

# TM 9-1825B

WAR DEPARTMENT TECHNICAL MANUAL

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ORDNANCE MAINTENANCE

ELECTRICAL

EQUIPMENT

(AUTO-LITE)

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WAR DEPARTMENT

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20 JANUARY 1944

**FOR ORDNANCE PERSONNEL ONLY**

*WAR DEPARTMENT TECHNICAL MANUAL*

*TM 9-1825B*

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**WAR DEPARTMENT**  
**Washington 25, D. C., 20 January 1944**

**TM 9-1825B, Ordnance Maintenance: Electrical Equipment (Auto-Lite) is published for the information and guidance of all concerned.**

**[ A.G. 300.7 (30 Nov. 43)**  
**[ O.O.M. 461/(TM-9) Rar. Ars. ]**

**BY ORDER OF THE SECRETARY OF WAR:**

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**DISTRIBUTION: R 5 and 9 (4); Bn 5 and 9 (2); C 5 and 9 (5)**

**(For explanation of symbols, see FM 21-6)**

**CONTENTS**

|   | Paragraphs | Pages   |
|---|------------|---------|
| CHAPTER 1. INTRODUCTION .....                       | 1-2        | 4-6     |
| CHAPTER 2. GENERATORS .....                         | 3-40       | 7-107   |
| SECTION I Generators—Basic principles               | 3-4        | 7-8     |
| II Generators—Group 1.....                          | 5-13       | 9-38    |
| III Generators—Group 2.....                         | 14-22      | 39-66   |
| IV Generators—Group 3.....                          | 23-31      | 67-89   |
| V Generators—Group 4.....                           | 32-40      | 90-107  |
| CHAPTER 3. REGULATORS .....                         | 41-61      | 108-164 |
| SECTION I Regulators—Basic principles               | 41-42      | 108-112 |
| II Regulators—Groups 1 and 2..                      | 43-47      | 113-121 |
| III Regulators—Group 3.....                         | 48-52      | 122-135 |
| IV Regulators—Group 4.....                          | 53-61      | 136-164 |
| CHAPTER 4. DISTRIBUTORS .....                       | 62-90      | 165-204 |
| SECTION I Distributors—Basic principles             | 62-63      | 165-167 |
| II Distributors—Group 1.....                        | 64-72      | 168-187 |
| III Distributors—Group 2.....                       | 73-81      | 188-195 |
| IV Distributors—Group 3.....                        | 82-90      | 196-204 |
| CHAPTER 5. CRANKING MOTORS.....                     | 91-119     | 205-260 |
| SECTION I Cranking motors—Basic<br>principles ..... | 91-92      | 205-207 |
| II Cranking motors—Group 1..                        | 93-101     | 208-230 |
| III Cranking motors—Group 2..                       | 102-110    | 231-245 |
| IV Cranking motors—Group 3..                        | 111-119    | 246-260 |
| CHAPTER 6. GENERAL ELECTRICAL<br>EQUIPMENT .....    | 120-169    | 261-293 |
| SECTION I Ignition coils.....                       | 120-128    | 261-263 |
| II Switches—Group 1.....                            | 129-130    | 264-266 |
| III Switches—Group 2.....                           | 131-139    | 267-276 |
| IV Windshield wipers.....                           | 140-148    | 277-281 |
| V Horns .....                                       | 149-157    | 282-284 |
| VI Booster coils.....                               | 158-165    | 285-288 |
| VII Filters and shielding.....                      | 166-167    | 289-290 |
| VIII Special solenoids.....                         | 168-169    | 291-293 |
| CHAPTER 7. SPECIFICATIONS .....                     | 170-174    | 294-302 |
| SECTION I Generators .....                          | 170        | 294-295 |
| II Regulators .....                                 | 171        | 296-297 |
| III Distributors .....                              | 172        | 298-299 |
| IV Cranking motors.....                             | 173        | 300     |
| V General equipment.....                            | 174        | 301-302 |
| CHAPTER 8. Special tools.....                       | 175        | 303-305 |
| REFERENCES .....                                    |            | 306     |
| INDEX .....   |            | 307     |

TM 9-1825B

1

## ORDNANCE MAINTENANCE—ELECTRICAL EQUIPMENT (AUTO-LITE)

## CHAPTER 1

## INTRODUCTION

|                            | Paragraph |
|----------------------------|-----------|
| Scope .....                | 1         |
| Arrangement of manual..... | 2         |

## 1. SCOPE.

a. This manual is published for the information and guidance of ordnance maintenance personnel. It contains illustrations, descriptions, and detailed instructions for maintenance, inspection, disassembly, repair and assembly of the following items manufactured by the Electric Auto-Lite Company for use in ordnance vehicles.

## (1) GENERATORS.

| Group 1  | Group 2   | Group 3   | Group 4   |
|----------|-----------|-----------|-----------|
| GAS 4151 | GDM 4803  | GEG 5004A | GBG 4601  |
| GAS 4166 | GDM 5001  | GEH 4806  | GBG 4612  |
| GAS 4172 | GDZ 4801  | GEH 5002  | GDJ 4802A |
| GDE 4107 | GDZ 4801B | GEW 4802  | GDJ 4804  |
| GDE 4108 | GDZ 4801C | GEW 4803  | GDJ 4804A |
|          | GDZ 4801D | GEW 4803A | GDJ 4804B |
|          | GEA 4802A | GEW 4804  | GDJ 4804C |
|          | GEB 4810  | GEW 4805  | GDJ 4808  |
|          | GEG 5001A | GEW 4806  | GDJ 4808A |
|          | GEG 5002  | GEW 4806A | GDJ 4809A |
|          | GEG 5002A | GEW 4806B | GDJ 4809B |
|          | GEG 5002B | GEW 4806C | GDJ 4812A |
|          | GEG 5002C | GFK 4801  | GDJ 4819A |
|          | GEG 5002D | GFM 4801  | GDJ 4820A |
|          | GEG 5002E | GFM 4801A | GFZ 4801A |
|          | GEG 5002F | GGA 4801A | GFZ 4801B |

## (2) REGULATORS.

| Group 1 | Group 2  | Group 3   | Group 4     |
|---------|----------|-----------|-------------|
| CB 4014 | TC 4328A | VRP 4001A | VAC 4001A   |
|         |          | VRP 4002C | VAD 4103A   |
|         |          | VRP 4004G | VAD 4105A   |
|         |          | VRP 4006E | VAD 4106A   |
|         |          | VRS 4004B | VAD 4106B   |
|         |          | VRX 4001A | VAL 4101A   |
|         |          |           | VAM 4101A   |
|         |          |           | VRA 4102A   |
|         |          |           | VRA 4105A   |
|         |          |           | VRG 4102B   |
|         |          |           | VRG 4103C   |
|         |          |           | VRH 4101C   |
|         |          |           | VRH 4102A   |
|         |          |           | VRH 4104A-1 |
|         |          |           | VRH 4104B-1 |
|         |          |           | VRH 4104C-1 |
|         |          |           | VRH 4105A   |
|         |          |           | VRH 4106A   |
|         |          |           | VRY 4201A   |
|         |          |           | VRY 4201B   |
|         |          |           | VRY 4203A   |
|         |          |           | VRY 4203B   |

## INTRODUCTION

## (3) DISTRIBUTORS.

|            | Group 1     |             | Group 2   | Group 3   |
|------------|-------------|-------------|-----------|-----------|
| IGC 4054D  | IGC 4707    | IGS 4111-1  | IAC 4001  | IGW 4049  |
| IGC 4281   | IGC 4707-1  | IGS 4112    | IAC 4002  | IGW 4053  |
| IGC 4286   | IGC 4708    | IGS 4112-1  | IAC 4002A | IGW 4147  |
| IGC 4701   | IGC 4709A   | IGS 4114    | IAC 4003  | IGW 4154  |
| IGC 4701-1 | IGC 4710    | IGS 4114-1  |           | IGW 4156A |
| IGC 4701-2 | IGC 4710-2  | IGS 4202A   |           | IGW 4165A |
| IGC 4702A  | IGC 4716    | IGS 4202A-1 |           | IGW 4165B |
| IGC 4703   | IGC 4717-1  | IGS-4203B   |           |           |
| IGC 4703-1 | IGC 4902A   | IGS 4203B-1 |           |           |
| IGC 4704   | IGE 4003H   | IGS 4204    |           |           |
| IGC 4704-1 | IGE 4003H-1 | IGS 4204-1  |           |           |
| IGC 4705   | IGE 4029    | IGT 4102    |           |           |
| IGC 4706A  | IGS 4111    |             |           |           |

## (4) CRANKING MOTORS.

|           | Group 1   |          | Group 2  | Group 3   |
|-----------|-----------|----------|----------|-----------|
| MAB 4071  | MAY 4114B | MBY 4001 | MAS 4003 | MBD 4007  |
| MAB 4082  | MAY 4132  | MZ 4059  | MAS 4009 | MBD 4007A |
| MAU 4006  | MAY 4133  | MZ 4059A | ML 4209  | MBD 4007B |
| MAW 4029  | MAY 4137  | MZ 4089A | ML 4211  | MBD 4008  |
| MAX 4041  | MAY 4138  | MZ 4113  | MR 4104  | MBD 4010  |
| MAY 4114A | MAY 4141  | MZ 4115  |          | MBD 4010A |

## (5) IGNITION COILS.

|          |         |         |          |          |
|----------|---------|---------|----------|----------|
| CE 4645  | CM 4001 | CM 4012 | IG 4065  | IG 4070Q |
| CE 4654  | CM 4002 | CM 4013 | IG 4070H | IG 4092  |
| CF 4001  | CM 4006 | CO 4001 | IG 4070J | IG 4652  |
| CF 4003  | CM 4007 | CO 4002 | IG 4070L | IG 4661  |
| CF 4009  | CM 4010 | CP 4001 | IG 4070P | IG 4801  |
| CF 4013A |         |         |          |          |

## (6) SWITCHES.

| Group 1  |         | Group 2  |          |
|----------|---------|----------|----------|
| SW 2677A | SW 4015 | SS 4001  | SS 4210  |
| SW 2813  | XA 456  | SS 4022  | SS 4505  |
| SW 4001  | XA 532  | SS 4205  | WSE 4001 |
| SW 4002  | XA 570  | SS 4209  | WSE 4002 |
| SW 4011  | XA 572  | SS 4209A | WSE 4003 |
| SW 4013  |         |          |          |

## (7) WINDSHIELD WIPERS.

|       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 28338 | 28938 | 29078 | 29180 | 29308 |
| 28474 | 28942 | 29118 | 29192 | 29366 |
| 28533 | 29058 | 29150 |       |       |

## (8) HORNS.

|         |          |         |         |          |
|---------|----------|---------|---------|----------|
| HA 4001 | HA 4032A | HD 4001 | HD 4017 | HD 4017A |
| HA 4032 |          |         |         |          |

**TM 9-1825B**

1-2

**ORDNANCE MAINTENANCE—ELECTRICAL EQUIPMENT (AUTO-LITE)****(9) BOOSTER COIL.  
BC 4001****(10) FILTERS AND SHIELDING.**

|         |         |         |        |        |
|---------|---------|---------|--------|--------|
| SP 1524 | SP 2545 | SP 4017 | XA 600 | XA 665 |
| SP 1525 | SP 2546 | SP 4018 | XA 615 | XA 671 |
| SP 1547 | SP 2547 | XA 586  | XA 636 | XA 686 |
| SP 1569 | SP 3545 | XA 599  | XA 643 |        |

**(11) SPECIAL SOLENOIDS.**

|          |           |         |           |          |
|----------|-----------|---------|-----------|----------|
| SS 4506  | SSL 4001  | WS 4001 | WSA 4001  | WSC 4001 |
| SSH 4001 | SSL 4002  | WS 4002 | WSA 4001A | WSF 4001 |
| SSK 4001 | SSL 4002A |         |           |          |

For SP 4022 assembly see GDJ 4804B generator and VRH 4104B-1 regulator.

For SP 4022B assembly see GDJ 4804C generator and VRH 4104B-1 regulator.

For SP 4027 assembly see GFZ 4801A generator and VAL 4101A regulator.

For SP 4027B assembly see GFZ 4801B generator and VAL 4101A regulator..

b. Detailed instructions for the removal and installation of the above components are given in the pertinent using arm technical manual.

c. The information and instruction in this manual is supplementary to those in the field and technical manuals prepared for the using arm. This manual does not contain information which is intended primarily for the using arm, since such information is available to ordnance personnel in using arm technical manuals and bulletins.

**2. ARRANGEMENT OF MANUAL.**

a. The detailed arrangement of material is shown in the Table of Contents. The specifications for fits, tolerances and performance, if any, are listed at the end of each chapter or section. A complete tabulation of the specifications for all equipment is given in chapter 7. Special tools required for all assemblies are listed in chapter 8.

## CHAPTER 2

### GENERATORS

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#### Section 1

### GENERATORS—BASIC PRINCIPLES

|                           | Paragraph |
|---------------------------|-----------|
| Description .....         | 3         |
| Theory and operation..... | 4         |

#### 3. DESCRIPTION.

**a. Construction.** Generators consist of four main subassemblies or components, namely: the frame and field, the armature, the commutator end head, and the drive end head. The frame and field is composed of the pole shoes, the field coils and the frame, which supports the main components of the generator. The field coils supply the magnetic field which is necessary to generate electricity. The pole shoes and frame supply the path for the magnetic field. The armature consists of a laminated iron core fixed to a shaft and the copper windings which are wound in slots in the core. The ends of these windings are connected to the commutator which consists of a number of copper segments that are insulated from each other and from the core and shaft. The commutator end head is a cast iron head that closes one end of the frame and supports one of the armature bearings. The commutator end head also supports the brush holders and brushes that contact the commutator and carry the electricity from the revolving armature. The drive end head closes the drive end of the frame and also supports a bearing for the armature shaft.

#### **b. General Description.**

(1) Generators differ as to the design of the above parts due to the different electrical and mechanical characteristics desired for particular installations. The size, type mounting, type of drive, or the voltage and current output differ but all generators include the four components just described.

(2) Generator part number is stamped on the name plate which is riveted to the frame or cover band. All reference to individual units is made according to this part number.

#### 4. THEORY AND OPERATION.

**a. Theory.** Electricity is generated when an electrical conductor is moved through a magnetic field. The amount of electricity is determined by the strength of the magnetic field and the speed, size and number of conductors moving through the field. The size and number of conductors is fixed by the design of the generator and the speed is determined by engine conditions. The strength of the field can be varied by changing the amount of current flowing through the field coils. It is by means of this last characteristic that generator regulation is obtained.



**TM 9-1825B****4****ORDNANCE MAINTENANCE—ELECTRICAL EQUIPMENT (AUTO-LITE)****b. Operation.**

(1) When the generator armature revolves, its conductors cut through the magnetic field supplied by the field coils. This generates electricity in each of the armature conductors. Due to the reversal process in a revolving armature each conductor generates electricity first in one direction then in the other. The commutator and brushes act to reverse the connections of each armature conductor at the proper instant to offset the reversal due to the revolving action. This results in a direct current at the generator terminal.

(2) The field excitation current is self-supplied by the generator. When the generator is stopped there is no field current but there is a slight residual magnetism in the pole shoes. This residual magnetism is sufficient to start the generating process which in turn increases the field coil strength and therefore the generated electricity. This building up of the generator output continues until it reaches the point where the regulating action begins to control the field current.

**CHAPTER 2****GENERATORS (Cont'd)****Section II****GENERATORS—GROUP 1**

|  | <b>Paragraph</b> |
|--|------------------|
| Description and data . . . . .                 | 5                |
| Cleaning, inspecting, and testing . . . . .    | 6                |
| Disassembly . . . . .                          | 7                |
| Cleaning of components . . . . .               | 8                |
| Inspection and test of components . . . . .    | 9                |
| Repair and rebuilding of components . . . . .  | 10               |
| Assembly . . . . .                             | 11               |
| Tests and adjustments . . . . .                | 12               |
| Fits, tolerances, and specifications . . . . . | 13               |

**5. DESCRIPTION AND DATA.****a. Description.**

(1) Group 1 generators are two pole, three brush units, with the output controlled by the third brush. Some of the generators are used with a two charge regulator which reduces the output when the maximum is not needed. Figure 1 is a disassembled view of a typical group 1 generator showing the main components and their attaching parts. Figure 2 is a disassembled view of a group 1 generator with a distributor drive housing.

(2) Third brush control of the output uses the principle of armature reaction to control the output. The field coil excitation is taken from the armature by the third brush. The position of the third brush is designed to take advantage of the reduction in output over part of the windings as generator speed is increased. Due to the action of the third brush the output increases until a maximum is reached and then is reduced as the speed is increased further. Figure 3 illustrates a typical third brush generator output curve.

(3) The third brush-action is typical of all three brush generators whether used with or without a regulator. A regulator is used to reduce the output when it is not needed and does not increase the output above the amount controlled by the third brush (fig. 3).

(4) For model numbers of Group 1 generators, see paragraph 1.

**b. Data.**

Rated Volts—6

Ground Polarity—negative

Field Coil Draw—4.1 to 4.5 amperes at 6.0 volts