



INSTALLATION INSTRUCTIONS for **HI-4 SINGLE FIRE MOTORCYCLE IGNITION** Part Number 8-2200

CAUTION: READ INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION

INTRODUCTION

The HI-4 Single Fire Ignition P/N 8-2200 is intended for use with Harley-Davidson® motorcycles. The HI-4 replaces the original equipment (OE) electronic ignition system and is 50 states street legal (California Air Resources Board E.O. D-225-43) for the following applications:

1984-93 FX Models

1985-93 FL Models

1986-93 XL Models

Part number 8-2200 is true single fire, even at cranking speed. Each cylinder is fired independently and only on the compression stroke. Single fire operation increases engine power at high RPM, improves starting, and reduces the likelihood of backfiring at low RPM.

WARNING: 1996 and later models have a vehicle tilt sensor that shuts off the ignition if the motorcycle rolls on its side. This feature is disabled when the HI-4 ignition is installed.

The HI-4 features state-of-the-art RISC microcontroller technology that allows an adjustable advance and rev limit. A timing LED indicates static timing (top dead center) and gives diagnostic information. Two starting modes are provided: electric start and kick start. A tach output insures accurate tach readings even at the rev limit.

COIL AND SPARK PLUG CABLE CONSIDERATIONS

We recommend replacing the OE coil. Coils used with the HI-4 must have at least 2 ohms primary resistance. Coils with 4 ohms or higher may be used, but may not produce optimum output. We recommend the following coils for single and dual-plug applications:

HI-4 Ignition With Single Plug Heads. Use Crane 8-3001 coil. This is a "Siamese" coil with two independent sections and will fit in the stock mounting location on most H-D® motorcycles. You can also use two dual spark tower coils and ground one of the towers on each coil to the engine case or frame. You will have to fabricate a bracket to mount the second coil.

HI-4 Ignition With Dual Plug Heads. Use two Crane 8-3006 coils. You will have to fabricate a bracket to mount the second coil.

Crane FireWire spiral core wires are recommended for maximum performance. Do not use non-suppression solid core spark plug wires; they will cause interference with your electronic ignition system and/or accessories.

REMOVAL OF OE ELECTRONIC IGNITION SYSTEM

1. Turn ignition switch off and disconnect battery ground cable.
2. Refer to Figure 1. Remove OE ignition module and wire harness (items 1-4). You will disconnect two wires at the coil, wire going to the VOES (Vacuum Operated Electrical Switch), ground wire at the module, and the 3 pin plug (20) that connects to the sensor plate. Refer to shop manual for locations.
3. Remove ignition cover plates and gasket (items 5-9). This will require drilling out two rivets. The rivets will later be replaced with two supplied self-threading screws.
4. In order to remove the sensor plate cable, the cable plug (20) must be removed first. Use needle nose pliers to pull the terminals out of the plug. Then pull the cable through the exit hole at the bottom of the timing cover.



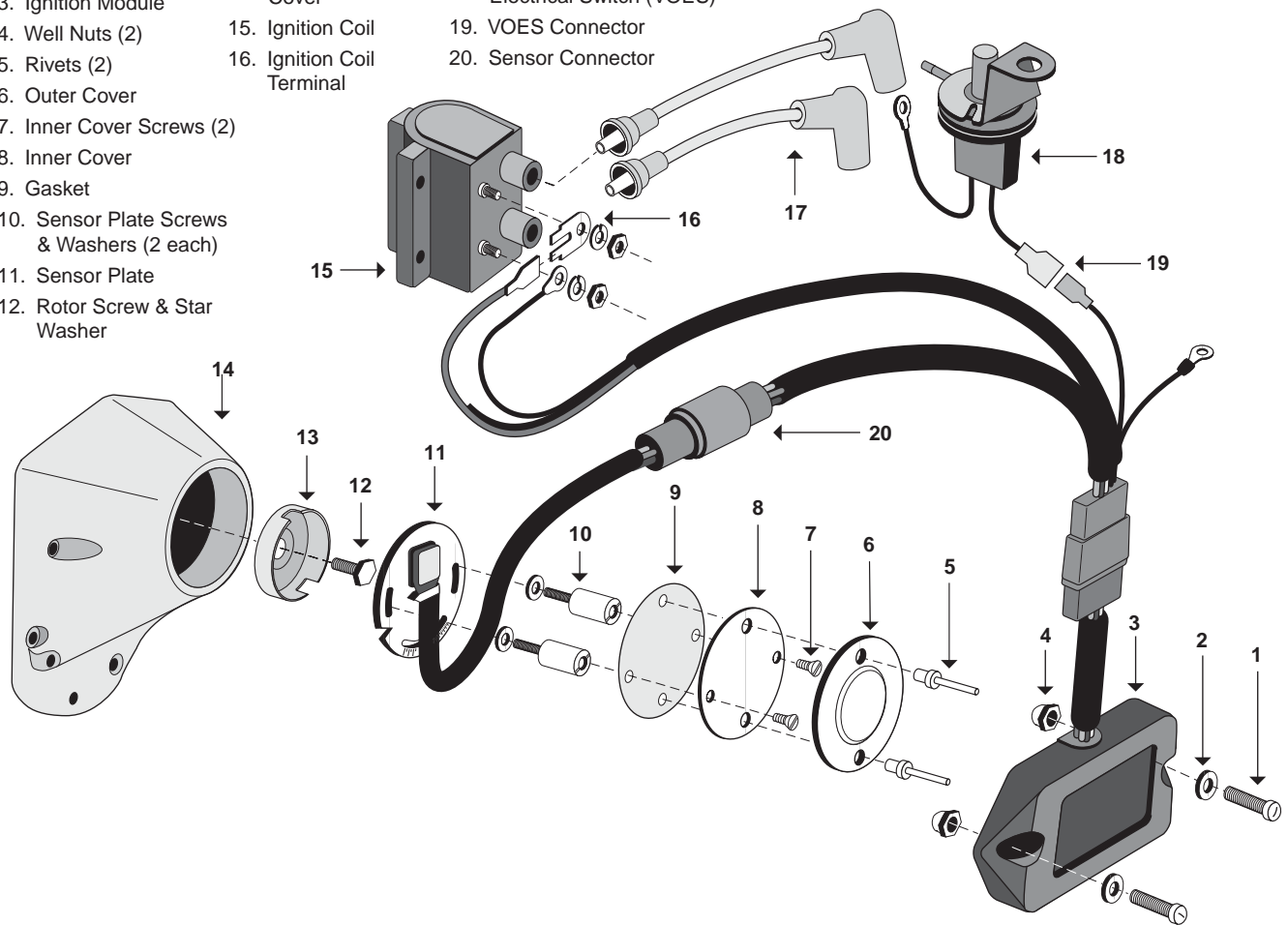
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Figure 1. Harley-Davidson® 1980 and Later OE Electronic System

- | | | |
|---|-------------------------------|---|
| 1. Screws (2) | 13. Rotor | 17. Spark Plug Wires (2) |
| 2. Washers (2) | 14. Gear Case
Cover | 18. Vacuum Operated
Electrical Switch (VOES) |
| 3. Ignition Module | 15. Ignition Coil | 19. VOES Connector |
| 4. Well Nuts (2) | 16. Ignition Coil
Terminal | 20. Sensor Connector |
| 5. Rivets (2) | | |
| 6. Outer Cover | | |
| 7. Inner Cover Screws (2) | | |
| 8. Inner Cover | | |
| 9. Gasket | | |
| 10. Sensor Plate Screws
& Washers (2 each) | | |
| 11. Sensor Plate | | |
| 12. Rotor Screw & Star
Washer | | |



- Note location of sensor plate (11). There is a V notch in the sensor plate used for alignment. When you install the HI-4, you should align the V notch in the same location. This should set the timing close enough to start the engine. Remove and save the two standoffs and washers (10). Remove the sensor plate (11).

HI-4 INSTALLATION

Refer to Figure 2. The HI-4 requires use of the OE timing rotor P/N 32402-83. Check your rotor (9) and verify that it is the correct part number.

- Install HI-4 system in place of OE sensor plate. Rotate the HI-4 about 90 degrees to give better access to the cable exit hole. Install the HI-4 first, then push the cable through the hole. Align the V notch on the HI-4 identically to the OE plate you removed. Use the OE standoffs to secure the HI-4. You must use lockwashers under the stand-

offs for proper clearance between the HI-4 and cover plate. Do not fully tighten the standoffs until the timing has been set.

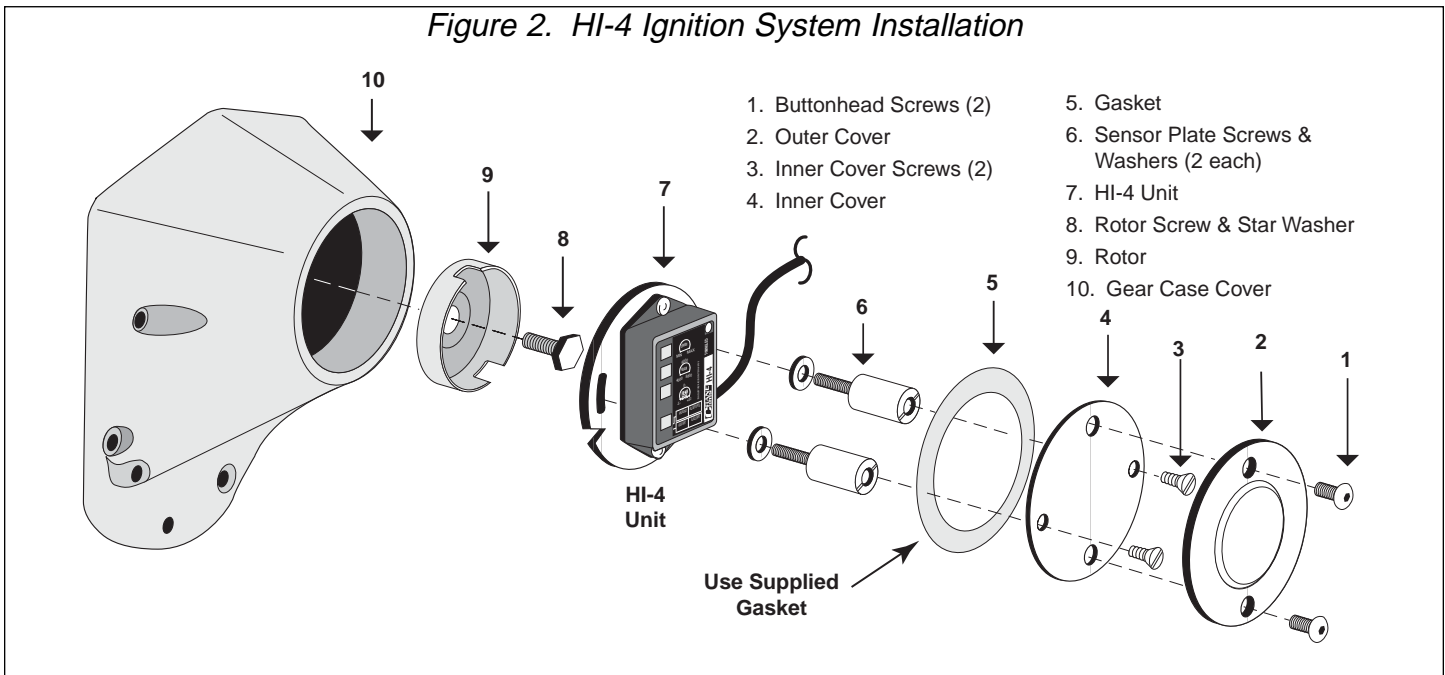
- Route the HI-4 wire harness along the frame rails up to the coil. Make sure that the harness will not be chafed or burned by exhaust heat. Secure harness with tie wraps. Do not install timing cover.

HI-4 HOOKUP

Crimp terminals and hardware are supplied for your convenience. Use the ring terminals for coil hookup. Use male-female quick disconnects for connections to the tach and vacuum switch (VOES). Tape up the tach wire if unused. Self-threading screws are supplied to reinstall the outer timing cover.

NOTE: Damage will result if the brown tach wire comes in contact with +12V.

Figure 2. HI-4 Ignition System Installation



1. Identify switched +12 volt wire and tach wire (if equipped) going to the coil. Refer to your service manual, or reconnect the battery and use a test light or voltmeter. The switched +12 volt wire will be hot when the ignition key is turned on.
2. Refer to Figure 3 or 4, depending on your application. Connect the HI-4 red wire and switched +12 volt wire to Coil positive.

NOTE: Most motorcycle coils do not have terminals marked. Most single-fire coils use the center terminal for +12V and the outer two terminals for front and rear cylinder Coil -. For dual-fire coils use either terminal for Coil + (positive) and the other one for Coil - (negative).

3. Connect the HI-4 black wire to one coil negative terminal for the front cylinder.
4. Connect the HI-4 white wire to the other coil negative terminal for the rear cylinder.
5. Connect the HI-4 green wire to the VOES (Figure 1, item 18,19).
6. Connect the HI-4 brown wire to the tach wire, if equipped with tach. Tape up if unused.
7. The HI-4 is grounded via the timing housing; a separate ground connection is not required.

8. Reconnect battery ground cable. Verify proper ground connections to the frame and engine.

VOES HOOKUP

The OE vacuum switch (VOES) is normally an open circuit. Above 3-5 inch-Hg vacuum, the VOES closes and grounds the vacuum input on the OE ignition module. This increases the total advance generated by the ignition module. Vacuum advance improves part throttle driveability and fuel economy.

NOTE: 1996 and later models use a 2-wire connector between the VOES and the OE harness. Connect one wire from the VOES switch to frame ground and connect the other wire to the VOES input (green wire) on the HI-4 harness.

The 8-2200 HI-4 must be used with a VOES. If your motorcycle does not have a VOES, retrofit the motorcycle with the H-D® VOES P/N 26566-91.

WARNING: Make sure that the VOES is connected and functioning properly prior to setting the timing.

HI-4 SETUP AND OPERATION

Refer to the label on the HI-4. The unit has two DIP switches that select the advance curve and starting mode. The top switch sets the advance curve. Select BIG

Figure 3. HI-4 Single Fire System Hookup with Single Plug Heads

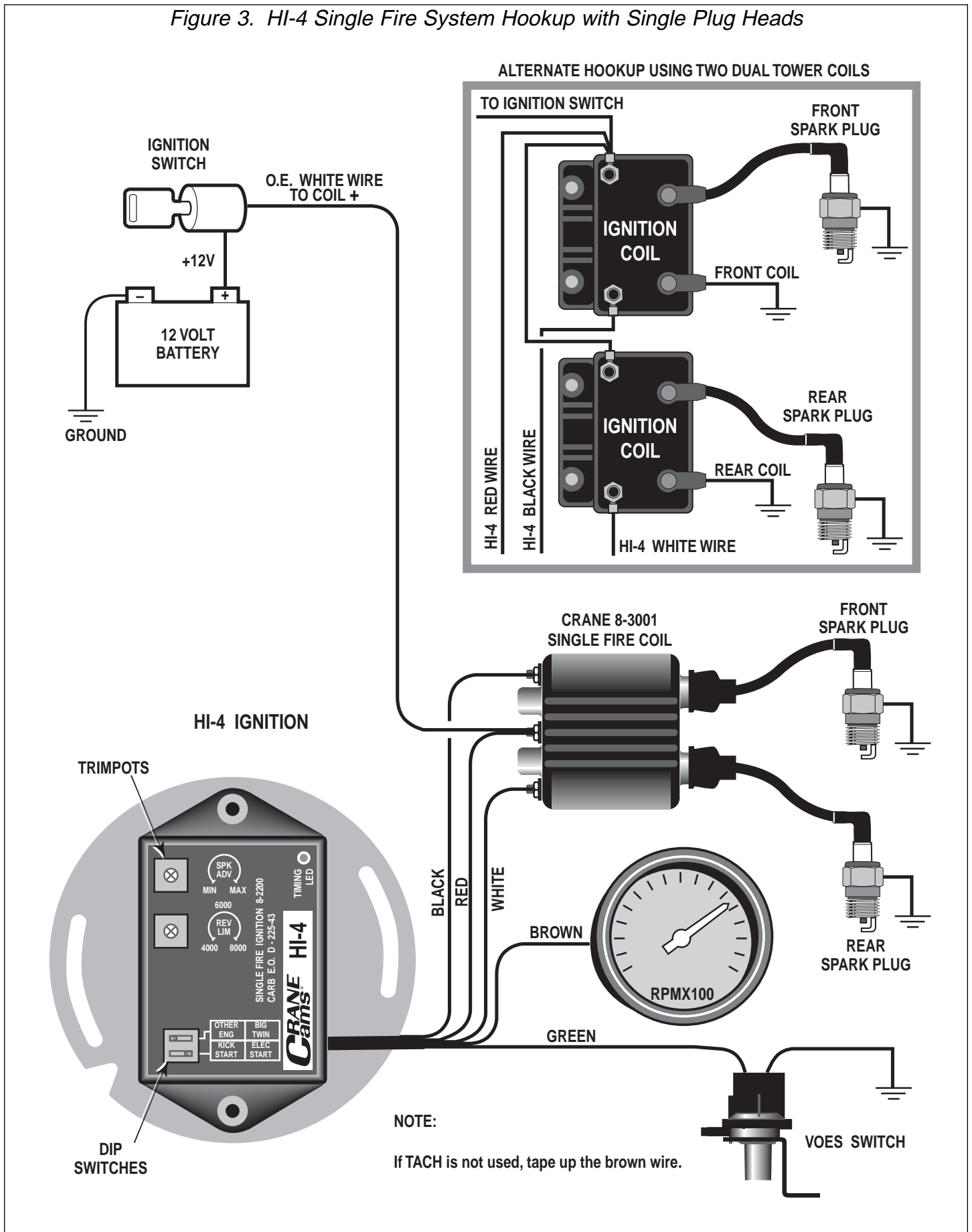
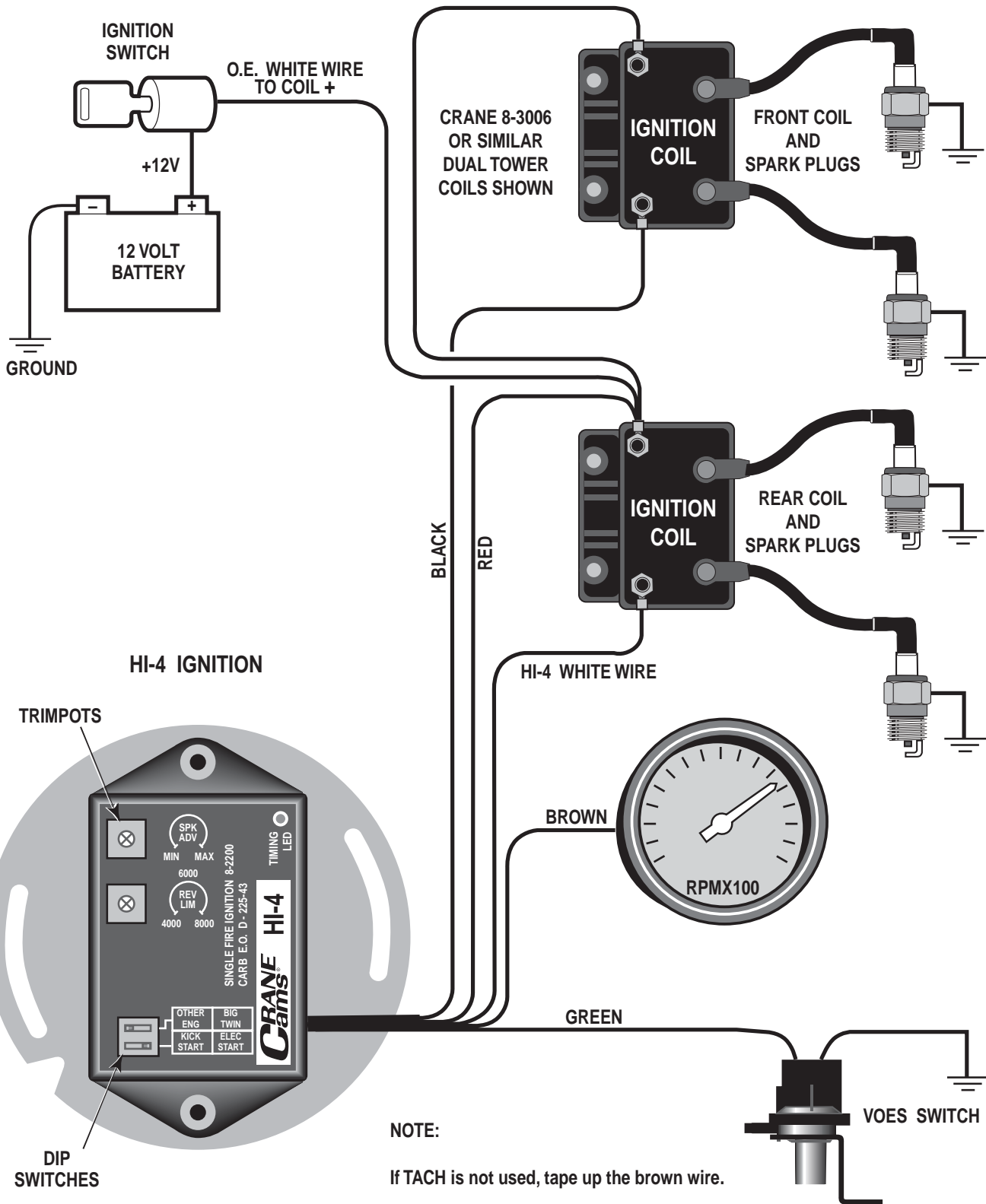


Figure 4. HI-4 Single Fire System Hookup with Dual Plug Heads



TWIN for 1340cc FX and FL models. Select OTHER for all other engine types.

The bottom switch sets the starting mode. Kick start mode fires the first cylinder for quickest starting. Electric start mode delays firing for 2-3 revolutions of the motor for smoother starts and less strain on the starter motor.

Trim pots on the HI-4 allow adjustment of advance and RPM limit settings. Use the screwdriver supplied in the parts kit to adjust the trim pots. Trim pot setting is indicated by the slot that has two small dots on each side.

NOTE: Each trim pot can be adjusted over a range of just under one turn. At the ends of the adjustment range, mechanical stops prevent further rotation of the trim pot. Do not attempt to turn the trim pots past their limits.

The advance curve is adjustable over a limited range via the advance trim pot (SPK ADV). Advance curves are given in Figures 5 and 6. Each set of advance curves includes minimum and maximum curves. The actual advance curve will be between the minimum and maximum curves depending on advance trim pot setting.

If you have a passenger or are using low octane gasoline, minimum advance will reduce spark knock. Maximum advance will give higher performance, but may require the use of high octane gasoline.

The RPM limit trim pot (REV LIM) is adjustable from 4,000 to 8,000 RPM. Use a safe RPM limit for your engine.

The HI-4 timing LED should light up when the ignition key is turned on. The timing LED will go off when the flywheel is rotated past TDC. During cranking, the LED will blink.

TIMING MARKS

The TDC and advance timing marks are located on the flywheel and can be observed via an inspection hole (refer to shop manual for details). Refer to Figure 7 for typical timing marks. Early Style includes most 1980 and earlier models. Late Style includes most 1981-95 models. If the shop manual is not available, remove spark plugs, turn engine until front piston is at TDC on compression stroke and identify TDC mark on the flywheel. Refer to Figure 7 and find the diagram with a matching TDC mark.

Use the corresponding advance mark shown in the diagram.

NOTE: 1996 and later models (1995 and later for export models) have a timing mark at 20° BTDC for setting the timing with the OE ignition module. Do not use this mark for setting the timing on the HI-4. In most cases an additional mark will remain at 35° BTDC (see Figure 7). Use this mark to set the timing with a timing light as described below.

INITIAL STATIC TIMING PROCEDURE

In most cases, aligning the V notch on the HI-4 plate to the same location as the OE plate will set the timing close enough to start the engine. If the engine will not start or runs very rough, you can use the following static timing procedure.

Remove spark plugs and turn the engine over until the TDC mark appears in the timing inspection hole (See Figure 7). Ground spark plugs with an alligator clip so you will not shock yourself. Turn on the ignition but do not start the motorcycle. Loosen the standoffs holding HI-4 and rotate the unit clockwise until the timing LED goes out. The point at which the timing LED goes off is TDC. Timing is now set approximately at TDC. Turn off ignition and re-install spark plugs. Once engine has been started, timing with a timing light is necessary.

SETTING ADVANCE TIMING USING STANDARD TIMING LIGHT

This timing procedure requires that a VOES switch be connected to the HI-4. Connect a timing light to the front cylinder. Set the HI-4 advance trim pot to a midrange setting. Run the engine at 2,000 to 2,200 RPM. Adjust the HI-4 module assembly in the gear cover until the advance timing mark is centered in the timing inspection hole (See Figure 7). Fasten the standoffs and verify that timing has not shifted.

ADVANCE CURVE SETUP

After you have set the timing as explained above, set the HI-4 advance trim pot to desired position. If you run 93 octane gasoline, you can usually leave the trim pot full clockwise for maximum advance and performance, without spark knock.

Figure 5. Advance Curves for Big Twin® Engines

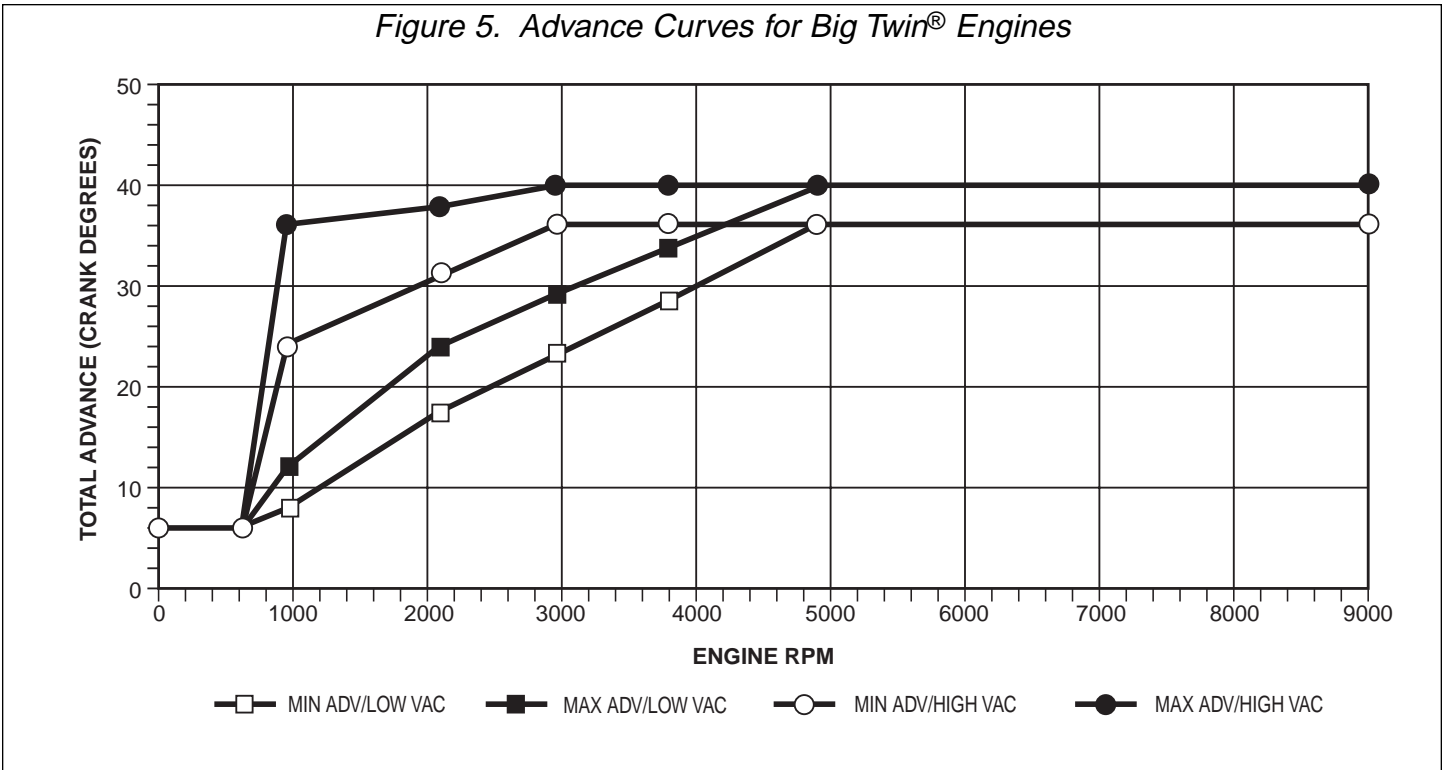
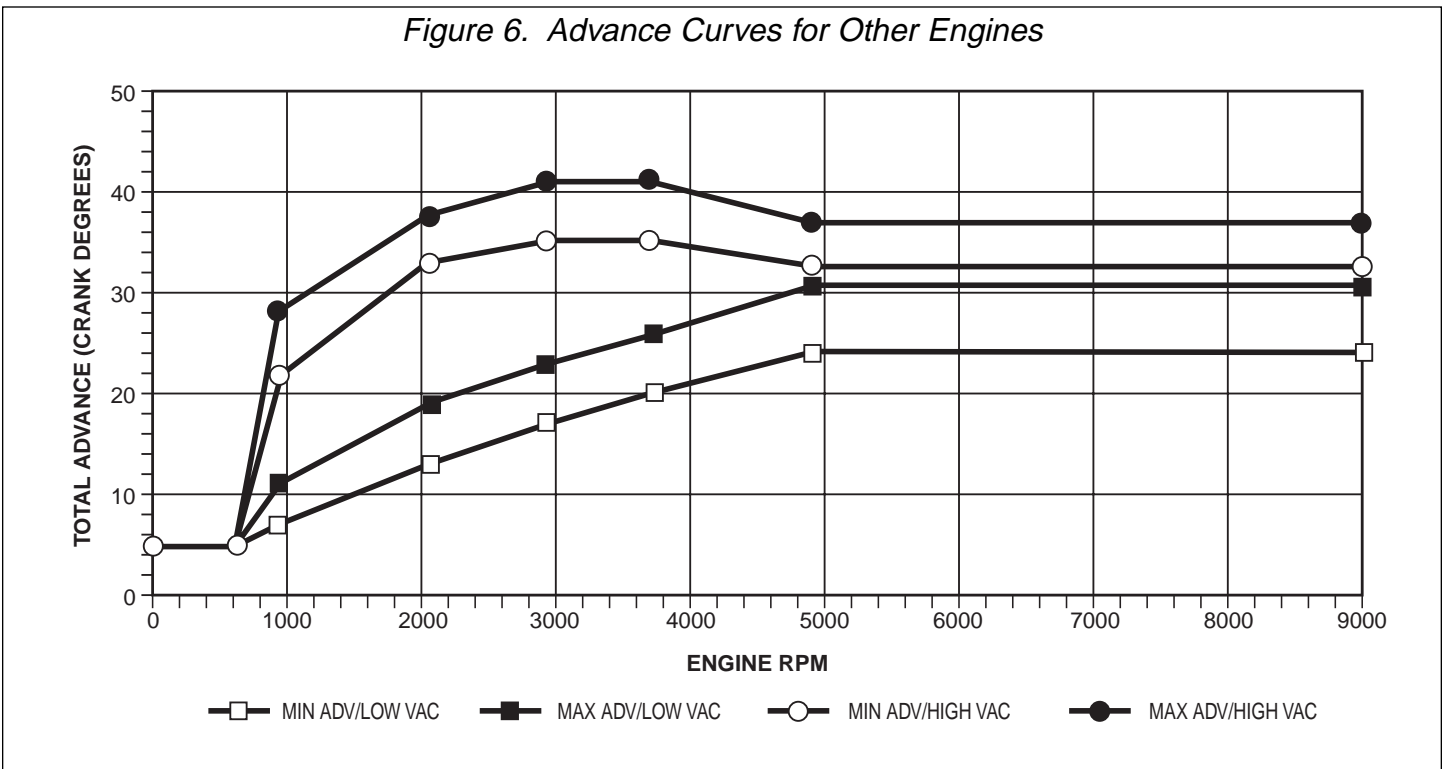


Figure 6. Advance Curves for Other Engines



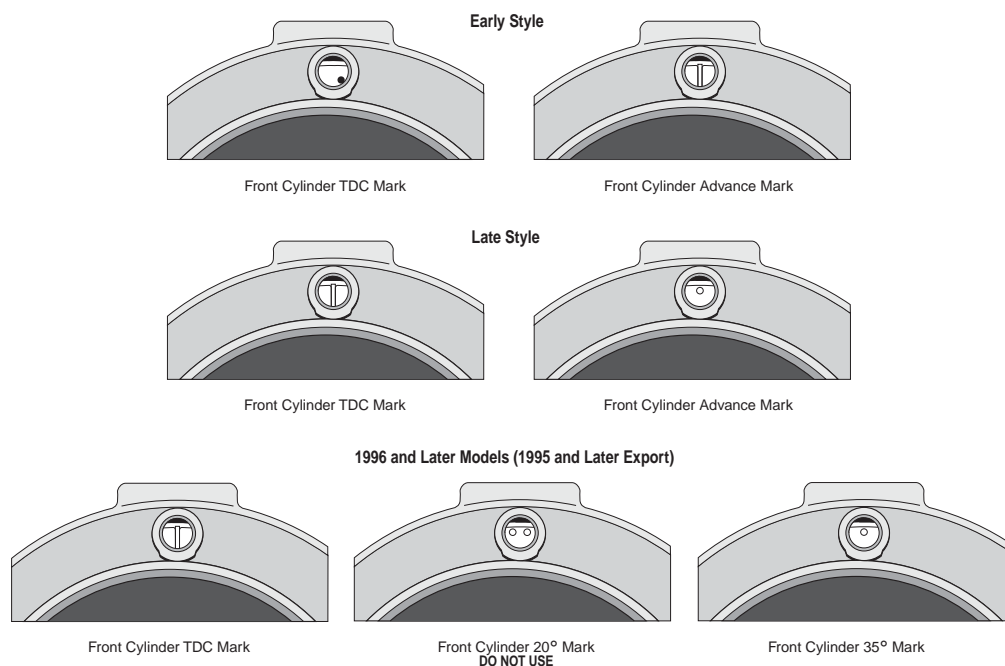
COVER PLATE ASSEMBLY

You can re-use the OE hardware, except use the supplied Crane gasket to provide proper clearance for the HI-4. Use the supplied self-threading screws in place of the rivets that held the outer cover.

TROUBLESHOOTING

Did the engine run properly before installation of the HI-4? If not, remove the HI-4, reinstall the OE ignition or another known good unit and then find and correct the original problem. Did the HI-4 function correctly before the problem occurred? If the answer is yes, did you change

Figure 7. Top Dead Center (TDC) and Front Cylinder Advance Marks for Various Models



anything that may have affected it? Try going back to the last setup that worked OK to help isolate the problem.

If the engine will not start, or runs rough or intermittently, use the following checklist steps:

ENGINE WILL NOT START

1. Check that timing LED lights up when ignition key is first turned on. If not, check for +12 volts on red wire from HI-4.
2. Check that timing LED blinks while engine is cranked. If not, HI-4 may be defective.
3. If the timing LED blinks, but engine will not start, recheck all wire harness connections or replace coil(s).
4. Check for low voltage from a faulty or marginal charging system and battery.

NOTE: The battery ground on most Harley-Davidsons® is connected to the frame behind the seat. In order to provide a dedicated ground for the high starter current, another cable should be installed from the point on the frame that the battery is already grounded to the starter mounting flange. This cable should be the same diameter as the battery ground cable presently on the bike, and will help prevent damage to your electronic components.

CHECKING FOR SPARK

To crank the engine and check for spark, use a KD Tools test plug or H-D® tool HD-26792. These test plugs come with an alligator clip that must be attached to frame or engine ground. Use a length of spark plug wire to connect the test plug to the coil.

WARNING: Never crank the engine with any spark plug wire disconnected.

MISFIRE OR INTERMITTENT OPERATION

Field experience has shown that popping back through the carburetor, misfiring, and intermittent failure (especially after the engine gets hot) are usually not caused by electrical problems within the HI-4. Carburetor problems, fouled spark plugs, coil failure, and loose wire harness connections are the most common culprits. Verify that spiral core or suppression type spark plug wires and resistor spark plugs are being used.

TACH INOPERATIVE

If the tach is inoperative after installation of the HI-4, you may require a tach adapter. The HI-4 tach output is compatible with ground sensing tachs which includes most OE and aftermarket tachs. Some tachs require a high voltage trigger pulse. In this case, install Crane tach adapter P/N 8-2050. Note that the tach will read correctly at the rev limit only if it is connected to the brown wire from the HI-4. Damage to the HI-4 circuitry may have occurred if 12 volts was applied to the brown tach wire at any time.