AIRCORPS AVIATION

DOCUMENT
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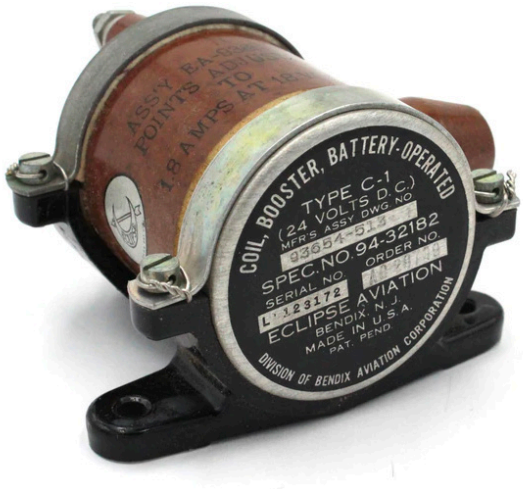
Lance's Lessons

C-1 Booster Coil

Manufacturer	Eclipse / General Electric
Aircraft	Numerous
AAF Specification Number	94-32182
AAF Part Number	Type C-1
Eclipse P/Ns	513
Proper Description	HIGH TENSION BOOSTER COIL
Location	Various installation locations accessible in routine service
Nickname	Booster Coil



OVERVIEW / EXECUTIVE SUMMARY

A stack fire is one moment every pilot dreads, and responding in that moment with or without a crowd of spectators is a stressful scenario. The resulting damage to the airframe and engine can cost hundreds of thousands of dollars, and can take months or years to repair. While the most common reason a stack fire occurs is over or extra priming, another factor can be a failed booster coil. Booster coils facilitate engine starting by furnishing a high-tension current to the spark plugs during engine cranking at a time when the output voltage of the magneto is low due to engine speed. Fortunately, an overhauled booster coil is an easily acquired and replaced component which almost eliminates the likelihood of this failure mode. Recently AirCorps Aviation has added the Spec. 94-32182 C-1 Booster Coil to its FAA Certified Repair Station to offer a solution to this failure mode. Even with an experienced operator at the controls, if the booster coil isn't operating correctly risk exposure is heightened. Read on to learn more.

LOCATION

The booster coil may be mounted in any position, and in any location that permits routine servicing. However, it is recommended that the high tension lead be of the minimum possible length and that unshielded units be mounted in a junction box.[1]

1 - HIGH TENSION SPOUT
2 - CLAMP
3 - COIL HOUSING BASE
4 - MOUNTING BRACKET ASSEMBLY
5 - CLAMP ASSEMBLY
6 - PADDING STRIP
7 - CONTACT BRACKET ASSEMBLY
8 - STATIONARY CONTACT ASSEMBLY
9 - STATIONARY CONTACT
10 - MOVING CONTACT
11 - CONTACT SPRING ASSEMBLY

[1]For more information related to mounting specifications and installation see AN 03-5-79, Op, Serv & Ovrh Inst w PC for High Tension Booster Coils A-1, C-1, 512, 513, 1313 & 1497 (Eclipse-Pioneer), 10-June-1945, (AN 03-5-79).

MAKEUP

The low rpm of the engine during initial starting fails to actuate the magneto with enough speed to generate the required high-tension current for engine ignition; consequently, the booster coil is actuated at the same time the starter switch is closed for cranking, and supplies the high voltage needed for safe, clean engine start up by the following process. The booster coil and magneto are separate components, and the former can generate a series of sparks on its own. During the start cycle, these sparks are routed to the trailing finger on the distributor rotor and then to the appropriate cylinder ignition lead. The primary winding has one end grounded at the internal grounding strip, and its other end connected to the moving contact point. The stationary contact is fitted with a terminal to which battery voltage is applied when the magneto switch is placed in the start position, or automatically applied when the starter is engaged. The secondary winding, which contains several times as many turns as the primary coil, has one end grounded at the internal grounding strip and the other terminated at a high-tension terminal. The high-tension terminal is connected to an electrode in the distributor by an ignition cable.

ADJUSTMENT OF BOOSTER COIL

Tampering with the setting of the booster coil is not recommended without training; adjustment of the setting requires special test equipment and must be made in accordance with the procedures outlined in section VII of Service and Instructions for High-Tension Booster Coils, AN 03-5-79, 10-June-1945

ELECTRICAL CONNECTIONS

Refer to the installation drawings in the manuals prepared by the aircraft manufacturer for connections and correct wire sizes.

Since the booster coil is designed to operate only during actual engine cranking, its positive terminal must be connected so that the primary coil circuit is energized only when the "START" switch is closed (in direct cranking systems), or when the "MESH" switch is closed (in systems having inertial type starters).

Since the return connection to the secondary winding of all the booster coils is made through the grounding strip at the base of the coil housing, all booster coils must be securely grounded. In the event that the selected location does not provide an adequate ground though the mounting feet of the unit, connect a ground strap between one of the mounting bolts and a structural member.

Make certain to use standard 7 mm high tension cable for making the connection between the high tension spout of the booster coil and the booster connection on the magneto.

VARIANTS OF BOOSTER COILS

The 94-32182 Army Air Forces (AAF) Type C-1 unshielded booster coil was primarily manufactured by Eclipse and General Electric.

The Eclipse components seem to be more prevalent and for that reason we will focus upon their part numbering system and nomenclature. Similar in look, the AAF Type A-1 was given the Eclipse Type 512 part number for 12 volt system voltage. The AAF Type C-1 was given the Eclipse Type 513 part number for 24 volt system voltage.

Styles are commonly referred to as A or B, with style B having a contact spring assembly of lighter construction than that used in corresponding style A units. Lighter spring construction decreases vibration frequency and results in lower leakage and higher output.

INTERCHANGEABILITY

Spec. 94-32182 Type C-1 unshielded booster coils produced under the AAF specification should allow for interchangeability between components produced by wartime manufactures of various part numbers.

REMOVAL OF BOOSTER COIL

Remove the box cover, high tension, battery and ground wires from the Booster Coil. Remove Coil.

IMPORTANCE OF BOOSTER COIL BOX

It is imperative to ensure that the coil is installed within a housing or box and mounted in the appropriate place with a cover installed.

When a coil is openly mounted on the frame, beams or engine mount the aircraft is exposed to an increased chance of fire. The manuals clearly specify that the booster coil should be installed in a box or housing. The purpose of the enclosure is to prevent radio frequency interference or RFI. The enclosure provides an electrical shield to prevent such interference transmitted during operation.The box also reduces the risk of fire if the fuel pump, primer lines or fuel lines should develop a leak putting fumes inside the cowling and the points then igniting those fumes.

INSPECTION & TEST

This integral component requires frequent inspection and attention.

Some key questions in determining if your booster coil needs to be inspected / tested / replaced:

- Has the booster coil ever been inspected or tested? Have the contacts been inspected for pitting or burning?
- 50 hour inspection - After every 50 hours of airplane operation, inspect the booster coil for housing cracks; replace the unit if cracks are found. Make certain that all mounting bolts are secure. Check that all shielding spout caps are tight. Should the high tension spout cap be loose, check that the high tension connection is secure.
- Know your A/C so any change will draw your attention. Typically most airframes are wired to power the booster coil when the starter is energized regardless of the position of the magneto switch. If your aircraft is equipped with a booster coil and will only start with the magneto switches turned to the on position you likely have a failed booster coil.
- 100 hour inspection - After every 100 hours of airplane operation,inspect the vibrator contacts. For access to the contacts of shielded units, loosen the shielding spout nuts, remove the housing cover screws and lift off the housing cover. Use crocus cloth to polish dirty, burned, or slightly pitted contacts; replace the booster coil if the contacts are badly pitted or burned.
- Engine Change - At the time of engine overhaul or change, remove the booster coil and overhaul.
- Thoroughly inspect during each annual inspection

As a reference, the Service and Instructions for High-Tension Booster Coils, AN 03-5-79, 10-June-1945 outlines a more thorough inspection of booster coils, and maintenance manuals within the electrical system sections have comprehensive instructions for pre-flight, after flight, daily flight, and at 25, 50, 100 hour inspections.

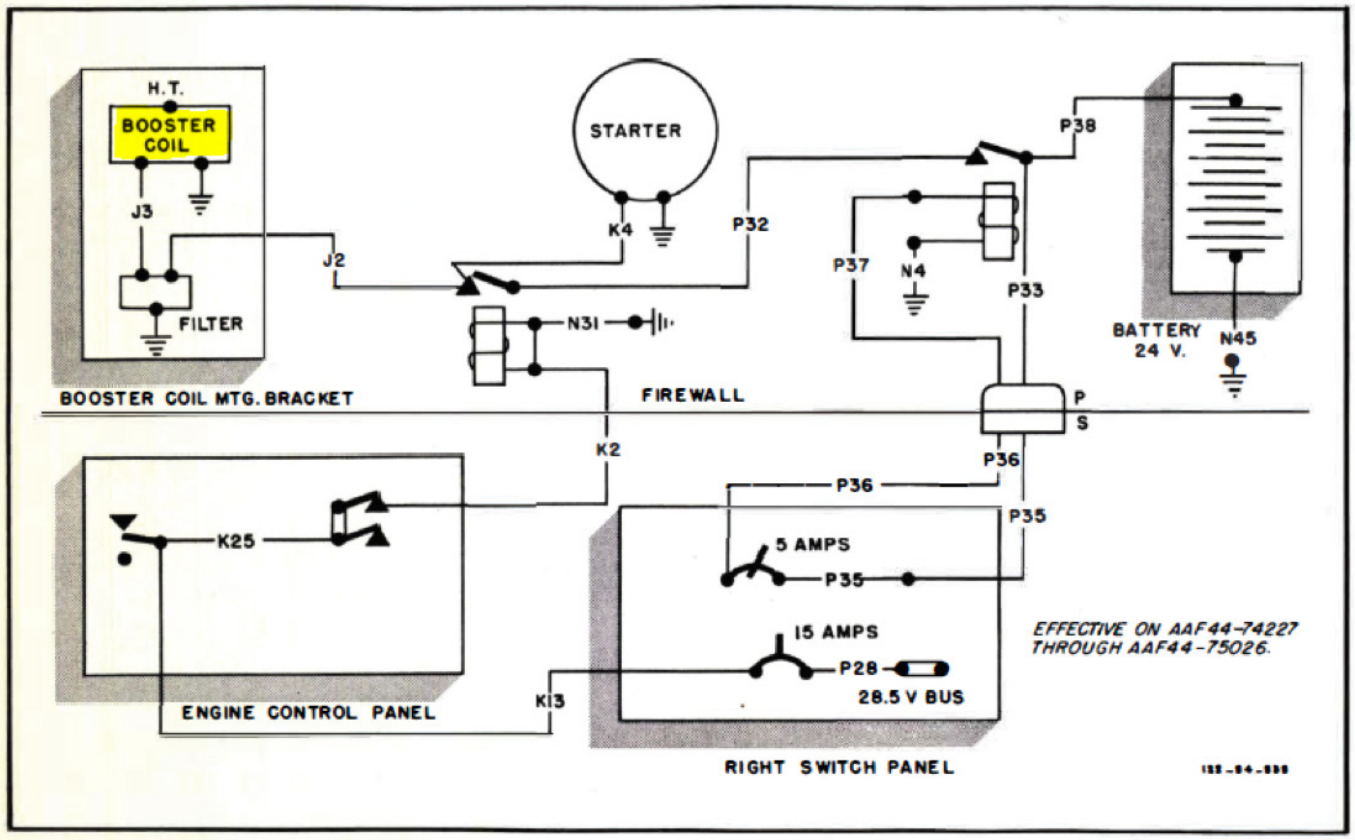


Figure 391B—Starter and Booster Coil Wiring Diagram—Four of Four

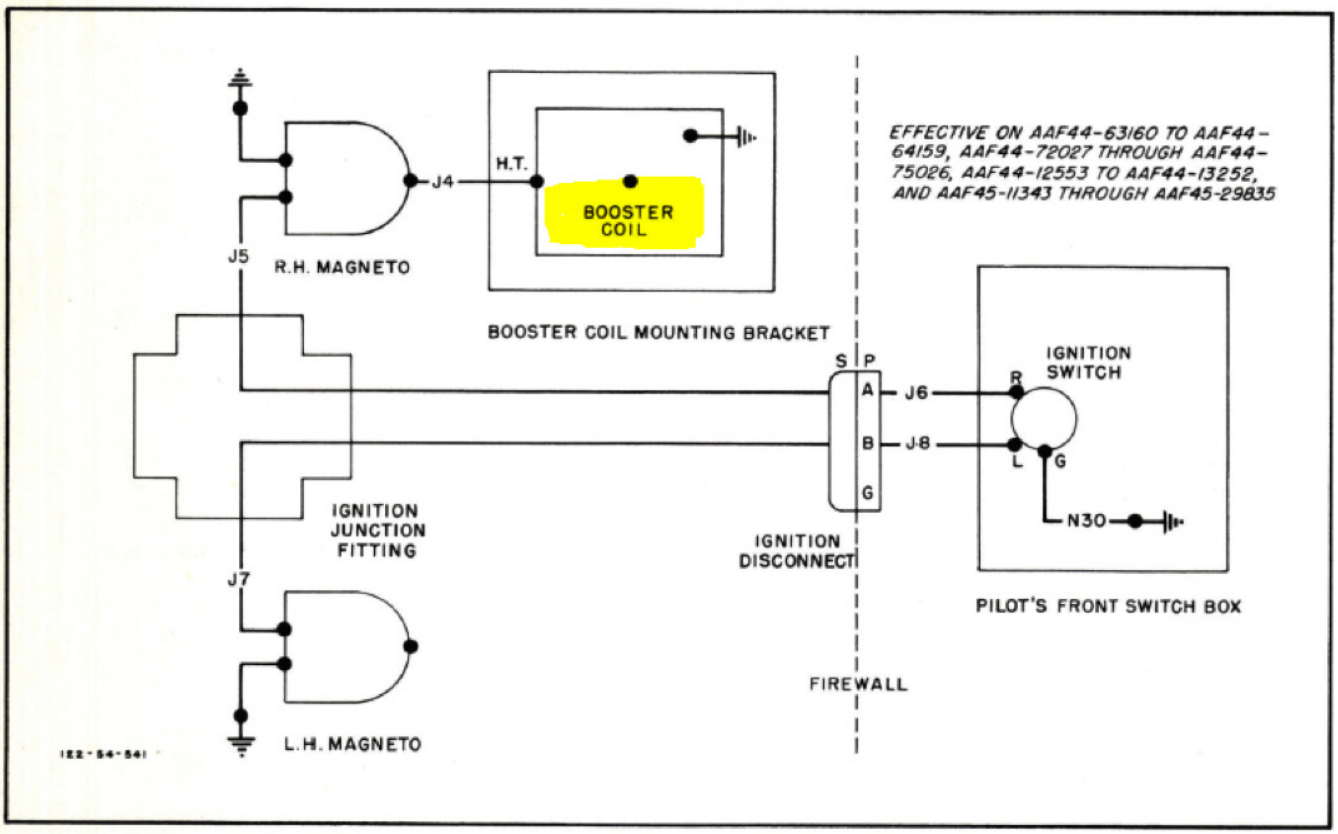


Figure 389B—Ignition and Booster Coil Wiring Diagram—Three of Three

FAILURES - BOOSTER COIL

TROUBLE	PROBABLE CAUSE	REMEDY
LOW OR ZERO OUTPUT FROM BOOSTER COIL	Open or shorted primary or secondary winding.	Replace the complete booser coil.
	Wiring not properly connected.	Change wiring to conform diagrams in the Handbook prepared by the aircraft manufacturer. Make sure all connections are clean and tight.
	Faulty external wiring to booster coil.	Check all wiring for continuity and for grounds. Replace faulty wiring.
	Faulty high tension cable.	Replace the high tension cable.
	Poor internal or external ground connection.	Clean and tighten the mounting bolt ground. Replace units having a faulty internal ground.
	Improper booster coil setting.	*Readjust the vibrator contacts.
	Burned, pitted, or welded vibrator contacts.	Resurface lightly burned or pitted contacts (refer to this section, paragraph 2, “100-Hour Inspection”).

WHEN PURCHASING

AIRCORPS AVIATION

If you question whether your booster coil is functioning properly, or you are planning to replace it all together, ensure airworthiness prior to purchasing. AirCorps maintains an inventory of Type C-1 booster coils overhauled and in stock. We also have the booster coil on our Certified FAA Repair Station (8ORR202D) accessory capabilities list.

We can perform inspections, overhaul, installation, and answer questions related to these important components.

Type C-1 - Booster Coil with 8130 Authorization- AirCorps Depot.

CHIEF INSPECTOR - LANCE SUMSTAD

Lance Sumstad serves as the Chief Inspector for the AirCorps Aviation Certified FAA Repair Station (8ORR202D) . Lance achieved his Airframe & Powerplant in 1989 while serving as a crew chief on a B-52G Stratofortress. In 1990, his military service concluded and after 4 years in commercial aviation he began a career in manufacturing, mechanical design, and welding. Lance returned to aviation at AirCorps and quickly put his technical expertise to work on warbirds with a focus on component overhaul and repair. His diverse technical background, humble nature, and work ethic make him a gifted technician. As the Chief Inspector for the Repair Station he helps support the award winning Restoration, Fabrication & Maintenance departments, which work not only on resurrecting historic aircraft, but also keeping aircraft worldwide operating safely by providing elite workmanship. Lance does inspections, light and heavy maintenance, and component overhaul / repair for a variety of aircraft, not just warbirds.

This month Lance can be found juggling the overhaul of another set of P-51 mustang landing gear (the 14th set AirCorps has done), working on the overhaul of R-4250 Robert Shaw Coolant door actuators, P-47 control systems installation, and inspecting and overhauling engine and cowl components for a historic B-25 Mitchell.

Contact us for more info on ways we can assist with your project!

ADDITIONAL RELEVANT ELECTRICAL TECH ORDERS & INFORMATION:

AirCorps Library - Electrical Resources

Service and Instructions for High-Tension Booster Coils, AN 03-5-79, 10-June-1945

Maintenance Instructions - Cavalier Mustang - F-51D, T.0. 1F-51D-2, 27-Sept-1968