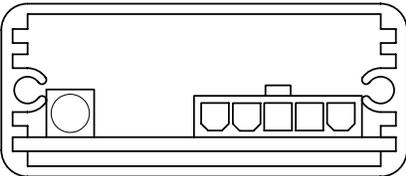


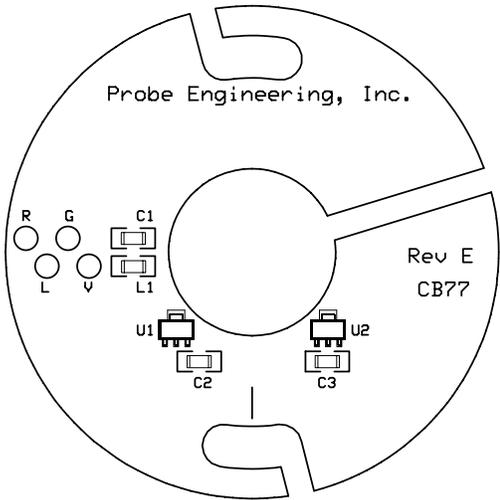
# ***PROBE ENGINEERING, INC.***

## **Installation Instructions**

### **Model FS-01E Ignition System**

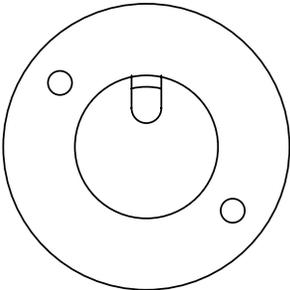


**Control Module**

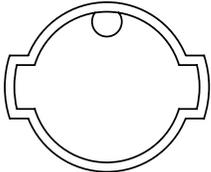


**Pickup Plate**

**Trigger Rotor**



**Rotor Clamp**



# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E Version 7.1**

The Model FS-01E 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 (180° crankshaft) engines.

Note: Known good resistor-type spark plug caps or resistor-type plugs MUST be used with the FS-01E ignition system. 40-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 for a few dollars each.

### **What should be in the kit:**

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

- ◆ Control Module
- ◆ Pickup Plate Assembly (with shielded leads and five-pin connector)
- ◆ Trigger Rotor
- ◆ Rotor Clamp (modified Oetiker-brand clamp)
- ◆ Power Cable Harness (with 4-pin connector)
- ◆ Self-adhesive Velcro pads (for mounting the module)

### **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

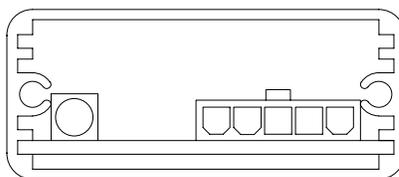
### **Installation:**

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).

# ***PROBE ENGINEERING, INC.***

## **Installation Instructions, Model FS-01E Version 7.1**

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. Center the pickup plate's mounting-screw slots on the screws (there is a white silk-screened line dead center just above the lower screw slot). Snug up the screws finger-tight; you'll have to loosen the screws again later to finalize the ignition timing.
13. 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.
14. Route the wires from the pickup plate over the cylinder head similar to the original breaker-points leads.
15. Locate the Control Module in the kit. It looks like this:



# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E**

### **Version 7.1**

16. There is a 5-pin connector at the right side of the module (into which the pickup plate lead-wires plug) and a red LED at the left side. There is also a 4-pin connector (not shown in the line drawing) at the end of a short wire bundle coming out the module; this connects to the Power Cable Harness.
17. Find a place where you'd like to mount the 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 provided in the kit may be used to mount the control module. 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.
18. Route the pickup plate assembly's shielded lead wires 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 ignition coils and spark-plug leads, so that the electronics won't get confused or damaged by spark-energy "pickup" from the high-voltage coil leads.**
19. The pickup assembly's wire bundle has a plug that matches the module's 5-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.

**The next series of steps tells you how to connect the Power Cable Harness to your bike's electrical system and to the ignition coils. The last step in the sequence, #26, instructs you to plug the 4-pin harness connector into the matching module connector. Do not plug them together until the wiring steps (beginning at #20, below) have been completed and double-checked.**

20. 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:

◆ 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 left-cylinder ignition coil
◆ Position 4:	Heavy-gauge blue wire – goes to right-cylinder ignition coil

# ***PROBE ENGINEERING, INC.***

## **Installation Instructions, Model FS-01E Version 7.1**

21. The power cable harness' heavy-gauge green wire (connector position 2) must go to a good chassis ground. A "good ground" means three things; it must have a low-resistance path to the battery's negative (-) terminal, it must have low-resistance path to the metal of the main chassis, and it must have a low-resistance path to the cylinder-head. If these three things are not well-connected together electrically, you will have problems. The ground wire is 12" long as supplied. If you want to make it shorter, you may, but it should not be extended. The chassis ground must be free of paint and be clean, bright metal.
22. The 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 coil's primary terminal.
23. The yellow wire (connector position 3) goes to the negative (-) primary terminal of the left cylinder's ignition coil; the positive (+) primary terminal of the coil should be connected to +12 volts.
24. The blue wire (connector position 4) goes to the negative (-) primary terminal of the right cylinder's ignition coil; the positive (+) primary terminal of the coil should be connected to +12 volts.
25. 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 have a "dot" at their intersection are electrically connected to one another, while a "jog" signifies that they are not connected.

# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E Version 7.1**

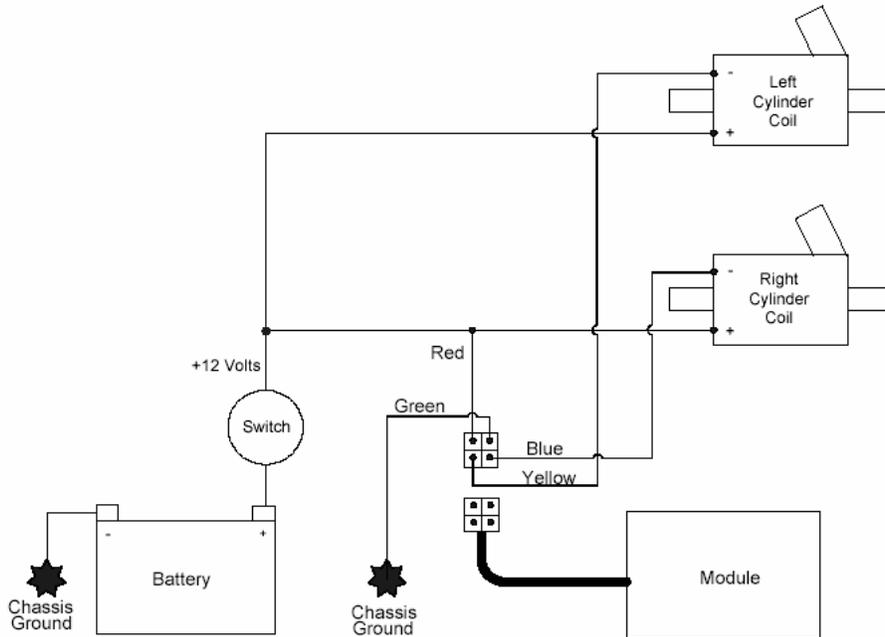


Figure 1

26. Plug the power harness 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.
27. Shake the tube of medium-strength (blue) Loctite or equivalent thread-locking compound for a minute to mix it up.
28. 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.
29. Slide the Trigger Rotor onto the points cam until it bottoms on the end of the cam.
30. 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.
31. 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.

# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E**

### **Version 7.1**

32. 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.)
33. 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.
34. 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.
35. 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 still centered in the window, grasp the rotor and turn it to realign the index mark. The rotor should turn on the points cam, with a little 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.
36. Reconnect the battery.
37. 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.
38. 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 four or five minutes to get to step 43, shut off the power, wait 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 five minutes at a time.**
39. 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.
40. 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

# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E**

### **Version 7.1**

module's red LED. 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 (when coil current flows and the LED is lit) occupies 360 degrees of crankshaft rotation, and the "fire" period (coil current interrupted; LED dark) occupies the next 360 degrees of crank rotation.

41. 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 LED should go dark near the point at which the alternator rotor's "LF" mark lines up with the timing indicator; this is the nominal idle-speed timing setting for the left-hand cylinder.
42. 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 does *not* go dark close to where the LF mark aligns with the indicator, loosen the pickup plate screws and rotate the pickup plate to get the timing correct, 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.
43. Turn the ignition key to the "off" position.
44. Disconnect the spare spark plugs and reinstall the plug caps on their respective engine spark plugs.
45. Reinstall the fuel tank, open the petcock, and set the choke as required.
46. Turn the ignition key to the "on" position.
47. Start the engine using the kick starter or the electric starter.
48. Warm up the engine a little bit, so that it will idle when you need it to.
49. Connect a xenon-flash type timing light (the bright kind) to the right-hand cylinder's plug wire, and connect the timing light to the battery.
50. 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 right cylinder, move the timing-light pickup to the left cylinder's plug wire and check its timing at full advance. If the timing is correct, tighten the pickup plate retaining screws.

# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E**

### **Version 7.1**

51. If the timing is not correct, shut off the engine, loosen the screws holding the pickup plate and rotate the plate to adjust 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.
52. 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.
53. Honda CB/CL72/77 engines 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.
54. 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.

# **PROBE ENGINEERING, INC.**

## **Installation Instructions, Model FS-01E Version 7.1**

### **Other details and notes:**

- ◆ **IMPORTANT: NEVER TURN ON THE IGNITION AND LEAVE IT ON FOR MORE THAN 5 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-01E ignition will work with stock ignition coils (about 4.5 ohm primary resistance), but OEM Honda coils from the sixties were not very good, and are usually in terrible shape now, forty years on. For those wishing to use high-quality aftermarket coils, parts with a primary resistance from 5 ohms down to about 3 ohms are permissible; we recommend the Dyna DC10-1 (5 ohms) or DC3-1 (3 ohms) coils, which are sold in pairs. Lower resistance equals higher current and more heat, and we recommend the 3-ohm coils only for racing applications; 5-ohm coils are excellent for street use.
  
- ◆ Coils intended for capacitive-discharge ignition (CDI) systems are generally less than 1 ohm primary resistance, and are incompatible with the Model FS-01E 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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