EIS-41000
Installation Manual

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Ignition System Technical Discussion

Ignition System Basics

The goal of any ignition system in a four-stroke engine is to start the combustion event so that peak pressure, as a result of combustion, occurs between 10 & 17 degrees after top dead center (ATDC) of the piston travel. This is the generally accepted range and the starting point when talking about ignition systems. From here we work backwards to understand how ignition systems work and what improvements can be made in order to get the most out of the engine.

Dual Magneto System Review

Traditional aircraft engines use a dual, or two, Magneto Ignition System (MIS). Both magnetos are timed to fire at a preset degree before Top Dead Center (TDC). The two magneto system can be made up of a number of combinations: one impulse coupled magneto and one direct drive magneto; two impulse coupled magnetos; or two magnetos that have some kind of “starting help” device like a shower of sparks or “Slick-Start” system. No matter the combination, the magnetos are responsible for supplying energy to the spark plugs causing a “spark” which is used to ignite a fuel/air mixture inside of the cylinder. For decades, this kind of ignition system has been used quite successfully in aircraft engines. Traditional aircraft ignition systems, however, have remained stagnant in technological development and because of their inherent limitations, hand-cuff the engine’s ability to deliver peak performance.

Magnetos have two big limitations: one, they produce a relatively small amount of energy; and two, they can only provide that energy (or spark) at a fixed time point in the crank-shaft rotation. Magnetos typically can provide 12,000V through about 5 degrees of crank rotation at the spark plug – less during the start sequence (6,000-8,000 volts during starting). The fixed time point where the spark occurs means that the magneto cannot adjust the spark event to compensate for variances in fuel/air mixtures. As fuel/air mixtures varies (either because of altitude, air density, fuel density, etc.), the time required to develop peak pressure from combustion also changes. If the ignition event timing doesn’t change, then the time where peak pressure occurs MUST change. When this happens, the experience is typically a loss of power.

EIS Overview & Primer

There are two principle differences between a magneto (MIS) and an electronic ignition system (EIS): one, an EIS is able to deliver much higher energy to the spark plug for a long period of time (70,000V through about 20 degrees of crank rotation) at any RPM; and two, an EIS is able to vary the ignition timing based on changes in the fuel/air mixture.

The very large voltage supplied to the spark plugs comes from using larger coils. The EIS’s ability to deliver that voltage at any RPM is because the output from the EIS is NOT dependent on engine RPM, but the battery supply. The high energy voltage from the EIS allows for a larger gap in the spark plug – insuring a big, long duration, high quality spark. This spark will then have the ability to ignite typically any kind of fuel/air mixture that passes by the spark plug. This is particularly important for hot-start applications, where the fuel/air mixture is corrupt in some way, caused by the high temperature, poor fuel quality, or any combination thereof.

The ability to vary spark timing is also critical. Any good propulsion engineer will pontificate that the way to develop power out of an engine is directly related to the amount of air that can be put into the combustion chamber (fuel can always be metered). Aircraft engines battle this problem
constantly with changing altitude and poorly designed intake systems. A good way of measuring the amount of air in the combustion chamber is by measuring Manifold Absolute Pressure (MAP). This directly correlates to the amount of air available for combustion. The EIS looks at MAP, and adjusts timing based on this to optimize the location (or degree of crank position) for the spark event to occur. The Electroair EIS uses the vacuum advance curve found in Figure 1 for adjusting timing based on MAP.

![Vacuum Advance Curve](image)

**Figure 1: Vacuum Advance Curve**

**How the Electroair EIS Works**

The Electroair EIS fires the spark plugs directly from the coils, not through a distributor. This is accomplished by using multiple coils, each with two spark terminals. The coil terminals are connected to the spark plugs, allowing one cylinder to fire on compression while its companion cylinder fires simultaneously on exhaust. Open spark gaps in the rotor and cap are eliminated, making wear and moisture problems a thing of the past.

What sets the Electroair Electronic Ignition System apart from others is the ability to charge multiple ignition coils at the same time. This increased dwell time means that full spark energy is available over the entire RPM range (up to 9600 RPM at 12 volts). Unlike capacitive discharge systems that only put out one very short spark, the EIS puts out a full energy, long burning spark at the highest and most critical engine speeds. Long burn times assure effective burning of even rich fuel mixtures.

The EIS Controller includes dual digital microprocessors using patented spark algorithms, which takes the electrical signal from the crankshaft (or mag timing housing) sensor, identifies top-
dead center, and then keeps track of the remaining rotation. The EIS determines engine speed and computes the spark advance using the settings pre-set at the factory for the engine as a base-line. Settings from the factory are preset for the engine’s certified placarded timing. Additionally, the EIS receives engine manifold pressure information and advances the ignition to compensate for altitude and throttle position.

Beyond the synchronization and firing the plugs at the correct advance angle, the EIS also computes the exact dwell time to produce 9 amps of coil current. Coil charging is dynamically measured, so changes in RPM, battery voltage, or temperature are accounted for on every spark. This corrects any errors that are caused by battery voltage or coil temperature changes and insure maximum spark energy.

High Resolution Crankshaft Position Sensor

The EIS uses a single, high resolution, 60-minus-2 tooth crankshaft position trigger wheel. The trigger wheel is either installed in a timing mechanism that is installed in a mag hole (aka Mag Timing Housing or MTH), or a trigger wheel is installed directly on the crankshaft just behind the prop flange. This affords resolution unheard of in any other electronic ignition available today, offering spark accuracy of ¼ degree of crankshaft rotation. This accuracy means the system is ideal for the most demanding engine applications – that’s why the Electroair EIS has accomplished altitude and speed records in the industry.

In summary, the Electroair EIS delivers more power because:

- Spark timing is precisely controlled under all conditions, including rapid engine acceleration.
- Longer dwell time and better propagation allows the engine to run better on various mixture settings.
- Accurate spark timing allows sustained engine operation closer to desired peak power timing.
- 100% spark energy up to 9600 RPM on 6 cylinder applications (at 12 volts).
- Longer spark duration!
- Built-in timing program.
- No power draining magnetos to drive.
- No moving parts to wear out or adjust.

Electrical Environmental Limitations

- Radiated Susceptibility – Tested to DO-160E section 20 category S
- Conducted Emissions – Tested to DO-160E section 21 category B
- Radiated Emissions – Tested to DO-160E section 21 category B
- Lightning – Tested to DO-160E section 22 category E2
Spark Plug Discussion

The installation manual specifies the recommended gap for the engine application. This gap will be larger than a typical aircraft plug gap because of the higher energy output from the EIS. This is perfectly acceptable with the EIS ignition charging method, since the high load of the cylinder pressure will allow the voltage to be quite high at the electrode; the gap will keep the plug from seeing an over-voltage situation.

The EIS system uses an inductive long duration charging method for the coils. Electroair’s experience has drawn us to the following guidelines for spark plug selection:

- Electroair manufactures aviation spark plugs that are gapped at the factory to Electroair’s recommended wide gap of 0.036 inches. Electroair manufactures both massive electrode and fine wire spark plugs for various applications. The spark plug information can be found on the Electroair website (www.electroair.net). Electroair spark plugs have been FAA approved for use with Electroair’s certified EIS-61000 ignition systems. These plugs are only approved for use with Electroair’s EIS. Electroair spark plugs should not be used with magnetos.

- Select aircraft spark plugs that will work with the EIS. For Lycoming engines, Electroair has found that the REM37BY (or equivalent) plugs work the best because they are easier to gap to the range required and fit the broadest heat range recommended by the engine manufacturers. (Fine wire plugs are also an excellent choice for Lycoming engines). For Continental Engines requiring long reach spark plugs, off-the-shelf fine wire spark plugs will generally be the easiest to adjust the gap. Electroair strongly recommends verifying the heat range for the engine and using the appropriate plugs.
EIS-41000 Kit Descriptions & Requirements

EIS-41000 System Description & Requirements:
1. This EIS Kit replaces one NON-impulse coupled magneto on the engine of a single engine aircraft
2. 12V or 24V electrical system capable of 0.75A
3. Manifold pressure line for installing the MAP sensor
4. A Direct Drive Magneto gear (NOT PROVIDED IN EIS KIT)
5. Toggle Switch x 1 (NOT PROVIDED IN EIS KIT)
6. 2 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)
7. 10 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)

EIS-41000IC System Description & Requirements:
1. This EIS Kit replaces one impulse coupled magneto on the engine of a single engine aircraft
2. 12V or 24V electrical system capable of 0.75A
3. Manifold pressure line for installing the MAP sensor
4. A Magneto Drive Gear (NOT PROVIDED IN EIS KIT)
5. Toggle Switch x 1 (NOT PROVIDED IN EIS KIT)
6. 2 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)
7. 10 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)

EIS-41000T System Description & Requirements:
1. This EIS Kit replaces one NON-impulse coupled magneto on ONE standard-rotating engine of a twin engine aircraft
2. 12V or 24V electrical system capable of 0.75A
3. Manifold pressure line for installing the MAP sensor
4. A Direct Drive Magneto gear (NOT PROVIDED IN EIS KIT)
5. Toggle Switch x 1 (NOT PROVIDED IN EIS KIT)
6. 2 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)
7. 10 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)

EIS-41000TLH System Description & Requirements:
1. This EIS Kit replaces one NON-impulse coupled magneto on the counter-rotating engine of a twin engine aircraft
2. 12V or 24V electrical system capable of 0.75A
3. Manifold pressure line for installing the MAP sensor
4. A Direct Drive Magneto gear (NOT PROVIDED IN EIS KIT)
5. Toggle Switch x 1 (NOT PROVIDED IN EIS KIT)
6. 2 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)
7. 10 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)

EIS-41000TIC System Description & Requirements:
1. This EIS Kit replaces one impulse coupled magneto on ONE standard-rotating engine of a twin engine aircraft
2. 12V or 24V electrical system capable of 0.75A
3. Manifold pressure line for installing the MAP sensor
4. A Magneto Drive Gear (NOT PROVIDED IN EIS KIT)
5. Toggle Switch x 1 (NOT PROVIDED IN EIS KIT)
6. 2 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)
7. 10 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)

EIS-41000TLHIC System Description & Requirements:
1. This EIS Kit replaces one impulse coupled magneto on the counter-rotating engine of a twin engine aircraft
2. 12V or 24V electrical system capable of 0.75A
3. Manifold pressure line for installing the MAP sensor
4. A Magneto Drive Gear (NOT PROVIDED IN EIS KIT)
5. Toggle Switch x 1 (NOT PROVIDED IN EIS KIT)
6. 2 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)
7. 10 amp circuit breaker or fuse x 1 (NOT PROVIDED IN EIS KIT)

Other items needed:
1. If replacing a Bendix Magneto, the Slick-type MAG holders are needed to mount the EA-3000, EA-3000IC, EA-3000LH, or EA-3000LHIC.
2. Basic tools and standard aircraft hardware required for mounting EIS controller, coil pack, and MAP sensor.
3. Electrical tools for cutting, stripping and terminating various wiring. Also recommended is a good selection of cable ties for harness routing and tie-off.

EIS-41000 Kit Contents & Optional Parts
EIS-41000 Kit Contents:
1. ___EIS Controller (EA-1000)
2. ___Coil Pack (EA-2000) with mounting plate and hardware kit
3. ___MAG Timing Housing (EA-3000) with hardware kit
4. ___MAP Sensor (EA-5000)
5. ___Spark Plug Wires (EA-4000) x2 Bundles, (2) bundles make (4) leads
6. ___EA-4000 REM Hardware Kit or EA-14000-4 Hardware Kit
7. ___Wiring Harness (EA-6000)
8. ___USB Drive Containing System Documents (Installation Manual)

EIS-41000IC Kit Contents:
1. ___EIS Controller (EA-1000)
2. ___Coil Pack (EA-2000) with mounting plate and hardware kit
3. ___MAG Timing Housing (EA-3000IC) with hardware kit
4. ___MAP Sensor (EA-5000)
5. ___Spark Plug Wires (EA-4000) x2 Bundles, (2) bundles make (4) leads
6. ___EA-4000 REM Hardware Kit or EA-14000-4 Hardware Kit
7. ___Wiring Harness (EA-6000)
8. ___USB Drive Containing System Documents (Installation Manual)
EIS-41000T Kit Contents:

1. ___EIS Controller (EA-1000)
2. ___Coil Pack (EA-2000) with mounting plate and hardware kit
3. ___MAG Timing Housing (EA-3000) with hardware kit
4. ___MAP Sensor (EA-5000)
5. ___Spark Plug Wires (EA-4000T) x2 Bundles, (2) bundles make (4) leads
6. ___EA-4000 REM Hardware Kit or EA-14000-4 Hardware Kit
7. ___Twin Engine Wiring Harness (EA-6000TP)
8. ___Instrument Panel Label Kit
9. ___USB Drive Containing System Documents (Installation Manual)

EIS-41000TLH Kit Contents:

1. ___EIS Controller (EA-1000)
2. ___Coil Pack (EA-2000) with mounting plate and hardware kit
3. ___MAG Timing Housing (EA-3000LH) with hardware kit
4. ___MAP Sensor (EA-5000)
5. ___Spark Plug Wires (EA-4000T) x2 Bundles, (2) bundles make (4) leads
6. ___EA-4000 REM Hardware Kit or EA-14000-4 Hardware Kit
7. ___Twin Engine Wiring Harness (EA-6000TP)
8. ___Instrument Panel Label Kit
9. ___USB Drive Containing System Documents (Installation Manual)

EIS-41000TIC Kit Contents:

1. ___EIS Controller (EA-1000)
2. ___Coil Pack (EA-2000) with mounting plate and hardware kit
3. ___MAG Timing Housing (EA-3000IC) with hardware kit
4. ___MAP Sensor (EA-5000)
5. ___Spark Plug Wires (EA-4000T) x2 Bundles, (2) bundles make (4) leads
6. ___EA-4000 REM Hardware Kit or EA-14000-4 Hardware Kit
7. ___Twin Engine Wiring Harness (EA-6000TP)
8. ___Instrument Panel Label Kit
9. ___USB Drive Containing System Documents (Installation Manual)

EIS-41000TLHIC Kit Contents:

1. ___EIS Controller (EA-1000)
2. ___Coil Pack (EA-2000) with mounting plate and hardware kit
3. ___MAG Timing Housing (EA-3000LHIC) with hardware kit
4. ___MAP Sensor (EA-5000)
5. ___Spark Plug Wires (EA-4000T) x2 Bundles, (2) bundles make (4) leads
6. ___EA-4000 REM Hardware Kit or EA-14000-4 Hardware Kit
7. ___Twin Engine Wiring Harness (EA-6000TP)
8. ___Instrument Panel Label Kit
9. ___USB Drive Containing System Documents (Installation Manual)
Receiving and Acceptance Checking of EIS Kit

1. Review the packaging before acceptance from the freight carrier. If damaged, refuse the package.
2. Open the package.
3. Review the contents of the package to the content listing on the package.
4. Are all of the materials there?
   a. Yes, proceed to step 5.
   b. No, contact the factory. Have the serial number of the kit available when contacting.
      (factory 517-552-9390 or sales@electroair.net)
5. Inspect the controller and MAP sensor for damage to the aluminum housing. Verify that the placarded controller timing matched the placarded engine timing. If not contact Electroair 517-552-9390 or sales@electroair.net.
6. Inspect the wires for nicks and cracks.
7. Inspect the coil pack and plate for external damage.
8. Inspect the CSTW/MTH for external damage.
9. Are all materials acceptable?
   a. Yes, proceed with installation.
   b. No, contact the factory. Have the serial number of the kit available when contacting.
      (factory 517-552-9390 or sales@electroair.net)

If possible, store parts in original packaging when not in use. If not possible, wrap parts in cushioning material and place in one location. Review above prior to reinstallation.

For latest copies of documentation, refer to www.electroair.net.

- AML
- AFMS
- ICA
- Installation Manual
- STC
- Trouble Shooting Instructions
Overview of Four Cylinder Single Engine Aircraft EIS Installation

Thank you for purchasing an Electroair Ignition System. Electroair is confident in that you will be happy with the performance of this EIS on the aircraft. The next several pages are a step-by-step process of installing the EIS on the aircraft. Electroair hopes the experience will be enjoyable and that this manual will provide clear direction and guidance through this process. This manual will cover the following general installation steps:

1. General overview and recommendations
2. Removal of old ignition components
3. Set-up & Installation of p/n: EA-3000 MTH (EIS-41000 Kit Only)
4. Set-up & Installation of p/n: EA-3000IC Impulse Coupled MTH (EIS-41000IC Kit Only)
6. Installation of p/n: EA-5000 MAP Sensor
7. Installation of p/n: EA-4000 Spark Plug Harness
8. Connection of p/n: EA-6000TP Wiring Harness
9. Final installation steps
10. Installation Options available from Electroair

Electroair strongly recommends reading through this entire installation procedure before installing the EIS on the aircraft. Make sure that any questions are answered before the actual installation. Also, make sure any extra components needed, e.g. cable ties, circuit breakers, switch terminations, etc., are all available. Removal of old components and installation of new components is to be completed in compliance with CFR Title 14 Part 43, as applicable, and any Airframe or Engine Manufacturer Maintenance Procedures, as applicable. Above all else, use good common sense and professional judgment. An electronic ignition system is a high voltage device. If an EIS is improperly installed or misfired, severe damage to the EIS, the aircraft, or the installer may result.

Please contact Electroair (517-552-9390 or sales@electroair.net) with any questions during this installation process. Good luck and happy flying!!

Electroair
Installation of EIS-41000 & EIS-41000IC

1. General Overview and Recommendations:
   a. Read through the entire installation instructions before beginning the installation to make sure each step is understood. Contact Electroair (517-552-9390 or sales@electroair.net) if there are any questions or if any items that are unclear.

   **VERIFY TIMING CONTROLLER PLACARD TO ENGINE PLACARD**

   b. If controller placarded timing does not match engine placarded timing, contact Electroair (517-552-9390 or sales@electroair.net). The controller will need to be re-timed before installation.
   c. This ignition system is designed to be installed by aviation professionals with the appropriate ratings and experience for maintaining General Aviation aircraft.
   d. If pre-existing components on the airframe are in the way of or are in close proximity to the installation locations of the EIS components, Electroair Acquisition Corp. recommends following the procedures listed below. **NOTE:** When making ANY changes or modifications to the aircraft or aircraft components, make sure all practices are in accordance with CFR Title 14 Part 43.
      i. If the preexisting components can be relocated, move the components to an acceptable location on the airframe where they will not come into contact with the EIS component(s).
      ii. If the preexisting components must come into contact or close proximity to the EIS component(s), make sure to protect all components from each other. This could mean, but not limited to, adding anti-chafing material, additional component securing devices, heat shielding material, etc.
   e. Always use good safety and work practices. Use appropriate safety equipment (safety glasses, etc.) and precautions. The EIS is a high voltage system and if installed or tested incorrectly can cause substantial damage to both the system and YOU!

2. Removal of Old Ignition Components:
   a. Remove cowling. Verify that Master Switch is off and battery is disconnected.
   b. **IMPORTANT:** Determine which magneto will be replaced, either the right or the left magneto and whether it is direct drive or impulse coupled magneto. **Note:** If an impulse coupled magneto is being replaced; EIS-41000IC kit is needed.
      i. When replacing a direct drive type magneto, the magneto will have single gear installed on its drive shaft. This gear will be reused to install p/n: EA-3000 MAG Timing Housing.
      ii. When replacing an impulse coupled magneto, the magneto will have an impulse coupler installed on its drive shaft and a drive gear installed on top of the impulse coupler. The drive gear will be reused to install p/n: EA-3000IC Impulse Coupled MAG Timing Housing. The impulse coupler will not be
needed. Instead a faux impulse coupler will be provided in the EA-3000IC hardware kit.

c Remove ignition harness from the spark plugs associated with the magneto that is being replaced.

d Disconnect the P-lead that is installed on the magneto that is being replaced from the ignition switch.

e Remove the selected magneto, the selected magneto’s ignition harness, and selected magneto’s P-lead from ignition switch. Retain the magneto hold down clips; they will be used to install the MTH (either p/n: EA-3000 or p/n: EA-3000IC).

f Remove the magneto drive components, as detailed in step 2b, from the magneto. Be careful not to damage the drive components. Electroair recommends using a standard gear puller. Retain drive components for installation of either p/n: EA-3000 or p/n: EA-3000IC.

g Remove spark plugs if new plugs are going to be used (recommended) with the electronic ignition system.

3. **Set-up & Installation of p/n: EA-3000 MTH (For EIS-41000 Kit Only):**

a Retrieve p/n: EA-3000 MTH and the EA-3000 MTH Hardware Kit.

b Insert the woodruff key into the key slot on the MTH shaft.

c Place the direct dive magneto gear on the MTH shaft. Be sure to align the Woodruff (half-moon shape) key with the slot in the gear.

d Install the washer and nut onto the MTH shaft and tighten the nut to the same torque value as recommended by the magneto manufacturer (Bendix or Slick). Install the cotter pin through the castle nut and MTH shaft with the long end of the cotter pin facing away from the MTH. Bend the long end of the cotter pin over the end of the shaft and the short end along the side of the nut. The direct drive gear is now installed onto the MTH shaft.

e Holding the MTH, insert the alignment pin in the alignment hole on the back cover (pin supplied with hardware kit). Slowly turn the gear on the front of the unit until the alignment pin drops into a second hole inside the MTH. The MTH is now set to Top Dead Center (TDC) and the MTH shaft should not be able to spin. Leave the alignment pin in the MTH and ready the engine for the MTH installation (next steps). See Figure 2 for an example.

![Figure 2: Installation of MTH Alignment Pin](image-url)
f  Clean magneto pad on the engine. Install new gasket on p/n: EA-3000.
g  **VERIFY MASTER SWITCH IS OFF AND BATTERY IS DISCONNECTED.**
h  Rotate the engine to Top Dead Center (TDC) for cylinder # 1. This done by rotating the prop **in the direction of the engine rotation** until TDC is reached. Verify TDC using the timing marks found on the engine. Typically, the first set is on the fly wheel and the starter; they will line up at TDC; the second set may be another mark on the back-side of fly wheel which lines up with the engine case seam at TDC. If any of these indications are not correct, repeat this step until they are. Other safe methods for obtaining TDC may be used, such as observing the cylinder movement through the spark plug holes. **Always rotate the engine in the direction that it rotates during operation.**
i  Install the MTH into the proper magneto hole. Secure the MTH using the mag holding clips referenced in step 2e and secure per engine manufacturer specifications.
j  **Remove the alignment pin.** Failure to remove the MTH Alignment Pin may cause damage to the MTH, the engine, or both.
k  P/N EA-3000 is now installed and timed properly.

4. **Set-up & Installation of p/n: EA-3000IC Impulse Coupled MTH (For EIS-41000IC Kit Only):**
a  Retrieve p/n: EA-3000IC Impulse Coupled MTH and the EA-3000IC Impulse Coupled MTH Hardware Kit.
b  Insert the two woodruff keys, provided in the EA-3000IC Hardware Kit, into the key slots on the Impulse Coupled MTH Shaft. See Figure 3.

![Figure 3: Impulse Coupled MTH Shaft with Woodruff Keys Inserted. Step 4b](image-url)
c  Install the faux Impulse Coupler provided in the EA-3000IC Hardware Kit on to the Impulse Coupled MTH shaft. Be sure to align the slot in the faux impulse coupler with the Woodruff key(s) on the shaft. See Figure 4 for a picture of this step.

![Figure 4: Faux Impulse Coupler Installed. Step 4c](image1)

d  Install the drive gear onto the installed faux impulse coupler on the shaft of the MTH. See Figure 5 for a picture of this step.

![Figure 5: Drive Gear installed on MTH. Step 4d](image2)
e From the EA-3000IC Hardware Kit, Install the large washer onto the drive gear. Then install the smaller washer on top of the large washer. Next tighten the castle nut onto the shaft to 160-190 in-lbs. Install the cotter pin through the castle nut and impulse coupled MTH shaft with the long end of the cotter pin facing away from the MTH. Bend the long end of the cotter pin over the end of the shaft and the short end along the side of the nut. The drive gear is now installed onto the impulse coupled MTH shaft. See Figure 6 for visual install order of components.

![Figure 6: Install Order of Components to Impulse Coupled Shaft.](image)

f Holding the Impulse Coupled MTH, insert the alignment pin in the alignment hole on the back cover (pin supplied with hardware kit). Slowly turn the gear on the front of the unit until the alignment pin drops into a second hole inside the Impulse Coupled MTH. The impulse coupled MTH is now set to Top Dead Center (TDC) and the Impulse Coupled MTH shaft should not be able to spin. Leave the alignment pin in the Impulse Coupled MTH and ready the engine for the Impulse Coupled MTH installation (next steps). See Figure 2 for an example.

g Clean magneto pad on the engine. Install new gasket on p/n: EA-3000IC.

h **VERIFY MASTER SWITCH IS OFF AND BATTERY IS DISCONNECTED.**

i Rotate the engine to Top Dead Center (TDC) for cylinder #1. This done by rotating the prop in the direction of the engine rotation until TDC is reached. Verify TDC using the timing marks found on the engine. Typically, the first set is on the fly wheel and the starter; they will line up at TDC; the second set may be another mark on the back-side of fly wheel which lines up with the engine case seam at TDC. If any of these indications are not correct, repeat this step until they are. Other safe methods for obtaining TDC may be used, such as observing the cylinder movement through the spark plug holes **Always rotate the engine in the direction that it rotates during operation.**

j Install the Impulse Coupled MTH into the proper magneto hole. Secure the MTH using the MAG holding clips referenced in step 2e and secure per engine manufacturer specifications.

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1 AC 43.13-1B Table 7-1, 09/08/98
k **Remove the alignment pin.** Failure to remove the MTH Alignment Pin may cause damage to the Impulse Coupled MTH, the engine, or both.

l P/N EA-3000IC is now installed and timed properly.

5. **Installation of p/n: EA-1000 EIS Controller and p/n: EA-2000 Coil Pack:**

a **EA-1000 Installation:** Install p/n EA-1000 EIS Controller where temperatures will not exceed 150°F. Because of this, Electroair recommends that the EIS Controller be mounted on the cockpit side of the firewall with the shortest practical distance from the coil pack for the wiring harness runs. Reference Figure 7 for controller dimensions.

![Figure 7: P/N EA-1000 Overall and Hole Dimensions](image)
b. **EA-2000 Installation:** The coil pack is designed to be installed on the engine side of the firewall. Locate the unit in a position to keep the spark plug wires as short as possible and not interfere with other components or create maintenance difficulties in the future. Electroair strongly suggests that the Coil Pack be positioned so that the connector on the coil is facing straight down, but can be positioned in any orientation if the installation requires alternate positioning. See Figure 8 for the Coil Pack Dimensions.

![Figure 8: P/N EA-2000 Dimensions](image)

- **c.** P/N EA-2000 comes with the mounting plate disassembled from the coil pack. This is done so the mounting plate can be used as a guide for easily locating mounting holes. When the mounting holes have been located, reinstall the plate to the coil pack following the procedure below:
  - i. Obtain the mounting plate, coil pack, six mounting screws, and Loctite #242 (included in the EIS-41000 kit box).
  - ii. Align the six clearance holes on the coil plate so that they line up with the six threaded inserts on the coil pack. Make sure that the countersink, on the plate, is facing outward.
  - iii. Apply a small drop of Loctite #242 to each of the coil mounting screws and install plate to coil pack. Make sure that that plate is straight and tighten screws (recommended torque value is 20-25 in-lbs\(^2\)). **Note:** Trying turning

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\(^2\) AC 43.13-1B Table 7-1, 09/08/98
each screw a little bit at a time, instead of turning one screw all the way down, to help the plate align with the coil pack.

**CAUTION: Prior to any drilling, verify that there is clearance from any components on both sides of the firewall.**

d. After all considerations have been made regarding the placement of the controller and the coil pack, drill the mounting holes and install both units using standard AN hardware. **NOTES:**

i. To avoid any firewall cracking, place large washers between the firewall and fastening nuts to reinforce these contact points.

ii. For honeycomb firewall installations, consider placing internal screw grommets inside the firewall around the mounting hardware to help prevent damage to the honeycomb structure.

6. **Installation of p/n: EA-5000 MAP Sensor and Connection of Manifold Pressure Line:**

a. Verify that a manifold pressure line exists from the engine.

b. If a manifold pressure line does NOT exist, then one will need to be installed to use p/n: EA-5000. **NOTE:** Use of p/n EA-5000 is optional. Leaving p/n: EA-5000 out of the system will simply cause the EIS to remain at a constant spark advance and not adjust spark timing for various manifold pressure readings, or altitude. This will reduce fuel efficiency and the overall performance of the ignition system, but will not harm any engine components.

c. Locate an appropriate location to mount the MAP Sensor. This location should be on the cool side of the firewall or somewhere where the temperatures will not exceed 150°F. Keep in mind all of the considerations that were mentioned in Step 5. Review step 5a for installation notes.

d. Mount the MAP Sensor using standard AN type hardware.

i. Mounting holes are sized for #6 fasteners. Use AN machine screws and either locking nuts or lock washers with plain nuts for installation.

ii. Connect secondary ground to MAP Sensor. A secondary ground wire should be connected to the MAP Sensor where indicated (observe that paint has been removed from the bottom side of the MAP Sensor case, showing the connection point).

e. Now connect the manifold pressure line to the MAP Sensor. Make sure the connection is tight.

i. **CAUTION:** Be careful not to apply too much force to the MAP Sensor hose when connecting it to the aircraft’s manifold pressure line. Improper forcing of the hose can cause internal damage to the MAP Sensor.

ii. If a Manifold Pressure gauge is installed, a “T” fitting can be placed into the manifold pressure line that is feeding the Manifold Pressure gauge.

1.) The hose coming from the MAP Sensor is MIL-H-5593 type hose commonly used in vacuum line installation (either Aeroquip 306 or Stratoflex 193). This size is -3 or 3/16 inch ID.
2.) Connect to the manifold pressure line with either standard fittings or other appropriate fittings for this application.

3.) Verify that all connections and lines are tight and secure.

iii If a Manifold Pressure gauge is not installed and a new manifold pressure line was created, connect that new line directly to the hose coming from the MAP Sensor using standard fittings. The hose coming from the MAP Sensor is MIL-H-5593 type hose commonly used in vacuum line installation (either Aeroquip 306 or Stratoflex 193). This size is -3 or 3/16 inch ID.

7. **Installation of p/n: EA-4000 Spark Plug Harness:**

   a) Install the spark plugs that will be connected to the Electronic Ignition System. Electroair recommends using new aircraft spark plugs. If re-using the old spark plugs, make sure that they are clean.

   i) **Optional:** Electroair has approved wide gap aircraft spark plugs for use with the Electroair Electronic Ignition Systems. These spark plugs are manufactured with the wider air gap Electroair recommends be used with the Electronic Ignition Systems. These Electroair spark plugs are not included in the standard EIS Kit. These plugs are only approved to be used with Electroair’s Electronic Ignition Systems. The Electroair part numbers and descriptions for these plugs are below:

      i. **EARHB32E Massive Electrode Spark Plug:** This plug is Electroair’s version of the standard RHM32E spark plug. The EARHB32E plug is manufactured with a 0.036 inch air gap. The EARHB32E spark plug can be installed on the engines that are approved for the RHB32E spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

      ii. **EARHB32S Single Fine Wire Spark Plug:** This plug is Electroair’s version of the standard RHB32S spark plug. The EARHB32S is manufactured with a 0.036 inch air gap. The EARHB32S spark plug can be installed on the engines that are approved for the RHB32S spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

      iii. **EAREM37HE Massive Electrode Spark Plug:** This plug is Electroair’s version of the standard REM37BY spark plug. The EAREM37HE plug is manufactured with a 0.036 inch air gap. The EAREM37HE spark plug can be installed on the engines that are approved for the REM37BY spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

      iv. **EARM38SE Single Fine Wire Spark Plug:** This plug is Electroair’s version of the standard RHM38S spark plug. The EARM38SE is manufactured with a 0.036 inch air gap. The EARM38SE spark plug can be installed on the engines that are approved for the RHM38S spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.
For all other aircraft spark plugs, Electroair recommends that opening the gap of the spark plugs to 0.028 - 0.036 inches. For Lycoming engines, Electroair suggests using the REM37BY (or UREM37BY) spark plug because they are the easiest to gap. Check the engine application data to verify that these plugs can be used in the engine.

**CAUTION:** Be careful when gapping any plugs other than the REM37BY (UREM37BY) plug, because the outer electrode can become over-stressed and break. If any problems arise with plug selection, please contact Electroair (sales@electroair.net or 517-552-9390).

The kit came with two spark plug wire bundles. Each bundle will make two spark plug wires. **Note:** The EIS kit comes with an EA-4000 REM Hardware Kit or EA-14000 spark plug tower attachments. If RHM or RHB spark plugs are being used, please contact Electroair for replacement hardware.

**CAUTION:** Since each assembly makes two spark plug wires, be careful when determining spark plug wire length.

Route the spark plug wire from the coil pack to the correct cylinder (See Coil Pack label for wire orientation) to determine the spark plug wire length. Make sure to keep spark plug wire routings away from exhaust pipes. Wires routed parallel to each other require a minimum of ¼ inch of separation.

Cut the spark plug wire leaving enough length to go three inches beyond the spark plug.

If your kit came with an EA-4000REM Hardware kit, continue with step c and skip step d. If your kit came with EA-14000 spark plug tower attachments, skip step c and proceed to step d.

Slide the aluminum nut, receptacle, and gasket on the wire. See Figure 9 for the correct component stack-up.

The wire supplied is a spiral core wire with a non-conductive center. Insert the spark plug spring on the outside of the spiral core so that the spring ‘tail’ makes contact with the spiral core. The spring ‘tail’ should be felt as it hits the spiral core during the insertion.

**CAUTION:** do not install the spring tail directly in the center of the non-conductive material as it will not make contact with the spiral core.

**OPTIONAL:** ~1/8 inch of the ignition wire insulation may be stripped to expose the spiral core wire to make installing the spring easier.

Verify continuity of the wires prior to install. Blue Wire (p/n EA-4090) resistance is 350 ohms/ft ±10%. Red Wire (p/n EA-4091) resistance is 5700 ohms/ft±10%.
iv To finish the connection, install the spark plug end of the wire first. This prevents the spark plug wire from twisting as the spark plug nut is tightened.

CAUTION: Do not over-tighten the spark plug nut as this may cause separation of the core of the wire. Torque 5/8-24 spark plug hardware to 90-95 in-lbs\(^3\). Torque ¾-20 spark plug hardware to 110-120 in-lbs\(^3\).

d If using EA-14000 Spark Plug Tower Attachments, insert the spring end of the part into the spark plugs. Tighten the tower to the spark plug with the aluminum nut. See Figure 10.

\(^3\) Bendix Ignition Manual
i Strip the end of the spark plug wire and expose the central core without damaging it. See Figure 11.

Figure 11: Exposed Central Core of Spark Plug Wire

ii Fold the wire core over in a 180° bend and attach the provided terminal. Crimp the terminal to the wire and make sure that the central core stays folded in place while crimping. See Figure 12.

Figure 12: Terminal Crimped over Folded Central Core

iii Insert the terminal as far as possible into the 90° rubber boot. See Figure 13.

Figure 13: Insertion of Terminal into Boot

iv Test the resistance of the spark plug wires. Red Wire: 5.7k Ohms/ft +/-10%. Blue Wire: 350 Ohms/ft +/-10%.

v Insert the 90° boot onto the spark plug tower attachment. An audible “SNAP” should be heard when the wire is properly installed onto each tower. If this
snap is not heard, remove the boot from the tower and repeat this step until the “SNAP” is heard.

vi Repeat steps i through v for each wire.

e Attach the other end of the spark plug wires to the coil pack at their appropriate coil tower. **NOTE:** When inserting the 90° boot over each tower on the coil pack, an audible “SNAP” should be heard when the wire is properly installed onto each tower. If this snap is not heard, remove the boot from the tower and repeat this step until the “SNAP” is heard.

i Coil towers are numbered on the coil pack: 1, 2, 3, and 4. Because of the nature of the system, coil towers 1 & 2 will fire simultaneously and then coil towers 3 & 4 will fire simultaneously.

ii For Lycoming and Continental engines, hook-up the spark plug wires according to the following chart:

<table>
<thead>
<tr>
<th>Coil Pack</th>
<th>Tower 1</th>
<th>Tower 2</th>
<th>Tower 3</th>
<th>Tower 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder #</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

iii The coil towers should be oriented towards the same side of the engine as the cylinders – this should make spark plug wire hook-up easier.
8. Connection of p/n: EA-6000 Wiring Harness:
   a Verify that the master switch is off and battery is disconnected.
   b The electrical connections that will be made are as follows:
      i. Harness to p/n: EA-1000, EIS Controller
      ii. Harness to p/n: EA-5000, MAP Sensor
      iii. Harness to p/n: EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC, Mag Timing Housing (MTH)
      iv. Harness to p/n: EA-2000, Coil Pack
      v. Harness to Switched Power & Ground for EIS Controller
      vi. Harness to Ignition Switch (Rotary Switch Only)
      vii. Harness to Tachometer
      viii. Diagnostic Lead
   c A small hole must be installed in the fire wall to route wires from the harness to their intended connections. Electroair recommends a 1 inch diameter hole be drilled to provide clearance for the wire harnesses. A grommet, suggested p/n: MS35489-12, can be used to help seal off the firewall hole after the wire harness has been passed through the firewall.

   CAUTION: Prior to any drilling, verify that there is clearance from any components on both sides of the firewall.

   d NOTES: The main harness is assembled so it can be installed through tight clearances such as a hole in the fire wall. A supply of terminations for switches, circuit breakers, and the bus bar will be needed. A wiring diagram with pin-out information has been supplied at the end of this section for reference. Refer to AC 43.13 regarding the bend radii of wires.

   CAUTION: Follow these wiring instructions very carefully to insure a correct hook-up of the EIS. Skipping ahead or taking short cuts increases the risk of an incorrect installation and either a poor performing EIS or the possibility of damaging equipment. Please contact Electroair with any questions.

   e Harness to p/n: EA-1000, EIS Controller:
      i Connect the wiring harness assembly to the EIS Controller. This is done by inserting the 23-pin female connector (C1) into the male header on the Controller. Begin routing the various harness bundles and wires from here.

   f Harness to p/n: EA-5000, MAP Sensor:
      i Route the harness with the WHITE three pin connector(C3) to the MAP Sensor from the Controller.
      ii Connect this connector to the MAP Sensor.
      iii Attached to the connector end of the harness is a loose white and black striped wire. Connect this wire to any ground source. This can be connected to the Secondary Ground connection on the MAP Sensor.
      iv Loop any excess wire and secure with cable ties.
g Harness to p/n: EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC, MAG
Timing Housing (MTH):
   i  Route the harness with the square BLACK three pin connector (C4) to the
       EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC MTH.
   ii From the already installed MTH, there will be a wire harness terminated with
      a female square BLACK three pin connector. See Figure 14.

![Figure 14: MTH and 3 Pin Female Connector](image)

   iii Connect connector from the routed harness to the connector on the MTH.
      Verify that the connection is secure. Connectors should ‘snap’ together and
      be unable to fall apart from each other on their own.
   iv Loop any excess wire and secure with cable ties.

h Harness to p/n: EA-2000, Coil Pack:
   i Route the harness with the round BLACK connector(C2) to the Coil Pack.
      This harness is terminated with a round plug type connector. See Figure 15
      for how the harness should look. **CAUTION: There is a noise suppressor
      capacitor in the harness just below Coil Pack Connector (covered by
      heat shrink). Use extreme caution when routing this harness. DO NOT
      make sharp bends in the portion of the harness covered by the heat
      shrink. Make all bends past the heat shrink tube covered portion of the
      harness. This will prevent damage to the capacitor. Please call
      Electroair Tech Support if there are any questions.**
Connect the (C2) connector from the harness to the mating connector on the Coil Pack.

Route the unterminated end of the Red wire from the harness through a 10 amp breaker (fuses may be used as an alternative to the breaker) to the Essential Bus Bar. Trim and terminate as required.

Loop any excess wire and cable tie or clamp the loop to a convenient location that does not interfere with any components (a location on the inside of the firewall is suggested).

Harness to Switched Power & Ground for EIS Controller:

Go to the harness connector that is installed on the Controller.

Obtain the RED wire that is coming out of this connector at Pin 1.

Route the loose end of this RED wire to the panel for switch termination and circuit breaker termination (fuses may be used as an alternative to the breaker).

Trim & Terminate the Red wire to a panel mounted switch. Label this panel mounted switch “EIS Switch”, and proper “ON/OFF” orientation. This switch should be a SPST switch.

Connect this panel mounted switch to a 2 amp breaker or fuse.

Connect the 2 amp breaker or fuse to Essential Bus Bar.

Go to the harness connector that is installed on the Controller.

Obtain the 16 gauge Black wire, labeled “ELECTROAIR GROUND”, that is coming out of this connector at Pin 23.

Trim & Terminate the Black wire to a competent aircraft ground.

IMPORTANT: For aircraft that are using the “EIS Switch” as the ignition switch for the EIS-41000 (or EIS-41000IC) and not a Rotary Style Grounding switch, follow these procedures:

Go to the harness connector that is installed on the Controller.

Obtain the shielded WHITE wire, labeled “ELECTROAIR KEY SWITCH P-LEAD”, which is coming out of this connector at Pin 2.
iii. Trim this wire out of the connector and discard. **NOTE:** Be careful not to nick or cut any of the surrounding wires in the connector when trimming out this wire.

j **Harness to Rotary Switch (if installed):**
   i. For aircraft that use two separate ignition switches, go to installation step 9b
   ii. Go to the harness connector that is installed on the Controller.
   iii. Obtain the shielded WHITE wire, labeled “ELECTROAIR KEY SWITCH P-LEAD”, which is coming out of this connector at Pin 2.
   iv. Trim and terminate this shielded WHITE wire to the appropriate connection on the ignition switch. The appropriate connection on the ignition switch will be the connection that the replaced magneto P-lead was removed from. Use the same methods for terminating a Magneto P-Lead when terminating the EIS P-Lead. **IMPORTANT:** Make sure the shield on the EIS P-Lead wire is grounded. Failure to ground this shield can cause the EIS to not operate properly.

k **Harness to Tachometer:**
   i. Go to the harness connector that is installed on the Controller.
   ii. Obtain the 22 gauge BLACK wire, labeled “ELECTROAIR TACHOMETER”, that is coming out of this connector at Pin 22.
   iii. The Tachometer output signal is a 12V or 24V (dependent on aircraft system voltage) square wave with two pulses per revolution. **CAUTION:** Verify that the Tachometer or engine monitor system being used can receive the above signal before connecting and operating. Incorrect signal types can cause incorrect readings or potentially damage monitoring systems.
   iv. Route this BLACK wire to Tachometer or monitor system and install the lead as specified by the equipment manufacturer.
   1.) Loop any excess wire and cable tie or clamp the loop to a convenient location that does not interfere with any components
   v. If this output is not intended to be used at this time, then this bundle should be looped and tied to an appropriate place inside the cockpit for later use. Alternatively, this wire can be trimmed out of the harness connector if this option will never be used.

l **Harness Diagnostic Lead:**
   i. Obtain the white wire, labeled “ELECTROAIR DIAGNOSTIC”, connector C1, PIN 17.
   ii. This lead is only used for troubleshooting the EIS by the factory or qualified maintenance technician. (Factory 517-552-9390)
   iii. Loop this wire and tie it to an appropriate location that can be easily accessed during maintenance.
Figure 16: Wiring Diagram for EIS-41000 & EIS-41000IC
9. Final Installation Steps:

a  Calibration and Timing settings: The unit has been pre-set at the factory to a pre-determined base timing (base timing is always placarded timing for the engine). Please contact Electroair (517-552-9390 or sales@electroair.net) if it is felt that the unit is not performing optimally, or if that base timing needs to be adjusted.

b  IMPORTANT: For aircraft that are using the “EIS Switch” as the ignition switch for the EIS-41000 (or EIS-41000IC) follow these procedures:
   i.  Go to the harness connector that is installed on the Controller.
   ii. Obtain the shielded WHITE wire, labeled “ELECTROAIR KEY SWITCH P-LEAD”, which is coming out of this connector.
   iii. Trim this wire out of the connector and discard. NOTE: Be careful not to nick or cut any of the surrounding wires in the connector when trimming out this wire.
   iv. Return to Wiring Harness install steps if necessary.

c  Re-attach and reinstall any connections or components that were removed or loosened during this installation.

d  Secure all new wires, harness, connections and lines to prevent failures due to vibration.

e  Connect battery connections and close any open circuit breakers.

f  Recover all tools that may have been used (tools ‘floating’ around inside the airplane are dangerous).

g  Proceed to the operational section and perform a test run-up before flying.

10. Installation Options available from Electroair:

a  P/N: EAREM37HE. Electroair’s Massive Electrode Spark Plug. This plug is Electroair’s version of the standard REM37BY spark plug manufactured with a 0.036 inch air gap and has been approved for use with only Electroair’s electronic ignition systems. These plugs come with the increased air gap Electroair recommends be used with our systems and eliminates the time and headache of re-gapping standard aircraft spark plugs. These Electroair spark plugs are not included in the standard EIS Kit. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

b  P/N: EARHM38SE. Electroair’s Single Fine Wire Spark Plug. This plug is Electroair’s version of the standard RHM38S spark plug manufactured with a 0.036 inch air gap and has been approved for use with only Electroair’s electronic ignition systems. These plugs come with the increased air gap Electroair recommends be used with our systems and eliminates the time and headache of re-gapping standard aircraft spark plugs. These Electroair spark plugs are not included in the standard EIS Kit. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.
Overview of Four Cylinder Twin Engine Aircraft EIS Installation

Thank you for purchasing Electroair Electronic Ignition Systems, or EISs, for twin engine aircraft. Electroair offers four optional EIS kits for four cylinder twin engine aircraft. These EIS kits differ in the type of magneto they replace. Listed below are the part numbers for each EIS kit and a brief description of which magneto is replaced by the EIS kits.

- **EIS-41000T**: This EIS kit replaces the NON-impulse coupled magneto on the standard rotating engine of a twin engine aircraft.
- **EIS-41000TIC**: This EIS kit replaces the impulse coupled magneto on the standard rotating engine of a twin engine aircraft.
- **EIS-41000TLH**: This EIS kit replaces the NON-impulse coupled magneto on the counter-rotating engine of a twin engine aircraft.
- **EIS-41000TLHIC**: This EIS kit replaces the impulse coupled magneto on the counter-rotating engine of a twin engine aircraft.

**EIS Kit Notes:** Only one EIS kit can be installed on each engine of a twin engine aircraft. Some twin engine aircraft do NOT have a counter-rotating engine, for that reason the EIS kits designated with an "LH" in their part number are not eligible for these aircraft type. The same part number EIS kit does NOT have to be installed on both engines on the twin engine aircraft.

The next several pages are a step-by-step process of installing both EIS’s on the aircraft. Electroair hopes that this manual will provide clear direction and guidance through this process. This manual will cover the following general installation steps:

1. General Overview and Recommendations
2. Removal of Old Ignition Components
3. Set-up & Installation of p/n: EA-3000 MTH (EIS-41000T Kit Only) and EA-3000LH MTH (EIS-41000TLH Kit Only)
4. Set-up & Installation of p/n: EA-3000IC MTH (EIS-41000TIC Kit Only) and EA-3000LHIC MTH (EIS-41000TLHIC Kit Only)
6. Installation of p/n: EA-5000 MAP Sensors
7. Installation of p/n: EA-4000 Spark Plug Harnesses
8. Connection of p/n: EA-6000T Twin Engine Wiring Harneses
9. Instrument Panel EIS Labeling
10. Final Installation Steps
11. Installation Options Available from Electroair

Electroair strongly recommends reading through this entire installation procedure before installing the EIS’s on the aircraft. Make sure that any questions are answered before the actual installation. Also, make sure any extra components that needed, e.g. cable ties, circuit breakers, switch terminations, etc., are all available. Removal of old components and installation of new components is to be completed in compliance with
CFR Title 14 Part 43, as applicable, and any Airframe or Engine Manufacturer Maintenance Procedures, as applicable. Above all else, use good common sense and professional judgment. An electronic ignition system is a high voltage device. If an EIS is improperly installed or misfired, severe damage may occur to the EIS, the aircraft, or even the installer.

Please contact Electroair with any questions during this installation process. Good luck and happy flying!!

Electroair
Installation of EIS-41000T, EIS-41000TIC, EIS-41000TLH, & EIS-41000TLHIC

1. **General Overview and Recommendations:**
   a. Read through the entire installation instructions before beginning the installation to make sure each step is understood. Contact Electroair (517-552-9390 or sales@electroair.net) with any questions or if there are any items that are unclear.

   **VERIFY TIMING CONTROLLER PLACARD TO ENGINE PLACARD**

   b. If controller placarded timing does not match engine placarded timing, contact Electroair (517-552-9390 or sales@electroair.net). The controller will need to be re-timed before installation.
   c. Review the installer's skill set. This ignition system is designed to be installed by aviation professionals with the appropriate ratings and experience for maintaining General Aviation aircraft.
   d. When installing all EIS components, if preexisting components on the airframe are in the way of or are in close proximity to the installation locations follow one of these two measures. **Note:** When making ANY changes or modifications to the aircraft or aircraft components, make sure all practices are in accordance with CFR Title 14 Part 43.
      i. If the preexisting components can be relocated, move the components to an acceptable location on the airframe where they will not come into contact with the EIS component(s).
      ii. If the preexisting components must come into contact or close proximity to the EIS component(s), make sure to protect all components from each other. This could mean, but not limited to, adding anti-chafing material, additional component securing devices, heat shielding material, etc.
   c. Always use good safety and work practices. Use appropriate safety equipment (glasses, etc.) and precautions. The EIS is a high voltage system and if installed or tested incorrectly can cause substantial damage to both the system and the installer!

2. **Removal of Old Ignition Components:**
   a. Remove cowlings. Verify that Master Switch is off and battery is disconnected.
   b. **IMPORTANT:** Determine which magnetos will be replaced, either the right or the left magneto, whether it is direct drive or impulse coupled magneto, and whether it is for a standard or counter-rotating engine.
      i. When replacing a direct drive type magneto, the magneto will have single gear installed on its drive shaft. This gear will be reused to install either p/n: EA-3000 or EA-3000LH.
ii When replacing an impulse coupled magneto, the magneto will have an impulse coupler installed on its drive shaft and a drive gear installed on top of the impulse coupler. The drive gear will be reused to install either p/n: EA-3000IC or EA-3000LHIC. The impulse coupler will not be needed. Instead a faux impulse coupler will be provided in the EA-3000IC hardware kit.

c Remove ignition harnesses from the spark plugs associated with the magnetos that are being replaced.

d Disconnect both magneto P-leads from their respective ignition switches. Note: These ignition switches will be used later in the installation of the EIS Wiring Harnesses.

e Remove the selected magnetos, the selected magnetos' ignition harnesses, and selected magnetos' P-leads from both the engines and the airframe. Retain the magneto hold down clips; they will be used to install the MTH (either p/n: EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC).

f Remove the magneto drive components, as detailed in step 2.b, from each magneto. Be careful not to damage the drive components. We recommend using a standard gear puller. Retain drive components for installation of either p/n: EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC.

g Remove spark plugs if new plugs are going to be used (recommended) with the electronic ignition systems.

3. Set-up & Installation of p/n: EA-3000 MTH (EIS-41000T Kit Only) and EA-3000LH MTH (EIS-41000TLH Kit Only):
   a Retrieve either p/n: EA-3000 or EA-3000LH and the EA-3000 Hardware Kit, depending on which EIS kit being installed.
   b Insert the woodruff key into the key slot on the MTH shaft.
   c Place the direct drive magneto gear on the MTH shaft. Be sure to align the woodruff key with the slot in the gear.
   d Install the washer and nut onto the MTH shaft and tighten the nut to 300-340 in-lbs. Install the cotter pin through the castle nut and MTH shaft with the long end of the cotter pin facing away from the MTH. Bend the long end of the cotter pin over the end of the shaft and the short end along the side of the nut. The direct drive gear is now installed onto the MTH shaft.
   e Holding the MTH, insert the alignment pin in the alignment hole on the back cover (pin supplied with hardware kit). Slowly turn the gear on the front of the MTH until the alignment pin drops into a second hole inside the MTH. The MTH is now set to Top Dead Center (TDC) and the MTH shaft should not be able to spin. Leave the alignment pin in the MTH and ready the engine for the MTH installation (next steps). See Figure 17 for an example.
f. Clean magneto pad on the engine. Install new gasket on the MTH.
g. **VERIFY MASTER SWITCH IS OFF AND BATTERY IS DISCONNECTED.**
h. Rotate the engine to Top Dead Center (TDC) for cylinder #1. This done by rotating the prop in the direction of the engine rotation until TDC is reached. At TDC, the impulse coupler on the remaining magneto should click. Verify TDC using the timing marks found on the engine. Typically, the first set is on the fly wheel and the starter; they will line up at TDC; the second set may be another mark on the back-side of fly wheel which lines up with the engine case seam at TDC. If any of these indications are not correct, repeat this step until they are. Other safe methods for obtaining TDC may be attempted, such as witnessing the cylinder movement through the spark plug holes. **Always rotate the engine in the direction that it rotates during operation.**
i. Install the MTH into the proper magneto hole. Secure the MTH using the mag holding clips referenced in step 2e and secure per engine manufacturer specifications.
j. **Remove the alignment pin.** Failure to remove the MTH Alignment Pin may cause damage to the MTH, the engine, or both.
k. P/N EA-3000 or EA-3000LH is now installed and timed properly.
l. Repeat these steps for the second engine on the airframe for installing either p/n: EA-3000 or EA-3000LH on that engine.

4. **Set-up & Installation of p/n: EA-3000IC MTH (EIS-41000TIC Kit Only) and EA-3000LHIC MTH (EIS-41000TLHIC Kit Only):**
a. Retrieve either p/n: EA-3000IC or EA-3000LHIC and the EA-3000IC Hardware Kit, depending on which EIS kit being installed.
b. Insert the two woodruff keys, provided in the EA-3000IC Hardware Kit, into the key slots on the Impulse Coupled MTH shaft. See Figure 18 for a picture of this step.
Install the faux Impulse Coupler provided in the EA-3000IC Hardware Kit on to the Impulse Coupled MTH shaft. Be sure to align the slot in the faux impulse coupler with the Woodruff key(s) on the shaft. See Figure 19 for a picture of this step.

Install the drive gear onto the installed faux impulse coupler on the shaft of the MTH. See Figure 20 for a picture of this step.
e From the EA-3000IC Hardware Kit, Install the large washer onto the drive gear. Then install the smaller washer on top of the large washer. Next tighten the castle nut onto the shaft to 160-190 in-lbs⁴. Install the cotter pin through the castle nut and impulse coupled MTH shaft with the long end of the cotter pin facing away from the MTH. Bend the long end of the cotter pin over the end of the shaft and the short end along the side of the nut. The drive gear is now installed onto the impulse coupled MTH shaft. See Figure 21 for visual install order of components.

⁴ AC 43.13-1B Table 7-1, 09/08/98
f Holding the Impulse Coupled MTH, insert the alignment pin in the alignment hole on the back cover (pin supplied with hardware kit). Slowly turn the gear on the front of the MTH until the alignment pin drops into a second hole inside the Impulse Coupled MTH. The impulse coupled MTH is now set to Top Dead Center (TDC) and the Impulse Coupled MTH shaft should not spin. Leave the alignment pin in the Impulse Coupled MTH and ready the engine for the Impulse Coupled MTH installation (next steps). See Figure 17 for an example.

g Clean magneto pad on the engine. Install new gasket on impulse coupled MTH.

h **VERIFY MASTER SWITCH IS OFF AND BATTERY IS DISCONNECTED.**

i Rotate the engine to Top Dead Center (TDC) for cylinder #1. This done by rotating the prop in the direction of the engine rotation until TDC is reached. Verify TDC using the timing marks found on the engine. Typically, the first set is on the fly wheel and the starter; they will line up at TDC; the second set may be another mark on the back-side of fly wheel which lines up with the engine case seam at TDC. If any of these indications are not correct, repeat this step until they are. Always rotate the engine in the direction that it rotates during operation.

j Install the Impulse Coupled MTH into the proper magneto hole. Secure the MTH using the MAG holding clips referenced in step 2e and secure per engine manufacturer specifications.

k **Remove the alignment pin.** Failure to remove the MTH Alignment Pin may cause damage to the Impulse Coupled MTH, the engine, or both.

l P/N EA-3000IC or EA-3000LHIC is now installed and timed properly.

m Repeat these steps for the second engine on the airframe for installing either p/n: EA-3000IC or EA-3000LHIC on that engine.

5. **Installation of p/n: EA-1000 EIS Controllers and p/n: EA-2000 Coil Packs:**

a **EA-1000 Installation:** Install both p/n: EA-1000 EIS Controllers where temperatures will not exceed 150°F. Electroair recommends that the EIS Controllers be mounted on the cool side of the firewall with the shortest practical distance from their respective coil packs for the wiring harness runs. Note: Some twin-engine airframes have open space inside the nose of the airframe. The controller could be placed on the nose side of the bulkhead which separates the cabin from the nose. Reference Figure 22 for controller dimensions.
b. **EA-2000 Installation:** The coil pack is designed to be installed on the engine side of the firewall. Establish coil pack installation locations on both engine firewalls that will keep the spark plug wires as short as possible, keep clearance between the coil pack and other components, and not create maintenance difficulties in the future. Electroair strongly suggests that the Coil Pack be positioned so that the connector on the coil is facing straight down, but can be positioned in any orientation if the installation requires alternate positioning. See Figure 23 for the Coil Pack Dimensions.
c. P/N EA-2000 comes with the mounting plate disassembled from the coil pack. This is done so the mounting plate can be used as a guide for easily locating mounting holes. When the mounting holes have been located, install each plate onto its coil pack following the procedure below:
   i. Obtain the mounting plate, coil pack, six mounting screws, and Loctite #242 (included in the EIS kit box).
   ii. Align the six clearance holes on the coil plate so that they line up with the six threaded inserts on the coil pack. Make sure that the countersink, on the plate, is facing outward.
   iii. Apply a small drop of Loctite #242 to each of the coil mounting screws and install each screw through the plate to threads in the coil pack. Make sure that the plate is straight and tighten screws (recommended torque value is 20-25 in-lbs\(^5\)). Note: Trying turning each screw a little bit at a time, instead of turning one screw all the way down, to help the plate align with the coil pack.

**CAUTION:** Prior to any drilling, verify that there is clearance from any components on both sides of each firewall.

\(^5\) AC 43.13-1B Table 7-1, 09/08/98
d. After all considerations have been made regarding the placement of the controllers and the coil packs, drill the mounting holes and install all four components using standard AN hardware. **NOTES:**
   i. To avoid any firewall cracking, place large washers between the firewall and fastening nuts to reinforce these contact points.
   ii. For honeycomb firewall installations, consider placing internal screw grommets inside the firewall around the mounting hardware to help prevent damage to the honeycomb structure.

6. **Installation of p/n: EA-5000 MAP Sensors and Connection of Manifold Pressure Lines:**
   a. Verify that a manifold pressure lines exists from both engines.
   b. If manifold pressure lines do NOT exist, then one will need to be installed from each engine to use both MAP Sensors. **NOTE:** Use of p/n EA-5000 is optional. Leaving p/n: EA-5000 out of the system will simply cause the EIS to remain at a constant spark advance and not adjust spark timing for various manifold pressure readings, or altitude. This will reduce the fuel efficiency and the overall performance of the ignition system but will not harm any engine components.
   c. Locate an appropriate location to mount both MAP Sensors. Preferably, this location should be inside the cockpit or somewhere where the temperatures will not exceed 150°F. Keep in mind all of the considerations that were mentioned in Step 5. Review step 5a for installation notes.
   d. Mount both MAP Sensors using standard AN type hardware.
      i. Mounting holes are sized for #6 fasteners. Use AN machine screws and either locking nuts or lock washers with plain nuts for installation.
      ii. Connect a secondary ground to both MAP Sensors. A secondary ground wire should be connected to both MAP Sensors where indicated (observe that paint has been removed from the bottom side of the MAP Sensor cases showing the connection point).
   e. Connect the manifold pressure line from the LEFT engine to the MAP Sensor that has been installed for the LEFT engine’s EIS Kit.
      i. **WARNING:** Each MAP Sensor must be connected to the manifold pressure line from the engine the MAP Sensor’s EIS is controlling. If the manifold pressure line is not from the correct engine, the EIS will not operate properly and could cause serious damage to the engine.
      ii. **CAUTION:** Be careful not to apply to much force to the MAP Sensor hose when connecting it to the aircraft’s manifold pressure line. Improper forcing of the hose can cause internal damage to the MAP Sensor.
      iii. If a Manifold Pressure gauge is installed, a “T” can be placed into the manifold pressure line that is feeding the Manifold Pressure gauge.
         1.) The hose coming from the MAP Sensor is MIL-H-5593 type hose commonly used in vacuum line installation (either Aeroquip 306 or Stratoflex 193). This size is -3 or 3/16 inch ID.
         2.) Connect to the manifold pressure line with either standard fittings or other appropriate fittings for this application.
         3.) Verify that all connections and lines are tight and secure.
Connect the manifold pressure line from the RIGHT engine to the MAP Sensor that has been installed for the RIGHT engine’s EIS Kit.

i **WARNING:** Each MAP Sensor must be connected to the manifold pressure line from the engine the MAP Sensor’s EIS is controlling. If the manifold pressure line is not from the correct engine, the EIS will not operate properly and could cause serious damage to the engine.

ii **CAUTION:** Be careful not to apply too much force to the MAP Sensor hose when connecting it to the aircraft’s manifold pressure line. Improper forcing of the hose can cause internal damage to the MAP Sensor.

iii If a Manifold Pressure gauge is installed, a “T” can be placed into the manifold pressure line that is feeding the Manifold Pressure gauge.

1. The hose coming from the MAP Sensor is MIL-H-5593 type hose commonly used in vacuum line installation (either Aeroquip 306 or Stratoflex 193). This size is -3 or 3/16 inch ID.
2. Connect to the manifold pressure line with either standard fittings or other appropriate fittings for this application.
3. Verify that all connections and lines are tight and secure.

iv If a Manifold Pressure gauge is not installed and a new manifold pressure line was created, connect that new line directly to the hose coming from the MAP Sensor using standard fittings. The hose coming from the MAP Sensor is MIL-H-5593 type hose commonly used in vacuum line installation (either Aeroquip 306 or Stratoflex 193). This size is -3 or 3/16 inch ID.

7. **Installation of p/n: EA-4000 Spark Plug Harnesses:**

a Install the spark plugs that will be connected to the Electronic Ignition Systems. Electroair recommends using new aircraft spark plugs. If re-using the old spark plugs, make sure that they are clean.

i **Optional:** Electroair has approved wide gap aircraft spark plugs for use with our Electronic Ignition Systems. These spark plugs are manufactured with the wider air gap Electroair recommends be used with the Electronic Ignition Systems. These Electroair spark plugs are not included in the standard EIS Kit. These plugs are only approved to be used with Electroair’s Electronic Ignition Systems. The Electroair part numbers and descriptions for these plugs are below:

1. **EARHB32E Massive Electrode Spark Plug:** This plug is Electroair’s version of the standard RHM32E spark plug. The EARHB32E plug is manufactured with a 0.036 inch air gap. The EARHB32E spark plug can be installed on the engines that are approved for the RHB32E spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

2. **EARHB32S Single Fine Wire Spark Plug:** This plug is Electroair’s version of the standard RHB32S spark plug. The EARHB32S is manufactured with a 0.036 inch air gap. The EARHB32S spark plug can be installed on the engines that are approved for the RHB32S spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.
3. **EAREM37HE Massive Electrode Spark Plug**: This plug is Electroair’s version of the standard REM37BY spark plug. The EAREM37HE plug is manufactured with a 0.036 inch air gap. The EAREM37HE spark plug can be installed on the engines that are approved for the REM37BY spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

4. **EARHM38SE Single Fine Wire Spark Plug**: This plug is Electroair’s version of the standard RHM38S spark plug. The EARHM38SE is manufactured with a 0.036 inch air gap. The EARHM38SE spark plug can be installed on the engines that are approved for the RHM38S spark plug, but can only be operated by an Electroair EIS. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.

For all other aircraft spark plugs, Electroair recommends opening the gap of the spark plugs to 0.028 - 0.036 inches. Electroair suggests using the REM37BY (or UREM37BY) spark plug because they are the easiest to gap. Check the engine application data to verify that these plugs can be used in the engine.

**CAUTION**: Be careful when gapping all other plugs than the REM37BY (UREM37BY) plug, because the outer electrode can become overstressed and break. If problems arise with plug selection, please contact Electroair (sales@electroair.net or 517-552-9390).

b Each EIS Kit came with two spark plug wire bundles. Each bundle will make two spark plug wires. **Note**: The EIS Kit comes with EA-4000 REM spark plug hardware or EA-14000 spark plug tower attachments. If RHM or RHB spark plugs are being used, please contact Electroair for replacement hardware.

**CAUTION**: Since each assembly makes two spark plug wires, be careful when determining spark plug wire length.

i Route the spark plug wire from the coil pack to the correct cylinder (See Coil Pack label for wire orientation) to determine the spark plug wire length. Make sure to keep spark plug wire routings away from exhaust pipes. Wires routed parallel to each other require a minimum of ¼ inch of separation.

ii Cut the spark plug wire leaving enough length to go three inches beyond the spark plug.

c If your kit came with an EA-4000REM Hardware kit, continue with step c and skip step d. If your kit came with EA-14000 spark plug tower attachments, skip step c and proceed to step d.

i Slide the aluminum nut, receptacle, and gasket on the wire. See Figure 24 for the correct component stack-up.

ii The wire supplied is a spiral core wire with a non-conductive center. Insert the spark plug spring on the outside of the spiral core so that the spring ‘tail’
makes contact with the spiral core. The spring ‘tail’ should be felt as it hits the spiral core during the insertion.

**CAUTION:** do not install the spring tail directly in the center of the non-conductive material as it will not make contact with the spiral core.

**OPTIONAL:** ~1/8 inch of the ignition wire insulation may be stripped to expose the spiral core wire to make installing the spring easier.

iii Verify continuity of the wires prior to install. Blue Wire (p/n EA-4090) resistance is 350 ohms/ft ±10%. Red Wire (p/n EA-4091) resistance is 5700 ohms/ft±10%.

![Figure 24: Spark Plug Wire Hardware Assembly](image)

**NOTE:** For assistance with Spark Plug Wire Assembly, you can go to [http://www.electroair.net/](http://www.electroair.net/). Under Tech Support and Troubleshooting there is a link to a video that provides a helpful demonstration for Spark Plug Wire Assembly.

iv To finish the connection, install the spark plug end of the wire first. This prevents the spark plug wire from twisting as the spark plug nut is tightened.

**CAUTION:** Do not over-tighten the spark plug nut as this may cause separation of the core of the wire. Torque the 5/8-24 spark plug hardware to 90-95in-lbs⁶. Torque the 3/4-20 spark plug hardware to 110-120 in-lbs⁶.

d If using EA-14000 Spark Plug Tower Attachments, insert the spring end of the part into the spark plugs. Tighten the tower to the spark plug with the aluminum nut. See Figure 25.

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⁶ Bendix Ignition Manual
i Strip the end of the spark plug wire and expose the central core without damaging it. See Figure 26.

![Figure 26: Exposed Core of Spark Plug Wire](image)

ii Fold the wire core over in a 180° bend and attach the provided terminal. Crimp the terminal to the wire and make sure that the central core stays folded in place while crimping. See Figure 27.

![Figure 27: Terminal Crimped with Central Core Folded](image)

iii Insert the terminal as far as possible into the 90° rubber boot. See Figure 28.
iv Test the resistance of the spark plug wires. Red Wire: 5.7k Ohms/ft +/- 10%. Blue Wire: 350 Ohms/ft +/- 10%.

v Insert the 90° boot onto the spark plug tower attachment. An audible “SNAP” should be heard when the wire is properly installed onto each tower. If this snap is not heard, remove the boot from the tower and repeat this step until the “SNAP” is heard.

vi Repeat steps i through v for each wire.

e Attach the other end of the spark plug wires to the coil pack at their appropriate coil tower. **NOTE:** When inserting the 90° boot over each tower on the coil pack, an audible “SNAP” should be heard when the wire is properly installed onto each tower. If this snap is not heard, remove the boot from the tower and repeat this step until this “SNAP” is heard.

i Coil towers are numbered on the coil pack: 1, 2, 3, and 4. Because of the nature of the system, coil towers 1 & 2 will fire simultaneously and then coil towers 3 & 4 will fire simultaneously.

ii For all Lycoming and Continental engines, hook-up the spark plug wires according to the following chart:

<table>
<thead>
<tr>
<th>Coil Pack</th>
<th>Tower 1</th>
<th>Tower 2</th>
<th>Tower 3</th>
<th>Tower 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder #</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

iii The coil towers should be oriented towards the same side of the engine as the cylinders – this should make spark plug wire hook-up easier.
8. **Connection of p/n: EA-6000T Twin Engine Wiring Harnesses:**

   a **Verify that the master switch is off and battery is disconnected.**

   b The electrical connections that will be made are as follows:
      i. Harness to p/n: EA-1000, EIS Controller
      ii. Harness to p/n: EA-5000, MAP Sensor
      iii. Harness to p/n: EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC, Mag Timing Housing (MTH)
      iv. Harness to p/n: EA-2000, Coil Pack
      v. Harness to Switched Power & Ground for EIS Controller
      vi. Harness to Tachometer

   c Use the aircraft’s existing wire runs as a guide for routing the EA-6000T Twin Engine Wiring Harnesses from the cabin to both wing mounted engines.

   ![CAUTION: Prior to any drilling, verify that there is clearance from any components on both sides of the firewall.](image)

   d **NOTES:** The main harness is assembled so it can be installed through tight clearances such as a hole in the firewall. A supply of terminations for switches, circuit breakers, and the bus bar will be needed. A wiring diagram with pin-out information has been supplied at the end of this section for reference. Refer to AC 43.13 regarding the bend radii of wires.

   ![CAUTION: Follow these wiring instructions very carefully to insure a correct hook-up of the EIS. Skipping ahead or taking short cuts increases the risk of an incorrect installation and either a poor performing EIS or the possibility of damaging equipment. Please contact Electroair with any questions.](image)

   d **Harness to p/n: EA-1000, EIS Controller:**
      i Connect the wiring harness assembly to the EIS Controller. This is done by inserting the 23-pin female connector (C1) into the male header on the Controller. The harness is properly installed when the clip on the 23-pin connector is securing the connector to the header. Begin routing the various harness bundles and wires from here.

   e **Harness to p/n: EA-5000, MAP Sensor:**
      i Route the harness with the WHITE three pin connector(C3) to the MAP Sensor from the Controller.
      ii Connect this connector to the MAP Sensor.
      iii Attached to the connector end of the harness is a loose white and black striped wire. Connect this wire to any ground source. This can be connected to the Secondary Ground connection on the MAP Sensor.
      iv Loop any extra wire and secure with cable ties.

   f **Harness to p/n: EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC MTH:**
      i Route the harness with the square BLACK three pin connector(C4) to the EA-3000, EA-3000LH, EA-3000IC, or EA-3000LHIC MTH.
ii From the already installed MTH, there will be a wire harness terminated with a female square BLACK three pin connector. See Figure 29 below.

![Figure 29: MTH and 3 Pin Female Connector](image)

iii Connect the (C4) connector from the routed harness to the connector on the MTH. Verify that the connection is secure. Connectors should ‘snap’ together and be unable to fall apart from each other on their own.

iv Loop any excess wire and secure with cable ties.

Harness to p/n: EA-2000, Coil Pack:

i Route the harness with the round BLACK connector(C2) to the Coil Pack.
This harness is terminated with a round plug type connector. See Figure 30 for how the harness should look. **CAUTION:** There is a noise suppressor capacitor in the harness just below Coil Pack Connector (covered by heat shrink). Use extreme caution when routing this harness. DO NOT make sharp bends in the portion of the harness covered by the heat shrink. Make all bends past the heat shrink tube covered portion of the harness. This will prevent damage to the capacitor. Please call Electroair Tech Support if there are any questions.

![Figure 30: Coil Pack Plug Harness](image)
ii Connect the connector from the harness to the mating connector on the Coil Pack.

iii Route the unterminated end of the Red wire from the harness through a 10 amp breaker (fuses may be used as an alternative to the breaker) to the Essential Bus Bar. Trim and terminate as required.

iv Loop any excess wire and cable tie or clamp the loop to a convenient location that does not interfere with any components (a location on the inside of the firewall is suggested).

h Harness to Switched Power & Ground for EIS Controller:

i Go to the harness connector that is installed on the Controller.

ii Obtain the RED wire that is coming out of this connector at Pin 1.

iii Route the loose end of this RED wire to the existing ignition switch that was used to operate the magneto that is being replaced by this EIS, reference step 2d for switch clarification. **CAUTION:** Make sure that the ignition switch and EIS are used to control the same engine.

1.) Remove all existing wires that are connected to the airframe from this ignition switch.

2.) Determine the orientation of the switch when the switch is “OPEN” and when the switch is “CLOSED”. When the switch is “CLOSED” the EIS will be “ON” and when the switch is “OPEN” the EIS will be “OFF”.

3.) If needed, rotate the EIS switch so that the EIS switch in its “OPEN” position is in the same orientation as the existing MAG switches in their “OFF” position. **NOTE:** When this step is complete, all of the ignition switches should be in the same position when they are “ON” and when they are “OFF”.

4.) Trim and Terminate the RED wire from the EIS harness to this ignition switch.

5.) Connect the other end of the ignition switch to a 2 amp breaker or fuse.

6.) Connect the 2 amp breaker or fuse to the essential bus bar.

7.) The power for the EIS Controller has now been installed to be turned ON and OFF by the existing ignition switch.

i Go to the harness connector that is installed on the Controller.

ii Obtain the 16 gauge Black wire, labeled “ELECTROAIR GROUND”, that is coming out of this connector at Pin 23.

iii Trim & Terminate the Black wire to a competent aircraft ground.

i Harness to Tachometer:

i Go to the harness connector that is installed on the Controller.

ii Obtain the 22 gauge BLACK wire, labeled “ELECTROAIR TACHOMETER”, that is coming out of this connector at Pin 22.

iii The Tachometer output signal is a 12V or 24V (dependent on aircraft system voltage) square wave with two pulses per revolution. **CAUTION:** Verify that the Tachometer or engine monitor system being used can receive the above signal before connecting and operating. Incorrect signal types can cause incorrect readings or potentially damage monitoring systems.

iv Route this BLACK wire to Tachometer or monitor system and install the lead as specified by the equipment manufacturer.
2.) Loop any excess wire and cable tie or clamp the loop to a convenient location that does not interfere with any components
   i. If this output is not intended for use at this time, then this bundle should be looped and tied to an appropriate place. Alternatively, this wire can be trimmed out of the harness connector if this option will never be used.

   k. **Harness Diagnostic Lead:**
      i. Obtain the white wire, labeled “ELECTROAIR DIAGNOSTIC”, connector **C1, PIN 17**.
      ii. This lead is only used for troubleshooting the EIS by the factory or qualified maintenance technician. (Factory 517-552-9390)
      iii. Loop this wire and tie it to an appropriate location that can be easily accessed during maintenance.
Figure 31: Wiring Diagram for EIS-41000T, EIS-41000TIC, EIS-41000TLH, & EIS-41000TLHIC
9. **Instrument Panel EIS Labeling:**
   a  Each twin engine EIS Kit contains an Instrument Panel Label Kit which contains different EIS labels for the instrument panel. These labels include the following:
      i  “EIS LEFT” Label: This label is roughly 5/8 x 3/8 inches and is intended to be used on the LEFT ignition switch, if the EIS replaced the LEFT magneto on that switch’s engine.
      ii “EIS RIGHT” Label: This label is roughly 5/8 x 3/8 inches and is intended to be used on the RIGHT ignition switch, if the EIS replaced the RIGHT magneto on that switch’s engine.
      iii “LEFT ENG. EIS” Labels: These labels are intended to identify the 2 amp and 10 amp breakers that have been installed on the instrument panel for the LEFT engine’s EIS.
      iv “RIGHT ENG. EIS” Labels: These labels are intended to identify the 2 amp and 10 amp breakers that have been installed on the instrument panel for the RIGHT engine’s EIS.
   b  Labeling the LEFT engine’s EIS ignition switch:
      i  Obtain the Instrument Panel Label Kit from the EIS Kit.
      ii Locate the two ignition switches for the LEFT engine.
      iii Determine which ignition switch is the EIS ignition switch.
      iv Obtain one cleaning wipe from the label kit.
      v Use the cleaning wipe to clean the residue off of the EIS ignition switch.
      vi Allow any cleaning solution to dry before placing label on switch.
      vii Obtain the EIS label that corresponds with the existing labeling on the EIS ignition switch. **EXAMPLE:** If the EIS switch is labeled “RIGHT MAG”, obtain the “EIS RIGHT” label. If the EIS switch is labeled “LEFT MAG”, obtain the “EIS LEFT” label.
      viii Before permanently placing the EIS label on the switch, verify that the EIS label will properly cover the existing “MAG” labeling on switch. If the EIS label extends off of the switch, trim label so it is flush with the sides of the switch.
      ix Remove the adhesive cover from the back of the EIS label and place the EIS label over the “MAG” labeling on the switch. Apply pressure to the label to ensure proper adhesion of the label to the switch.
   c  Labeling the RIGHT engine’s EIS ignition switch:
      i  Obtain the Instrument Panel Label Kit from the EIS Kit.
      ii Locate the two ignition switches for the RIGHT engine.
      iii Determine which ignition switch is the EIS ignition switch.
      iv Obtain one cleaning wipe from the label kit.
      v Use the cleaning wipe to clean the residue off of the EIS ignition switch.
      vi Allow any cleaning solution to dry before placing label on switch.
      vii Obtain the EIS label that corresponds with the existing labeling on the EIS ignition switch. **EXAMPLE:** If the EIS switch is labeled “RIGHT MAG”, obtain the “EIS RIGHT” label. If the EIS switch is labeled “LEFT MAG”, obtain the “EIS LEFT” label.
Before permanently placing the EIS label on the switch, verify that the EIS label will properly cover the existing “MAG” labeling on switch. If the EIS label extends off of the switch, trim label so it is flush with the sides of the switch.

Remove the adhesive cover from the back of the EIS label and place the EIS label over the “MAG” labeling on the switch. Apply pressure to the label to ensure proper adhesion of the label to the switch.

d Labeling the LEFT engine’s EIS circuit breakers:
   i Obtain the Instrument Panel Label Kit from the EIS Kit.
   ii Locate the two circuit breakers for the LEFT engine’s EIS. These breakers should include one 2 amp breaker and one 10 amp breaker.
   iii Obtain one cleaning wipe from the label kit.
   iv Use the cleaning wipe to clean the residue off of the panel area just under each breaker.
   v Allow any cleaning solution to dry before placing labels on the panel.
   vi Obtain two “LEFT ENG. EIS” labels from the label kit. NOTE: There are two types of circuit breaker labels in each kit, a long and thin label type and a short and wide label type. Use the type of label that works best for the installation.
   vii Before permanently placing the EIS labels on the panel, verify that there is proper room in the desired panel locations to fit the EIS labels.
   viii Remove the adhesive cover from the back of each EIS label and place the EIS labels under both breakers. Apply pressure to the label to ensure proper adhesion of the label to the switch.

e Labeling the RIGHT engine’s EIS circuit breakers:
   i Obtain the Instrument Panel Label Kit from the EIS Kit.
   ii Locate the two circuit breakers for the RIGHT engine’s EIS. These breakers should include one 2 amp breaker and one 10 amp breaker.
   iii Obtain one cleaning wipe from the label kit.
   iv Use the cleaning wipe to clean the residue off of the panel area just under each breaker.
   v Allow any cleaning solution to dry before placing labels on the panel.
   vi Obtain two “RIGHT ENG. EIS” labels from the label kit. NOTE: There are two types of circuit breaker labels in each kit, a long and thin label type and a short and wide label type. Use the type of label that works best for the installation.
   vii Before permanently placing the EIS labels on the panel, verify that there is proper room in the desired panel locations to fit the EIS labels.
   viii Remove the adhesive cover from the back of each EIS label and place the EIS labels under both breakers. Apply pressure to the label to ensure proper adhesion of the label to the switch.

f All switches and breakers/fuses that are connected to an EIS MUST be labeled with either the labels included in each EIS kit or an Electroair approved alternative.
10. **Final Installation Steps:**
   a. Calibration and Timing settings: The unit has been pre-set at the factory to a pre-determined base timing (base timing is always placarded timing for the engine). Contact Electroair (517-552-9390 or sales@electroair.net) if it is felt that the unit is not performing optimally, or if that base timing needs to be adjusted.
   b. Re-attach and reinstall any connections or components that were removed or loosened during this installation.
   c. Secure all new wires, harness, connections and lines to prevent failures due to vibration.
   d. Connect battery connections and close any open circuit breakers.
   e. Recover all tools that may have been used (tools ‘floating’ around inside the airplane are dangerous).
   f. Using the Approved Flight Manual Supplement for the EIS, perform a test run-up before flying.

11. **Installation Options Available from Electroair:**
   a. **P/N: EAREM37HE.** Electroair’s Massive Electrode Spark Plug. This plug is Electroair’s version of the standard REM37BY spark plug manufactured with a 0.036 inch air gap and has been approved for use with only Electroair’s electronic ignition systems. These plugs come with the increased air gap Electroair recommends be used with our systems and eliminates the time and headache of re-gapping standard aircraft spark plugs. These Electroair spark plugs are not included in the standard EIS Kit. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.
   b. **P/N: EARHM38SE.** Electroair’s Single Fine Wire Spark Plug. This plug is Electroair’s version of the standard RHM38S spark plug manufactured with a 0.036 inch air gap and has been approved for use with only Electroair’s electronic ignition systems. These plugs come with the increased air gap Electroair recommends be used with our systems and eliminates the time and headache of re-gapping standard aircraft spark plugs. These Electroair spark plugs are not included in the standard EIS Kit. Please contact Electroair or one of our distributors for current pricing and availability of this spark plug.
Miscellaneous Information:

- For updated versions of this and other documents Electroair documents; refer to the company website: [www.electroair.net](http://www.electroair.net).
- Announcements regarding updates will be made via the Electroair page on [www.facebook.com](http://www.facebook.com) and constant contact.

Glossary and Abbreviations:

AD(s) – Airworthiness Directive(s)
AFM – Aircraft Flight Manual
AFMS – Aircraft Flight Manual Supplement
ALS – Aircraft Limitations Section
AML – Approved Model List
APU – Auxiliary Power Unit
BTDC – Before Top Dead Center
CFR – Code of Federal Regulations
CSTW – Crank Shaft Trigger Wheel
EIS – Electronic Ignition System
FAA – Federal Aviation Administration
Ignition Timing – is the process of setting the angle relative to piston position and crankshaft angular velocity that a spark will occur in the combustion chamber near the end of the compression stroke.
MAG – magneto
MAP – Manifold Absolute Pressure
May/Should – an optional requirement
MTH – Mag Timing Housing
Must/Shall – a mandatory requirement
RPM – Revolutions per Minute
POH – Pilot’s Operating Handbook
STC – Supplemental Type Certificate
TDC – Top Dead Center
### Revision Log:

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<td>Included instructions for installing the EIS-41000IC and EA-3000IC. Reworded P/N EA-6000 installation instructions for clarity, to address the use of fuses, and to address the use of non-rotary style ignition system. Also, added revision log at this time.</td>
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<td>Included optional use of Electroair spark plugs part numbers EAREM37HE &amp; EARHM38SE, to this manual.</td>
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<td>Included installation instructions for twin engine aircraft EIS kits P/N: EIS-41000T, EIS-41000TIC, EIS-41000TLH, EIS-41000LTHIC</td>
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