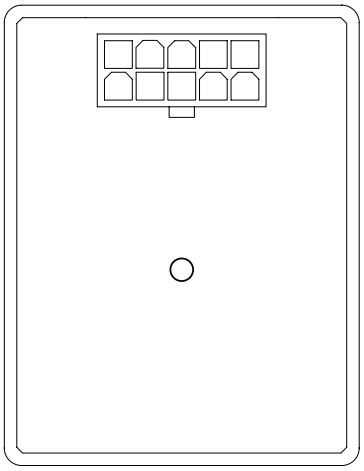
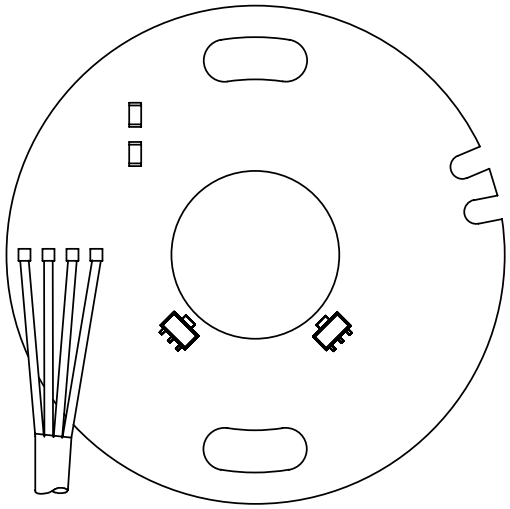
PROBE ENGINEERING, INC.

Installation Instructions

Model FS-01B Electronic Ignition

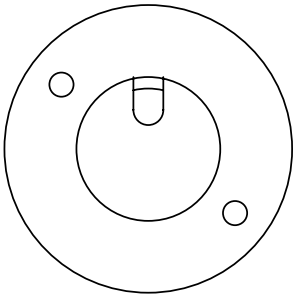


Control Module

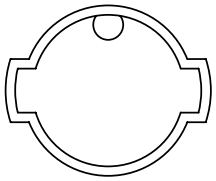


Pickup Plate

Trigger Rotor



Rotor Clamp



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Installation Instructions, Model FS-01B
Version 5.0

The Model FS-01B electronic ignition is designed specifically for 1960s Honda models 250 Hawk (CB72), 305 Superhawk (CB77), 250 Scrambler (CL72), and 305 Scrambler (CL77), all with Type 1 (180º crankshaft) engines. The FS-01B is the successor to the earlier FS-01 and FS-01L systems, and incorporates a built-in static-timing indicator LED. The FS-01B system is fully backward-compatible with the earlier designs.

What should be in the kit:

The Model FS-01B kit includes the following components:

- Control Module
- Pickup Plate (with wire harness and connector)
- Trigger Rotor
- Rotor Clamp (modified Oetiker-brand clamp)
- Self-adhesive Velcro pads (one "hooks," one "loops")
- Tie-wraps (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:

- End-cutting pliers (or the Oetiker clamp installation tool, if you have access to one)
- Wire cutters/strippers
- Solderless crimp-type connectors, bullet connectors, or solder and shrink tubing
- Loctite medium-strength (blue) thread-locking compound or equivalent

Installation:

1. Remove the side panels (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 breaker points and their backing plate as a complete assembly.

8. Disconnect the breaker points from the ignition coils.

9. Remove the condensers (they should not be used with the solid-state ignition).

10. Thoroughly clean and degrease the points cam with solvent. Commercial brake cleaner works well for this – wet a rag or paper towel with solvent and scrub the cam clean, including the end of the shaft.

11. Using the original screws from the points backing plate, install the new Pickup Plate into the recess formerly occupied by the points backing plate. Don't tighten the screws yet.

12. Check to see that the pickup plate can be rotated in the housing with the screws loose. It's a close fit and will sometimes bind if the housing has any damage or is a little small. If the plate won't rotate easily with the screws loose, remove it now and take a couple of easy swipes with a file around its outside edge. Be careful not to slip off the edge and damage the components or leads. If there's obvious damage to the alloy housing, clean it up with a small file or X-acto knife.

13. Center the pickup plate's mounting-screw slots on the screws and snug up finger-tight (you'll have to loosen the screws again later to finalize the ignition timing).

14. Carefully seat the grommet carrying the pickup leads into its recess in the points housing. Leave a little play in the wires so that the pickup plate can be rotated later to finalize the timing.

15. Route the wires from the pickup plate over the cylinder head similar to the original breaker-points leads.

16. 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 module. The large zip ties are included to "back up" the Velcro mount, so that the module can't vibrate loose.

17. 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**

18. **<u>Wire routing</u>** – take care to route the five heavy wires away from the bundle of light-gauge wires that goes to the pickup plate**. It is critically important to keep all of the system wires well away from the high-voltage ignition wires to the spark plugs, which can induce destructive voltages into the system leads.**

19. 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 main-chassis or engine-case metal. The wires are 18" long as supplied, to ensure that they are grounded close to where the control module is located. The wires may be cut shorter if desired, but they should not be extended.

20. 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.

21. The heavy-gauge yellow wire (connector position 6) goes to the left-hand ignition coil (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.

22. The heavy-gauge blue wire (connector position 10) goes to the right-hand ignition coil (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.

23. Plug the connector into the control module. It's keyed, so it only goes one way, but it will be obvious. Make sure the connector is seated fully – the connector's retaining latch will engage with a "click" when it's fully home.

24. Shake the tube of medium-strength (blue) Loctite or equivalent thread-locking compound for a minute to mix it up.

25. Smear a couple of drops of thread-locking compound around the cylindrical part of the points cam (opposite the index mark stamped on the end of cam). Also smear a drop of thread-locking compound directly on the end of the points cam.

26. Slide the Trigger Rotor onto the points cam until it bottoms on the end of the cam.

27. Rotate the trigger rotor until the index mark stamped into the end of the points cam is centered in the "window" in the end of the rotor.

28. Slip the Rotor Clamp over the rotor. The ball attached to the clamp will engage the slot in the rotor – how it goes will be obvious.

29. Carefully grab the "ear" at one end of the rotor clamp with the end-cutting pliers, and clamp down until the ear is deformed about 1/16" or so from its original profile. You've got to use end-cutters for this operation, because their jaws are perfectly parallel at all times as they close – diagonal cutters won't work. Don't pinch the ear off – we're just trying to squeeze it down a little. (The special tool available for crimping Oetiker clamps looks just like end-cutting pliers, but has blunt, not sharpened, jaws. Most folks don't have the special tool lying around. The end-cutting pliers work just the same, and are available at any hardware store.)

30. Grab the ear at the opposite end of the clamp, and deform it the same way you did the first ear in the previous step.

31. Go back to the first ear and squeeze it a little more, then return to the second ear and give it another little squeeze. By now the clamp should be pushing the ball against the low spot of the points cam, forcing the cylindrical portion of the points cam against the ID of the trigger rotor.

32. Check the alignment of the index mark on the end of the points cam to the window in the end of the rotor. If the index mark is not perfectly centered in the window, grasp the rotor and turn it to realign the index mark. The rotor should turn on the points cam, with some effort, until the Loctite sets up. Note that that if you try to reposition the rotor clockwise on the points cam, you will have to overcome the initial turning of the points cam against the advancer springs first.

33. Reconnect the battery.

34. Disconnect the spark plug caps and install a spare set of plugs into the caps. Lay the metal base of the plugs down so they contact the cylinder head surface.

35. Turn the ignition key to the "on" position. **NOTE: The following steps may take you more than a couple of minutes to accomplish, during which time the engine will not be running, but the ignition will be powered, causing the coils and module to heat up more than they normally would. If it takes more than two or three minutes to get to step 40, shut off the power, wait four or five minutes, then turn the power back on and complete the remaining tasks. Never leave the system under power with the engine not running for more than a couple of minutes at a time.**

36. Kick the engine through a couple of revolutions while keeping an eye on the spark gaps in the two spare plugs. Each plug should spark in turn.

37. Using a 14mm socket or box-end wrench on the alternator rotor center bolt, slowly rotate the engine clockwise (in the "forward," running direction) while watching the red LED in the center of the control module. The LED is illuminated during the "dwell" period for the left-hand cylinder, and goes dark exactly as the left-hand plug fires. Rotate the engine through a couple of cycles to get a feel for it; the "dwell" period (coil current flowing; LED lit) occupies 360 degrees of crankshaft rotation, and the "fire" period (coil current interrupted; LED dark) occupies the next 360 degrees of crank rotation.

38. Stop turning the crank just as the LED goes dark (you will also hear the left-cylinder plug spark at the same time, if it's quiet enough, and your ears are sufficiently keen). The spark should occur near the point at which the alternator rotor's "LF" mark lines up with the timing indicator, denoting the nominal idle-timing setting for the left-hand cylinder.

39. The final ignition timing will be set with the engine running and with the auto-advancer at full spark lead (advance), but the LED/idle-timing check will tell you if the timing's close enough to start the engine. If the LED goes dark not very close the LF mark being aligned with the timing indicator, loosen the pickup plate screws and rotate the pickup plate to get the timing closer, and then snug the screws back up. Rotating the plate in the direction of trigger rotor rotation (clockwise) will *retard* the timing; rotating the plate counter-clockwise will *advance* the timing.

40. Turn the ignition key to the "off" position.

41. Disconnect the spare spark plugs and reinstall the plug caps on their respective engine spark plugs.

42. Reinstall the fuel tank, open the petcock, and set the choke as required.

43. Turn the ignition key to the "on" position.

44. Start the engine using the kick starter or the electric starter, as you prefer.

45. Warm up the engine a little bit, so that it will idle when you need it to.

46. Connect a xenon-flash type timing light (the bright kind) to the right-hand (#2) cylinder's plug wire, and connect the timing light to the battery.

47. With the timing light aimed at the alternator rotor's timing marks, rev the engine up to the full-advance RPM level (3,300 RPM or so). If the timing light "freezes" the timing indicator between the two full-advance marks for the #2 cylinder, move the timing-light pickup to the left-hand (#1) cylinder's plug wire and check its timing at full advance. It should be very close to that of the #2 cylinder's full-advance timing position. If the timing is correct, tighten the pickup plate retaining screws.

48. If the timing is not correct, shut off the engine, loosen the screws holding the pickup plate and rotate the plate to correct the timing. For every 0.023" of rotation at the edge of the plate, the ignition timing will change about 2° at the crankshaft. Rotating the plate in the direction of trigger rotor rotation (clockwise) will *retard* the timing; rotating the plate counter-clockwise will *advance* the timing. After you've readjusted the timing, tighten the pickup plate retaining screws.

49. Restart the engine and recheck the timing. Repeat as required. If you run out of adjustment slot length in the pickup plate, grab the trigger rotor and slightly reposition it on the end of the points cam. (That's why we installed the rotor last – so the Loctite won't be set up at this point.) If you ran out of pickup plate slot length while trying to retard the timing, reposition the rotor slightly counterclockwise on the points cam. If you ran out of slot length while trying to advance the timing, reposition the rotor slightly clockwise.

50. Honda CB/CL72/77engines are sensitive to excessive timing advance, and can overheat and possibly seize if the timing is not correctly set – that's why the timing is adjusted to be correct at the full-advance position. Once the full-advance timing is set, the timing at the normal idle speed should fall on or near the "F" mark on the alternator rotor (for the right-hand cylinder; the left-hand cylinder's equivalent mark is "LF," as we used in previous steps). If the idle-speed timing is not correct when the full-advance timing is set properly, the problem is with the centrifugal advance mechanism. This is not an uncommon problem, and the error is usually *too much* advancer action, which results in retarded idle timing (closer to TDC) with the full-advance timing correctly set.

51. When the timing is set and the pickup plate screws tightened, turn off the ignition key, close the petcock, and reinstall the points cover, alternator rotor cover, seat, and all other covers or bodywork.

Other details and notes:

- **IMPORTANT: NEVER TURN ON THE IGNITION AND LEAVE IT ON FOR MORE THAN 2 MINUTES WITHOUT STARTING THE ENGINE! WHEN THE ENGINE IS NOT RUNNING AND THE KEY IS IN THE "ON" POSITION, THE POWER MODULE IS OPERATING "FULL-ON," AND CAN OVERHEAT VERY QUICKLY.**

- The Model FS-01B ignition will work well with stock ignition coils (about 4.5 ohm primary resistance). For those wishing to use higher-performance coils, aftermarket parts with a primary resistance from 5 ohms down to about 3 ohms are permissible. If you use 3-ohm coils, take care to mount the control module where it will receive additional airflow, as the module itself will run warmer with lower-resistance coils.

- Coils intended for capacitive-discharge ignition (CDI) systems are generally less than 1 ohm primary resistance, and are incompatible with the Model FS-01B ignition system. The wrong ignition coils may cause immediate, irreversible damage to the control module. Many inexpensive multimeters can't measure accurately down to a few ohms, so be careful to know what coil resistance you've really got.

For questions and/or assistance, contact:
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