TM 9-4910-458-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS)

TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER, FLOOR MOUNTED, 10 TO 50-V, 500-AMP, DC, AND 25 TO 50-V, 100 TO 400 AMP, AC, TESTING RANGES, W/800 TO 11,000-RPM, 22½-HP, 220/440-V, 60-C, 3-PH DUAL HEAD VARIDRIVE ASSEMBLY (UNITED MANUFACTURING COMPANY MODEL AGARTS, TYPE II, PART NUMBER 7336-1, MODEL AGARTS, TYPE II, PART NUMBER 7336-2 AND MODEL AGARTS, TYPE II, PART NUMBER 7336-3 (4910-767-0218) AND TYPE II, PART NUMBER 7336 (4910-316-5252))

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 NOVEMBER 1966

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

may result if personnel fail
to observe safety precautions.

Be careful not to contact high-voltage connections or 220/440-volt ac input connections when installing or operating this equipment.

When working inside the equipment, after the power has been turned off, always ground every part before touching it.

EXTREMELY DANGEROUS POTENTIALS
exist in the following units:

High voltage compartment (figs. 6, 11, and 12).

Meter panel and main control panel (fig. 16) (when lowered).

Panels on rear of test stand (fig. 3) (when removed).

For artificial respiration, refer to FM 21-11.

Change
No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., *29 June 1973*

Operator and Organizational Maintenance Manual (Including Repair Parts and Special Tool Lists) TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER, FLOOR MOUNTED, 10 TO 50-V, 500-AMP, DC, AND 25 TO 50-V, 100 TO 400 AMP, AC, TESTING RANGES, W/800 TO 11,000-RPM, 22-1/2 HP, 220/440-V, 60-C, 3-PH DUAL HEAD VARIDRIVE ASSEMBLY (UNITED MANUFACTURING COMPANY MODEL AGARTS, TYPE II, PART NUMBER 7336-1, MODEL AGARTS, TYPE II, PART NUMBER 7336-2 AND MODEL AGARTS, TYPE II, PART NUMBER 7336-3 (4910-767-0218) AND TYPE II, PART NUMBER 7336 (4910-316-5252)

TM 9-4910-458-12, 1 November 1966, is changed as follows:
Page 160. Add the following paragraphs:

Report of Equipment Publication Improvements

The reporting 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 Publications) and forwarded direct to Commander, US Army Weapons Command, ATTN: AMSWE-MAS-SP, Rock Island, IL 61201.

Components of the End Item

Parts included with the end item and considered as components of the end item configuration are listed in the following table 0:

Table 0. Components of the End Item

Components	Part No.	(FSCM)	Qty
ADAPTER, MOUNTING FLANGE:	11055	(99664)	1
ADAPTER, SPLINED BUSHNG:	11054	(99664)	1
BASE, RECTIFIER MOUNTING:	39915	(99664)	1
BELT, V:	A33	(72781)	
BELT, V:	B33	(72781)	
BELT, V:	3L350	(72781)	
BOLT, SHOULDER, FLAT HEAD:	BP53061	(04720)	1
BRACKET, RECTIFIER MOUNTING:	39154	(99664)	
BRACKET, MOUNTING:	91160	(99664)	
BRACKET, STARTER:	38346	(99664)	1
CABLE, HARNESS:	38387	(99664)	1
CABLE, HARNESS:	38386	(99664)	1
CABLE, HARNESS:	38303	(99664)	1
CABLE, HARNESS:	38383	(99664)	1
CABLE, HARNESS:	38391	(99664)	1
CABLE, HARNESS:	38377	(99664)	1
CABLE, HARNESS:	38378	(99664)	1
CABLE, HARNESS:	38412	(99664)	1
CABLE, HARNESS:	38411	(99664)	1
CABLE, HARNESS:	38409	(99664)	1
CABLE, HARNESS:	38410	(99664)	1
CABLE, HARNESS:	38407	(99664)	2
CABLE, HARNESS:	38406	(99664)	2
CABLE, HARNESS:	38405	(99664)	2
CABLE, HARNESS:	38388	(99664)	2
CABLE, HARNESS:	38389	(99664)	2
CABLE, HARNESS:	38390	(99664)	2
CABLE, HARNESS:	38384	(99664)	1
CABLE, HARNESS:	38385	(99664)	
CABLE, HARNESS:	38382	(99664)	1
CABLE, HARNESS:	38381	(99664)	
CABLE, HARNESS:	38380	(99664)	
CABLE, HARNESS:	38379	(99664)	
CABLE, HARNESS:	34408	(99664)	2
CABLE HARNESS, BATTERY:	38414	(99664)	2
CABLE HARNESS, BATTERY:	38413	(99664)	2
CABLE HARNESS, BATTERY:	38416	(99664)	
CABLE HARNESS, BATTERY:	38415	(99664)	1
CABLE HARNESS, BATTERY:	38327	(99664)	1
CABLE HARNESS:	38438	(99664)	1
CHAIN ASSEMBLY:	181205	(99664)	1
CHAIN CLAMP:	121227	(99664)	1
CHAIN MOUNTING ASSEMBLY:	38540	(99664)	1
CLIP, ELECTRICAL:	35262	(49671)	4
CLIP, ELECTRICAL:	WC440	(81348)	2
COUPLING, SPLINED:	171260	(99664)	1
HEAD SET, ELECTRICAL:	31531	(99664)	
KEY, MACHINE: 1/4 h, 1/4 w	NO REF	(33333)	1
KEY, MACHINE: 3/8 h, 3/8 w	NO REF	(33333)	1
LINK CONNECTING:	69304	(99664)	2
LINK, LINK BOARD:	39546	(99664)	1
LINK, LINK BOARD:	39302	(99664)	5
LOCKING HANDLE:	31514A	(99664)	1
MOUNTING BRACKET:	61191A	(99664)	1
MOUNTING PLATE ASSEMBLY:	38555	(99664)	1
NUT, PLAIN HEXAGON:	QQS-633-F S 1 0 3 5	(81348)	18

Table. Components of the End Item - Continued

Components	Part No.	(FSCM)	Qty
HOT, PLAIN HEXAGON:	MSS1969-3	(96906)	3
PIN, SPRING:	30253	(99664)	1
PLATE, MOUNTING, CONTROL BOX:	3144	(99664)(1)	1
PLATE, MOUNTING, CONTROL BOX:	3145	(99664) (1)	1
PULLEY, GROOVE:	42183	(99664)	1
PULLEY, GROOVE:	52127	(99664)	1
PULLEY SHAFT AND BEARING ADAPTER:	51038	(99664)	1
SCALE, BEAM INDICATING:	160	(11710)	1
SCREW, CAP, HEXAGON HEAD:	MSS35307 - 364	(96906)	2
STARTER TORQUE ARM AND BRACKET ASSEMBLY:	51040	(99664)	1
SUPPORT:	SK2828	(99664)	1
TACHOMETER, VIBRATING REED:	31627	(99664)	1
TEST LEAD:	38425	(99664)	4
TERMINAL INSULATOR:	EL	(89007)	8
TERMINAL, LUG:	21857	(99664)	4
TORQUE ARM:	23187	(99664)	1
TURNBUCKLE ASSEMBLY:	38454	(99664)	1
TURNBUCKLE ASSEMBLY:	38455	(99664)	1
VISE MOUNTING ASSEMBLY:	38539	(99664)	1
WASHER, FLAT:	AN960-PA616	(88044)	4

(1) Not supplied with the type II part number 7336 (4910-316-5252) test stand.

Page 161. Appendix II is superseded as follows:

APPENDIX
BASIC ISSUE ITEMS LIST
AND
ITEMS TROOP INSTALLED OR AUTHORIZED LIST

Section I. INTRODUCTION

1. Scope

This appendix lists basic issue items and items troop installed or authorized required by the crew/operator for operation of the Test Stand, Automotive Generator, Alternator and Starter.

2. General

This Basic Issue Items List and Items Troop Installed or Authorized List is divided into the following sections:

a. Basic Issue Items List. Not applicable.

b. Items Troop Installed or Authorized List. Not applicable.

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:

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To be distributed in accordance with DA Form 12-38 Organizational Maintenance requirements for Truck, Utility, 1/4 Ton, M151 and DA Form 12-40 Organizational Maintenance requirements for Rifle, 5.56-MM, M16, M16A1.

NG: State AG (3)

USAR: None

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TECHNICAL MANUAL
No. 9-4910-458-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *1 November 1966*

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS) TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER, FLOOR MOUNTED, 10 TO 50-V, 500-AMP, DC, AND 25 TO 50-V, 100 TO 400 AMP, AC, TESTING RANGES, W/800 TO 11,000-RPM, 22½-HP, 220/440-V, 60-C, 3-PH DUAL HEAD VARIDRIVE ASSEMBLY (UNITED MANUFACTURING COMPANY MODEL AGARTS, TYPE II, PART NUMBER 7336-1, MODEL AGARTS, TYPE II, PART NUMBER 7336-2 AND MODEL AGARTS, TYPE II, PART NUMBER 7336-3 (4910-767-0218) AND TYPE II, PART NUMBER 7336 (4910-316-5252))

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This technical manual contains instructions on operation and maintenance of the test stand for the operator and instructions for organizational maintenance of the test stand by personnel of the using organization.

b. Appendix I contains a list of current references, including supply manuals, forms, technical manuals, and other available publications applicable to the test stand.

c. Appendix II contains a list of the basic issue items. It is composed of those items which make up the major end item of equipment and the operator tools, equipment, and repair parts that are issued with the equipment and are required for stockage for operating and performing operator or crew maintenance on the test stand.

d. Appendix III contains the maintenance allocation chart for the test stand listing all maintenance and repair operations authorized for all maintenance categories.

e. Appendix IV contains a list of repair parts which are required by the using organization for performing organizational maintenance on the test stand.

f. Reports by the individual user, of errors, comments, and suggestions are encouraged. They should be reported on DA Form 2028 (Recommended Changes to DA Publications) and forwarded directly to Commanding General, Headquarters, U.S. Army Weapons Command, ATTN: AMSWE-SMM-P, Rock Island Arsenal, Rock Island, Ill, 61201.

2. Maintenance Allocation

a. Operator or Crew Maintenance Allocation. The prescribed maintenance to be performed by the operator or crew will apply as reflected in the maintenance function column of the maintenance allocation chart (app. III), under the category of maintenance C.

b. Organizational Maintenance Allocation. The prescribed maintenance to be performed by maintenance personnel of the using organization will apply as reflected in the maintenance function column of the maintenance allocation chart (app. III), under category of maintenance O. In all cases, where the nature of the repair, modification, or adjustment is beyond the scope or facilities of the using organization, the supporting category of maintenance should be informed so that trained personnel with suitable tools, and equipment may be provided or other instructions issued.

3. Forms, Records, Reports

a. General. Responsibility for the proper execution of forms, records, and reports rests upon the officers of all categories of maintenance maintaining this equipment. However, the value of accurate records must be fully appreciated by all personnel responsible for their compilation, maintenance, and use. Records, reports, and authorized forms are normally utilized to indicate the type, quantity and condition of materiel to be inspected, to be repaired, or to be used in repair. Properly executed forms convey authorization and serve as records for repair or replacement of materiel in the hands of troops and for delivery of materiel requiring further repair to shops in arsenals, depots, etc. The forms, records, and reports establish the work required, the progress of the work within the shops, and the status of the materiel upon completion of its repair.

b. Authorized Forms. The forms generally applicable to units operating or maintaining this

materiel are listed in appendix I. For a listing of all forms, refer to DA Pam 310-2. For instructions on use of these forms, refer to TM 38-750.

c. *Equipment Improvement Recommendation.* Any deficiencies detected in the equipment covered herein which occur under the circumstances indicated in AR 750-5, should be immediately reported in accordance with the applicable instructions in cited regulation.

d. Field Reports of Accidents. The reports necessary to comply with the requirements of Army safety program are prescribed in detail in AR 385-40. These reports are references whenever accidents involving injury to personnel or damage to materiel occur.

Section II. DESCRIPTION AND DATA

4. Description

The test stand (figs. 1, 2, 3, and 4) is an electrically operated device having a 10 to 50 volt, 50 to 500 ampere, dc testing range and a 25 to 50 volt, 100 to 400 ampere, ac testing range. Its electrical construction consists of a multiple of circuits which are utilized to test direct-drive or pulley-driven generators, generator regulators, generator control boxes, ac/dc systems (alternator, rectifier, and generator regulator), and starters (cranking motors). A built-in manually operated battery charging unit is supplied with the test stand to provide a means to keep the storage batteries of the internal battery circuit in a fully charged condition (this battery charging unit is not supplied with the type II, part number 7336 (4910-316-5252) test stand). Basically its physical construction consists of a steel cabinet containing a control panel; 22½-horsepower, 220/440-volt, 60-cycle, 3-phase varidrive motor with a 800 to 11,000-revolution per minute dual-head take-off assembly; load bank with a blower both of which are enclosed within a sheet metal hous-

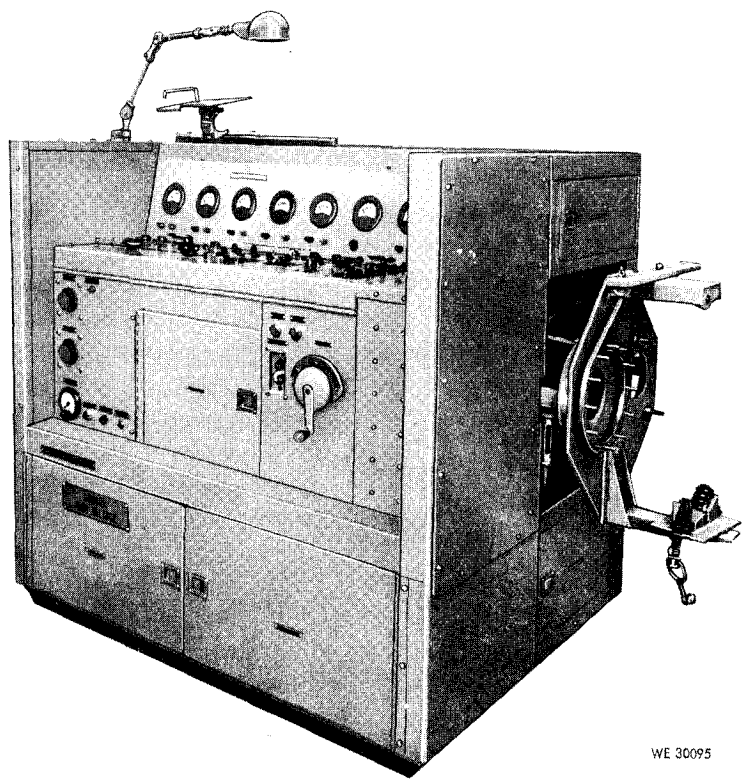


Figure 1. Test stand (model AGARTS, type II, part number 7336-1) (4910-767-0218) - right front view.

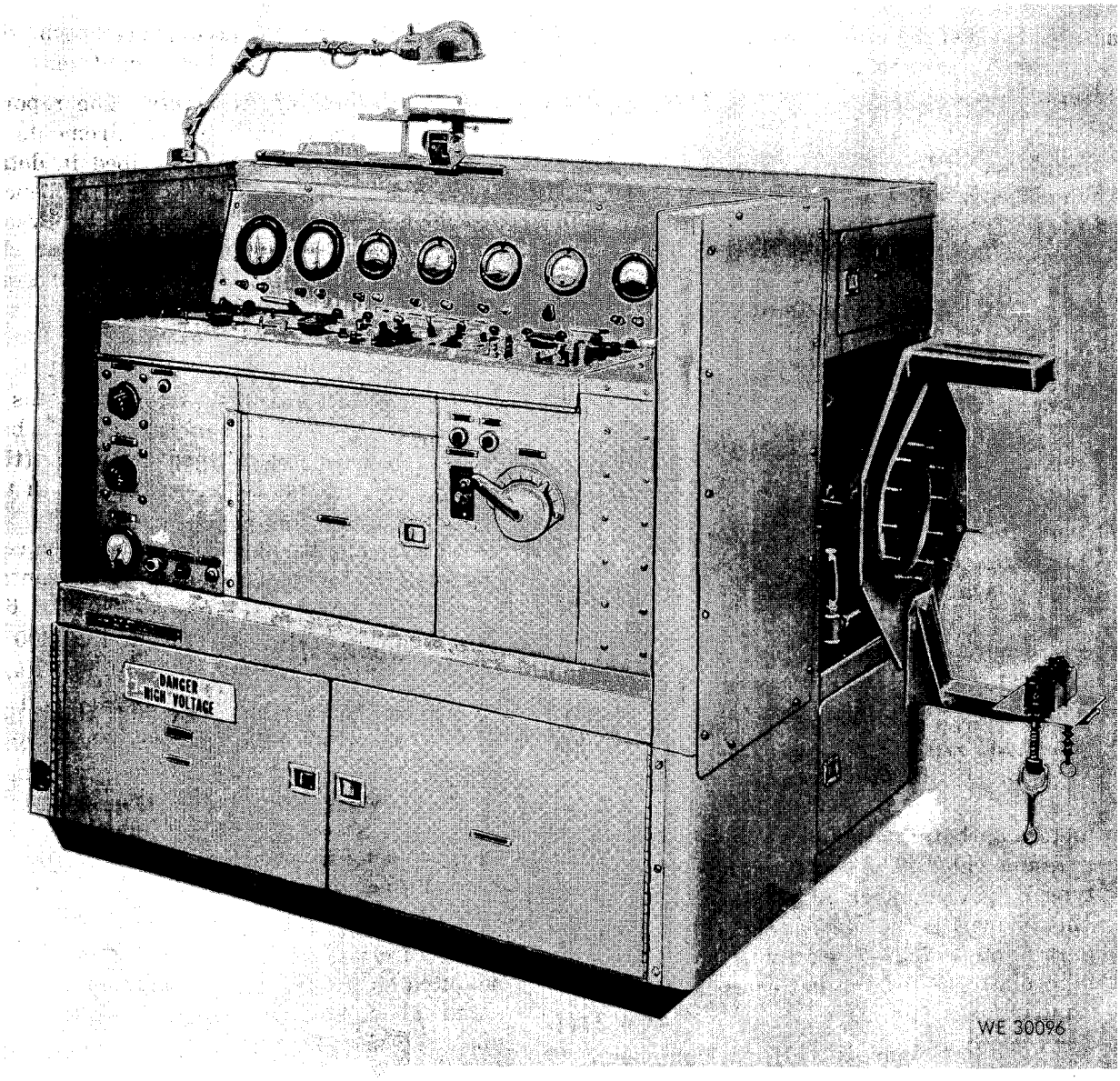


Figure 2. Test stana (moaet AGARTS, type II, part number 7336-2) (4910-767-0218)-right front view.

ing; generator regulator and generator control box mounting brackets; generator, alternator, or starter (cranking motor), mounting bracket; and the necessary equipment for completing circuits and for setting up the items undergoing tests on the test stand to perform the various tests described within this publication.

Note. The test stand model AGARTS, part number 7336-6 (4910-767-0218 not illustrated) see paragraph *5a.*

5. Difference Between Models

a. Basically the two model test stands: model AGARTS, type II, part numbers 7336-1 (4910-767-0218) (fig. 1) and model AGARTS, type II, part number 7336-2 (4910-767-0218) (fig. 2) are identical; the exception is that the battery circuit selector instrument panel (41, fig. 16) has three pilot lights on the test stand under part number 7386-2, whereas, the test stand under 7336-1 has only one pilot light on this instrument panel, also, the load d.c. ammeter (1, fig. 16) and the field d.c. ammeter (2, fig. 16) of the test stand under part number 7336-2 have larger dial faces than the dial faces on these same two meters of the test stand under part number 7336-1. The capacity of these two

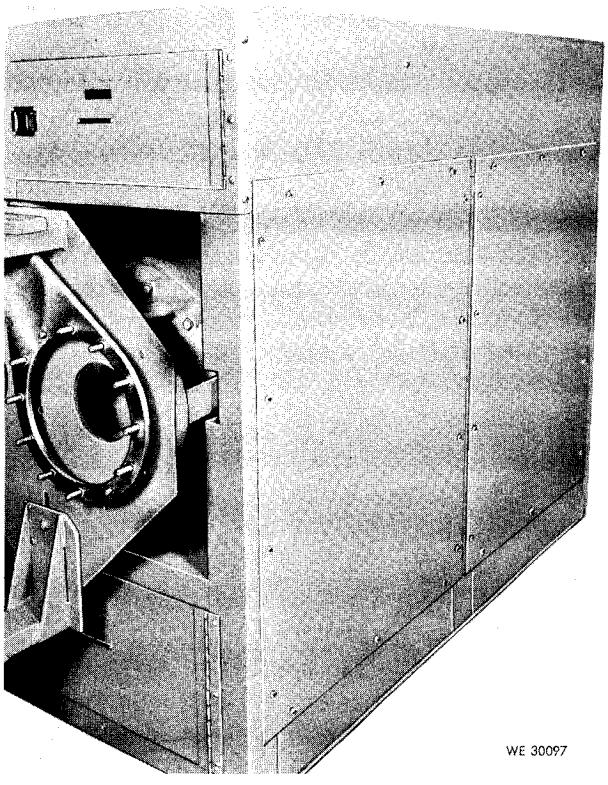


Figure 3. Test stand (model AGARTS, type II, part numbers 7336-1 and 7336-2) (4910-767-0218) - right rear view.

meters on both of the above test stands are of the same value. The test stand model AGARTS, type II, part number 7336-3 (4910-767-0218) (not shown) is the same as the test stand under part number 7336-2, except it has a slide-out type platform for the batteries in the battery compartment (fig. 9).

b. The test stand, type II, part number 7336 (4910-316-5252) (fig. 4) is basically the same as model AGARTS, type II, part number 7336-1 test stand in a above; the exception is that this model test stand has oblong shaped meters which are larger and are not shock mounted. It has no manually operated battery charging unit and the equipment does not include the numbers 3144 and 3145 control box mounting plates (fig. 69). In the place of these mounting plates a control box mounting bracket is included on the right hand side of the test stand (fig. 4).

6. Data Plates (fig. 5)

a. Gear Case Lubrication Caution Decalcomania. The gear case lubrication caution is a decalcomania located on the right hand end of the test stand cabinet near the top center. It contains instructions and a precaution to fill the gear case chamber before operating the test stand.

b. Varidrive Motor General Information Plate. This plate is located on the front of the stator housing of the varidrive motor. It specifies the electrical and mechanical characteristics of the motor, the type letters of the motor, and the manufacturer's name and address, also the "LO-VOLTS" and "HI-VOLTS" (fig. 13) hook-up for the motor.

c. *Varidrive Assembly General Instruction Plate.* This plate is located on the top front surface of the varidrive assembly housing. It specifies lubrication operating instructions (also refer to fig. 62), and precautionary measures to be observed when operating and maintaining the varidrive assembly.

d. Gear Case Oil Level Indicator Decalcomania. The gear case oil level indicator is a decalcomania which is supplied with the test stand unattached. After the gear case is filled to the proper level (fig. 62) place this indicator decalcomania on the right hand end of the test stand cabinet at the level of the oil in the oil level sight glass (fig. 62). The indicator can then be used to maintain the oil in the gear case at its proper level.

e. Magnetic Motor Starter Drive Control Time Interval Caution Plate. This plate is mounted on the front of the cabinet of the test stand, above the drive control start and stop push buttons (33, fig. 16). It cautions the operator not to exceed depressing the start button more than 30 seconds, otherwise, damage can develop within the magnetic motor starter (fig. 11).

f. Speed Control Precautionary Instructions. The speed control precautionary instructions is imprinted in the casting of the handle of the speed control (32, fig. 16). It alerts the operator not to turn the handle when the varidrive assembly is not running, otherwise, damage can develop in the chain drive mechanism of the speed control.

g. High-Speed Head RPM Range and Generator Speed Caution Plate. This plate is mounted on the left hand drive head of the

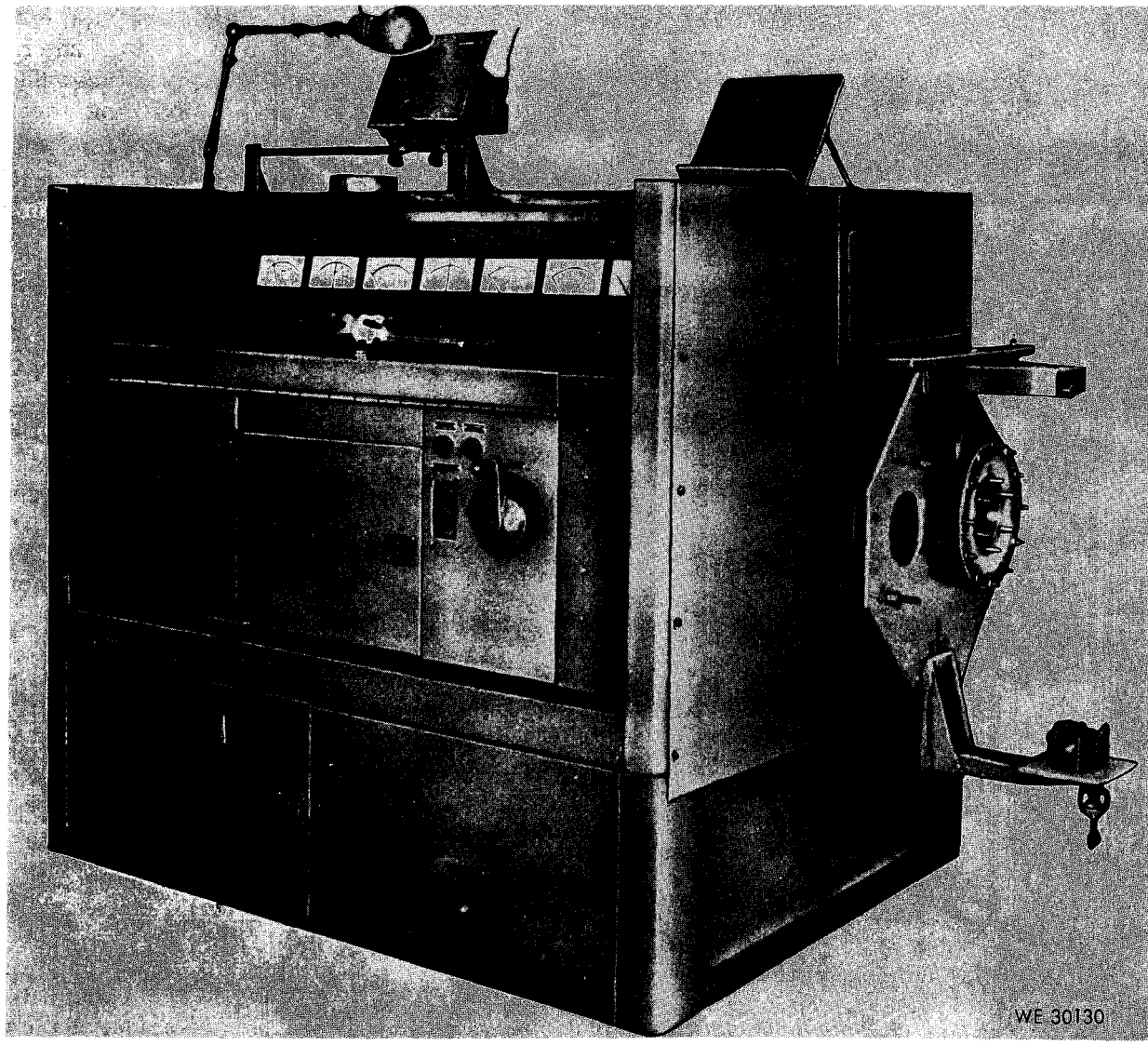


Figure 4. Test stand (type II, part number 7336) (4910-316-5252) - right front view.

varidrive assembly. It identifies the high-speed head and specifies the rpm (revolutions per minute) range, and cautions the operator not to use this head for low speed generators.

h. Low-Speed Head RPM Range Plate. This plate is mounted on the right hand drive head of the varidrive assembly. It identifies the low speed head and specifies the rpm range.

i. Test Stand General Information Plate. This plate is mounted on the right hand side of the main control panel of the test stand. It specifies the Federal stock number, manufacturer's type and model numbers, serial number, contract and specification number, and the manufacturer's name and address.

j. Reversing Switch Precautionary Instruction Plate. This plate is mounted above the high voltage compartment door, behind which the drive reversing switch is located. It cautions the operator not to operate the drive reversing switch (fig. 12) while the varidrive assembly is in motion.

k. Tachometer Precautionary Instruction Plate. This plate is mounted on the meter panel above the tachometer indicator meter (3, fig. 16) and cautions the operator not to exceed the

Figure 5. Data plates.

manufacturer's predetermined maximum speed of the generator or alternator undergoing test.

1. Meters Operation Instruction Plate. This plate is mounted on the center of the meter panel (fig. 16) below the meters. It instructs the operator to set the multipliers on the switches (15 through 17, fig, 16) to the higher settings to register higher ranges on the meters.

7. Tabulated Data

a. Test Stand.

Manufacturer	United Manufacturing Co., Division UMC Electronics Co.
Model	AGARTS, type II, part number 7336-1 (4910-767-0218)
Model	AGARTS, type II, part number 7336-2 (4910-767-0218)
Model	AGARTS, type II, part number 7336-3 (4910-767-0218)
Type	II, part number 7336 (4910-316-5252)
Testing range	
Amperes, dc	50-500
Voltage, dc	10-50
Amperes, ac	100-400
Voltage, ac	25-50

b. Varidrive Assembly.

Manufacturer	U.S. Electrical Motors Inc.
Horsepower	22½
(intermittent)	35
Voltage	220/440
Frequency	60 cycle
Speed (motor)	1800 rpm
Phase	3
Amperes (440 volts)	34
Amperes (220 volts)	68
Temperature rise	40°C.
Frame	54-326U-51Y
Type	VEUHVGSDT
Class	B
Gear ratio	
(high speed head)	2.62:1
(low speed head)	1.12:1
High speed head	1830 to 11,000 rpm
Low speed head	800 to 4800 rpm

c. Blower Motor.

Manufacturer	Eskola Air Equipment Company
Model	SISW, Class I
Horsepower	½
Voltage	220
Frequency	60
Speed	1750 rpm

d. Dimensions and Weights.

Length	75 in. (including side mounting bracket-cabinet alone 63 in.)
Width	48 in.
Height	54 in.
Weight (without equipment)	2390 lbs
Equipment	190 lbs
Cubage (with equipment)	117 cubic feet
Cubage (packed for shipment)	207.1 cubic feet
Weight (packed for shipment)	3160 lbs

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

8. Purpose

a. When a new or reconditioned test stand is first received, it is the responsibility of the officer in charge to determine whether the materiel has been properly prepared for service by the supplying organization and to be sure it is in condition to perform its function. For this purpose, assure that all authorized repair parts, tools, and equipment are present and in good condition; inspect all assemblies and parts to be sure they are properly assembled, secured, cleaned, adjusted, and/or lubricated.

b. Make a record of any missing parts and/or equipment, and of any malfunctions. Correct any deficiencies as quickly as possible.

9. Services

a. Unpacking and checking. Place the exterior container containing the test stand in an area where there is sufficient working space. Remove the nails securing the top section of the exterior container to the skid-type base under the test stand. Lift the top section off as a unit from the base. The skid-type base will be left intact until test stand is located in position during installation, *c* below. Remove the barrier material enveloping the test stand and all cushioning material, desiccant (bags), and wrappings from the test stand. Remove the boxed equipment and loose parts from the storage compartments of the test stand. Particular attention should be given to the area behind the access door of the high voltage compartment (fig. 6) as there are power leads located near or within this area. Unpack the equipment and parts from the boxes. Check the equipment and loose parts with listing in appendix II to be sure every item is present and in good condition.

b. Cleaning. Clean all parts of the test stand as prescribed in paragraph 146.

c. Installation.

(1) Regulator mounting bracket assembly (fig. 6). The mounting base for the regulator mounting bracket assembly is shipped installed on the test stand. The mounting plate for the regulator mounting bracket assembly is shipped stored in one of the stowage compartments. Place the mounting plate on the mounting base and aline holes in the plate with those in the base and secure the plate with the four bolts and nuts provided.

(2) Generator, alternator, and starter mounting bracket assembly.

Note. The key numbers shown below in parentheses refer to figure 7.

(a) Place the mounting bracket (3-C) in position on the mounting plate (6) and secure with the locking handle (3-F).

(b) Place the chain vise (3-B) and chain (3-A) in position on the mounting bracket (3-C), inserting the lever on the end of the chain (3-A) in the slot of the mounting bracket (3-C). Secure the chain vise to the mounting bracket with the ½-inch split lock washer (3-D) and ½-13 hexagon plain nut (3-E).

(3) Batteries. Install one 12-volt and two 6-volt batteries or four 6-volt batteries (for 6-12-24 volt hook-up) in the battery compartment of the test stand and connect in accordance with battery wiring diagram (fig. 8).

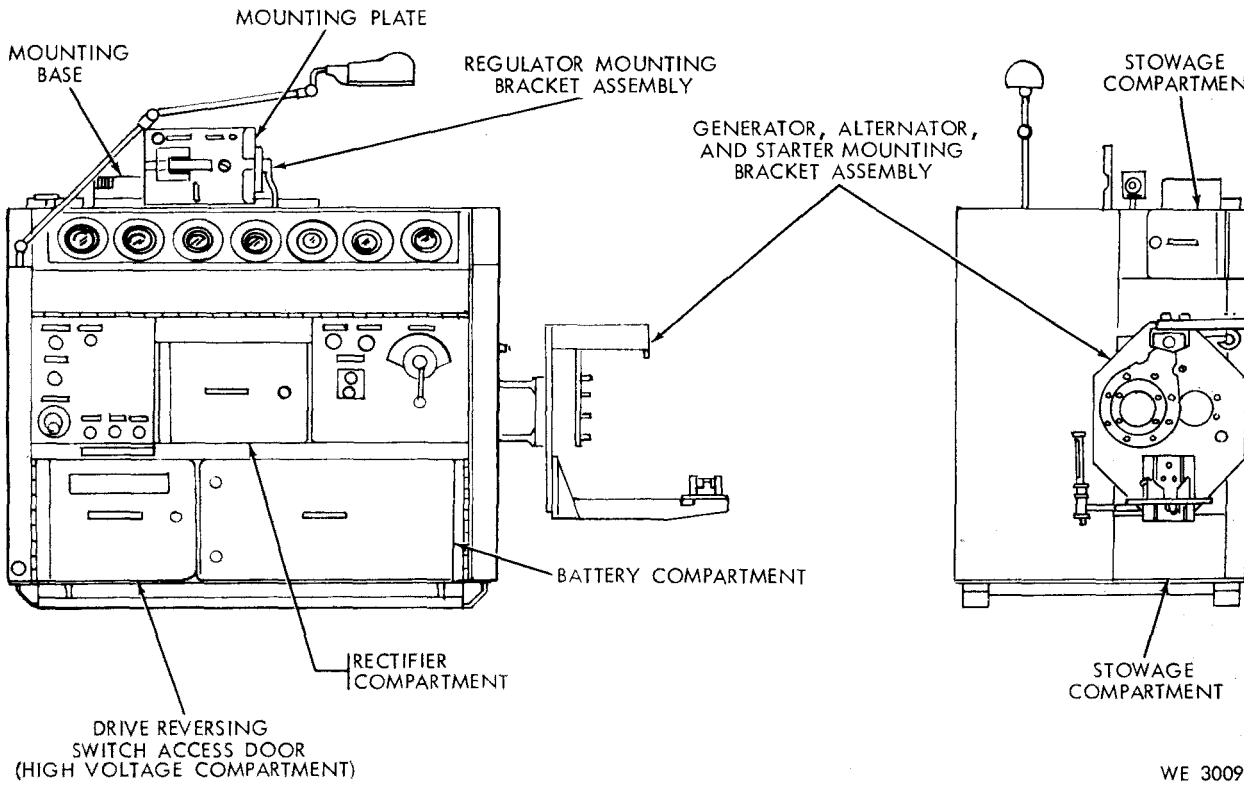


Figure 6. Location of mounting brackets, access door, and compartments.

Figure 9 shows a four 6-volt battery hook-up. The hook-up for one 12-volt and two 6-volt batteries is the same as shown in figure 9, except the two 6-volt batteries A and B are replaced with one 12-volt battery.

Caution: **When the battery leads are not connected, insulate the loose ends of the leads by taping or by other suitable means or disconnect the leads and remove from the battery compartment to prevent accidental grounding of the test stand circuitry.**

(4) *Depot Installation.*

(a) Test stand (figs. 1, 2, and **4).** Select a location for the test stand which is properly ventilated, dry, and not subject to extreme heat, dripping moisture, or exposed to dirt. The location should be where hazardous processes are not being performed. Lift the test stand off the floor using a suitable type hoist and utilizing the four lifting eyes (fig. 12) which are permanently attached to the base of the test stand. Remove the wooden skid-type base, *a* above, and position the test stand in place on the floor of the selected location.

Note. Normally the test stand need not be secured to the floor for depot installation, however, if need arises for this requirement refer to figure 14 for location of mounting holes for securing the test stand in position.

Caution: **The test stand is shipped without oil in the gear case of the varidrive assembly. Do not operate the test stand until the gear case has been filled to the proper level with lubricating oil prescribed in paragraph 139.**

(b) Venting (fig. 10).

1. Venting of the air intake and exhaust are not required for depot installation; however, be certain

the air intake and exhaust are not restricted as restrictions will affect the operation of the air-flow mercury switch located in the air exhaust outlet and prevent the test stand from operating.

2. The battery compartment is vented by means of a rubber hose extending from the rear of the battery compartment to the top of the cabinet assembly.

(c) Circuit breaker switch (fig. 11). The switch on the circuit breaker, located inside the high voltage compartment (fig. 6), serves as an "ON-OFF" switch for the total input power to the test stand. Place this switch in the "ON" position prior to operating the test stand. This switch may be left in the "ON" position unless there will be requirements of maintenance to the input

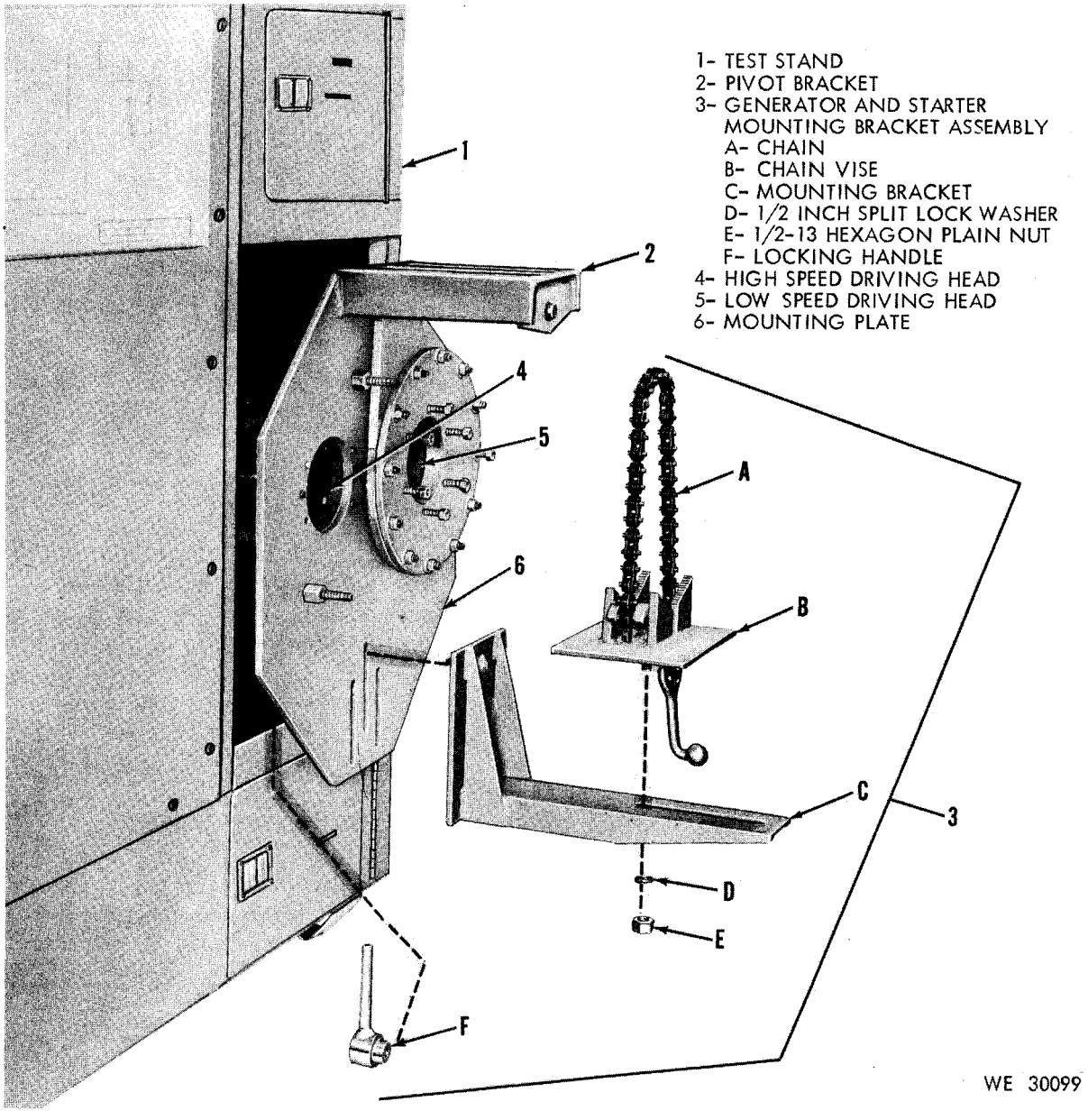
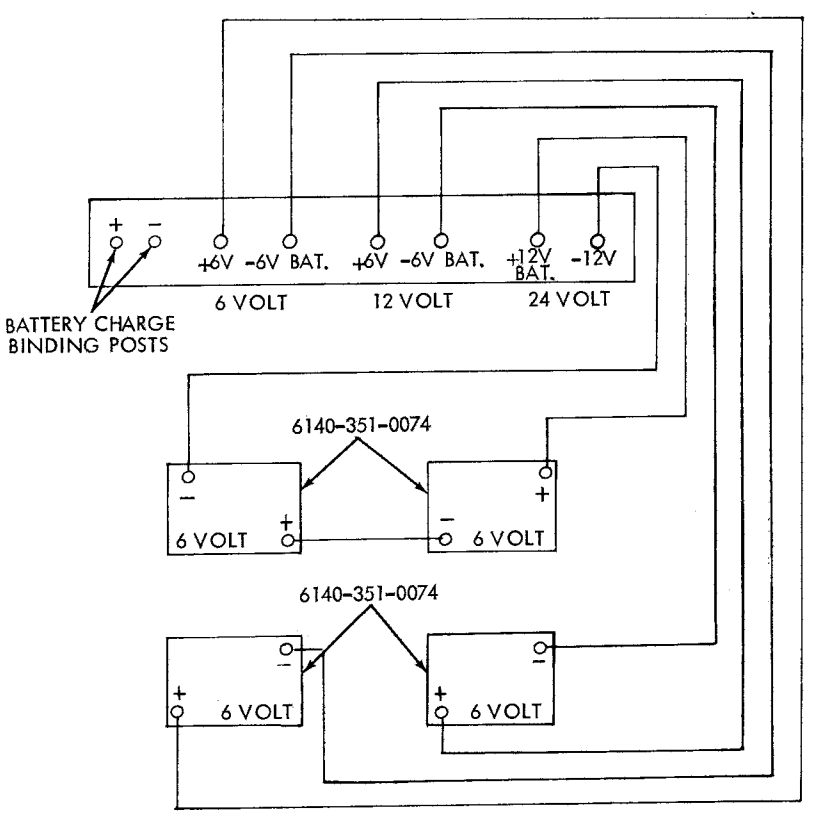
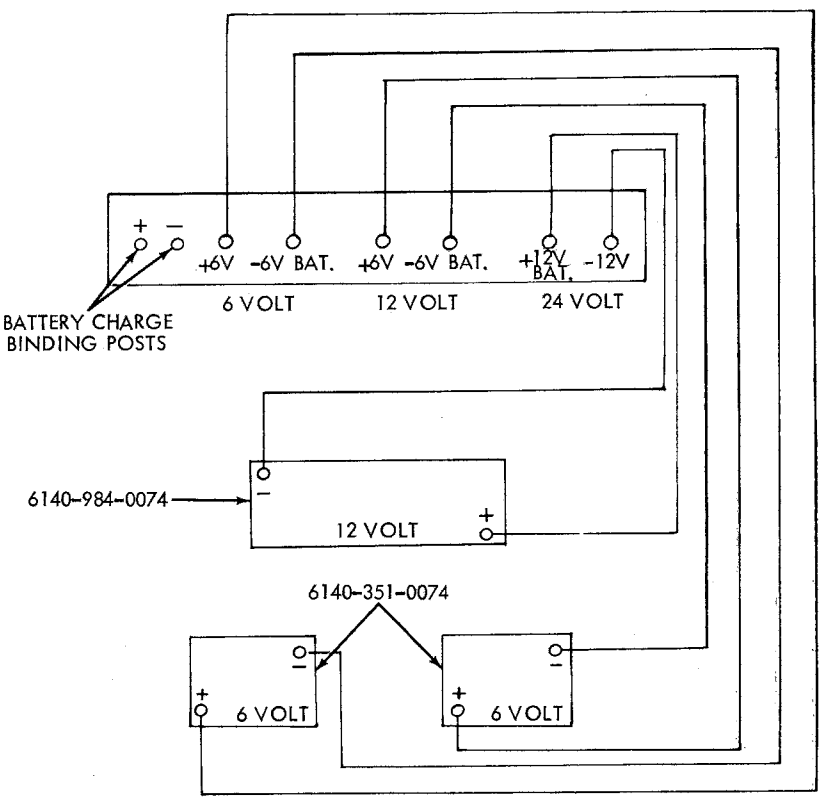


Figure 7. Installation of generator, alternator, and starter mounting bracket assembly.



6 - 12 - 24 VOLT SERIES HOOK-UP (FOUR 6-VOLT BATTERIES)



6 - 12 - 24 VOLT SERIES HOOK-UP
(ONE 12-VOLT AND TWO 6-VOLT BATTERIES)

WE 30100

Figure 8. Battery wiring diagram.

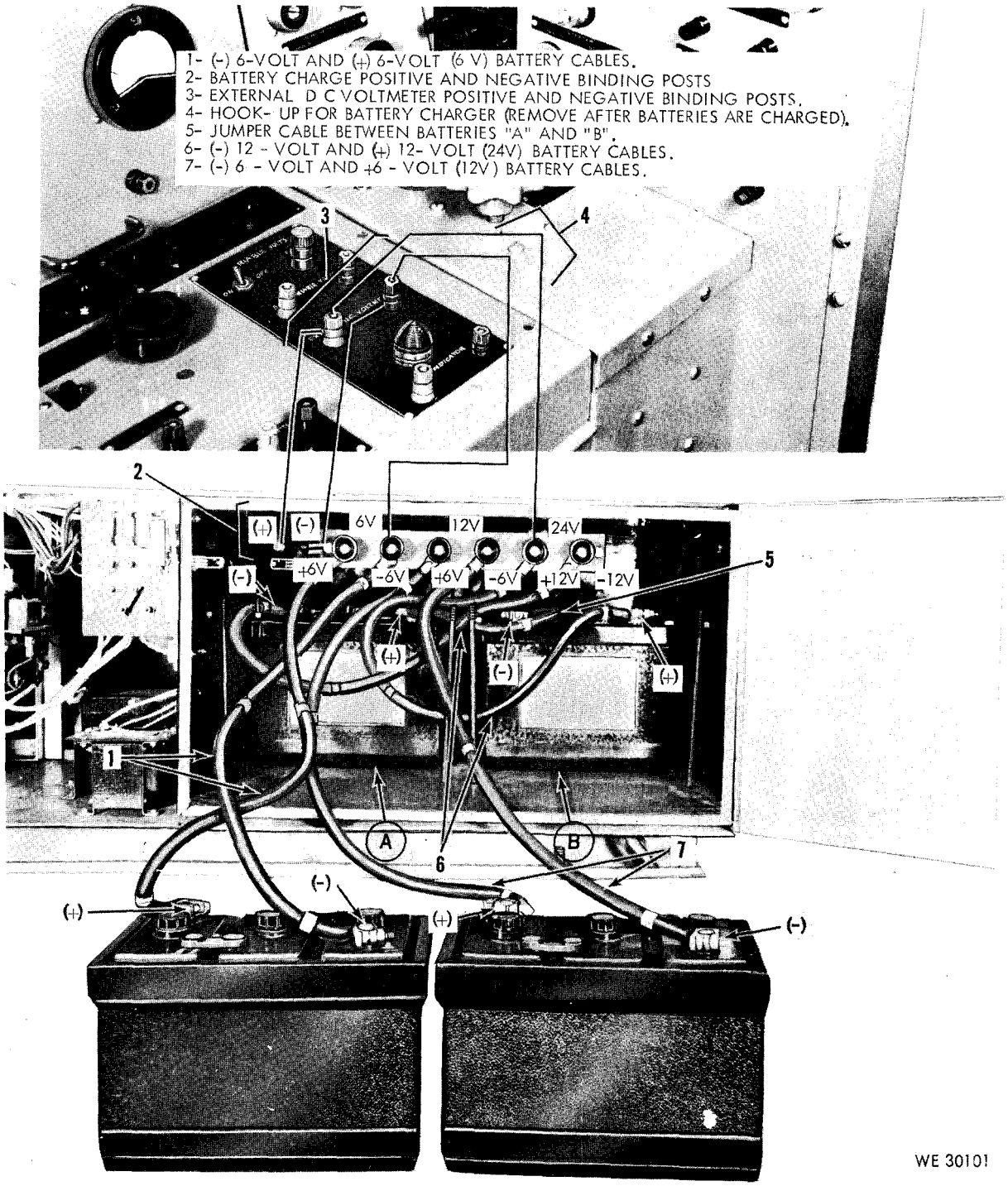


Figure 9. 6-, 12-, *24-volt series battery hook-up using four 6-volt batteries and hook-up for battery charger.*

circuitry, changing the position of the drive reversing switch (fig. 12), or the test stand is not in use for an extended period.

(d) Wiring.

1. Install the power cable (fig. 11) through the power service entrance (fig. 10). Connect three of the con-

ductor leads (red, white, black) of the power cable to the power cable connections on the circuit breaker, and ground the fourth conductor lead (green) to the test stand as shown in figure 11. Ground the test stand to a suitable external ground.

Note. Interchanging any two conductor leads (red, white, black) on the power cable connections of the circuit breaker (fig, 11), will change the rotation of the driving heads (4 and 5, fig. 7).

Warning: **Disconnect the external power supply from the test stand and place the switch on circuit breaker in the "OFF" position, *(c)* above, before any attempt is made to change wiring or contact components in the high voltage compartment.**

2. On the high voltage compartment there is an interlock switch (fig. 12) to prevent operation of the test stand while the compartment door is open or not closed tightly. Be sure this door is closed tightly or the test stand will not function properly because the interlock switch will not maintain the continuity of the control circuit.

Note. The test stand is connected for 220-volt operation when received from the factory. If 440-volt operation is desired, disconnect the external power supply and place the switch on the circuit breaker in the "OFF" position (fig. 11). Connect the drive motor terminal board links and the transformer terminal board link in accordance with wiring diagram (fig. 13) and as shown in figure 12. Remove the number CR123F91.4B heater elements (fig. 11) and install in their place the number CR123F48.7B heater elements (fig. 65). The 100-ampere, 600-volt fuses (fig. 12) will not have to be changed inasmuch as they are used for short circuit protection only.

d. Lubrication. Lubricate the test stand as prescribed in chapter 4, section II.

e. Inspection.

(1) Perform a general inspection of the test stand to assure all parts are properly and securely assembled and in good condition.

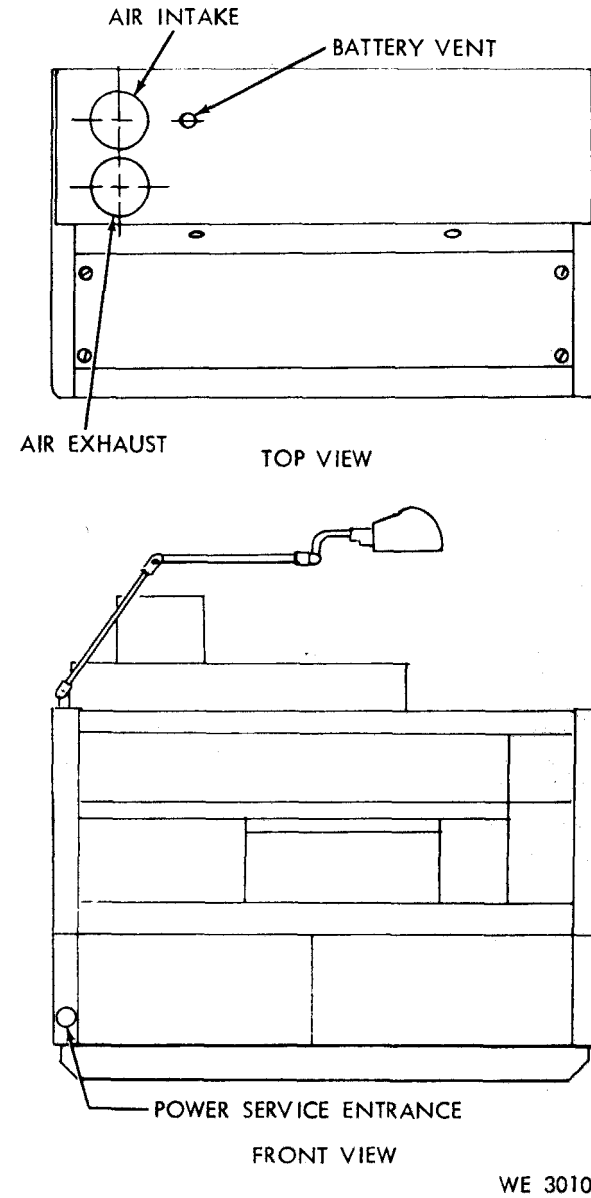


Figure 10. Location of power service entrance, battery vent, air intake and exhaust.

(2) Inspect to see that all connections are secure (figs. 11 and 12).

Warning: **Disconnect the external power supply from the test stand and place the switch on the circuit breaker (fig. 11) in the "OFF" position before any attempt is made to inspect connections, (2) above.**

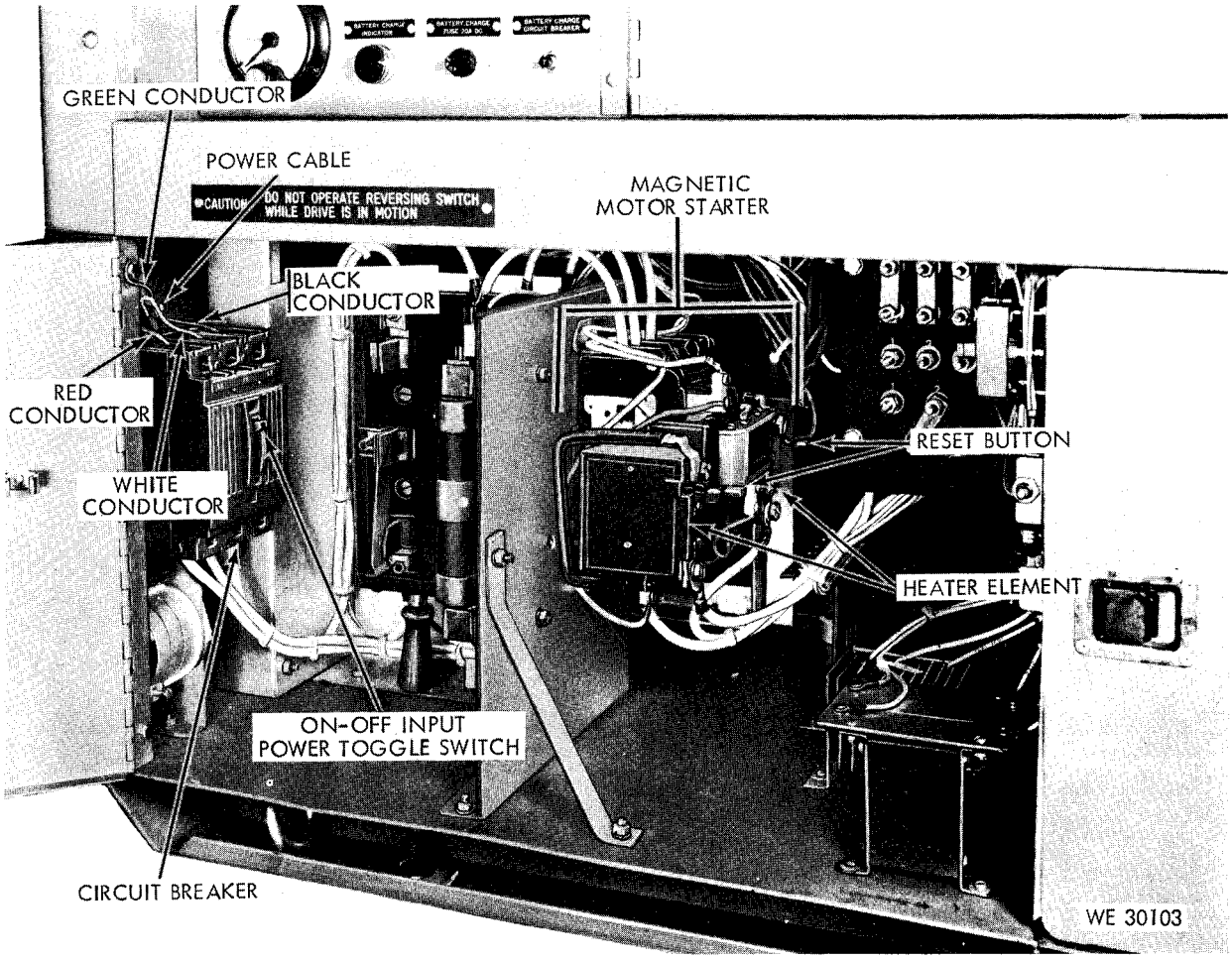


Figure 11. Location of power supply connection points, circuit breaker, intake power toggle switch, and motor starter.

(3) Check to see that the meter windows have no presence of static charge (par. *146a(3)*).

(4) Check the compartments (fig. 6) in the test stand for any items (equipment, etc.) that may interfere with the operation of the stand.

(5) Perform the preventive-maintenance services as prescribed in tables 10 and 12.

(6) Operate the test stand and check for proper testing operation (pars. 92 through 98). Listen for unusual noises when the varidrive assembly is operated, such as, bearing grind or excessive gear noise.

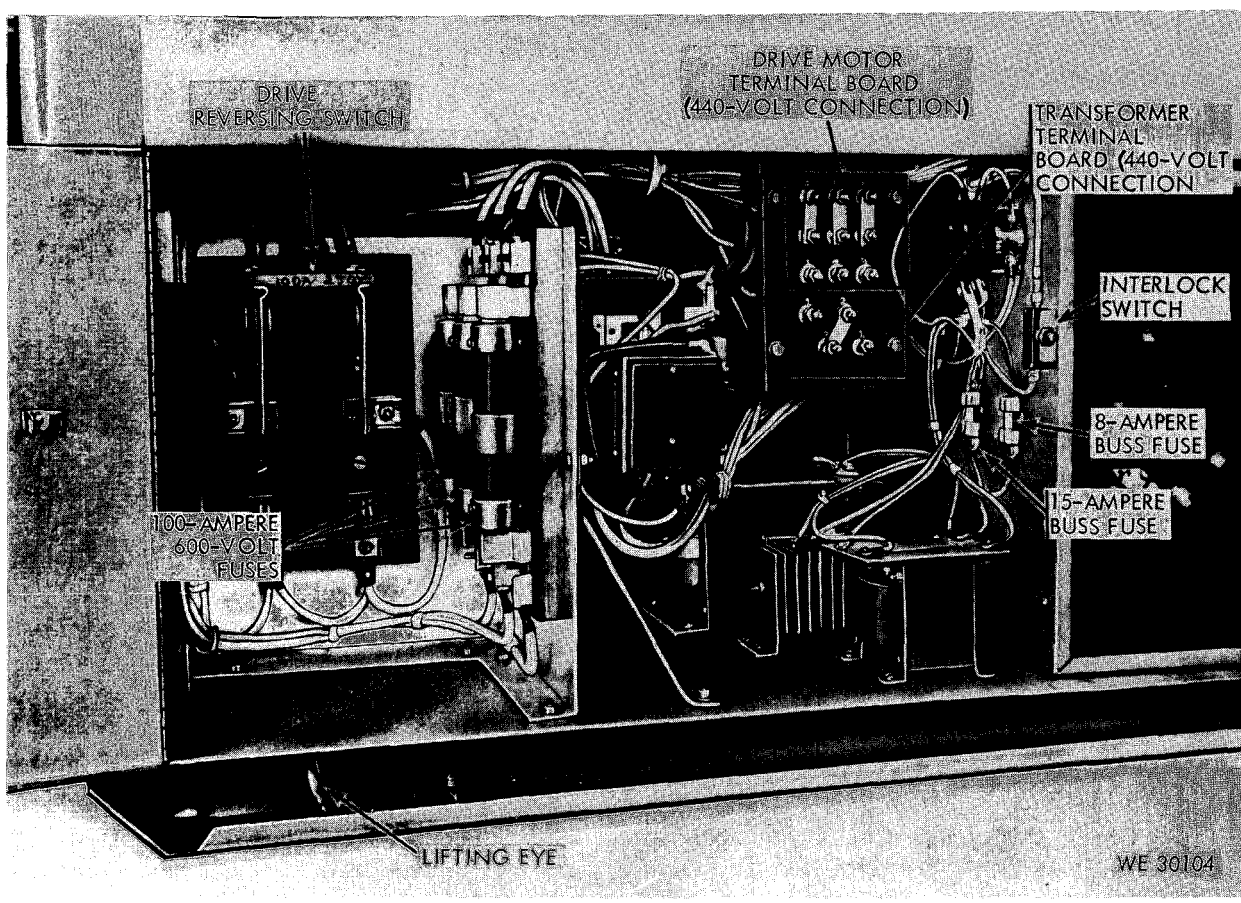
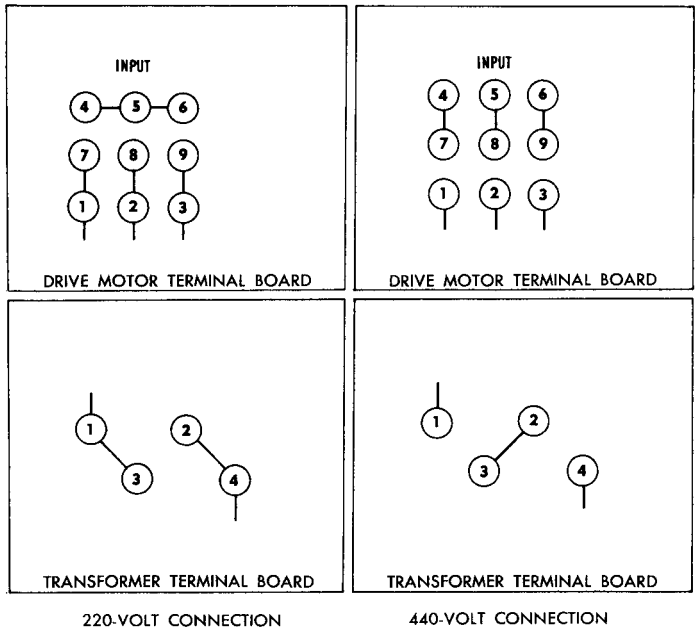


Figure 12. Location of lifting eyes, interlock switch, drive reversing switch, terminal boards, and fuses.



THERMAL RELEASE HEATER ELEMENT DATA

VOLTAGE	HEATER ELEMENT NO.
220	CR123 F91.4B
440	CR123 F48.7B

WE 30105

Figure 13. Power supply wiring diagram.

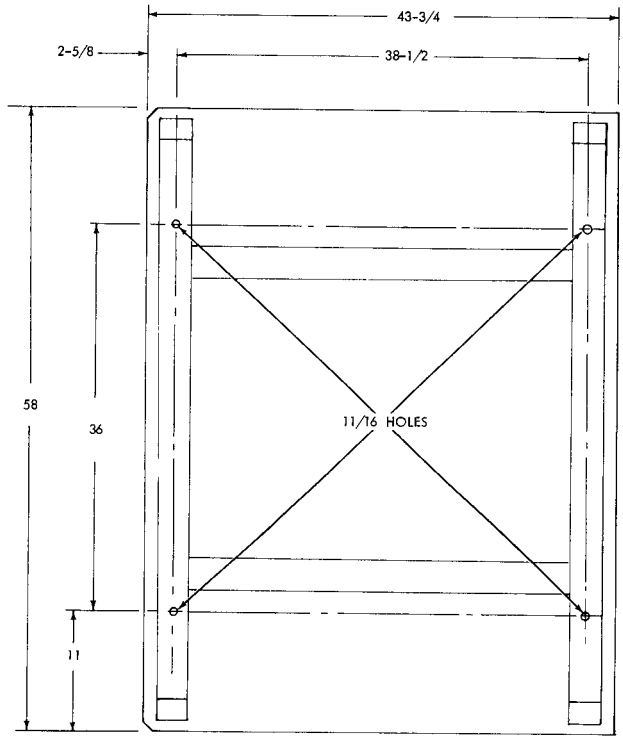


Figure 14. Location of mounting holes for securing test stand to floor.

Note. The key numbers shown below in parentheses in paragraphs 11 through 75 in this section refer to figure 16.

Section II. CONTROLS, INSTRUMENTS, AND RELATED ITEMS

10. General

This section describes, locates, illustrates, and furnishes the operator with sufficient information pertaining to the various controls, instruments, and related items provided for the proper operation of the test stand.

11. Load Dc Ammeter

The load dc ammeter (1), located on the left hand end of the meter panel, is a 15-0-50 dc ampere off-center-zero, one-scale meter. The scale can be converted to register 0-50, 0-150 and 0-500 dc ampere through the settings of a selector switch (par. 25). The meter is used to measure the generator output current when testing dc generators. It can also be used to measure the current draw when testing starters (cranking motors), and to measure the current output of the battery charge circuit through settings of two other switches (par. 26 and 69)

12. Field Dc Ammeter

The field dc ammeter (2), located near the left hand end of the meter panel, is a 5-0-5 dc ampere off-center-zero, one scale meter. The scale can be converted to register 0-5-0-15, and 0-30 dc amperes through the settings of a selector switch (par. 27). The meter is used to measure the field current when testing dc generators and ac (alternator) generators.

13. Tachometer-Indicator Meter (Designated as TACHOMETER INDICATOR)

The tachometer indicator meter (3), located near the left hand center of the meter panel, is a two-scale meter used to indicate the driving speed of the generator or alternator being tested. The scales on the meter are 0-12 and 0-5.5 and are multiplied by 1000 to determine the correct revolutions per minute meter reading. The scale used is determined by the driving head (4 or 5, fig. 7) on which the generator or alternator is mounted. The meter is calibrated to compensate for the variation between generator speed and varidrive speed through the settings of two switches and a potentiometer (pars. 28, 29, and 67).

14. Dc Volts-Millivolts Meter

The dc volts-millivolts meter (4), located in the center of the meter panel, is a 9-0-9 dc volts and 900-0-900 dc millivolts off-center-zero, one-scale meter. The scale can be converted to register 0-9 dc volts and 0-900 dc millivolts through the setting of a selector switch (par. 30). The meter is used to measure the dc voltage differential between generator volts and battery volts through a momentary-on switch (par. 31). Deflection to the right of the zero mark on the meter indicates higher generator voltage and deflection to the left of the zero mark indicates higher battery voltage.

15. Dc Voltmeter

The dc voltmeter (5), located near the right hand center of the meter panel, is a 0-10 dc volts one-scale meter. The scale can be converted to register 0-10, 0-20 and 0-50 dc volts through the settings of a selector switch (par. 32). The meter is used to measure the battery voltage prior to testing operations. It can also be used to measure the applied variable dc voltage and the generator output voltage when testing dc generators, and to measure the dc voltage from a source external to the test stand. These various measurements are acquired through the settings of a selector switch (par. 33).

16. The Ac Ammeter

The ac ammeter (6), located near the right hand end of the meter panel, is a 0-100 ac amperes one-scale meter with a basic movement on the scale of 0-5 ac amperes. The scale can be converted to register 0-100 and 0-400 ac amperes through the settings of a selector switch (par. 35). The meter is used to measure the ac amperes output of ac/dc systems, and also to determine balanced phase conditions of ac/dc systems through the settings of a selector switch (par. 34).

17. Ac Voltmeter

The ac voltmeter (7), located on the right hand end of the meter panel, is a 0-25 ac volts one-scale meter. The scale can be converted to

register 0-25 and 0-50 ac volts through the settings of a selector switch (par. 36). The meter is used to measure the ac voltage output of ac/dc systems and also to determine balance phase conditions of ac/dc systems through the settings of a selector switch (par. 37).

18. Load Dc Ammeter Calibrating Binding Posts

The load dc ammeter calibrating binding posts (8), located directly under the load dc ammeter (1) on the left hand end of the meter panel, are a threaded two-piece post which can be threaded apart to receive a test lead terminal and tightened to hold the terminal secure or, a plug-in type terminal can be inserted in the top of the post. They are used when calibrating the load dc ammeter. With the selector switch (15) set between "50A (X1)" and "150A (X3)" positions or between "150 (X10)" positions, and the selector switch (16) set between "FREE RUN (X4)" and "STALL TORQUE (X20)" positions, the meter can be calibrated by connecting a 50 millivolt dc input to the calibrating binding posts (8) with allowance being made for the resistance of the external circuit as compared with the resistance of the meter circuit within the test stand. By varying the input between 0 and 50 dc millivolts, the meter can be checked at different points on the scale.

19. Field Dc Ammeter Calibrating Binding Posts

The field dc ammeter calibrating binding posts (9), located directly under the field dc ammeter (2) near the left hand end of the meter panel, are a threaded two piece post as described in paragraph 18. They are used when calibrating the field dc ammeter. With the selector switch (17) set between "5A (X1)" and "15A (X3)" positions or between "15A (X3)" and "30A (X6)" positions, the meter can be calibrated by connecting a 50 millivolt dc input to the calibrating binding posts (9), with allowance being made for the resistance of the external circuit as compared with the resistance of the meter circuit within the test stand. By varying the input between 0 and 50 dc millivolts, the meter can be checked at different points on the scale, and by reversing the polarity of the input, the meter can be checked in both directions.

20. Tachometer Indicator Meter Calibrating Binding Posts

The tachometer indicator meter calibrating binding posts (10), located directly under the tachometer indicator meter (3), near the left hand center of the meter panel, are a threaded two-piece post as described in paragraph 18. They are used when calibrating the tachometer indicator meter. With the high-low switch (18) set between the "Hi" and "Lo" positions, and the direct drive-calibrating potentiometer switch (19) set between the "DIRECT DRIVE" and "CAL POT" positions, the meter can be calibrated. The movement of the meter pointer over the entire meter scale is activated by a 0 to 12 ac voltage, therefore, by connecting a 0 to 12 ac volt supply to the calibrating binding posts the meter can be calibrated by varying the ac voltage and checking the reading at different points on the scale of the meter. To determine whether the speed of either output shaft of the varidrive assembly coincides with the meter reading, the speed of the output shafts can be checked with a hand tachometer, or a stobotac. Recalibration instructions for the entire tachometer indicator circuitry is prescribed in paragraph 91b.

21. Dc Volts-Millivolts Meter Calibrating Binding Posts

The dc volts-millivolts meter calibrating binding posts (11), located directly under the dc volts-millivolts meter (4) in the center of the meter panel, are a threaded two-piece post as described in paragraph 18. They are used when calibrating the dc volts-millivolts meter. With the dc volts-millivolts range selector switch (20) set in either the "9V" position or "900MV" position, the meter can be calibrated by applying the same amount of dc voltage which was selected on the switch (20) to the calibrating binding posts. To take readings on the meter, it is necessary to place the dc volts-millivolts momentary-on switch (21) in the "READ" position. A correctly calibrated meter will indicate the amount of applied dc voltage.

22. Dc Voltmeter Calibrating Binding Posts

The dc voltmeter calibrating binding posts (12), located directly under the dc voltmeter (5) near the right hand center of the meter panel, are a threaded two-piece post as de-

scribed in paragraph 18. They are used when calibrating the dc voltmeter. With the dc voltmeter circuit selector switch (23) set in a position between any of the selection points and the dc voltmeter range selector switch (22) set in one of the voltage positions (10V(X1), 20V (X2), or 50V (X5)), the meter can be calibrated by applying the same amount of dc voltage which was selected on the switch (22) to the calibrating binding posts. A correctly calibrated meter will indicate the amount of applied dc voltage.

23. Ac Ammeter Calibrating Jack

The ac ammeter calibrating jack (13), located directly under the ac ammeter (6) near the right hand end of the meter panel, is a plug-in type unit and is used when calibrating the ac ammeter. The ac ammeter can be calibrated while in use by connecting an external accurate ac ammeter in series with it, using the calibrating jack, and the readings on both meters should coincide, The external meter must have a movement of 0-5 ac amperes and be capable of being used throughout the frequency range of 70 to 800 cps (cycles per second).

24. Ac Voltmeter Calibrating Binding Posts

The ac voltmeter calibrating binding posts (14), located directly under the ac voltmeter (7) on the right hand end of the meter panel, are a threaded two-piece post as described in paragraph 18. They are used when calibrating the ac voltmeter. With the ac voltmeter phase selector switch (27) set between "T1-T2" and "T1-T3" positions or between "T1-T3" and "T2-T3" positions, and the ac voltmeter range selector switch (26) set in either the "25V (X1)" or "50V (X2)" position, the meter can be checked for correct calibration by connecting the same amount of ac voltage which was selected on the switch (26) to the calibrating binding posts. A correctly calibrated meter will indicate the amount of applied ac voltage.

25. Load Dc Ammeter Range Selector Switch (Designated as LOAD DC AMMETER RANGE SELECTOR)

The dc ammeter range selector switch (15), located directly under the load dc ammeter (1), on the left hand end of the main control panel, is a 5-position (position between marked ampere positions open circuit), 3-pole, 2-deck, rotary-type selector switch. It is used to place the load dc ammeter (1) in series with the dc systems undergoing test, within ranges of 50, 150, and 500 dc amperes, by setting the switch in the "50A (X1)," "100A (X3)," and "500A (X10)" positions (par. 11).

26. Load Dc Ammeter Starter Test Selector (Designated as LOAD DC AMMETER STARTER TEST)

The load dc ammeter starter test selector switch (16), located directly under the load dc ammeter (1) near the left hand end of the main control panel, is a 5-position (position between marked positions open circuit) 3-pole, 2-deck, rotary type selector switch. It is used to place the load dc ammeter (1) in series with the circuit of the starter system undergoing test to indicate current draw (par. 11). The switch is set in the "FREE-RUN" (X4) position when performing no load (free running) tests on starters (cranking motor) and set in the "STALL TORQUE (X20)" position when performing stall torque tests on starters. The switch is placed in the off position when not being used for the above two tests.

27. Field DC Ammeter Range Selector Switch (Designated as FIELD DC AMMETER RANGE SELECTOR)

The field dc ammeter range selector switch (17), located directly under the field dc ammeter (2) near the left hand end of the main control panel, is a 5-position (position between marked ampere positions open circuit) 2-pole, 1 deck, rotary type selector switch. It is used to place the field dc ammeter (2) in series with the field circuit of the dc system undergoing test, within ranges of 5, 15, and 30 dc amperes, by setting the switch in the "5A (X1)," "15A (X3)," and "30A (X6)" positions (par. 12).

28. Tachometer Indicator High-Low Switch (Designated as TACHOMETER INDICATOR HI-LO)

The tachometer indicator high-low switch (18), located directly under the tachometer indicator meter (3) near the left hand center of the main control panel, is a 3-position (center position open circuit), 1-pole, 1-deck, rotary type selector switch. It is used in conjunction

with the direct-drive calibrating potentiometer switch (par. 29) and the tachometer indicator calibrating potentiometer (par. 67) to calibrate the tachometer indicator meter (par. 13) for either a direct-driven or pully-driven generator or alternator. When testing direct-driven generators or alternators the switch is set in the "LO" position and the generator speed (rpm) is read on either the 0-12 or 0-5.5 scale of the tachometer indicator meter which is determined by the driving head (4 or 5, fig. 7) on which the generator or alternator is mounted. For a pulley-driven generator or alternator the position of this switch is determined by the driven generator or alternator speed and the preset speed (par. 84c(4)). The scale 0-12 or 0-5.5 of the tachometer indicator meter which is used is determined as stated above.

29. Tachometer Indicator Direct-Drive-Calibrating Potentiometer Switch (Designated as TACHOMETER INDICATOR DIRECT DRIVE-CAL POT)

The tachometer indicator direct-drive-calibrating potentiometer switch (19), located directly under the tachometer meter (3) near the left hand center of the main control panel, is a 3-position (center position open circuit), 1-pole, 1-deck, rotary type selector switch. It is used in conjunction with the tachometer indicator high-low switch (par. 28), and the tachometer indicator calibrating potentiometer (par. 67) to calibrate the tachometer indicator meter (par. 13), for either a direct-driven or pulley-driven generator or alternator. When testing direct-driven generators or alternators the switch is set in the "DIRECT-DRIVE" position and for pulley-driven generators and alternators it is set in the "CAL POT" position.

30. Dc Volts-Millivolts Range Selector Switch (Designated as DC VOLTS/MILLIVOLTS RANGE SELECTOR)

The dc volts-millivolts range selector switch (20), located directly under the dc volts-millivolts meter (4) in the center of the main control panel, is a 3-position (center position open circuit), 2-pole, 1-deck, rotary type selector switch. It is used to place the dc volts-millivolts meter (4) in the circuit of the dc system undergoing test, in either the 9 dc volts or 900 dc millivolts ranges, by setting the switch to the "9V" and "900MV" positions (par. 14)

31. Dc Volts-Millivolts Momentary-On Switch (Designated as READ)

The dc volts-millivolts momentary-on switch (21), located directly under the dc volts-millivolts meter (4) in the center of the main control panel, is a 25-ampere, 30 volt dc, single-pole, single-throw, off momentary-on toggle switch, used to connect the dc volts-millivolts meter (4) in the circuit with the dc volts-millivolts range selector switch (par. 30). Holding the switch lever up to the "READ" position when performing tests will activate the dc volts-millivolts meter (par. 14).

32. Dc Voltmeter Range Selector Switch (Designated as DC VOLTMETER RANGE SELECTOR)

Dc voltmeter range selector switch (22), located directly under the dc voltmeter (5) near the right hand center of the main control panel, is a 5-position (position between marked voltage positions open circuit), 1-pole, 1-deck, rotary type selector switch. It is used to place the dc voltmeter (5) in the circuit of the dc system undergoing test, within ranges of 10, 20, and 50 dc volts, by setting the switch in the 10V (X1), 20V (X2), and 50V (X5) positions (par. 15).

33. Dc Voltmeter Circuit Selector Switch

a. General. The dc voltmeter circuit selector switch (23), located directly under the dc voltmeter (5) near the right hand center of the main control panel, is a 7-position (position between marked positions open circuit), 2-pole, 2-deck, rotary type selector switch. It is used to place the dc voltmeter (par. 15) in parallel with the battery circuitry of the test stand or to place the dc voltmeter in the testing circuitry of the test stand for a variety of tests on a dc systems and ac/dc systems. It is also used to place the dc voltmeter in the circuit of a voltage source external to the test stand. These various procedures are acquired by placing the switch in positions: "BAT VOLTS," "VARIABLE VOLTS," "RECT GEN," and "EXT VOLTS," *b* through *e* below.

b. "BAT VOLTS" Position. The "BAT VOLT" position connects the dc voltmeter cir-

cuit to the battery circuitry of the test stand, permitting the voltage condition of the batteries (fig. 9) to be indicated on the dc voltmeter (5). To take the battery voltage reading on the dc voltmeter, turn the dc voltmeter circuit selector switch (23) to the "BAT VOLTS" position and place the battery switch (41-B) in the "ON" position. Always place the battery switch in the "OFF" position after voltage reading is taken, this will allow voltage to be indicated on the dc voltmeter when performing tests on dc systems and ac/dc systems, *d* below.

c. "VARIABLE VOLTS" Position. The "VARIABLE VOLTS" position connects the dc voltmeter (5) circuit to the dc variable volts negative and positive binding posts (28-C). When the two binding posts are connected to the dc system under test and with the variable external volts ON-OFF switch (28-A) in the "ON" position the variable voltage applied (par. 57) will be indicated on the dc voltmeter.

d. "RECT GEN" Position. The "RECT GEN" position connects the dc voltmeter (5) circuit to the G+ and G- generator input binding posts (13-A and 13-B, fig. 15) when testing dc systems and to the D- and C+ rectifier input binding posts (42-B and 42-D, fig. 16) when testing ac/dc systems permitting voltage readings to be indicated on the dc voltmeter for these two systems.

e. "EXT VOLTS" Position. The "EXT VOLTS" position connects the dc voltmeter (5) circuit to the external dc voltmeter positive and negative binding posts (29) and permits the use of the dc voltmeter for measuring posts (29) and permits the use of the dc voltmeter for measuring dc voltage from a source external to the test stand circuitry.

34. Ac Ammeter Phase Selector Switch (Designated as AC AMMETER PHASE SELECTOR)

The ac ammeter phase selector switch (24), located directly under the ac ammeter (6) near the right hand end of the main control panel, is a 5-position (position between marked positions open circuit), 3-pole, 2-deck, rotary type selector switch. It is used to place the circuitry of the ac ammeter (6) in the circuit of the phase of an ac/dc system being tested. Balance phase condition of an ac/dc system can be detected by setting the switch in the "PH1, PH2," and "PH3" positions and observing the amperage reading on the ac ammeter (6). Ampere differential of more than ten amperes between any two settings indicates unbalanced phase conditions (par. 16).

35. Ac Ammeter Range Selector Switch (Designated as AC AMMETER RANGE SELECTOR)

The ac ammeter range selector switch (25), located directly under the ac ammeter (6) near the right hand end of the main control panel, is a 3-position (center position open circuit), 3-pole, 2-deck, rotary type selector switch. It is connected in series with the ac ammeter phase selector switch (par. 34). The switch can be set to acquire 100 and 400 ac ampere ranges on the ac ammeter (6) for testing ac/dc systems (par. 16), by setting the switch in the "100 (X1)" and "400A (X4)" positions.

36. Ac Voltmeter Range Selector Switch (Designated as AC VOLTMETER RANGE SELECTOR)

The ac voltmeter range selector switch (26), located directly under the ac voltmeter (7) near the right hand end of the main control panel, is a 3-position (center position open circuit), 1-pole, 1-deck, rotary type selector switch. It is connected in series with the ac voltmeter phase selector switch (par. 37). The switch can be set to acquire 25 to 50 ac volt ranges on the ac voltmeter (7) for testing ac/dc systems (par. 17), by setting the switch in the "25V (X1)" and "50V (X2)" positions.

37. Ac Voltmeter Phase Selector Switch (Designated as AC VOLTMETER PHASE SELECTOR)

The ac voltmeter phase selector switch (27), located directly under the ac voltmeter (7) on the right hand end of the main control panel, is a 5-position (position between marked positions open circuit), 2-pole, 1-deck, rotary type selector switch. It is used to place the circuitry of the ac voltmeter (7) in the circuit of the phase of an ac/dc system being tested. Balance phase condition of an ac/dc system can be detected by setting the switch in the "T1-T2," "T1-T3" and "T2-T3" positions and observing the voltage reading on the ac voltmeter (7).

Voltage differential of more than 1 volt (plus or minus) between any two settings indicates unbalanced phase conditions (par. 17).

38. Variable Volts Circuit Instrument Panel (Designated as VARIABLE VOLTS, ON-OFF FUSE, DC VARIABLE VOLTS)

a. General. The variable volts circuit consists of four units, which are located on an instrument panel (28) on the upper right hand end of the main control panel. The units are used for the testing of relay pick-up and drop-out voltage of generator regulators and generator control boxes, and provide a variable dc voltage circuit with an external output from 0 to 32 volts which is indicated on the dc voltmeter (5) when the circuit is in operation. The circuit is protected for overload by a 15-ampere fuse, *c* below a circuit breaker (49), and is available with or without the varidrive assembly operating (par. 43) and is independent of the batteries within the test stand. The dc voltmeter circuit selector switch (23) and the dc variable power supply control (48) are used in conjunction with this circuit and are described in paragraphs 33c and 57. Refer to these two paragraphs for further information on operation of the variable external volts circuit. The four units of this circuit and their description and function are given in *b* through *d* below.

b. Variable Volts On-Off Switch. The variable volts on-off switch (28-A) is a two-position, single-pole, single-throw, 25-ampere, 30-volt, dc, toggle switch used to control the output of the variable external volts circuit. When the switch is in the "ON" position it connects a 0 to 32 volts output to the dc variable external volts negative and positive binding posts (28-C). Always place this switch in the "OFF" position when the circuit is not in use.

c. Variable Volts Circuit Fuse Holder. The variable volts circuit fuse holder (28-B) contains a 15-ampere fuse which is held in the holder by a threaded cap. To remove the fuse for inspection or replacement turn the cap to the left until free. The fuse is held in the cap by a friction fit sleeve and can be removed by firmly gripping it and pulling outward on the fuse. The fuse provides an overload protection in the 0-32 dc volt output of the variable external volts circuit.

d. Dc Variable Volts Negative and Positive Binding Posts. The dc variable volts negative and positive binding posts (28-C) are a threaded two-piece post which can be threaded apart to receive a test lead terminal and tightened to hold the terminal secure. The binding posts will also receive a plug-in type terminal which can be inserted in a ferrule in the top of the post. The posts are used to connect the variable external volts circuit to the units undergoing test by means of two test leads.

39. External Dc Voltmeter Negative and Positive Binding Posts (Designated as EXTERNAL DC VOLTMETER)

The external dc voltmeter negative and positive binding posts (29), located on the center right hand end of the main control panel, are a threaded two-piece post as described in paragraph 38d. When the dc voltmeter circuit selector switch (23) is set in the "EXT VOLTS" position and by using a set of test leads connected to the two binding posts, a external dc voltage source independent of the test stand can be measured which will be indicated on the dc voltmeter (5).

40. Test Indicator Circuit Instrument Panel (Designated as TEST INDICATOR)

a. General. The test indicator circuit consists of three units which are located on an instrument panel (30) on the lower right hand end of the main control panel. The units of the circuit are used for visually checking the opening and closing of the contact points of individual relays of generator regulators and generator control boxes. The circuit can be used in voltage ranges of 6, 12, or 24 volts and is connected in series with unit undergoing test. The circuit can also be used without the varidrive operating where a method is needed to check the continuity of a circuit, etc. (par. 43). The three units of this circuit and their description and function are given in *b* and *c* below.

b. Test Indicator Lamp. The test indicator lamp (30-A) consists of a 6-8-volt bulb with a red torpedo lens. It is connected in series with a relay so that a visual indication is given for

the opening and closing of the relay contact points.

c. Negative and Positive Binding Posts. The negative and positive binding posts (30-B) of the test indicator circuit are a two piece post as described in paragraph 38d. The posts are used to connect the test indicator circuit to the relays undergoing test by means of two tested leads.

41. Ac Power-On Indicator Lamp (Designated as AC POWER ON)

The ac power-on indicator lamp (31) located on the near center of the front panel above the drive control (33), is connected to the external ac power source leading to the circuitry within the test stand and consists of a 125-volt dc lamp with a green lens. It provides a visual means to indicate that the external ac power source is being supplied to the circuitry within the test stand. This visual indication is detected when the external ac power source is turned on and the switch on the circuit breaker (fig. 11) is in the "ON" position.

42. Speed Control

The speed control (32) located on the center right hand side of the front panel, is a manually operated mechanism used for varying the speed of the generator or alternator being tested, by turning the speed control handwheel clockwise to increase the speed and counterclockwise to decrease the speed. The numerals on the speed control dial do not necessarily indicate the speed of the unit being tested, but it is used as a reference guide only. Any variation in generator or alternator speed will be indicated directly on the tachometer indicator meter (3).

43. Drive Control

The drive control (33) located on the near center of the front panel and to the left of the speed control (32), is a 110-volt, 60 cycle, push-button type switch which is the manual operating device used to set the magnetic motor starter (fig. 11) in action to start the varidrive assembly of the test stand. Depressing the start button (33-A) starts the varidrive assembly and depressing the stop button (33-C) stops the assembly. There is a safety clip (33-B) on the control which automatically slides in place over the stop button after the button is depressed. This prevents the varidrive assembly from being started when accidentally pushing the start button. This safety clip also holds the stop button in a partially depressed position which places the circuit of the external ac power source to the test stand in an open condition. This safety clip must be slid off the stop button to close this circuit when performing tests that do not require the use of the varidrive assembly or to release the stop button when the start button is depressed to start the varidrive assembly.

44. Drive Running Indicator Lamp (Designated as DRIVE RUNNING)

The drive running indicator lamp (34), located on the near center of the front panel and to the left of the ac power-on indicator lamp (31), is connected to the circuitry of the varidrive assembly and consists of a 125-volt dc lamp with a green lens. It provides a visual means to indicate that the varidrive assembly is in operation.

45. Pile Flutter Circuit Instrument Panel (Designated as PILE FLUTTER JACK)

a. General. The pile flutter circuit consists of three units which are located on an instrument panel (35) on the lower right hand end toward the center of the main control panel. The circuit is used when adjusting the carbon pile of a generator (alternator) regulator of an ac/dc system and is used without the varidrive assembly operating (par. 43). The circuit is connected to the contacts under the regulator cover leading to the carbon pile (cover is removed for access). An electrical headset (fig. 65) is connected to the pile flutter circuit and is used to listen for the vibration of the carbon pile when adjusting it. A crackle in the earphone or an erratic vibration indicates loose adjustment of the carbon pile. No noise at all indicates too tight an adjustment of the carbon pile. For a correct adjustment there should be a distinct even hum. The three units of this circuit and their description and function are given in *b* and *c* below.

b. Phone Jack. The phone jack (35-A) of the pile flutter circuit is an open circuit two conductor type jack which is used to plug the

lead of the electrical headset into the pile flutter circuit.

c. Negative and Positive Binding Posts. The negative and positive binding posts (35-B) of the pile flutter circuit are a two-piece post as described in paragraph 38d. The posts are used to connect the pile flutter circuit to the carbon pile of a generator (alternator) regulator by means of two test leads.

46. Regulator Check Fixed Resistance Circuit Instrument Panel (Designated as REGULATOR CHECK FIXED RESISTANCE METHOD (OHMS), REGULATOR CHECK INPUT)

a. General. The regulator check fixed resistance circuit consists of two units which are located on an instrument panel (36). The units of the circuit are used to check the setting of a voltage regulator unit (figs. 33, 34, and 35) of a generator regulator (par. 102). The two units of this circuit and their description and function are given in *b* and *c* below.

b. Fixed Resistance Selector Switch. The fixed resistance selector switch (36-A) is a 10-position (position between marked resistance positions open circuit), 1-pole, 1-deck, rotary type selector switch used to select a fixed resistance value. The switch can be set to acquire resistance of 0.25 ohms, 0.75 ohms, 1.5 ohms, 2.25 ohms, and 7.0 ohms by setting the switch in these marked positions on the dial of the switch.

c. Regulator Check Input Binding Post. The regulator check input binding post (36-B) is a threaded two-piece post as described in paragraph 38d. The post is used to connect a fixed resistance, *b* above, into a dc circuit undergoing test.

47. 0-25 0-12.5 Ampere Load Switch Variable Control (Designated as VARIABLE LOAD 0-25 0-12.5 AMPS INCREASE)

The 0-25 0-12.5 ampere load switch variable control (37), located on the upper right hand end of the main control panel, is a 45-ohm, taper wound rheostat and can be used in conjunction with the fixed load switches (39), (40), and (57). The control is connected in series with the 0-25 0-12.5 load switch (38) (see note below). It will apply a variable current load of 0-12.5 amperes on units undergoing test with an operating voltage rating of 15 volts and below and a variable current load of 0-25 ampere on units with an operating voltage rating above 15 volts to 30 volts. To apply the current load it is rotated clockwise to increase the load and counterclockwise to decrease the load.

Note. The load switch (38) must be in the "ON" position to connect the variable control (37) in the circuit of the test stand or in series with the other load switches (39), (40), and (57).

48. 0-25 0-12.5 Load Switch (Designated as LOAD SWITCHES 0-25 0-12.5)

The 0-25 0-12.5 load switch (38), located on the upper right hand end of the main control panel, is a 50-ampere at 30-volts dc, toggle switch used to connect a current load of 0-25 and 0-12.5 amperes in the circuit with the 0-25 0-12.5 ampere load switch variable control (37), which is applied as specified in paragraph 47. The current load of this switch can be used individually or in conjunction with the fixed load switches (39), (40), and (57) when applying loads on units undergoing test.

49. 25-12.5 and 50-25 Fixed Load Switches (Designated as LOAD SWITCHES 25-12.5 50-25)

The 25-12.5 and 50-25 fixed load switches (39) and (40), located near the right hand center of the main control panel, are both a 50-ampere at 30 volts dc, single-throw, toggle switch. The load switch (39) is used to apply a fixed current load of 0-12.5 amperes on units undergoing test with an operating voltage rating of 15 volts and below and a fixed current load of 0-25 amperes on units with an operating voltage rating above 15 volts to 30 volts. The load switch (40) will apply a fixed current load of 0-25 on units with an operating voltage rating of 15 volts and below and a fixed current load of 0-50 amperes on units with an operating voltage rating above 15 volts to 30 volts. The switches may be used individually or in conjunction with the other load switches (37), (38), and (57).

50. Battery Circuit Selector Instrument Panel (Designated as BATTERY CIRCUIT SELECTOR, BATTERY SWITCH, BATTERY TEST CIRCUIT)

a. General. The battery circuit selector consists of three units which are located on an instrument panel (41), near the lower center of the main control panel. The units are used when applying battery voltage to units undergoing tests, either through the internal circuitry of the test stand or externally by means of two binding posts. The type of application desired can be selected by placing the dc voltmeter circuit selector switch (23) in the "RECT GEN" position for an internal application and in the "BAT VOLTS" position for an external application. The three units of the circuit and their description and function are given in *b* through *d* below.

b. Voltage Selector Switch. The voltage selector switch (41-A), is a 5-position (position between marked positions open circuit), 4-pole, 2-deck, rotary type selector switch used to select the proper battery voltage for the system undergoing test. It has a battery voltage selection range of 6 volts, 12 volts, and 24 volts, which are indicated by a green indicator lamp for each voltage selected on the switch dial.

c. Battery On-Off Switch. The battery on-off switch (41-B) is a two-position, single-pole, single-throw, 25-ampere, 30-volt dc, toggle switch used to control the battery voltage of the internal battery circuit of the test stand to the circuitry of the battery circuit selector, *a* above. When the switch is in the "ON" position it connects the selected battery voltage, *b* above, to the battery test circuit positive and negative binding posts, *d* below, or to the internal circuitry of the test stand, depending on the position of the selector switch (23), *a* above.

d. Battery Test Circuit Positive and Negative Binding Posts. The battery test circuit positive and negative binding posts (41-C), are a threaded two-piece post as described in paragraph 38d. The posts are used to connect the battery test circuit to the units undergoing test by means of two test leads, when applying an external battery voltage to perform the test.

51. Rectifier Input Binding Posts

The rectifier input binding posts (42), located inside the rectifier compartment on the center part of the front panel, consists of five binding posts marked T1, T2, T3, D--, and C+. The binding posts are used to connect a rectifier to the test stand when testing an ac/dc system. The binding post markings correspond with the markings on the leads of the harness used to connect the rectifier to the test stand to assure correct installation.

52. Battery Charge Circuit Breaker

The battery charge circuit breaker (43), located near the lower left hand end of the f ront. panel next to the rectifier compartment, is a 7.5-ampere, ac, 120-volt, 60-cps (cycles per second), single-pole, circuit breaker which provides an overload protection in the ac input circuit leading to the battery charger. The reset button on the circuit breaker, extending through the front panel will snap out when there is an overload in the circuit and disconnects the ac current supply to the battery charger. The circuit breaker can be reset by pushing the button inward which will reconnect the ac input circuit provided the overload condition is corrected.

53. Battery Charge Fuse Holder (Designated BATTERY CHARGE FUSE 20 ADC)

The battery charge fuse holder (44), located on the lower left hand end of the front panel next to the circuit breaker (43), contains a 20-ampere fuse which is held in the holder by a threaded cap. To remove the fuse for inspection or replacement turn the cap to the left until free. The fuse is held in the cap by a friction fit sleeve and can be removed by firmly gripping it and pulling outward on the fuse. The fuse provides an overload protection in the "0-32" dc volt output of the battery charger.

54. Battery Charge Indicator Lamp (Designated BATTERY CHARGE INDICATOR)

The battery charge indicator lamp (45), located near the lower left hand end of the front panel next to the fuse holder (44), is connected in the circuit of the battery charge timer (46) and consists of a 125 volt dc lamp with a green lens. It provides a visual means to indicate that the battery charger is operating. The lamp

comes on when the battery charge timer (46) is set for a time interval.

55. Battery Charge Timer

The battery charge timer (46), located on the lower left hand end of the front panel, is a 115-volt, 60-cycle, automatic reset timer having a dial division of 5 minutes and a maximum interval range of 5 hours. It is used to select a charge time interval when charging the batteries of the test stand. To operate the timer, the black knurled knob at the lower part of the dial must first be in the fully counterclockwise position to reset the timer and open the output circuit, then to activate the output circuit the knob is turned clockwise to the desired time interval on the dial of the timer and the red button depressed, observing that the battery charge indicator lamp (45) lights up, which indicates that the battery charger is operating (par. 54).

56. Battery Charge Circuit Variable Control (Designated as BATTERY CHARGE CIRCUIT INCREASE)

The battery charge circuit variable control (47), located on the left hand end of the front panel above the battery charge timer (46), is a 120-ac volt input, 0-140-ac volt output, single-phase 7.5-ampere variable transformer. It is used to adjust the 0-32 dc voltage output of the battery charger to the rated voltage value of the batteries under charge (par. 33b).

57. Dc Variable Power Supply Control (Designated as DC VARIABLE POWER SUPPLY 0-32VDC INCREASE)

The dc variable power supply control (48), located on the upper left hand end of the front panel, is identical to the variable control (47) in paragraph 56, both physically and electrically. It is used to adjust the 0-32 dc voltage output of the variable external volts circuit (par. 38) to the required dc voltage when performing tests on generator regulators and generator control boxes.

58. Dc Power Supply Circuit Breaker (Designated as DC PWR SUPPLY CIRCUIT BREAKER)

The dc power supply circuit breaker (49) located on the upper left hand end of the front panel to the right of the dc variable power supply control (48), is a 7.5-ampere, ac, 120-volt, 60-cps (cycles per second), single-pole, circuit breaker which provides an overload protection in the ac input circuit leading to the variable external volts circuit (par. 38). The reset button on the circuit breaker, extending through the front panel will snap out when there is an overload in the circuit and disconnect the ac current supply to the variable external volts circuit. The circuit breaker can be reset by pushing the button inward which will reconnect the ac input circuit provided the overload condition is corrected.

59. Polarity Reversing Switch (Designated as POLARITY REVERSING SWITCH POS GND NEG GND)

The polarity reversing switch (50), located on the bottom left hand end of the main control panel, is a 3-position (ON-NONE ON-ON), single-pole, single-throw, 25-ampere, 30-volt dc, toggle switch used to change the polarity within the test stand to negative or positive ground (pars. 87 and 88), whichever is required to coincide with the generators and generator regulators system undergoing test. The switch is placed in the "NEG GND" position for a negative ground circuit and in the "POS GND" position for a positive ground circuit. The center position on the switch is open circuit and will disconnect the system undergoing test from the circuitry of the test stand and should be placed in this position after tests are completed.

60. Generator Field External-Internal Ground Switch (Designated as GEN FIELD EXT GND INT GND)

The generator field external-internal ground switch (51), located near the bottom left hand end of the main control panel, is a 3-position (ON-NONE ON-ON) single-pole, single-throw, 25-ampere, 30-volt dc, toggle switch used to connect the field of the generator undergoing test to the proper type ground. The switch is placed in the "EXT GND" position for a generator with an external grounded field and placed in the "INT GND" position for a generator with an internal grounded field (par. 99). The center position on the switch is open circuit and will disconnect the field of the generator undergoing test or the switch from the circuitry of the test stand and should be placed in this position after tests are completed.

61. 40-Ohm Field Current Rheostat (Designated as FIELD 'CURRENT INCREASE)

The 40-ohm field current rheostat (52), located, near the bottom left hand end of the main control panel, is a 30-ampere (maximum) 0.2-ampere (minimum, 40-ohm, taper wound rheostat. It is used with a generator having a field-current-draw above 5 amperes and controls the output of the generator undergoing test by placing a variable resistance on its field. When it is connected to a generator field it substitutes for the control which a generator regulator or generator control box would have on the output of the generator, therefore, no generator regulator or generator control box need be used in the test set-up. The rheostat is turned in the clockwise rotated to decrease the resistance on the generator field which increases the generator output and turned in the counterclockwise rotation to increase the resistance on the generator field which decreases the generator output. The rheostat is connected in the system undergoing test by placing the switch (53) in the RHEO position (par. 62).

Note. The generator regulator or generator control box do not have to be removed from the circuit if already connected in the test set-up. When the switch (53) is placed in the "RHEO" position this will disconnect these items from the circuit and connect. the rheostat (52) which will substitute for their function in controlling the generator output.

Note. Always place the 250-ohms 5-ampere maximum switch (54) in the "OFF" position when using the 40-ohms field current rheostat (52) above, also, this rheostat will have no control on the output of a third brush generator which is self-regulated for the generator output. When testing this type generator, place the switch (53) in the center (OFF) position (par. 62).

62. Field Current Rheostat-Regulator Switch (Designated as 40-OHMS 30 AMPS MAX R H E O R E G)

The field current rheostat-regulator switch (53), located near the center bottom of the main control panel, is a 3-position (on-off-on), single-pole, double-throw, 20-ampere, 30-volt dc, toggle switch. The switch is used to conneet either the 40-ohm field current rheostat (52), or the 250-ohm field current rheostat (55) in series with the field of the generator undergoing test. To connect the rheostats to the field the switch is placed in the "RHEO" position which permits the rheostats to control the' output of the generator. (Refer to paragraph 63 for further instructions for connecting these rheostats.) The "REG" position of this switch is used to connect a generator regulator or generator control box in the circuit with the generator undergoing test. In this position either of these items will control the ouput of the generator. The center position on the switch is open circuit and will disconnect the switch from the circuitry of the test stand, and should be placed in this position after tests are completed.

63. 250-Ohm 5-Ampere Maximum Switch (Designated as 250-OHMS 5 AMPS MAX ON-OFF)

The 250-ohm 5-ampere maximum switch (54), located near the center bottom of the main control panel, is a 2-position (on-off), single-pole, single-throw, 25-ampere, 30-volt dc, toggle switch. The switch is used to connect the 250-ohms field current rheostat (55) in the circuitry of the test stand by placing it in the "ON" position.

Note. Always place the 250-ohms 5-ampere maximum switch (54) above in the "OFF" position when not in use.

64. 250 Ohms Field Current Rheostat (Designated as FIELD CURRENT INCREASE)

The 250-ohm field current rheostat (55), located near the center bottom of the main control panel, is a 5-ampere (maximum), 0.1-ampere (minimum), 250-ohm, taper wound rheostat. If is used with a generator having a field-current-draw below 5 amperes and controls the output of the generator undergoing test by placing a variable resistance on its field. When it is connected to a generator field it substitutes for the control which a generator regulator or generator control box would have on the output of the generator, therefore, no generator regulator or generator control box need be used in the test set-up (see note (par. 61) relative to when a generator regulator or generator control box is used in the test set-up). The rheostat is turned in the clockwise rotation to decrease the resistance on the generator field which increases the generator output and turned in the counterclockwise rotation to increase the resistance on the generator field which decreases the generator output. The rheostat is connected in the

system undergoing test with the switch (53) (par. 62) and switch (54) (par. 63).

Note. The 250-ohm field current rheostat (55) will have no control on the output of a third brush generator which is self-regulated for the generator output. When testing this type generator, place the switch (53) in the center (OFF) position (par. 62).

65. 250-Ohm Field Current Rheostat Fuse Holder (Designated as FUSE)

The 250-ohm field current rheostat fuse holder (56), located in the center bottom of the main control panel contains a 5-ampere fuse which is held in the holder by a threaded cap. To remove the fuse for inspection or replacement turn the cap to the left until free. The fuse is held in the cap by a friction fit sleeve and can be removed by firmly gripping it and pulling outward on the fuse. The fuse provides an overload protection for the 250-ohm field current rheostat (55) circuitry in case the field-current-draw exceeds 5-amperes when testing a dc generator with or without a generator regulator or generator control box in the circuit.

66. 100-50 Fixed Load Switches (Designated as LOAD SWITCHES 100-50)

The 100-50 fixed load switches (57), located in the center top of the main control panel consists of four 100-ampere at 30 volts dc, single-throw, toggle switches. Each load switch is used to apply a fixed current load of 0-50 amperes on units undergoing test with an operating voltage rating of 15 volts and below and a fixed current load of 0-100 ampres on units with an operating voltage rating above 15 volts to 30 volts. The switches may be used individually or in conjunction with the other load switches (37), (38), (39), and (40).

67. Tachometer Indicator Calibrating Potentiometer (Designated as CAL POT MAX)

The tachometer indicator calibrating potentiometer (58), located near the center top of the main control panel, is a 50 K (kilohm), 4-watt wire-wound potentiometer used in conjunction with the tachometer indicator high-low switch (18) and tachometer indicator direct-drive-calibrating potentiometer switch (19) for calibrating the tachometer indicator circuitry. Refer to paragraph 83 for complete information.

68. Field Ammeter DC AC/DC Switch (Designated as DC AC/DC)

The field ammeter dc ac/dc switch (59), located near the top left hand end of the main control panel is a 2-position (on-off), single-pole, single-throw, 25-ampere, 30-volts dc, toggle switch. The switch is used to connect an ac/dc system to the alternator input binding posts (12, fig. 15) by placing the switch in the "AC/DC" position or to connect a dc system to the generator input binding posts (13, fig. 15) by placing the switch in the "DC" position.

69. Battery Charge Rate Read Switch (Designated as BATTERY CHARGE RATE READ 0-50 AMPS)

The battery charge rate read switch (60), located near the top left hand end of the main control panel is a 2-position (none-monetary on) two-pole, double throw, 25-ampere, 30-volt dc, toggle switch. The switch is used to activate the load dc ammeter (1) when charging the batteries in the test stand while using the battery charger. Holding the switch lever up to "READ" position will indicate the current output of the battery charger on the load dc ammeter (1) and releasing the lever to the down position will disconnect the battery circuitry to the load dc ammeter (par. 98).

70. Starter Test Load Disconnect Switch (Designated as STARTER TEST LOAD DISCONNECT ON)

The starter test load disconnect switch (61), located on the top left hand end of the main control panel, is a 2-position (on-off), single-pole, single-throw, 25-ampere, 30-volt dc, toggle switch. The switch is used in conjunction with the load switches (37), (38), (39), (40), and (57) for placing ampere loads on dc generators and ac alternators undergoing tests by throwing the switch lever up to the "ON" position to apply ampere loads and to the down "OFF" position to disconnect the loads. It is also used to place a resistance on starters (cranking motors) undergoing test by connecting the starter carbon rheostat (5, fig. 15) in the circuit of the starter (par. 94) by placing the switch in the up "ON" position or disconnecting the resistance by placing the switch to the down "OFF" position.

71. Interlock Switch

The interlock switch (fig. 12), located behind the access door of the high voltage compartment (fig. 6), is a single-pole, single-throw, 15-ampere, 250-volt ac, push button switch. The switch is used to disconnect the input circuit to the varidrive assembly. When the access door is opened the switch will cut-off the electrical power preventing the varidrive assembly from operating. (Drive running indicator lamp (34) will go out indicating this.)

Warning: **Before reaching into the high voltage compartment, turn the on-off input power toggle switch (fig. 11) to "OFF" position as high voltage exists in the surrounding area of this compartment.**

72. Drive Reversing Switch

The drive reversing switch (fig. 12), located behind the access door of the high voltage compartment (fig. 6), is a two-pole, double-throw, 100-ampere, 500-volt ac, non-fusible knife switch, used to change the rotation of the generator or alternator undergoing test (by changing the varidrive assembly rotation). The switch is placed in either the upper or lower position to change the rotation of the unit being tested. The upward position turns the varidrive shaft to the left when facing the varidrive assembly and the downward position turns the shaft to the right when facing the varidrive assembly.

73. 100-Ampere 600-Volt Fuses

The three 100-ampere, 600-volt fuses (fig. 12), located behind the access door of the high voltage compartment (fig. 6), are cartridge type fuses which provide protection when short circuit or overload conditions exist in the ac input circuit to the drive motor of the varidrive assembly or to the circuitry of the testing control units of the test stand.

74. 8-Ampere Buss Fuse

The 8-ampere buss fuse (fig. 12), located behind the access door of the high voltage compartment (fig. 6), is rated at 125-volt ac, and provides protection when short circuit or overload conditions exist in the circuitry to the load dc ammeter (1), the battery circuit selector (41), and the test indicator circuit (30) of the test stand. When this fuse is blown-out the general reaction is that the load dc ammeter (1) will not register amperes or the indicator lamps of the battery circuit selector (41) will not light-up (blown-out lamp (bulb) could also cause this trouble, also, be sure to have the battery on-off switch (41-B) in the "ON" position and the safety clip (33-B) off the stop button (33-C) and turn the knob of the voltage selector switch (41-A) to the different voltage indicated on the dial when checking the battery circuit selector (41)). Another condition which will exist if the fuse is blown-out is that the test indicator lamp (30-A) will not light-up when used to test the units of a generator regulator or generator control box.

75. 15-Ampere Buss Fuse

The 15-ampere buss fuse (fig. 12), located behind the access door of the high voltage compartment (fig. 6), provides protection when short circuit or overload conditions exist in the circuitry within the test stand for the various instruments and controls on the main control panel (fig. 16). When this fuse is blown-out the general reaction is that the current to the entire instrument panel of the test stand is cut-off including the current to the drive control (33) preventing the test stand from operating completely.

76. Rectifier Compartment

The rectifier compartment (fig. 16), located in the center of the front panel is used to contain a rectifier mounted on a mounting bracket and base (fig. 69). The compartment is air cooled by an electric blower to prevent the rectifier from overheating and damaging the plates of the rectifier. It is important that the mounting bracket and base holding the rectifier is positioned in the compartment so that it receives the full flow of air.

Note. The key numbers shown below in paragraph 77 through 89 refer to figure 15 except where otherwise indicated.

77. 150-Ampere Generator Control Box Receptacles (Designated as 53 GEN CONTROL BOX 6 1)

The 150-ampere generator control box receptacles (1), located on the upper section of the receptacle panel (fig. 15) are numbered

"5," "6," "3," and "1" on the plate between the receptacles. The receptacles are used to connect a 150-ampere generator control box to the test stand for testing its function. Each of the numbered receptacles correspond with the numbered markings on the four cable assemblies, numbers 38379, 38380, 38381, 38382 (fig. 72) for an easy method to identify the cables when connecting the control box to the test stand.

78. 400-Ampere Generator Control Box Receptacles (Designated as 400-AMP GEN CONTROL BOX GENERATOR BATTERY)

The 400-ampere generator control box receptacles (2), located in the center of the receptacle panel (fig. 15) are identified by markings "GENERATOR" and "BATTERY" on the name plate above the receptacles. The receptacles are used to connect a 300- or 400-ampere generator control box to the test stand for testing its function. The identifying markings "GENERATOR" and "BATTERY" on the receptacles correspond with the markings on the two cable assemblies number 38377 and 38378 (fig. 72) for an easy method to identify the cables when connecting the control box to the test stand.

79. Auxiliary Start Momentary-On Switch (Designated as AUX START)

The auxiliary start momentary-on switch (3), located on the upper left hand end of the auxiliary panel (fig. 15) is a two position (off-momentarily-on), single-pole, single-throw, 20-ampere, 30-volts dc, toggle switch used to test the auxiliary start characteristics of some 400-ampere control boxes having the facilities for these auxiliary start procedures. To set the test stand up for these tests after all other tests on the generator control box have been completed, the load dc ammeter range selector switch (15, fig. 16) is placed in the "500A (X10)" position, the field dc ammeter range selector switch (17, fig. 16) in the "30A (X6)" position, the field current rheostat-regulator switch (53, fig. 16) in the "REG" position, the field shorting switch (6) in the "ON" position, the battery-on-off switch (41-B, fig. 16) in the "ON" position, the starter test load disconnect switch (61, fig. 16) in the "ON" position and then momentarily hold the auxiliary start momentary-on switch (3) in the "ON" position. The generator should run as a motor driving the test stand varidrive assembly.

80. Voltage Adjusting Rheostat (Designated as VOLTAGE ADJ INCREASE)

The voltage adjusting rheostat (4), located on the center upper section of the auxiliary panel (fig. 15) is a 100-ohm, 25 watt rheostat. It is used when testing 400-ampere generator control boxes and 400-ampere generators to increase or decrease the generator output voltage by overtaking the voltage control which the carbon pile unit of the general control box ordinarily has under normal operating conditions (par. 82).

Note. When testing 150-ampere generator control boxes the voltage adjusting device is contained within the generator control box and the voltage adjusting rheostat (4) is not required to test these items.

81. Starter Carbon Rheostat (Designated as STARTER RHEOSTAT CURRENT)

The starter carbon rheostat (5), located on the center of the auxiliary panel (fig. 15) is used to adjust the voltage for the starter (cranking motor) when performing free-run or stall torque tests on starters (cranking motors). The voltage will be indicated on the dc voltmeter (5, fig. 16). When the required voltage is reached the manufacturer's specified current draw, rpm, or foot-pounds torque will be indicated, depending on the test (free-run or stall torque) being performed. When the starter carbon rheostat is turned clockwise it is fully compressed with minimum resistance. When turned counterclockwise the rheostat is decompressed and offers maximum resistance (refer to pars. 133 and 134 for details). To operate the rheostat, turn it counterclockwise first (see caution note below) and then clockwise until a feel of a slight drag or pressure is noticed. Keep turning in the clockwise rotation until the required voltage is obtained to give the current amperage (current draw) on the load dc ammeter (1, fig. 16) (the above voltage, ampere, and rpm readings are specified by manufacturer or refer to table 9 paragraph 134, which lists these specifications for several manufacturer's models).

Caution: **Turning the starter carbon rheostat counterclockwise first (do not turn in ex-**

treme counterclockwise direction) and then in the clockwise rotation until a slight drag or pressure is felt will help prevent damage to starters in the event that incorrect voltage is applied to the input terminal (11-A) and will also minimize the possibility of an open circuit. Never turn the starter carbon rheostat in the extreme counterclockwise position as an open circuit condition will exist.

82. Field Shorting Switch (Designated as FIELD SHORTING)

The field shorting switch (6), located on the upper right hand end of the auxiliary panel (fig. 15) is a two-position, single-pole, single-throw, 20-ampere, 30-volt dc, toggle switch. It is used to short-out the carbon pile unit in the generator control box when performing generator output voltage test on 400-ampere generators and generator control boxes (par. 80).

83. Ignition Switch (Designated IGN SW ON OFF)

The ignition switch (7), located near the lower left hand end of the binding post panel (fig. 15) is a two position (on-off), single-pole, single-throw, 25-ampere, 30-volt dc, toggle switch. It is used in conjunction with the voltage selector switch (41-A, fig. 16), battery on-off switch (41-B, fig. 16) and the starter test load disconnect switch (61, fig. 16) for setting-up the battery circuit of the test stand for indicating the ac and dc output voltage when testing 28-volt (100- or 400-ampere) ac/dc systems. Place the lever of the switch to the "ON" position to set the circuit in operation and to the "OFF" position to disconnect the circuit.

84. Equalizer Coil Test Switch (Designated as EQUALIZER COIL TEST ON OFF)

The equalizer coil test switch (8), located at the lower left hand end of the binding post panel (fig. 15) is a 2-position (off-momentary-on) single-pole, single-throw, 20-ampere, 30-volt dc, toggle switch. It is used to indicate the generator (alternator) drop-off voltage when performing tests on 28-volt (100-or 400-ampere) ac/dc systems and 150 and 400-ampere generator control boxes. Place the lever of the switch to the "ON" position to indicate the drop-off voltage and release to "OFF" position **to disconnect the switch.**

85. Ac/Dc System Binding Posts (Designated as AC DC SYSTEMS)

The ac/dc system binding posts (9), located near the lower left hand end of the binding post panel (fig. 15) consists of three binding posts marked "D," "E," and "IGN SW." The binding posts are a threaded two-piece post which can be threaded apart to receive a test lead terminal and tightened to hold the terminal secure or, a plug-in type terminal can be inserted in the top of the post. The markings on the posts correspond with the markings on the leads of the cable assembly number 38384 (fig. 73) for an easy method to identify the leads when connecting the generator (alternator) regulator to the test stand.

86. Regulator Binding Posts (Designated as REGULATOR)

The regulator binding posts (10), located, on the center top of the left hand end of the binding post panel (fig. 15) consists of seven binding posts marked "B+," "B-," "G+," "G-," "GND," "D," and "F-B." The four upper binding posts are threaded and contain a nut, tapered wedge, and a flat washer. To connect a test lead to the post the nut is loosened to receive the test lead terminal which is inserted between the tapered wedge and flat washer on the post. The nut can then be tightened down to hold the test lead and terminal secure. The lower three binding posts are constructed as prescribed in paragraph 85. The markings on the posts correspond with the markings on the leads of the cable assemblies numbers 38384 and 38385 (fig. 73) for an easy method to identify the leads when connecting the generator (alternator) regulator to the test stand.

87. Starter Binding Posts (Designated as STARTER INPUT STARTER FREE-RUN STARTER COMMON STALL TORQUE)

The starter binding posts (11), located in the center of the binding post panel (fig. 15) consists of four binding posts marked "STARTER INPUT," "STARTER FREE-RUN," and "STARTER" "COMMON" AND "STALL TORQUE." The binding posts are threaded and are constructed as the upper four

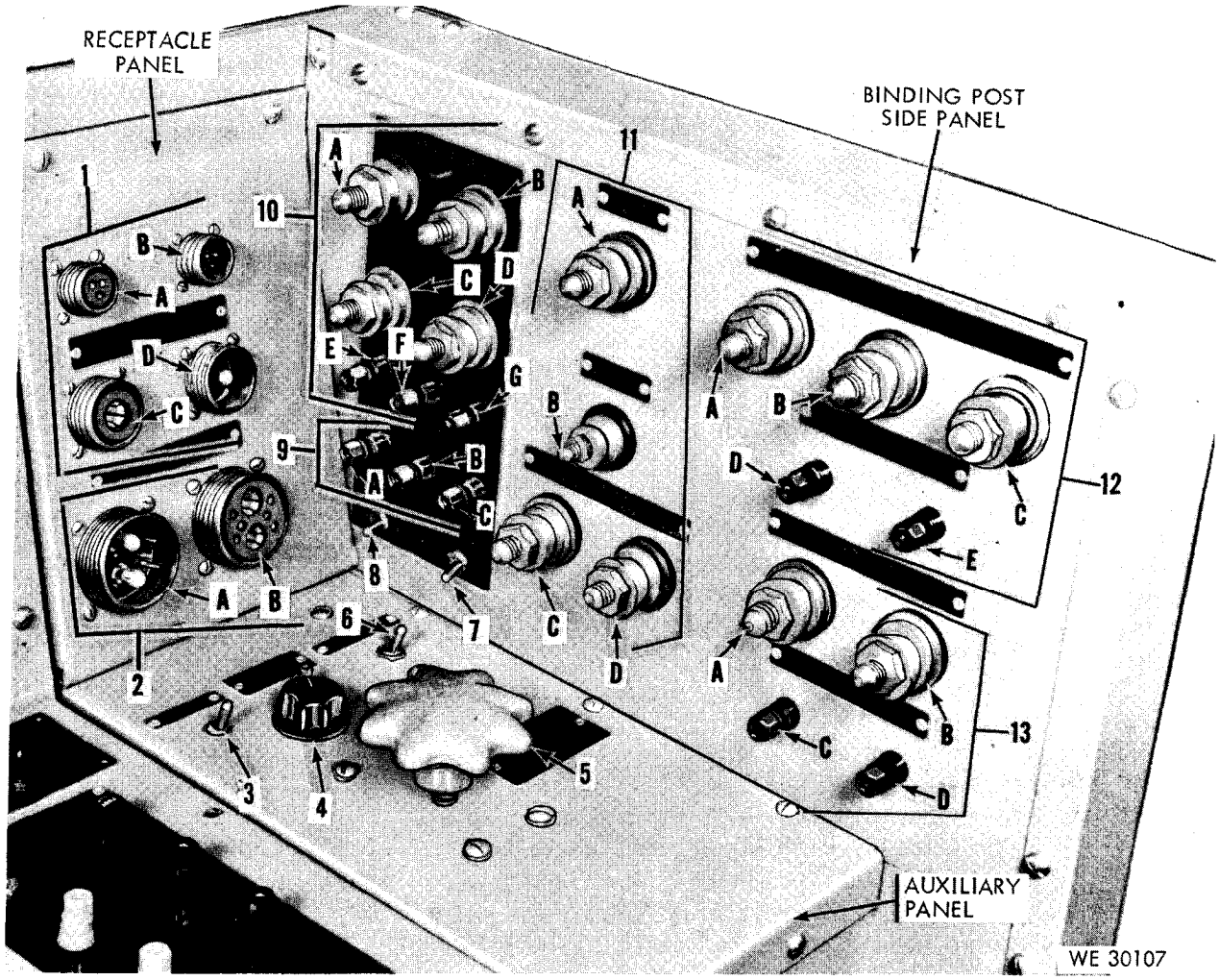


Figure 15. Receptacle panel, binding post side panel, and auxiliary panel.

1-150-ampere generator control box receptacles
- A - No. 5 receptacle
- B - No. 6 receptacle
- C - No. 3 receptacle
- D - No. 1 receptacle

2-400-ampere generator control box receptacles
- A - Generator receptacle
- B - Battery receptacle

3 - Auxiliary start momentary-on switch
4 - Voltage adjusting rheostat
5 - Starter carbon rheostat
6 - Field shorting switch
7 - Ignition switch (ign sw)
8 - Equalizer coil test switch
9 - AC/dc system binding posts
- A - No. D binding post
- B - No. E binding post
- C - Ignition switch (ign sw) binding post

10 - Regulator binding post
- A - No. B+ binding post
- B - No. B- binding post
- C - No. G+ binding post
- D - No. G- binding post
- E - Ground (grid) binding post
- F - No. D binding post
- G - No. F-B binding post

11 - Starter binding posts
- A - Input binding post
- B - Free-run binding post
- C - Common binding post
- D - Stall torque binding post

12 - Alternator input binding posts
- A - No. T1 binding post
- B - No. T2 binding post
- C - No. T3 binding post
- D - No. D binding post
- E - No. E binding post

13 - Generator input binding posts
- A - No. G+ binding post
- B - No. G- binding post
- C - No. D binding post
- D - No. F binding post

binding posts described in paragraph 86. The test leads and cable harnesses used to connect starters (cranking motors) to these binding posts are numbers 38388, 38405, 38408, and 38425 (figs. 70, 71, and 74).

88. Alternator Input Binding Posts (Designated as ALTERNATOR)

The alternator input binding posts (12) located on the upper right hand end of the binding post panel (fig. 15) consists of 5 binding posts marked "T1," "T2," "T3," "D" and "E" (some test stands are marked "F" instead of "E"). The binding posts are threaded and are constructed as those described in paragraphs 85 and 86. The markings on the posts correspond with the markings on the leads of the cable assembly numbers 38386 and 38387 (fig. 73) for an easy method to identify the leads when connecting the generator (alternator) to the test stand.

89. Generator Input Binding Posts (Designated as "GENERATOR")

The generator input binding posts (13), located on the lower right hand end of the binding post panel (fig. 15) consists of four binding posts marked "G+," "G-," "D," and "F." The binding posts are threaded and are constructed as those described in paragraphs 85 and 86. The generators (150-ampere or 300-ampere) are connected to these posts with cables 38389, 38411, 38412 (figs. 71 and 74).

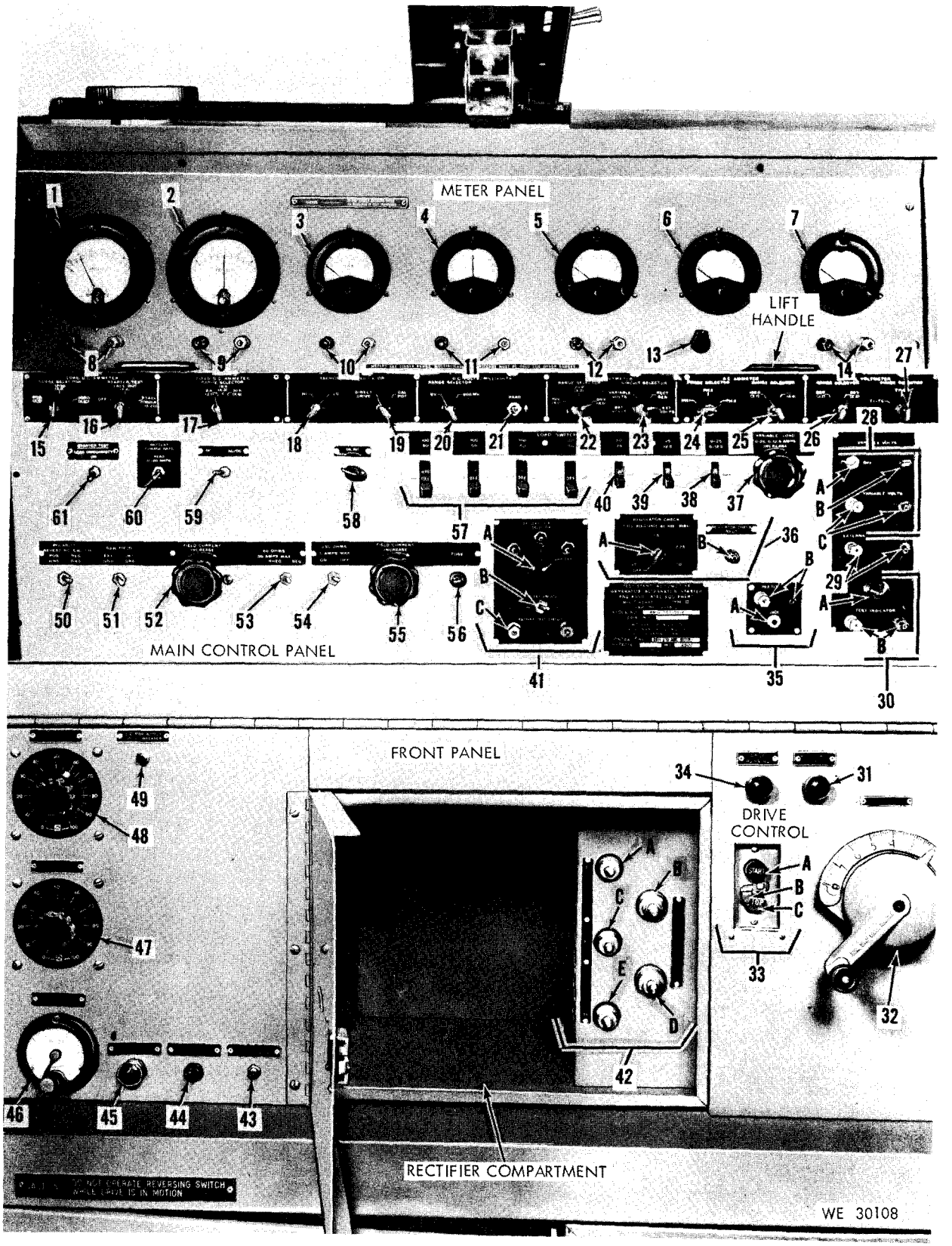


Figure 16. Controls, instruments, and related items.

Figure 16 - Continued.

1 - Load dc ammeter
2 - Field dc ammeter
3 - Tachometer indicator meter
4 - Dc volts-millivolts meter
5 - Dc voltmeter
6 - Ac ammeter
7 - Ac voltmeter
8 - Load dc ammeter calibrating binding posts
9 - FieId dc ammeter calibrating binding posts
10 - Tachometer indicator meter calibrating binding posts
11 - Dc volts-millivolts meter calibrating binding posts
12 - Dc voltmeter calibrating binding posts
13 - Ac ammeter calibrating jack
14 - Ac voltmeter calibrating binding posts
15 - Load dc ammeter range selector switch
16 - Load dc ammeter starter test selector switch
17 - Field dc ammeter range selector switch
18 - Tachometer indicator high-low switch
19 - Tachometer indicator direct-drive-calibrating potentiometer switch
20 - Dc volts-millivolts range selector switch
21 - Dc volts-millivolts momentary-on switch
22 - Dc voltmeter range selector switch
23 - Dc voltmeter circuit selector switch
24 - Ac ammeter phase selector switch
25 - Ac ammeter range selector switch
26 - Ac voltmeter range selector switch
27 - Ac voltmeter phase selector switch
28 - Variable volts circuit instrument panel
  A - Variable volts on-off switch
  B - Variable volts circuit fuse holder
  C - Dc variable volts positive and negative binding posts
29 - External dc voltmeter positive and negative binding posts
30 - Test indicator circuit instrument panel
  A - Test indicator lamp
  B - Positive and negative binding posts
31 - Ac power-on indicator lamp
32 - Speed control
33 - Drive control
  A - Start button
  B - Safety clip
  C - Stop button
34 - Drive running indicator lamp
35 - Pile flutter circuit instrument panel
  A - Phone jack
  B - Positive and negative binding posts
36 - Regulator check fixed resistance circuit instrument panel
  A - Fixed resistance selector switch
  B - Regulator check input binding post
37 - 0-25 0-12.5 ampere load switch variable control
38 - 0-25 0-12.5 load switch
39 - 25-12.5 fixed load switch
40 - 50-25 fixed load switch
41 - Battery circuit selector instrument panel
  A - Voltage selector switch
  B - Battery on-off switch
  C - Battery test circuit positive and negative binding posts
42 - Rectifier input binding posts
  A - No. T1 binding post
  B - No. D- binding post
  C - No. T2 binding post
  D - No. C+ binding post
  E - No. T3 binding post
43 - Battery charge circuit breaker
44 - Battery charge fuse holder
45 - Battery charge indicator lamp
46 - Battery charge timer
47 - Battery charge circuit variable control
48 - Dc variable power supply control
49 - Dc power supply circuit breaker
50 - Polarity reversing switch
51 - Generator field external-internal ground switch
52 - 40-ohm field current rheostat
53 - Field current rheostat-regulator switch
54 - 250-ohm 5-amperes maximum switch
55 - 250-ohm field current rheostat
56 - 250-ohm field current rheostat fuse holder
57 - 100-50 fixed load switches
58 - Tachometer indicator calibrating potentiometer
59 - Field ammeter dc ac/dc switch
60 - Battery charge rate read switch
61 - Starter test load disconnect switch

Section III. OPERATION UNDER USUAL CONDITIONS

90. General

This section contains instructions for the operation of the test stand under conditions of moderate temperature and humidity. Every organization equipped with this item must thoroughly train its personnel in the procedures for operating this item. For operation under unusual conditions, refer to paragraphs 103 through 106.

91. Preparation for Operation

a. Adjust each of the seven meters (1 through 7, fig. 16) to zero, if required, by turning the adjustment screw (located below lens on center part of meter) clockwise to swing the pointer to the right, or counterclockwise to swing the pointer to the left.

b. Calibrate the tachometer indicator circuitry for a direct-driven generator (97b) and

with no generator mounted and connected to the test stand, start the varidrive assembly as prescribed in paragraph 93b. Turn the handle of speed control (32, fig. 16) until 2000 revolutions per minute are indicated on the tachometer indicator meter (3, fig 16). Test the tachometer indicator circuitry by checking the speed of the shaft of either driving head (4 and 5, fig. 7), utilizing a hand tachometer or strobotac of known accuracy. If the reading on the tachometer indicator meter does not coincide with the reading on the hand tachometer or strobotac, the tachometer indicator circuitry will need recalibrating. This may be accomplished by adjusting the potentiometer located on a vertical plate behind the control panel (fig. 17). To obtain access to the potentiometer remove the six round head machine screws from the panel, and lift the panel up and out to length of nylon cords, using the lift handles under the meters (fig. 16). Adjust the potentiometer by loosening the locknut on the adjusting screw of the potentiometer (fig. 17) and turning the screw either clockwise or counterclockwise until the reading on the instrument used for checking and the reading on the tachometer indicator meter are identical. Upon completion of the adjustment, tighten the locknut and replace the control panel in the original position.

Warning: **Disconnect the external power supply from the test stand and place the on-off input power toggle switch on the circuit breaker (fig. 11) in the "OFF" position before any attempt is made to lower the control panel for access to the potentiometer.**

Caution: **Do not move the handle of the speed control (32, fig. 16) when the varidrive assembly is not operating, also, before stopping the varidrive assembly always reduce speed to one-quarter setting.**

c. Check the storage batteries following procedures specified in TM 9-6140-200-15.

92. Operation

a. Turn all range selector switches beneath the meters on the test stand (fig. 16) to the maximum position, all rheostats counterclockwise, and all toggle switches to the "OFF" position (fig. 16).

b. Prior to performing any tests, position the voltage selector switch (41-A, fig. 16) to the voltage rating corresponding to the system under test.

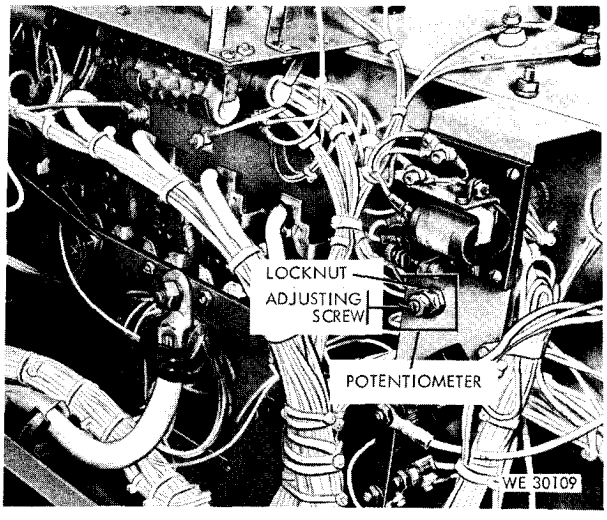


Figure 17. Location of the tachometer indicator circuit potentiometer.

Caution: **During any test procedures, do not rotate the voltage selector switch (41-A, fig. 16) as this will cause damage to the components within the test stand as well as the equipment being tested.**

c. Before the start of any test, position the polarity reversing switch (50, fig. 16) as required for the type of electrical system undergoing test (par. 100).

93. Starting and Stopping the Varidrive Assembly

a. Place the ON-OFF input power toggle switch on the circuit breaker (fig. 11) in the "ON" position. Be sure to close the high voltage compartment access door (fig. 6) tightly or the interlock switch (fig. 12) on the compartment may keep the input circuit open preventing the varidrive assembly from operating.

b. To start the varidrive assembly, slide the safety clip (33-B, fig. 16) to the left and off the "STOP" button (33-C, fig. 16) of the drive control. Depress the "START" button (33-A, fig. 16) on the drive control and hold the button closed long enough until the varidrive assembly comes up to speed at which time the interlock of the magnetic motor starter (fig. 11) will function and hold the starting contacts of the starter closed. Holding the button closed should

not be in excess of 30 seconds. Before starting tests operate the varidrive assembly over the entire speed range of 11000 to 1830 rpm (revolutions per minute) by turning the handle of the speed control (32, fig. 16) clockwise and then counterclockwise.

Note. The safety clip (33-B, fig. 16) must be off the "STOP" button to supply current to the circuitry of the test stand when performing tests that do not require the use of the varidrive assembly.

Caution: **Repeated starting of the magnetic motor starter at frequent short intervals may damage starter coil and contacts by overheating.**

c. Check for correct rotation of the unit undergoing test and if it is necessary to reverse the direction of rotation, this may be accomplished by stopping the varidrive assembly and placing the reversing switch (fig. 12) in the opposite position.

Warning: **High voltage exists in the area near the drive reversing switch. Place the on-off input power toggle switch (fig. 11) in the "OFF" position before reaching into this area to change position of this switch.**

d. Depress the "STOP" button on the drive control (33-C, fig. 16) to stop the varidrive assembly.

Caution: **The varidrive assembly must be stopped completely before changing position of the drive reversing switch (fig. 12).**

Warning: **Do not remove any units being tested or connections from the test stand until the varidrive assembly has come to a complete stop.**

94. Mounting Direct-Driven Generator or Alternator

Note. The key numbers shown below in parentheses refer to figure 18 except where otherwise indicated.

a. Install the machine key (9) and the adapters (5 and 6) on the shaft of the proper driving head (high speed or low speed) (4 or 5, fig. 7), which is determined by the speed range of the generator (table 1, par. 95) or applicable manufacturer's test specifications) and secure with the set screw (4).

Note. The splined adapter (5) is made to fit a generator or alternator with a large splined shaft and the generator or alternator is mounted directly into this adapter without the adapter (6).

b. Pull the pivot arm (2) outward along the pivot shaft (1) far enough to clear the hexagon studs (3) and swing the pivot arm in position with the driving head, *a* above. Aline the two stud holes in the pivot arm with the two hexagon studs (3) and push the pivot arm inward allowing the two hexagon studs to enter the stud holes.

c. Install the mounting flange adapter (10) on the pivot arm (2) and secure with 12 hexagon plain nuts (8). Mount the direct driven generator (7) over the middle row of studs on the adapter (10), sliding the splined shaft of the generator into the adapter (6), Secure the generator on the adapter with the six hexagon plain nuts (8). Figure 19 shows the direct-driven generator in the installed position.

Caution: **Do not leave couplings (5 and 6) on the driving head shafts after tests have been completed. Remove the couplings and machine key (9) and place in the stowage compartment.**

95. Mounting Pulley-Driven Generator or Alternator

Note. The key numbers shown below in parentheses refer to figure 20 except where otherwise indicated.

a. Pull the pivot arm (2) outward along the pivot shaft (1) far enough to clear the hexagon studs (3) and swing the pivot arm in position with the proper driving head (high speed or low speed) (4 or 5, fig. 7), which is determined by the speed range of the generator (table 1 below) or applicable manufacturer's test specifications. Aline the two stud holes in the pivot arm with the two hexagon studs (3) and push the pivot arm inward allowing the two hexagon studs to enter the stud holes.

b. Insert the machine key (6) in the keyway on the shaft of the driving head and install the mounting flange adapter (5) on the pivot arm (2). Secure the adapter with 12 hexagon plain nuts (4). Install the pulley (8), (select the proper size pulley to match the generator pulley, refer to appendix II and fig. 67) on the pulley shaft and bearing adapter (7) and secure it on the adapter. Aline the keyway in the shaft of the adapter (7) with the machine key (6) and slide the adapter (7) on the shaft of the driving head and over the middle row of studs on the adapter (5). Secure the adapter (7) on

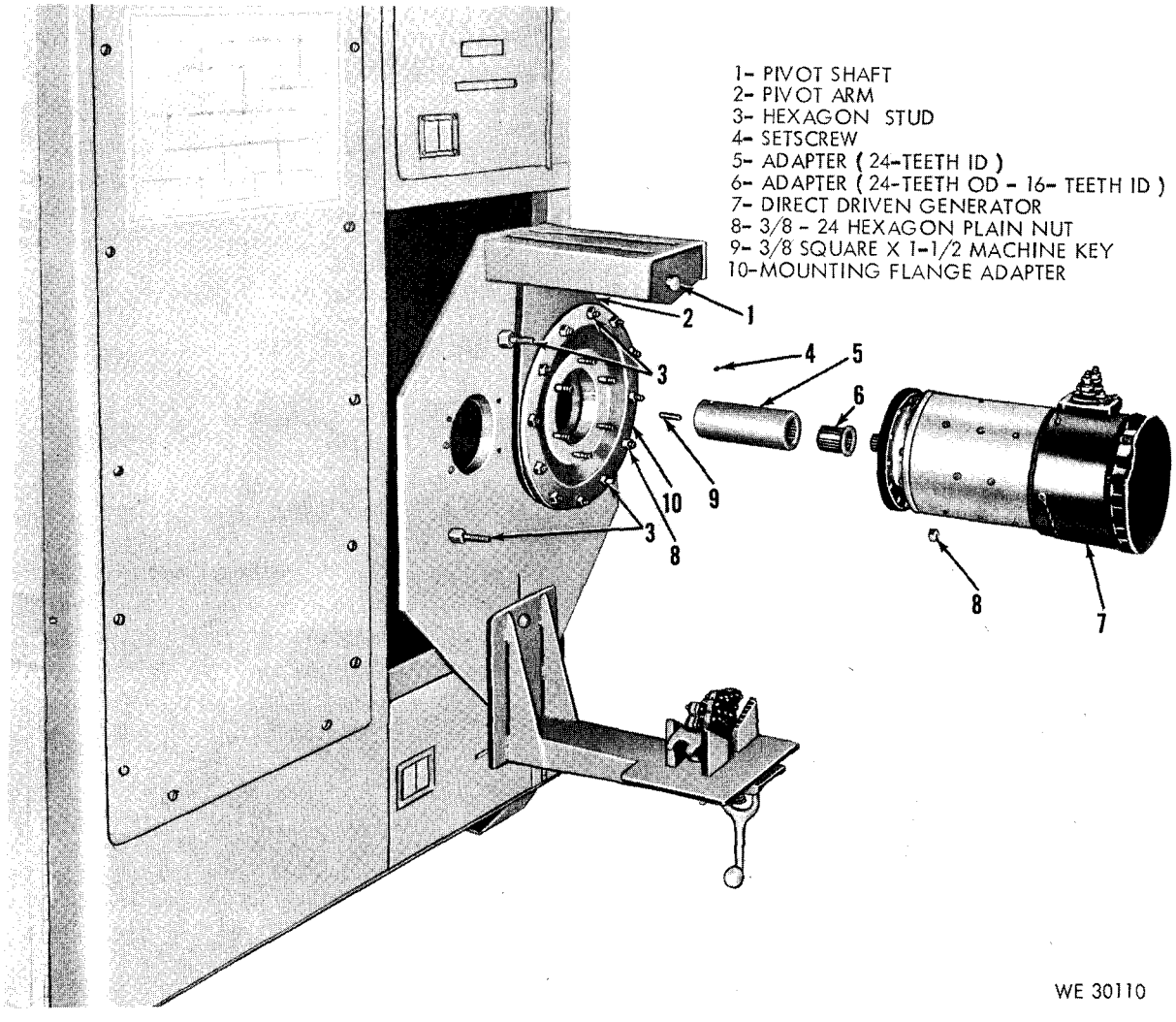


Figure 18. Components used for mounting direct-driven generator or alternator.

the adapter (5) with six hexagon plain nuts (4).

c. Mount the pulley-driven generator (8) on the generator and starter mounting bracket (11) and secure with the chain vise (12). Loosen the hexagon plain nut (3-E, fig. 7) under the chain vise and slide the unit as required to aline the pulley on the generator with the pulley (8).

d. Loosen the locking handle (3-F, fig. 7) and adjust the generator and starter mounting bracket (11) to the required height to allow installation of the V belts (10) (install the proper size V belts to match pulley (8), *b*. above, refer to appendix II and fig. 68) on the generator pulley and the pulley (8). Adjust the bracket (11) to obtain proper tension on the V belts and tighten the locking handle (3-F, fig. 7) to secure the bracket in place. If further alignment of the pulleys is required, slide the chain vise (12) on the bracket (11) as needed. Tighten the hexagon nut under the chain vise to secure the vise in place. Figure 21 shows the pulley-driven generator in the installed position.

Caution: **When installing a alternator or generator in the chain vise (12), be sure to avoid clamping over nameplates and raised or protruding surfaces. On alternator use the vise mounting assembly and the chain mounting assembly (fig. 67) and do not clamp over**

Table 1. Generator Test Data

1	2	3	4	5	6		7			8	
					Field-Current-Draw		Output			Pulley	
Group	Mfg No.	Ord Part No.	Type	Rotation 1 2	Volts	Amps	Rpm	Volts	Amps	Mfg No.	Ord Part No.
				Auto-Lite							
2B	GEG–5002	7540262	W/O PULLEY	C	5	1.3–1.5	1575	8	40	AL–SP502	0345710
2B	GEG–5002A	7540277	W/PULLEY	C	5	1.3–1.5	1575	8	40	.....	0345710
2B	GEG–5002D	0196300	W/PULLEY	C	5	1.3–1.5	1575	8	40	.....	0345710
2B	GEG–5101	7743676	W/O PULLEY	C	5	1.3–1.5	1575	8	40	.....	0345710
2B	GEG–5101D	7734389	W/PULLEY	C	5	1.3–1.5	1575	8	40	AL–SP484A	7734834
2B	GEG–5001A	D196299	W/PULLEY	C	5	1.3–1.5	1575	8	40	AL–SP484A	7734834
3	GDJ–4808	7713901	W/O PULLEY	C	10	1.1–1.3	1125	15	55	.....	7713902
3	GDJ–4808A	7007460	W/PULLEY	C	10	1.1–1.3	1125	15	55		
3	GDJ–4824A	6249017	W/PULLEY	C	10	1.1–1.3	1125	15	55		
2B	GGA–4801A	C–128436	W/PULLEY	C	10	1.1–1.3	1600	15	40		
				Delco-Remy							
	985	D–48138	W/O PULLEY	C	12	1.46–1.62	1000	13	54	DR1884041	B–184141
2	1105906	C–139535	W/O PULLEY	C	12	1.1–1.2	1500	15	26	.....	B–282979
4	1117308	C–126149	W/O PULLEY	C	12	1.46–1.62	950	13	55	DR1884041	B–184141
	1117492	7354165	SPLINE DR	CC	24	.85–.89	1600	28.5	25		
4	1117309	078456	W/O PULLEY	CC	24	1.0–1.20	1700	26	50	AL–SP631	B–206331
4	1117486	7524474	W/O PULLEY	C	24	.85–.89	1600	28.5	25	AL–SP966	7374744
5	1117495	7355736	W/O PULLEY	C	24	.85–.89	1600	28.5	25	AL–SP992	7375071
	1902661	A–348554	W/FAN AND PULLEY	CC	24	0.76–0.84	1670	26	50		
				Auto-Lite							
3	GFR–4803B	7744142	W/PULLEY	CC	20	0.7–0.8	1675	30	50		
3	GFR–4804	7712806	S/O PULLEY	CC	20	0.7–0.8	1700	28.5	50	AL–SP631	B–206331
3	GFR–4804B	5700080	W/PULLEY	CC	20	0.7–0.8	1675	30	50		
4	GHA–4802BUT	7374750	W/O PULLEY	C	20	0.7–0.8	1800	28.5	25	AL–SP966	7374744
				Eclipse-Pioneer							
	F91810	D–47404	.....	CC	24	1.1–1.2	1700	28.5	50		
				General Electric Company							
	P8499315	7021505	W/PULLEY & REG		24	1.65–2.95	4500	28.5	150		
				Leece & Neville Generator (Alternator)							
	5258012P	.....	.....	C	22.6	8.20	2000				
	5300G12P	7954720	.....	C	21.0	7.70	5000	28	100	37397	8699739

1/C—Clockwise rotation at drive end.
2/CC—Counterclockwise rotation at drive end.
Note. Additional generators which can be tested on test stand are Auto-Lite GDJ–4820 and Delco Remy A8585. Refer to manufacturer's literature or available publications for data on these items.

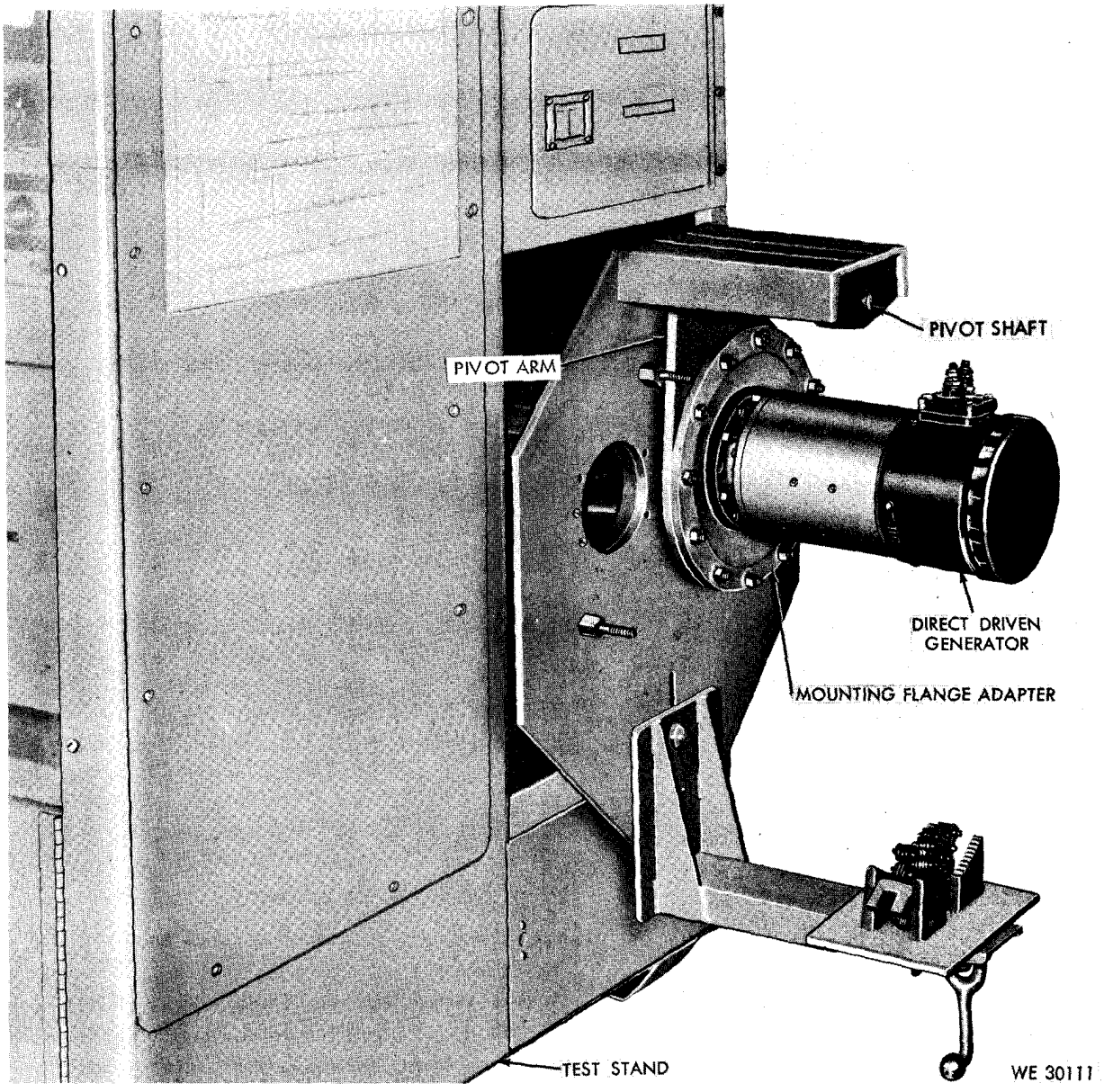


Figure 19. Direct-driven generator-installed view.

shell sections (sheet metal) not supported by stator or flange iron to prevent crushing the sheet steel alternator shell.

96. Mounting Starters (Cranking Motors) and Testing Arrangements

Mounting of starters (cranking motor) is done in a similar manner as the method used for mounting a pulley driven generator or alternator (par. 95c and *d).* Refer to referenced paragraphs above, and figures 22, 23, 24, 25, 26, and 27, which illustrate the different type mounting arrangements and other information for setting-up the several kinds of starters for testing. Refer to paragraphs 133 and 134 for test procedures and further information on starters. The equipment illustrated on the above figures for performing these tests is listed and illustrated in appendix II.

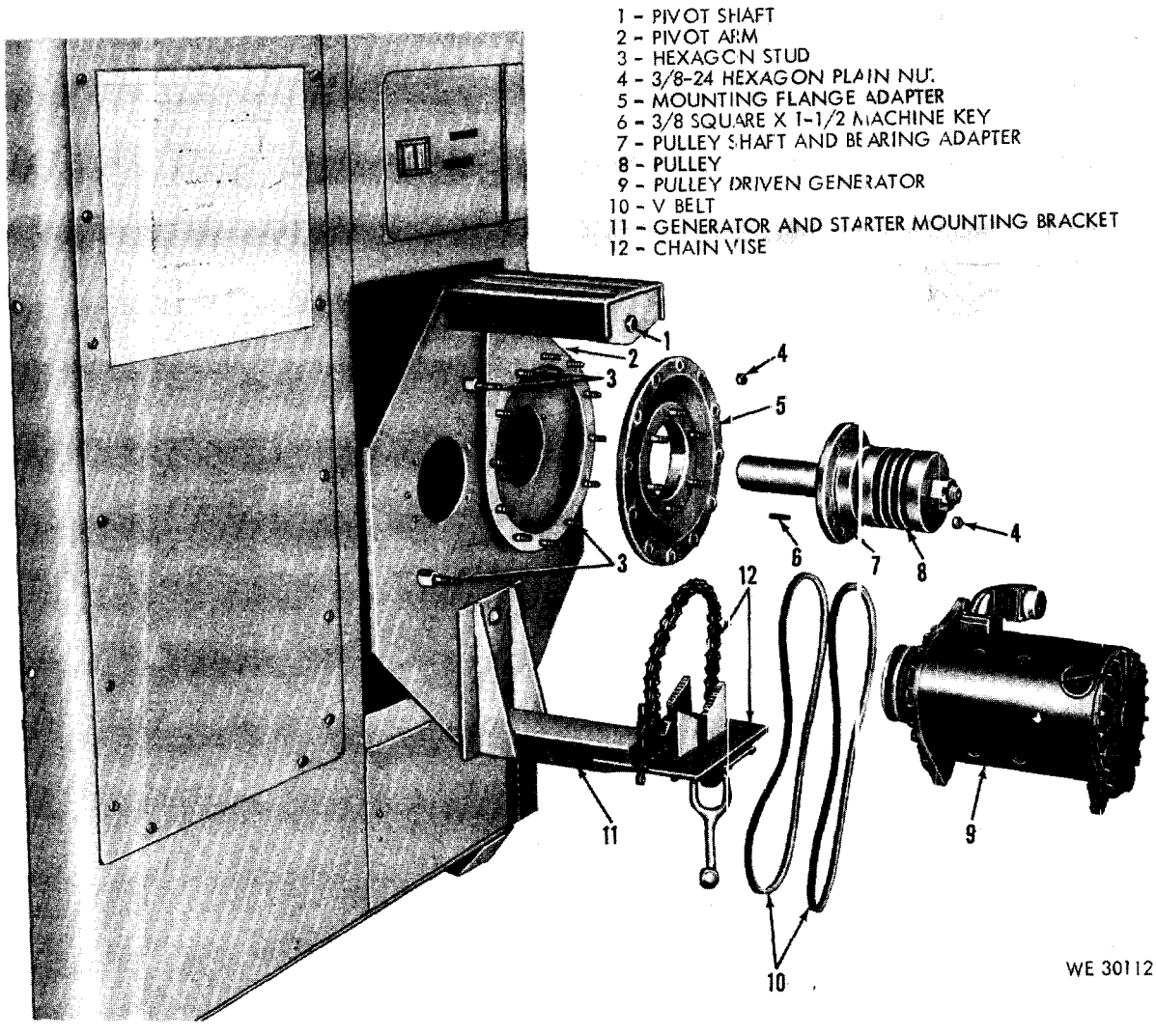


Figure 20. Components used for mounting pulley-driven generaator or alternator.

97. Operating the Tachometer Indicator Circuitry

Note. The key numbers shown below in parentheses refer to figure 16 except where otherwise indicated.

a. General. The tachometer indicator circuitry is so designed that the speed or rpm (revolutions per minute) of the generator or alternator being tested, whether direct-or-pulley-driven, is indicated. It consists of a tachometer generaton (B, fig. 64), tachometer indicator meter (3), several control switches (18 and 19) and a potentiometer (58) for calibrating the circuitry. To determine the speed or rpm of the generator being tested proceed with calibrating procedures as follows :

b. Direct-Driven Generator.

(1) Obtain the rated speed (rpm) for the general or to be tested from table 1, paragraph 95, or from manufacturer's literature or nameplate data on generator.

(2) If the rated speed is below 3,000 rpm, mount the generator on the low speed driving head (5, fig. 7). When the rated speed is above 3,300 rpm, mount the generator on the high speed driving head (4, fig. 7). Follow mounting procedures prescribed in paragraph 94.

(3) Turn the tachometer indicator high-low switch (18) to the "LOW" posi-

tion and the tachometer indicator direct-drive-calibrating potentiometer switch (19) to the "DIRECT DRIVE" position.

(4) Start the varidrive assembly as prescribed in paragraph 93.

(5) Obtain the reading from either the 0-3.3 (low speed range) or 0-12 (high speed range) scale on the face of the tachometer indicator meter (3), depending on which driving head the generator is mounted, and multiply this reading by 1,000 to determine the speed in rpm.

(6) After the test has been completed, stop the varidrive assembly as prescribed in paragraph 93 and remove the generator from the driving head.

c. Pulley-Driven Generator or Alternator. When testing a pulley-driven generator or al-

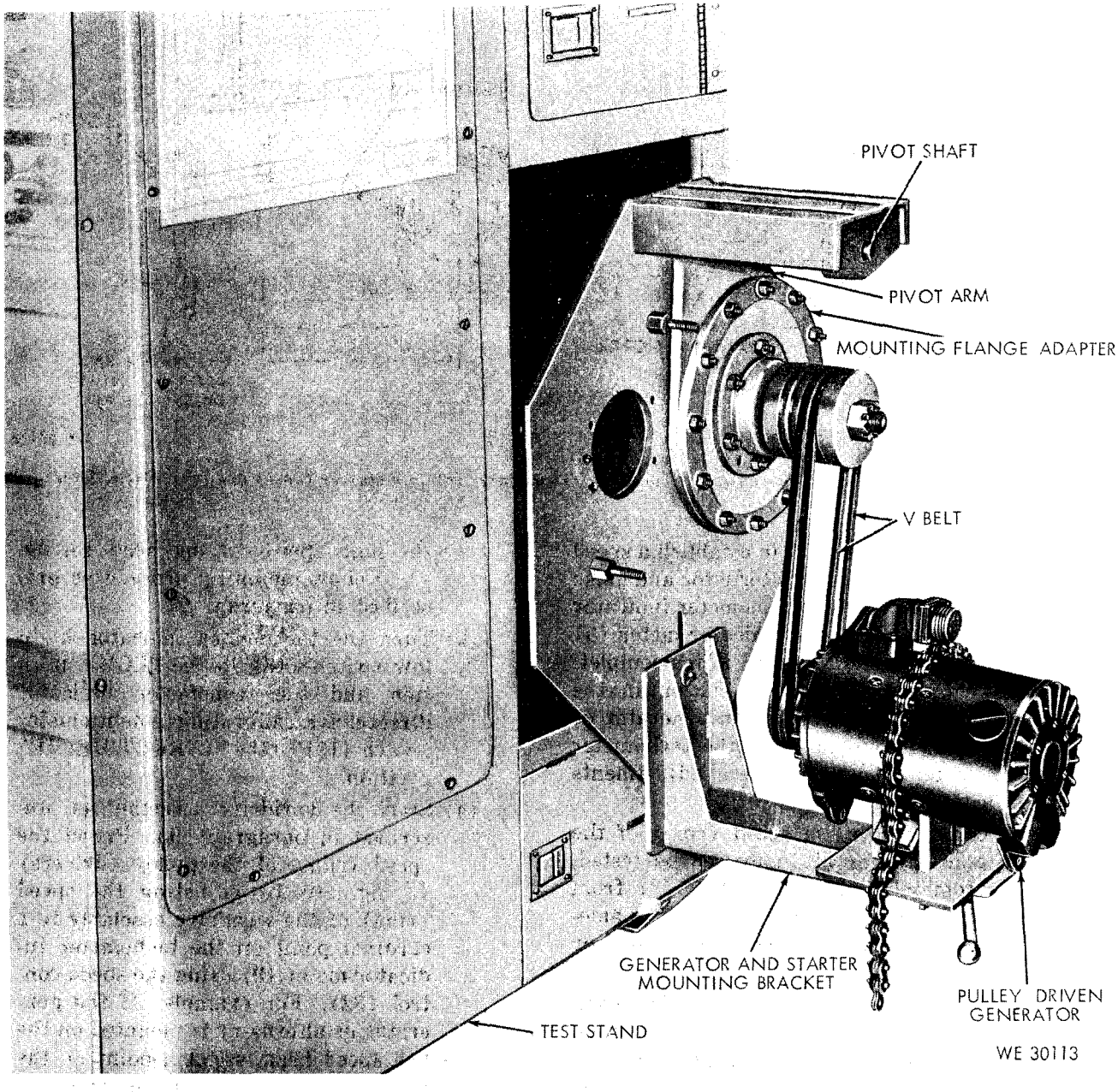


Figure 21. Pulley-driven generator—installed view.

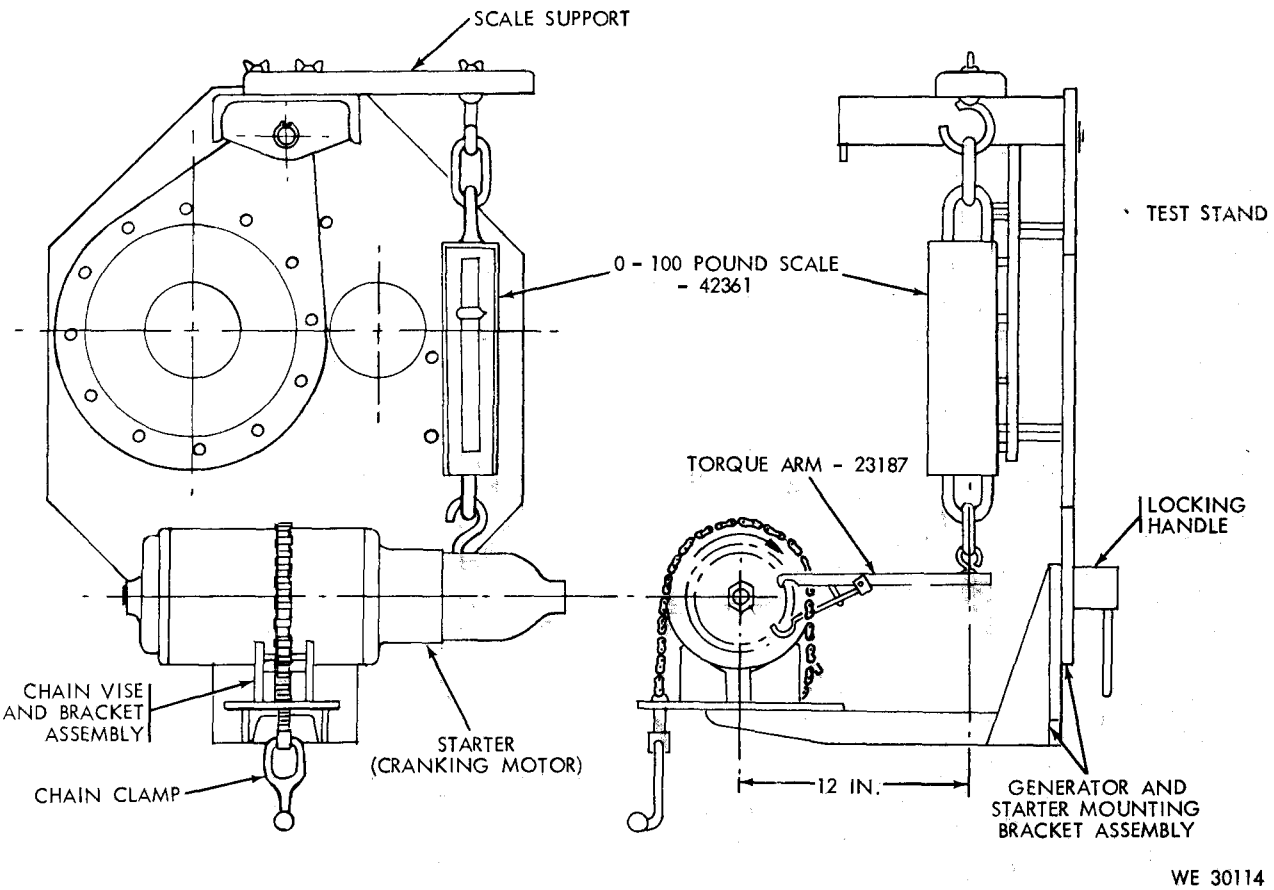


Figure 22. Starter torque test—chain vise mounted for clockwise rotation starter (hook type torque arm drive).

ternator it will be necessary to establish a speed (rpm) for the generator or alternator and make certain adjustments to the tachometer indicator circuitry so the tachometer indicator meter (3) will indicate this speed (rpm). After completing these adjustments, any variation in the speed (rpm) of the pulley driven generator or alternator will be indicated on the tachometer indicator meter. To make these adjustments proceed as follows:

(1) Obtain the rated speed (rpm) of the generator or alternator to be tested, from table 1, paragraph 95, or from manufacturer's literature or nameplate data on the generator or alternator.

(2) If the rated speed is below 3,300 rpm, mount the generator or alternator on the low speed driving head (5, fig. 7). If the rated speed is above 3,300 rpm, mount the generator or alternator on the high speed driving head (4, fig. 7). Follow mounting procedures prescribed in paragraph 95.

(3) Turn the tachometer indicator high-low switch (18) to the "LOW" position and the tachometer indicator direct-drive calibrating potentiometer switch (19) to the "DIRECT DRIVE" position.

(4) Start the varidrive assembly as prescribed in paragraph 93. Preset the speed (rpm) of the pulley (drivers) (8, fig. 20) by adjusting the speed (rpm) of the varidrive assembly to a cardinal point on the tachometer indicator meter (3) using the speed control (32). For example: If the generator or alternator is mounted on the low speed head, select a point on the tachometer indicator meter (reading on lower scale) in the vicinity of 2,000

rpm. If mounted on the high speed head, select a point on the tachometer indicator meter (reading on upper scale) in the vicinity of 6,000 rpm.

(5) Determine the speed (rpm) on the driven generator or alternator pulley using the following formula:

$$Y = \frac{(x) \times 4}{D}$$

Where Y = Speed (rpm) of driven generator or alternator (9, fig. 20) pulley

(X) = Preset speed (rpm) of pulley (driver) on test stand (8, fig. 20)

D = Diameter of driven pulley (generator or alternator) (9, fig. 20).

4 = Diameter of driven pulley of the generator or alternator (9, fig. 20).

(6) Turn the tachometer indicator calibrating potentiometer (58) to the "MAX" position and the tachometer indicator direct-drive-calibrating potentiometer switch (19) to the "CAL POT" position.

(7) If the speed (rpm) of the driven pulley calculated in (5) above is greater than the preset speed (rpm) of the driver pulley in (4) above, turn the tachometer indicator high-low switch (18) to the "HI" position. If the speed (rpm) of the driven pulley is less than the preset speed (rpm) of the driver pulley, turn the switch (18) to the "LO" position.

(8) Turn the tachometer indicator calibrating potentiometer (58) until the speed (rpm) calculated in (5) above is indicated on the tachometer indicator meter (3).

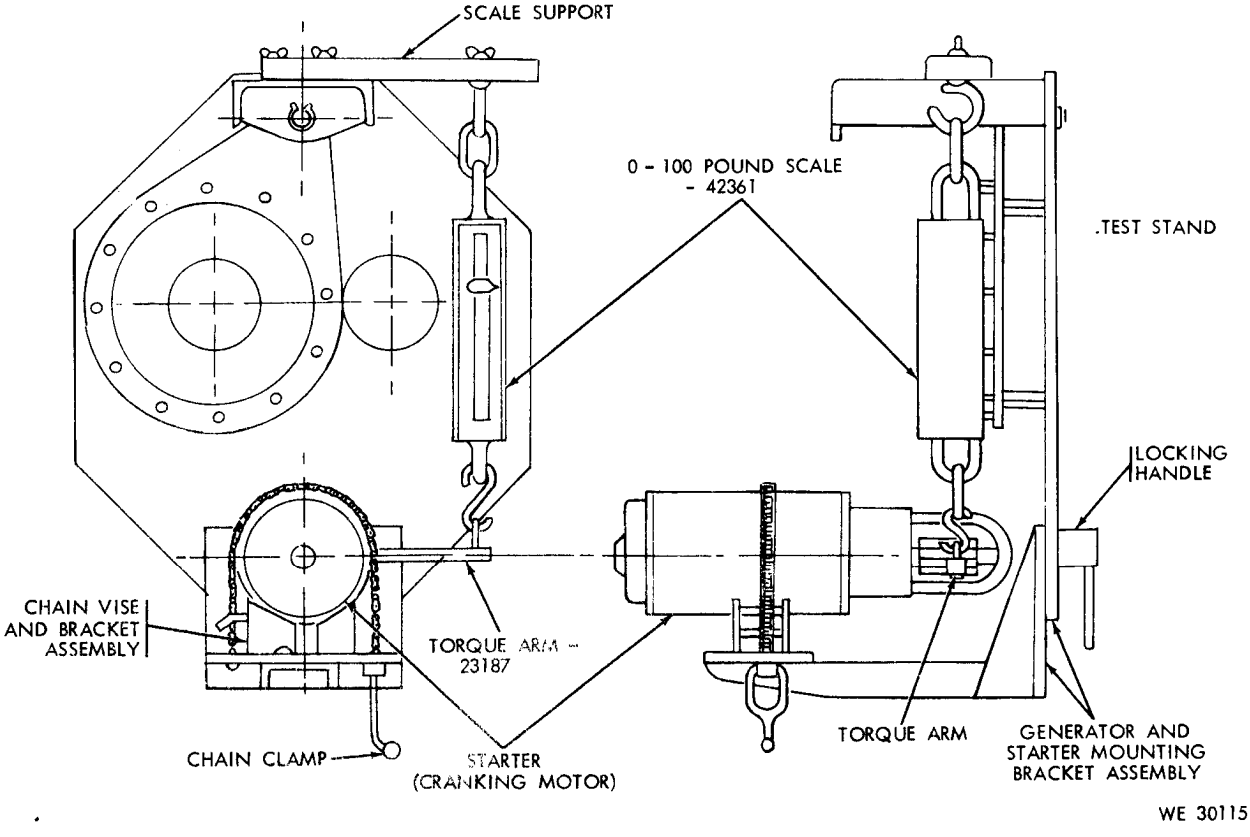


Figure 23. Starter torque test—chain vise mounted for counterclockwise rotation starter (hook type torque arm drive).

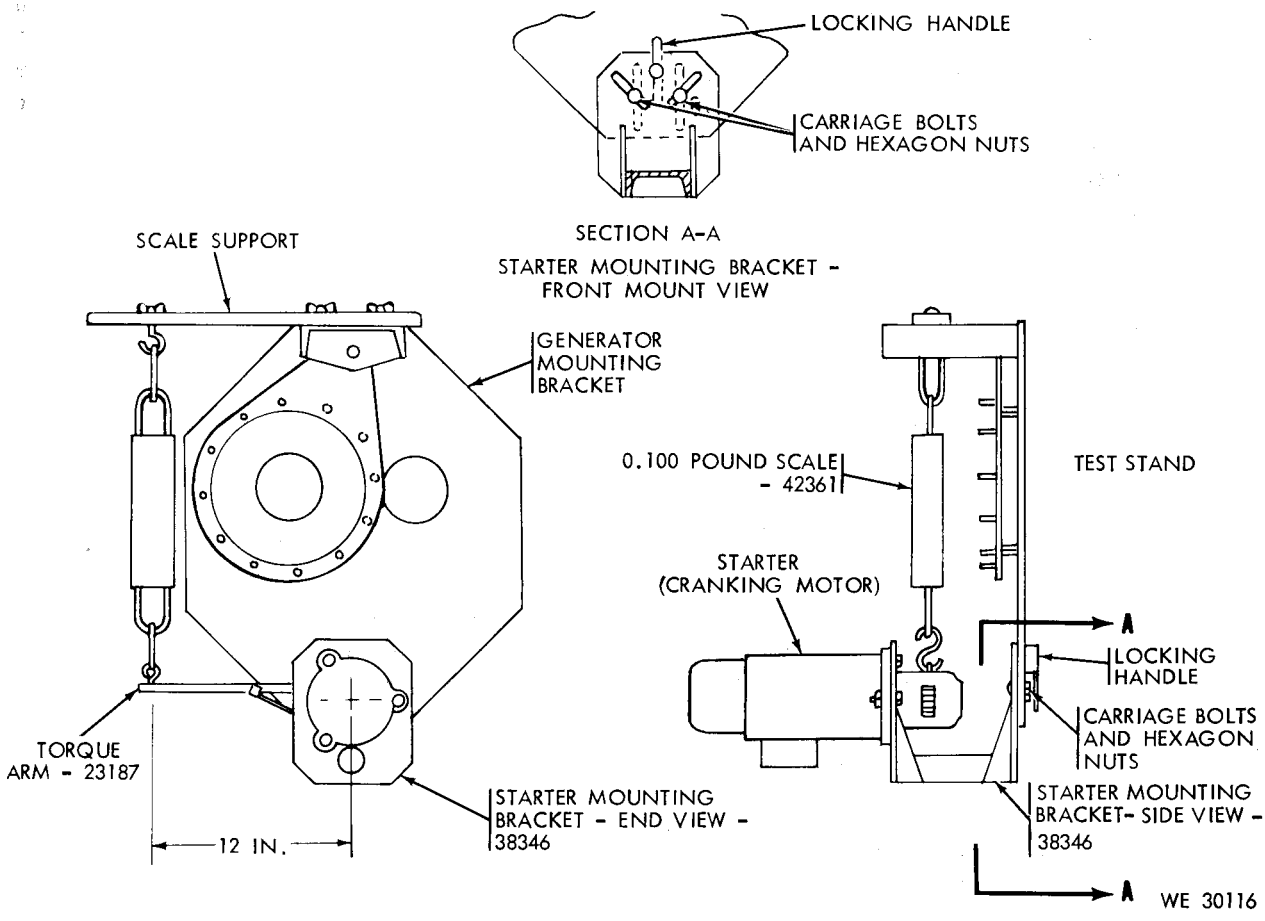


Figure 24. Starter torque test-starter mounting bracket mounted for clockwise rotation starter (hook type torque arm drive.)

(9) Refer to *c* and *d* below for examples of adjusting the varidrive assembly.

d. Example I. The preset speed (rpm) of the pulley (driver) (8, fig. 20) is 2,000, the diameter of the driven pulley of the generator or alternator (9, fig. 20) is 5 inches, and the diameter of the pulley (driver) (8, fig. 20) is 4 inches.

(1) Determine the speed (rpm) of the generator or alternator (9, fig. 20) driven pulley using the formula in b(5) above:

$$\frac{2{,}000 \times 4}{5} = 1{,}600 \text{ rpm}$$

(2) Install the pulley (driver) (8, fig. 20) and the pulley driven generator or alternator (9, fig. 20) on the low speed driving head (5, fig. 7), as prescribed in paragraph 95.

(3) Turn the tachometer indicator high-low switch (18) to the "LO" position and the tachometer indicator direct drive calibrating potentiometer switch (19) to the "DIRECT DRIVE" position.

(4) Start the varidrive assembly as prescribed in paragraph 93 and turn the handle of the speed control (32) clockwise until the tachometer indicator meter (3) reads 2,000 rpm.

(5) Turn the tachometer indicator calibrating potentiometer (58) to the "MAX" position and the tachometer indicator direct-drive calibrating po-

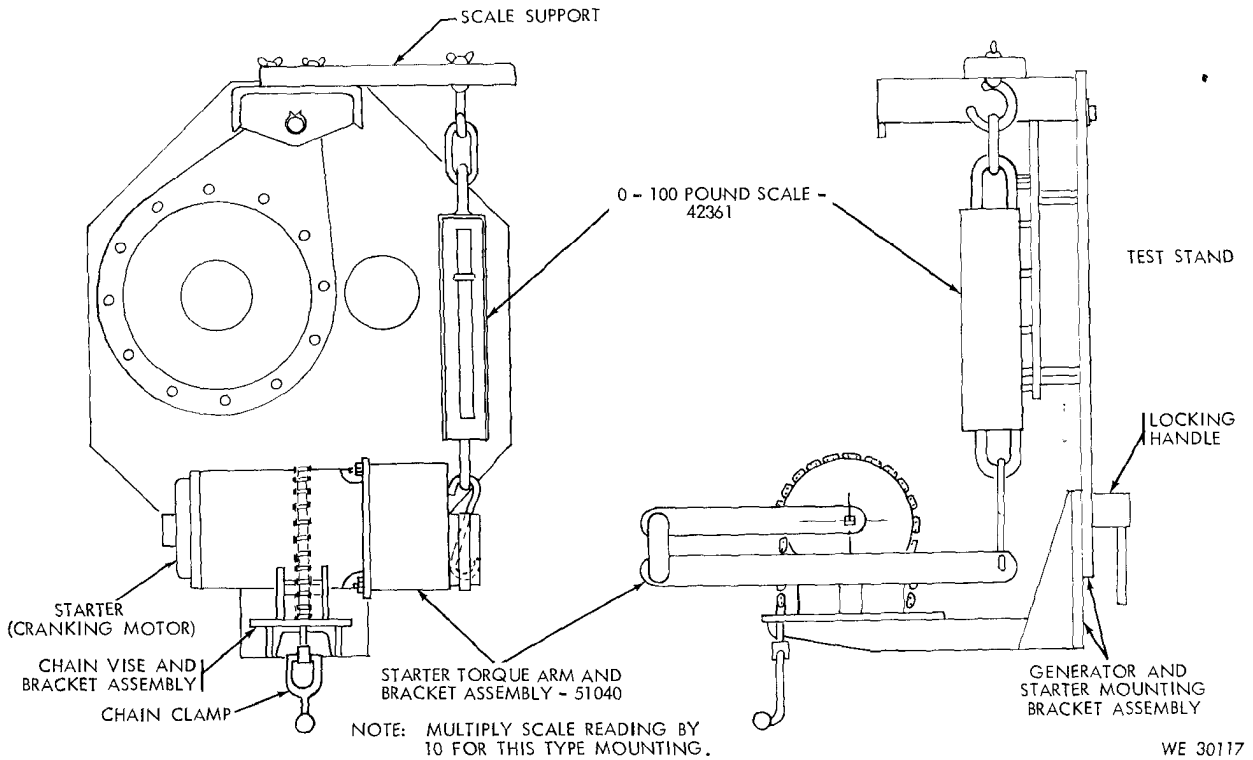


Figure 25. Starter torque test—chain vise mounted for counterclockwise rotation starter (jaw type torque arm drive).

tentiometer switch (19) to the "CAL POT" position.

(6) Leave the switch (18) in the "LO" position, d(3) above, and turn the tachometer indicator calibrating potentiometer (58) until the speed (rpm) calculated in (1) above (16,000 rpm), is indicated on the tachometer indicator meter (3) (lower scale on meter).

(7) After tests are completed, stop the varidrive assembly as prescribed in paragraph 93 and remove the generator or alternator from the test stand.

e. Example II. The preset speed (rpm) of the pulley (driver) (8, fig. 20) is 6,000, the diameter of the driven pulley of the generator or alternator (9, fig. 20) is 3 inches, and the diameter of the pulley (driver) (8, fig. 20) is 4 inches.

(1) Determine the speed (rpm) of the generator or alternator (9, fig. 20) driven pulley using the formula in b(5) above:

$$\frac{6{,}000 \times 4}{3} = 8{,}000 \text{ rpm}$$

(2) Install the pulley (driver) (8, fig. 20) and the pulley-driven generator or alternator (9, fig. 20) on the high speed driving head (4, fig. 7) as prescribed in paragraph 95.

(3) Turn the tachometer indicator high-low switch (18) to the "LO" position and the tachometer indicator direct drive calibrating potentiometer switch (19) to the "DIRECT DRIVE" position.

(4) Start the varidrive assembly as prescribed in paragraphs 93a and *b* and turn the handle of the speed control (32) clockwise until the tachometer indicator meter (3) reads 6,000 rpm.

(5) Turn the tachometer indicator calibrating potentiometer (58) to the

"MAX" position, the tachometer indicator direct drive calibrating potentiometer switch (19) to the "CAL POT" position, and the tachometer indicator high-low switch (18) to the "HI" position.

(6) Turn the tachometer indicator calibrating potentiometer (58) until the speed calculated in (1) above (8,000 rpm), is indicated on the tachometer indicator meter (3) (upper scale on the meter).

(7) After tests are completed, stop the varidrive assembly prescribed in paragraph 93d and remove the generator or alternator from the test stand.

98. Battery Charger Operation

Note. The key numbers shown below in parentheses refer to figure 16.

a. Checking Battery Voltage Condition.

(1) The voltage condition of the batteries within the test stand can be checked before tests are started to assure that the battery voltage is adequate for performing tests and to determine the rated voltage value of the batteries before charging. To perform this check, place the dc voltmeter range selector switch (22) in the "50V (X5)" position for a 24-volt check (for a 6-volt check set in the "10V (X1)" position and for a 12-volt check set in the "20V (X2)" position). Place the load dc ammeter range selector switch (15) in the "50A (X1)" position, and the voltage selector switch (41A) to the "24V" position for a 24-volt check (for a 6-volt check set in the "6V" position and for a 12-volt check set in the "12V" position).

(2) Turn the dc voltmeter circuit selector switch (23) to the "BAT VOLTS" position and place the battery on-off switch (41B) in the "ON" position.

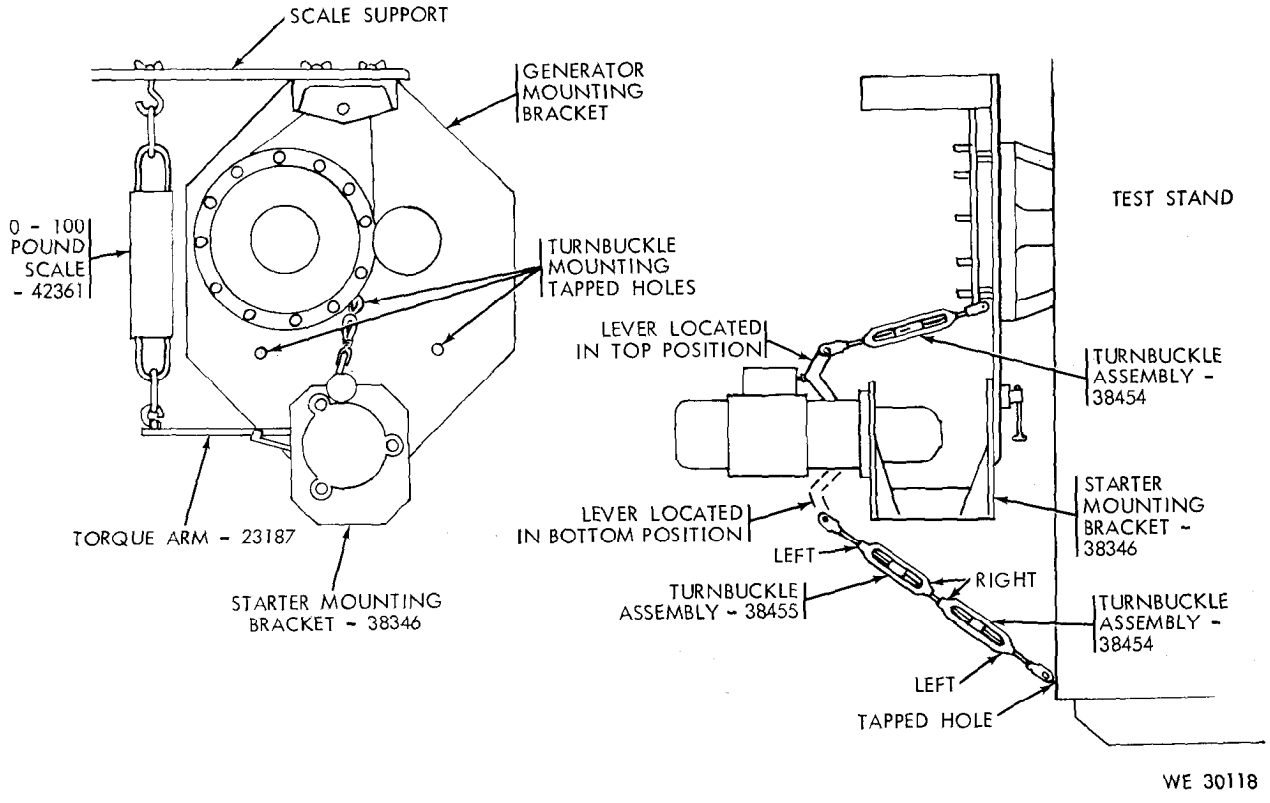


Figure 26. Installation and mounting arrangement of turnbuckles for holding starter pinion gear in position for engagement of torque arm hook or jaw.

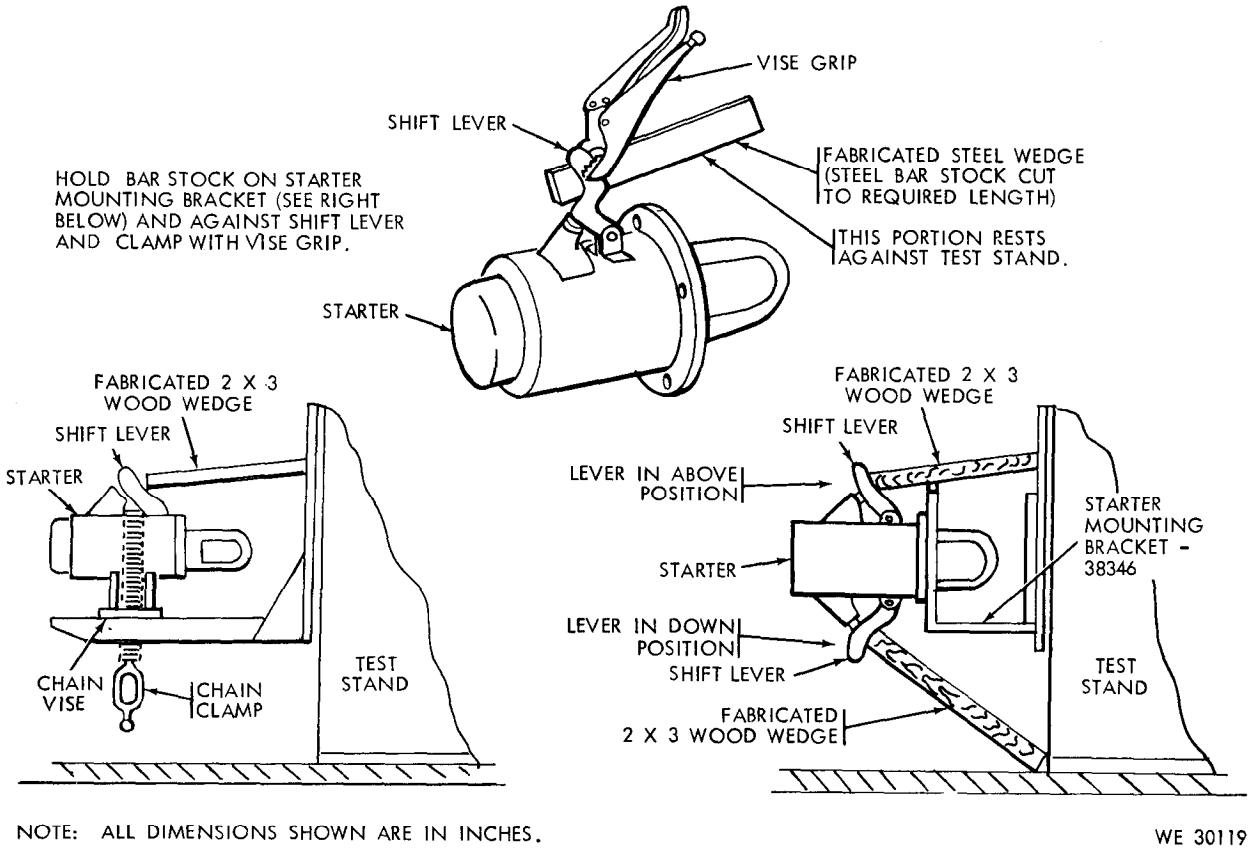


Figure 27. Installation and mounting arrangement of fabricated wedges for holding starter pinion gear in position for engagement of torque arm hook or jaw.

Read the voltage condition of the batteries on the dc voltmeter (5). Reading should be 24 volts or a few volts above for an adequate 24-volt check (6- or 12-volt check should read accordingly). Place the battery on-off switch (41-B) in the "OFF" position and turn the dc voltmeter circuit selector switch (23) to the "EXT VOLTS" position. If voltage readings are several volts below the readings specified above, connect the battery charger as prescribed in *b* below (also see note in *b* below).

Note. It is also advisable to check the batteries with a hydrometer for specific gravity. Refer to TM 9-6140-200-15 for details.

b. Connecting and Setting the Battery Charger.

Note. The procedures for checking the various battery voltage conditions (6-volt, 12-volt, and 24-volt) by setting the voltage selector switch (41-A) as specified in *a* above, will determine which circuit (6-, 12-, or 24-volt) need be recharged which can be accomplished by methods specified in (1) through (3) below, also, a battery cable length of 36 inches is provided. This allows the battery to be removed from the battery compartment so that the electrolyte can be checked with a hydrometer (the test stand under part number 7336-3 has a sliding platform which can be pulled outward for checking the batteries). Refer to TM 9-6140-200-15 for details covering storage batteries charging procedures.

(1) *6-Volt battery charging procedures.*

(a) Connect the batteries to the battery charging circuit (specified as hook-up for battery charger (4, fig. 9) by connecting the external dc voltmeter positive and negative binding posts (3, fig. 9) to the battery charge positive and negative binding posts (2, fig. 9) and to the "-6V" and "+12" battery connections located in the battery compartment as illustrated

in figure 9, using test leads number 38425 (fig. 74) .

(b) Slide the safety clip (33-B) off the stop button (33-C) to open the ac input circuit to the circuitry of the test stand. This is an essential procedure or the battery circuitry will be in an open condition and will not operate.

(c) Turn the voltage selector switch (41-A) to the "6V" position. Turn the knurled knob on the lower section of the battery charge timer (46) fully counterclockwise to reset the timer and open the battery charging circuit.

Note. Turning the knurled knob fully counterclockwise is an important procedure to follow, otherwise the battery charging circuit will not function properly.

(d) Turn the knurled knob on the battery charge timer clockwise to a specified time (see manufacturer's specifications and/or TM 9-6140-200-15) and depress the red button on the battery charger timer (46) and the battery charge indicator lamp (45) should light up. Rotate the battery charge circuit variable control (47) counterclockwise or clockwise until the voltage reading on the dc voltmeter (5) is approximately 2 volts below the voltage reading of 6 volts on the dc voltmeter (5), *a* (2) above.

(e) Turn the battery on-off switch to the "ON" position and push the lever of the battery charge rate read switch (60) up to "READ" position to check the amperage output of the battery charger on the load dc ammeter (1). The battery charge circuit variable control (47) can be turned counterclockwise or clockwise to obtain the specified ampere output reading on the dc ammeter (see manufacturer's specification and/or TM 9-6140-200-15) for the battery charger.

(f) The voltage reading on the dc voltmeter (5) will advance when adjusting the variable control (47), but this is a normal reaction when these adjustments are being made. It is also advisable to periodically check the rate of current charge on the load dc ammeter (1) with the battery charge rate read switch (60), as the current output of the battery charger will vary when the battery charger is in operation over a period of time. If the current reading has dropped, turn the variable control (47) clockwise until the correct current output is indicated on the load dc ammeter.

(g) The battery charger will automatically turn itself off when the battery charge timer (46) has timed out which will be indicated when the battery charge indicator lamp (45) goes out or the battery charger can be timed out if desired by turning the knurled knob on the timer fully counterclockwise.

(h) To disconnect the battery charge circuit completely, rotate the battery charge circuit variable control (47) fully counterclockwise. Place the battery on-off switch (41-B) in the "OFF" position and disconnect the complete hook-up (4, fig. 9) to the external dc voltmeter positive and negative binding posts (29) and the battery charge positive and negative binding posts (2, fig. 9) and the "-6" and "+12" connections located in the battery compartment (fig. 9). Place the batteries back in the battery compartment if removed for electrolyte check.

(2) *12-Volt battery charging procedures.* The procedures for charging the 12-volt battery system of the test stand is the same as prescribed in b(1) above, except the voltage selector switch (41-A) is set in the "12V" position, the dc voltmeter range selector switch (22) in the "20V (X2)" position, and the battery charge circuit variable control (47) is adjusted until approximately 2 volts reading is indicated below the 12 volt rating of the battery

system which will register on the dc voltmeter (5), a(2) above, and the correct ampere output reading is indicated on the load dc ammeter (1) with the correct time interval set on the battery charge timer (46) b(1) *(d)* and *(e)* above, (see manufacturer's specification and/or TM 9-6140-200-15). Turn off and disconnect the battery charge circuit and replace batteries in the battery compartment as prescribed in *b(1) (h)* above.

(3) *24-Volt battery charging procedures.* The procedures for charging the 24-volt battery system of the test stand is the same as prescribed in b(1) above, except the voltage selector switch (41-A) is set in the "24V" position, the dc voltmeter range selector switch (22) in the "50V (X5)" position, and the battery charge circuit variable control (47) is adjusted until approximately 2 volts reading is indicated below the 24 volt rating of the battery system which will register on the dc voltmeter (5), a(2) above, and the correct ampere output reading is indicated on the load dc ammeter (1) with the correct time interval set on the battery charge timer (46) b(1) *(d)* and *(e)* above, (see manufacturer's specifications and/or TM 9-4910-200-15). Turn off and disconnect the battery charge circuit and replace the batteries in the battery compartment as prescribed in *b(1) (h)* above.

99. Testing and Polarizing Internal-Ground Field and External-Ground Field Generators (fig. 28)

a. General. The generator regulators of automotive generators are either standard-duty or heavy-duty. The difference between the two systems is the method of grounding the field coil of the generator (fig. 28). In standard-duty generator regulators, the generator field coil is externally grounded, whereas, in the heavy-duty generator regulator, the generator field coil is internally grounded. For details for preparing the test stand for these two types of grounded generators and for polarizing instructions refer to *b* through *d* below.

b. Generator Regulator not used in the System. When using the 40-ohm or the 250-ohm field current rheostat (52 and 55, fig. 16) to control the output of the generator having no generator regulator connected in the system, the generator field external-internal ground switch (51, fig. 16) must be placed in either the "EXT-GND" or "INT-GND" position, depending upon the system under test, *a* above.

c. Generator. Regulator used in the System. When a generator regulator is used in the system under test to control the output of the generator, the generator regulator itself will complete the field circuit and provide the correct ground for the system. In this hook-up the generator field external-internal ground switch (51, fig. 16) is not required and is placed in the center "OFF" position.

Note. Attach the leads from the generator to the test stand in the same manner for either external-ground field or internal-ground field.

d. Polarizing Methods for Internal and External Ground Field Generator.

(1) *General.* After a generator has been repaired and reinstalled on a vehicle or at any time before or after a generator has been tested, it must be depolarized to make sure that it has the correct polarity with respect to the battery it is to charge or to have the correct polarity to perform tests on the generator. Failure to depolarize the generator may result in burned relay contact points, a run-down battery and possibly serious damage to the generator itself when assembled on the vehicle or incorrect test results when testing it on the test stand. The procedure to follow in correcting generator polarity depends upon the generator-regulator wiring circuits-that is, whether the generator field is internally grounded or is grounded through the regulator (externally grounded).

(2) *Polarizing internal and external ground field generators using battery current of vehicle.*

(a) Internal ground field type (heavy duty system) (fig. 28.) Mount the generator regulator on the vehicle

and, after all leads are connected, disconnect the lead from the "FIELD" terminal ("B" terminal) of the generator regulator and momentarily touch this lead to the generator regulator "BATTERY" terminal ("A" terminal). This allows a momentary surge of current to flow through the generator field coils so that the generator is correctly polarized.

Caution: **Always disconnect the field terminal lead from the regulator when touching battery terminal on the generator regulator during polarizing procedures. Never apply battery voltage to the field terminal of the generator regulator, such as shorting from the battery terminal to field terminal of the generator regulator, or by connecting a jumper wire directly from the battery to the generator field terminal. This action causes excessive current to flow from the battery through the generator regulator contacts to ground, thus burning the points.**

(b) External ground field type (standard duty system) (fig. 28). Mount the generator regulator on the vehicle and connect a jumper lead momentarily between the "ARMATURE" and "BATTERY" terminals of the generator regulator (relay on third brush generators) after leads have been reconnected but before the engine is started. This allows a momentary surge of current to flow through the generator so that it is correctly polarized.

Caution: **Determine the type generator (internal or external ground field) before attempting to repolarize it since using the wrong polarizing will result in reversed generator polarity and serious damage to the electrical equipment, (1) above, will occur.**

(3) *Polarizing generator using the test stand (heavy-duty system).*

Note. The key numbers shown below in parentheses refer to figure 16 except where otherwise indicated.

(a) Turn all range selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (some toggle switches have center position as off) (fig. 16).

(b) Mount the generator to be polarized (if not already mounted for other tests) on the test stand (high speed or low speed driving head (4 and 5, fig. 7)) as required (par. 94), and connect to the generator input binding posts (13, fig. 15) (prepare the test stand, refer to specific test, chapter 3).

(c) Connect a test lead number 38425 (fig. 74) to the dc variable external volts positive (red) binding post and a test lead number 38425 to the dc variable external volts negative (black) binding post (28-C).

(d) Connect the test lead, *(c)* above, from the dc variable external volts positive (red) binding post (28-C) to the "F" generator input binding post (13-D, fig. 15).

(e) Connect the test lead, *(c)* above, from the dc variable external volts negative (black) binding post (28-C) to the ground (GND) binding post (10-E, fig. 15).

(f) Be sure the dc voltmeter range selector switch (22) is in the "50V (X5)" position and place the dc voltmeter circuit selector switch (23) in the "VARIABLE VOLTS" position.

Caution: **Be sure the dc variable power supply control (48) is in the fully counterclockwise position.**

(g) Place the variable external volts on-off switch (28-A) in the "ON" position.

(h) Place the polarity reversing switch (50) in the "POS GND" or "NEG GND" position (position of this switch will vary according to system

under test, pars. 100 and 101) and slide the safety clip (33-B) off the stop button (33-C).

Note. The safety clip (33-B) must be off the stop button (33-C) to perform the polarizing procedures, (3) above. Do not push the start button (33-A) as the varidrive assembly need not be running for this test.

(i) Turn the dc variable power supply control (48) SLOWLY clockwise while observing the dc voltmeter (5) until a 6 volt reading is obtained on the dc voltmeter, hold at this voltage for about 5 seconds, then turn the dc variable power supply control (48) fully counterclockwise.

(j) The generator is now properly polarized. Place the variable external volts on-off switch (28-A) in the "OFF" position and turn the dc voltmeter circuit selector switch (23) to the "RECT GEN" position.

(k) Remove test leads *(c), (d),* and *(e)* above.

100. Positive Ground Systems

When testing systems having a positive ground (fig. 29) place the polarity reversing switch (50, fig. 16) in the "POS-GND" position and connect the generator armature terminal to the "G-" binding post (13-B, fig. 15) of the generator input binding posts of the test stand. Connect the generator frame (ground) to the "G+" binding post (13-A, fig. 15) of the generator input binding posts.

101. Negative Ground Systems

When testing systems having a negative ground (fig. 29), place the polarity reversing switch (50, fig. 16) in the "NEG-GND" position and connect the generator armature terminal to the "G+" binding post (13-A, fig. 15) of the generator input binding posts of the test stand. Connect the generator frame (ground) to the "G-" binding post (13-B, fig. 15) of the generator input binding posts.

102. Checking the Setting of Voltage Regulator Unit

a. The method used to check the setting of the voltage regulator unit (fig. 34) of a gen-

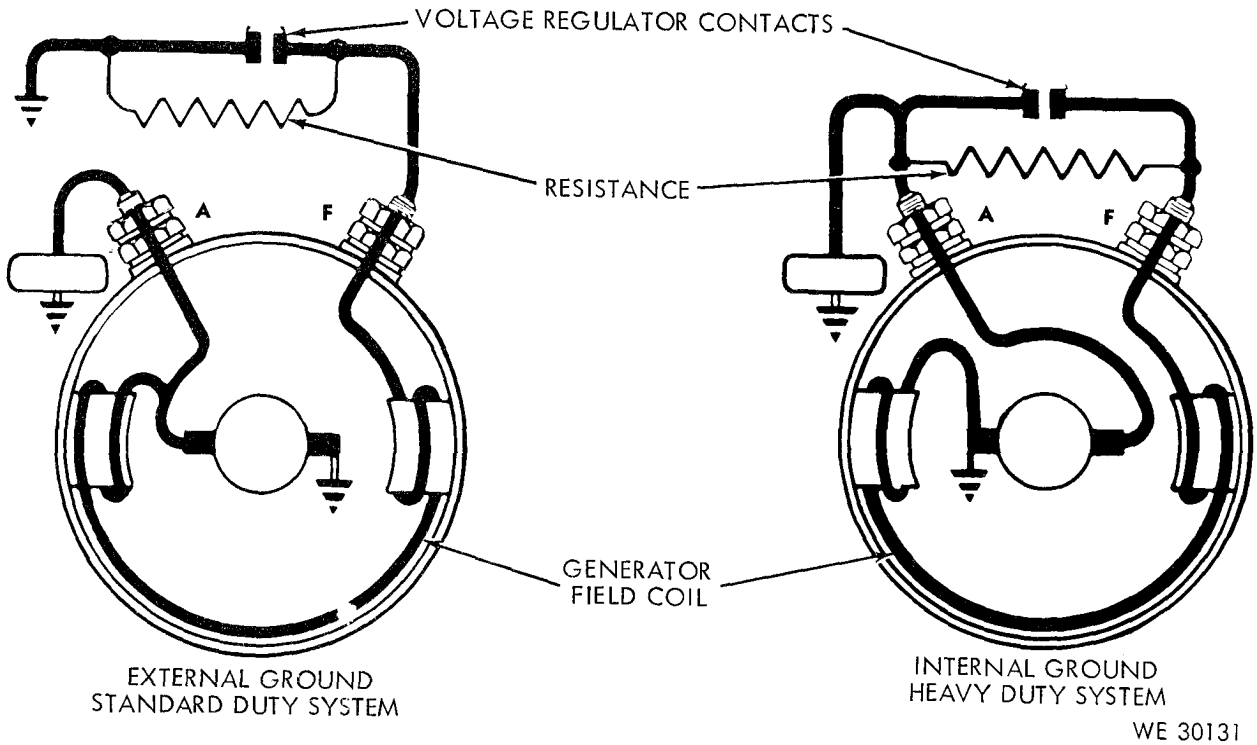


Figure 28. Internal-ground (heavy-duty system) generator field and external-ground (standard-duty system) generator field.

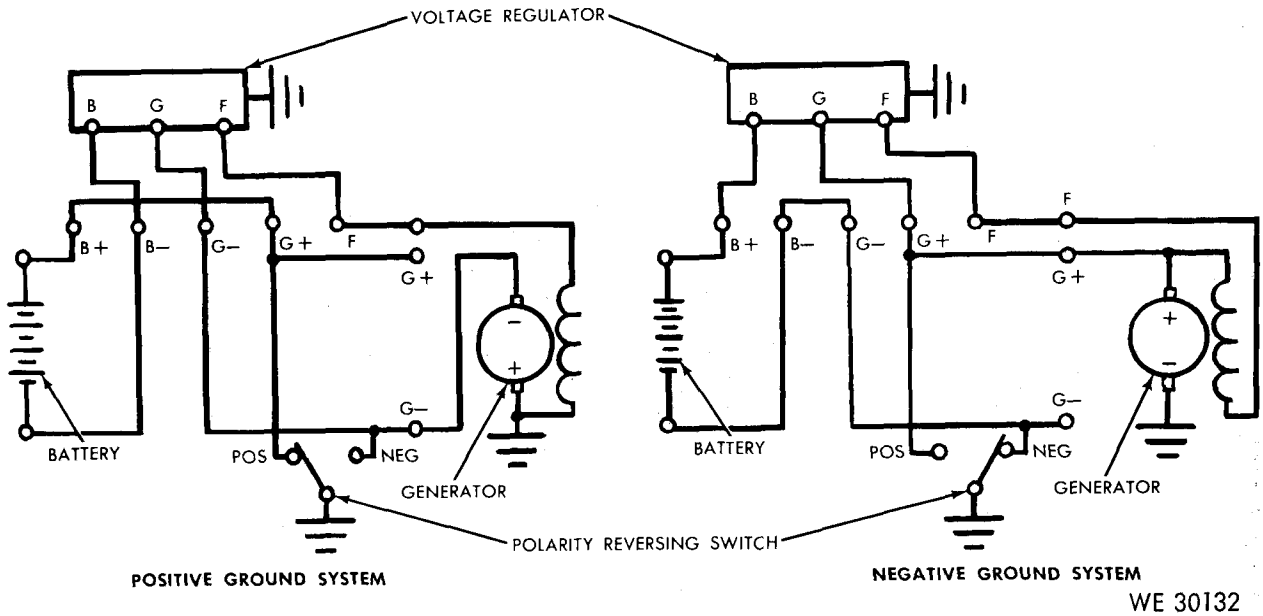


Figure 29. Positive and negative ground systems.

erator regulator is the "Fixed Resistance Method." The fixed resistance is substituted for the external charging circuit and is connected in series with the circuit to compensate for the fluctuation in the resistance value of the circuit (lights turned on, battery not fully charged, etc.). Resistors of 0.25 ohm, 0.75 ohm, 1.5 ohms, 2.25 ohms, and 7.0 ohms are provided within the test stand and the selection of these different value resistors is made through a selector switch (36-A, fig. 16).

b. To connect this resistance in the circuit the lead number 38425 is disconnected from the battery terminal (marked "A") (fig. 31) at the generator regulator and this lead is connected to the regulator check binding post (36-B, fig. 16) on the test stand main control panel. Using another test lead number 38425, connect the binding post (36-B, fig. 16) to the battery terminal marked "A" (fig. 31) on the generator regulator. By connecting the resistance value of 0.75 ohm, 1.5 ohms, 2.25 ohms, or 7.0 ohms through the fixed resistance selector switch (36-A, fig. 16), these respective values will then be connected between the "BAT" terminal of the generator regulator and the negative bus circuit or ground in the test stand.

c. Normally, the 0.75 ohm is used with 6-volt units, the 1.5 ohms with 12-volt units, and the 7.0 ohms with 24-volt units, however, with 6-volt units of less than 15 amperes capacity some specifications will call for the use of 1.5 ohm fixed resistance to avoid interference with the current regulator unit of the generator regulator, and with 12-volt units of less than 15 amperes capacity the use of 2.25 ohms resistance for the same reason. The 0.25 ohm resistance is used for certain 6 and 12-volt systems, but is connected to the plus or positive bus circuit in the test stand. Refer to data in pertinent publication and/or manufacturer's literature covering the unit under test for information relative to these circumstances.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

103. General

In addition to the normal operating procedures described in Section III, Operation Under Usual Conditions, special instructions for operating under unusual conditions are contained herein. In addition to the normal preventive-maintenance services (pars. 90 through 102), special care in cleaning and lubrication must be

observed when extremes of temperature, humidity, and atmospheric conditions are present. Proper cleaning, lubrication, and storage and handling of lubricants not only insure proper operation and functioning, but also guard against excessive wear of the working parts and deterioration of the materiel.

104. Operation in Extreme Cold-Weather Conditions

a. General. Other than as specified below, operation under extreme cold-weather conditions will be the same as under usual conditions.

b. Batteries. Refer to TM 9-6140-200-15 for procedures to follow for the care of batteries when used under unusual conditions.

c. Lubrication. Lubricate the test stand in accordance with prevailing temperatures as prescribed in the lubrication chart (fig. 62) and paragraphs 139 through 141.

d. Starting. Start the varidrive assembly (par. 93a and *b)* and allow the assembly to run for at least 15 minutes at approximately 1,000 rpm to warm up completely before starting tests.

105. Operation in Extreme Hot-Weather Conditions

a. General. The test stand should be situated so that it is protected from the direct rays of the sun during operation. Keep the air intake and exhaust free of obstructions which may hamper proper ventilation. Be alert during operation for unusual odors, smoke, noises, or other indications of an overheated varidrive assembly or unit under test.

b. Batteries. Refer to paragraph 104b.

c. Lubrication. Lubricate the test stand in accordance with prevailing temperatures as prescribed in the lubrication chart (fig. 62) and paragraph 141.

106. Operation in High Humidity

Start the test stand and run the test stand approximately 15 minutes at 1,000 rpm to allow circulation of air within the cabinet to dissipate any condensation. When moving the test stand from a low-temperature area to a high-temperature area, keep the unit covered, if possible, with a waterproof coverage until it warms to ambient temperature in order to minimize "SWEATING" or moisture formation.

CHAPTER 3

OPERATOR TESTING INSTRUCTIONS

Section I. GENERAL

107. Purpose

The instructions contained in this chapter cover testing of items for serviceability and detecting and locating malfunctions using the test stand. Testing for serviceability and locating malfunctions is a detailed and exacting procedure, requiring specific instructions for each item. In addition to instructions in this chapter, any available data in pertinent publications and/or manufacturer's literature covering the unit under test are also required to properly test each item and to prevent damage to the test stand or the item (s) being tested.

108. Scope

The basic data, instructions, operations, and test procedures covered in this chapter are for specific items which can be checked and tested using the test stand. Personnel performing tests should have a good understanding of the theory and operation of each circuit and units of the item being tested. Each item must first be thoroughly bench inspected, adjusted, and in some instances bench tested before attempting to test the item on the test stand. Always refer to the latest manufacturer's literature and available pertinent technical manual and/or technical bulletin for the item, as these publications will contain the current rebuild procedures, settings, and adjustments. To obtain a more accurate setting and adjustment, units should be reset and readjusted several times, and a test made after each setting and adjustment.

109. Serviceability Test Procedures

a. General. The items tested in this chapter are interrelated, therefore, it will be necessary to test each of the items with serviceable components, e.g., the generator to be tested is mounted on the test stand with a known serviceable generator regulator or generator control box; or an alternator is mounted on the test stand with a known serviceable rectifier and generator regulator. Procedure to follow for determination of serviceability are given in *b*, *c*, and *d* below.

b. Generator Serviceability Test. To determine the serviceability of a generator, tests are performed on the test stand without a generator regulator or generator control box in the circuit. Serviceability tests of this type with serviceability standards are listed in sections under specific manufacturer and model in this chapter. Refer to the section covering generator under test for these test procedures and serviceability standards.

c. Generator Regulator or Generator Control Box Serviceability Test. Serviceability of the generator regulator or generator control box can be determined by testing either of these items in the circuit with a serviceable generator. Test procedures and serviceability standards for tests of this type are listed in sections of this chapter in the same manner as specified in *b* above.

d. Ac/dc System (Alternator, rectifier, and generator regulator). Refer to TB 9-2300-206-15 for procedure for checking and testing the components of this system before mounting on the test stand for testing.

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section II. TESTING DELCO PRODUCTS AND AUTO-LITE 25-AMPERE GENERATORS

110. Description

The generators listed in paragraph 111 can be tested by methods prescribed in this section. They are waterproof types and are pulley-driven with a clockwise shaft rotation at drive end (turns to the right facing pulley). Refer to TM 9-8627 and TM 9-2920-209-35 for complete descriptive information.

111. 25-Ampere Generator Performance Test (Delco-Remy and Auto-Lite)

a. Purpose. This test is performed to determine whether the generator is functioning in accordance with the manufacturer's specifications for ampere and voltage output when operating under normal conditions.

b. Tabulated Data.

(1) *Delco Products (Delco-Remy) generators.*

Model 1117486 (4 brush)	ORD 7524474
Model 1117495	ORD 7355736
Volts (field-current draw)	24
Rated volts (cold output)	28.5
Rated amperes (cold output)	25
Revolutions per minute (for rated output)	1750
Ground polarity	negative
Field ground	internal

(2) *Auto-Lite Generators.*

Model GHA-4802 UAT	ORD 7355736
Model GHA-4802 BUT	ORD 7374750
Volts (field-current draw)	20
Rated volts (cold output)	28.5
Rated amperes (cold output)	25
Revolutions per minute (for rated output)	1800
Ground polarity	negative
Field ground	internal

Note. The Auto-Lite 25-ampere generator model GHA-4802 BUT, ordnance number 7374750, table 1, can also be tested following procedures in this section. Refer to referenced table above and TM 9-1825-B for tabulated and testing data when performing tests on this generator.

c. Preparation.

(1) Turn all range selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (some toggle switches have center position as "OFF" (fig. 32)).

(2) Mount the 25-ampere generator under test on the low speed driving head (5, fig. 7).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97c.

(4) Connect the generator terminals and housing (ground) to the generator input binding post panel (13, fig. 15) of the test stand using applicable leads as shown in figure 30. These leads are listed in appendix II (fig. 74).

(5) Connect a connecting link (fig. 65) between the "B+" and "G+" and between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 30.

(6) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not depress the "START" button more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (pars. 93c and 110).

(7) If it is necessary to change the rotation of the generator pulley (correct rotation is important, otherwise generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. 93c).

Warning: **Before reaching into the high voltage compartment to change**

the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.

(8) Remove the waterproof inspection plug from the side of the generator housing, so that the brushes may be observed during generator operation, d(7) below.

d. Test Procedures.

Note. Polarize the generator before and after testing (par. 99d).

(1) The position of switches and controls pertinent to this test are listed in table 2 below. Place each of these items in the position indicated in column *3a* of the table before tests are started.

Table 2. Position of Switches *and Controls Before and After Generator* Performance *Test (Delco-Remy or Auto-Lite 25-Ampere Generator)*

(1)	(2) Figure No. 32	(3) Position	
	Key No.	(a) Before	(b) After
Load dc ammeter range selector switch	5	50A (X1)	500A (X10)
Field dc ammeter range selector switch	6	5A (X1)	30A (X6)
Dc volts-millivolts range selector switch	7	9V	9V
Dc voltmeter range selector switch	8	50V (X5)	50V (X5)
Dc voltmeter circuit selector switch	9	RECT GEN	ANY
Starter test load disconnect switch	10	ON	OFF
Field ammeter dc ac/dc switch	11	DC	ANY
Load switches	12-A, B and C	OFF	OFF
0-25 0-12.5 load switch	12-D	ON	OFF
Variable load 0-25 0-12.5 ampere rheostat	13	Fully counter-clockwise	Fully counter-clockwise
Polarity reversing switch	14	NEG GND	CENTER (OFF)
Generator field external-internal ground switch	15	INT GND	CENTER (OFF)
40-ohm field current rheostat	16	Fully counter-clockwise	Fully counter-clockwise
40-ohm 30 ampere maximum rheo-reg switch	17	RHEO	CENTER (OFF)
250-ohm 5 ampere maximum switch	18	OFF	OFF
Battery circuit selector switch	19	24V	24V
Battery on-off switch	20	OFF	OFF
Drive control	21	STOP (button depressed)	STOP (button depressed)
Speed control handle	22	one-quarter speed (turn counter-clockwise)	one-quarter speed (turn counter-clockwise)

(2) Place the battery on-off switch (20) in the "ON" position and turn the dc voltmeter circuit selector switch (9) to the "BAT VOLTS" position to determine whether the battery voltage of the test stand is the same as the voltage of the system under test. Correct voltage is 24 volts which will be indicated on the dc voltmeter (4). If reading is less than 24 volts recharge batteries (par. 98). It is also advisable to check the batteries with a hydrometer for specific gravity (refer to TM 9-6140-200-15).

Note. The safety clip (21-B) must be off the stop button (21-C) to perform the battery check in (2) above. Do not push the start button (21-A) as the varidrive assembly need not be running for this test.

(3) Place the battery on-off switch (20) in the "OFF" position and turn the dc voltmeter circuit selector switch (9) to the "RECT GEN" position.

(4) Start the varidrive assembly, c(6) above, and turn the speed control handle (22) slowly clockwise until 2,500 rpm are indicated on the tachometer indicator meter (3)

(5) Turn the variable load 0-25 0-12.5 amps rheostat (13) and the 40-ohm field current rheostat (16) simultaneously in the clockwise direction, slowly increasing the field current until the load dc ammeter (1) reads 25 amperes. (If more ampere load is required turn the rheostat (13) fully counterclockwise and place the 25-12.5 fixed load switch (12-C) to "ON" position and then turn the rheostat (13) clockwise until the 25 amperes is recorded.)

Note. If no amperage reading can be obtained on the load dc ammeter (1), refer to paragraphs 74 and 75 for instructions.

(6) The dc voltmeter (4) should indicate approximately 28 volts and the field dc ammeter (2) not more than one ampere.

(7) While the generator is running at this speed, check the generator for unusual noises and excessive heat and the generator brushes for sparking. Replace the waterproof inspection plug, c(8) above.

(8) Turn the 40-ohm field current rheostat (16) and the variable load 0-25 0-12.5 amps rheostat (13) simultaneously in the full counterclockwise direction.

(9) Turn the speed control handle (22) partially counterclockwise until the varidrive assembly speed is reduced to one-quarter speed. Stop the varidrive assembly by depressing the stop button (21-C) on the drive control (21).

(10) Place switches and controls in table 2 above in positions indicated in column 3b of the table.

(11) Continue with generator draw test below.

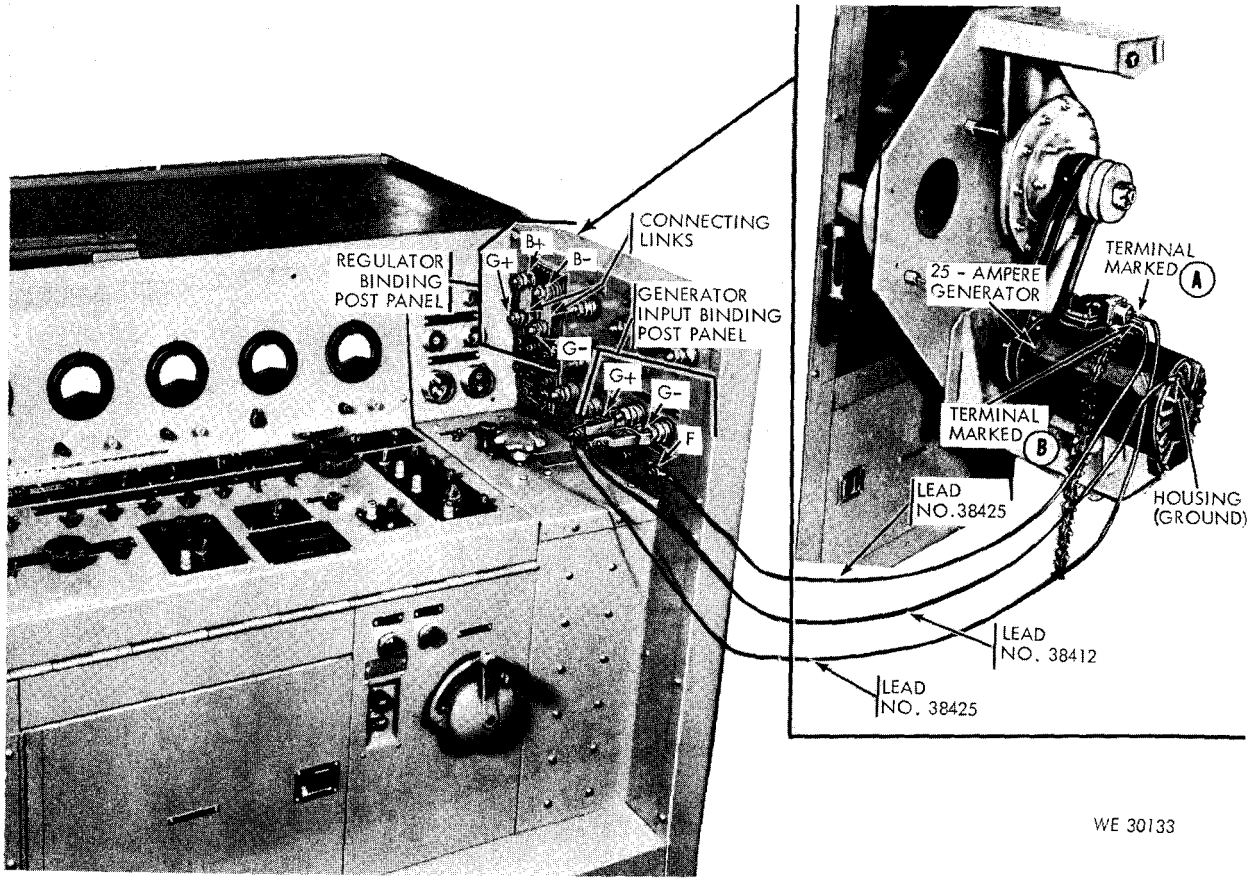


Figure 30. Testing output of Delco-Remy or Auto-Lite 25-ampere generator.

112. 25-Ampere Generator Draw Test (Delco-Remy and Auto-Lite)

a. General. This test is performed with a generator regulator that has been tested and was determined to be in serviceable condition (pars. 114 and 116). The generator hook-up to the test stand for this test will be the same as for the generator performance test (par. 111).

b. Purpose. This test is conducted to determine whether the generator is performing in accordance with manufacturer's specifications in regards to the current (ampere) draw, when it is motorized by a current supply independent from itself.

c. Preparation.

(1) Turn all range selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (fig. 32) (some toggle switches have center position as "OFF").

(2) Remove the connecting link from the "B+" and "G+" regulator binding posts (fig. 30).

(3) Mount a 25-ampere generator regulator of known serviceable condition (pars. 114 and 116) on the regulator mounting bracket and connect it to the regulator binding post panel using applicable harness and leads as shown in figure 31.

(4) Connect the positive (red) and negative (black) battery circuit binding posts to the "G+" and "G-" generator input binding posts using applicable leads (dotted lines on figure 31) and remove the two V belts from the generator as indicated in figure 31.

d. Test Procedures.

(1) The position of switches and controls pertinent to this test are listed in table 3 below. Place each of these items in position indicated in column 3a of the table before tests are started.

Table 3. Position of Switches and Controls Before and After Generator Draw Test (Delco-Remy or Auto-Lite 25-ampere Generator)

(1) Item	(2) Figure No. 32	(3) Position	
	Key No.	(a) Before	(b) After
Load dc ammeter range selector switch	5	500A (X10)	500A (X10)
Field dc ammeter range selector switch	6	15A (X3)	30A (X6)
Dc volt-millivolt range selector switch	7	9V	9V
Dc voltmeter range selector switch	8	50V (X5)	50V (X5)
Dc voltmeter circuit selector switch	9	BAT VOLTS	ANY
Starter test load disconnect switch	10	ON	OFF
Field ammeter dc ac/dc switch	11	DC	ANY
Polarity reversing switch	14	NEG GND	CENTER (OFF)
Generator field external-internal ground switch	15	INT GND	CENTER (OFF)
40-ohm field current rheostat	16	Fully counter-clockwise	Fully counter-clockwise
40-ohm 30 ampere maximum rheo-reg switch	17	RHEO	CENTER (OFF)
250-ohm 5 ampere maximum switch	18	OFF	OFF
Battery circuit selector switch	19	24V	24V
Battery switch	20	OFF	OFF
Drive control	21	STOP (button depressed)	STOP (button depressed)
Speed control handle	22	One-quarter speed (turn counter-clockwise)	One-quarter speed (turn counter-clockwise)

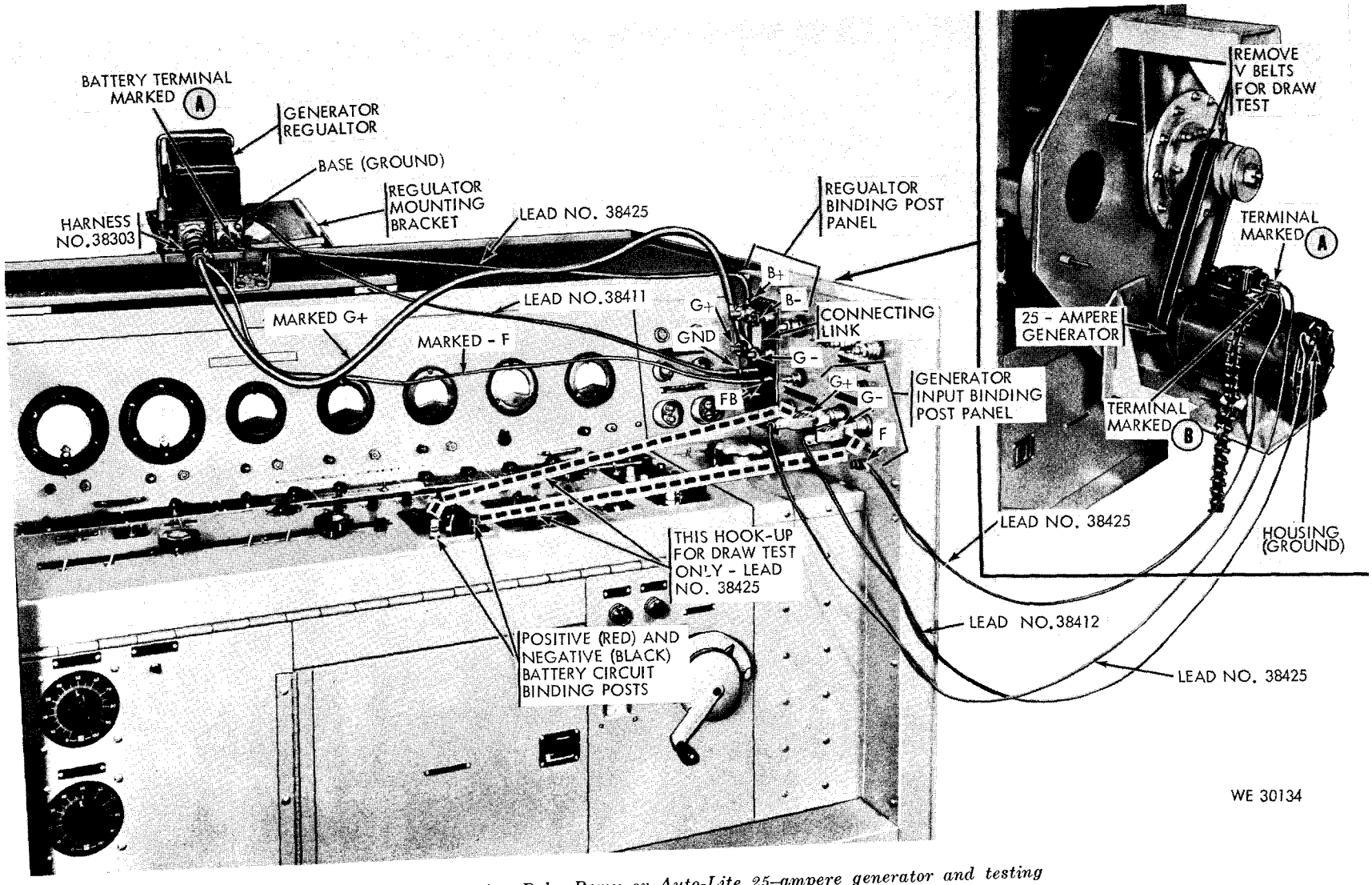
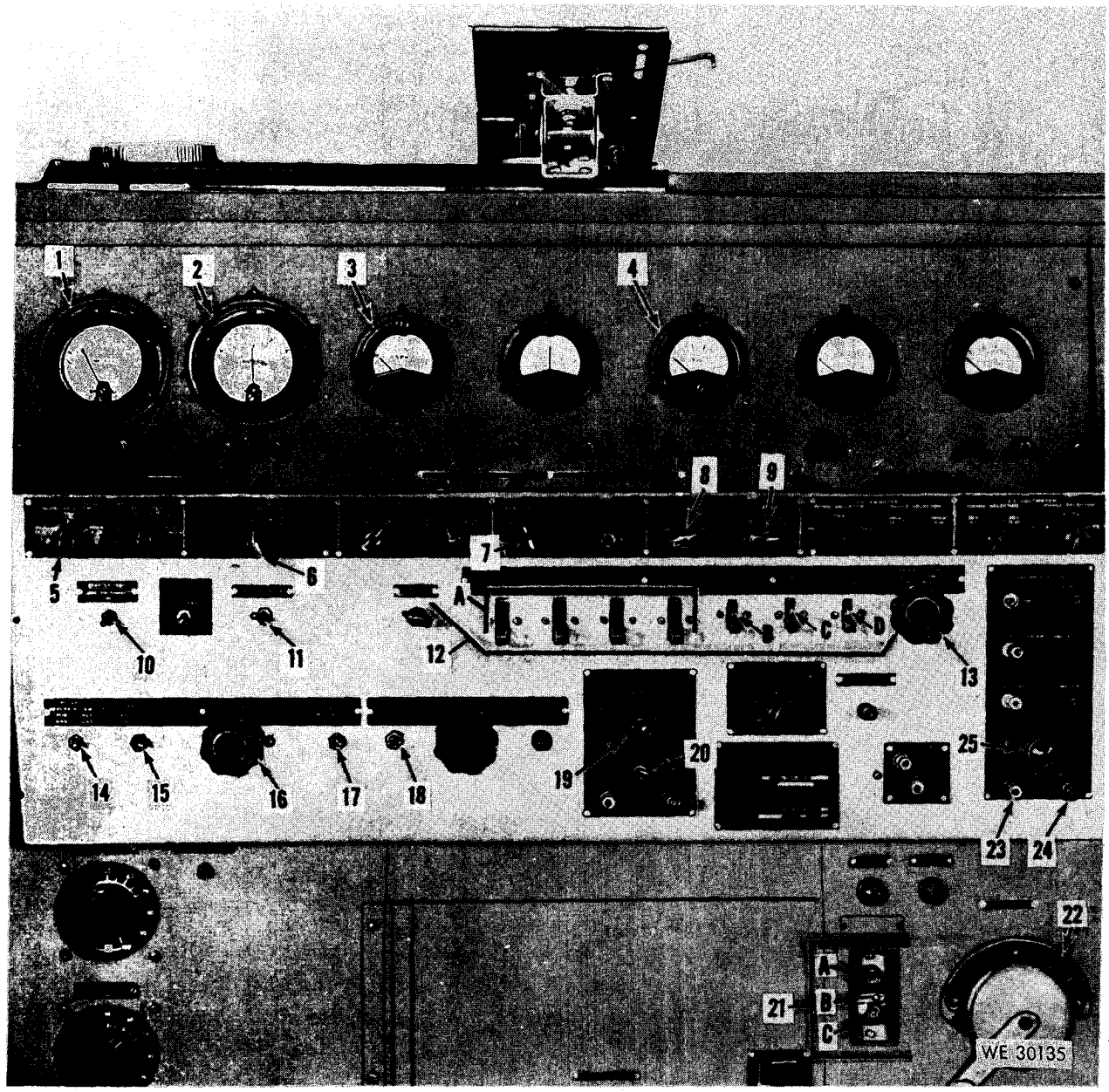


Figure 31. Draw testing Delco-Remy or Auto-Lite 25–ampere generator and testing the performance of Delco-Remy or Auto-Lite 25–ampere generator regulator.



1 - Load dc ammeter
2 - Field dc ammeter
3 - Tachometer indicator meter
4 - Dc voltmeter
5 - Load dc ammeter range selector switch
6 - Field dc ammeter range selector switch
7 - Dc volt-millivolts range selector switch
8 - Dc voltmeter range selector switch
9 - Dc voltmeter circuit selector switch
10 - Starter test load disconnect switch
11 - Field ammeter dc ac/dc switch
12 - Fixed load switches
  A - 100-50 fixed load switches
  B - 50-25 fixed load switch
  C - 25-12.5 fixed load switch
  D - 0-25 0-12.5 load switch
13 - Variable load 0-25 0-12.5 amperes rheostat
14 - Polarity reversing switch
15 - Generator field external-internal ground switch
16 - 40-ohm field current rheostat
17 - 40-ohm 30 ampere maximum rheo-reg switch
18 - 250-ohm 5 ampere maximum switch
19 - Battery circuit selector switch
20 - Battery on-off switch
21 - Drive control
  A - Start button
  B - Safety clip
  C - Stop button
22 - Speed control handle
23 - Positive test indicator binding post
24 - Negative test indicator binding post
25 - Test indicator lamp

Figure 32. Switches, controls, and meters used to perform generator performance and draw tests, and generator regulator serviceability test.

(2) Release the safety clip (21-B) on the "STOP" button of the drive control (21) by sliding it to the left and off the button. This will connect the input power to the circuitry of the test stand.

Note. Do not push the start button (21-C) and operate the varidrive assembly.

(3) Place the battery switch (20) in the "ON" position and when the generator motorizes to full speed place the load dc ammeter range selector switch (5) in the "50A (X1)." The ampere reading on the load dc ammeter (1) must be less than 5 amperes.

(4) Place the battery switch (20) in the "OFF" position and put switches and controls in table 3 above in position indicated in column 3b of the table.

(5) Remove the harness, leads, generator, and generator regulator from the test stand.

(6) After removing the generator from the test stand repolarize the generator (par. 99d(2)).

Note. Generators in groups 2, 2B, 3, 4, and 5 listed in table 5, paragraph 116, may be tested by following procedures in paragraphs 111 and 112, and setting the load dc ammeter range selector switch (15) and speed control (32) to cover the ampere and rpm ranges specified in column 7 of the table. Refer to TM 9-1825B (Auto-Lite) and TM 9-8627 (Delco-Remy) for further information when performing these tests.

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section III. TESTING DELCO PRODUCTS AND AUTO-LITE 25-AMPERE 3-UNIT VIBRATING CONTACT TYPE GENERATOR REGULATOR

113. Description

The Delco Products (Delco-Remy) 25-ampere 3-unit vibrating contact type (number 1118656) generator regulator (fig. 33) is comprised of three control units mounted as an assembly, which are the cut-out relay, voltage regulator, and current regulator. Each unit has a set of contact points and an energizing coil for operating the points. The units function individually and can be adjusted at a predetermined setting to maintain control of the voltage and the flow of current within a generator circuitry. When the three units of the regulator are adjusted to a specified setting, the output from the generator to the unit under charge is regulated protecting the unit within its electrical storage limitations, but also maintaining the unit at its maximum electrical capacity. It also regulates the output of the generator preventing a burned-out generator. Refer to TM 9-8627 for complete descriptive information.

114. 25-Ampere Generator Regulator Control Units Tests (3 Unit Type)

a. Purpose. This test is performed to indicate the functioning of the 3-control units of the 25-ampere generator regulator (figs. 33 and 34) and whether setting adjustments are required to the units so they perform in accordance with manufacturer specifications. (See note below (par. b(6)) for testing Auto-Lite 25-ampere generator regulator.)

b. Tabulated Data.

(1) *Manufacturer.*
Delco Products (Delco-Remy)

(2) *Identification number.*
Manufacturer's number 1118656
Ordnance number 8360020

(3) *Ground polarity.*
Type ..... negative

(4) *Voltage regulator unit.*
Air gap setting .... 0.084 inch
Satisfactory operating range ..... 27.5 to 29.5 volts
Adjust to ..... 28.2 volts

(5) *Current regulator unit.*
Air gap ..... 0.115 inch
Satisfactory operating range ..... 23 to 27 amperes
Adjust to ..... 25 amperes

(6) *Cut-out relay unit.*

Air gap	0.048 inch
Point opening	0.035 inch
Satisfactory closing range	25 to 27 volts
Adjust to	26 volts

Note. The Auto-Lite 25-ampere 3-unit vibrating contact type generator regulator VBC 4002UT ordnance number 7524309, table 5, paragraph 116, can also be tested following procedures in this section. Refer to referenced table and TM 9-1825-B for tabulated data when performing tests on this regulator.

c. Preparation.

(1) Turn all range selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to off position (some toggle switches have center position as "OFF") (fig. 32).

(2) Mount a 25-ampere generator of known serviceable condition (pars. 111 and 112) on the low speed driving head (5, fig. 7) (par. 95).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97c if this procedure has not been performed previously (par. 111c(3)).

(4) Connect the generator terminals and housing (ground) to the generator input binding post panel of the test stand using applicable leads as shown in figure 31. These leads are listed in appendix II (fig. 74).

(5) Connect a connecting link (fig. 65) between "B-" and "G-" as shown in figure 31.

(6) Mount the 25-ampere generator regulator undergoing test on the regulator mounting bracket and connect it to the regulator binding post panel using applicable harness and leads as shown in figure 31. These leads and harness are listed in appendix II (figs. 73 and 74).

Note. Do not connect the two leads shown as dotted lines on illustration 31 for this test.

(7) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position, then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not hold the "START" button depressed more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (par. 93c).

(8) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise, the generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. 93c).

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

d. Test Procedures for Control Units as an Assembly.

(1) This test is performed as prescribed for generator performance test paragraph 111c and *d*, except a generator regulator is connected in the circuit of the test stand as specified in paragraphs 114c(6) or 116c and the setting of the 40-ohm 30-ampere maximum rheo-reg switch is changed, (2) below. The 40-ohm field current rheostat (16) is not used for this test as the generator regulator compensates for this item.

(2) The position of switches and controls pertinent to the tests in paragraphs (3) through (6) below are listed in table 4. Place each of the items in the position indicated in column 3a of the table before tests are started except for one change which is the 40-ohm 30-ampere maximum rheo-reg switch key no. 17 in the table). Place this switch in the "REG" position instead of the "RHEO" position.

(3) When performing the tests (par. 111d) the ampere reading should be 25 amperes on the load dc ammeter (1), the voltage reading 28 volts on the dc voltmeter (4), and not more than 1 ampere reading on the field dc ammeter (2) if the generator regulator is performing properly.

(4) Shock test the generator and generator regulator while performing tests. Place the starter test load disconnect switch (10) to "OFF" position and the voltage reading on the dc voltmeter (4) should rise. Place the load disconnect switch (10) to the "ON" position and the ampere reading on the load dc ammeter (1) should return to the 25 ampere reading and the voltage reading on the dc voltmeter (4) should return to 28 volts with not more than 1 ampere reading on the field dc ammeter (2), as specified in (3) above.

(5) Increase the ampere load by turning the variable load 0-25 0-12.5 ampere rheostat (13) clockwise or use a combination of the 50-25 fixed load switch (12-B) and the rheostat (13) and observe a slight drop-off in the regulator voltage on the dc voltmeter (4) and the leveling off of the ampere reading on the load dc ammeter (1) when the current regulator unit (fig. 33 and 34) of the generator regulator goes into action.

(6) Turn the variable load 0-25 0-12.5 ampere rheostat (13) fully counterclockwise and place all load switches (12) in the "OFF" position.

(7) If the generator regulator does not perform as specified in (3), (4), and (5) above, continue with test procedures in *e* below.

e. Test Procedures for Individual Control Units.

(1) *General.* This test is similar to the test in *d* above, except that the cover of the generator regulator is removed and each individual control unit of the regulator is tested for performance as specified by manufacturer and/or pertinent publication(s) covering the regulator. These tests and specifications are given in (3) through (6) below.

(2) *Switches and controls position.* The position of switches and controls pertinent to the tests in paragraph (3) through (6) below are listed in table 4 below. Place each of these items in the position indicated in column 3a of the table before tests are started.

Table 4. Position of Switches and Controls Before and After 25-Ampere Generator Regulator Control Units Test (Delco-Remy or Auto-Lite)

(1)	(2) Figure No. 32	(3) Position	
	Key No.	(a) Before	(b) After
Load dc ammeter range selector switch	5	50A (X1)	500A (X10)
Field dc ammeter range selector switch	6	5A (X1)	30A (X6)
Dc volts-millivolts range selector switch	7	9V	9V
Dc voltmeter range selector switch	8	50V (X5)	50V (X5)
Dc voltmeter circuit selector switch	9	RECT GEN	ANY
Starter test load disconnect switch	10	OFF	OFF
Field ammeter dc ac/dc switch	11	DC	ANY
Fixed load switches	12	OFF	OFF
Variable load 0-25 0-12.5 ampere rheostat	13	Fully counter-clockwise	Fully counter-clockwise
Polarity reversing switch	14	NEG GND	CENTER (OFF)
Generator field external-internal ground switch	15	INT GND	CENTER (OFF)
40-ohm field current rheostat	16	Fully counter-clockwise	Fully counter-clockwise
40-ohm 30 ampere maximum rheo-reg switch	17	RHEO	CENTER (OFF)

Table 4 - Continued.

(1)	(2) Figure No. 32 Key No.	(3) Position (a) Before	(3) Position (b) After
250-ohm 5-ampere maximum switch	18	OFF	OFF
Battery circuit selector switch	19	24V	24V
Battery on-off switch	20	OFF	OFF
Drive control	21	STOP (button depressed)	STOP (button depressed)
Speed control handle	22	One-quarter speed (counter-clockwise)	One-quarter speed (counter-clockwise)

(3) *Cut-out relay unit.*

(a) Remove the cover from the generator regulator (fig. 31) as shown in figure 34 and plug a test lead number 38425 (fig. 74) in the top of the negative test indicator binding post (24) and connect the other end to the ground (GND) binding post (10-E, fig. 15). Plug another test lead number 38425 in the top of the positive test indicator binding post (23) and clip the other end on the armature (upper points (battery side)) of the cut-out relay unit (figs. 33 or 34).

(b) Start the varidrive assembly as specified in c(7) above and turn the speed control handle (22) slowly clockwise until 1,700 rpm are indicated on the tachometer indicator meter (3).

(c) Turn the 40-ohm field current rheostat (16) clockwise slowly, until the points of the cut-out relay unit close (figs. 33 or 34) which will be indicated when the test indicator lamp (25) lights up. Observe the voltage reading on the dc voltmeter (4) when the points close. The reading should be approximately 26 volts.

(d) Stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21) and remove the test leads, *(a)* above.

(e) If the voltage reading is not as specified in *(c)* above, adjustment of the cut-out relay unit will be required. Refer to manufacturer's literature or pertinent publication (s) covering the generator regulator for this procedure. Continue with tests in (4) below.

(4) *Voltage regulator unit.*

(a) Place the 40-ohm 30-ampere maximum rheo-reg switch in the "REG" position and connect a jumper cable across the upper and lower points of the voltage regulator unit (fig. 34).

(b) Start the varidrive assembly as prescribed in c(7) above. Turn the speed control handle (22) slowly clockwise until 3,000 rpm are indicated on the tachometer indicator meter (3). The voltage reading on the dc voltmeter (4) should be approximately 28.2 volts.

(c) Stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21) and remove the jumper cable, *(a)* above.

(d) If the voltage reading is not as specified in *(b)* above, adjustment of the voltage regulator unit will be required. Refer to manufacturer's literature or pertinent publication (s) covering the generator regulator for this procedure. Refer to paragraph 102 for additional instructions for setting the voltage regulator unit. Continue with tests in (5) below.

(5) *Current regulator unit.*

(a) Place both the battery switch (20) and the starter test load disconnect switch (10) in the "ON" position.

(b) Start the varidrive assembly as prescribed in c(7) above and turn the speed control handle (22) slowly clockwise until 3,000 rpm are indicated on the tachometer indicator meter (3).

(c) Place a load of approximately 25-30 amperes in the circuit by placing the 25-12.5 fixed load switch (12-C) and the 0-25 0-12.5 load switch (12-D) in the "ON" position and then turn the variable load 0-25 0-12.5 ampere rheostat (13) clockwise about a ¼ turn. The ampere reading on the load dc ammeter (1) should be approximately 25 amperes.

(d) If the ampere reading is not as specified in *(c)* above, adjustment of the current regulator unit will be required. Stop the varidrive assembly and place the starter test load disconnect switch (10) in the "OFF" position. Refer to manufacturer's literature or pertinent publication(s) covering the generator regulator for adjustment procedures. After adjustments are made continue with tests in (6) below.

(6) *Final test procedure for control units.*

(a) Place the cover on the generator regulator but do not secure and start the varidrive assembly as prescribed in c(7) above. With the control units set as indicated in *(e)* above, make the following settings of the controls and switches on the test stand:

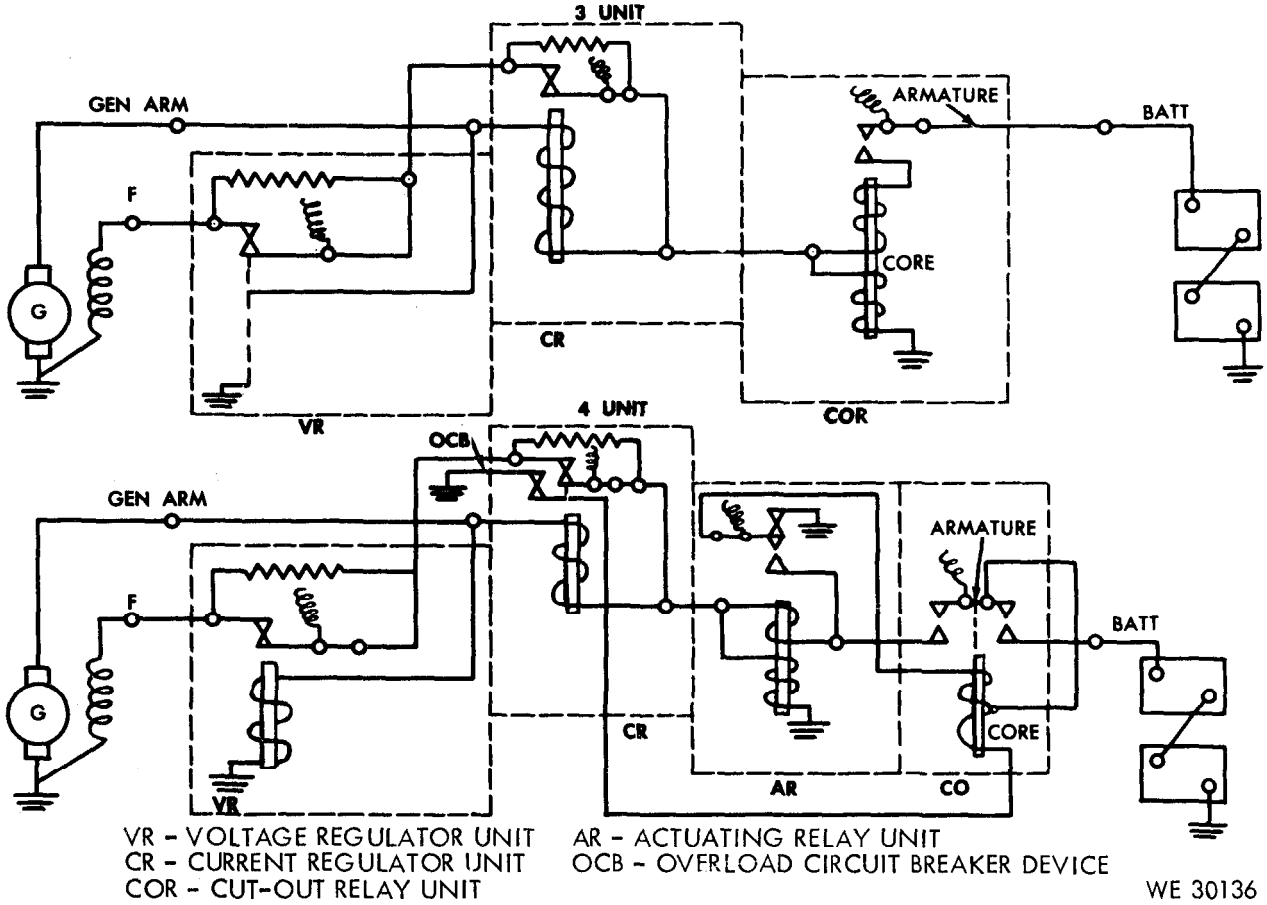


Figure 33. Wiring diagram for 25-ampere 3 control and 4 control unit vibrating contact type generator regulator.

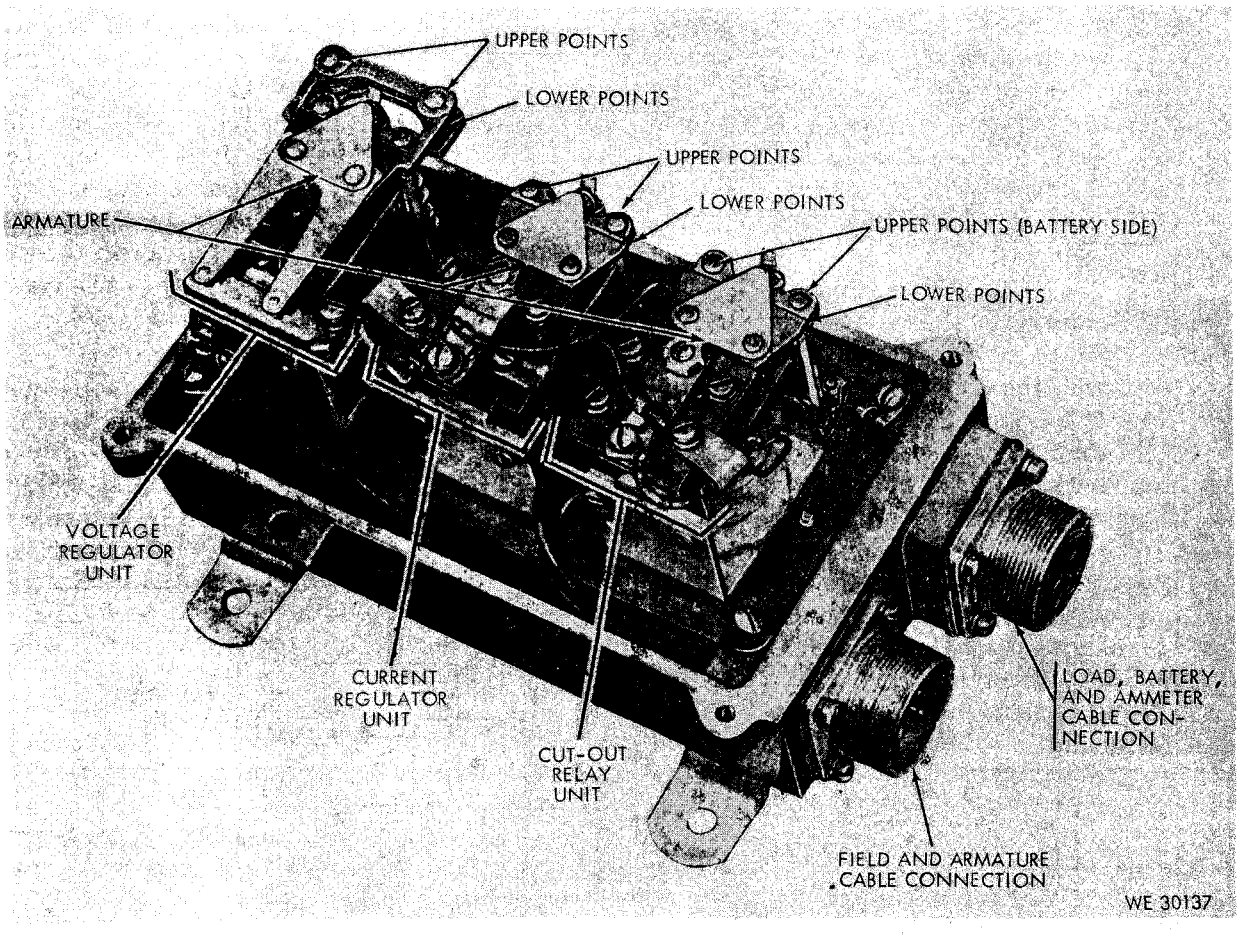


Figure 34. 25-ampere 3 control unit vibrating contact type (Delco-Remy 1118656) generator regulator - cover removed.

1. Turn the speed control handle (22) until 1,500 rpm are indicated on the tachometer indicator meter (3).
2. Change the ampere load in the circuit by placing the 25-12.5 fixed load switch (12-C) in the "OFF" position. Place the starter test load disconnect switch (10) in the "ON" position. Turn the variable load 0-25 0-12.5 amperes rheostat (13) clockwise or counterclockwise until a reading of 10 amperes is indicated on the load dc ammeter (1).

b. Operate the test stand with the setting in these positions for 15 minutes, then stop the varidrive assembly by pushing the "STOP" button (21-C).

(c) Repeat tests outlined in paragraph 114e (1) through (4) respectively while the generator and generator regulator are still warm from operation. Turn the 40-ohm field current rheostat (16) fully counterclockwise and stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21).

(d) Make any necessary readjustments to the cut-out relay unit, voltage regulator unit, and current regulator unit, as required, to meet man-

ufacturer's or pertinent publication(s) specifications.

(e) Remove the generator and generator regulator from the test stand and secure the cover on the regulator. Place switches and controls in table 4 above in positions indicated in column 3 *b* of the table.

Note. See table 5, paragraph 116, for test data on other models of generator regulators. Refer to TM 9-1825B (Auto-Lite) and TM 9-8627 (Delco-Remy) for further information when performing tests.

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section IV. TESTING DELCO PRODUCTS 25-AMPERE 4-UNIT VIBRATING CONTACT TYPE GENERATOR REGULATOR

115. Description

The function of the Delco Products (Delco-Remy) 25-ampere 4-unit vibrating contact type (number 1118606) generator regulator (figs. 33 and 35) is similar to that of the 3-unit type (figs. 33 and 34) described in paragraph 113, except its construction includes the addition of an actuating relay unit and an overload circuit breaker device. The primary purpose of the actuating relay unit is to prevent the points of the circuit breaker relay unit (cutout relay unit) from opening from shock or vibration which assures better operation of the unit. This is accomplished by the manner in which the windings are connected between the two units. The overload circuit breaker device is attached to the front of the current regulator unit. Its function is to open the contact points of the circuit breaker relay unit (cut-out relay) should they fail to open normally, thus preventing a high reverse current to the generator. Refer to TM 9-8627 for complete descriptive information.

116. 25-Ampere Generator Regulator Control Units Tests (4-Unit Type)

a. Purpose. This test is performed to indicate the functioning of the 4-control units of the 25-ampere generator regulator (figs. 33 and 35) and whether setting adjustments are required to adjust the units so they perform in accordance with manufacturer's specifications.

b. Tabulated Data.

(1) *Manufacturer.*
Delco Products (Delco-Remy)

(2) *Identifying number.*

Manufacturer's number	1118606
Ordnance number	7351952

(3) Ground polarity ..... negative

(4) *Current regulator unit.*

Air gap	0.105 inch
Operating range	23 to 27 amperes
Adjust to	25 amperes

(5) *Actuating relay unit.*

Air gap (with lower points just touching)	0.037 inch
Point opening (with upper points just touching)	0.037 inch
Closing range	25 to 27 volts
Adjust to	26.0 volts

(6) *Circuit breaker relay unit (cut-out relay).*

Air gap	0.035 inch
Point opening	0.035 inch
Closing range	14 to 17 volts
Sealing	2 to 5 volts above closing

(7) *Overload circuit breaker device.*

Current regulator armature and core gap	0.050 inch
Current regulator maximum opening gap	0.020 inch

Note. The Auto-Lite 25-ampere 4-unit vibrating contact type generator regulator VBC 4003UT ordnance number 8689216, table 5 below, can also be tested following procedures in this section. Refer to referenced table above and TM 9-1825-B for tabulated data when performing tests on the regulator.

c. Preparation. Prepare the test stand following procedures outlined in paragraph 114c

(1) through (6) except mount a 25-ampere 4-unit generator regulator, *b* above, in place of a 25-ampere 3-unit generator regulator (par. 114b).

Note. Perform the test procedures for the control units as an assembly, first, paragraph 114d, before testing the individual control units, *d* below.

d. Test Procedures for Control Units.

(1) *Circuit Breaker Relay Unit (Cut-out Relay).*

(a) Remove the cover from the generator regulator (fig. 31) as shown in figure 35 and plug a test lead number 38425 (fig. 74) in the top of the negative test indicator binding post (24) and connect the other end to the ground (GND) binding post (10-E, fig. 15). Plug another test lead number 38425 in the top of the positive test indicator binding post (23) and clip the other end on the armature (upper points (battery side)) of the circuit breaker relay unit (cut-out relay) (figs. 33 and 35).

(b) Start the varidrive assembly and check the rotation of the generator as prescribed in paragraph 114c(7) and (8). Turn the control handle (22) slowly clockwise until 1,700 rpm are indicated on the tachometer meter (3).

(c) Hold the contact points of the actuating relay unit (fig. 33 or 35) closed, using an insulated screwdriver. Turn the 40-ohm field current rheostat (16) clockwise slowly, until the points of the circuit breaker relay unit (cut-out relay) close (fig. 33 or 35) which will be indicated when the test indicator lamp (25) lights up. Observe the voltage reading on the dc voltmeter (4) when the points close. The reading should be between 14 and 17 volts.

(d) If the voltage reading is not as specified in *(c)* above, adjustment of the circuit breaker relay unit (cut-out relay) will be required. Stop the varidrive assembly and refer to manufacturer's literature or pertinent publication (s) covering the generator regulator for this procedure.

(e) Start the varidrive assembly and check the sealing voltage (voltage at which the armature of the relay seals (touches) against the core of the relay (figs. 33 or 35) by repeating the procedures in *(c)* above until the points of the circuit breaker relay unit (cut-out relay) (figs. 33 or 35) close, then continue to turn the 40-ohm field current rheostat (16) clockwise until the armature seals to the core. Satisfactory sealing range is 2 to 5 volts above closing voltage specified in *(c)* above.

(f) Release the contact points of the actuating relay unit, *(c)* above, and turn the 40-ohm field current rheostat (16) fully counterclockwise, Stop the varidrive assembly and adjust the armature of the circuit breaker relay (figs. 33 or 35), if necessary, following instruction in manufacturer's literature or pertinent publication (s) covering the generator regulator for this procedure. Continue with tests in (2) below.

(2) *Actuating relay unit.*

(a) Start the varidrive assembly as prescribed in 114c(7) and (8) and turn the 40-ohm field current rheostat (16) clockwise until the points of the actuating relay unit close (figs. 33 or 35) which will be indicated when the test indicator lamp (25) lights-up. Observe the voltage reading on the dc voltmeter (4) when the points close. The reading should be approximately 26 volts.

(b) Turn the 40-ohm field current rheostat (16) fully counterclockwise and stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21) and remove the test leads (1) *(a)* above.

(c) If the voltage reading is not as specified in *(a)* above, adjustment of the actuating relay unit will be

required. Refer to manufacturer's literature or pertinent publication(s) covering the generator regulator for this procedure. After adjustments are made continue with tests in (3) below.

(3) *Voltage regulator unit.*

(a) Place the 40-ohm 30-ampere maximum rheo-reg switch (17) in the "REG" position and connect a jumper cable across the upper and lower points of the current regulator unit (fig. 35).

(b) Start the varidrive assembly as prescribed in 114c(7) and (8) and turn the speed control handle (22) until 3,000 rpm are indicated on the tachometer indicator meter (3). The voltage reading on the dc voltmeter (4) should be approximately 28.2 volts.

(c) Stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21) and remove the jumper cable *(a)* above.

(d) If the voltage reading is not as specified in *(b)* above, adjustment of the voltage regulator unit will be required. Refer to manufacturer's literature or pertinent publication(s) covering the generator regulator for this procedure. Refer to paragraph 102 for additional instructions for setting the voltage regulator unit. Continue with tests in (4) below.

(4) *Current regulator unit.*

(a) Place the starter test load disconnect switch (10) and the battery switch (20) in the "ON" position and start the varidrive assembly as prescribed in 114c(7) and (8). Turn the speed control handle (22) until 3,000 rpm are indicated on the tachometer indicator meter (3).

(b) Place the 25-12.5 fixed load switch (12-C) and 0-25 0-12.5 load switch (12-D) in the "ON" position and turn the variable load 0-25 0-12.5 ampere rheostat (13) fully clockwise. The ampere reading on the load dc ammeter (1) should be approximately 25-amperes.

(c) Place the load switches (12-C and 12-D) in the "OFF" position and turn the rheostat (13) fully counterclockwise and stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21).

(d) If the ampere reading is not as specified in *(b)* above, adjustment of the current regulator unit will be required. Refer to manufacturer's literature or pertinent publication(s) covering the generator regulator for this procedure.

(e) After the adjustments are made, *(d)* above, start the varidrive assembly, *(a)* above and place the 50-25 fixed load switch (12-B) in the "ON" position to check the operation of the current regulator unit. Use the 50-25 fixed load switch (12-B) above or use the combination of the 0-25 0-12.5 load switch (12-D) and 25-12.5 fixed load switch (12-C) and turn the variable load 0-25 0-12.5 ampere rheostat (13) fully clockwise to obtain the required load. The points of the current regulator unit should continue to close and open as the 50-25 fixed load (12-B) is applied to and disconnect from the circuit or, when the rheostat (13) is turned clockwise or counterclockwise.

(f) Place all load switches *(e)* above, in the "OFF" position and turn the rheostat (13) fully counterclockwise. Leave the varidrive assembly running and continue with tests in (5) below.

(5) *Overload circuit breaker device.*

(a) Turn the load dc ammeter range selector switch (5) to the "150A (X3)" position.

(b) Hold the contact points of the actuating relay unit (figs. 33 or 35) closed using an insulated screwdriver. Turn the speed control handle (22) counterclockwise, reducing the rpm of the generator until the

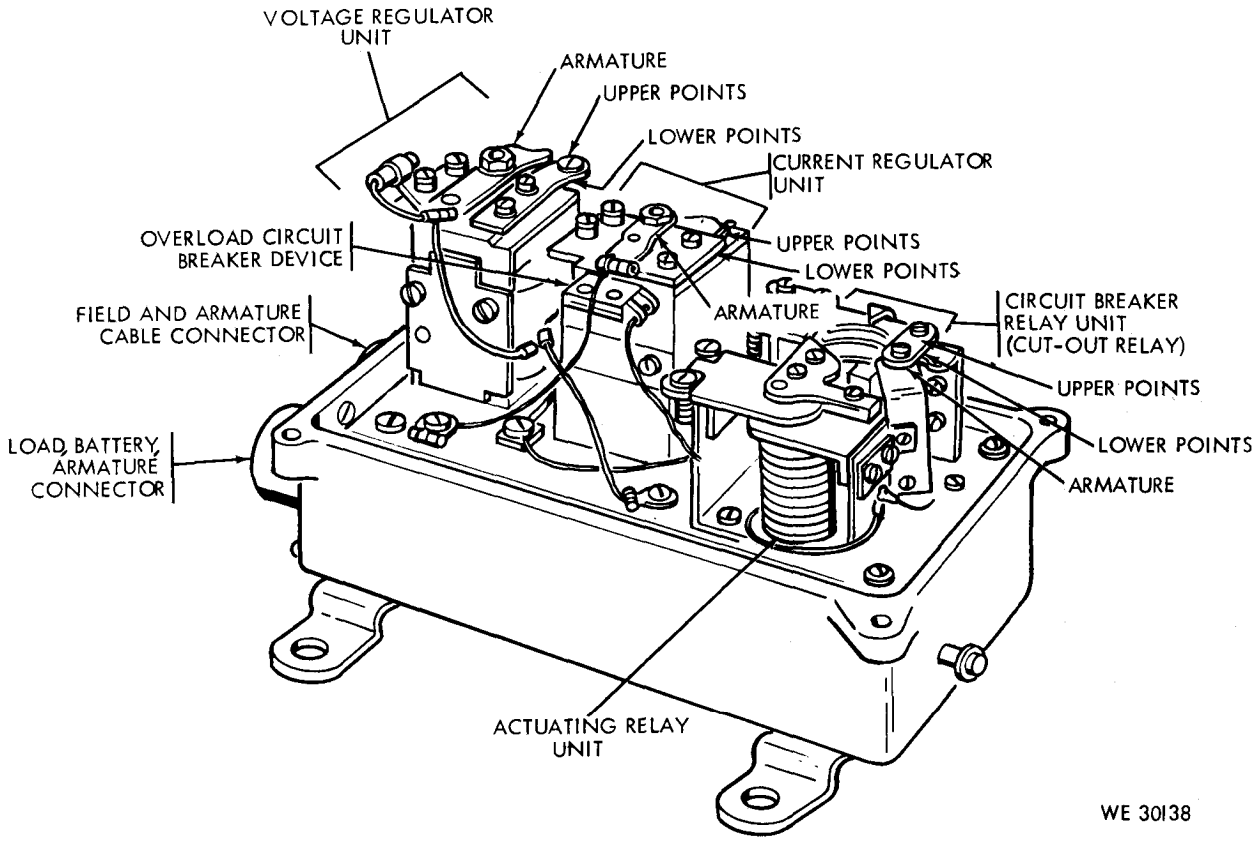


Figure 35. 25-Ampere 4-unit vibrating contact type (Delco-Remy 1118606) generator regulator—cover removed.

points of both the overload circuit breaker device and circuit breaker relay unit (cut-out relay) (figs. 33 or 35) are open. Observe the ampere reading on the load dc ammeter (1) when both sets of points are open. The ampere reading should be at approximately 32 amperes.

Caution: **Do not perform this test more than is necessary, as it causes high arcing across the points of the circuit breaker relay unit (cut-out relay).**

(c) Stop the varidrive assembly by depressing the "STOP" button (21-C) on the drive control (21) and remove the generator and generator regulator from the test stand and secure the cover on the regulator. Place switches and controls in table 4 above in positions indicated in column 3b of the table.

Note. See table 5, below, for test data on other models of generator regulators. Refer to TM 9-1825B (Auto-Lite) and TM 9-8627 (Delco-Remy) for further information when performing tests.

Table 5. Generator Regulator and Generator Control Box Test Data

Mfg. No.	Ord part No.	Gnd polarity	Rated volts	Cutout relay				Actuating relay points close		Voltage regulator			Current regulator		
				Range volts	Adj closing volts	Pts opng rvrs cur (amps)	Armature sealing volts	Range volts	Adj volts	Range volts	Adj volts	Generator rpm	Range volts	Adj amps	Circuit breaker pt open (volts)
Auto-Lite															
VRY4203A	7411810	NEG	6	6.5–7.0	6.7	0.5–6.0	.....	.....	.....	7.2–7.5	.....	.....	40–42	40	
VRY4203B	0367250	NEG	6	6.5–7.0	6.7	0.5–6.0	.....	.....	.....	7.2–7.5	.....	.....	40–42	40	
VRY4203D	7411810	NEG	6	6.5–7.0	6.7	0.5–6.0	.....	.....	.....	7.2–7.5	.....	.....	40–42	40	
VRY4203F	7411810	NEG	6	6.5–7.0	6.7	0.5–6.0	.....	.....	.....	7.2–7.5	.....	.....	40–42	40	
VRY4203G	7337495	NEG	6	6.5–7.0	6.7	0.5–6.0	.....	.....	.....	7.2–7.5	.....	.....	40–42	40	
VAM4101A	B266575	NEG	12	13.0–13.5	13.2	0.5–6.0	.....	.....	.....	14.0–14.5	.....	.....	39.0–41.0	40	
VAM4101B	7010672	NEG	12	13.0–13.5	13.2	0.5–6.0	.....	.....	.....	14.2–14.7	.....	.....	39.0–41.0	40	
VRH4101C	C–118349	NEG OR POS	12	13.0–13.5	13.2	0.5–6.0	.....	.....	.....	14.0–14.5	.....	.....	49–51	50	
VRH4104A1	C–118349	POS OR NEG	12	13.0–13.5	13.2	0.5–6.0	.....	.....	.....	14.0–14.5	.....	.....	54–56	55	
VRH4104D1	C–118349	NEG OR POS	12	13.0–13.5	13.2	0.5–6.0	.....	.....	.....	14.0–14.5	.....	.....	54–56	55	
VRH4104E1	7371991	NEG OR POS	12	13.0–13.5	13.2	0.5–6.0	.....	.....	.....	14.0–14.5	.....	.....	54–56	55	
Delco-Remy															
5639	D–48141	NEG	12	13.0–14.0	13.5	0–3–0	.....	.....	.....	.....	15	2000	54–56	55	
5641	C–139536	NEG	12	13.0–14.0	13.5	0–3–0	.....	.....	.....	.....	15	1500	24–26	25	
1118488	5626265	NEG	12	13.0–14.0	13.5	0–3–0	.....	.....	.....	.....	15	2000	54–56	55	
Auto-Lite															
VAD4106B	D–70556	NEG	24	25.7–26.7	26.2	16–21	.....	.....	.....	29.0–29.8	.....	.....	50–53	50	
VAD4106C	6578455	NEG	24	25.7–26.7	26.2	16–21	.....	.....	.....	29.0–29.8	.....	.....	50–53	50	
VBC4002UT	7524309	NEG	24	25.7–26.7	26.2	7.0–11.0	.....	.....	.....	27.9–28.7	.....	.....	24.5–26	25	
VBC4003UT	8689216	NEG	24	25.7–26.7	26.2	7.0–11.0	.....	.....	.....	27.9–28.7	.....	.....	24.5–26	25	
Delco-Remy															
1118413	7968600	NEG	24	19.5–21.5	20.5	15–32	21.1–23.1	24.5–26.5	25.5	26.9–28.1	27.5	4500	145–155	150	19.5–21.5
1118478	5616109	NEG	24	25.0–27.0	26.0	0–3–0	.....	.....	.....	.....	30	2000	48–52	50	
1118492	C–121605	NEG	24	25.0–27.0	26.0	0–3–0	.....	.....	.....	.....	30	2000	48–52	50	
1118501	D–76284	NEG	24	14–17	15.5	.....	19.5–23	25–28	26.5	27.5–29.5	28.2	.....	48–52	50	
1118546	7524472	NEG	24	25.0–27.0	26	.....	.....	.....	.....	27–29	28.2	.....	22–26	25	
1118604	7354243	NEG	24	25.0–27.0	26.0	0–3–0	.....	.....	.....	28–29.5	28.5	2000	48–52	50	
1118606	7351952	NEG	24	14–17	15.5	.....	19.5–23	25–27	26.0	27.5–29.5	28.5	3000	23–26	25	28–33
1118656	8360020	NEG	24	25–27	26	.....	.....	.....	.....	27.5–29.5	28.2	.....	22–26	25	

Eclipse-Pioneer														
40E12-1A	7727078	.....	24	24–28	26	20	.....	.....	.....	26–29	27.5	.....	300–400	300
40E27-1A	7528304	.....	24	24–29	26.5	20	.....	.....	.....	27–29	28	.....	150–200	150
40E27-2A	7355925	.....	24	24–29	26.5	20	.....	.....	.....	27–29	28	.....	150–200	150
General Electric Company														
D5414473	7355925	.....	24	25–29	27	20	.....	.....	.....	27–29	28	.....	150–200	150
D5413652	7727078	.....	24	25–29	26.5	20	.....	.....	.....	27–29	28	.....	150–200	150
P8298512-G2	7035801	.....	24	25–29	27	20	.....	.....	.....	27–29	28	.....	.....	150

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section V. TESTING BENDIX ECLIPSE PIONEER 150-AMPERE GENERATOR

117. Description

The Bendix-Eclipse Pioneer 150-ampere generator (par. 118) is fan cooled with an internal grounded field consisting of interpole and compensating windings (fig. 37). It is direct driven with a counterclockwise shaft rotation at the drive end (turns to the left facing pulley) (fig. 38). Refer to TM 9-8631 for complete descriptive information.

118. 150-Ampere Generator Performance Test (Eclipse Pioneer)

a. Purpose. This test is performed to determine whether the generator is functioning in accordance with the manufacturer's specifications for ampere and voltage output when operating under normal conditions.

b. Tabulated Data.

Manufacturer	Bendix-Eclipse Pioneer
Federal stock number	2920-772-7461
Stock number (superseded by FSN above)	G244-77-27461
Manufacturer's part number	EC30E-00-3A
Rated volts	30
Rated amperes	150
Speed range	2,870 to 8,600 rpm

c. Preparation.

(1) Turn all range selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (some toggle switches have center position as "OFF") (fig. 32).

(2) Mount the 150-ampere generator under test on the low speed driving head (5, fig. 7) (par. 94).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97b.

(4) Connect the generator to the generator input binding posts (13, fig. 15) of the test stand, as shown in figure 36, using applicable leads and cable harnesses (figs. 71 and 74).

(5) Connect a connecting link (fig. 65) between "B+" and "G+" and between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 36.

(6) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position then slide the safety clip (21-B) off the "STOP" button (21-C) and depress the "START" button (21-A) (do not depress the "START" button more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (pars. 93c and 117).

(7) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. 93c).

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

d. Test Procedures.

Note. Polarize the generator before and after testing (par. 99d).

(1) The positions of the switches and controls pertinent to this test are listed in table 6 below. Place each of these items in the position indicated in column 3a of the table before tests are started.

Table 6. Position of Switches and Controls Before and After Generator Performance Test (Bendix Eclipse Pioneer 150-ampere Generator and Jack and Heintz 300-ampere Generator)

(1) Item	(2) Figure No. 32 Key No.	(3) Position (a) Before	(3) Position (b) After
Load dc ammeter range selector switch	5	500A (X10)	500A (X10)
Field dc ammeter range selector switch	6	15A (X3)	30A (X6)
Dc volts-millivolts range selector switch	7	9V	9V
Dc voltmeter range selector switch	8	50V (X5)	50V (X5)
Dc voltmeter circuit selector switch	9	RECT GEN	ANY
Starter test load disconnect switch	10	ON	OFF
Field ammeter dc ac/dc switch	11	DC	CENTER (OFF)
Load switches	12A, B and C	OFF	OFF
0-25 0-12.5 load switch	12-D	ON	OFF
Variable load 0-25 0-12.5 ampere rheostat	13	Fully counter-clockwise	Fully counter-clockwise
Polarity reversing switch	14	NEG GND	CENTER (OFF)
Generator field external-internal ground switch	15	INT GND	CENTER (OFF)
40-ohm field current rheostat	16	Fully counter-clockwise	Fully counter-clockwise
40-ohm 30-ampere maximum rheo-reg switch	17	RHEO	CENTER (OFF)
250-ohm 5-amperes maximum switch	18	OFF	OFF
Battery circuit selector switch	19	24V	24V
Battery on-off switch	20	OFF	OFF
Drive control	21	STOP (button depressed)	STOP (button depressed)
Speed control handle	22	One-quarter speed (counter-clockwise)	One-quarter speed (counter-clockwise)

(2) Place the battery switch (20) in the "ON" position and turn the dc voltmeter circuit selector switch (9) to the "BAT VOLTS" position to determine whether the battery voltage of the test stand is the same as the voltage of the system under test. Correct voltage is 24 volts which will be indicated on the dc voltmeter (4). If reading is less than 24 volts recharge batteries (par. 98). It is also advisable to check the batteries with a hydrometer for specific gravity (refer to TM 9-6140-200-15).

Note. The safety clip (21-B) must be off the stop button (21-C) to perform the battery check in (2) above. Do not push the start button (21-A) as the varidrive assembly need not be running for this test.

(3) Place the battery switch (20) in the "OFF" position and turn the dc voltmeter circuit selector switch (9) to the "RECT GEN" position.

(4) Start the varidrive assembly by sliding the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not depress the "START" button more than 10 seconds) to start the varidrive assembly.

(5) Turn the speed control handle (22) slowly clockwise until 3,000 rpm are indicated on the tachometer indicator meter (3).

(6) Place one of the 100-50 fixed load switches (12-A) and the 50-25 fixed load switch (12-B) in the "ON" position (be sure the starter test load disconnect switch (10) is in the "ON" position before load switches are turned on).

(7) Turn the 40-ohm field current rheostat (16) until 150 ampere are indicated on the load dc ammeter (1). The dc voltmeter (4) should indicate approximately 28 volts and the field

dc ammeter (2) not more than 7.5 amperes.

Note. If no amperage reading can be obtained on the load dc ammeter (1), refer to paragraphs 74 and 75 for instructions.

Note. Observe the dc voltmeter (4) and bring the generator voltage up to approximately 20 volts reading on the dc voltmeter rapidly, and evenly, then proceed slowly until 150 amperes are indicated on the load dc ammeter (1) par. (7) above.

(8) Turn the 40-ohm field current rheostat (16) in the fully counterclockwise direction and the speed control handle (22) partially counterclockwise until the varidrive assembly speed is reduced to ¼-speed. Stop the varidrive assembly by depressing the stop button (21-C) on the drive control (21). If the generator performs as specified in (7) above, next test in (9) below can be performed, otherwise, generator is unserviceable and will require repairing. Leave all leads, connecting links, switches, and controls remain as specified at this point and continue with test in (9) below if generator is not unserviceable.

(9) Test for interpole and compensating winding shorts as follows:

(a) Place the dc voltmeter range selector switch (8) in the "10V (X1)" position and the dc voltmeter circuit selector switch (9) "EXT VOLTS" position.

(b) Connect the external dc voltmeter positive (red) binding post (29, fig. 16) to the ground (GND) binding post (10-E, fig. 15) and connect the external dc voltmeter negative (black) binding post (29, fig. 16) to the "D" generator input binding post (13-C, fig. 15) of the test stand, using two test leads 38425 (fig. 74).

(c) Start the varidrive assembly, c(6) above, and turn the speed control

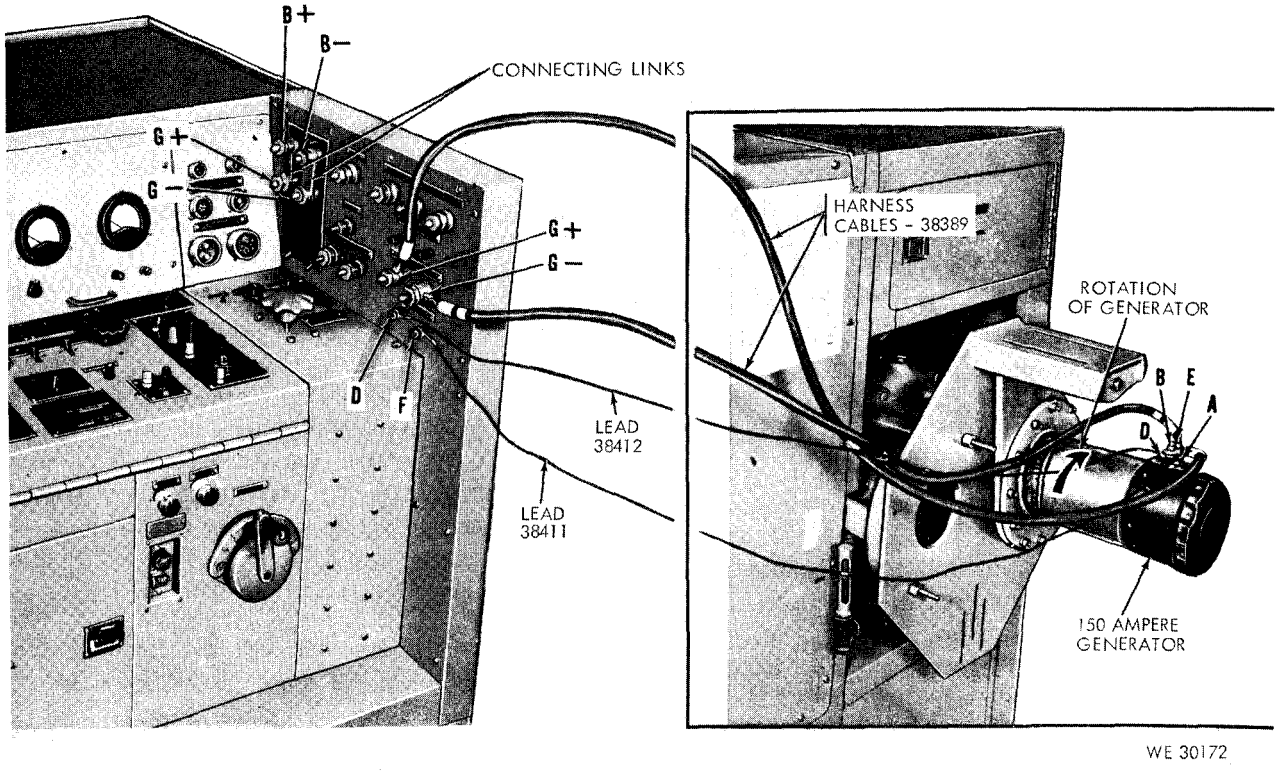


Figure 36. Testing the output of Bendix Eclipse Pioneer model EC30E003-A 150-ampere generator.

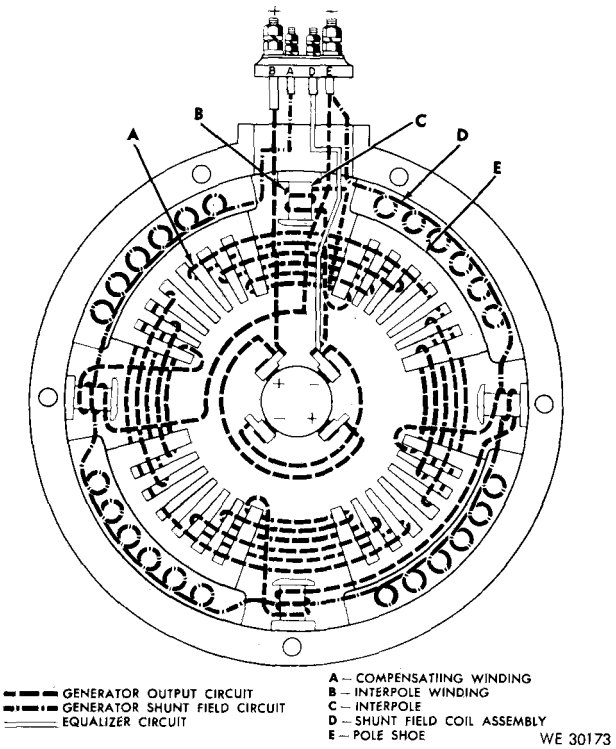


Figure 37. Schematic internal wiring diagram for Bendix Eclipse Pioneer model EC30E00-3A 150-ampere generator.

handle (22) slowly clockwise until 3,000 rpm are indicated on the tachometer indicator meter (3).

(d) Turn the 40-ohm field current rheostat (16) clockwise until 150 amperes are indicated on the load dc ammeter (1).

(e) The reading on the dc voltmeter (4) should be between 1.6 to 2.1 volts. A lower than the above voltage reading indicates a shorted interpole and compensating windings; higher than above voltage reading indicates high resistance in the windings.

(f) Check the generator brushes for sparking, and the generator for unusual noises and excessive heat.

(g) Turn the 40 ohm field current rheostat (16) in the fully counterclockwise direction and the speed control handle (22) partially counterclockwise until the varidrive assembly speed is reduced to ¼ speed. Stop the varidrive assembly by depressing the stop button (12-C) on the drive control (21).

(h) Place switches and controls in table 6 above, in positions indicated in column 3b of the table. Remove all cables, leads, and the generator from the test stand.

(i) Polarize the generator (par. 99d).

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section VI. TESTING BENDIX ECLIPSE PIONEER 150-AMPERE GENERATOR CONTROL BOX

119. Description

The Bendix Eclipse Pioneer 150-ampere generator control box (fig. 39) is designed for use with a generator that has a current output of 150-amperes (par. 117). The control box is composed of a series of control units which function in unison to regulate the output voltage and limit output current of the generator. It also automatically connects or disconnects the generator to or from the electrical system dependent upon the need for, or ability of the generator to supply the electrical energy requirements, therefore, maintaining a sufficient electrical output to keep the unit under charge at its maximum electrical capacity and/or controls the output of the generator within allowable limits preventing a burned-out generator. The individual control units and components used in the construction of the control box are listed in paragraph 120. Refer to TM 9-8631 for complete descriptive information.

120. 150-Ampere Generator Control Box Control Units Test (Eclipse Pioneer)

a. Purpose. This test is performed to indicate the functioning of the control units of the 150-ampere control box (fig. 39) and whether setting adjustments are required to the units

so they perform in accordance with manufacturer's specifications. Refer to TM 9-8631 for data covering setting adjustments.

b. Tabulated Data.

(1) *Manufacturer.*

Bendix Eclipse Pioneer

(2) *Identifying number.*

Model number	Type 40E27 model 1 style B
Ordnance number	7528304

(3) *Voltage regulator.*

Normal voltage rating	28 volts
Voltage adjustment by means of rheostat	26 to 27 volts
Maximum power dissipation in the carbon pile	75 watts a 71° F
Shunt coil resistance	4.13 ohms, plus or minus 5%
Equalizer coil resistance	0.144 ohms, plus or minus 5%

(4) *Current regulator.*

Normal setting	150 amperes

(5) *Polarized relay assembly.*

Pilot relay:

Closing voltage	20 to 25.5 volts - preferred 22 volts
Opening voltage	13 to 16 volts - preferred 16 volts
Coil resistance	10 ohms, plus or minus 10%

(6) *Differential and reverse current relay assembly.*

Closing voltage	0.5 volts, plus or minus 0.4 volts
Opening current (amperes)	10 to 35 amperes, preferred 20 amperes reverse current
Differential coil resistance	4.4 ohms, plus or minus 10%
Reverse current coil resistance	2.6 ohms, plus or minus 10%

(7) *Paralleling relay.*

Closing voltage	9 to 16 volts
Opening voltage	3.5 to 9 volts
Coil resistance	200 ohms, plus or minus 10%

(8) *Line switch.*

Contact rating	200 ampere
Contact drop	0.10 volts (maximum)
Closing voltage	19 volts (maximum)
Holding voltage	9 volts (maximum)
Coil resistance	59 ohms, plus or minus 10%

(9) *Variable resistors.*

Paralleling potentiometer (if used)	3 ohms, 3 watts
Voltage adjusting rheostat	3 ohms, 3 watts

(10) *Fixed resistors.*

Stabilizing	350 ohms, 5 watts
Parallel	0.4 ohms, 10 watts
Pilot relay coil	250 ohms, 10 watts
Parallel relay coil	150 ohms, 10 watts

c. Preparation.

(1) Turn all selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to "OFF" position (some toggle switches have center positions as "OFF") (fig. 32).

(2) Mount a 150-ampere generator of known serviceable condition (par. 118) on the low speed driving head (5, fig. 7) (par. 94).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b*.

(4) Connect the generator to the generator input binding posts (13, fig. 15) of the test stand, as shown in figure 38, using applicable leads and cable harnesses (figs. 71 and 74).

(5) Connect a connecting link (fig. 65) between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 38.

(6) Mount the 150-ampere generator control box undergoing test on the control box mounting plate (number 3144 (fig. 69)) and bolt it to the regu-

later mounting bracket (fig. 38). Connect the generator control box to the regulator binding post panel using applicable harnesses and leads as shown in figure 38 (these harnesses and leads are listed in appendix II (figs. 72 and 74)).

(7) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position, then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not hold the start button depressed more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (par. 93*c*) and (fig. 38).

(8) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise, the generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. 93*c*).

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

d. Test Procedures.

(1) The position of switches and controls pertinent to the tests in paragraphs (3) through (10) below are listed in table 6, paragraph 118. Place each of these items in the position indicated in column 3*a* of the table before tests are started except for one change, which is the 40-ohm 30-ampere maximum rheo-reg switch (key no. 17 in the table). Place this switch in the "REG" position instead of the "RHEO" position, also be sure the voltage adjusting rheostat (4, fig. 15) is turned fully counterclockwise.

Note. The generator control box shown in figure 38 is a Delco-Remy model 1118413, however, the hook-up and the harnesses and test leads shown in this illustration will be the same for the Bendix Eclipse Pioneer generator control box being tested in this section.

(2) This test is performed as prescribed for the generator performance test in paragraph 118*c* and *d*, except a generator regulator is connected in the circuit of the test stand, *c* above, and the setting of the 40-ohm 30-ampere maximum rheo-reg switch is changed, (1) above. The 40-ohm field current rheostat (16) is not used for this test, except in (10) below, as the generator regulator compensates for this rheostat.

(3) When performing the tests, (1) and (2) above, the ampere reading should be 150 amperes on the load dc ammeter (1), the voltage reading 28 volts on the dc voltmeter (4), and not more than 7.5 amperes reading on the field dc ammeter (2) if the generator regulator is performing properly.

(4) Shock test the generator and generator control box while performing tests, (1) and (2) above. Place the starter test load disconnect switch (10) to "OFF" position and the voltage reading on the dc voltmeter (4) should rise. Place the load disconnect switch (10) to the "ON" position and the ampere reading on the load dc ammeter (1) should return to 150 amperes, and the voltage reading on the dc voltmeter (4) should return to 28 volts with not more than 7.5 amperes reading on the field dc ammeter (2), as specified in (3) above. Perform this shock test several times on the generator and generator control box and observe the results as indicated above.

(5) Place the 100-50 fixed load switch (12-A) and the 50-25 fixed load switch (12-B (par. 118*d* in the "OFF" position, then increase the

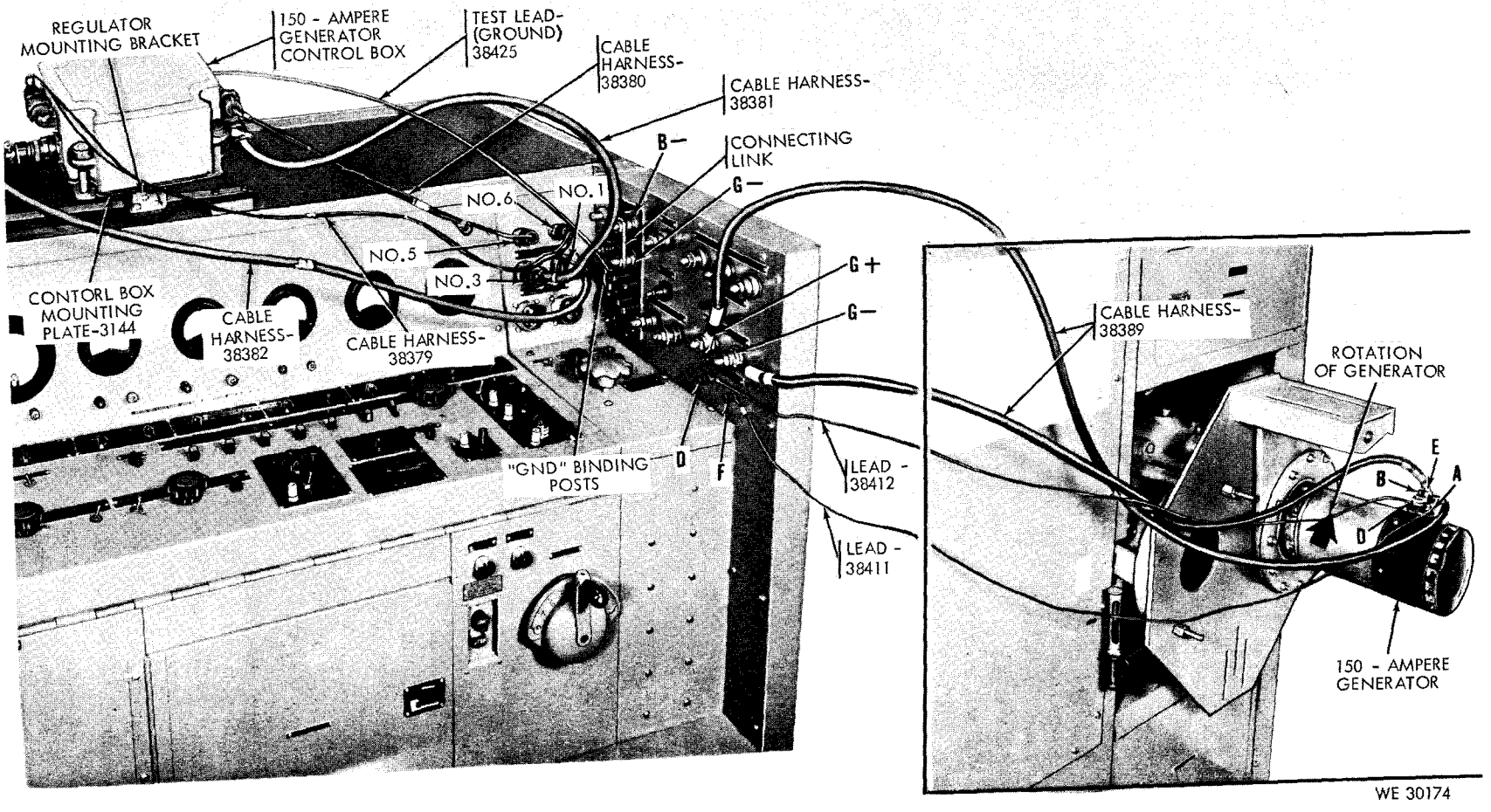


Figure 38. Testing the performance of Bendix Eclipse Pioneer type 40E27, model 1, style B, ordnance no. 7528304, 150–ampere generator control box (Delco-Remy model 1118413 generator control box shown).

ampere load slowly by using the above fixed load switches, and if necessary, by placing the 0-25 0-12.5 load switch (12-D) in the "ON" position and turning the variable load 0-25 0-12.5 ampere rheostat (13) slowly clockwise and observe a slight drop-off in the regulator voltage on the dc voltmeter (4) and the leveling off of the ampere reading on the load dc ammeter (1), when the current regulator (fig. 39) of the generator control box goes into action.

(6) Place the fixed load switches (12-A) (12-B) and (12-D) in the "OFF" position and turn the rheostat (13) fully counterclockwise. Continue with the differential voltage and reverse current test for the differential and reverse current relay in (7) below.

Note. The starter test load disconnect switch (10) remains in the "ON" position for the following tests.

(7) Place the 40-ohm 30 ampere maximum rheo-reg switch (17) in the "RHEO" position, the load dc ammeter range selector switch in the "50A (X1)" position, and the dc volts-millivolts range selector switch (7) in the 900MV position. Turn the 40-ohm field current rheostat (16) slowly clockwise until the voltage on the dc voltmeter (4) indicates 2 to 4 volts below battery voltage (below 18 volts), then place the battery switch (20) in the "ON" position.

(8) Hold the dc volts-millivolts momentary-on switch (21, fig. 16) up to the "READ" position and turn the 40-ohm field current rheostat (16) further clockwise very slowly, until approximately 18 volts are indicated on the dc voltmeter (4). The needle of the dc volts-millivolts meter (4, fig. 16) should deflect to past "0" and to the left (negative) side of the dial to approximately 450 millivolts and as the voltage reading on the dc voltmeter (4) is increased to approximately 25 volts by turning the rheostat (16) further clockwise, the needle of the dc volts-millivolts meter (4, fig. 16) should go back to "0" and to the right (positive) to approximately 100 millivolts.

(9) Release the dc volts-millivolts momentary-on switch (21, fig. 16). The highest dc millivolts reading on the dc volts-millivolts meter (4, fig. 16) is the differential voltage (see *b*(6) above for specification for voltage setting).

(10) Turn the 40-ohm field current rheostat (16) counterclockwise, very slowly, to decrease the voltage reading on the dc voltmeter (4), observing the load dc ammeter (1). The current reading on the meter should increase, then indicate a reverse reading, and then come back to "0" when the relay opens. The maximum reverse current reading attained is the reverse current setting for the differential and reverse current relay assembly (see *b*(6) above for specifications for reverse current setting). Turn off the battery switch (20).

(11) Change the load dc ammeter range selector switch (5) to the 150A (X3) position. Place the 50-25 fixed load switch (12-B) in the "ON" position (be sure the starter test load disconnect switch (10) is in the "ON" position).

(12) Hold the dc volts-millivolts momentary-on switch (21, fig. 16) up to "READ" position and note the millivolt drop reading across the contacts. The millivolts drop should be approximately 150 millivolts reading on the dc volts-millivolts meter (4, fig. 16) and the reading on the load dc ammeter (1) should be approximately 48 amperes (refer to TM 9-8631). Stop the varidrive assembly by depressing the stop button (21-C) of the drive control (21).

(13) Place the switches and controls in table 6, paragraph 118, in positions indicated in column 3*b* of the table. Re-

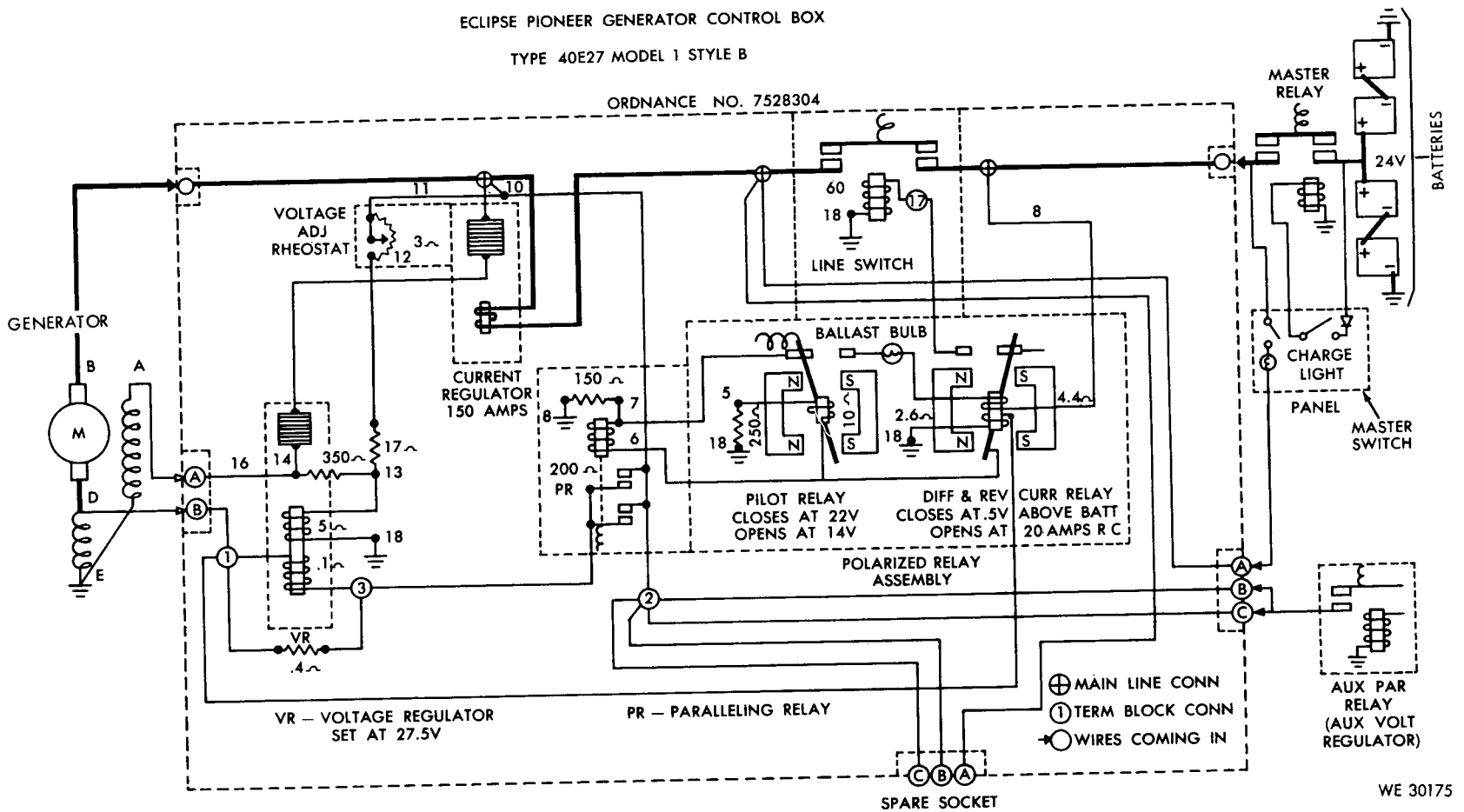


Figure 39. Wiring diagram for Bendix Eclipse Pioneer type 40E27, model 1, style B, ordnance no. 7528304, 150-ampere generator control box—complete hook-up to vehicle electrical system.

move the cable harnesses, test leads, generator, and generator control box from the test stand.

Note. See table 5, paragraph 116, for test data on other models of generator control boxes.

Note. If the voltage reading on the dc volts-millivolts meter (4, fig. 16) is excessive, check all cable connections from the generator control box to the 150-ampere generator control box receptacles (1, fig. 15) to assure that the connections are all clean and tight.

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section VII. TESTING GENERAL ELECTRIC COMPANY 150-AMPERE GENERATOR CONTROL BOX

121. Description

The General Electric 150-ampere generator control box (fig. 40) is designed for use with a generator that has a current output of 150-amperes (par. 117). The generator control box is composed of a series of control units which function in unison to regulate the output voltage and limit the output current of the generator. It also automatically connects or disconnects the generator to or from the electrical system dependent upon the need for, or ability of the generator to supply the electrical energy requirements, therefore, maintaining a sufficient output to keep the unit under charge at its maximum electrical capacity and/or controls the output of the generator within allowable limits preventing a burned-out generator. The individual control units and components used in the construction of the control box are listed in paragraph 122.

122. 150-Ampere Generator Control Box Control Units Tests (General Electric)

a. Purpose. This test is performed to indicate the functioning of the control units of the 150-ampere generator control box (fig. 40) and whether setting adjustments are required to the units so they perform in accordance with manufacturer's specifications.

b. Tabulated Data.

(1) *Manufacturer.*

General Electric Company

(2) *Identifying number.*

Ordnance number . . . 7355925

(3) *Line switch.*

Rating . . . . . 400 amperes
Pick-up . . . . . 16 volts (maximum)
Drop-out . . . . . 5 volts (maximum)
2 volts (minimum)
Coil resistance . . . . . 69 ohms, plus or minus 10%

(4) *Differential and reverse current relay.*

Pick-up . . . . . 0.3 to 0.7 volts (above battery voltage)
Drop-out . . . . . 24 to 34 amperes (preferred 30 amperes) reverse current
Coil resistance . . . . . 105 ohms, plus or minus 10%

(5) *Voltage regulator.*

Voltage coil (red-green leads) . . . . . 5.40 ohms, plus or minus 10%
Equalizer coil (brown-black leads) . . . . . 0.4 ohms, plus or minus 10%
Stack resistance (white lead to stack adjusting screw end) . . . Less than 1 ohm with coils not energized

(6) *Current regulator.*

Data identical to (5) above.

(7) *Voltage adjusting rheostat.*

Rating . . . . . 10 ohms, plus or minus 10%, 3 watts
Range . . . . . approximately 5 volts

(8) *Paralling relay.*

Coil resistance . . . . . 173 ohms, plus or minus 10%
Pick-up . . . . . plus or minus 14% (maximum)
Drop-out . . . . . plus or minus 2 volts (minimum)

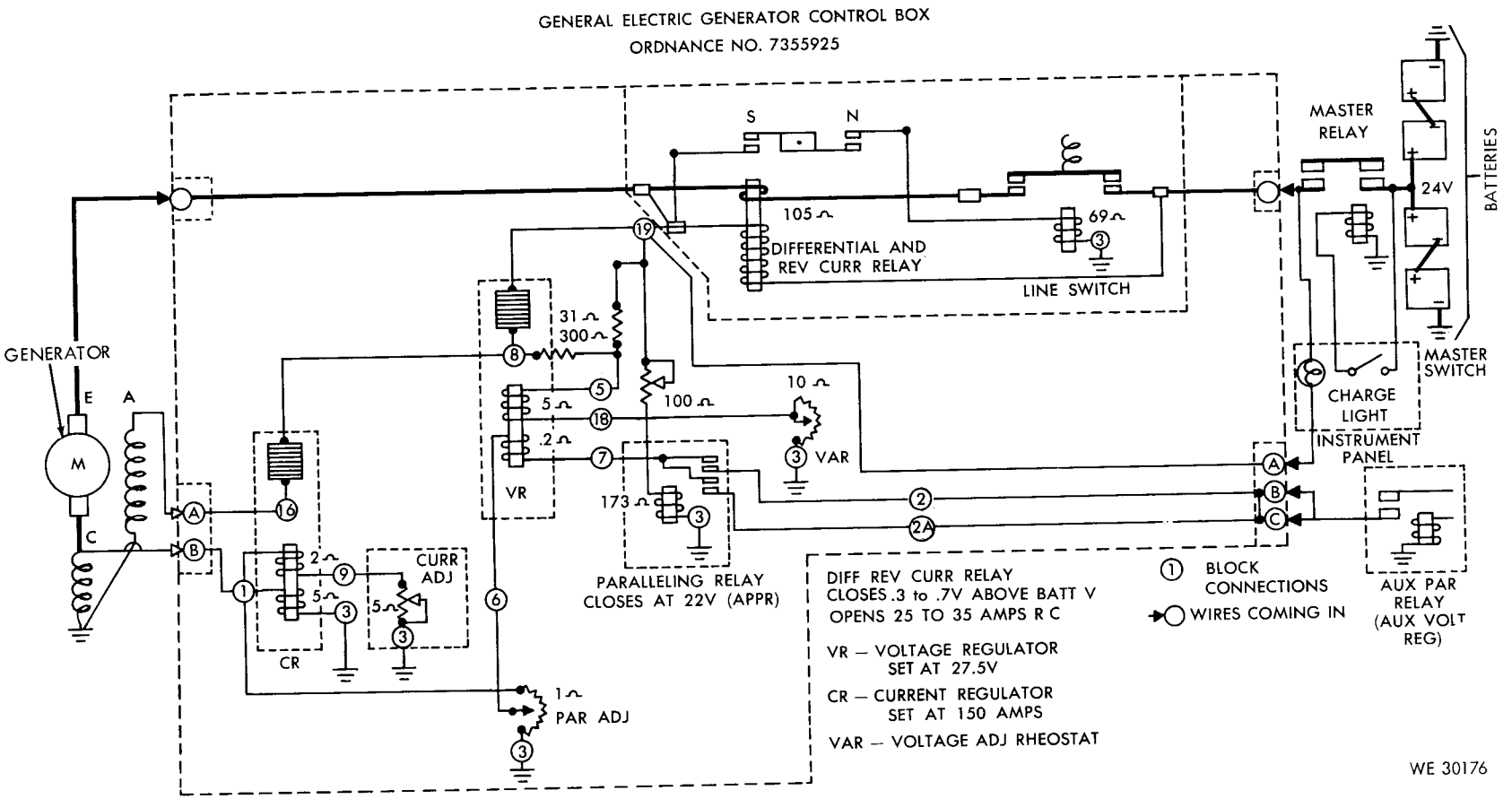


Figure 40. Wiring diagram for General Electric, ordnance no. 7355925, 150–ampere generator control box—complete hook-up to vehicle electrical system.

(9) *Paralleling adjusting potentiometer.*

Rating ..... 3 ohms, plus or minus 10%, 3 watts

(10) *Swamping resistor.*

Rating ..... 31 ohms, plus or minues 5%, 25 watts

(11) *Stabilizing resistor.*

Rating ..... 500 ohms, plus or minus 10%, 1 watt

(12) *Variable resistor (current setting).*

Rating ..... approximately 5 ohms

(13) *Variable resistor (paralleling relay adjustment).*

Rating ..... 100 ohms, plus or minus 10%

c. Preparation.

(1) Turn all selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (some toggle switches have center position as "OFF" (fig. 32)).

(2) Mount a 150-ampere generator of known serviceable condition (par. 118) on the low speed driving head (5, fig. 7) (par. 94).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b*.

(4) Connect the generator to the generator input binding posts (13, fig. 15) of the test stand, as shown in figure 38, using applicable leads and cable harnesses (figs. 71 and 74).

(5) Connect a connecting link (fig. 65) between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 38.

(6) Mount the 150-ampere generator con-control box undergoing test on the control box mounting plate (number 3144 (fig. 69)) and connect it to the regulator binding post panel using applicable harnesses and leads as shown in figure 38 (these harnesses and leads are listed in appendix II (figs. 72 and 74)).

(7) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position, then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not hold the start button depressed more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (par. **93*c*).**

(8) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise, the generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. **93*c*).**

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

d. Test Procedures. The procedures for this test are the same as prescribed in paragraph **120*d*,** except the ampere load applied with the fixed load switches (12-A), (12-B), (12-C), (12-D) and the variable load 0-25 0-12.5 ampere rheostat (13) may have to be varied to obtain the output specified in paragraph **120*d*** (3).

Note. The generator control box shown in figure 38 is a Delco-Remy model 1118413, however, the hook-up and the harnesses and test leads shown in this illustration will be the same for the General Electric Company generator control box being tested in this section.

Note. See table 5, paragraph 116, for test data on other models of generator control boxes.

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section VIII. TESTING DELCO PRODUCTS (DELCO-REMY) 150-AMPERE GENERATOR CONTROL BOX

123. Description

The Delco Products (Delco-Remy) 150-ampere generator control box (fig. 41) differs somewhat in construction from the General Electric 150-ampere generator control box described in paragraph 121 but the functional end results are the same. It consists of a voltage regulator, actuating relay, circuit breaker relay, current regulator, differential relay, paralleling relay, reverse current overload relay, voltage adjusting rheostat and several rectifiers and receptacles.

124. 150-Ampere Generator Control Box Control Units Tests (Delco Products)

a. Purpose. This test is performed to indicate the functioning of the control units of the 150-ampere generator control box (fig. 41) and whether setting adjustments are required to the units so they perform in accordance with manufacturer's specifications.

b. Tabulated Data.

(1) *Manufacturer.*

Delco Products (Delco-Remy)

(2) *Identifying number.*

Model number	1118413
Ordnance number	7968600

(3) *Voltage regulator.*

Voltage setting range	26.9 to 28.1 volts
Adjust to	27.5 volts

(4) *Actuating relay.*

Closing voltage range	24.5 to 26.5 volts adjust to 25.5 volts
Reverse current	15 to 32 amperes at 25.0 volts

(5) *Circuit breaker relay.*

Closing voltage	19.5 to 21.5 volts adjust to 20 volts
Sealing voltage	Not less than closing voltage and not more than 1.6 volts above closing voltage

(6) *Current regulator.*

Current setting range	145 to 155 amperes, adjust to 150 amperes

(7) *Differential relay.*

Closing voltage	19.5 to 21.5 volts
Adjust to	20 volts

(8) *Paralleling relay.*

Closing voltage	19.5 to 21.5 volts
Adjust to	20 volts

(9) *Reverse current overload relay.*

Reverse current setting	75 to 100 amperes

c. Preparation.

(1) Turn all selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (some toggle switches have center position as "OFF") (fig. 32).

(2) Mount a 150-ampere generator of known serviceable condition (par. 118) on the low speed driving head (5, fig. 7) (par. 94).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b*.

(4) Connect the generator to the generator input binding posts (13, fig. 15) of the test stand, as shown in figure 38, using applicable leads and cable harnesses (figs. 71 and 74).

(5) Connect a connecting link (fig. 65) between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 38.

(6) Mount the 150-ampere generator control box undergoing test on the control box mounting plate (number 3144 (fig. 69)) and connect it to the regulator binding post panel using applicable harnesses and leads as shown in figure 38 (these harnesses and leads are listed in appendix II (figs. 72 and 74)).

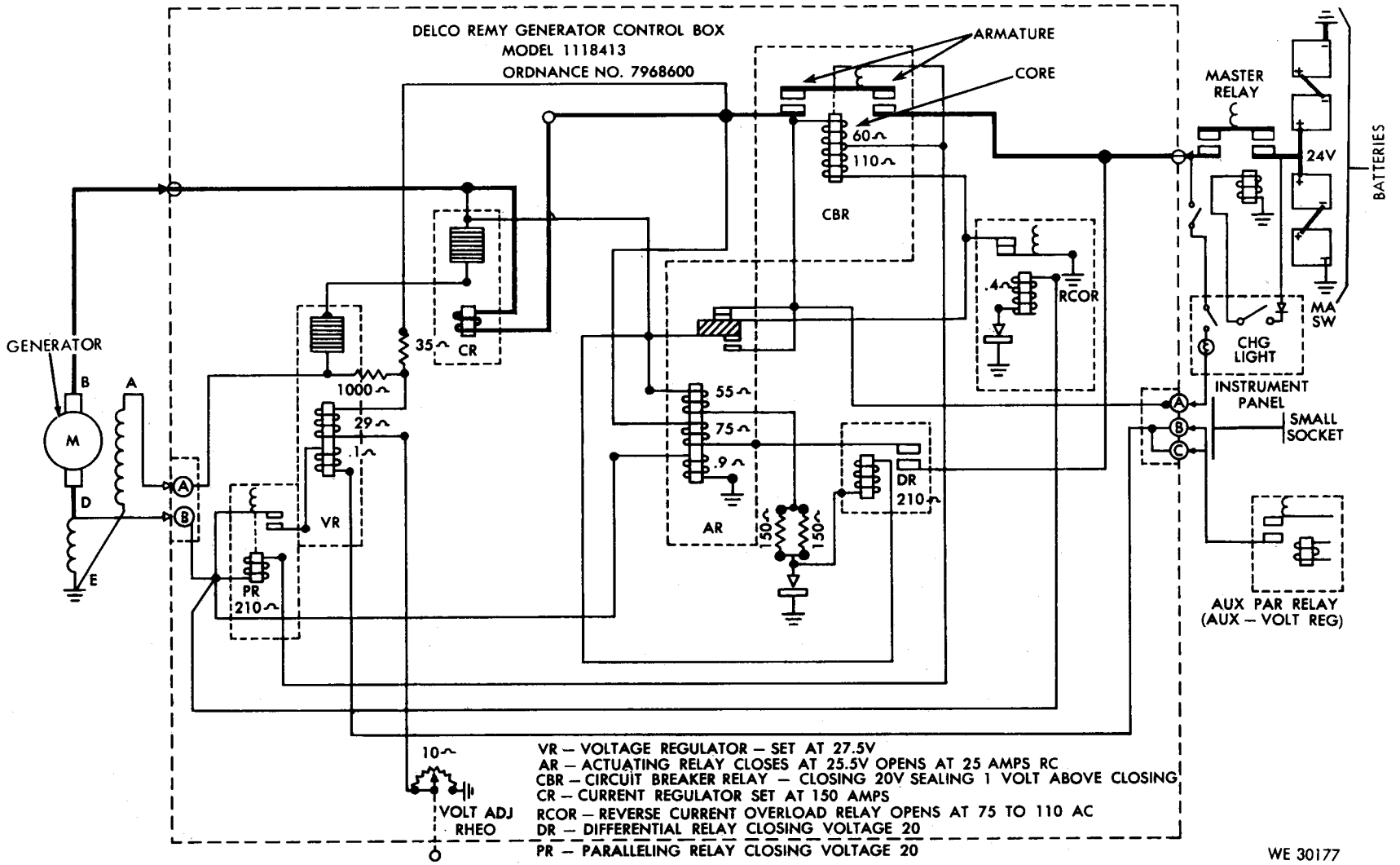


Figure 41. Wiring diagram for Delco Products (Delco-Remy) model 1118413, ordnance no. 7968600, 150-ampere generator control box—complete hook-up to vehicle electrical system.

(7) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position, then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not hold the start button depressed more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (par. 93*c*)

(8) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise, the generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position. (par. 93*c*)

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

d. Test Procedures. The procedures for this test are the same as prescribed in paragraph 120*d*, except the ampere load applied with the fixed load switches (12-A), (12-B), (12-C), (12-D) and the variable load 0-25 0-12.5 ampere rheostat (13) may have to be varied to obtain the output specified in paragraph 120*d*.

Note. See table 5, paragraph 116, for test data on other models of generator control boxes.

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section IX. TESTING JACK AND HEINTZ 300-AMPERE GENERATOR

125. Description

The Jack and Heintz 300-ampere generator (model G22, G22-2, or G22-7F, (fig. 43) is fan cooled. The generator has an internally grounded field, consisting of interpole and compensating windings. It is direct driven in a counterclockwise rotation at the drive end (turns to the left facing pulley (fig. 42). The models G22 and G22-2 have a built-in cooling fan whereas the model G22-7F has a cooling blower which is mounted separately on the housing of the generator. Refer to TM 9-2920-224-35.

126. 300–Ampere Generator Performance Test (Jack and Heintz)

a. Purpose. This test is performed to determine whether the generator is functioning in accordance with the manufacturer's specifications for ampere and voltage output when operating under normal conditions.

b. Tabulated Data.

Manufacturer	Jack and Heintz
Model and ordnance number	G22 (ORD 7358630)
Model and ordnance number	G22-2 (ORD 8717421)
Model and ordnance number	G22-7F (ORD 10889998)
Federal stock number model (G22-7F)	2920-830-1293
Poles	6
Brushes	6
Speed range	2,000 to 6,500 rpm
Weight	94 pounds (model G22 and G22-2)
Weight	105 pounds w/o blower (model G-22-7F)
Type windings	Interpole and compensating
Field connections	To negative brush
Rotation direction (drive end)	Counterclockwise
Rated voltage	30 volts
Rated amperes	300 amperes
Type housing	nonwaterproof
Spline drive	16 tooth
Brush length	new 1-3/16 inch-worn minimum 11/16 inch
Field ground	internal

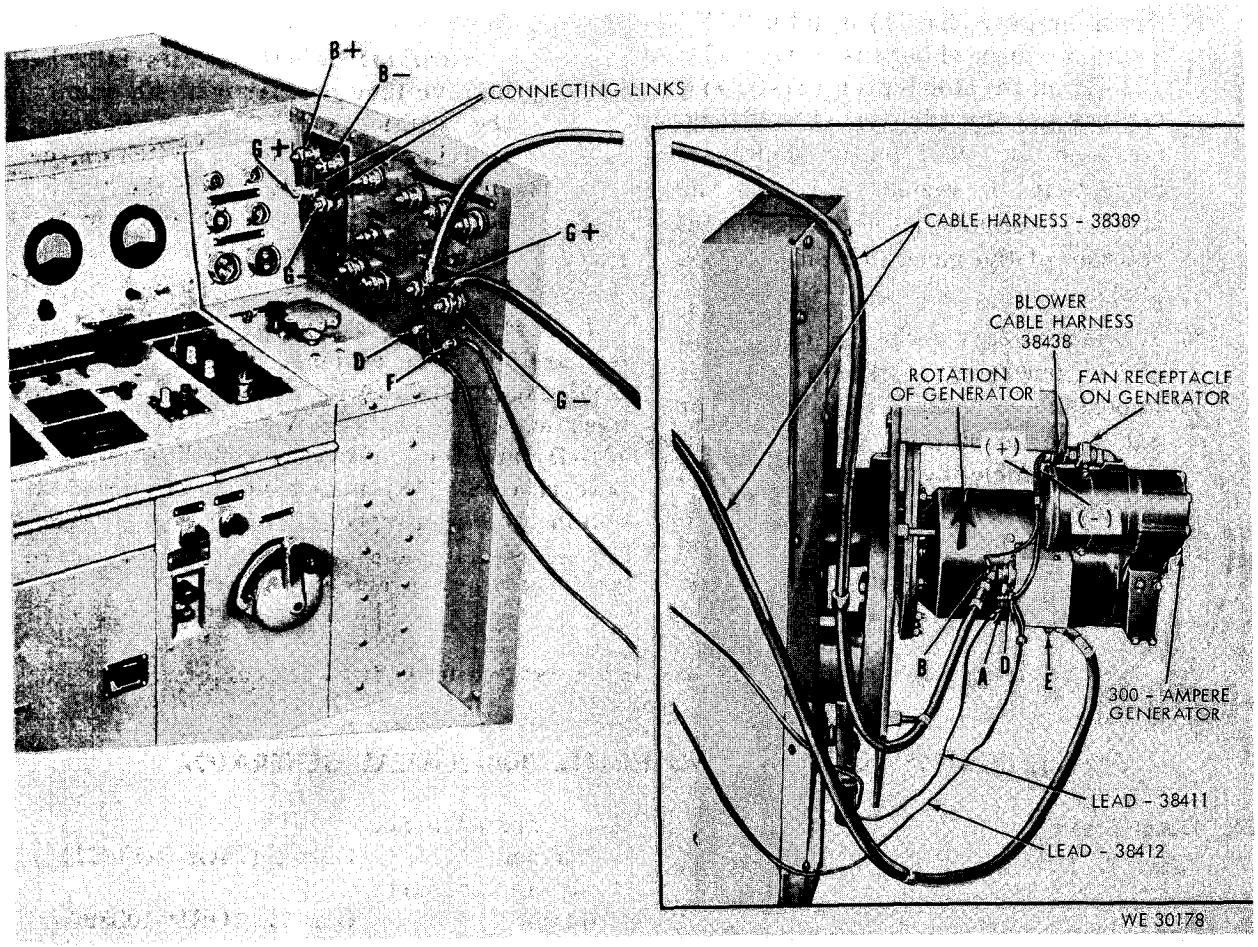


Figure 42. Testing output of Jack and Heintz, model G22-7F, 300-ampere generator.

Field resistance	2.25 ohms + 0.2 ohms at 77° F
Interpole drop	1.3 volts + 0.1 volts at 6,500 rpm 28.5 volts and 300 amperes, terminals "E" and "D"
Blower data (model G22-7F):	
Manufacturer's model number	30022-316
Weight	5.40 pounds
Ordnance number	10898759

c. Preparation.

(1) Turn all selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to the "OFF" position (some toggle switches have center positions as "OFF") (fig. 32).

(2) Mount the 300-ampere generator under test on the low speed driving head (5, fig. 7) (par. 94).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b*.

(4) Connect the generator to the generator input binding posts (13, fig. 15) of the test stand, as shown in figure 42, using applicable leads and cable harnesses (figs. 71, 73, and 74).

(5) Connect a connecting link (fig. 65) between "B+" and "G+" and between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 42.

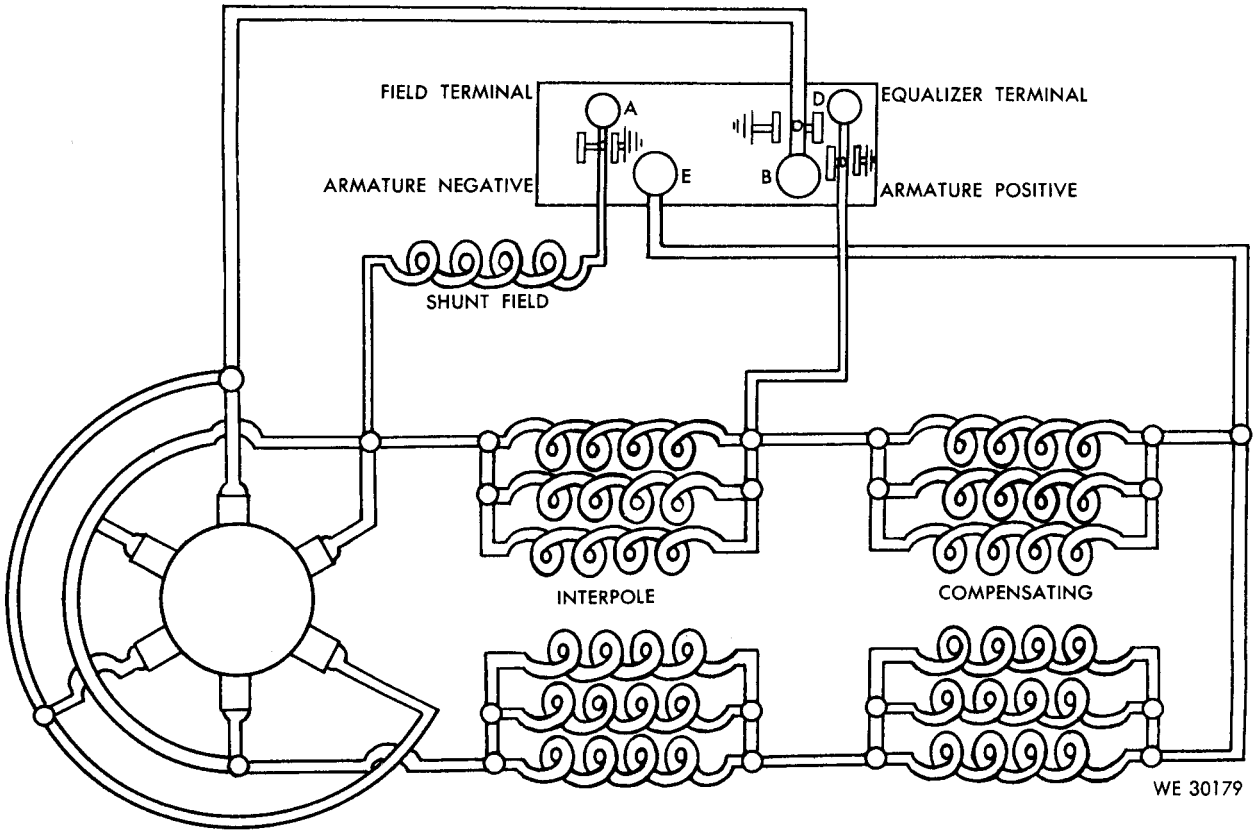


Figure 43. Schematic internal wiring diagram for Jack and Heintz models G22, G22-2, and G22-7F, 300-ampere generators.

(6) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position, then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not hold the start button depressed more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (par. 93*c*).

(7) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise, the generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. 93*c*)

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

Note. The generator hook-up for testing a 300 ampere generator shown in figure 42 is for a Jack and Heintz model G22-7F. When testing a model G22 or G22-2 Jack and Heintz generator the hook-up will be the same except for the connection for the blower of the generator. This connection is not required as the cooling device for the models G22 and G22-2 is built within these generators by the use of a fan propelled by the generator shaft. When testing other models of 300-ampere generators the hook-up illustrated in figure 42 may be followed as a guide.

d. Test Procedures.

Note. Polarize the generator before and after testing (par. 99*d*).

(1) The position of the switches and controls pertinent to this test are listed in table 6, paragraph 118. Place each of these items in positions indicated in column 3*a* of the table before tests are started.

(2) Place the battery switch (20) in the "ON" position and turn the dc voltmeter circuit selector switch (9) to the "BAT VOLTS" position to determine whether the battery voltage of the test stand is the same as the voltage of the system under test. Correct voltage is 24 volts which will be indicated on the dc voltmeter (4). If the reading is less than 24 volts recharge batteries (par. 98). It is also advisable to check the batteries with a hydrometer for specific gravity (refer to TM 9-6140-200-15).

Note. The safety clip (21-B) must be off the stop button (21-C) to perform the battery check in (2) above. Do not push the start button (21-A) as the varidrive assembly need not be running for this test.

(3) Place the battery switch (20) in the "OFF" position and turn the dc voltmeter circuit selector switch (9) to the "RECT GEN" position.

(4) Start the varidrive assembly by sliding the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not depress the start button more than 10 seconds) to start the varidrive assembly.

(5) Turn the speed control handle (22) slowly clockwise until 3,000 rpm are indicated on the tachometer indicator meter (3).

(6) Place three of the fixed load switches (12-A) in the "ON" position (be sure the starter test load disconnect switch (10) is in the "ON" position before load switches are turned on).

(7) Turn the 40-ohm field current rheostat (16) clockwise until 300 amperes are indicated on the load dc ammeter (1). The dc voltmeter (4) should indicate approximately 28 volts and the field dc ammeter (2) not more than 7.5 amperes (refer to paragraphs 74 and 75 if no amperage reading can be obtained on the load dc ammeter (1)).

Note. Observe the dc voltmeter (4) and bring the generator voltage up to approximately 20 volts reading on the dc voltmeter rapidly, and evenly, using the 40-ohm field current rheostat (16), then proceed slowly until 300 amperes are indicated on the load dc ammeter (1), (7) above.

(8) Turn the 40-ohm field current rheostat (16) in the fully counterclockwise direction and the speed control handle (22) partially counterclockwise until the varidrive assembly speed is reduced to ¼-speed. Stop the varidrive assembly by depressing the stop button (21-C) on the drive control (21). If the generator performs as specified in (7) above, next test in (9) below can be performed, otherwise, generator is unserviceable and will require repairing. Leave all leads, connecting links, switches, and controls remain as specified at this point and continue with test in (9) below if generator is not unserviceable.

(9) Test for interpole and compensating winding shorts as follows:

(a) Place the dc voltmeter range selector switch (8) in the "10V (X1)" position and the dc voltmeter circuit selector switch (9) in the "EXT VOLTS" position.

(b) Connect the external dc voltmeter positive (red) binding post (29, fig. 16) to the ground (GND) binding post (10-E, fig. 15) and connect the external dc voltmeter negative (black) binding post (29, fig. 16) to the "D" generator input binding post (13-C, fig. 15) of the test stand using two test leads 38425 (fig. 74).

(c) Start the varidrive assembly, c(6) above, and turn the speed control handle (22) slowly clockwise until 3,000 rpm are indicated on the tachometer indicator meter (3).

(d) Turn the 40-ohm field current rheostat (16) clockwise until 3000 amperes are indicated on the load dc ammeter (1).

(e) The reading on the dc voltmeter (4) should be between 1.1 to 1.4 volts. A lower than above voltage reading indicates a shorted interpole and compensating windings; higher than above voltage reading indicates high resistance in the windings.

(f) Check the generator brushes for sparking, and the generator for unusual noises and excessive heat.

(g) Turn the 40 ohm field current rheostat (16) in the fully counterclockwise direction and the speed control handle (22) partially counterclockwise until the varidrive assembly speed is reduced to ¼ speed. Stop the varidrive assembly by depressing the stop button (21-C) on the drive control (21).

(h) Place switches and controls in table 6, paragraph 118, in positions indicated in column 3b of the table. Remove all cables, leads, and the generator from the test stand.

(i) Polarize the generator (par. 99d).

Note. The key numbers shown below in parentheses in this section refer to figure 32 except where otherwise indicated.

Section X. TESTING RETT PRODUCTS COMPANY, THE ELECTRO-MECHANICAL PRODUCTS COMPANY, AND TENN-TRONICS, INC. 400-AMPERE GENERATOR CONTROL BOXES

127. Description

The Rett Products Company 400-ampere generator control box (fig. 44), the Electro-mechanical Products Company 400-ampere generator control box (not illustrated), and the Tenn-Tronics Inc 400-ampere generator control box (fig. 45), all identified under ordnance number 8723894 have a construction similar to that of the 150-ampere generator control box described in paragraph 119, except that they are designed for a 400-ampere circuit. The individual control units used in the construction of the Rett Products Company generator control box are a line switch, polarized voltage relay, differential and reverse current relay, voltage regulator, and voltage adjusting rheostat. The Electrical-Mechanical Products Company and Tenn-Tronics Inc generator control boxes are similar in construction with the Rett Products Company generator control box and the purpose and functional results of these three control boxes are the same as that which is described for the 150-ampere generator control box paragraph 119.

128. 400-Ampere Generator Control Box Control Units Tests (Rett Products Company, Electro - Mechanical Products Company, and Tenn-Tronics Inc.)

Refer to TM 9-2320-222-35/1.

a. Purpose. This test is performed to indicate the functioning of the control units of the 400-ampere generator control box (fig. 44) and whether setting adjustments are required to the units so they perform in accordance with manufacturer's specifications.

b. Tabulated Data.

(1) *Manufacturer* (par. 127).

(2) *Identifying number.*

Ordnance 8723894

(3) *Voltage regulator.*

Voltage coil (red-green leads) . . . . . 5.40 ohms, plus or minus 10%

Equalizer coil (brown-black leads) . . . . . 0.4 ohms, plus or minus 10%

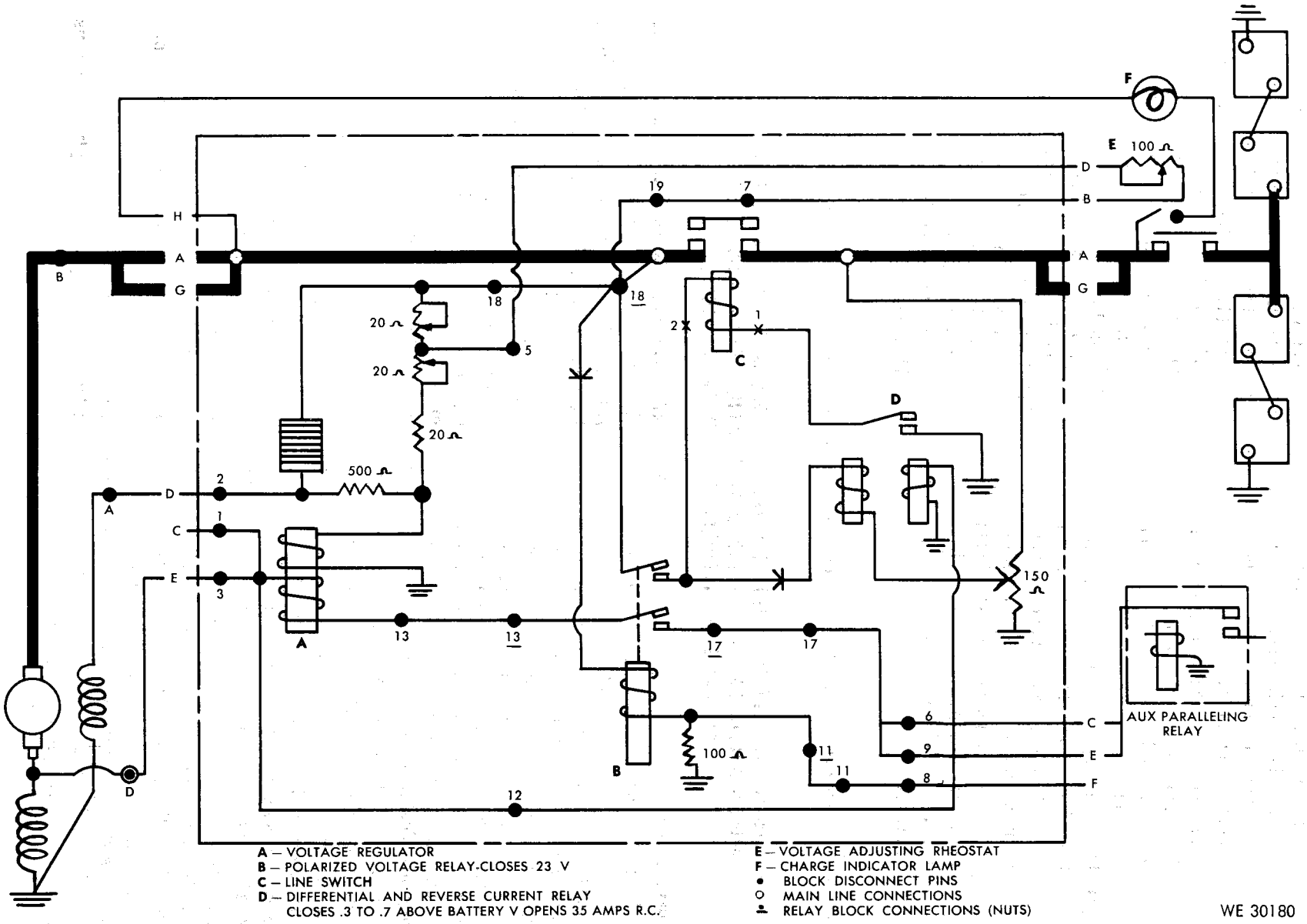


Figure 44. Wiring diagram for ordnance number 8723894 generator control box—complete hook-up to vehicle electrical system.

Stack resistance (white-lead to stack adjusting screw end)	0.2 ohm approximately with coil not energized

(4) *Line switch.*

Rating	200 amperes
Closing voltage	18 volts
Opening voltage range	7 to 15 volts
Millivolt drop	175 millivolts
Coil resistance	60 ohms, plus or minus 10%

(5) *Polarized voltage relay.*

Closing voltage	23 volts, approximately
Opening voltage	8 volts, approximately
Coil resistance	235 ohms

(6) *Differential and reverse current relay.*

Differential closing	0.3 to 0.7 volt above battery voltage
Differential coil resistance	1.9 ohms, approximately
Reverse current opening	35 to 45 amperes
Reverse current coil resistance	1.9 ohms, approximately

(7) *Miscellaneous resistors.*

(a) Fixed resistors.

Stabilizing	500 ohms
Operating coil of regulator circuit	20 ohms
Stabilizing for regulator	500 ohms
Polarized voltage relay coil	100 ohms

(b) Variable resistors.

Regular circuit operating coil	20 ohms
Differential circuit coil	150 ohms

(c) Rectifiers.

Polarized voltage relay coil	qty - 1
Differential relay coil circuit	qty - 1

c. Preparation.

(1) Turn all selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise and all on-off toggle switches to the "OFF" position (some toggle switches have center position as "OFF") (fig. 32).

(2) Mount a 300-ampere generator of known serviceable condition (par. 126) on the low speed driving head (5, fig. 7) (par. 94).

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b*.

(4) Connect the generator to the generator input binding posts (13, fig. 15) of the test stand, as shown in figure 46, using applicable leads and cable harnesses (figs. 71, 73, and 74).

(5) Connect a connecting link (fig. 65) between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 46.

(6) Mount the 400-ampere generator control box undergoing test on the control box mounting plate (number 3145 (fig. 69)) and bolt it to the regulator mounting bracket (fig. 46). Connect the generator control box to the regulator binding post panel using applicable harnesses and leads as shown in figure 46 (these harnesses and leads are listed in appendix II (fig. 73)).

(7) Check to see if the toggle switch on the circuit breaker (fig. 11) is in the "ON" position, then slide the safety clip (21-B) off the stop button (21-C) and depress the start button (21-A) (do not hold the start button depressed more than 10 seconds) to start the varidrive assembly. Check for correct rotation of the generator pulley (par. 93*c* and (fig. 46)).

(8) If it is necessary to change the rotation of the generator (correct rotation is important, otherwise, the generator will have no output), stop the varidrive assembly by pushing the stop button (21-C), let the varidrive assembly come to a complete stop, and place the drive reversing switch (fig. 12) in the opposite position (par. 93*c*)

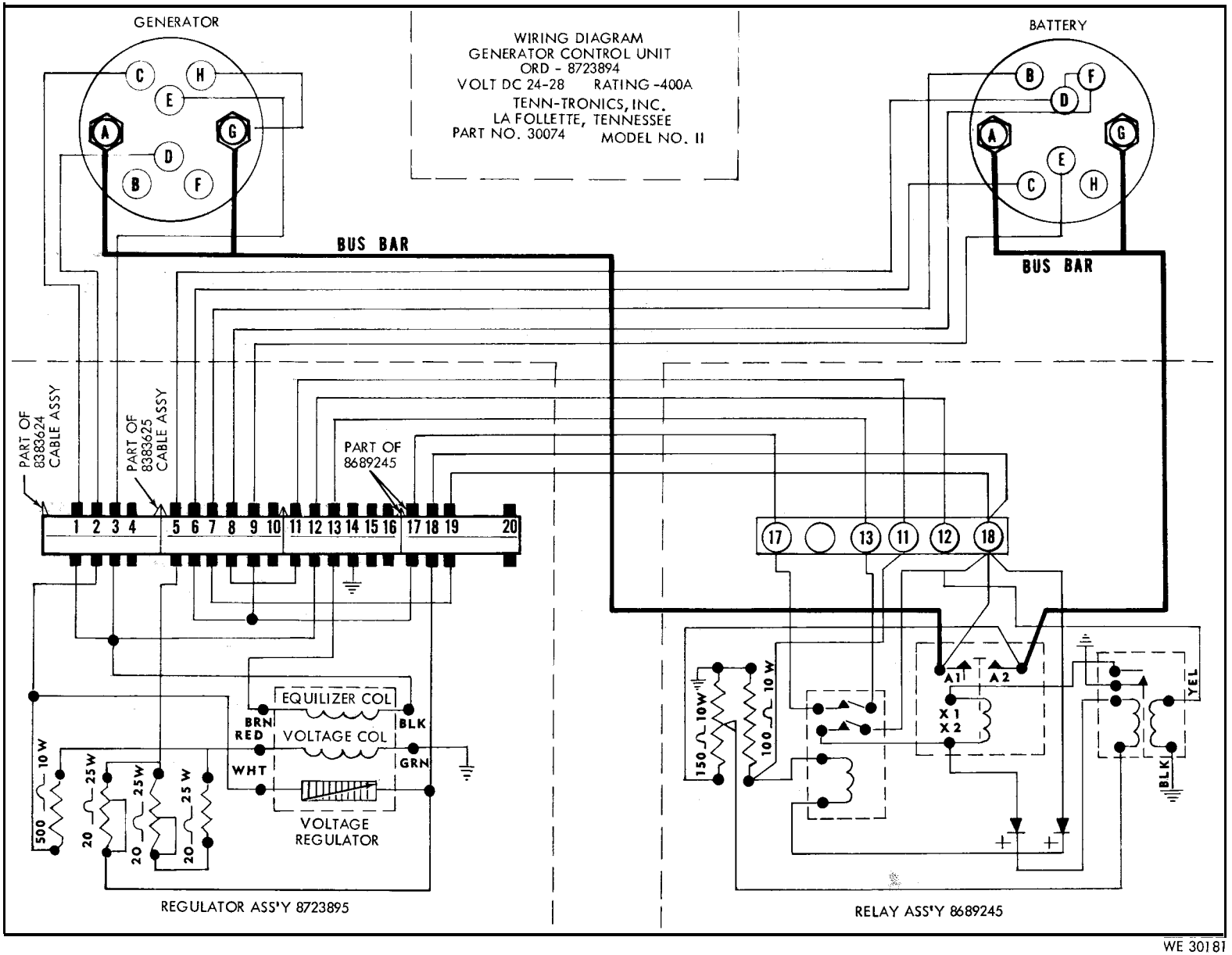


Figure 45. Wiring diagram for Tenn-Tronics, Inc. ordnance no. 8723894, part no. 30074, model II, 400-ampere generator control box—w/o hook-up to vehicle.

Warning: **Before reaching into the high voltage compartment to change the position of the drive reversing switch, place the toggle switch on the circuit breaker (fig. 11) in the "OFF" position, as high voltage exists in the surrounding area of this compartment.**

d. Test Procedure.

(1) The position of switches and controls pertinent to the tests in paragraphs (3) through (10) below are listed in table 6, paragraph 118. Place each of these items in positions indicated in column 3*a* of the table before tests are started except for one change, which is the 40-ohm 30-ampere maximum rheo-reg switch (key no. 17 in the table). Place this switch in the "REG" position instead of the "RHEO" position, also be sure the voltage adjusting rheostat (4, fig. 15) is turned fully counterclockwise.

(2) This test is performed as prescribed for the generator performance test in paragraph 126*c* and *d,* except a generator regulator is connected in the circuit of the test stand *c* above. and the setting of the 40-ohm 30-ampere maximum rheo-reg switch is changed, (1) above. The 40-ohm field current rheostat (16) is not used for this test, except in (10) below, as the generator regulator compensates for this item.

(3) When performing the tests (par. 126*d*) the ampere reading should be 300 amperes on the load dc ammeter (1), the voltage reading 28 volts on the dc voltmeter (4), and not more than 7.5 amperes reading on the field dc ammeter (2) if the generator regulator is performing properly.

(4) Shock test the generator and generator control box while performing tests above. Place the starter test load disconnect switch (10) to "OFF" position and the voltage reading on the dc voltmeter (4) should rise. Place the load disconnect switch (10) to the "ON" position and the ampere reading on the load dc ammeter (1) should return to 300 amperes reading and the voltage reading on the dc voltmeter (4) should return to 28 volts with not more than 7.5 amperes reading on the field dc ammeter (2), as specified in (3) above. Perform this shock test several times on the generator and generator control box and observe the results as indicated above.

(5) Place the three 100-50 fixed load switches (12-A) (par. 126*d* in the "OFF" position, then increase the ampere load slowly by using the above fixed load switches, and if necessary, by placing the 0-25 0-12.5 load switch (12-D) in the "ON" position and turning the variable load 0-25 0-12.5 ampere rheostat (13) slowly clockwise and observe a slight drop-off in the regulator voltage on the dc voltmeter (4) and the leveling off of the ampere reading on the load dc ammeter (1), when the current regulator (figs. 44 or 45) of the generator control box goes into action.

(6) Place the three fixed load switches (12-A) in the "OFF" position and turn the rheostat (13) fully counterclockwise. Continue with the differential voltage and reverse current test for the differential and reverse current relay in (7) below.

Note. The starter test load disconnect switch (10) remains in the "ON" position for the following tests.

(7) Place the 40-ohm 30-ampere maximum rheo-reg switch (17) in the "RHEO" position, the load dc ammeter range selector switch in the "50A (X1)" position, and the dc volts-millivolts range selector switch (7) in the 900MV position. Turn the 40-ohm field current rheostat (16) slowly clockwise until the voltage on the dc voltmeter (4) indicates 2 to 4 volts below battery voltage (below 18 volts), then place the battery switch (20) in the "ON" position.

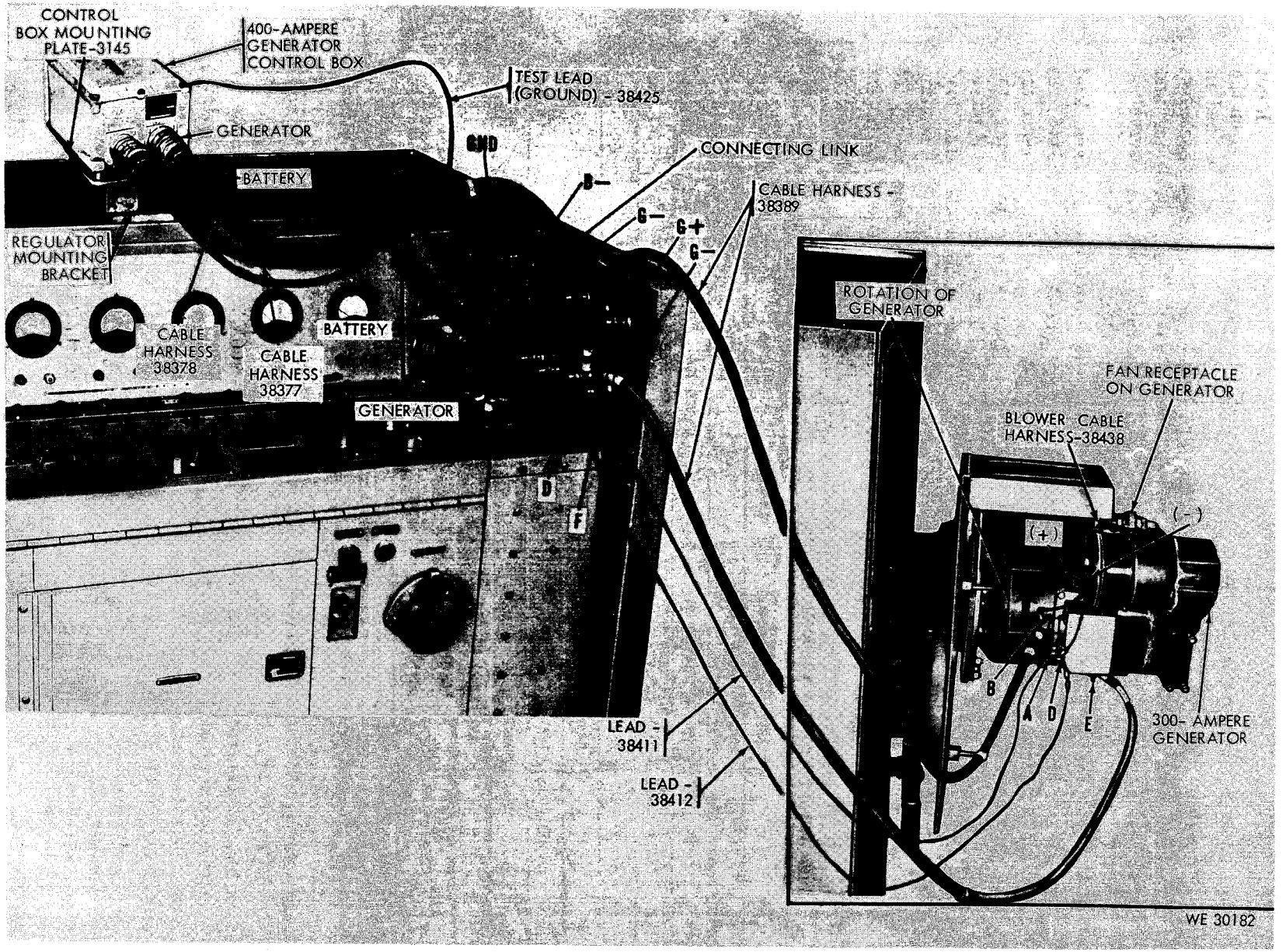


Figure 46. Testing performance of 400–ampere generator control box (Tenn-Tronics, Inc., ordnance number 8723894 generator control box shown) using 300–ampere, model G22–7F, Jack and Heintz generator in circuit.

(8) Hold the dc volts-millivolts momentary-on switch (21, fig. 16) up to the "READ" position and turn the 40-ohm field current rheostat (16) further clockwise very slowly, until approximately 18 volts are indicated on the dc voltmeter (4). The needle of the dc volt-millivolts meter (4, fig. 16) should deflect to past "0" and to the left (negative) side of the dial to approximately 450 millivolts and as the voltage reading on the dc voltmeter (4) is increased to approximately 25 volts, by turning the rheostat (16) further clockwise, the needle of the dc volts-millivolts meter (4, fig. 16) should go back to "0" and to the right (positive) to approximately 100 millivolts.

(9) Release the dc volts-millivolts momentary-on switch (21, fig. 16). The highest dc millivolts reading on the dc volts-millivolts meter (4, fig. 16) is the differential voltage (see *b* above for specification for voltage setting).

(10) Turn the 40-ohm field current rheostat (16) counterclockwise, very slowly, to decrease the voltage reading on the dc voltmeter (4), observing the load dc ammeter (1). The current reading on the meter should increase, then indicate a reverse reading, and then come back to "0" when the relay opens. The maximum reverse current reading attained is the reverse current setting for the differential and reverse current relay assembly (see *b* above for specifications for reverse current setting). Turn off the battery switch (20).

(11) Change the load dc ammeter range selector switch (5) to the "150A (X3)" position. Place one 100-50 fixed-load switch (12-A) in the "ON" position (be sure the starter test load disconnect switch (10) is in the "ON" position).

(12) Hold the dc volts-millivolts momentary-on switch (21, fig. 16) up to "READ" position and note the millivolts drop reading across the contacts. The millivolts drop should be approximately 150 millivolts reading on the dc volts-millivolts meter (4, fig. 16) and the reading on the load dc ammeter (1) should be approximately 48 amperes. (Refer to manufacturer's and/or pertinent publication(s) covering the generator control box). Stop the varidrive assembly by depressing the stop button (21-C).

(13) Place the switches and controls in table 6, paragraph 118, in positions indicated in column 3*b* of the table. Do not remove any cables, leads, or generator and continue with tests in paragraph *e* below if the individual control units of the generator control box require checking and/or resetting adjustments.

Note. The key numbers shown below in parentheses in this section refer to figure 47 except where otherwise indicated.

Section XI. TESTING LEECE NEVILLE COMPANY 100-AMPERE GENERATOR (ALTERNATOR) (PULLEY OR DIRECT-DRIVEN)

129. Description

The Leece Neville Company 100-ampere generator (alternator) (figs. 48, 50, or 52) is used in conjunction with the Leece Neville Company generator (alternator) regulator (par. 131). The generator (alternator) is pulley-driven or direct-driven, fan cooled, non-waterproof, and has an internally grounded field. For detailed description refer to TM 9-7003. TM 9-2920-225-35. and TB 9-2300-206-15.

130. 100-Ampere Generator (Alternator) Performance Test (Leece Neville Company, Pulley or Direct Driven)

a. Purpose. This test is performed to determine whether the generator (alternator) is

functioning in accordance with the manufacturer's specifications for ampere and voltage output when operating under normal conditions.

b. Tabulated Data.

(1) *Pulley-driven.* (figs. 48 and 52)

Manufacturer	The Leece-Neville Company
Federal stock number	2920-314-0556
Manufacturer's model	Type A0015320GP and 5320-G12P
Ordnance number	8376691
Rated voltage	28 volts
Rated amperes	100 amperes
Speed range	1,650 to 8,000 rpm
Number brushes	4 (2 pair)
Rotation	nondirectional
Weight	37 pounds
Field current	8 to 10 amperes at 100 amperes output

(2) *Direct-driven.* (figs. 50 and 52)

Manufacturer	The Leece Neville Company
Manufacturer's model	Type A0015504AA
Ordnance number	10922191
Rated voltage	28 volts
Rated amperes	100 amperes
Speed range	1,650 to 8,000 rpm
Number brushes	4 (2 pair)
Rotation	nondirectional
Weight	37 pounds
Field current	8 to 10 amperes at 100 ampere output

(3) *Rectifier.* (Used with pulley or direct-driven generator) (alternator) (figs. 49 and 52)

Manufacturer	The Leece Neville Company
Manufacturer's model	Type C0011029CP
Ordnance number	7954343
Rated volts	28 volts
Rated amperes	100 amperes

c. Preparation.

Note. Before testing the generator (alternator) for performance check the rectifier, (3) above, for serviceability as prescribed in TM 9-7003 or TB 9-2300-206-15.

(1) Turn all switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to "OFF" position (some toggle switches have center position as "OFF") (fig. 47).

(2) Mount the generator (alternator) (pulley- or direct-driven) undergoing test on low speed driving head (5, fig. 7) pars. 94 or 95) as shown in figures 48 and 50.

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b* or 97*c* as applicable for the type (pulley- or direct-driven) generator (alternator) undergoing test.

(4) Connect the generator (alternator) (pulley- or direct-driven) to the alternator input binding posts (12, fig. 15), as shown in figures 48 or 50, using applicable leads and cable harness sets (fig. 73).

(5) Connect a connecting link (fig. 65) between "B+" and "G+" and between "B-" and "G-" regulator binding posts (10, fig. 15) as shown in figure 48.

(6) Remove the rectifier mounting bracket assembly from the rectifier compartment and mount a rectifier, *b.* above, (ordnance number 7954343) of know serviceable condition (see note *c* above) on the bracket assembly (fig. 49).

(7) Place the rectifier and mounting bracket assembly (6) above, in the rectifier compartment as shown in figure 49.

(8) Lower or raise the rectifier and mounting bracket assembly, so the rectifier is centered in the air flow of the air vents in the rectifier compartment, and with the fins of the rectifier vertical with the flow of air.

(9) Connect the rectifier to the binding posts in the rectifier compartment, as shown in figure 49, using applicable cable harnesses (fig. 73). Close the rectifier compartment door.

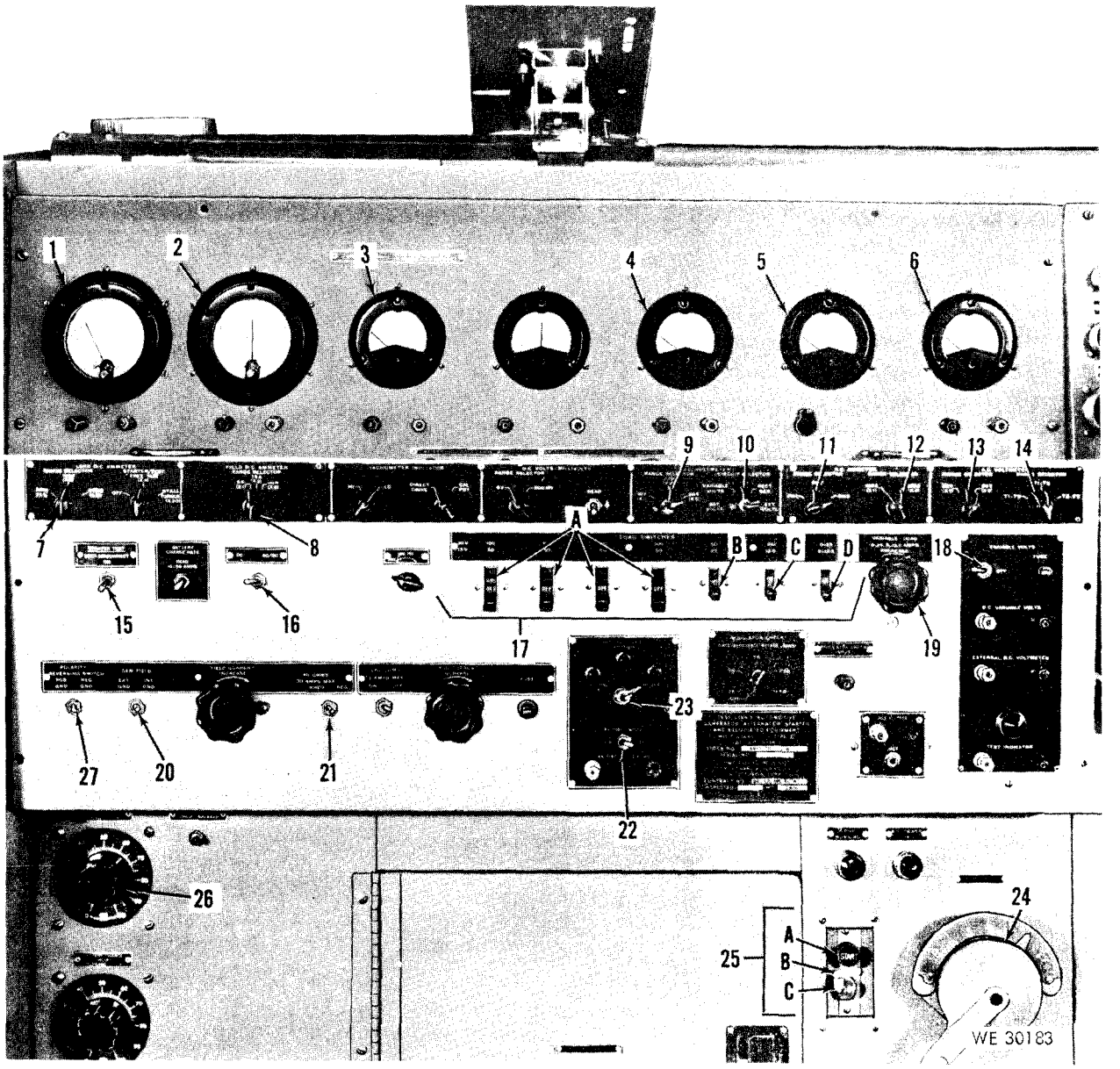


Figure 47. Switches, controls, and meters used to perform 100-ampere generator (alternator) performance test and generator (alternator) regulator test.

1 - Load dc ammeter
2 - Field dc ammeter
3 - Tachometer indicator meter
4 - Dc voltmeter
5 - Ac ammeter
6 - Ac voltmeter
7 - Load dc ammeter range selector switch
8 - Field dc ammeter range selector switch
9 - Dc voltmeter range selector switch
10 - Dc voltmeter circuit selector switch
11 - Ac ammeter phase selector switch
12 - Ac ammeter range selector switch
13 - Ac voltmeter range selector switch
14 - Ac voltmeter phase selector switch
15 - Starter test load disconnect switch
16 - Field ammeter dc ac/dc switch
17 - Field load switches
    4 - 100-50 fixed load switch
    B - 50-25 field load switch
    C - 25-12.5 fixed load switch
    D - 0-25 0-12.5 load switch
18 - Variable volts on-off switch
19 - Variable load 0-25 0-12.5 ampere rheostat
20 - Generator field external-internal ground switch
21 - Field current rheostat-regulator switch
22 - Battery on-off switch
23 - Battery circuit selector switch
24 - Speed control handle
25 - Drive control
    A - Start button
    B - Safety clip
    C - Stop button
26 - Dc variable power supply control
27 - Polarity reversing switch

Note. The rotation of the generator (alternator) is nondirectional, therefore, the rotation of the varidrive assembly can be in either direction without loss of the generator (alternator) output.

d. Test Procedures.

(1) Connect the dc variable volts positive (red) and negative (black) binding posts to the "D" and "F" (some stands are marked "E" instead of "F") binding posts of the alternator input binding posts (12, fig. 15) as shown in figure 48, using applicable test leads (fig. 74).

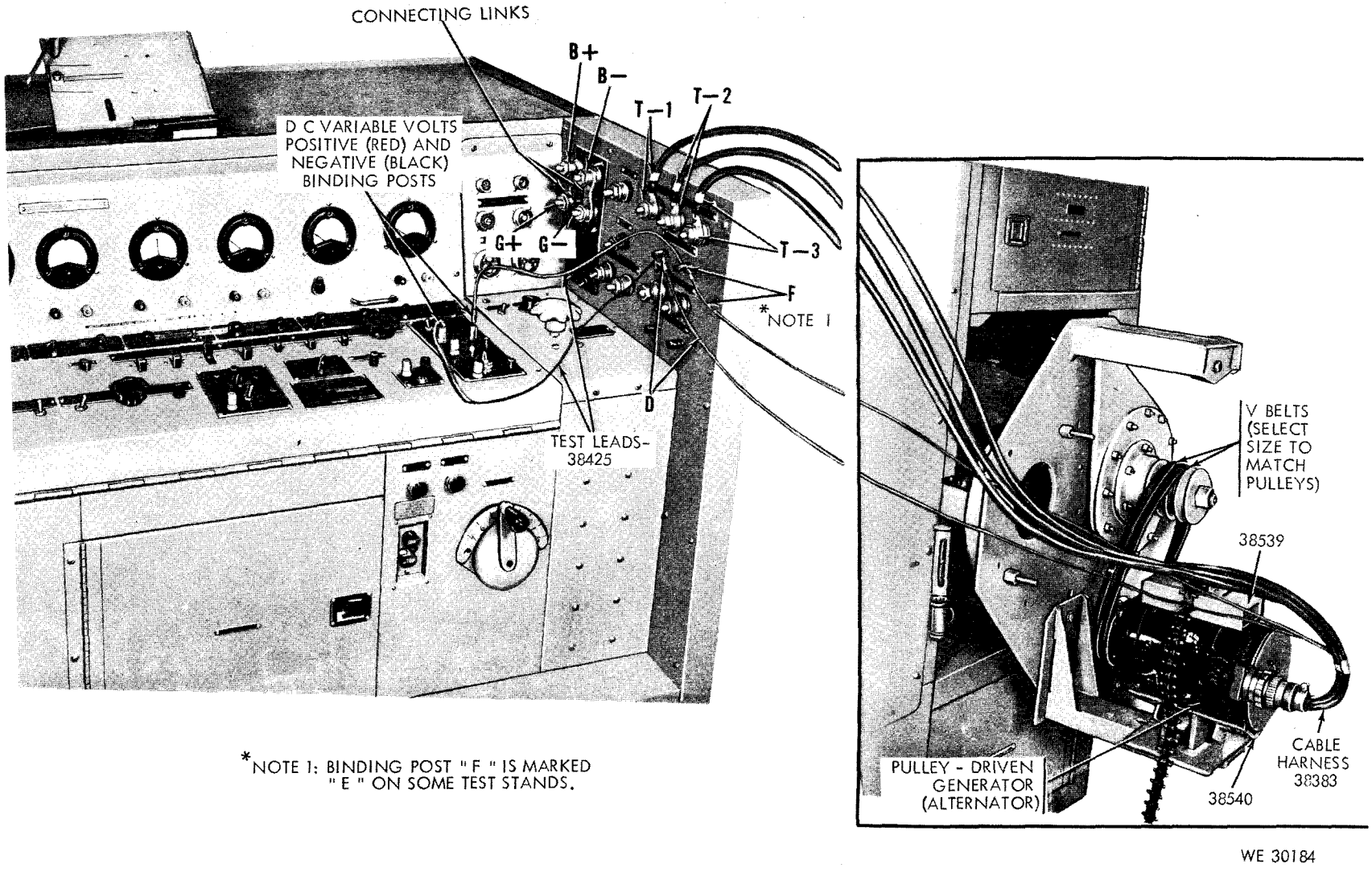
(2) The position of the switches and controls pertinent to this test are listed in table 7 below. Place each of these items in the positions indicated in column 3*a* of the table before tests are started.

(3) Place the battery on-off switch (22) in the "ON" position and turn the dc voltmeter circuit selector switch (10) to the "BAT VOLTS" position to determine whether the battery voltage of the test stand is the same as the voltage of the system under test. Correct voltage is 24 volts, or above which will be indicated on the dc voltmeter (4). Place the battery on-off switch (22) in the "OFF" position. If the reading is less than 24 volts recharge batteries (par. 98). After the batteries are charged, place the battery on-off switch (22) in the "ON" position again and turn the dc voltmeter circuit selector switch (10) to the "RECT GEN" position. It is also advisable to check the batteries with a hydrometer for specific gravity (refer to TM 9-6140-200-15).

Note. The safety clip (25-B) must be off the stop button (25-C) to perform the battery check in (3) above. Do not push the start button (25-A) as the varidrive assembly need not be running for this test.

Table 7. Position of Switches and Controls Before and After Generator (alternator) Performance Test and Generator (alternator) Regulator Test (Leece Neville Company)

(1) Item	(2) Figure No. 47 Key No.	(3) Position (a) Before	(3) Position (b) After
Load dc ammeter range selector switch	7	150A (X3)	500 (X10)
Field dc ammeter range selector switch	8	15A (X3)	30A (X6)
Dc voltmeter range selector switch	9	50V (X5)	50V (X5)
Ac ammeter range selector switch	12	100A (X1)	400A (X4)
Ac voltmeter range selector switch	13	50V (X2)	50V (X2)
Field ammeter dc ac/dc switch	16	AC/DC	CENTER (OFF)
Dc voltmeter circuit selector switch	10	RECT GEN	ANY
Battery on-off switch	22	OFF	OFF
Battery circuit selector switch	23	24V	24V
Polarity reversing switch	27	NEG GND	CENTER (OFF)
Generator field external-internal ground switch	20	INT GND	CENTER (OFF)
Starter test load disconnect switch	15	ON	OFF
Load switches	17-A, B, C, and D	OFF	OFF
Variable volts on-off switch	18	ON	OFF
40-ohm 30-ampere maximum rheo-reg switch	21	CENTER (OFF)	CENTER (OFF)
Dc variable power supply control	26	Fully counter-clockwise	Fully counter-clockwise
Drive control stop button	25-C	STOP (button depressed)	STOP (button depressed)
Speed control handle	24	One-quarter speed counter-clockwise	One-quarter speed counter-clockwise
Variable load 0-25 0-12.5 ampere rheostat	19	Fully counter-clockwise	Fully counter-clockwise



*NOTE 1: BINDING POST "F" IS MARKED "E" ON SOME TEST STANDS.

Figure 48. Testing the output of Leece-Neville Company no. A0015320GP or no. 5320–G12P, ordnance no. 8376691 100–ampere pulley-driven generator (alternator).

(4) Start the varidrive assembly by sliding the safety clip (25-B) off the stop button (25-C) and depress the start button (25-A) (do not depress the start button more than 10 seconds).

Note. Let the test stand operate for about 15 minutes or more (depending on ambient temperature conditions) to warm-up the generator (alternator) and rectifier before proceeding with tests in (6) below.

(5) Turn the speed control handle (22) slowly clockwise until 2,000 rpm are indicated on the tachometer indicator meter (3).

(6) Place the 50-25 fixed local switch (17-B) to the "ON" position and add the 25-12.5 fixed load switch (17-C) and 0-25 0-12.5 load switch (17-D). Turn the variable load 0-25 0-12.5 ampere rheostat (19) clockwise as necessary to bring the load up to a 100-ampere load.

(7) Turn the dc variable power supply control (26) clockwise until the ampere reading on the load dc ammeter (1) is approximately 100 amperes and the voltage reading on the dc voltmeter (4) is approximately 28 volts. The ac ammeter (5) should read 72 amperes and the ac voltmeter (6) should read approximately 25 volts. The reading on the field dc ammeter (2) will be "0."

Note. The load switch (17-D) must be in the "ON" position to connect the rheostat (19), also, adjust the rheostat (19) and the dc variable power supply control (26), slowly until the 100-ampere load is reached and the reading on the dc ammeter (1) is 100 amperes. Check the load dc ammeter (1) during this procedure and do not allow the ampere reading to exceed more than 100 amperes.

Caution: Never allow the voltage reading on the dc voltmeter (4) to exceed 32 volts when performing the operation, (6) and (7) above, or the rectifier (fig. 49) may be damaged.

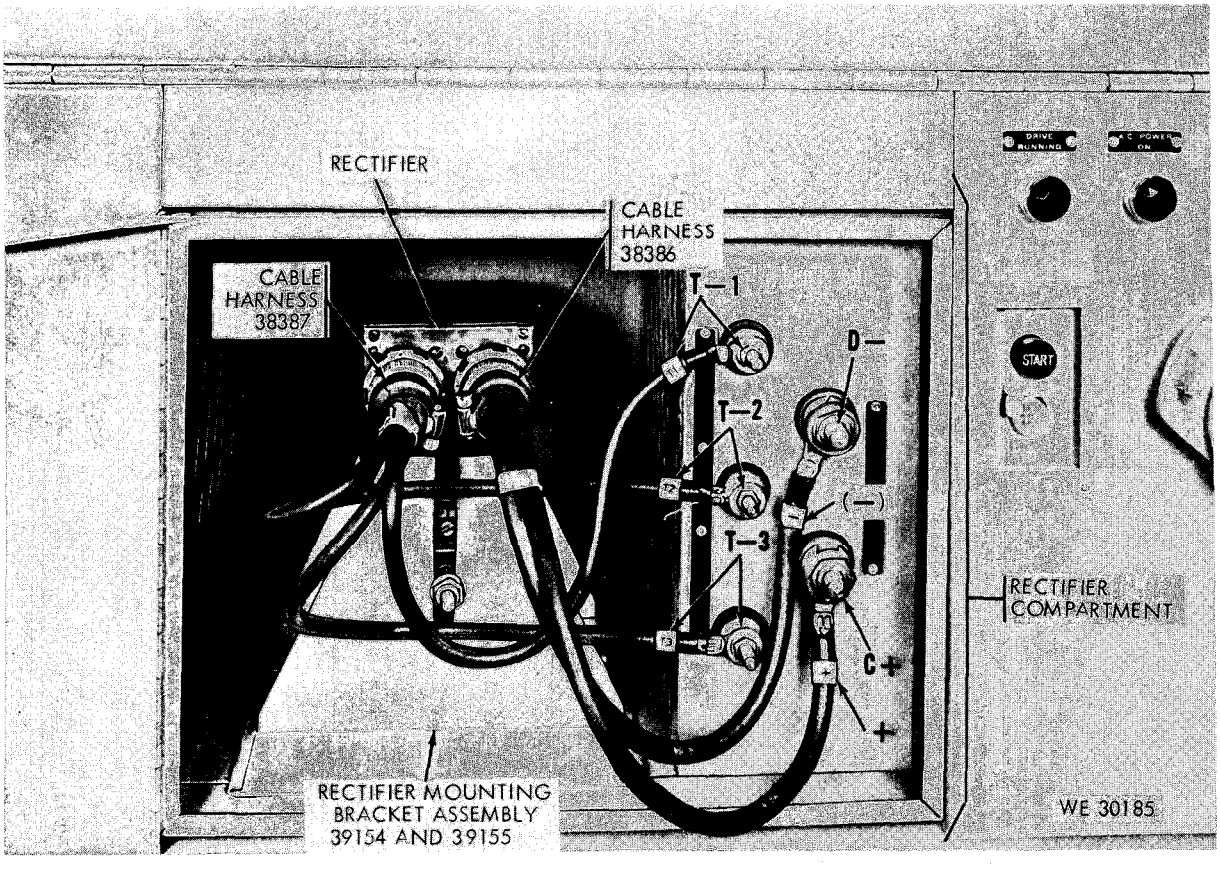


Figure 49. Leece-Neville Company no. C0011029CP ordnance no. 7954343 100-ampere rectifier - installed view and hook-up to test stand.

(8) Rotate the ac ammeter phase selector switch (11) through the "PH1," "PH2,'' and "PH3'' positions. The ampere reading on the ac ammeter (5) should not differ by more than 10 amperes for all three positions on the ac ammeter phase selector switch.

(9) Rotate the ac voltmeter phase selector switch (14) through the "T1-T2," "T1-T3," and "T2-T3" positions. The voltage reading on the ac voltmeter (6) should not differ by more than plus or minus 1 volt for all three positions on the ac voltmeter phase selector switch.

Note. If test results are not obtained as indicated in paragraphs (2) through (9) above, check the indicator knob on all rotary switches under the meters (fig. 47) to be sure the knob is secure on the shaft of the switch and pointing to the correct position on the switch dial. If this condition exists, place the knob and switch shaft in the correct position on the switch dial and tighten the set screw in the knob securely.

(10) Turn the speed control handle (24) partially counterclockwise until the varidrive assembly speed is reduced ¼-speed. Place the switches and controls in table 7 above, in positions indicated in column 3*b* of the table. Stop the varidrive assembly by depressing the stop button (25-C) on the drive control (25).

(11) Remove the cable harnesses and test leads (fig. 48) and continue with test in *e* below.

e. Overspeed Test Procedures.

(1) Remove the generator (alternator) from the low speed driving head (5, fig. 7) and mount it on the high speed driving head (4, fig. 7). Recalibration of the tachometer indicator circuitry will not be necessary if the generator (alternator) is direct-driven, however, the reading will be taken from the upper scale on the tachometer meter (3.) for the test in paragraph (2) be-

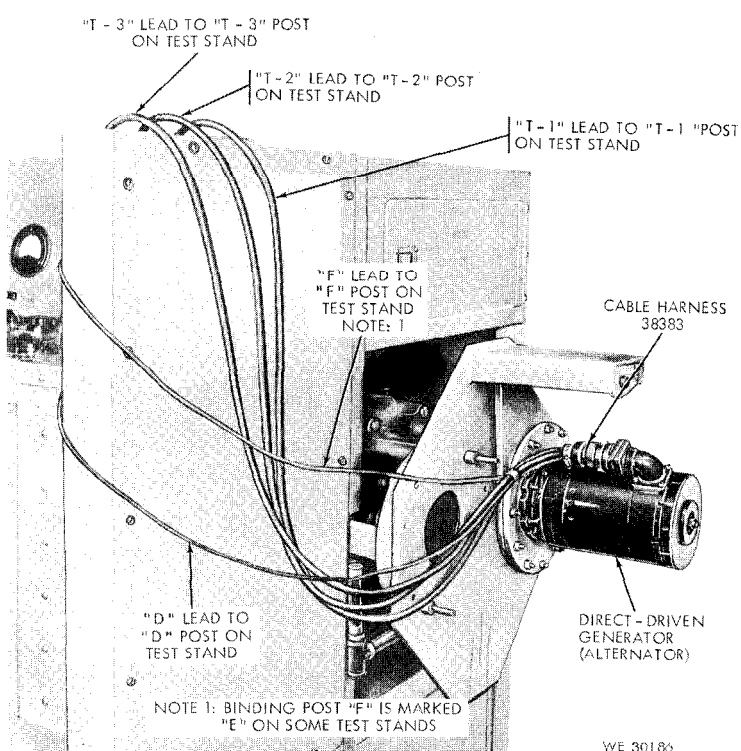


Figure 50. Leece-Neville Company no. A0015504AA ordnance no. 10922191 100-ampere direct-driven generator (alternator - installed view and hook-up to test stand.

low. If the generator (alternator) is pulley-driven refer to paragraph 97*c*.

(2) Start the varidrive assembly by sliding the safety clip (25-B) off the stop button (25-C) and depress the start button (25-A) (do not depress the start button more than 10 seconds).

(3) Slowly turn the speed control handle (24) until 8,000 rpm are indicated on the tachometer indicator meter (3) and hold at this speed for 5 minutes, Check for bearing noises and unusual vibration. Observe for abnormally high bearing heat. Check for any mechanical failure.

(4) Stop the varidrive assembly by depressing the stop button (21-A). Remove the generator (alternator), rectifier, and the generator (alternator) regulator from the test stand.

Note. The key numbers shown below in parentheses in this section refer to figure 47 except where otherwise indicated.

Section XII. TESTING LEECE NEVILLE COMPANY 100-AMPERE (ALTERNATOR) REGULATOR

131. Description

The Leece Neville Company 100-ampere generator (alternator) regulator (figs. 51 and 52) is used in conjunction with the Leece Neville company 100-ampere generator (alternator) in either the pulley- or direct-driven types (par. 130*b* The generator (alternator) regulator is designed to control the output voltage and current of a generator (alternator) by the presetting of three control units, which are the voltage regulator (carbon pile), line switch (load relay), and voltage adjusting rheostat. For detailed description of the components and control units refer to TM 9-7003, TM 9-2300-224-34/3, TB 9-2300-206-15, and paragraph 132*b*.

132. 100-Ampere Generator (Alternator) Regulator Control Units Tests (The Leece Neville Company)

a. Purpose. This test is performed to indicate the functioning of the 3 control units of the 100-ampere generator (alternator) regulator (figs. 51 and 52) and whether setting adjustments are required to the units so they perform in accordance with manufacturer's specifications *(e)* below.

b. Tabulated Data.

(1) *Identifying number.*

Manufacturer	The Leece Neville Company
Manufacturer's model number	R0013392RP or 3392-R12P
Ordnance number	8699744

(2) *Generator regulator output rating.*

Rated voltage	28 volts
Rated amperes	100 amperes

(3) *Components.*

(a) Voltage regulator.

Type	carbon pile
Operating coil resistance	3.3 ohms
Paralleling coil resistance	4 ohms
Carbon pile resistance (minimum)	will not exceed 0.50 ohms
Heat dissipation of carbon pile	90 watts

(b) Line switch (load relay).

Closing voltage	13 volts, plus or minus 1 volt
Opening voltage	9 to 11 volts
Coil resistance	174 ohms, plus or minus 10 ohms
Gap settings	0.060 inch, main, 0.030 inch, auxiliary

(c) Fixed and variable resistors.

Ballast	18.0 ohms, plus or minus 0.9 ohms
Stabilizing	360 ohms, plus or minus 18 ohms
Voltage adjusting rheostat	5.0 ohms, plus or minus 0.5 ohms

(d) Capacitors.

Rating	25 mfd
Type	coaxial type

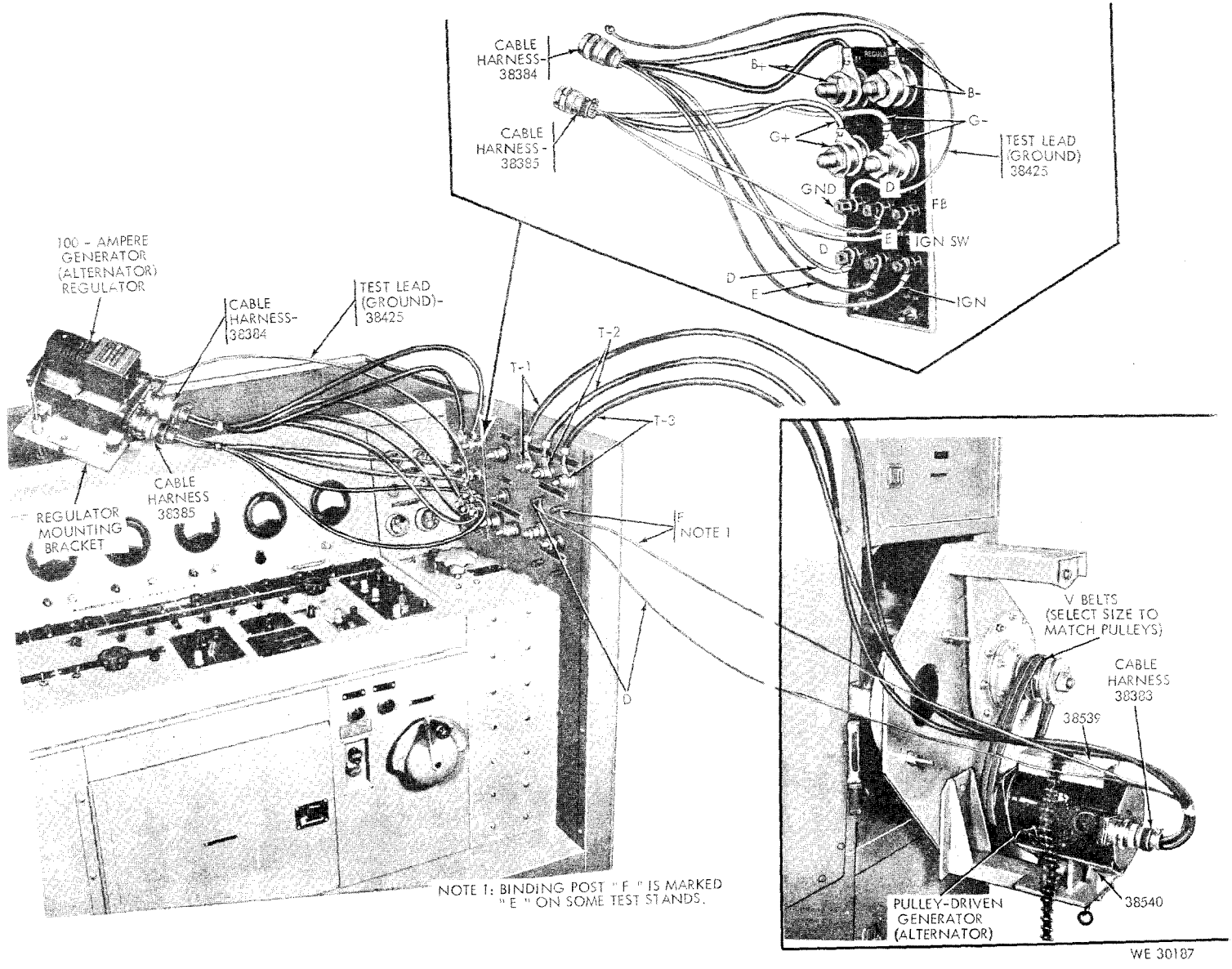


Figure 51. Testing the performance of the Leece-Neville Company no. R0013392RP ordnance no. 8699744 100-ampere generator (alternator) regulator.

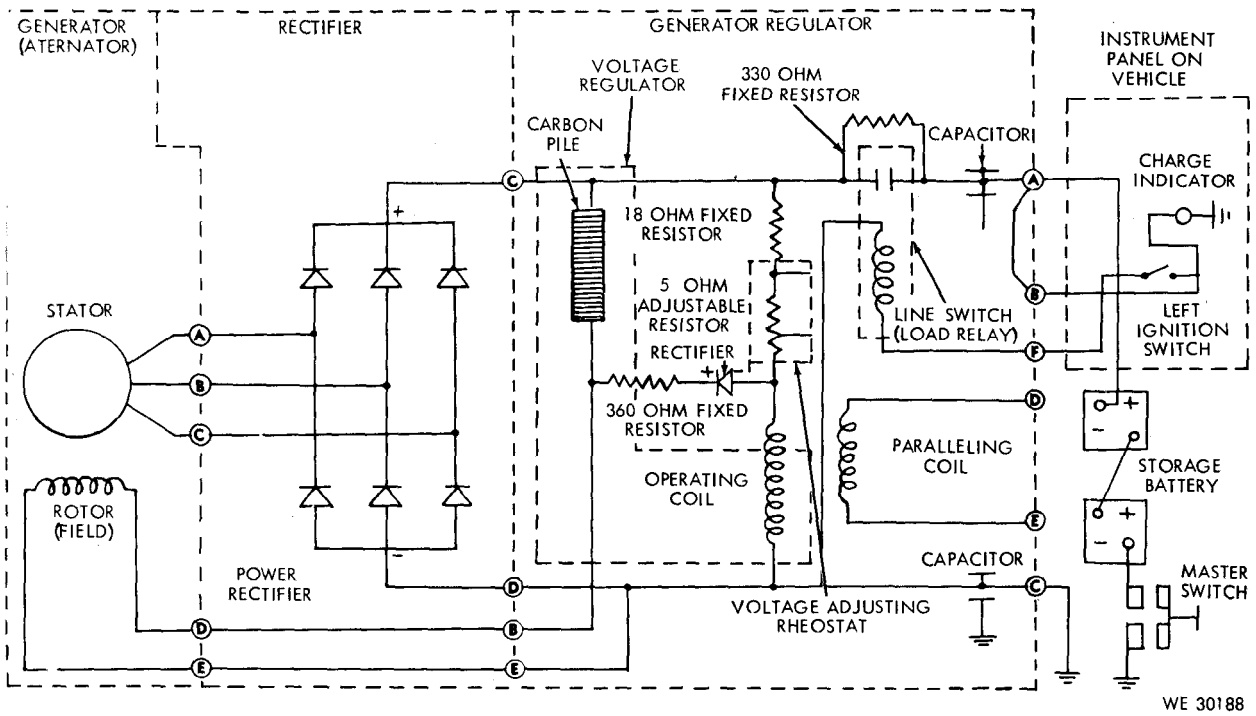


Figure 52. Wiring diagram for the Leece-Neville Company generating system—complete hook-up to vehicle electrical system.

c. Preparation.

(1) Turn all switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to "OFF" position (some toggle switches have center position as "OFF") (fig. 47).

(2) Mount the generator (alternator) (pulley- or direct-driven) of known serviceable condition (pars. 130*d* and *e)* on the low speed driving head (5, fig. 7) (pars. 94 or 95) as shown in figures 50 and 51.

(3) Calibrate the tachometer indicator circuitry as prescribed in paragraph 97*b* or 97*c*, as applicable for the type (pulley- or direct-driven) generator (alternator) use, (2) above.

(4) Connect the generator (alternator) to the alternator input binding posts (12, fig. 15), as shown in figures 50 or 51, using applicable cable harnesses (fig. 73).

(5) Mount the 100-ampere generator (alternator) regulator undergoing test on the regulator mounting bracket and connect it to the regulator binding posts (10, fig. 15) and the ac/dc system binding posts (9, fig. 15) using applicable harnesses and lead as shown in (fig. 51) (these harnesses and lead are listed in appendix II (figs. 73 and 74)).

(6) Remove the rectifier mounting bracket assembly from the rectifier compartment and mount a rectifier of known serviceable condition (par. 130*b* (Refer to TM 9-7003 or TB 9-2300-206-15 for checking rectifier) on the rectifier mounting bracket assembly (fig. 49).

(7) Place the rectifier and mounting bracket assembly, (6) above, in the rectifier compartment as shown in figure 49.

(8) Lower or raise the rectifier and mounting bracket assembly so the rectifier

is centered in the air flow of the air vents in the rectifier compartment, and with the fins of the rectifier vertical with the flow of air.

(9) Connect the rectifier to the binding posts in the rectifier compartment, as shown in figure 49, using applicable cable harnesses (fig. 73). Close the rectifier compartment door.

Note. The rotation of the generator (alternator) is nondirectional, therefore, the rotation of the varidrive assembly can be in either direction without loss of the generator (alternator) output.

d. Test Procedures for Control Units as an Assembly.

(1) The position of switches and controls pertinent to the tests in paragraphs (2) through (14) below are listed in table 7, paragraph 130*d*. Place each of these items in the position indicated in column 3*a* of the table before tests are started.

Note. The variable volts on-off switch (18) is not used in this test, therefore, place this switch in the "OFF" position.

(2) Place the battery on-off switch (22) in the "ON" position and turn the dc voltmeter circuit selector switch (10) to the "BAT VOLTS" position to determine whether the battery voltage of the test stand is the same as the voltage of the system under test. Correct voltage is 24 volts or above which will be indicated on the dc voltmeter (4). Place the battery on-off switch (22) in the "OFF'" position. If the reading is less than 24 volts recharge batteries (par. 98). After the batteries are charged, place the battery on-off switch (22) in the "ON" position again and turn the dc voltmeter circuit selector switch (10) to the "RECT GEN" position. It is also advisable to check the batteries with a hydrometer for specific gravity (refer to TM 9-6140-200-15).

Note. The safety clip (25-B) must be off the stop button (25-C) to perform the battery check in (3) above. Do not push the start button (25-A) as the varidrive assembly need not be running for this test.

(3) Start the varidrive assembly by sliding the safety clip (25-B) off the stop button (25-C) and depress the start button (25-A) (do not depress the start button more than 10 seconds).

Note. Let the test stand operate for about 15 minutes or more (depending on ambient temperature conditions) to warm-up the generator (alternator) and rectifier before proceeding with tests in (5) below.

(4) Place the ignition switch (IGN SW) (7, fig. 15) in the "ON" position and the 40-ohm 30-ampere maximum rheo-reg switch (21) in the "REG" position.

(5) Turn the speed control handles (22) slowly clockwise until 2,000 rpm are indicated on the tachometer indicator meter (3).

(6) Place the 50-25 fixed load switch (17-B) to the "ON" position and add the 25-12.5 fixed load switch (17-C) and 0-25 0-12.5 load switch (17-D). Turn the variable load 0-25 0-12.5 ampere rheostat (19) clockwise as necessary to bring the load up to a 100-ampere load. Check the load on the load dc ammeter (1).

Note. The load switch (17-D) must be in the "ON" position to connect the rheostat (19), also, adjust the rheostat (19) slowly until the 100-ampere load is reached. Check the load dc ammeter (1) at the same time and do not allow the ampere reading to exceed more than 100 ampere.

(7) Test the voltage ouput of each phase by rotating the ac voltmeter phase selector switch (14) through the "T1-T2," "T1-T3," and "T2-T3" positions. The reading on the ac voltmeter (6) should not differ by more than plus or minus 1 volt for all three positions on the ac voltmeter phase selector switch.

(8) Test the amperage output of each phase by rotating the ac ammeter phase selector switch (11) through the "PH1," "PH2," and "PH3" positions. The ampere reading on the ac ammeter (5) should not differ by more than 10 amperes for all three positions on the ac ammeter phase selector switch.

(9) Continue to operate the generator (alternator) under above conditions for about 15 minutes. Throughout the test the dc voltage reading on the dc voltmeter (4) should be within the range of 27.4 to 28 volts. The field dc ammeter (2) reading should be within the range of 6 to 10 amperes.

Note. It may be necessary to adjust the variable load 0-25 0-12.5 ampere rheostat (19) to maintain the 100-ampere load during the test, (6) above.

(10) Decrease the speed of the varidrive assembly to 1000 rpm on the tachometer indicator meter (3) by turning the speed control handles (24) clockwise. Turn off the 50-25 fixed load switch (17-B) and adjust the variable load 0-25 0-12.5 ampere rheostat (19) until approximately 50 amperes are registered on the load ac ammeter (1).

(11) The output voltage should be 27.7 plus or minus 0.3 volts on the dc voltmeter (4). The field dc ammeter (2) should register between 6 to 10 amperes and the ac ammeter (5) should register approximately 46 amperes with a reading of approximately 24 volts on the ac voltmeter (6).

(12) Place the equalizers coil test switch (8, fig. 15) in the "ON" position momentarily and note the drop-off of the dc voltage on the dc voltmeter (4). Voltage drop-off should be between 1.5 to 3.0 volts.

Note. After the drop-off voltage is taken in (12) above, it will take between 2 and 3 minutes for the generator (alternator) regulator to recover and "kick-in" to register the voltage and amperage readings on the meters specified in paragraphs (10) and (11) above.

(13) Turn the speed control handle (24) partially counterclockwise until the varidrive assembly speed is reduced ¼-speed and stop the varidrive assembly by depressing the stop button (21-C).

(14) Remove the generator (alternator) from the low speed driving head (5, fig. 7) and mount it on the high speed driving head (4, fig. 7). Recalibration of the tachometer indicator circuitry will not be necessary if the generator (alternator) is direct-driven, however, the reading will be taken from the upper scale on the tachometer indicator meter (3) for the tests below. If the generator (alternator) is pulley-driven refer to paragraph **97*c***.

(15) Start the varidrive assembly (3) above, and turn the speed control handle (24) until 6,000 rpm are recorded on the tachometer indicator meter (3) and repeat test procedures (4) and (6) above (leave the battery switch (22) remain in the "ON" position).

(16) The dc ouput voltage should be within the range of 27.3 to 28.3 volts on the dc voltmeter (4), the field current (input) should be in the range from 6 to not more than 10-ampere on the field dc ammeter (2).

(17) Turn the speed control handle (24) partially counterclockwise until the varidrive assembly speed is reduced ¼-speed. Place the switches in table 7, paragraph **130*d*** in positions indicated in column **3*b*** of the table. Stop the varidrive assembly by depressing the stop button (25-C) on the drive control (25).

Note. If test results are not obtained as indicated in paragraphs (1) through (16) above, check the indicator knob on all rotary switches under the meters (fig. 47) to be sure the knob is secure on the shaft of the switch, and pointing to the correct position on the switch dial. If this condition exists, place the knob and switch shaft in the correct position on the switch dial, and tighten the set screw in the knob securely.

Note. The following instructions are for tests and adjustments using the test stand covered by this publication. For further information for tests and adjustments to the control units of the generator (alternator) regulator refer to TM 9-7003 and TB 9-2300-206-15 when performing test procedures in *e* and *f* below.

e. Test Procedures for Individual Control Units.

(1) *General.*

(a) This test is similar to the test in *d* above, except that the cover of the generator (alternator) regulator

is removed, (when necessary for access to the control units for setting adjustment) and each individual control unit of the generator (alternator) regulator is tested for performance as specified by manufacturer and/or pertinent publication(s) covering the generator (alternator) regulator. The tests and specification settings are given in (2) through (4) below.

(b) The position of switches and controls pertinent to tests in paragraph (2) through (4) below are listed in table 7, paragraph 130*d*. Place each of these items in the positions indicated in column 3*a* of the table before tests are started.

(2) *Voltage regulator ground test.*

(a) Connect two test leads to the test indicator binding posts as shown in (fig. 53). Connect the test lead

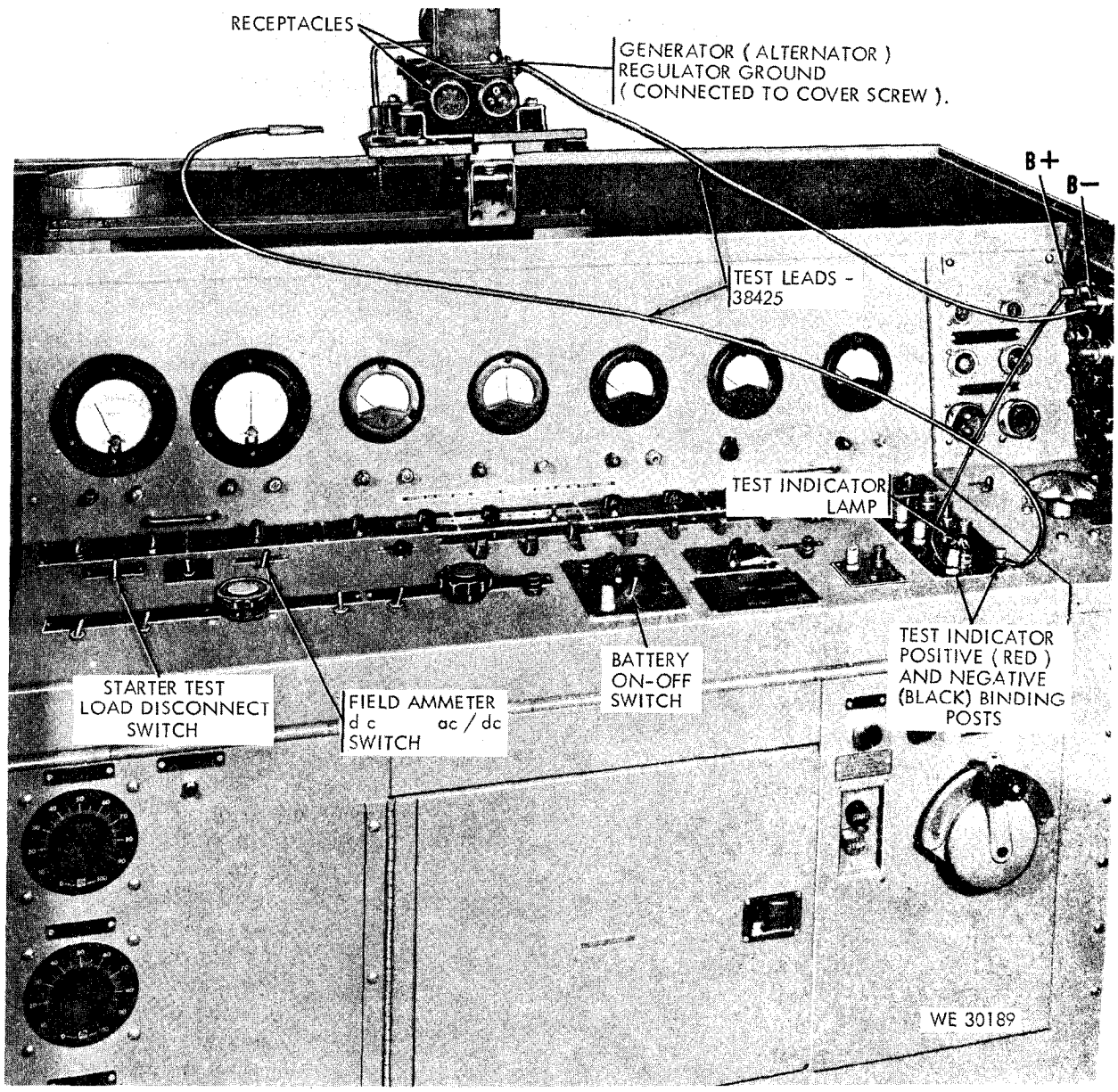


Figure 53. Testing the voltage regulator of Leece-Neville Company generator (alternator) regulator for grounds.

from the positive (red) test indicator binding post to the B+ binding post (A, fig. 15) as shown in figure 53, and leave the other end of the test lead which is connected to the negative (black) test indicator binding post unconnected as shown in figure 53.

(b) Connect a test lead from the cover screw of the generator (alternator) regulator to the B- binding post (B, fig. 10) as shown in figure 53.

(c) Place the starter test load disconnect switch in the "ON'" position, the field ammeter dc ac/dc switch in the "ON" position, and the battery on-off switch in the "ON" position (fig. 53).

(d) Touch the free end of the test lead, *(a)* above, to each pin and socket of the two receptacles (fig. 53) of the generator (alternator) regulator. Test indicator lamp (fig. 53) should not light when any receptacle pin or socket is touched. Remove the test leads from the test indicator binding posts and continue with tests in (3) below.

(3) *Line switch (load relay) - closing and opening test.*

(a) Remove the cover assembly (fig. 54) from the generator (alternator) regulator to have access to the adjustment nut (fig. 56) of the line switch (load relay).

(b) Connect two test leads to the dc variable volts binding posts as shown in figure 54. Connect the lead from the positive (red) dc variable volts binding post to the "F" pin in the receptacle as shown in figure 54. Connect the lead from the negative (black) dc variable volts binding post to the "C" pin in the receptacle as shown in figure 54.

(c) Connect a test lead from the cover screw of the generator (alternator) regulator to the ground (GND) binding post (10-E, fig. 15) as shown in figure 54.

(d) Place the dc voltmeter circuit selector switch (fig. 54) in the "VARIABLE VOLTS" position.

(e) Slowly turn the dc variable power supply control (fig. 54) clockwise, until the lower contacts of the line switch (load relay) (fig. 56) close, and observe the voltage reading on the dc voltmeter (fig. 54). The voltage reading should be 13 volts plus or minus 1 volt.

(f) Slowly turn the dc variable power supply control (fig. 54) counterclockwise until the lower contacts of the line switch (load relay) (fig. 56) open, and observe the voltage reading on the dc voltmeter (fig. 54). The voltage reading should be between 9 and 11 volts.

(g) Adjust the line switch, if necessary, by turning the line switch (load relay) adjusting nut (fig. 56) to increase or decrease the closing voltage. Remove the test leads from the "C" and "F" pins, *(b)* above, and continue with test in (4) below.

(4) *Carbon pile - setting adjustments.*

Note. Setting procedures for the carbon pile is accomplished by lapping the carbons of the voltage regulator element assembly (fig. 55 or 7, fig. 58) together by rapid vibration. The voltage regulator element assembly (see TB 9-2300-206-15 for complete breakdown) is placed in the circuit with the test stand which allows the carbon disks to vibrate under controlled conditions by use of the test stand. The vibration can be heard through a headset connected as shown in figure 55.

(a) Place the cover assembly with the voltage regulator element assembly (fig, 55 or 7, fig. 58) on the work surface on top of the test stand as shown in figure 55.

(b) Leave the two test leads connected to the dc variable volts binding posts, (3) *(b)* above, and as shown in figure 55. Connect the lead from the positive (red) dc variable volts binding posts to the "A" contact of the cover assembly and the lead from the negative (black) dc variable volts binding post to the "D"

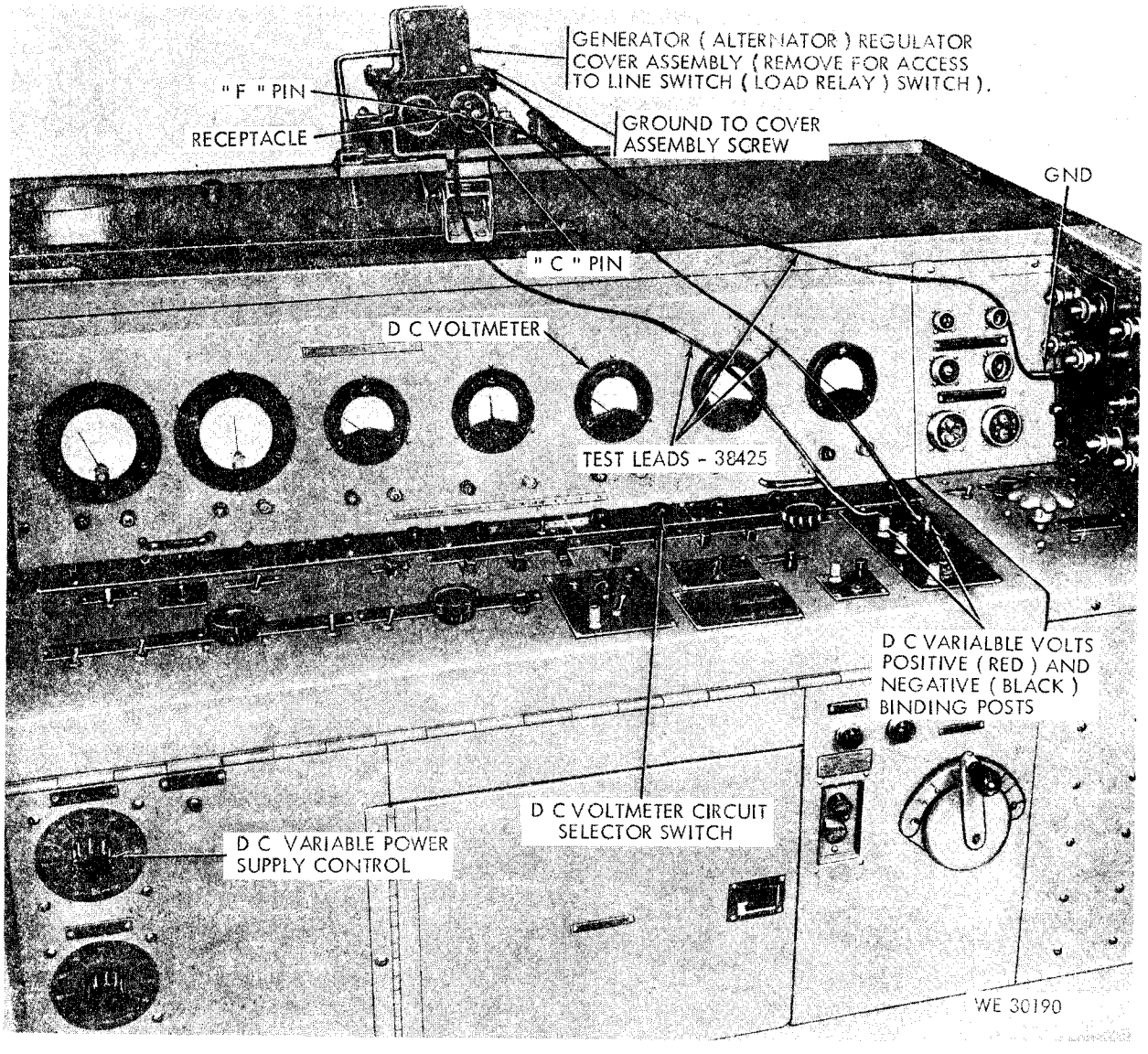


Figure 54. Testing the line switch (load relay) of the Leece-Neville Company generator (alternator) regulator for closing and opening voltage.

contact of the cover assembly as shown in figure 56.

(c) Connect two test leads to the positive (red) binding post and negative (black) binding post of the pile flutter, and the headset to the phone jack of the pile flutter as shown in figure 55.

(d) Connect the positive (red) binding post of the pile flutter to the "C" contact of the cover assembly and the negative (black) binding post of the pile flutter to the "A" contact of the cover assembly as shown in figure 55. Place a jumper lead from the "B" contact to the "C" contact of the cover assembly as shown in figure 55.

(e) Check to see if the dc voltmeter circuit selector switch (fig. 55) is in the "VARIABLE VOLTS" position and turn the dc voltmeter range selector switch (fig. 55) to the 20 (X2) position. Slowly turn the dc variable power supply control fig. 55) clockwise, until a reading

on the dc voltmeter (fig. 55) shows 12 to 14 volts and listen with the headset (fig. 55).

(f) A crackle in the headset or an erratic vibration indicates loose adjustments of the carbon pile. No noise at all indicates too tight an adjustment of the carbon pile.

(g) Remove the carbon pile support cover (1, fig. 58) and tighten a loose carbon pile by turning the contact screw assembly (fig. 58) clockwise just enough to eliminate the crackle and leave a distinct hum. Loosen a tight carbon pile by turning the contact screw assembly counterclockwise until a hum begins. Keep turning the contact screw assembly until hum stops. Reverse direction of contact screw assembly until hum just begins and then stop turning the contact screw assembly at this point.

Note. The contact screw assembly is locked by a locking screw (fig. 58) on each side of it. Loosen these screws before attempting to adjust the contact screw assembly. Tighten these two locking screws after adjustments are made to the carbon pile.

(h) After the carbon pile of the voltage regulator element assembly is adjusted for setting, allow to vibrate for 30 minutes, and check occasion-

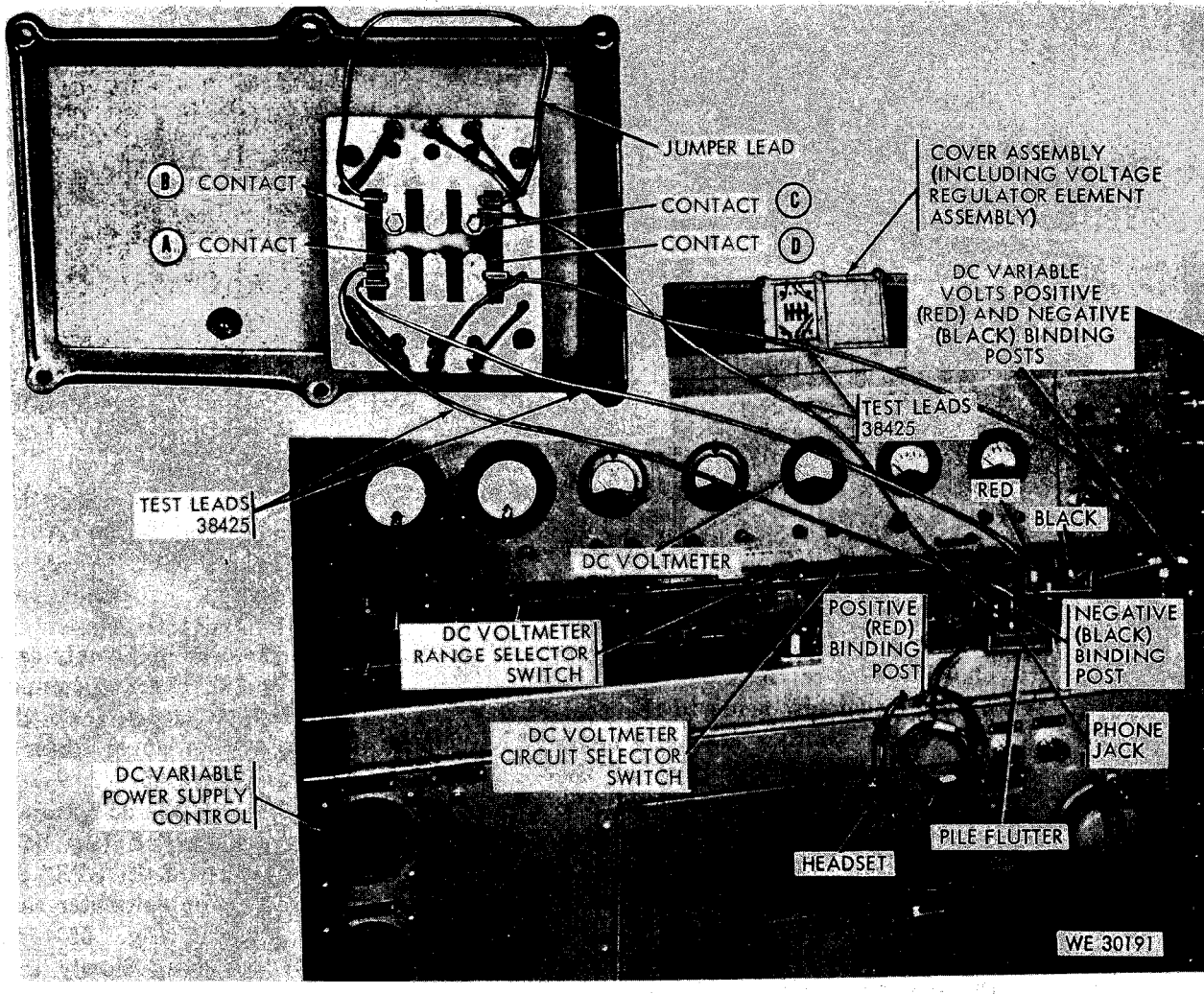


Figure 55. Setting the carbon pile of the Leece-Neville Company generator (alternator) regulator.

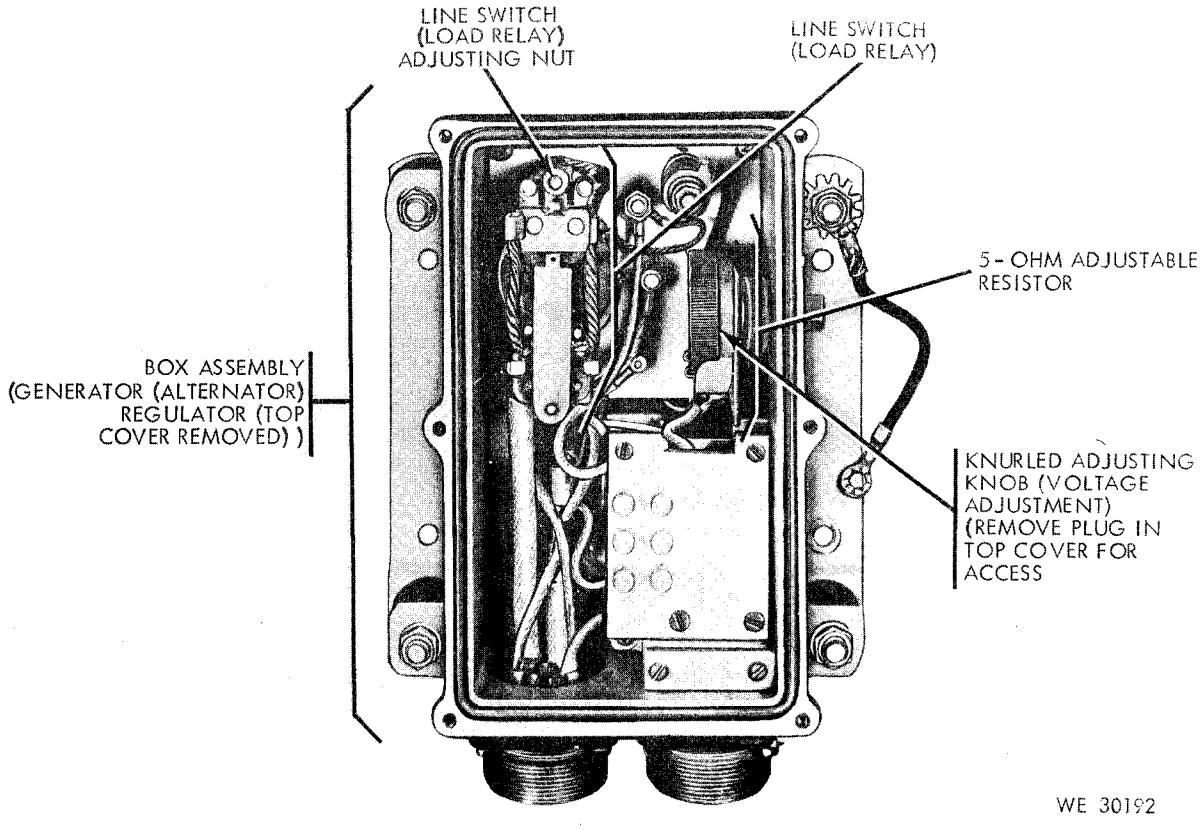


Figure 56. Generator (alternator) regulator (top cover removed) voltage adjustment control and line switch (load relay) adjustment control.

ally to make sure the hum does not stop.

(i) After all tests are completed in *e*(2), (3), and (4) above, remove all test leads and headset from the test stand and assemble the generator (alternator) regulator by connecting the cover assembly, (fig. 55) on the box assembly (fig. 56).

(j) Leave the switches and controls in table 7, paragraph 130*d*, remain in positions indicated in column 3*a* of the table and continue with tests in *f* below.

f. Operational Test and Adjustment of the Control Units. (Generator (Alternator) Regulator Assembled).

(1) *General.* The following tests are performed after the units of the generator (alternator) regulator have been checked and adjusted individually, *(e)* above, and the generator (alternator) regulator has been assembled.

(2) *Preparation.*

(a) Connect the assembled generator (alternator) regulator (1) above, and a generator (alternator), and rectifier of known serviceable condition on the test stand as prescribed in paragraph 132*c* and follow procedures in paragraph 132*d* (1) through (6).

(b) Remove the carbon pile support cover (1, fig. 58), cover end plate (17, fig. 58), and pipe plugs (fig. 57) from the generator (alternator) regulator.

(3) *Testing carbon pile flutter.*

Caution: **Never allow voltage on the dc voltmeter (4, fig. 47) to exceed 32 volts during the following tests.**

(a) Be sure the battery on-off switch (22) and the ignition switch (IGN SW) (7, fig. 15) are both in the "ON" position. Place the 40-ohm 30-ampere maximum rheo-reg switch (21) in the "REG" position.

(b) Turn the speed control handle (24) slowly clockwise until 1,000 rpm are indicated on the tachometer indicator meter (3).

(c) Turn the knurled adjusting knob of the 5-ohm adjustable resistor (fig. 56) (access through top cover of regulator) (fig. 57) fully counterclockwise (full increase) and observe the dc voltmeter (4) to assure that it is in the safe range below 32 volts.

(d) Connect two test leads 38425 (fig. 74) to the positive and negative binding posts (35-B, fig. 16) and plug the lead of the electrical headset (fig. 65) into the phone jack (35-A, fig. 16) of the pile flutter circuit instrument panel (35, fig. 16).

(e) Connect the lead from the positive pile flutter binding posts, *(d)* above, to the No. G+ binding post (10-C, fig. 15) and the lead from the negative pile flutter binding post, *(d)* above, to the No. F-B binding post (10-G, fig. 15).

(f) Detect the action on the carbon pile flutter of the generator (alternator) regulator by listening with the headset. The sound should be a distinct hum.

(g) Adjust the ampere fixed load by placing all fixed load switches (17) in the "OFF" position and the variable load 0-25 0-12.5 ampere rheostat (19) in the full counterclockwise position; then place the 50-25 fixed load switch (17-B) in the "ON" position. Increase the rpm

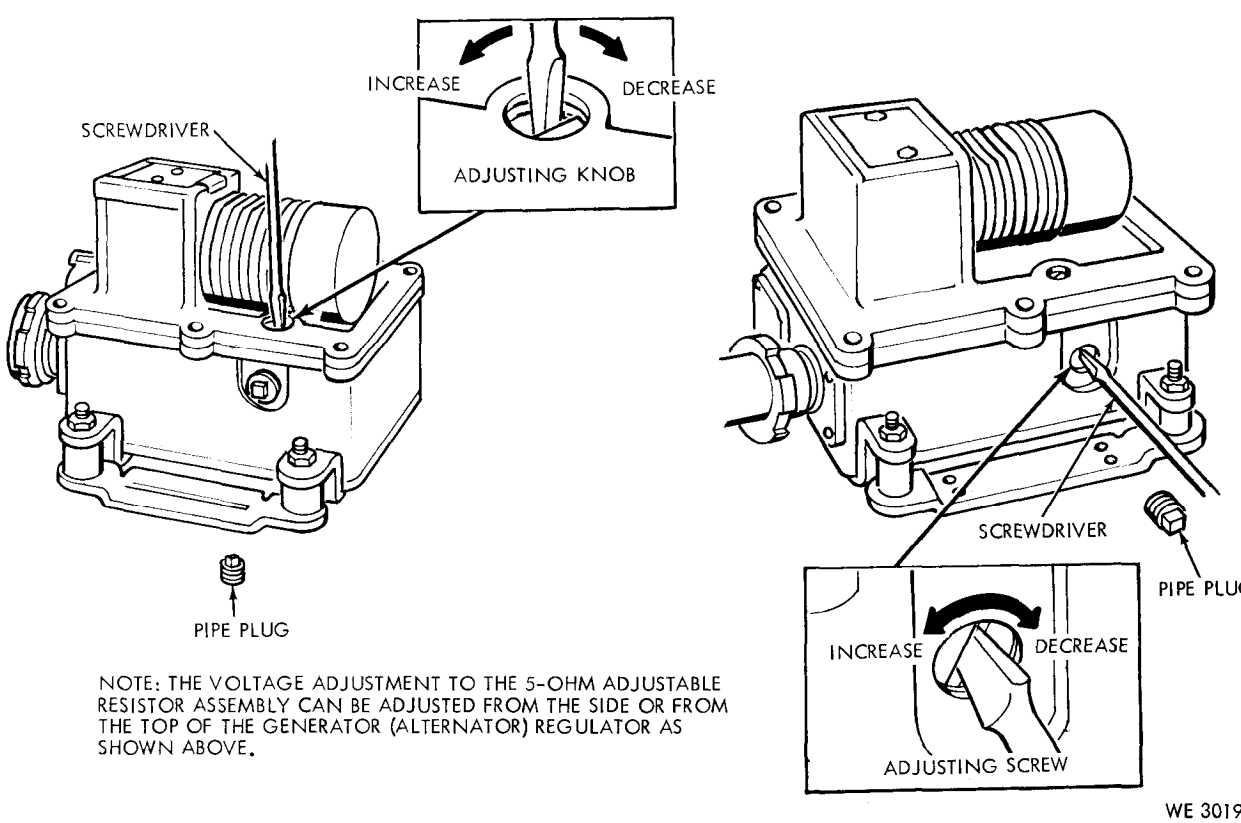


Figure 57. Generator (alternator) generator regulator - external voltage adjustments.

of the varidrive assembly by turning the speed control handle (24) counterclockwise until 2,000 rpm are indicated on the tachometer indicator meter (3).

(h) Set the generator (alternator) regulator voltage to 28.0 plus or minus 0.1 volt by adjusting the 5-ohm adjustable resistor (fig. 56) by the voltage adjustments (fig. 57) (access from the top or side of the regulator). Operate under these conditions for about 15 minutes or more (depending on ambient temperature conditions) to warm up the regulator.

(i) Check occasionally with the electrical headset, *(f)* above, to see that the hum of the carbon pile flutter does not stop. Check the carbon pile flutter by shock testing: place the starter test load disconnect switch (15) to "ON" then to "OFF" positions and listen in the electrical headset for the hum to not stop.

Note. If carbon pile stops humming, adjust carbon pile, *(e)* (4) *(a)* through *(g)* above, and repeat *(f)* (3) *(a)* through *(c)* above. Continue with adjustments in (4) below.

(4) *Preliminary voltage adjustment.*

(a) Place the battery on-off switch (22) in the "OFF" position and turn the speed control handle (24) slowly clockwise until 1,000 rpm are indicated on the tachometer indicator meter (3).

(b) Adjust the 5-ohm adjustable resistor (fig. 56) by turning the voltage adjustment (fig. 57) (from the top or side of the regulator) clockwise (full decrease).

(c) Turn the contact screw assembly (fig. 58) (loosen the two locking screws first, (fig. 58), and tighten them after adjustments are made) clockwise until a stable voltage is reached as indicated in *(d)* below.

(d) As the contact screw assembly *(c)* above, is turned in, voltage will rise, then drop, and then start to rise again. Proper point of adjustment is just before voltage starts to rise the second time (observe dc voltmeter (4)).

Caution: **Adjust to the peak point of 32 volts or less. If voltage tends to go higher, screw coil core (8, fig. 58) out and repeat, *(d)* above, until the peak voltage is equal to or less than 32 volts.**

Note. The coil core (8, fig. 58) in *(e)* below, has a locking screw (14, fig. 58) which must be loosened before and tightened after each adjustment of the coil core.

(e) If the voltage is stable at 29.5 when making adjustments in *(d)* above, continue with procedures in (6) below. If not, adjust to 29.5 volts by screwing the coil core (8, fig. 58) out to raise the voltage and in to lower the voltage.

Note. When the generator (alternator) regulator is in proper adjustment, the core flush paint marks on the coil pot end plate (9, fig. 58) and on the coil core (8, fig. 58) (marked with paint by manufacturer during assembly) must aline within one-eighth of a turn clockwise and within one-fourth of a turn counterclockwise, measured from the stationary mark. If the core mark is more than one-eighth of a turn clockwise, disassemble the regulator and remove shims (one shim is equivalent to about one-eighth of a turn). If the core mark is more than one-fourth of a turn counterclockwise, disassemble regulator and add shims.

Caution: **Never leave less than two shims in the regulator. When this condition arises, replace the armature assembly of the regulator (cc, fig. 59).**

(f) Check the range of the adjustment of the regulator by adjusting the 5-ohm adjustable resistor (fig. 56) by turning the voltage adjustment (fig. 57) (access from the top or side of the regulator) from maximum clockwise (full decrease) to maximum counterclockwise (full increase). The range should be at least 25.0 to 30.0 volts reading on the dc voltmeter (4). If the voltage range reading is off center of

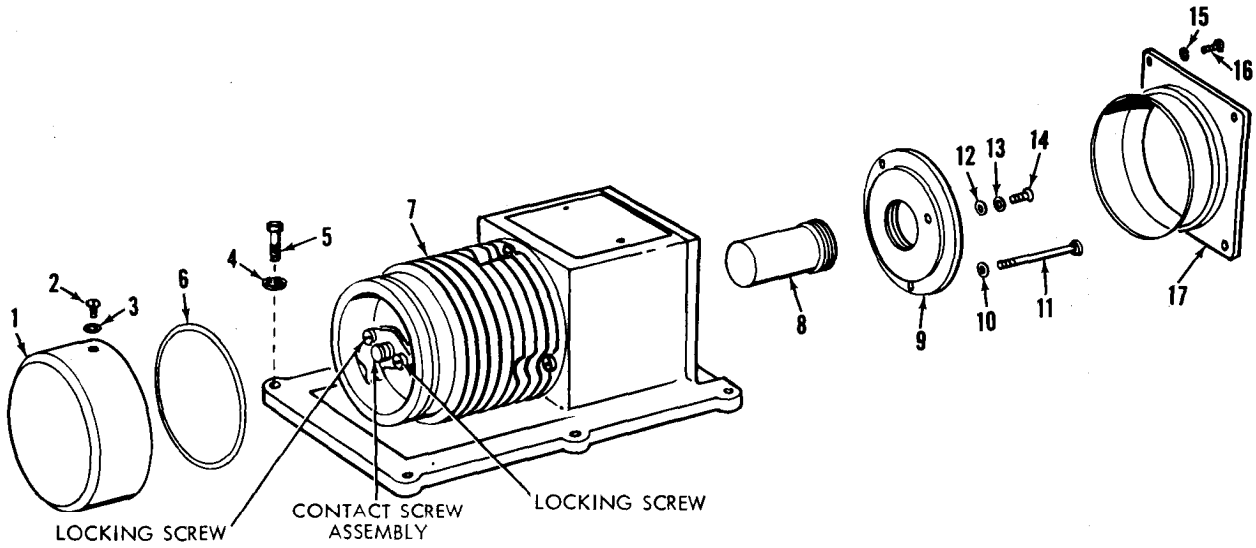


Figure 58. Voltage regulator element assembly - partially exploded view.

the above readings, the coil core (8, fig. 58) should be adjusted.

Note. If the 5-ohm adjustable resistor (fig. 56) does not control voltage through a spread of at least 5 volts, it should be replaced.

(g) Set the 5-ohm adjustable resistor by adjusting as specified in *(f)* above until 28 volts is registered on the dc voltmeter (4). Apply 100 ampere load by placing the 50-25 fixed load switch (17-B) to "OFF" position, *f* (3) *(g)* above, and then place one of the 100-50 fixed load switches (17-A) in the "ON" position and check to see that the voltage reading on the dc voltmeter (4) remained within plus or minus of the 28-volt setting indicated above.

(5) *Testing voltage adjustments at 2000 rpm.*

(a) Place the battery on-off switch (22) in the "ON" position and decrease the ampere load by placing the 100-50 fixed load switch (17-A) in the "OFF" position and placing the 50-25 fixed load switch (17-B) to the "ON" position.

(b) Increase the rpm of the varidrive assembly by turning the speed control handle (24) counterclockwise until 2000 rpm are indicated on the tachometer indicator meter (3).

(c) Observe the dc voltmeter (4) and if the voltage stays within the 27.4 to 28 volts range, shock load the regulator by placing the starter test load disconnect switch (15) to the "ON" position then to "OFF" position several times. If the voltage still remains in the 27.4 to 28 volts range as will be indicated on the dc voltmeter (4), continue with test in (6) below.

(d) If the voltage reading on the dc voltmeter (4) decreases more than

0.6 volt during the shock load test in *(c)* above, turn the contact screw assembly (fig. 58) outward (loosen the locking screws first then tighten again after adjustment (fig. 58)).

Note. The adjustment in *(d)* above must be made very gradually.

(e) If the voltage reading on the dc voltmeter (4) exceeds 28 volts turn the contact screw assembly (fig. 58) inward.

(f) After each adjustment of the contact screw assembly (fig. 58), readjust the coil core (8, fig. 58) (loosen screw (14, fig. 58) first before adjustment and tighten again after adjustment). The coil core is screwed in or out to give an output of 28.0 (plus or minus 0.2) volts with battery on-off switch (22) to "ON" position only. Repeat procedures in *(a)* through *(f)* above until the generator (alternator) regulator controls the voltage within the limits of 27.4 to 28.0 volts while the load is shocked off and on, *(c)* above, several times. Continue with tests in (6) below.

(6) *Testing voltage adjustment at 4,000 rpm.*

(a) Turn the speed control handle (24) partially counterclockwise until the varidrive assembly speed is reduced ¼-speed and stop the varidrive assembly by depressing the stop button (21-C).

(b) Remove the generator (alternator) from the low speed driving head (5, fig. 7) and mount it on the high speed driving head (4, fig. 7). Recalibration of the tachometer indicator circuitry will not be necessary if the generator (alternator) is direct-driven, however, the reading will be taken from the upper scale on the tachometer indicator meter (3) for tests below. If the generator (alternator) is pulley-driven refer to paragraph 97*c*.

(c) Start the varidrive assembly by sliding the safety clip (25-B) off the stop button (25-C) and depress the start button (25-A) (do not depress button more than 10 seconds). Turn the speed control handle (24) slowly until 4,000 rpm are indicated on the tachometer indicator meter (3) and observe the voltage reading on the dc voltmeter (4). Voltage reading should be 28.3 plus or minus 0.3 volts.

(d) With the 100-50 fixed load switch (17-A) in the "ON" position place the starter test load disconnect switch (15) in the "OFF" and "ON" positions several times and observe the voltage reading on the dc voltmeter (4). The voltage reading should not rise above 28.3 or drop below 27.3 under the 100-50 fixed load.

(e) If voltage drops below 27.3 volts when full 100-50 fixed load is applied, *(d)* above, turn the contact screw assembly (fig. 58) (loosen the two locking screws first, and tighten them after adjustments are made (fig. 58)) counterclockwise and repeat, *(d)* above. If voltage exceeds 28.3 volts, turn the contact screw assembly (fig. 58) clockwise and repeat, *(d)* above. Repeat procedure until voltage remains within 27.3 to 28.3 volts range under battery (battery on-off switch (22) "ON") and full load (100-50 fixed load (17-A) "ON") condition.

(7) *Testing voltage adjustment at 2,000 rpm.*

(a) Stop the varidrive assembly, (6) *(a)* above, and remove the generator (alternator) from the high speed driving head (4, fig. 7) and place it on the low speed driving head (5, fig. 7). Recalibrate the tachometer indicator circuitry accordingly, (6) *(b)* above.

(b) Repeat complete test, (4) above.

g. Final Test and Voltage Adjustment.

(1) *Voltage regulator element - minimum resistance check.*

Note. This test determines whether the proper coil resistance has been achieved.

(a) Place the 100-50 fixed load switch (17-A) in the "OFF" position *f* (6) (*d*) *(d)* above, and then place the 50-25 fixed load switch (17-B) and the 25-12.5 fixed load switch (17-C) both in the "ON'' position to obtain a 75 ampere load.

(b) Reduce the varidrive assembly speed by turning the speed control handle (24) counterclockwise until the voltage reading on the dc voltmeter (4) is within 26.0 to 26.5 volts.

(c) Connect two test lead 38425 (fig. 74) to the external dc voltmeter positive and negative binding posts (29, fig. 16).

(d) Connect the test lead from the external dc voltmeter positive binding post, *(c)* above, to the No. G+ binding post (10-C, fig. 15) and the test lead from the external dc voltmeter negative binding post, *(c)* above, to the No. F-B binding post (10-G, fig. 15).

(e) Place the dc voltmeter circuit selector switch (10) in the "EXT VOLTS" position.

(f) Observe the current reading on the field dc ammeter (2) and voltage reading on the dc voltmeter (4).

(g) Divide the voltage reading of the dc voltmeter (4) by the current reading of the field dc ammeter (2). The resultant should not exceed 0.5 ohms.

(2) *Testing and adjustment at 6,000 rpm.*

(a) stop the varidrive assembly, *e (a)* above, and remove the generator (alternator) from the low speed driving head (5, fig. 7) and place it on the high speed driving head (4, fig. 7). Recalibrate the tachometer indicator circuitry accordingly, *f* (6) *(b)* above.

(b) Turn the speed control handle (24) slowly clockwise until 6,000 rpm are indicated on the tachometer indicator meter (3).

(c) Place the 50-25 fixed load switch (17-B) and 25-12.5 fixed load switch (17-C) both in the "OFF" position (1) *(a)* above, then place the 100-50 fixed load switch (17-A) in the "ON" position. If the voltage drop is more than 0.5 volt (repeat placing fixed load switch on and off several times), remove load and reduce speed of the varidrive assembly to 3,200 rpm by turning the speed control handle (24) counterclockwise.

(d) Turn the contact screw assembly counterclockwise (loosen locking screw on each side of the contact screw first, then tighten after adjustment is made (fig. 58)).

(e) Increase the varidrive assembly rpm to 4,000 on the tachometer indicator meter (3) and shock load by turning the 100-50 fixed load switch (17-A) on and off to settle the carbon pile of the generator (alternator) regulator. Adjust the regulator to 28 volts by adjusting the 5-ohm adjustable resistor assembly (fig. 56) with the external voltage adjustments (fig. 57).

(f) Repeat *(c)* through *(e)* above at least three times to assure repetition of performance.

(3) *Checking voltage range.*

(a) Leave the battery on-off switch (22) in the "ON" position and place all fixed load switches (17) in the "OFF" position.

(b) Stop the varidrive assembly, *f* (6) *(a)* above, and remove the generator (alternator) from the high speed driving head (4, fig. 7) and place it on the low speed driving head (5, fig. 7). Recalibrate the tachometer indicator circuitry accordingly, *f* (6) *(b)* above.

(c) Start the varidrive assembly, (6) *(c)* above, and turn the speed control handle (24) clockwise until 1,000 rpm are indicated on the tachometer indicator meter (3).

(d) Observe the voltage reading on the dc voltmeter (4) and adjust the 5-ohm adjustable resistor assembly by first turning the adjusting knob or screw (fig. 57) counterclockwise

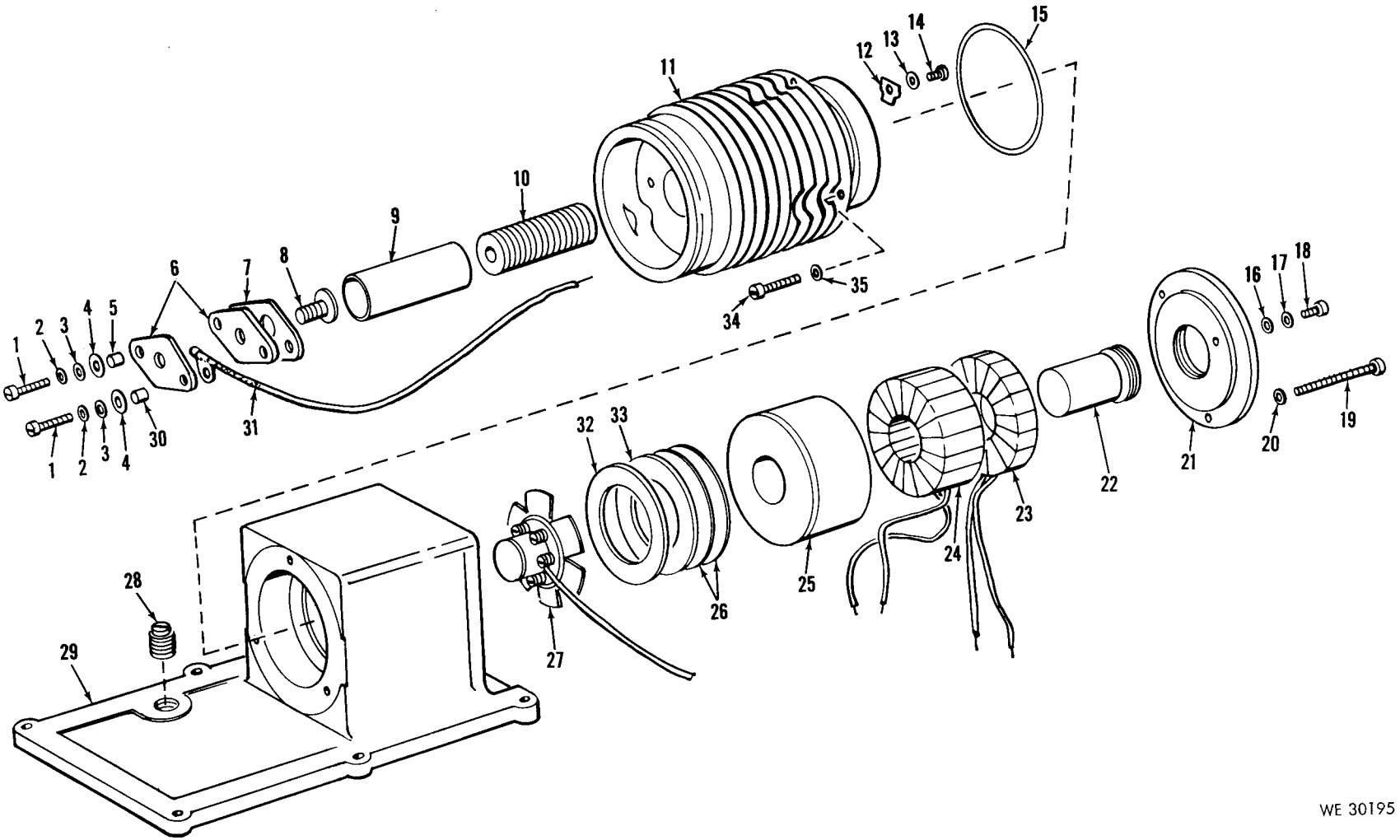


Figure 59. Voltage regulator element assembly—exploded view.

1 - No. 6-32NC-2 x ½ screw
2 - No. 6 lockwasher
3 - 0.148-in. id plain washer
4 - Insulating washer
5 - Short bushing-type insulator
6 - Contact screw plate
7 - Contact screw plate insulator
8 - Contact screw assembly
9 - Carbon pile tube
10 - Carbon pile
11 - Carbon pile support
12 - Tab lockwasher
13 - No. 6 lockwasher
14 - No. 6-32NC-2 x $\frac{3}{16}$ screw
15 - Support O-ring gasket (packing)
16 - $\frac{7}{16}$-in. od plain washer
17 - No. 10 lockwasher
18 - No. 10-32NF-2 x ¼ screw
19 - No. 6-32NC-2 x 1¾ screw
20 - No. 6 lockwasher
21 - Coil pot end plate
22 - Coil core
23 - Paralleling coil
24 - Operating coil
25 - Coil pot
26 - Shim
27 - Armature assembly
28 - ¼-in. pipe plug
29 - Cover
30 - Long bushing-type insulator
31 - Contact screw cable
32 - Spacer
33 - Bimetal ring
34 - No. 6-32NC-2 x ½ screw
35 - No. 6 lockwasher

Figure 59 - Continued.

(full increase) and then turning these adjustments fully clockwise (full decrease). Voltage reading on the dc voltmeter (4) should be 25.5 to 29.5 volts. If the voltage range is incorrect, adjust by loosening the screw (T, fig. 59) and turning the coil core (8, fig. 58). If the voltage is too high, turn the coil core clockwise. If the voltage is too low, turn the coil core counterclockwise. Set the voltage at 28.0 volts by adjusting the 5-ohm adjustable resistor assembly with the adjustment (fig. 57). Tighten the screw (T, fig. 59). Continue with the tests in (4) below.

(4) *Checking performance.*

(a) Turn the speed control handle (24) clockwise until 2000 rpm are indicated on the tachometer indicator meter (3).

(b) Shock load the generator (alternator) regulator by placing the 100-50 fixed load switch (17-A) in the "ON" position and then the "OFF" position several times. Place the 100-50 fixed load switch (17-A) to the "OFF" position but leave the battery on-off switch (22) in the "ON" position.

(c) Turn the variable load 0-25 0-12.5 ampere rheostat (19) clockwise until 10 ampere reading is indicated on the load dc ammeter (1). The voltage reading on the dc voltmeter (4) should be 28 volts plus or minus 0.2 volts.

(d) Turn the variable load 0-25 0-12.5 ampere rheostat (19) fully counterclockwise. Place one of the 100-50 fixed load switches (17-A) in the "ON" position. The voltage reading on the dc voltmeter (4) should be 27.7 plus or minus 0.3 volts. Place the 100-50 fixed load switch (17-A) in the "OFF" position.

(e) Stop the varidrive assembly, *f(6) (a)* above, and remove the generator (alternator) from the low speed driving head (5, fig. 7) and place it on the high speed driving head (4, fig, 7). Recalibrate the tachometer indicator circuitry accordingly, *f(6) (b)* above.

(f) Start the varidrive assembly *f(6) (c)* above, and turn the speed control handle (24) clockwise until 4,000 rpm are indicated on the tachometer indicator meter (3) and repeat tests in *(b)* through *(d)* above. The voltage reading for the 10 ampere reading, *(c)* above, should be 27.9-28.3 volts and the voltage reading for the 100-50 fixed load, *(d)* above, should be 27.3-28.3 volts.

(g) Turn the speed control handle (24) clockwise until 8,000 rpm are indicated on the tachometer indicator meter (3) and repeat tests in *(b)* through *(d)* above. The voltage

reading for 10 ampere reading *(c)* above, should be 27.8 - 28.6 volts and the voltage reading for the 100 - 50 fixed load, *(d)* above, should be 27.3 - 28.7 volts.

(h) If performance results, *(a)* through *(g)* above, areas indicated in these paragraphs, assemble the generator (alternator) regulator, if not, repeat all voltage adjustments and test.

(i) Stop the varidrive assembly, *f* (6) (a) above, and remove all cables, leads, generator (alternator), and generator (alternator) regulator from the test stand.

Note. The key numbers shown below in parentheses refer to figure 47, except where otherwise indicated.

Section XIII. TESTING STARTERS (CRANKING MOTORS)

133. General

a. To determine the general operating condition of starters (cranking motors) two types of tests are normally performed which are: the no load (free-running) test and the stall torque (measuring stall current and torque) test.

b. Precautionary procedures to follow in preparing the test stand before testing starters (cranking motors) are listed below.

(1) The starter (cranking motor) must be mounted properly by using the correct type mounting. There are several manufacturer's with various types and models of starters, therefore, a particular type mounting is required for each of the various units. Figures 22 through 27 depict these mountings and other mounting requirements. Refer to these illustrations to select the appropriate type mounting when mounting the starter on the test stand.

(2) The voltage, amperage, and battery voltage must be properly adjusted for the unit undergoing test. These adjustments are made with the dc voltmeter range selector switch (9), load dc ammeter range selector switch (7), and battery circuit selector switch (23).

(3) The torque arm (fig. 61) or the starter torque arm and bracket assembly (fig. 25) must be securely attached, also, the scale support (fig. 61) must be bolted down securely.

(4) The stall torque test must be short in duration and never performed at the rated voltage of the starter (cranking motor). Refer to manufacturer's literature, technical manuals listed in appendix 1 or table 9, for the proper voltage at which this test is to be conducted.

(5) The direction of rotation of the starter (cranking motor) must be determined before tests are started. The direction is normally indicated on the nameplate of the starter, or in the manufacturer's literature and table 9, and must be considered for attaching the torque arm (fig. 61) or the starter torque arm and bracket assembly (fig. 25) properly, also, the rotation of the starter will determine the location of the scale and scale support (fig. 61). If there is any question on the direction of rotation of the starter, it can be resolved by watching the pinion gear of the starter when performing the no load (free running) test, paragraph 134.

c. For any of the mountings for the starters, adjustments can be made to the scale support to permit a vertical pull on the scale (figs. 22 through 25) and, therefore, obtain an accurate reading on the scale. The two threaded holes in the torque arm (figs. 22, 23, and 24) are provided as a means of exerting a direct pull on the torque arm when the gear engagement by the adjustable jaws of the torque arm is not directly under the center of the starter shaft. The location of the eyebolt in the torque arm is changed to either of these threaded holes to allow a direct pull on the torque arm.

d. The no load (free running) test is performed by mounting the starter (cranking mo-

tor) on the test stand using the appropriate mounting b(1) above, and connecting it to the test stand as shown in figure 60, and simple motorizing the unit, paragraph 134, while a record of the voltage, current (amperes), and motor speed (rpm) (table 9).

Caution: **In most cases, the no load (free running) test is performed with the starter (cranking motor) run at the normal rated voltage of the starter (cranking motor). However, some of the more powerful starters (cranking motors) will attain such excessive speeds when running under a no load condition, that the manufacturer specifies a reduced voltage for the no load (free running) test. Refer to manufacturer's literature, technical manuals in appendix I, or table 9 which covers several manufacturers and models of starters (cranking motors) for this information before conducting the no load (free running) test.**

e. The stall torque (measuring stall current and torque) test is performed after the no load (free running) test, *d* above, has been completed. The stall torque test is performed similarly to the no load (free running) test, except a scale for recording foot-pounds (torque) is connected to the pinion gear of the starter (cranking motor), by means of a torque arm (figs. 22, 23, 24) or a starter torque arm and bracket assembly (fig. 25). Detail procedures are given in paragraph 134.

Caution: **Stall torque tests are seldom, if ever, performed at the nominal rated voltage of the starter (cranking motor). Most generally the applied voltage is reduced (specified as testing voltage, table 9) considerably below the nominal rated voltage for performance of this type of test. Refer to manufacturer's literature, technical manuals in appendix I, or table 9 which covers several manufacturers and models of starters (cranking motors) for the proper amount of voltage to be applied during these test procedures.**

f. When performing the stall torque test, requirements may necessitate applying the battery voltage rating next higher than the specified testing voltage: for example: 4.8 testing voltage requires a 6 volt input voltage, 9.6 testing voltage requires a 12 volt input voltage, and 19.2 testing voltage requires a 24 volt input voltage. The setting of the 6, 12, and 24 volt input voltage is accomplished with the battery circuit selector switch (23, fig. 47).

g. For stall torque tests within 200 ampere capacity, one cable harness 38405 (fig. 61) is connected between the starter input binding post (fig. 61) and the starter (cranking motor) (+) terminal stud (fig. 61).

h. For stall torque tests above 200 amperes capacity, two cable harness 38405 (fig. 61) are connected in parallel between the starter input binding post (fig. 61) and the starter (cranking motor) (+) terminal stud (fig. 61).

i. Torque, in foot-pounds, is read directly on the scale when using the torque arm (figs. 22, 23, 24, and 25), however, when the starter torque arm and bracket assembly (fig. 25) is used the scale reading is multiplied by 10 to obtain the correct torque in pound feet.

j. The chain vise and bracket assembly (figs. 22, 23, and 25) holding the starter (cranking motor) on the generator and starter mounting bracket (fig. 21) can be rotated 90 degrees, and can be moved horizontally a distance of 6 inches. Loosen the hexagon plain nut (3-E, fig. 7) and adjust as required.

Note. When performing the stall torque test it is necessary to provide a means of shifting the starter (cranking motor) pinion gear for maintaining gear accessibility for engagement of the jaws of the torque arm. Figures 26 and 27 depict the several methods which may be used for this procedure.

Caution: **Do not depend on the jaws of the torque arm to maintain the pinion gear in the shifted position. Always use one of the methods depicted in figures 26 and 27 to hold the pinion gear in proper position.**

134. Testing Procedures

a. Using the Test Stand for Power Source for no Load (free running) test.

(1) *Purpose.* This test is performed to indicate the functioning of the starter (cranking motor) when there is no load connected to the starter (cranking motor) permitting it to run freely. The starter (cranking motor) will revolve at a specified rpm when a given testing voltage is applied to the input (+) terminal (stud (fig. 60)) of the starter (cranking motor).

Note. The load (free running) test procedures in (3) and (4) below are for a Delco Products (Delco-Remy) starter (cranking motor) model DR 1108575. When testing other manufacturers and/or models starters (cranking motors) these instructions can be used as a guide. Refer to table 9, technical manuals listed in appendix I, or manufacturer's literature for test data when performing tests on other starters (cranking motors).

(2) *Tabulated data.*

Manufacturer	Delco Products (Delco-Remy)
Manufacturer's model number	DR 1108575
Ordnance number	7762618
Rotation	Clockwise (to left facing test stand)
Rated voltage	25 volts
Ampere	(Refer to table 9)

(3) *Preparation.*

(a) Turn all range selector switches beneath the meters on the test stand to the maximum reading position, all rheostats fully counterclockwise, and all on-off toggle switches to off position (some toggle switches have center position as "OFF") (fig. 47).

(b) Mount the starter (cranking motor) undergoing test on the test stand using the starter mounting bracket 38346 (fig. 66) as shown in figures 24 and 60.

(c) Connect the regulator B+ binding post of the test stand to the starter free-run binding post of the test stand using a cable harness 38408 (fig. 70) as shown in figure 60.

(d) Connect the starter input binding post of the test stand to the (+) terminal stud of the starter (cranking motor) using a cable harness 38405 (fig. 70) as shown in figure 60.

(e) Connect the starter common binding post of the test stand to the starter mounting flange (ground) (-) using a cable harness 38388 (fig. 71) (use the top mounting bolt to secure the cable harness to the starter mounting flange) as shown in figure 60.

(f) Connect the external dc voltmeter positive (red) binding post of the test stand to the (+) terminal stud of the starter (cranking motor) using a test lead 38425 (fig. 74) as shown in figure 60.

(g) Connect the external dc voltmeter negative (black) binding post of the test stand to the starter mounting flange (ground) (-) of the starter (cranking motor) using a test lead 38425 as shown in figure 60.

(4) *Testing.*

(a) The position of switches and controls pertinent to the tests in paragraphs *(b)* through *(j)* below are listed in table 8. Place each of these items in the positions indicated in column 3*a* of the table before tests are started.

Table 8. Position of Switches and Controls Before and After No Load (free running) and Stall Torque (measuring stall curent and torque) Tests.

(1)	(2) Figure No. 47	(3) Position	
	Key No.	(a) Before	(b) After
Load dc ammeter range selector switch	7	50A (X1)[1] 100 (X3)[2]	500A (X10)
Dc voltmeter range selector switch	9	50V (X5)	50V (X5)
Dc voltmeter circuit selector switch	10	EXT VOLTS	ANY
Battery circuit selector switch	23	24V	24V
Battery on-off switch	22	OFF	OFF
Starter test load disconnect switch	15	OFF	OFF
Drive control	25	STOP (button depressed)	STOP (button depressed)
Starter carbon rheostat	(figs 60 or 61)	(See par. 81 for setting)	(See par 81 for setting)

1 - Place in the "50A (X1)" position for the no load (free running test).

2 - Place in the "100A (X3)" position for the stall torque measuring stall current and torque) test.

(b) Place the load dc ammeter starter test selector switch (fig. 61) in the "free run (X4)" position.

(c) Place the battery on-off switch (22) in the "ON" position and turn the dc voltmeter circuit selector switch (10) to the "BAT VOLTS" position to determine whether the battery voltage of the test stand is the same as the voltage of the system under test. Correct voltage is 24 volts which will be indicated on the dc voltmeter (4). If reading is less than 24 volts recharge batteries (par. 98). It is also advisable to check the batteries with a hydrometer for specific gravity (refer to TM 9-6140-200-15).

Note. The safety clip (25-B) must be off the stop button (25-C) to perform the battery check in *(c)* above. Do not push the start button (25-A) as the varidrive assembly need not be running for this test.

(d) Let the battery on-off switch (22) remain in the "ON" position and turn the dc voltmeter circuit selector switch (10) to the "EXT VOLTS" position, also, the safety clip (25-B) will remain off the stop button (25-C).

(e) Place the starter test load disconnect switch (15) in the "ON" position and turn the starter carbon rheostat (fig. 60) clockwise until approximately 23.8 volts are indicated on the dc voltmeter (4). The current draw on the load dc ammeter (1) should be 20 amperes (table 9).

(f) Check the rpm of the starter (cranking motor) using the slide rule tachometer (fig. 66) as prescribed below and as shown in figure 60.

1. Place the flange end of the slide rule tachometer firmly against the case of the starter (cranking motor), being careful not to resist the movement of the vibrating reed of the tachometer (fig. 60).

2. Slide the knurled sleeve on the tachometer to extend the vibrating reed.

3. Adjust the vibrating reed outward and inward until the reed reaches its maximum swing (or vibration). Starter speed (rpm) is indicated on the housing of the tachometer at the edge of the knurled sleeve closest to the reed.

(g) The speed for the starter (cranking motor) should be approximately 3700 rpm (table 9).

(h) Place the starter test load disconnect switch (15) in the "OFF" position and note the rotation of the pinion gear of the starter (cranking motor) as it comes to a stop. Record this information for the stall torque (measuring stall current and torque) test in *c* below.

(i) Place the battery on-off switch (22) in the "OFF" position and adjust the starter carbon rheostat (fig. 60) to near full resistance position by rotating it in the counterclockwise direction until a slight drag or pressure is felt.

(j) Press the stop button (25-C) of the drive control (25) and continue with tests in *c* below.

b. Using Generator for Power Source for no Load (free running) Test.

Note. Test procedures below are utilized when the test stand is not used as a source of power for operating the starter (cranking motor) when performing a no-load (free-running) test, *a* above. Begin this test with all cable harness and test leads removed from the test stand and proceed as prescribed in *(a)* through *(i)* below.

(1) *General*. It is possible to provide dc voltage power for no load (free running) tests on starters (cranking motors) through the means of a dc generator driven by the varidrive assembly of the test stand. Air for cooling the generator must be supplied by an external blower.

(2) *Procedures.*

Note. Depending on the voltage and current rating of the starter (cranking motor)

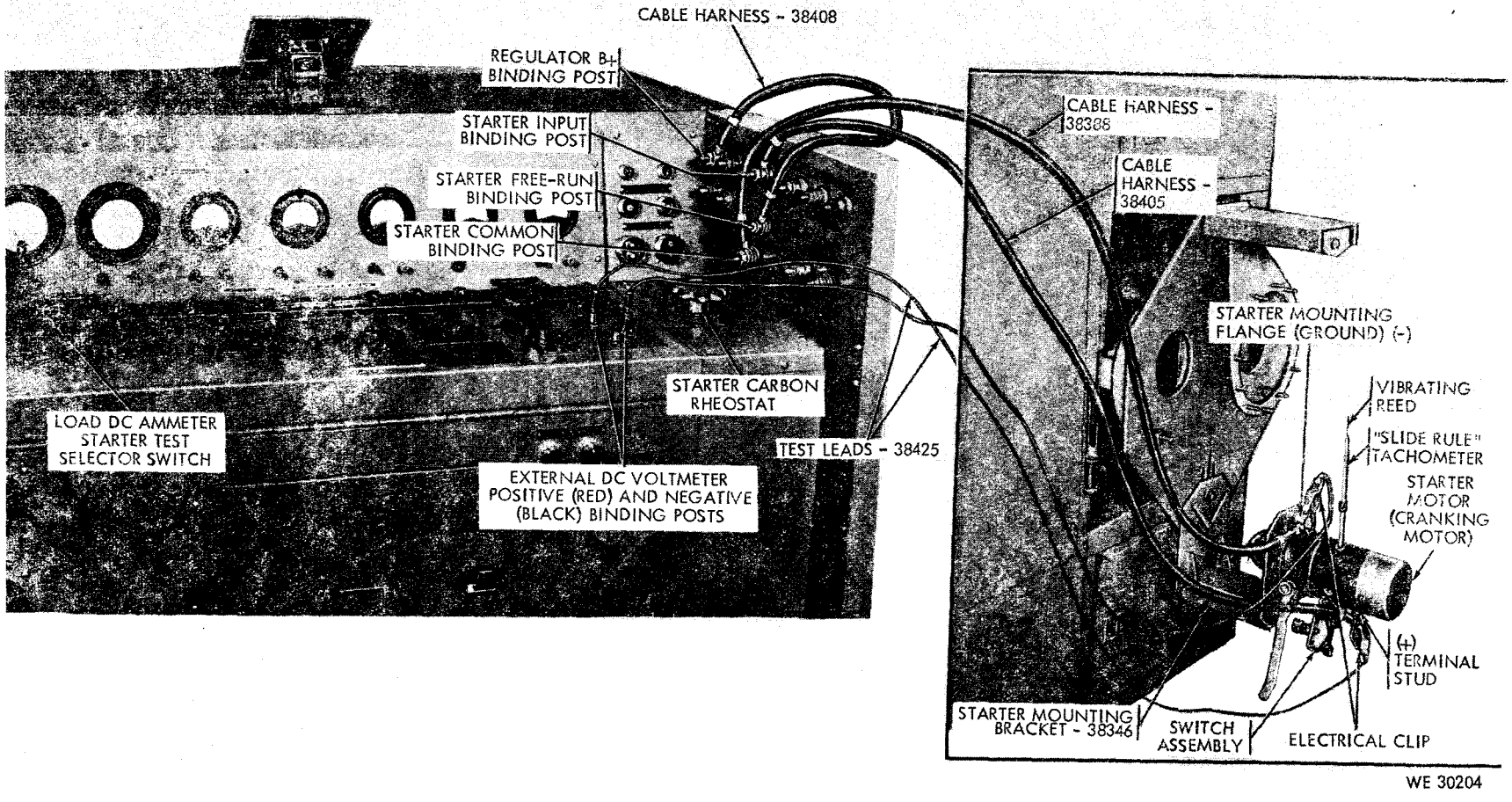


Figure 60. Testing starter (cranking motor) for no load (free running).

under test it may be necessary to use a generator of corresponding output voltage. In other instances using a 24-volt generator for lower voltage starter tests is accomplished by dropping the generator output voltage with the adjustment of the generator regulator, the speed (rpm) of the generator, and the setting of the 40-ohm or 250-ohm field current rheostat (52 and 55, fig. 16) of the test stand (adjustment of this rheostat is explained in detail in sections II, III, and IV of Chapter 3. Since the final adjustment of voltage and speed may be necessary when the generator is under load, care should be exercised to prevent ceiling volts and specified field current being exceeded when load is dropped.

(a) Mount a direct-driven generator of proper voltage and current rating for the starter (cranking motor) undergoing test as prescribed in paragraph 94 and connect it to the generator input binding posts (13, fig. 15). Refer to generator test procedures under chapter 3 for connecting the generator of the voltage rating being used.

(b) Mount a generator regulator or a generator control box on the regulator mounting bracket of the test stand and connect it to the regulator binding posts (10, fig. 15). Refer to generator regulator or generator control box test procedures under chapter 3 for connecting the generator regulator or generator control box of the voltage rating being used.

(c) Connect the starter free-run binding post (11-B, fig. 15) to the generator input No. G+ binding post (13-A, fig. 15) using a cable harness 38408 (fig. 70). This binding post in turn should be connected to the (+) input terminal on the generator being used in the test. Example: on the 25 ampere generator (fig. 30) this (+) input terminal is marked "A".

(d) Connect the starter input binding post (11-A, fig. 15) to the (+) terminal stud on the starter (cranking motor) using cable harness 38405. Figure 60 shows an example of a hook-up from the starter input binding post to the (+) terminal stud on the starter (cranking motor).

(e) Connect the generator input No. G- binding post (13-B, fig. 15) to the starter frame (ground) using cable harness 38388. Figure 60 shows an example of a hook-up from the input No. G- binding post (13-B, fig. 15) to the starter frame (ground). This binding post in turn should be connected to the frame (ground) of the generator being used in the test.

(f) Connect the external dc voltmeter positive (red) and negative (black) binding posts of the test stand to the starter (cranking motor) undergoing test as prescribed in **a(3)** *(f)* above, and as shown in figure 60,

(g) The no load (free running) test will be performed the same as, *a* above, except with the battery on-off switch (22) in the "OFF" position and with use of the generator to supply the required voltage and current to operate the starter (cranking motor).

Note. For instructions to operate the generator being used during starter (cranking motor) tests above, refer to appropriate section in chapter 3 covering the generator.

(h) After the test is completed place the switches and controls in table 8 above, in positions indicated in column **3***b* of the table.

(i) Remove the generator, generator regulator, and all cable harnesses and test leads connected to the test stand, but let all cable harnesses and test leads connected to the starter (cranking motor) remain in place. Continue with the stall torque (measuring stall current and torque) test in *c* below.

c. Using the Test Stand for Power Source for Stall Torque (measuring stall current and torque) test.

(1) Purpose. This test is performed to indicate the functioning of the starter (crank motor) when there is a load

(foot-pounds) connected to the rotor of the starter (cranking motor). A means is provided by use of a scale to record the torque (lock rotor) in foot-pounds. The current (ampere) draw is also registered on the load dc ammeter (1) under these conditions. The starter (cranking motor) rotor is set into action when a given testing voltage is applied to the starter in the same manner as specified in the no load (free running) test, *a* above.

Note. The stall torque (measuring stall current and torque) test procedures in (2) and (3) below are for a Delco Products (Delco-Remy) starter (cranking motor) model DR 1108575. When testing other manufacturers and models starters (cranking motors) these instructions can be used as a guide. Refer to table 9, technical manuals listed in appendix I, or manufacturer's literature for test data when performing tests on other starters (cranking motors).

(2) *Preparation.*

(a) Connect the starter (cranking motor) and prepare the test stand as prescribed in *a*(3) above, except for the instructions in *a*(3) *(c)* above change as follows: Connect the regulator B+ binding post of the test stand to the starter stall torque binding post of the test stand using a cable harness 38408 (fig. 70) as shown in figure 61.

Note. Refer to figure 61 when making connections above and procedures prescribed below.

Caution: **When connecting starters (cranking motors) having a capacity above 200 amperes use two (2) cable harnesses 38405 between the starter input binding post of the test stand and the (+) terminal stud of the starter (cranking motor) (fig. 61).**

(b) Place a fabricated wood wedge (fig. 27) between the base of the test stand and the lever of the switch assembly of the starter (cranking motor) to hold the pinion gear of the starter (cranking motor) in an exposed position (fig. 61).

(c) Place the scale support (fig, 61) in position on the test stand and secure loosely. (Scale support is tightened securely after scale and torque arm are alined, *(d)* below.) Hooks the scale on the scale support (fig. 61).

(d) Position the jaws of the torque arm (fig. 61) over the pinion gear of the starter (cranking motor) and hook the free end of the starter torque arm on the scale, *(c)* above, (fig. 61). Adjust the scale support outward or inward until the torque arm and scale are alined, then tighten the scale support securely, *c* above.

Caution: **When installing the torque arm (fig. 61) be sure the jaws of the torque arm are placed over and in the teeth of the pinion gear of the starter (cranking motor) correctly to allow the gear to throw the arm downward, also, always tighten the screw on the torque arm jaws to secure them in place. Proper installation of the torque arm is important because starter rotation varies according to manufacture and model and is either clockwise or counterclockwise.**

(3) *Testing.*

(a) The position of switches and controls pertinent to the tests in paragraphs *(b)* through *(i)* below are listed in table 8 above. Place each of these items in the positions indicated in columns 3*a* of the table before tests are started.

(b) Place the load dc ammeter starter test selector switch (fig. 61) in the stall torque (X20) position.

(c) Place the battery on-off switch (22) in the "ON" position and slide the safety clip (25-B) off the stop button (25-C) but do not push the start button (25-A). This will close the circuit to the switches and controls of the test stand.

Note. The varidrive assembly need not be operating for the test, therefore, the start button (25-A) is not depressed.

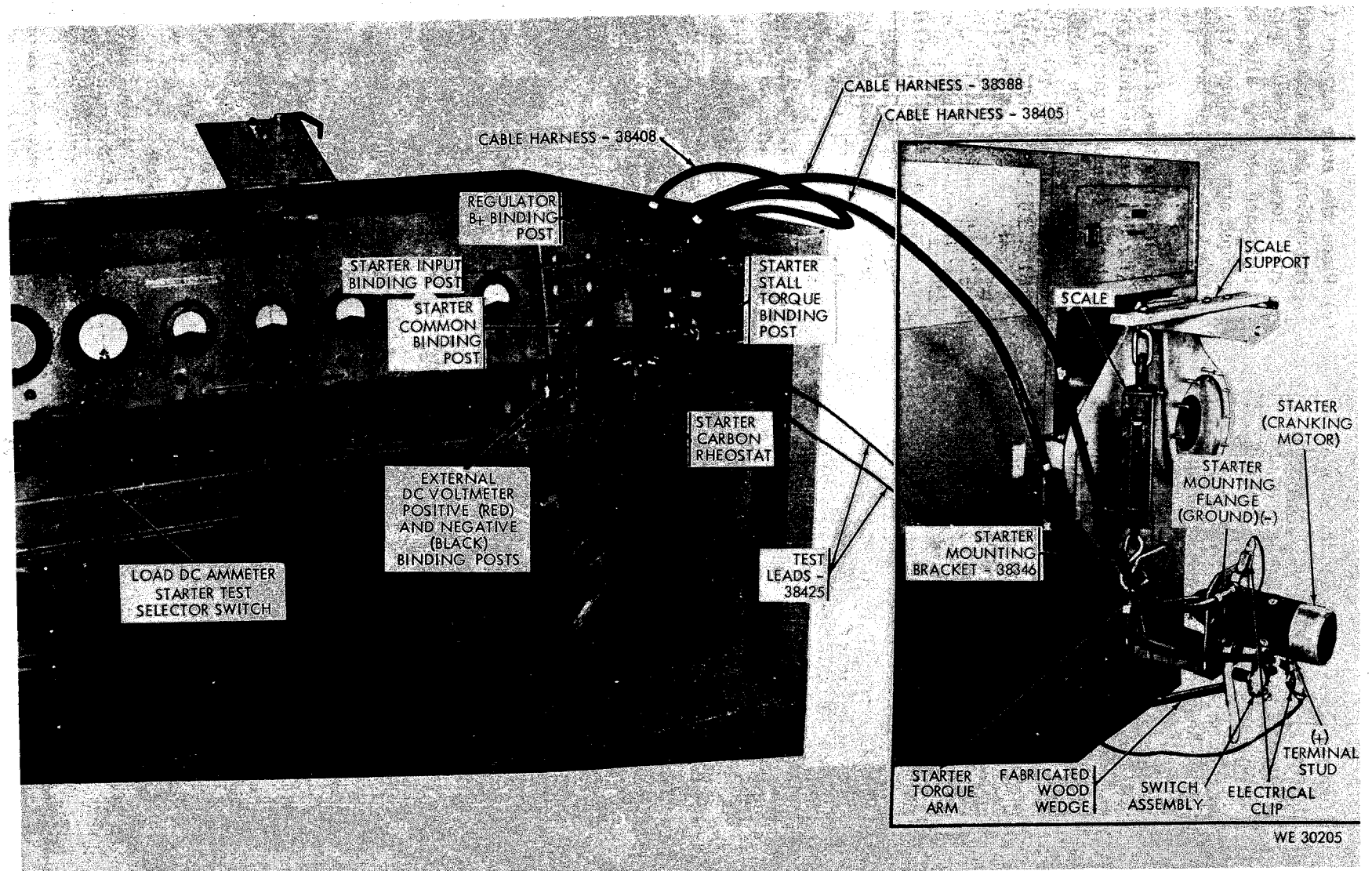


Figure 61. Testing starter (cranking motor) for stall torque (measuring stall current and torque).

(d) Adjust the setting of the starter carbon rheostat (fig. 61) to near full resistance position by rotating it in the counterclockwise direction until a slight drag or pressure is felt. Do not turn counterclockwise completely (Refer to paragraph 81 for details).

(e) Place the starter test load disconnect switch (15) in the "ON" position and turn the starter carbon rheostat (fig. 61) clockwise until approximately 19.8 volts are indicated on the dc voltmeter (4). The current (amperes) draw on the load dc ammeter (1) should be 200 amperes (table 9).

***Caution:* Application of the stall torque current (amperes) in *(e)* above can damage the starter motor. Do not keep it applied for more than 15 seconds at a time.**

(f) The foot-pounds indicated on the scale (fig. 61) should be 20 pounds (table 9).

(g) Turn the starter carbon rheostat counterclockwise to reduce the current (amperes) to a minimum. Do this rapidly when the 15 seconds period is reached, *(e)* above.

(h) Place the starter test load disconnect switch (15) to the "OFF" position. Adjust the starter carbon rheostat (fig. 61) to near full resistance position by rotating it in the counterclockwise direction until a slight drag or pressure is felt (par. 81).

(i) Press the stop button (25-C) of the drive control (25) and remove the cable harness, test leads, scale, scale support torque arm, and starter (cranking motor) from the test stand.

Table 9. Starter (cranking motor) Test Data

Mfg No.	Ord part No.	Rotation 1 2	No load test			Stall test			
			Max amp	Testing voltage at min rpm	Min rpm	Max amp	Testing voltage	Ft-lb min torque	Rated voltage
Auto-Lite									
MAW-2148	7411590	CC	65	5	4300	335	2	6	6
MAW-4029	7411588	C	65	5	4300	335	2	6	6
MZ-4113	7417959	C	68	5	4800	280	2	4.4	6
MAY-4132	.....	C	35	10	4800	175	4	6.7	12
MAY-4138	6248694	C	35	10	4800	175	4	6.7	12
MAY-4141	C-128135	C	35	10	4800	175	4	6.7	12
MZ-4124	7713415	C	75	10	5500	560	4	10	12
Eclipse-Pioneer									
EC-1416-29G	7705699	CC	..	Use 12 volts only.	24 (3)	175	13.5	400	24
EC-1416-29F	7705699	CC	.....	.....	24	175	13.5	400	24
EC-36E15-1A	7386254	CC	.....	.....	24	175	13.5	400	24
EC-36E16-1A	7346519	CC			24	175	13.5	400	24
Delco-Remy									
DR-1108533	D-48136	C	70	10	2800	530	6.7	33	12
DR-1109123	C-97137	C	65	12	4500	725	4.8	44	12
DR-X10483	8329740	C	35	23.5	2500	265	19.1	19	24
DR-1108568	5614960	C	35	23.5	2500	265	19.1	19	24
DR-1108575	7762618	C	20	23.8	3700	200	19.8	20	24
DR-1108581	7410752	C	35	23.5	2500	265	19.1	19	24
DR-1108685	D- 7397	C	50	23	120	125	21.5	150(4)	24
DR-1108898	7731426	C	35	23.7	4000	200	6.0	19.5	24
DR-1109312	D-66462	CC	110	23.3	8500	500	3.0	25	24
DR-1109313	D-66463	CC	110	23.3	8500	500	3.0	25	24
DR-1109317	D-39368	CC	110	23.3	8500	500	3.0	25	24
DR-1109746	8360017	C	35	23.7	4100	200	6.0	19.5	24

Table 9. Starter (cranking motor) Test Data - Continued

Mfg No.	Ord part No.	Rotation 1	Rotation 2	No load test: Max amp	No load test: Testing voltage at min rpm	No load test: Min rpm	Stall test: Max amp	Stall test: Testing voltage	Stall test: Ft-lb min torque	Stall test: Rated voltage
Jack and Heintz										
JHZ-D30—	7538988	C		31.5	24–28	25	170	13	400	24
JHZ-D42—	8365476	. . . .			.....	.....	.....	.....	.....	24
Auto-Lite										
MBD-4008—	C124376	C		65	20	5300	380	4	21	24
MBD-4023—	7059688	C		65	20	5300	380	4	21	24
MBP-4301UT	7762166	C		26	22	3000	190	16	12	24
MCZ-4001UT	8328132	C		12	22	3400	145	16	13	24
MCZ-4002UT	7355783	C		12	22	3400	145	16	13	24
MCS-4301UT	7762617	C		22	22	4800	250	16	21	24

1c —Clockwise.
2cc—Counterclockwise.
3 No load test without gear reduction min rpm 3190.
4 Running torque at 65 rpm

CHAPTER 4

OPERATOR OR CREW MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, TOOLS, AND EQUIPMENT

135. General

Repair parts, tools, and equipment are issued to the operator and/or crew operating and maintaining the test stand. Tools and equipment should not be used for purposes other than prescribed and when not in use, should be properly stored.

136. Repair Parts

Repair parts are supplied to the operator and/or crew for replacement of those parts most likely to become worn, broken, or otherwise unserviceable, provided replacement of these parts is within the scope of the operator's and/or crew's maintenance functions. Repair parts supplied for the test stand are listed in appendix II, which is the authority for requisitioning replacements.

137. Common Tools and Equipment

Common tools and equipment having general application to this materiel are authorized by tables of allowances and table of organization and equipment.

138. Special Tools and Equipment

No tools or equipment specially designed for operation or operator and/or crew maintenance are supplied or required for the test stand.

Section II. LUBRICATION

139. Lubrication Chart

The lubrication chart (fig. 62) prescribes cleaning and lubricating procedures as to location, intervals, and proper materials for the test stand.

140. General Lubrication Instructions

a. Usual Conditions. Lubrication intervals specified on the lubrication chart are for normal operation and where moderate temperature and humidity prevail.

b. Lubrication Equipment. Clean lubrication equipment both before and after use. Operating lubricating guns carefully and in such a manner as to insure a proper distribution of the lubricant.

c. Points of Application.

(1) Lubrication fittings, oiling points, and the gear case filling point shown on the lubrication chart (fig. 62) are indicated by an appropriate identifying call-out. Wipe these devices and the surrounding surfaces clean before applying lubricant.

(2) A ¾-inch red circle should be painted around all lubrication fittings.

d. Reports and Records.

(1) Report unsatisfactory performance of prescribed petroleum fuels, lubricants, or preserving materials, using DA Form 2407, Maintenance Request.

(2) Maintain a record of lubrication of the test stand on DA Form 2408-2, Lubrication Record.

141. Lubrication Under Unusual Conditions

a. Unusual Conditions. Reduce lubrication intervals specified on the lubrication chart to compensate for abnormal operation and extreme conditions, such as high or low tempera-

LUBRICATION CHART

TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER, 10 TO 50-V, 500-AMP, DC, AND 25 TO 50-V, 100 TO 400-AMP, AC, TESTING RANGES, (UNITED MANUFACTURING CO MODEL AGARTS, TYPE II, PART NUMBERS — 7336-1, 7336-2, AND 7336-3) (4910-767-0218) AND (TYPE II, PART NUMBER 7336) (4910-316-5252)

Intervals are based on normal operations. Reduce to compensate for abnormal operation and severe conditions or contaminated lubricants. During inactive periods, intervals may be extended commensurate with adequate preservation.

Clean lubrication points before lubricating. Clean parts with THINNER, PAINT, MINERAL SPIRITS (TPM), or SOLVENT, DRY CLEANING (SD). Dry before lubricating.

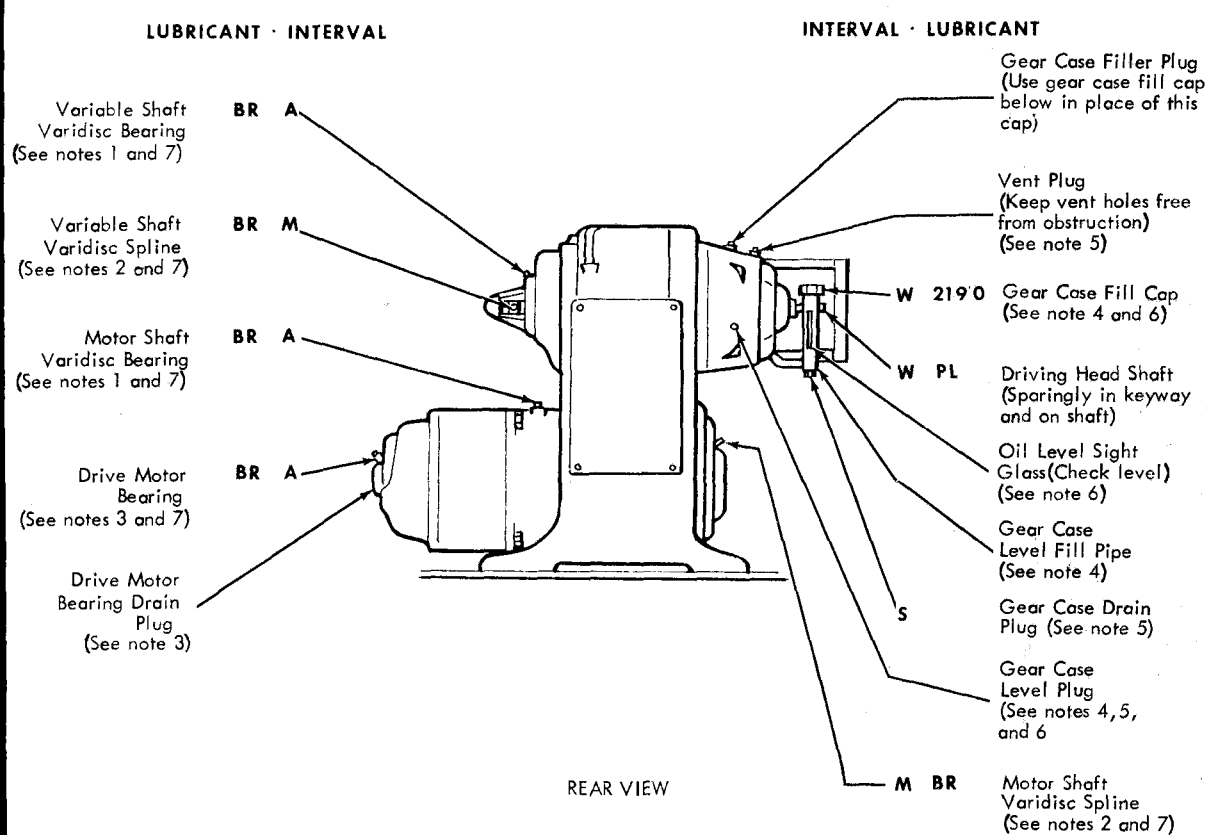


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Figure 62. Lubrication chart.

- KEY -

LUBRICANT	EXPECTED TEMPERATURES			INTERVALS
	above +32° F	+40° F to - 10° F	0° to - 65° F	W — Weekly
2190 2135 2075 — LUBRICATING OIL, general purpose	2190	2135	2075	M — Monthly
3042	2135	2075	3042	S — Semiannually
BR - GREASE, ball and roller bearing	All TEMPERATURES			A — Annually
PL - LUBRICATING OIL, preservative, special				

-NOTES-

1. **VARIABLE SHAFT AND MOTOR SHAFT VARIDISC BEARINGS** - Lubricate sparingly with care to prevent surplus lubricant from being forced out around shaft. Remove all surplus lubricant if this condition exists.
Caution: Surplus lubricant will cause bearings to run hot.

2. **VARIABLE SHAFT AND MOTOR SHAFT VARIDISC SPLINES** - Lubricate sparingly with care to prevent surplus lubricant from being expelled on to varidiscs and varidrive belt surface. Clean lubricant from surface if this condition exists.
Caution: Surplus lubricant on varidiscs and varidrive belt surface will cause belt slippage or deterioration.

3. **DRIVE MOTOR BEARING** — Remove drive motor bearing drain plug. Lubricate until clean grease emerges from drain plug hole. Operate drive motor for a few minutes to expel excess grease. Install drain plug and wipe excess grease from around hole and drive motor.

4. **GEAR CASE** - Remove gear case level plug and gear case fill cap. Fill gear case through opening in gear case level fill pipe until oil flows from level plug hole (gear case capacity is approximately three (3) quarts). Install gear case level plug and gear case fill cap. Wipe excess oil from fill pipe and gear case.

5. **GEAR CASE DRAIN** - After first week of operation (new or rebuilt test stand) and semiannually thereafter, drain gear case. Place a 1 gallon container under gear case drain plug. Remove drain plug and gear case level plug. After oil has drained (removing vent plug will cause oil to drain at a faster rate), install drain plug and level plug, also, vent plug if removed.

6. **OIL LEVER SIGHT GLASS** — After initial filling of gear case to proper capacity, use decalcomania oil level marker provided and place on side of test stand in line with oil level in sight glass. Use marker for oil level indicator to keep gear case filled to proper level, also, when gear case is drained and refilled this marker can be used as an indicator to fill gear case to proper level and omitting removal of gear case level plug.

7. **ACCESSIBLE BY REMOVING REAR PANELS OR SIDE PANEL OF CABINET ASSEMBLY** - Variable shaft varidisc bearing, motor shaft varidisc bearing, variable shaft varidisc spline, motor shaft varidisc spline, drive motor bearing, and drive motor bearing drain plug.

8. **OIL CAN POINTS** — Monthly lubricate generator and starter mounting bracket assembly pivot points, adjusting points, chain vise, and threads with PL.

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Figure 62—Continued.

tures, prolonged periods of high-speed operation, continued operation in sand or dust, or exposure to moisture, any one of which may quickly destroy the protective qualities of the lubricant. Lubrication intervals may be extended during inactive periods.

b. Changing Grade of Lubricants. Lubricants are prescribed in the "Key" on the lubrication chart, in accordance with three temperature ranges: above +32°F., from +40° to -10°F., and from 0° to -65°F. When to change grades of lubricants is determined by maintaining a close check on operation of the test stand during the approach to change-over periods in accordance with weather forecast date. Ordinarily, it will be necessary to change grade of lubricants only when air temperatures are consistently in the next higher or lower range.

Section III. PREVENTIVE-MAINTENANCE SERVICES

142. General

Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational readiness. Operator and/or crew preventive maintenance is accomplished by the equipment operator and/or crew. The operator's and/or crew's role in the performance of preventive-maintenance service is:

a. To perform the daily service each day the equipment is operated.

b. To assist the organizational maintenance mechanics in the performance of any other scheduled periodic services specified by pertinent technical manuals.

c. To assist the organizational maintenance mechanics in the lubrication of the equipment in accordance with the pertinent lubrication order or chart.

143. Responsibility

Operators and crew chiefs are personally responsible for assigned equipment. Squad, section, and platoon leaders are charged with supervisory responsibility for equipment pertaining to their commands. Unit and organization commanders are required to insure that equipment issued or assigned to their commands are properly maintained in a serviceable condition, and that they are properly cared for and used.

144. Recording Repairs

Repairs accomplished will be in accordance with procedures and standards prescribed in appropriate technical manuals. The equipment record system provides for recording repairs required and accomplished on specific items of equipment. This will include, but is not limited to, adjusting, cleaning, replacing. Deficiencies discovered before, during, and after operation that cannot be corrected by the operator and/or crew will be entered on DA Form 2404. Deficiencies immediately corrected by the operator and/or crew are not recorded, except when such corrections are made by replacing parts, or which constitute repairs above operator and/or crew maintenance. Such repairs will be recorded as organizational maintenance.

145. General Procedures for All Services and Inspections

a. The following general procedures apply to operator and/or crew preventive-maintenance services and all inspections, and are just as important as the specific procedures.

b. Inspection to see if items are in good condition, correctly assembled or stowed, secure, not excessively worn, not leaking, and adequately lubricated apply to most items in the preventive-maintenance and inspection procedures. Any or all of these checks that are pertinent to any item (including supporting, attaching, or connecting members) will be performed automatically, as general procedure, in addition to any specific procedures given.

(1) Inspection for "good condition" is usually an external visual inspection to determine whether the unit is damaged beyond safe or serviceable limits. Good condition is explained further as meaning; not bent or twisted, not chafed or burred, not broken or cracked, not bare or frayed, not dented

or collapsed, not torn or cut, not deteriorated.

(2) Inspection of a unit to see that it is correctly assembled or stowed is usually a visual inspection to see if the unit is in its normal position in the vehicle, and if all its parts are present and in their correct relative position.

(3) Inspection of a unit to determine if it is "secure" is usually an external visual examination or a check by hand, wrench, or pry-bar for looseness. Such an inspection must include any brackets, lockwashers, locknuts, locking wires, or cotter pins as well as any connecting tubes, hoses, or wires.

(4) By "excessively worn" is meant worn beyond serviceable limits or to a point likely to result in failure if the unit is not replaced before the next scheduled inspection. Excessive wear of mating parts of linkage connection is usually evidenced by too much play (lash or lost motion). It includes illegibility as applied to markings, data and caution plates, and printed matter.

(5) Where the instruction "tighten" appears in the procedure, it means tighten with a wrench, even if the item appears to be secure.

(6) Such expressions as "adjust if necessary" or "replace if necessary" are not used in the specific procedures. *It is understood that whenever inspection reveals the need of adjustment, repairs, or replacement, the necessary action will be taken.*

146. Cleaning

a. General. Any special cleaning instructions required for specific components or parts are contained in the pertinent section. General cleaning instructions are outlined in (1) through (4) below:

(1) *Metal parts.*

(a) Use self-emulsifying solvent cleaning compound (MIL-S-11090), mineral spirits paint thinner (TT-T-291), or dry-cleaning solvent (Stoddard) (P-S-661) to clean or wash grease or oil from all metal parts of the test stand.

(b) Use clean water or a solution of either ¼ pound of soap chips or 6 ounces of painted surface detergent to 1 gallon of hot water for all parts and overall general cleaning of painted surfaces.

(c) After parts are clean, dry them thoroughly. Apply a light film of special preservative lubricating oil (PL, fig. 62) to all parts having a polished surface to prevent misting.

(d) Before installing new parts, remove any rust-preventive compound, protective grease, etc.; prepare as required (oil seals, etc.) ; and for those parts requiring lubrication apply the lubricant prescribed in the lubrication chart (fig. 62).

(2) *Electrical parts.* Use technical trichloroethane (methyl chloroform) (0-T-620) for cleaning electrical parts. Clean painted parts and plastics by wiping, brushing, or spraying but never by immersing or soaking in trichloroethane. Do not use trichloroethane for cleaning leather or rubber parts (other than neoprene).

(3) *Meter lens.*

(a) General. A static charge may build up in the lens of the meters and it will have an effect on the accuracy of the meter indication as well as the zero setting of the instrument. The rate at which this charge builds up in the meter lens will vary, depending upon the atmospheric conditions in which the test stand is being used, as well as being effected by rubbing of the windows to remove any accumulation of dust.

(b) Inspection. To check the pressure of a static charge in the meter windows, hold the hand as close as possible to the window, without touching it, and move the hand toward the end of the scale. If there is a charge present, the meter pointer will follow the hand for a short distance and will not return to its original

setting. This condition can be corrected by cleaning and recoating with antistatic and cleaning compound as prescribed in *(c)* below.

(c) Cleaning and recoating.

1. Wash the lens of the meter(s) using a damp chamois or a nonabrasive tissue or soft cloth and a mild detergent and water solution, do not rinse.

2. Wipe or blot the lens dry. Avoid use of a dry cloth since it may scratch or mar the surface and possibly produce a static charge.

Caution: **Never use solvents, or cleaning solutions containing acetone, benzene, carbon tetrachloride, etc. These solvents may attach and ruin the meter cover or lens surface.**

3. Coat the lens with antistatic and cleaning compound 6850-368-5227 and allow to dry thoroughly.

4. After the coating is completely dry, inspect the action of the meters, as set forth in *(b)* above.

(4) *Rubber parts other than electrical.* Clean rubber parts with soap and warm water. Apply a coating of powdered technical talcum (ZZ-T-416) to preserve the rubber.

General Precautions in Cleaning.

(1) Provide adequate ventilation both during and after use of trichloroethane. Avoid prolonged inhalation of vapor. Rubber gloves should be worn since this cleaner has a drying effect on the skin.

(2) Self-emulsifying degreasing solvent compound, mineral spirits paint thinner, and dry-cleaning solvent are flammable and should not be used near an open flame. Fire extinguisher should be provided when these materials are used. Use only in well-ventilated places. These cleaners evaporate quickly and have a drying effect on the skin. If used without gloves, they may cause cracks in the skin and, in the case of some individuals, a mild irritation or inflammation.

(3) Avoid getting petroleum products, such as mineral spirits paint thinner, dry-cleaning solvent, engine fuels, or lubricants on rubber parts, as they will deteriorate the rubber.

(4) The use of diesel fuel oil, gasoline, or benzene (benzol) for cleaning is prohibited.

c. Rust Removal. Remove rust or corrosion from all parts of the materiel. To remove rust or corrosion from unfinished surfaces, use steel cleaning brushes or abrasive cloth. On finished surfaces, other than highly polished surfaces, remove rust or corrosion by buffing with a rotary wheel wire brush constructed of steel wire between 0.010 and 0.025 inch in diameter. Crocus cloth may be used manually to remove rust or corrosion from polished surfaces.

147. Preventive Maintenance by Operator and Crew

a. Purpose. To assure maximum operational readiness, it is necessary that equipment be systematically inspected at intervals every day it is operated, so defects may be discovered and corrected before they result in serious damage or failure. Certain scheduled maintenance services will be performed at these designated intervals. Any deficiencies discovered that cannot be corrected by the operator and/or crew, or corrected by replacing parts will be reported on DA Form 2404.

b. Daily Preventive-Maintenance Service. Each equipment will be inspected each day that it is operated. This service is divided into three parts, as indicated in (1) through (3) below.

(1) *Before-operation service.* This is a brief service to ascertain that the equipment is ready for operation, it is mainly to check to see if conditions affecting the equipment's readiness have changed since the last after-operation service.

(2) *During-operation service.* This service consists of detecting unsatisfactory performance.

(3) *After-operation service.* This is the basic daily service for the equipment. It consists of correcting, insofar as possible, any operating deficiencies. Thus, the equipment is prepared to operate upon a moment's notice.

148. Specific Procedures for Operator and/or Crew

Table 10 gives the specific procedures to be performed on the equipment by the operator and/or crew for each daily service.

Table 10. Preventive-Maintenance Checks and Services

Operator/Crew — Daily schedule

Interval and sequence No.			Item to be inspected	Procedure	Reference
Before Operation	During Operation	After Operation			
1		11	Instrument panel and cabinet.	*a.* Clean outside surface of panel and cabinet.	Clean with low pressure air, free of moisture. See figs. 15 and 16.
				b. Inspect painted surfaces for chips and peeling, and compartment fasteners for distorted or bent condition. Notify organizational-maintenance personnel if surfaces require refinishing or fasteners require repairs.	
2		12	Meters	*a.* Check lens of each meter for loss of antistatic coating. Run hand across lens without touching it and check meter needle for fluctuation. Recoat lens if required.	Par. 146, see fig. 16
				b. Adjust needle of each meter to zero if required.	par. *91a*, see fig. 16
3		13	Knobs.....	Tighten setscrew in knobs of switches and controls if loose. Be sure pointer of the knob is set in correct position on indicator dial before tightening setscrew.	See figs. 15 and 16
4		14	Stowage compartments.	Remove all items of equipment that may interfere with operation of test stand.	See fig. 6.
5		15	Test leads and cable harness.	*a.* Remove accumulation of corrosion and other foreigh matter from clips, sockets, and ferrules. Keep a coating of automotive and artillery grease (GAA) MIL-G-10924 applied to clips, sockets, and ferrules to prevent further corrosion.	Par. 146. See figs. 70, 71, 72, 73, 74, and 75.
				b. Inspect electrical wiring for frayed, broken, cracked, and burned insulation.	See figs. 70, 71, 72, 73, 74, and 75.
				c. Wipe clean and roll-up neatly. Store in stowage compartments provided in test stand.	See fig. 6.
	8		Toggle, selector, and control switches.	Observe operation of toggle switches for non-positive action, also check selector or control switches for binding when rotated.	See fig. 16.
	9		Lamps.....	Inspect for burned out condition (observe whether lamp is lit when test stand is operating).	See fig. 16.

Table 10. Preventive-Maintenance Checks and Services - Continued

Operator/Crew — Daily schedule

Interval and sequence No.			Item to be inspected	Procedure	Reference
Before Operation	During Operation	After Operation			
6	....	16	V belts.....	Inspect the V belts provided with equipment for fraying, cracks, and other indications of excessive wear.	See fig. 68.
7		17	Gear case level.... . .	Observe oil level sight glass and check for proper oil level.	See lubrication chart (fig. 62).
	10	. . .	Speed control	Observe operation for unusual feel, binding, or excessive free play.	See fig. 16.

Section IV. TROUBLESHOOTING

149. Purpose

Troubleshooting is a systematic determination of malfunctions and defective components by indications, symptoms, and tests. Close adherence to the procedures covered herein will materially reduce the time required to locate trouble and restore the materiel to normal operation.

Caution: Operation of materiel without a preliminary examination can cause further damage to a disabled component. Be careful during inspection and troubleshooting, so that damage can be avoided.

150. Scope

This section covers troubleshooting which is peculiar to the operator's and/or crew's maintenance operations.

151. Procedure

Malfunctions which may occur with the test stand are listed in table 11. Upon observing any one of these malfunctions, take immediate steps to locate and correct the cause. Causes are listed opposite each malfunction and are arranged according to the ease of correction.

Table 11. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Test stand fails to operate.	*a.* On-off input power toggle switch (fig. 11) is open.	*a.* Place switch in "ON" position.
	b. Air intake and exhaust vents restricted.	*b.* Remove any obstructions from intake and exhaust vents (fig. 10).
	c. Interlock switch (fig. 12) open...	*c.* Close drive reversing switch access door (high voltage compartment) tightly (fig. 6).
	d. Other causes.	*d.* Refer other causes to organizational maintenance personnel for correction.
2. Incorrect reading noted on meters.	*a.* Meter require zero adjustment.	*a.* Zero adjust meters (par. 91*a*).
	b. Knob loose on switch or control shaft.	*b.* Set knob in correct position and tighten setscrew (see item 6 below).
	c. Switch set in open position (between markings on dial).	*c.* Set knob of switch to selected markings on switch dial.
	d. Other causes	*d.* Refer other causes to organizational maintenance personnel for correction.
3. Indicator lamps fail to light.	*a.* Fuses burned out	*a.* Replace fuses (pars. 74, and 75).
	b. Other causes	*b.* Refer other causes to organizational maintenance personnel for correction.

Table 11. Troubleshooting - Continued

Malfunction	Probable cause	Corrective action
4. Battery charger fails to operate.	*a.* Short circuit causing circuit breaker to kickout.	*a.* Reset circuit breaker (par. 52).
	b. Fuse burned out	*b.* Replace fuse (par. 53).
	c. Batteries not connected properly to charger.	*c.* Check for proper hookup (par. 98) and (fig. 9).
	d. Timer on battery charger not set properly.	*d.* Refer to instructions (par. 98).
5. Variable circuit fails to operate. (28, fig. 16)	*a.* Short circuit causing circuit breaker to kickout.	*a.* Reset circuit breaker (par. 58).
	b. Fuse burned out	*b.* Replace fuse (par. *38c*).
	c. Other causes	*c.* Refer other causes to organizational maintenance personnel for correction.
6. Knob turns on switch shaft or control shaft, or knob is set in wrong position on switch dial.	*a.* Setscrew loose or missing	*a.* Turn shaft of switch or control to the extreme left or right position and aline pointer of knob with extreme lower left or right lined marking on switch or control dial. Replace and/or tighten setscrew in knob.
	b. Other causes	*b.* Refer other causes to organizational maintenance personnel for correction.
7. Binding posts do not hold leads securely.	*a.* Threads on binding posts dirty or corroded.	*a.* Clean threads (par. 146).
	b. Other causes	*b.* Refer other causes to organizational maintenance personnel for correction.
8. Incorrect speed noted on tachometer indicator.	*a.* Tachometer indicator circuitry requires adjustment.	*a.* Adjust tachometer indicator circuitry (par. 97).
	b. Other causes	*b.* Refer other causes to organizational maintenance personnel for correction.
9. Generator, alternator, or starter (cranking motor) vibrates excessively, when revolving, while undergoing test.	*a.* Not clamped securely in mounting bracket.	*a.* Tighten clamp of mounting bracket down onto item undergoing test (pars. 94 and 95).
	b. Other causes	*b.* Refer other causes to organizational maintenance personnel for correction.
10. Varidrive assembly noisy.		Refer malfunction to organizational maintenance personnel for correction.
11. Varidrive assembly operates but drive heads run erractic or do not turn.		Refer malfunction to organizational maintenance personnel for correction.

Section V. VARIABLE VOLTS CIRCUIT FUSE, BATTERY CHARGER FUSE, AND 250-OHM FIELD CURRENT RHEOSTAT FUSE GROUP

152. Description

a. Variable Volts Circuit Fuse. The variable volts circuit fuse, located under the fuse holder (28-B, fig. 16), is a 15-ampere 32-volt type ABS (4AB) fuse (fig. 65). It provides overload protection for the variable volts circuit when the circuit is being used as an external voltage output for testing generator regulators and generator control boxes.

b. Battery Charger Fuse. The battery charger fuse, located under the fuse holder (44, fig. 16), is a 20-ampere 32-volt type ABS (4AB) fuse

(fig. 65). It provides overload protection for the battery charging circuit when the circuit is in operation for charging the batteries within the test stand.

c. 250-Ohm Field Current Rheostat Fuse. The 250-ohm field current rheostat fuse, located under the fuse holder (56, fig. 16) is a 5-ampere 32-volt type ABS (4AB) fuse (fig. 65). It provides overload protection for the 250-ohm field current rheostat circuit when testing dc generators without a generator regulator in the circuit.

153. Maintenance

a. General. operator and/or crew maintenance is limited to such disassembly and assembly required to replace the variable volts circuit fuse, battery charger fuse, and the 250-ohm field current rheostat fuse (par. 151*a*

b. Disassembly. Fuses referenced in, *a* above, are removed by turning the fuse holder counterclockwise and lifting the cap. The fuse is held in the cap with a friction type sleeve and is removed by pulling outwardly on the fuse.

c. Inspection.

(1) Inspect the fuse holder for cracks, breaks, and damaged threads.

(2) Check the continuity of the fuses using a multimeter.

d. Assembly. Place a serviceable fuse in the fuse holder cap for each of the fuses in *a* above, and screw the fuse holder cap in place by turning it clockwise in the test stand.

CHAPTER 5

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. REPAIR PARTS, TOOLS, AND EQUIPMENT

154. General

Repair parts, tools, and equipment over and above those available to the operator are supplied to the using organization for maintaining the test stand. Tools and equipment should not be used for purposes other than prescribed and, when not in use, should be properly stored.

155. Repair Parts

Repair parts are supplied to the using organization for replacement of those parts most likely to become worn, broken, or otherwise unserviceable, providing replacement of these parts is within the scope of organizational maintenance functions. Repair parts supplied for the test stand are listed in appendix IV.

156. Common Tools and Equipment

Common tools and equipment having general application to this materiel are authorized by tables of allowances and tables of organization and equipment.

157. Special Tools and Equipment

No tools or equipment specially designed for organizational maintenance are supplied or required for the test stand.

Section II. LUBRICATION AND PAINTING

158. Lubrication

Refer to section II of chapter 4 for lubricating instructions for the operator. These instructions apply equally to maintenance personnel of the using organization.

159. Painting

Instructions for preparation of the materiel for painting, methods of painting, and materials to be used are contained in TM 9-213. Materials for painting are listed in appendix IV.

Section III. PREVENTIVE-MAINTENANCE SERVICES

160. General

Preventive-maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdown, and assure maximum operational readiness. Organization preventive-maintenance is accomplished by the organizational mechanics. Their role in the performance of preventive-maintenance services is:

a. To perform the periodic services specified.

b. To lubricate the equipment in accordance with the lubrication chart (par. 139).

161. Recording Repairs

Repairs accomplished will be in accordance with procedures and standards prescribed in appropriate technical manuals. The equipment record system provides for recording repairs required and accomplished on specific items of equipment. This will include, but is not limited to, adjusting, cleaning, replacing, and straightening. Deficiencies and shortcomings not corrected by operators or crew, or those discovered during periodic inspections, will be corrected insofar as possible by organizational maintenance personnel. These repairs will be indicated

on DA Form 2404 and recorded on the organizational maintenance record of the equipment log.

162. General Procedures

a. Automatically Applied. All of the general procedures given in the operator's manual will be followed. Organizational mechanics must be so thoroughly trained in these procedures that they apply them automatically at all times in the performance of their duties.

b. Operator Participation. The operator usually accompanies the equipment and assists the organizational mechanics in the performance of organization periodic services.

c. Plates. Nameplates, caution plates, and instruction plates made of steel rust very rapidly. When they are found to be in a rusty condition, they should be thoroughly cleaned and heavily coated with an application of lacquer. Refer to TM 9-213.

d. Services. Organization services are defined by, and restricted to the following general procedures unless approval has been given by the direct or general support maintenance categories.

(1) *Adjust.* Make all necessary adjustments in accordance with instructions contained in the pertinent section of this technical manual.

(2) *Clean.* Clean the unit as outlined in paragraph 146 to remove old lubricant, dirt, and other foreign material.

(3) *Tighten.* All tightening operations should be performed with sufficient wrench torque (force on the wrench handle) to tighten the unit according to good mechanical practice. Use a torque-indicating wrench where specified. Do not overtighten, as this may strip threads or cause distortion. Tightening will always be understood to include the correct installation of lockwasher, locknuts, locking wire, or cotter pins, to secure the tightened nut.

e. Special Conditions. When conditions make it difficult to perform the complete preventive-maintenance procedures at one time, they can sometimes be handled in sections. Plan to complete all operations within the week, if possible. All available time at-halts and in bivouac areas may be utilized, if necessary, to assure that maintenance operations are completed.

163. Specific Procedures for Organization

Table 12 gives the specific procedures to be performed on the test stand by organizational personnel for each monthly "M" service.

Table 12 Preventive-Maintenance Check and Services

Organizational — Monthly schedule

Sequence No.	Item to be inspected	Procedure	Reference
1	Painted surfaces of test stand cabinet and instrument panels.	Inspect for deterioration of painted surfaces. Remove rust or scaled or loose paint, grease, and dirt. Repaint surfaces.	See par. 146 for cleaning instructions, See figs. 1, 2, 3, and 4.
2	Binding posts on instrument panels and rectifier compartment.	Inspect for corrosion and damaged threads. Clean by removing corrosion and repair threads using a wire brush or file to dress-up threads.	See par. 146 for cleaning instructions. See fig. 1.
3*	Fuses and fuse holders.	Inspect fuses for being secure in holder and the fuse metal ends free from corrosion or grease preventing positive contact.	See fig. 16.
4	Load bank blower assembly.	Remove screws securing meter and main control panels and using lift handles raise panels outwardly to length of supporting nylon cords. Inspect for dust and dirt in blower fan wheel, and clean all parts as required. ***Warning:*** **Be sure external power supply is disconnected before working behind control panels.**	See fig. 16.

Table 12. Preventive-Maintenance Checks and Services-Continued.

Organizational — Monthly schedule

Sequence No.	Item to be inspected	Procedure	Reference
5	Generator, alternator and starter mounting bracket assembly.	Inspect the bracket for secure mounting and positive action of chain vise. Check threads for dirt, rust, etc. Clean as required and lubricate threads and chain as prescribed in lubrication chart (fig. 62).	See par. 146 for cleaning instructions. See figs. 6 and 7.
6*	Magnetic starter and on-off input power toggle switch terminals.	Inspect terminals for corrosion and loose connections. Clean off corrosion and tighten terminal screws. ***Warning:*** **Be sure external power supply is disconnected before working in area of above items.**	See par. 146 for cleaning instructions See fig. 11.
7*	Magnetic starter reset buttons.	Check reset buttons on magnetic starter to be pushed into reset position (push inwardly).	See fig. 11.
8*	Fuses in high voltage compartment (fig. 6).	Check fuses for corrosion and loose seating in fuse holders. Clean and reset fuses in holder if required. ***Warning:*** **Be sure external power supply is disconnected before working in area of above items.**	See par. 146 for cleaning instructions See fig. 12.
9*	Drive motor and transformer terminal boards.	Inspect terminals for corrosion and loose connections. Clean off corrosion and tighten terminal screws if required. ***Warning:*** **Be sure external power supply is disconnected before working in area of above items.**	See par. 146 for cleaning instructions. See fig. 12.
10*	Drive reversing switch.....	Inspect switch for positive contact and corrosion on knife connections. Clean and tighten knife contacts if required. ***Warning:*** **Be sure external power supply is disconnected before working in area of above items.**	See par. 146 for cleaning instructions. See fig. 12.
11	Varidrive assembly and V belt.	Inspect the varidics of the varidrive assembly for scored, greasy, or otherwise damaged condition. Inspect the V belt for frayed, cracked, and excessive wear. Prevent overlubrication as specified in lubrication chart (fig. 62).	See par. 146 for cleaning instructions. See fig. 64.
12	Binding posts in battery compartment.	Inspect for corrosion and damaged threads. Clean by removing corrosion and repair threads using a wire brush or file to clean or dress threads.	See par. 146 for cleaning instructions. See fig. 9

*—To be accomplished upon failure of test stand operation instead of monthly if this condition exists.

Section IV. TROUBLESHOOTING

164. Purpose

Troubleshooting is a systematic determination of malfunctions and defective components by indication, symptoms, and tests. Close adherence to the procedures covered herein will materially reduce the time required to locate trouble and restore the materiel to normal operation.

Caution: **Operation of materiel without a preliminary examination can cause further damage to a disabled component. Be careful during inspection and troubleshooting, so that damage can be avoided.**

165. Scope

This section covers troubleshooting which is peculiar to organizational maintenance operations. For troubleshooting procedures performed by the operator, see paragraphs 148 through 150.

166. Procedure

Malfunctions which may occur with the test stand are listed in tables 11 and 13. In effect, table 13 is a continuation of table 11. Causes are listed opposite each malfunction and are arranged according to the ease of correction.

Table 13. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Test stand fails to operate	*a.* Fuses external of test stand blown	*a.* Check external power source fuses for continuity using a test light and/or multimeter.
	b. 100-ampere 600-volt fuses (fig. 12 blown or fuses have a non-positive contact in fuse holder clips	*b.* Check fuses for continuity using a multimeter, replace fuses if defective. Clean fuse connections and clips and bend clips to hold fuses tightly.
	c. 15-ampere buss fuse (fig. 12) blow or fuse has a non-positive contact in fuse block.	*c.* Check fuse for continuity using a multimeter, replace fuse if required. Clean fuse contacts and clips and bend clips to hold fuse tightly.
	d. Burned-out heater elements (fig. 11).	*d.* Check heater elements using a multimeter. Replace heater elements if required.
	e. Other causes	*e.* Refer other causes to direct support maintenance personnel for correction.
2. Incorrect reading noted on meters.	*a.* 8-ampere fuse (fig. 12) blown o fuse has a non-positive contact ir fuse block (this pertains to loac dc ammeter (1, fig. 16) only.	*a.* Check fuse for continuity using a multimeter, replace fuse if required. Clean fuse contacts and clips and bend clips to hold fuse tightly.
	b. Other causes. .	*b.* Refer other causes to direct support maintenance personnel for correction.
3. Indicator lamps fail to light	*a.* Lamp (bulb) burned out	*a.* Check lamp (bulb) for continuity using a multimeter, replace lamp (bulb) if required (pars. *40b*, 41, 44, *50b*, and 54).
	b. 8-ampere or 15-ampere fuses (fig. 12) blown out or fuses have a nonpositive contact in fuse block	*b.* Check fuse(s) for continuity using a multi meter, replace fuse(s) if required. Clean fuse contacts and clips and bend clip to hold fuse tightly.
	c. Other causes	*c.* Refer other causes to direct support maintenance personnel for correction.
4. Battery charger fails to operate		Refer malfunction to direct support maintenance personnel for correction.
5. Variable circuit (fig. 28) fails to operate.	. .	Refer malfunction to direct support maintenance personnel for correction.
6. Knob turns on switch shaft or knob is set in wrong position on switch dial.		Refer malfunction to direct support maintenance personnel for correction.

Table 13. Troubleshooting - Continued

Malfunction	Probable cause	Corrective action
7. Binding posts do not hold leads securely.	*a.* Threads on post cross threaded.	*a.* Use appropriate size file and dress threads and/or repair threads by chasing, if practicable.
	b. Other causes.	*b.* Refer other causes to direct support maintenance personnel for correction.
8. Incorrect speed noted on tachometer.		Refer malfunction to direct support maintenance personnel for correction.
9. Generator, alternator, or starter (cranking motor) vibrator excessively, when revolving while undergoing test.		Refer malfunction to direct support maintenance personnel for correction.
10. Varidrive assembly noisy. . .		Refer malfunction to direct support maintenance personnel for correction.
11. Varidrive assembly operates but drive heads run erratic or do not turn.	*a.* Check V belt and varidiscs for greasy deposits or frayed, cracked, and excessive wear.	*a.* Clean grease from V belt and varidiscs (par. 146). Replace V belt if unserviceable.
	b. Other causes	*b.* Refer other causes to direct support maintenance personnel for correction.

Section V. INPUT POWER SUPPLY FUSE GROUP

167. Description

The input power supply fuses consists of three 100-ampere 600-volt fuses (fig. 12) mounted on a fuse block. The fuses have a knife type contact at each end and are pressed or snapped into clip type connections on the fuse block. The fuses provide short circuit protection for the input power source circuit of the test stand.

168. Maintenance

a. General. Organizational maintenance is authorized to remove and replace the three 100-ampere 600-volt fuses (figs. 12 and 65).

Warning: **Disconnect the external power supply source, and place the on-off input power toggle switch (fig. 11) in the "OFF" position, before any attempt is made to remove the three 100-ampere 600-volt fuses.**

b. Removal.

(1) Open the drive reversing switch access door (high-voltage compartment) (fig. 6).

(2) Use a suitable type tool as a lever and pry the three 100-ampere 600-volt fuses loose from the clips securing the fuses in the fuse block (fig. 12).

c. Inspection.

(1) Inspect the fuses for damaged, corroded, and burned condition.

(2) Check each fuse for continuity using a multimeter.

d. Installation. Place three serviceable 100-ampere 600-volt fuses in the fuse block (figs. 12 and 65).

Section VI. INDICATOR LAMP GROUP

169. Description

The indicator lamps (30-A, 31, 34, and 45, fig. 16) are all installed in a twist-type lock socket assembly built within the main and front control panels (fig. 16) and are inclosed by a torpedo type lens. The three indicator lamps of the battery circuit selector instrument panel (41, fig. 16) are installed in a screw-in type

socket assembly. The indicator lamp (30-A, fig. 16) provides the means for a visual inspection when using the circuit for testing purposes. The remaining indicator lamps (31, 34, and 35, fig. 16) are used to provide a visual means to indicate whether the respective circuits which they are connected with are receiving the necessary current to function properly.

170. Maintenance

a. General. Organizational maintenance is authorized to remove and replace the indicator lamps (30-A, 31, 34, 41, and 45, fig. 16).

b. Removal.

(1) *Indicator lamps (30-A, 31, 34, and 45, fig. 16).* Unscrew the torpedo lens from the socket assembly and turn the lamp (bulb) counterclockwise and remove the lamp (bulb) from the socket assembly.

(2) *Indicator lamps (of the battery circuit selector instrument panel (41, fig. 16).* Unscrew each lamp (bulb) from the socket assembly.

c. Inspection.

(1) Inspect each lamp (bulb) base for corroded condition.

(2) Check the continuity of each bulb using a multimeter.

d. Installation. Install a serviceable lamp (bulb) in each socket assembly. Install the torpedo lens over the indicator lamps (30-A, 31, 34, and 45, fig. 16).

Section VII. MERCURY SWITCH GROUP

171. Description

The mercury switch (fig. 63) contains two electrical leads and a small amount of mercury in a glass enclosure. The two leads are connected to the test stand circuitry and the switch is either closed or open, depending upon whether or not the mercury is contacting the end of the enclosure to which both leads are attached. The leads are also connected to the circuitry of the blower assembly which cools the load bank within the test stand by expelling the heat out through the air exhaust (fig. 10) of the test stand. The switch is mounted on an air trip plate in the air intake duct and the mercury flow direction is controlled by the angle in which the switch is placed. Through this action the test stand operation is stopped when there is an obstruction in the air intake (fig. 10) of the test stand preventing the heat expelled from the test stand load bank to cause overheating and consequently damaging the load bank and/or the components of the test stand.

172. Maintenance

a. General. Organizational maintenance is limited to such removal and installation required to replace the mercury switch.

b. Test and Adjustment. Operate the test stand by sliding the safety clip (33-B, fig. 16) off the stop button (33-C, fig. 16) and depress the start button (33-A, fig. 16). Determine whether the mercury switch functions by covering the air intake or air exhaust (fig. 10). The test stand should stop, then when the cover is removed and the drive control (33) is reset by depressing the start button (33-A), the test stand should start again.

c. Removal (fig. 63).

(1) Remove the screws securing the meter panel and main control panel in place and lift the panels up and outward to the length of the nylon cord supports, using the lift handles (fig. 16).

(2) Unscrew the two pan-head machine screws and remove the leads of the mercury switch from the terminal block. Pull the mercury switch out of the retaining clip.

d. Inspection (fig. 63). Inspect the mercury switch for breaks, chipped glass, cracks, and frayed, burned, hard and brittle leads.

e. Installation (fig. 63).

(1) Insert the mercury switch in the retaining clip, Position the leads of the switch on the terminal block and secure each lead with a No. 6-32 x ¼ pan-head machine screw.

Note. Adjust the mercury switch up or down in the retaining clip until the trip plate in the air intake duct is balanced properly and functions as specified in *b* above.

(2) Lift the meter panel and main control panel and let the panels fall gently in place on the test stand cabinet. Secure the panels in place with the screws removed in *c* above.

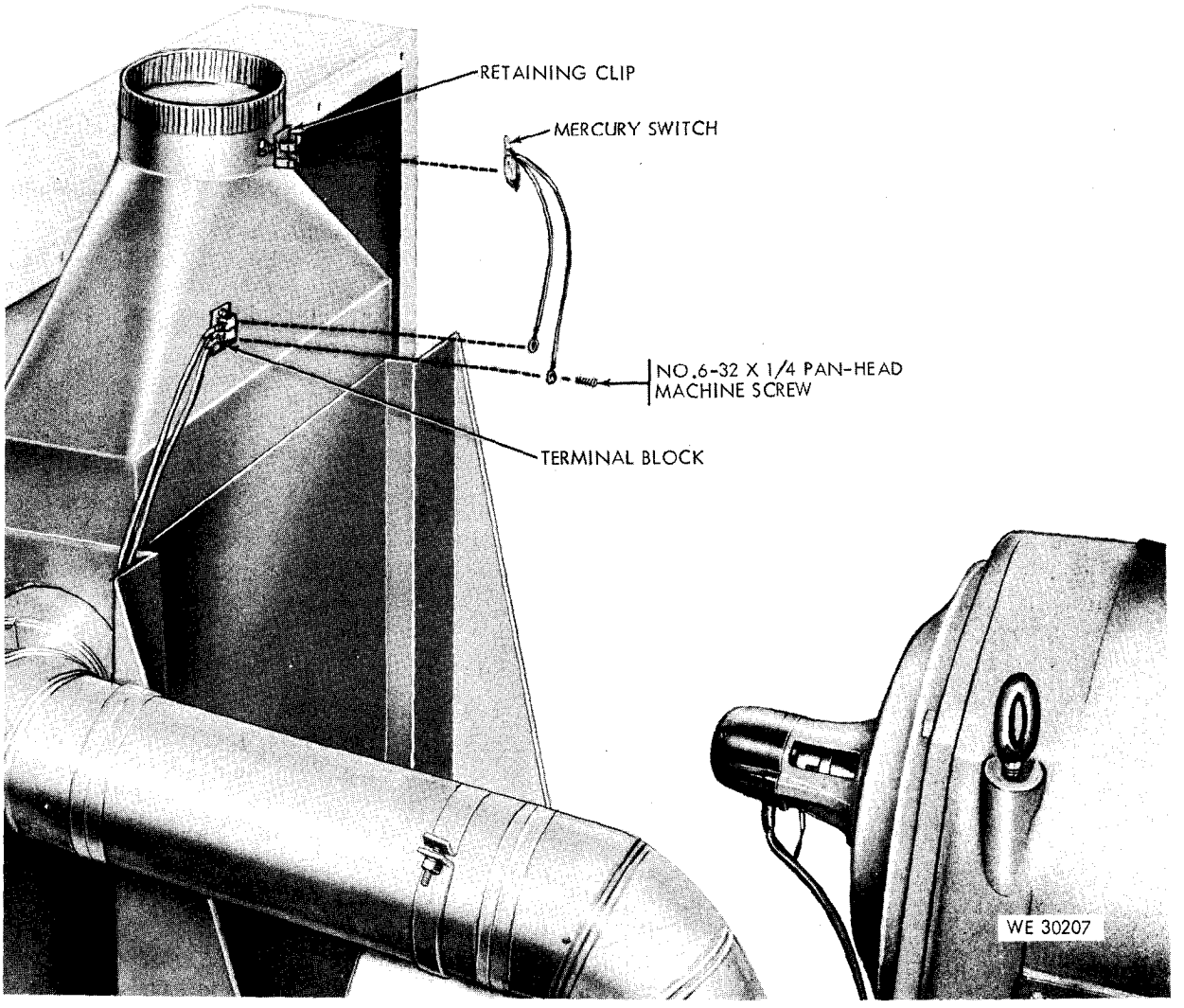


Figure 63. Removal of mercury switch.

Section VIII. MAGNETIC MOTOR STARTER GROUP

173. Description

The magnetic motor starter (fig. 11) is an across-the-line magnetic type starter and is accessible for connection and maintenance through the drive reversing switch access door (high voltage compartment) (fig. 6). It provides a thermal overload protection for the motor control circuit.

174. Maintenance

a. General. Organizational maintenance is limited to disassembly and assembly required to replace the heater elements (fig. 11).

Warning: **Disconnect the external power supply source, and place the on-off input power toggle switch (fig. 11) in the "OFF" posi-**

tion, before any attempt is made to replace the heater elements.

b. Removal (fig. 11). Open the drive reversing switch access door (high voltage compartment) (fig. 6). Unscrew the four binding-head machine screws from each heater element and remove the two heater elements from the magnetic motor starter.

c. Inspection (fig. 11). Inspect the two heater elements for burned-out, cracked, or broken condition.

d. Installation (fig. 11).

(1) Position two serviceable heater elements in their respective position in the magnetic motor starter and secure with the four binding-head machine screws removed in *b* above.

(2) Close the drive reversing switch access door (high voltage compartment) (fig. 6) tightly.

Note. The key numbers shown below in parentheses in this section refer to figure 64 except where otherwise indicated.

Section IX. VARIDRIVE ASSEMBLY AND TACHOMETER GENERATOR GROUP

175. Description

a. Varidrive Assembly. The varidrive assembly is a self-contained unit, embodying a motor and a built-in speed transmission, all shock mounted on one base to prevent vibration of the control panel. Constant horsepower is maintained through its infinite range of speeds, and any desired speed (rpm) can be obtained by merely turning the handle of the speed control (32, fig. 16). Rotating the handle of the speed control in a clockwise direction actuates a pivoted strut which slides one of the lower varidiscs (11) on the rotor (motor) shaft (13) toward its companion varidisc, thus causing the V belt (18) of the varidrive assembly to climb upward on the tapered varidisc to a larger diameter. Simultaneously, the V belt causes the slidable upper varidiscs (15) on the driven (driving heads) shaft (17) to retract against a spring, permitting the V belt to assume a smaller diameter on the upper varidiscs and increasing the speed of the driven shaft. Thus the speed of the driven shaft is increased but the rotor (motor) shaft speed remains constant. Reduced speed in any degree is obtained by rotating the handle of the speed control in a counterclockwise direction.

b. Tachometer Generator. The tachometer generator mounted on the end of the driven (driving heads) shaft (17) of the varidrive assembly with a coupling adapter (5) and a flexible shaft coupling (built within the tachometer generator (2)), provide a means of measuring the actual speed (rpm) of a generator or alternator, which is indicated on the tachometer indicator meter (3, fig. 16) on the meter panel.

176. Maintenance

a. General. Organizational maintenance is limited to such removal and installation required to replace the V belt (18) and tachometer generator (2).

b. Removal.

(1) Start the test stand by sliding the safety clip (33-B, fig. 16) off the stop button (33-C, fig. 16) and depressing the start button (33-A, fig. 16) (do not hold the "START" button depressed more than 10 seconds).

(2) Turn the handle of the speed control (32, fig. 16) fully counterclockwise until the varidrive assembly is operating at minimum speed. Stop the test stand by depressing the stop button (33-C, fig. 16).

Warning: **Disconnect the external power supply source and place the on-off input power toggle switch (fig. 11) in the "OFF" position before any attempt is made to perform procedures in (3) through (10) below.**

(3) Open the drive reversing switch access door (high voltage compartment) (fig. 6) and remove the three 100-ampere 600-volt fuses (fig. 12).

(4) Remove the two rear panels (fig. 3) and the generator, alternator, and starter mounting bracket assembly (fig. 6) from the test stand. Remove the access cover (not shown) from the side of the varidrive assembly housing (19).

(5) Unscrew the four hexagon-head cap screws (8) and remove the end cover (9) and lubrication fitting extension (12).

(6) Unscrew the four round-head machine screws (1) and remove the tachometer generator (2) and coupling bushing (3).

(7) Unscrew the two cup-point hexagon-socket setscrews (4) and unscrew the coupling adapter (5).

(8) Unscrew the eight hexagon-head cap screws (6) and remove the support cover (7).

Note. Before removing the lower varidisc (11) from the rotor (motor) shaft (13), measure and note the exact distance (14) or scribe a locating line on the rotor (motor) shaft to assure proper V belt alinement at time of installation in *d* below.

(9) Loosen the four hexagon-head cap screws (10) on the lower varidisc (11) and remove the lower varidisc from the rotor (motor) shaft (13).

(10) Remove the V belt (18) from the varidrive assembly housing, by sliding one end of the V belt off and over the end of the rotor (motor) shaft (13), and the opposite end of the V belt off and over the upper varidisc (15) and out of the support cover opening (16), as illustrated in figure 64.

c. Inspection.

(1) Inspect the V belt (18) for frayed, cracked, or other indications of deterioration. Replace if unserviceable.

(2) Inspect the tachometer generator (2) for chipped, cracked or broken housing, and for frayed, burned, hard, and brittle insulation on the electrical leads.

(3) Inspect the lower and upper varidiscs (11) and (15) and their companion varidiscs for scarred and greasy condition. Clean if required (par. 146) or replace if unserviceable.

d. Assembly.

(1) Insert the V belt (18) through the support cover opening (16). Position one end of the V belt between the upper varidiscs (15), and slide the opposite end of the belt over the end of the rotor (motor) shaft (13) as illustrated in figure 64.

(2) Slide the lower varidisc (11) onto the rotor (motor) shaft (13) to the exact position of distance (14) (measured or scribed location line before removal; refer to note *b*(8) above).

(3) Secure the lower varidisc (11) by tightening the four ⅜–16 x 2½ hexagon-head cap screws (10).

Note. Correct lower varidisc alinement is essential and at no time should the V belt be more than $\frac{1}{16}$ inch out of line.

(4) Rotate the lower varidisc (11) by hand, and at the same time turn the handle of the speed control (32, fig. 16) slightly in the clockwise direction until the slack in the V belt is taken up.

(5) Slip the support cover (7) over the end of the driven (driving heads) shaft (17) and secure the cover to the varidrive assembly housing (19) with the four ½-13 x 2 hexagon-head cap screws (6).

(6) Thread the coupling adapter (5) into the end of the driven (driving heads) shaft (17) and secure with the two ¼-20 x ⅜ cup-point hexagon-socket setscrews (4).

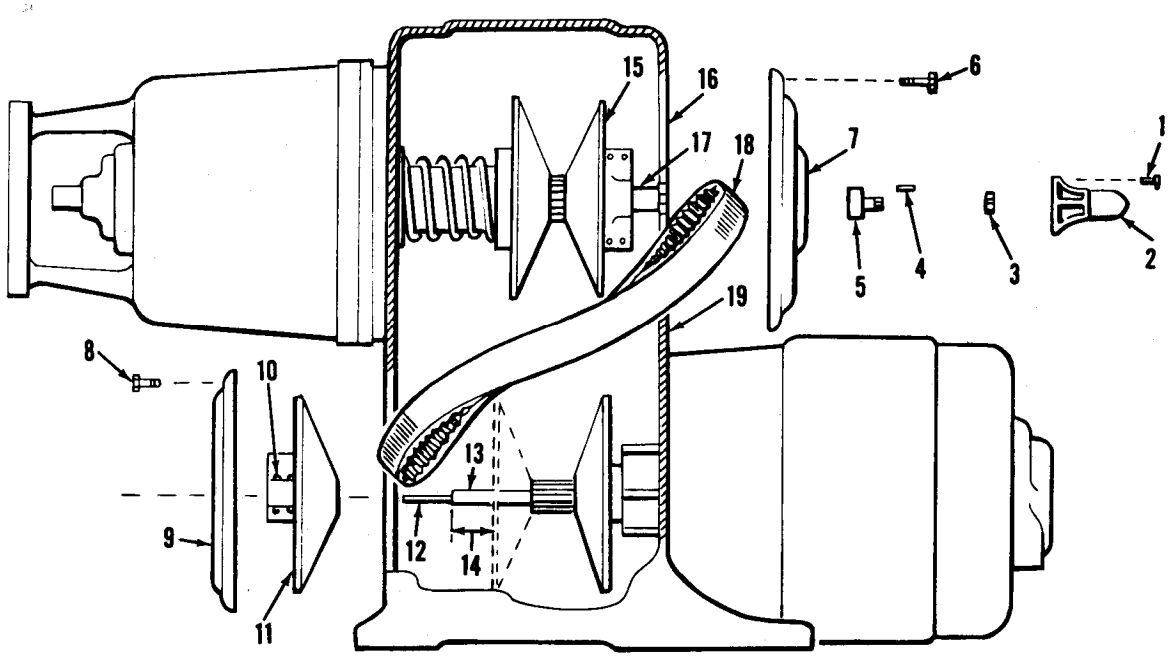
(7) Replace the coupling bushing (3) and tachometer generator (2) on the support cover (7) and secure with the four No. 12-24 x ¾ round-head machine screws (1).

(8) Install the lubrication fitting extension (12) in the end of the rotor (motor) shaft (13).

(9) Place the end cover (9) in position on the varidrive assembly housing (19) and secure with the four $\frac{7}{16}$–14 x 1½ hexagon-head cap screws (8).

(10) Install the access cover (not shown) on the side of the varidrive assembly housing (19).

(11) Install the two rear panels (fig. 3) and generator, alternator, and starter mounting bracket assembly (fig. 6) on the test stand.



1. NO. 12 - 24 X 3/4 ROUND-HEAD MACHINE SCREW
2. TACHOMETER GENERATOR
3. COUPLING BUSHING
4. 1/4 - 20 X 3/8 CUP-POINT HEXAGON - SOCKET SETSCREW
5. COUPLING ADAPTER
6. 1/2 - 13 X 2 HEXAGON-HEAD CAP SCREW
7. SUPPORT COVER
8. 7/16 - 14 X 1 - 1/2 HEXAGON-HEAD CAP SCREW
9. END COVER
10. 3/8 - 16 X 2 - 1/2 HEXAGON-HEAD CAP SCREW
11. LOWER VARIDISC
12. LUBRICATION FITTING EXTENSION
13. ROTOR (MOTOR) SHAFT
14. DISTANCE
15. UPPER VARIDISC
16. SUPPORT COVER OPENING
17. DRIVEN (DRIVING HEADS) SHAFT
18. V BELT
19. VARIADRIVE ASSEMBLY HOUSING

WE 30208

Figure 64. Removal of varidrive assembly V belt and tachometer generator.

CHAPTER 6

SHIPMENT AND ADMINISTRATIVE STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND ADMINISTRATIVE STORAGE

177. Shipping Instructions

a. Responsibility. When shipping the test stand the unit commander will be responsible for shipping the materiel, including all tools and equipment, adequately processed, packaged, and packed to protect it from damage until it reaches the category of maintenance for required repairs; or in the case of troop movement, reaches its destination in a serviceable condition.

b. Army Shipping Documents. Prepare all Army shipping documents in accordance with AR 725-50.

c. Preparation for Shipment. The test stand removed from administration storage for shipment need not be reprocessed unless inspection storage for shipment need not be reprocessed unless inspection reveals it to be inadequately preserved or when it is necessary because of anticipated intransit weather or shipping conditions. Preservatives must not be removed or disturbed except as necessary to insure that the test stand is complete and serviceable. If preservatives are removed, they must be restored prior to shipment.

178. Preservation, Packaging, Packing, and Marking Instructions

a. Preservation and Packaging. Preservation of the test stand must be sufficient to protect it against deterioration and damage during shipment and administrative storage and/or the subsequent interval prior to use. Under no conditions will tools and equipment with critical surfaces be packaged without benefit of sufficient preservatives to assure adequate protection (TM 9-200). Preservation and packaging must be compatible with end use requirements.

b. Packing. Packed items must be acceptable to the carrier while affording adequate protection to the items during shipment and administrative storage and/or the subsequent interval prior to use.

c. Marking. All materiel will be marked in accordance with TM 9-200.

179. Administrative Storage

a. General.

(1) Unit commanders may, with the approval of major commanders, place test stands in administrative storage or return to supply agencies equipment that is beyond the maintenance capability of the unit. Test stands must be stored in the most favorable location available, preferably one which affords protection from exposure to elements and pilferage.

(2) All test stands in administrative storage must be maintained so that test stands will be ready for immediate use and/or ready for shipment.

(3) Administrative storage is restricted to a period of 90 days and must not be extended unless the test stand is reprocessed.

b. Storage Procedures.

(1) Perform a quarterly preventive-maintenance (PM) service on the test stand. This maintenance will consist of inspecting, cleaning, servicing, preserving, lubricating, and adjusting, as required, and will also include minor repair parts replacement (if required) not requiring highly technical skills or

expensive, complicated, or bulky test equipment or tools.

(2) Lubricate the test stand in accordance with lubrication chart (fig. 62) and as prescribed in paragraphs 139 and 141 as applicable.

(3) Provide adequate drainage of test stand.

(4) Remove all tools and equipment and box and store with test stand.

(5) Provide access to the test stand to permit inspection, servicing, and removal from storage.

(6) Mark the test stand "Administrative Storage" (by use of tag or other convenient method). Test stand so marked must not be operated while in this category.

c. Inspections in Administrative Storage. Visual inspection of test stand in administrative storage must be conducted at least once each month to detect corrosion and rust. When corrosion and rust are found, corrective action must be taken immediately. A record of these inspections must be maintained for each test stand in administrative storage. The record must be attached to the test stand in such a manner as to protect it from the elements.

180. Loading and Blocking Instructions

Organizational maintenance personnel may assist, as required, in loading and blocking boxed test stand on railroad cars and/or trucks.

Section II. SHIPMENT OF MATERIEL TO PREVENT ENEMY USE

181. General

a. Destruction of the automotive generator, alternator, and starter test stand when subject to capture or abandonment in the combat zone will be undertaken by the using Army only when, in the judgement of the unit commander concerned, such action is necessary in accordance with order of, or policy established by the Army commander. When in the hands of Army maintenance personnel or in storage, destruction will be in accordance with FM 9-6 and the information below when applicable.

b. The information which follows is for guidance only. Certain of the procedures outlined require the use of explosives and incendiary grenades which normally may not be authorized items of issue to the using organization. The issue of these and related materials and the condition under which destruction will be effected are command decisions in each case, according to the tactical situation. Of the several means of destruction, those most generally applicable are:

Mechanical - Requires axe, pick mattock, sledge, crowbar, or similar implement.

Burning - Requires gasoline, oil, incendiary grenades, or other flammables, or welding or cutting torch.

*Demolition - Requires suitable explosives, or ammunition.

*Gunfire - Includes artillery, machine guns, rifles using rifle grenades, and launchers using antitank rockets. Under some circumstance hand grenades may be used.

Disposal - Requires burying in the ground, dumping in streams or marshes, or scattering so widely as to preclude recovery of essential parts.

* Generally applicable only when the automotive generator, alternator, and starter test stand is to be destroyed in conjunction with other equipment.

In general, destruction of essential parts followed by burning will usually be sufficient to render the materiel useless. However, selection of the particular method of destruction requires imagination and resourcefulness in the utilization of the facilities at hand under the existing conditions. Time is usually critical.

c. If destruction to prevent enemy use is resorted to, the materiel must be so badly damaged that it cannot be restored to a usable condition in the combat zone either by repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the materiel, including essential spare parts, be destroyed or damaged beyond repair. How-

ever, when lack of time and personnel prevents destruction of all parts, priority is given to the destruction of those parts most difficult to replace. Equally important, the same essential parts must be destroyed on all like material so that the enemy cannot construct one complete unit from several damaged ones.

d. If destruction by demolition or gunfire is directed, due consideration should be given to the observance of appropriate safety precautions.

182. Destruction of the Automotive Generator, Alternator, and Starter Test Stand

a. Method No. 1 - Destruction by Mechanical Means.

(1) Disconnect the test stand from its source of electricity.

(2) Open all doors and remove the side and rear sheet metal panels from the cabinet.

(3) Using an axe, pick mattock, sledge, or other heavy implement, destroy the test stand by smashing the drive motor, varidrive assembly, mounting brackets, terminals, meters, jacks, indicators, blower assembly, switches, and controls.

(4) Destroy the cables by cutting them into short lengths.

Elapsed time: about 15 minutes.

b. Method No. 2 - Destruction by Burning.

(1) Disconnect the test stand from its source of electricity.

(2) Open all doors and remove the side and rear sheet metal panels from the cabinet.

(3) Using a welding or cutting torch, burn through the stator housing and into the armature of the drive motor. Also fuse the gears in the gear case. Burn the blower assembly, mounting brackets, meters, indicators, switches, and controls.

(4) Destroy the cables by burning them in several places.

(5) In the absence of a welding or cutting torch, place piles of combustible on and about the test stand. Pour gasoline or oil over the combustible and the materiel; ignite by means of an incendiary grenade fired from a safe distance, by a combustible train of suitable length, or other appropriate means. Take cover immediately. A hot fire is required to render the materiel useless.

Warning: **When igniting gasoline, due consideration should be given to the highly flammable nature of gasoline and its vapor. Carelessness in its use may result in painful burns.**

Elapsed time: about 15 minutes.

c. Method No. 3 - Destruction by Demolition.

(1) Disconnect the test stand from its source of electricity.

(2) Open all doors.

(3) Planning for simultaneous detonation, prepare and place four 1-pound demolition charges (using a 1-pound TNT block or equivalent per charge, together with the necessary detonating cord to make up each charge) as follows:

(a) Place the first charge in the high-voltage compartment.

(b) Place the second charge in the stowage compartment.

(c) Place the third charge in the rectifier chamber.

(d) Place the fourth charge on the varidrive assembly housing where it extends through cabinet on the right hand side of the test stand.

(4) Connect the four charges for simultaneous detonation with detonating cord.

(5) Provide for dual priming to minimize the possibility of a misfire.

(6) Detonate the charges. For complete details on the use of demolition materials and methods of priming and detonating demolition charges, refer to FM 5-25. Training and careful planning are essential. The danger zone is approximately 250 yards.

Elapsed time: about 4 minutes.

APPENDIX I

REFERENCES

1. General

a. Military Publications. The packaging publications listed herein are available to activities requiring such publications. Forward request for Military Specifications to Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania. Requisition technical manuals, technical bulletins, supply bulletins, and other publications indexed in 310 series DA Pamphlets, in accordance with AR 310-1.

b. Commercial Publications. Commercial publications listed herein may be obtained from the following addresses: Uniform Freight Classifications Rules and Containers Specifications for Rail Shipment; Uniform Classifications Committee, 202 Union Station, Chicago, Illinois. National Motor Freight Classification Rules and Container Specifications for Truck Shipments; American Trucking Association, 1424 16th Street, N.W., Washington, D.C. National Electrical Code; American Standard Association, 70 E. 45th St., New York, N.Y.

2. Army Regulations

Issue of Supplies and Equipment: Requisitioning Receipt, and Issue System — AR 725-50

Logistics (General):

Report of Damaged or Improper Shipment — AR 700-58

Maintenance of Supplies and Equipment:

Organizational, Policies and Responsibilities for Maintenance Operations — AR 750-5

Military Publications: General Policies — AR 310-1

Military Terms, Abbreviations, and Symbols:

Dictionary of United States Army Terms — AR 320-5

Safety: Accident Reporting and Records — AR 385-40

3. Publications Indexes

The following publications indexes should be consulted frequently for latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this manual.

Indexes of Army Motion Pictures, Film Strips, Slides and Phono-Recordings — DA Pam 108-1

Military Publications:

Index of Administrative Publications — DA Pam 310-1

Index of Blank Forms — DA Pam 310-2

Index of Graphic Training Aids and Devices — DA Pam 310-5

Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders. — DA Pam 310-4

Index of Doctrinal, Training and Organizational Bulletins — DA Pam 310-3

4. Field Manuals

Ammunition Service in the Theater of Operations ..... FM 9-6
Explosives and Demolition ..... FM 5-25
Military Symbols ..... FM 21-30
Military Training Management ..... FM 21-5
Ordnance Direct Support Service ..... FM 9-3
Techniques of Military Instructions FM 21-6

5. Forms

The following forms pertain to this materiel:

DA Form 2028, Recommended Changes to DA Technical Manual Parts List or Supply Manual 7, 8, or 9 (cut sheet).
DA Form 2402, Exchange Tag.
DA Form 2404, Equipment Inspection and Maintenance Worksheet.
DA Form 2407, Maintenance Request.
DA Form 2408-2, Equipment Lubrication Record.
DD Form 6, Report of Damaged or Improper Shipment (cut sheet).
DD Form 250, Materiel Inspection and Receiving Report.
DD Form 1149, Requisition and Invoice/Shipping Document (cut sheet).
DD Form 1348, DOD Single Line Item Requisition System Document (Manual).

6. Other Publications

a. General.

DS, G5, and Depot Maintenance Repair Parts and Special Tools Lists for TM 9-2300-224-35P/3
M113 (gasoline) and M113A1 (diesel) carrier vehicle family includes: carrier, personnel, full tracked, armored M113 2320-629-1294 and M113A1 2320-968-6321; carrier, command post, light, armored, M577 2320-856-6624 and M577A1 2320-056-6806; motor, self-propelled, 107-MM, M106 2350-860-2350 and M106A1 2350-076-9002; flame thrower, self-propelled, M132 2350-987-8900 and M132 2350-056-6809; and carrier, guided missile equipment XM474E2 1450-831-6942.

Field Maintenance Repair Parts for Starter Assembly (2920-678-1850) TM 9-2920-211-34P
(Autolite Model MCZ 4005UT) and Drive Assembly (2920-678-1858)

The Army Equipment Record System and Procedures TM 38-750

¼-Ton, 4 X 4, Trucks M38, M38A1, M38A1C, and M170; ¾-Ton, 4 X 4 TB 9-2300-206-15
Chassis M56, M56B1, and M56C; Trucks, M37, M37B1, M43, M43B1, and M201; 2½-Ton, 6 X 6, Chassis M44, M45, M45C, M46, M47, M57, M58, M133, M207, M207C, and M209; Repair Shop M185 and M238; Trucks M34, M35, M36C, M49, M49C, M50, M59, M60, M108, M109, M109C, M135, M211, M215, M217, M217C, M220, M220C, M222, V17A/MTQ, and V18A/MTQ; and Truck Tractors M148, M221, and M275 Equipped with High-Capacity, Ac-dc, 100-Amperes, 28-Volt Generating Systems: Test and Rebuild of Generating Systems.

b. Rebuild Procedures and Materials.

(1) *General.*

Cleaning of Ordnance Materiel ..... TM 9-208-1

DS, GS, and Depot Maintenance Manual (Including Repair Parts) TM 9-2920-242-35
Starter, Engine Electrical, Assembly - 2920-226-6545 (Delco-Remy Model 1113943) (Military Part Number 10911018-1) Starter, Engine Electrical, Assembly - 2920-911-5637 (Delco-Remy Model 1113904)

(Military Part Number 10911018) Starter, Engine Electrical, Assembly - 2920-912-9510 (Delco-Remy Model 1113944).	
DS and GS (Including Repair Parts and Special Tool Lists) Generator Assembly (2920-903-9534) (Prestolite Model GHA4804JUT).	TM 9-2920-247-34
DS and GS Maintenance Manual: for Part One, Carrier, Personnel, Full Tracked: Armored, M113 (2320-269-1294); and Carrier, Personnel, Full Tracked: Armored M133A1 (2320-968-6321); Part Two, Carrier, Command Post, Light Tracked, M577 (2320-856-6624) and Carrier, Command Post, Light Tracked, M577A1 (2320-056-6808); Part Three, Motor, 107-MM, Self-Propelled: M106 (2350-860-2350); and Motor, 107-MM, Self-Propelled: M106A1 (2350-076-9002); Part Four, Flame Thrower, Self-Propelled: M132 (2350-987-8900), and Flame Thrower, Self-Propelled: M132A1 (2350-056-6809); Part Five, Carrier, Guided Missile Equipment: XM474E2 (1450-831-6942).	TM 9-2300-224-34/3
DS and GS Maintenance Manual (Including direct and general support and depot maintenance repair parts list) for Starter, Engine, Electrical (2920-784-1708) (Prestolite model MEK6001T) and Starter, Engine, Electrical (2920-953-9708) (Prestolite model MEK6001AT).	TM 9-2920-222-34
DS and GS and Depot Maintenance Manual (Including direct and general support and depot maintenance repair parts list) for Generators, Engine, Assemblies (alternating current) 2920-050-8221, 2920-314-0556, 2920-475-1446, 2920-818-8635, 7954722, and 10929868 (Leece-Neville models 2134, 3002, 5258, 5300, and 5504).	TM 9-2920-225-35
Electrical Equipment, D30 and D42 Starter G22 Generator, F20-4 Inverter and LA4 Magneto (Jack & Heintz).	TM 9-8637
Electrical Equipment (Auto-Lite)	TM 9-1825-B
Electrical Equipment (Delco-Remy)	TM 9-8627
General Packaging Instructions for Ordnance General Supplies	TM 9-200
Field and Depot Maintenance Manual (Including field and depot maintenance repair parts): Generator assembly (2920-737-4750) (Electric Autolite model GHA-4802UT).	TM 9-2920-209-35
Field and Depot Maintenance Manual (Including field and depot maintenance repair parts list) for Generator, Engine, Assembly (300 Amp) 2920-294-3472, 2920-445-0857, 2920-563-0299, 2920-786-1175, 2920-830-1293, 2920-830-6660, and 6115-629-1149; (Lear Siegler (formerly) Jack & Heintz) models G22, G22-2, G22-3, G22-6, G22-6F, G22-7, G22-7F, and G22-9).	TM 9-2920-224-35
Field and Depot Maintenance for Recovery Vehicle, Full Tracked: Medium, M88 (T88) (2320-678-5772).	TM 9-2320-222-35/1
Field Maintenance Manual: Starter Assembly (2920-678-1850) and Drive Assembly (2920-678-1858) (Autolite model MCZ 4005UT).	TM 9-2920-211-34
Field and Depot Maintenance Manual: Starter (2920-025-9988) Autolite model no. MCZ-4001-UT.	TM 9-2920-215-35
Materials Used for Cleaning, Preserving, Abrading and Cementing Ordnance Materiel; and Related Materials Including Chemicals.	TM 9-247
National Electrical Code	
Operation and Organizational Field and Depot Maintenance Storage Batteries Lead-Acid Type.	TM 9-6140-200-15
Ordnance Maintenance: Auxiliary Generator (Delco Products model GM-A8585) and Engine Assemblies (Detroit Diesel GMC Types A41-1 and A41-2).	TM 9-7017-4

Ordnance Maintenance: Electrical Equipment (Eclipse-Pioneer)	TM 9-8631
Ordnance Maintenance: Miscellaneous Components for Full-Tracked Armored Personnel Carrier M59 (T59).	TM 9-7003
Protection of Ordnance General Supplies in Open Storage	TB ORD 379
Use, Care, and Maintenance of Electric Motors	TM 9-244

(2) *Cleaning.*

1, 1, 1 Trichloroethane, Technical, Inhibited (Methyl Chloroform)	O-T-620
Solvents, Dry-Cleaning	P-S-661
Thinner, Paint, Volatile Mineral Spirits (Petroleum Spirits)	TT-T-291
Tire and Tube Reconditioning Materials and Equipment (Rubber and Related Products).	ZZ-T-416

(3) *Demolition.*

Ammunition Service in the Theater of Operations	FM 9-6
Demolition Materials	TM 9-1375-200
Explosives and Demolitions	FM 5-25

(4) *Lubrication and Painting.*

Grease, Automotive and Artillery	MIL-G-10924
Grease, Ball and Roller Bearing	MIL-G-18709
Lubricating Oil, General Purpose	MIL-L-15016
Lubricating Oil, Preservative, Special	MIL-L-644
Painting Instructions for Field Use	TM 9-213

SEE CHANGE 1

APPENDIX II

BASIC ISSUE ITEMS LIST

Section I. PREFACE

1. General

This appendix is a list of basic issue items. It is composed of items which make up the major end item of equipment and the operator's and/or crew's tools, supplies, assemblies, and repair parts that are issued with the equipment and are required for stockage. For a list of repair parts for the equipment see appendix IV.

2. Requisitioning a Part to Which FSN Has Not Been Assigned

When requisitioning a C source (local procurement) item identified only by a manufacturer's part number, it is mandatory that the following information be furnished the supply officer:

a. Manufacturer's code number (5 digit number preceding the colon in the descriptive column).

b. Manufacturer's part number (the number, and sometimes letters, following the colon, *(a* above)). Dashes, commas, or other marks must be included exactly as listed.

c. Nomenclature exactly as listed herein, including dimensions if necessary.

d. Name of manufacturer of end item (from cover of TM or manufacturer's name plate).

e. Federal stock number of end item (from TM).

f. Manufacturer's model number (from TM or name/data plate, preferably name/data plate).

g. Manufacturer's serial number (from name/data plate).

h. Any other information such as type, frame number, and electrical characteristics, if applicable.

i. If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field, in accordance with AR 725-50. Complete form as follows:

(1) In blocks 4, 5, and 6, list manufacturer's code and part number (as listed in description column).

(2) In Remarks field, list noun name (repair part), end item application (FSN of end item), manufacturer, model number (end item), serial number (end item), and any other pertinent information such as frame number, type, etc.

3. Explanation of Columns

a. Source, Maintenance, and Recoverability Code (Col. 1).

(1) *Materiel numerical codes (col 1a).* The column not required.

(2) Source *(col. 1b).* The column indicates the selection status and source for the listed item. Source code used in this list is:

Code	*Explanation*
C	Obtain through local procurement. If not obtainable from local procurement, requisition through normal supply channels with a supporting statement of nonavailability from local procurement.

(3) *Maintenance level (col. 1c).* This column indicates the category of maintenance authorized to install the listed item. Maintenance level code used in this list is:

Code	*Explanation*
C	Operator or crew maintenance.

(4) *Recoverability (col. 1d).* This column indicates whether unserviceable items should be returned for recovery or salvage. When no code is indicated, the item will be considered expendable. Recoverability code used in this list is:

Code	*Explanation*
R	Items which are economically repairable at direct and general support maintenance activities and are normally furnished by supply on an exchange basis.

b. Federal Stock Number (Col. 2). Self explanatory.

c. Description (Col. 3). This column indicates the Federal item name (shown in capital letters) and any additional description required for supply operations. The manufacturer's code and part number are also included for reference.

Code	*Explananation*
11710	Chatillion, John and Sons, Inc., New York, N. Y.
24446	General Electric Co., Schenectady, N. Y.
72076	Economy Fuse and Mfg. Co., Chicago, Ill.
72781	Durkee Atwood Co., Minneapolis, Minn.
89007	Van Brode Milling Co., Inc., Clinton, Mass.
99664	United Mfg. Co. Division of UMC Electronics Co., Handen, Conn.

d. Unit of Issue (Col. 4), Quantity Authorized (Col. 5), and Illustration (Col. 6). Self explanatory.

4. Abbreviations

Abbreviation	*Explanationation*
ac	alternating current
al	aluminum
amp	ampere(s)
btry	battery
cap	capacity
cd	cadmium
circ	circumference
dble	double
dc	direct current
elec	electric (al)
fbr	fiber
fin	finish(ing)
h	high, height
id	inside diameter (dimension)
in.	inch(es)
ld-pltd	lead plated
lg	length (long)
max	maximum
od	outside diameter(s)
opng	opening
pltd	plated
rd	round
recep	receptacle
rpm	revolutions per minute
ru	rubber
S	steel
SE	set
sgle	single
shk	shank
term.	terminal(s)
thd	thread(ed) (s) (ing)
thk	thick(ness)
TPI	threads per inch
u/w	used with
UNC	Unified Coarse Thread
UNF	Unified Fine Thread
v	volt(s)
w	wide, width
w/	with
zn-pltd	zinc plated

5. Errors, Comments, and/or Suggestions

Reports by the individual user of errors, comments, and/or suggestions are encouraged. They should be submitted on DA 2028 (Recommended Changes to DA Publications) and forwarded directly to Commanding General, Headquarters, U.S. Army Weapons Command, ATTN: AMSWE-SMM-P, Rock Island Arsenal, Rock Island, Illinois 61201.

6. Footnotes

[1] Test stand model AGARTS, type II, part number 7336-3 (4910-767-0218) is not shown. It is identical to the model AGARTS, type II, part number 7336-2 (fig. 2) except that it has a slide out tray in the battery compartment.

[2] Not supplied with the type II part number 7336 (4910-316-5252) test stand.

Section II. BASIC ISSUE ITEMS

(1) Source, maintenance, and recoverability code			(2)	(3)	(4)	(5)	(6) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity authorized	(a) Figure number	(b) Item number
					MAJOR COMBINATIONS				
					The following items are to be requisitioned f initial issue only.				
	.	....	R	4910-316-5252	TEST STAND, AUTOMOTIVE GENERATO ALTERNATOR AND STARTER: (9966 type II, part number 7336).	EA		4	....
	. .	....	R	4910-767-0218	TEST STAND, AUTOMOTIVE GENERATO ALTERNATOR, AND STARTER: (9966 model AGARTS, type II, part numbers 7336-7336-2, and 7336-3).[1]	EA	...	, 2, nd	....
					COMPONENTS OF MAJOR COMBINATIO None authorized.				
					REPAIR PARTS FOR: TEST STAND, AUTOMOTIVE GENERATO ALTERNATOR, AND STARTER: (99644: type II, part number 7336) (4910-316-5252) and 99664: model AGARTS, type II, part numbers 7336-1, 7336-2, and 7336-3) (4910-767-0218).				
	C	C		.....	FUSE, CARTRIDGE: 100 amp, 600 v (7207 ECO 16100).	EA	6	65	....
	C	C		5920-783-7859	FUSE, CARTRIDGE: glass body, 15 amp, 125 dc, normal instantaneous, ferrule type term.	EA	6	65	....
	C	C		5920-280-3166	FUSE, CARTRIDGE: normal instantaneou one time operation, nonindicating, 5 amp, 125 ferrule term., ceramic body, 1.250 lg, 0.281	EA	6	65	....
	C	C		5920-142-7409	FUSE, CARTRIDGE: normal instantaneou one time operation, nonindicating, 20 amp, 32 ferrule term., plastic body, 1.250 lg, 0.281	EA	6	65	....
	C	C	. .	5920-296-0530	FUSE, CARTRIDGE: plastic body, 8 amp, 115 normal instantaneous, ferrule type term., silv plated, one time nonindicating, 1.250 lg, 0.281	EA	6	65	....
	C	C		5110-795-1593	HEATER, THERMAL RELEASE: (2444 CR123F-48.7B).	EA	2	65	....
	C	C		5110-756-5549	HEATER, THERMAL RELEASE: (2444 CR123F-91.4B).	EA	2	65	....
					TOOLS AND EQUIPMENT FOR: TEST STAND, AUTOMOTIVE GENERATO ALTERNATOR, AND STARTER: (99644: type II, part number 7336) (4910-316-5252) and 99664: model AGARTS, type II, part numbers 7336-1, 7336-2, and 7336-3) (4910-767-0218).				
	C	C		4910-789-0479	ADAPTER, MOUNTING FLANGE: (9966 11055).	EA	1	67	....
	C	C		4910-786-4118	ADAPTER, SPLINED BUSHING: 24 teeth o 16 teeth id (99664: 11054).	EA	1	67	....

For explanation of footnotes, see paragraph 6.

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity authorized	(a) Figure number	(b) Item number
					TOOLS AND EQUIPMENT FOR—Continued				
					TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER—Continued				
	C	C		.....	BASE, RECTIFIER MOUNTING: (99664: 39915).	EA	1	69	...
	C	C		.....	BELT, V: plain type, A cross sectional designation, ru fabric, w/fbr cords, 17/32 in. top w, 11/32 in. thk, 33 in. nominal inside circ (matched set of 2 belts) (72781 :A33).	SE	2	68	
	C	C		.....	BELT, V: plain type, B cross sectional designation, ru fabric, w/fbr cords, 11/16 in. top w, 7/16 in. thk, 33 in. nominal inside circ, (matched set of 2 belts) (72781 :B33).	SE	2	68	
	C	C		.....	BELT, V: plain type, O cross sectional designation, ru fabric, w/fbr cords, 13/32 in. top w, 7/32 in. thk, 33 1/2 in. nominal inside circ, 40 degree angle (matched set of 4 belts) (72781 :3L350).	SE	2	68	
	C	C		5306-281-6300	BOLT, SHOULDER, FLAT HEAD: S, 3/8-24 UNF-2A x 1 9/32 shk lg, 11/32 thd lg.	EA	1	65	
	C	C		.....	BRACKET, RECTIFIER MOUNTING: (99664:39154).	EA	2	69	
	C	C		.....	BRACKET, MOUNTING: starter and belt driven generator (99664 :91160).	EA	1	76	
	C	C		.....	BRACKET, STARTER: flange type mount (99664:38346).	EA	1	66	
	C	C		.....	CABLE HARNESS: ac rectifier (for ac input recep of rectifier to test stand) (99664 :38387)	EA	1	73	
	C	C		.....	CABLE HARNESS: dc rectifier (for dc output recep of rectifier to test stand) (99664:38386).	EA	1	73	
	C	C		.....	CABLE HARNESS: 25 amp dc generator regulator (for generator recep of regulator) (99664: 38303).	EA	1	73	
	C	C		.....	CABLE HARNESS: 100 amp generator (alternator) (ac/dc system) (99664:38383).	EA	1	73	
	C	C		.....	CABLE HARNESS: 400 amp ac generator (alternator) and 300 amp generator (F-D) (99664:38391).	EA	1	74	
	C	C		.....	CABLE HARNESS: 400 amp dc generator control box (for battery recep of regulator to test stand) (99664 :38377).	EA	1	72	...
	C	C		.....	CABLE HARNESS: 400 amp dc generator control box (for generator recep of regulator to test stand) (99664 :38378).	EA	1	72	
	C	C		.....	CABLE HARNESS: 400 amp generator regulator ac/dc system and dc generator regulator (GND) (99664:38412).	EA	1	74	
	C	C		.....	CABLE HARNESS: 400 amp generator regulator ac/dc system and dc generator regulator (IGN) 99664:38411).	EA	1	74	
	C	C		.....	CABLE HARNESS: 400 amp generator regulator ac/dc system and dc generator regulator (D) (99664:38409).	EA	1	74	

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number		Unit of issue	Quantity authorized	(a) Figure number	(b) Item number
					TOOLS AND EQUIPMENT FOR—Continued TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER—Continued				
	C	C			CABLE HARNESS: 400 amp generator regulator ac/dc system and dc generator regulator (F) (99664:38410).	EA	1	74	
	C	C			CABLE HARNESS: 400 amp generator regulator ac/dc system, dc generator regulator, and dc starter system (B+) (99664:38407).	EA	2	70	
	C	C			CABLE HARNESS: 400 amp generator regulator ac/dc system, dc generator regulator, and dc starter system (G−) (99664:38406).	EA	2	70	
	C	C			CABLE HARNESS: 400 amp generator regulator ac/dc system, dc generator regulator, and dc starter system (G+) (99664:38405).	EA	2	70	
	C	C			CABLE HARNESS: 400 amp ac generator (alternator) and 300 amp dc generator (T1, G+, S+) (99664:38388).	EA	2	71	
	C	C			CABLE HARNESS: 400 amp ac generator (alternator) and 300 amp dc generator (T2, G−, S−) (99664:38389).	EA	2	71	
	C	C			CABLE HARNESS: 400 amp ac generator (alternator) and 300 amp dc generator (T3) (99664:38390).	EA	2	71	
	C	C			CABLE HARNESS: 100 amp generator (alternator) regulator (ac/dc system) (for btry recep of regulator to test stand) (99664:38384).	EA	1	73	
	C	C			CABLE HARNESS: 100 amp generator (alternator) regulator (ac/dc system) (for generator recep of regulator to test stand) (99664:38385).	EA	1	73	
	C	C			CABLE HARNESS: 150 amp dc generator control box (for recep of control box to no. 1 recep on test stand) (99664:38382).	EA	1	72	
	C	C			CABLE HARNESS: 150 amp dc generator control box (for recep of control box to no. 3 recep on test stand) (99664:38381).	EA	1	72	
	C	C			CABLE HARNESS: 150 amp dc generator control box (for recep of control box to no. 5 recep on test stand) (99664:38380).	EA	1	72	
	C	C			CABLE HARNESS: 150 amp dc generator control box (for recep of control box to no. 6 recep on test stand) (99664:38379).	EA	1	72	
	C	C			CABLE HARNESS: 400 amp generator regulator ac/dc system and dc generator regulator (B−) (99664:38408).	EA	2	70	
	C	C			CABLE HARNESS, BATTERY: − 6 v binding post (99664:38414).	EA	2	75	
	C	C			CABLE HARNESS, BATTERY: − 6 v binding post (99664:38413).	EA	2	75	
	C	C			CABLE HARNESS, BATTERY: − 12 v binding post (99664:38416).	EA	1	75	

(1) Source, maintenance, and recoverability code			(2)	(3)	(4)	(5)	(6) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity authorized	(a) Figure number	(b) Item number
					TOOLS AND EQUIPMENT FOR—Continued				
					TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR, AND STARTER—Continued				
	C	C			CABLE HARNESS, BATTERY: +12 v binding post (99664:38415).	EA	1	75	
	C	C			CABLE HARNESS, BATTERY: jumber (99664: 38327).	EA	1	75	
	C	C			CABLE HARNESS: blower (for Jack and Heintz G22–7F dc generator) (99664:38438).	EA	1	73	
	C	C	. . .		CHAIN ASSEMBLY: w/chain clamp (99664: 181205).	EA	1	67	
	C	C			CHAIN CLAMP : mounting bracket (99664: 121227).	EA	1	67	
	C	C			CHAIN MOUNTING ASSEMBLY: alternator (99664:38540).	EA	1	67	
	C	C		5940–195–9699	CLIP, ELECTRICAL: alligator type style 1, uninsulated, no elec rating 0.5 in. max jaw opng, S, cd pltd, 1 solder lug.	EA	4	65	
	C	C		5940–195–9676	CLIP, ELECTRICAL: btry type, style 1, sect G, RDG 37, 1.125 in. max jaw opng, S, ld-pltd fin., uninsulated, 1 screw type term.	EA	2	65	
	C	C			COUPLING, SPLINED: solid, generator or alternator mounting (99664:171260).	EA	1	67	
	C	C			HEAD SET, ELECTRICAL: sgle earphone, w/lead and phone jack tip (99664 :31 531).	EA	1	65	
	C	C		5315–050–5759	KEY, MACHINE: ¼ h, ¼ w, 2¾ lg.	EA	1	65	
	C	C		5315–246–9719	KEY, MACHINE: ⅜ h, ⅜ w, 1½ lg.	EA	1	65	
	C	C			LINK, CONNECTING: binding post (99664: 69304).	EA	2	65	
	C	C			LINK, LINK BOARD: long (99664:39546).	EA	1	65	
	C	C			LINK, LINK BOARD: short (99664 :39302).	EA	5	65	. .
	C	C			LOCKING HANDLE: starter and belt driven generator mounting bracket (99664 :31 514A).	EA	1	76	
	C	C			MOUNTING BRACKET: chain vise (99664: 61191A).	EA	1	67	
	C	C			MOUNTING PLATE ASSEMBLY: regulator (99664:38555).	EA	1	76	
	C	C	. . .	5310–268–7357	NUT, PLAIN, HEXAGON: S, zn-pltd, ⅜–24 UNF–2B, ⅝ w across flats.	EA	18	65	
	C	C		5310–011–5772	NUT, PLAIN, HEXAGON: ⅜–16 UNC–2B, 9/16 w across flats.	EA	3	65	
	C	C			PIN, SPRING: (ORD 585963) (99664:30253).	EA	1	65	
	C	C			PLATE, MOUNTING, CONTROL BOX: (99664:3144).[2]	EA	1	69	
	C	C			PLATE, MOUNTING, CONTROL BOX: (99664:3145).[2]	EA	1	69	
	C	C		4910–786–4125	PULLEY, GROOVE: S, 4 in. od, 4 grooves, u/w A & B sectional belts (99664:42183).	EA	1	67	
	C	C		4910–786–4126	PULLEY, GROOVE: S, 4 in. od, 4 grooves, u/w O sectional belts (99664:52127).	EA	1	67	
	C	C			PULLEY SHAFT AND BEARING ADAPTER: generator or alternator (99664:51038).	EA	1	67	

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity authorized	(a) Figure number	(b) Item number
					TOOLS AND EQUIPMENT FOR—Continue TEST STAND, AUTOMOTIVE GENERATO ALTERNATOR, AND STARTER—Continue				
	C	C		6670–812–9	SCALE, BEAM INDICATING: weighing, 1 lb max weighing cap., hanging style, 1 hook ty load receiver (11710:160).	EA	1	66	
	C	C	. . .	5305–021–8	SCREW, CAP, HEXAGON HEAD: 3/8–16 T UNC–2A x 1½ in. lg.	EA	2	65	
	C	C	. . . .	. .	STARTER TORQUE ARM AND BRACKE ASSEMBLY: (99664:51040).	EA	1	66	
	C	C	. . .	. . . . .	SUPPORT: beam indicating scale (9966 SK2828).	EA	1	76	
	C	C		. . . .	TACHOMETER, VIBRATING REED: sli rule type 1500 to 15000 rpm scale, w/leath case (99664:31627).	EA	1	66	
	C	C	. . . .	. . . . .	TEST LEAD: voltage, 84 in. lg (99664:3842	EA	4	74	. . . .
	C	C	. .	. . . . .	TERMINAL INSULATOR: btry cable (8900 EL).	EA	8	65	. . . .
	C	C	. . .	5910–786–4	TERMINAL, LUG: spade type (99664:2185'	EA	4	65	. . . .
	C	C	. . .	. . . . .	TORQUE ARM : starter pinion connecti (99664:23187).	EA	1	66	. . .
	C	C	. . . .	. .	TURNBUCKLE ASSEMBLY: dble clevis ty (99664:38454).	EA	1	66	. . . .
	C	C		.	TURNBUCKLE ASSEMBLY: sgle clevis o end w/threaded rod opposite end (9966 38455).	EA	1	66	. . .
	C	C		. . . . .	VISE MOUNTING ASSEMBLY: alternat (99664:38539).	EA	1	67	
	C	C		5310–187–2	WASHER, FLAT: rd shape, al anodized fi 0.375 id, 0.625 od, .064 thk.	EA	4	65	. .

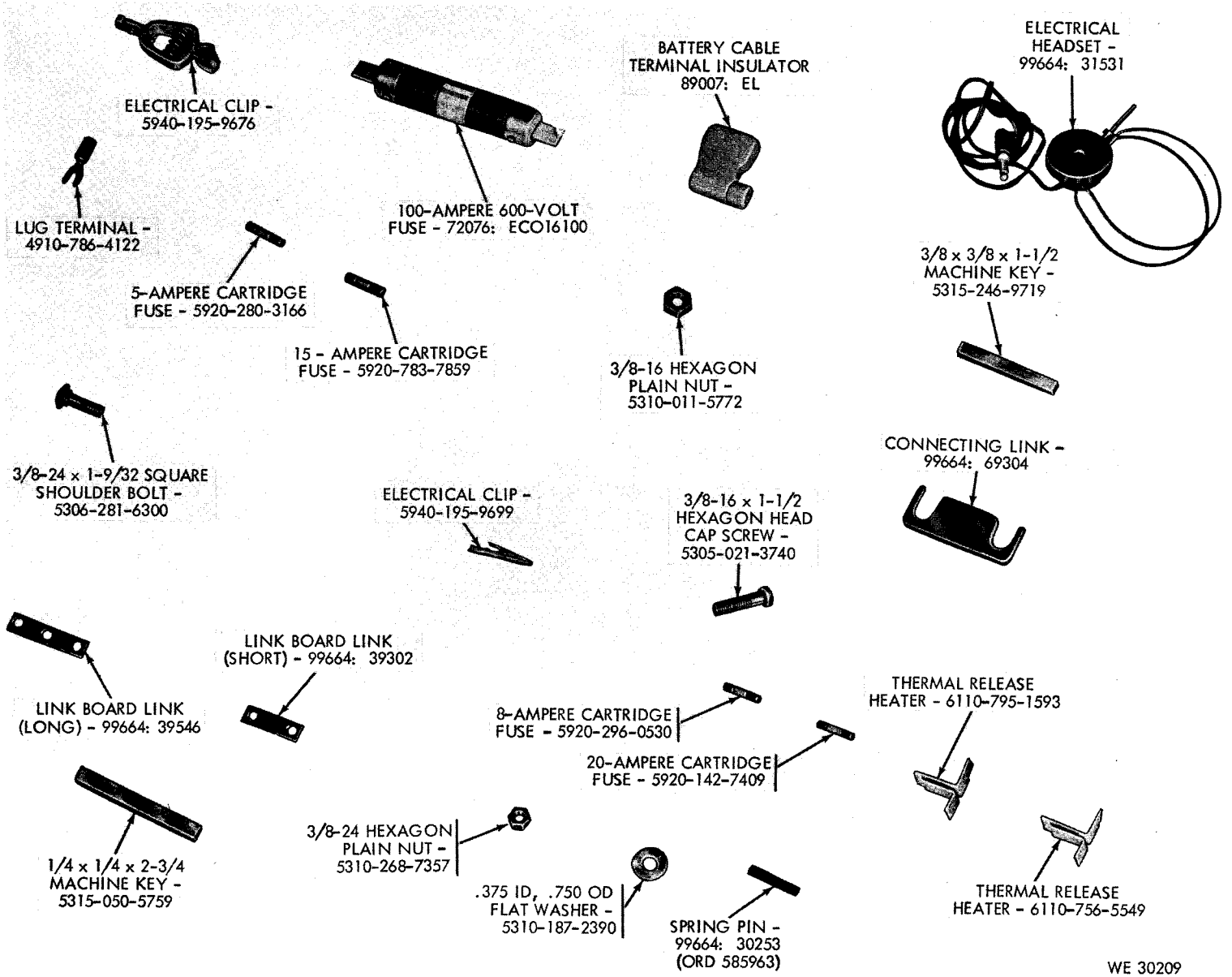


Figure 65. Repair parts and equipment.

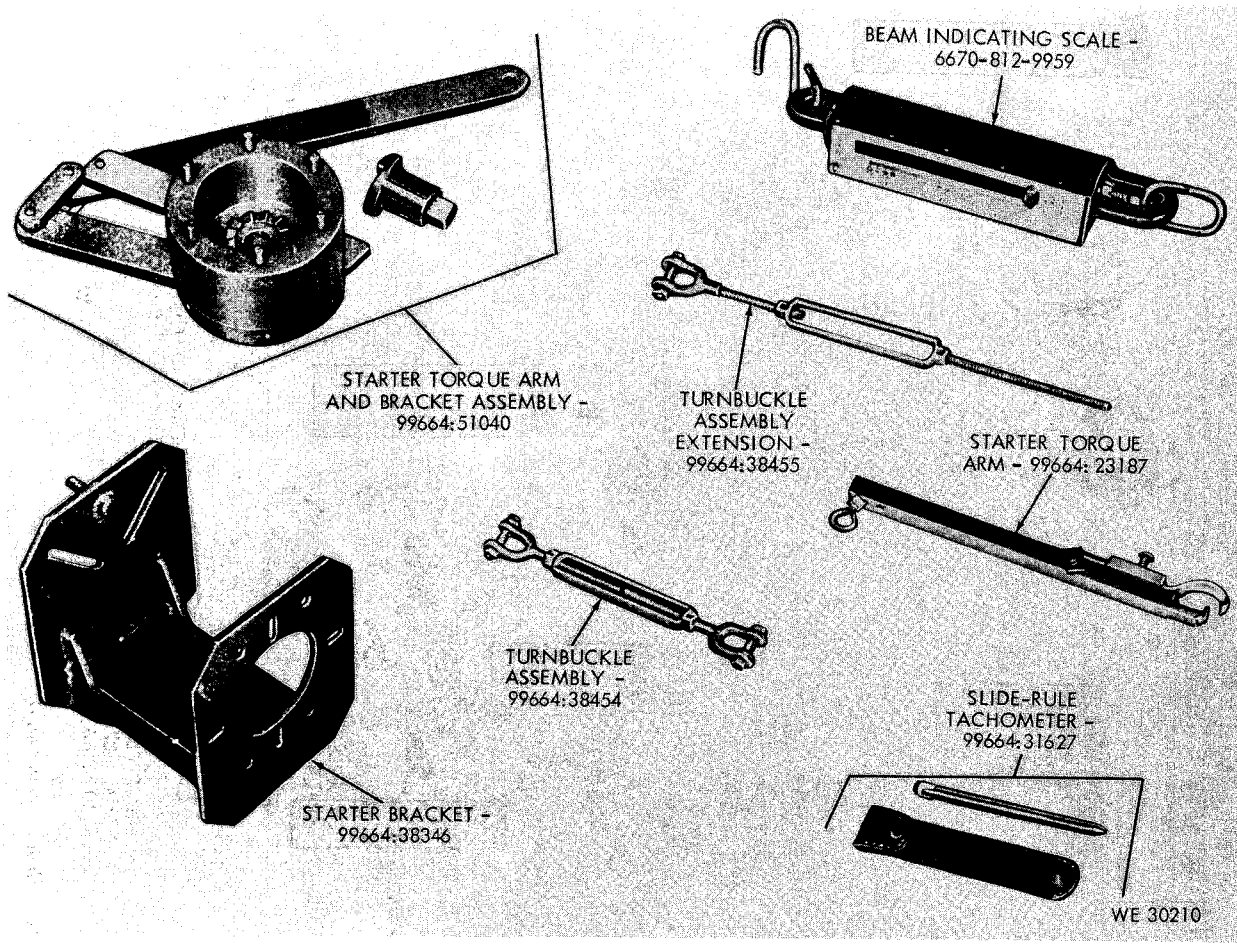


Figure 66. Equipment - mounting and testing.

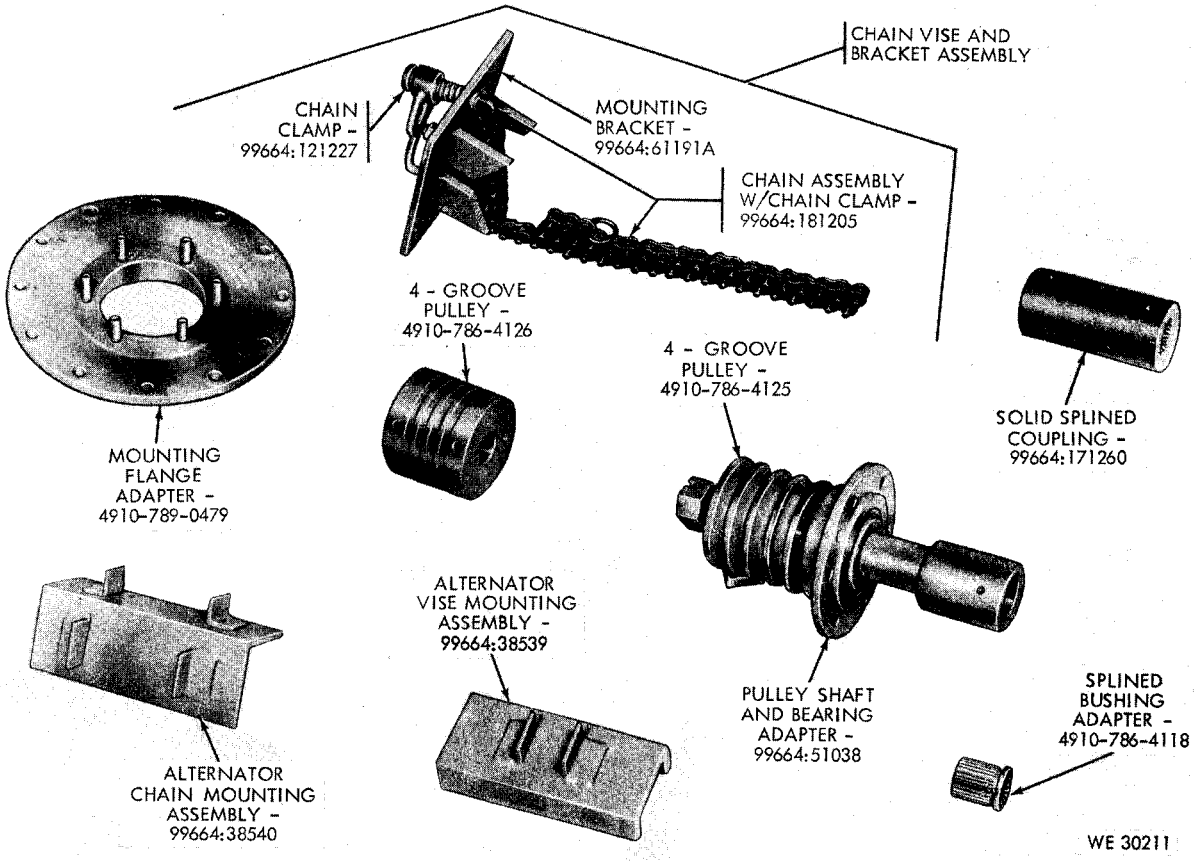


Figure 67. Equipment - mounting.

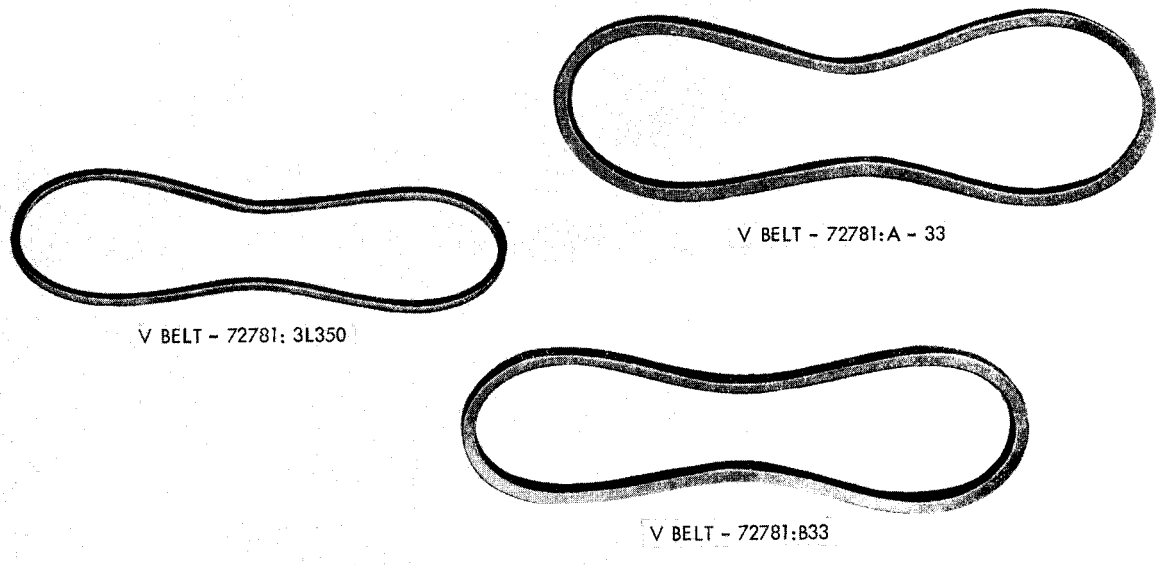


Figure 68. Equipment - mounting.

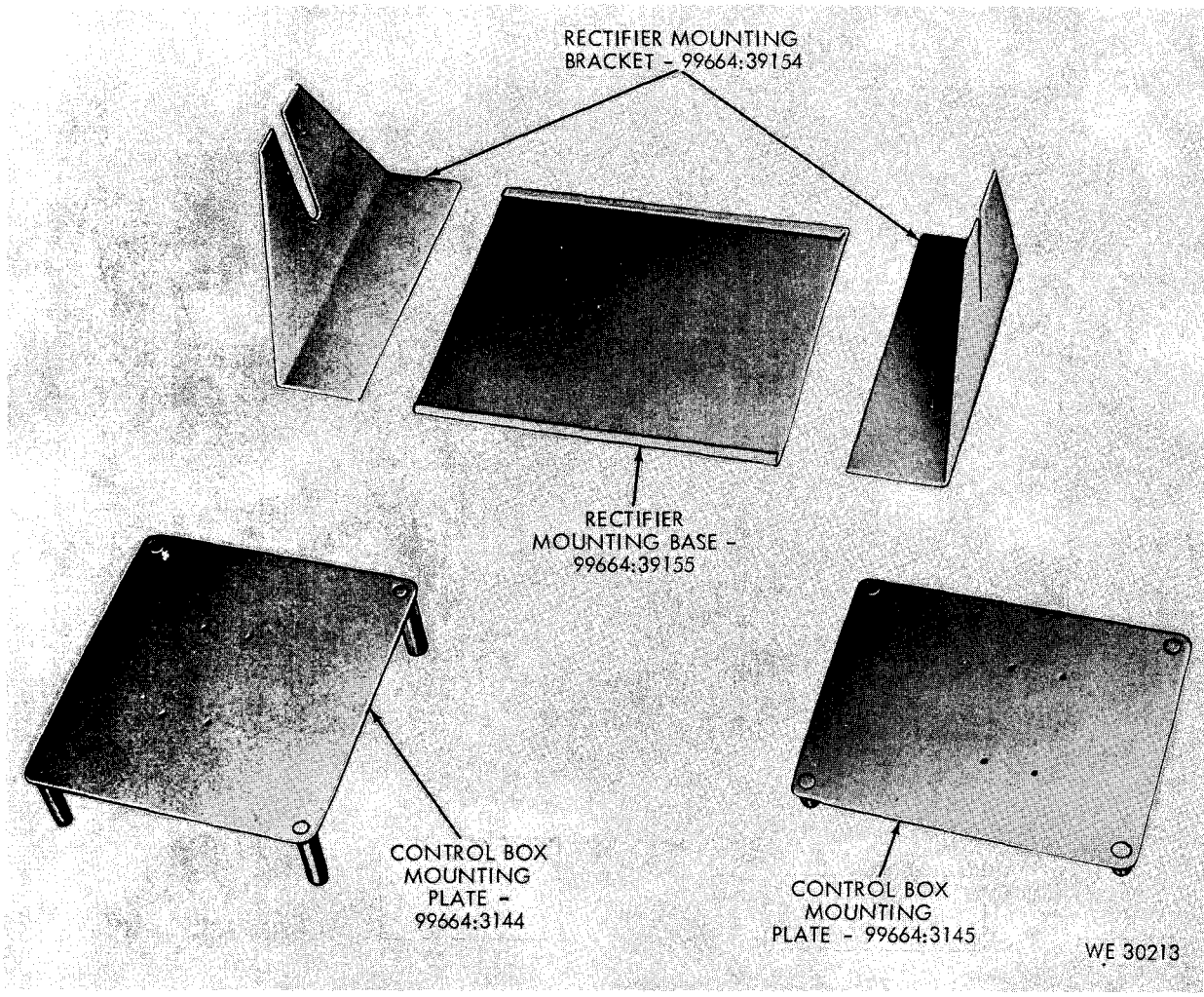


Figure 69. Equipment - mounting.

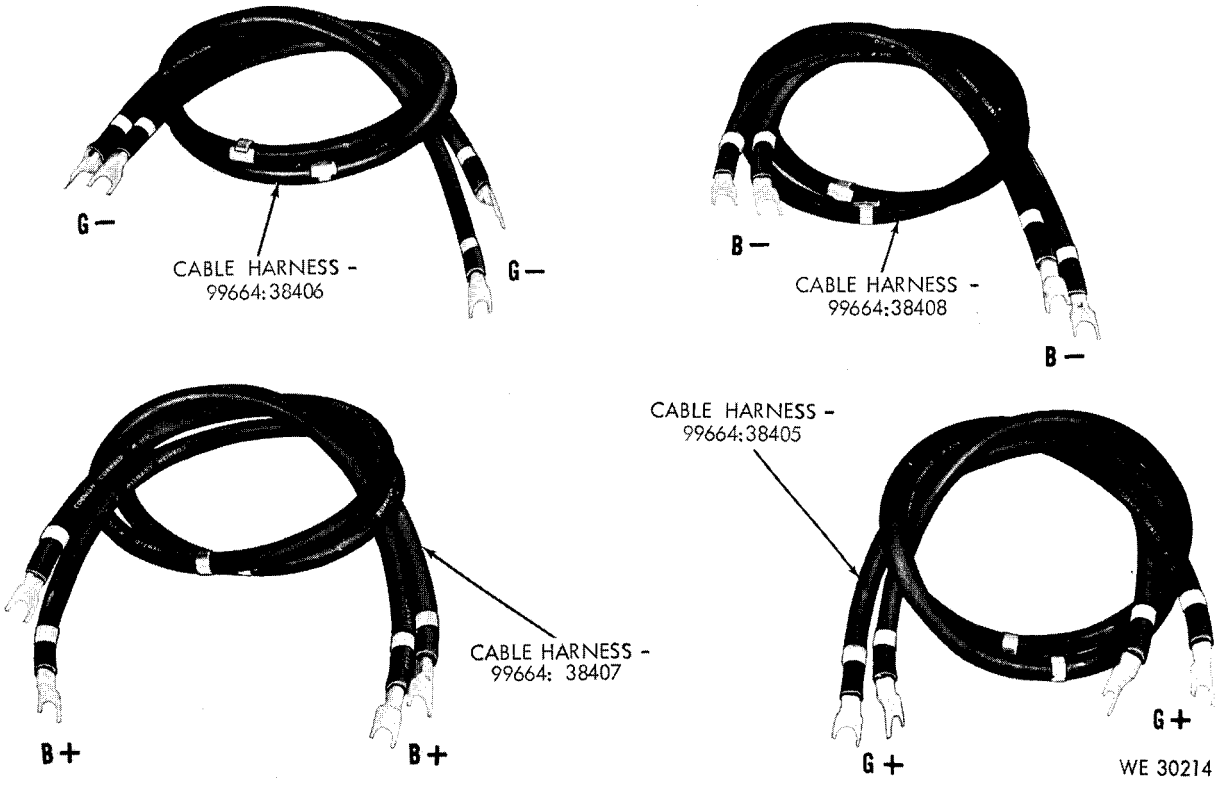


Figure 70. Equipment - testing, cable harnesses.

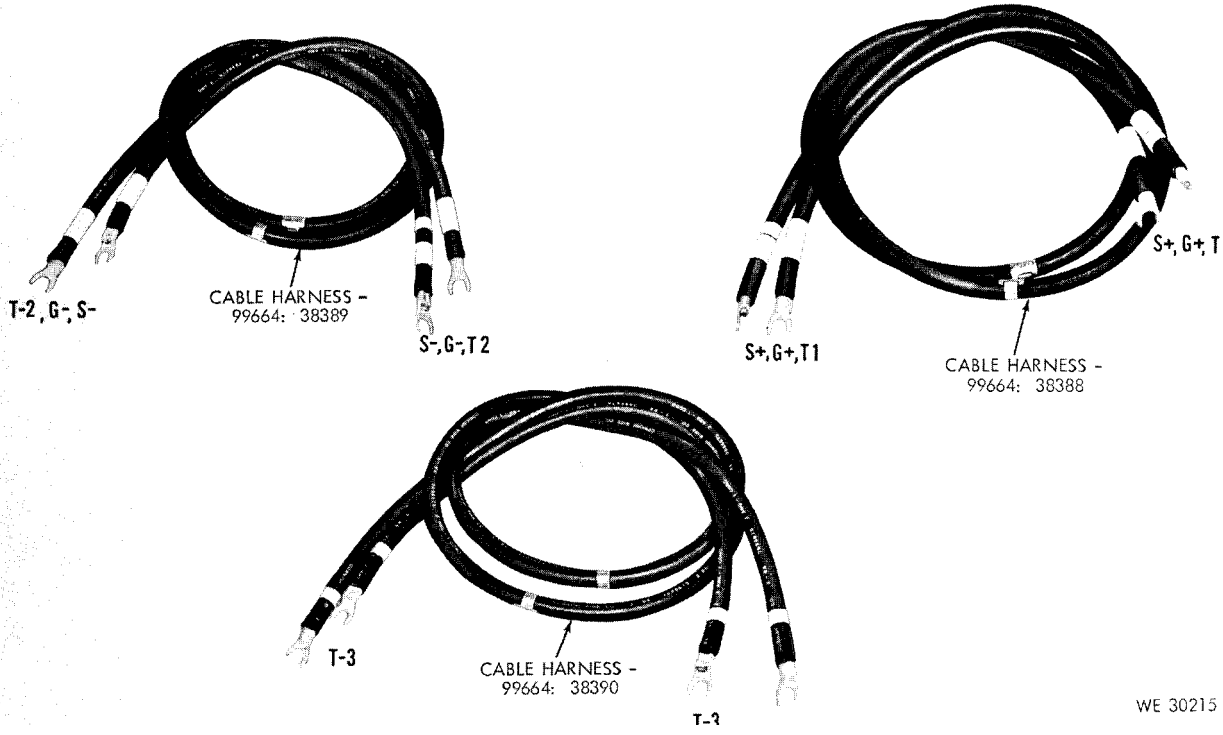


Figure 71. Equipment - testing, cable harnesses.

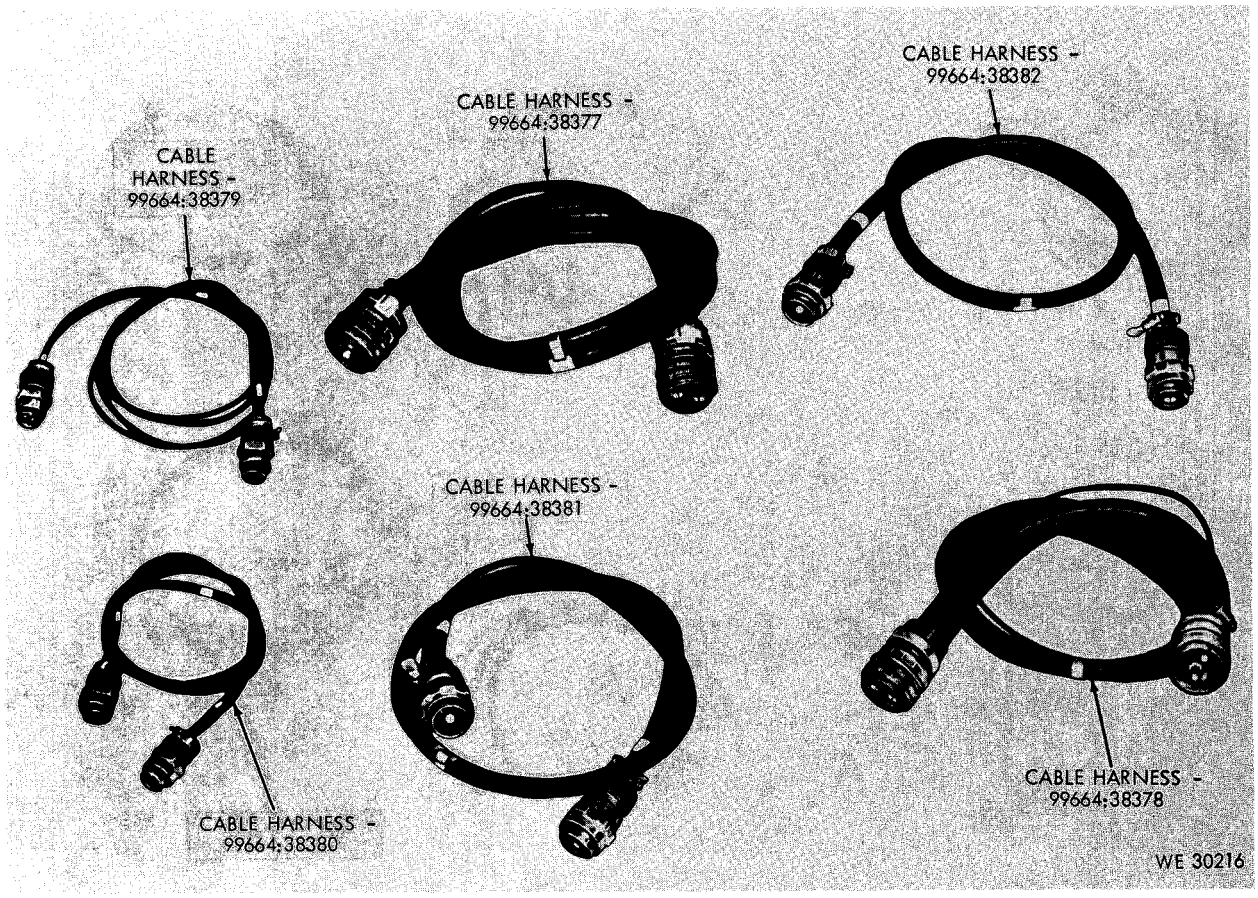
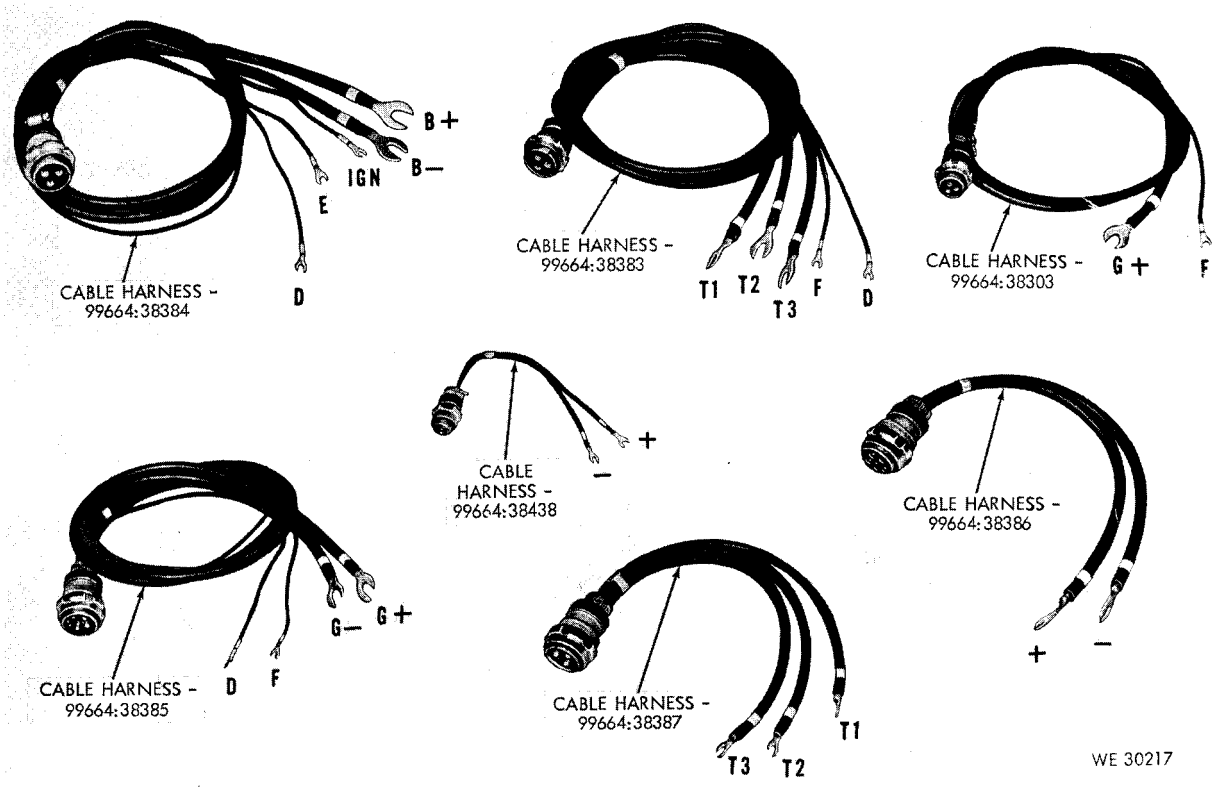


Figure 72. Equipment - testing, cable harnesses.


B+
IGN
B—
E
CABLE HARNESS -
99664:38384
D
CABLE HARNESS -
99664:38383
T1
T2
T3
F
D
CABLE HARNESS -
99664:38303
G+
F
CABLE
HARNESS -
99664:38438
+
—
CABLE HARNESS -
99664:38386
+
—
G—
G+
CABLE HARNESS -
99664:38385
D
F
CABLE HARNESS -
99664:38387
T1
T3
T2
WE 30217

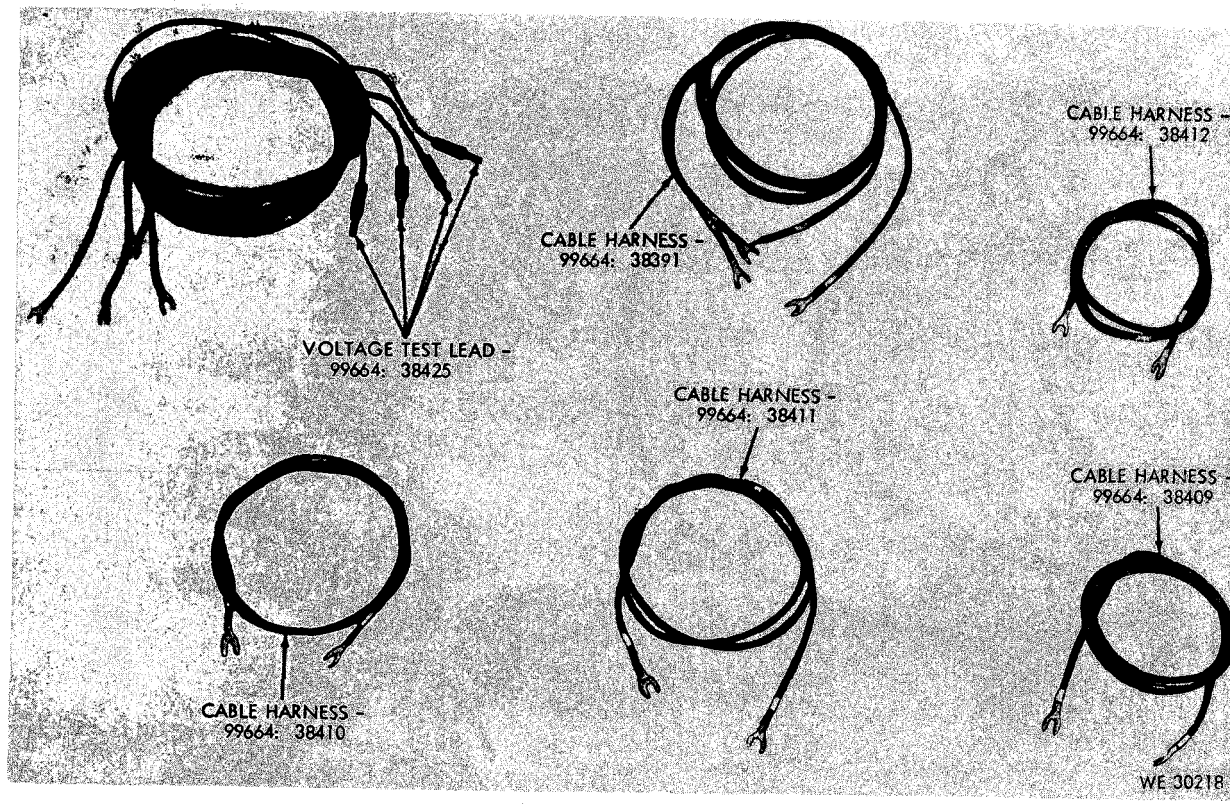


Figure 74. Equipment - test leads and cable harnesses.

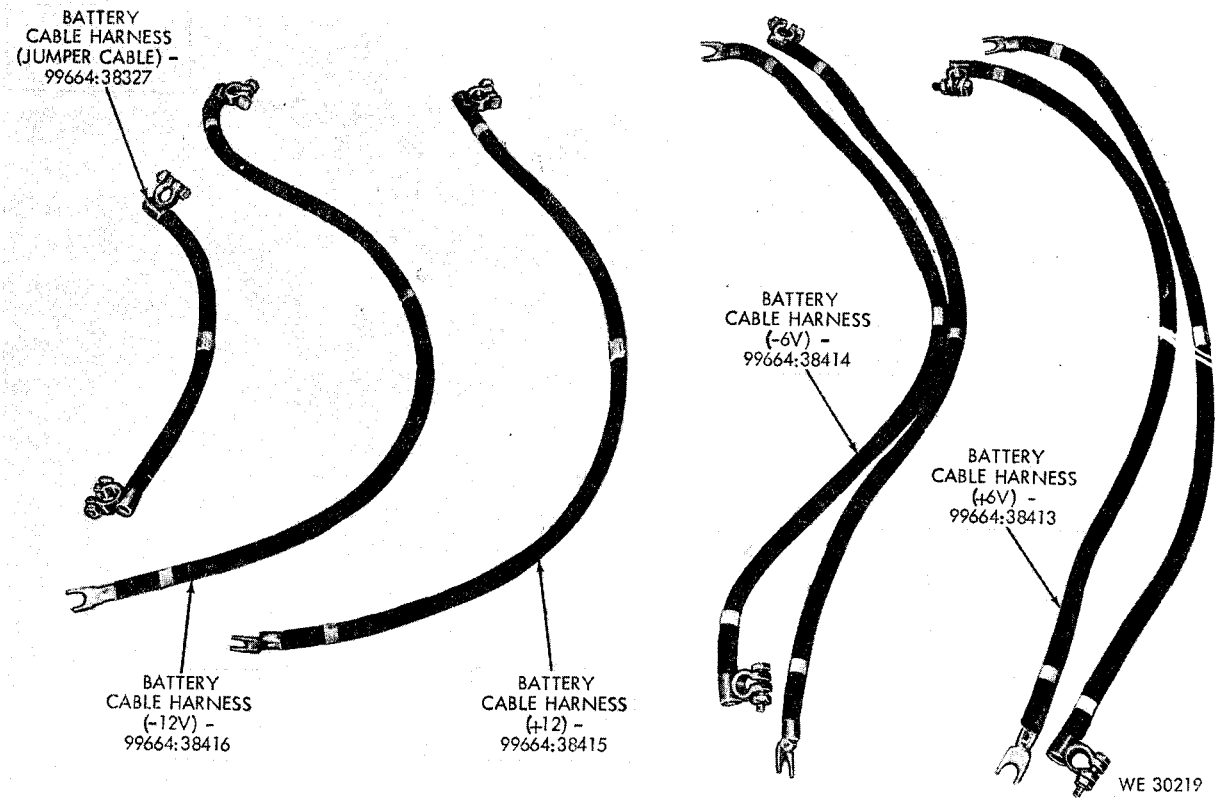


Figure 75. Equipment - battery cable harnesses.

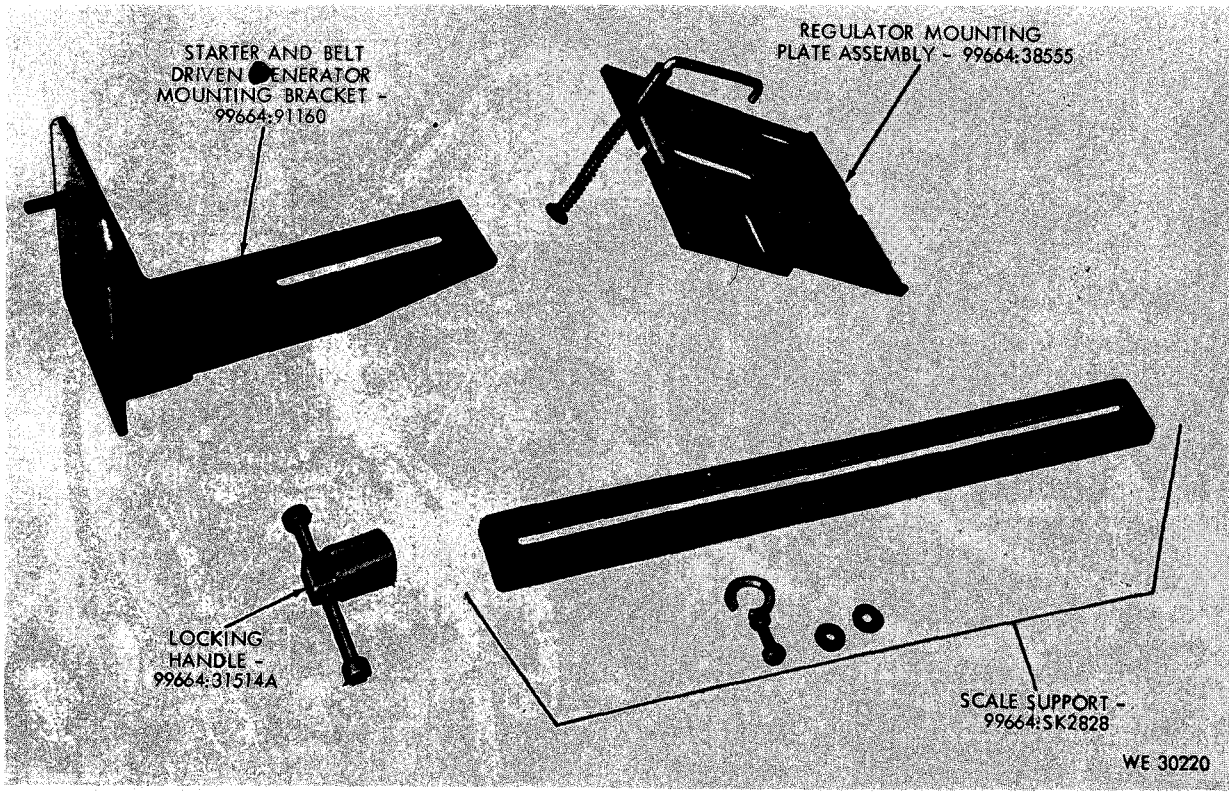


Figure 76. Equipment - mounting.

APPENDIX III

MAINTENANCE ALLOCATION CHART

1. General

The maintenance allocation chart allocates maintenance operations to the proper category of maintenance. Allocations of maintenance operations is made on the basis of time, tools, and skills normally available to the various categories of maintenance in combat situation and influenced by maintenance policy and sound maintenance practices, as outlined in AR 750-5.

2. Explanation of Format

Purpose and use of the maintenance allocation chart format are as follows:

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, *Functional Group.* Column 2 lists the noun names of components, assemblies, subassemblies and modules on which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the category of maintenance.

d. Column 4, Tools and Equipment. This column will be used to specify, by code, those tools and test equipment required to perform the designated function.

e. Column 5, Remarks. Self explanatory.

3. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

INSPECT	To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.
TEST	To verify serviceability and to detect electrical or mechanical failure by use of test equipment.
SERVICE	To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air.
ADJUST	To rectify to the extent necessary to bring into proper operating range.
ALIGN	To adjust specified variable elements of an item to bring to optimum performance.
CALIBRATE	To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.
INSTALL	To set up for use in an operational environment such as an emplacement, site, or vehicle.
REPLACE	To replace unserviceable items with serviceable assemblies, subassemblies, or parts.
REPAIR	To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting and strengthening.

OVERHAUL — To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards.

REBUILD — To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

MAINTENANCE LEVEL — The letter placed in the appropriate column indicates the level responsible for performing that particular maintenance function. The maintenance level codes used are:

Maintenance Level	*Code*
Operator/Crew	C
Organizational Maintenance	O
Direct Support Maintenance	F
General Support Maintenance	H
Depot Maintenance	D

Maintenance Allocation Chart

(1) Group No.	(2) Functional group	(3) Maintenance Function											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
1	Battery Charger Circuit (on front panel)	O	F		.			..	F	C	H	D		Level C—authorized replacement of fuze and level O—authorized replacement of indicator lamp (bulb) only.
2	Binding Posts and Phone Jacks (except those in groups no. 8 and 13)	C	F		.			..	F	O	..	.		Level O—authorized cleaning, preserving, and repairing threads only.
3	Battery, Rectifier, and stowage compartments	C			.			..	H	F	H	D		
4	Cabinet and test stand Identification Plate	C			..			..	H	O	H	D		Level O—authorized cleaning and spot painting (painting cleaned-off, rusted or scaled surfaces), also, preserving surfaces where required to prevent rust or corrosion.
5	Drive Control (running) (on front panel)	O	..		..			..	F	..	..	..		Level O—authorized replacement of indicator lamps (bulb) only.

(1) Group No	(2) Functional group	(3) Maintenance Function											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace	Repair	Overhaul	Rebuild		
6	Input and Drive Control Circuitry (high voltage compartment):													
	a. Circuit breaker	O	F	..		..	..		F	H	H	D		
	b. Drive reversing switch	O	F	..		..	..		F	F	H	D		
	c. Magnetic motor starter and related components	O	F	..		..	..		F	O				Level O—authorized replacement of heater elements and input power supply fuses only.
7	Load Bank Blower, Blower Motor, and Mercury Switch	F	F	..	..	..	..		F	O	D	D		Level O—authorized replacement of mercury switch only.
8	Meters	O	F	..		..	F		F	O	H	D		Level O—authorized cleaning outside surfaces and setting zero adjustment only.
9	Mounting Brackets	C	..	O		..	..		F	F	H	D		
10	Panel Light	C	F	..		..	..		F	F	H	D		
11	Rheostats, Switches, and Controls (except those in group no. 13)	O	F	..		..	..		F	C				Level C—authorized replacement of fuze in the 250-ohm field current rheostat circuit only.
12	Speed Control (varidrive assembly)	O		..		..	..		F	F	H	D		
13	Test Circuits (on main control panel):													
	a. Battery circuit selector	O	F	..		..	..		F	O	H	D		Level O—authorized replacement of indicator lamps (bulbs) only.
	b. Variable Volts Circuit	O	F	..		..	..		F	C	H	D		Level C—authorized replacement of fuse only.
	c. External DC Voltmeter	O	F	..		..	..		F	F	H	D		
	d. Pile Flutter	O	F	..		..	..		F	F	H	D		
	e. Regulator Check (fixed resistor methods)	O	F	..		..	..		F	F	H	D		
	f. Test Indicator	O	F	..		..	..		F	O	H	D		Level O—authorized replacement of indicator lamp (bulb) only.
14	Tools and Equipment	C	O	..		..	..		C	C	F			

(1) Group No.	(2) Functional group	(3) Maintenance Function											(4) Tools and equipment	(5) Remarks
		Inspect	Test	Service	Adjust	Align	Calibrate	Install	Replace		Overhaul	Rebuild		
15	Varidrive Assembly and Tachometer Generator	O	F	O	. .	. .	O	. .	H		H	D		Level O—authorized replacement of V belt and tachometer generator only.
16	Wiring and components of internal circuitry (resistors, fuse blocks, insulator blocks, shunts, transformers, capacitors, etc.).	F	F		. .		. .	. .	H		H	D		

APPENDIX IV

REPAIR PARTS AND SPECIAL TOOL LISTS

Section I. PREFACE

1. General

This appendix is a list of repair parts which may be required by the using organization for performing organizational maintenance but are not authorized to be stocked.

2. Requisition Notes

Refer to appendix II, paragraph 2.

3. Explanation of Columns

a. Source, Maintenance, and Recoverability Code (Col. 1).

(1) *Materiel numerical codes (col. 1a).* This column is not required.

(2) *Source (col. 1b).* This column indicates the selection status and source for the listed item. Source code used in this list is:

Code	*Explanation*
C	Obtained through local procurement. If not obtainable from local procurement, requisition through normal supply channels with a supporting statement of nonavailability from local procurement.

(3) *Maintenance level (col. 1c).* This column indicates the category of maintenance authorized to install the listed item. Maintenance level code used in this list is:

Code	*Explanation*
O	Organizational maintenance.

(4) *Recoverability (col. 1d).* This column indicates whether unserviceable items should be returned for recovery or salvage. When no code is indicated in this column, the item will be considered expendable and not recoverable.

b. Federal Stock Number (Col. 2). Self explanatory.

c. Description (Col. 3). This column indicates the Federal item name (shown in capital letters) and any additional description required for supply operations. The manufacturer's code and part number are also included for reference.

Code	*Explanation*
72619	Dial Light Co. of America, Inc., New York, N.Y.
79938	US. Electrical Motors, Inc., Milford, Conn.
89661	Westinghouse Electric and Mfg. Co., Baltimore, Md.

d. Unit of Issue (Col. 4). Self explanatory.

e. Quantity Incorporated in Unit (Col. 5). This column indicates the total number of times the listed item is used in the end item (major item) or major combination.

f. 15-Day Maintenance Allowance (Col. 6). This column indicates the quantitative allowance for the organization maintenance category of the listed items. These allowances represent one prescribed load, for a 15-day period, for the number of major items supported. They must be on hand or on order at all times. Major commanders will determine the number of prescribed loads organizational units will carry. Units and organizations authorized additional prescribed loads will multiply the number of equipments supported by the number of prescribed loads. Additional repair parts which may be required for performing authorized maintenance, but are not authorized for stockage in the prescribed load, are indicated by an

asterisk (*). These items are to be requisitioned, as required, for immediate use only.

4. Abbreviations and Symbols

a. Abbreviations.

	Explanation
amp	ampere(s)
bay	bayonet (lamp base)
cntr	container
deg	degree(s)
dr	drum
ea	each
F	Fahrenheit
Fed	Federal
fil	filament(s)
fin.	finish(ing)
ga	gage
gal	gallon(s)
hr	hour(s)
hv	heavy
id	inside diameter (dimension)
in.	inch(es)
lb	pound(s)
lg	length (long)
l t	light
max	maximum
MIL	military
min	miniature
min	minimum
oz	ounce(s)
par., pars	paragraph, paragraphs
pkg	package(s)
pl	plate
qt	quart(s)
sq	square
term.	terminal(s)
thk	thick(ness)
w	wide, width
w/	with
wt	weight
yd	yard(s)

b. Symbols.

†	as required
*	see par. **3*f***

5. Errors, Comments, and/or Suggestions

Refer to paragraph 5, appendix II.

6. Notes Footnotes

[1] Incandescent lamp (bulb) for test indicator lamp (30-A, fig. 16).

[2] Incandescent lamp (bulb) for ac power-on indicator lamp (31, fig. 16), drive running indicator lamp (34, fig. 16), and battery charge. indicator lamp (45, fig. 16).

[3] Lamp (bulb) for battery circuit selector instrument panel (41, fig. 16). Contains one bulb with metal housing.

Section II. REPAIR PARTS AND SPECIAL TOOLS

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6)	(7) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity incorporated in unit	15-day maintenance allowance per 100 equipment	(a) Figure number	(b) Item number
					REPAIR PARTS FOR:					
					TEST STAND, AUTOMOTIVE GENERATOR, ALTERNATOR AND STARTER (99664:type II), part number 7336 (4910-316-5252) and model AGARTS, type II, part numbers 7336-1, 7336-2, and 7336-3 (4910-767-0218).					
	C	O	....		BELT, V: cog type, rubberized fabric, w/cord, hv wt (varidrive) (79938-54-4).	EA	1	*	64	18
...	C	O	....	4910-703	GENERATOR, TACHOMETER: (99664:11475).	EA	1	*	64	2
	C	O	....	6240-155	LAMP, INCANDESCENT: 6.3 v, 0.15 amp, min bay base, T-3-1 /4 clear fin. bulb, white light, 1 tungsten C-2R fil, RDG 7, 1 3/16 lg, 3000 hr rated life, burns in any position (MIL-std 15571-2, type TB-14, trade no. 47) (504521).[1]	EA	1	*	16	
	C	O	....		LAMP, INCANDESCENT: 6 w—120 v, double contact, bay base (72619:6S6DC-125).[2]	EA	3	*	16	
...	C	O	....	6220-068	LAMP, INDICATOR: (72619:134-3830-122).[3]	EA	3	*	16	
. .	C	O	....	910-674	SWITCH, MERCURY: type 9-16R, ac, 4 amp, 115 v, blower stack control (99664: 32538).	EA	1	*	63	
					SPECIAL TOOLS: None authorized.					
					TOOLS AND EQUIPMENT: None authorized.					
					CLEANING, PRESERVING, AND PACKAGING MATERIALS					
. . .	....	....	....	8020-242	BRUSH, PAINT: fl, hog bristle, w/sq edge, 3 in. w, 7/8 in. thk, 3 1/4 in. min exposed lg, Fed H-B-420, class 1, gr B, size 3 in.	EA	†			
...		....	....	8135-282	BARRIER MATERIAL, WATER VAPORPROOFED, FLEXIBLE: 0.07 GM max rated water vapor transmission rate per 100 sq in. ea 24 hrs, 200 yd roll, MIL-B-131, class 1.	1	†			
		....	....	8850-664	CLEANING COMPOUND, ALKALI, BOILING VAT: composition A/A, grandular form, 100 lb dr, Fed P-C-436.	1	†			

For explanation of footnotes, see paragraph 6.

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6)	(7) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity incorporated in unit	15-day maintenance allowance per 100 equipments	(a) Figure number	(b) Item number
					CLEANING, PRESERVING, AND PACKAGING MATERIALS—Continued					
					CLEANING COMPOUND, SOLVENT: emulsion type, for removing oil, greases, asphalt, tar and rust prenventive compound other than wax type from metallic and painted surface, MIL-C-11090:					
				6850-224-6665	5 gal pail	1	†			
				6850-224-6666	55 gal dr	1	†			
					CORROSION PREVENTIVE COMPOUND: solvent cutback, hard film MIL-C-16173, grade 1:					
				8030-231-2345	1 gal cntr	1	†			
				8030-231-2362	5 gal cntr	1	†			
				6850-753-4885	CORROSION REMOVING COMPOUND: composed of 99.5% hydrochloric acid, 0.25 % hexamethyene-tetramine, 0.25 % P-toluidine, liquid form, 15 gal polyethlene lined steel drum, MIL-A-13528 except for composition and pkg data.	1	†			
					CORROSION REMOVING COMPOUND: liquid form, 57.22 deg C main flash point, MIL-M-10578 type I:					
				6850-656-1291	5 gal plastic dr	1	†			
				6850-270-5551	1 gal can	1	†			
					CORROSION REMOVING COMPOUND: liquid form, 57.22 deg C main flash point, MIL-M-10578 type II:					
				6850-174-9672	1 gal bottle	1	†			
				6850-656-1292	5 gal plastic dr	1	†			
				7930-985-6901	DETERGENT, GENERAL PURPOSE: powdered, water soluble type, 80% min biodegradeable, 5 lb pail, Fed P-D-220, type I.	1	†			
					DRY CLEANING SOLVENT: liquid, for removing soil from surfaces in dry cleaning process Fed F-D-680:					
				6850-281-1986	55 gal dr, 16 ga	1	†			
				6850-285-8011	55 gal dr, 18 ga	1	†			
				6850-637-6135	bulk	1	†			
					ENAMEL: air drying, dry tack free 2 hr, dry hard 8 hr max class B—Baking, bake hard 45 minutes at 250 deg F, full gloss, use on primed interior or exterior wood or metal, primarily used for finishing and refinishing automobile and construction equipment, gray (medium), color no. 16187, Fed TT-E-489, class A:					
				8010-298-2300	1 qt can	1	†			

(1) Source, maintenance, and recoverability code				(2)	(3)	(4)	(5)	(6)	(7) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description	Unit of issue	Quantity incorporated in unit	4-day maintenance allowance per 15 equipments	(a) Figure number	(b) Item number
					CLEANING, PRESERVING, AND PACKAGING MATERIALS—Continued					
				8010-286-7731	1 gal can		†			
				8010-286-7749	1 gal pail		†			
					GREASE, BALL AND ROLLER BEARING: lubricating oil and gelling agent, corrosion resistant, 300 deg F min dropping paint, used on ball and roller bearings operating at med speeds and temp range 125 deg F to 200 deg F, MIL-G-18709:					
				9150-526-4205	1 lb can		†			
				9150-663-9795	5 lb can		†			
				9150-249-0908	35 lb pail		†			
					INSULATING VARNISH, ELECTRICAL: air or baked drying, red, dielectric strength, 1400 v per MIL of thk dry, resistant to acid, moisture, and and oil:					
				9970-284-5448	1 qt can		†			
				9970-161-7422	1 gal can		†			
					LUBRICATING OIL, GENERAL PURPOSE: corrosion and oxidation resistant. 7000 centistokes at − 40 deg F max viscosity, 6000 centistokes at − 65 deg F max viscosity, 12 centistokes at 100 deg F min viscosity, − 70 deg F, max pour point, 275 deg F min flash point by Cleveland open-cup test method, min viscosity index not rated, Fed VV-L-800 used in lubrication and protection against corrosion of small arms, in lubrication of fuze mechanisms and wherever a general purpose low temp lubricating oil is required also suitable for interior of metal drums:					
				9150-185-0629	2 oz can	1	†			
				9150-273-2389	4 oz can	1	†			
				9150-231-6689	1 qt can	1	†			
				9150-231-9062	5 gal can	1	†			
				9150-281-2007	55 gal dr, 16 ga	1	†			
				9150-281-2060	55 gal dr, 18 ga	1	†			
					PRIMER COATING: caution: contain zinc chromate. Avoid breathing mis when spraying. Avoid skin contact Dry for recoating, 15 min max. Use base coat on bare or chemically treate metal surfaces. Suitable for use unde either synthetic enamel or lacquer enam top coats, Fed TT-P-664:					
				8010-161-7275	5 gal can (red or brown oxide MS-35612-2	1				

(1) Source maintenance, and recoverability code				(2)	(3)		(5)	(6)	(7) Illustration	
(a) Materiel code	(b) Source	(c) Maintenance level	(d) Recoverability	Federal stock number	Description		Quantity incorporated in unit	15-day maintenance allowance per 1 equipment	(a) Figure number	(b) Item number
					CLEANING, PRESERVING, AND PACKAGING MATERIALS—Continued					
					REMOVER, PAINT: alkali-organic solvent, liquid, MIL–R–12294:					
				3010–283–0511	5 gal pail	1	†			
				3010–286–7719	50 gal dr	1	†			
				3010–227–1693	REMOVER, PAINT: alkali, class 1, for use w/ferrous and magnesium metals (when coupled w/aluminum, magnesium must be stripped in class 2 remover), Fed TT–R–230, 400 lb dr.	1	†			
					SEALING COMPOUND: Use: For sealing threaded joints and gaskets where resistance to jet fuel, petroleum base oil, non-corrosive ethylene glycol and water is required, paste, MIL–S–7916:					
				3030–088–7818	3 oz cn (brush or spatula appl)	1	†			
				3030–985–2350	8 oz cn (gun or spatula appl)	1	†			
				3030–543–4384	1 pt cn (brush or spatula appl)	1	†			
					TALC, TECHNICAL: powder form, general purpose use, Fed ZZ–T–416, type IV, class c:					
				5810–270–9989	1 lb can	1	†			
				5810–270–9990	2 lb can	1	†			
				5810–270–9988	5 lb can	1	†			
					TAPE, PRESSURE SENSITIVE ADHESIVE: cellulose backing, transparent, clear, waterproof, 3 in. id of core, 72 yd roll, Fed PPP–T–60, type III, class 2:					
				5135–266–6716	½ in. w	1	†			
				5135–663–3732	1 in. w	1	†			
				5135–266–6715	2 in. w	1	†			
				5135–281–2700	3 in. w	1	†			
					THINNER, PAINT, MINERAL SPIRITS: grade 1, distillation range deg F 302 to 410 l t type thinner, Fed TT–T–291:					
				8010–290–4079	1 qt can	1	†			
				8010–242–2089	1 gal can	1	†			
				8010–558–7026	5 gal pail	1	†			
					., 1, 1, TRICHLOROETHANE, TECHNICAL, FED O–T–620:					
				6810–664–0273	1 pt can	1	†			
				6810–664–0387	1 gal can	1	†			
				6810–664–0388	5 gal pail	1	†			
				6810–551–1487	55 gal dr	1	†			

INDEX

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Major General, United States Army,
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ARADCOM Rgn (2)
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NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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