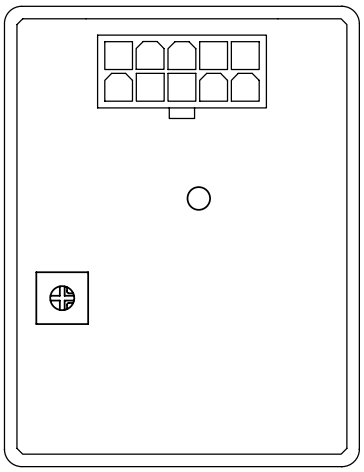
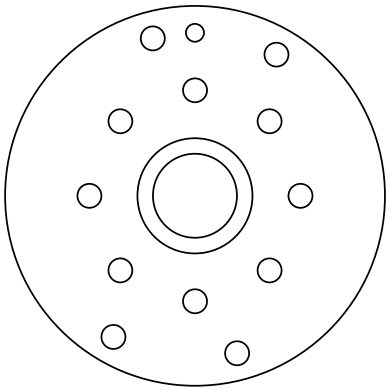
PROBE ENGINEERING, INC.

Installation Instructions

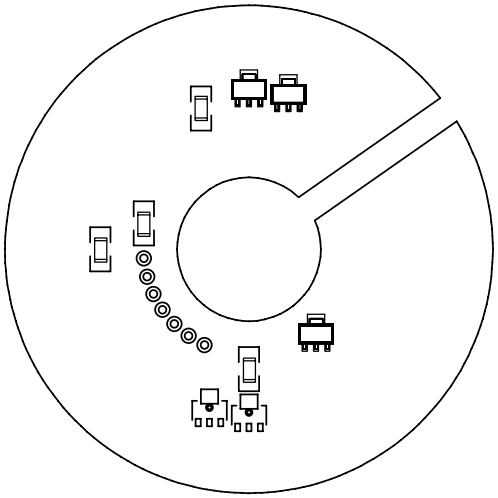
Model FS-10 Electronic Ignition



Control Module



Trigger Rotor



Pickup Plate

PROBE ENGINEERING, INC.

Installation Instructions, Model FS-10
Version 1.01

The Model FS-10 electronic ignition is designed for 1960s through 1970s Honda Models CB160, CL160, CB175, CL175, and SL175, all with derivatives of Honda's early ("sloper") or later ("upright") 360º crankshaft twin-cylinder engine.

The Model FS-10 is a dual-fire ignition system that fires both spark plugs simultaneously once per crankshaft revolution, using a dual-tower ignition coil. The system will work with the OEM coil, but for superior performance, an aftermarket coil between 3 ohms and 5 ohms primary resistance should be used. For competition applications, a 3-ohm coil will give hotter spark at sustained maximum RPM. For street applications, a 5-ohm coil will give good performance, and will make life easier for the charging system.

The system has fully electronic advance/retard, and does not use the OEM mechanical advancer assembly. Once set, the timing remains fixed and stable.

Note: Known good resistor-type spark plug caps MUST be used with the FS-10 ignition system. 30-year-old OEM resistor caps are usually shot; the best insurance is a pair of new NGK resistor plug caps, widely available from parts retailers at about $2.50 each.

What should be in the kit:

The Model FS-10 kit includes the following components:

- Control Module
- Trigger Rotor (with spacer shims for CB160 use pre-installed)
- Pickup Plate (with wire harness and connector)
- Rubber-faced flat washers (2 each, for retaining the Pickup Plate)
- M5 hardened washer, 15mm diameter by 3.5mm thick (for Rotor retaining bolt)
- Self-adhesive Velcro pads (for mounting the Control Module)
- 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
- A drain pan to catch oil from the "wet" area around the alternator rotor

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Installation:

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

2. Remove the seat.

3. Disconnect the battery.

4. Remove the fuel tank.

5. Place a drain pan beneath the alternator rotor cover and remove the cover (the alternator area on these bikes is "wet;" there is no left-side crankshaft seal).

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 wire from the ignition coil.

11. Disconnect and remove the condenser (a condenser is not necessary with the Model FS-10 system).

12. Remove the advancer mechanism from the quill on the end of the camshaft.

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. Rotate the crankshaft so that the 3mm diameter locating dowel at the base (shoulder end) of the quill is at the 12:00 position. If you have any question about the dowel being firmly retained, remove it, degrease the dowel and its bore, and reinstall it with medium-strength (blue) Loctite or equivalent thread-locking compound.

15. **For CB/CL160 engines**: The 160 engines have a camshaft quill that is 10mm diameter, versus the 175 engines' 11mm quill diameter; the two engines' camshafts are otherwise similar. The Trigger Rotor has a bore ID machined to fit over the 175's 11mm quill. So that the same ignition kit can be used for either engine, the Trigger

Rotor is delivered with spacer shims installed at each end of its bore, which reduce the ID to match the smaller quill of the 160 engine. If you're installing the Trigger Rotor onto a 160 cam, carefully slip the Trigger Rotor over the quill, taking care not to disturb the two spacer shims. Align the notch in the Trigger Rotor hub with the 3mm locating dowel at the 12:00 position (there is a 0.094" through-hole in the Trigger Rotor's face that aligns with the notch in the hub, so that you can tell where you are). Seat the Trigger Rotor's hub end firmly against the shoulder at the base of the quill.

16. **For CB/CL/SL175 engines**: The 175 engines have a camshaft quill that is 11mm diameter, versus the 160 engines' 10mm quill diameter; the two engines' camshafts are otherwise similar. The Trigger Rotor has a bore ID machined to fit over the 175's 11mm quill. So that the same ignition kit can be used for either engine, the Trigger Rotor is delivered with spacer shims installed at each end of its bore, which reduce the ID to match the smaller quill of the 160 engine. If you're installing the Trigger Rotor onto a 175 cam, first use a pointed object to tease the two shims out of the bore of the rotor. With the shims removed, slip the Trigger Rotor over the quill, aligning the notch in the Trigger Rotor hub with the 3mm locating dowel at the 12:00 position. (There is a 0.094" through-hole in the Trigger Rotor's face that aligns with the notch in the hub, so that you can tell where you are.) Seat the Trigger Rotor's hub end firmly against the shoulder at the base of the quill.

17. Install the M5 hardened washer from the ignition kit between the hex head of the original advancer retaining bolt and the original flat washer (the OEM flat washer is 17mm diameter, and the new, hardened washer is 15mm diameter). Use these to bolt the Trigger Rotor in place. Apply medium-strength (Loctite "blue" or equivalent) anaerobic thread locker on the retaining bolt threads.

18. Slip the Pickup Plate over the Trigger Rotor (the plate's center hole is large enough to clear the retaining bolt and washers), with the electrical components facing in toward the Trigger Rotor, and the wires facing out toward you. Note that the words "Probe Engineering, Inc." are etched in copper across the top of the Pickup Plate's outward-facing side.

19. Install the two rubber-faced washers provided in the kit onto your original points-plate retaining screws, with the washers' metal faces against the screw heads. The compliant rubber face of the washers provides a way of taking up the small "step" clearance between the thickness of the Pickup Plate and the depth of the recess into which it locates (the original points-plate recess). Loosely thread the screws and washers into the retaining holes in the left cam-box housing. **NOTE: CB175-series engines are threaded for standard M5 by 0.8mm pitch screws in this location, and CB160-series engines are threaded for the non-standard M5 by 1.0mm**

"coarse" pitch screws. If you don't have the original screws, make sure to obtain the correct thread for your application.

20. Align the words "Probe Engineering, Inc." on the Pickup Plate parallel with the plane of the head gasket (horizontally for 175 engines, and angled for 160 "sloper" engines), and lightly tighten the screws to retain the plate.

21. There is a flatted grommet on the Pickup Plate lead wires. Seat the 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 washers, or sharp edges of the housing.

22. Route the wires from the Pickup Plate out over the cylinder head, similar to the original points wires.

23. Find a place to mount the Control Module. It should be mounted in a zone where it will receive airflow when the bike is moving. Self-adhesive Velcro is provided for mounting the Control Module. 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 vibration) will eventually succeed in doing just that. Once the Control Module is mounted, it's good practice to back up the Velcro fastening with a positive retention method; large zip-ties are included in the kit for that purpose.

24. 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." The wires in each position are as follows. You only have to connect the three heavy-gauge wires shown in **boldface** type:

♦ Position 1:	Light-gauge red wire – goes to Pickup Plate
♦ Position 2:	Light-gauge black wire – goes to Pickup Plate
♦ Position 3:	Open position – for optional tach-select connection
♦ Position 4:	Open position – for optional tachometer output
♦ **Position 5:**	**Heavy-gauge red wire – goes to switched +12 volts**
♦ Position 6:	Light-gauge green wire – goes to Pickup Plate
♦ Position 7:	Light-gauge yellow wire – goes to Pickup Plate
♦ Position 8:	Light-gauge orange wire – goes to Pickup Plate
♦ **Position 9:**	**Heavy-gauge green wire – goes to chassis ground**
♦ **Position 10:**	**Heavy-gauge yellow wire – goes to ignition coil**

25. <u>Wire routing</u> – Route the three heavy-gauge power and ground wires away from the light-gauge signal wires (in the tinned copper braid) that go to the Pickup Plate. It is very important to keep the power, ground, and especially the Pickup Plate wires well away from the high-voltage ignition wires that go from the coils to the spark plugs.

26. The heavy-gauge green wire (connector position 9) goes to a good chassis ground. The ground wire is 12" long as supplied, to ensure that it is grounded close to where the Control Module is located.

27. The heavy-gauge red wire (connector position 5) 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 coil's "plus" (+) terminal. Dual-tower coils are generally not marked for (+) and (-) primary terminals (since it does not matter); the OEM wire harness's black wire is usually connected to +12V.

28. The heavy-gauge yellow wire (connector position 10) goes to the ignition coil's negative (-) terminal, which was formerly connected to the points and condenser.

29. Figure 1 shows how the power wiring should look when you're done. The Pickup Plate and its wires are left out of the diagram for clarity – only the wires that the installer is responsible for connecting are shown. If you are unfamiliar with wiring diagrams, wires that cross one another without a "dot," but with a "jog" at their intersection are NOT connected to one another. Wires with a "dot" at their intersection are electrically connected to one another.

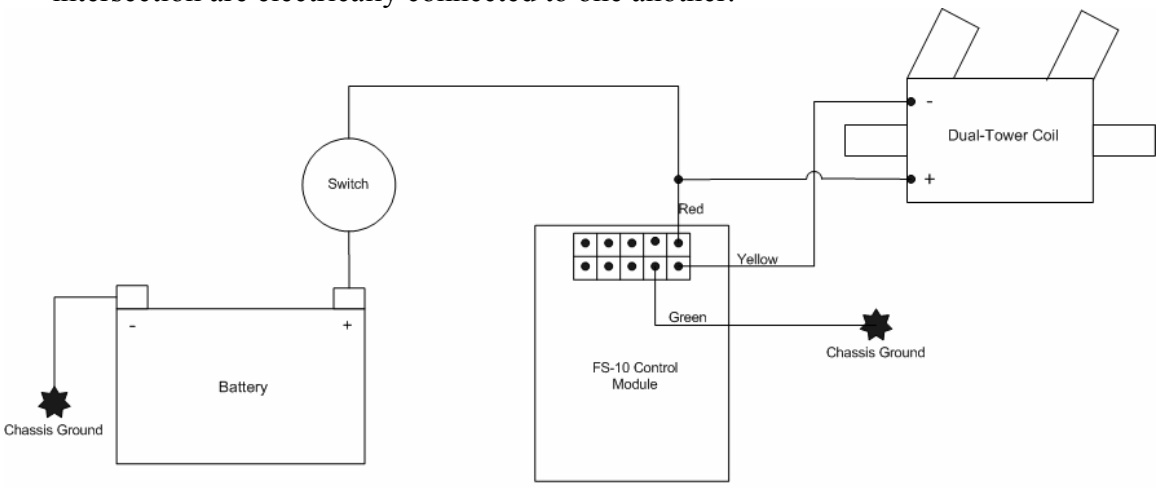

Figure 1

30. After the wiring is complete and you have carefully checked your work, plug the connector into the Control Module. It's keyed, so it only goes one way, which will be obvious. Make sure the connector is seated fully – the retention latch will engage with an audible "click" when it's fully home.

31. Reconnect the battery.

32. Disconnect the spark plug caps and remove the spark plugs. Reinstall the plug 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.**

33. Turn the ignition power switch to the "on" position.

34. Using a socket or box end wrench on the alternator rotor's retaining nut, rotate the crankshaft slowly counterclockwise while watching the timing marks.

35. As you rotate the engine, the red LED on the Control Module will alternately illuminate and go dark. Lighting up signifies that the Hall-effect "run" sensor is in the "dwell" mode; where coil current will be passing through the coil when the bike is running.

36. Exactly when the LED goes dark at the end of the dwell mode is when the spark plugs will fire at the full-advance point. Note that unlike the points-type setup, for which factory-type "static" timing is usually done at the full-retard position, the electronic ignition's timing LED changes state at the full-advance timing.

37. The factory full-advance timing location is marked on the alternator rotor by an engraved line located counterclockwise from the "T" and "F" marks. The timing is correct when the LED goes dark just as the timing pointer aligns to the full-advance mark.

38. If adjustment is required to the Pickup Plate position, loosen the two retaining screws and rotate it to obtain correct full-advance timing. Rotating the Pickup Plate clockwise advances the timing, and rotating it counterclockwise retards the timing. For every 0.022" of movement at the edge of the Pickup Plate, the crankshaft timing will change by 2° of angle.

39. When you've got the full-advance timing set, tighten the two Pickup Plate hold down screws. To make the washers' rubber facing deform enough to make up the small "step" between Pickup Plate and recess, you will have to tighten the screws firmly.

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

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

42. 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.

43. Loosely reinstall the alternator cover; you are about to start and warm up the engine, and this will minimize the oil-fling mess from the "wet" alternator cavity.

44. Start the engine and warm it up a little bit, so that it will carburet cleanly. Stop the engine.

45. Connect a xenon-flash timing light to a plug wire, and connect the timing light to the battery, if required.

46. With the engine stopped, remove the alternator cover again, and restart the engine. Watch out for oil fling.

47. With the timing light operating, rev the engine up to about 3,500 RPM. The timing light should "freeze" the alternator rotor's timing indicator at the full-advance mark. 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.

48. Once the full-advance timing is verified, check the idle-speed timing. Let the engine idle at its recommended idle speed, and shine the timing light on the alternator rotor. The small blue potentiometer on the face of the Control Module can be used to finalize the low-speed timing; turning the potentiometer clockwise increases the timing delay and retards the timing; turning the potentiometer counter-clockwise advances the timing.

49. When the desired timing has been set and verified, shut off the ignition power, close the petcock, reinstall the alternator rotor cover and points housing cover, and top up the oil level.

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Version 1.01

Appendix, tachometer and kill switch options:

As noted in the wiring table on page 5, there are tachometer output and tach-select options available. If you've already completed the basic ignition system installation, you've dealt with the three heavy-gauge wires that came pre-installed in the 10-pin Power Cable Harness connector. The remaining two open positions on the connector housing are associated with the tachometer and tach-select options. They are:

- Position 3: Tach-select control
- Position 4: Tachometer output

Position 4, the tachometer drive output, is for connection to an electronic tach's engine-speed input wire. The tachometer output has two selectable pulse rates.

The **"4-cylinder"** output (the default mode) gives two signal pulses per crank revolution, the same as a 4-cylinder automobile engine. This gives you the option of tapping into the automotive aftermarket for tachometers, most of which have 4/6/8-cylinder setup options.

The **"2-cylinder"** tachometer output gives one signal pulse per crankshaft revolution.

The tach-select control on connector position 3 sets the tachometer output rate. If position 3 is left open (no wire), the tach output of pin 4 is the default 4-cylinder mode. If a wire is installed into connector position 3 and connected to ground, the tachometer output changes to the 2-cylinder mode.

For those who wish to use the electronic tach feature, the FS-10 kit includes two foot-long #18 wires, one white and one black, with crimped-on terminals. They must be installed into the connector housing; the terminals "snap" into place in the housing from the wire-entry end. The simplest way to see how the terminals should be oriented is to use one of the other five wires that are already installed in the connector as a guide. Install the white wire in position 4 (tachometer output), and the black wire (if used) for position 3 (tach-select control).

For questions and/or assistance, contact:
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