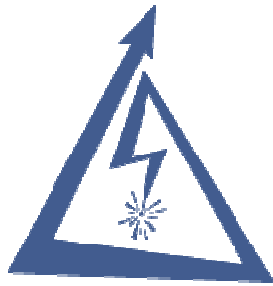


Customer: _____ Date: _____



electroair
ELECTRONIC IGNITION SYSTEMS

Trouble Shooting Instructions

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Instructions:

1. Complete the Initial Information Gathering section.
2. Complete the Customer Stated Problem section; be specific in the description.
3. Look for the title that most closely matches the stated problem.
4. Review and answer the questions.
5. Scan and submit this document to Electroair.

Initial Information Gathering:

1. What is the best way to communicate with you for prompt responses?
 - a. Email: _____
 - b. Phone: _____
2. What is the tail number?
 - a. _____
3. How many hours are on the aircraft?
 - a. _____
4. How many hours are on the engine?
 - a. _____
5. How many hours are on the EIS system?
 - a. _____
6. Is this a single or a twin engine aircraft?
 - a. Single
 - b. Twin
7. What is the type of aircraft?
 - a. _____ (ie Cessna 182C)

8. What is the make and model of the engine(s) is installed?
- a. Single/Left: _____
 - b. Right: _____
9. Is the aircraft in current annual? (Up to date with all applicable STC's and AD's)
- a. Yes/No
10. What EIS kit was purchased?
- a. Model Number: _____
 - b. Serial Number: _____
11. What is the engine's placarded (data tag) timing?
- a. _____ BTDC
12. Verify the engine placarded timing matches the EIS placarded timing. (EIS timing is a yellow card in the EIS kit and on the end of the controller.)
- a. _____ (initials of technician)
13. Prior to the installation of the EIS; what were the RPM drops during the ignition check?
- a. Single/Left engine: Left _____(RPM) Right mag _____(RPM)
 - b. Right engine: Left mag _____(RPM) Right mag _____(RPM)
14. Which mag(s) was replaced by the EIS
- a. _____ (Mag Part Number and location)
 - b. _____ (Mag Part Number and location)
15. Was/were the replaced mag(s) impulse coupled?
- a. Yes/No

16. Following the installation of the EIS, what were the RPM drops during the ignition check?

a. Single/Left engine: Left _____(RPM) Right _____(RPM)

b. Right engine: Left _____(RPM) Right _____(RPM)

17. Was the battery voltage low prior to start-up?

a. Yes/No

18. What spark plugs are being used?

a. Mag: _____
(Brand and part number)

b. EIS: _____
(Brand and part number)

19. What are the spark plug gaps?

a. Mag: _____

b. EIS: _____

20. Did the EIS ever run correctly?

a. Yes/No

21. What was the RPM rise on mixture shutdown?

a. _____ (RPM)

22. Did the engine kick-back or backfire during start?

a. Yes/No

Higher than Normal RPM drops during Ignition Check:

1. Perform an ignition check per the POH and note the RPM drops.
 - a. Single/Left engine: Left _____(RPM) Right _____(RPM)
 - b. Right engine: Left _____(RPM) Right _____(RPM)
2. Is engine running rough during ignition check (single engine operation)?
 - a. Yes/No
3. If yes to 2, then which ignition is the engine running rough?
 - a. EIS – Refer to “Engine Runs Poorly or Rough”.
 - b. Mag – Follow magneto troubleshooting procedures and/or POH.
4. If no to 2, then
 - a. Are CHTs normal or high? Refer to High CHT section.
 - b. Review and/or perform induction leak test.
 - c. Verify correct installation of MTH or CSTW.

Hard Starting and/or Engine Kick-Back during starting:

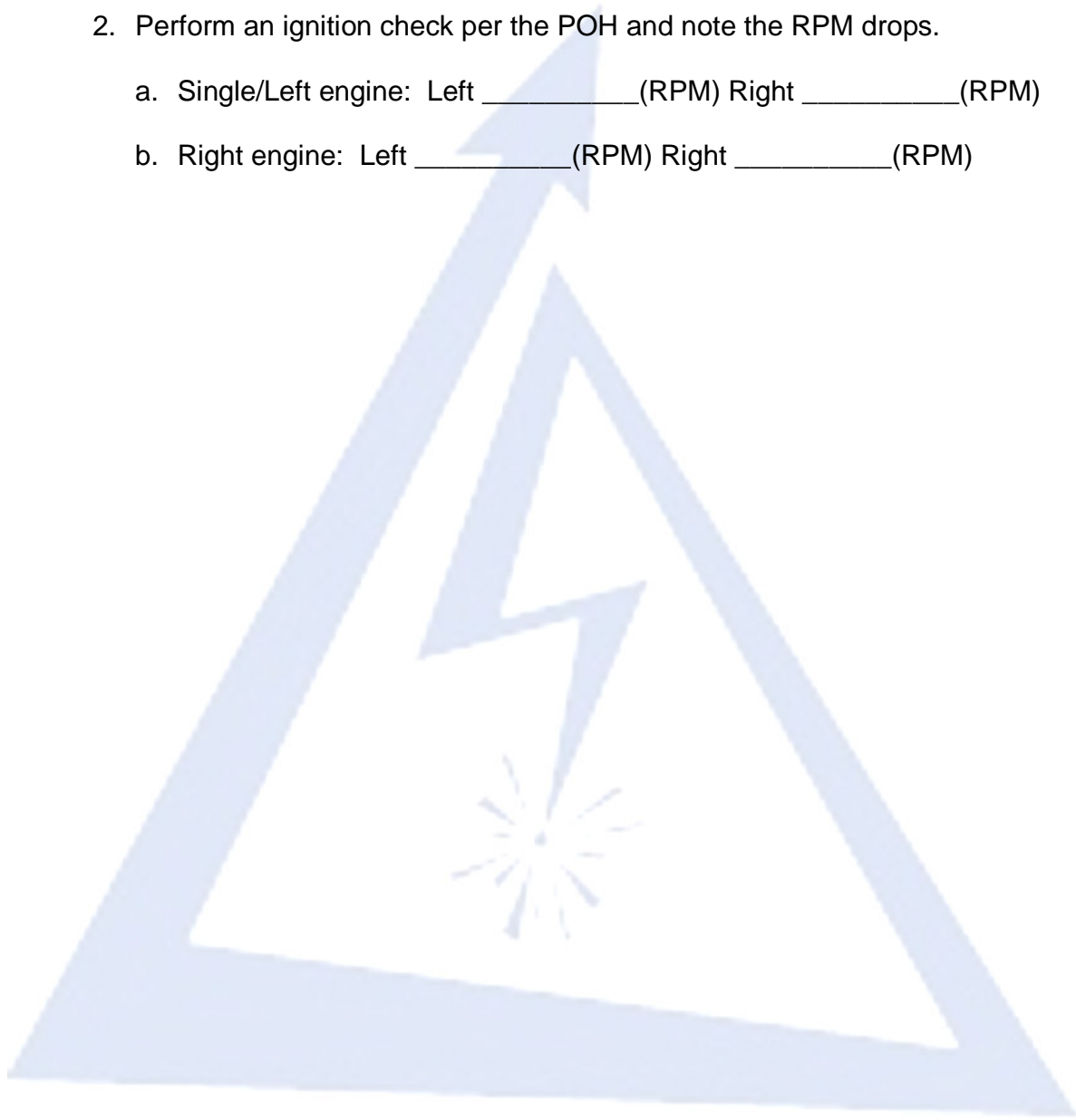
2. Is the EIS wired to be part of the start sequence?
 - a. Yes/No
3. Check all ground connections.
 - a. _____ (initials of technician)
4. Check for weak battery (particularly if using a permanent magnet type lightweight starter).
 - a. What is the system voltage? _____
 - b. What is the actual voltage? _____
 - c. _____ (battery distance from the starter)
 - d. _____ (wire gauge of battery cables)
5. Check for bad/worn/small gauge starter cables.
 - a. _____ (pictures taken)
 - b. _____ (location of pictures)
6. Check starter functionality.
 - a. _____ (initials of technician)
7. Verify that MTH and/or CSTW was installed at TDC on cylinder #1.
 - a. _____ (initials of technician)
8. Verify that timing on EIS is set correctly.
 - a. _____ (initials of technician)
 - b. _____ (timing value)
9. Is the Fuel system working correctly?
 - a. Yes/No

Engine runs poorly or rough:

1. Perform an ignition check per the POH and note the RPM drops.
 - a. _____ (Mag only)
 - b. _____ (EIS only)
2. Check all ground connections.
 - a. _____ (initials of technician)
3. Verify that spark plug wires are set to correct firing order and securely connected at the coil tower and spark plug.
 - a. _____ (initials of technician)
4. Inspect all spark plug harnesses for evidence of arching or arc-out (indicated by small burn marks near the spark plug/cigarette spring); round black marks on spark plug wire near attaching hardware.
 - a. _____ (pictures taken)
5. Inspect all spark plugs for proper gap, cracked ceramic, cleanliness, wear and resistance (resistance values are $5k\Omega$ or less).
 - a. _____ (pictures taken)
 - b. _____ (gap/cylinder)
 - c. _____ (resistance)
6. Verify that timing on EIS is set correctly.
 - a. _____ (initials of technician)
 - b. _____ (timing value)
7. On shutdown, what is the RPM rise?
 - a. _____(RPM)
8. On throttle advance, does the engine stumble or die out?
 - a. Yes/No

Engine runs poorly or rough at high RPM and/or high engine load:

1. Indicates possible failure of either a spark plug or spark plug wire; follow procedures for engine running rough.
2. Perform an ignition check per the POH and note the RPM drops.
 - a. Single/Left engine: Left _____(RPM) Right _____(RPM)
 - b. Right engine: Left _____(RPM) Right _____(RPM)



EIS is dropping off-line or is intermittent:

1. Indicates possible magnetic pick-up failure. Inspect pick-up by disconnecting from the main EIS wire harness. Check the resistance. The resistance should be between 600-800 ohms and not change when wires are moved. Refer to figure 1 and 2. (Resistance that changes indicates a bad magnetic pick-up). (Partial length of wire magnetic sensor to connector)

a. _____ (resistance value obtained)

b. _____ (constant or changing)



Figure 1: Measurement of Mag Sensor Resistance. Measure from red wire to black wire.

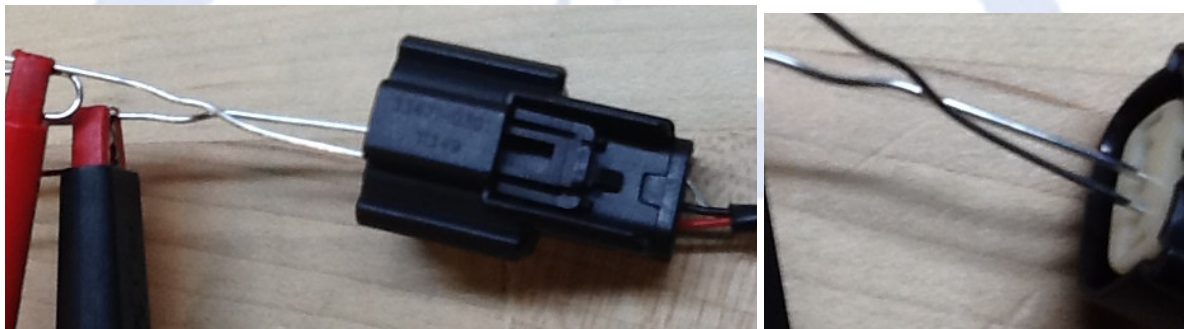


Figure 2: Measuring resistance of magnetic sensor detail.

2. Check the resistance of the magnetic sensor. (Full length of wire magnetic sensor to controller) Inspect power supply to the coil pack, controller, and map sensor for proper voltage. Refer to figures 3, 4, 5 and 6.

- a. _____
(resistance of the magnetic sensor 600-800Ω continuous)

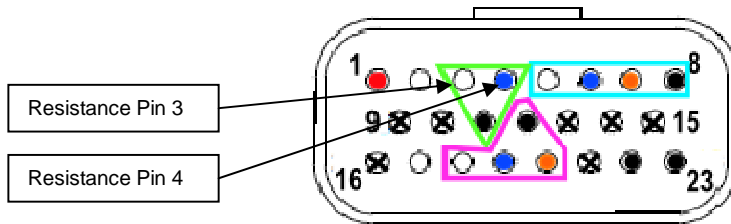


Figure 3: Connector typically located on the cool side of the firewall plugged into the controller. Then, measure from pin 3 to pin 4, for resistance.

- b. _____
(supply voltage to controller = aircraft battery voltage)

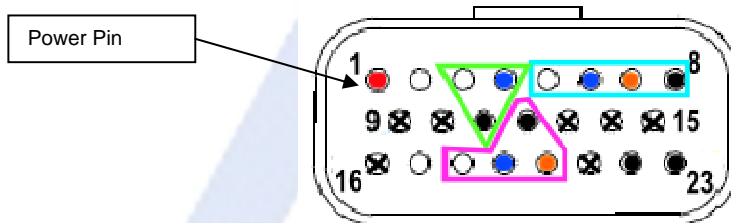


Figure 4: Controller Connector typically located on the cool side of the firewall plugged into the controller. Measure from pin 1 for voltage.

- c. _____
(supply voltage to coil pack = aircraft battery voltage)



Figure 5: Coil Pack Connector typically located on the engine side of the firewall plugged into the coil pack. Measure from pin 4 for voltage reading.

- d. _____
(supply voltage to map sensor = 5VDC)

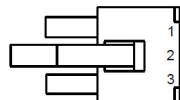


Figure 6: MAP Sensor Connector typically located on the cool side of the firewall plugged into the MAP Sensor, check supply voltage on pin 1 (voltage) to pin 2 (ground).

High CHTs (Timing Related):

1. What were the mag drops during mag checks?
 - a. _____ (Mag only)
 - b. _____ (EIS only)
2. Is the engine running smooth at idle?
 - a. Yes/No
3. Is the engine running smooth at full power?
 - a. Yes/No
4. At what RPM is the engine running rough?
 - a. _____ to _____ RPM
5. What are the CHT readings? (if available)
 - a. Single/Left #1: _____ °C/°F; Right #1: _____ °C/°F
 - b. Single/Left #2: _____ °C/°F; Right #2: _____ °C/°F
 - c. Single/Left #3: _____ °C/°F; Right #3: _____ °C/°F
 - d. Single/Left #4: _____ °C/°F; Right #4: _____ °C/°F
 - e. Single/Left #5: _____ °C/°F; Right #5: _____ °C/°F
 - f. Single/Left #6: _____ °C/°F; Right #6: _____ °C/°F
6. Check the mag timing housing/crankshaft trigger wheel was installed at 0°TDC on cylinder #1.
 - a. _____ (MTH or CSTW)
 - b. _____ (initials of technician)
7. Verify timing on EIS is set correctly by comparison of controller placarded timing and engine placarded timing.
 - a. _____ (initials of technician)

8. Disconnect MAP Sensor at the vacuum source. Seal hole in vacuum source before operating engine. Verify that operation returns to normal settings (without vacuum advance) during a ground run-up.
 - a. _____ (initials of technician)
 - b. Single/Left engine: Left _____(RPM) Right _____(RPM)
 - c. Right engine: Left _____(RPM) Right _____(RPM)
9. Verify the heat range of the spark plugs is correct for the engine application (particularly important with automotive spark plugs).
 - a. _____ (heat range of plug used)
 - b. _____ (engine application)
10. Perform and induction leak test on all intake tubes, intake hoses, gaskets, carburetor gasket, and throttle shaft. (Refer to procedure at end of this instruction.)
 - a. _____ (what was found leaking? If available)
11. What are the new CHT readings after corrections? (if available)
 - a. Single/Left #1: _____ °C/°F; Right #1: _____ °C/°F
 - b. Single/Left #2: _____ °C/°F; Right #2: _____ °C/°F
 - c. Single/Left #3: _____ °C/°F; Right #3: _____ °C/°F
 - d. Single/Left #4: _____ °C/°F; Right #4: _____ °C/°F
 - e. Single/Left #5: _____ °C/°F; Right #5: _____ °C/°F
 - f. Single/Left #6: _____ °C/°F; Right #6: _____ °C/°F

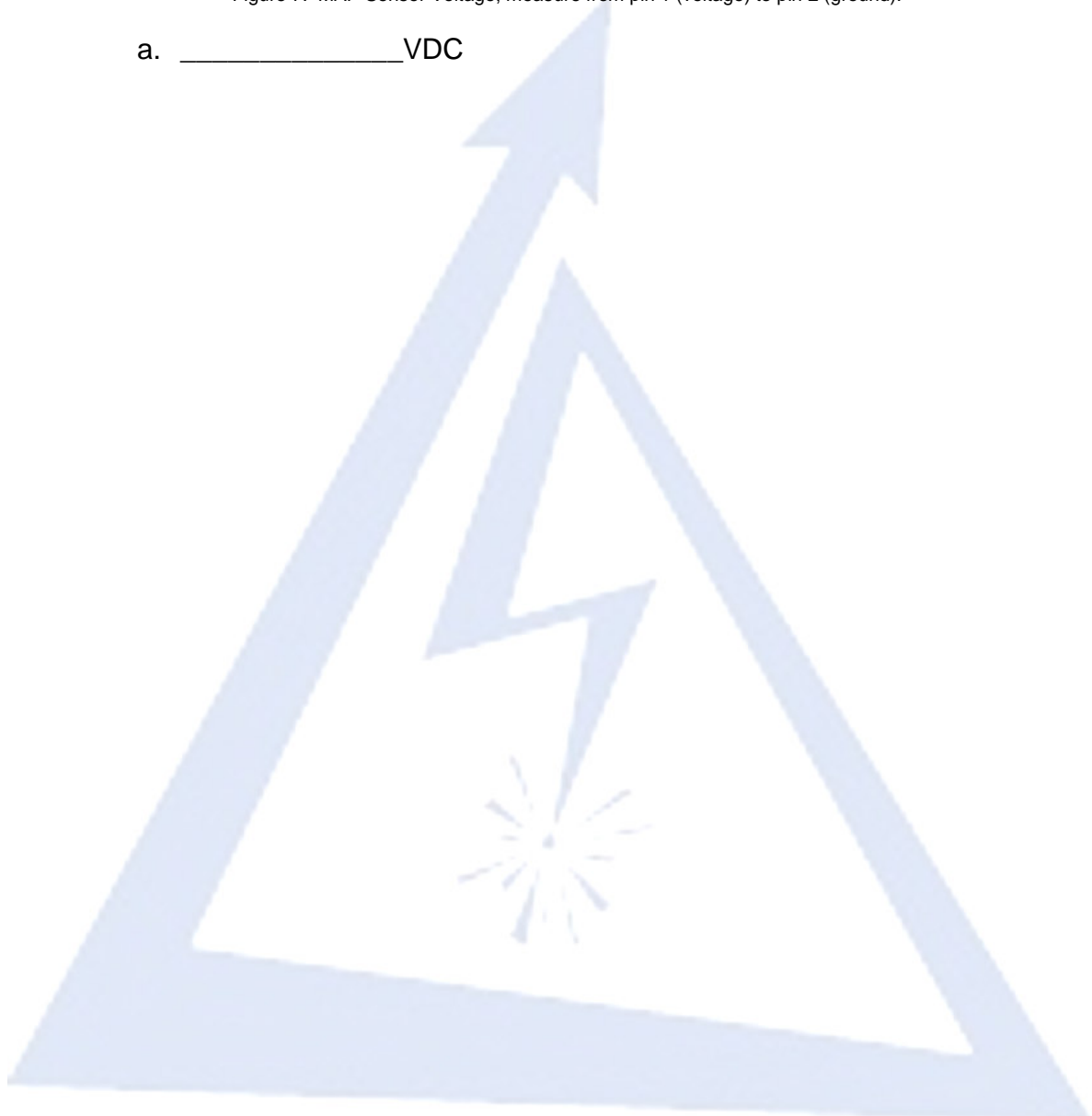
High CHTs (MAP Sensor)

1. Check that controller is sending 5VDC to the MAP Sensor. Refer to figure 7.



Figure 7: MAP Sensor Voltage, measure from pin 1 (voltage) to pin 2 (ground).

- a. _____ VDC



High CHTs (Engine Missing, Surging)

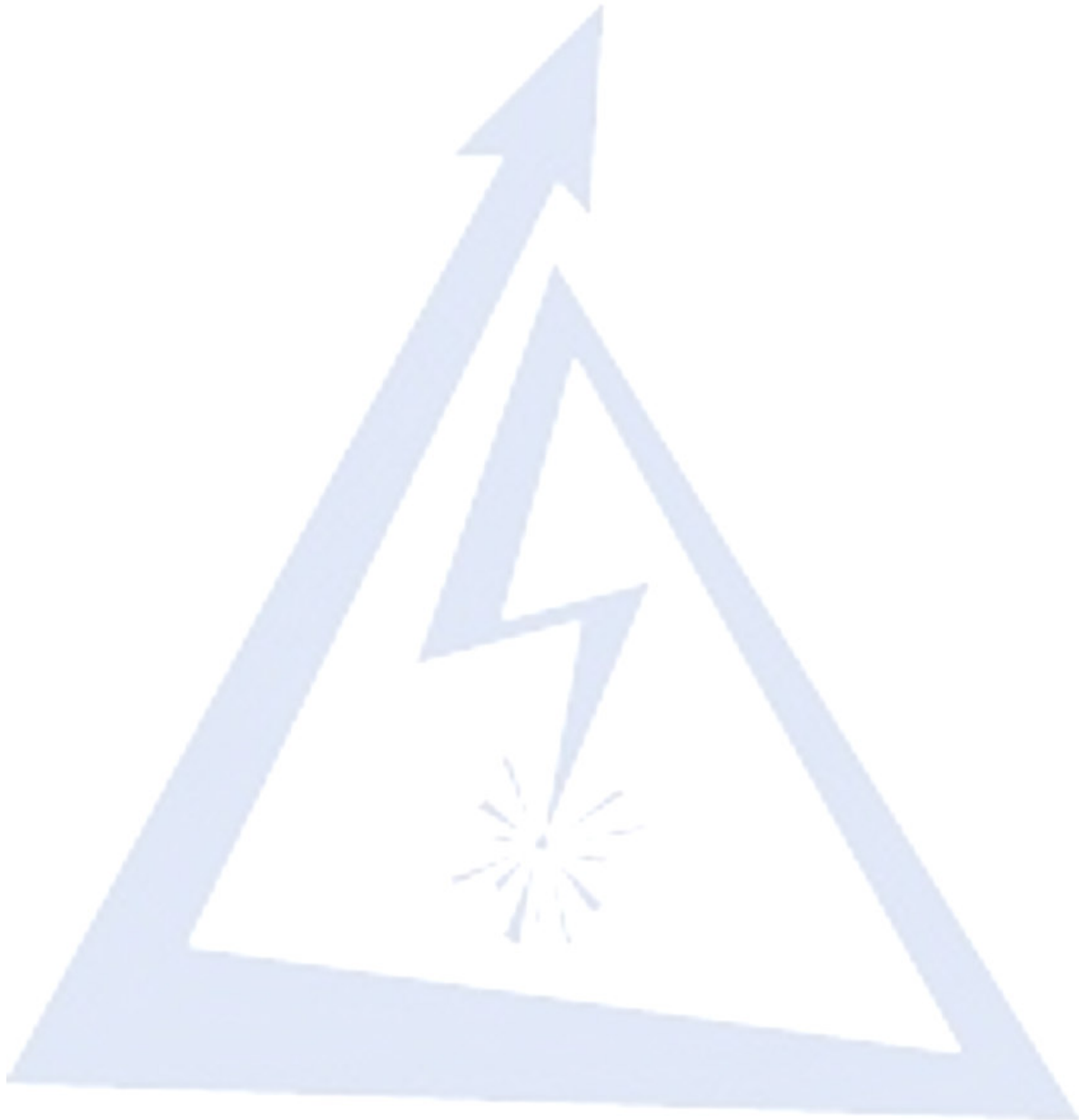
MTH Installed

1. Verify that unit was properly installed with cylinder 1 at 0° BTDC.
 - a. _____ (initials of technician)
2. Remove the MTH cap and verify there is no oil inside the housing.
 - a. _____ (initials of technician)
3. Verify magneto holder holding the MTH is properly torqued (_____ in-lbs).
 - a. _____ (initials of technician)

MTH Removed

1. Verify gear is properly installed on shaft with woodruff key still installed and castle nut properly torqued (_____ in-lbs) and cotter pinned.
 - a. _____ (initials of technician)
2. Verify shaft rotates smoothly in housing.
 - a. _____ (initials of technician)
3. Verify that shaft has no fore, aft, or side play by pushing and pulling on the shaft. Indicating the possibility of bad bearing.
 - a. _____ (initials of technician)
4. Is the tamper paint undisturbed?
 - a. _____ (initials of technician)
 - b. _____ (color of tamper paint)
5. Verify magnetic sensor properly gapped in at least 3 locations around the shaft. Use the (0.015 thick) feeler gauge provided with the original kit.
 - a. _____ (initials of technician)
6. Is the sensor firmly held into place by the set screws?

- a. _____ (initials of technician)
- 7. Verify that the trigger wheel has not struck the sensor.
 - a. _____ (initials of technician)



Radio Noise, Rough Engine, Missing

1. Verify proper connection to the coil towers; hear and feel plug connectors seat onto coil towers.
 - a. _____ (initials of technician)

2. Verify spring terminal has been installed properly off center of the solid wire coil in the center of the spark plug wire per the installation instructions and tip has not bent outward.
 - a. _____ (initials of technician)

3. Measure the resistance of the spark plug wires. Verify resistance is $350\Omega/\text{foot} \pm 10\%$.
 - a. Single/left #1: _____ Length of Wire: _____
 - b. Single/left #2: _____ Length of Wire: _____
 - c. Single/left #3: _____ Length of Wire: _____
 - d. Single/left #4: _____ Length of Wire: _____
 - e. Single/left #5: _____ Length of Wire: _____
 - f. Single/left #6: _____ Length of Wire: _____
 - g. Right #1: _____ Length of Wire: _____
 - h. Right #2: _____ Length of Wire: _____
 - i. Right #3: _____ Length of Wire: _____
 - j. Right #4: _____ Length of Wire: _____
 - k. Right #5: _____ Length of Wire: _____
 - l. Right #6: _____ Length of Wire: _____

4. Visually inspect the wires for burn marks, cracking, age hardening, physical damage, loose spring terminals, or arcing on spring contact (arcing in plug well).
 - a. _____ (initials of technician)

5. Verify correct depth of the lead that is being inserted into the plug and that the spring is compressing in the spark plug well.

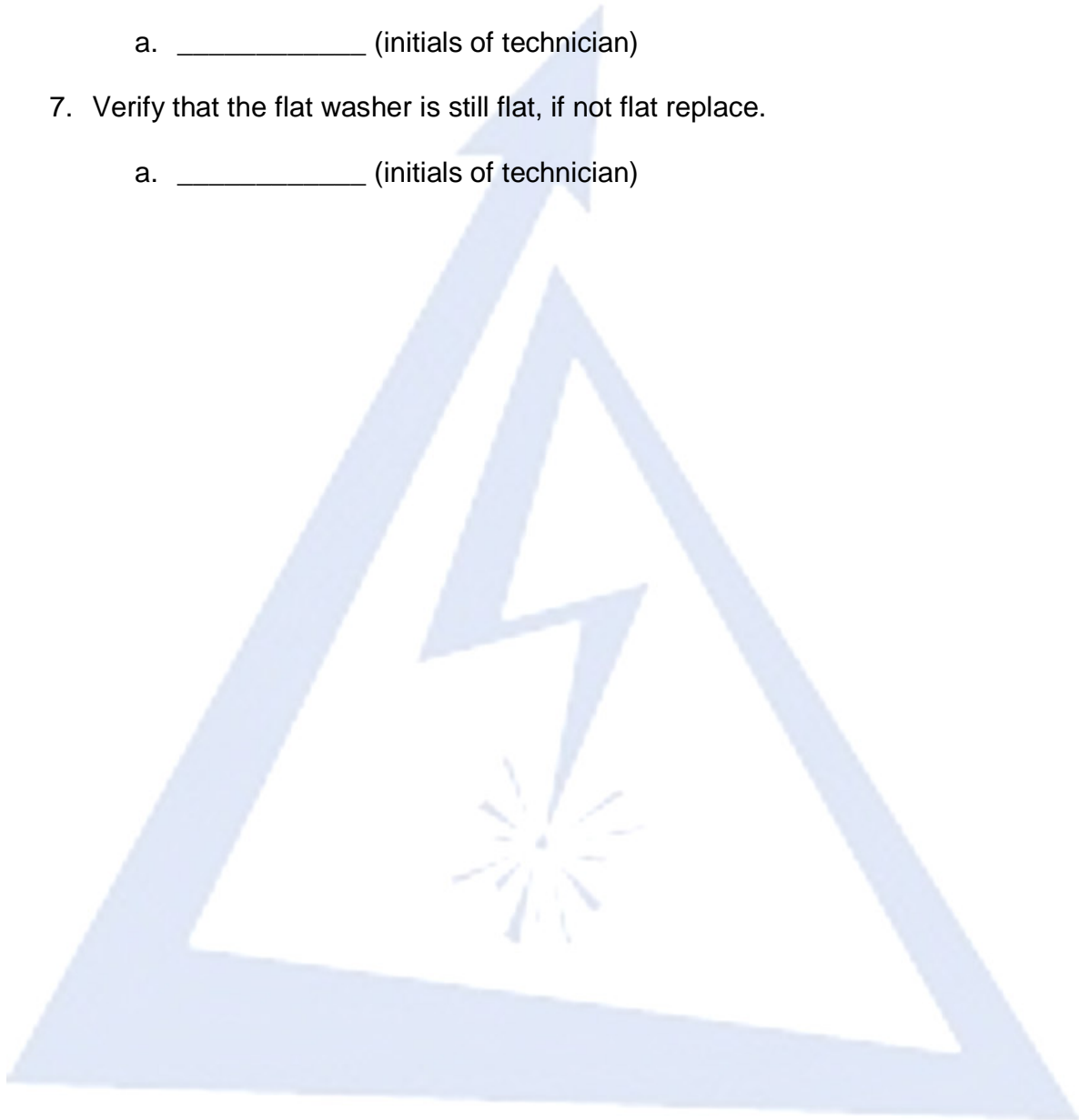
a. _____ (initials of technician)

6. Verify that the rubber gasket is still in good condition.

a. _____ (initials of technician)

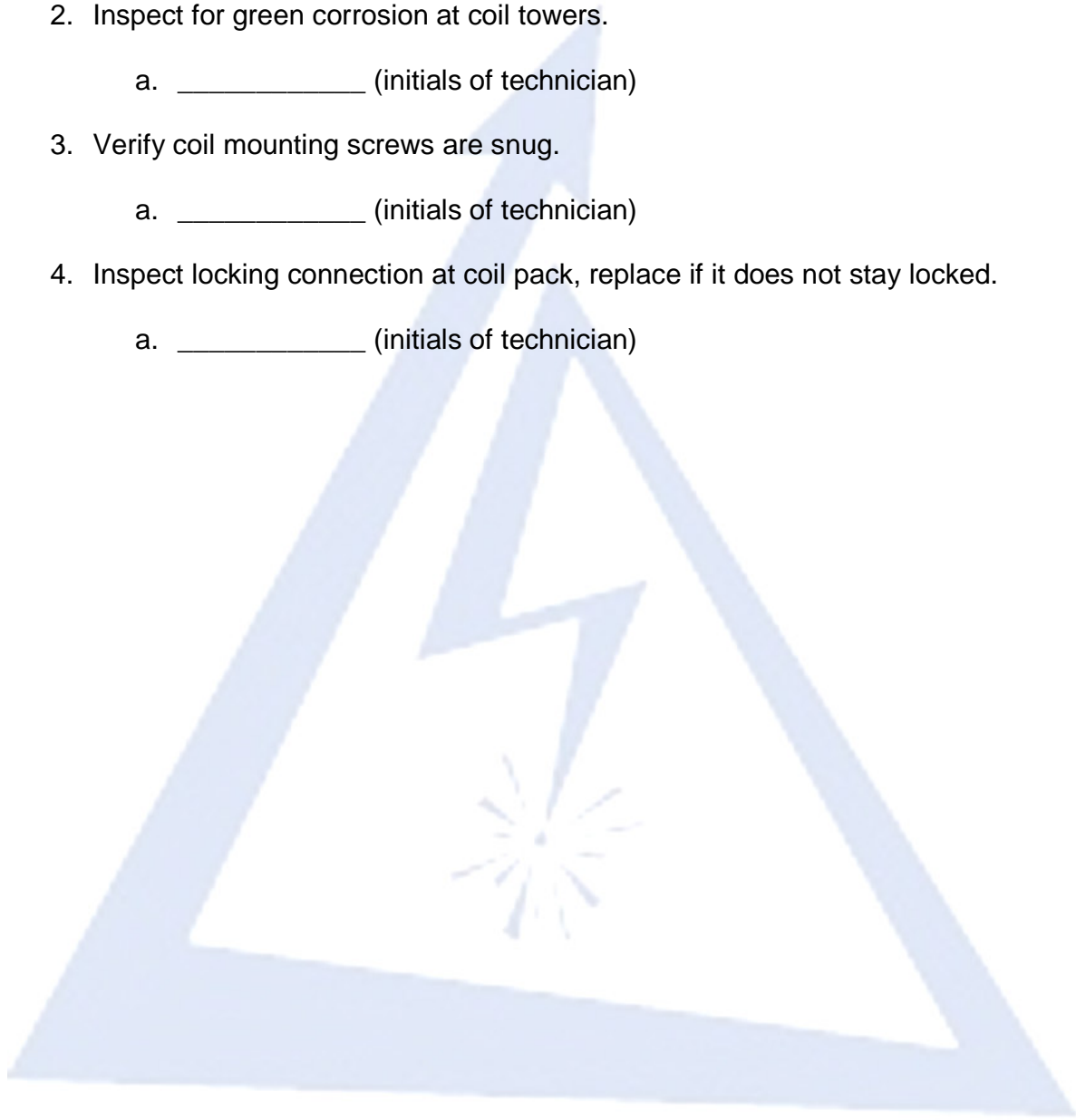
7. Verify that the flat washer is still flat, if not flat replace.

a. _____ (initials of technician)



Radio Noise, Missing, Failure to Start (Coils)

1. Inspect for cracked coil towers or cracked bodies.
 - a. _____ (initials of technician)
2. Inspect for green corrosion at coil towers.
 - a. _____ (initials of technician)
3. Verify coil mounting screws are snug.
 - a. _____ (initials of technician)
4. Inspect locking connection at coil pack, replace if it does not stay locked.
 - a. _____ (initials of technician)



Radio Noise (No other symptoms noted)

1. When is the noise present during receive, transmit, or seat to seat?
 - a. Receive: _____
 - b. Transmit: _____
 - c. Intercom: _____

2. When individual radios are switched off is the noise still present? If yes, which radio was off when the noise went away?
 - a. Yes/No
 - b. Radio: _____

3. Review the installation from spark plug to coil pack.
 - a. Look for loose connections: _____
 - b. Look for degraded gaskets: _____
 - c. Look for burnt wires: _____
 - d. Look for broken wire casings: _____
 - e. Look for dry rotted wire casings: _____
 - f. Look for connections to the coil pack towers that are not fully seated: _____
 - g. Look for cracks in the coil pack: _____

4. Leaving the EIS on and turn other electronic devices off/on. Verify if there are any changes in the noise levels.
 - a. Changes: _____

5. Review the wire bundles; separate audio wires from any other wires.
 - a. Bundled: _____
 - b. Not Bundled: _____

6. Review the avionics grounding. Are all grounds less than 6 inches? Ideally, there grounds should be right next to the unit themselves.
 - a. Yes/No

7. Are the grounds individual or combined? Radio grounds should not be combined with "earth" grounds.
 - a. Individual: _____
 - b. Combined: _____

8. Does the owner still have the installation instruction for the radio stack upgrade?
 - a. Yes/No
9. Examine the radios themselves. If they are older, the internal noise suppression may not exist or may have failed.
 - a. Findings: _____

If the listed troubleshooting techniques are ineffective, scan and email this completed document to sales@electroair.net. Then, contact the factory for support. Evaluation of coil pack, EIS Controller, and any other components are all available through Electroair technical support for a nominal fee. (sales@electroair.net or 517-552-9390)

Induction Leak Test

Materials:

Spray Bottle with Soapy Solution
Differential Compression Tester
Two People (one on bubble watch, one on propeller)

Instructions:

1. Master switch off. EIS switch off.
2. Remove one spark plug.
3. Place the cylinder without the spark plug at TDC.
4. Connect the differential compression tester to cylinder without the spark plug.
5. Set the differential compression tester at 80 PSI.
6. Ensure the throttle is closed.
7. Hold propeller with both hands and rotate backwards until the intake valve opens on that cylinder.
8. The intake valve opening, will allow the built up pressure in the cylinder to pressurize the induction system.
9. Spray a soapy solution on all potential leak points.
10. "Burp" the propeller (allow propeller to turn backwards until the valve opens) at different time intervals to allow different pressures in to the induction system.
11. Leaks will be seen as foaming bubbles/bubbles coming from hoses, gaskets, or connection points.
12. Higher burping pressures may blow the soapy solution away from the leak leaving no indication.
13. Lower burping pressures will tend not to show leaks with the soapy solution.
14. Therefore multiple burping times and pressures should be tried to ensure finding leaks large or small.

Note: Process does not need to be repeated on every cylinder.

CAUTION:

Using this technique can be dangerous and injurious in the event your hands slip off of the propeller allowing the propeller to spin. Take proper precautions to ensure that no one is injured.

CAUTION:

Do not hook differential compression tester to a cylinder with a manifold pressure gauge attached. The gauge will be damaged.

CAUTION:

Ensure Master Switch is off. Ensure Ignition Switches are off.

Glossary

- DVM – digital volt meter
- DMM – digital multimeter
- CHT – cylinder head temperatures
- CSTW – crankshaft trigger wheel
- MTH – mag timing housing
- MAP – manifold absolute pressure
- RPM – revolutions per minute
- PSI – pounds per square inch
- TDC – top dead center
- BTDC – before top dead center
- Burp – release the pressure built by the differential compression tester into the induction system.

Revision Log

Revision	Date of Revision	Description of Revision	Approved by	Date of Approval
00	10/18/2013	Initial Release		
01	06/06/2014	ECO 1116-0024	HP	06/06/2014