

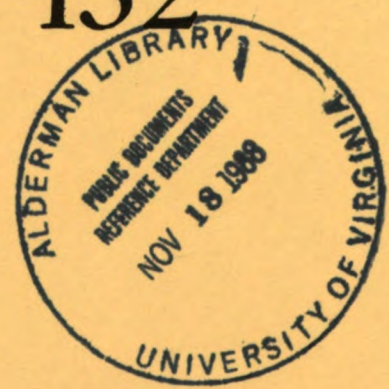
D 101.11:
11-2064

TM 11 - 2064

TO 16-40 BD 132-5

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

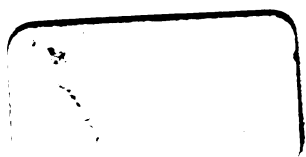
PANEL BD-132



This reprint includes all changes in effect at the time of publication; changes 1 through 7.

DEPARTMENT OF THE ARMY • JULY 1949





PANELS BD-132 AND BD-132-A

CHANGES }
 No. 1 }

TM 11-2064, 28 July 1949, is changed as follows:
 The title of the manual is changed to read
PANELS BD-132 and BD-132-A.

3. Description of Panel BD-132

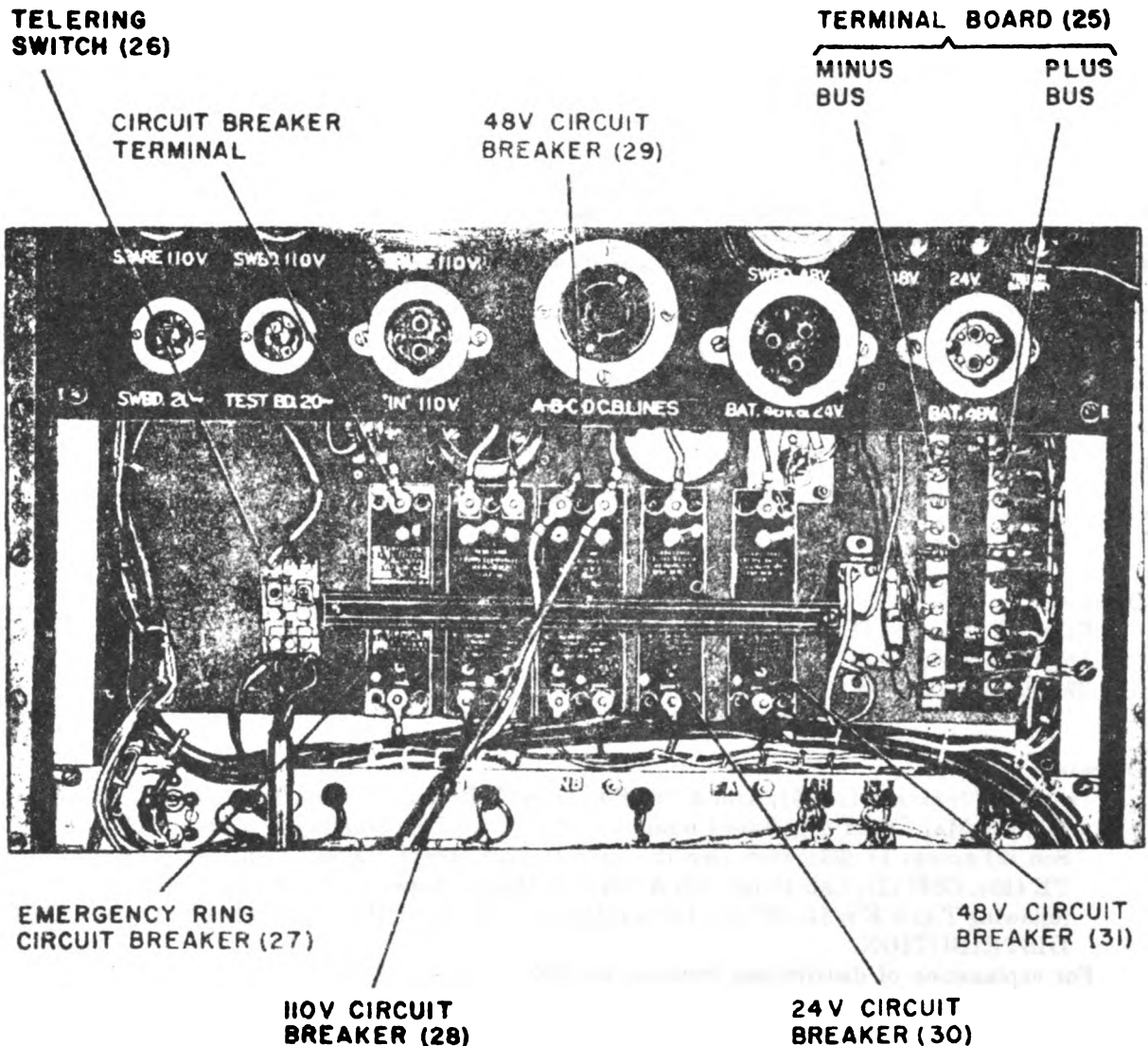
* * * * *
Note (Added). Panel BD-132-A is similar to Panel
 BD-132, except for the use of Rectifier RA-91-B instead
 of Rectifier RA-91-A (TM 11-964) and the use of differ-

DEPARTMENT OF THE ARMY
 WASHINGTON 25, D. C., 26 April 1951

ent types of circuit breakers (fig. 5.1). However, Rectifier
 RA-91-A (par. 5f) may be used with Panel BD-132-A.

In figure 22, in the apparatus legend, item 25,
 change the description "NO APPARATUS" to
 read "TERMINAL BOARD." Add the following
 note after part No. 57:

Note. In Panel BD-132-A, the manufacturer's type
 number of part numbers 27, 30, and 31 is Heinemann
 1163-SM6; the type number of part numbers 28 and 29
 is Heinemann 2263-SM6.



TM 2064-C1-1

Figure 5.1 (Added). Panel BD-132-A, circuit breaker group and terminal board, wiring side. (Apparatus numbers refer to figs. 22 and 23.)

APPENDIX III

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that * * * authorized supply basis. The Department of the Army Supply Catalog applicable to Panel BD-132-A is SIG 7 & 8-BD-132. For an index * * * of SIG 1.

3. Identification Table of Parts for Panel BD-132-A

(Added)

The identification table of parts for Panel BD-132-A is the same as for Panel BD-132, with the following exceptions:

Figure No.	Name of part and description	Function of part	Signal Corps stock No.
	PANEL BD-132-A: distribution board for 48-v d-c and 110-v a-c; contains olt breakers and sw to control power distribution to swbd; case is integral part of power panel.		3H4100-132
5. 1	CIRCUIT BREAKER: single pole; 10 amp; Heinemann #1163SM-6.	Emergency ring, 24- and 48-volt circuit breakers.	3H900-10-26
5. 1	CIRCUIT BREAKER: 2 pole; 15 amp; Heinemann #2263SM-6.	110- and 48-volt switches	3H900-15-15
	RECTIFIER RA-91-B	Rectifies current for battery charge and d-c circuits.	3H4699-91

[AG 300.7 (9 Apr 51)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:

EDWARD F. WITSELL
Major General, USA
The Adjutant General

J. LAWTON COLLINS

Chief of Staff, United States Army

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Tech Svc (2) except 11 (65); Arm & Svc Bd (1); AFF Bd (ea Svc Test Sec) (1); AFF (5); AA Comd (2); OS Maj Comd (5); Base Comd (5); MDW (5); Log Comd (5); A (20); CHQ (2); FC (2); Sch (2) except 11 (25); Gen Dep (2); Dep 11 (20) except Sig Sec, Gen Dep (10); Tng Div (2); PE (10), OSD (2); Lab 11 (5); 4th & 5th Ech Maint Shops 11 (3); Two (2) copies to each of the following T/O & E's: 11-107; 11-127; 11-500 CA, CB, CC, CD; 11-587; 11-592; 11-597; SPECIAL DISTRIBUTION.

For explanation of distribution formula, see SR 310-90-1.

TECHNICAL MANUAL

PANELS BD-132 and BD-132-A

CHANGES }
No. 2 }

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 21 October 1953.

TM 11-2064, 28 July 1949, is changed as follows:

3. Description of Panel BD-132

* * * * *

Note. Panel BD-132-A is * * * with Panel BD-132-A. Panel BD-132-A, procured on Order No. 6586-Phila-51 is similar to Panel BD-132-A covered in the manual, except that Interrupter PE-250 (Telering, model H) is not used. Instead, Panels BD-132-A bearing serial numbers 2599 through 2641 use Static Ringing Generator TA-248/TT (Telering, model R, Type B), and Panels BD-132-A bearing serial numbers 2642 through 2863 use Static Ringing Generator TA-248A/TT (Telering, model R, Type BG-2).

5. Description of Components

* * * * *

d.1 (Added) *Telering (Static Ringing Generator TA-248/TT)* (fig. 4.1). Static Ringing Generator TA-248/TT performs the same functions and has the same electrical characteristics as Interrupter PE-250 (*d* above). It is 10 inches long, 4½ inches wide, and 4 inches deep. A mounting plate is used to secure the unit to the panel. The unit

is fused by a standard 5-ampere, glass-type fuse mounted on a fuse block on the back of the mounting plate. The Telering weighs 7½ pounds. The unit is not equipped with a pilot lamp.

d.2 (Added) *Telering (Static Ringing Generator TA-248A/TT)* (figs. 4.2 and 8.1). Static Ringing Generator TA-248A/TT is electrically and physically the same as Static Ringing Generator TA-248/TT (*d.1* above), except that two 3-ampere, glass-type fuses are mounted on the housing of the generator and a strip-type bracket is used instead of a mounting plate to secure the unit to the panel.

* * * * *

38. Ringing Supply

(figs. 27 and 27.1)

The Telering unit, Interrupter PE-250 or Static Ringing Generators TA-248/TT or TA-248A/TT, is a vibrating-reed type of frequency converter for supplying power to 20-cycle ringing equipment. It operates from * * * on the Telering.

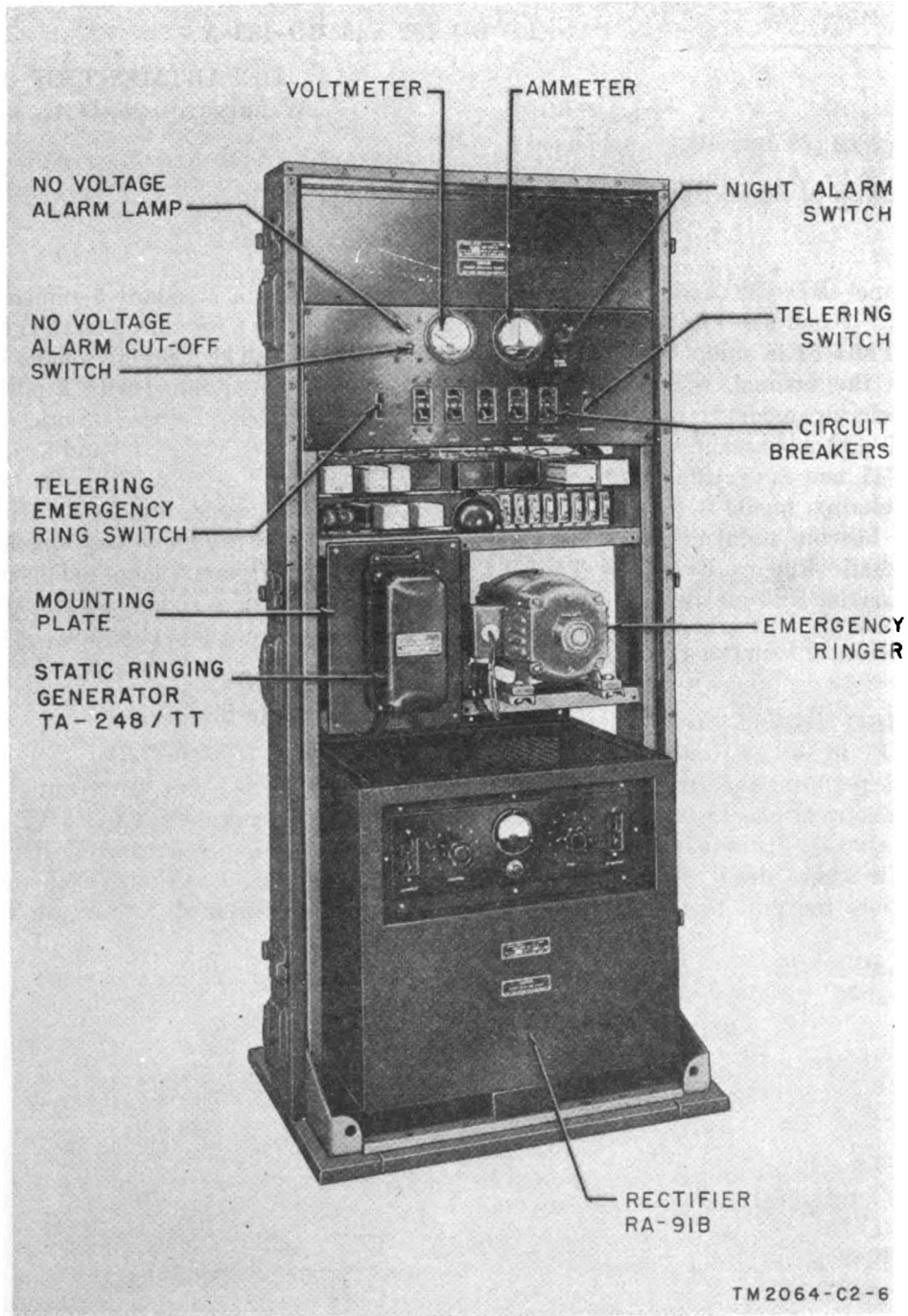
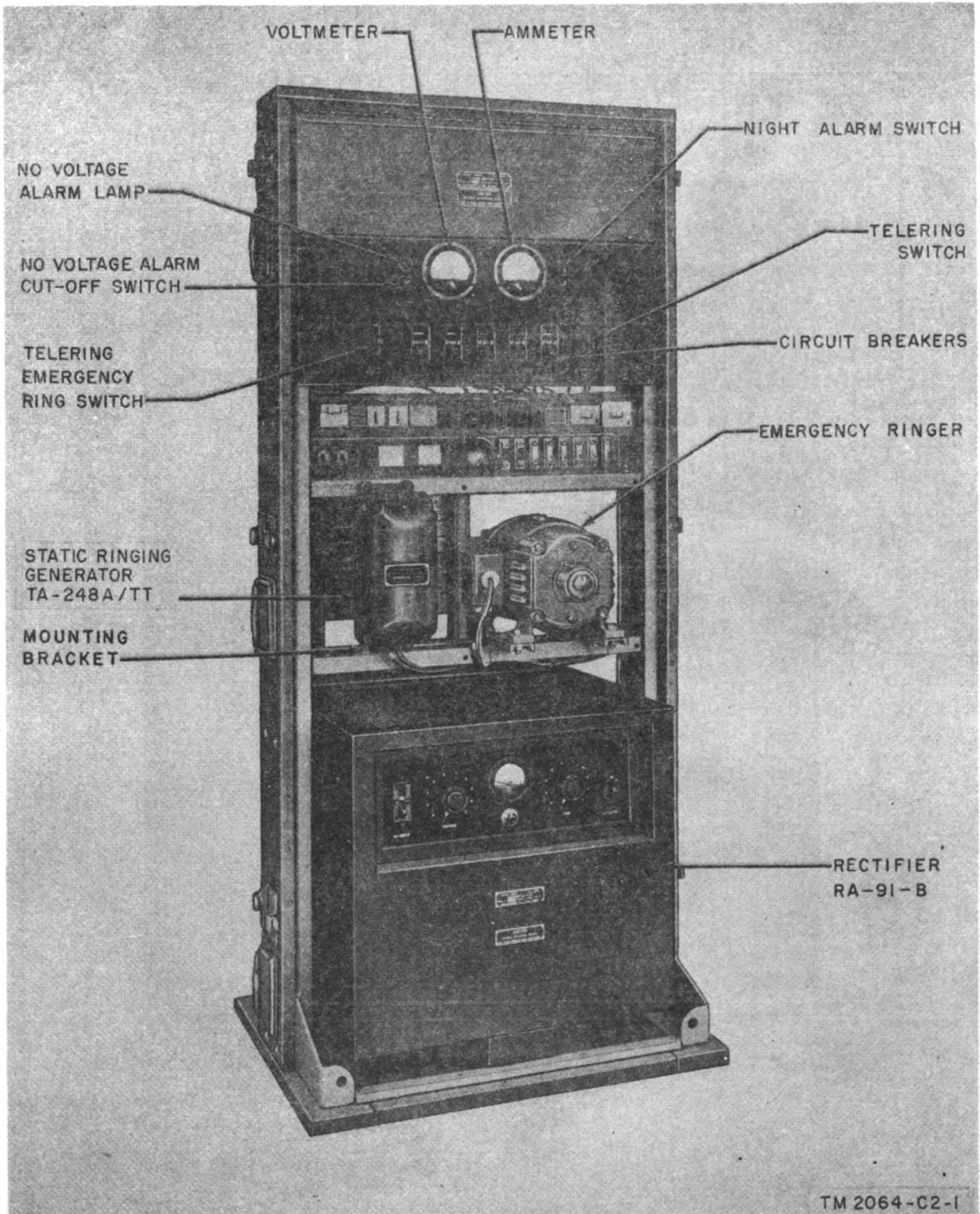


Figure 4.1 (Added) Panel BD-132-A, front view, serial numbers 2599 through 2641.



TM 2064-C2-1

Figure 4.2 (Added) Panel BD-132-A, front view, serial numbers 2642 through 2863.

Figure 8. Telering (Model H) showing location of fuses and incandescent lamp.

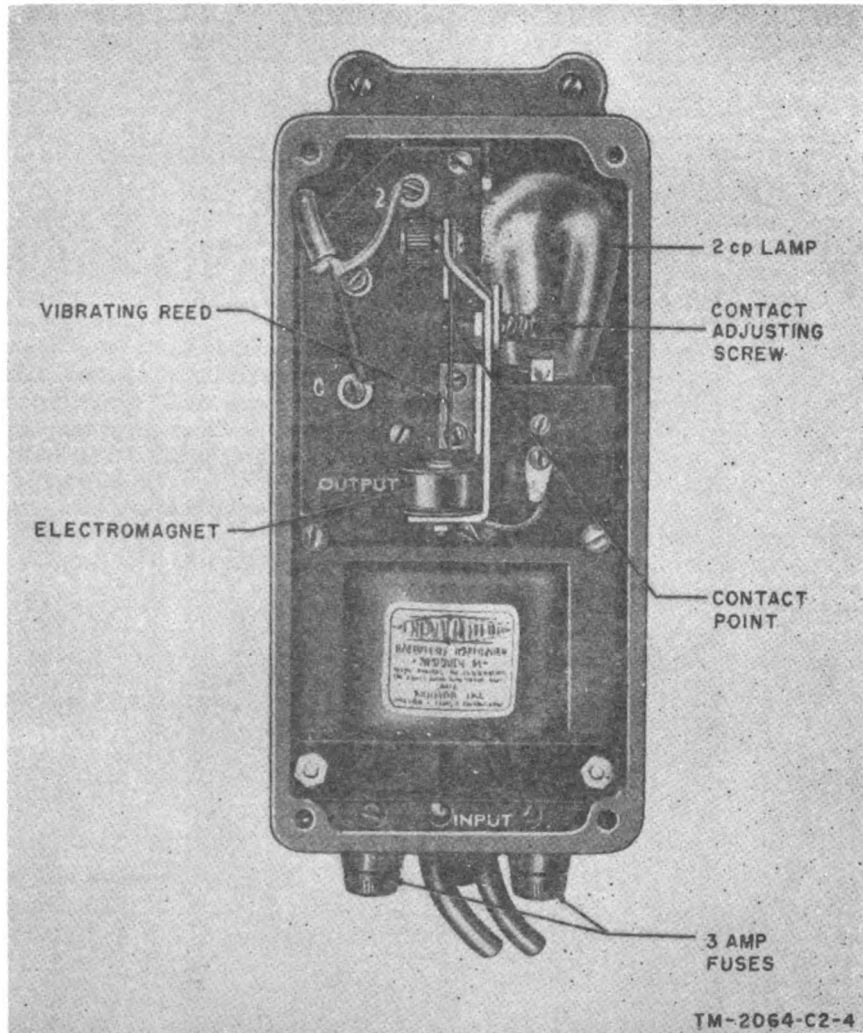
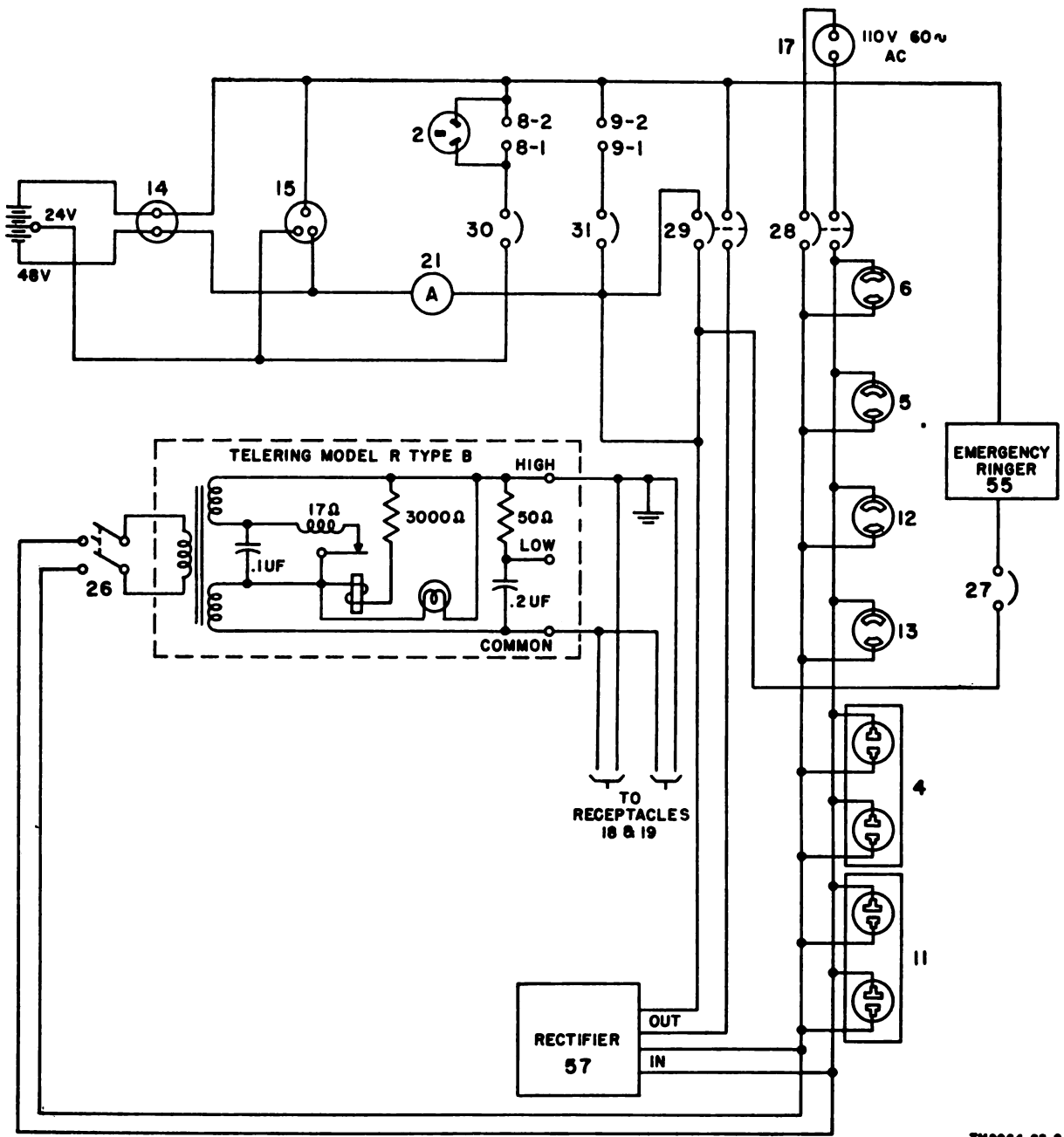


Figure 8.1 (Added) Static Ringing Generator TA-248A/TT, with cover removed.



TM2064-C2-2

Figure 27.1 (Added) Power and ringing supply circuit using Static Ringing Generator TA-248A/TT, schematic diagram

APPENDIX III

IDENTIFICATION TABLE OF PARTS

* * * * *

4. Identification Table of Parts for Static Ringing Generators TA-248/TT and TA-248A/TT (Sig C stock No. 4F2050-248) (Added)

Fig. No.	Name of part and description	Function of part	Signal Corps stock No.
27. 1	CAPACITOR, fixed: paper dielectric; 100,000 $\mu\mu\text{f}$ $\pm 20\%$; 600 vdcw; JAN type CP26A1EF104M.	Spark suppressor.....	3DA100-720
27. 1	CAPACITOR, fixed: paper dielectric; 250,000 $\mu\mu\text{f}$ $\pm 20\%$; 600 vdcw; JAN type CP26A1EF254M.	Voltage and waveshape correction filter.	3DA250-326
8. 1	COIL, RF: choke.....	Filter.....	3C320M
8. 1	CONTACT, vibrator.....	Makes contact to vibrating reed.....	4Z3322
	FUSE, cartridge: 5 amp, 250 v.....	Equipment protection.....	3Z2605
	FUSE, cartridge: 3 amp, 250 v.....	Equipment protection.....	3Z2593.5
	FUSEHOLDER, block type: 30 amp, 250 v.....	Holds two cartridge fuses.....	3Z3282-11-4
	FUSEHOLDER, extractor post type; 15 amp, 125 v.....	Holds one cartridge fuse.....	3Z3285-2
	GROMMET, rubber: fits $\frac{3}{8}$ " and $\frac{1}{2}$ " holes.....	Wire insulation.....	6Z2856-67
8. 1	LAMP, incandescent: screw base, 10 w, 115 v; 2 cp.....	Ballast.....	6Z6815-44
	LAMPHOLDER: medium screw base.....	Holds 2 candle-power lamp.....	6Z8351-2
8. 1	REED, vibrating: for time relay.....	Frequency converter.....	4Z6729-1
27. 1	RESISTOR, fixed: WW; 3,000 ohms $\pm 5\%$	Current limiter.....	3Z6300-236
27. 1	RESISTOR, fixed: WW; 50 ohms $\pm 5\%$	Output reducer.....	3RW16-543
	SPRING, helical compression: cont screw spring of vibrating reed assy.	Adjusts frequency.....	4Z6901-15
	TERMINAL, lug: ring type.....	Connection for motor field winding..	3Z12050-4
	TRANSFORMER, power: $\frac{1}{2}$ amp, 115 v, 60 cyc; plate type; single phase.	Changes current phase.....	2Z9612-359
	WINDING, motor field.....	Excites vibrating reed.....	3H8400-57

[AG 300.7 (15 Sep 53)]

BY ORDER OF THE SECRETARY OF THE ARMY:

M. B. RIDGWAY,
General, United States Army,
Chief of Staff.

OFFICIAL:

WM. E. BERGIN,
Major General, United States Army,
The Adjutant General.

DISTRIBUTION:

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NG: Same as Active Army except one copy to each unit.

Army Reserve: Same as Active Army except one copy to each unit.

For explanation of distribution formula, see SR 310-90-1.

TECHNICAL MANUAL

PANELS BD-132 AND BD-132-A AND POWER SWITCHBOARD SB-361/TT

CHANGES }
No. 3 }

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 7 December 1954

TM 11-2064, 28 July 1949, is changed as follows:

The title of the manual is changed to read: PANELS BD-132 AND BD-132-A AND POWER SWITCHBOARD SB-361/TT.

3. Description of Panel BD-132-A

Note. Panel BD-132-A is * * * Telering, model R, type BG-2), Panel BD-132-A procured on Order No. 11659-Phila-52 is similar to Panel BD-132-A covered in the manual except as indicated in these changes. Power Switchboard SD-361/TT is covered in chapter 5.

5. Description of Components

e. *Emergency Ringer* (fig. 2). A close-up view * * * Telering becomes disabled. The emergency ringer (fig. 9.1) furnished with the BD-132-A (11659-Phila-52 only) is equipped with a terminal box and removable end plates, and it requires no field lubrication.

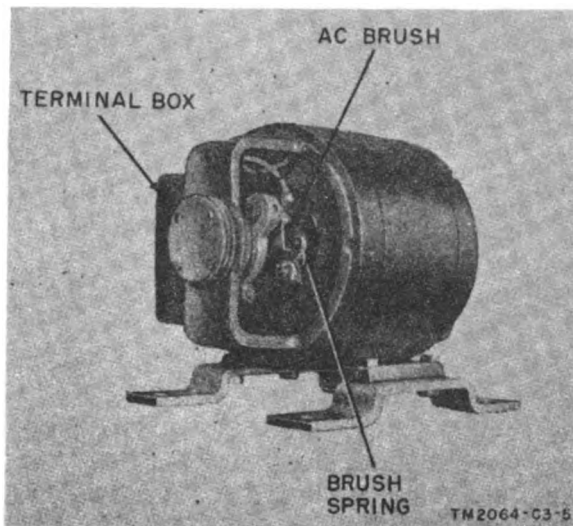


Figure 9.1 (Added) *Emergency ringer for Panel BD-132-A (11659-Phila-52 only), end plate removed.*

9. Service Upon Receipt of New Equipment

a.1. (Added) *Uncrating and Unpacking Panel BD-132-A (11659-Phila-52 only)*. To uncrate and unpack the BD-132-A, proceed as follows:

- (1) Cut the metal straps that bind the shipping crate.
- (2) Use a nail puller to remove the top cover, the sides, and the ends of the crate.
- (3) Tear open the waterproof barrier.
- (4) Remove the corrugated filler.
- (5) Cut the metal straps that bind the panel to the pallet.
- (6) Grasp the component by its handles and lift it off the pallet.
- (7) Place the unit in an upright position and unlatch the front and rear covers.
- (8) Visually inspect the BD-132-A for possible damage incurred during shipment.

16. Preoperating Checks and Adjustments

With all circuit * * * each oil cup. The emergency ringer furnished with the BD-132-A (11659-Phila-52 only) requires no field lubrication.

23. Converter Lubrication

The only component of panel BD-132 requiring periodic lubrication is the converter (emergency ringer) (figs. 23, 26, and 27). The emergency ringer furnished with the BD-132-A (11659-Phila-52 only) requires no field lubrication.

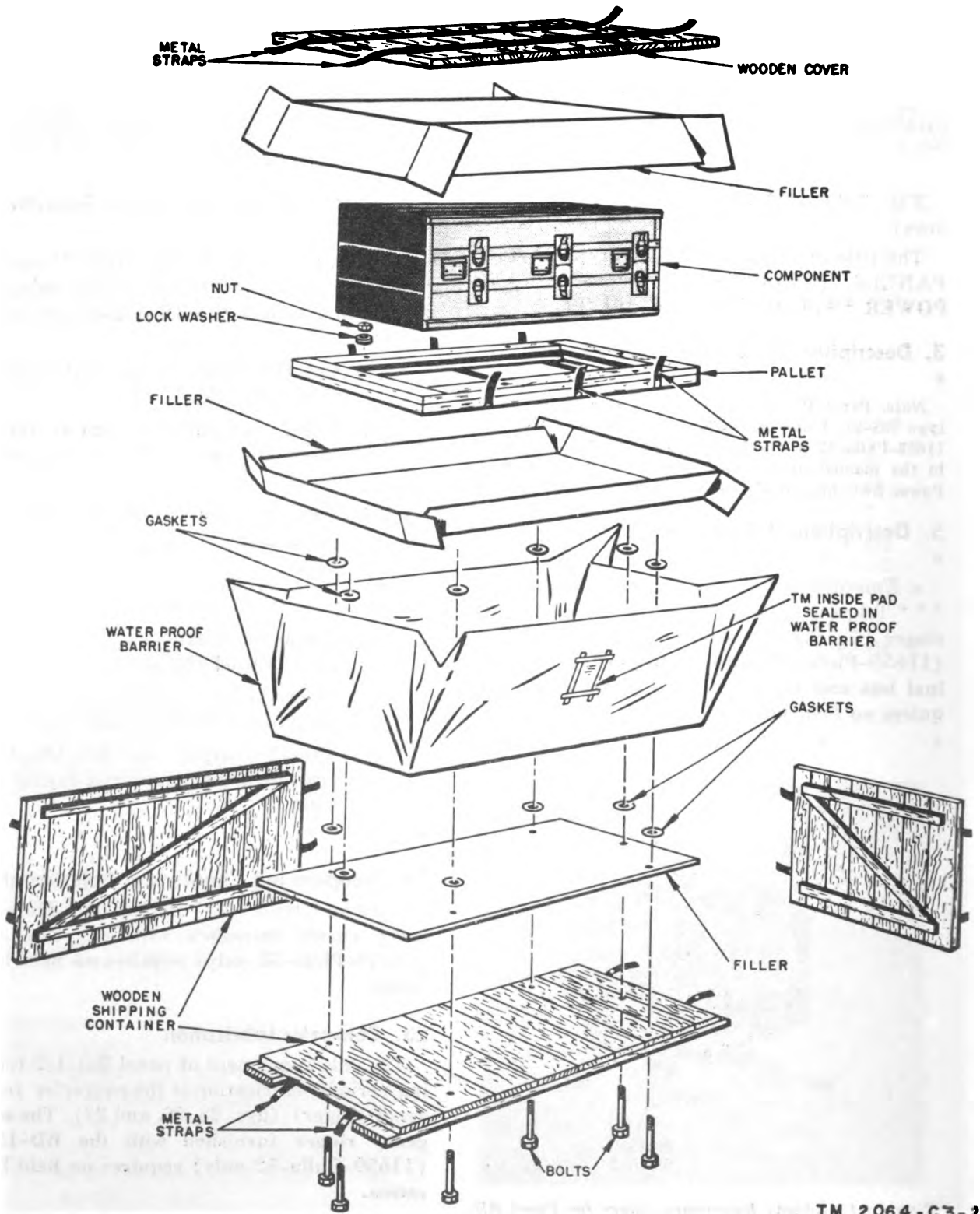


Figure 12.1 (Added) Panel BD-132-A (11659-Phila-52 only), packing and packaging diagram.

24. Weatherproofing Equipment

* * * * *
c. *Dustproofing.* In desert localities * * *
armature shaft ends.

- (1) *Disassembly of emergency ringer.* To clean the * * * frame (fig. 19). To reach the movable parts of the emer-

gency ringer on the BD-132-A (11659-Phila-52 only), remove the end plate screws and the end plate (fig. 18.1). Remove the terminal box plate to check the connections to the emergency ringer (fig. 19.1).

* * * * *

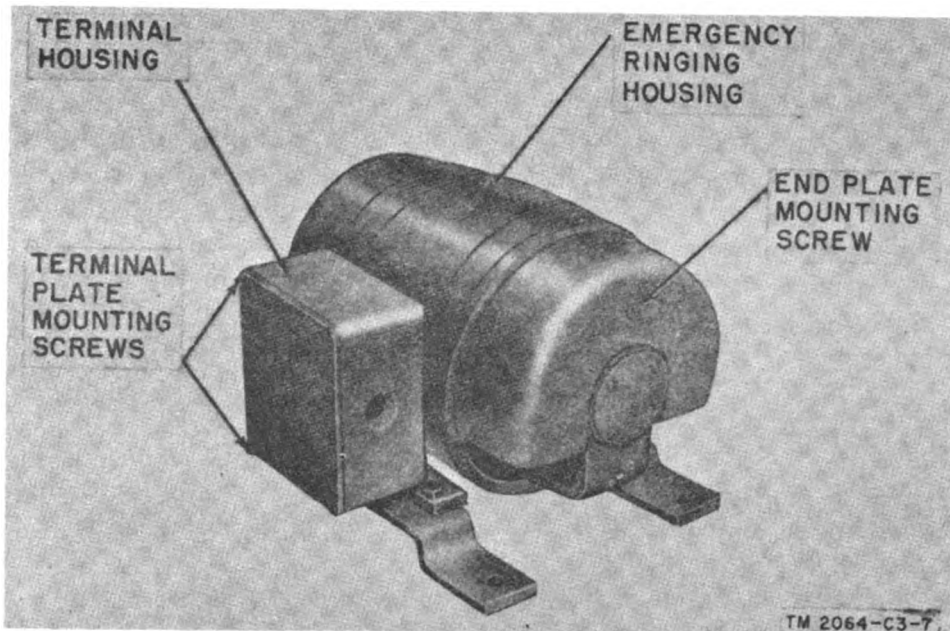


Figure 18.1 (Added) Emergency ringer for Panel BD-132-A (11659-Phila-52 only).

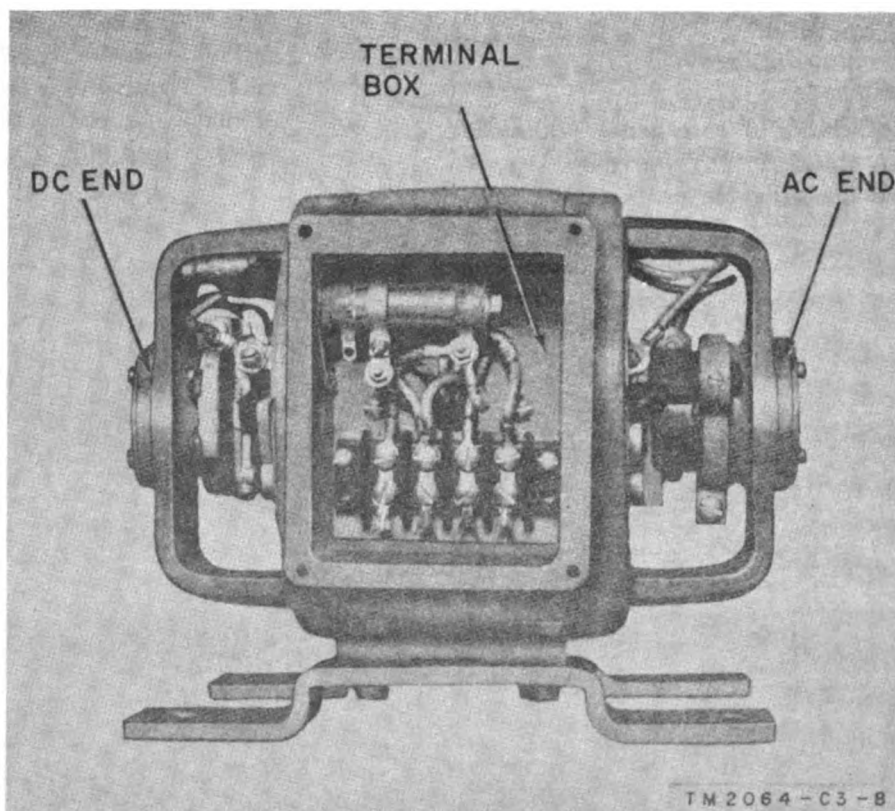


Figure 19.1 (Added) Emergency ringer for Panel BD-132-A (11659-Phila-52 only), movable parts and connections exposed.

Figure 22. Note 2 is rescinded and the following notes are added:

10. REMOVE THE POLARITY SYMBOLS ON APPARATUS 29 AND 30.

11. REVERSE WIRES NUMBERED 15 AND 21 ON THE TOP OF APPARATUS 29.

CHAPTER 5

POWER SWITCHBOARD SB-361/TT

(Added)

Section I. INTRODUCTION

49. General

Power Switchboard SB-361/TT is a transportable power panel similar to Panel BD-132-A except that it is used with equipment requiring a 24-volt battery supply instead of a 48-volt battery supply. The SB-361/TT provides ringing current from either a 60-cycle source or the 24-volt central office battery. A rectifier is mounted in the power panel which is used to keep the central office battery charged. Power

Switchboard SB-361/TT does not include the night alarm, fuse alarm, or no-voltage alarm circuits that are included in Panels BD-132 and BD-132-A.

50. Description

(figs. 29 and 30)

a. Exterior. The SB-361/TT is assembled in a case similar to the case used for the BD-132-A.

b. *Top Panel (Front).* The top panel is a hinged door that covers the wiring side of the receptacles, mounted on the rear panel.

c. *Meter and Switch Panel.* This panel contains a voltmeter, an ammeter, and seven circuit breaker switches. The voltmeter has a range of 0-75 volts and indicates the battery charge. The ammeter measures up to 15 amperes on either side of zero and indicates the flow of current to, or from, the central office battery. The seven circuit breakers are marked to indicate the circuit that they control.

d. *Static Ringing Generator TA-248A/TT.* The TA-248A/TT is mounted in the left center of the panel and is used to convert 110-volt, 60-cycle ac to 20-cycle ringing current.

e. *Emergency Ringer (Rotary Converter).* The emergency ringer (Sig C stock No. 4F1587-A-1) is mounted in the left center of the panel and is used to convert 24-volt dc to 20-cycle ringing current when there is no 60-cycle ac available.

f. *Rectifier RA-91-C.* Rectifier RA-91-C is mounted in the bottom of the case and is used to convert 110-volt, 60-cycle ac to 24-volt dc for battery charging purposes.

g. *Cord Connector Panel.* The cord connector panel, located on the back of the SB-361/TT, is used to mount all of the receptacles that are provided for rapid interconnection of the power panel and other equipment. The receptacles are panel-marked to indicate the associated circuit.

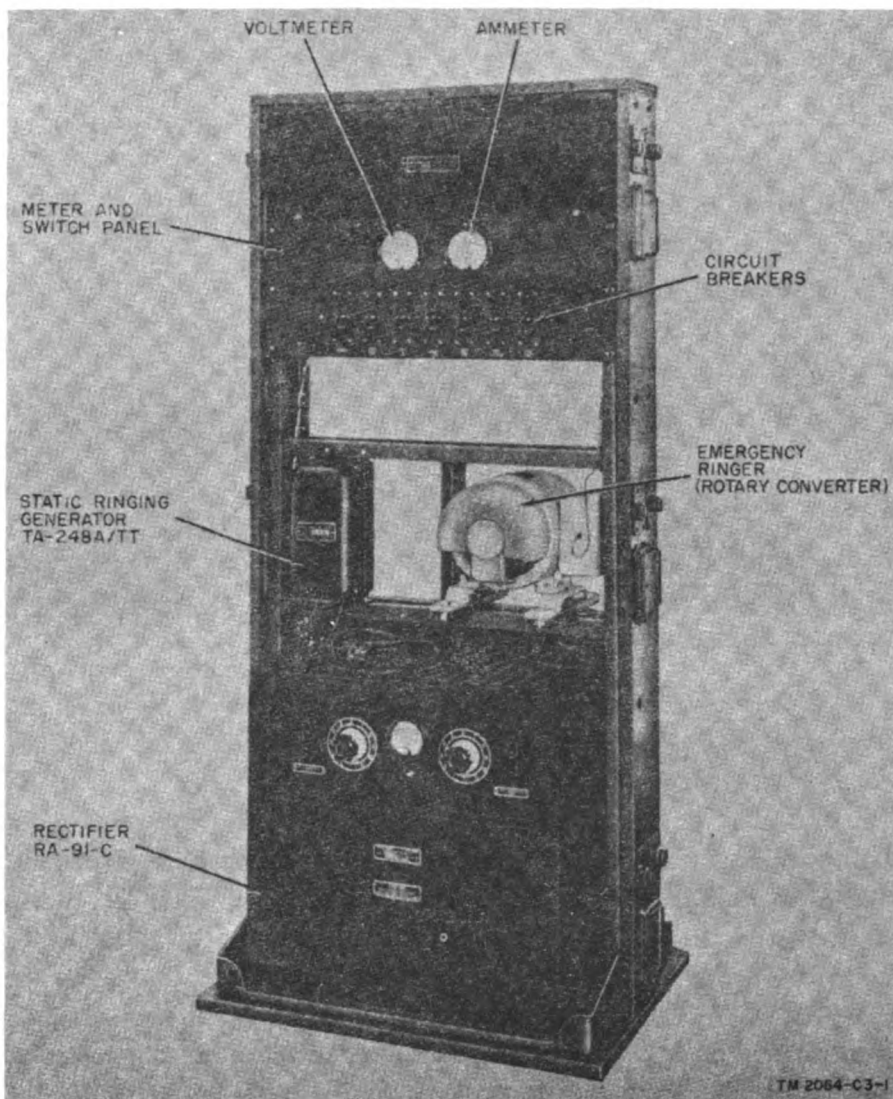


Figure 29 (Added) Power Switchboard SB-361/TT, front view.

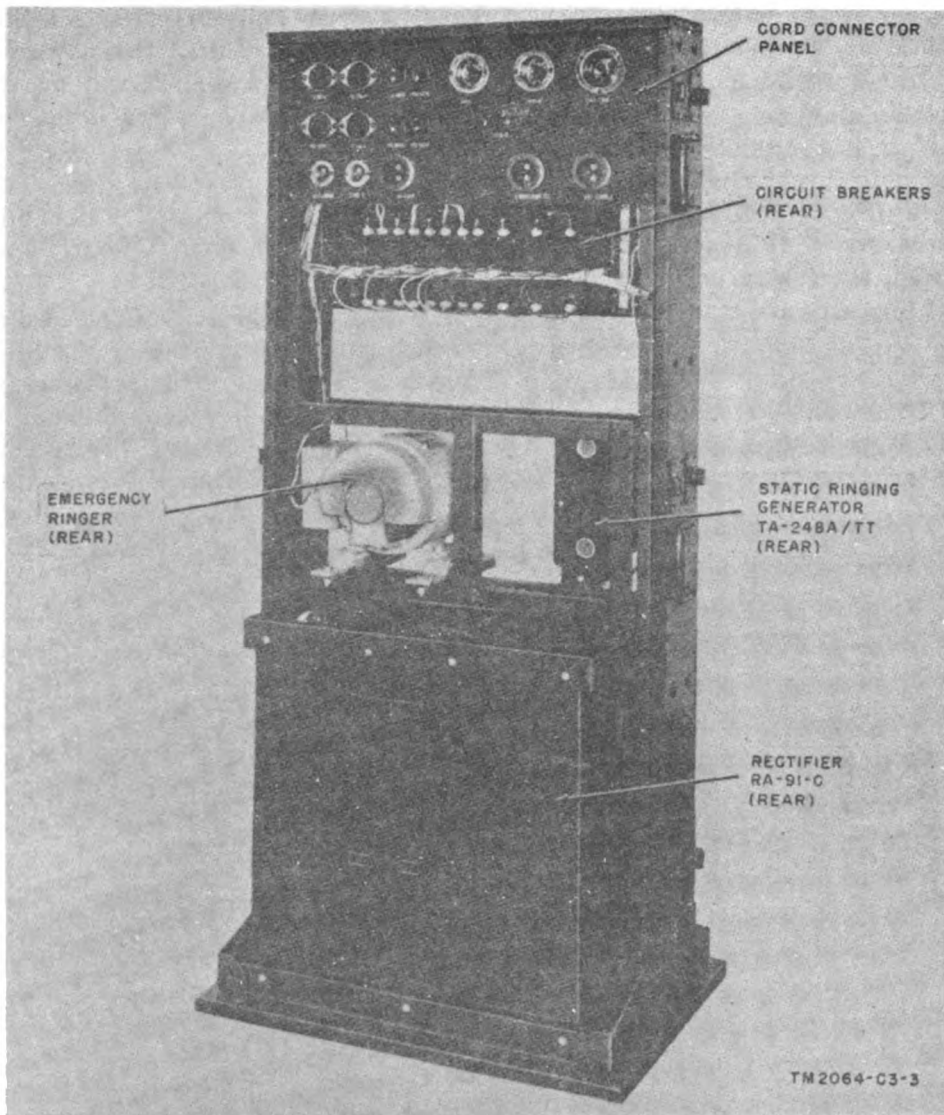


Figure 30 (Added) Power Switchboard SB-361/TT, rear view.

Section II. OPERATION

51. Uncrating and Unpacking Power Switchboard SB-361/TT (fig. 12.1)

Be careful when uncrating and unpacking the equipment to prevent damage. The instructions given in paragraph 9a.1 apply equally to the SB-362/TT. Inspect the equipment, after

completing the unpacking procedure, for damage incurred during shipment.

52. Controls and Instruments (fig. 31)

a. The table below lists the controls and instruments mounted on the meter and switch panel and indicates their functions.

Control or instrument	Rating	Function
EMG R circuit breaker-----	15 amp	Connects central office battery to the emergency ringer.
24V A & B circuit breaker-----	15 amp	Connects 24 volts dc to output receptacles A and B.
24V C circuit breaker-----	15 amp	Connects 24 volts dc to output receptacle C.
MAIN circuit breaker-----	15 amp	Connects 24-volt central office battery to the bus bars on the power panel.
110V 1 & 2 circuit breaker-----	15 amp	Connects 110 volts ac to output receptacles 100V #1 and #2.
110V 3, 4, 5, and 6 circuit breaker-----	15 amp	Connects 110 volts ac to output receptacles #3, #4, #5, and #6.
110V 7 and 8 circuit breaker-----	15 amp	Connects 110 volts ac to output receptacles #7 and #8.
Voltmeter-----	0-75 v	Indicates the voltage of the central office battery.
Ammeter-----	15-0-15 amp	Indicates the current drain from the central office battery (discharge) or the current supplied to the battery (charge).

b. For a detailed description of the controls and instruments on Rectifier RA-91-C, refer to TM 11-964A.

53. Connections (fig. 32)

Connections to Power Switchboard SB-361/TT may vary for different installations. Figure 32 shows the connections required for use in manual Telephone Central Office AN/TTC-10. For additional information, refer to chapter 2.

54. Operating Instructions

The method of operation depends on the requirements of the installation. Check the power facilities available, the connections to the SB-361/TT, and operate the switches required to furnish the required power to the central office. For additional information, refer to chapter 2.

55. Organizational Maintenance

The organizational maintenance for the SB-361/TT is the same as the organizational maintenance for the BD-132-A. For detailed information, refer to chapter 3.

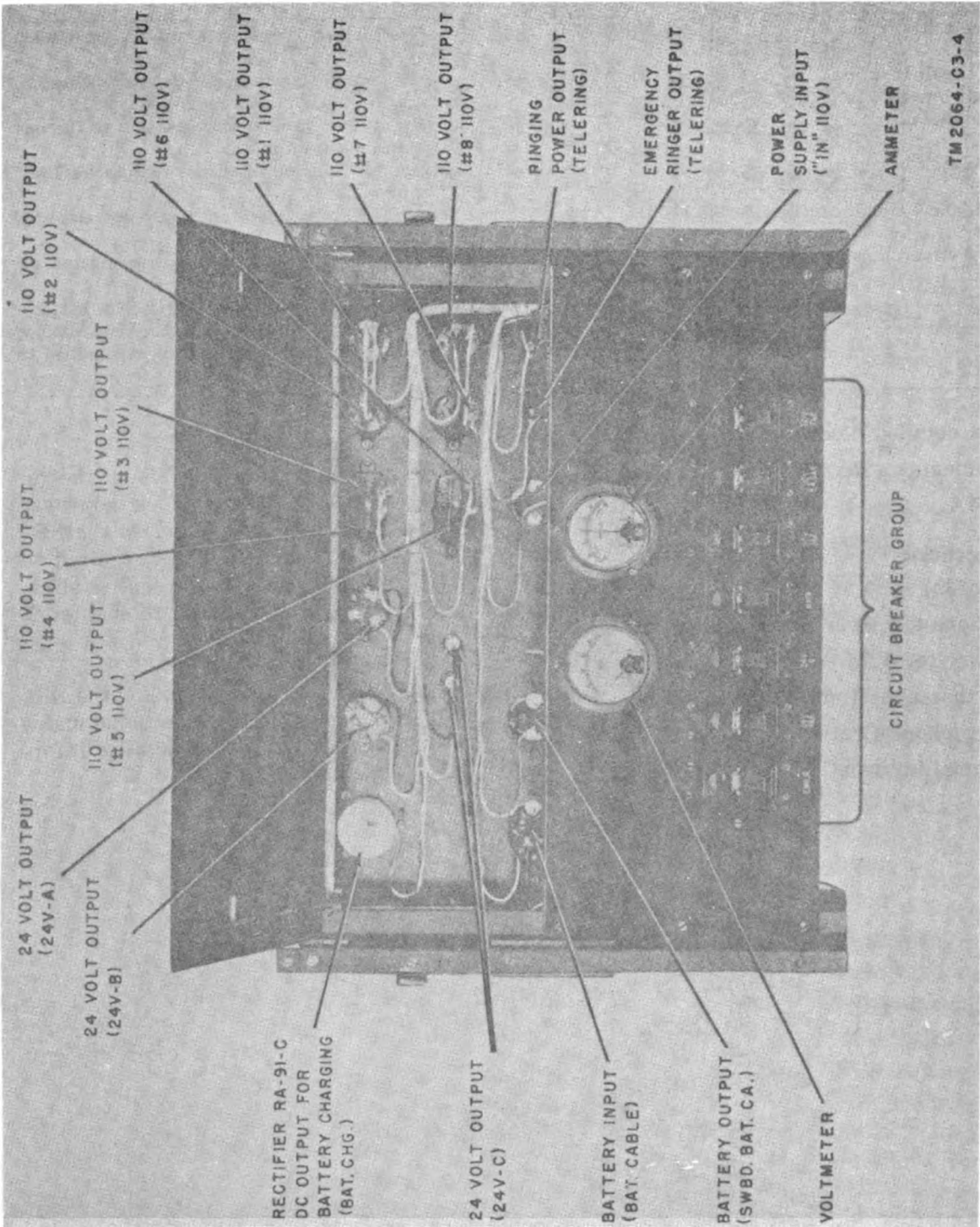


Figure 31 (Added) Meter and switch panel, front view, and wiring side of cord connector panel.

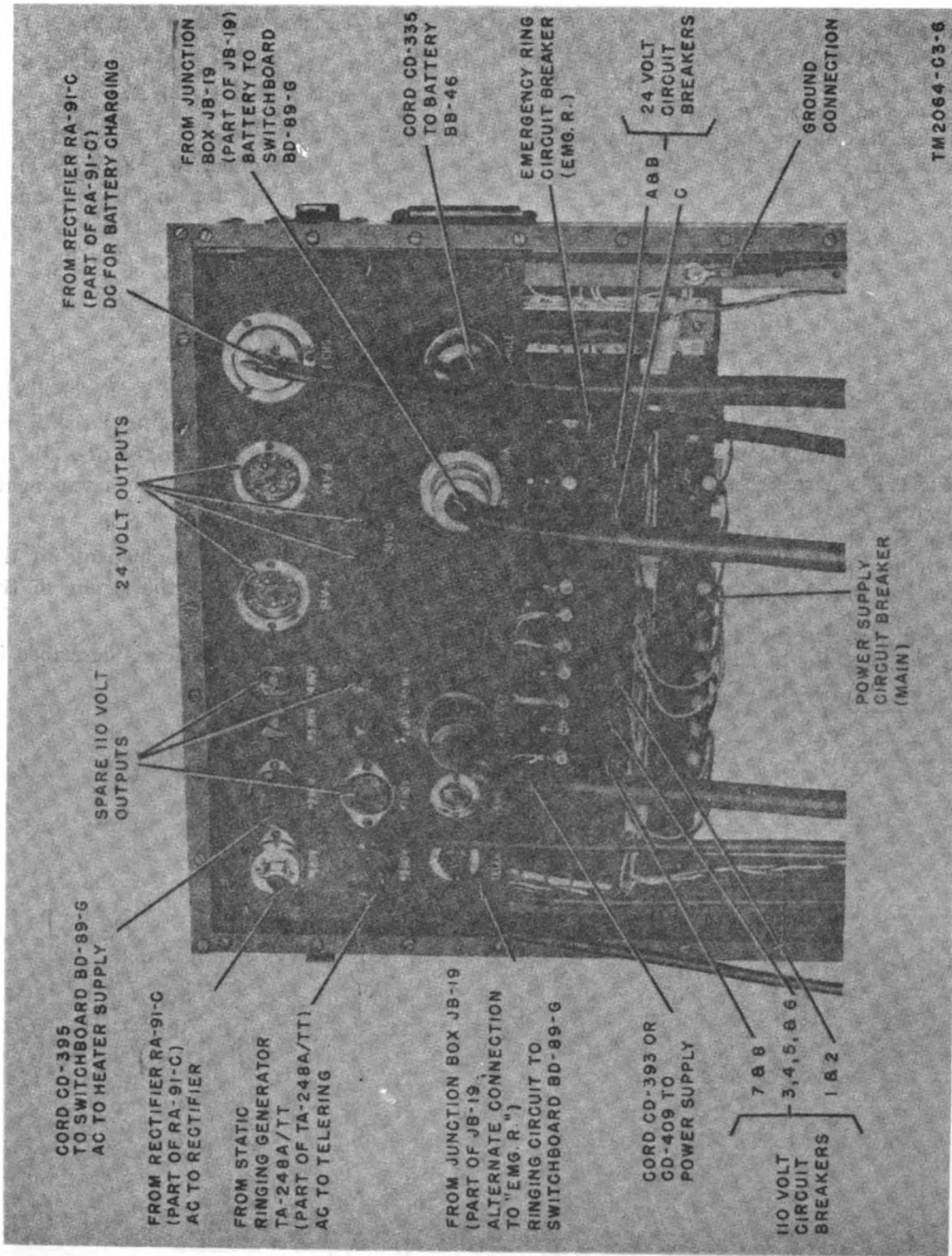


Figure 32 (Added) Connections to cord connector panel and wiring side of meter and switch panel.

Section III. THEORY

56. General

Power Switchboard SB-361/TT is used to control and distribute power and ringing current that is required for the operation of a tactical central office. It protects the equipment to which it is connected and the operating personnel.

57. Theory of Components

a. The theory of the components, except Rec-

tifier RA-91-C, is explained in chapter 4.

b. The theory of operation for Rectifier RA-91-C is explained in TM 11-964A.

c. The theory of operation for the emergency ringer (Signal Corps stock No. 4F1587A-1) is the same as the theory for the 48-volt emergency ringer except that 24 volts are used to operate the equipment instead of 48 volts.

Section IV. TROUBLESHOOTING AND REPAIR

58. General

Troubles in the equipment may occur through extensive use or through rough handling during field use. When these faults occur, the repairman must locate and repair them as soon as possible. Use the schematic diagram (fig. 33) and the wiring diagrams (figs. 34 and 35) as an aid in locating trouble in the SB-361/TT.

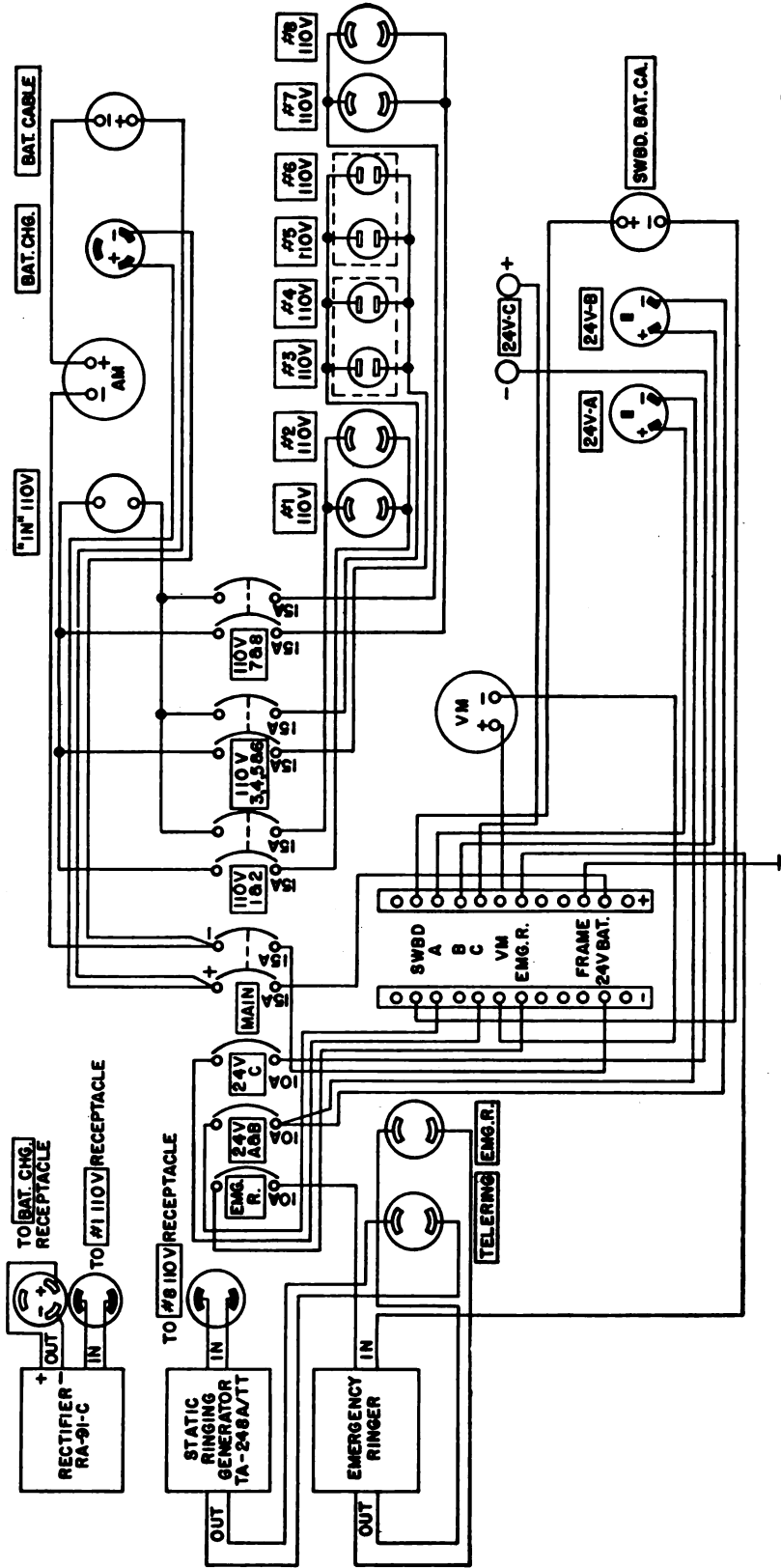
59. General Repair Procedures and Precautions

Repair of the SB-361/TT should be per-

formed by competent personnel who have the necessary tools, test instruments, and skill. Be careful when replacing parts in the SB-361/TT to prevent additional damage to the components or the wiring.

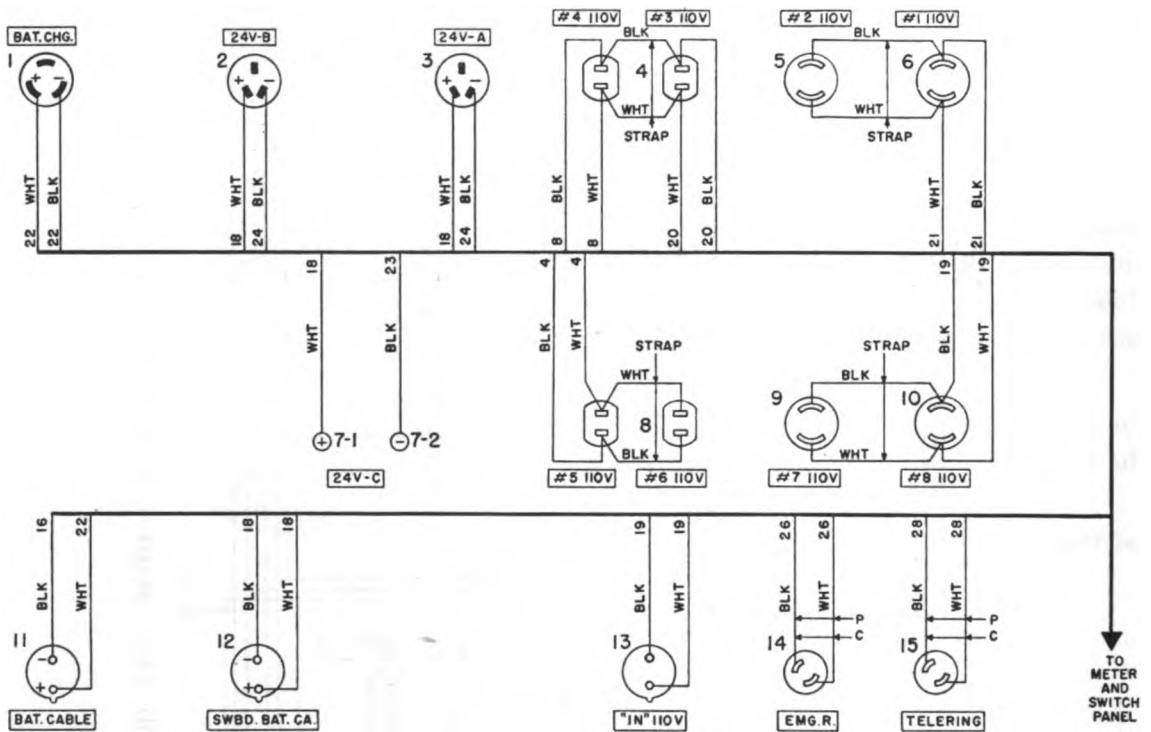
a. The repair of all the components of the SB-361/TT is the same as the repair of the BD-132-A (ch. 4).

b. The repair of the rectifier is described in TM 11-964A.



TM 2064-G3-9

Figure 33 (Added) Power Switchboard SB-361/TT, schematic diagram.



NOTES

1. ALL WIRES ARE NO. 14 AWG.
2. "P" DENOTES PAIR.
3. "C" WIRING IS SEPARATE WIRE SEWED TO OUTSIDE OF REGULAR FORM.

TM 2064-C3-10

Figure 34 (Added) Power Switchboard SB-361/TT, cord connector panel, wiring diagram.

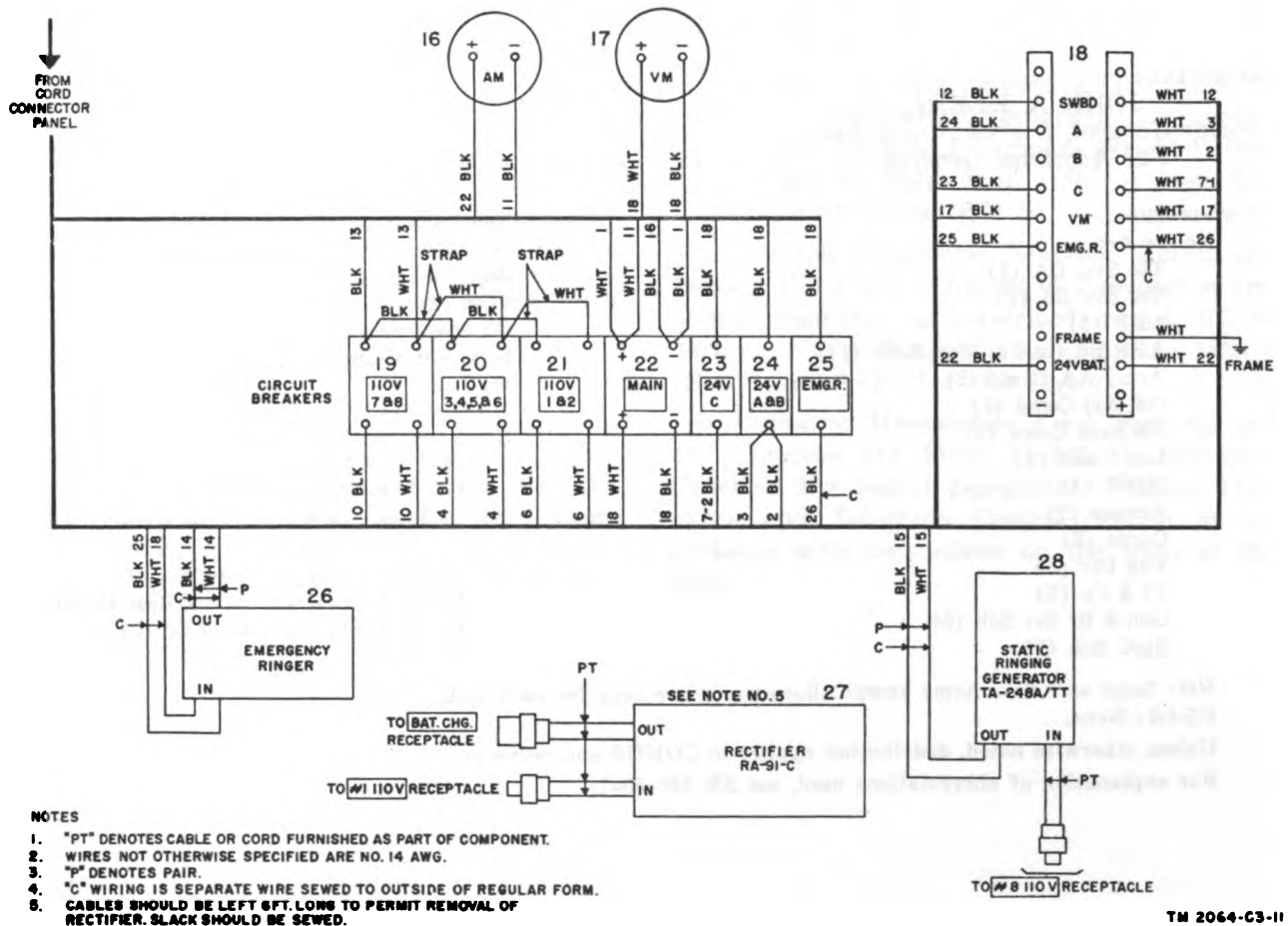


Figure 35 (Added) Power Switchboard SB-361/TT, meter and switch panel, wiring diagram.

IDENTIFICATION TABLE OF PARTS
APPENDIX III.

(Rescinded.)

[AG 300.7 (8 Nov 54)]

BY ORDER OF THE SECRETARY OF THE ARMY:

M. B. RIDGWAY,
General, United States Army,
Chief of Staff.

OFFICIAL:

JOHN A. KLEIN,
Major General, United States Army,
The Adjutant General.

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Corps (2)
Tng Div (2)
Ft & Cp (2)
Gen & Br Svc Sch (5)
SigC Sch (25)

Gen Depots (2)
SigC Sec, Gen Depots (10)
SigC Depots (20)
POE (2)
OS Sup Agencies (2)
SigC Fld Maint Shops (3)
SigC Lab (5)
Mil Dist (1)
Units organized under following TOE:
11-127, Sig Rep Co (2)
11-128A, Sig Depot Co (2)
11-500A (AA thru AE), Sig Admin
Teams (2)
11-587A, Sig Base Maint Co. (2)
11-592A, Hq & Hq Co, Sig Base Depot (2)
11-597A, Sig Base Depot Co (2)

NG: Same as Active Army except allowance is one copy for each unit.

USAR: None.

Unless otherwise noted, distribution applies to CONUS and overseas.

For explanation of abbreviations used, see SR 320-50-1.

TECHNICAL MANUAL

PANELS BD-132, BD-132-A, AND POWER SWITCHBOARD SB-361/TT

TM 11-2064 }
CHANGES NO. 4 }

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 20 February 1958

TM 11-2064, 28 July 1949, is changed as indicated so that the manual also applies to the following equipment:

Nomenclature	Order No.	Serial No.
Panel BD-132-A	52218-Phila-57	1 through 47

Page 1, chapter 1. Add the following note below the title of chapter 1.

Note. Panel BD-132-A (Order No. 52218-Phila-57) is similar to Panels BD-132-A, Orders No. 6586-Phila-51 (Serial No. 2642 through 2863) and No. 11659-Phila-52. Information in this manual applies equally to all Panels BD-132-A unless otherwise specified in chapter 6.

Page 1. Delete paragraph 2 and substitute:

2. Forms and Records

a. Unsatisfactory Equipment Reports.

- (1) Fill out and forward DA Form 468, (Unsatisfactory Equipment Report) to Commanding Officer, U. S. Army Signal Equipment Support Agency, Fort Mon-

mouth, N. J., as prescribed in AR 700-38.

- (2) Fill out and forward AFTO Form 29 (Unsatisfactory Report) to Commander, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, as prescribed in AF TO 00-35D-54.

b. *Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army); Navy Shipping Guide, Article 1850-4 (Navy); and AFR 71-4 (Air Force).

c. *Preventive Maintenance Form* (figs. 43 and 44). Prepare DA Form 11-242 (Maintenance Checklist For Signal Equipment, Manual Telephone and Telegraph Central Offices) in accordance with instructions on the front of the form.

CHAPTER 6

PANEL BD-132-A (ORDER NO. 52218-PHILA-57)

(Added)

Section I. DESCRIPTION AND DATA

60. General

The functional relationship between Panel BD-132-A and its associated equipments, when used with a telephone central office such as Manual Telephone Central Office AN TTC-7, is illustrated in figure 36.

a. The input voltage of the BD-132 A may be supplied by any 110- or 220-volt, 60-cycle, single-phase, 1650 watt or greater power source. When a 220-volt power source is used, Transformer TF-11 steps the 220 volts down to 110 volts. A power unit, such as Power Unit PE 75 (), is used as an emergency source of power when the BD-132 A is used with a telephone central office.

b. The BD-132 A distributes power and ringing current to the positional units of a telephone central office. It also furnishes charging current for the central office battery.

c. The BD-132 A contains night alarm and fuse alarm equipment which can be connected to a telephone central office when necessary.

d. Official nomenclature followed by parentheses with no number or symbol in the parentheses is used to indicate all models of the equipment.

Thus, Power Unit PE-75-() refers to every model of Power Unit PE 75.

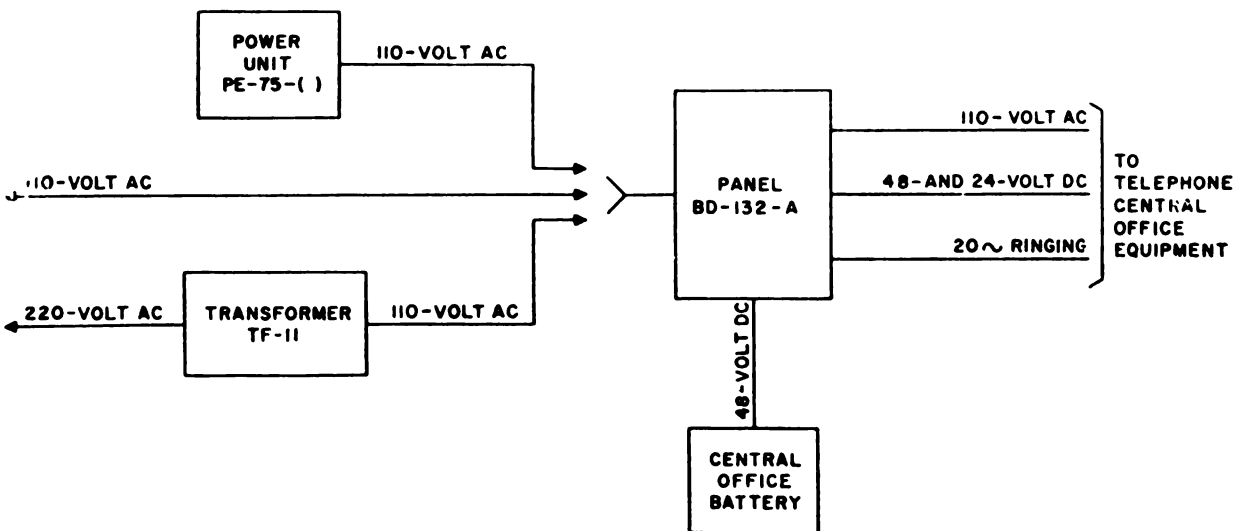
61. Technical Characteristics

a. Static Ringing Generator TA 248A TT (Telering).

Type	Vibrating reed.
Input	110 to 115 volts ac, 60 cps.
Output	90 to 107 volts ac, 20 cps.
Power output	30 watts, at 90 volts.

b. Machine Ringing Generator (Emergency Ringer).

Type	Rotary converter.
Motor speed	1,110 to 1,355 rpm.
Input:	
Voltage	44 to 56 volts dc.
Current	.72 to 1.3 amperes.
Output:	
Voltage:	
No load	79 to 102 volts ac, 20 cps.
Full load	67 to 86 volts ac, 20 cps.
Current, full load	.204 to .275 amperes.
Power	15 watts.
Efficiency	85 to 99 percent.



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Figure 36. Input and output circuits of Panel BD-132-A (Order No. 52218)-Phila-57, block diagram.

62. Table of Components

The following chart lists the components of Panel BD-132-A (Order No. 52218-Phila-57).

Quantity	Item	Height (in.)	Depth (in.)	Width (in.)	Unit weight (lb)
1	Rectifier RA-91-C.....	21¼	12	19½	100
1	Static Ringing Generator TA-248A/TT.	10	4¼	4¼	7½
1	Meter and switch panel..				
1	Cord connector panel....				
1	Alarm mounting plate....				
1	Fuse mounting plate.....				
1	Retardation coil A.....				
1	Machine ringing generator				
1 set	Running spares consisting of:				
	1 Lamp 10 w, 115 volts				
	3 Fuses, 3 amp.....				
	12 Fuses, indicator alarm 1¼ amp.				
	1 Lamp C2, 36 volts..				
Total	Assembled BD-132-A (Order No. 52218-Phila-57).	58½	28	26	625

63. Description, Panel BD-132-A (Order No. 52218-Phila-57)

Panel BD-132-A (Order No. 52218-Phila-57) is similar in appearance to Panel BD-132-A (Order No. 6586-Phila-51), serial numbers 2599 through 2641 (par. 5d.2, page 1 of C 2). On Panel BD-132-A (Order No. 52218-Phila-57), Rectifier RA-91-C is used instead of Rectifier RA-91-B and different types of machine ringing generator (emergency ringer), voltmeter, and ammeter are used.

Section II. OPERATION

Notes. Connections to Panel BD-132-A (Order No. 52218-Phila-57) are given in paragraph 15 and TM 11-2146.

66. Controls and Instruments

a. Meter and Switch Panel (fig. 87).

Controls	Function
Ammeter.....	15-0-15 ampere scale dc: indicates total current supplied to or taken from 48-volt battery.

64. Additional Equipment Required

The chart below lists the equipment required for operation, but not supplied as part of Panel BD-132-A (Order No. 52218-Phila-57).

Quantity	Equipment	Function
4	Batteries, 12-volt (BB-46 or equivalent).	Used to supply 24 and 48 volts dc for operation of central office.
1	Transformer TF-11...	Used to step down 220 volts ac to 110 volts ac when 110-volt ac source is not available.
1	Cord Plug CD-393...	Used to connect 110-volt ac power source to Panel BD-132-A or 220-volt ac power source to Transformer TF-11.
1	Cord Plug CD-409...	Used to connect Transformer TF-11 to Panel BD-132-A.
1	Cord Plug CD-784...	Used to connect batteries to power panel.
1	Power Unit PE-75-().	Used as emergency power supply for a telephone central office.

65. Capacity of Panel BD-132-A

Because Rectifier RA-91-C can only supply 12 amperes of current and because of the output imitations of the batteries and the ringing supply, Panel BD-132-A is recommended for use with only a single, complete, three-position, manual telephone central office set, such as Manual Telephone Central Office AN/TTC-7 (TM 11-2146). During heavy traffic, the current requirements of each switchboard position may exceed 3 amperes. If peak traffic loads do not exceed 12 amperes for long periods of time, six switchboard positions and their associated equipments may be connected to Panel BD-132-A.

Controls	Function
Voltmeter.....	0-75 volt scale dc: indicates total voltage supplied to equipment.
110V circuit breaker.....	Magnetic, two-position, 15 ampere: ON position—provides overload protection to 110-volt ac supply source.

Controls	Function
48V circuit breaker	<p>OFF position—disconnects 110-volt ac supply from panel.</p> <p>Magnetic, two-position, 15 ampere:</p> <p>ON position—provides overload protection and extends negative battery to bus bar of panel.</p> <p>OFF position—disconnects negative battery from bus bar of panel.</p>
24V and BIND POST 48V circuit breakers.	<p>Magnetic, two-position, 10 ampere:</p> <p>ON position—provides overload protection and extends negative battery to connected equipment.</p> <p>OFF position—disconnects negative battery from connected equipment.</p>
EMERGENCY RING circuit breaker.	<p>Magnetic, two-position, 10 ampere:</p> <p>ON position—provides overload protection and connects negative battery to emergency ringer.</p> <p>OFF position—disconnects negative battery from emergency ringer.</p>
TELERING switch	<p>Two-position, toggle switch:</p> <p>ON position—connects 110 volts ac to telering.</p> <p>OFF position—disconnects 110 volts ac from telering.</p>
TELERING-EMERGENCY RING switch.	<p>Three-position, toggle switch:</p> <p>TELERING position, connects output (20-cps ringing current) of telering to equipment and negative battery to no-voltage alarm circuit.</p> <p>EMERGENCY RING, position connects output (20-cps ringing current) of emergency ringer to equipment and negative battery to no-voltage alarm circuit.</p> <p>Middle position, disconnects both telering and emergency ringer output to equipment and negative battery from no-voltage alarm circuit.</p>
NIGHT ALARM switch	<p>Two position, locking, lever switch:</p> <p>ON position—provides audible alarm when incoming call is extended to switchboards.</p>

Control	Function
NO VOLTAGE ALARM switch.	<p>OFF position disconnects audible alarm when incoming call is extended from switchboards.</p> <p>Nonlocking, push-button type switch.</p> <p>When operated—no voltage alarm buzzer stops buzzing.</p>
NO VOLTAGE ALARM lamp.	<p>Red opal lens:</p> <p>When lighted, indicates low ringing voltage condition.</p>

b. Rectifier RA-91-C Control Panel (fig. 38).

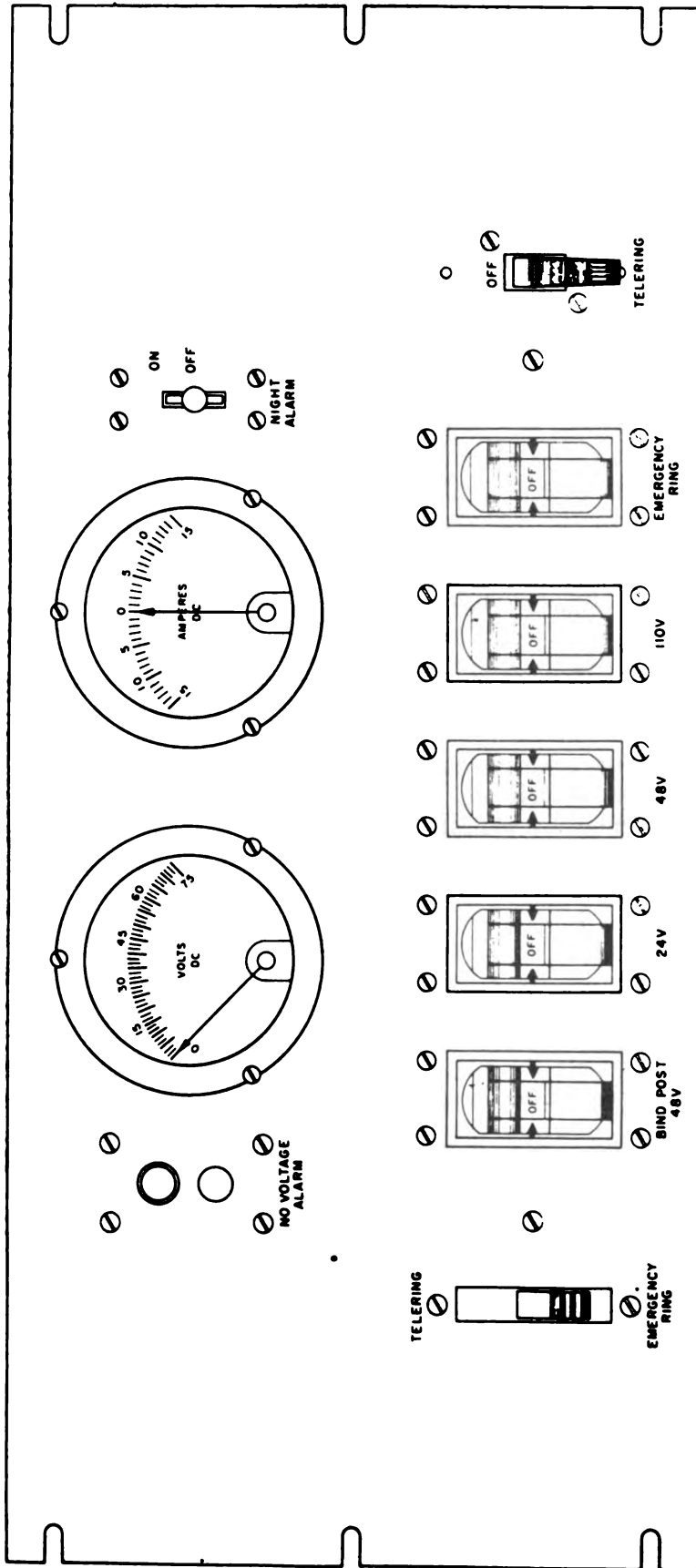
Control	Function
AMMETER	15-0-15 ampere scale dc; indicates charger current output.
AC-INPUT circuit breaker	<p>Magnetic, two-position, 6.5 ampere:</p> <p>ON position provides overload protection and connects 110 volts ac to input of Rectifier RA-91-C.</p> <p>OFF position disconnects 110 volts ac from input of Rectifier RA-91-C.</p>
DC-OUTPUT circuit breaker.	<p>Magnetic, two-position, 20 ampere:</p> <p>ON position provides overload protection and extends negative battery to load.</p> <p>OFF position disconnects output from load.</p>
PILOT LAMP	Red opal; indicates 110 volts ac is supplied to input of Rectifier RA-91-C.
COARSE adjustment	Rotary selector switch; adjusts input voltage (from secondary) in 12-volt (approximately) steps.
FINE adjustment	Rotary selector switch; adjusts input voltage (from secondary) in 1-volt (approximately) steps.

67. Operation, Panel BD-132-A (Order No. 52218-Phile-57)

After the connections have been made, operate the BD-132-A as described below.

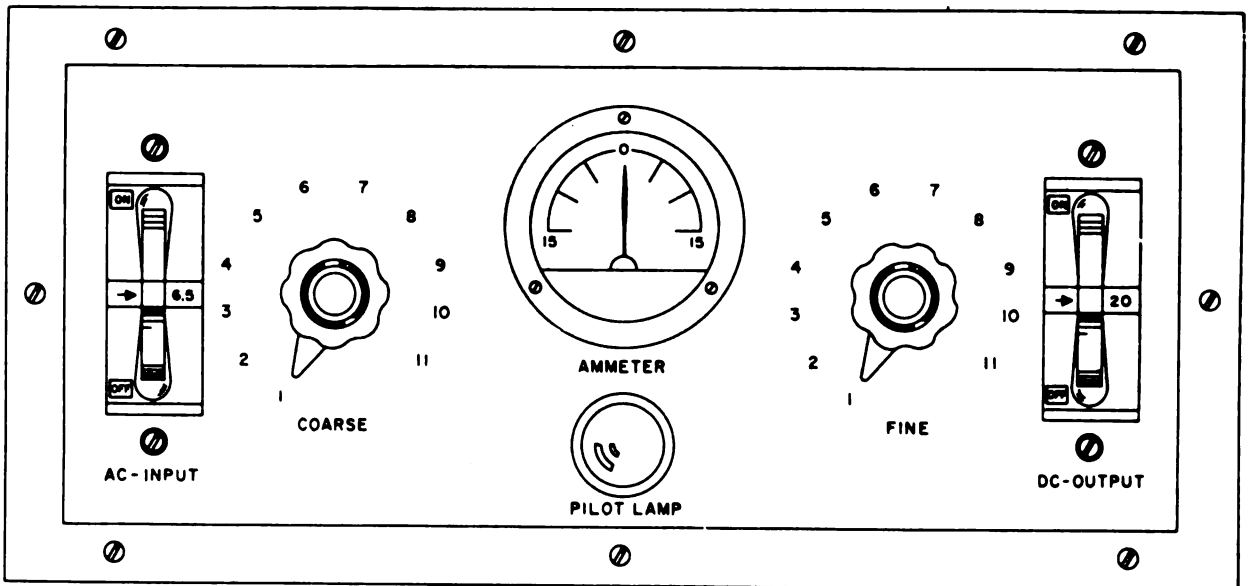
a. Starting Procedure (Normal Operation).

- (1) Operate the 110V circuit breaker on the meter and switch panel (fig. 37) to the ON position.



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Figure 37. Panel BI-152-A (Order No. 52218-Philo-57) controls and instruments, meter, and switch panel.



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Figure 38. Rectifier RA-91-C, control panel.

- (2) Operate the 48V circuit breaker on the meter and switch panel to the ON position.
 - (a) The meter needle of the voltmeter indicates between 44 and 56 volts dc.
 - (b) The needle of the ammeter indicates the discharge current.
- (3) Operate the AC-INPUT circuit breaker on the rectifier control panel (fig. 38) to the ON position. The pilot lamp lights.
- (4) Operate the DC-OUTPUT circuit breaker on the rectifier control panel to the ON position. Regulate the output of the rectifier as described in paragraph 68.
- (5) Operate the TELERING switch on the meter and switch panel (fig. 37) to the ON position. A buzzing sound is heard from the telering.
- (6) Operate the TELERING-EMERGENCY RING switch on the meter and switch panel to the TELERING position.
- (7) Operate the BIND POST 48V circuit breaker on the meter and switch panel to the ON position.
- (8) If 24 volts dc is to be used as an auxiliary or test source, operate the 24V circuit breaker on the meter and switch panel to the ON position.
- (9) Operate the NIGHT ALARM switch on the meter and switch panel to the ON position if audible night indications are desired.
 - b. *Changeover Procedure When Ac Input Source Fails.*
 - (1) *Indications.* When the ac input source fails.
 - (a) The PILOT LAMP on the rectifier control panel (fig. 38) goes out.
 - (b) The meter needle of the AMMETER on the rectifier control panel returns to 0.
 - (c) The telering stops buzzing.
 - (d) The meter needle of the voltmeter on the meter and switch panel (fig. 37) indicates the battery voltage (approximately 50 volts dc).
 - (e) The NO VOLTAGE ALARM lamp on the meter and switch panel lights.
 - (f) The no voltage alarm (C buzzer) on the alarm relay and buzzer mounting plate (fig. 3) sounds.
 - (2) *Procedures.*
 - (a) Momentarily push and release the NO VOLTAGE ALARM switch. The no voltage alarm stops sounding and the NO VOLTAGE ALARM lamp remains lighted.

- (b) Operate the 110V circuit breaker on the meter and switch panel to the OFF position.
- (c) Operate the TELERING switch on the meter and switch panel to the OFF position.
- (d) Operate the TELERING-EMERGENCY RING switch on the meter and switch panel to the EMERGENCY RING position.
- (e) Operate the EMERGENCY RING circuit breaker on the meter and switch panel to the ON position. The emergency ringer operates and the NO VOLTAGE ALARM lamp goes out.
- (f) Disconnect the ac input cord (Cord Plug CO-393) from the ac outlet which supplies the operating power.
- (g) Connect Cord CD-393 between Power Unit PE-75-() and the IN 110V. receptacle on the cord connector panel of the power panel.
- (h) Start the PE 75 () as described in TM 11-900.
- (i) Operate the 110V circuit breaker on the meter and switch panel (fig. 37) to the ON position; the following occurs:
 1. The pilot lamp on the rectifier control panel (fig. 38) lights.
 2. The meter needle of the ammeter on the rectifier control panel indicates the charging current.
 3. The meter needle of the voltmeter on the meter and switch panel (fig. 37) indicates approximately 50 volts.
- (j) Operate the TELERING switch on the meter and switch panel to the ON position. The telering starts buzzing.
- (k) Operate the TELERING-EMERGENCY RING switch on the meter and switch panel to the TELERING position.
- (l) Operate the EMERGENCY RING circuit breaker on the meter and switch panel to the OFF position. The emergency ringer stops.

c. Stopping Procedure (Shut Down). To shut down Panel BD-132 A completely, proceed as follows:

- (1) Operate circuit breakers (BIND POST 48V, 110V, 48V, 24V, and EMER-

GENCY RING) on the meter and switch panel (fig. 37) to their OFF position.

- (2) Operate the AC-INPUT and DC-OUTPUT switches on the rectifier control panel (fig. 38) to their OFF position.

68. Regulating Battery Charge

a. General. Rectifier RA-91-C is used to furnish direct current for the operation of the telephone central office, including the charging current required by the telephone central office batteries. The output of the rectifier must be adjusted to provide sufficient current for the operation of the central office and to maintain the batteries in a float condition (fully charged). When the telephone central office is installed, charge the batteries at a slow rate until they are fully charged (TM 11 2146). With a normal traffic load, adjust the output of the rectifier until the ammeter on the BD-132 A shows a small charge to the batteries. Since the traffic is constantly changing, regulate the rectifier as described in *b* through *d* below whenever necessary.

b. Daily Check of Pilot Cell. Since the traffic load of the telephone central office normally varies from day to day, it is important that the specific gravity of the batteries be carefully checked.

- (1) Designate one cell of the central office battery for use as a pilot cell. Select a cell that is located at the approximate center of the central office battery.
- (2) Check the specific gravity of the pilot cell at the same specified time each day.

Note. The time specified should be in a low traffic period of the day (usually early in the morning).
- (3) Record the temperature-corrected specific gravity reading of the pilot cell.

c. Weekly Check of All Cells. Check the specific gravity of all cells in the central office battery at the same specified time and date each week (usually instead of the pilot cell check for that day). Record the temperature-corrected specific gravity readings.

d. Adjustment of Rectifier. If the daily check of the pilot cell or the weekly check of all cells shows a marked change in the specific gravity readings, adjust the rectifier to compensate for the change. After the rectifier has been adjusted, monitor the effect of the adjustment by carefully checking the specific gravity readings of the pilot

cell for a few days following the adjustment. Readjust the rectifier, if necessary, to keep the specific gravity of the pilot cell approximately at full charge.

Caution: When the specific gravity of the pilot cell shows a full charge condition, the cells should be checked carefully for excessive gas bubbling, indicating that the cells are being overcharged. Excessive gas bubbling also indicates that the

charging rate is too high. Reduce the charging rate until the cells do not form excessive gas bubbles.

Warning: During the charging period, a highly explosive gas is given off from the batteries. Do not smoke or use matches in the vicinity of the batteries and be very careful not to cause any arcing when working in the vicinity of the batteries.

Section III. THEORY

69. Circuit Analysis, Panel BD-132-A (Order No. 52218-Phila-57)

a. 110-volt Ac Distribution Circuit (fig. 39). The 110 volts ac connected to the BD-132-A through the IN 110V. connector and 110V circuit breaker supplies all the SPARE 110V., TEST BD 110V., and SWBD 110V. power outlets, and Rectifier RA-91-C. The 110-volt ac supply is also supplied to the telering through the TELERING switch. The output of the RA-91-C is applied in parallel across the batteries and dc distribution circuit (*b* below). The 20-cps output of the telering is applied to the ringing circuit.

b. Dc Distribution Circuits.

(1) *48-volt circuit.* The 48-volt dc is supplied from Rectifier RA-91-C through the 48V circuit breaker to the minus (-) and plus (+) bus bars (fig. 40). The RA-91-C is connected in parallel with the 48-volt central office batteries through the ammeter on the BD-132-A, BAT 48V. & 24V. receptacle, and Cord Plug CD-784. The ammeter indicates the charge or discharge current of the 48-volt central office batteries. The bus bars distribute the 48-volt dc supply to the night alarm circuit, no-voltage alarm circuit, and fuse alarm circuit through fuses (fig. 49). Additional circuits are extended through circuit breakers to the emergency ringer and BIND. POST 48V. binding posts. Direct connections are extended from the bus bars to the TEST BD 48V. receptacle, SWBD 48V. receptacle, the + terminal of the VM TEST BATTERY binding post, and the voltmeter. The FRAME terminal on the + bus bar is connected to central office ground through the ground lug which

is mounted on the frame of the BD-132-A (Order No. 52218-Phila-57).

(2) *24-volt dc circuit.* The 24-volt dc output is available only if the central office battery is center tapped (fig. 40). Negative 24-volt dc is extended from the center tap of the 48-volt central office batteries through the -24 terminal of the BAT 48V. & 24V. receptacle and 24V circuit breaker to the negative terminal of the 24V receptacle and binding posts. The return circuit to positive battery is through the +24V BAT. (22) terminal of the + bus bar. Because the voltmeter is connected directly to the bus bars (48-volt), it will not indicate the voltage of the 24-volt dc circuit. No metering facilities are available for the 24-volt dc circuit.

c. Ringing Circuit. The telering ((1) below) or the emergency ringer ((2) below) extends 20-cps, 90- to 107-volt ac ringing current to the telephone central office and to the no voltage alarm circuit ((3) below).

(1) *Normal operation.*

(a) *Input circuit.* Under normal conditions, the TELERING switch is operated to the ON position (fig. 39) and 110-volt ac is supplied through the 110-volt (in) input leads to the telering.

(b) *Output circuit.* The output circuit (fig. 41) from the telering to the SWBD 20f and TEST BD 20f receptacles, and through ac alarm relay A in parallel is completed when the TELERING-EMERGENCY RING switch is operated to the TELERING position. Contacts 4-5 of the TELERING-EMERGENCY RING switch extend negative battery through the

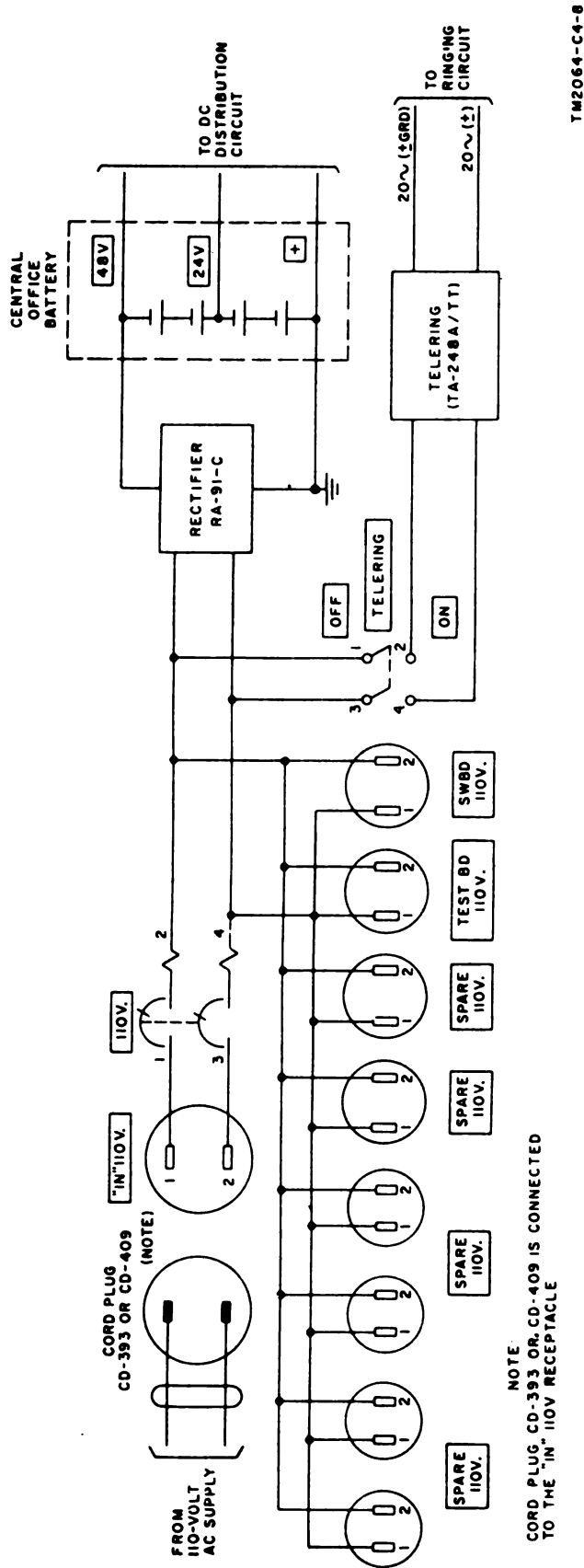
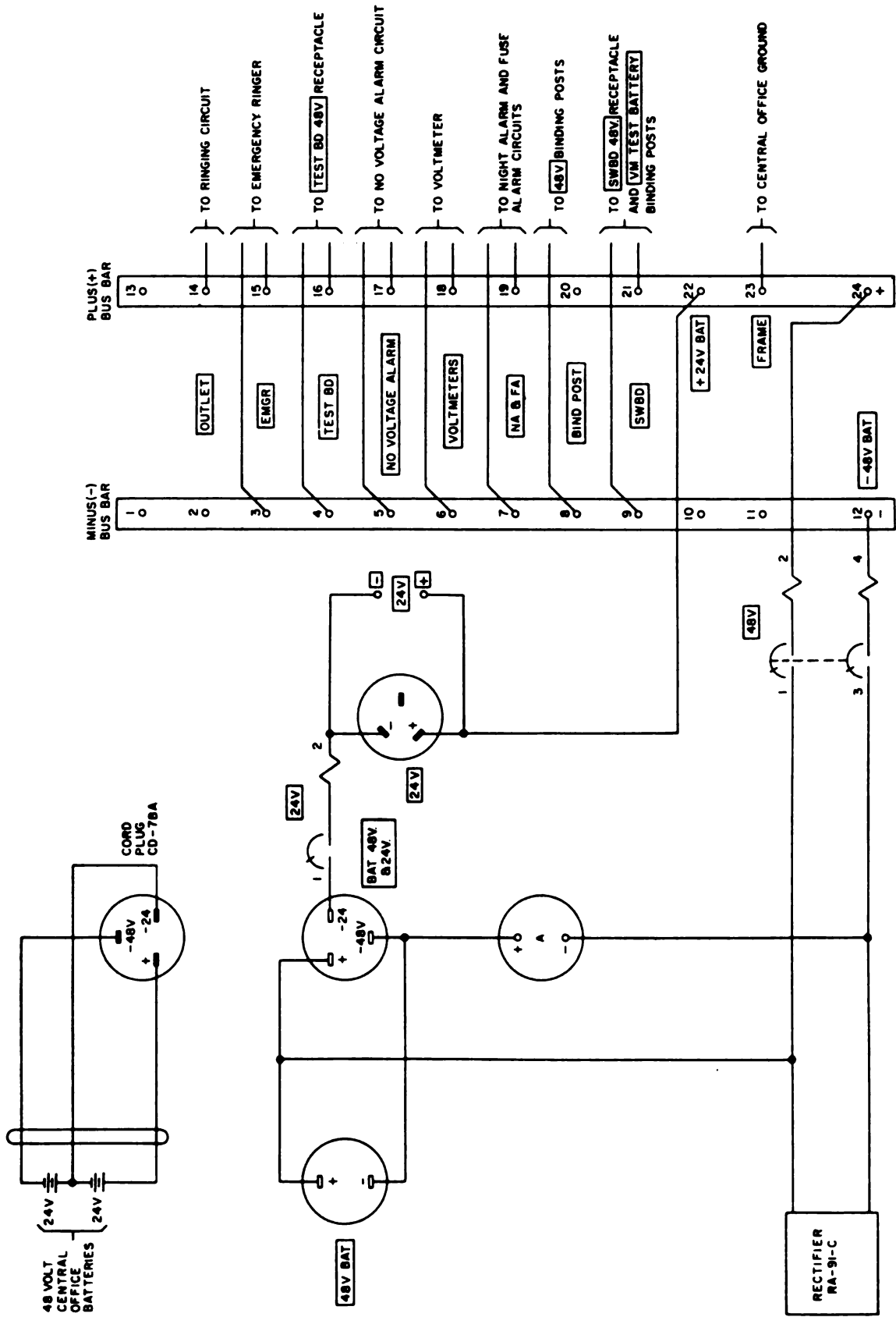


Figure 39. Panel BD 132 A (Order No. 52218 Phila. 57), 110-volt ac distribution circuit, simplified schematic diagram.



NOTE:
BUS BAR TERMINAL NUMBERS ARE
ARBITRARILY ASSIGNED

Figure 40. Panel BD-152-A (Order No. 52218-Philn-57), dr distribution circuit.

fuse NV (no voltage) to the no voltage alarm circuit ((3) below).

(2) *Emergency operation.* When the ac power source or the telering output voltage fails, the emergency ringer (which operates on 48 volts dc) is used to supply 20 cps ringing current (79 to 102 volts ac).

(a) *Input circuit.* The input circuit (fig. 40) to the emergency ringer is completed over the -48-volt (in) and +ground (in) leads when the EMERGENCY RING circuit breaker is operated to the ON position.

(b) *Output circuit.* The output circuit (fig. 41) from the emergency ringer to the SWBD 20f and TEST BD 20f receptacles, and to relay A is completed when the TELERING-EMERGENCY RING switch is operated to the EMERGENCY RING position.

(3) *No voltage alarm circuit* (fig. 41). When the ringing output voltage from the telering or the emergency ringer decreases to less than 20 volts ac, relay A releases.

(a) *Relay A releases.* Contacts 1-2 make and extend ground from the NO VOLTAGE ALARM terminal (+) in parallel to the NO VOLTAGE ALARM lamp and through contacts 2-1 of relay B to buzzer C and then through contacts 6-5 or 4-5 of the TELERING-EMERGENCY RING switch, fuse NV to the negative bus bar at the NO VOLTAGE ALARM terminal. Buzzer C sounds and the NO VOLTAGE ALARM lamp lights, indicating a no voltage alarm condition.

(b) *Releasing audible indication.* When the NO VOLTAGE ALARM switch is operated, contacts 1B-2B and 1A-2A make and ground is extended to relay B, in parallel with the NO VOLTAGE ALARM lamp and buzzer C, causing relay B to operate. Contacts 1-2 of relay B break and open the circuit to buzzer C, causing it to stop sounding. Contacts 2-3 of relay B make and complete a lockup circuit to itself. Relay B remains operated and the NO VOLTAGE ALARM lamp remains lighted until the low-voltage condition is cleared.

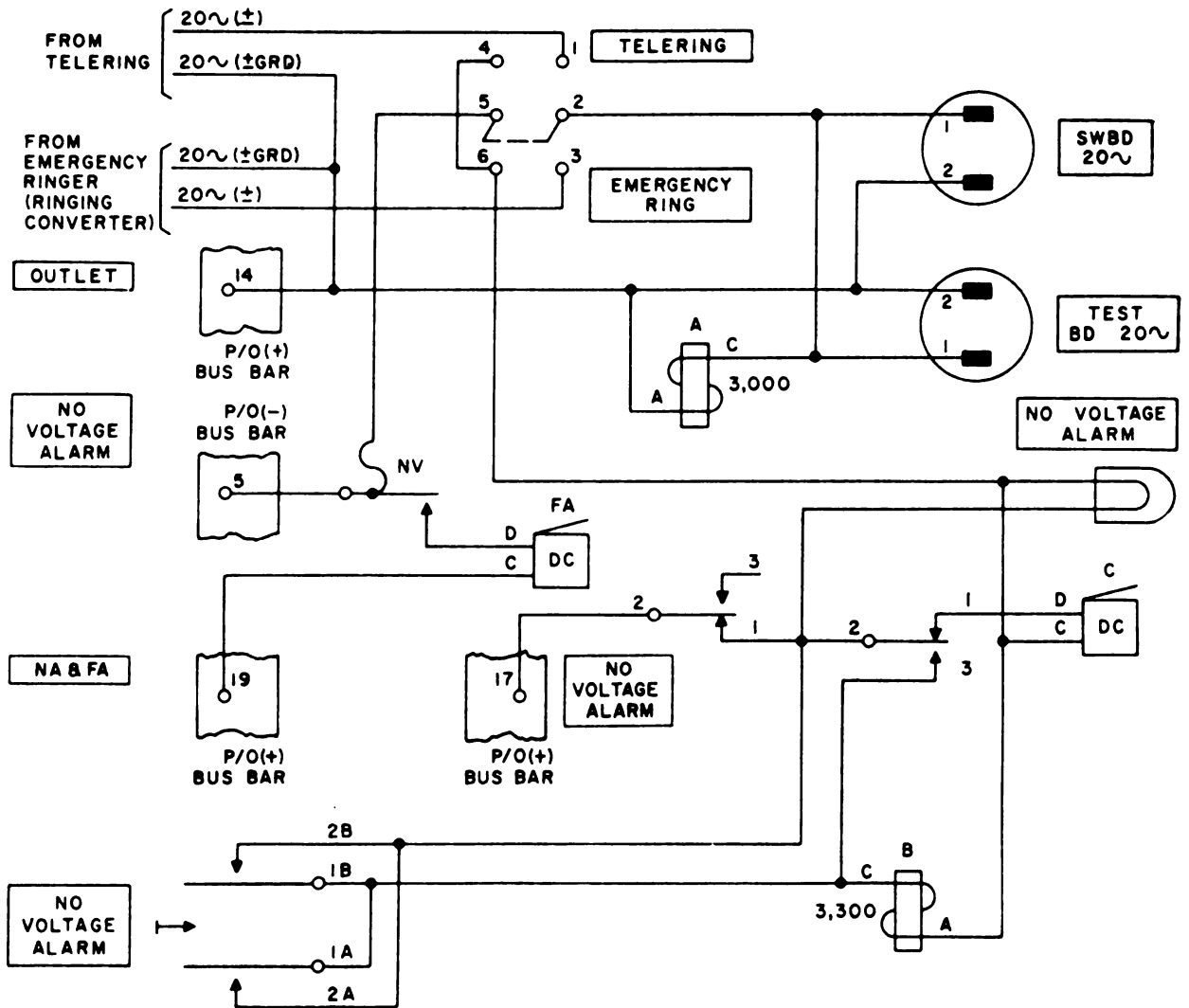
(c) *Ringing output voltage increases.* When the ringing output voltage increases to above 60 volts ac, relay A reoperates. Contacts 1-2 of relay A break and open the lockup circuit to relay B and the circuit to the NO VOLTAGE ALARM lamp, causing the lamp to extinguish and relay B to release.

d. Night Alarm Circuit (fig. 42). The night alarm circuit provides an audible signal (when the NIGHT ALARM switch is in the ON position) on incoming calls to a connected switchboard.

(1) *Incoming call from local battery lines.* When the NIGHT ALARM switch is in the ON position, ground is extended from the switchboard through the NA terminal of the RLS-NA-FA-VT receptacle, contacts 5B-6B of the NIGHT ALARM switch, night alarm bell NB to negative battery through fuse NA(1). The night bell sounds. When the ground circuit is opened at the switchboard, the night bell (NB) stops sounding.

(2) *Incoming call from common battery lines.* When the NIGHT ALARM switch is in the ON position, ground is extended from the switchboard through the A, B, C, or D terminal of the A-B-C-D C.B. LINES receptacle, its associated fuse, and a bridge circuit, to negative battery through fuse NA. The bridge circuit functions as follows: Relay AU is connected to terminals 2 and 3 of coil A. When ground is connected from the switchboard to terminal 4 of retardation coil A, the current starts to build up in both windings of retardation coil A. The impedance of the windings increases and causes an unbalanced effect on the bridge circuit. Therefore, more current flows through resistor A (R1), the winding of relay AU, resistor B (R2) through the NA (NIGHT ALARM) fuse to negative battery. This causes relay AU to operate momentarily until the impedance of retardation coil A decreases.

(a) *Relay AU operates.* Contacts 2-5 make and complete a circuit to operate relay NA (night alarm).



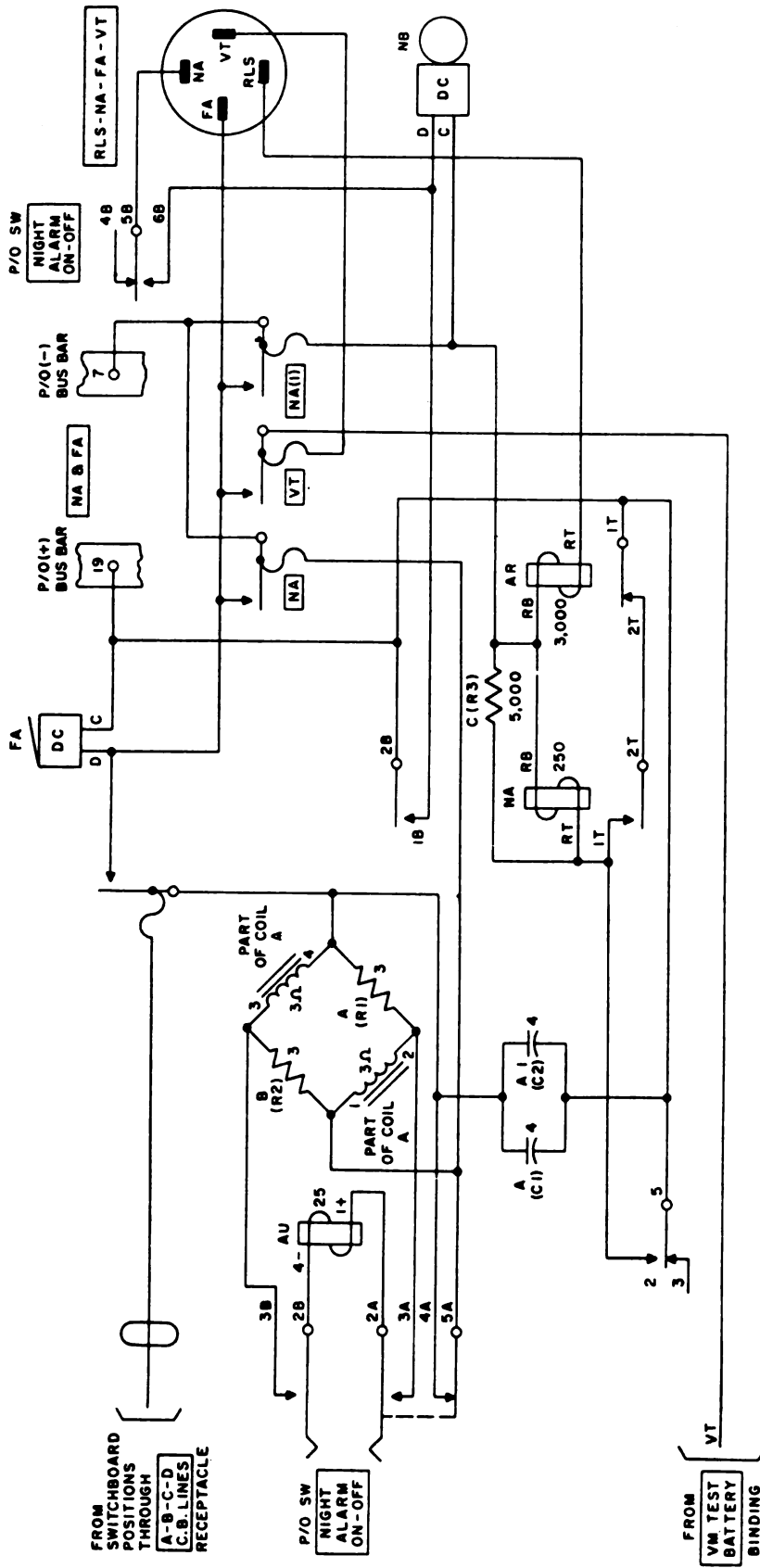
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Figure 41. Panel BD-132 A (Order No. 52218-Phila-57), ringing output circuit, simplified schematic diagram.

- (b) *Relay NA operates.*
1. Contacts 1T-2T make and provide a lockup circuit.
 2. Contacts 1B-2B make and complete a circuit to the night bell.
- (c) *Night bell operates.* The night bell NB, which is self-interrupted, operates and releases, causing an audible alarm. Capacitors A (C1) and A1 (C2) prevent excessive sparking at the interrupter contacts of the night bell NB and the buzzer FA (fuse alarm).
- (d) *Release of relay AU.* When the surge of current applied to the bridge circuit levels off, the impedance in the windings of retardation coil A decreases to equal the resistance of re-

sistors A (R1) and B (R2). This balances the bridge circuit and causes the current to be equally distributed in all branches of the bridge network, thus reducing the current flow through the winding of relay AU. Relay AU releases and opens the operating circuit to relay NA. Relay NA remains locked-up to maintain the circuit to night bell NB.

- (e) *Operator at switchboard answers call.* To stop the night alarm bell from sounding, the operator at the switchboard momentarily operates a switch which extends ground to the RLS (release) terminal at the RLS-NA-FA-VT receptacle, which completes



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Figure 42. Panel BD-192-A (Order No. 52218-Phila-57), night alarm and fuse alarm circuit, simplified schematic diagram.

the operating circuit to alarm release relay AR.

- (f) *Relay AR operates.* Contacts 1T-2T break and open the lockup circuit to relay NA.
- (g) *Relay NA releases.* Contacts 1B-2B break and open the circuit to the night bell NB causing it to stop sounding.
- (h) *Relay AR releases.* When ground is removed from the RLS terminal of the RLS NA-FA-VT receptacle, relay AR releases and contacts 1T-2T break, restoring the night alarm circuit to normal.

e. *Fuse Alarm Circuit* (fig. 41). Each circuit on Panel BD-132-A (Order No. 52218-Phila-57) is fused separately and an audible alarm is received when a fuse blows. If any one of the fuses operates, a circuit is completed from the bus bar terminal associated with the circuit in trouble, through the operated fuse, buzzer FA, to the + bus bar terminal associated with the circuit in trouble. Buzzer FA continues to sound until the operated fuse is removed.

70. Theory of Machine Ringing Generator

a. The emergency ringer (fig. 49) consists of a shunt and series field winding and a double wound armature winding. The armature windings consist of a motor (MOT) and a generator (GEN) winding. The MOT winding terminates on a commutator and the GEN winding terminates on collector rings. Negative battery and ground are extended to -A1 and +A2 terminals of the emergency ringer. The MOT winding in conjunction

with the series and shunt field windings, function as a compound wound motor. Since the GEN winding is also wound on the armature, it rotates in the same magnetic field as the MOT winding, which causes it to function as a compound wound generator. Refer to TM 11-681 for detailed information covering compound wound motors. A 20-cps ac voltage, developed in the GEN winding, is extended to the M1 and M2 terminals of the converter through brushes, which are in physical contact with the collector rings.

b. When the load across terminals M1 and M2 of the converter is low, the current flow through the MOT winding and the series field winding is sufficient to keep the armature rotating at a constant speed. As the load increases, the current flow through the MOT winding and the series field winding increases, causing the magnetic field in which the armature is rotating to become stronger. This increased field strength keeps the armature rotating at a constant speed, which in turn maintains the output of the GEN winding at approximately a constant level.

c. One complete revolution of the armature develops one CPS of ac voltage in the GEN winding. Since the motor speed of the converter is approximately 1,200 revolutions per minute or 20 revolutions per second, the ac voltage output of the GEN winding is approximately 20 cycles per second (cps).

d. Capacitors C1 and C2 are connected across the brushes on the dc end of the unit, and prevent excessive sparking at the commutator segments. Field rheostat R1 provides a means for regulating the generator voltage and speed by controlling the current flow through the shunt field coils.

Section IV. ORGANIZATIONAL MAINTENANCE

71. Scope of Organizational Maintenance

a. The extent of organizational maintenance is limited by the available spare parts, tools, materials, and test equipment, and by the skill of the personnel.

b. Organizational maintenance for Panel BD-132-A (Order No. 52218-Phila-57) consists of the following:

- (1) Preventive maintenance (par. 73).
- (2) Lubrication (par. 74).
- (3) Cleaning emergency ringer (par. 75).
- (4) Equipment performance checklist (par. 76).

- (5) Troubleshooting (pars. 77 and 88).
- (6) Removal and replacement of parts (par. 79).
- (7) Brush replacement (par. 80).
- (8) Adjustments (par. 81).

72. Tools, Materials, and Test Equipment

The tools, materials, and test equipment required for organizational maintenance of Panel BD-132-A (Order No. 52218-Phila-57) are listed below.

a. *Tools.*

- (1) Tool Equipment TE-49.
- (2) Tool Equipment TE-112.

b. Materials.

- (1) Lint-free cloth.
- (2) Cleaning Compound (Federal stock No. 7930-395-9542).
- (3) Electrical tape.
- (4) Insulating tape.
- (5) Orangestick.
- (6) Cheesecloth.
- (7) Solder.
- (8) Sandpaper (00 or 000).

c. Test Equipment.

- (1) Multimeter ME-77/U or equal.
- (2) Test Set I-181-().

73. Preventive Maintenance

a. Use of DA Form 11-242. DA Form 11-242 (Figs. 43 and 44) is a preventive maintenance checklist to be used by organizational maintenance personnel. Items not applicable to the equipment are lined out in the figures. References in the ITEM block in the figures are to the chart below, which contains additional maintenance information pertinent to the particular item. Instructions for the use of the form appear on page 1 of the form.

b. Items. The information listed in the chart below is supplementary to DA Form 11-242. The numbers in the Item column correspond to the ITEM numbers on the form.

Item	Maintenance procedures
1	If necessary, wet a cloth with Cleaning Compound*, then wipe the parts with a dry, clean cloth.
3	If battery cases are found dirty, clean outside surfaces with a soda and water solution to remove corrosion, excess dirt, or spilled electrolyte.
5	<ul style="list-style-type: none"> a. Operate the EMERGENCY RING circuit breaker to the ON position. Operate the TELERING-EMERGENCY RING switch to the EMERGENCY RING position. Allow the emergency ringer to operate for 10 or 15 minutes. Check for vibration and overheating. Check output voltage of emergency ringer for 79 to 102 volts ac. Restore both switches to normal. b. Short the battery side of each fuse to the fuse alarm bar. Fuse alarm buzzer FA should sound each time. c. Check the voltage reading of the voltmeter on the meter and switch panel. It should indicate 46 to 52 volts dc. d. Check the output voltage of the telering. It should be 90 to 107 volts ac. e. Check the pilot cell of the batteries (par. 68b).
12	Check the specific gravity of all cells (par. 68c).
15	Inspect wiring for frayed ends and oil soaked cables.
17	Tighten all loose nuts, bolts, screws and fasteners. Do not overtighten because threads on the bolts or screws may become stripped.

Item	Maintenance procedures
18	<ul style="list-style-type: none"> a. Inspect brushes of emergency ringer for wear, cracks, chips, and broken flexible wires. Replace brushes if damaged or excessively worn (par. 80). b. Inspect brush holders of emergency ringer and springs for cleanliness and proper spring tension (12 to 14 ounces on commutator brushes and 9 to 12 ounces on collector rings). Adjust spring tension if necessary (par. 81b). c. Check that the brushes of the emergency ringer move freely in the brush holders. A slight clearance must be maintained between the brushes and the brush holder. d. Inspect commutator and collector rings of the emergency ringer for excessive pitting or wear. Clean if necessary (par. 75). e. Check the commutator for high mica insulation between commutator bars.

* Cleaning Compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.

74. Lubrication

No lubrication is required for any of the components of Panel BD-132-A (Order No. 52218-Phila-57). Unlike the emergency ringers used on the BD-132 (par. 23) and most Panels BD-132-A, the emergency ringer used on Panel BD-132-A (Order No. 52218-Phila-57) has sealed-type bearings which are permanently lubricated for the life expectancy of the bearings.

75. Cleaning Emergency Ringer Commutator and Collector Rings

The commutator, on a properly functioning machine, will develop a uniform, brown glazed polish on the brush contact area. It is important that this polish is not disturbed except for routine cleaning (a below). A bluish color or nonuniform commutator surface indicates improper commutation and the surface must be cleaned as described in b below.

a. Routine Cleaning.

- (1) Remove the ac and dc end plates.
- (2) Turn on the emergency ringer (par. 67b(2)(c)-(e)).
- (3) Clean with a well-padded canvas wiper affixed to a firm but pliable nonmetallic paddle cut to the width of the commutator or collector rings.
- (4) Place the canvas wiper on the rotating commutator or collector ring surface and press down lightly.

MAINTENANCE CHECK LIST FOR SIGNAL EQUIPMENT MANUAL TELEPHONE AND TELEGRAPH CENTRAL OFFICES (AR 750-425)																																			
23. INSPECT COVER, SWITCHES, LEADERSHIP, AND INTERLOCK BEARING 24. CHECK OPERATION OF CRANKER, BRUSHES AND BATTERIES 25. INSPECT OPERATIONAL EQUIPMENT FOR LEAKS, CONNECTIONS AND PROPER ELECTRICAL CONNECTIONS 26. INSPECT ELECTRICAL EQUIPMENT FOR PROPER CONNECTIONS	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">EQUIPMENT NOMENCLATURE PANEL BD-132-A</td> <td style="width: 30%;">EQUIPMENT SERIAL NUMBER 33</td> <td style="width: 40%;">INSTRUCTIONS This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue. 1. For detailed Preventive Maintenance instructions see: a. The Technical Manual (in TM 11 series) for the equipment (See DA Pamphlet Number 310-4) b. The Supply Bulletin (SB 11-100 series) for the equipment. (See DA Pamphlet Number 310-4) c. The Department of the Army Lubrication Order. (See DA Pamphlet Number 310-4) 2. The following action will be taken by either the Communications Officer/Chief for 1st echelon, or the Inspector for higher echelon: a. Enter Equipment Nomenclature and Serial Number. b. Strike out items that do not apply to the equipment. 3. Operator/Inspector will enter in the columns entitled CONDITION, on the proper line, a notation regarding the condition, using symbols specified under LEGEND. 4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor. </td> </tr> <tr> <td colspan="3" style="text-align: center;">TYPE OF INSPECTION</td> </tr> <tr> <td style="width: 15%;">OPERATOR</td> <td style="width: 15%;">2/3 ECH-ELON</td> <td style="width: 15%;">DATE</td> <td style="width: 55%;">SIGNATURE</td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> <td style="text-align: center;">7 JAN 58</td> <td style="text-align: center;">R. B. Jones</td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">30 JAN 58</td> <td style="text-align: center;">J. C. Hange</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>	EQUIPMENT NOMENCLATURE PANEL BD-132-A	EQUIPMENT SERIAL NUMBER 33	INSTRUCTIONS This form may be used for a period of one month by using the correct dates and weeks of the month. It is to be used as a Preventive Maintenance check list for Signal equipment in actual use, or for a check on equipment prior to issue. 1. For detailed Preventive Maintenance instructions see: a. The Technical Manual (in TM 11 series) for the equipment (See DA Pamphlet Number 310-4) b. The Supply Bulletin (SB 11-100 series) for the equipment. (See DA Pamphlet Number 310-4) c. The Department of the Army Lubrication Order. (See DA Pamphlet Number 310-4) 2. The following action will be taken by either the Communications Officer/Chief for 1st echelon, or the Inspector for higher echelon: a. Enter Equipment Nomenclature and Serial Number. b. Strike out items that do not apply to the equipment. 3. Operator/Inspector will enter in the columns entitled CONDITION , on the proper line, a notation regarding the condition, using symbols specified under LEGEND . 4. After operator completes each daily inspection he will initial over the appropriate dates under "Daily Condition for Month", then return form to his supervisor.	TYPE OF INSPECTION			OPERATOR	2/3 ECH-ELON	DATE	SIGNATURE	✓		7 JAN 58	R. B. Jones		✓	30 JAN 58	J. C. Hange																
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| IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING THE INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION | **ITEM 18 - DC BRUSHES ON RINGING MACHINE WORN; REQUISITIONED REPLACEMENT BRUSHES.** |

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DA FORM 11-242
 REPLACES DA FORMS 11-242, 1 MAY 51 AND 11-249,
 1 DEC 55, WHICH ARE OBSOLETE.

Figure 43. DA Form 11-242, pages 1 and 4.

LEGEND for marking conditions: Satisfactory, ✓ Adjustment, Repair or Replacement required, X. Defect Corrected, (X).		DAILY CONDITION FOR MONTH OF JANUARY 1958																																							
		DAILY ITEM																																							
NO.	DAILY ITEM	WEEKLY							ADDITIONAL ITEMS FOR 2D AND 3D ECHELON INSPECTIONS																																
		1ST	2D	3D	4TH	5TH	6TH	7TH	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	2D	3D	ECHELON						
1.	CLEAN DIRT AND MOISTURE FROM EXPOSED SURFACES OF SWITCHBOARD-JACK PANELS, TERMINALS, CASES AND HOUSINGS, INTERCONNECTING CABLING, ETC.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
2.	INSPECT INTERCONNECTING CABLES FOR CORRECT POSITIONING, KINKS AND STRAINS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
3.	CHECK STORAGE BATTERIES FOR EVIDENCE OF GASING OR ELECTROLYTE LEAKAGE. CLEAN AS REQUIRED.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
4.	INSPECT SWITCHBOARD-CASES FOR FULL RESTRICTION OF JACKETING-LOOSE PLUGS OR SLUG SHELVES AND TIGHTEN-UP SLACK AND TIGHTEN.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
5.	DURING OPERATION BE ALERT FOR ANY UNUSUAL PERFORMANCE OR CONDITION.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓					
6.	INSPECT ALL EXTERNAL CABLE CONNECTORS FOR FIRMNESS OF SEATING AND EVIDENCE OF FUNGUS OR CORROSION. HAND TIGHTEN TO A SNUG FIT.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
7.	INSPECT THE EXTERIOR SURFACES OF COMPONENTS FOR LOOSE OR MISSING MOUNTING SCREWS, CHIPPED PAINT, RUST OR CORROSION, BROKEN LATCHES AND FASTENINGS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
8.	INSPECT INTERCONNECTING CABLES FOR DAMAGED INSULATION AND JACKETING, SHARP BENDS, KINKS, STRAINS AND CORRECT POSITIONING. INSPECT ALL EXTERNAL CABLE CONNECTORS FOR FIRMNESS OF SEATING AND EVIDENCE OF FUNGUS OR CORROSION. HAND TIGHTEN TO A SNUG FIT.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
9.	INSPECT SWITCHBOARD-CASES FOR FRAILED JACKETING-LOOSE PLUGS OR SLUG SHELVES AND TIGHTEN-UP SLACK AND TIGHTEN.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
10.	INSPECT SWITCHBOARD AND POWER-BOARD MECH AND SWITCHES FOR SECURE MOUNTING AND POSITIVE ACTION. CHECK FOR BROKEN HANDLES OR LEVERS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
11.	INSPECT STORAGE BATTERY TRAYS-LEVEL FOR POSITIVE ACTION-OUT-SWITCH AND SYSTEMS. TURN THE KEY TO THE LOCK POSITION AND TAP THE KEY FOR LIGHTLY-LOZEN FOR SWITCHING-OUT SWITCHES IN THE OPERATING-HEAVY.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
12.	CHECK STORAGE BATTERY ELECTROLYTE PAR. 73b LEVEL AND SPECIFIC GRAVITY. ADD WATER IF REQUIRED. CLEAN BATTERY TOP AND CONNECTOR OF ELECTROLYTE SPRAY OR SULPHATION.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
13.	INSPECT GROUND ROD FOR FIRM EMBEDDING, LOOSE OR CORRODED CONNECTIONS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
14.	INSPECT THE EXTERIOR SURFACES OF CASES AND HOUSINGS FOR LOOSE OR MISSING MOUNTING AND ASSEMBLY SCREWS, BROKEN LATCHES AND FASTENINGS, CHIPPED PAINT, RUST OR CORROSION.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
15.	INSPECT INTERCONNECTING CABLES FOR DAMAGED INSULATION AND JACKETING, SHARP BENDS, KINKS, STRAINS AND CORRECT POSITIONING. INSPECT ALL EXTERNAL CABLE CONNECTORS FOR FIRMNESS OF SEATING AND EVIDENCE OF FUNGUS OR CORROSION. HAND TIGHTEN TO A SNUG FIT.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
16.	INSPECT SWITCHBOARD-CASES FOR FRAILED JACKETING-LOOSE PLUGS OR SLUG SHELVES AND TIGHTEN-UP SLACK AND TIGHTEN.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
17.	CLEAN INTERIOR OF SWITCHBOARD-TROUGH AND THE UNITS, POWER-BOARDS, TEST-INTER-STATES, OF DIRT AND MOISTURE. INSPECT FOR LOOSE MOUNTING SCREWS, BROKEN FASTENERS AND MOUNTING BRACKETS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
18.	INSPECT INTERIOR WIRING HARNESSES FOR CORRECT POSITIONING, FRAID OR ABRASION INSULATION, LOOSE, BROKEN OR CORRODED CONNECTIONS.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
19.	INSPECT THE RETAINING FASTENERS AND SEATING OF PLUG-OUT TEAM-DO NOT REMOVE-POSS OR THAT USE ONLY A DIRECT PRESSURE TO INSURE THAT EACH ITEM IS FULLY SEATED.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20.	INSPECT ELECTROLYTE CAPACITORS FOR LEAKS AND BULGES.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
21.	INSPECT POWER SUPPLY RESISTORS FOR CRACKS, BLISTERING, DISCOLORATION AND EVIDENCE OF OVER-HEATING.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
22.	INSPECT INSULATOR-BUSHINGS FOR DAMAGE AND PROPER PLACEMENT.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

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CONTINUED ON PAGE 4

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Figure 44. DA Form 11 242, pages 2 and 3.

- (5) Stop the emergency ringer (par. 67b(2) (i)-(l)) when cleaning is completed and inspect the surface.
- (6) Replace the dc and ac end plates (par. 80b(8) and (9)).

b. Cleaning Defective Commutator or Collector Rings.

- (1) Remove the dc and ac end plates.
- (2) Fasten a piece of fine sandpaper, by some nonscratching nonmetallic means, to a wooden block that is curved to fit the curvature of the commutator or collector rings.

Caution: Do not use emery cloth or any metallic abrasive when cleaning the commutator because metallic particles may short circuit the commutator segments.

- (3) Start the emergency ringer (par. 67b(2) (c)-(e)).
- (4) Place the sandpaper over the defective

area and press down lightly until the surface area is clean or uniform.

76. Equipment Performance Checklist, BD-132 -A (Order No. 52218-Phila-57)

The equipment performance checklist is used to systematically check equipment performance. All corrective measures which the organizational maintenance personnel can perform are given in the corrective measures column. If the action taken by the organizational maintenance personnel does not correct the fault, additional maintenance is required by higher echelon personnel. The organizational maintenance personnel should note on the repair tag how the equipment performed and what corrective measure was taken. When using the checklist, start at the beginning and follow each step consecutively to locate trouble. If trouble is suspected in a particular area, start checking at that point and continue the steps in sequence.

	Item No.	Item	Action or condition	Normal indications	Corrective measures
P R E P A R A T O R Y	1	48-volt dc input cables	Check connections between Panel BD-132-A and 48-volt battery.		
	2	48-volt dc output cables	Check connections between Panel BD-132-A and connected equipment.		
	3	110-volt ac input cables	Check connections between Panel BD-132-A and the ac power source.		
	4	Batteries (12-volt)	Check straps between the four batteries in battery rack.		
	5	20-cps output cable	Check connections between Panel BD-132-A and connected equipment.		
S T A R T I N G	6	110V circuit breaker on meter and switch panel.	Operate to ON position.		
	7	-48V circuit breaker on meter and switch panel.	Operate to ON position.	a. Voltmeter on meter and switch panel indicates battery voltage. b. Ammeter on meter and switch panel indicates discharge current from batteries.	a. Check battery connections. b. Check ammeter (par. 78, item 5).
	8	AC-INPUT circuit breaker on rectifier control panel.	Operate to ON position.	Pilot lamp on rectifier control panel lights.	Replace lamp.
	9	DC-INPUT circuit breaker on rectifier control panel.	Operate to ON position.	a. Ammeter on rectifier control panel indicates output of rectifier. b. Ammeter on meter and switch panel indicates charge or discharge of batteries.	a. Check ammeter (TM 11-964A). b. Check ammeter (par. 78, item 5).

	Item No.	Item	Action or condition	Normal indications	Corrective measures
S T A R T I N G	10	BIND POST 48V circuit breaker on meter and switch panel.	Operate to ON position.		
	11	EMERGENCY RING circuit breaker on meter and switch panel.	Operate to ON position.	Emergency ringer operates	a. Check circuit breaker (par. 78, item 8). b. Check emergency ringer.
	12	TELERING-EMERGENCY RING switch on meter and switch panel.	Operate to EMERGENCY RING position.		
	13	TELERING switch on meter and switch panel.	Operate to ON position.	Buzzing sound heard from telering.	Check telering (TB SIG 203).
	14	TELERING-EMERGENCY RING switch on meter and switch panel.	Operate to TELERING position.		
E Q U I P M E N T P E R F O R M A N C E	15	EMERGENCY RING circuit breaker on meter and switch panel.	Operate to OFF position.	Emergency ringer stops.	Check circuit breaker (par. 78, item 8).
	16	NIGHT ALARM switch on meter and switch panel.	a. Operate to ON position. b. Operate to OFF position.	a. Bell sounds when call is extended to switchboard. b. Bell does not sound when call is extended to switchboard.	a. Check night alarm circuit (par. 78, item 9). b. Check NIGHT ALARM switch (par. 78, item 9).
	17	NO VOLTAGE ALARM switch on meter and switch panel.	Momentarily operate push-button switch (when alarm condition exists).	Audible alarm indication (C buzzer) stops sounding.	Check no voltage alarm circuit (par. 78, item 16).
S T O P P I N G	18	-48V circuit breaker on meter and switch panel.	Operate to OFF position.	Voltmeter on meter and switch panel indicates zero.	
	19	110V circuit breaker on meter and switch panel.	Operate to OFF position.	a. Ammeter on rectifier control panel indicates zero. b. Ammeter on meter and switch panel indicates zero. c. Pilot lamp on rectifier control panel goes out. d. Telering stops buzzing.	
	20	BIND POST 48V circuit breaker on meter and switch panel.	Operate to OFF position.		
	21	DC-OUTPUT circuit breaker on rectifier control panel.	Operate to OFF position.		
	22	AC-INPUT circuit breaker on rectifier control panel.	Operate to OFF position.		
	23	TELERING switch on meter and switch panel.	Operate to OFF position.		

77. Troubleshooting Procedures

Warning: When troubleshooting or making repairs on Panel BD-132-A (Order No. 52218-Phila-57), be extremely careful. Voltages as high as 110 volts are present internally.

a. General. The first step in servicing defective equipment is to sectionalize the fault. Sectionalization means tracing the fault to the major component or to the circuit responsible for the abnormal operation. The second step is to isolate the fault. Isolation means tracing the fault to a defective part. Some defective parts such as burned-out lamps, fuses, resistors, capacitors, transformers and controls can be located by sight, smell, or hearing. The majority of faults can be isolated by checking the switches, controls, relays, and connections. While troubleshooting, refer to the schematic diagram (fig. 49), wiring diagram (fig. 50), and to the applicable illustration to locate parts indicated by the symbols in the circuit schematic.

b. Procedure. When a trouble is suspected

within Panel BD-132-A (Order No. 52218-Phila-57), determine the circuit in which the trouble exists.

- (1) Check to see that the controls are in the proper position.
- (2) Make a visual check of all the points that may be suspected of trouble such as relays, meters, lamps, and fuses.
- (3) Check for loose connections or broken insulation.
- (4) Use the troubleshooting charts (par. 78) to isolate the trouble.

78. Troubleshooting Chart, Panel BD-132-A (Order No. 52218-Phila-57)

The troubleshooting chart lists some of the common troubles that may occur. The trouble indication that the maintenance man will receive is listed in the symptom column; the common troubles which may cause the symptom are listed in the probable trouble column; and the corrective action required to clear the trouble is in the correction column.

Item	Symptom	Probable trouble	Correction
1	Pilot lamp and ammeter on RA-91-C control panel do not function.	<p>a. Tripped circuit breakers.</p> <p>b. Burned out fuse in power source.</p> <p>c. Cord Plug CD-393 (or CD-409) disconnected from power source or loose in IN 110V receptacle.</p> <p>d. Defective Cord Plug CD-393 (or CD-409).</p> <p>e. Faulty IN 110V receptacle.</p> <p>f. Faulty 110V circuit breaker.</p> <p>g. Faulty wiring or loose connections at terminals.</p> <p>h. Faulty Rectifier RA-91-C.</p>	<p>a. Check 110 V circuit breaker on meter and switch panel and AC-INPUT circuit breaker on RA-91-C control panel to see that they are turned to ON.</p> <p>b. Check fuse in power source and replace if necessary.</p> <p>c. Check for firmness of seating and reconnect if necessary.</p> <p>d. Check for voltage at output of CD-393 (or CD-409) and replace or repair if defective.</p> <p>e. Check for faulty receptacle contacts and terminals. Replace if defective.</p> <p>f. Check for voltage across terminals 2 and 4 of circuit breaker and replace if defective.</p> <p>g. Check wiring and repair or replace.</p> <p>h. Check input and output voltage of rectifier. If input is present with no output, repair or replace rectifier (TM 11-964A).</p>
2	Telering fails to operate, when TELE-RING SWITCH is operated to ON position and pilot light on RA-91-C is lighted.	<p>a. Burned-out fuse in input circuit of telering.</p> <p>b. No input voltage to telering.</p>	<p>a. Check fuses and replace if defective (TB SIG 203).</p> <p>b. Check for voltage input of telering. If no voltage is present, proceed with f below.</p>

Item	Symptom	Probable trouble	Correction
		<ul style="list-style-type: none"> c. Telering vibrator contacts burned or dirty. d. Telering vibrator out of adjustment. e. Open input circuit to telering. f. Dirty or defective contacts 1-2 or 3-4 of TELERING switch. g. Faulty wiring or loose connection. 	<ul style="list-style-type: none"> c. Remove cover and inspect vibrator contacts. Clean if necessary (TB SIG 203). d. Check adjustment and readjust as necessary (TB SIG 203). e. Check for voltage and replace telering if defective (TB SIG 203). f. Check for voltage on each side of the closed switch and replace if necessary. g. Inspect visually and check for continuity. Repair as necessary.
3	Telering operated but ringing current is not delivered to load when TELERING switch is operated to ON and TELERING-EMERGENCY RING switch is in TELERING position.	<ul style="list-style-type: none"> a. Open ringing circuit. b. Defective TELERING-EMERGENCY RING switch. c. Defective telering output circuit. 	<ul style="list-style-type: none"> a. Check for output at SWBD 20~ or TEST BD 20~ receptacle with TS-190/U. If output is present, check ringing cord and ringing circuits of connected components. If no ringing current is present, proceed with <i>b</i> below. Repair or replace ringing cord if defective. b. Check for output between terminals 1 and 2 of switch and ground. If output is available at terminal 1 but not present at terminal 2, the switch is defective. Replace the defective TELERING-EMERGENCY RING switch. c. Check for loose connections, and then for output voltage. Replace telering if defective.
4	No dc voltage supplied to switchboard equipment. Pilot lamp on rectifier is lighted.	<ul style="list-style-type: none"> a. Tripped Circuit breakers. b. Defective or loose wiring to bus bars. c. Loose connection or faulty contacts on SWBD 48V receptacle. d. Faulty power output cord or defective circuits in connected equipment. 	<ul style="list-style-type: none"> a. Check DC-OUTPUT circuit breaker on control panel if rectifier and 48V circuit breaker on meter and switch panel to see that they are turned to ON. b. Check for voltage between bus bars and 48V circuit breaker. Repair defective wiring. c. Check for voltage and repair wiring or replace SWBD 48V receptacle. d. Check power cord and connected circuits for opens. Repair or replace faulty components.
5	Ammeter on meter and switch panel fails to indicate.	<ul style="list-style-type: none"> a. Faulty or loose wiring. b. Defective ammeter. 	<ul style="list-style-type: none"> a. Inspect wiring and repair or replace if required. b. Replace ammeter.
6	Voltmeter on meter and switch panel fails to indicate.	<ul style="list-style-type: none"> a. Faulty or loose wiring. b. Defective voltmeter. 	<ul style="list-style-type: none"> a. Inspect wiring and repair or replace if required. b. Replace voltmeter.
7	Emergency ringer fails to operate when EMERGENCY RING circuit breaker is operated to ON.	<ul style="list-style-type: none"> a. Loose connection or faulty wiring to A1 and A2 terminals of emergency ringer. b. Defective EMERGENCY RING circuit breaker. c. Defective wiring or loose connections. 	<ul style="list-style-type: none"> a. Check for voltage at terminals. If voltage is present, emergency ringer is defective. Repair or replace emergency ringer (par. 82). b. Check for continuity. Replace if defective. c. Repair wiring or replace if necessary.

Item	Symptom	Probable trouble	Correction
8	Emergency ringer operates but fails to deliver ringing current to load (TELERING-EMERGENCY RING switch operated to EMERGENCY RING).	a. Dirty or defective contacts 2-3 of TELERING-EMERGENCY switch. b. Defective emergency ringer (ac end).	a. Clean or adjust contacts. b. Clean commutator or collector rings (par. 75). Replace brushes (par. 80).
9	Night alarm bell fails to sound when call is extended to switchboard (NIGHT ALARM switch in ON position).	a. Open NA or NA(1) fuse. b. Dirty or defective contacts 2A-3A or 2B-3B of NIGHT ALARM switch. c. Open 1-4 winding of relay AU. d. Relay AU out of adjustment. e. Dirty or defective contacts 2-5 of relay AU. f. Open winding of relay NA. g. Relay NA out of adjustment. h. Dirty or defective contacts 1B-2B of relay NA. i. Dirty or defective interrupter contacts of night bell (NB). j. Open winding of night bell NB. k. Defective A-B-C-D C.B. LINES receptacle. l. Defective cord plug.	a. Replace fuse. b. Clean or adjust contacts. c. Replace relay AU. d. Adjust relay AU (par. 81d). e. Clean or adjust contacts. f. Replace relay NA. g. Adjust relay NA (par. 81d). h. Clean or adjust contacts. i. Clean or adjust contacts. j. Replace night bell (NB). k. Replace A-B-C-D C.B. LINES receptacle. l. Repair or replace cord or plug.
10	Night alarm bell sounds then stops (NIGHT ALARM switch in ON position).	a. Dirty or defective contacts 1T-2T of relay NA. b. Dirty or defective contacts 1T-2T of relay AR.	a. Clean or adjust contacts. b. Clean or adjust contacts.
11	Night alarm bell fails to stop sounding when operator at switchboard places ground to RLS terminal of RLS-NA-FA-VT receptacle (NIGHT ALARM switch in ON position).	a. Open winding of relay AR. b. Relay AR out of adjustment. c. Defective RLS-NA-FA-VT receptacle. d. Defective cord plug.	a. Replace relay AR. b. Adjust relay AR (par. 81d). c. Replace RLS-NA-FA-VT receptacle. d. Repair or replace cord or plug.
12	Line lamp fails to light on switchboard when call is extended to switchboard (NIGHT ALARM switch in OFF position).	a. Dirty or defective contacts 4A-5A of NIGHT ALARM switch. b. Open NA fuse.	a. Clean or adjust contacts. b. Replace fuse NA.
13	NO VOLTAGE ALARM lamp lighted, ringing output voltage is above 20 volts ac (TELERING-EMERGENCY RING switch in either position).	a. Open winding of relay A. b. Relay A out of adjustment. c. Dirty or defective contacts 1-2 or 2-3 of TELERING-EMERGENCY RING switch.	a. Replace relay A. b. Adjust relay A (par. 81e). c. Clean or adjust contacts.
14	NO VOLTAGE ALARM lamp fails to light when ringing output voltage is below 20 volts ac (TELERING-EMERGENCY RING switch in either position).	a. Dirty or defective contacts 1-2 of relay A. b. Dirty or defective contacts 6-5 (EMERGENCY RING position) or 4-5 (TELERING position). c. Open NV fuse. d. Burned out NO VOLTAGE ALARM lamp.	a. Clean or adjust contacts. b. Replace TELERING-EMERGENCY RING switch. c. Replace NV fuse. d. Replace lamp.
15	NO VOLTAGE ALARM lamp lights but buzzer C fails to sound (TELERING-EMERGENCY RING switch in either position).	a. Dirty or defective contacts 2-1 of relay B. b. Dirty or defective contacts of buzzer C. c. Defective buzzer C.	a. Clean or adjust contacts. b. Clean or adjust contacts. c. Replace buzzer.
16	Buzzer C fails to stop sounding when NO VOLTAGE ALARM switch is operated (TELERING-EMERGENCY RING switch in either position).	a. Open winding of relay B. b. Relay B out of adjustment.	a. Replace relay B. b. Adjust relay B (par. 81f).

Item	Symptom	Probable trouble	Correction
17	Buzzer C stops sounding when NO VOLTAGE ALARM switch is operated, then sounds again when NO VOLTAGE ALARM switch is released (TELERING-EMERGENCY RING switch in either position).	Dirty or defective contacts 3-2 of relay B.	Clean or adjust contacts.
18	Buzzer FA fails to sound when fuse blows.	a. Dirty or defective interrupter contacts of buzzer FA. b. Open winding of buzzer FA.	a. Clean or adjust contacts. b. Replace buzzer FA.
19	Excessive sparking at contacts of relay AR.	Open resistor C (R3).	Replace resistor.
20	Excessive sparking at interrupter contacts of fuse alarm FA buzzer or night bell NB.	Defective capacitor A (C1) or A1 (C2).	Replace capacitor.
21	Excessive sparking at brushes on emergency ringer.	Cracked, chipped, worn, or defective brushes.	Replace brushes (par. 80).

79. Removal and Replacement of Parts

a. General Parts Replacement Techniques.

- (1) Avoid solder drops or splashes when removing or connecting wires.
- (2) Install the replacement part in the same position as the original part.
- (3) Avoid burning insulation of the wires adjacent to wires being removed.
- (4) Always use the proper tools when removing or replacing parts.
- (5) Do not strip or break the mounting screws by tightening them too tight.
- (6) When a new part has been replaced, such as resistors, relays, bells or buzzers, test the circuit for proper operation and readjust the replaced part, if necessary.
- (7) Dress the wiring after soldering any leads so that it is neat.

b. *Access to Parts.* All parts except those on the cord connector panel are easily reached. To remove or replace any of the parts on the cord connector panel, raise the hinged door located on the top front of the BD-132-A (fig. 1).

(1) *Access to rear of cord connector panel.*

- (a) Loosen the two wingnuts on the front of the hinged door (fig. 45).
- (b) Raise the panel until the rear cord connector panel is exposed.
- (c) Pull down the supporting rods to prevent the hinged panel from falling back to its normal position.

(2) *Closing hinged door.*

- (a) Pull up the supporting rods (fig. 45) and lower the panel into place.

- (b) Tighten the two wingnuts on the hinged door.

80. Replacing Emergency Ringer Brushes

Replace the brushes (ac brushes or dc brushes) when they are cracked, chipped, or worn so that the tops of the brushes are less than one sixteenth inch from the top of the brush holder. Replace both brushes when one brush of a set fails to meet this requirement.

a. *Dissassembly for Brush Replacement.*

- (1) To expose the dc brush holder assembly (6, fig. 46), remove the primary (dc end) plate (2) by removing the dc end plate retaining screw (1).
- (2) To expose the ac brush holder assembly (5), remove the secondary (ac end) plate (4) by removing ac end plate retaining screw (3).
- (3) To remove the dc brushes (7) or ac brushes (8), loosen the brush lead terminal screw (14, fig. 47 or 16, fig. 48) and disconnect the brush lead. Raise the end of the brush tension spring (10, fig. 47, or 13, fig. 48) and pull the brush from its brush holder assembly (5, fig. 47, or 9, fig. 48).
- (4) Check the commutator (48, fig. 46) and collector rings (50) for unusual pitting or wear. Clean if necessary (par. 75).

b. *Reassembly for Brush Replacement.*

- (1) Raise the end of the brush tension spring (10, fig. 47 or 13, fig. 48) and place a

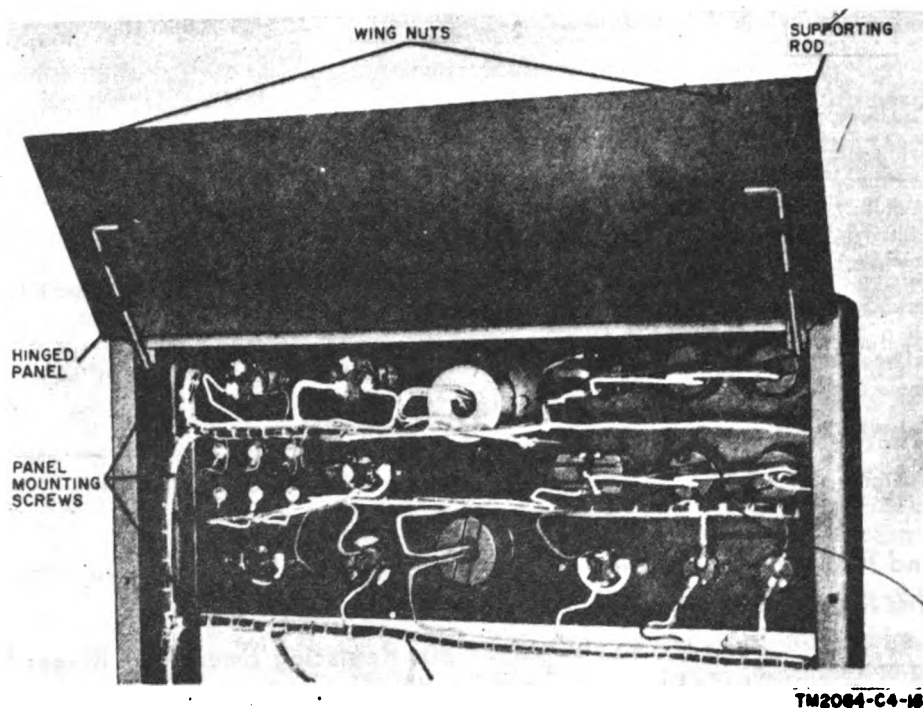


Figure 45. Rear of cord connector panel, hinged door raised.

- new brush (7 or 8, fig. 46) into its brush holder assembly (6) or (5).
- (2) Raise each replaced brush and brush tension spring and place a piece of 00 sandpaper (cut to about 1 inch wider than the brush) between the commutator or collector rings and brush with the abrasive end away from the commutator or collector rings. Release the brush tension spring.
 - (3) Grasp the sandpaper with both hands and pull the sandpaper back and forth to seat the brush. Keep the direction of the pull in a vertical plane so that the entire contact surface of the brush will be fitted properly to the commutator or collector rings.
 - (4) When the brush appears to be seated with its entire contact surface bearing on the commutator or collector rings, finish the seating with a few strokes of the sandpaper in the direction of armature rotation.
 - (5) Remove the sandpaper.
 - (6) Check the spring tension of the brush tension spring (10, fig. 47 or 13, fig. 48). It should be 12 to 14 ounces on the dc brushes and 9 to 12 ounces on the ac

brushes. If the tension requirements are not sufficient, adjust the spring tension (par. 81b), then proceed as described in (7) below.

- (7) Reconnect the brush leads to the brush terminals and tighten the brush lead terminal screws (14, fig. 47 or 16, fig. 48).
- (8) Fasten the dc end plate (2, fig. 46) to the dc end of the unit by using the dc end plate retaining screw (1).
- (9) Fasten the ac end plate (4) to the ac end by using the ac end plate retaining screw (3).

81. Adjustments

a. *Adjustment of Resistor R1 in Emergency Ringer (fig. 46).* The output voltage of the emergency ringer is regulated by varying resistor R1 (39). To adjust the output voltage to 87 ± 2 volts ac, proceed as follows:

- (1) Remove the four terminal box plate mounting screws (31) from the terminal box plate (33).
- (2) Connect the test probes of Multimeter ME-77 U (arranged as an ac voltmeter, 250-volt ac scale) across terminals M1 and M2 on the terminal board (34).

- (3) Loosen the slide on resistor R1.
- (4) Operate the EMERGENCY RING circuit breaker to the ON position.
- (5) Adjust the slide on resistor R1 until the meter needle on the ME-77 U indicates 87 volts ac.
- (6) Tighten the slide mounting screw on resistor R1.
- (7) Recheck the output voltage ((2) above). It should be 87 ± 2 volts ac.
- (8) Disconnect the test probes of the ME-77, U from terminals M1 and M2 of the terminal board.
- (9) Replace the terminal box plate (33) by using the four terminal box plate mounting screws (31).

b. Adjustment of Emergency Ringer Brush Tension Springs.

- (1) *Dc brush tension springs.* The brush tension springs should have 12 to 14 ounces of spring tension. Adjust the tension on the springs as follows:
 - (a) Remove the dc end plate (par. 80a(1)).
 - (b) Loosen the tension adjustment setscrew (12, fig. 47).
 - (c) Use an offset screwdriver and turn the tension adjustment stud (11) in an upward direction to add tension to the right side brush tension spring (10) and in a downward direction to increase tension on the left side brush tension spring. *Do not remove the offset screwdriver from the tension adjustment stud (11) until the tension adjustment setscrew (12) is tightened.*
 - (d) When the desired spring tension (12 to 14 ounces) is obtained, tighten the tension adjustment setscrew (12).
 - (e) Replace the dc end plate (par. 80b(8)).
- (2) *Ac brush tension springs.* The brush tension springs should have 9 to 12 ounces of spring tension. Adjust the tension on the spring as follows:
 - (a) Remove the ac end plate (par. 80a(2)).
 - (b) Adjust the brush tension spring (13, fig. 48) mounted on the short brush holder stud (6) as follows:
 1. Loosen the tension adjustment setscrew (14).
 2. Use a straight screwdriver and turn the tension adjustment stud (11) counterclockwise (as viewed from

the ac end) to increase the spring tension and clockwise to decrease spring tension. *Do not remove the screwdriver from the tension adjustment stud (11) until the tension adjustment set screw (14) is tightened.*

3. When the proper spring tension (12 to 14 ounces) is obtained, tighten the tension adjustment setscrew (14).
- (c) Adjust the brush tension spring (13) mounted on the ac long brush holder stud (5) as follows:
 1. Loosen the ac brush holder mounting stud setscrew (4) on the ac brush holder mounting ring assembly (2).
 2. *Carefully* pry the ac long brush holder stud (5) into the socket on the ac brush holder mounting ring assembly (2) until an offset screwdriver can be placed into the tension adjustment stud (11).
 3. Loosen the tension adjustment setscrew (14).
 4. Use an offset screwdriver and turn the tension adjustment stud (11) clockwise to add spring tension and counterclockwise to decrease the spring tension. *Do not remove the screw driver from the tension adjustment stud (11) until the tension adjustment setscrew (14) is tightened.*
 5. When the desired spring tension (12 to 14 ounces) is obtained, tighten the tension adjustment setscrew (14).
 6. Carefully tap the ac long brush holder mounting stud (5) out of the socket of the brush holder mounting ring assembly (2) until the brush (15) is centered on the collector ring.
 7. Tighten the ac brush holder mounting stud setscrew (4) into the ac brush holder mounting ring assembly (2).
 8. Replace the ac end plate (par. 80b(9)).

c. Adjustment of Emergency Ringer Dc Brush Holder Mounting Ring Assembly (fig. 47). Make these adjustments only when the replacement and

reseating of brushes or the cleaning of commutator segments does not stop the emergency ringer from arcing at the brushes, or if irregular operation prevails. White marks are painted on the dc housing cover (3) and the dc brush holder mounting ring assembly (2). These marks should be alined. If the marks are not visible, adjust the dc brush holder mounting ring assembly (2) as follows:

- (1) Remove the dc end plate (par. 80a(1)).
- (2) Loosen the dc brush holder mounting ring retaining screw (1).
- (3) Move the dc brush holder mounting ring assembly (2) until the dc brushes (13) are alined with the two side, dc housing cover retaining screw holes (21).
- (4) Tighten the dc brush holder mounting ring retaining screw (1).
- (5) Replace the dc end plate (par. 80b(8)).

d. Relay, Switch, and Alarm Equipment Adjustments. All relays in the BD-132-A (Order No. 52218-Phila-57, except relays A and B, described in *e* and *f* below), buzzers, switches, and the night alarm bell are tested and adjusted as described in TM 11-4302. Use Test Set I-181-() for all current flow tests. Since the items described in TM 11-4302 are listed by commercial type number, the reference symbol and commercial type number of each of the adjustable items in the BD-132-A (Order No. 52218-Phila-57) are listed in the following chart for ease of identification.

Item	Reference symbol	Commercial type number (WECo)
Relay	NA	E931
Relay	AR	R27
Relay	AU	239GB
Buzzers	C and FA	7FW
Night alarm bell	NA	7FW
Switch	NIGHT ALARM ON-OFF	479EL (lever type)
Switch	NO VOLTAGE ALARM	92Y (plunger type)

e. Relay A. To test relay A, follow the procedures described in (1) below. If the test requirements are not met, readjust relay A by using the adjustment procedures described in (2) below.

(1) *Testing*

- (a) Connect one end of Multimeter ME-77/U (arranged as a 250-volt ac voltmeter) to one end of a 2,500- to 5,000-ohm, 5-watt potentiometer.
- (b) Connect the other end of Multimeter ME-77/U to the A (inside) winding terminal of relay A.
- (c) Block relay B in the operated position.
- (d) Set the slide of the potentiometer to minimum resistance.
- (e) Connect a grounded 20 cps, 90- to 107-volt ac ringing source to the slide of the potentiometer. Relay A should operate and the meter needle on the ME-77/U should indicate between 90 to 107 volts ac.
- (f) Move the slide of the potentiometer (increasing resistance) until the meter needle on the ME-77/U indicates 20 volts ac. Relay A should release.
- (g) Move the slide of the potentiometer (decreasing resistance) until the meter needle on the ME-77/U indicates 60 volts ac. Relay A should reoperate.
- (h) If relay A fails to meet these requirements, adjust it as described in (2) below. If relay A meets the requirements, remove the block from relay B, disconnect the 20-cps ringing source from the potentiometer, and disconnect the potentiometer and ME-77 U from the relay.

(2) *Adjustments.*

- (a) *Operate adjustments.* If relay A does not operate at 60 volts ac, adjust the contact spring to reduce the armature air gap or reduce the spring tension in the armature spring.
- (b) *Release adjustments.* If relay A does not release at 20 volts ac, increase the contact follow in the front (normally open) contact spring or increase the spring tension on the armature spring.

f. Relay B Adjustments. If relay B is not functioning properly, adjust it to meet the requirements listed in the chart below. General relay adjustment procedures are provided in TM 11-4302.

Functional designation	Armature travel (in.)	Circuit preparation			Dc flow required			
		Block	Test clip data	Test set PREP.	Test for	After soak	Test (amp)	Readjust (amp)
B	013	(A) NO	Conn. grd to terminal A.	GRD	0		.0061	.0058

Section V. DEPOT REPAIR AND FINAL TESTING

82. Depot Repair

To completely disassemble and reassemble the emergency ringer for repair, follow the procedure in the order given in *a* and *b* below. To undercut the mica insulation on the commutator of the emergency ringer, follow the procedure in *c* below. To test for proper insulation resistance, follow the procedure in *d* below and varnish the components of the emergency ringer as described in *e* below.

a. Disassembly of Emergency Ringer.

- (1) *Removal of dc or ac end plates and brushes.*
Remove the end plates (par. 80a(1) and (2)) and brushes (par. 80a(3)).
- (2) *Removal of Capacitors C1 and C2 (fig. 47).*
 - (a) Disconnect the leads of capacitors C1 (18) and C2 (19) from the brush lead terminal screws (14).
 - (b) Unscrew and remove each capacitor mounting screw (20) from the dc brush holder mounting ring (2).
- (3) *Removal of armature shaft from housing.*
 - (a) Unscrew and remove the two field coil lead terminal screws (16, fig. 47) and lock-washers (17), from the dc end. Tag and remove the two dc field coil leads (9, fig. 46) from the dc brush holder assembly (6).
 - (b) Remove the snap ring (10), from the dc housing cover socket (11), by placing a pair of long-nosed pliers into the holes on the snap rings and pressing, then prying out with a screwdriver.
 - (c) Remove the bearing shield (12) and pressure ring (13) from the dc housing cover socket (11). This exposes the sealed bearing (14).
 - (d) Unscrew and remove the four dc housing cover retaining screws (15).
 - (e) Pry the dc housing cover (16) from the housing (17). Usually the arma-

ture shaft (18) will still be attached to the dc housing cover (16) and can be removed with the housing cover. When this occurs, carefully tap the sides of the housing cover (16) until the armature shaft (18) is free from the housing cover, then proceed as described in (5) below. If the housing cover (16) is removed without the armature attached, follow the procedure described in 1 through 3 below.

1. Remove the snap ring (19) from the ac housing cover socket ((b) above).
2. Remove the bearing shield (20) and pressure ring (21) from the ac housing socket to expose the sealed bearing (22) and the armature shaft (18).
3. *Carefully* tap the armature shaft (18) until it is free from the ac housing cover (23), remove the armature from the housing (17), and proceed as described in (4)(a), (b), (c), and (f) below.
- (4) *Removal of ac housing cover.*
 - (a) Unscrew and remove the two brush lead terminal screws (16, fig. 48) and lockwashers (8) from the ac end. Tag and remove the two ac field coil leads (24, fig. 46).
 - (b) Unscrew and remove the four ac housing cover retaining screws (25).
 - (c) *Carefully* pry the ac housing cover (23) from the housing (17).
 - (d) Slide the pressure ring (21) and the bearing shield (20) from the ac housing cover socket.
 - (e) Remove the snap ring (19) from the ac housing cover socket ((3)(b) above).
 - (f) Unscrew and remove the four dust shield retaining screws (26) and washers (27) and remove the dust shield (28).

(5) *Removal of field coils (fig. 46).*

Caution: The field coils should *not* be removed unless they are to be replaced. The field coils are held in place by copper studs (29) which are welded into the field coil pole pieces (30) and bent over the field windings. Excessive bending will break the studs.

- (a) Remove the four terminal box plate mounting screws (31) from the terminal box (32) and remove the terminal box plate (33).
- (b) Loosen the terminal screws on the terminal board (34). Remove the four input and output field coil leads (54) and the resistor lead which are connected to terminal board (34). The leads are marked to correspond with the terminals to which they are connected.
- (c) Unscrew and remove the two terminal board mounting screws (35), the terminal board (34), name plate (36), and spacers (37).
- (d) Bend the two copper studs (29) on the bottom field coil pole pieces (30) upward and raise the lower portion of the field coil (38) until it can be removed.
- (e) Bend the two copper studs on the upper field coil pole pieces downward and lower the top portion of the field coil (38) until it can be removed.

(6) *Removal of dc brush holder mounting ring assembly (fig. 47).*

- (a) Loosen the dc brush holder mounting ring retaining screw (1) and slide the dc brush holder mounting ring assembly (2) and its attached right and left dc brush holder assemblies (5 and 6) away from the dc housing cover (3).
- (b) Unscrew and remove the four dc brush holder mounting screws (4) with their fiber bushings (7).
- (c) Remove the right and left dc brush holder assemblies (5 and 6) from the dc brush holder mounting ring assembly (2).
- (d) Slide the brush tension springs (10) from the tension adjustment studs (11).

- (e) Loosen the tension adjustment setscrews (12) and slide the tension adjustment studs (11) out of the sockets.

(7) *Removal of ac brush holder mounting ring assembly (fig. 48).*

- (a) Loosen the ac brush holder mounting ring retaining screw (1) and slide the ac brush holder mounting ring assembly and its attached components (2) from the ac housing cover (3).
- (b) Loosen the two brush holder mounting stud setscrews (4) on the ac brush holder mounting ring assembly (2).
- (c) Remove the ac long and short brush holder studs (5 and 6) from the ac brush holder mounting ring assembly sockets.
- (d) Unscrew and remove the two ac brush holder mounting screws (7) and lockwashers (8).
- (e) Remove the ac brush holder assemblies (9) from the ac long and short brush holder studs (5 and 6).
- (f) Remove the cotter pins (10) from the tension adjustment studs (11).
- (g) Slide the washers (12) and the brush tension spring (13) from the tension adjustment studs (11).
- (h) Loosen the two tension adjustment setscrews (14) and slide the tension adjustment studs (11) from the ac brush holder assembly (9).

(8) *Removal of resistor R1 (fig. 46).*

- (a) Remove the four terminal box plate mounting screws (31) and remove the terminal box plate (33) if not already removed ((5)(a) above).
- (b) Unsolder the lead from the slide of resistor R1 (39).
- (c) Unscrew and remove the other resistor lead terminal nut (41) and remove the lead from the resistor terminal screw.
- (d) Unscrew and remove the two resistor mounting screws (40) and remove the resistor from the terminal box (32).

b. *Reassembly of Emergency Ringer.*

(1) *Replacement of ac brush holder mounting ring assembly (fig. 48).*

- (a) Insert the tension adjustment studs (11) into the ac brush holder assembly (9) and tighten the tension adjustment setscrews (14).

- (b) Slide the brush tension springs (13) on the tension adjustment studs (11).
 - (c) Slide the washers (12) on the tension adjustment studs (11).
 - (d) Insert the cotter pins (10) into the hole on the end of the tension adjustment studs (11) and spread the ends.
 - (e) Fasten the ac brush holder assemblies (9) to the ac long and short brush holder studs (5 and 6) with the two brush holder mounting screws (7) and lockwashers (8).
 - (f) Insert the ac long and short brush holder studs (5 and 6) into their respective sockets in the brush holder mounting ring assembly (2).
 - (g) Insert the two ac brush holder stud setscrews (4) into the ac brush holder mounting ring assembly (2) and tighten.
 - (h) Seat the ac brush holder mounting ring assembly (2) on its mounting in the ac housing cover (3) and aline the paint marks.
 - (i) Insert the ac brush holder mounting ring retaining screw (1) into the ac brush holder mounting ring assembly (2) and tighten.
- (2) *Replacement of dc brush holder mounting ring assembly (fig. 47).*
- (a) Insert the tension adjustment studs (11) into the dc brush holder assemblies (5 and 6) and tighten the tension adjustment setscrews (12).
 - (b) Slide the two brush tension springs (10) onto their respective tension adjustment studs (11).
 - (c) Insert the four dc brush holder mounting screws (4) through the four fiber bushings (7) and then through the four holes in the dc brush holder mounting ring assembly (2).
 - (d) Replace the two elevation plates (8) and mica shields (9) over the dc brush holder mounting screws (4). Insert the four dc brush holder mounting screws (4) into their mounting holes in the dc brush holder assemblies (5 and 6) and tighten securely.
 - (e) Seat the dc brush holder mounting ring assembly (2) on its mounting in the dc housing cover (3) and position the brush holder mounting ring assembly (2) so that the white mark on the dc housing cover (3) lines up with the white mark on the dc brush holder mounting ring assembly (2).
 - (f) Insert the dc brush holder mounting ring retaining screw (1) in the dc brush holder mounting ring assembly (2) and tighten.
- (3) *Replacement of field coils (fig. 46).*
- (a) Replace the upper field coil (38) over its field coil pole piece in the top of the housing (17) and insert its input-output field coil leads (54) through the hole in the housing (17) and terminal box (32).
 - (b) *Carefully* bend the two copper studs on the field coil pole piece upward to secure the field coil.
 - (c) Replace the lower field coil (38) over the field coil pole piece (30) and insert its input-output field coil lead (54) through the hole in the housing (17) and terminal box (32).
 - (d) Bend the two copper studs (29) on the field coil pole piece (30) downward until the field coil is secure.
 - (e) Replace the two terminal board mounting screws (35) through the top holes of the terminal board (34), name plate (36), and spacers (37) and insert them into their mounting holes in the terminal box (32) and tighten.
 - (f) Connect the four marked input-output field coil leads (54) (A1+, A2-, M1, and M2) and the resistor lead to the marked terminals on the terminal board (34) and tighten the terminal screws.
- (4) *Replacement of ac housing cover.*
- (a) Fasten the dust shield (28, fig. 46) to the ac housing cover (23); use the four dust shield retaining screws (26) and washers (27).
 - (b) Fasten the ac housing cover (23) to the housing (17); use the four ac housing cover retaining screws (25).
 - (c) Insert the two brush lead terminal screws (16, fig. 48) with lockwashers (8) through the lugs attached to the end of the ac field coil leads (24, fig. 46) and insert them into the brush holder mounting assembly (9, fig. 48).

- (d) Insert the snap ring (19, fig. 46) into the socket of the ac housing cover (23).
 - (e) Insert the bearing shield (20) and pressure ring (21) into the ac housing cover socket.
- (5) *Replacement of armature shaft into housing* (fig. 46).
- (a) Carefully insert the ac end of the armature shaft (18) into the housing (17) until the collector rings (50) are alined with the ac brush holder assemblies (5).
 - (b) Replace the dc housing cover (16) on the housing (17) while sliding the sealed bearing (14) into the dc housing cover socket (11).
 - (c) Insert the four dc housing cover retaining screws (15) into their mounting holes and tighten.
 - (d) Insert the pressure ring (13) and then the bearing shield (12) into the dc housing cover socket (11).
 - (e) Replace the snap ring (10).
 - (f) Insert the two field coil lead terminal screws (16, fig. 47) with lockwashers (17) through the lugs attached to the end of the dc field coil leads (9, fig. 46), and tighten them into the dc brush holder mounting assembly (6) and remove the tags.
- (6) *Replacement of capacitors C1 and C2 and brushes* (fig. 47).
- (a) Insert the capacitor mounting screw (20) into the capacitor mounting bracket and fasten capacitors C1 and C2 (18 and 19) to the dc brush holder mounting ring assembly (2).
 - (b) Replace the brush lead terminal screws (14) with lock washers (15) on the dc brush holder assemblies (5 and 6).
 - (c) Connect the spade clip (attached to the capacitor leads) to the brush lead terminal screw (14) and tighten.
 - (d) Replace and reseal the brushes (par. 80b) and adjust the dc brush holder mounting ring assembly (par. 81c).
 - (e) Replace the ac and dc end plates (par. 80b(8) and (9)).
- (7) *Replacement of resistor R1* (fig. 46).
- (a) Secure resistor R1 (39) to the terminal box (32) with the two resistor mounting screws (40).
 - (b) Resolder the lead to the slide terminal of resistor R1.
 - (c) Connect the other lead to the resistor lead terminal screw.
 - (d) Replace the resistor lead terminal nut (41) to the resistor lead terminal screw and tighten. Adjust resistor R1 (par. 81a).
 - (e) Fasten the terminal box plate (33) by using the four terminal box plate mounting screws (31).
- c. Undercutting Commutator.* After extended service, the commutator may become worn to a point where the mica insulation is even with the commutator segments. Cut away the mica insulation approximately one thirty-second of an inch below the tops of the bars with a commutator undercutting file.
- d. Insulation Resistance Test.* Check the insulation resistance of the commutator and the field windings with Ohmmeter ZM-21 U. Refer to TM11-2050A, Ohmmeter ZM-21 U, for complete detailed testing instructions. Disassemble the unit as described in a(1) and (3) above. Observe the indications while testing:
- (1) If Ohmmeter ZM 21 U indicates less than $\frac{1}{2}$ megohm, the unit should be completely cleaned (par. 75).
 - (2) Recheck the insulation with the ZM 21 U. If the test set still indicates less than $\frac{1}{2}$ megohm, the windings (field coil and armature) should be varnished (e below).
 - (3) When the test set indicates $\frac{1}{2}$ megohm or more, reassemble the emergency ringer (b(5) and (6)(d) and (e) above).
- e. Varnishing Armature Coils and Field Windings.* If the unit needs to be varnished because of low insulation resistance test (d above), disassemble the unit (a(1) and (3) above), then proceed as follows:
- (1) Be sure all parts have been wiped clean.
 - (2) Cover the commutator segments, collector rings, bearing, and bearing surfaces.
 - (3) Coat (spray or brush) windings with high-grade, air-drying insulation varnish MIL-V-1137.
 - (4) Allow the varnish to dry. Cover varnished units during drying with canvas, or use heating lamps to insure that the varnish dries evenly.

- (5) After the varnish dries, wipe adjacent parts clean with a dry lint-free cloth and reassemble the emergency ringer (b(5) and (6)(d) and (e) above).

83. Final Testing, Power Panel BD-132-A (Order No. 52218-Phila-57)

a. General. Equipment which has been repaired must meet definite minimum standards before it is returned to service. The tests outlined below are designed to measure the performance capability of a repaired Panel BD-132-A (Order No. 52218-Phila-57). Equipment which meets the minimum standards stated in these tests will furnish satisfactory operation.

b. Test Equipment Required. In addition to the test equipment listed in paragraph 72c, Test Set TS-190/U is required for making continuity tests.

c. Preliminary Procedures.

- (1) Connect the IN 110V. receptacle to a 110-volt ac supply by using Cord Plug CD-393. Connect the BAT. 48V. and 24V. receptacle to a 24-volt tapped, 48-volt battery bank, such as Batteries BB-46.
- (2) Start the BD-132-A (par. 67a) and charge the batteries for a short period of time before making the final tests.

d. Final Testing Alarm Circuits.

(1) Fuse alarm.

- (a) Place the metallic portion of a screwdriver between one side of the fuse and the fuse alarm bar on the fuse panel. The FA buzzer should sound.
- (b) Remove the screwdriver from the fuse panel. The FA buzzer should stop sounding.

(2) Night alarm.

- (a) Operate the NIGHT ALARM switch to the ON position.
- (b) Connect the alligator clip end of Test Set TS-190/U to ground.
- (c) Connect the TS-190/U test probe to the D terminal of the A-B-C-D C.B. LINES receptacle on the cord connector panel and observe the following indications:
 1. Relay AU should operate.
 2. Relay NA should operate.
 3. Night bell NB should sound and relay AU should release.
 4. Relay NA should lock up.

- (d) Disconnect the TS-190/U test probe from the D terminal of the A-B-C-D C.B. LINES receptacle at the cord connector panel and connect it to the RLS terminal of the RLS-NA-FA-VT receptacle on the cord connector panel and observe the following indications:
 1. Relay AR should operate.
 2. Relay NA should release and night bell NB should stop sounding.

- (e) Disconnect the TS-190 U test probe from the RLS terminal of the RLS-NA-FA-VT receptacle. Relay AR should release.

- (f) Operate the NIGHT ALARM switch to the OFF position and tap the TS-190/U test probe to the D terminal at the A-B-C-D C.B. LINES receptacle of the cord connector panel. A click should be heard in the test receiver.

- (g) Disconnect the alligator clip of the TS-190/U from ground.

(3) No voltage alarm (ringing output).

- (a) Arrange the ME-77 U to indicate on the 250-volt ac scale.

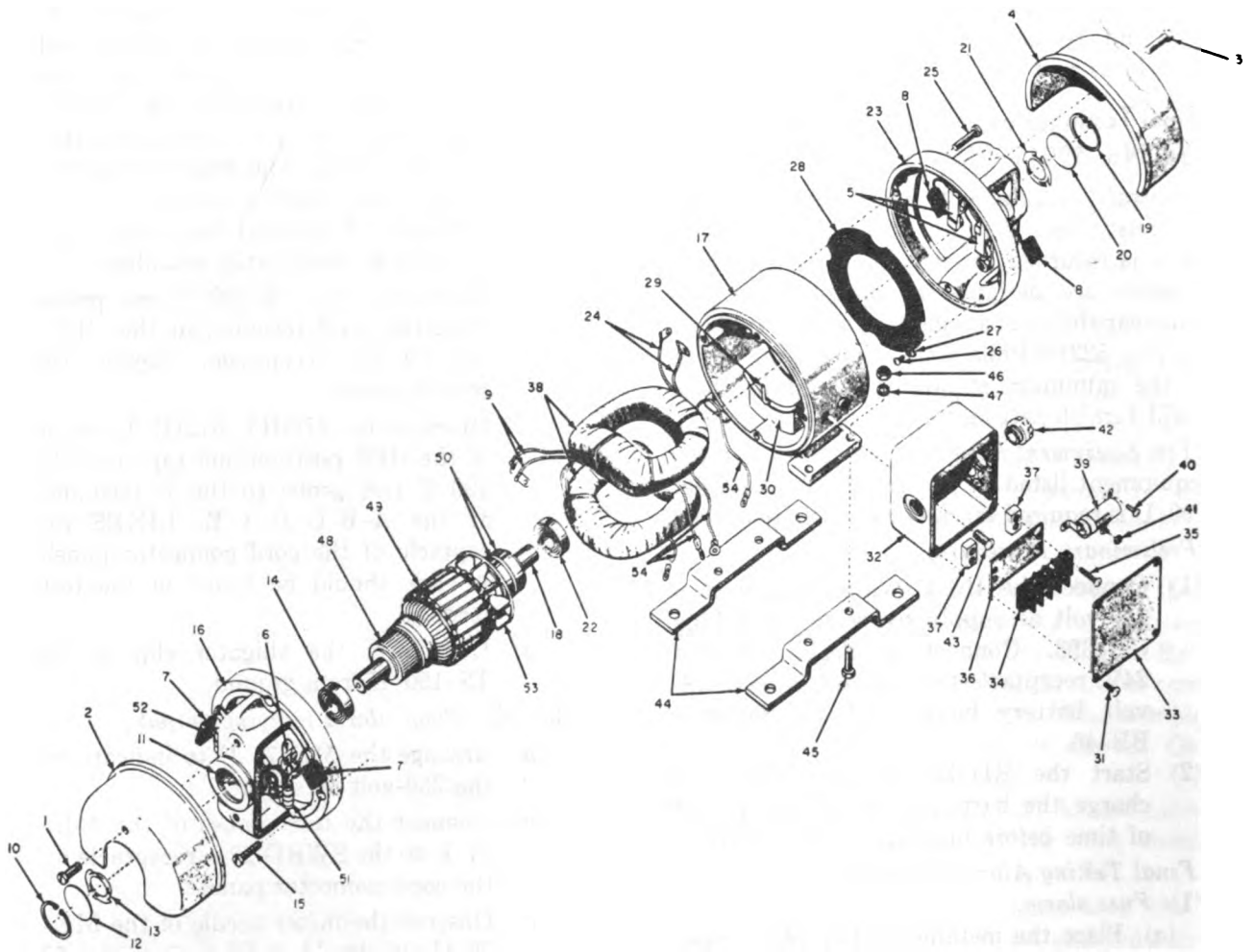
- (b) Connect the test probes of the ME-77 U to the SWBD 20~ receptacle on the cord connector panel.

- (c) Observe the meter needle of the ME-77 U; it should indicate between 90 and 107 volts ac.

- (d) Operate the TELERING switch to the OFF position. Observe the following indications:
 1. The meter needle of the ME-77/U should indicate 0 volt ac.
 2. Relay A should release.
 3. The NO VOLTAGE ALARM lamp should light and buzzer C should sound.

- (e) Operate the NO VOLTAGE ALARM switch and observe the following indications:
 1. Relay B should operate and lock up.
 2. The NO VOLTAGE ALARM lamp should remain lighted.
 3. Buzzer C should stop sounding.

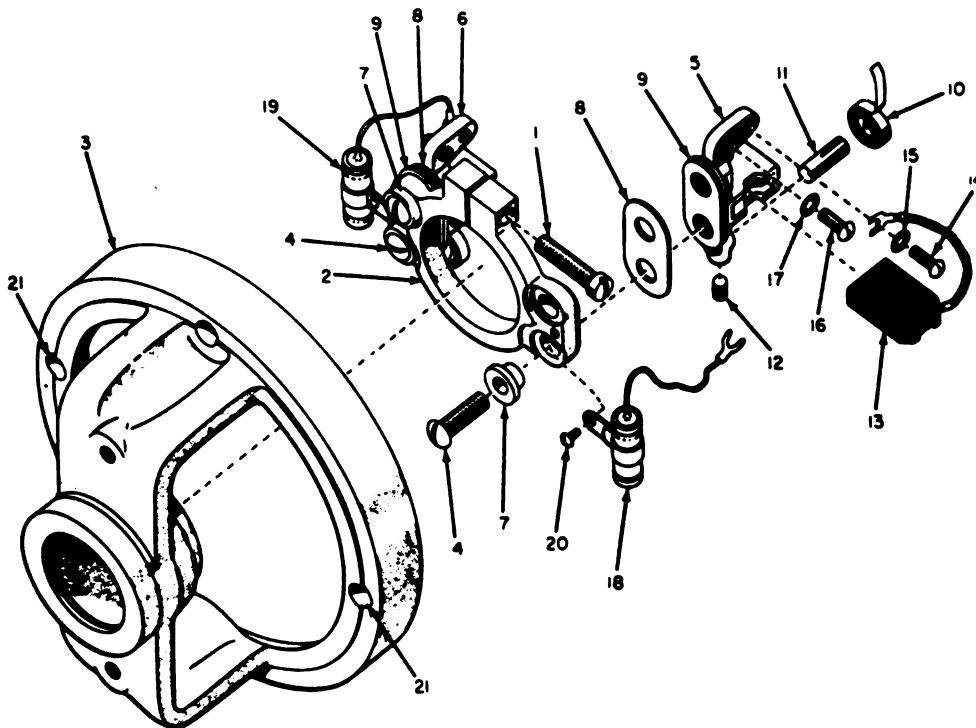
- (f) Operate the TELERING-EMERGENCY RING switch to the EMERGENCY RING position.



TM2064-C4-17

- | | |
|---|--|
| 1 Dc end plate retaining screw | 28 Dust shield |
| 2 Dc end plate | 29 Copper stud |
| 3 Ac end plate retaining screw | 30 Field coil pole piece |
| 4 Ac end plate | 31 Terminal box plate mounting screw |
| 5 Ac brush holder assembly | 32 Terminal box |
| 6 Dc brush holder assembly | 33 Terminal box plate |
| 7 Dc brush ($\frac{3}{16}$ by $\frac{3}{4}$ by $1\frac{1}{16}$ inch) | 34 Terminal board |
| 8 Ac brush ($\frac{3}{16}$ by $\frac{5}{8}$ by $1\frac{3}{8}$ inch) | 35 Terminal board mounting screw |
| 9 Dc field coil leads | 36 Name plate |
| 10 Snap ring | 37 Spacers |
| 11 Dc housing cover socket | 38 Field coil |
| 12 Bearing shield | 39 Resistor |
| 13 Pressure ring | 40 Resistor mounting screw |
| 14 Sealed bearing | 41 Resistor lead terminal nut |
| 15 Dc housing cover retaining screw | 42 Insulating bushing |
| 16 Dc housing cover | 43 Terminal box mounting screw |
| 17 Housing | 44 Special mounting bracket |
| 18 Armature shaft | 45 Special mounting bracket mounting screw |
| 19 Snap ring | 46 Special mounting bracket mounting nut |
| 20 Bearing shield | 47 Special mounting bracket washer |
| 21 Pressure ring | 48 Commutator |
| 22 Sealed bearing | 49 Armature windings |
| 23 Ac housing cover | 50 Collector rings |
| 24 Ac field coil leads | 51 Capacitor C1 |
| 25 Ac housing cover retaining screw | 52 Capacitor C2 |
| 26 Dust shield retaining screw | 53 Cooling fan |
| 27 Dust shield washer | 54 Input-output field coil leads |

Figure 46. Emergency ringer (Order No. 52218-Phila-57), exploded view.



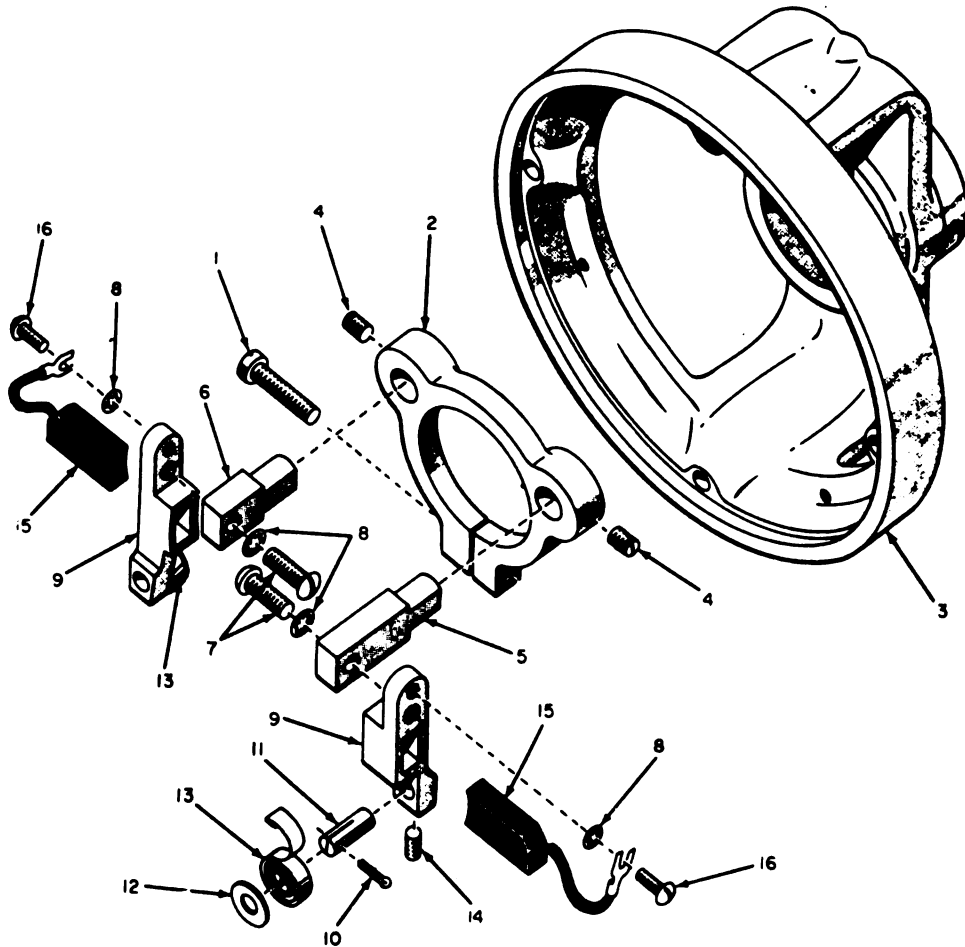
TM2064-C4-19

- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Dc brush holder mounting ring retaining screw 2 Dc brush holder mounting ring assembly 3 Dc housing cover 4 Dc brush holder mounting screw 5 Right dc brush holder assembly 6 Left dc brush holder assembly 7 Fiber bushing 8 Elevation plate 9 Mica shield 10 Brush tension springs 11 Tension adjustment stud | <ul style="list-style-type: none"> 12 Tension adjustment setscrews 13 Dc brush 14 Brush lead terminal screw 15 Lockwasher ($\frac{3}{16}$-inch internal diameter) 16 Field coil lead terminal screw 17 Lockwasher ($\frac{3}{16}$-in. internal diameter) 18 Capacitor C1 19 Capacitor C2 20 Capacitor mounting screw 21 Dc housing cover retaining screw holes |
|---|--|

Figure 47. Emergency ringer (Order No. 52218-Phila-57), dc end, exploded view.

- (g) Operate the EMERGENCY RING circuit breaker to the ON position and observe the following indications:
 1. The emergency ringer should operate.
 2. The meter needle of the ME-77/U should indicate between 79 and 102 volts ac.
 3. Relay A should operate and relay B should release.
- (h) Disconnect the test probes of the ME-77/U from the SWBD 20~ receptacle and connect them to the TEST BD 20 cycle receptacle. The meter needle of the ME-77/U should indicate between 79 and 102 volts ac.
- (i) Disconnect the test probes of the ME-77/U from the TEST BD 20~ receptacle.

- (j) Operate the EMERGENCY RING circuit breaker to the OFF position. The emergency ringer should stop.
- e. Final Testing Output Circuits to Switchboard.
 - (1) 110-volt ac output circuit.
 - (a) Arrange the ME-77, U to read on the 250V ac scale.
 - (b) Momentarily touch the test probes of the ME-77/U to the terminals at the SPARE 110V., TEST BD 110V., and SWBD 110V. receptacles on the cord connector panel. The ME-77/U should indicate approximately 110 volts ac.
 - (2) 48-volt dc output circuit.
 - (a) Arrange the ME-77 U to read on the 100-volt dc scale.
 - (b) Momentarily touch the test probes of the ME-77/U to the + and -



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- | | |
|---|--------------------------------|
| 1 Ac brush holder mounting ring retaining screw | 9 Ac brush holder assembly |
| 2 Ac brush holder mounting ring assembly | 10 Cotter pin |
| 3 Ac housing cover | 11 Tension adjustment stud |
| 4 Ac brush holder stud setscrew | 12 Washers |
| 5 Ac long brush holder stud | 13 Brush tension spring |
| 6 Ac short brush holder stud | 14 Tension adjustment setscrew |
| 7 Ac brush holder mounting screw | 15 Ac brush |
| 8 Lockwasher | 16 Brush lead terminal screw |

Figure 48. Emergency ringer (Order No. 52218-Phila-57), ac end, exploded view.

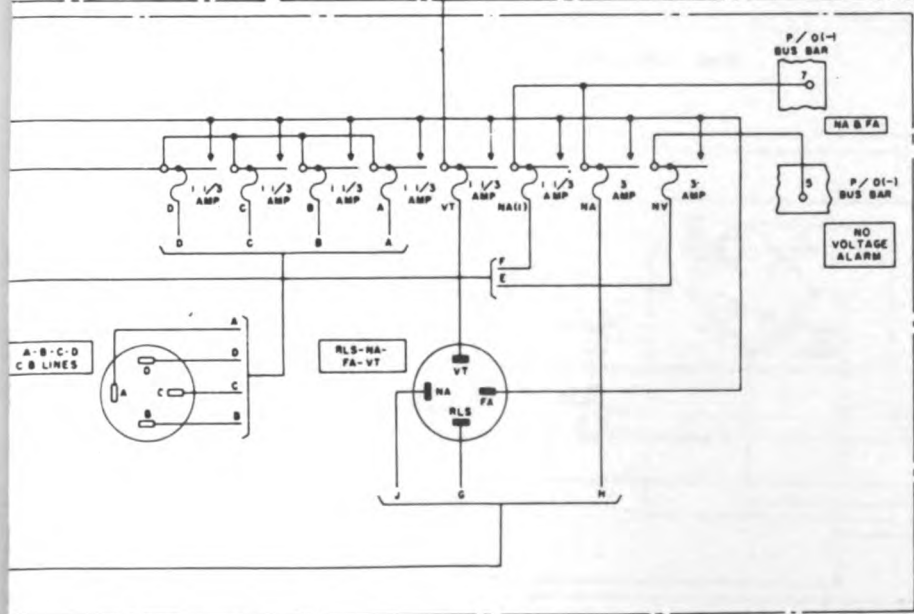
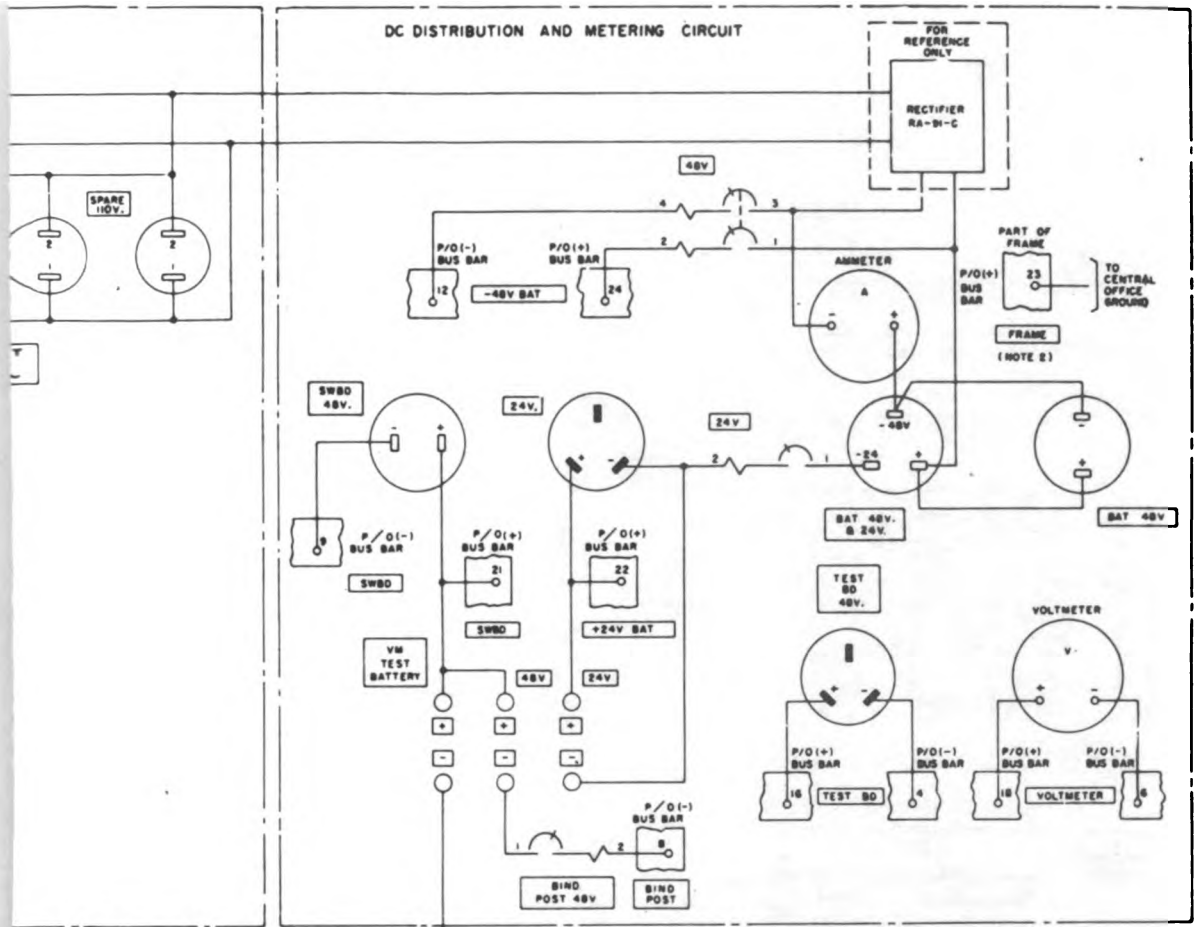
terminals of the 48V., SWBD 48V., and TEST BD 48V., receptacles and the 48V. and VM TEST BATTERY binding posts. The ME-77/U should indicate approximately the same voltage reading as indicated by the voltmeter on the meter and switch panel (approx. 50 volts dc).

- (3) **24-volt dc output circuit.** Momentarily touch the test probes of the ME-77/U to the + and - terminals of the 24V. receptacle and the 24V binding posts

on the cord connector panel. The meter needle of the ME-77/U should indicate approximately 24 volts dc.

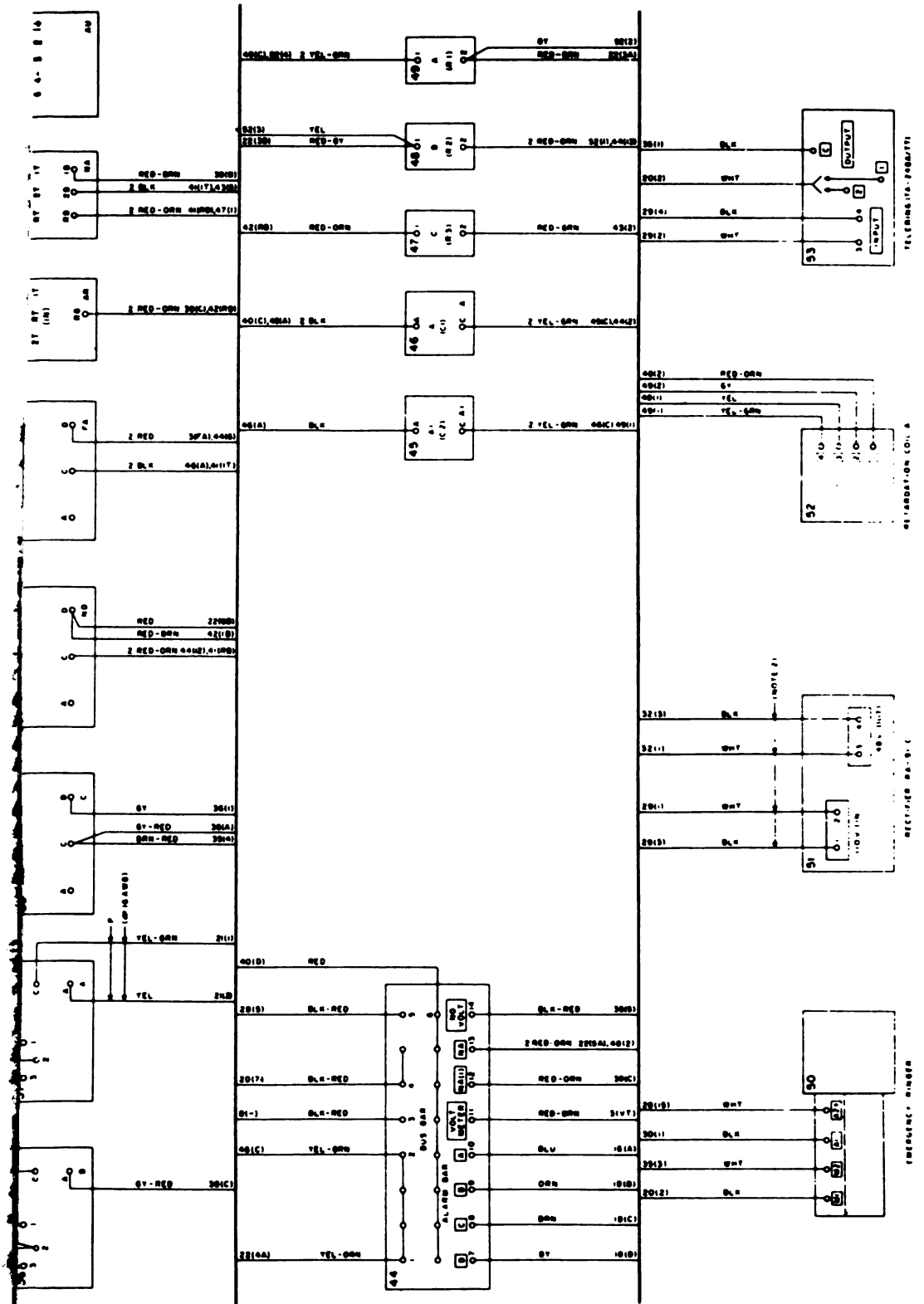
f. Ammeter.

- (1) Operate the 48V circuit breaker on the meter and switch panel to the OFF position.
- (2) Unscrew and remove the retaining nut on the positive side of the ammeter and remove the lead.
- (3) Arrange the ME-77/U to be used as an ammeter.



- NOTES
1. RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UF
 2. GROUND LVS APPEARS ON SIDE OF FRAME MOUNTING BRACKET
 3. CAPACITORS C1 AND C2 ARE GROUND TO EMERGENCY RINGER FRAME
 4. INDICATES PANEL MARKING
 5. BUS BAR, BUZZER, RELAY, RECEPTACLE, AND SWITCH TERMINAL NUMBERS ARE ASSIGNED

2218-Phila-57, schematic diagram.



BOTTOM OF PANEL

- (4) Connect the red test probe of the ME-77 U to the positive (+) terminal of the ammeter on the meter and switch panel.
- (5) Connect the black test probe of the ME-77 U to the loose lead from the ammeter on the meter and switch panel and tape the leads.
- (6) Operate the 48V circuit breaker on the meter and switch panel to the ON position.
- (7) Both meters should indicate the same current flow.
- (8) Reoperate the 48V circuit breaker on the meter and switch panel to the OFF position.
- (9) Disconnect the ME 77 U from the ammeter and the loose lead.
- (10) Reconnect the loose lead to the (+) terminal of the ammeter on the meter and switch panel.

AG 300.7 (7 Feb 58)

By Order of *Wilber M. Brucker*, Secretary of the Army:

MAXWELL D. TAYLOR,
General, United States Army,
Chief of Staff.

Official:

HERBERT M. JONES,
Major General, United States Army,
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MDW
Armies
Corps
Div
USATC
Ft & Camps
Svc Colleges
Br Svc Sch
USA Sig Pub Agcy
USA Pictorial Cen
TASSA, Philadelphia, Pa

Gen Depots
Sig Sec, Gen Depots
Sig Depot
USA Sig Comm Engr Agcy
USA Comm Agcy
AMS
Engr Maint Cen
AFIP
WRAMC
Port of Emb (OS)
Trans Terminal Comd
Army Terminals
OS Sup Agcy
Sig Fld Maint Shops
Sig Lab
Yuma Test Station
TASSA, Chicago Rgn Ofc
USA White Sands Sig Agcy
USA Elet PG
Sandia Base, Sp Wpn Comd
Mil Dist
JBUSMC

Units org under fol TOE:

11-7	11-500 (TM's AA AE)
11-16	11-557
11-57	11-587
11-127	11-592
11-128	11-597

NG: State AG; units—same as Active Army.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

TECHNICAL MANUAL
PANELS BD-132, BD-132-A, AND POWER SWITCHBOARD
SB-361/TT

TM 11-2064
CHANGES NO. 5

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 22 August 1960

TM 11-2064, 28 July 1949, is changed as follows:

APPENDIX V
MAINTENANCE ALLOCATION CHART
(Added)

SECTION I. MAINTENANCE ALLOCATION

I. General

a. This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon.

b. Columns in the maintenance allocation chart are as follows:

- (1) *Part or component.* Only the nomenclature or standard item name is shown in this column. Additional descriptive data is included only where clarification is necessary to identify the part. Components and parts comprising a major end item are listed alphabetically. Assemblies and subassemblies are in alphabetical sequence with their components listed alphabetically below the assembly listing.
- (2) *Maintenance function.* This column indicates the various maintenance functions allocated to the echelon capable of performing the operation.
 - (a) *Service.* To clean, preserve and replenish fuel and lubricants.
 - (b) *Adjust.* To regulate periodically to prevent malfunction.

(c) *Inspect.* To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(d) *Test.* To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc.

(e) *Replace.* To substitute serviceable assemblies, subassemblies, and parts for unserviceable components.

(f) *Rebuild.* To restore to a condition comparable to new by disassembling the item to determine the condition of its component parts and reassembling it using serviceable, rebuilt, or new assemblies, subassemblies, and parts.

(3) *1st, 2d, 3d, 4th, 5th echelon.* The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon marked by X are authorized to perform the indicated operation.

* These changes supersede the first echelon portion of DA Supply Manual SIG 7&8 BD-132, 24 September 1957, including C 1, 14 September 1959.

(4) *Tools required.* This column indicates codes assigned to each individual tool equipment, test equipment, and maintenance equipment referenced. The grouping of codes in this column of the maintenance allocation chart indicate the tool, test, and maintenance equipment required to perform the maintenance function.

(5) *Remarks.* Entries will be utilized when necessary to clarify any of the data cited in the preceding columns.

c. Columns in the allocation of tools for maintenance functions are as follows:

(1) *Tools required for maintenance functions.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

(2) *1st, 2d, 3d, 4th, 5th echelon.* A dagger (†) indicates the echelons allo-

cated the facility.

(3) *Tool Code.* This column lists the tool code assigned.

(4) *Remarks.* Entries are used to clarify data in the other columns.

2. Maintenance by Using Organizations

When this equipment is used by signal service organizations organic to theater headquarters or communication zones, to provide theater communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

3. Mounting Hardware

The basic entries of this maintenance allocation chart do not include mounting hardware such as screws, nuts, bolts, washers, brackets, clamps, etc.

MAINTENANCE ALLOCATION CHART

(1) PART OR COMPONENT	(2) MAINTENANCE FUNCTION	(3) 1ST ECH.	(4) 2ND ECH.	(5) 3RD ECH.	(6) 4TH ECH.	(7) 8TH ECH.	(8) TOOLS REQUIRED	(9) REMARKS
PANEL BD-132, BD-132-A	service	X						Exterior Interior
	adjust	X	X				1,3,4,6	Relays, Spring tension of brushes, contacts, vibrator, resistor, R1, fuseholders, night bell, buzzer
	inspect		X					Exterior and Interior
	test		X				1,2,3,4	Continuity, voltage, current, ringing generator (No load, full load), Static generator, circuit breakers, no voltage alarm ckt, fuse alarm ckt, NACKT, resistors capacitors relays.
	adjust				X		1,3,4,6	All adjustments
	test				X		1,2,3,4,5	All tests
	rebuild				X			
AMMETER	replace			X			1,2,4	
BELL, ELECTRICAL	replace			X			1,4	
BUZZER	replace			X			1,4	
CAPACITOR, FIXED, PAPER DIELECTRIC	replace			X			1,4	
CATCH, FASTENER	replace			X			4	
CIRCUIT BREAKER	replace			X			1,2,4	
COIL, TELEPHONE, RETARDATION	replace			X			1,4	
CONNECTOR, RECEPTACLE, ELECTRICAL	replace			X			4	
FUSE, INDICATOR ALARM	replace		X					
GENERATOR, RINGING, MACHINE	replace			X			1,4,6	
BRUSHES, CARRON	replace			X			4,6	
GENERATOR, RINGLING, STATIC TA-248/TT, TA-248A/TT OR	replace			X				Separate MAC
INTERRUPTER PE-250	replace			X				Separate MAC
HANDLE, SWITCH	replace			X			4	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
PART OR COMPONENT	MAINTENANCE FUNCTION	1ST ECH	2ND ECH	3RD ECH	4TH ECH	5TH ECH	TOOLS REQUIRED	REMARKS
BD-132, BD-132-A (continued)								
INSERT, ELECTRICAL, CONNECTOR	replace	X		X			4	
LAMP, INCANDESCENT	replace	X		X			4	
LAMPHOLDER	replace				X		5	
LATCH, FASTENER	replace	X						
LENS, INDICATOR LIGHT	replace				X		5	
LOCKSPRING, TURNLOCK FASTENER	replace			X			4	Separate MAC
POST, BINDING: TM-109	replace			X				
RECTIFIER RA-91-A, B, C	replace			X			1.4	
RELAY, ARMATURE	replace			X			1.4	
RESISTOR, FIXED, WIRE WOUND	replace			X			4	
SWITCH, LEVER	replace			X			1	
SWITCH, PUSH-PULL	replace			X			1.4	
SWITCH, TOGGLE	replace			X				
VOLTMETER	replace			X				

ALLOCATION OF TOOLS FOR MAINTENANCE FUNCTIONS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH.	2ND ECH.	3RD ECH.	4TH ECH.	5TH ECH.	TOOL CODE	REMARKS
BD-132, BD-132-A (continued)							
MULTIMETER AN/URM-103		†	†	†	†	1	If not available use TS-352/U
SHUNT INSTRUMENT MULTIRANGE MX-1471/U		†	†	†	†	2	If not available use TS-352/U
TEST SET T-181		†	†	†	†	3	
TOOL EQUIPMENT TE-49		†	†	†	†	4	
TOOL EQUIPMENT TE-112		†	†	†	†	5	
SCALE SPRING FSN 6670-291-8721		†	†	†	†	6	

APPENDIX VI
BASIC ISSUE ITEMS LIST, PANEL BD-132, BD-132-A
(Added)

Section I. INTRODUCTION

1. Scope

a. This appendix lists items supplied for initial operation and for running spares. The list includes tools, accessories, parts, and material issued as part of the major end item and all items authorized for basic operator maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in the equipment authorization tables and other documents that are a basis for requisitioning.

b. Columns are as follows:

- (1) *Source, maintenance, and recoverability code.* (Not used).
- (2) *Federal stock number.* The stock number lists the 11-digit Federal stock number.
- (3) *Designation by model.* A dagger (†) indicates the model in which the part is used.
- (4) *Description.* Nomenclature or the standard item name and brief identifying data for each item is listed in this column. When requisitioning, enter the nomenclature and description on the requisition.
- (5) *Unit of issue.* The unit of issue is the supply medium by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.
- (6) *Expendability.* Expendable items are indicated by the letter X; non-expendable items are indicated by NX.
- (7) *Quantity authorized.* Under "Items Comprising an Operable Equipment" the column lists the quantity of items supplied for the initial operation of the equipment. Under "Running Spares and Accessories" the quantities listed are those issued initially with the equipment as spare parts. The quantities are authorized to be kept on hand by the operator for maintenance of the equipment.
- (8) *Illustration.* (Not used).

2. Critical Items

A zero slash (Ø) in the "Description" column indicates items expected to fail during the first year; also items that will make the equipment inoperative if they fail.

3. References

Additional instructions concerning maintenance of this equipment are contained in—

TM 11-5805-298-12P, Operator's, Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart, Generator, Ringing, Static TA-248/TT, TA-248A/TT

TM 11-6130-220-12P, Operator's, Organizational Maintenance Repair Parts and Special Tools List and Maintenance Allocation Chart, Rectifier RA-91-A, RA-91-B, RA-91-C

SIG 7&8-PE-250, Interrupter PE-250.

4. Comments or Suggestions

Any comments concerning omissions and discrepancies in this manual will be prepared on DA Form 2028 and forwarded directly to Commanding Officer, U. S. Army Signal Material Support Agency, ATTN: SIGMS-ML, Fort Monmouth, N. J.

Section II. FUNCTIONAL PARTS LIST

(j) SOURCE MAINTENANCE AND RECOVERABILITY CODE	(k) FEDERAL STOCK NUMBER	(l) DESIGNATION BY MODEL	(m) DESCRIPTION	(n) UNIT OF ISSUE	(o) EXPENDABILITY	(p) QUANTITY AUTHORIZED	(q) ILLUSTRATIONS	
							FIGURE NO.	ITEM NO.
		1 2	ITEMS COMPRISING AN OPERABLE EQUIPMENT					
			PANEL BD 132, BD-132A					
			NOTE: Model Column 1 refers to BD-132; Column 2 refers to BD-132-A.					
	5803-231-7037		PANEL BD-132; BD-132-A (Basic Component)	ea	NX	1		
	Ord thru AGC	† †	TECHNICAL MANUAL TM 11-2061	ea	X	2		
	5803-162-6256	† †	GENERATOR, RINGING, STATIC TA-218/TT: TA 218A/TT: WECo Spec No. KS-5192-01, List No. 1	ea	NX	1		
			OR					
	5803-543-1450	† †	INTERUPPER PE-250	ea	NX	1		
	6130-222-6201	† †	RECTIFIER RA-91-A, RA-91-B, RA-91-C	ea	NX	1		
			RUNNING SPARES AND ACCESSORY ITEMS					
			PANEL BD 132, BD-132A					
			NOTE: Items below are listed to insure availability but are not to be installed below 2nd echelon.					
	5920-156-0837	† †	0 FUSE, INDICATOR ALARM: 3 amp; 90 v; SIGC dwg No. SM-B-142653	ea	X	5		
	5920-156-0840	† †	0 FUSE, INDICATOR ALARM: 1-1/3 amp; 90 v; SIGC dwg No. SM-B-14313	ea	X	10		
	6240-238-8522	† †	0 LAMP, INCANDESCENT: WECo type No. C-2	ea	X	1		

By Order of *Wilbur M. Brucker*, Secretary of the Army:

L. L. LEMNITZER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army:

To be distributed in accordance with DA Form 12-7 requirements for TM 11-series (UNCL) plus the following additional formula:

ASA (2)	Eighth US Army (2)	
CNGB (1)	Units org under fol TOE (2	
Tech Stf, DA (1) except	copies each):	
CSigO (18)	11-7	11-500 AA-AE
Def Atomic Spt Agcy (5)	11-16	11-557
US ARADCOM (2)	11-57	11-587
US ARADCOM Rgn (2)	11-97	11-592
MDW (1)	11-117	11-597
Seventh US Army (2)	11-155	

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

**PANELS BD-132, AND BD-132-A AND
POWER SWITCHBOARD SB-361/TT**

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 7 October 1963

No. 6 }
CHANGE }

TM 11-2064, 28 July 1949, is changed as follows:

Note. The parenthetical reference to previous Change (example: "page 1 of C 4") indicates that pertinent material was published in that Change.

Page 1. Delete paragraphs 1 and 2 (page 1 of C 4) and substitute:

1. Scope

a. This manual describes Panels BD-132 and BD-132-A and Power Switchboard SB-361/TT. The manual includes information covering installation, operation, cleaning and inspection of equipment, preventive maintenance services, theory, and repair and adjustment procedures.

b. The maintenance allocation chart appears in appendix V.

1.1. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. Department of the Army Pamphlet No. 310-4 is a current index of technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes to and revisions of each equipment publication.

2. Forms and Records

a. *Reports of Maintenance and Unsatisfactory Equipment.* Use equipment forms and records in accordance with instructions in TM 38-750.

b. *Report of Damaged or Improper Shipment.* Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication 378 (Navy), and AFR-71-4 (Air Force).

c. *Reporting of Equipment Manual Improvements.* The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged.

DA Form 2028 (Recommended changes to DA technical manual parts lists or supply manual 7, 8, or 9) will be used for reporting these improvements. This form will be completed in triplicate using pencil, pen, or typewriter. The original and one copy will be forwarded direct to: Commanding Officer, U.S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, N.J. 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc.).

Page 13, paragraph 9a. Delete subparagraphs (2) (i) and (j).

Add paragraph 10.1 after paragraph 10.

10.1. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (par. 2).

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the basic issue items list (app. VI). Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear on the front panel near the nomenclature plate. Check to see whether the MWO number (if any) and appropriate notations concerning the modification have been entered in the equipment manual.

Note. Current MWO's applicable to the equipment are listed in DA Pam 310-4.

Page 24. Delete paragraph 22.

Page 25. Make the following changes:

Delete section I and substitute:

Section I. OPERATOR'S PREVENTIVE MAINTENANCE

22. Scope of Operator's Maintenance

The maintenance duties assigned to the operator of these equipments are listed below together with a reference to the paragraphs covering the specific maintenance function. The duties assigned do not require tools or test equipment.

- a. Daily preventive maintenance checks and services (pars. 22.1 through 22.3).
- b. Cleaning (par. 22.4).
- c. Troubleshooting (par. 19d).
- d. Repairs and adjustments.
 - (1) Replacement of lamp (fig. 8).
 - (2) Replacement of batteries (par. 21b).
 - (3) Replacement of fuses (par. 18c).
 - (4) Adjustment of charging rate (pars. 16 and 17).

22.1. Operator's Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. *Systematic Care.* The procedures given in paragraphs 22.2 through 22.4 cover routine systematic care and cleaning essential to proper upkeep of this equipment when it is used separately. When this equipment is used as part of a *set* or *system*, follow the procedures established in the *set* or *system* manual.

b. Preventive Maintenance Checks and Services.

The preventive maintenance checks and services chart (par. 22.3) outlines functions to be performed daily; however, if the equipment is used as part of a *set* or *system*, follow the procedures established in the *set* or *system* manual. For equipments operated separately, these checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and what the normal conditions are; the *References* column lists the illustrations, paragraphs, or manuals that contain supplementary information. If the defect cannot be remedied by the operator, higher echelon maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

22.2 Preventive Maintenance Checks and Service Periods

a. Preventive maintenance checks and services of the equipment is required on a daily basis.

b. Paragraph 22.3 specifies checks and services that must be accomplished daily and under the special conditions listed below when the equipment is used in transportable and mobile installations.

- (1) When the equipment is initially installed.
- (2) When the equipment is reinstalled after removal for any reason.

22.3. Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Panels BD-132 and BD-132-A, and Power Switchboards SB-361/TT.	Check the equipment for completeness including a full complement of running spares.	Appendix VI. Paragraphs 17a and 68.
2	Exterior surfaces	Remove dirt, dust, oil, moisture, or fungus from exposed surfaces.	
3	External cables or cords...	Check for sharp bends, kinks, or broken and deteriorated insulation.	
4	Batteries	Check for evidence of gassing or electrolyte leakage. Clean as required with soda and water solution.	
5	Switches	Check for positive action and secure mounting.	
6	Rectifier	Check the ammeter of the rectifier for the charging rate. Adjust coarse and fine controls.	
7	Equipment performance...	Check for normal indications. Refer any unusual results to qualified maintenance personnel.	

Sequence No.	Item	Procedure	References
		a. BD-132 and SB-361/TT	Paragraph 20, items 5 through 11.
		b. BD-132-A	Paragraph 76, items 6 through 23.

22.4. Cleaning

Inspect all the exposed surfaces of the equipment. The exterior surfaces should be clean, and free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean soft cloth.

Warning: Cleaning compound is flammable and its fumes are toxic. Provide adequate ventilation. Do not use near a flame.

b. Remove oil, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with cleaning compound, FSN 7930 395 9542.

c. Remove dust or dirt from the rectifier control panel, the upper control panel, and the emergency ringer with a brush.

Caution: Do not press on the meter faces (glass) when cleaning; the meter may be damaged.

d. Clean the front panels, meters, and control knobs; use a soft clean cloth. If dirt is difficult to remove, dampen the cloth with water; mild soap may be used for more effective cleaning.

Page 25, paragraph 24b. Delete second sentence.

Page 26. Delete section III and substitute:

Section III. ORGANIZATIONAL PREVENTIVE MAINTENANCE

25. Scope of Organizational Maintenance

Organizational maintenance of this equipment includes the following:

a. Preventive Maintenance (pars. 26 through 27.3).

b. Lubrication (pars. 23 and 74).

c. Cleaning emergency ringer (pars. 24 and 75).

d. Troubleshooting (pars. 29 and 77).

e. Removal and replacement of parts (pars. 79 and 80).

f. Adjustments (pars. 41 and 81).

26. Tools and Test Equipment

The tools and test equipment required for organizational maintenance are listed in the Maintenance Allocation Chart in appendix V.

27. Organizational Preventive Maintenance

a. Preventive maintenance is the systematic care, inspection, and servicing of equipment to maintain it in serviceable condition, prevent breakdowns, and assure maximum operational capability. Preventive maintenance is the responsibility of all echelons

concerned with the equipment and includes the inspection, testing, and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance checks and services of the equipment at the second echelon level are made at monthly intervals unless otherwise directed by the commanding officer. The preventive maintenance checks and services should be scheduled concurrently with the periodic service schedule of the carrying vehicle for all vehicular installations.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

27.1. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (par. 27.2). A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating

conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and

services performed on it. Equipment in limited storage requires service before operation; it does not require monthly preventive maintenance.

27.2. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item	Procedure	References
1	Fuses	Clean and inspect for condition and for rated value. Replace with correct rated fuses, as required.	
2	Terminal strips	Clean and thoroughly inspect for loose mountings, frayed wiring, or faulty connections.	
3	Receptacles	Clean and inspect for secureness of mounting and for cracked or broken parts.	
4	Relays	Check contact surfaces and relay adjustment. Clean and adjust, as required.	Paragraph 41a.
5	Bells and buzzers	Check for cleanliness and adjust as required.	Paragraph 41 d.
6	Switches	Inspect for mounting, secure wiring, and positive action.	Paragraph 41f.
7	Emergency ringer	Check input and output with the use of an ac voltmeter. Set the EMERGENCY RING switch at OFF. Check the brushes if the no-load output is below 90V.	Paragraph 41 e.
8	Lubrication	Check the emergency ringer (of all equipment except BD-132-A procured on Order No. 11650-PH-52) and lubricate as required.	Paragraph 23.
9	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4.
10	Modifications	Check DA Pam 310-4 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. ALL ROUTINE MWO's must be scheduled.	TM 38-750 and DA Pam 310-4.
11	Spare parts	Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisition.	Appendix VI.

27.3. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TM 9-213.

Page 32. Change chapter heading to: **FUNCTIONING AND REPAIR OF PANEL BD-132.**

Delete section I.

Page 36. Delete section III.

Page 38. Delete section VI.

Page 14 (C 4). Delete paragraph 72 and substitute:

72. Tools, Materials, and Test Equipment

The tools, materials, and test equipment required for organizational maintenance of Panel BD-132-A are listed in the Maintenance Allocation Chart in appendix V.

Page 15 (C 4). Delete paragraph 73 and substitute:

73. Preventive Maintenance

The preventive maintenance for Panel BD-132-A is the same as that required for Panel BD-132. Refer to paragraphs 27, 27.1, and 27.2.

Page 16 (C 4). Delete figure 43.

Page 17 (C 4). Delete figure 44.

APPENDIX II REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Buleltins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TB SIG 203	Installation, Adjustment, and Maintenance of Interrupter PE-250 (Telering).
TM 9-213	Painting Instruction for Field Use.
TM 11-900	Power Units PE-75-C, -D, -J, -K, -P, -S, -T, -U, -W, -AA, -AB, -AC, -AD, and -AE.
TM 900A	Power Unit PE-75-AF.
TM 11-964	Rectifiers RA-91 and RA-91-A.
TM 11-964A	Rectifiers RA-91-B and RA-91-C.
TM 11-4302	Tactical Switchboards and Long Lines Equipment; Repair Instructions, Apparatus Requirements.
TM 11-6625-202-10	Operator's Manual, Test Sets I-181, I-181-A, and I-181-B.
TM 11-6625-202-20	Organisational Maintenance, Test Sets I-181, I-181-A, and I-181-B.
TM 11-6625-203-12	Operation and Organizational Maintenance; Multimeter AN/URM-105 including Multimeter ME-77/U.
TM 11-6625-203-35	Field and Depot Maintenance Manual; Multimeter AN/URM-105 including Multimeter ME-77/U.
TM 38-750	The Army Equipment Record System and Procedures.

By Order of the Secretary of the Army:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

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TSG (1)
CofSptS (1)
ARADCOM (2)
ARADCOM Rgn (2)
MDW (1)
Seventh, USA (2)
EUSA (2)
Lexington Army Dep (10)

Units org under fol TOE (2 cy ea):

11-7
11-16
11-57
11-97
11-117
11-155
11-500 (Tms AA-AC)
11-557
11-587
11-592
11-597

NG: None.

USAR: None.

For explanation of abbreviations used, AR 320-50.

CHANGE }
NO. 7 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 12 August 1974

**PANELS BD-132 AND BD-132-A
AND POWER SWITCHBOARD SB-361/TT**

TM 11-2064, 28 July 1949, is changed as follows:

Page 1. Delete paragraph 1.1 and substitute:

1.1. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

Delete paragraph 2 and substitute:

2. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as

prescribed in AR 700-58/NAVSUP PUB 378/AFR 71-4/MCO P4030.29, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A, and DSAR 4500.15.

Paragraph 2.1 is added as follows:

2.1. Reporting 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 Blank Forms) and forwarded direct to: Commander, US Army Electronics Command, ATTN: AMSEL-MA-AN, Fort Monmouth, NJ 07703.

Page 9. After paragraph 7 add:

7.1. Items Comprising an Operable Equipment

PSN	Qty	Nomenclature, part No., and mfg code	Dimensions (in.)			Weight (lbs)
			Height	Depth	Width	
5906-234-7057		Panel BD-132 and Panel 132-A Consisting of: NOTE The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc.	58	18	26	625
5905-875-1215	1	Generator, Ringing, Static TA-248/TT, TA-248A/TT: KS-5492-01, List No. 1; 64959	10	4-1/8	4-3/8	7-1/2
5905-543-1450	1	Interrupter PE-250				
6130-222-6240	1	Rectifiers RA-91A, RA-91-B, RA-91-C (RA-91-B is used on the BD-132 and the RA-91-C is used on the BD-132-A)	21-1/4	12	19-1/2	100

Delete paragraph 62 in its entirety.

Page 13, paragraph 10.1, subparagraph b. Delete the second sentence of paragraph 10.1 b.

Page 25, paragraph 23.3. Delete "Appendix VI" from the reference column.

By Order of the Secretary of the Army:

Page 26, paragraph 27.2. Delete "Appendix VI" from the reference column.

Delete appendix VI in its entirety.

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

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- TSG (1)
- USAARENBD (1)
- USAMB (10)
- AMC (1)
- MICOM (2)
- TECOM (2)
- HISA (Ft Monmouth) (18)
- USACC (4)
- TRADOC (2)
- TRADOC (2)
- ARADCOM Rgn (2)
- OS Maj Comd (4)
- LOGCOMD (3)
- MDW (1)

- Armies (2)
- Corps (2)
- Ft Gordon (10)
- Ft Huachuca (10)
- Ft Carson (5)
- WSMR (1)
- Svc Colleges (1)
- USASESS (5)
- USAINTCS (3)
- USAADS (2)
- USAFAS (2)
- USAARMS (2)
- USAIS (2)
- USAES (2)
- AD (1) except
- SAAD (30)
- LBAD (14)
- TOAD (14)
- ATAD (10)

- USA Dep (2)
- Sig Sec USA Dep (2)
- Sig Dep (2)
- ATS (1)
- MAAG (1)
- WRAMC (1)
- USARMIS (1)
- USAERDAA (1)
- USAERDAW (1)
- Sig FLDMS (1)
- Ft Richardson (ECOM Ofc) (2)
- Units org under fol TOE: - 1 ea.
- 11-16
- 11-97
- 11-117
- 11-500 (AA-AC)

ARNG & USAR: None.

For explanation of abbreviations used, see AR 310-50.

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

TM 11-2064

PANEL BD-132

DEPARTMENT OF THE ARMY

•

JULY 1949

United States Government Printing Office

Washington: 1949

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 28 July, 1949

TM 11-2064, Panel BD-132, is published for the information and guidance of all concerned.

[AG 300.7 (7 July 48)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:

EDWARD F. WITSELL
Major General
The Adjutant General

OMAR N. BRADLEY
Chief of Staff, United States Army

DISTRIBUTION:

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For explanation of distribution formula, see SR 310-90-1.

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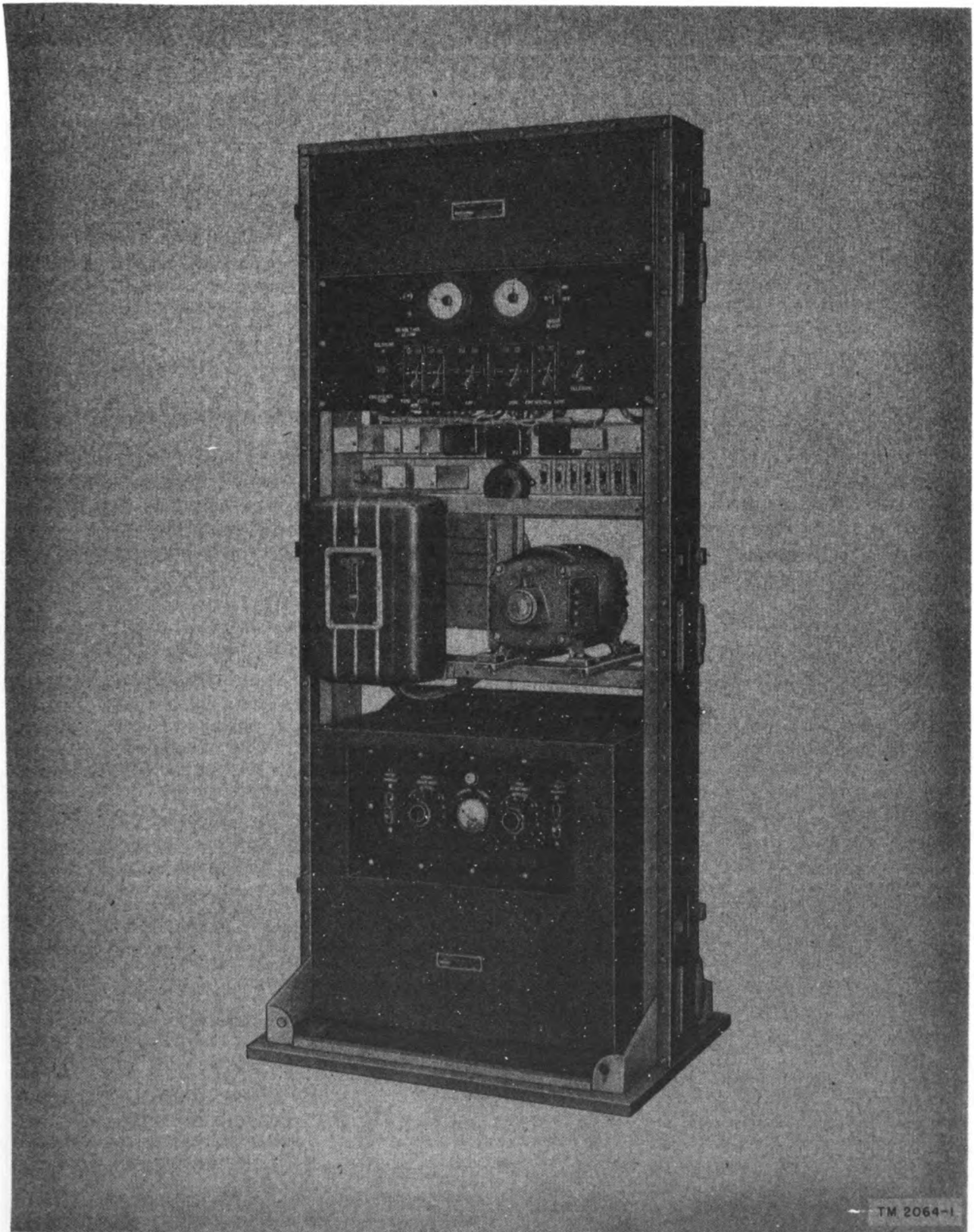


Figure 1. Panel BD-132.

CHAPTER I

INTRODUCTION

Section I. GENERAL

1. Purpose and Scope

This technical manual describes Panel BD-132 (fig. 1), a portable power control and alarm panel used with telephone central office sets. The manual includes essential data needed by personnel for the installation, operation, maintenance, and repair of the equipment.

2. Forms and Records

a. **FORMS.** The following forms are used in reporting operations and maintenance of the equipment:

- (1) WD AGO Form 468 (Unsatisfactory Equipment Report) for equipment used by the Army. WD AGO Form

468 will be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D.C., when trouble occurs more often than is normal, as determined by qualified repair personnel.

- (2) AF Form 54 (Unsatisfactory Report) for equipment used by the Air Force. AF Form 54 will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, in accordance with AF Regulation 15-54.

b. **OTHER FORMS AND RECORDS.** Use other forms and records as authorized.

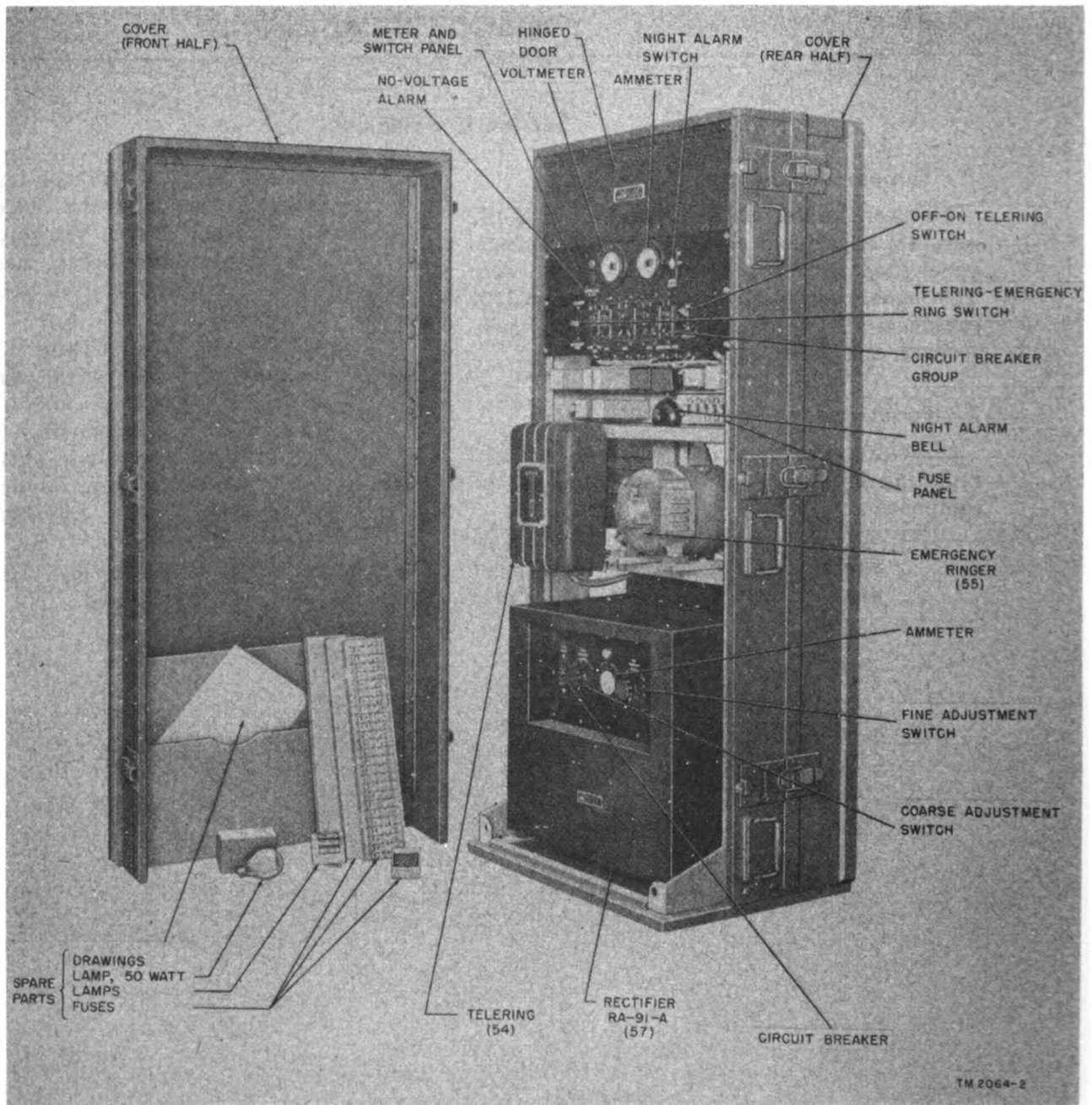


Figure 2. Panel BD-132, front cover removed.

Note. Figures appearing under designations on illustrations showing various components, controls, etc., are provided to assist in locating these on diagrams in this manual.

Section II. DESCRIPTION AND DATA

3. Description of Panel BD-132

a. This panel (fig. 1) is the point of protection, control, and distribution of power and ringing leads which supply a telephone central office. The panel is equipped with the necessary meters, switches, and other apparatus required to supply and control power needed for proper operation of such an office.

b. Panel BD-132 is the connecting point for the 24-v (volt) and 48-volt battery circuits commonly associated with telephone central office equipment. The panel is also the source of ringing power for the switchboard, or switchboards, in a central office set-up and, in addition, performs the functions of an alarm panel. Included in the panel are a night alarm circuit, a no voltage alarm circuit, and power and ringing circuits.

4. Location of Components in Panel

a. Panel BD-132 is a steel frame box structure with front and rear covers (fig. 2). At the top front of the panel is a hinged door (fig. 2) through which there is access to the wiring side of a cord connector panel (rear) (fig. 3), a meter and switch panel (fig. 2), a mounting plate for a night alarm bell (fig. 2), and Interrupter PE-250[†] Telering* (model H) (fig. 2), which is a power ringer to obtain 90-volt, 20-cy (cycle) ringing current from a 110-volt, 60-cycle a-c (alternating-current) supply, and an emergency ringer (fig. 2). Built into the bottom section of the panel is a Rectifier RA-91-A (fig. 2) which converts ac to dc (direct current) for furnishing current for d-c circuits and charging batteries commonly used in telephone central offices.

b. Provision is made in the bottom of the front cover of the power panel (fig. 2) for storage of spare parts. These include a 50-w (watt) lamp for the Telering, alarm lamps, and assorted fuses. Pertinent drawings also are kept here.

[†]Interrupter PE-250 (Telering) is Signal Corps nomenclature for Telering. TB SIG 208 gives instructions for installation, adjustment, and maintenance of the interrupter. Throughout this manual the interrupter is referred to under the name Telering since that is the name which appears on the equipment.

5. Description of Components

a. METER AND SWITCH PANEL. This panel (fig. 2) is mounted in the upper half front of the unit, and contains a voltmeter (left) (fig. 2) and ammeter (fig. 2). A no voltage alarm switch (fig. 4) is located at the left of the voltmeter. A circuit breaker group is located just below the voltmeter and ammeter (fig. 2) and consists of the following switches: TELERING EMERGENCY RING switch, two 48-volt switches, 24-volt switch, 110V switch, EMERGENCY RING switch, and TELERING OFF ON switch. All these switches are shown in figure 4, and figure 5 shows the wiring side (rear) of the part of the meter and switch panel on which they are located.

b. NIGHT ALARM BELL MOUNTING PLATE. Upon this plate (fig. 6) are mounted in addition to the night alarm bell (from left to right) : the cut-out relay for the no voltage alarm circuit, the no voltage alarm relay, the no voltage alarm buzzer, the fuse alarm buzzer, and the AR, NA, and AU relays in the night alarm circuit.

c. FUSE MOUNTING PLATE. Mounted upon this plate (fig. 7) is the fuse block, a pair of 4-mf (microfarad) capacitors, two 3-ohm resistors, and a 5,000-ohm resistor for the night alarm relay circuit.

d. TELERING (INTERRUPTER PE-250) (figs. 8 and 28). This is a vibrating-reed type of frequency converter for supplying 20-cycle ringing equipment from a 110-volt, 60-cycle a-c source in telephone central office installations. The interrupter consists of a metal cabinet 12 inches long, 8½ inches wide, and 4 inches deep, within which is suspended a vibrating-reed assembly, an electromagnet, and a contact-adjusting thumbscrew. Contacts on the reed and on the contact-adjusting screw are located in a small compartment behind a removable plate on the face of the cabinet. There is a removable plate on the back of the cabinet. Two standard 3-amp (ampere), glass type fuses (fig. 8) are arranged in a standard fuse block on the inside of the back cover of the cabinet and are easily accessible. A 50-watt lamp (fig. 8) is arranged in the circuit and lights if there is a short on the line or a heavy load on the

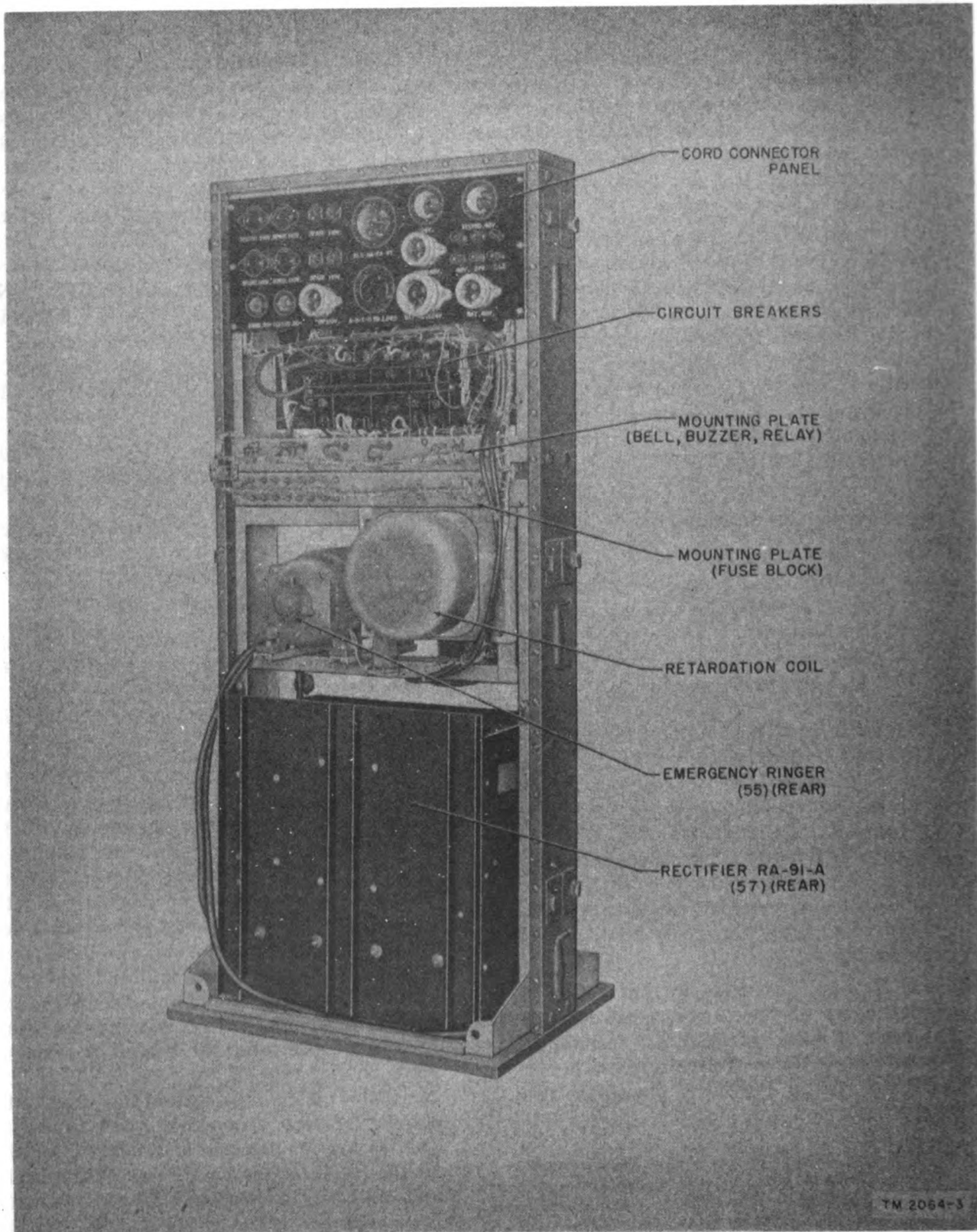


Figure 3. Panel BD-132, rear view.

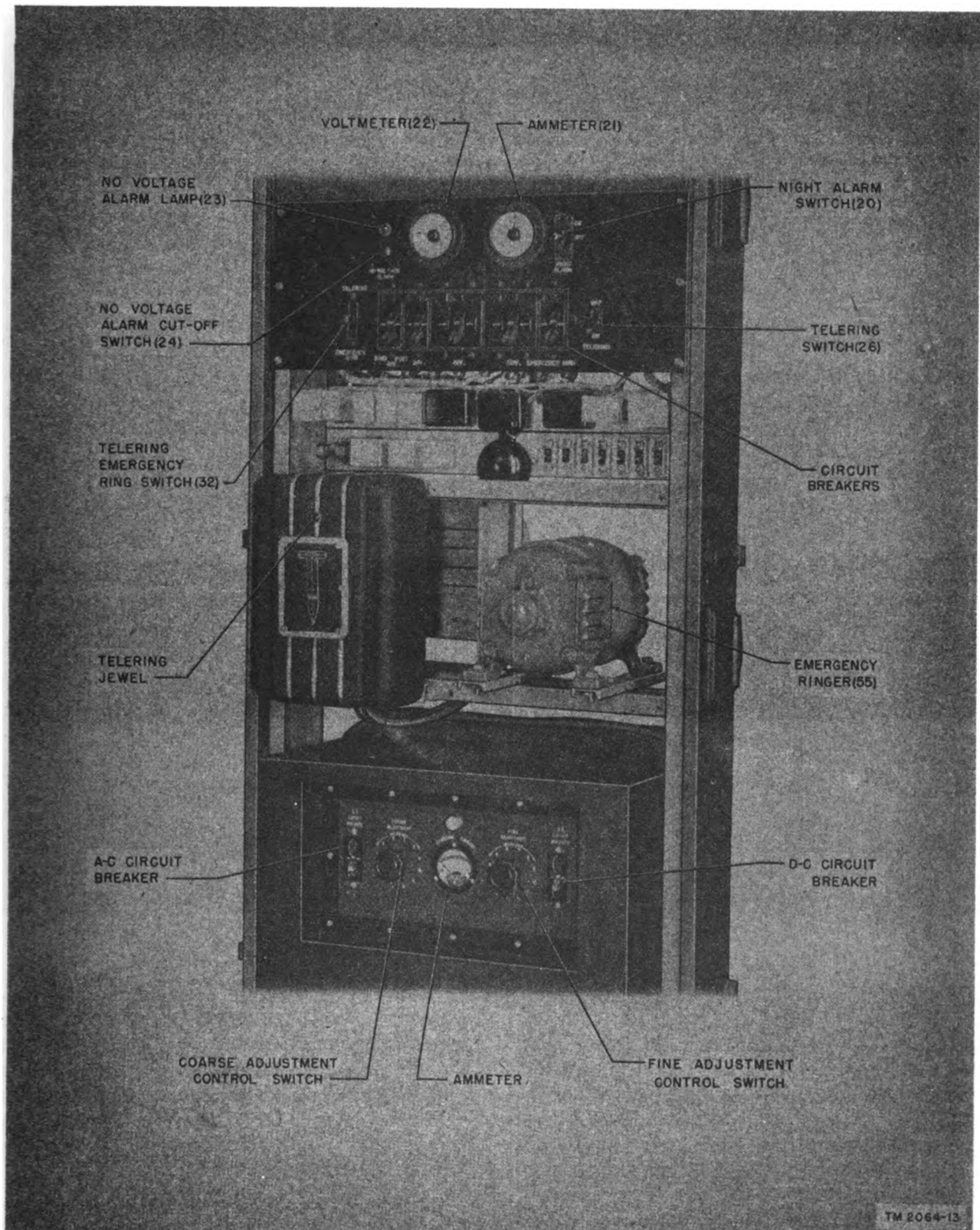


Figure 4. Location of operating controls.

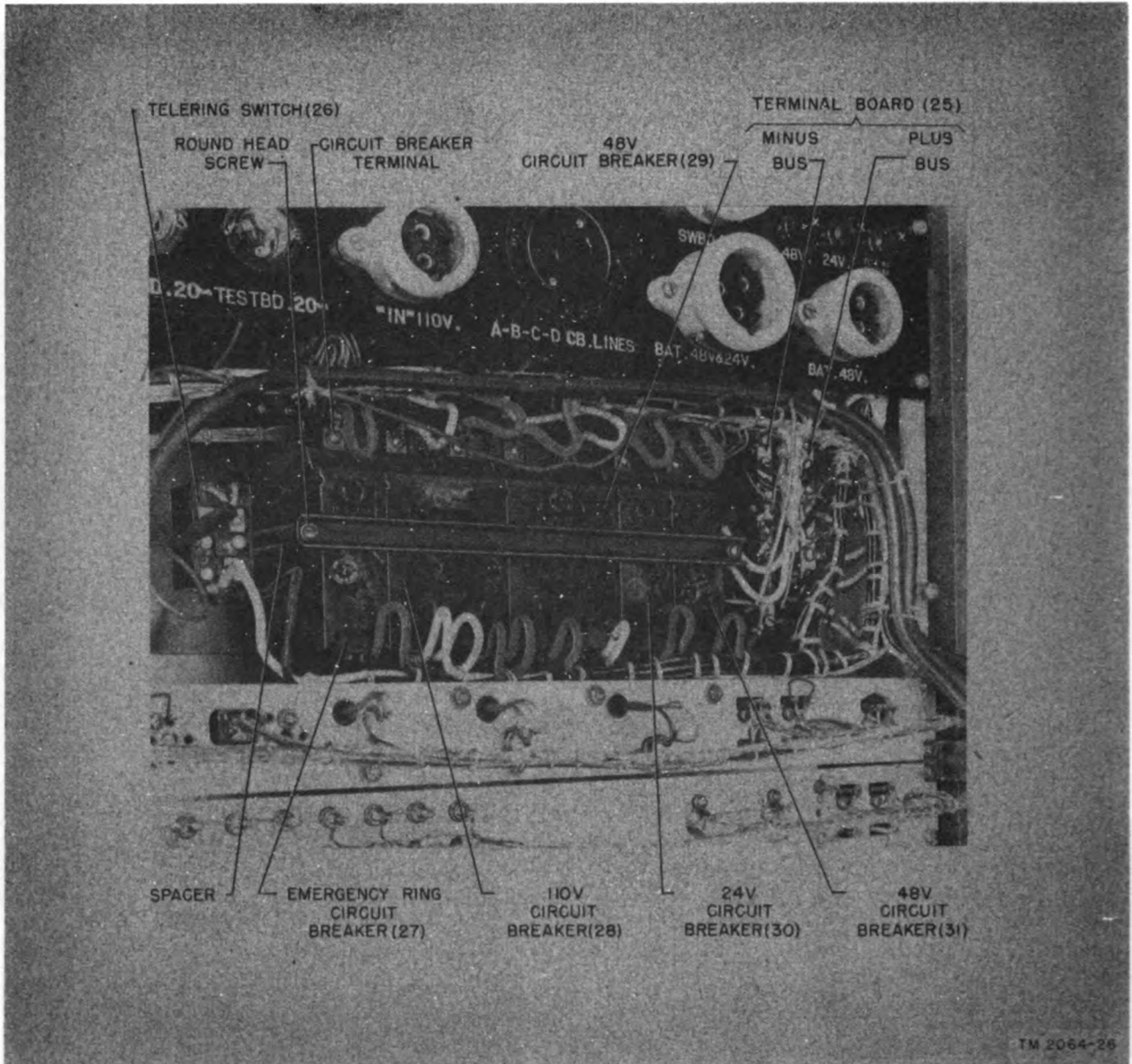


Figure 5. Circuit breaker group and terminal board, wiring side.

interrupter. In the face of the cabinet, directly in front of this lamp, is a red pilot light which reflects instantly any trouble indicated by the 50-watt lamp.

e. **EMERGENCY RINGER** (fig. 2). A close-up view of the ringer separated from the panel, with the brush cover plate removed from the a-c end of the unit, is shown in figure 9. The ringer is a 48-volt battery-driven source of 20-cycle emergency ringing power to be used if the Telering becomes disabled.

f. **RECTIFIER RA-91-A** (fig. 2). This rectifier

is a full-wave selenium disk rectifier for converting ac to dc for power for the 48-volt d-c circuits in a telephone central office set-up and for charging the battery or batteries ordinarily associated with such an office. It produces an adjustable output of voltage for charging at a rate of from 2 to 12 amperes. TM 11-964 covers Rectifier RA-91-A in detail.

g. **CORD CONNECTOR PANEL** (fig. 3). Receptacle connectors, for mating with power supply cords of associated units, and binding posts for test connections are mounted on this panel. The

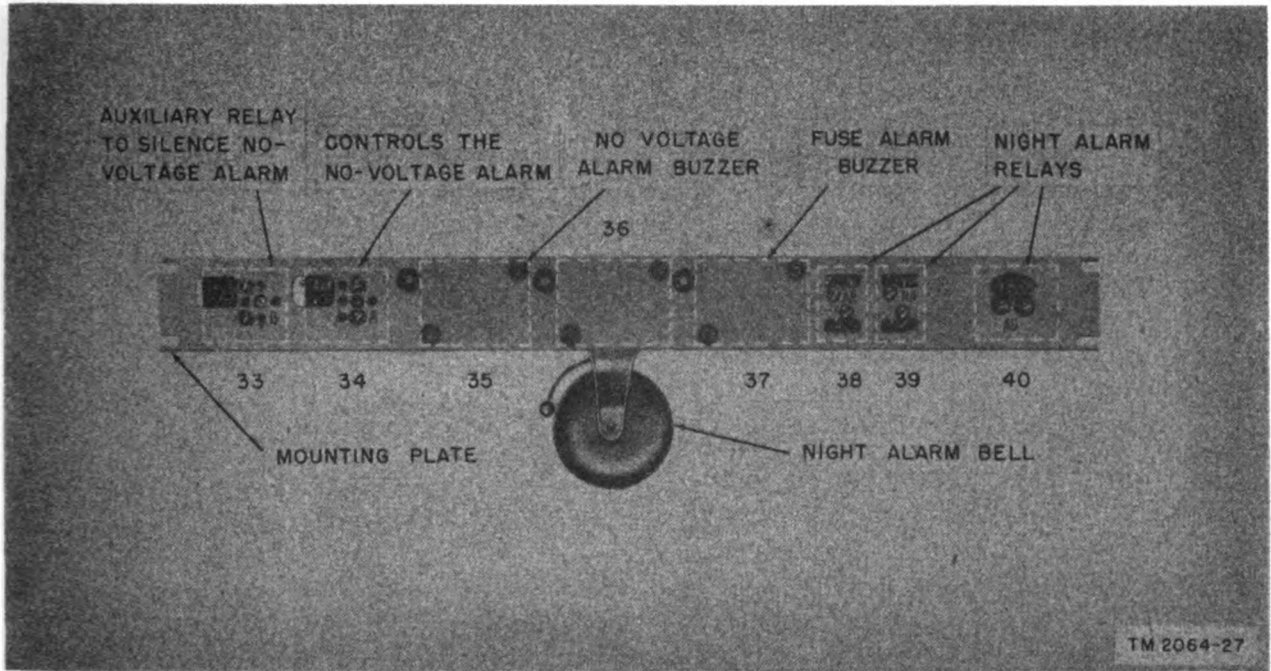


Figure 6. Mounting plate for night alarm bell, no voltage and fuse alarm buzzers, no voltage alarm, and night alarm relays.

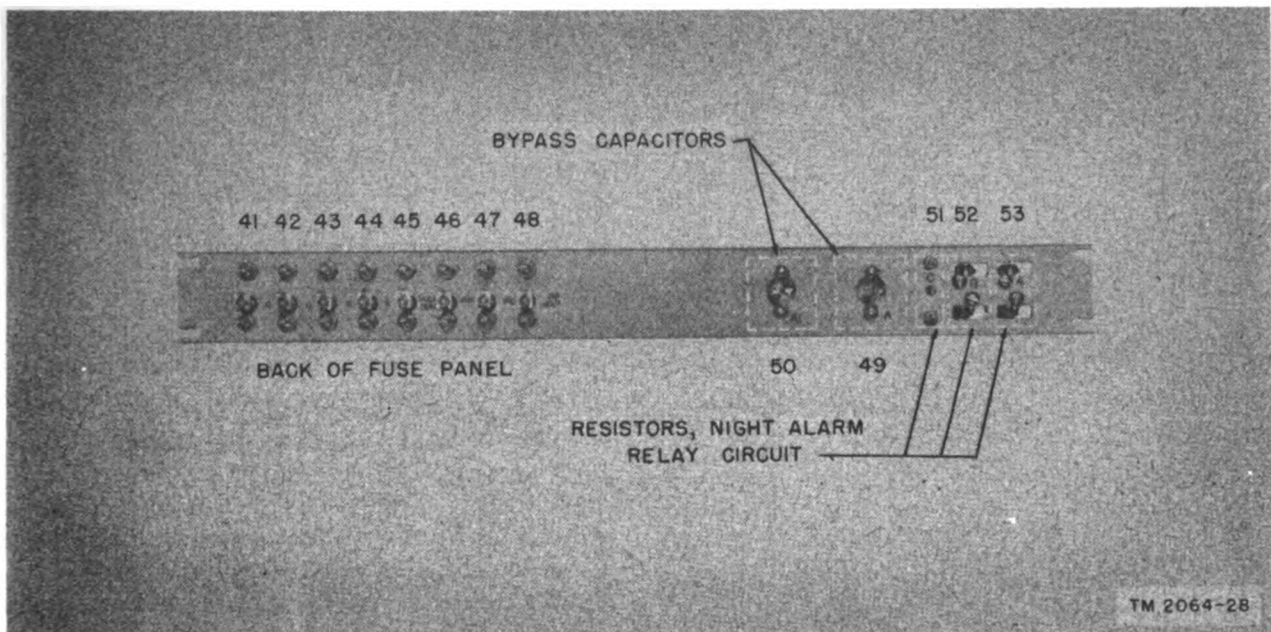


Figure 7. Mounting plate for fuse block, wiring side.

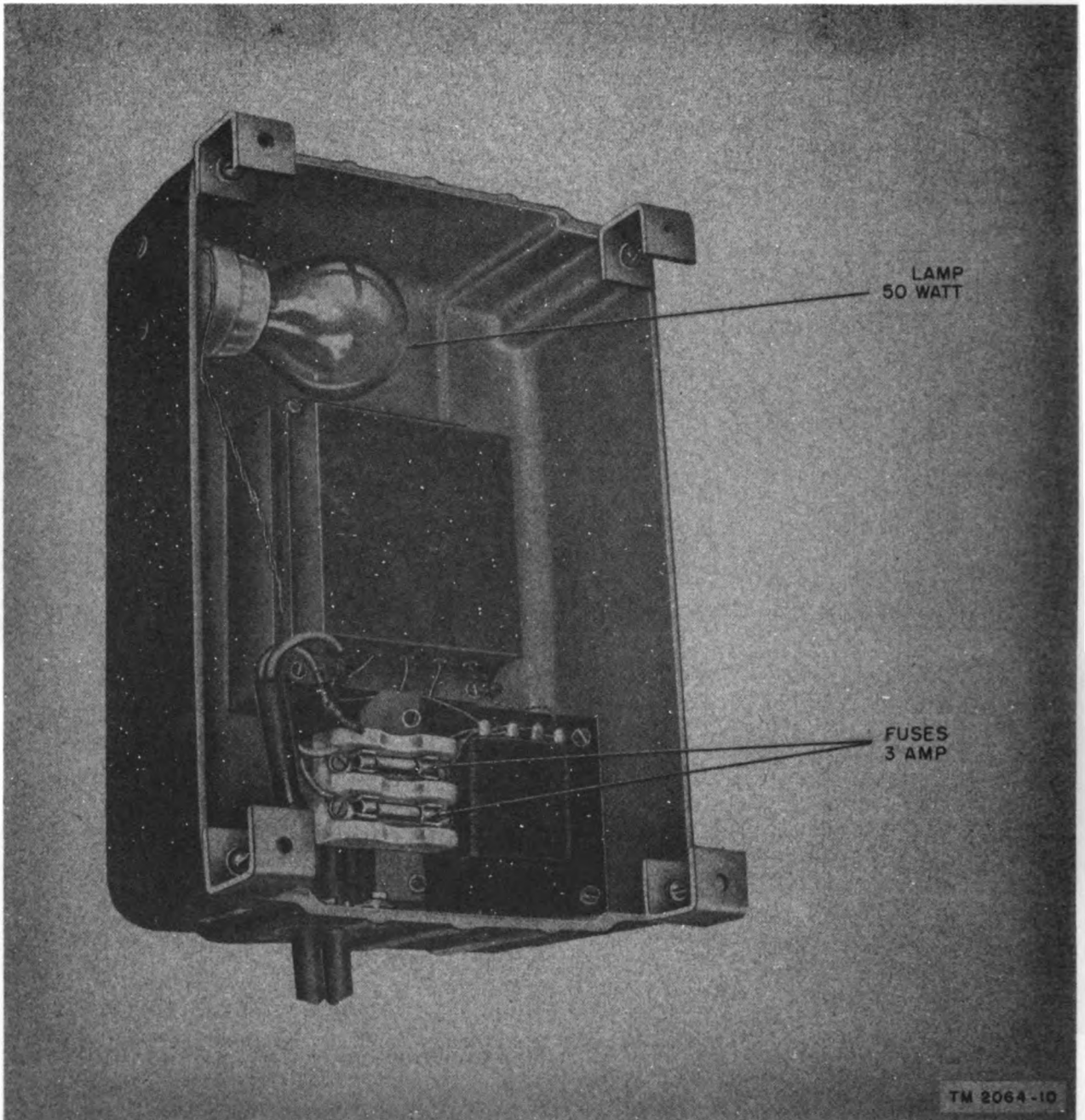


Figure 8. Telering, showing location of fuses and incandescent lamp.

method of making connections to this panel is illustrated in figure 17.

6. Weights and Dimensions

Unpacked, Panel BD-132 is 58 inches high, 26 inches wide, and 18 inches deep. When the

panel is packed for oversea shipment, it is placed in a container 60 inches high, 30 inches wide, and 24 inches deep. Unpacked, the panel weighs 625 pounds; when packed, its gross weight is 700 pounds. Figure 10 shows the panel with front and rear covers in place and ready for domestic movement.

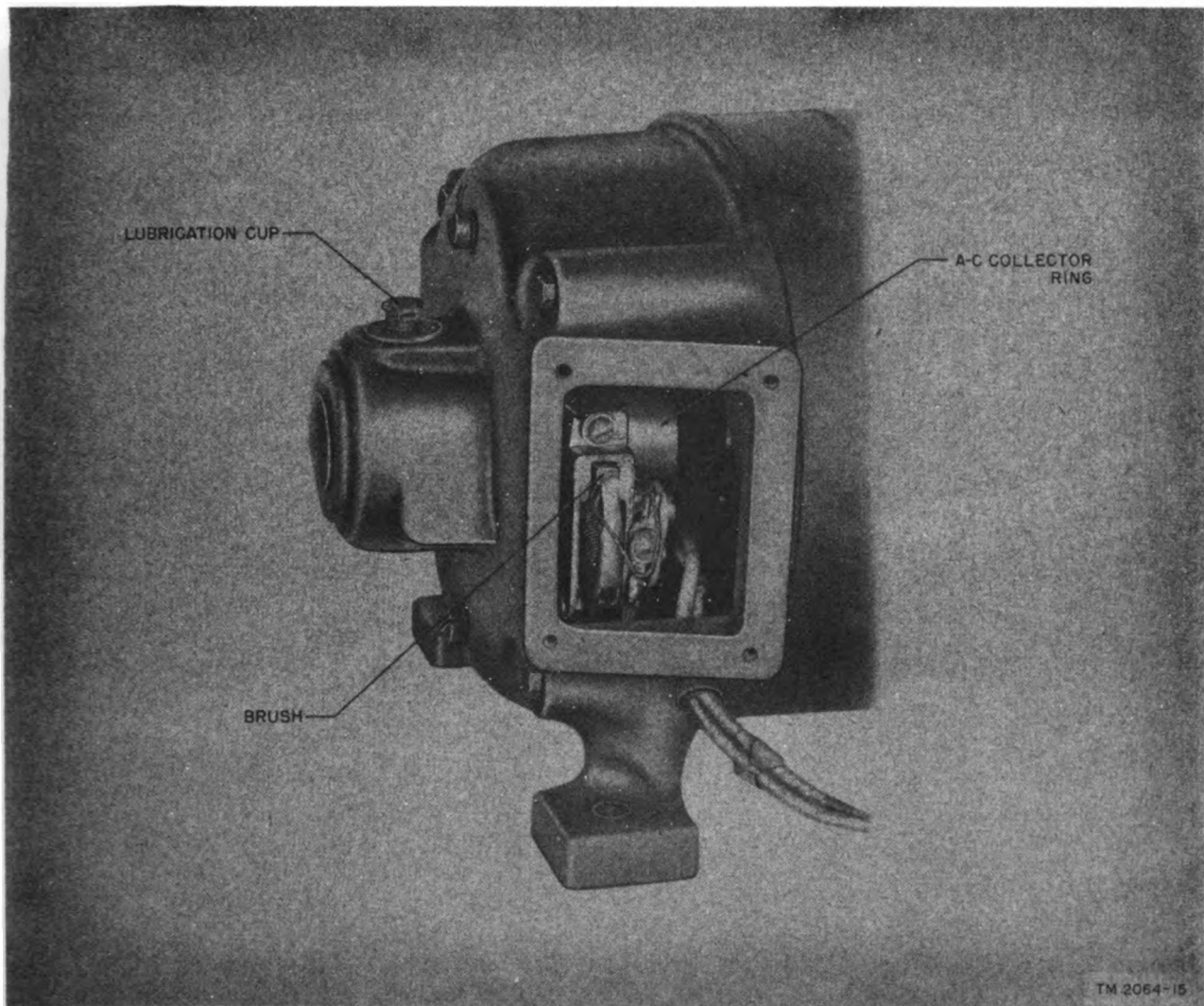


Figure 9. Emergency ringer with brush cover plate removed from a-c end.

7. Tabulated Data

a. OPERATING CHARACTERISTICS.

Temperature range (ambient)
 -40° F. (-40° C.) to +149° F. (+65° C.)
 Relative humidity up to 100%
 Input voltage (ac) 110 v
 Frequency cps (cycles per second) 60 cy

b. INTERNAL VOLTAGE SUPPLIED BY PANEL BD-132.

To Rectifier RA-91-A 110 v ac
 To emergency ringer
 (from Battery BB-46)* 48 v dc
 To power and ringing circuit 110 v ac
 To Telering power ringer 110 v ac

* Battery BB-46 is the type of battery most commonly used with telephone central office sets of which Panel BD-132 is a component.

c. RECTIFIER OUTPUT TO BATTERIES (VOLTAGE).

Minimum 44 v dc
 Maximum 56 v dc
 Trickle limits... between 50.4 and 52.8 v dc

d. RECTIFIER OUTPUT TO BATTERIES (CURRENT).

Maximum 12 amp

e. WORKING RESISTANCE OF NIGHT ALARM AND FUSE ALARM CIRCUITS.

External circuit loop, all lines
 maximum 600 ohms
 Insulation, all line,
 minimum 5 meg (megohms)

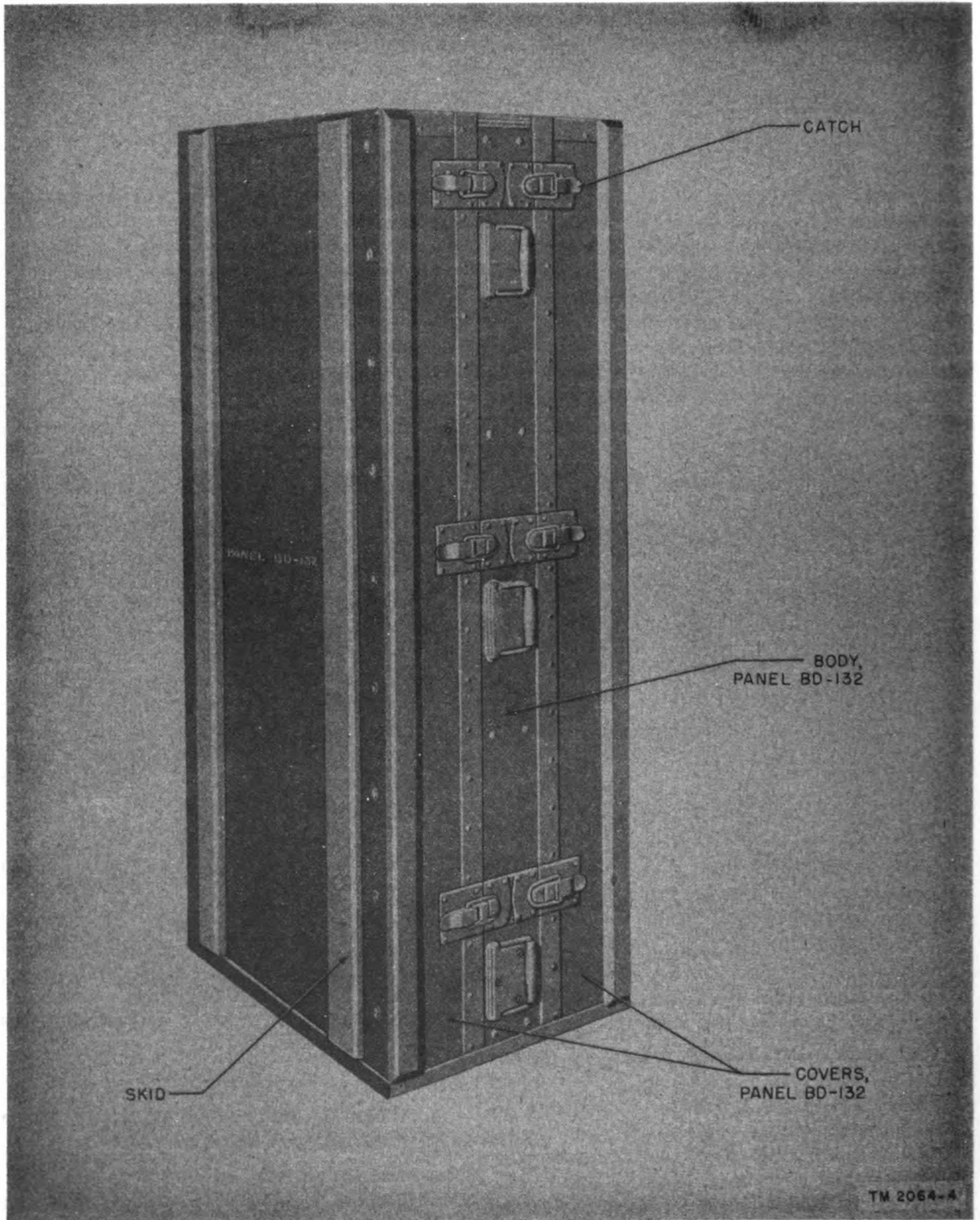


Figure 10. Panels BD-132, front and rear covers in place.

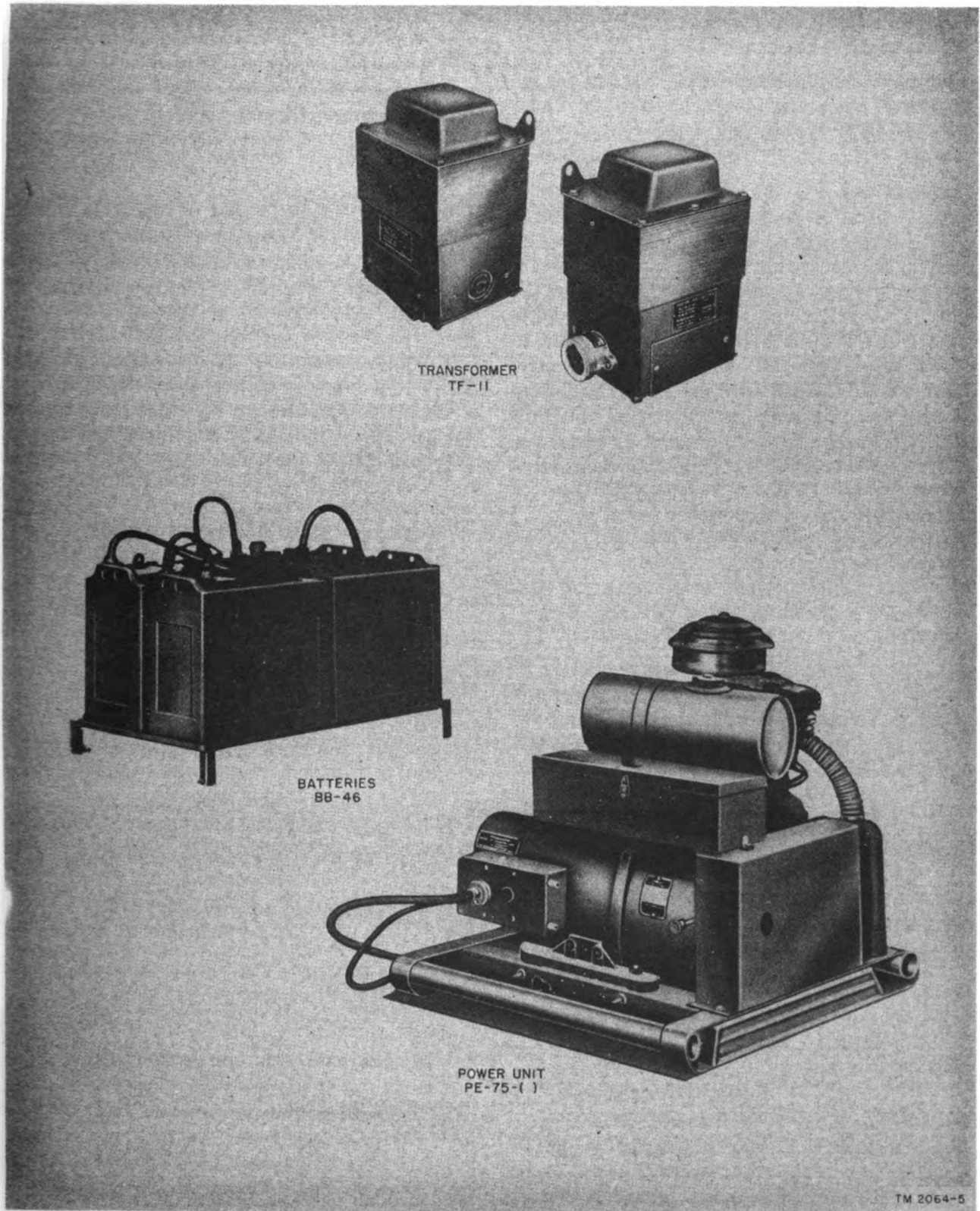


Figure 11. Accessory equipment not supplied with, but used with, Panel BD-132.

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8. Accessory Equipment

This paragraph gives brief descriptions of accessory equipment often used with Panel BD-132 in a typical telephone central office set-up.

a. BATTERY BB-46 (fig. 11). In most telephone central offices in which Panel BD-132 is used, Battery BB-46 or an equivalent may be used to furnish power for the 24-volt and 48-volt circuits and the emergency ringer. For the type of operation for which Battery BB-46 is used four of these batteries are connected in series. When Panel BD-132 is used in a central office set-up, the batteries are generally floated in the line, meaning that much of the time they are used mainly for stand-by purposes. The rectifier is capable of supplying the current

necessary for the 48-volt d-c circuits as well as keeping the batteries charged so that they may be used to furnish some of the required current in times of heavy traffic, or all of it (for a limited time) if trouble is encountered with the rectifier.

b. POWER UNIT PE-75-() (fig. 11). Power Unit PE-75-() supplies 110-volt, 60-cycle power when a commercial source of power is not available. TM 11-900 covers this power unit in detail.

c. TRANSFORMER TF-11 (fig. 11). When a 220-volt a-c power source is the only source available for operation of Panel BD-132, Transformer TF-11 is used to step down the power supply to 110 to 115 volts.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Service Upon Receipt of New Equipment

a. UNCRATE, UNPACK, AND CHECK. For over-sea shipment, a special packing case (fig. 12) is provided for Panel BD-132. For domestic shipment, the panel is usually shipped with only its front and rear covers securely fastened (fig. 10). Generally the panel is delivered as a unit of a telephone central office set, so that the selection of a location where it is unpacked is dictated more or less by the location chosen for the complete central office set. Instructions contained in (2) (a) through (j) below apply to equipment delivered in oversea packing cases; instructions contained in *b* below apply to equipment delivered with only front and rear covers of the panel fastened in place.

- (1) *General.* Be careful in uncrating, unpacking, and handling the equipment. It is easily damaged and, if damaged or exposed, may require a complete overhaul or be rendered useless.
- (2) *Step-by-step instructions for uncrating and unpacking export shipments.*
 - (a) Place the packing case (fig. 12) as near the selected site as possible.
 - (b) Remove the steel straps which bind the packing case.
 - (c) Remove the top part of the case with a nail puller.

Caution: Do not pry the sides loose; this may result in damage to the panel equipment.

- (d) Remove the sides and ends of the crate with a nail puller.
- (e) Remove the liner bag, the fiberboard detail, the moistureproof barrier, and the corrugated paper which covers the equipment inside the packing case.
- (f) Lift Panel BD-132 from the bottom part of the packing case and

place it in an upright position at the selected location.

- (g) Remove front and rear covers (fig. 10).
 - (h) Remove the silica gel and containers from Panel BD-132 (fig. 12).
 - (i) Thoroughly inspect each component for signs of possible damage during shipment.
 - (j) Check the contents of the packing case against the master packing slip.
- (3) *Opening cardboard carton and waterproof barrier.* No special instructions are needed for opening the waterproof paper barrier and removing the equipment from the cardboard carton. A typical paper barrier is shown in figure 12.

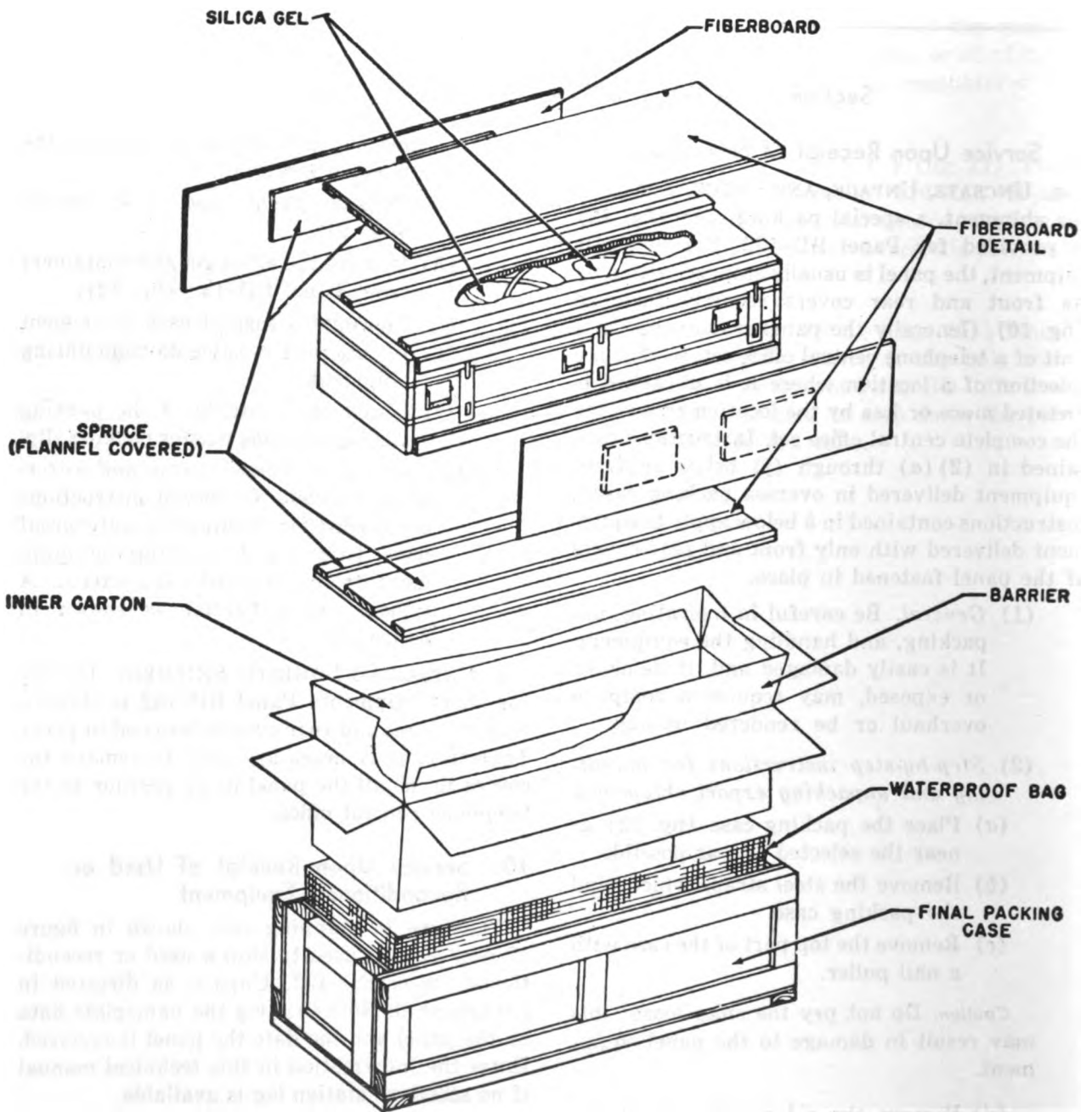
b. UNPACKING DOMESTIC SHIPMENT. Usually for short shipments Panel BD-132 is shipped with its front and rear covers fastened in place. Therefore, it is necessary only to remove the covers to install the panel in its position in the telephone central office.

10. Service Upon Receipt of Used or Reconditioned Equipment

The type of shipping case shown in figure 12 may also be used to ship a used or reconditioned Panel BD-132. Unpack as directed in paragraph 9. Note in a log the nameplate data on the panel and the date the panel is received. Enter the information in this technical manual if no standard station log is available.

11. Locating Equipment

a. Typical applications of Panel BD-132 are shown in figures 13 and 14. Leave sufficient space between components of the central office system and between any partitions near which they may be placed for the performance of maintenance duties. The maximum distance between Panel BD-132 and the switchboard, or



NOTES:

1. OVERALL DIMENSIONS OF PACKING CASE: 60 IN X 30 IN X 24 IN (APPROX)
2. VOLUME: 25 CU FT
3. WEIGHT PANEL, BD-132 IN CASE: 515 LBS
4. NET WT: 625 LBS
5. GROSS WT: 700 LBS

TM 2064-6

Figure 12. Packing case for oversea shipment.

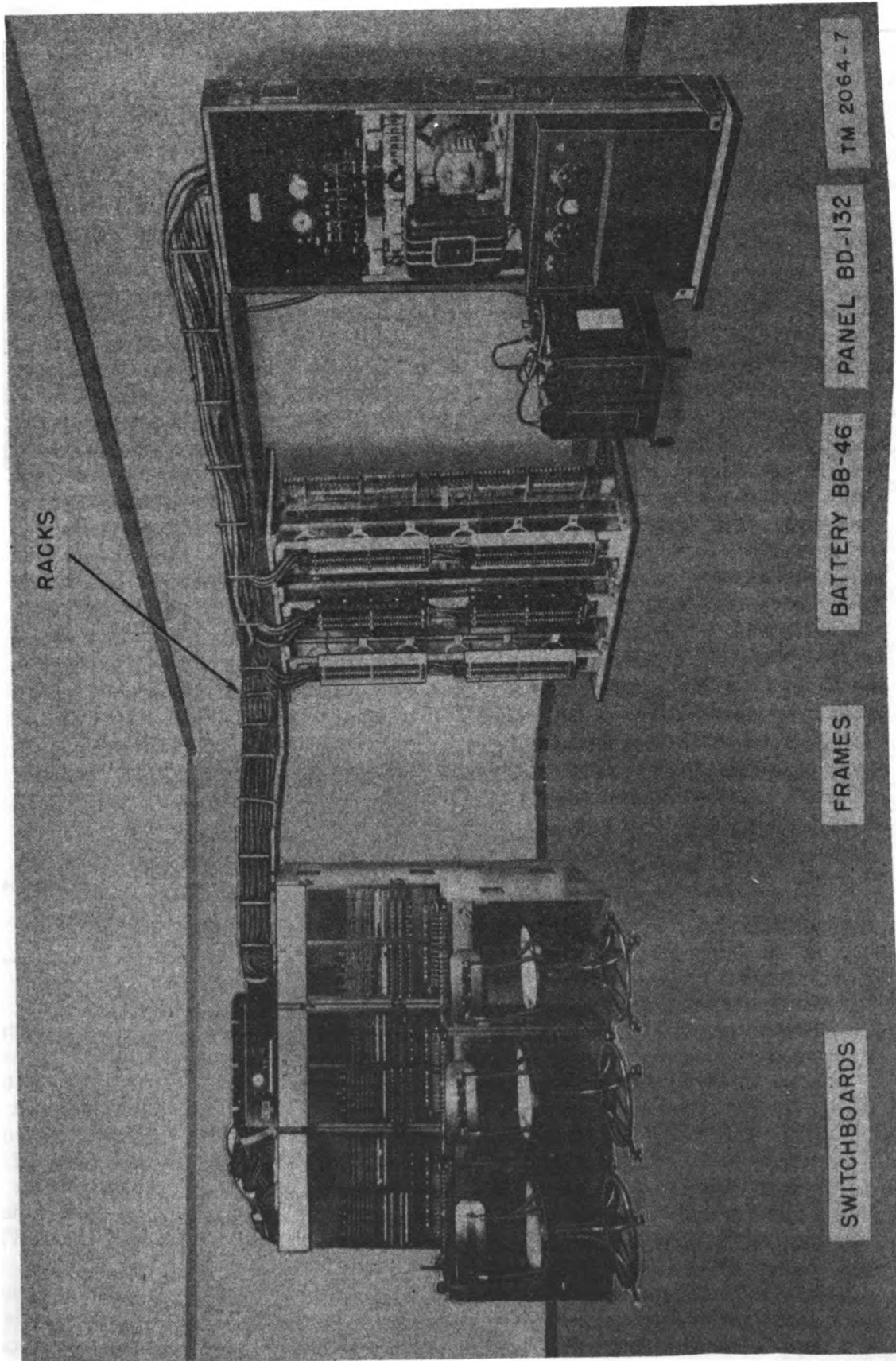
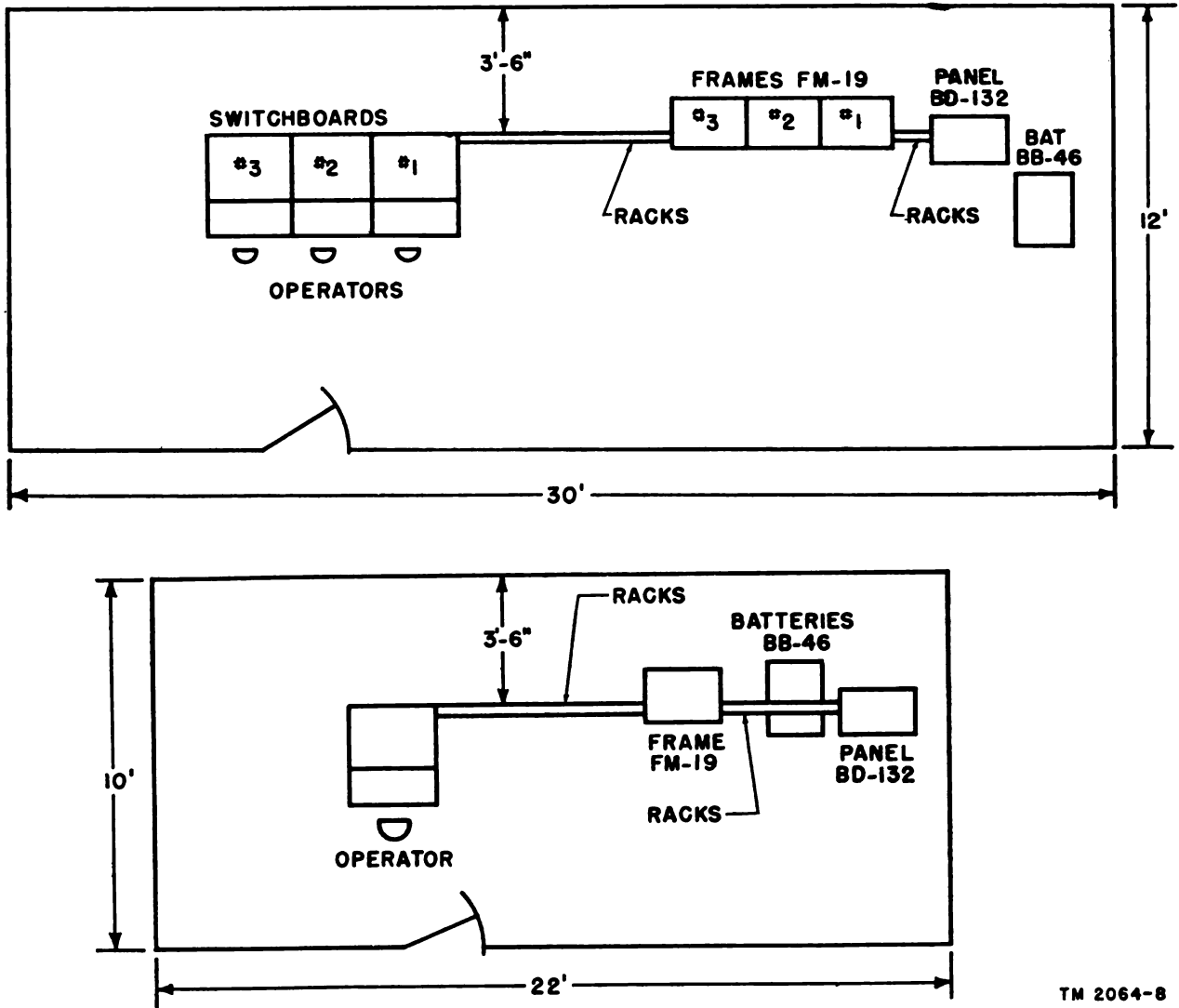


Figure 18. Typical installation of Panel BD-132.



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Figure 14. Spacing requirements, typical installations: Panel BD-132 and associated equipment, three-switchboard grouping (above), single-switchboard grouping (below).

switchboards, with which it is used is approximately 40 feet, limited by the length of the standard cords. The spacing requirements and directions for setting up the over-all central office are contained in the technical manual covering the system of which Panel BD-132 is a part.

b. The floor loading of Panel BD-132 is about 180 pounds to the square foot. Check the condition of the flooring and the strength of the floor beams before setting up a station. Suggested groupings of equipment for a three-switchboard station and for a single-switchboard station are shown in figure 14.

c. When Power Unit PE-75-() is installed in connection with a telephone central office, either as a primary power source or as a stand-by source of power, locate the power unit in a room separate from the central office equipment. This will eliminate any possibility of personnel being affected by exhaust fumes and minimize noise that interferes with efficient operation of the switchboard equipment. Whenever Power Unit PE-75-() is installed, provide for piping the exhaust to the exterior of the building. Also arrange adequate ventilation for the room in which the power unit is located so that combustion will not be interfered with.

Section II. CONTROLS AND INSTRUMENTS

12. Controls

Controls on Panel BD-132 are switches for the control of circuits which supply power to the units that make up a telephone central office. These controls are listed in the subparagraphs below:

a. BATTERY-CHARGING CONTROLS.

- (1) Circuit breaker, 110-volt, shown on figure 4 as 110V.
- (2) Circuit breaker, a-c, shown on figure 4 (Rectifier RA-91-A) as A.C. CIRCUIT BREAKER.
- (3) Circuit breaker, d-c, shown on figure 4 (Rectifier RA-91-A) as D.C. CIRCUIT BREAKER.
- (4) Coarse adjustment control switch, shown on figure 4 (Rectifier RA-91-A) as COARSE ADJUSTMENT.
- (5) Fine adjustment control switch, shown on figure 4 (Rectifier RA-91-A) as FINE ADJUSTMENT.

b. SWITCHBOARD POWER SUPPLY CONTROLS.

- (1) Circuit breaker, 48-volt, shown in figure 4 as 48V.
- (2) Telering.
 - (a) Telering switch shown on figure 4 as OFF ON TELERING.
 - (b) Telering emergency ring switch shown on figure 4 as TELERING EMERGENCY RING.
 - (c) Emergency ringer switch, shown on on figure 4 as EMERGENCY RING.

c. AUDIBLE ALARMS.

- (1) NIGHT ALARM ON OFF switch (figs. 2 and 4) and night alarm bell (fig. 2).
- (2) NO VOLTAGE ALARM buzzer cut-off switch (fig. 4).
- (3) Fuse alarm buzzer (fig. 6).

d. VISIBLE ALARMS.

- (1) No voltage alarm lamp (fig. 4).
- (2) Open fuse signal.

13. Instruments

Two ammeters, one at the top of Panel BD-132 (fig. 2), the other on Rectifier RA-91-A

(fig. 2), and a voltmeter, top front of Panel BD-132 (fig. 2), comprise the instruments on Panel BD-132. The ammeter at the top of the panel indicates either discharge caused by load drain in excess of charging current or charge in excess of such drain. The ammeter on the rectifier indicates the output of the rectifier. The voltmeter records voltage output to the 24- or 48-volt circuits.

14. Description of Controls and Instruments

a. **CIRCUIT BREAKERS.** The circuit breakers (fig. 4) with which Panel BD-132 is equipped are conventional type on-off switches. Refer to figure 22, wiring diagram for the panel, for functional applications of the circuit breakers and to figures 4 and 23 for a view of their relative locations.

b. **COARSE AND FINE ADJUSTMENT CONTROL SWITCHES.** These switches (fig. 4) are located on the front panel of Rectifier RA-91-A and are 11-position switches which tap into 11 leads from a transformer in the rectifier. The COARSE ADJUSTMENT switch taps vary on a-c voltage from 5 volts at tap No. 1 to 118 volts at tap No. 11, while the FINE ADJUSTMENT switch taps vary the a-c voltage from 118.0 volts at tap No. 1 to 129.5 volts at tap No. 11 at normal line voltage for the system.

c. **TELERING OFF ON SWITCH.** This is a toggle-type DPST (double-pole, single-throw) switch.

d. **TELERING EMERGENCY RING SWITCH.** This is the switch used to transfer ringing power from the Telering, in the event of its disablement, to the emergency ringer. It, too, is toggle type but a DPDT (double-pole, double-throw) switch. When this switch is turned to ON, power for the ringer is furnished from battery.

e. **AUDIBLE ALARMS.** The night alarm bell and buzzers provide audible alarms for the night alarm and no voltage alarm circuits, and for alarms in the event of open fuses.

f. **VISIBLE ALARMS.** The red jewel on the front of the Telering shines brilliantly if there is a short on the line or a heavy load on the interrupter. Illumination of this jewel type of alarm is furnished by the 50-watt lamp positioned in the Telering directly behind the jewel. The

grasshopper type fuses (fig. 15), which denote an open fuse, contain low-melting links which open when the current load becomes excessive, allowing the released member of the fuse to fly up through approximately 160 degrees. A colored bead on the top of this fuse gives notice that the fuse is open; at the same time a buzzer sounds, the circuit for operation of this open

fuse alarm being closed when the low-melting point member is severed and flies up. Lighting of the no voltage alarm lamp indicates that voltage for the ringing circuits has dropped below voltage required.

g. AMMETERS AND VOLTMETER. The ammeters have 15-0-15-ampere scales and the voltmeter has a 0-75-volt scale.

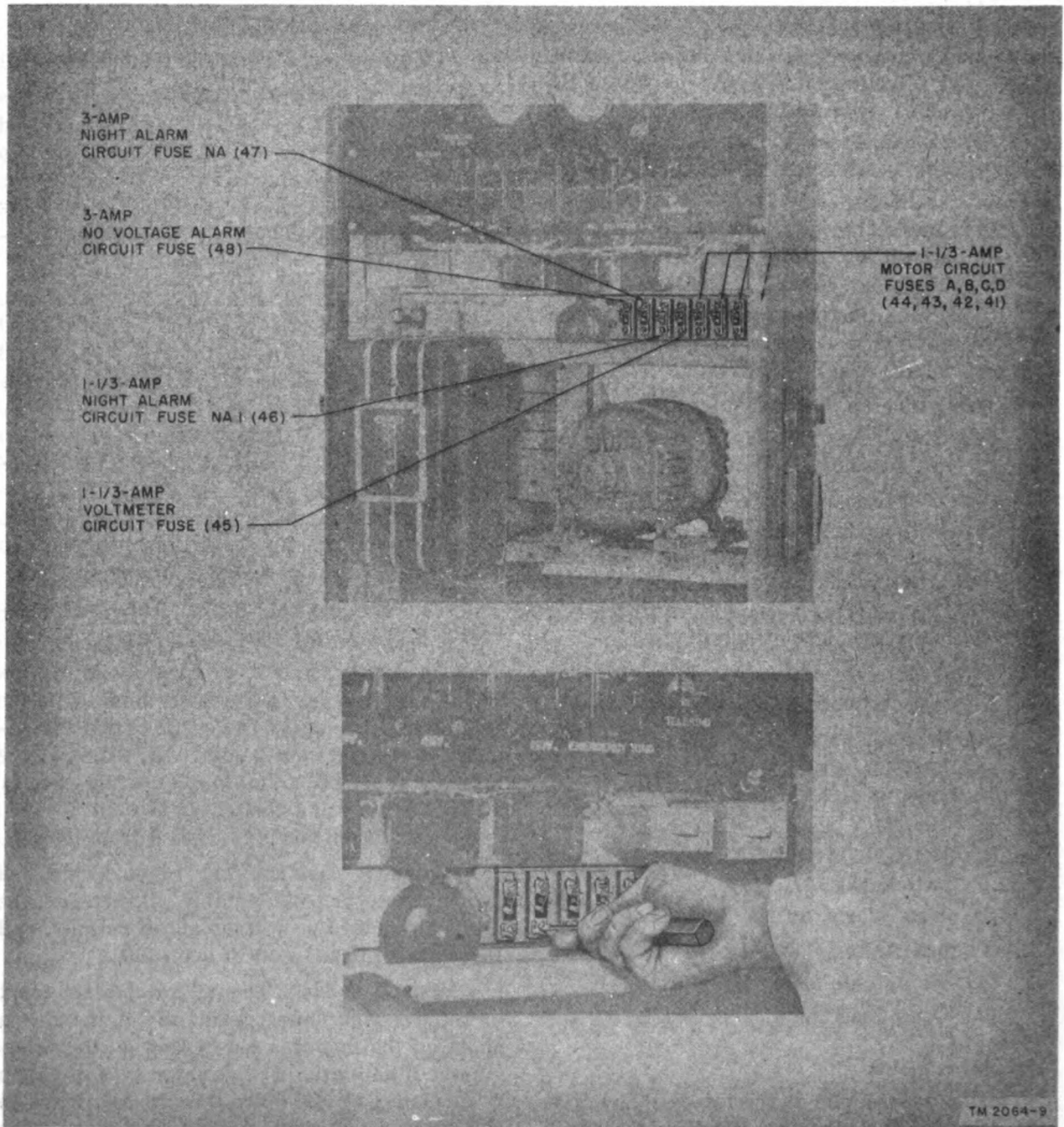


Figure 15. Location of fuses and method of removal from Panel BD-132 for replacement.

Section III. OPERATION UNDER USUAL CONDITIONS

15. Equipment Connections

a. GENERAL. Panel BD-132 is internally connected at the time of delivery, hence no additional terminal board work is necessary to equip the unit for operation. Technical manuals covering the particular central office sets with which the panel is used outline the method of interconnection to other units of the central office.

- (1) *Grasshopper type fuse.* If initial installation requires insertion of the alarm-type fuses in the fuse block at the front center of Panel BD-132, note the fuse values (fig. 15). The two fuses nearest the center of the panel are WECO type 35G; all other grasshopper type fuses are WECO type 35A. Install them as indicated in figure 15.
- (2) *Cartridge type fuses.* The Telering power ringer is equipped with two car-

tridge fuses which should be in place at time of delivery (fig. 8). Assume that these fuses are in place and complete the installation of the other units. If the ringing system operates, the Telering fuses are satisfactory.

b. CORD CONNECTOR PANEL. Cording runs from the cord connector panel at the rear of Panel BD-132 (fig. 3). A block diagram, Panel BD-132 interconnected with accessory equipment, is shown in figure 16.

c. CONNECTION RECEPTACLES. The receptacles to which connections are made on the cord connector panel are shown in figure 17. There need be no specific sequence in the manner of making connections once it is established that all circuit breakers on Panel BD-132 are in their OFF positions, that all adjustment switches on Rectifier RA-91-A are in their *extreme counterclockwise* positions, and that a ground has been arranged.

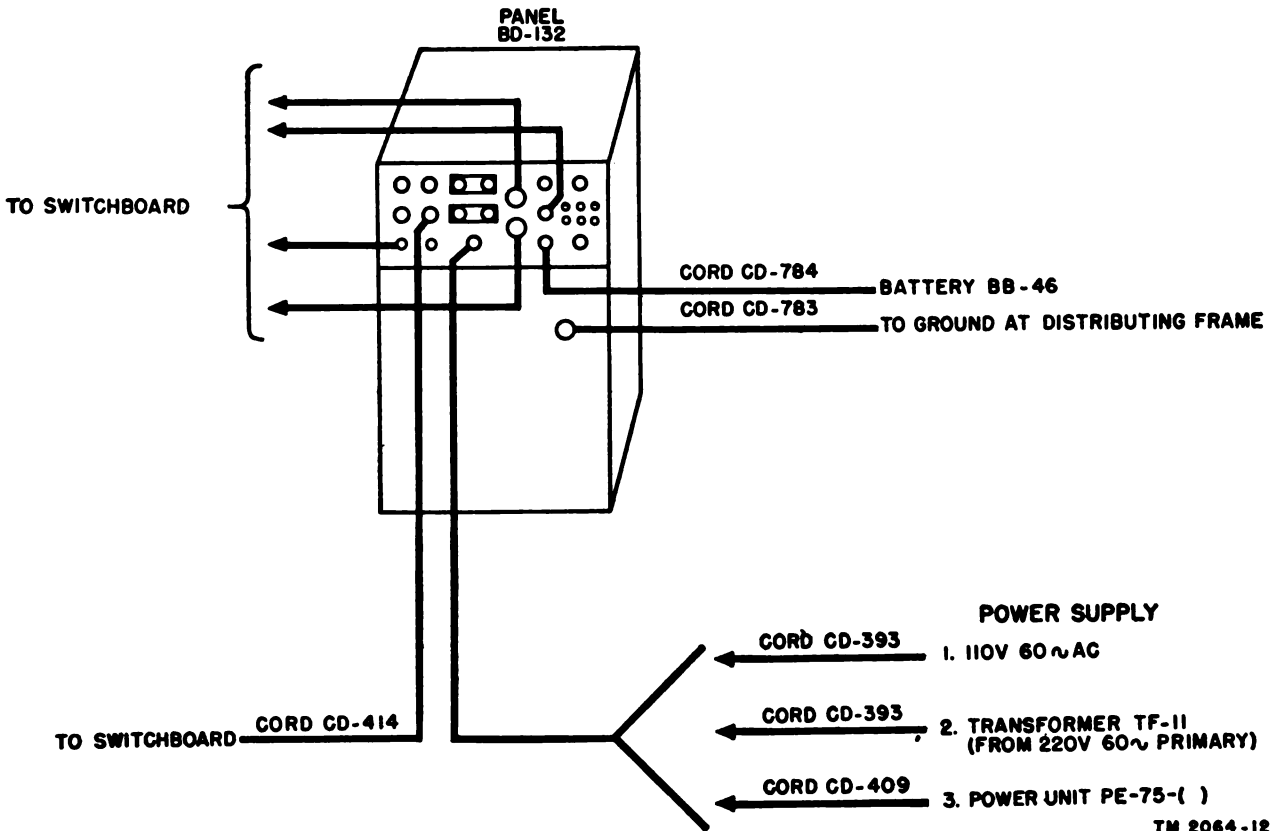


Figure 16. Panel BD-132, interconnected with accessory equipment.

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d. **GROUNDING.** Grounding is usually accomplished through the central office distributing frames group, connection for the ground at the panel being made with Cord CD-783 as shown in figures 16 and 17.

e. **A-C POWER.** A-c power input to Panel BD-132 for operation of Teling, Rectifier RA-91-A, and such circuits (through later connections) which use it, is accomplished through connection of Cord CD-393 or Cord CD-409 into the receptacle marked IN 110V. The connection is shown in figure 17. When the power source is a commercial one, either of 110 or of 220 volts, use Cord CD-393. However, if the source is one of 220 volts, connection at the source end is made to the secondary of Transformer TF-11, used to step down the voltage to 110 to 115 volts. When no commercial power source is available, use Cord CD-409 to make the connection between the panel and Power Unit PE-75-().

f. **BATTERY SUPPLY.** D-c power input to Panel

BD-132 from Battery BB-46 or its equivalent is by means of connection of Cord CD-784 between the battery and the receptacle on the cord connector panel marked 24V BAT 48V. In figure 17 this panel marking is hidden by the manner in which the cord is positioned. The emergency ringer, the alarm circuits, and the switchboard or switchboards may be powered from either the rectifier or battery, or by a combination of the two, the latter situation occurring at times of heavy traffic. Usually, however, the battery floats in the line.

g. **SWITCHBOARD CONNECTIONS.** Cords CD-414 (fig. 17) are used to connect 110-volt ac to the switchboard, or switchboards, and test board for heating purposes (when the equipment is used in extremely humid climates), and for use at convenience outlets for heating soldering irons, etc. Twenty-cycle ringing power to the switchboard or switchboards and the test board is taken by cords plugged into the receptacles marked SWBD 20~ and TEST BD 20~.

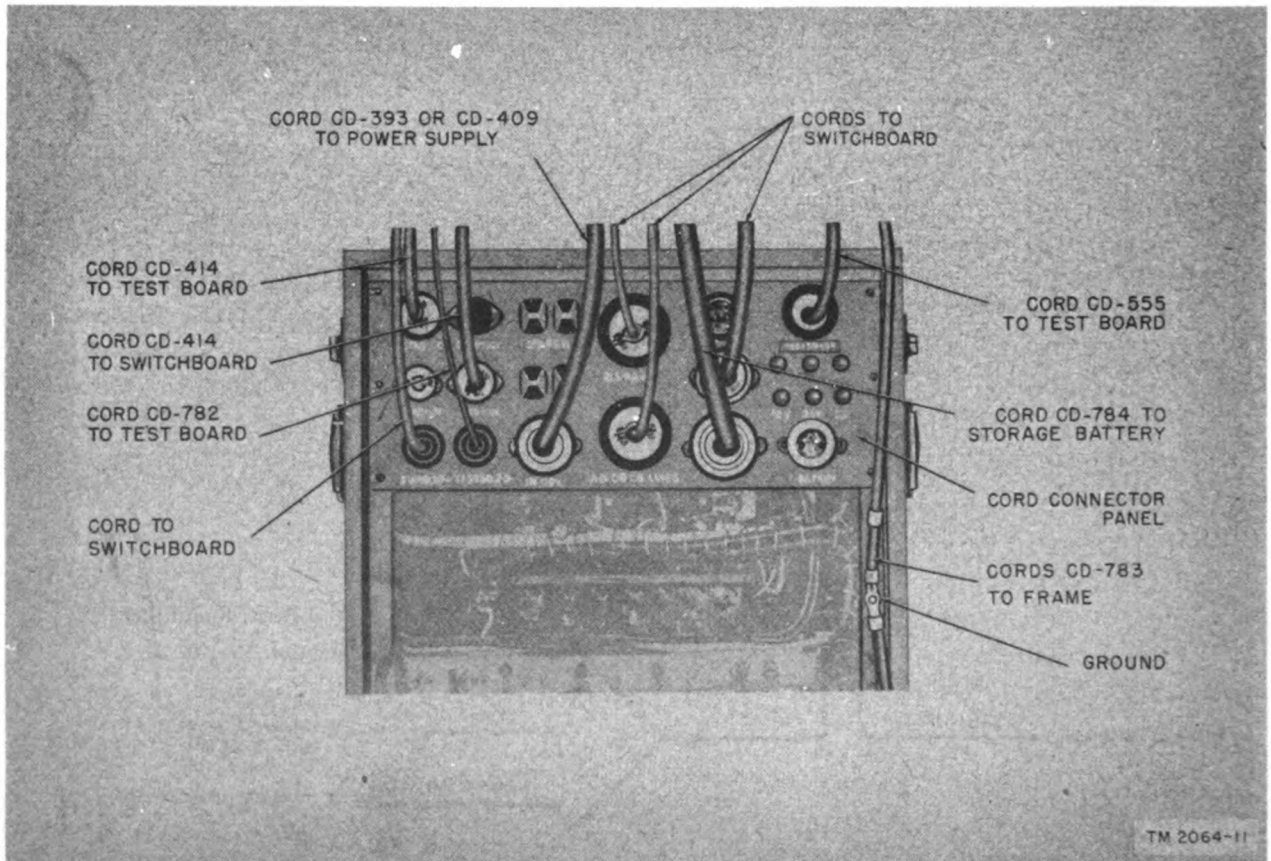


Figure 17. Method of inserting connection cords into cord connector panel.

Connection for the release, night alarm and fuse alarm circuits are made to the receptacles marked RLS-NA-FA in the top center of the cord connector panel. Connection for power for switchboard lines is made into the receptacle marked AB-CD CB in the center of the lower section of the cord connector panel.

h. TESTING CONNECTIONS. On the right-hand side of the cord connector panel (fig. 17) are receptacles marked TEST BD 48V (above) and BAT 48V (below). Connection to the upper receptacle furnishes 48-volt power to the test-board. The lower receptacle is a d-c convenience outlet.

i. SPARE 110V. Receptacles to the left of the top center of the cord connector panel (fig. 17) marked SPARE 110V are used at the rear of the panel, when desired, for such purposes as plugging in an electric soldering iron, lamps for trouble location, etc.

16. Preoperating Checks and Adjustment

With all circuit breakers on Panel BD-132 in their OFF positions and with the COARSE and FINE ADJUSTMENT switches on Rectifier RA-91-A in full counterclockwise positions, check, with power off, that the voltmeter and ammeter at the top of the panel record zero. If any of these instruments record other than zero under these conditions, adjust them to zero by carefully turning the central pivot point of the pointer. Check to see that the emergency ringer has been lubricated. If it has not been, apply 3 tablespoonfuls of oil, engine (OE 10, SAE 10) to each oil cup.

17. Starting Procedure

When all connections have been made between Panel BD-132 and other units of the telephone central office in accordance with instructions in technical manuals covering the particular telephone central office set with which the panel is used, pursue the following procedure:

a. BATTERY-CHARGING EQUIPMENT.

- (1) Snap the 48-volt circuit breaker (marked 48V) (fig. 4) to ON. This furnishes operating battery.

- (2) Snap the 110-volt circuit breaker (marked 110V) (fig.4) to ON.
- (3) Snap the A.C. CIRCUIT BREAKER (fig. 4), located on the left-hand side of the panel of Rectifier RA-91-A, to ON:
- (4) Snap the D.C. CIRCUIT BREAKER (fig. 4), located on the right-hand side of the panel of the rectifier, to ON.
- (5) Turn the COARSE ADJUSTMENT control switch on the rectifier (fig. 4) clockwise until an approximate charging rate shows on the ammeter on the rectifier. If an approximate rate does not show, step up the COARSE ADJUSTMENT switch 1 step and check the ammeter again.

Caution: Always keep the charging rate below 12 amperes.

- (6) Turn the FINE ADJUSTMENT switch on the rectifier (fig. 4) clockwise until the exact charging rate is obtained.

b. SWITCHBOARD SUPPLY.

- (1) Snap the 48-volt circuit breaker to ON. This provides operating battery.
- (2) The voltmeter should indicate approximately 50 volts. A reading appreciably different indicates trouble or wrong connection. Correct before proceeding.
- (3) Move the NIGHT ALARM switch (fig. 4) to ON if an audible signal (electric bell) is desired for each incoming call; if not desired, move the NIGHT ALARM switch to OFF.
- (4) Snap the Telering switch (fig. 4) to ON. This connects 110 volts, 60-cycle ac to the Telering power ringer. The red jewel on the Telering does not light if the Telering fuses and power supply are satisfactory.
- (5) Move the TELERING EMERGENCY RING switch (fig. 4) on the left side of Panel BD-132 to the TELERING position. This connects the output of the Telering to the switchboard ringing circuit.
- (6) If the no voltage alarm lamp (fig. 4) lights and the buzzer sounds, the

Telering is not operating properly. In this case, connect the emergency ring- ing machine as follows:

- (a) Snap the TELERING switch, on the right-hand side of the panel (fig. 4) to OFF.
- (b) Snap the EMERGENCY RING circuit breaker (fig. 4), on the right-hand side of the panel, to ON. This connects dc to the emergency ring- ing circuit.
- (c) Move the TELERING EMER- GENCY RING switch (fig. 4), on the left-hand side of the panel, to the EMERGENCY RING position. This connects the output of the emergency ringer to the switch- board ringing circuit. The no-volt- age alarm lamp should be unlighted and the buzzer silent.

18. Operating Checks for Panel BD-132

a. Check the ammeter on Rectifier RA-91-A to see that readings of less than 12 amperes are maintained.

b. Check the voltmeter on the meter and switch panel for readings of approximately 50 volts.

c. Stand by to replace a fuse, if fuse alarm sounds or the glass bead on a fuse indicates an open circuit.

d. Check the red jewel in the cover of the Telering to indicate that power supply is adequate at the a-c power ringer. If this lamp lights, assume the fuses have opened. Switch to

EMERGENCY RING to provide a d-c power ringer source, and check for cause of fuse failure. Remove the Telering to replace the fuses (fig. 8).

19. Purpose and Use of Equipment Performance Checklist

a. GENERAL. The equipment performance checklist enables an operator to check quickly the proper functioning of Panel BD-132 and associated equipment. The checklist outlines items to be checked, normal indications of correct operation, and, in some instances, correc- tive measures that the operator may take. Check items 1 to 4, inclusive, before starting; items 5 to 10, inclusive, when starting, and item 11 during operation. Check item 6 at least once during a normal operating period or at least 4 times a day during continuous operation.

b. ACTION OR CONDITION. This column indi- cates the condition or connections which must exist, or be set up, before making the check.

c. NORMAL INDICATIONS. Normal indications include the visible or audible signs that the operator receives when checking the items.

d. CORRECTIVE MEASURES. Corrective meas- ures are those which the operator may make without turning the equipment in for repairs. If the equipment becomes completely inoper- ative, or if the recommended corrective meas- ures do not yield results, trouble shooting is required. Refer to chapters 3 and 4. If the tac- tical situation requires that communication be maintained, however, and if the equipment is not entirely inoperative, maintain the equip- ment in operation as long as possible.

20. Equipment Performance Checklist

	Item No.	Item	Action or condition	Normal indications	Corrective measure
P R E P A R A T O R Y	1	Power cables....	Appearance of connections between Panel BD-132, and switchboard.		
	2	Heater cables...	Appearance of connections between Panel BD-132 and switchboard.	Resistors hot (in bottom of switchboard).	
	3	Batteries.....	Four batteries in place and series connected with straps. Cable appearance between Panel BD-132 and Battery BB-46.		
	4	110-v, 60-cy a-c supply cable.	Appearance of cable between Panel BD-132 and commercial or generated supply.		
S T A R T I N G	5	110-v circuit breaker.	Move to ON.....		
	6	48-v circuit breaker.	Move to ON. Check voltmeter for battery voltage: 44 v (min)..... 56 v (max).....	Voltmeter on Panel BD-132 will read 48 v.	If less than 48 v, re-charge batteries.
	7	NIGHT ALARM switch.	Move to ON for audible signal; to OFF if audible signal not required.	Bell rings. Bell silent.	
	8	Telering 20-cy ringing.	Move TELERING EMERGENCY RING switch to neutral; TELERING switch to ON; TELERING EMERGENCY RING switch to TELERING.	Low buzzing sound from Telering.	
	9	Emergency ringer 20-cy ringing.	Move TELERING SWITCH to OFF; TELERING EMERGENCY RING switch to neutral; EMERGENCY RING circuit breaker to ON; TELERING EMERGENCY switch to EMERGENCY RING.	Emergency ringer very quiet.	
	10	NO VOLTAGE ALARM lamp and switch.	Lamp should be lighted and switch in un-operated position.	When lamp is lighted, ringing voltage is less than desired value.	Transfer from a-c ringing supply to d-c supply, or use hand generator at switchboard.
O P E R A T I O N	11	Power and heating circuit.	110-v, 60-cy, ac connected to system.....	Resistors heat switchboard.	

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

21. Emergency Operation

a. FAILURE OF RINGING SUPPLY.

- (1) If the Telering power ringer fails, as indicated by NO VOLTAGE ALARM bell ringing and lighting of the no voltage alarm lamp, switch the TELERING, EMERGENCY RING switch (fig. 4) to EMERGENCY RING and EMERGENCY RING circuit breaker (fig. 4) to ON.
- (2) If the d-c emergency ringer fails, obtain ringing supply by means of the hand-cranked generator on an associated switchboard.

b. FAILURE OF BATTERY CHARGING SYSTEM.

If battery voltage drops below 44 volts and a step-up of the charging rate indicates a current in excess of 12 amperes before the voltage climbs, operate Rectifier RA-91-A at excessive current capacity *only* if tactical requirements dictate continuous operation. Otherwise, replace the batteries, recharging the existing units if possible. Note the effect of transferring prime power supply (c. below).

c. FAILURE OF POWER SUPPLY.

- (1) If the commercial power supply fails, transfer to a site-generated power sup-

ply, using Power Unit PE-75-(), if available.

- (2) If the power supply becomes erratic, while using the power unit, try to obtain a 110-volt, 60-cycle input from existing power lines. Use Transformer TF-11, if necessary.

22. Operation in Arctic, Tropical, and Desert Climates

a. Operation and maintenance of Panel BD-132 and associated equipment in Arctic, tropical, or desert regions involves a number of problems peculiar to these regions. Deterioration of parts from rust and corrosion may lead to complete break-down of the equipment. Dirt, dust, and sand, encountered in desert regions, enters the equipment, and affects operation, and may lead to break-down. Batteries become inoperative in extreme cold.

b. Guard against corrosion by keeping the equipment as dry as possible. In extremely cold regions, use the equipment in a heated inclosure.

c. Refer to pertinent publications listed in appendix II, for data on operation under extreme weather conditions.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. SPECIAL ORGANIZATIONAL TOOLS AND EQUIPMENT

Note. No specific tools, parts, or equipment sets are supplied with Panel BD-132. Refer to technical manuals covering the over-all telephone central office sets with which Panel BD-132 is used for information concerning necessary repair equipment.

Section II. LUBRICANTS AND PRESERVATIVES

23. Converter Lubrication

The only component of Panel BD-132 requiring periodic lubrication is the converter (emergency ringer), item 55 on schematic drawings (figs. 23, 26, and 27).

a. **PREPARATION FOR LUBRICATION.** The oil cups at both ends of the emergency ringer provide the only points of lubrication. Refer to paragraph 24*c*(1) for methods of disassembly. On some emergency ringers there are horizontal type oil cups; on others the oil cups are the vertical type.

b. **INITIAL LUBRICATION** (fig. 18). For initial lubrication of the converter bearings, apply 3 tablespoonfuls ($\frac{3}{8}$ ounce) of oil (OE 10) to each oil cup.

c. **QUARTERLY LUBRICATION.** Replenish the oil consumed in operation by adding 10 or 12 drops to each oil receptacle.

d. **LUBRICATION UNDER UNUSUAL CONDITIONS.** This equipment is designed for use in inclosed installations and operates under comparatively good conditions. Do not subject it to extreme heat, cold, dust, or other hazards that tend to break down equipment. The recommended lubricant (OE 10) is stable under the expected operating temperatures to which Panel BD-132 may be subjected.

24. Weatherproofing Equipment

a. **WEATHERPROOFING.** Panel BD-132 is constructed of moistureproof and fungiproof materials, hence treatment necessary for equipment not constructed of such material is unnecessary in this instance.

b. **WINTERIZATION.** Take special precautions to prevent poor performance or total failure of Panel BD-132 in subzero temperatures. See TB SIG 66, Winter Maintenance of Signal Equipment, for complete information. The following conditions may be encountered:

- (1) Steel contacts become brittle in subzero temperatures.
- (2) Certain types of synthetic rubber become very brittle.
- (3) Lubricants become stiff and cause drag and sticking of moving parts.

c. **DUSTPROOFING.** In desert localities the amount of sand, dust, and foreign matter in the air may affect components of the Panel DB-132. Prevent infiltration of sand and other elements into the lubricated parts of the emergency ringer; cover the equipment when it is not in use. Under severe conditions, usual routine replenishment of the oil cups is inadequate. The lubricant may thin rapidly and drain from the bearing surfaces, or the armature may turn in a film of sand-entrained oil. In the former instance, use a heavier grade of oil; in the latter, clean and relubricate the armature shaft ends.

- (1) *Disassembly of emergency ringer.* To clean the shaft ends, remove the emergency ringer from the panel body. Take off the two brush cover plates, loosen the brushes, and remove the four hexagonal head bolts from the d-c end frame. Pull the end frame away from the field frame. Use the same procedure to remove the a-c end frame (fig. 19).

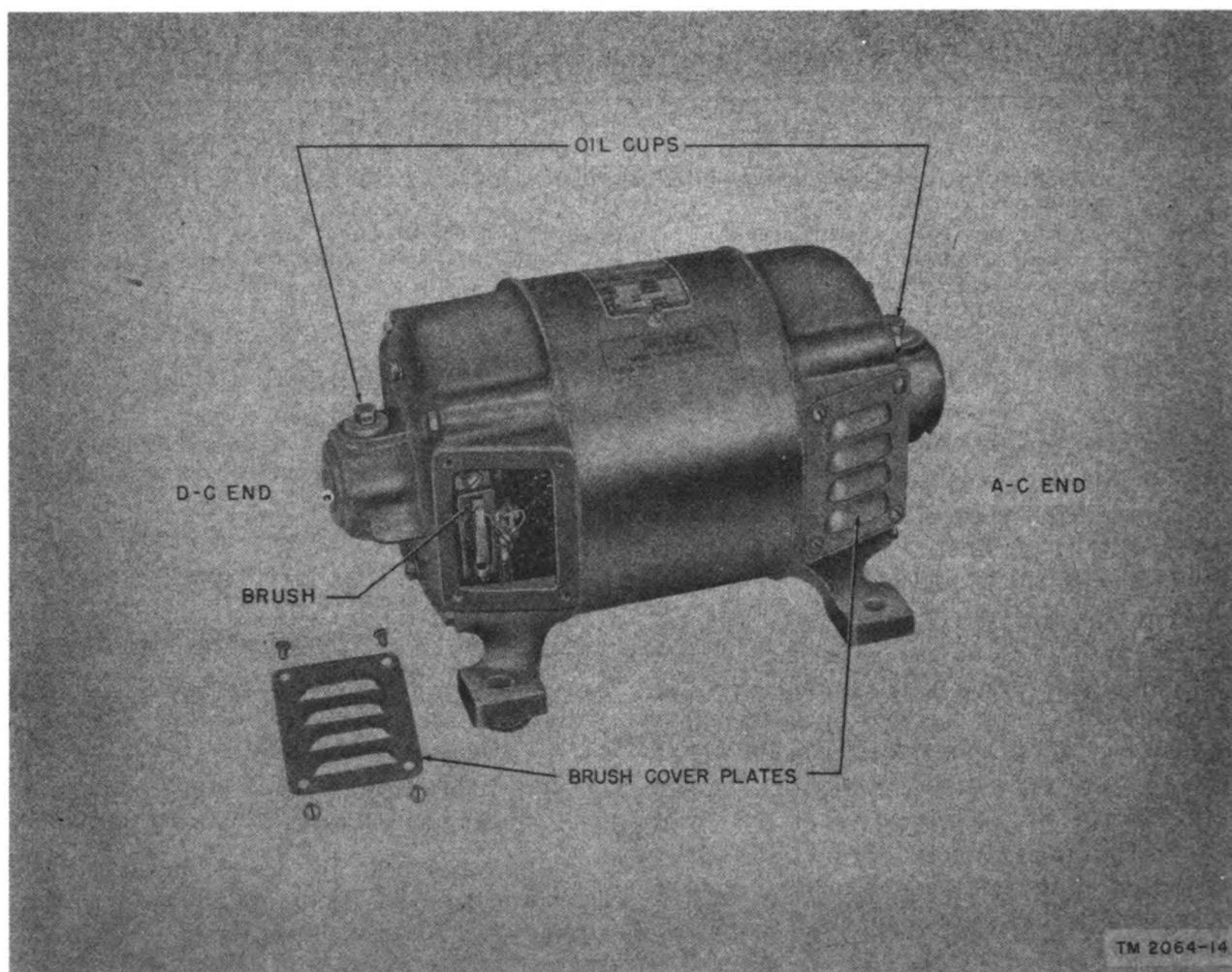


Figure 18. Lubrication point, emergency ringer with brush cover plate removed from d-c end.

- (2) *Cleaning emergency ringer.* With a cleaning cloth moistened with carbon tetrachloride wipe the exposed armature shaft ends clean of sand and dirt. Clean the bearing surfaces in the same

Note. Do not use Solvent, dry-cleaning (SD) on the interior of the emergency ringer.

manner. If a very thorough cleaning is required because of the nature of the foreign matter, remove the brush assemblies from both the d-c and a-c end frames (figs. 9, 18, 19, and 20). Check the commutator surfaces for wear and pitting at the same time.

Section III. PREVENTIVE MAINTENANCE SERVICES

25. Meaning and Importance

a. MEANING. PM (preventive maintenance) means making systematic checks and adjustments at regular intervals to keep equipment operating at top efficiency. It is not the same as trouble shooting and repair. The purpose of PM is to *prevent* break-downs and, therefore, the need for repair. On the other hand, the pur-

pose of trouble shooting and repair is to locate and *correct existing defects.*

b. IMPORTANCE. The importance of PM cannot be overemphasized. The entire system of wire communication depends on each unit being in operation when it is needed. Refer to TB SIG 123, Preventive Maintenance Practices for Ground Signal Equipment.

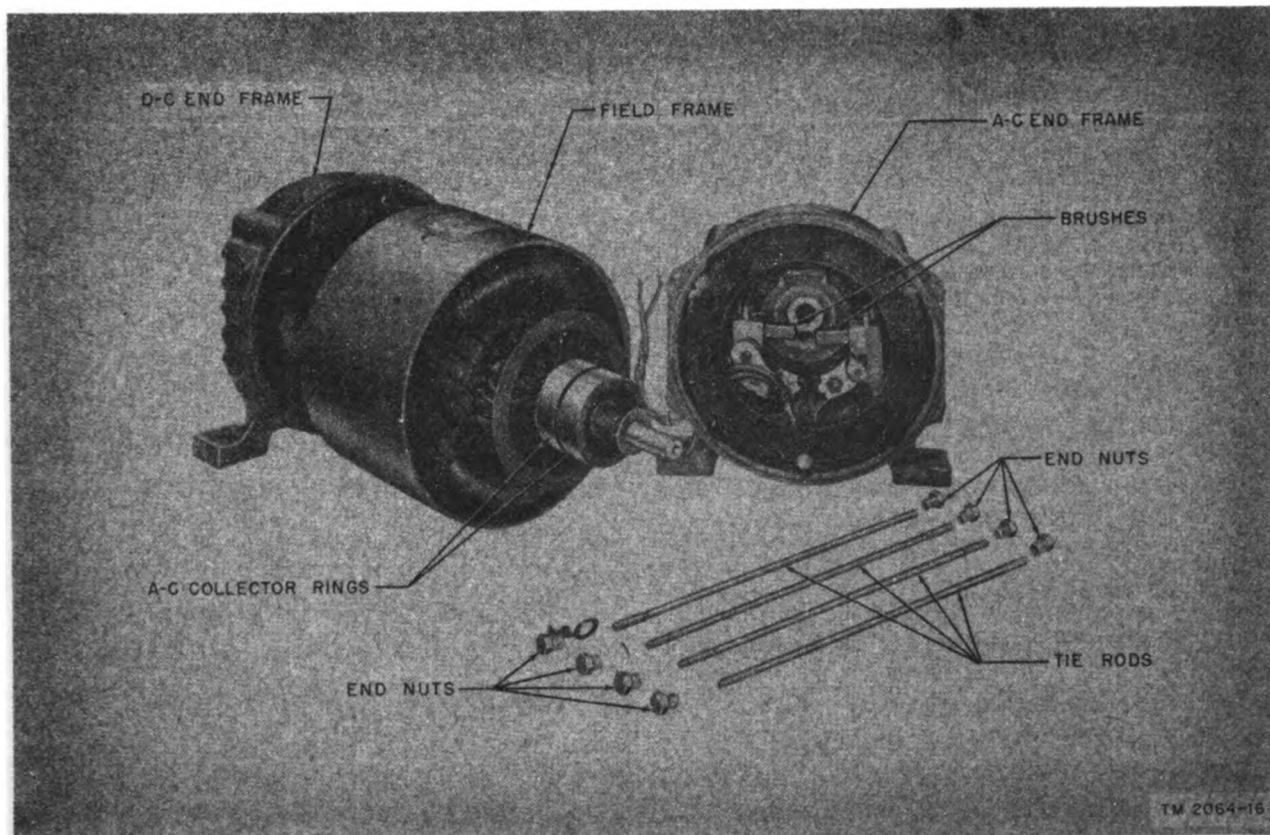


Figure 19. Partially disassembled emergency ringer.

26. Preventive Maintenance Checklists

a. Successful PM of field equipment depends on the planning of a systematic inspection of all the units which make up Panel BD-132. Inspection permits personnel to detect abnormal conditions and possible sources of trouble and to correct these before major troubles and break-downs occur.

b. PM scheduling may be daily, weekly, monthly, quarterly, semiannually, and annually or it may be on the basis of before operation, during operation, and after operation, or at the halt. The PM checklist (par. 27) follows the first of these two-time patterns. If field experience with this equipment warrants re-scheduling, consider the more frequent scheduling of before, during, and after operation.

27. Preventive Maintenance Checklist for Panel BD-132

Item No.	What to check	When to check	How to check	Corrective action
1	Relays.....	M	Check for dirt and dust. Examine contacts for pitting and positioning. Inspect stud clearance for binding or rubbing.	Clean pole pieces with bond paper. Clean dirty contacts with contact burnisher.
2	Switches.....	M	Inspect for mounting tightness and secure wiring.	Tighten mounting, reconnect wiring if needed.
3	Receptacles.....	M	Inspect for loose mountings and connections, and for cracked or broken parts.	Tighten loose mountings or connections, and replace cracked receptacles.
4	Terminal strips.....	M	Inspect for loose mountings and connections, and dust between terminals.	Resolder loose connections; clean with soft brush.

Item No.	What to check	When to check	How to check	Corrective action
5	Local cable.....	Q	Inspect for damaged insulation and proper clearance.	Dress wiring and repair damaged insulation.
6	Night alarm bell....	D	Check operation.....	Short terminal D to nearest ground; if no ring, call field repair crew.
7	Rectifier RA-91-A....	D	Inspect charging rate (max 12 amp). Refer to TM 11-964. Adjust coarse and fine control knobs to correct rate.	
8	Telering.....	D	See TB SIG 203 for information.	
9	Emergency ringer....	W	Check output with a-c voltmeter across output terminals. EMERGENCY RING switch at OFF.	If output is below 90 v, check for sparking at brushes.
		Q	Inspect brushes for sparking.....	Check brushes for proper contact.
10	Fuses.....	M	Inspect for mounting tightness.....	Adjust fuse holders.
11	Cartridge fuses.....	M	Inspect for mounting tightness.....	

Note. In the above table D, W, M, and Q indicate daily, weekly, monthly, and quarterly.

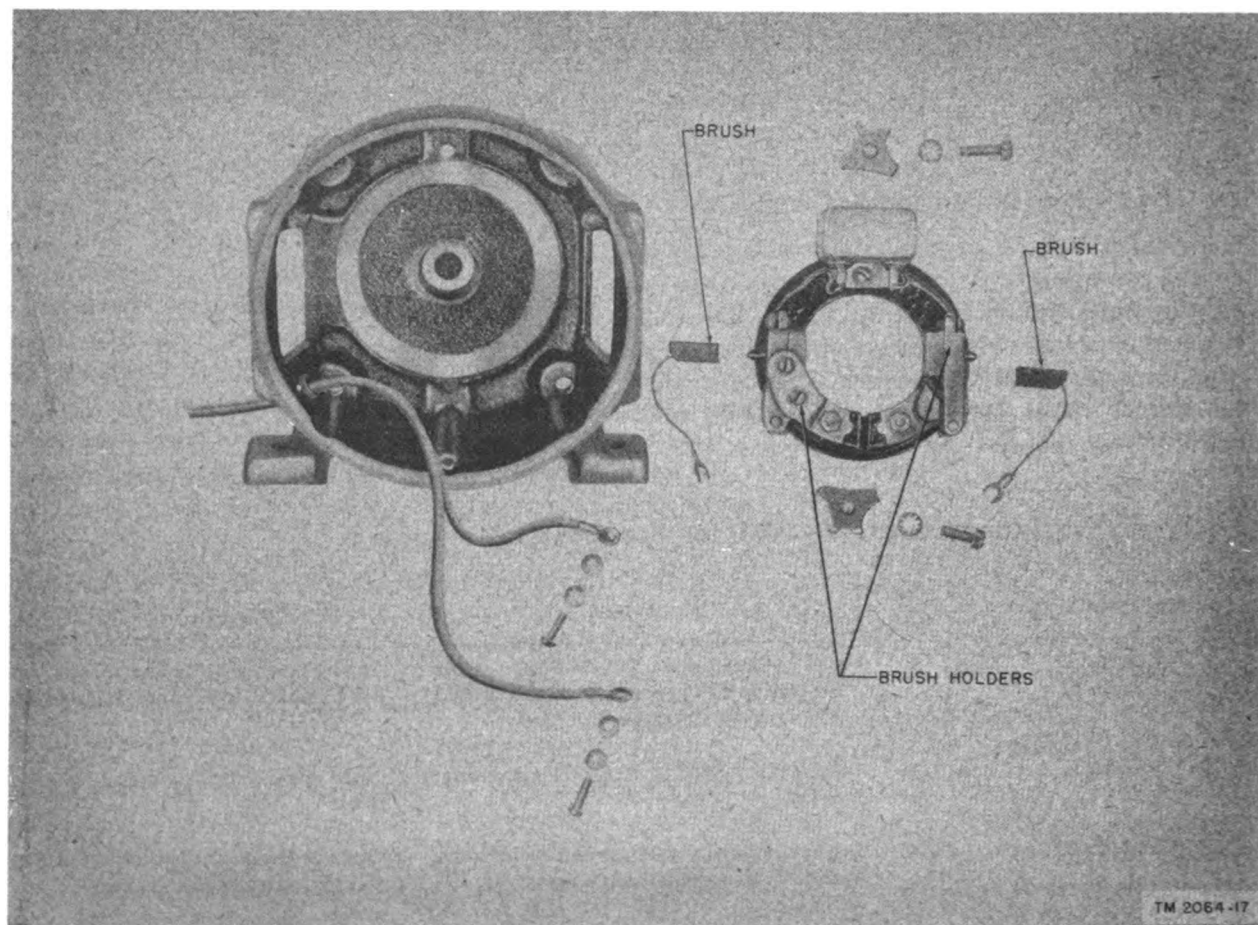


Figure 20. A-c end frame of the emergency ringer with brush holder assembly removed.

Section IV. TROUBLE SHOOTING

28. Trouble Shooting Defined

a. Most mechanical equipment is subject to operational faults which develop in service. The operator or repairman must be able to locate the difficulties as quickly as possible and take the necessary steps to correct them.

b. Take advantage of the instructions in this manual to locate more rapidly the faults that develop in the use of Panel BD-132. Consult the following diagrams when necessary.

- (1) Block diagram of Panel BD-132 as interconnected with a typical telephone central office set (fig. 21).
- (2) Wiring diagram of Panel BD-132 (fig. 22).
- (3) Schematic wiring diagram of Panel BD-132 (fig. 23).

c. To aid in locating troubles, each item of apparatus is assigned an item number which is shown on illustrations and schematics.

29. Steps in Trouble Shooting

Trouble shooting requires the isolation of a faulty unit from a system of otherwise adequate parts. The first step of determining the faulty component or circuit starts with careful observation at the time Panel BD-132 is put into operation. An inoperable Rectifier RA-91-A shows immediately, for instance, if the voltmeter on the meter and switch panel indicates 48-volt battery supply at the panel, and the ammeter on the panel of Rectifier RA-91-A remains at zero. Isolation of the fault into a specific part of the rectifier is the second phase of a trouble-shooting program.

30. Localizing Electrical Troubles

Panel BD-132 is arranged to provide visible and audible alarms at the time trouble occurs. Trouble shooting in these instances is relatively simple; the alarm indicates the sectionalizing of the electrical trouble to a particular circuit and requires a routine check to identify the faulty part. The following trouble-shooting chart lists probable troubles and trouble sources.

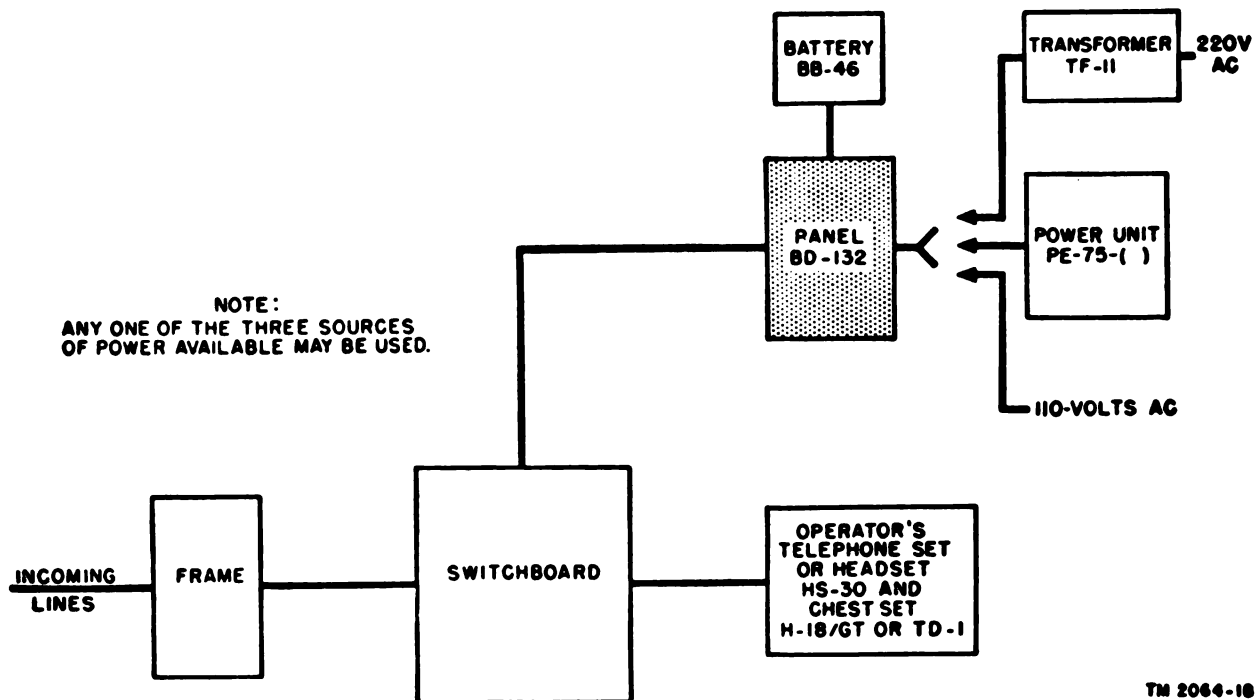


Figure 21. Panel BD-132 interconnected with typical telephone central office set.

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31. Trouble-shooting Chart

Condition	Possible trouble	Corrective action
<p>Night alarm bell (36) does not ring with NA switch operated when a call is received on switchboard.</p>	<ol style="list-style-type: none"> 1. NB, night bell (36) out of adjustment. 2. AU relay (40), contacts dirty or relay out of adjustment. 3. Contacts on NA switch (20) dirty or need adjustment. 4. AR relay (38) contacts dirty or need adjustment. 5. Open in wiring. 6. Open in: <ol style="list-style-type: none"> a. A retardation coil (56). b. A or B resistor (53, 52). c. AU or NA relay (40, 39). d. NB, night bell (36). 	<ol style="list-style-type: none"> 1. Adjust bell. 2. Clean contacts and adjust relay. 3. Clean contacts and adjust switch. 4. Clean contacts and adjust relay. 5. Repair open. 6. Replace retardation coil, resistor, relay, or bell.
<p>Night alarm bell does not stop ringing when switchboard release switch RLS is operated or line drop is restored.</p>	<ol style="list-style-type: none"> 1. NA relay (39) not released. 2. Contacts do not open when AR relay (38) is operated. 3. Wire from switchboard release switch RLS to relay AR open. 	<ol style="list-style-type: none"> 1. Operate telephone night alarm relay switch. 2. Clean contacts and adjust relay. 3. Repair open. 4. Replace relay.
<p>With power applied to Panel BD-132; any one of eight fuses A, B, C, D, VT, NA1, NA, NV Nos. (41) to (46), inclusive, open. Fuse alarm buzzer does not sound.</p>	<ol style="list-style-type: none"> 1. FA buzzer (37) out of adjustment. 2. Open in wiring. 3. FA buzzer (37) winding open. 	<ol style="list-style-type: none"> 1. Adjust buzzer. 2. Repair open. 3. Replace buzzer.
<p>With power applied to Panel BD-132; voltage at 20-cy TEST BOARD or SWBD receptacle (18) is less than 20 v. No voltage alarm buzzer C does not sound.</p>	<ol style="list-style-type: none"> 1. C buzzer (35) out of adjustment. 2. A relay (34) contacts dirty or out of adjustment. 3. B relay (33) contacts dirty or relay out of adjustment. 4. D switch (24) operated. 5. Open in wiring. 	<ol style="list-style-type: none"> 1. Adjust buzzer. 2. Clean contacts and adjust relay. 3. Clean contacts and adjust relay. 4. Restore key to normal. 5. Repair open.
<p>No voltage C buzzer (35) does not stop sounding when D switch (24) is operated.</p>	<ol style="list-style-type: none"> 1. B relay (33) contacts do not make when operated. 2. D switch (24) contacts do not make when operated. 3. Open in wiring. 	<ol style="list-style-type: none"> 1. Clean contacts and adjust relay. 2. Clean contacts and adjust jack. 3. Repair open.
<p>Does not light no voltage alarm lamp when buzzer sounds.</p>	<ol style="list-style-type: none"> 1. E lamp (23) open. 2. Open in wiring. 	<ol style="list-style-type: none"> 1. Replace lamp. 2. Repair open.

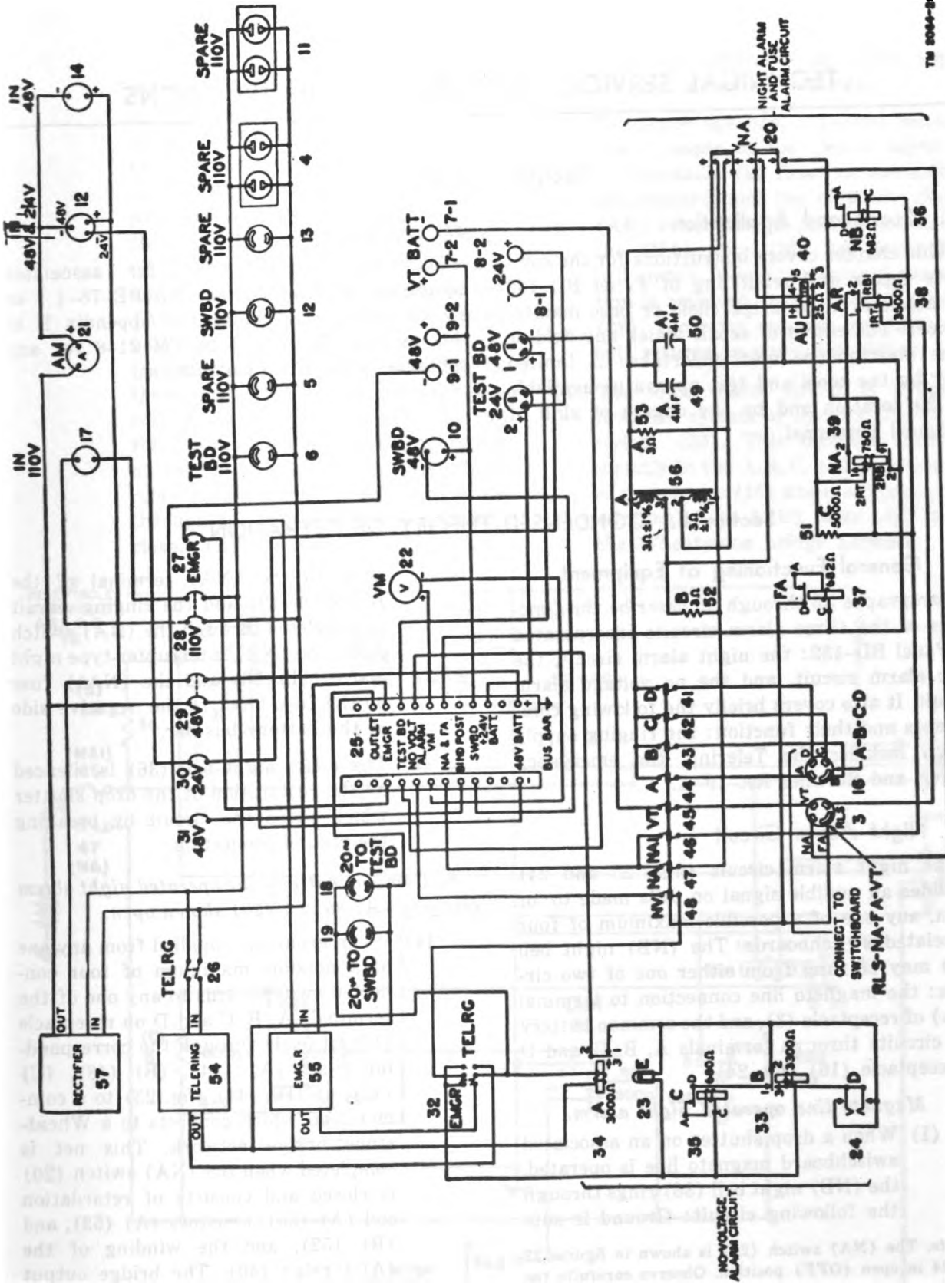


Figure 26. Panel BD-105, schematic wiring diagram.

CHAPTER 4

TECHNICAL SERVICES—MAINTENANCE INSTRUCTIONS

Section I. GENERAL

32. Scope and Application

This chapter covers instructions for the complete repair and rebuilding of Panel BD-132 at mobile or fixed shops (field or base maintenance). The extent of repair which any field or base maintenance unit undertakes is limited only by the tools and test apparatus available at the location and by the degree of skill of assigned personnel.

33. References

Maintenance instructions for associated equipment, such as Power Unit PE-75-() or switchboards, are tabulated in appendix II of this manual. Refer also to FM 21-6 for any subsequent published instructions.

Section II. CONDENSED THEORY OF OPERATION

34. General Functioning of Equipment

Paragraphs 35 through 39 describe the functions of the three alarm circuits incorporated in Panel BD-132: the night alarm circuit, the fuse alarm circuit, and the no voltage alarm circuit. It also covers briefly the following components and their function: the ringing supply which includes the Telering, the emergency ringer, and Rectifier RA-19-A.

35. Night Alarm Circuit

The night alarm circuit (figs. 23 and 24) provides an audible signal on calls made to, or from, any one of a possible maximum of four associated switchboards. The (NB) night bell (36) may be rung from either one of two circuits: the magneto line connection to terminal (NA) of receptacle (3), and the common battery line circuits through terminals A, B, C, and D of receptacle (16) (fig. 24).

a. Magneto line operated night alarm.

- (1) When a drop shutter on an associated switchboard magneto line is operated, the (NB) night bell (36) rings through the following circuit: Ground is sup-

Note. The (NA) switch (20) is shown in figures 23 and 24 in open (OFF) position. Observe carefully the switch positions described in the following paragraphs on circuit theory.

plied to the (NA) terminal of the receptacle (3) and the ringing circuit is completed through the (NA) switch (20), the (NB) interrupter-type night alarm bell (36) and the (NA1) fuse on the fuse block to the negative side of the battery bus-bar.

- (2) The (NB) night bell (36) is silenced by the restoration of the drop shutter which opens the circuit by breaking the ground connection.

b. Common battery line operated night alarm circuit (NA) switch (20) shown open.

- (1) When ground is supplied from any one of a possible maximum of four connected switchboards to any one of the terminals A, B, C and D on receptacle (16), it leads through the corresponding fuses (A) (44), (B) (43), (C) (42), or (D) (41) (fig. 23) to a common lead which connects to a Wheatstone bridge network. This net is completed when the (NA) switch (20) is closed and consists of retardation coil (A) (56), resistors (A) (53), and (B) (52), and the winding of the (AU) relay (40). The bridge output is connected through the (NA) fuse (47) on the fuse block, to the (NA

and FA) terminal on the negative battery bus-bar (fig. 23). The function of the bridge is to energize the coil of the (AR) relay in the following manner: The inductance of the windings of the retardation coil (A) (56) prevents rapid build-up of current in these windings and provides for a sufficient portion of the current to reach and energize the armature coil of the (AU) relay (40). When the current build-up in the windings of the retardation coil (A) (56) is complete, there is no further flow through the coil of the (AU) relay (40), and the relay is released. During the operation of the (AU) relay (40), the (NA) relay (39) is activated and holds through the contacts of the normally closed (AR) relay (38). The (NA)

relay (39) operates the (NB) night bell (36) as an audible signal.

- (2) To silence the bell, a ground connection is made to the (RLS) terminal of receptacle (3) from an associated switchboard, and the normally closed (AR) relay (38) is opened to release the (NA) relay (39) and break the bell circuit. When the ground connection is removed from the (AR) relay (38), the relay releases and the circuit returns to normal condition.
- (3) The night alarm circuit is removed from the system by opening the (NA) switch (20). This connects battery directly to the A, B, C, and D terminals of receptacles (16) and disconnects the winding of the (AU) relay (40) from the Wheatstone bridge network

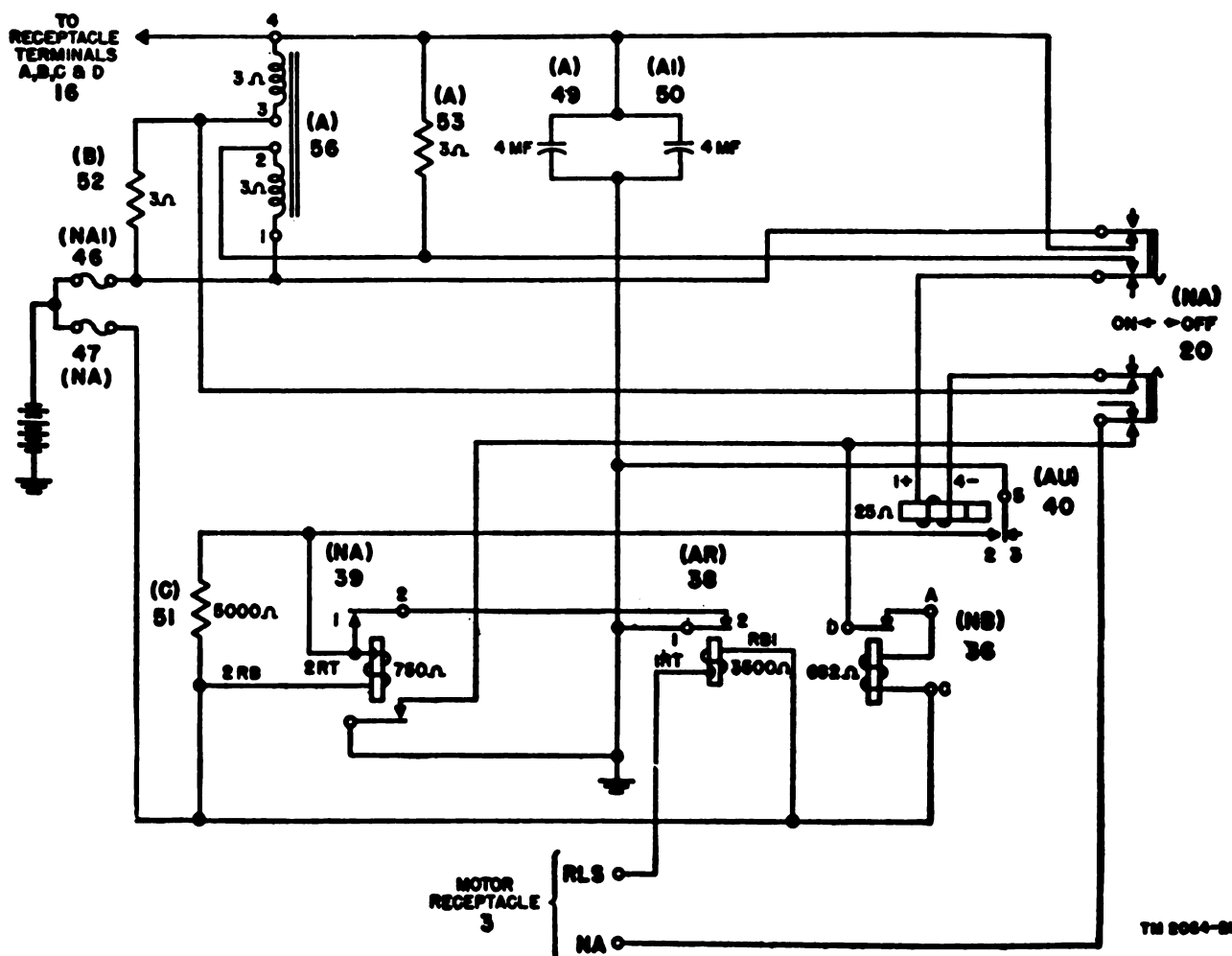


Figure 24. Night alarm circuit, schematic diagram.

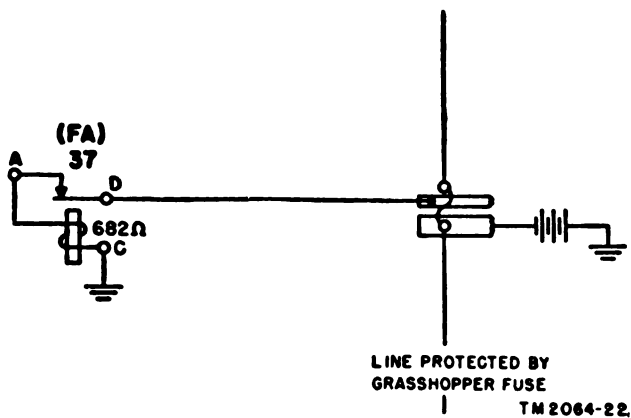


Figure 25. Fuse alarm circuit, schematic diagram.

36. Fuse Alarm Circuit (fig. 25)

When a grasshopper fuse blows, negative battery is connected to the fuse alarm bar by the spring on the bottom of the fuse contacting this bar. Simultaneously, the circuit into which the fuse is normally placed for protection is opened, and the circuit which energizes the fuse alarm buzzer (37) is closed, causing the buzzer to operate. The circuit to the buzzer coil is made through its spring-loaded armature. The attraction of the armature to the coil breaks the circuit, and its subsequent release, because of the spring action, remakes it. These alternate operations and the resultant sounding of the buzzer continue until a new fuse is installed.

37. No Voltage Alarm Circuit (fig. 26)

a. The no voltage alarm circuit provides an audible and visual alarm to indicate a decrease in ringing voltage to below a given value of 20 volts, 20 cycles ac. Such a drop releases the (A) relay (34), which is connected directly across the ringing voltage output. The (A) relay (34) operates the (C) buzzer (35) to sound and simultaneously causes the (E) lamp (23), mounted in parallel, to light.

b. The buzzer can be silenced by operating the (D) switch (24) which closes the (B) relay (33); this relay operates under the control of the (A) relay (34). When ringing voltage is restored, the (A) relay (34) functions to disconnect the no voltage alarm circuit from ground and to restore the circuit to its normal condition.

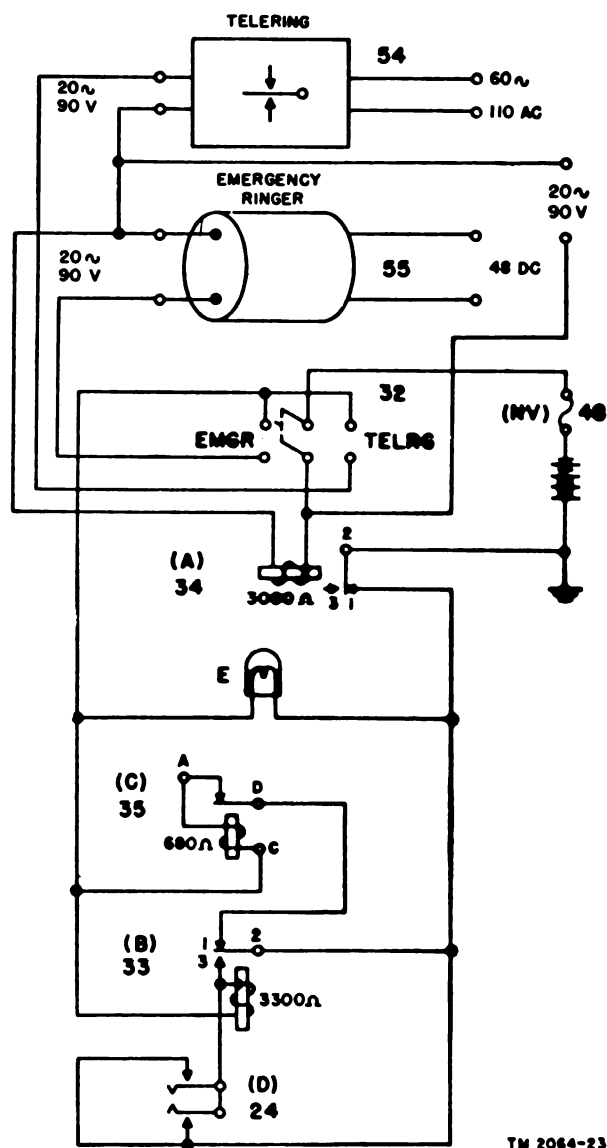


Figure 26. No voltage alarm circuit, schematic diagram.

38. Ringing Supply (fig. 27)

The Telering unit, Interrupter PE-250, is a vibrating-reed type of frequency converter for supplying power to 20-cycle ringing equipment. It operates from the 110-volt, 60-cycle a-c power lines of Panel BD-132 and supplies 80 to 109 volts, 20-cycle a-c power for ringing associated switchboards. A Telering switch (26) connects the Telering to the 110-volt a-c line on Panel BD-132. A double-pole, double-throw switch (32) marked EMGR TELRG (fig. 26), permits change-over to an emergency ringer (55) in the event that the Telering fails.

The emergency ringer (55) operates from the 48-volt d-c line. It is connected to the 48-volt battery line across the circuit breaker (27). The emergency ringer (55) output is the same as the Telering unit, 90-volt, 20-cycle a-c. Refer to TB SIG 203 for detailed information on the Telering.

39. Rectifier Unit RA-91-A (fig. 27)

Rectifier RA-91-A is a full-wave selenium disk rectifier, designed to provide a charging current of from 2 to 12 amperes. Refer to TM 11-964 for further information pertinent to the rectifier.

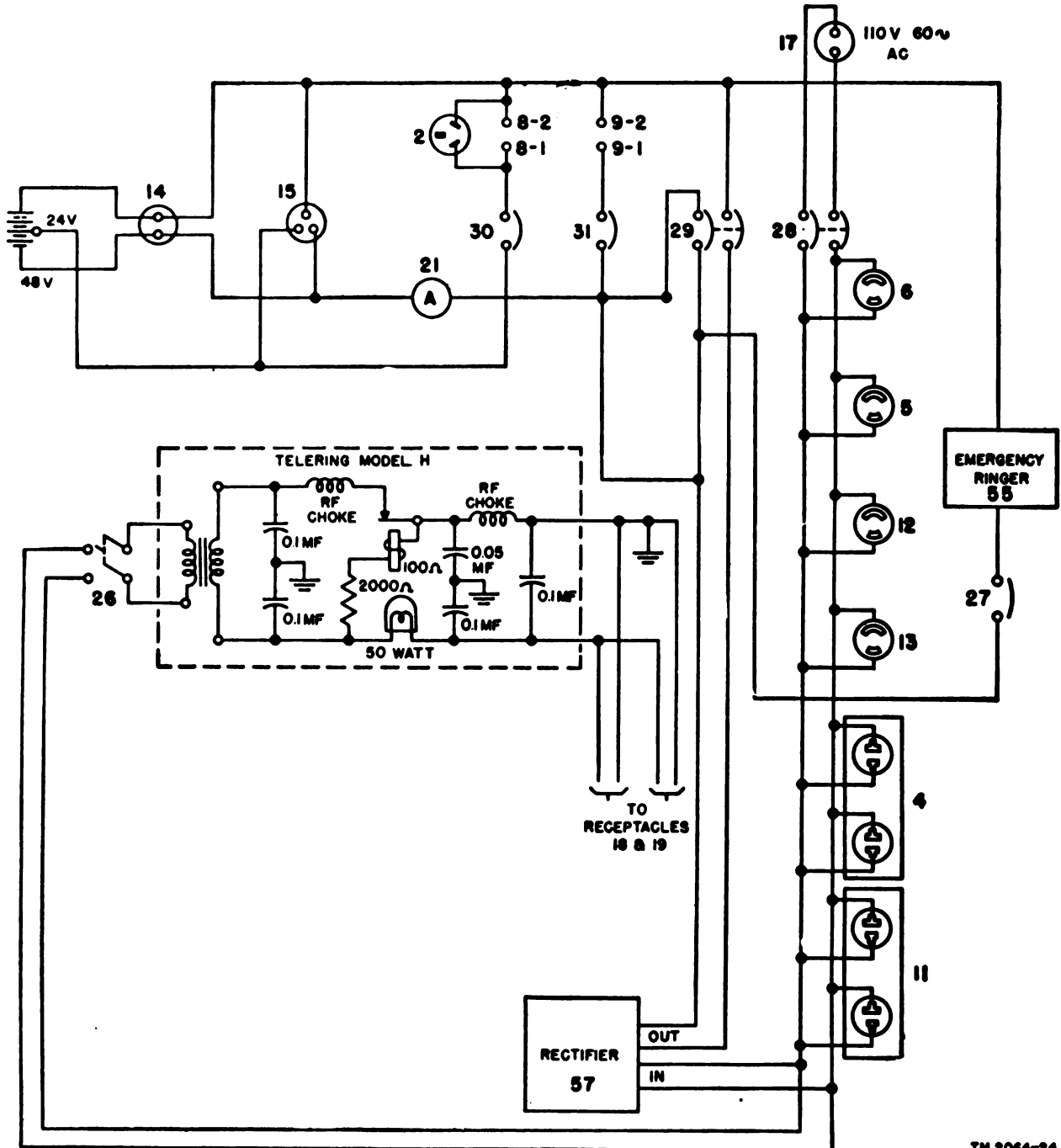


Figure 27. Power and ringing supply circuits, schematic diagram.

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Section III. TEST AND REPAIR EQUIPMENT

Note. Tools and test equipment required for the maintenance of Panel BD-132 are already a part of the telephone central office equipment. Refer to TM 11-2063 and TM 11-4302 for descriptions of tools and test equipment useful in field and base repair of components of telephone central office set equipment such as Panel BD-132.

Section IV. REPAIRS

40. Removal and Replacement

a. REMOVAL. When trouble has been localized to a specific point, access must be gained to the defective part to inspect, adjust, or replace it. Parts are either directly accessible or are reached by removal of other parts. The following items may require removal for servicing:

- (1) Telering (Interrupter PE-250).
- (2) Rectifier RA-91-A.
- (3) Emergency ringer (converter).

b. REPLACEMENT. Consult the wiring diagram (fig. 22) when replacing parts to be certain that the wiring code is followed accurately.

41. Apparatus Adjustment

a. RELAYS. Refer to TM 11-4302 and TM 11-338 for detailed instructions on the repair and adjustment of the following relays:

- (1) Night alarm (NA) relay WECO type E No. 931.
- (2) (AR) relay WECO type R No. 27.
- (3) (AR) relay WECO type D No. 293-GB.
- (4) No voltage alarm (A) relay AECO type 10 No. ZR3012-2381.
- (5) No voltage alarm (B) relay AECO type 27 No. R2444-AB.

b. RECTIFIER RA-91-A. See TM 11-964 for instructions on the testing and repair of the rectifier.

c. TELERING (INTERRUPTER PE-250) (fig. 28). See TB SIG 203, Installation, Adjustment, and Maintenance of Interrupter PE-250 (Telering), for detailed instructions on the repair and adjustment of the Telering.

d. BELLS AND BUZZERS. Adjust bells and buzzers as instructed in TM 11-4302; replace

them only when they cannot be adjusted to meet their operating requirements.

e. EMERGENCY RINGER (CONVERTER).

- (1) To replace the sleeve bearings, see disassembly procedure given in chapter 3, section II. The disassembly procedure exposes the armature for removal in case of damage to the shaft or the windings.
- (2) The converter may be operated without damage on primary voltages up to 56 volts. The power data given in the table below may be used as an indication of the operating efficiency of the equipment:

INPUT			
D-c volts	Amp		Fusatron cap.
	Full load	No load	
43-47	1.25	1.0	3.2

OUTPUT			
A-c volts	Amp	Freq	Speed
75-90	0.20	20 cy nominal	1,200 rpm

(3) The converter windings are designed to give the a-c voltage and frequency regulation, shown below, under both hot and cold conditions, without the use of a resistance:

D-c volts	Output load amp	A-c volts	Cycles
43	0.20	75 min	17 min
47	0.025	90 max	23 max

f. SWITCHES.

- (1) The switches used in Panel BD-132 have stamped functional designations which show on figures 22 and 23. It is usually necessary to remove a switch from its panel mounting before attempting adjustments. At the time of removal inspect the entire switch for apparent faults and correct these at once.
- (2) Test for contact make, if there is evidence that a switch contact is not properly closed. Use a test receiver across the springs of the contact

through which current is flowing. Clicks or flutter in the receiver give evidence of a faulty switch. If the switch is electrically unsatisfactory and mechanically in adjustment, burnish the contacts. Remove excess dirt or dust accumulations with a soft hair paint brush (Sig C stock No. 6Z1581) or with a lint-free cloth (Sig C stock No. 6Z2056). Keep the burnisher clean by wiping frequently with a clean dry cloth. Do not use abrasives on switch contacts. If necessary, use a solvent such as carbon tetrachloride (Sig C stock No. 6G184.1).

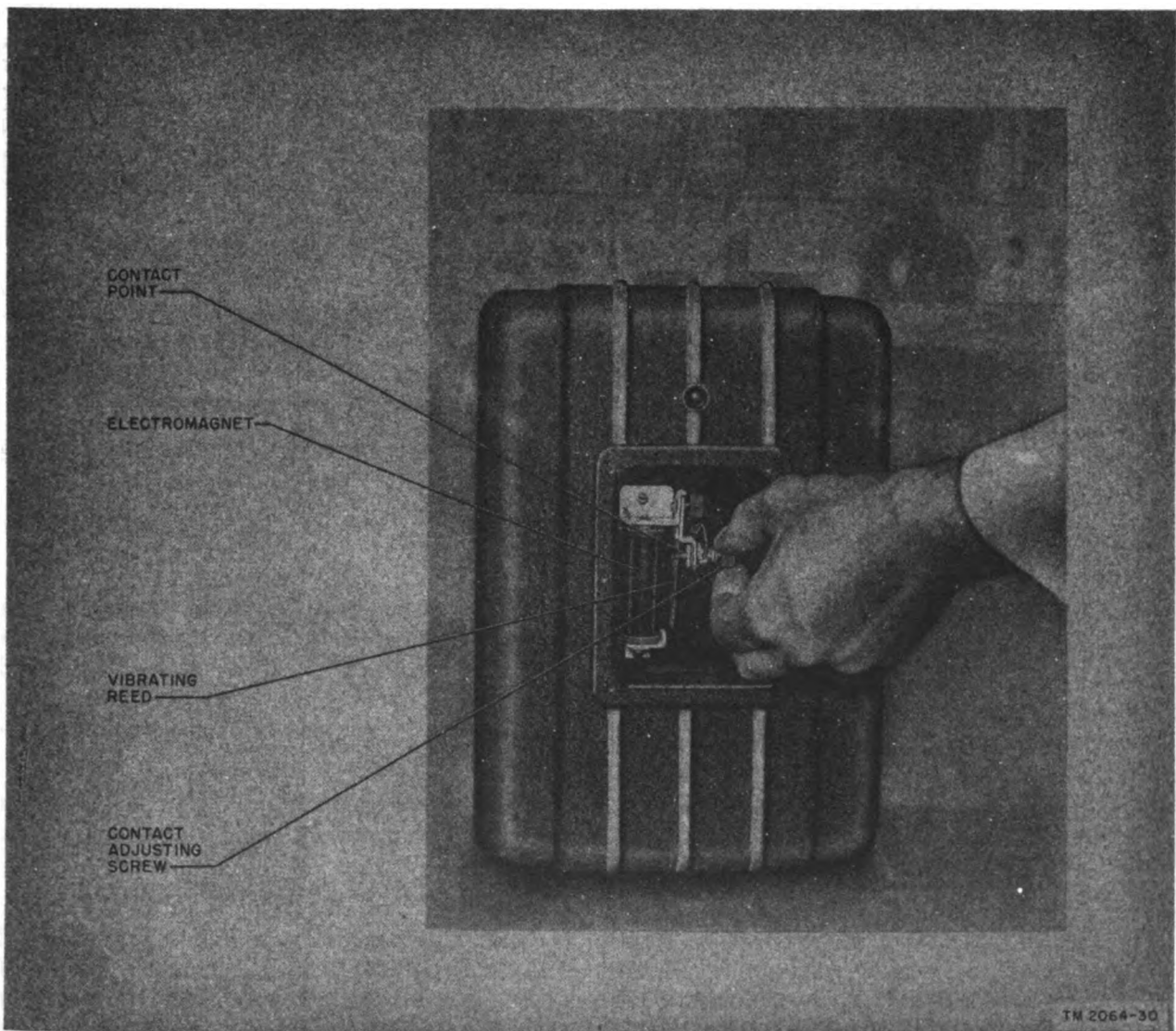


Figure 28. Telering, front cover plate removed, showing contact adjusting screw and vibrating reed.

Section V. FINAL TESTING

42. General

Panel BD-132 repaired or reconditioned in army or base depot repair shops should be tested as outlined below for return to the user or to class A stock.

43. Testing

a. TELERING. Connect a thermocouple type milliammeter in series with each of the non-inductive resistance loads listed below across the bottom left terminal of the TELERING EMERGENCY RING switch (32) and the ground (+) bus-bar of the terminal board. With the TELERING EMERGENCY RING switch unoperated and the TELERING switch to ON the minimum current output for each load will be as listed below:

Output load (ohms)	Output current (ma)
200	140
1,000	70
10,000	10

b. EMERGENCY RINGER. Connect an a-c volt-meter load across upper left terminal of the TELERING EMERGENCY RING switch (32) and the ground (+) bus-bar. With the TELERING EMERGENCY RING switch unoperated and the EMGR circuit breaker operated to ON, the no-load voltage output of the emergency

ringer must be not less than 90 volts. With a 200-ohm noninductive resistance load connected as described above, the output voltage must be not less than 70 volts.

c. CIRCUIT BREAKERS. All circuit breakers on Panel BD-132 should hold on rated current and open on 135 percent of rated current within 2 to 5 seconds, and on 200 percent of rated current within 1 to 2 seconds, based on d-c rating and circuits.

d. WIRING. Test all wiring for continuity. The insulation resistance between any circuit and all other circuits and to ground should be not less than 5 megohms. The insulation resistance measurement may be made with a voltmeter having a resistance of not less than 100,000 ohms at 1000 ohms per volt, connected in series with a 90-volt battery. The voltmeter reading corresponding to 5 megohms should be calculated from the following formula:

$$V = \frac{rE}{r + R}$$

V = voltmeter deflection.

r = resistance of voltmeter in ohms.

R = insulation resistance in ohms.

E = voltage of the test battery.

Note. A deflection smaller than that calculated indicates a greater resistance.

Section VI. REFINISHING

44. Appearance

Inspect the panel for finish. If any sign of scratches or other surface damages are found, refinish the entire panel. Rust and corrosion may be prevented if painted surfaces of Panel BD-132, that are scratched or where the finish is damaged, are thoroughly cleaned and the finish retouched. If only small areas of the finish have been chipped or scraped, proceed as follows:

a. Remove all traces of dirt, oil, or grease with solvent (SD) and thoroughly sandpaper the areas to be painted. Apply the paint with a small brush. Two light coats of paint are better than one heavy coat.

b. Refinish the unit carefully whenever it has received an overhaul. If the painted surface is in fair condition, repaint all scratches and scrapes as outlined in subparagraph *a* above; if the painted surface is in poor condition refinish completely.

Caution: Avoid getting paint on moving parts in such a manner as to hinder their movement.

45. Circuit Labels and Designations

Individual apparatus designations are marked on the apparatus or on the mounting panels. If the designations are worn, the apparatus or panels should be remarked. Circuit designations are shown on figure 23.

46. Connectors, Binding Posts, and Terminal Lugs

Inspect for cleanliness. Check that contacting surfaces are free of corrosion and dirt. Clean with carbon-tetrachloride cleaner. Replace components which are deeply pitted or misshaped. Refer to appendix III for proper part.

47. Terminal Strips

Check for tightness and cleanliness of connections at the terminal strips. Check the secur-

ity of the six screws holding the bus-bars to the insulations. Replace defective terminals and binding screws. If bus-bars are dirty, wash with carbon-tetrachloride cleaner (Sig C stock No. 6G184.1).

48. Terminal Panels

Inspect the terminal board which is part of the cord connector panel for loose mounting posts and legible designations. Secure mounting posts and reletter worn designations.

APPENDIX I

SHIPMENT AND STORAGE

Section I. DISASSEMBLY AND REPACKING

I. Disassembly

a. Position all circuit breakers and switches on Panel BD-132 in OFF position.

b. Disconnect equipment from all sources of power.

- (1) If Power Unit PE-75-() is used as a source of supply, shut down the engine as explained in TM 11-900, and remove Cord CD-409.
- (2) If power is supplied locally, remove Cord CD-398 from the a-c outlet.
- (3) Remove Cords CD-38 and CD-784 from the terminals of Batteries BB-46.
- (4) Remove Cord CD-783 from the distributing frame.

Caution: Always remove all cords from power sources before performing any other disassembly.

c. Disconnect all remaining cables.

2. Repacking for Shipment or Limited Storage

a. Place front and rear covers on the panel. Snap the catches (fig. 10).

b. This equipment is designed as portable equipment and therefore can be transported or stored with the covered panel uncrated. However, for export packing purposes, these chests must be crated.

APPENDIX II

REFERENCES

Note. For availability of items listed, see FM 21-6 and Department of the Army Supply Catalog SIG 1. Also see latest issue of FM 21-6 for applicable technical bulletins, supply bulletins, modification work orders, and changes.

1. Supply Publications

SIG 1, Introduction and Index.
 SIG 3, List of Items for Troop Issue.
 SIG 4-1, Allowances of Expendable Supplies.
 SIG 4-2, Allowances of Expendable Supplies for Schools, Training Centers, Boards, and Fixed Installations.
 SIG 5, Stock List of All Items.
 SB 11-6, Dry Battery Supply Data.
 SB 11-76, Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment.

2. Technical Manuals on Associated Equipment and Test Equipment

TB SIG 208, Installation, Adjustment, and Maintenance of Interrupter PE-250 (Telering).
 TM 11-338, Telephone Central Office Set TC-10.
 TM 11-473, Central Office Maintenance.
 TM 11-900, Power Unit PE-75-().
 TM 11-964, Rectifiers RA-91 and RA-91-A.
 TM 11-2036, Test Set I-181.
 TM 11-2613, Voltohmmeter I-166.
 TM 11-4302, Tactical Switchboards and Long Lines Equipment — Repair Instructions, Apparatus Requirements.

3. Painting, Preserving, and Lubrication

TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment.

4. Shipping Instructions

U. S Army specification No. 100-14A, Army-Navy General Specification for Packaging and Packing for Overseas Shipment.

5. Decontamination

TM 3-220, Decontamination.

6. Demolition

FM 5-25, Explosives and Demolitions.

7. Camouflage

FM 5-20, Camouflage, Basic Principles.

8. Other Publications

TB SIG 25, Preventive Maintenance of Power Cords.
 TB SIG 66, Winter Maintenance of Signal Equipment.
 TB SIG 72, Tropical Maintenance of Ground Signal Equipment.
 TB SIG 75, Desert Maintenance of Ground Signal Equipment.
 TM 1-455, Electrical Fundamentals.
 TM 11-462, Signal Corps Reference Data.
 TM 38-650, Basic Maintenance Manual.

9. Forms

WD AGO Form 468 (Unsatisfactory Equipment Report).
 AF Form 54 (Unsatisfactory Report).

10. Abbreviations

acalternating current
 AMammeter
 ampamperes
 BATbattery
 BDboard
 cpscycles per second
 cycycles
 dcdirect current
 DPDTdouble-pole, double-throw
 DPSTdouble-pole, single-throw
 EMGRemergency ringer
 FAfuse alarm
 fig.figure (s)
 mfmicrofarad
 NAnight alarm
 NVno voltage
 par.paragraph (s)
 rpmrevolutions per minute
 SWBDswitchboard
 TELRGtelering
 TMtechnical manual
 vvolt
 VMvolt-milliammeter
 wwatt

APPENDIX III

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that an item appears in this technical manual is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as T/O&E, T/A, T/BA,

SIG 6, SIG 7&8, SIG 7-8-10, SIG 10, list of allowances of expendable material, or another authorized supply basis. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

2. Identification Table of Parts for Panel BD-132

Reference symbol	Name of part and description	Function of part	Signal Corps stock No.
NB.....	BELL: vibrating type; 3" diam gong..... BOLT: steel; 5/16"-18 x 1 1/2" lg..... BOLT: steel; 5/16"-18 x 1 3/4" lg.....	Night alarm bell.....	4Z560 6L635-1.5PR 6L635-1.7PR
C, FA.....	BUZZER, signal: vibrating.....	Audible signal in no voltage alarm and fuse alarm circuits.	4Z3050
A, A1.....	CAPACITOR, fixed: paper, 4 mf; 200 vdcw.	Bypass capacitors.....	3DB4-241
EMGR, 24V, 48V ...	CIRCUIT BREAKER: single pole; 10 amp.	Emergency ring, 24 v, 48 v circuit breakers.	3H900-10
110V, 48V.....	CIRCUIT BREAKER: 2 pole; 15 amp.....	110 v, 48 v switches.....	3H900-15-38
A.....	COIL, telephone retardation: 2 windings.....	Part of Wheatstone bridge.....	3C1759C
Spare 110V, Test BD 110V, SWBD 110V.	CONNECTOR, receptacle: female contact.....	Circuit connectors for circuits indicated in reference symbol column.	6Z7588.1
Spare 110V.....	CONNECTOR, receptacle: 4 female contacts.	Circuit connector for circuit indicated in reference symbol column.	6Z786-1
IN 110V, IN 48V....	CONNECTOR, receptacle: female contact, Crouse-Hinds No. 2302.	Circuit connectors for circuits indicated in reference symbol column.	
IN 48V and 24V....	CONNECTOR, receptacle: 3 female contacts, Crouse-Hinds No. 2303.	48 v, 24 v input.	
Test BD 48V, 24V....	CONNECTOR, receptacle: male contact.....	Circuit connectors for circuits indicated in reference symbol column	6Z8367
16.....	CONNECTOR, receptacle: female contact.....	Power supply.....	6Z8367-1
3.....	CONNECTOR, receptacle: male contact.....	Power supply.....	6Z8366-1
20 cy to SWBD, 20 cy to Test BD.	CONNECTOR, receptacle: male contact.....	Connectors for circuits indicated in reference symbol column.	6Z816
	COVER: relay, push-on.....		4C3105-E1
	COVER: relay, push-on.....		2Z3351-98
	FASTENER, catch: suitcase type.....	For panel cover.....	6Z3640
	FASTENER: Dsus.....	For hinged door at top front of panel....	2ZK4318-4

Reference symbol	Name of part and description	Function of part	Signal Corps stock No.
A, B, C, D, VT, NA1	FUSE, indicator alarm: 1½ amp.....	Circuit protectors.....	3Z2135A.1
NA, NV.....	FUSE, indicator alarm: 3 amp..... HANDLE: chest; steel..... HOLDER: block type; 2 amp..... HOLDER: block type; 5 amp.....	In night alarm and no voltage circuits..... For panel chest..... Fuse holder..... Fuse holder.....	3Z2135G 6Z5009 4E312E 3Z2831-1
TELERING.....	INTERRUPTER PE-250, ringing: 16/24 cy. LABEL: circuit..... LABEL: circuit..... LABEL: circuit..... LABEL: circuit..... LAMPHOLDER: slide base.....	Provides 20 cy ringing power.....	4F2425.1 6D16818-27 6D16818-28 6D16818-29 6D16818-30 4C9783.4.1
E.....	LAMP, incandescent: 36 v 0.032-0.044 amp. LENS, indicator light: red.....	Visible signal in no voltage alarm circuit..... For Telering indicator lamp.....	4C5492 4C2504B
AM.....	METER, ammeter: 15-0-15 amp.....	Measures battery charge.....	3F1030
VM.....	METER, voltmeter: DC, 0-75 v.....	For testing voltage.....	3F8080-5
48V, 24V, VT, BAT..	POST, binding: TM-109.....		
Rectifier.....	RECTIFIER RA-91, RA-91-A.....	Rectifies current for battery charge and d-c circuits.	3H4090-91
NA.....	RELAY, armature.....	Night alarm relay to operate bell alarm.....	4C8749.981
AR.....	RELAY armature.....	Holds and releases NA relay.....	4C8827
B.....	RELAY, armature.....	Helps silence busser in no voltage alarm circuit.	3H4090/E4
A.....	RELAY, armature.....	Operates busser and light in no voltage alarm circuit.	3H4090/E-3
AU.....	RELAY, armature.....	In Wheatstone bridge network.....	4C-9139GB
C.....	RESISTOR, fixed: 5000 ohms, ± 5%; 5.1 w.....	Voltage limiter.....	3Z5800-19
A, B.....	RESISTOR, fixed: 3 ohm ± 1%.....	In Wheatstone bridge network.....	3Z5800B5
EMGR.....	RINGING EQUIPMENT, telephone.....	Used if Telering fails.....	4F1800
Night alarm and fuse alarm.	SWITCH, lever.....	Night alarm and fuse alarm switches.....	4C5104-79EL
D.....	SWITCH, rotary.....	Silences busser in no voltage alarm circuit.	4C5092Y.1
TELRG.....	SWITCH, toggle.....	Telering switch.....	3Z9858-19.1
EMGR-TELRG.....	SWITCH, toggle.....	Permits change-over to emergency ringer.....	3Z9882-1
	TERMINAL, lug: ring type.....		3Z12050-5.3
	TERMINAL, lug: ring type.....		3Z12046

APPENDIX IV

DEMOLITION TO PREVENT ENEMY USE

WHY —To prevent the enemy from using or salvaging this equipment.

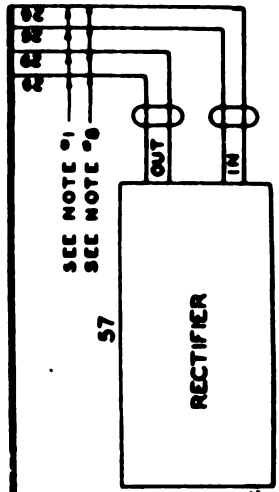
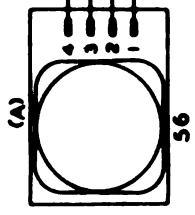
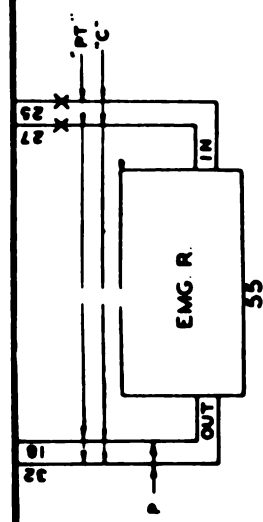
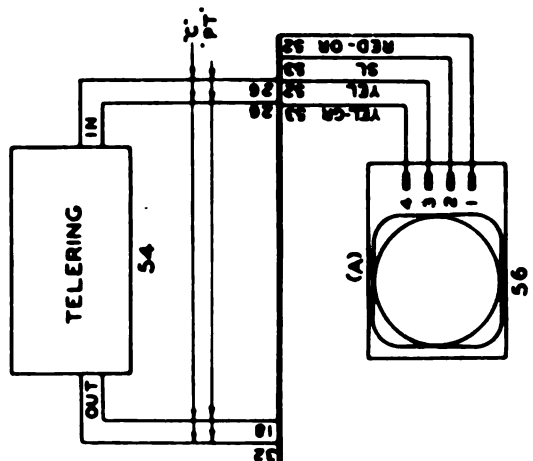
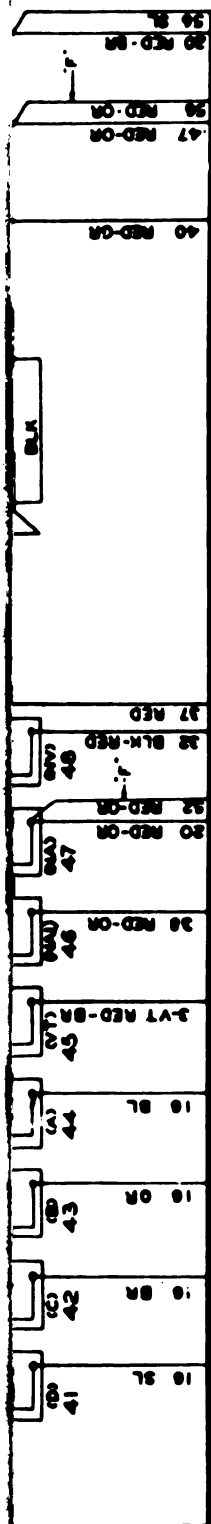
WHEN—When ordered by your commander.

- HOW** —1. **Smash**—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. **Cut**—Use axes, handaxes, machetes.
 3. **Burn**—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
 4. **Explosives**—Use firearms, grenades, TNT.
 5. **Disposal**—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

- WHAT**—1. **Smash**—Meters, the rectifier, switches, etc.
2. **Cut**—All power and signal cords and wiring.
 3. **Burn**—This technical manual, all records, etc.
 4. **Bend**—Framework, terminal board, etc.
 5. **Bury or scatter**—All debris, and all above pieces after smashing, cutting, burning, breaking.

DESTROY EVERYTHING



NOTES

- 1- P.T. DENOTES LEADS FURNISHED AS PART OF APPARATUS.
- 2- USE WHITE WIRES FOR ALL GROUND AND + LEADS AND BLACK WIRES FOR ALL BATTERY AND - LEADS
- 3- WIRES NOT OTHERWISE SPECIFIED TO BE 20 A W/G
- 4- #14, #16, #20 WIRE SHALL BE TYPE 60.
- 5- #12 WIRE SHALL BE TYPE 60.
- 6- BLAND #18 WIRE SHALL BE AS MADE BY WESTERN ELECTRIC CO., CHICAGO, ILL. OR EQUAL MODIFIED PER SPEC. 7-1016.

3-P' DENOTES PAIR.
 6-7' WIRING TO BE BROUGHT FROM CABLE FORM AT SUBMUNE SWITCH.
 7-C' WIRING TO BE SEPARATE WIRE SEWED TO OUTSIDE OF REGULAR FORM
 8- CABLES SHOULD BE LEFT 8 FT LONG TO PERMIT REMOVAL OF RECTIFIER. BLACK SHOULD BE SEWED.
 9-X' INDICATES SPLICE.

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