Chapter 23

GENERATOR, DELCO REMY, TYPE 1117086

LIST OF CONTENTS

	Para.		Para.
Introduction	1	**Servicing**	13
Description		*Dismantling*	14
General	2	*Replacing diode in heat sink*	15
Stator	3	*Replacing diode in end frame*	16
Rotor	6	*Replacing the brush assembly*	17
Diodes	7	*Cleaning*	18
Brush gear	8	*Assembling*	19
Operation	9	*Testing*	20

LIST OF ILLUSTRATIONS

	Fig.
Exploded view of generator	1
Circuit diagram	2
Slip ring end frame	3

LIST OF APPENDICES

	App.
Standard serviceability test per generator, Delco Remy Type 1117086	A

LEADING PARTICULARS

Generator, Type 1117086	**Ref. No. 136H/381**
Output at 9000 *rev/min*	71*A at* 28*V*
Rotation viewed from drive end	*Counter clockwise*
Brush spring pressure	8–14 *oz.*
Minimum brush length	0·5 *in.*
Minimum slipring diameter	1·96 *in.*
Maximum eccentricity	0·003 *in.*

Introduction

1. The generator is a rotating field a.c. generator which incorporates a full wave rectifier circuit. The rectifier circuit comprises six diodes, three positive frame diodes in the heat sink and three negative frame diodes in the end frame giving a 28V d.c. supply at the BAT terminal.

DESCRIPTION

General

2. The generator comprises a stator and two end frames secured together by two through bolts, a rotor which rotates within the stator and is supported by two ball bearings housed in the end frames.

Stator

3. The stator consists of a large number of stationary conductors assembled on the inside of a laminated core which form the external mid frame of the generator. The three cables from the phase windings on the stator are connected to the external a.c. terminals.

4. A light-alloy casting forms the drive end frame which incorporates a cooling air inlet adaptor and a housing in which the sealed ball bearing for the rotor shaft is a push fit. The bearing is retained in position by an internally fitted retainer plate, secured to the end frame with screws which are wire locked together and to lugs incorporated in the retainer plate. Engine lubrication oil is prevented from entering the generator by a seal spacer, which is fitted to the rotor shaft between the driving gear wheel and the bearing inner race, and sealed by inner and outer rubber rings.

5. The light alloy slip ring end frame incorporates a rotor shaft bearing housing, in which a sealed ball bearing is a press fit, heat sink, rectifier diodes and slip ring brush assemblies. The insulated heat sink is secured to the internal end face of the frame with three screws, the largest screw protrudes through the top casing to form the BAT terminal. Three diode sockets provided with left hand pipe threads are incorporated in the heat sink, and three similar sockets with right hand pipe threads are incorporated in the end frame wall.

Rotor

6. The rotor assembly comprises a steel shaft, keyed and threaded at one end to receive a driving gear and securing nut, upon which are mounted four poles of alternate North and South polarity. The poles are provided with field coils, connected

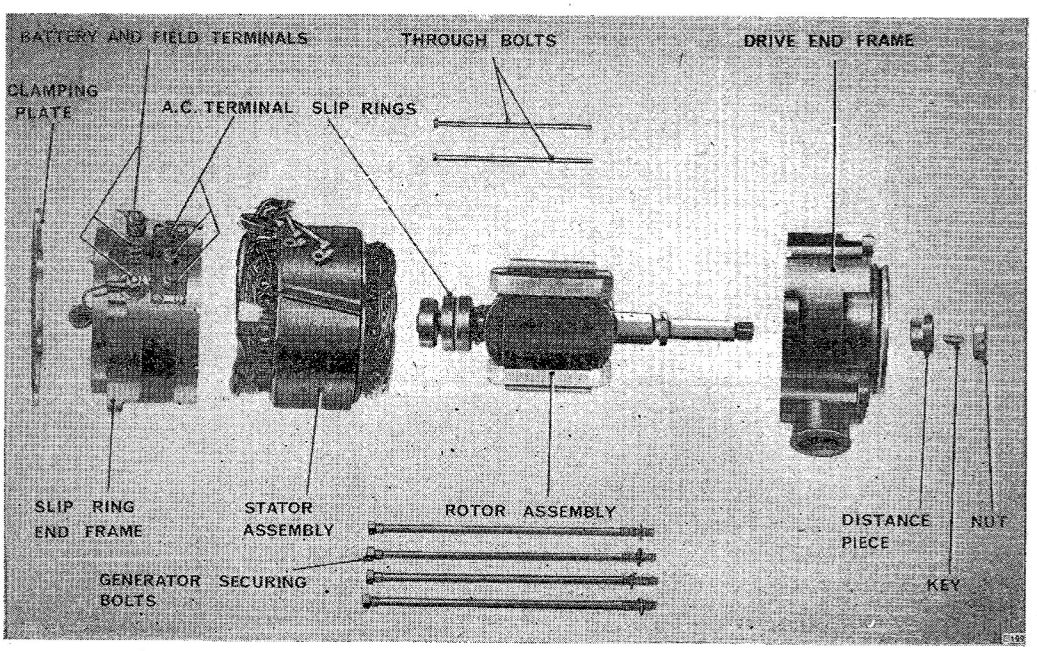

Fig. 1. Exploded view of Generator

in series, from which cables are led to two insulated slip rings pressed on to the rotor shaft.

Diodes

7. Each diode consists of a positive or negative case with a lead of opposite polarity, the polarity of the case being identified by a + or — marking on the hexagonal head. Diodes with positive case polarity are assembled in the heat sink, those of negative case polarity are assembled in the end frame with their heads protruding through the heat sink. Adjacent positive and negative diode heads are paired and each pair is connected to one of three AC terminals mounted externally on the end frame.

Brush gear

8. The brush assembly is mounted on a pivot pin secured in the end frame, and consists of two brushes held in separate holders and maintained in correct contact with the slip rings by springs. Cables from the brushes are connected to the F1 and F2 terminals on the end frame casing.

Operation

9. The field windings are energized by an external d.c. power supply from the aircraft battery through terminals F1 and F2, brushes and slip rings. The three leads from the stator windings are connected via the a.c terminals to a full wave rectifier circuit giving a 28V d.c. supply between the BAT terminal and frame.

10. The d.c. voltage of the a.c./d.c. system is controlled by varying the amount of field current which excites the generator. To ensure voltage control at high speeds the generator has a reverse field winding which consists of a high resistance shunt winding connected in parallel with the main field winding. The reverse winding is so wound and connected that when the generator is charging, current flow in the reverse winding creates a magnetic field which opposes that created by current flow in the main winding. The magnetic field created by the reverse winding remains approximately the same throughout the generator speed range, whereas the magnetic field of the main winding varies considerably with generator speed.

11. At low generator speeds, current flow in the main field winding is comparatively high, creating a magnetic field which is strong in comparison with the opposing field of the reverse field winding. At high generator speeds, however, current flow in the main field winding is comparatively low, resulting in a weak magnetic field which is noticeably affected by the opposing field created by current flow in the reverse field winding. This effect results in a higher main field current at high speeds than would otherwise be required.

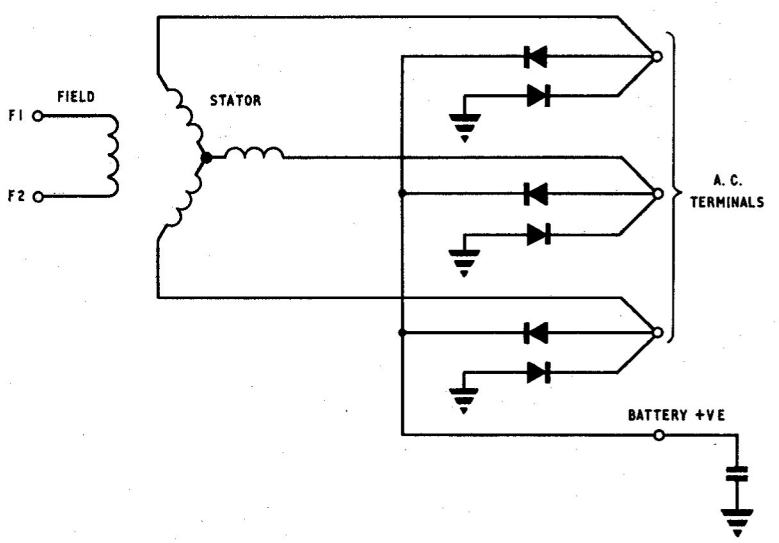

Fig. 2. Circuit diagram

12. The higher main field current makes the generator easier to control, and satisfactory voltage control is thereby obtained at high generator speeds.

SERVICING

13. The generator should be serviced at intervals specified in the relevant Servicing Schedule. Examine the generator for signs of damage or corrosion. Examine the terminals and wiring for security of connection, corrosion or frayed insulation. Further information on the servicing of generators is contained in A.P.4343, Vol. 1, Sect. 2, Chap. 1.

Dismantling

14. If it is necessary to fit new bearings or diodes the generator should be dismantled as follows:—

(1) Remove the split pin, nut, washer, gear drive assembly, spring, gear hub and Woodruff key.

(2) Cut the locking wire, unscrew the two through bolts and remove ring plate and bolts.

(3) Support the brushes clear of the sliprings.

(4) Tap the drive end frame with a hide faced hammer to achieve initial separation from the stator, and prise apart slowly using suitable levers inserted in two of the slots diametrically opposite. Remove the drive end frame and rotor with slipring end bearing attached.

(5) Remove the nuts, washers and the stator connections from the three a.c. terminals.

(6) The slipring end frame can now be separated from the stator assembly in a similar manner to that used for the drive end frame.

(7) Remove the stator from the drive end frame.

(8) Remove the screws securing the retaining plate then remove the retaining plate. The bearing may now be removed.

Replacing diode in heat sink

15. If a diode is found to be defective it may be removed as follows:—

(1) Remove the brush assembly.

(2) Cut the flexible cable as close as possible to, and on each side of, the defective diode lead.

(3) Cut the flexible connecting cables of the other paired diodes at their mid point.

(4) Remove the nut, washer and nylon washer and remove 'BAT' terminal and insulating washer.

(5) Remove the nuts, washers and insulating washers from the three a.c. terminals and withdraw diode cables, terminals and insulating washers from sockets in the frame.

(6) Remove the two securing screws, washers and nylon washers and withdraw the heat sink assembly from the end frame. Remove the heat sink nylon insulation washers.

(7) Using a socket spanner, remove the defective diode.

Note . . .

To ease the removal of the diode, it is recommended that the diode and heat sink be heated in an oven to 65·5 deg. C. *or briefly immersed in hot water just below boiling point.*

(8) Ensure that the new diode is of the same polarity as the defective diode, and cut the diode lead with a hacksaw or diagonal cutters to give a diode overall length of 1·375 inches.

Caution . . .

Do not hold the diode case when cutting. Grip the diode at the cutting point with a pair of pliers. This will avoid stressing and internal damage.

(9) Lightly coat the threads of the new diode with silicon grease and with heat sink and diode at room temperature, install the diode in the socket. Tighten to a torque of 160–190 lb./in.

Note . . .

Since pipe threads are employed, the depth of penetration may vary from diode to diode.

(10) Locate heat sink insulation washers on securing screw bosses in end frame, install heat sink and secure with insulating washers, washers and screws.

(11) Fit the connecting clip on the diode lead, insert the flexible cable into the clip and crimp securely. Solder the clip to the cable and to the diode lead.

(12) Connect the flexible leads between each pair of diodes with the connecting clips, crimp securely and solder.

Caution . . .

Remove soldering iron from cables and leads as soon as possible, since excessive heat may damage the diode.

(13) Fit the three a.c. terminals and insulating washers into the frame sockets, fit the external insulators and brass washers and secure with the brass nuts.

(14) Fit the 'BAT' terminal with nylon insulators interposed between heat sink and frame, assemble nylon washer and plain washer on terminal and secure with brass nut.

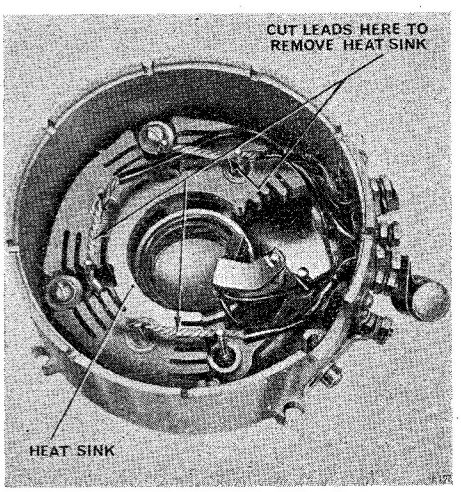

Fig. 3. Slip ring end frame

Replacing diode in end frame

16. If a diode in the end frame is found to be defective it should be replaced as follows:—

(1) Carry out operations (1) and (2) of para. 15.

(2) Heat the end frame and diode as specified for the heat sink, and remove defective diode with a socket spanner.

(3) Ensure that the new diode is of the same polarity as the defective diode.

(4) Carry out operations (9) and (11) of para. 15.

Replacing the brush assembly

17. If it is required to replace the brush assembly proceed as follows:—

(1) Remove the nuts, washers and insulators, and withdraw terminals F1 and F2 and their insulators from the slip ring end frame.

(2) Remove the retainer clip from the brush pivot pin.

(3) Remove the brush holders, springs and brushes.

(4) Fit a wave washer on the pivot pin.

(5) Fit one brush holder and brush, both springs and the other brush holder and brush on the pivot pin, ensuring that the looped ends of the springs bear upon the brush holders. Secure the assembly with the retainer clip.

Note . . .

The brush assembly must be fitted to the left of the pivot pin viewed from the outside of the slipring end frame.

(6) Fit the F1 and F2 terminals, insulators, washers and nuts.

Cleaning

18. Remove the loose dirt and dust from all components using clean dry compressed air and a small soft haired brush. All parts having insulation, insulating varnish or paint should be cleaned using lead free kerosine.

Assembling

19. When the defective item has been renewed the generator should be assembled as follows:—

(1) If the bearings have been removed, lubricate the bearings using grease XG/277 (Ref. No. 34B/9100514).

(2) Fit the slipring end bearing to the rotor shaft.

(3) Fit the drive end bearing in the drive end frame securing it in position with the retainer plate, three screws and spring washers. Wire lock the screws together and to the lugs on the retainer plate.

(4) For ease of assembly, mark the positions of the locating dowel holes on the outside of the end frames.

(5) To hold the brush assembly clear of the sliprings during assembly pass a piece of wire through an aperture in the end frame, under the brush holders and out at the grommet aperture. Twist the wire ends together.

(6) Locate the dowel in the stator frame with the dowel hole in the slip ring end frame and press together, ensuring that the rubber grommet on the stator cables is correctly located between the stator and end frame.

(7) Connect the stator cables to the three a.c. terminals on the end frame and secure with washers and nuts.

(8) Fit the bearing spacer on the drive end of the rotor shaft, locate the shaft in the drive end frame bearing and press in position ensuring that pressure is applied only to the bearing inner race.

(9) Locate the dowel in the stator frame with the dowel hole in the drive end frame, and locate bearing in slip ring end housing. Press the assembly together and secure the two end frames with the two through bolts and the ring plate, ensuring that terminal markings on ring plate correspond with terminal positions. Do not wire lock the bolts.

Note . . .

When the generator is fitted to the engine with the four large bolts, the two end frame bolts will require to be retightened before locking.

(10) Cut the wire holding the brushes and withdraw the wire from end frame.

(11) Fit the Woodruff key, gear hub, spring, gear drive assembly, washer and nut to the rotor shaft. Tighten the nut to 450–500 lb. in and secure with a new split pin.

Testing

20. The generator should be tested as detailed in the Appendix A.

Appendix A

STANDARD SERVICEABILITY TEST
for
GENERATOR, DELCO REMY, TYPE 1117086

Introduction

1. The following tests may be applied to the machine before it is put into Service, or at any time to determine its serviceability.

Test equipment

2. The following test equipment is required:

(1) Tester, generator MK5D.

(2) Balance, spring 0–4 lb. (Ref. No. 1H/97).

(3) Insulation resistance tester, Type C (Ref. No. 5G/152).

(4) Voltage regulator Part No. 9000591 (Ref. No. 5UC/7835).

Testing

3. Before mounting the generator on the test rig, check for freedom of rotating parts by turning the armature by hand.

Performance test

4. Run the generator over the speed range 3000–9000 rev./min. and ensure that the field current and output current are within the limits shown in Table 1.

Table 1

Speed	Output		Field current
Rev./Min.	Volts	Amps. (min.)	Amps. (max.)
3000	28	58	3·6
6000	28	71	3·6
9000	28	73	3·6

During this test, ensure that temperature of the cooling air at the exhaust end of the generator does not exceed 93·3 deg. C.

Note . . .

The generator must not be run on open circuit.

Insulation resistance test

5. Disconnect the three stator leads and test between the leads and frame and between terminals F1, F2 and frame using a 250V insulation resistance tester. A reading of not less than 50000 ohm should be obtained.

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