STARTER/GENERATOR BRUSHES - MAINTENANCE PRACTICES
(Lear Siegler/Lucas Aerospace Model 23081-023 Only)

1. General

A. Following procedures apply to only the Lear Siegler/Lucas Aerospace Model 23081-023 starter/generator.

WARNING: The model 23081-023A starter/generator is not field serviceable. Parts and brushes are not interchangeable between the 23081-023 and 23081-023A.

NOTE: Model 23081-023 starter/generator brushes have a diagonal wear mark which allows identification of when brushes require replacement.

2. Description and Operation

A. Brushes carry current to starter/generator armature from external circuit (in START mode). They are made of a mixture of graphite and metallic powder. Brushes must be free to slide in their holders, so that they may follow small irregularities in curvature of commutator. In addition, brushes must be able to feed in as they wear. Proper pressure of brushes against commutator is maintained by brush holder springs. A low-resistance connection between brushes and brush holders is maintained by means of braided copper pigtails attached.

B. Brushes require periodic inspection and replacement when wear indicator disappears. Each brush carries a diagonal wear mark which allows identification of when a brush requires replacement. Refer to Figure 201 for details.

3. Brush Removal/Installation

A. Remove Starter/Generator Brushes (Refer to Figure 201).

NOTE: If brushes are to be reused, mark each brush to allow reinstallation in brush holder from which it was removed.

(1) Remove starter/generator. Refer to Starter/Generator - Removal/Installation.

(2) Loosen screws and remove cooling fan/brush cover.

(3) Remove screws securing brush pigtails to brush holders, and, using a stiff wire hook, lift springs from brushes and remove brushes.

B. Install Starter/Generator Brushes (Refer to Figure 201).

NOTE: Ensure pigtails are separated as shown in Figure 201. Starter/generator brushes must be seated after installation.

CAUTION: Brushes must be installed in correct position with regard to armature rotation as shown in Figure 201.

(1) Lift brush springs and insert brushes in brush holders; tighten brush pigtail retaining screws.

(2) Install cooling fan/brush cover and tighten retaining screws.

(3) Reinstall starter/generator. Refer to Starter/Generator - Removal/Installation.

4. Brush Inspection/Check

A. Inspection/Checks (Refer to Figure 201).

(1) Remove starter/generator. Refer to Starter/Generator - Removal/Installation.

(2) Remove cooling fan/brush cover.

(3) Observe brush wear marks and compare with information shown in Figure 201.

(4) Check brush holders for looseness, damage from arcing and broken brush holder springs.

5. Starter/Generator Brush Seating and Run-In

A. Brush Seating and Run-In Procedures.

(1) Full brush seating is comprised of both coarse brush pre-seating by sanding combined with final brush run-in by running the unit on a drive stand or operating the unit as a motor.

CAUTION: If functional faults are evident before line maintenance, or material defects are apparent during inspection, do not install new brushes. Replace the original brush inspection cover, and submit the unit to an FAA Authorized Accessory Overhaul Facility for repair and/or overhaul.

CAUTION: Failure to fully pre-seat and run-in brushes on high starter current applications (starting current equal to or exceeding 300 percent of the machine's DC current rating) may cause excessive sparking, burning and pitting of the commutator.

NOTE: For low starting current applications, perform coarse brush pre-seating procedures. Final brush run-in, although not required, increases commutator and brush life.

6. Course Brush Pre-Seating

A. Pre-Seating Procedures.

(1) Cut a strip of 180 grit (or finer) sandpaper, slightly wider than brush contact area and one inch longer than the circumference of commutator.

WARNING: Methyl alcohol is both toxic and flammable. Use in a well ventilated area free from sparks, flame and hot surfaces. In case of eye contact, flush with water and seek medical attention. In case of skin contact, wash with soap and water.

(2) Clean any four adjacent commutator bars with methyl alcohol.

(3) Tape leading edge of sandpaper to clean commutator bars with masking tape, so that taped end of sandpaper is in normal direction of armature rotation, and abrasive side of sandpaper faces away from commutator.

(4) Rotate armature in its normal direction of rotation so that sandpaper strip wraps around commutator. Trailing edge of the paper should cover masking tape.

CAUTION: Rapid release of the brush springs can damage the brushes.

(5) Remove brush and sandpaper residue from the unit using compressed air. Remove fingerprints from the commutator surface using methyl alcohol.

(6) Lift brush springs and slide the brushes down the brush holder to contact commutator. Position brush leads over the brush spring clips.

7. Final Brush Seating

A. Final Brush Seating or Run-in.

NOTE: The following instructions are for final brush run-in by both drive stand operation and motoring methods. Because of the time factor, the drive stand method is preferred.

(1) Final brush run-in by drive stand operation.

(a) Use a variable speed drive stand capable of driving the unit at speeds between 5,500 and 12,000 RPM at 50 percent of maximum rated electrical load.

(b) Operate the starter/generator as a generator from 25 to 50 percent of maximum rated electrical load and at 75 percent of rated normal top operational speed for the following time periods:

BRUSH TYPE	TIME
Particle Flake	15 to 30 minutes
Cored	2 to 4 hours.

(2) Final brush run-in by motoring.

(a) Obtain a power source with a 24.0 to 28.0 VDC, 50 ampere minimum power source. The following chart lists acceptable power sources and capacities.

SOURCE	CAPACITY REQUIREMENTS
Airplane Battery	24.0 to 28.0 VDC (50 ampere hour minimum)
Inverter	28.0 VDC, 50 ampere hour minimum output
Power Supply	28.0 VDC, 50 ampere hour minimum output

(b) Mount the unit securely in a V-block holder.

CAUTION: The switch must be open when connecting the power supply to the rheostat.

CAUTION: The rheostat must read 10 ohms, +1 or -1 ohm, when set at maximum resistance setting. An infinite (open) reading can cause unit destruction due to excessive speeds.

(c) Hook-up electrical connections to starter/generator. Refer to Figure 202.

(d) Set the rheostat to its minimum resistance setting.

(e) Close the switch to energize the circuit.

NOTE: If the unit rotates opposite its normal direction, check for improper internal and external lead connections.

(f) Adjust the rheostat to set speed between 50 and 75 percent of the maximum rated operational speed.

NOTE: Final brush run-in by motoring of cored brushes takes approximately one hour for each 0.001 inch of commutator groove depth.

NOTE: A properly seated and fully run-in portion of a brush has a smooth, semigloss surface.

(g) Operate the unit as a motor until the brushes are fine seated a minimum of 75 percent in the axial plane and 100 percent in the rotational plane. Refer to Figure 203.

(h) Disconnect the starter/generator from the motoring equipment.

WARNING: When using compressed air, regulate pressure to 40 PSI or less. Wear goggles or face shield to protect eyes. Use a dust filter respirator. Do not aim the air jet at exposed skin.

(i) Remove carbon dust from the unit using dry filtered compressed air.

(j) Install starter/generator on airplane. Refer to Starter/Generator - Removal/Installation.

Figure 201 : Sheet 1 : Starter/Generator Brush Installation

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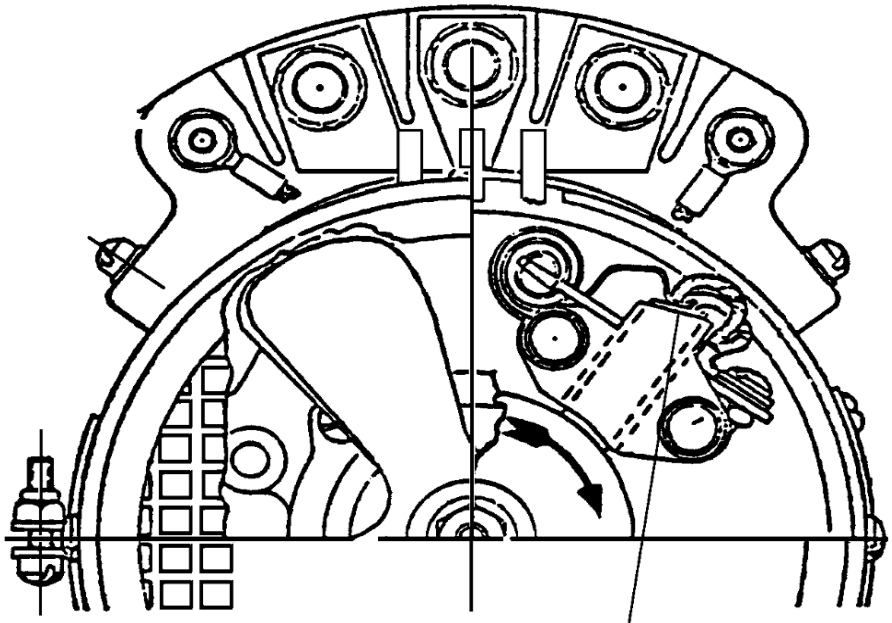
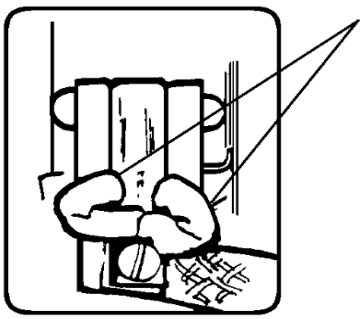
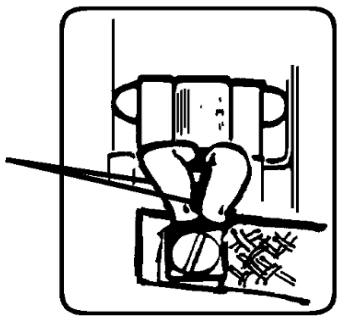


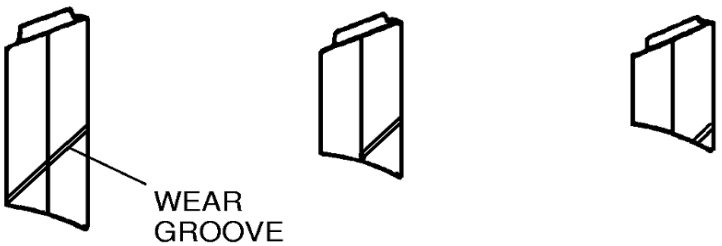
CORRECT POSITION OF BRUSHES AND SPRING
WITH REGARD TO ARMATURE ROTATION



BRUSH LEADS MUST BE POSITIONED
AS SHOWN TO AVOID HANG-UP ON
SIDES OF BRUSH BOX.

NEVER PUSH BRUSH LEADS
DOWN AGAINST THE BRUSH BOX.
THIS CAUSES BRUSHES TO HANG-UP
AND RESULTS IN UNIT FAILURE.





WEAR
GROOVE

NEW BRUSH

1/2 LIFE
REMAINING

1/4 LIFE
REMAINING

BRUSH WEAR STAGES

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Figure 202 : Sheet 1 : Final Brush Run-in Set Up By Motoring

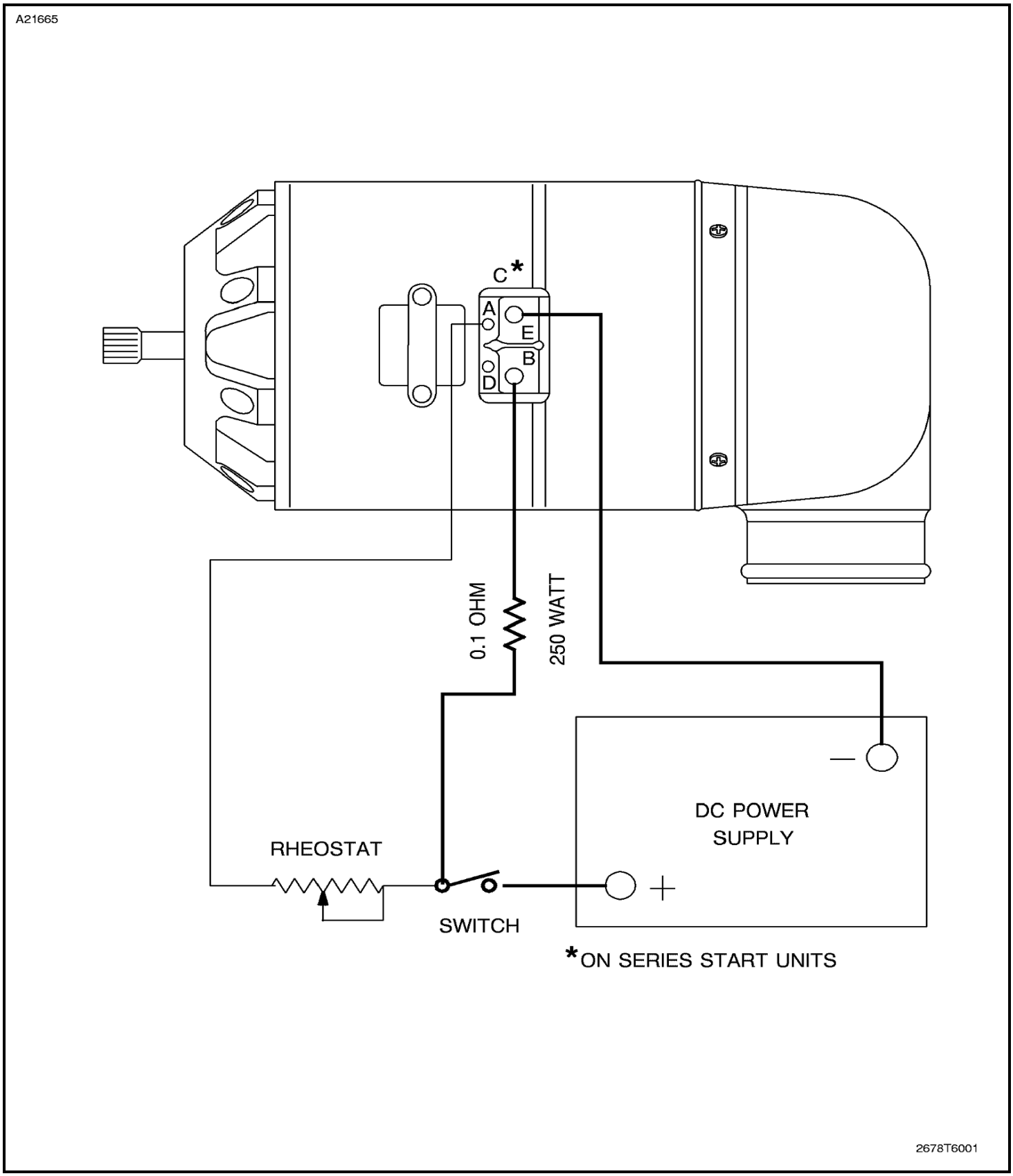

Figure 203 : Sheet 1 : Examples of Seated and Fully Run-in Brushes