TM 11-6625-648-45

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

GS AND DEPOT MAINTENANCE MANUAL

TEST SET, TELEPHONE AN/PTM-7

This copy is a reprint which includes current pages from Changes 1 through 4.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1967

WARNING

Up to 1,100 volts may be encountered when using Test Set, Telephone AN/PTM-7.

USE EXTREME CAUTION

DON'T TAKE CHANCES!

CAUTION

This equipment is transistorized. Do not make resistance measurements. Do not make voltage measurements without first consulting the maintenance section of this manual.

CHANGE No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 5 *January* 1982

General Support and Depot Maintenance Manual

TEST SET, TELEPHONE AN/PTM-7 (NSN 6625-00-902-7574)

TM 11-6625-648-45, 9 January 1967, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
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Remove	*Insert*
None	a and b
i and ii	i and ii
1-1	1-1/(1-2 blank)
2-7 through 2-10	2-7 through 2-10
3-5 and 3-6	3-5 and 3-6
4-5 and 4-6	4-5 and 4-6
A-1 and A-2	A-1 and A-2

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CHANGE No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
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General Support and Depot Maintenance Manual
TEST SET, TELEPHONE AN/PTM-7
(NSN 6625-00-902-7574)

TM 11-6625-648-45, 9 January 1967, is changed as follows:

1. Remove old pages and insert new pages as indicated below.
2. New or changed material is indicated by a vertical bar in the margin of the page.

Remove	*Insert*
i and ii	i and ii
3-5 and 3-6	3-5 and 3-6
4-1 and 4-2	4-1 and 4-2
4-13 through 4-18	4-l3 through 4-l8

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USARMIS (1)
USAERDAA (1)
USAERDAW (1)
Ft Gordon (10)
Ft Carson (5)
Ft Gillem (10)
Ft Richardson (CERCOM Oft) (2)
Army Dep (1) except
SAAD (30)
TOAD (14)
SHAD (2)
USA Dep (1)
Sig Sec USA Dep (1)
Units org under fol TOE:
29-207 (2)
29-610 (2)

NG: None
USAR: None

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

WARNING

Do not service or adjust alone.

Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

WARNING

A periodic review of safety precautions in TB 385-4, Safety Precautions for Maintenance of Electrical/Electronic Equipment, is recommended. When the equipment is operated with covers removed, DO NOT TOUCH exposed connections or components. MAKE CERTAIN you are not grounded when making connections or adjusting components inside the test instrument.

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

1 DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

2 IF POSSIBLE , TURN OFF THE ELECTRICAL POWER

3 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

4 SEND FOR HELP AS SOON AS POSSIBLE

5 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

TECHNICAL Manual
No. 11-6625-648-45

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *9 January 1967*

GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL
TEST SET, TELEPHONE AN/PTM-7
(NSN 6625-00-902-7574)

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, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, New Jersey 07703.

In either case, a reply will be furnished direct to you.

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LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

1-1. Scope.

This manual covers general support and depot maintenance for Test Set, Telephone AN/PTM-7. It includes instructions for troubleshooting, testing, and repair and overhaul of the equipment. It also lists materials and test equipment required for general support maintenance and functioning of the equipment. The complete technical instructions for this equipment include TM 11-6625-648-12.

1-2. Index of Technical 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.

1-3. 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 TM 38-750, The Army Maintenance Management System.

*b. Report of Packaging and Handling Deficiencies.*Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMAT-INST 4355.73/AFR 400-54/MCO 4430.3E.

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/NAVSUP-INST 4610.33B/AFR 75-18/NCO P4610.19C/DLAR 4500.15.

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your AN/PTM-7 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. Tell us why a procedure is hard to perform. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command, ATTN: DRSEL-ME-MQ Fort Monmouth, New Jersey 07703. We'll send you a reply.

1-5. Administrative Storage

Administrative storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment of shipment or limited storage are covered in TM 11-6625-648-12, paragraphs 5-1 and 5-2.

1-6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

CHAPTER 2

FUNCTIONING

Section I. BLOCK DIAGRAM ANALYSIS

2-1. General

Test Set, Telephone AN/PTM-7 is used by linemen to perform field testing on the cable links that connect between Multiplexer TD–204/U. The purpose, operation, and interoperation of the various circuits in the AN/PTM-7 are explained in this chapter. Familiarity with the equipment, how it works, and why it works that way are valuable tools in troubleshooting the equipment rapidly and effectively. The block diagram analyses of the circuits are presented in paragraphs 2-2 and 2-3 below, and the detailed circuit analyses are presented in paragraphs 2-4 and 2-5.

2-2. Order-Wire Circuits
(A, fig. 5-6)

a. Order-Wire Signal Circuit.

(1) For signaling, ORDERWIRE switch S7 is momentarily set to SIG. Oscillator Q4 generates a 1,600-cycle-per-second (cps) output which is applied through part of switch S7 to the signal amplifier. The amplified signal is routed through part of ORDERWIRE switch S7 and part of DIRECTION switch S2 to EMERGENCY OW terminals 13 and 11, and connectors 1 and 8.

(2) Received 1,600-cps order-wire signals are applied through EMERGENCY OW terminals 11 and 13, connector 1 or connector 8, through part of DIRECTION switch S2, part of ORDERWIRE switch S7, through hybrid transformer T4 to the input of the receiver amplifier. The amplified and equalized signal is applied to HEADSET terminal J11A and to the input of the signal detector. The signal detector detects the 1,600-cps tone and causes buzzer DS1 to sound and CALL lamp DS2 to light.

b. Order-Wire Talk Circuit. ORDERWIRE switch S7 is set to TALK. Voice signals are applied through HEADSET connector J11C, part of ORDERWIRE switch S7, part of METER SELECT switch S3, to the input of the transmitter amplifier. The amplified signal is routed through part of METER SELECT switch S3, hybrid transformer T4 part of ORDERWIRE switch S7, and through part of DIRECTION switch S2, to EMERGENCY OW terminals 11 and 13, and to connectors 1 and 8. Received voice signals from EMERGENCY OW terminals 11 and 13, connector 1 or connector 8 are routed through part of DIRECTION switch S2, part of ORDERWIRE switch S7, and hybrid transformer T4 to receiver amplifier Q12, Q13, and Q14. The amplified output of the receiver amplifier is connected through J11A to Headset Microphone H-91A/U. Incoming signals will be received with ORDERWIRE switch S7 at either TALK or OFF.

c. Order-Wire Off Circuit. ORDERWIRE switch S7 is set to OFF. The audio signal is applied through EMERGENCY OW terminals 11 and 13, or connectors 1 and 8 through part of DIRECTION switch S2, part of ORDERWIRE switch S7 and hybrid transformer T4, to the input of the receiver amplifier. The amplified and equalized input signal is applied to HEADSET terminal J11A. Also, the audio signal is direct-coupled from one cable input to the other, through part of ORDERWIRE switch S7 and part of DIRECTION switch S2.

2-3. Test Circuits
(fig. 5-6)

a. Battery Test (C, fig. 5-6). To test the battery voltage, METER SELECT switch S3 is held at BATTERY with BATTERY POWER switch S8 pulled out. Voltage is applied through BATTERY POWER switch S8 and part of METER SELECT switch S3 to TEST METER M1.

b. Probe Test (B, fig. 5-6). METER SELECT switch S3 is set to PROBE and pulse code modulation (pcm) pulses picked up by the pcm probe, are applied through PROBE connector J12 and part of METER SELECT switch S3 to the input of the pcm detector. The pcm detector amplifies and detects the input signal. The output of the pcm detector is applied to TEST METER M1 through part of METER SELECT switch S3.

c. Dc Volts Test (C, fig. 5-6). With METER SELECT switch S3 set to DC VOLTS, cable voltage from connector 1 or 8 (depending on the position of DIRECTION switch S2) is applied through part of DIRECTION switch S2 through the meter circuits and part of METER SELECT switch S3 to TEST METER M1.

d. Dc Ampere Test (C, fig. 5-6). With METER SELECT switch S3 set to DC AMPS, cable current from connector 1 or 8 (depending on the position of DIRECTION switch S2) is applied through part of DIRECTION switch S2, through the meter circuits and part of METER SELECT switch S3 to TEST METER M1.

e. Volt Drop Test (C, fig. 5-6). With METER SELECT switch S3 set to VOLT DROP, a portion of the cable voltage from connector 1 or 8 (depending on the position of DIRECTION switch S2) is applied through part of DIRECTION switch S2, through the meter circuits and part of METER SELECT switch S3 to TEST METER M1.

f. Pcm In Test (C, fig. 5-6). With METER SELECT switch S3 set to PCM IN, pcm signals from connector 1 or 8 (depending on the position of DIRECTION switch S2) are applied through part of DIRECTION switch S2 through the meter circuits and part of METER SELECT switch S3 to the input of the pcm detector. The pcm detector amplifies and shapes the input signal. The output of the pcm detector is routed to TEST METER Ml through part of METER SELECT switch S3.

g. Pcm Out Test (C, fig. 5-6). With METER SELECT switch S3 set to PCM OUT, pcm signals from connector 2 or 7 (depending on the position of DIRECTION switch S2) are applied through OPERATION switch S1, part of DIRECTION switch S2, through the meter circuits and part of METER SELECT switch S3, to the input of the pcm detector. The pcm detector amplifies and shapes the input signal. The output of the pcm detector is routed to TEST METER M1 through part of METER SELECT switch S3.

h. Loop-Back Test (C, fig. 5-6).

(1) OPERATION switch S1 is operated to LOOP BACK. Pcm signals and direct-current (dc) cable current applied to connector 1 are routed through part of DIRECTION switch S2 to connector 3 From connector 3, the pcm signals and dc cable current are applied through the AR repeater of the TD-206/G to connector 5, OPERATION switch S1, and connector 2.

(2) In the opposite direction, pcm signals and dc cable current applied to connector 8 are applied through part of DIRECTION switch S2 to connector 6. From connector 6, the pcm signals and dc cable current are applied through the BA repeater of the TD–206/G to connector 4, OPERATION switch S1, and connector 7.

i. Bridge Test (D, fig. 5-6).

(1) When measuring the resistance of a suspected shorted cable, METER SELECT switch S3 is set to BRIDGE and CAP-RES switch S4 is set to RES. READ switch S5 connects the cable resistance at connectors 9 and 10 or terminal 14 to the bridge circuit. A reference voltage is applied through CAP-RES switch S4 and READ switch S5 to the bridge circuit, where voltage drops across known and unknown resistances are balanced. TEST METER M1 is connected to the bridge circuit through part of METER SELECT switch S3.

(2) When measuring the capacitance of an open cable, CAP-RES switch S4 is set to CAP; READ switch S5 connects the cable capacitance at connectors 9 and 10 or terminal 14 of the bridge circuit. The 1,600-cps output of oscillator Q4 is applied to the transmitter amplifier, where it is amplified and applied to the bridge circuit through part of METER SELECT switch S3. TEST METER M1 is connected to the bridge circuit through part of METER SELECT switch S3.

Section II. CIRCUIT ANALYSIS

2-4. Order-Wire Circuits
(fig. 5-7)

The order-wire circuits in the AN/PTM-7 provide the capability of connecting to the order wire in both directions while maintaining continuity through the link. Figures 2-1 and 2-2 are simplified schematic diagrams showing the connections made and the basic circuits involved when connections are made at a cable junction or when they are made at a TD–206/G location. The complete circuit schematic diagram is shown in figure 5–7.

a. Order-Wire Signal Circuits. Order-wire signaling from the AN/PTM–7 is accomplished by momentarily operating ORDERWIRE switch S7 to SIG. This connects a 1,600-cps tone to the cable link through connectors 3 and 6, or through EMERGENCY OW terminals 11 and 13 (E1 and E3). The tone is generated in oscillator Q4 (panel 8A1) and amplified in signal amplifier Q9, Q10, and Q11 (panel 8A3).

(1) Transistor Q4 and its associated circuits form a tickler coil oscillator. Transformer T1 and capacitor C12 determine the operating frequency, and resistor R14 determines the oscillator gain. Resistor R28 limits emitter current, and capacitor C21 is a decoupling capacitor. The output of the oscillator is a 1,600-cps signal taken from the secondary circuit of transformer T1, which is routed through current-limiting resistor R15 and contacts 8 and 5 of ORDERWIRE switch S7B (in SIG position) to the input of signal amplifier Q9, Q10, and Q11 through coupling circuit C52 and R44.

(2) Transistors Q9, Q10, and Q11 form a three-stage, direct-coupled amplifier. Collector voltage (-7.5 volts) is supplied through contacts 9 and 12 of S7B in the SIG position, and emitter voltage (+4.5 volts) is applied through contacts 9 and 12 of S7A in the SIG position. Transistor Q9 is a resistance-capacitance (rc)-coupled amplifier. Resistors R47 and R48 provide the collector load, and resistor R50 and capacitor C38 provide emitter bias. Resistor R49 limits emitter current. Transistor Q10 and resistor R52 form an emitter follower with the output applied to the base of transistor Q11, which is a power amplifier. Two balanced outputs are taken from the secondary of transformer T3 and are routed through the contacts of ORDERWIRE switch S7A, capacitors C7 and C8, and filters L1 and L2 to connectors 3 and 6 (J3 and J6); or through capacitors C1 and C2 to EMERGENCY OW terminals 1 and 3.

b. Order-Wire Recieve Circuits. Incoming order-wire voice and signaling frequencies can be received with ORDERWIRE switch S7 at either TALK or OFF. The signals are received through connector 1 or 8, or through EMERGENCY OW terminal 1 or 3, through filter circuit L1, C2, and C1 or L2, C7, and C8 and the contacts of ORDERWIRE switch S7 to the primary of hybrid transformer T4. The incoming signals are amplified in receiver amplifier Q12, Q13, and Q14 and routed to HEADSET receptacle J11 and the input of the signal detector circuit on panel 8A1. The signal detector detects the 1,600-cps signaling tone, operates buzzer DS1 and lights CALL indicator DS2.

(1) The received signals from hybrid transformer T4 are passed through low-pass filter network FL1, R55, R57, and R58, which removes any pcm or other high-frequency components, to a compressor circuit consisting of diodes CR14 through CR17, resistors R60, R61, and R62, and capacitors C39 and C40.

(2) The input signal level may vary between 300 millivolts (mv) and 16 volts alternating current (ac). When the input signal is less than 1.2 volts ac, the signal is applied direct to the base of transistor Q12 through resistor R62 and coupling circuit C41 and R63. When the input signal exceeds 1.2 volts ac, diodes CR14 and CR15 conduct, charging capacitors C39 and C40 through load resistors R60 and R61. At the same time, the charging voltage provides current through diodes CR16 and CR17 which is in direct proportion to the input signal level to diodes CR14 and CR15. An increase in current

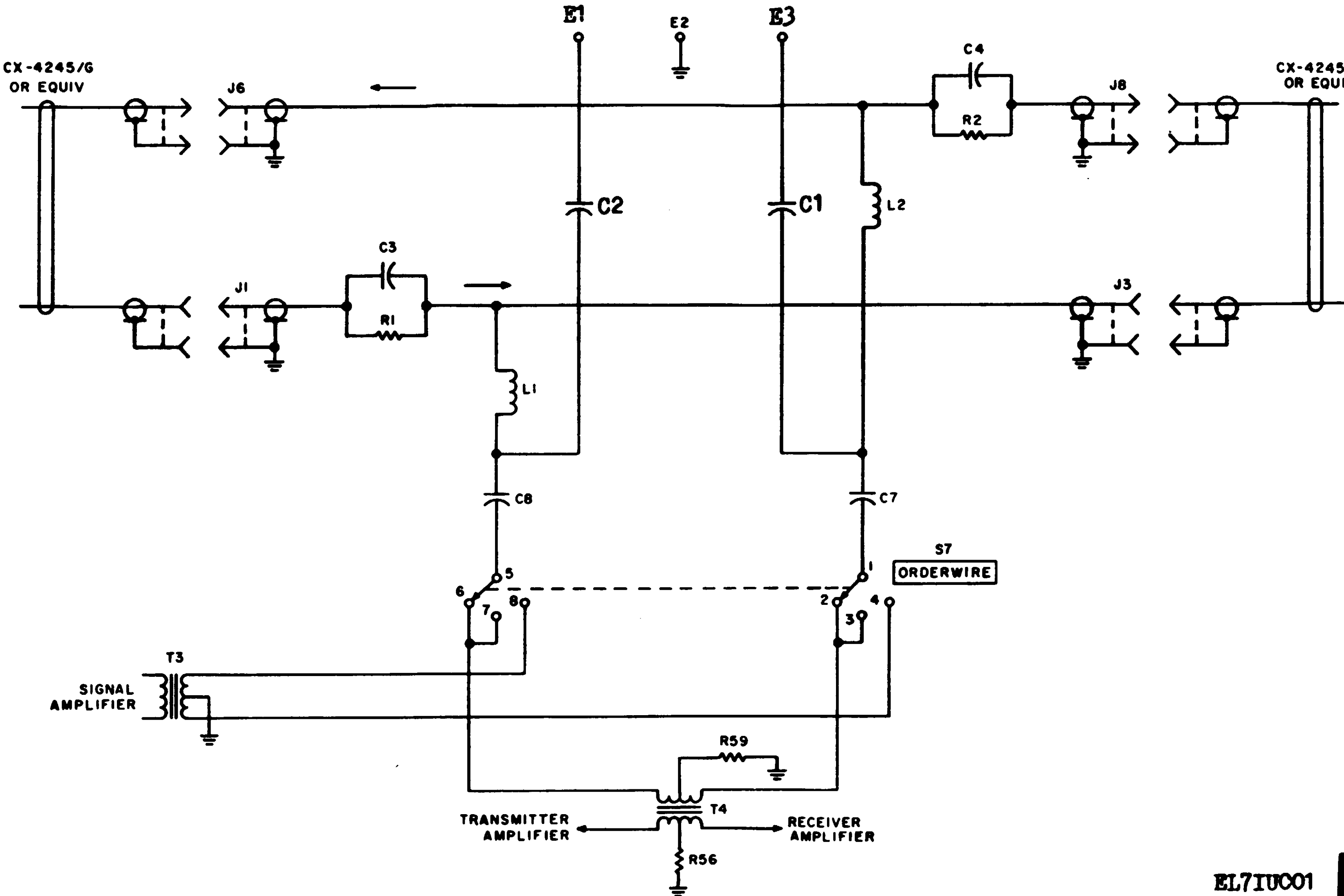


Figure 2–1. Order wire connections [illegible] able junction, simplified schematic diagram.

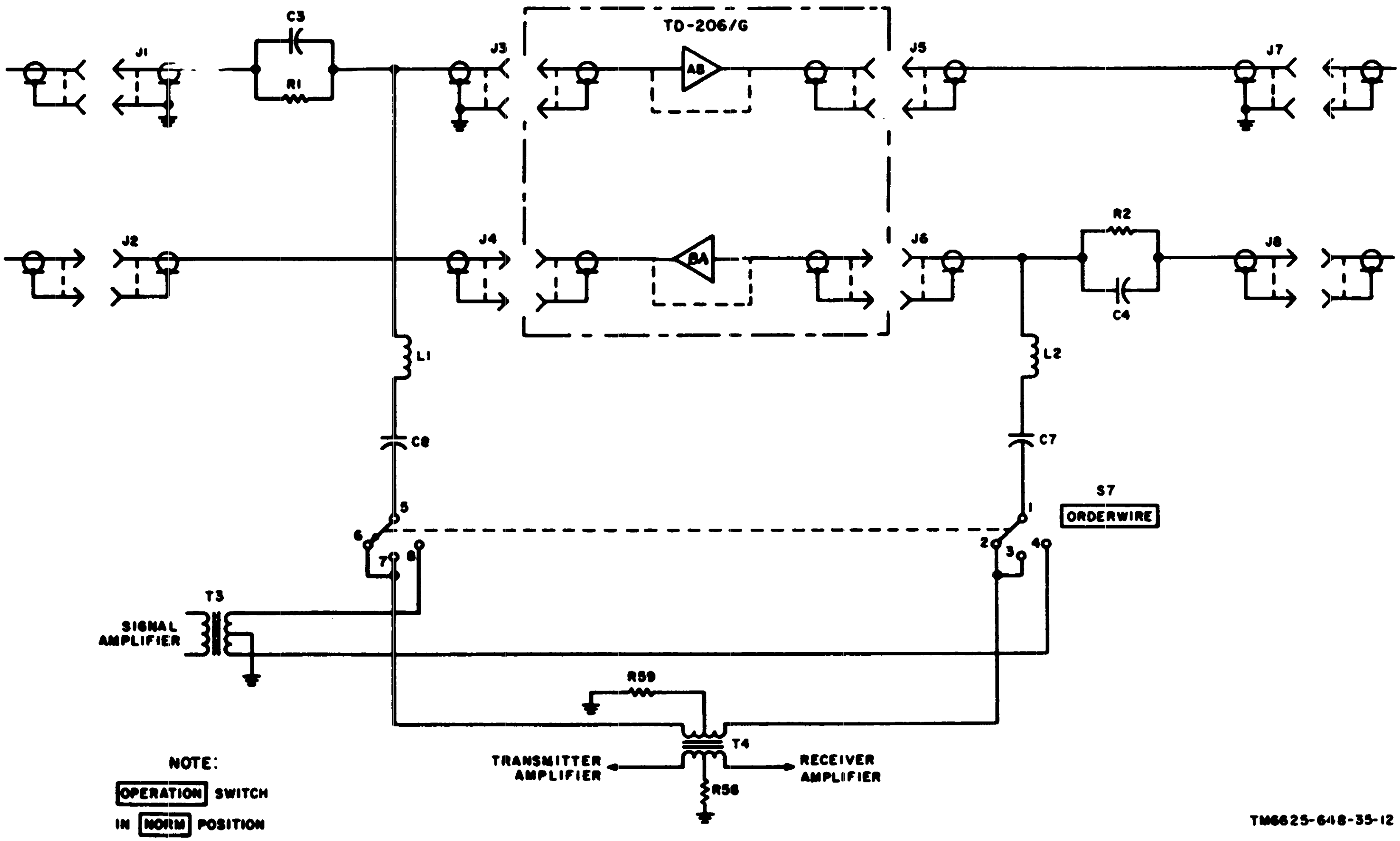


Figure 2-2. Order wire connections at TD-206/G location, simplified schematic diagram.

causes a decrease in the ac impedance, which reduces the signal level applied to the base of transistor Q12. A decrease in current causes an increase in the ac impedance, which increases the signal level applied to the base of transistor Q12.

(3) Transistor Q12 is a buffer which provides its output to the base of transistor Q13 through coupling capacitor C42. Resistor R64 develops the output signal of transistor Q12. Capacitor C41 and resistor R63 provide coupling to the base of transistor Q13.

(4) Transistor Q13 provides an amplified and inverted replica of its input signal to the base of transistor Q14. Resistors R67 and R66 determine the ac voltage gain of transistor Q13, and resistor R69 determines the dc operating level for transistor Q13. Capacitor C43 passes undesired ac components to ground. Transistor Q14 and resistors R70 and R71 form an emitter-follower which provides its output through dc-blocking capacitor C44 to HEADSET connector J11A and to the input of the signal detector.

(5) The signal detector is a four-stage amplifier consisting of transistors Q5 through Q8. Transistor Q5 amplifies the input signal, resistor R31 establishes the gain of transistor Q5, and capacitors C33 and C34 filter the dc voltage. Resistor R29 is the base bias resistor and resistor R30 establishes the operating voltage level. The amplified and inverted output of transistor Q5 is taken from its collector and applied through dc-blocking capacitor C22, where it is divided into three branches.

(6) One branch is applied to the base of transistor Q6 through coupling capacitor C13 and a tuned circuit composed of inductor L7 and capacitor C14. The tuned circuit resonates at 1,600 cps, providing an input to the base of buffer transistor Q6.

(7) Another branch is applied to a tuned circuit composed of inductor L8 and capacitor C23, which also resonates at 1,600 cps. The outputs of the two tuned circuits combine, increasing the selectivity so that only a very narrow band of frequencies, centered at 1,600 cps, are applied to the primary of transformer T2.

(8) The third branch is applied direct to the primary of transformer T2 where signals not at 1,600 cps are sharply attenuated. These 1,600-cps signals are induced into the secondary of transformer T2, which applies them to a rectifier network consisting of diodes CR10 and CR11 and capacitors C24 and C25.

(9) Transistor Q7 is normally cut off, with its base held slightly positive by diodes CR12 and CR13, resistor R33, and capacitors C26, C35, and C36. When transistor Q6 conducts, a 1,600-cps signal, 180° out of phase with the signal across the output of transformer T2 is developed across resistor R16 and is applied through coupling capacitor C15 to the junction of diodes CR12 and CR13.

(10) When the signal rises in a positive direction, it is clamped to ground by diode CR12. At the same time, the negative-going signal is rectified by diode CR10. It also charges capacitor C24, and applies a negative potential to the base of transistor Q7 through load resistor R33.

(11) When the signal falls in a negative direction at the junction of diodes CR12 and CR13, diode CR13 rectifies the signal, applying it through load resistor R33 to the base of transistor Q7, thereby maintaining the negative potential. At the same time, the positive-going signal at the junction of diodes CR10 and CR11 reverse-biases diode CR11.

(12) With a negative voltage at its base, switch transistor Q7 conducts. The emitter output of transistor Q7 is applied to switch transistor Q8, which conducts, closing relay K1. Resistor R37 protects transistor Q8 against surges of collector current. For transistor Q7, resistor R32 provides the normal base bias and resistor R36 limits the current drawn. Capacitor C27 allows ac components to pass to ground. Resistor R34 establishes the collector-to-emitter voltage for transistor Q7.

(13) Closing relay K1 causes CALL lamp DS2

to become illuminated. Buzzer DS1 sounds if BUZZER switch S6 is operated to ON. Operating BUZZER switch S6 to OFF; causes buzzer DS1 to be silenced.

c. Order-Wire Send Circuit.

(1) With ORDERWIRE switch S7 at TALK, voice signals are applied through HEADSET connector J11C and terminals 1 and 2 of switch S7B to terminals 5 through 11 of METER SELECT switch S3D (rear). In all positions of the METER SELECT switch, except BRIDGE, the audio signal is applied to the input of the transmitter amplifier.

(2) The transmitter amplifier is a four-stage amplifier consisting of transistors Q15 through Q19. The input signal is applied across resistor R72 to the base of transistor Q15. Emitter bias for Q15 is supplied by resistor R77 and capacitor C47, and amplifier gain is determined by resistor R76. Resistor R74 is the collector load and resistor R75 and capacitor C45 provide decoupling. Transistor Q16 and resistors R78, R79, and R80 form a voltage amplifier which is re-coupled to the base of transistor Q17 through capacitor C48 and resistor R82.

(3) Transistor Q17 applies the amplified signal through load resistor R83 to the primary of transformer T5. The two secondary outputs of transformer T5 are applied to the bases of transistors Q18 and Q19 which are connected as a push-pull class B amplifier through network resistors R85 through R88. The outputs of transistors Q18 and Q19 are combined in the primary of transformer T6. Degenerative feedback is supplied from the secondary of transformer T6 through resistors R89, R90, and R91, and coupling capacitor C50 to emitter resistor R84 of transistor Q17.

(4) The secondary output of transformer T6 is applied through the contacts of METER SELECT switch S3A, S3B, S3C, and S3D (front sections) to the input of hybrid transformer T4. The output of transformer T4 is connected through contacts 2 and 6 of ORDERWIRE switch S7A, through capacitors C7 and C8, and inductors L1 and L2 to connectors 3 and 6, and through capacitors C1 and C2 to EMERGENCY OW terminals 1 and 3.

2-5. Test Circuits

a. Battery Test. With METER SELECT switch S3 held at BATTERY and with BATTERY POWER switch S8 pulled out, -7.5 volts dc is applied through switch S8A and contacts 10 and 8 of switch S3E to the junction of precision resistors R8 and R9. The +4.5-volt end of the battery supply is connected through switch S8B to resistor R8 and through contacts 11 and 7 of switch S3A to TEST METER M1. Resistor R9 is connected through contacts 1 and 9 of switch S3B to the negative side of TEST METER M1 which indicates the total battery voltage (7 volts or greater).

b. Probe Test.

(1) Pcm signals picked up through Lead, Test CX-10355/PTM-7 (pcm probe) are applied through PROBE connector J12 and pins 4 and 11 of switch S3C (in PROBE position) to the input of the pcm detector.

(2) The pcm detector consists of a three-stage, high-frequency amplifier composed of transistors Q1, Q2, and Q3 and their associated circuits, and a bridge detector composed of diodes CR1 through CR4, resistors R11 and R12, and capacitors C9 and C10. The input circuit of transistor Q1 is a low Q tuned circuit consisting of resistor R38, capacitor C28, and inductor L5. Resistor R18 is the collector load for transistor Q1, and resistor R40 provides bias. The output of transistor Q1 is coupled through capicitor C17 and resistor R19 to the base of transistor Q2.

(3) Transistor Q2 is a tuned collector amplifier. Inductor L6 and capicitor C18 form a tuned circuit resonant at 2,304 kilocycles (kc), and providing the collector load. The output of the tuned circuit is applied through coupling capacitor C19 and resistor R22 to the base of transistor Q3. Transistor Q3 reamplifies the signal and applies the output through coupling capacitor C11 to a meter detector consisting of diodes CR1 through CR4. The detected output is filtered through resistors R11 and R12 and capacitors C9 and C10.

The filtered output passes through contacts 12 and 7 of switch S3A and contacts 9 and 2 of switch S3B to TEST METER M1, which indicates the pcm level.

c. Dc Volts Test.

(1) Switch S3 is set to DC Volts with DIRECTION switch S2 set to AB. Cable voltage is applied through connector 1, through switch S2B, and through high-frequency compensating inductor L3 to resistors R3 and R10, where the meter current is developed. From resistor R10, the current is applied through pins 1 and 7 of switch S3A through TEST METER M1. The return of TEST METER M1 is through pins 9 and 3 of switch S3B to resistor R93 and ground.

(2) With switch S2 to BA, the cable current is applied through connector 8 to switch S2B. The direction of flow is then the same as that described in (1) above.

d. Dc Ampere Test.

(1) Switch S3 is set to DC AMPS, With switch S2 set to AB, cable current is applied through connector 1 and switch S2B. The cable current is applied to a high-frequency- and low-frequency-separation network composed of inductor L1, capacitor C3, and resistor R1.

(2) Inductor L1 offers little loss to low frequencies, and capacitor C3 offers little loss to high frequencies. Inductor L1 allows the dc components to be passed to the metering circuits; capacitor C3 allows the pcm to be applied to connector 7 through connectors 3 and 5 and switch SIB.

(3) The current is applied through inductor L1 and switch S2A, to contacts 4 and 9 of switch S3B, to TEST METER M1. From TEST METER M1, the return path is through contacts 7 and 2 of switch S3A, through inductor L3 and switch S2B, through resistor R1.

(4) With switch S2 operated to BA, cable current is applied through the AN/PTM-7 as described in (1), (2), and (3) above, except that the cable current is applied to connector 8, and the output is applied to a high-frequency- and low-frequency-separation network composed of inductor L2, capacitor C4, and resistor R2. The high-frequency output of capacitor C4 is applied to connector 2 through connectors 6 and 4, and switch S1A.

e. Volt Drop Test.

(1) Switch S3 is set to VOLT DROP. With switch S2 set to AB, the cable voltage follows the same path as the cable current described in d(1) and (2) above.

(2) The cable voltage is applied through inductor L1, through switch S2A and through contacts 3 and 7 of switch S3A, to TEST METER M1. The return path from TEST METER M1 is through contacts 9 and 5 of switch S3B, through load resistor R4 and inductor L4, and through switch S2C and S1B to connector J7.

(3) With switch S2 set to BA, cable voltage is applied through the AN/PTM-7 as described in (1) and (2) above, except that the cable voltage is applied to connector 8, and the output is applied to a high-frequency- and low-frequency-separation network composed of inductor L2, capacitor C4, and resistor R2. The high-frequency output of capacitor C4 is applied to connector J2 through connectors 6 and 4 and switch S1A.

f. Pcm In Test.

(1) Switch S3 is set to PCM IN. With switch S2 set to AB, pcm applied to connector 1 and switch S2B is applied through the high-frequency- and low-frequency-separation network composed of inductor L1, capacitor C3 and Resistor R1 (d(2) above). Diode CR20 and CR21 protect the meter circuits from high voltage surges.

(2) The pcm is also applied though coupling capacitor C6 and load resistor R7, through contacts 8 and 11 of switch S3C, to the input of the pcm detector.

(3) The operation of the pcm detector is described in *b* above. The positive-going output is applied through load resistor R11 which charges capacitor C9; the output is applied through contacts 5 and 7 of switch S3A to TEST METER M1. The return path from TEST METER M1 is through contacts 9 and 6 of switch S3B through resistor R12 to capacitor C10.

(4) The negative-going output of the pcm detector is applied through resistor R12 which charges capacitor C10; the output is applied to contacts 6 and 9 of switch S3B to TEST METER M1. The return path from TEST METER M1 is through contacts 7 and 5 of switch S3A, through resistor R11 to capacitor C9.

(5) With switch S2 set to BA, pcm is applied to connector 8 and switch S2B; most of the pcm is applied through the high-frequency- low-frequency-separation network composed of inductor L2, capacitor C4, and resistor R2 (d(4) above). The path of the pcm through TEST METER M1 is described in (2), (3), and (4) above.

g. Pcm Out Test.

(1) Switch S3 is set to PCM OUT. With switch S2 set to AB, pcm is applied to connector 7 and switch S1B; most of the pcm is applied through connectors 5 and 3, and through the high-frequency- and low-frequency-separation network composed of inductor 1.1, capacitor C3, and resistor R1 (d(2) above). The high-frequency components from capacitor C3 are applied to connector 1.

(2) The remainder of the pcm is applied through switch S2C, through capacitor C5 and voltage-divider resistors R5 and R6, and through contacts 9 and 11 of switch S3C, to the input of the pcm detector. The operation of the pcm detector is described in *b* above.

(3) With switch S2 set to BA, pcm is applied to connector 2 and switch S1A; most of the pcm is applied through connectors 4 and 6, and through a high-frequency- and low-frequency-separation network composed of inductor L2, capacitor C4, and resistor R2. The high-frequency components are applied to connector 8. The remainder of the pcm is applied through switch S2C and TEST METER M1, as described in (2) above.

h. Loop-Back Test.

(1) OPERATION switch S1 is set to LOOP BACK. Pcm and dc cable current applied to connector J1 are routed through switch S2B to connector 3 through a high-frequency- and low-frequency-separation network composed of inductor L1, capacitor C3, and resistor- R1 (d(2) above). From connector 3, the combination of pcm and dc cable current is routed through the AB repeater of the TD-206/G to connector 5, switch S1A, and connector 2.

(2) In the opposite direction, pcm and dc cable current applied to connector 8 are routed through switch S2B to connector 6 through a high-frequency- and low-frequency-separation network composed of inductor L2, capacitor C4, and resistor R2. From connector 6, the combination of the pcm and dc cable current is routed through the BA repeater of the TD-206/G to connector 4, switch S1B, anti connector 7.

i. Bridge Test, Resistance.

(1) Switch S3 is set to BRIDGE. With CAPRES switch S4 set to RES and READ switch S5 depressed, the cable resistance at connectors 9 and 10 or terminal 14 is made available for the measurement in the resistance bridge circuit (fig. 2-3). A potential of + 4.5 volts dc is also applied to the bridge circuit through switch S4C and contacts 2 and 7 of switch S5.

(2) The resistance bridge circuit is a Wheatstone bridge. A balance of the rcsistance bridge is accomplished by varying the resistance of potentiometer R68A until it balances the unknown cable resistance.

(3) The balance of the resistance bridge is applied to opposite sides of a meter detector composed of diodes CR5 through CR8. With no voltage drops across diodes CR5 and CR6, an output is applied through load resistor R94 and through contacts 6 and 7 of the switch S3A to TEST METER M1. The return path is through contacts 9 and 8 of switch S3B to the junction of diodes CR7 and CR8. Diode CR9 protects TEST METER M1 if a dc voltage is inadvertently applied to the cable under test.

j. Bridge Test, Capacitance.

(1) METER SELECT switch S3 is set to

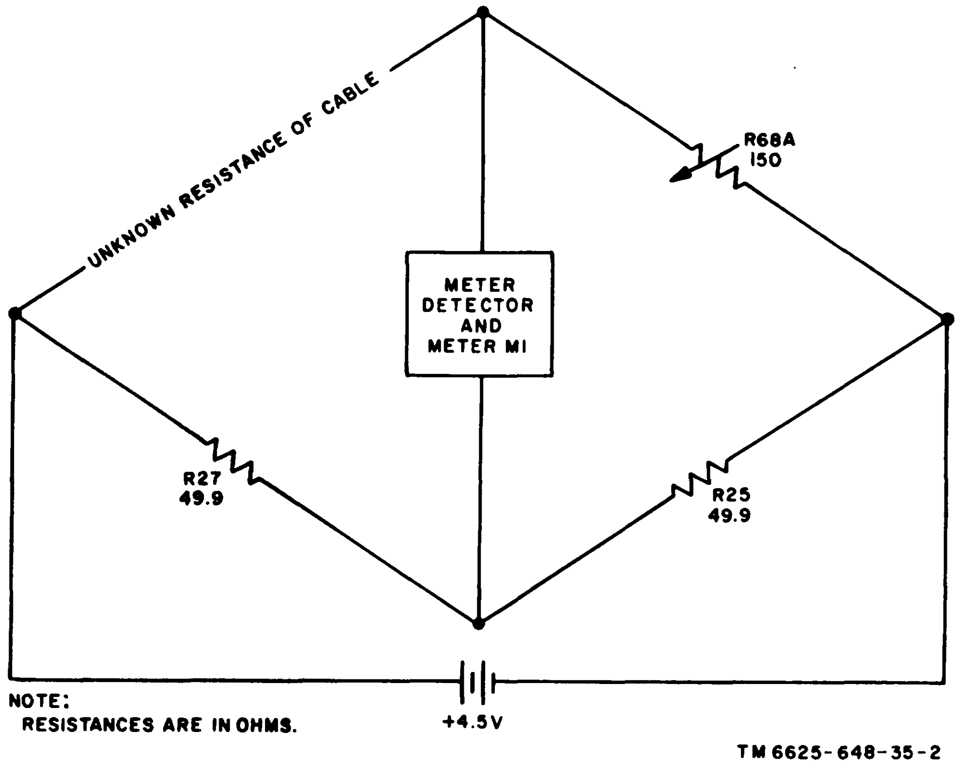


Figure 2-3. Resistance bridge, schematic diagram.

BRIDGE. With CAP-RES switch S4 set to CAP and READ switch S5 depressed, the cable capacitance at connectors 9 and 10 or terminal 14 is made available for measurement in the capacitance bridge circuit (fig. 2-4).

(2) The 1,600-cps output of oscillator Q4 para 2-4a) is applied to the input of the transmitter amplifier (para 2-4b) through contacts 12 and 6 of switch S3D. The output of the transmitter amplifier is applied through contacts 3 and 4 of switch S3D and through contacts 2 and 7 of switch S5 to the input of the capacitance bridge circuit, where the known input frequency is balanced across capacitor C32 and resistor R26 in series, and potentiometer R68B, resistor R42 and the unknown cable capacitance in parallel.

(3) The null output of the capacitance bridge is applied to opposite sides of the meter detector which consists of diodes CR5 through CR8. The null output is applied through load resistor R94 to TEST METER M1 through contacts 6 and 7 of switch S3A. The return path is through contacts 8 and 9 of switch S3B.

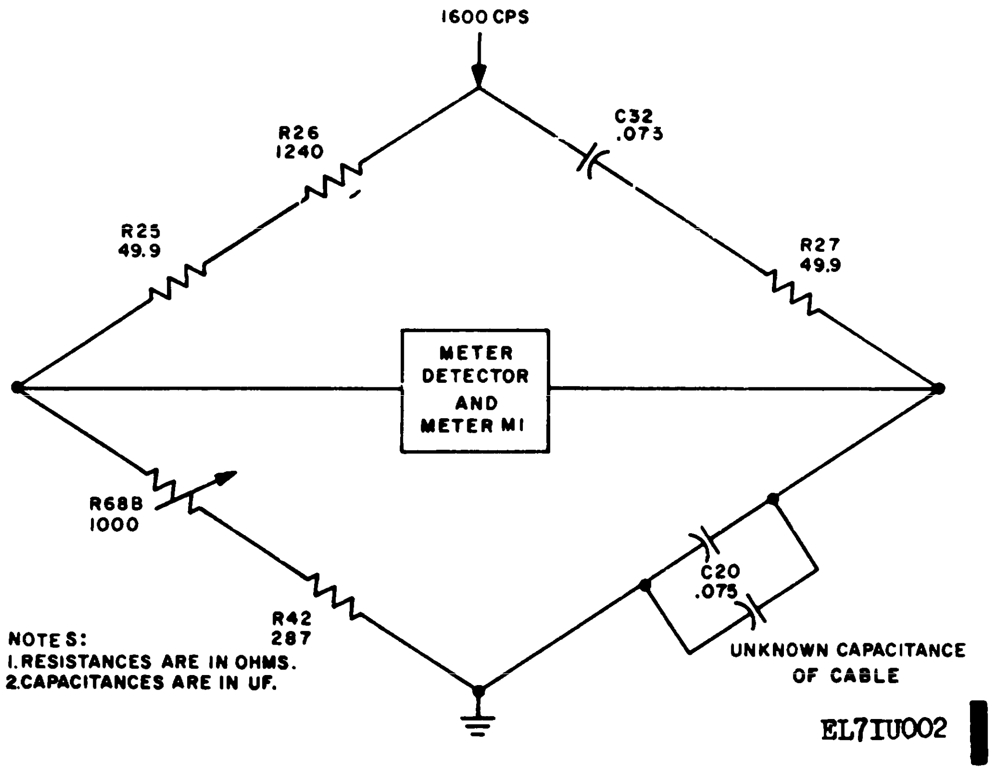


Figure 2-4. Capacitance bridge, schematic diagram.

CHAPTER 3

GENERAL SUPPORT MAINTENANCE

3-1. General

These general support maintenance procedures are not complete as outlined but supplement those described for organizational maintenance (TM 11-6625-648-12). Troubleshooting at general support includes all techniques specified for operational and organizational levels. The systematic troubleshooting procedures, which begin with the operational and sectionalization checks performed at an organizational category, must be completed by further localizing and isolating techniques performed at general support maintenance. Paragraph 3-2 contains general information for troubleshooting.

3-2. Troubleshooting Procedures

a. General. The first step in servicing a defective AN/PTM-7 is to sectionalize the fault, which means tracing the fault to circuits responsible for the trouble. Refer to TM 11-6625-648-12 for sectionalization procedures in the AN/PTM-7. The second step is to localize the fault, which means tracing the fault to the defective stage. The third step, isolation, means tracing the fault to the defective part. Some faults, such as burned-out resistors, can often be detected by sight, smell, or hearing. The majority of faults, however, must be located by checking waveforms and voltages.

b. Sectionalization. If the trouble has not been sectionalized, perform the operator and organizational preventive maintenance checks given in TM 11-6625-648-12.

c. Localization.

(1) *General.* In the troubleshooting chart (para 3-4), procedures are outlined for sectionalizing troubles to a particular type of circuit (signal detector, receiver amplifier, etc.), and for localizing troubles to a stage within the particular type of circuit. When trouble has been localized to a particular stage, use waveform and voltage measurements to isolate the trouble to a particular part and then replace the part. Parts locations are indicated in figures 5-1, 5-2, and 5-3. The schematic diagram, which provides the required waveform presentations, is found in figure 5-7. The wiring diagram is found in figure 5-8.

(2) *Use of chart.* The troubleshooting chart is designed to supplement the troubleshooting chart found in TM 11-6625-646-12. If previous operational checks have resulted in a reference to higher category maintenance, go direct to the referenced item. If no operational symptoms are known, perform the procedures in the troubleshooting chart (TM 11-6625-648-12) until a symptom of trouble appears.

Note. The corrective measures in the troubleshooting charts do not indicate the possibility of defective wiring. When the specified measures do not correct the trouble, the wiring should be checked and any necessary repairs made.

d. Isolation. Use resistor and capacitor color codes (figs. 5-4 and 5-5) to find component values. Compare the waveforms on the schematic diagram with the oscilloscope readings taken. Isolate the defective part by *voltage* measurements at the transistor terminals (*e* below). In all tests, do not overlook the possibility of intermittent troubles. This type of fault may often be located by tapping or jarring the equipment while in operation. Similarly, wiring and connections to the equipment should also be checked.

e. Transistor Terminal Voltages. The transistor terminal voltage readings below were made with a 20,000 ohms-per-volt meter. A measurement that differs widely from those in the chart can, when used with the schematic diagram, often localize the trouble to a specific part.

Note. The voltages measured at the emitter and base terminals of replaced transistors may vary by as much as 15 to 20 percent from the voltages listed below. Collector voltages, however, should not vary by more than 10 percent. Bias (difference voltage from emitter to base) should remain approximately the same.

Voltage to ground

Transistor (all PMP)	Emitter	Collector	Base
Q1	+0.2	–4.4	0
Q2	+0.2	–5.0	0
Q3	+0.2	– 3.5	0

Transistor (all PMP)	Voltage to ground Emitter	Collector	Base
Q4	+ 0.5	– 7.5	o
Q5	+ 0.2	– 7.0	0
Q6	+ 0.3	–7.5	0
Q7	+ 0.3	–7.0	+0.5
Q8	0	– 7.0	+ 0.3
Q9	+ 0.5	– 4.5	+ 0.2
Q10	– 3.7	–7.0	–4.0
Q11	0	– 5.0	o
Q12	+ 0.3	– 7.5	0
Q13	+ 0.3	– 5.0	0
Q14	–4.7	–7.5	– 5.0
Q15	+ 0.3	– 3.0	0
Q16	– 27	– 4.3	– 3.0
Q17	+ 0.3	– 5.5	0
Q18	+4.0	–7.0	+ 3.5
Q19	+4.0	-7.0	+ 3.5

3-3. Test Equipment and Materials Required

The following test equipment and materials should be provided for troubleshooting the AN/PTM-7.

a. Test Equipment.

(1) Multiplexer TD-352/U (2 required).
(2) Multiplexer TD-204/U (2 required).
(3) Oscilloscope AN/USM-140.
(4) Frequency Meter AN/TSM-16.
(5) Signal Generator SG-15/PCM.
(6) Voltmeter, Meter ME-30/U (2 required).
(7) Restorer, Pulse Form TD-206/G.
(8) Microphone, Headset H-91/U (3 required).
(9) Test Set, Transistor TS-1836/U.
(10) Multimeter TS-352/U.

b. Material.

(1) Battery, 1.5-volt, type BA-30 (8 required).
(2) Resistor, 91-ohm, ½-watt, ±5% (8 required).
(3) Resistor, 51-ohm, ½-watt, ±5%.
(4) Capacitor, .05-µf, 20-volt dc, ±1%.
(5) Cable CX-4245/G, ¼-mile reel (8 required).

3-4. Troubleshooting

a. General. The symptoms listed in the troubleshooting chart (*b* below) are based on those listed in the troubleshooting chart in TM 11-6625-648-12. The possible troubles listed indicate defective circuits, stages, or parts that may cause each symptom. The corrective measures listed in the chart indicate methods used to localize the trouble to a defective circuit or stage, or to isolate the trouble to a defective part. Refer to paragraph 3-2 for an explanation of the logic of troubleshooting procedures.

Item No.	Symptom	Probable trouble	Correction
1	With BATTERY POWER switch S8 set to OFF and METER SELECT switch S3 set to BATTERY, TEST METER M1 needle indicates more than 0 volt.	*a.* TEST METER M1 defective . . . *b.* BATTERY POWER switch S8 defective.	*a.* Check TEST METER M1. *b.* Check BATTERY POWER switch S8.
2	With BATTERY POWER switch pulled out and METER SELECT switch S3 set to BATTERY, TEST METER M1 needle indicates less than 8, but more than zero.	*a.* Batteries weak . . . . . *b.* Contacts in battery compartment dirty.	*a.* Check batteries. *b.* Check contacts for dirt.
3	With BATTERY POWER switch S8 pulled out and METER SELECT switch S3 set to BATTERY, TEST METER M1 needle indicates zero.	*a.* Contacts in battery compartment broken. *b.* METER SELECT switch S3 defective.	*a.* Check contacts for continuity. *b.* Check switch S3.
4	With ORDERWIRE switch S7 held at SIG, CALL lamp DS2 becomes illuminated, but buzzer DS1 does not sound.	*a.* Buzzer DS1 defective . . . . *b.* BUZZER switch S6 defective .	*a.* Check buzzer DS1. *b.* Check switch S6.
5	With ORDERWIRE switch S7 held at SIG and BUZZER switch S6 ON, CALL lamp DS2 does not illuminate and buzzer DS1 does not sound.	*a.* Signal detector defective . . . . . *b.* Receiver amplifier defective. *c.* Transformer T3 defective. *d.* Signal amplifier defective.	Proceed to step 6.

Item No.	Symptom	Probable trouble	Correction
		e. ORDERWIRE switch S7 defective. *f.* Transformer T1 or capacitor C12 defective. *g.* Transistor Q4 defective.	
6	Correct voltage level at base of transistor Q8.	*a.* Relay K1 defective *b.* Transistor Q8 defective	*a.* Check relay K1. *b.* Check transistor Q8.
7	Negative voltage at base of transistor Q7; incorrect voltage level at base of transistor Q8.	Transistor Q7 defective	Check transistor Q7.
8	Positive voltage at base of transistor Q7 ac input at junctions of diodes CR10 and CR11, and CR12 and CR13.	*a.* Diodes CR10 through CR13 defective. *b.* Capacitors C24 and C25 defective. *c.* Capacitors C35 and C36 defective. *d.* Resistor R33 defective	*a.* Check diodes CR10 through CR13. *b.* Check capacitors C24 and C25. *c.* Check capacitors C35 and C36. *d.* Check resistor R33.
9	Positive voltage at base of transistor Q7; ac input at junction of diodes CR10 and CR11; no ac input at junction of diodes CR12 and CR13.	*a.* Transistor Q6 defective . . *b.* Capacitor C15 defective . . *c.* Resistor R16 defective	*a.* Check transistor Q6. *b.* Check capacitor C15. *c.* Check resistor R16.
10	Positive voltage at base of transistor Q7; ac input at junction of diodes CR 12 and CR13; no ac input at junction of diodes CR10 and CR11.	Transistor T2 defective	Check transformer T2.
11	Correct waveform at jack J16; no input to primary of transformer T2 and to base of transistor Q6.	*a.* Transformer T2 defective . . . *b.* Collector output of transistor Q5 defective.	*a.* Check transformer T2. *b.* Check transistor Q5.
12	Incorrect waveform at jack J16; correct voltage level at base of transistor Q5.	Transistor Q5 defective	Check transistor Q5.
13	Incorrect voltage level at base of transistor Q5; correct voltage level at emitter of transistor Q13.	Transistor Q14 defective	Check transistor Q14.
14	Incorrect voltage at emitter of transistor Q13; correct voltage level at emitter of transistor Q12.	Transistor Q13 defective	Check transistor Q13.
15	Incorrect voltage level at emitter of transistor Q12; correct waveform at jack J21	Transistor Q12 defective	Check transistor Q12.
16	Ac output at pin 2 of filter FL1; incorrect waveform at jack J21.	*a.* Diodes CR14 through CR17 defective. *b.* Capacitors C39 and C40 defective. *c.* Resistors R60 and R61 defective.	*a.* Check diodes CR14 through CR17. *b.* Check capacitors C39 and C40. *c.* Check resistors R60 and R61.
17	Ac input at pin 1 of filter FL1; no output at pin 2.	Filter FL1 defective.	Check filter FL1.
18	No ac input at pin 1 of filter FL1; correct waveform at E62.	Transformer T4 defective	Check transformer T4.
19	Ac input at primary of transformer T3; no waveform at jack J20.	Transformer T3 defective	Check transformer T3.
20	No ac input at primary of transformer T3; correct waveform at jack J19.	Transistor Q11 defective	Check transistor Q11.
21	Incorrect waveform at jack J19; correct waveform at base of transistor Q9.	Transistor Q10 defective.	Check transistor Q10.

Item No.	Symptom	Probable trouble	Correction
22	Correct waveform at base of transistor Q9; incorrect voltage level at emitter of transistor Q9.	Transistor Q9 defective . . .	Check transistor Q9.
23	No 1,600-cps input at base of transistor Q9.	*a.* ORDERWIRE switch S7 defective. *b.* Transformer T1 defective . *c.* Capacitor C12 defective . . . . *d.* Transistor Q4 defective	*a.* Check switch S7. *b.* Check transformer T1. *c.* Check capacitor C12. *d.* Check transistor Q4.
24	With ORDERWIRE switch S7 set to TALK, there is no output between EMERGENCY OW terminals 11 and 12 when talking into Microphone, Headset H-91A/U; a correct output is available between terminals 12 and 13.	*a.* Capacitor C2 or C8 defective *b.* ORDERWIRE switch S7 defective.	*a.* Check capacitors C2 and C8. *b.* Check switch S7.
25	With ORDERWIRE switch S7 set to TALK, there is no output between EMERGENCY OW terminals 12 and 13 when talking into Microphone, Headset H-91A/U; a correct output is available between terminals 11 and 12.	*a.* Capacitor C1 or C7 defective . . . *b.* ORDERWIRE switch S7 defective.	*a.* Check capacitors C1 and C7. *b.* Check switch S7.
26	With ORDERWIRE switch S7 set to TALK, no output is available between EMERGENCY OW terminals 11 and 12 and between terminals 12 and 13 when talking into H-91A/U.	*a.* Capacitor C2 or C8 defective . . . . *b.* Capacitor C1 or C7 defective . . . . *c.* ORDERWIRE switch S7 defective. *d.* Transformer T4 defective . . . . . . *e.* Receiver amplifier defective . . . . . *f.* Microphone, Headset H-91A/U defective. *g.* Transmitter amplifier defective . .	*a.* Check capacitors C2 and C8. *b.* Check capacitors C1 and C7. *c.* Check switch S7. *d.* See step 18 above. *e.* See steps 13 through 17 above. *f.* Check H-91A/U. *g.* Proceed to step 27.
27	No output at jack J23; ac voltage available between pins 1 and 3 of transformer T6.	Transformer T6 defective	Check transformer T6.
28	Correct waveform at jack J22; no ac voltage available between pins 1 and 3 of transformer T6.	*a.* Transistor Q18 or Q19 defective. *b.* Transformer T5 defective	*a.* Check transistors Q18 and Q19 *b.* Check transformer T5.
29	No waveform at jack J22; correct voltage level at emitter of transistor Q16.	Transistor Q17 defective	Check transistor Q17.
30	Incorrect voltage level at emitter of transistor Q16; connect voltage level at emitter of transistor Q15.	Transistor Q16 defective.	Check transistor Q16.
31	Correct signal at E53; incorrect voltage level at emitter of transistor Q15.	Transistor Q15 defective	Check transistor Q15.
32	Buzzer does not sound and CALL lamp does not illuminate when a 1,600-cps signal is applied to EMERGENCY OW terminals 11 and 13.	*a.* Capacitor C2 or C8 defective. *b.* Capacitor C1 or C7 defective. *c.* ORDERWIRE switch S7 defective. *d.* Transformer T4 defective . . . . *e.* Receiver amplifier defective. . . . . . *f.* Signal detector defective.	*a.* Check capacitors C2 and C8. *b.* Check capacitors C1 and C7. *c.* Check switch S7. *d.* See step 18 above. *e.* See steps 13 through 17 above. *f.* See steps 6 through 12 above.
33	Incorrect waveform between terminals 11 and 12 with ORDERWIRE switch held at SIG.	Same as step 5 above.	Same as step 5 above.

Item No.	Symptom	Probable Trouble	Correction
34	Voltage output between terminals 11 and 12 below 3 volts rms with a 100-MV rms voltage at 1,000 cps applied to terminals C and D of HEADSET connector.	Same as step 26 above	Same as step 26 above
35	Meter output below 2 on TEST METER M1 with pcm probe inserted into lightning arrestor of operating TD-206/G, and METER SELECTOR switch S3 set to PROBE. *Note*. See test setup in figure 4-1	*a.* Switch S3 defective. . . . . *b.* PCM detector defective	*a.* Check switch S3 *b.* Proceed to step 36.
36	Correct waveform at jack J14; meter does not deflect.	*a.* Diode CR1 or CR2 defective *b.* Resistor R11 or capacitor C9 defective. *c.* Diode CR3 or CR4 defective. *d.* Resistor R12 or capacitor C10 defective.	*a.* Check diodes CR1 and CR2. *b.* Check resistor R11 and capacitor C9. *c.* Check diodes CR3 and CR4. *d.* Check resistor R12 and capacitor C10.
37	Incorrect waveform at jack J14; correct waveform at base of transistor Q2.	*a.* Capacitor C11 defective . . . *b.* Transistor Q3 defective	*a.* Check capacitor C11. *b.* Check transistor Q3.
38	Waveform at jack J14 is at wrong frequency.	Capacitor C18 or inductor L6 defective.	Check capacitor C18 and inductor L6
39	Incorrect waveform at base of transistor Q2, correct voltage level at emitter of transistor Q1.		Chink transistor Q2.
40	Incorrect waveform at jack J13; incorrect voltage level at emitter of transistor Q1.	Transistor Q1 defective	Check transistor Q1.
41	With input signal in AB direction, TEST METER needle does not indicate above zero with METER SELECT switch S2 at PCM OUT, with operation switch S1 at LOOP BACK and DIRECTION switch S2 at BA.	*a.* Switch S1 defective *b.* Resistor R1, capacitor C3, or inductor L1 defective. *c.* Switch S2 defective *d.* Switch S3 defective	*a.* Check switch S1. *b.* Check resistor R1 capacitor C3, or inductor L1. *c.* Check switch S2 *d.* Check switch S3
42	With input signal in BA direction, TEST METER needle does not indicate above zero with METER SELECT switch S3 at PCM OUT, with OPERATION switch S1 at LOOP BACK position and DIRECTION switch S2 at AB.	Resistor R2, capacitor C4, or inductor L2 defective.	Check resistor R2, capacitor C4, or inductor L2
43	TEST METER needle does not indicate above zero with METER SELECT switch S2 at PCM OUT with OPERATION switch S1 at NORMAL, and DIRECTION switch S2 at AB.	Same as step 41 above	Same as step 41 above
44	TEST METER needle does not indicate above zero with METER SELECT switch S3 at PCM OUT, with OPERATION switch S1 at NORMAL, and DIRECTION switch S2 at BA.	Same as step 42 above	Same as step 42 above.
45	TEST METER needle does not indicate in green region with METER SELECT switch S3 at VOLT DROP and TD-206/G, connected to AN/PTM-7.	Inductor L4 or resistor R4 defective.	Check inductor L4 and resistor R4.

Item No.	Symptom	Probable trouble	Correction
46	TEST METER needle does not indicate in yellow region with METER SELECT switch S3 at DC AMPS.	*a.* Inductor L3 defective . . . . *b.* Resistor R1 defective	*a.* Check inductor L3. *b.* Check resistor R1.
47	TEST METER needle does not indicate required reading with METER SELECT switch S3 at DC VOLTS.	*a.* Resistor R3 or R10 defective . . . . *b.* Resistor R93 defective	*a.* Check resistors R3 and R10. *b.* Check resistors R93.
48	RES dial does not indicate 2,400 to 2,800 feet with a 51-ohm resistor connected across terminals 14 and 15, with METER SELECT switch at BRIDGE, with READ switch depressed, and with DISTANCE TO FAULT control adjusted for null on TEST METER M1	*a.* Resistors R25 and R27 defective. . . . . *b.* Potentiometer R68A defective . . . . . *c.* Diodes CR5 through CR8 defective. . . *d.* Resistor R94 defcctive	*a.* Check resistors R25 and R27. *b.* Check potentiometer R68A. *c.* Check diodes CR5 and CR8. *d.* Check resistor R94.
49	CAP dial does not indicate 1,600 to 2,000 feet with a .05-µf capacitor connected across terminals 14 and 15, with METER SELECT switch at BRIDGE, and READ switch depressed, and with DISTANCE TO FAULT control adjusted for null on TEST METER M1.	*a.* Resistor R26 or R42 defective . . . . *b.* Potentiometer R68B defective . . . . *c.* Capacitor C32 or C20 defective	*a.* Check resistors R26 and R42. *b.* Check potentiometer R68B. *c.* Check capacitors C32 and C20.

CHAPTER 4
GENERAL SUPPORT TESTING PROCEDURES

4-1. General

a. These testing procedures are prepared for use by General Support Maintenance Shops and Organizations responsible for general support maintenance of electronic equipment to determine the acceptability of repaired electronic equipment. These procedures set forth specific requirements that repaired electronic equipment *must* meet before it is returned to the using organization.

b. Each test depends on the preceding test for certain operating procedures. Comply with the instructions preceding the body of the 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 *Control settings* column, then perform each specific test procedure and check results against its performance. standard.

4-2. Test Equipment and Materials

All test equipment, materials, and other equipment required to perform the testing procedures listed in paragraphs 4-6 through 4-8 are listed in *a* and *b* below. They are authorized under TA 11-17, Signal Field Maintenance Shops, and TA 11-100(11-17), Allowances of Signal Corps Expendable Supplies for Signal Field Maintenance Shop, Continental United states. When test equipment listed in *a* and *b* below is not available, perform the alternate test procedure listed in paragraphs 4-9 through 4-11 using test equipment and materials listed in *c* and *d* below.

a. Test Equipment.

Nomenclature	Federal stock No.	Technical manual
Multiplexer TD-352/U (2 required).	5805-900-8199	TM 11-5805-367-12
Multiplexer TD-204/U (2 required).	5805-900-8200	TM 11-5805-367-12
Restorer, Pulse Form TD-206/G.	5895-868-8078	TM 11-5805-367-12
Microphone, Headset H-91A/U (2 required).	5965-699-6871	TM 11-5965-206-14P
Electric Light Assembly MX-1292/PAQ.	6695-551-4470	TM 11-5540

b. Materials.

Materials	Federal stock No.
Battery, 1.5-volt, type BA-30 (8 required).	6135-120-1020
Resistor, 91-ohm, ½-watt ±5% (8 required).	5905-279-3516
Resistor, 51-ohm, ½-watt, 5%.	5905-279-3517
Capacitor, .05-µf, 100-vdc, ±2%.	5910-686-6927
Cable CX-4245/G (¼-mile reel) (8 required).	5995-868-8160
Cable Assembly, Radio Frequency CG-1040B/U (5 ft) (8 required).	5995-913-0509

c. Test Equipment (Alternate Test Procedure).

Nomenclature	National stock No.	Technical Manual
Oscilloscope, AN/USM-281C.	6625-00-106-9622	TM 11-6625-2658-14
Signal Generator SG-553A (p/o AN/USM-205A).	6625-01-007-4796	TM 11-6625-2644-14
Counter, AN/USM-207A.	6625-00-044-3228	TM 11-6625-700-14-1
Power Supply 0-10±0.01 V.D.C.		

d. Materials (Alternate Test Procedure).

Materials	National stock No.
Battery, 1.5-volt, type BA-30 (8 required).	6135-00-120-1020
Resistor 51-ohm, ½ watt ±5%, Fxd Comp.	5905-00-279-3517
Resistor 100-ohm, ½ watt ±5%, Fxd Com	5905-00-190-8889
Capacitor, 0.5-mf, 100-V.D.C. ±2%	5910-00-686-6927
Cable assembly, CX-10734/G (to be modified per para 4-9).	5995-00-133-9125
Cable assembly, Radio Frequency, CG-1040B/U (5 ft).	5995-00-913-0509
Connector, UG-274B/U (2).	5935-00-683-7892
Connector, UG-1033/U BNG (2).	5935-00-926-7487

4-3. Test Facilities

a. To properly test the AN/PTM-7, the following inputs must be furnished: dc voltage, direct current, random pcm, order-wire signaling, and order-wire voice communication. Figure 4-1 illustrates the test equipment required to supply these inputs.

b. Each TD-352/U supplies the required random pcm pulse train through each TD-204/U; the TD-204/U furnishes the dc voltage, direct current, and order-wire facilities. If the TD-352/U is not available, a dummy pulse train can be supplied by the TD-204/U by placing the NORM OPR-ZERO SET-READ switch to READ. However, it is not recommended, because the dummy pulse train, with its regularly spaced pulses, may not disclose a faulty pcm detector which is not altogether in operative. The TD-206/G is used to provide continuity through the AN/PTM-7, and as a device to be tested. No test facility is required to test the bridge circuits in the AN/PTM-7.

c. When using the alternate test procedure, figures 4-5 and 4-6 illustrate the test equipment required to supply the required inputs to the AN/PTM-7.

4-4. Modification Work Orders

The performance standards listed in the test assume that no modification work orders have been performed. A listing of current modification work orders will be found in DA Pam 310-7.

4-5. Physical Tests and Inspections

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

b. Test Connections and Conditons.

(1) Do not make any connection to the equipment.

(2) Perform the following check when repairs are completed.

(3) Connect the MX-1292/PAQ to a 115-volt 60-cps source, and install the wideband transmission filter.

c. Test Procedure.

Step No.	Control settings: Test Equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	N/A	Controls may be in any position.	*a*. Inspect front panel for evidence of physical damage, loose or missing parts, screws, or panel fasteners. *b*. Inspect connectors and plugs for cleanliness and evidence of physical damage. *c*. Check all resistors for evidence of overheating. *d*. Inspect all wiring and cabling for worn or frayed insulation. *e*. Inspect all metal surfaces for conditions of finish. **NOTE** Touchup paint is recommended in lieu of refinishing whenever practical.	*u*. Front panel is complete and not damaged. *b*. Connectors and plugs are clean and not damaged. *c*. Resistors show no signs of discoloration due to overheating. *d*. Wiring and cabling are free of cuts and frays. *e*. All metal surfaces intended to be painted do not show bare metal. Panel lettering is legible.
2	N/A	Controls may be in any position.	Check the equipment for applicable modification work orders. (Refer to Da Pam 310-4 for a list of MWO's.)	If MWO is performed MWO number appears on equipment.
3	MX-1292/PAQ 245V FOR M.V. LAMP:ON	Controls may be in any position	*a*. Expose equipment to rays of MX-1292/PAQ, and inspect condition of moisture and fungusproofing (mfp) varnish. **NOTE** Mfp varnish appears blue-green under rays of MX-1292/PAQ. Conformal coating on panels appears milky white under rays of MX-1292/PAQ. A blue-grey appearance indicates inadequate coating. *b*. Turn 245V for M.V. LAMP switch of MX-1292/PAQ to OFF.	*a*. All components, wiring and chassis surfaces are completely covered with mfp varnish with no evidence of it on connectors or switch contacts. *Note.* Do not apply mfp to parts not originally treated with it. *b*. None.

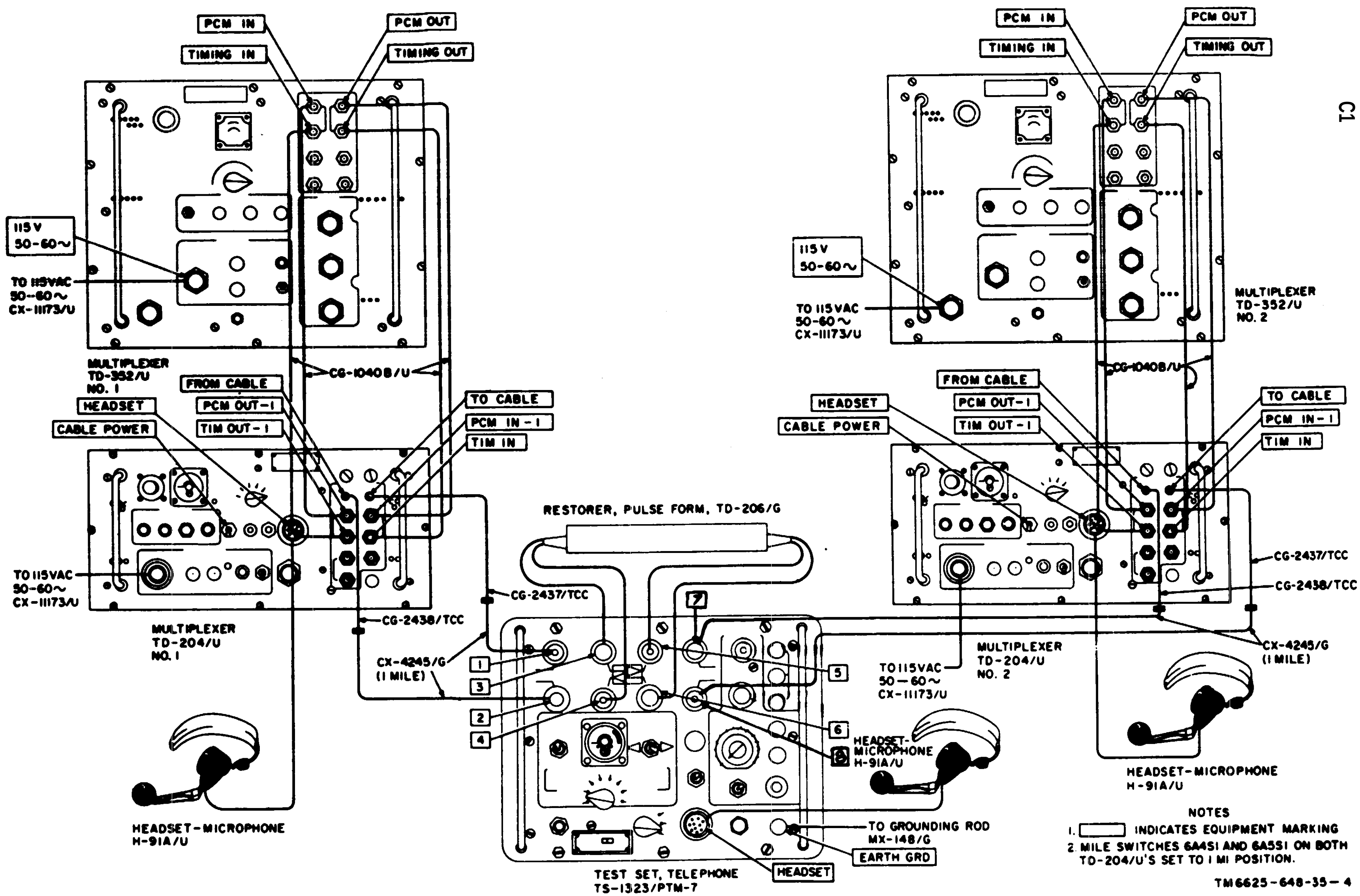


Figure 4-1. Test Set, Telephone AN/PTM-7, performance test setup, battery, order wire, and meter circuit tests.

4-6. Battery, Order-Wire, and Meter Circuit Tests (fig. 4-1)

a. Test Equipment and Materials.

(1) Multiplex TD-352/U (2 ea).
(2) Multiplexer TD-204/U (2 ea).
(3) Headset-Microphone H-91A/U (3 ea).
(4) Cable Assembly, Special Purpose, Electrical CX-4245/G or equivalent (¼-mile reel) (8 ea).
(5) Cable Assembly, Radio Frequency CG-1040B/U (5 ft) (8 ea).
(6) Cable Assembly, Radio Frequency CG-2437/TCC (10 ft) (2 ea).
(7) Cable Assembly, Radio Frequency CG-2438/TCC (10 ft) (2 ea).
(8) Restorer, Pulse Form, TD-206/G (1 ea).

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-1.

c. Test Procedure.

Step No.	Control settings		Test Procedure	Performance standard
	Test Equipment	Equipment under test		
	Warning: Up to 1,100 volts dc is carried by the CX-4245/G cable. Don't take chances. Each time interconnections or loads are changed, set the CABLE POWER switch on each TD-204/U to OFF.			
			Battery test	
1	*TD-352/U (No. 1 and 2)* AC POWER switch: ON. ADDRESS switch: MASTER. *TD-204/U (No. 1 and 2)* AC POWER switch: ON. CABLE POWER switch: OFF. TALK-OFF-SIG switch: TALK. TRAFFIC SEL switch: 12.	ORDERWIRE switch: OFF. BUZZER switch: ON. OPERATION switch: NORMAL. DIRECTION switch: AB. DISTANCE TO FAULT control: 0. CAP-RES switch: RES. BATTERY POWER switch: OFF.	*a.* Hold METER SELECT switch at BATTERY. *b.* Pull BATTERY POWER switch. *c.* Push BATTERY POWER switch. *d.* Release METER SELECT switch.	*a.* TEST METER needle indicates 0 volt. *b.* TEST METER needle indicates 7 or greater. *c.* TEST METER needle indicates 0 volt. *d.* None.
			Order-wire Tests	
2	Same as step 1.	Same as step 1 except: BATTERY POWER switch: ON.	*a.* Hold ORDERWIRE switch on TS-1323/PTM-7 at SIG. *b.* Operate ORDERWIRE switch to TALK. Communicate with TD-204/U No. 1 and 2 by H-91A/U. *c.* Signal TS-1323/PTM-7 with TD-204/U No. 1 by momentarily depressing TALK-OFF-SIG switch to SIG. *d.* Signal TS-1323/PTM-7 with TD-204/U No. 2 by momentarily depressing TALK-OFF-SIG switch to SIG.	*a.* Buzzer sounds, CALL lamp illuminates on TS-1323/PTM-7. Buzzer sounds, CALL lamp illuminates at each TD-204/U. *b.* Communication is maintained between TS-1323/PTM-7 and TD-204/U No. 1 and 2. *c.* Buzzer sounds, CALL lamp illuminates on TS-1323/PTM-7. *d.* Buzzer sounds, CALL lamp illuminates on TS-1323/PTM-7.

Step No.	Control settings		Test Procedure	Performance standard
	Test Equipment	Equipment under test		
3	Same as step 1.	Same as step 1 except: BATTERY POWER switch: ON. METER SELECT switch: PCM IN.	***Meter tests***	
			a. Operate OPERATION switch to LOOP BACK.	*a.* None.
			b. Operate CABLE POWER switch on TD-204/U No. 1 to ON.	*b.* TEST METER needle indicates above zero.
			c. Operate METER SELECT switch to PCM OUT.	*c.* TEST METER needle indicates in green region or above.
			d. Operate DIRECTION switch to BA.	*d.* TEST METER needle indicates above zero.
			e. Operate METER SELECT switch to PCM IN.	*e.* TEST METER needle indicates in green region or above.
			f. Operate CABLE POWER switch on TD-204/U No. 1 to OFF. Set CABLE POWER switch on TD-204/U No. 2 to ON.	*f.* TEST METER needle indicates above ZERO.
			g. Operate METER SELECT switch to PCM OUT.	*g.* TEST METER needle indicates in green region or above.
			h. Operate DIRECTION switch to AB.	*h.* TEST METER needle indicates above zero.
			i. Operate METER SELECT switch to PCM IN.	*i.* TEST METER needle indicates in green region or above.
			j. Operate CABLE POWER switch on TD-204/U No. 2 to OFF.	*j.* None.
			k. Operate OPERATION switch to NORMAL.	*k.* None.
			l. Operate CABLE POWER switches on TD-204/U No. 1 and 2 to ON.	*l.* TEST METER needle indicates above zero.
			m. Operate METER SELECT switch to PCM OUT.	*m.* TEST METER needle indicates above zero.
			n. Operate DIRECTION switch to BA.	*n.* TEST METER neelde indicates above zero.
			o. Operate METER SELECT switch to PCM IN.	*o.* TEST METER needle indicates above zero.
			p. Operate METER SELECT switch to VOLT DROP.	*p.* TEST METER needle indicates in green region.
			q. Operate DIRECTION switch to AB.	*q.* TEST METER needle indicates in green region
			r. Operate METER SELECT switch to DC AMPS.	*r.* TEST METER needle indicates in yellow region.
			s. Operate DIRECTION switch to BA.	*s.* TEST METER needle indicates in yellow region.
			t. Operate METER SELECT switch to DC VOLTS.	*t.* TEST METER needle on TS-1323/PTM-7 indicates same as TEST METER indication of TD-204/U No. 2.
		NOTE: TEST METER will indicate approximately 10 volts.		

		Note: TEST METER will indicate approximately 10 volts.	*u*. Operate DIRECTION switch to AB.	*u*. TEST METER needle on TS–1323/PTM–7 indicates same as TEST METER indication of TD–204/U No. 1.
			v. Operate CABLE POWER switch on TD–204/U No. 1 and 2 to OFF; operate AC POWER switch on TD–204/U No. 1 and 2 to OFF; operate AC POWER switch on TD–352/U No. 1 and 2 to OFF.	*v*. None.
			w. Remove TS–1323/PTM–7 from test setup; do not remove connections between TD–204/U No. 1 and 2 and TD–352/U No. 1 and 2.	*w*. None.

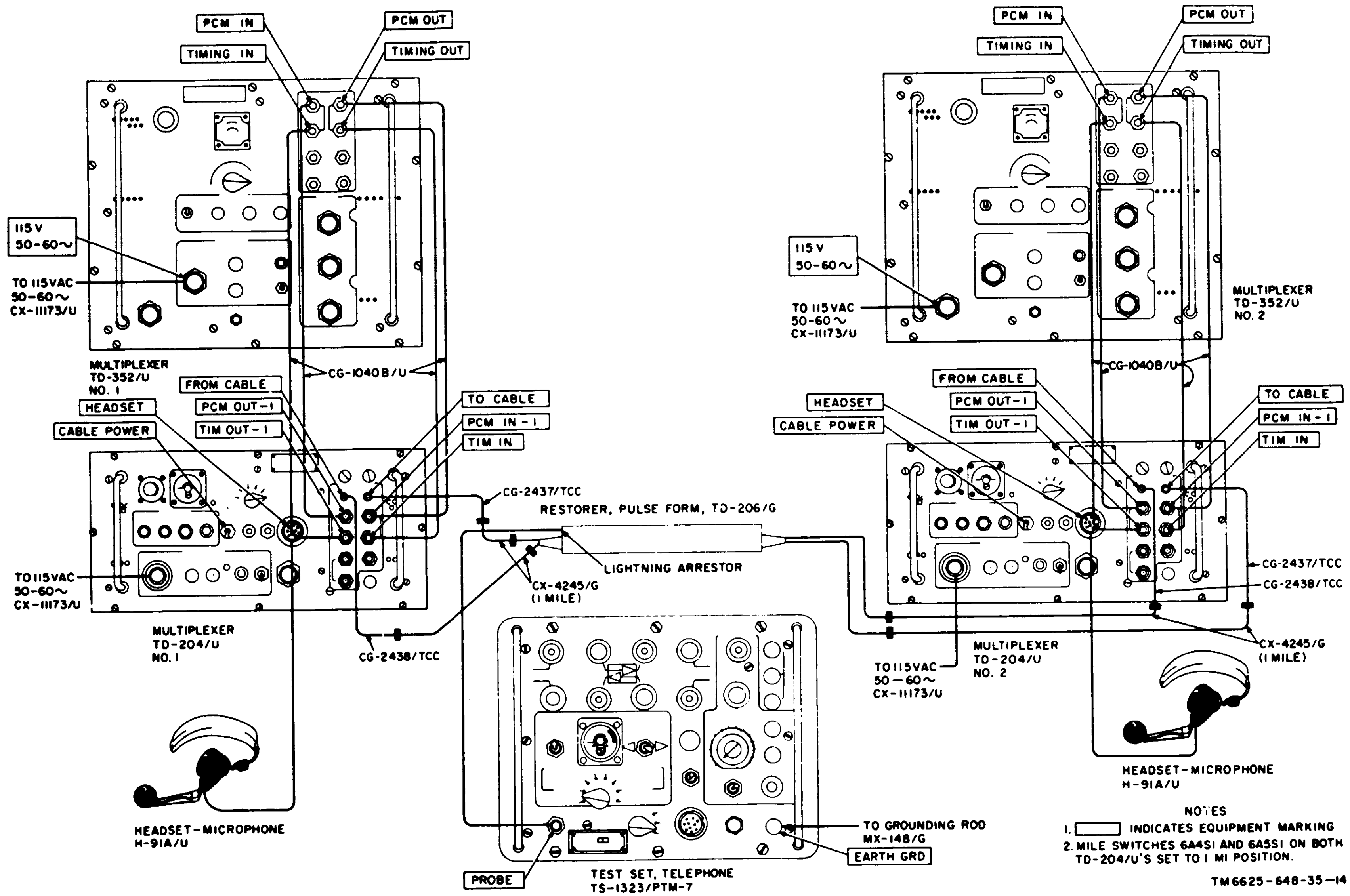


Figure 4-2. Test Set, Telephone AN/PTM-7, performance test setup, pcm probe test.

4-7. Pcm Probe Tests
(fig. 4-2)

a. Test Equipment and Material.

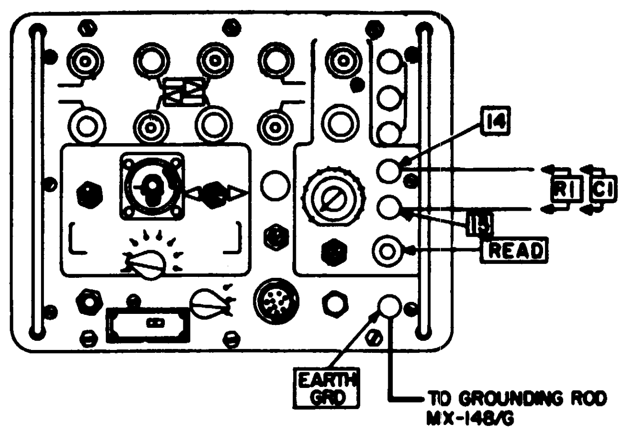
(1) Multiplexer TD-352/U (2 ea).
(2) Multiplexer TD-204/U (2 ea).
(3) Headset-Microphone H-91A/U (2 ea).
(4) Cable Assembly, Special Purpose Electrical CX-4245/G or equivalent (¼-mile reel (8 ea).
(5) Cable Assembly, Radio Frequency CG-1040B/U (5 ft) (8 ea).
(6) Cable Assembly, Radio Frequency CG-2437/TCC (10 ft) (2 ea).
(7) Cable Assembly, Radio Frequency CG-2438/TCC (10 ft) (2 ea).
(8) Restorer, Pulse Form, TD-206/G (1 ea).

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-2.

c. Test Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	Warning: **Up to 1,100 volts dc is carried by the CX-4245/G cable. Don't take chances. Each time interconnections or loads are changed, set the CABLE POWER switch on each TD-204/U to OFF.**			
1	*TD-352/U (No. 1 and 2)* AC POWER switch: ON. ADDRESS switch: MASTER. *TD-204-U (No. 1 and 2):* AC POWER switch: ON. CABLE POWER switch: OFF. TALK-OFF-SIG switch: TALK. TRAFFIC SEL switch: 12.	ORDERWIRE switch: OFF. BUZZER switch: ON. OPERATION switch: NORMAL. DIRECTION switch: AB. DISTANCE TO FAULT control: 0. CAP-RES switch: RES. BATTERY POWER switch: ON. METER SELECT switch: PROBE.	*a.* Insert CX-10355/PTM-7 into lightning arrestor well of TD-206/G as shown in figure 4-2. *b.* Operate CABLE POWER switches on TD-204/U No. 1 and 2 to ON. *c.* Operate CABLE POWER switches on TD-204/U No. 1 and 2 to OFF. *d.* Remove CX-10355/PTM-7 from lightning arrestor well.	*a.* None. *b.* TEST METER on TS-1323/PTM-7 indicates between 2 and 5. (see note) *c.* None. *d.* None.

Note: When traffic is present, a pronounced meter deflection will occur. Actual TEST METER reading is dependent upon depth of insertion of pcm probe into the lightning arrestor well. The meter will indicate from zero to values greater than 5 as the probe is inserted to maximum depth.



NOTES

1. ▭ INDICATES EQUIPMENT MARKING
2. C1: 0.05 UF ±5% 200 VDC
3. R1: 51 OHM, 1/2 WATT, ±5%

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Figure 4-3. Test Set, Telephone AN/PTM-7, performance test setup, bridge test.

4-8. Bridge Tests
(fig. 4-3)

a. Test Equipment and Materials.

(1) Capacitor, .05-μf ±5%, 200-vdc.

(2) Resistor, 51-ohm, ±5%, ½-watt.

b. Test Connections and Conditions. None.

c. Test Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	N/A	ORDERWIRE switch: OFF. BUZZER switch: ON. OPERATION switch: NORMAL. DIRECTION switch: AB. DISTANCE TO FAULT control: 0. CAP-RES switch: RES. BATTERY POWER switch: ON. METER SELECT switch: PCM IN.	*a.* Connect resistor R1 to TS-1323/PTM-7 as shown in figure 4-3. *b.* Operate METER SELECT switch to BRIDGE. Operate CAP-RES switch to RES. *c.* Depress READ switch and adjust DISTANCE TO FAULT control for null on TEST METER. *d.* Release READ switch and remove resistor R1. Connect capacitor C1 to TS-1323/PTM-7 (fig. 4-3). *e.* Operate CAP-RES switch to CAP. Depress READ switch and adjust DISTANCE TO FAULT control for a null on TEST METER. *f.* Remove capacitor C1.	*a.* TEST METER needle indicates zero. *b.* TEST METER needle indicates zero. *c.* DISTANCE TO FAULT control indicates between 2,400 and 2,800 feet on RES dial. *d.* TEST METER needle indicates zero. *e.* DISTANCE TO FAULT control indicates between 1,600 and 2,000 feet on CAP dial. *f.* TEST METER needle indicates zero.

4-9. Test Cable Fabrication

Using materials listed in *a* below, fabricate test cables as shown in A and B of figure 4-4 by performing steps in *b* below.

a. Materials.

(1) Cable Assembly, CX-10374/G

(2) Connector, UG-1033C/U (2 ea)

b. Procedure.

(1) Cut CX-10734/G cables at designated X mark.

(2) Connect a BNC connector to end of each cable cut in (1) above.

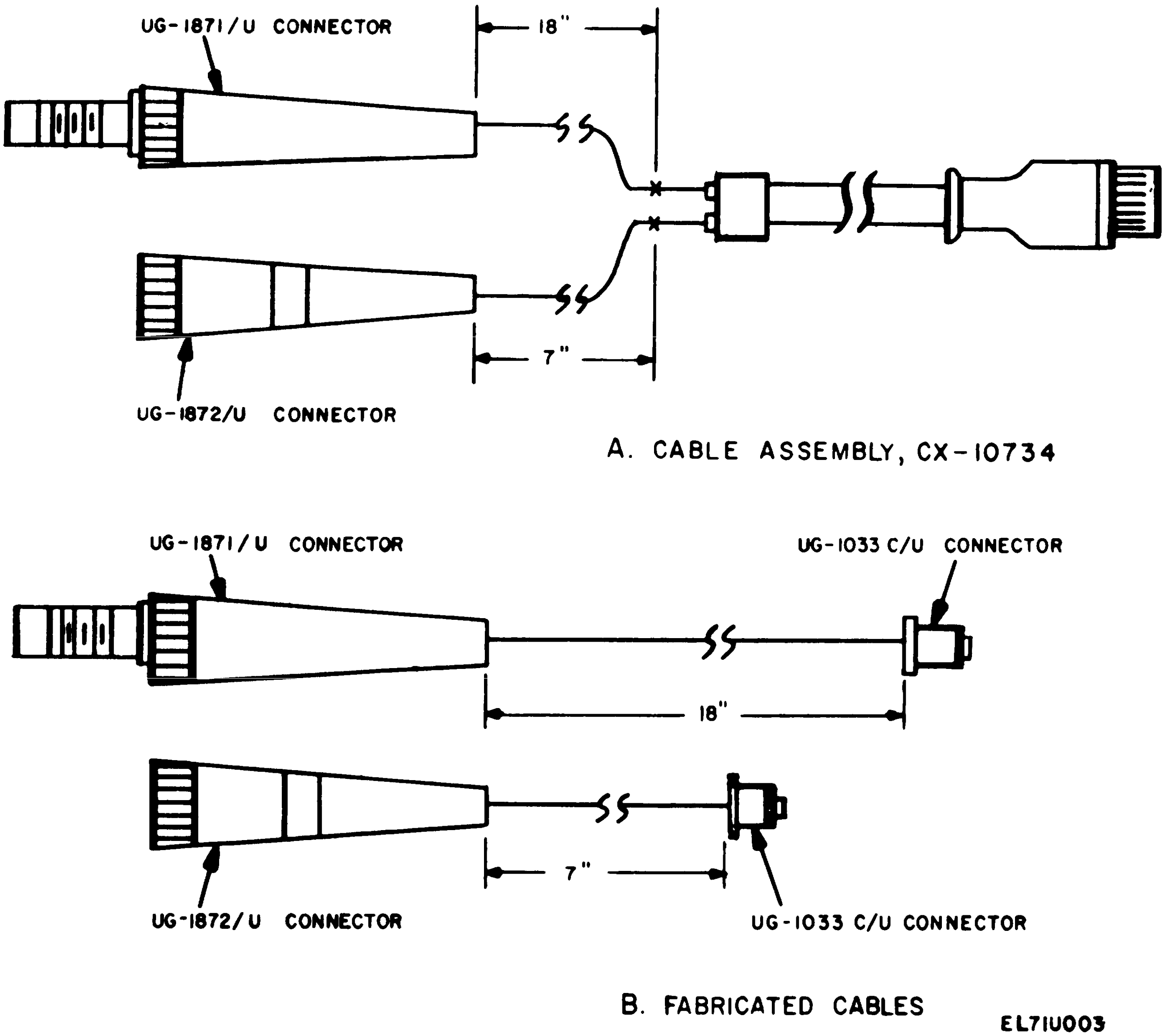

Figure 4-4. Test cable fabrication.

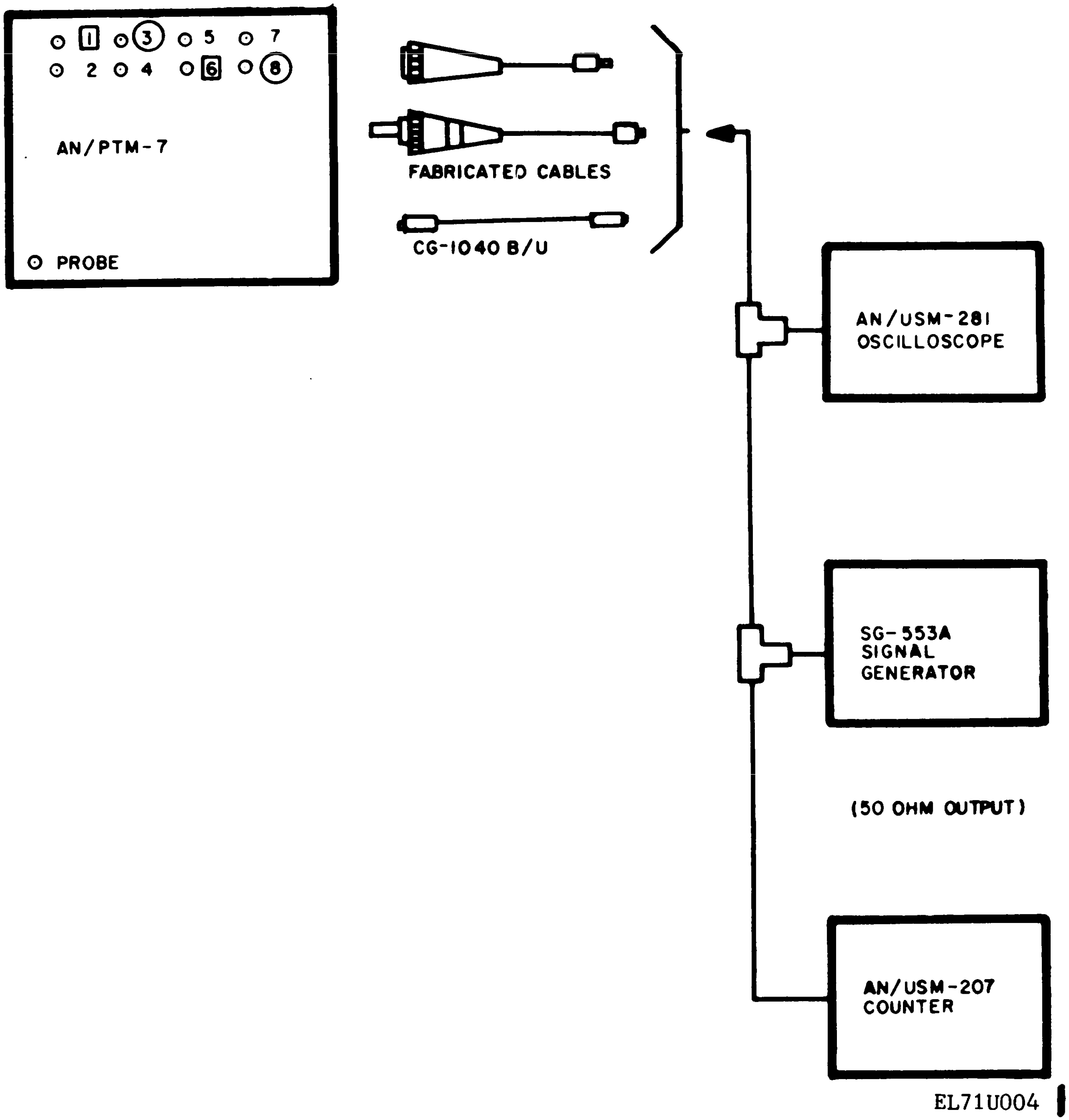

Figure 4-5. Alternate performance test setup diagram.

4-10. Alternate Performance Test

a. Test Equipment and Material.

(1) SG-553A, Signal Generator
(2) AN/USM-281C, Oscilloscope
(3) AN/USM-207A, Frequency Counter
(4) Modified Cable Assembly, CX-10734/G
(5) Cable, CG-1040B/U
(6) Connectors, UG-274B/U (2)

b. Test Connections and Conditioning. Connect the equipment as shown on figure 4-5.

c. Test Procedure.

Step No.	Control settings: Test Equipment	Control settings: Equipment under test	Test procedure	Performance standard
			BATTERY TEST	
1		Order Wire Switch: OFF Buzzer Switch: ON Operation Switch: NORMAL Direction Switch: AB Distance to Fault Switch: 0 CAP-RES Switch: RES Battery Power Switch: OFF	*a.* Hold Meter Select switch at Battery *b.* Pull Battery Power switch *c.* Push Battery Power switch IN *d.* Release Meter Select switch	*a.* Test Meter needle indicates 0 volts. *b.* Test Meter needle indicates 8 volts or above. *c.* Test Meter needle indicates 0 volts.
			ORDERWIRE, PCM, AND PROBE TEST	
2	AN/USM-281C AC Power Switch: ON SG-553-A AC Power Switch: ON AN/USM-207A AC Power Switch: ON	Battery Power Switch: ON Meter Select Switch: PROBE Buzzer Switch: OFF Buzzer Switch: On – prior to step *d.*	*a.* Connect teat equipment to connector ③ *b.* Set Signal generator at 1600 Hz. *c.* Adjust output for a 0.85V PP indication on oscilloscope *d.* Increase signal generator output for a 15V PP indication on oscilloscope. *e.* Adjust signal generator output for zero output. *f.* Connect test equipment to connector 6. *g.* Repeat step "2c" above. *h.* Repeat step "2d" above.	*a.* Test Meter needle indicates 0. *b.* Test Meter needle indicates 0. *c.* Orderwire call lamp is lighted. *d.* Orderwire call lamp remains lighted and audible alarm buzzer should sound. e. Orderwire call lamp is off and audible alarm buzzer is off. *f.* Orderwire call lamp remains off. *g.* Orderwire call lamp is lighted. *h.* Orderwire call lamp remains lighted and audible alarm buzzer should sound.
		Meter Select Switch: PCM IN	*i.* Connect test equipment to connector 1. *j.* Set signal generator to 2.304 MHz and adjust output. *k.* Adjust signal generator output for zero output.	*i.* Test Meter needle indicates 0. *j.* Test Meter needle indicates 6 (a 20MV PP max. indication should be observed on the oscilloscope). *k.* Test Meter needle indicates 0.
		Direction Switch: BA	*l.* Connect test equipment to connector ③ *m.* Repeat step "2j" above, *n.* Adjust signal generator output for zero output.	*l.* Test Meter needle indicates 0. *m.* Test Meter needle indicates 6 (a 20MV PP max. indication should be observed on the oscilloscope). *n.* Test Meter needle indicates 0.

Step No.	Control settings: Test Equipment	Control settings: Equipment under test	Test procedure	Performance standard
		Meter Select Switch: PCM OUT.	*o*. Connect test equipment to connector 2.	*o*. Test Meter needle indicates 0.
			p. Adjust signal generator output.	*p*. Test Meter needle indicates 7 (a 1.4V PP max. indication should be observed on the oscilloscope).
			q. Adjust signal generator output for zero output.	*q*. Test Meter indicates 0.
		Direction Switch: AB	*r*. Connect test equipment to connector 7.	*r*. Test Meter needle indicates 0.
			s. Repeat step 2p.	*s*. Test Meter needle indicates 7 (a 1.4V PP max. indication should be observed on the oscilloscope).
		Meter Select Switch: PROBE	*t*. Adjust signal generator output for zero output.	*t*. Test Meter needle indicates 0.
			u. Connect test equipment to Robe input connector.	*u*. Test Meter needle indicates 0.
			v. Adjust signal generator output.	*v*. Test Meter needle indicates 6 (a 20 MV PP max. indication should be observed on the oscilloscope).

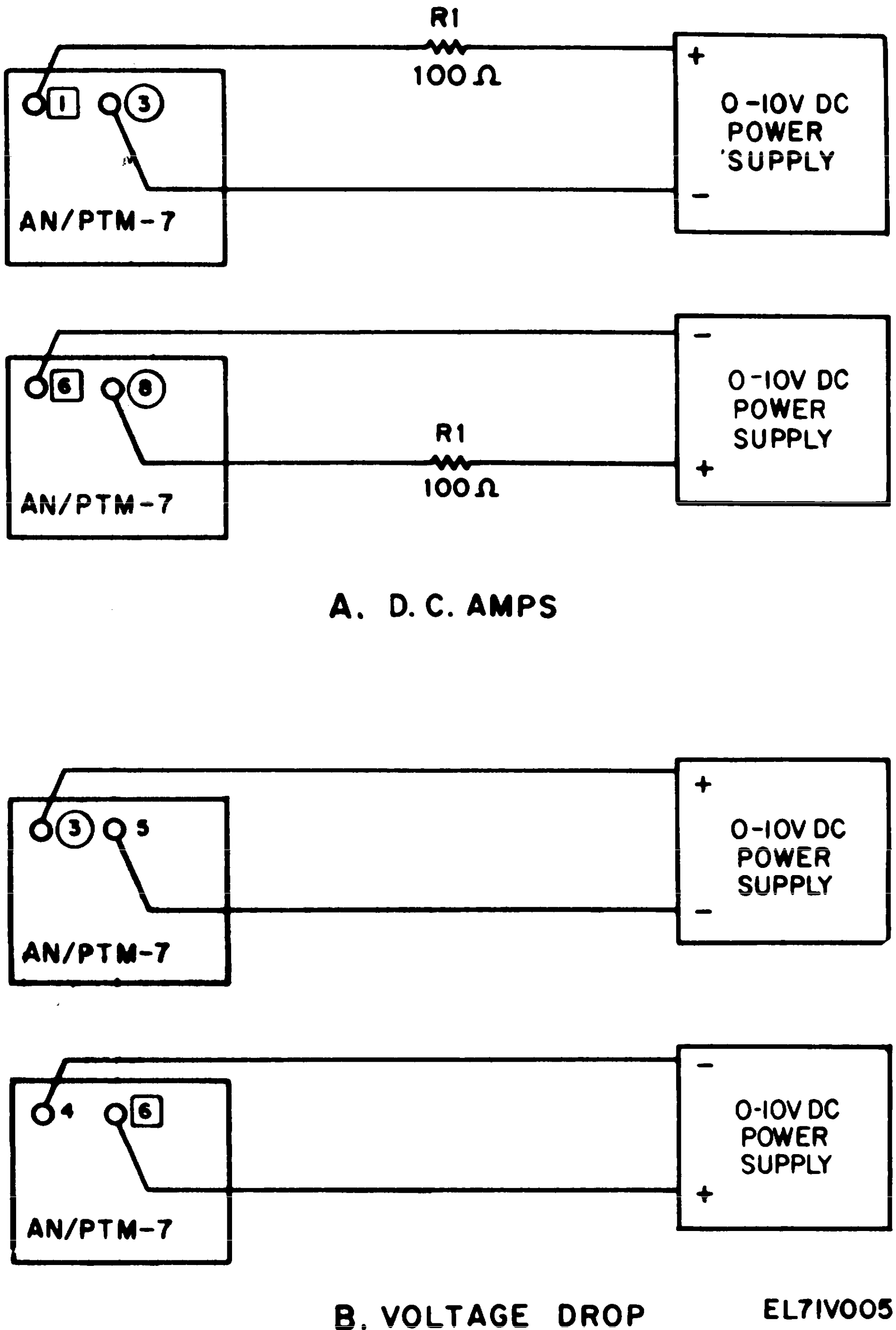

Figure 4-6. Meter circuit test setup diagram (alternate).

4-11. Meter Circuit Tests - DC Amps and Voltage Drop

a. Test Equipment and Material.

(1) Power Supply, 0-10V±0.01 V D.C.
(2) Resistor, 100 ohms 5%, ½ watt
(3) Modified Cable Assembly, CX-10734/G

b. Test Connections and Conditions. Connect the equipment as shown in figure 4-6.

c. Test Procedure.

Step No.	Control settings: Test Equipment	Control settings: Equipment Under Test	Test Procedure	Performance Standard
			METER CIRCUIT TEST - D.C. AMPS (figure 4-6A)	
1	0-10V D.C. Power Supply AC Power Switch: ON	Meter Select Switch: DC AMPS Direction Switch: AB Battery Power Switch: OFF	*a.* Apply 3.5 volts D.C. to connectors [1] and (3) (connector [1] positive)	*a.* Test Meter needle indicates between 6 and 9.
		Direction Switch: BA	*b.* Same as above.	*b.* Test Meter needle indicates 0.
		Direction Switch: AB	*c.* Apply 3.5 volts D.C. to connector ■ and ● (connector ■ positive).	*c.* Test Meter needle indicates 0.
		Direction Switch: BA	*d.* Same as above.	*d.* Test Meter needle indicates between 6 and 9.
			METER CIRCUIT TEST - VOLTAGE DROP (figure 4-6B)	
2		Direction Switch: AB Meter Select Switch: VOLT DROP	*a.* Apply 7 volt D.C. to connector (3) and 5 (connector (3) positive).	*a.* Test Meter needle indicates 7 to 8 volts.
		Direction Switch: BA	*b.* Same as above.	*b.* Test Meter needle indicates 0 volts.
		Direction Switch: AB	*c.* Apply 7 volts D.C. to connectors ■ and 4 (connector ■ positive).	*c.* Test Meter needle indicates 0 volts.
		Direction Switch: BA	*d.* Same as above.	*d.* Test Meter needle indicates 7 volts.
		Direction Switch: AB	*e.* Apply 9 volts D.C. to connectors (3) and 5 (connector (3) positive).	*a.* Test Meter needle indicates 9 volts or greater.
		Direction Switch: BA	*f.* Same as above.	*f.* Test Meter needle indicates 0 volts.
		Direction Switch: AB	*g.* Apply 9 volts D.C. to connectors ■ and 4 (connector ■ positive).	*g.* Test Meter needle indicates 0 volts.
		Direction Switch: BA	*h.* Same as above.	*h.* Test Meter needle indicates 9 volts or greater.

CHAPTER 5

DEPOT OVERHAUL STANDARDS

5-1. Applicability of Depot Overhaul Standards

The tests outlined in this chapter are designed to measure the performance capability of an equipment to be stocked or returned to the user. Equip ment that meets the minimum standards stated in the tests will have performance capabilities equivalent to that of new equipment.

5-2. Applicable References

a. Repair Standards. Applicable procedures of the depot performing this test and its general standards for repaired equipment form a part of the requirement for testing this equipment.

b. Technical Publication. Refer to the appendix.

c. Modification Work Orders. Perform all applicable Modification Work Orders pertaining to this equipment before making the tests specified. DA Pamphlet 310-4 lists all current MWO's.

5-3. Test Facilities Required

The test facilities required are identical with those required for general support testing. Refer to the requirements of paragraph 4-2 for a listing of test equipment and materials.

5-4. Test Procedures

Perform the general support test procedures outlined in paragraphs 4-5 through 4-8. Acceptable standards of performance for depot overhaul are the same as those for general support testing.

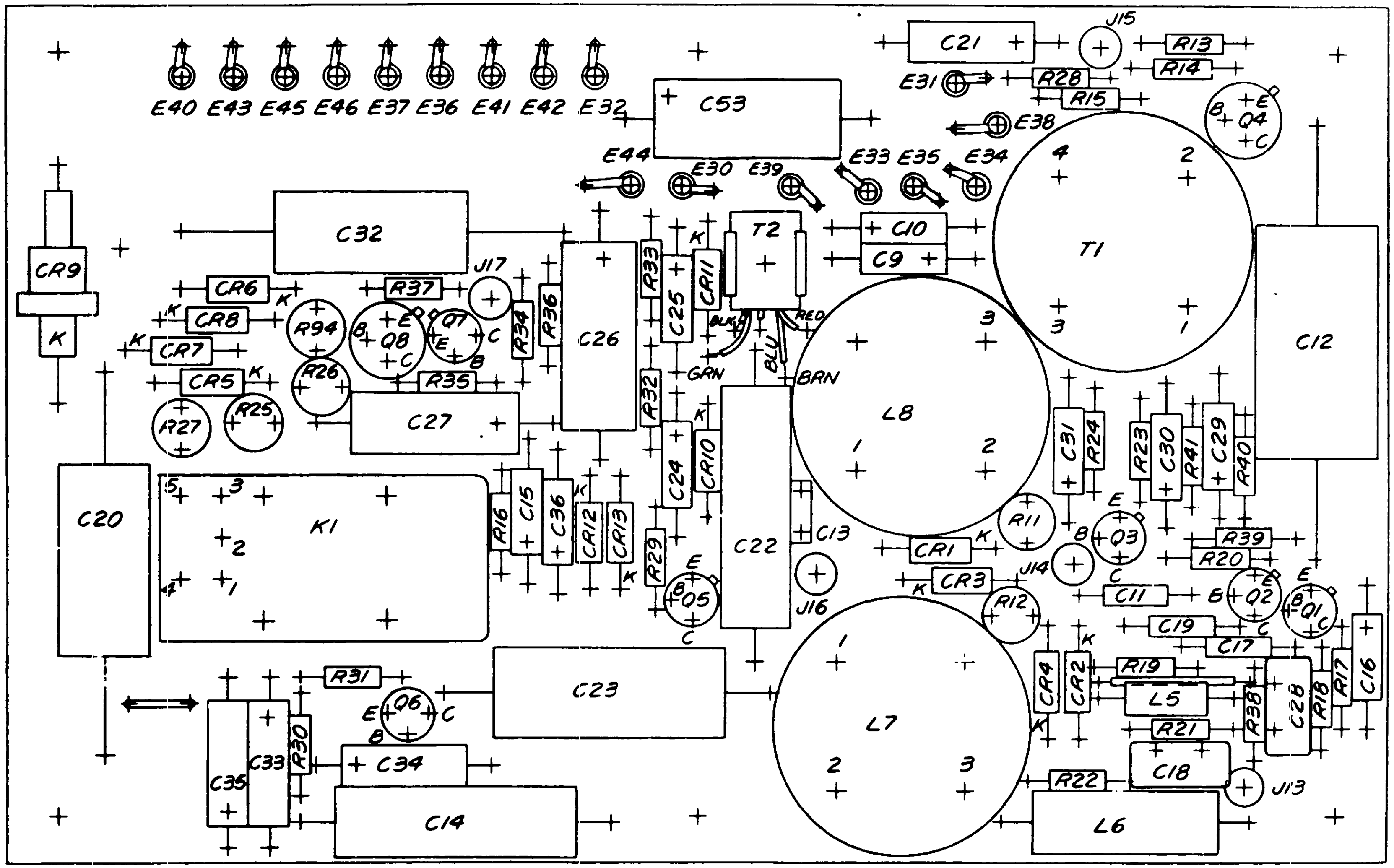

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Figure 5–1. Panel 8A1, top panel view.

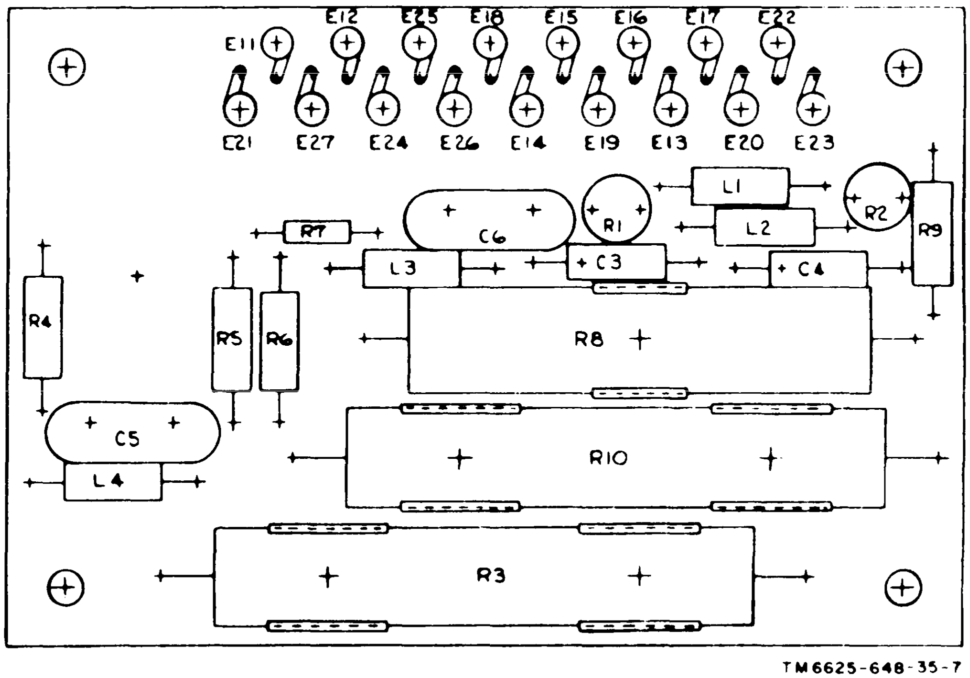
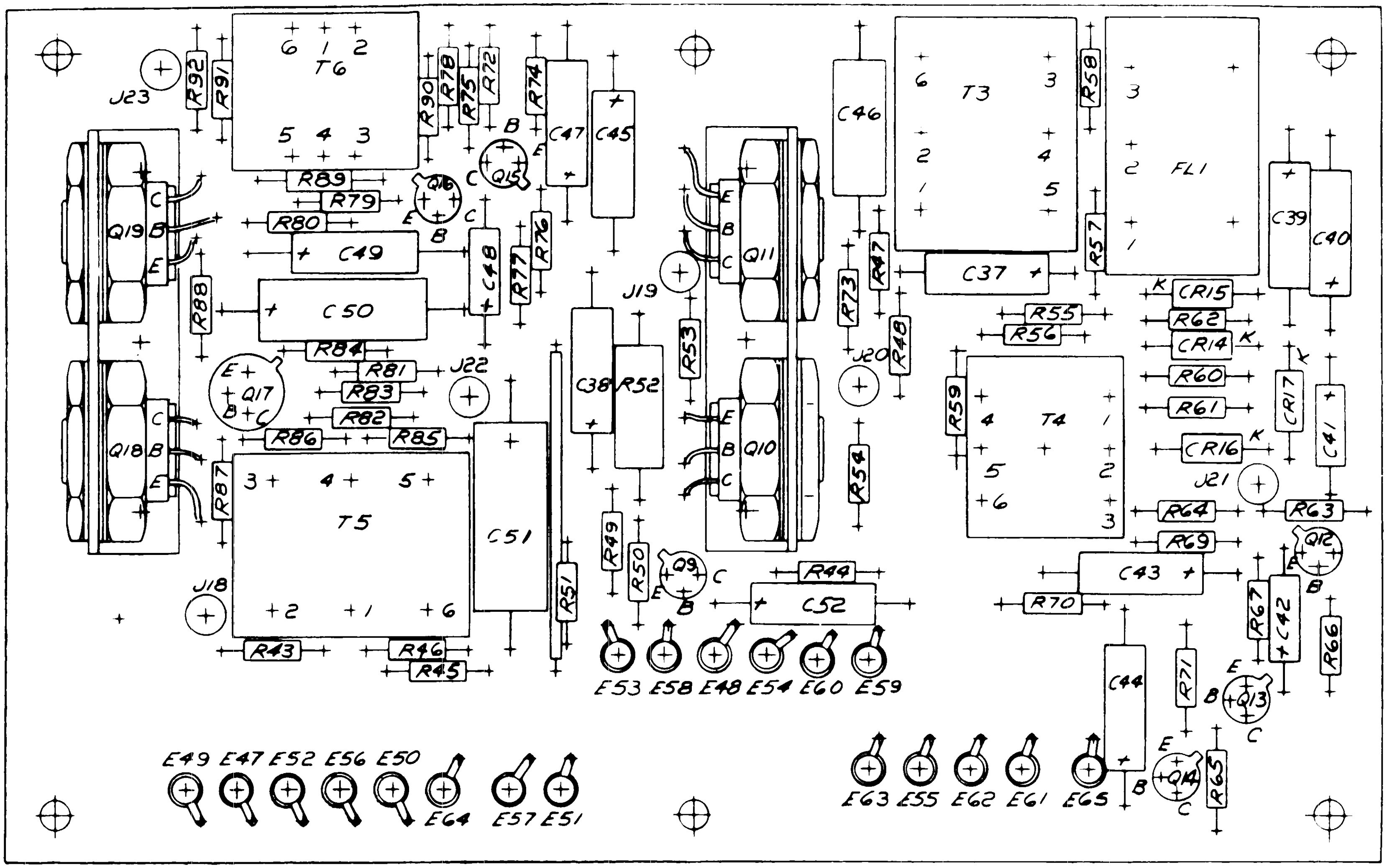


Figure 5-2. Panel 8A2, top panel view.



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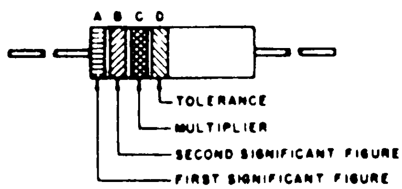
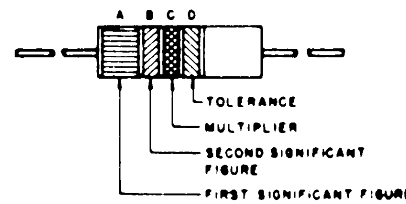
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS



BAND A— Double Width Signifies Wire-wound Resistor

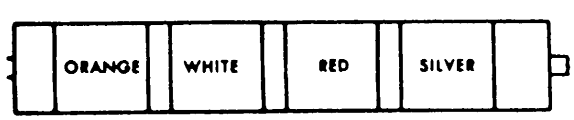
COLOR CODE TABLE

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

BAND

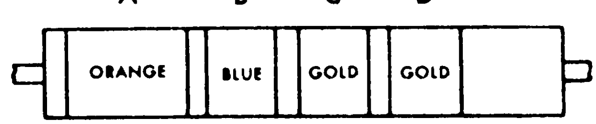
A B C D*



3 9 X100 ± 10%

BAND

A B C D*



3 6 X0.1 ± 5%

NOMINAL RESISTANCE	3,900 Ohms	3.6 Ohms
RESISTANCE TOLERANCE	± 10 percent	± 5 percent

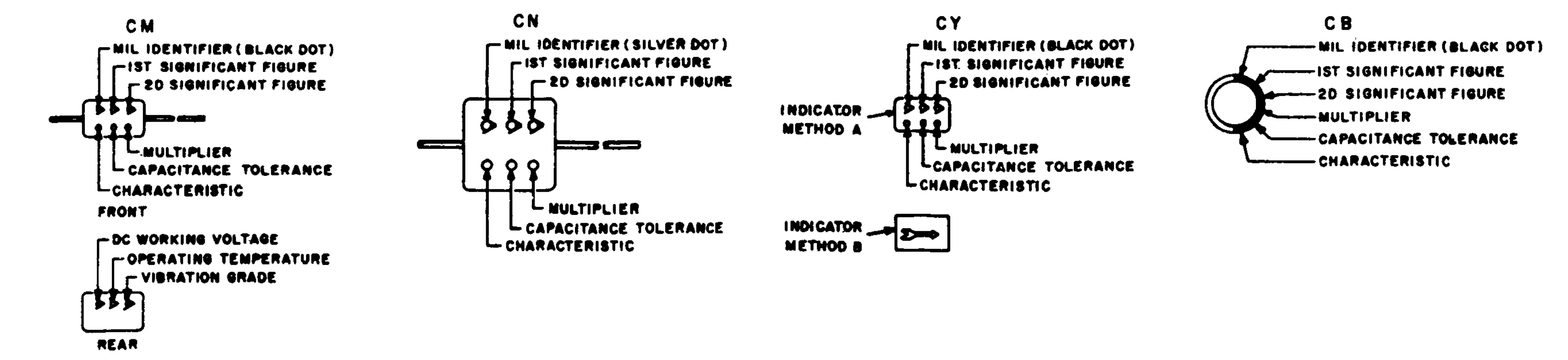
STD-R2

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

Figure 5-4. Resistor color code chart.

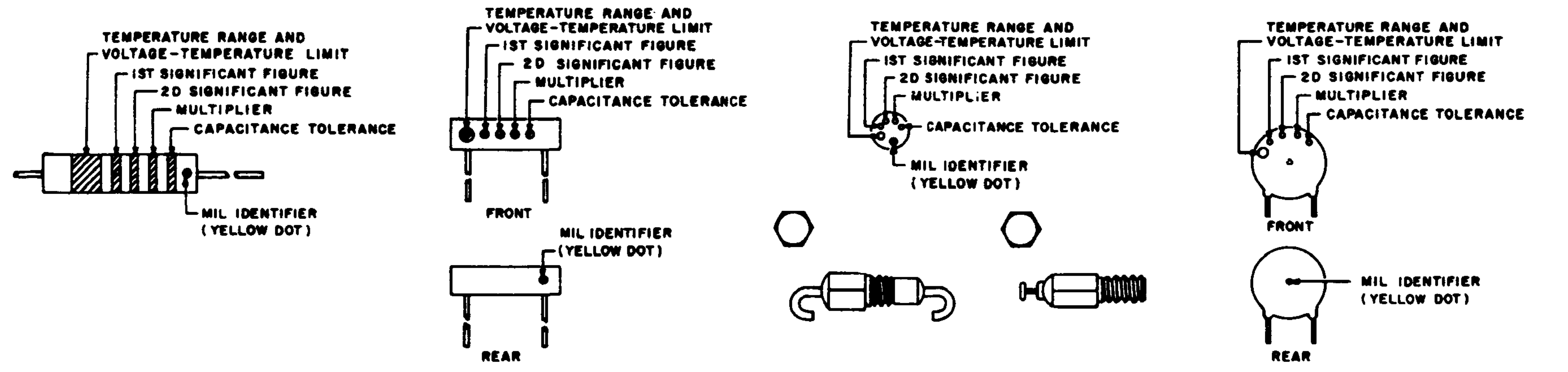
COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



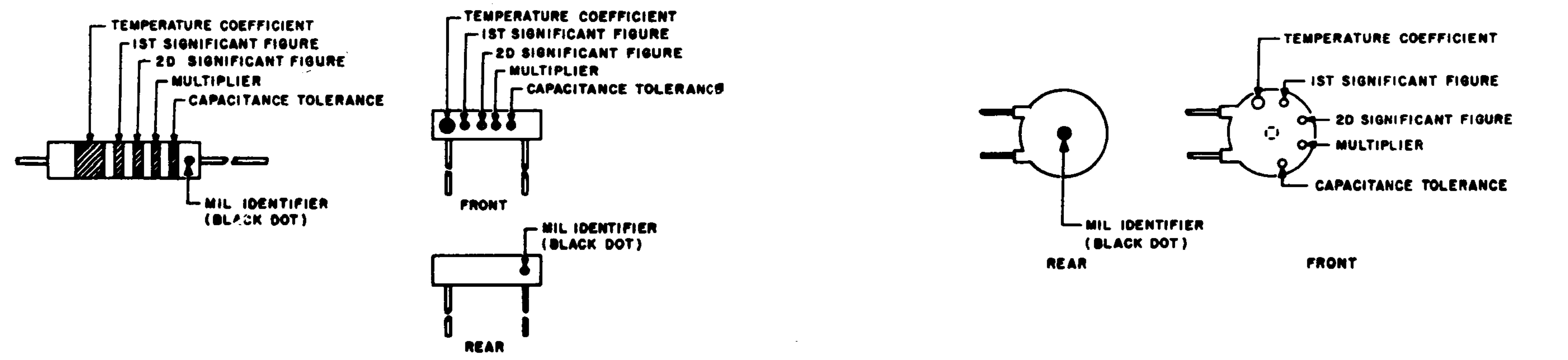
MICA-DIELECTRIC | PAPER-DIELECTRIC | GLASS-DIELECTRIC, GLASS CASE | MICA, BUTTON TYPE

GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



AXIAL LEAD | RADIAL LEAD | FEED-THROUGH | STAND-OFF | DISK-TYPE

GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



AXIAL LEAD | RADIAL LEAD | DISK-TYPE

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[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING 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[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	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[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

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.

STB–C2

Figure 5–5. Capacitor color code chart.

APPENDIX

REFERENCES

AR 310-25	Dictionary of United States Army Terms (Short Title: AD)
AR 310-50	Catalog of Abbreviations and Brevity Codes (Available in 48X Microfiche Only — No Printed Copies Exist)
DA Pam 310-4	Index of Technical Publications.
SB 11-6	Dry Battery Supply Data.
TB 385-4	Safety Precautions for Maintenance of Electrical/Electronics Equipment.
TB SIG 222	Solder and Soldering.
TM 11-415	Primary Batteries (Dry and Reserve Types).
TM 11-664	Theory and Use of Electronic Test Equipment.
TM 11-2044	Attenuators TS-402/U and TS-402A/U.
TM 11-5540	Electric Light Assembly MX-1292/PAQ.
TM 11-5805-367-12	Operator's and Organizational Maintenance Manual: Multiplexers, TD-202/U (NSN 5805-00-884-2176), TD-203/U (5805-00-884-2177), TD-204/U (5805-00-900-8200), TD-352/U (5805-00-900-8199) and TD-353/U (5805-00-985-9153), Restorers, Pulse Form, TD-206/G (5805-00-868-8078) and TD-206B/G (5805-01-020-2251) and Converters, Telephone Signal CV-1548/G (5805-00-069-8795) and CV-1548A/G (5805-00-069-8795).
TM 11-5965-206-14P	Operator's Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tool Lists (Including Depot Maintenance Repair Parts and Special Tools): Headset-Microphone H-91AU (FSN 5965-669-6871); Handset-Headset H-144/U, H-144A/U, H-144B/U and H-144C/U (FSN 5965-682-2769) and Headset-Microphone H-210/G (FSN 5965-892-1068).
TM 11-6625-200-15	Operator's, Organizational, Direct Support, General Support, and Depot Manual Multimeters ME-26A/U (NSN 6625-00-360-2493), ME-26B/U and ME-26C/U (6625-00-646-9409), and ME-26D/U (6625-00-913-9781).

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: Test Set TS-140/PCM; Signal Generator SG-15/PCM and SG-15A/PCM and Decibel Meters ME-22/PCM and ME-22A/PCM.
TM 11-6625-320-12	Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U.
TM 11-6625-366-10	Operator's Manual for Multimeter TS-352B/U (NSN 6625-00-552-0142).
TM 11-6625-435-12	Operator and Organizational Maintenance Manual: Generator, Pulse SG-366/U.
TM 11-6625-539-15	Operator, Organizational, Field and Depot Maintenance Manual: Test Set, Transistor TS-1836/U.
TM 11-6625-648-12	Operator's and Organizational Maintenance Manual, Test Set, Telephone AN/PTM-7 (NSN 6625-00-902-7475).
TM 11-6625-700-14-1	Operator, Organizational, Direct Support and General Support Maintenance Manual Including Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools): Digital Readout Electronic Counter AN/USM-207A (Serial Nos. 1A thru 1100A) (NSN 6625-00-044-3228).
TM 11-6625-2644-14	Operator's Organizational, Direct Support and General Support Maintenance Manual: Signal Generator AN/USM-205A, NSN 6625-01-007-4796.
TM 11-6625-2658-14	Operator's, Organizational, Direct Support, and General Support Maintenance Manual for Oscilloscope AN/USM-281C (NSN 6625-00-106-9622).
TM 38-750	The Army Maintenance Management System.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

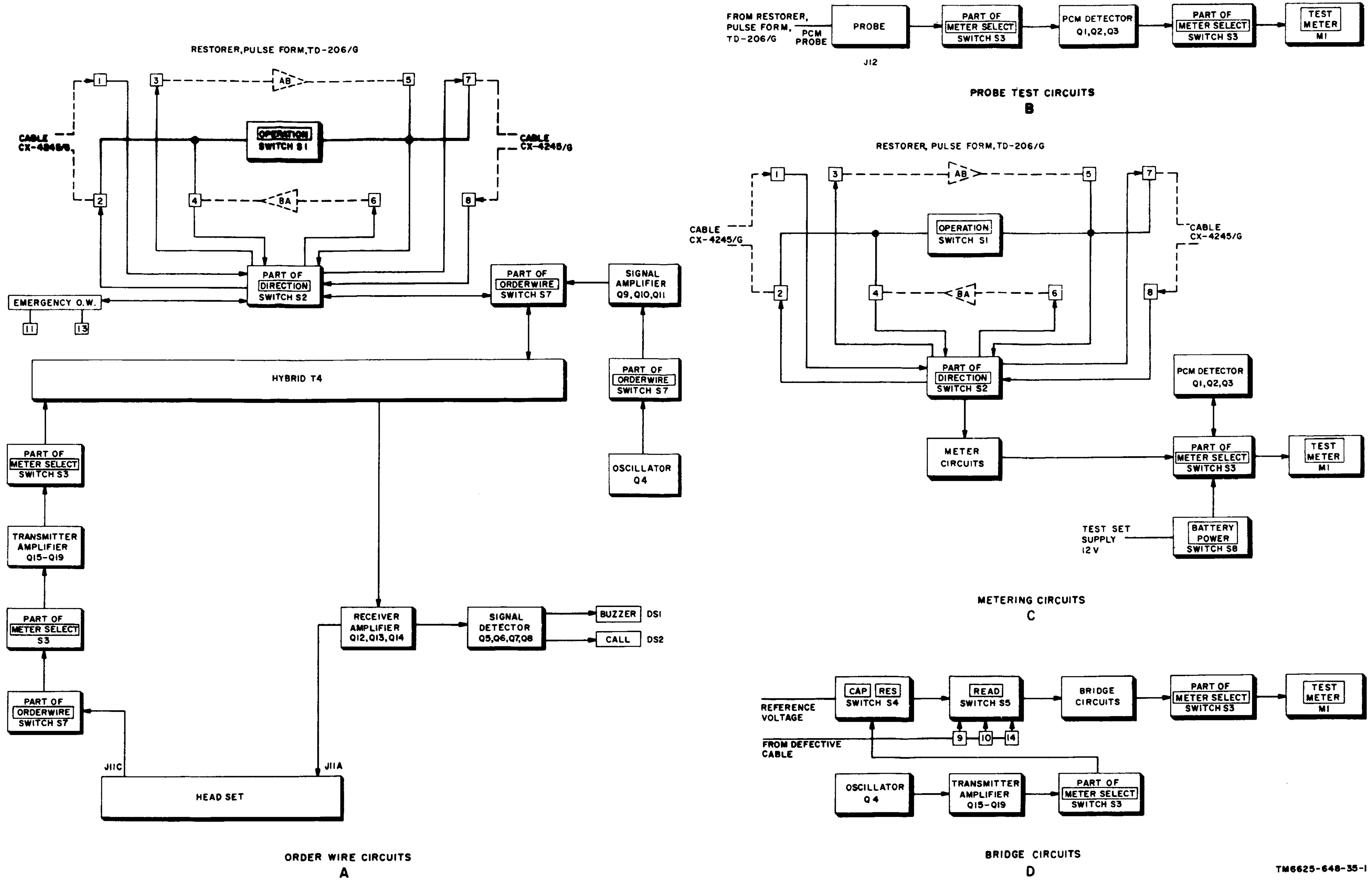
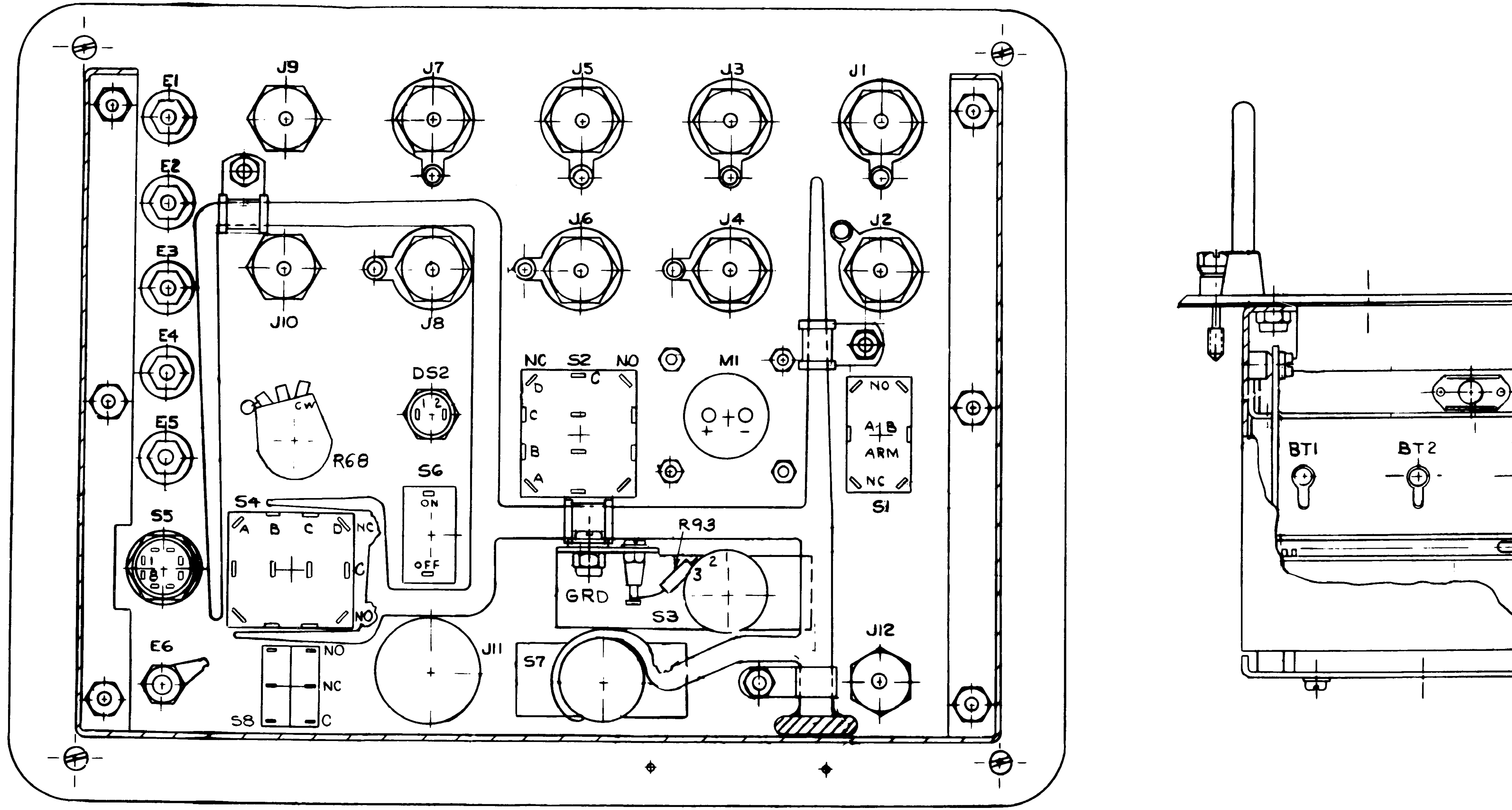


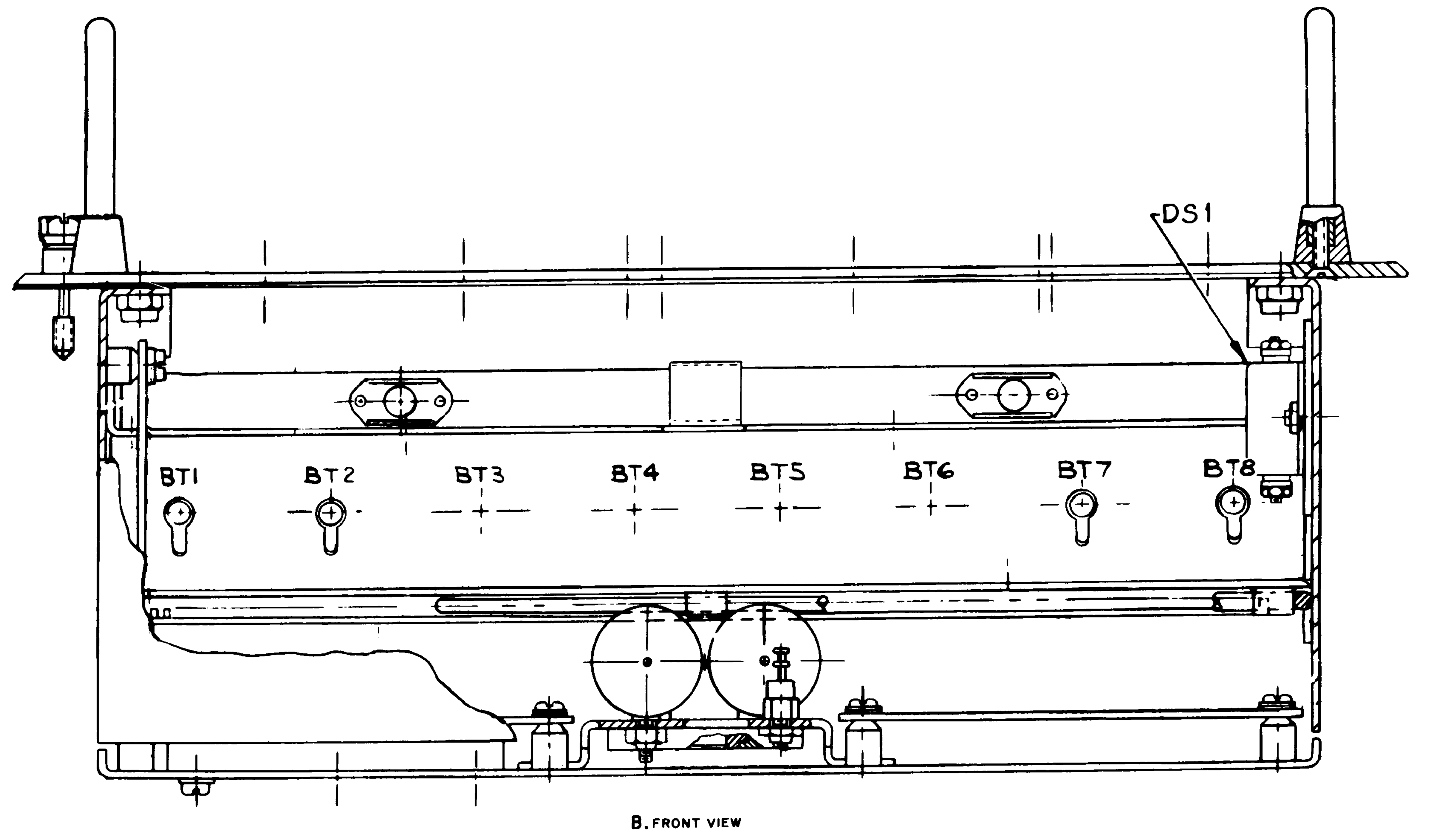
Figure 5-6. Test Set, Telephone TS-1323/PTM-7, block diagram.

Figure 5-7. Test Set, Telephone TS-1323/PTM-7, schematic diagram and troubleshooting waveforms.

Figure 5-8. Test Set, Telephone TS-1323/FTM-7, wiring diagram.



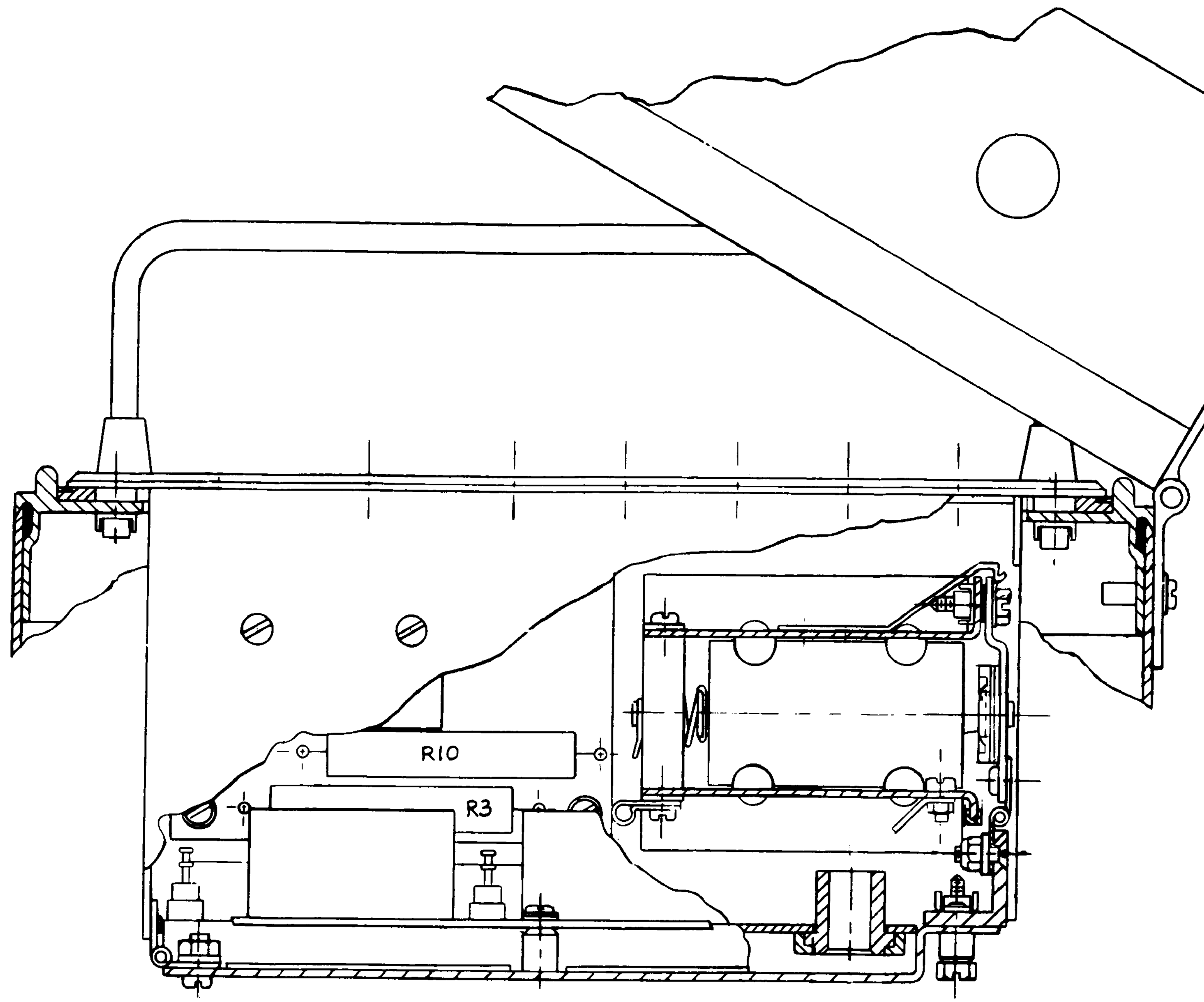
A. REAR OF TOP PANEL



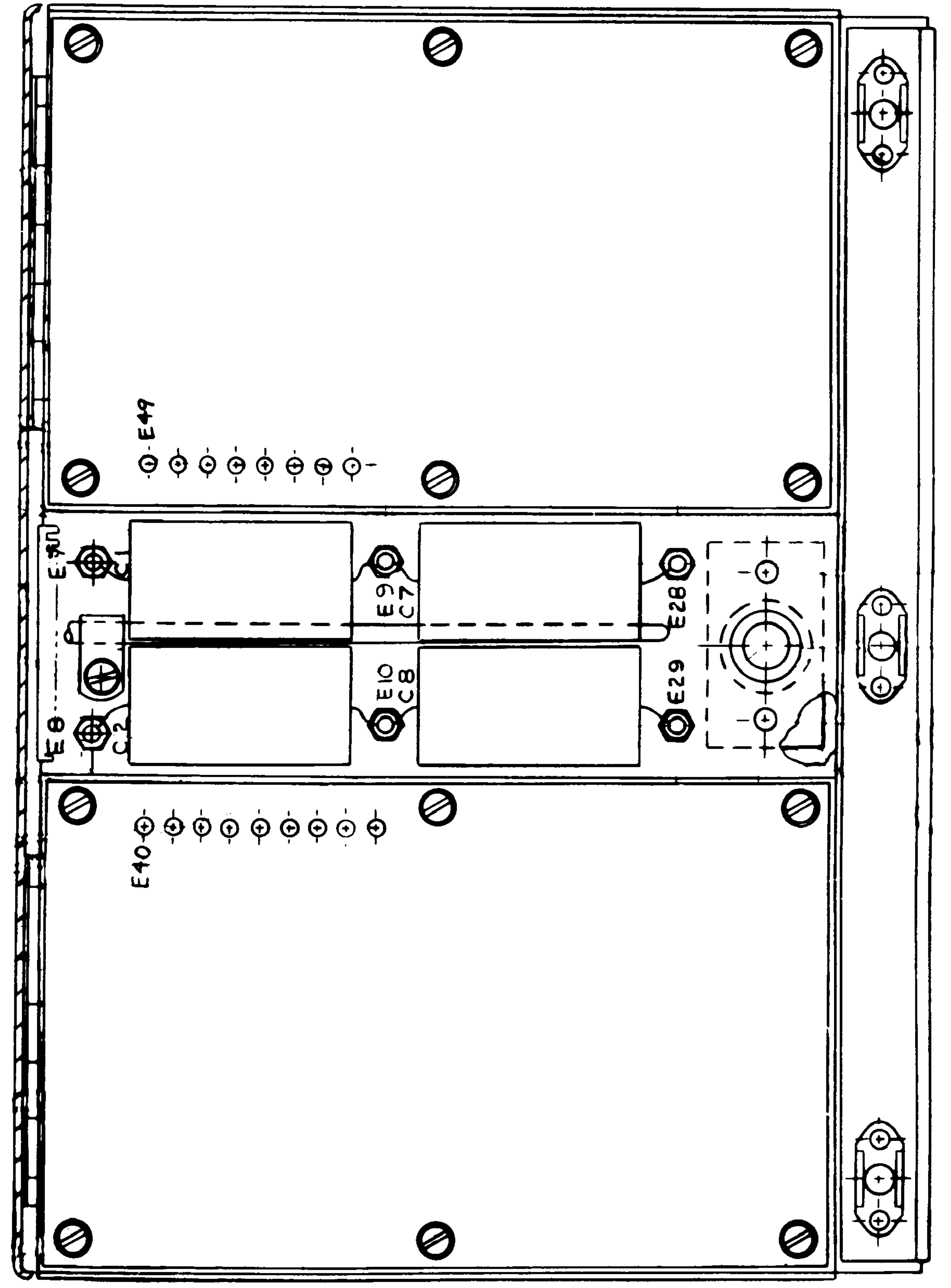
B. FRONT VIEW

TM 6625-648-35-13 ①

Figure 5-9①. Test Set, Telephone TS-1323/PTM-7, component location diagram.



A. LEFT SIDE VIEW



B. PANELS 8A2 AND 8A3

TM6625-648-35-13②

Figure 5-9②. Test Set, Telephone TS-1323/PTM-7, component location diagram.

4

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  Fort Knox (12)
Army Dep (2) except
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  SAAD (30)
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  SHAD (3)
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  11-98
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  11-127
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  11-157
  11-158
  11-500 (AA-AC)
  11-587
  11-592
  11-597

NG: None.
USAR: None.
For explanation of abbreviations used, see AR 32&50.

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2-25	2-28			Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°. REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of 25 knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation
3-10	3-3		3-1	Item 5, Function column. Change "2 db" to "3db." REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.
5-6	5-8			Add new step f.1 to read, "Replace cover plate removed in step e.1, above." REASON: To replace the cover plate.
		F03		Zone C 3. On J1-2, change "+24 VDC to "+5 VDC." REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

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