

2002 ENGINE PERFORMANCE

Sensor Operating Range Charts

INTRODUCTION

NOTE: Before using sensor operating range information, check for any related Technical Service Bulletins (TSBs).

Sensor operating range information can help determine if a sensor is out of calibration. An out-of-calibration sensor may not set a diagnostic trouble code, but it may cause driveability problems.

NOTE: Unless stated otherwise, perform all voltage tests using a Digital Volt-Ohmmeter (DVOM) with a minimum 10-megohm input impedance.

SERVICE PRECAUTIONS

PRIUS

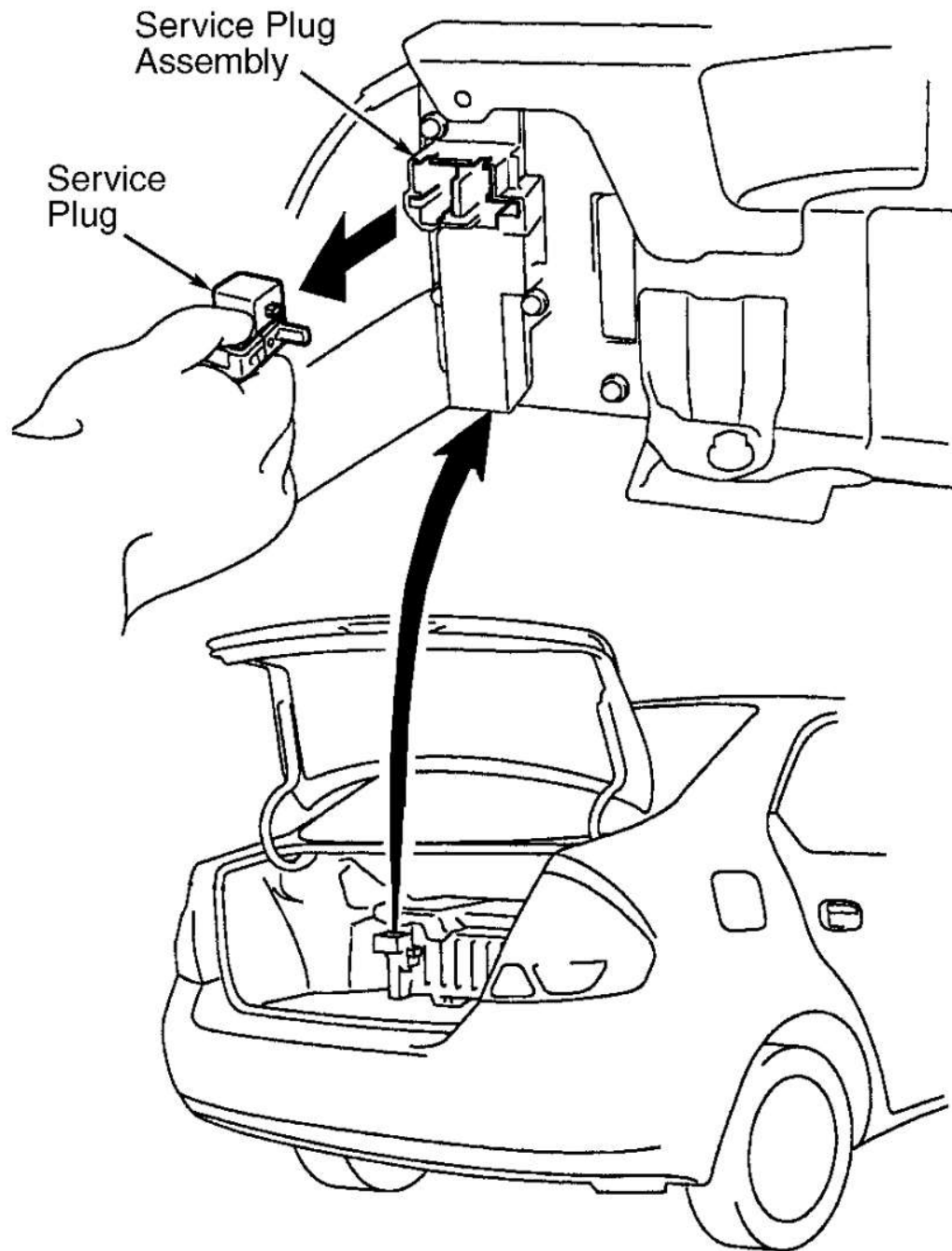
WARNING: When performing any inspection or service procedure on this vehicle, ensure following service precautions are followed to prevent personal injury or death due to the extremely high voltage.

The following service precautions must be followed:

- Ensure ignition is off and ignition key is removed from ignition before performing any inspection or service procedure in engine compartment, as engine may automatically start and shut off when ignition is on and READY light is illuminated. READY light is displayed just above the shift lever position indicator on instrument cluster at center of instrument panel.
- Read all service and warning labels in engine compartment before performing any procedures in engine compartment.
- All high-voltage wiring harness connectors contain Orange connectors. DO NOT touch any wiring harness that contains Orange connectors.
- High-voltage battery and other high-voltage components may be identified by HIGH VOLTAGE caution labels on them. DO NOT touch these components.
- If necessary to inspect or service high-voltage system, ensure ignition is off. Remove service plug and wait at least 5 minutes to ensure high voltage is fully discharged before touching any high-voltage wiring harness, connectors or components. Service plug is located on service plug assembly at driver's side front corner of trunk compartment, near high-voltage battery. See **Fig. 1**. Ensure service plug is stored in a location in which no one may install service plug while technician is working on the vehicle.
- If necessary to touch any high-voltage wiring harness, connectors or components, ensure service plug is removed and battery voltage or less exists at electrical connector. Use Toyota insulated gloves when touching any high-voltage wiring harness, connectors or components. Ensure insulated gloves are dry and in good condition. Ensure that no holes exist in insulated gloves. Test by applying air to insulated glove

before touching any high-voltage wiring harness, connectors or components.

- DO NOT wear any metal objects while working on vehicle which may accidentally drop and cause a short circuit.
- If any high-voltage wiring harness connector is disconnected, ensure terminal on wiring harness connector is wrapped with tape to prevent wiring harness connector from contacting any surface.
- If servicing high-voltage system, place sign on roof of vehicle to indicate to other technicians that high-voltage system is being serviced.



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Fig. 1: Locating Service Plug & Service Plug Assembly (Prius)
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

SENSOR OPERATING RANGE INFORMATION

ACCELERATOR PEDAL POSITION SENSOR

Camry 2.4L 4-Cylinder & Camry Solara 2.4L 4-Cylinder

For accelerator pedal position sensor testing procedures, see **ACCELERATOR PEDAL POSITION SENSOR** under ENGINE SENSORS & SWITCHES in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

Camry 3.0L V6

For accelerator pedal position sensor testing procedures, see **ACCELERATOR PEDAL POSITION SENSOR** under ENGINE SENSORS & SWITCHES in SYSTEM & COMPONENT TESTING - V6 & V8 article.

Land Cruiser, Sequoia, Tundra 4.7L V8 & 4Runner

For accelerator pedal position sensor testing procedures, see **THROTTLE BODY** under IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - V6 & V8 article.

MR2 With Sequential Manual Transaxle

There are 2 types of manual transaxles used. Sequential manual transaxle may be identified by the shift lever pattern which consists of "R", "N", "S" and "+" in place of the conventional type shift lever pattern and there is no clutch pedal. This model uses an accelerator pedal position sensor. For accelerator pedal position sensor testing procedures, see **THROTTLE BODY** under IDLE CONTROL SYSTEMS in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

Prius

WARNING: Read service precautions before proceeding with service procedure. See **SERVICE PRECAUTIONS** .

For accelerator pedal position sensor testing procedures, see **ACCELERATOR PEDAL POSITION SENSOR** under ENGINE SENSORS & SWITCHES in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

AIR/FUEL SENSOR

NOTE: Air/Fuel (A/F) sensor may also be referred to as Air/Fuel (A/F) ratio sensor.

Avalon, Camry, Camry Solara 2.4L 4-Cylinder, Camry Solara 3.0L V6 With A/T, Highlander, RAV4, Sienna, Tacoma, Tundra 3.4L V6 & 4Runner

For Air/Fuel (A/F) sensor testing procedures, see AIR/FUEL SENSOR under ENGINE SENSORS &

SWITCHES in appropriate SYSTEM & COMPONENT TESTING article.

AIRFLOW METER

NOTE: Airflow meter may be referred to as Mass Airflow (MAF) meter.

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

All Models

For airflow meter terminal identification and testing procedures, see AIRFLOW METER under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article. Ensure resistance is within specification in relation to specified temperature. See AIRFLOW METER RESISTANCE table.

AIRFLOW METER RESISTANCE

Application & Temperature	Ohms
Avalon	
-4°F (-20°C)	13,600-18,400
68°F (20°C)	2210-2690
140°F (60°C)	490-670
Camry	
-4°F (-20°C)	13,600-18,400
68°F (20°C)	2210-2690
140°F (60°C)	493-667
Camry Solara	
2.4L 4-Cyl.	
-4°F (-20°C)	13,600-18,400
68°F (20°C)	2210-2690
140°F (60°C)	490-670
3.0L V6	
-4°F (-20°C)	14,600-17,800
68°F (20°C)	2210-2690
140°F (60°C)	290-350
Celica & ECHO	
-4°F (-20°C)	13,600-18,400
68°F (20°C)	2210-2690
140°F (60°C)	490-670
Corolla	
-4°F (-20°C)	13,600-18,400
68°F (20°C)	2200-2700
140°F (60°C)	500-700

Highlander		
-4°F (-20°C)		13,600-18,400
68°F (20°C)		2210-2690
140°F (60°C)		493-667
Land Cruiser		
-4°F (-20°C)		12,500-16,900
68°F (20°C)		2190-2670
140°F (60°C)		500-680
MR2, Prius & RAV4		
-4°F (-20°C)		13,600-18,400
68°F (20°C)		2210-2690
140°F (60°C)		490-670
Sequoia		
-4°F (-20°C)		12,500-16,900
68°F (20°C)		2190-2670
140°F (60°C)		500-680
Sienna		
-4°F (-20°C)		13,600-18,400
68°F (20°C)		2210-2690
140°F (60°C)		490-670
Tacoma		
2.4L 4-Cyl. & 2.7L 4-Cyl.		
-4°F (-20°C)		10,000-20,000
32°F (0°C)		4000-7000
68°F (20°C)		2000-3000
104°F (40°C)		900-1300
140°F (60°C)		400-700
176°F (80°C)		200-400
3.4L V6		
-4°F (-20°C)		13,600-18,400
68°F (20°C)		2200-2700
140°F (60°C)		500-700
Tundra		
3.4L V6		
-4°F (-20°C)		13,600-18,400
68°F (20°C)		2200-2700
140°F (60°C)		500-700
4.7L V8		
-4°F (-20°C)		12,500-16,900
68°F (20°C)		2190-2670
140°F (60°C)		500-680

4Runner	
-4°F (-20°C)	13,600-18,400
68°F (20°C)	2200-2700
140°F (60°C)	500-700

CAMSHAFT POSITION SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

For camshaft position sensor testing procedures, see CAMSHAFT POSITION SENSOR under IGNITION SYSTEMS in appropriate BASIC DIAGNOSTIC PROCEDURES article. Ensure resistance is within specification. See CAMSHAFT POSITION SENSOR RESISTANCE table.

CAMSHAFT POSITION SENSOR RESISTANCE

Application	Ohms
Avalon & Camry	
Cold ⁽¹⁾	835-1400
Hot ⁽²⁾	1060-1645
Camry Solara	
2.4L 4-Cyl.	
Cold ⁽¹⁾	835-1400
Hot ⁽²⁾	1060-1645
3.0L V6	
Denso Sensor ⁽³⁾	
Cold ⁽¹⁾	835-1400
Hot ⁽²⁾	1060-1645
Wabash Sensor ⁽³⁾	
Cold ⁽¹⁾	1690-2560
Hot ⁽²⁾	2145-3010
Celica & Corolla	
Cold ⁽¹⁾	835-1400
Hot ⁽²⁾	1060-1645
ECHO & Prius	
Cold ⁽¹⁾	1630-2740
Hot ⁽²⁾	2065-3225
Highlander, Land Cruiser, MR2, RAV4, Sequoia, Sienna, Tacoma, Tundra & 4Runner	

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).	
(3) This is manufacturer of camshaft position sensor.	

CRANKSHAFT POSITION SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

For crankshaft position sensor testing procedures, see CRANKSHAFT POSITION SENSOR under IGNITION SYSTEMS in appropriate BASIC DIAGNOSTIC PROCEDURES article. Ensure resistance is within specification. See CRANKSHAFT POSITION SENSOR RESISTANCE table.

CRANKSHAFT POSITION SENSOR RESISTANCE

Application	Ohms
Avalon	
Cold ⁽¹⁾	1630-2740
Hot ⁽²⁾	2065-3225
Camry & Camry Solara	
2.4L 4-Cyl.	
Cold ⁽¹⁾	985-1600
Hot ⁽²⁾	1265-1890
3.0L V6	
Cold ⁽¹⁾	1630-2740
Hot ⁽²⁾	2065-3225
Celica & Corolla	
Cold ⁽¹⁾	1630-2740
Hot ⁽²⁾	2065-3225
ECHO	
Cold ⁽¹⁾	985-1600
Hot ⁽²⁾	1265-1890
Highlander	
2.4L 4-Cyl.	
Cold ⁽¹⁾	985-1600

Hot ⁽²⁾	1265-1890
3.0L V6	
Cold ⁽¹⁾	1630-2740
Hot ⁽²⁾	2065-3225
Land Cruiser & MR2	
Cold ⁽¹⁾	1630-2740
Hot ⁽²⁾	2065-3225
Prius & RAV4	
Cold ⁽¹⁾	985-1600
Hot ⁽²⁾	1265-1890
Sequoia, Sienna, Tacoma, Tundra & 4Runner	
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).	

EGR GAS TEMPERATURE SENSOR

Camry 3.0L V6, Camry Solara 3.0L V6 & Tacoma 2.7L 4-Cylinder 3RZ-FE

For EGR gas temperature sensor testing procedures, see EGR GAS TEMPERATURE SENSOR under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article. Ensure resistance is within specification in relation to specified temperature. See **EGR GAS TEMPERATURE SENSOR RESISTANCE** table.

EGR GAS TEMPERATURE SENSOR RESISTANCE

Application & Temperature	Ohms
Camry	
122°F (50°C)	69,400-88,500
212°F (100°C)	11,890-14,370
302°F (150°C)	2790-3590
Camry Solara & Tacoma	
122°F (50°C)	64,000-97,000
212°F (100°C)	11,000-16,000
302°F (150°C)	2000-4000

EGR POSITION SENSOR

Camry 3.0L V6 & Camry Solara 3.0L V6

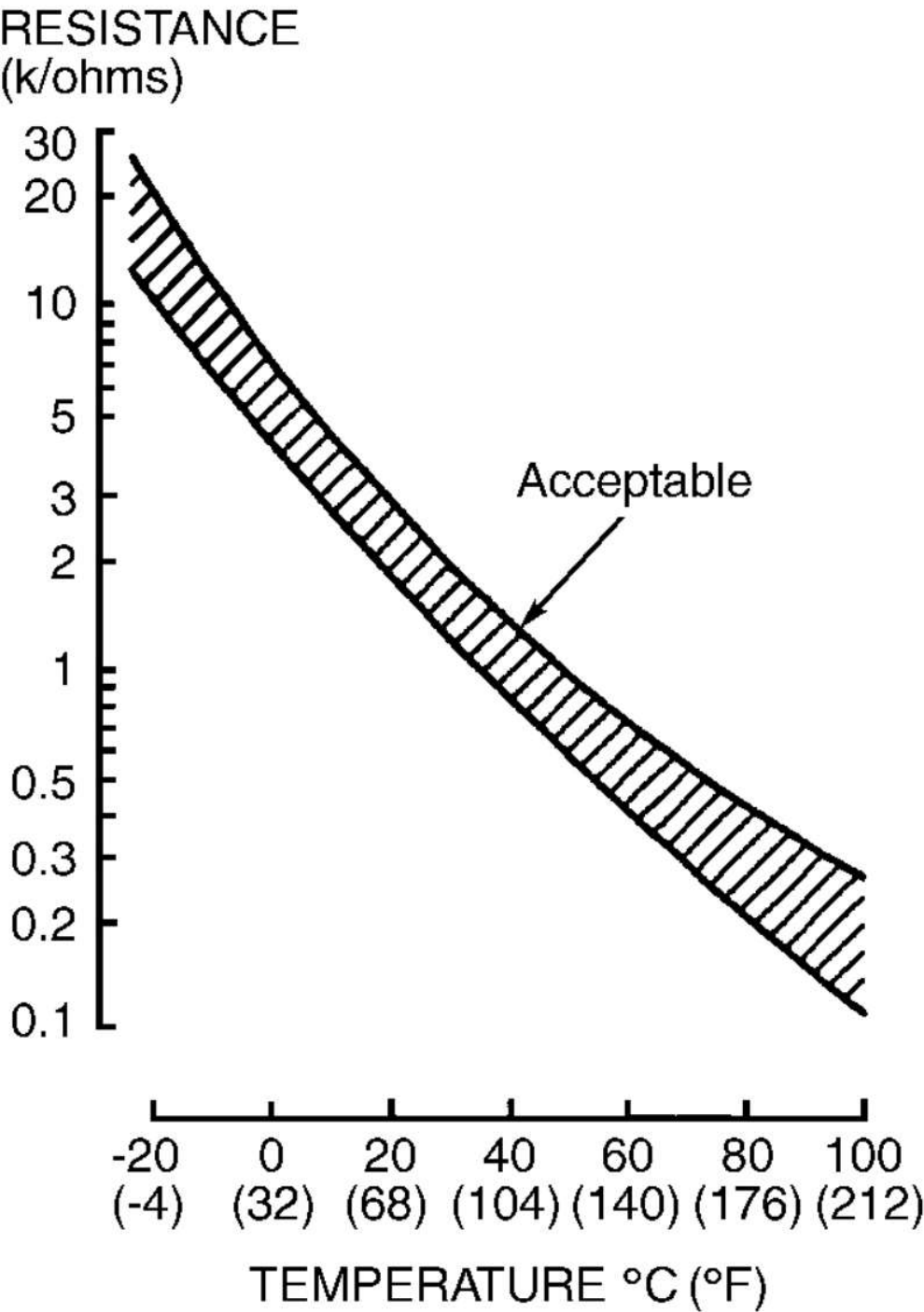
For EGR position sensor testing procedures, see **EGR POSITION SENSOR (CAMRY & CAMRY SOLARA)** under EMISSION SYSTEMS & SUB-SYSTEMS in SYSTEM & COMPONENT TESTING - V6 & V8 article.

ENGINE COOLANT TEMPERATURE SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See **SERVICE PRECAUTIONS** .

For Engine Coolant Temperature (ECT) sensor location and testing procedures, see ENGINE COOLANT TEMPERATURE SENSOR under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article. Ensure resistance is within specification in relation to specified temperature. See **Fig. 2** .



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Fig. 2: Testing Engine Coolant Temperature Sensor
Courtesy of TOYOTA MOTOR SALES, U.S.A., INC.

HEATED OXYGEN SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

For heated oxygen sensor application and sensor testing procedures, see HEATED OXYGEN SENSOR under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article.

INTAKE AIR TEMPERATURE SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

Intake air temperature sensor is incorporated in to airflow meter. For testing procedures, see AIRFLOW METER under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article.

KNOCK SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

For knock sensor testing procedures, see KNOCK SENSOR under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article.

POWER STEERING PRESSURE SENSOR

NOTE: Power steering pressure sensor may also be referred to as power steering oil pressure sensor.

ECHO

Power steering pressure sensor is located on side of power steering pump. Testing information is not available from manufacturer.

THROTTLE POSITION SENSOR

All Models

For Throttle Position (TP) sensor terminal identification and testing procedures, see THROTTLE POSITION SENSOR under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article.

VACUUM SENSOR FOR HYDROCARBON ADSORBER CATALYST SYSTEM

Prius

WARNING: Read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

For vacuum sensor testing procedures, see VACUUM SENSOR FOR HYDROCARBON ADSORBER CATALYST SYSTEM under ENGINE SENSORS & SWITCHES in SYSTEM & COMPONENT TESTING - 4-CYLINDER article.

VAPOR PRESSURE SENSOR

All Models

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

For vapor pressure sensor testing procedures, see VAPOR PRESSURE SENSOR under FUEL EVAPORATIVE SYSTEM under EMISSION SYSTEMS & SUB-SYSTEMS in appropriate SYSTEM & COMPONENT TESTING article.

VARIABLE VALVE TIMING SENSOR

NOTE: Variable Valve Timing (VVT) sensor may also be referred to as camshaft position sensor.

WARNING: On Prius, read service precautions before proceeding with service procedure. See SERVICE PRECAUTIONS .

Avalon, Camry 2.4L 4-Cylinder, Camry Solara 2.4L 4-Cylinder, Celica, Corolla, ECHO, Highlander, MR2, Prius, RAV4 & Sienna

For Variable Valve Timing (VVT) sensor testing procedures, see CAMSHAFT POSITION SENSOR under IGNITION SYSTEMS in appropriate BASIC DIAGNOSTIC PROCEDURES article.

VEHICLE SPEED SENSOR

Camry 2.4L 4-Cylinder, Camry Solara, Celica, Corolla, ECHO, Tacoma, Land Cruiser, Sequoia & Tundra

For vehicle speed sensor testing procedures, see VEHICLE SPEED SENSOR under ENGINE SENSORS & SWITCHES in appropriate SYSTEM & COMPONENT TESTING article.