DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL

RESTORER, PULSE FORM TD-206/G

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

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 NOVEMBER 1966

WARNING

Up to 1,100 volts delay be encountered when using Restorer, Pulse Forms TD-206/G.

USE EXTREME CAUTION

DON'T TAKE CHANCESI

CAUTION

This equipment is transistorized. Do not make resistance measurements. Consult tile maintenance section of this manual before making voltage or waveform measurements.

CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 5 December 1983

**DIRECT SUPPORT, GENERAL SUPPORT AND
DEPOT MAINTENANCE MANUAL
RESTORER, PULSE FORM TD-206/G
(NSN 5805-00-868-8078)**

TM 11-5805-367-35/4, 1 November 1966, is changed as follows:

1. The title is changed as shown above.

2. New or added material is indicated by a vertical bar in the margin.

3. A new or changed illustration is indicated by a vertical bar opposite the figure caption.

4. Remove old pages and insert new pages as indicated below.

Remove pages	Insert pages
1-1	i
2-1 through 2-4	2-1 through 2-4
3-1 and 3-2	3-1 and 3-2
3-5 and 3-6	3-5 and 3-6
4-1 and 4-2	4-1 and 4-2
5-1 through 5-4	5-1 through 5-4
A-I	A-I
Figure 4-1 and paragraph 4-5 (foldout)	Figure 4-1 and paragraph 4-5 (foldout)
Figure 5-5 (foldout)	Figure 5-5 (foldout)

5. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

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To be distributed in accordance with DA Form 12-51C, Direct and General Support Maintenance requirements for TD-206/U.

TECHNICAL MANUAL
No. 11-5805-367-35/4

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

DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL RESTORER, PULSE FORM TD-206/G (NSN 5805-00-868-8078)

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: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. A reply will be furnished direct to you.

CHAPTER 1

INTRODUCTION

1-1. Scope

This manual covers general support and depot maintenance for Restorer, Pulse Form TD-206/G. It includes instructions for troubleshooting, testing, and aligning the TD-206/G. It also lists tools, materials, and test equipment required for general support and depot maintenance. The functioning of the TD-206/G is covered in chapter 2. Troubleshooting and repair of the TD-206/G will not be performed at direct support level.

1-2. 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 TD-206/G.

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 (Army).

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/ 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.

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your Pulse Form Restorer TD-206/G 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: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

CHAPTER 2

FUNCTIONING

2-1. General

Restorers, Pulse Form TD-206/G are used as unattended repeaters, at 1 mile intervals, in a two way, pulse code modulation (pcm) transmission cable: (cable link). A TD-206/G restores the original amplitude, wave shape, and timing of a pcm signal transmitted in either direction. A maximum of 39 TD-206/G's may be used in a cable link between attended repeaters (Multiplexers TD- 204/U and TD-754/G). The purpose, operation, and inter operation of the various circuits in the TD-206/G are explained in paragraphs 2 -2 and 2-3. Familiarity with the TD-206/G, how it works, and why it works that way are valuable tools for troubleshooting the TD-206/G rapidly and effectively.

2-2. Block Diagram Analysis (fig. 2-1)

a. The input applied to either IN terminal of the TO-206/G consists of a 2,304-kilocyele (kc) pcm signal, an order-wire signal, and a 38-milliampere (ma) current. Since the circuits are identical in either direction, the following discussion covers the block diagram of either 7A1 panel. The 2,304-kc pcm signal is applied through the transformer to the preamplifier. The Order -wire signal is direct coupled through the power supply and fault locator circuits to the OUT terminal. The 38-ma current also flows through the power supply and fault locator circuits. The power supply provides operating voltage for panel 7A1 circuits, and the fault locator circuit acts as a cable link troubleshooting aid.

b. The 2,304-Kc pen, signal applied through the preamplifier is applied through the gate driver circuit to one input of the AND gate. The 2,304-kc pen, signal is also applied through the timing circuit to the second input of the AND gate. The 2,304-kc signal is synchronized in the timing circuit when it is applied through the crystal filter. The linear and differential amplifiers amplify the synchronized signal for the second input of the AND gate. When coincident pulses appear at the inputs of the AND gate, an output pulse is applied to the output driver, amplified in the power amplifier, and applied through the transformer to the OUT terminal. The output of the power amplifier is applied through a feedback circuit to control the AND gate and a bias circuit to disable the fault locator circuit. If a loss of pcm occurs, the bias circuit no longer disables the fault locator circuit and the fault locator circuit provides a voltage drop which is detected at the attended repeater supplying the 38-ma current.

2-3. Circuit Analysis (figs. 2-2 and 5-5)

a. Figure e 2-2 is a schematic diagram of the TD-206/G. which shows the input and output connections to each 7A1 panel. Lightning arrestors E1 and E2 provide protection for the input and output circuits of each 7A1 panel. The schematic diagram for a 7A1 panel is shown in figure 5-5 and analyzed in b through k below.

b. The combined 2,304-Kc pcm signal, order-wire signal, and 38-ma current is applied across IN and SHLD terminals E3 and Ed `fig. 5-5) of panel 7A1. The 2,304-Kc pcm signal is developed across coil L1 and coupled through transformer T1. Diodes (JR] and CR2 protect the input circuit from high-voltage surges.

c. The 2,304-kc pcm signal is amplified by preamplifier transistor Q1 and coupled through transformer T2 to gate driver transistor Q2 and crystal filter Y! l. Resistor R1 and capacitor C2 make up a decoupling network. Resistor R2 and capacitor C3 establish bias for transistor Q2, and resistor R3 is the collector load resistor. Transformer T2 is the output coupling transformer, and capacitor C27 provides an increased bandwidth.

d. The output of preamplifier transistor Q1 is applied through resistor R5 to gate driver transis

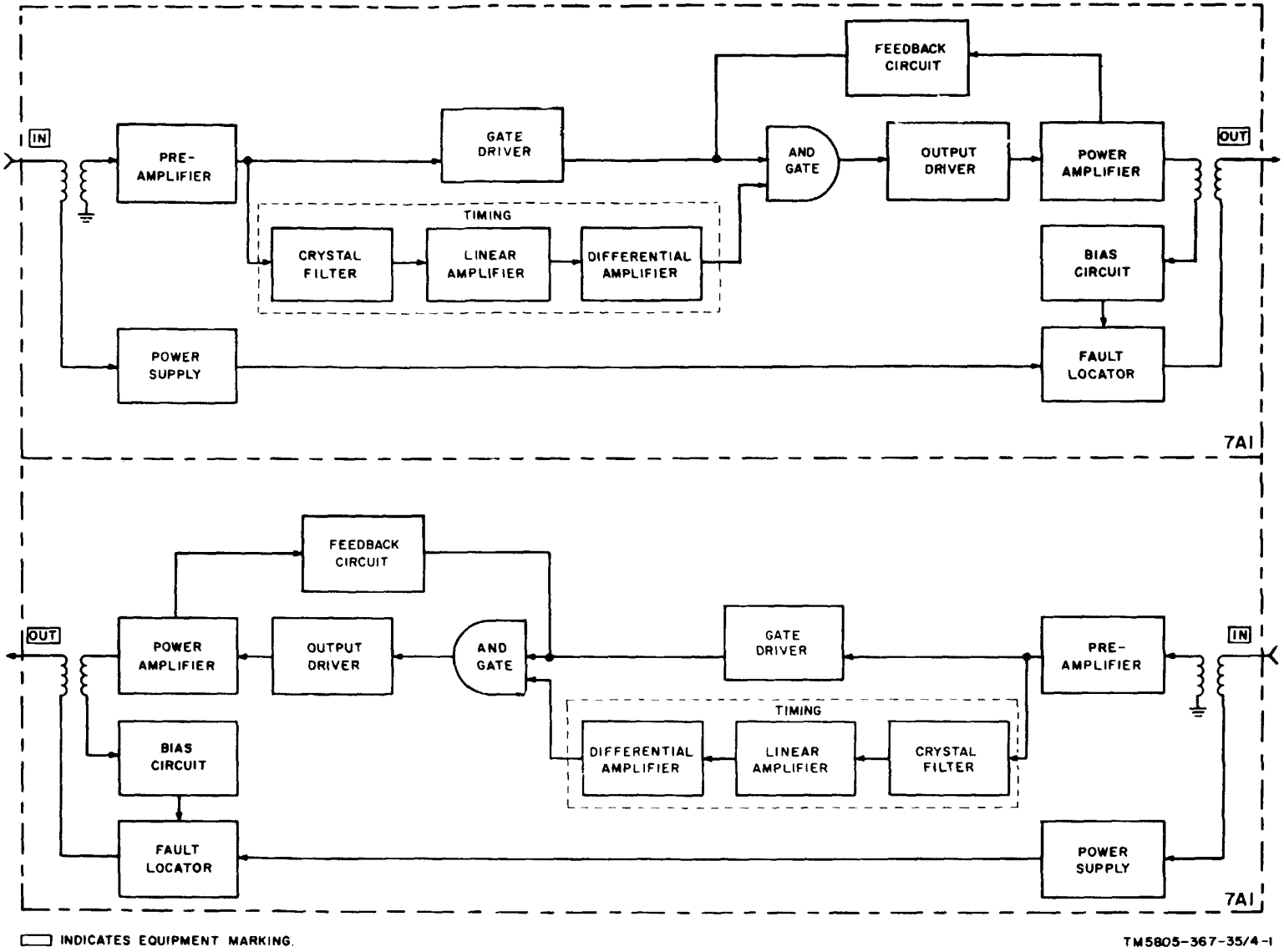


Figure 2-1. Restorer, Pulse Form, TD-206/G, block diagram.

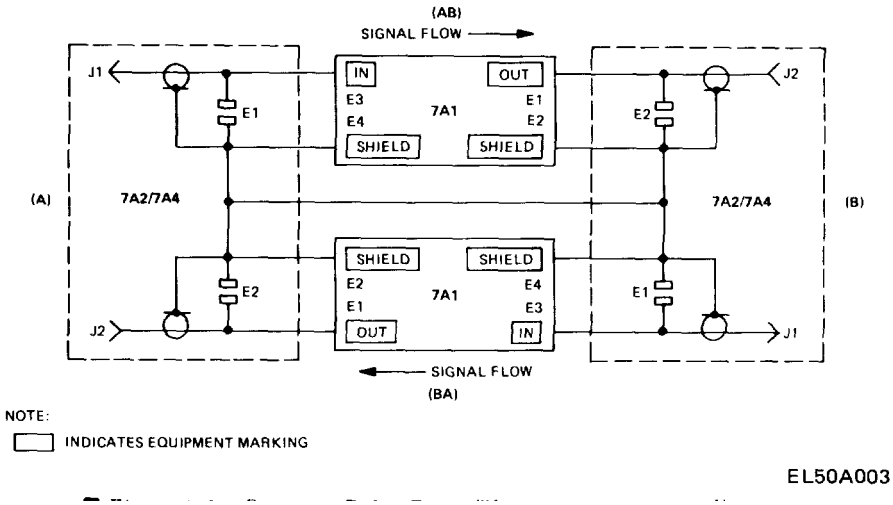


Figure 2-2. Restorer, Pulse Form TD-206/G, schematic diagram.

torQ2,where it is amplified and applied to AND gate diode CR3. Capacitor C22 and resistor RG establish a cutoff bias for transistor Q2, and conduction occurs only during negative pulses. Resistor R7 is the collector load resistor.

e. The output of preamplifier transistor Q1 is also applied to crystal filter Y1. Transformer T4 and capacitor C25 make up a tuned circuit for 2,304 kc, and the output from crystal filter Y1 produces an accurately timed sine-wave signal. Coil L8 and capacitor C26 make up a tuned circuit to develop the output of crystal filter Y1.

f. The output of crystal filter Y1 is applied through resistor R8 developed across resistor R9, and applied to the base of linear amplifier transistor Q3. Linear amplifier transistor Q3 isolates the crystal filter circuit from differential amplifier transistors Q4 and Q5. Resistor R10 is an emitter swamping resistor. Resistor R11 and capacitor C4 establish bias for transistor Q3. Coil L2 and capacitor C23 make up a tuned collector network.

g. The output of linear amplifier transistor Q3 is applied through capacitor C5 and developed across coil L3. Differential amplifier transistors Q4 and Q5 provide an output wave form of positive-going square-wave pulses at 2 304 kc. Resistor R28 and capacitor C19 establish bias for transistor Q4. Resistor R12 is a common emitter resistor for transistors Q4 and Q5. Resistors R14 and R15 and capacitor C20 establish bias for transistor Q5. Coil L4 and resistor R13 make up the collector load for transistor Q5. Coil L9 and capacitor C18 make up a Common decoupling network.

h. The Positive pulses of gate driver transistor Q2 are applied to AND gate diode CR3 and the positive pulses of differential amplifier transistor Q5 are applied to AND gate diode CR4. When the pulses are in coincidence the voltage developed across AND gate resistor R20 causes output driver transistor Q7 to conduct and generate a negative-going pulse. Capacitor C11, diode CR6, and resistor R12 establish bias for transistor Q7. Resistor R22 is the collector load resistor. Coil L6 provides decoupling for the power supply.

i. The signal from output driver transistor Q7 is coupled through capacitor C13 to power amplifier transistor Q8. The amplified pcm signal is applied through transformer T3 and the OUT and SHLD terminals (E1 and E2) to the transmission cable. The output is also applied through the feedback circuit (resistor R30 capacitor C21, and diode CR13) to prevent an outlast from the AND gate when transistor Q8 is conducting. soil L7 and capacitor C14 make up a decoupling network. Diode CR7 and resistor R23 establish bias for transistor Q8. Diodes CR8 and CR9 and resistor R24 aid the rapid switching action of transistor Q8. Diodes CR10 and CR11 protect the output circuit from high- voltage surges. Resistor R25 diodes CR5 and CR16 and capacitors C12 and C24 make up a bias circuit for control of the fault locator circuit.

j. When the pcm signal is applied to transformer T3, a negative voltage is developed by the bias circuit and applied to the base of fault locator transistor Q6. Transistor Q6 conducts and the 38-ma. Current flows through transistor Q6, shorting out resistor R16. When the pcm signal fails, capacitor C10 discharges through resistor R19. When the charge on capacitor C10 becomes sufficiently low, transistor Q6 cuts off. Resistors R16, R17 and R18 and capacitor C9 then develop a 4-volt drop which is detected at the attended repeater (TD-204/U or TD-754/G) supplying the 38-ma. Current. Note that a 4-volt drop will be developed in each succeeding TD-206/G in the cable link, since no pcm signal is applied to the OUT and SHLD terminals. Capacitor C* is a decoupling capacitor and resistors R17 and R18 are the emitter swamping resistors for transistor Q6.

k. The 38-ma. Current flowing through breakdown diode VR1 produces a 6-volt drop. Capacitors C15 and C16 establish the required operating voltages for the circuits in the 7A1 panel. Resistor R27 balances the load for the positive side. Capacitor C1 prevents any pcm signal from entering the power supply. Capacitors C6 and C7 and coil L5 make up a filtering network for the power supply.

CHAPTER 3

GENERAL SUPPORT MAINTENANCE

Warning: **Voltages as high as 1,100 volts direct current (dc) may be present in the circuitry and in the lightning arrestor wells of the TD-206/G when cable current is applied. Turn off the cable current before touching any internal parts.**

3-1. General Troubleshooting Information

a. General support maintenance procedures consist of troubleshooting and repair procedures for all circuits except tile timing circuits on panel 7A1. If the troubleshooting procedures localize trouble to the timing circuits, the panel must be returned to the depot for repair.

b. Troubleshooting at general support level is performed with the TD-206/G removed from service and disassembled. Refer to paragraph 3-3 to disassemble the TD-206/G, and to paragraph 3-4 to sectionalize, localize, and isolate troubles. Sectionalization means tracing the fault to the defective panel. Localization means tracing the fault to the defective circuit, and isolation means tracing the fault to the defective part. Some faults can be isolated by sight, touch, smell, or hearing. The majority of faults, however, must be isolated by waveform checks fig. 5-5) and voltage measurements (para 3-5). Refer to figure 3-1 to analyze trouble in the wiring of the TD-206/G.

3-2. Test Equipment and Materials Required

a. Test Equipment.

(1) Multiplexer TD-204/U.
(2) Oscilloscope AN/USM-140.
(3) Multilneter ME-26B/U.
(4) Test Set, Transistor TS-1836/U.

b. Material.

(1) Cable Assembly, Special Purpose, Electrical CX-4245/G or equivalent (1/4-mile reel) (8 ea).
(2) Cable Assembly, Radio Frequency CG1040B/U (5 ft) (2 ea).
(3) Cable Assembly, Radio Frequency CG2437/TCC (10 ft) (1 ea).
(4) Cable Assembly, Radio Frequency CG2438/TCC (10 ft) (1 ea).

3-3. Disassembly Procedure (fig. 3-2)

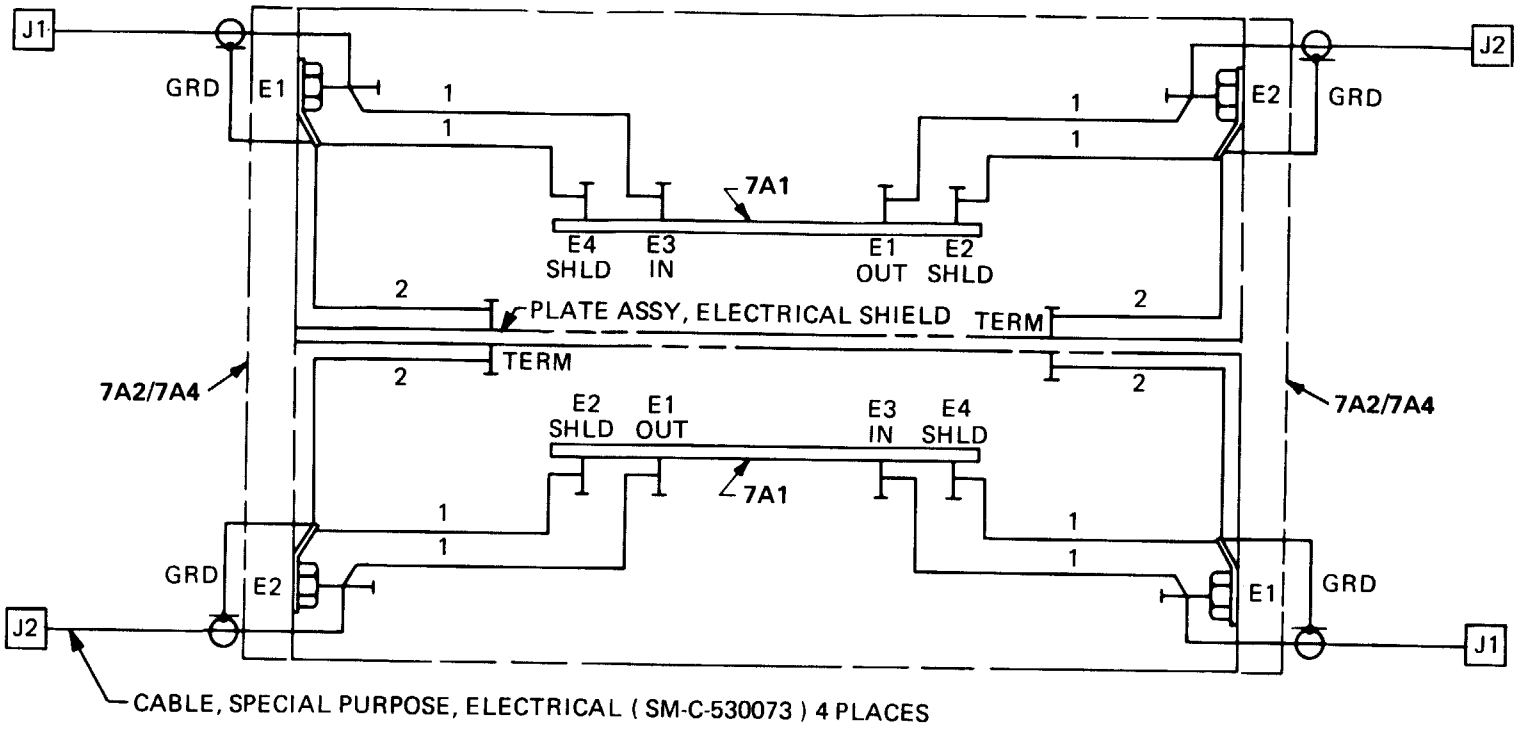
a. Remove the nut from one end of the TD206/G.
b. Remove the ring (with extrusion) from the housing.
c. Pull the strain relief cable until the shielding gasket and O-ring are exposed.
d. Remove the shielding gasket and O-ring.
e. Repeat the procedures given in *a* through *d* above for the other end of the TD-206/G.
f. Pull the strain relief cable at one end of the TD206/G and(remove the housing.

3-4. Troubleshooting

a. *General*. The symptoms listed in the troubleshooting chart (*c* below) are based on waveform measurements (fig. 5-5) taken with the TD-206-G operating in the test setup described in *b* below. The possible troubles listed indicate defective circuits or parts that may cause each symptom. The corrective measures indicate procedures used to localize the trouble to a defective circuit or to isolate the trouble to the defective part.

b. Test Setup.

(1) *Preliminary procedures*. Connect the equipment as shown in figure 3-3 and op



NOTE:

WIRE TYPE / COLOR CODE

CODE:

1 20 AWG GREY
2 20 AWG BARE WIRE

EL50A004

Figure 3-1. Restorer, Pulse Form TD-206/G, wiring diagram.

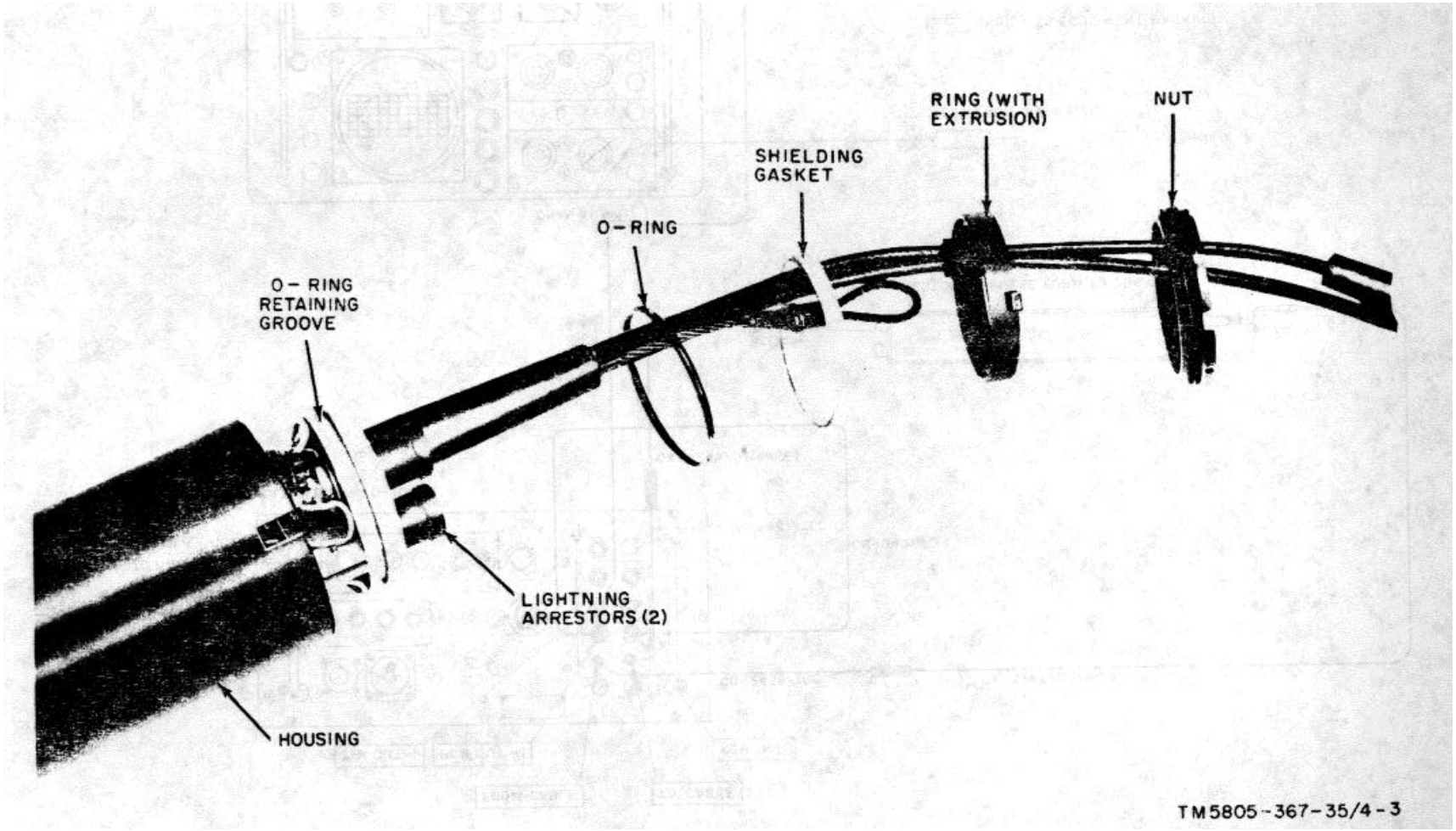


Figure 3-2. Restorer, Pulse Form TD-206/G, exploded view.

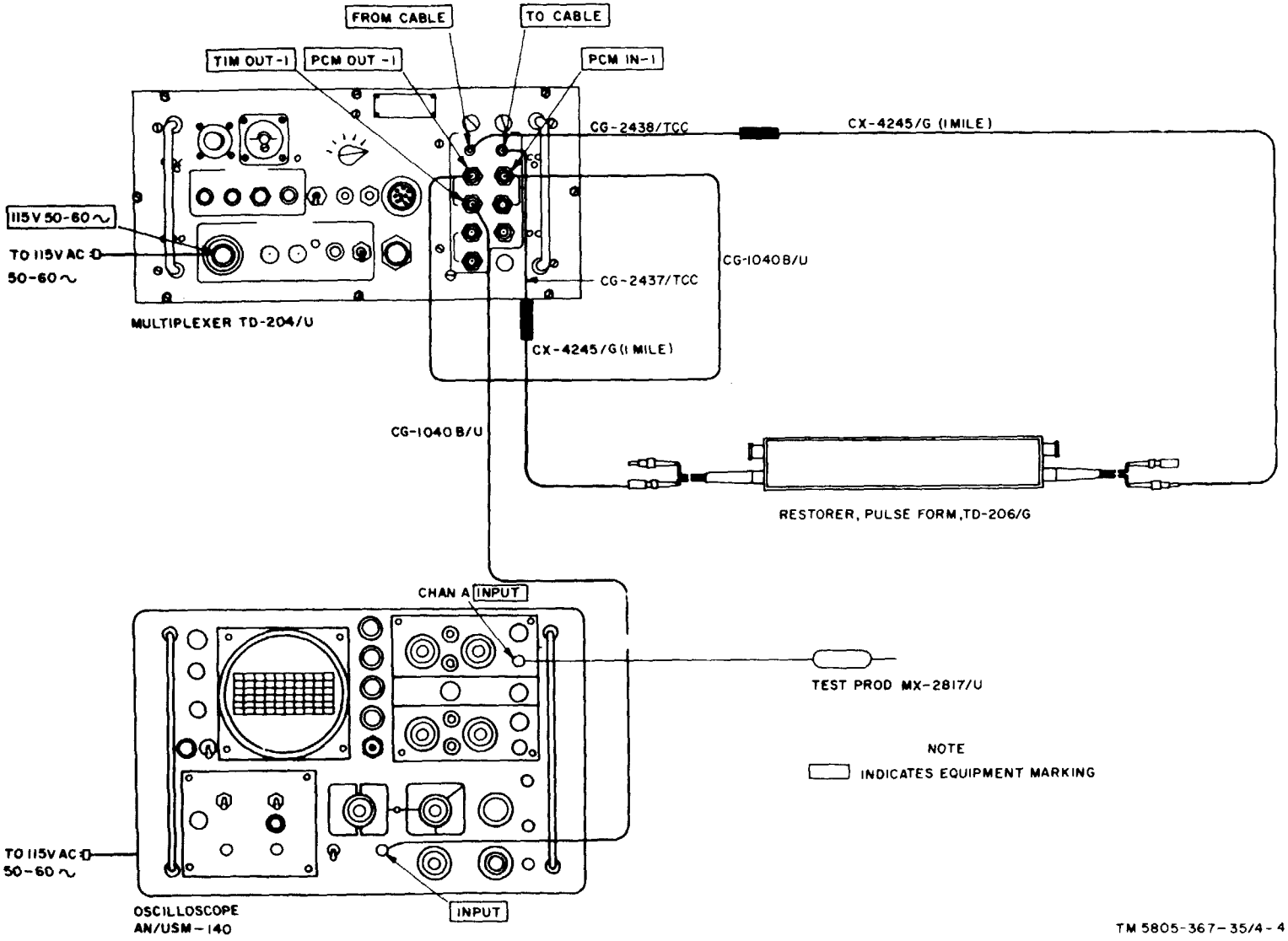


Figure 3-3. Panel 7A1, troubleshooting test setup.

erate the switches on the TD-204/U or TD-754/G as follows:

Switch	*Position*
NORM OPR-ZERO SET-READ	READ
MILE (panel 6A5 or 12A4).....	1 MI
TRAFFIC SEL	48 AR
AC POWER	ON
CABLE POWER	ON

(2) Operate the AN/USAM-140 as required and compare the actual waveform at each TM 11-5805-367-35/4 test point with the waveform indicated in figure 5-5.

(3) Measure the +3- and 3-volt power supply with the ME-26B/U. Be sure the +3- and -3-volt measurements are made with respect to the common point (A) indicated in figure 5-5, and be sure the measurement across breakdown diode VRI is 6 volts.

c. Troubleshooting Chart.

Note. A no-waveform symptom in the chart below may also be considered as a significantly different waveform from that shown in figure 5-5.

Item No.	Symptom	Probable trouble	Corrective measure
1	No waveform or incorrect waveform at OUT terminal E1.	Defective transistor Q8 (waveform missing) or diode CR13(waveform incorrect).	Check waveform at jacks J1 and J2. If present at jack J1 and not jack J2, refer to Item No. 2. If present at jack J1 and not jack J2, refer to Item No. 3. If not present at either jack J1 or J2, refer to Item No. 6. If present at jacks J1 and J2, refer to Item No. 8.
2	No waveform at jack J1	Defective transistor Q2	Check waveform at jack J5. If present, check transistor Q2 (para 3-5). If not present, refer to Item No. 6.
3	No waveform at jack J2	Defective transistor Q4 or Q5	Check waveform at jack J3. If present, refer to Item No. 11. If not present, refer to Item No. 4.
4	No waveform at jack J3	Defective transistor Q3 or crystal Y1.	Check waveform at jack J6. If present, refer to Item No. 12. If not present, refer to Item No. 5.
5	No waveform at jack J6	Defective transformer T2	Check waveform at jack J5. If present, check transformer T2. If not present refer to Item No. 6.
6	No waveform at jack J5	Defective transistor Q1	Check waveform at pin 1 of transformer T1. If present, check Q1 (para 3-5). If not present, refer to Item No. 7.
7	No waveform at pin 1 of transformer	Defective Transformer T1	Check waveform at IN terminal E3. If present, check transformer T1. If not present, check lightning arrestors and associated wiring (fig. 3-1) and make necessary repairs
8	No waveform at pin 1 of transformer T3-	Defective transformer T3	If present, check transformer T3. If not present, check waveform at junction of capacitor C13 and resistor R23. If present and correct, check transistor Q8 (para 3-5). If present and incorrect. check diode CR13. If not present, refer to Item No. 9.

Item No.	Symptom	Probable trouble	Corrective measure
9	No waveform at junction of capacitor C13 and resistor R23.	Defective transistor Q7	Check waveform at anode of diode CR3. If present, check transistor Q7 (para 3-5). If not present, refer to Item No. 10.
10	No waveform at anode of diode CR3.	Defective diode CR3 or CR4	Check waveform at jacks J1 and J2. If present at both jacks, check diodes CR3 and CR4. If present at only one jack, refer to Item No. 2 or 3 as applicable. If not present at either jack, check waveform at jack J5. If not present, refer to Item No. 6.
11	No waveform at emitter of transistor Q5.	Defective transistor Q5	If present, check transistor Q5 (para 3-5). If not present, check waveform at jack J3. If present, check transistor Q4 (para 3-5). If not present, refer to Item No. 4.
12	No waveform at jack J3	Defective transistor Q3	If present, check transistor Q3 (para 3-5). If present, refer to Item No. 13.
13	No waveform at junction of capacitor C26 and resistor R8.	Defensive crystal Y1	Check waveform at jack J6. If present, refer to depot for repair. If not present, refer to Item No. 5.

3-5. Additional Troubleshooting Data

Use the ME-26B/U to make the following measurements with respect to the common point (A), and the schematic diagram (fig. 5-5) to isolate the trouble to a specific part

	Dc voltage		
Transistor	Emitter	Collector	Base
Q1	+0.18	--2.7	0
Q2	0	--0.74	+ 0.65
Q3	+024	--2.7	0
Q4	--0.075	--2.7	+0.04
Q5	--0.075	--0.56	+0.26
Q6	--2.7	--2.75	--2.95
Q7	--0.56	--0.74	--0.6
Q8	+2.3	--1.3	+4-2.3

3-6. Reassembly Procedure (fig. 3-2)

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

a. Clean the housing thoroughly with Cleaning I Compound (NSN 7930-00-395-9542), and apply a thin 3-6 Change 1 film of silicone primer encapsulating compound (SM-B530080) and encapsulating compound resin (SM-B530081) before reassembling nut assembly 7A2 to ensure a watertight seal.

b. Insert the circuit board assembly in the housing and leave one end exposed as indicated in figure 3-2.

c. Lubricate and install the new O-ring in the O-ring retaining groove.

d. Pull the strain relief cable until the other end of the circuit board assembly is exposed as indicated in figure 3-2.

e. Install the O-ring in the O-ring retaining groove.

f Lubricate and install the new shielding gasket, the ring (with extrusion), and the nut in the end of the TD-206/G where the circuit board assembly is not exposed. Handtighten the nut.

g. Pull the strain relief cable (on the same end of the TD-206/G) until the end of the circuit board assembly is seated firmly against the shielding gasket.

h. Install the shielding gasket, the ring (with extrusion), and the nut in the other end of the TD-206/G.

i. Tighten both nuts so that they are equally spaced in the ends of the housing. *Do not* overtighten the nuts, since this may damage the housing.

CHAPTER 4

GENERAL SUPPORT TESTING PROCEDURES

4-1. General

a. These testing procedures are prepared for use by General Support Maintenance Shops and Service Organizations responsible for general support maintenance of electronics equipment to determine the acceptability of repaired electronic equipment. These procedures set forth specific requirements that repaired electronics equipment *must* meet before it is returned to the using organization. Perform the physical tests and inspection (para 4-4) on the TD-206/G. Refer to paragraph 4-5 for the performance tests. A summary of performance standards is provided in paragraph 4-6.

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, and then perform each specific test procedure, and check results against its performance standard.

4-2. Test Equipment, Materials, and Other Equipment

a. General. All test equipment, materials, and other equipment required to perform the testing procedures are listed in the following charts. 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.

b. Test Equipment.

Nomenclature	National stock No.	Technical manual
Multiplexer TD-352/U.	5805-00-900-8199	TM 11-5805-367-12
Multiplexer TD-204/U or TD 754/G	580500-900-8200 580500-930-8078	TM 11-5805-367-12 TM 11-5805-383-12
Headset-Microphone H-91A/U	5965-00-699-6871	TM 11-5965-206-15F

c. Materials.

Quantity (ea)	Description	National stock I
8	Cable Assembly, Special Purpose, Electrical CX-425/G (1/4-mile reel).	5995-00-868-81
4	Cable Assembly, Radio Frequency CG-1040B/U (5 ft).	5995-00-913-05
1	Cable Assembly, Radio Frequency CG-2437/TCC (10 ft).	5995-00-916-22
1	Cable Assembly, Radio Frequency CG-2438/TCC (10 ft).	5995-00-913-05
1	Light Assembly, Electric MX-1292/PAQ.	6695-00-537-44

4-3. Modification Work Orders

The performance standards listed in the tests assume that no modification work orders have been performed. A list of current modification work orders is provided in DA Pamphlet 310-1.|

4-4. Physical Test and Inspection

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

b. Test Connections and Conditions.

(1) Do not make any connections to the equipment.
(2) Before reassembly of the equipment, perform the following checks when repairs are completed.
(3) Connect the MX-1292/PAQ to a 115-volt, 60-cycle-per-second (cps) power source, and install the wideband transmission filter.

c. Test Procedures.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	NA	N/A	a. Inspect housing and panel assembly for physical damage and, loose or loose or missing nuts, screws, bolts, and gaskets.	a. Housing and panel assembly are complete and not damaged.
			b. Inspect connector, plugs, and lightning arrestors for cleanliness and evidence of physical damage.	b. Connectors, plugs, and lightning arrestors are clean and not damaged.
			c. Check all resistors for evidence of overheating.	c. Resistors show no signs of discoloration due to overheating.
			d. Inspect all wire and cables for worn or frayed insulation.	d. Wires and cables are free of cuts and frays.
			e. Inspect housing for condition of exposed metal parts.	e. All metal surfaces intended to be painted do not show bare metal.
			Note. Touchup painting is recommended in lieu of refinishing whenever practical.	
2	N/A	N/A	Check equipment for applicable modification work orders (MWO's) (see DA Pamphlet 310-4 for a list of MWO's).	If MWO is performed, MWO number appears on equipment.
3	MX-1292/PAQ 245 FOR M.V. LAMP: ON	N/A	a. Expose equipment to direct rays of MX-1292/PAQ. Inspect condition of moisture- and fungus-proofing (mfp)) varnish and conformal coating on panels.	a. All components and wiring not on panels are completely covered with moisture- and fungus-proofing varnish. All panels are completely covered with conformal coating.
			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-gray appearance indicates inadequate coating.	*Note*. Do not apply mfp varnish to parts that were not originally treated with mfp varnish.
			b. Operate 245 FOR M.V. LAMP switch on MX-1292/PAQ to OFF.	b. None.

NOTE: Figure 4-1 and paragraph 4-5 located in back of manual.

4-6. Summary of Performance Standards

Test No.	Description	Performance standard	Test data
	Pem circuit tests:		
1c	Tone	Clear tone with no clicks	
1e	No tone	Quiet with no clicks	
	Fault locator circuit tests:		
2c	With pem	TEST ALIGN meter indicates center hairline.	
2d	Without pem	TEST ALIGN meter indicates center hairline.	
3b	Order-wire test:		
	Audio	Audio heard in H-91A/U receiver	

CHAPTER 5

DEPOT MAINTENANCE

5-1. General

Depot maintenance consists of alignment of the timing circuits in panel 7A1 and complete rebuilding of the TD-206/G. Final tests for a rebuilt TD-206/G are the same as for general support maintenance (paras 4-4 and 4-5). The test equipment and materials required for depot alignment are indicated in paragraph 5-2. The alignment procedures are provided in paragraph 5-3.

5-2. Test Equipment and Materials

a. Signal Generator, General Radio 805-D.

b. Multimeter ME-30/U.

c. Oscilloscope AN/USM-281C.

d. Resistor, carbon, 510 ohms, ±5 percent, 1/2 watt.

e. Resistor, carbon, 62 ohms, ±5 percent, 1/2 watt.

f: Capacitor, fixed, mica, 0.01 microfarad (µf), ±5 percent, 100 vdcw.

g. Capacitor, fixed, mica, 68 picofarads (pf), ±5 percent, 300 vdcw.

h. Capacitor, fixed mica, 75 pf, ±5 percent, 300 vdcw.

i. Capacitor, fixed, mica, 82 pf, ±5 percent, 300 vdcw.

j. Capacitor, fixed, mica, 91 pf, ±5 percent, 300 vdcw.

k. Capacitor, fixed, mica, 0.01 µf, ±5 percent, 300 vdcw.

l. Hookup wire, 22 AWG (as required).

5-3. Timing Circuit Alignment (fig. 5-1)

a. Connect the equipment as indicated in A, figure 5-1.

b. Operate the Signal Generator 805-D controls as follows:

Control	Position
ON-OFF switch	ON
OSC PLATE-OFF switch.....	OSC PLATE
MODULATION switch	OFF
RANGE SELECTOR switch	E
CARRIER FREQUENCY and FREQUENCY INCREMENTS	for 2,304-kc
control.	± 10-cps
.....	output
OUTPUT VOLTAGE control.....	2 volts pp

c. Operate Multiplexer TD-204/U or TD-754/G switches as follows:

Switch	Position
AC POWER	ON
CABLE POWER	ON
NORM OPR-ZERO SET-READ	NORM OPR

d. Operate the ME-30/U ON-OFF switch to ON and the range selector switch for a midscale indication.

e. Adjust capacitor C26 (fig. 5-1) for a peak indication on the ME-30/U.

f Adjust the Signal Generator 805-D CARRIER FREQUENCY and FREQUENCY INCREMENT controls for 2,300 kc ± 10 cps.

g. Adjust capacitor C25 for a peak indication on the ME-30/U and note the indication.

h. Adjust the Signal Generator 805-D CARRIER FREQUENCY and FREQUENCY INCREMENT controls for 2,308 kc +10 cps.

i. Adjust capacitor C25 for a peak indication on the ME-30/U and note the indication.

j. If the indications in g and i above are not within +1 decibel (db) of each other, repeat the procedures given in h through i above until this balance is achieved.

k. Adjust the Signal Generator 805-D CARRIER FREQUENCY and FREQUENCY INCREMENT

controls for 2,304 kc - 10 cps, and readjust capacitor C26 for a peak indication on the ME-30/U.

l. Operate the TD-204/U or TD-754/G CABLE POWER switch to OFF.

m. Connect the equipment as indicated in B, figure 5-1.

n. Operate the TD-204/U or TD-754/G CABLE POWER switch to ON and the NORM OPR-ZERO SET-READ switch to READ.

o. Operate the AN/IUSM1 140 controls as follows:

Control	*Position*
POWER ON switch	ON
SWEEP MODE switch	INT
CHOPPED-A-B-ALTERNATE switch.	A-B
Gain control	0.5V/CM
VERNIER SENSITIVITY (VOLTS/CM) (vertical).	1
VERNIER SWEEP TIME control	0.1 MICRO-SECOND/CM

p. Operate the TD-352/'U switches as follows:

Switch	*Position*
METER SELECT	SERV FAC
CHAN	1-12
SERV SEL	OSC
ADDRESS	MASTER
AC POWER	ON

q. Operate the ME-30/U range selector switch to 1 VOLTS.

r. Adjust the TD-352/U OSC ADJI'ST control until the TEST ALIGN meter needle indicates at center hairline.

s. Operate the TD-352/U SERV SEL, switch to CHAN 1-12. The ME-30/U should indicate approximately 0.5 volt: root mean square (rms).

t. Check the J1 and J4 waveform on the AN/USM-140 (fig. 5-5). Substitute the proper value of capacitor C23 (68, 75, 82, or 91 pf) to provide the phasing (T1) closest to 40 nanoseconds (nsec).
Note. The indication on the ME-30/U may exceed 0.5 volts when the proper phasing is obtained.

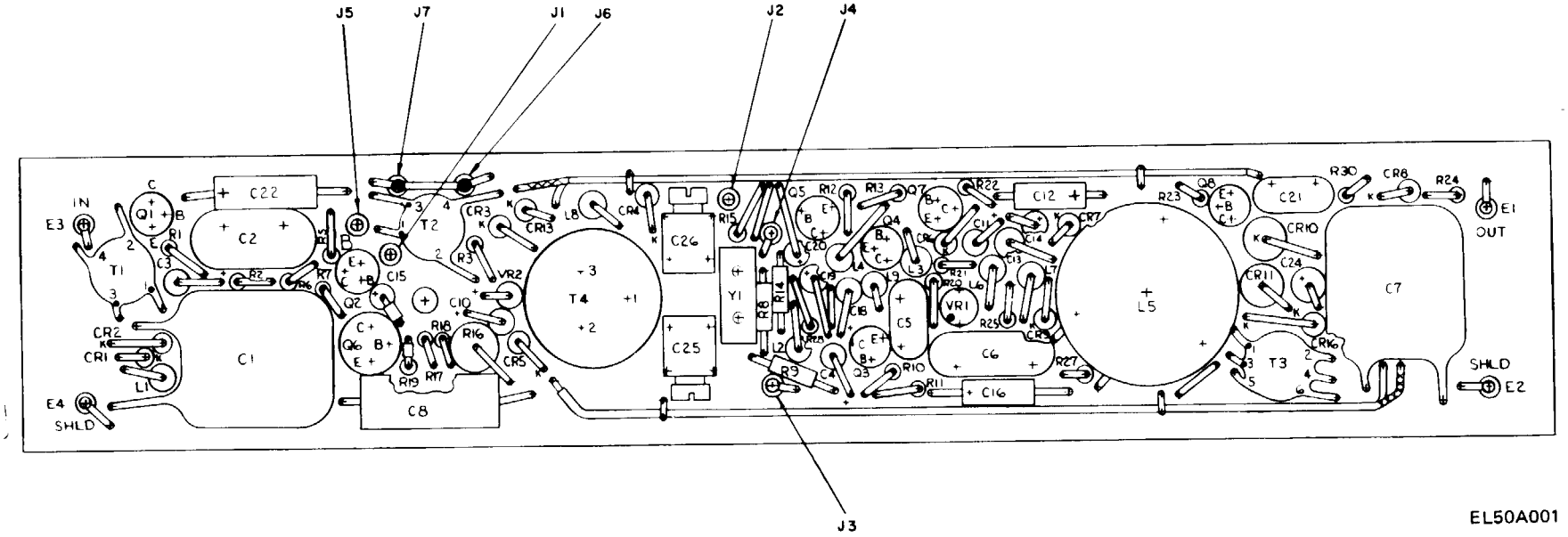
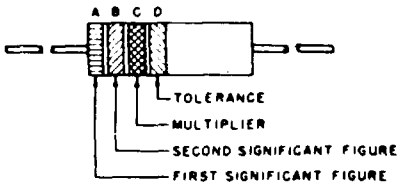


Figure 5-2. Panel 7A1, top panel view.

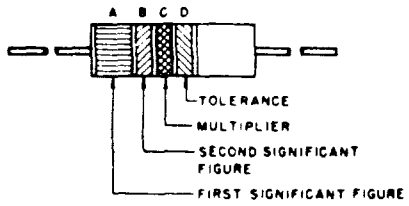
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

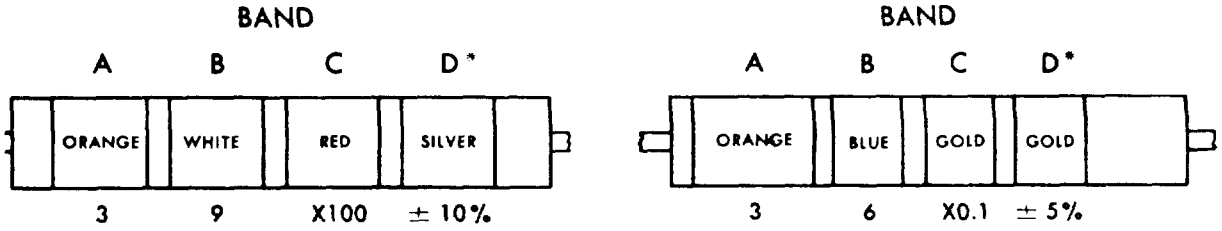


BAND A— Double Width Signifies Wire-wound Resistor

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 5-3. Color code marking for MIL STD resistors.

APPENDIX

REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms I
TB SIG 222	Solder and Soldering
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, CU-1548/G (5805-00-069-8795) and CU-1548 A/G (5805-00-069-8795) (Reprinted W/Basic Incl C1-6)
TM 11-6625-200-15	Operator's, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Multimeters ME-26A/U (NSN 6625-00-360-2493), ME-26B/U, ME-26C/U (6625-00-646-9409), ME-26D/U, (6625-00-913-9781) (Reprinted W/Basic Incl C1-3)
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 11-6625-535-15	Operator's, Organizational, Direct Support, General Support and Depot Maintenance Manual: Oscilloscope AN/USM-140A
TM 38-750	The Army Maintenance Management System (TAMMS)

FM-913-73

CAPACITOR 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				300		
YELLOW		4	4	10,000					E			D		– 55 ° to + 125 °C	10 - 200 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						

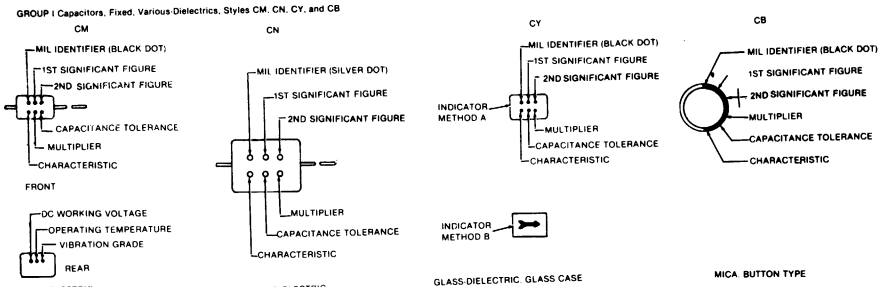
TABLE III - For use with Group III, Temperature Compensating, Style CC

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	0.01			
GREY		8	8	0.1	± 10%		
WHITE		9	9				
GOLD	+ 100					± 1.0uuf	
SILVER							

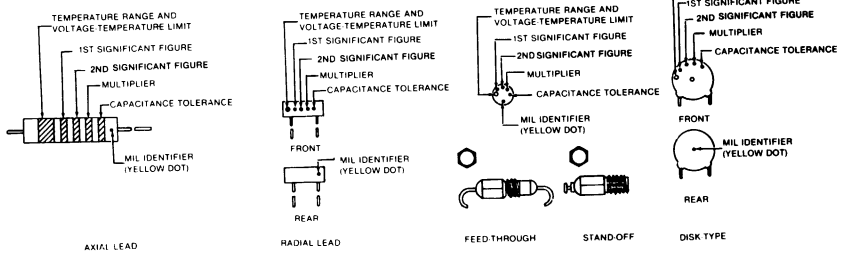
1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letter indicate the Characteristics designated in applicable specification: MIL-C-5, MIL-C-91, MIL-C-11272, and MIL-C-10950 *respectively*.
3. Letters indicate the temperature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

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

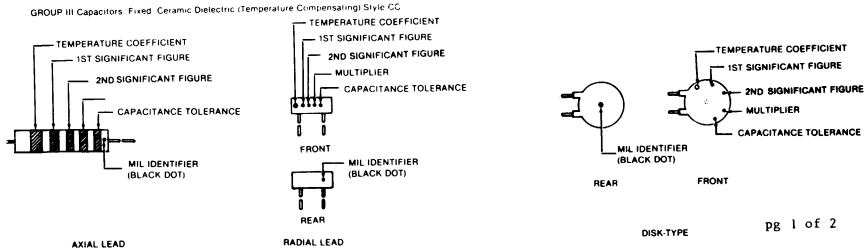
GROUP I Capacitors, Fixed, Various Dielectrics, Styles CM, CN, CY, and CB

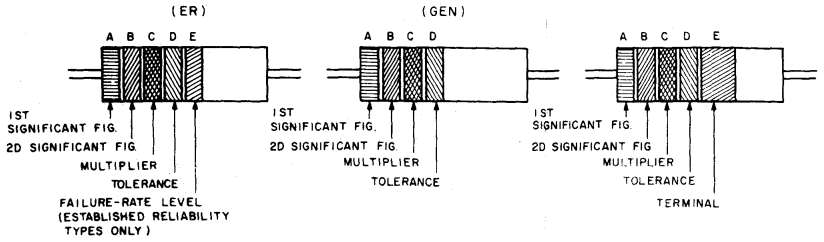


GROUP II Capacitors, Fixed Ceramic Dielectric (General Purpose) Style CK



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





COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS.

TABLE I
COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS.

BAND A		BAND B		BAND C		BAND D		BAND E		
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM.
BLACK	0	BLACK	0	BLACK	1			BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1	
RED	2	RED	2	RED	100			ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP. TYPE ONLY)	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY).			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH.)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE.

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE.

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE — RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1-1/2 TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS
(THESE ARE NOT COLOR CODED)

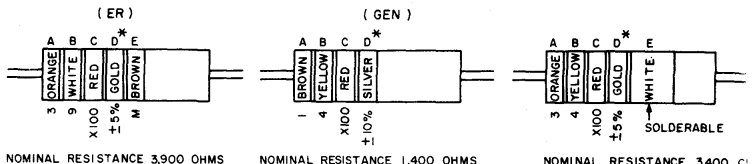
SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 1ORO = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED, IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

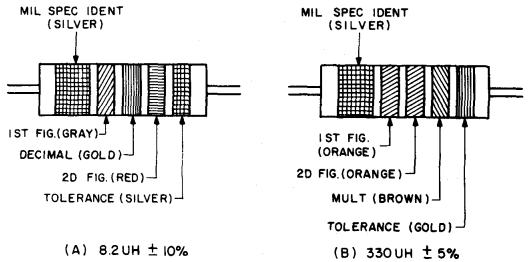
A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS.

EXAMPLES OF COLOR CODING



COMPOSITION-TYPE RESISTORS FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD.



COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES. AT A, AN EXAMPLE OF OF THE CODING FOR AN 8.2UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330UH INDUCTOR ARE ILLUSTRATED.

TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

FO-1 COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS AND INDUCTORS

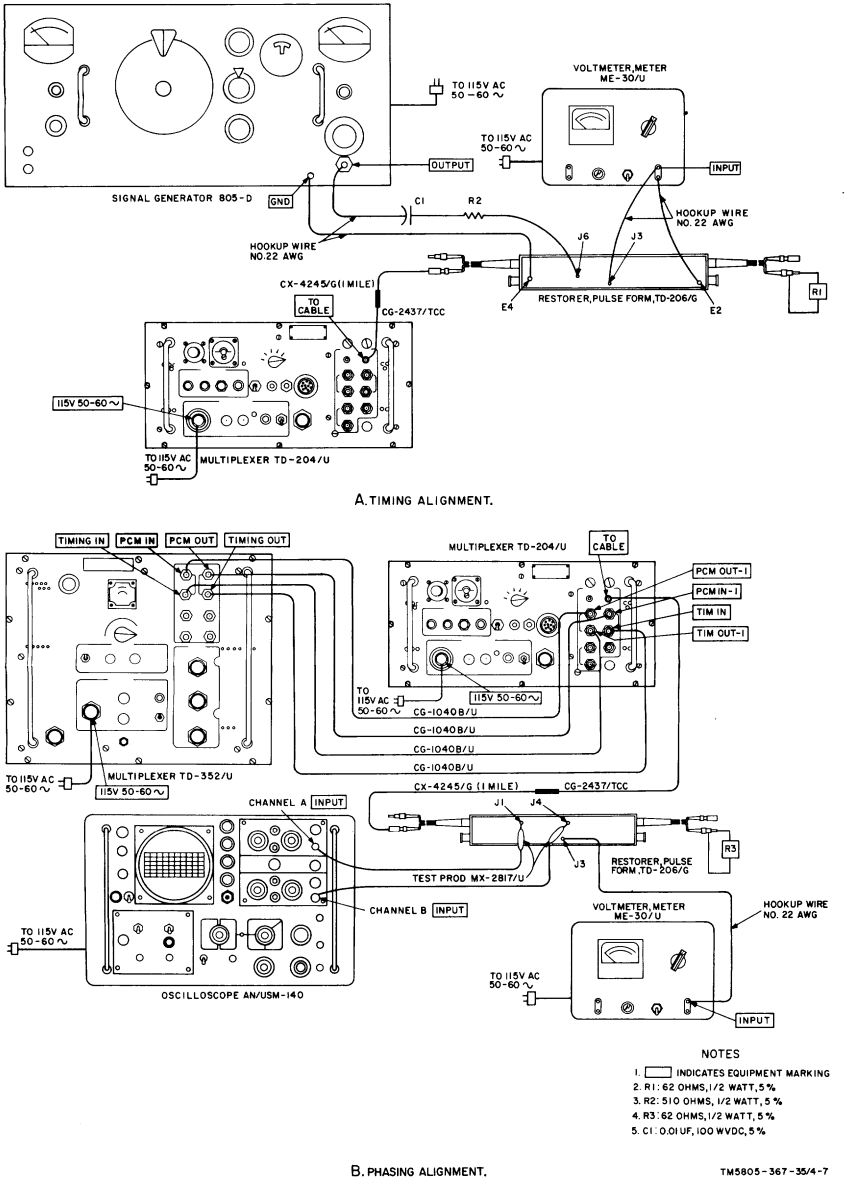
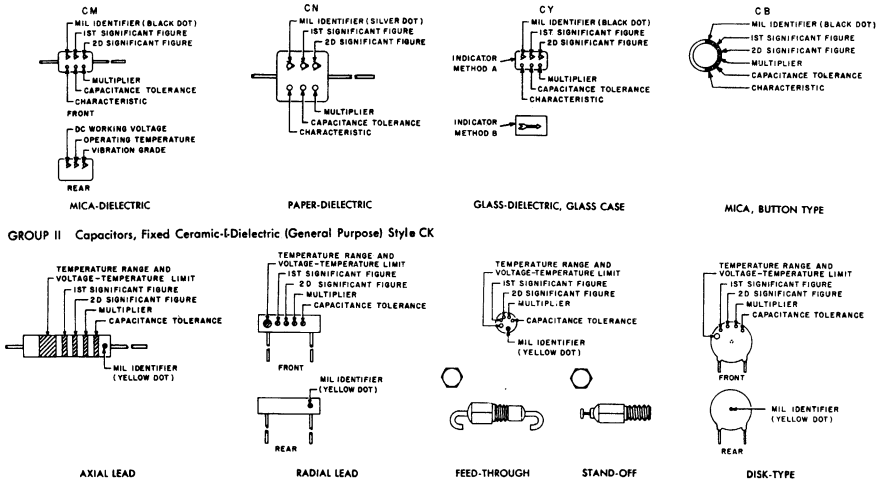


Figure 5-1. Panel 7A1, timing circuit alignment test setup.

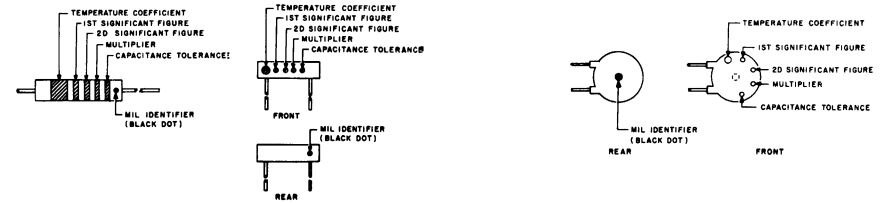
COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

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



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

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



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.

STD–CR

Figure 5-4. Color code marking for MIL STD capacitors.

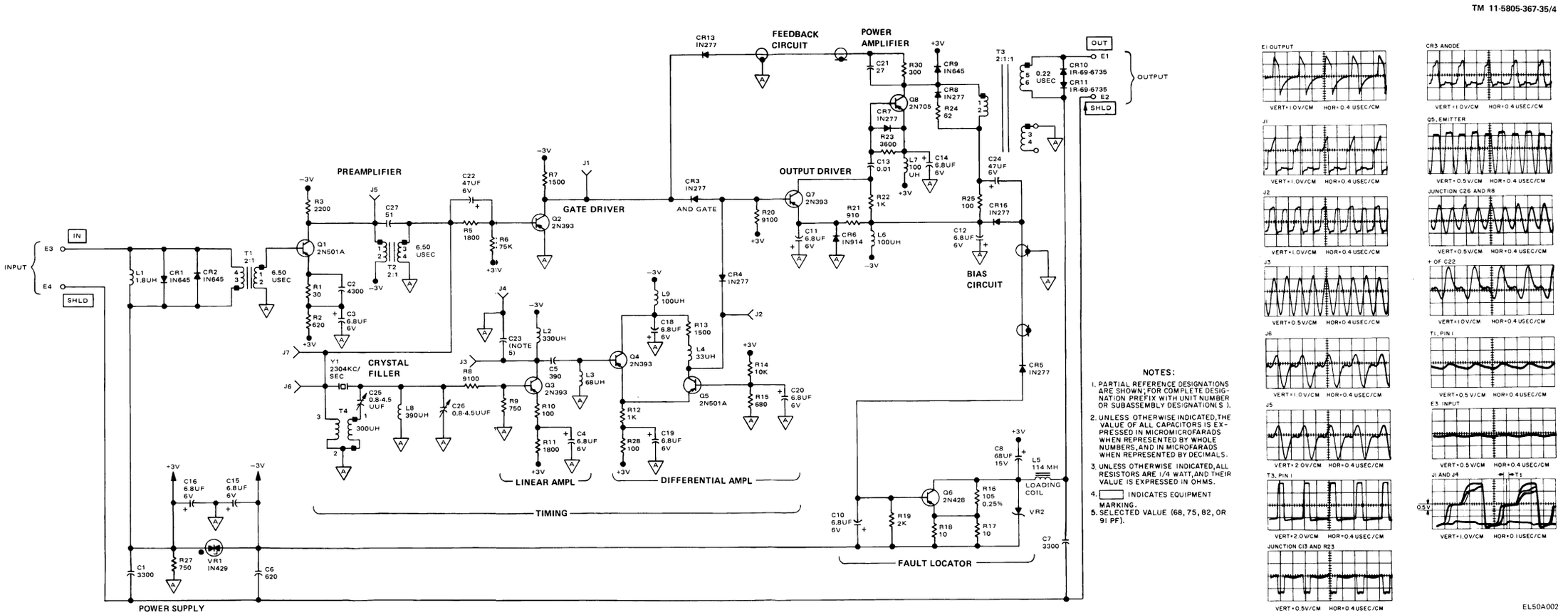


Figure 5-5. Panel 7A1, schematic diagram and waveform

Change 1

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

Official:
KENNETH G. W'ICKHAM,
Major General, United States Army,
The Adjutant General.

Distribution:

Active Army
- USASA (2)
- CNGB (1)
- CC-E (7)
- Dir of Trans (1)
- CofEngrs (1)
- TSG (1)
- CofSptS (1)
- USAARENBD (2)
- USAAESWBD (5)
- JSACDCEA (1)
- USACDCEC (10)
- USACDCCBRA (1)
- USACDCCEA (1)
- USACDCCEA (Ft Huachuca) (1)
- USACDCOA (1)
- USACDCQMA (1)
- USACDCTA (1)
- USACDCADA (1)
- USACDCARMA (1)
- USACDCAVNA (1)
- USACDCARTYA (1)
- USACDCSWA (1)
- USAMC (5)
- USCONARC (5)
- ARADCOM (5)
- ARADCOM Rgn (2)
- OS Maj Comd (4)
- LOGCOMD (2)
- USAMICOM (4)
- USASTRATCOM (4)
- USAESC (70)
- MDW (1)
- Armies (2) except
  - Seventh USA (5)
- Corps (2)
- USAC (3)
- Instl (2) except
  - Ft Gordon (10)
  - Ft Huachuca (10)
  - WSMR (5)
  - Ft Carson (21)
  - Ft Knox (12)
- Svc Colleges (2)
- USASCS (60)
- USASESCS (90)
- USAADS (2)
- USAAMS (2)
- USAARMS (2)
- USAIS (2)
- USAES (2)
- USATC Armor (2)
- USAECFB (2)
- USATC Inf (2)
- USASTC (2)
- Army Dep (2) except
  - LBAD (14)
  - SAAD (30)
  - TOAD (14)
  - LEAD (7)
  - SHAD (3)
  - NAAD (5)
  - SVAD (5)
  - CHAD (3)
  - ATAD (10)
- Gen Dep (2)
- Sig Sec, Gen Dep (5)
- Sig Dep (12)
- WRAMC (1)
- Army Pic Cen (2)
- AMS (1)
- Sig FLDMS (2)
- USAERDAA (2)
- ITSAERDAW (13)
- USACRREL (2)
- Units org under fol TOE :--2 ea.
  - 11-57
  - 11-97
  - 11-98
  - 11-117
  - 11-127
  - 11-155
  - 11-157
  - 11-158
  - 11-500 (AA-AC)
  - 11-587
  - 11-592
  - 11-597

NG: State AG (3).
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centæ) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 021870-001