

## Installing the Hot-Spark Electronic Ignition Conversion Kit

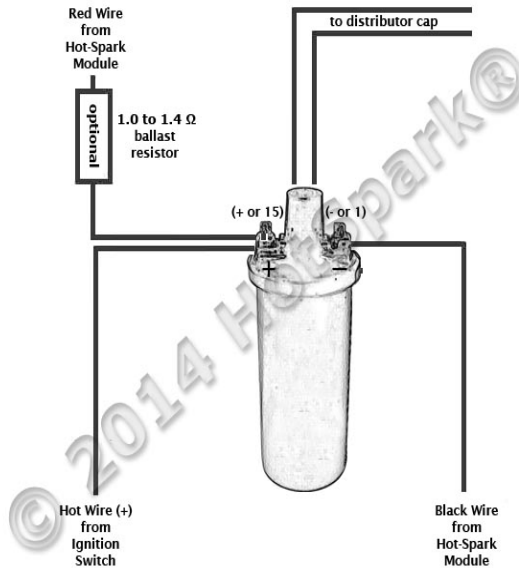
### in Volvo-Penta Engines with Bosch Distributors

*Applies to red Hot-Spark 3-series ignition kits*

**Warning: Reversing the red and black ignition wires will destroy the ignition module.** The Hot-Spark module's red wire connects to positive ( + or 15 on Bosch coil). The black wire connects to negative ( - or 1 on Bosch coil). Remove the condenser and its wire from vehicle. Connect any other wires to the coil in their original positions. This module is designed for 12V negative ground applications only.

**Test Maximum Charging System Voltage:** If the charging system voltage, measured at the coil's positive terminal, is more than 14.0 volts at any RPM level, the voltage regulator likely needs replacing. Too much voltage can destroy the ignition module and other electronic components. A maximum charging system voltage of 13.7 volts or so is plenty. A quick fix is to wire a **1.4 Ohm external ballast resistor** between the coil's + terminal and the HotSpark ignition's red wire. Adding the ballast resistor is cheap insurance against voltage surges, etc.

Make sure that the ignition wires have plenty of slack inside the distributor and are not rubbing on any moving parts. It's best to use a small zip-tie, on the inside of the distributor, where the ignition wires exit, to keep the wires from being pulled into contact with moving parts. If you need to extend the length of the ignition wires, use 20-gauge (AWG) wire. Crimp tightly or solder all connections.



**Remove points, condenser and condenser wire from distributor.** Remove the condenser and its wire from the vehicle. If there is a **purple wire** that went to the condenser, **tape it off**, as it will **no longer be used**. **Important:** Clean the distributor's breaker points plate thoroughly, so that the ignition module's base plate makes good thermal contact with the distributor.

**Coil Required:** Do not use a low-resistance coil that does not have the minimum primary resistance required by the ignition module, as stated in the instructions (minimum 3 ohms for 4- and 6-cyl, assuming a 12-Volt electrical system).

The coil resistance regulates the current in the ignition module/coil circuit. Too little coil primary resistance results in too much amperage going to the ignition module, which can overheat the electronics. The failure may not happen immediately, but the excess heat will shorten the life of the ignition module electronics. How long the electronics will last depends on how much heat is generated. It could be a matter of a couple of hours to a few hundred hours, depending on temperature.

To measure primary resistance: Label and remove all wires to coil ( + or - ). Using a common digital multimeter in the 200  $\Omega$  mode, cross the red and black leads of the Ohmmeter. Allow 10 seconds or more for the reading to settle and write down the reading. Still in the 200 Ohm mode, measure between coil's + and - terminals. Allow a few seconds for the reading to settle, until it stabilizes. Subtract the previous reading, taken with the leads crossed, to compensate for Ohmmeter's inherent resistance. Do not use a low-resistance coil, such as the MSD or Accel coil; they don't have enough primary resistance for this application. For best performance, the coil should also have 7,000 Ohms or more secondary resistance (measured from coil's + or - terminal to center high tension terminal, in the 20K  $\Omega$  mode of the Ohmmeter).

**Test Battery Voltage to Coil:** With ignition switch ON, engine not running, check voltage at coil's + terminal. The voltmeter should read somewhere around +11 to +13 volts. If voltage is too low or there's no reading, the battery's terminals or ground connection may be corroded and need cleaning or the battery may need charging. Some vehicles have a resistor wire running from the ignition switch to the coil's + terminal. If this resistor wire drops the voltage below 9 volts or so, you may need to run a non-resistor wire from the ignition switch to the coil's + terminal or run a +12V wire directly from the ignition switch to the red Hot-Spark ignition wire. Make sure that the ignition switch terminal to which you connect this wire has power only when the ignition switch is in the ON position. Or, you can, for temporary testing purposes only, run a wire directly from the battery's + terminal to the coil's + terminal, the Hot Spark ignition's red wire to the coil's + terminal and the black Hot-Spark wire to the coil's - terminal. Do not leave the wire from the battery connected to the coil's + terminal for more than a minute or so without the engine running.

**Air Gap between Magnet Sleeve and Ignition Sensor:** If you need to increase air gap slightly, hold ignition base plate away from distributor shaft while tightening set screw and/or loosen the two Allen head screws and retighten screws while lightly prying ignition module away from magnet sleeve. Do not over-torque these Allen screws. Black magnet sleeve should not rub against red ignition module, but exact gap is not critical. In rare instances, it may be necessary to gently pry red ignition module away from black magnet sleeve to keep them from rubbing together.

**Ignition Timing:** Set the ignition timing, with a stroboscopic light, to the distributor's factory specification. The difference in distributor position with points vs. electronic ignition can be as much as 30 degrees or so clockwise or counterclockwise, so you'll definitely have to reset the timing, using a stroboscopic timing light.



*3BOS4UI for 4-cylinder Bosch Vacuum- or Centrifugal-advance Distributor*

1. Turn off the ignition switch and/or remove the ground strap from the battery. Though not absolutely necessary, it is probably easiest overall to remove the distributor from the car before installing the Hot-Spark module. If the contacts in the inside of the distributor cap are worn or damaged, replace the distributor cap. Replace the rotor if it's worn.
2. Remove distributor cap, leaving the plug wires in place, unless replacing the distributor cap as well.
3. Remove points, condenser and the condenser's wire from the vehicle. Because the Hot-Spark kit does not modify the distributor, the points and condenser can be reinstalled at a later time.
4. Clean any grease or dirt thoroughly from the distributor's points cam and the breaker points plate.
5. Insert the Hot-Spark module's wires, one at a time, from the inside of the distributor out, through the hole in the side of the distributor. Gently pull and rock, up-and-down and side-to-side, the rubber grommet, halfway through the hole, until it seats.
6. Clean the breaker plate thoroughly to provide a solid electrical ground and good thermal transfer. Apply a thin coat of the included white thermal transfer paste to the bottom of the ignition base plate. Place the Hot-Spark module's bottom plate onto the distributor's breaker plate. The peg should fit snugly into the hole in the breaker plate and the screw holes should line up. The Hot-Spark module's base plate should lie flat and snug on the distributor's breaker plate. Insert the screw and tighten, while gently pressing the ignition module away from the distributor shaft.

**3BOS4U1 (supersedes 3BOS4V1 and 3BOS4C1):** Universal ignition kit for 4-cylinder Bosch distributors. Fits both vacuum-advance and centrifugal-advance-only distributors with one-piece, right-hand points. If you need to increase the air gap slightly, hold the ignition base plate away from the distributor shaft while tightening the points set screw and/or loosen the two Allen head screws and retighten the screws while lightly prying the ignition module away from magnet sleeve. Do not over-torque these Allen screws.

**3BOS6U1 (supersedes 3BOS6V1):** Universal ignition kit for 6-cylinder Bosch distributors with one-piece, right-hand points. Fits both vacuum-advance and centrifugal-advance-only distributors. Installation is similar to 3BOS4U1.

**3BOS6U2L** Universal ignition kit for 6-cylinder Bosch distributors with one-piece, left-hand points. Fits both vacuum-advance and centrifugal-advance-only distributors. Installation is similar to 3BOS4U1.

7. Install magnet sleeve, with the larger opening down. Turn the magnet sleeve left and right, while pushing down firmly, until you can feel the distributor shaft cam lobes line up with the flat spots inside the magnet sleeve. Press down firmly until the magnet sleeve slides as far down as it will. Install the rotor on top of the magnet sleeve, making sure the rotor is aligned with the slot in the top of the distributor shaft. The rotor should slide all the way down and lock into place, so that it cannot turn independently of the distributor shaft. If you can still turn the rotor independently of the distributor shaft, the magnet sleeve and/or rotor is not seated all the way down.

**Magnet sleeve positioned too high:** Situation: The fit between the distributor shaft and the magnet sleeve is especially tight and you can't slide the magnet sleeve down onto the distributor shaft all the way. The rotor rides too high, causing the distributor cap to wobble when you rotate the distributor shaft. Fix: Rotate the magnet sleeve so that it lines up with the lobes of the distributor shaft cam and the magnet sleeve can slide down a bit. Install the rotor and tap lightly, with a small hammer or a soft rubber mallet, on the center of the rotor, until the magnet sleeve seats firmly onto the distributor shaft, over the distributor cam lobes. With the rotor and distributor cap installed, you should be able to rotate the distributor shaft without the distributor cap wobbling. If the distributor cap still wobbles, you may need to adjust the number or thickness of the distributor shaft shims.

**Magnet sleeve fit too loose:** If the fit between the distributor shaft lobes and the magnet sleeve is too loose, the distributor shaft may be worn down from years of the points block rubbing on the distributor cam lobes, with accumulated dirt and grit, and/or insufficient lubrication. If the fit is especially loose, the only solution, short of replacing the distributor, may be to clean the distributor cam lobes thoroughly with alcohol and wrap the lobes with a single wrap of high-quality electrical tape, before pressing the magnet sleeve down over the lobes. Too loose a fit between magnet sleeve and distributor cam lobes can result in erratic timing.

8. Check to see if the vacuum advance is working properly by sucking on the vacuum canister port (vacuum distributors only). The breaker plate should move smoothly and freely.

9. Adjust the two Hot-Spark ignition wires so that they have plenty of slack inside the distributor and they're not rubbing on any moving parts.
10. Install the distributor cap.
11. Reinstall the distributor.
12. The Hot-Spark module's red wire connects to positive ( + or 15 on Bosch coil). The black wire connects to negative ( - or 1 on Bosch coil). DO NOT reverse these wires or the ignition module will be destroyed.
13. Check all wire connections, including the two Hot-Spark wires and the spark plug and coil high-tension wires. If you need to extend the length of the wires, use 18- or 20-gauge wire. We recommend soldering all splices and connections, if you can, or crimp all connections tightly. Make doubly sure that all wires are connected to the proper terminals, etc. before reconnecting the battery or turning the ignition switch to the ON position. Make sure that all connectors are snug. Reconnect the battery and set the distributor timing statically. It's a good idea to secure the wires inside the distributor, next to where they exit, with a zip tie, to keep the wires from being pulled into contact with the spinning magnet sleeve or rotor.
14. You can set the timing statically to about 0° (TDC) at first, so that the engine will start. You may need to tweak the distributor, a little at a time, right or left, to enable the engine to start and remain running. Time the engine with a stroboscopic light, engine running, according to Volvo-Penta specifications. Most 4-cylinder Volvo-Penta Bosch distributors should be set to 12° BTDC at 1,000 RPM.

**Setting Timing:** This will probably be the last time you have to set the timing for a long time, so it's worth it to spend the extra time and effort to set the timing absolutely spot-on accurately. An engine with its timing set to perfection will start with the slightest bump of the starter and purr like a kitten at idle – something to make you feel good every time you start the engine. Most 4-cylinder Volvo-Penta Bosch distributors should be set to 12° BTDC at 1,000 RPM. TDC = Top Dead Center or 0°, BTDC = Before Top Dead Center, ATDC = After Top Dead Center.

**Distributor Cap and Rotor:** Stock Bosch rotors and distributor caps work fine with the Hot-Spark module. A worn, corroded or scored distributor cap and/or rotor is often the cause of the timing jumping around erratically at idle. With the Hot-Spark electronic ignition installed in place of points, several times as much voltage surges through the rotor to the distributor cap terminal contacts.

**Spark Plug Gap:** With the Hot-Spark ignition kit, the stock spark plug gap specification is fine.

**Rubber Grommet:** The 3BOS4U1 and 3BOS6U1 use the larger, square rubber grommet for later Bosch four-cylinder distributors. If your distributor uses the earlier, smaller, round grommet, you'll need to replace the square grommet with a 3/16" round grommet. Cut off the ignition module's 1/4" female connectors. Pass the wires, from the inside of the distributor out, through the round hole in the side of the distributor body and then through the round rubber grommet. Seat the grommet in the hole. Crimp or solder new 1/4" female connectors onto the ends of the wires. Make sure that the wires have plenty of slack inside the distributor and won't rub on moving parts. Fasten a zip-tie around the HotSpark wires, just inside the distributor's rim, to prevent the wires from being pulled into contact with the rotating shaft or magnet sleeve.

### **Cleaning, Lubricating, Checking the Distributor:**

You likely won't have the distributor out of the engine again for some time. So now is a good time to lubricate under the vacuum advance plate, the distributor shaft and its bushing and the swinging centrifugal advance weights in the bottom of the distributor. You can access the centrifugal advance weights easily by removing the curved plug on the outside of the distributor, near the bottom. A somewhat sharp, flat-bladed putty knife is handy for prying off this plug. A small amount of heavy oil, such as 90W hypoid, synthetic heavy transmission oil or heavy motor oil works well for lubricating the distributor. Don't use a thin solvent, such as WD-40, for lubrication, as its lubricating qualities won't last for long. Apply a few drops of oil to the felt pad under the rotor. Clean up any excess oil or grease.

If the distributor is dirty and covered with grit and gunk inside and out, you may need to soak it overnight in a solvent such as naphtha or kerosene (don't allow solvent to leak into the vacuum canister, if it has one - remove the vacuum canister first). After soaking and scrubbing with a stiff nylon brush, rinse thoroughly with clean solvent, dry with compressed air or allow to air-dry and lubricate the shaft, bushing, advance weights and breaker advance plate. Wipe up excess grease and oil. If the vacuum advance plate still doesn't move freely, you may need to replace the vacuum canister or replace the distributor.

Check the distributor shaft for axial (up-and-down) play and radial (side-to-side) play. If there's too much radial play, you may need to replace the distributor or have it rebuilt with new bushings, etc. Axial (up and down) play can be reduced by adding special washers (shims) to the distributor shaft. The Bosch distributor rebuild kit (Bosch 1 237 010 007) contains these washers.

### **Volvo-Penta Marine Engines with four-cylinder Bosch distributor, and with one-piece (not two-piece) points**

**3BOS4U1:** Ignition kit for 4-cylinder Bosch distributors. Fits both vacuum-advance and centrifugal-advance-only distributors with one-piece, right-pivoting points. If you need to increase the air gap slightly, hold ignition base plate away from distributor shaft while tightening set screw and/or loosen the two Allen head screws and retighten screws while lightly prying ignition module away from magnet sleeve. Do not over-torque these Allen screws.

Make sure that there's enough space between the ignition sensor and the magnet sleeve. Sometimes, the screw that attaches the distributor cap clip to the distributor body protrudes too far into the distributor, crowding the ignition module too close to the magnet sleeve. You'll probably have to add one or two extra washers to the distributor cap clip screw, to keep the screw from sticking too far into the distributor.

The Volvo-Penta distributor uses an 8mm (5/16") O.D. round rubber grommet. You'll have to cut the spade connectors off the two ignition wires. Pass the wires, from the inside of the distributor out, through the round rubber grommet inside of the distributor body. Seat the grommet in the hole. Crimp or solder (soldering is best) new 1/4" (6.37mm) female quick-connect terminal connectors onto the ends of the wires.

Typically, a **purple wire** goes to the **condenser** on the Volvo-Penta distributor. When installing the Hot-Spark ignition, remove the points and condenser and **tape off the purple wire**, as it will no longer be used.

### **Wiring Installation Basics:**

1. Begin with a fully-charged battery. Touch the red lead of a voltmeter to the coil's positive ( + ) terminal. Touch the voltmeter's black lead to engine ground. With the ignition switch on, engine not running, measure the voltage at the coil's positive ( + ) terminal. The reading should be somewhere around +12.5 volts, or battery voltage. If voltage is too low or there's no reading, the battery's terminals or ground connection may be corroded and need cleaning. Some vehicles have a resistor wire running from the ignition switch to the coil's + terminal. If this resistor wire drops the voltage below 10 volts or so, you may need to run a non-resistor wire from the ignition switch to the coil's + terminal or run a +12V wire directly from the ignition switch to the red Hot-Spark ignition wire. Make sure that the ignition switch terminal to which you connect this wire has power only when the ignition switch is in the ON position.

Measure voltage, with voltmeter in the 20 DCV mode, red lead on coil's + terminal, black lead on engine ground. With engine running at 2,000 RPM or more, the voltage reading should not be more than +14.0 volts. If reading is more than +14.0 volts, you may need to wire a **ballast resistor** with 1.0 to 1.4 Ohms resistance, between the ignition switch (+12-volt power supply) and the coil's + terminal. Adding the ballast resistor is cheap insurance against voltage surges, etc.

2. Remove points, condenser and condenser wire from the vehicle.

To get the ignition running initially, only these wires should be attached to the coil's + and – terminals:

A. +12 volts from the ignition switch to the coil's + terminal

B. Red Hot-Spark wire to the coil's + terminal

C. Black Hot-Spark wire to the coil's – terminal. **DO NOT connect any +12-volt wire to the coil's – terminal. Connect only the black Hot-Spark ignition wire to the coil's – terminal.**

D. The automatic choke and fuel shut-off valve may also need to be attached to the coil's + terminal.

E. Generally, only the black Hot-Spark wire is attached to the coil's – terminal. If a tachometer wire is usually attached to the coil's - terminal, don't attach it until the timing has been set and engine is running properly. No other wires should be connected to the coil's + and – terminals at this time.

F. **Static timing, using an ordinary 12-volt test lamp, will not work.** Attach a stroboscopic timing light to the spark plug wire of cylinder number 1. With engine rotated to TDC (0 degrees) on the firing stroke of Cylinder number 1, ignition switch ON, turn the distributor until the timing light flashes. You may need to turn the distributor left or right, a little at a time, until the engine will stay running, so that you can set the timing with the engine running, using a stroboscopic timing light, according to factory specifications.

G. For testing purposes, no other wires should be attached to the coil terminals, except for the center high-tension lead to the distributor cap.

With engine rotated to TDC on the firing stroke of Cylinder number 1, ignition switch ON, slowly turn the distributor clockwise or counter-clockwise until the timing light flashes. Tighten the distributor clamp a little, so that you can still turn the distributor by hand, but the distributor won't turn on its own. The rotor should be pointing to number 1 cylinder's spark plug wire.

Start the engine. You may need to turn the distributor left or right a little, until the engine will stay running, so that you can set the timing with the engine running, using a stroboscopic timing light, according to factory specifications.

**Problems with Installation? See [www.Hot-Spark.com/Troubleshooting.pdf](http://www.Hot-Spark.com/Troubleshooting.pdf)**

**Latest On-Line Installation Instructions: [www.Hot-Spark.com/Installing-Hot-Spark-Volvo-Penta.pdf](http://www.Hot-Spark.com/Installing-Hot-Spark-Volvo-Penta.pdf)**

**Using Hot-Spark Ignition with VDO Tachometer:** Connect a diode no. 1N4005 between the negative terminal (- or 1) of the coil and the wire that goes to the tachometer. The cathode end (silver band) should be nearest the tachometer side, not the coil side. You should be able to buy a diode no. 1N4005 at Radio Shack or another electronic supply store.

**Hot-Spark Ignition and MSD 6 Series Wiring Diagram: [www.Hot-Spark.com/Hot-Spark-MSD-6-series.jpg](http://www.Hot-Spark.com/Hot-Spark-MSD-6-series.jpg)**

**OMC Marine Engine Shift Assist Adapter: Click here for wiring diagram:**

**[www.Hot-Spark.com/OMC-Shift-Assist-Adapter.jpg](http://www.Hot-Spark.com/OMC-Shift-Assist-Adapter.jpg)**

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