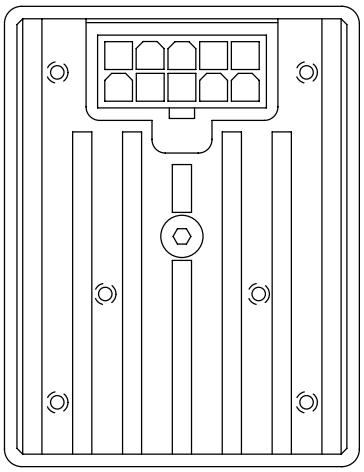
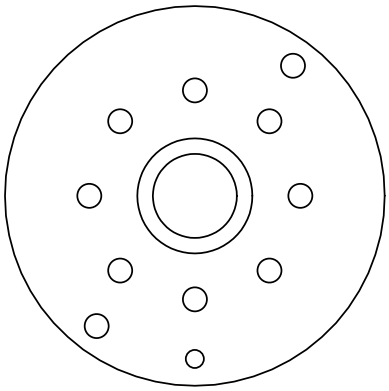
PROBE ENGINEERING, INC.

Installation Instructions

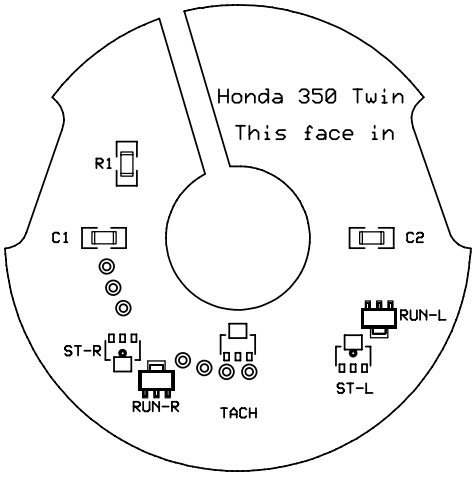
Model FS-03 Electronic Ignition



Control Module



Trigger Rotor



Pickup Plate

PROBE ENGINEERING, INC.

Installation Instructions, Model FS-03
Version 1.0

The Model FS-03 electronic ignition is designed specifically for 1970s Honda Models CB350, CL350, and SL350, all with derivatives of Honda's 180º crankshaft twin-cylinder engine.

The Model FS-03 is a competition-only system that uses neither mechanical nor electronic advance/retard; the ignition timing is fixed at the full-advance position. The kick-starter should never be used with this ignition, as it will kick back, and could cause injury.

The Model FS-03 is for bump- (push- or powered-roller) starting only. For best bump-start results, battery power should not be applied to the ignition until the engine is spinning over.

What should be in the kit:

The Model FS-03 kit includes the following components:

- Control Module
- Trigger Rotor
- Pickup Plate (with wire harness and connector)
- Dimpled brass washers (2 each, for retaining the Pickup Plate)
- Self-adhesive Velcro pads (one "hooks," one "loops")
- Tie-wraps (for backing up the Velcro fastening and for organizing the wiring)

What else you will need:

In addition to the usual small hand tools required to get access to the engine's breaker-points assembly and to remove the fuel tank, side panels, etc., installation will require the following tools and supplies:

- Wire cutters/strippers
- Solderless crimp-type connectors, bullet connectors, or solder and shrink tubing
- Loctite® "blue" medium-strength thread-locking compound or equivalent

Installation:

1. Remove the side panels, if applicable (for general access).

2. Remove the seat.

3. Disconnect the battery.

4. Remove the fuel tank (you will need access to the ignition coils).

5. Remove the alternator rotor cover (for setting the timing later).

6. Remove the breaker points cover.

7. Remove the bolt and washer that secure the centrifugal advancer mechanism and put them aside (they will be reused to retain the electronic ignition's Trigger Rotor).

8. Remove the two screws and washers that retain the points backing plate, and put them aside (the screws will be reused to retain the electronic ignition's Pickup Plate).

9. Remove the breaker points and backing plate as an assembly.

10. Disconnect the breaker points lead wires from the ignition coils.

11. Disconnect and remove the condensers (they should not be used with the solid-state ignition).

12. Remove the advancer mechanism from the quill on the end of the camshaft. It may need gentle persuasion in the form of mild heat, penetrating oil, or a puller. If a puller is required, you can loosely reinstall the retaining nut a few threads shy of full engagement to use as the "push" point.

13. Clean any gross rust or debris from the cam-end quill and from the seating surface (shoulder) at the end of the quill.

14. Slip the Trigger Rotor over the quill, and align the notch in the Trigger Rotor hub with the 3mm locating dowel on the camshaft end (the notch in the hub is in line with the 0.094" through-hole in the Trigger Rotor's face, so that you can tell where you are).

15. Using the original retaining bolt and washer from the centrifugal advancer, bolt the Trigger Rotor in place with its locating notch over the cam end's locating dowel (that is, seated squarely on the shoulder at the end of the quill). It's good practice to use the medium-strength (Loctite "blue" or equivalent) anaerobic thread locker on the Trigger Rotor retaining bolt.

16. Slip the Pickup Plate over the Trigger Rotor (the plate's center hole is large enough to clear the retaining bolt and washer), with the electrical components facing in toward the Trigger Rotor and the wires facing out toward you. The words "Probe Engineering, Inc." are etched in copper near the bottom of the Pickup Plate's outside face; you will also find the words "Honda 350 Twin" and "This face out" in the upper left side of the outward-facing surface. Align the slot in the Pickup Plate with the center of the notch in the points-plate housing.

17. Install the two dimpled brass washers provided in the kit onto the original points-plate retaining screws; the dimples bend one edge of each brass washer over slightly, and should be installed so that the bent-over projection is *away from* the screw head. The dimpled projections make up for the difference between the 1/16" thickness of the Pickup Plate and the 0.075" depth of the points plate recess into which it fits, and should be installed so that they are directly over the Pickup Plate edge. Lightly tighten the screws to retain the plate, but don't bother really locking down the retaining screws yet; you will final-adjust the Pickup Plate position to accurately set the timing in subsequent steps.

18. Seat the flatted grommet in the lead-out hole at the lower right of the points housing. Leave a little play in the wires so that the Pickup Plate can be rotated later to finalize the timing, and be sure that none of the Pickup Plate's wires are in contact with the Trigger Rotor, the retaining bolt and/or washer, or sharp edges of the cast points-plate housing..

19. Route the wires from the Pickup Plate over the cylinder head, similar to the original points leads.

20. Find a place where you'd like to mount the Control Module. It's best not to have it directly exposed to radiated engine heat, and mounting it in a zone with a little airflow when the bike's moving is a good idea. It doesn't take much airflow – don't worry about a big breeze. The self-adhesive Velcro may be used to mount the Control Module, depending on where you'd like it. If you use the Velcro, don't mount the Control Module so that it's "upside-down;" if it hangs from the Velcro so that gravity wants to pull it straight off, gravity (and the vibration) will eventually succeed in doing exactly that. Once the Control Module is mounted with Velcro, it is important to back up the Velcro fastening with a positive retention method; the large zip-ties included in the kit are for that purpose.

21. Look at the 10-pin connector at the end of the wire harness. On the connector's rear surface (where the wires enter), there are molded-in numbers showing each wire's position. Numbers 1 through 5 are in the first row (furthest away from the molded "latch"), and 6 through 10 are in the second row. The wires in each position are as follows (you only have to deal with the five heavy-gauge wires shown in **boldface** type):

♦ **Position 1:**	**Heavy-gauge red wire – goes to switched +12 volts**
♦ Position 2:	Light-gauge red wire – goes to Pickup Plate
♦ Position 3:	Light-gauge black wire – goes to Pickup Plate
♦ Position 4:	Light-gauge black wire – goes to shield braid
♦ **Position 5:**	**Heavy-gauge green wire – goes to chassis ground**
♦ **Position 6:**	**Heavy-gauge yellow wire – goes to left-cylinder coil**
♦ **Position 7:**	**Heavy-gauge green wire – goes to chassis ground**
♦ Position 8:	Light-gauge yellow wire – goes to Pickup Plate
♦ Position 9:	Light-gauge blue wire – goes to Pickup Plate
♦ **Position 10:**	**Heavy-gauge blue wire – goes to right-cylinder coil**

22. **Wire routing** – Route the five heavy wires (in the corrugated plastic split-loom) away from the bundle of light-gauge wires (in the tinned copper braid) that goes to the Pickup Plate. Also, it is important to keep everything away from the high-voltage ignition wires to the spark plugs, especially if you're using the original wire-core, non-suppression sparkplug wires. If you're using non-suppression wires, you must use resistor plug caps (5k ohm, as the Honda original components). If you are using aftermarket coils, spiral-core suppression wire is strongly recommended; good quality resistor-core suppression wire is an acceptable second choice. Either of these may be used without resistor plug caps.

23. The two heavy-gauge green wires (connector positions 5 and 7) go to a good chassis ground. All the usual notes apply regarding the ground being free of paint and being clean, bright metal. These two green wires are several feet long as supplied; it is preferred that they not be over 12" long from the Control Module connector to where the chassis ground is eventually located.

24. The heavy-gauge red wire (connector position 1) goes to a switched source of +12 volts from the battery. You can pick this up from the wire supplying +12 volts to the ignition coils' "+" terminal, or any other convenient source that is can be switched on and off.

25. The heavy-gauge yellow wire (connector position 6) goes to the left-cylinder ignition coil's "-" terminal (for the #1 cylinder, on the "shifter" side of the bike), in place of the wire that formerly went to the left-hand set of points. On an original and stock bike, the left cylinder's ignition coil has a yellow lead coming out of it, and the colors will match. However, it is possible to swap coils from side-to-side (or you may have aftermarket coils that don't match the Honda color code), so no matter what, route the yellow wire from connector position 6 to the left cylinder's ignition coil.

26. The heavy-gauge blue wire (connector position 10) goes to the right-cylinder ignition coil's "-" terminal (for the #2 cylinder, on the "kickstart" side of the bike), in place of the wire that formerly went to the right-hand set of points. On an original and stock bike, the right cylinder's ignition coil has a blue lead coming out of it, and the colors will match. However, it is possible to swap coils from side-to-side (or you may have aftermarket coils that don't match the Honda color code), so no matter what, route the blue wire from connector position 10 to the right cylinder's ignition coil.

27. Plug the connector into the Control Module. It's keyed, so it only goes one way, but it will be obvious – the notch in the finned heat sink of the Control Module is to clear the latch of the connector. Make sure the connector is seated fully – the latch will engage with an audible "click" when it's fully home.

28. Reconnect the battery.

29. Disconnect the spark plug caps and remove the spark plugs. Reinstall the caps onto the plugs, and lay the metal base of the plugs down so they make electrical contact with the cylinder head surface. **Make sure that the spark plugs are well away from the empty spark plug holes in the head, and that the carburetors and cylinders are "dry" (no fuel), so that you will not ignite fuel vapor with the sparks you are about to create at the plug gaps.**

30. Connect a xenon-flash timing light (the bright kind) to the left-hand cylinder's spark plug wire and to the battery (if required; some of us are lucky enough to use the Summit Racing/Flaming River self-powered timing light, and love it).

31. Turn the ignition key to the "on" position, or otherwise energize the ignition with battery power.

32. Using a 14mm socket or box end wrench on the crankshaft's alternator rotor retaining bolt, rotate the engine counterclockwise through a couple of revolutions while keeping an eye on the spark gaps in the two spare plugs. Each plug should spark in turn.

33. Aim the timing light at the alternator rotor, and slowly rotate the engine until the light flashes to determine how close the timing was initially set to the desired full-advance point. If the timing is right where you wanted it, tighten the two Pickup Plate retaining screws now.

34. To alter the full-advance timing point, loosen the two retaining screws and rotate the Pickup Plate clockwise to advance the timing, or counterclockwise to retard the timing. The timing will change about 2º at the crankshaft for each .021" of rotation at the edge of the Pickup Plate. Note: the relative timing of the right- and left-hand cylinders is set by the physical location of their respective Hall-effect sensors on the Pickup Plate, and is fixed at manufacture. The sensors are located exactly 90º apart on the Pickup Plate, which corresponds to the 180º of crankshaft displacement between the two "fire" events.

35. Switch ignition power to the "off" position.

36. Disconnect the spark plugs from the plug caps, reinstall the plugs in the engine, and reinstall the plug caps onto the plugs.

37. Reinstall the seat, any side panels, and the fuel tank; open the petcock, and set the choke or enrichener, as required for a cold start.

38. Put the bike in gear for a bump-start, and get it rolling before switching ignition power on to start the engine.

39. Warm up the engine a little bit, so that it will carburet cleanly.

40. Reconnect the xenon-flash timing light to the left-hand (#1) cylinder's plug wire, and connect the timing light to the battery, if required.

41. With the timing light operating, slowly rev the engine up about 3000 RPM. The timing light should "freeze" the alternator rotor's timing indicator between the two full-advance marks for the #1 cylinder. If small corrections are needed to get the timing spot-on, make them now in the same way that you did while setting the static timing. If you are using a full-advance timing marker different from stock, adjust the Pickup Plate position to obtain the desired timing.

42. Move the timing-light pickup to the right-hand (#2) cylinder's plug wire and check its timing at about 3,000 RPM. The spark timing should be very close to that of the #1 cylinder.

43. When the desired timing has been set and verified, shut off the ignition power, close the petcock, and reinstall the alternator rotor cover and points housing cover.

Other details and notes:

- **IMPORTANT: NEVER TURN ON THE IGNITION AND LEAVE IT ON FOR MORE THAN 1 MINUTE WITHOUT STARTING THE ENGINE! WHEN THE ENGINE IS NOT RUNNING AND THE KEY IS IN THE "ON" POSITION, THE CONTROL MODULE MAY BE OPERATING "FULL-ON," AND CAN OVERHEAT.**

- The Model FS-03 ignition system has two magnets spaced at 180º on the Trigger Rotor; one magnet results in a "fire" command from the right- or left-hand cylinder's Hall-effect sensor pickup, and the other magnet results in a "dwell" command. "Fire" interrupts battery current through the ignition coil's primary windings, and "dwell" resumes current through the coil; this means that each coil's "crankshaft dwell" is 360º, much longer than is provided by points-type ignitions. At 13,000 crankshaft RPM, this equates to a dwell time of just over 4.6 milliseconds, which is adequate to get most of the maximum coil energy to the plug. The benefit of the electronic ignition's longer dwell time compared to points is higher spark energy (able to jump a larger gap at higher cranking pressures); this will be particularly true at higher engine speeds.

- For those who are running high-compression, high-RPM applications and wish to use high-performance aftermarket coils, a coil with a primary resistance down to about 3.0 ohms is permissible.

- Coils intended for capacitive-discharge ignition (CDI) systems are generally less than 1 ohm primary resistance, and are incompatible with the Model FS-03 ignition system. The wrong ignition coils may cause rapid, irreversible damage to the Control Module. Many inexpensive multimeters can't measure accurately down to a few ohms, so be especially careful to know what coil resistance you've really got.

For questions and/or assistance, contact:
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