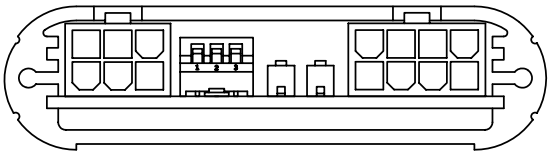
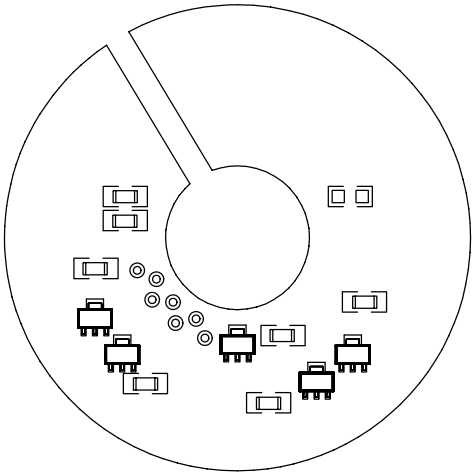
PROBE ENGINEERING, INC.

Installation Instructions

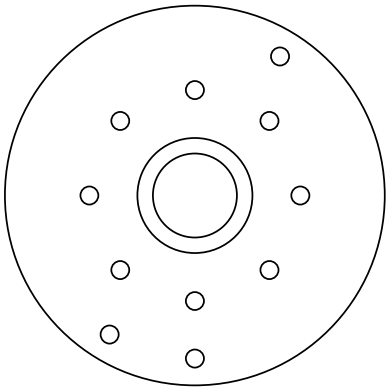
Model PR-360EL Ignition System



Control Module



Pickup Plate



Trigger Rotor

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Installation Instructions, Model PR-360EL

Version 2.0

The Model PR-360EL electronic ignition is designed specifically for 1970s Honda Models CB360, CL360, and CJ360, all with derivatives of Honda's 180º crankshaft twin-cylinder engine.

The PR-360EL ignition system is a single-fire design, using a pair of single-tower coils and firing each cylinder once per 720º of crankshaft rotation (no "wasted spark").

The system incorporates a user-adjustable rev-limiter circuit. When the rev limit is reached, each cylinder fires on every-other power stroke, cutting power in half and preventing engine over-speeding without accumulating unburned fuel in the cylinders.

Table of Contents

What should be in the kit:

The Model PR-360EL kit includes the following components:

- Control Module
- Pickup Plate (with wire harness and connector)
- Trigger Rotor
- Power Cable Harness
- Pair of NGK LB05F resistor spark plug caps (**use of resistor caps is required**)
- Rubber-faced flat washers (2 each, for retaining the Pickup Plate)
- 9V battery connector
- Spare white and orange wires (1-foot long each, for optional features)

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:

- 9V snap-connect type battery (for setting the static timing)
- 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 (you will need access to the ignition coils).

5. Place a drain pan beneath the alternator rotor cover and remove the cover (the alternator area on these engines is "wet;" there is no left-side crankshaft seal). HINT: when setting the initial "static" ignition timing during the installation steps that follow, if you lean the bike to its right side against a sturdy and stable surface, you will not lose significant oil with the alternator cover removed – but *be careful and make sure the bike is stably propped* if you use this trick.

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 (small-diameter extension shaft) on the end of the camshaft.

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

14. Slip the Trigger Rotor over the quill, and align the notch in the rotor hub with the 3mm locating dowel on the camshaft end.

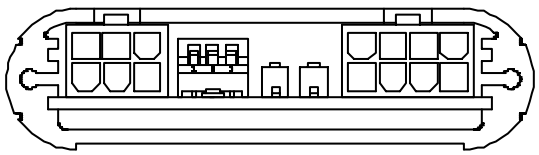
15. Using medium-strength (Loctite "blue" or equivalent) anaerobic thread locker and the original retaining bolt and washer from the centrifugal advancer, bolt the trigger rotor in place.

16. Slip the Pickup Plate over the trigger rotor, with the electrical components facing in toward the rotor and the wires facing out toward you. Align the slot in the pickup plate with the center of the notch in the points-plate housing.

17. 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 reinstall the screws to retain the plate, but don't tightening anything up yet.

18. Seat the pickup plate leads' flatted grommet into 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 washer, or the sharp edges of the points-plate housing. Don't bother routing the pickup plate lead wires out across the cylinder head yet; you're about to set the static timing, and will temporarily want the connector at the end of the leads dangling down near the alternator rotor.

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



20. There is a 6-pin connector near the left side of the module and an 8-pin connector toward the right side; between the two are a three-position DIP switch and a pair of micro pushbuttons. There is also a small, flat red LED directly in front of the DIP switch (the LED lens is a milky-white color until the LED is illuminated; then it is bright red). For the next steps, statically timing the system, temporarily suspend the module somewhere near the alternator assembly, so that you can see both the alternator's ignition timing marks and the module's red LED in your field of view at the same time.

21. The sensor assembly's wire bundle has an 8-pin plug that matches the module's 8-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.

22. Locate the 9V battery connector harness in the kit (it has a 9V battery "snap" connector on one end, and a 6-pin plug that matches the corresponding module connector on the other end). Don't plug it into the module connector yet.

23. Snap a fresh 9V battery onto the matching terminals of the connector harness. Do this first, before plugging the harness into the module, so that if you get the battery terminals backward at first, you will not damage the module.

24. Plug the 9V battery and harness into the module's 6-pin connector.

25. Using a 14mm socket or box end wrench on the alternator rotor's retaining nut, rotate the crankshaft slowly counterclockwise while watching the timing marks and the module's LED. You may prefer to remove the spark plugs at this point, so that you're not trying to spin the engine over against compression.

26. As you rotate the engine, the module's LED will alternately illuminate and go dark. The illumination signifies the left-hand coil's "dwell" time, when battery current will be flowing through its primary winding (when the installation is complete). The LED going dark occurs when the coil current is interrupted, which is the left-cylinder "fire" event.

27. Exactly as the LED goes dark at the end of the dwell mode is the point at which the spark plug for the left cylinder will fire at the full-advance point. We want to see the LED go dark *JUST AS* the alternator rotor's full-advance timing marks align with the static pointer. **Yes, this is different from the way we're all used to setting "static timing" on a set of points, in that we're using the full-advance mark, not the idle-timing (retarded) mark, but it is correct for this system.**

28. The left-cylinder's full-advance timing location is marked on the alternator rotor by a pair of inscribed parallel lines located counterclockwise from the "LT" and "LF" marks. When the pickup plate position is correct, the LED will just go dark as the fixed timing pointer aligns with or between the two full-advance lines.

29. If correction is needed in the pickup plate position to get the timing spot-on, loosen the two retaining screws and adjust the plate's position. Rotating the pickup plate clockwise will advance the timing, and rotating it counterclockwise will retard the timing, just as with the original breaker-points setup. The timing will change by two degrees at the crankshaft for every 0.021" of movement at the edge of the pickup plate.

30. When you've got the full-advance timing correctly set, tighten the two pickup plate hold-down screws.

31. Disconnect the pickup plate wire harness and the 9V battery harness from the control module.

32. Find a place where you'd like to mount the control module. **NOTE: the module should not be mounted close to either coil; the coils typically have large stray magnetic fields that will interfere with correct operation of the logic electronics.** The module's two micro pushbuttons can be used to make small trim adjustments to the idle-speed spark advance, which is independent of the full-advance timing. The idle-speed timing comes preset for your bike, 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 any adjustment easier.

33. 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 modest 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.

34. 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. *NOTE: the pickup assembly wires must be kept well away from the coil bodies and the spark-plug leads, so that the electronics won't get confused or damaged by magnetic or spark-energy "pickup" from the high-voltage coil leads.*

35. Examine the 6-pin connector at the end of the Power Cable Harness. On the connector's rear surface, where the wires enter, there are (hard-to-see) molded-in numbers showing each wire's position. Numbers 1 through 3 are in the first row (furthest away from the molded-in retaining latch), and numbers 4 through 6 are in the second row. The wires in each position are described in the following table. For the basic system installation, you only have to deal with the four 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 left-cylinder coil**
♦ Position 4:	**Heavy-gauge blue wire – goes to right-cylinder coil**
♦ Position 5:	Open (reserved for kill-switch option)
♦ Position 6:	Open (reserved for electronic tachometer option)

36. **Important notes**:

- When routing wires, keep the power cable harness wires separated from the pickup plate wires.
- It is important to keep *all* ignition system wires, both pickup and power cable harness, spaced well away from the ignition coils and the high-voltage spark plug leads. Running system wiring alongside the HT plug leads is an invitation to damage from spark-energy coupling by induction.
- New NGK resistor-type spark plug caps are included in the kit, and their use is mandatory.

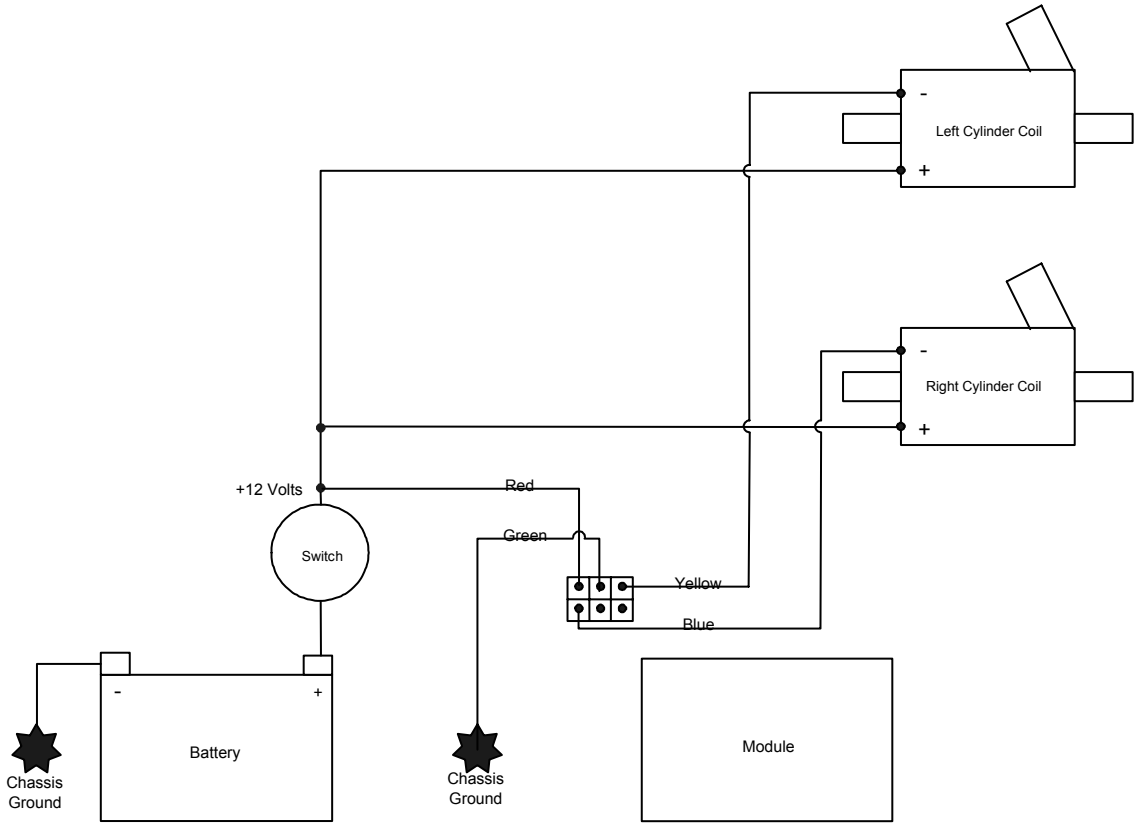
37. The power cable harness' heavy-gauge red wire (connector position 1) goes to a switched source of +12 volts. You can pick this up from the wire supplying +12 volts to the ignition coils. On the stock CB/CL/CJ360 series, this wire is black with a white stripe. For a free online view of the Honda CB360's wiring diagram, try the following website: **http://oldmanhonda.com/MC/WiringDiagrams/MCwiring.php**

38. The power cable harness' heavy-gauge green wire (connector position 2) goes 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.

39. The heavy-gauge yellow wire (connector position 3) goes to the negative (-) terminal of the ignition coil for the left cylinder.

40. The heavy-gauge blue wire (connector position 4) goes to the negative (-) terminal of the ignition coil for the right cylinder.

41. The following schematic wiring diagram shows how the system connections should be made. For those not familiar with such diagrams, a "dot" where wires meet signifies that they are connected together electrically, while a "jog" signifies that they are not connected.



Wiring Diagram

42. Once you've got the pickup plate wire harness and the power cable harness wiring and routing complete, plug the pickup plate and power cable harness connectors into the control module's mating connectors.

43. If you are reusing your existing coils, disconnect your old spark plug caps from the HT leads and replace them with the NGK resistor plug caps included in the kit; the

new plug caps "screw in" to the wire's core. If you are installing new coils, you may use stranded copper-core plug wire or suppression-type wire with the NGK plug caps. Remove your spark plugs and unscrew the coke-bottle-shaped nut at the end of the plugs, if so equipped; the new plug caps mount to the threaded stud, not the nut. Push the caps onto the threaded studs, and lay the metal bases of the plugs down so they contact 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.**

44. Take a deep breath, clear your head, and double-check your wiring. When you are done checking, reconnect the battery.

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

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

47. If both plugs are sparking, switch off the ignition power.

48. Disconnect the spark plugs from the caps, reinstall the plugs in the engine, and reconnect the caps to the plugs.

49. 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.

50. 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.

51. Start the bike. The kick or electric starter may be used (or bump start, if you've built a racer).

52. Warm up the engine, so that it will carburet cleanly.

53. Connect a xenon-flash timing light to the left-hand cylinder's spark plug wire and to the battery (if required; some timing lights have internal batteries).

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

55. With the timing light operating, slowly rev the engine up about 3,500 RPM. You'll see the timing advance from somewhere around the "LF" mark (at low speeds) to the

full-advance marks; as you approach 3,000 RPM, you'll see the last degree of two of spark lead come in, and thereafter, there will be no further advance. Since calibration between tachometers is always in question, we'll measure the full-advance timing at about 3,500 RPM. At 3,500 RPM, the timing light should "freeze" the alternator rotor's timing indicator between the two full-advance marks, just as you set it using the red LED and the 9V battery during initial setup. 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.

56. 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. You will see the rotor's nominal "LF" idle-speed timing mark "frozen" somewhere near the fixed reference mark. If you wish to adjust the idle-speed timing, follow this procedure:

    a. The module's two micro pushbuttons have small black plastic actuators that project from their tops by about one millimeter. The actuators are pressed "down" (toward the green printed-circuit board beneath them) to make momentary contact; the switches are of the "tactile feedback" type, which make a little click when the buttons are depressed. The left pushbutton has a minus sign (-) printed on the PC board in front of it, and the right pushbutton has a plus (+) sign. The sign indicates the effect each button has on the idle-speed spark-timing adjustment; the (-) button retards the timing, while the (+) button 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. With the engine idling, begin the adjustment process by flipping all three white toggles of the module's red DIP switch to the "up" position. When you have done this, and provided that engine speed is above 480 RPM, the red LED, which will have been flashing on and off at one-half crank speed, will go dark and stay dark. When the LED stops flashing, you have entered the adjustment mode, and the two micro pushbuttons are "active."
    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 or (-) to retard. Each press-release cycle of a button (i.e., a single "click") will change the idle-speed timing by just over one-half degree of spark-timing angle at the crankshaft (i.e., very fine adjustment steps). You must press and release the button for each increment of timing change; the timing adjustment will not "scroll" through multiple changes if the button is held down continuously.

e. When the idle-speed timing adjustment is set to your satisfaction, flip all three toggles back to their "down" position; you will see that the red static-timing LED begins flashing again. This signifies that the adjuster buttons are back in "safe" mode, which prevents the timing from being altered any further. The module "remembers" the last idle-speed timing setting, even after the power is turned off; the adjustment value is stored in non-volatile memory.

57. Move the timing-light pickup to the right-hand cylinder's plug wire and check its timing at 3,500 RPM. The relative spark timing should be very close to that of the left-hand cylinder. Small differences can be "split" by repositioning the pickup plate a little, if desired. Generally, the left-right timing will be as identical as printed-circuit board tolerances and Hall-effect device matching will allow.

58. 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.

Appendix 1; setting the rev limiter

The three toggles of the module's DIP switch allow the user to set the rev limiter to one of eight combinational settings. In ascending order, these are:

Rev Limit	Switch 1	Switch 2	Switch 3
RPM	Position	Position	Position
9,250	Down	Down	Down
9,500	Down	Down	Up
9,750	Down	Up	Down
10,000	Down	Up	Up
10,250	Up	Down	Down
10,500	Up	Down	Up
10,750	Up	Up	Down
None (limiter off)	Up	Up	Up

The as-delivered DIP switch setting is with all three toggles in the "down" position, with the rev limit set to 9,250 RPM (factory redline). The toggles are numbered from one to three (from left to right); the numbers are visible on the switch housing.

When the engine reaches the set rev limit, each cylinder fires on every other power stroke (that is, every four crankshaft rotations, instead of every two crankshaft rotations, as is normal for a four-stroke engine). The resulting "stutter" sound and feel will alert the

rider that the rev limit has been reached, at the same time cutting engine power by half to prevent over-revving. As soon as engine speed is reduced below the limit, normal ignition firing resumes.

Setting all three toggles to the "up" position disables the rev limiter and allows unrestricted engine RPM. **NOTE:** this is also the setting that enables the idle-speed timing adjustment pushbuttons and disables the LED (for all engine speeds above 480 RPM), so **it is recommended that you normally leave the rev limiter set to one of the seven available speed-limit settings, not in the "limiter off" position. If you feel it is necessary to permanently defeat the rev limiter, be aware that the idle-speed adjustment pushbuttons will be in their "active" mode, and that depressing them, whether intentionally of otherwise, will alter your idle-speed spark-timing setting.**

Appendix 2; kill switch and tachometer options

As noted in the wiring table earlier in this document, there are tachometer and kill switch options available. If you've completed the basic ignition system installation, you've already dealt with the four heavy-gauge wires that came pre-installed in the 6-pin power cable harness connector. The two remaining connector positions are associated with the tachometer and kill switch options. Their numbers are:

- Position 5: Kill switch
- Position 6: Tachometer output

The PR-360EL installation kit includes one white and one orange wire that can be inserted into the 6-pin connector housing to make the kill switch and tachometer connections.

The terminals are preinstalled onto the ends of the wires; these may be inserted into the connector housing from the back (where the molded-in numbers are, and where the existing red, green, yellow, and blue wires are sticking out). The terminals "snap" into place and are then permanently retained; you can feel and hear them "click" when they go all the way home. The simplest way to see how the terminals must be oriented for insertion is to use one of the other wires already installed in the connector as a guide.

The first option is the kill switch. If you install the kit's accessory white wire in connector position 5, and short the other end of the wire to chassis ground, the plugs will stop sparking for as long as the electrical connection is made. The kill function does NOT disable the ignition's control module or tachometer output signal, just the spark.

The second option is the "digital" tachometer output signal (orange wire), which is configured to give one signal pulse per crankshaft revolution, swinging between 0V and 12V with a 50% duty-cycle square wave.

Electronic tachometers will generally have either three or four wires (four-wire tachometers have an additional dedicated lead for the internal backlight). The three-wire versions typically have the following connections:

- +12V
- Ground
- Signal Input

Color coding for the tachometer's wiring varies from manufacturer to manufacturer, so you will have to determine which is which according to your tachometer's documentation.

Other details and notes:

- For those who wish to use aftermarket coils for maximum spark energy, coils with primary resistance as low as 3.0 ohms are permissible. The PR-360EL system incorporates a "progressive dwell control" feature that minimizes average coil current without compromising spark energy.

- To prevent draining the battery or damaging the coils and/or module if the system is accidentally left energized, the PR-360EL system has an auto-shutoff feature that cuts off coil current if the engine is not started within 32 seconds of the key switch being turned on (or if the engine is started, then stalled). Once "timed out," the module will automatically restore coil current when crank rotation is detected; you don't have to cycle the power to re-boot the system.

- 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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