TM 11-5805-247-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DS, GS, AND DEPOT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS

CONVERTER, TELEGRAPH-TELEPHONE SIGNAL TA-182/U

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY
NOVEMBER 1965

WARNING

HIGH VOLTAGE

is used in this equipment.

DEATH ON CONTACT

may result if safety precautions are not observed.

Do not touch the LOOP binding posts on the front panel while the TA-182/ U is installed in an operating system or is in operation; 90-volt ringing signals may be present. Do not touch internal wiring or parts when the TA-182/U is removed from its case for tests or repairs; voltages as high as *355 volts ac* are present on some internal wiring and components. Turn off the power and discharge all high-voltage capacitors before making any repairs.

DON'T TAKE CHANCES!

CHANGE

NO.1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 24 *August* 1976

Direct Support, General Support, and Depot Maintenance Manual Including Repair Parts and Special Tools Lists CONVERTER, TELEGRAPH TELEPHONE SIGNAL TA 182/U

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27(blank) 28 through 30.	27 through 30
33 and 34	33 and 34
39	39/(40 blank)
Figure 1	Figure 1(fold-out)

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CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
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DIRECT SUPPORT, GENERAL SUPPORT. AND DEPOT MAINTENANCE MANUAL
CONVERTER, TELEGRAPH-TELEPHONE SIGNAL TA-182/U
(NSN 5805-00-263-3326)

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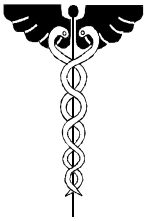

SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A WOODEN POLE OR A ROPE OR SOME OTHER INSULATING MATERIAL

SEND FOR HELP AS SOON AS POSSIBLE

AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNING

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TECHNICAL MANUAL
No. 11-5805-247-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON DC, *9 November 1965*

Direct Support, General Support, and Depot Maintenance Manual
CONVERTER, TELEGRAPH-TELEPHONE SIGNAL TA-182/U
(NSN 5805-00-263-3326)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5007.

In either case a reply will be furnished to you.

*** This manual supersedes TM 11 5805-247 35, 10 November 1960, including C 1, 14 December 1961; and TM 11-58O5-247- 35P, 25 January 1965. Portions pertaining to Repair Parts and Special Tools are superseded by TM 11 - 5805-247-35P, 31 October 1973.**

CHAPTER 1
INTRODUCTION

1. Scope

a. This manual covers direct and general support and support maintenance for Converter, Telegraph-Telephone Signal TA-182/U. It includes instructions appropriate to direct and general support for troubleshooting, testing, aligning, and repairing the equipment It also lists tools, materials, and test equipment required. Applicable references are provided in the appendix.

b. The complete technical manual for this equipment includes TM 11-5805-247-12.

NOTE

For applicable forms and records, refer to TM l 1 -5805-247- 12 .

1.1. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1.2. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 Report of Discrepancy (ROD) as prescribed in AR 735-112/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

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 4610.33C/AFR 75-18/ MCO P4610.19D/DLAR 4500.15.

1.2.1. Reporting Equipment improvement Recommendations (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We'll send you a reply.

1.3. Administrative Storage

For procedures, forms and records, and inspections required during administrative storage of this equipment, refer to TM 740-90- l .

1.4. Destruction of Army Materiel

Demolition and destruction of electronic equipment will be under the direction of the commander and in accordance with TM 750-244-2.

2. Internal Differences

a. Resistor R42 is not provided in equipment bearing the following identification:

(1) Order No. 19650-Phila-50, Serial No. 1 through 8,236.

(2) Order No. 6506-Phila-51, Serial No. 1 through 3,913.

b. Resistor R43 is not provided in equipment bearing the identification indicated in the following chart:

Order No.	Serial No.		
	All	Below	Above
19650-Phila-50.....	X	.....	.....
3289-Phila-51.....	.....	701	900
6438-Phila-51.....	...	10,027	10,882
6506-Phila-51.....	X	.....	.....
30005-Phila-51.....	.....	.....	1,100
3291-Phila-52.....	.....	911	1,153
3366-Phila-52.....	.....	2,000	11,539
4697-Phila-52.....	.....	2,901	11,539

c. Capacitor C15 is either 3,600 micromicrofarads (µµf) or 5,600 µµf in equipment bearing Order No. 3366-Phila-52; in all other equipment, Cl5 is either l,300 µf or 2,700 µf.

d. Capacitor C6 consists of three sections. In equipment bearing order numbers listed in b above, the value of each section is 12 microfarads (µf); in all other equipment, the value of each section is 9 µf.

CHAPTER 2
THEORY

NOTE

The circuits of the TA-182/U are divided into four parts to simplify analysis; input-output circuit, receiving circuit, sending circuit, and power supply circuit.

Section I. INPUT-OUTPUT CIRCUIT, SCHEMATIC DIAGRAM ANALYSIS

3. General

(fig. 1)

The input-output circuit of the TA-182/U can be arranged for either 2-wire or 4-wire operation.

Figure 1. Converter, Telegraph-Telephone Signal TA-182/U,.schematic diagram. (Located in back of manual.)

a. Two-wire Operation. When 2W-4W switch S1 is operated to 2W, the TA-182/U is arranged for two-wire operation. The loop circuit is connected to the LOOP 2W-4W-R binding posts, and the line circuit is connected to the LINE 2W-4W-S binding posts.

b. Four-wire Operation When the 2W-4W switch S1 is operated to 4W, the TA-182/U is arranged for four-wire operation. The loop transmitting circuit is connected to the LOOP 4W-S binding posts and the loop receiving circuit is connected to the LOOP 2W-4W binding posts; the line transmitting circuit is connected to the LINE 2W-4W-S binding post, and the line receiving circuit is connected to the LINE 4W-R binding posts.

4. Voice-Frequency Circuit

(fig. 1)

a. Two-wire Operation. Voice-frequency (vf) signals that are applied to the LOOP 2W-4W-R binding posts (para 3a) are routed to the LINE 2W-4W-S binding posts through contacts of relay K3, the rear section of switch S 1, and contacts of relay K2. Voice-frequency signals that are applied to the LINE 2W-4W-S binding posts are routed to the LOOP 2W- binding posts in the same manner.

b. Four-wire Operation. Voice-frequency signals that are applied to the LOOP 4W-S binding posts (para 3b) are routed to the LINE 2W-4W-S binding posts through contacts of switch S1 and relay K2. Voice-frequency signals that are applied to the LINE 4W-R binding posts are routed to the LOOP 2W-4W-R binding posts through contacts of switch S1 and relay K3.

5. Twenty-Cps Ringing Circuit

(fig. 1)

a. 2-wire Operation. Twenty cycle-per-second (cps) ringing signals that are applied to the LOOP 2W-4W-R binding posts (para 3*a*) are routed to terminals 1 and 5 of relay K 1, through contacts of relay K3 and the contacts of the rear section of switch S1. Contacts 3 and 4 of relay K 1 close to supply direct- (dc) operating voltage from rectifier V7 to terminals 1-10 or relay K2; closed contacts of relay K2 apply the vf ringing signal output from the sending circuit (para 16) to the LINE 2W-4W-S binding posts.

b. 4-wire Operation. Twenty-cps ringing signals that are applied to the LOOP 4W-S binding posts (para 3*b*) are routed to terminals 1 and 5 of relay K1, through the contacts of the rear section of switch S 1. The actions of relay K 1, K2, and the sending circuit are the same as in *a* above.

6. Vf Ringing Circuit

(fig. 1)

a. Two-wire Operation. Vf ringing signals that are applied to the LINE 2W-4W-S binding posts (para 3*a*) are routed to the input of the receiving circuit through the contacts of the rear section of switch S1. The receiving circuit responds to the vf ringing signal input by supplying a dc voltage which operates relay K3 (para 11a). Closed contacts 7 and 8 of operated relay K3 apply dc operating voltage from rectifier V8 to terminals 1 and 2 of the static ringing generator. A 20-cps ringing signal is thus supplied from the actuated static ringing generator to the LOOP 2W-4W-R binding posts through incandescent (ballast) lamp E9 and contacts of operated relay K3.

b. Four-wire Operation. Vf ringing signals that

are applied to the LINE 4W-R binding posts (para 3 *b*) are routed to the input of the receiving circuit through the front and rear sections of switch S1. The receiving circuit responds to the vf ringing signal, and the static ringing generator is actuated in the same manner as in *a* above.

Section II. RECEIVING CIRCUIT, SCHEMATIC DIAGRAM ANALYSIS

7. General

(fig. 1)

The TA-182/U receiving circuit receives vf ringing signals from the line circuit, and responds by causing the static ringing generator to function (para 6). Thus, when it receives a vf ringing signal, the TA- provides a 20-cps output ringing signal (conversion). Adjustment for sensitivity (para 8 *b*) and protection against false operation (para 12) are also provided by the receiving circuit. The receiving circuit consists of electron tube circuits V 1 through V5.

8. Limiter-Amplifier V1A and V1B

(fig. 1)

a. Limiter-Amplifier V1A. The vf ringing signal input to the receiving circuit (para 6) is applied through blocking capacitors C1 and C2, isolating resistors R1 and R2, to primary winding 1-2 of audio transformer T 1. The secondary winding 3-4 of transformer T1 is tuned to 1,600 cps by capacitor C4 for telephone operation (TP-TG switch S2 on TP). When the TP-TG switch S2 is operated to the TG position, capacitor C3 is added in parallel with C4 and lowers the tuned circuit frequency to 1,225 cps for telegraph operation. The input signal is developed across grid resistor amplifier VIA through grid limiting resistor R3. Unbypassed cathode resistor R5 provides cathode bias and also degeneration for amplifier stability. Resistor R6 is the plate load; resistor R7 and capacitor C5A provide plate decoupling. Blocking capacitor C6 couples the signal from limiter- V1A to the grid of limiter-amplifier V1B.

b. Limiter-Amplifier V1B. The input signal to limiter-amplifier VIB is developed across grid resistor R9 and applied to the grid through grid limiting resistor R8 (SENSITIVITY switch S3 on HI). When series resistors R8 and R24 are connected in parallel with resistor R9 by SENSITIVITY switch S3 (LO position), the input signal amplitude (sensitivity) to the stage is reduced. Cathode resistor R10, bypassed by capacitor C7, provides cathode bias for the stage. Resistor R11 is the plate load; resistor R12 and capacitor C5B provide plate decoupling. Blocking capacitor C8 couples the signal output from limiter- V1B to the grid of limiter V2.

NOTE

The HI position of SENSITIVITY switch is used when the TA-182/U is connected to a line circuit in which the line loss is between 25 and 45 decibels (db). When the line loss does not exceed 25 db, the LO position of the switch is used (TM 11-5805-247- 12).

9. Limiter V2

(fig. 1)

Limiter V2 is a standard saturation cutoff limiter. Only one section of the dual triode tube is used; the elements of the unused section are grounded. The input signal from limiter-amplifier V1B to limiter V2 is developed across grid resistor R14 and applied to the grid through grid-limiting resistor R13. Cathode resistor R15, bypassed by capacitor C9, develops cathode bias. Tuned primary windings 1-2 of discriminator transformers T2 and T3 are the plate loads (para 10).

10. Discriminator

(fig. 1)

a. General. The discriminator consists of detector-doubler circuits V3 and V4. Since the functions of V3 and V4 are similar, only the circuit function of V3 is covered in detail. When items in the circuit of V4 are noted parenthetically, it indicates that the item has a similar function in V4.

b. Transformer T2 (T3). The input to detector-doubler V3 (V4) from limiter V2 (para 9) is applied through transformer T2

F3). Primary winding 1-2 of transformer T2 (T3) is tuned to 1,600 cps (1,885 cps) by capacitors C10 and C11 (C14 and C15) (TPswitch S2 on TP position). When TP-TG switch S2 is operated to TG, it connects capacitors C12 and C13 (C16 and C17) in parallel with capacitors C10 and C11 (C14 and C15) to lower the tuned circuit frequency of transformer T2 (T3) primary to 1,225 cps (1,415 cps). Secondary winding 3-4 of transformer T2 (T3) couples the input signal to detector doubler V3 (V4).

c. Detector-Doubler V3 (V4).

(1) During the positive half of an input cycle, terminal 3 of transformer T2 (T3) is positive with respect to terminal 4. Diode V3A (V4A) conducts and charges capacitor C21 (C18). During the negative half of the input cycle, terminal 4 of transformer T2 (T3) becomes positive with respect to terminal 3. Diode V3A (V4A) cuts off and capacitor C21 (C18) begins to discharge through diode V3B (V4B) and resistor R17 (R16). Thus, the capacitor charge time is short and its discharge time is long (para 12*b*).

(2) During the negative half of the input cycle ((1) above), capacitor C22 (C19) charges in a similar manner through diode V3B (V4B), and then begins to discharge through diode V3A (V4A) and resistor R17 (R16) during the positive half of the input cycle.

(3) The voltages developed across capacitors C21 and C22 (C18 and C19) are in series aiding, and the effect of twice the amplitude of the input voltage appears as the rectified output across resistor R17 (R16).Capacitors C20 and C23 filter the rectified outputs across resistors R16 and R17, respectively.

(4) The voltages developed across resistors R16 and R17, which are in series opposition, determine the discriminator output voltage (*d* below).

d. Discriminator Output.

(1) When the vf ringing signal input to the TA-182/U is between 1,300 cps and 1,725 cps (approximately) (TP- switch S2 on TP), or between 1,000 cps and 1,305 cps (approximately) (TP-TG switch S2 on TG), the resonant characteristics of tuned transformers T2 and T3 cause the voltage developed across T2 to be greater than the voltage developed across T3. Thus, the voltage developed across resistor R17 will be greater than the voltage developed across resistor R16, (*c* above), and the algebraic sum (resultant) of these voltages, which appears across resistor R18 as the discriminator output, will be positive with respect to ground.

(2) When the vf ringing signal input is above 1,725 cps (TP-TG switch S2 on TP) and above 1,305 cps (TP-TG switch S2 on TG) ((1) above), the voltage developed across transformer T3 will be greater than the voltage developed across transformer T2. Thus, the voltage developed across resistor R16 will be greater than the voltage developed across resistor R17 (*c* above), and the discriminator output voltage will be negative.

(3) The ranges of vf ringing signal input frequencies which will operate the TA-182/U (produce a positive discriminator output voltage that causes dc amplifier V5B to function (para 11) are shown in figure 2.

11. Restorer-Dc Amplifier V5

(fig. 1)

When the positive output voltage from the discriminator, which results from the detection of ringing signals (para 10*d*), is applied to the series combination of resistor R19 and capacitor C24, the circuit of tube V5 functions as follows:

a. *Vf Ringing Signal Applied to TA-182/U.*

(1) Capacitor C24 charges and applies a positive voltage, through series grid resistor R20, to the grid of dc amplifier V5B.

(2) The positive voltage provided by capacitor C24 overcomes the fixed bias voltage on dc V5B provided by rectifier V7. The fixed bias voltage is produced across the voltage divider network of parallel resistors R21 and R22 in series with cathode resistor R23.

(3) Dc amplifier V5B conducts; its plate current, through relay K3 winding 10-1, operates the relay and allows the static ringing generator to operate (para 13).

b. Vf Ringing Signal to TA-182/U Stops.

(1) The discriminator output stops.

(2) Capacitor C24 discharges rapidly through resistor R18 and restorer V5A.

(3) Fixed cathode bias (*a*(2) above) cuts off dc amplifier V5B, and its plate current stops.

(4) Relay K3 deenergizes; its contacts 7-8 open and remove operating voltage from the static ringing generator.

12. Protection Against False Operation

The TA-182/U responds only to vf ringing signals. Protection against false operation of the TA-182/U is provided in the receiving circuit by the discriminator and by the long time constant of the resistance-capacitance (rc) input circuit of dc amplifier V5B.

a. Protection by Discrimination. Only vf ringing signals within the frequency ranges shown in A and B, figure 2, will produce a positive output from the discriminator of sufficient amplitude to overcome the fixed bias on dc amplifier V5B (para 11). Frequencies other than those indicated produce a discriminator output that is either too low in amplitude (although positive) or of incorrect polarity (negative) to overcome the fixed bias on V5B.

b. Protection by Long Time Constant. The time constant of the rc input circuit of dc amplifier V5B (resistor R19 and capacitor C24) is approximately 0.55 second. The positive discriminator output voltage (fig. 2) applied to V5B must be of sufficient amplitude (*b* above) , and must also be applied long enough to charge capacitor C24 (para 11). Random vf components of intelligence signals, although detected by the discriminator (within the vf ringing signal frequency range) , are not applied long enough to charge capacitor C24.

13.Static Ringing Generator E10

(fig. 1)

The function of the static ringing generator is to supply a 20-cps telephone ringing signal in telephone applications, or a 20-cps break signal to activate the buzzer at a teletypewriter station. This is done with a vibrator, a mechanically resonant electrical device used to change direct current into pulsating dc. A suppression filter (not shown), included in the static ringing generator circuit, eliminates radio frequencies that would cause interference in the TA-182/U and associated equipment. The theory of operation for the static ringing generator is not covered because it is not a repairable item.

Section III. SENDING CIRCUIT, SCHEMATIC DIAGRAM ANALYSIS

14.General

(fig. 1)

The output of the TA-182/U sending circuit is applied to the line circuit when a 20-cps ringing signal is received from the loop circuit (para 5). The sending circuit supplies either a 1,600-cps (telephone) or a 1,225-cps (telegraph) ringing signal, depending on the set tiny of TP-TG switch S2 (TM 11-5805-24712). The sending circuit consists of an oscillator (para 15) and an output amplifier (para 16).

15. Oscillator V6A

(fig. 1)

Electron tube circuit V6A comprises a re- shunt-fed Hartley-oscillator. Unbypassed cathode resistor R30 provides cathode bias and also degeneration for stability of the class A oscillator. Regenerative

coupling from the plate circuit to the grid is provided through blocking capacitor C28, and through winding 3-4 to winding 1-2 of audio transformer T5. Stabilizing resistor R31 limits the amount of regenerative feedback. Capacitors C31 and C32 provide coarse grid circuit tuning to 1,600 cps (TP-TG switch S2 on TP); when the TP-TG switch S2 is operated to TG, it connects capacitors C29 and C30 in parallel with C31 and C32 to lower the oscillator frequency to 1,225 cps. Variable capacitor C27 provides fine grid circuit tuning at both 1,600 cps and 1,226 cps (para 28). Resistor R28 is the oscillator plate load; resistor R29 and capacitor C26A provide plate decoupling. Blocking capacitor C25 couples the oscillator signal to output amplifier V6B.

16. Output Amplifier V6B

(fig. 1)

Output amplifier V6B receives its input from the oscillator (para 15) through grid resistors R26 and R27; R27 also provides grid limiting. Resistor R43 and its associated straps allow the sending circuit output spinal strength to be adjusted (para 29). Unbypassed cathode resistor R25 provides cathode bias and degeneration for amplifier stability. The amplifier output is developed across winding 3-4 and coupled through winding 1-2 of transformer T4 to LINE 2W 4W-S binding posts E1 and E2. Resistor R42 matches the impedance of transformer T4 to the 600-ohm impedance of the line. Resistor R41 provides a load for the sending circuit when relay K2 is not energized (no 20-cps ringing signal being received).

Note. Resistor R42 and resistor R48, with associ-ated straps are not included in every TA-182/U (para 2).

Section IV. POWER SUPPLY CIRCUIT, SCHEMATIC DIAGRAM ANALYSIS

17. General

(fig. 1)

a. The TA-182/U power supply contains two rectifier circuits. Rectifier V7 provides operating voltage for relay K2 and the electron tubes as required. Rectifier V8 provides operating voltage for the static ringing generator (para 13).

b. Transformer T6 is used to supply alternating-current (ac) voltages for rectification to rectifiers V7 and V8, and filament voltages for the electron tubes.

(1) Primary winding 1-2 of transformer T6 is supplied with 115 volts, 50 to 60 cycles per second from the power source through connector plug PI and fuse F1.

(2) Center-tapped secondary winding 8-9 of transformer T6 supplies 6.3 volts ac filament voltages. All 12-volt fila-ments are supplied with 6.3 volts at their-center tape.

18.Rectifiers V7 and V8

(fig. 1)

a. Full-wave rectifier V7 is supplied with ac voltage by secondary winding 3-4 of transformer T6. Load resistors R32 through R36 and capacitor C26B form the filtering network for the dc output. Resistors R37 and R38 form a voltage divider network to provide proper operating voltage for tube V6; capacity C26C and C5C provide additional dc filtering for oscillator stability. Resistors R39 ant R40 limit the current drawn by relay K1.

b. Full-wave rectifier V8 is supplied with ac voltage by secondary winding 5-7 of trans-former T6. Capacitor C33 is used to filter the dc output.

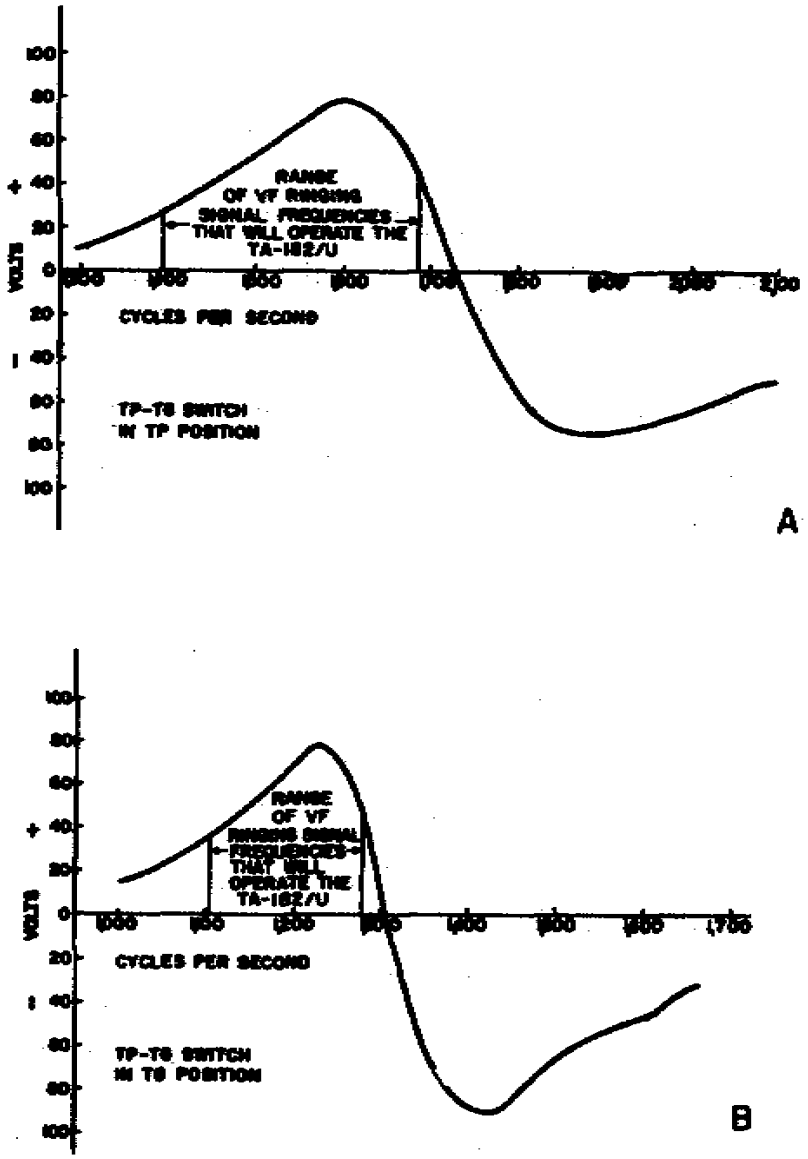


Figure 2. Discriminator output characteristic curves.

CHAPTER 3
DIRECT SUPPORT MAINTENANCE

Section I. GENERAL TROUBLESHOOTING INFORMATION

WARNING

When troubleshooting or making repairs in the TA-182/U. be extremely careful. Voltages as high as 355 volts ac are present internally.

19. General Instructions

a. Troubleshooting the TA- 182/U at the direct support maintenance level includes all the techniques outlined for organizational maintenance and any special techniques required to isolate a defective part. Direct support maintenance procedures are not complete in themselves but supplement the organizational maintenance procedures. The systematic troubleshooting procedure which begins at the organizational level must be completed by means of further localizing and isolating techniques.

b. Troubleshooting may be performed while the TA-182/U is operating as part of a system or, if necessary, after the TA-182/U has been removed from service. Usually, when troubleshooting is performed while the TA- 182/U is operating as part of a system, it is done at the organizational level (TM-5805-247-12). When trouble occurs, certain observations and measurements can be made which will help in determining whether the local TA-182/U is at fault or whether the trouble exists elsewhere in the system. Troubleshooting at the direct support level is usually performed with the TA-182/U removed from the equipment with which it is normally associated. Paragraphs 20 through 25 describe the steps to be followed in a systematic procedure which will enable the direct support repairman to locate the cause of the trouble and correct the fault.

20. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective TA-182/U is to sectionalize the fault. Sectionalization means tracing the fault to either the input/output, sending, or receiving circuit, or to the power supply. Sectionalization is normally accomplished as a result of troubleshooting at the organizational level (TM 11-5805-247-12). The second step is to localize the fault. Localization means tracing the fault to a defective stage. The third step, isolation, is to trace the fault to the defective part. Some faults such as burned-out lamps, fuses, resistors, etc., often may be located by inspection; the majority of faults, however, must be isolated by making voltage and resistance checks at the individual parts.

b. Sectionalization. After the trouble has been sectionalized, remove the defective TA-182/U from the system and perform a bench test (para 22). The bench test serves as a check on the sectionalization test. It indicates definitely whether or not the TA-182/U is functioning properly. When the bench test indicates a particular trouble, a check of all pluck-out parts and a visual inspection (TM 11-5805-247-12) will often lead the repairman directly to the source of trouble; if not, localization and isolation procedures (*c* and *d* below) will aid in locating the defective part of the circuit.

c. Localization. Use the troubleshooting charts (para 23) to aid in localizing the trouble to a circuit or stage.

d. Isolation. After localization, use voltage, resistance, and continuity measurements to isolate the trouble to the defective part. In all tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble may often be made to appear by tapping or jarring the unit.

21. Tools and Test Equipment Required.

Tool or test equipment	Equipment Manual
Tool Kit, Telephone Terminal TE-123	SC 5180-90-CL-N49
Frequency Meter AN/TSM-16	TM 11-6625-218-2
Test Set TS-19OA/U	TM 11-6625-302-15
Multimeter TS-352B/U	TM 11 -6625-366-15
Test Set TS-140/PCM	TM 11-6625-251- 15
Telephone Set TA-312/PT	TM 11-5805-201-12
Test Set, Electronic TV-7&u	TM 11 -6625-274- 12
Load Test Fixture*	

*Load having an impedance of 1500-j1500 ohms at 20 Hz. made from 1500 ohm 10 W, carbon resistor in series with a 5 µf capacitor. (Series/parallel resistors in a squirrel cage layout to obtain required wattage)

SECTION II. TROUBLESHOOTING CONVERTER, TELEGRAPH TELEPHONE SIGNA TA 182/U

22. Branch Test of TA 1 82/U

a. General. Remove the TA-182/u from its case and perform a visual inspection (TM 11-5805-247-12). Make sure that the electron tubes, fuse, and incandescent lamp are properly installed. Replace the TA-182/U in its case after completing *b* through *d* below as required.

b. Power Supply Test.

(1) Start the TA—182/U (TM 1 1-5805-247- 12).

(2) Use the TS-352/U to measure the dc voltage output from rectifiers V7 and V8, and check the dc operating voltage applied to the plates of V1, V2, V5B, and V6. Dc voltages are listed in TM 11-5805-247-12. If abnormal voltage readings are noted, perform the troubleshooting procedures outlined in paragraph 23*b*.

(3) Disconnect the TA-182/U from the ac power source.

c 20-cps Ringing Signal Output Test (Receiving Circuit).

(1) Connect the TA-312/PT to the 2W-4W-R binding posts 5 and 6, and the SG-15/PCM to the 2W-4W-S binding posts 1 and 2 of the TA- 182/U.

(2) Operate the TA-182/U TP-TG switch to TG, the 2W-.4W switch to 2W, and the SENSITIVITY switch to HI.

(3) Start the SG- 15/PCM (TM 11 -2096) and the TA-182/u (TM 11-5805-247-12); wait the specified warm-up time for the SG15/PCM.

(4) Adjust the output level of the SG-15/PCM for 0 db and the output frequency for 1,600 cps.

(5) Operate the TP-TG switch on the TA-182/U to TP; listen for relay K3 and the static ringing generator to operate approximately 0.5 second after operating the TP-TG switch.

(6) The TA-312/PT should ring and the incandescent (ballast) lamp in the TA-182/U should glow; if they do not, perform the troubleshooting procedures outlined in paragraph 23*c*.

(7) Adjust the output of the SG- 1 5/PCM for 1,225 cps at 0 db.

(8) Operate the TP-TG switch to TG; listen for relay K3 and the static ringing generator to operate approximately 0.5 second after operating the TP-TG switch.

(9) Repeat the procedure given in (6) above.

(10) Deleted.

(11) Disconnect the SG-15/PCM from the 2W-4W-S binding posts 1 and 2 and connect it to the 4W-R binding posts 3 and 4.

(12) Operate the TP-TG switch to TG and the 2W-4W switch to 4W.

(13) Repeat the procedures (4) through (9) above.

(14) Disconnect the equipment.

d. Vf Ringing Signal Output Test (Sending Circuit).

(1) Connect the TA-312 1 2/PT to the 2W-4W-R binding posts 5 and 6 on the TA- 1 82/U.

(2) Operate the TP-TG switch to TG; the 2W-4W switch to 2W.

NOTE

The position of the SENSITIVITY switch does not affect this test.

(3) Connect the AN/TSM- 16 to the 2W-4W-S binding posts 1 and 2 on the TA-182/U. Refer to TM 11-6625-218-12 for control settings and connections to the AN/TSM- 16.

(4) Start the AN/TSM-16 and the TA-182/U (TM 1 1-5805-247-12); wait the specified warm-up time for the AN/TSM- 16.

(5) Operate the hand generator on the TA-312/PT; the frequency measured on the AN/TSM-16 should be 1,225 cps $\pm$ 6.

(6) Operate the TP-TG switch to TP.
(7) Operate the hand generator on the TA-312/PT; the frequency measured on the AN/TSM-16 should be 1,600 cps ±6.
(8) If no output is obtained in (3) and (5) above, perform the troubleshooting procedures outlined in paragraph 23d. If the output frequency is not within the specified tolerance, perform the oscillator adjustment procedure outlined in paragraph 28.
(9) Disconnect the equipment.

23. Troubleshooting Checklist

a. General. The troubleshooting checklist outlined in *b* through *d* below is furnished as a guide in localizing and isolating trouble in the T4-182jU. Use Test Set TS-19OA/U to monitor the ringing signals at the test points indicated. When the trouble is localized, visually inspect the wiring, connections, and parts of the stage involved (TM 11-5805-247-12). Use the TV-7/U to test electron tubes (TM 11-5805-247-12). Use the TS-352/U for voltage, continuity, and resistance measurements, and the TS - 460/U for capacitance measurements, when isolating a defective part. Disconnect, check, and , if necessary, replace part. After replacing a defective part, perform a bench test of the TA-182/U (para 22) before placing it back in service. Refer to TM 11-5805-247-12 for tube socket voltage and resistance measurements, and to figure 3 for terminal board voltage and resistance measurements. Refer to figures 4, 5, and 6 for location of parts and test points.

Note. The troubleshooting checklist items in *b* through *d* below cover two-wire operation. If the TA-182/U functions properly for two-wire operation and trouble occurs only during four-wire operation, make a continuity check in the 4W position of 2W-4W switch S1 and the four-wire binding post circuits.

Warning: **Do not replace other than pluck-out circuit parts while the TA-182/U is connected to the ac power source.**

b. Faulty Power Supply. Start the TA182/U (TM 11-5805-247-12) and check the power supply circuit for the trouble symptoms outlined below. If a trouble symptom is present in the circuit, check the possible causes and take the indicated remedial action.

(1) No dc output voltage from rectifier V7 and V8, and no filament supply voltage when measured at tube sockets.

Probable cause	What to check	Remedy
Defective power cord or fuse F1	Check power cord and fuse (TM 11-5805-247-12).	Replace defective part.
Defective primary winding 1-2 of transformer T6.	Check dc resistance of transformer T6 (para 25).	Replace if defective.

(2) No dc output voltage from either rectifier V7 or V8, or no filament supply voltage when measured at tube sockets (TM 11-5805-247-12)

Probable cause	What to check	Remedy
Defective diode V7 or V8.....	Check diode V7 or V8 as appropriate (TM 11-5805-247-12)	Replace defective diode.
Defective part, wiring, or connection in circuit of diode V7 or V8, or of filament supply circuit.	Troubleshoot circuit of V7 or V8, or of filament supply as appropriate; check dc resistance of the appropriate secondary windingoftransformerT6 (para 25).	Repair wiring or connection or replace defective part as required

c. Faulty Receiving Circuit.
(1) *General procedure.*
(a) Perform the procedures outlined in paragraph 22*c*(1) through (6).
(b) Check the receiving circuit for
(c) trouble symptoms in the sequence indicated in (2) below. If a trouble symptom is present in the circuit, check the possible causes and take the indicated remedial action
(2) *Troubleshooting procedures.*
(a) No signal winding 1-2 of transformer T1

Possible cause	What to check	Remedy
Defective binding post, wiring, or connection.	Line 2W-4W-S binding post E1 and E2, and their wiring and connect-ions through to transformer T1.	Replace defective part or resolder connections as required.
Defective 2W-4W switch S1	Check for dirty or defective 2W-4W switch S1.	Clean contacts if dirty; repair or replace switch if defective.
Defective relay K2	Check for continuity between contacts 11 and 2, and between contacts 12 and 4 of relay K2.	Replace relay K2.
Defective capacitor C1 or C2, defective resistor R1 or R2	Check C1, C2, R1, and R2 individually.	Replace defective part.

(b) No signal from terminal A5 of terminal board AB to ground.

Possible cause	What to check	Remedy
Defective limiter-amplifier V1.....	Check limiter-amplifier V1 (TM 11-5805-247-12).	Replace if defective.
Defective transformer T1.....	Check dc resistance of transformer T1 (para 25).	Replace if defective
Defective limiter-amplifier V1 circuit part.	Make tube socket (TM-11-5805-247-12) and terminal board voltage and resistance measurement.	Isolate and replace defective part.

(c) No signal across winding 3-4 of transformer T2 and T3.

Possible cause	What to check	Remedy
Defective limiter V2.....	Check limiter-amplifier V1 (TM 11-5805-247-12).	Replace if defective.
Defective limiter V2 circuit part.....	Make tube socket and terminal board voltage and resistance measurement.	Isolate and replce if defective.
Defective limiter-amplifier V1 circuit part.	Check the dc resistance of transformer T2 and T3 (para 25)	Replace defective transformer.

(d) Signal is heard across terminals B17 and A18 of terminal board AB but relay K3 and static ringing generator do not operate

Possible cause	What to check	Remedy
Defective restorer-dc amplifier V5.....	Check restorer-dc amplifier V5 (TM 11-5805-247-12).	Replace if defective.
Bias voltage on restorer-dc amplifier V5 too high.	Make tube socket and terminal board voltage and resistance measurements to isolate defective component in tube V5 or tube V7 circuit.	Replace defective component.
Relay K3 defective.....	Check dc resistance of relay K3 (para 25) and continuity of associated wiring.	Replace relay K8 or repair wiring if defective.
Discriminator requires alignment	Perform discriminator test (para 24).	Refer TA-182/U to higher echelon for discriminator alignment.

(e) Relay K3 operates but static ringing generator E10 does not.

Possible cause	What to check	Remedy
Defective rectifier V8	Check rectifier V8 (TM 11-5805-24712).	Replace if defective.
Faulty relay K3 contacts 7-8	Measure dc voltage at contact 8 of operated relay K3; it should be the same as measured at pin 7 of rectified Pr V8.	Replace relay K3.
Defective transformer T6 secondary winding 5-6-7.	Check dc resistance ,of secondary winding 5-6-7 (para 25).	Replace transformer T6 if winding is defective.
Defective capacitor C33	Check capacitor C33	Replace if defective
Defective static ringing generator E10	Check by substitution	Replace if defective.

(f) Static ringing generator E10 operates but there is no 20-cps output at LOOP 2W-4W-R binding posts

Possible cause	What to check	Remedy
Defective incandescent lamp E9	Place a temporary jumper between LOOP 2W-4W-R binding posts while static ringing generator is operating; lamp E9 should light.	Replace incandescent lamp E9.
Defective relay K3 contacts 5-12 or 3-11	Monitor 20-cps ringing signal across contacts 5 and 3 and then across 11 and 12 of relay K3; it should be heard at both Places.	Replace relay K3.
Defective binding post, wiring, or connection.	Make continuity check and check for shorts to ground from E5 and E6 to relay K3 contacts 12 and 11 re-spectively.	Replace defective part as required.

d. Faulty Sending Circuit.

(1) General procedure.

(a) Disconnect the TA-182/U from the ac power source and place a temporary jumper between contacts 3 and 4 of relay K1.

(b) Start the TA-182/U (TM 11-5805-247-12).

(c) Check the sending circuit for trouble symptoms in the sequence indicated in (2) below. If a trouble symptom is present in the circuit, check the possible causes and take the indicated remedial action.

(2) *Troubleshooting procedure.*

(a) No signal across resistor R30 (monitor across terminals Y8 and Z8 of terminal board YZ)

Possible cause	What to check	Remedy
Defective oscillator V6A	Cheek tube V6 (TM 11-5806-247-12).	Replace if defective.
Faulty dc plan supply circuit (receiving circuit operates normally).	Troubleshoot dc supply circuit from rectifier V7 to tube V6.	Isolate and replace defective component.
Defective oscillator V6A circuit part, wiring, or connection.	Make tube socket and terminal board voltage and resistance measurements of oscillator V6A circuit check dc resistance of transformer T5 (para 25); check suspected circuit parts individually.	Replace defective circuit part and check oscillator frequency (para 22*d*),

(b) Oscillator does not change frequency when TP-TG switch is operated

(monitor across terminals Y8 and Z8 of terminal board YZ)

Possible cause	What to check	Remedy
Defective TP-TG switch S2, wiring, or connection	Inspect switch S2 and check its action: measure continuity through switching circuit	Clean switch S2 contacts if dirty; replace switch or repair wiring if defective

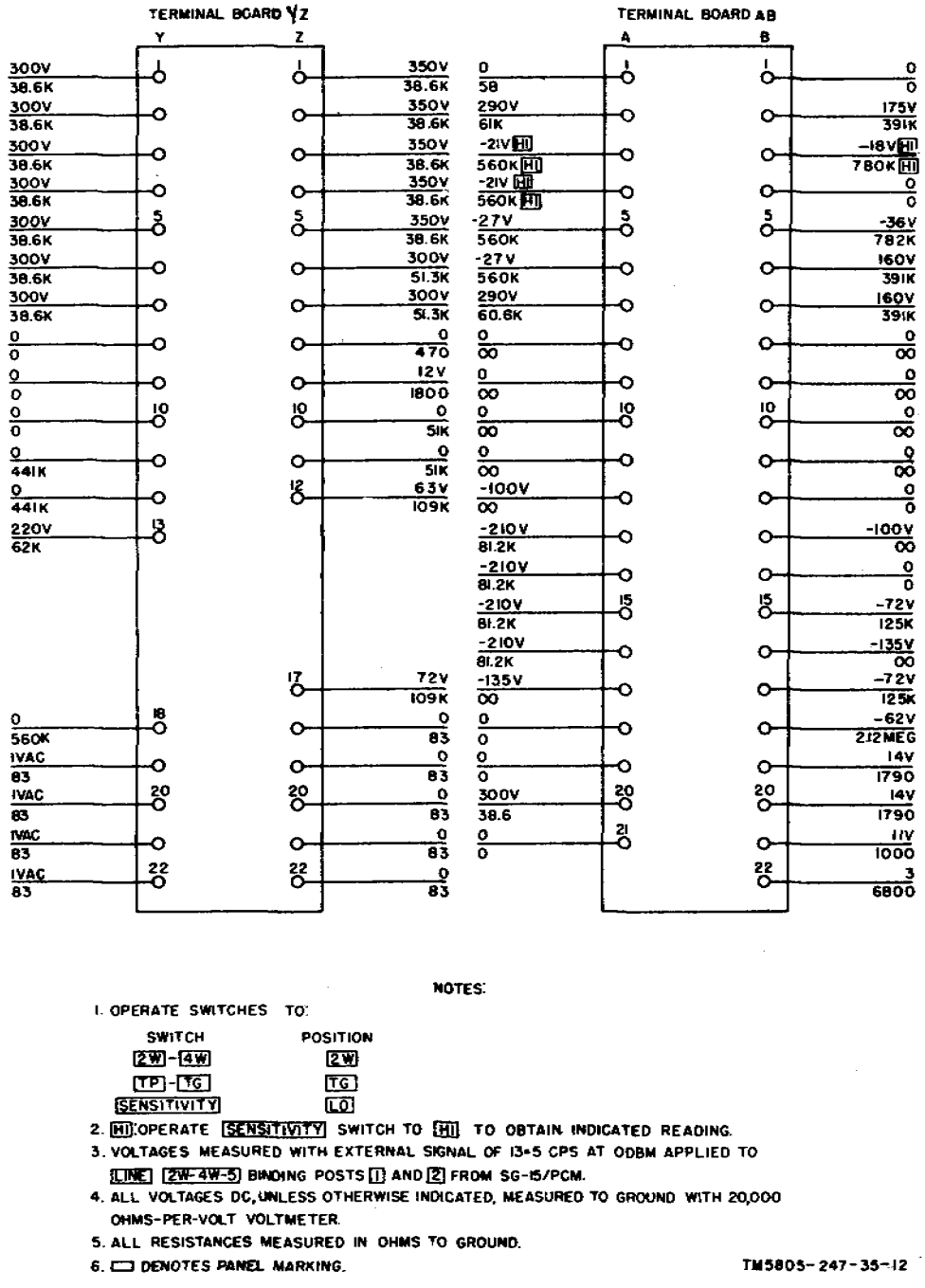


Figure 3. Terminal boards AB and YZ, voltage and resistance diagram.

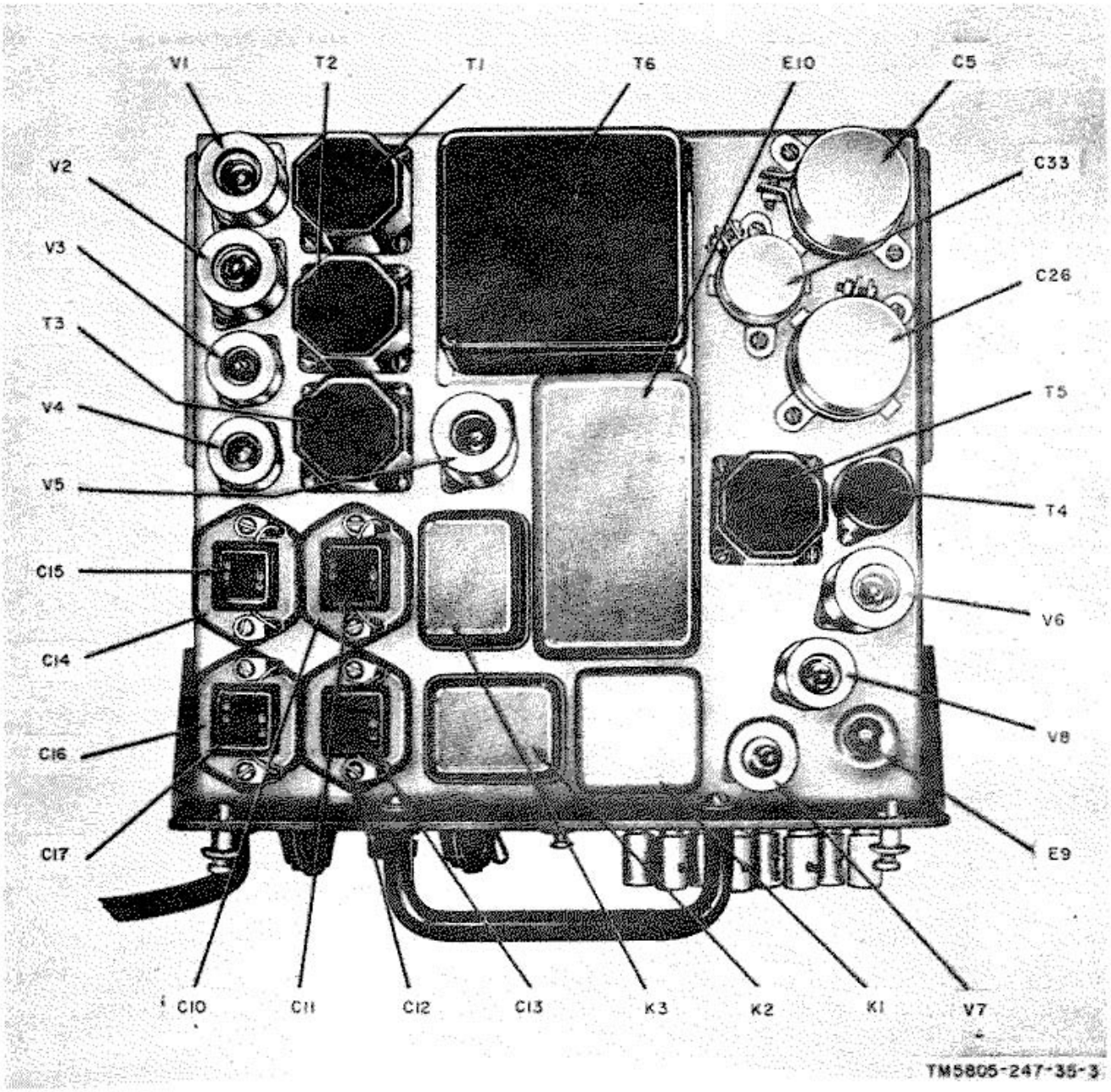


Figure 4. Top view of chassis

(c) No signal across resistor R25 (monitor across terminals Y9 and Z9 of *(d)* terminal board YZ).

Possible cause	What to check	Remedy
Defective output amplifier V6B	Check tube V6 (TM 11-5805-247-12)..	Replace if defective.
Defective output amplifier V6B circuit part or strap arrangement.	Make tube socket and terminal board voltage and resistance measure meets of output amplifier V6B circuit; check suspected circuit parts individually; check strap arrangement (para 29)	Replace defective part or correct strap arrangement as required

(d) No signal across LINE 2W-4W-S binding posts E1 and E2.

Possible cause	What to check	Remedy
Defective wiring or connection from transforming T4 winding 1-2 it binding posts E1 and E2.	Check continuity of wiring and connections.	Repair as required.
Defective transformer T4.....	Check dc resistance of transformer T4 (para 25)	Replace if defective.
Defective relay K2.....	Check for signal between contacts 11 and 12 of relay K2,; check dc resistance of relay k2 winding 10-1.	Replace relay if defective
Defective binding post E1 or E2	Check for continuity and shorting to ground.	Replace if defective

(*e*) Sending circuit operates normally during troubleshooting ((*a*) through (*d*) above) but there is no vf ringing signal output during bench test (para 22) or during operational test.

Possible cause	What to check	Remedy
Defective winding 1-5 of relay K1...	Check dc resistance of relay K1 (para 25).	Replace relay K1 if defective.
Defective contacts 3-4 of relay K1....	Check for dc operating voltage at contact 10 of relay K2 during bench or operational test.	Replace relay K1 if dc operating voltage does not exist on relay K2.

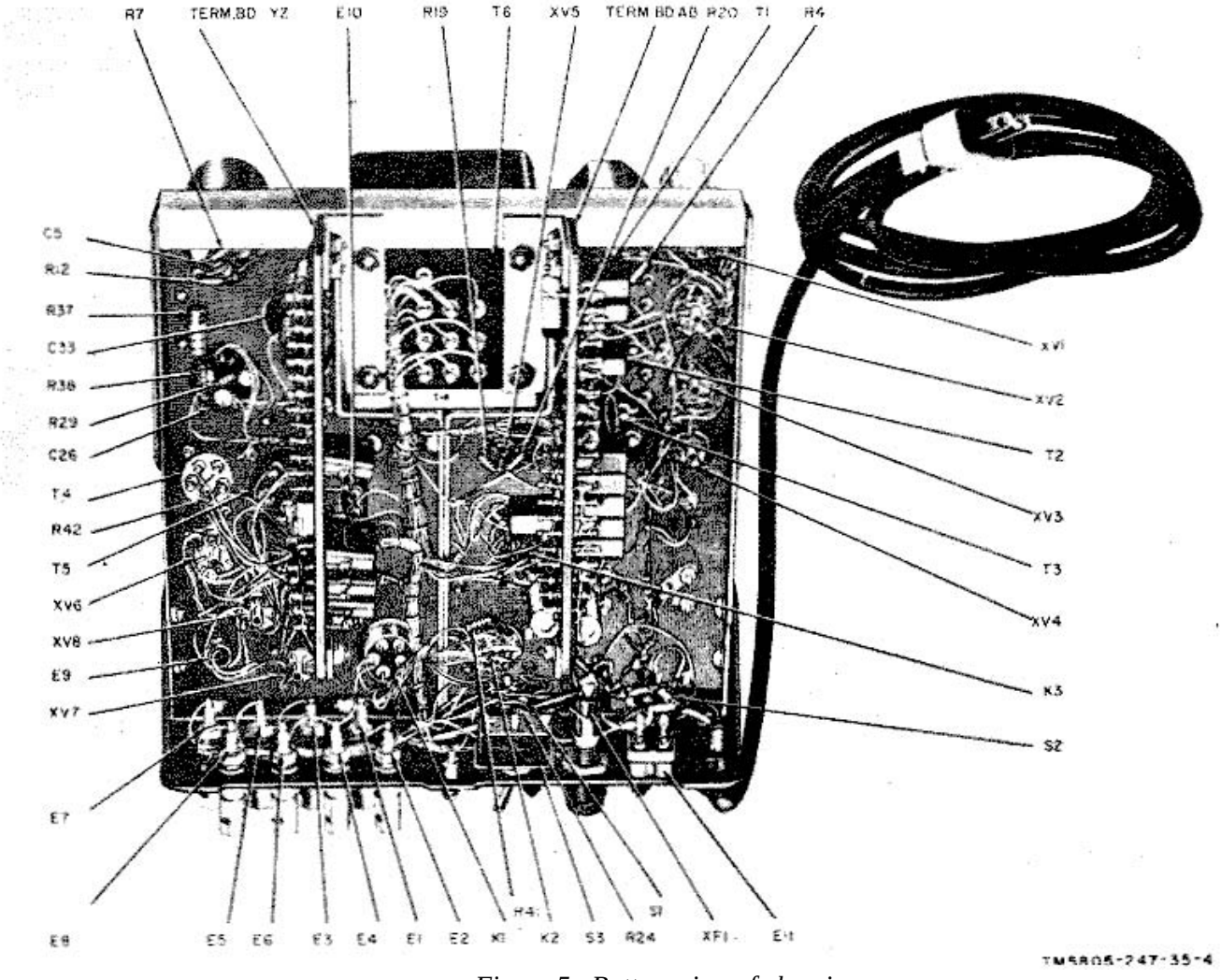


Figure 5. Bottom view of chassis.

24. Discriminator Test

a. General. The discriminator is checked, by measuring its output with various frequencies applied to the TA-182/U (c below).Although the exact voltage limits of the discriminator characteristic curve may vary between units, the band pass should remain generally the same for all units (fig. 2).

b. Test Setup.

(1) Remove the TA-182/U from its case.
(2) Operate the 2W-4W switch to 2W; the TP-TG switch to TP; and the SENSITIVITY switch to LO.
(3) Connect the output of the SG-15/PCM (TM 11-2096) to the LINE 2W-4W-S binding posts of the TA-182/U.
(4) Start the S~15/PCM and the TA-182/U (TM 11-5805-247-12); wait the warm up time specified for the SG-15/PCM.
(5) Adjust and maintain the output level of the SG-15/PCM at 0 dbm.
(6) Perform the procedure outlined in *c* below. If the band pass is not with in the specified limits (fig. 2) refer the TA-182/U fourth echelon for discriminator alignment.
(7) Disconnect the equipment and replace the TA-182/U in its case.

c. Test Procedure. Measure the discriminator output voltage across resistor R18 (fig. 2 and 6) with the TS-352/U at the input frequencies listed below.

Note. To obtain the readings listed in the TG column, operate the TP-TG switch to TG.

TP			TG		
Input frequency (CPS)	Voltage output		Input frequency (CPS)	Voltage Output	
	Positive	Negative		Positive	Negative
1,300	10		1,000	15	
1,350	20		1,050	22	
1,400	28		1,100	32	
1,450	38		1,150	52	
1,500	52		1,200	65	
1,550	60		1,250	42	
1,700	30		1,300	5	
1,750		15	1,350		40
1,800		60	1,400		85
1,850		74	1,450		80
1,900		78	1,500		68
1,950		74	1,550		55
2,000		65	1,600		45
2,050		60	1,650		35
2,100		52	1,700		25

a. Relay K3 and static ringing generator begin operating at 1,400cps (TPI and at i,100 cps (TG)
b. Relay K3 and the static ringing generator stop operating at 1,630 cps (TPI and at 1,276 cps (TG).

25. Dc Resistance of Transformer and Relay Windings

The dc resistance of the transformer and relay windings in the TA-182/U are listed in the chart below. Disconnect the TA-182/U and make all measurements with Multimeter TS-352/U.

Transformer or relay winding	Terminals	Ohms
T1	1-2	21
T1	3-4	57.5
T2	1-2	21.3
T2	3-4	26.6
T3	1-2	21.3
T3	3-4	26.6
T4	1-2	59
T4	3-4	920
T5	1-2	81
T5	3-4	82
T6	1-2	10.5
T6	3-4	413
T6	3-G	208
T6	4-G	205
T6	5-6	106
T6	5-7	214
T6	6-7	108
T6	8-9	.075
T6	8-G	.038
T6	9-G	.037
K1[a]	1-5	2000
K2	1-10	6500
K3	1-10	6500

a Operate the 2W-4W switch to 2W for this measurement.

Section III. REPAIRS AND ADJUSTMENTS

26. Tools, Test Equipment, and Materials Required

a. Tools. Tool Equipment TE-123 is required for both repair and adjustment of the TA-182/U..

b. Test Equipment The following test

equipment is required for adjustment of the TA-182/U.

Test equipment	Technical manual
Frequency Meter AN/TSM-16.	TM 11-6625-218-12
Test Set TS-140/PCM.....	TM 11-2096
Telephone Set TA-312/PT....	TM 11-2155

c. Materials.

Cleaning Compound (Federal stock number 7930-395-9542).

Cleaning cloth or brush.

Warning: **Cleaning Compound is flammable and its fumes are toxic. Do not use it near fire or flame. Provide adequate ventilation.**

27. Replacement of Parts

(fig. 4 and 5)

Except for the parts indicated in a through *d* below, TA-182/U parts authorized for replacement at third echelon (appendix II) are accessible after the front panel and chassis assembly has been removed from its case (TM 11-5805-247-12). Tag or otherwise identify connecting leads during removal of the part.

a. To reach and replace inaccessible parts mounted either on the front portion of the chassis or on the front panel:

(1) Remove the six screws that hold the front panel to the chassis.

Caution: Do not destroy the bonding by which the elastic stopnuts are attached to the chassis.

(2) Separate the front panel from the chassis. Be careful not to break or excessively bend the attached wiring.

(3) After replacing the defective part, seat the front panel on the chassis and replace the holding screws. Before tightening the holding screws, make sure that none of the chassis wiring is caught between the front panel and the chassis.

b. To reach and replace parts obscured by the terminal boards:

(1) Remove the four mounting screws from the appropriate terminal board.

Caution: Do not destroy the bonding by which the elastic stopnuts are attached to the terminal board mounting bracket.

(2) Separate the terminal board from its bracket. Be careful not to break or excessively bend the attached wiring.

(1) After replacing the defective part, reinstall the terminal board on its bracket with the mounting screws ((1) above).

***Caution*: Do not crack the terminal board by overtightening the mounting screws.**

c. To replace parts that are riveted to the chassis:

(1) Use a drill and reamer or a cold chisel to remove the rivet.

(2) Mount the replacement part with screws, nuts, and washers; use the original mounting holes.

d. To replace the incandescent (ballast) lampholder:

(1) Unsolder the leads from the lampholder.

(2) Use a drill, reamer, or a cold chisel to remove the lampholder if it is swayed to the chassis.

(3) Solder the leads to the replacement lampholder.

(4) Position the replacement lampholder in the mounting hole and swage it to the chassis.

Note. If the replacement lampholder to be mounted with screws, nuts, and washers drill appropriately sized and spaced holes in the chassis before soldering the connecting leads (((3)) above).

28. Oscillator Adjustment Procedure

a. General. Adjustment of capacitor C27 (fig. 6) will affect both the 1,225-cps ((TG)) and the 1,600-cps (TP) output of the sending circuit oscillator. After each adjustment, the frequency of- the sending circuit oscillator should be checked on both the TP and TG positions of the switch (para 22*d*).

b. Adjustment Procedure.

(1) Perform the steps outlined in paragraph 22*d* (1) through (7) .

(2) With an insulated tuning tool, alternately vary the sections of capacitor C27 until the oscillator frequency is within the specified ranges (para 22*d*).

(3) If the oscillator cannot be adjusted by varying capacitor C27, note the symptom on a repair tag and request higher echelon maintenance.

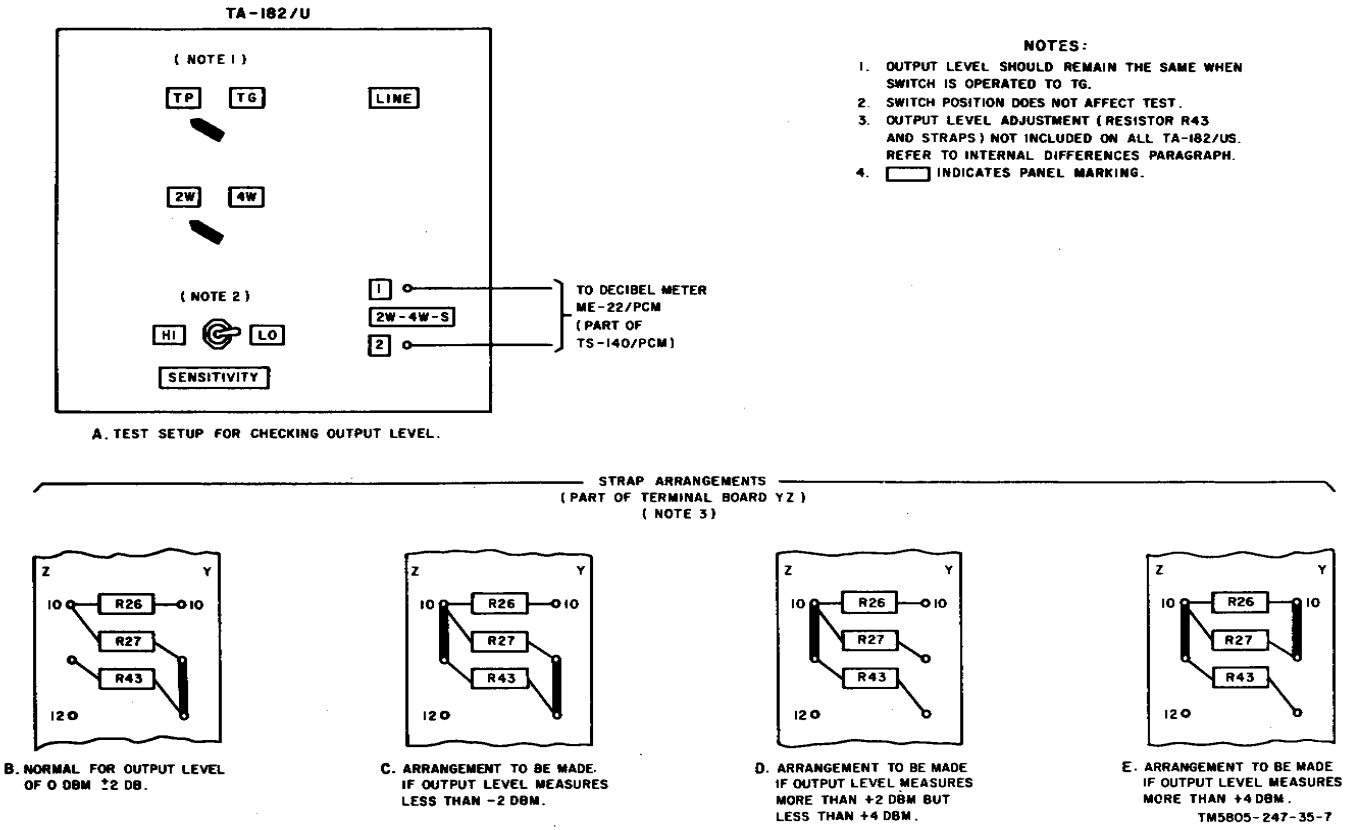


Figure 7. Test setup for check and adjustment of vf ringing signal output level.

29. Output Level Check and Adjustment

Note. The output level adjustment is not provided in any TA-182/U that does not contain resistor R43(para 2).

a. General. The output level adjustment is performed when the vf ringing signal output level is above or below 0 dbm □2 db. Check the vf ringing signal output frequency (para 22*d*)before adjusting the output level.

b. Check and Adjustment Procedure

(1) Remove the TA-182/U from its case and place a temporary jumper between pins 3 and 4 of relay K1.

(2) Determine the strapping arrangement which exists in output amplifier V6Binput circuit (B, C, D, or E, fig. 6and fig. 7).

(3) Operate the TA-182/U controls and connect the equipment as shown in A, figure 7. Refer to TM 11-2096 for control settings and connections to the ME-22,/PCM.

(4) Start the, TA-182/U (TM 11-5805- D, fig. 7247-12) and the ME-22/PCM; wait the warm-up time specified for the ME-22/PCM.

(5) Observe the TA-182/U vf ringing signal output level on the ME-22/PCM. If the output level is not within the specified range (*a* above), make the appropriate strapping arrangement as indicated in the chart below. After completing the output level adjustment, disconnect the equipment and replace the TA-182,/U in its ease.

Warning: **Disconnect the TA-182/U from the power source before changing the strapping arrangement. Allow approximately 3 minutes warm-up time after reconnecting the TA-182/U to the power source before making the final output level measurement.**

Strapping Arrangement	When Used
B, fig. 7	Normally used for output level of O dbm □ 2 db.
C, fig. 7	If the output level is less than -2 dbm (increases output level by approximately-proximately 4 db).
D, fig. 7	If the output level is greater than + 2 dbm but less than + 4 dbm (reduces output level by approximately 3 db).
E, fig. 7	If the output level is greater than + 4 dbm (reduces output level by approximately 4 db) .

CHAPTER 4
GENERAL SUPPORT MAINTENANCE

Section I. REPAIRS AND ALIGNMENT

30. Tools, Test Equipment, and Materials Required

a. Tools. Tool Equipment TE-123 is required for both repair and alignment of the TA-182/'U.

b. Test Equipment. The following test equipment is required for alignment of the TA-182/U.

Test equipment	Technical manual
Frequency Meter AN/TSM-16.....	TM 11-6625-218-12
Impedance Bridge TS-460/U.....	TM 11-2634
Multimeter TS-352/U	TM 11-5527
Test Set TS-140/PCM.....	TM 11-2096
Ringer TA-48/FT (para 35)	

c. Materials.

Cleaning compound.

Cleaning cloth or brush.

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

31. Repairs

Note. Parts authorized for fourth echelon maintenance of the TA-182/U are listed in Appendix II.

General support repair of the TA-182/U consists of any repair of the converter case and cover assembly, including replacement of the luggage catches and spring lock fasteners (illustrated in TM 11-5805-247-12). Replacement of the capacitors required in tuning the oscillator (para 32) and the discriminator (para 33) is also performed by general support.

Note. The cover assembly, which is normally attached to the converter case by the hinge arrangement of the spring lock fasteners and luggage catches on top of the case, must be detached for some installations (TM 11-5805-247-12). Repair of the hinge arrangement is not required.

32. Oscillator V6A Alignment Procedure

Note. Oscillator V6A alignment is required only when the oscillator adjustment procedure (para 28) does not properly correct the output frequency deviation.

a. Procedure.

(1) Perform the test procedure outlined in paragraph 39d, step No. 1

(2) With an insulated tuning tool, alternately vary. the sections of capacitor C27 (fig. 6) until the oscillator frequency is as close as possible to 1,600cps ±6 and 1,225 cps ±6.

Note. The setting of capacitor C27 affects both the 1,600-cps and 1,225-cps oscillator frequencies. Whenever a compensating adjustment of C27 is made, the oscillator frequency should be checked on both the TP and TG positions of the TP-TG switch.

(3) Perform *b* or *c* below as required.

(4) Complete the test procedure outlined in paragraph 39d, step No. 2.

b. Oscillator Tuning. Procedure for 1,600 cps ±6.

***Warning:* Disconnect the TA-182/U from the power source whenever replacing parts other than the fuse, incandescent lamp, or the electron tubes.**

(1) Replace capacitor C32 (fig. 6) with a capacitor selected from the chart in d below as follows:

(a) If the frequency measured in a(2) above is higher than 1,600 cps ± 6, select the next higher value capacitor.

(b) If the frequency measured in *a*(2) above is lower than 1,600 cps ± 6, select the next lower value capacitor.

Note. A capacitor decade, if available, may be used to determine the specific value for capacitor C32.

(1) Readjust capacitor C27 (*a*(2) above) if necessary until the oscillator frequency is 1,600 cps ±6.

(2) If the oscillator frequency cannot be adjusted to 1,600 cps±6, repeat the procedures given in (1) and (2) above.

Note. It may be necessary to combine capacitors in series or in parallel to obtain the required value for C32.

c. Oscillator Tuning Procedure for 1,225 cps±6.

Warning: Disconnect the TA-182/U from the power source whenever replacing parts other

than the fuse, incandescent lamp, or the electron tubes.

(1) Operate the TP-TG switch to the TG position and perform *a*(2) above for 1,225 cps ± 8.

(2) Replace capacitor C30 (fig. 6) with a capacitor selected from the chart in *d* below as follows:

(a) If the frequency measured in *a* (2) Above is higher than 1,225 cps ± 6, select the next higher value capacitor.

(b) If the frequency measured in *a*(2)above is lower than 1,225 cps ± 6, select the next lower value capacitor.

Note. A capacitor decade, if available may be used to determine the specific value for capacitor C30.

(3) Readjust capacitor C27 (*a*(2) above) if necessary until the oscillator frequency is 1,225 cps ± 6.

(4) If the oscillator frequency cannot be adjusted to 1,225 cps ± 6, repeat (2) and (3) above.

Note. It may be necessary to combine capacitors in series or in parallel to obtain the required value for C30.

d) Capacitors Available for Oscillator Tuning.

Item	Federal stock numbers
Capacitor, fixed, 47 uuf ± 10 percent	5910-101-4901
Capacitor, fixed, 100 uuf ± 10 percent	5910-101-5615
Capacitor, fixed, 200 uuf ± 10 percent	5910-161-4501
Capacitor, fixed, 300 uuf ± 5 percent	5910-161-4500
Capacitor, fixed, 390 uuf ± 5 percent	5910-101-4909
Capacitor, fixed, 510 uuf ± 5 percent	5910-101-4881
Capacitor, fixed, 620 uuf ±5 percent	5910-195-0539
Capacitor, fixed, 680 uuf ± 5 percent	5910-112-6986

33. Discriminator Alignment Procedure

Note. Do not perform the discriminator alignment until after completing the discriminator check (para 24) .

a. General. Alignment of the discriminator consists of installing the proper values of capacitance in the circuits of detector-doublers V3 and V4.

(1) Remove the TA-182/U from its case.

(2) Perform the procedure outlined in *b* below, depending on the result of the discriminator check.

Warning: Disconnect the TA-182/U from the power source before replacing circuit parts.

b. Alignment Procedure.

(1) Remove capacitors C10 through C17 (fig. 4)from the TA-182/U. Tag or otherwise identify each capacitor.

Note. The capacitors should be unsoldered from their terminal lugs only if replacement is required.

(2) Use the TS-460,/U (TM 11-2634) to check each capacitor for defects and for proper value as indicated in the chart (*c* below). Fixed capacitors C11, C13, C15, and C17 may be either one of the two values listed.

(3) Substitute capacitors, as required, for those which are defective or of incorrect value, then replace capacitors C10 through C17 in the TA-182/U.

(4) Perform a discriminator check (para 24).

c. Capacitor Values for Discriminator Alignment.

Capacitors	Value in uf	Percent tolerance	Federal stock No.
C10	0.039	±5	5910-280-7018
C11	0.0039 or	±5	5910-190-9438
	0.0056	±5	5910-191-3072
C10 and C11 in parallel	0.044	±2	
C12	0.033	±5	5910-101-3873
C13	0.0020 or	±5	5910-101-5781
	0.0036	±5	5910-101-4047
C12 and C13 in parallel	0.0356	±2	
C14	0.033	±5	5910-101-3873
C15	0.0013 or	±5	5910-101-3999
	0.0027	±	5910-160-1156
C14 and C15 in parallel	0.0345	±2	
C16	0.024	±5	5910-191-5404
C17	0.0036 or	±5	5910-101-4047
	0.0043	±5	5910-101-3849
C16 and C17 *in parallel	0.0277	±2	
		±	

a Total value of capacitance required for discriminator tuning.

b Capacitor C15 is either 3,600 uuf or 5,600 uuf in equipment bearing Order No. 3366-Phila-52 (para 2).

Section II. GENERAL SUPPORT TESTING PROCEDURES

34. General

a. These testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service Organizations responsible for general support maintenance to determine the acceptability of a repaired TA-182/U. These testing procedures are also used for final testing of a TA-182/U. The procedures set forth specific requirements that a repaired TA-182/U must meet before it is returned to the using organization. The testing procedures may also be used as a guide for testing a TA-182/U repaired at direct support if the proper tools and test equipments are available. A summary of the performance standards is given in paragraph 41.

b. Each test depends on the preceding one for certain operating procedures and, where applicable, for test equipment calibration. Comply with the instructions preceding the body of each chart before proceeding to the chart. Perform each test in sequence. Do not vary the sequence. For each step, perform all the actions required in the Test equipment control settings and Equipment under test control settings columns; then perform each specific test procedure and verify it against its performance standard.

35. Test Equipment and Materials

All test equipment and materials required to perform the testing procedures given in this section are listed in the following charts and are authorized under TA 11-17 and TA 11-100 (11-17), except as noted. Specific models of test equipment are used to perform the test procedures given in paragraphs 39, 40, and 41. If these test procedures are performed -with other models of test equipment, an allowance must be made for any test connection or test results that may differ from those given in these test procedures.

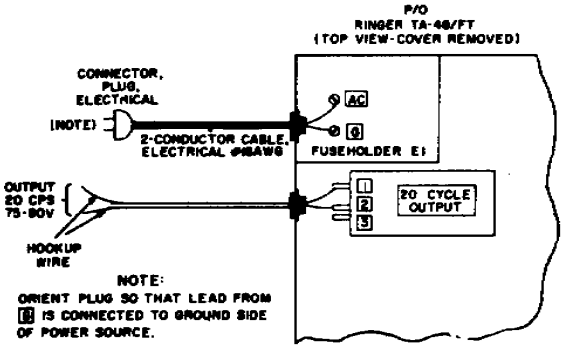


Figure 8. Ringer TA-48/F,T, power cord construction and connections.

a. Test Equipment.

Item	Federal stock No.	Technical manual
Multimeter Ts-352/U or equal	6625-242-5023	TM 11-5527
Frequency Meter AN/TSM-16.	6625-542-1666	TM 11-6625-218-12
Test Set TS-140/PCM consisting of:	6625-243-4888	TM 11-2096
Signal Generator Sg-15/PCM or equal.	6625-229-1087	TM 11-2096
Decibel Meter ME-22/PCM or equal.	6625-498-3469	TM 11-2096
Telephone Set TA-312/PT	5805-543-0012	TM 11-2155
Ringer TA-48/FT	5805-254-7759	
Light Assembly, Electric MX-1292/PAQ	6625-537-4470	TM 11-5540

a Multimeter AN/URM-105 authorized under TA 11-17, was purposely omitted in favor of Multimeter TS-352/
U which is most likely to be available. Multimeter AN/URM-105 (TM 11-6625-203-12) and Frequency Meter AN/TSM-16 (TM11-6625-218-12) may be used if available.

b. Materials.

Item	Federal stock No.	Length (approx)
Hookup wire, stranded, #18 AWG.	6145-160-5317	12 ft
Cable, power, electrical, stranded, 2-conductor, #18 AWG (or larger)	6145-251-3542	5 ft
Connector Plug.....	5935-149-4013	

36. Special Instructions

a. *Ringer TA-48/FT.* Ringer TA - 48/FT is not supplied with an ac power cord or output leads. Remove the TA-48/FT cover. Construct an ac power cord and output leads and connect them to the TA-48/FT (fig. 8), then replace the cover.

b. *Modification Work Orders*. Modification work orders (MWO) affecting the TA-182/U are listed in DA Pamphlet 310-1.

37. Physical Tests and Inspection

a. Test Equipment. Light Assembly, Electric MX-1292/PAQ.

b. Test Connections and Conditions. Install the wide transmission filter in the mercury vapor lamp assembly and connect the lamp to the 245 V. FOR M.V. LAMP receptacle on the longwave unit. Connect the longwave unit to a source of ac power. No connection to the TA-182/U under test is required. Remove the TA-182/U from its case.

c. Procedure

Step No.	Test equipment Control settings	Equipment under test Control settings	Test procedure	Performance standard
1	N/A	Controls may be in any position	*a.* Inspect the exterior and interior of the case and front panel; look for damaged, loose, or missing screws, knobs, or other parts. *b.* Inspect case and front panel for rust, corrosion, and condition of finish *Note*. Touchup painting recommended in lieu of refinishing whenever practicable Screwheads binding posts and plated fastener parts wI11 not be painted or polished or polished with abrasives. *c.* Inspect fuseholder; look for burns, breaks, and sufficient spring tension. Check fuse rating. *d.* Operate each switch to each position..... *e.* Inspect power cord insulation and connector; look for cracks, abrasions, and indication of excessive wear. .	*a.* No evidence of damaged, loose, or missing screws, knobs, or parts. *b.* There should be no rust or corrosion evident. All surfaces intended to be painted must not show bare metal. Panel markings must be legible. *c.* Fuseholder must not be burned or broken, and spring tension must hold fuse firmly in place. A 1-ampere, 260-volt fuse must be installed. *d.* Switches operate smoothly without binding. *e.* Power cord and connector must be of the three conductor grounded type in good condition, free from cracks, abrasions, and evidence of excessive wear.
2	MX-1292/PAQ Longwave unit 245 V. FOR M V. LAMP: ON	Controls may be in any position.	*a.* Expose to the direct rays of the lamp the portion of the equipment that has been repaired or disturbed *Note*: There should be no moisture and fungiproofing varnish on switch contacts *b. b.* Turn off the lamp	*a.* All electronic components, connections, chassis surfaces, and wiring show continuous, unbroken coverage of the varnish *Note.*MFP varnish glows grayish under the lamp *b.* None.
3	N/A	N/A C	Check the equipment for applicable MWO (para 36).	
4	N/A	N/A	Replace the TA-182/U in its case.	

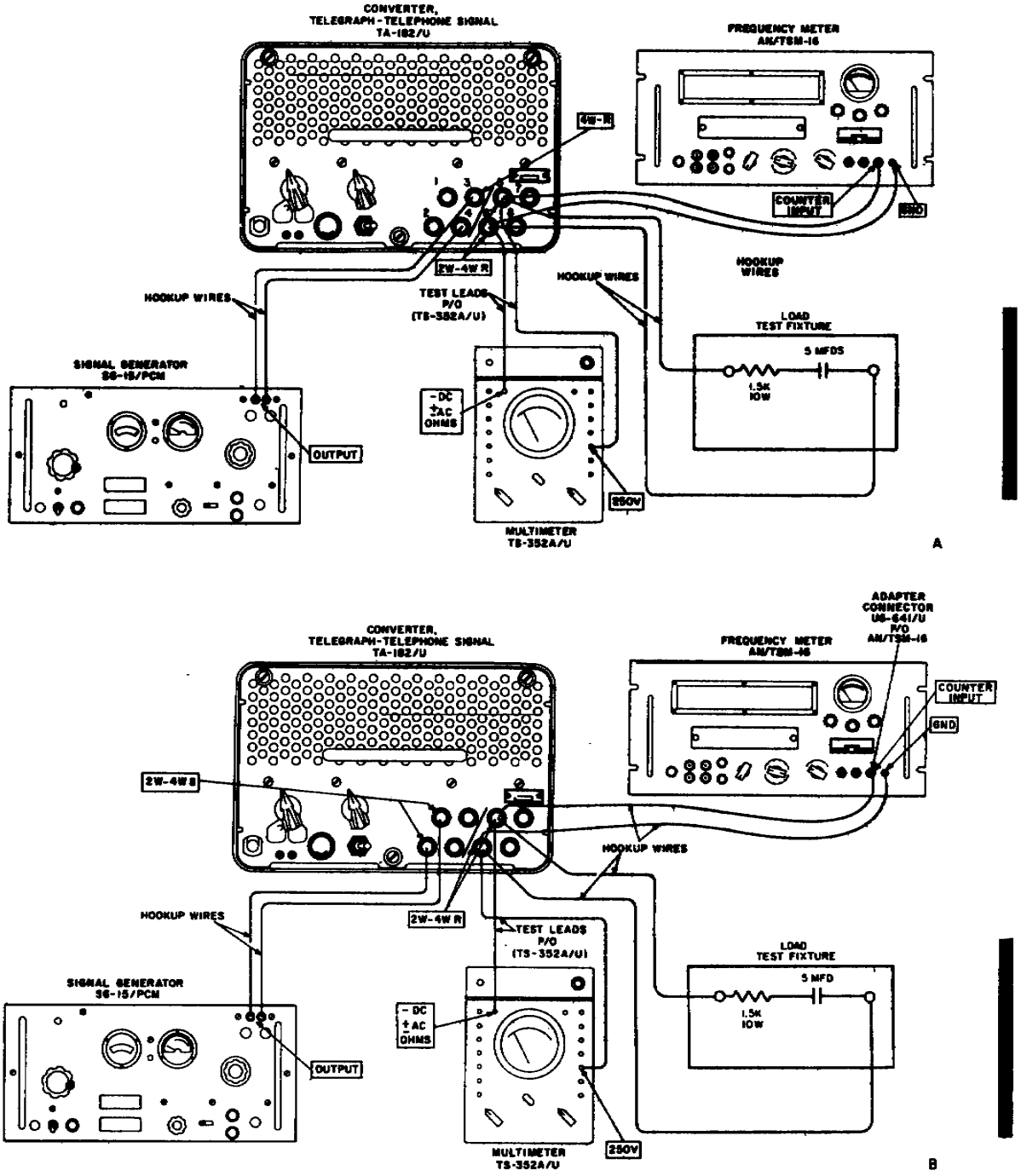


Figure 9. Receiving circuit sensitivity and static ringing generator test setups.

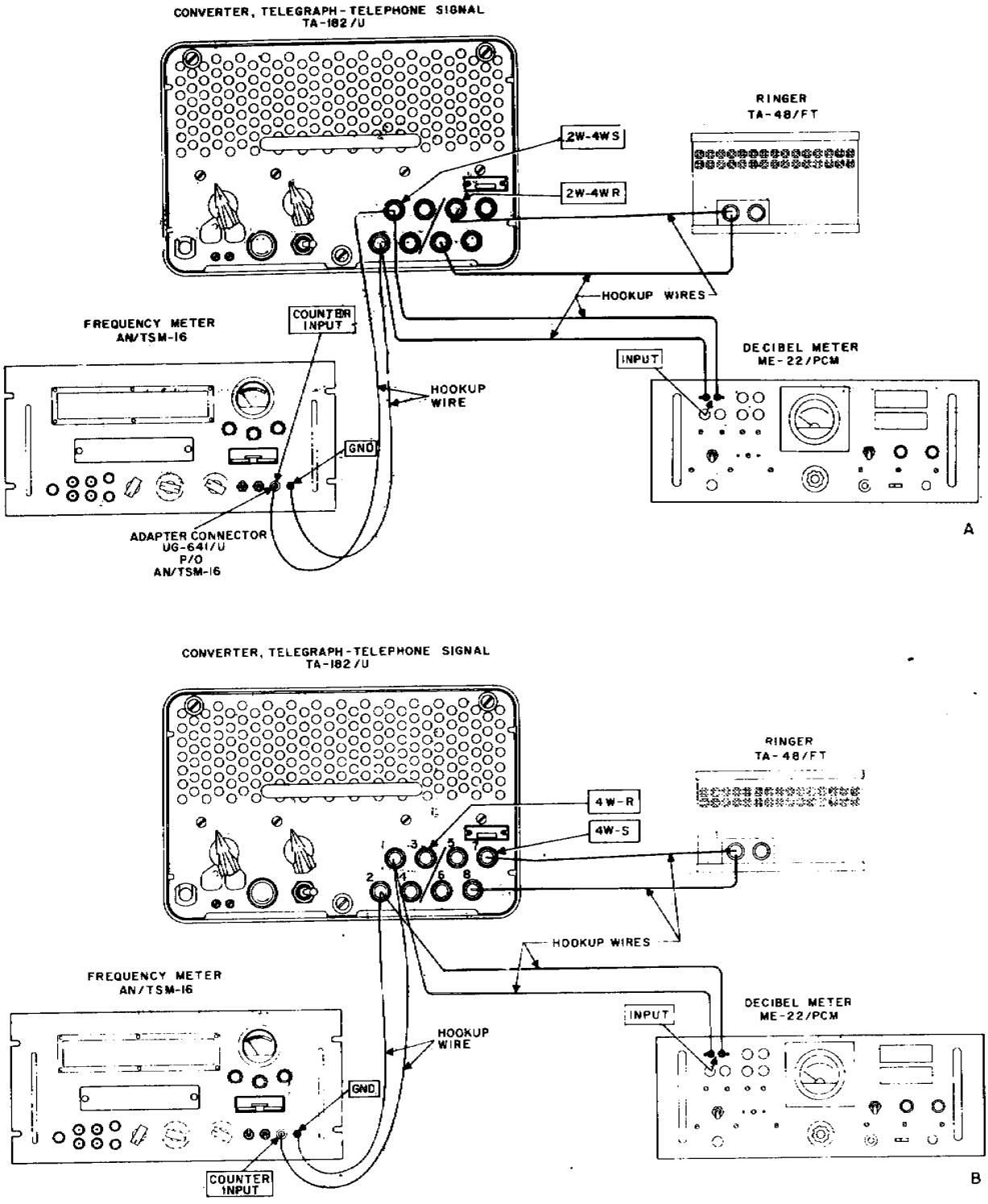


Figure 10. Voice-frequency ringing output test setups.

38. Receiving Circuit Sensitivity and Static Ringing Generator Tests
(fig. 9)

a. Test Equipment and Materials
(1) Signal Generator SG-15/PCM (part of Test Set TS-140/PCM).
(2) Frequency Meter AN/TSM-16
(3) Multimeter TS-352A/U
(4) LOAD Test Fixture.
(5) Hookup wire.

b. Calibration of SG-15/PCM. Calibrate the SG-15/PCM as follows:
(1) Operate the power ON-OFF switch to OFF, and the PRIMARY VOLTAGE switch to 115V.
(2) Connect the ac power cord to the ac power source.
(3) Operate the power ON-OFF switch to ON. Allow the test set to warm up at least 15 minutes.
(4) Operate the FINE DBM control for a reading of approximately +6 on the OUTPUT LEVEL meter.
(5) Operate the FREQUENCY control to 0 as indicated on the KILOCYCLES dial.
(6) Adjust the ZERO BEAT ADJ control for zero-beat indication on the OUTPUT LEVEL meter.

c. Test Connections and Conditions. Connect the TA-182/U to the test equipment as shown in A, figure 9. Connect the power cords on the AN/TSM-16 and the TA-182/U to the ac power source. Allow a 5-minute warm up before performing the tests.

d. Procedures

Step No	Test equipment Control Settings	Equipment under test Central settings	Test procedure	Performance standard
1	SIG-15/PCM: FREQUENCY: 1,600 COARSE DBM: -50 (dbm). FINE DBM: Set for +5 indication on OUTPUT LEVEL meter. AN/TSM- 16: POWER-OFF: POWER AUTO-MANUAL: AUTO DISPLAY TIME Midposition FUNCTION: FREQ. COUNT MULTIPLY FREQUENCY BY: 1. SENSITIVITY. Maximum counterclockwise. TS-352A/U: FUNCTION: A.C. VOLTS. LOAD Test fixture	TP-TG: TP 2W-4W: 4W SENSITIVITY: HI.	*a* Record the TS-325A/U meter indication *b*. Adjust the AN/TSM-16 SENSITIVITY control for an indication within the green portion of the meter scale. Allow the frequency meter to count the signal frequency three times. Compute and record the average count. *c*. Operate the SG- I 5/PCM COARSE DBM switch to ZERO OUTPUT *d*. Operate the TA- I 82/U SENSITIVITY switch to LO *e*. Operate the SG- I 5/PCM COARSE DBM switch to -30; listen for the operation of the K3 relay in the TA- I 82/U. Record the TS-352A/U indication. *f*. Operate the TA- I 82/U SENSITIVITY switch to Hl and the TP-TG switch to TG. *g*. Operate the SG- I 5/PCM FREQUENCY control for 1,225 cps; operate the COARSE DBM control to-50. If necessary, readjust the FINE DBM control for +5 (dbm) indication on the OUTPUT LEVEL .meter *h*. Record the TS-352A/U indication. *i*. Operate the SG- 1 15PCM COARSE DBM control to ZERO OUTPUT. Wait at least 5 seconds, then reset the COARSE DBM controls to - 50. Note the length of time before the TS-352A/U indicates maximum output voltage. **NOTE** An oscilloscope may be connected across the LOAD Test Fixture for a more precise indication.	*a*. The TS-352A/PT meter indicates no less than: (1) 64 volts ac for units equipped with mechanical inverters. (2) 50 volts ac for units equipped with solid state inverters. *b*. Average count is 2() cps + 3. c. None. *d*. None. *e*. TA-182/U relay K3 is heard to operate approximately one-half second after COARSE DBM switch is operated to - 30. *f*. None. *g*. None. *h*. The TS-352A/PT meter indicates no less than: (1) 64 volts ac for units equipped with mechanical | inverters. (2) 50 volts ac for units equipped with solid state inverters. | *i*. The TS-352A/U indicates same voltage obtained in *h* above in approximately one-half second after the COARSE DBM control is set to - 50.
2	Same as in step 1.	TP-TG: TP 2W-4W: 2W SENSITIVITY: HI	*a*. Connect the equipment as shown in B, figure 9 *b*. Repeat procedures given in *a* through *i* of step No. 1 *c*. Disconnect the TS-352A/U, SG-15/PCM, and TA-312/PT from the test setup.	*a*. None *b*. Same as in step No. 1 *c*. None.

39. Voice-Frequency Ringing Output Tests

(fig. 10)

a. Test Equipment and Material

(1) Decibel Meter ME-22/PCM (part of Test Set TS-140/PCM.

(2) Frequency Meter AN/TSM-16.

(3) Ringer TA - 8/F.T.

(4) (4) Hookup wire.

b. Adjusting ME-22/PCM. Before connecting the ME-22/PCM to the test setup, adjust it. as follows:

(1) Operate the INPUT IMPEDANCE switch to 600 OHM.

(2) Operate the PRIMARY VOLTAGE switch to 115V; and the power ON-OFF switch to OFF.

(3) Use hookup wire to connect the ME-22/PCM INPUT binding posts to the SG-15/PCM OUTPUT binding posts.

(4) Operate the ME-22/PCM power ON-OFF switch to ON. Allow the test set to warm up at least 15 minutes.

(5) Operate the SG-15/PCM -FREQUENCY control to 0 as indicated on the KILOCYCLES dial.

(6) Operate the ME-22/PCM FINE DBM control for a reading of zero on the OUTPUT LEVEL meter.

(7) Operate the ME-22/PCM DBM switch to 0 on SCALE B; adjust the CAL ADJ control until the meter indicates exactly zero dbm on SCALE B.

(8) Operate the ME-22/PCM DBM switch to 0 on SCALE A. The meter should indicate 0 dbm ±0.5 on SCALE A.

(9) Disconnect the hookup wire from the SG-15/PCM. binding posts.

c. Test Connections and Conditions. Connect the TA-182/U to. the test equipment as shown in A, figure 10. Connect the power cords of the TA - 8/FT and the TA-182/U to the ac power source.

d. Procedure.

Step No.	Test equipment Control settings	Equipment under test Control settings	Test procedures	Performance standard
1	ME-22/PCM INPUT IMPEDANCE 600 OHM DBM range: ±10 Power ON-OFF: ON AN/TSM-16: MULTIPLY FRE QUENCY BY: 1 AUTO-MANUAL: AUTO DISPLAY TIME: Midposition	SENSITIVITY : HI 2W-4W: 2W	*a*. Set the TA-182 /U TP-GG switch to TP *b*. Note the indication of the ME-22/PCM meter. c. Adjust the AN/TSM-16 SENSITIVITY control. for an indication within the green portion of the meter scale. Allow the AN/TSM-16S to count the signal frequency three times. Compute the average of the three counts. *d*.. Operate the TA-1821U TP-TG switch to TG and repeat b and c above	*a*. None. *b*. ME-22 / PCM meter indicates between -2 and +4 dbm. *c*. The average count is 1,600 cps +6. *d*. ME-22/PCM meter indicates between -2 and + 4 dbm. The average count is 1,225 cps ± 6.
	POWER: ON SENSITIVITY: Maximum counter clockwise.	SENSITIVITY HI 2W-4W: 4W	*a*. Connect the equipment as shown in B, figure 10. *b*. Repeat *a* through *d* of step No. 1. *c*. Disconnect all test equipment.	*a*. None. *b*. Same as in step No. 1. *c*. None.
2	Same as in step No. 1.			

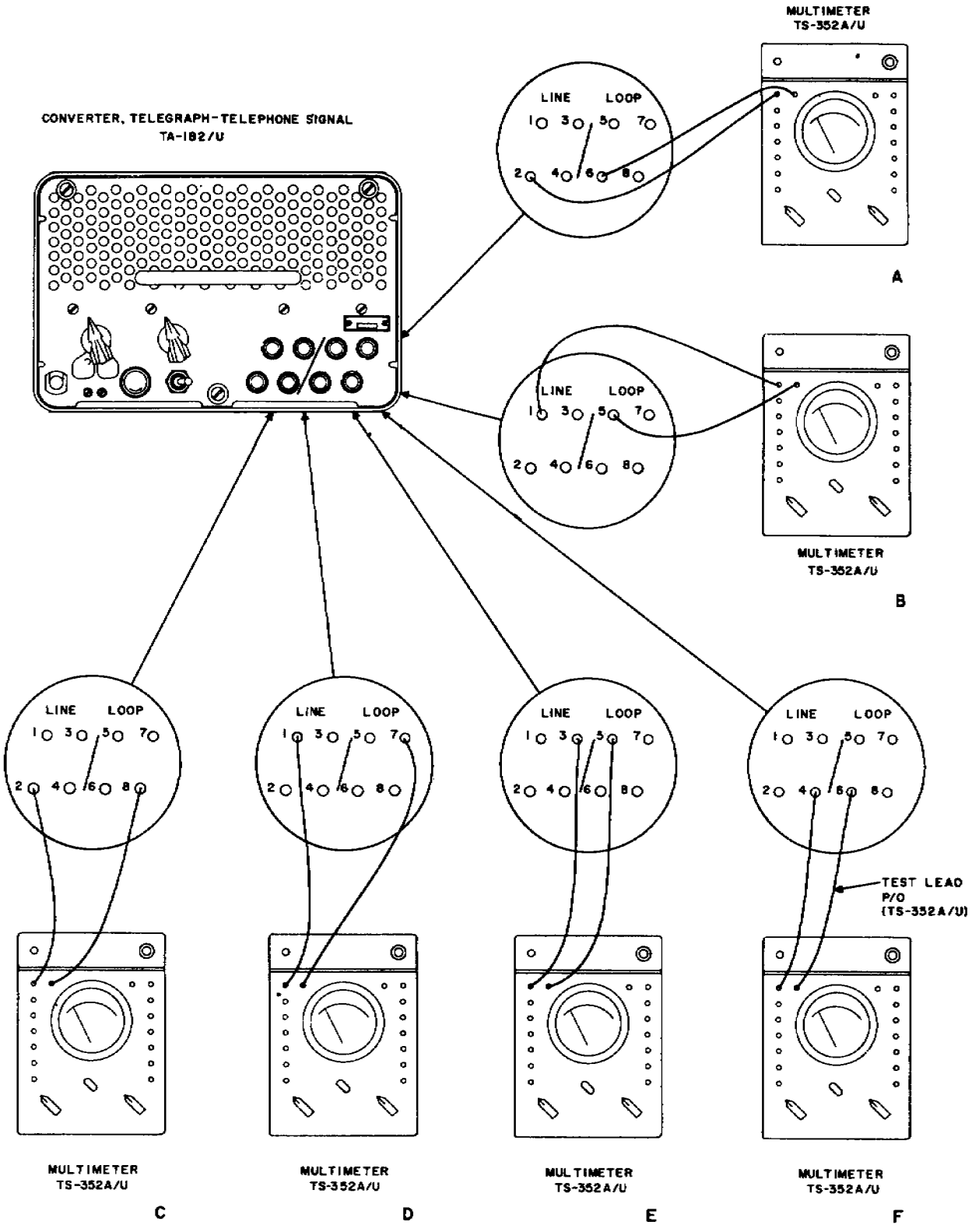


Figure 11. Input-output circuit continuity test setups.

40.Continuity Tests of Input Output Circuits

(fig. 11)

a. Test Equipment Multimeter TS 362A/U.

b. Test Conditions and TS - 52/U Meter Calibration.

(1) Disconnect the TA-182/U power cord from the ac power source.

(2) Adjust the TS 362A/U for ohmmeter operation as follows:

(a) Connect the TS 362A/U test leads to the OHMS and - DC, +AC, OHMS receptacles.

(b) Operate the range 'twitch to RX1; and the FUNCTION switch to OHMS.

(c) Touch the ends of the test leads together and adjust the OHMS ZERO ADJ control until the meter needle indicates exactly 0 ohm on the ohms scale.

(3) Connect the TS 352A/U to the various LINE and LOOP binding posts on the TA-182/U (c below).

c. Procedure.

Step No.	Test equipment test control settings	Equipment under test Control settings	Test procedure	Performance standard
1	TS-352A/U FUNCTION: OHMS Range switch: RX1	2W-4W: 2W	Connect the TS-352A/U test leads to binding posts 2 and 6 (A, fig. 11).	TS - 52A/U indicates 0 ohm
2	Same as in step No.1	2W-4W: 2W	Connect the TS-352A/U test leads to binding posts 1 and 5 (B, fig. 11).	TS - 52A/U indicates 0 ohm
3	Same as in step No.1	2W-4W:4W	Connect the TS-352A/U test leads to binding posts 2 and 8 (C, fig. 11).	TS - 52A/U indicates 0 ohm
4	Same as in step No.1	2W-4W:4W	Connect the TS 362A/U test leads to binding posts 1 and 7 (D, fig. 11).	TS - 52A/U indicates 0 ohm
5	Same as in step No.1	2W-4W:4W	Connect the TS-352A/U test leads to binding .posts 3 and 6 (E, fig. 11) .	TS - 52A/U indicates 0 ohm
6	Same as in step No.1	2W-4W:4W	Connect the TS 362A/U test leads to binding posts 4 and 6 (F, fig. 11).	TS - 52A/U indicates 0 ohm

41. Test Data

A convenient method for recording equipment performance test data is outlined below.

1. RECEIVING CIRCUIT SENSITIVITY AND STATIC RINGING GENERATOR TESTS

a. Receiving circuit sensitivity

(1) SENSITIVITY switch on HI — *-45 dbm*

(2) SENSITIVITY switch on LO — *-25 dbm*

b. Static ringing generator

(1) Frequency — 20 Hz ±3

(2) Output voltage — 90 to ll0 volt s ac

(3) Relay (K3) delay operation — *approx ½ sec. delay*

2. VOICE-FREQUENCY RINGING OUTPUT TESTS

a. TP operation, 2W and 4W circuits

(1) Frequency — *1,600 cps ± 6*

(2) Output level — *-2 to +4 dbm*

b. TG operation, 2W and 4W circuits

(1) Frequency — *1,225 cps ± 6*

(2) Output level — *-2 to +4 dbm*

3. INPUT-OUTPUT CIRCUITS, CONTINUITY TESTS

a. 2W circuits

(1) Binding posts 2. and 6 — *0 ohm*

(2) Binding posts 1 and 6 — *0 ohm*

b. 4W circuits, send

(1) Binding poets 2 and 8 — *0 ohm*

(2) Binding posts 1 and 7 — *0 ohm*

c. 4W circuits, receiving

(1) Binding posts 4 and 6 — *0 ohm*

(2) Binding posts 8 and 5 — *0 ohm*

CHAPTER 5

DEPOT MAINTENANCE

42. General

Depot maintenance consists Of rebuilding the TA182/U, including the converter case and cover assembly.

Final tests for a rebuilt TA-182/Uare the same as for fourth echelon (para 34 through 41). Parts available for depot maintenance of the TA-182/U are listed in Appendix II.

43. **Tools and Test Equipment Required**

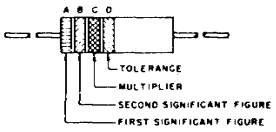
The following is a list of the tools and test equipment required for depot maintenance, and associated technical manuals, as appropriate.

Item	Reference
Tool Equipment TE-123	SM 11-5180-S07
Multimeter TS-352/U	TM 11-5527
Test Set, TS-140/PCM.....	TM 11-2096
Test Set, Electron Tube TV-2/U.....	TM 11-2661
Frequency Meter AN/TSM-16.....	TM 11-6625-218-12
Impedance Bridge TS-460/U	TM 11-2634

Note. The test equipment and materials required for final testing are listed in paragraph 35.

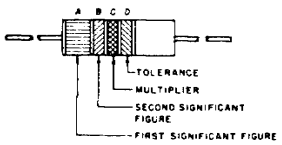
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

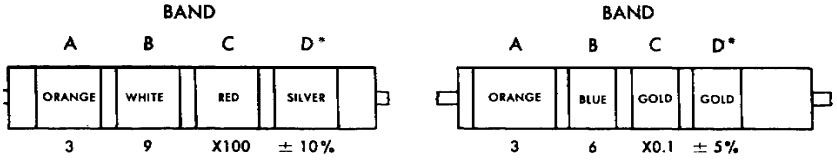


BAND A— *Double Width Signifies* Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 Ohms 3.6 Ohms

RESISTANCE TOLERANCE ± 10 percent ± 5 percent

STD-R2

*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

Figure 12. MIL-STD resistor color code marking.

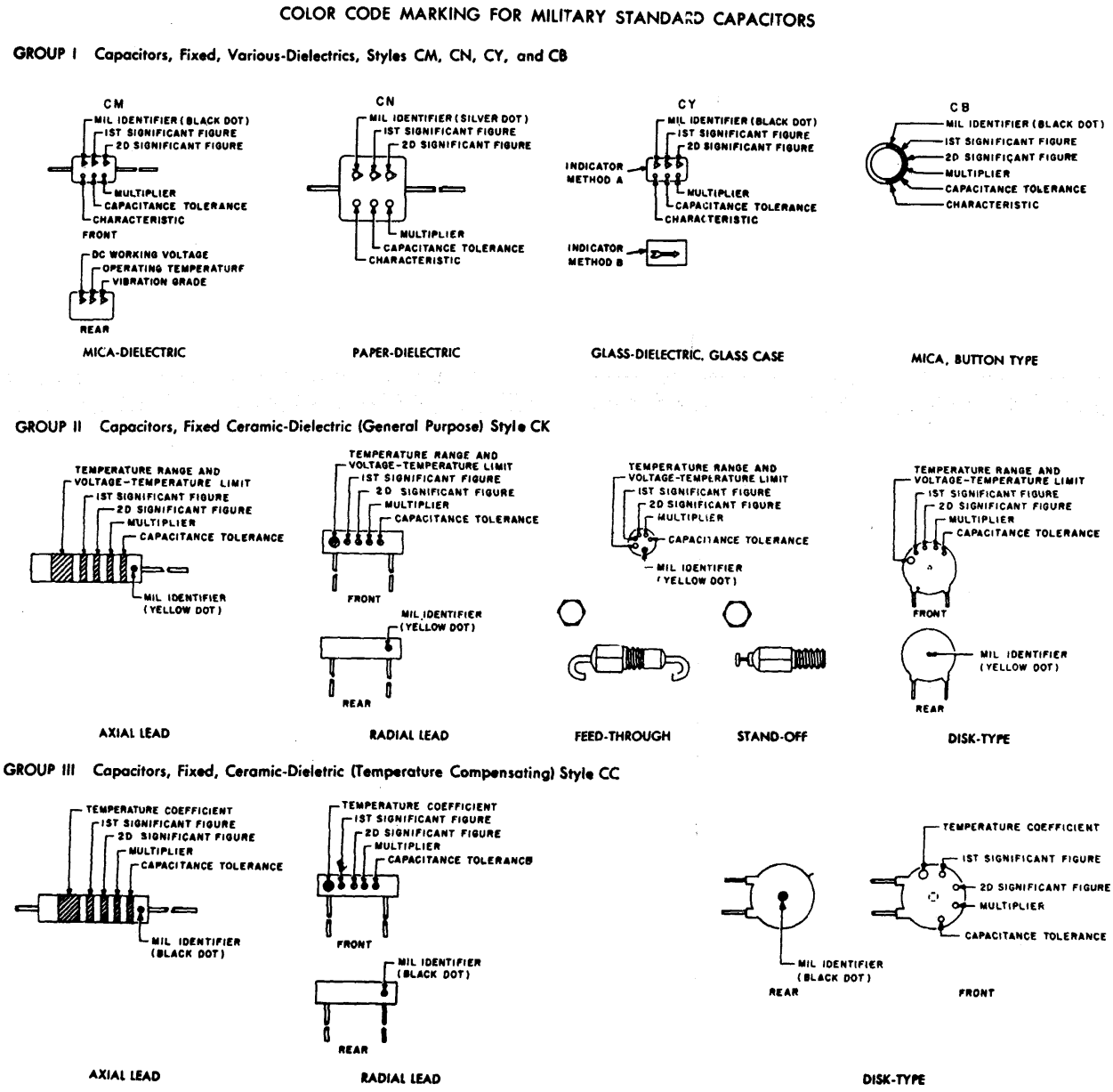


Figure 13. MIL-STD capacitor color code marking

COLOR CODE TABLES

TABLE I - For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE				CHARACTERISTIC				DC WORKNIG VOLTAGE	OPERATING TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	±20%		A				-55° to +70° C	10-55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			-55° to +85° C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					-55° to +125° C	10-2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											-55° to +150° C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II - For use with Group II, General Purpose, Style CK

COLOR	TEMP.RANGE AND VOLTAGE - TEMP. LIMITS	1st SIG FIG	2nd SIG FIG	MULTIMETER	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III - For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT	1ST SIG FIG	2ND SIG FIG	MULTIPLIER	CAPACITANCE		MIL ID
					Capacitancees OVER 10UUF	Capacitances 10 uuf or less	
BLACK	0	0	0	1		± 2.0 uuf	CC
BROWN	-30	1	1	10	± 1%		
RED	-80	2	2	100	± 2%	± 0.25 uuf	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4				
GREEN	-330	5	5		± 5%	± 0.5 uuf	
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GREY		8	8				
WHITE		9	9	0.01			
GOLD	+100			0.1	± 10%		
SILVER						± 1.0 uuf	

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: Mil-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL-C-11015.
4. Temperature coefficient in parts per million per degree centigrade.

Figure 13 MIL-STD capacitor color code marking STD-C2

APPENDIX I
REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
SC5l80-90-CL-N49	Tool Kit, Telephone Terminal TE-123:(NSN 5180-00-408-1881) (LIN W57253).
TM 11-5540	Electric Light Assembly MX-1292/PAQ (NSN 6695-00-378-5449).
TM 11-5805-201-12	Operator's and Organizational Maintenance Manual for Telephone Set TA-312/PT (NSN 5805-00-543-0012).
TM 11-5805-247-12	Operator's and Organizational. Maintenance Manual: Converter, Telegraph-Telephone Signal TA-182/U (NSN 5805-00-263-3326).
TM 11-6625-218-12	Organizational Maintenance Manual: Frequency Meter AN/TSM-16.
TM 11-6625-251-15	Organizational, Direct Support, General Support, and Depot Maintenance Manual for Test Set TS-140 PCM. Signal Generators SG-15/PCM, and SG-15A/PCM, and Decibel Meters ME-22/PCM and ME-22A/PCM.
TM 11-6625-274-12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, V-7A/U,TV-7B/U (NSN 6625-00-376-4939), and TV-7D/U (6625-00-820-0064).
TM 11-6625-302-15	Operator's Organizational, Direct Support, General Support, and Depot Maintenance Manual: Test Sets TS-190/U and TS-190A/U (NSN 6625-00-553-0932).
TM 11-6625-366-10	Operator's Manual for Multimeter, TS-352B/U (NSN 6625-00-553-0l12).
TM 11-6625-366-15	Operator's Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS 352B/U (NSN 6625-00-553-0l12).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

All data on pages 41 through 50 are deleted.

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For explanation of abbreviations used see AR 320-50.

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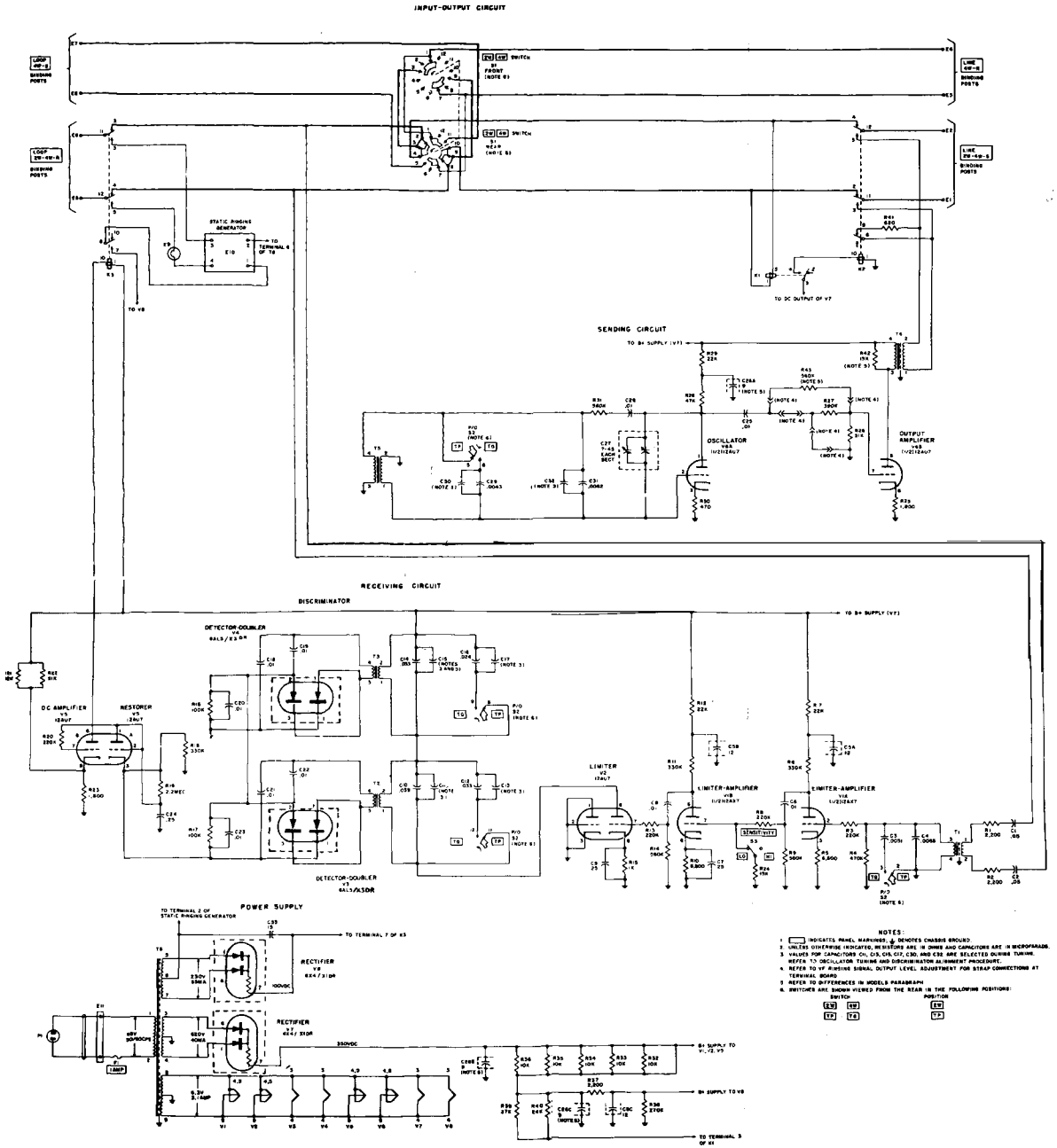

Figure 1. Converter, Telegraph-Telephone Signal TA-182/U, schematic diagram.

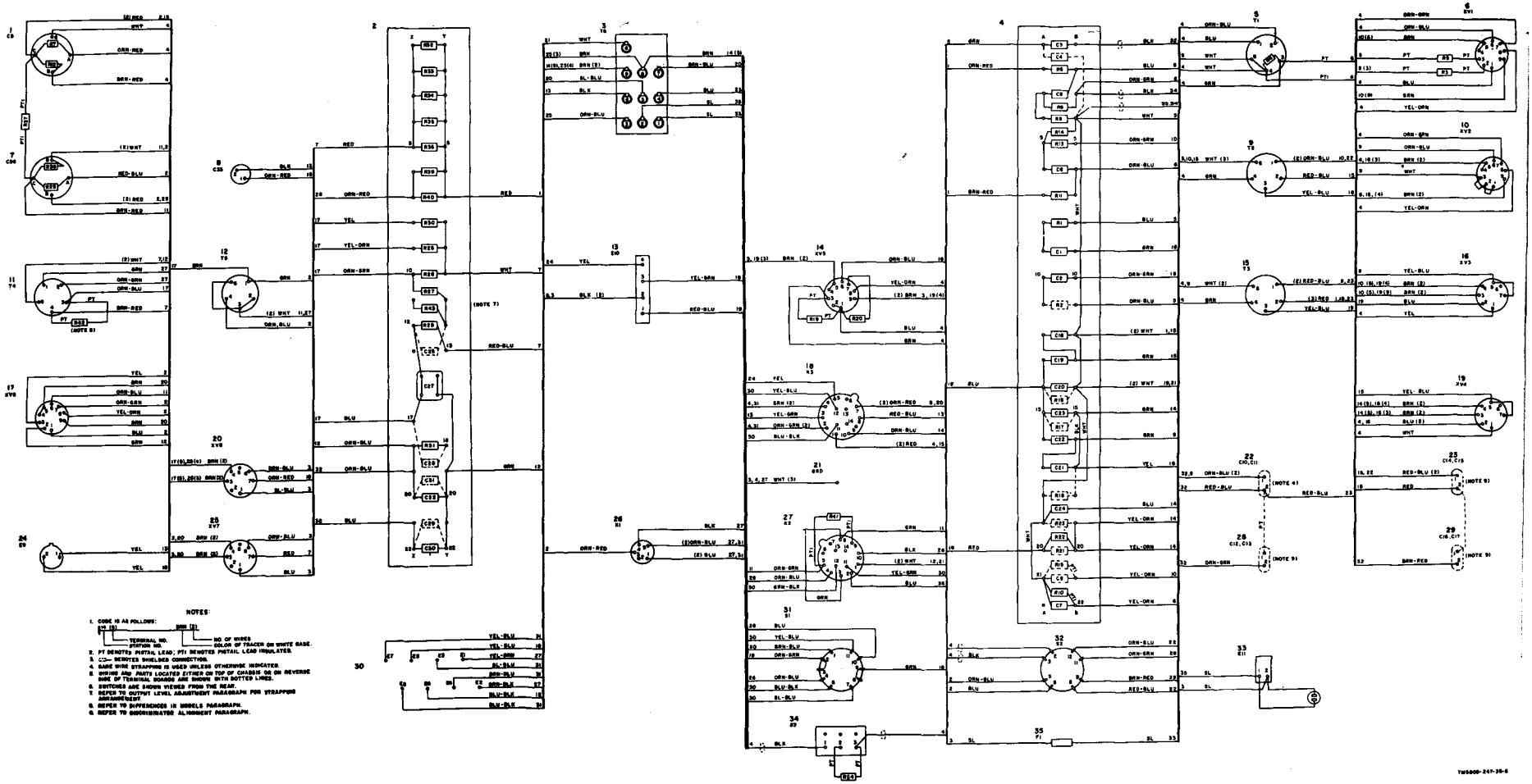

Figure 6. Converter, Telegraph-Telephone Signal TA-182/U, wiring diagram.

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