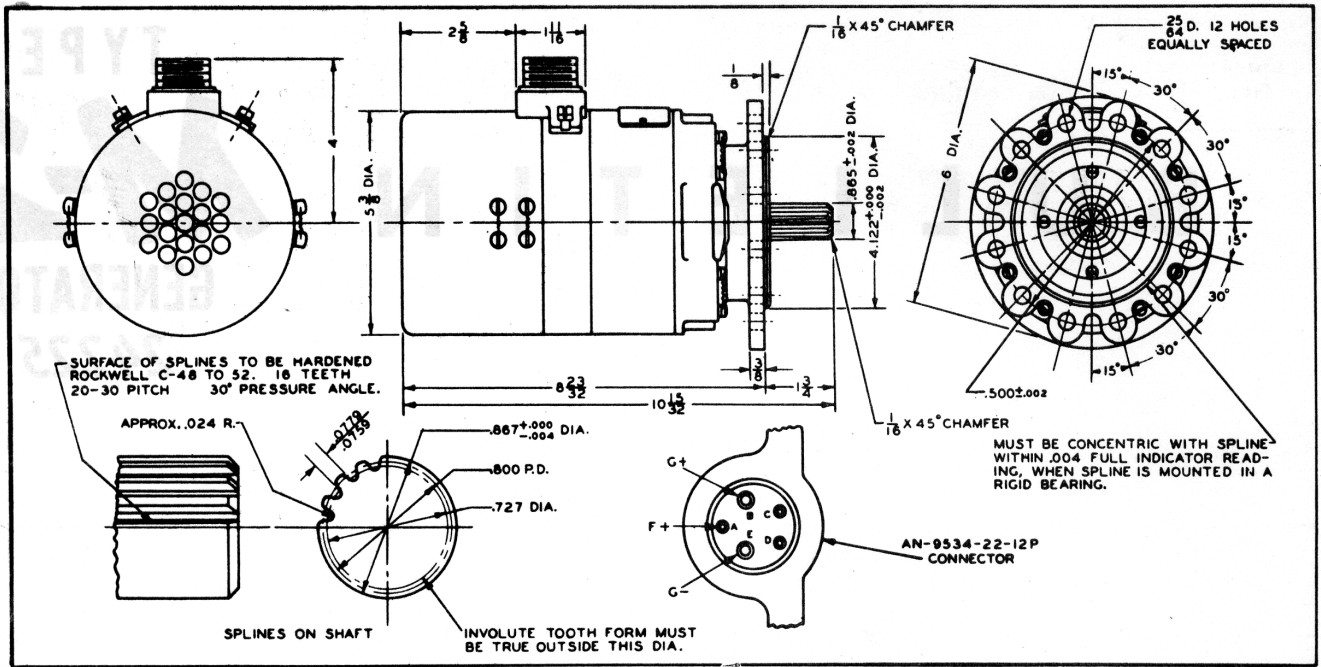


BULLETIN

TYPE **M-2** GENERATOR 24225



THE LEECE ★ ★ NEVILLE CO.
C L E V E L A N D . . O H I O . . U . S . A .



TYPE M-2 GENERATOR

Leece-Neville Part Number 24225

Rating: 28.5 Volts

50 Amperes

2500/4500 R.P.M

Built to AAF Specification 95-32285

Used with Leece-Neville Regulator Type 24700 or 24950, built to AAF Specification 94-32276, and Leece-Neville Relay Type 24552 or 24565, built to AAF Specification 94-32278.

The M-2 generator is a direct current, straight shunt generator having four poles.

The generator is equipped with altitude treated brushes in order to provide maximum possible brush life under all operating conditions.

Weight: 20 lbs.

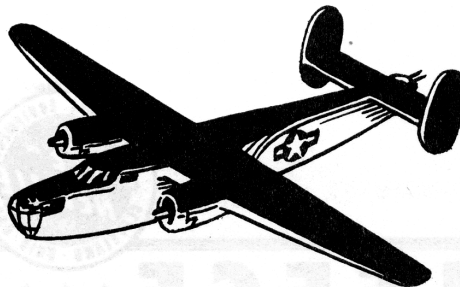
Length: $10\frac{1}{2}$ "

Diameter $5\frac{3}{8}$ "

12 Bolt Mounting Flange

16 Flute Spline

Rotation CC



VISUAL INSPECTION OF GENERATOR

1. Unpack generator carefully. Do not lift or carry generator by holding the spline shaft at the drive end. Lay the generator down on its side.
2. Inspect cover for dents. If dented, replace with a new cover.
3. Examine mounting flange for cracks or damaged pilot. Make sure there are no damaged teeth on the spline shaft.
4. Check terminal pins
5. Rotate armature shaft by hand in counterclockwise direction only (looking at drive end), to make certain it is free to turn.

GENERATOR TEST

In cases where testing of generator is required before installation on the engine the following may be used as a guide. For ground or short tests, use a test light, buzzer, or ohmmeter as follows:

1. Connect the tester from "E" pin to the generator frame. No circuit should be present.
2. For paralleling connection connect tester from the "D" to the "E" pins. The circuit should be completed.
3. Do not connect the tester from the "A" pin to any other terminal pin on the generator, as the field polarity may be reversed by doing so.

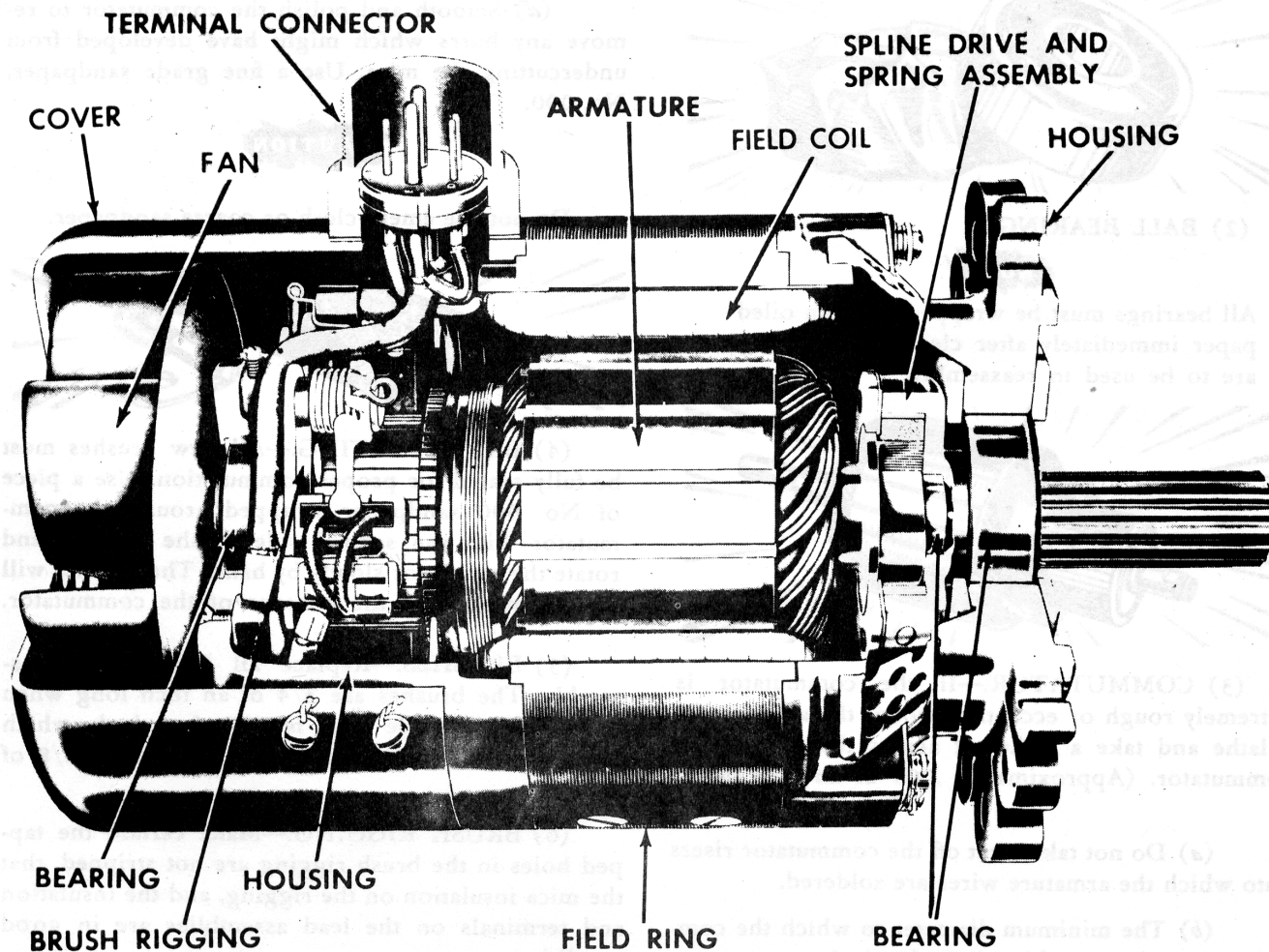
If the generator is run on a test stand, the wiring diagram will serve as a guide in connecting the generator, voltage regulator, and reverse current relay. Generator should be run at 2500 RPM, and deliver 50 amperes at 28.5 volts. This is the maximum continuous rating of this generator.

For complete details refer to airplane wiring diagram.

INSTALLATION ON ENGINE

1. Remove mounting pad cover from engine, and place generator gasket (AN 4047) in position.
2. Mount generator, and draw nuts down tightly.

In cases where the installation is not made for some time after the generator has been unpacked, the generator should be stored in its original dust and moisture-proof wrapper and laid on its side only, until installed.



CLEANING, INSPECTION AND REPAIR

CLEANING.

(1) GENERAL

(a) Blow out the brush dust from the brush rigging, armature assembly, and field ring assembly with *dry* compressed air.

CAUTION

Be careful not to damage the mica insulation on the brush rigging.

(b) Clean the field ring assembly and commutator with a gasoline-moistened cloth, using only unleaded gasoline.

CAUTION

Do not dip or soak the field ring assembly or armature assembly in the cleaning solution.

(c) Smooth the commutator with No. 000 sandpaper.

CAUTION

Do not use emery cloth or coarse sandpaper. Blow out all sand particles from the armature with *dry* compressed air.

(d) Clean out all old grease in the spring drive coupling.



(2) BALL BEARINGS.

NOTE

All bearings must be wrapped in clean oiled paper immediately after cleaning until they are to be used in reassembly.



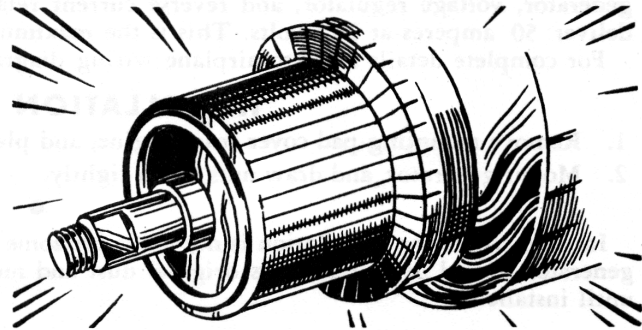
(3) COMMUTATOR.—If the commutator is extremely rough or eccentric; mount the armature in a lathe and take a light cut across the face of the commutator. (Approximately .005 of an inch depth)

(a) Do not take a cut off the commutator risers into which the armature wires are soldered.

(b) The minimum diameter to which the commutator can be turned is 1-7/8 of an inch.



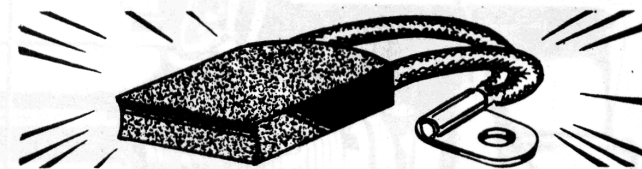
(c) After turning, carefully undercut the mica to a depth of .020 of an inch. Use a cutting tool slightly wider than the thickness of the mica (.020 of an inch), to insure complete removal of the mica to the required depth.



(d) Smooth and polish the commutator to remove any burrs which might have developed from undercutting the mica. Use a fine grade sandpaper, No. 000.

CAUTION

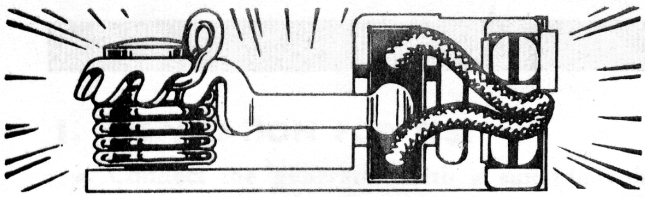
Do not use emery cloth or coarse sandpaper.



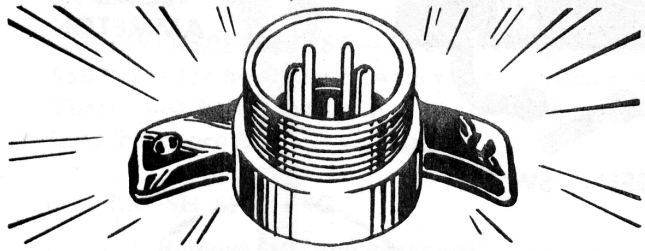
(4) BRUSH SEATING.—All new brushes must be fully seated for proper commutation. Use a piece of No. 000 sandpaper wrapped around the commutator with the sanded side to the brushes and rotate the generator slowly by hand. The brushes will seat themselves to the contour of the commutator.

(5) BRUSHES.—Replace all brushes on reassembly. The brushes are 3/4 of an inch long when new. The allowable wear is 3/8 of an inch, which means that the minimum allowable length is 3/8 of an inch.

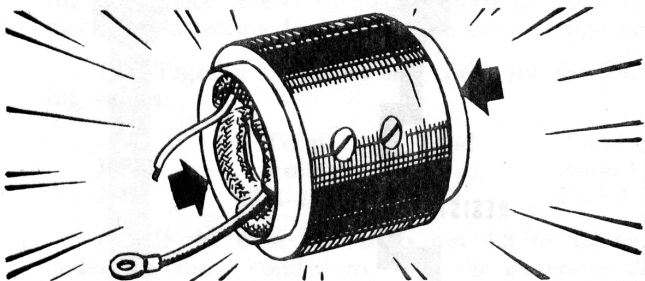
(6) BRUSH RIGGING.—Make certain the tapped holes in the brush rigging are not stripped, that the mica insulation on the rigging, and the insulation and terminals on the lead assemblies are in good condition.



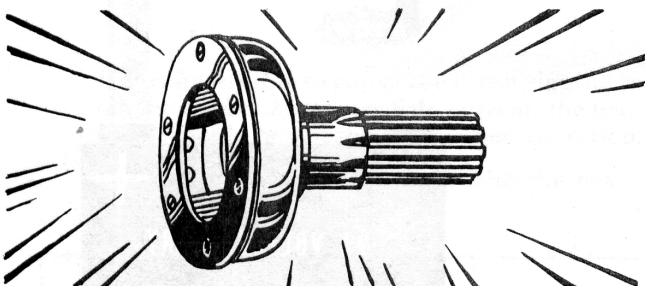
(7) **BRUSH SPRING PRESSURE.**—The recommended brush spring pressure for the type M-2 generator is 1-3/4 to two pounds. On new brushes this pressure should be obtained with the spring end in the second notch of the lever. As the brush wears the spring end is advanced to maintain the required pressure. When the pressure, with the spring end in the last notch, is less than 1-3/4 to two pounds, the brush rigging must be replaced.



(8) **TERMINAL HOUSING ASSEMBLY.**—Replace the assembly if the insulator is cracked, if the terminal pins are burned, or if they are bent beyond safe straightening. Replace the heavy leads if the insulation is burned or cracked and peeling.



(9) **FIELD COIL INSULATORS.**—If the insulating strips at each end of the field ring assembly are damaged, they should be replaced.



(10) **SPLINE DRIVE AND SPRING ASSEMBLY.**

(a) If the liners are worn, replace them.

(b) Since the springs are ground on the ends as a group to form the set, the sets should be replaced with new ones whenever the spring leaves adjacent to the cam are badly worn.

(c) If the cam is worn below its tolerance, replace with a new one having the correct dimensions.

d. **ELECTRICAL TEST—ARMATURE AND FIELD COILS.**—Test the armature and field coils for short circuits, open circuits, and grounds. Replace, if repairs cannot be made.

NOTE

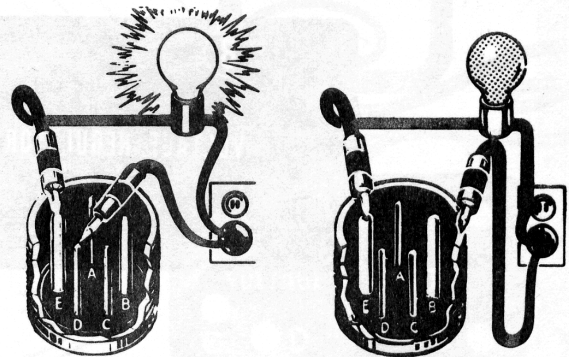
When testing with a lamp circuit, a 220-volt a-c line with a 50-watt lamp in series is recommended. However, if only a 110-volt line is available, it may be used with a 50-watt lamp in series.

1 **GROUNDING ARMATURE.**—Touch one test lamp prod to the armature shaft or to the core laminations and the other prod to the commutator copper segments. If the lamp lights, the armature is grounded.

2 **OPEN ARMATURE.**—Inspect the armature to insure that all the wire ends are firmly soldered in the commutator risers. If such is the case, it may be assumed that there is no open circuit.

3 **SHORTED ARMATURE.**—Test the armature on a "growler". Make certain that none of the copper segments on the commutator are joined electrically by conducting materials such as copper, steel chips, or solder.

4 **OPEN FIELD CIRCUIT.**—Touch the test lamp prods to the terminal ends of the field winding. If the test lamp lights, the circuit is complete.

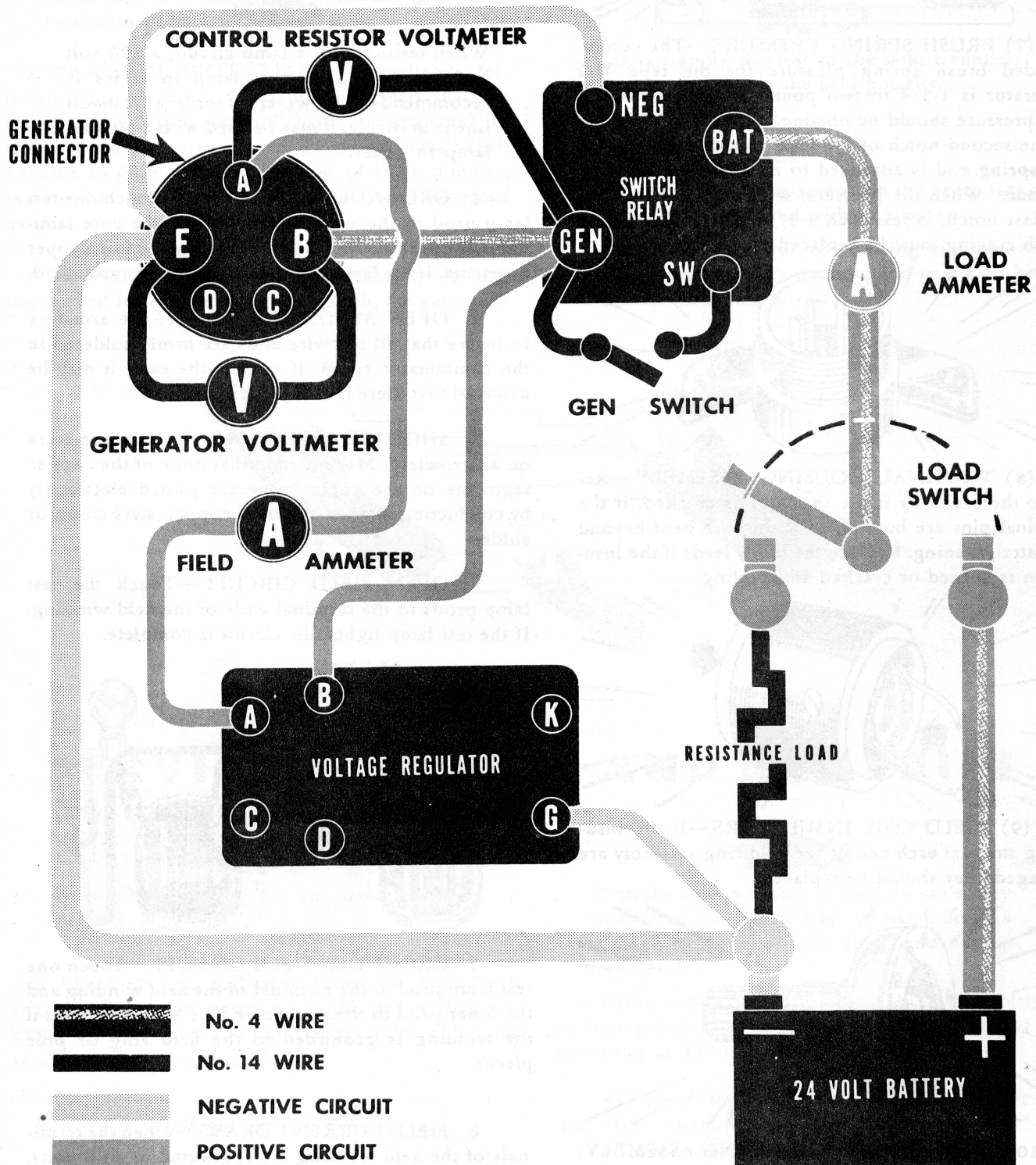


5 **GROUNDING FIELD CIRCUIT.**—Touch one test lamp prod to the terminal of the field winding and the other prod to the connector. The lamp will light if the winding is grounded to the field ring or pole pieces.

6 **FIELD CURRENT DRAW.**—When the terminals of the field winding are connected to 24.0 volts, a test ammeter should indicate 8.43 to 8.49 amperes. The total resistance of this field winding is 2.83 to 2.85 ohms.

NOTE

The field coils are connected in series parallel. Two sets of two coils each, are connected in series and then the two sets are connected in parallel.



Wiring Diagram for Testing M-2 Generator

TEST PROCEDURE

1. PREPARATION FOR TEST

a. Connect the generator with a suitable voltage regulator and switch relay, a 50 ampere resistance load, load and field ammeters, generator and control resistor voltmeters, as indicated in the accompanying wiring diagram.

b. Set the end of each brush spring in the second notch of the lever.

2. FINAL TEST

a. **OVERSPEED TEST.**—Operate the generator at 5500 rpm for five minutes with the field circuit open. There must be no mechanical injury if the generator is to be approved.

b. BRUSH SETTING.

(1) Remove fan from generator.

(2) Loosen two brush rigging screws in rear of commutator end housing, as well as the two set screws.

(3) Brushes should be fully seated and advanced approximately one brush width past the center line of the pole piece screws in an advanced position (in a clockwise direction looking at the commutator end).

(4) Tighten all screws and check for the following values:

| RPM | Term. Volts | Load Amps. | Field Amps. |
|------|-------------|------------|-------------|
| 2500 | 28.4-28.6 | 50 | 4.8-5.2 |

(5) If the field current is not 4.8 to 5.2 amps. under the above conditions, with the generator *cold*, advance or retard the brushes a small amount at a time until this field current is obtained. Make sure that the brushes are fully seated during this test.

NOTE

If it is impossible to adjust the brush rigging to obtain 4.8 to 5.2 amperes field current, the generator should be rejected for further inspection.

(6) Replace fan and continue with the heat run.

c. **PERFORMANCE TEST.**—Subject the generator to a minimum 30-minute heat run.

NOTE

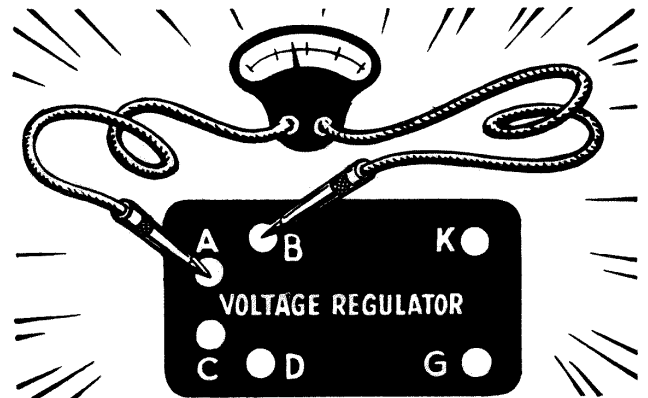
All heat runs must be made with a resistance load only.

(1) Brush seating and positioning must be done within five minutes after a cold start. If the time required exceeds five minutes, remove the generator from the test block and cool to room temperature before making the heat run.

(2) Operate the generator at full load. (50 amperes) and minimum speed (2500 rpm) for 30 minutes. The terminal voltage and field amperes must be as listed in Paragraph 2, b, (4), this section.

NOTE

Room temperature affects control resistor voltage as shown. Therefore, observe room temperature when making heat run. Control resistor voltage is measured across terminals "A" and "B" at the voltage regulator base.



(3) At the end of 30 minutes the value of the "control resistor volts" must not be less than shown in the following table:

| TERM. V. | LOAD AMPS. | RPM | CONTROL RESISTOR | | ROOM TEMP. | |
|-----------|------------|------|------------------|--|------------|--------|
| | | | VOLTS | | Cent. | Fahr. |
| 28.4-28.6 | 50 | 2500 | 3.5 | | 23.9° | (75°) |
| | | | 3.4 | | 26.7° | (80°) |
| | | | 3.3 | | 29.4° | (85°) |
| | | | 3.2 | | 32.2° | (90°) |
| | | | 3.1 | | 35.0° | (95°) |
| | | | 3.0 | | 37.8° | (100°) |
| | | | | | | |

NOTE

If the control resistor voltage is less than the values given, the generator must be rejected as this is a method of determining the maximum permissible temperature.

d. **MAXIMUM SPEED TESTS.**—Immediately following the 30-minute heat run, the speed shall be raised to 4500 rpm with full load (50 amperes) on the generator for *three minutes*. Terminal voltage shall be 28.4 to 28.6 volts. At the end of three minutes, reduce the speed to 2500 rpm and check for rated output.

e. **HI-POTENTIAL TEST.**—Immediately following the test in the preceding paragraph, the generator

shall be subjected to a voltage breakdown test by applying 500 volts (60-cycle a-c) between the frame of the generator and the "E" terminal.

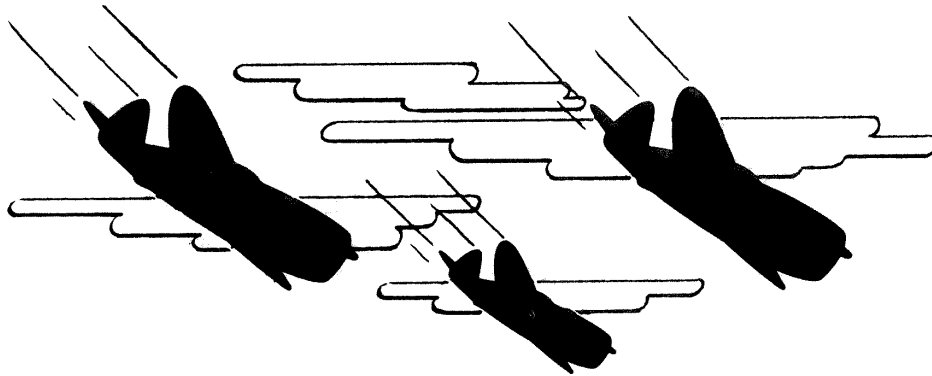
CAUTION

Do not apply the test to the field terminals as this may reverse the field polarity.

3. FINAL ASSEMBLY

a. Make certain the set-screws on the brush rigging are tightened and secured with lock wires.

b. Attach the generator cover using eight fillister-head screws, spring lock washers, and guard washers, and secure with lock wires.



SERVICE TROUBLES AND REMEDIES

CAUTION

Before investigating for any trouble, check the following:

a. Check all electrical connections and make sure that they are made according to the test wiring diagram and are clean and tight. See that the cables and terminals are in good condition.

b. Close the generator line switch.

c. Check the battery to make sure that it is in good condition electrically and mechanically.

d. Check the generator voltage with a precision voltmeter.

CAUTION

With the battery switch closed, do not at any time close the switch relay by hand. Serious damage to the generator, relay, and wiring may result.

e. Using a precision voltmeter, check the voltage at these points in the airplane when the generator is operating at 2500 rpm or above.

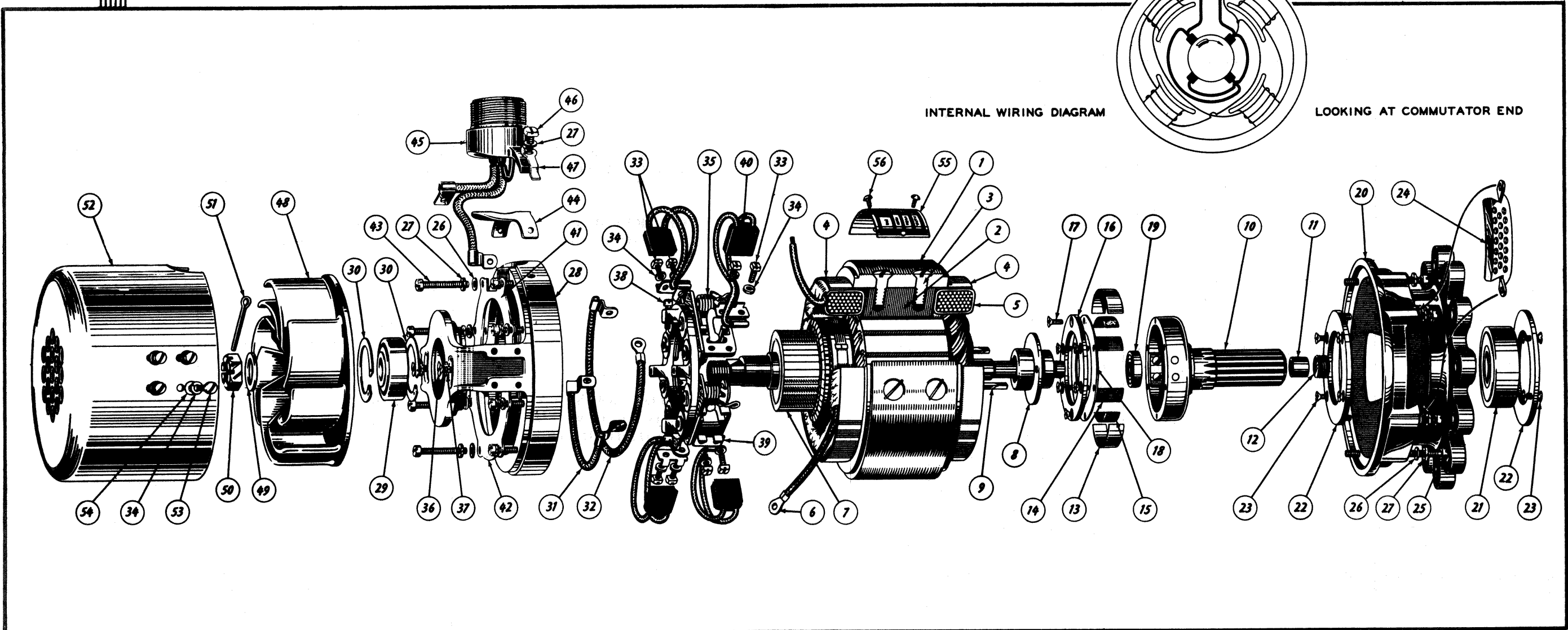
(1) Check the voltage at the switch relay, from the "Gen" terminal to "Neg", and from "Bat" to "Neg". Both voltages should be 28 to 29 volts.

(2) Check the voltage at the voltage regulator terminals "B" to "G". This voltage should be 28 volts.

(3) Check the voltage across the battery terminals. This voltage should be 27 to 28 volts.

| TROUBLE | PROBABLE CAUSE | REMEDY |
|---|--|---|
| <p>GENERATOR IS OPERATING AT RATED RPM BUT VOLTAGE IS EITHER LOW OR NO VOLTAGE IS INDICATED.</p> | <p>Connections are loose, dirty, or have high resistance.</p> <p>The brushes are binding in the holders.</p> <p>Brush spring tension is too low.</p> <p>Brushes are worn out.</p> <p>Commutator is dirty rough, pitted, or eccentric.</p> <p>Armature winding is short-circuited or open-circuited.</p> <p>Generator field polarity is reversed (magnetized in wrong direction).</p> | <p>Clean and tighten connections.</p> <p>Remove the brushes and clean with a lint-free dry cloth.</p> <p>Move the spring into a more advanced position. If enough tension cannot be obtained, replace the brush holder assembly.</p> <p>Replace.</p> <p>Clean or resurface according to instructions</p> <p>Replace</p> <p>Flash field in proper direction. This should be done with the voltage regulator removed. Connect two No. 18 or larger cables to a 24 volt battery. With the engine operating at 1800 rpm connect the negative lead of the battery to ground and momentarily touch the "hot" battery lead to the "A" terminal on the voltage regulator mounting base.</p> |
| <p>GENERATOR IS OPERATING AT RATED RPM BUT HIGH VOLTAGE IS INDICATED.</p> | <p>There is a short-circuit between the two cables to the regulator terminals "A" and "B".</p> <p>The regulator cannot be adjusted.</p> | <p>Restore to the correct condition.</p> <p>Replace with new unit.</p> |
| <p>EXCESSIVE ARCING IS PRESENT AT GENERATOR BRUSHES.</p> | <p>Brushes are worn too short to be held against the commutator.</p> <p>Brushes are binding in their holders.</p> <p>Brush spring tension is too low.</p> | <p>Replace</p> <p>Remove the brushes, clean with a clean, lint-free cloth.</p> <p>Increase the tension by moving the spring end as instructed Replace the brush-rigging if sufficient tension cannot be obtained.</p> |

| TROUBLE | PROBABLE CAUSE | REMEDY |
|---|--|--|
| | <p>Rough, burned pitted, or eccentric commutator.</p> <p>High voltage. Regulator is out of adjustment.</p> <p>Connections between the generator and the switch relay are wrong.</p> <p>A short circuit exists between the cables to the terminals.</p> | <p>Clean or resurface according to instructions</p> <p>Check and adjust.</p> <p>Check and correct according to wiring diagram.</p> <p>Restore to correct condition.</p> |
| <p>GENERATOR COMMUTATOR IS THROWING SOLDER.</p> | <p>Excessive arcing at the generator brushes.</p> | <p>Use REMEDIES listed under "Excessive arcing at generator brushes."</p> |
| <p>GENERATOR IS NOT CHARGING THE BATTERY.</p> | <p>Battery may be damaged, worn out, or may merely need water.</p> <p>Switch relay is out of adjustment.</p> <p>Voltage regulator setting too low. Will not allow switch relay to close.</p> | <p>Add enough water to cover the plates.</p> <p>Check and correct.</p> <p>Reset voltage regulator to 28.0 volts.</p> |
| <p>FIELD CURRENT CANNOT BE ADJUSTED WITHIN THE SPECIFIED LIMITS.</p> | <p>Wiring and connections are faulty.</p> <p>Field circuit is either open-circuited or short-circuited or field resistance is incorrect.</p> <p>Air gap between the armature and pole pieces is incorrect. This may even cause friction in extreme cases.</p> <p>Brushes are not operating properly.</p> | <p>Clean and tighten all connections; replace any defective wires or connections.</p> <p>Generator will have to be disassembled to correct these faults if they exist.</p> <p>Tighten the pole piece screws as much as possible. If this does not help, disassembly may show some foreign matter between the pole pieces and field ring.</p> <p>Check and apply remedies</p> |
| <p>GENERATOR OVERHEATS AS SHOWN BY LOW POINT VOLTAGE.</p> | <p>Brushes are improperly seated.</p> <p>Armature is short-circuited.</p> <p>Bearings are tight.</p> <p>Commutator bars are high or out of alignment.</p> | <p>Reseat, as instructed</p> <p>Replace the armature</p> <p>Replace the bearings.</p> <p>Replace the armature assembly if the commutator bars are out of alignment; turn down the bars on a lathe if they are too high.</p> |

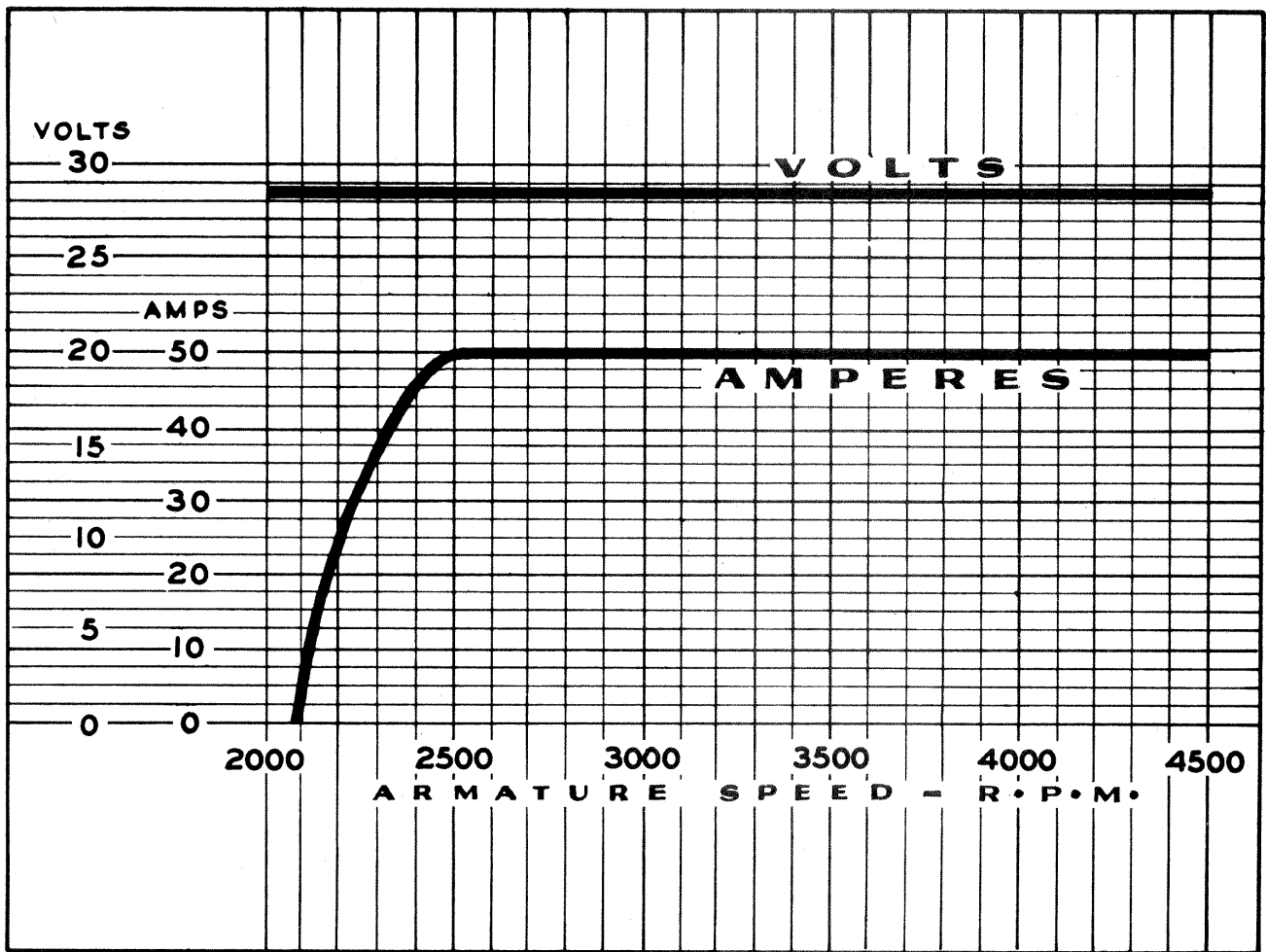


BLOWOUT PARTS LIST FOR TYPE M-2 GENERATOR

| Index No. | Part No. | Nomenclature | Quantity | Index No. | Part No. | Nomenclature | Quantity |
|-----------|----------|--|----------|-----------|----------|--|----------|
| * | S-24225 | Generator Assembly | (1) | 31 | S-24812 | Lead Assembly | (1) |
| * | S-24244 | Ring Assembly—Field | (1) | 32 | S-24802 | Lead Assembly | (1) |
| 1 | 24230 | Ring | (1) | 33 | 13833 | Screw | (2) |
| 2 | S-24245 | Piece Assembly—Pole | (4) | 34 | 2435 | Lockwasher | (2) |
| 3 | 4533 | Screw | (8) | 35 | S-24800 | Rigging Assembly—Brush | (1) |
| 4 | 37908 | Insulator | (2) | 36 | 2376 | Screw | (2) |
| | | | | 37 | 4577 | Lockwasher | (2) |
| 5 | S-24242 | Coil Assembly—Field | (1) | 38 | 22144 | Screw—Set | (2) |
| 6 | 24496 | Terminal | (1) | * | 22287 | Wire—Lock | (2) |
| 7 | S-24237 | Armature Assembly | (1) | 39 | 22282 | Plate—Lock | (4) |
| 8 | S-11815 | Cam Assembly | (1) | 40 | 36709 | Brush | (4) |
| 9 | 11826 | Key—Straight | (2) | 33 | 13833 | Screw | (4) |
| * | S-24805 | Shaft and Spring Assembly | (1) | 34 | 2435 | Lockwasher | (4) |
| 10 | S-24804 | Shaft Assembly—Spline | (1) | 41 | 24807 | Baffle—Upper | (1) |
| 11 | 7277 | Bushing | (1) | 42 | 24808 | Baffle—Lower | (1) |
| 12 | 11237 | Plug | (1) | 43 | 24678 | Screw | (8) |
| 13 | 24806 | Liner | (2) | 26 | 5413 | Washer—Guard | (8) |
| 14 | S-24241 | Spring Assembly | (2) | 27 | 24678 | Lockwasher | (8) |
| 15 | 24249 | Pad—Felt | (2) | * | 22287 | Wire—Lock | (1) |
| 16 | 24239 | Plate | (1) | 44 | 21563 | Gasket—Terminal Housing | (1) |
| 17 | 22057 | Screw | (6) | 45 | S-24819 | Housing Assembly—Terminal | (1) |
| 18 | 26613 | Gasket | (1) | 46 | 13783 | Screw—No. 10-32 x ½ sq. hd. steel | (2) |
| 19 | 11824 | Bearing | (1) | 47 | 6812 | Lockwasher | (2) |
| * | S-24817 | Housing Assembly—Drive End | (1) | 27 | 2434 | Lockwasher | (2) |
| 20 | 29623 | Housing | (1) | 33 | 13833 | Screw—Lead | (2) |
| 21 | 24297 | Bearing | (1) | 34 | 2435 | Lockwasher | (2) |
| 22 | 24289 | Retainer | (2) | 48 | 24233 | Fan | (1) |
| 23 | 3322 | Screw | (8) | 49 | 3249 | Washer—Guard | (1) |
| 24 | 20427 | Guard—Air Vent | (4) | 50 | 13629 | Nut—Castle ½-20 Hex. steel | (1) |
| 25 | 13689 | Screw | (8) | 51 | 22088 | Pin—Cotter | (1) |
| 26 | 5413 | Washer—Guard | (8) | 52 | 24248 | Cover | (1) |
| 27 | 2434 | Lockwasher | (8) | 53 | 6844 | Screw | (8) |
| * | 22287 | Wire—Lock | (1) | 54 | 13624 | Washer Guard | (8) |
| * | S-24818 | Housing Assembly—Commutator End | (1) | 34 | 2435 | Lockwasher | (8) |
| 28 | 24227 | Housing | (1) | * | 22287 | Wire—Lock | (4) |
| 29 | 24298 | Bearing | (1) | 55 | 22261 | Plate—Name | (1) |
| 30 | 25661 | Ring—Snap | (2) | 56 | 6810 | Screw | (2) |

*Not referenced on illustration.





SPEED LOAD CURVE

Type M-2 Generator Assembly No. 24225

Regulator L-N Type 24700

Terminal Volts 28.5, Resistance Load

