TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, AND GENERAL SUPPORT

MAINTENANCE MANUAL

INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS

FOR

ELECTRONIC MARKER GENERATOR AN/USM-108B

(NSN 6625-00-038-7371)

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1975

WARNING

Be careful when working on the 115 VAC or 230 VAC power line connections. Serious injury or death may result from contact with these terminals.

TECHNICAL MANUAL
No. 11-6625-2642-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *31 July 1975*

OPERATOR'S, ORGANIZATIONAL, AND GENERAL SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS FOR ELECTRONIC MARKER GENERATOR AN/ USM-108B (NSN 6625-00-038-7371)

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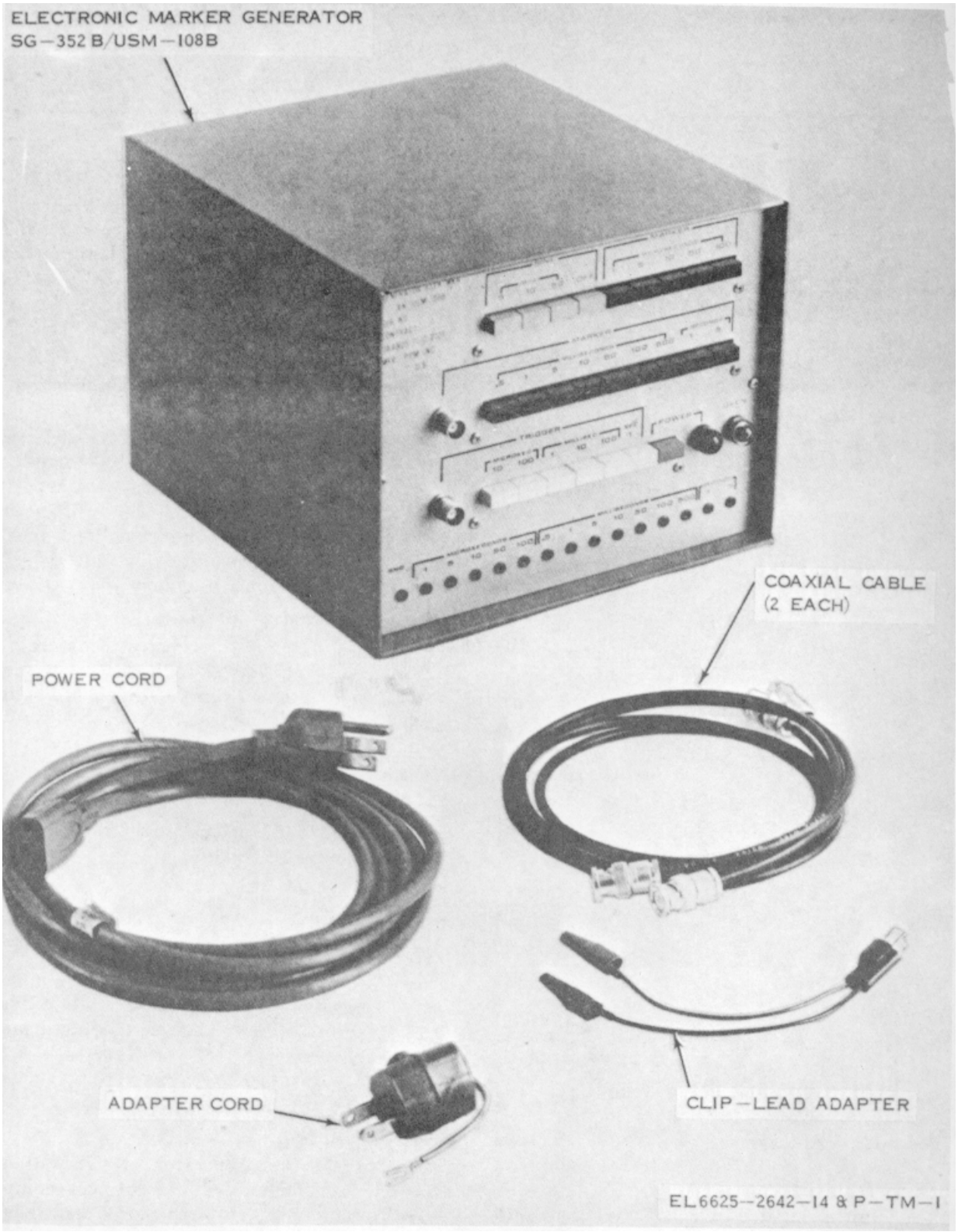


Figure 1-1. Electronic Marker Generator AN/USM-108B.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

This manual describes Electronic Marker Generator AN/USM-108B (fig. 1-1) and provides instructions for operation and maintenance of the equipment. It also includes a repair parts and special tools list. There is no direct support maintenance authorized for the equipment.

1-2. Indexes of Publications

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

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

1-3. Forms and Records

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

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DSAR 4145.8.

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

1-4. Reporting of Equipment Publication Improvements

The reporting of errors, omissions and recommendations for improving this publication by the individual user is encouraged. Submit reports on DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-Q, Fort Monmouth, NJ 07703.

1-5. Administrative Storage

The procedures for administrative storage are outlined in TM 740-90-1; however, the exact procedure in repackaging for limited storage depends on the materials available and the conditions under which the equipment is to be stored.

1-6. Destruction to Prevent Enemy Use

Refer to TM 750-244-2 for demolition procedures for electronic equipment.

Section II. DESCRIPTION AND DATA

1-7. Purpose and Use

a. Electronic Marker Generator AN/USM-108B is capable of generating precision time-mark pulses, trigger pulses and sine wave outputs. It is used to superimpose time markers onto an oscilloscope display to test the time base calibration, or wherever evaluation of time intervals is required.

b. The unit is capable of delivering time-mark pulses at 14 pulse intervals from one microsecond to five seconds; trigger pulses at six repetition rates from one to 100,000 pulses per second; and three sine wave outputs at frequencies of five, ten and fifty megahertz. Time-mark pulses may be selected so any or all are available at the MARKER output. Only one sine wave can be selected at one time.

1-8. Description

Electronic Marker Generator AN/USM-108B is a portable, transistorized unit of test equipment which comes complete with power cord, adapters and cables. All operating controls, indicators and output jacks are mounted on the front panel, The power fuse and input voltage switch is located on the rear of the unit.

All electrical characteristics are summarized below in paragraph 1-9.

1-9. Tabulated Data

Power requirements. 105 to 125 vac or 210 to 250 vac, 50 to 400 Hz, 15 watts av.

Crystal oscillator frequency. 10 MHZ ± 0.001 %

Crystal oscillator stability. Frequency drift no greater than 3 parts per million in 24 hours.

Time-mark pulse intervals. 1, 5, 10, 50, 100, 500 microseconds; 1, 5, 10, 50, 100, 500 milliseconds; 1, 5 seconds.

Time-mark pulse output voltage. One volt minimum across a 50 ohm resistive load at the MARKER output, and 12.5 volts minimum across a 600 ohm resistive load at the tip jack output.

Time-mark pulse risetime. Less than 70 nanoseconds for markers to one microsecond (50 ohm termination); less than 500 nanoseconds for markers to five seconds (50 ohm termination).

Time-mark pulse overshoot. Less than 5 % of average maximum pulse amplitude.

Time-mark pulse interval variation. Less than 0.1% of pulse interval.

Time-mark pulse delay. Time-mark pulses are co-incident with trigger pulses of the same repetition rate.

Sine-wave outputs. 3 volts peak-to-peak into a 50 ohm resistive load; at frequencies of 5, 10 and 50 MHz.

Trigger pulse repetition rates. 1, 10, 100, 1000, 10,000, and 100,000 pulses per second, corresponding to trigger pulse intervals of 1 second; 100, 10 and 1 millisecond; and 100 and 10 microseconds.

Trigger pulse output voltage. Five volts across a 50 ohm resistive load at the TRIGGER output.

Trigger pulse risetime. Less than 80 nanoseconds (50-ohm term.)

1-10. Items Comprising an Operable Equipment

Items comprising an operable AN/USM-108B are listed in table 1-1.

Table 1-1. Items Comprising an Operable AN/USM-108B

NSN	QTY	NOMENCLATURE	Fig. No.
6625-00-038-7371	1 ea	Electronic Marker Generator AN/USM-108B	1-1
6625-00-011-3134	1 ea	Electronic Marker Generator SG-352B/USM-108B	1-1
6150-00-949-9348	1 ea	Cord, Power	1-1
5995-00-099-5888	2 ea	Cable, Coaxial	1-1
	1 ea	Adapter cord (p/n GE4391-8)	1-1
6625-00-006-9026	1 ea	Adapter, Clip-lead	1-1

CHAPTER 2

SERVICE UPON RECEIPT OF EQUIPMENT AND INSTALLATION

2-1. Unpacking

Upon receipt of Electronic Marker Generator AN/USM-108B, inspect the shipping carton for signs of damage and the unit for evidence of hidden damage. Report all damage on DD Form 6 (para. 1-3 b).

2-2. Checking Unpacked Equipment

After unpacking the unit, check the material received against the packing slip. If a packing slip is not available, check equipment against the data given in table 1-1. Visually inspect all materials for condition, proper fit of connectors and plugs, mechanical function of pushbuttons and evidence of moisture or condensation. Remove and inspect the fuse mounted at the rear of the chassis. Report any missing items, unsatisfactory or unusual conditions in accordance with paragraph 1-3.

CAUTION

Prior to applying power, check that source voltage agrees with the position of the input voltage switch mounted on the rear of the chassis.

2-3. Preparation for Use

a. The unit is equipped with a 3 conductor power cord suitable for plugging into a standard 115 vac duplex outlet receptacle, and a 3 to 2 wire adapter for use as required at the installation site. Connect the female end of the power cord into the receptacle on the rear of the generator chassis, and connect the male end of the power cord to the ac power source.

b. Use the coaxial cables (2) to connect to the MARKER and TRIGGER output jacks. Connect the other end of the coaxial cables to the equipment to be tested as required (use the cliplead adapter as necessary).

CHAPTER 3

OPERATING INSTRUCTIONS

Section I. CONTROLS AND INSTRUMENTS

3-1. General

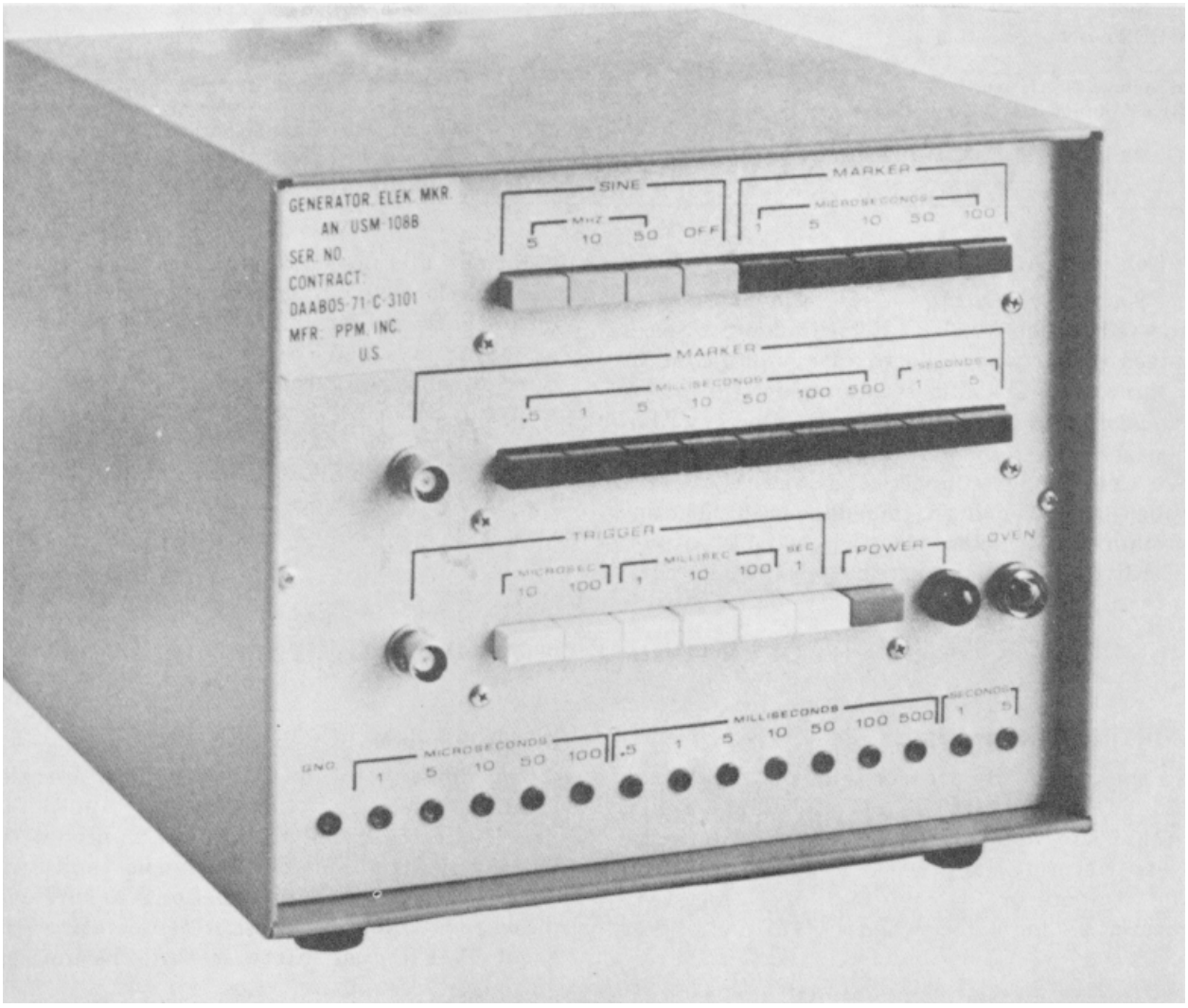
Before operating Electronic Marker Generator AN/USM-108B, the operator must become thoroughly familiar with all controls and indicators.

CAUTION

Improper setting of the controls may damage the equipment. Do not operate the equipment until the location, function, and use of each control and indicator is understood.

3-2. Operator Controls

Locations of the operator controls and indicators are shown in figure 3-1. Table 3-1 provides information on the function of each control and indicator.



EL6625-2642-14&P-TM-2

Figure 3-1. Operator controls and Indicators.

Table 3-1. Operator Controls and Indicators

Controls, indicator or connector	Function
POWER pushbutton switch	Applies or removes primary power to equipment.
POWER indicator lamp	Illuminates to indicate power is being applied.
OVEN indicator lamp	Illuminates steadily until proper oven temperature is reached; thereafter, illuminates intermittently as it monitors oven temperature.
SINE pushbutton switches	Provides fixed frequency sine wave outputs of 5 MHz, 10 MHz or 50 MHz at MARKER output jack. Only one frequency may be selected at a time. OFF setting prevents sine wave outputs and allows time-mark pulses to be selected. **NOTE** **Time-mark pulses are not available at any output jacks unless SINE OFF switch is depressed.**
MARKER pushbutton switches	Fourteen pushbuttons provide fixed time-mark pulses outputs, from 1 microsecond to 1 second, at MARKER output jack. Any combination of time mark pulses may be selected by depressing the appropriate pushbuttons. A second depression of a selected pushbutton will cancel the selection and return pushbutton to off position.
Time-mark pulse tip jacks	Fourteen output jacks. located across lower front panel, make available fixed time-mark pulses as indicated above each tip jack. It is not necessary to operate a MARKER pushbutton to obtain an output from a tip jack. GND tip jack provides a ground return for time-mark pulses.
TRIGGER pushbutton switches	Provides six trigger pulse outputs, from 10 microseconds to 1 second, at TRIGGER output jack. Only one trigger pulse may be selected at a time.
Input voltage switch (rear)	Enables equipment to be operated from 115 or 230 volt power source.
MARKER output jack	Makes available low impedance (50 ohms) sine wave outputs and time-mark pulse outputs when appropriate pushbuttons are depressed.
TRIGGER output jack	Makes available low impedance (50 ohms) trigger pulse outputs when appropriate pushbutton is depressed.

3-3. Selection of Outputs

a. Sine Wave Output. Use the coaxial cable connected to the MARKER output jack. Select the desired sine waveform frequency and connect the signal to a 50 ohm termination.

b. Time-Mark Pulse Outputs. For low impedance applications (50 ohm termination), use the coaxial cable connected to the MARKER output jack. For high impedance applications (600 ohm termination), use the tip jack outputs for individual time-mark pulses; or if combinations of time-mark pulses are required, use the coaxial cable connected to the MARKER output jack and terminated into a 50 ohm resistor as a dummy load. Select time-mark pulses as desired, observing the previous notes requiring that the SINE OFF pushbutton is depressed.

c. Trigger Pulse Output. Use the coaxial cable connected to the TRIGGER output jack. Select the desired trigger pulse interval and connect the signal to a 50 ohm termination.

Section II. OPERATION UNDER USUAL CONDITIONS

3-4. Preliminary Starting

Turn the unit on by pressing the POWER push-button. Observe that the POWER lamp lights, and that the OVEN lamp comes on. Allow the unit to warm-up (approx. 3 minutes at 70° F. room temperature) to normal operating temperature, as indicated when OVEN lamp goes out.

3-5. Operation

After allowing the unit to warm-up, operate as required, selecting the necessary outputs as previously described to obtain the proper time-mark pulses or sine wave signals, and trigger pulses. Use proper terminations as previously described. Upon completion of operation, press the POWER pushbutton to turn the unit off.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

3-6. Operation in Extreme Heat

If the normal warm-up period as described in paragraph 3-4 does not occur, the oven may be at or above its proper operating temperature. This will be indicated by the failure of the OVEN lamp to come on when the unit is turned on. Under these conditions, allow the unit to remain on until normal OVEN lamp operation is observed.

3-7. Operation in Extreme Cold

If the normal warm-up period as described in para. 3-4 does not occur, the oven may be below proper operating temperature. This will be indicated by the failure of the OVEN lamp to go out after the unit has been on for an extended warm-up period. Under these conditions, allow the unit to remain on until normal OVEN lamp operation is observed. If necessary, wrap the unit in a suitable thermal insulating material.

CHAPTER 4

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope of Operator and Organizational Maintenance

The maintenance duties assigned to the operator and organizational repairman of Electronic Marker Generator AN/USM-108B are listed below together with corresponding references covering the specific maintenance functions.

a. Operator's daily preventive maintenance checks and services (table 4-1).

b. Operator's weekly preventive maintenance checks and services (table 4-1).

c. Organizational monthly preventive maintenance checks and services (table 4-2).

d. Organizational quarterly preventive maintenance checks and services (table 4-3).

e. Cleaning (para 4-5).

f. Touchup painting (para. 4-6).

g. Troubleshooting (para. 4-7 and table 4-4).

h. Repairs and adjustments (para 4-8).

(1) Chassis removal and replacement (para 4-8a).

(2) Replacement of line POWER indicator lamp and/or the OVEN indicator (para. 4-8b).

(3) Replacement of fuse (para. 4-7c).

4-2. Tools and Test Equipment

Tools and test equipment used by operator and organizational maintenance personnel for the AN/USM-108B are listed in section III of appendix C.

Section II. PREVENTIVE MAINTENANCE

4-3. Scope

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

a. Systematic Care. The procedures given in tables 4-1 through 4-3 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services tables (tables 4-1 through 4-3) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat-serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the tables indicate what to check, how to check and what the normal conditions are. If a defect cannot be remedied by the operator, higher category of maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirement set forth in TM 38-750.

4-4. Preventive Maintenance Checks and Service Periods

Preventive maintenance checks and services are required daily, weekly, monthly and quarterly.

a. Table 4-1 specifies checks and services that must be accomplished daily and under the special conditions listed below.

(1) When the equipment is initially installed.

(2) When the equipment is reinstalled after removal for any reason.

(3) At least once each week if the equipment is maintained in a standby condition.

b. The latter part of table 4-1 and tables 4-2 and 4-3 specify additional checks and services that must be performed on a weekly, monthly and quarterly basis, respectively.

Table 4-1. Operator Preventive Maintenance Checks and Services

D-Daily
Time required: 0.2

W-Weekly
Time required: 0.1

Interval and Sequence No. D	Interval and Sequence No. W	Item to be inspected Procedure	Work Time (M, H)
1		COMPLETENESS See that equipment is complete (table 1-1).	0.1
2		EXTERIOR SURFACES Clean exterior surfaces (para. 4-4). Check indicator lens for cracks.	
3		CONNECTORS AND CABLES Check all connectors and cables for tightness. cracks and overall condition.	
4		PUSHBUTTON SWITCHES While making operating checks. observe that the mechanical action of each switch is smooth and free of external or internal binding, and that there is no excessive looseness.	0.1
5		PRELIMINARY START-UP a. Set all pushbutton switches to off position lout). b. Depress POWER switch and note that switch latches in and that POWER lamp lights. c. Note that OVEN lamp comes on and remains on until unit warms up (approx. three minutes at 70 degrees F room temperature). after which OVEN lamp will cycle on and off as oven maintains proper operating conditions.	
6		POWER CORD 0.1 Inspect for chafed. cracked. frayed or damaged insulation. Replace cord if in unsatisfactory condition.	
7		CABLES Inspect for chafed. cracked. frayed or damaged insulation or loose connectors. Replace cable if in unsatisfactory condition. Tighten connectors if loose.	

Table 4-2. Organizational Monthly Preventive Maintenance Checks and Services

M-Monthly
Total man-hours required: 0.2

Sequence Number	Item to be inspected Procedure	Work Time (M H)
1	SOLDERED TERMINALS AND CONNECTIONS Inspect all soldered terminals and connections for corrosion and looseness.	0.1
2	RESISTORS AND CAPACITORS Inspect all resistors and capacitors for cracks, blistering and secureness.	
3	TRANSISTORS AND INTEGRATED CIRCUITS Inspect for broken leads.	
4	OUTPUT JACKS AND CONNECTORS Inspect for tightness and condition. Tighten mount nuts as required.	
5	INTERIOR Clean interior of chassis and cabinet.	0.1

Table 4-3. Organizational Quarterly Preventive Maintenance Checks and Services

Q-Quarterly
Total man-hours required: 0.3

Sequence Number	Item to be inspected Procedure	Work Time (M/H)
1	PUBLICATIONS See that all publications are complete, serviceable and current (see DA Pam 310-4).	0.1
2	MODIFICATIONS Check DA Pam 310-7 to determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	0.1
3	SPARE PARTS Check all spare parts (operator and organizational) for general condition and method of storage. There should be no evidence of overstock, and all shortages must be on valid requisitions.	0.1

4-5. Cleaning

The exterior surfaces should be clean, and free of dust, dirt, grease and fungus.

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

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable but exposure of fumes to an open flame converts flame to highly toxic, dangerous fumes.

b. Remove grease, fungus, and ground-in dirt from the cases; use a cloth dampened (not wet) with trichloroethane.

c. Remove dust or dirt from output jacks and connectors with a brush.

d. Clean the front panel, controls and indicator lens; use a clean cloth. If necessary, dampen the cloth with water; mild soap may be used for more effective cleaning.

4-6. Touchup Painting Instructions

CAUTION

The use of steel wool for the removal of rust or corrosion is not recommended. Small particles of steel entering the case can cause harmful internal electrical short circuits or the grounding of circuits. Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further deterioration. Refer to the applicable cleaning and refinishing practices specified in TB 746-10.

Section III. TROUBLESHOOTING

4-7. General Troubleshooting Information

Troubleshooting this equipment is based upon the operational check contained in the daily preventive maintenance checks and services table 4-1, sequence number 5. If an abnormal condition or result is observed, note the trouble in the troubleshooting table 4-4 and perform the corrective actions indicated in the table. If the corrective measures indicated do not result in correction of the trouble, or if there is no corresponding trouble in the troubleshooting table, higher category of maintenance is required. Paragraph 4-8 contains additional information and step-by-step instructions to be used during the troubleshooting procedures.

Table 4-4. Organizational Troubleshooting

Malfunction	Probable cause	Corrective action
POWER indicator lamp does not light.	a. Defective ac line cord.	a. Check ac line cord. Replace cord if necessary.
	b. Defective indicator lamp.	b. Check POWER indicator lamp. Replace if necessary. (para 4-8*b*).
	c. Defective ac line fuse.	c. Check line fuse (para 4-8*c*). **NOTE. Defective line fuse usually indicates some other trouble. If new fuse blows. higher category of maintenance is required.**
OVEN indicator lamp does not light.	Defective indicator lamp.	Check OVEN indicator lamp. Replace if necessary (para 4-8*b*).

4-8. Repairs and Adjustments

a. Chassis Removal and Replacement.

(1) Remove the chassis from the cabinet by removing two screws from the front panel and one screw from the rear of the unit, and then slide the chassis out the front of the cabinet.

(2) Replace the chassis into the cabinet by sliding the chassis in the front of the cabinet and then install one screw at the rear of the unit and install two screws at the front panel.

b. Replacement of Line POWER Indicator Lamp and/or OVEN Indicator Lamp.

(1) Remove chassis from cabinet (a above).

(2) Remove indicator lamp from holder by turning lamp 1/4 turn counterclockwise.

(3) Insert new indicator lamp into holder and turn lamp 1/4 turn clockwise.

(4) Replace chassis into cabinet.

c. Replacement of Fuse.

(1) Turn the fuse holder cap counterclockwise and remove it from the body of the fuse holder.

(2) Remove the defective fuse from the fuse holder cap.

(3) Insert a new fuse in the fuse holder cap.

NOTE

Be sure the fuse is of proper rating (0.5 ampere, 115 volts for 115 volt operation).

(4) Replace the fuse holder cap in the fuse holder body and turn it clockwise to tighten.

CHAPTER 5

FUNCTIONING OF EQUIPMENT

Section I. GENERAL

5-1. Overall Configuration.

(fig. 5-1)

Electronic Marker Generator AN/USM-108B derives its various outputs from a precision 10 megahertz crystal oscillator. The oscillator provides signals to frequency multiplying and dividing circuits; the outputs of the multiplying and dividing circuits are then waveshaped and amplified, and finally connected through the front panel controls to the output terminals. The unit is isolated from the power source by a power transformer which delivers low voltage to a crystal oven heater circuit, a 30 vdc power supply and a 25 vdc power supply. The ac and dc power supplies are shown in schematic diagram FO-2.

5-2. Physical Features

The unit incorporates all transistorized circuitry, including integrated circuits (IC's) for low power consumption, small volume packaging and long-term component reliability. For ease of maintenance, major circuits are located on individual printed circuit boards (PCB's) with push-on connectors for interfacing of the PCB's and chassis mounted components. The unit has three PCB's; the bottom PCB containing the ac and dc power supplies, the trigger pulse amplifier and the lower row of front panel switches; the middle PCB containing some of the time-mark pulse circuitry and the middle row of front panel switches; and the top PCB containing the crystal oscillator, sine wave circuitry, additional time-mark pulse circuitry and the top row of front panel switches.

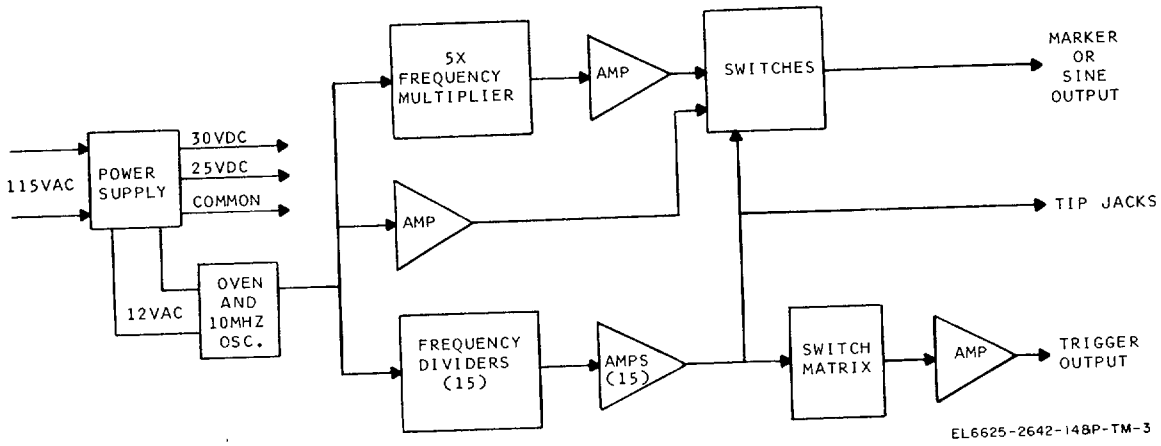


Figure 5-1. Electronic Marker Generator AN/USM-108B, block diagram.

Section II. UNIT FUNCTIONING

5-3. Crystal Oscillator

The crystal oscillator (fig. FO-3) is temperature stabilized to insure accuracy. A temperature sensitive switch in the base of the crystal oven controls the application of low voltage ac to the oven heater element. Oven operation is monitored by the front panel OVEN lamp. The output of the oscillator is coupled, after SINE pushbutton selection, to amplifiers Q4 through Q8 (and IC 1 for 5 MHz signals) for sine wave generation. For time-mark pulses, the oscillator output is dc coupled to IC 1 for subsequent frequency division.

5-4. Sine Wave Outputs.

Sine wave outputs (fig. FO-3) are generated by amplifying the oscillator output directly to achieve a 10 MHz signal; multiplying the oscillator output frequency by a factor of 5 through transistor Q6 for a 50 MHz signal or dividing the oscillator output frequency by /2 through IC 1 for a 5 MHz signal.

5-5. Time-Mark Pulse Outputs.

(figs. FO-3 and FO-4)

a. General. There are 14 time-mark pulse outputs. The theory of operation for generating one time-mark pulse is applicable to each time-mark pulse. The various pulse time intervals are derived by repeated frequency division of the 10 MHz oscillator output through IC's 1 thru 3 on the top PCB and IC's 1 thru 5 on the middle PCB. Outputs from the IC's are wave-shaped and amplified, and coupled to the proper output terminals.

NOTE

Observe that if a component failure occurs in a prior IC, subsequent frequency division cannot be achieved beyond the last operative IC.

b. Typical Pulse. As a specific example, the generating of time-mark pulses at 1 millisecond intervals will be examined. From the 10 MHz oscillator, the output frequency must be divided until the wave-form period is one millisecond entering Q2 on the middle PCB. Thus, following the successive divisions through IC 1, IC 2 and IC 3 on the top PCB, resultant frequencies of 1 MHz, 100 KHz and 10 KHz are obtained. The 10 KHz signal entering IC 1 on the middle PCB is further divided by a factor of 10, with an output of 1 KHz, the period of which is the required one millisecond necessary to establish the 1 msec time-mark pulses. This 1 KHz signal is differentiated at amplifier Q2 of the middle PCB, then amplified and fed through separate circuits to the 1 msec tip jack (high impedance output) and the MARKER output jack.

5-6. Trigger Pulse Outputs

(fig. FO-2)

The trigger outputs are derived from the time-mark pulse amplifiers, and are fed to the trigger amplifier, Q3 and Q4 on the bottom PCB. The output of the trigger amplifier is connected directly to the TRIGGER output jack.

CHAPTER 6

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL TROUBLESHOOTING TECHNIQUES

NOTE
No direct support maintenance is authorized.

WARNING
Voltages as high as 230 volts exist at various points in the equipment. Use caution when servicing the equipment, even when power has been turned off as voltages may still be present in the line power circuitry. Failure to comply may result in serious or fatal injury.

6-1. General Instructions

Troubleshooting at the general support level includes all the techniques required to isolate a defective part. Section II presents detailed troubleshooting procedures to enable the repairman to localize and isolate a defective component.

6-2. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective AN/USM-108B is to localize the fault. Localization means tracing the fault to a defective circuit responsible for the abnormal condition. The second step is isolation. Isolation means locating the defective part or parts. Some defective parts, such as burned-out resistors and arcing or shorted transformers, can often be located by sight, smell or hearing; however, most defective parts must be isolated by checking individual inputs and outputs during operation. The overall wiring diagram (FO-5) and composite schematic diagram (FO-6) are provided as useful aids when troubleshooting the equipment.

b. Localization. The localization procedures applicable to this equipment are listed in (1), (2) and (3) below, and should be used in localizing the trouble to a circuit in the suspected unit.

(1) *Visual Inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. Indicator lamp operation and all other visual signs should be observed and an attempt made to localize the fault to a particular circuit.

(2) *Operational Test.* The operational test will usually indicate the general location of trouble and will help in determining the exact nature of the fault. An operational test is given in paragraph 6-5.

(3) *Troubleshooting Table.* Troubleshooting table 6-1 lists symptoms of probable troubles and gives corrective measures. The repairman should use this table as a guide in analyzing symptoms that may not be listed.

c. Isolation. Procedures for isolating troubles are given in d below.

d. Techniques. In performing the localization and isolation procedures, one or more of the techniques below may be applied. Use these techniques as applicable, observing all cautions.

(1) Signal tracing. This equipment is transistorized and also incorporates integrated circuits. When tracing signals with an oscilloscope, use tape or sleeving (spaghetti) to insulate the entire test probe, except for the extreme tip. A momentary short can ruin a transistor or integrated circuit. Signals should be traced from their origin at the oscillator through the various divider and amplifier stages to the final individual outputs. Signal tracing is preferable to voltage and resistance measurements on this equipment due to the digital operation of most stages.

(2) *Voltage measurements.* Voltage measurements are used to check for the presence of proper supply voltages at the supply levels of the various stages and at the oscillator heater circuit. Observe the same precautions regarding the voltmeter probe as described for the oscillator probe during signal tracing in step (1) above.

(3) *Intermittent troubles.* In all test, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. Make a visual inspection of all wiring and printed circuit boards for cold solder joints or hair-line cracks. Continuity measurements of printed conductors may be made using the same techniques ordinarily used on hidden conventional wiring.

6-3. Test Equipment Required

Test equipment required for troubleshooting Electronic Marker Generator AN/USM-108B is listed below. The associated technical manuals are also listed.

Test Equipment	*Technical Manual*
Differential Voltmeter ME-202/U	TM 11-6625-537-15
Oscilliscope AN/USM-281A	TM 11-6625-1703-15

Section II. TROUBLESHOOTING PROCEDURES

6-4. Test Setup

a. Bench tests require connection of 115 or 230 volt ac power source, depending on the power source to be used, and on various test equipment. The test equipment connections vary from test to test. For all tests, make a test setup as outlined below.

b. Remove the chassis from the cabinet (para 4-8*a*).

c. Connect the power cord to a 115 or 230 volt ac power source, being sure that the 115-230 volt switch position agrees with the voltage of the power source.

d. Turn POWER switch on.

e. Connect the test equipment as specified for the test required.

6-5. Operational Test

a. General. This operational test is sequenced to check the performance of the equipment from the signal source at the oscillator to the individual outputs. To perform this test, perform the test setup (para 6-4) and the additional setup below as applicable.

(1) During the testing of the SINE outputs, connect a coaxial cable to the MARKER output BNC connector, then connect the clip lead adapter to the free end of the coaxial cable. Insert a 50 ohm terminating resistor across the alligator clips and connect the oscilliscope across the 50 ohm resistor.

(2) During testing of the MARKER outputs, use the same circuit arrangement as described in step (1).

(3) During testing of the TRIGGER outputs, connect the coaxial cable with attached adapter, 50 ohm terminating resistor and oscilliscope to the TRIGGER output BNC connector.

(4) During testing of the individual, high impedance output pulses from the tip jacks on the front panel, connect the oscilliscope probe ground connection to the GND tip jack, and connect the oscilliscope probe to the MICROSECONDS, MILLISECONDS or SECONDS tip jack under test.

b. Sequence. Perform each step of the following procedure and not any results which deviate from those specified. Check the trouble noted in troubleshooting table 6-1.

(1) Apply power and press the POWER switch. The POWER indicator and OVEN lamps should illuminate.

(2) Check the SINE output. Connect the oscilliscope as indicated in paragraph 6-5a(1). Press the SINE 10 MHZ pushbutton. With the oscilliscope set for 0.01 microsecond per centimeter horizontal sweep and one volt per centimeter vertical deflection (using a X1 probe), the oscilliscope pattern should be a 3 volt peak to peak (minimum) sine wave signal with a 0.1 microsecond period ($\pm$ 0.1 cm).

(3) Press the SINE 50 MHZ pushbutton. The period of the displayed sine waveform should be 0.02 microseconds.

(4) Change the oscilliscope horizontal sweep to 0.02 microseconds per centimeter. Press the SINE 5 MHZ pushbutton. The period of the displayed sine waveform should be 0.2 microseconds.

(5) Press the SINE OFF pushbutton and press the MARKER 1 MICROSECOND pushbutton. Change the oscilliscope horizontal sweep to one microsecond per centimeter and the vertical deflection to 0.5 volts per centimeter. The oscilliscope display should be marker pulses one volt in amplitude at one microsecond intervals.

(6) Release the MARKER 1 MICROSECOND pushbutton and repeat the procedure described in step (5) at each MARKER MICROSECONDS, MILLISECONDS, and SECONDS pushbutton station. Never allow more than one pushbutton to be selected at any one time. Adjust the oscilliscope horizontal sweep accordingly as the MARKER interval increases. After checking all MARKER stations, eject all MARKER pushbuttons.

(7) Check the TRIGGER outputs. Connect the oscilliscope as indicated in paragraph 6-5a (3). Press the TRIGGER 10 MICROSEC pushbutton, adjust the oscilliscope horizontal sweep to ten microseconds per centimeter and the vertical

deflection to one volt per centimeter. The oscilliscope display should be trigger pulses five volts in amplitude at ten microsecond intervals.

(8) Release the TRIGGER 10 MICROSEC pushbutton and repeat the procedure described in step (7) at each TRIGGER MICROSEC, MILLISEC and SEC pushbutton station. Never allow more than one pushbutton to be selected at any one time. Adjust the oscilliscope horizontal sweep accordingly as the TRIGGER interval increases. After checking all TRIGGER stations, eject all TRIGGER pushbuttons.

(9) Check the MARKER outputs at the MARKER output tip jacks. Connect the oscilliscope as indicated in paragraph 6-5a (4). Adjust the oscilliscope vertical deflection to five volts per centimeter and the horizontal sweep accordingly for the output being checked. Do not press any marker pushbuttons for this check. At each tip jack, marker pulses twelve or more volts in amplitude at the interval indicated should be observed.

(10) To test any individual tip jack for a specified output, load the tip jack with a 600 ohm terminating resistor and check for a 12.5 volt marker amplitude.

Table 6-1. Troubleshooting

Malfunction	Probable cause	Corrective action
1 POWER switch on; indicator lamp fails to light and no output signal.	*a.* No power from source.	*a.* Check power source.
	b. Defective power cord	*b.* Check cord.
	c. Blown fuse	*c.* Replace fuse.
	d. Defective 115-230 switch	*d.* Check switch and wiring.
	e. Defective L1 or L2 on bottom PCB	*e.* Check L1 and L2. Replace as required.
	f. Defective switch SIG on bottom PCB	*f.* Repair or replace.
	g. Defective transformer T101	*g.* Repair or replace.
2 POWER switch on, POWER indicator lamp on; no output signal at any SINE position	*a.* Defective 30 volt power supply on bottom PCB	*a.* Check for 30vdc at pin 6 of bottom PCB. If absent, troubleshoot 30 volt supply.
	b. Defective 12 volt supply circuit on top PCB	*b.* Check for 12 vdc at cathode of D1 on top PCB. If absent, check and replace as required. R1, R2, C2 and D1 on top PCB.
	c. Defective oscillator circuit on top PCB	*c.* Check for 10 MHZ signal at emitter of Q2 on top PCB with all SINE pushbuttons ejected. If absent, check for shorted base to emitter of Q3 on top PCB. If Q3 is good and signal is absent, troubleshoot oscillator circuit.
3 No voltage output from 30 volt supply	*a.* Short circuit on middle PCB.	*a.* Unplug tan lead between top and middle PCB. If short disappears, check all components on middle PCB for short to ground. Eliminate short and replace components as required. Reconnect tan lead.
	b. Short circuit on top PCB.	*b.* Unplug tan lead between bottom and top PBC. If short disappears, check all components on top PCB for short to ground. Eliminate short and replace components as required. Reconnect tan lead.
	c. Short circuit on bottom PCB.	*c.* If short still exists with tan lead disconnected in step b. above, then short is on bottom PCB in Q3, Q4 TRIGGER output circuit or in Q2, BRI of 25 volt supply circuit. Eliminate short and replace components as required. Check the tan lead to make sure it is reconnected.

Table 6-1. Troubleshooting - Continued

Malfunction	Probable cause	Corrective action
3 Cont.	*d.* No ac input to 30 volt supply on bottom PCB.	*d.* Check for 50 VAC across pins 7 and 8 of bottom PCB. If absent, check transformer T101 for continuity, rectifier BRI and capacitor C2 for short. Replace as required.
	e. Defective component in 30 volt supply on bottom PCB.	*e.* Check for open Q1, C3 or R1, or shorted C4 or rectifier BRI. Replace as required.
4 Defective oscillator circuit on top PCB	*a.* No signal at emitter of Q2 on top PCB.	*a.* Check for signal at collector of Q1. If signal is present, check R6 for open, and Q2, C7 and R7 for short. Replace as required.
	b. No signal at collector of Q1 on top PCB.	*b.* Check for shorted Q1 or C6 (zero volts at collector), or shorted base emitter junction, C4 or R4 (zero volts at base). Check for defective crystal by replacing CO-1. Replace components as required.
5 No output at SINE 10 MHZ position.	Defective 10 mhz amplifier circuit. Q5 on top PCB.	Check for signal at base of Q5. If absent. check for shorted R15, C17 or Q5 base for emitter. If present, check for signal at collector of Q5. If absent, check for shorted Q5 or open R14, R16, or L3. If signal is present at L3, check for shorted or open L4. Replace components as required.
6 No output at SINE 50 MHZ position.	Defective 50 mhz frequency multiplier stage on top PCB.	Check for 10 mhz at base of Q6, then at collector of Q6. Isolate components as in item 5. Then check for 50 mhz signal at emitter and collector of Q7 and Q8. Isolate components as in 5 (above). Replace components as required.
7 No output at SINE 5 MHZ positive.	*a.* Defective 25 volt supply on bottom PCB.	*a.* Troubleshoot as in 3d and 3e (above). For ac input, check for 15 vac across pins 2 and 3 of bottom PCB. Observe that, while this supply called the 25 volt (relative to ground) supply, it is electrically referenced to tire 30 volt supply and operates 5 volts below it.
	b. Defective IC driver circuit (Q3) on top PCB.	*b.* Check for 10 mhz signal at base and collector of Q3. If absent, check for shorted or open Q3, R9, R10 or C8. Replace components as required.
	c. Defective IC1 on top PCB.	*c.* Check ICI for 10 mhz input, 5 mhz output. Replace if required (see 8 below).
	d. Defective 5 mhz amplifier circuit, Q4 on top PCB.	*d.* Check and isolate components as in 5 (above).
8 Improper output from an IC unit.	Shorted or open IC unit.	To determine condition of an IC used in this equipment, establish that the zero (ground) 25 volt and 30 volt levels are present; then with a signal applied to the input, an output must be present. If not, replace the IC.
9 No output from a MARKER position (each marker pulse is derived in an electrically similar manner).	*a.* Defective IC.	*a.* Check 1C as in 8 (above). Refer to diagram 5-1 for specific IC input-output conditions, starting with 10 mhz input at IC 1 and dividing frequencies by the fractions indicated on the block diagram.

Table 6-1. Troubleshooting-Continued

Malfunction	Probable cause	Corrective action
9 Cont.	b. Defective marker amplifier, Q9 thru Q13 on top PCB or Q1 thru Q9 on middle PCB, as applicable.	b. Check for proper signal at amplifier base, then at collector. Isolate components as in 5 (above). Replace components as required.
10 No output from a TRIGGER position (each trigger pulse is derived in an electrically similar means).	Defective trigger amplifier circuit on bottom PCB.	Check for proper trigger input from marker circuit at base of Q3. If absent, check operation of switch S1A then S1F on middle PCB, the check for shorted R3 on bottom PCB. Check for shorted zener D2 (5.6 VDC at cathode) and check for shorted Q3. Check for signal at base of Q4, then at collector of Q4. Replace components as required.
11 No output from a MARKER tip jack (each tip jack output is derived in an electrically similar manner).	a. Defective connection from marker amplifier to tip jack.	a. Repair wire or connection.
	b. Open resistor in series with tip jack and amplifier output.	b. Replace resistor.
12 Oscillator frequency out of tolerance.	a. Oven heater inoperative.	a. Check oven operation as described in Chapter 3. Check for continuity across pins 1 and 3 on the top PCB when the heater has cooled to room temperature. Replace as required.
	b. Oscillator drifts due to physical change in crystal.	b. Readjust capacitor C5 on top PCB until oscillator frequency is 10 mhz ±100 hz.
13 Sine wave amplitude not three volts peak to peak into a 50 ohm termination.	a. Oscilliscope not properly adjusted.	a. Check oscilliscope probe and vertical amplifier alignment, particularly for measurements at 50 mhz.
	b. Out of alignment at 5 mhz.	b. Adjust C11 on top PCB for 3 volts p-p at 5 mhz.
	c. Out of alignment at 10 mhz.	c. Adjust C15 on top PCB for 3 volts p-p at 10 mhz.
	d. Out of alignment at 50 mhz.	d. Adjust in sequence, C21, C27, and C32 on top PCB for peak output, then repeat sequence until 3 volts p-p is obtained at 50 mhz.
14 Marker pulse amplitude not one volt into a 50 ohm termination	a. If output is low at all markers, probable cause is low 25 and/or 30 volt supply.	a. Check power supplies as in 3 and 7*a* (above).
	b. If output is low at one marker, probable cause is defective amplifier circuit.	b. Check individual amplifier as in 9 (above).
15 Trigger pulse amplitude not 5 volts into a 50 ohm termination.	Defective trigger amplifier circuit.	Check amplifier as in 10 (above).

Section III. REPAIRS AND ADJUSTMENTS

6-6. General Parts Replacement Techniques

When replacing parts in Electronic Marker Generator AN/USM-108B, follow the precautions given below.

a. Do not disturb the settings of variable capacitors C5, C11, C15, C21, C27 or C32 on the top PCB.

b. Before a part is unsoldered, note the position of the leads. If the part to be replaced has a number of connections, such as a transformer, tag each lead.

c. Be careful not to damage other leads by pulling or pushing them out of the way to reach other parts or connections.

d. Do not allow drops of solder to fall into the equipment; they may cause short circuits and damage the unit.

e. When a part is replaced, it must be positioned exactly as the original part.

Pay particular attention to proper grounding when replacing a part. Use the same ground as in the original wiring. Failure to comply may result in unwanted oscillations or instability.

6-7. Replacement of Parts

a. Most parts in the AN/USM-108B can be replaced without disturbing the adjustment of the unit, however if parts are replaced in the oscillator, 5 mhz, 10 mhz or 50 mhz amplifier circuit, the unit must be checked and readjusted as required.

b. In replacing printed circuit boards, or if a printed circuit board is removed for repairs and then reinstalled, the unit must be checked and readjusted as required. All components on the printed circuit boards are clearly marked for easy identification.

c. During the replacement of printed circuit boards, observe the following:

(1) When connecting wires to the pins on the bottom PCB, there are three green wires and three pins labeled GRN. Connect the small (22 gauge) wire to pin #22, and the larger green wires from the power transformer to the remaining two pins labeled GRN.

(2) When connecting wires to the middle and top PCB's, use a white jumper (not included in the wiring harness) between pin 5, labeled WHT, on the middle PCB and pin 11, labeled WHT, on the top PCB. Also, connect the white with green tracer wire in the harness to pin 9, labeled W/GRN; and connect a white with green tracer wire (not included in the wiring harness) between pin 10, labeled W/GRN, on the middle PCB.

(3) When connecting shielded signal leads to pins on the top PCB, connect the shield to the S pin and the center conductor to the C pin. For example, the shielded labeled RED from the MARKER output BNC is connected to pins 20 and 21, labeled RED, C and S respectively. Connect the center conductor to pin 20, labeled C, and the shield to pin 21, labeled S.

6-8. Adjustments

The following adjustments should be performed as necessary to insure the reliability of the AN/USM-108B. The only test equipment required is Oscilloscope AN/USM-218A. The initial setup of the AN/USM-108B is as follows: POWER switch on, SINE 10 MHZ pushbutton depressed, all other pushbuttons ejected.

a. Oscillator Adjustments. With the oscilloscope across a 50-ohm terminating resistor connected at the MARKER output connector (para 6-5), set the oscilloscope horizontal sweep to 0.01 microseconds per centimeter. The period of the displayed waveform must be 0.1 microseconds ± 0.001 microseconds (± 0.1 cm.). Adjust C5 on the top PCB as required to obtain the proper period.

b. 10 MHZ Amplifier Adjustment. Press the SINE 10 MHZ pushbutton and set the oscilloscope horizontal sweep to 1 microsecond per centimeter. Adjust C15 on the top PCB for a displayed waveform amplitude of 3 volts peak to peak.

c. 5 MHZ Amplifier Adjustment. Press the SINE 5 MHZ pushbutton. Adjust C11 on the top PCB for a displayed waveform amplitude of 3 volts peak to peak.

d. *50 MHZ Amplifier Circuit Adjustments.* Press the SINE 50 MHZ pushbutton. Adjust, in sequence, C21, C27 and C32 on the top PCB for peak to peak output, then repeat the sequence until the displayed waveform amplitude is 3 volts peak-to-peak.

Section IV. GENERAL SUPPORT TESTING PROCEDURES

6-9. General

a. The following testing procedures are prepared for use by general support maintenance personnel to determine the acceptability of repaired electronic equipment. These procedures establish specific requirements that repaired equipment must meet before it is returned to the using organization.

b. Comply with the instructions preceeding each table. Perform each step in sequence; do not vary the sequence. For each step, perform all the actions required in the Control settings column; then perform each specified procedure and verity it against the performance standard.

c. Allow an equipment warm-up of at least 15 minutes before proceeding with the tests.

6-10. Test Equipment and Material Required

a. Oscilloscope AN/USM-218A
b. Terminating resistor, 50-ohm, 1/2 watt

6-11. Modification Work Orders

The performance standards listed in the tests (tables 6-2 through 6-6) are based on the assumption that all modifications have been performed.

A listing of current modification work orders will be found in DA Pam 310-7.

6-12. Physical Tests and Inspection

a. Test Equipment and Materials. None required.

b. Test Connections and Conditions. Remove chassis from cabinet (para 4-8a).

c. Procedure. Follow procedures in table 6-2.

Table 6-2. Physical Tests and Inspection

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	None	Any position	a. Inspect case and chassis for damage, missing parts and condition of paint.	a. No damage evident or missing parts. External surfaces intended to be painted will not show bare metal. Panel lettering will be legible.
			b. Inspect all controls and mechanical assemblies for loose or missing screws, bolts and nuts.	b. Screws, bolts and nuts will be tight. None missing.
			c. Inspect all connectors, sockets, and fuseholders for looseness, damage or missing parts.	c. No looseness or damage evident. No missing parts.
2	None	Any position	Operate all switches.	Switches will operate properly.

6-13. Frequency Test

a. Test Equipment and Materials.

(1) Oscilloscope AN/USM-231A

(2) Terminating resistor, 50-ohm, V/2 watt

b. Test Connections and Conditions.

(1) Connect the coaxial cable to the MARKER output BNC connector, the clip-lead adapter to the coaxial cable, and the 50-ohm terminating resistor to the adapter.

(2) Connect the oscilloscope X1 probe across the 50-ohm terminating resistor.

(3) Apply power to the equipment and allow a warm-up of at least 15 minutes before performing the test procedure.

c. Procedure. Follow procedure in table 6-3.

Table 6-3. Frequency Test

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
	Horiz sw: .01 microsec. Vert def: 1v. Int trig Slope.	POWER on. SINE 10 MHZ depressed, all other pushbuttons ejected.	Observe sine wave period on scope. Adjust scope trigger level as required for proper triggering at waveform zero crossing.	Period of sine wave shall be 0.1 microsecs.

6-14. Marker Pulse Output Tests

a. Test Equipment and Materials.

(1) Oscilloscope AN/USM-281A

(2) Terminating resistor, 50-ohm, 1/2 watt

b. Test Connections and Conditions.

(1) Connect the coaxial cable to the MARKER output BNC connector, the clip-lead adapter to the coaxial cable, and the 50-ohm terminating resistor to the adapter.

(2) Connect the oscilliscope X1 probe across the 50 ohm terminating resistor.

c. Procedure. Follow procedures in table 6-4.

Table 6-4. Marker Pulse Output Tests

Step no.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	Horiz sw: 1 microsec. Vert defl: lv Int trig. Slope.	POWER on. SINE OFF depressed. MARKER MICROSECONDS 1 depressed.	Observe marker pulses on oscilliscope	Marker pulses shall be available at one microsecond intervals at a one volt amplitude.
2	Same as 1, except horiz. sweep 5 microseconds.	Same as 1, except MARKER MICROSECONDS 1 ejected, 5 depressed.	Same as 1	Marker pulses shall be available at five microsecond intervals at one volt amplitude.
3	Same as 2	Same as 2, except MARKER MICROSECONDS 5 ejected, 10 depressed	Same as 1	Marker pulses shall be available at ten microsecond intervals at a one volt amplitude.
4	Same as 1 except horiz. sweep: 50 microseconds	Same as 3, except MARKER MICROSECONDS 10 ejected, 50 depressed	Same as 1	Marker pulses shall be available at 50 microsecond intervals at a one volt amplitude.
5	Same as 4	Same as 4, except MARKER MICROSECONDS 50 ejected, 100 depressed.	Same as 1	Marker pulses shall be available at 100 microsecond intervals at one volt amplitude.
6	Same as 1, except horiz. sweep: 0.5 milliseconds	Same as 5, except MARKER MICROSECONDS 100 ejected, MILLISECONDS .5 depressed.	Same as 1	Marker pulses shall be available at 0.5 millisecond intervals at a one volt amplitude.
7	Same as 6	Same as 6, except MARKER MILLISECONDS .5 ejected, 1 depressed.	Same as 1	Marker pulses shall be available at 1 millisecond intervals at a one volt amplitude.
8	Same as 1 except horiz. sweep: 5 milliseconds. 1 ejected, 5 depressed.	Same as 7, except MARKER MILLISECONDS	Same as 1	Marker pulses shall be available at 5 millisecond intervals at a one volt amplitude.
9	Same as 8 MARKER |MILLISECONDS 5 ejected, 10 depressed.	Same as 8, except	Same as 1	Marker pulses shall be available at 10 millisecond intervals at a one volt amplitude.
10	Same as 1, except horiz. sweep: 50 milliseconds	Same as 9, except MARKER MILLISECONDS 10 ejected, 50 depressed	Same as 1	Marker pulses shall be available at 50 millisecond intervals at a one volt amplitude.
11	Same as 10	Same as 10, ex-cept MARKER MILLISECONDS 50 ejected, 100 depressed	Same as 1	Marker pulses shall be available at 100 millisecond intervals at a one volt amplitude.
12	Same as 1, except horiz. sweep: 0.5 seconds.	Same as 11, ex-cept MARKER MILLISECONDS 100 ejected, 500 depressed.	Same as 1	Marker pulses shall be available at 500 millisecond intervals at a one volt amplitude.

Table 6-4. Marker Pulse Output Test-Continued

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
13	Same as 12	Same as 12, except MARKER MILLISECONDS 500 ejected, SECONDS 1 depressed.	Same as 1	Marker pulses shall be available at one second intervals at a 1 volt amplitude.
14	Same as 1 except horiz. sweep: 1 second.	Same as 13, except MARKER SECONDS 1 ejected, 5 depressed.	Same as 1	Marker pulses shall be available at five second intervals at a one volt amplitude.

6-15. Trigger Pulse Output Tests

a. Test Equipment and Materials.

(1) Oscilloscope AN/USM-281A

(2) Terminating resistor, 50-ohm, ½ watt

b. Test Connections and Conditions.

(1) Connect the coaxial cable to the TRIGGER output BNC connector, the clip-lead adapter to the coaxial cable, and the 50-ohm terminating resistor to the adapter.

(2) Connect the oscilloscope X1 probe across the 50-ohm terminating resistor.

c. Procedure. Follow procedure in table 6-5.

Table 6-5. Trigger Pulse Output Tests

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	Horiz. sweep: 10 mircroseconds: Vert. deflection: 1 volt: Int trigger: slope.	POWER on, TRIGGER MICROSEC 10 depressed, all other pushbuttons ejected.	Observe trigger pulses on oscilliscope.	Trigger pulses shall be available at ten microsecond intervals at a five volt amplitude.
2	Same as 1, except horiz. sweep: 1 millisecond.	Same as 1, except TRIGGER MICROSEC 10 ejected, 100 depressed.	Same as 1	Trigger pulses shall be available at 100 microsecond intervals at a five volt amplitude.
3	Same as 1, except horiz. sweep: 1 millisecond.	Same as 2, except TRIGGER MICROSEC 100 ejected, MILLISEC 1 depressed.	Same as 1	Trigger pulses shall be available at 1 millisecond intervals at a five volt amplitude.
4	Same as 1, except horiz. sweep: 10 milliseconds.	Same as 3, except TRIGGER MILLISEC 1 ejected, 10 depressed	Same as 1	Trigger pulses shall be available at 10 millisecond intervals at a five volt amplitude.
5	Same as 1, except horiz. sweep: 100 milliseconds.	Same as 4, except TRIGGER MILLISEC 10 ejected, 100 depressed.	Same as 1	Trigger pulses shall be available at 100 millisecond intervals at a five volt amplitude.
6	Same as 1, except horiz. sweep: 1 second.	Same as 5, except TRIGGER MILLISEC 100 ejected, SEC 1 depressed.	Same as 1	Trigger pulses shall be available at one second intervals at a five volt amplitude.

6-16. Marker Tip Jack Output Test

a. Test Equipment and Materials. Oscilloscope AN/USM-281A.

b. Test Connections and Conditions. Connect the oscilliscope probe ground to the GND tip jack on the generator.

c. Procedure. Follow procedure in table 6-6.

Table 6-6. Marker Tip Jack Output Test

Step no.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1	Horiz. sweep: 1 microsecond; Vert. deflection: 5 volts; Int. Trigger; Slope.	POWER on, all other pushbuttons ejected.	Connect the oscilliscope probe to the MICROSECOND 1 tip jack and observe the marker pulse on the oscilliscope.	Marker pulses shall be available at the interval indicated at a 12.5 volt amplitude.
2	Same as 1, except horiz. sweep set to correspond to pulse interval of tip jack under test.	Same as 1.	Same as 1, except make successive observations at each tip jack.	Same as 1.

APPENDIX A

REFERENCES

DA PAM 310-4	Index of Technical Bulletins, Technical Bulletins, Supply Manuals (Type 7, 8 and 9), Supply Bulletins and Lubrication Orders.
DA PAM 310-7	U.S. Army Equipment Index of Modification Work Orders.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 38-750	The Army Maintenance Management System (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use.
TM 11-6625-1703-15	Operator, Organizational, DS, GS and Depot Maintenance Manual Including Repair Parts and Special Tools List: Oscilloscope AN/USM-281A.

APPENDIX B

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,

AND GENERAL SUPPORT MAINTENANCE

REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists repair parts; special tools; test, measurement, and diagnostic equipment (TMDE); and other support equipment required for operation and performance of organization, direct support, and general support maintenance of the AN/USM-108B.

B-2. General

This Basic Issue Items, Items Troop Installed or Authorized, Repair Parts and Special Tools List is divided into the following sections:

a. Section II-Basic Issue Items List. Not applicable.

b. Section III-Items Troop Installed or Authorized List. Not applicable.

c. Section IV-Repair Parts List. A list of repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence, with the parts in each group listed in figure and item number sequence.

d. Section V-Special Tools List. A list of special tools, TMDE, and support equipment authorized for the performance of maintenance.

e. Section VI-National Stock Number and Part Number Index. A list, in ascending numerical sequence, of all National stock numbers appearing in the listings, followed by a list, in alpha-numeric sequence, of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

B-3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* The number used to identify each item called out in the illustration.

b. Source, Maintenance, and Recoverability Codes (SMR).

(1) *Source code.* Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second positions of the Uniform SMR Code format as follows:

Code	*Definition*
PA -	Item procured and stocked for anticipated or known usage.
PD -	Support item, excluding support equipment, procured for initial issue or outfitting and stocked only for subsequent or additional initial issues or outfittings. Not subject to automatic replenishment.
XD -	A support item that is not stocked. When required. item will be procured through normal supply channels.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded XA, XD, and aircraft support items as restricted by AR 700-42.

(2) *Maintenance code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

Code	*Application/Explanation*
O -	Support item is removed, replaced, used at the organizational level.
H -	Support item is removed, replaced, used at the general support level.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete repair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code	*Application/ Explanation*
H -	The lowest maintenance level capable of complete repair of the support item is the general support level.
Z -	Nonreparable. No repair is authorized.

(3) *Recoverability code.* Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform SMR Code format as follows:

Recoverability Codes	*Definition*
Z -	Nonreparable item. When dispose at the level indicated in position 3.
D -	Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal not authorized below depot level.

c. National Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

NOTE

When a stock-numbered item is requisitioned, the repair part received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer (FSCM). The FSCM is a 5-digit numeric code listed in SB708-42 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. Description. Indicates the Federal item name and, if required, a minimum description to identify the item. In the Special Tools List, the initial basis of issue (BOI) appears as the last line in the entry for each special tool, TMDE, and support equipment. When density of equipments supported exceeds density spread indicated in the basis of issue, the total authorization is increased accordingly.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr, etc.). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned.

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly.

B-4. Special Information

Not applicable.

B-5. How to Locate Repair Parts

a. When National Stock Number or Part Number is Unknown:

(1) *First.* Using the table of contents, determine the functional group or functional subgroup within which the repair part belongs. This is necessary since illustrations are prepared for functional groups or functional subgroups and listings are divided into the same groups.

(2) *Second.* Find the illustration covering the functional group or functional subgroup to which the repair part belongs.

(3) *Third.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National Stock Number or Part Number is Known;

(1) *First.* Using the Index of National Stock Numbers and Part Numbers, find the pertinent

National stock number or part number. This index is in ascending NSN sequence, followed by a list of part numbers in ascending alphanumeric sequence, crossreferenced to the illustration figure number and item number.

B-4. Abbreviations

Not applicable.

(Next printed page is B-5.)

SECTION IV. REPAIR PARTS LIST

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
						GROUP: 00 GENERATOR, ELECTRONIC MARKER AN/USM-108B		
B-1	1	XDHZZ		C-4434A	29504	CABINET	EA	1
B-1	2	PDOHD		C-3924	29504	GEN., S-352B	EA	1
B-1	3	PAHZZ	5305-00-855-0969	MS24629-11	96906	SCREW	EA	6
B-1	4	XDHZZ		B-4563	29504	PANEL, FRONT	EA	1
B-1	5	PAHZZ	5305-00-543-4333	MS35234-14	96906	SCREW	EA	7
B-1	6	XDHZZ		C9029SS-49	78533	NUT, SPEED	EA	2
B-1	7	PAOZZ	6210-00-978-1138	101-0933	72619	LENS ASSY, AMBER	EA	1
B-1	8	PAOZZ	6210-00-842-1679	101-0931	72619	LENS ASSY, RED	EA	1
B-1	9	PAHZZ	5310-00-934-9739	MS3569-242	96906	NUT	EA	8
B-1	10	XDHZZ		REC-20825	24324	FOOT, RUBBER	EA	4
B-1	11	PAHZZ	5305-00-543-2749	MS35234-17	96906	SCREW, FLAT HEAD	EA	2
B-1	12	PAOZZ	5995-00-099-5888	BNC-C-42	05276	CABLE	EA	2
B-1	13	PAOZZ		GE-4391-8	24446	ADAPTER, CORD	EA	1
B-1	14	PAOZZ	6625-00-006-9026	2631	05276	ADAPTER	EA	1
B-1	15	PAHZZ	6150-00-949-9348	17258	70903	CORD, POWER	EA	1
B-1	16	PAHZZ	5935-00-004-1974	105-1042	74970	TIP JACK, RED	EA	14
B-1	17	XDHZZ		B-4435-A	29504	PLATE, BOTTOM CABINET	EA	1
B-1	18	PAHZZ	5935-00-004-1975	105-1043	74970	TIP JACK, BLACK	EA	1
B-1	19	PAHZZ	5935-00-665-5718	31-221	96791	CONNECTOR, UG-1094/U	EA	2
B-1	20	PAHZZ	5305-00-957-6264	MS35190-225	96906	SCREW, COUNTER SUNK	EA	2
B-1	21	XDHZZ		A-6303	29504	NAMEPLATE	EA	1
B-1	22	XDHZZ		B-4546A	29504	WALL, REAR	EA	1
B-2	1	PAHHD	6625-00-001-1384	4318-E	29504	PRINTED CIRCUIT BOARD ASSY #1 (See Fig 3 for breakdown)	EA	1
B-2	2	PAHHD	6625-00-001-1384	4319-D		PRINTED CIRCUIT BOARD ASSY #2 (See Fig 4 for breakdown)	EA	1
B-2	3	XDHZZ		A-462B	29504	PLATE SHIELD	EA	1
B-2	4	PAHZZ	5305-00-53-4333	MS35234-14	96906	SCREW	EA	6
B-2	5	PAHZZ	5305-00-052-7407	MS24627-11	96906	SCREW	EA	12
B-2	6	XDHZZ		A4549A	29504	BRACKET, PRINTED CIRCUIT BOARD	EA	2
B-2	7	PAHZZ	5940-00-660-9317	MS35436	96906	LUG, SOLDER	EA	2
B-2	8	XDHZZ		A4549A	29504	BRACKET, PRINTED CIRCUIT BOARD	EA	4
B-2	9	PAHHD	6625-00-001-1385	4320-C	29504	PRINTED CIRCUIT BOARD ASSY #3 (See Fig. 5 for breakdown)	EA	1
B-2	10	XDHZZ		C-4390-B	29504	PANEL, REAR PRINTED CIRCUIT BOARD	EA	1
B-2	11	PAHZZ	5325-00-276-6089	MS35489-16	96906	GROMMET	EA	2
B-2	12	PAHZZ	5310-00-934-9747	MS35649-262	96906	NUT	EA	2
B-2	13	PAHZZ	5305-00-059-4550	MS35190-235	96906	SCREW	EA	4
B-2	14	PAHZZ	5950-00-003-4718	A-4215-B	29504	XFMR	EA	1
B-2	15	PAHZZ	5310-00-934-9739	MS35649-242	96906	NUT	EA	4
B-2	16	PAHZZ	5930-00-059-1390	46256LF	82389	SWITCH, D.P.D.T.	EA	1
B-2	17	PAHZZ	5920-00-881-4636	342014	79515	HOLDER, FUSE	EA	1

SECTION IV. REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
B-2	18	PAHZZ	5920-00-199-9498	313.500	79515	FUSE, 115V, 0.5A	EA	1
B-2	19	PAHZZ	5935-00-058-9423	AC3-G	82389	RECEPTACLE, POWER	EA	1
B-2	20	XDHZZ		A4547	29504	BRACKET, PRINTED CIRCUIT BOARD	EA	1
B-2	21	XDHZZ		B4600-B	29504	HARNESS, WIRING	EA	1
B-3	1	PAHZZ	6625-00-455-7001	4325-D	29504	PRINTED CIRCUIT BOARD	EA	1
B-3	2	XDHZZ		1223	91833	PIN, TERMINAL	EA	21
B-3	3	XDHZZ		1245	91833	SOCKET, TERMINAL	EA	21
B-3	4	PAHZZ		NE62/CR27A/V	00815	OVEN & XTAL, 10 MHZ	EA	1
B-3	5	PAHZZ	5910-00-691-1246	TE1127	56289	CAPACITOR FIXED	EA	1
B-3	6	PAHZZ	5910-00-405-8329	500D506G050007	56289	CAPACITOR FIXED	EA	1
B-3	7	PAHZZ	5910-00-957-8577	CD15ED680J03	14655	CAPACITOR, FIXED	EA	2
B-3	8	PAHZZ	5910-00-781-7929	CD15ED910J03	14655	CAPACITOR, FIXED	EA	2
B-3	9	PAHZZ	5910-00-946-0451	538-006D-9-35	72982	CAPACITOR FIXED	EA	6
B-3	10	PAHZZ	5910-00-068-1332	CD15ED39J03	1465	CAPACITOR, FIXED	EA	3
B-3	11	PAHZZ	5910-00-810-4849	C023B101F103M	56289	CAPACITOR FIXED	EA	13
B-3	12	PAHZZ	5910-00-822-3765	5GA-T10-400-200	56289	CAPACITOR FIXED	EA	1
B-3	13	PAHZZ	5910-00-686-6652	DD201	71590	CAPACITOR FIXED	EA	4
B-3	14	PAHZZ	5910-00-902-0335	CD15ED100J03	14655	CAPACITOR FIXED	EA	2
B-3	15	PAHZZ	5910-00-051-4612	CM15ED220J03	14655	CAPACITOR FIXED	EA	1
B-3	16	PAHZZ	5910-00-950-9873	DD220	71590	CAPACITOR FIXED	EA	1
B-3	17	PAHZZ	5910-00-814-8998	DD680	71590	CAPACITOR FIXED	EA	1
B-3	18	PAHZZ	5910-00-130-2719	TE1301	56289	CAPACITOR, FIXED	EA	2
B-3	19	PAHZZ	5910-00-782-1635	DD501	71590	CAPACITOR FIXED	EA	2
B-3	20	PAHZZ		GP450	01624	CAPACITOR FIXED	EA	1
B-3	21	PAHZZ	5910-00-901-6104	192P2229R8	56289	CAPACITOR FIXED	EA	2
B-3	22	PAHZZ	5961-00-407-2405	SZ12.0	81071	DIODE, ZENER, 12V	EA	1
B-3	23	PAHZZ	5961-00-938-1135	1N4148	73760	DIODE	EA	1
B-3	24	PAHZZ	5962-00-102-7519	SN7490N	27014	CIRCUIT, INTEGRATED	EA	3
B-3	25	PAHZZ	5935-00-004-0100	PC274	92219	SOCKET, OCTAL	EA	1
B-3	26	PAHZZ	5950-00-833-0947	2150-24	71895	CHOKE, R.F.	EA	1
B-3	27	PAHZZ	5950-00-100-1199	A-4769-1	29504	COIL, COUPLING	EA	1
B-3	28	PAHZZ	5950-00-004-0091	2150-08	71895	CHOKE, R.F.	EA	1
B-3	29	PAHZZ	5950-00-003-4720	A-4769-2	29504	COIL, COUPLING	EA	1
B-3	30	PAHZZ	5950-00-769-4326	1537-00	71895	CHOKE, R.F.	EA	2
B-3	31	PAHZZ	5950-00-657-8167	1537-36	71895	CHOKE, R.F.	EA	2
B-3	32	PAHZZ	5950-00-497-4046	1537-02	71895	CHOKE, R.F.	EA	1
B-3	33	PAHZZ	5950-00-003-4721	A-4769-3	29504	COIL, COUPLING	EA	1
B-3	34	PAHZZ	5961-00-840-4826	2N4123	04713	TRANSISTOR	EA	6
B-3	35	PAHZZ	5961-00-496-9403	2N35134 A	07263	TRANSISTOR	EA	2
B-3	36	PAHZZ	5961-00-103-3981	2N3644	07263	TRANSISTOR	EA	5
B-3	37	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED	EA	8
B-3	38	PAHZZ	5905-00-141-0717	RCR07G473KM	81349	RESISTOR, FIXED	EA	1
B-3	39	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED	EA	1

SECTION IV. REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
B-3	40	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED	EA	4
B-3	41	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED	EA	6
B-3	42	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR FIXED	EA	1
B-3	43	PAHZZ	5905-00-113-4861	RCR07G390KM	81349	RESISTOR FIXED	EA	2
B-3	44	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED	EA	18
B-3	45	PAHZZ	5905-00-119-8768	RCR07G821JS	81349	RESISTOR, FIXED	EA	5
B-3	46	PAHZZ	5905-00-119-3503	RCR07G271JS	81349	RESISTOR, FIXED	EA	6
B-3	47	PAHZZ		2KCM054000382	71590	SWITCH ASSEMBLY	EA	1
B-3	48	PAHZZ	5950-00-003-4719	A4621	29504	XFMR, PULSE	EA	1
B-4	1	PAHZZ	6625-00-455-6866	4326-B	29504	PRINTED CIRCUIT BOARD	EA	1
B-4	2	XDHZZ		1223	91833	PIN, TERMINAL	EA	14
B-4	3	XDHZZ		1245	91833	SOCKET, TERMINAL	EA	14
B-4	4	PAHZZ	5910-00-782-1994	192P2239R8	5689	CAPACITOR, FIXED	EA	2
B-4	5	PAHZZ	5910-00-901-6110	192P2249R8	56289	CAPACITOR, FIXED	EA	2
B-4	6	PAHZZ	5910-00-880-5430	CS13BE225K	56289	CAPACITOR, FIXED	EA	2
B-4	7	PAHZZ	5910-00-943-2865	CSR13E156KL	56289	CAPACITOR, FIXED	EA	3
B-4	8	PAHZZ	5910-00-691-1246	TE1127	56289	CAPACITOR, FIXED	EA	1
B-4	9	PAHZZ	5910-00-130-2719	TE1301	56289	CAPACITOR, FIXED	EA	2
B-4	10	PAHZZ	5910-00-810-4849	C023B101F103M	56289	CAPACITOR, FIXED	EA	2
B-4	11	PAHZZ	5962-00-102-7519	SN7490N	27014	INTEGRATED CIRCUIT	EA	5
B-4	12	PAHZZ	5961-00-103-3981	2N3644	07263	TRANSISTOR	EA	9
B-4	13	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED	EA	36
B-4	14	PAHZZ	5905-00-119-8768	RCR07G821JS	81349	RESISTOR, FIXED	EA	9
B-4	15	PAHZZ	5905-00-119-3503	RCR07G271JS	81349	RESISTOR, FIXED	EA	9
B-4	16	PAHZZ		2KCB09000380	71590	SWITCH ASSEMBLY	EA	1

SECTION V. SPECIAL TOOLS LIST

(1) ILLUSTRATION (a) FIG NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) U/M	(8) QTY INC IN UNIT
B-5	1	PAHZZ	6625-01-001-4122	4327-B	29504	PRINTED CIRCUIT BOARD	EA	1
B-5	2	XDHZZ		1223	91833	PIN TERMINAL	EA	25
B-5	3	XDHZZ		1245	91833	SOCKET	EA	25
B-5	4	PAHZZ	5961-00-155-8678	VE27	83003	RECTIFIER	EA	2
B-5	5	PAHZZ	5910-00-469-8650	WMF6P1	14655	CAPACITOR, FIXED	EA	1
B-5	6	PAHZZ		EG500/50	1G431	CAPACITOR, FIXED	EA	2
B-5	7	PAHZZ	5910-00-405-8329	500D506G050007	56289	CAPACITOR, FIXED	EA	1
B-5	8	PAHZZ	5910-00-826-3379	BR1000-15	14655	CAPACITOR, FIXED	EA	1
B-5	9	PAHZZ	5910-00-879-6892	TE1162	56289	CAPACITOR, FIXED	EA	1
B-5	10	PAHZZ	5910-00-080-6474	DD100	71590	CAPACITOR, FIXED	EA	1
B-5	11	PAHZZ	5910-00-691-1246	TE1127	56289	CAPACITOR, FIXED	EA	1
B-5	12	PAHZZ	5910-00-130-2719	TE1301	56289	CAPACITOR, FIXED	EA	1
B-5	13	PAHZZ	5961-00-004-0095	SZ5.9A	81071	DIODE, ZENER	EA	1
B-5	14	PAHZZ	5961-00-995-2310	1N752	08910	DIODE	EA	1
B-5	15	PAOZZ	6250-00-003-0265	22-250	81073	LAMP ASSY	EA	2
B-5	16	PAOZZ	6240-00-937-5919	CM7-7330	71744	LAMP	EA	2
B-5	17	PAHZZ	5950-00-079-6014	2890-42	71895	CHOKE	EA	2
B-5	18	PAHZZ	5950-00-833-0947	2150-24	71895	CHOKE	EA	1
B-5	19	PAHZZ	5961-00-491-1431	2N3569	07263	TRANSISTOR	EA	1
B-5	20	PAHZZ	5961-00-497-9132	40372	79089	TRANSISTOR	EA	1
B-5	21	PAHZZ	5961-00-840-4826	2N4123	04713	TRANSISTOR	EA	1
B-5	22	PAHZZ	5961-00-103-3981	2N3644	07263	TRANSISTOR	EA	1
B-5	23	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED	EA	1
B-5	24	PAHZZ	5905-00-119-8812	RCR07G121KM	81349	RESISTOR, FIXED	EA	1
B-5	25	PAHZZ	5905-00-105-7767	RCR07G474KM	81349	RESISTOR, FIXED	EA	1
B-5	26	PAHZZ	5905-00-141-0717	RCR07G473KM	81349	RESISTOR, FIXED	EA	1
B-5	27	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED	EA	1
B-5	28	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED	EA	2
B-5	29	PAHZZ	5905-00-141-0742	RCR07G181KM	81349	RESISTOR, FIXED	EA	1
B-5	30	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED	EA	1
B-5	31	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED	EA	2
B-5	32	PAHZZ	5930-00-003-2662	2KCM070000381	71590	SWITCH ASSEMBLY	EA	1

SECTION VI. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIG. NO.	ITEM NO.
5305-00-052-7407	B-2	5
5305-00-059-4550	B-2	13
5305-00-543-2749	B-1	11
5305-00-543-4333	B-1	5
5305-00-543-4333	B-2	4
5305-00-855-0969	B-1	3
5305-00-957-6264	B-1	20
5310-00-934-9739	B-1	9
5310-00-934-9739	B-2	15
5310-00-934-9747	B-2	12
5325-00-276-6089	B-2	11
5905-00-104-8368	B-3	41
5905-00-104-8368	B-5	31
5905-00-105-7764	B-3	40
5905-00-105-7767	B-5	25
5905-00-106-3666	B-3	39
5905-00-106-3666	B-5	27
5905-00-110-7620	B-3	37
5905-00-110-7620	B-5	30
5905-00-113-4861	B-3	43
5905-00-114-0711	B-5	28
5905-00-119-3503	B-3	46
5905-00-119-3503	B-4	15
5905-00-119-8768	B-3	45
5905-00-119-8768	B-4	14
5905-00-119-8812	B-5	24
5905-00-120-9154	B-3	44
5905-00-120-9154	B-4	13
5905-00-121-9932	B-5	23
5905-00-141-0717	B-3	38
5905-00-141-0717	B-5	26
5905-00-141-0742	B-5	29
5905-00-141-1183	B-3	42
5910-00-051-4612	B-3	15
5910-00-068-1332	B-3	10
5910-00-080-6174	B-5	10
5910-00-130-2719	B-3	18
5910-00-130-2719	B-4	9
5910-00-130-2719	B-5	12
5910-00-405-8329	B-3	6
5910-00-405-8329	B-5	7
5910-00-469-8650	B-5	5
5910-00-686-6652	B-3	13
5910-00-691-1246	B-3	5
5910-00-691-1246	B-4	8
5910-00-691-1246	B-5	11
5910-00-781-7929	B-3	8
5910-00-782-1635	B-3	19
5910-00-782-1994	B-4	4
5910-00-810-4849	B-3	11
5910-00-810-4849	B-4	10
5910-00-814-8998	B-3	17
5910-00-822-3765	B-3	12
5910-00-826-3379	B-5	8
5910-00-879-6892	B-5	9
5910-00-880-5430	B-4	6
5910-00-901-6104	B-3	21
5910-00-901-6110	B-4	5
5910-00-902-0335	B-3	14
5910-00-943-2865	B-4	7
5910-00-946-0451	B-3	9
5910-00-950-9873	B-3	16
5910-00-957-8577	B-3	7
5920-00-199-9498	B-2	18
5920-00-881-4636	B-2	17
5930-00-003-2662	B-5	32
5930-00-059-1390	B-2	16
5935-00-004-0100	B-3	25
5935-00-004-1974	B-1	16
5935-00-004-1975	B-1	18
5935-00-058-9423	B-2	19
5935-00-665-5718	B-1	19
5940-00-660-9317	B-2	7
5950-00-003-4718	B-2	14
5950-00-003-4719	B-3	48
5950-00-003-4720	B-3	29
5950-00-003-4721	B-3	33
5950-00-004-0091	B-3	28
5950-00-079-6044	B-5	17
5950-00-100-1199	B-3	27
5950-00-497-4046	B-3	32
5950-00-657-8167	B-3	31
5950-00-769-4326	B-3	30
5950-00-833-0947	B-3	26
5950-00-833-0947	B-5	18
5961-00-004-0095	B-5	13
5961-00-103-3981	B-3	36
5961-00-103-3981	B-4	12
5961-00-103-3981	B-5	22
5961-00-155-8678	B-5	4
5961-00-407-2405	B-3	22
5961-00-491-1431	B-5	19
5961-00-496-9403	B-3	35
5961-00-497-9132	B-5	20
5961-00-840-4826	B-3	34
5961-00-840-4826	B-5	21
5961-00-938-1135	B-3	23
5961-00-995-2310	B-5	14
5962-00-102-7519	B-3	24
5962-00-102-7519	B-4	11
5995-00-099-5888	B-1	12
6150-00-949-9348	B-1	15

SECTION VI. NATIONAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
6210-00-842-1679	B-1	8			
6210-00-978-1138	B-1	7			
6240-00-937-5919	B-5	16			
6250-00-003-0265	B-5	15			
6625-00-001-1383	B-2	2			
6625-00-001-1384	B-2	1			
6625-00-001-1385	B-2	9			
6625-00-001-4122	B-5	1			
6625-00-006-9026	B-1	14			
6625-00-455-6866	B-4	1			
6625-00-455-7001	B-3	1			

SECTION VI. NATIONAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
A-4215-B	29504	B-2	14
A-4624B	29504	B-2	3
A-4769-1	29504	B-3	27
A-4769-2	29504	B-3	29
A-4769-3	29504	B-3	33
A-6303	29504	B-1	21
A4547	29504	B-2	20
A4548A	29504	B-2	6
A4549A	29504	B-2	8
A4621	29504	B-3	48
AC3-G	82389	B-2	19
B-4435-A	29504	B-1	17
B-4546A	29504	B-1	22
B-4563	29504	B-1	4
B4600-B	29504	B-1	21
BNC-C-42	05276	B-1	12
BR1000-15	14655	B-5	8
C-3924	29504	B-1	2
C-4390-B	29504	B-2	10
C-4434A	29504	B-1	1
C9029SS-49	78533	B-1	6
CD15ED100J03	14655	B-3	14
CD15ED390J03	14655	B-3	10
CD15ED680J03	14655	B-3	7
CD15ED910J03	14655	B-3	8
CM15ED220J03	81349	B-3	15
CM7-7330	71744	B-5	16
C023B101F103M	56289	B-3	11
C023B101F103M	56289	B-4	10
CS12BE225K	56289	B-4	6
CSR13E156KL	56289	B-4	7
DD100	71590	B-5	10
DD201	71590	B-3	13
DD220	71590	B-3	16
DD501	71590	B-3	19
DD680	71590	B-3	17
EG500/50	10G431	B-5	6
CE-4391-8	24446	B-1	13
GP450	01624	B-3	20
MS24627-11	96906	B-2	5
MS24629-11	96906	B-1	3
MS35190-2	96906	B-1	20
MS35190-235	96906	B-2	13
MS35234-14	96906	B-1	5
MS35234-14	96906	B-2	4
MS35234-17	96906	B-1	11
MS35436-2	96906	B-2	7
MS35489-16	96906	B-2	11
MS35649-242	96906	B-1	9
MS35649-242	96906	B-2	15
MS35649-262	96906	B-2	12
NE62/CR27A/V	00815	B-3	4
PC274	92219	B-3	25
RCR07G101JS	81349	B-3	42
RCR07G102JS	81349	B-3	37
RCR07G102JS	81349	B-5	30
RCR07G103JS	81349	B-3	39
RCR07G103JS	81349	B-5	27
RCR07G121KM	81349	B-5	24
RCR07G181KM	81349	B-5	29
RCR07G222JS	81349	B-3	40
RCR07G271JS	81349	B-3	46
RCR07G271JS	81349	B-4	15
RCR07G390KM	81349	B-3	43
RCR07G391JS	81349	B-5	23
RCR07G470JS	81349	B-3	41
RCR07G470JS	81349	B-5	31
RCR07G471JS	81349	B-3	44
RCR07G471JS	81349	B-4	13
RCR07G472JS	81349	B-5	28
RCR07G473KM	81349	B-3	38
RCR07G473KM	81349	B-5	26
RCR07G474KM	81349	B-5	25
RCR07G821JS	81349	B-3	45
RCR07G821JS	81349	B-4	14
REC-20825	24324	B-1	10
SN7490N	27014	B-3	24
SN7490N	27014	B-4	11
SZ5.9A	81071	B-5	13
SZ12.0	81071	B-3	22
TE1122	56289	B-3	5
TE1127	56289	B-4	8
TE1127	56289	B-5	11
TE1162	56289	B-5	9
TE1301	56289	B-3	18
TE1301	56289	B-4	9
TE1301	56289	B-5	12
VE27	83003	B-5	4
WMF6P1	14655	B-5	5
1N4148	73760	B-3	23
1N752	08910	B-5	14
101-0931	72619	B-1	8
101-0933	72619	B-1	7
105-1042	74970	B-1	16
105-1043	74970	B-1	18
1223	91833	B-3	2
1223	91833	B-4	2
1223	91833	B-5	2
1245	91833	B-3	3
1245	91833	B-4	3
1245	91833	B-5	3
1537-00	71895	B-3	30
1537-02	71985	B-3	32
1537-36	71895	B-3	31
17258	70903	B-1	15
192P2229R8	56289	B-3	21
192P2239R8	56289	B-4	4
192P2249R8	56289	B-4	5
2KCB09000380	71590	B-4	16
2KCM054000382	71590	B-3	47
2KCM070000381	71590	B-5	32
2N3569	07263	B-5	19
2N3644	07263	B-3	36
2N3644	07263	B-4	12

SECTION VI. NATIONAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
2N3644	07263	B-5	22				
2N4123	04713	B-3	34				
2N4123	04713	B-5	21				
2N5134	07263	B-3	35				
2150-08	71895	B-3	28				
2150-24	71895	B-3	26				
2150-24	71895	B-5	18				
22-250	81073	B-5	15				
2631	05276	B-1	14				
2890-42	71895	B-5	17				
31-221	96791	B-1	19				
313.500	79515	B-2	18				
342014	79515	B-2	17				
40372	79089	B-5	20				
4318-E	29504	B-2	1				
4319-D	29504	B-2	2				
4320-C	29504	B-2	9				
4325-D	29504	B-3	1				
4326-B	29504	B-4	1				
4327-B	29504	B-5	1				
43256LF	82389	B-2	16				
5GA-T10-400-200	56289	B-3	12				
500D506G05007	56289	B-3	6				
500D506G05007	56289	B-5	7				
538-006D-9-35	72982	B-3	9				

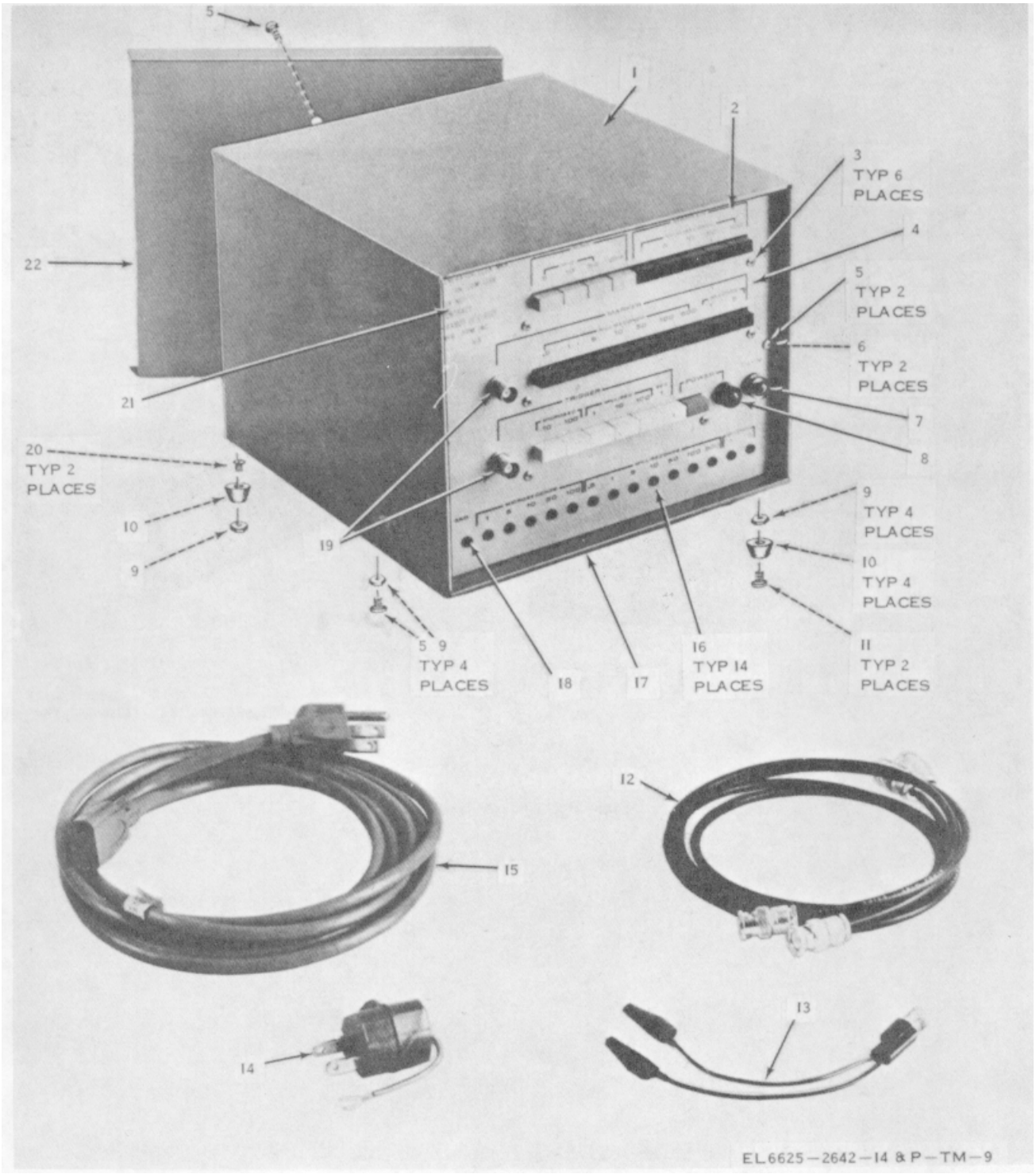


Figure B-1. Generator assembly.

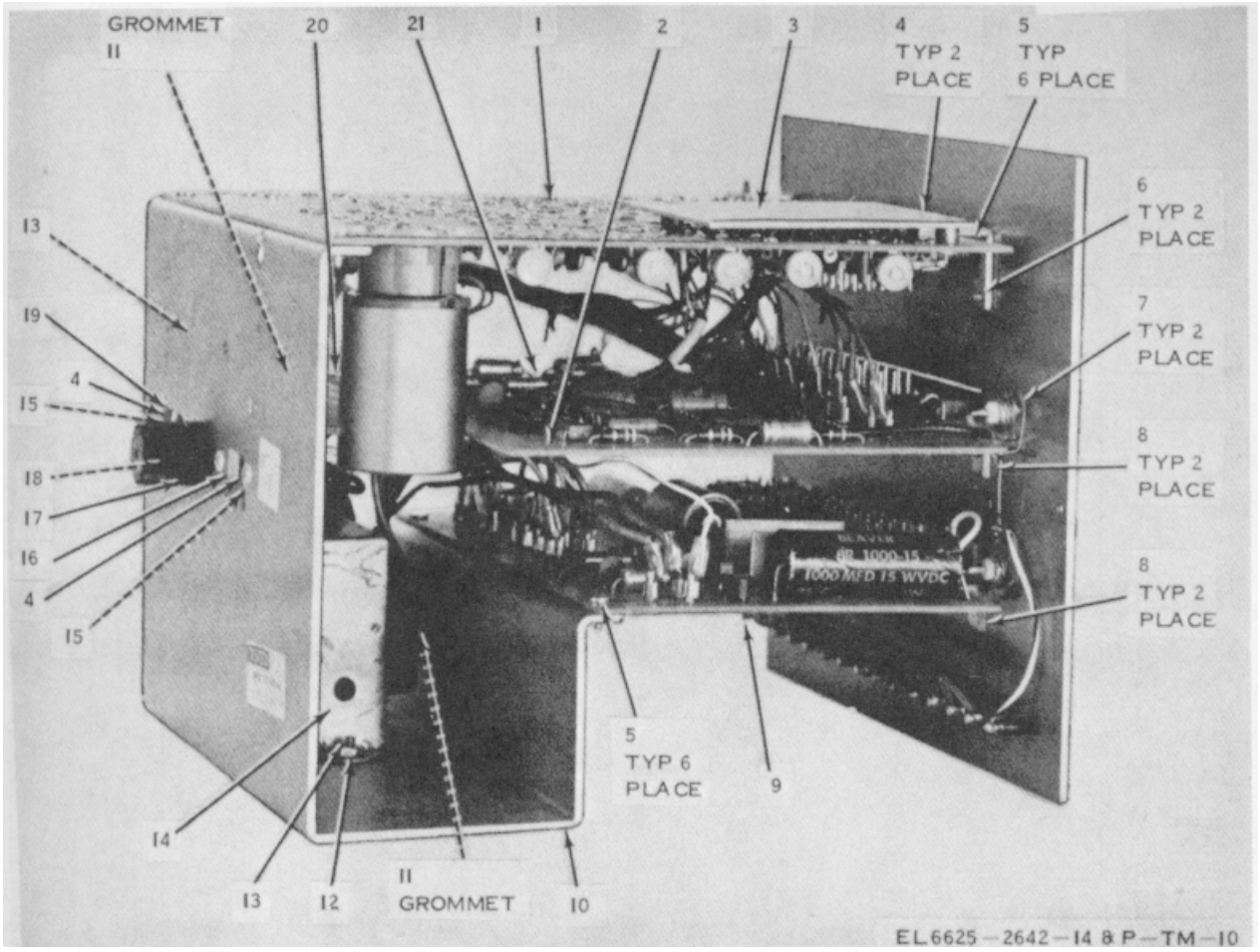


Figure B-2. Chassis assembly.

REF DES	ITEM NO.	REF DES	ITEM NO.
CO-1	4	Q4	34
C1	5	Q5	34
C2	6	Q6	34
C3	7	Q7	34
C4	8	Q8	34
C5	9	Q9	36
C6	10	Q10	36
C7	11	Q11	36
C8	12	Q12	36
C9	11	Q13	36
C10	11	R1	37
C11	9	R2	37
C12	7	R3	38
C13	13	R4	39
C14	11	R5	40
C15	9	R6	40
C16	8	R7	37
C17	13	R8	41
C18	11	R9	37
C19	13	R10	37
C20	10	R11	37
C21	9	R12	40
C22	11	R13	41
C23	14	R14	37
C24	12	R15	40
C25	12	R16	41
C26	10	R17	37
C27	9	R18	42
C28	14	R19	41
C29	11	R20	43
C30	11	R21	41
C31	15	R22	43
C32	9	R23	41
C33	16	R24	44
C34	17	R25	44
C35	18	R26	45
C36	11	R27	46
C37	11	R28	44
C38	11	R29	44
C39	19	R30	46
C40	19	R31	44
C41	20	R32	45
C42	13	R33	46
C43	21	R34	44
C44	21	R35	44
C45	18	R36	44
D1	22	R37	44
D2	23	R38	45
IC1	24	R39	46
IC2	24	R40	44
IC3	24	R41	44
J1	25	R42	44
L1	26	R43	44
L2	27	R44	45
L3	28	R45	46
L4	29	R46	44
L5	30	R47	44
L6	30	R48	44
L7	31	R49	44
L8	31	R50	45
L9	32	R51	46
L10	33	R52	44
Q1	34	S1A	
Q2	35	THRU	47
Q3	35	S1J	
		T1	48

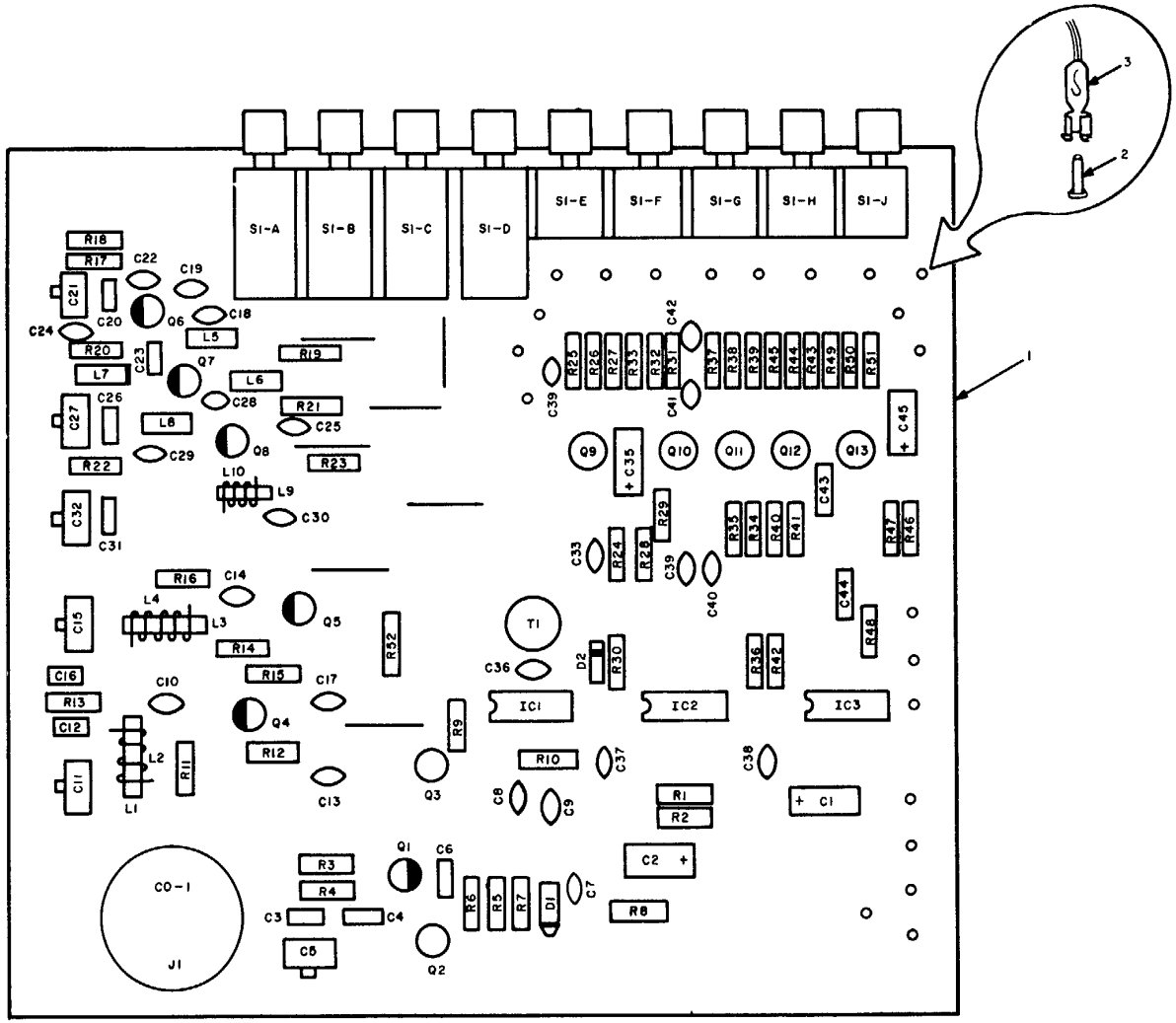


Figure B-3. Top PCB assembly.

REF DES	ITEM NO.	REF DES	ITEM NO.
C1	4	R15	13
C2	4	R16	13
C3	5	R17	14
C4	5	R18	15
C5	6	R19	13
C6	6	R20	13
C7	7	R21	13
C8	7	R22	13
C9	7	R23	14
C10	8	R24	15
C11	9	R25	13
C12	9	R26	13
C13	10	R27	13
C14	10	R28	13
IC1	11	R29	14
IC2	11	R30	15
IC3	11	R31	13
IC4	11	R32	13
IC5	11	R33	13
Q1	12	R34	13
Q2	12	R35	14
Q3	12	R36	15
Q4	12	R37	13
Q5	12	R38	13
Q6	12	R39	13
Q7	12	R40	13
Q8	12	R41	14
Q9	12	R42	15
R1	13	R43	13
R2	13	R44	13
R3	13	R45	13
R4	13	R46	13
R5	14	R47	14
R6	15	R48	15
R7	13	R49	13
R8	13	R50	13
R9	13	R51	13
R10	13	R52	13
R11	14	R53	14
R12	15	R54	15
R13	13	SIA THRU SIJ	16
R14	13		

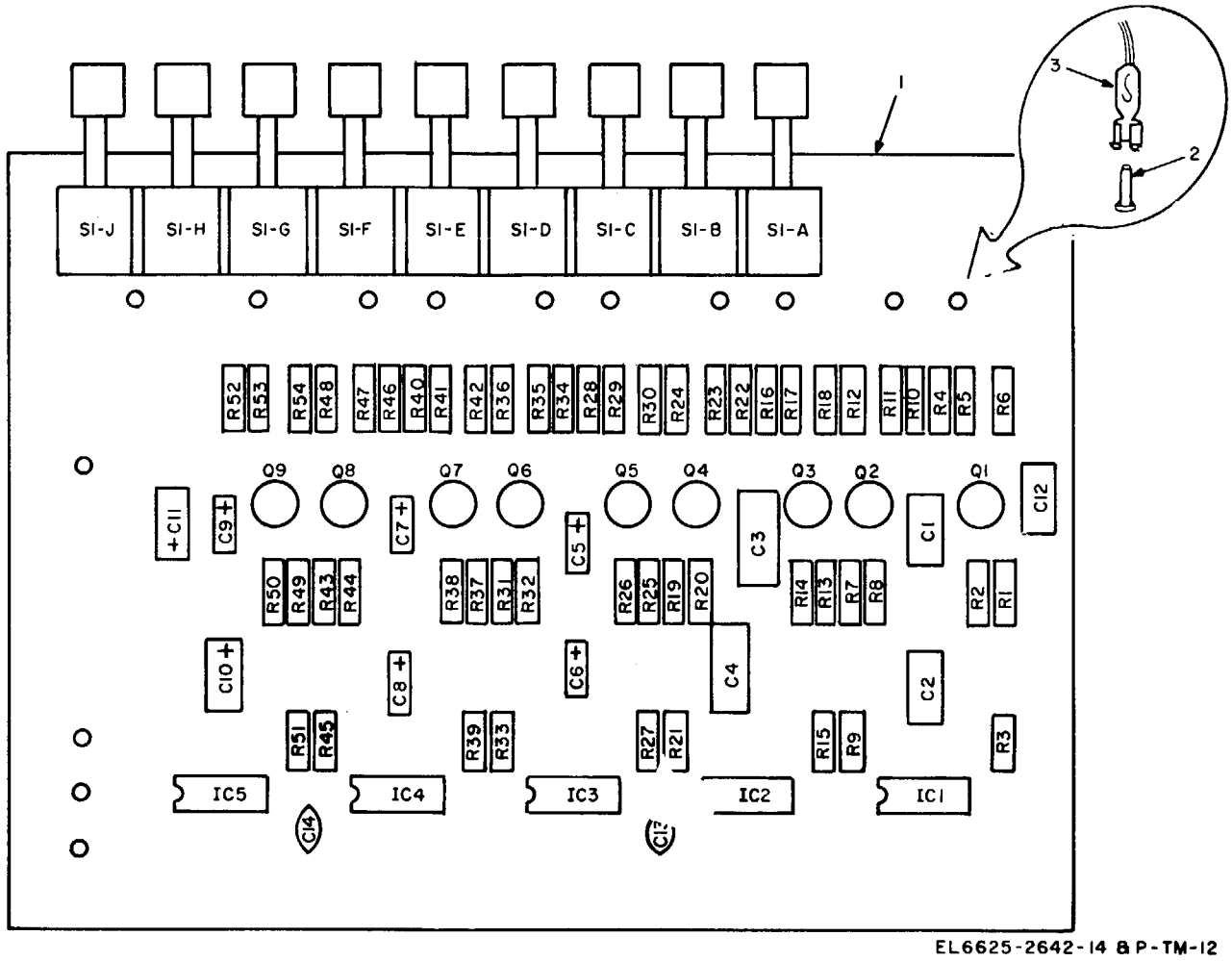


Figure B-4. Middle PCB assembly.

REF DES	ITEM NO.
BR1	4
BR2	4
C1	5
C2	6
C3	7
C4	6
C5	8
C6	9
C7	10
C8	11
C9	12
D1	13
D2	14
I1	15
I2	16
L1	17
L2	17
L3	18
Q1	19
Q2	20
Q3	21
Q4	22
R1	23
R2	24
R3	25
R4	26
R5	27
R6	28
R7	29
R8	30
R9	28
R10	31
R11	31
S1A THRU SIG	32

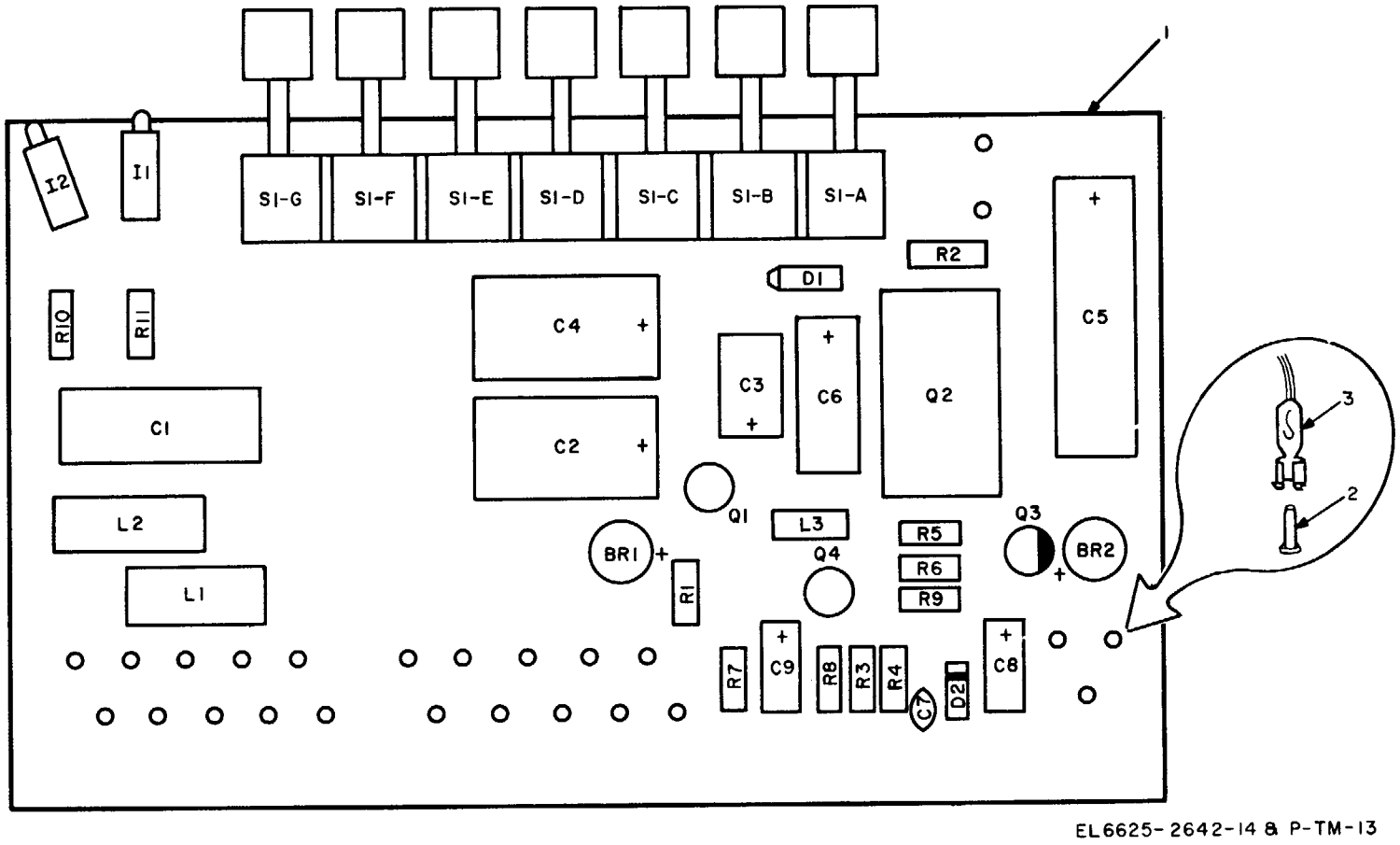


Figure B-5. Bottom PCB assembly.

APPENDIX C

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

C-1. General

This appendix provides a summary of the maintenance operations for AN/USM-108B. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

d. Adjust. Maintain within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to about optimum or desired performance .

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment/system.

h. Replace. The act of substituting a serviceable like-type part, subassembly, model (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system.

j. Overhaul. That periodic maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (e.g., DWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components .

C-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2.

d. Column 4, Maintenance Category. Column 4

specifies, by the listing of a "worktime" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "worktime" figures will be shown for each category. The number of man-hours specified by the "worktime" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time and quality assurance/quality control time in additional to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C - Operator/Crew
O - Organization
F - Direct Support
H - General Support
D - Depot

e Column 5, Tool and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

C4. Tool and Test Equipment Requirements (Table 1)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturer (5-digit) in parentheses.

SECTION II MAINTENANCE ALLOCATION CHART

FOR

ELECTRONIC MARKER GENERATOR AN/USM-108B

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL C	O	F	H	D	(5) TOOLS AND EQUIPMENT
00	ELECTRONIC MARKER GENERATOR AN/USM-108B	Inspect		0.1				
		Service		0.3				7
		Repair		0.2				7
		Test				0.5		1 thru 6
		Adjust				0.5		1 tru 6
		Repair				0.7		1 thru 6
		Rebuild					2.0	1 thru 6

TABLE TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
ELECTRONIC MARKER GENERATOR AN/USM-108B

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H,D	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM207	6625-00-911-6368	
2	H,D	MULTIMETER AN/USM-223	6625-00-999-7465	
3	H,D	OSCILLOSCOPE AN/USM-281	6625-00-228-2201	
4	H,D	TEST SET, TRANSISTOR TS-1836/U	6625-00-893-2628	
5	H,D	VOLTMETER ME-202/ U	6625-00-972-4046	
6	H,D	TOOL KIT TK-100/G	5180-00-605-0079	
7	0	TOOLS AND TEST EQUIPMENT AVAILABLE TO THE ORGANIZATIONAL REPAIRMAN BECAUSE OF HIS ASSIGNED MISSION		

INDEX

By Order of the Secretary of the Army:

FRED C. WEYAND
General United States Army,
Chief of Staff

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

Distribution:

Active Army:
- USASA (2)
- Dir of Trans (1)
- COE (1)
- TSG (1)
- USAARENBD (1)
- AMC (1)
- MICOM (2)
- TECOM (2)
- TRADOC (2)
- ARADCOM (2)
- ARADCOM Rgn (2)
- OS Maj Comd (4)
- LOGCOMD (3)
- USACC (4)
- MDW (1)
- Armies (2)
- Corps (2)
- HISA (Ft Monmouth) (43)
- Ft Gillem (10)
- Ft Gordon (10)
- Ft Huachuca (10)
- Ft Carson (5)
- WSMR (1)
- Svc Colleges (1)
- USASESS (5)
- USAINTCS (3)
- USAADS 12W
- USAFAS (2)
- USAARMS (2)
- USAIS (2)
- USAES (2)
- Ft Richardson (ECOM Ofc) (2)
- AD (1) except
  - SAAD (30)
  - LBAD (14)
  - TOAD (14)
  - SHAD (3)
  - USA DEP (2)
  - Sig Sec USA Dep (2)
  - Sig Dep (2)
  - ATS (1)
  - MAAG (1)
  - WRAMC (1)
  - USARMIS (1)
  - USAERDAA (1)
  - USAERDAW (1)
  - Sig FLDMS (1)
  - Units org under fol TOE:
    - 11-500(AA-AC) (1)
    - 29-134 (1)
    - 29-136 (1)

ARNG: State AG (3).
USAR: None.
For explanation of abbreviations used, see AR 310-50.

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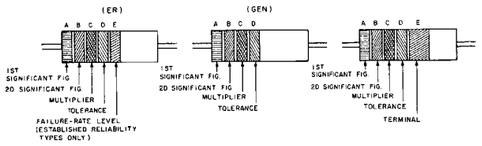


COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS.

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 1½ TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

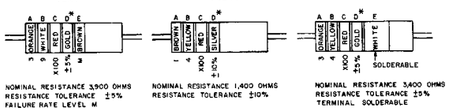
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS
(THESE ARE NOT COLOR CODED)

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 1OR0 = 10.0 OHMS

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

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

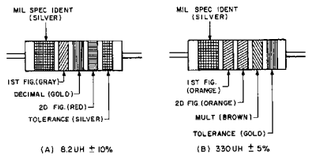
NOMINAL RESISTANCE 3,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

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

A. COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS.



(A) 8.2UH ± 10%

(B) 330UH ± 5%

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

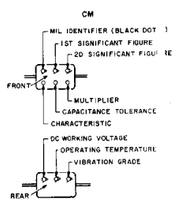
TABLE 2
COLOR CODING FOR TUBULAR ENCAPSULATED R.F. CHOKES.

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

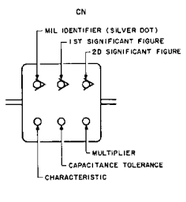
MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL.

B. COLOR CODE MARKING FOR MILITARY STANDARD INDUCTORS.

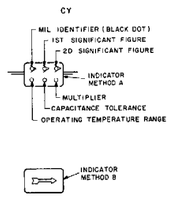
CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB.



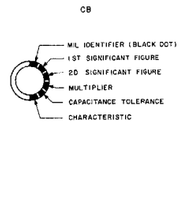
MICA-DIELECTRIC



PAPER-DIELECTRIC



GLASS-DIELECTRIC, GLASS CASE



MICA, BUTTON TYPE

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB.

COLOR	MIL ID	1ST SIG FIG.	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE			CHARACTERISTIC[2]			DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY, CB	CM	CN	CB	CM	CY, CM	CM
BLACK	CM, CY, CB	0	0	1		±20%	±20%		A			-55°C TO +70°C	10-55 HZ
BROWN		1	1	10				B	E	B			
RED		2	2	100	±2%	±2%	±2%	C				-55°C TO +85°C	
ORANGE		3	3	1,000		±30%		D		D	300		
YELLOW		4	4	10,000				E				-55°C TO +125°C	10-2,000 HZ
GREEN		5	5		±5%			F			500		
BLUE		6	6									-55°C TO +150°C	
PURPLE (VIOLET)		7	7										
GRAY		8	8										
WHITE		9	9										
GOLD				0.1		±5%	±5%						
SILVER	CN			0.01	±10%	±10%	±10%	±10%					

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC.

COLOR	TEMPERATURE COEFFICIENT[4]	1ST SIG FIG.	2D SIG FIG.	MULTIPLIER*	CAPACITANCE TOLERANCE		MIL ID	
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS		
BLACK	0	0	0	1		±2.0 UUF	CC	
BROWN	−30	1	1	10	±1%			
RED	−80	2	2	100	±2%	±0.25 UUF		
ORANGE	−150	3	3	1,000				
YELLOW	−220	4	4					
GREEN	−330	5	5		±5%	±0.5 UUF		
BLUE	−470	6	6					
PURPLE (VIOLET)	−750	7	7					
GRAY		8	8	0.01*				
WHITE		9	9	0.1*	±10%			
GOLD	+100			0.1		±1.0 UUF		
SILVER				0.01				

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-250, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY.
3. LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D.
4. TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE.
* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE.

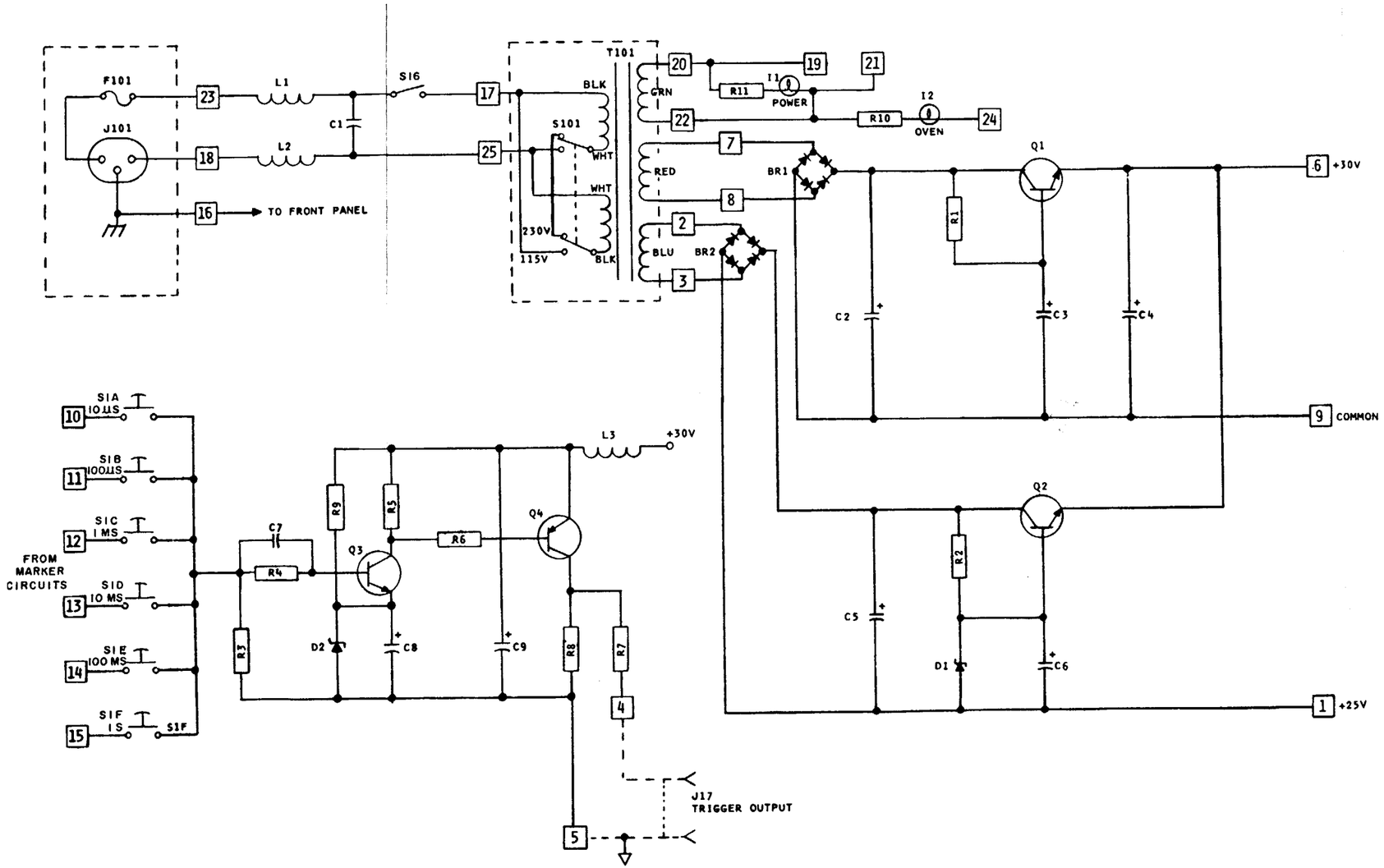
AXIAL LEAD

RADIAL LEAD

DISK-TYPE

C. COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS.

Figure FO-1. Standard resistor, inductor, and capacitor color codes.



BOTTOM PRINTED CIRCUIT BOARD	
BR1,2	VE27
C1	0.1 UF
C2,4	500 UF
C3	50 UF
C5	1000 UF
C6	100 UF
C7	10 UUF
C8	5 UF
C9	2 UF
D1	SZ5.9 AMP
D2	1N752

ALL CHOKE VALUES IN MICROHENRYS

L1,2	100
L3	10
Q1	2N3569
Q2	40372
Q3	2N4123
Q4	2N3644
R1	390 OHM
R2	120 OHM
R3	470K
R4	47K
R5	10K
R6,9	4.7K
R7	180 OHM
R8	1K
R10,11	47 OHM

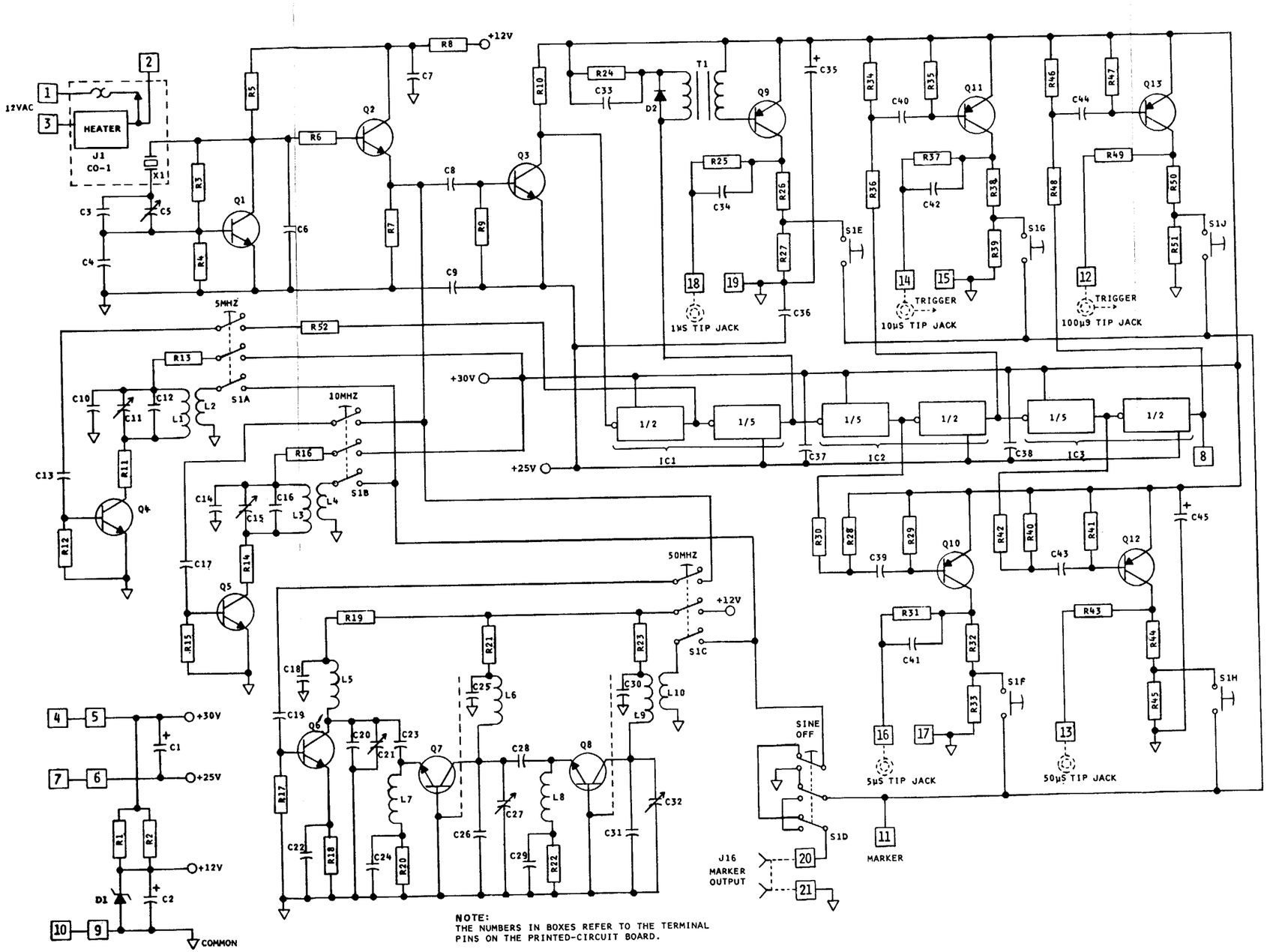
NOTES:

1 THE NUMBERS IN BOXES REFER TO THE TERMINAL PINS ON THE PRINTED-CIRCUIT BOARD.

2 THE COMPONENTS INSIDE THE DOTTED LINES ARE MOUNTED ON THE REAR WALL OF THE INSTRUMENT.

EL6625-2642-14&P-TM-4

Figure FO-2. Bottom PCB, schematic diagram.



NOTE:
THE NUMBERS IN BOXES REFER TO THE TERMINAL PINS ON THE PRINTED-CIRCUIT BOARD.

TOP PRINTED CIRCUIT BOARD

C1	5 UF
C2	50 UF
C3	56 UUF
C4,16	91 UUF
C5,11,15,21,27,32	9-35 UUF
C6,20,26	39 UUF
C7,9,10,14,18,22, 24,25,29,30,36, 37,38	0.01 UF
C8	100 UUF
C12	68 UUF
C13,17,19,42	200 UUF
C23,28	10 UUF
C31	22 UUF
C33	22 UUF
C34	68 UUF
C35,45	2 UF
C39,40	500 UUF
C41	50 UUF
C43,44	0.0022 UF
D1	SZ12.0
D2	1N4148
IC1-3	SN7490N

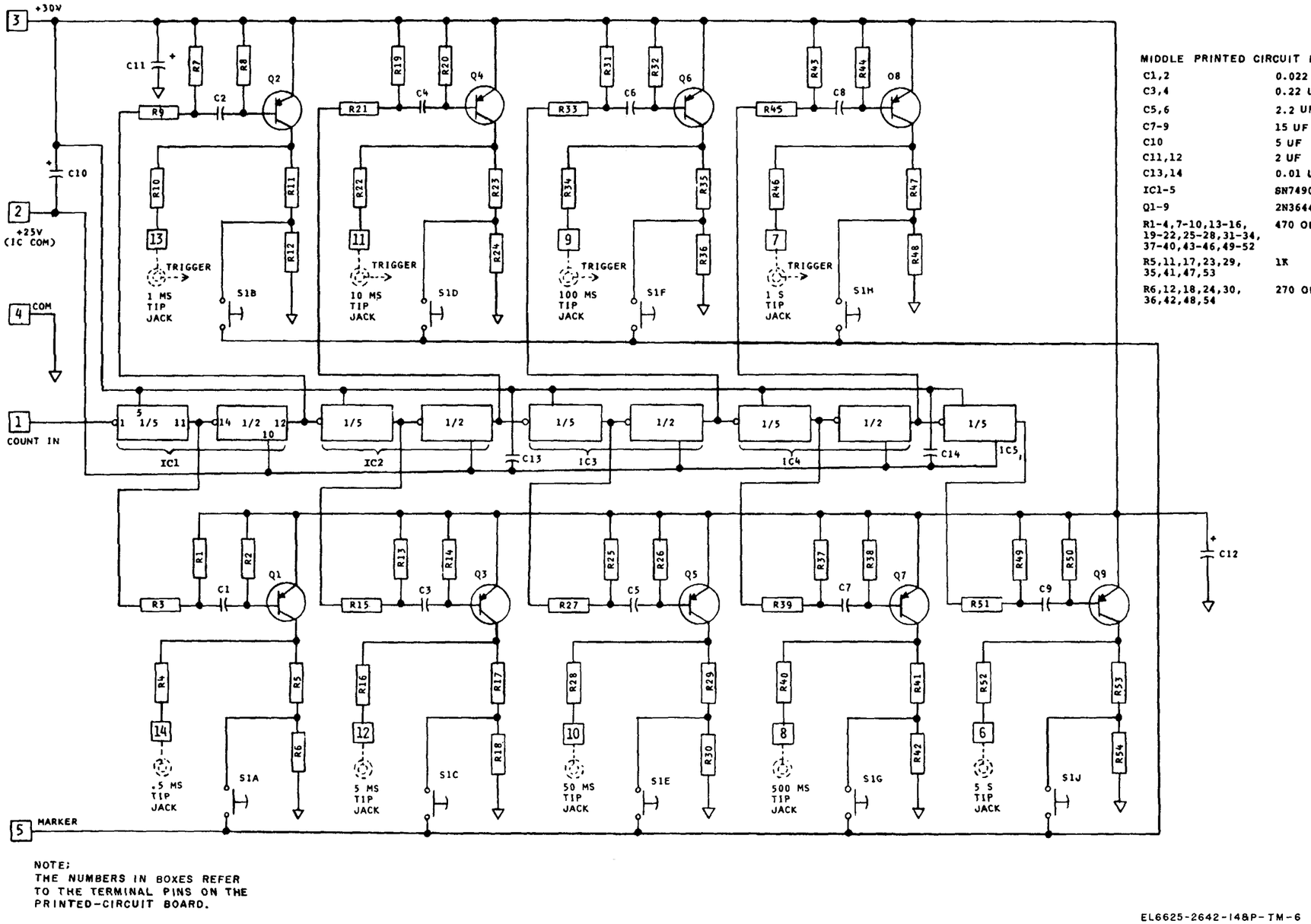
ALL CHOKE VALUES IN MICROHENRYS.

L1	10
L3	2.2
L5,6	0.15
L7,8	10
L9	0.22
Q1,4,5,6,7,8	2N4123
Q2,3	2N5134
Q9-13	2N3644
R1,2,7,9,10,11,14, 17,26,32,38,44,50	1K
R3	47K
R4	10K
R5,6,12,15	2.2K
R8,13,16,19,21,23	47 OHM
R18	100 OHM
R20,22	39 OHM
R24,25,28,29,31, 34-37,40-43,46-49,52	470 OHM
R27,30,33,39,45,51	270 OHM

L2,4,10 VALUES FACTORY SELECTED. SEE RPSTL.

EL6625-2642-14&P-TM-5

Figure FO-3. Top PCB, schematic diagram.



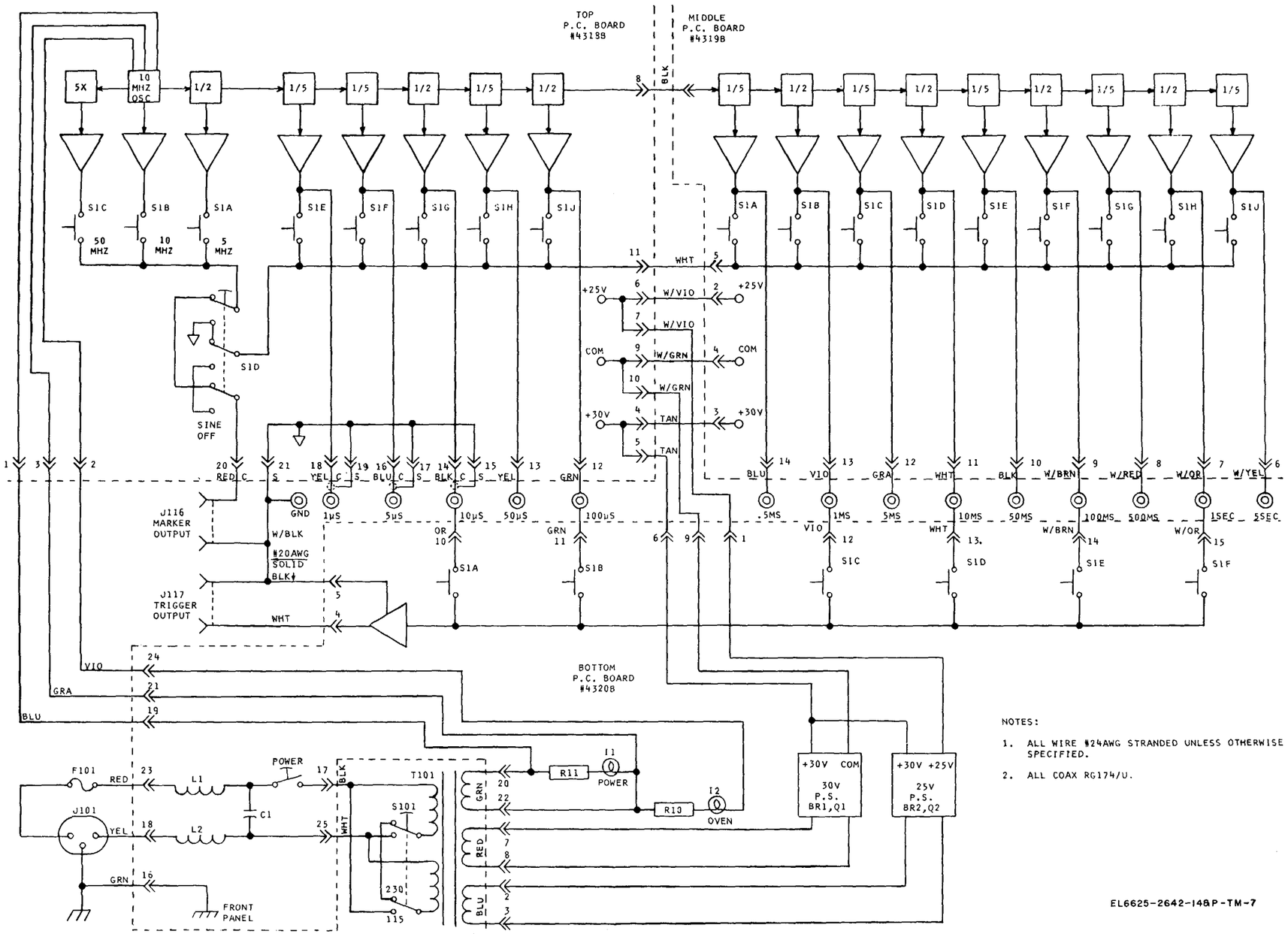
MIDDLE PRINTED CIRCUIT BOARD

C1,2	0.022 UF
C3,4	0.22 UF
C5,6	2.2 UF
C7-9	15 UF
C10	5 UF
C11,12	2 UF
C13,14	0.01 UF
IC1-5	SN7490N
Q1-9	2N3644
R1-4,7-10,13-16, 19-22,25-28,31-34, 37-40,43-46,49-52	470 OHM
R5,11,17,23,29, 35,41,47,53	1K
R6,12,18,24,30, 36,42,48,54	270 OHM

NOTE:
THE NUMBERS IN BOXES REFER TO THE TERMINAL PINS ON THE PRINTED-CIRCUIT BOARD.

EL6625-2642-14&P-TM-6

Figure FO-4. Middle PCB, schematic diagram.

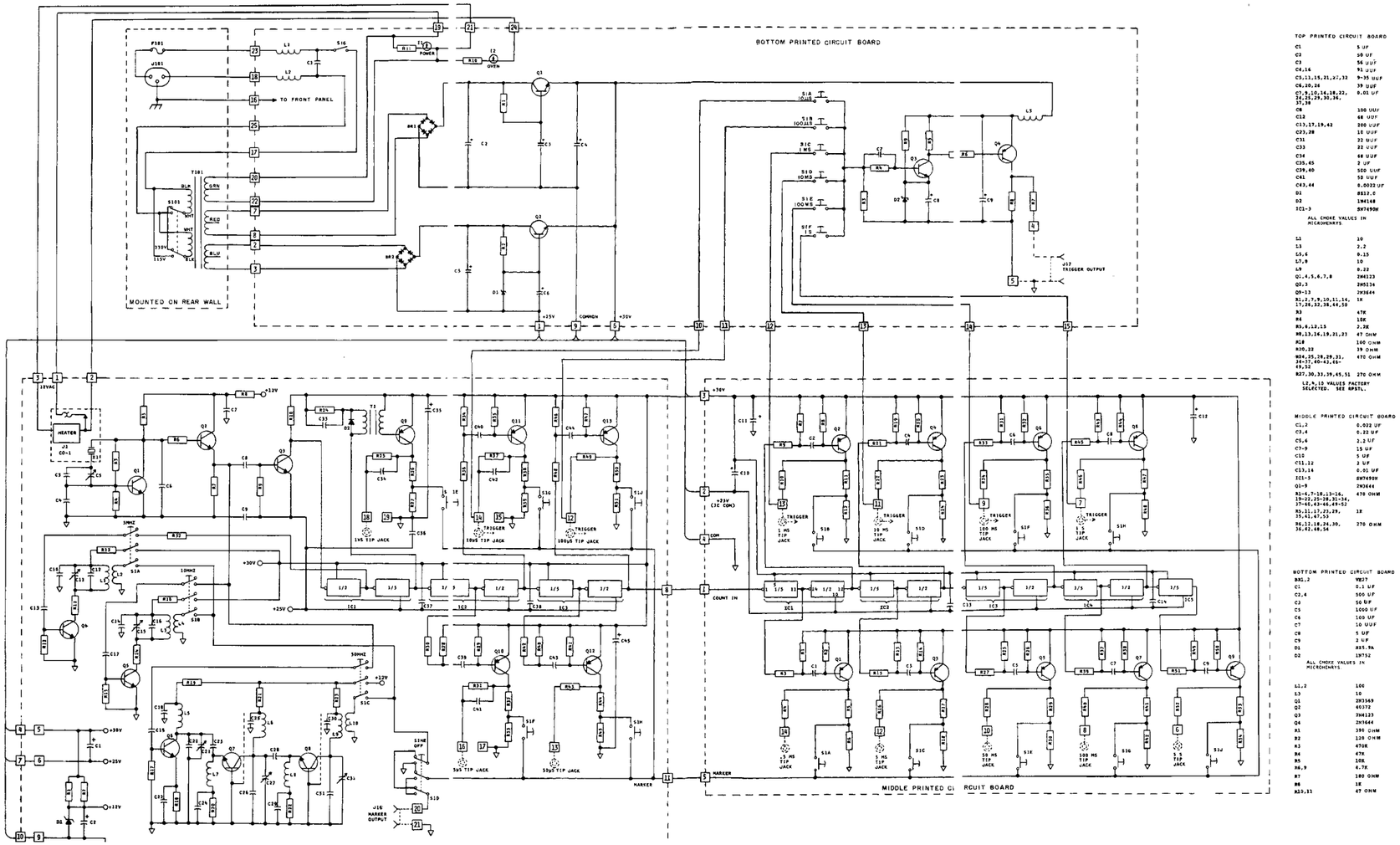


NOTES:

1. ALL WIRE #24AWG STRANDED UNLESS OTHERWISE SPECIFIED.
2. ALL COAX RG174/U.

EL6625-2642-14&P-TM-7

Figure FO-5. Electronic Marker Generator AN/USM-108B, wiring diagram



TOP PRINTED CIRCUIT BOARD

C1	5 UF
C2	50 UF
C3	56 UUF
C4,16	91 UUF
C5,11,15,21,27,32	9-35 UUF
C6,20,24	39 UUF
C7,9,10,14,18,22, 26,28,29,30,36, 37,38	0.01 UF
C8	100 UUF
C12	68 UUF
C13,17,19,42	200 UUF
C23,28	16 UUF
C31	22 UUF
C33	22 UUF
C34	68 UUF
C35,45	2 UF
C39,40	500 UUF
C41	50 UUF
C43,44	0.0022 UF
D1	8833.C
D2	1N4148
IC1-3	SN7490N

ALL CHOKE VALUES IN MICROHENRYS

L1	10
L3	3.2
L5,6	0.15
L7,9	10
L8	0.22
Q1,4,5,6,7,8	2N4123
Q2,3	2N5134
Q9-13	2N3644
R1,2,7,9,10,11,14, 17,20,22,38,44,50	1K
R3	47K
R4	10K
R5,8,12,15	2.2K
R6,13,16,19,21,23	47 OHM
R18	100 OHM
R30,32	39 OHM
R24,25,26,29,31, 34-37,40-42,46-49,52	470 OHM
R27,30,33,39,45,51	270 OHM

L2,9,10 VALUES FACTORY SELECTED. SEE RPSTL.

MIDDLE PRINTED CIRCUIT BOARD

C1,2	0.022 UF
C3,4	0.22 UF
C5,6	1.2 UF
C7-9	15 UF
C10	5 UF
C11,12	2 UF
C13,14	0.01 UF
IC1-5	SN7490N
Q1-9	2N3644
R1-4,7-10,13-16, 19-22,25-28,31-34, 37-40,43-46,49-52	470 OHM
R5,11,17,23,29, 35,41,47,53	1K
R6,12,18,24,30, 36,42,48,54	270 OHM

BOTTOM PRINTED CIRCUIT BOARD

RN1,2	VR27
C1	0.1 UF
C2,4	500 UF
C3	50 UF
C5	1000 UF
C6	100 UF
C7	10 UUF
C8	5 UF
C9	3 UF
D1	883.9A
D2	1N752

ALL CHOKE VALUES IN MICROHENRYS

L1,2	100
L3	10
Q1	2N3569
Q2	40372
Q3	2N4123
Q4	2N3644
R1	390 OHM
R2	120 OHM
R3	470K
R4	47K
R5	10K
R6,9	4.7K
R7	180 OHM
R8	1K
R10,11	47 OHM

NOTE:

THE NUMBERS IN BOXES REFER TO THE TERMINAL PINS ON THE PRINTED-CIRCUIT BOARDS.

Figure FO-6. Electronic Marker Generator AN/USM-108B, schematic diagram.

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