Chapter 31

GENERATOR, TYPE 527A

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LEADING PARTICULARS

Generator, Type 527A (Type AE2505 Style 3)	*Ref. No. 5UA/8330*
Rated output	12 kW
Current	400A
Voltage, terminal	30V
Voltage, nominal	28V
Speed range	2850 *to* 8550 *rev/min*
Rotation, viewed at driving end	*Clockwise*
Rating	*Continuous*
Cooling	*Blast air, pressure of 6 in. head of water*
Altitude, maximum	25000 *feet*
Minimum operating temperature	−30 *deg. C*
Brush length, new, measured on long side	1·328 *in.*
Brush length, minimum measured on long side	0·925 *in.*
Brush grade	*PEG* 11
Commutator diameter	
New	4·020-0·010 *in.*
Minimum	3·940 *in.*
Brush spring pressure, red springs	46¼ *to* 50 *oz.*
Brush spring pressure, green springs	50 *to* 53¾ *oz.*
Weight	116 *lb.*
Voltage regulator	*Type 50A (Type 7307 Style 2)*

Introduction

1. The d.c. generator Type 527A is a unidirectional machine, which, when used in conjunction with the voltage regulator, Type 50A, provides a constant output over a wide range of engine speeds.

DESCRIPTION

General

2. The generator is a four pole compound wound machine which has an armature assembly rotating in bearings housed in the drive end (d.e.) and tail end (t.e.) endplate assemblies. The machine is electrically suppressed by capacitors and cooled by blast air which flows through the machine. A manacle flange and four lugs provide the means of fixing the generator on associated equipment, which drives the generator via serrations integral with the d.e. of the armature shaft. The lugs may also be used to facilitate transit of the machine.

Frame and terminal block assembly

3. The rolled and welded steel frame houses the field windings and ferry ring. Mounted on the frame is the terminal box which houses five suppression capacitors, moulded terminal block and four grommets. Cable entry into the terminal box is via the grommets.

Armature and bearing assembly

4. Housed within the laminated armature core is the retrogressive wave wound winding, the ends of which terminate in the commutator fitted to the t.e. of the armature. The armature rotates in flanged roller and ball bearings which are supported in the endplate assemblies and positioned on the armature shaft by a locknut and cupwasher (at the t.e.) and locknut and sleeve (at the d.e.). An 'O' ring positioned between the sleeve and shaft prevents oil percolating into the ball bearing via the clearance between the sleeve and armature shaft.

Drive-end endplate assembly

5. The d.e. flanged bearing is clamped to the d.e. endplate by the seal housing which

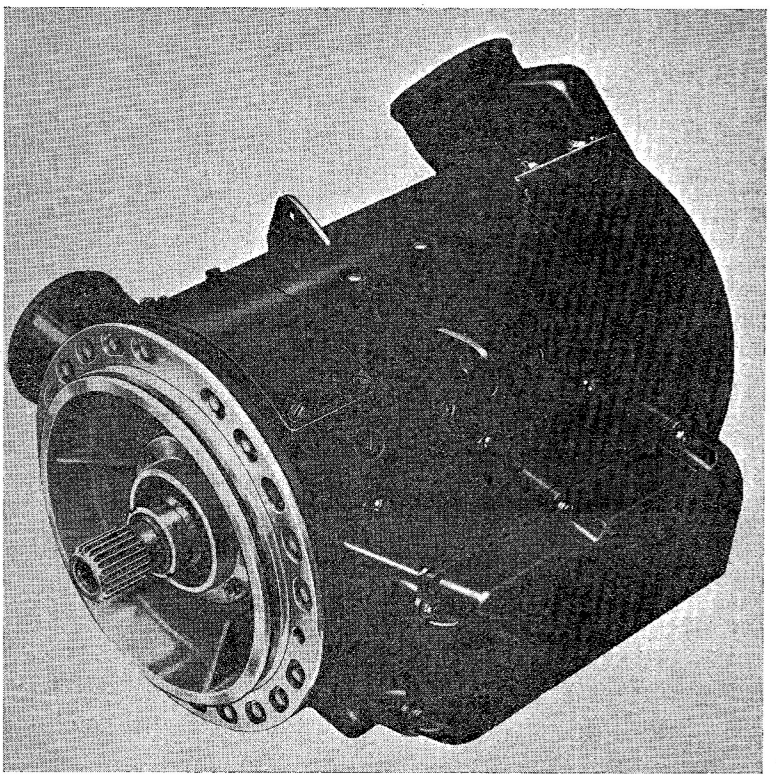

Fig. 1. Generator, Type 527A

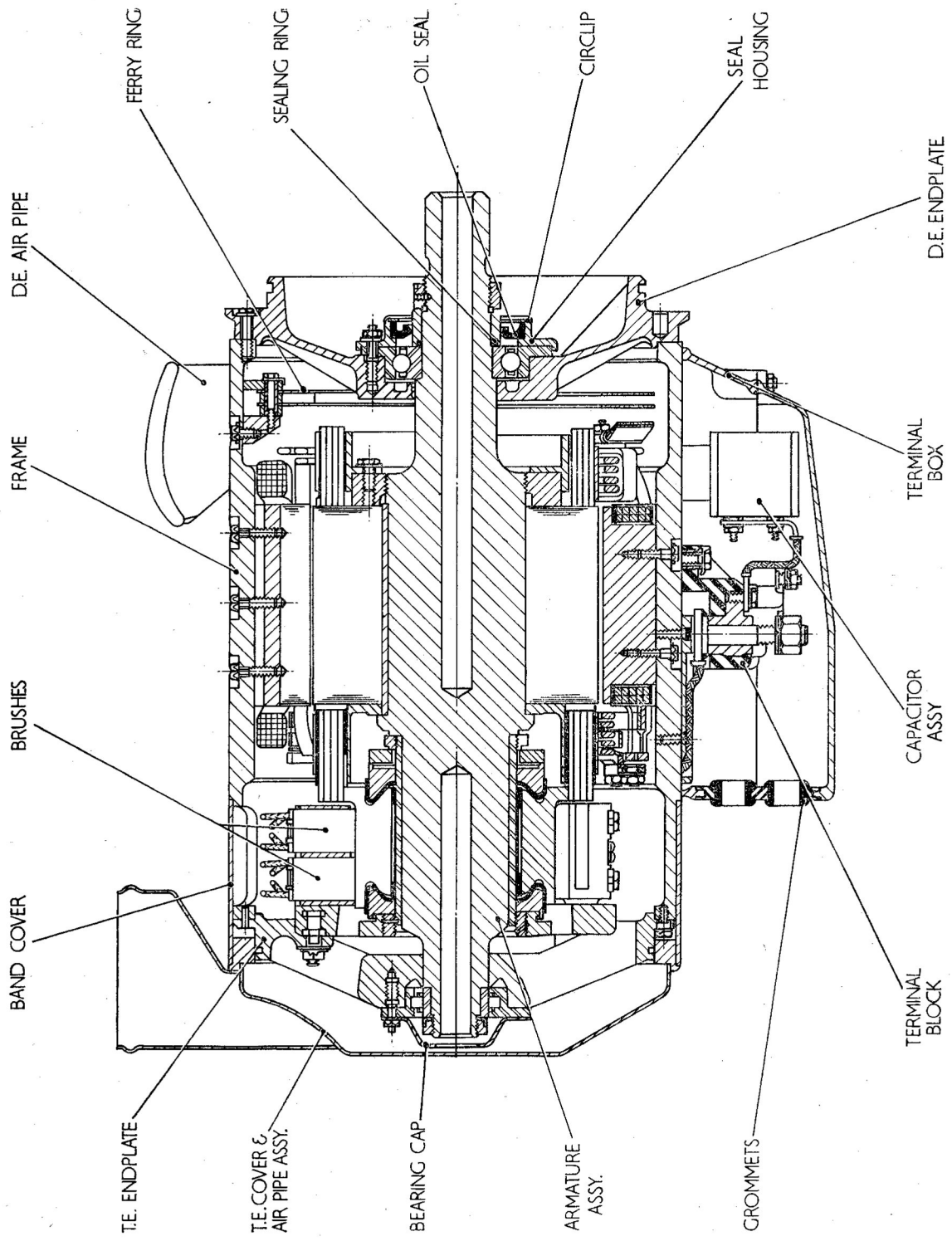

Fig. 2. Sectional view of generator

is secured to studs anchored in the d.e. endplate. An oil seal located in the seal housing, and positioned by a circlip, prevents the ingress of oil into the armature and field windings via the seal housing and seal sleeve. Grooves, machined in the inner bore of the endplate, form a grease seal between the endplate and shaft. A dowel hole drilled in the mating face of the d.e. endplate aligns the generator during installation procedure.

Tail-end endplate and cover assembly

6. Affixed to the t.e. endplate is the brushgear assembly, the outer race assembly of the roller bearing and t.e. bearing endcap. Kidney slots machined in the cast endplate allows the brushgear assembly to be rocked into the magnetic neutral axis of the machine. A groove machined in the endplate provides a location for the spigots integral with the ch. hd. screws which position the t.e. cover and airpipe assembly on the endplate. The groove integral with the endplate enables the t.e. cover and airpipe assembly to be moved to any angle required, to effect the installation of the generator. A band cover fitted around the t.e. of the generator frame, covers the cutouts in the generator frame and also clamps the t.e. and airpipe assembly in position.

Brushgear assembly

7. Four brush box assemblies (each housing two brushes) are secured to the brush rocker attached to the t.e. endplate. Attached to the brush boxes, with captive ch. hd. screws, are spring plate and bracket assemblies, which embody coiled springs riveted to 'L' shaped brackets. The springs apply constant pressure on the brushes irrespective of brush length. Holes drilled in the 'L' shaped brackets enable a check to be made on the brush position to obviate the removal of brushes when checking brush length.

Cooling

8. The generator is cooled by blast air which is supplied to the generator via the t.e. airpipe and cover assembly and leaves the machine via the air pipe fitted at the d.e. of the generator frame. The position of the d.e. air pipe can be varied to any one of three positions (situated 90° apart) to suit installation requirements, the alternative positions being blanked off with cover plates.

Connections

9. A diagram of the generator internal connections is shown in fig. 6. The following designations apply to the terminals.

No. 1 and No. 2	— Main
No. 3	— Ferry ring tapping
No. 4	— Shunt
No. 7	— Equalizer
No. 5 and No. 6	— Spare

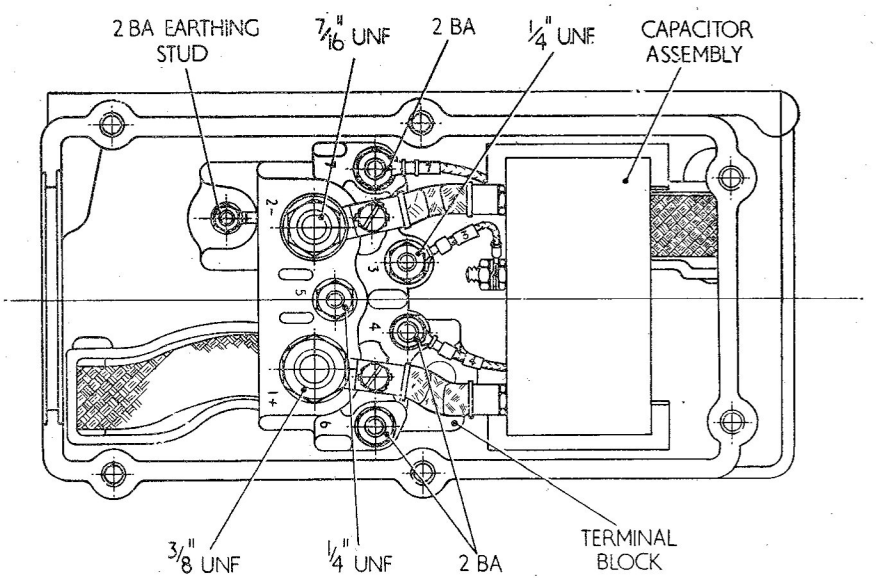

Fig. 3. View of terminal box (cover removed)

INSTALLATION

10. When installing the generator a sealing ring should be fitted in the groove machined in the d.e. endplate, and the generator positioned, by using the manacle clamp, before finally securing with bolts. The generator should not be run without the air cooling installation connected and operating.

SERVICING

General

11. To enable the generator to be examined, the air pipe cover, band covers, air outlet covers and terminal block cover should be removed from the generator.

12. Examine the generator for the security of all screws, bolts, nuts, washers and electrical connections. Check also the general serviceability of components, examine for oil leakage, and check that corrosion has not taken place. When the t.e. band cover has been replaced in position ensure that an air tight joint exists between the frame and cover.

Serration inspection

13. Check and ensure that the serrated shaft is not worn beyond the limits shown in fig. 4.

Brush renewal

14. Brush grades and minimum brush lengths are given in LEADING PARTICULARS to be found at the commencement of the chapter. Brushes should be renewed if the length of brush available is not sufficient to enable the generator to remain in service for a further full operating period.

Note . . .

(1) *To withdraw the brushes from the boxes, first remove the spring and bracket assemblies, by detaching the captive ch. hd. screws from the brush boxes.*

(2) *When refitting the brackets, a check should be made that the brackets are positioned as shown in fig.* 6, *and that the brush springs are identical in grade, (all coloured red or all coloured green).*

(3) *When refitting the brushes in position, ensure that the cushions fixed to the bracket assemblies are located in the recesses in the ends of the brushes.*

Brush spring pressure

15. Check that the brush pressure is within the range 50 + $3\frac{3}{4}$ oz. for springs (green grade), and 50 — $3\frac{3}{4}$ oz. for springs (red grade).

Setting neutral position

16. The following procedure should be adopted to set the neutral position.

(1) Remove the brushes from the brush boxes.

(2) Place a pencil brush (located in an insulated block the size of a brush) in a positive and negative brush box and connect a 0-75mV, centre zero voltmeter between the brushes.

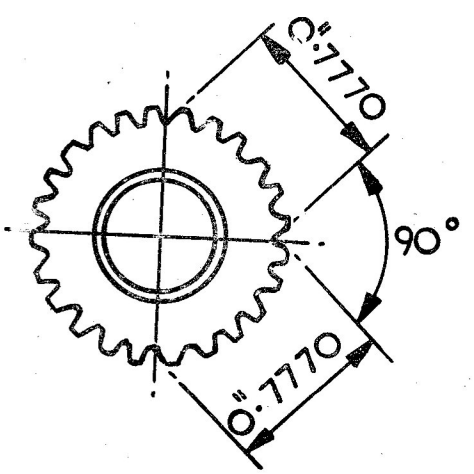

Fig. 4. Serration worn dimension

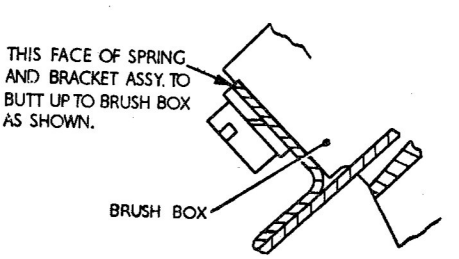

Fig. 5. Brush box spring and bracket location

(3) Pass a current of 0·5 amperes intermittently through the shunt field and secure the brushgear in the position which causes the needle of the voltmeter to deflect an equal amount in either direction from the centre zero position.

(4) Check and ensure that the same degree of deflection can be obtained for 8 positions of the armature (i.e. each position to be separated by 45 $\pm \frac{1}{4}°$).

Brush bedding

Preliminary bedding

17. The procedure for the preliminary bedding of brushes is described and illustrated in A.P.4343, Vol. 1, Sect. 1, Chap. 2, and should be followed when new brushes are fitted.

Final bedding

Note . . .

The generator should not be motored unless the oil seal at the d.e. has been removed, or alternatively, if the oil seal is not removed, a jet of oil should be applied to the contact surface of the seal and sleeve.

18. On completion of the preliminary bedding, the generator should be run as a motor to give the final surface finish to the brushes. The sequence of operations to achieve this, should be as follows.

(1) Remove the circlip from the seal housing.

(2) Unlock and remove the nuts and washers securing the seal housing. Withdraw the seal housing and oil seal from the d.e. endplate assembly using E.E. jig No. L2505X29.

(3) Remove the oil seal from the housing, and replace and secure the seal housing to the d.e. endplate. If a slave seal housing is available, this should be used to obviate the removal of the oil seal.

(4) Connect terminals 1 and 2 to a 15V d.c. supply, terminal 1 being positive, and connect a 2 ohm resistor between terminals 1 and 4, for field excitation.

(5) Run the generator as a motor on no load, until the brushes are bedded over their full axial width and at least 80 per cent of the contact surface. Remove all carbon dust from the generator with dry compressed air.

(6) Remove the seal housing from the d.e. endplate, and replace the oil seal in the seal housing using E.E. jig. No. S2505X09.

(7) Replace the seal housing in the d.e. endplate assembly and secure with tab washers and nuts. Tighten the nuts progressively, one pair at a time, to prevent damage to the seal housing.

(8) Replace the circlip securing the oil seal in the seal housing.

Testing

19. The tests which should be applied to the generator to verify its serviceability will be found in Appendix A to this chapter. An additional test which may be applied to the generator, if required, is detailed in para. 20.

Resistance check

20. Using a bridge megger, check the resistance of the generator windings as follows.

Winding	Minimum ohms	Maximum ohms
Armature	0·00412	0·0050
Shunt field	0·756	0·924
Interpole	0·00117	0·00143
Compensating and series	0·00243	0·00297
Ferry ring	0·00244	0·00275

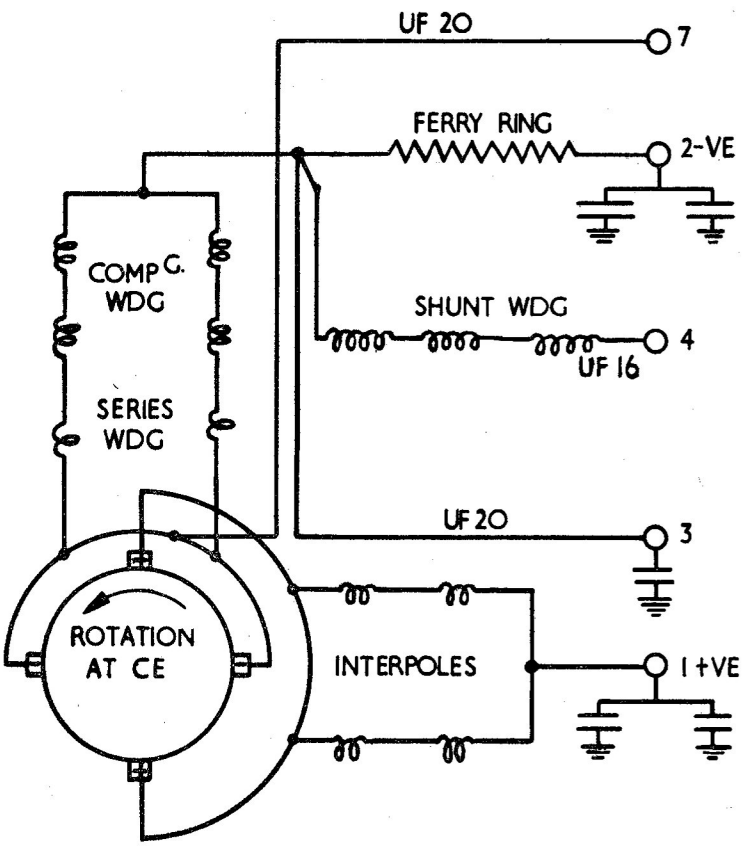

Fig. 6. Circuit diagram

Appendix A

STANDARD SERVICEABILITY TEST

for

D.C. GENERATOR, TYPE 527A (E.E. TYPE AE2505, STYLE 3)

Introduction

1. The following tests should be applied to the generator before it is put into Service, or whenever its serviceability is suspect.

TESTING

2. Check manually that the armature rotates freely and that the bearing end play is a minimum. Radial play is not permissible.

3. For all load tests, blast air should be applied to the generator at a pressure of 6 in. W.G., and the degree of commutation should not exceed slight sparking with occasional streamers.

Load excitation test

4. With the generator running at a speed of 2850 rev/min check that the shunt field current to produce 30V at terminals 1 and 2 when delivering load current is as follows.

Load	Shunt field	
	Minimum	Maximum
0A	6·7A	8·6A
200A	9·3A	12·0A

Check that at load of 200A the voltage measured between terminals 2 and 3 is within the range 0·49 to 0·55 volts.

5. With the generator running at a speed of 8550 rev/min check that the shunt field current to produce 30V at terminals 1 and 2 when delivering load current is as follows.

Load	Shunt field	
	Minimum	Maximum
0A	1·6A	2·5A
200A	2·5A	3·8A

Load tests at reduced speeds

6. With the generator running at a speed of 2100 rev/min, shunt field current at 18A, and a terminal voltage of between 27 and 30 volts, check that the generator output is not less than 1·5 kW (measured as a product of load current and terminal voltage).

7. Repeat the test detailed in para. 6, with the generator running at 2500 rev/min. The output should not be less than 6·0 kW.

Note . . .

In the above tests the terminal voltage should not exceed 30V.

Insulation resistance test

8. Using a 250V insulation resistance tester, check that the insulation resistance between terminal 1 and the frame is not less than 0·5 megohms.

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