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Chapter 16

GENERATORS, ROTAX B2700 SERIES

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Introduction

1. The B2700 series of generators are driven by gearing from the aircraft engine, and serve as a power source for the aircraft electrical system in flight. Operating in conjunction with the voltage regulator, Type 94, the generator provides a constant voltage supply over a wide range of engine speeds.

DESCRIPTION

2. A typical generator is illustrated in fig. 1. It is a four-pole, shunt-wound machine, embodying interpoles and compensating windings. It is spigot mounted on the engine gearbox with a quick-release manacle ring fixing, and has a serrated shaft drive. The sectional view (fig. 2) shows the construction of the machine which consists essentially of a yoke, armature and two end frames.

Cooling

3. Blast cooling by air from the slipstream of the aircraft is employed. The air enters the machine through ports in the face of the commutator end frame and leaves through windows in the circumference of the driving end frame. These windows are protected by a wire mesh cover strap. The adjustable radial inlet duct is shown in fig. 1 but some machines are fitted with an axial type.

Yoke

4. The cylindrical yoke, housing the armature, carries the field system within its bore. The main pole and interpole pieces are bolted to the yoke, the bolt heads being let into its outer surface and locked by tab-washers.

5. The ends of the yoke are spigoted to take the commutator and driving end frames which are each secured by eight bolts. The driving end frame is additionally secured by nuts on four studs inserted in the yoke.

Note . . .

Some earlier versions of the machine are not provided with these studs.

Armature

6. The armature is supported in bearings mounted in the end frames, the serrated end of its shaft protruding through the driving end frame to engage with the engine gearbox. All connections are brazed and the windings are secured by shrunk steel banding rings. During manufacture, the complete armature is balanced by removing metal from the surface of these banding rings as required.

Commutator end frame

7. This end frame supports the brush gear and houses a roller bearing which is mounted on one end of the armature shaft. In addition to the cooling of air ports in the end face, the circumference of the frame is provided with four brush inspection windows which are normally enclosed by a cover band. This cover band is secured by a hook and wing nut fixing.

Roller bearing

8. The outer race of the bearings is a push fit within a lined boss cast integral with the end face of the frame. The race is positioned on

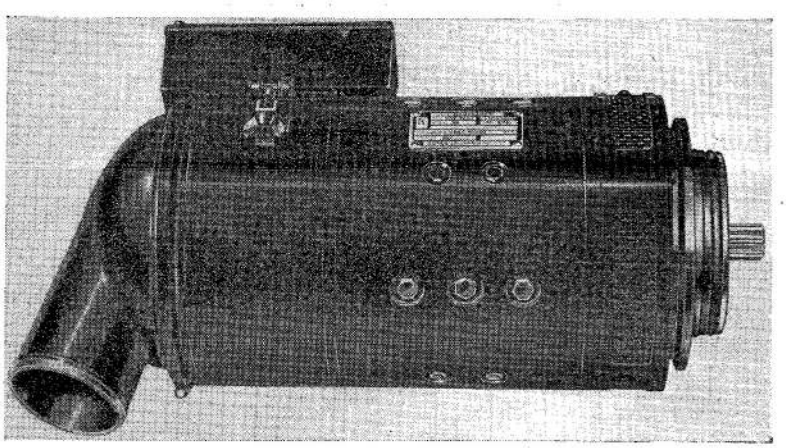

Fig. 1. Typical B2700 series generator

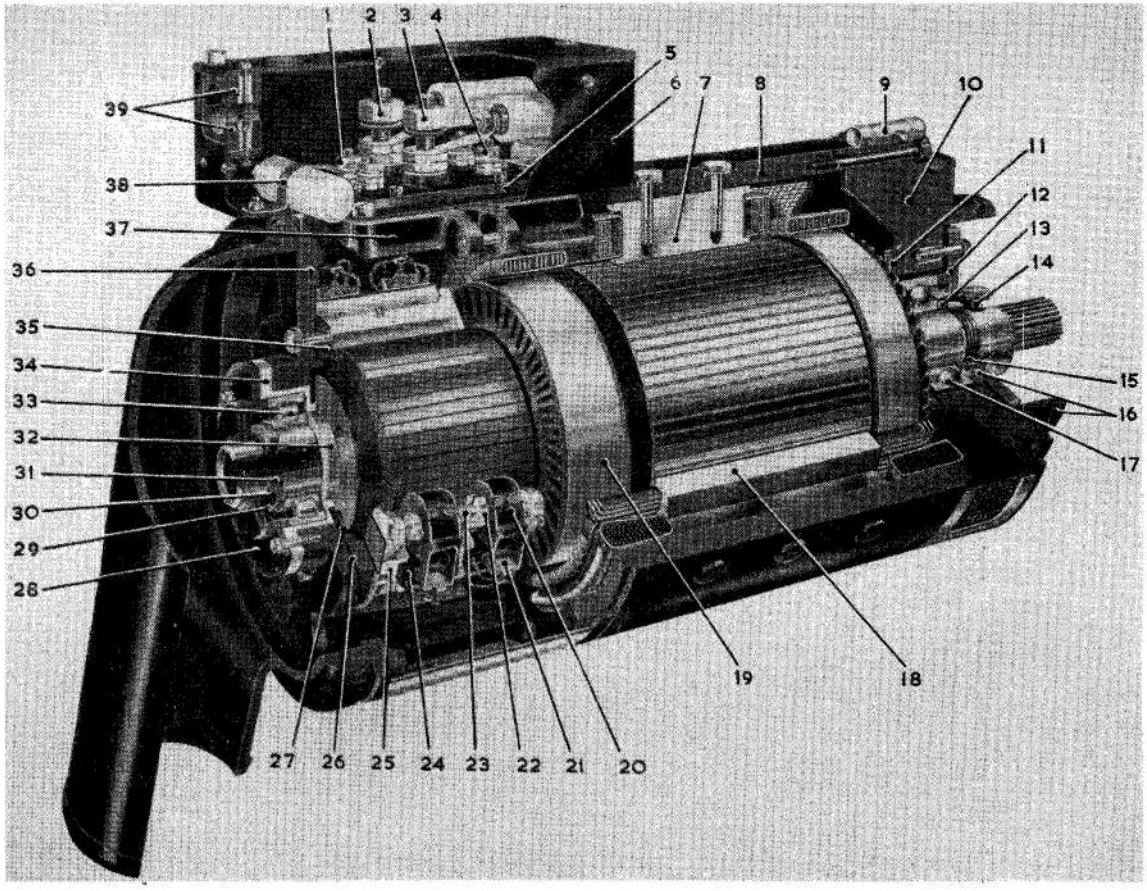

Fig. 2. Sectional view

1 FIELD TERMINAL (No. 5)
2 NEGATIVE OUTPUT TERMINAL (No. 2)
3 POSITIVE OUTPUT TERMINAL (No. 1)
4 EQUALISING TERMINAL (No. 3)
5 TERMINAL BLOCK
6 TERMINAL BOX
7 INTERPOLE PIECE
8 YOKE
9 WINDOW COVER STRAP
10 DRIVING END FRAME
11 RETAINING PLATE
12 OIL SEAL HOUSING
13 SPACER
14 OIL SEAL
15 CLAMPING NUT
16 SEALING RINGS
17 BALL BEARING
18 MAIN POLE PIECE
19 BANDING RING
20 BRUSH SPRING
21 TRIGGER
22 SLEEVE
23 MOUNTING SPINDLE
24 SPLIT BRUSH
25 BRUSH BOX
26 INSULATING RING
27 INSULATION
28 BEARING CAP
29 FELT SEAL
30 CIRCLIP
31 WASHER
32 SPACER
33 ROLLER BEARING
34 LINER
35 BRUSH BOX CARRIER RING
36 COMMUTATOR END FRAME
37 SADDLE
38 CAPACITOR AND CLAMP
39 CABLE CLAMPING CLEATS

the commutator side by an internal flange on the liner, and on the external side by the spigot of a bearing cap which is bolted to the end face boss. The inner race is an interference fit on the armature shaft and is separated from the end of the commutator by a circular spacer. A washer and a circlip are mounted on the shaft at the other side of the race. The washer is an interference fit on the shaft which is grooved to take the circlip.

9. Escape of the bearing lubricant is prevented on the commutator side by the flange of the liner, and between the bearing cap and the shaft by a felt seal which is positioned within the cap by a retaining washer and circlip. The felt seal also serves to protect the bearing from grit and dirt in the blast of cooling air.

Brush gear

10. The brush gear consists of four brush boxes, each containing a pair of split brushes, arranged at right-angles around the periphery of the commutator. Each brush box is attached to a steel carrier ring by a pair of bolts, a ring of insulating material being interposed between the carrier ring and the boxes. The bolts are insulated from the ring and box by bushes and mica washers, and are secured on the box side by staked nuts. The ring, which is recessed to accommodate the bolt heads, is mounted on a spigot on the end face of the frame and is secured by four screws. The end face is slotted to take these screws, thus permitting up to 10 deg. overall adjustment of the brush gear position.

11. Projecting from the ends of each brush box are a pair of lugs which support the spindle carrying the two brush springs. The spindle is secured within one of the lugs by a split pin. Each spring is housed within the body of a trigger, the arm of which bears on the split brush. The trigger is mounted on a sleeve surrounding the spindle, this sleeve anchoring one end of the spring coil. On one side of the trigger, the extended sleeve is drilled to take a split pin which passes through the spindle. Four holes are provided in the sleeve so that the position of the trigger relative to the spindle may be adjusted to give the specified brush spring pressure. A collar on the other side of the sleeve is provided with a screwdriver slot to facilitate this adjustment.

12. The pairs of positive and negative brush boxes are each linked by a taped strap connector, the ends of which are brazed to a terminal strip which is secured to the brush by a csk/hd. screw, and by two ch/hd. screws. These latter screws also secure terminal tags, to each of which are brazed the pair of pigtails from a split brush. On one positive and one negative brush box, these screws also secure a second terminal strip, to which is brazed the connection to the series field windings.

Driving end frame

13. This end frame is cast to provide a housing for the ball bearing which supports the driving end of the armature, and also to form the mounting spigot. The circumference of the spigot is grooved to take a rubber sealing ring which prevents leakage of oil from the engine gearbox. When mounted, a dowel pin on the gearbox mates with a hole drilled in the end face of the casting.

Ball bearing

14. Within the housing, the ball bearing is positioned between a retaining plate and oil seal housing. The retaining plate is on the inner side of the bearing and also forms the bearing lining; inside the spigot, the oil seal housing and its sealing ring are secured to the end frame by four bolts. The housing locates an oil seal around the armature shaft, by which means oil from the engine gearbox is prevented from entering the bearing and diluting the grease.

Note . . .

The sectional view in fig. 2 shows an earlier design, where the retaining plate did not form the bearing lining; it was secured to the end frame by four ch/hd. screws, the heads of which were fully let into the casting and were accessible after removal of the oil seal housing.

15. Within the oil seal housing, the bearing is held against a step in the shaft by a clamping nut which bears on a spacer interposed between it and the bearing. A portion of the shaft is threaded to take this nut, and is also axially grooved to accommodate the tongue of a tab-washer which locks the nut.

Terminal box

16. The ends of the cover strap, enclosing the brush inspection windows, are attached by a hook and wing nut fixing to a saddle which is seated on the circumference of the commutator end frame and secured by four csk/hd. screws. The rectangular terminal box is mounted on the saddle, and both these items are cut away to accommodate an insulating terminal block

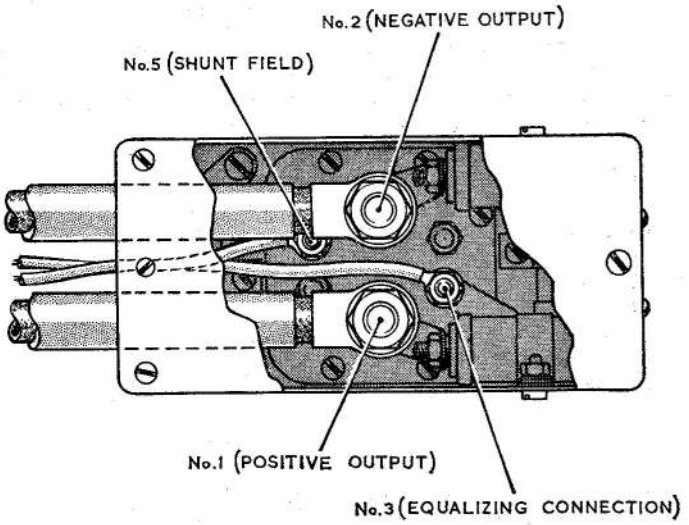

Fig. 3. Terminal connections

which carries the generator terminals. The box and block are each secured to the saddle by four ch/hd. screws.

17. Four interference suppression capacitors are mounted in clamps within the terminal box, these clamps being attached to the box by pairs of ch/hd. screws. Connecting strips link the generator terminals to their respective capacitors.

18. At the commutator end of the machine, the terminal box is cut away to provide a cable entry. The cables are clamped between a pair of moulded cleats, one attached to a bracket riveted to the box, and one to the box cover, the attachment being by means of a single, centrally disposed ch/hd. screw. When inserted, the cables are clamped between the cleats by a pair of fixed screws and captive nuts, these latter also serving to secure the cover. At the driving end of the terminal box, the cover is secured by a single quick-release fastener.

Connections

Terminal connections

19. The terminal arrangement is shown in fig. 3. Terminals 1 and 2 are the positive and negative generator output terminals respectively, and 5 is the positive shunt field terminal. The equalizing connection (para. 24) is made to terminal 3, and the lead, together with that from the field terminal, passes through the small central aperture in the cleats.

Note . . .

The terminals marked "4" are not to be used, and no connection should be made to them.

Internal connections

20. The generator circuit diagram is shown in fig. 4. On the machine, the connecting leads

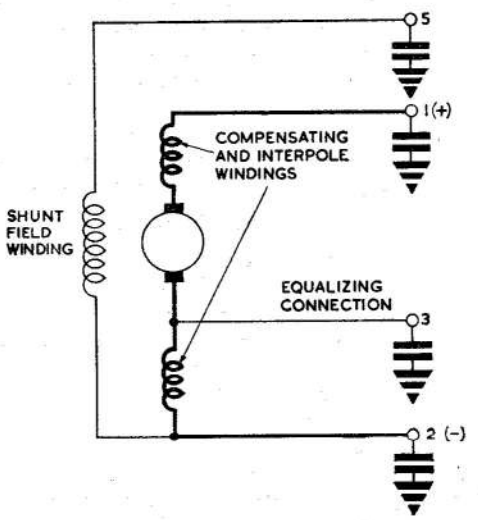

Fig. 4. Generator circuit diagram

to the field system are brazed to the ends of the terminal studs which project beneath the terminal block. The connections to the brush boxes are referred to in para. 12. Terminal 3 is internally connected by a lead to one of the securing screws on that negative brush box which is nearest to the terminal box. Looking at the commutator end of the machine, this brush box is below and to the left of the terminal box.

INSTALLATION

21. Before installing the generator, ensure that the direction of rotation, as indicated on the name-plate, is suitable for the engine gearbox. Remove the protecting ferrule from the shaft end and examine the serrations for damage. Ensure that an oil seal is fitted and mount the generator on the gearbox, aligning the dowel on the latter with the corresponding recess in the end face of the driving end frame. Then secure the manacle fixing.

Note . . .

If the generator is to be used in conjunction with a Rotol drive gearbox, it is essential to examine the generator shaft to ascertain whether a 3/8 in. B.S.F. or unified bolt is fitted into the gearbox end of the shaft. If a bolt is fitted, it must always be removed before the generator is fitted to the gearbox, as otherwise serious damage may be caused to the gearbox.

22. Remove the protection cover from the commutator end frame by loosening the screw securing the clamp ring, and fit the inlet duct. The radial type should be positioned to suit the arrangement of the air pipe before tightening the clamp ring securing screw. Connect the cables to the terminals and secure the terminal box cover.

Note . . .

At the commutator end of the terminal box, the two outer screws both secure the cover and clamp the cables. The small central screws secures the upper cleat and should not be touched when fixing the cover.

OPERATION

23. The generator will normally form part of an aircraft supply system, comprising two or more generators, each driven by a separate engine, and feeding a common bus-bar. The power system incorporates voltage regulating circuits, each generator working in conjunction with a Type 94 voltage regulator. By this means, the generator terminal voltage is maintained at a value of 28 volts ($\pm$ 2.5 per cent) at all loads up to its rated maximum and over a speed range of 2,860–10,000 r.p.m.

24. To ensure that the total load of the system is shared equally between all the generators, an equalizing circuit is employed. The voltage appearing at terminal 3 of the generator (fig. 4) is proportional to the load and an equalizing connection is made from this terminal to the voltage regulator. Full details of the system may be obtained from A.P.4343, Vol. 1, Sect. 2, Chap. 5.

SERVICING

25. Information on servicing, common to all d.c. generators, is to be found in A.P.4343, Vol. 1, Sect. 2, Chap. 1. The following paragraphs should be read in conjunction with that chapter and with the relevant Servicing Schedule.

26. To examine the machine, the air pipe should be disconnected and the inlet duct removed. The cover straps at the commutator and driving ends should also be removed, together with the terminal box cover.

27. Clean and examine the frame, commutator, and brush gear, ensuring that all nuts, bolts, screws, and locking devices are secure. Check the insulation of all connecting leads and straps for damage or deterioration, and ensure that the connections are tight. When replacing the cover straps, examine them for distortion and renew if necessary.

Oil seal

28. If the machine is to be run on the test bench, either for brush bedding purposes or for testing, it is recommended that the oil seal should first be removed, since under these conditions the seal is not adequately lubricated. Under normal conditions the seal is in contact with the oil in the engine gearbox.

29. When the oil seal is to be removed, the serrations on the armature shaft should first be covered with tape, transparent, water-proof, colourless, adhesive (Ref. No. 32B/997). The tape should be wound on commencing at the extremity of the shaft. The layer of the tape prevents the seal being damaged when drawn over the serrations. The procedure for removing the seal is then as follows :—

(1) Ease off the tabs on the locking washers and remove the four 2 B.A.

hex/hd. bolts securing the oil seal housing to the driving end frame.

(2) Carefully withdraw the housing over the taped serrations and off the shaft.

(3) Remove the retaining circlip and press the seal out of its recess in the housing.

(4) Replace the housing and its gasket and tighten the bolts before running the machine.

30. When all test bench runs have been completed, the oil seal should be examined for signs of wear or damage and renewed if necessary. To fit the oil seal, the serrations should first be re-wound with tape, but this time commencing from the bearing side, and the shaft should be lightly greased. The seal should then be eased on to the shaft and pressed into its recess in the housing, and the circlip inserted. The seal is the correct way round when the coiled spring band, inserted in the seal, is visible from the driving end of the machine.

Brushgear

31. The minimum permissible brush length is 0.562 in., measured along the long side. Brushes should be renewed at periods prescribed in the relevant Servicing Schedule, and whenever examination reveals that they will not remain serviceable for the period that must elapse before the next servicing. Check that brushes slide freely in their boxes.

Bedding

32. When new brushes are fitted, they must be bedded on the commutator over their full circumferential thickness for at least 80 per cent of their axial width.

The preliminary bedding procedure is described in A.P.4343, Vol. 1, Sect. 1, Chap. 2. Final bedding may be achieved in two stages, as follows :—

(1) Preliminary bedding with the machine motoring on the test bench. A 28-volt d.c. supply should be connected to the output terminals, the positive supply lead to terminal 1 and the negative to terminal 2. The positive lead should also be connected to the shunt field terminal 5. A variable resistor should be connected in series with the shunt field so that the speed may be adjusted to about 6,000 r.p.m.

(2) Final bedding with the machine driven as a generator by a generator test bench in the Mk. 5 series. The speed should be adjusted to 6,000 r.p.m. and the output to 100 amp. at 28 volts.

33. Throughout both stages of the bedding run, the machine must be cooled by air supplied by an air blower, Type D (Ref. No. 5A/4124). The air must be blown into the machine through the inlet duct fitted to the commutator end frame.

Spring pressure

34. The pressure of each brush spring trigger should be checked to ensure that it lies between 23 oz. and 29 oz. when the trigger is parallel to the top of the brush box. The measurement may conveniently be carried out if a small length of wire, hooked to engage under the end of the trigger where it bears on the brush, is attached to a suitable pull-type spring balance.

35. Should a spring pressure be incorrect, an adjustment may be made as follows :—

(1) Insert a screwdriver into the slot provided at one end of the trigger sleeve and take the pressure off the spindle.

(2) Remove the split pin from the other end of the sleeve and rotate the sleeve in the required direction until the next hole in the sleeve is aligned with the hole in the spindle.

(3) Insert the split pin and re-check the spring pressure, repeating this procedure until the pressure is brought within the specified limits.

Fitting of new brush springs

36. To fit new brush springs, proceed as follows :—

(1) Remove the split pin locking the brush box spindle to the brush box. The tension will now have been removed from the brush triggers.

(2) Remove the split pin locking the trigger sleeves to the spindle. The spindle may now be withdrawn from the brush box and brush spring triggers.

(3) Push out the sleeve from the trigger assembly; the brush spring may now be removed from the assembly.

(4) Insert a new brush spring in the trigger and refit the sleeve, ensuring that the tongue of the spring locates in one of the two slots in the sleeve.

(5) Reassemble the trigger assemblies in the brush boxes and refit the spindle, relocking it with a new split pin.

(6) Fit a $\frac{1}{4}$ in. B.S.F. spanner over the hex/hd. end of one of the sleeves, rotating the spanner to increase the spring tension. Fit a new split pin through the hole in the spindle and a corresponding hole in the sleeve, but do not lock it.

(7) Check and adjust the spring pressure as described in para. 34 and 35.

(8) Repeat (6) and (7) for the other trigger assembly. Lock both split pins when satisfactory.

Bearings

37. The bearings are lubricated only when the generator is dismantled. Both are lubricated with grease XG-271, and should be packed to one third of their capacity.

38. To dismantle the machine for access to the bearings, proceed as follows :—

(1) Stand the machine on its commutator end, using wooden blocks to support it. Mark the driving end frame to ensure correct replacement, then unlock and remove the four $\frac{1}{4}$ in. B.S.F. nuts, and the eight 2 B.A. bolts which secure the driving end frame to the yoke.

(2) Using a hide-faced hammer, gently and evenly tap the driving end frame clear of the yoke and withdraw the end frame together with the armature from the yoke assembly, taking care not to damage the commutator surface by fouling the brush boxes or pole pieces.

(3) Unlock and remove the four 2 B.A. bolts securing the oil seal housing to the driving end frame and withdraw the housing, complete with the oil seal and its sealing ring from the shaft.

(4) Unlock and remove the bearing clamping nut and slide the nut and locking washer off the shaft. Collect the spacer, and remove the drive end frame complete with the ball bearing from the armature shaft. The ball bearing may now be removed from the drive end frame.

(5) Remove the circlip from the commutator end of the armature shaft and collect the washer. The inner race of the roller bearing may be withdrawn from the armature shaft using a suitable extractor. Collect the spacer.

(6) Unlock and remove the four bolts securing the bearing cap to the commutator end frame and lift off the cap. The felt seal and retaining washer within the bearing cap may be removed by first withdrawing the circlip. Remove the outer race of the roller bearing from the commutator end frame.

TESTING

39. The following paragraphs describe the full testing procedure for generators in the B2700 series. If the serviceability of a machine is at any time suspect, it may be subjected to the standard serviceability test as laid down in Appendix A.

40. The generators should be driven by a generator test set in the Mk. 5 series, as described in A.P.4343S, Vol. 1, Book 2, Sect. 13. For prolonged runs, the oil seal, if fitted, should first be removed.

41. For all running tests, cooling air supplied by an air blower, Type D (Ref. No. 5A/4124), must be blown into the machine through the inlet duct fitted to the commutator end frame. In addition, care should be taken to ensure that the duration of a test run on full-load is kept as short as possible.

42. The armature should first be revolved by hand to ensure that it does not foul any leads or fixed parts of the machine. Rotation should be smooth, and the end play in the bearings should not be excessive. Slight radial play which can just be felt by hand is permissible. The machine should also be observed for undue vibration during the following running tests.

Minimum load test

43. A Type 94 voltage regulator, which has previously been tested for correct operation, should be used in conjunction with the generator for this test. Reference may be made to A.P.4343B, Vol. 1, Book 1, Sect. 1, Chap. 31 for details of this regulator.

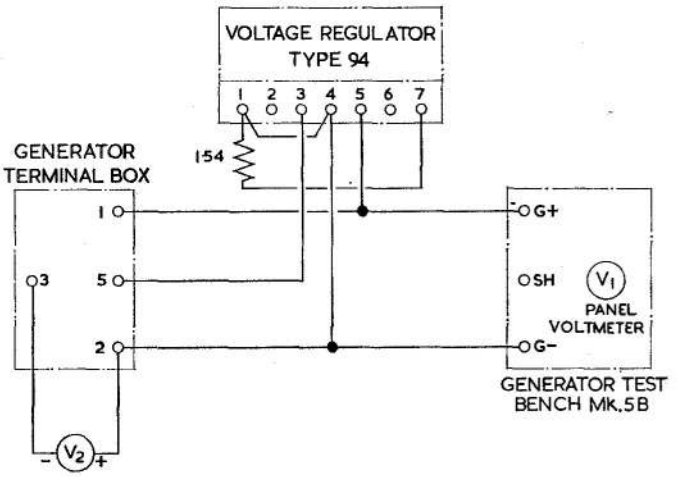

Fig. 5. Test circuit diagram

44. The test should be carried out with the generator mounted on the test bench and connected as shown in the test circuit diagram (fig. 5). An external trimmer resistance, set to 1.54 ohms, is connected between terminals 1 and 7 of the voltage regulator. The voltmeter V1 on the d.c. panel of the test bench should be switched to the 0-40 volt range. This voltmeter will record the voltage across terminals G+ and G— i.e., the regulated terminal voltage of the generator. A suitable millivoltmeter V2 is connected across terminals 2 and 3 of the generator, with its polarity as shown in the diagram. Before commencing the test, the fixed load resistor in the test bench should be switched out and the variable load rheostat adjusted to the minimum-load position.

45. Run the generator in the correct direction of rotation at a speed of 2,860 r.p.m., and observe the readings of meters V1 and V2. If the polarity of the generator is correct, positive readings will be obtained as the voltage builds up.

46. The terminal voltage of the generator (voltmeter V1) should build up without hesitation to between 27.5 and 28.5 volts. The millivoltmeter (V2) should give a reading of between about 60mV and 100mV.

47. If positive readings are not obtained, check all connections and ensure that the direction of rotation is correct. Should the polarity prove to be incorrect, or the generator fail to build up, the poles must be re-magnetized.

Re-magnetizing

48. To re-magnetize the poles, disconnect the test set circuit, and connect a 6-volt battery in series with a single-pole quick-break switch across the generator field terminals. The positive battery lead must be connected to the generator terminal 5, and the negative lead to terminal 2 on the generator. Using the switch make and break the circuit once only to magnetize the poles. Repeat the test in para. 45 to ensure that the machine has been correctly magnetized.

Full-load tests

Minimum speed

49. For this test, the voltage regulator is replaced by a resistance of 0.7 ohm (rated at 10 amp.), connected between generator terminals 1 and 5, and millivoltmeter V2 is disconnected. Run the generator at 2,860 r.p.m., switch in the fixed load resistor in the test bench, and adjust the variable load rheostat until the load current indicated by the test bench meter is 200 amp. With these values of speed and load, ensure that the terminal voltage of the generator is not less than 27.5 volts (voltmeter V1). Also check that there is no more than pin-point sparking at the brushes.

Maximum speed

50. Re-connect the voltage regulator according to the test circuit diagram (omitting the millivoltmeter V2) and run the machine at 10,000 r.p.m. with the load current adjusted to 200 amp. Under these conditions ensure that the terminal voltage of the generator is within the range 27.5—28.5 volts, and again check that there is no more than pin-point sparking at the brushes.

Insulation resistance

51. With the machine hot from the full-load test, disconnect the interference suppression capacitors and then measure the insulation resistance between the generator terminals and the frame, using the standard 250-volt insulation resistance tester (Ref. No. 5G/152). The reading obtained should not be less than 50,000 ohms.

Note . . .

The capacitors are not designed to withstand test pressures in excess of 150 *volts, and it is for this reason that they must be disconnected before using the insulation resistance tester.*

Appendix A

STANDARD SERVICEABILITY TEST FOR GENERATORS, ROTAX, B2700 SERIES

Introduction

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

Test equipment

2. The following test equipment is required:—

(1) Tester, generator—one in the Mk. 5 series.

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

(3) Bridge megger tester, Type B (Ref. No. 5G/1708).

(4) Insulation resistance tester, Type C (Ref. No. 5G/152) (for R.A.F.) or Type 0557/A.P.5047 (for R.N.).

Note . . .

If the oil seal is in position during testing, care should be taken to ensure that it is adequately lubricated with the appropriate grade of engine oil. Adequate cooling should also be provided.

Testing

3. Before mounting the generator on the test set, check for freedom of rotating parts by turning the armature by hand. There should be no excessive end play in the bearings; a slight radial play which can just be felt by hand is permissible.

Brushgear

4. Check the brush length and brush spring pressure; the brush length should not be less than 0.562 in., and the spring pressure should lie between 23 and 29 oz.

Resistance of windings

5. With the machine cold, the resistances of the shunt field winding and the negative half of the compensating and interpole windings should be measured and corrected to 20 deg. C. The former is measured between terminal 5 and terminal 2 and should lie between 1.41 and 1.49 ohm. The latter should be measured between the negative brush and terminal 2 and should lie between the following values :—

Type	*Rotation*	*Resistance value (ohms)*
517 (Rotax B2701/1)	Anti-clockwise	0.0083 and 0.0090
517 (Rotax B2702/1)	Clockwise	0.0088 and 0.0095
B2704	Clockwise	0.0088 and 0.0095
B2705	Clockwise	0.0088 and 0.0095
B2706	Anti-clockwise	0.0083 and 0.0090
B2708	Clockwise	0.0088 and 0.0095

Polarity

6. Run the generator in the correct direction of rotation, as indicated above, with a suitable voltmeter across the output terminals. The meter reading should confirm the terminal markings.

Performance

7. With the generator connected to the test set, run up on no load to approximately 2,860 r.p.m. There should be no hesitation in build-up, and the correct voltage should be attained.

8. Run at the same speed on half load (100 amp.) for 10 min. During this run, there should be no more than pin-point sparking at the brushes. At the end of the test the brushes should still slide freely in their boxes.

Insulation resistance

9. With the machine still warm and the suppression capacitors disconnected, the insulation resistance, measured with a 250-volt insulation resistance tester between all live parts and the frame, should not be less than 0.05 megohm.

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Appendix B

STANDARD SERVICEABILITY TEST FOR AXIAL BLOWER, ROTAX, TYPE ZA11001

Introduction

1. The following tests may be applied to the unit before it is put into service, or at any time when its serviceability is suspect.

Test equipment

2. The following test equipment is required:—

(1) Generator test set—one in the Mk. 5 series.

(2) Generator, Type B2708.

Testing

3. Before the blower is mounted on the test set, check for freedom of rotating parts by turning the rotor by hand. There should be no excessive end play in the bearings; a slight radial play which can just be felt by hand is permissible.

Performance

4. The generator should be mounted on the test set, and the axial blower coupled to the splined shaft. When the generator is driven over the speed range of 2,860–10,000 r.p.m., the blower should run smoothly with no signs of fouling of the blades nor undue vibration.

Appendix 1

GENERATOR, TYPE 517 (ROTAX B2701/1)

LEADING PARTICULARS

Generator, Type 517 (Rotax B2701/1)	*Ref.No.5UA/6087*
Output	*30 volts d.c., 200 amp., 6 kW*
Speed range	*2,860 - 10,000 r.p.m.*
Rotation (viewed from drive end)	*Anti-clockwise*
Brushes -	
Grade	*PEG. 11*
Minimum length	*0.562 in.*
New length	*0.895 in. (approx.)*
Spring pressure	*23 - 29 oz. (652 - 822 gm.)*
Commutator -	
Diameter (new)	*2.800 ± 0.005 in.*
Diameter (minimum permissible)	*2.675 in.*
Maximum permissible eccentricity	*0.0005 in.*
Maximum bar-to-bar variation	*0.0001 in.*
Voltage regulator	*Type 94 (Ref.No.5UC/5937)*
Regulated voltage	*28 volts ± 2½ per cent*
Weight	*61.25 lb.*

1. This generator is identical with that described and illustrated in the main chapter. The rotation is anti-clockwise when viewed from the driving end.

Appendix 2

GENERATOR, TYPE 517 (ROTAX B2702/1)

LEADING PARTICULARS

Generator, Type 517 (Rotax B2702/1)	*Ref.No.5UA/6088*
Output	*30 volts d.c., 200 amp., 6 kW*
Speed range	*2,860 - 10,000 r.p.m.*
Rotation (viewed from drive end)	*Clockwise*
Brushes -	
Grade	*PEG.11*
Minimum length	*0.562 in.*
New length	*0.895 in. (approx.)*
Spring pressure	*23-29 oz. (652 - 822 gm.)*
Commutator -	
Diameter (new)	*2.800 in. ± 0.005 in.*
Diameter (minimum permissible)	*2.675 in.*
Maximum permissible eccentricity	*0.0005 in.*
Maximum bar-to-bar variation	*0.0001 in.*
Voltage regulator	*Type 94 (Ref.No.5UC/5937)*
Regulated voltage	*28 volts ± 2½ per cent*
Weight	*61.25 lb.*

1. This generator is identical with that described and illustrated in the main chapter. The rotation is clockwise when viewed from the driving end.

Appendix 3

GENERATOR, ROTAX, TYPE B2704

LEADING PARTICULARS

Generator, Type B2704	*Ref.No.5UA/*
Output	*30 volts d.c., 200 amp., 6 kW*
Speed range	*2,860 - 10,000 r.p.m.*
Rotation (viewed from drive end)	*Clockwise*
Brushes -	
Grade	*PEG.11*
Minimum length	*0.562 in.*
New length	*0.895 in. (approx.)*
Spring pressure	*23 - 29 oz. (652 - 822 gm.)*
Commutator -	
Diameter (new)	*2.800 in. ± 0.005 in.*
Diameter (minimum permissible)	*2.675 in.*
Maximum permissible eccentricity	*0.0005 in.*
Maximum bar-to-bar variation	*0.0001 in.*
Voltage regulator	*Type 94 (Ref.No.5UC/5937)*
Regulated voltage	*28 volts ± 2½ per cent*
Weight	*61.25 lb.*

1. The generator, Type B2704, is similar to that described and illustrated in the main chapter except that a new armature has been fitted. The armature shaft is serrated internally at the commutator end to accept the male drive of an associated axial blower, designed to provide fan cooling for the unit.

2. A flame trap has also been introduced at the drive end of the unit, to replace the free air outlet cover illustrated in fig.1 of the main chapter.

Appendix 4

GENERATOR, ROTAX, TYPE B2706

LEADING PARTICULARS

Generator Type B2706	Ref.No.5UA/
Output	30 volts d.c., 200 amp., 6 kW
Speed range	2,860–10,000 r.p.m
Rotation (viewed from drive end)	Anti-clockwise
Brushes –	
Grade	H.A.M. EG.11
Minimum length	0.562 in.
New length	0.895 in. (approx.)
Spring pressure	23–29 oz. (652–822 gm.)
Commutator -	
Diameter (new)	2.800 ± 0.005 in.
Diameter (minimum permissible)	2.675 in.
Maximum permissible eccentricity	0.0005 in.
Maximum bar-to-bar variation	0.0001 in.
Voltage regulator	Type 94 (Ref.No.5UC/5937)
Regulated voltage	28 volts ±2½ per cent
Weight	61.25 lb.
Altitude	20,000 ft.

1. This generator is similar to that described and illustrated in the main chapter. It is identical to the B2701/1, except that low altitude brushes *(Grade H.A.M. EG.11) have been introduced.*

Appendix 5

GENERATOR, ROTAX, TYPE B2708

LEADING PARTICULARS

Generator, Type B2708	Ref. No. 5UA/7552
Rotation	Clockwise (from driving end)
Rated output	28 volts d.c., 200 amp.
Rated voltage	28 to 30 volts d.c.
Speed range	2,860 to 10,000 r.p.m.
Regulated voltage	28 volts ± 2.5 per cent
Brushes–	
Grade	P.E.G. 11
Minimum length	0.562 in.
New length	0.895 in. (approx.)
Spring pressure	23–29 oz. (652–822 gm.)
Commutator–	
Diameter (new)	2.800 ± 0.005 in.
Diameter (min. permissible)	2.675 in.
Maximum permissible eccentricity	0.0005 in.
Maximum bar-to-bar variation	0.0001 in.
Weight	61.25 lb.

1. The B2708 generator is identical to that described and illustrated in the main chapter, except that new commutator and drive end frames, together with a new armature, have now been introduced. The armature shaft is serrated internally at the commutator end to accept the male drive of an associated axial blower designed to provide fan cooling for the unit.

2. Four flame traps have also been introduced at the drive end of the unit to replace the free air outlet cover illustrated in fig.1 of the main chapter. The commutator end frame has been re-designed to accommodate the axial blower, Type ZA11001, which is used with the B2708 generator.

3. Electrical details for the B2708 generator are identical to that described in the main chapter, to which reference should be made when testing and servicing is to be carried out.

4. For mounting details reference should be made to the installation drawing (fig.1).

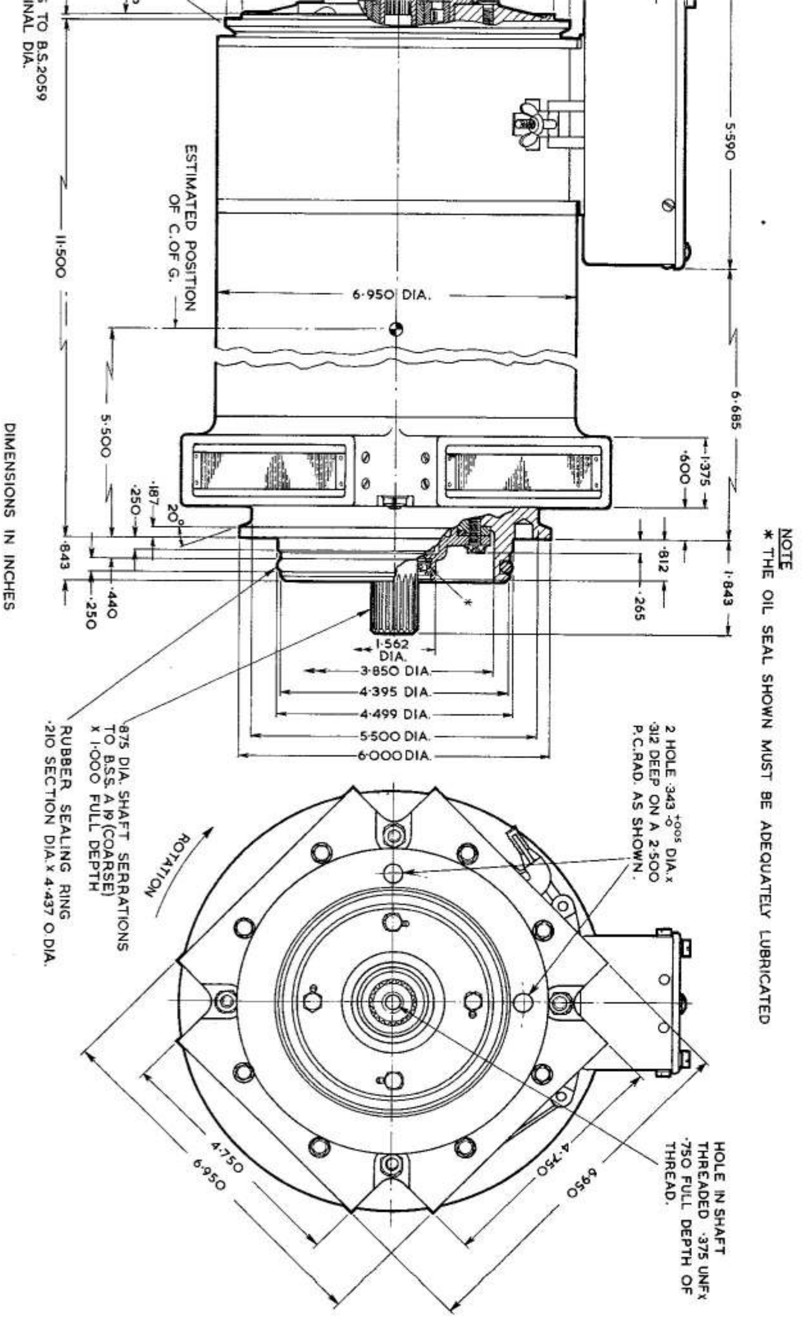

Fig.1 Installation details of generator, Type B2708

Appendix 5A

AXIAL BLOWER, ROTAX, TYPE ZA 11001

(as fitted to Generator, Type B2708)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Axial blower, Type ZA 11001 ... ... *Ref. No. 5UA/7220*

Blower performance—

(1) *At altitude* 40,000 *ft., 7500 r.p.m., temperature* 15 *deg. C ambient. Mass flow* 5·7 *lb./min., head* 6·0 *in. w.g.*

(2) *At ground level,* 7500 *r.p.m., temperature* 90 *deg. C ambient. Mass flow* 23.0 *lb./min., head* 15·2 *in. w.g.*

Input ... ... 1·2 *H.P.*

Rotation (viewed from D/E) ... ... *Clockwise*

Performance of blower (attached to B 2708 *generator with flame traps) at* 20 *deg. C. ambient temperature at ground level.*

Speed (r.p.m.)	*Volumetric flow (cu. ft./min.)*	*Pressure head across blower and generator (in. w.g.)*
3000	50	1·3
5000	82	3·0
7000	121	6·3
9000	145	8·1
11000	168	8·9

Overall dimensions—

Blower only—

Length ... ... 6·080 *in.*

Diameter over bosses ... ... 7·150 *in.*

Diameter of locating spigot ... ... 6·687 *in.*

Generator and axial blower coupled together—

Length excluding airspout ... ... 19·030 *in.*

Width ... ... 6·568 *in.*

Height ... ... 9·034 *in.*

Weight (blower only) ... ... 6·5 *lb.*

Introduction

1. The ZA 11001 axial blower is designed specifically for use with the B2708 generator, via the splined bushed shaft end, to supply cooling air at ground level for the generator. Both machines are designed to operate over a speed range of 2860–10000 r.p.m. at an ambient temperature range of −65 deg. C to +90 deg. C and at altitudes up to 40000 ft.

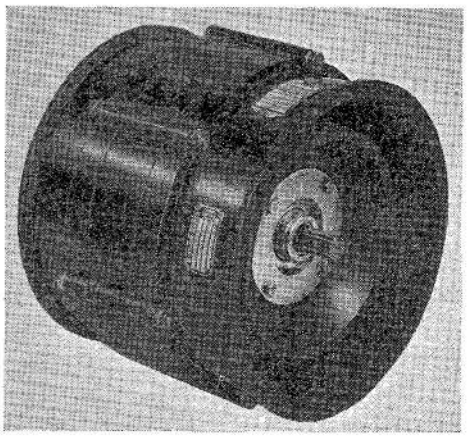

Fig. 1. Type ZA 11001 axial blower (air outlet)

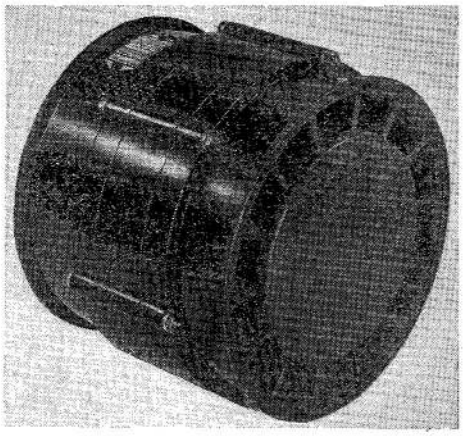

Fig. 2. Type ZA 11001axial blower (air inlet)

DESCRIPTION

2. The blower comprises basically an external stator frame, and an internal rotor fan mounted on a hollow shaft. The stator frame embodies three magnesium alloy shells bolted together, and the fan consists of two rotor blades carried on a hollow shaft, which is supported by a ballrace at each end.

3. The rotor fans are driven via a quill shaft which is splined at both ends, one end being located in the internal spline of the hollow rotor shaft, and the other end being coupled to the internally splined bushed shaft-end of the generator.

Operation

4. The quill shaft drive of the axial blower engages the armature shaft splined bush of the generator armature, and supplies the cooling air to the generator at ground level.

5. Sufficient air is supplied through the axial blower to obtain full load conditions throughout the speed range of the generator without overheating.

6. The rotor blades are spaced at either side of the recovery stator, to produce a mass air flow proportional to the revolutions per minute of the axial blower over the speed range of 2860 to 10000 r.p.m.

INSTALLATION

7. The generator and the axial blower are each designed for spigot mounting and manacle ring fixing at both ends, the generator being mounted at the drive end with the axial blower coupled to it at the commutator end.

8. These mounting arrangements are designed to withstand an acceleration of 25g. The machines may be mounted together on any axis, by the aircraft manufacturers mounting arrangements.

SERVICING

9. The axial blower should be given a visual inspection for freedom from damage.

Testing

10. If the serviceability of the blower is suspect, it may be tested as laid down in Appendix B.

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