



L-1499B

Ignition Lead Assembly & Maintenance Manual

**Technical Aspects
FAA APPROVED**

SCOPE

This Assembly, Installation, and Maintenance Manual provides detailed assembly and installation instructions as well as maintenance information about the design and operation of Slick 5 mm High Temperature Shielded Ignition Leads.

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LOG OF REVISIONS

<u>Rev. No.</u>	<u>Description</u>	<u>Pages Revised</u>	<u>Date</u>
A	This revision changes company from Unison Industries to Champion Aerospace	All	3/01/09
B	Added FAA Approved statement to cover page.	Cover	7/06/10
	Updated Log of Revisions	<i>i</i>	7/06/10
	Updated 0.4 Slick Harness Overview and added	Page 0-1	7/06/10
	Added Note for nylon inserts.	Page 0-2	7/06/10
	Removed eight cylinder as application in paragraph 1.3.1.	Page 1-1	7/06/10
	Corrected hardware reference in ¾" installation in paragraph 1.4.1.	Page 1-2	7/06/10
	Changed part number of Lubricant in 2.0.	Page 2-1	7/06/10
	Updated paragraph 6.1.1B for torque data.	Page 6-1	7/06/10
	Updated paragraph 6.2.C.	Page 6-1	7/06/10
	Added Note (4) to Table One.	Page 11-4	7/06/10

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All reasonable attempts were made to make this manual as complete and accurate as possible. If you have any questions, comments, corrections or require clarification of any information contained herein, please write to Champion Aerospace Customer Service Department at 1230 Old Norris Road, Liberty, SC 29657, or email slicksupport@champaero.com.

0.2 ORGANIZATION

This manual is divided into the following sections: Technical Reference; Tools; Preparation and Assembly; Installation; Testing; and Tables. The Technical Reference section, (Section 1), provides detailed component design and operational information and includes exploded views of all models of Slick Harness End Connectors and Terminations.

The *Preparation and assembly* sections, (Section 3 and 4), detail complete preparation and assembly procedures for all types of Slick ignition leads and are fully illustrated with comprehensive drawings. Because of the similarity of preparation and assembly procedures, these sections are generalized to be applicable to all types of Slick ignition leads. Specific part numbers and dimensions for each application are detailed in the Tables section of this manual.

Testing, (Section 5) and *Installation*, (Section 6), describe the complete ignition lead testing and installation procedures.

Tables One and Two are part number and dimension cross reference tables and should be used in conjunction with the Assembly section of this manual. The column headings in Tables One and Two include the referenced paragraph number from the Assembly section. Table Three illustrates Slick Mounting Hardware.

0.3 RELEVANT PUBLICATIONS

Slick Form L-1318 Consolidated Application Data

0.4 SLICK HARNESS OVERVIEW

Champion Aerospace's custom-fit ignition harnesses are the top choice among manufacturers of piston-engine aircraft, offering distinct advantages over competitive products.

For over 25 years, Champion Aerospace has been manufacturing 4- and 6-cylinder harnesses, providing an FAA/PMA approved product now specified by OEM's on 4 out of every 5 new reciprocating aircraft engines.

Complete in-house manufacturing capabilities allow Champion Aerospace to control quality to precise tolerances from raw material to finished product, setting the standard for the rest of the industry.

UNIQUE COILED CONDUCTOR

Champion Aerospace's use of a patented coiled conductor results in an ultra-flexible lead for easy routing in close quarters. The coiled conductor also eliminates the need for costly, bulky elbows that can collect heat and induce failure. The coiled center conductor provides greater flexibility and fatigue resistance than a straight stranded wire conductor, minimizing the adverse expansion and contraction characteristics caused by changing ambient temperatures.

RELIABILITY

Slick's high temperature, 5 mm ignition cable incorporates a tough, abrasion-resistant outer jacket that is silicon-coated for moisture protection. The scuff-resistant outer jacket also acts as a heat shield. From installation to TBO, a Slick Harness will fire almost a billion times-and last.

SPECIALLY DESIGNED LIPPED FERRULE

Champion Aerospace's specially designed lipped ferrule combines with the special electrical properties of the coiled conductor to ensure a superior ground shield and virtually eliminate radio interference.

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LOW RADIO NOISE

Slick Harnesses are recognized for their superior ignition-radio noise suppression. When aircraft must carry sensitive electronic equipment, Slick Harnesses are the first choice.

MATERIALS

Champion Aerospace selects materials which are known for their reliability and durability. Slick Harnesses operate in a harsh ozone/electrical environment under widely varying ambient temperatures.

OUTER COATING

Slick harnesses use unique silicone impregnates in the metal braid to keep moisture and other contaminants from penetrating the harness wire and causing electrical failure. Extruded silicone jackets are applied over Slick harnesses in five distinctive colors: clear, red, blue, black and yellow.

A CUSTOM FIT UNIT

Champion Aerospace offers over 180 tailor-made harnesses, all furnished as complete factory assembled units. Lead wires are cut to the exact lengths required by engine specifications. No "extra" parts are required for installation.

Self-locking cable ties and injection-molded nylon inserts over stainless steel brackets provide long life and lead protection.

Note: Nylon inserts not used with colored harnesses because of their larger outside dimension. Colored harnesses use only the stainless steel brackets without plastic inserts.

A COMPLETE OFFERING

Harnesses are available in the following ways:

- * Custom-Fit Complete and Half Harnesses for quick and easy installation.
- * Universal Harness Kits for those who prefer to build up their own assemblies.
- * Fully assembled Dual Harnesses and Dual Harness Kits for all Bendix dual magnetos.
- * Individual leads for single lead replacement.
- * Harness Service parts for all current production Slick and non-Slick magnetos.
- * Harness Installation Hardware available separately or in kit form for 4- and 6-cylinder engines.

WORLDWIDE DISTRIBUTION NETWORK

Slick Ignition Harnesses are available through an international network of aircraft distributors that offer outstanding product support, delivery and service.

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1.0 TECHNICAL REFERENCE

1.1 GENERAL DESCRIPTION

Slick 5 mm Ignition Leads consist of a length of conductor wire with a terminating connection at the magneto end and a terminating connection at the spark plug end.

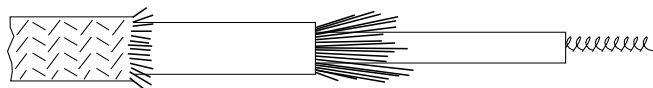
1.2 IGNITION WIRE

The ignition wire is a copper-coated, stainless steel coiled conductor encased in silicone and fiberglass and sheathed by a woven metallic braid impregnated with silicone. (See Cross-Section below)

The patented coiled conductor provides for flexibility and high fatigue resistance over a wide range of ambient temperatures and atmospheric conditions. The conductor has spring like properties and expands or contracts with changes in temperature while being dampened by its inner silicone core.

As a result, the expansion and contraction is more uniform and not localized along the wire, eliminating the kinking and resultant "shorting-out" commonly associated with stranded conductors. The coiled conductor also eliminates the need for costly, bulky elbows that can collect heat and induce failure.

The coiled conductor provides greater inductance and lower RFI (Radio Frequency Interference) than a stranded conductor, resulting in superior avionics noise suppression. The woven metallic braid provides mechanical strength and a ground plane shield for the coiled conductor to reduce radio frequency interference. The woven braid is impregnated with silicon rubber for scuff resistance, superior moisture protection and heat resistance.



High grade silicone insulator "cigarettes" and special corrosion-resistant stainless steel compression springs and retaining hardware are used in the terminating ends. Material specifications are critical in this application because of the highly reactive environment inherent in magnetos and spark plugs.

1.3 MAGNETO END TERMINATION

1.3.1 GENERAL

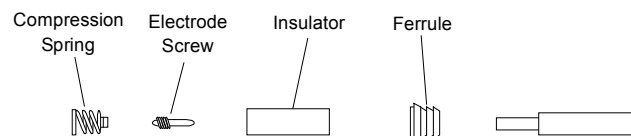
Champion Aerospace manufactures magneto harness caps, insulators and mounting hardware for all Slick and Bendix four- and six-cylinder applications including the Bendix Dual Magneto.

Magneto end termination is accomplished with a lipped aluminum ferrule, high temperature nylon or silicone insulator "cigarettes" and corrosion resistant, stainless steel compression springs and retaining electrode pins.

The lipped aluminum ferrule mechanically secures the wire to the harness cap while providing a superior ground path that virtually eliminates electrical "ringback". "Ringback" occurs when part of the electrical energy delivered to the spark plug is reflected back from the spark plug to the magneto. Ringback causes extra stress on magneto components as well as causing additional electrical noise. With the Champion Aerospace ferrule design, the reflected voltage from ringback is dissipated evenly over the braided shield, the magneto and then to the engine block. This grounding action increases electrical efficiency and reduces avionics interference.

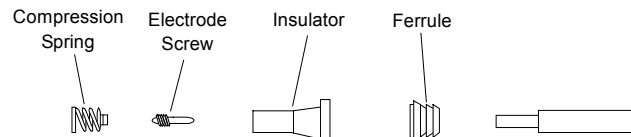
1.3.2 SLICK 4200 / 4300 SERIES

Slick 4200 / 4300 Series 4-cylinder terminator ends offer superior low to middle altitude performance.



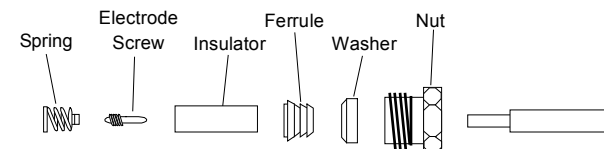
1.3.3 SLICK 6200 / 6300 SERIES

Slick 6200 / 6300 Series 6-cylinder harness ends offer excellent high altitude performance. A specially engineered high grade silicone insulator "cigarette" is flared slightly before the shoulder and seats tightly against the magneto distributor block tower, sealing out dust and moisture. Pressurized magneto applications for operation in excess of 20,000' altitudes use an additional seal around the circumference of the harness cap.



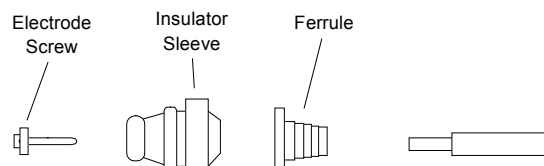
1.3.4 SLICK 400 AND 600 SERIES

Slick 400 and 600 Series Magneto terminations use individual lead nuts in place of a central harness cap.



1.3.5 BENDIX SERIES MAGNETOS

Slick hardware for Bendix Magneto installations fits all Bendix 4-, 6- and 8-cylinder applications.



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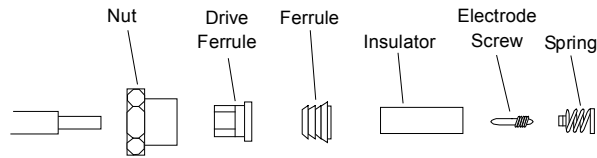
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1.4 SPARK PLUG END

1.4.1 GENERAL

Slick Ignition Leads can be configured for both 5/8"-24 and 3/4"-20 shielded aviation spark plugs. Although similar in construction, hardware is not interchangeable between 5/8" and 3/4" installations.

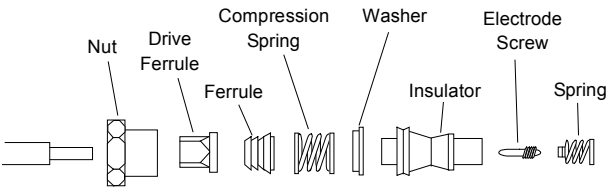
1.4.2 5/8"-24 CONNECTORS



Champion Aerospace 5/8"-24 Connectors offer excellent Operational performance for low to middle altitude flight.

1.4.3 3/4"-20 CONNECTORS

Current 3/4"-20 high altitude connectors were originally developed for military applications with sustained operations over 50,000 feet. The design seals moisture out of the spark plug chamber, while allowing the harness to be removed repeatedly for normal spark plug cleaning and gap adjustment.



Hardware from the current production 3/4"-20 connectors can be used on the old style 3/4"-20 connectors. Hardware from the old style 3/4"-20 connectors CANNOT be used on current production 3/4"-20 high altitude connectors.

NOTE: Harnesses manufactured after July, 1986 are new style harnesses.

When installed, the compression spring presses against the insulator "cigarette", causing it to expand and create an airtight seal against the top and inner walls of the ceramic spark plug chamber. A secondary seal is achieved halfway down the "cigarette" barrel and inner rib seals squeeze against the silicone insulation on the conductor wire. Spring rates and material selection proved critical in the design of this connector. When the nut is fully tightened, it will bottom out against the top of the plug.

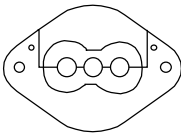
1.5 MOUNTING HARDWARE

1.5.1 GENERAL

Slick Mounting Hardware is used to secure the ignition leads to the engine or surrounding baffles. Refer to Table Three for mounting hardware dimensions and part numbers.

1.5.2 BULKHEAD HARDWARE

Bulkhead hardware is available in two- and three wire configurations that snap together for easy installation.



1.5.3 STANDING HARDWARE

Standing hardware is available in one-, two-, four and six-lead configurations in various lengths and mounting hole sizes.

Slick Mounting Clamps are fabricated from high-grade stainless steel with plastic inserts to provide proper support and insulation for Slick Ignition Leads. Securing the ignition leads with the correct hardware is critical to the life of any ignition harness.

NOTE: Plastic clamp inserts are not used with harnesses configured with red, blue, black or yellow outer silicone jackets.



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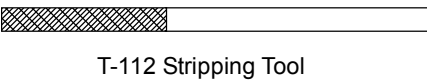
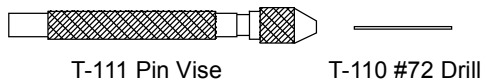
2.0 **REQUIRED TOOLS**

Slick's T200 Assembly Tool Kit is required to install Slick Ignition Harness Leads on all magneto harness caps and spark plug termination ends.

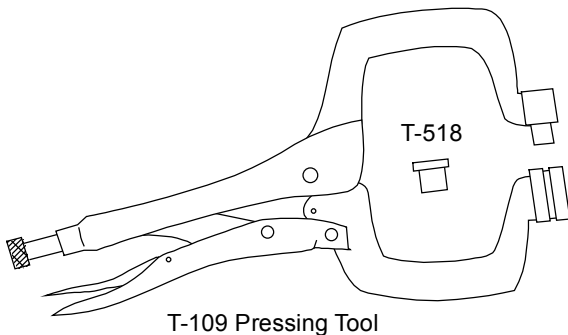
T200 ASSEMBLY TOOL KIT INCLUDES:

- 1 ea. T-109 Pressing Tool
- 1 ea. T-110 #72 Drill
- 1 ea. T-111 Pin Vise
- 1 ea. T-112 Stripping Tool
- 1 ea. T-115 Spring Assembly Tool
- 1 ea. T-126 Shield Stripper

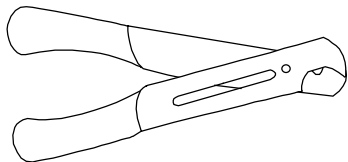
T-200 ASSEMBLY TOOL KIT



T-115 Spring Assembly Tool



T-109 Pressing Tool



T-126 Shield Stripper

Also required for proper assembly, installation and testing:

<u>Part Number</u>	<u>Nomenclature/Address</u>
Century 20	AC/DC Hi-Pot Tester QuadTech, Inc. Bolton, MA 01740-1107
Fluke 787	Process Meter John Fluke Mfg. Co. Everett, WA 98206
RTV #159	Adhesive General Electric Silicones 260 Hudson River Road Waterford NY 12188
DC-3452	Lubricant Dow Corning Corp. 220 W. Salzburg Rd. Box 0994 Midland MI 48686

NOTE: EQUIVALENT SUBSTITUTES MAY BE USED FOR LISTED ITEMS.

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3.0 IGNITION LEAD ASSEMBLY

3.1 MODELS AFFECTED

The following assembly instructions are for harnesses compatible with the following magnetos:

SLICK 4000 4100 4200/4300 6200/6300 400 600
BENDIX 20/200 1200 2000 2200 3000 3200

The assembly process for each Series magneto is very similar. Differences are in specific dimensions and part numbers. These dimensions and part numbers are pictured in Table One of this manual. Refer to Table One as you are preparing and installing your Slick High Temperature Lead.

3.2 SLICK 400 & 600 SERIES SPECIAL INSTRUCTIONS

Slick 400 and 600 Series Magnetos do not utilize a harness cap; a nut, female and male ferrule assembly is used instead. In the following assembly instructions, all references to a harness cap also apply to the nut and ferrule assembly in 400 and 600 Series magneto termination ends, unless specifically noted.

3.3 IGNITION LEAD ASSEMBLY HARNESS CAP END

3.3.1 WIRE REMOVAL- HARNESS CAP

- A. Remove harness cap from magneto.
- B. Cut off old lead as close to harness cap as possible.
- C. Fold or pinch wire shielding in toward the center of the harness lead.
- D. HARNESS CAP: Place the T-115 spring assembly tool on the cut harness lead. The T-115 tool will be used as a punch to loosen the lead and drive ferrule from the harness cap.

400/600 SERIES MAGNETOS: Nut and ferrule assemblies should be discarded and replaced with new parts. Proceed to Paragraph 3.3.2 Preparing Slick High Temperature Lead.

- E. Strike the T-115 tool firmly with a hammer (See Figure 3.3.1A).

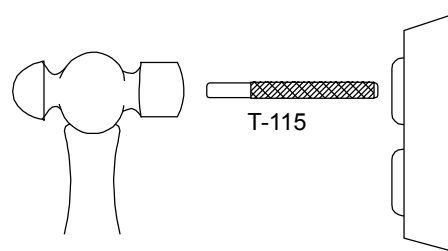


Figure 3.3.1A

- F. Remove the lead and drive ferrule from the harness cap.
- G. Perform any required maintenance or inspections on the harness cap per original manufacturer's maintenance manuals and service bulletins.

3.3.2 PREPARING SLICK HIGH TEMPERATURE LEAD

A. CUT LEAD TO CORRECT LENGTH

1. Measure overall length of lead being replaced. Be sure to add in the length of lead punched out from harness cap.

DO NOT STRETCH IGNITION CABLE WHEN MEASURING OVERALL LENGTH.

2. Mark correct length on new ignition cable.
3. Cut ignition cable with T-126 shield stripper tool (See Figure 3.3.2A).

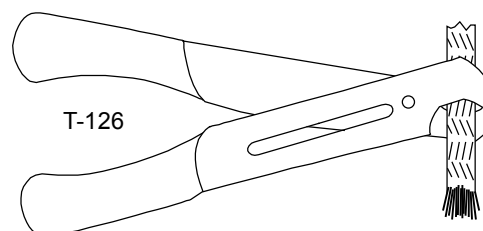


Figure 3.3.2A

B. REMOVE SILICONE COATING

1. Add $\frac{3}{8}$ " to the strip dimension given in column "A" of Table One. Remove this total amount of outer protective silicone coating to provide a ground path for the woven metallic braid of the lead. For example, Table One says to remove $\frac{3}{4}$ " of metallic braid on the Slick 4200 magneto. Adding $\frac{3}{8}$ " to the $\frac{3}{4}$ " dimension, you would remove $1\frac{1}{8}$ " of the outer protective silicone coating.
2. Carefully scrape the metallic braid with a knife, wire brush, or fine sandpaper until the copper colored metallic braid is exposed.

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CAUTION: DO NOT DAMAGE SHIELDING.

NOTE: SILICONE COATING MUST BE REMOVED COMPLETELY TO ENSURE A COMPLETE GROUND PATH BETWEEN THE METALLIC BRAID, THE HARNESS CAP AND THE CRIMPING FERRULE. FAILURE TO COMPLETELY REMOVE THE SILICONE COATING MAY RESULT IN IMPROPER GROUNDING AND CAUSE EXCESSIVE ELECTRO MAGNETIC INTERFERENCE (EMI). EMI CAN RESULT IN POOR AVIONICS PERFORMANCE OR NOISY RECEPTION AND TRANSMISSION OF RADIO SIGNALS.

C. CUT METALLIC BRAID TO LENGTH

- 1. Refer to Table One, Column A for specific dimensions. Mark cable from end to indicate where to cut wire shielding (See Figure 3.3.2B).

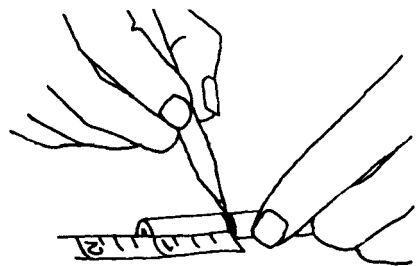


Figure 3.3.2B

- 2. Flare shielding to allow easy insertion of T-112 stripping tools (See Figure 3.3.2C).

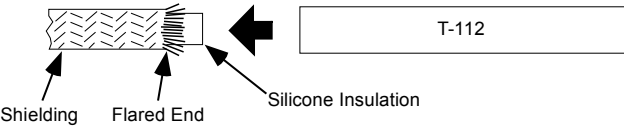


Figure 3.3.2C

- 3. Insert T-112 tool between wire shielding and silicone insulation. T-112 should be inserted past cutting mark (See Figure 3.3.2D).

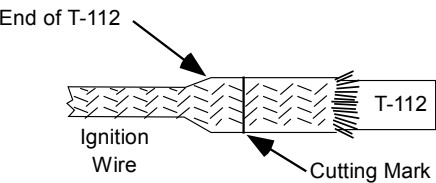


Figure 3.3.2D

- 4. Cut the shielding along the mark with T-126 shield stripping tool.
- 5. Remove T-112 stripping tool. The shielding will pull off with the T-112 tool.
- 6. Remove silicone 1/4" from the end of the braid to provide ground path. Scrape braid with a knife or wire brush until copper colored wire is exposed.

CAUTION: DO NOT DAMAGE SHIELDING.

D. PREPARING LEAD WIRE FOR ASSEMBLY

- 1. Mark exposed silicone insulation 1/8" from end.
- 2. Cut exposed silicone insulation with a sharp knife (See Figure 3.3.2E).

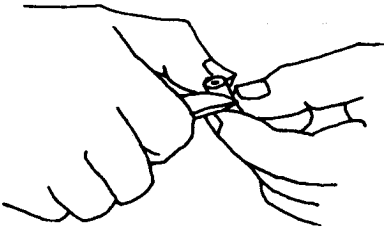


Figure 3.3.2E

- 3. Remove cut silicone insulation by rotating clockwise off coiled conductor (See Figure 3.3.2F).

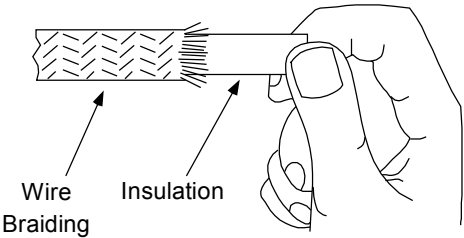


Figure 3.3.2F

CAUTION: DO NOT USE A PULLING MOTION TO REMOVE INSULATION OR DAMAGE MAY RESULT TO THE COILED CONDUCTOR.

- 4. If necessary, trim coiled conductor so that only 3 complete coils protrude past silicone insulation (See Figure 3.3.2G).

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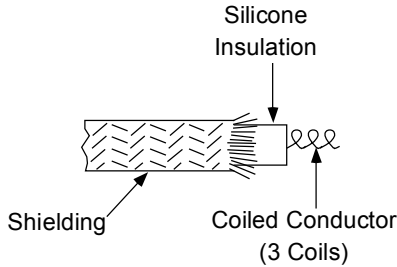


Figure 3.3.2G

5. Remove silicone insulation from the center of coiled conductor using the T-110 drill and the T-111 pin vise.
- a. Insert (T-110) drill into (T-111) pin vise.
 - b. Insert exposed end of drill into the center of the coiled conductor.
 - c. Turn pin vise clockwise until drill has reached a depth of 1/2" (See Figure 3.3.2H).

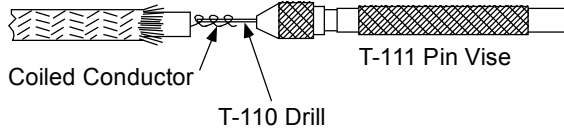


Figure 3.3.2H

- d. Turn pin vise counterclockwise to remove drill bit from coiled conductor.

3.4 ASSEMBLY PROCEDURE

3.4.1 INSTALLING LEAD INTO DISTRIBUTOR CAP

- A. Pull prepared lead wire through the appropriate hole in the distributor cap (See Table One, Column B).

CAUTION: CHECK FIRING ORDER AND PROPER LEAD LENGTH.

- B. Flare shielding to allow easy insertion of male drive ferrule (See Table One, Column C) by bending and rotating silicone insulation (See Figure 3.4.1A).

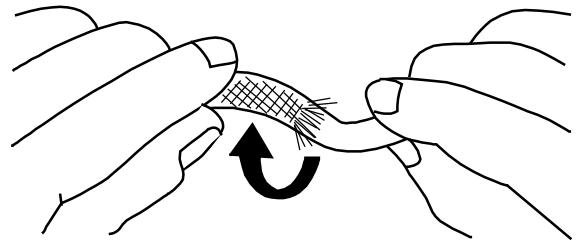


Figure 3.4.1A

CAUTION: BE CAREFUL NOT TO CUT SILICONE INSULATION WITH SHARP EDGE OF SHIELDING.

- C. Install male drive ferrule.
- 1. Slide male drive ferrule onto end of ignition wire.
 - 2. Slide ferrule taper over silicone insulation and under shielding until ferrule flange is 1/16" from shielding (See Figure 3.4.1B).

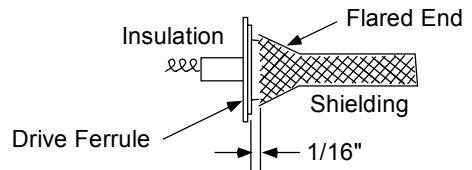


Figure 3.4.1B

CAUTION: DO NOT ALLOW SHIELDING TO OVERLAP FERRULE FLANGE AS IMPROPER GROUNDING MAY RESULT.

- D. Press male drive ferrule into distributor cap or nut and ferrule assembly.
- 1. Place T-109 pressing tool (without T-518 jaw insert) over lead wire and onto distributor cap (See Figure 3.4.1C).

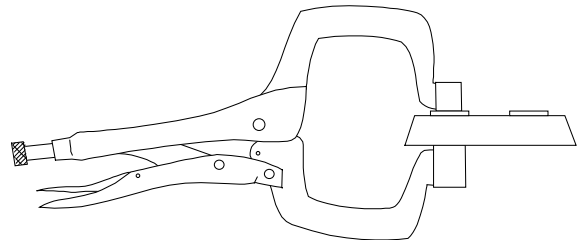


Figure 3.4.1C

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- 2. Apply pressure with T-109 until ferrule flange seats tightly against distributor cap (See Figure 3.4.ID).

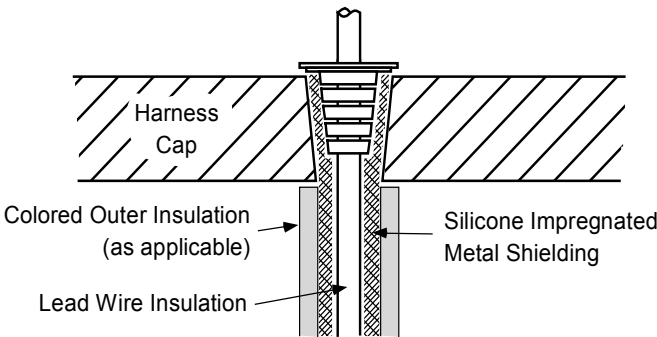


Figure 3.4.ID

NOTE: WHEN USING THE T-109 PRESSING TOOL, TIGHTEN THE ADJUSTING SCREW AS YOU APPLY PRESSURE.

Bendix Applications-Proceed to Paragraph H below.

- E. (SLICK MAGNETOS ONLY) Install electrode screw (See Table One, Column E).

- 1. Install threaded end of electrode screw into T-111 pin vise.
- 2. Insert electrode screw into center of coiled conductor using a counterclockwise turning motion.
- 3. Release T-111 pin vise and remove from electrode screw.

- F. (SLICK MAGNETOS ONLY) Install insulator sleeve (See Table One, Column D) over wire and seat on drive ferrule.

- G. (SLICK MAGNETOS ONLY) Screw electrode spring 3 full turns onto electrode screw (See Figure 3.4.IE).

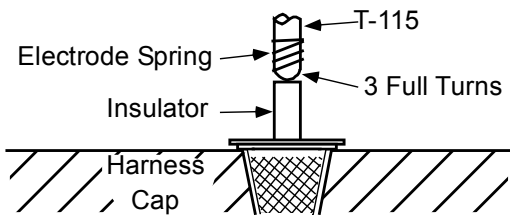


Figure 3.4.IE

- H. (BENDIX MAGNETOS ONLY) Install insulator sleeve (See Table One, Column D) over wire and seat on drive ferrule (See Figure 3.4.IF).

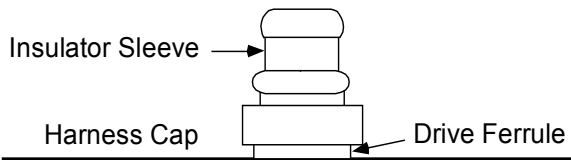


Figure 3.4.IF

- I. (BENDIX MAGNETOS ONLY) Install electrode pin (See Table one, Column E).

- 1. Insert electrode pin into T-111 pin vise, pin length exposed.
- 2. Insert electrode pin through insulator sleeve and into center of coiled conductor using a counterclockwise turning motion. Electrode pin should be seated against end of insulator sleeve. See Figure 3.4.IG.

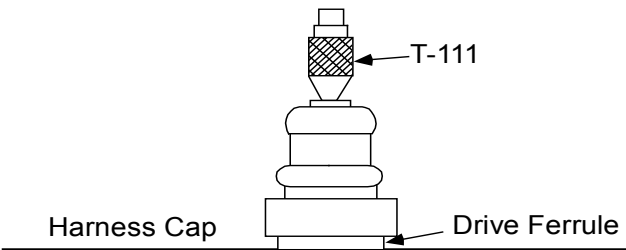


Figure 3.4.IG

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4.0 ASSEMBLY SPARK PLUG END

4.1 MODELS AFFECTED

The following assembly instructions are for both $\frac{5}{8}$ "-24 and $\frac{3}{4}$ "-20 spark plug terminating ends. The hardware mounting methods are identical for both styles. The differences are in specific dimensions and part numbers. These dimensions and part numbers are pictured in Table Two of this manual. Refer to Table Two as you are preparing and assembling your Slick High Temperature Lead.

4.2 WIRE PREPARATION

A. REMOVE SILICONE COATING

1. Add $\frac{3}{8}$ " to the strip dimension given in column "A" of Table Two. Remove this total amount of outer protective silicone coating to provide a ground path for the woven metallic braid of the lead. For example, Table Two says to remove $\frac{15}{16}$ " of metallic braid for the $\frac{5}{8}$ "-24 spark plug. Adding $\frac{3}{8}$ " to the $\frac{15}{16}$ " dimension, you would remove $1\frac{5}{16}$ " of the outer protective silicone coating.
2. Carefully scrape the metallic braid with a knife, wire brush, or fine sandpaper until the copper colored metallic braid is exposed.

CAUTION: DO NOT DAMAGE SHIELDING.

NOTE: SILICONE COATING MUST BE REMOVED COMPLETELY TO ENSURE A COMPLETE GROUND PATH BETWEEN THE METALLIC BRAID, THE HARNESS CAP AND THE CRIMPING FERRULE. FAILURE TO COMPLETELY REMOVE THE SILICONE COATING MAY RESULT IN IMPROPER GROUNDING AND CAUSE EXCESSIVE ELECTROMAGNETIC INTERFERENCE (EMI). EMI CAN RESULT IN POOR AVIONICS PERFORMANCE OR NOISY RECEPTION AND TRANSMISSION OF RADIO SIGNALS.

B. CUT METALLIC BRAID TO LENGTH

Refer to Table One, Column A for specific dimensions. Mark cable from end to indicate where to cut wire shielding (See Figure 4.2A).

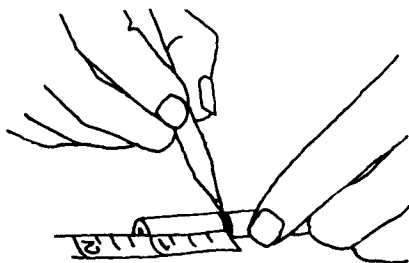


Figure 4.2A

4.3 HARDWARE ASSEMBLY

- A. Slip the spark plug nut and hex ferrule over the lead wire (See Table Two, Column B).

NOTE: ENSURE THAT THE HEX PORTION OF THE FERRULE IS TOWARD THE SPARK PLUG NUT.

- B. Flare shielding to allow easy insertion of male drive ferrule (See Table Two, Column C) by bending and rotating silicone insulation (See Figure 4.3A).

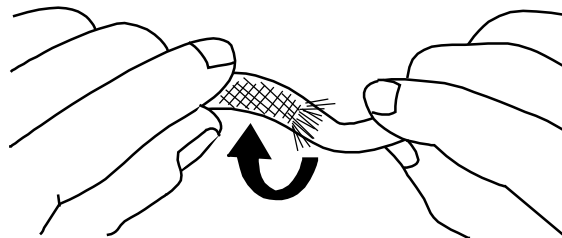


Figure 4.3A

CAUTION: BE CAREFUL NOT TO CUT SILICONE INSULATION WITH SHARP EDGE OF SHIELDING

- C. Install male drive ferrule.

1. Slide male drive ferrule onto end of ignition wire.
2. Slide ferrule taper over silicone insulation and under shielding until ferrule flange is $\frac{1}{16}$ " from shielding (See Figure 4.3B).

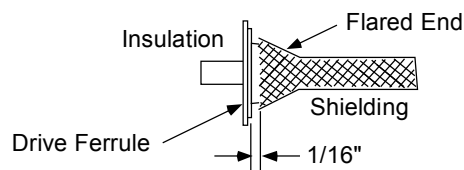


Figure 4.3B

CAUTION: DO NOT ALLOW SHIELDING TO OVERLAP FERRULE FLANGE AS IMPROPER GROUNDING MAY RESULT.

- D. Press drive ferrule and hex ferrule together.

1. Place T-109 pressing tool (without T-518 jaw insert) over lead wire and onto the hex and drive ferrules.

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2. Apply pressure with T-109 until the hex and drive ferrules are tightly seated (See Figure 4.3C).

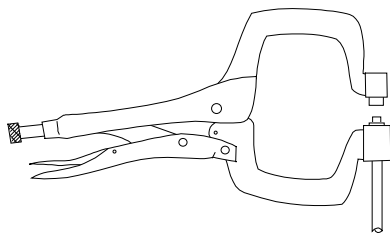


Figure 4.3C

NOTE: WHEN USING THE T-109 PRESSING TOOL, TIGHTEN THE ADJUSTING SCREW AS YOU APPLY PRESSURE.

- E. Install electrode screw & spring (See Table Two, Column E).
 1. Insert the threaded end of the electrode Screw into T-111 pin vise.
 2. Insert electrode screw into the center of coiled conductor using a counterclockwise turning motion.
 3. Release T-111 pin vise and remove from electrode screw.
- F. Install insulator sleeve or insulator sleeve assembly (See Table Two, Column D) over wire and seat on drive ferrule (See Figure 4.3D).

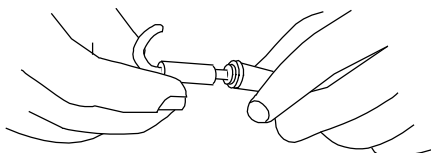


Figure 4.3D

NOTE: IN $\frac{3}{4}$ "-20 INSTALLATIONS, SPREAD RTV #159 SPARINGLY OVER THE SILICONE INSULATION ON THE CONDUCTOR WIRE BEFORE INSTALLING THE INSULATOR SLEEVE.

- H. Slide the electrode spring over the T-115 spring assembly tool. Screw electrode spring 3 full turns onto electrode screw (See Figure 4.3E).

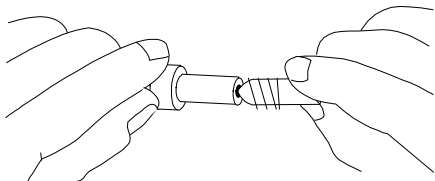


Figure 4.3E

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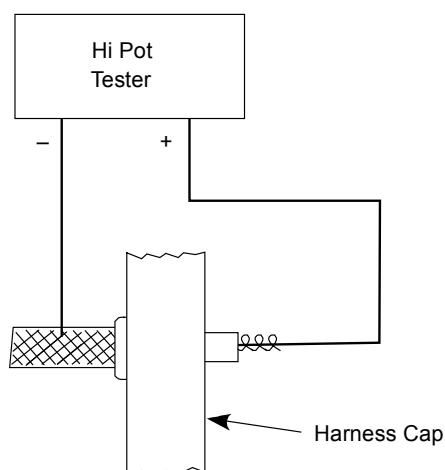
5.0 LEAD WIRE TESTING

5.1 CONDUCTOR

Check for continuity using a Fluke 787 Process Meter or equivalent between the electrode spring or electrode pin in the magneto end termination and the electrode spring at the spark plug connector. An open circuit reading indicates a faulty conductor. Replace lead wire as necessary

5.2 INSULATION

Test lead wire insulation for dielectric standoff with a Century 20 Hi-Pot tester or equivalent. Apply a 60 Hz potential of 1 KVAC RMS/SEC up to 6 KVAC. Test at 6 KVAC for 1 sec and then decrease potential at 1 KVAC RMS/SEC until potential equals zero (0). Replace lead wire as necessary.



CAUTION: DO NOT TOUCH ANY EXPOSED PORTION OF TEST PROBES OR COMPONENTS UNDER TEST WHILE TESTER IS ENERGIZED. ENERGIZED TESTER CAN PRODUCE ELECTRICAL SHOCK. OBSERVE THE CUSTOMARY PRECAUTIONS WHEN OPERATING HIGH VOLTAGE EQUIPMENT.

5.3 SHIELDING-GROUND PLANE

Check for continuity using a Fluke 787 Process Meter or equivalent between the harness cap or hex ferrule on the magneto end and the hex ferrule at the spark plug connector. An open circuit reading indicates poor shield attachment. Repeat Section 3.3.2 (B) (6).

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6.0 **INSTALLATION**

6.1 **INSTALL IGNITION HARNESS**

6.1.1 **SINGLE HARNESS INSTALLATION**

- A. Attach Slick Ignition Harness to the appropriate magneto. The left harness is marked "left" and should be attached to the left magneto. The right harness is marked "right" and should be attached to the right magneto.

- B. Torque the mounting cap screws or nuts as follows:

Slick Magnetos torque to 18-20 in-lbs.

Bendix S-20 and S-200 Series Magnetos:
12-15 in-lbs.

Bendix S-1200 Series Magnetos: 18-22 in-lbs.

6.1.2 **DUAL HARNESS INSTALLATION**

- A. Remove the two capacitors from the old dual harness cap, following magneto manufacturer's recommended procedures.
- B. Wipe capacitors with a clean lint-free cloth. Test capacitors for electrical integrity following magneto manufacturer's recommended procedures. Replace as necessary.
- C. Install two capacitors in the Slick Dual Harness Cap following magneto manufacturer's recommended procedures. Secure capacitors with appropriate Lockwasher and nut and torque to 60-70 in-lbs.
- D. Assemble harness cap to magneto. Follow magneto manufacturer's recommended procedures for reconnecting capacitor terminals and seating harness cap on distributor housing. Evenly tighten the harness cap mounting screws and torque as follows:

NON-PRESSURIZED MAGNETOS:
Torque to 30-35 in-lbs.

PRESSURIZED MAGNETOS:
Torque to 40-45 in-lbs.

Do not overtighten housing screws.

6.2 **ROUTE IGNITION LEADS**

- A. Route Slick Ignition Leads to the appropriate spark plug position as indicated by the alphanumeric markings on each spark plug nut.

Each spark plug nut is marked with a letter and number code identifying the spark plug position on each respective cylinder. For example, a spark plug

nut marked "T1" indicates that lead should be connected to the TOP spark plug on cylinder #1. Similarly, a spark plug nut marked "B4" indicates that lead should be connected to the BOTTOM spark plug on cylinder #4.

- B. Route the lead wires according to the engine manufacturer's instructions. The leads should be routed so that they are not allowed to rub against hot portions of the engine such as exhaust manifolds. Leads should also be kept away from sharp edges to prevent chafing or cutting of the shielding.

- C. Slick recommends clean, dry installations. If needed, coat insulator with Dow Corning DC-3452 and install into spark plug. Torque the nut as follows:

$\frac{5}{8}$ "-24 hardware torque to 80- 90 in-lbs. $\frac{3}{4}$ "-20 hardware torque to 110-120 in-lbs

NOTE: When installed, a hex ferrule will protrude above the spark plug mounting nut. This hex ferrule should be held with a $\frac{7}{16}$ " wrench while tightening the spark plug nut to prevent twisting of the ignition lead.

6.3 **SECURING HARNESS TO ENGINE**

Remove excess slack from the harness starting at the spark plug end. Use the wire tie wraps provided to secure the wires from both magnetos together, providing added support. Any slack that remains in the wire should be gathered near the magneto and bundled securely together to prevent damage. Refer to Table Three for Slick Mounting Hardware Part Number Reference.

CAUTION: CARE MUST BE TAKEN NOT TO OVERTIGHTEN HARNESS TIE WRAPS. OVERTIGHTENING THE WRAPS CAN CRUSH LEAD WIRES.

6.4 **GROUND TEST IGNITION SYSTEM**

Slick Ignition Systems should be tested on the ground according to the engine manufacturers recommended procedures.

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7.0 **MAINTENANCE SCHEDULE**

Slick Harnesses are designed for maintenance-free operation and normally do not require service. However, an inspection is recommended at 500-hour intervals or annual inspection, whichever occurs first.

NOTE: If Slick Harness wire is installed in another manufacturer's harness cap, maintenance and inspection procedures required by original cap manufacturer must be complied with in addition to the procedures recommended within this manual.

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8.0 MAINTENANCE PROCEDURE

8.1 PROOF OF COMPLIANCE

Any inspection, repair and /or overhaul must be recorded in the appropriate engine and airframe logbooks. Be specific and complete in describing the work performed.

A checklist has been provided on the back cover of this manual for your use while performing general maintenance and inspection of Slick Ignition Leads.

8.2 TOOLS REQUIRED

Standard shop tools, a Century 20 Hi-Pot tester or equivalent and Fluke 787 Process Meter or equivalent are required for general maintenance and inspection of Slick Ignition Leads.

8.3 CLEANING

Slick Ignition Harnesses should be cleaned prior to inspection. Certain chemicals and cleaning solvents can damage the stainless steel, copper and silicone materials of the harness, resulting in a non-airworthy condition. Following are lists of recommended cleaners:

Approved cleaners for Slick Ignition Harnesses:

1. Mild soap and water
2. Isopropyl Alcohol

Cleaning agents NOT recommended for Slick Ignition Harnesses:

1. Any solvent that could leave a residual film on the harness components
2. Any acid
3. Chemicals containing chlorinated hydrocarbons, such as:
 - Trichloroethylene
 - Tri-chloroethane
 - Carbon tetrachloride
4. Gasoline
5. Hydraulic Fluids
6. Brake Fluids

Wipe the harness leads gently with a clean rag containing approved cleaners. Termination ends may be dipped in solvent. Rinse dirt and solvent residue from harness using warm water prior to inspection. Harness should be dry before inspection.

8.4 INSPECTION

8.4.1 CONDUCTOR WIRE

- A. Any wires found to have fraying or open abrasions in the shielding must be replaced.

- B. Conductor wire should be flexible. Any wire that does not bend easily or is found to be brittle must be replaced.
- C. Any wire that is "soft", oil-soaked, or swollen must be replaced.

8.4.2 MAGNETO END

Inspect general condition of cap assembly.

- A. Wire should be held tightly in cap by ferrule. Replace any loose connections.
- B. Insulators should retain their original molded color. Any insulator showing signs of discoloration, burning, deterioration or deformation must be replaced.
- C. Springs showing signs of burning or corrosion must be replaced.

Full illustrated instructions for replacement of ferrules, insulators, springs, etc. are contained in Section 3 of this manual.

8.4.3 SPARK PLUG END

Inspect general condition of spark plug assembly.

- A. Spark plug nuts showing signs of wear, excessive corrosion, or overtightening must be replaced.
- B. Wire should be held tightly by ferrule assembly. Replace any loose connections.
- C. Insulators should retain their original molded color. Any insulator showing signs of discoloration, burning, deterioration or deformation must be replaced.
- D. Springs showing signs of burning or corrosion must be replaced.

8.4.4 HARNESS INSTALLATION

Inspect general condition and installation of harness assembly.

- A. Harness must be securely fastened to the engine by clamps and tie wraps. Be sure that tie wraps have not been overtightened and are not crushing lead wires.
- B. Leads should be routed so they do not rub against hot portions on the engine or against sharp edges. Leads should not bend at too sharp a radius at the spark plug end. Correct any discrepancies.

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8.4.5 ELECTRICAL INSPECTION

Test each lead wire for continuity with a high-tension lead tester. Follow lead tester manufacturer's instructions.

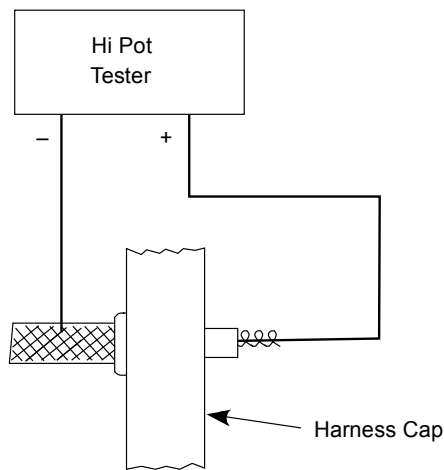
A. CONDUCTOR

Check for continuity using a Fluke 787 Process Meter or equivalent between the electrode spring or electrode pin in the magneto end termination and the electrode spring at the spark plug connector. An open circuit reading indicates a faulty conductor. Replace lead wire as necessary.

B. INSULATION

Test lead wire insulation for dielectric standoff with a Century 20 Hi-Pot tester or equivalent. Apply a 60 Hz potential of 1 KVAC RMS/SEC up to 6 KVAC. Test at 6 KVAC for 1 sec and then decrease potential at 1 KVAC RMS/SEC until potential equals zero (0). Replace lead wire as necessary.

CAUTION: DO NOT TOUCH ANY EXPOSED PORTION OF TEST PROBES OR COMPONENTS UNDER TEST WHILE TESTER IS ENERGIZED. ENERGIZED TESTER CAN PRODUCE ELECTRICAL SHOCK. OBSERVE THE CUSTOMARY PRECAUTIONS WHEN OPERATING HIGH VOLTAGE EQUIPMENT.



C. SHIELDING-GROUND PLANE

Check for continuity using a Fluke 787 Process Meter or equivalent between the harness cap or hex ferrule on the magneto and the hex ferrule at the spark plug connector. An open circuit reading indicates poor shield attachment.

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9.0 REPAIR KITS

The following Slick Ignition Harness Kits are available:

M-1820 IGNITION HARNESS KIT

PART NO.	QTY.	PART NO.	QTY.
M-1406-1 NUT	5	M-1498 SCREW	100
M-1406-2 NUT	5	M-1671 FERRULE	10
M-1406-3 NUT	5	M-1673 T1 NUT	5
M-1406-4 NUT	5	M-1673 T2 NUT	5
M-1406-5 NUT	5	M-1673 T3 NUT	5
M-1406-6 NUT	5	M-1673 T4 NUT	5
M-1451 WASHER	15	M-1673 B1 NUT	5
M-1453 SLEEVE	15	M-1673 B2 NUT	5
M-1458 FERRULE	100	M-1673 B3 NUT	5
M-1459 FERRULE	12	M-1673 B4 NUT	5
M-1462-T1 NUT	5	M-1677 SLEEVE	15
M-1462-T2 NUT	5	M-1738 SLEEVE	15
M-1462-T3 NUT	5	M-1767 WIRE (FT.)	50
M-1462-T4 NUT	5	M-1797 FERRULE	15
M-1462-T5 NUT	5	M-1798 PIN	100
M-1462-T6 NUT	5	M-2926 SPRING	12
M-1462-B1 NUT	5	M-2927 WASHER	12
M-1462-B2 NUT	5	M-2928 SLEEVE	12
M-1462-B3 NUT	5	M-2929 SPRING	100
M-1462-B4 NUT	5	M-3123 SLEEVE	12
M-1462-B5 NUT	5	M-3168 SLEEVE	15
M-1462-B6 NUT	5	T-200 TOOL KIT	1*

M-2368 HARNESS REPAIR KIT

PART NO.	QTY.	PART NO.	QTY.
M-1406 NUT (PLAIN)	2	M-1767 WIRE (FT.)	50
M-1451 WASHER	2	M-1797 FERRULE	10
M-1453 SLEEVE	5	M-1798 PIN	25
M-1458 FERRULE	50	M-2926 SPRING	2
M-1459 FERRULE	2	M-2927 WASHER	2
M-1462 NUT (PLAIN)	2	M-2928 SLEEVE	5
M-1498 SCREW	50	M-2929 SPRING	50
M-1671 FERRULE	2	M-3123 SLEEVE	5
M-1673 NUT (PLAIN)	2	M-3168 SLEEVE	5
M-1677 SLEEVE	5	T-200 TOOL KIT	1*
M-1738 SLEEVE	5		

*T-200 TOOL KIT

PART NO.	QTY.	PART NO.	QTY.
T-109 PRESSING TOOL	1	T-115 SPRING ASSY. TOOL	1
T-110 DRILL	1	T-126 WIRE STRIPPER	1
T-111 PIN VISE	1		
T-112 STRIPPING TOOL	1		

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10. **OVERHAUL**

Ignition harnesses should be removed and replaced at engine overhaul.

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11.0 TROUBLESHOOTING

11.1 TROUBLESHOOTING GUIDE

The following charts are intended to be used as a guide only. Many non-ignition harness factors influence the performance of aircraft ignition systems and the replacement or repair of ignition components may not remedy problems in all cases. After verifying that all non-ignition harness related causes for possible problems have been explored, then proceed to use this troubleshooting guide.

I. OPERATIONAL PROBLEMS

PROBLEM	POSSIBLE CAUSE	REMEDY
RADIO INTERFERENCE	Faulty Shielding	Replace any wires that have broken or faulty shielding. Shielding may be checked visually or by using a high tension lead tester.
	Poor Electrical Grounding	Check ferrule assembly for integrity. Replace ferrule assembly if it is not tightly secured at magneto cap or spark plug end.
	Harness Clamps or Tie Wraps Too Tight, Crushing Wire	Inspect wire for evidence of crushing. If damaged, repair or replace as necessary.
	Dirty Spark Plug Inner Barrel	Inspect spark plug and clean according to manufacturer's recommendations.
MISFIRING – ROUGH OPERATION	Faulty Lead	Replace any wires that have broken or faulty shielding or conductor. Lead may be checked visually or by using a high tension lead tester.
	Faulty Connection at Spark Plug	Inspect tension spring and connection for corrosion. Repair or replace as necessary. Inspect spark plug inner barrel for contamination. Clean according to spark plug manufacturer's specifications.
	Electrode Pin Not Making Contact with Conductor	Ensure that electrode pin is inserted into coiled conductor. Repair or replace as necessary
	Harness Clamps or Tie Wraps Too Tight, Crushing Wire	Inspect wire for evidence of crushing. If damaged, repair or replace as necessary.

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II. PHYSICAL DAMAGE

PROBLEM	POSSIBLE CAUSE	REMEDY
BROKEN SHIELDING – SPARK PLUG END	As spark plug nut is installed or removed, wire is allowed to turn, breaking shielding.	Use a 7/16" wrench to hold the small ferrule nut as large spark plug nut is turned. Repair or replace as necessary.
BROKEN SHIELDING – LEAD WIRE	Excessive vibration, chafing, exposure to heat.	Inspect wire routing. Wires must be protected by rubber grommets when passed through baffling, supported by clamps to prevent wires from touching engine, and secured with tie-wraps to prevent vibration. Repair or replace damaged components as necessary.
	Exposure to harmful chemicals, solvents, etc.	Use warm soap and water to clean Slick Harness components. Inspect wire for damage and repair or replace as necessary.
	Harness clamps or tie wraps too tight, crushing shielding.	Inspect wire for evidence of crushing. If damaged, repair or replace as necessary.
	Spark plug leakage from combustion chamber.	Clean spark plug insulator sleeve. Consult spark plug manufacturer's manual for replacement criteria.
SPARK PLUG NUT GALLED OR SEIZED ON PLUG	Nut over-torqued.	Replace damaged hardware.
SPARK PLUG NUT THREADS STRIPPED	Nut over-torqued, cross-threaded, or reinstalled after galling.	Replace damaged hardware.
CRACKED HEX FERRULE	Over-torqued. Ferrule not seated squarely on spark plug when tightened.	Replace damaged hardware.
	Improper use of T-109 pressing tool.	Replace damaged hardware.
INSULATOR "CIGARETTE" BURNED OR DISTORTED	Possible engine over temp.	Consult engine operations manual for proper operation and performance. Correct as required.
	Spark plug heat range incorrect.	Consult engine manufacturer's specifications on spark plugs. Correct as required.
	Heat buildup due to poor electrical connection	Inspect spark plug terminal connection. Tension spring should be replaced if it is corroded or burned. Electrode pin should secure hardware in wire lightly.
	Spark plug leakage from combustion chamber.	Consult spark plug manufacturer's manual for replacement criteria.
DISCOLORED LEAD WIRE WHITE/CHALKING RED YELLOW/STICKY	Excessive heat; leaking exhaust manifold.	Inspect wire routing around exhaust stacks. Check for exhaust leaks. Repair as necessary.
	Brake fluid. Hydraulic fluid.	Check for source of fluid. Correct as necessary.
	Improper solvent.	Clean harness as necessary.

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A/C Type _____

Engine Make _____

N# _____

Model _____

Harness P/N _____

Total Time on Engine _____

Date _____

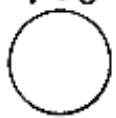
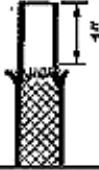
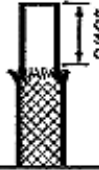
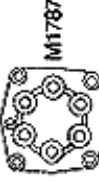
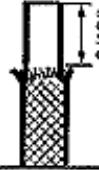
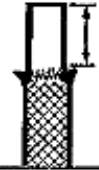
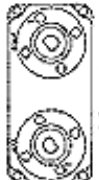
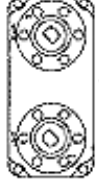
Total Time on Harness _____

-
- ☐ **CLEAN HARNESS USING APPROVED CLEANER** Sec. 8.3
- ☐ **INSPECT CONDUCTOR WIRE** Sec. 8.4.1
- ☐ Check for fraying or abrasions
- ☐ Check for flexibility
- ☐ **INSPECT MAGNETO TERMINATION END** Sec. 8.4.2
- ☐ Check for tight connection
- ☐ Inspect insulators
- ☐ Inspect springs
- ☐ **INSPECT SPARK PLUG TERMINATION END** Sec. 8.4.3
- ☐ Check nuts for wear or overtightening
- ☐ Check for tight connection
- ☐ Inspect insulators
- ☐ Inspect springs
- ☐ **INSPECT HARNESS INSTALLATION** Sec. 8.4.4
- ☐ Inspect clamps and tie wraps
- ☐ Inspect routing
- ☐ **ELECTRICAL INSPECTION** Sec. 8.4.5
- ☐ Test each wire for continuity
- ☐ Test lead wire insulation for dielectric standoff

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Magneto Series	"A" Dimension	"B" Harness Cap or Nut/Ferrule Assy.	"C" Drive Ferrule	"D" Insulator Sleeve/Grommet	"E" Electrode Screw/Pin
	Reference 3.3.2	Reference 3.4.1 (A)	Reference 3.4.1 (B)	Reference 3.4.1 (E)	Reference 3.4.1 (F)
Slick 4000/4100 4200/4300		 M1569 Cap	 M1458	 M1738	 M1498 M2929
Slick 6200/6300		 M1568 Cap  *M3196 Cap & O-Ring	 M1456	 M3168	 M1498 M2929
Slick 400/600		 M1451 Washer  M1406 Nut	 M1458	 M1453	 M1498 M2929
Bendix 20/200		 M1893  M1787	 M1797 M3124	 M3123(2)	 M1798
Bendix 1200		 M2018  M1891	 M1797	 M3123(2)	 M1798
Bendix Dual 4- and Dual 6-Cyl		 M2922  (1)	 M1797	 M3123(2)	 M1798

*Pressurized

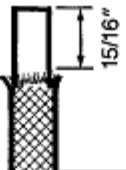
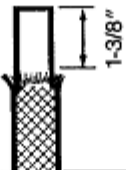
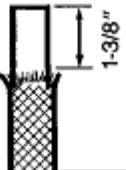
- (1) Dual Harness M2947; Dual Harness M2919 uses cap M2923.
 (2) Grommet M3123 is always furnished with ferrule M1797 and procured as M3124.
 (3) On Leads with colored insulation, strip outer insulation to expose 3/8" of inner braid.
 (4) Qty. 3 harness cap screws M1553-15 (pack of 15 pcs.) required to attach harness to Slick Magneto.

TABLE ONE: MAGNETO END TERMINATIONS

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Spark Plug Size	"A" Dimension	"B" Nut & Ferrule Assy.	"C" Drive Ferrule	"D" Insulator Sleeve Assembly	"E" Electrode Screw & Spring
	Reference 4.2	Reference 4.3 (A)	Reference 4.3 (B)	Reference 4.3 (F)	Reference 4.3 (E)
5/8"-24		 M1673 Nut M1671 Ferrule	 M1458	 M1677	 M1498 Screw M2929 Spring
3/4"-20 Old-Style Configuration (See Note)		 M1462 Nut M1459 Ferrule	 M1458	 M1463 Seal Spring M1457 Washer M1456 Sleeve	 M1498 Screw M2929 Spring
3/4"-20 High Altitude Configuration (New-Style) (See Note)		 M1462 Nut M1459 Ferrule	 M1458	 M2926 Seal Spring M2927 Washer K-3300 Sleeve	 M1498 Screw M2929 Spring

Note: Hardware from current production 3/4-20 high altitude connectors can be used on the old style configuration 3/4-20 connectors.
 Hardware from old style configuration 3/4-20 connectors CANNOT be used on the new style high altitude configuration 3/4-20 connectors.
 Any Slick Ignition harness manufactured after July, 1986 is considered a new style configuration.
 M2927 Washer and M2928 Sleeve are always furnished together and procured as kit K-3300.
 On leads with colored outer insulation, strip outer insulation to expose 3/8" of inner braid.

TABLE TWO: SPARK PLUG CONNECTORS

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Cap Hardware

M1553 Harness Cap Screw	
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Bulkhead Hardware

M2375 Two Hole 1/4" Dia.	
M2376 Three Hole 1/4" Dia.	

Standing Hardware

M2754 Single Lead	
M2755 Two Lead	
M2756 Four Lead w/90° Twist	
M2757 Six Lead	
M2758 Six Lead w/90° Twist	
M3169 Cable Ties	

TABLE THREE: MOUNTING HARDWARE

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