CPI Aviation Supplement Mar. 20/22

This document details aviation CPI units and aviation specific installation and tuning details. It's designed to be used in conjunction with the main CPI aero manual. **If you don't have the proper skills, experience and crimping tools to do the work outlined below, don't attempt it! One critical wire connection failure can cause complete ignition system failure.**

Disclaimer

This product does not conform to any recognized set of standards or certifications for aviation applications.

The CPI is not waterproof and will not function as designed if moisture invades the enclosure or power/ ground connections are interrupted.

Failure of this unit may result in a complete loss of engine power.

Use of this product on amateur built/ experimental aircraft is at the discretion of the buyer who accepts full responsibility for any consequences resulting from its use. Since Racetech Inc. cannot control the installation, programming, application environment or use of its products, we accept no responsibility for damage, loss or personal injury resulting from the use of SDS products. By using SDS products, the user understands and accepts this.

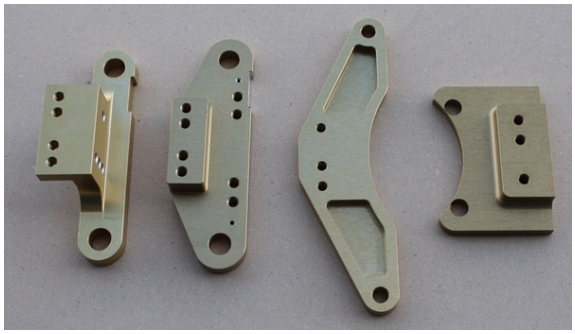
If any user does not agree to this disclaimer, they may return the system/ parts in new condition for a full refund.

System Differences

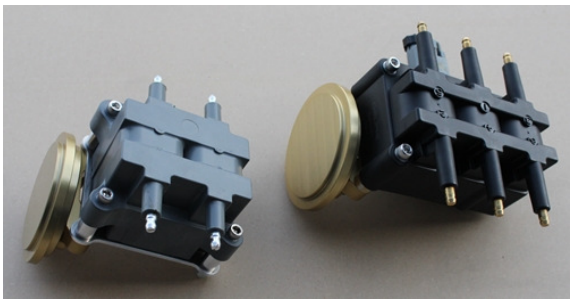
Most aviation CPI kits will have the module set up for 100 rpm programming increments instead of 250 rpm, the exception would be ones used on Rotax 912/914 engines.

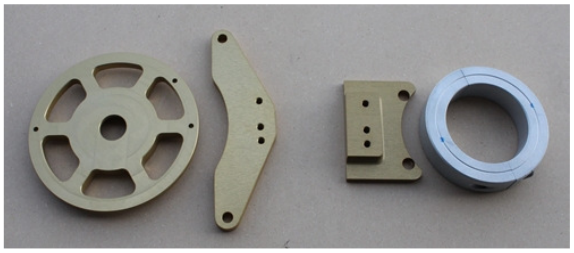
Aviation modules are also set up for MAP units reading in inches of Mercury Absolute.
Aviation CPIs have a provision for an optional advance switch which can add advance to the programmed timing curves. This is used for Lean of Peak operation to achieve maximum cylinder pressure when running lean or as an octane selector when switching between 100LL and 91 octane Mogas.

CPI kits intended for replacing magnetos on traditional aero engines such as Lycoming, may have additional hardware included to make the installation easier. Integrated coil pack mounts/ magneto covers, dedicated Hall effect sensors/ mounting brackets, panel mount kits and 18 to 14mm spark plug adapters would be some examples.



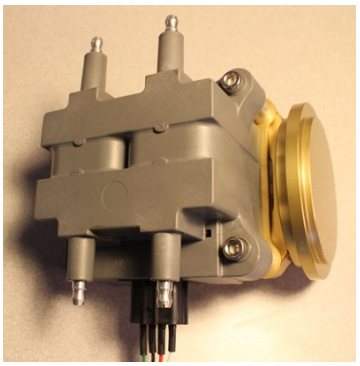
Left to right, Lycoming 4 and 6 cylinder Hall sensor mounts, Rotax 912, Jabiru 2200/3300

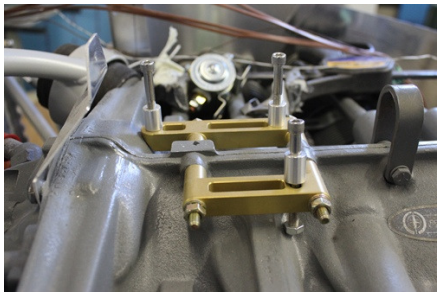

4 and 6 cylinder magneto cover/ coil mounts

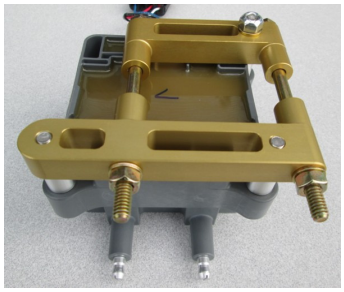

Rotax magnet disc and Hall mount left, Jabiru right

Lycoming 4 Cylinder Coil Pack Installation

Coil pack(s) may be mounted on the firewall, top rear case area or using the integrated magneto cover coil mounts, depending on space available and component interference with other items. Fuse with 7.5 amp fuse or breaker..


Mag cover mount


Top crankcase mount


Shown inverted

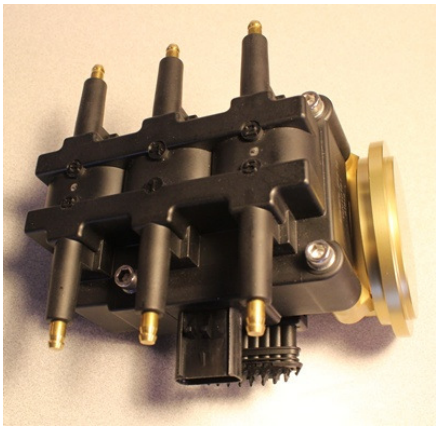
Be sure to remove any parts which are not positively held in place once the mags are removed. If these come loose inside the engine, severe damage or complete engine failure could result!
If you're installing a single coil pack, remove the right magneto and any gears or bearings which rely on the magneto to hold them in place. Put a light coating of RTV on the sealing face of the mount, replace the tabs and nuts. The coil pack may be rotated slightly to clear any obstructions. Tighten the nuts to Lycoming specs.

When replacing both mags, you need to again remove any gears, drive couplings or bearings which are normally held in place by the mag. Lycomings may be fitted with various different mag drives and parts so you need to understand what to remove.
If you're not using the mag/ coil mounts, use the standard mag covers that come with the kit.
Top mount coil bracket fasteners are torque to 75 inch/lbs.

If using the top crankcase mount, remove the two rear, upper ¼ inch case through bolts. Fit the longer supplied bolts and torque to the specs listed for your engine. Bolt the coil pack in place with the spacers and hardware provided.

Lycoming 6 Cylinder Coil Pack Installation

Coil packs may be firewall/ engine mount mounted using the standard coil plate. Alternately, mag mounts similar to the 4 cylinder ones above may be used. There's also a top case mount and RV10 specific coil mount which bolts to the engine mount tubes. Follow the same procedures and cautions as above. Fuse with 10 amp fuse or breaker.



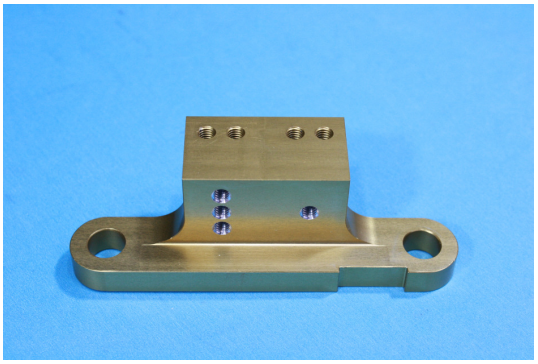
6 cylinder mag mount

Hall Sensor

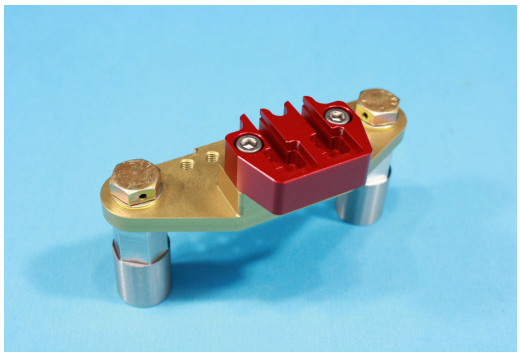
Hall sensors for Lycomings come in two types- single and dual. The Hall sensor is non-adjustable and bolts to a dedicated CNC'd mount on the right front side of the crankcase, using the front-most case through bolts.

Hall Sensor Mounts

We provide CNC'd mounts for Lycoming engines as shown below:



Lycoming mount for 3.25" case bolt spacing

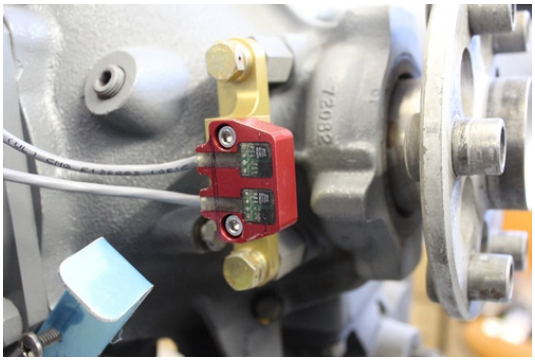


Lycoming mount for 3.50" case bolt spacing

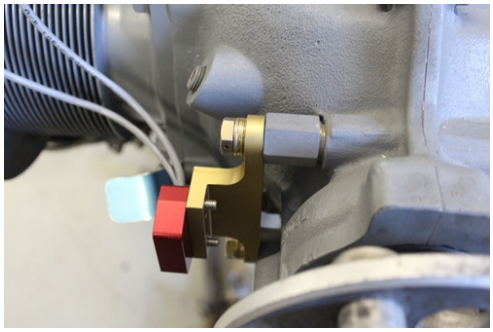
Undo the nuts and be sure the bolts go through the case with the heads on the left side and threads protruding on the right side. On 540 engines, the upper fastener is a stud instead of a bolt as on the 4 cylinder engines.

Be sure to have one standard washer against the case on the right side in both cases. Screw the long hex nuts provided on in place of the standard Lycoming nuts. Torque as recommended for your model of engine.

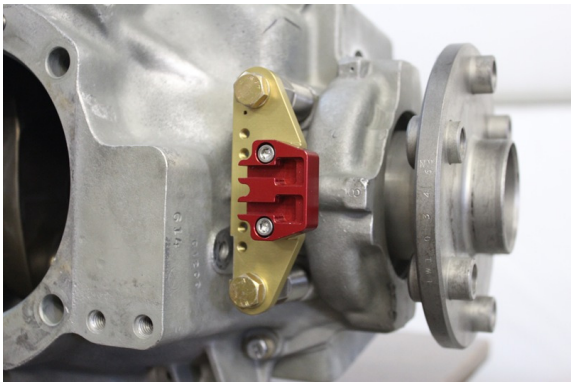
Single CPIs use a twin element sensor (red color) with a single cable. Twin ECU systems use a quad element Hall sensor with 2 cables. If you have the single cable, place one standard washer between the hex nuts and the gold sensor mount. If you have two cables, place one light washer between the hex nut and gold sensor mount. Install the AN-6 bolts provided with one standard washer under the head, through the gold bracket, into the hex nuts. Install the flywheel and check for a minimum of .025 edge clearance from sensor. **. Torque SS case nuts to 300 in/ lbs. Torque Hall mount bolts to 215 in/ lbs.**



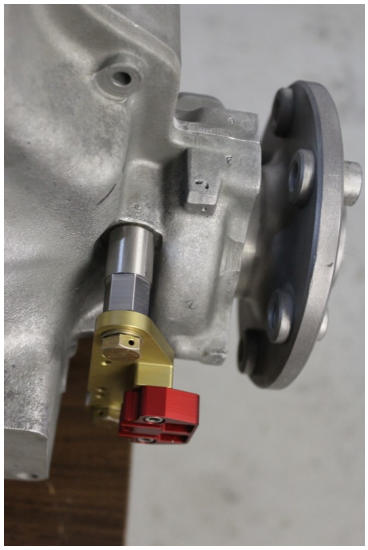
4 cylinder installation with dual sensor



Standoff detail



6 cylinder mount with dual sensor



Standoff detail

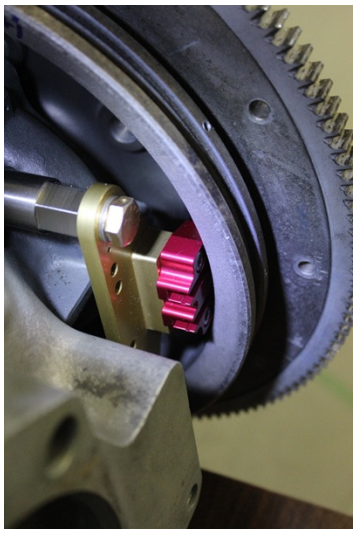
The magnets on Lycoming installations are mounted into the flywheel using the drilling/ tapping kit provided for your engine type. You must have the 8 7/16 ID flywheel. See the separate detailed instructions included for your engine type.

Magneto Gear Removal (IMPORTANT)

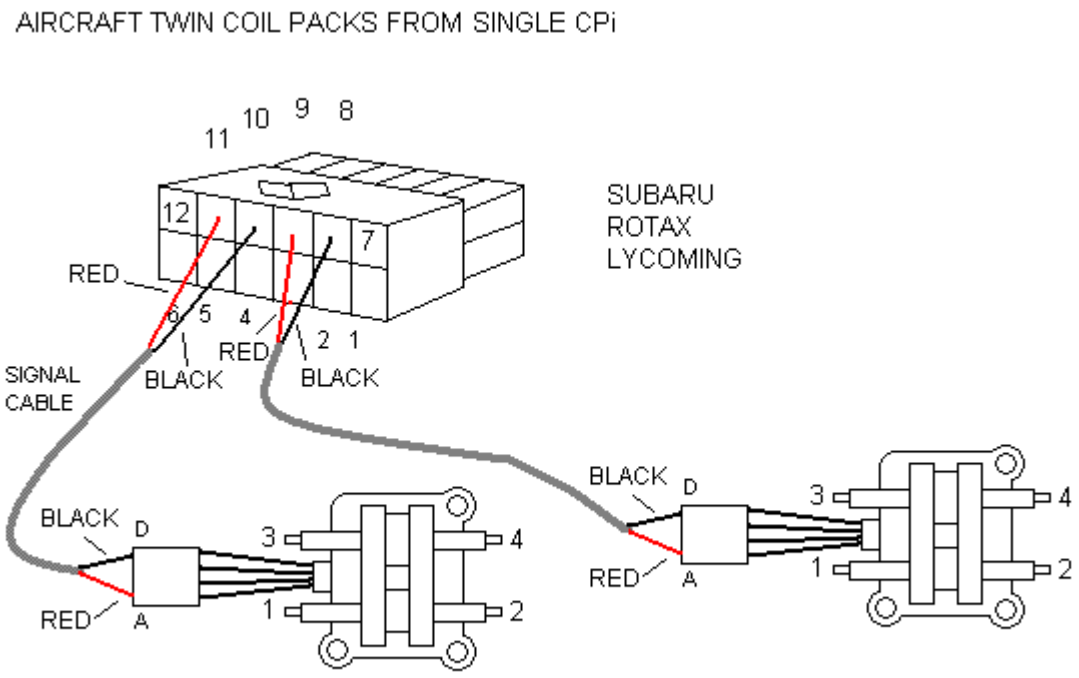
Where magnetos are removed, you must remove any drive gears, bearings or unsupported shafts from the engine. Also ensure that any oiling holes exposed to lubricate these parts are blocked off so that oil pressure is not compromised.

On Continental IO-550 engines, the magneto bearings support the rear accessory drives and the gears are required to drive these accessories. A suitable dummy shaft may have to be fitted to plug the oiling

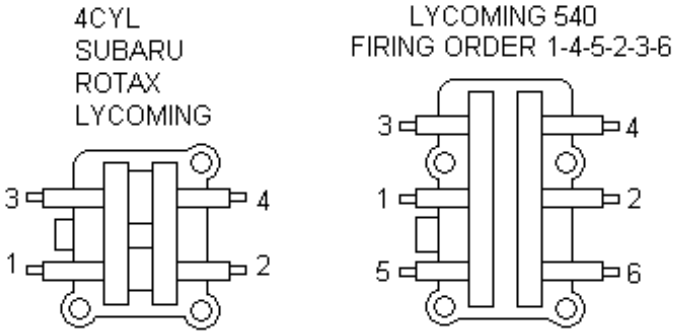
holes for the unused accessories and a support bearing must be used to take the place of the magneto where rear accessories are in place.



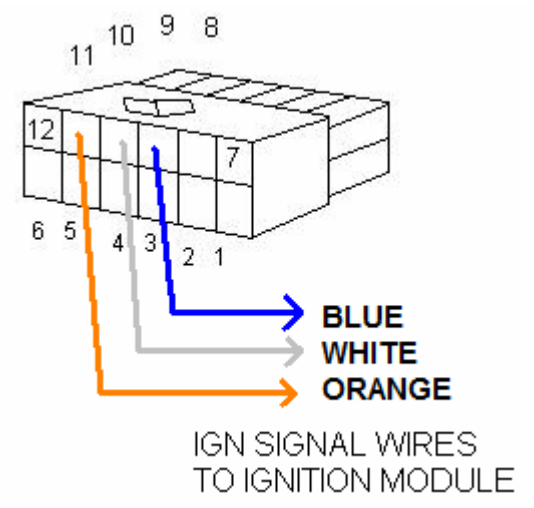
4A single CPI can drive twin 4 cylinder coil packs if desired as depicted below:

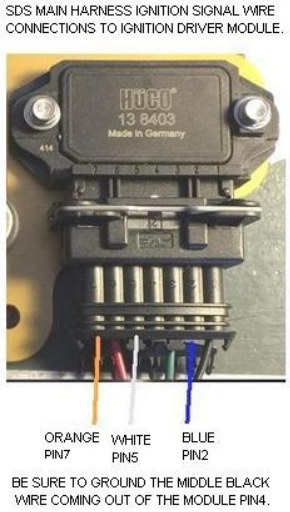


Plug Wire Connections to Coil Packs



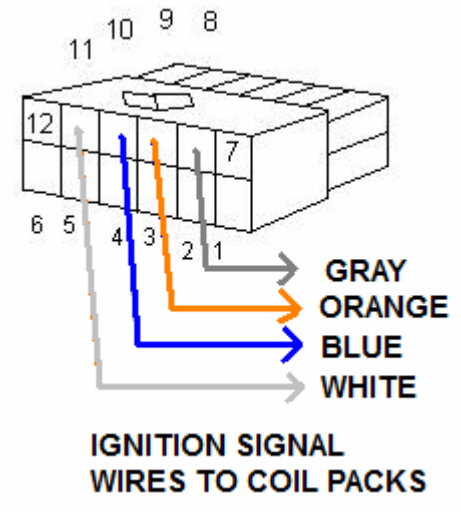
Six cylinder Module Wiring

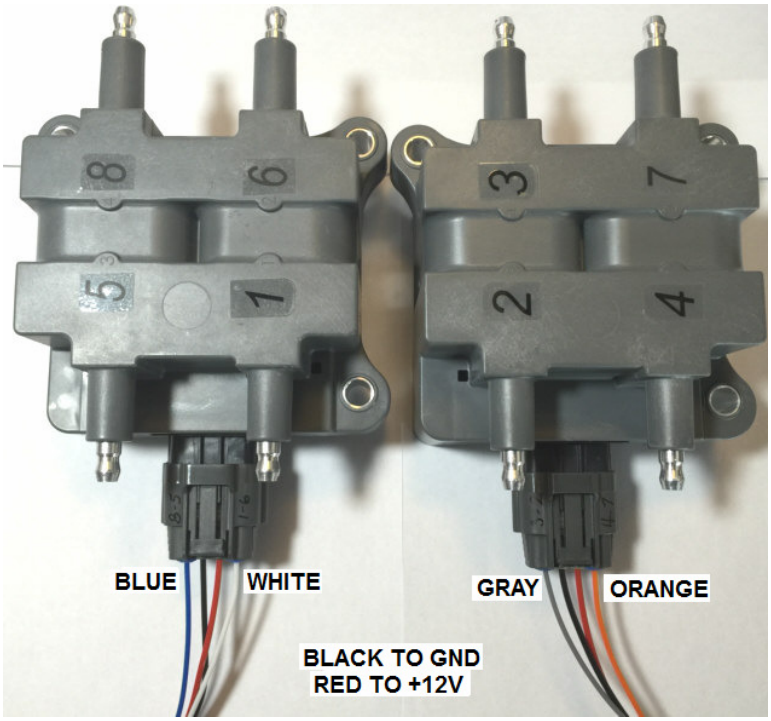




Eight cylinder Coil pack wiring

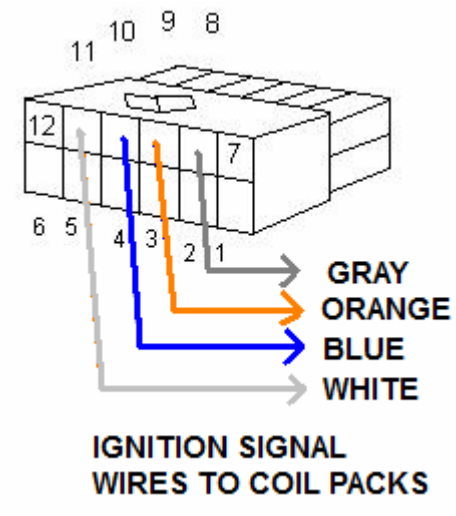
Applies only to Chev, Dodge Pontiac, AMC, Lexus.

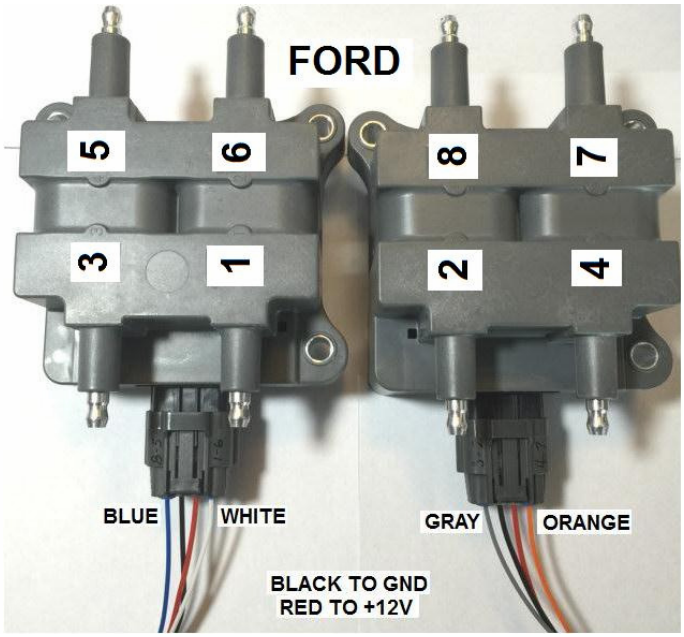




Above show coil pack numbering

8 cylinder Ford Coil pack Wiring



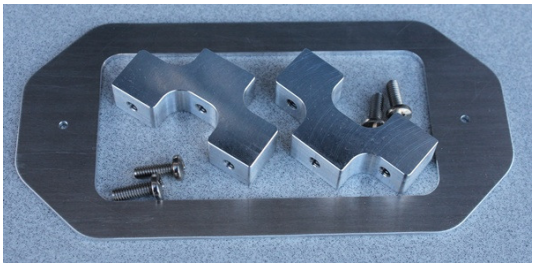


Panel Mounting your CPI

If you purchased your CPI with the panel mount kit, you'll be able to easily mount your CPI on the back of your panel. Use the aluminum drilling template to determine where you want to mount the CPI. Be sure to leave room for the connector, wires and vacuum hose on the bottom to turn without stressing the wires and clear any other components on your panel. You should leave a minimum of 1 inch from the bottom of the CPI for this purpose.

Clamp the template up against your panel, being sure it's square. Drill through the 2 template holes with a 1/8 drill. Tightly scribe around window face cutout. Remove the template and drill the 2 holes out to about .165- .169, a number 18 drill works well. Machine out the window area to the scribe mark. Deburr the edge of the cutout and the two holes.

Use the supplied CNC's blocks and #8 hardware to attach the blocks to the CPI flange and bolt the module up to the back panel face, leaving the fasteners just loose enough to shift the unit with medium hand pressure. Align the unit with the panel cutout and tighten all 6 screws firmly.



Panel mount template and hardware

Blocks installed on CPI

Drilling template shown over CPI

Spark Plug Adapters 18 to 14mm

We provide brass adapters to convert Lycoming 18mm plug threads over to 14mm in order to utilize less expensive automotive type plugs. We can also supply NGK plugs in most cases.

1. Thread the plug into the adapter
2. Torque the assembly into the head using the PLUG hex to 19 ft./lbs.
3. 3. Torque the ADAPTER further to 25 ft. lbs. Use only a small dab of anti-seize compound on the threads here, do not coat all the threads.

Magnet Position

On Lycoming engines, set magnet position to 92 when using a single CPI and single Hall sensor.

On dual CPI setups, set the CPI connected to the top most Hall sensor to 97 and the other to 88.

Spark Plugs and Plug Wires

You MUST use resistor spark plugs and suppression type plug wires with the CPI. Failure to do so could result in malfunction of the CPI module and a complete power loss. Never use solid core/ non suppression type wires or non-resistor spark plugs. We prefer that people use MSD Superconductor wires, boots and terminals. We highly recommend spark plugs with solid caps rather than screw on ones.

Proper assembly and crimping on the plug wires is essential to reliability. Here is a video link as to how to do this properly: **https://www.youtube.com/watch?v=8kQDSlpKrCw**
See the MSD sheet at the end of the manual. Use MSD crimping tool PN 35051 or loose dies PN 3508.

Programming

Optimal ignition timing is dependent on many factors such as fuel octane, compression ratio, manifold pressure, cylinder head temperature and intake air temperature. **Too much timing advance may cause detonation and eventually pre-ignition which can lead to rapid engine failure**.

Important- Be aware that TOTAL timing is a composite of RPM timing minus MAP retard or plus MAP advance.

Below are recommended rpm and MAP retard settings for parallel valve engines with 7.5 to 8.0 to 1 compression ratios running either 100LL Avgas or 91 octane Mogas. **Because of the many factors involved, use these settings at your own risk!** For engines with higher than 8 to 1 CRs, **subtract 1 degree** from these values for each **half point** of CR above 8.0. **You must also run the MAP retard values shown in the second chart following this chart. Some angle valve engines are timed at 20 degrees. Check your data plate.**

Lycoming RPM Ignition Chart

RPM	IGN Timing 100LL	IGN Timing Mogas
500	10	10
750	15	15
1000	20	20
1100	20	20
1200	20	20
1300	21	21
1400	22	22
1500	23	23
1600	24	24
1700	25	24
1800	25	24
1900	25	24
2000	25	24
2100	25	24
2200	25	24
2300	25	24
2400	25	24
2500	25	24
2600	25	24
2700	25	24
2800	25	24

Lycoming MAP Retard Values

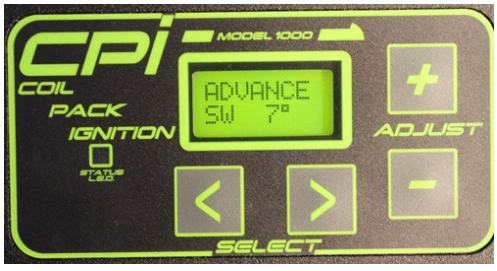
MAP Break Points	Retard Value 100LL	Retard Value 91 Mogas
2.32	0	0
3.52	0	0
4.72	0	0
5.92	0	0
7.12	0	0
8.22	0	0
9.42	0	0
10.6	0	0
11.5	0	0
12.7	0	0
13.9	1ADV	1ADV
15.0	2ADV	2ADV
16.2	3ADV	3ADV
17.4	4ADV	4ADV
18.6	5ADV	4ADV
19.8	5ADV	3ADV
20.7	5ADV	2ADV
21.9	4ADV	2ADV
23.0	3ADV	1ADV
24.2	2ADV	0
25.4	1ADV	0
26.6	0	1RET
27.8	0	1RET
28.9	0	2RET
30.1	0	3RET
30.9	0	3RET

Optional Advance Switch

Your CPI can be configured for an advance switch, which will add a programmed amount of advance whenever pin 12 (blue wire) sees 12V. This is useful if you run LOP to achieve maximum cylinder pressure for best power and economy or if you run 2 different fuel octanes, say 91 Mogas and 100LL. You can set the amount of advance to be added to your programmed values when the switch is ON as shown below, using the + or – buttons.

Advance Switch Mounting

If you have the optional advance switch, decide where you want to place this (make sure the wiring will reach) and drill a ¼" hole through your panel. The far end of the wire will go to a switched 12V source. When the switch is on, 12V will go to pin 12 (blue wire) on the CPI. You cannot use knock sensing as the advance switch since both options share the same input pin.



For octane selection, you'd leave the switch energized to run 100LL and off (less total advance) to run 91 Mogas.

Warning: Put this item on your checklist when increasing power. Forgetting the position of the switch while in the advance setting could cause detonation and engine damage in some cases. There is a software limit to help protect above 25 inches MAP in case you forget.

MSD INSTALLATION INSTRUCTIONS

Dual Crimp Terminal Installation

ONLINE PRODUCT REGISTRATION: Register your MSD product online and you'll be entered in our monthly 8.5mm Super Conductor Spark Plug Wire give-away! Registering your product will help if there is ever a warranty issue with your product and helps the MSD R&D team create new products that you ask for! Go to www.msdperformance.com/registration.

The terminals supplied feature a new Dual Crimp Terminal. The benefits of the new wire terminal is that the conductor has its own crimp to the terminal so it does not need to be bent over and pressed between the terminal and the sleeve of the plug wire. Following is a new crimp procedure for the Dual Crimp Terminal.

1. Strip approximately 1/4" of sleeving from the wire. When using the Mini-Stripper-Crimper, **do not** push the wire all the way into the tool to strip it. **Note:** Use extreme care not to damage the conductor.
2. Follow the standard instructions to crimp the terminal to the sleeve of the wire. **Do not** use the Mini-Crimper to crimp the conductor.
3. Position the conductor between the "conductor tabs" of the terminal. Using needle nose pliers, push the tabs towards each other so they firmly grip the conductor. Make sure the conductor does not squeeze out as you apply pressure to the tabs.