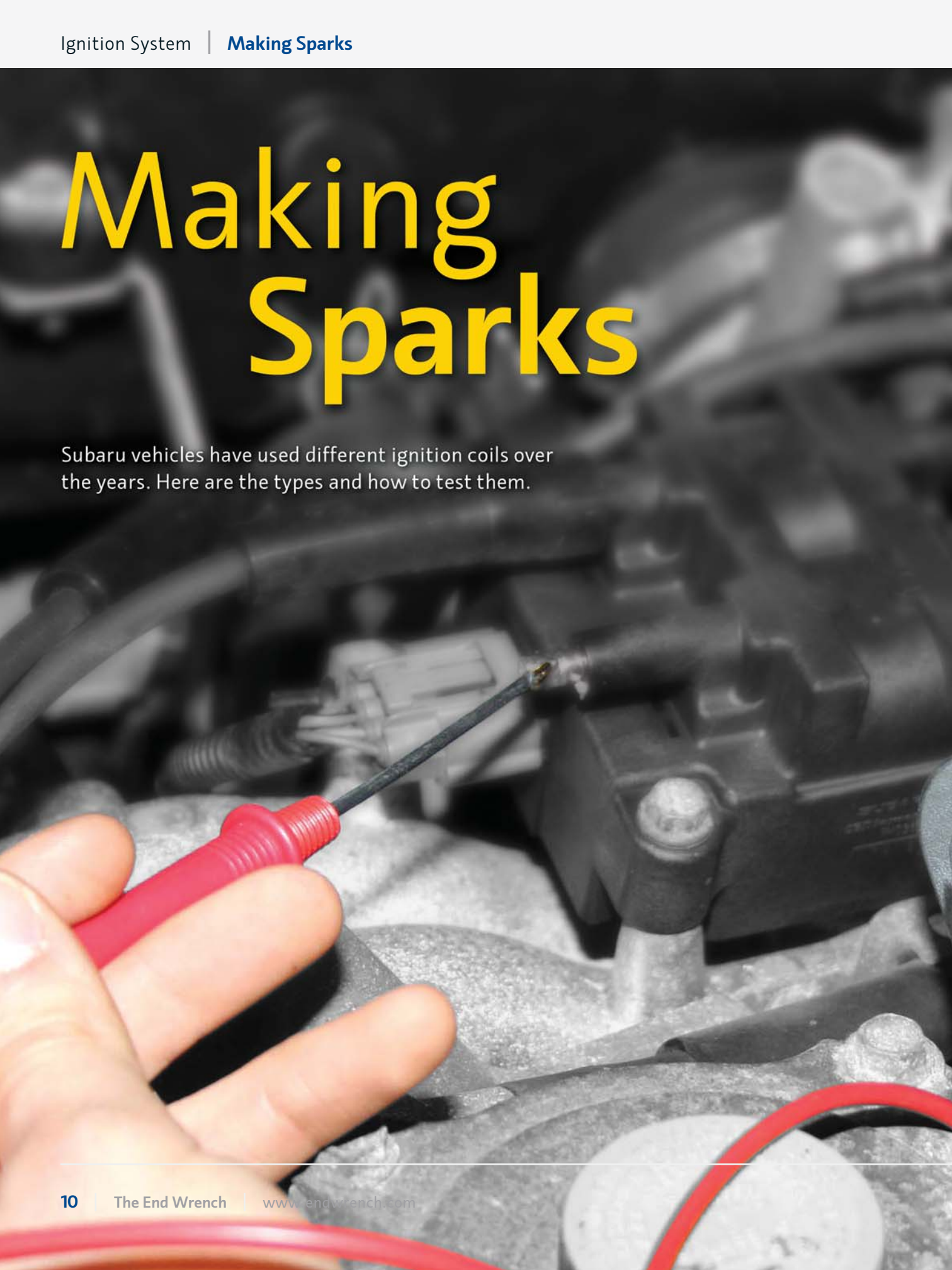


Making Sparks

Subaru vehicles have used different ignition coils over the years. Here are the types and how to test them.



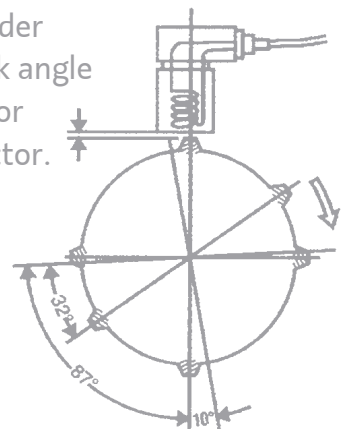
Subaru ignition systems are pretty straightforward and easy to understand. However, some confusion may occur when testing the ignition coils due to the various types that have been used over the years. Let's review the basic theory of Subaru ignition systems and clarify the types of ignition coils and the how to test them.

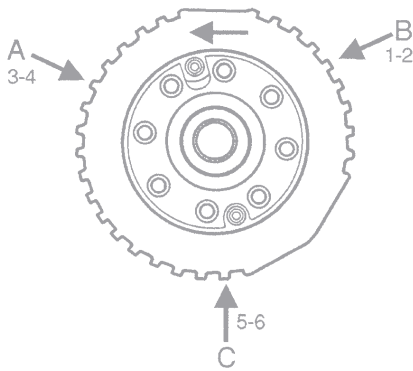
Subaru vehicles are designed with distributorless direct ignition systems. The engine control module (ECM) oversees the cylinder firing operation with the input from several sensors, those for crank and cam angle, throttle position, spark knock, coolant temperature, among others. Of these sensors, the crank and cam angle sensors are of key importance as they provide the ignition timing points and sequence.

Crank Angle Sensor

The crank angle sensor determines the crankshaft position and speed by sensing pulses created by a reluctor passing through a magnetic field. On four-cylinder engines, the reluctor has six teeth in two sets, each set at 10, 65 and 97 degrees BTDC. The reluctor is machined into the back of the crankshaft timing belt sprocket.

➤ A four-cylinder crank angle sensor reluctor.





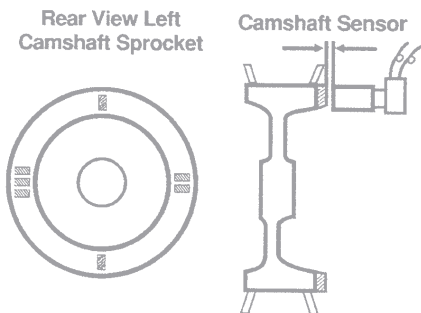
> A six-cylinder crank angle sensor reluctor.

On six-cylinder engines, the reluctor is mounted on the flywheel end of the crankshaft. As the crank rotates, it sends signals to the ECM, which, when combined with the signal from the cam angle sensor, indicate the cylinder to be fired.

The ECM uses the crank angle sensor input to control the fuel and ignition systems where rpm, fuel injection timing, dwell and timing advance are concerned.

Cam Angle Sensor

The cam angle sensor functions the same as the crank angle sensor. Its reluctor teeth are located on the back



> Cam angle sensor and reluctor (four-cylinder engines).

of the left side camshaft sprocket. The ECM uses the input from the cam angle sensor to determine the fuel injection sequence and to reference the #1 cylinder.

Ignition Coil Types

Subaru engines use one of three basic types of ignition coils:

- > Separate Coil and Igniter
- > Combined Coil and Igniter
- > Coil-on-Plug (COP)

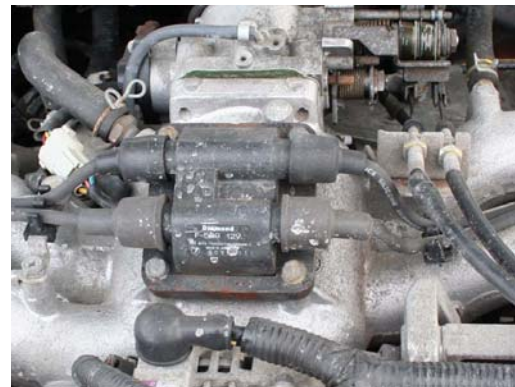
On non-turbo four-cylinder engines, secondary ignition is supplied by a coil that serves two cylinders. On four-cylinder turbo-equipped engines and six-cylinder engines, coil-on-plug (COP) technology is used.

Separate Coil and Igniter

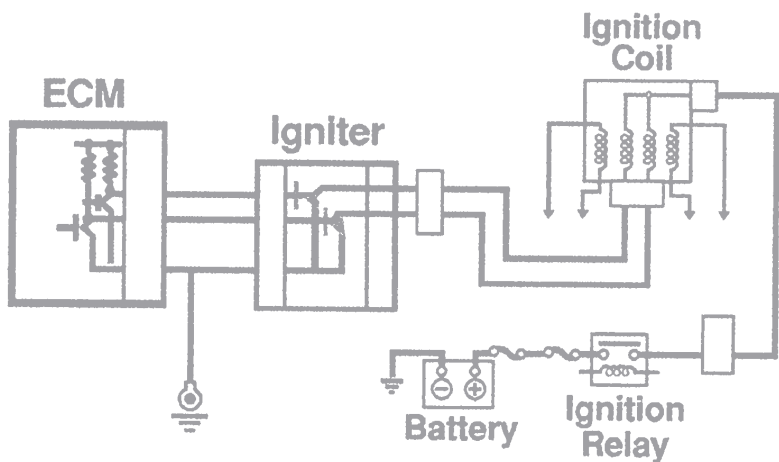
In this application, the igniter is remote from the coil, located elsewhere under the hood, normally on the firewall.



> Igniter unit mounted on firewall.



> Coil unit mounted on top of intake manifold.



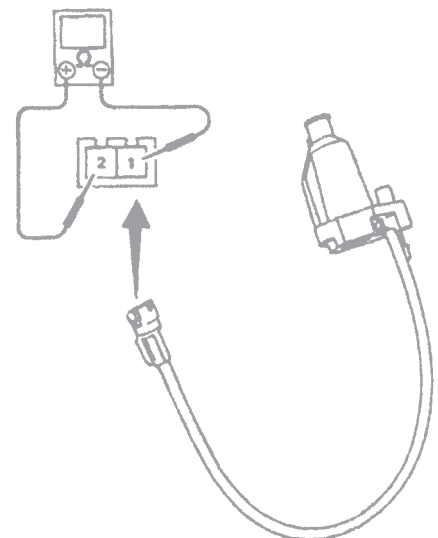
> Ignition circuit for separate coil and igniter type.

For a complete list of coil testing procedures for specific Subaru models, please go to www.endwrench.com and click on the "Bulletin Board" tab.

SVX Coil on Plug System

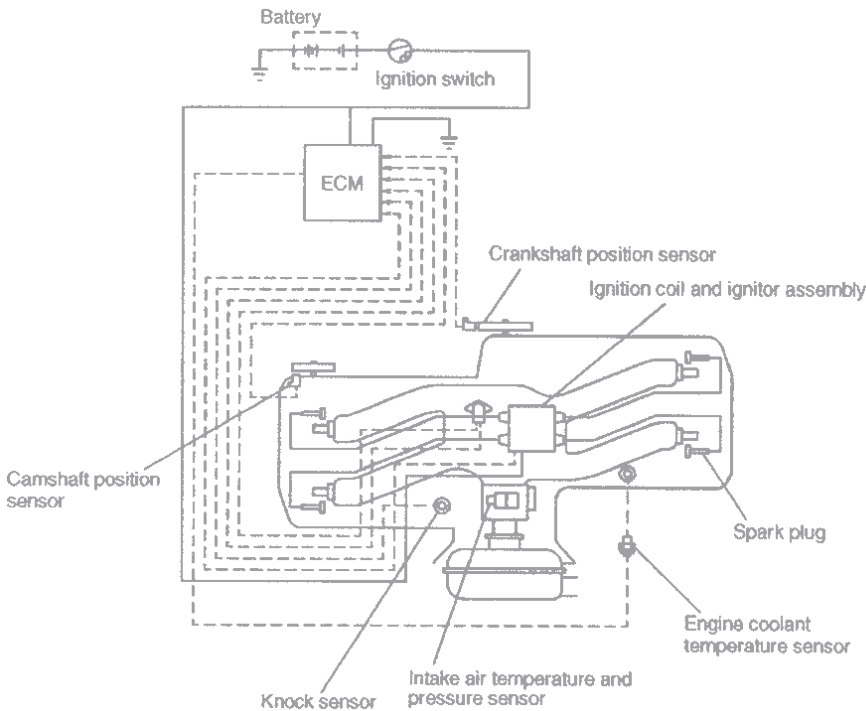
The ignition system on 1997 and prior SVX models uses a COP unit for each cylinder, fed by an igniter module. The igniter is controlled by the ECM. Both the primary and secondary windings are contained in the coil. Like later versions of COP, the unit sits atop the plug and is bolted to the cylinder head, through the valve cover.

Testing the primary coil can be accomplished with the use of a DMM. Test the pigtail connector as shown in the diagram below. The specified resistance range is 0.68 – 0.83 Ω . If the resistance is extremely low, the presence of a short circuit is indicated and replacement is called for.



> SVX primary coil testing.

For additional SVX ignition testing procedures, refer to the proper service manual, or visit the Subaru Technical Information System website at <http://techinfo.subaru.com>. <



> Ignition circuit for ignition coil with integrated igniter.

Combined Coil and Igniter

On newer vehicles, the igniter is integrated into the coil unit, eliminating any problems of voltage drop, damaged wiring or corroded connectors. It is located on top of, or at the rear of, the intake manifold.

COP

The current version of coil-on-plug (COP) ignition systems first appeared on 2001 Legacy and Outback models equipped with the H6DO six-cylinder engines. This type of direct ignition system uses one coil for each cylinder, mounted on the spark plug. As there are no traditional spark plug wires, there are none of the problems common to plug wires: secondary voltage drop, short circuits at connections, high-voltage "leaks," or broken/cracked wires.

The system spread to the 2002 H4DOTC four-cylinder turbo engines on Impreza and Outback Sport models. It continues forward on six-cylinder and 4-cylinder turbo engines.

> The coil-on-plug ignition coil is used on six-cylinder and turbo-equipped four-cylinder engines.

