SECTION XIV

ACCESSORIES AND UTILITIES

14-1. INTRODUCTION. This section covers accessories which are available for this airplane and not covered in other sections of this Service Manual. This information provides instructions for remedying difficulties which may arise in any of the accessories, and the instructions are organized so the mechanic may refer to whichever component or system he must service.

14-2. TROUBLESHOOTING. A troubleshooting chart is located at the end of each accessory covered in this section. The various troubles and suggested remedies found in the tables are provided to assist in locating and correcting malfunctions in the particular system.

14-3. PROPELLER DEICING SYSTEM.

14-4. DESCRIPTION AND PRINCIPLES OF OPERATION. (Refer to Figure 14-1.) The Propeller Deicing System consists of an electrically heated deicer (1) bonded to each propeller blade, a slip ring assembly (2) with a brush block assembly (3) to transfer electrical power to the rotating deicers, a timer (4), an ammeter (5), a control switch circuit breaker (7), shunt (6), together with wiring harnesses (8) to complete the circuit. Power is drawn from the aircraft electrical system (10).

Dual element deicers are utilized on the two blade propeller installation. Each deicer has two separate heaters; one for the outer half and one for the inner half. By heating all outer or inner heaters on only one propeller at a time, rotational balance is held during deicing. Current is drawn from the airplane electrical system through the switch, ammeter and timer. The timer successively delivers current via the slip ring and brush block arrangement to (phase 1) the outer heaters on the right propeller, (phase 2) the inner heaters on the same propeller, (phase 3) the outer heaters of the left propeller and (phase 4) the inner heaters on the left propeller. The timer energizes each of these four phases in turn for about 34 seconds and then repeats the cycle as long as the control switch is on. The cycling sequence given is vital so that outboard heaters on each propeller operate before the inboard heaters. See cycle sequence. (Refer to Figures 14-2 thru 14-5.) The system may be used continuously in flight if needed. To conserve electrical power, current is cycled to the deicer heaters at timed intervals rather than continuously.

NOTE

Heating may begin at any phase in the cycle depending on the timer position when the switch was turned off from previous use.

The optional McCauley three bladed propeller installation utilizes single element deicers. When the switch is turned on power is directed through the brush block and slip ring to all the heating elements on one propeller for approximately 34 seconds. The timer then directs the power to the other propeller for approximately 34 seconds. This cycle continues until the switch is turned off.

a. Deicers: The deicers contain special heater wires protected by fabric plies and by oil and abrasion-resistant rubber. The side of the deicer cemented to the propeller has a dull finish whereas the air side finish is "glossy."

Dual element deicers have a separate lead for the inboard and outboard heater and a third lead which is a common ground. These leads are so marked. An unmarked ground can be identified by using an ohmmeter across the three possible pairs of leads. One pair will show twice the resistance of the other pairs. The latter are the "hot" leads and the lead excluded from the pair that shows twice the resistance of the other pairs is the ground lead.

Single element deicers have only two leads; one input and one ground.

b. Slip Rings, Brushes and Brush Blocks: To transfer electrical power to the rotating deicers, a brush block assembly is mounted to the engine by means of a bracket and has brushes which are spring-loaded to press against the revolving slip rings.

c. Timer: The timer is a sealed unit. If found inoperative, it must be replaced as an assembly - no field repairs are authorized.

d. Ammeter: The ammeter is designed for each particular system and it is therefore important that the correct replacement part number be used if replacement should be required. In the event of low aircraft battery voltage (very possible in ground checks), the ammeter readings will be lower than at full voltage. Provided the ammeter needle reads in the shaded range on the scale (full aircraft voltage), current flow is considered as normal.

e. Switch: The switch-circuit breaker is mounted in the switch and circuit breaker control panel.

14-5. DEICER SYSTEM OPERATIONAL CHECK.

a. Chock the wheels and operate the engine at near takeoff power.

b. Turn deicer system switch ON and observe deicer ammeter for at least two minutes.

c. The ammeter needle must "flicker" approximately every 34 seconds as the step switch of the timer operates.

d. With engines stopped, turn deicer switch ON and feel deicers on propellers for proper sequence of heater operation.

e. The starting point is not important but the sequence is vital and must be: Right Outboard, Right Inboard, Left Outboard, Left Inboard Heaters, in that order.

f. Temperature rise should be noticeable and each heater should warm for about 34 seconds.

g. Local hot spots indicate surface damage of deicer heaters and should be repaired.

14-6. TROUBLESHOOTING. Troubles peculiar to the deicing system are listed in Table XIV-IV at the end of these instructions, along with their probable causes and suggested remedies.

14-7. USING THE AMMETER. Whether in flight or during ground testing, the ammeter can be used to indicate the general nature of most electrical problems. The troubleshooting chart is primarily based on this use of the ammeter and assumes that the user does understand all normal operating modes of the system as given in Paragraph 14-4.

NOTE

When troubleshooting, first use the "ammeter test" and "heat test" to determine which circuits are involved. Use circuit diagram, Figure 14-8, for assistance to check voltages or continuity.

14-8. HELPFUL TIPS.

a. If the ammeter reading drops to one-third normal current, this indicates that one heater circuit is open or, on the dual element deicer, possibly improper connections are allowing both inboard and outboard units to heat at the same time.

b. Excess current reading on the ammeter always indicates a power lead is shorted to ground. Thus, when trouble of this nature is found, it is vital that the grounded power lead be located and corrected.

c. A considerable number of timers that have been returned for repair proved to be fully workable when tested. Accomplish the test described in Paragraph 14-33 before concluding that the timer is defective.

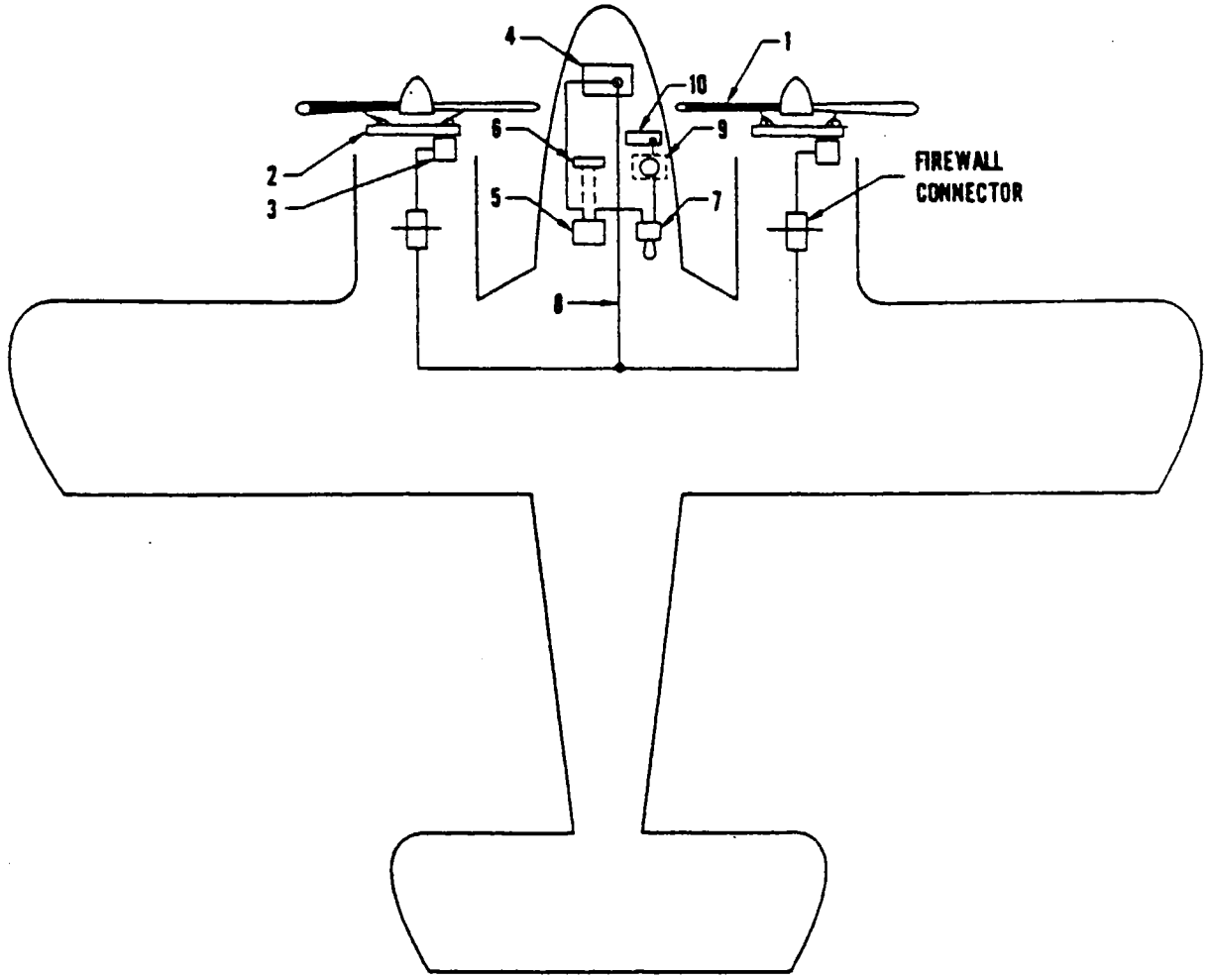

Figure 14-1. Propeller Deicing Installation

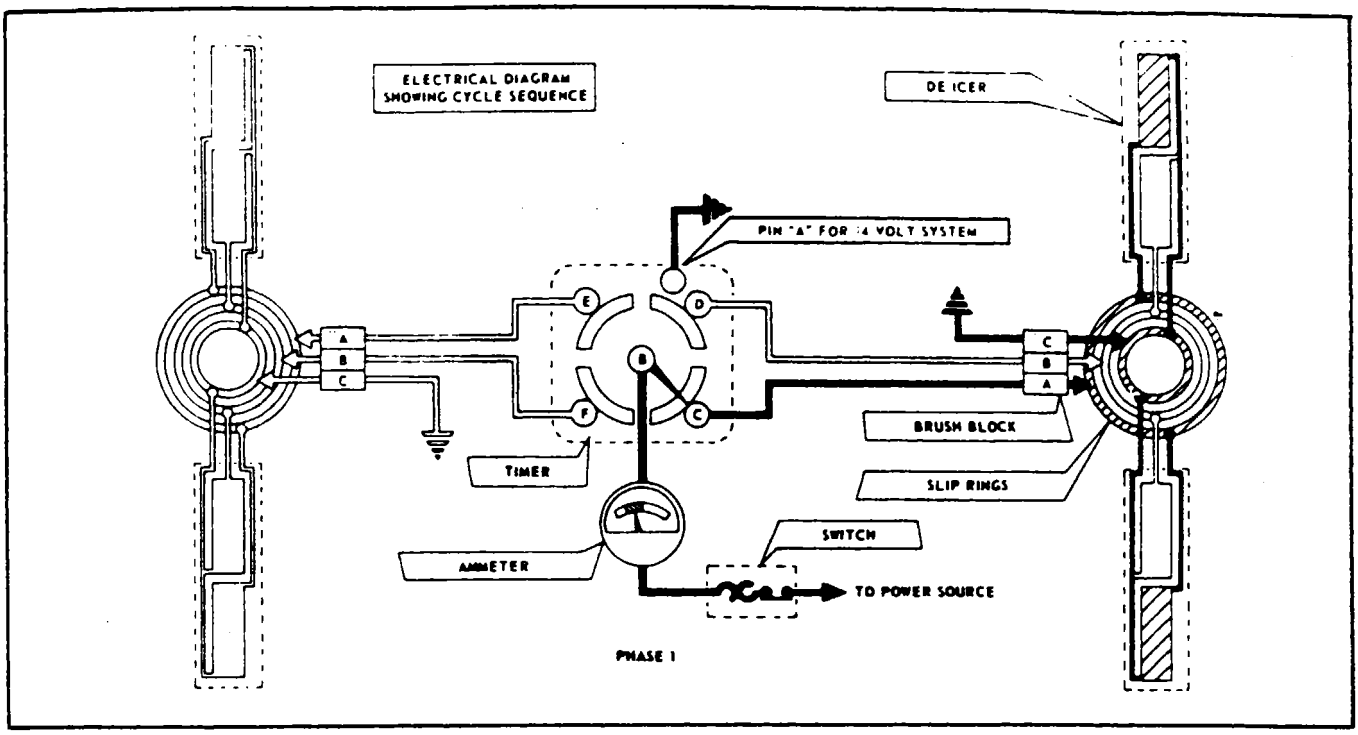

Figure 14-2. Electrical Diagram Showing Cycle Sequence - Phase I

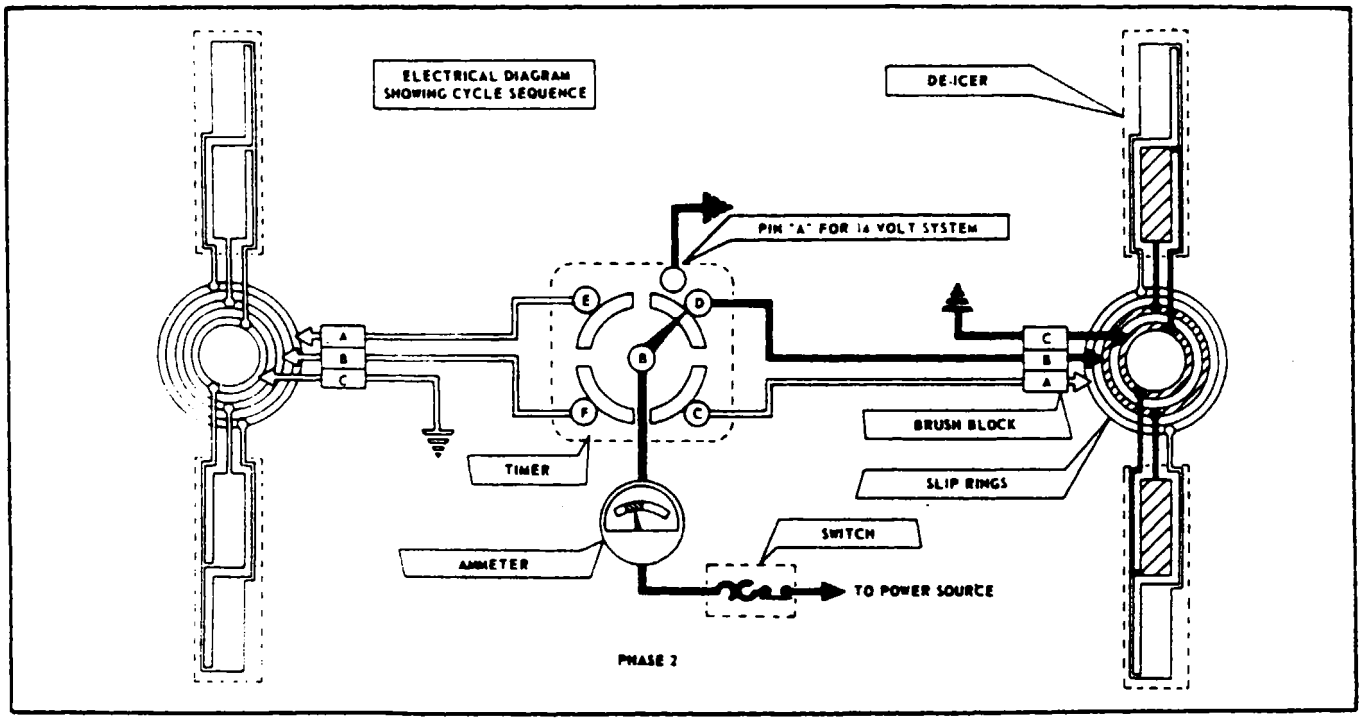

Figure 14-3. Electrical Diagram Showing Cycle Sequence - Phase II

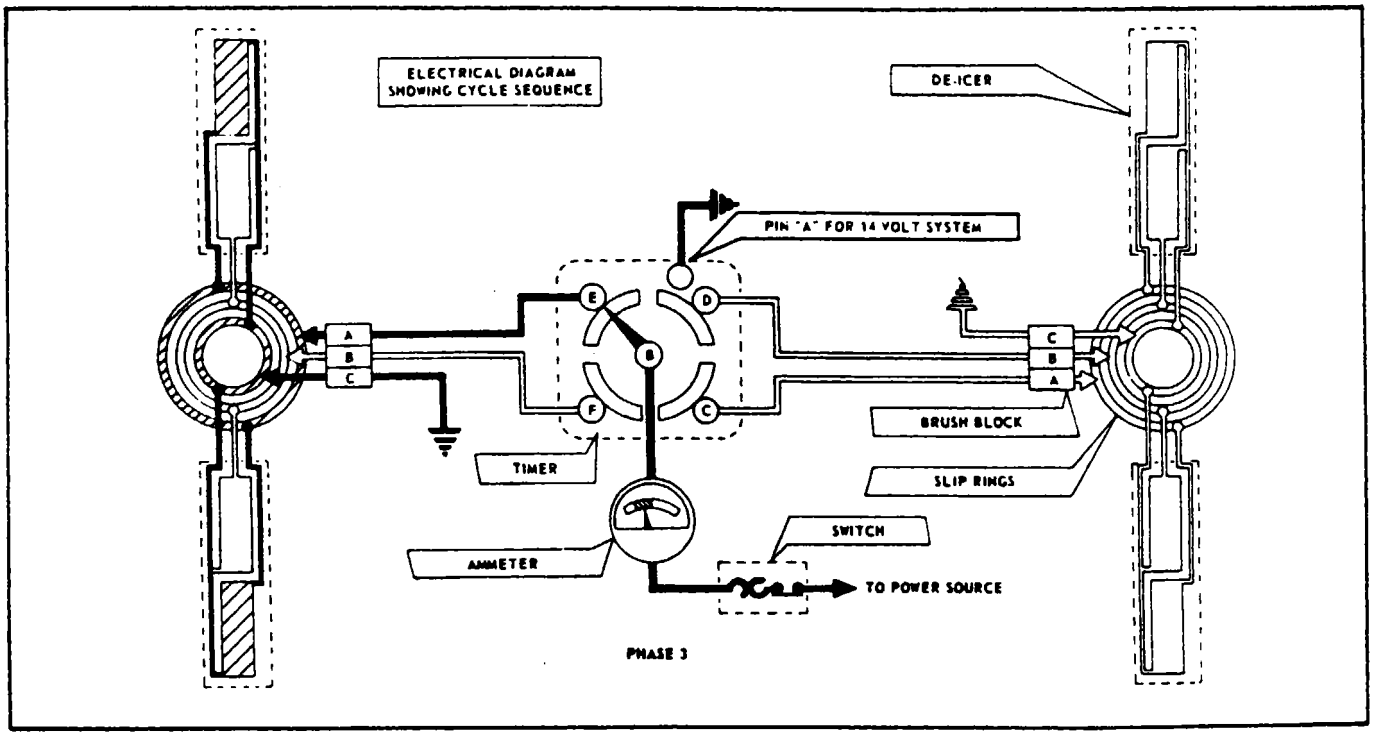

Figure 14-4. Electrical Diagram Showing Cycle Sequence - Phase III

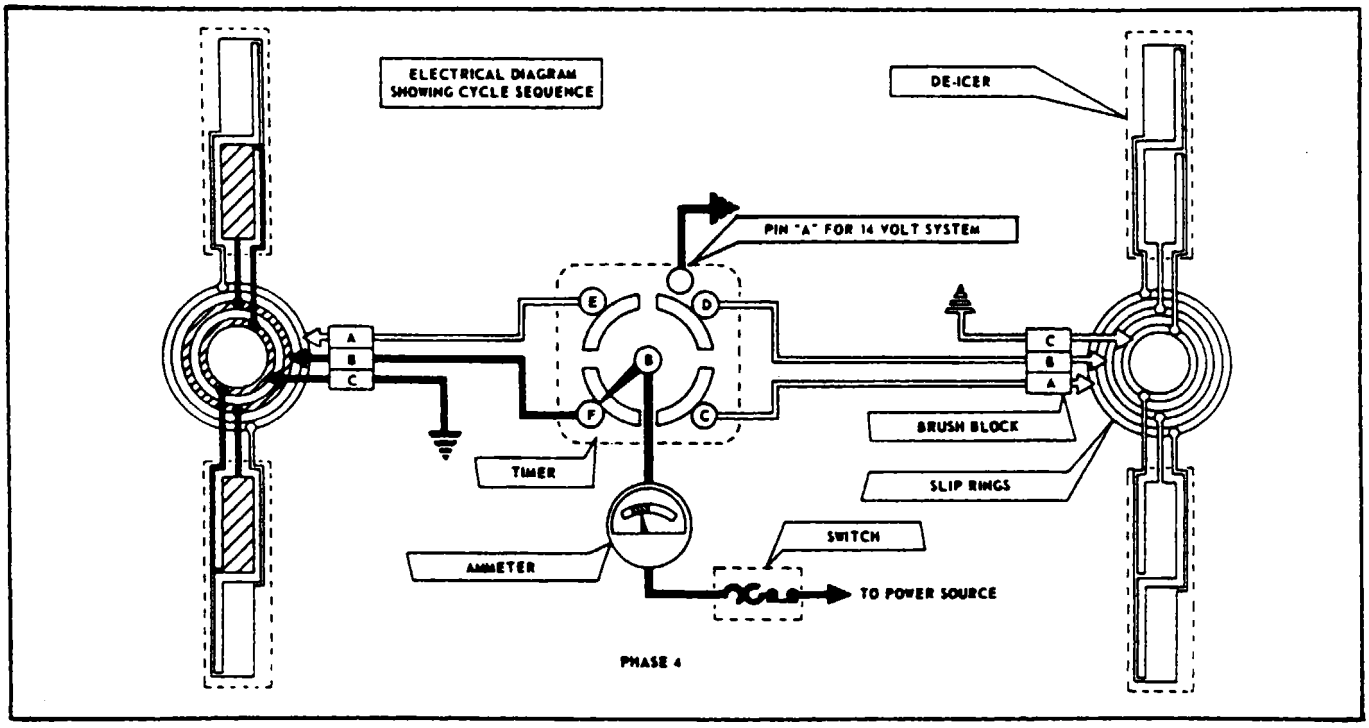

Figure 14-5. Electrical Diagram Showing Cycle Sequence - Phase IV

14-9. INSPECTION.

14-10. 50 HOUR INSPECTION.

a. Lock brakes and operate engines at near takeoff power. Turn deicer system switch ON and observe deicer ammeter for at least two minutes. Ammeter needle must rest within the shaded band except for a "flicker," approximately every 34 seconds, as the step switch of the timer operates. If not, refer to the appropriate entry of the troubleshooting chart.

b. With engines stopped, turn deicer switch ON and feel deicers on propellers for proper sequence of heater operation. The starting point is not important but sequence is vital and must be: Right Outboard, Right Inboard, Left Outboard and Left Inboard Heaters, in that order. Temperature rise should be noticeable and each heater should warm for about 34 seconds. Local hot spots indicate surface damage of deicer heaters; inspect and repair in accordance with Paragraphs 14-21 to 14-24.

c. Remove spinner dome and engine cowling. With assistant observing deicer ammeter and with deicer switch ON, flex all accessible wiring, particularly the deicer lead straps, leads from slip ring assembly, and the fire wall electrical connectors and their wiring. Any movement of the ammeter needle other than the "34 second flicker" of cycling indicates a short or open that must be located and corrected.

14-11. 100 HOUR INSPECTION.

a. Remove cowling in accordance with Removal of Engine Cowling, Section VIII.

b. Conduct 50 hour inspection.

c. Check for radio noise or radio compass interference by operating the engine at near takeoff power and with radio gear ON while turning deicer switch ON and OFF. If noise or interference occurs with deicer switch ON and disappears when switch is OFF, see troubleshooting chart.

d. Ascertain that all clamps, clips, mountings and electrical connections are tight. Check for loose, broken or missing safety wire.

e. Deicers: Closely check deicers for wrinkled, loose or torn areas, particularly around the outboard end and where the strap passes under the strap retainer. Look for abrasion or cuts, especially along the leading edge and the flat or thrust face. If heater wires are exposed in damaged areas or if rubber is found to be tacky, swollen or deteriorated (as from oil or solvent contact), replace the damaged deicer in accordance with Paragraphs 14-24 to 14-29.

NOTE

Check the strap restrainers are correctly located and secure. Look for cracks or other damage. Operate propeller from "full pitch" to "feathering" and check that deicer lead straps do not come under tension or are pinched by propeller blade. (Refer to Figure 14-11.)

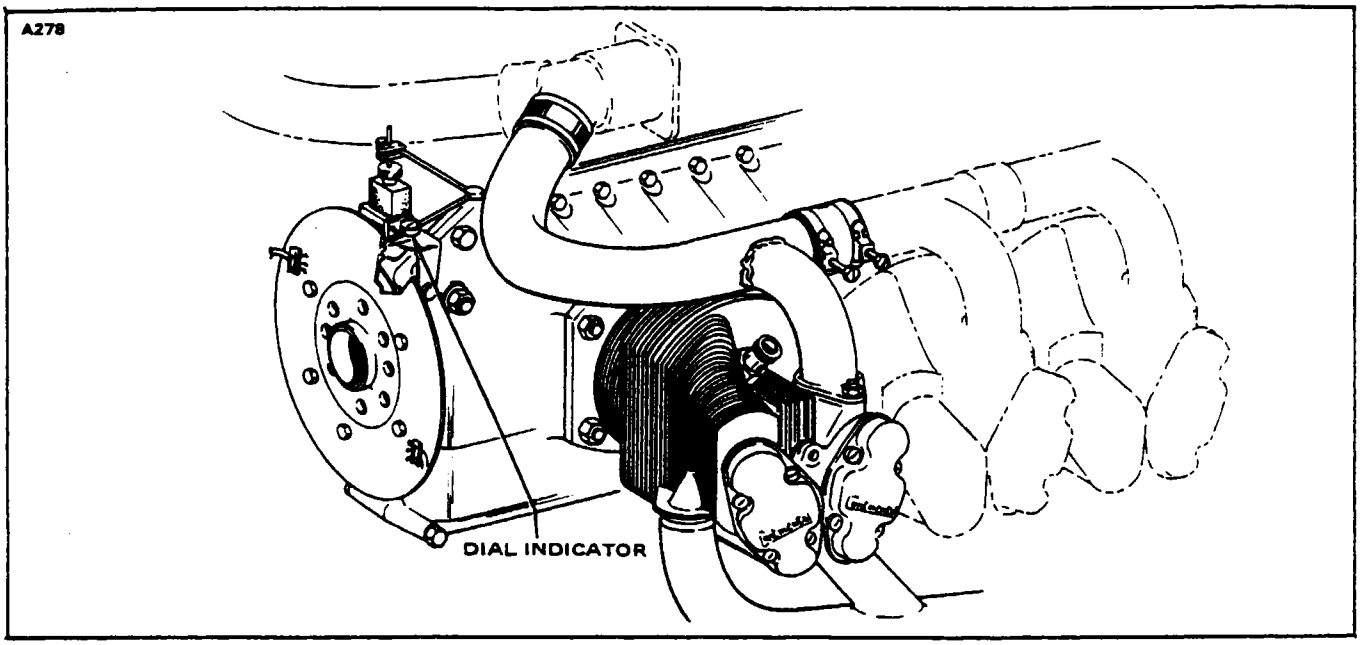

Figure 14-6. Typical Use of Dial Indicator

f. Slip Rings: Check slip rings for gouges, roughened surface, cracks, burned or discolored areas, and for deposits of oil, grease or dirt.

1. Clean greasy or contaminated slip rings with CRC 2-26 solvent. (This solvent is available from C.R.C. Chemical Division, Webb Inc., C-J10 Limekiln Pike, Dreshner, Penna. 19025.)

2. If uneven wear is found or if wobble is noticed, set up dial indicator as shown in Figure 14-6 to check alignment of slip rings to propeller shaft per Paragraph 14-17.

g. Brush Block - Brushes: Examine mounting brackets and housing for cracks, deformation or other physical damage.

1. Test that each brush rides fully on its slip ring over 360°. Figure 14-7 shows the wear pattern if this condition is not corrected. If alignment is off, shim where brush block is mounted to bracket or adjust mounting bracket support arm.

NOTE

The shim is a series of laminates and may be peeled for proper alignment of brushes to slip ring.

2. Check for proper clearance of brush block to slip rings as shown in Figure 14-10d. If not correct, loosen mounting screws and move in elongated holes to correct block position before tightening securely.

3. Visually check brush block for approximately 2° angle of attack. (Refer to Figure 14-10d.) If not, loosen mounting screws and twist block, but be sure to hold clearance limits shown when tightening.

h. System Wiring: With deicer system operating, have assistant observe ammeter while visually inspecting and physically flexing wiring from brush blocks through fire wall, to timer, to ammeter, to switch and to aircraft power supply. The ammeter will flicker as the timer switches approximately every 34 seconds in the cycle. Jumps or flickers at other times indicates loose or broken wiring in the area under examination at that moment. In such case, check continuity through affected harness, while flexing and prodding each wire in the area that gave initial indication of trouble. Use the wiring diagram in Figure 14-8 to trace circuitry.

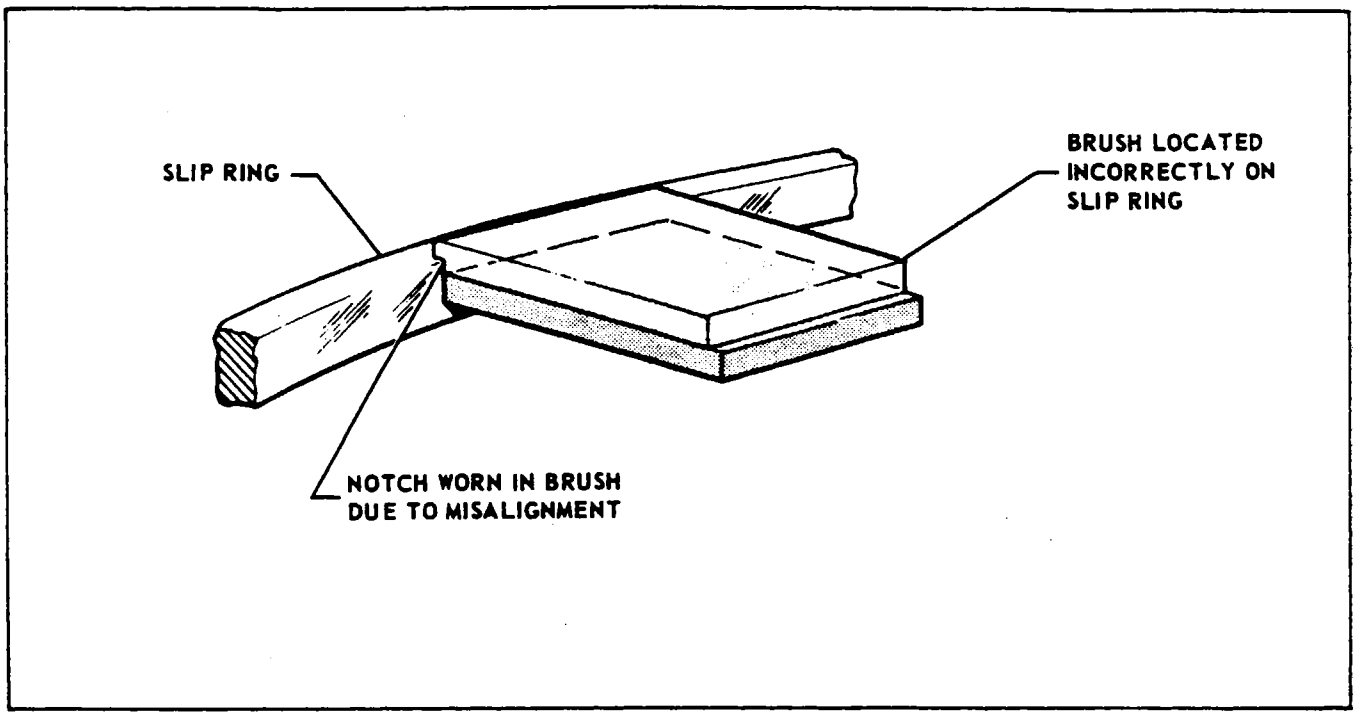

Figure 14-7. Centering of Brushes on Slip Rings

14-12. REPAIR PROCEDURES FOR INDIVIDUAL COMPONENTS.

14-13. BRUSH RETAINER REPLACEMENT. Brushes should be replaced when .375 inch of brush material remains; brushes must be replaced when .250 inch remains. Measure the brushes as shown in Figure 14-9. Replace the brush retainer as follows:

a. Remove the brush block assembly from the mounting bracket by removing attachment hardware.

b. Remove screws and separate brush retainer assembly from guide block. Note orientation of terminals.

NOTE

When separating brush retainer block, guide block and brush retainer assembly; move guide block laterally to disengage dowel pin grooves.

c. Discard old brush retainer assembly.

d. Determine correct orientation of brushes to receptacle (refer to Figure 14-9) and carefully insert brushes into brush guide block slots. When reassembling brush retainer assembly, align receptacle as shown in Figure 14-9.

CAUTION

Avoid side loads on brushes; brushes are extremely fragile.

e. Reinstall brush retainer attachment screws.

f. Install brush block on mounting bracket with attachment hardware. Safety all bolts and check alignment of brushes to slip ring.

14-14. INDIVIDUAL BRUSH REPLACEMENT.

a. Remove brush retainer assembly per Paragraph 14-13.
b. Mark receptacle flange and brush retainer block to permit reinstallation in the same position.
c. Unsolder brush leads from receptacle pins and discard old brushes and springs.
d. Install insulating tubing over brush leads and solder brush leads to receptacle pins; follow pin identification as shown on Figure 14-9.
e. Assemble brushes and springs to brush guide block.
f. Align marks and reinstall brush retainer as described in Paragraph 14-13.
g. Check freedom of movement of each brush by pressing it into the brush guide block and allowing the spring to force it back out slowly.

CAUTION

Do not allow brush to snap back.

h. Check resistance from each brush face to the respective receptacle pin with low range ohmmeter. Resistance must not exceed 0.013 ohms. Probe contacting brush should have an area of .062 square inch to provide an accurate measurement.
i. Check insulation resistance between brushes and from brushes to receptacle housing with 500 VDC, 1000 megohm range "Megger" ("Meg" Type Insulation Tester, James G. Biddle Company, Plymouth Meeting, Penna., or equivalent). Resistance should not be less than 10 megohms for one minute.
j. Install assembly on aircraft and check alignment. Safety all bolts.

14-15. ALIGNMENT OF NEW BRUSHES. Any time the brush block assembly is dismounted, the alignment at reinstallation must be checked as described in Paragraph 14-11 and Figure 14-7.

14-16. SLIP RINGS.

14-17. ALIGNMENT OF SLIP RING ASSEMBLY. Excessive slip ring run-out will result in severe arcing between the slip ring and brushes and cause rapid brush wear. If the run-out is not corrected, rapid deterioration of the slip ring and brush contact surfaces will result and lead to eventual failure of the Deicing System. Check the slip ring run-out with a dial indicator securely attached to the engine with the pointer resting on the slip ring. (Refer to Figure 14-6.) Rotate the propeller slowly noting the run-out indicated on the gauge. The total run-out must not exceed 0.005 inch $\pm$0.0025 inch and 0.002 inch in any 4 inch interval of slip ring travel.

NOTE

Some error may be induced in the readings by pushing in or pulling out on the propeller. Care must be taken to exert a uniform push or pull.

Small amounts of run-out may be corrected by varying the torque on the slip ring mounting bolts (AN4-7A) between 40 to 100 inch-pounds to obtain the required flatness.

14-18. REPLACEMENT OF SLIP RING ASSEMBLIES. Slip ring assemblies that are open or shorted electrically, cracked or damaged structurally, or which have damaged surfaces beyond the scope of minor repair to clean up, should be replaced.

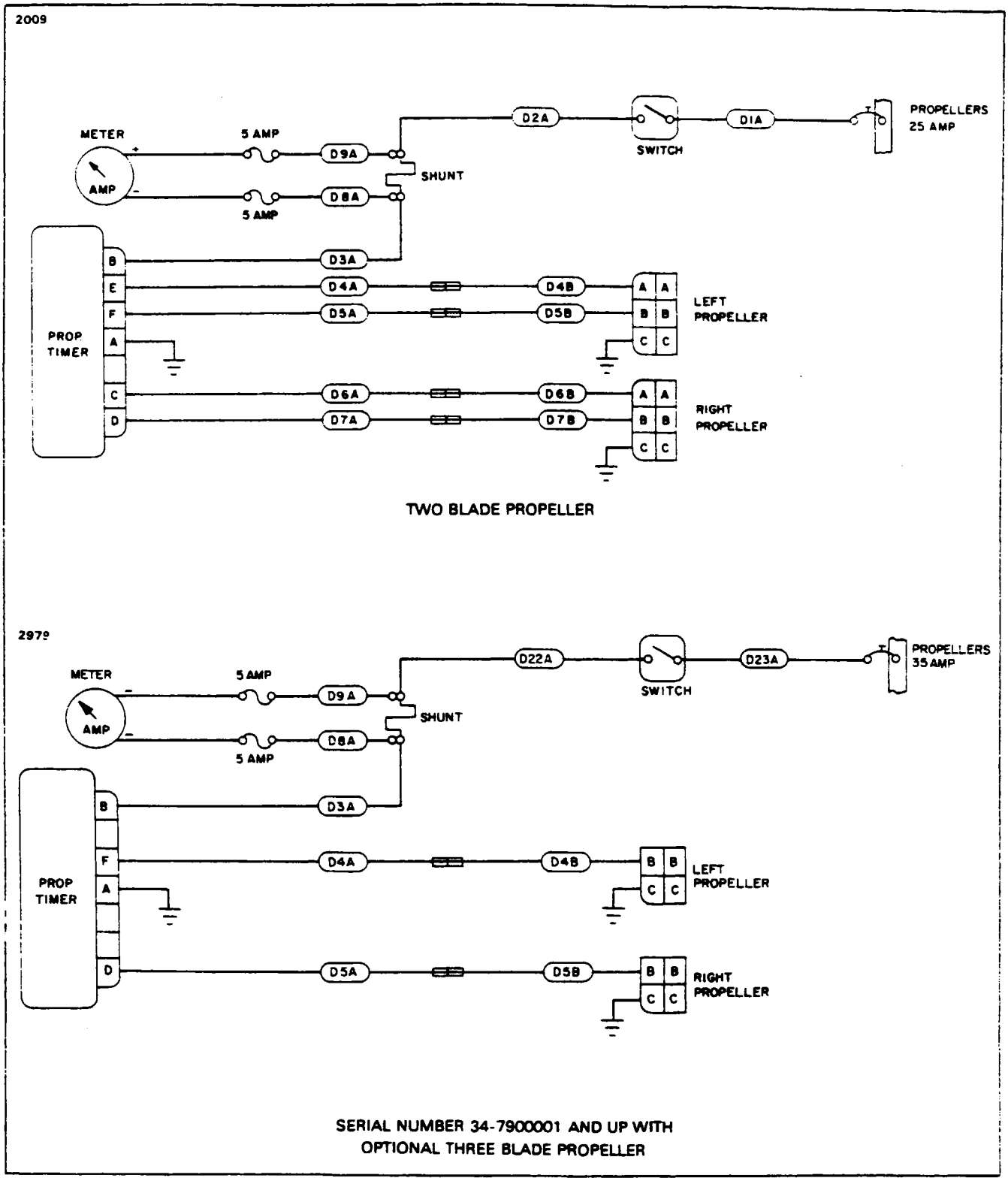

Figure 14-8. Wiring Schematic - Electrical Prop Deicing System

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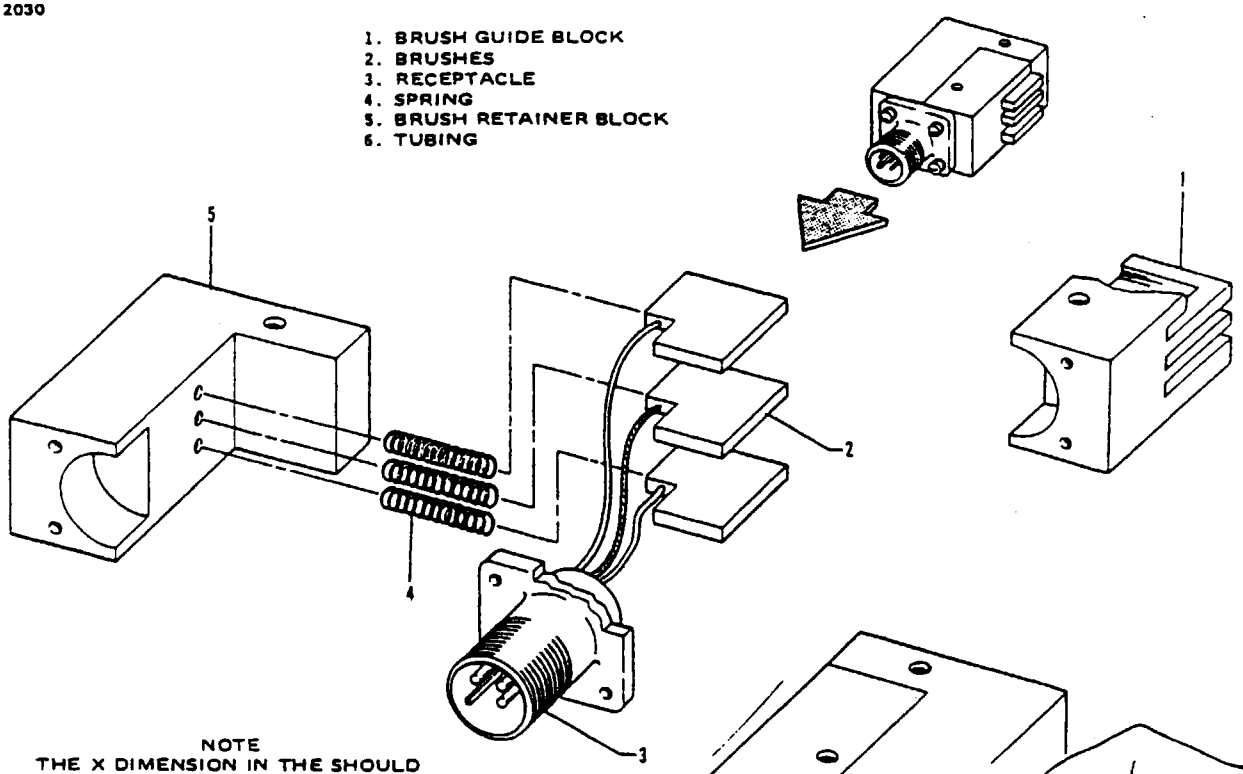
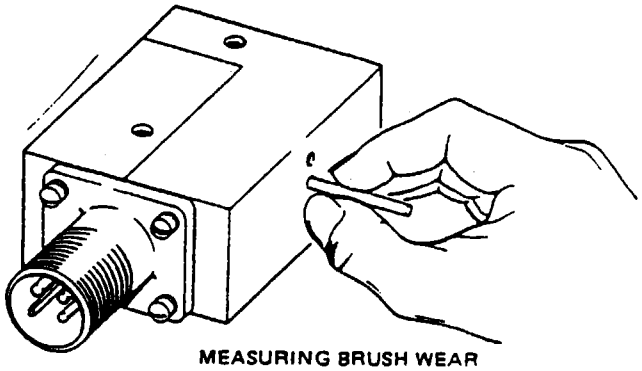
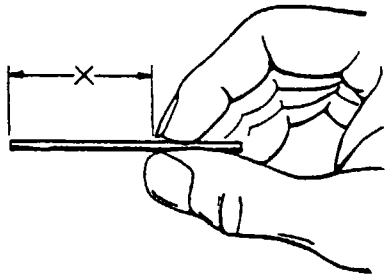
1. BRUSH GUIDE BLOCK
2. BRUSHES
3. RECEPTACLE
4. SPRING
5. BRUSH RETAINER BLOCK
6. TUBING

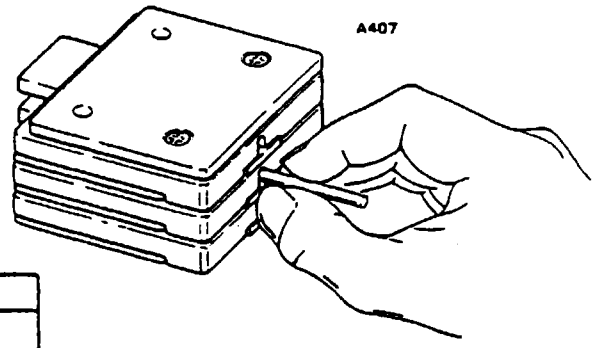


NOTE
THE X DIMENSION IN THE SHOULD REPLACE COLUMN INDICATES 3/8 INCH OF BRUSH REMAINS; THE X DIMENSION FOR THE MUST REPLACE COLUMN INDICATES 1/4 INCH REMAINS. DURING MEASUREMENT ON 1/16 INCH OF BRUSH SHOULD BE ALLOWED TO PROTRUDE FROM BRUSH BLOCK. THIS IS THE NORMAL POSITION OF THE BRUSH WHEN INSTALLED ON THE AIRCRAFT.



MEASURING BRUSH WEAR





BRUSH BLOCK ASSEMBLY	X DIMENSION (INCHES)	
	SHOULD REPLACE	MUST REPLACE
4E-1387-6	1 1/2	1 5/8
3E-2042-1		
BRUSHES WITH RODS	15/64	19/64
BRUSHES WITHOUT RODS	1 5/64	1 9/64

Figure 14-9. Brush Block Assembly

14-18a. REPLACEMENT OF BRUSH BLOCK WITH MODULAR BRUSH ASSEMBLIES. Modular brush block assembly part number 3E2042-1, is a direct replacement for brush block assemblies part numbers 4E1837-3 and 4E1837-5. Instructions concerning replacement of brush block assemblies with modular brush assemblies are given in B.F. Goodrich Service Bulletin E-77-54.

14-18b. BRUSH MODULE REPLACEMENT. Brush modules should be replaced when .375 inch of brush material remains; brush modules must be replaced when .250 inch remains. Measure the brushes as shown in Figure 14-9. Replace brush modules as follows:

NOTE

Brushes are not offered individually as replacements; When a brush wears out, the module containing it should be replaced.

a. Remove the modular brush assembly from the aircraft, by removing the attachment hardware, and disconnect the engine wire harness.
b. Remove assembly screws and separate modules and spacers.

NOTE

The part number of each module is etched into the surface of the plastic housing; replace with the same part number module.

c. Restack modules and spacers as shown in Figure 14-10b. If there is interference between adjacent ring terminals, reorient center module as shown in Figure 14-10a.

NOTE

Ascertain flat washer is positioned between star washer and housing.

d. Reconnect aircraft wire harness and insure adjacent ring terminals are not touching.
e. Install assembly on aircraft and check adjustment.

14-19. DEICER BLADES.

14-20. RESISTANCE CHECK OF DEICER BLADE. To determine incorrect resistance, short or open at the brush-to-slip ring contact, disconnect harness at the timer and use low range ohmmeter to read resistance from each deicer circuit lead (Pins C,D, E and F of harness plug) to ground; it should read .47 to .58. If this reading is not obtained, disconnect the deicer lead harness to measure heater resistances individually. Individual heater should be 0.95 to 1.15. If first check is off limits but second check is satisfactory, trouble is probably in the brush-to-slip ring area; if the second check is off limits, the deicer is damaged and must be replaced.

14-21. REPLACEMENT. If tests show the blade deicer to have an open circuit, to be the wrong resistance or to be visibly damaged beyond repair as outlined in Paragraph 14-11 of this section, replace the deicer as directed in Paragraphs 14-24 thru 14-30.

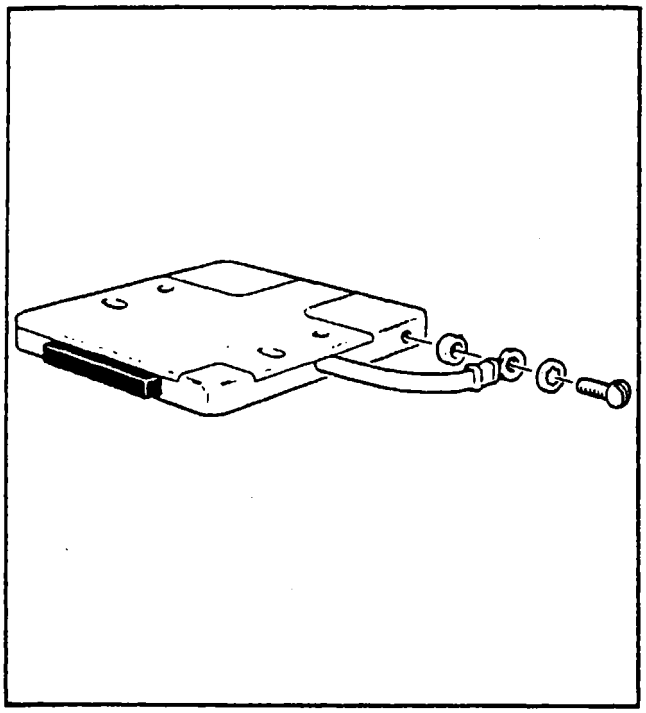


Figure 14-10. Brush Module Assembly 3E2011.

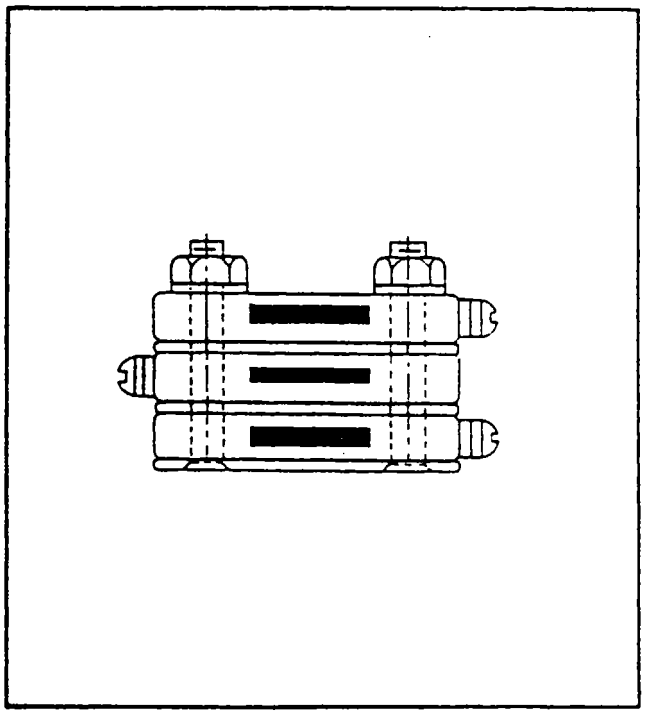


Figure 14-10a. Alternate Module Stacking Arrangement.

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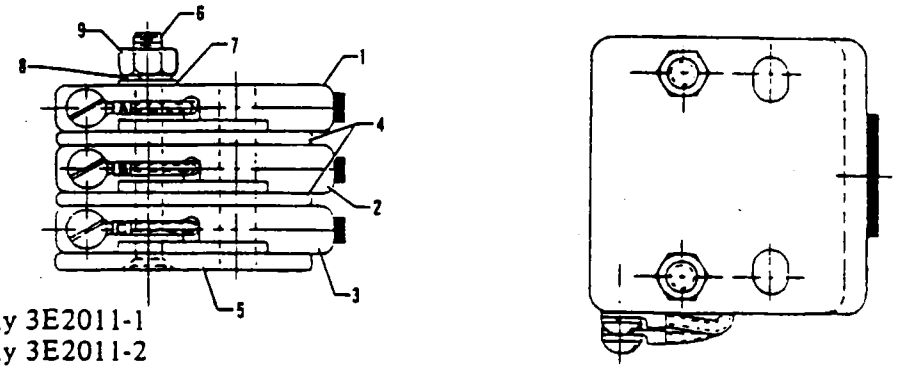
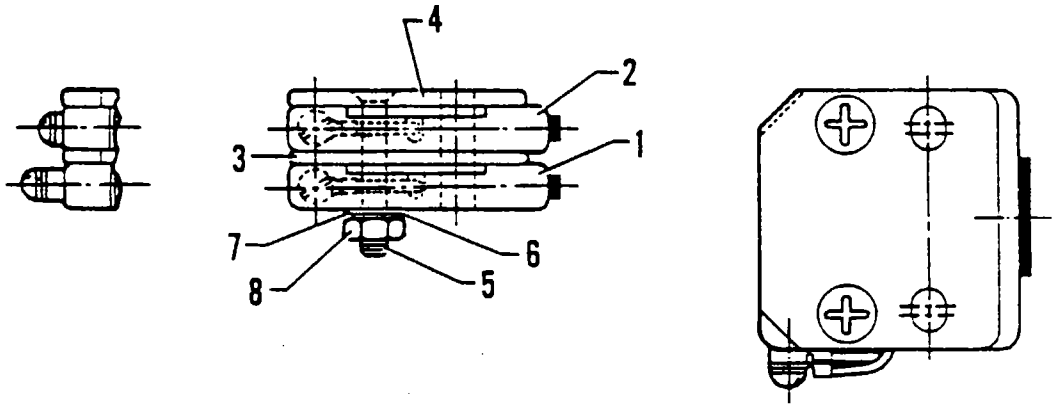


1. Brush Module Assembly 3E2011-1
2. Brush Module Assembly 3E2011-2
3. Brush Module Assembly 3E2011-3
4. Spacer
5. Spacer
6. Screw
7. Washer
8. Lockwasher
9. Nut

Figure 14-10b. Modular Brush Assembly 3E2042-1 (2 Bladed Prop)



1. Brush Module Assembly 3E2011-2
2. Brush Module Assembly 3E2011-3
3. Spacer 4E2218-3
4. Spacer 4E2218-4
5. Screw MS 24693-S32
6. Washer AN960C6
7. Lockwasher MS 35333-37
8. Nut MS 35649-262

Figure 14-10c. Modular Brush Assembly 3E2062-2 (3 Bladed Prop)

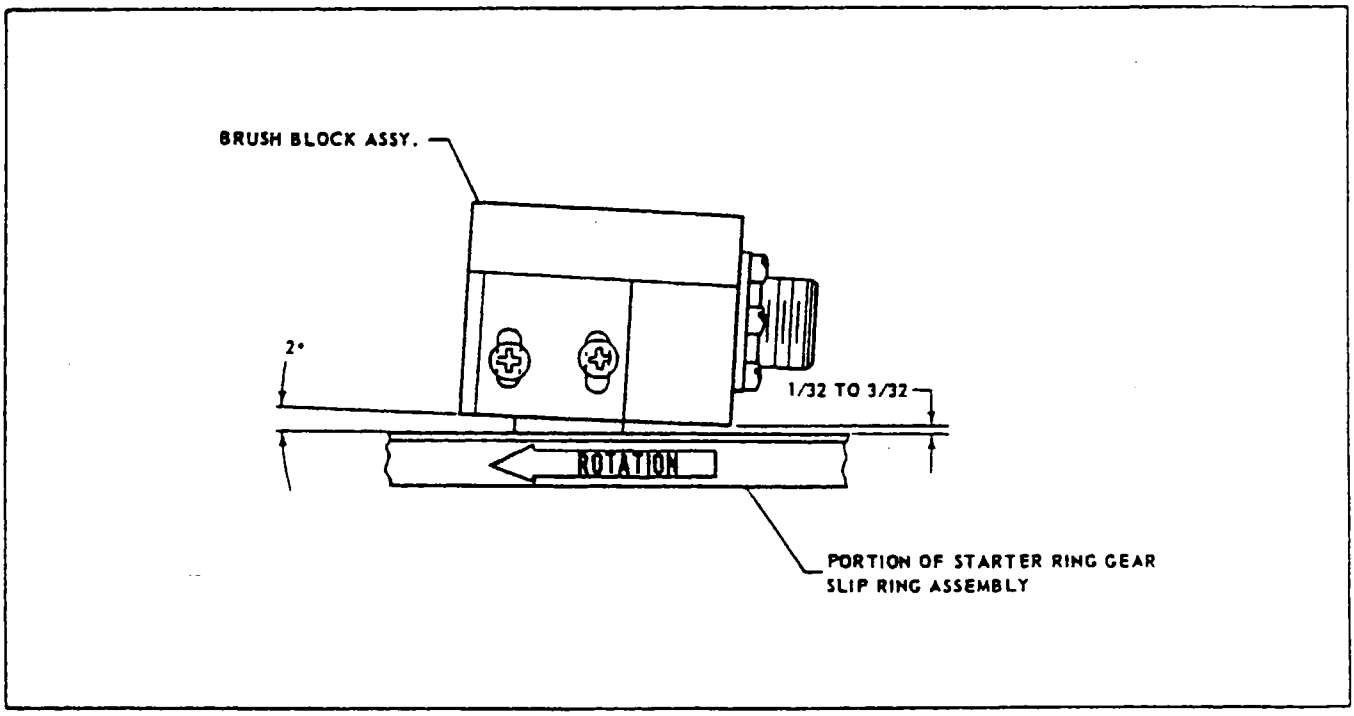


Figure 14-10d. Angle of Contact Brushes to Slip Rings

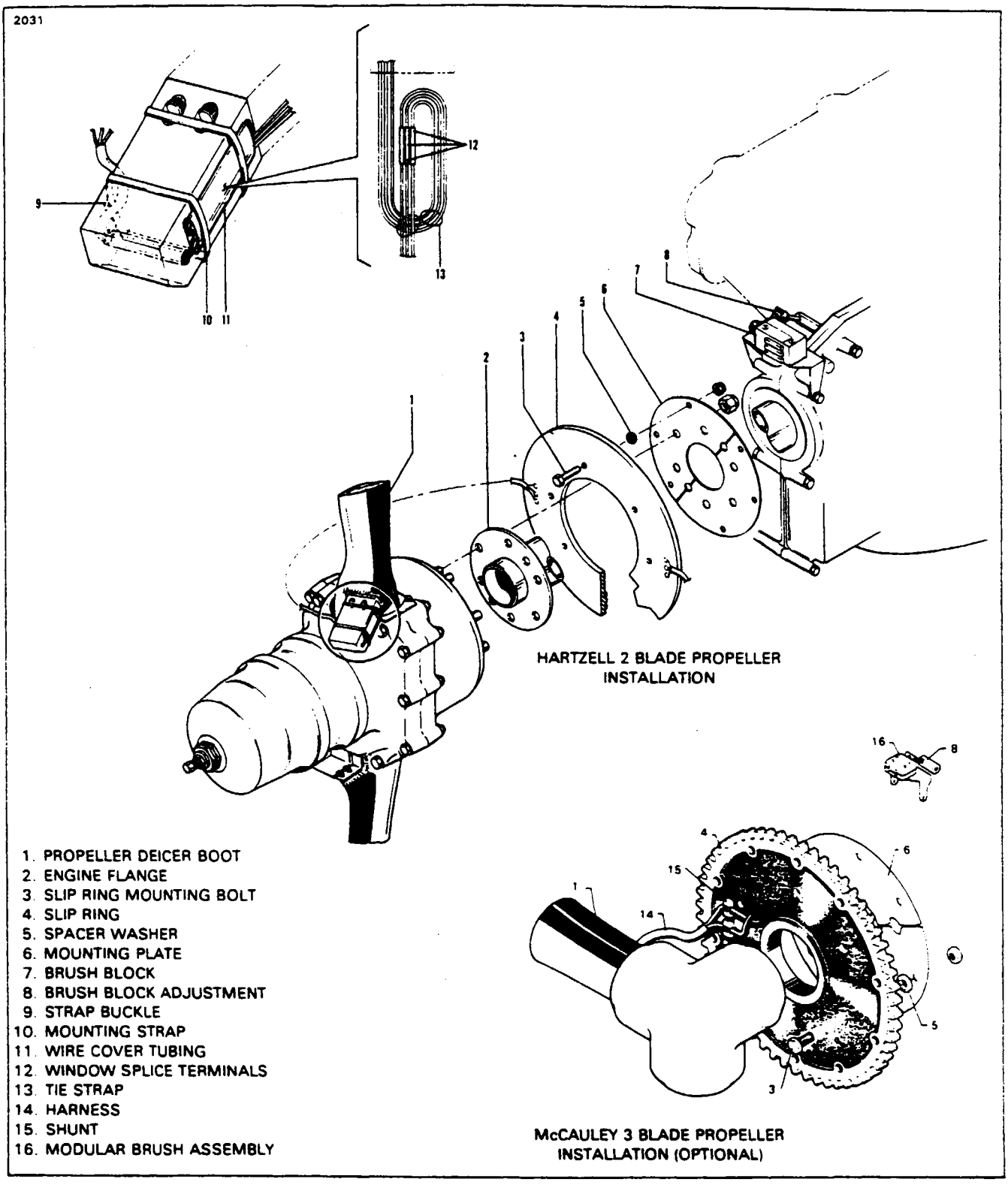


Figure 14-11. Propeller Deicer Installation

14-22. REMOVAL OF DEICER.

a. Disconnect terminals of propeller deicer from studs on the spinner bulkhead.

b. Use MEK or Toluol to soften the adhesion line between the deicer and the propeller blade.

CAUTION

Do not allow solvents to leak into propeller hubs and cause damage to seals.

c. Starting at one corner of the deicer, loosen enough of the deicer to grasp in the jaws of vise grip pliers or similar tool.

d. Apply a steady pull on the deicer to pull it off the propeller surface. Continue using MEK or Toluol to soften the adhesion lines. Unless the deicer being removed is damaged and is to be scrapped, cushion the jaws of any pulling tool used to prevent damage to the deicer surface. Remove very slowly and carefully. If deicer has failed and is to be returned under request for warranty, extreme care should be exercised so that no additional damage is incurred to the deicer during and after removal.

e. Remove residual cement from blade. Use Turco No. 3 or equivalent to help with dried cements.

14-23. BLADE PREPARATION.

a. Mark and cut from masking tape a pattern the size of the propeller deicer. (Refer to Figure 14-12.)

b. Place a mark at the hub end of the blade in line with the blade leading edge. The location for this mark can be determined by sighting along the leading edge. Starting at the hub (see Note below), center the pattern on this mark and stick the pattern to the leading edge. Mark the position of the deicer harness.

NOTE

All deicers on a single propeller must be located the same distance from the hub for rotational balance.

c. Remove the pattern and remove any paint in the marked off area. Clean down to bare metal. Next, clean the area thoroughly with MEK or acetone. For final cleaning, wipe the solvent off quickly with a clean, dry lint-free cloth to avoid leaving a film.

CAUTION

Cleanliness of metal and rubber parts cannot be too highly stressed. Only perfectly clean surfaces will assure maximum adhesion.

d. Using a pencil or pen, mark a centerline at the hub of the propeller blade and on the tape at the outboard edge of the masked area.

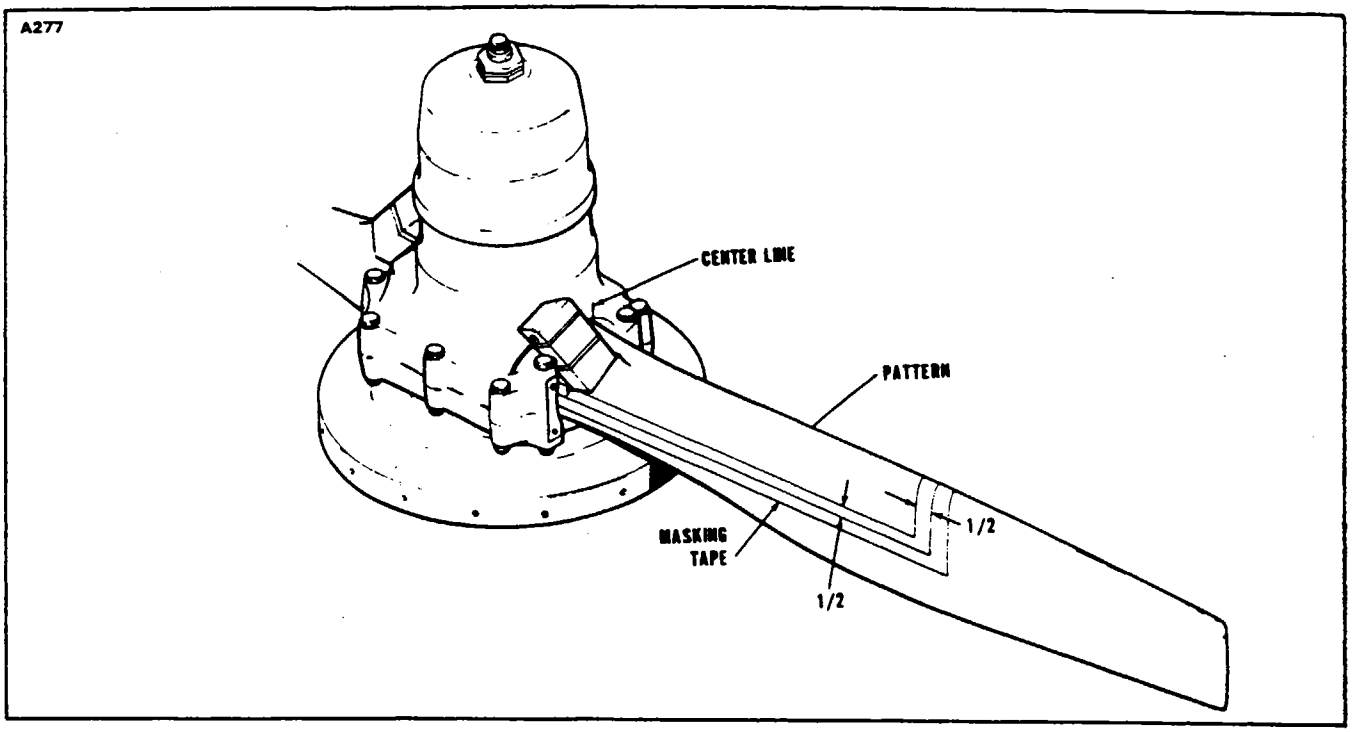


Figure 14-12. Installation of Deicer Boot

TABLE XIV-1. REQUIRED MATERIALS FOR REPAIR OF PROPELLER DEICER

The materials and tools listed below are commercially available and are not supplied by B.F. Goodrich in kit form:

Cement 1300L or EC1403 (Minnesota Mining & Mfg. Co.)
Sealer 82-076-1 and -2 (B.F. Goodrich, Akron, Ohio, or Sealer C-19861, C-21871 and C-16176 (Lowe Bros., Dayton, Ohio)
Cleaning Solvent - MEK (MethylEthylKetone) or Acetone
Tackifying Solvent - Toluol or MEK (See Note)
Cleaning Cloth - any clean, lint-free cloth
1 inch paint brushes
2 inch rubber hand roller
1/4 inch hand stitcher
Masking tape

NOTE

MEK may be used instead of Toluol to tackify cement, but it provides approximately 10 seconds working time for deicer applications, whereas Toluol provides approximately 40 seconds working time.

14-24. CEMENT APPLICATION.

a. Using a silver pencil, mark a centerline on the glossy side of the deicer.

b. Moisten a clean cloth with MEK or acetone and clean the unglazed surface of the deicer, changing cloth frequently to avoid contamination of the clean area.

c. Thoroughly mix the 1300L cement. Apply one even brush coat of cement to the unglazed back surface of the deicer. Cement one inch of the deicer lead strap. Allow to air dry for a minimum of one hour at 40° F or above, when the relative humidity is less than 75%. If the humidity is 75% to 90%, allow two hours drying time. Do not apply cement if the relative humidity is higher than 90%. After allowing the proper amount of drying time, apply a second even brush coat of 1300L cement.

NOTE

If curling of the deicer edges is a problem, apply masking tape to the edges of the glazed side before applying cement to the unglazed side. Remove the tape before starting to install the deicer.

d. Apply an even brush coat of 1300L cement on the cleaned surface of the propeller blade, immediately after the second coat of cement has been applied to the deicer. This timing is important for the cement on both surfaces to reach the tack stage at the same time.

14-25. INSTALLATION OF DEICER AND REQUIRED MATERIALS. It is imperative that the following instructions be followed exactly to insure maximum adhesion to the propeller blades:

a. When the cement coats are tacky (slightly sticky to the touch-like masking tape), dry on both the propeller surface and deicer surface, position deicer on blade leading edge. Start at hub end, using centerlines as a guide. (Refer to Figure 14-12.)

b. Make sure that the harness will fall in the previously marked position.

c. Working outward toward the tip, tack the deicer centerline to the leading edge of the propeller blade.

d. Use the tackifying solvent as necessary. If deicer is allowed to get off course, pull up with a quick motion and re-apply deicer.

e. If cement is removed from either surface, completely remove the deicer and re-apply cement per Paragraph 14-24.

f. When the deicer is correctly positioned, roll firmly along the centerline with a rubber roller. (Refer to Figure 14-13.)

g. Gradually tilt the rubber roller and carefully work the deicer over either side of the blade contour to avoid trapping air. Roll outwardly from centerline to edges. Be especially careful to work out excess material at outboard edge of deicer before other edges are completely rolled down. If excess material at edges tends to pucker, work out puckers smoothly and carefully with fingers.

h. Roll the tapered edges, especially inboard edge of the deicer with the metal stitcher.

CAUTION

To avoid damage to deicer resistance wires, do not use metal stitcher on body of deicer. Area where metal stitcher is permitted not to exceed 3/16" along deicer edge.

14-26. PREPARATION AND APPLICATION OF SEALER. Deicers loosened due to destruction of adhesive bond by lubricants do not respond well to recementing. Therefore, removal, cleaning, and reinstallation of the deicers are recommended. (Refer to Paragraphs 14-22 and 14-25.)

a. Clean an area .500 of an inch wide around the circumference of the deicer down to the bare metal. Use MEK or Acetone and clean thoroughly.

b. Clean outer .500 of an inch of all deicer edges and back under deicer about .250 of an inch on all sides past loosened areas with MEK or Acetone. For final cleaning, quickly wipe off solvent with a clean, dry lint-free cloth to avoid leaving a film.

c. Recement loosened areas of deicers in accordance with Paragraph 14-24.

d. Mix the filler, sealer, or paint thoroughly and in the proper proportions by weight, as given in Table XIV-II.

e. Locate masking tape approximately .125 of an inch beyond the cemented area around the deicer to permit filler material to contact bare metal.

f. Apply one even coat of filler to area around the inboard end and sides of the deicer. (Refer to Figure 14-14.) Immediately remove the masking tape and allow the filler to dry for six hours.

g. Apply masking tape about .125 of an inch beyond filler or .250 of an inch beyond cemented area when no filler is used, to permit sealer to contact bare metal. Apply one even brush coat of sealer to the area around the deicer. (Refer to Figure 14-14.) Remove masking tape immediately and allow sealer to dry. Allow 12 hours cement curing time before starting engine, allow 24 hours cement curing time before operating the deicers.

TABLE XIV-II. MIXING OF MATERIALS

Material	Manufacturer & No.	Mixing Proportions
Filler	3M EC1031 and EC801	Twelve parts EC1031 with one hundred parts EC801.
Sealer	BFG 82-076-1 & -2 or Lowe Brothers V66V27, F63B8, & R7K69	Twelve parts -1 with one part -2. One part V66V27 with seven parts F63B8 (and up to two and two-thirds parts R7K69 thinner as needed).

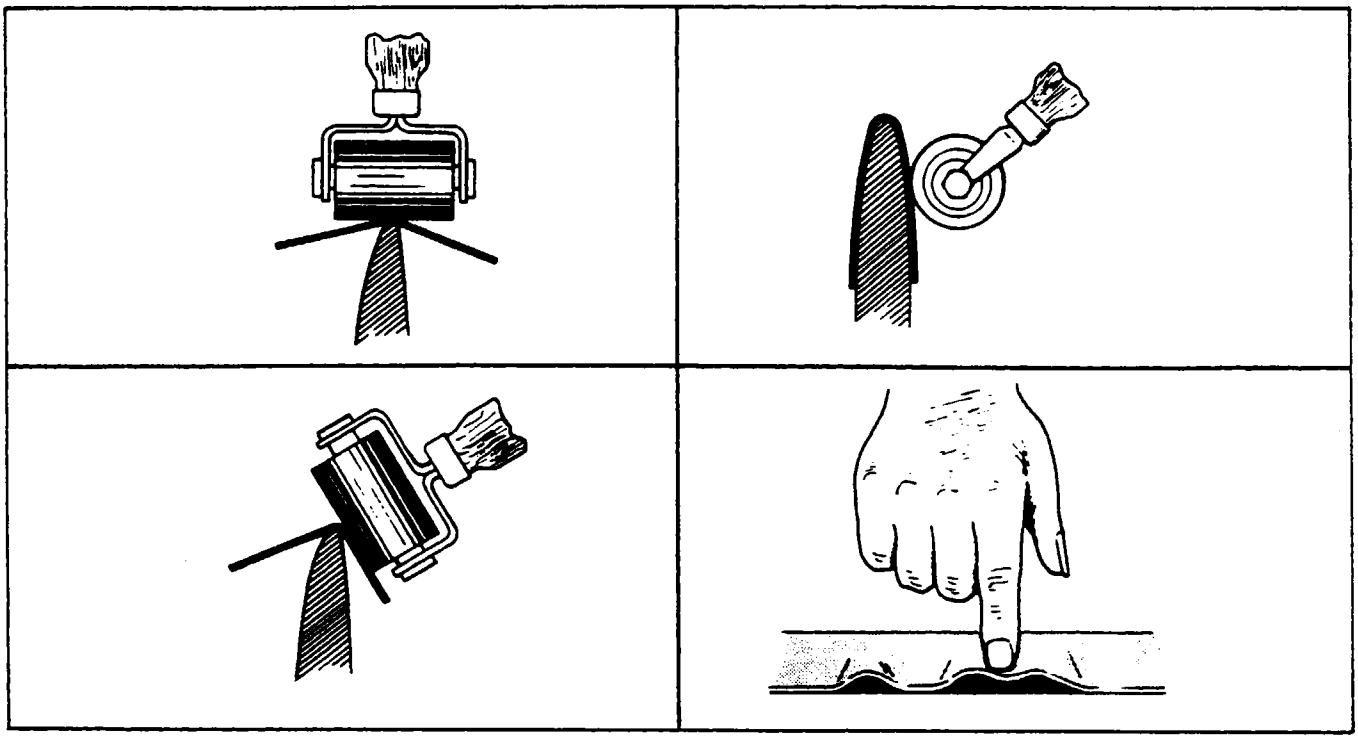


Figure 14-13. Wrinkled Deicers

14-27. WRINKLED DEICERS. (Refer to Figure 14-13.) If edge of deicer is found wrinkled or loose, try recementing. Use MEK or Toluol to loosen the bond for an additional 1/4 inch beyond the loose or wrinkled area. Apply one coat of 1300L cement to the deicer and propeller bonding surfaces and allow to air dry for one hour. Then apply a second coat of 1300L cement to both the deicer and bonding surface. Allow to dry. Retackify with MEK or Acetone and press with fingers to work out wrinkles or to secure loose edges. If material has stretched and will not cement flat, replace the deicer.

14-28. ELECTRICAL CHECK.

a. Check the electrical resistance of each of the two elements within the deicer. (Refer to Schematic, Figure 14-8 and Resistance Readings.) (Refer to Table XIV-III.)

b. Check for intermittent open circuits by tensioning the deicer strap slightly while measuring the resistance. Also, press lightly on the deicer surface in the area adjacent to the harness. Resistance must not vary.

c. Identification of the circuits within the element may be confirmed by referring to the resistance values and schematic diagram. Proper identification is necessary in order to make the system cycle properly and to obtain the correct amperage values during system operation. Minimum and maximum ohms between common ground and either of the other terminals is .095 to 1.15.

NOTE

These resistances apply only to deicers that are not connected to terminal studs.

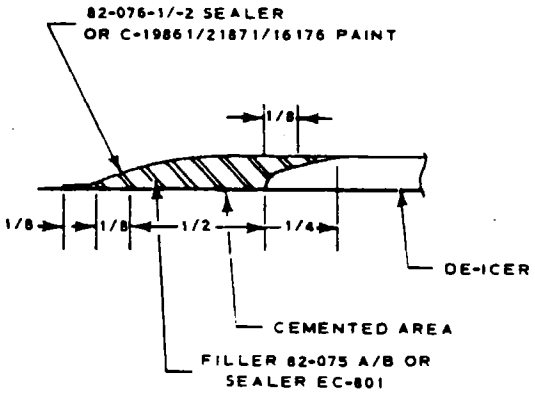


Figure 14-14. Sealer Application (Boot)

TABLE XIV-III. ELECTRICAL RESISTANCE

Resistance Check	Max.	Min.
1 Blade each Element	1.15	0.95
2 Blades in Parallel	0.58	0.47

14-29. INSTALLATION OF DEICER WIRING HARNESS. (Refer to Figure 14-11.) The deicer wiring harness must be installed to the propeller counterweight as follows:

a. Place the wires in a configuration as shown in Figure 14-11.
b. Slide the 5/8 inch I.D. tubing over the wire configuration.
c. Feed the wire harness through the hole in the counterweight as shown in Figure 14-11.
d. Position the wire bundle on the counterweight and install tie straps with the buckle on the side of the counterweight as shown in Figure 14-11.
e. Route the wire harness and protective tubing under the first tie strap and tighten both tie straps.
f. Install terminals of harness to screws on spinner bulkhead and tighten lead clip over harness.

14-30. BALANCING. To assure balance of the propeller assembly, the original balancing weights or their equivalents must be reinstalled. The weights must be left in the original position on the propeller hub. The restrainer and weights should not interfere with any part of the propeller assembly under any condition. If for any reason balance weights were removed, reinstall safety wire on screws. The deicer wire harness must be installed on the propeller as described in Paragraph 14-29.

14-31. FINAL ELECTRIC CHECK.

a. Make certain that all terminals are tight. Do not over torque.
b. Check the electrical resistance between the deicer terminals or between the slip rings. The reading should be per Table XIV-III.

14-32. OTHER COMPONENTS. Do not attempt internal repairs of the timer, ammeter or switch. If inoperative, these components must be replaced with one of the correct part numbers. For any other repair or maintenance problems not covered in this manual, inquire at Aerospace and Defense Products Division of the B.F. Goodrich Company, Akron, Ohio 44318.

14-33. TIMER TEST. Field experience indicates that too often the timer is considered at fault when the true trouble lies elsewhere. Before removing a timer as defective, perform this test:

a. Disconnect wire harness at timer and with deicer switch ON, check voltage from Pin B of harness plug to ground. If system voltage is not present, the fault is not in the timer. If system voltage is present at Pin B, check ground circuit using ohmmeter from Pin G to ground. If no circuit is shown, the fault is in ground lead, not in timer. If ground connection is open, the timer step switch will not change position.
b. When power and ground circuits have been checked, connect a jumper wire from Pin B of harness to B contact of timer socket to power timer. Connect a jumper wire from Pin G of harness to G contact of timer socket to complete the power circuit. Now use voltmeter from ground to the timer socket and check that timer is cycling to deliver system voltage to C, D, E, and F contacts in that order. (The starting point is not important but sequence must be as given.) Each of these four contacts must deliver voltage for approximately 34 seconds, in turn, and there must be zero voltage on the three contacts not energized.
c. If the timer meets these requirements, it is not the cause of the trouble. If it fails to perform as indicated, the trouble does lie in the timer and it should be replaced.

TABLE XIV-IV. TROUBLESHOOTING CHART
(PROPELLER DEICER SYSTEM)

Trouble	Cause	Remedy
Ammeter shows zero current. (All 4 phases of the 2 minute cycle.)	Tripped circuit breaker switch.	Locate and correct short before setting circuit breaker.
	No power from airplane.	If no voltage into switch, locate and correct open.
	Circuit breaker switch faulty.	If no voltage at switch output with voltage at switch input, replace the switch. If voltage is satisfactory at switch output, go to next step.
	Ammeter faulty. (If some or all deicers heat with ammeter at zero, replace the ammeter.)	Test for voltage up to and out of ammeter. If low or zero output and input satisfactory, replace ammeter. If no voltage to ammeter, locate and fix open between switch and ammeter.
	Open ammeter to timer.	Disconnect harness at timer and check voltage at Pin B (of harness) to ground. If none, locate and correct open.

TABLE XIV-IV. TROUBLESHOOTING CHART
(PROPELLER DEICER SYSTEM) (cont.)

Trouble	Cause	Remedy
Ammeter shows normal current part of cycle, zero current rest of cycle.	Open in wiring between timer and brush block assembly.	Use heat test to find deicers not heating and test for voltage on that contact of wire harness plug. (At brush block assembly.) If zero over 2 minutes, locate and fix open in wiring from timer to wire harness plug.
	Open between brush block assembly and deicer lead straps.	If there is voltage to brush block wire harness plug, try voltage at junction to deicer lead and slip ring lead. If no voltage, find and correct open in wiring within brush block or no contact of brush to slip ring.
	No ground circuit, one engine.	If voltage is found at deicer leads, locate and fix open from deicer to ground.
Ammeter shows normal current part of cycle, low current rest of cycle.	Inner and outer deicers heating same phase.	Locate and repair incorrect connections.
	Open in deicer or slip ring leads.	Disconnect deicer harness to check heater resistance as in Paragraph 14-28. If satisfactory, locate and fix open in slip ring leads.

TABLE XIV-IV. TROUBLESHOOTING CHART
(PROPELLER DEICER SYSTEM) (cont.)

Trouble	Cause	Remedy
Ammeter shows normal current part of cycle, low current rest of cycle. (cont.)	High resistance in circuit with low current.	If not in contact of brush to slip ring (including ground brush), trace wiring to deicer and to timer to fix partially broken wire, loose or corroded connection.
Ammeter shows low current over entire cycle.	Aircraft voltage low.	Check voltage into switch.
	Ammeter faulty.	Test for voltage up to and out of ammeter. If low or zero output and input satisfactory, replace ammeter. If no voltage to ammeter, locate and fix open between switch and ammeter.
	High resistance up to timer.	Check for partially broken wire, loose or corroded connection in wiring from aircraft supply to timer input.
Ammeter shows excess current over entire cycle.	Ammeter faulty.	Test for voltage up to and out of ammeter. If low or zero output and input satisfactory, replace ammeter. If no voltage to ammeter, locate and fix open between switch and ammeter.

TABLE XIV-IV. TROUBLESHOOTING CHART
(PROPELLER DEICER SYSTEM) (cont.)

Trouble	Cause	Remedy
Ammeter shows excess current over entire cycle. (cont.)	Ground between ammeter and timer.	Disconnect harness at timer and with ohmmeter check from Pin B (of harness) to ground. If ground is indicated, locate and correct.
Ammeter shows normal current part of cycle, excess current rest of cycle.	Ground between timer and brush block.	Disconnect leads at brush block and with ohmmeter check from power leads to ground. If ground is indicated, locate and correct.
	Ground between brush block and deicers. (Excluding ground brush circuit.)	If no short exists at brush-slip ring contact, check for ground from slip ring lead to propeller assembly while flexing slip ring and deicer leads. If a ground is indicated, locate and correct.
	Short between two adjacent circuits.	Check for cuts or low resistance between circuits. If any, locate and correct.
	Timer faulty.	Test timer as in Paragraph 14-33.

TABLE XIV-IV. TROUBLESHOOTING CHART
(PROPELLER DEICER SYSTEM) (cont.)

Trouble	Cause	Remedy
Ammeter does not "flick" approximately every 34 seconds.	Timer ground open.	Disconnect harness at timer and check with ohmmeter from Pin G (of harness) to ground. If no circuit, fix open per schematic diagram.
	Timer contacts are welded (caused by short circuit in system).	Test timer as in Paragraph 14-33. If timer does not cycle with voltage at Pin B, replace timer but be sure short causing original failure has been located and corrected.
Ammeter flicks between 34 second phase periods.	Loose connection between aircraft power supply and timer input.	If trouble occurs over entire cycle, trace wiring from power source to timer input to locate and tighten loose connection.
	Loose or poor connection timer to deicers.	If trouble occurs in part of cycle, find which deicers are affected and check for rough or dirty slip rings causing brush to "skip." If not this, trace circuits to locate and fix loose or poor connection. (If all deicers on one propeller are affected, check the ground circuit.) Flex deicer straps for break in deicer straps.

TABLE XIV-IV. TROUBLESHOOTING CHART
(PROPELLER DEICER SYSTEM) (cont.)

Trouble	Cause	Remedy
Ammeter flicks between 34 second phase periods. (cont.)	Timer cycles erratically.	Test timer as in Paragraph 14-33.
Radio noise or interference with deicers on.	Brushes "arcing."	Check brush alignment as shown in Figures 14-7 and 14-10. Look for rough or dirty slip rings. If this is the cause, clean machine or replace slip ring assembly, as required. Check slip ring alignment. (Refer to Paragraph 14-17.)
	Loose connection.	Refer to "Ammeter flicks between 34 second phase period."
	Switch faulty.	Try jumper wire across switch. If radio noise disappears, replace the switch.
	Wiring located within 8 inches of radio equipment wiring.	Relocate at least 8 inches away from input wiring to radio equipment.
Cycling sequence not correct.	Crossed connections.	Check system wiring circuit diagram for improper connections. (Refer to Figure 14-8.)
Rapid brush wear or frequent breakage.	Brush block out of alignment.	Check brush alignment. (Refer to Paragraph 14-15.)
	Slip ring wobbles.	Check slip ring alignment with dial indicator as shown in Figure 14-6.

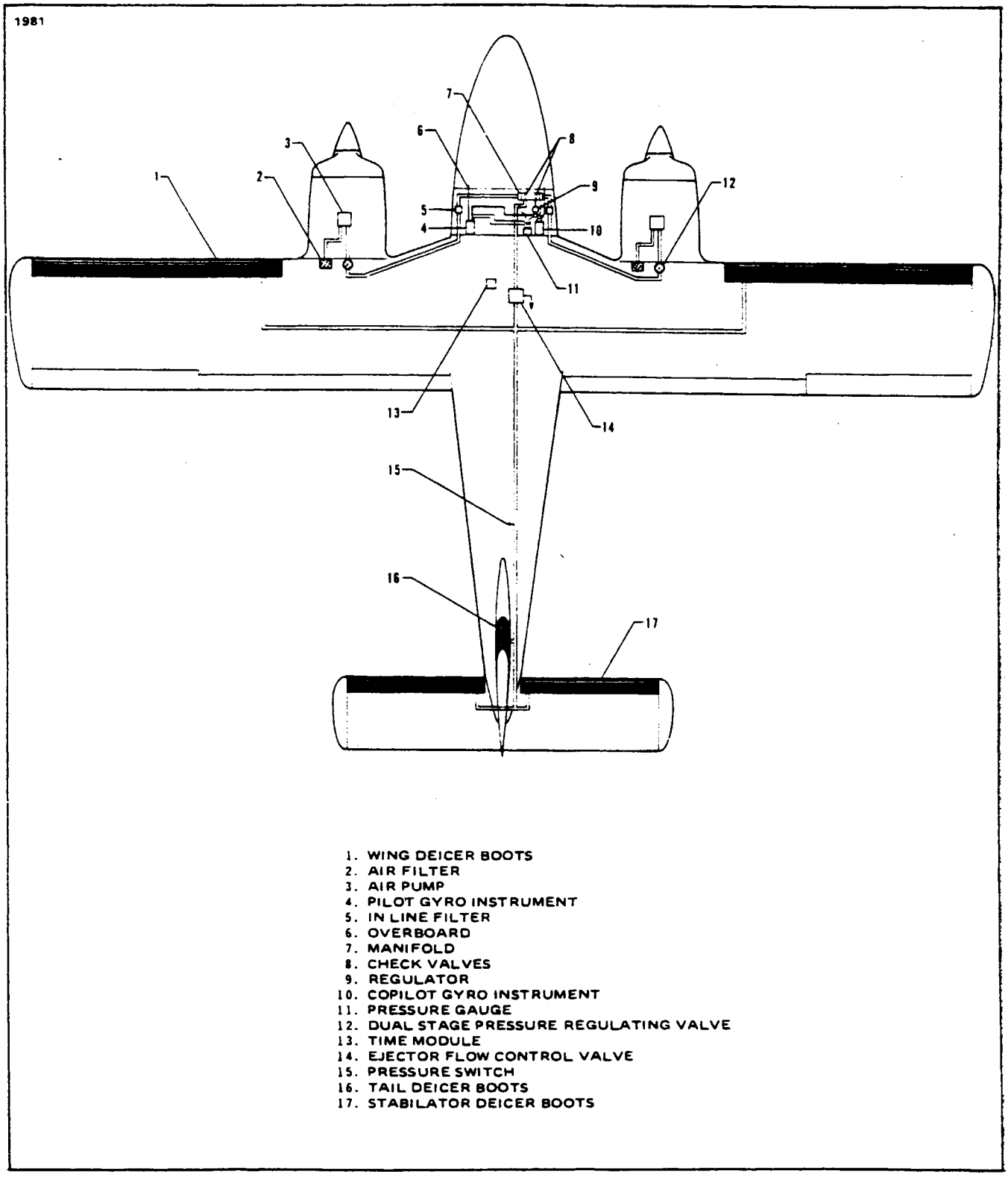
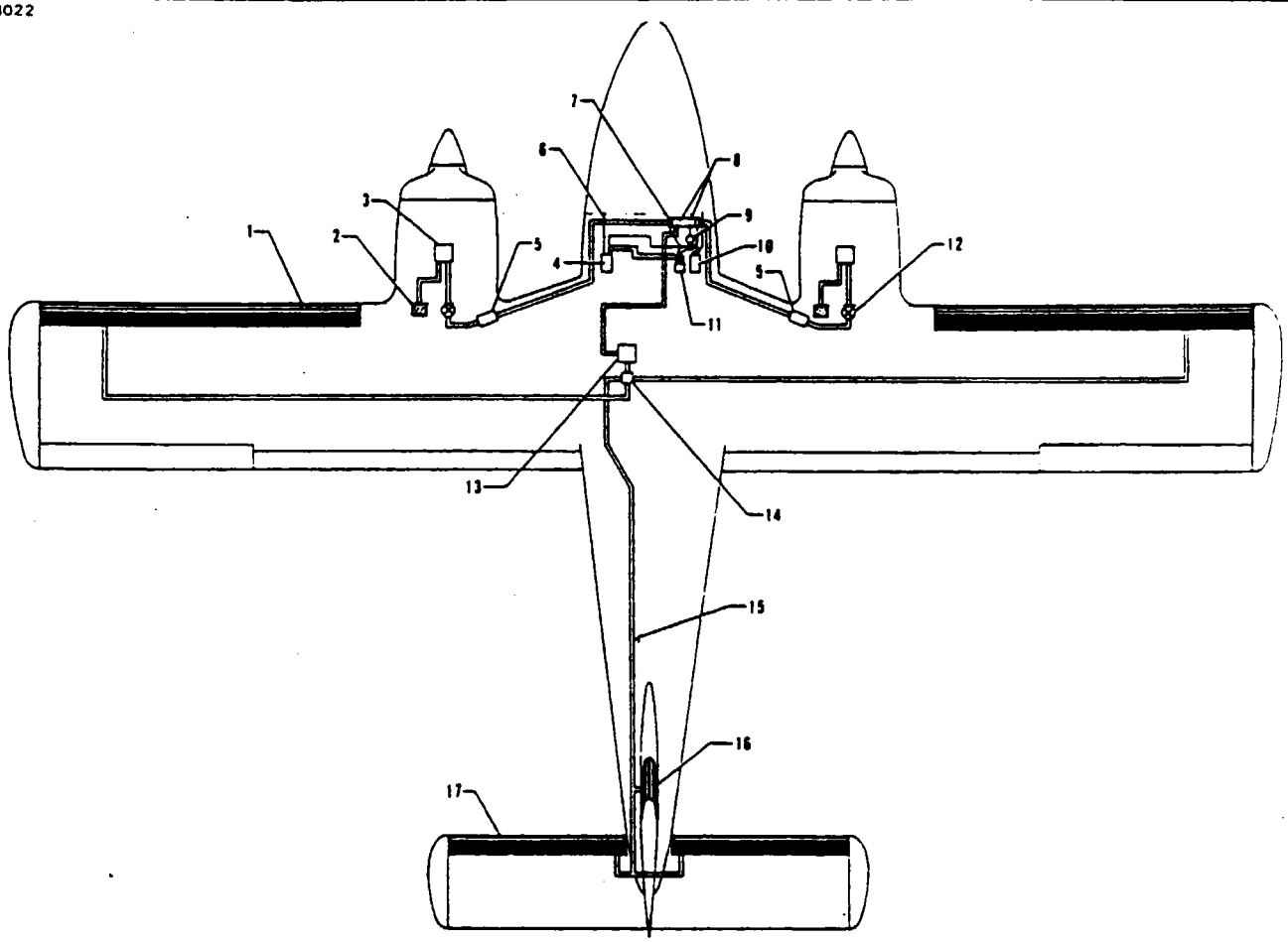


Figure 14-15. Pneumatic Deicer System Installation
(Serial Nos. up to 34-8070144)



1. WING DEICER BOOTS
2. AIR FILTER
3. AIR PUMP
4. PILOT GYRO INSTRUMENT
5. IN LINE FILTER
6. OVERBOARD
7. MANIFOLD
8. CHECK VALVES
9. REGULATOR
10. COPILOT GYRO INSTRUMENT
11. PRESSURE GAUGE
12. DUAL STAGE PRESSURE REGULATING VALVE
13. TIME MODULE
14. EJECTOR FLOW CONTROL VALVE
15. PRESSURE SWITCH
16. TAIL DEICER BOOTS
17 STABILATOR DEICER BOOTS

Figure 14-15a. Pneumatic Deicer System Installation
(Serial Nos. 34-8070144 and up)