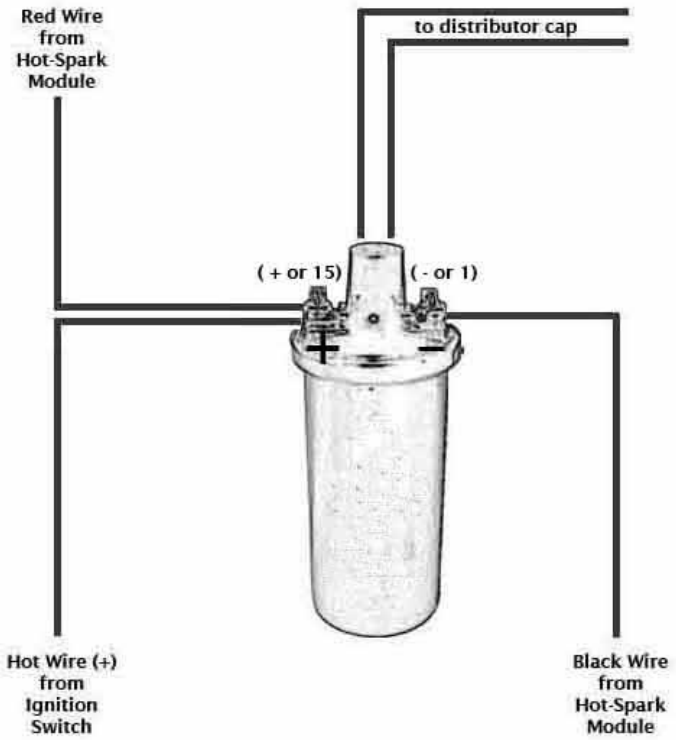
Installing the Hot-Spark Electronic Ignition Conversion Kit in Bosch Distributors

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.

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 plastic zip-tie, on the inside of the distributor, where the ignition wires exit, to keep the wires from being accidentally pulled into contact with moving parts. If you need to extend the length of the ignition wires, use 20-gauge (AWG) wire. Solder or crimp tightly all connections.



Remove points, condenser and condenser wire from distributor. Remove the condenser and its wire from the vehicle. **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: 4-Cylinder: Coil must have a minimum of 3.0 Ohms primary resistance. **6-Cylinder:** Coil must have a minimum of 1.5 Ohms primary resistance The Bosch blue coil (00012) has a little more than 3 Ohms primary resistance. The **HS34HEC** high-energy coil and **Beru Blue Coil** (3.3 Ohms, primary) have sufficient resistance for 4-cylinder applications. The **HS17HEC** high-energy coil has 1.7 Ohms primary resistance.

To measure primary resistance: Label and remove all wires to coil (+ or -). Using a common digital multimeter in the 200 Ω mode, cross the red and black leads of the Ohmmeter. Allow a few seconds for the reading to settle and record it.

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 multimeter'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. **Using a coil with too little primary resistance can cause the ignition module to overheat and misfire until it cools down again or fail, voiding the warranty.**

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 Ω mode of the Ohmmeter).

Test Charging Voltage to Coil: Check the voltage reading at the coil's + terminal, engine running, at 2,500+ RPM. If the voltage measures more than +14.0 volts, you'll need to replace the voltage regulator, install a coil with 3 Ohms or more internal primary resistance or install a 1.4 Ohm external ballast resistor between the ignition switch and the coil's + terminal.

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.

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.

Wiring Installation Basics:

1. Remove points, condenser and condenser wire from the vehicle.
2. Attach the red lead of a voltmeter to the coil's positive (+ or 15) terminal. Attach the voltmeter's black lead to engine ground. With the ignition switch on, engine not running, measure the voltage at the coil's positive (+ or 15) terminal. The reading should be 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. 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, 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.

To get the ignition running initially, only these wires should be attached to the coil's + (15) and - (1) 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.

Attach a stroboscopic timing light to the spark plug wire of Cylinder number 1. 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.

Detailed Installation Instructions:

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. You can apply a *very* thin coat of thermal transfer grease 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.



Left: 3BOS4U1 in distributor with 1-piece, right-hand points, Center: 3BOS4C2 in 010 non-vacuum distributor with 2-piece, right-hand points, Right: 3BOS4V2 in vacuum-advance distributor with 2-piece points

Left: 3BOS4U1 for 1-piece, right hand points, Center: 3BOS4U2L for 1-piece, left-hand points
Right: 3BOS4V2 for vacuum-advance distributor with 2-piece, right-hand points

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. Installs same as 3BOS4C1, but has smaller footprint and shorter magnet sleeve. 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.

3BOS4U2L (supersedes 3BOS4U1L) Universal ignition kit for 4-cylinder Bosch distributors with one-piece, left-hand points. Fits both vacuum-advance and centrifugal-advance-only distributors. Installation is similar to 3BOS4U1.

3BOS4V2 Ignition kit for early 4-cylinder Bosch vacuum-advance distributors with two-piece, right-hand points. Installation is similar to 3BOS4U1. Before installing ignition module or magnet sleeve, install an 8mm (5/16") O.D. round rubber grommet in the round hole in the side of the distributor body for the two wires to pass through. Push/pull the wires through the grommet from the inside out. Solder or crimp tightly connectors on the wire ends.

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. After you remove the points, a 16mm box-end wrench should fit easily over the distributor shaft lobes. If the lobes are larger than that, you may need to order the 18.6mm I.D. magnet sleeve for Bosch 6-cylinder distributors (3BOS6U3).

3BOS6U2L (supersedes 3BOS6U1L) 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. After you remove the points, a 16mm box-end wrench should fit easily over the distributor shaft lobes. If the lobes are larger than that, you may need to order the 18.6mm I.D. magnet sleeve for Bosch 6-cylinder distributors (3BOS6U3L).

3BOS4C2 Ignition kit for early 4-cylinder Bosch non-vacuum-advance distributors with two-piece, right-hand points. Installation is similar to 3BOS4U1. Before installing ignition module or magnet sleeve, install an 8mm (5/16") O.D. round rubber grommet in the round hole in the side of the distributor body for the two wires to pass through. Push/pull the wires through the grommet from the inside out. Solder or crimp tightly connectors on the wire ends.

3BOS6C2 Ignition kit for early 6-cylinder Bosch non-vacuum-advance distributors with two-piece, right-hand points. Installation is similar to 3BOS4U1. Before installing ignition module or magnet sleeve, install an 8mm (5/16") O.D. round rubber grommet in the round hole in the side of the distributor body for the two wires to pass through. Push/pull the wires through the grommet from the inside out. Solder or crimp tightly connectors on the wire ends. After you remove the points, a 16mm box-end wrench (ring spanner) should fit easily over the lobes of the distributor shaft.

3BOS6V2 Ignition kit for early 6-cylinder Bosch vacuum-advance distributors with two-piece, right-hand points. Installation is similar to 3BOS4U1. Before installing ignition module or magnet sleeve, install an 8mm (5/16") O.D. round rubber grommet in the round hole in the side of the distributor body for the two wires to pass through. Push/pull the wires through the grommet from the inside out. Solder or crimp tightly connectors on the wire ends. After you remove the points, a 16mm box-end wrench (ring spanner) should fit easily over the lobes of the distributor shaft.

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. You may need to install magnet sleeve, the the rotor on top of that and tap gently on the center of the rotor to seat magnet sleeve fully.

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 may result in erratic timing.

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, with the butt of a screwdriver, a small hammer or a soft rubber mallet, *very gently*, 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, especially if you're installing the ignition in a Chinese knockoff 009 distributor.

8. 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. You can secure the two ignition wires with a small plastic zip-tie, inside the distributor, just next to where the wires exit.

9. Install the distributor cap.

10. Reinstall the distributor. Be sure that the anti-chatter spring is in place in the distributor drive gear in the bottom of the distributor shaft hole.

11. 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 the polarity of these wires or the ignition module will be destroyed.

12. 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.

13. You can set the timing statically to about 0° (TDC) at first, so that the engine will start. You may need to turn 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 in the normal manner.

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.

TDC = Top Dead Center, or 0° BTDC = Before Top Dead Center ATDC = After Top Dead Center

It's hard to say which distributor an old air-cooled VW actually has in place. The original stock distributor could very well have been replaced with a different distributor over the years. Bosch distributors for VW have a Bosch number on a badge or stamped onto their sides similar to 0 231 XXX XXX. Distributors may also have a VW number, which is preceded by a VW (and maybe an Audi) symbol. It's most useful to find the Bosch number and look up the timing specifications for that particular VW distributor here:

External link: www.oldvolkshome.com/ignition.htm

Finding Timing Marks on Type I VW Engine (Beetle, Ghia, Thing, pre-1972 Bus, etc.): There are several different versions of stock crankshaft pulleys that came with Type I VW engines over the years, each having its own set of notches (timing marks) in different places relative to TDC - very confusing. Like the distributor, the pulley may have been swapped out several times over the years, so you don't know what the notches on it mean. Locate Top Dead Center (0° or TDC). There should be a notch in the crankshaft pulley wheel at TDC, aligned with where the crankcase halves join. You can copy and cut out the pulley wheel degree template on the last page of these instructions to find 7.5°, 30°, 40° BTDC, etc.

Timing the Bosch 009 or 050 Centrifugal-Advance Distributor (VW or Porsche only): Use a stroboscopic timing light, regardless of whether the distributor is equipped with points or an electronic ignition module. Static timing at around 7° (TDC) is suitable only for the initial adjustment, in order to get the engine running. To set the timing accurately, you must use a stroboscopic light connected to No. 1 cylinder's spark plug wire. Set the timing with the engine running at 3,500+ RPM, so that the timing is fully advanced. The 009's timing should usually be set no further advanced than 30°-32° BTDC at 3,500+ RPM. **Static timing, using an ordinary 12-volt test lamp, will not work.**

You can locate the 30° BTDC spot on a stock VW Type I crankshaft pulley, which has a 175 mm (6-7/8 in.) diameter, by measuring, clockwise, from top dead center, around the circumference of the pulley, 45.8 mm, or 1-13/16 in. Make a small white paint mark there. That's about 30° BTDC.

Timing a Stock, Air-Cooled VW Vacuum-advance Distributor: A stock, vacuum-advance distributor should be timed with a stroboscopic light and tach/dwell meter, according to the specifications in the VW service manual. **Static timing, using an ordinary 12-volt test lamp, will not work.**

For dual vacuum-advance distributors (with vacuum canisters having two vacuum ports): You can locate the 5° ATDC spot on a stock VW Type I crankshaft pulley, which has a 175 mm (6-7/8 in.) diameter, by measuring, counterclockwise, from TDC, around the circumference of the pulley, 7.6 mm (5/16 in.). Paint a small white mark here. This is about 5^{o} ATDC, the point at which the dual vacuum-advance distributor (its vacuum canister has two vacuum ports) is usually timed at idle. Refer to the official VW Service Manual for the proper timing specifications for the distributor used in your vehicle.

For SVDA (single vacuum, dual advance) distributors: You can locate the 7.5° BTDC spot on a stock VW Type I crankshaft pulley, which has a 175 mm (6.895 in.) diameter, by measuring, clockwise (to the right), from TDC, around the circumference of the pulley, 11.45 mm (7/16 in.). Paint a small white mark here. This is the point at which the centrifugal advance (009) and certain single-vacuum, dual-advance (SVDA) distributors (their vacuum canister has only one vacuum port) are timed at idle. Again, refer to the official VW Service Manual for the proper timing specifications for the distributor used in your vehicle.

Spark Plug Gap: With the Hot-Spark ignition kit, the stock spark plug gap specification is fine. For racing purposes, you can increase the spark plug gap by about .005 inches, or .12 mm.

Rubber Grommet: The 3BOS4U1 and 3BOS6U1 have the larger, square rubber grommet for later Bosch 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 ¼" 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 ¼" 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. It's a good idea to install a small plastic zip tie around the red and black wires, where they exit on the inside and outside of the distributor to keep the wires from being pulled accidentally into contact with moving parts inside the distributor.

Testing Vacuum-Advance Mechanism: If your engine has a vacuum-advance distributor, test the vacuum canister by sucking hard on its vacuum port. The breaker plate should move counterclockwise and clockwise freely when you do this repeatedly. If you suck and then cover the vacuum port with your tongue, the vacuum advance plate should stay in the same position until you lift your tongue. If it drifts back before you lift your tongue, the diaphragm is leaking and it won't advance the timing properly. In that case you need to replace the vacuum canister or the entire distributor.

Hot-Spark Ignition and MSD 6 Series Wiring Diagram:

www.Hot-Spark.com/Hot-Spark-MSD-6-series.jpg

Volvo 1800 with Tachometer and Hot-Spark Wiring Diagram:

www.Hot-Spark.com/Volvo-1800-Wiring-Diagram.htm

Porsche 911 CDI Box Wiring Diagram:

www.Hot-Spark.com/Porsche-911-CDI-Wiring-Diagram.jpg

Latest On-Line Installation Instructions:

www.Hot-Spark.com/Installing-Hot-Spark-Bosch.pdf

Measuring Coil Resistance: www.HotSpark.com/Coil.htm

Problems with Installation? See www.Hot-Spark.com/Troubleshooting.pdf

A printable VW Type I crankshaft pulley degree wheel template for the SVDA 034:

www.Hot-Spark.com/Hot-Spark-SVDA034-VW-Type-I-Pulley-Degree-Template.pdf

A printable VW Type I crankshaft pulley degree wheel template for the 009 distributor:

www.Hot-Spark.com/Hot-Spark-009-VW-Type-I-Pulley-Degree-Template.pdf