



INSTALLATION INSTRUCTIONS for
HI-6 CD IGNITION
WITH REV LIMITER AND TIMING RETARD
 Part Numbers 6000-6440, 6000-6441, 6000-6442,
 6000-6443, and 6000-6444

CAUTION: READ INSTRUCTIONS CAREFULLY BEFORE STARTING INSTALLATION.

READ THIS BEFORE YOU BEGIN!

Before proceeding with the HI-6 installation, read the introductory material below so that you will understand the basic features and operation of the unit. The installation instructions are organized by application; use the Applications Index to find the appropriate section for your vehicle.

For hookup of optional TRC-2 Timing Retard Control Part Number 6000-6425, additional information is provided in the TRC-2 section starting on page 17.

CAUTION: READ THE FOLLOWING CAREFULLY:

- HI-6 part numbers listed above are CD ignitions that are primarily intended for use on 1981-1995 cars and 1986-1995 light trucks with engine control computers. These HI-6 units are fully encapsulated with urethane and capable of operation in severe environments. Marine applications require the HI-6M (6000-6462). Most 1980 and earlier cars and 1985 and earlier light trucks have magnetic trigger ignitions and require HI-6R part number 6000-6400. 1996 and later OBD II (on board diagnostics) equipped vehicles require HI-6 part number 6000-6445.
- All HI-6 units now include wire harnesses with Weather Pack connectors. **Please note that cutting off any Weather Pack connectors voids the HI-6 warranty!**
- Make sure that all original equipment wires are disconnected from coil.
- Tape up any unused wires after completing the installation.

APPLICATIONS INDEX

Late Model except Ford, GM, and HondaPage 5
 (most 1981-95 cars and 1986-95 light trucks with OE electronic ignition and engine control computer and 1972-86 Mopar with 4 or 5 pin module)

FordPage 5
 (with Duraspark or TFI-IV electronic ignition)

GMPage 5
 (with computer engine control and Coil-In-Cap, dual plug external coil, or LT-1 style coil)

Honda and Acura IntegraPage 10
 (with OE electronic ignition and external or internal coil)

Aftermarket Ignitions and PointsPage 10
 (pre-1980 vehicles with aftermarket ignitions including Mallory Unilite and points)

INTRODUCTION

The Crane Cams HI-6 is an advanced capacitive discharge (CD) type ignition system intended for racing and performance street vehicles. The HI-6 is 50 states street legal (California Air Resources Board E.O. D-225-52 and D-225-63 for 1995 and prior non-OBD II vehicles) and can be installed in most vehicles with computer engine control.

MULTIPLE SPARK

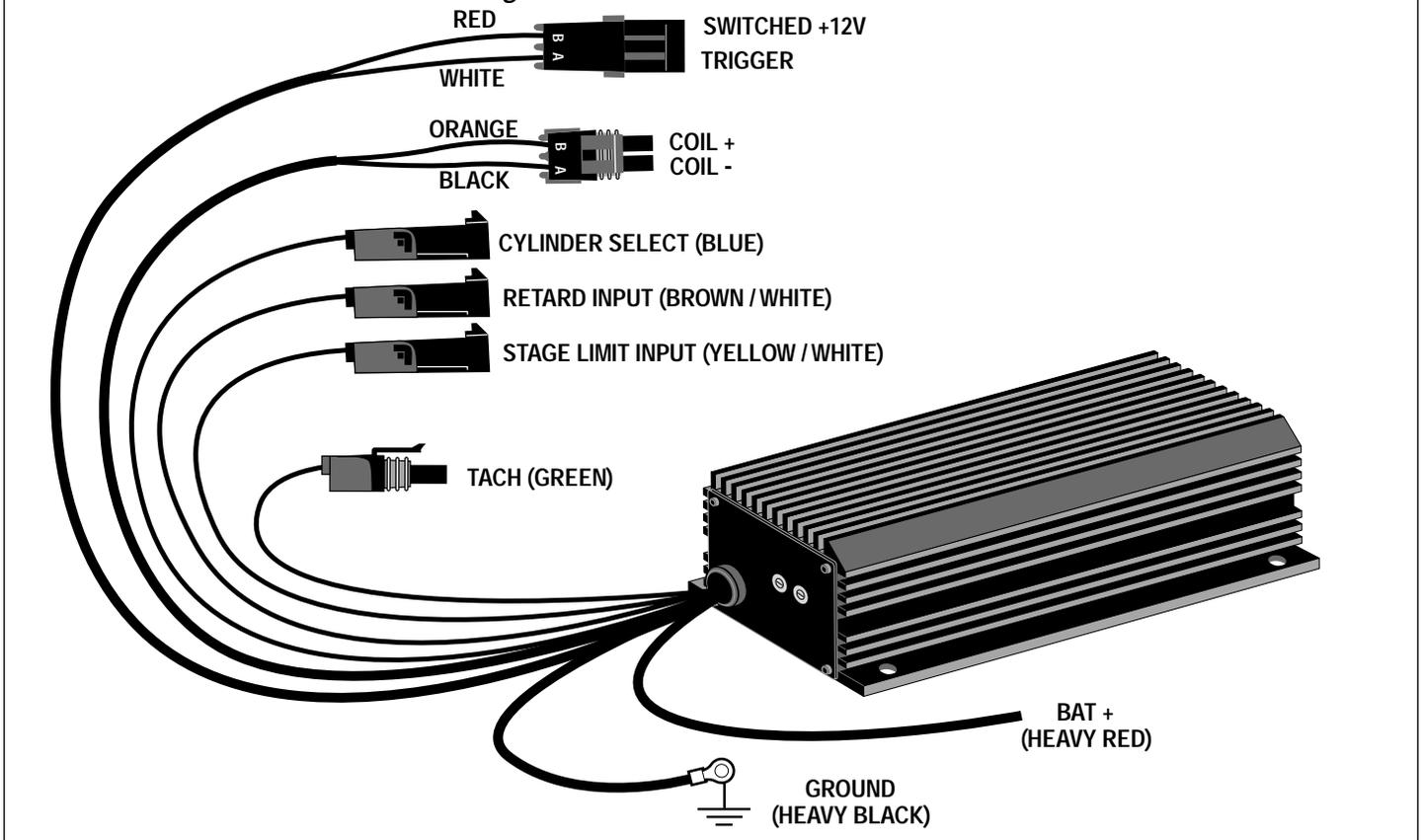
Under low RPM cranking conditions, the HI-6 generates up to 12 sparks. This assures quick starting even under the most adverse conditions. At idle and cruise, the number of sparks fired is adjusted to maintain a total spark duration of approximately 20 degrees (crankshaft), assuring smooth idle, improved throttle response, and eliminating the lean surge characteristic of some late model emission controlled

CAUTION: The HI-6 is not compatible with any odd firing engines or distributorless ignition systems. Use the HI-6DI² (part number 6000-6500) for distributorless ignitions.



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Figure 1. HI-6 Wire Identification



vehicles. Above 3,000 RPM, the HI-6 generates a single powerful spark with many times the spark gap current of most competitive systems.

DIGITAL SEQUENTIAL REV LIMITER

All HI-6 units have an externally activated stage rev limiter that can be digitally set from 600 to 9,900 RPM in 100 RPM increments via rotary switches. The yellow/white wire (yellow with thin white stripe) is used to activate the stage rev limiter. Since most late model vehicles have on-board engine control computers that set a safe maximum rev limit, the stage limit feature on the HI-6 can be used for selecting a lower rev limit for drag racing.

The rev limiter can be set to operate with 4, 6 or 8 cylinder engines. Accuracy is +/-30 RPM. The rev limiter is not compatible with any odd firing engines.

The HI-6 utilizes a sequential firing program to equalize cylinder firing at the rev limit. When engine RPM exceeds the rev limit, firing stops. The HI-6 counts the number of cylinder firings that are skipped. Once RPM drops below the rev limit, firing is resumed when the count reaches an odd number. If the engine is held against the rev limit, RPM will stay within a narrow band. All cylinders will be fired equally in rotation. Fuel loading and plug fouling will be greatly reduced. Sequential firing also minimizes harmonics and vibrations that can stress engine and drivetrain parts.

RETARD CAPABILITY

All HI-6 units have a timing retard capability. Several retard modes are supported including boost proportional retard. An optional TRC-2 Timing Retard Control module (6000-6425) is required to make use of the timing retard capability. The TRC-2 attaches to the brown/white wire (brown with thin white stripe). Refer to the TRC-2 section starting on page 17 for details.

TACH TEST FEATURE

The HI-6 includes a tach test feature that can be used to test tachometers and other RPM activated accessories connected to the HI-6 tach output (green wire). The tach test feature is described in greater detail in the tach hookup section starting on page 14.

DIAGNOSTICS

When the ignition switch is turned on, the HI-6 completes an internal diagnostic check and lights up the status LED. When the engine is cranked, the status LED will rapidly blink to indicate that a valid trigger signal is being received.

If certain failure modes occur, the HI-6 will shut off (engine stops running) and the status LED will continuously blink a diagnostic code, similar to a check engine light. The LED will blink a number of times followed by a 2

second pause. The number of blinks indicates the fault mode. Refer to the troubleshooting section starting on page 14.

COIL COMPATIBILITY

Most original equipment (OE) coils are compatible with the HI-6. We recommend the Crane Cams LX91, LX92, PS91, and PS92. The LX91 and PS91 are recommended for street applications. The LX92 and PS92 coils are recommended for race applications and are capable of continuous operation at 8,500 RPM and 85 degrees C (185 degree F) ambient temperature.

WARNING: High voltage is present at the coil primary and secondary terminals. Do not touch the coil while the engine is running. Do not connect any test equipment to the coil.

SPARK PLUGS AND WIRES

Do not use solid core wire, as this can generate electrical noise that may interfere with the HI-6 or other on-board computer and radio equipment. Do not use high resistance carbon wire, as this may burn out from the high energy levels. Optimum wire resistance is 300-800 ohms per foot.

For optimum performance in racing applications use only non-resistor spark plugs. Resistor spark plugs are required for all street applications unless recommended otherwise by vehicle manufacturer. Recommended plug gap is .045" for normally aspirated engines used for off-road racing.

CAUTION: Use only low resistance spark plug wires such as Crane FireWire.

MOUNTING THE HI-6

Preferred mounting location for the HI-6 is within the passenger compartment. If the HI-6 is mounted within the engine compartment, make sure that the mounting location is away from exhaust system heat, protected from water splash, and has good airflow for cooling. Orient the cable exit downward.

When you have picked a mounting location, make sure that the wire harness will reach and that the rev limit switches are accessible. Use the sheet metal screws provided in the parts bag to mount the unit. Rubber shock mounts are recommended for racing.

BASIC HOOKUP

This section provides generic hookup information that can be used for applications not specifically referenced in the Applications Index.

The HI-6 is supplied with Weather Pack connectors and a universal adapter harness (refer to Figures 1 and 2) that facilitate installation in most vehicles. **Please note that cutting off any Weather Pack connectors voids the HI-6 warranty.** The universal adapter harness uses melt liner type crimp splices to connect to the OE wiring. After crimping carefully heat the splices with a hot air gun or butane cigarette lighter to form a watertight seal.

Special adapter harnesses are available for popular Ford and GM applications. A parts bag with hardware and electrical terminals is provided for your convenience. All connections must be made with stranded copper wire. Make sure all terminals are clean and free of corrosion. Scrape off paint, dirt, and grease when making connections to ground. You will require common hand tools including proper wire stripping and Weather Pack crimping tools. Low cost Weather Pack crimping tools such as Pep Boys P/N 85363 are available at many auto parts stores. Do not attempt to use pliers to crimp terminals.

POWER AND GROUND

Heavy Red Connect to Battery+ or battery cable at starter solenoid. Use 3/8" ring terminal supplied.

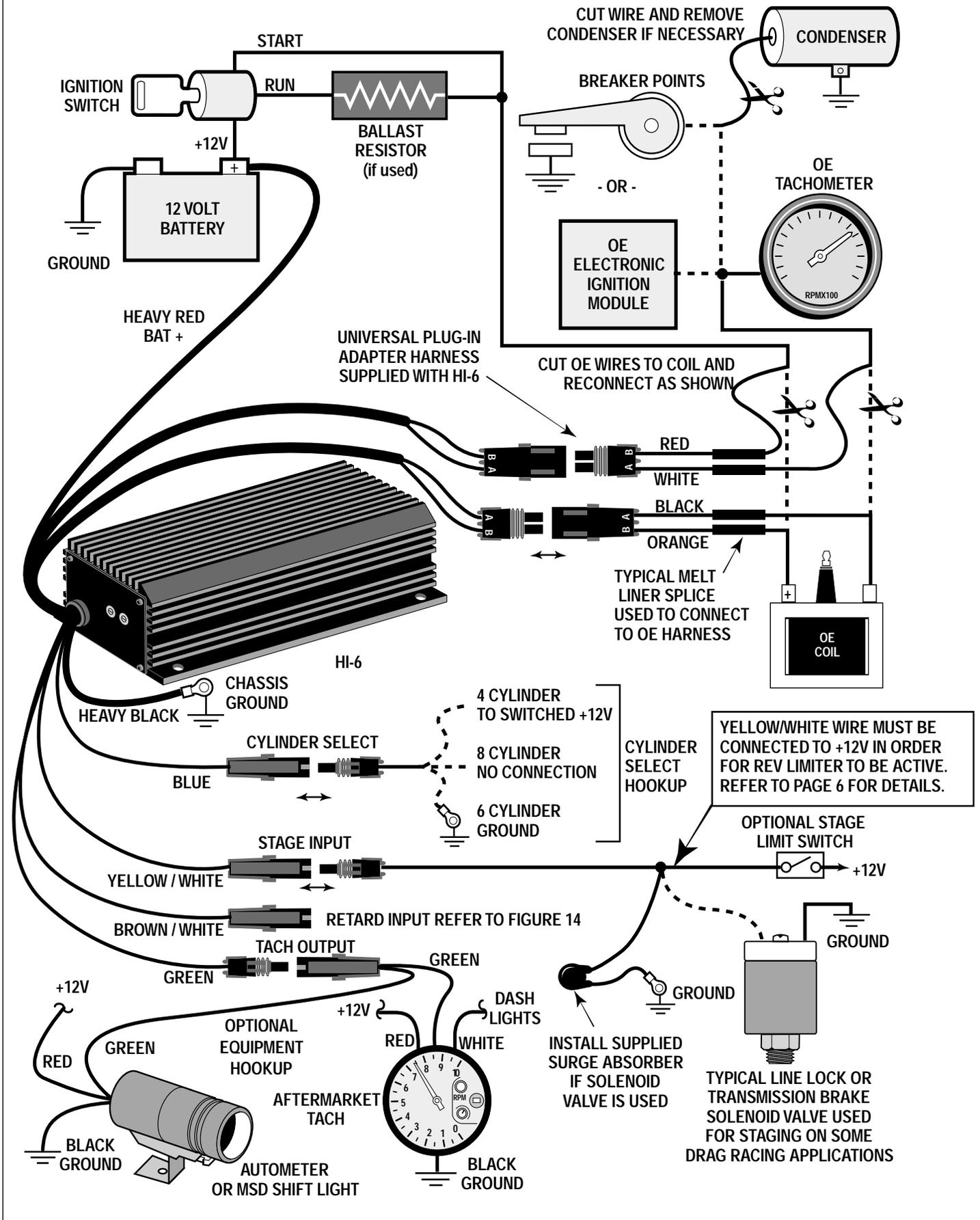
Heavy Black Connect to chassis ground. Scrape off paint to insure good contact. Use 3/8" ring terminal. Do not lengthen this wire.

CAUTION: If the heavy red wire must be extended, use 10 or 12 gauge copper wire and read the filter capacitor note on page 16.

COIL, SWITCHED +12V AND TRIGGER HOOKUP

Identify Coil- and Coil+. If you are unsure, refer to your vehicle wiring diagram or use the following procedure. Label and then disconnect OE wires from the coil. Turn the ignition switch on. Use a 12 volt test light or voltmeter. The wire from the ignition switch to Coil+ will be hot. Cut the wires several inches from the coil and connect to the HI-6 adapter harness as shown. If more than one OE wire goes to a given coil terminal, cut both wires and connect them to the HI-6 adapter harness. All OE wiring to the coil must be interrupted and routed through the HI-6 adapter harness.

Figure 2. Basic Hookup



CYLINDER SELECT

Blue Refer to Figure 2. Use a mating Weather Pack connector and length of wire from the parts bag:

8 cyl: Do not connect. Install a green cavity plug in the mating connector (no wire required).

6 cyl: Connect to ground with 1/4" ring terminal.

4 cyl: Connect to thin red switched +12V wire with 3M splice found in parts bag.

STAGE LIMIT INPUT

Yellow/White Yellow wire with thin white stripe. Refer to Figure 2. You must apply +12V to the yellow white wire to activate the rev limit. Otherwise no rev limiting will occur. Use a mating Weather Pack connector from the parts bag. Connect the wire to a normally open switch or direct to +12V using a 3M wire splice. If you are not using this input, you can install a green cavity plug in the mating connector.

CAUTION: If the stage limit switch also activates a line lock or transmission brake solenoid, you must install the supplied surge absorber as shown. Read the stage input noise suppression note on page 16

RETARD INPUT

Brown/White Brown wire with thin white stripe. Refer to the TRC-2 section starting on page 17. Connect to the TRC-2 using a mating Weather Pack connector from the parts bag. If you are not using this input, you can install a green cavity plug in the mating connector.

TACH OUTPUT

In most cases the OE connections to the tach are made to the Coil- terminal. Sometimes these connections are within the wire harness and are not brought out to Coil- as separate wires. If you connected all OE wires that went to Coil- to the white wire on the HI-6 adapter harness as shown in Figure 2, your tach and fuel injection should continue to function. Connect an aftermarket tach or RPM activated accessory switch to the HI-6 green tach output wire as shown in Figure 2. Use a mating Weather Pack connector from the parts bag. If you are not using this output, you can install a green cavity plug in the mating connector. Some tachs may require an adapter. Refer to the Tach Hookup section on page 14 for details.

HOOKUP INSTRUCTIONS FOR SPECIFIC APPLICATIONS

VEHICLES WITH HALL EFFECT SYSTEMS

Many late model vehicles, especially European vehicles, have OE Hall Effect ignition systems. Use the universal adapter harness supplied with the HI-6 and the basic hookup shown in Figure 2 and explained starting on page 3. The Hall Effect pickup cannot directly trigger the HI-6; the OE module must be functioning correctly and remain installed.

1972-86 MOPAR VEHICLES WITH 4 OR 5 PIN MODULES

Use the universal adapter harness supplied with the HI-6 and the basic hookup shown in Figure 2 and explained starting on page 3. All these Mopar vehicles have a ceramic ballast resistor mounted on the firewall. Five pin modules use a four terminal ballast resistor. The ballast resistor also supplies power to the five pin module. Bypassing the resistor may damage the module.

FORD VEHICLES WITH TFI-IV ELECTRONIC IGNITION

These applications will require optional adapter harness P/N 6000-6707. Use the adapter harness to make the power, coil, and trigger connections as shown in Figure 3. Then follow the instructions starting on page 3 and refer back to Figure 2 to hookup the ground wire, cylinder select, and any additional inputs.

FORD VEHICLES WITH DURASPARK ELECTRONIC IGNITION

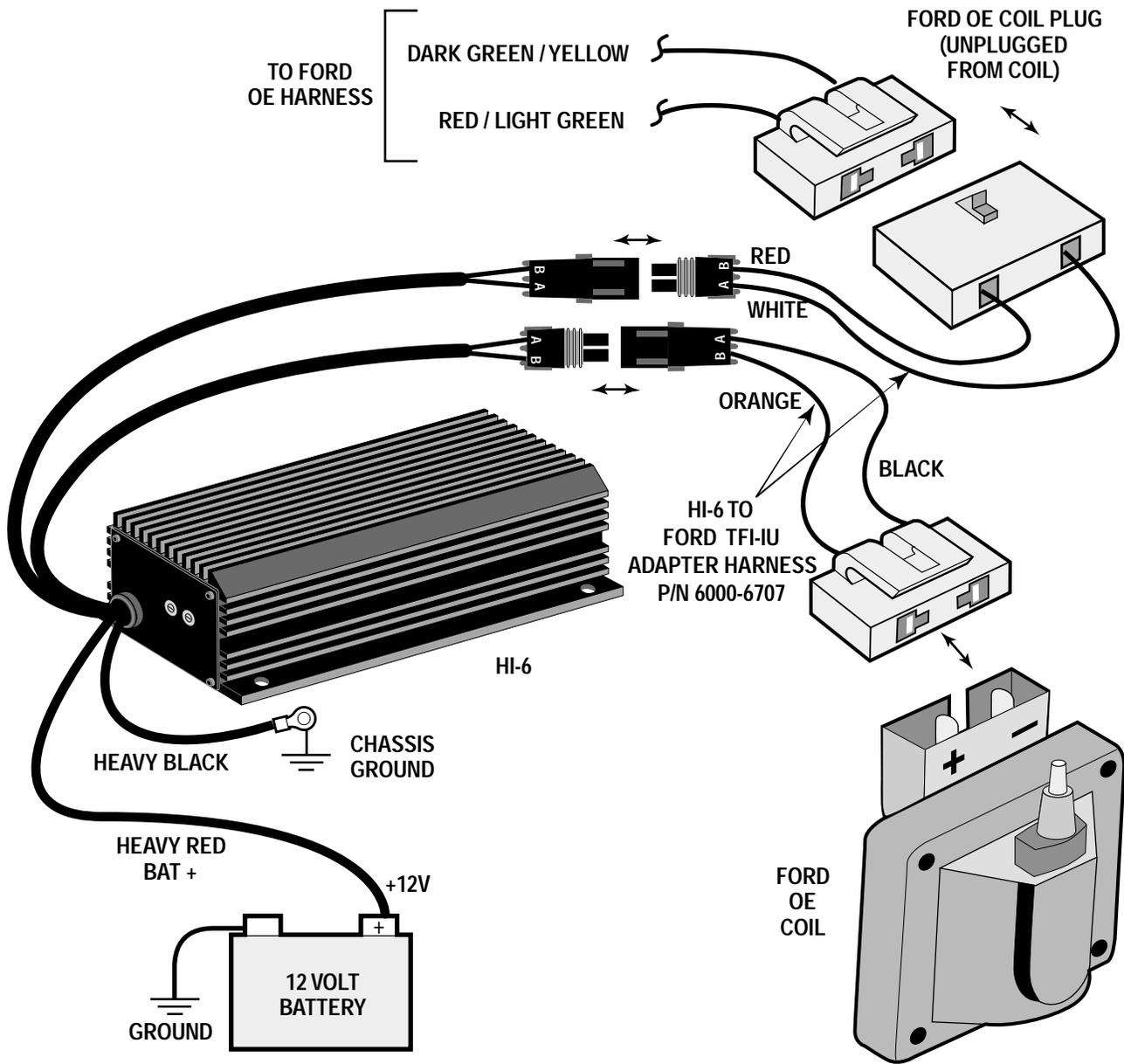
Use the universal adapter harness supplied with the HI-6 and the basic hookup shown in Figure 2.

GM VEHICLES

Note that the HI-6 part numbers covered by this instruction sheet cannot be used with early GM vehicles with 4 or 5 pin HEI modules (typically 1974-1980 model years and distributor with vacuum advance). GM HEI systems with vacuum advance require triggering directly from the magnetic pickup. Use the Crane HI-6R CD system (P/N 6000-6400) for these early GM HEI applications.

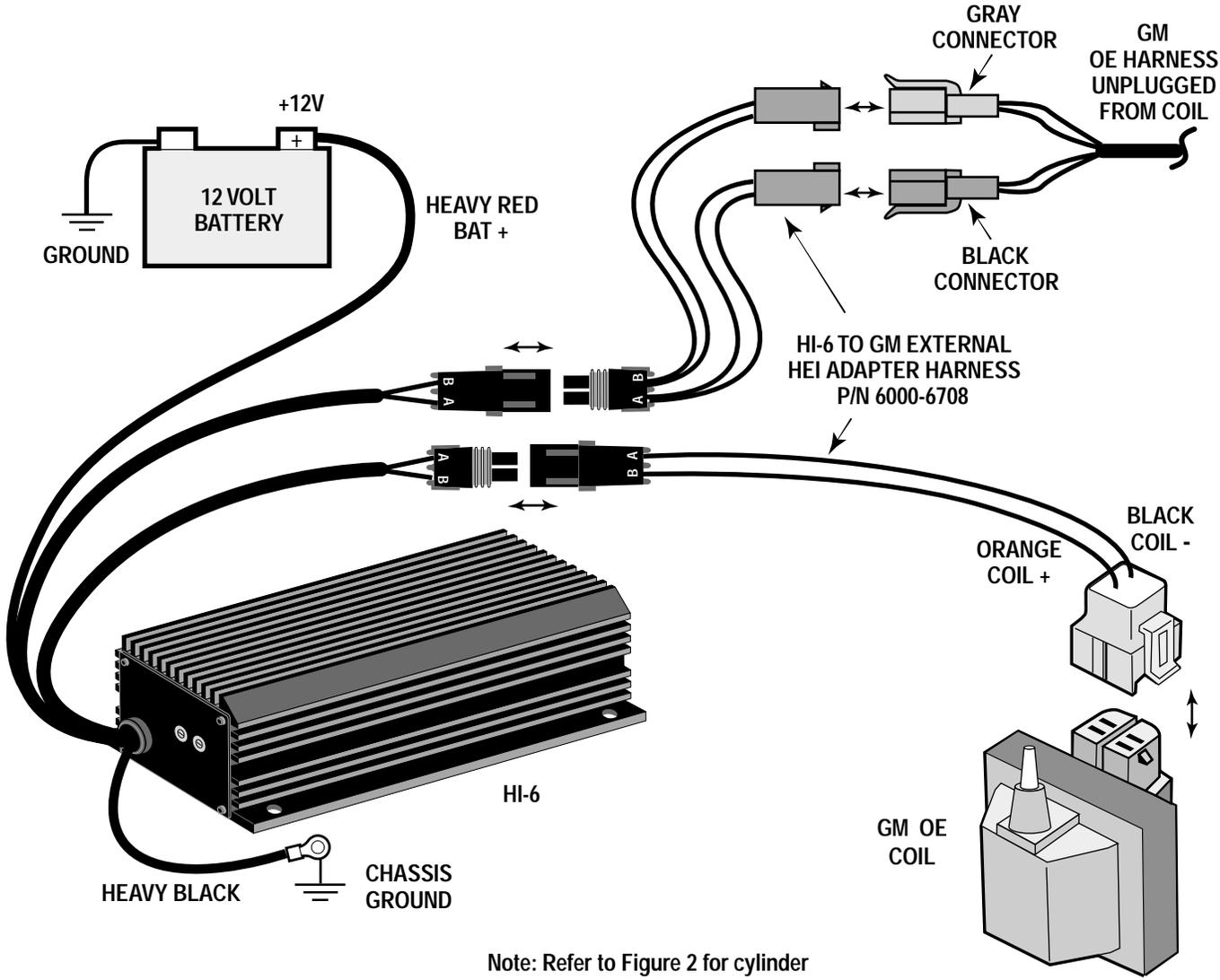
GM applications will require an optional adapter harness. Use P/N 6000-6713 for coil-in cap HEI (refer to Figure 4), P/N 6000-6708 for dual plug external coil (refer to Figure 5), and P/N 6000-6709 for LT-1 applications (refer to Figure 6). Use the adapter harness to make the power, coil, and trigger connections as shown in Figures 4-6. Then follow the instructions starting on page 3 and

Figure 3. Ford TFI-IV Hookup



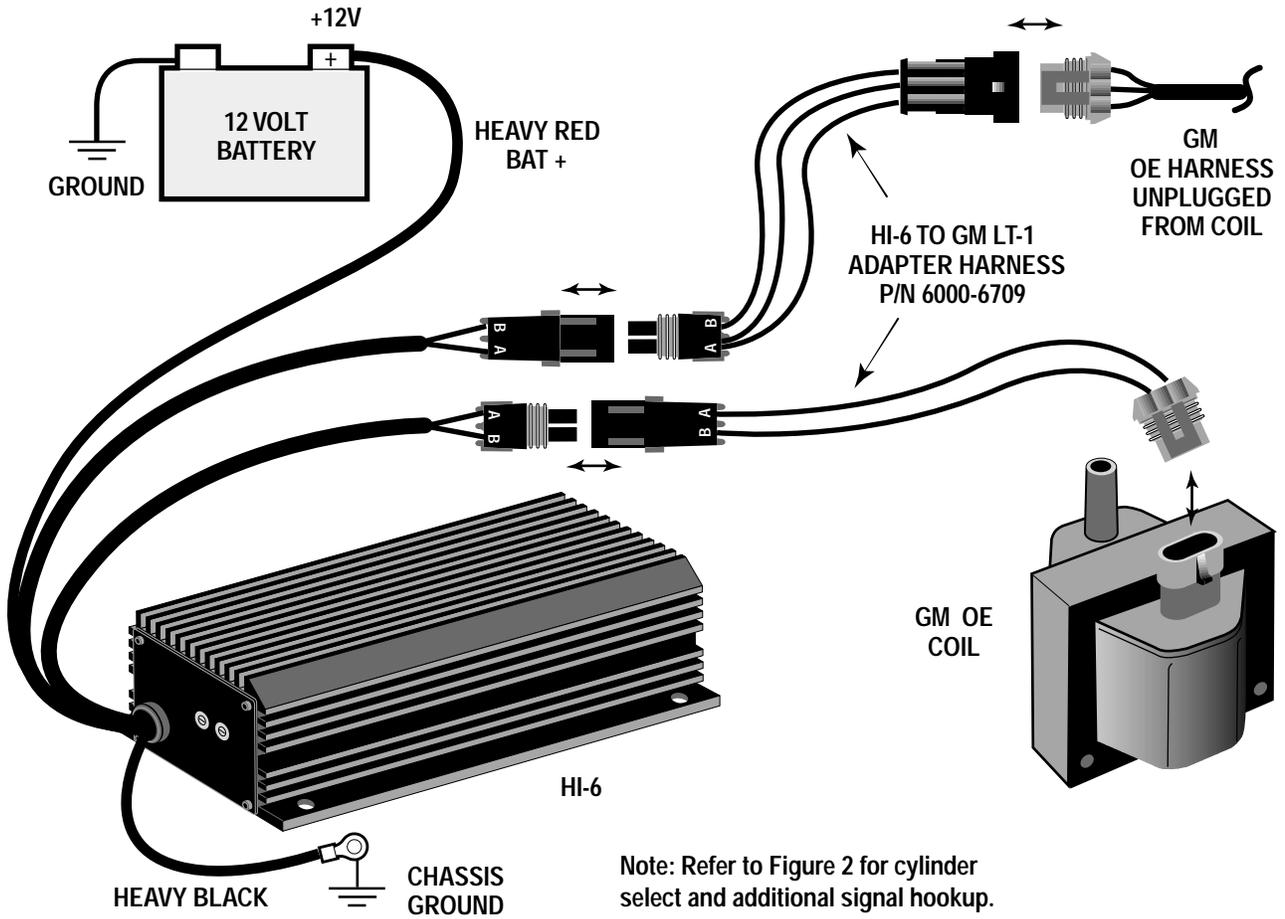
Note: Refer to Figure 2 for cylinder select and additional signal hookup.

Figure 5. GM Dual Plug Coil Hookup



Note: Refer to Figure 2 for cylinder select and additional signal hookup.

Figure 6. GM LT-1 Hookup



refer back to Figure 2 to hookup the ground wire, cylinder select, and any additional inputs.

HONDA AND ACURA INTEGRA

Late model Honda and Acura Integra have either a distributor with internal coil or an external coil. The OE internal coil is not suitable for use with the HI-6 and must be replaced with a Crane LX91 or PS91. Internal coil distributors can easily be converted to external coil by changing the distributor cap. Detailed instructions are given in the following sections.

HONDA EXTERNAL COIL HOOKUP

Use the universal adapter harness supplied with the HI-6 and the hookup shown in Figure 7 to make the power, coil, and trigger connections. Then follow the instructions starting on page 3 and refer back to Figure 2 to hookup the ground wire, cylinder select, and any additional inputs.

Note that some Honda OE coils have only a single plug. Identify wires and connect similar to Figure 7. Switched +12V that went to Coil+ is connected to the red HI-6 adapter harness wire and the trigger signal from the ignition module and any tach wire that went to Coil- are connected to the white HI-6 adapter harness wire.

HONDA INTERNAL COIL CONVERSION

Refer to Figure 8. You will require an external coil distributor cap. Crane offers a range of cap adapters to fit most 1988-2000 models. The Crane cap adapters are predrilled and include all required installation hardware. Check our web site for the most up to date applications information. Crane P/N 730-0694 covers the same applications as Honda OE P/N 30102-PT3-A12.

Remove the distributor cap and dust shield. You should keep the dust shield for high boost turbo applications as it reduces the possibility of arcing. You may have to modify it to fit the new cap. Carefully note the OE wiring within the distributor. Remove the OE coil (held in place with two screws). Install a 2 position terminal block as shown. This is supplied with the Crane adapter kit or you can use Radio-Shack P/N 274-656. Tie wrap the terminal block to one of the coil mounting holes or fabricate a support bracket from aluminum channel material. Connect the OE coil wires to the terminal block as shown.

Use the universal adapter harness supplied with the HI-6 and the hookup shown in Figure 8 to make the power, coil, and trigger connections. Then follow the instructions starting on page 3 and refer back to Figure 2 to hookup the ground wire, cylinder select, and any additional inputs.

If you did not purchase a Crane adapter kit, you will have to fabricate a high voltage cable for use between the coil and new distributor cap.

AFTERMARKET IGNITIONS

Crane XR700 and XR3000 and other aftermarket points conversion systems such as the Mallory Unilite, are compatible with the HI-6.

Aftermarket CD systems such as Accel, Holley, Jacobs, Mallory and MSD-6 units are not compatible with the Crane HI-6. Remove these aftermarket units and then use the HI-6 hookup recommended for the particular vehicle.

VEHICLES WITH MALLORY UNILITE

Use the hookup shown in Figure 9 if you are adding an HI-6 to a vehicle equipped with a Mallory Unilite system.

Tach and fuel injection: in most cases the tach and fuel injection (if equipped) wires would originally have been connected to Coil-. Trace out these wires and connect them to the green tach output wire from the HI-6. If this doesn't work, you may need tach adapter P/N 6000-8910.

VEHICLES WITH CRANE XR700 AND XR3000

Use the basic hookup shown in Figure 2 and treat the Crane XR700 or XR3000 as if it were the OE ignition module. The yellow wire from the XR700 or XR3000 will be used to trigger the HI-6 white wire. Additional details are given in the XR700 or XR3000 instructions.

Tach and fuel injection: in most cases the tach and fuel injection (if equipped) wires would originally have been connected to Coil-. Trace out these wires and connect them to the green tach output wire from the HI-6. If this doesn't work, you may need tach adapter P/N 6000-8920.

EARLY VEHICLES WITH POINTS

Directly triggering the HI-6 from mechanical breaker points is possible but not recommended, due to problems with points bounce and wear. If you must trigger from points, use the hookup shown in Figure 2. Be sure to remove the condenser. You will no longer be able to use a dwell meter. However, the points gap is not critical when the points are only used for triggering and do not carry any coil current. Use a feeler gauge and set the points gap to .016".

A much better approach is to replace the mechanical breaker points with an optical trigger system, such as

Figure 7. Honda External Coil Hookup

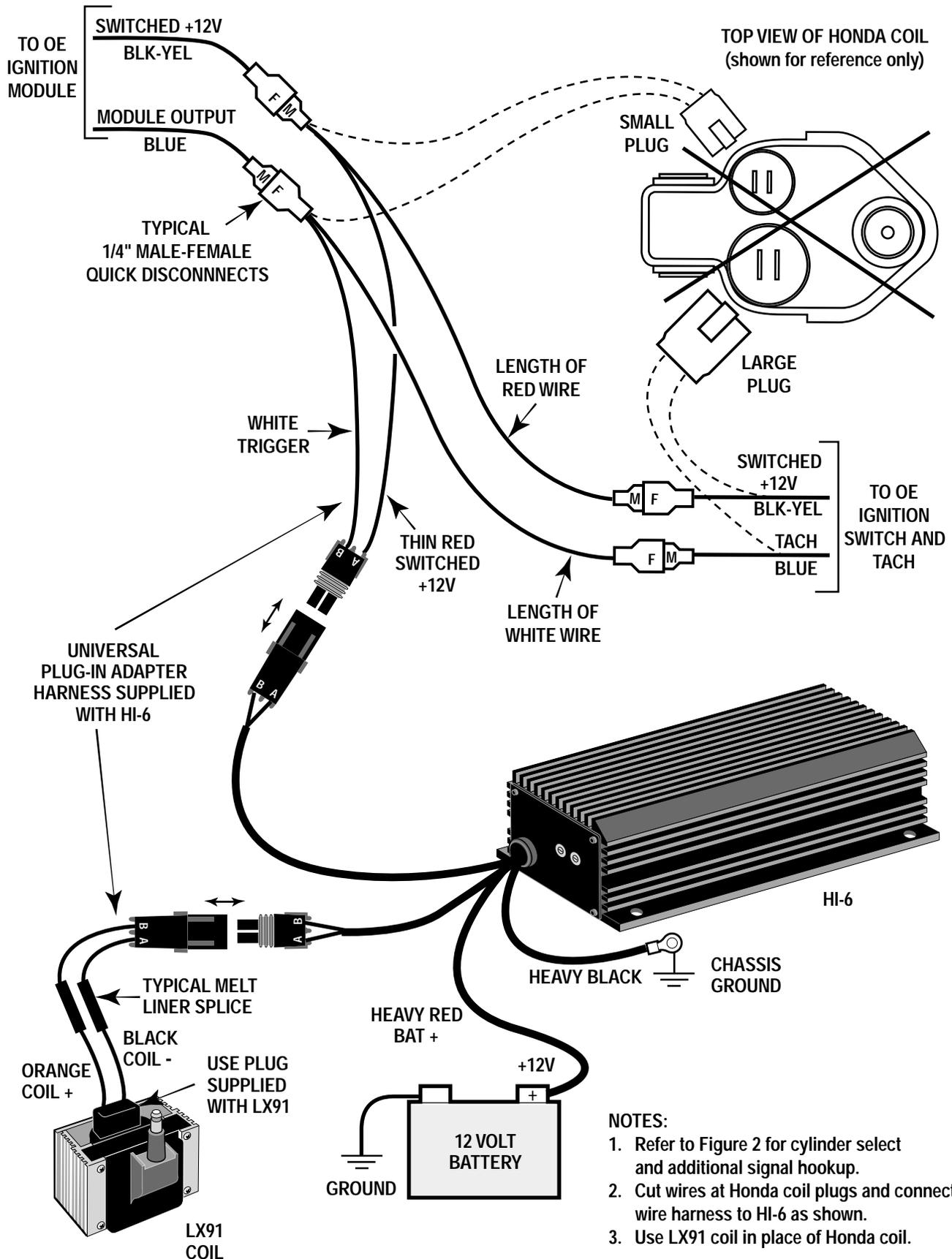
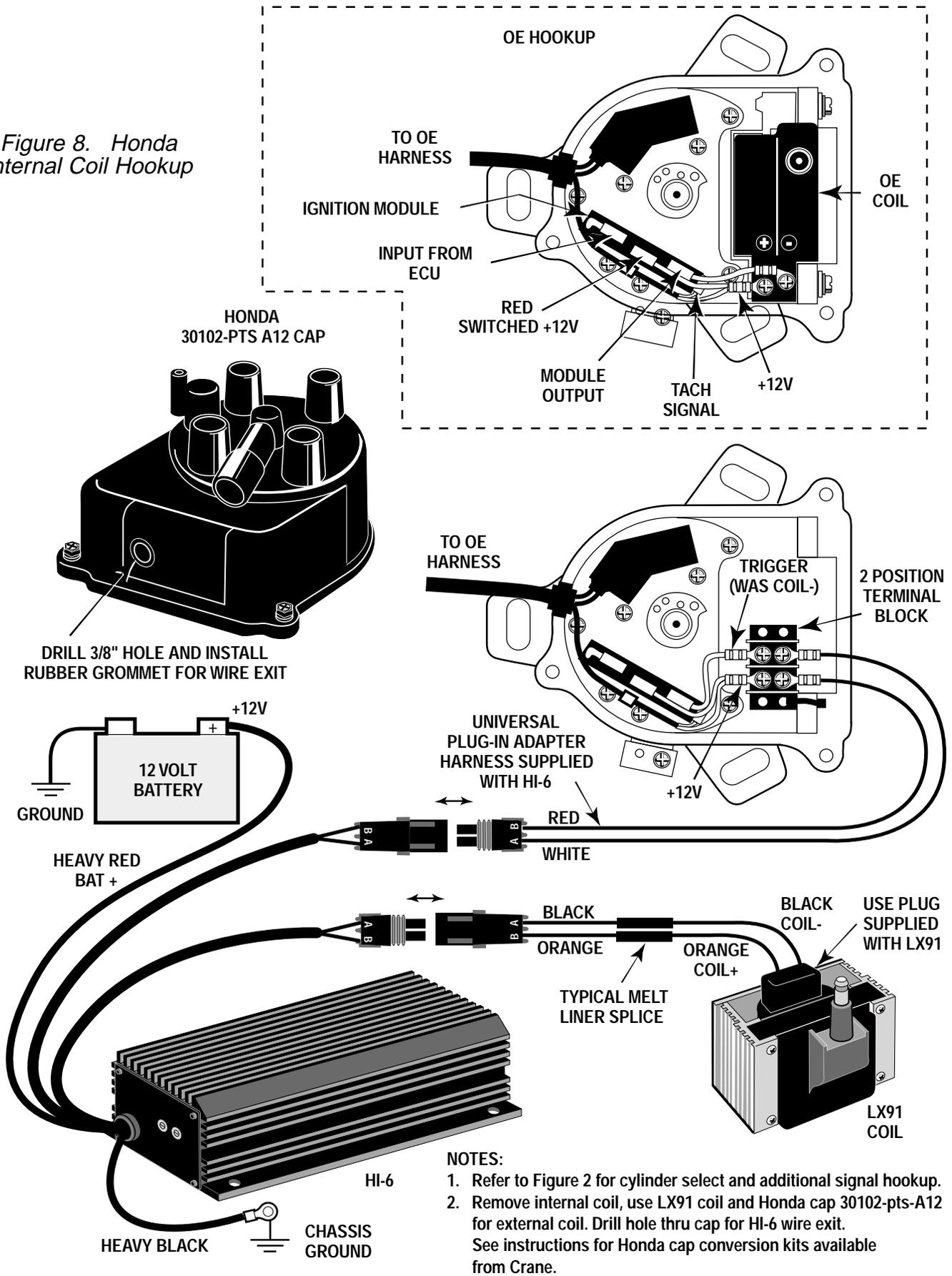


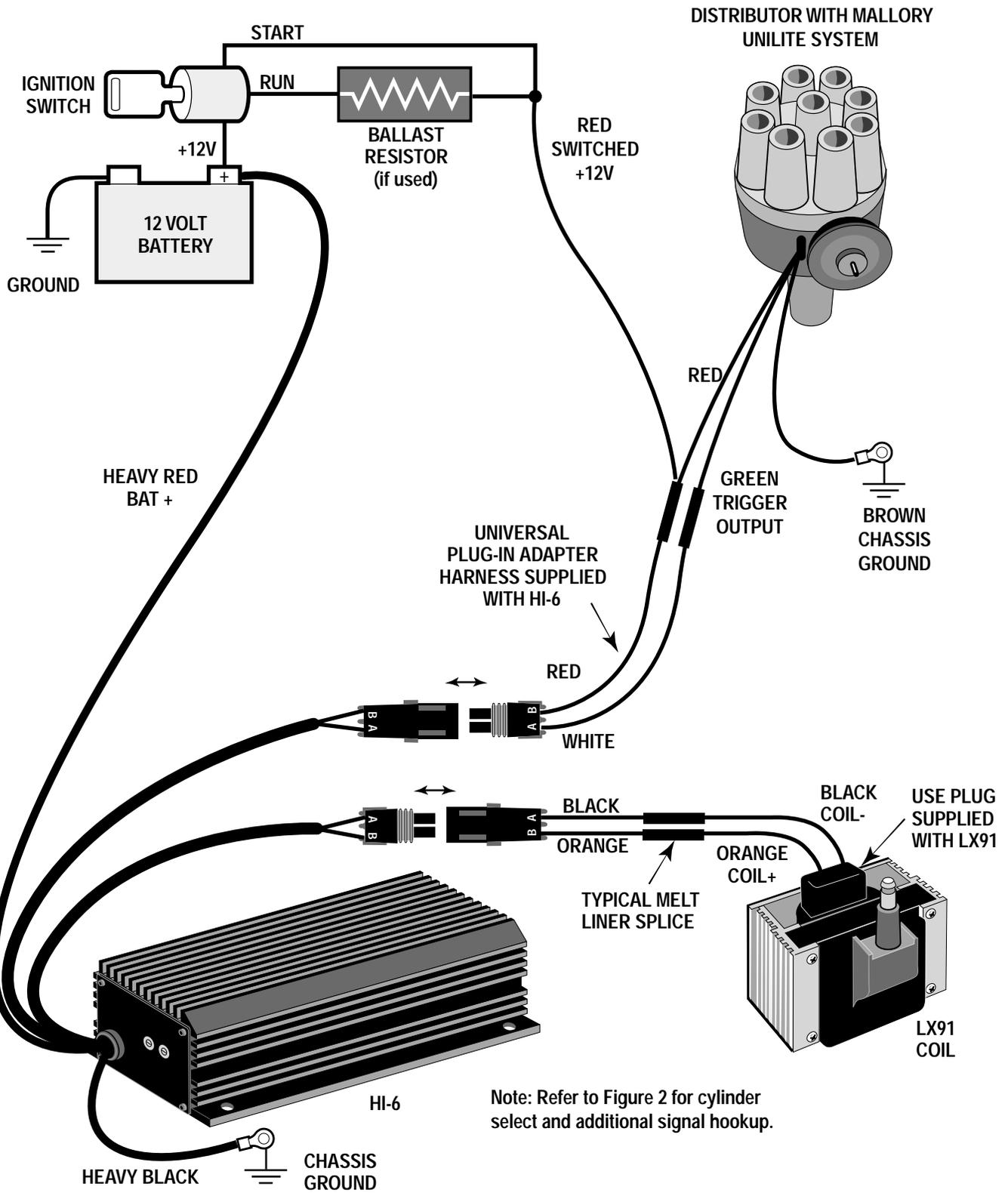
Figure 8. Honda Internal Coil Hookup



NOTES:

1. Refer to Figure 2 for cylinder select and additional signal hookup.
2. Remove internal coil, use LX91 coil and Honda cap 30102-pts-A12 for external coil. Drill hole thru cap for HI-6 wire exit. See instructions for Honda cap conversion kits available from Crane.

Figure 9. Mallory Unilite Hookup



Crane P/N 715-0020. This will provide more stable timing and extend the RPM range.

FINAL CHECK

Before starting the engine for the first time, double check all electrical connections and set a safe rev limit. Start the engine and check the ignition timing. The timing may change a few degrees after HI-6 installation. If required, reset timing to manufacturer's specifications.

REV LIMITER

Rev limiter is activated only if +12V is applied to stage limit input. Select a safe stage rev limit that is less than the red line for your engine. Set the rotary switches on the HI-6 to the selected stage rev limit. Settings are X100 engine RPM (i.e. 57 = 5,700 RPM). The rev limit can be set over the range of 600 to 9,900 RPM. Use the small screwdriver supplied in the parts bag to set the switches. Special switch settings are:

- 00** Disables the internal rev limiter and allows operation above 9,900 RPM.
- 01** Disables multiple spark and internal rev limiter.
- 02** Disables the internal rev limiter and timing retard. Special compatibility mode for external Crane rev limiters and engine controls.
- 03** Tach test step mode. Causes tach to step from 1,000 to 10,000 RPM in 1,000 RPM increments.
- 04** Tach test ramp mode. Causes tach to slowly ramp from 200 to 10,000 RPM.
- 05** Not used.

The HI-6 reads rev limit settings when ignition power is first turned on. If you change the rev limit setting, you must turn the ignition switch off momentarily for the new setting to become effective.

TROUBLESHOOTING

TACH TEST FEATURE

Selection of the tach test mode is explained in rev limiter section above. During tach test mode, the green tach wire is used to output a tach test signal when the ignition switch is turned on. Note that the engine will not run if tach test mode is selected. To leave tach test mode, you must change back to normal rev limit switch settings and turn the ignition switch off and then on again so the HI-6 will read the new switch settings.

All HI-6 units have step and slow ramp tach test modes. The step mode is useful for quickly testing accuracy and transient response of the tach. Slow ramp mode is useful for testing RPM activated accessories such as a

shift light. The tach test feature cannot be used if an external Crane rev limiter is connected to the blue cylinder select wire. Note that the test feature can only be used if the tach is connected to the HI-6 green tach output wire.

TACH HOOKUP

Most factory and aftermarket tachs will work correctly when connected using the instructions given in the previous hookup sections. If you are adding an aftermarket tach or shift light, refer to Figure 2 for hookup. If your tach will not work:

1. Trace the original tach trigger wire or refer to service manual. If it was connected to Coil-, you can connect it to the green HI-6 tach output wire. If the original tach wire was connected to Coil+, you will require tach adapter P/N 6000-8920.
2. GM vehicles have an inline tach filter (refer to Figure 10). On vehicles with HEI coil-in-cap, trace the wire from the TACH terminal on the distributor cap. All others, trace wires from Coil-. Locate the filter and disconnect it. Then connect the tach as explained in step 1 above.
3. If your tach still does not work, you may require a tach adapter. If your HI-6 is triggered via the white wire from points or the output of an electronic system, you should use P/N 6000-8910. If your HI-6 is triggered via the magnetic pickup cable from a magnetic pickup or crank trigger, you should use P/N 6000-8920.

FUEL INJECTION AND FUEL PUMP RELAYS

Some import vehicles are equipped with electronic fuel injection or a fuel pump cut-out relay. These systems require a RPM signal the same as the tach. If the engine will not start, first try installing a tach adapter as described in the previous section.

Japanese vehicles with fuel injection will require a module trigger hookup where the HI-6 white wire is connected to the output of the OE electronic ignition. In most cases, the fuel injection will not function unless Crane Tach Adapter P/N 6000-8910 is installed.

RUNNING ON

Running on is a condition where the engine continues to run after the ignition switch is turned off. First, verify that the condition is due to the ignition system. Dieseling can

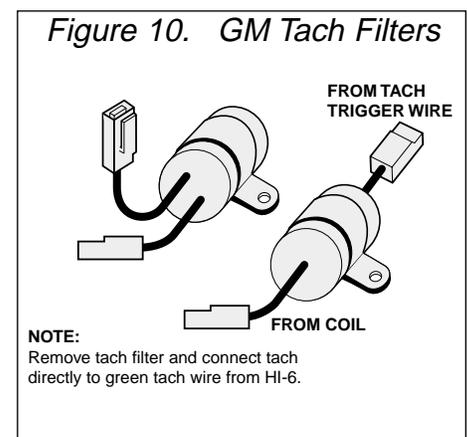
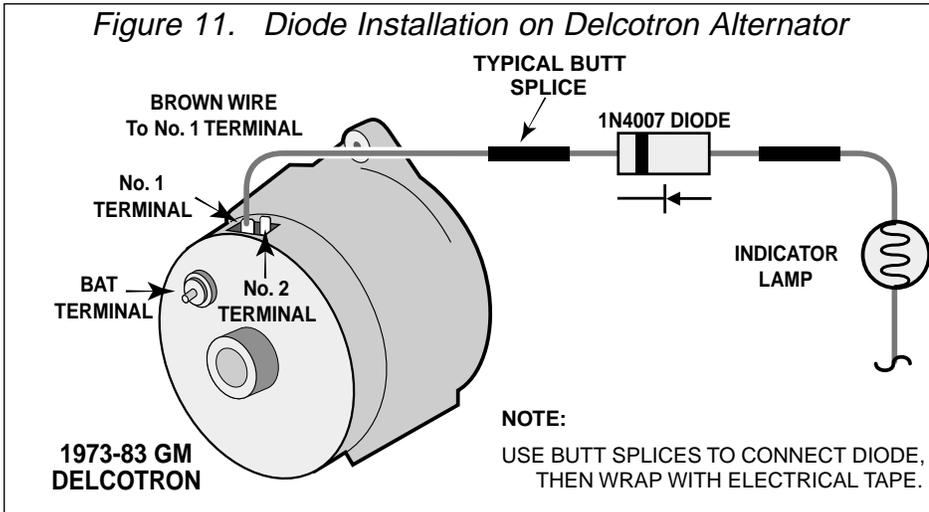


Figure 11. Diode Installation on Delcotron Alternator

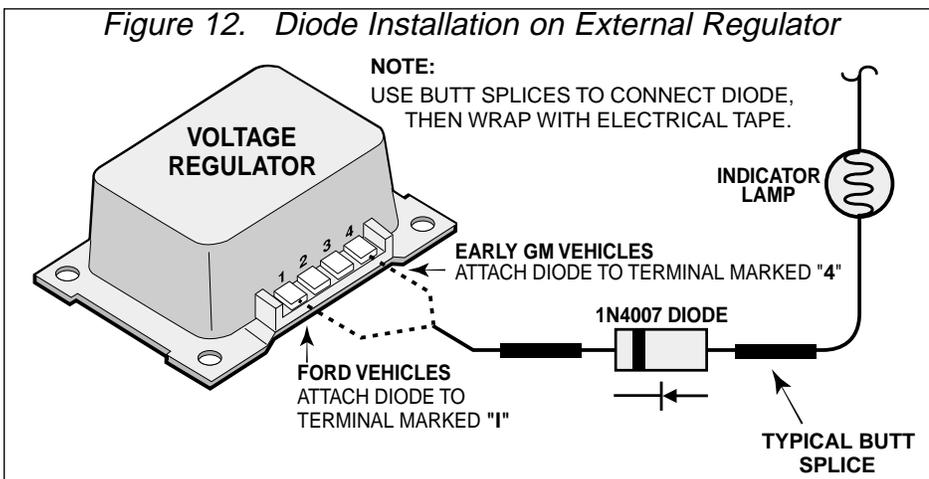


run on is caused from current leaking back to the HI-6 through the charging system indicator. To solve this problem, install the diode supplied in the parts kit on the voltage regulator.

GM vehicles with Delcotron alternator and internal regulator: refer to Figure 11. Install the diode in the thin brown wire going to the indicator light.

GM or Ford with external voltage regulator: refer to Figure 12. For GM vehicles, install the diode on the #4 terminal. For Ford vehicles, install the diode on the terminal marked "I".

Figure 12. Diode Installation on External Regulator



Installation of the diode may not correct the run on problem on some AMC vehicles. Refer to Figure 13. Use a 1973-76 Chrysler dual ballast resistor (available at most parts stores). Solder a jumper wire across both terminals on one end. Then connect the terminals on the other end to ground and to the red ignition switch wire from the HI-6.

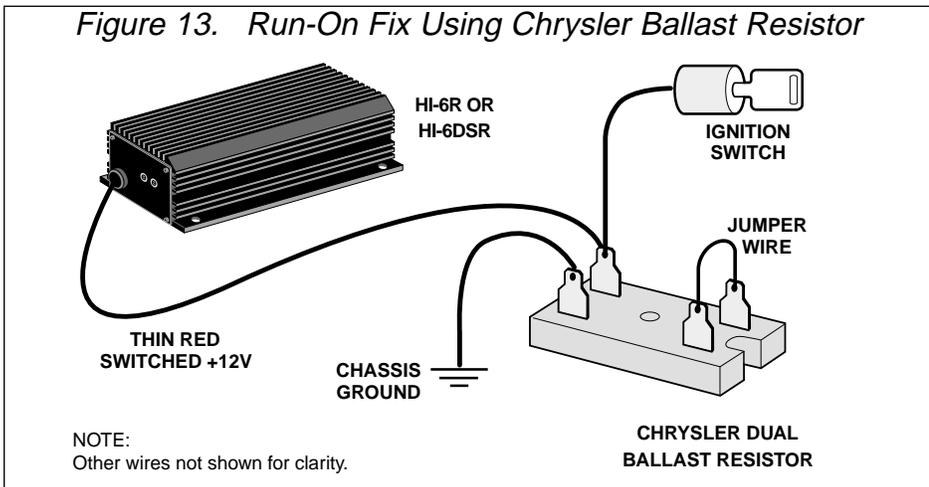
RADIO NOISE

A powerful multiple spark system such as the HI-6 will tend to generate more noise than the OE ignition. To some extent this is unavoidable, but steps can be taken to reduce the noise level.

Radio frequency (RF) noise is radiated from coil and spark plug wires. RF noise primarily affects AM and CB radios. Conducted noise appears as a whine that follows engine RPM and may affect all systems including tape players and FM radio. Use the following check list to reduce RF noise:

1. Make sure a ground strap is installed between the engine and chassis.
2. Make sure that radio, tape and CB systems are grounded direct to the chassis.
3. Mount the HI-6 unit as far away as possible from the antenna (including windshield antenna) and other electronic devices. Make sure the HI-6 is grounded direct to the chassis. Keep the ground wire short, preferably no more than 6".

Figure 13. Run-On Fix Using Chrysler Ballast Resistor



cause running on. The engine will run very rough when it is dieseling. This may be due to an overly rich mixture, excessive timing, or heavy carbon deposits. Dieseling can usually be cured by installing colder spark plugs.

With ignition run on, the engine continues to run smoothly, as if the ignition had not been turned off. Ignition

4. Replace spark plug wires with spiral core type wire. Replace rotor and cap. Apply a small amount of silicone dielectric grease to the rotor tip and to all high voltage terminals. Use only resistor spark plugs when running on the street.

Conducted noise from the HI-6 is carried through +12 volt power connections. Conducted noise can be reduced by installing a power line noise filter (available at Radio Shack) near the affected radio.

NOISE SUPPRESSION ON STAGE LIMIT INPUT

In some applications the stage input (yellow/white wire) is connected to a switch that also controls a line lock or transmission brake solenoid valve. When the switch opens and current flow to the solenoid is interrupted, electrical transients (up to 500 volts) occur. These transients can lead to glitches in on-board electronics. Arcing also occurs in switch contacts greatly decreasing switch life and possibly resulting in erratic operation. This may cause inconsistent launch and 60 foot times.

The solution is to install the supplied surge absorber. It will limit the maximum voltage to about 40 volts. The surge absorber appears as a small 1/2 inch diameter disk with two wire leads. Solder one lead to the stage switch and the other lead to a terminal that connects to ground as shown in Figure 2.

POWER SUPPLY FILTER CAPACITOR HOOKUP

A filter capacitor on the 12 volt supply is recommended if the HI-6 power wires are extended, the battery is located in the trunk, or solenoid valves drawing more than 10 amps are used. Use a minimum 38,000 microfarad (uF) 16 volt capacitor such as Crane P/N 9000-0014. Install the capacitor across the 12 volt supply (heavy red wire) and chassis ground near the HI-6 unit.

TROUBLESHOOTING HI-6 OPERATION

Did the engine run properly before installation of the HI-6? If not, remove the HI-6, reinstall the OE ignition or another known good unit and then find and correct the original problem. Did the HI-6 function correctly before the problem occurred? If the answer is yes, did you change anything that may have affected it? If you connected an external control or changed ignition coils, 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 check list steps:

INTERNAL DIAGNOSTICS

When the ignition switch is turned on, the HI-6 completes an internal diagnostic check and lights up the status LED. When the engine is cranked, the status LED

will rapidly blink to indicate that a valid trigger signal is being received.

If certain failure modes occur, the HI-6 will shut off (engine stops running) and the status LED will continuously blink a diagnostic code, similar to a check engine light. The LED will blink a number of times followed by a 2 second pause. The number of blinks indicates the fault mode:

1 Blink: Power supply fault on initial power up. This may indicate that the coil connections are directly shorted to ground. Turn the ignition switch off, disconnect the coil primary wires and temporarily tape them up. If the same fault reoccurs when the ignition switch is turned on again, the HI-6 has failed.

2 Blinks: Power supply leakage on initial power up. This may indicate that coil wire insulation has broken down or that the coil secondary has a short to ground. Turn the ignition switch off, disconnect the coil primary wires and temporarily tape them up. If the same fault reoccurs when the ignition switch is turned on again, the HI-6 has failed.

3 Blinks: Coil short to ground during operation. This may be caused by an intermittent fault in the coil or wiring. Turn the ignition switch off, disconnect the coil primary wires and temporarily tape them up. If fault codes 1 or 2 occur when the ignition switch is turned on again, the HI-6 has failed.

4 Blinks: Coil primary short during operation. The two coil primary wires are shorted together or the coil has an internal short across the primary. Turn the ignition switch off, disconnect the coil primary wires and temporarily tape them up. If fault codes 1 or 2 occur when the ignition switch is turned on again, the HI-6 has failed.

5 Blinks: Coil primary open during operation. This fault will occur only if the coil primary connection is broken (open) while the engine is running.

NO STATUS LED WHEN IGNITION IS ON

If the status LED doesn't light up after the ignition switch is turned on, check power and ground connections. Use a volt meter to verify +12 volts at the two HI-6 red wires. Make sure you also have +12 volts when the ignition switch is in start position. The HI-6 requires a minimum voltage of about +9.5 volts when the ignition switch is first turned on. During cranking, the HI-6 will continue to operate down to about +5 volts.

ENGINE WILL NOT START

1. If the status LED lights up when the ignition switch is turned on but the engine will not start, verify that the status LED blinks while the engine is cranking.
2. If the status LED doesn't blink, the HI-6 is not receiving

a trigger signal. Recheck trigger signal electrical connections and trigger source. Make sure the magnetic trigger leads are not shorted together or to ground. Make sure the white points trigger wire is not shorted to ground.

3. If the status LED blinks, but engine will not start, recheck coil primary connections or replace coil. The only wires going to the coil primary should be the orange and black wires from HI-6 coil cable. Note: GM internal HEI coils require a ground wire that grounds the secondary and core to the distributor.
4. If the engine momentarily starts and then dies, go back to the Fuel Injection And Fuel Pump Relay section on page 14.

CHECKING FOR SPARK

To crank the engine without starting or to check for spark, use a KD Tools HEI test plug. The test plug comes with an alligator clip that can be attached to chassis ground. Make up a length of spark plug wire to connect the test plug to the coil.

WARNING: High voltage is present at the coil primary and secondary Terminals. Do not touch the coil while the engine is running. Do not connect any test equipment to any coil terminal.

MISFIRE OR INTERMITTENT OPERATION

1. A weak battery may cause misfire or intermittent operation, especially at high RPM, if battery voltage drops below +10 volts. If in doubt, charge or replace the battery.
2. Field experience has shown that misfire at high RPM is usually not an electrical problem within the HI-6. Coil failure, including internal arcing or arcing at the high voltage terminal, is a common cause. Arcing across spark plug boots or the distributor cap is also common.
3. Route all magnetic trigger connections away from any other wiring, especially HI-6 coil cable and any high voltage coil and spark plug wires.
4. Replace spark plugs. Check that spark plugs are proper type, heat range, and gap size.
5. Replace distributor high voltage rotor and cap.
6. Replace spark plug wires. Do not use solid core wires or high resistance wires. Use only spiral core type wires.
7. Check for loose or corroded connections and broken wires at magnetic pickup, HI-6 unit, coil, and distributor cap. Also check distributor for loose, missing, or jamming parts in pickup or advance mechanism (if used). Magnetic pickups and crank trigger: check for proper air gap.

TRC-2 TIMING RETARD CONTROL INSTALLATION AND OPERATION

The Crane Cams TRC-2 is an accessory for HI-6 systems that provides driver-adjustable retard. The TRC-2 can provide continuous timing retard (0° - 20°), retard using a switch (0° - 20°), or retard proportional to boost (up to 4° per psi) on supercharger or turbocharger installations (with an optional MAP sensor, not included).

INSTALLATION

Complete the installation of the HI-6 ignition module prior to installing the TRC-2. Figure 14 shows hookup of the TRC-2 to the HI-6. The red wire from the TRC-2 is connected to a key switched +12 volt supply. You may splice it into the thin red wire on the HI-6. The yellow wire from the TRC-2 is connected directly to ground for continuous retard control, through a boost/nitrous switch to ground for retard on demand, or taped off when using the optional MAP sensor. When using retard on demand, the switch must complete the circuit to ground to activate the retard (use a normally open switch or relay).

FINAL CHECK

Before starting the engine for the first time, double check all electrical connections. Set the TRC-2 knob to 0° (fully counterclockwise), then start the engine and check the ignition timing. The timing may change a few degrees after installation. Reset timing to manufacturer's specs. Upon starting the engine, the LED on the TRC-2 module will be lit only if the yellow wire is grounded.

OPERATION

The TRC-2 module allows you to adjust the amount of retard produced by the HI-6. It also contains an LED that indicates when the retard function is activated. How you use the TRC-2 depends on whether you have connected it for continuous, demand, or boost-proportional retard.

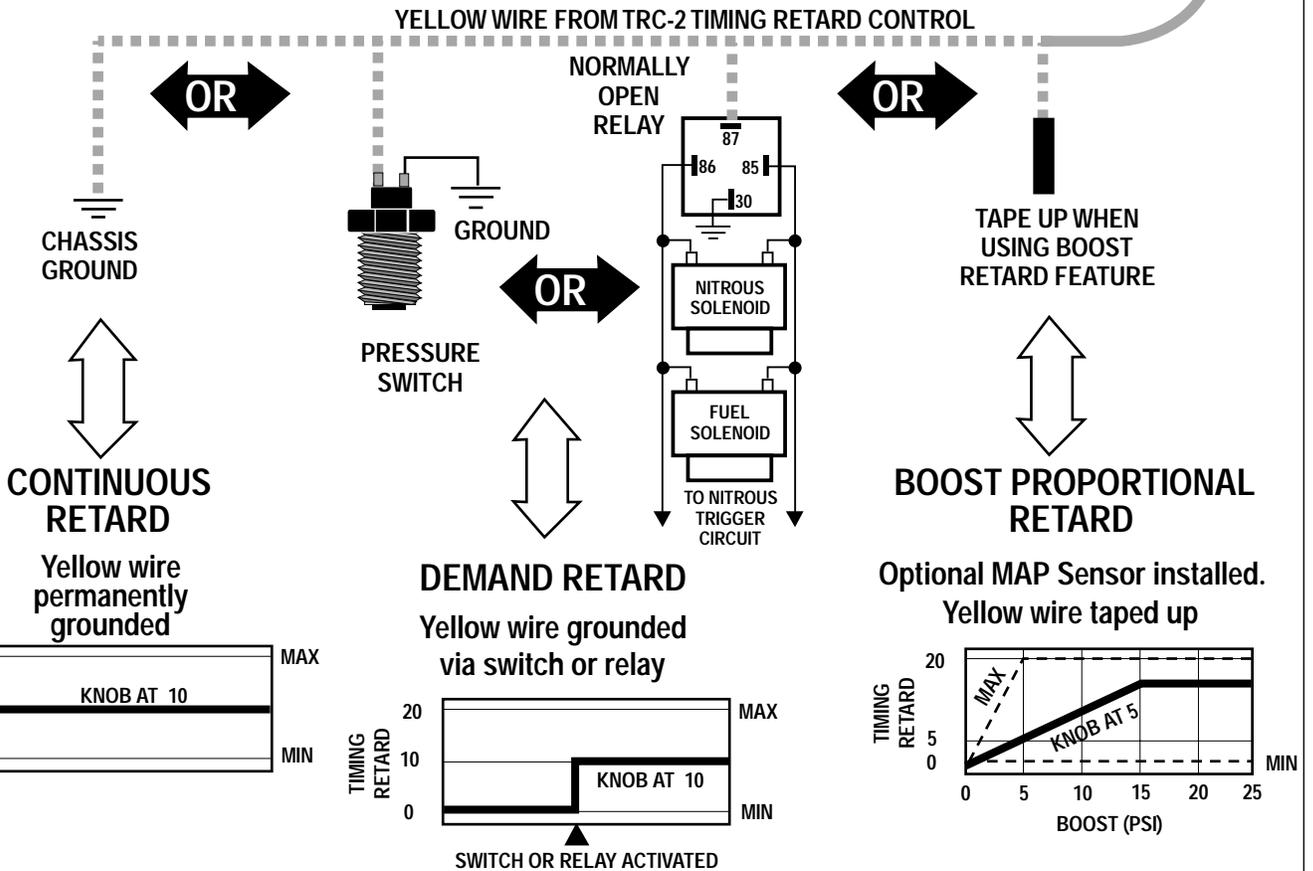
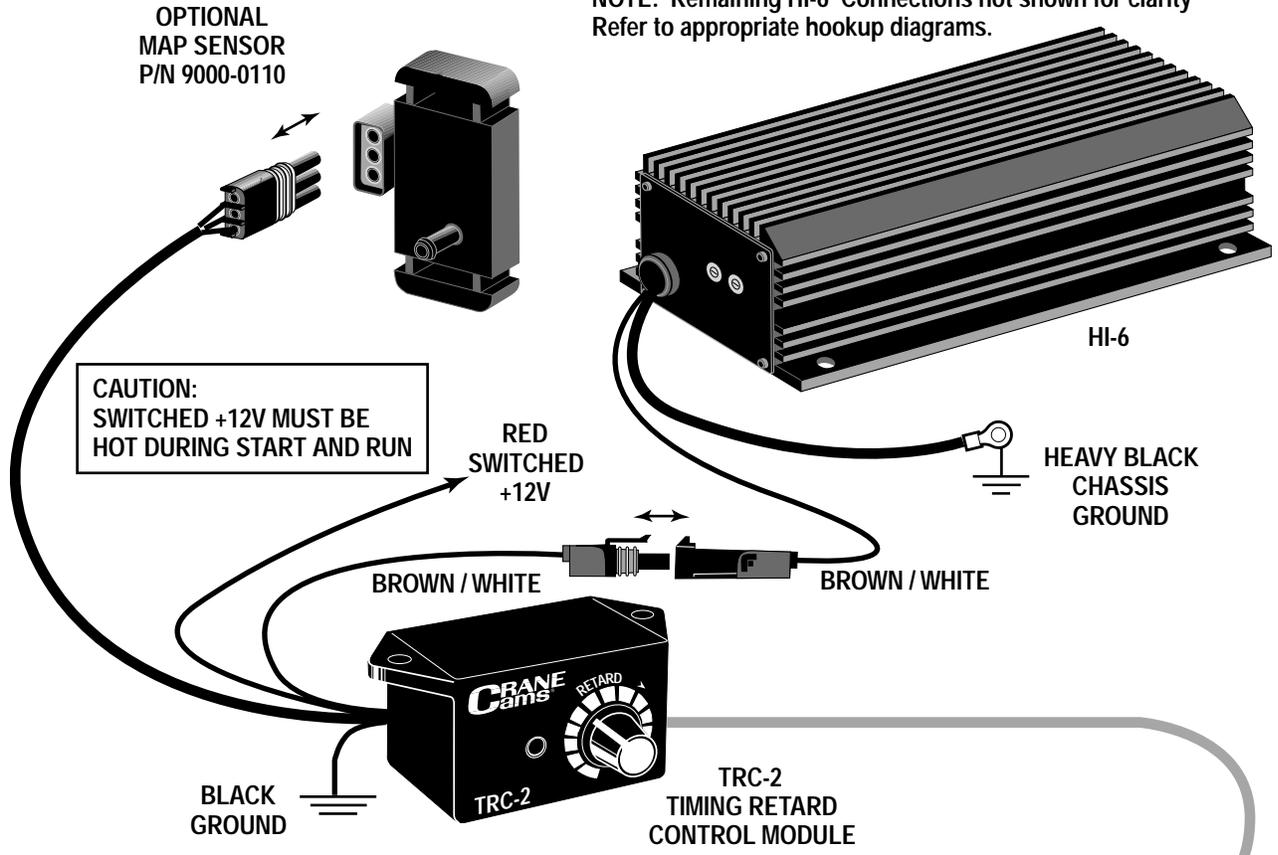
Continuous Retard

Refer to Figure 14. Connect the yellow wire from the TRC-2 directly to chassis ground for continuous retard. Since the retard feature is active all the time, the LED on the TRC-2 will be illuminated whenever the key is on. Turning the knob fully counterclockwise (0°) produces no retard. Turning the knob clockwise increases the retard up to 20°. The TRC-2 is approximately linear throughout its range, so half scale is about 10° of retard. For precise retard calibration, you must use a high-quality timing light.

The uses for this type of timing control include adjusting timing to prevent knock because of inferior fuel quality or insufficient octane, altitude adjustments, etc. As you drive, you can apply just the amount of retard required to prevent spark knock and optimize fuel economy. In rac-

Figure 14. TRC-2 Hookup

NOTE: Remaining HI-6 Connections not shown for clarity Refer to appropriate hookup diagrams.



ing applications the retard control can be used to tune the vehicle to specific track and atmospheric conditions. The TRC-2 also may be used on vehicles with mechanical advance distributor or computer engine controls to change the total ignition timing.

Demand Retard

Refer to Figure 14. Connect the yellow wire from the TRC-2 to a normally open switch or relay that will complete a path to chassis ground when retard is desired. Example: A pressure switch that closes at a certain boost level. The LED on the TRC-2 will light up when the yellow wire is grounded. When the LED is lit, the retard feature is active and the spark is retarded by the amount set on the TRC-2 knob from 0° - 20°. The TRC-2 is approximately linear throughout its range, so half scale is about 10° of retard. For precise retard calibration, you must use a high-quality timing light. The diagram in Figure 14 shows an example with the knob set for 10° of retard.

This type of timing control is great for nitrous oxide and supercharged applications, or any vehicle that requires adjustable retard. For nitrous applications, Figure 14 shows how a normally-open relay is used to ground the yellow wire when nitrous and fuel solenoids are activated. The pin numbers are for a standard automotive relay such as Radio Shack P/N 275-226. Figure 14 also shows a pressure activated switch designed to retard timing when the boost pressure reaches a pre-set value. NAPA Balkamp offers two adjustable pressure switches: P/N 701-1591 (3-7 psig range) and P/N 701-1603 (1.1-3 psig range).

Demand retard mode is also great for crank trigger systems where a momentary start retard is required. A manual switch or a normally open relay energized by the starter solenoid can be used to ground the yellow wire during cranking to provide up to 20° of starting retard. Once the switch is released, timing returns to normal.

Boost Proportional Retard

Refer to Figure 14. An optional MAP sensor (Crane P/N 9000-0110) is required for boost proportional retard. This sensor is a rugged unit that can measure pressures up to 15 psi above normal atmospheric pressure. The sensor comes with vacuum tubing and adapters for plumbing it to the intake manifold. The yellow wire from the TRC-2 should be taped up when using the MAP sensor.

When the MAP sensor is connected, the retard setting on the TRC-2 now refers to a retard slope from 0° to 4° per psi of boost. Simply divide the knob setting by 5 to determine the retard slope (see Figure 14). For example, if the knob is set to 5° the retard slope is 1° per psi and at 5 psi of boost the retard is 5°. As boost rises further, the retard increases at this same slope up to a maximum of 20°. If the boost level exceeds 15 psi, the retard levels off as

shown in Figure 14 below (sensor damage may occur above 18 psi).

The status LED on the TRC-2 illuminates when retard is being applied. Under most conditions, this occurs between 0.5 and 1.0 psi of boost. As boost rises, retard rises with a slope determined by the knob setting. Note that the retard slope stops rising when the boost reaches 15 psi or the retard reaches 20°. The TRC-2 is approximately linear throughout its range, but for precise retard calibration use a timing light to obtain retard value.

TROUBLESHOOTING

Did the engine run properly before installation of the TRC-2? If not, remove the both the TRC-2 and HI-6 units, reinstall the OE ignition or another known good unit and then find and correct the original problem. Make sure the HI-6 system functions properly before installing or troubleshooting the TRC-2 accessory. Did the TRC-2 function correctly before the problem occurred? If the answer is yes, did you change anything that may have affected it? If you connected an external control or changed ignition coils, try going back to the last setup that worked to help isolate the problem. Refer to the HI-6 installation instructions for more details, including the use of the HI-6 built-in diagnostic LED located on the ignition module.

If you are not getting the amount of retard you expect, check the LED on the TRC-2 module; it lights up when retard is being applied. If it does not light up in continuous or demand retard modes, check the yellow wire from the TRC-2. It must contact a good chassis ground when retard is needed. Also re-check the brown/white wire connection from the TRC-2 to the HI-6.

In boost retard mode the amount of retard should be proportional to the pressure measured by the optional MAP sensor. The amount of retard may vary in a given application if local atmospheric (barometric) pressure changes significantly. This occurs most often with a change in altitude of 1000 feet or more.

If the TRC-2 settings seem to be off, check the travel of the knob from no-retard (0°) to maximum (20°). Make sure that the pointer is properly aligned when the knob is at each limit.

