

TM 55-2925-236-40

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

GS MAINTENANCE MANUAL

STARTER GENERATOR

PART NO. 30E20-61-A

(BENDIX)

HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 1969

WARNING
PRECAUTIONARY DATA

Personnel performing instructions involving operations, procedures, and practices which are included in this technical manual shall observe the following instructions. Disregard of these warnings and precautionary information can cause serious injury, death, or an aborted mission.

PRECAUTIONARY DATA DEFINITION

CLEANING SOLVENT

PRECAUTIONARY DATA PRESENTATION.

Use solvent in a well-ventilated area. Avoid inhaling solvent fumes. Do not allow solvent to contact skin as burns may occur.

CHANGE }
No. 5 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 19 December 1988

**GS Maintenance Manual
Including Repair Parts and Special Tools Lists**

STARTER GENERATOR

PART NO. 30E20-61-A

NSN 2925-00-927-9483

(BENDIX)

TM 55-2925 -236-40,2 May 1969, is changed as follows:

Cover and page i. Title is changed as shown above.

Page 1-1, para. b. 7th and 8th lines. ATTN: AMSAV-R-M, P. O. Box 209, St. Louis, Missouri 63166 i changed to read ATTN: AMSAV-MMD, 4300 Goodfellow Blvd., St. Louis, Mo. 63120-1798.

Page 1-1, para. 1-3, 2nd and 4th lines. TM 38-750 is changed to read DA PAM 738-751.

Page 1-2, para. 1-7. Add after the first sentence: For general technical information on preparation] for storage and shipment refer to TM 55-1500-204-25/1 and TM 743-200-1.

Page 2, Change 2, Figure 3-2, Index No's 11, 18, and 25. Add alternate part number MS2503-150 (96906).

Page 2-2, Change 3. The following item is added to Table 2-3:

Item No.	Nomenclature	Number	Specification
20	Epoxy Lead Putty		Devon L. (FMC 16059)

Page 3-1c. (1) Delete the last sentence - "Do not attempt to remove terminals (4, 11, 18, or 25) unless damaged."

Page 3-1. Add note following paragraph 3-16. (8): NOTE. Replace capacitor lead terminals with alternate part number for indexes 11, 18, 25 (Figure 3-2). These leads will be reconnected to brush holders (28) Figure 3-2 with screws (5), Figure 3-1.

Page 3-3, Figure 3-1, Index No. 19. Part Number 59NTE2834-054 is changed to read F52NTE2834-054.

Page 3-11, para. 3-12a. (1) The note is superseded as follows: NOTE. Terminals of capacitors 6, 13, 20, and 27 will be secured to electrical contact holders (28) when the brushes are installed, para. b. (18).

Page 3-12, para. 3-12b. (14) is rescinded.

Page 3-12, para. 3-12b. (14) is **added after para. 3-12b. (13)**. (14) Use setting gage (1106353-1) to measure and check the compressed length of compression spring (21). This assembled length should be 1.100 inches. Insert the gage size plug into the fan housing end of the fan (18) and install washer (20) and self-locking nut (19). Insure washer (20) and self-locking nut (19) are seated flat on the shoulder of the gage size plug. Seat the setting gage on the washer and adjust gage indicator to read zero. Remove the setting gage, self-locking nut, washer, and gage size plug. Install front plate (23) on drive shaft assembly (22) and insert the shaft through armature assembly (39). Install fan (18) on drive shaft assembly (22). Install compression spring (21), washer (20), self-locking nut (19) and the setting gage. Using spline wrench (QB80059-3) to keep the shaft from turning, retighten self-locking nut (19) with the 7/16 inch (12 point thin wall) socket wrench until the setting gage again indicates zero, plus or minus 0.005 inch. Remove the setting gage. NOTE: Insure indicator makes at least one full revolution prior to zeroing to insure contact is made between plunger and washer.

Page 3-12 para. 3-12b. (18) is rescinded.

Page 3-12 para. 2-12b. (18) is added after para 3-12b. (17). (18) Align the terminals of capacitors (6, 13, 20, and 27, Figure 3-2) over the threaded holes for brush cap screws (5, Figure 3-1). Install split-type brushes ((4, Figure 3-1) in brush holders, and secure, along with capacitor terminals, using eight screws (5), eight lockwashers (6), and eight plainwashers (7). Tighten the screws to a torque of 35 to 50 pound-inches.

Page 4-3, para. 4-5b. Is rescinded.

Page 4-3, para. 4-5b. Is added after para. 4-5a. b. Disconnect all capacitor terminals using insulation breakdown test set 13700-1C, apply 250 present volts, 60 CPS for one minute between each terminal post and the frame (ground).

Page 4-3, para. 4-5c, 1st line. Is changed to read 1.5.

Page 6, change 1. NSN 5310-804-0075 is rescinded.

Page 6, change 1. Part Number EB054 is changed to read F52NTE2834-054.

Page A-1. TM 38-750 is rescinded.

Page A-1. Add before MS 33540 (ASG) DA PAM 738-751 Functional Users Manual for the Army Maintenance Management Systems Aviation (TAMMS-A).

Page A-1. TM 55-405-10 is rescinded.

Page A-1. Add after QQ-S-571, TM 743-200-1 Storage and Materials Handling.

Page A-1. Add after TM 743-200-1, TM 55-1500-204-25/ 1, General Aircraft Maintenance Manual.

By Order of the Secretary of the Army:

Official:

CARL E. VUONO
General, United States Army
Chief of Staff

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION :

To be distributed in accordance with DA Form 12-31, AVUM and AVIM Maintenance requirements for AH-1G Helicopter, Attack and UH-1C, UH-1H and UH-1M Helicopter, Utility.

PIN: 013968~~7~~005

CHANGE }
 No. 4 }

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 WASHINGTON, DC., 3 October 1975

GS Maintenance Manual
 Including Repair Parts and Special Tools Lists

STARTER GENERATOR PART NO. 30E20-61-A

(BENDIX)

TM 55-2925-236-40, 2 May 1969, is changed as follows:

Page 2-2, Table 2-3, Item No. 12. Number Specification "MIL-G-3545" is changed to read "MIL-G-81322A."

Page 3-8. Paragraph 3-6^f is superseded as follows:

f. Check the armature assembly for static and dynamic balance, using balancing machine, model 40B. If out of balance by more than 0.020 oz. in., rebalance by inserting leaded epoxy material inside and under winding openings as required. Armature having Balance Ring will be rebalanced by applying Solder (item 17, table 2-3) to inside of balancing ring. Solder must not extend beyond lip of ring.

By Order of the Secretary of the Army:

Official:

PAUL T. SMITH

*Major General, United States Army
 The Adjutant General*

FRED C. WEYAND

*General, United States Army
 Chief of Staff*

DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 Direct and General Support Maintenance Requirements for AH-1G, UH-1C/M and UH-1D/H aircraft.

CHANGE }
No. 3 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 11 March 1974

GS Maintenance Manual
Including Repair Parts and Special Tools Lists

STARTER GENERATOR PART NO. 30E20-61-A

(BENDIX)

TM 55-2925-236-40, 2 May 1969, is changed as follows:

Page 2-2. The following items are added to table 2-3.

Item No.	Nomenclature	Number Specification
17	Solder	Type QQS571SN5WRAP3 (FCM 81348)
18	Adhesive	FSN 8040-145-0019
19	Adhesive paper	FSN 5350-224-7207

Page 3-8. Paragraph 3-4a is superseded as follows:

a. *General.*

- (1) Replace or repair all parts that are worn and damaged.
- (2) Replace split-type brushes (4, figure 3-1) and ball bearings (36 and 44) at each overhaul.
- (3) Replace all wiring having burned or cracked insulation, or broken or corroded terminals.
- (4) Terminal board (item 49, figure 3-1) with damage not exceeding 1 crack per mounting hole and with no chunking out of parent material may be repaired as follows: Clean terminal board with trichlorethylene (item 1, table 2-3). Fill mounting flange crack with adhesive (item 18, table 2-3). Wipe away excess material. Before adhesive cures blend area with 240 grit abrasive paper (item 19, table 2-3). Allow terminal board dust to imbed in uncured adhesive.

Page 3-8. Paragraph 3-6f is superseded as follows:

- f. Check the armature assembly for static and dynamic balance, using balancing machine, model 40B. If out of balance by more than 0.020 inch-ounce, rebalance by applying solder (item 17, table 2-3) to inside of balancing rings. Solder must not extend beyond lip of rings.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS

General, United States Army

Chief of Staff

Official:

VERNE L. BOWERS

Major General, United States Army

The Adjutant General

DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 (qty rqr blocks no. 35, 354, and 39, cumulative for all blocks) Direct and General Support Maintenance Requirements for UH-1C, UH-1D and 1H, and AH-1G Aircraft.

CHANGE }
 No. 2 }

HEADQUARTERS
 DEPARTMENT OF THE ARMY
 WASHINGTON, D. C., 18 December 1970

GS Maintenance Manual
 Including Repair Parts and Special Tools Lists

STARTER GENERATOR
 PART NO. 30E20-61-A (BENDIX)

TM 55-2925-236-40, 2 May 1969, is changed as follows:

Page 2-1, table 2-1. In line 2, the first three columns are changed from "1650A 24655 Capacitance Bridge" to: "ZM3/U 80058 Capacitance Analyzer."

Pages 3-5 and 3-6. Figure 3-2 and "LEGEND FOR FIGURE 3-2" are superseded.

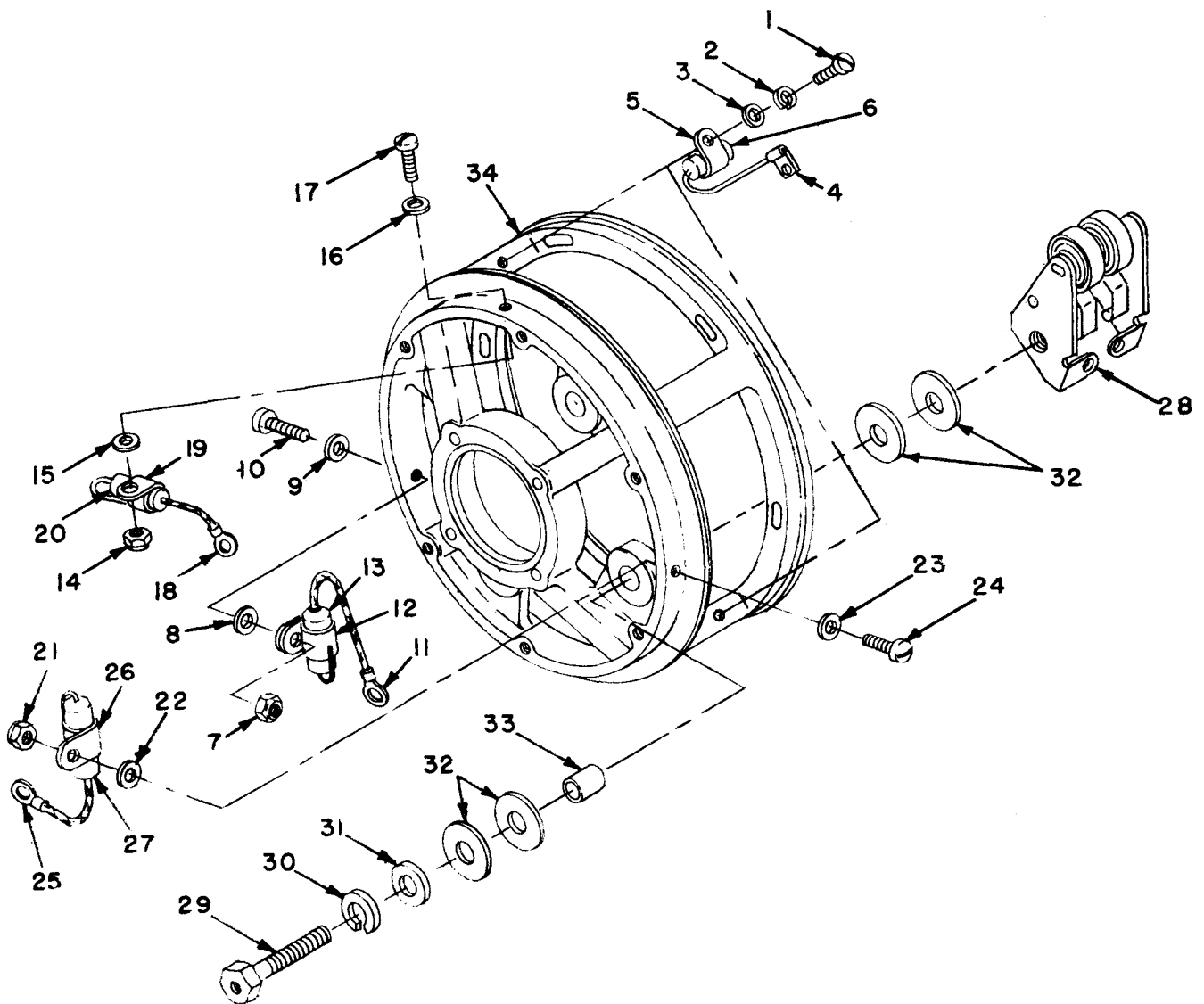


Figure 3-2. End Bell Assembly, Exploded View.

LEGEND FOR FIGURE 3-2

Index No.	Part Number	Description	Qty Per Assy
3-2-	1543956	END BELL ASSEMBLY (See item 30, fig. 3-1 for nha)	Ref
	1545592-1	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	2
-1	819106-110	. SCREW, fil h, cad. pl stl, No. 6-32 x 5/16 in. lg	2
-2	MS35338-41	. WASHER, Lock	2
-3	890487	. WASHER, Flat, sst, for No. 6 screw	2
		----*----	
-4	1329221	.. TERMINAL	1
-5	1532827-3	.. CLAMP, Loop	1
-6	109D406C2075TO	.. CAPACITOR, Fixed, 40 uf + 20 pct -15 pct, 75 V dc (06001) (83298, part No. 1102113-2)	2
	1545592-6	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	2
-7	MS21044N06	. NUT, Self-locking	1
-8	33338	. WASHER, Flat, cad. pl stl, for No. 6 screw	1
-9	AN960-6L	. WASHER	1
-10	MS35265-31	. SCREW	1
		----*----	
-11	34110	.. TERMINAL, Solderless (00779) (83298, part No. 1102238-4)	1
-12	1532827-19	.. CLAMP, Loop	1
-13	121P10401R5S2	.. CAPACITOR, Fixed, 0.10 uf ± 20 pct, 150 V dc (56289) (83298, part No. 1111769-5)	1
	1545592-3	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	1
-14	MS21014NO6	. NUT, Self-locking	1
-15	33338	. WASHER, Flat, cad. pl stl, for No. 6 screw	1
-16	AN960-CL	. WASHER	1
-17	MS35265-31	. SCREW	1
		----*----	
-18	34110	.. TERMINAL, solderless (00779) (83298, part No. 1102238-4)	1
-19	1532827-20	.. CLAMP, Loop	1
-20	69F196G3	.. CAPACITOR, Fixed, 4.7 uf ± 10 pct, 100 V dc (06001) (83298, part No. 1545591-1)	1
	1545592-4	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	1
-21	MS21044NO6	. NUT, Self-locking	1
-22	33338	. WASHER, Flat, cad. pl stl, for No. 6 screw	1
-23	AN960-6L	. WASHER	1
-24	MS35265-31	. SCREW	1
		----*----	
-25	34110	.. TERMINAL, Solderless (00779) (83298, part No. 1102238-4)	1
-26	1532827-19	.. CLAMP, Loop	1
-27	121P4740R5S1	.. CAPACITOR, Fixed, 0.47 uf ± 20 pct, 50 V dc (56289) (83298, part No. 1545590)	1
-28	1542776	. HOLDER, Electrical contact (ATTACHING PARTS)	4
-29	1543503	. SCREW, Cap, hex hd, 5/16-18 x 1-1/8 in. lg	4
-30	MS35338-45	. WASHER, Lock	4
-31	867491	. WASHER, Flat, cad, pl stl, for 5/16 in. screw	4
-32	1543622	. WASHER, Insulating	16
-33	1328928	. TUBE, Insulating	4
-34	1543976	. BELL, End	1

Page 4-3, paragraph 4-6c(2). In line 1, the words "blower and" are deleted.

Page 4-4. Figure 4-2 is changed as follows:

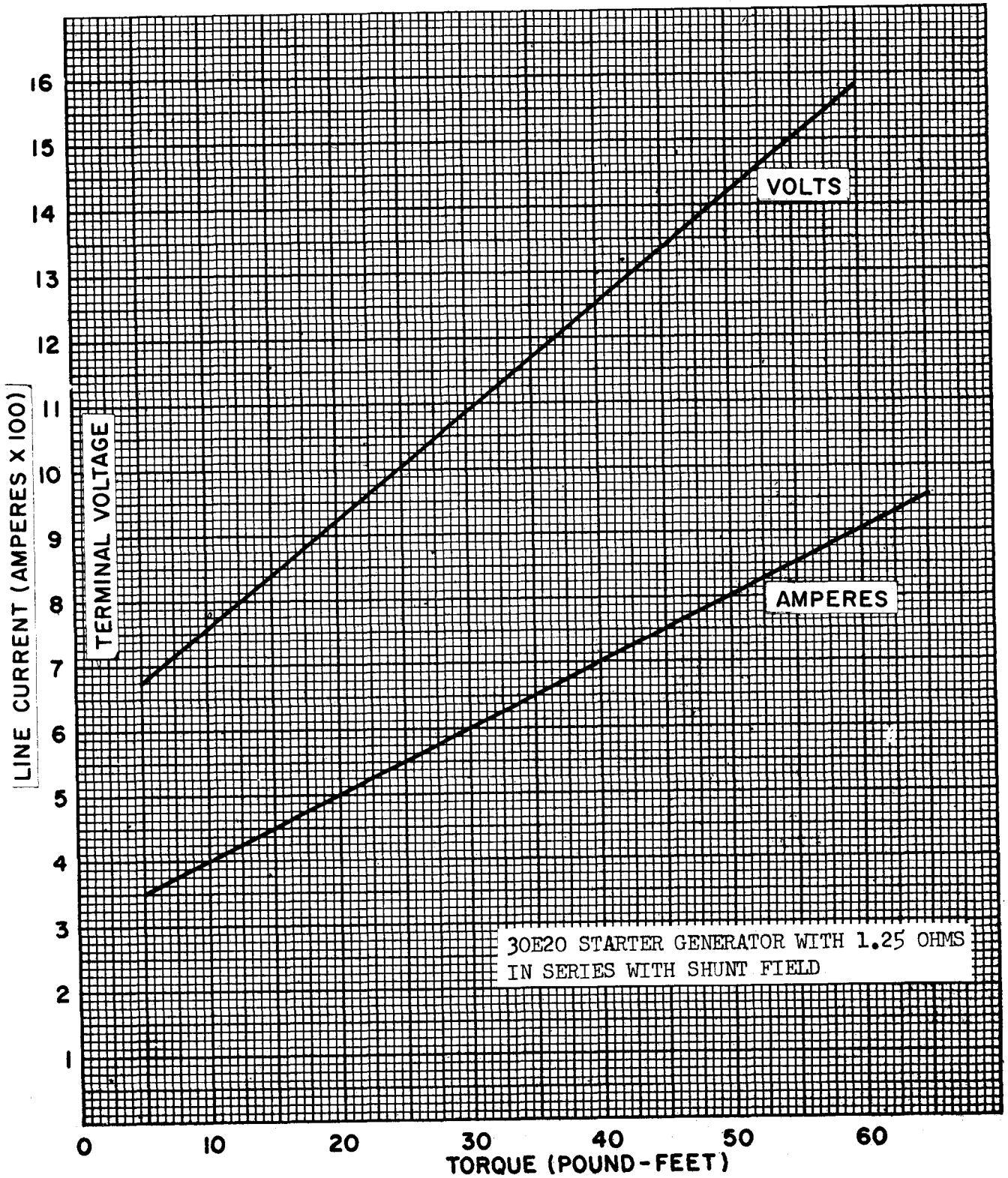


Figure 4-2. Stall Torque Curve.

Page 4-5, paragraph 4-6e(4). In line 2, "6000 rpm" is changed to read "8000 rpm."

By Order of the Secretary of the Army:

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

DISTRIBUTION:

To be distributed in accordance with DA Form 12-31 (qty rqr block nos. 35, 354, and 39, cumulative for all blocks) requirements for Direct and General Support Maintenance Instructions for UH-1C, UH-1D and 1H, and AH-1G Aircraft.

CHANGE }
No. 1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 29 December 1969

GS Maintenance Manual
Including Repair Parts and Special Tools Lists

STARTER GENERATOR

PART NO. 30E20-61-A

(BENDIX)

TM 55-2925-236-40, 2 May 1969, is changed as follows:

Cover and page i. Title is changed as shown above.

Page i. Change "page A-1" for "REFERENCES" to read "page A-1/B-1." Add "Appendix B, REPAIR PARTS AND SPECIAL TOOLS LISTS, page A-1/B-1" to Table of Contents.

Page A-1. Change page no. to read "A-1/B-1." Appendix B is added as follows:

APPENDIX B

REPAIR PARTS AND SPECIAL TOOLS LISTS
(Current as of 28 July 1969)

Section I. INTRODUCTION

B-1. Scope

This appendix lists repair parts, special tools, test and support equipment, and maintenance supplies required for the performance of general support maintenance of the starter-generator, engine.

B-2. General

The Repair Parts and Special Tools Listing is divided into the following sections:

a. Repair Parts - Section II. A list of repair parts authorized for the performance of maintenance at the general support level in figure and item number sequence. Maintenance supplies (MSUP) are listed within the section in ascending Federal stock Number (FSN) sequence.

b. Special Tools, Test and Support Equipment - Section III. A list of special tools, test and support equipment authorized for the performance of maintenance at the general support level.

c. Federal Stock Number and Reference Number Index - Section IV.

This section is divided as follows:

(1) A list of FSNs in ascending numerical sequence, cross-referenced to the illustration figure and item number.

(2) A list of reference numbers (R/Ns) in ascending alpha-numerical sequence, cross-referenced to the manufacturer's Federal supply code, illustration figure, and item number.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular lists in sections II and III:

a. Source, Maintenance and Recoverability Codes (SMR) - Column 1.

(1) *Source code.* Indicates the selection status and source for the listed item. Source codes used are:

CODE	EXPLANATION
P	Applies to repair parts which are stocked in or supplied from GSA/DSA, or Army supply system and authorized for use at indicated maintenance categories.
X1	Applies to repair parts which are not procured or stocked. The requirement for such items will be filled by use of the next higher assembly or component.
X2	Applies to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain same through cannibalization. When such repair parts are not obtainable through cannibalization, requirements will be requisitioned, with accompanying justification, through normal supply channels.

(2) *Maintenance code.* Indicates the lowest category of maintenance authorized to install the listed item. Maintenance codes used are:

CODE	EXPLANATION
O	Organizational maintenance
F	Direct support maintenance
H	General support maintenance

(3) *Recoverability code.* Indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable.

b. *Federal Stock Number - Column 2.* Indicates the FSN assigned to the item and will be used for requisitioning purposes. Items source coded X1 are not assigned an FSN.

c. *Description - Column 3.* Indicates the Federal item name and any additional description of the item required. The description column contains the following subcolumns.

(1) *Reference number and manufacturer's code.* Indicates a part number or other R/N for the listed item, followed by the applicable five-digit Federal supply code for manufacturers in parentheses.

(2) *Usable on code.* Not applicable.

d. *Unit of Issue (U/I) - Column 4.* A two-character alphabetic abbreviation indicating the standard or minimum basic quantity in which the item is issued (e.g., EA, FT, PR).

e. *Quantity Incorporated in Unit - Column 5.* Indicates the quantity of the item used in the assembly. A "V" appearing in this column in lieu of a quantity indicates that a definite quantity cannot be indicated.

f. *Thirty-day GS Maintenance Allowance - Column 6.*

(1) The allowance column is divided into three subcolumns. Indicated in each subcolumn, opposite the first appearance of each item is the total quantity of items authorized for the number of equipments supported. Subsequent appearances of the same item will have the letters "REF" in this column. Items authorized for use as required but not for initial stockage are identified with an asterisk (*) in the allowance column.

(2) The quantitative allowance for GS level of maintenance will represent initial stockage for a 30-day period for the number of equipments supported.

(3) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a demical point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized allowance for 51-100 allowance column. Example: authorized allowance for 51-100 equipments is 40; for 150 equipments, multiply 40 by 1.50 or 60 parts required.

g. *One-year Allowance per 100 Equipments/Contingency Planning Purposes - Column 7.* Indicates opposite the first appearance of each item, the total

quantity required for distribution and contingency planning purposes. The range of items indicates total quantities of all authorized items required to provide for adequate support of 100 equipments for one year.

h. Depot Maintenance Allowance per 100 Equipments - Column 8. Not applicable.

i. Illustration - Column 9. Illustrations appear in the narrative portion of this manual. This column is divided as follows:

(1) *Figure number - column 9a.* Indicates the figure number of the illustration in which the item is shown. Appearances of the letters "MSUP" in this column indicate maintenance supplies located in section II, the letters "TOOL" indicate special tools located in section III.

(2) *Item number - column 9b.* Indicates the callout number used to reference the item in the illustration.

B-4. Special Information

a. Attaching parts are listed following the part(s) they attach and in the same indent. They are separated from the part(s) by the words "attaching parts" in the description column. When they attach an assembly which is broken down to show detail parts, the attaching parts are separated from the details of the assembly by the symbol "---*---." Details of the assembly are then indented one space to the right of their next higher assembly, which appears above the attaching parts.

B-5. How to Locate Repair Parts

a. When FSN or R/N is unknown.

(1) *First.* Find the exploded view illustration of the assembly or subassembly to which the repair part belongs.

(2) *Second.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(3) *Third.* Using the Repair Parts Listing, find the figure and item number listed in the illustration column.

b. When Federal stock number or reference number is known:

(1) *First.* Using the index of FSNs and R/Ns, find the pertinent FSN or R/N. This index is in ascending FSN sequence, followed by a list of R/Ns in ascending alpha-numerical sequence, cross-referenced to the illustration figure and item number.

(2) *Second.* Using the Repair Parts Listing, find the figure and item number listed in the illustration column referenced in the index of FSNs and R/Ns.

B-6. Federal Supply Codes for Manufacturers

CODE	MANUFACTURER
24446	General Electric Co 1 River Road Schenectady NY 12305
72962	Elastic Nut Corp of America 2330 Vauxhall Road Union NJ 07083
81348	Federal Specifications Promulgated by General Services Administration
81349	Military Specifications Promulgated by Standardization Div Directorate of Logistic Services DSA
83298	Bendix Corp the Electric Power Division W/S Route 35 Eatontown NJ 07724
88044	Aeronautical Standards Group Dept of Navy and Air Force
96214	Texas Instruments Inc Apparatus Division 6000 Lemmon Ave Dallas Tx 75209
96906	Military Standards Promulgated by Standardization Div Directorate of Logistic Services DSA

(1) SOURCE, MAINT AND RECOV CODE			(2) FEDERAL STOCK NUMBER		(3) DESCRIPTION		(4) MODELS USABLE ON	(5) QTY INC IN UNIT	(6) 30-DAY MAINT ALW 'GS			(7) 1-YR ALWPER 100 EQUIP CNTGCV	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION	
(a) SOURCE CODE	(b) MAINT LEVEL	(c) RECOV CODE		REFERENCE NUMBER & MFR CODE					(a) 1-20	(b) 21-50	(c) 51-100			(a) FIG NO	(b) ITEM NO
			2925-927-9483	30E20-61A (83298)	STARTER-GENERATOR, ENGINE.....		EA							1-1	
					SECTION III REPAIR PARTS STARTER-GENERATOR										
P	F		9999-247-0215	1544776 (83298)	COVER, ACCESS.....		EA	1	*	*	*			3-1	1
P	F		5305-912-4832	MS35276-268 (96906)	.SCREW, MACHINE.....		EA	1	*	*	*			3-1	2
P	F		5310-439-4711	833656 (83298)	.NUT, PLAIN, SQUARE.....		EA	1	*	*	*			3-1	3
P	H		5977-681-1431	1110489 (83298)	BRUSH, ELECTRICAL, CONTACT.....		EA	8	*	*	*			3-1	4
					ATTACHING PARTS										
P	H		5306-523-8866	890065-2 (83298)	BOLT, INTERNAL WRENCHING.....		EA	8	*	*	*			3-1	5
P	H		5310-582-5965	MS35338-44 (96906)	WASHER, LOCK.....		HD	8	*	*	*			3-1	6
P	H		5310-141-1795	AN960-416 (88044)	WASHER, FLAT.....		HD	8	*	*	*			3-1	7
					---*---										
P	O		5310-926-1852	MS21083N6 (96906)	NUT, SELF-LOCKING, HEXAGON.....		HD	3	*	*	*			3-1	8
P	O		5310-167-0821	AN960-616 (88044)	WASHER, FLAT.....		HD	3	*	*	*			3-1	9
P	O		5310-807-1467	MS21042-3 (96906)	NUT, EXTENDED WASHER, HEXAGON.....		HD	2	*	*	*			3-1	10
P	O		5310-167-0834	AN960-10L (88044)	WASHER, FLAT.....		HD	2	*	*	*			3-1	11
P	H		5910-443-4010	1545592-5 (83298)	CAPACITOR ASSEMBLY.....		EA	1	*	*	*			3-1	12
P	H		2925-228-8854	1543975 (83298)	HOUSING, GENERATOR.....		EA	1	*	*	*			3-1	16
					ATTACHING PARTS										
P	H		5305-959-2689	MS35191-279 (96906)	SCREW, MACHINE.....		EA	6	*	*	*			3-1	17
					---*---										
P	H		6150-455-9645	1543970 (83298)	FAN, ELECTRICAL.....		EA	1	*	*	*			3-1	18
					ATTACHING PARTS										
P	H		5310-804-0075	EB054 (72962)	NUT, SELF-LOCKING, HEXAGON.....		EA	1	*	*	*			3-1	19
P	H			1549110-1 (83298)	WASHER, FLAT.....		EA	1	*	*	*			3-1	20
					---*---										
P	H		5340-420-5954	1543736 (83298)	SPRING, HELICAL, COMPRESSION.....		EA	1	*	*	*			3-1	21
P	H		2925-228-8852	1543441 (83298)	SHAFT ASSEMBLY, DRIVE.....		EA	1	*	*	*			3-1	22
P	H		2925-731-4906	1111791 (83298)	PLATE, RETAINING, SHAFT.....		EA	1	*	*	*			3-1	23
P	H		5305-940-9488	MS35275-226 (96906)	SCREW, MACHINE.....		EA	3	*	*	*			3-1	24
P	H		5310-680-4241	819001-016 (83298)	WASHER, LOCK.....		EA	3	*	*	*			3-1	25
P	H		5310-531-9514	AN960C6 (88044)	WASHER, FLAT.....		MX	3	*	*	*			3-1	26
P	H		5340-804-2026	MS16624-1098 (96906)	RING, RETAINING.....		EA	1	*	*	*			3-1	27
P	H		5305-943-5918	MS35275-249 (96906)	SCREW, MACHINE.....		EA	4	*	*	*			3-1	28
P	H		5310-045-3299	MS35338-42 (96906)	WASHER, LOCK.....		HD	4	*	*	*			3-1	29
X1				1543956 (83298)	END BELL ASSEMBLY.....			1						3-1	30
					ATTACHING PARTS										
P	H		5305-983-6654	MS16998-31 (96906)	SCREW, CAP, SOCKET HEAD.....		EA	6	*	*	*			3-1	31
P	H		5310-045-3296	MS35338-43 (96906)	WASHER, LOCK.....		HD	6	*	*	*			3-1	32
P	H		5310-435-0511	1546968-1 (83298)	WASHER, SPECIAL.....		EA	6	*	*	*			3-1	33
					---*---										
P	H		5315-823-8740	MS171434 (96906)	PIN, SPRING.....		HD	1	*	*	*			3-1	34
P	H		6115-512-6759	844923 (83298)	DEFLECTOR, DIRT AND LIQUID.....		EA	2	*	*	*			3-1	35

TM 55-2925-236-40
C 1

(1) SOURCE, MAINT AND RECOV CODE			(2) FEDERAL STOCK NUMBER		(3) DESCRIPTION		(4) MODELS USABLE ON	(5) QTY INC IN UNIT	(6) 30-DAY MAINT ALW GS			(7) 1-YR ALWPER 100 EQUIP CNTGNCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION	
(a) SOURCE CODE	(b) MAINT RECOV CODE	(c) RECOV CODE		REFERENCE NUMBER & MFR CODE				(a) 1 - 20	(b) 21 - 50	(c) 51 - 100			(a) FIG NO	(b) ITEM NO	
P	H		3110-516-5151	890659-5	(83298)	BEARING, BALL, ANNULAR.....	EA	1	*	*	*		3-1	36	
P	H		6115-326-5049	1329018	(83298)	PLATE, RETAINING, BEARING.....	EA	1	*	*	*		3-1	37	
P	H		5340-804-2026	MS16624-1098	(96906)	RING, RETAINING.....	EA	1	*	*	*		3-1	38	
P	H		2925-228-8853	1543957-1	(83298)	ARMATURE, GENERATOR.....	EA	1	*	*	*		3-1	39	
P	H		6115-698-0569	1322942	(83298)	PLATE, RETAINING, BEARING.....	EA	1	*	*	*		3-1	40	
ATTACHING PARTS															
P	H		5305-638-3499	1322944	(83298)	SCREW, MACHINE.....	EA	4	*	*	*		3-1	41	
---*---															
P	H		2925-585-9604	1325794-3	(83298)	BUSHING, SLEEVE.....	EA	4	*	*	*		3-1	42	
P	H		6115-512-6759	844923	(83298)	DEFLECTOR, DIRT AND LIQUID.....	EA	2	*	*	*		3-1	43	
P	H		3110-516-5151	890659-5	(83298)	BEARING, BALL, ANNULAR.....	EA	1	*	*	*		3-1	44	
P	H		6115-326-5049	1329018	(83298)	PLATE, RETAINING, BEARING.....	EA	1	*	*	*		3-1	45	
P	H		9905-798-1292	1543979	(83298)	PLATE, IDENTIFICATION.....	EA	1	*	*	*		3-1	46	
ATTACHING PARTS															
P	H		5305-053-1111	MS24621-7	(96906)	SCREW, TAPPING, THREAD.....	HD	4	*	*	*		3-1	47	
---*---															
X2	H			1543960	(83298)	STATOR, GENERATOR.....	EA	1					3-1		
P	H		5940-435-4830	1544525	(83298)	. TERMINAL BOARD.....	EA	1	*	*	*		3-1	49	
ATTACHING PARTS															
P	H			819110-120	(83298)	. SCREW, FILLISTER HEAD.....	EA	2	*	*	*		3-1	50	
P	H		5310-590-7931	890489	(83298)	. WASHER, FLAT.....	EA	2	*	*	*		3-1	51	
---*---															
P	H		5970-421-1837	1543966	(83298)	. INSULATOR, PLATE.....	EA	3	*	*	*		3-1	52	
X2	H			1543960	(83298)	. STATOR, GENERATOR.....	EA	1					3-1	53	
END BELL ASSEMBLY															
X1				1543956	(83298)	END BELL ASSEMBLY.....		1					3-2		
P	H		5910-421-0286	1545592-1	(83298)	. CAPACITOR ASSEMBLY.....	EA	2	*	*	*		3-2		
ATTACHING PARTS															
P	H			819106-110	(83298)	. SCREW, FILLISTER HEAD.....	EA	2	*	*	*		3-2	1	
P	H		5310-045-4007	MS35338-41	(96906)	. WASHER, LOCK.....	HD	2	*	*	*		3-2	2	
P	H		5310-515-8243	30723	(96214)	. WASHER, FLAT.....	EA	2	*	*	*		3-2	3	
---*---															
P	H		5910-420-8367	1545592-6	(83298)	. CAPACITOR ASSEMBLY.....	EA	1	*	*	*		3-2		
ATTACHING PARTS															
P	H		5310-081-8087	MS21044N06	(96906)	. NUT, SELF-LOCKING, HEXAGON.....	EA	1	*	*	*		3-2	7	
P	H		5310-950-1310	MS27183-4	(96906)	. WASHER, FLAT.....	HD	1	*	*	*		3-2	8	
P	H		5310-167-0832	AN960-6L	(88044)	. WASHER, FLAT.....	HD	1	*	*	*		3-2	9	
P	H		5305-582-5808	MS35265-31	(96906)	. SCREW, MACHINE.....	EA	1	*	*	*		3-2	10	
---*---															
P	H		5910-420-8365	1545592-3	(83298)	. CAPACITOR ASSEMBLY.....	EA	1	*	*	*		3-2		
ATTACHING PARTS															
P	H		5310-081-8087	MS21044N06	(96906)	. NUT, SELF-LOCKING, HEXAGON.....	EA	1	*	*	*		3-2	14	
P	H		5310-950-1310	MS27183-4	(96906)	. WASHER, FLAT.....	HD	1	*	*	*		3-2	15	
P	H		5310-167-0832	AN960-6L	(88044)	. WASHER, FLAT.....	HD	1	*	*	*		3-2	16	
P	H		5305-582-5808	MS35265-31	(96906)	. SCREW, MACHINE.....	EA	1	*	*	*		3-2	17	
---*---															

(1) SOURCE, MAINT AND RECOV CODE			(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION		(4) MODELS USABLE ON	(5) QTY INC IN UNIT	(6) 30-DAY MAINT ALW GS			(7) 1-YR ALWPER 100 EQUIP CNTGCT	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION		
(a) SOURCE CODE	(b) MAINT LEVEL CODE	(c) RECOV CODE		REFERENCE NUMBER & MFR CODE				(a) 1 - 20	(b) 21 - 50	(c) 51 - 100			(a) FIG NO	(b) ITEM NO	
P	H		5910-420-8366	1545592-4	(83298)	.CAPACITOR ASSEMBLY..... ATTACHING PARTS	EA	1	*	*	*			3-2	
P	H		5310-081-8087	MS21044N06	(96906)	.NUT, SELF-LOCKING, HEXAGON.....	EA	1	*	*	*			3-2	21
P	H		5310-950-1310	MS27183-4	(96906)	.WASHER, FLAT.....	HD	1	*	*	*			3-2	22
P	H		5310-167-0832	AN960-6L	(88044)	.WASHER, FLAT.....	HD	1	*	*	*			3-2	23
P	H		5305-582-5808	MS35265-31	(96906)	.SCREW, MACHINE..... -----	EA	1	*	*	*			3-2	24
P	H		5977-369-9720	1542776	(83298)	.HOLDER, ELECTRICAL..... ATTACHING PARTS	EA	4	*	*	*			3-2	28
P	H		5305-435-3321	1543503	(83298)	.SCREW, SPECIAL.....	EA	4	*	*	*			3-2	29
P	H		5310-407-9566	MS35338-45	(96906)	.WASHER, LOCK.....	HD	4	*	*	*			3-2	30
P	H		5310-205-8985	867491	(83298)	.WASHER, FLAT.....	EA	4	*	*	*			3-2	31
P	H		5970-435-5674	1543622	(83298)	.INSULATOR, WASHER.....	EA	16	*	*	*			3-2	32
P	H		5970-846-1664	1328928	(83298)	.INSULATION, SLEEVEING, ELECTRICAL.... -----	EA	4	*	*	*			3-2	33
X2	H			1543976	(83298)	.END BELL GENERATOR..... MAINTENANCE SUPPLIES	EA	1						3-2	34
P	F		3439-224-3567		(81348)	SOLDER, TIN ALLOY FED QQ-S-571,..... COMPOSITION SNG0, 5 LB SPOOL	EA	V	*	*	*			MSUP	
P	H		5970-161-7421	1201	(24446)	INSULATING VARNISH, ELECTRICAL-..... COLORED RED, OIL, MOISTURE & SALT WATER RESISTANT, 1 PT CAN	PT	V	*	*	*			MSUP	
P	H		6810-184-4800		(81348)	TRICHLOROETHYLENE, TECHNICAL..... FED O-T-634, TYPE 2, 55 GAL	DR	V	*	*	*			MSUP	
P	F		6810-201-0907		(81348)	ALCOHOL, DENATURED-COLORLESS,..... FED O-E-760, GRADE 3, 5 GAL	CN	V	*	*	*			MSUP	
P	O		6850-264-9038		(81348)	DRY CLEANING SOLVENT FED P-D-680,.. TYPE 1, 5 GAL	PL	V	*	*	*			MSUP	
P	O		8010-141-6081		(81348)	SHELLAC, DRY-FED TT-S-271, TYPE 1,.. FORM A, GRADE A, 1 LB	CN	V	*	*	*			MSUP	
P	O		8030-081-2338		(81349)	SEALING COMPOUND-LIQUID FORM, FOR... SEALING & RETAINING METAL PARTS, MIL-S-22473, GRADE A, 50 CC, PLASTIC BOTTLE	EA	V	*	*	*			MSUP	
P	O		8305-267-3015		(81348)	CLOTH, CHEESECLOTH, COTTON-WHITE,.... UNSHRUNK, 36 IN.W, FED CCC-C-440, TYPE 2, CLASS 2	YD	V	*	*	*			MSUP	
P	F		9150-223-4003		(81349)	GREASE, AIRCRAFT-PETROLEUM OIL..... & GELLING AGENT, CORROSION, OXIDATION & WATER RESISTANT, MIL-G-3545, 1 LB CAN	LB	V	*	*	*			MSUP	
P	O		9150-263-3490		(81349)	LUBRICATION OIL, GENERAL PURPOSE-... CORROSION & OXIDATION RESISTANT, MIL-L-7870, 1 QT CAN	QT	V	*	*	*			MSUP	

(1) SOURCE, MAINT AND RECOV CODE			(2) FEDERAL STOCK NUMBER		(3) DESCRIPTION		(4) MODELS USABLE ON	(5) UNIT OF ISSUE	(6) 30-DAY MAINT ALW	GS	(7) 1-YR ALWPER 100 EQUIP CNTG	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION	
(a) SOURCE CODE	(b) MAINT LEVEL	(c) RECOV CODE	REFERENCE NUMBER & MFR CODE						(a) 1 - 20	(b) 21 - 50	(c) 51 - 100		(a) FIG NO	(b) ITEM NO
SECTION III														
SPECIAL TOOLS, TEST AND SUPPORT EQUIPMENT														
P	H		4920-435-7838	1106187	(83298)	STAND, MAINTENANCE.....		EA	1	*	*	*		TOOL
P	H		4920-453-9516	1106354-1	(83298)	INTERFACE, MAINTENANCE.....		EA	1	*	*	*		TOOL
P	H		4920-456-6008	1106149	(83298)	STAND, ROTOR MAINTENANCE.....		EA	1	*	*	*		TOOL
P	H		5120-075-6015	QB80059-3	(83298)	WRENCH.....		EA	1	*	*	*		TOOL
P	H		5120-178-1275	1106353-1	(83298)	TOOL, INDICATOR.....		EA	1	*	*	*		TOOL
P	H		5120-339-0606	QB80277-1	(83298)	HOOK, BRUSH SPRING.....		EA	1	*	*	*		TOOL
P	H		5120-369-9472	1106269-1	(83298)	PULLER, RETAINER BEARING.....		EA	1	*	*	*		TOOL
P	H		5120-511-0253	1106005-1	(83298)	PILOT, BRUSH BOX.....		EA	1	*	*	*		TOOL
P	H		5120-511-0254	1106006-1	(83298)	ALIGNER, BRUSH BOX.....		EA	1	*	*	*		TOOL

SECTION IV
FEDERAL STOCK NUMBER AND REFERENCE NUMBER INDEX

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
2925-228-8852	3-1	22	5310-439-4711	3-1	3
2925-228-8853	3-1	39	5310-515-8243	3-2	3
2925-228-8854	3-1	16	5310-531-9514	3-1	26
2925-585-9604	3-1	42	5310-582-5965	3-1	6
2925-731-4906	3-1	23	5310-590-7931	3-1	51
2925-927-9483	1-1		5310-680-4241	3-1	25
3110-516-5151	3-1	36	5310-804-0075	3-1	19
3110-516-5151	3-1	44	5310-807-1467	3-1	10
3439-224-3567	MSUP		5310-926-1852	3-1	8
4920-435-7838	TOOL		5310-950-1310	3-2	8
4920-453-9516	TOOL		5310-950-1310	3-2	15
4920-456-6008	MSUP		5310-950-1310	3-2	22
5120-075-6015	TOOL		5315-823-8740	3-1	34
5120-178-1275	TOOL		5340-420-5954	3-1	21
5120-339-0606	TOOL		5340-804-2026	3-1	27
5120-369-9472	TOOL		5340-804-2026	3-1	38
5120-511-0253	TOOL		5910-420-8365	3-2	
5120-511-0254	TOOL		5910-420-8366	3-2	
5305-053-1111	3-1	47	5910-420-8367	3-2	
5305-435-3321	3-2	29	5910-421-0286	3-2	
5305-582-5808	3-2	10	5910-443-4010	3-1	
5305-582-5808	3-2	17	5940-435-4830	3-1	49
5305-582-5808	3-2	24	5970-161-7421	MSUP	
5305-638-3499	3-1	41	5970-421-1837	3-1	52
5305-912-4832	3-1	2	5970-435-5674	3-2	32
5305-940-9488	3-1	24	5970-846-1664	3-2	33
5305-943-5918	3-1	28	5977-369-9720	3-2	28
5305-959-2689	3-1	17	5977-681-1431	3-1	4
5305-983-6654	3-1	31	6115-326-5049	3-1	37
5306-523-8866	3-1	5	6115-326-5049	3-1	45
5310-045-3296	3-1	32	6115-512-6759	3-1	35
5310-045-3299	3-1	29	6115-512-6759	3-1	43
5310-045-4007	3-2	2	6115-698-0569	3-1	40
5310-081-8087	3-2	7	6150-455-9645	3-1	18
5310-081-8087	3-2	14	6810-184-4800	MSUP	
5310-081-8087	3-2	21	6810-184-4800	MSUP	
5310-141-1795	3-1	7	6810-201-0907	MSUP	
5310-167-0821	3-1	9	6850-264-9038	MSUP	
5310-167-0832	3-2	9	8010-141-6081	MSUP	
5310-167-0832	3-2	16	8030-081-2338	MSUP	
5310-167-0832	3-2	23	8305-267-3015	MSUP	
5310-167-0834	3-1	11	9150-223-4003	MSUP	
5310-205-8985	3-2	31	9150-263-3490	MSUP	
5310-407-9566	3-2	30	9905-798-1292	3-1	46
5310-435-0511	3-1	33	9999-247-0215	3-1	1

SECTION IV

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C 1

REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER	REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER
AN960-10L	88044	3-1	11	1201	24446	MSUP	
AN960-416	88044	3-1	7	1322942	19315	3-1	40
AN960-6L	88044	3-2	9	1322944	83298	3-1	41
AN960-6L	88044	3-2	16	1325794-3	83298	3-1	42
AN960-6L	88044	3-2	23	1328928	83298	3-2	33
AN960-616	88044	3-1	9	1329018	83298	3-1	37
AN960C6	88044	3-1	26	1329018	83298	3-1	45
EB054	72962	3-1	19	1542776	83298	3-2	28
MS16624-1098	96906	3-1	27	1543441	83298	3-1	22
MS16624-1098	96906	3-1	38	1543503	83298	3-2	29
MS16998-31	96906	3-1	31	1543622	83298	3-2	32
MS171434	96906	3-1	34	1543736	83298	3-1	21
MS21042-3	96906	3-1	10	1543956	83298	3-1	30
MS21044N06	96906	3-2	7	1543956	83298	3-2	
MS21044N06	96906	3-2	14	1543957-1	83298	3-1	39
MS21044N06	96906	3-2	21	1543960	83298	3-1	
MS21083N6	96906	3-1	8	1543960	83298	3-1	53
MS24621-7	96906	3-1	47	1543966	83298	3-1	52
MS27183-4	96906	3-2	8	1543970	83298	3-1	18
MS27183-4	96906	3-2	15	1543975	83298	3-1	16
MS27183-4	96906	3-2	22	1543976	83298	3-2	34
MS35191-279	96906	3-1	17	1543979	83298	3-1	46
MS35265-31	96906	3-2	10	1544525	83298	3-1	49
MS35265-31	96906	3-2	17	1544776	83298	3-1	1
MS35265-31	96906	3-2	24	1545592-1	83298	3-2	
MS35275-226	96906	3-1	24	1545592-3	83298	3-2	
MS35275-249	96906	3-1	28	1545592-4	83298	3-2	
MS35276-268	96906	3-1	2	1545592-5	83298	3-1	
MS35338-41	96906	3-2	2	1545592-6	83298	3-2	
MS35338-42	96906	3-1	29	1546968-1	83298	3-1	33
MS35338-43	96906	3-1	32	1549110-1	83298	3-1	20
MS35338-44	96906	3-1	6	30E20-61A	83298	1-1	
MS35338-45	96906	3-2	30	30723	96214	3-2	3
QB80059-3	83298	TOOL		819001-016	83298	3-1	25
QB80277-1	83298	TOOL		819106-110	83298	3-2	1
1106005-1	83298	TOOL		819110-120	83298	3-1	50
1106006-1	83298	TOOL		833656	83298	3-1	3
1106149	83298	MSUP		844923	83298	3-1	35
1106187	83298	TOOL		844923	83298	3-1	43
1106269-1	83298	TOOL		867491	19315	3-2	31
1106353-1	83298	TOOL		890065-2	19315	3-1	5
1106354-1	83298	TOOL		890489	83298	3-1	51
1110489	83298	3-1	4	890659-5	19315	3-1	36
1111791	83298	3-1	23	890659-5	19315	3-1	44

By Order of the Secretary of the Army:

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To be distributed in accordance with DA Form 12-31 requirements for Direct and General Support Maintenance Instructions for UH-1C, UH-1D, and AH-1G Aircraft.

GS Maintenance Manual

STARTER GENERATOR
PART NO.30E20-61-A
(BENDIX)

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SECTION I INTRODUCTION

1-1. General information

a. This technical manual comprises overhaul instructions for starter generator, part no. 30E20-61-A (figure 1-1). This equipment is manufactured by The Bendix Corporation, Electric Power Division (83298), Eatontown, New Jersey 07724. Sections I through IV of this technical manual contain instructions only for the basic type.

b. Report of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commanding General, US. Army Avia-

tion Systems Command, ATTN: AMSAV-R-M, P. O. Box 209, St. Louis, Missouri 63166.

1-2. Purpose of Equipment

The starter generator is used to start the engine, and generate the electrical power required for 28-volt aircraft electrical systems.

1-3. Equipment Records

The Army equipment record system and procedures established in TM 38-750 apply to this equipment. The applicable forms as required by TM 38-750 shall be used.

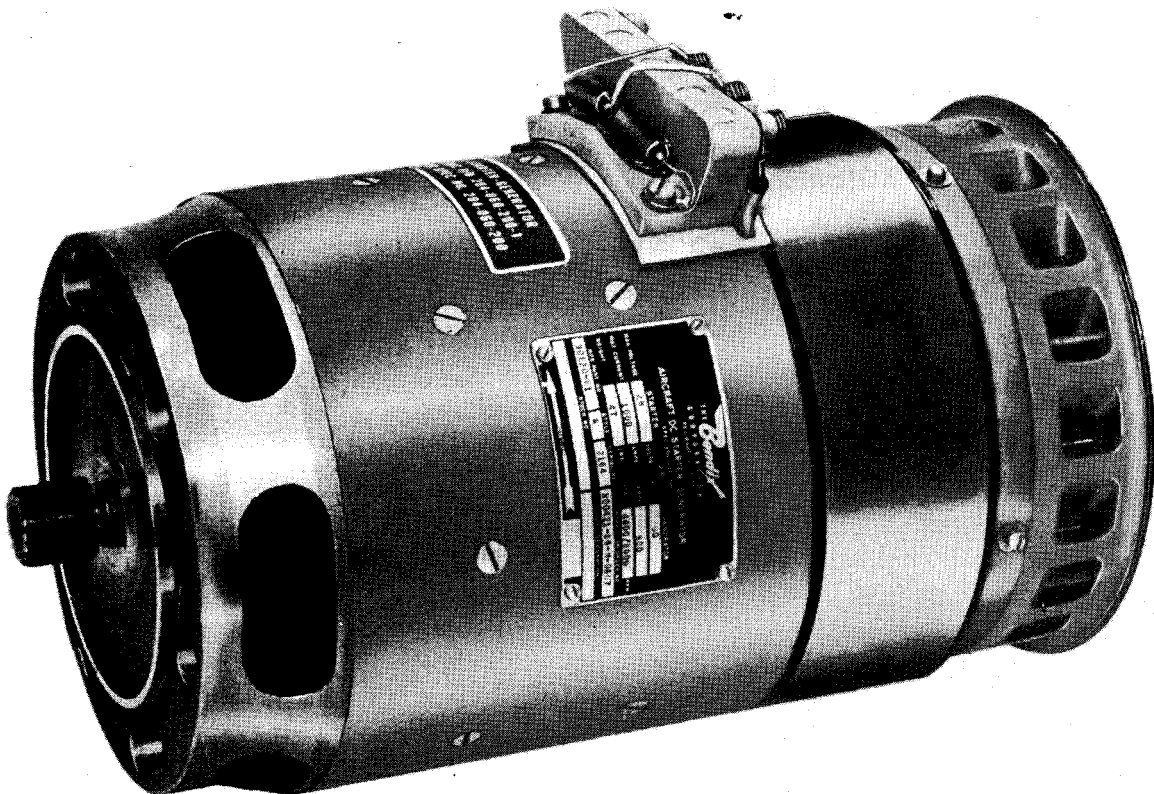


Figure 1-1. Three-quarter *View*, Starter Generator *Part No.* 30E20-61-A.

1-4. Description

The starter generator is a brush-type rotating machine capable of delivering 30 volts dc at a rated current of 300 amperes, when driven at a speed within its rated speed range. The unit is self-cooled by means of an integral fan rotating with the output shaft. A terminal board is mounted on the housing to facilitate external connections. Slotted mounting holes are provided for ease of installation on the engine.

1-5. Leading Particulars

Refer to table 1-1 for leading particulars of the starter generator.

Table 1-1. Leading Particulars

Item	Characteristic
Rated Voltage	30 V
Rated current	300 amp
Rated speed	4000-8600 rpm
Minimum Speed for Regulation	4400 rpm
Maximum Speed for Regulation	10,000 rpm
Cooling Air	40°C (max)
Weight	47 lb (approx)
Diameter (Housing)	6-1/2 in.
Length (Housing)	10-7/8 in.
Outside Spline	16 teeth
Mounting Bolt Circle Diameter	5.000 in.
No. of Mounting Slots	6
Rotation (Viewing Drive. End)	Counterclockwise

1-6. Painting Requirements

Repainting or touching up surfaces if required shall be done in accordance with table 1-2.

Table 1-2. Painting Requirement

Item Name	Fig. No.	Index No.	Paint Type and Specification	Method of Application	No. of Coats	Notes
Fan Housing	3-1	16	MIL-P-8585, Primer	Brush	1	Paint Flange and Rear Face Only
			MIL-E-5557, Type I, Color Black, Enamel	Brush	2	
End Bell	.3-2	84	MIL-P-8585, Primer	Brush	1	No Paint or Prime in Area Covered by Brush Access Cover or in Bearing Mounting Surface
			MIL-E-5557, Type I, Color Black, Enamel	Brush	2	

1-7. Preservation, Packaging, Packing and Marking Requirements

Preservation, packaging, packing and marking shall be in accordance with figure 1-2.

PRESERVATION, PACKAGING, PACKING AND MARKING REQUIREMENTS							
NOMENCLATURE Starter Gen.		STOCK NUMBER 2925-014-0734					
		PART NUMBER 2925-014					
NET WEIGHT	DIMENSIONS	GROSS WEIGHT	CUBIC FEET				
<i>All specifications and standards applicable to the requirements herein shall be the issue in effect on date of invitation for bids.</i>							
PACKAGING							
<input checked="" type="checkbox"/> LEVEL A <input type="checkbox"/> LEVEL C <input checked="" type="checkbox"/> PACKAGING SHALL BE IN ACCORDANCE WITH SPECIFICATION MIL-P-116, THE FOLLOWING DETAILED REQUIREMENTS SHALL APPLY:							
UNIT	PKG QTY	METHOD	PRESERVATIVE	WRAP	DUNNAGE	CONTAINER	
	1	IId	-----	MIL-B-121 Gr A or Polyethylene	MIL-N-7700 or	Pee Packing or MIL-1-29514	
PACKING							
<input checked="" type="checkbox"/> LEVEL A <input type="checkbox"/> LEVEL C <input checked="" type="checkbox"/> ITEMS SHALL BE PACKED IN CONTAINERS CONFORMING TO SPECIFICATION NO. MIL-1-1054 PLYWOOD USED SHALL BE STANDARD GRADE WITH EXTERIOR GLUE OF U.S. PRODUCT STANDARD PSI-66. THIS PLYWOOD SHALL HAVE THE GRADE STAMP OF AN APPROVED TESTING AGENCY. FURTHER, PLYWOOD SHALL BE SURFACE TREATED IN ACCORDANCE WITH SPECIFICATION TT-W-572. WOOD CLEATED PLYWOOD CONTAINERS SHALL BE CONSTRUCTED WITH THE TOP INVERTED SO AS TO PROVIDE A FLUSH TOP SURFACE FOR WATER RUNOFF. <input type="checkbox"/> ITEMS SHALL BE PACKED IN A MANNER TO INSURE CARRIER ACCEPTANCE AND SAFE DELIVERY AT DESTINATION. CONTAINERS SHALL BE IN ACCORDANCE WITH UNIFORM FREIGHT CLASSIFICATION RULES OR REGULATIONS OF OTHER CARRIERS APPLICABLE TO THE MODE OF TRANSPORTATION.							
MARKING							
<input checked="" type="checkbox"/> a. IN ADDITION TO ANY SPECIAL MARKING REQUIRED BY THE CONTRACT OR ORDER, SHIPMENT SHALL BE MARKED IN ACCORDANCE WITH STANDARD MIL-STD-129D, WITH CHANGE NOTICE 1 THRU 7, "MARKING FOR SHIPMENT AND STORAGE," DATED 28 DECEMBER 1964. THE MATERIEL CONDITION TAGS OR LABELS ARE REQUIRED. REF PARA 5.5.17 AND CHANGE NOTICE 6. THE CONTRACTING OFFICER WILL SUPPLY TAGS AND LABELS. THE SERIAL NUMBER AND THE CONTROL NUMBER OF DA FORM 2410 SHALL BE MARKED ON THE UNIT CONTAINER. <input checked="" type="checkbox"/> b. ADDITIONAL MARKING REQUIREMENTS. EACH INTERIOR PACKAGE SHALL BE MARKED ON AT LEAST TWO (2) SIDES WITH A SILHOUETTE OF THE AIRCRAFT. (WHERE THE SIZE OF THE UNIT CONTAINER IS TOO SMALL TO PERMIT THE APPLICATION OF TWO (2) LABELS, A SINGLE LABEL SHALL BE APPLIED.) WHEN THE UNIT CONTAINER IS THE SHIPPING CONTAINER AND THE ITEM IS PACKED "LEVEL A", EACH CONTAINER SHALL BE MARKED ON TWO (2) SIDES, TOP AND ONE (1) END WITH A SILHOUETTE OF THE AIRCRAFT. THE SIZE OF THE SILHOUETTE MAY VARY, BUT WILL BE LARGE ENOUGH TO FACILITATE EASY VISUAL IDENTIFICATION WITHOUT OBSCURING OTHER MARKINGS. THE CONTRACTING OFFICER WILL SUPPLY LABELS ON REQUEST. THE NOMENCLATURE OF THE MAJOR COMPONENTS SHALL BE EXTENDED TO INDICATE THE END ITEM APPLICATION AND THE POSITION OF THE PART; e.g., GEAR BOX, MAIN FOR (APPLICABLE AIRCRAFT); WING ASSEMBLY, RIGHT, FOR (APPLICABLE AIRCRAFT). <input checked="" type="checkbox"/> c. MATERIEL CONDITION MARKING SHALL BE APPLIED IN ACCORDANCE WITH PARAGRAPH 5.5.17 OF MIL-STD-129. A MATERIEL CONDITION TAG OF THE APPLICABLE TYPE WILL BE SECURELY ATTACHED DIRECTLY TO ALL UNINSTALLED OR STORED AERONAUTICAL OR AIR DELIVERY ITEMS. WHEN SUCH ITEMS ARE PLACED OR STORED IN CARTONS, PACKAGES, CRATES OR METAL SHIPPING CONTAINERS, A DUPLICATE MATERIEL CONDITION TAG OR LABEL WILL BE SECURELY ATTACHED TO THE EXTERIOR OF THE PACKAGE OR CONTAINER IN SUCH A MANNER THAT WILL AFFORD MAXIMUM PROTECTION FROM HANDLING AND WEATHER. TAGS WILL BE COMPLETED EITHER BY TYPEWRITTEN OR PRINTED BLACK LEAD PENCIL ENTRIES. ITEMS OF A COMMON OR NONTECHNICAL NATURE (i.e., COMMON HARDWARE, BULK MATERIALS, ETC.) THE SERVICEABILITY OF WHICH IS OBVIOUS, AND THE IDENTITY AND INSPECTION REQUIREMENTS ADEQUATELY INDICATED BY COMMERCIAL TAGS, LABELS OR MARKINGS, MAY BE RECEIVED, STORED, ISSUED OR SHIPPED WITHOUT MATERIEL CONDITION TAGS.							
APPROVED BY P. H. Siler		ORGANIZATION ANSAVOR-NR		DATE 29 Oct 1964			

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Previous editions of this form are obsolete.

Figure 1-2. Preservation, Packaging, Packing and Marking Requirements.

SECTION II

TEST EQUIPMENT, SPECIAL TOOLS, AND MATERIALS

2-1. Test Equipment

Refer to table 2-1 for a list of test equipment required to perform the procedures described in this manual.

Table 2-1. Test Equipment Required

Part, Model or Mil Des	FML	Nomenclature	Technical Description
Model 40B	06365	Balancing Machine	Used to Balance Armature Assembly.
1650A	24655	Capacitance Bridge	Used to Check Capacitor Values.
13700-1C	19315	Insulation Breakdown Test Set	Used to Perform Insulation Breakdown Tests.
7085-5	99664	Electrical Test Stand	Used to Provide Load Conditions for Performance Testing.
7199-1	99664	Aircraft Generator Test Stand	Used for Performance Testing of Starter Generator.
Type B-1	99664	Starter Torque Tester	Used to Test Starter Generator Torque.

Note. Equivalent test equipment may be used.

2-2. Special Tools

Refer to table 2-2 for a list of special tools required to perform the procedures described in this manual.

Table 2-2. Special Tools Required

Part, Model or Mil Des	Nomenclature
QB80059-3	Spline Wrench
QB80277-1	Brush Spring Hook
1106005-1	Brush Box Aligner Pilot
1106006-1	Brush Box Aligner
1106023-1	Bearing Puller
1106140-3	Spring Scale
1106149	Rotor Stand
1106187	Generator Overhaul Stand

Table 2-2. Special Tools Required - Continued

Part, Model or Mil Des	Nomenclature
1106269	Bearing Retainer Puller
1106353-1	Setting Gage
1106354-1	Interface

Note. All tools listed above are manufactured by The Bendix Corporation, Electric Power Division, Eatontown, New Jersey. Equivalent tools may be used.

2-3. Consumable Materials

Refer to table 2-3 for a list of all consumable materials required to perform the procedures described in this manual.

Table 2-3. Consumable Materials

Item No.	Nomenclature	Specification Number	Title
1	Trichlorethylene	MIL-T-7003	Trichlorethylene, Stabilized Degreasing
2	Solvent	P-D-680	Dry Cleaning Solvent
3	Lint-free Cloth	CCC-C-440	Cloth, Cotton, Cheesecloth, Bleached and Unbleached
4	Lubricating Oil	MIL-L-7870	Lubricating Oil, General Purpose, Low Temperature
5	Corrosion Preventive	MIL-C-4339	Corrosion Preventive, Soluble Oil
6	Shellac	TT-S-271	Shellac, Dry
7	Dentured Alcohol	MIL-A-6091	Alcohol, Ethyl, Specially Denatured, Aircraft
8	Soft Solder	MIL-S-6872	Soldering Process, General Specification for
9	Epoxy Resin (red)	Type CR-1056B (FMC 72688)	

Table 2-3. Consumable Materials-Continued

Item No.	Nomenclature	Number Specification	Title
10	Epoxy Reactor (tan)	Type CC-1056A (FMC 72688)	
11	Spline Lubricant.	Pioneer No. 31 (FMC 83298)	
12	High Temperature Lubricating Grease (<i>Alternate for item 11</i>)	MIL-G-3545	Lubricating Grease, High Temperature
13	Red Glyptal Lacquer	Part No. 1201 (FMC 04314)	
14	Sealant, Grade C	MIL-S-22473	Sealing, Lock and Retaining Compounds, Single Component
15	Sealant, Grade A	MIL-S-22473	Sealing, Locking and Retaining Compounds, Single Component
16	LockWire	MS20995C32-6	

SECTION III

GENERAL SUPPORT MAINTENANCE

3-1. Disassembly

a. General.

(1) Disassemble the starter generator to the extent necessary for repair by following the illustrated parts breakdowns and the exploded views (figures 3-1 and 3-2), as described in paragraphs *b* and *c*.

(2) The index numbers are assigned in the order of disassembly, except that attaching parts are listed immediately following the parts they attach.

b. Starter Generator.

(1) Secure the starter generator to interface (1106354-1) and mount both on generator overhaul stand (1106187).

(2) Loosen screw (2, figure 3-1) enough so that brush access cover assembly (1) can be slipped off from the fan end of the housing and stator (53).

Note. The last two threads of screws (2) have been distorted to captivate nut (3).

(3) Remove eight screws (5), eight lock washers (6), and eight washers (7). Using brush spring hook (QB80277-1, lift up the brush springs, and remove eight split-type brushes (4). Discard the brushes.

(4) Remove three self-locking nuts (8) and three washers (9), and disconnect capacitor terminals from the B + and E- studs.

(5) Remove two self-locking nuts (10) and two washers (11), and disconnect the stator terminals from the A+ and D terminal studs.

(6) If visual inspection indicates damage, remove capacitors (15) with terminals (12 through 14).

(7) Remove six screws (17) and fan housing (16). Hold the spline of drive shaft assembly (22) with spline wrench (QB80059-3), and using a 7/16-inch (12-point thin wall) socket wrench, remove self-locking nut (19), washer (20), fan (18), and compression spring (21). Remove drive shaft assembly (22), and front plate (23).

(8) Remove three screws (24), three lock washers (25), and three washers (26) to free capacitor leads,

(9) Using retaining ring pliers, remove lock rings (27 and 38). Remove outer dirt slingers (35 and 43). Remove four screws (28) and four lock washers (29) to free bearing retainer (37).

(10) Remove four screws (41) to free bearing retainer (45). Remove outer race bearing retainer (40).

(11) Remove six screws (31), six lock washers (32), and six special washers (33). Press armature assembly (39), with attached end bell assembly (30), out of housing and stator (53).

Note. Use bearing retainer puller (1106269) only if there is bearing or other internal failure.

(12) Using bearing retainer puller (1106269), press armature assembly (39), with ball bearings (36 and 44) attached, out of end bell assembly (30). Refer to paragraph *c* below for disassembly instructions of the end bell assembly.

(13) Using bearing puller (1106023-1), pull ball bearings (36 and 44) off the shaft of armature assembly (39). Discard the ball bearings at each overhaul.

(14) Remove inner dirt slingers (35 and 43) and bearing retainers (37 and 45). Remove four bushings (42) from housing and stator (53).

(15) Remove four screws (47) and identification plate (46).

(16) Remove two screws (50), two washers (51), terminal board (49), and terminal board insulators (52) if they are damaged.

c. End Bell Assembly.

(1) Remove capacitors (6, 13, 20, and 27, figure 3-2) if physical damage is indicated, by removing two screws (1), two lock washers (2), and two washers (3), self-locking nuts (7, 14, and 21), washers (8, 15, and 22), washers (9, 16, and 23), and screws (10, 17, and 24). Do not attempt to remove terminals (4, 11, 18, or 25) unless damaged.

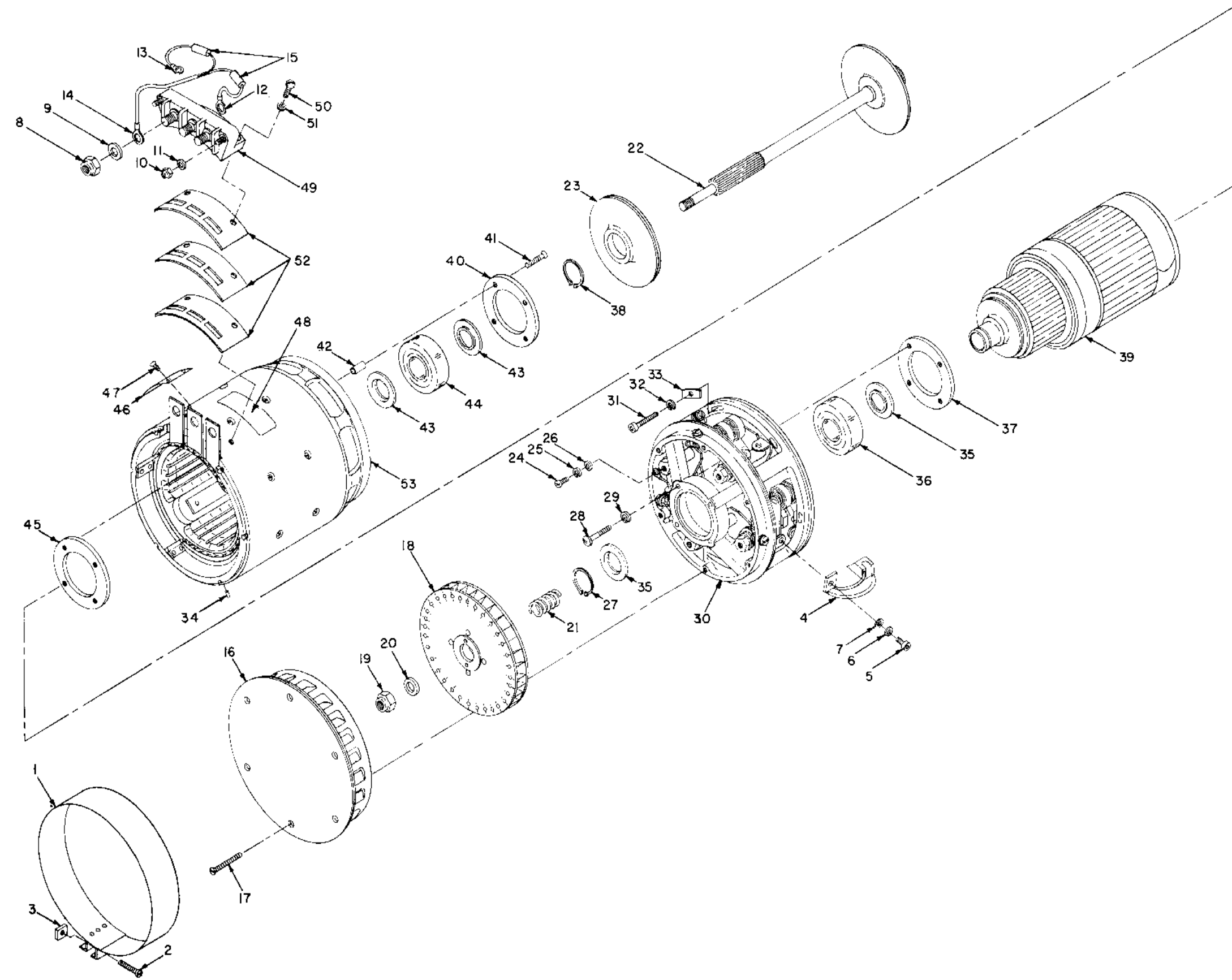


Figure 3-1. Starter Generator, Exploded View.

Index No.	Part Number	Description	Qty Per Assy
3-1-	30E20-61-A	GENERATOR, Starter	1
-1	1544776	. COVER ASSEMBLY, Brush access	1
-2	MS35276-268	. . SCREW	1
-3	833656	. . NUT, Square, cad. pl stl, No. 10-32	1
-4	1110489	. BRUSH, Split-type	8
		(ATTACHING PARTS)	
-5	890065-2	. SCREW, Cap, sch, cad. pl brz, 1/4-28 x 1/2 in. lg	8
-6	MS35338-44	. WASHER, Lock	8
-7	AN960-416	. WASHER	8
		-----*	
-8	MS20364-624A	. NUT, Self-locking	3
-9	AN960-616	. WASHER	3
-10	MS20364-1032A	. NUT, Self-locking	2
-11	AN960-10L	. WASHER	2
	1545592-5	. CAPACITOR ASSEMBLY	1
-12	34112	. . TERMINAL, Solderless (00779) (83298, part No. 1102238-7)	1
-13	34115	. . TERMINAL, Solderless (00779) (83298, part No. 1102238-15)	1
-14	34126	. . TERMINAL, Solderless (00779) (83298, part No. 1102238-16)	1
-15	96P47302S2	. . CAPACITOR, FIXED, 0.047 uf ±20 pct, 200 V dc (56289) (83298, part No. 1103587-45)	2
-16	1543975	. HOUSING, Fan	1
		(ATTACHING PARTS)	
-17	MS35191-279	. SCREW	6
		-----*	
-18	1543970	. FAN	1
		(ATTACHING PARTS)	
-19	59N1E2834-054	. NUT, Self-locking (72962) (83298, part No. 1549109-1)	1
-20	1549110-1	. WASHER, Flat, cad. pl stl, for 5/16 in. screw	1
		-----*	
-21	1543736	. SPRING, Compression	1
-22	1543441	. SHAFT ASSEMBLY, Drive	1
-23	111791	. PLATE, Front	1
-24	819006-008	. SCREW, Fil h, sst, No. 6-32 x 1/4 in. lg	3
-25	819001-016	. WASHER, Lock sst, for No. 6 screw	3
-26	819002-006	. WASHER, Flat, sst, for No. 6 screw	3
-27	MS16624-1098	. RING, Lock	1
-28	MS35275-249	. SCREW	4
-29	MS35338-42	. WASHER, Lock	4
-30	1543956	. END BELL ASSEMBLY (See fig. 3-2)	1
		(ATTACHING PARTS)	
-31	1544079-1	. SCREW, Cap, sch, cad. pl stl, No. 10-32 x 1 in. lg	6
-32	MS35337-43	. WASHER, Lock	6
-33	1546968-1	. WASHER, Special	6
		-----*	
-34	MS171434	. PIN, Roll	1
-35	844923	. SLINGER, Dirt	2
-36	890659-5	. BEARING, Ball	1
-37	1329018	. RETAINER, Bearing	1
-38	MS16624-1098	. RING, Lock	1
-39	1543957-1	. ARMATURE ASSEMBLY	1
-40	1322942	. RETAINER, Bearing, outer race	1
		(ATTACHING PARTS)	
-41	1322944	. SCREW, Flat hd, cad. pl stl, No. 8-32 x 15/16 in. lg	4
		-----*	
-42	1325794-3	. BUSHING	4
-43	844923	. SLINGER, Dirt	2
-44	890659-5	. BEARING, Ball	1
-45	1329018	. RETAINER, Bearing	1
-46	1543979	. PLATE, Identification	1
		(ATTACHING PARTS)	
-47	22996-16	. SCREW, Self-tapping, rd hd, stl, No. 4 x 3/16 in. lg	4
		-----*	

Index No.	Part Number	Description	Qty Per Assy
3-1-			
-48	1546139	. PLATE, Identification	1
	1543960	. STATOR, Generator	1
-49	1544525	. BOARD, Terminal	1
		(ATTACHING PARTS)	
-50	819110-120	. . SCREW, Fil h, cad. pl stl, No. 10-32 x 5/16 in. lg	2
-51	890489	. . WASHER, Flat, sst, for No. 10 screw	2
		-----*	
-52	1543966	. . INSULATOR, Terminal board	3
-53	No Number	. . HOUSING AND STATOR (order 1543960)	1

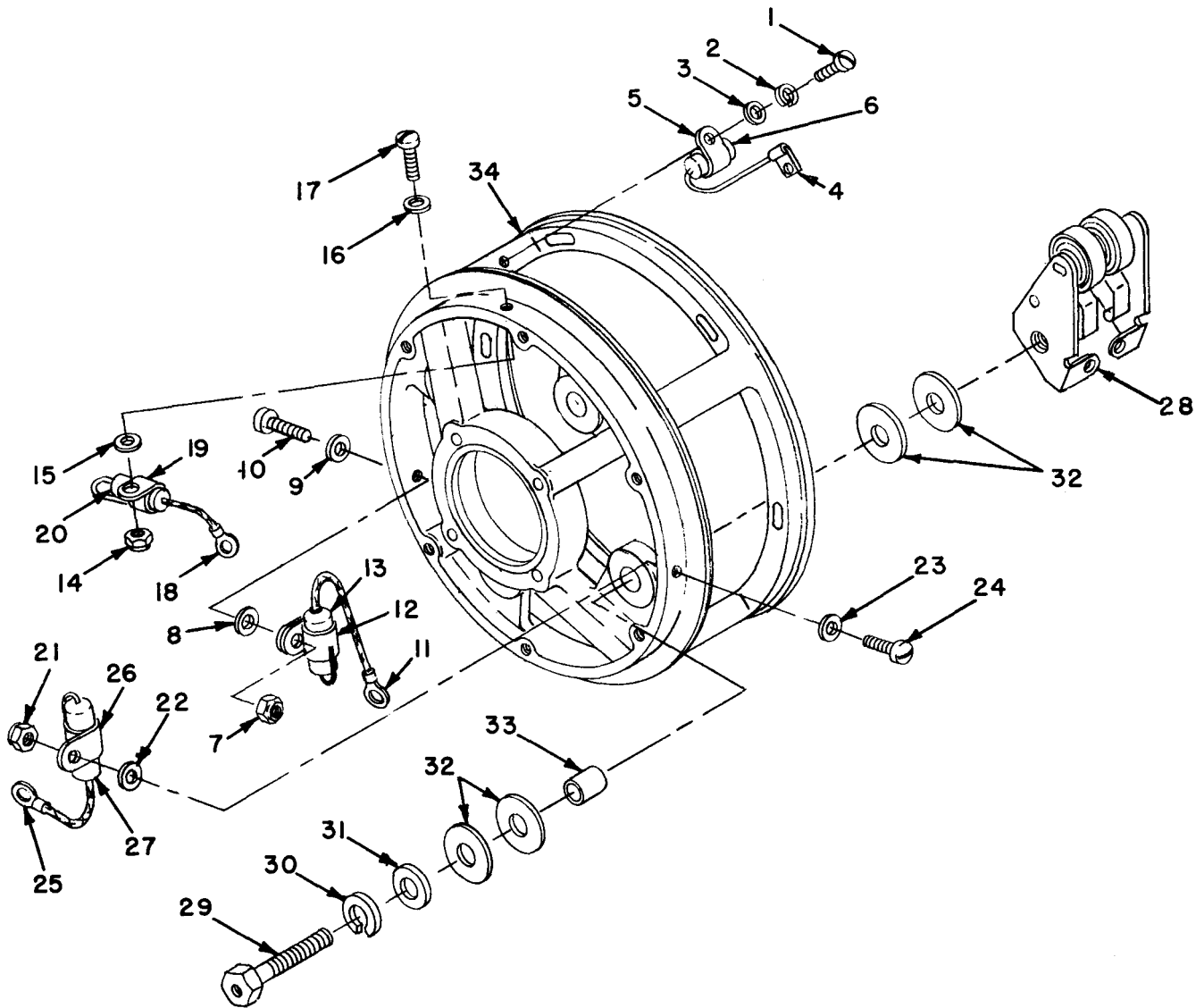


Figure 3-2. End Bell Assembly, Exploded View.

LEGEND FOR FIGURE 3-2

Index No.	Part Number	Description	Qty Per Assy
3-2-	1543956	END BELL ASSEMBLY (See item 30, fig. 3-1 for nha)	Ref
	1545592-1	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	2
-1	819106-110	. SCREW, fil h, cad. pl stl, No. 6-32 x 5/16 in. lg	2
-2	MS35338-41	. WASHER, Lock	2
-3	890487	. WASHER, Flat, sst, for No. 6 screw	2
		---*---	
-4	1329221	.. TERMINAL	1
-5	1532827-3	.. CLAMP, Loop	1
-6	1102113-2	.. CAPACITOR, Fixed, 40 uf +20 pct -15 pct, 75 V dc	1
	1545592-6	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	1
-7	MS21044N06	. NUT, Self-locking	1
-8	33338	. WASHER, Flat, cad. pl stl, for No. 6 screw	1
-9	AN960-6L	. WASHER	1

Index No.	Part Number	Description	Qty Per Assy
3-2-			
-10	MS35265-31	. SCREW ---*---	1
-11	34110	.. TERMINAL, Solderless (00779) (83298, part No. 1102238-4)	1
-12	1532827-19	.. CLAMP, Loop	1
	1545592-3	.. CAPACITOR, Fixed, 0.10 uf, 150 V dc (56289) (83298, part No. 1111769-5)	1
-13	121 P10401R5S2	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	1
-14	MS21044NO6	. NUT, Self-locking	1
-15	33338	. WASHER, Flat, cad. pl stl, for No. 6 screw	1
-16	AN960-CL	. WASHER	1
-17	MS35265-31	. SCREW ---*---	1
-18	34110	.. TERMINAL, solderless (00779) (83298, part No. 1102238-4)	1
-19	1532827-20	.. CLAMP, Loop	1
-20	69F196G3	.. CAPACITOR, Fixed, 4.7 uf ± 10 pct, 100 V dc (06001) (83298, part No. 1545591-1)	1
	1545592-4	. CAPACITOR ASSEMBLY (ATTACHING PARTS)	1
-21	MS21044NO6	. NUT, Self-locking	1
-22	33338	. WASHER, Flat, cad. pl stl, for No. 6 screw	1
-23	AN960-6L	. WASHER	1
-24	MS35265-31	. SCREW ---*---	1
-25	34110	.. TERMINAL, Solderless (00779) (83298, part No. 1102238-4)	1
-26	1532827-19	.. CLAMP, Loop	1
-27	121 P4740R5S1	.. CAPACITOR, Fixed, 0.47 uf ± 20 pct, 50 V dc (56289) (83298, part No. 1545590)	1
-28	1542776	. HOLDER, Electrical contact (ATTACHING PARTS)	4
-29	1543503	. SCREW, Cap, hex hd, 5/16-18 x 1-1/8 in. lg	4
-30	MS35338-45	. WASHER, Lock	4
-31	867491	. WASHER, Flat, cad, pl stl, for 5/16 in. screw	4
-32	1543622	. WASHER, Insulating	16
-33	1328928	. TUBE, Insulating ---*---	4
-34	1543976	. BELL, End	1

(2) Remove four screws (29), four lock washers (30), four washers (31), sixteen insulating washers (32), and four insulating tubes (33), from end bell (34). Do not remove four electrical contact holders (28) unless damage is visible.

Caution: Do not attempt to remove the cast-in bearing liner from end bell (34).

3-2. Inspection Requirements

a. Refer to table 3-1 for detail inspection requirements for components of the starter generator.

Table 3-1. Detail Inspection Requirements

Fig. No.	Index No.	Nomenclature	Inspection Category	Method of Inspection	Remarks
3-1	15	Capacitor	Cracks, Leaks, Damaged Insulation	Visual	Refer to Parts List for Ratings
3-2	6, 13, 20, 27		Electrical Rating	*1650A	
3-1	21	Compression Spring	Cracks, Distortion Load at Compressed Length of 1.100 in. to be 180 to 200 lb	Visual	
3-1	22	Drive Shaft Assembly	Cracks	Magnetic Particle (Specification MIL-I-6868)	Para 3-2b
3-1	39	Armature Assembly	Commutator Undercut to 0.030 in. Wide by 1/32 in. Deep		

Table 3-1. Dental Inspection Requirements - Continued

Fig No.	Index No.	Nomenclature	Inspection Category	Method of Inspection	Remarks
			Commutator Contact Surface	Visual	Para 3-2c
			Cracks, Damaged Insulation, Damaged Conductors	Visual	
			Insulation Breakdown – 300 volts, 60 cps for 1 sec Between Commutator Bars and Shaft (Ground)	*13700-1C	Para 3-5e
			Static and Dynamic Balance within 0.020 oz in.	*Model 40B	
3-1	53	Housing and Stator	Bearing Surfaces		Table 3-2
			Cracks, Damaged Insulation	Visual	
			Bearing Bore Worn		Para 3-2d
			Insulation Breakdown - 300 volts, 60 cps for 1 sec Between Terminals and Housing (Ground)	*13700-1C	
3-2	28	Electrical Contact Holder	Cracks, Distorted Springs	Visual	
			Spring Pressure to be 46 to 52 oz when Spring is Just Lifted Beyond Brush Position	*1106140-3	
3-2	33	Insulating Tube	Cracks	Visual	
3-2	34	End Bell	Cracks, Damaged Threads	Visual	
			Bearing Bore Worn		Para 3-2d

● See tables 2-1 and 2-2.

b. Check the drive shaft assembly (22, figure 3-1) splines for wear. The “top land” dimension of new spline teeth are 0.029 inch minimum for the 16-tooth spline, and 0.039 inch minimum for the 12-tooth spline. Replace the drive shaft when the “top land” dimension of a spline reaches zero.

Note. The spline is safe down to a “top land” dimension of zero, but if service records indicate “top land” dimension may reach zero during the next service period, the drive shaft should be replaced.

Caution: Spline wear rate will increase rapidly after reaching the zero “top land” dimension condition.

c. Inspect the commutator of armature assembly (39). The brush contact surface should be even, high burnished, and dark brown or almost black in color. If the contact surface is rough, pitted, burned, or covered by a hardened film of carbon or oil which cleaning does not remove, resurface the commutator as described in paragraph 3-6.

d. Refer to table 3-2 for fits and clearances of component parts. If the inside diameter of housing and stator (53) or end bell (34, figure 3-2) bearing bore is worn beyond 2.0475 inches, as measured with an air gage, air probe, and 2.0475-inch setting ring, metallize the worn surface as described in paragraph 3-7.

Table 3-2 Fits and Clearances

Part No.	Nomenclature	Service Dimensions (Inches)	Mating		Service Dimensions (Inches)	Service Tolerance (Inches)
			Part No.	Nomenclature		
1543957-1	Armature Assembly	0.9843 OD	890659-5	Ball Bearing	0.9843 ID	0.0000 L/L
1543976	End Bell	2.0475 ID	890659-5	Ball Bearing	2.0470 OD	0.0005 L
1543960	Generator Stator	2.4075 ID	890659-5	Ball Bearing	2.0470 OD	0.0005 L

3-3. Cleaning

a. *General.* Clean all parts of the starter generator with trichlorethylene (item 1, table 2-3)

or dry cleaning solvent (item 2, table 23). Do not dip parts into the solvent. Use a stiff, non-wire brush to scrub the parts thoroughly.

Warning: Use solvent only in a well-ventilated area. Avoid inhaling solvent fumes. Do not allow solvent to contact the skin as burns may occur.

Note. Refer to paragraph *b* for specific cleaning procedures for armature assembly (39, figure 3-1) and housing and stator (53).

(1) Ultrasonic cleaning equipment may be used, if available. Consult the manufacturer of this equipment for proper cleaning solutions and methods to be used.

(2) Dry parts with a clean, lint-free cloth (item 3, table 2-3).

b. Armature Assembly and Housing Stator.

Using a cleaning solvent specified in paragraph 3-3 with a stiff, non-wire brush, scrub armature assembly (39, figure 3-1) and housing and stator (53) thoroughly to remove any carbon and copper particles imbedded between commutator bars and stator bars.

(1) After cleaning, bake the armature assembly and the housing and stator in an oven at 250° F (121° C) for two hours or at 200° F (93° C) for three hours.

(2) After baking, apply a light film of lubricating oil (item 4, table 2-3) or corrosion preventive (item 5, table 2-3) to all ferrous metal surfaces to prevent rusting.

Caution: Do not apply oil to the commutator.

3-4. Repair or Replacement

Note. Paragraphs 3-5 through 3-7 list and describe procedures for reparable parts only.

a. General.

(1) Replace all parts that are worn and damaged,

(2) Replace split-type brushes (4, figure 3-1) and ball bearings (36 and 44) at each overhaul.

(3) Replace all wiring having burned or cracked insulation, or broken or corroded terminals.

3-5. Armature Assembly

Replace armature assembly (39, figure 3-1) if any of the following conditions exist:

a. If the shaft diameter is less than 0.9843 in.

b. If the commutator has badly burned bars, because such a condition is usually the result of open-circuited armature coils.

c. If commutator bars are loose or out of alignment.

d. If resurfacing the commutator (paragraph 3-6) would reduce the outside diameter below the allowable minimum of 2.800 inches. This diameter is indicated by a step cut into the edge of the commutator.

e. If the insulation breakdown test (table 3-1) between commutator bars and ground shows indication of insulation breakdown.

Caution: When performing this test, keep test probes outside brush path to avoid damaging contact surface.

3-6. Resurfacing the Commutator

a. To remove oil or carbon film, mount armature assembly (39, figure 3-1) in a lathe and take a single light cut across the face of the commutator at a speed of approximately 600 surface feet per minute. If the contact surface is scored or pitted, take a series of light cuts at approximately 200 surface feet per minute. A diamond-tipped cutting tool (figure 3-3) is recommended. The point of the cutting tool must be held on the centerline of the armature shaft (see figure 3-4). If a Carboloy-tipped cutting tool (figure 3-5) is used, the point of the cutting tool must be held 0.031 in. below the centerline of the armature shaft. The minimum diameter to which the commutator may be turned down is 2.800 inches. This limit is indicated by a step cut into the commutator. If necessary to remove metal beyond this point, replace the armature assembly.

b. After the commutator has been turned down, measure the depth of undercutting between commutator bars. If the depth is less than 1/32 in., undercut to this depth and to a width of .030 in.,

c. After undercutting, take a final light cut of not more than 0.001 in. across the face of the commutator to remove burrs. If a diamond-tipped cutting tool is not available, make the final cut with a freshly honed Carboloy-tipped tool. Cutting speed should be approximately 600 surface feet per minute with dither type tool. Do not use polishing abrasives. After the final cut, remove burrs between commutator bars with a strip of fiber.

d. Check that the commutator is concentric with the bearing surfaces of the armature shaft within 0.005 in. full indicator reading.

e. After resurfacing, clean the commutator to remove all traces of oil, grease, and metal chips, as specified in paragraph 3-36.

f. Check the armature assembly for static and dynamic balance, using balancing machine, model

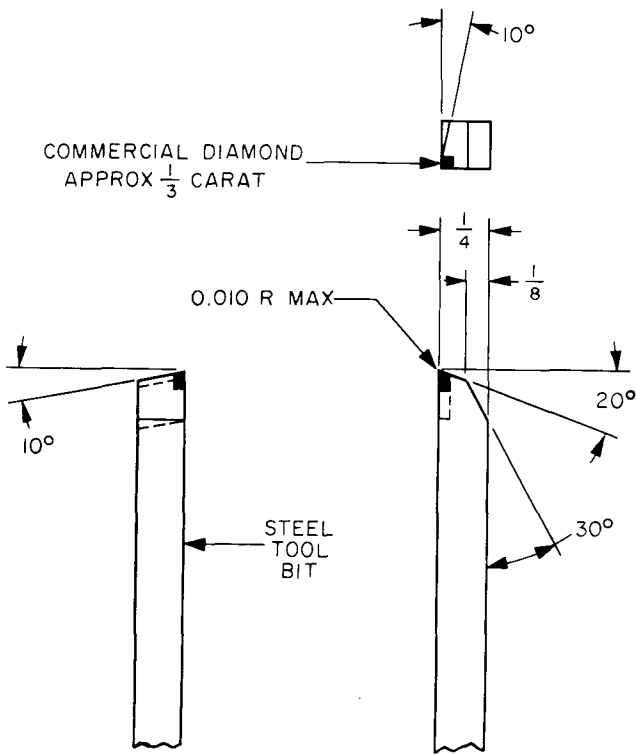


Figure 3-3. Fabrication of Diamond-tipped Cutting Tool

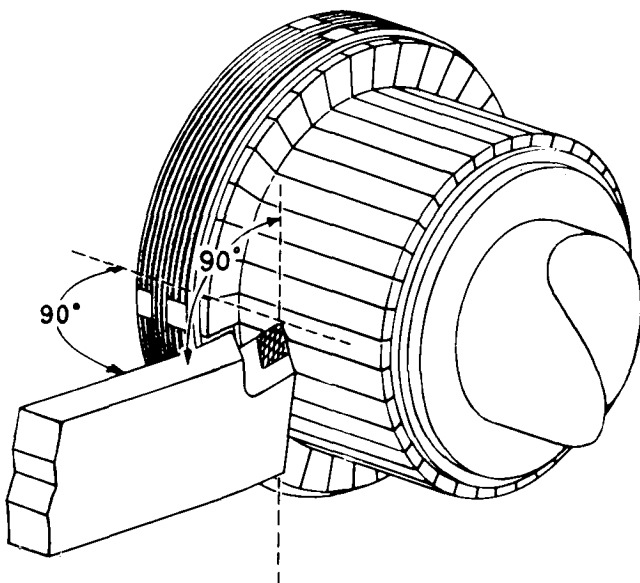


Figure 3-4. Mounting of Commutator Cutting Tool.

40B. If out of balance by more than 0.020 oz in., rebalance by inserting leaded epoxy material inside and under winding openings as required.

3-7. Metallizing Bearing Bores

If the bearing bore of end bell (34, figure 3-2) or housing and stator (53, figure 3-1) is worn beyond 2.0475 in., metallize the bore as described in steps a through i.

a. Degrease the face of the bore and adjacent areas from which contaminants might be introduced, using a solvent specified in paragraph 3-32.

b. Mask the area adjacent to the face of the bearing bore with shellac (item 6, table 2-3) to prevent adherence of the sprayed metal to these surfaces. Any shellac on the face of the bore will be removed by boring (step c).

c. Using a feed which will provide a suitable base for metallizing, roughbore the bearing surface to correct any taper or out-of-round condition. Remove at least 0.006 in., but do not exceed the original dimension by more than 0.015 in. on the radius.

d. Insert the housing in a lathe, and rotate it at a speed of approximately 60 rpm.

Caution: The area to be metallized must be absolutely clean.

e. To prevent condensation of moisture, make several rapid passes over the work with the flame only, immediately before applying the molybdenum (spraybond or molybond) coating. Should the bore be so impregnated with grease as to prevent metallizing, replace the end bell or housing and stator.

f. Make several passes over the bearing bore, to deposit a thin coat of molybdenum.

g. Complete the metallizing with molybdenum or 0.80 percent carbon steel wire to a thickness of 0.006 in. on top of the finished diameter (finished diameter minus 0.012 in.)

h. Rough-bore the surface to 0.010 in. under the finished diameter. Finish the surface by grinding to an inside diameter of 2.0472, plus 0.0003, minus 0.0000 in. The concentricity between the inside diameter of the bearing bore and both the outermost (4.122 in.) diameter of the housing and stator, and the largest inside diameter (6.125 in.) of the end bell must be within 0.002 in., full indicator reading.

i. Remove masking shellac and grinding residue with denatured alcohol (item 7, table 2-3).

3-8. Soldering

a. In all soldering operations (capacitor leads to terminals), use a resin core solder composed of 63 percent tin and 37 percent lead (item 8, table

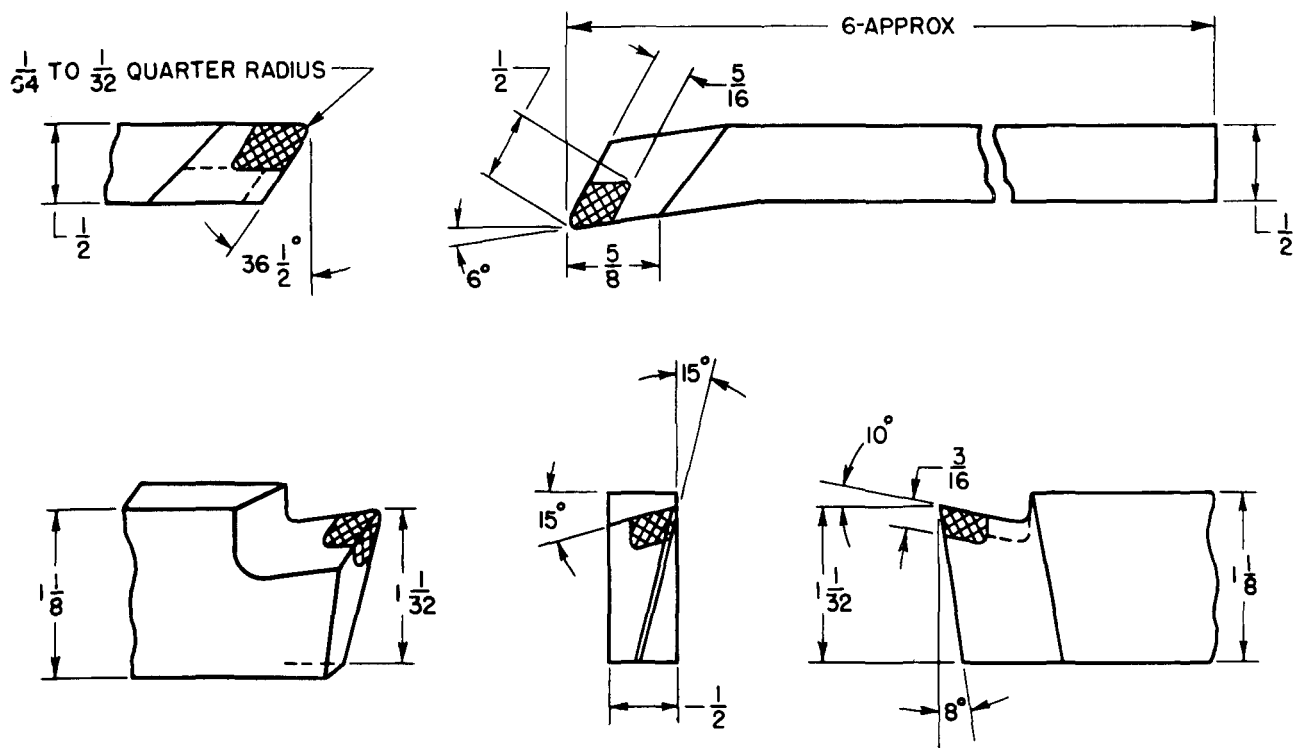


Figure 3-5. Fabrication of Carboloy-tipped Cutting Tool.

2-3). This solder has a melting temperature of 357° F (181° C).

Caution: Do not use an acid core solder or an acid flux. Do not burn insulation when soldering.

b. All soldering must be done in accordance with Federal Specification QQ-S-571.

c. After soldering, clean all joints with denatured alcohol (item 7, table 2-3) to remove all traces of resin and other foreign matter.

3-9. Sleeving Replacement

All sleeting used on the starter generator is teflon natural color sleeting, and with the exception of the one length specified in step a, all sleeting has an inside diameter between 0.032 and 0.039 in. The wall thickness on all sleeting is 0.030 in. Lengths are given in steps a through f.

a. The length of sleeting joining capacitors (15, figure 3-1) to terminal post E- has an inside diameter between 0.051 and 0.061 in. and is 1-1/2 in. long.

b. The sleeting on the lead of capacitor (15) to terminal post B + is 2-1/16 in. long.

c. The two lengths of sleeting on capacitor (6, figure 3-2) are 2 in. long.

d. The sleeting on capacitor (13) is 1-5/32 in. long.

e. The sleeting on capacitor (20) is 1-15/32 in. long.

f. The sleeting on capacitor (27) is 1-1/4 in. long.

Note. All capacitors are firm components. There is no alternate or equivalent part number for capacitors.

3-10. Capacitor Mounting

If any capacitors have been removed or replaced, they must be cemented in their mounting positions. The material to be used consists of two parts of red epoxy resin (item 9, table 2-3) to one part of tan epoxy reactor (item 10, table 2-3) by weight. Follow the procedure of steps a through f.

a. Make sure areas to be cemented are free from grease, oil, or any contaminant that might prevent adhesion.

b. Stir the epoxy mixture until uniform in color.

Note. The pot life of the mixture is 3 hours.

c. Secure the end bell capacitors in place with mounting hardware (see figure 3-2).

d. Position the terminal board capacitors as shown in figure 3-6.

e. Apply the epoxy mixture with a paddle or spatula to form a fillet. On the end bell capacitors, cement the capacitors and loop clamps to the housing. Wipe away all excess material before curing.

f. Allow the mixture to cure for 24 hours at room temperature or for 3 hours at 150° F (66° C).

3-11. Lubrication

The only lubrication required for the starter generator is after assembly, coat the drive shaft spline with a light film of spline lubricant (item 11, table 2-3). If this lubricant is not available, use high-temperature lubricating grease (item 12, table 2-3).

Note. Use of sealing compounds is specified throughout the reassembly paragraphs.

3-12. Reassembly

Reassembly is basically the reverse of disassembly. Follow the exploded views (figures 3-1 and 3-2), the schematic diagram (figure 3-7) and the detailed instructions (paragraphs a and b) for reassembly information.

a. End Bell Assembly.

(1) If capacitors (6, 13, 20, and 27, figure 3-2) were removed or replaced, secure them to end bell (34) and cement as described in paragraph 3-10.

Note. Terminals of capacitors (6) will be secured to electrical contact holders (28) when split-type brushes are installed (paragraph b). Terminals of capacitors (13, 20, and 27) will be secured to threaded holes in heads of screws (29) at final assembly (paragraph b).

(2) Using brush box aligner (1106006-1) and brush box aligner piler (1106005-1), secure electrical contact holders (28) to end bell (34) with four screws (29), four lock washers (30),

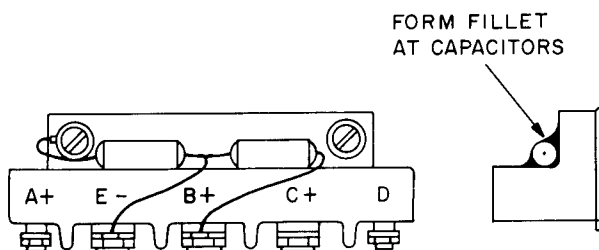
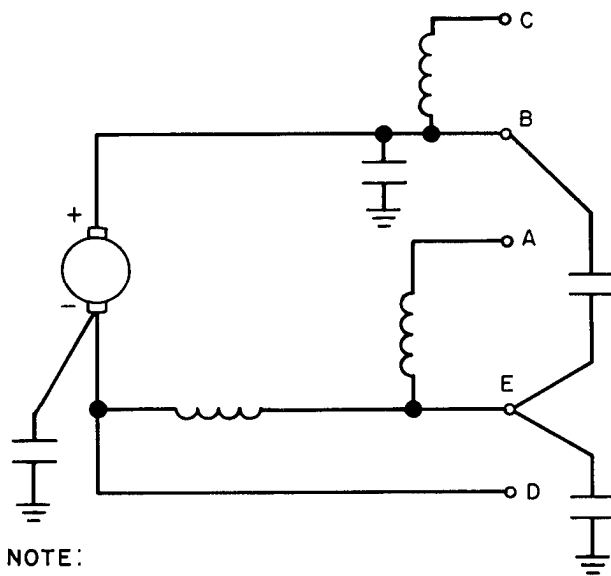


Figure 3-6. Capacitor Mounting Position.



NOTE:
ALL WIRING INSULATED
FROM HOUSING

Figure 3-7. Starter Generator, Schematic Diagram.

four washers (31), sixteen insulating washers (32), and four insulating tubes (33).

(3) Coat the area between the insulating washers and the electrical contact holder bosses with red glyptal lacquer (item 13, table 2-3), and tighten screws (29) to a torque of 75 to 80 pound-inches.

b. Starter Generator.

(1) Mount three terminal board insulators (52, figure 3-1) in position on housing and stator (53). Apply sealing compound (item 14, table 2-3) to threads of two screws (50). Secure terminal board (49) to the housing and stator with two screws (50) and two washers (51), making sure to install the terminal of capacitor (15) under one screw as shown in figure 3-6.

(2) If capacitors (15, figure 3-1) were removed or replaced, secure them to terminal board (49) as described in paragraph 3-10.

(3) Install identification plate (46) on housing and secure with four screws (47).

(4) Mount bearing retainer (45) and one dirt slinger (43) on the drive end of armature assembly (39).

(5) Mount bearing retainer (37) and one dirt slinger (35) on the commutator end of armature assembly (39).

(6) Stand armature assembly (39) on rotor stand (1106149). Heat ball bearings (36 and 44) to 250° F (121° C) and install on armature assembly (39), making sure that the dirt slingers are properly positioned.

(7) Insert armature assembly (39) into housing and stator (53), seating ball bearing (44) in the bore of the housing.

(8) Mount end bell assembly (30) on ball bearing (36), and secure to housing and stator (53) with six screws (31), six lock washers (31), and six special washers (33). Tighten screws to a torque of 35 to 40 pound-inches.

(9) Secure the housing to interface (1106354-1) and mount on generator overhaul stand (1106187).

(10) Install the remaining dirt slingers (35 and 43) and lock rings (17 and 38).

(11) Align bearing retainer (45) with the holes in housing and stator (53). Apply sealing compound (item 15, table 2-3) to the threads of four screws (41). Install bushings (42) and outer race bearing retainer (40), and secure with four screws (41).

(12) Align bearing retainer (37) with the four holes in end bell assembly (30). Apply sealing compound (item 15, table 2-3) to the threads of four screws (28), and install the screws with four lock washers (29).

(13) Align the terminals of end bell capacitors (13, 20, and 27, figure 3-2) over the threaded holes in four screws (29), and secure with three screws (24, figure 3-1), three lock washers (25), and three washers (26).

(14) Use setting gage (1106353-1) to measure and check the compressed length of compression spring (21). This assembled length should be 1.100 inches. Insert the gage size plug into the fan end of armature assembly (39), and install washer (20) and self-locking nut (19). Seat the setting gage on the washer, and tighten the self-locking nut, using a 7/16-inch (12-point thin wall) socket wrench until the gage indicator is at zero, plus or minus 0.005 inch. Remove the setting gage, self-locking nut, washer, and gage size plug. Install front plate (23) on drive shaft assembly (22) and insert the shaft through ar-

mature assembly (39). Install fan (18) through the armature assembly. Install compression spring (21), washer (20), self-locking nut (19) and the setting gage. Using spline wrench (QB80059-3) to keep the shaft from turning, retighten selflocking nut (19) with the 7/16-inch (12-point thin wall) socket wrench until the setting gage again indicates zero, plus or minus 0.005 inch. Remove the setting gage.

(15) Apply sealing compound (item 14, table 2-3) to the threads of six screws (17). Secure fan housing (16) to end bell assembly (30) with six screws (17).

(16) Fasten generator stator terminals to terminal posts D and A+ with two self-locking nuts (10) and two washers (11).

(17) Fasten generator stator terminals and capacitor terminals to terminal posts E-, B+, and C+ with three self-locking nuts (8) and three washers (9) (see figure 3-6 and 3-7).

(18) Install split-type brushes (4, figure 3-1) in brush holders, and secure, along with two end bell capacitor terminals, with eight screws (5), eight lock washers (6), and eight washers (7). Tighten the screws to a torque of 35 to 40 pound-inches.

(19) Slide brush access cover assembly (1) over fan housing (16), and tighten screw (2) and square nut (3).

(20) After the starter generator has been tested satisfactorily, safety wire the drilled head screw (2) to brush access cover assembly (1) with lock wire (item 16, table 2-3) in accordance with Military Standard MS33540 (ASG).

(21) After the final test procedure has established optimum position of brushes, lock the end bell assembly in position. Using the notch in the end bell for location, drill a 0.062, plus 0.003, minus 0.000 in. diameter hole through the housing, and press in roll pin (34) flush to the housing.

SECTION IV

FINAL TEST PROCEDURES

4-1. General

If the starter generator fails to meet any of the test requirements and visual inspection does not disclose the cause of the trouble, refer to the

troubleshooting table 4-1, disassemble, and repeat inspection procedures as outlined in Section III. After reassembling, repeat the test procedure from the beginning.

Table 4-1. Troubleshooting

Item	Trouble	Probable Cause	Remedy
1	Short Brush Life or Excessive Sparking	Worn, Improperly Seated, or Loose Fitting Brushes Low Brush Spring Tension Dirty Commutator Scored, Pitted, or out-of-round Commutator	Replace, Service, and/or Readjust Brushes as Necessary. Readjust and/or Replace Spring. Service Commutator. Resurface Commutator.
2	Generator Noisy	Short, Ground, or Open Armature Ball Bearings Worn Shorted Compensating Winding Faulty Condensers Discharged Battery Excessive Sparking at Generator Brushes	Replace Armature, Replace Ball Bearings. Replace Yoke Assembly. Replace Condensers. Replace Battery. See Item 1.
3	Output Voltage Low or no Reading	Shorted or Open Rotor or Exciter and/or Shorted or Open Diodes control Panel Faulty Shorted and/or Open Output Windings Drive Inoperative	Test; if Faulty, Replace Rotor and/or Diodes. Replace Control Panel. Test; Replace Housing if Necessary.
4	Output Voltage Indicates High	Control Panel Faulty	Check Drive. Replace Control Panel.
5	Output Voltage Erratic or Fluctuates	Wrong or Faulty Connection Between Generator and Control Panel Faulty Control Panel High Resistance, Internal or External Connection in the dc Connection of Generator	Make Proper Connections and/or Tighten Connections. Replace Control Panel. Clean and/or Tighten Connections.
6	Output Phase Sequence Incorrect With Generator Rotation Correct	Intermittently Shorted, Grounded, or Open ac Rotor and/or Stator External Wiring Not Properly Connected	Test; Replace Rotor and/or Housing if Necessary. Check External Wiring. Make Proper Connections. (Refer to External Wiring Diagram.)
7	System Meters Indicates Zero, Low, or Fluctuating Reading (Output Voltage satisfactory)	External Wiring Not Properly Connected Improper Adjustment of Voltage Regulator	Check External Wiring. Make Proper Connections and Tighten. Check Adjustments. Make Proper Adjustments.
8	System Meters Read Off Scale in Wrong Direction, with Generator Connected to Load	Generator Field Magnetized in Wrong Direction External Wiring Not Properly Connected	Flash Field in Proper Direction.
9	Equipment Operating Unsatisfactorily Although No Load Voltage is at Proper Value	Faulty Control Panel Improper Frequency	Refer to Wiring Diagram. Check All Wiring Connections. All Connections Should be Clean and Tight. Replace Control Panel. Check Drive.
10	Generator Overheats	Excessive Load	Check and Reduce Load, if Necessary.

a. *Test Conditions.*

(1) *Temperature.* Since the starter generator is self-cooled, no cooling air is required. Check that the ambient temperature is $77 \pm 27^\circ \text{F}$ ($25 \pm 15^\circ \text{C}$).

(2) *Direction of rotation.* Drive the starter generator in a counterclockwise direction, as viewed from the drive end, during all tests.

(3) *Plastic windows.* It is recommended that a transparent plastic window strap be used during the brush seating procedure, so that the commutator end brushes will be visible. A spare brush access cover can be modified in the shop by cutting out squares, and riveting transparent non-flammable plastic window panes in place on the cover.

Caution: Do not operate the starter generator without the brush access cover in place, as overheating may occur.

(4) *Mounting.* The starter generator should be mounted on aircraft generator test stand (7199-1), or an equivalent test stand, capable of driving the generator continuously over the rated speed. The longitudinal axis of the generator should be horizontal.

(5) *Excitation.* The starter generator should be self-excited and controlled by a suitable variable resistance with the shunt field.

Note. The shunt field current should not be considered as part of the starter generator load current.

(6) *Load location.* The load for the starter generator should be located so that it will not affect the ambient temperature.

(7) *Warm-up.* The starter generator should be operated at a continuous operating speed delivering the rated load at the rated voltage, to obtain a constant temperature.

(8) *Voltage measurements.* The voltages should be measured between terminals E and B.

(9) *Shunt field voltage.* The voltage drop across the shunt field should be measured between terminals A and E. (See figure 3-7.)

b. *Test Equipment.* When performing stall torque test, use starter torque tester, type B-1.

4-2. Flashing the Field

To be sure that the d-c magnetic circuit retains enough residual magnetism to allow the starter generator voltage to build up properly, flash the field as described in steps a through d.

a. Connect the positive terminal of a 12-volt battery through a singlepole, single throw knife switch to terminal A+ on terminal board (49, figure 3-1).

b. Connect the negative terminal of the battery to terminal E- on the terminal board.

c. Apply battery current to the field for 5 seconds by closing the knife switch.

d. Repeat the operation several times to be sure that the field is properly flashed.

Caution: Use a knife switch when flashing the field. Opening the circuit at the starter generator or battery terminals can result in severe damage to the terminals or explosion of the battery.

4-3 Brush Seating

a. Remove the brush access cover and replace it with the plastic window strap. (Refer to paragraph 4-1a(3).) The brush "run-in" can now be observed.

b. Operate the starter generator at the rated speed until the face of each brush contacts the commutator 100 percent in the direction of rotation and for at least 75 percent of brush dimension parallel to the shaft. (See figure 4-1.) There must be no evidence of excessive grooving or other surface damage to the face of the brush.

c. There must be no sparking except for fine pinpoint sparking at the generator brushes. Brushes should be removed from their brush holders for periodic inspection.

Note. If the brushes are removed from the brush holders, be sure to return each brush to the brush holder from which it was removed.

4-4. Stall Torque Test

a. Mount the starter generator on starter torque tester, type B-1.

b. Connect the spline coupling of the torque coupling arm to the spline of drive shaft assembly (22, figure 3-1) and place one of the notched ends of the torque coupling arm in the shackle suspended from the scale.

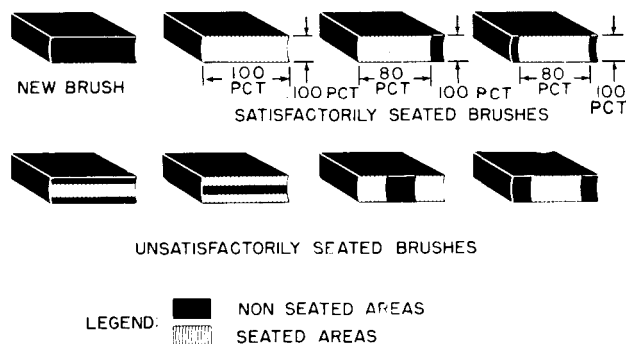


Figure 4-1. Typical Brush Seating.

- c. Connect the starter generator to the vari-drive and start the vari-drive.
- d. Set the main switch to ON.
- e. Set the VOLTAGE INPUT GENERATOR AND SUPPLY switch to SUPPLY. The voltage indicated is the field voltage applied to the starter generator.
- f. Turn the LINE AMPERE ADJUSTMENT control to obtain a current reading between 500 and 800 amperes. The stall torque as indicated by the stall torque test stand scale, at any point within this 500- to 800-ampere range, must comply with the values indicated by figure 4-2.
- g. If the specified stall torque cannot be obtained within the current range indicated in step f, turn end bell assembly (30, figure 3-1) until the correct torque is obtained.
- h. Set the VOLTAGE INPUT GENERATOR AND SUPPLY switch to VOLTAGE INPUT GENERATOR and read and record the starter generator voltage. The voltage reading should be in accordance with values given in figure 4-2.
- i. If for any reason the position of end bell assembly (30, figure 3-1) was shifted, allow the starter generator to run for 1/2 hour and repeat the test.

4-5. Dielectric Strength

- a. Perform this test before any of the final tests.
- b. Using insulation breakdown test set 13700-1C, apply 250 volts, 60 cps for one minute between each terminal post and the frame (ground).
- c. A current flow of more than 15 milliamperes indicates insulation breakdown.

4-6. Final Tests

- a. *General.* Mount the starter generator on the test stand, as described in paragraph 4-1a(4).
- b. *Maximum Speed for Regulation.*

Note. The starter generator must not be given an operational warm-up prior to this test.

- (1) Turn on the test stand controls and increase the drive motor speed to 10,000 rpm.
- (2) Adjust the regulator until the output voltage is 30 volts.
- (3) Record the field voltage (Ef) and field current (If).
- (4) Calculate the external resistance in the field circuit by dividing the field voltage by the field current.
- (5) The external resistance in the shunt field must not exceed 35 ohms.

c. Heating, Commutation, Minimum Speed and Equalizing Voltage.

- (1) For heating, commutation, minimum speed, and equalizing voltage tests, the following is considered as a continuous operating condition: While the starter generator is cold, the resistance and temperature of the shunt field must be determined for use in calculating the average field temperature rise used during continuous operation at full load. The starter generator is considered to have reached its continuous operating condition when the rate of rise of the shunt field temperature does not increase more than 2°F (1° C) during a five-minute period.
- (2) Start the blower and drive motor. Increase the drive motor speed to operate the starter generator at 8000 rpm. Close suitable switches of the load bank to apply 300 amperes d-c load. When the starter generator reaches its continuous operating condition as described in step a proceed as follows:
 - (a) Check the readings of the instruments. During the heat run, readings must be limited to those shown in table 4-2.

Table 4-2. Heating Test Readings

Shunt Field	8 amperes (max)
Load Ammeter	300 amperes
Line Voltage	30 volts

- (b) Measure the equalizing voltage across terminals D and E on terminal board (49, figure 3-1). The voltage must be between 1.9 and 2.1 volts.
- (3) After completing the previous test, decrease the speed of the motor until the minimum rated speed of 4000 rpm is measured on the tachometer. Adjust the voltage regulator until a 26-volt reading is obtained. The starter generator must deliver rated current of 300 amperes, as read on the ammeter.

Note. At no time during the above heat runs should the required resistance external to the shunt field be less than 1.25 ohms. Refer to paragraph 4-6b to calculate the external shunt field resistance.

- (4) Readjust the regulator until a 30-volt reading is obtained.
- d. *Commutation.* Immediately following the previous heat runs, with the starter generator hot, observe the commutation of the starter generator over the speed range 4400 to 8000 rpm for no load (all load switches off), half load (suitable load switches turned onto give 150 amperes), and rated load (suitable switches turned on to give 300 amperes). Table 4-3 lists the vari-

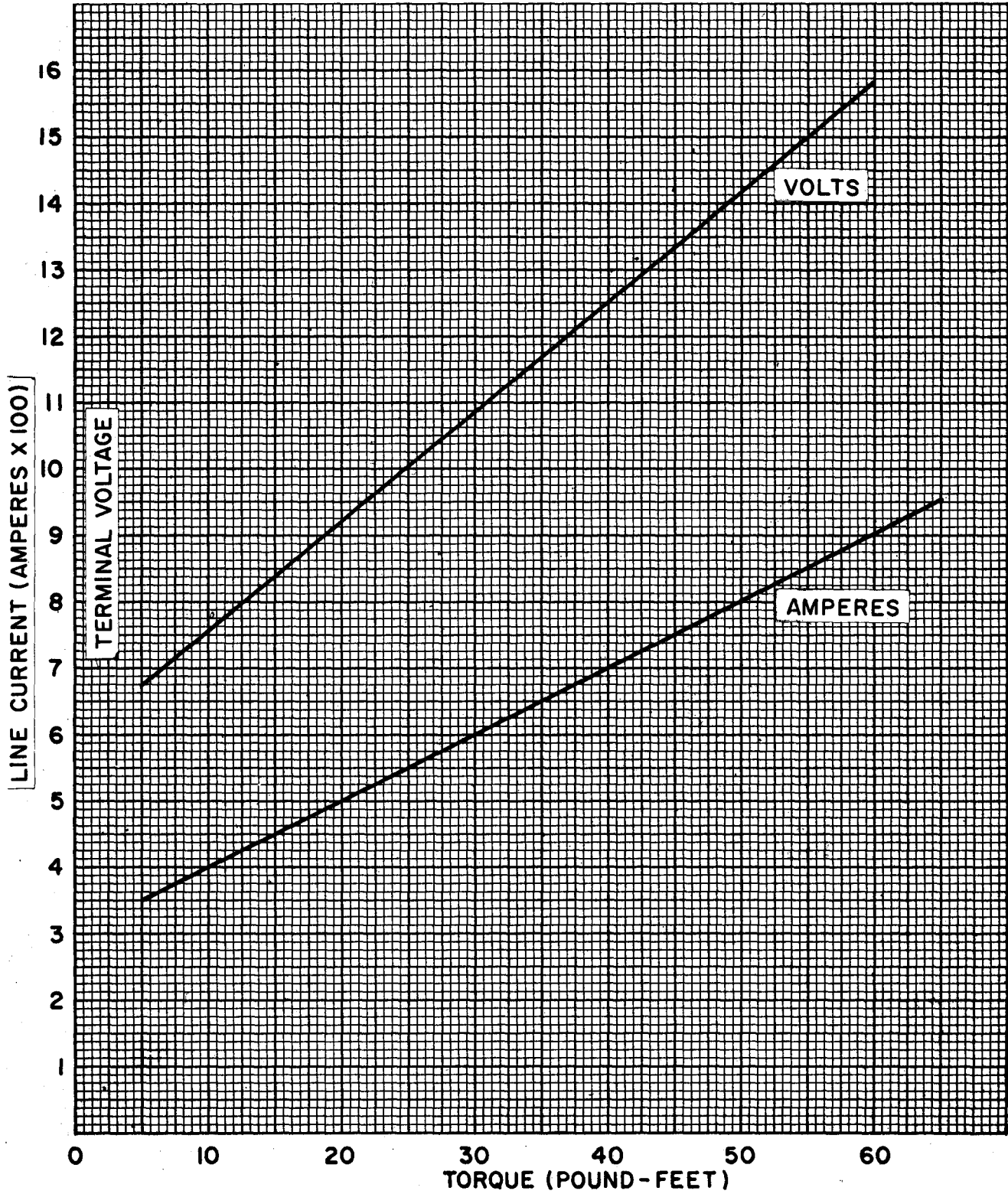


Figure4-2. Stall Torque Curve.

ous conditions. There should be no sparking except for the fine pinpoint sparking at the generator brushes.

Note. For any speed within the speed range, the field current must increase with increases in load.

Table 4-3. Commutation Test Readings

Speed (rpm)	Line Voltage	Load (amperes)
4400	30	0
4400	30	150
4400	30	300
6000	30	0
6000	30	150
6000	30	300
8 (MO)	30	0
8000	30	150
8000	30	300

e. Overspeed.

- (1) Perform this test while the starter generator is hot as a result of testing.
- (2) Open all load switches and the field switch. Operate the generator at no load.

(3) Increase the speed of the driving motor to 11,000 rpm. The generator must operate at this speed for five minutes without mechanical failure, the throwing of varnish, or impairment of electrical performance.

(4) At the end of the five-minute overspeed run, reduce the speed to 6000 rpm. Apply rated load of 300 amperes.

(5) Operate the starter generator for one minute and check the electrical performance. The results should compare with those observed in paragraph 4-6c.

f. Polarity Check.

(1) Operate the starter generator at rated speed and load conditions. Connect the voltmeter leads to starter generator terminals B+ and E- observing proper polarity.

(2) If the voltmeter connections must be reversed to obtain a reading, the polarity of the starter generator is reversed. In this case, flash the field in the proper direction as described in paragraph 4-2.

**APPENDIX A
REFERENCES**

MS33540 (ASG)
QQ-S-571
TM 33-750
TM 55-405-10

Safety Wiring, General Practices for
Solder, Soft
Army Equipment Record System
Ground Handling and Service Equipment

By Order of the Secretary of the Army:

Official:

**KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.**

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