CHAPTER 3 PART A

OPERATING AND SERVICE INSTRUCTIONS

ECLIPSE AVIATION ENGINE-DRIVEN SINGLE-VOLTAGE D-C GENERATORS — TYPES 307, 308, 309, 310, 311, 312, 313, 314, 703, 728, 790, 865, & 1235

MANUFACTURED BY
ECLIPSE-PIONEER DIVISION
BENDIX AVIATION CORPORATION TETERBORO, NEW JERSEY, U. S. A.

MARCH, 1944

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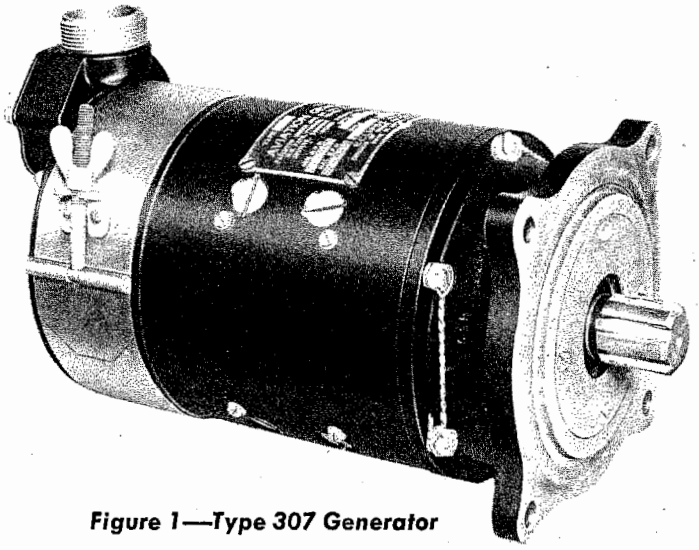


Figure 1—Type 307 Generator

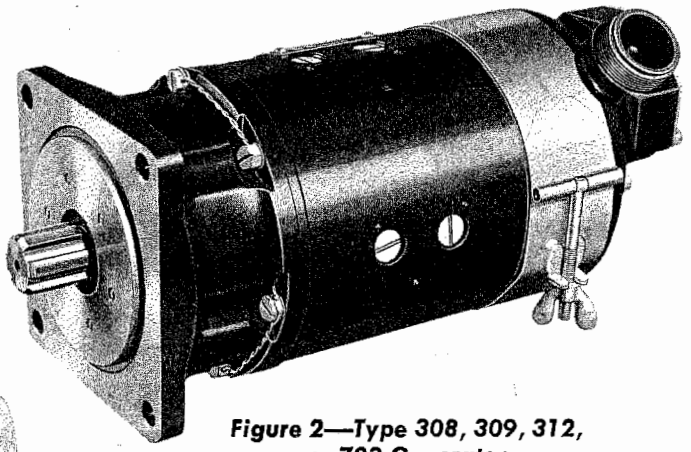


Figure 2—Type 308, 309, 312, or 703 Generator

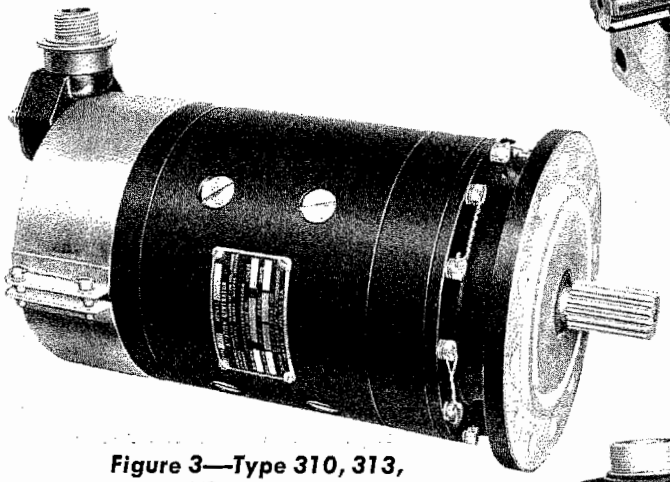


Figure 3—Type 310, 313, or 728 Generator

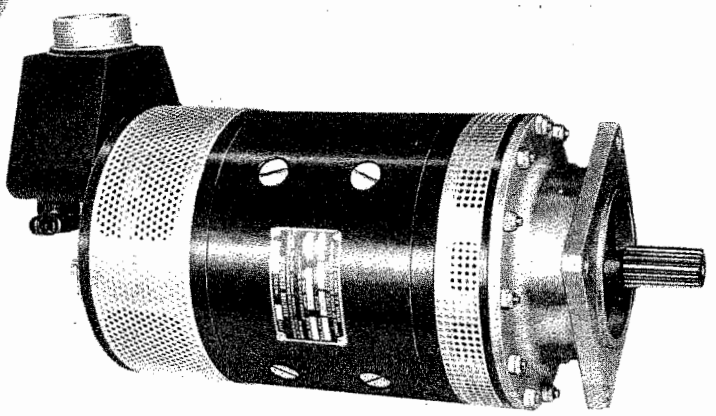


Figure 4—Type 311 Generator

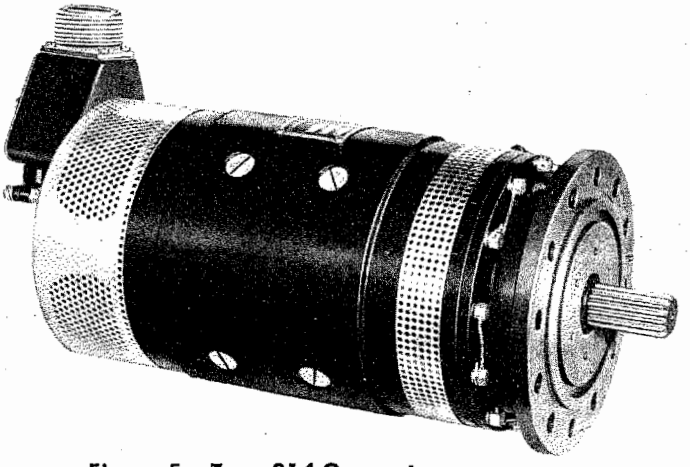


Figure 5—Type 314 Generator

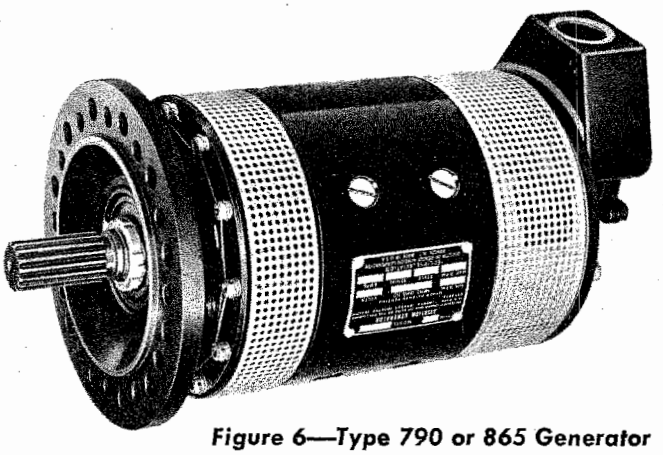


Figure 6—Type 790 or 865 Generator

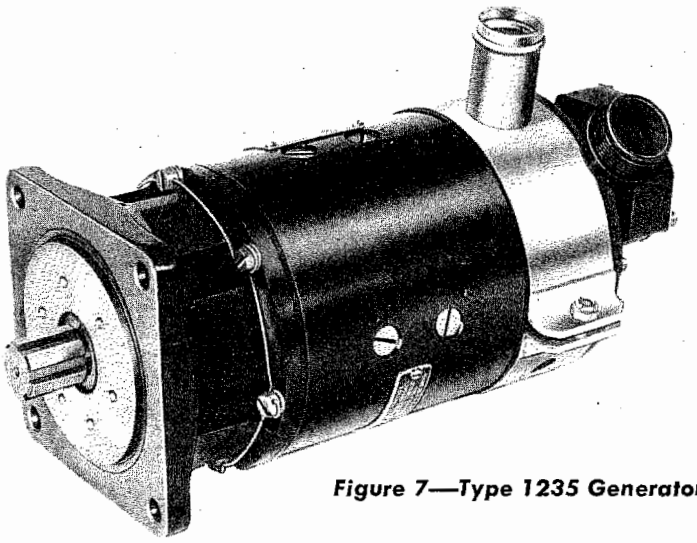


Figure 7—Type 1235 Generator

SECTION I

INTRODUCTION

1. GENERAL.

This chapter applies to all models of Eclipse Types 307, 308, 309, 310, 311, 312, 313, 314, 703, 728, 790, 865, and 1235 Engine-Driven Single Voltage D-C Generators. Those models which are further identified by AAF or Navy Type Numbers or by British Reference Numbers are listed in table 1.

2. IDENTIFICATION OF PARTS.

Reference numbers in brackets, "[ ]", are used throughout this chapter to identify parts of the generator. Apply the reference number following the part name in the text to the corresponding bubble number where it appears in figures 8 through 18.

SECTION II

GENERAL DESCRIPTION

1. CONSTRUCTION.

(See figures 8 through 14.)

The generators consist mainly of five basic components: namely, the front head [45], yoke [12], and armature [50] assemblies; and the intermediate [17] and back [25] heads.

The front head assembly [45] and the back head [25] are attached to opposite ends of the yoke assembly [12], with the intermediate head [17] interposed between the yoke assembly and back head, forming the housing of the generator. Types 307, 790, and 865 generators, however, do not include an intermediate head in their design.

The armature assembly [50] is supported in ball bearings [4], [55] pressed into the front [40] and intermediate [17] heads, and rotates within the yoke assembly [12]. In those generators not incorporating an intermediate head, the drive end of the assembly is supported by a ball bearing [27] pressed into the back head [25].

A removable window strap assembly [7] clamped to the outside of the front head [40], permits access to the brush rigging, brushes [46], and commutator [47]. The brush rigging consists of a brush board assembly [41] which mounts the brush boxes [44] and brush springs [42]. The brush board assembly is bolted to the inside face of the front head [40]. The brush springs press the brushes [46] into contact with the commutator [47], which is assembled on the armature shaft [49]. The Types 310, 311, 314, 728, 790, and 865 generators incorporate four brushes; the other generators have only two.

Three terminal posts, mounted in the front head [40], are provided for completing the external electrical connections. A terminal shield [36] bolted to the front head shields the terminals and forms a threaded spout for attachment of shielding conduit. In some of the generators, the terminal shield forms one or more spouts for condenser mounting. In the Type 314, Model 33 generators only, the terminal shield houses an AN receptacle [3] which is connected to the terminal posts.

The Types 311, 314, 790, and 865 generators incorporate a cooling fan [16] mounted on the armature shaft [49]. In the Type 1235 generator only, the front head window strap assembly [7] incorporates an air spout [39] for attachment of a blast cooling duct.

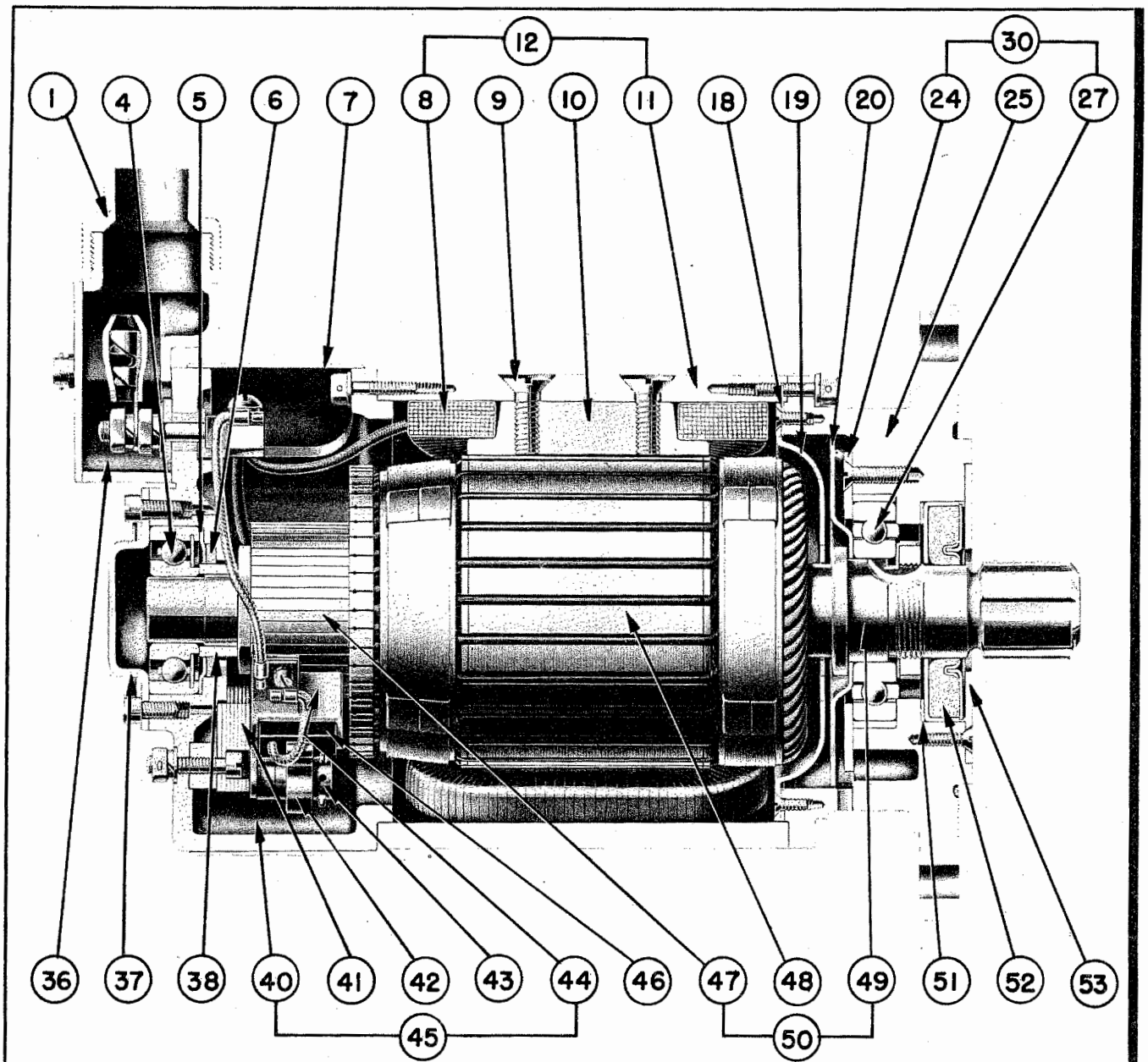
The back head [25] of the generator forms a standard SAE mounting flange.

A drive spline, extending beyond the mounting flange, is provided as a means of coupling the armature assembly [50] to the engine-drive member. In all of the generators, except the Type 307, flexible coupling is provided between the drive spline and armature assembly.

TABLE 1

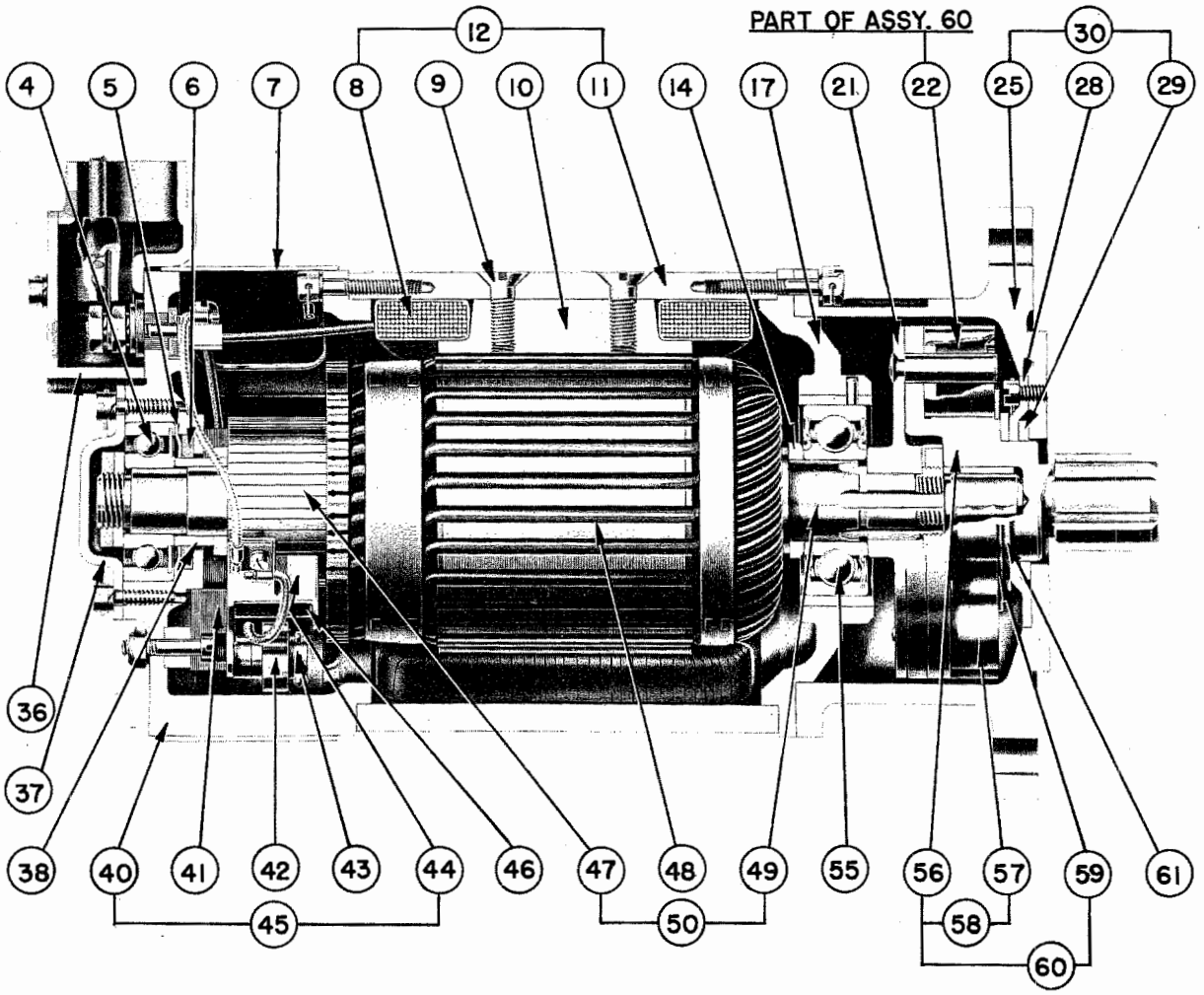
Eclipse Designation	*AAF Type Number*	*Navy Type Number*	*British Reference Number*	*Manufacturer's Drawing Number*
309-1-A	....	D-1-A	.....	E-44895
309-3-A	....	.....	105U/65	E-61912-2
309-7-A	....	.....	105U/108	E-44895
309-8-A	....	.....	105U/109	E-44895
309-17-A	D-3	.....	.....	F-52471-2
309-21-A	D-4	.....	.....	F-73056-2
309-25-A	....	.....	105U/12	E-85469
310-1-A	....	.....	105U/139	F-88689
310-5-A	....	.....	105U/67	F-88692
310-7-A	....	.....	105U/97	F-88689
310-9-A	....	.....	105U/70	F-88692
310-17-A	....	.....	105U/13	F-88689
310-25-A	....	NE-1	.....	F-69080
310-27-A	....	NE-1-B	.....	F-68504
310-29-A	E-5	.....	105U/100	F-88689
*310-31-B	E-7	.....	.....	E-81718-310-31
310-49-A	....	NE-1	.....	F-69080
310-53-A	....	NE-1	.....	F-114161
311-9-A	....	.....	105U/85	F-76839
313-1-A	....	.....	105U/14	F-88960
313-3-A	....	.....	105U/15	F-88922
313-12-A	....	.....	105U/16	F-88922
313-13-A	....	.....	105U/17	F-88960
314-1-A	....	NN-1-B	.....	F-73998
314-3-A	....	.....	105U/69	F-72866
314-5-A	....	.....	105U/18	F-73733
314-7-A	M-1	.....	.....	F-70300
314-11-A	....	.....	105U/19	F-74989
314-13-A	....	NM-1	105U/20	F-76474
314-17-A	....	.....	105U/21	F-81699
314-29-A	M-1	.....	.....	F-84654
314-33-A	....	NM-1-B	.....	E-100304
703-3-A	....	ND-2	.....	E-82424
728-1-A	....	.....	105U/22	F-67512-728-1
790-1-A	E-5-A	.....	.....	F-85541-790-1
*790-1-B	E-5-A	.....	.....	F-105128-790-1
790-3-A	E-7-A	.....	.....	F-85541-790-3
*790-3-B	E-7-A	.....	.....	F-105128-790-3
1235-1-A	T-1	.....	.....	E-112180

* For a description of the changes which have been made in Style B generators, see section II, paragraph 2.



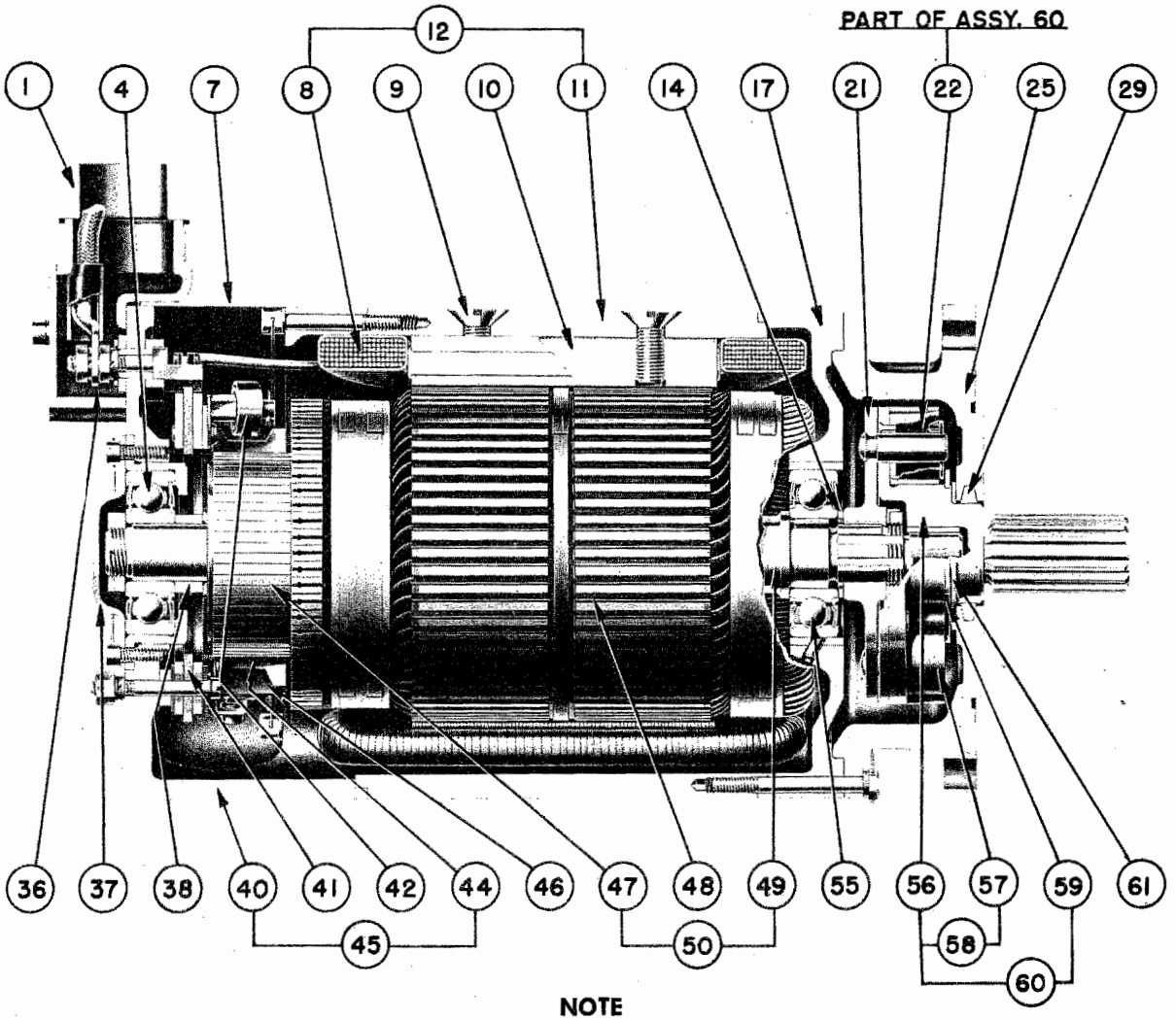
[1] ADAPTER—TERMINAL SHIELD
[4] BEARING—BALL (FRONT HEAD)
[5] RETAINER—FELT WASHER (FRONT HEAD)
[6] WASHER—FELT (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[18] GASKET—OIL RETAINER
[19] RETAINER—OIL
[20] SLINGER—OIL
[24] RETAINER—BEARING (BACK HEAD)
[25] HEAD—BACK
[27] BEARING—BALL (BACK HEAD)
[30] HEAD ASSEMBLY—BACK
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[38] SPACER—ARMATURE SHAFT (COMMUTATOR END)
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[43] SLEEVE—ADJUSTING
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[51] GASKET—OIL SEAL
[52] SEAL—OIL (BACK HEAD)
[53] RETAINER—OIL SEAL

Figure 8—Sectional View Drawing—Type 307 Generator



[4] BEARING—BALL (FRONT HEAD)
[5] RETAINER—FELT WASHER (FRONT HEAD)
[6] WASHER—FELT (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[14] SPACER—ARMATURE SHAFT (DRIVE END)
[17] HEAD—INTERMEDIATE
[21] PLATE ASSEMBLY—DRIVE
[22] RUBBER—DRIVING
[25] HEAD—BACK
[28] RETAINER—FELT WASHER (BACK HEAD)
[29] WASHER—FELT (BACK HEAD)
[30] HEAD ASSEMBLY—BACK
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[38] SPACER—ARMATURE SHAFT (COMMUTATOR END)
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[43] SLEEVE—ADJUSTING
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[55] BEARING—BALL (INTERMEDIATE HEAD)
[56] SHAFT ASSEMBLY—DRIVE
[57] HOUSING—DRIVING RUBBER
[58] HOUSING AND DRIVE SHAFT COUPLING ASSEMBLY
[59] RING—LOCK (DRIVING RUBBER)
[60] COUPLING AND RUBBERS ASSEMBLY
[61] WASHER—THRUST

Figure 9—Sectional View Drawing—Type 308, 309, 312, or 703 Generator

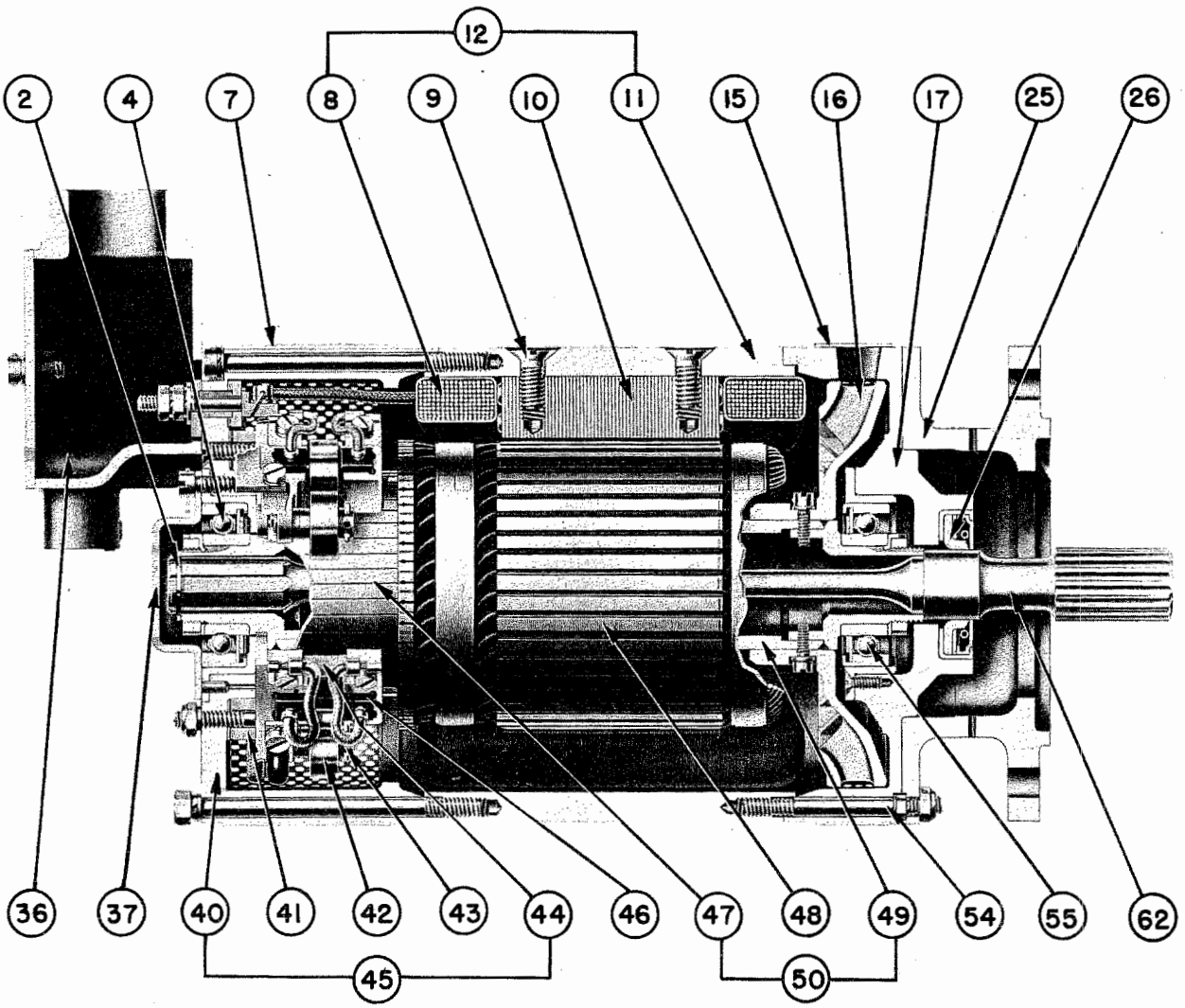


NOTE

The Type 313 generator does not incorporate the lower brush boxes and jumpers shown in the figure.

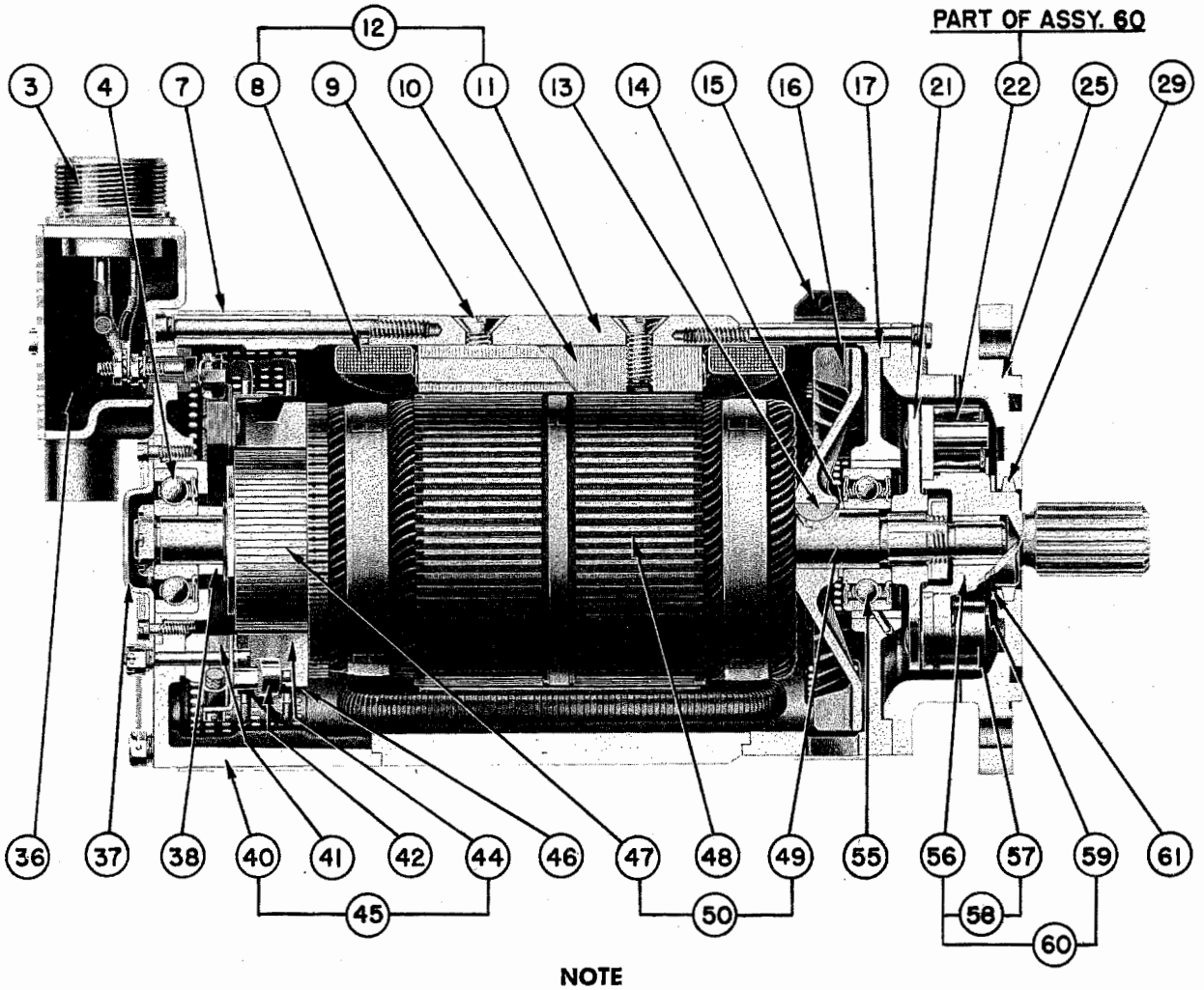
[1] ADAPTER—TERMINAL SHIELD
[4] BEARING—BALL (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[14] SPACER—ARMATURE SHAFT (DRIVE END)
[17] HEAD—INTERMEDIATE
[21] PLATE ASSEMBLY—DRIVE
[22] RUBBER—DRIVING
[25] HEAD—BACK
[29] WASHER—FELT (BACK HEAD)
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[38] SPACER—ARMATURE SHAFT (COMMUTATOR END)
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[55] BEARING—BALL (INTERMEDIATE HEAD)
[56] SHAFT ASSEMBLY—DRIVE
[57] HOUSING—DRIVING RUBBER
[58] HOUSING AND DRIVE SHAFT COUPLING ASSEMBLY
[59] RING—LOCK (DRIVING RUBBER)
[60] COUPLING AND RUBBERS ASSEMBLY
[61] WASHER—THRUST

Figure 10—Sectional View Drawing—Type 310, 313, or 728 Generator



[2] RING—LOCK (PENCIL DRIVE SHAFT)
[4] BEARING—BALL (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[15] STRAP ASSEMBLY—WINDOW (INTERMEDIATE HEAD)
[16] FAN
[17] HEAD—INTERMEDIATE
[25] HEAD—BACK
[26] SEAL—OIL (INTERMEDIATE HEAD)
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[43] SLEEVE—ADJUSTING
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[54] STUD—INTERMEDIATE HEAD TO YOKE
[55] BEARING—BALL (INTERMEDIATE HEAD)
[62] SHAFT—PENCIL DRIVE

Figure 11—Sectional View Drawing—Type 311 Generator

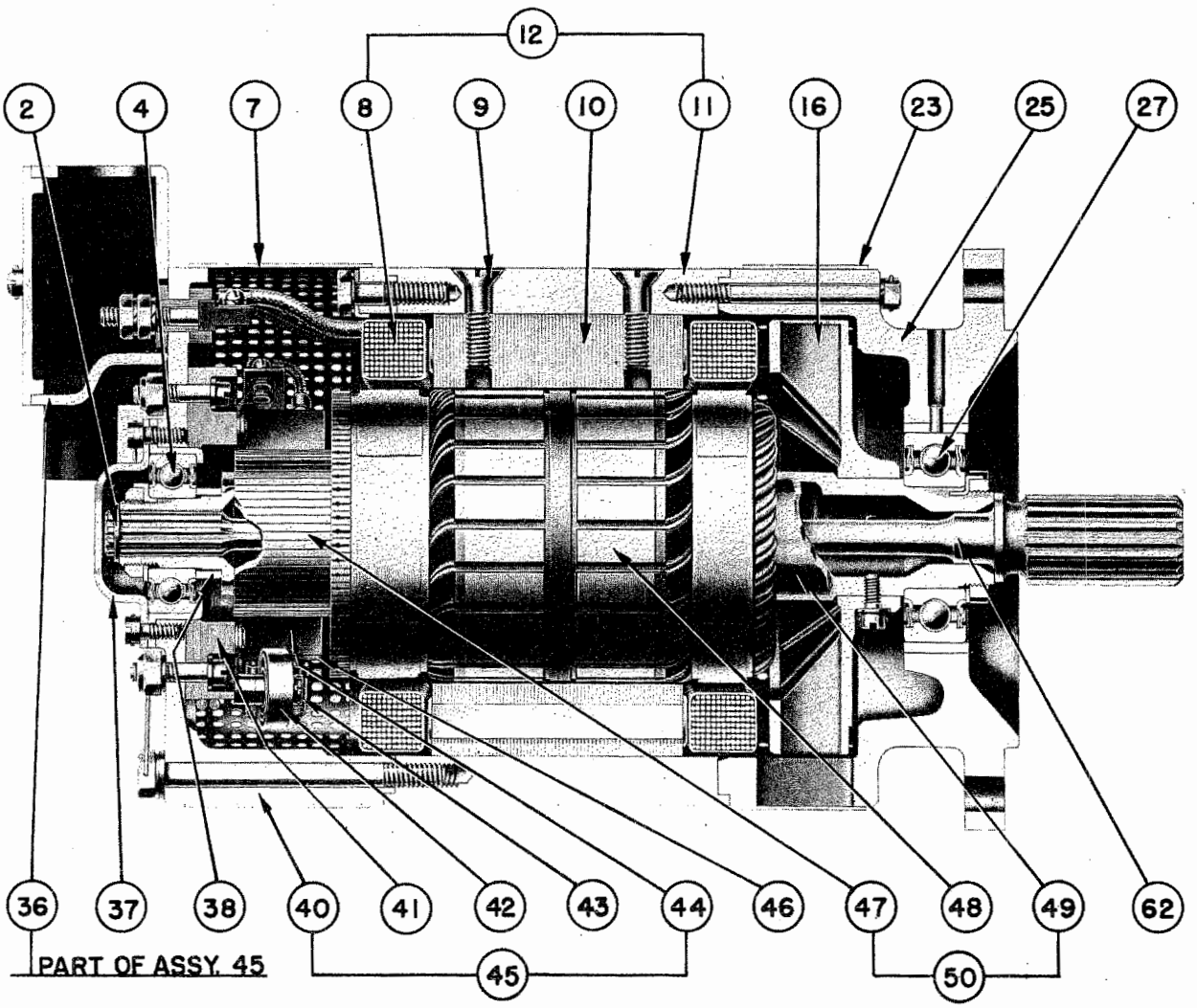


NOTE

The Model 33 generator, only, incorporates a receptacle [3].

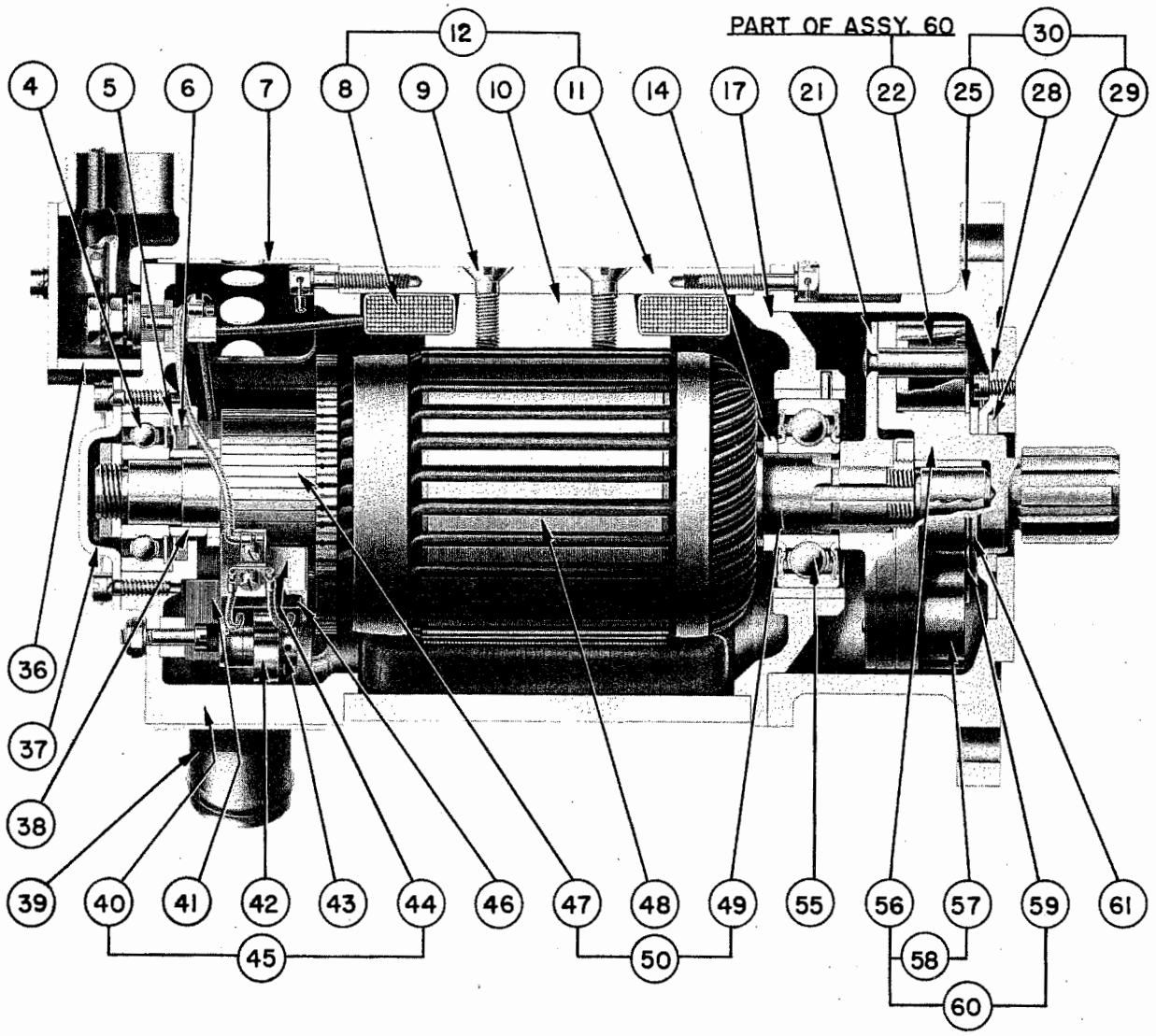
[3] RECEPTACLE
[4] BEARING—BALL (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[13] KEY—FAN
[14] SPACER—ARMATURE SHAFT (DRIVE END)
[15] STRAP ASSEMBLY—WINDOW (INTERMEDIATE HEAD)
[16] FAN
[17] HEAD—INTERMEDIATE
[21] PLATE ASSEMBLY—DRIVE
[22] RUBBER—DRIVING
[25] HEAD—BACK
[29] WASHER—FELT (BACK HEAD)
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[38] SPACER—ARMATURE SHAFT (COMMUTATOR END)
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[55] BEARING—BALL (INTERMEDIATE HEAD)
[56] SHAFT ASSEMBLY—DRIVE
[57] HOUSING—DRIVING RUBBER
[58] HOUSING AND DRIVE SHAFT COUPLING ASSEMBLY
[59] RING—LOCK (DRIVING RUBBER)
[60] COUPLING AND RUBBERS ASSEMBLY
[61] WASHER—THRUST

Figure 12—Sectional View Drawing—Type 314 Generator



[2] RING—LOCK (PENCIL DRIVE SHAFT)
[4] BEARING—BALL (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[16] FAN
[23] STRAP ASSEMBLY—BACK HEAD
[25] HEAD—BACK
[27] BEARING—BALL (BACK HEAD)
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[38] SPACER—ARMATURE SHAFT (COMMUTATOR END)
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[43] SLEEVE—ADJUSTING
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[62] SHAFT—PENCIL DRIVE

Figure 13—Sectional View Drawing—Type 790 or 865 Generator



[4] BEARING—BALL (FRONT HEAD)
[5] RETAINER—FELT WASHER (FRONT HEAD)
[6] WASHER—FELT (FRONT HEAD)
[7] STRAP ASSEMBLY—WINDOW (FRONT HEAD)
[8] COIL ASSEMBLY—SHUNT FIELD
[9] SCREW—POLE SHOE
[10] POLE SHOE ASSEMBLY
[11] YOKE
[12] YOKE ASSEMBLY
[14] SPACER—ARMATURE SHAFT (DRIVE END)
[17] HEAD—INTERMEDIATE
[21] PLATE ASSEMBLY—DRIVE
[22] RUBBER—DRIVING
[25] HEAD—BACK
[28] RETAINER—FELT WASHER (BACK HEAD)
[29] WASHER—FELT (BACK HEAD)
[30] HEAD ASSEMBLY—BACK
[36] SHIELD—TERMINAL
[37] CAP—BEARING
[38] SPACER—ARMATURE SHAFT (COMMUTATOR END)
[39] AIR SPOUT
[40] HEAD—FRONT
[41] BOARD ASSEMBLY—BRUSH
[42] SPRING—BRUSH
[43] SLEEVE—ADJUSTING
[44] BOX—BRUSH
[45] HEAD ASSEMBLY—FRONT
[46] BRUSH
[47] COMMUTATOR
[48] ARMATURE
[49] SHAFT—ARMATURE
[50] ARMATURE ASSEMBLY
[55] BEARING—BALL (INTERMEDIATE HEAD)
[56] SHAFT ASSEMBLY—DRIVE
[57] HOUSING—DRIVING RUBBER
[58] HOUSING AND DRIVE SHAFT COUPLING ASSEMBLY
[59] RING—LOCK (DRIVING RUBBER)
[60] COUPLING AND RUBBERS ASSEMBLY
[61] WASHER—THRUST

Figure 14—Sectional View Drawing—Type 1235 Generator

2. STYLE CHANGES.

a. TYPE 310 GENERATOR.—The Type 310, Model 31, Style B, generator incorporates a front head [40] and brush board assembly [41] of improved design. The front head to yoke [11] mounting screws pass completely through the new front head, strengthening the generator housing. The new brush board assembly has a brush board made of solid insulating material, lessening the possibility of grounds and short circuits.

b. TYPE 790 GENERATOR.—The Type 790, Models 1 and 3, Style B generators incorporate a back head [25] of improved design. The back head to yoke [11] mounting screws pass completely through the new back head, strengthening the generator housing.

3. SPECIFICATIONS.

a. ROTATION.—Direction of armature rotation is indicated by the direction of the arrow stamped on the bearing cap [37]. Rotation, as viewed at the generator drive end, is also specified on the name plate.

b. SHIELDING.—The terminal shield [36] normally forms a $1\frac{3}{16}$ inch—18 threaded spout for attachment of $\frac{3}{4}$-inch shielding conduit, but is also furnished to meet varied shielding specifications. The Type 314, Model 33 generators incorporate a Specification Number AN-3102-22-6P receptacle [3].

c. WIRING.—The generators may incorporate either grounded or ungrounded electrical circuits. Grounded generators incorporate a metal grounding washer, placed on the "A—" terminal post inside the terminal shield [36].

d. COOLING.—The Type 1235 generators incorporate an air spout [39] of one-inch outside diameter, and require a minimum of 25 cubic feet of cooling air per minute, at a temperature of 20° to 30°C (68° to 86°F) and a pressure of three inches of water (static plus velocity head), measured in the air duct at a point 12 inches from the air spout. All the other generators are self-cooled.

e. MOUNTING FLANGE AND DRIVE SPLINE.—The generators are furnished with the various mounting flange and drive spline combinations shown in table 2.

NOTE

Generators incorporating a mounting flange drilled for $\frac{3}{8}$-inch mounting studs may be mounted on engines having $\frac{5}{16}$-inch mounting studs.

f. ELECTRICAL RATING AND TYPE OF FLEXIBLE COUPLING.—The electrical ratings of the generators when operated within the rated speed range, and the type of flexible coupling incorporated, are shown in table 3.

TABLE 2

Mounting Flange			*Drive Spline*
Shape	*Number of Holes*	*Dia. of Holes*	
Square	4	$\frac{11}{32}$ in.	6-Tooth (square)
Square	4	$\frac{25}{64}$ in.	6-Tooth (square)
Square	4	$\frac{25}{64}$ in.	16-Tooth (involute)
Round	12	$\frac{25}{64}$ in.	16-Tooth (involute)

TABLE 3

Generator Type	*AAF, Navy or Commercial Type*	*Rating*				*Type of Flexible Coupling*
		Electrical		*†Speed*		
		**Volts*	*Amp*	*Minn*	*Max*	
307	All	15	15	2250	3750	None (direct drive)
308	AAF	15	15	2250	4200	Coupling and Rubbers Assembly [60]
	Coml	15	15	2250	3750	
309	Navy	15	25	2000	4000	
	AAF	15	25	2250	4200	
	Coml	15	25	2250	3750	
310	Navy	15	50	2200	4200	
	AAF	15	50	2250	4200	
	Coml	15	50	2200	4200	
311	All	15	100	2600	4500	Pencil Drive Shaft [62]
312	All	30	10	2400	3750	Coupling and Rubbers Assembly [60]
313	All	30	20	2250	3750	
314	Navy-NM	30	50	2000	4500	
	Navy-NN	30	50	2600	4500	
	AAF	30	50	2600	4500	
	Coml	30	50	2600	4500	
703	Navy	15	25	1800	4200	
728	All	30	30	2600	3750	
790	AAF	15	50	2500	4500	Pencil Drive Shaft [62]
865	All	15	50	4000	7500	
1235	All	30	15	2500	4500	Coupling and Rubbers Assembly [60]

* Do not confuse rated voltage of generator with setting of voltage regulator which is specified by the procuring agency.

† The speed ranges specified apply generally to all models of the generators listed. However, for the specific speed range of a particular generator, refer to the generator nameplate.

SECTION III

INSTALLATION

1. GENERAL.

In order to assure satisfactory operation, the general instructions outlined in this section should be observed during installation of the equipment. For complete details, refer to drawings and specifications of the AAF or Bureau of Aeronautics, and to the aircraft manufacturer's installation drawings for the particular airplane on which the generator is to be used. Make certain that the voltage, current, and speed rating of the generator to be used will be suitable for the installation.

CAUTION

A generator of higher rated output than that specified for the installation should not be substituted, since to do so may permit overloading of the aircraft wiring and associated equipment.

The generator drive spline and mounting flange must be suitable for coupling and mounting the generator to the engine drive and mounting pad.

2. PREPARATION FOR USE AFTER STORAGE.

Generators left in storage for a period exceeding one year, should be forwarded prior to installation to a service station or overhaul base for cleaning, relubrication, and test: FAILURE TO OBSERVE THIS PROCEDURE WILL RESULT IN EXCESSIVE WEAR DUE TO DRIED OUT LUBRICANTS. Generators which have been in storage for less than one year may be placed in immediate service. However, the procedure outlined in following paragraphs *a.* through *c.* should be observed to insure satisfactory condition of the generator prior to installation.

a. ROTATION CHECK.—Check the direction of rotation of the generator, as indicated by the arrow stamped on the bearing cap [37] or as specified on the nameplate, to make certain that the engine-drive member will drive the generator in the proper direction. Should it be necessary to reverse the direction of rotation of the generator, proceed as outlined in following paragraphs (1) through (3).

(1) Reverse the two terminals of the shunt field coil assembly [8] at the "F+" and "A—" terminal posts, inside the front head [40].

(2) Make appropriate changes on the nameplate of the unit, and restamp the arrow on the bearing cap [37] to indicate the new direction of rotation.

(3) Flash the field for the new direction of rotation, as outlined in following paragraph *b.*

b. FLASHING THE FIELD.—The field circuit of all generators, except those being installed directly after overhaul, must be flashed with a 12-volt battery, to insure that the magnetic circuit of the generator retains sufficient residual magnetism to allow the generator to "build up" properly. Connect the negative battery terminal to the "A—" generator terminal post. Connect the positive battery lead through a single-pole, single-throw knife switch to the "F+" generator terminal post.

NOTE

For Type 314, Model 33 generators, make the specified battery connections to the "C" and "B" receptacle [3] prongs respectively.

Apply battery current to the field for a period of five seconds, by closing and then opening the knife switch. Repeat the operation several times to insure that the field is properly flashed.

CAUTION

It is absolutely necessary that a knife switch be used when flashing the field, since the spark caused by opening the circuit at the generator or battery terminals can easily cause explosion of the battery or severe damage to the terminals.

c. MECHANICAL CHECK.—Remove the front head window strap assembly [7]. Pull up the brush springs [42], and lift out the brushes [46] from the brush boxes [44]. Then, check the mechanical condition of the generator, as outlined in following paragraphs (1) through (5). If any fault is found, return the generator to a service station or overhaul base for complete overhaul, unless otherwise specified.

(1) Examine all parts visible through the brush box [44] windows for rust and corrosion.

(2) Rotate the armature assembly [50] by hand, and check for rubbing, binding, or audible noise. The armature should rotate with a very slight and uniform drag caused by the grease in the ball bearings.

(3) Replace the brushes [46] in their original positions in the brush boxes [44], making certain not to twist the brush leads. Be sure that the brushes are a free fit in the brush boxes and that the brush springs [42] bear centrally on the top of the brushes to insure full brush contact with face of the commutator [47].

NOTE

Clean binding brushes [46] and the brush boxes [44] with a cloth moistened in unleaded gasoline.

(4) Make sure that all internal wiring connections are clean and tight.

(5) Replace the front head window strap assembly [7] and safety wire.

3. MOUNTING THE GENERATOR.

Determine the best mounting position of the generator for alignment and attachment of the shielding

conduit. Generators incorporating round mounting flanges may be rotated in increments of 30 degrees to the desired mounting position. Generators incorporating square flanges may be rotated in increments of 90 degrees. Proceed as outlined in following paragraphs *a.* through *d.*

a. Remove the cover plate and gasket from the engine mounting pad.

b. Wipe the pad clean, and replace the gasket.

c. Coat the drive spline of the generator with Royco Number 5 grease (Navy Specification Number AN-G-5, AAF Specification Number 3560, Grade Hard) manufactured by the Royal Engineering Co., Whippany, N. J., or the equivalent.

d. Place the generator on the engine mounting studs in the desired mounting position and securely bolt in place.

NOTE

Type 307, Models 7 and 8, generators have a tapped hole in the drive end of the armature shaft [49] which is used when coupling the shaft to the engine-drive member of Lycoming 0-435 engines only. Prior to mounting generators on these engines, attach the engine-drive member to the generator drive spline with a $\frac{5}{16}$ inch—24 threaded screw and proper locking device.

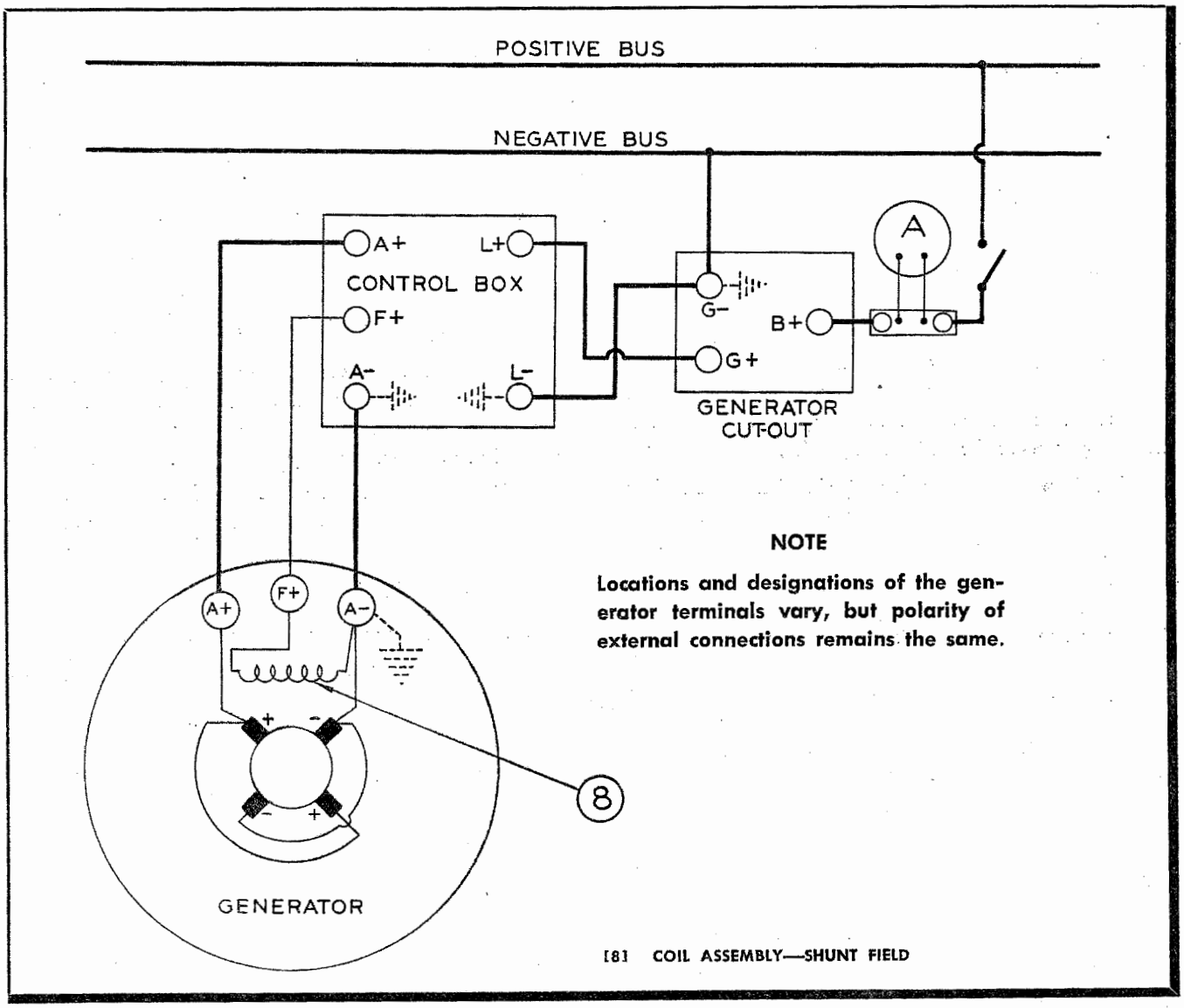


Figure 15—Schematic Circuit Diagram—Type 308, 309, 310, 312, 313, 314, 703, 728, 790, or 865 Generator With NF-Type Control Box (Vibrator or Carbon Pile Type) and Generator Cut-Out

4. ATTACHING THE AIR SPOUT [39].

The air spout of Type 1235 generators must be attached to an air duct in order to provide the necessary generator cooling. Refer to section II, paragraph 3., for the recommended inlet pressure of cooling air. The air spout may be rotated to the proper position for attachment of the air duct by loosening the front head window strap assembly [7]. Make sure that the air duct is clean and free of obstructions. After the air duct is attached, make certain to tighten the window strap assembly, and replace all safety wire. The other generators do not require air blast cooling.

5. ACCESSORIES AND CONTROL EQUIPMENT.

(See figures 15 through 18.)

For satisfactory control of generator operation, it is necessary that certain associated equipment, as described in following paragraphs *a.* through *e.*, be used. For schematic circuit diagrams of generating systems including various combinations of the equipment described, refer to figures 15 through 18. For complete details relative to the installation, electrical connection, and operation of the associated equipment, refer to applicable Handbooks, and to drawings and specifications of the aircraft manufacturer and AAF or Bureau of Aeronautics, covering the equipment in

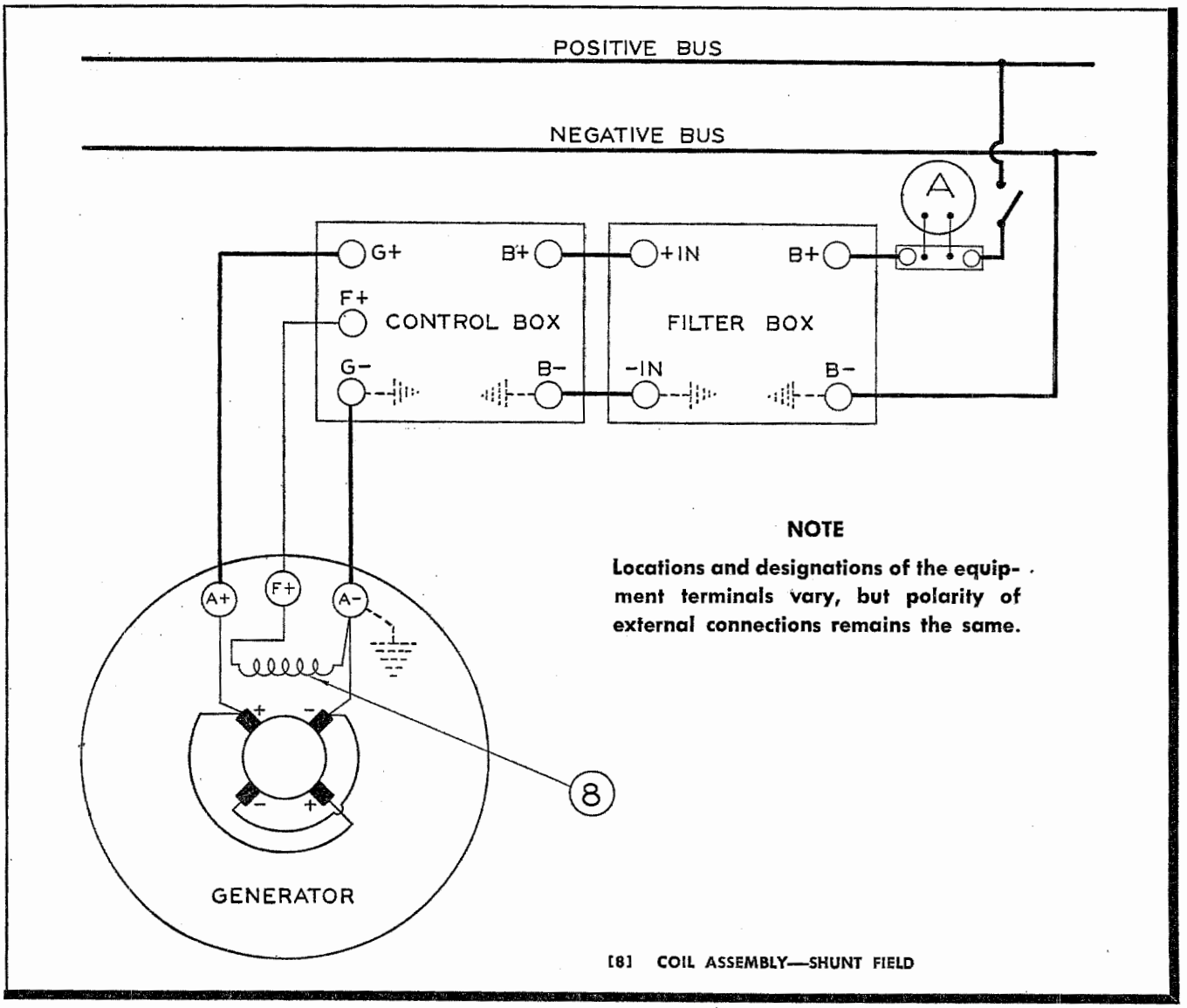


Figure 16—Schematic Circuit Diagram—Type 307, 308, 309, 310, 312, 313, 314, 728, 790, or 865 Generator With Two- or Three-Unit Permanent Mount Control Box and Filter Box

question. Refer to chapters 13, 70, 71, 72, 73, and 77 for details of Eclipse control boxes and panels which comprise various combinations of the devices described.

a. VOLTAGE REGULATOR.—A voltage regulator is connected in the system in order to maintain a constant generator output voltage. Vibrating contact voltage regulators used in parallel systems must be especially designed for such installations. However, regulators suitable for parallel systems may be used satisfactorily in single generator systems.

b. REVERSE CURRENT CUT-OUT.—A reverse current cut-out is used to prevent battery current from feeding back into the generator at low engine speeds or when the engine is not operating.

c. CURRENT LIMITER.—In some generating systems a current limiter is used to protect the generator from excessive overloads.

d. FILTER BOX.—A filter box may be used in the system to filter the generator output.

NOTE

Some control boxes include an integral filter, but a separate filter box may be used for additional filtering.

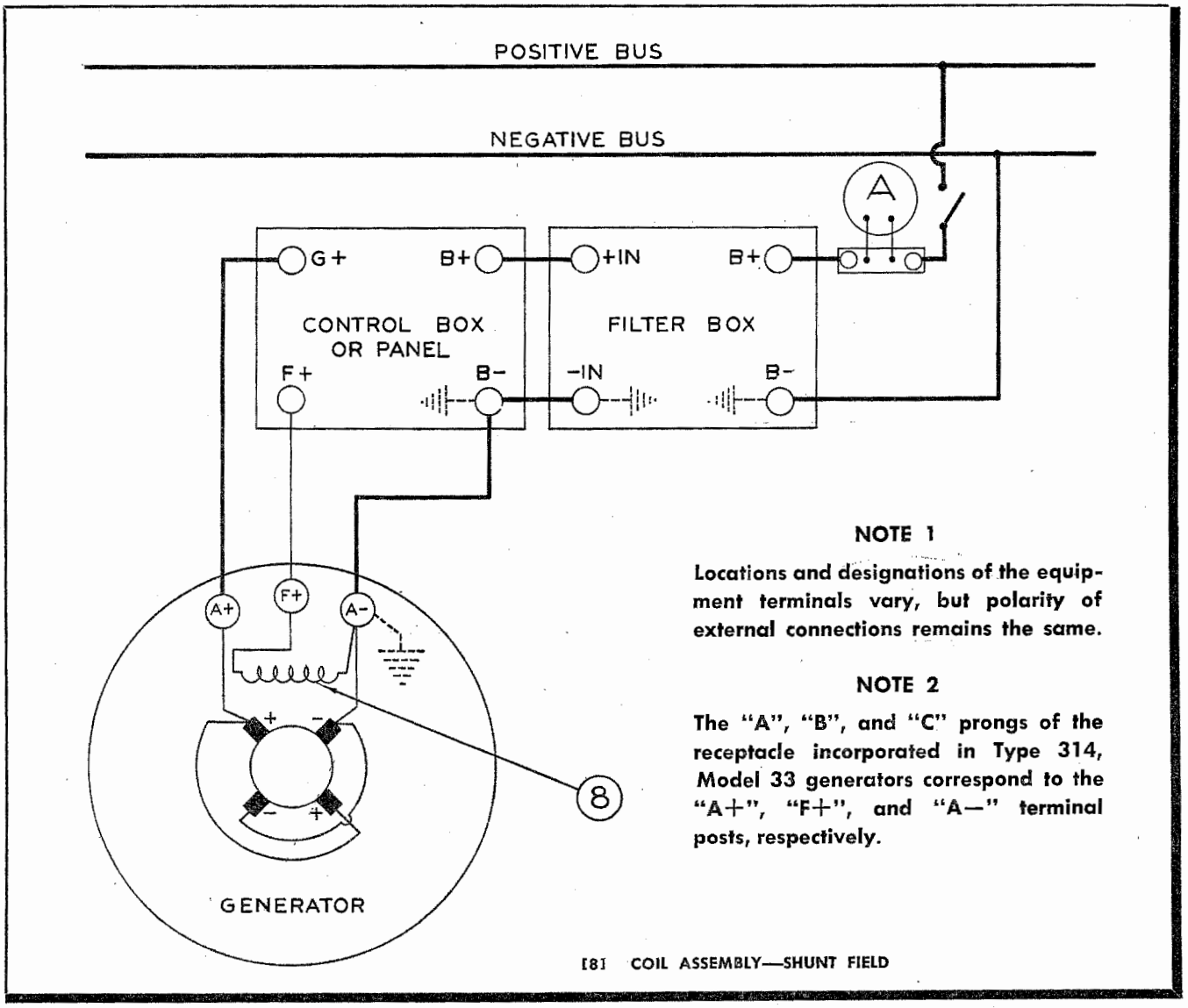


Figure 17—Schematic Circuit Diagram—Type 307, 308, 309, 310, 311, 312, 313, 314, 728, 790, or 865 Generator With Two- or Three-Unit Detachable Control Box or Two-Unit Panel and Filter Box

e. SWITCHES.

(1) A generator switch is normally used to connect and disconnect the generator from the electrical circuit of the airplane.

(2) In parallel systems which include an equalizer bus, some means must be provided for closing and opening the equalizer circuit of each generator. Because the generator and equalizer switches must be opened and closed simultaneously, it is recommended that in installations having more than two generators the equalizer switches be combined with the generator switches in suitable double-pole switches.

NOTE

In parallel systems which include only two generators, only one equalizer switch is required. In such cases a separate single-pole equalizer switch should be used, in order to permit single operation of either generator with the equalizer switch "open".

A schematic circuit diagram of a parallel generating system having an equalizer bus and an Eclipse Type 1202 or 323 (Model 4 only) control panel is shown in figure 18. Refer to chapter 66 for complete details of the Type 1202 control panel, or to chapter 72 for details of the Type 323 panel.

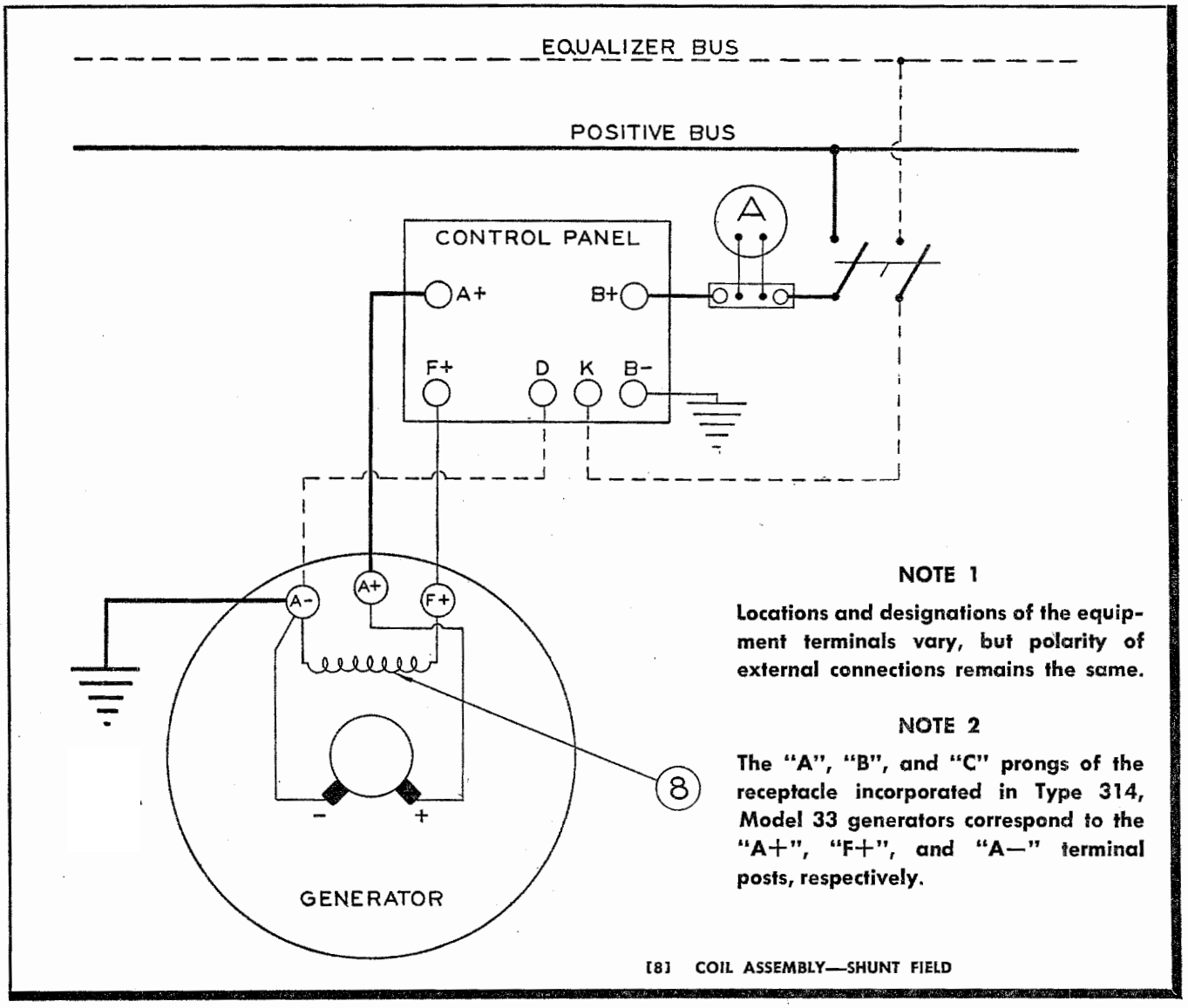


Figure 18—Schematic Circuit Diagram—Type 314 or 1235 Generator With Type 1202 or 323 (Model 4 Only) Control Panel

6. ELECTRICAL CONNECTIONS.

For all electrical connections and recommended wire sizes, refer to installation drawings of the aircraft manufacturer and AAF or Bureau of Aeronautics, for the particular airplane on which the equipment is to be used. Also ascertain whether the system requires a grounded or ungrounded generator. Should it be desired to convert a grounded generator for use in an insulated system, remove the metal grounding washer from the "A—" generator terminal post located inside the terminal shield [36]. Then, use an insulating washer to completely insulate the "A—" terminal post from the front head [40]. To convert an insulated generator for grounded installation, remove the insulating washer from the terminal shield end of the "A—" terminal post.

NOTE

In some of the generators a single insulating strip is used for all three posts. In this case, cut away that portion of the strip which insulates the "A—" post.

Then, install a metal grounding washer on the post, making certain that the contact surface of the front head is bright and clean, to assure a good ground connection. Make sure all leads are connected to the proper terminals and that all connections are clean and tight.

7. FINAL INSTALLATION CHECK.

After installation of the generator and its associated equipment is completed, check the system for satisfactory operation.

NOTE

It is recommended that operation of the generator and its control equipment be checked at the same time, since the functions of these units are complementary to each other. Refer to the manufacturer's instructions concerning the particular control equipment used.

Connect an accurate portable d-c voltmeter between the positive bus and ground or negative bus. The voltmeter should have a range of 0 to 50 volts for 30-volt generators or a range of 0 to 30 volts for 15-volt generators. Proceed as outlined in following paragraph *a.* for a single generator system, or as outlined in paragraph *b.* for a parallel system.

a. SINGLE GENERATOR SYSTEM.—Proceed as outlined in following paragraphs (1) through (6).

(1) Start the engine and increase its speed until the generator is operating at minimum rated speed.

NOTE

The proper engine speed may be determined from the ratio of generator-drive speed to engine crankshaft speed, as given in the engine manufacturer's instructions.

(2) Open the master battery switch and leave it open throughout the check.

(3) Switch off all load possible.

(4) Close the generator switch.

(5) Check the reading of the portable voltmeter. If the system voltage is not within the limits specified for the particular installation by the AAF or Bureau of Aeronautics, adjust the voltage regulator as outlined in the applicable instructions covering the control unit. If such adjustment fails to correct the voltage, refer to section V, paragraph 4., for aid in locating the difficulty.

(6) Apply load to the generator by switching on lights or some other load. The reading of the portable voltmeter should remain within the specified limits, and the system ammeter should indicate that the generator is delivering current. If, however, the reading of either instrument is not as described, refer to section V, paragraph 4. for aid in locating the difficulty.

b. PARALLEL GENERATOR SYSTEM.—Proceed as outlined in following paragraphs (1) through (9).

(1) Open the master battery switch and all generator and equalizer switches, if equalizer switches are used. Leave the master battery switch open throughout the check.

(2) Check each generator singly, and make any necessary adjustments to the voltage, as outlined in preceding paragraph *a.* The voltage of all control boxes should be adjusted as closely as possible to the value specified for the particular installation in order to simplify the paralleling adjustments.

(3) With all generators operating at or above minimum rated speed, close the generator switches of all generators in the system. If equalizer switches are used, they must be closed simultaneously with the corresponding generator switches.

(4) Switch on a total load approximately equivalent to the full-load rating of one generator.

(5) Check the readings of the portable voltmeter and system ammeters. The voltage should be within the specified limits, and the ammeters should indicate that each generator is carrying its proportional share of the load, WITHIN PLUS OR MINUS 10 PERCENT OF ITS RATED OUTPUT CURRENT.

NOTE

If, at any time during the checking procedure, the portable voltmeter does not indicate the proper voltage or if the load does not divide within the specified limits, adjust the voltage regulators as outlined in the manufacturer's instructions covering the control units used. If such adjustment fails to correct the difficulty, refer to section V, paragraph 4, for aid in locating the difficulty.

(6) Switch on load approximately equivalent to half load per generator.

(7) Again check the readings of the portable voltmeter and system ammeters as described in preceding paragraph (5). All readings should be within the values specified.

(8) Switch on all load possible, up to full load per generator.

(9) Repeat the check of voltmeter and ammeter readings described in preceding paragraph (5). All readings should be within the values specified.

NOTE

At or above full load per generator, it is permissible for each generator to carry its proportional share of the load within plus or minus 15 percent of its rated output current.

SECTION IV

OPERATION

1. PRINCIPLES OF OPERATION.

The generators are self-excited and have a shunt connected field coil assembly [8]. The negative terminal of the field coil assembly is directly connected to the negative brushes [46]. The positive terminal is connected to an external voltage regulator and thence to the positive brushes of the generator.

When the engine-driven armature assembly [50] is rotated within the yoke assembly [12], its armature coils cut the weak residual magnetic field existing in the magnetic circuit of the generator. The small voltages then induced in the armature coils are collected from the commutator [47] by the brushes [46]. Although the induced voltages reverse in each coil as the armature rotates, the commutator acts as a rotating switch to maintain constant polarity at each brush. These small voltages therefore cause a flow of direct current through the field coils, increasing the intensity of the magnetic field. Increased field intensity in turn leads to higher induced voltages, increased field current, and still higher field intensity. Since the value of the induced voltages is also proportional to speed of armature rotation, this "building up" of generated voltage continues as the speed of the generator increases, until a value predetermined by the setting of the voltage regulator is reached. At this point the regulator prevents further increase in field current, maintaining a constant generated voltage by automatically adjusting the field circuit resistance. The regulator allows the field current to increase, however, when the voltage decreases due to the application of load or a decrease in speed.

2. OPERATING INSTRUCTIONS.

Proceed as outlined in following paragraph *a.* for a single generator system, or as outlined in paragraph *b.* for a parallel generator system.

a. SINGLE GENERATOR SYSTEM.—With the generator operating at or above minimum rated speed, operation of the generating system is completely automatic upon manual closing of the generator switch.

NOTE

A common misunderstanding regarding the operation of the generating system is that the system is not functioning properly when the ammeter shows little or no charging current. This may or may not be true. Since

the voltage of the generator is maintained at an almost constant value by the voltage regulator, the current output depends entirely upon the condition of the battery and the amount of external load. Therefore, when the battery is fully charged and there is no load on the system, the difference in voltage between the generator and the battery is so small that little or no current flows between them.

The precautions outlined in following paragraphs (1), (2), and (3) should be observed to assure a minimum of service troubles.

(1) In order to prevent chattering of the control equipment contacts, leave the generator switch open when taxiing or idling the engine. However, be sure to close the generator switch before opening the throttle for take-off.

(2) In all cases of failure or improper operation of the generating system, open the generator switch immediately to prevent further damage to the system.

(3) Open the generator switch before shutting down the engine, in order to prevent damage to the system in the event that the reverse current cut-out fails to "open".

b. PARALLEL GENERATOR SYSTEM.—With the generators operating at or above minimum rated speed, operation of a parallel system not having an equalizer bus is completely automatic upon manual closing of the generator switches. In the event, however, that the system incorporates an equalizer bus, follow the detailed procedure outlined in following paragraph (1) for a system having only two generators, or that outlined in paragraph (2) for a system having more than two generators.

NOTE

The operating precautions outlined in preceding paragraph *a.* apply to all generating systems.

(1) For a parallel system having only two generators, proceed as outlined in following paragraphs *(a)* through *(d)*.

(a) To connect a single generator, simply close the generator switch.

NOTE

If a single equalizer switch is used to control both generators, do not close this switch for single operation of either generator. To do so will result in a lowering of the output voltage.

(b) To connect both generators, close both generator and equalizer switches.

NOTE

If two separate equalizer switches are used, close each generator switch and its corresponding equalizer switch simultaneously. If a single separate equalizer switch is used to control both generators, close both generator switches and the equalizer switch simultaneously.

(c) To disconnect a single generator from the system with both generators operating, open both the generator switch and its corresponding equalizer switch.

(d) To disconnect both generators, open all generator and equalizer switches.

(2) For a parallel system having more than two generators, proceed as outlined in following paragraphs *(a)* through *(c)*.

NOTE

In the event that each generator is controlled by a combined generator and equalizer switch, simultaneous opening and closing of the generator and equalizer circuit for each generator will be accomplished automatically. If, however, combined switches are not used, when closing a generator switch also close the corresponding equalizer switch at the same time.

(a) To connect a single generator, simply close the generator switch. Even if the generator switches are combined with the equalizer switches, the equalizer circuit will remain open until additional generators are connected. System voltage will be unaffected by closing one equalizer switch only.

(b) To connect two or more generators, simultaneously close the generator and equalizer switches controlling the generators to be connected.

CAUTION

Failure to close any one of the corresponding equalizer switches will result in improper paralleling of the generators.

(c) To disconnect one or more generators from a system which is already in operation, open all generator and equalizer switches controlling the generators to be disconnected.

NOTE

Failure to open any one of the corresponding equalizer switches will result in a lowering of the system voltage.

SECTION V

SERVICE INSPECTION, MAINTENANCE, AND LUBRICATION

1. SERVICE TOOLS REQUIRED.

The inspection and maintenance procedure outlined in this section does not require the use of special tools.

2. LUBRICATION.

The generators do not require lubrication of any kind between major overhaul periods.

3. SERVICE INSPECTION AND MAINTENANCE.

When properly installed and operated, the generator should not require any attention between engine changes other than that outlined in this section.

CAUTION

Before attempting to inspect or service the generator in the airplane, it is very important that the master battery switch be in the "open" position, to avert the possibility of fire due to a short circuit. In the absence of a battery switch, disconnect the leads from the battery terminals.

a. PREFLIGHT INSPECTION. — It is recommended that operation of the generating system be checked during the engine warm-up period before each flight, as outlined in following paragraph (1) or (2).

(1) SINGLE GENERATOR SYSTEM.—With the master battery switch "open", accelerate the engine until the generator is operating at or above its minimum rated speed. Close the manually operated generator switch, and apply load to the system. The system ammeter should then indicate the flow of load current. If the system ammeter (or voltmeter) indicates zero, refer to this section, paragraph 4., for aid in locating the difficulty.

CAUTION

Make certain to close the master battery switch before take-off.

(2) PARALLEL GENERATOR SYSTEM. — Make an individual check on each generator in the system, as described in preceding paragraph (1). Then, with all generators operating at or above minimum rated speed, parallel the generators by closing all generator switches. If equalizer switches are used, they must be closed simultaneously with the corresponding generator switches. Apply load approximately equivalent to full load rating of one generator, and then check the readings of the system ammeters. The system ammeters should indicate that each generator is carrying its share of the load within plus or minus 15 percent of its full rated current. If the load does not divide within the specified limits, refer to this section, paragraph 4., for aid in locating the difficulty.

b. 50-HOUR INSPECTION.—After every 50 hours of engine operation, inspect the generator as outlined in following paragraphs (1) through (8). Detach the air duct. Remove the front head window strap assembly [7] to permit access to the parts to be inspected.

NOTE

Closely examine the inside of the front head window strap assembly [7] for presence of brush and copper particles and engine oil. Absence of such matter usually indicates that the generator is operating properly. Presence of brush and copper particles indicates unsatisfactory condition of the brushes [46] or commutator [47]. Presence of engine oil may indicate that engine oil is leaking into the generator through the back [27] or intermediate [55] head ball bearing.

(1) HOUSING AND MOUNTING FLANGE.—Give the generator a thorough visual inspection for cracks or housing and mounting flange failures. Replace the generator if cracks or failures are found. Make certain that the generator is securely attached to the engine mounting pad.

(2) BRUSHES [46].—Check the brushes for free fit in the brush boxes [44]. Clean binding brushes and the brush boxes by wiping them with a cloth moistened in unleaded gasoline or any other suitable solvent. DO NOT USE CARBON TETRACHLORIDE AS ITS USE WILL CAUSE RAPID BRUSH WEAR. Examine the brush lead sleeving. If it is scuffed or burned, it should be replaced. Resolder or replace loose or broken terminals. Replace worn brushes before their maximum wear limit is reached in order to insure satisfactory operation until the next inspection period. The maximum permissible wear of the brushes is 1/4 inch from a new length of 7/8 inch, or when the length of brush remaining is 5/8 inch. During brush replacement make certain not to twist the brush leads.

(3) BRUSH SPRINGS [42].—The brush springs should bear centrally on the top of the brushes [46] to insure full brush contact with the face of the commutator [47]. Measure the tension of each brush spring with a zero to six pound standard spring scale. Hook the scale underneath each spring, and lift the end of the spring to a position 3/16 inch above brush box. If the spring tension does not measure within the limits specified in table 4, the tension must be adjusted. This operation requires disassembly of the generator, and reference should be made to the applicable overhaul chapter as listed in table 5.

TABLE 4

Generator Type	*Brush Spring [42] Tension*
307, 308, 309, 312, 703	21 to 29 ounces
310, 313, 314, 728, 790, 865	24 to 28 ounces
311	50 to 56 ounces
1235	17 to 21 ounces

(4) COMMUTATOR [47].—Inspect the contact surface of the commutator for roughness and color. An even, highly burnished, copper color indicates satisfactory condition. If the commutator has a dirty appearance, it should be cleaned with a cloth moistened in unleaded gasoline or any other suitable solvent. DO NOT USE CARBON TETRACHLORIDE, SINCE ITS USE WILL CAUSE CORROSION OF THE COMMUTATOR. If solvent fails to clean the commutator, polish with Number 0000 sandpaper. DO NOT USE EMERY CLOTH OR COARSE SANDPAPER. After the commutator has been sanded, use compressed air to remove all sand and metal particles, otherwise excessive wear will result. If the commutator is badly scored or pitted, it must be resurfaced. This operation requires disassembly of the generator, and reference should be made to the applicable overhaul chapter as listed in table 5.

TABLE 5

Generator Type	*Applicable Overhaul Chapter*
307	Chapter 3, Part B
308, 309, 310, 312, 313, 314, 703, 728	Chapter 3, Part C
790, 865	Chapter 3, Part D
311	Chapter 3, Part E
1235	Chapter 3, Part F

(5) INTERNAL CONNECTIONS.—Check all internal wiring connections to make sure they are clean and tight, and replace any wiring which has scuffed, burned, or frayed insulation. Resolder or replace loose or broken terminals. If the generator incorporates a receptacle [3], and it has been found to have cracked or burned insulation or loose prongs; replace the receptacle.

(6) EXTERNAL CONNECTIONS.—Check all external wiring connections to make sure they are clean and tight, and replace any wiring which has scuffed, burned, or frayed insulation. Resolder or replace loose or broken terminals. If the connections are made by means of an AN plug, replace plugs which have cracked or burned insulation, or loose prongs. Make certain that the plug is properly tightened.

(7) AIR SPOUT [39].—If the generator incorporates an air spout, make sure that the air duct is clean and free of obstructions. Also make certain that the air spout is firmly attached to the air duct and that the front head window strap assembly [7] is securely fastened.

(8) OUTPUT CHECK.—After the mechanical condition of the generator has been checked, as outlined in preceding paragraphs (1) through (7), make an output check as outlined in the following paragraph *(a)* or *(b)*.

NOTE

It is recommended that operation of the generator and its control equipment be checked at the same time, since the functions of these units are complementary to each other. Refer to the manufacturer's instructions concerning the particular control equipment used.

Connect an accurate portable d-c voltmeter between the positive bus and ground or negative bus. The voltmeter should have a range of 0 to 50 volts for 30-volt generators or a range of 0 to 30 volts for 15-volt generators. Proceed as outlined in following paragraph *(a)* for a single generator system, or as outlined in paragraph *(b)* for a parallel system.

(a) SINGLE GENERATOR SYSTEM.—Proceed as outlined in following paragraphs *1.* through *6.*

1. Start the engine and increase its speed until the generator is operating at or above minimum rated speed.

NOTE

The proper engine speed may be determined from the ratio of generator-drive speed to engine crankshaft speed, as given in the engine manufacturer's instructions.

2. Open the master battery switch and leave it open throughout the check.

3. Switch off all load possible.

4. Close the generator switch.

5. Check the reading of the portable voltmeter. If the system voltage is not within the limits specified for the particular installation by the AAF or Bureau of Aeronautics, adjust the voltage regulator as outlined in the applicable instructions concerning the control unit. If such adjustment fails to correct the voltage, refer to this section, paragraph 4., for aid in locating the difficulty.

6. Apply load to the generator by switching on lights or some other load. The reading of the portable voltmeter should remain within the specified limits, and the system ammeter should indicate that the generator is delivering current. If, however, the reading of either instrument is not as described, refer to this section, paragraph 4. for aid in locating the difficulty.

(b) PARALLEL GENERATOR SYSTEM.—Proceed as outlined in following paragraphs *1.* through *9.*

1. Open the master battery switch and all generator and equalizer switches, if equalizer switches are used. Leave the master battery switch open throughout the check.

2. Check each generator singly making any necessary adjustments to the voltage as outlined in preceding paragraph *(a)*. The voltage of all control boxes should be adjusted as closely as possible to the value specified for the particular installation in order to simplify the paralleling adjustments.

3. With all generators operating at or above minimum rated speed, close all generator switches of all generators in the system. If equalizer switches are used, they must be closed simultaneously with the corresponding generator switches.

4. Switch on a total load approximately equivalent to the full-load rating of one generator.

5. Check the readings of the portable voltmeter and system ammeters. The voltage should be within the specified limits, and the ammeters should

indicate that each generator is carrying its proportional share of the load, within plus or minus 15 percent of its rated output current.

NOTE

If, at any time during the checking procedure, the portable voltmeter does not indicate the proper voltage or if the load does not divide within the specified limits, adjust the voltage regulators as outlined in the manufacturer's instructions covering the control units used. If such adjustment fails to correct the difficulty, refer to this section, paragraph 4. for aid in locating the difficulty.

6. Switch on load equivalent to half load per generator.

7. Again check the readings of the portable voltmeter and system ammeters as described in preceding paragraph 5. All readings should be within the values specified.

8. Switch on all load possible, up to full load per generator.

9. Repeat the check of voltmeter and ammeter readings described above in preceding paragraph 5. All readings should be within the values specified.

c. ENGINE CHANGE.—At the time of the periodic engine overhaul, detach the generator from the engine and follow the generator overhaul procedure outlined in the applicable overhaul chapter listed in table 5.

4. SERVICE TROUBLES AND REMEDIES.

In all cases of failure or improper operation in order to prevent further damage to the system, disconnect the generator immediately by opening the generator switch. If equalizer switches are used, also open the corresponding equalizer switch. Do not attempt to operate equipment which is not functioning properly; investigate the trouble as soon as possible.

NOTE

Do not disassemble faulty generators in the field; forward them to an authorized repair depot or overhaul base for inspection, repair, and test.

In the event that trouble is experienced during routine operation, an accurate portable voltmeter should be connected for test purposes. Connect the positive voltmeter terminal to the positive line between the generator and voltage regulator, at any accessible point. Connect the negative voltmeter terminal to the negative line, or to ground in grounded systems, at any accessible point.

NOTE

Observe that the voltmeter connections for trouble shooting differ from those made for routine checking.

The following chart is provided to assist in locating the difficulty. For performance of all remedies marked with an asterisk (*), reference should be made to the applicable overhaul chapter, as listed in table 5.

Trouble	*Probable Cause*	*Remedy*
a. With generator and equalizer (if used) switches "open", test voltmeter indicates low generator output voltage.	(1) Faulty or improperly adjusted voltage regulator	(1) Refer to applicable instructions covering the voltage regulator.
	(2) High resistance internal or external generator connections	(2) Check all internal connections as outlined in this section, paragraph 3. *b.* (5). Also check external connections.
	(3) Binding, worn, improperly seated, or loosely fitting brushes [46]	(3) Service the brushes [46] as outlined in this section, paragraph 3. *b.* (2).
	(4) Low brush spring [42] tension	(4) *Readjust or replace the brush spring [42].
	(5) Dirty commutator [47]	(5) Service commutator as described in this section, paragraph 3. *b.* (4).

Trouble	*Probable Cause*	*Remedy*
a. With generator and equalizer (if used) switches "open", test voltmeter indicates low generator output voltage. *(Continued)*	(6) Scored or pitted commutator [47]	(6) *Resurface commutator [47].
	(7) Shorted or open armature [48]	(7) *Test, and if necessary, replace armature assembly [50].
b. With generator and equalizer (if used) switches "open", test voltmeter indicates zero generator output voltage.	(1) Faulty or improperly adjusted voltage regulator	(1) Refer to applicable instructions covering the voltage regulator.
	(2) High resistance, loose, or broken internal connections	(2) Service as described in this section, paragraph 3. *b.* (5).
	(3) External wiring not properly connected	(3) Refer to aircraft manufacturer's wiring diagram and check all wiring connections. All connections should be clean and tight.
	(4) Field coil assembly [8] open or grounded	(4) *Test, and if necessary, replace field coil assembly [8].
	(5) Generator field demagnetized	(5) Flash field in the proper direction as instructed in section III, pargraph 2. *b.*
	(6) Grounded armature	(6) *Test, and if necessary, replace armature assembly [50].
	(7) Faulty aircraft wiring	(7) Refer to aircraft manufacturer's wiring diagram and check all wiring connections for continuity and grounds.
c. With generator and equalizer (if used) switches "open", test voltmeter indicates erratic or fluctuating generator output voltage.	(1) Unstable operation of voltage regulator	(1) Refer to applicable instructions covering the voltage regulator.
	(2) Same as trouble *a.*, items (2) through (7)	(2) Same as trouble *a.*, items (2) through (7)
d. With generator and equalizer (if used) switches "open", test voltmeter reads off scale in wrong direction.	(1) Generator field magnetized in the wrong direction	(1) Flash field in proper direction as instructed in section III, paragraph 2. *b.*
	(2) External wiring not properly connected	(2) Refer to aircraft manufacturer's wiring diagram and check all wiring connections. All connections should be clean and tight.
	(3) Improper operation of generator cut-out	(3) Refer to applicable instructions covering the generator cut-out.
e. Excessive sparking at generator brushes [46]	(1) Same as trouble *a.*, items (2) through (7)	(1) Same as trouble *a.*, items (2) through (7)
f. With generator switch closed, system ammeter indicates zero output current.	(1) Open generator circuit breaker or blown generator fuse	(1) Locate cause of overload, and then close breaker or replace fuse.
	(2) Improper operation of generator cut-out	(2) Refer to the applicable instructions covering the generator cut-out.

Trouble	*Probable Cause*	*Remedy*
f. With generator switch closed, system ammeter indicates zero output current. *(Continued)*	(3) Generator field demagnetized	(3) Flash field in the proper direction as instructed in section III, paragraph 2. *b.*
	(4) Burned out ammeter	(4) Refer to applicable instructions covering the ammeter.
	(5) Faulty generator switch	(5) Refer to applicable instructions covering the generator switch.
	(6) See trouble *b.* all items	(6) See trouble *b.* all items.
g. System ammeter indicates low output current.	(1) See note in section IV, paragraph 2	(1) See note in section IV, paragraph 2.
	(2) See trouble *a.* all items	(2) See trouble *a.* all items.
h. System ammeter or voltmeter reads off scale in the wrong direction.	(1) Generator field magnetized in the wrong direction	(1) Flash field in proper direction as instructed in section III, paragraph 2. *b.*
	(2) External wiring not properly connected	(2) Refer to aircraft manufacturer's wiring diagram and check all wiring connections. All connections should be clean and tight.
	(3) Improper operation of generator cut-out	(3) Refer to applicable instructions covering the generator cut-out.
i. System ammeter or voltmeter fluctuates excessively.	(1) Improper operation of generator cut-out	(1) Refer to the applicable instructions covering the generator cut-out.
	(2) Improper adjustment of voltage regulator	(2) Refer to applicable instructions covering the voltage regulator.
	(3) Loose connections or grounds in aircraft wiring	(3) Refer to aircraft manufacturer's wiring diagram and check for loose connections and grounds.
j. Noisy radio operation.	(1) Faulty filter condensers	(1) Refer to applicable instructions covering the filter condensers used.
	(2) Discharged battery	(2) Replace discharged battery.
	(3) Excessive sparking at generator brushes [46]	(3) Same as trouble *a.* items (2) through *(7)*.
k. Load does not divide properly in parallel system.	(1) Improper operation or adjustment of voltage regulator	(1) Refer to applicable instructions covering the voltage regulator.
	(2) Generator ground straps (if used) not properly installed	(2) Refer to aircraft manufacturer's instructions covering ground strap installation.
	(3) Equalizer switch (if used) inoperative	(3) Refer to applicable instructions covering the equalizer switch.
	(4) High resistance internal or external connections	(4) Check all internal connections as outlined in this section, paragraph 3. *b.* Also check all external connections.

Trouble	*Probable Cause*	*Remedy*
k. Load does not divide properly in parallel system. *(Continued)*	(5) Inaccurate or burned out system ammeter	(5) Refer to applicable instructions covering the system ammeter.
	(6) Shorted or open armature [48]	(6) *Test, and if necessary, replace armature assembly [50].
l. Short brush [46] life.	(1) Same as trouble *a.* causes (3) through (7)	(1) Same as trouble *a.* remedies (3) through (7).
	(2) Wrong type of brush [46] being used	(2) Check to make sure that proper brushes [46] are being used. Replace brushes if necessary.

SECTION VI

WEIGHT AND CUBAGE

Weight and cubage of the generators, singly packed, are shown in table 6.

TABLE 6

Generator Type	*Outside Dimensions of Packing Box in Inches*	*Volume Cu Ft*	*Gross Weight Pounds*
307	19 x 11 x 11	1.33	24
308	19 x 11 x 11	1.33	30
309	19 x 11 x 11	1.33	32
310	19 x 11 x 11	1.33	42
311	19 x 11 x 11	1.33	55
312	19 x 11 x 11	1.33	32
313	19 x 11 x 11	1.33	42
314	19 x 11 x 11	1.33	45
703	19 x 11 x 11	1.33	35
728	19 x 11 x 11	1.33	35
790	19 x 11 x 11	1.33	31
865	19 x 11 x 11	1.33	28
1235	19 x 11 x 11	1.33	32

SECTION VII

PARTS CATALOG

Reference to an Eclipse Parts Catalog K is required when ordering service replacement parts. Refer to the applicable cross-sectional assembly drawing for identification of part number and local quantity of parts required. To determine part name, refer to numerical list of service part. When ordering parts, specify part name and number as well as manufacturer's drawing number appearing on nameplate of generator for which parts are desired.