THE LIGHT SPEED ENGINEERING

PLASMA II, II+, and III CDI SYSTEMS
INSTALLATION AND OPERATION MANUAL

FOR FOUR AND SIX CYLINDER INSTALLATIONS

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CONGRATULATIONS ON YOUR PURCHASE OF A LIGHT SPEED ENGINEERING (LSE) PLASMA CAPACITOR DISCHARGE IGNITION (CDI) SYSTEM.

YOU WILL NOW BE ABLE TO EXPERIENCE THE SIGNIFICANT ADVANTAGES OF DISTRIBUTORLESS HIGH ENERGY ELECTRONIC IGNITION IN FLIGHT PERFORMANCE AND EFFICIENCY.

TO ENSURE RELIABLE LONG TERM OPERATION, AND TO ACHIEVE THE FULL PERFORMANCE POTENTIAL, PLEASE READ THE ENTIRE MANUAL CAREFULLY, AND FOLLOW THE PROCEDURES.

SINCERELY,

KLAUS SAVIER, OWNER LSE.

NOTICE

Light Speed Engineering **Plasma CDI** Systems are authorized for installation *only on engines licensed in the Experimental category*, or on engines used in non-aircraft applications. These systems must not be used in an aircraft licensed in any other category unless a Supplemental Type Certificate is granted for its use in that specific aircraft.

Seller makes no representation or warranty of any kind, expressed or implied, as to the merchantability, fitness for particular purpose, or any other matter with respect to the **Plasma CDI** Systems.

WARNING!

System failure can cause serious injury or death.

To avoid system failure, read this entire manual in order to gain a thorough understanding of the LSE *PLASMA* Capacitor Discharge Ignition System.

Follow all instructions carefully.

Seller shall not be liable for, and buyer assumes responsibility for all personal injury and property damage resulting from the use of the *PLASMA* CDI System by buyer.

In no event shall seller be liable for incidental or consequential injury or damage.

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Section 1 INTRODUCTION

This manual covers all **4 and 6 cylinder** versions of the LSE ***PLASMA* CDI** Systems. Included herein are a description of concept and design philosophy, installation instructions, testing procedures, troubleshooting guidelines, and repair and warranty instructions for those systems.

The LSE ***PLASMA* CDI** System was designed to replace one or two magnetos on home built aircraft and in other aircraft for which a specific supplemental type certificate has been issued.

1.1 FEATURES AND OPTIONS

The ***PLASMA* CDI** ignition systems can replace an impulse or non-impulse magneto since its automatic spark retard to top dead center ensures reliable starting under all conditions. High compression fuel injected 6 cylinder engines start easily by hand or electric start.

LSE PLASMA CDI Systems provide optimum ignition timing for best performance under all conditions. The extremely wide timing curve extends from 15° to 42° degrees BTDC. Full retard for starting holds the timing back to TDC. After starting, the system advances according to RPM and manifold pressure.

For the ultimate improvement in performance and ignition reliability you can replace both magnetos with LSE Plasma CDI Systems. In this case LSE recommends the installation of a standby battery as a backup to your electrical system. Due to the light weight of the LSE PLASMA CDI Systems a dual system with backup battery is still several pounds lighter than two magnetos. If two systems are used, either or both tachometer outputs can be used.

Dual systems can be connected to each other such that each system knows if the other one is operating. If one of the two systems is turned off or has failed, the remaining system will automatically shift its timing curve to provide optimum engine performance with one system. This eliminates the common power loss when one magneto is turned off. The extremely wide operating voltage range, from 5v-35v allows hand starting long after the electric starter has stopped due to a low battery.

On aircraft with 24v systems no special considerations need to be addressed, just hook up the power leads to positive (+) and negative or ground (-) as you would with a 12v electrical system. There is no need to install an external noise filter capacitor on LSE PLASMA CDI Systems; they were designed from the ground up to operate in aircraft with radios.

The LSE ***PLASMA* CDI** System can be turned off and on at any time in flight without the risk of misfiring.

The systems can be turned on by supplying power to the power lead on the input connector via a toggle switch.

PLASMA II PLUS and ***PLASMA III*** systems, additionally, have a "P lead" from the output connector to be used with an aircraft key switch.

An optional digital timing display can be installed to monitor the current ignition advance (PLASMA II PLUS and PLASMA III systems only). This output can also be used to supply a data acquisition system with timing information.

On all Plasma systems the 15 pin "D" input connector to the system is pre-wired with its power and signal inputs. A pulse tach **output** is also provided on this connector. Refer to ***PLASMA II*** CDI Electrical Connections diagram.

Four and six cylinder systems share the same enclosures and most of the electronics. A 4 cylinder module can be upgraded to a 6 cylinder module by LSE and will fit into the same space, should you decide to change from a 4 to a 6 cylinder engine.

RG58 leads are supplied as primary ignition wires with BNC connectors, ready to connect to the single electronic module. They must be terminated at the LSE provided ignition coils with standard spade connectors.

LSE ***PLASMA CDI*** Systems are designed using discrete logic in place of programmable memory or micro processors, to avoid any potential problems from static discharges, minor lightning strikes or single event upsets (SEU).

As with all electronic devices, their enemies are heat, moisture and vibration. This should be considered for the best installation of the system.

1.2 HALL EFFECT MODULE

The Hall Effect sensor module (shown at left) is used in place of a magneto and is designed to make the installation extremely easy and more similar to magnetos. Two modules can be used to provide full trigger redundancy when two electronic ignitions are used.

A standard magneto gear from a **non impulse magneto** must be provided. A timing light is built into the module. The 9 pin "D" connector on the sensor module simply connects to the harness from the ignition module.

The Hall Effect sensor module should be removed every 50 hours and inspected for gear, bearing, and seal wear. After first inspection, inspect as necessary or at least every 100 hours by removing cover plate and checking for bearing and seal wear.

1.3 DIRECT CRANK SENSOR

Alternatively, the direct crank sensor system provides complete redundancy for single or dual ***PLASMA CDI*** systems. This crank sensor concept requires removal of the flywheel for installation. Its reliability and performance is expected to be superior to that of the accessory case mounted Hall Sensor Module because of its lack of bearings, seals, and gears. All 6-cylinder versions use direct crank sensors.

The LSE ***PLASMA II*** **CDI** System contains the following items. If any items are missing or damaged, contact LSE ***immediately***.

HALL EFFECT MODULE	**CRANK SENSOR**	**CRANK SENSOR**
4-cylinder system	**4-cylinder system**	**6-cylinder system**
PLASMA Installation Instr.	PLASMA Installation Instr.	PLASMA Installation Instr.
1 PLASMA Ignition Module	1 PLASMA Ignition Module	1 PLASMA Ignition Module
1 Hall Effect Sensor Module	Crank Sensor circuit board and bracket	Crank Sensor circuit board and bracket
Wiring Harness	2 Trigger Magnets per Ignition System	2 Trigger Magnets per Ignition System
2 dual output ignition coils with mounting bracket	Wiring Harness	Wiring Harness
2 RG58 primary cables and 4 spade terminals	2 dual output ignition coils with mounting bracket	3 dual output ignition coils with mounting bracket
4 High Tension Ignition Leads	2 RG58 primary cables and 4 spade terminals	3 RG58 primary cables and 6 spade terminals
4ea. Spark Plugs and Inserts	4 High Tension Ignition Leads	6 High Tension Ignition Leads
	4ea. Spark Plugs and Inserts	6ea. Spark Plugs and Inserts

Section 2 INSTALLATION

It is important to locate antennas, receiving or transmitting, away from the engine and ignition systems. Signal noise is drastically reduced with distance. Any static noise emitted from the system is usually canceled by the squelch of the radio. Common aircraft radio systems are not affected by ignition noise.

SHIELDING: The wires supplied in the ***PLASMA*** **CDI** System kit are high quality ignition leads designed to transmit spark energy efficiently and to suppress ignition noise. Therefore, they usually do not need shielding. It is also necessary to use resistor spark plugs to avoid radio noise. High tension leads should be kept as short as possible. ADF and Strikefinder use may call for additional shielding.

2.1 FLYWHEEL

To verify proper operation of the ignition system, the timing must be checked with a timing light (strobe light) as described in section 3.2. For this, the flywheel or prop-extension must be graduated with the proper timing marks. Also an indicator should be built to mount on the case center adjacent to the timing marks on the flywheel.

NOTE: You may also send the flywheel to LSE for trigger magnet and timing mark installation. The cost is $50 plus $10 for insured shipping.

LYCOMING ENGINES

TDC, 20 deg., and 25 deg. BTDC markings are stamped on the flywheel engine side by the factory. Add markings at 35 and 40 degrees. These markings should be duplicated 180 degrees out, to reference the other ignition coil timing. On 6 cylinder engines the factory timing marks should be duplicated twice, 120 deg. and 240 degrees from TDC.

If you are installing a direct crank sensor system, refer to section 2.3 for the installation of the trigger magnets on the flywheel.

ALL OTHER ENGINES

Apply the same concept to install timing reference marks on the propeller extension or spinner bulkhead.

2.2 HALL EFFECT SENSOR MODULE INSTALLATION

To install the accessory case driven Hall Effect Sensor Module, please follow the following instructions:

Install a magneto drive gear from a non-impulse magneto onto the shaft of the sensor module using the same woodruff key as well as the LSE supplied washer and locknut.

Fasten the gear in a soft jaw vise and tighten the nut to 30 lbs/ft ensuring that the washer is centered on the shaft.

The module can be installed on either mag pad using standard clamps. Install all system wiring except the BNC connectors on the ignition module.

Remove all sparkplugs from cylinders and turn the crankshaft to TDC #1 and #2 cylinders using the factory timing marks.

Turn electrical power on, and rotate the sensor module in the accessory case counter-clockwise until the green light on the module case turns on and then off again. Maintaining its position, fasten the case with toe clamps commonly used with Slick Magnetos.

Light Speed Engineering highly recommends that you check ignition timing using a strobe light, automotive style, both on your new ignition and, should you still have one, on the magneto. The magneto timing should be set to the manufacturers specs.

The timing is now correctly set for those engines normally timed at 25º BTDC (usually standard compression ratio). During start, the system will fire at TDC for standard compression engines with ratios less than 8.7:1. At idle the strobe light should indicate 21º $\pm$ 2º when the manifold pressure hose is disconnected and 40º $\pm$ 2º when connected.

If you are using a compression ratio of 8.7:1 or higher, the timing must be retarded another 5º. In this case, position the crankshaft to 5º after TDC and use the procedure outlined above. During high compression engine start, the system will now fire at 5º ATDC. The idle strobe light readings should be 16º $\pm$ 2º when the manifold pressure hose is disconnected and 35º $\pm$ 2º when connected. These values are for sea level conditions. Slightly higher values apply at altitudes.

The Hall Effect Sensor module should be removed every 50 hours and inspected for gear, bearing, and seal wear. After first inspection, inspect as necessary or at least every 100 hours by removing the cover plate and checking for bearing and seal wear.

2.3 DIRECT CRANK SENSOR INSTALLATION

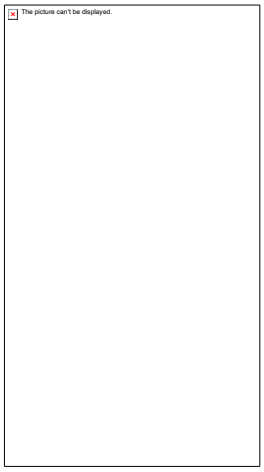
The crank sensor circuit board has two completely independent triggering systems if it is used for dual Plasma CDI applications. On single installations only the outer set of sensors and associated wiring is installed.

This crank sensor concept requires removal of the flywheel for installation. The outer trigger magnets are installed on a 4.000" radius. The inner trigger magnets, used for a second system, are installed on a 3.840" radius. The gap between the sensor surface and the marked surface of the triggering magnets should be 0.030” - 0.060”.

The clearance should fall within these parameters with the crankshaft pushed in and pulled out. It may be necessary to shim the mounting plate from the crankcase to achieve this clearance.

Please refer to the attached pictures and those on the Crank Sensor page of the web site (www.LightSpeedEngineering.com) to mount the sensor plate to your crankcase and integrate the trigger magnets into your flywheel. Use a number 32 drill, 1/8" deep so that the magnets can be pressed in flush with the surface. Use Loctite and stake around them. Two or four magnets are included. Single systems require only two magnets with 45 degree separation on the 4" radius. Looking into the pulley side of the flywheel, the left magnet position should always line up with the TDC indication under the starter ring gear. For the other magnet position, add 20 degrees to the recommended timing for your engine and install it on the same radius to the right of the first magnet. This means that on engines that should have their magnetos timed at 25 deg. The leading magnet should be installed at 45 deg BTDC and thereby 45 degrees to the right of the TDC magnet. Only the north pole can trigger the sensors. This is the face marked with an X and therefore, should point to the sensor. In other words, the X must be visible after installation. You can also use a compass to identify the correct polarity.

If you have seal retainer plates installed, remove them and use existing holes to mount the bracket. You might have to adjust the holes in the bracket using a dremmel to make them align with the existing holes. If the bosses are not drilled, use the anodized mounting plate as a drill template as follows.



Align plate concentric to crankshaft by registering on centering tabs. Visually align crankcase split line with the center between the top and bottom 2 holes of the mounting plate. Mark the crankcase mounting locations through the existing holes in the bracket. If possible, use a #2 centering drill for a pilot hole. Drill #6 (0.2040) x 5/8" deep. Tap ¼-20. For best results, use a 2-flute spiral point HSS tap with aluminum tapping fluid such as Tap-Magic. Once the bracket is mounted to the crankcase, remove the three alignment tabs then remove the two control tabs. This sequence allows you to later verify that the alignment tabs were removed. If the circuit board was removed for this operation, re-install it. All screws holding the crank sensor circuit board to the mounting plate must be secured with Loctite and the proper torque. The 0 degree mark on the circuit board should now align with the split line in the crankcase when the screws are fastened in the center of their positioning slot.

Now that the sensor plate is installed, perform a simple operational check: Disconnect all high tension leads from the ignition coils. With power to the system and all else connected, take any magnet and swipe it back and forth past each sensor. Every other pass should produce a loud spark at the coil. Only the north pole works. Check each sensor.

Lycoming external engine dimensions can vary significantly, so you need to verify the proper clearance between the sensor and the magnets installed in the flywheel surface. Two measurements need to be compared to determine the gap.

- First, measure the height from the inside of the flywheel where it touches the crankshaft flange to the surface that has the magnets installed.

- Then measure from the face of the crankshaft flange back to the sensor face on the circuit board. This second dimension needs to be larger by .030"- .060". The clearance should fall within these parameters with the crankshaft pushed in and pulled out.

Too little gap and a flexing crankshaft might touch the sensors.
Too much gap will not activate them.

** Note- Magneto removal-
If you are removing a magneto that has a pilot bearing on the engine side of the magneto, be sure to remove the entire bearing with the magneto. The magneto is replaced with the mag hole cover provided by LSE. Use only liquid sealant and the magneto attachments to secure this plate. Gaskets are not recommended as they distort the cover plate.

You may wish to send your flywheel to LSE for installation of the trigger magnets and timing marks; cost is $50 plus $10 for insured shipping; plan on 1 day plus shipping time.

2.4 IGNITION MODULE AND IGNITION COILS

The ***PLASMA*** **CDI** module should be mounted in the electrical compartment of the aircraft or on the cold side of the firewall. In certain cases, mounting on the engine side of the firewall is permissible if the components and connectors are shielded from excessive heat and moisture. In this situation, the module should be oriented such that the connectors are to the sides of the plane and a protective metal cover should be used to protect the module from water/engine cleaning materials. Air must be allowed to flow between the bottom of the module and the mounting surface.

Ignition coils are typically mounted on the top center of the engine. They can also be mounted on the motor mount tubes using adell clamps or on the fire wall to a piece of angle aluminum. Ignition coils should be mounted so that spark plug lead length will be kept to a minimum for maximum spark energy and minimum noise. It is important that each coil connects to **opposing** cylinders, i.e. one coil fires cylinders 1 and 2 and the other coil fires 3 and 4.

CAUTION!

BE CAREFUL NOT TO DRILL INTO ANY PRIMARY AIRCRAFT STRUCTURE WHILE MOUNTING YOUR *PLASMA* CDI SYSTEM. THE BEST IGNITION SYSTEM IN THE WORLD WILL BE NO HELP IF YOUR MAIN SPAR FAILS.

WARNING!

- **WIRING CAN CAUSE ELECTRICAL SHOCKS WHEN IGNITION IS TURNED ON.**
- **DO NOT TOUCH ANY WIRES WHEN SYSTEM IS IN OPERATION.**
- **DISCONNECT BATTERY DURING INSTALLATION TO AVOID SHOCK.**

2.5 ELECTRICAL CONNECTIONS

HERE ARE SOME NOTES ON HOW THE SYSTEM IS WIRED UP:

The ***PLASMA* CDI** System includes a pre-assembled electrical harness/connector(s) with all essential wires ready to route between the triggering mechanism (Hall Effect Sensor, Direct Crank Sensor, or Trigger coils) and Plasma CD ignition module input connector. The power wires in the harness remain un-terminated. The input connector, output connector and manifold pressure input barb are located on one side of the Plasma CD module; BNC connectors for the primary ignition wires are located on the other side of the Plasma CD module.
Pictured here: Primary ignition wire terminal connection to the ignition coil.

When connecting the power supply, route the positive lead to a 5A pull-able circuit breaker and then to the battery plus terminal, bypassing any electrical buss or master solenoid. Refer to input connector diagram.

If a toggle switch is used as an on/off switch, it should be installed next to the circuit breaker. If an aircraft key switch is used (some Plasma I systems and all Plasma II Plus and Plasma III systems only), do not use a toggle switch; instead, hook up the "P"-Lead from the output connector to your key switch (connecting and disconnecting pin 1 and pin 9 of the output connector). Route the negative lead directly to the battery ground terminal (not airframe or ground buss) to avoid ignition noise. The shield should not be connected.

For Dual Plasma CDI Installations, an auxiliary battery is recommended. Please click here for a wiring diagram.

Trim the power supply wires to length and connect them with quality crimp connectors or by soldering and heat shrink insulation. Do not use any heat shrink on the black RG58 cable going to the ignition coils.

Route the RG58 coax cables to the ignition coils. Avoid their exposure to heat from cylinder heads or exhaust systems. The primary ignition coil wires running from the Plasma CD Ignition module to the ignition coils can be routed together, however they should be kept separate from the ignition system input wires (harness). There is no polarity on these, even though they might be labeled (+) and (-). Connect the center conductor to one ignition coil blade and the shield to the other blade using standard spade terminals. Again, polarity at the coils does not matter.

The high tension leads supplied in the kit **must** be used with the ***PLASMA I and the PLASMA III* CDI** System since its spark energy is far too great to be used with any

shielded aircraft leads or high resistance automotive wires. The two high tension leads from each coil connect to spark plugs on opposite sides of the crankshaft. One coil fires cylinders 1 and 2 and the other coil fires 3 and 4.

Connect the manifold pressure line to your ignition processor. If you have a MP gauge, you can tee into that line. A standard 1/8" ID MP Tygon tube is recommended. Refer to your engine manual for manifold pressure pick-up.

IMPORTANT: The two high tension leads from each coil connect to spark plugs on opposite sides of the crank shaft. That means one coil fires cylinder 1 and 2 the other coil fires 3 and 4. If your mag fires top and bottom plugs, reroute the cables to fire either all on top or all on the bottom spark plugs. The ***PLASMA* CDI** can fire either the top or the bottom plugs. If you use one magneto, your engine runs a little better with the advanced spark on the top plugs.

For Dual PLASMA CDI Installations, an auxiliary battery is recommended. Please click here for a wiring diagram.

Plasma II & Plasma II Plus Input Connector Diagram (Please allow longer loading time)

Plasma II Plus Output Connector Diagram (Please allow longer loading time)

The ***PLASMA II PLUS* and *PLASMA III* CDI** systems can optionally be turned on and off with an aircraft key switch by connecting and disconnecting pin 1 and pin 9 of the output connector.

ALL SYSTEMS:

Ensure wiring is securely fastened, especially near the terminals, to avoid damage from vibration.

Gap spark plugs fired by the CDI to .032"-.040" for standard compression engines and .026"-.035" for high compression engines. Turbo / Supercharged engines should gap the spark plugs to .026” - .035” while turbo normalized engines should gap the spark plugs according to the compression ratio. Install the spark plugs and inserts using 15 and 25 lb/ft respectively, using anti-seize.

Connect the manifold pressure line to your ignition processor. If you have a MP gauge in the cockpit , you can tee into that line.

If you disconnected your battery during the installation, don't forget to reconnect it now.

CONGRATULATIONS!

YOU HAVE NOW COMPLETED THE INSTALLATION OF YOUR LSE *PLASMA II* CDI SYSTEM.

YOUR NEXT STEP TO IS PERFORM OPERATIONAL TESTING TO ENSURE THE UNIT IS CORRECTLY INSTALLED AND ACCURATELY TIMED.

Section 3 OPERATIONAL TESTING

It is important to check timing accuracy and range before attempting flight.

WARNING!

WIRING CAN CAUSE ELECTRICAL SHOCKS WHEN IGNITION IS TURNED ON. HIGH TENSION LEADS AND IGNITION SYSTEM OUTPUT WIRES CAN CAUSE ELECTRICAL SHOCKS.

DO NOT TOUCH ANY WIRES WHEN SYSTEM IS IN OPERATION.

3.1 PHASING (CYLINDER FIRING ORDER)

Since we have not specified wire tracing and valve position, which define the difference between compression stroke and exhaust stroke, on 4-cylinder engines, there is a 50% chance that the timing will be 180° out of phase.

With all spark plug wires removed from the coils and one sparkplug removed from each cylinder, turn your ignition on and rock the propeller back and forth near cylinder 1 TDC. A spark should jump between the output terminals of one ignition coil. The high tension leads from this coil must be connected to cylinders 1 & 2. Repeat this procedure 180º out and confirm firing the second coil, then connect the high tension leads from this coil to cylinders 3 & 4.

On 6-cyl engines, refer to the engine firing order to assign the second and third coil.

On Direct Crank Sensor systems, this test should be done before the flywheel is installed by waving the "N"-pole of a magnet past each top sensor. The top sensor(s) relate to cylinders 1 & 2 on all installations. Connect the high tension leads to opposing cylinders since they fire simultaneously, use your engine's firing order as a reference for the remaining coil assignments.

If your coils are connected correctly to opposing cylinders, you can change phasing by switching BNC connectors.

Due to the performance increase, the engine idle is now increased by 50-150 RPM. Reduce idle to normal by adjusting the carburetor or fuel injection system. Re-adjust idle mixture.

The engine may now be running extremely well, smooth and quiet. However, **DO NOT FLY UNTIL THE REST OF THE OPERATIONAL TESTS ARE COMPLETED.**

3.2 TIMING LIGHT HOOKUP AND TESTS

Use a conventional "clip-on" inductive timing light to verify the timing accuracy and range.

During start, the system will fire at TDC for standard compression engines with ratios less than 8.7:1. At idle the strobe light should indicate 21º ± 2º when the manifold pressure hose is disconnected and 40º ± 2º when connected.

If you are using a compression ratio of 8.7:1 or higher, the timing must be retarded another 5º. If you are using the Hall effect sensor module in place of the magneto, reposition it to show idle strobe light readings of 16º ± 2º when the manifold pressure hose is disconnected and 35º ± 2º when connected. These values are for sea level conditions. Slightly higher values apply at high altitudes.

Be aware that the indicated timing is dependent on the accuracy of the timing marks.

(1) Make a written note of the actual ignition timing as seen with the timing light for the most advanced position.

(2) Disconnect the manifold pressure vacuum hose. Verify retard to the correct values for your engine.

(3) Make a written note of the ignition timing for the most retarded position.

(4) Clip your timing light pickup to one of the ignition leads from the other coil. The timing light should illuminate the opposite set of timing marks on the prop-extension or flywheel in the same way.

(5) Check ignition timing with the vacuum hose connected, and with it disconnected, and compare the timing of each coil.

YOU ARE NOW READY TO FLY!

HOWEVER, FIRST READ THE REMAINDER OF THIS MANUAL, SO THAT YOU HAVE A THOROUGH UNDERSTANDING OF YOUR LSE *PLASMA* CDI SYSTEM.

3.3 RUN UP TESTS

NOTE:

Due to the significantly higher performance of the LSE ***PLASMA* CDI** System, it cannot be compared to magnetos during run up in a conventional manner.

If fuel mixture setting is near optimum, there will be no detectable RPM drop when the mag is turned off and the engine runs on the ***PLASMA* CDI** alone.

A large RPM drop will be noticed when the electronic ignition is turned off.

No significant drop is noticed if two Plasma III systems, one Plasma III and one Plasma II Plus, or two Plasma II Plus systems are used and the interconnect feature is installed.

3.4 IN-FLIGHT TESTS

For normal operation, always turn on both the magneto and electronic systems, even if the benefit of the magneto is not noticeable. If you have sensitive EGT information you may notice a lower EGT when both spark plugs are firing. Verify that all cylinder head temperatures are within normal limits. Too much timing advance might cause high CHT's.

Section 4 TROUBLESHOOTING

One of the first priorities in designing the LSE ***PLASMA*** **CDI** System was its reliability. State-of-the-art circuitry is used throughout combined with professional design. It is unlikely that failures will occur during normal operation.

This is unlike the conventional magneto systems where failure is predictable. Also, contrary to magneto or other distributor systems, there is no wear or other loss in performance over time. In short, it either works or does not.

IF SYSTEM FAILURE DOES OCCUR:

All components supplied with the PLASMA CD system have been carefully tested. If any of these components are substituted, optimum performance cannot be guaranteed and such changes might affect the warranty. If deviations from the instructions or supplied materials have been made, please correct those changes before contacting LSE with any problems.

Consult the wiring diagram and assure proper connections of signal wires and power supply.

LSE recommends high tension lead replacement every 500 hours or every three years whichever comes first, independent of the ignition source.

On Hall Sensor modules, remove the cover with its circuit board attached and inspect for bearing wear and oil contamination. If problems are visible, return the housing to LSE for inspection and overhaul.

With the spark plug leads removed from all coils and the 9 pin connector in place (accessory case driven Hall Effect Modules) and power on, rapidly move the north pole of a magnet past each Hall sensor. On Direct Crank sensor systems, this can be achieved by rocking the prop so that the magnets in the flywheel move past the Hall sensors on the circuit board. You should be able to generate a spark at the coils from each of the four sensors. Also, verify the gap between the sensors and the magnet to be 0.020” – 0.060”.

Using an Ohm meter, the BNC cable should be open between the shield and the center conductor and about 1 ohm when it is connected to the coil. Measuring from each spade terminal to each output terminal of the coil should show an open circuit. Any conductivity here indicates a failed coil.

Verify the input wire harness (running from the triggering mechanism to the Plasma CD module) is routed with at least a 3” separation from the output wires (RG58 primary ignition wires running from the Plasma CD module to the ignition coils). These wires must be routed through different holes in the firewall in order to maintain a 3” or greater separation.

4.1 STARTING PROBLEMS

If your battery can no longer crank your engine over, you can hand start your engine using proper safe procedures. The LSE ***PLASMA*** **CDI** System will provide an accurate spark every compression stroke on 4 or 6 cylinder engines as long as the battery has more than 8 Volts.

Do not attempt to hand prop your engine with your non-impulse magneto hot.

If the engine backfires it is also possible that the impulse coupling of the remaining mag is not engaging properly. Any backfiring into the intake side contaminates the intake manifold and starting will be more difficult until fresh fuel is available. Turn the mag off during engine start if it causes a problem.

4.2 Radio Noise

The Plasma CDI systems are designed to not interfere with any aircraft radios if installed per manual. If noise is noticed on the radio, it is an indication of arcing on the high voltage lines. This can be anywhere between the BNC connectors and the sparkplugs.

Powering the system from your avionics buss will also cause noise. Both power and ground should come directly from the battery terminals.

If you experience radio static that disappears when you turn the Plasma CD electronic ignition system off, check the following possible sources and make any necessary corrections.

1. If you are operating an aircraft key switch, confirm there is not a ground wire installed from the ignition switch to aircraft ground. Remove the ground wire if one is installed. Only the shield of the two "P"-leads should be connected to the switch terminal labeled ground.
2. If you are using Denso ESR-U or ESR-V sparkplugs, check the security of the ferules on the sparkplug electrical connection. These plugs have threaded ferules that must be tightened securely. Sparkplugs included with systems sold after June 2002 have solid terminals.
3. Examine the high-tension lead connection to both the coils and the sparkplugs and confirm they are secured tightly to the metal connector clip inside the boot.

Section 5 FACTORY REPAIR AND WARRANTY

ONE YEAR LIMITED WARRANTY.

THE WARRANTY PERIOD BEGINS UPON INSTALLATION OF THE SYSTEM, OR AT A TIME NO LATER THAN SIX MONTHS FROM THE DATE OF PURCHASE.

ALL WARRANTY IS VOID IF ELECTRONIC COMPONENTS HAVE BEEN OPENED OR OTHERWISE TAMPERED WITH.

YOU MUST OBTAIN A RETURN AUTHORIZATION FROM LIGHT SPEED ENGINEERING TO ACCOMPANY ANY RETURNED COMPONENTS.

For further information or questions concerning our products,

please e-mail lightspeedengineering.com or contact us at:

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