PORSCHE 924 TURBO DIGITAL IGNITION TIMING

DESCRIPTION

Porsche has developed a computerized engine control system called Digital Ignition Timing Control (DITC) for the 924 Turbo model. Using various engine sensors, the system provides the best ignition timing for optimum engine power, emission control and fuel economy under all operating conditions.

The DITC system consists of the following components: a computer control unit, ignition control unit, pressure sensor (located inside the computer control unit), temperature sensor, throttle switch, crankshaft sensor, distributor, and an ignition coil. DITC system works in conjunction with the oxygen sensor system.

OPERATION

SPARK CONTROL

The flywheel has an extra ring of 100 teeth. As the crankshaft turns, the flywheel sensor receives 2 voltage pulses from each tooth. It therefore can count the teeth or sense each 1.8° of crankshaft rotation.

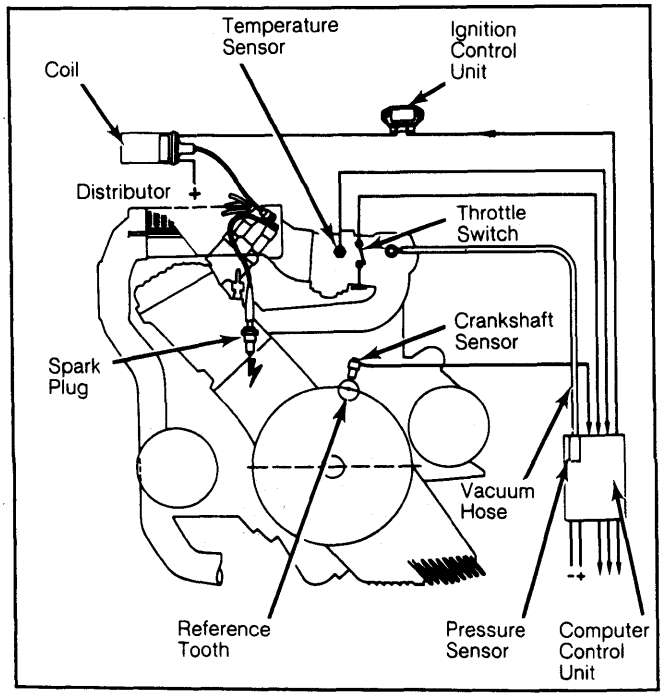
One of the flywheel teeth, called the reference tooth, has a special soft iron insert. When it rotates past the crankshaft sensor, the sensor sends 2 stronger pulses to the computer control unit.

By counting the number of teeth which pass the flywheel sensor after the reference tooth, the computer control unit can determine both engine speed and crankshaft position (piston position) in relation to TDC.

When the engine is running, the computer control unit receives information from the various engine sensors. Based on this information, it determines the appropriate time to signal the ignition control unit.

The ignition control unit then makes and breaks the primary circuit to the ignition coil, firing the spark plug. As engine speed and crankshaft position are determined by the crankshaft sensor, the only function of the distributor is to distribute the spark to the spark plugs.

Fig. 1: Porsche Digital Ignition Timing Control System



NOTE: Testing information for the DITC system is not available from manufacturer.

FUEL CONTROL

An acceleration enrichment control unit has been introduced to the system to replace the speed relay. It also has a circuit for cold engine acceleration enrichment. Air/fuel enrichment occurs only when coolant temperature is below 140°F (60°C) and sensor temperature is below about 480°F (250°C) (during warm-up).

If either temperature is exceeded, there will be no acceleration enrichment. If the throttle is opened, the control unit will be activated at a throttle angle of 1° or 7°. The control unit puts out a voltage signal to the oxygen sensor control unit, which increases the duty cycle to 75% for about 2.5 seconds. Air/fuel mixture will be enriched during this time.

The DITC control unit stabilizes idle speed whenever accessories are turned on which might cause a fluctuation in idle speed. It does this by advancing or retarding the ignition timing.

DIAGNOSIS

The following should be considered when diagnosing the system:

- With a closed throttle and an intake air temperature below 120-140°F (50-60°C), ignition timing will only be changed by engine speed.
- If wire connection on left wheel housing in engine compartment is disconnected, ignition timing is retarded by 7°. Plug can be disconnected to eliminate detonation in areas where poor quality gasoline is provided.
- If temperature sensor fails or wire is pulled off, ignition timing will be retarded.
- If pressure sensor of control unit fails or pressure hose is disconnected or leaks, ignition timing will be advanced. Be sure connections are tight and pressure hoses are correctly routed.
- If throttle switch fails or a wire is pulled off, there will be no ignition retard during starting or coasting, and idle speed will be too high.
- If flywheel sensor fails, entire system will not operate.

ADJUSTMENT

IDLE ADJUSTMENT

NOTE: The Digital Ignition Timing Control system controls idle speed by varying the ignition timing. Idle speed adjustments are made using an ignition timing light. Sensor temperature must be below 120°F (50°C) before making idle adjustment.

1) With engine off, remove temperature sensor from intake manifold, and place it in the fresh air tray behind engine firewall. Leave wire connected to sensor. Install a plug into temperature sensor hole (in intake manifold).

2) Start and run engine until normal operating temperature is reached. Connect a CO tester according to manufacturer's instructions. Attach a timing light to engine.

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3) Turn the idle control screw (air by-pass screw), until ignition timing mark (dot on flywheel) is fully visible at timing pointer edge. Check idle speed. Speed should be below 900 RPM.

NOTE: Timing mark (dot) will move around because of the computer regulating timing.

4) If necessary, adjust CO level at same time idle adjustment is being made. With idle speed (and CO level) adjusted, turn engine off and remove all test equipment. Replace temperature sensor.

MAINTENANCE

OXYGEN SENSOR

1) Oxygen sensor must be replaced every 30,000 miles. To replace, raise and support vehicle. Remove rubber cap plug terminal for oxygen sensor and pull plug off. Pull off saftey plug from oxygen sensor.

2) Remove sensor by unscrewing. To install, coat threads of sensor with Bosch paste VS 140 16 Ft. Paste must not get into slot of sensor. Tighten sensor to 35-45 ft. lbs. (50-60 N.m).

3) Mileage counter must be reset each time oxygen sensor is replaced. To reset, raise and support vehicle. Remove engine guard. Press in reset button on counter (located in left front wheel housing) with a small screwdriver. Counter should go to 0 and sensor lamp should go out.

REMOVAL & INSTALLATION

DITC component removal and installation procedures are not available from manufacturer.

DISTRIBUTOR

Removal

Before removing distributor, crank engine until number 1 cylinder is at TDC. The Z1 mark on flywheel will line up with timing pointer edge, and mark on camshaft sprocket will be opposite valve cover.

Installation

When installing distributor, align distributor so that tab for distributor cap faces flywheel, and mounting clips face in same direction as vehicle (front-to-rear). Also, rotor must align with cylinder number 1 mark on distributor housing.

Fig. 2: Porsche Digital Ignition Timing Wiring Diagram