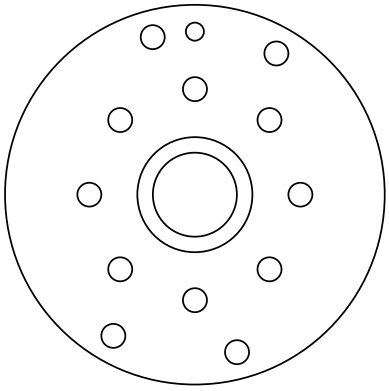
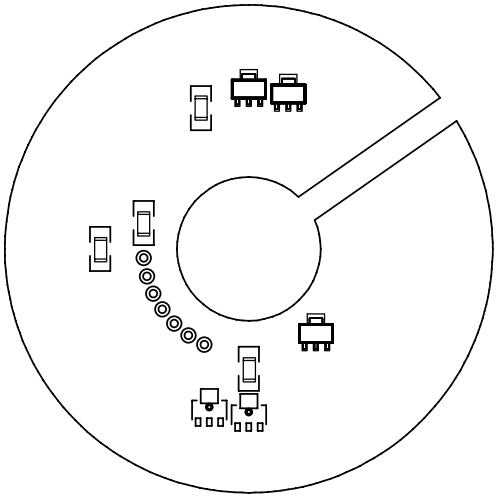
PROBE ENGINEERING, INC.

Installation Instructions

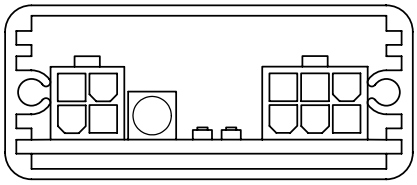
Model FS-10G Ignition System



Trigger Rotor



Pickup Plate



Control Module

PROBE ENGINEERING, INC.

Installation Instructions, Model FS-10G

Version 7.4

The Model FS-10G 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 ("vertical") twin-cylinder engine with a 360º crankshaft. The system has fully electronic advance/retard; it does not use the OEM mechanical advancer assembly.

The Model FS-10G is a dual-fire ignition system that works with a dual-tower coil and fires both spark plugs simultaneously, once per crankshaft revolution. The system will work with the OEM Honda coil, but for superior performance, an aftermarket coil between 3 ohms and 5 ohms primary resistance should be used.

The FS-10G module now features progressive dwell control, which minimizes average coil current consumption with no penalty to spark energy. Reduced average coil current makes lower demands on the bike's charging system, and extends run time if you are using a total-loss battery power source (i.e., as the racers do). As an added benefit, the coil and module run cooler with progressive dwell control.

Important: Known-good resistor-type spark plug caps and/or resistor-type plugs **MUST** be used with the FS10-G ignition system. The 30-year-old OEM resistor caps your bike came with from the factory are usually shot by now; the best insurance is a pair of new NGK resistor plug caps, widely available from parts retailers for a few dollars each.

What should be in the kit:

The Model FS-10G kit includes the following components:

- Control Module
- Trigger Rotor (with spacer shim for CB160 use pre-installed)
- Pickup Plate (with shielded leads and 6-pin connector)
- Power Cable Harness (with 4-pin 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 for mounting the Control Module
- Spare orange wire (12" long, for optional electronic tachometer connection)

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

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.

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 rotor is delivered with a spacer shim installed in its bore, which reduce the ID to match the smaller quill of the 160 engine. If you're installing the rotor onto a 160 cam, carefully slip the rotor over the quill, taking care not to disturb the spacer shim. Align the notch in the rotor's hub with the 3mm locating dowel at the 12:00 position (there is a 0.094" through-hole in the rotor's face that aligns with the notch in the hub, so that you can tell where you are). Seat the 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 rotor is delivered with a spacer shim installed in its bore, which reduce the ID to match the smaller quill of the 160 engine. If you're installing the rotor onto a 175 cam, first use a pointed object to tease the shim out of the rotor bore. With the shim removed, slip the rotor over the quill, aligning the notch in the hub with the 3mm locating dowel at the 12:00 position. (There is a 0.094" through-hole in the rotor's face that aligns with the notch in the hub, so that you can tell where you are.) Seat the hub 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 rotor and the wires facing out toward you. Note that the words "Probe Engineering, Inc." are etched in copper across the top of the 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

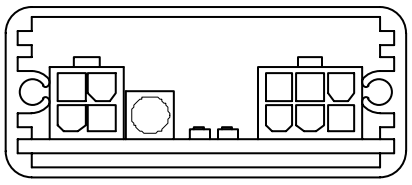
compliant rubber face of the washers provides a way of taking up the small "step" clearance between the thickness of the pickup plate and the depth of the recess into which it locates (the original points-plate recess). Loosely thread the screws and washers into the retaining holes in the left cam-box housing. **NOTE: CB175-series "vertical" engines are threaded for standard M5 by 0.8mm pitch screws in this location, and CB160-series "sloper" engines are threaded for 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 "vertical" engines, and angled for "sloper" engines), and lightly tighten the screws to retain the plate.

21. There is a flatted grommet on the pickup plate's 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 plate can be rotated later to finalize the timing, and be sure that none of the 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 how the original points wires were routed.

23. Locate the Control Module in the kit. It looks like this:



24. There is a 4-pin connector at the left side of the module and a 6-pin connector at the right side; between the connectors are a red LED and a pair of micro pushbuttons.

25. Find a place where you'd like to mount the control module. The module's micro pushbuttons can be used to make small trim adjustments to the idle-speed spark timing, which is independent of the full-advance timing. The idle-speed timing is preset for your bike at the factory, and will usually not require adjustment unless you elect to run significantly more or less full-advance timing than Honda's original specifications. If the pushbuttons are accessible when the module is in place, it will make this adjustment easier.

26. The control module is delivered with Velcro fastening material. The "loop" side is attached to the module; the "hook" side has an aggressive "peel-and-stick" adhesive, for attaching to a clean, flat surface on the bike. The module dissipates low power,

and will get warm to the touch during operation. It does not require aggressive airflow, but should not be mounted in a sealed volume with no airflow at all. Don't mount the 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.

27. Route the pickup plate assembly's wire bundle to the location of the control module. The pickup plate wires are insulated using high-temperature Teflon, and have a tinned-copper braided shield surrounding them; the wires can be routed pretty much anywhere (except to an exhaust pipe!) without major temperature concerns. **However, the pickup wires must be kept well away from the spark-plug leads, so that the electronics won't get confused or damaged by spark-energy "pickup" from the high-voltage coil leads.**

28. The pickup assembly's wire bundle has a 6-pin plug that matches the module's 6-pin connector housing. Plug them together; they are keyed, so that they only fit one way. The retaining latch that will "click" when the connectors are fully mated.

29. There is a 4-pin connector on the Power Cable Harness. On the connector's rear surface (where the wires enter), molded-in numbers show each wire's position, 1 through 4. The wires in each position are as follows. For the basic installation, you only have to deal with the three wires shown in boldface type:

♦ **Position 1:**	**Heavy-gauge red wire – goes to switched +12 volts**
♦ **Position 2:**	**Heavy-gauge green wire – goes to chassis ground**
♦ **Position 3:**	**Heavy-gauge yellow wire – goes to ignition coil**
♦ Position 4:	Open (reserved for electronic tachometer option)

30. The red wire (connector position 1) goes to a switched source of +12 volts from the battery. Your bike's wire harness will have a switched source of +12V that brings battery voltage to one of the ignition coil's primary terminals; you can connect the red module wire to that terminal, as well.

31. The green wire (connector position 2) goes to a good chassis ground. A "good ground" in this case means two things; it must have low-resistance path to the metal of the main chassis, and it must have a low-resistance path to the battery's negative (-) terminal. The ground wire is 12" long as supplied. If you want to make it shorter, you may, but it should not be extended.

32. The yellow wire (connector position 3) goes to the coil's primary terminal that is OPPOSITE the primary terminal connected to +12 volts.

33. Figure 1 is a diagram of 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 have a "dot" at their intersection are electrically connected to one another.

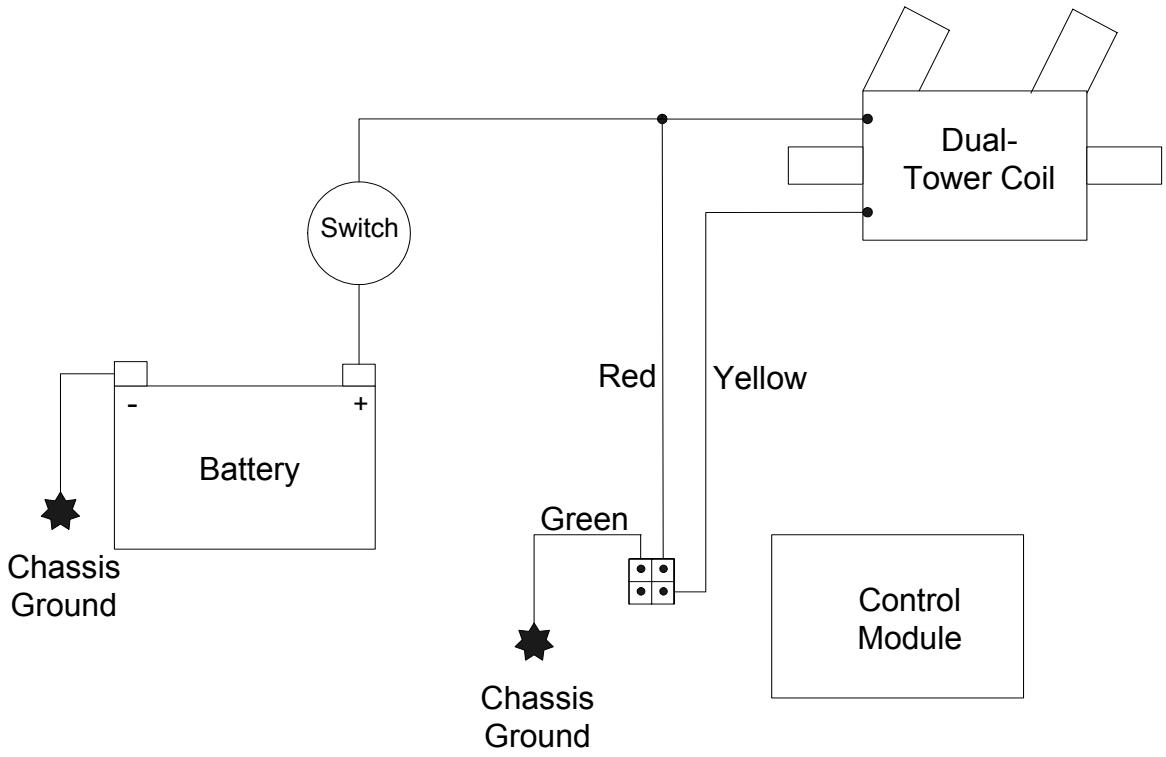


Figure 1

34. Plug the 4-pin connector into the control module's matching connector. It's keyed, so it only goes one way, and it will be obvious. Make sure the connector is completely seated– the latch will engage with a "click" when the connector is fully home.

35. Take a deep breath, clear your head, and double-check your wiring.

36. Reconnect the battery.

37. 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.

38. Turn the ignition power on.

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

40. As you rotate the engine, the red LED on the control module will alternately illuminate and go dark, once per crankshaft revolution.

41. 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 OEM 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 point.

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

43. Full-advance timing is adjusted by rotating the pickup plate. If adjustment is required, loosen the two retaining screws and rotate the plate to obtain correct full-advance timing. Rotating the 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 timing will change by 2° of angle at the crankshaft.

44. 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 plate and recess, you will have to tighten the screws firmly.

45. Turn off the ignition power.

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

47. 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.

48. 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.

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

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

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

52. 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.

53. Once the full-advance timing is verified, check the idle-speed timing. Let the engine idle at between 1,100 RPM and 1,200 RPM, and shine the timing light on the alternator rotor. The idle timing is correct when the timing light "freezes" the timing indicator mark on the alternator rotor at the "F" marks. If you wish to adjust the idle-speed timing, follow this procedure:

    a. The two micro pushbuttons have round, black actuators about 1/16th inch diameter that project from their tops by about one millimeter. The actuators are the "tactile" type; they make a little click when they are depressed. The left pushbutton has a minus sign (-) in front of it, and retards the idle-speed timing; the right one has a plus (+) sign, and advances the timing.
    b. The engine must be running to adjust the idle-speed timing; the adjustment buttons are disabled when the engine is stopped, whether or not the ignition is powered.
    c. Begin adjustment process by depressing both pushbuttons at the same time. When you have done this, the red LED, which will have been flashing on and off at each engine revolution, will go dark and stay dark. When the LED stops flashing, you have entered the adjustment mode.
    d. Now that you are in adjustment mode, advance or retard the idle-speed timing by pressing and releasing the appropriate micro pushbutton ("+" to advance, "-" to retard). Each press-release cycle will change the idle-speed timing by slightly more than one-half degree of timing angle at the crankshaft (i.e., a timing change of 2 degrees would require 3 or 4 depressions of a pushbutton). If you hold a button down continuously, the timing will not "scroll" through multiple changes; you must press and release the button for each increment of timing change.
    e. When the idle-speed timing adjustment is completed, turn off the ignition, then turn it back on and restart the engine; you will see that the red static-timing LED is flashing once again. This signifies that the adjuster buttons are back in "safe" mode, which prevents the timing from being altered until both

buttons are depressed together to enable the adjuster. The module "remembers" the new idle-speed timing setting, per your recent adjustment.

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

Appendix; electronic tachometer option

The open position of the power cable harness connector, number 4, carries a digital tachometer output signal providing one signal pulse per crankshaft revolution and swinging from 12V to zero volts as a 50% duty-cycle square wave.

The FS-10G kit includes a 12" long orange wire with the correct crimped-on terminal that can be inserted into the number 4 connector housing position from the back (where the molded-in numbers are). The terminal "snaps" into place and is then permanently retained. Use one of the wires already installed in the connector housing as a guide to how the terminal must be oriented for insertion.

A typical aftermarket electronic tachometer will have three basic connections (color codes vary by manufacturer, so check your tachometer's data sheet for guidance):

- +12V (powers the tachometer)
- Ground (returns the tachometer power to the battery)
- Signal Input (this connects to the module's orange wire)

Other details and notes:

- To prevent overheating the ignition coil and/or module, the FS-10G system has an auto-shutoff feature that interrupts the coil current if the engine is not started within 32 seconds of the key switch being turned on (or if the engine is stalled). Once "timed out," the module will automatically resume normal operation when crank rotation is detected; you do not have to "re-boot" the ignition power to start the bike.

- Recheck ignition timing after each periodic cam chain adjustment; since the ignition rotor is driven from the end of the cam, a stretched cam chain will retard the ignition.

For questions and/or assistance, contact:
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