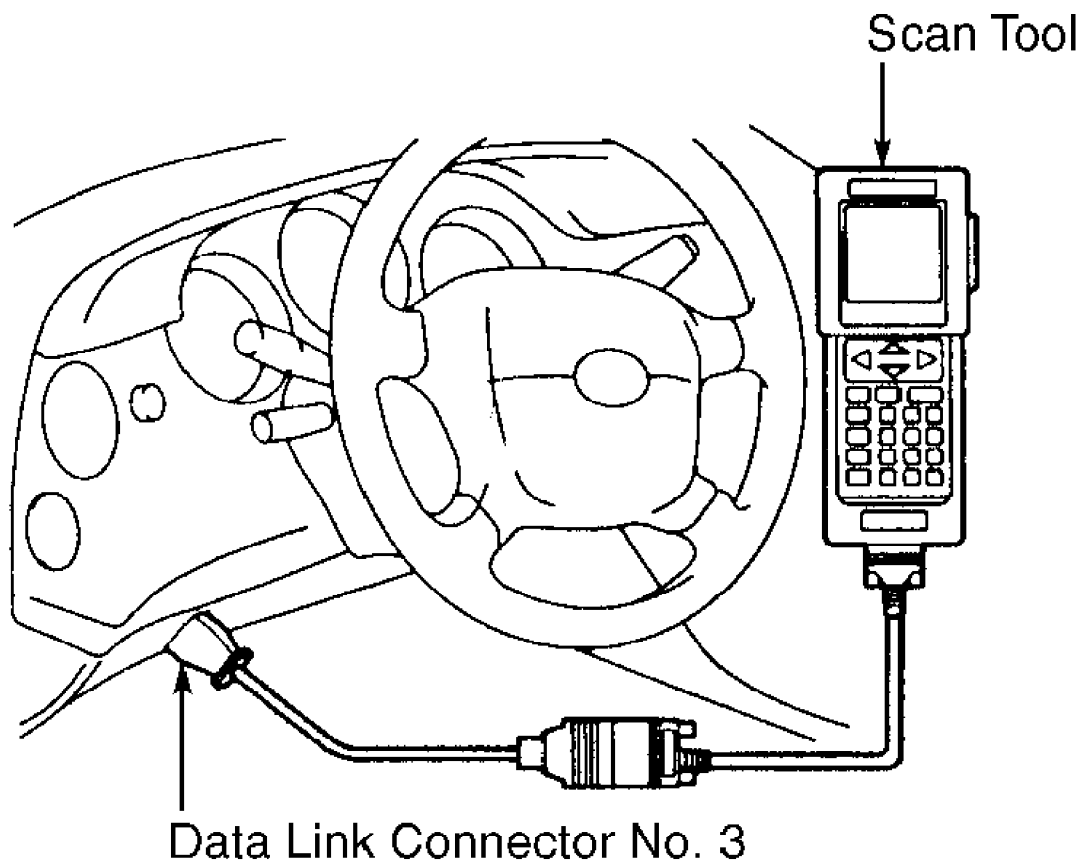
9) Check for defective fuel pump. See CHECKING FUEL PUMP OPERATION BY APPLYING BATTERY VOLTAGE TO FUEL PUMP under FUEL SYSTEM. Replace fuel pump if defective. If fuel pump is okay, check for open

or short in wiring harness between terminal No. 5 (Blue/Red wire) at fuel pump ECU, fuel pump (Blue wire) and ground (White/Black wire). See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring as necessary. If wiring is okay, replace fuel pump ECU. See N - REMOVE/INSTALL/OVERHAUL article.

10) Check for open or short in Violet/White wire between terminal No. 3 at fuel pump ECU and Engine Control Module (ECM). ECM is located below passenger's side of instrument panel, underneath the carpet on the floor, below glove box. Also check for open in White/Black wire between terminal No. 1 at fuel pump ECU and ground. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring if necessary. If wiring is okay, replace ECM. See N - REMOVE/INSTALL/OVERHAUL article.

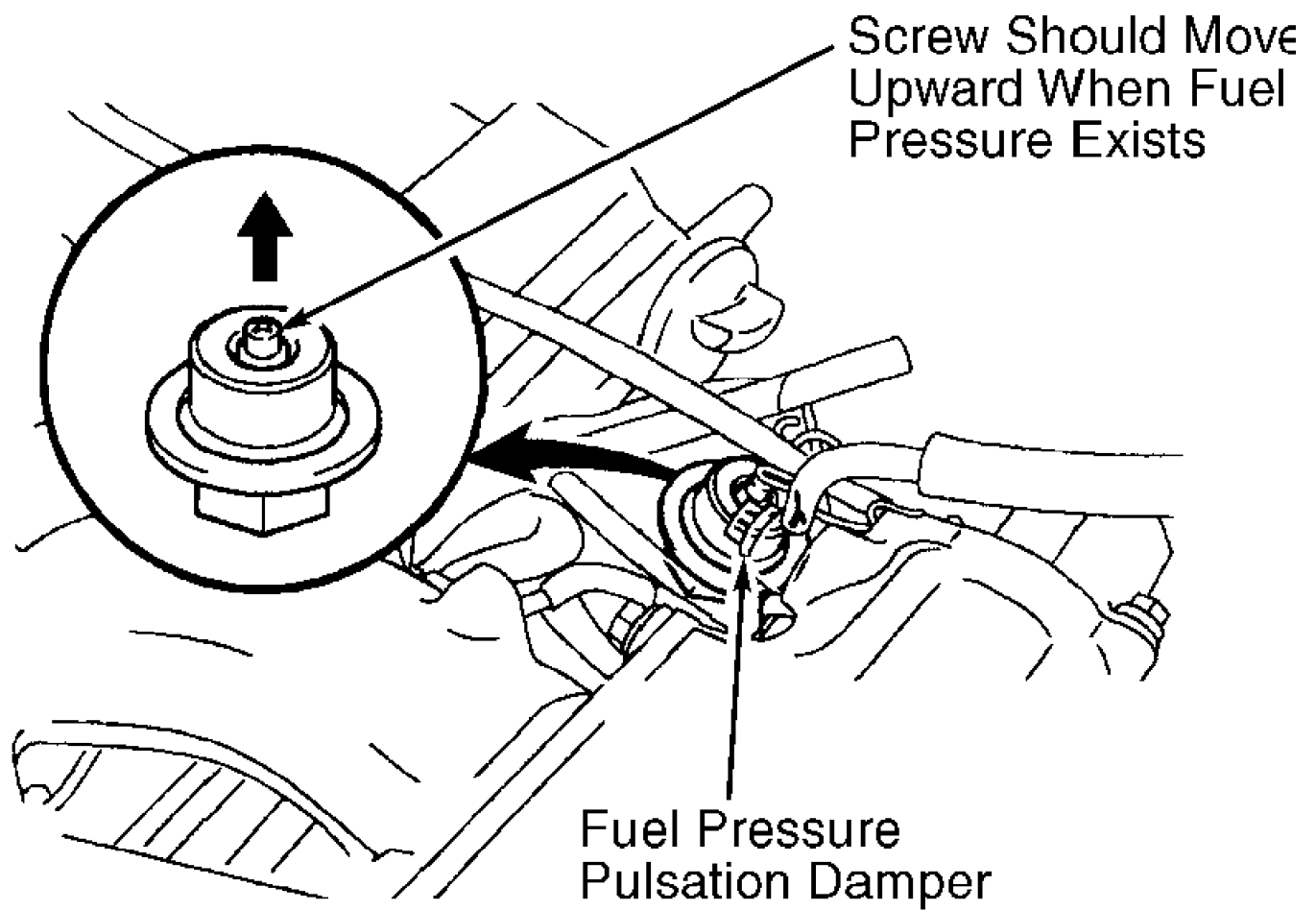
11) Remove carpet and necessary panel for access to Fuel Pump Electronic Control Unit (ECU). See Fig. 3. Disconnect Black 5-pin connector at fuel pump ECU.

12) Check for open or short in Green wire between terminal No. 2 at fuel pump ECU and Engine Control Module (ECM). ECM is located below passenger's side of instrument panel, underneath the carpet on the floor, below glove box. See appropriate wiring diagram in L - WIRING DIAGRAMS article. Repair wiring if necessary. If wiring is okay, replace ECM. See N - REMOVE/INSTALL/OVERHAUL article.



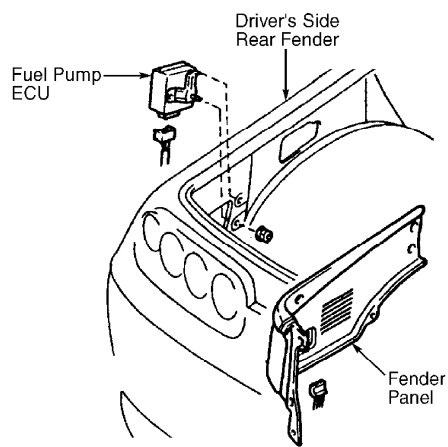
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Fig. 1: Connecting Scan Tool
Courtesy of Toyota Motor Sales, U.S.A., Inc.



98B11230

Fig. 2: Locating Fuel Pressure Pulsation Damper & Screw (Non-Turbo)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



97F08504

Fig. 3: Locating Fuel Pump ECU
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Checking Fuel Pump Operation Using Scan Tool (Turbo)

1) Connect scan tool to data link connector No. 3. See Fig. 1

. Turn ignition on. DO NOT start engine.

2) Turn scan tool on. Select ACTIVE TEST MODE on scan tool. Using scan tool manufacturer's instructions, activate fuel pump. Listen for operating sound at fuel pump and feel for fuel pressure in fuel inlet at fuel filter. Turn ignition off. Remove scan tool. If fuel pump operates, check fuel pressure. See FUEL PRESSURE (FUEL SYSTEM).

3) If fuel pump does not operate, EFI main relay or EFI No. 2 relay may be defective. For explanation of EFI main relay or EFI No. 2 relay operation, see FUEL PUMP CONTROL CIRCUIT under FUEL SYSTEM. For testing of EFI main relay and EFI No. 2 relay, see I - SYSTEM/COMPONENT TESTS article.

4) If EFI main relay and EFI No. 2 relay are okay, check for defective fuses or wiring circuit. See appropriate wiring diagram in WIRING DIAGRAMS article. If fuses and wiring are okay, check for defective fuel pump. See CHECKING FUEL PUMP OPERATION BY APPLYING BATTERY VOLTAGE TO FUEL PUMP under FUEL SYSTEM.

NOTE: If problem exists in the fuel pump Electronic Control Unit (ECU) or control circuit, a Diagnostic Trouble Code (DTC) P1200 may be stored in the Engine Control Module (ECM). See G - TESTS W/CODES article for retrieving and servicing of any DTCs.

Checking Fuel Pump Operation By Applying Battery Voltage To Fuel Pump (Non-Turbo & Turbo)

1) Remove spare tire cover, spare tire and cover plate on floor panel for access to electrical connector at fuel pump. Disconnect electrical connector for fuel pump.

CAUTION: When applying battery voltage to fuel pump, DO NOT apply battery voltage for more than 10 seconds or fuel pump may be damaged.

2) Connect battery voltage to specified terminals on fuel pump to activate fuel pump. See Fig. 4. DO NOT apply battery voltage to fuel pump for more than 10 seconds.

3) Listen for fuel pump operating sound. If fuel pump operates, check fuel pressure. See FUEL PRESSURE (FUEL SYSTEM). Disconnect battery voltage from fuel pump. If fuel pump fails to operate, replace fuel pump and/or lead wire to the fuel pump (if equipped). See N - REMOVE/INSTALL/OVERHAUL article.

4) If fuel pump will not operate while trying to start engine, EFI main relay, EFI No. 2 relay (turbo models only) or fuel pump Electronic Control Unit (ECU) may be defective. See CHECKING FUEL PUMP OPERATION USING SCAN TOOL under FUEL SYSTEM for additional testing information.

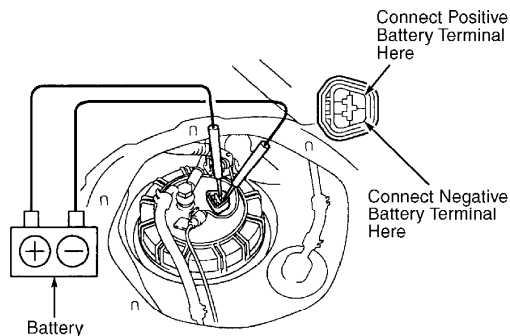


Fig. 4: Identifying Fuel Pump Electrical Connector Terminals
Courtesy of Toyota Motor Sales, U.S.A., Inc.

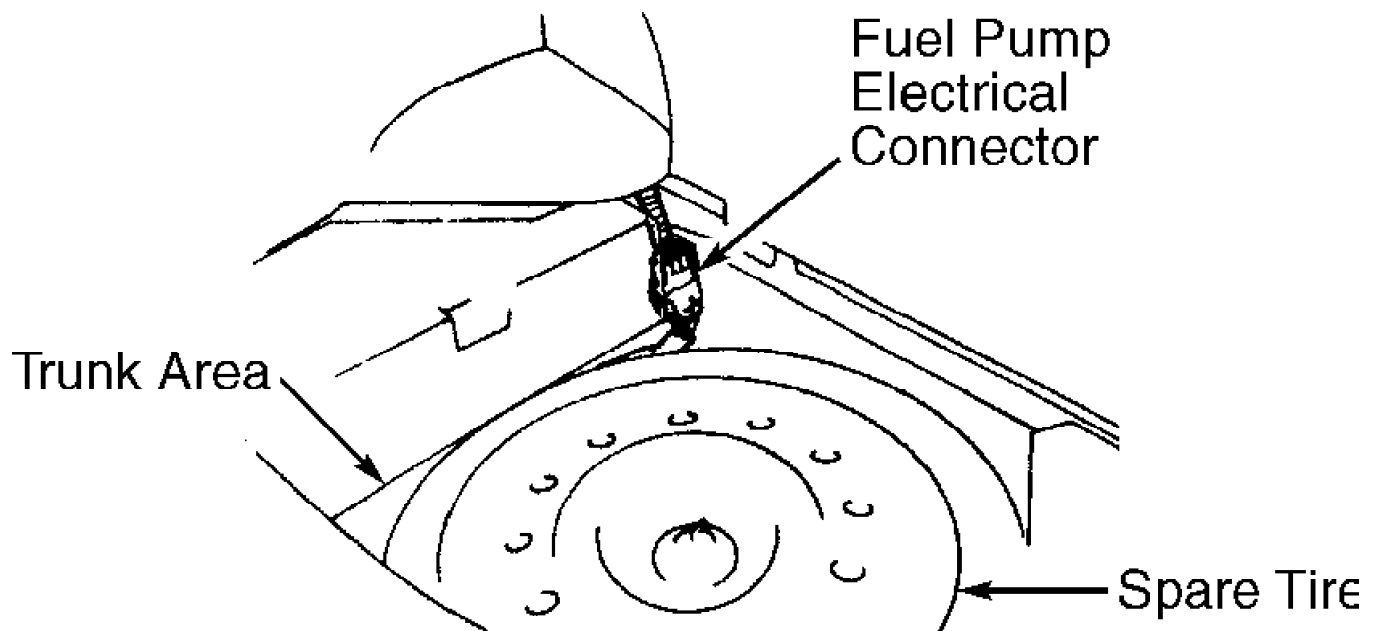
FUEL PRESSURE RELEASE

Non-Turbo & Turbo

1) Disconnect fuel pump electrical connector located in trunk area, near spare tire. See Fig. 5.

2) Start engine and allow engine to idle until engine stalls. Turn ignition off. Reinstall fuel pump electrical connector.

3) Disconnect negative battery cable. Place suitable container under fuel line connection. Cover fuel line connection with shop towel. Slowly loosen fuel line connection, allowing any fuel pressure to be released. Once fuel pressure is released, fuel system components may be serviced.



97E06508

Fig. 5: Locating Fuel Pump Electrical Connector
Courtesy of Toyota Motor Sales, U.S.A., Inc.

FUEL PRESSURE (FUEL SYSTEM)

Non-Turbo

1) Ensure battery is fully charged. Release fuel pressure. See FUEL PRESSURE RELEASE under FUEL SYSTEM. Disconnect negative battery cable. Note location of fuel inlet hose on fuel pipe support. See Fig. 6.

2) Cover union bolt with shop towel. Slowly loosen union bolt to release fuel pressure. Remove union bolt with gaskets, and disconnect fuel inlet hose from fuel pipe support.

3) Using adapter union bolt and union from Fuel Pressure Gauge Set (SST 09268-45014) with gaskets, install fuel pressure gauge and fuel inlet hose. See Fig. 6. Tighten adapter union bolt to 21 ft. lbs. (29 N.m). Install negative battery cable.

4) Connect scan tool to data link connector No. 3. See Fig. 1. Turn ignition on. DO NOT start engine. Turn scan tool on. Select ACTIVE TEST MODE on scan tool. Using scan tool manufacturer's instructions, activate fuel pump and note fuel pressure. Fuel pressure should be 44-50 psi (3.1-3.5 kg/cm²).

NOTE: Fuel pump may also be activated by connecting battery voltage to specified terminals on fuel pump. See Fig. 4.

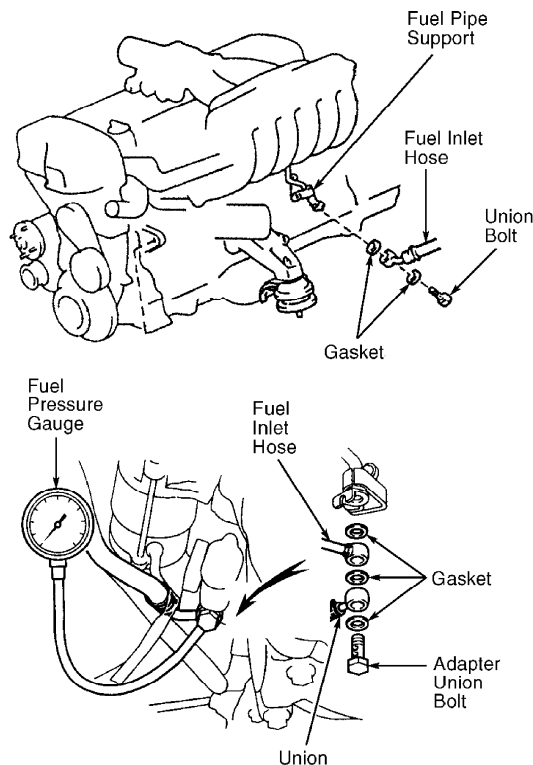
5) If fuel pressure is within specification, go to next step. If fuel pressure exceeds specification, replace fuel pressure regulator mounted on fuel pump in the fuel tank. See N - REMOVE/INSTALL/OVERHAUL article. If fuel pressure is less than specified, check for leaking fuel hoses or connections, restricted fuel filter, defective fuel pump or defective fuel pressure regulator.

6) Remove scan tool from data link connector No. 3. Start engine and note fuel pressure with engine idling. Fuel pressure should be 44-50 psi (3.1-3.5 kg/cm²). If fuel pressure is within specification, go to next step. If fuel pressure is not within specification, check for by defective fuel pressure regulator.

7) Shut engine off and note fuel pressure. Fuel pressure should remain at least 21 psi (1.5 kg/cm²) for a minimum of 5 minutes. If fuel pressure holds as specified, go to next step. If fuel pressure does not hold as specified, check for defective fuel pump, fuel injector or fuel pressure regulator.

8) Release fuel pressure. Disconnect negative battery cable. Remove adapter union bolt, union and fuel pressure gauge. Reinstall fuel inlet hose on fuel pipe support using NEW gasket. Tighten union bolt to 21 ft. lbs. (29 N.m). Install negative battery cable. Check for fuel leaks by using scan tool to energize fuel pump.

NOTE: For more information on checking fuel injectors and other fuel system components, see I - SYSTEM/COMPONENT TESTS article.



98J01400
Fig. 6: Locating Fuel Inlet Hose & Installing Fuel Pressure Gauge
(Non-Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Turbo

1) Ensure battery is fully charged. Release fuel pressure. See FUEL PRESSURE RELEASE under FUEL SYSTEM. Disconnect negative battery cable. Fuel pressure gauge is installed on fuel filter for checking fuel pressure. See Fig. 7.

2) Place container under fuel filter. Cover union bolt with shop towel. Remove union bolt and gaskets. Using NEW gaskets, install Fuel Pressure Gauge (SST 09268-45014) with fuel inlet hose on fuel filter. See Fig. 7. Tighten union bolt to 21 ft. lbs. (29 N.m). Install negative battery cable.

3) Connect scan tool to data link connector No. 3. See Fig. 1. Turn ignition on. DO NOT start engine. Turn scan tool on. Select ACTIVE TEST MODE on scan tool. Using scan tool manufacturer's instructions, activate fuel pump and note fuel pressure. Fuel pressure should be 33-40 psi (2.3-2.8 kg/cm²).

NOTE: Fuel pump may also be activated by connecting battery voltage to specified terminals on fuel pump. See Fig. 4.

4) If fuel pressure is within specification, go to next step. If fuel pressure exceeds specification, replace fuel pressure regulator mounted on the fuel rail. See N - REMOVE/INSTALL/OVERHAUL article. If fuel pressure is less than specified, check for leaking fuel hoses or connections, restricted fuel filter, defective fuel pump or defective fuel pressure regulator.

5) Remove scan tool from data link connector No. 3. Start engine. Disconnect and plug vacuum hose at fuel pressure regulator mounted on fuel rail. Note fuel pressure with engine idling. Fuel pressure should be 33-40 psi (2.3-2.8 kg/cm²).

6) Reconnect vacuum hose on fuel pressure regulator and note fuel pressure with engine idling. Fuel pressure should 24-31 psi (1.7-2.2 kg/cm²). If fuel pressure is within specification, go to next step. If fuel pressure is not within specification, check for defective vacuum hose or fuel pressure regulator.

7) Shut engine off and note fuel pressure. Fuel pressure should remain at least 21 psi (1.5 kg/cm²) for a minimum of 5 minutes. If fuel pressure holds as specified, go to next step. If fuel pressure does not hold as specified, check for defective fuel pump, fuel injector or fuel pressure regulator.

8) Release fuel pressure. Disconnect negative battery cable. Remove fuel pressure gauge. Using NEW gaskets, install fuel inlet hose on fuel filter. Tighten union bolt to 21 ft. lbs. (29 N.m). Install negative battery cable. Check for fuel leaks by using scan tool to energize fuel pump.

NOTE: For more information on checking fuel injectors and other fuel system components, see I - SYSTEM/COMPONENT TESTS article.

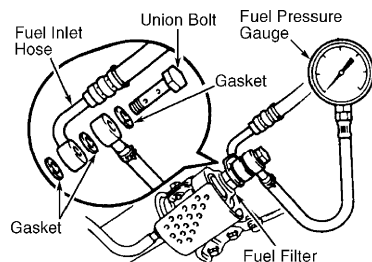


Fig. 7: Installing Fuel Pressure Gauge (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

FUEL PUMP CONTROL CIRCUIT

NOTE: For information on testing relays and fuel system components, see I - SYSTEM/COMPONENT TESTS article. For complete wiring circuit of electrical components on a specific model, see appropriate wiring diagram in L - WIRING DIAGRAMS article.

EFI Main Relay (Non-Turbo)

The EFI No. 1 fuse (30-amp) supplies constant battery voltage to EFI main relay. EFI No. 1 fuse and EFI main relay are located in fuse/relay box at driver's side front corner of engine compartment, near the battery. The EFI main relay is turned on by M-REL terminal of Engine Control Module (ECM). When EFI main relay is turned on, voltage is supplied to +B and +B2 terminals of ECM, data link connector No. 1, +B terminal of fuel pump Electronic Control Unit (ECU) and various other electrical components. Fuel pump ECU is located in driver's side rear corner of trunk. See Fig. 3. Fuel pump operating speed is controlled by the operating condition of the engine such as: starting, light load or heavy load. The ECM delivers an input signal voltage signal from FPC terminal on ECM to FPC terminal on fuel pump ECU in accordance with the engine operating condition. The fuel pump ECU uses this input signal to determine how much voltage should be delivered to the fuel pump for varying fuel pump operating speed.

EFI Main Relay & EFI No. 2 Relay (Turbo)

The EFI No. 1 fuse (30-amp) supplies constant battery voltage to EFI main relay. The EFI main relay is turned on by M-REL terminal of Engine Control Module (ECM). When EFI main relay is turned on, voltage is supplied to EFI No. 2 relay, +B terminal of ECM, data link connector No. 1 and various other electrical components. EFI No. 1 fuse, EFI main relay and EFI No. 2 relay are located in fuse/relay box at driver's side front corner of engine compartment, near the battery.

EFI No. 2 EFI fuse (30-amp) supplies constant battery voltage to EFI No. 2 relay. When EFI No. 2 relay is energized by voltage supplied from EFI main relay, relay closes and voltage is provided to +B terminal on fuel pump Electronic Control Unit (ECU). Fuel pump ECU is located in driver's side rear corner of trunk. See Fig. 3. Fuel pump operating speed is controlled by the operating condition of the engine such as: starting, light load or heavy load. The ECM delivers an input signal voltage signal from FPC terminal on ECM to FPC terminal on fuel pump ECU in accordance with the engine operating condition. The fuel pump ECU uses this input signal to determine how much voltage should be delivered to the fuel pump for varying fuel pump operating speed.

IGNITION CHECKS

SPARK TEST

Non-Turbo

- 1) Remove ignition coils. See N - REMOVE/INSTALL/OVERHAUL article. Reconnect electrical connectors on ignition coils.
- 2) Remove spark plugs. Install spark plug on each ignition coil and spark plug wire. Ground spark plugs against cylinder block.

CAUTION: To prevent gasoline from being injected, DO NOT crank engine for longer than 5 seconds when checking for spark.

- 3) Crank engine and check for spark. If spark exists at spark plug on ignition coil, but not at spark plug on spark plug wire, go to next step. If spark does not exist at any spark plug, check ignition coil and ignitor electrical connections. Ignitor is located in engine compartment, on top of driver's side strut tower. If electrical

connections are okay, go to step 5). If electrical connections are defective, repair as necessary and recheck for spark.

4) Using ohmmeter, check resistance of spark plug wire.

Replace spark plug wire if resistance exceeds 25,000 ohms per wire.

5) Turn ignition on. Using voltmeter, check for battery voltage at positive terminal on ignitor and ignition coil. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If battery voltage exists, go to next step. If battery voltage does not exist, check wiring between ignition switch, ignition coil and ignitor. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

6) Check ignition coil resistance. See IGNITION COIL RESISTANCE under IGNITION CHECKS. If ignition coil resistance is within specification, go to next step. If ignition coil resistance is not within specification, replace ignition coil. See N - REMOVE/INSTALL/OVERHAUL article.

7) Check resistance of camshaft position sensor. See CAMSHAFT POSITION SENSOR RESISTANCE under IGNITION CHECKS. If camshaft position sensor resistance is within specification, go to next step. If camshaft position sensor resistance is not within specification, replace camshaft position sensor. See N - REMOVE/INSTALL/OVERHAUL article.

8) Check resistance of crankshaft position sensor. See CRANKSHAFT POSITION SENSOR RESISTANCE under IGNITION CHECKS. If crankshaft position sensor resistance is within specification, go to next step. If crankshaft position sensor resistance is not within specification, replace crankshaft position sensor. See N - REMOVE/INSTALL/OVERHAUL article.

9) Check ignition IGT signal from Engine Control Module (ECM) to ignitor. If ignition IGT signal from ECM is defective, Diagnostic Trouble Code (DTC) P1300 will be set in the ECM memory to indicate an ignitor circuit malfunction. See G - TESTS W/CODES article for retrieving and servicing of any DTCs.

10) If ignition IGT signal is okay, substitute another ignitor and recheck system operation. If ignition IGT signal is defective, check wiring between ECM and ignitor. ECM is located below passenger's side of instrument panel, underneath the carpet on the floor, below glove box. If wiring is defective, repair wiring as necessary and recheck system operation. If wiring is okay, substitute another ECM and recheck system operation. Reinstall components. Install and tighten spark plugs to 13 ft. lbs. (18 N.m).

Turbo

1) Remove ignition coils. See N - REMOVE/INSTALL/OVERHAUL article. Reconnect electrical connectors on ignition coils. Remove spark plugs. Install spark plug on each ignition coil. Ground spark plugs against cylinder block.

CAUTION: To prevent gasoline from being injected, DO NOT crank engine for longer than 5 seconds when checking for spark.

2) Crank engine and check for spark. If spark does not exist, check ignition coil and ignitor electrical connections. Ignitor is located in engine compartment, on top of driver's side strut tower. If electrical connections are okay, go to next step. If electrical connections are defective, repair as necessary and recheck for spark.

3) Turn ignition on. Using voltmeter, check for battery voltage at positive terminal on ignitor and ignition coil. See appropriate wiring diagram in L - WIRING DIAGRAMS article. If battery voltage exists, go to next step. If battery voltage does not exist, check wiring between ignition switch, ignition coil and ignitor. See appropriate wiring diagram in L - WIRING DIAGRAMS article.

4) Check ignition coil resistance. See IGNITION COIL RESISTANCE under IGNITION CHECKS. If ignition coil

resistance is within specification, go to next step. If ignition coil resistance is not within specification, replace ignition coil. See N - REMOVE/INSTALL/OVERHAUL article.

5) Check resistance of camshaft position sensor. See CAMSHAFT POSITION SENSOR RESISTANCE under IGNITION CHECKS. If camshaft position sensor resistance is within specification, go to next step. If camshaft position sensor resistance is not within specification, replace camshaft position sensor. See N - REMOVE/INSTALL/OVERHAUL article.

6) Check resistance of crankshaft position sensor. See CRANKSHAFT POSITION SENSOR RESISTANCE under IGNITION CHECKS. If crankshaft position sensor resistance is within specification, go to next step. If crankshaft position sensor resistance is not within specification, replace crankshaft position sensor. See N - REMOVE/INSTALL/OVERHAUL article.

7) Check ignition IGT signal from Engine Control Module (ECM) to ignitor. If ignition IGT signal from ECM is defective, Diagnostic Trouble Code (DTC) P1300 will be set in the ECM memory to indicate an ignitor circuit malfunction. See G - TESTS W/CODES article for retrieving and servicing of any DTCs.

8) If ignition IGT signal is okay, substitute another ignitor and recheck system operation. If ignition IGT signal is defective, check wiring between ECM and ignitor. ECM is located below passenger's side of instrument panel, underneath the carpet on the floor, below glove box. If wiring is defective, repair wiring as necessary and recheck system operation. If wiring is okay, substitute another ECM and recheck system operation. Reinstall components. Install and tighten spark plugs to 13 ft. lbs. (18 N.m).

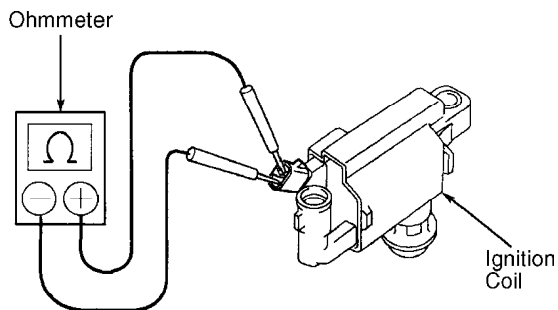
IGNITION COIL RESISTANCE

Non-Turbo

1) Remove ignition coil. See N - REMOVE/INSTALL/OVERHAUL article.

2) Using ohmmeter, check ignition coil primary resistance between positive (+) and negative (-) electrical terminals on ignition coil. See Fig. 8. Replace ignition coil if ignition coil primary resistance is not within specification. See IGNITION COIL RESISTANCE table.

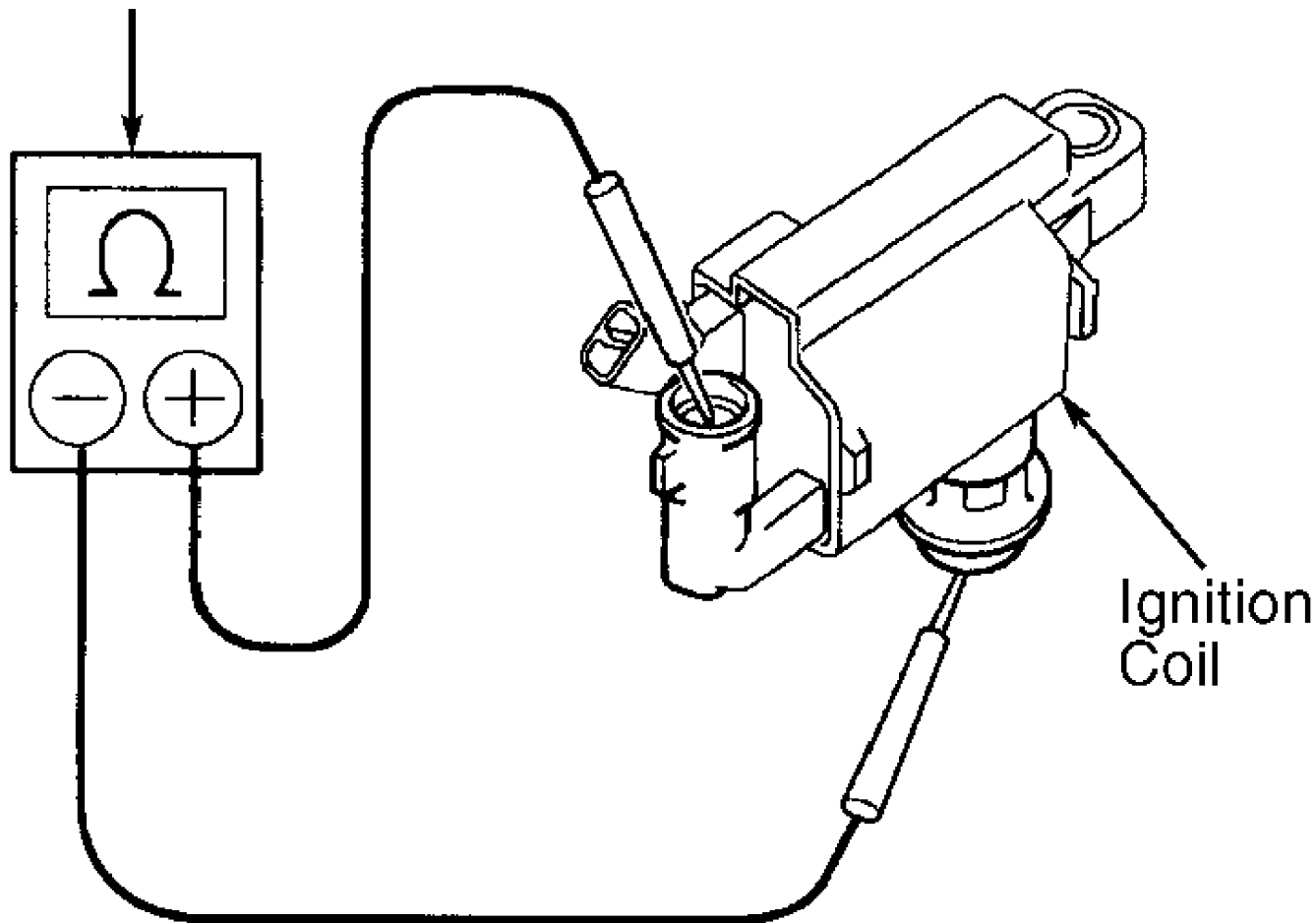
3) Using ohmmeter, check ignition coil secondary resistance between electrical terminals on ignition coil. See Fig. 9. Replace ignition coil if ignition coil secondary resistance is not within specification. See IGNITION COIL RESISTANCE table. Reinstall ignition coil.



98C11231

Fig. 8: Checking Ignition Coil Primary Resistance (Non-Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Ohmmeter



98D11232

Fig. 9: Checking Ignition Coil Secondary Resistance (Non-Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Turbo

1) Ignition coil secondary resistance cannot be checked. Only the ignition coil primary resistance may be checked. Disconnect negative battery cable. Remove oil filler cap. Remove timing belt cover and gasket located above ignition coils on top of cylinder head.

2) Disconnect electrical connector from ignition coil. Using ohmmeter, check ignition coil primary resistance between positive (+) and negative (-) electrical terminals on ignition coil. See Fig. 10.

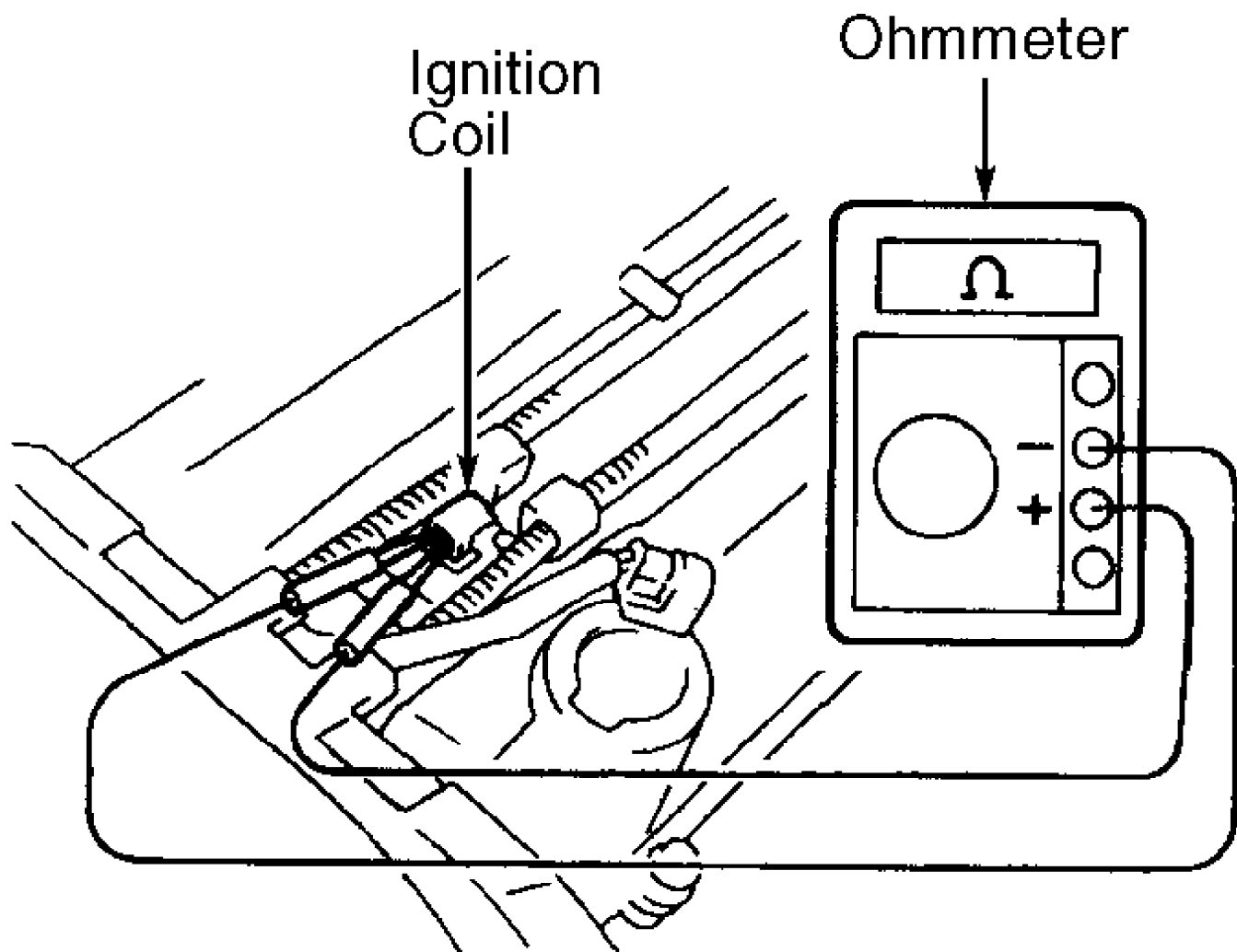
3) Replace ignition coil if ignition coil primary resistance is not within specification. See IGNITION COIL RESISTANCE table. Reinstall electrical connector on ignition coil, timing belt cover, gasket and negative battery cable.

IGNITION COIL RESISTANCE - Ohms TABLE

Application	Primary	Secondary
Non-Turbo		

Cold (1)	.....	.33-.52	.....	8500-14,700
Hot (2)	.....	.42-.61	.....	10,800-17,200
Turbo				
Cold (1)	.....	.54-.84	.....	(3)
Hot (2)	.....	.68-.98	.....	(3)

- (1) - Cold is with temperature of 14-122°F (-10-50°C).
(2) - Hot is with temperature of 122-212°F (50-100°C).
(3) - Secondary ignition coil resistance cannot be measured.



98E11233

Fig. 10: Checking Ignition Coil Primary Resistance (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

CAMSHAFT POSITION SENSOR RESISTANCE

Non-Turbo

1) Disconnect electrical connector from camshaft position sensor. Camshaft position sensor is located just above the intake manifold on rear corner of cylinder head, just below the valve cover. See Fig. 11. Using ohmmeter, check resistance between electrical

terminals on camshaft position sensor.

2) Ensure camshaft position sensor resistance is within specification. See CAMSHAFT POSITION SENSOR RESISTANCE table. Replace camshaft position sensor if resistance is not within specification. See N - REMOVE/INSTALL/OVERHAUL article. Reinstall electrical connector on camshaft position sensor.

Turbo

1) Disconnect electrical connector from camshaft position sensors. Camshaft position sensors are located on intake manifold side of cylinder head. See Fig. 12. Using ohmmeter, check resistance between electrical terminals on each camshaft position sensor.

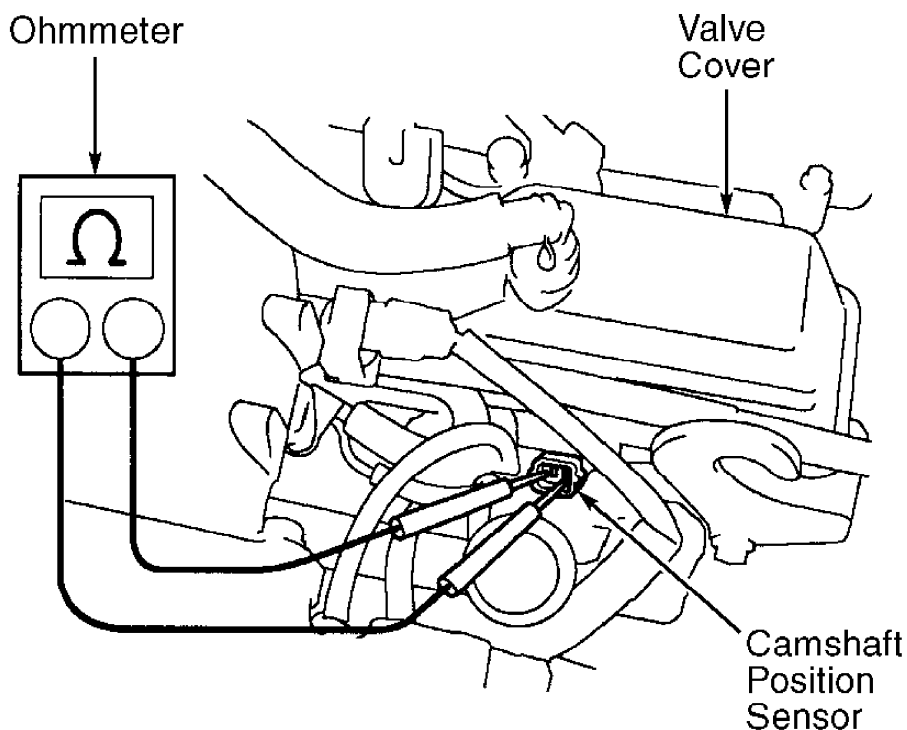
2) Ensure camshaft position sensor resistance is within specification. See CAMSHAFT POSITION SENSOR RESISTANCE table. Replace camshaft position sensor if resistance is not within specification. See N - REMOVE/INSTALL/OVERHAUL article. Reinstall electrical connector on camshaft position sensor.

CAMSHAFT POSITION SENSOR RESISTANCE TABLE

Application	Ohms
Non-Turbo & Turbo	
Cold (1)	835-1400
Hot (2)	1060-1645

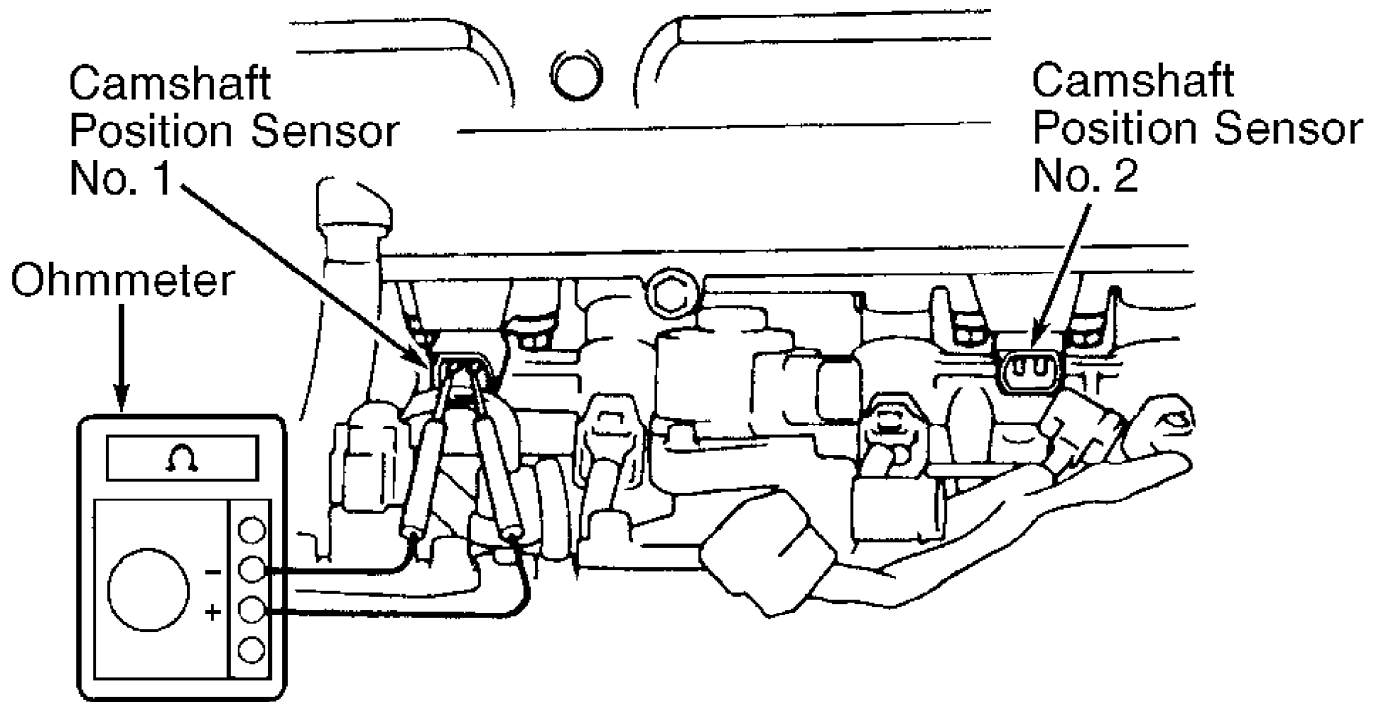
(1) - Cold is with temperature of 14-122°F (-10-50°C).

(2) - Hot is with temperature of 122-212°F (50-100°C).



98F11234

Fig. 11: Locating & Checking Camshaft Position Sensor (Non-Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.



95G31365

Fig. 12: Locating & Checking Camshaft Position Sensor (Turbo)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

CRANKSHAFT POSITION SENSOR RESISTANCE

Non-Turbo

1) Crankshaft position sensor is located near crankshaft pulley, just above oil pan on passenger's side of engine with electrical connector located near water pump. Disconnect crankshaft position sensor electrical connector. See Fig. 13. Remove bolt from electrical connector retaining bracket. See Fig. 13.

2) Using ohmmeter, check resistance between electrical terminals on crankshaft position sensor electrical connector. Ensure crankshaft position sensor resistance is within specification. See CRANKSHAFT POSITION SENSOR RESISTANCE table. Replace crankshaft position sensor if resistance is not within specification. See N - REMOVE/INSTALL/OVERHAUL article. Reinstall electrical connector.

Turbo

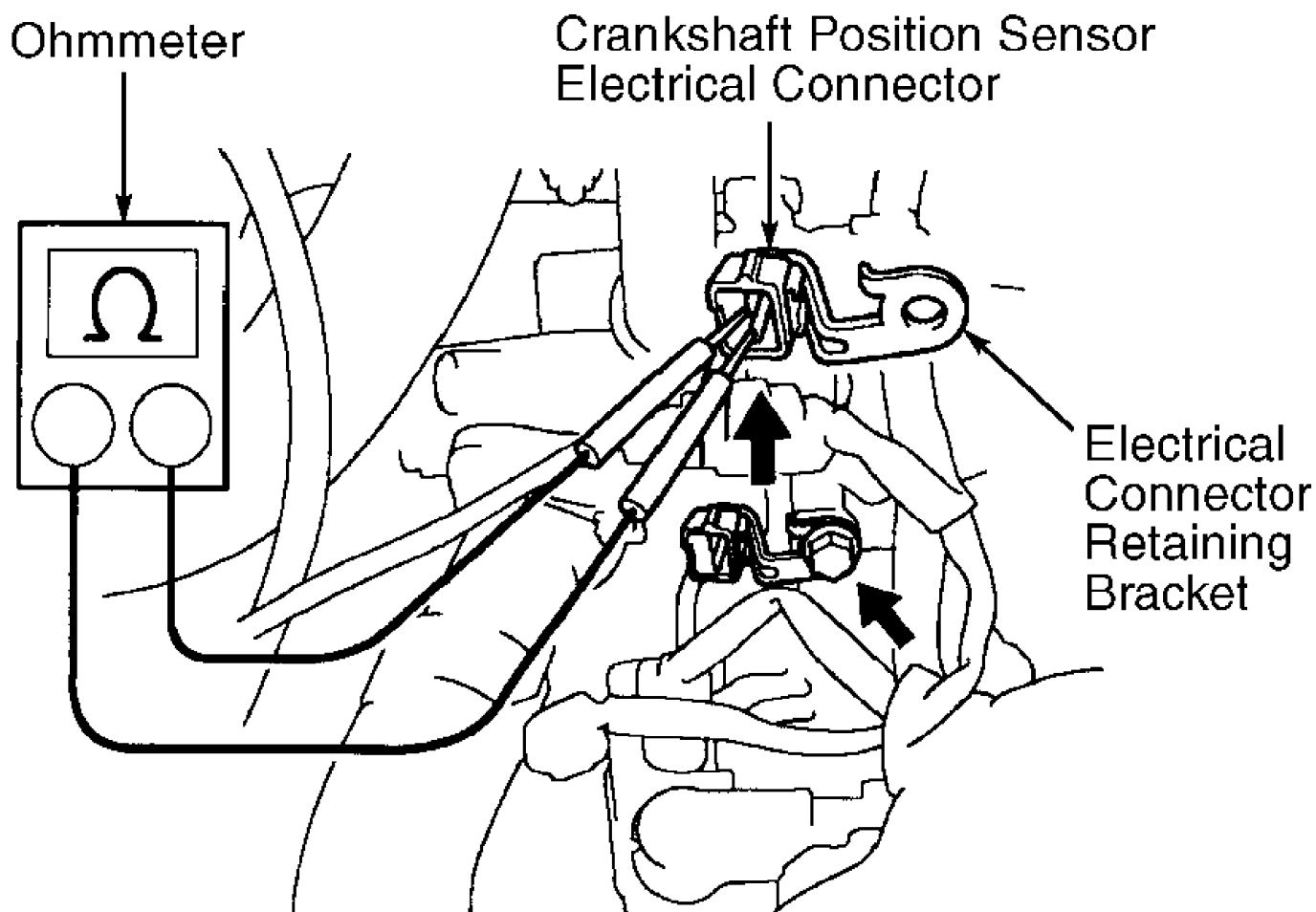
1) Remove air tube for charge air cooler located near front of crankshaft, for access to crankshaft position sensor electrical connector. Disconnect crankshaft position sensor electrical connector. See Fig. 14. Crankshaft position sensor electrical connector is located on passenger's side front corner of engine. Crankshaft position sensor is located near crankshaft pulley, just above oil pan on passenger's side of engine.

2) Using ohmmeter, check resistance between electrical terminals on crankshaft position sensor electrical connector. Ensure crankshaft position sensor resistance is within specification. See CRANKSHAFT POSITION SENSOR RESISTANCE table. Replace crankshaft position sensor if resistance is not within specification. See N - REMOVE/INSTALL/OVERHAUL article. Reinstall electrical connector and air tube.

CRANKSHAFT POSITION SENSOR RESISTANCE TABLE

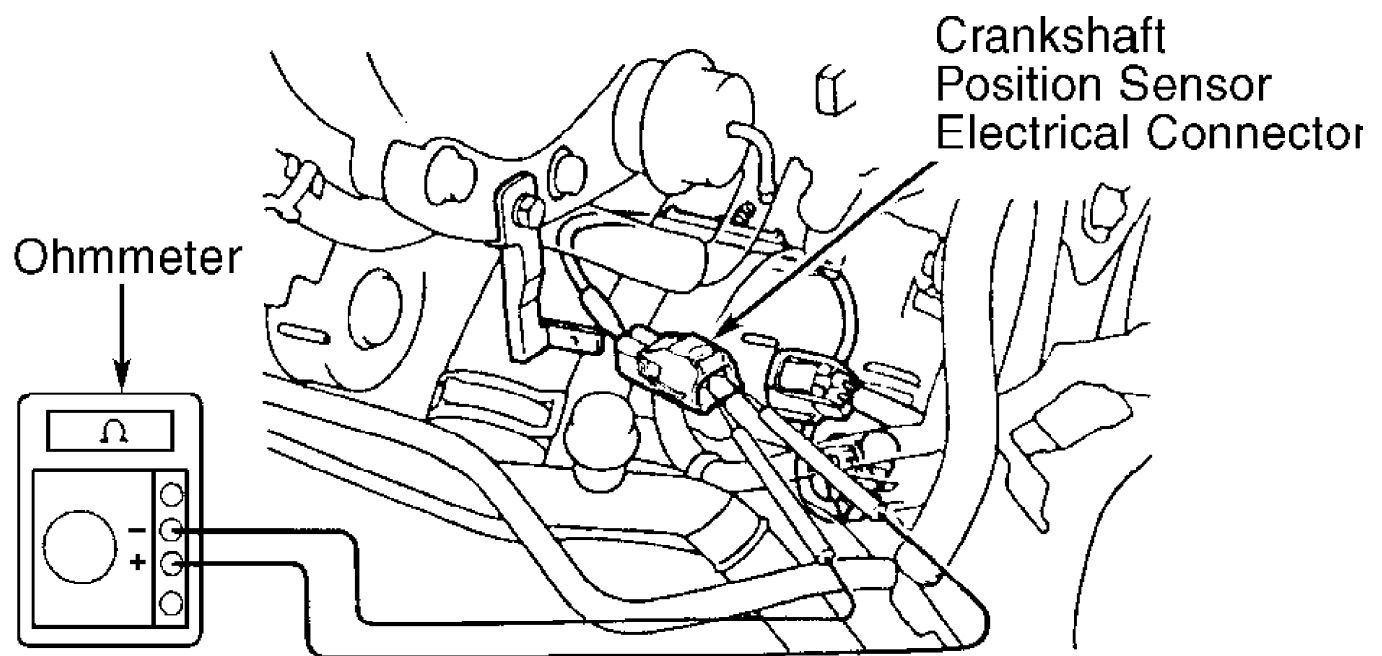
Application	Ohms
Non-Turbo & Turbo	
Cold (1)	1630-2740
Hot (2)	2065-3225

(1) - Cold is with temperature of 14-122°F (-10-50°C).
 (2) - Hot is with temperature of 122-212°F (50-100°C).



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Fig. 13: Locating & Checking Crankshaft Position Sensor (Non-Turbo)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 14: Locating & Checking Crankshaft Position Sensor (Turbo)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

IDLE SPEED & IGNITION TIMING

Ensure idle speed and ignition timing are set to specification. For adjustment procedures, see D - ADJUSTMENTS article.

SUMMARY

If no faults were found while performing BASIC DIAGNOSTIC PROCEDURES, proceed to appropriate G - TESTS W/CODES article. If no hard diagnostic trouble codes are found in self-diagnostics, proceed to H - TESTS W/O CODES article for diagnosis by symptom (i.e., ROUGH IDLE, NO START, etc.) or intermittent diagnostic procedures.