



INSTALLATION INSTRUCTIONS for HI-4E PERFORMANCE MOTORCYCLE IGNITION Part Numbers 8-3100 and 8-3101

CAUTION: READ INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION

INTRODUCTION

The HI-4E ignition system is intended for use with Harley-Davidson® motorcycles. Model 8-3100 is for 1991-1994 H-D® applications with 7 pin "D" style plug and Model 8-3101 is for 1995 and later H-D® applications with the new 8 pin Deutsch® plug. The HI-4E mounts in place of the OE (original equipment) module and offers easy plug-in installation without requiring removal of the timing cover. Both models feature the proven advance curves of Crane's original HI-4. Model 8-3100 can also be used with most 1970-90 H-D® applications; however installation of additional H-D® parts is required. Use the Applications Index to find the appropriate section for your motorcycle. The HI-4E features:

- **Switch selectable multi-spark mode.** Crane's exclusive FIRE (Fast Inductive Restrike) generates up to nine sparks at idle and three sparks up to 6,000 RPM. Reduces lean surge and plug fouling.
- **Switch selectable single or dual fire.** Initially the unit can be installed using the OE dual fire coil. With the purchase of a single fire coil such as the Crane 8-3001, the unit converts to single fire for smoother operation and increased power.
- **Digitally set rev limiter** adjustable from 500 to 9,900 RPM in 100 RPM increments via two rotary switches. Sequence type rev limiter equalizes cylinder firing at the rev limit and reduces "popping and banging."
- **Choice of two advance curve families:** performance advance curve for stock and modified engines and race curve for high compression engines. Both curves support the use of the VOES switch for vacuum advance. The advance slope of either curve can be adjusted in ten steps via a rotary switch to allow fine tuning the curves to meet particular applications.
- **Rear cylinder timing offset** digitally set from -5 to +4 degrees via a rotary switch (works in both dual and single fire modes). Optimizing rear cylinder timing can increase performance when dyno tuning.
- **Choice of start modes:** electric start with 2 revolution firing delay and kick start with immediate firing.
- **Timing LED.** Indicates TDC (top dead center) and also serves as a diagnostic aid.

APPLICATIONS INDEX

Late Model With 7 Or 8 Pin Plug.....Page 1
(1991 and later H-D® models with "D" style or Deutsch® plug at original equipment ignition module)

1984-1990 Models Without Ignition Plug.....Page 2

Early Models Prior To 1984.....Page 4
(includes early electronic ignition and 1970 and later points equipped models)

COIL AND SPARK PLUG CABLE CONSIDERATIONS

Coils used with the HI-4E 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:

Dual Fire Mode With Single Plug Heads. You can retain the O.E. coil. For increased ignition energy, we recommend the Crane 8-3006 or 8-3002 coils.

Single Fire Mode 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.

Single Fire Mode With Dual Plug Heads. Use two Crane 8-3006 or 8-3002 coils. You will have to fabricate a bracket to mount the second coil.

Crane FireWire spiral core spark plug wires or equivalent suppression wires are recommended for best performance. **Do not use non-suppression solid core spark plug wires;** they may cause interference with your ignition system and accessories. Use resistor (suppression type) spark plugs. Non-resistor spark plugs may cause interference with the computer in the HI-4E.

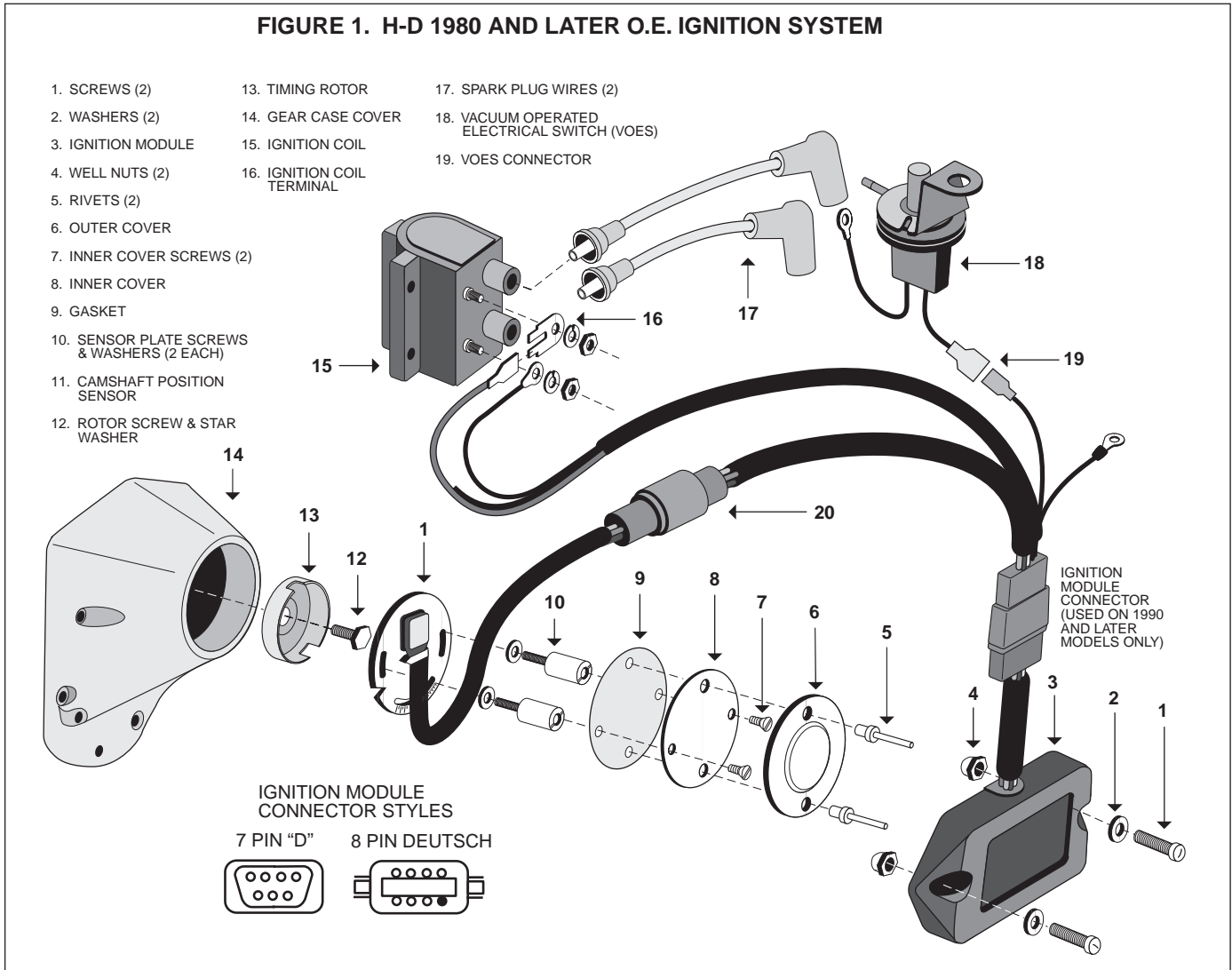
INSTALLATION ON LATE MODELS WITH 7 OR 8 PIN PLUG

1. Turn ignition switch off and disconnect battery ground cable.



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FIGURE 1. H-D 1980 AND LATER O.E. IGNITION SYSTEM

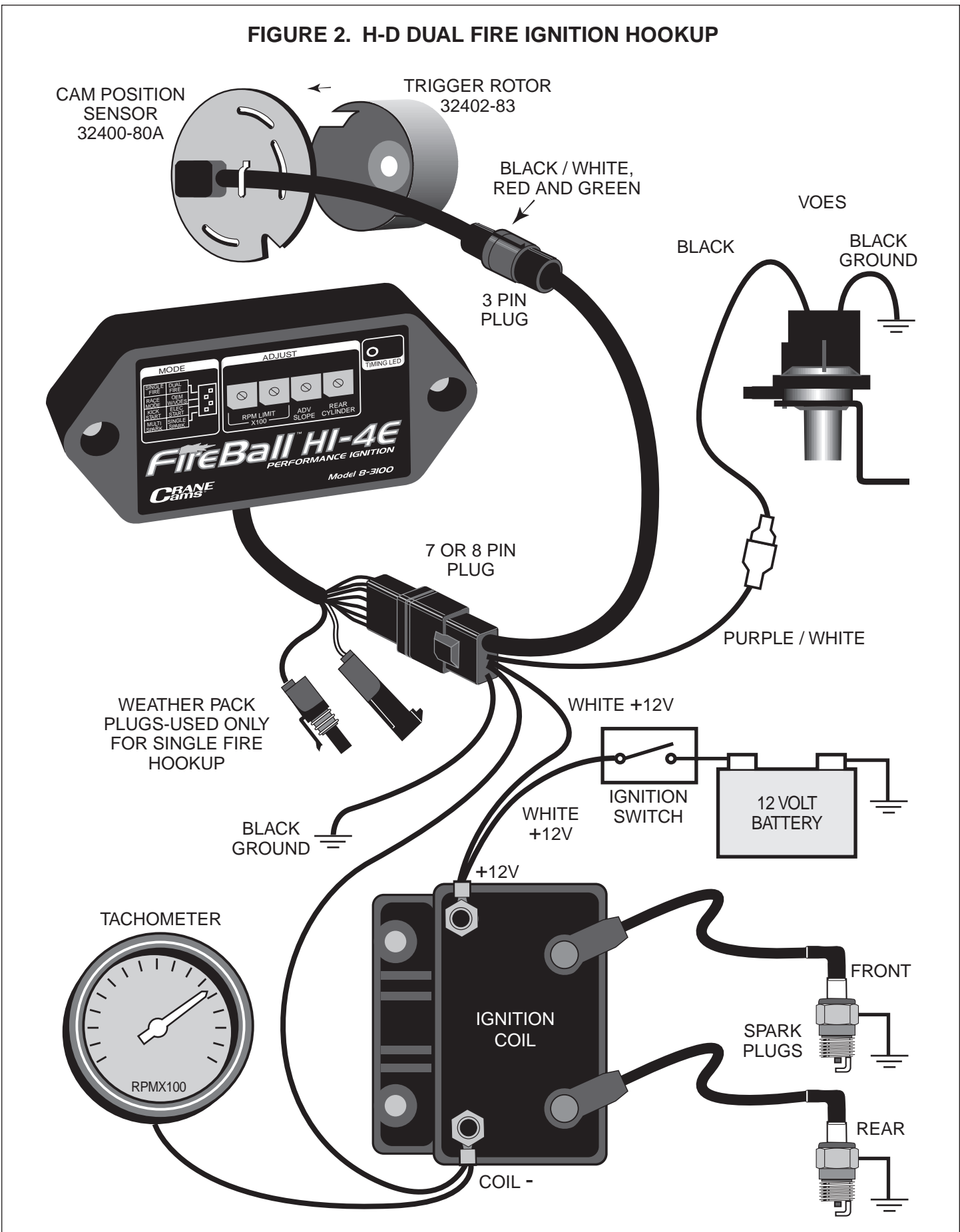


2. Refer to Figure 1 for an overview of the ignition system. The O.E. ignition module is usually located under the seat, under a side cover or on the frame below the handle bars. Unplug the O.E. module and remove the two mounting bolts.
3. Verify that your HI-4E module has the correct mating plug: either a 7 pin "D" or 8 pin (Deutsch®) style.
4. Install the HI-4E module in the original location using the original hardware. Connect the HI-4E plug to the wire harness. Your ignition system will now be wired as shown in Figure 2.
5. The two additional Weather Pack plugs are not required for standard dual fire operation. The rear coil connection is for single fire mode only (refer to page 5).
6. The tach will fluctuate at the rev limit if the O.E. tach hookup to Coil- is used as shown in Figure 2. For accurate tach indication at the rev limit, connect the tach to the brown wire from the HI-4E as shown in Figure 3.
7. For initial setup and operation, proceed to page 4.

INSTALLATION ON 1984-1990 MODELS WITHOUT IGNITION PLUG

1. These models did not have a plug at the ignition module. To install the HI-4E model 8-3100, you will require H-D® ignition module adapter wiring harness kit P/N 32408-90. This part is not included with the HI-4E and can be purchased from your local dealer. Follow the supplied instructions to upgrade your wire harness for plug-in ignition. Turn ignition switch off and disconnect battery ground cable before starting the installation. Refer to Figure 1 for an overview of the ignition system.
2. FL series Big Twin models prior to 1985 will require changing the timing rotor (refer to Figure 1). You must install H-D® P/N 32402-83. After the HI-4E installation is complete, you must reset the ignition timing. Refer to your service manual or the information on page 5.
3. The O.E. ignition module is usually located under the seat, under a side cover or on the frame below the handle bars. Remove the O.E. module and remove the two mounting bolts.

FIGURE 2. H-D DUAL FIRE IGNITION HOOKUP



4. Install the HI-4E module in the original location using the original hardware. Connect the HI-4E plug to the new wire harness you installed in step 1. Your ignition system will now be wired as shown in Figure 2.
5. The two additional Weather Pack plugs are for single fire mode. Connections to these plugs are not required for standard dual fire operation. Refer to page 5 for information about single fire coil hookup.
6. Continue to the section below on operation and setup.

INSTALLATION ON EARLY MODELS PRIOR TO 1984

1. Figure 1 shows an overview of the ignition system with the proper trigger rotor, camshaft position sensor, and wiring harness. On 1980 to 1983 models, you must install a wire harness kit with mating ignition plug and a new trigger rotor. Models prior to 1980 will also require a new camshaft position sensor.
2. All applications will require H-D[®] ignition module adapter wiring harness kit P/N 32408-90. This part is not included with the HI-4E and can be purchased from your local dealer. Follow the supplied instructions to upgrade your wire harness for plug-in ignition. Turn ignition switch off and disconnect battery ground cable before starting the installation.
2. All applications will require H-D[®] P/N 32402-83 trigger rotor. After the HI-4E installation is complete, you must reset the ignition timing. Refer to your service manual or the information on page 5.
3. All applications prior to 1980 will require H-D[®] P/N 32400-80A camshaft position sensor (also called the ignition sensor plate).
4. The O.E. ignition module on 1978 and later models is usually located under the seat, under a side cover or on the frame below the handle bars. Remove the O.E. module and remove the two mounting bolts.
5. Install the HI-4E module in the original location using the original hardware. For early points equipped models prior to 1978, you may have to fabricate a mounting bracket. Connect the HI-4E plug to the new wire harness you installed in step 1. Your ignition system will now be wired as shown in Figure 2.
6. The two additional Weather Pack plugs are for single fire mode. Connections to these plugs are not required for standard dual fire operation. Refer to page 5 for information about single fire coil hookup.

HI-4E SETUP AND OPERATION

1. **VOES switch.** Most 1980 and later H-D[®] models have a VOES switch which is used to increase the spark advance under high vacuum (cruise) conditions.

Vacuum advance improves part throttle driveability and fuel economy. Do not remove the VOES switch. If you are retrofitting an HI-4E to an early H-D[®] model, fuel economy and driveability will be improved if you install a VOES. We recommend you use H-D[®] VOES P/N 26566-91. Connect it as shown in Figure 2.

2. **Advance curves.** The HI-4E offers a choice of two advance curves, which are shown in Figures 5 and 6. The OEM style advance curve is recommended for stock and modified engines. Use the race advance curve for high compression engines. The advance curves are selected by a DIP switch (2nd position from top of the four section switch at the left side of the unit). Use a small screwdriver to slide the switch to the desired position. Each advance curve is adjustable over a limited range via the advance slope switch. This is a rotary switch that can be set with a small screwdriver. Setting the advance slope to zero results in the minimum (lower) curve. Setting the switch to 9 results in the maximum (upper) advance curve. Intermediate settings result in an advance curve in between the minimum and maximum values, with higher switch settings moving the curve closer to the maximum values. If you use low octane gasoline, minimum advance will reduce spark knock. Maximum advance will give higher performance, but may require the use of high octane gasoline. We suggest that you start with an advance slope setting of 5. Then use the highest possible setting that does not cause audible spark knock.
3. **RPM limiter.** Two rotary switches are used to digitally set the rev limit from 500 to 9,900 RPM in 100 RPM increments. Settings are X100 engine RPM (i.e. 59 = 5,900 RPM). Select a safe rev limit that is less than the red line for your engine. Most H-D[®] engines with OE valvetrain parts should not be revved over 5,500 RPM.
4. **Rear cylinder timing offset.** This feature allows slight offset of rear cylinder timing for critical race applications and dyno tuning. The offset range is -5 to +4 degrees. The offset function works in both dual fire and single fire modes, since the HI-4E knows which cylinder is firing. Normally, the rear cylinder offset switch should be set to zero.
5. **Option setup.** The four position DIP switch at the left of the unit is used for option setup. The top position is used to select single or dual fire. You must select dual fire mode if you do not hookup a single fire coil. The 2nd switch position selects the advance curve. The 3rd switch position selects kick start or electric start mode. Do not use kick start mode on engines with an electric starter. The bottom switch position selects single or multi-spark mode. Multi-spark mode is recommended for optimum performance in most applications. Some late model engines with very lean carburetor jetting may exhibit excessive spark knock in multi-spark mode.

6. **Timing LED.** This can be used for static timing and as a diagnostic aid. The LED should light up when the ignition key is turned on. The timing LED will go off when the crankshaft is rotated past TDC. During cranking the LED will blink.

SINGLE FIRE HOOKUP

Refer to Figure 3 for hookup with single plug heads. Refer to Figure 4 for hookup with dual plug heads. In either case, you must connect the Weather Pack connector with the white wire to the rear COIL- terminal and the Weather Pack connector with the brown wire to the tach. Mating Weather Pack connectors with an attached length of color coded wire are supplied with the HI-4E. You must break the original connection from the tach to the COIL- terminal. The H-D[®] OE tach wire is usually pink. On many late models, this wire separates from the COIL- connection at a main wire harness plug near the ignition module (not the 7 or 8 pin plug). Refer to your service manual for details.

TIMING PROCEDURE

For most 1984 and later models, HI-4E installation does not require resetting the ignition timing. For earlier models where a new trigger rotor or camshaft position sensor is installed, you must reset the timing.

The TDC and advance timing marks are located on the flywheel and can be observed via an inspection hole (refer to the 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 O.E. ignition module. Do not use this mark for setting the timing with the HI-4E. 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

If the engine will not start or runs very rough, you can use the following static timing procedure. Remove spark plugs and turn engine until TDC mark appears in observation hole. Ground spark plugs with an alligator clip so you will not shock yourself. Turn on ignition. Loosen the standoffs holding camshaft position sensor and rotate it clockwise until timing LED goes out. The point at which LED goes off is TDC. Timing is now set approximately at TDC, which is correct for cranking conditions. Turn off ignition and reinstall spark plugs.

ADVANCE TIMING PROCEDURE - USING STANDARD TIMING LIGHT

This timing procedure requires that a VOES switch be connected to the HI-4E. **For racing applications without a VOES switch, you must ground the VOES input (purple/white wire) while setting the timing.** Connect a timing light to the front cylinder. Set the HI-4E advance slope switch to 5 (midrange). Run the engine at 2,400 to 2,500 RPM. Rotate camshaft position sensor until advance timing mark is centered in the observation hole. Tighten the standoffs and verify that timing has not shifted. Timing will now correspond to the curves in Figures 5 or 6.

SETTING PRECISE ADVANCE TIMING FOR RACING - USING DIAL BACK TIMING LIGHT

NOTE: Applicable to single fire mode only. Most dial-back timing lights will not work correctly in dual fire mode.

Determine the advance you want at 2,500 RPM. Use a dial-back timing light. Set the amount of advance you want, say 35 degrees, on the dial-back timing light. Connect the dial-back timing light to the front cylinder. If the VOES is used, disconnect the VOES input (purple/white wire) while setting the timing with this procedure. Set the HI-4E advance slope switch to 9 for maximum advance. Run the engine at 2,500 RPM. Rotate camshaft position sensor until TDC timing mark is centered in the observation hole. You will now have the amount of advance you dialed into the timing light. Tighten the standoffs and verify that timing has not shifted. Some dial-back timing lights are not compatible with odd firing H-D[®] V twin engines. Most Sears units are OK. Snap-On units may not function correctly.

TROUBLESHOOTING

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

Check that timing LED lights up when ignition key is first turned on. If not, check for +12 volts on white wire to COIL+.

Check that timing LED blinks while engine is cranked. If not, camshaft position sensor or HI-4E may be defective.

If the timing LED blinks, but engine will not start, recheck all wire harness connections or replace coil(s).

FIGURE 3 H-D SINGLE FIRE IGNITION HOOKUP FOR SINGLE PLUG HEADS

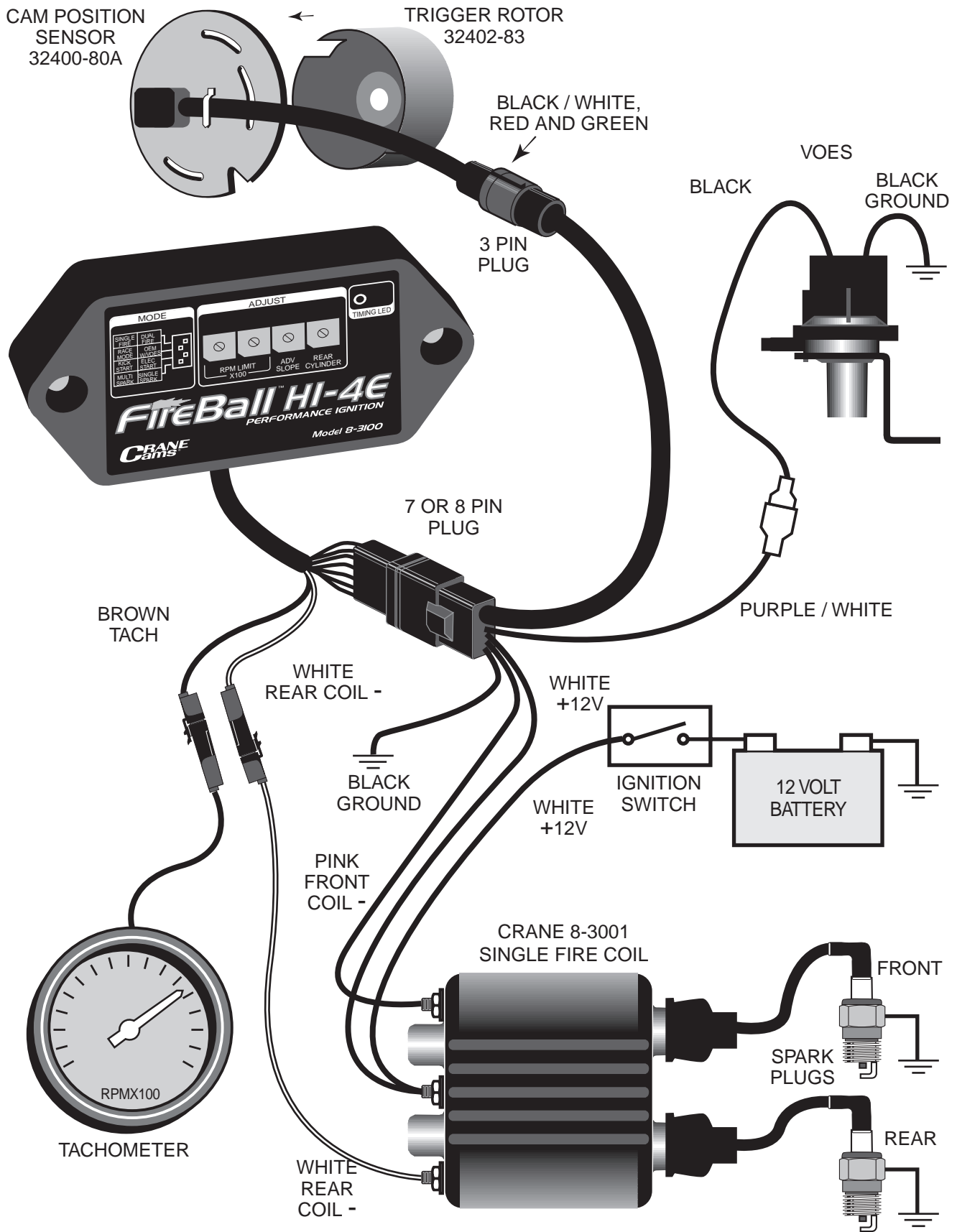
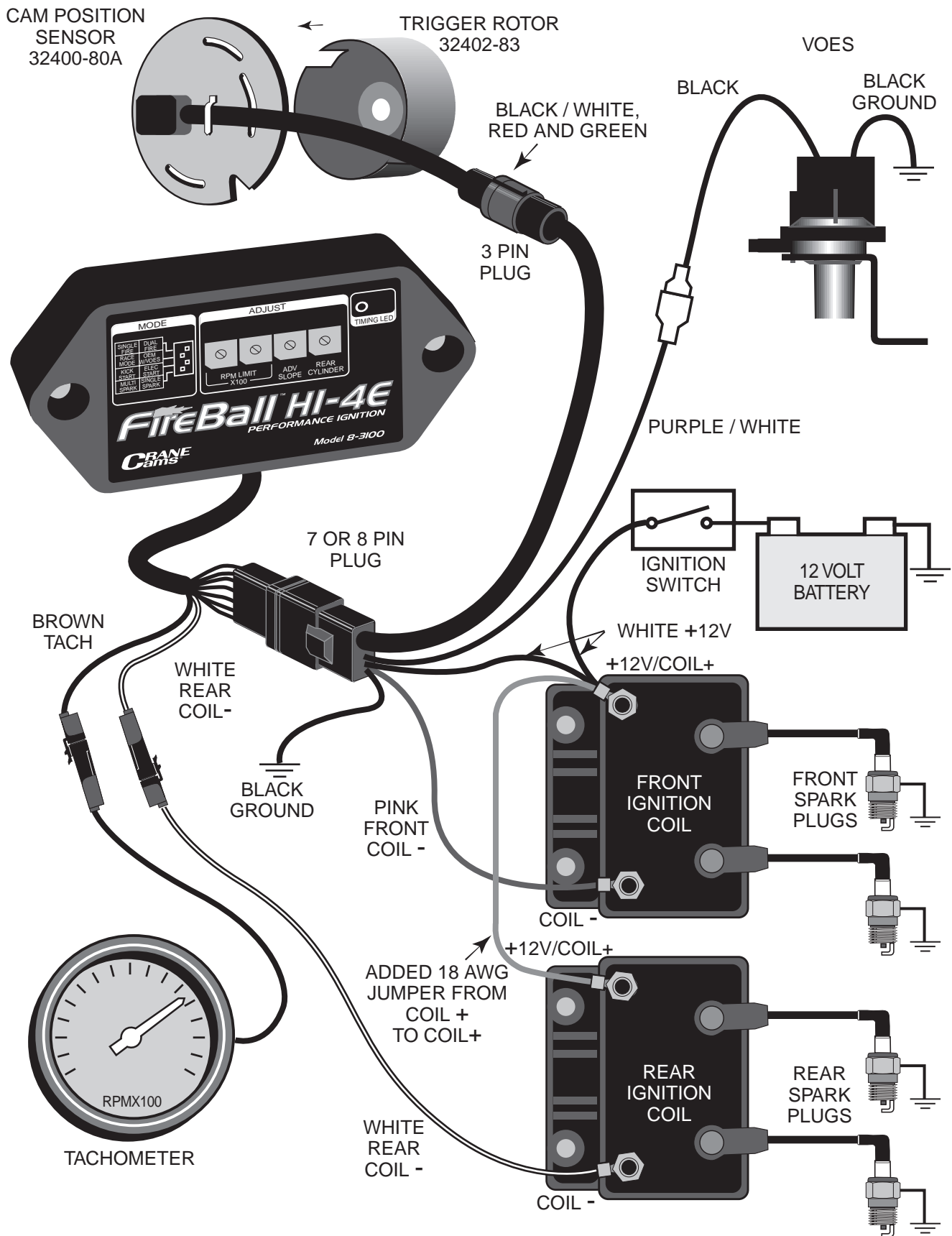


FIGURE 4. H-D SINGLE FIRE IGNITION HOOKUP FOR DUAL PLUG HEADS



Check for low voltage from a faulty or marginal charging system and battery.

CHECKING FOR SPARK

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

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.

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-4E. 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 plug wires are being used.

TACH INOPERATIVE

If the tach is inoperative after installation of the HI-4E in single fire mode, you may require a tach adapter. The HI-4E tach output is compatible with ground sensing tachs which includes most O.E. 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-4E. Damage to the HI-4 circuitry may have occurred if 12 volts was applied to the brown tach wire at any time.

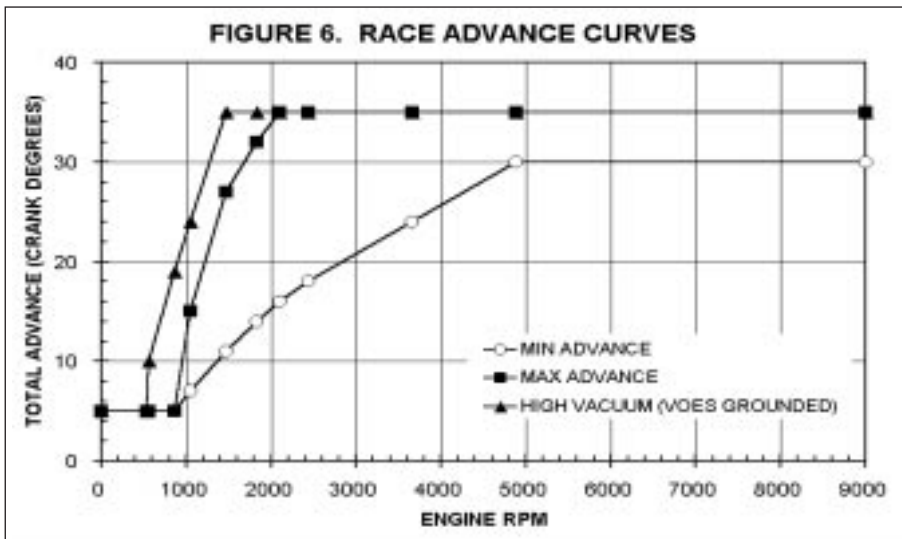
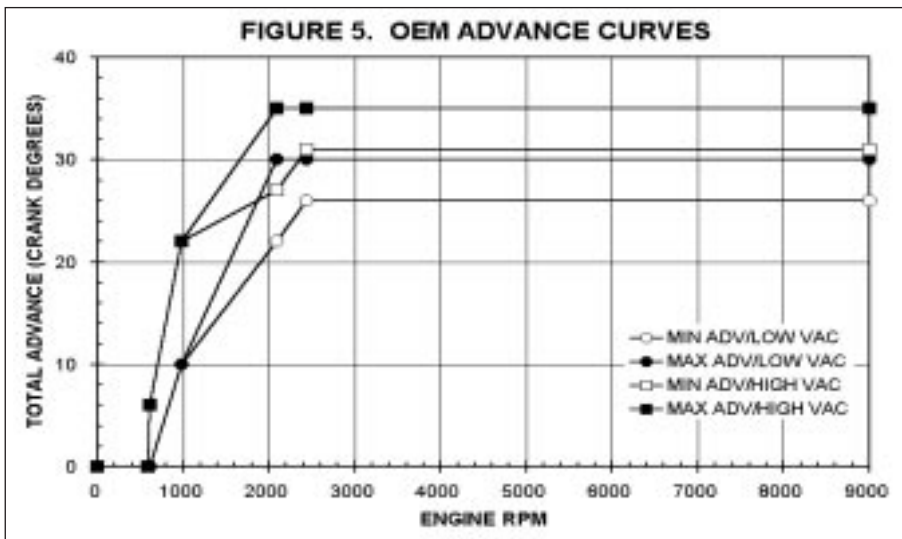


FIGURE 7. TOP DEAD CENTER (TDC) AND ADVANCE MARKS FOR VARIOUS MODELS

