TM 11-6625-403-15-1

TECHNICAL MANUAL

OPERATORS, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL (INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS FOR AN/UPM-98C)

TEST SETS, RADAR

AN/UPM-98A, AN/UPM-98B, AND AN/UPM-98C

This copy is a reprint which includes current pages from Changes 1 through 7.

HEADQUARTERS, DEPARTMENT OF THE ARMY

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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *18 July* 1969

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TEST SETS, RADAR AN/UPM-98A, AN/UPM-98B, AND AN/UPM-98 C

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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

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

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SECTION O

INTRODUCTION

0-1. Scope

a. This manual describes Test Sets, Radar AN/UPM-98A, AN/UPM-98B, and AN/UPM-98C (referred to as the test sets) and covers the installation and operation, and organizational, general support, and depot maintenance of the equipments.

b. A complete repair parts and special tools list for the AN/UPM-98C appears in Appendix B and the maintenance allocation chart (MAC) is presented in Appendix C. The MAC is current as of 30 September 1976.

0-2. Indexes of Publications

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

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

0-3. Maintenance Forms, Records, and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DLAR 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 4610.33B/AFR 75-18/MCO P461O.19C and DLAR 4500.15.

0-4. Administrative Storage

The test sets may be stored in warehouses or other sheltered facilities. Before temporary storage, make the following preparations:

a. Determine the serviceability of the equipment by performing the operator's and organizational maintenance preventive maintenance checks and services.

b. Stow all accessories in the accessory case.

0-5. Destruction of Army Electronics Materiel

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

0-6. Reporting Equipment Improvement Recommendations (EIR)

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

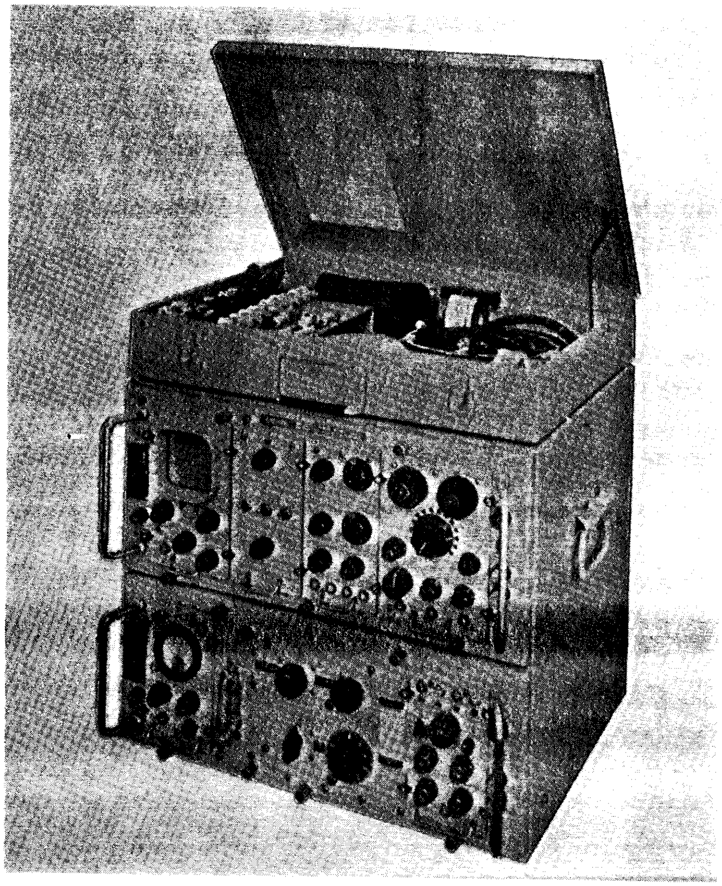


Figure 1-1. Radar Test Set AN/UPM-98A Overall Equipment View

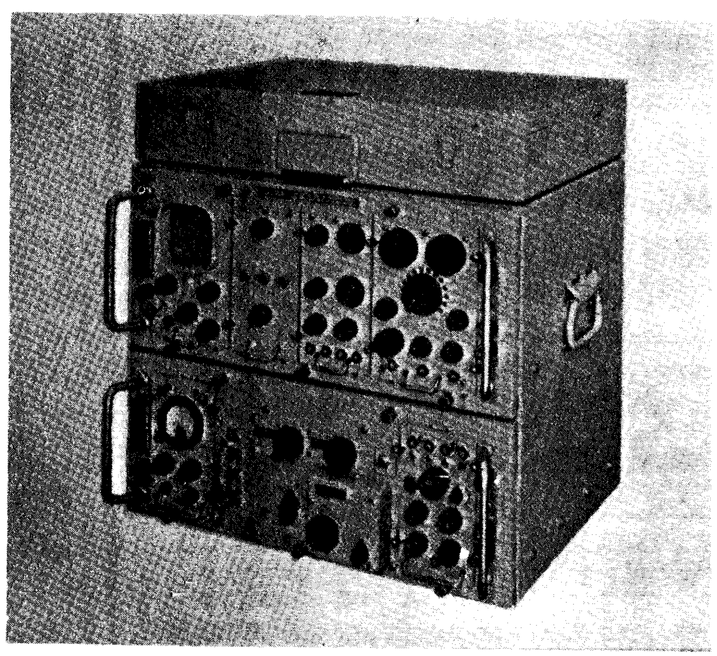


Figure 1-1A. Radar Test Set AN/UPM-98B Overall Equipment View

SECTION 1
GENERAL INFORMATION

1-1 GENERAL DESCRIPTION

a SCOPE OF TECHNICAL MANUAL This technical manual covers Radar Test Sets AN/UPM-98A, AN/UPM-98B, and AN/UPM-WC. Radar Test Set AN/UPM-98A is new equipment designed in its final configuration. Radar Test Set AN/UPM-iH3B is a former Radar Test Set AN&JPM-98 updated to incorporate the advanced features of Radar Test Set AN/UPM-98A by Navy Field Change No. 3 AN/UPM-98 (NAVSHIPS 0967-291 0040), which also added to the test set the direct frequency indicating wavemeter feature not included in the AN/UPM-WA. Radar Test Set ANUPM-98C is a test set AN/UPM-98A field modified in accordance with U.S. Army Modification Work Order (MWO) No. 11-6625403402 which added to the test set only the direct frequency indicating wavemeter feature, making test sets AN/UPM-98B and AN/UPM-98C functionally identical except for some detail parts numbers as shown in the supplementary parts list.

NOTE

All information and instructions in this technical manual referring to Radar Test Set AN/UPM-98A, its units and subassemblies also apply to Radar Test Sets AN/UPM-98B and AN/UPM-98C, unless specifically indicated otherwise. Information marked in the manual se applying to Radar Test Set AN/UPM-98B also applied to Radar Test Set AN/UPM-98C (but not to AN/UPM-98A) and is located at the end of each specific paragraph or section of the technical manual. The part number differences between AN/UPM-98B and AN/UPM-98C are fisted in Supplementary Parts List for AN/UPM-98C in section 5 of the manual

b. PHYSICAL CHARACTERISTICS. Figure 1-1 shows both Radar Test Sets AN/UPM-98A and AN/UPM-98B. Both are transportable test sets for use with secondary radar equipments and consist of two separately nomenclature drawer assemblies mounted in a common electrical equipment case. The detailed nomenclatures and accessory items applicable to each Radar Test Set are listed in table 1-1.

The upper drawer assembly of AN/UPM-98A, AN/UPM-98B, and AN/UPM-98C test sets contains a main frame chassis into which are plugged the following four functional units: the Display unit Sweep and Intensity Mark unit, Crystal Mark and Sync unit, and SIF Coder unit The lower drawer assembly consists of a main frame chassis with two functional plug-in units: the Cal-Control (Calibration-&ntrol) unit and the Interrogation Coder unit All operating controls, switches, connectors, indicators, and fuses are located on the front panels of the applicable units.

c. ELECTRICAL CHARACTERISTICS Radar Test Sets AN/UPM-98A and AN/UPM-98B, and AN/UPM-98C are electrically identical, except for the direct reading frequency indicator of AN/UPM-98B and AN/UPM-98C.

The Radar Taut Set performs the following basic functions:

(1) Produces signal (both rf and video simulating “challenge” (interrogation) signals transmitted by Mark X I FF (identification: friend or Foe) SIF (Selective Identification Feature) interrogators. A simulated ISLS (Interrogation Side Lobe Suppression) reference pulse may be added to the interrogation signals when desired. These outputs can be used in testing equipment designed to receive these types of signals.

(2) produces signals (both rf and video) simulating the replies transmitted by IFF/SIF transponders. Both mode identification pulses and reset tag pukes may be added to the reply video. A delayed interleaved reply signal is provided to simulate multiple reply reception. These can be used in testing equipment designed to receive these types of signals.

(3) Provides an oscilloscope facility for displaying signals from equipment under test and from the test set itself.

(4) Produces synchronizing trigger pulses for use by external equipment and by the test set units.

(5) Demodulates pulse-coded rf signals from transmitters under test, producing pulsed video outputs.

(6) Produces a positive supressor pulse output for use in “gating off” circuits under test.

(7) Measures the frequency of rf signals by means of a resonant cavity wavementer.

(8) Measures the pulse repetition frequency (prf) of pulse signals of the types used in IFF/SIF systems.

(9) produces a calibrated signal for making minimum discernible signal (MDS) checks, and for measuring signal levels by the comparison method.

(10) Measures the peak power of rf signals.

(11) Provides a precision 1030 mHz rf signal from a crystal controlled oscillator for use as a calibrating signal.

(12) Decodes mode 4, 3-pulse replies, producing a single pulse output”

1-1.1. ITEMS COMPRISING AN OPERABLE EQUIPMENT

FSN	Qty	Nomenclature, part No., and mfr code	Fig. No.
6625-912-0429		Radar Test Set AN/UPM-98A	1-1, 1-1A
6625-403-7990		Radar Test Set AN/UPM-98B	
6625-136-2469		Radar Test Set AN/UPM-98C which include:	

NOTE

The part number is followed by the applicable 5-digit Federal supply code for manufacture (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc.

FSN	Qty	Nomenclature, part No., and mfr code	Fig. No.
5935-842-9614	2	Adapter, Connector: MIL Type UG-201A/U, 96906	1-5
5935-149-3534	3	Adapter, Connector: MIL Type UG-273, 96906	1-5
5935-683-7892	2	Adapter, Connector: MIL Type UG-274B/U, 96906	1-5
5935-143-3535	2	Adapter, Connector: MIL Type UG-309/U, 96906	1-5
5935-557-9862	4	Adapter, Connector: MIL Type UG-636A/U, 96906	1-5
5945-957-6071	2	Cable Assembly, Radio Frequency CG-409E/U: (5'2”)	1-7
5995-889-1046	2	Cable Assembly, Radio Frequency CG-409E/U: (10'2”)	

FSN	QTY	Nomenclature, part, No, and mfr code	Fig No.
5995-935-0341	4	Cable Assembly, Radio Frequency CG-530F/U: (5'2")	1-7
5995-935-0347	1	Cable Assembly, Radio Frequency CG-530F/U: (O'1O")	1-7
599-889-1049	1	Cable Assembly, Radio Frequency CG-1848/U: (0'6")	1-7
6625-935-0139	1	Cable Assembly, Radio Frequency CG-3380/U: (3'0")	1-7
5995-889-1047	1	Cable Assembly, Special Purpose, Electrical: CX-4963/UPM	1-7
6625-973-2142	1	Cable Assembly, Special Purpose, Electrical: CX-4964/UPM	1-7
5995-889-1048	1	Cable Assembly, Special Purpose, Electrical: CX-6092/U (3'0")	1-7
6625-933-4840	1	Coder, Simulator SM-197A/UPM-98	5-40
5935-257-8018	2	Dummy Load, Electrical DA+232/U	1-5
	1	Light Indicator: 208-0410-01312O1; 72619	5-24
6625-933-4746	1	Radar Test Set TS-1253A/UP (This item is expendable)	1-2
6625-870-7053	1	Test Lead MX-2681/UP	5-5
6625-957-4513	1	Visor, Cathode Ray Tube MX-2953/UPM	1-5

1-2. OUTPUT SIGNALS AVAILABLE FROM THE RADAR TEST SET

The signals supplied by the Radar Test Set include those listed below:

a. Mark X coded interrogation signals (video and rf).

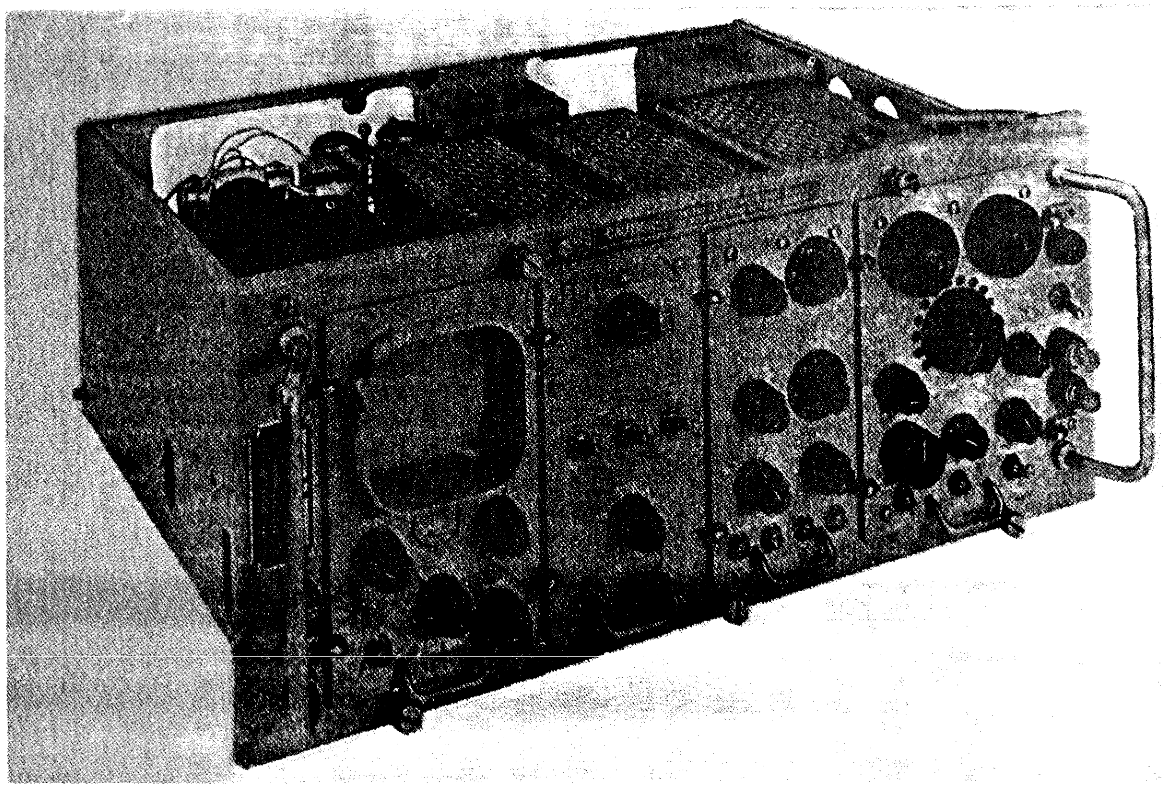


Figure l-2. Radar Test Set TS-1253A/UP or TS-1253B/UP

b. SIF Coded reply signals (video and rf).

c. Interleaved SIF coded reply signals (video and rf).

d. Trigger pulses (zero delay and variable delay).

e. Calibrated video pulses.

f. ISLS pulses for use with interrogation signals.

Mode identification pulse signals for use in "tagging" reply video.

h. Reset tag pulse signal simulating the interrogator receiver "end of receiver on time" pulse signal.

i. Suppressor pulse signal to gate off circuits under test.

j. Mode 4 reply decode signal output pulse.

1-3. DESCRIPTION OF UNITS

a. RADAR TEST SET. - The Radar Test Set upper unit, shown in figure 1-2, provides simulation of the coded reply pulse trains produced by SIF transponders. It also provides oscilloscope facilities for video analysis and signal tracing. It contains the following plug-in units:

(1) DISPLAY UNIT. - This unit provides an *'A" type display of the video signals on a 4-inch cathode ray tube. A graduated scale on the CRT face may be illuminated to enhance readability. Panel controls permit adjustment of focus, intensity, centering, sensitivity, and scale illumination. Video signals to be displayed are fed in through a BNC-type panel connector. A toggle switch allows the operator to select either a high or low termination for the video input line.

(2) SWEEP AND INTENSITY MARK UNIT. - This unit generates sweep signals for the oscilloscope, and also produces intensity gate pulse signals and intensity modulation time markers for use on the oscilloscope. Panel controls permit selection of sweep durations ranging from 1 to 20,000 microseconds. Two momentary-contact toggle switches on the front panel permit temporary return of the sweep or trigger to the zero time reference position and the display of a marker to indicate the start of the delayed sweep or trigger. Intensity markers with various spacings may be superimposed upon the display trace. A toggle switch permits the operator to start these marks in coincidence with either the sweep or system trigger.

(3) CRYSTAL MARK AND SYNC UNIT. - This unit generates crystal-controlled time markers for use on the display oscilloscope. It also produces triggers (both delayed and undelayed for display oscilloscope synchronization and provides controlled delay of the oscilloscope sweep signal. A panel switch permits the operator to trigger the equipment either internally or externally. The sweep trigger

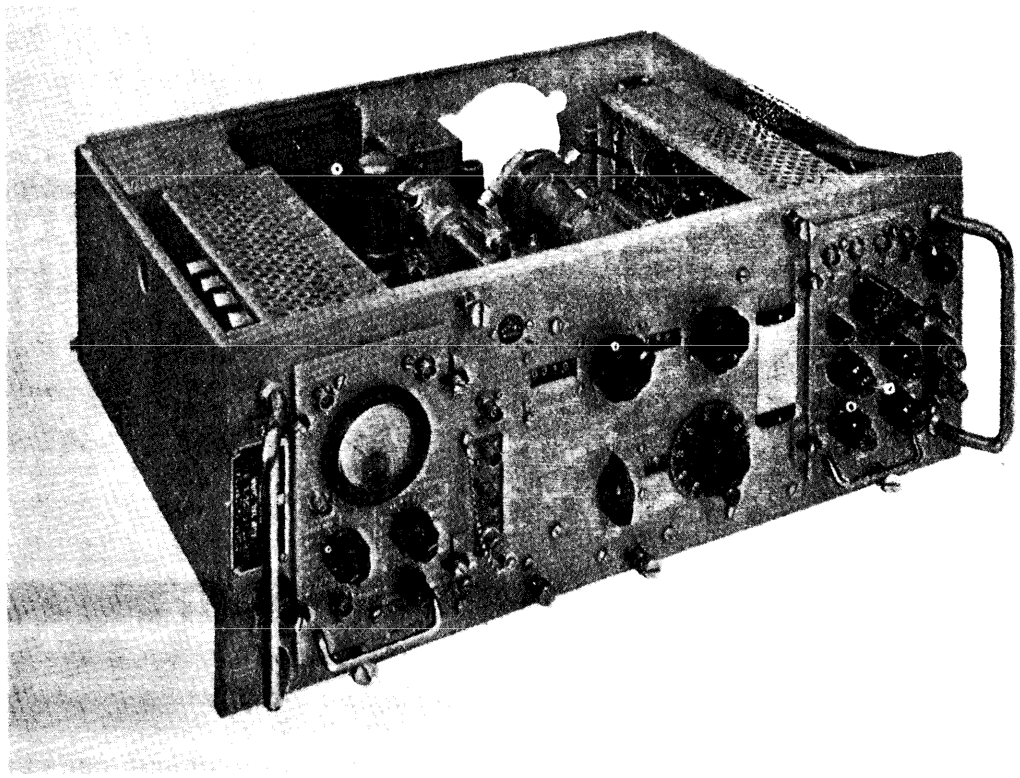


Figure 1-3, Coder Simulator SM-197A/UPM-98

and the equipment synchronizing trigger may be delayed independently from 1 to 750 microseconds. The crystal controlled markers are displayed along with the input video on a time-sharing basis, above the video trace. When internally triggered, a control permits setting the system prf between 15 pps and 4100 pps. Trigger signals are available at panel connectors for external use. A connector is also provided for triggering the test set from an external trigger source.

(4) SIF CODER. This unit generates signals which simulate SIF reply code trains. In addition to the pulses normally found in SIF reply signals, the SIF coder permits the insertion of the “X” pulse and the “ID” pulse (sometimes called “IP” for “Identification of Position”) for tests requiring them. Any of the pulses in the train except the first bracket pulse and the ID pulse can be omitted and substituted with a special pulse which is separately variable in position for test purposes. The SIF coder is also capable of simulating a condition in which two signals reach a receiver at almost the same time so that two interleaved pulse trains are present. By proper adjustment, a type of garbled signal may be simulated in which one of the pulses of the second train falls in the space exactly 1.45 microseconds after the last pulse in the first train, causing confusion in the decoding process. These signals may be used for checking the capability of a decoder to decode two interleaved trains and to block (or “degarble”) two garbled (overlapped) trains. The SIF coder normal output (variable amplitude) is fed out through one panel connector, while a separate (fixed amplitude) output is made available for such uses as modulating the interrogation coder.

b, CODER SIMULATOR. The Coder Simulator SM-197A/UPM–98 shown in figure 1-3 comprises the lower drawer. Several functional sections are mounted directly on the assembly chassis in a fixed manner while two other sections are designed as plug-in units. A "time operated” (elapsed time) indicator is located on the front panel. The fixed sections include an rf section which is made up of an RF oscillator a variable attenuator, and a wavemeter, The output level and frequency of the signal generator are adjustable. Modulation is normally provided by the Interrogation Coder of SIF Coder. Coder Simulators SM-197B/UPM-98 and SM-197C/UPM-98 shown in figure I–3A are similar to SM-197A/UPM–98 described above, except they contain a wavemeter frequency indicator mechanism and associated marker generator which provides a display of the frequency to which the wavemeter is tuned directly in megahertz (mHz), thus not requiring conversion of the digital counter numerical indication into actual frequency reading by reference to the Book of Calibration Charts supplied with Radar Test Sets AN/UPM-98 and AN/UPM-98A. Also, the SM-197B/UPM-98 and SM–197C/UPM–98 do not contain an elapse time indicator.

The coder simulators contain the following plug-in units:

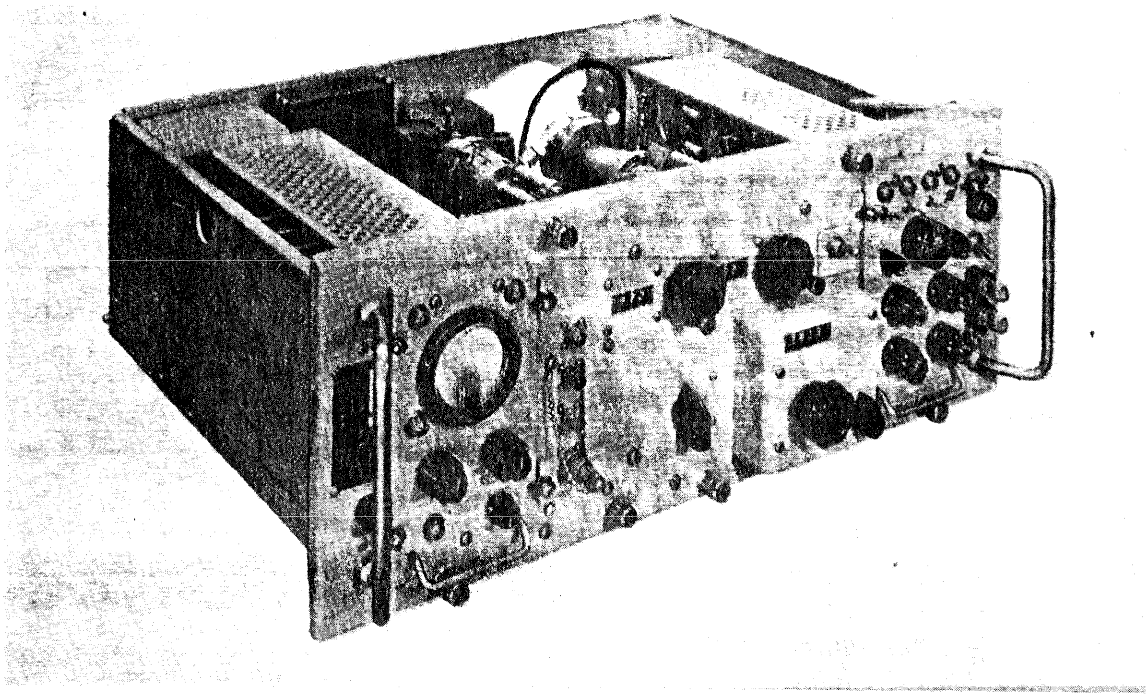


Figure 1-3A. Coder Simulator SM-197B/UPM-98

(1) CALIBRATION-CONTROL UNIT. The Calibration-Control unit produces a calibrated pulse output signal. It contains circutry for automatic signal level control and metering circuits for indicating wavemeter resonance. The meter is also used to give an indication of the prf of pulse signals being counted, The Calibration-Control unit also contains the mode 4 reply decoding circuitry.

(2) INTERROGATION CODER. This unit generates simulated Mark X IFF interrogation signals. An ISLS pulse can be added to the basic interrogation signal when desired. The Interrogation Coder is capable of independently producing interrogations in modes 1, 2, 3/A, and C. For Mode 4 interrogations only the four synchronizing pulses are produced by the test set. In addition, the Interrogation Coder produces mode identification pulses for replies. It also provides reset tag signals consisting of three pulses (8, 2 and 4 microseconds wide, spaced 2 and 3 microseconds apart). The output pulses can be used internally to modulate the signal generator and are also available at a front panel connector for external use.

c. ELECTRICAL EQUIPMENT CASE. Electrical Equipment Case CY-2726A/UPM-98 shown in figure 1-4 is used on Radar Test Sets AN/UPA-98A and C Electrical Equipment Case CY-2726/UPM-98 is used on Radar Test Set AN/UPM-98B. The cases provide the necessary electrical interconnections between the major assemblies through two nine-contact connectors that mate with similar connectors on the drawer chassis. A blower is mounted in the rear of the case to provide air circulation through the major assemblies.

d. ACCESSORIES CASE CY-2725/UPM-98. The Accessories Case, shown in figure 1-5, is a carrying case for all accessories listed in table 1–1.

e. ACCESSORIES

(1) TEST LEAD MX-2681/UP. Test Lead MX-2681/UP, shown in figure 1-6, is an oscilloscope attenuator probe which is supplied for signal-tracing video circuits, The test lead can be set for any one of three attenuation ratios of 1 to 1, 10 to 1, and 100 to 1. When desired, the pointed probe tip shown can be replaced with an alligator clip for more convenient connection to the circuit under test. The test lead is normally connected to the VIDEO input jack on the Display unit.

(2) VIDEO CABLES. For connecting video signals from equipment under test to the radar test set and making ‘{patch” connections between units of the test set, several CG-530B/U cable assemblies are supplied as listed in table 1-1. They are made up of RG-62/U type low-capacitance coaxial cable having a nominal impedance of 93 ohms and nominal capacitance of 13.5 pf per ft. Each cable assembly is equipped with two UG-260/U (BNC type) connectors,

(3) RADIO FREQUENCY CABLES. For interconnecting radio-frequency signals, CG–409E/U cable assemblies are provided. These cables use RG–58C/U coaxial cable having nominal impedance of 50 ohms and have a capacitance of 29,5 pf per foot. They are equipped with UG–88F/U connectors at

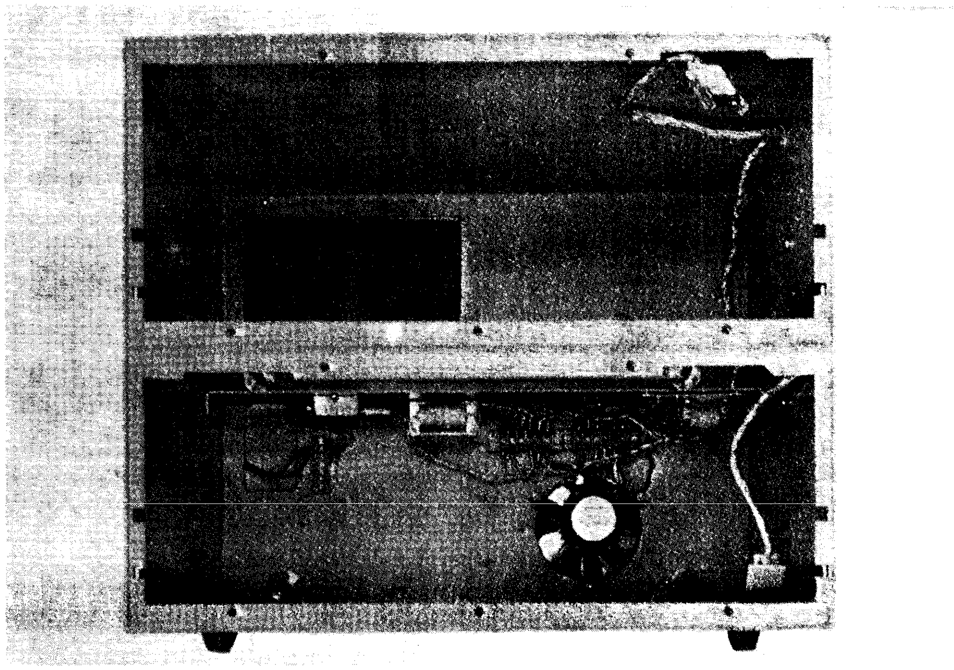


Figure 1-4, Electrical Equipment Case CY-2726A/ UMP-98

each end. A similar cable designated CG-1848/U is provided for "jumpering" the VIDEO OUT jack on the Cal-Control unit to VIDEO jack on the Display unit.

(4) CONNECTOR ADAPTERS. Five types of adapters (listed in table l–l) are included for making connections between various types of connectors, using the video and rf cable assemblies supplied.

(5) ELECTRICAL DUMMY LOAD DA-232/ U. Two BNC-type plugs containing 75 ohm resistors and designated with the nomenclature DA-232/U are supplied with the accessories. The purpose of these plugs is to properly terminate open-end transmission lines.

(6) SPECIAL SERVICING CABLES. Four special-purpose servicing cable assemblies (figure 1-7) are supplied for connecting the plug-in units to their major assembly connectors when the units have to be operated outside of the drawer-chassis for adjustment or maintenance, Cable Assembly CX–4963/UPM is for use on any of the four plug-in units of the TS-1253A/UP. Cable Assembly CX–4964/UPM is designed to provide extended connections between 1P3 on the Display unit and 2J2 on the Sweep and Intensity Mark unit of TS-1253A/ UP. Cable Assembly CX–6092 is for use with the two plug-in units of the Coder Simulator, Cable Assembly CG-3380 /U is for connecting the RF output from the jack on rear of the Interrogation Coder unit to the Coder Simulator front panel jack LP IN for test measurements of ISLS output power. Extender Card GB4825 is for use during troubleshooting of Interrogation Coder subassemblies.

(7) CATHODE RAY TUBE VISOR MX-2953/ UPM. This visor fits over and clamps onto the lip around the opening for the cathode ray tube face on the Display unit to shade the screen under bright light conditions.

(8) BOOK OF CALIBRATION CHARTS, This book contains the correction and calibration curves to be used for accurately interpreting the demodulator and rf oscillator frequency readings on the Coder Simulator. The Wavemeter Calibration Curves in the Book of Calibration Charts apply *only* to Radar Test Set AN/UPM-98A. For Radar Test Sets AN/UPM-98B and AN/UPM-98C, the wavemeter calibration curves should be disregarded, because the wavemeter digital display shows the frequency directly in megahertz (mHz), when spot-calibrated at the nearest 20-mHz reference frequency.

(9) CALIBRATION CARD AND SPARES, An easily replaceable card is attached to the front panel of the Coder Simulator. This card provides space for recording twelve frequencies and their corresponding dial readings. Twelve spare cards are included in the Accessories Case for use in different applications.

1-4. REFERENCE DATA

Tables 1-2 and 1-3 provide quick reference data for Radar Test Sets AN/UPM-98A, AN/UPM-98B, and AN/UPM-98C.

1-5. EQUIPMENT SUPPLIED Table 1-1 lists the equipment supplied and the corresponding physical data. Dimensions are in inches, volume is in cubic feet, and weight is in pounds.

a. SHIPPING DATA. Table 1-4 lists the physical characteristics of the equipment. Dimensions are in inches, volume is in cubic feet, and weight is in pounds.

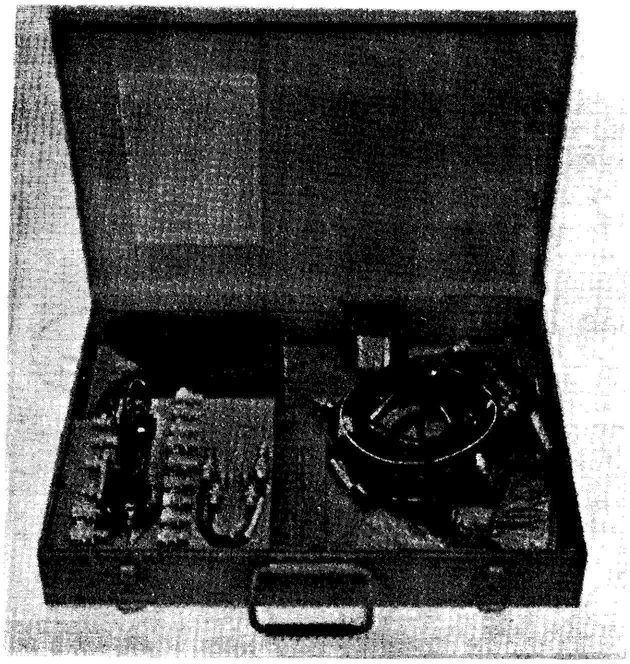


Figure l-5. Accessories Case CY-2725/UPM-98

1-6. EQUIPMENT AND PUBLICATIONS REQUIRED BUT NOT SUPPLIED

No additional equipment and no publications other than listed in this technical manual are required for operation of the Radar Test Sets. Test equipment required for maintenance is listed in table 1-7

1-7. FACTORY OF FIELD CHANGES

No factory or field changes have been initiated or authorized for Radar Test Set AN/UPM-98A as of the approval of this manual. For changes which may exist in the future, refer to Electronics Maintenance Book (EMB), NAVSHIPS 0967–000-0000 for the complete field change index.

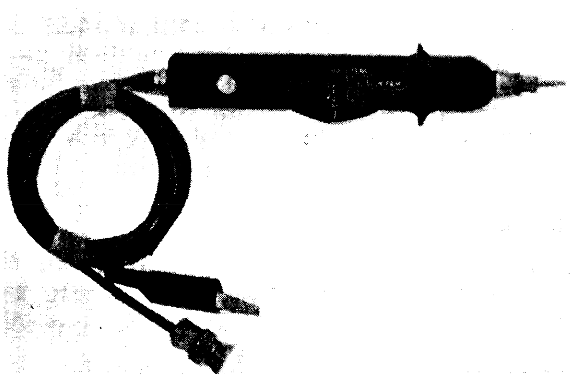


Figure 1-6. Test Lead MX-2681/UP

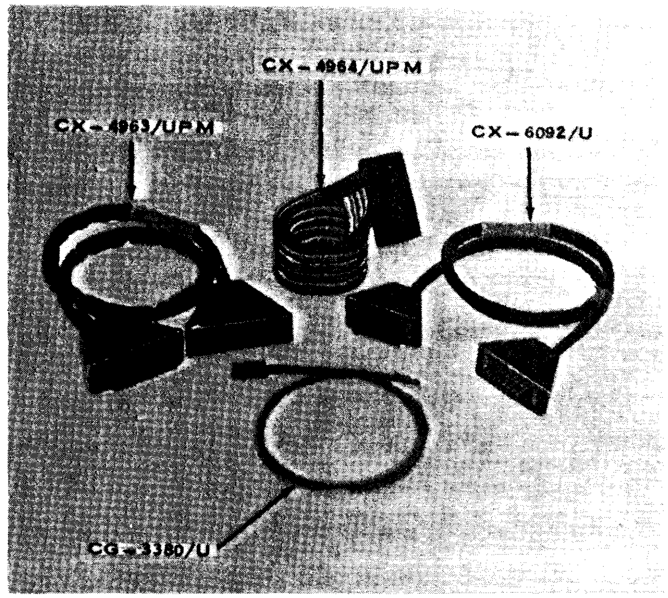


Figure l-7. Servicing Cable Assemblies

Radar Test Set AN/UPM-98B is a field modified Radar Test Set AN/UPM-98 by Field Change No. 3—AN/UPM-98, NAVSHIPS 0967-291-0040.

1-8. EQUIPMENT SIMILARITIES

Radar Test Sets AN/UPM-98A, -98B, and -98C are basically similar to several other equipments. These equipments, along with their similarities and differences, are listed in table 1-5. The assemblies and subassemblies of Radar Test Sets AN/UPM-98A, -913B, -98C and are identified in table 1-6.

1-9. PREPARATION FOR RESHIPMENT

To repackage the test set for shipment or storage, it is preferable to use the original containers and packaging, filler, blocking, and bracing materials, if they are available.

The Accessories Case CY-2725/UPM-98 contains compartments designed to accommodate all the accessories and handbooks supplied with the test set. See that all the accessories listed on the Contents Index Card in the Accessories Case are present, and located in their proper positions.

If the Accessories Case has been attached to the top of the Electrical Equipment Case during use of the equipment, it is not necessary to detach it. The test set can be safely shipped with both cases bolted together

Table 1-1. Equipment Supplied

QTY PER EQPMT	NOMENCLATURE NAME	NOMENCLATURE TYPE	OVERALL DIMENSION (inches) HEIGHT	WIDTH or LENGTH	DEPTH	VOLUME (Cu ft)	WEIGHT (lbs)
	RADAR TEST SET AN/UPM-98A						
1	Radar Test Set	TS-1253A/UP	9-3/4	22-1/4	18-1/4	2.3	54
1	Coder Simulator	SM-197A/UPM-98	8-3/4	22-1/4	18-1/4	2.1	63
1	Electrical Equipment Case	CY-2726/UPM-98	19-5/8	23-5/8	20-3/16	6.6	33
1	Accessories Case	CY-2725/UPM-98	4-5/8	22-1/2	16-7/8	1.0	37
	RADAR TEST SET AN/UPM-98B						
1	Radar Test Set	TS-1253B/UP	9-3/4	22-1/4	18-1/4	2.3	54
1	Coder Simulator	SM-197B/UP	8-3/4	22-1/4	18-1/4	2.1	63
1	Electrical Equipment Case	CY-2726A/UPM-98	19-5/8	23-5/8	20-3/16	6.6	33
1	Accessories Case	CY-2725/UPM-98	4-5/8	22-1/2	16-7/8	1.0	37
	RADAR TEST SET AN/UPM-98C						
1	Radar Test Set	TS-1253B/UP	9-3/4	22-1/4	18-1/4	2.3	54
1	Coder Simulator	SM-197C/UPM-98	8-3/4	22-1/4	18-1/4	2,1	63
1	Electrical Equipment Case	CY-2726/UPM-98	19-5/8	23-5/8	20-3/16	6.6	33
1	Accessories Case	CY-2725/UPM-98	4-5/8	22-1/2	16-7/8	1.0	37
	CONTENTS OF ACCESSORIES CASE CY-2725/UPM-98						
1	Test Lead	MX-2681/UP	1-1/2	72	1-3/4		
1	Cable Assy, Special Purpose	CX-4963/UPM		36-1/2			
1	Cable Assy, Special Purpose	CX-4964/UPM		36-3/4			
1	Cable Assy, Special Purpose	CX-6092/U		36			
2	Cable Assy, RF	CG-409E/U		62			
1	Cable Assy, RF	CG-409E/U		122			
4	Cable Assy, RF	CG-530F/U		62			
1	Cable Assy, RF	CG-530F/U		10			
1	Cable Assy, RF	CG-1848/U		6			
1	Cable Assy, RF	CG-3380/U		36			
2	Adapter	UG-201A/U					
3	Adapter	UG-273/U					
2	Adapter	UG-274B/U					
2	Adapter	UG-309/U					
4	Adapter	UG-636A/U					
2	Dummy Load, Electrical (75Ω)	DA-232/U					
1	Visor, Cathode Ray Tube	MX-2953/UPM					
1	Clamp, Visor	511B44					
1	Extender Card	GB4825					
12	Calibration Cards	542A1					
1	Book of Calibration Charts	548A95					
2	Technical Manual	NAVSHIPS 0967-291-0010					
2	Maint. Stds Book	NAVSHIPS 0967-291-0030					
1	Ref. Stds Sheet	NAVSHIPS 0967-291-0020 (AN/UPM-98A only) NAVSHIPS 0967-291-0021 (AN/UPM-98A & AN/UPM-98B)					

Table 1-2. Radar Test Set TS-1253A/UP and TS-1253B/UP Reference Data

FUNCTION		CHARACTERISTIC
External Trigger Input	Polarity	Positive
	PRF	15 to 4100 pps
	Duration	0.3 to 25 µsec
	Amplitude	5 to 50 volts
	Rise Time	0.5 µsec max.
Internal Trigger	PRF	15 to 4100 pps
Zero ("0") Delay Trigger output	Polarity	Positive-going
	Width	Not less than 0.5 µsec
	Amplitude	a. 50 to 100 volts into 500 ohms load bypassed by 175 pf capacitor b. 20 volts into 75 ohm load bypassed by 1100 pf capacitor
	PRF	15 to 4100 pps (adjustable)
	Delay	Zero (fixed)
Variable Delay Trigger Pulse Output	Polarity	Positive-going
	Width	0.5 to 3 µsec
	Amplitude	a. 50 to 100 volts into 500 ohm load bypassed by 175 pf capacitor b. 20 volts into 75 ohm load bypassed by 1100 pf capacitor
	Rise Time	0.2 µsec, 10% to 90% level
	Delay Time	1 µsec, 90% to 10% level
	PRF	15 to 4100 pps or 7.5 to 2050 pps depending upon SYNC SELECT position
	Delay	0 to 750 µsec (adjustable)
Suppressor Pulse Output	Polarity	Positive-going
	Width	2 to 220 µsec (adjustable)
	Rise Time	0.4 µsec max from 10% level to 10 volt level (500 ohm load) or from 10% level to 3 volt level (75 ohm load)
	Decay Time	0.4 µsec max from 10 volt level to 10% level (500 ohm load) or from 3 volt level to 10% level (75 ohm load)
	Amplitude	a. 20 volts into 500 ohm load bypassed by 175 pf capacitor b. Not less than 3 volts into 75 ohm load bypassed by 1100 pf capacitor
	PRF	15 to 4100 pps (adjustable)
Oscilloscope	Vertical Sensitivity	Calibrated settings at 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10.0, and 20.0 volts per inch
	Vertical Rise Time	Less than 0.05 µsec
	Horizontal Sweep Time	Variable from 1 to 20,000 µsec
	Horizontal Sweep Delay	0 to 750 µsec (adjustable)
	Frequency Response	Essentially flat (±1.5 db) from ,50 Hz to 6 mHz
Intensity Markers	Type	Intensity modulation marking of oscilloscope trace 0.1, 0,1 and 1.0, 1.0, 5.0 (±0.25%) and 50.0 Less than 0.02 µsec for 0.1, less than 0.05 µsec for 1.0, less than 0.1 µsec for 5.0, and less than 1.0 for 50 µsec

Table 1-2. Radar Test Set TS - 1253A/UP and TS-1253B/UP Quick Reference Data (Cent.)

FUNCTION	CHARACTERISTIC	
Crystal Markers	Type	Positive and negative-going on time-sharing basis with video
	spacing	1.0 or 1.45 µsec (+0.05 usec)
	Amplitude	Variable to one inch on display, independent of vertical attenuation
	Marker Width	Less than 0.02 µsec
SIF Reply Code Train Output	Polarity	Positive-going
	Composition	Two framing pulses plus up to 12 information pulses and center X pulse
	Amplitude	a. VARI OUT, LO 0 to approx. 5 volts b. VARI OUT, HI 7 to approx. 30 volts c. MOD DRIVE, LO approx. 25 volts d. MOD DRIVE, HI approx. 45 volts
	Rise Time	a. VARI OUT 0.05 µsec or less b. MOD DRIVE O. 1 µsec or less
	Decay Time	a. VARI OUT O. 1 µsec or less b. MOD DRIVE, LO O. 15 µsec or less c. MOD DRIVE, HI O. 2 µsec or less
	Pulse Width	0.3 to 1.0 µsec (nominal 0.45 µsec)
	Pulse Spacing	1.45 usec (±0.05 usec)
	Residual Delay	4 µsec or less from input trigger
Identification of Position Pulse (ID)	Pulse Characteristics	Single pulse, same as SIF reply code
	Position	24.65 ±0.1 µsec from first bracket pulse of pulse train
Emergency Code	Pulse Characteristics	Same as SIF code
	Composition	One pair of bracket pulses containing code pulses (7700 for Mode 3/A) followed by 3 pairs of bracket pulses with no code pulses between
Emergency + X	Pulse Characteristics	Same as emergency, plus center X pulse added to code pulses
SIF Substitute Pulse	Polarity Amplitude Width Residual Delay	Same as for SIF code replies
	Position	Any selected pulse in the reply pulse train, except first framing pulse and ID pulse. The substitute pulse is variable within ±l.6 µsec of the position of the omitted pulse
Interleaved SIF Code Trains (Same as above SIF Reply Code Train, but with a second delayed train interleaved)	Pulse Characteristics	Same as SIF Reply Code Train
	Delay	Second pulse train delay continuously variable from 0.1 to 2.3 µsec with respect to the first train

Table 1-3. Coder Simulator SM-197A/UPM-98 and SM-197B/UPM-98 Quick Reference Data

FUNCTION	CHARACTERISTIC	
IFF Interrogation Pulse Pair	Polarity	Positive or negative-going
	Amplitude (maximum control setting)	35 volts minimum into 75 ohm resistive load
	Pulse Spacing (P_1 to P_3	Mode 1 3 ±0.05 µsec Mode 2 5 ±0.05 µsec Mode 3/A 8 ±0.05 µsec Mode C 21 ±0.05 µsec Mode 4 4 pulses spaced 2 ±0.1 µsec
	Pulse Width	0.3 to 1.3 µsec (nominal 0.8 except mode 4 is O. 5)
	Pulse Rise Time	O. 1 µsec maximum
	Pulse Decay Time	O. 2 µsec maximum
ISLS Pulse (P_2 in 3-pulse system) NOTE In 2-pulse system, ISLS pulse is substituted for P_3. In mode 4 the ISLS pulse is 2 µsec after the fourth sync pulse.	Pulse Width	0.5 µsec to 1.0 µsec (indexed at 0.8 ±0.05 µsec)
	Amplitude	Adjustable +1.5 to -12 db with respect to rf interrogation. Indexed at O, ±0.5, and -9 ±1 db
	Spacing	P_2 at 2 ±0.05 µsec after P_1; spacing variable +0.4 µsec P_5 in Mode 4 at 8 ±0.05 µsec after P_1; variable +0.4 µsec
Reset Tag Signal	Three pulses of distinctive width and spacing (see figure 3-7.)	Polarity and Amplitude same as SIF reply pulses
Interrogation Substitute Pulse	Selected by Interrogation] Coder Sub Pulse Selector, varied in position by means of SUB PULSE position control	Variable position pulse. Can replace P_2 (ISLS pulse) or P_3 in standard mode interrogations; can replace second, third, or fourth sync pulse or ISLS (fifth) pulse in mode 4 interrogations. To replace ISLS pulse in P_3 position (2-pulse ISLS) the P_3 substitute pulse is used.
Reset Tag Substitute Pulse	Selected by Interrogation Coder Sub Pulse Selector, varied in position by means of SUB PULSE position control	Second or third reset pulse can be replaced by a variable position substitute pulse.
Calibration pulses	Duration	2.5 ±0.5 µsec
	PRF	15 to 4100 pps
	Amplitude	0.1, 0.5, 1, 2, 5, 10, or 50 volts ±3%, positive-going
	Rise and Decay Times	T_R T_D 0.l thru 5y 0.05µsec 0.1µsec 10 v 0.1 0.2 50 v 0.2 0.5
Mode 4 Reply Decode Signal	Single pulse output for each correct 3-pulse reply	Amplitude 2 to 5 volts Polarity Positive-going Rise Time O.1 µsec max. Decay Time O.25 µsec max.

Table 1-3. Coder Simulator Quick Reference Data (Cont.)

FUNCTION	CHARACTERISTIC		
Pulse Modulated RF Signal output	Frequency Range	925 to 1225 mHz (continuously tunable)	
	Power	21 to 121 db below one volt (continuously variable)	
	Standing Wave Ratio	Less than 2 db into a 53.5 ohm line	
	Residual Delay	Less than O.3 microseconds	
Wavemeter	Frequency Range	925 to 1225 mHz	
	Accuracy	AN/UPM-98A	+0.7 mHz (+Q2 mHz at 1030 and 1090 mHz)
		AN/UPM-98B AN/UPM-98C	995 to l125mHz ±0.2mHz 925 to 945 and 1025 to 1225 mHz ±0.5 mHz
Pulse Counter	Ranges	a. 0 to 500 pps b. 0 to 5000 pps	
	Accuracy	±10% at full scale, ±30% at one-tenth scale	
Demodulator	Frequency Range	925 to 1225 mHz	
	Input Impedance	53.5 ohms	
	RF Input Capability	LP IN: connector	pulsed rf O to 35 w peak. Continuous rf average: O.5 w max.
		HP IN: connector	pulsed rf 35 to 3500 w peak. Continuous rf, average: 5 w max.
		SG IN: cmnector	input from SC OUT jack
	Demodulated Output Level Accuracy	±db 0.5 to 3500 w	
Input Power (Complete Radar Test Set)	Voltage	Single Phase ac 115 v ±10%	
	Frequency	AN/UPM-98A	45 to 420 Hz
		AN/UPM-98B AN/UPM-98C	57 to 420 Hz
	Requirement	Approximately 630 volt -amperes	

Table 1-4. Radar Test Set AN/UPM-98A Shipping Data

NAME	DESIGNATION	HEIGHT (in.)	WIDTH (in.)	DEPTH (in.)	WEIGHT (lbs)
Radar Test Set, including items below:	AN/UPM-98A	27-1/8	28-1/2	24	248
Radar Test Set	TS-1253A/UP				
Coder Simulator	SM-197A/UPM-98				
Electrical Equipment Cane	CY-2726A/UPM-98				
Accessories Case	CY-2725/UPM-98				

Table 1-5. Comparison with Similar Equipment

CAPABILITY	AN/UPM-98 and AN/UPM-99	AN/UPM-111 and AN/GPM-44	AN/UPM-135 and Admiral Model 198A	AN/UPM-98A and AN/UPM-98B
Internal triggering (15 to 4100 pps)	Yes	Yes	Yes	Yes
IFF Interrogations				
a. Mode 1	Yes	Yes	Yes	Yes
b. Mode 2	Yes	Yes	Yes	Yes
c. Mode 3/A	Yes	Yes	Yes	Yes
d. Mode B	No	No	Yes	No
e. Mode C	No	No	Yes	Yes
f. Mode D	No	No	Yes	No
g. Mode 4 (Sync Pulses only)	No	No	No	Yes
ISLS Pulse	No	No	Yes	Yes
Mark X Replies				
a. SGL pulse	Yes	No	Yes	No
b. pulse	Yes	No	Yes	No
c. EMER	Yes	No	Yes	No
SIF Replies	Yes	Yes	Yes	Yes
SIF Emergency Replies				
a. Four complete code trains	Yes	Yes	Yes	No
b. One code train and three bracket sets	No	No	No	Yes
Mode 4 Reply Decode	No	No	No	Yes
Mode Ident Tags	No	No	Yes	Yes
Reset Pulses	No	No	No	Yes
RF Signal Output	Yes	No	Yes	Yes
RF Signal Demodulation	Yes	No	Yes	Yes
RF Wavemeter	Yes	No	Yes	Yes
Direct Wavemeter Frequency Readout	No	No	No	UPM-98A: No UPM-98B: Yes UPM-98C: Yes
RF Signal Output Calibrator (1030 mHz)	No	No	Yes	Yes
Calibrated Video Pulses	No	No	Yes	Yes
Pulse Counter (O to 5000 pps)	Yes	No	Yes	Yes
RF Pulse Power Meter	Yes	No	Yes	Yes

Table, l-6. Identificatlon of Assemblies and Subassemblies

REF DESIG NO.	NAME	REF DESIG NO.	NAME
1	Display unit	8A9	Directional Coupler Assembly
2	Sweep and Intensity Mark Unit	8A10	20 mHz Gated Oscillator (AN/UPM-98B AN/UPM-98C, only)
3	Crystal Mark and Sync Unit	9	Calibration-Control Unit
4	SIF Coder	9A2	ALC Input Integrator Subassembly
4A1	Code Delay Line Subassembly	9A4	Mode 4 Reply Decoder
4A2	Interleaved Code Train Generator Assembly	10	Not Used
5	Radar Test Set Chassis Assembly	11	ExternaI Cables, Accessories
6	Not Used	12	Interrogation Coder
7	Electrical Equipment Case	12A 1	Clock and Line Drive Assembly
8	Coder Simulator Chassis Assembly	12A2	Code Delay Line Assembly
8A1	RF Oscillator Assembly	12A3	Diode Matrix Assembly
8A2	ALC/Attenuator Assembly	12A4	Blocking Oscillator Assembly
8A3	Wavemeter Assembly	12A5	RF (ISLS) Subassembly
8A4	Demodulator Assembly	12A6	Delay and Tag Generator Assembly

Table 1-7. Test Equipment Required For Troubleshooting and Maintenance

NO.	TEST EQUIPMENT	DESIGNATION	ALTERNATE	APPLICATION
1	Multimeter	AN/PSM-4	AN/USM-223	Voltage measurements
2	Oscilloscope	AN/USM-l05A	AN/USM-281C	Waveform display
3	RF Power Meter	AN/USM-177	AN/URM-98	RF attenuator check
4	Square Wave Generator	SG-299C/U		Video attenuator alignment
5	Pulse Generator	AN/UPM- 55	AN/UPM-15A	External Triggering
6	RF Signal Generator	AN/UPM-41A	AN/URM-64A	Wavemeter Calibration
7	Frequency Counter	AN/USM-207		Prf adjustment
8	Transfer oscillator	CM-77A/USM		RF freq. measurement
9	Electronic Multimeter With HV Probe	AN/USM - 116	ME-26D w/MX-2517/U	Voltage measurement
10	Standing Wave Indicator	AN/USM-37C	IM-175/U	ALC Tests
11	Directional Coupler	Hewlett-Packard766D	HP-776D (NSN 5895-00-837-8664)	Wavemeter Calibration
12	Slotted Line	IM-193/U	TM-92	ALC Tests
13	Thermistor Mount	Hewlett-Packard 477B	MX-2144/U (P/O AN/URM-98)	Demodulator Calibration

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

No special instructions are required for uncrating and unpacking the equipment. However, because the Radar Test Sets are precision instruments, rough handling of the equipment must be avoided. If it is dropped or otherwise treated roughly, extensive recalibration may become necessary.

2-2. SITE SELECTION.

No special location is required for operation of the Radar Test Set. The placement of the unit is usually temporary and determined by the location of the equipment to be tested.

2-3. POWER REQUIREMENTS AND DISTRIBUTION.

Radar Test Set AN/UPM–98A will operate from a source of 115 volts + 10%, single phase, 45 to 420 Hz; the AN/UPM–98, and AN/UPM–98C will operate from a power input source of 54 to 420 Hz. Power input to the Radar Test Set is through terminals 2 and 3 of terminal hoard 7TB3 (inside Electrical Equipment Case CY-2726A/UPM-98) to filter 7FL1. From here, power is distributed to blower 7B1, blower motor phase shift capacitors 7C1 and 7C2, lower drawer power distribution connector 7P3, and upper drawer distribution connector 7P2. The two panel-chassis assemblies contain their own power switching, fusing, and dc power supplies. Refer to figure 5-67 for the primary power distribution diagram.

2-4. INSTALLATION LAYOUT.

No installation layout instructions are required for the Radar Test Set when used in a temporary location near the equipment to be tested.

When a permanent installation for the radar test set is required, a space of at least 4 inches must be provided at the rear of the case for efficient operation of the blower. Also, space is required in front of the equipment so that drawers and subassemblies may be removed for testing and adjustment. Provision must be made for sufficient space at the front of the equipment for operating and testing. Figures 2-1 and 2–2 are dimensional drawings provided as aids in planning permanent installations. The accessories case is so designed that it can be bolted to the top of the test set by removing the four machine screws, flat washers, and rubber washers in the top of the test set, positioning the accessories case and mounting by means of the holes in the bottom of the accessories case. It provides a convenient storage facility for all the accessories used with the test set.

2-5. INSTALLATION REQUIREMENTS.

a. GROUNDING. Because of the filter capacitors connected between the ac supply line and the chassis, there is a small difference of ac potential between the equipment case and a true ground when one side of the ac supply line is also grounded. To prevent the possibility of electric shock when the test unit and ground are touched at the same time, make a connection between the case and ground before applying power to the radar test set.

b. INTERCONNECTION OF UNITS. The operating ac and dc power for all the units of the Radar Test Set are distributed internally through the multiple-pin receptacles of the various plug-in units.

The delayed triggers from the Crystal Mark and Sync unit are also routed internally to the Calibration Control unit for the pulse counting and calibration pulse generator circuits. The “O” triggers from the Crystal Mark and Sync unit are routed to the Sweep Circuits in the Sweep and Intensity Mark unit to trigger the Display Sweep. Other signal paths between the various units required for testing are established by means of external cable assemblies supplied as accessories to the Radar Test Set (see table 1-1). These interconnections will vary in accordance with the type of test performed and are described in the applicable procedures in this technical manual.

c. CABLE ASSEMBLIES. Cables supplied with the Radar Test Sets are, with the exception of the servicing cables, standard types (covered in publications NAVSHIPS 900.171 and NAVSHIPS 0967-000-0110). The servicing cable assemblies CX-4963/UPM and CX-6092 /U are required to operate the plug-in units when withdrawn from the drawer-chassis for adjustment or maintenance. Cable assembly CX–4964/UPM is a special cable for connecting sweep signals between the Display unit and the Sweep and Intensity Mark units.

2-6. INSPECTION AND ADJUSTMENTS.

a. GENERAL. After unpacking and before energizing the equipment for the first time, inspect each unit as follows:

(1) Check mechanical operation of all f rent panel controls to insure that they operate through all positions without excessive binding.

(2) Verify that the plug-in units and the two panel-chassis assemblies are fully inserted into the electrical equipment case and that the appropriate fasteners are firmly in place.

Table 2-1. Preliminary Control Settings

CONTROL	POSITION
RADAR TEST SET TS-1253A/UP	
DISPLAY UNIT	
INT	Fully ccw
FOCUS	Center
HOR	Center
VERT	Center
75 Ω	OUT
VOLTS/IN (volts per inch)	20
VIDEO SENS	CAL
SCALE	Fully CCW
ASTIG	Center
SWEEP AND INTENSITY MARK UNIT	
SWEEP SPEED RANGE	1-30
SWEEP SPEED ADJUST	Center
MARKER TRIGGER	NORMAL
INTENSITY MARKS RANGE	OFF
INTENSITY MARKS LEVEL	Fully CCW
CRYSTAL MARK AND SYNC UNIT	
SWEEP DE LAY RANGE	0
SWEEP DELAY COARSE	Fully ccw
SWEEP DELAY FINE	Fully CCW
TRIGGER DELAY RANGE	o
TRIGGER DELAY COARSE	Fully CCW
TRIGGER DELAY FINE	Fully CCW
SYNC SELECT	INT
XTAL MARK LEVEL	Fully CCW
PRF	Center
SUP	Fully CCW
SIF CODER	
CODE	0000
FUNCTION	N
SUB PULSE SELECT	OFF
LEVEL	Lo
SUB PULSE POS	0
PULSE WIDTH	.45
AMPLITuDE	Fully CCW (0)
INTERLEAvE	Fully CCW

CONTROL	POSITION
CODER SIMULATOR SM-197A/UPM-98	
ATTENUATION	Fully CCW
SG FREQUENCY	Fully CCW
WAVEMETER INPUT	DEMOD
WAVEMETER FREQUENCY	Fully CCW
CALIBRATION-CONTROL UNIT	
METER SELECT	CAL
WM SENS	Fully CCW
VIDEO OUT	50
CAL ADJ	Fully CCW
TRIGGER	DE MOD
INTERROGATION CODER	
VIDEO Selector Switch	CODE
Sub Pulse Position Control	0
ISLS LEVEL Control	0
Mode Selector Switch	3/A
Function Selector Switch	MOD-INT
CODE WIDTH Control	Center
CODE LEVEL Control	Fully ccw
TRIG Connector Terminate Switch (75Ω)	off
MOD Connector Terminate Switch (75Ω)	off
ISLS Connector Terminate Switch (75Ω)	off
ISLS Selector Switch	OUT
Substitute Pulse Selector Switch	OUT
ISLS WIDTH Control	Center
VIDEO LEVEL Control	Center

b. ADJUSTMENT FOR LOW OR HIGH INPUT POWER CONDITION. - The Radar Test Sets are de: signed to operate from an ac power source of 115 volts ±10%. However, if the input power in an installation is consistently above or below the nominal 115 volts by more than 5%, the input power connection to the power transformers 5T1 and 8T1, located at the rear of each drawer chassis, should be changed from the 115 volt tap (terminal 3) to the 103.5 volt tap (terminal 2) or to the 126.5 volt tap (terminal 4) accordingly.

2-7. INTERFERENCE REDUCTION.

The Radar Test Sets have been designed to comply with NAVSHIPS requirements concerning maximum permissible radiation for nonportable equipment, The power source must be free of noise injected by other equipment. The Radar Test Sets have been designed for a minimum of interference with other equipment and are capable of operating in proximity to high power radar equipment. To ensure proper interference-free operation, all connections to the test set must be completed and assemblies must be properly secured. Make sure equipment is properly grounded. No further interference precautions are required during installation or operation.

2-8. OPERATIONAL CHECKOUT OF EQUIPMENT.

(Pages 2-3 through 2-6 are foldouts located at the back of this manual.)

a. GENERAL. - Before using the test set for the first time after unpacking, or at any time when there is a need to check that the test set is in full operational readiness, use the procedure given below. If any normal indication cannot be obtained, refer to the troubleshooting and maintenance procedures in sections 4 and 5.

b. CHECKOUT OF RADAR TEST SET TS-1253A/UP. - Place all operating controls (figure 3-1) in preliminary settings given in table 2-1, then proceed as follows:

(1) DISPLAY AND ASSOCIATED UNITS

Step 1. Turn POWER switch on TS-1253A/UP to ON position.
Step 2. Allow fifteen minutes warmup.
Step 3. Advance INTEN control on Display unit until trace is visible on CRT.

NOTE

It may be necessary to advance PRF control to increase display intensity.

Step 4. Adjust VERT and HOR controls on Display unit to move the trace to the center of CRT screen.
Step 5. Adjust FOCUS and ASTIG controls on Display unit for sharp, even trace.
Step 6. Set SYNC SELECT switch on Crystal Mark and Sync unit to INT 1.00. Advance XTAL MARK LEVEL control until pulse appears on trace.
Step 7. Turn XTAL MARK LEVEL control on Crystal Mark and Sync unit fully counterclockwise to eliminate crystal marks.
Step 8. Connect CG-530B/U cable from O TRIGGERS connector on Crystal Mark and Sync unit to VIDEO input connector on Display unit. The trailing edge of the trigger pulse should appear on the display.
Step 9. Set VOLTS/IN switch and adjust VIDEO SENS control on Display unit for two-inch pulse height on display.
Step 10. Set INTENSITY MARKS RANGE switch on Sweep and Intensity Mark unit to .1 position.
Step 11. Advance INTENSITY MARKS LEVEL control on Sweep and Intensity Mark unit until intensity marks are visible on sweep trace. Nine to thirteen intensity marks should be visible on the full trace.
Step 12. Turn SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit fully clockwise. Set Intensity Marks Range switch to 1.0 position. At least thirty l-µsec intensity marks should be visible on the full trace.
Step 13. Set INTENSITY MARKS RANGE switch on Sweep and Intensity Mark unit to 5.
Step 14. Set SWEEP SPEED RANGE switch on Sweep and Intensity Mark unit to 20-200. At least four 5-µsec markers should be visible with SWEEP SPEED ADJUST control fully counter - clockwise.
Step 15. Remove coaxial cable from O TRIGGERS connector and connect to SUP TRIGGERS connector on Crystal Mark and Sync unit. Turn SWEEP SPEED ADJUST control fully clockwise. One suppressor pulse should be visible at left end of trace.
Step 16. Turn SUP control on Crystal Mark and Sync unit clockwise and observe pulse width. Pulse width should be at least 220 microseconds.
Step 17. Turn SUP control on Crystal Mark and Sync unit fully counterclockwise.
Step 18. Disconnect coaxial cable from SUP TRIGGER connector on Crystal Mark and Sync unit and connect to DELAYED TRIGGER connector on *Crystal* Mark and Sync unit.
Step 19. Set INTENSITY MARKS RANGE switch on Sweep and Intensity Mark unit to 50. At least four 50-µsec marks should be visible on full trace with SWEEP SPEED control fully clockwise.
Step 20. Adjust VOLTS/IN (volts per inch) switch and VIDEO SENS (sensitivity) control on Display unit for two-inch display of delayed trigger pulse at left end of trace.
Step 21. Set TRIGGER DELAY RANGE switch on Crystal Mark and Sync unit to 1-11 and set SWEEP SPEED ADJUST on Sweep and Intensity Mark unit fully counterclockwise.
Step 22. Turn TRIGGER DELAY FINE control on Crystal Mark and Sync unit clockwise and note that delayed trigger pulse moves from its extreme left position on trace toward the center.
Step 23. Set SWEEP DELAY RANGE switch on Crystal Mark and Sync unit to 1-11.
Step 24. Turn SWEEP DELAY FINE

control on Crystal Mark and Sync unit clockwise. The delayed trigger pulse should move back to left end of trace.

Step 25. Disconnect cable from VIDEO connector on Display unit.

Step 26. Press TRIGGER DELAY STROBE switch on Sweep and Intensity Mark unit. The delayed trigger pulse should appear slightly to the left of center on trace.

Step 27. Release TRIGGER DELAY STROBE switch. Press down SWEEP DE LAY STROBE switch on Sweep and Intensity Mark unit. The delayed sweep pulse should appear slightly to the left of center on trace. Release SWEEP DELAY STROBE switch.

Step 28. Connect coaxial cable to VIDEO connector on Display unit.

Step 29. Turn SWEEP DELAY FINE control on Crystal Mark and Sync unit fully counterclockwise.

Step 30. Set TRIGGER DELAY RANGE switch on Crystal Mark and Sync unit to 5-50. The delayed trigger pulse should appear approximately at the center of trace.

Step 31. Set SWEEP DELAY RANGE switch on Crystal Mark and Sync unit to 11-21. The delayed trigger pulse should appear near left end of trace.

Step 32. Turn TRIGGER DELAY COARSE control on Crystal Mark and Sync unit clockwise until pulse moves to right end of trace.

Step 33. Set SWEEP DELAY RANGE switch on Crystal Mark and Sync unit to 21-31. The delayed trigger pulse should appear slightly to the right of center on the trace.

Step 34. Set SWEEP DELAY RANGE switch on Crystal Mark and sync unit to 5-50.

Step 35. Turn SWEEP DELAY FINE control on Crystal Mark and Sync unit fully clockwise. The delayed trigger pulse should appear at the right end of the trace.

Step 36. Set TRIGGER DELAY RANGE switch on Crystal Mark and sync unit to 50-750.

Step 37. Set SWEEP DELAY RANGE switch on Crystal Mark and sync unit to 50-750.

Step 38. Turn SWEEP DELAY COARSE control on Crystal Mark and Sync unit clockwise until the delayed trigger pulse appears at right end of trace. Five-microsecond intensity marks should appear to move left during clockwise rotation of SWEEP DELAY COARSE control.

Step 39. Set MARKER TRIGGER switch on Sweep and Intensity Mark unit to SWEEP.

Step 40. Rotate SWEEP DELAY COARSE control on Crystal Mark and Sync unit through entire range and back to original setting. The intensity marks should appear stationary during this control adjustment.

Step 41. On Sweep and Intensity Mark unit, set MARKER TRIGGER switch to NORMAL.

Step 42. Set TRIGGER DELAY RANGE switch on Crystal Mark and sync unit to 1-11.

Step 43. Set SWEEP DELAY RANGE switch on Crystal Mark and Sync unit to 0.

Step 44. Disconnect coaxial cable from VIDEO connector on Display unit and reconnect to TRIGGER INPUT connector on SIF Coder.

(2) SIF CODER

(a) GENERAL

Step 1. Connect coaxial cable from MOD DRIVE connector on SIF Coder to VIDEO connector on Display unit.

Step 2. Set all four CODE selectors on SIF Coder to 7.

Step 3. Set FUNCTION selector on SIF Coder to ID.

Step 4. Adjust VOLTS/IN switch and VIDEO SENS control on Display unit for two-inch pattern height.

Step 5. Turn SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit clockwise until a train of fifteen pulses is seen. These shall appear as a group of fourteen code pulses with a blank space at the center, followed by a single separate ID pulse.

Step 6. Set FUNCTION selector on SIF Coder to X. The pulse train should now contain fifteen evenly spaced pulses. (The separate ID pulse is removed and the center space is now occupied by an X pulse).

(b) SIF SUBSTITUTE PULSES

Step 1. Turn SUB PULSE SELECT switch on SIF Coder one

position clockwise (from OFF to C1 position)
Step 2. Turn SUB PULSE POS control on SIF Coder in both directions. The second pulse in the train (Cl) should be movable from left to right on either side of the normal pulse position The substitute pulse should be in the, normal position when SUB PULSE POS control is set to 0.
Step 3. To check position adjustment of each of the re. maining thirteen pulses, repeat steps 1 and 2 above with the SUB PULSE SELECT switch moved to the next position for each succeeding pulse
Step 4, Set SUB PULSE SELECT switch on SIF Coder to OFF.
Step 5. Turn PULSC WIDTH control on SIF Coder in both directions Note change in width of pulses Return control to .45 position.

(c) EMERGENCY AND X PULSES

Step 1. Set FUNCTION Selector on SIF Coder to EMER + X.
Step 2. Turn SWEEP SPEED ADJUST control on Sweep and intensity Mark unit clockwise until a series of four pulse trains is seen on trace. The first train should consist of two bracket pulses and any selected information pulses, with the X pulse in the center. The remaining three trains should consist of only two pulses each (resembling bracket pulse pairs).
Step 3. Set FUNCTION selector on SIF Coder to EMER. The center (X) pulse in the first train should disappear.

(d) OUTPUT LEVEL

Step 1. Set LEVEL switch on SIF Coder to HI. Oscilloscope pattern height should increase by approximately 30 percent,
Step 2. Disconnect cable from MOD DRIVE connector and connect it to VARI OUTPUT connector on SIF Coder,
Step 3. Turn AMPLITIJDE control on SIF Coder fully clockwise.
Step 4. Adjust VOLTS/IN switch and VIDEO) SENS control on Display unit for a one. inch pattern height.
Step 5. Turn AMPLITUDE control on SIF Coder fully counterclockwise, The pattern height should decrease to zero. Return to one. inch setting.

(e) INTERLEAVED SIF TRAINS

Step 1. Set FUNCTION selector on SIF Coder to I position. Set the four Code selectors to 7700. A normal code train and an identical but delayed train which is interleaved with the normal train should be seen (fig. 3-2 B).

NOTE:

SUB PULSE SELECT switch should be in OFF position, If it is not, the pulse selected will be omitted from both the normal and the delayed train.

Step 2. Check that the delayed train is variable in position by means of the INTERLEAVE control. The control does not permit adjustment to zero delay; however, the delay may be increased until each interleaved pulse merges with and overlaps the next pulse in the normal train.
Step 3. Return FUNCTION selector to N position.
Step 4. Disconnect cables from front panel connectors.

C. CHECKOUT OF CODER SIMULATOR SM-197A/UPM-98. - Place all operating controls (figure 3-4} in the preliminary positions given in table 2-1. The coder simulator is checked out in conjunction with the Radar Test Set TS–1253A ‘U P; therefore, before starting any checks on the SM-197A, ascertain that the TS-1253A/UP is functional, then proceed with the following steps:

(1) PREPARATION

Step 1. Connect coaxial cable between VIDEO input connector on Display unit and VIDEO OUT connector on Calibration-Control unit. Place SM-197A POWER switch in ON position,
Step 2. Advance INT control on Displsiy unit until trace is visible.
Step 3. Adjust VERT and HOR controls on Display unit to center trace,
Step 4. Adjust FOCUS and ASTIG controls on Display unit for sharp, even trace
Step 5. Set VOLTS/IN switch on Display unit to .1.
Step 6. Set TRIGGER DELAY RANGE switch on Crystal Mark and Sync unit to 1-11.
Step 7. Set SWEEP SPEED RANGE switch on Sweep and Intensity Mark unit to 1-30.

(2) CALIBRATION-CONTROL UNIT.

(a) GENERAL.

Step 1. Set VIDEO OUT switch on Calibration-Control unit to .1.

Step 2. Set TRIGGER switch on Calibration-Control unit to INT.

Step 3. With METER SELECT switch in CAL position, turn CAL ADJ control on Calibration-Control unit clockwise until Calibration-Control meter indication is full scale.

Step 4. Turn SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit clockwise until a‘ complete calibration pulse can be seen on the oscilloscope trace. (Pulse height should be 1 +.05 inches.)

Step 5. Set VIDEO OUT switch to .5, 1, 2, 5, and 10 successively. In each position, set VOLTS/IN switch on Display unit to corresponding value and repeat steps 3 and 4.

Step 6. Set VIDEO OUT switch to 50. Set VOLTS/IN stitch to 20. Repeat step 3. Pulse height should be 2.5 +0. 125 inches.

Step 7. Set METER SELECT switch on Calibration-Control unit to 500 PRF.

Step 8. Turn PRF control on Crystal Mark arid Sync unit until reading of 500 (full scale) is obtained on Calibration-Control meter.

Step 9. Set METER SELECT switch on Calibration-Control unit to 5000 PRF. The Calibration-Control meter should indicate 50. Read as 500 by multiplying by 10.

Step 10. Set METER SELECT switch on Calibration-Control unit to WM.

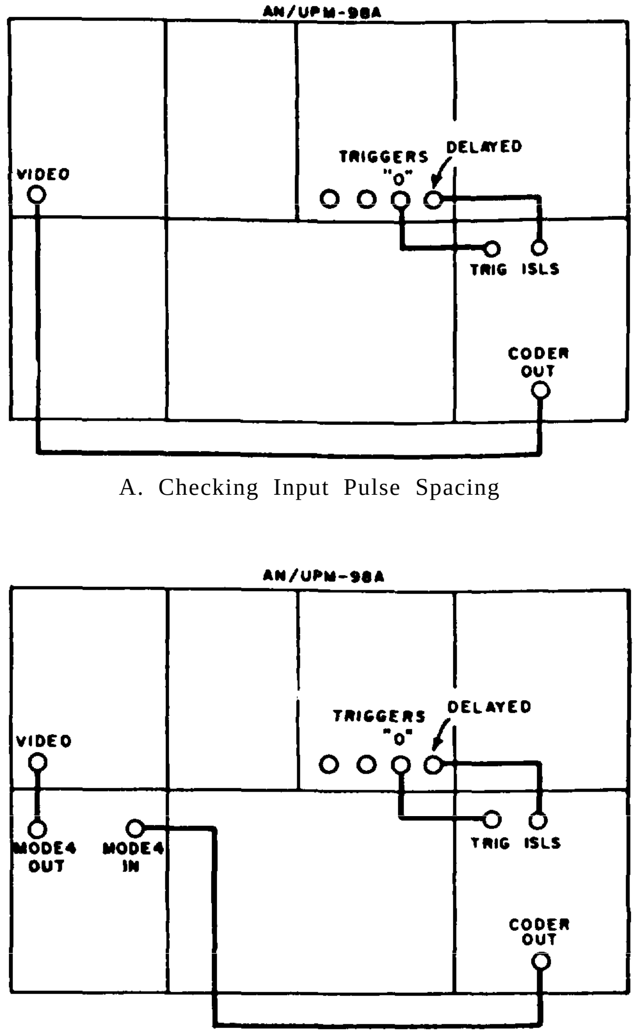
Step 11. Set VIDEO OUT switch on Calibration -Control unit to SC MON.

Step 12. Disconnect cable from VIDEO OUT connector on Calibration-Control unit and VIDEO connector on Display unit.

(b) MODE 4 REPLY DECODING.

Step 1. Connect equipment as in figure 2-3A to provide a source of simulated Mode 4, 3-pulse reply signals.

Step 2. Set INTENSITY MARKS RANGE on Sweep and Intensity Mark unit to 1 position and adjust INTENSITY MARKS LEVEL until markers are visible.



A. Checking Input Pulse Spacing

B. Checking Single Pulse Mode 4 Decode Output

Figure 2-3. Hookup for Mode 4 Reply Decoding Check

Step 3. Set SWEEP RANGE to 1-30 position and vary SWEEP SPEED ADJUST to display seven markers.

step 4. Set VOLTS on Display unit to 5.

step 5. On Interrogation Coder set Mode Selector to 1, Function Selector to TEST, Substitute Pulse Selector to P3, ISLS Selector to EXT, and CODE LEVEL and VIDEO LEVEL controls to mid-scale.

Step 6. On Crystal Mark and Sync unit set TRIGGER DELAY RANGE to 5-50, set SWEEP DELAY RANGE to 21-31, and adjust SWEEP DELAY FINE control to display three pulses.

Step 7. On Interrogation Coder, adjust SUB PULSE POS control to place the third pulse 3.6 microseconds from the first pulse (between leading edges). (Note: The second pulse here is provided by the ISLS pulse.)

Step 8. Use the TRIGGER DELAY FINE control to place the second pulse 1.8 µsec behind the leading edge of the first pulse.

Step 9. Adjust the CODE WIDTH and ISIS WIDTH controls on the Interrogation Coder to obtain a O. 45 µsec pulse width.

Step 10. Adjust the CODE LEVEL control to equalize pulse amplitude.

Step 11. Adjust the VIDEO LEVEL control for a 5-volt pulse amplitude.

Step 12. Disconnect cable from VIDEO input on Display unit and connect if to MODE 4 IN connector on Calibration-Control unit (figure 2-3 B).

Step 13. Connect a cable between the MODE 4 OUT connector on the Calibration-Control unit and the VIDEO input connector on the Display unit.

Step 14. Check oscilloscope for a single pulse output for each 3-pulse input. The output pulse should have the following characteristics.

Polarity	Positive
Amplitude	5 volt max.
Duration	0. 5 ±0.1 µsec
Rise Time	Less than 0. 1 #see
Decay Time	Less than 0. 15 µsec

(3) INTERROGATION CODER

(a) GENERAL

Step 1. Connect coaxial cable between DELAYED TRIGGERS connector on Crystal Mark and Sync unit and TRIG connector on Interrogation Coder.

Step 2. Connect coaxial cable between CODER OUT connector on Interrogation Coder and VIDEO input connector on Display unit.

Step 3. Set Mode Selector on Interrogation Coder to the 1 position, Function Selector to (+) position, ISLS Selector to OUT position, VIDEO Selector to CODE, and Substitute Pulse Selector to OUT.

Step 4. Turn VIDEO LEVEL control on Interrogation Coder clockwise until pattern height of one inch is obtained on oscilloscope.

Step 5. Turn SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit clockwise until both coder output pulses appear on the oscilloscope trace.

Step 6. Turn CODE WIDTH control on Interrogation Coder clockwise. Note increase in width of both pulses. Reset CODE WIDTH control to center position.

(b) CODE PULSE SPACING

Step 1. Change Mode Selector on Interrogation Coder from the 1 position to the 2 position. Spacing of output pulse pair should increase about 66 percent (from 3 microseconds to 5 microseconds).

Step 2. Set Mode Selector on Interrogation Coder to the 3/A position. Spacing of output pulse pair should increase about 60 percent (from 5 microseconds to 8 microseconds).

Step 3. Set Mode Selector on interrogation Coder to the C position. Spacing of output pulse pair should increase about 2- 1/2 times (from 8 microseconds to 21 microseconds).

Step 4. Set SWEEP SPEED RANGE switch on Sweep and Intensity Mark unit to 20-200.

Step 5. Turn SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit until both coder output pulses appear on trace. Further rotation of the control should not cause additional output pulses to appear beyond the two observed near midrange control setting.

Step 6. Set Function Selector on Interrogation Coder to (-) position. The polarity of the coder output pulses should appear inverted on oscilloscope trace. Return Function Selector to (+) position.

(c) ISLS PULSE CHECK

Step 1. Set Mode Selector on Interrogation Coder to 3/A. Turn SWEEP SPEED RANGE and ADJUST controls on Sweep and Intensity Mark unit until a pair of code pulses appears on the oscilloscope.

Step 2. Set LSLS Selector on the

Interrogation Coder to the 2 µsec position. Set the Function Selector on the Interrogation Coder to TEST.

Step 3. Rotate ISLS LEVEL control on Interrogation Coder back and forth and check that the ISLS pulse (P2) located one-fourth of the way from the PI to the P3 pulse, varies in amplitude. Set the ISLS pulse level so that amplitudes of P1 and P2 are equal.

Step 4. Turn ISLS WIDTH control on Interrogation Coder and note that the P2 changes in width. Reset control to center position.

Step 5. Set ISLS Selector on the Interrogation Coder to the 2 PULSE position. The ISLS pulse should replace the P3 pulse. Check by repeating steps 3 and 4 above.

Step 6. Connect an external trigger source (or the delayed trigger) from the Crystal Mark and Sync unit to the ISLS connector on the Interrogation Coder. Set the ISLS Selector to the EXT position. Vary the timing of the external trigger and note that the P2 pulse follows.

Step 7. Set the ISLS Selector to the OUT position. Note that the ISLS pulse disappears.

(d) INTERNAL MODULATION OF INTERROGATION CODER.

Step 1. Disconnect cable from VIDEO connector on Display unit and CODER OUT connector on Interrogation Coder.

Step 2. Connect coaxial cable between VIDEO OUT connector on Cal-Control unit and VIDEO connector on Display unit.

Step 3. Set VOLTS/IN switch on Display unit to .5 position.

Step 4. Set SC FREQUENCY control to approximately 100.

Step 5. On Cal-Control unit, place VIDEO OUT switch in SG MON position.

Step 6. Set the Function Selector on Interrogation Coder to MOD-INT position. Two negative code pulses should appear on oscilloscope trace.

(e) INTERROGATION CODER SUBSTITUTE PULSES

Step 1. Set the Substitute Pulse Selector on the Interrogation Coder to P3. A pulse which can be varied in time should replace the P3 (the last) pulse.

Step 2. Rotate the SUB PULSE POS control on the interrogation Coder back and forth on both sides of the center position. Note that the substitute pulse is shifted in both directions.

Step 3. Return the Substitute Pulse Selsctor to the OUT position.

(f) SIF CODER MODULATION OF INTERROGATION CODER

Step 1. Connect coaxial cable between MOD DRIVE connector on SIP Coder and MOD connector on Interrogation Coder.

Step 2. Connect coaxial cable between OUT (40 #see delayed trigger) connector on Interrogation Co&r and TRIGGER INPUT connector on SIF Coder.

Step 3. Connect Display unit VIDEO input to VIDEO OUT connector on Cal-Control unit and set VIDEO OUT selector on Cal-Control unit to SG MON.

Step 4. Set Function selector on Interrogation Coder to MIX position.

Step 5. Set VIDEO selector on Interrogation Coder to RESET position.

Step 6. Set SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit as required to view the three reset tag pulses.

Step 7. Set LEVEL switch on SIF Coder to HI position and CODE selectors to 7777.

Step 8. Set VIDEO selector on Interrogation Coder to BOTH position. Note that the SIF pulse train is followed by the three reset tag pulses and preceded by the two mode identification pulses. Return VIDEO selector to CODE position. Only the mode identification (interrogation) pulses should remain on the display.

(4) WAVEMETER.

Step 1. CONNECT CABLE FROM DELAYED TRIGGER CONNECTOR ON CRYSTAL MARK AND SYNC uNIT TO TRIG CONNECTOR ON INTERROGATION CODER. TURN WM SENS CONTROL ON CAL—CONTROL UNIT FULLY CLOCKWISE AND METER SELECT SWITCH TO WM.

Step 2. Turn WAVEMETER INPUT switch to SIG GEN.

Step 3. Turin WAVEMETER FREQUENCY control until resonance is indicated by a dip of the Cal-Control meter needle.

Step 4. Turn WM SENS control on Cal-Control unit clockwise and “rock” WAVEMETER FREQUENCY control to determine exact point of minimum meter reading (exact wavemeter resonance point).

Step 5* Remove cable from DELAYED TRIGGER connector on Crystal Mark and Sync unit and TRIG connector on Interrogation Coder.

Step 6. Remove all cable from front panel connectors. Return all equipment controls to preliminary settings Listed in table 2-1.

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

a. GENERAL. Radar Test Sets AN/UPM-98A, -98B, and 98C are designed primarily for use in testing Mark X IFF/SIF equipment. However, they can also be used to make various tests on other radar equipment operating within the 925 to 1225 megahertz frequency range. The operating procedures for the AN/ UPM–98A, –98B, and –98C test sets are identical, except for the wavemeter frequency indicator. The AN/ UPM–98B and AN/UPM-98C test sets indicate the wavemeter frequency directly in megahertz (mHz); they do not require reference to the conversion curves in the Book of Calibration Charts previously supplied with each Radar test set. Refer to paragraph 3–7e of this section of the technical manual for operating procedures applicable to both types of the wavemeter frequency indicator. All other operating procedures in this technical manual apply equally to Radar Test Sets AN/UPM-98A, -98B, and AN/UPM-98C.

b. RADAR TEST SET TS-1253A/UP. This unit combines the functions of a precision oscilloscope and an SIF code pulse generator. Figure 3–1 is a front view of the TS–1253A /UP unit showing all the operating controls.

(1) OSCILLOSCOPE. The oscilloscope circuitry is contained in the Display, Sweep and Intensity Mark, and Crystal Mark and Sync plug-in units. The video pulses to be displayed are applied through a coaxial cable or the Test Lead MX–2681/UP (furnished with the equipment) to the VIDEO connector on the Display unit front panel. The video input line can be internally terminated in a 75-ohm impedance by placing the 75Ω switch in the IN position.

The FOCUS and ASTIG controls adjust the sharpness and evenness of the display trace, and the INTEN control adjusts the brightness of the trace, To avoid display "blooming", just enough intensity should be used to afford comfortable viewing. The displayed pattern is centered on the cathode ray tube screen by adjusting the HOR and VERT controls. The vertical size of the display (for a given input voltage) is determined by the VOLTS/ IN switch.

The VOLTS /IN switch permits setting the vertical sensitivity of the oscilloscope to one of nine levels ranging from 0.05 to 20 volts per inch. In addition, Test Lead MX–2681/UP contains a three-step attenuator which permits adjustment of the vertical sensitivity from 0.05 to 2000 volts per inch. The VIDEO SENS control is an additional continuously-variable vertical sensitivity control which operates within each range setting of the VOLTS/IN switch. It is normally set to the detented CAL position so that calibration of the selected level is accurate.

The starting point of the horizontal scanning line can be delayed with respect to the synchronizing trigger by means of the three SWEEP DELAY controls on the Crystal Mark and Sync unit. The SWEEP DELAY RANGE switch has six positions for selecting delay ranges from 0 to 750 microseconds. The COARSE and FINE controls permit accurate adjustment of the delay time within each range. Accurate measurement of the sweep delay can be made by pressing down on the momentary-contact DELAY STROBE SWEEP switch on the Sweep and Intensity Mark unit and using the intensity markers for time measurement. This switch also provides a means of presetting the sweep delay prior to examination of pulses or pulse trains.

The INTENSITY MARKS RANGE switch and the LEVEL control provide a means for superimposing intensity modulation-type markers (in the form of small bright spots spaced 0.1, 1, 5, or 50 microseconds apart) upon the displayed pattern. The 1- and 0.1-microsecond markers may be used together; the l-microsecond markers are recognizable by their size; they are larger than the O l-microsecond markers. Also, the l-microsecond marker height is adjustable by the LEVEL control, while the level of the O. I-microsecond markers remains constant.

Another set of markers is generated by a crystal controlled oscillator and are available in the form of video "pips" spaced either 1 or 1.45 microseconds apart on the displayed pattern. These are selected by placing the SYNC SELECT switch in either the INT 1.45 or the INT 1.00 position. The amplitude of these markers is controlled by the XTAL MARK LEVEL control. The 1-microsecond markers are provided primarily for checking the interrogation code pulse spacing, and the 1.45-microsecond markers are used primarily for checking the spacing of SIF pulse trains. These video markers are applied to alternate sweeps and the viewed signal is applied to the remaining sweeps so that distortion of the viewed pulses does not occur.

The SYNC SELECT switch enables the operator to select one of five types of triggering to be used for establishing a zero time reference for synchronizing the test unit. When using an external trigger signal, the SYNC SELECT switch is set to either the EXT + or the EXT – position, depending upon the polarity of the external trigger pulse. When the SYNC SELECT switch is in either the INT 1.45 or the INT 1.00 position, the test unit is synchronized by the internal crystal controlled oscillator output at either 689 kHz or 1000 kHz. When the SYNC SELECT switch is in the INT position, the teat unit is synchronized by the internal free-running blocking oscillator, the pulse repetition frequency of which is adjustable continuously from 15 to 4100 pps by means of the PRF control.

The trigger pulses used to synchronize the test unit can be delayed from 0 to 760 microseconds by means of the TRIGGER DELAY RANGE switch and the COARSE and FINE controls. The delayed positive-going trigger pulse is available at the DELAYED TRIGGERS connector on the Crystal Mark and Sync unit. The trigger delay can be measured visually on the oscilloscope by pressing down on the DELAY STROBE TRIGGER momentary-contact

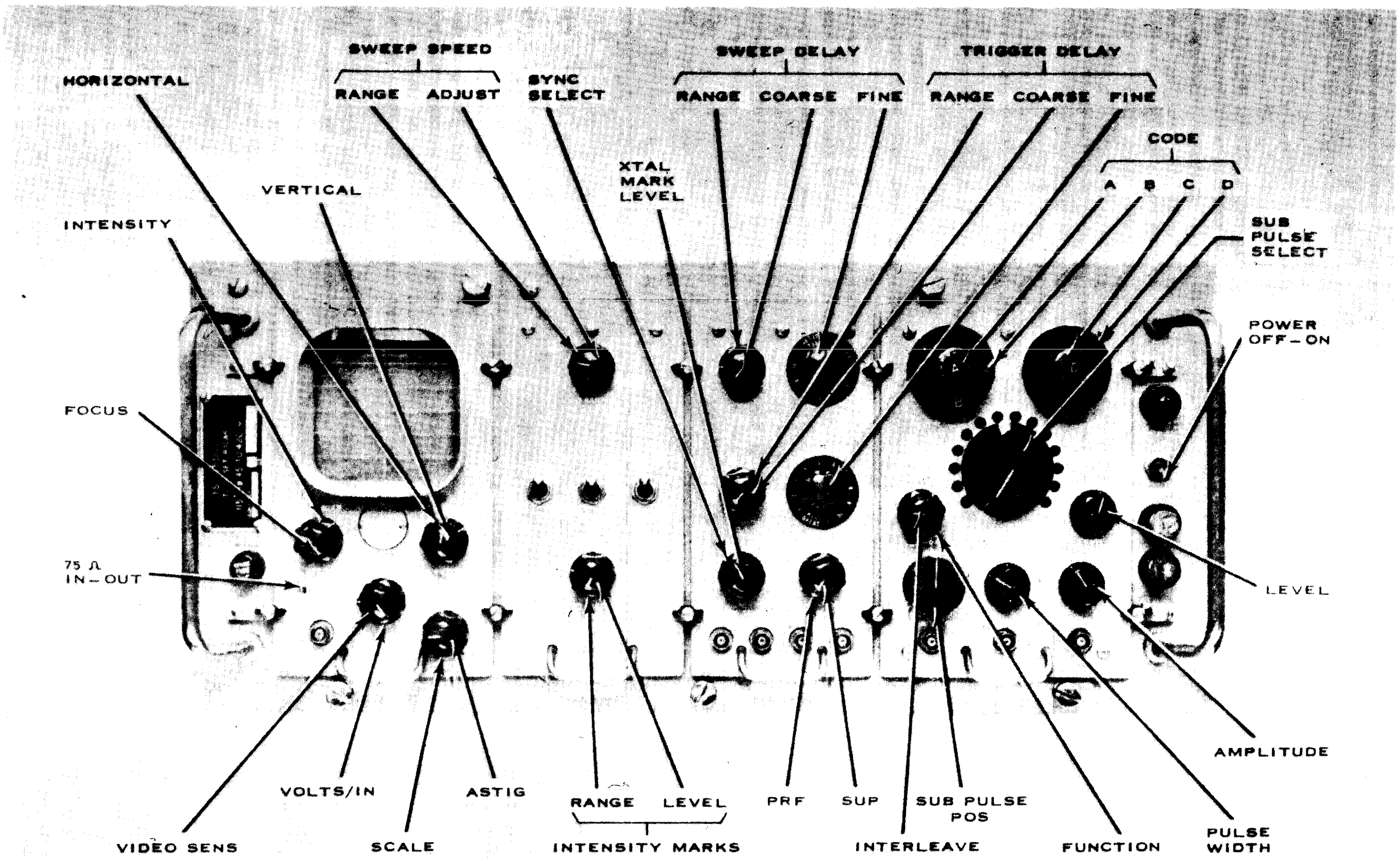


Figure 3-1. Radar Test Set TS–1253A/UP, Front Panel Control

switch and counting the intensity-type markers superimposed upon the trace. The zero-time trigger or delayed trigger can be used to synchronize the SIF Coder, the Interrogation Coder, or the equipment under test.

A suppressor pulse is available at the SUP TRIGGERS connector. The width of this pulse is adjustable between 2 and 220 microseconds by means of the SUP control. This pulse can be used to gate off ("suppress") certain external equipment when desired.

It may be desired to delay the starting point of the intensity markers by the same amount that the sweep is delayed. This can be accomplished by setting the MARKER TRIGGER switch to the SWEEP position. When this is done, the same delayed sweep trigger signal is used to trigger both the oscilloscope sweep and the intensity marker circuits. When the MARKER TRIGGER switch is in the NORMAL position, the intensity marker circuits are triggered at zero time.

(2) SIF CODER.

(a) SIF CODE SYSTEM. - The SIF code utilizes the binary system of number notation wherein all numbers are represented by combinations of only two symbols, "O" and "1". In the SIF pulse **code,** a voltage pulse represents a binary "l", while the absence of a pulse represents a binary' '0"

In the binary system of number notation, a "1" symbol in the first place to the left of the decimal point represents a quantity of one, just as in the conventional decimal system. In the second place (corresponding to "tens" place in the decimal system) a "l" symbol represents a quantity of two (double that of the first place). The value of the "1" symbol is doubled with each place it is moved away from the decimal point. Numerical values not represented by a "1" symbol in a single place are represented by combinations such that the sum of the quantities represented equals the desired number. Thus, in binary notation, "111" represents the quantity seven (4+2+1).

SIF numerical codes may contain 'up to four Arabic numerals. The numerals used are O through 7. The numeral in each of the four places is independently encoded into the binary form for transmission as a series of pulses.

It was shown that the number 7, which is the largest used in the SIF code, can be represented in the binary system by means of three symbols (and three places). The system needed for handling the SIF code, then, is a "3-bit" binary system. Since it is desired to transmit as many as four different numbers in some cases, it is necessary to use up to twelve (4 by 3) information pulses in the pulse train (not including the start and stop bracket pulses which play no actual part in the numerical code)

For efficiency, the space within the pulse train is allocated in such a manner that the three bits for the four numerals are interlaced (see figure 3-2). The four numerals in a code number are given the designations A, B, C, and D, while the "bits" are numbered according to the value of the three binary places used (1, 2, and 4). Thus a pulse identified as "A4" in a pulse train indicates that a binary "l" is present in the "fours" place for the first numeral on the left, while the absence of a pulse at this point in the train indicates a binary "O" in the "fours" place for this numeral.

The space between the bracket ("framing") pulses is divided into two equal parts on either side of a normally unused center space ("X"). The front half (following the start pulse) is used for interlaced C and A pulses, while the second half is used for interlaced B and D pulses. The interval between the leading edges of the bracket pulses is 20.3 microseconds. The length of each pulse is 0.45 microseconds, and the interval between leading edges of adjacent pulses is 1.45 microseconds.

Mode 1 code numbers consist of selected numbers from 1 through 73. Only five of the information pulse positions are used in mode 1 (the B4 position is not used). See figure 3-3 for the mode 1 reply code pattern.

Mode 2 code numbers include both 6 and 12-pulse numbers, using selected numbers from 0000 through 7777. Groups A and B are used for 6-pulse code numbers, while all four groups (A, B, C, and D) are used for 12-pulse code numbers. See figure 3-3 for the mode 2 reply code patterns.

Mode 3/A code numbers consist of both 6 and 12 pulse numbers, using selected numbers from 0000 through 7777. Groups A and B are used for 6-pulse code numbers, while all four groups (A, B, C and D) are used for 12-pulse code numbers. See figure 3-3 for the mode 3/A reply code patterns.

The mode C (altitude) code is similar to the *mode* 2, 12-pulse code; however, no D1 pulses are used and an SPI (Special Position Identification) pulse which is the same as the ID pulse (figure 3-3), is used with each D4 pulse.

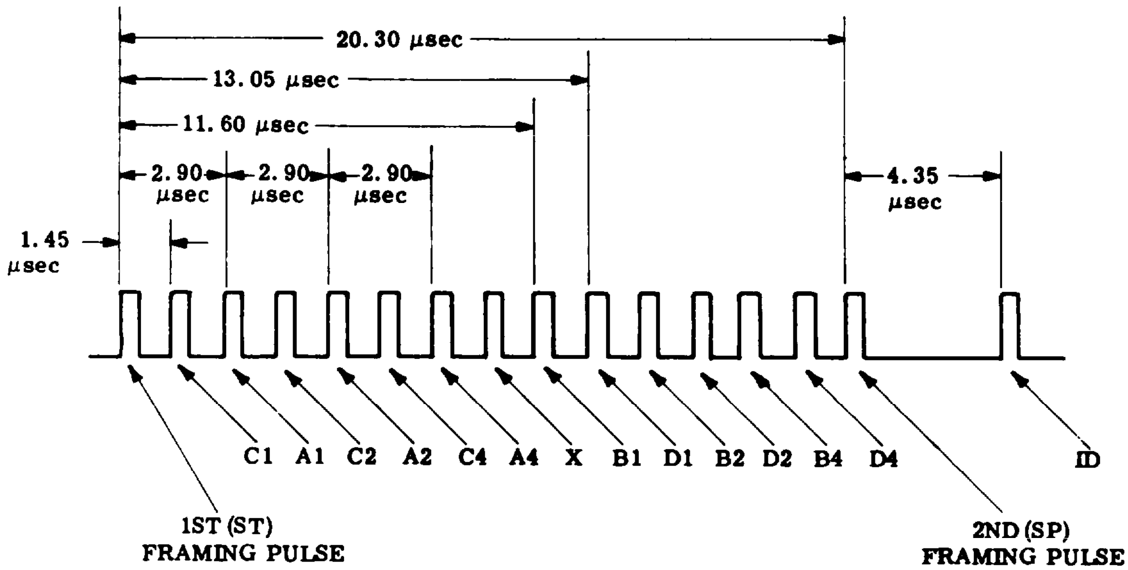
(b) SIF PULSE CODE GENERATION. The SIF Coder generates SIF code pulse trains of the type illustrated in figure 3-2 and 3-3. These include two framing pulses, up to twelve information pulses, and optionally, an X pulse or an ID pulse.

The width of the SIF Coder pulses is adjusted by means of the PULSE WIDTH control from 0.3 to 1.0 microsecond. Nominal pulse width is 0.45 microsecond. The amplitude of the pulses available at the MOD DRIVE connector depends upon the setting of the LEVEL switch. The pulse amplitude available at the VARI OUTPUT connector is controlled by the continuously variable AMPLITUDE control and the LEVEL switch.

The two framing pulses ("start" and "stop" bracket pulses) are present in all pulse trains regardless of the setting of the controls. The presence of the six information pulses on each side of the pulse train center (figure 3-2) is determined by the settings of the four CODE number selectors at the top of the front panel. The switches are designated by letters A, B, C, and D corresponding to the four pulse groupings. Any combination of the twelve information pulses can be made up by use of these four selectors. Table 3-1 shows the pulse combinations obtained for each of the seven settings of the CODE number selectors.

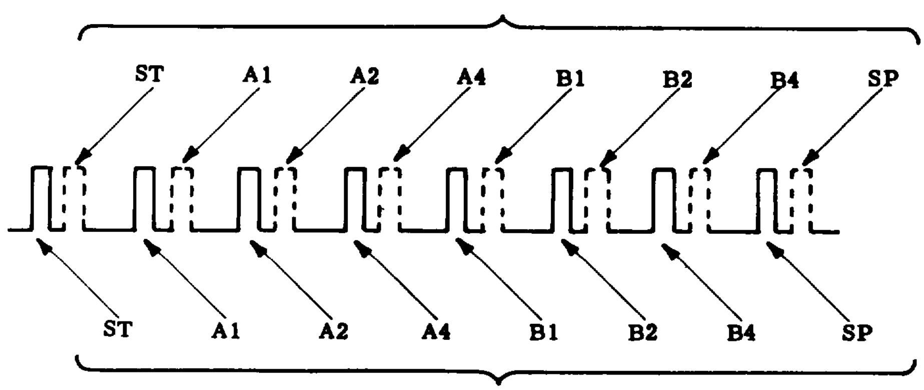
The output to be made available at the MOD DRIVE and VARI OUTPUT connectors is determined by the FUNCTION selector switch. In the N position, a normal pulse train (two framing pulses and information pulses as set by the four CODE

NOTE: NOMINAL PULSE WIDTH IS 0.45 μSEC



A. AVAILABLE SIF CODE PULSE PSITIONS (SINGLE TRAIN)

INTERLEAVED PULSE TRAIN (ADJUSTABLE DELAY)



B. TYPICAL INTERLEAVED PULSE TRAIN (CODE 7700)

Figure 3-2. General SIF Pulse Code Pattern

number selectors) is supplied. Moving the FUNCTION switch to the ID position adds the ID pulse (figure 3-3) after the pulse train. In the X position, the ID pulse is removed and the X or center pulse appears. In the EMER position, each prf trigger pulse produces a pair of bracket pulses with the selected information pulses between them, followed by three more pairs of bracket pulses without any information pulses, each pair spaced 4.35 use. apart. In the EMER +X position, another pulse (''X") is inserted "into the center of the information pulses.

Any pulse in a train except the start pulse and the ID pulse can be removed (one at a time) and a pulse of identical characteristics which is separately variable in position can be substituted for it. The pulse for which substitution is to be made is selected by the SUB PULSE SELECT switch. The SUB PULSE POS control varies the position of the substitute pulse ±1.6 microseconds around the normal position of the removed pulse.

An output consisting of two identical reply signals in which the pulse trains are overlapped or interleaved can be obtained by placing the FUNCTION selector in the I position. The relative spacing of the pulses in the two pulse trains can be varied by means of the INTERLEAVE control.

(3) POWER SUPPLY. - Operating voltages for Radar Test Set TS-1253A/UP are supplied by a power supply located at the rear of the unit. Application of input power to the unit is controlled by the POWER switch located at the right side of the

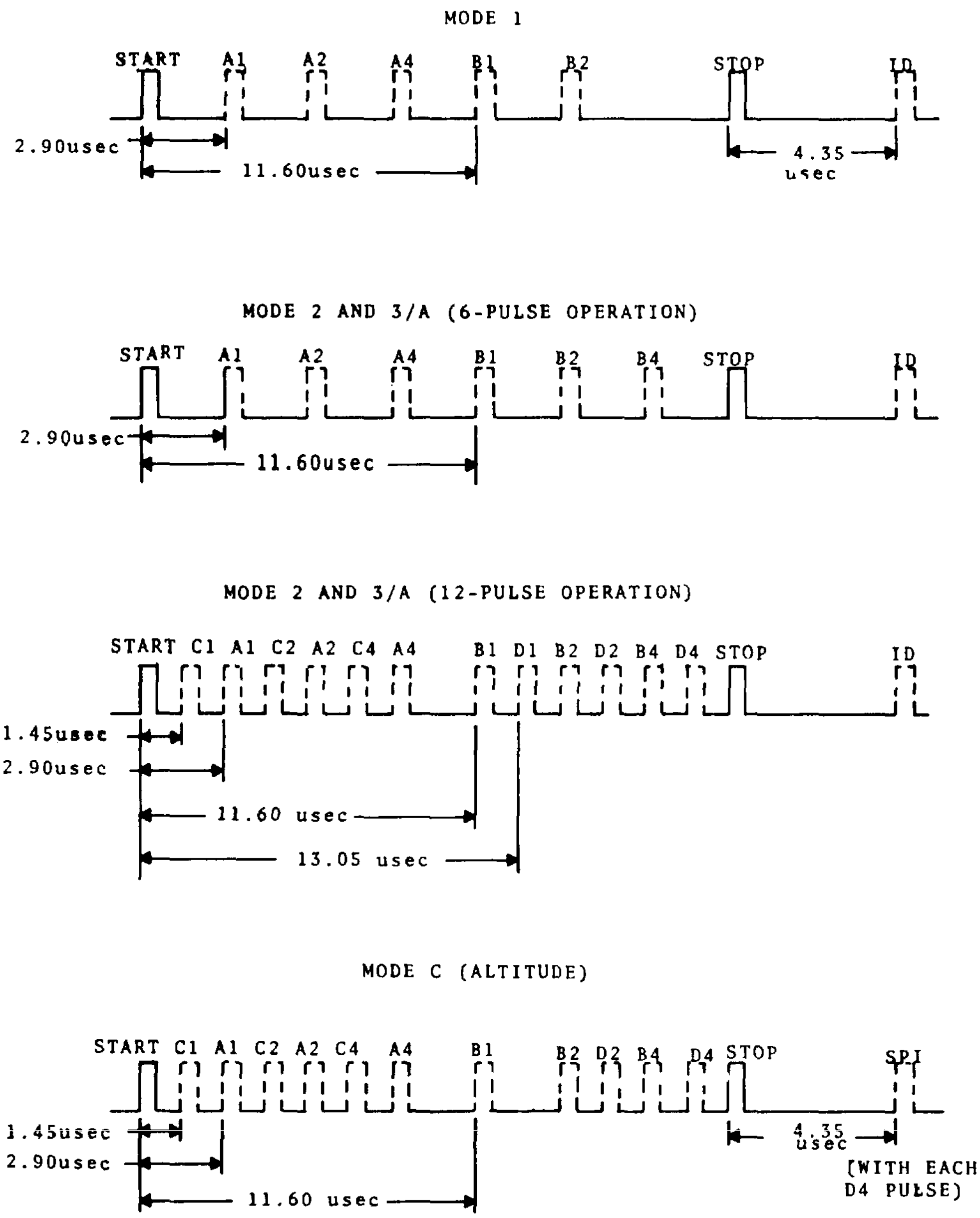


Figure 3-3. Pulse Positions Available in Standard SIF Modes

front panel. A red panel light marked POWER ON indicates that the unit is energized. Located immediately below the POWER switch are the primary power fuses.

c. CODER SIMULATOR SM-197A/UPM- 98. - Coder Simulator SM-197A/UPM-98 comprises the bottom half of Radar Test 'Set AN/UP M-98A. Its basic functional sections include an rf signal generator, a pulse calibrator, a wavemeter, a demodulator, a prf counter, a mode 4 reply decoder, and a pulse generator ("coder") capable of simulating the interrogation pulse pairs of the Mark X IFF System, plus an ISLS pulse if desired. Figure 3-4 is a view of the Coder Simulator front panel showing all the operating controls.

(1) RF OUTPUT. - The rf output signal can be adjusted in frequency from 925 to 1225 megahertz by means of the SC FREQUENCY control. This signal is available at the SG OUT connector. The output signal is fed through a variable attenuator which is controlled by the ATTENUATION knob, The chosen amount of attenuation in decibels below one volt can be read on the associated digital indicator.

The rf output signal can be modulated using an internally generated pulse signal by setting the Function Selector switch on the Interrogation Coder to the INT position. External modulating signals are applied through the MOD connector. For modulation with external pulses from 3 to 20 volts in amplitude, the Function Selector switch is set to the MOD- LOW position. For external pulses 20 to 35 volts in amplitude, the switch is set to the

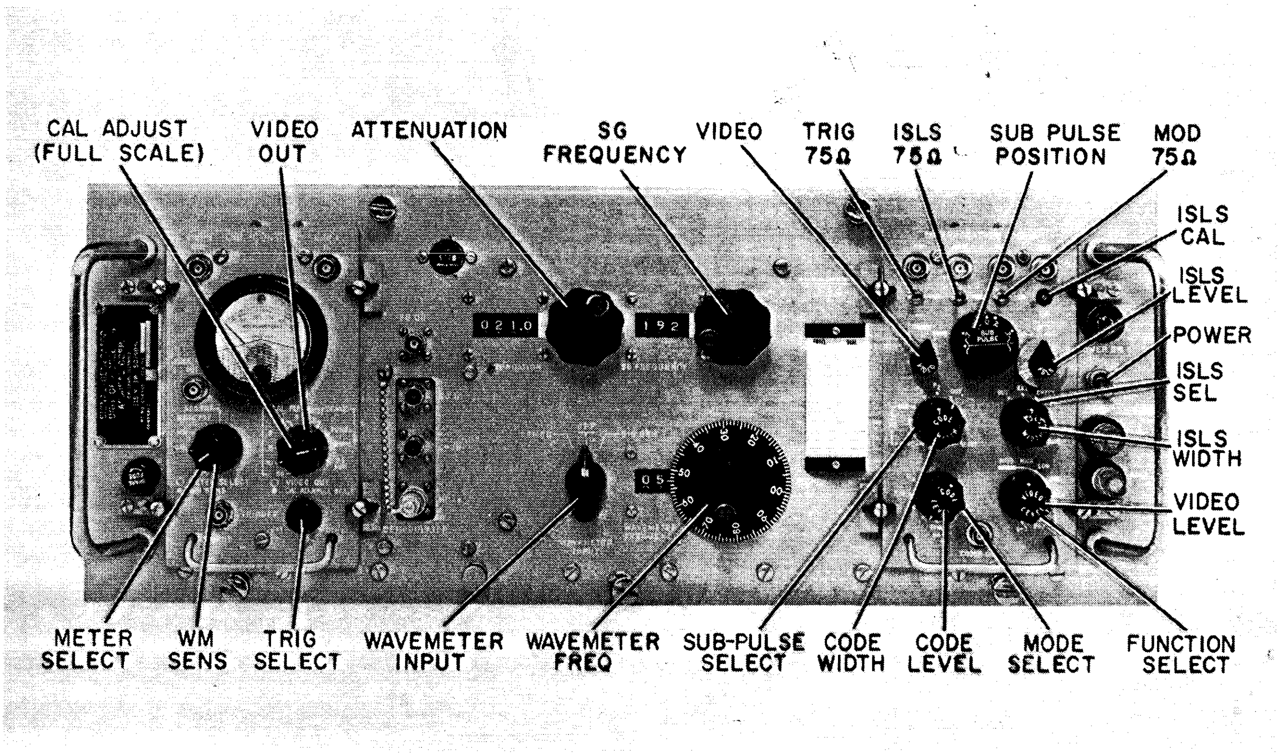


Figure 3-4. Coder Simulator SM-197A/UPM-98 Front Panel Controls

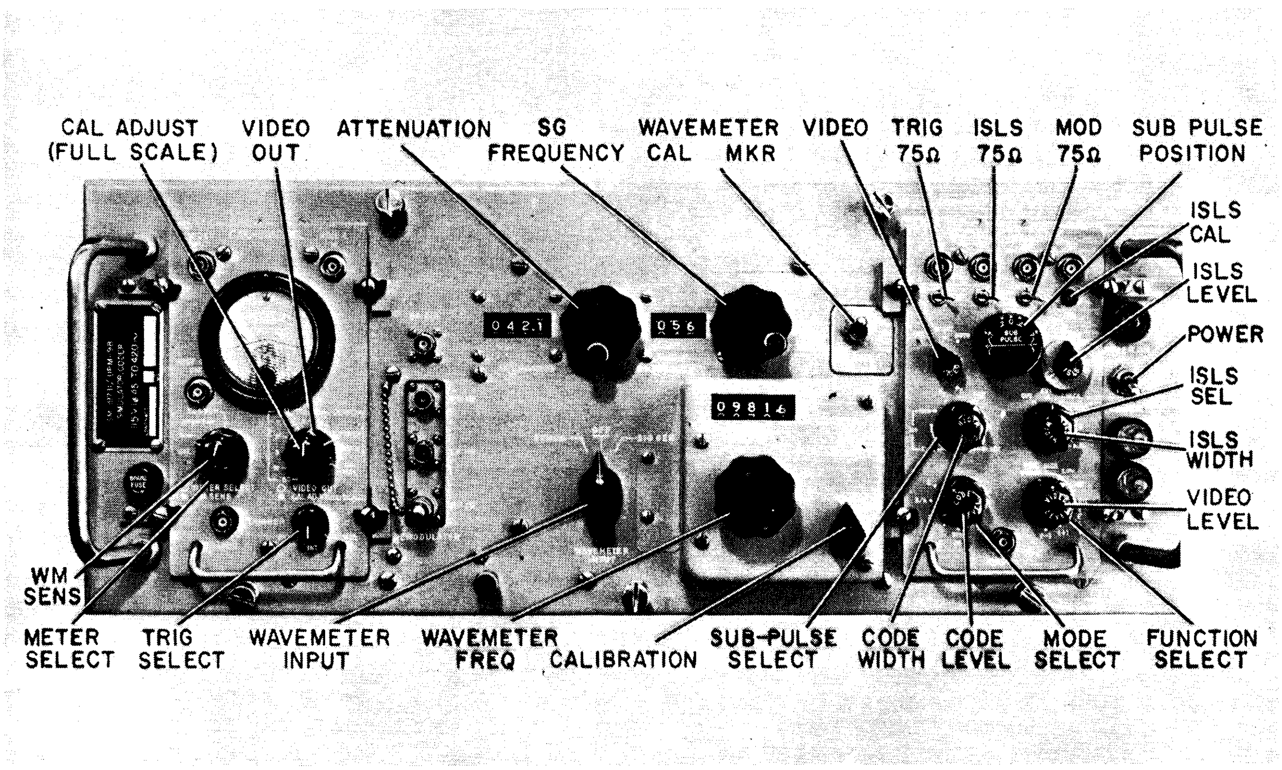


Figure 3-4A. Coder Simulator SM-197B/UPM-98 Front Panel Controls

TABLE 3-1. CODE NUMBER SELECTOR CHART

CONTROL POSITION	PULSES ON	CONTROL POSITION	PULSES ON
A1	A_1	B1	B_1
A2	A_2	B2	B_2
A3	A_1, A_2	B3	B_1, B_2
A4	A_4	B4	B_4
A5	A_1, A_4	B5	B_1, B_4
A6	A_2, A_4	B6	B_2, B_4
A7	A_1, A_2, A_4	B7	B_1, B_2, B_4
C1	C_1	D1	D_1
C2	C_2	D2	D_2
C3	C_1, C_2	D3	D_1, D_2
C4	C_4	D4	D_4
C5	C_1, C_4	D5	D_1, D_4
C6	C_2, C_4	D6	D_2, D_4
C7	C_1, C_2, C_4	D7	D_1, D_2, D_4

MOD-HIGH position. With the Function Selector switch in the MOD- MIX position, mixed video signal in applied to the modulator. When in the TEST posi. tion, "the mixed video is applied to the CODER OUT connector. With the switch set to (+) *or (-),* the modulating signal is removed from the rf signal generator and switched to the CODER OUT connector on the Interrogation Coder. Delay in the signal due to inherent delay in the rf circuitry is not more than O. S microsecond.

(2) WAVEMETER. -When the WAVEMETER INPUT switch is in the SIG GEN position, the RF signal generated by the Radar Test Set is internally applied to the wavemeter circuit within the test set. The frequency of this signal can be measured by setting the METER SELECT switch (on Cal-Control unit) to the WM position and adjusting the WAVEMETER FREQUENCY control so that a dip is obtained cm the Cal-Control meter indicating resonance. On AN/UPM-98A, the actual frequency of the wavemeter resonance point is determined by referring to the Book of Calibration Charts furnished with each equipment. On AN/UPM-98B, the frequency is indicated directly in megahertz (mHz) and no other intermediate steps are required. When the WAVEMETER INPUT switch is in the DEMOD position, the wavemeter measures the frequency of the external signal at either the HP IN or LP IN connectors.

(9) DEMODULATOR. - Internal or external pulse-modulated rf signals can be demodulated by applytng them to one of the DEMODULATOR connectors (SG IN, LP IN, or HP IN). Low power (0.5 to 35 watt) external rf signals are applied to the LP IN connector and high power (35 to 3500 watt) signals are applied to the HP IN connector. The video signal resulting from the demodulation of the rf signal becomes available at the VIDEO OUT connector. With the VIDEO OUT switch in the POWER position, the peak pulse amplitude of the video signal is available for power measurement on the oscilloscope. In the SHAPE position, a video output having minimum distortion is available for waveshape observation and measurement. With the VIDEO OUT switch in the SC MON position a small portion of the rf output signal at the SG OUT connector is applied to the demodulator and the resulting video is available at the VIDEO OUT connector for monitoring purposes.

(4) RF POWER MEASUREMENT. - To measure rf power, the VIDEO OUT control is placed in the POWER position and the Demodulator Calibration Curves in the Book of Calibration Charts are used to translate the oscilloscope voltage reading to a power reading. These curves are plotted for peak amplitude (volts versus decibels above one watt) at the VIDEO input connector on the Display unit. A correction factor for different frequencies must be added to or subtracted from the demodulator chart reading to arrive at an exact power measurement. The relative accuracy of the demodulator power measurement is ±0. 5 db over the range of 0.5 to 9500 watts peak pulsed power at frequencies from 925 to 1225 megahertz. The CG-530B/U cable supplied with the Radar Test Set should be used for this power measurement, otherwise inaccuracies will be introduced.

CAUTION

The average power applied to the LP IN connector should not exceed O. 25 watt for continuous signals. Intermittent signals having average powers up to 10 watts may be tolerated for periods up to five minutes if they are not repeated more often than at 15 minute intervals.

(5) SC OUT, SC IN, LP IN, AND HP IN CONNECTORS. - When the SC OUT (signal generator out) connector is jumpered by cable CC-1848/U to the SC IN (signal generator in) connector, the attenuated rf signal becomes available at the .LP IN (low power in) connector. The internal attenuation between the SC IN and LP IN connectors is approximately 13 db and the attenuation between the LP IN end HP IN connectors is approximately 20 db. The level of the internal rf signal is too low to be demodulated by this circuit; however, high power reply signals will be demodulated and the result will appear at the VIDEO OUT connection on the Calibration-Control unit.

(6) MODE 4 REPLY DECODING. - The Radar Test Set has a capability for decoding 3-pulse Mode 4 reply signals (3-pulse trains with a 1.8 microsecond spacing between adjacent pulses), producing a single pulse output signal. The Mode 4 decoding circuitry is located in the Calibration-Control unit. The MODE 4 OUTPUT connector (which has an impedance of 90 ±10 ohms) provides an output up to 5 volts in amplitude. The positive

output has a duration of 0. 530.1 microseconds, with a rise time of O. 1 microsecond and a fall time of less than O. 15 microsecond.

(7) PRF COUNTER. - This pulse counter is used to determine the repetition frequency of the internal trigger signal, the external trigger signal, or the demodulator output signal, as selected by the front panel TRIGGER switch. The BNC-type INPUT connector serves as an input to both the pulse counter and the video calibrator. There are two pulse counter ranges: O to 500, and O to 5000 pps, selectable by the METER SELECT switch. The accuracy of the pulse counter is within plus or minus 5 percent at full scale and within plus or minus 10 percent at 1/10 full scale. External triggers to be counted should have the following characteristics:

(a) Polarity - positive
(b) Repetition rate -15 to 4100 pps
(c) Pulse duration -0.3 to 25 usec
(d) Amplitude - 20 to 150 volts
(e) Rise Time - less than O. 5 usec per volt

(8) CALIBRATION PULSES. - When the METER SELECT switch is in the CAL position, the test set makes available positive calibrated pulses at the VIDEO OUT connector on the Calibration-Control unit. These pulses are of 2.5 ± 0.5 usec duration and of 0.1, 0.5, 1, 2,5,10, or 50 volts amplitude as selected by the VIDEO OUT switch. These pulses may be used for calibrating the oscilloscope vertical pattern height. The calibrator circuit may be triggered by internal pulses, by an external input, or by the demodulator output, depending upon the TRIGGER switch position. The calibrator will operate at frequencies from 15 to 4100 pulses per second.

(9) INTERROGATION CODER. - The Interrogation Coder simulates interrogations used by Mark X type IFF equipment. The coder output is determined by the setting of the Mode Selector switch. Table 3-2 shows the types of coder output pulses available. Front panel controls are shown in figure 3-4.

(10) POWER SUPPLY. - Operating power is supplied to all Coder Simulator circuits by a power supply located at the rear of the panel-chassis assembly. The POWER switch is located on the right end of the front panel. A POWER ON indicator light is above the switch. Fuses 8F1 and 8F2 are mounted below the switch. A spare fuse is mounted at the left of the front panel.

3-2. THEORY OF TESTS MADE WITH RADAR TEST SETS AN/UPM-98A, AN/UPM-98B, AND AN/UPM-98C.

A brie explanation of some of the tests made with the Radar Test Sets is given below.

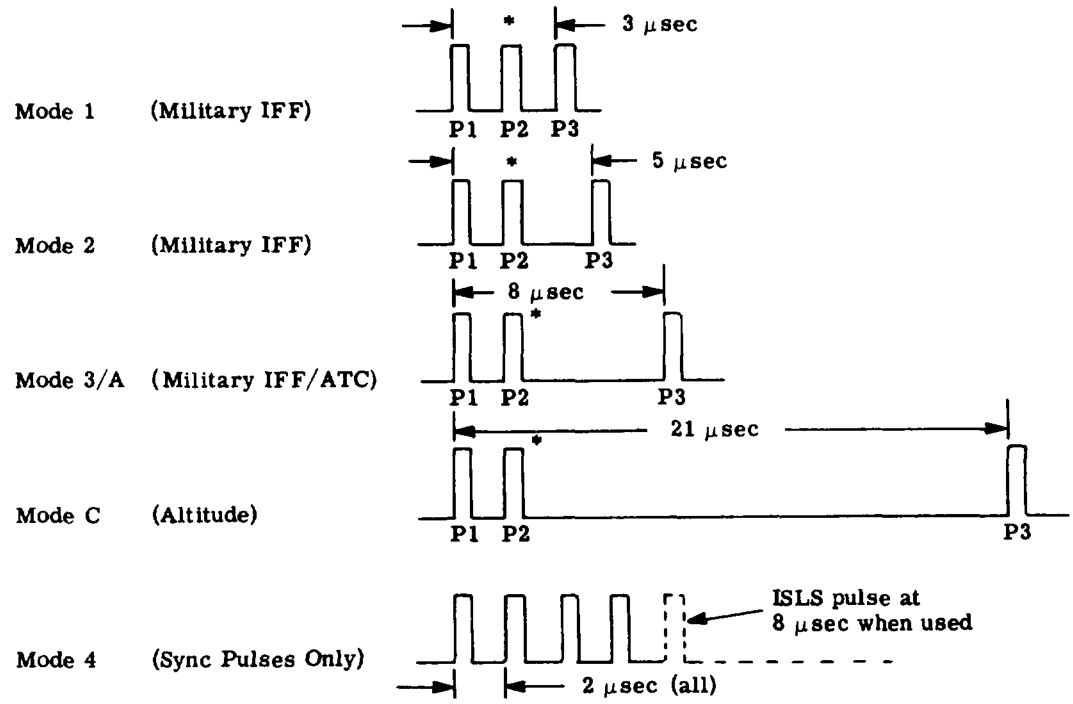
a. SIMULATION OF CODED INTERROGATION SIGNALS. - With the exception of the Mode 4 interrogation signal, the interrogate ions are made up of a simple code involving two pulses spaced to indicate the mode of interrogation (figure 3-5). Simulated signals of this type are supplied by the Interrogation Coder in the Radar Test Set. For Mode 4 interrogations, the pulse modulation signal must be obtained from an external source. This Mode 4 code signal may contain up to 37 pulses (including four synchronizing pulses which are supplied by this equipment). The special case of a simulated interrogation signal containing an ISLS (Interrogation Side Lobe Suppression) pulse is explained below.

(1) ISLS CHECKING. - To prevent a transponder from responding erroneously to an interrogation signal which is transmitted on a lobe other than the main lobe of an essentially directional sending antenna, another signal is also sent out from an omnidirectional antenna (or "sum and difference" antenna array) for use as a reference. Since the signal from an omnidirectional antenna will have the same strength in all directions, it is possible to distinguish the main lobe signal from the side lobe signals by means of their relative amplitudes. In the "sum and difference" system the difference will be accentuated by the cardioid reference pattern. The Radar Test Set has the capability to provide signals for checking transponders designed to operate in this manner. A simulated ISLS pulse is added to the normal interrogation pulses for this purpose (figure 3-6). By varying the relative amplitudes of the pulses, the reception pattern from any type of antenna lobe can be simulated. The position of the ISLS pulse may be varied ±0.8 usec from nominal by means of the SUB PULSE POSITION control. when this control is in the detented "O" position, the ISLS pulse follows the P1 pulse by 2 ± 0.05 usec.

b. SIMULATION OF CODED REPLY SIGNALS. - The basic IFF response signal consists of a pair of pulses spaced 20.3 'microseconds apart. (These pulses are sometimes referred to as "framing' pulses or start and stop "bracket"

TABLE 3-2. INTERROGATION CODER OUTPUT PULSES

MODE SELECTOR SWITCH POSITION	TYPE OF OUTPUT	PULSE DURATION	PULSE SPACING (Microseconds)
Sync M4	4 sync pulses	0.4 to 0.6 usec (O. 5 nom)	1.3 to 2.7 (2 nominal)
1	Paired pulses	0.35 to 1.3 usec (O. 8 nom)	2.3 to 3.7 (3 nominal)
2	Paired pulses	0.35 to 1.3 usec (O. 8 nom)	4.3 to 5.7 (5 nominal)
3/A	Paired pulses	0.35 to 1.3 usec (O. 8 nom)	7.3 to 8.7 (8 nominal)
C	Paired pulses	0.35 to 1.3 usec (0.8 nom)	20.3 to 21.7 (21 nominal)



NOTES:

1. *P2 present when ISLS is used and is speced 2 μsec from P1 in all cases shown above.
2. All pulse widths 0.8 μsec, except Mode 4 sync pulses which are 0.5 μsec wide.

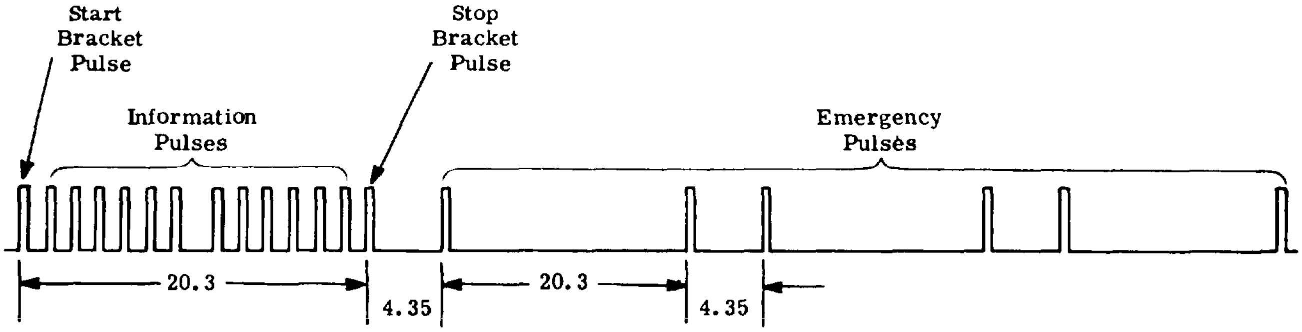
Figure 3-5. Interrogation Pulse Patterns

pulses.) Additional information pulses (up to 12) are inserted between the bracket pulses according to the SIF code plan (figure 3-2). Simulated signals of this type are supplied by the SIF Coder. Certain variations to this basic code pattern for emergency and special identification purposes are explained below.

(1) EMERGENCY REPLIES. - In order to indicate an emergency condition, a transponder may be operated so that it transmits a special readily-identified signal. This signal consists of one pair of bracket pulses which enclose any preselected information pulses, followed by three additional (empty) pairs of pulses having the same characteristics as the bracket pulse, with a 4.35 ± 0.1 microseconds separation between the pairs (figure 3-6). This pulse group will be repeated once for each prf trigger period. Radar Test Set AN/UPM-98A has the capability of simulating this emergency signal for testing interrogator-receivers designed to receive this type of signal. In addition to this simulated emergency signal, the AN/UPM-98A has a capability for inserting an 'X' pulse into the train (in the center of the information pulses). Although the X pulse is not normally used in actual transponder replies, this signal may be used for special tests requiring it.

(2) IDENTIFICATION OF POSITION REPLIES. - In order to identify an individual aircraft (locate its position on the radar screen) in a group of aircraft all replying with the same basic code number, a special identifying signal may be sent out by the transponder. This signal consists of the basic coded pulse train, followed by an additional single ID pulse (having the same characteristics as the bracket pulses) spaced a distance of 24.65 ± 0.1 microseconds after the first bracket pulse (figure 3-2). This pulse group will be repeated once for each prf trigger period. The AN/UPM-98A has the capability of simulating this signal for testing interrogator-receivers designed to receive it.

(3) MODE IDENTIFICATION PULSES,- When a complex video signal containing two or more replies to interrogations in more than one mode is fed to the decoder from the IFF/SIF receiver, it is necessary to correlate each reply with the mode of transmission to which it responded. This mode



NOTES

1. All spacings in microseconds
2. All pulses 0.45 microsecond wide
3. Information pulses show coded number 7777

Figure 3-6. Emergency Reply Pulse Pattern

identification is accomplished by "labeling" the received pulse train with a set of the interrogation pulses which were sent out by the interrogating transmitter. (When an ISLS pulse is present in the interrogation, it will also appear in the mode identification signal.) The identification pulses are superimposed upon the video signal so that the leading edge of the last of the identification pulses is 14 microseconds ahead of the first framing pulse (figure 3-7). (First framing pulse 40 ± 4 usec after O trigger, last identification pulse 26 ± 1 usec from O trigger). For all modes but Mode 4, the Identification pulses will consist of two pulses (plus a third pulse when ISLS is used). For Mode 4, they will consist of four pulses spaced two microseconds apart (corresponding to the Mode 4 synchronizing pulses). In Mode 4, a fifth pulse will be present 8 microseconds after the first identification pulse when ISLS is used. Radar Test Set AN/UPM-98A has the capability for simulating signals of this type for testing equipment designed to use these signals.

NOTE

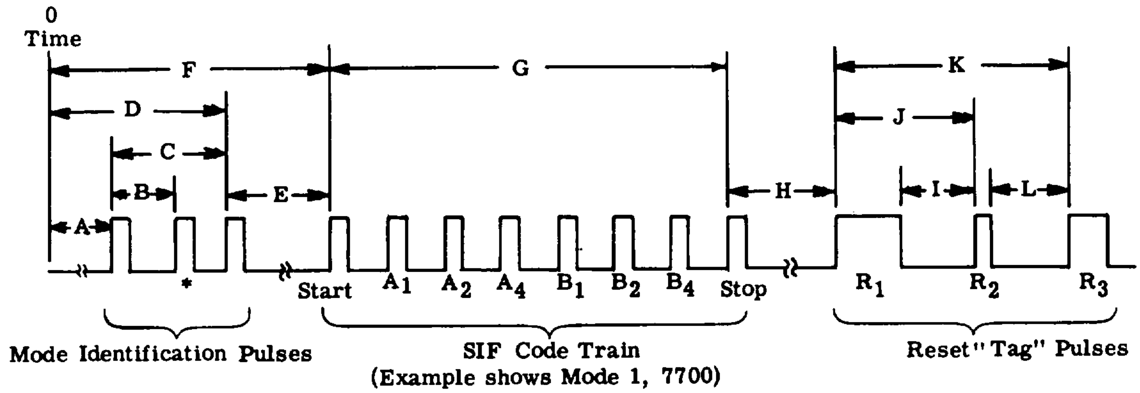
The mode identification pulses are sometimes called "tags", but to avoid confusion with the reset tag pulses, they will be called mode identification pulses herein.

(4) RESET TAG SIGNAL. - When interrogations and replies are transmitted in two or more interlaced modes, the transponder sends a signal indicating the end of the reply, enabling the decoder to reset to the normal condition where it awaits the arrival of the next reply in another mode. This reset signal consists of three "tag" pulses (figure 3-7) having distinctive pulse widths and spacings. The first pulse is 8 ± 0.25 usec wide, the second is 2.0 ± 0.25 usec wide, and the third is 4 ± 0.25 usec wide. The first pulse is placed 24 usec after the leading edge of the last pulse of the coded pulse train, the second pulse 10 ± 0.1 usec later, and the third is 15 ± O. 1 microseconds later. When only a normal pulse train is present in the reply, the first reset tag pulse will follow the stop bracket pulse by 24 usec; when the ID pulse is present, the first reset tag pulse will follow the ID pulse by 24 usec, and when an emergency train is present, the first reset tag pulse will follow the last pulse of the third empty pulse pair by 24 usec (figure 3-7). Radar Test Set AN/UPM-98A simulates this signal, providing a set of three tag pulses which may be superimposed upon the composite video signal.

(5) INTERLEAVED REPLY SIGNALS. When checking the capability of a receiver to process multiple replies, two separately variable reply signals are injected simultaneously into the receiver under test. The spacing of the two pulse signals is varied to check that the signals are individually processed and decoded correctly within the specified range of spacing. Also the pulse spacing is adjusted to overlap so as to cause garbling, checking the ability of the receiver to recognize and reject this kind of signal. The AN/UPM-98A has the capability of producing a signal of this kind for making such tests.

3-3. PREPARATION FOR USE .

If the test set has not previously been prepared for use, or if it has been relocated, follow the instructions in Section 2 of this manual. To prevent damage to the equipment, give special attention to the data regarding input voltage adjustment, electrical grounding of the equipment, and preliminary control settings.



*This pulse is present in simulated signal when ISLS is used.

A = 23 µsec
B = 2.0±0.05 µsec
C = 3.0±0.1 µsec
D = 26±1.0 µsec
E = 14±1.0 µsec
F = 40±4 µsec
G = 20.3 µsec
H = 24±2 µsec
I = 2 µsec
J = 10.0±0.1 µsec
K = 15.0±0.1 µsec
L = 3 µsec

Mode Identification Pulse Width — 0.8 µsec
SIF Code Pulse Width — 0.45 µsec
Reset Tag Pulse R1 Width — 8±0.25 µsec
Reset Tag Pulse R2 Width — 2±0.25 µsec
Reset Tag Pulse R3 Width — 4±0.25 µsec

Figure 3-7. Typical Composite SIF Video Pulse Pattern with Mode Identification Pulses and Reset Tag Pulses Added.

3-4. OPERATING PROCEDURES.

a. DESCRIPTION OF CONTROLS. - All controls required for normal operation of the test set are located on the front panels and are illustrated in figures 3-1 and 3-4. Tables 3-3 through 3-10 list all controls required by the operator for normal use of the equipment. The right column of the table describes the function of each control.

b. SEQUENCE OF OPERATION.

(1) BEFORE USE.

(a) PRELIMINARY CONTROL SETTINGS. - Before the test set is energized, operating controls should be set to the positions indicated in table 2-1. These settings ensure correct operation and prevent accidental damage to the test set or to the equipment being tested. Begin each testing procedure with these settings and change them only as required by the test being performed.

(b) APPLICATION OF POWER. - After controls have been set as shown in table 2-1, apply external power as explained in paragraph 2-3. Place POWER switches of Radar Test Set TS-1253A/UP and Coder Simulator SM-197A/UPM-98 in ON position. The POWER ON indicator lamp above each switch should light.

TABLE 3-3.
DISPLAY UNIT CONTROLS AND INDICATORS

NAME	FUNCTION
INTEN(Intensity) Control 1R74A	Adjusts brilliance of oscilloscope trace
FOCUS Control 1R74B	Controls focus (sharpness) of oscilloscope trace
HOR(Horizontal) Control 1R47B	Adjusts horizontal position of oscilloscope pattern
VERT (Vertical) Control 1R47A	Adjusts vertical position of oscilloscope pattern
75Ω switch 1S1	Switches in and out 75-ohm termination across VIDEO input connector
VOLTS/IN Switch 1S2	Nine-position rotary switch Selects one of nine oscilloscope vertical sensitivites. Calibrated in volts per inch

TABLE 3-3. DISPLAY UNIT
CONTROLS AND INDICATORS (Cont.)

NAME	FUNCTION
VOLTS/IN Switch 1S2 (Cent.)	(Determines display pattern size for a given signal amplitude)
VIDEO SENS (Sensitivity) Control 1R41	Adjusts the height of oscilloscope pattern within the ranges of the VOLTS/IN switch. (Normally set to CAL position.)
SCALE Control 1R59B	Adjusts brightness of illumination of the scale on the face of the cathode ray tube
AST IG (Astigmatism) Control 1R59A	Corrects for uneven focusing on oscilloscope

TABLE 3-4.
SWEEP AND INTENSITY MARK UNIT
CONTROLS AND INDICATORS

NAME	FUNCTION
SWEEP SPEED RANGE 2A3	Determines the range of oscilloscope sweep speeds to be used
SWEEP SPEED ADJUST 2R29 A&B	Adjusts sweep speed within the range setting of the SWEEP SPEED RANGE switch
DE LAY STROBE TRIGGER Switch 2S1	Permits temporary return to "ZERO" time triggers while displaying a video mark for the location of the delayed trigger
DE LAY STROBE SWEEP Switch 2S4	Permits temporary return to "zero" time sweep while displaying a mark for the beginning of delayed sweep
MARKER TRIGGER NORMAL SWEEP Switch 2S2	Permits intensity markers to be delayed the same amount as sweep
INTENSITY MARKS RANGE Switch 2S6	Selects ***range*** of spacing between intensity marks
INTENSITY MARKS LEVEL Control 2R95	Adjusts brightness of intensity marks on the display

TABLE 3-5. CRYSTAL MARK AND SYNC UNIT
CONTROLS AND INDICATORS

NAME	FUNCTION
SWEEP DELAY RANGE Switch 3S3	Six position rotary switch concentric with SWEEP DELAY COARSE control. Positions marked 0, 1-11, 11-21, 21-31, 5-50, 50-750. Determines range of oscilloscope sweep delay
SWEEP DELAY COARSE 3R1OO	Provides coarse adjustment of sweep delay within range set by SWEEP DELAY RANGE switch in coarse positions (5-50 and 50-750)
SWEEP DELAY FINE Control 3L5	Provides fine adjustment of sweep delay within fine ranges set by SWEEP DELAY RANGE switch
TRIGGER DELAY RANGE Switch 3S2	Four-posit ion rotary switch concentric with TRIGGER DELAY COARSE CONTROL. positions marked O, 1-11, 5-50, 50-750. Determines range of oscilloscope trigger delay
TRIGGER DELAY COARSE CONTROL 3R72	Provides coarse adjustment of trigger delay within coarse range (5- 50 and 50-750) set by the TRIGGER DELAY RANGE switch
TRIGGER DELAY FINE Control 3L3	Provides fine adjustment of trigger delay within fine ranges set by the TRIGGER DELAY RANGE switch
SYNC SELECT Switch 3S1	Determines type of synchronizing trigger to be used to establish "zero time"
XTAL MARK LEVEL Control 3R64	Controls amplitude of markers generated by crystal controlled oscillator
PRF Control 3R38A	Adjusts pulse repetition frequency of internal triggers.
SUP (Suppress) Control 3R38B	Adjusts duration length of suppressor pulse

TABLE 3-6
SIF CODER CONTROLS AND INDICATORS

NAME	FUNCTION
CODE Switch 4S5A	Selects "A" pulses for SIF pulse code trains

TABLE 3-6. SIF CODER
CONTROLS AND indicators (Cent.)

NAME	FUNCTION
CODE Switch 4S5B	Selects "B" pulses for SIF pulse code trains
CODE Switch 4S4A	Selects "C" pulses for SIF pulse code trains
CODE Switch 4S4B	Selects "D" pulses for SIF pulse code trains
FUNCTION Selector 4S1	Six-position rotary switch. Determines type of output appearing at MOD DRIVE and VARI OUTPUT connectors. Positions marked: I – Interleaved Code pulse train N – Normal code pulse train I D – Normal code pulse train plus ID (Identification of position) pulse X — Normal code pulse train plus X (center) pulse EMER+X – Normal code pulse train plus X pulse, followed by 3 pairs of bracket-type pulses EMER – As above but without X pulse
SUB PULSE SELECT Switch 4S2	Determines which pulse in the pulse train is to be removed and replaced by a substitute pulse
LEVEL Switch 4S3	Selects high or low amplitude level of the pulse train output at the VARI OUTPUT (variable output) connector
SUB PULSE POS Centrol 4L27	Varies position of the substitute pulse
PULSE WIDTH Control 4R49	Varies width of pulses in the pulse train
AMPLITUDE Control 4R91	Adjusts amplitude of pulses at VARI OUTPUT receptacle within range setting of LEVEL switch
INTERLEAVE Control 4R148	A variable resistor concentric with FUNCTION switch. Varies position of second (delayed) pulse train following normal train in interleaved signal

TABLE 3-7. RADAR TEST SET TS-1253A/UP
CONTROLS AND INDICATORS

NAME	FUNCTION
POWER Switch	Two position toggle switch, turns power on and off for TS-1253A
POWER ON light	Indicates TS-1253A/UP power is on
Fuse Indicators	Two self-indicating fuses. When the neon bulb is lit, it indicates that fuse is blown

TABLE 3-8. CALIBRATION- CONTROL UNIT
CONTROLS AND INDICATORS

NAME	F UNCTION
METER SELECT Switch 9S3	Four-position rotary switch, concentric with WM SENS control. Determines meter function to be used. Positions marked as shown below: CAL – In this position, the calibration signal level is adjusted for a full scale meter indication by means of the CAL ADJ control WM - In this position, the meter shows the wavemeter voltage, giving a dip as an indication of the resonance point 5000 PRF – In this position, the prf counting circuit is switched in and the meter is calibrated to indicate 5000 pps full scale 500 PRF - In this position, the prf counting circuit is switched in and the meter is calibrated to indcate 500 pps full scale
WM SENS Control 9RS1	Controls gain of wavemeter indicator amplifier
VIDEO OUT Switch 9S2	Ten-position rotary switch. Positions marked as shown below:

TABLE 3-8. CALIBRATION-CONTROL UNIT CONTROLS AND INDICATORS (Cent.)

NAME	FUNCTION
VIDEO OUT Switch 9S2	50 - In this position the calibration pulse at the VIDEO OUT connector has a 50-volt amplitude 10 - Same as above, but 10 volts 5 - Same as above, but 5 volts 2 - Same as above, but 2 volts 1 - Same as above, but 1 volt .5 Same as above, but 0.5 volt .1 Same as above. but 0.1 volt POWER - In this position, peak pulse amplitude of the video signal from the demodulator is available for power measurement on the oscilloscope SHAPE - In this position, video with minimum distortion is available for waveshape observation SC MON - In this position. a small portion" of the rf signal from the demodulator is made available at the VIDEO OUT connector for monitoring

TABLE 3-8. CALIBRATION- CONTROL UNIT CONTROLS AND INDICATORS (Cent.)

NAME	FUNCTION
CAL ADJ (FULL SCALE) Control 9R45	Adjusts meter current for full scale needle deflection when reading calibration pulse amplitude
TRIGGER Selector 9S1	Three position rotary switch. Positions marked as shown below: DEMOD - In this position, the output of the demodulator is fed to the pulse counting circuits INT - In this position, the internally generated trigger pulses are counted EXT - In this position, external pulses for the TRIGGER INPUT connector are counted, (using a patch connection)
METER 9M1	Indicator for wavemeter resonance, prf counting, and pulse calibration

TABLE 3-9.
INTERROGATION CODER CONTROL

NAME	FUNCTION
Function Selector 12S4	Seven-position rotary switch, concentric with VIDEO LEVEL control. Determines type of signal to be used as modulation and to appear at CODER OUT connector. Positions marked as shown below:

TABLE 3-9. INTERROGATION CODER CONTROLS (Cont.)

NAME	FUNCTION
Function Selector 12S4 (Cont.)	MOD-HIGH - In this position, high level external video signals (20 to 35v) fed into the MOD connector, are applied to the modulator for modulating the rf signal
	MOD- LOW - In this position, low level external video signals (3 to 20v) fed into the MOD connector, are applied to the modulator for modulating the rf signal
	MOD- INT - In this position, an internally generated video signal is applied to the modulator for modulating the rf signal
	MOD-MIX - In this position, a mixed internal and external video signal (including code and mode identification pulses) is applied to the modulator for modulating the rf signal
	TEST - In this position, the same video signal as in MOD MIX position is made available at CODER OUT connector for monitoring and test purposes
	(+) - In this position, the modulating signal is removed from the modulator and is made available in a positive polarity at the

TABLE 3-9. INTERROGATION CODER CONTROLS (Cent.)

NAME	FUNCTION
Function Selector 12S4 (Cont.)	CODER OUT connector
	(-) - In this position, the modulating signal is removed from the modulator and is made available in a negative polarity at the CODER OUT connector
VIDEO LEVEL Control 12R11	Adjusts level of video signal selected by the Function Select or
Mode Selector 12S5	Five-position rotary switch, concentric with CODE LEVEL control. Positions marked as shown below :
	SYNC M4 - In this position, a series of 4 pulses is internally supplied for use at the beginning of an interrogation train supplied from an external source (up to 37 pulses total). The pulses are 0.5 ± 0.1 usec wide and spaced 2 l O. 1 usec apart
	1 - In this position, a mode 1 interrogation signal is generated con. sisting of two pulses which are variable in width from 0.35. to 1.3 usec and in spacing (by substitution) from 2.3 ±0.05 to 3.7 ±0.05 usec (normally 3.0 usec)
	2 - In this position, a mode 2 interrogation signal is generated con sisting of two

TABLE 3-9. INTERROGATION CODER CONTROLS (Cont.)

NAME	FUNCTION
Mode Selector 12S5 (Cont.)	pulses which are variable in width from 0.35 to 1.3 usec and in spacing (by substitution) from 4.3 ± 0.05 to 5.7 ± 0.05 usec (normally 5.0 usec) 3 - In this position, a mode 3/A interrogation signal is generated consisting of two pulses which are variable in width from 0.35 to 1.3 usec and in spacing (by substitution) from 7.3 ± 0.05 to 8.7 + 0.05 usec (normally 8.0 usec) **C** - In this position, a Mode C interrogation signal is generated consisting of two pulses which are variable in width from 0.35 to 1.3 usec and in spacing (by substitution) from 20.3 ± 0.05 to 21. 7,* 0.05 usec (normally 21.0 usec)
CODE LEVEL Control 12R12	Adjusts the level of interrogation pulses selected by Mode Selector
Substitute Pulse Selector 12S6	Nine-position rotary switch, concentric with CODE WIDTH control. Positions marked as shown below: RESET (1) - In this position, the second reset tag pulse is removed and a variable posit ion pulse substituted for it

TABLE 3-9. INTERROGATION CODER CONTROLS (Cont.)

	FUNCTION
	RESET (2) - In this position, the third reset tag pulse is removed and a variable position pulse substituted for it M4 SYNC (l)-In this position, the second Mode 4 synchronizing pulse is removec and a variable-position pulse substituted for it M4 SYNC (2)-In this position, the third Mode 4 synchronizing pulse is removed and a variable-position pulse substituted for it M4 SYNC (3)-In this position, the fourth Mode 4 synchronizing pulse is removed and a variable-position pulse substituted for it M4 8 usec - In this position, the 8 usec ISLS pulse (when inserted by the ISLS Selector) is removed and a variable- position pulse substituted for it P3 - In this position, the third (last) pulse in the IFF/SIF interrogation is removed and a variable-position pulse substituted for it P2 - In this position, the second (ISLS) pulse in the IFF/SIF interrogation is removed and a variable-position pulse substituted for it

TABLE 3-9. INTERROGATION CODER CONTROLS (Cont.)

NAME	FUNCTION
Substitute Pulse Selector 12S6 (Cont.)	OUT - In this position, no substitute pulses are used
CODE WIDTH Control 12R5	Adjusts width of all pulses in IFF/SIF code train
SUB PULSE Posit ion Control 12L1	Variable drive coil on substitute pulse delay line 12DL1; enables continuous variation ± 3.5 usec from normal position for substitute pulses. Detented at 0, ± .2, and ± .7 positions
ISLS Selector 12S7	Six-position rotary switch, concentric with ISLS WIDTH control. Positions marked as shown below:
	OUT - In this position, no ISLS pulse is used
	EXT - In this position, a trigger signal (3 to 35v) fed into the ISLS connector from an external source is applied to the ISLS oscillator, producing an ISLS pulse (P2) 2 l 0.05 usec after the first Mark X interrogation pulse (Pl)
	CHECK - In this position, the ISLS pulse generator is triggered in coincidence with the first pulse (P1) of the Mark X interrogation. This condition is used for checking the frequency of the variable rf oscillator (1030 mHz) by zero-beating with. the signal from the precision ISLS oscillator
	2 usec - In this position, the ISLS pulse (P2) is triggered 2 ± 0.05 microseconds after the first interrogation pulse (Pi). This is the normal position for the

TABLE 3-9. INTERROGATION CODER CONTROLS (Cont.)

NAME	FUNCTION
ISLS Selector 12S7 (Cont.)	pulse when using the three-pulse ISLS system
	2 PULSE- In this position, the ISLS pulse (P2) replaces the last interrogation pulse (P3) forming the two-pulse ISLS pattern
	8 usec In this position, (used for Mode 4 only) an ISLS pulse is triggered 8 ± 0.05 usec after the first mode 4 synchronizing pulse
ISLS WIDTH Control 12R7	Adjusts the width of the ISLS pulse from O. 5 to 1 usec
ISLS LEVEL Control	Adjusts the power of the rf ISLS pulse from approximately 1.5 db above the variable signal generator level to a value 12 db below it
VIDEO Selector 12S8	Three-position rotary switch. Positions marked as 'shown below:
	CODE - In this position, only the normal interrogation pulses are present in the out put
	RESET - In this position, only the three reset tag pulses (undelayed) are present in the output
	BOTH - In this position, the interrogation pulses are present for use as mode identification tags (when combined with the SIF Coder output). The reset tag pulses, delayed 24 ± 2 usec after last pulse of coder output, are also present (to be put into place after the SIF pulse train)

TABLE 3-9. INTERROGATION CODER CONTROLS (Cont.)

NAME	FUNCTION
TRIG Connector Terminating Switch (75Ω) 12s2	Two-position toggle switch. In the 75Ω position, the TRIG connector is terminated in 75 ohms
ISLS Connector Terminating Switch (75Ω) 12S3	Two-position toggle switch. In the 75Ω position, the ISLS connector is terminated in 75 ohms.
MOD Connector Terminating Switch (75Ω) 12S1	Two-position toggle switch. In the 75Ω position, the MOD connector is terminated in 75 ohms.

TABLE 3-10. CODER SIMULATOR DRAWER CHASSIS FRONT PANEL CONTROLS AND INDICATORS

NAME	FUNCTION
ATTENUATION Control 8MP4	Adjusts amplitude of rf signal generator output.
SG FREQUENCY Control 8MP5	Adjust frequency of rf signal generator output.
WAVEMETER INPUT Switch 8S1	Three-position rotary switch. Selects either signal generator or demodulator output for application to the wavemeter (or "OFF" condition).
WAVEMETER FREQUENCY Control 8MP3 or 41	Adjusts wavemeter resonance frequency for signal frequency measurement.
CAL Control 8MP40 (AN/UPM-98B, AN/UPM-98C only)	Calibrates wavemeter indicator.
WAVEMETER CAL MKR Switch 8S4 (AN/UPM-98B, AN/UPM-98C only	Applies 20 mHz calibrating signal to wavemeter.
POWER Switch 8S2	Turns power to the Coder Simulator on and off.
POWER ON light 8DS1	When lit, it indicates power is applied to Coder Simulator.
Fuse Indicators 8F1 and 8F2	When lit, indicates the associated fuse is open.

(2) DURING USE.

(a) OSCILLOSCOPE. To operate the oscilloscope in the Display unit, proceed as follows:

Step 1. Rotate INTEN control on Display unit clockwise until the trace is visible.

step 2. Adjust FOCUS AND ASTIG controls on Display unit for sharpest and most even trace.

Step 3. Set the SWEEP SPEED RANGE and ADJUST controls on the Sweep and Intensity Mark unit for the desired horizontal sweep length.

step 4. Set the VOLTS/IN switch on Display unit to required vertical sensitivity in volts per inch.

Step 5. Connect the signal to be displayed to VIDEO input connector on the Display unit, using Test Lead MX-2681/UP or a CG–530/U cable assembly.

Step 6. If intensity markers are required, set INTENSITY MARKS RANGE switch on the Sweep and Intensity Mark unit to desired position and adjust INTENSITY MARKS LEVEL control for desired marker amplitude.

Step 7. If crystal controlled markers are required, set SYNC SELECT switch on the Crystal Mark and Sync unit to either INT 1.45 or INT 1.00 and adjust the XTAL MARK LEVEL control for proper marker amplitude.

(b) TRIGGER AND SUPPRESSOR PULSE APPLICATION.

1. SUPPRESSOR PULSE APPLICATION. When it is necessary to suppress or gate the output of a radar transmitter or other equipment associated with the equipment under test, connect the SUP TRIGGERS connector on the Crystal Mark and Sync unit to the suppressor input connector on the external equipment, using CG-530B/U cable. The positive suppressor pulse is of an amplitude between 10 and 30 volts into a 500 ohm load or not less than 3 volts into a 76 ohm load. The pulse width can be adjusted from 2 to 220 micro-seconds by means of the SUP control.

2. EXTERNAL TRIGGERING OF TEST SET. The test set may be triggered by an external synchronizing trigger signal having the following characteristics:

Pulse repetition frequency: 15 ot 4100 pps
Pulse duration: 0.3 to 25 µsec
Amplitude: 3 to 35 volts across 76 ohms
Rise time: less than 0.5 µsec

If the equipment under test includes such a trigger signal output which is known to be working properly, trigger the test set as follows:

step 1. Start and warm up both pieces of equipment.

Step 2. Connect trigger output from the equipment under test to the INPUT TRIGGER connector on the Crystal Mark and Sync unit, using a CG-530B/U cable assembly.

Step 3. Set the SYNC SELECT switch on the crystal Mark and Sync unit to the EXT + or the EXT – position, depending upon the polarity of the input trigger.

3. INTERNAL TRIGGERING OF TEST SET. When the equipment under test does not provide a trigger pulse, or the trigger source is not

operating properly, the test set can be triggered internally. In such cases, proceed as follows:

Step 1. Start test set.

Step 2. Set SYNC SELECT switch on the Crystal Mark and Sync unit to the INT, INT 1.45, or INT 1.00 position. When the switch is in the INT position, the test set is not synchronized with the markers; the sync pulse circuit is free-running and its pulse repetition frequency may be adjusted from 15 to 4100 pps by means of the PRF control. When the SYNC SELECT switch is in the INT 1.45 position, the internal sync pulse source is locked to the crystal-controlled 1.45 usec (689 kHz) markers. In the INT 1.00 position the sync pulse source is locked to the crystal controlled 1.00 usec (1 mHz) markers. In both cases the prf at the "O" trigger connector is variable between 15 and 4100 pps.by the PRF control.

Step 3. To find the approximate pulse repetition frequency of internal or external trigger pulse signals, use the pulse counter as described in paragraph 3-5k.

4. UNDELAYED TRIGGERING OF EXTERNAL EQUIPMENT.

Step 1. Trigger the test set as described above.

Step 2. Connect the external equipment to be triggered to the O TRIGGERS connector using CG-530B/U cable assembly. The trigger pulse supplied at this connector must be of positive polarity, with a fixed duration of approximately 2 microseconds, an amplitude of 50 to 100 volts into a 500 ohm load paralleled with 175 pf, or not less than 20 volts into 75 ohms paralleled with 1100 pf, and having a rise time of O. 2 microseconds. The pulse must be delayed not more than 0.25 microsecond from the leading edge of an external trigger pulse at the INPUT TRIGGERS connector.

5. DELAYED TRIGGERING OF EXTERNAL EQUIPMENT.

Step 1. Trigger test set as described in paragraph 3-4b (2) (b) 3 or 4 above.

Step 2. Set TRIGGER DELAY RANGE switch to a range position which includes the desired delay time.

Step 3. Adjust TRIGGER DELAY FINE and COARSE controls for the desired delay. The COARSE control can set the trigger delay to within approximately 1,0 microsecond of the desired delay, The FINE control can adjust the delay to within 0.05 microsecond by using the calibration markers.

Step 4. Connect the equipment to be triggered to the DELAYED TRIGGERS connector using CG-530 B/U cable. The trigger pulse obtained from this connector will have the characteristics described in step 2 of paragraph 3-4 b (2) (b) 4.

(3) AFTER USE. - After completion of tests using Radar Test Set AN/UPM-98A, place POWER switches on both Radar Test Set TS-1253A/UP and Coder Simulator SM-197A/UPM-98 in OFF posit ion. Disconnect all the interconnecting cables between the radar test set and the equipment under test.

(4) SECURING THE TEST SET. - After completing test using Radar Test Set AN/UPM-98A and disconnecting the interconnecting cables between the test set and the equipment under test secure the test set as follows:

Step 1. Disconnect and remove all external video and rf intereconnnecting cables from the test set and place them in Accessories Case CY-2725/UPM-98.

Step 2. Remove all connector adapters, if any were used. Place them in proper stowage locations in Accessories Case.

Step 3. Remove Test Lead MX-2681/UP and Cathode Ray Tube Visor MX -2953/UPM, if they were used, and place them in proper compartments in the Accessories Case.

Step 4. Close Accessories Case and store it together with Radar Test Set AN/UPM-98A for future use.

c. PRECAUTIONS.

(1) GENERAL. -Damage to either the test unit or the equipment being tested may result from improper use. Usually, damage is caused by application of input signals with excessive peak amplitudes or by application of signals having excessively high duty cycles.

(2) DUTY CYCLE LIMITATIONS. - Care must be taken not to apply signals having excessive duty cycles (pulse duty factors) to either the equipment under test or to the test equipment. When the O or DELAYED output trigger pulses are used to trigger external equipment, determine the duty cycle limitation of the external equipment, and calculate the duty cycle of the test set output signals from the formula given below. Adherence to this precaution will prevent damage to pulse-modulated microwave circuits and decoder circuits. Usually the duty cycle limit of this type of equipment is about 2 percent.

To calculate the duty cycle (pulse duty . factor) of a pulse signal, it is necessary to determine the ratio of the "on" time to the total time period under consideration. When the pulses are of equal widths, the number of pulses in each prf period (N) is multiplied by the pulse width (D) to obtain the "on" time for each prf period. The "on" time figure is multiplied by the prf figure (equivalent to dividing by its reciprocal, the prf period) and the result is multiplied by 100 to obtain the duty cycle figure in percent.

Duty Cycle in %= N x D x F x 100

Where: N=number of pulses per prf period
D=pulse duration in seconds
F=pulse repetition frequency (basic prf of system)

When pulses having different widths from the normal are present in the train, the widths of these pulses should be separately summed and added to the ND product in the above formula.

The SIF Coder is designed to safely handle signals of any duty cycle normally applied to it from the Crystal Mark and Sync unit. However, when the SIF Coder is triggered from an external source, the duty cycle might be greater. Using the formula above, calculate the duty cycle of the external signal. It should not exceed 6 percent. As a general rule, avoid input trigger signals having prf in excess of 4100 pps because of the associated high pulse duty factors.

(3) RAD1O FREQUENCY POWER LIMITATIONS. - Do not apply radio frequency power in excess of 35 watts peak (continuous average of O. 25 watt) to the LP IN connector and do not apply power in excess of 3500 watts peak (continuous average of 5 watts) to the HP IN connector. Signals having ten watts average power may be applied to the HP IN connector for periods up to 5 minutes when not repeated more frequently than every 15 minutes.

(4) TEST LEAD MX-2681/UP LIMITATIONS AND CHARACTERISTICS, - The characteristics of the Test Lead MX-2681/UP are listed in Table 3-11.

TABLE 3-11.
TEST LEAD MX-2681/UP CHARACTERISTICS

ATTEN RATIO	INPUT CAPACITANCE	USEFUL RANGE (pulse amplitude)	SAFE OPERATION LIMITS (Peak ampl)
1:1	—	up to 50 v	50 v
10:1	20 pf	25 to 500 v	500 v
100:1	5 pf	250 to 5000 v	5000 v

(5) USE OF CABLES. - Two types of interconnecting cables are provided for use with the test set. Type CG-409E/U is used for carrying radio frequency energy and has a nominal characteristic impedance of 53.5 ohms. Type CG-530B/U is video frequency cable having a nominal characteristic impedance of 93 ohms. The CG-530 B/U cables should not be used for patching radio frequency' signals, since impedance mismatch will result in standing waves and power loss with ensuing errors in measurements.

WARNING

There are dangerous voltages (up to 3000 volts ac) and a high vacuum associated with the cathode ray tube. Exercise care to prevent tube breakage and to avoid injury from electric shock.

(6) CATHODE RAY TUBE PRECAUTIONS. - Avoid the use of excessive intensity on the cathode ray tube display, especially when operating for extended periods of time, or when the Sweep and Intensity Mark unit is not being triggered and the trace is not swept horizontally on the screen. Make a practice of reducing the trace intensity whenever the oscilloscope is not used to prevent screen damage in case the horizontal sweep function should fail.

CAUTION

Always turn the INT control fully counterclockwise, cutting off the electron beam, when the Display unit is removed from the main frame and the sweeps are disabled. An intense electron beam concentrated on a small area will burn a permanent spot in the screen.

3-5. SUMMARY OF OPERATING PROCEDURES.

a. GENERAL. - The following is a short summary of operating instructions for Radar Test Set AN/UPM-98A. If additional information is required, refer to the detailed operating and test procedures in paragraphs 3-4 and 3-7.

b. STARTING THE EQUIPMENT .

Step 1. Connect the test set to a power source.
Step 2. Place POWER switches on both TS-1253A/UP and SM-197A/UPM-98 in ON position.

c. OSCILLOSCOPE OPERATING ADJUSTMENTS.

Step 1. Rotate INTEN control clockwise until trace is visible.
Step 2. Adjust FOCUS and ASTIG (astigmatism) controls for sharpest, most even trace.
Step 3. Set SWEEP SPEED RANGE and ADJUST controls for desired horizontal sweep duration.
Step 4. Set VOLTS/IN switch to required vertical sensitivity in volts per inch.
Step 5. Feed video signal to be displayed into VIDEO input connector using Test Lead MX-2681/UP or CG-530/U cable.
Step 6. If intensity markers are required, set INTENSITY MARKS RANGE switch to desired position and

adjust INTENSITY MARKS LEVEL controI for proper marker display.

Step 7. If crystal markers are required, set SYNC SELECT switch to either INT 1.45 or INT 1.00 and adjust XTAL MARK LEVEL control for proper marker amplitude.

d. SWEEP DE LAY ADJUSTMENT.

Step 1. Set SWEEP DELAY RANGE switch to range position covering the desired delay time. (Ranges are given in microseconds.)

Step 2. For sweep delay ranges 1-11, 11-21, and 21-31, adjust the SWEEP DELAY FINE control for proper delay.

Step 3. For sweep delay ranges 5-50 and 50-750, adjust both the SWEEP DELAY COARSE control and the SWEEP DELAY FINE control for proper delay.

e. TRIGGER DELAY ADJUSTMENT

Step 1. To delay the trigger at the DELAYED TRIGGERS connector, switch to range position covering the desired delay time. (Ranges are given in microseconds.)

Step 2. For trigger delay range 1-11, adjust the TRIGGER DELAY FINE control for proper delay. For trigger delay ranges 5-50 and 50-750, adjust both the TRIGGER DELAY COARSE control and the TRIGGER DELAY FINE control for proper delay.

NOTE

To temporarily return the delayed sweep or trigger to zero time, momentarily hold the DELAY STROBE TRIGGER or SWEEP switch as applicable in its spring-loaded position. This will cause a pip-type marker to be also displayed on the trace at the spot where the delayed sweep or trigger will occur.

f. SIF CODER OPERATING ADJUSTMENT.

Step 1. Connect zero triggers, delayed triggers, or external triggers to TRIGGER INPUT connector.

Step 2. Set FUNCTION and CODE selectors for required pulse train

Step 3. Set LEVEL switch to LO or HI output as required.

Step 4. Connect output video from either MOD OR vari output connector to equipment under test.

NOTE

Video level at VARI OUTPUT connector is continuously variable by means of AMPLITUDE control. Width of the pulses is variable by means of PULSE WIDTH control.

Step 5. If desired, use SUB PULSE SELECT switch to remove (one at a time) any pulse in the train except the start and ID pulses and to substitute a pulse which can be separately positioned by means of the SUB PULSE POS control.

Step 6. If interleaved code pulse train is desired, set FUNCTION switch in I position and adjust delay of the interleaved train as desired with INTERLEAVE control.

g. INTERROGATION CODER OPERATING ADJUSTMENTS.

Step 1. Connect zero triggers, delayed triggers, or external triggers to TRIG connector on the Interrogation Coder.

Step 2. Set Mode Selector switch for required type of output.

Step 3. Place Function Selector switch in (+) or (-) position to obtain desired polarity of output at CODER OUT connector. Set output amplitude by means of CODE LEVEL control and VIDEO LEVEL control.

Step 4. If the ISLS pulse is not desired, set ISLS Selector in OUT position. If three-pulse ISLS is to be simulated, set ISLS Selector in 2 usec position, If two-pulse ISLS is to be simulated, set ISLS Selector in 2 PULSE position. If an externally generated ISLS pulse is to be inserted, set ISLS Selector to EXT and connect external source to ISLS connector. Adjust amplitude of ISLS pulse with ISLS Level control and adjust width with ISLS width control,

Step 5. lf a video output is desired, place Function Selector in (+) or (-) position. If the Interrogation Coder output is to be used to modulate the rf output, set Function Selector to MOD- INT posit ion.

NOTE

The amplitude of the video output at CODER OUT connector is continuously variable by means of the CODE LEVEL and VIDEO LEVEL controls.

Step 6. If desired, select substitute pulse with substitute Pulse Selector switch and use SUB PULSE position control to vary the position of the substitute pulse. Use CODE WIDTH control to vary the width of the output code pulses.

Step 7. If desired to modulate Interrogation Coder with SIF Coder output, connect SIF Coder TRIGGER INPUT to OUT connector on Interrogation Coder; connect SIF Coder MOD DRIVE to MOD connector on Interrogation Coder. Set Interrogation Coder function switch to MOD-MIX.

Step 8. If reset pulses are desired, set VIDEO switch on Interrogation Coder to RESET.

Step 9. If both mode identification pulses and reset tag pulses are desired, set VIDEO switch on Interrogation Coder to BOTH,

h. RF SIGNAL GENERATOR OPERATING ADJUSTMENTS.

Step 1. Apply modulation signal internally from Interrogation Ceder by placing Function Selector switch in MOD-INT position or apply modulation signal from an external source by connecting source to MOD connector, and placing Function Selector switch in MOD-HIGH or MOD-LOW position as applicable.

Step 2. Set SG FREQUENCY dial to required frequency by using applicable graph in Book of Calibration Charts.

Step 3. Set ATTENUATION indicator to proper signal output level.

Step 4. Connect pulsed rf signal from SG OUT connector to equipment under test using CG-409E/U cable.

i. WAVEMETER OPERATING ADJUSTMENTS.

Step 1. Place METER SELECT switch in WM position and set WM SENS control to center of range.

Step 2. To measure frequency of external rf: Signals up to 35 watts in power should be connected to LP IN connector, and signals from 35 to 3500 watts to HP IN connector. Terminate the connector not in use with the attached dummy load plug. Place WAVEMETER INPUT switch in DEMOND position. To measure frequency of internally generated rf: Place WAVE METER INPUT switch in SIG GEN position,

Step 3. On AN/UPM-98B and AN/UPM-98C, calibrate the wavemeter indicator at the nearest marker frequency (a multiple of 20 mHz).

Step 4. Turn WAVEMETER FREQUENCY knob until the meter dips, indicating resonance,

NOTE

To locate precisely the position of maximum needle deflection, it may be necessary to readjust the WM SENS control.

Step 5. On AN/UPM-98A, read the wavemeter dial and determine the actual signal frequency from Book of Calibration Charts. On AN/ UPM-98B and AN/U PM–98C, the wavemeter dial incates the frequency in mHz,

j. DEMODULATOR OPERATING ADJUSTMENTS.

Step 1. Connect external rf signals as in step 2 of Wavemeter Operating Adjustments above.

Step 2. Place VIDEO OUT switch on the Calibration-Control unit in the POWER position to measure the rf signal on oscilloscope, or in the SHAPE position to obtain a signal with less waveshape distortion for waveform observation on the oscilloscope.

Step 3. Connect CG-530/U cable from the VIDEO OUT connector on Calibration-Control unit to the VIDEO input connector on the Display unit.

Step 4. Adjust oscilloscope as in paragraph 3-5C.

k. PULSE COUNTING.

Step 1. Set METER SELECT switch to 5000 PRF.

Step 2. Set trigger switch to INT to count internally generated trigger pulses, to DEMOD to count pulses from the demodulator, or to EXT (using a patch connection) to count external signal pulses at INPUT connector.

Step 3. Read prf directly in pps from meter. If prf is below 500 pps, set METER SELECT switch to 500 PRF and read again.

1. SETTING UP CALIBRATION PULSES.

Step 1. Place METER SELECT switch in CAL position.

Step 2. Place VIDEO OUT switch in the desired CAL PULSE position to obtain a pulse having a precisely measured amplitude for calibration purposes.

Step 3. Adjust CAL ADJ control for full clockwise deflection of meter needle.

Step 4. Connect calibrated pulse signal from VIDEO OUT connector on Calibration-Control unit to equipment under test.

m. TURNING OFF THE EQUIPMENT. To turn off the radar test set, place POWER switch on both Radar Test Set TS-1253A/UP and Coder Simulator SM-197A/ UPM-98 in OFF positions.

n. SECURING THE EQUIPMENT. After using the radar test set, make certain that all the accessories supplied in the Accessories Case are removed from the test set front panel and the equipment under test are returned to the Accessories Case for future use.

3-6. EMERGENCY OPERATION.

a. GENERAL. Radar Test Set AN/UPM–98A consists of the following functional sections which may be operated independently under certain conditions and with the proper modifications:

(1) Oscilloscope (Display Unit)
(2) SIF Coder
(3) Interrogation Coder
(4) Rf Signal Generator
(5) Wavemeter
(6) Demodulator
(7) Pulse Counter
(8) Calibrated Pulse Generator

All of the above sections are capable of independent operation in case of emergency, provided the applicable power supply circuits located in the rear of each drawer chassis are in operable condition and connected to the circuits and proper triggering signals are provided.

b. OPERATION WITHOUT INTERNAL TRIGGERS. - If the internal circuitry for generating either the free-running or the crystal controlled triggers is not functioning properly, the rest of the radar test set can be operated in most cases by supplying a proper external trigger pulse to the INPUT TRIGGERS connector on the Crystal Mark and Sync unit (see paragraph 3-7b (2) (b) (3)).

c. OPERATION WITH DEFECTIVE 0SCILLOSCOPE .- If the oscilloscope circuitry contained in the Display Unit, the Sweep and Intensity Mark unit, and the Crystal Mark and Sync unit of TS-1253A is not functioning properly, it can be substituted with a standard oscilloscope of similar capability, using a common triggering signal source for both pieces of equipment.

3-7. TEST PROCEDURES.

a. PULSE MEASUREMENTS.

(1) GENERAL. - The Display Unit, the Sweep and Intensity Mark unit, and the Crystal Mark and Sync unit of Radar Test Set TS-1253A/UP together comprise a precision oscilloscope on which the horizontal sweep may be delayed with respect to the internal or external trigger pulse to permit viewing any part of a pulse or pulse train. Measurements of pulse characteristics can be made by following the procedures given below.

(2) SWEEP AND TRIGGER DELAY APPLICATION. - When it is desired to delay the start of horizontal sweep with respect to the synchronizing trigger pulse, proceed as follows:

Step 1. Set SWEEP DELAY RANGE control switch to a range position including the desired sweep delay; adjust SWEEP DELAY COARSE and FINE controls for the amount of delay required. (Rotating controls clockwise will cause the display to move to the left.) In this manner, a single pulse in a train or part of a pulse can be displayed.

Step 2. To view the leading edge of a pulse, the trigger should be delayed with respect to the sweep by means of the TRIGGER DELAY controls. To view the trailing edge of the pulse, the sweep should be delayed with respect to the trigger by means of the SWEEP DELAY controls. Any portion of a pulse *or* pulse train can be observed by gradually delaying trigger or sweep signal until the portion of interest comes into view.

(3) DELAY STROBE APPLICATIONS. - When switching to shorter duration sweeps to display a segment of a pulse or pulse train, it is difficult to locate the exact portion of the display desired by use of delay controls alone. Two DELAY STROBE switches provide a convenient means of locating the portion of the display to be viewed with delayed sweep or trigger. When either of the DELAY STROBE switches is pushed down to the spring-loaded position, the beginning of the horizontal sweep will return to zero time. At the same time, a marker pip will appear on the display, indicating the position of the delayed trigger or delayed sweep start as set by TRIGGER DELAY or SWEEP DELAY controls.

To obtain an expanded view of a part of the display by means of delayed sweep, proceed as follows :

Step 1. Hold DELAY STROBE SWEEP switch down.

Step 2. Adjust SWEEP DELAY RANGE switch and COARSE and FINE controls until marker pip appears under the leading edge of that portion of display to be expanded.

Step 3. Release DELAY STROBE SWEEP switch.

Step 4. Turn SWEEP SPEED RANGE switch and ADJUST control to sweeps of shorter duration to provide expansion of the pattern desired.

Step 5. A slight readjustment of SWEEP DELAY FINE control may be necessary to center the pattern properly on the screen.

To obtain an expanded view of part of the display employing delayed triggers, proceed as follows :

Step 1. Hold DELAY STROBE TRIGGER switch down.

Step 2. Adjust TRIGGER DELAY, COARSE and FINE controls until marker pip appears under the leading edge of the portion of the display to be expanded.

Step 3. Release DELAY STROBE TRIGGER switch.

Step 4. Turn SWEEP SPEED RANGE switch and ADJUST control to sweeps of shorter duration to provide the expansion of the pattern desired.

Step 5. A slight readjustment of TRIGGER DELAY FINE control may be necessary to center the image properly on the screen.

(4) INTENSITY MARKERS. - To superimpose intensity-type time marks (calibrated at time intervals of O. 1, 0.1 and 1, 1, 5, and 50

microseconds) on the horizontal trace for the purpose of measuring displayed waveforms, proceedas follows:

NOTE

In the .1 and 1 position, markers will be spaced at both 0.1 and 1 microsecond intervals. The l-microsecond markers are wider for easy identification.

Step 1. Place intensity MARKERS RANGE switch in the position which provides the desired marker spacing.
Step 2. Adjust brightness of the 1, 5, or 50 microsecond markers as desired with INTENSITY MARK LEVEL control.

NOTE

The 0.1-microsecond markers are not affected by the INTENSITY MARKS LEVEL control.

(5) USE OF CRYSTAL MARKERS. - Crystal-controlled video marker pulses are displayed when the test unit is triggered from the internal crystal oscillator with the SYNC SELECX switch in either the INT 1.45 or the INT 1.00 position. The l-microsecond crystal-controlled markers can be used to check interrogation pulse spacing for the interrogation coder or external source. The 1.45 microsecond markers are provided mainly for checking and calibrating spacing of SIF reply pulse trains from the SIF Coder or from an external source. Turn the XTAL MARK LEVEL control clockwise until markers of the desired amplitude can be seen on the display trace.

(6) SIGNAL TRACING. - The Test Lead MX-2681/UP is supplied with the test set for signal tracing It has a built-in attenuator providing three attenuation ratios: 1:1, 10:1 and 100:1. Whenever possible, use the 100:1 attenuation, since this probe impedance causes the least loading of the circuit under test. When the amplitude of the signal to be checked is low (less than approximately 2 volts), it will be necessary to use the 1:1 or 10:1 attenuation ratio.

CAUTION

Do not use the probe attenuation ratio of 1:1 where voltages in the circuit under test are over 500 volts dc. Do not use the 10:1 attenuation ratio in circuits where the voltage is over 1000 vdc. Do not use the video probe on circuits where voltages exceed 5000 volts dc. Do not use the video probe on circuits carrying radio-frequency energy.

NOTE

When using the video probe for pulse amplitude measurements. be certain that the 75Ω switch on the Display unit is in the OUT position, otherwise voltage amplitude indications will not be in accordance with the calibrated settings of the VOLTS/IN switch.

(7) PULSE AMPLITUDE. - To measure amplitude of a video pulse, proceed as follows:

Step 1. Start test set.
Step 2. Trigger test set.
Step 3. Feed video pulse signal to be measured into VIDEO input connector on the Display unit. If pulse signal comes from a high-impedance source, leave 75Ω switch in OUT position. If the pulse signal comes from a low impedance source, set 75Ω switch to IN position. If the signal is picked up through the video probe (test lead), set the 75Ω switch to the OUT position.
Step 4. Adjust SWEEP SPEED and SWEEP DELAY controls for suitable pulse width.
Step 5. Adjust SCALE control until calibration lines are clearly visible.
Step 6. Adjust HOR and VERT controls until bottom of pulse to be measured is aligned with the vertical scale calibration line so that scale divisions can be easily counted.
Step 7. Adjust VOLTS/IN switch to set display pulse amplitude to between one and two inches. Note setting of the VOLTS/IN switch and use the calibrated scale markings to measure amplitude of pulse. Be certain that VIDEO SENS control is in CAL position (fully clockwise).

NOTE

Do not set video probe attenuation to 100:1 for display of signal pulses having durations over approximately 2 usec. In this setting the probe provides only capacitive coupling and longer pulses will be distorted.

(8) PULSE DELAY. - Procedures for measuring the delay between two signal pulses are given below. When the first pulse is coincident with the trigger pulse, proceed as follows:

Step 1. Start test set.
Step 2. Trigger equipment under test using no time delays, as described in paragraph 3-4b (2) (b) 5.
Step 3. Connect delayed pulse to VIDEO input connector on Display unit.
Step 4. Adjust SWEEP SPEED and SWEEP DELAY controls for a convenient view of the delayed pulse, and note its position.
Step 5. Depress DELAY STROBE SWEEP switch and adjust the SWEEP

DELAY control to put the weep delay trigger pulse in the position formerly occupied by the second (delayed) pulse. Use intensity markers to measure time delay of the sweep delay trigger pulse. This is the time delay of the second pulse.

When the first and the second pulses are both delayed from the trigger pulse, separately measure the time delay of each pulse from the trigger using a method similar to that outlined above. The difference between the two delays will give the delay from the first pulse to the second pulse.

(9) PULSE DURATION. - To determine the time duration (width) of a pulse, proceed as follows :

Step 1. Display the pulse on the oscilloscope, using the SWEEP SPEED RANGE switch and the SWEEP SPEED ADJUST control to set the pulse width to a convenient size.

Step 2 Adjust the SWEEP DELAY controls to center the pulse on the screen.

Step 3 Turn the INTENSITY MARKS RANGE switch to the position which superimposes upon the pulse pattern a number of intensity-type time markers having a suitable spacing. (Greatest accuracy will be obtained from the 1 and O. 1 microsecond markers.)

Step 4 Count the number of time intervals marked off between the leading and trailing edges of the pulse. (Standard measurement is between 50% amplitude points on both leading and trailing edges.)

Step 5 Multiply the number of time increments by the length of an increment (INTENSITY MARKS RANGE switch setting) to obtain pulse width.

(10) OVERSHOOT. - Measure the amplitude from the base line of the trace to the peak of the overshoot point as described in paragraph 3-7a (8) and measure the duration of the overshoot interval as described in paragraph 3- 7a(9) above.

(11) PULSE TOP DETERIORATION. - The characteristics of the pulse top, including its deteriorate ion, can be measured by the methods described in paragraphs 3-7a(8) and 3- 7a(9) above. The pulse top is usually considered to be that part of a pulse above the points at 90% of full height on the leading and trailing edges.

(12) RISE AND DECAY TIME. - Rise and decay times are usually defined as the time required to go from 10% of full amplitude to 90% of full amplitude and from 90% of full amplitude to 10% 0f full amplitude, respectively. The measuring procedure is the same as the width measurement described in paragraph 3-7a(9). The vertical scale on the oscilloscope screen can be used as an aid in determining the 10% and 90% points.

(13) PULSE SPACING. - Pulse spacing measuring are made using the procedure for either duration or delay measurement as described in paragraph 3-7a(8) and 3-7a(9), respectively. Spacing is measured from a point on the leading edge of the first pulse to a corresponding point on the leading edge of the other pulse.

b. SIF CODER USE.

(1) GENERAL. - The general SIF pulse code pattern as generated by the SIF Coder is illustrated in figure 3-2 and described in paragraph 3-1 b (2). Simulated SIF codes (set up by the four CODE selectors) can be employed for signal tracing, modulating transmitters under test, and for decoder testing. They also can be used to modulate the rf oscillator in Coder Simulator SM-197A/UPM-98, the output of which in turn can be used to test and adjust receivers, decoders, or transponders.

(2) TRIGGERING. - The SIF Coder can be triggered by external equipment which delivers a positive pulse, or it can be triggered from the Crystal Mark and Sync unit by utilizing the output from the 0 TRIGGERS or DELAYED TRIGGERS connector. The trigger pulse signal is supplied to the TRIGGER INPUT connector on the SIF Coder through a CG-530B/U cable.

(3) PULSE TRAINS. - Five basic types of coded pulse trains can be set up on the SIF Coder. The type is selected by the FUNCTION switch. Table 3-12 gives the makeup of the pulse train for each position of the FUNCTION switch. A sixth FUNCTION switch position provides the combination of a normal and a slightly delayed pulse train to simulate interleaved code replies.

(4) PULSE TRAIN SETTING. - To set up any of the SIF pulse trains, proceed as follows:

Step 1. Start test set.

Step 2. Trigger equipment.

Step 3. Connect TRIGGER INPUT connector on SIF Coder and O TRIGGERS or DELAYED TRIGGERS connector on Crystal Mark and Sync unit as applicable, with CG-530B/U cable.

Step 4. Set the four CODE selectors to the desired code number.

Step 5. Connect VARI OUPUT connector and the VIDEO input connector (on the Display unit) with CG-530 B/U cable.

Step 6. Adjust PRF control for the desired pulse repetition rate (between 15 and 4100 pps).

Step 7. Adjust SWEEP SPEED and SWEEP DELAY controls until the entire pulse train can be seen on the screen.

Step 8. Adjust AMPLITUDE control for desired pulse amplitude. Place LEVEL switch in HI position for for maximum output. Measure amplitude of the pulses using VOLTS/IN switch.

Step 9. Disconnect coaxial cable between VIDEO and VARI OUTPUT connectors. Video output pulse trains can now be used for test

TABLE 3-12. SIF CODER OUTPUTS

FUNCTION Selector Position	SIF CODER Output	Pulses Available (figure 3-2)
N	Framing pulses plus up to 12 information pulses	A, B,C, D
ID	Same as N plus ID pulse	A, B, C, D+ II)
X	Same as N plus X pulse	A, B, C,D+X
EMER	One pulse group consisting of framing pulses and up to 12 information pulses followed by three empty pairs of bracket-type pulses with 4.35 microsecond spacing between pairs	A, B, C, D and three pairs of bracket-type pulses
EMER + X	Same as EMER plus X pulse	A, B, C,D+X (also 3 empty pairs of bracket-type pulses)
I	Each pulse train interleaved with another identical pulse train delayed as determined by the setting of the INTERLEAVE control	Same as normal train

purposes either directly from the VARI OUTPUT connector or (if the pulse train is to be employed to modulate the rf output signal) by "jumpering" the MOD DRIVE connector on the SIF Coder to the MOD connector on the Interrogation Coder.

(5) SUBSTITUTE PULSE FACILITY. - Any one of the twelve code pulses, the X pulse, or the last framing pulse may be removed from the train and substituted with a movable pulse. This substitute pulse can be shifted ± 1.6 microseconds from its original position. To use the substitute pulse feature, proceed as follows:

Step 1. Set SUB PULSE SELECT switch to a numbered position representing the pulse to be replaced.

Step 2. Adjust position of the substitute pulse with the SUB PULSE POS control.

(6) PULSE WIDTH ADJUSTMENT. - The width of the pulses in the pulse train can be adjusted from less than 0.3 to more than 1.0 microsecond by the PULSE WIDTH control. The control panel has a mark at the 0.45 microsecond position, which is the nominal pulse width.

c. INTERROGATION CODER USE .

(1) TRIGGERING, - The Interrogation Coder is triggered in the same manner as the SIF Coder (see paragraph 3-7b2)). Set the TRIG terminating switch to 75Ω, if an external trigger of more than a 50 volts amplitude is used.

(2) FUNCTION SELECTOR SETTINGS. - The Function Selector determines the type of Interrogation Coder output to be used (see table 3-13).

(3) VIDEO OUTPUTS. - The basic pattern of the video output provided by the Interrogation Coder is determined by the setting of the Mode Selector. The width of the interrogation pulses is adjustable by the CODE WIDTH control. The ISLS Selector determines the type of ISLS pulse to be combined with the basic interrogation pattern if such is desired. The width of the ISLS pulse is adjusted by the ISLS WIDTH control and the amplitude of the ISLS pulse is determined by the ISLS LEVEL control. The Substitute Pulse Selector permits substitution of a variable-position pulse for (a) the second interrogation pulse or in the ISLS pulse in M-1, M-2 or M-3/A interrogations, (b) for the second, third, or fourth Mode 4 sync pulses, or (c) for the second or third reset tag pulses. An externally generated ISLS trigger can be employed by applying it to the ISLS input connector and setting the ISLS Selector to the EXT position.

(4) MODULATION BY EXTERNAL SIGNAL. - Modulation of the rf signal generator from an external source can be accomplished by connecting the signal to the MOD connector and setting the Function Selector to the MOD-HIGH or MOD-LOW position. Setting the Function Selector to MOD-MIX allows output modulation by external high level pulses as well as the internally generated pulses.

(5) EXTERNAL SIGNAL GENERATOR MODULATION. - To obtain the Interrogation Coder

TABLE 3-13.
INTERROGATION CODER FUNCTIONS

Function Selector Setting	Application
(+)	Makes available at CODER OUT connector a positive-going signal (without ISLS) selected by Mode Selector. No rf output.
(-)	Same as (+) except that a negative-going signal is made available at CODER OUT connector.
MOD-MIX	Internally mixes internal code and external modulation signals for application to rf signal generator as a modulating signal.
TEST	Same as MOD-MIX except it makes available at CODER OUT connector the same signal which was internally switched in MOD-MIX position.
MOD-INT	Connects output signal selected by Mode Selector so as to modulate the rf output of the signal generator. Code pulse width adjusted by CODE WIDTH control.
MOD- LOW	Internally connects MOD connector to rf signal generator for modulating its output. For use with modulating signals 3 to 20 volts in amplitude. Pulse width is externally controlled.
MOD-HIGH	Same as MOD-LOW except for use with modulating signals 20 to 35 volts in amplitude.

video output for modulation of an external rf signal generator, proceed as follows:

Step 1. Connect CODER OUT connector on Interrogation Coder to modulation input of the external signal generator.

Step 2. Place Function Selector in (+) or (-) position, as desired.

step 3. Adjust CODE LEVEL control for required pulse amplitude. The VIDEO LEVEL control adjusts the amplitude of all the output pulses at the CODER OUT connector.

(6) MODE IDENTIFICATION PULSE OUTPUT. - Mate identification video is obtained by combining the interrogation signal with the composite SIF reply video as a means for identifying the mode. To obtain mode identification video, proceed as follows:

Step 1. Set VIDEO selector to BOTH position.

Step 2. Connect output of triggering source to TRIG connector.

Step 3. Connect OUT connector to TRIGGER INPUT on SIF Coder.

Step 4. Connect MOD DRIVE on SIF Ceder to MOD input connector on Interrogation Coder,

Step 5. Set Function Selector on Interrogation Coder to MOD-MIX position. The SIF Code pattern selected on the SIF Coder will be preceded by the tags consisting of the original interrogation pulses. This composite signal will modulate the rf generator. If it is desired to have it appear at the CODER OUT connector, place the Function Selector in the TEST position,

(7) RESET TAGS. - Reset tag pulses are added to the above composite signal to simulate the reset signal occurring at the end of the reply. Reset tags may be produced either with or without the mode identification pulses. To obtain reset tag pulses, proceed as follows:

Step 1. Set up as for mode identification pulses above.

Step 2. For reset tag pulses alone, set VIDEO selector to RESET position. For reset tag pulses and mode identification pulses combined, set selector to BOTH position. Three reset tag pulses of different widths will follow the SIF train.

d. RF SIGNAL GENERATOR USES.

(1) RF OUTPUT SIGNAL LEVEL ADJUSTMENT. - The level of the pulsed rf output at the SC OUT connector is adjusted by means of the ATTENUATION control and is read on the associated counter dial. The output level at the SG OUT connector, when terminated by a 53.5 ohm load, can be read directly from the dial in decibels below one volt.

When the SG OUT and SG IN connectors are jumpered together with the CG-1848/U rf cable, the output of the rf signal generator is available at the LP IN and HP IN connectors through additional attenuation. To find the exact amount of attenuation for *a* particular test set, refer to the Demodulator Calibration Curves in the Book of Calibration Charts supplied with each test set. The approximate attenuation from the LP IN connector to the HP IN connector is 20 db. The total attenuation from the SC IN connector to the HP IN connector is approximately 33 db. If either the LP IN or the HP IN connector is used, the other connector should be terminated with the dummy load plug 8P15, attached near the connector on the f rent panel.

NOTE

When more accurate measurments are required, compensate for the inherent attenuation in the coaxial cable used between the test set and the external equipment. The loss in RG–62/U rf cable at the frequencies used in this test set is approximately 17 db per 100 feet.

(2) RF OUTPUT SIGNAL FREQUENCY SETTING. The frequency of the signal generator is set by means of the WAVEMETER FREQUENCY and SG FREQUENCY controls. The procedure for making this setting is as follows:

step 1. Provide either internal or external modulation input to the signal generator.

step 2. Place the METER SELECT switch on the Calibration-Control unit in the WM position.

step 3. Set the WM SENS control on the Calibration-Control unit fully clockwise for maximum sensitivity.

step 4. Place the WAVEMETER INPUT switch in the SIG GEN position.

step 5. On AN/UPM-98A only, set the WAVEMETER FREQUENCY dial to a proper indication for the desired frequency as obtained from the applicable curve in the Book of Calibration Charts supplied with the test set.

On AN/UPM-98B and AN/UPM-98C before setting the desired frequency on the WAVEMETER FREQUENCY dial, calibrate the indicator at the nearest 20-mHz multiple (e.g., 940, 960, ... 1200, 1.220) as follows:

a. Hold the WAVEMETER CAL MKR toggle switch down and adjust the WAVEMETER FREQUENCY knob for maximum dip on the Cal-Control meter closest to the calibrating frequency.

b. While continuing to depress the toggle switch, adjust the CAL knob on the wavemeter indicator box so that the indicator dial reads exactly the 20-mHz multiple frequency used for calibration.

c. Release the WAVEMETER CAL MKR switch and set the wavemeter dial indication for the desired frequency.

Step 6. Adjust the SG FREQUENCY control until the needle dips, indicating resonance. In order to determine the exact point of needle deflection, it may be necessary to readjust the W M SENS control. When the resonance point has been located, the signal generator frequency has been set.

(3) RF OUTPUT SIGNAL MODULATION.

(a) MODULATION OR RF OUTPUT SIGNAL BY INTERROGATION CODER. To modulate the rf signal output with the Interrogation Coder, proceed as follows:

step 1. Connect the trigger source to the TRIG connector on the Interrogation Coder, using CG-530B/U cable.

NOTE

One of three different trigger sources may be used: (1) O TRIGGERS output from the Crystal Mark and Sync unit. (2) DELAYED TRIGGERS output from the Crystal Mark and Sync unit. (3) An external trigger source.

step 2. Place the Function Selector on the Interrogation Coder in the INT position.

Step 3. Set the Mode Selector for the mode of interrogation to be simulated. Adjust the CODE WIDTH control for desired pulse width.

Step 4. Set frequency and power level of the rf signal as described in paragraphs 3–7d(l) and 3–7d(2) above.

(b) MODULATION OF RF OUTPUT SIGNAL BY SIF CODER. To modulate the rf signal output with the SIF Coder, proceed as follows:

step 1. Trigger the SIF Coder as described in paragraph 3-7b(2).

Step 2. Jumper the MOD DRIVE connector to the MOD connector on the Interrogation Coder using CG-530B /U coaxial cable.

Step 3. Place Function Selector on the Interrogation Coder in MOD–HIGH position.

step 4. Place LEVEL switch (on the SIF Coder) in HI position.

step 5. Set SIF Coder for required pulse train.

Step 6. Set the rf signal frequency and power level as described in paragraphs 3-7d (1) and 3-7d(2).

(c) MODULATION OF RF OUTPUT SIGNAL BY EXTERNAL SIGNALS. To modulate the rf signal with an external pulsed signal, proceed as follows:

step 1. Using CG-530B/U cable assembly, connect MOD connector on the Interrogation Coder to an external signal source delivering from 3 to 55 volt positive pulses into a 120 ohm impedance.

step 2. Place Function Selector in MOD-LOW position if level of the external signal is below 20 volts, or in MOD-HIGH position if the level is from 20 to 35 volts.

Step 3. Set power level and frequency of the rf signal as described in paragraphs 3-7d(l) and 3-7d(2).

(4) TESTING RECEIVERS AND DECODERS. To test IFF/SIF interrogator receivers with associated decoders or transponders using the pulse-modulated rf signal, proceed as follows:

step 1. Start and warm up equipment.

step 2. Jumper SG OUT connector to SG IN connector using cable assembly CG–1848/U, and connect rf input of the equipment under test to HP IN connector on Coder Simulator using cable assembly CG–409E/U.

Step 3. Connect either Interrogation Coder or SIF Coder as described in paragraphs 3-7d(l) and 3-7d(2).

step 4. Set power level and frequency of the signal as described in paragraph 3-7d (3)(c).

step 5. Observe response of the equipment under test on the oscilloscope. The particular response required for acceptance will depend upon the nature and setting of the decoder under test.

(5) TESTING ISLS CAPABILITY OF TRANSPONDERS. To test the performance of the side lobe suppression circuits of an IFF transponder, proceed as follows :

step 1. Connect the transponder under test and Radar Test Set

AN/UPM-98A as outlined in the applicable test instructions in the technical manual for the transponder. Interrogate the transponder in any mode and observe the replies from it.

Step 2. Set substitute Pulse Selector to OUT position. Set ISLM Selector to 2 usec position. Turn ISLS Level control fully clockwise. The transponder should stop replying.

Step s. Turn ISLS Level control slowly counter-clockwise. Up to the O mark (at which point the simulated ISLS reference signal amplitude is equal to the amplitude of the simulated interrogation signal) the transponder should not reply, since the interrogation signal amplitude is well below the reference signaI, indicating it is from a side lobe rather than the main lobe of the sending antenna.

Step 4. Continue turning the ISLS Level control slowly counter-clockwise. Between the 0 mark and the -9 db mark (which indicates that the ISLS reference signal is 9 db below the interrogation signal), the transponder may or may not reply, depending upon a number of variable factors.

Step 5. Continue turning the ISLS Level control slowly counter-clockwlse. Beyond the -9db mark the transponder should reply continuously since the amplitude d the interrogation signal is well above that of the ISLS reference signal, indicating it is the signal from the main lobe of the sending antenna and not from a side lobe.

Step 6. Turn the ISLS Level control in the reverse direction. As the control is turned clockwise the transponder should behave as described above in each of the three zones of the control.

(6) RECEIVER FREQUENCY SETTING. - To set the frequency of a receiver under test, proceed as follows:

Step 1. Start and warm up equipment.

Step 2. Set desired rf output power level and frequency as desired in Paragraph 3-7d. Be sure that power level is low enough to prevent saturation of the receiver under teat.

Step 3. Connect SG OUT connector on the signal generator to antenna input of the equipment under test, using CG-409E/U cable assembly.

Step 4. Connect the demodulated (video) output of the receiver under test to the VIDEO input connector on the Display unit.

Step 5. Tune receiver under test so that maximum amplitude pulse appears on the oscilloscope screen. (See paragraph 3-7a.) Reduce gain of the receiver, when necessary, to produce convenient pattern size. When the receiver is tuned to give maximum pattern height on oscilloscope, it is tuned to the signal generator frequency.

(7) RECEIVER BANDWIDTH MEASUREMENT. - To measure the bandwidth of a receiver under test, proceed as follows:

Step 1. Start and warm up equipment.

Step 2. Set signal generator to the desired output level and the given receiver operating frequency as described in paragraph 3-7. The output level must be low enough to prevent receiver saturatiom.

Step 3. Connect SG OUT connector on the signal generator to the appropriate input of the receiver under test, using CG-409E/U cable assembly.

Step 4. Measure the amplitude of the signal at the video output of the receiver under test, using the oscilloscope (see paragraph 3-7a).

Step 5. Note setting on the ATTENUATION dial and decrease the amount of attenuation by 6 db. This will increase the rf output level by 6 db.

Step 6. Adjust SG FREQUENCY control on the signal generator to one side of center frequency until video output Voltage reading on *the* oscilloscope is equivalent in amplitude to the original center frequency reading in Step 4 above. (This is the "6 db down" point). Note the frequency at this point.

Step 7. Repeat step 6 on the other side d center frequency.

Step 6. The difference between the two frequencies obtained in steps 6 and 7 is the bandwidth of thereceiver at the -6 db points for the given operating frequency.

(8) RECEIVER SENSITIVITY MEASUREMENT. - To measure the tangential sensitivity of a receiver under test, proceed as follows:

Step 1. Start and warm up both pieces of equipment.

Step 2. Set signal generator frequency to the receiver operating frequency as described in paragraph 3-7d.

Step 3. Connect SC OUT connector on the signal generator to the appropriate input of the receiver under test, using the CG-409E/U cable assembly.

Step 4. Observe the output of circuit under test on the oscilloscope (see paragraph 3-7a).

Step 5. Adjust ATTENUATION control on the signal generator until height of receiver output signal as observed on the oscilloscope is twice that of the noise signal appearing with it. Read ATTENUATION indicator to obtain tangential sensitivity in db below 1 volt.

NOTE

Readings on the signal generator ATTENUATION dial will be accurate only if receiver under test presents the proper 53.5 ohm load impedance to the signal generator.

l . WAVEMETER USES,

(1) FREQUENCY MEASUREMENT OF EXTERNAL PULSED RF SIGNALS. To measure frequency of an external puked rf signal, proceed as follows:

Step 1. Start and warm up equipment.
Step 2. Feed the external rf signal into the LP IN connector on Coder Simulator if power level is leas than 35 watts, or into the HP IN connector if power level is between 35 and 3500 watts. In either case, terminate the unused connector with a dummy load plug 8P16.
Step 8. Place METER SELECT switch on the Calibration-Control unit in WM position.
Step 4. Adjust WM SENS control until meter shows maximum deflection.
Step 5. Adjust WAVEMETER FREQUENCY control until meter needle dips, indicating resonance. To determine exact point of maximum needle deflection, it may be necessary to readjust WM SENS control to a higher setting.
Step 6. When resonance point has been located, note reading on the WAVEMETER FREQUENCY dial. On AN/UPM-98A, determine the frequency corresponding to this dial reading by using curves in Book of Calibration Charts, provided with each test unit. On AN/UPM-98B and AN/UPM-98C, calibrate the indicator at the nearest 20-mHz multiple as in step 5 of paragraph 3-7d(2).

(2) FREQUENCY MEASUREMENT OF INTERNAL RF SIGNAL. To measure frequency of internal rf signal, proceed as follows:

Step 1. Place METER SELECT switch on Calibration-Control unit in WM position.
Step 2. Adjust WM SENS control until meter shows maximum needle deflection.
Step 3. Place WAVEMETER INPUT switch in SIG GEN position and adjust WAVEMETER FREQUENCY control until meter needle dips, indicating resonance. To determine exact point of maximum needle deflection, it may be be necessary to readjust WM SENS control to a higher setting.
Step 4. When resonance point has been located, note reading on the WAVEMETER FREQUENCY dial.
(SEE STEP 6 OF PARA. I).

f. DEMODULATOR USES.

(1) TRANSMITTER POWER MEASUREMENTS. To measure the output power of a transmitter under teat, proceed as follows:

Step 1. Start and warm up equipment.
Step 2. Feed the transmitter output to the HP IN connector on Coder Simulator. Terminate the LP IN connector with the 8P15 dummy load plug.
Step 3. Place VIDEO OUT switch on Calibration-Control unit in POWER position.
Step 4. Jumper VIDEO OUT connector on Calibration-Control unit to the VIDEO input connector on the Display unit.
Step 5. Turn VIDEO SENS control on Display unit to the extreme clockwise position.
Step 6. Place VOLTS/IN switch on Display unit in the position in which the pat tern on the crt most nearly reaches full-scale amplitude.

NOTE

If no position of the VOLTS/IN switch gives a deflection of appreciable size on the crt, change the transmitter output connection to the LP IN connector and terminate the HP IN connector with the 8P15 dummy load plug.

Step 7. Measure the peak-to-peak pattern height in volts.
Step 8. Determine power level corresponding to this peak-to-peak height by using the correct demodulator calibration curve in Beak of Calibration Charts provided with each test set. (There is one curve for the HP IN connection and another for the LP IN connection.)
LP IN connection.)

(2) TRANSMITTER OUTPUT WAVEFORM TESTS. To observe undistorted output waveforms on the oscilloscope, proceed as follows:

Step 1. Connect rf output of the transmitter under test to the test set as described in paragraph 3-7f (1).

Step 2. Place VIDEO OUT switch on the Calibration-Control unit in SHAPE position,

To measure characteristics of the demodulated transmitter output pulses observed on the Display unit, refer to procedures described in paragraph 3-7a.

(3) MONITORING WAVEFORM OF MODULATED RF SIGNAL, - The waveform of the modulation "envelope" on the signal generator output can be observed on the oscilloscope while rf power is being delivered to an external load. To make this observation, proceed as follows:

Step 1. Connect the SG OUT connector to the signal generator to the external load.

Step 2. Place the VIDEO OUT switch on the Calibration-Control unit in the SG MON (signal generator monitoring) position.

Step 3. Jumper the VIDEO OUT connector on the Calibration-Control unit to the VIDEO input connector on the Display unit.

Step 4. Adjust oscilloscope sweep to observe pulse.

13. PULSE COUNTER USE.

(1) GENERAL, - The test set is capable of measuring prf up to 5000 pps. A directly calibrated meter is provided for this purpose. Meter accuracy is 5% at full-scale indication and 10% at one-tenth of the scale. The TRIGGER switch on the Calibration-Control unit connects the pulse source to the counter circuits as shown in table 3-14.

NOTE

The pulse counter is so designed that it will directly indicate the prf of trigger pulse signals. If a normal SIF reply signal (up to 7777 with ID) is applied to the pulse counter, each pulse train will be counted as a single pulse.

(2) PROCEDURE. - To measure an unknown prf, proceed as follows:

Step 1. Place TRIGGER switch on Calibration- Control unit in the desired position (see table 3-14).

TABLE 3-14. PULSE COUNTER APPLICATIONS

TRIGGER Switch Positions	PULSES COUNTED
DEMOD	Demodulated rf (video) pulses.
INT	Delayed sync pulses from the Crystal Mark and Sync unit.
EXT	External pulses brought in through TRIGGER INPUT connector on the Calibration-Control unit.

Step 2. Place METER SELECT on Calibration- Control unit switch in 5000 PRF position,

Step 3. Note deflection of the meter needle and read meter directly in pps, If prf is read as less than 500 pps, turn METER SELECT switch to 500 PRF and read again.

h. USE OF VIDEO CALIBRATOR PULSES.

(1) PURPOSE. - Video calibrator pulses from 0.1 volt to 50 volts amplitude can be made available at VIDEO OUT connector on the Calibration- Control unit for troubleshooting and test purposes.

(2) PROCEDURE. - To obtain video calibrator pulse output, proceed as follows:

Step 1. Provide a trigger source in any one of the three ways described in paragraph 3-4b (2) (b).

Step 2. Place METER SELECT switch on Calibration-Control unit in CAL position.

Step 3. Turn VIDEO OUT switch on the Calibration- Control unit to the position providing the desired pulse amplitude.

Step 4. Feed the calibrated pulses from VIDEO OUT connector on the Calibration- Control unit to the proper input point on equipment under test using CG-530B/U coaxial cable.

Step 5. Adjust the CAL ADJ control on the Calibration- Control unit so that the meter shows full-scale needle deflection.

i. USE OF CALIBRATION CHARTS.

(1) GENERAL. - A Book of Calibration Charts is provided with each test set. This book contains calibration curves for the wavemeter, the demodulator, and the rf oscillator.

(2) USE OF WAVEMETER CALIBRATION CURVES. - To find the exact frequency for a particular setting of the wavemeter counter dial, proceed as follows:

Step 1. Note the WAVEMETER FREQUENCY dial reading.

Step 2. Refer to the wavemeter calibration curve which contains this reading.

Step 3. Read the frequency in megacycles (megahertz) from the calibration curve.

(3) USE OF DEMODULATOR CALIBRATION CURVES. - To find the power of an rf signal applied to the demodulator inputs, proceed as follows:

Step 1. Note the peak oscilloscope pattern height obtained for the power measurement described in paragraph 3-7f (1).

Step 2. Refer to either the LP IN or HP IN Demodulator Calibration Curve, depending upon which input connector is being used.

Step 3. Read the rf power input in db above 1 watt from the curve.

Step 4. Add of subtract from the reading obtained in step 3 the correction factor for the particular frequency being measured as shown in Correction Chart provided underneath the Demodulator Calibration Curve.

(4) USE OF OSCILLATOR CALIBRATION CURVE. - To set the variable rf oscillator to desired frequency with the SG FREQUENCY control, proceed as follows:

Step 1. On the Oscillator Calibration Curve, find the proper dial reading for the desired frequency.

Step 2. Set the SG FREQUENCY counter to the number obtained in step 1.

NOT E

The setting of a frequency from the Oscillator Calibration Curve will be only approximate. For a more accurate frequency check, follow the procedure described in paragraph 3-7i(2) using the proper Wavemeter Calibration Curve.

3-8. OPERATOR'S MAINTENANCE,

a. OPERATING CHECKS. - To establish that the Radar Test Set AN/UPM-98A is in full operational readiness, use operational check-out procedures outlined in paragraph 2-7 of this manual. These procedures are arranged to make possible a complete check-out of the test set using only the built-in test features. No additional test equipment is required to perform the checks. If any of the normal indications cannot be obtained, refer to the troubleshooting and maintenance procedures in section 4 and 5.

b. PREVENTIVE MAINTENANCE ROUTINES. - Preventive maintenance routes to be performed by the operator are described in Section 5.

c. EMERGENCY MAINTENANCE. -Radar Test Set AN/UPM-98A is a piece of complex test equipment for use chiefly by maintenance technicians during repair and testing of operational IFF equipment. Refer to Section 4, Troubleshooting, and Section 5, Maintenance, for instructions and precautions to be followed during maintenance and for illustrations showing locations of electron tubes, fuses, and assemblies.

(1) REPLACEMENT OF PLUG-IN UNITS.- In an emergency, when the trouble can be located in one of the plug-in units and a replacement unit is available, a complete plug-in unit may be replaced with a new unit. Refer to Section 5 for information regarding removal and exchange of these units.

TABLE 3-15. AN/UPM-98A SIGNAL CONNECTORS

Connector	Location	Function
VIDEO lJ1	Display Unit	BNC type UG-625B/U connector. Input point for video signal to be displayed on oscilloscope. Input impedance may be changed from 7 megohms to 75 ohms by means of 75Ω switch,
INPUT TRIGGERS 3J1	Crystal Mark and Sync Unit	BNC type UG-625B/U connector.
SUP TRIGGERS 3J2	Crystal Mark and Sync Unit	BNC type UG-625B/U connector. Impedance 470 ohms
0 TRIGGERS 3J3	Crystal Mark and Sync Unit	BNC type UG-625B/U connector. Impedance 500 ohms
DELAYED TRIGGERS 3J4	Crystal Mark and Sync Unit	BNC type UG-625B/U connector. Impedance 470 ohms
TRIGGER INPUT 4J1	SIF Coder	BNC type UG-625B/U connector.
MOD DRIVE 4J2	SIF Coder	BNC type UG-625B/U connector. Impedance 690 ohms
VARI OUTPUT 4J3	SIF Coder	BNC type UG-625B/U connector. Impedance varies from 250 ohms to O with setting of AMPLITUDE control. Main signal output point for SIF Coder. Output amplitude variable from 0 to 5 volts with LEVEL switch in LO position and from 7 to 35 volts with LEVEL switch in HI position.
SG OUT 8J6	SM-197A Panel	Type UG-291/U connector. Main output from rf oscillator section. Output variable by means of ATTENUATION control. When terminated in a 53.5 ohm load, the SG OUT level can be read directly from the attenuator dial in db below one volt. Can be jumpered to SG IN for further fixed attenuation.
SG IN 8J13	SM-197A Panel	Type UG-291/U connector. Impedance 75 ohms. Input point to demodulator circuit for rf oscillator signal. When jumpered to SG OUT connector, rf signal generator output becomes available at LP IN and HP IN connectors. Attenuation is determined from charts.
LP IN 8J14	SM-197A Panel	Type UG-291/U connector. Input point to demodulator circuit for low power (below 35 watts) external rf signals. Terminated with dummy load 8P15 when HP IN is used. Approximate attenuation from SG IN is 13 db.
HP IN 8J15	SM-197A Panel	Type UG-291/U connector. Input point to demodulator circuit for high power (35 to 3500 watts) external rf signals. Also used as rf output point when SG IN is jumpered to SG OUT. Terminated with dummy load 8P15 when LP IN is used. Approximate attenuation over LP IN is 20 db, from SG IN, 33 db
TRIGGER INPUT 9J2	Calibration-Control Unit	Type UG-625/U connector. Input point to Calibration-Control circuits for external trigger signal. Used when TRIGGER switch is in EXT position.
VIDEO OUT 9J3	Calibration-Control Unit	Type UG-625B/U connector. Main signal output for Calibration Control circuits. Output type may be any one of ten selected by the VIDEO OUT switch: 50, 10, 5, 2, 1, .5, or .1 volt calibrating pulses, a pulse signal for power measuring purposes, a low distortion signal for waveform analysis, or a signal generator monitoring signal.

TABLE 3-15. AN/UPM-98A SIGNAL CONNECTORS (Cont.)

Connector	Location	Function
MODE 4 IN 9J9	Calibration-Control Unit	Type UG-625B/U connector. Input point to mode 4 reply decoding circuits.
MODE 4 OUT 9J1O	Calibration-Control Unit	Type UG-625B/U connector. Output from mode 4 reply decoding circuits.
TRIG 12J1	Interrogation Coder	Type UG-625B/U connector. Input point to Interrogation Coder circuits for external trigger signal. Impedance may be changed from high to low (75 ohms) by means of terminating switch 12S2. 75 ohm position used for signals over 50 volts. Normally connected to 0 TRIGGERS or DELAYED TRIGGERS on Crystal Mark and Sync Unit or an external trigger source.
ISLS 12J2	Interrogation Coder	Type UG-625B/U connector. Input point to ISLS circuits for external ISLS trigger signal. Impedance may be changed from high to low (75 ohms) by means of terminating switch 12S3.
MOD 12J3	Interrogation Coder	Type UG-625B/U connector. Input point to interrogator modulator circuits for external modulating signals. Impedance may be changed from high to low (75 ohms) by means of terminating switch 12S1. Connected into circuit by Function Selector in MOD-LOW, MOD-HIGH, MOD-MIX, and TEST positions. Inputs from 3 to 20 volts accepted in MOD-LOW; from 20 to 35 volts" in MOD-HIGH (source voltage rated into 120 ohms).
OUT 12J4	Interrogation Coder .	Type UG-625B/U connector. Impedance 470 ohms. Output point for trigger signal delayed 40 usec from main trigger.
CODER OUT 12J5	Interrogation Coder	Type UG-625B/U connector. Impedance varies from O to 500 ohms with Video Level control. Output point for coder signals selected by function switch in TEST, (+), or (-) position. TEST signal consists of complete composite video signal. Signal on (-) is same as (+) but reversed in polarity.

3-9. Scope of Preventive Maintenance

The maintenance duties assigned to the operator and organizational maintenance categories are listed below, together with a reference to the paragraphs covering the specific maintenance functions.

a. Operator’s daily preventive maintenance checks and services chart (para 3-12).

b. Organizational weekly preventive maintenance checks and services chart (para 3-13).

c. Organizational monthly preventive maintenance checks and services chart (para 3-14).

d. Organizational quarterly preventive maintenance checks and services chart (para 3-15).

e. Cleaning (para 3-16).

f. Touchup painting (para 3-17).

3-10. Preventive Maintenance

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

a. <u>Systematic Care</u>. The procedures given in paragraphs 3-11 through 3-15 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 charts (para 3-11 through 3-15) 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 charts indicate what to check, how to check, and the normal conditions; the References column lists the illustrations, paragraphs, or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by the corrective actions listed, higher category maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

-11. Preventive Maintenance Checks and Services Periods

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

a. Paragraph 3-12 specifies the checks and services that must be accomplished daily (or at least once a week if the equipment is maintained in a standby condition).

b. Paragraphs 3-13, 3-14, and 3-15 specify additional checks and services that must be performed weekly, monthly, and quarterly, respectively.

3-12. Operator's Daily Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Completeness	Check to see that the equipment is complete.	Appx B.
2	Exterior surfaces	Clean the exterior surfaces, including the panel. Check the meter glass for cracks.	None.
3	Connectors	Check the tightness of all connectors.	None.
4	Controls and indicators.	While making operating checks (item 5), observe that mechanical action of each switch and control is smooth and free of external or internal binding, and there is no excessive looseness.	None.
5	Operation	During operation, be alert for any unusual performance or condition.	None.

3-13. organizational Weekly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Cables	Inspect cords, cables, and wires for chafed, cracked, or frayed insulation. Replace connectors that are broken, arced, stripped, or worn excessively.	None.
2	Handles and latches	Inspect handles and latches for looseness. Replace or tighten as necessary.	None.
3	Metal surfaces	Inspect exposed metal surfaces for rust and corrosion. Touch up paint as required.	Para 3-16.

3-14. Organizational Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Jacks and plugs	Inspect jacks and plugs for snug fit and good contact.	None.
2	Switch decks	Inspect switch decks for loose connections and cracks.	None.
3	Resistors and capacitors...	Inspect the resistors and capacitors for cracks, blistering, or other defects.	None.
4	Printed circuit boards	Inspect printed circuit boards for cracks and breakage.	None.
5	Air filter	Inspect and clean air filter if necessary.	Para 5-52.

3-15. Organizational Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Publications	Check to see that all publications are complete, serviceable, and current.	DA Pam 310-4.
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 MW0's must be scheduled.	DA Pam 310-7, TM 38-750.
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.	None.

3-16. Cleaning

Inspect the exterior of Test Set, Radar AN/UPM-98( ). The exterior surfaces must be free of dust, grease, and fungus.

a. Remove dust and loose dirt with a clean 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 the fumes to an open flame or hot metal forms highly toxic phosgene gas.

b. Remove grease, fungus, and ground-in dirt from the case and cover of the test set. Use a cloth dampened (not wet) with tnchloroethane.

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

d. Clean the front panel and control knobs with a soft, clean cloth. If dirt is difficult to remove, dampen the cloth with water; use mild soap if necessary.

3-17. **Touchup Painting Instructions**

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 43-0118.

SECTION 4

TROUBLESHOOTING

4-1. GENERAL.

This section contains troubleshooting procedures and tests for locating and correcting some of the trouble that may occur in Radar Test Sets AN/UPM–98A, –98B, and AN/UPM–98C. To take advantage of the troubleshooting information, maintenance personnel should be thoroughly familiar with the installation, operation, and theory of the equipment.

The troubleshooting procedures given here are intended to isolate a malfunction to a particular unit, and then to isolate it to a particular section, stage, and element within the unit. When troubleshooting or repairing the equipment, personnel should refer to the schematic diagrams and block diagrams. This section contains a tabulation of all assemblies and subassemblies, a list of test points, and the associated voltages and waveshapes. Figure 4–1 is an overall block diagram of the Radar Test Set. The AN/UPM-98A, -98B, AN/UPM-98C are essentially the same except for the direct-reading wavemeter indicator; therefore, statements made in regard to the AN/UPM-98A also apply to the AN/UPM-98B unless otherwise stated. Material intended specifically for the AN/UPM-98B and AN/UPM-98C is included at the end of the section.

All possible troubles that may arise when operating the equipment cannot be described in this manual. Whenever a specific trouble is not covered, maintenance personnel should proceed to locate the defective component using standard signal-tracing techniques as described in NAVSHIPS 0967-000-0130, Handbook of Test Methods and Practices.

NOTE

Before starting troubleshooting procedures, check front panel controls to make certain that incorrect settings are not causing faulty operation.

4-2. LOGICAL TROUBLESHOOTING.

a. SYMPTOM RECOGNITION. This is the first step in the troubleshooting procedure and is based on overall knowledge and understanding of operating characteristics of the equipment. Equipment troubles are not always the direct result of complete component failure; therefore, a trouble in an equipment may not always be easy to recognize since all conditions of less than peak performance are not always apparent. This type of equipment malfunction is usually discovered while accomplishing preventive maintenance procedures. If is important that the “not so apparent” troubles, as well as the apparent troubles, be recognized.

b. SYMPTOM ELABORATION. After an equipment trouble has been recognized, all the available aids designed into the equipment should be used to further elaborate on the original trouble symptom. Use of front panel controls and other built-in indicating and testing aids should provide better identification of the original trouble symptom.

c. LISTING PROBABLE FAULTY FUNCTION. The next step in logical troubleshooting is to formulate a number of “logical choices” as to the cause and likely location of the trouble. The “logical choices” are mental decisions which are based on knowledge of the equipment operation, a full identification of the trouble symptom, and information contained in this manual. The overall functional description and its associated block diagram should be referred to when selecting possible faulty functional sections.

d. LOCALIZING THE FAULTY FUNCTION. For the greatest efficiency in localizing trouble, the functional sections which have been selected by the “logical choice” method should be tested in the order that will require the least time. This requires a mental selection to determine which section to test first. The selection should be based on the validity of the “Logical Choice” and the difficulties in making the necessary tests. If the tests do not prove that functional section to be at fault, the next selection should be tested, and so on until the faulty functional section is located. As aids in this process, the manual contains block diagrams for the various functional sections of the equipment. Waveforms (or other pertinent indications) are included for significant test points to aid in isolating the faulty section. Also, test data (such as information on control settings, critical adjustments, and required test equipment) is supplied.

e. LOCALIZING TROUBLE TO THE CIRCUIT. After the faulty functional section has been isolated, it is necessary to make additional “logical choices” as to which circuit or group of circuits (within the functional section) is at fault. Block diagrams and schematic diagrams for the functional section and individual functional circuit groups (when required) provide the signal flow and test location information needed to bracket and then isolate the faulty circuit.

f. FAILURE ANALYSIS. After the trouble (faulty part, misalignment, etc.) has been located (but prior to performing corrective action), the procedures followed up to this point should be reviewed to determine exactly why the fault affected the equipment in the manner that it did. This review is necessary to make certain that the fault discovered is actually the cause of the malfunction, and not just a result of the malfunction.

g. VOLTAGE AND RESISTANCE MEASUREMENT. As an aid in troubleshooting, important

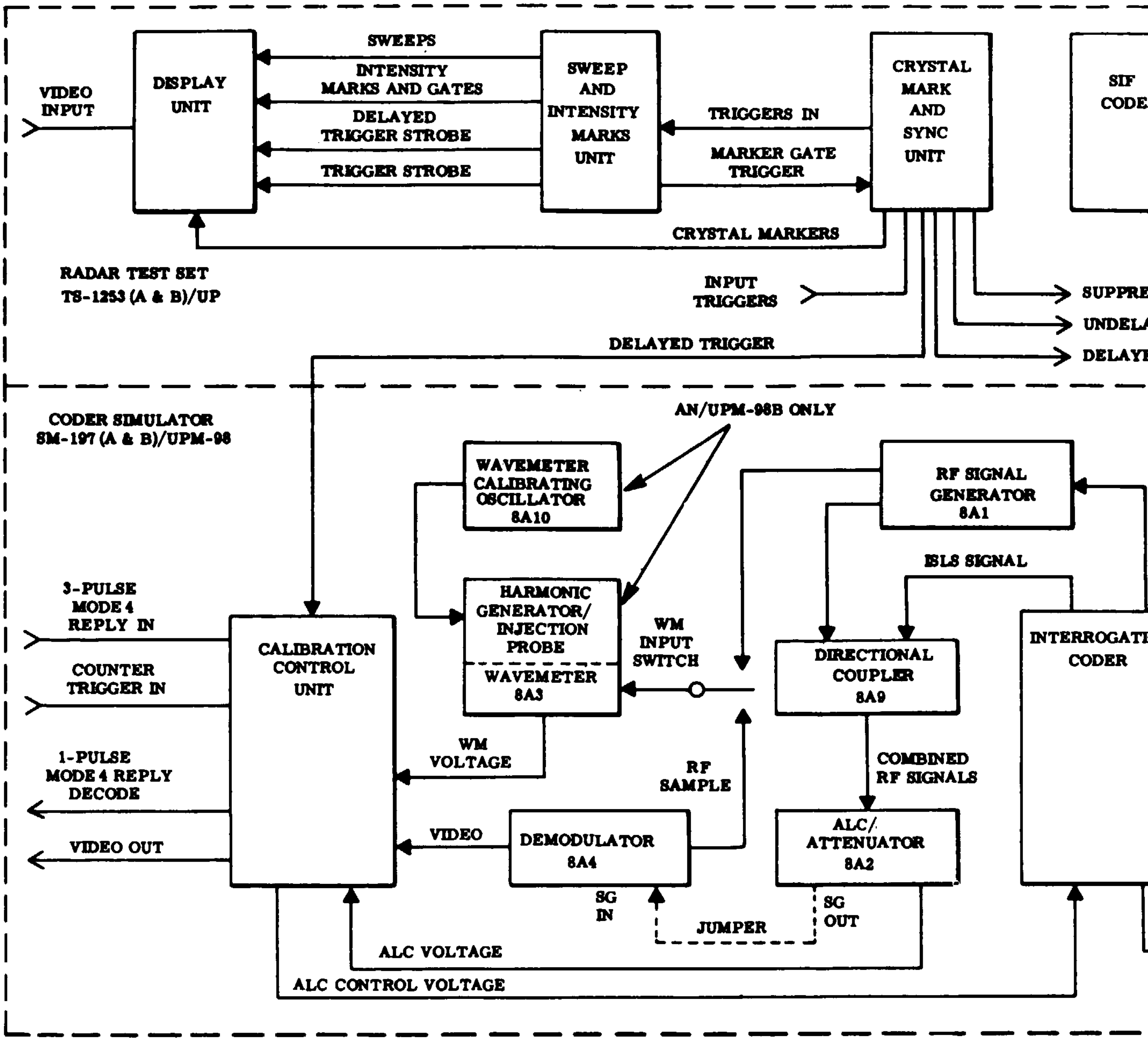


Figure 4-1. Radar Test Set AN/UPM-98 (A&B), Block Diagram

voltages are marked on the appropriate lines and terminals in the schematic diagrams. Correct resistances between most points in the circuits may be readily determined from the resistance values shown in the diagrams. More important waveforms and voltage and resistance measurements at the test points are included in the data for each functional section. Equipment required for testing the Radar Test Set is listed is table 1-7.

WARNING

At some points in this equipment, potentials exist which may cause death or serious injury upon contact. Maintenance personnel should exercise due taut ion when servicing the equipment.

4-3. OVERALL FUNCTIONAL DESCRIPTION.

Test Set AN/UPM-98A consists of two main functional sections as shown in figure 4-1. The test set combines several different test instruments into a single piece of equipment, therefore some individual functional sections of Radar Test Set AN/UPM-98A can be operated independently from each other for certain tasks.

The two main sections of the Test Set are identified as Radar Test Set, TS-1253A/UP (upper section) and Coder Simulator SM-197 A/UP M- 98 (lower section). Each of these two sections has its own power supply, but both are operated from a common ac power line. (See figure 5-67 for overall power distribution.)

4-4. CODER SIMULATOR SM-197A/UPM-98 FUNCTIONAL DESCRIPTION .

a. OVERALL DESCRIPTION. - The Coder Simulator provides pulses necessary for checking Mark X Coders and rf test facilities for checking secondary radar equipment. This unit consists of a panel-chassis assembly which includes the power supply, the main UHF assemblies, and the facilities for connecting the plug-in Calibration-Control unit and the plug-in Interrogation Coder.

The pulse generator and the counter circuits of the Calibration-Control unit use either external positive triggers or the delayed triggers supplied internally from Radar Test Set TS-1253A/UP. Voltage-calibrated “video” pulses are supplied at the VIDEO OUT connector on the Calibration-Control unit. The prf of either the external or internal triggers can be used on the panel meter. This unit also provides switching, control, and indicating functions for the panel-chassis assembly.

The SM-197A/UPM-98 panel-chassis assembly contains the power controls, the rectifier circuits and the regulator circuits for Coder-Simulator SM-197A/UPM-98. This chassis assembly has provisions for mounting and interconnecting the plug-in Calibration-Control and Interrogation Coder units. In addition, this assembly contains the main rf signal generator, the wavemeter, the attenuator, and the demodulator for use in rf tests and measurements.

b. CODER SIMULATOR SM-197A/UPM-98 TEST DATA. - Tables 4-5 and 4-6 give voltage and resistance measurements for Coder Simulator SM-197A/UPM-98. Other test data for the Coder Simulator is included in the data for the individual functional sections.

CODER SIMULATOR SM-197A/UPM-98 CIRCUIT DESCRIPTION.

(1) INTERROGATION CODER. - As shown in the block diagram, figure 4-2, the Interrogate ion Coder may be divided for discussion into two main functional sections: the coder section and the modulator section, with additional circuits for production of ISLS pulses, substitute pulses, and reset tag pulses. The coder section is capable of simulating interrogation signals in the severaI modes used in IFF/SIF systems. Waveforms are shown in figure 4-3 and voltage and resistance measurements are given in table 4-1.

The Interrogation Coder uses an externally generated positive trigger pulse to initiate the production of interrogation pulse pairs. Operator controls permit mode selection, video output amplitude adjustment, and output polarity selection. The Interrogation Coder panel switching also permits selection of the type of modulation signal to be fed to the rf signal generator; the Interrogation Coder output, or either low amplitude or high amplitude external signals. Panel connectors are provided for both external ISLS triggers and external code triggers, for an external modulation input, and for pulse signal output.

A miniature stripline directional coupler is used to combine the rf signals from the ISLS rf generator with those from the main(variable frequency) signal generator on the SM-197A chassis. Combining the signals in a directional coupler prevents loading of the signal generator, thereby preventing frequency and modulation “pulling” effects. The combined signals (consisting of pulses PI, P2, and P3) are passed through the attenuator and used as an interrogation signal with ISLS.

(a) CODER SECTION. - The coder section of the Interrogation Coder includes the circuits whose primary function is to produce pulse-train signals in the standard code patterns; timing, spacing, synchronizing, and repeating them as required. (See figure 4-4.)

NOTE

Modes 1, 2, 3/A, and C are referred to as “Standard” in this document; mode 4 is considered non- standard.

This is accomplished by means of a clock oscillator and associated triggering, gating, and recycling circuits (located in Clock and Line Drive Assembly 12 AI) working in conjunction with Delay Line Assembly 12A2 and associated diode Matrix Assembly 12A3. Code pattern selection is essentially a matter of switching enabling voltages (by means of Mode Selector 12S5) onto the matrix diodes associated with the proper delay line taps.

1. CLOCK AND LINE DRIVE ASSEMBLY 12A1. - The main functions of this assembly are performed by circuits for timing and synchronizing the other Interrogation Coder functions, and circuits for repeating the coding cycle

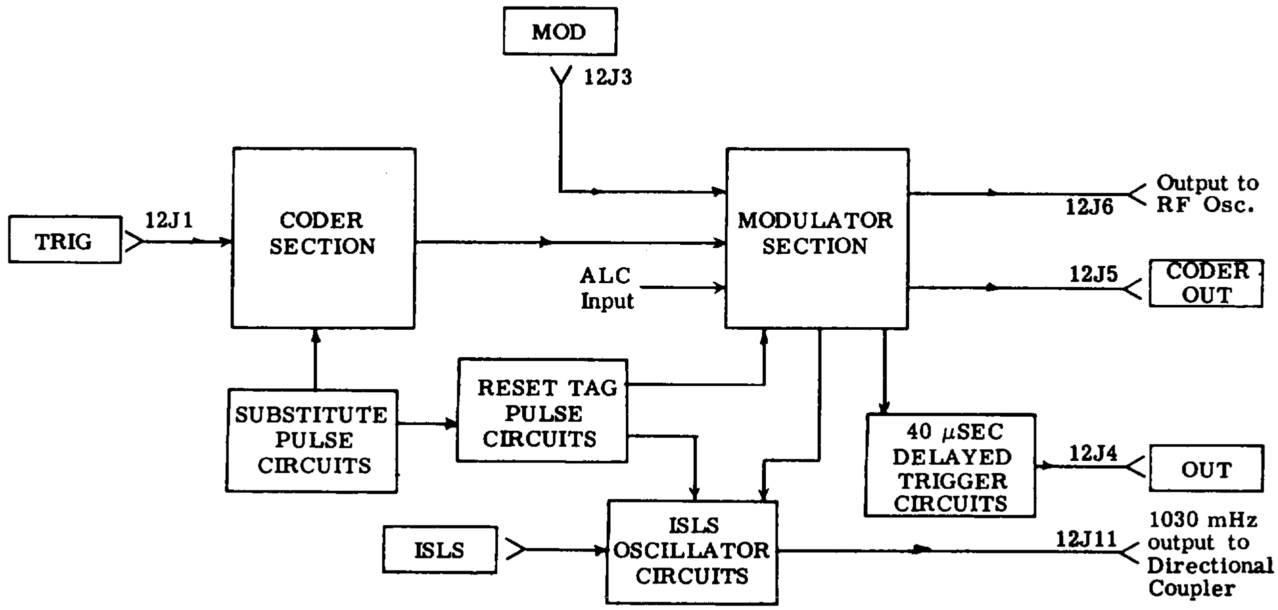


Figure 4-2. Interrogation Coder Overall Functional Block Diagram

TABLE 4-1 INTERROGATION CODER VOLTAGE AND RESISTANCE MEASUREMENTS

TEST POINTS	VOLTAGE MEASUREMENTS
12TP1 to ground	-30 vdc
12TP2 to ground	-12 vdc
12TP3 to ground	+12 vdc
12TP4 to ground	+25 vdc
12TP5 to ground	+300 vdc
Transformer 12T2 terminal 1 to 2	6.3 vac
Connector 12J7 pin S to ground	+25 vdc
Connector 12J7 pin 4 to ground	+12 vdc
Connector 12J7 pin 14 to ground	-12 vdc
Connector 12J9 pin B to ground	+25 vdc
Connector 12J9 pin 14 to ground	+12 vdc
Connector 12J9 pin 3 to ground	-12 vdc
Connector 12J10 pin 6 to ground	+300 vdc
Connector 12J10 pin 3 to ground	+25 vdc
Connector 12J10 pin 5 to ground	+12 vdc
Connector 12J10 pin 2 to ground	6.3 vac

TUBE	MEASUREMENTS - TUBE PIN TO GROUND								
	1	2	3	4	5	6	7	8	9
12V1	+43 v 1.2 mego	-0.02 v 5.8 k	0 0	0 ∞	Fil. v ∞	NC NC	+65 v ∞	NC NC	NC NC
12V2	-30 v 69 k	+43 v 1.2 mego	0 ∞	Fil. v ∞	+170 v ∞	NC NC	-30 v 14 k	-	-
12V3	+300 v 1 mego	-30 v 68 k	NC NC	0 ∞	Fil. v ∞	NC NC	+170 v 1 mego	-5 v 6.4 k	NC NC

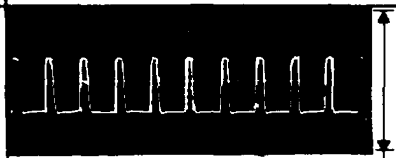
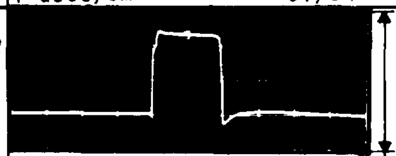
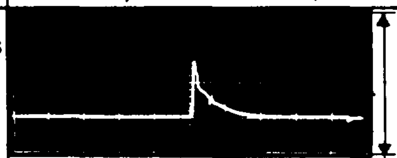
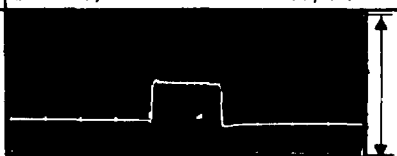
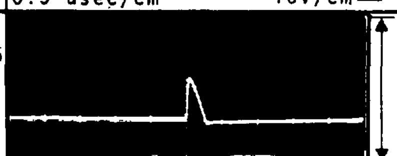
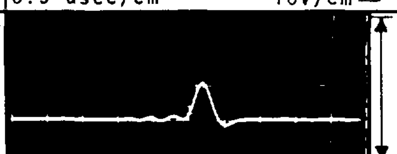
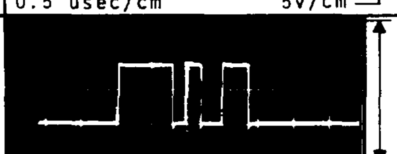
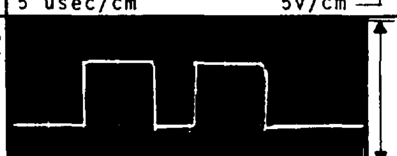
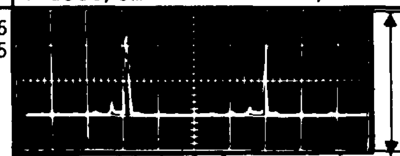
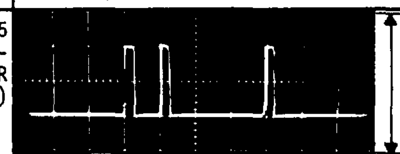
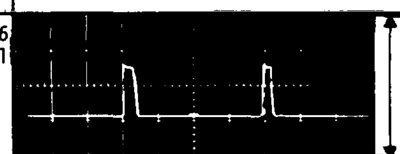
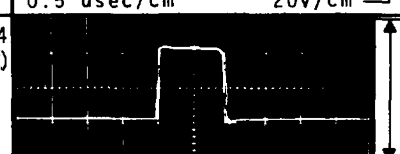
NO	TEST POINT	WAVEFORM	REMARKS
1	12A1 TP1	 1 usec/cm 5v/cm	
2	12A1 TP2	 0.5 usec/cm 5v/cm	SUB PULSE switch at 2 usec
3	12A1 TP3	 2 usec/cm 2v/cm	VIDEO switch at BOTH
4	12A1 TP4	 0.5 usec/cm 10v/cm	
5	12A1 TP5	 0.5 usec/cm 10v/cm	
6	12A2 TP1	 2 usec/cm 5v/cm	
7	12A2 TP2	 0.5 usec/cm 5v/cm	
8	12A6 TP1	 5 usec/cm 5v/cm	VIDEO switch at RESET
9	12A6 TP2	 20 usec/cm 5v/cm	VIDEO switch at BOTH
10	12A6 TP3	 20 usec/cm 5v/cm	VIDEO switch at BOTH
11	12A6 TP4	 1 usec/cm 5v/cm	ISLS switch at 2 usec
12	12A6 TP5	 2 usec/cm 2v/cm	
13	12J5 (CODER OUT)	 2 usec/cm 10v/cm	FUNCTION switch at TEST VIDEO switch at CODE ISLS switch at 2 usec LEVEL controls cw
14	12J6 -1	 2 usec/cm 100v/cm	
15	12J6 -3	 0.5 usec/cm 20v/cm	ISLS switch at 2 usec
16	12J4 (OUT)	 0.5 usec/cm 10v/cm	VIDEO switch at BOTH

Figure 4-3. Interrogation Coder Waveforms

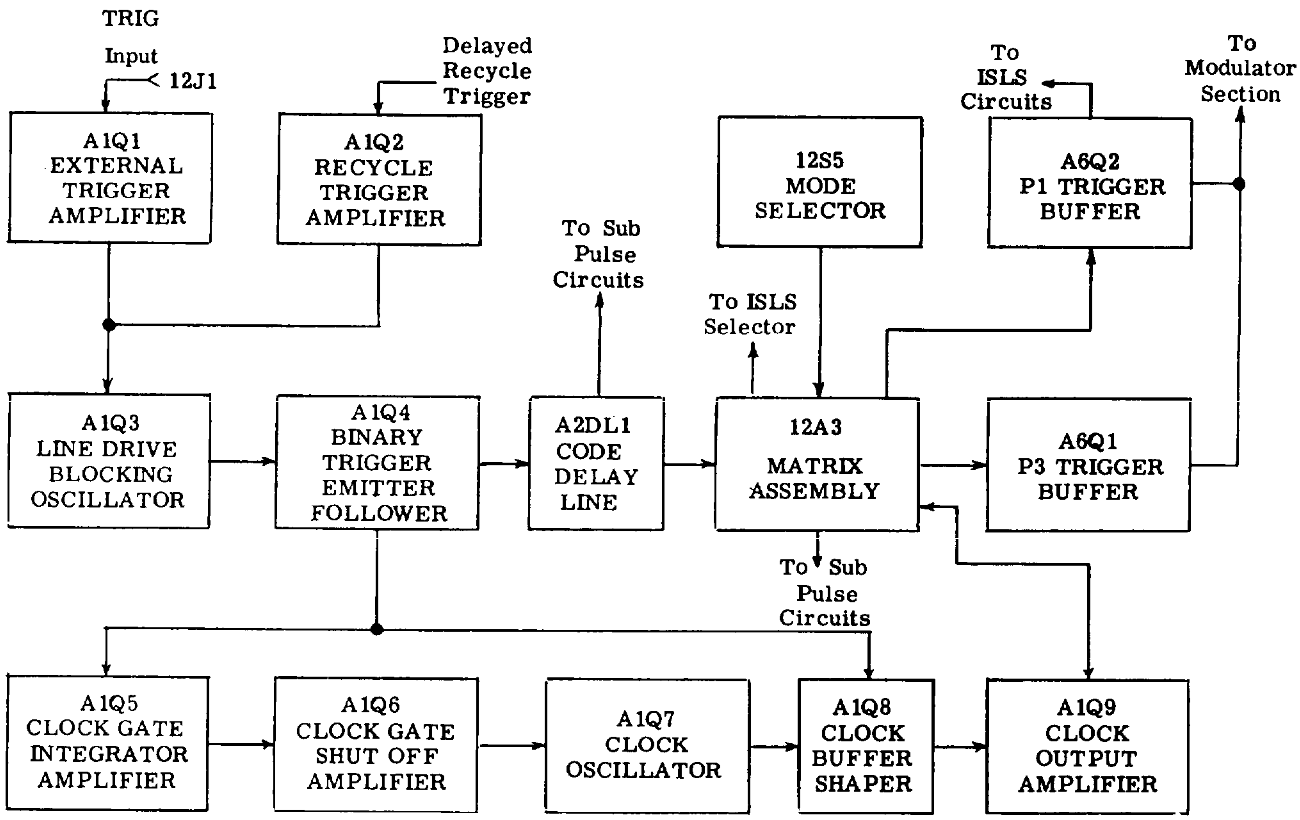


Figure 4-4. Interrogation Coder, Timing and Coding Circuit, Block Diagram

("recycling") as required. The assembly also includes circuits for processing trigger signals, for processing substitute pulses, for processing external modulation signals, and for mixing pulse signals.

The trigger signal required by these circuits is obtained from the signal source connected to TRIG connector 12J1 (figure 4-5). This positive signal may be supplied from a source external to the AN/UPM-98A Radar Test Set or from the Crystal Mark and Sync unit in the Radar Test Set. Connector 12J1 will present either a high impedance or a low (75 ohm) impedance, depending upon the position of terminating switch 12S2. The input trigger pulse signal is fed into Clock and Line Drive Assembly 12A1 through 12J7-7, then passed through capacitor 12A1C1 and clipping diode 12A1CRI It is coupled through diode 12A1CR2 and capacitor 12A1C2 to external trigger amplifier 12A1Q1. The amplified output from 12A1Q1 is coupled through capacitor 12A1C3 to the primary of transformer 12A1T1, the secondary of which applies it to binary trigger input emitter follower 12AIQ4. The output of 12A1Q4 is fed to delay line (Code) 12 A2DL1. At the same time, the output of 12A1Q4 is applied to clock gate integrator amplifier 12A1Q5 (figure 4-6) causing it to conduct. Capacitor 12A1C7 and resistor 12A1R7 in the collector circuit of 12AIQ5 perform an integrating function, determining the length of time gate shut-off amplifier 12A1Q6 will be cut off, and permitting clock oscillator 12A1Q7 to run. The operation of the clock oscillator circuits may be inhibited by a ground applied to the cathode of diode 12A1CR5. The output of 12A1Q7 is processed by clock buffer shaper 12A1Q8 and clock output amplifier 12A1Q9. The clock pulse signal is fed out of the 12A1 assembly through 12J7-A for distribution to the proper circuits.

The 12A1 assembly includes circuits for processing substitute pulses. Separate input channels are used for standard code pulse substitute triggers and for reset pulse substitute triggers (figure 4-7). Standard substitute triggers (2 usec early "reference" triggers from Matrix Assembly 12A3) are fed into the 12A1 assembly to the input of sub pulse reference emitter follower 12AIQ10.

ISLS pulse substitute reference triggers are fed to the same point. Reset tag pulse substitute triggers are fed in to the input of reset sub pulse emitter follower 12A1Q11. The output of either 12 AIQ10 or 12A1Q11 is coupled through a diode (12CR10 or 12CR9) and through capacitor 12A1C13 to sub pulse trigger amplifier 12A1Q12. The output of 12A1Q12 is coupled through 12A1C14 and transformer 12A1T2 to sub pulse blocking oscillator 12A1Q13, the output of which is passed through sub pulse line drive, emitter follower 12A1Q14 to the movable drive coil 12DL1 of sub pulse position delay line 12DL1 (4 usec). The delayed output of 12DL1 is returned to sub pulse emitter follower 12A1Q15. The output of 12A1Q15 is fed to sub pulse shaper 12A1Q16 and then to the junction of diodes 12AICR17 and 12A1CR18. At this point the delayed sub pulse may

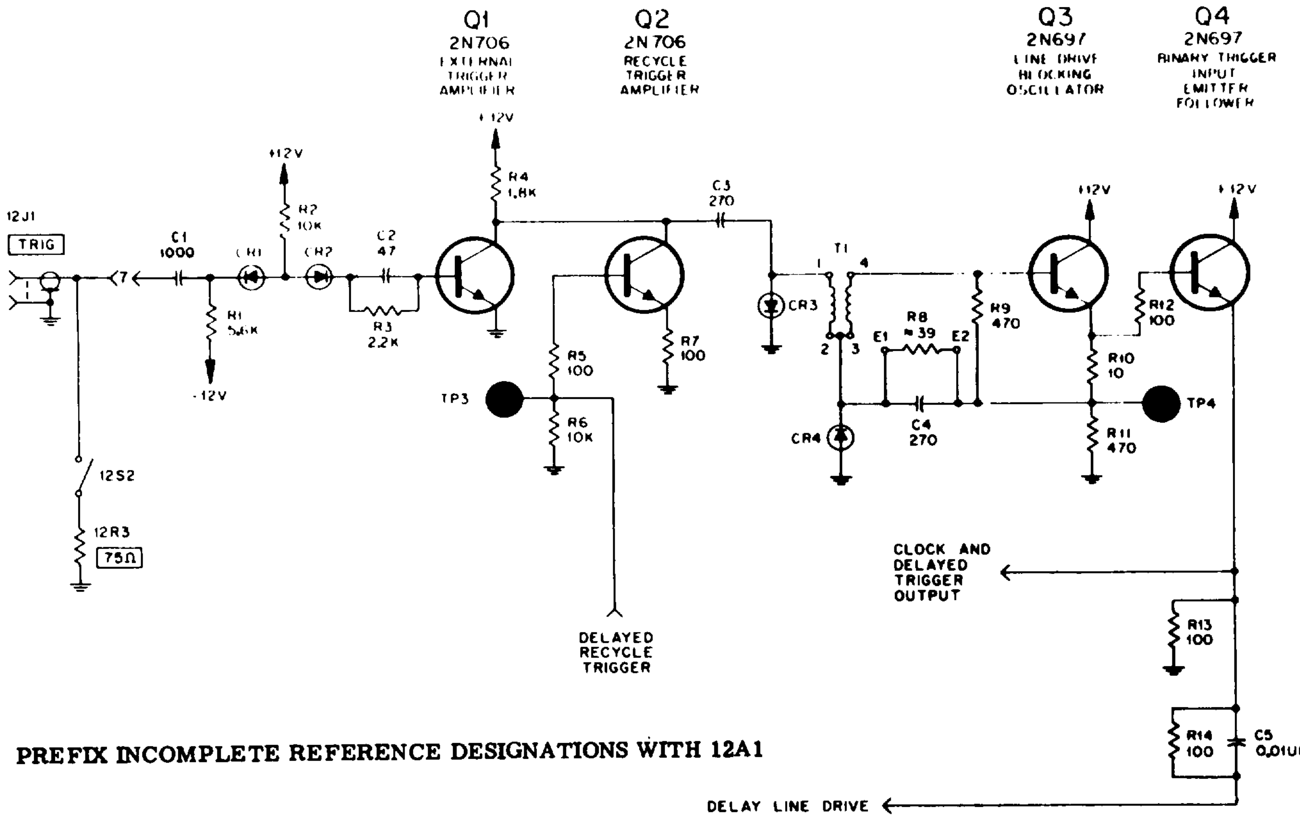


Figure 4-5. External Trigger and Recycle Cyrcuits, Simplified Schematic Diagram

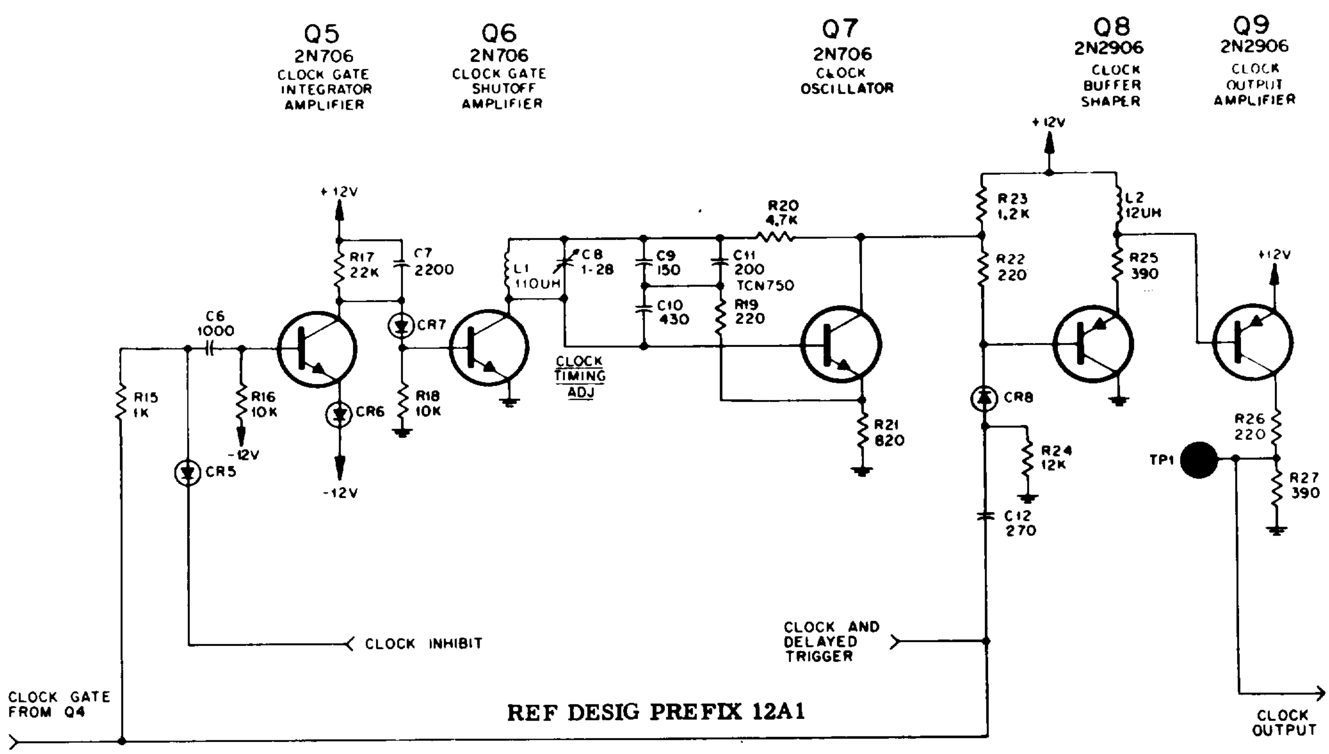
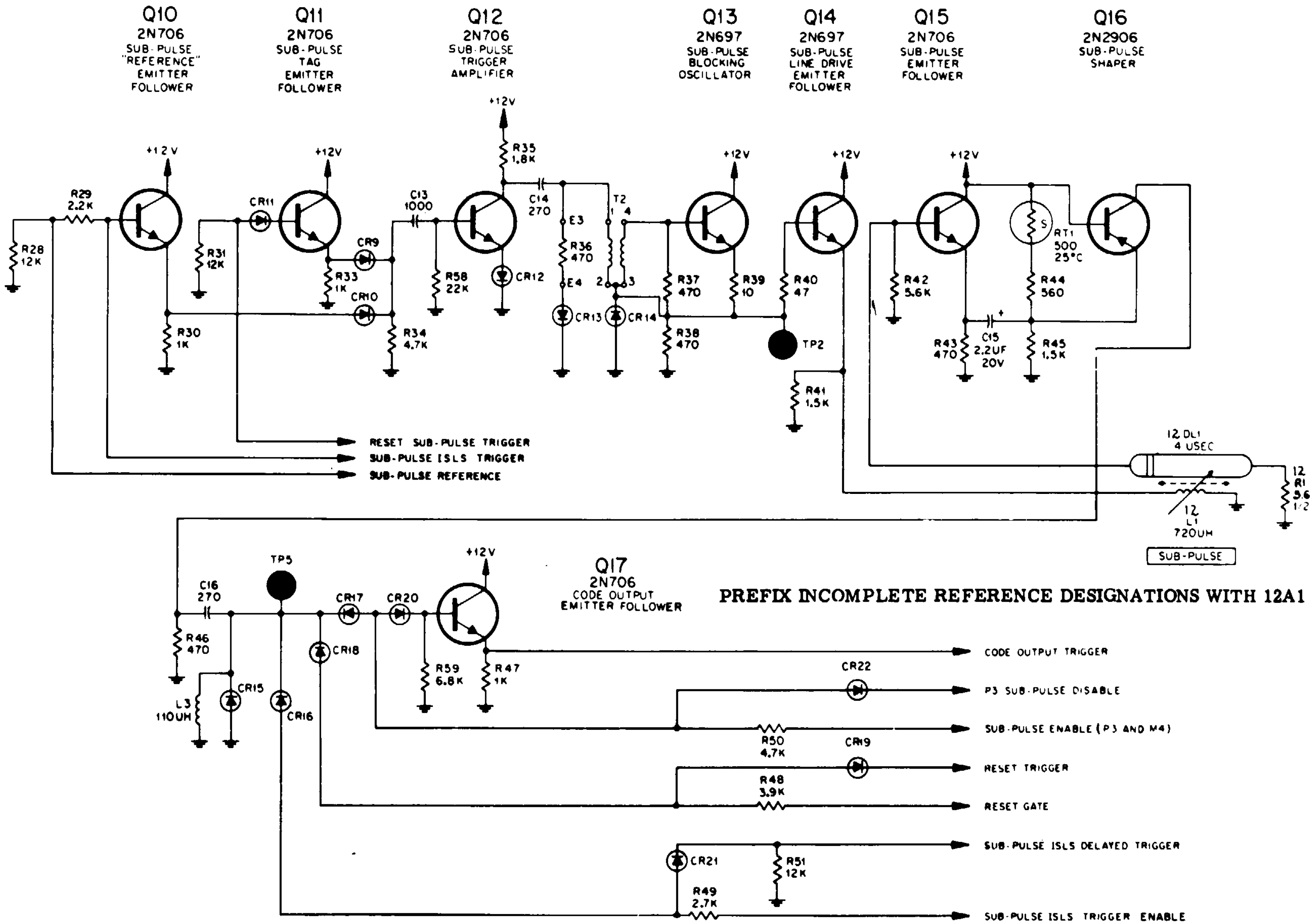


Figure 4-6. Clock Circuits, Simplified Schematic Diagrams



PREFIX INCOMPLETE REFERENCE DESIGNATIONS WITH 12A1

Figure 4-7. Substitute Pulse Circuits, Simplified Schematic Diagram be switched to one of three different output channels for use a code pulse substitute trigger, as an ISLS pulse substitute trigger, or as a reset pulse substitute trigger. When the sub pulse enable (P3 and M4) voltage is applied to the anodes of 12A1CR17 and 12A1CR20, the code trigger is allowed to pass to code output emitter follower 12A1Q17 and then out of the circuit. When a positive ISLS sub pulse trigger enable voltage is applied to the anodes of 12 A1CR16 and 12A1CR21, the ISLS delayed sub pulse trigger is allowed to go out of the circuit. When a positive reset gate pulse (enable voltage) is applied to the anodes of 12A1CR18 and 12A1CR19, the reset tag delayed sub pulse trigger is allowed to pass on out of the circuit.

Also contained in the 12A1 assembly is the modulation emitter follower stage 12A1Q18 (figure 4-8). External modulating signals fed in are coupled through capacitor 12A1C17 to the base of modulation emitter follower 12A1Q18. The output of 12A1Q16 is coupled through diodes 12A1CR23 and 12A1CR24 to the contacts of Function Selector 12S4C.

The 12A1 assembly also includes a signal mixer stage (output emitter follower 12A1Q19) for combining the code, ISLS, SIF, and reset pulses into a composite pulse signal for test purposes (figure 4-9). When Function Selector 12S4 is in the TEST position, the composite pulse signal is made available at CODER OUT connector 12J5 through VIDEO LEVEL control 12R11.

NOTE

The term “video” as used herein applies to either the pulse signals used for modulating the rf oscillator or those intended for viewing on the display.

2. DELAY LINE ASSEMBLY 12A2.- The lumped-constant, terminated delay line 12A2DL1 is the basic element used in the formation of the interrogate ion pulse pattern. By passing a pulse down the delay line, it is possible to pick off a voltage pulse caused by the input pulse at any of the tap points along the line, each pulse picked off being successively delayed a slightly greater length of time. Two or more of these output pulses may be combined on a common output line to form a desired pulse pattern. The pulses having various time delays formed along Delay Line 12A2DL1 (figure 4- 10) are put into use as required by means of the switching action of diode Matrix Assembly 12A3 in conjunction with the proper enabling voltages from the selector switches. The proper timing pulses from the clock circuits are also required.

Delay Line 12A2DL1 is driven by the positive output pulses from binary trigger input emitter follower 12A1Q4 in Clock and Line Drive Assembly 12A1. The pulses appearing at the “0” usec reference tap is used as the P3 pulse in all standard modes. Thus P3 will always remain

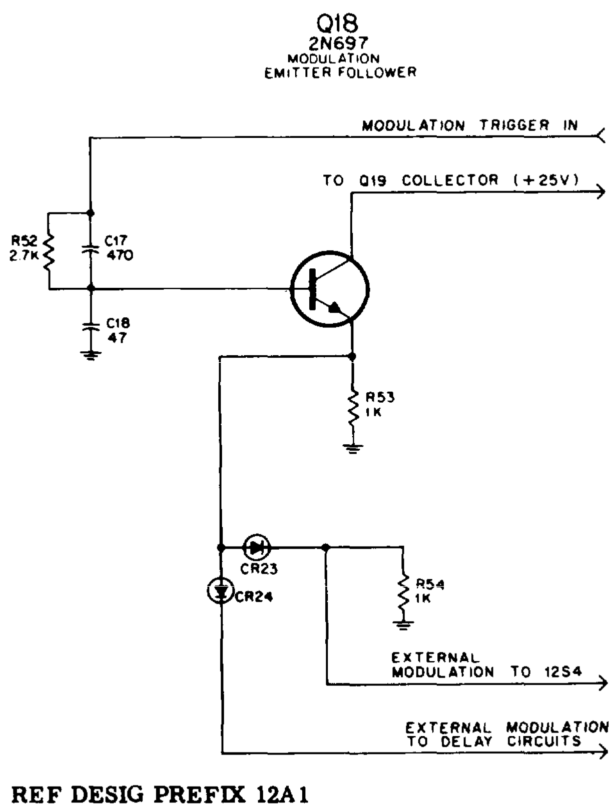


Figure 4-8. Modulation Emitter Follower, Simplified Schematic Diagram

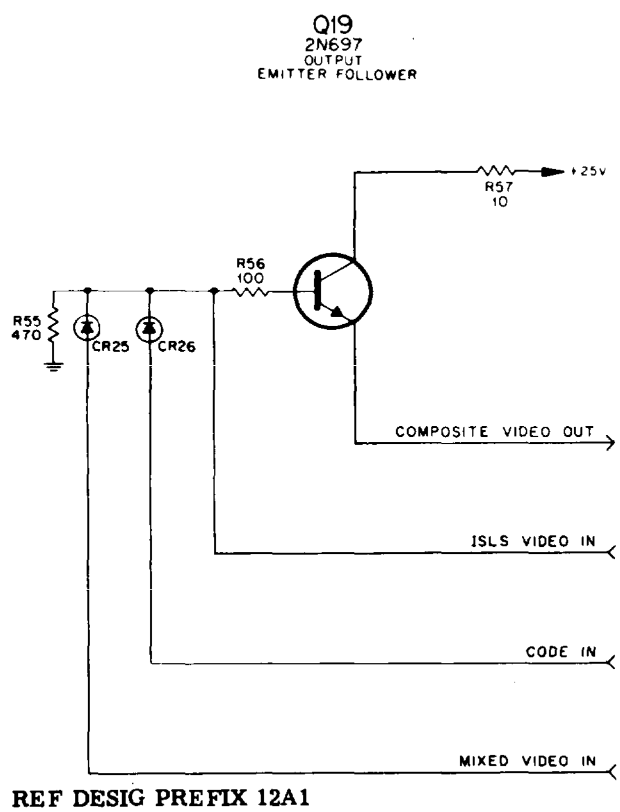
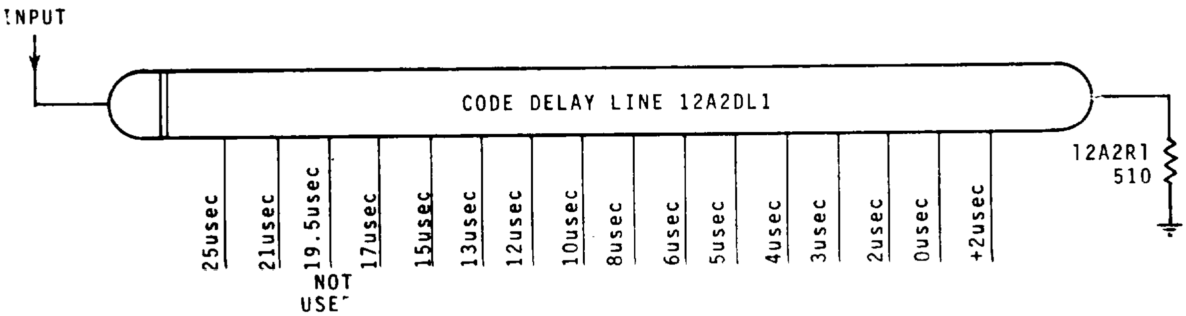


Figure 4-9. Output Emitter Follower, Simplified Schematic Diagram



NOTE: Times assigned to taps refer to spacing with respect to the "0 usec" reference and not to actual delays.

Figure 4-10. Code Delay Line 12A2DL1, Simplified Schematic Diagram

constant, while P1 will vary in delay for different modes. Pl will appear at the “3 usec’’tap for mode 1, at the “5 usec’’ tap for mode 2, at the “8 usec” tap for mode 3/A, and at the “21 usec’’ tap for mode c.

NOTE

The assignment of time designations to the delay line taps is based on the increasing amount of separation between P3 and P1 and not on the actual amount of delay given to the input pulse.

The substitute pulse reference trigger for standard mode interrogations will always be taken from a point two microseconds ahead of the normal pulse position.

NOTE

In all the standard modes, an ISLS (P2) Pulse is obtained by using the PI pulse and delaying it two microseconds. A substitute P2 pulse is obtained in these cases by using the undelayed P1 pulse as the P2 substitute reference pulse.

For production of mode 1 interrogation pulses the following delay line taps are used.

For P1; the “3 usec” tap
For P3; the “O usec” tap
For P3 substitute pulse; the **2 usec" tap (this pulse is later given an additional delay).

For production of mode 2 interrogation pulses, the following delay line taps are used:

For Pr; the “5 usec” tap
For P3; the “O usec” tap
For P3 substitute pulse; the “2 usec” tap

For product ion of mode 3/A interrogate ion pulses, the following delay line taps are used:

For P1; the “8 usec” tap
For P3; the ‘‘0 usec” tap
For P3 substitute pulse; the “2 usec” tap

For product ion of mode C interrogation pulses, the following delay line taps are used:

For P1; the “21 usec” tap
For P3; the ’'0 usec" tap
For P3 substitute pulse; the “2 usec” tap

For production of mode 4 interrogation synchronizing pulses, the following delay line taps are used:

For the first sync pulse; the “6 usec” tap
For the second sync pulse* the “4 usec” tap
For the third sync pulse; the “2 usec” tap
For the fourth sync pulse; the “O usec” tap
For the 8 usec ISLS pulse (when used); the "+2 usec" tap

For production of substitute pulses for the sync pukes, the following delay line taps are used. (No substitution is used for the first sync pulse).

For the second sync substitute pulse; the “6 usec” tap
For the third sync substitute pulse; the “4 usec” tap
For the fourth sync substitute pulse; the “2 usec” tap
For the 8 usec ISLS substitute pulse; the “0 usec” tap

For production of reset tag pulses, the following delay line taps are used:

For reset tag pulse number one; the “25 usec” and “17 usec” taps.

For reset tag pulse number two; the ‘’15 usec” and “13 usec’’ taps.

For reset tag pulse number three; the “10 usec” and “6 usec” taps.

It will be noted that the use of these delay line taps results in a spacing of two microseconds between pulses R1 and R2, and a spacing of three microseconds between R2 and R3.

For the production of substitute pulses for the reset tag pulses, a set of taps, each of which is two microseconds earlier, is used. No substitution is provided for reset pulse number one.

For reset tag substitute number two; the “17 usec” and “15 usec” taps.

For reset tag substitute number three; the “12 usec” and “8 usec” taps.

3. MATRIX ASSEMBLY 12A3.- The Matrix Assembly consists of an array of switching networks used for selecting the desired trigger pulses from those developed by Delay Line Assembly 12A2. For each switching network, several coincident conditions must be met before a pulse is allowed to pass. A pulse must be present at the line from the delay line tap of interest, a positive enabling voltage must be available to the switching diodes, a positive timing pulse from the clock circuits must be present, and the disabling diode must not be grounded.

All of the matrix switching circuits are basically similar and their operation is explained by the typical example shown in figure 4-11. The basic circuit consists of a gate diode 12A3CR64 and a coupling diode 12A3CR65. A positive enabling voltage is applied (through 12R25) to the anodes of these two diodes to turn the basic switch “on”. However, this switching circuit requires a total of four coincident conditions in order to pass (in effect) a delay line pulse on to the output line:

First - a +12 volt potential must be applied to the anodes of diodes of 12A3CR64 and 12A3CR65 (through gating resistor 12R25).
Second - the disabling ground must be off;
Third - a positive delay line pulse must be present at the switch input;
Fourth - a positive clock pulse must be applied to the cathode of 12A3AR66 .

When the first two of these four conditions are met, the +12 volt potential enables the circuit by forward-biasing the gate diode 12A3CR64 and coupling diode 12A3CR65, and no disabling ground is present to nullify the effect. When the third condition is met; that is a delay line pulse is present, still no pulse reaches the output line because the current is shorted to ground through 12A3CR66 and 12A1R27. However, when a clock pulse arrives at the same time, diode 12A3CR66 will be in a conductive state, and the clock pulse will back-bias it, causing a voltage rise at the junction of 12A3CR66 and 12A3CR65 which appears as a pulse on the output (P3) line. This pulse will have a width

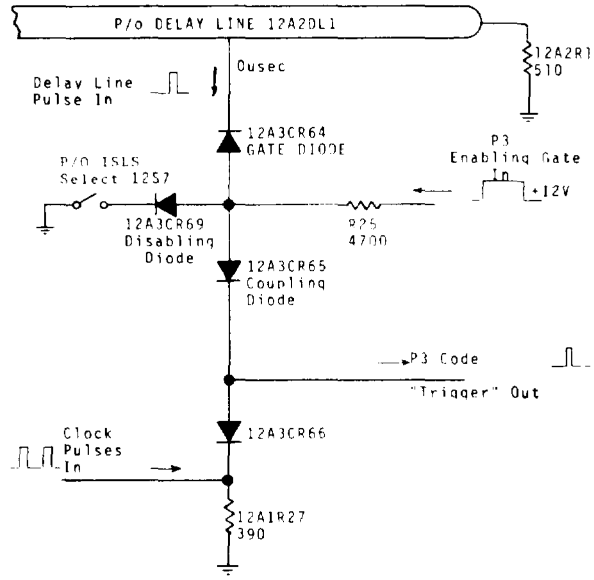


Figure 4-11. Typical Switching Section of Diode Matrix Assembly 12A3, Simplified Schematic Diagram

determined by that of the relatively narrow clock pulse. The pulse height will be determined by the lower of the potentials applied. When no delay line pulse is present, but +12 volts is present, current will flow through 12A3CR64, through the delay line, and back to ground through the terminating resistor. When the disabling switch is closed, the junction of the 12A3CR64 and 12A3CR65 diodes is held at ground potential and no pulse will reach the output line.

NOTE

Although it is seen that a delay *line* pulse does not actually pass through the switch circuit to the output, the expression “pass through” will be used for convenience throughout the rest of the circuit discussion.

To produce a pattern simulating a set of three reset tag pulses, three pairs of delay line taps are used. Each of the pulses from these taps represents the leading or trailing edge of one of the reset tag pulses. (These pairs of pulses are later processed to form individual pulses.)

For producing substitute (movable) pulses, an output from a tap (a pair of taps in the case of a reset tag pulse) is utilized which produces a pulse two microseconds earlier than the normal time. The resulting pulse may then be varied in position approximately 2 microseconds on both sides of the normal position.

When mode 1 operation is selected (for example) by means of Mode Selector 12S5, a positive enabling voltage is applied to the junction of diodes 12A3CR50 and 12A3CR51 (see overall Interrogation Coder Schematic Diagram, figure 5-65) which biases them (and also 12A3CR8) into conduction permitting a “3 usec” pulse to pass out on the PI trigger output line (if all other conditions are correct). At the same time, a positive clock pulse is applied to the cathode of 12A3CR8, causing it to conduct and causing a rise in voltage at the junction of 12A3CR50 and 12 A3CR51 which appears as a pulse on P1 trigger output line.

The mode 1 interrogation signal consists of a pair of pulses spaced three microseconds apart. A positive trigger input at TRIG connector 12J1 is fed to external trigger amplifier 12A1Q1 in Clock and Recycle Assembly 12A1 where it is amplified. The output of 12A1Q1 is coupled in through capacitor 12A1C3 and transformer 12A1T1 to line drive blocking oscillator 12A1Q3. The shaped output pulses from 12A1Q3 are direct-coupled to the base of binary trigger emitter follower 12A1Q4. The output of 12A1Q4 is fed out to Delay Line Assembly 12A2 and is also coupled to the clock circuits (12A1Q5 through 12A1Q9).

Mode 1 trigger pulses for P1 and P3 respectively enter P1 trigger buffer l2A6Q2 and P3 trigger buffer 12A6Q1 in Delay and Tag Generator Assembly 12A6. The outputs from these buffers are combined on a common line to form the mode 1 code output triggers. They are fed to internal blocking oscillator amplifier 12A4Q1 in Blocking Oscillator Assembly 12A4 for use in the modulating circuits.

The method of generating mode 2, 3/A, and C interrogation pulses is the same as for mode 1 except that the P1 trigger pulse precedes the P3 trigger pulse by the amounts stated previously, that the enabling voltages are applied to different lines by the contacts of Mode Selector 12S5, and that the pulses pass through different switching diodes in Matrix Assembly 12A3.

When operating in mode 4, Mode Selector 12S5 is in the M4 SYNC position, so the Interrogation Coder is set up for simulating interrogations in the mode 4 pattern. This means that the preliminary mode 4 synchronizing pulses (spaced two microseconds apart) are supplied by the Interrogation Coder and the remaining pulses (up to 33) are supplied from an external source through the MOD connector on the Interrogation Coder.

4. SUBSTITUTE PULSE CIRCUITS. - The Interrogation Coder has the capability of providing variable pulse spacing (pulse shift) in the pulse pattern for any mode of interrogate ion. This is accomplished by removing a normal pulse from the pulse train, replacing it with a substitute pulse, and using the SUB PULSE position control to vary its position in the train. (See figure 4-7.)

Pulse position variability is achieved by starting the substitute pulse two microseconds earlier than the normal pulse posit ion, and applying it to a 4-microsecond variable delay line. By changing the drive coil position on the delay line, the amount of delay can be varied and the pulse position adjusted over approximately 1.5 microseconds on either side of the normal position.

A substitute pulse can replace either the last interrogation pulse (designated as P3) or the ISLS pulse (P2) in standard IFF interrogations. In mode 4 interrogations, a substitute pulse can replace the second, third, *or* fourth synchronizing pulse, as well as the ISLS (8 usec) pulse. A substitute pulse may also be used to replace the second or third reset tag pulse.

In all standard modes, replacement of the P2 (ISLS) pulse with a substitute pulse requires that a variable-position pulse be put into the space two microseconds after the P1 pulse. For production of an ISLS pulse, ISLS Selector 12S7 is set to the 2 usec position. This will cause a +12 volt ISLS enable potential to be applied to the anodes of switch diodes 12A6CR6 and 12A6CR5 in ISLS and Tag Generator Assembly 12A6, permitting the output of P1 trigger buffer 12A6Q2 to pass to the ISLS delay multivibrator 12A6Q3/Q4.

To maintain this relationship, with the P2 pulse two microseconds after the P1 pulse in all standard modes, the P2 pulse is produced by using the P1 pulse to trigger a multivibrator which generates a pulse delayed by two microseconds. When a substitute P2 pulse is desired, Substitute Pulse Selector 12S6 is set to the P2 posit ion, and this normal P2 pulse will be replaced by a variable-position pulse. The normal P2 pulse is removed by switching the PI trigger off the delay multivibrator. The substitute P2 pulse is then processed like the other code pulse substitutions.

As stated before, for P2 pulse substitution, ISLS Selector 12S7 will be in the 2 usec posit ion, and Substitute Pulse Selector 12S6 will be the P2 position. Under these conditions, a positive sub pulse enable (ISLS) voltage will be applied to diodes 12A6CR4 and 12A6CR8, providing a path for the P1 trigger from P1 trigger buffer 12A6Q2 through 12A6CR4 and 12A6CR8 to sub pulse reference emitter follower 12A1Q1O in Clock and Recycle Assembly 12A1. Since the P1 pulse is two microseconds ahead of the P2 pulse, the P1 pulse is utilized as the ‘‘2 usec early” reference pulse for substitute pulse production.

The positive enabling voltage on 12A6CR4 also serves to disable diodes 12A6CR3 and 12A6CR5 so that the P1 trigger is prevented from reaching the ISLS delay multivibrator 12A6Q3/Q4 and the normal ISLS pulse is eliminated from the output .

When using external ISIS triggering, a substitute pulse trigger for the ISIS delay multivibrator is fed in through resistor 12A6R84 and conducting switch diode 12A6CR4. The rest of the operation is the same as for internally-triggered ISLS pulse substitution. The Substitute Pulse Selector is set to P2 so as to permit diode 12A6CR2 to apply the initial IFF output pulse (Pi) from P1 trigger buffer 12A6Q2 to sub pulse reference emitter follower 12A1Q1O. This output pulse is amplified by sub pulse trigger amplifier 12A1Q12. The output of 12A1Q12 triggers sub pulse blocking oscillator 12A1Q13 which drives an adjustable delay line (12DL1). An output pulse of variable delay is available at sub pulse emitter follower 12A1Q15. This externally triggered delayed output pulse is sent to ISLS trigger emitter follower 12A4Q5 from where it follows the path described for internally-triggered ISLS pulses.

When Substitute Pulse Selector 12S6 is set to the P3 position, a +12 volt sub pulse reference enable potential is applied to the anodes of switching diodes 12A3CR55 and 12A3CR56 in Matrix Assembly 12A3. This permits the passage of a "reference" pulse (which precedes the P3 pulse by two microseconds) to sub pulse reference emitter follower 12A1Q10 in Clock and Line Drive Assembly 12A1. The output of 12A1Q10 is coupled through 12A1CR10 and capacitor 12A1C13 to sub pulse trigger amplifier 12A1Q12 which feeds it through 12A1C14 and 12A1T2 to sub pulse blocking oscillator 12A1Q13. The output of blocking oscillator 12A1Q13 is fed to sub pulse line drive emitter follower 12A1Q14, the output of which is applied to the variable drive coil 12L1 of sub pulse delay line 12DL1. The desired delay is set by means of 12DL1 and the delay line output is coupled to sub pulse emitter follower 12A1Q15. The output of 12A1Q15 drives sub pulse shaper 12A1Q16, the output of which is gated on by the positive voltage applied to switch diodes 12A1CR17 and 12AICR20, passing the signal to code output emitter follower 12A1Q17 which feeds it out to internal blocking oscillator amplifier 12A4Q1 in Blocking Oscillator Assembly 12A4. It is then processed like a normal modulating signal.

5. 40- MICROSECOND DELAY TRIGGER CIRCUITS. - A pulse delayed 40 microseconds from the input is available at OUT receptacle 12J4 during the simulation of interrogations in most modes. As shown in figure 4-12, the delay trigger signal from VIDEO selector switch 12S8 is fed to 40-microsecond delay trigger amplifier 12A6Q6 in Delay and Tag Generator Assembly 12A6. The output of 12A6Q8 is coupled to 40 usec delay multivibrator 12A6Q7/Q8. The output from 12A6Q8 is gated on and off by the code gate applied to the anode of 12A6CR13.

Multivibrator output pulses are applied to 40-microsecond delay blocking oscillators 12A6Q9 and 12A6Q10 for pulse shaping. A 40-microsecond delayed output trigger from 12A6Q10 is made available at OUT receptacle 12J4 for application to the SIF Coder. This permits the simulation of the composite video from a reply signal consisting of the following:

First - a set of the original interrogation pulses serving as mode identification tags;

Second - a set of SIF code reply pulses (delayed 40 microseconds for proper spacing) containing bracket and information pulses, and

Third - a set of three special reset pulses which serve to indicate the end of the receiver "on" time for each prf period.

(b) MODULATING SECTION. - There are two possible sources of pulses for the input of the modulating circuits. One source is the coder section of the Interrogation Coder and the other is an external source connected to MOD connector 12J3. Function Selector 12S4 determines which of the two sources is used.

In addition to the pulse input, the modulating circuits require a dc voltage input to

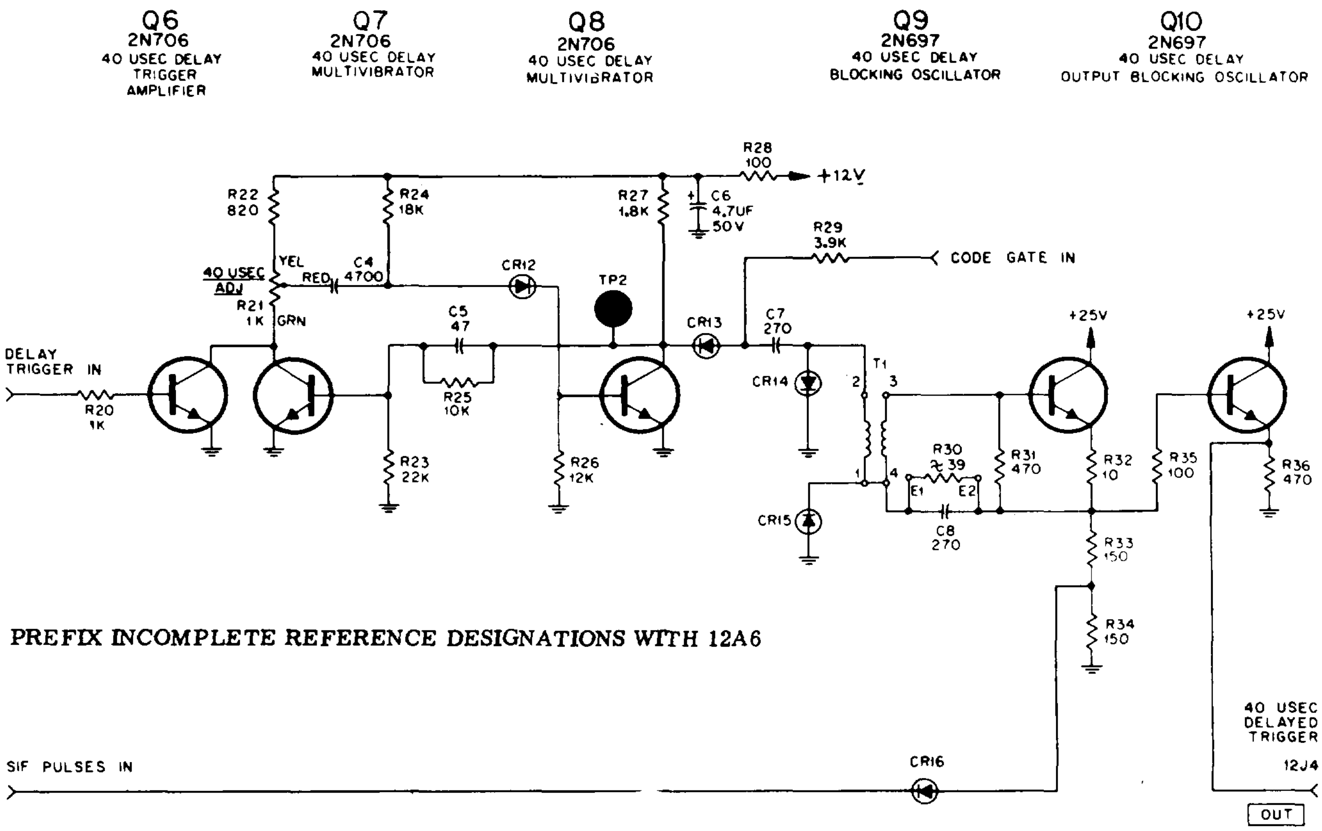


Figure 4-12. 40-μsec Delay Trigger Generating Circuits, Simplified Schematic Diagram

accomplish the automatic level control function. This dc voltage is provided by the ALC amplifier in the Calibration- Control unit.

The output of the modulating section can go to either of two possible places, depending upon the setting of Function Selector 12S4. One destination is the main rf oscillator, located on the SM-197A chassis. The other is CODER OUT connector 12J5, where the input signal level can be adjusted by means of the VIDEO LEVEL control.

Modulating signals are processed by two separate sections of circuitry in the Interrogation Coder: the Blocking Oscillator Assembly 12A4 and the electron tube modulating circuits.

1. BLOCKING OSCILLATOR ASSEMBLY 12A4. - This assembly contains transistor blocking oscillator circuits for producing pulses to be used in modulating both the main rf oscillator and the ISLS rf oscillator. Both blocking oscillators may be triggered by either internally-produced or externally-produced pulse signals.

When Function Selector 12S4 is in the MOD-INT position, the internal modulating code output signal from Delay and Reset Pulse Generator Assembly 12A6 is applied to the input of internal blocking oscillator amplifier 12 A4Q1. (This signal consists of the basic interrogation pulses P1 and P3 for standard modes, and consists of four synchronizing pulses for mode 4 interrogations.)

Internal blocking oscillator amplifier 12A4Q1 and external modulation blocking oscillator amplifier 12A4Q2 share a common collector load (figure 4-13). The collector output of 12A4Q1 is coupled through capacitor 12A4C3 to output blocking oscillator 12 A4Q3. The width of the pulse produced by this blocking oscillator is controlled by means of CODE WIDTH control 12R4. The output of the blocking oscillator is fed to output emitter follower 12A4Q4. The output of 12A4Q4 is passed through the contacts of Function Selector 12S4, and through coupling capacitor 12C1 to the input of pulse amplifier 12V1. The output of the pulse amplifier is clamped by output clamper 12V2A to the positive level determined by the ALC circuit, and again by output clamper 12V2B, and then coupled to the grid of modulator cathode follower 12V3.

The output of 12V3 is passed through the contacts of Function Selector 12S4, and through connector 12J6 to the rf oscillator circuits on the SM-197A chassis. When Function Selector 12S4 is in the MOD- LOW position, the positive pulses from connector 12J3 which are coupled to modulation emitter follower 12 A1Q18 (in Clock and Line Drive Assembly 12A1) are then fed through the contacts of switch section 12S4C, front, to the input of external blocking oscillator amplifier 12A4Q2 in Blocking Oscillator Assembly 12A4. The output of 12A4Q2 is coupled through capacitor 12A4C3 to output blocking oscillator 12A4Q3.

From this point on the circuits are the same as for internal modulation. When internal modulating signals are used, the code output trigger signal from ISLS and Tag Generator Assembly 12A6 is applied to internal blocking oscillator

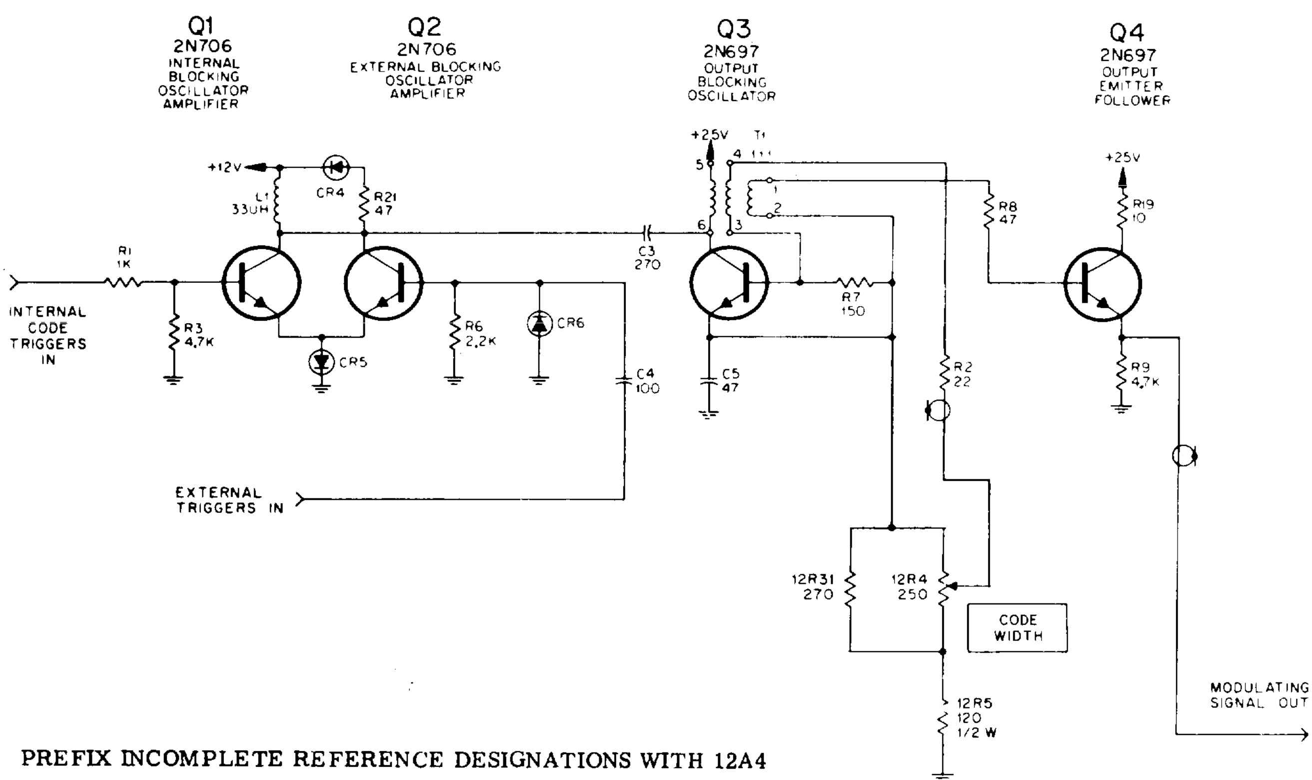


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Figure 4-13. Code Modulation Blocking Oscillator Circuit, Simplified Schematic Diagram amplifier 12A4Q1 in Blocking Oscillator Assembly 12A4. The output of 12A4Q1 is coupled through capacitor 12A4C3 to output blocking oscillator 12A4Q3. The output of 12A4Q3 is fed to output emitter follower 12A4Q4. The output of 12A4Q4 is passed through the contacts of Function Selector 12S4 (when in the MOD- INT position) to the input of the electron-tube modulating circuits (12V1, 12V2, and 12V3).

For external modulation, the modulating signal source is connected to MOD connector 12J3. Function Selector 12S4 is set to either MOD- HIGH or MOD- LOW position, depending upon whether the signal amplitude is over or under 20 volts.

The MOD- LOW position of Function Selector 12S4C routes external input signals from MOD connector 12J3 through modulation emitter follower 12A1Q18 in Clock and Line Drive Assembly 12A1, back through the contacts of Function Selector 12S4C to external blocking oscillator amplifier 12A4Q2, output blocking oscillator 12A4Q3, output emitter follower 12A4Q4 again through Function Selector 12S4C, and into pulse amplifier 12V1 in the electron tube modulator circuits.

For external modulating pulses of over 20 volts amplitude, Function Selector 12S4 is set to MOD-HIGH position. In this position the input signal is routed through modulation emitter follower 12A1Q18 in Clock and Line Drive Assembly 12A1, back through the contacts of Function Selector 12S4C, and directly into pulse amplifier 12V1 in the electron tube modulator section. When SIF Coder pulses are being used as external input pulses, the pulse width will be controlled by the SIF coder in the MOD-HIGH position and in the MOD-LOW position it will be controlled by the interrogation coder. It is recommended in the MOD-LOW position that a narrow pulse be fed in for better operation.

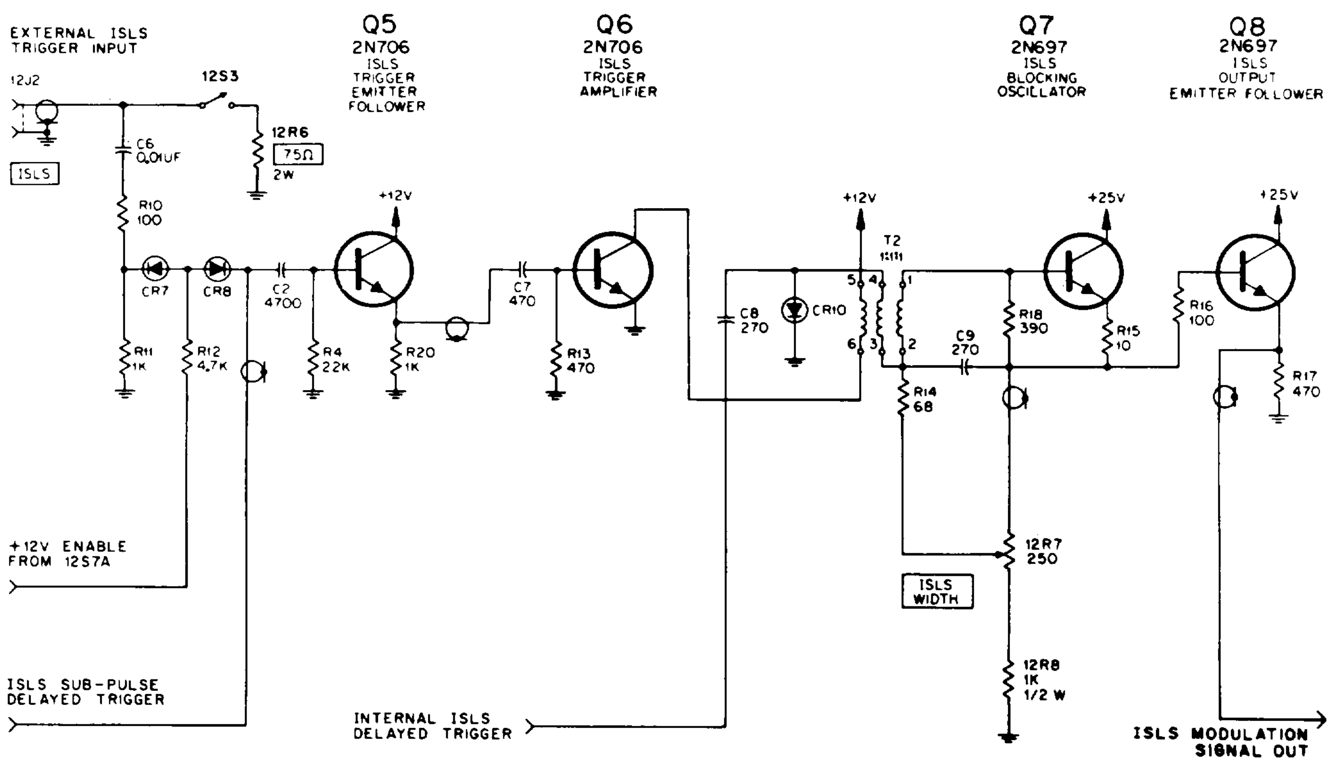
Setting Function Selector 12S4 to the MOD-INT position routes the code output trigger from P3 trigger buffer 12A6Q1 and P1 trigger buffer 12A6Q2 (in ISLS and Delay Pulse Generator Assembly 12A6) through internal blocking oscillator amplifier 12A4Q1, output blocking oscillator 12A4Q3, output emitter follower 12A4Q4, and through the contacts of 12S4C into pulse amplifier 12V1 in the electron tube modulator section.

When Function Selector 12S4 is set to the MOD-MIX position, an external trigger at MOD connector 12J3 follows a path identical to that taken in the MOD-HIGH position. The code output trigger is also fed into pulse amplifier 12V1 in the electron tube modulator section through the contacts of Function Selector 12S4C,

The TEST position of Function Selector 12S4 applies the external modulation input trigger from output emitter follower 12A4Q4 to CODER OUT connector 12J5.

When Function Selector 12S4 is set to (+) or (-), either positive or negative-going pulses are made available at CODER OUT connector 12J5.

When an ISLS pulse is to be produced, the ISLS blocking oscillator 12A4Q7 and associated circuits is used (figure 4-14). When an internally generated trigger is used, it is applied to



PREFIX INCOMPLETE REFERENCE DESIGNATIONS WITH 12A4

Figure 4-14. ISLS Modulation Blocking Oscillator Circuit, Simplified Schematic Diagram blocking oscillator transformer 12A4T2, triggering the blocking oscillator. The width of the blocking oscillator pulse is adjusted by ISLS WIDTH control 12R7. The output of 12A4Q7 is direct-coupled to ISLS output emitter follower 12A4Q6.

When an external trigger source is used, it is connected to LSLS connector 12J2, and a +12 volt enabling potential is applied to switching diodes 12A4CR7 and 12A4CR8. The diodes conduct, permitting the pulse to pass through the ISLS trigger emitter follower 12A4Q5. The output of 12A4Q5 is amplified by ISLS trigger amplifier 12A4Q6 before being applied to the blocking oscillator. From here on, the pulse is processed as for internal triggering, and is passed out of the assembly to Rf (ISLS) Subassembly 12A5.

2. ELECTRON TUBE MODULATING CIRCUITS. - The electron tube modulating circuits consist of three stages, pulse amplifier 12V1, output clamper 12V2, and modulator cathode follower 12V3 (figure 4-15). The input to the first stage, 12 VI, is determined by the setting of Function Selector 12S4C. The input signal is fed through coupling capacitor 12C1. Pulse amplifier 12V1 is a cat bode- driven pentode.

The positive peaks of the output from the plate of 12V1 are clamped at the dc level set by the first diode section (A) of output clamper 12V2 which is biased by the ALC circuit in the Calibration- Control unit. This type of modulator control maintains a constant-level signal generator pulse output. The output from 12V1 is coupled through capacitor 12C5 and parasitic suppressor 12R19 to the grid of modulator cathode follower 12V3. At the same time it is coupled to output clamper 12V2B which is connected across the 12V3 grid-return resistor 12R18. The plate load resistor 12R15 of 12V1 is tapped to provide a screen voltage for 12V3 which tends to rise with an increase in duty cycle. This effect compensates for the normal tendency for the screen voltage to drop. Resistor 12R20 and inductor 12L3 function as a compensated load for the cathode of 12V3. Positive output pulses from 12V3 are applied to the rf oscillator in the SM-197A chassis through the contacts of Function Selector 12S4B, f rent, and connector 12J6.

When Function Selector 12S4 is set to the MOD-HIGH, MOD- LOW, MOD- INT, or MOD- MIX position, the input to 12V1 is as described previously. However, when the selector is in the TEST posit ion, no signal is applied to 12V1, but the signal is routed directly to CODER OUT connector 12J5 instead of to the modulator circuits.

(c) RF (ISLS) SUBASSEMBLY 12A5.- This assembly contains the circuits for generating an independent rf signal to be used in simulating an ISLS reference signal, and also the circuits for pulse modulating the rf signal using either an internally or externally generated modulating signal.

1. OSCILLATOR CIRCUIT .- The initial source for the ISLS signal is Crystal-Controlled Oscillator 12A5Q1 (figure 4-16). The basic oscillator frequency of 85.833 mHz is set by frequency-control crystal 12A5Y1. Oscillator

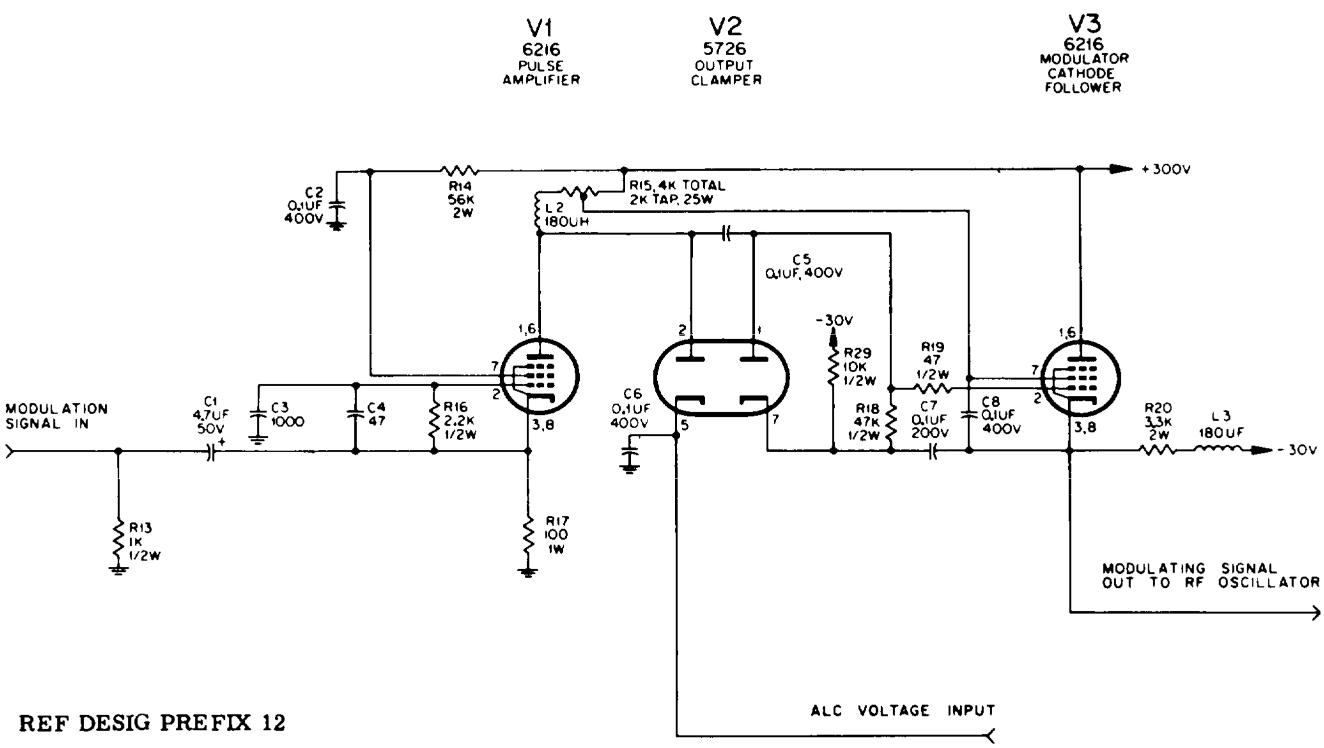
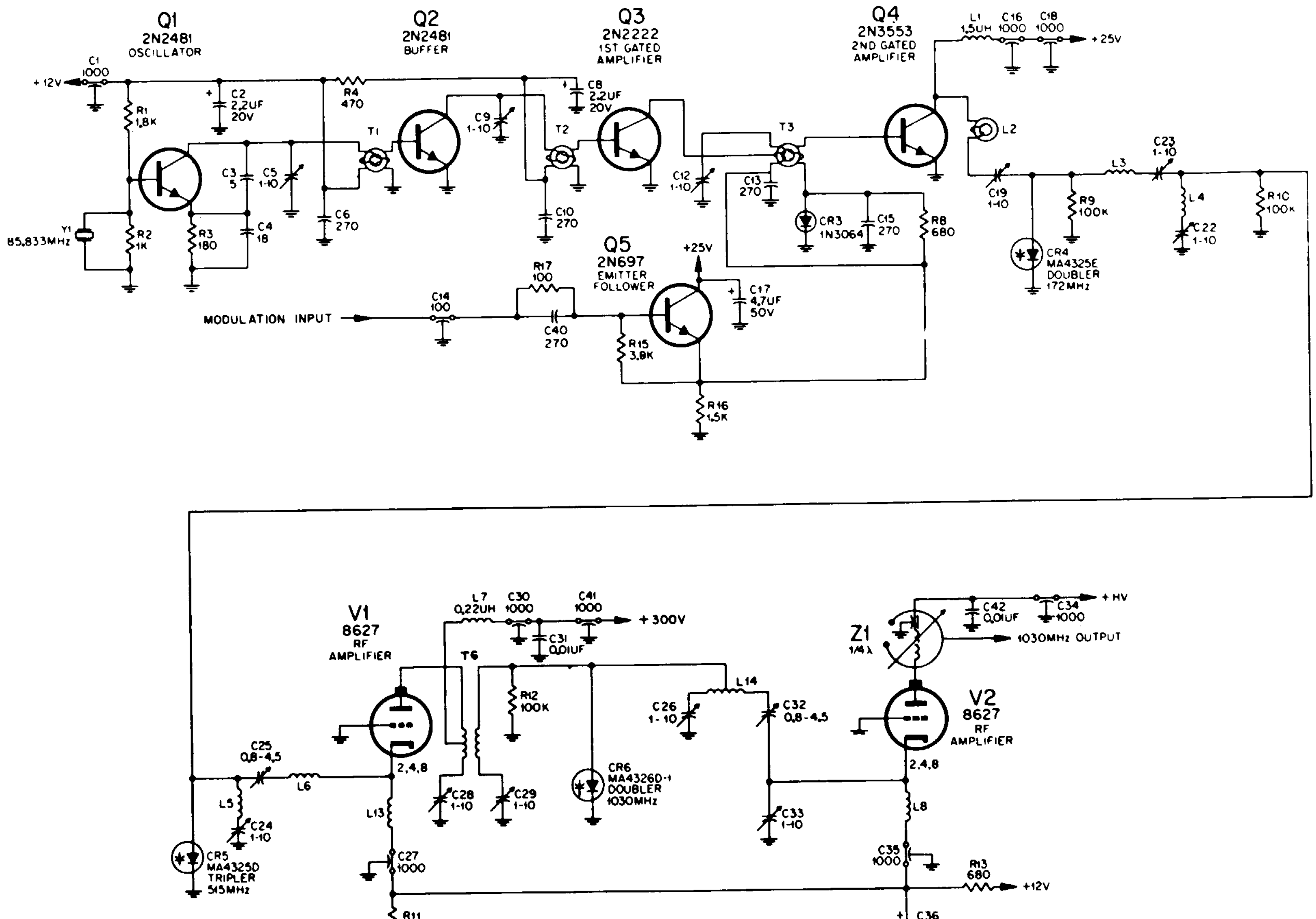


Figure 4-15. Electron Tube Modulating Circuits, Simplified Schematic Diagram



REF DESIG PREFIX 12A5

Figure 4-16. ISLS Oscillator Circuits, Simplified Schematic Diagram

12A5Q1 operates continuously when input power is applied. The output at the collector of 12A5Q1 is transformer-coupled to buffer 12A5Q2. Transformer 12A5T1 is tuned to 85.833 mHz by means of variable capacitor 12A5C5. The output of buffer 12A5Q2 is applied to the base of gated amplifier 12A5Q3 through transformer 12A5T2.

2. PULSE MODULATION CIRCUITS. - Gated amplifier 12A5Q3 is normally disabled by the grounding of the collector through the primary of transformer 12A5T3 and the emitter resistor 12A5R16 of the "normally off" emitter follower 12A5Q5. When a positive modulation pulse from either an external source (through the ISLS pulse-processing circuits in blocking oscillator assembly 12A4) or an internal source (the normal modulating signal selected by section 12S4B, front of the Function Selector) is fed to the base of 12A5Q5, the transistor conducts, applying 25 volts to the collector of 12A5Q3 through the primary of 12A5T3. This causes 12A5Q3 to be enabled for the duration of the pulse.

3. FREQUENCY MULTIPLIERS. The 85.833 mHz signal at the output of 12A5Q4 is applied to varactor diode 12A5CR4, which acts as a harmonic generator and (in conjunction with the associated tuned circuits), doubles the frequency to 171.667 mHz. This frequency is then tripled by means of varactor diode 12A5CR5 to obtain a signal frequency of 515 mHz. The 515 mHz signal is coupled to the cathode of grounded-grid rf amplifier 12A5V1 which amplifies the signal and applies it through transformer 12A5T6 to varactor diode 12A5CR6 which doubles the frequency to 1030 mHz.

4. RF AMPLIFIERS. - The 1030 mHz signal (which was already amplified by 12A5V1) is coupled to the cathode of grounded-grid rf amplifier 12A5V2 for further amplification. The output of the plate cavity of 12A5V2 is fed out of the assembly through connector 12A5J2 for use as a pulse-modulated rf signal simulating ISLS transmission. This precise 1030 mHz signal is also used as a frequency-calibrating signal for adjusting the main rf oscillator and for similar applications.

(d) DELAY AND RESET TAG GENERATOR ASSEMBLY 12A6. - The primary function of the 12A6 assembly is to produce the pulses which are used as triggers for pulse-modulating the ISLS rf circuits. This assembly also mixes trigger pulses for generating the normal code trains and the reset pulses, and in addition it produces a 40-microsecond delayed trigger signal (figure 4-12).

An ISLS pulse (designated as P2) can be supplied with each IFF interrogation pulse train (see table 3-2 for ISLS pulse characteristics). The ISLS pulse normally follows the first pulse in the train (Pi) by 2 +0.05 microseconds, when triggered internally. The ISLS pulse can also be triggered by an external trigger pulse at any time desired.

As shown in figure 4-17, if internal triggering is selected for the ISLS pulse, proper biasing on switching diodes 12A6CR5 and 12A6CR6

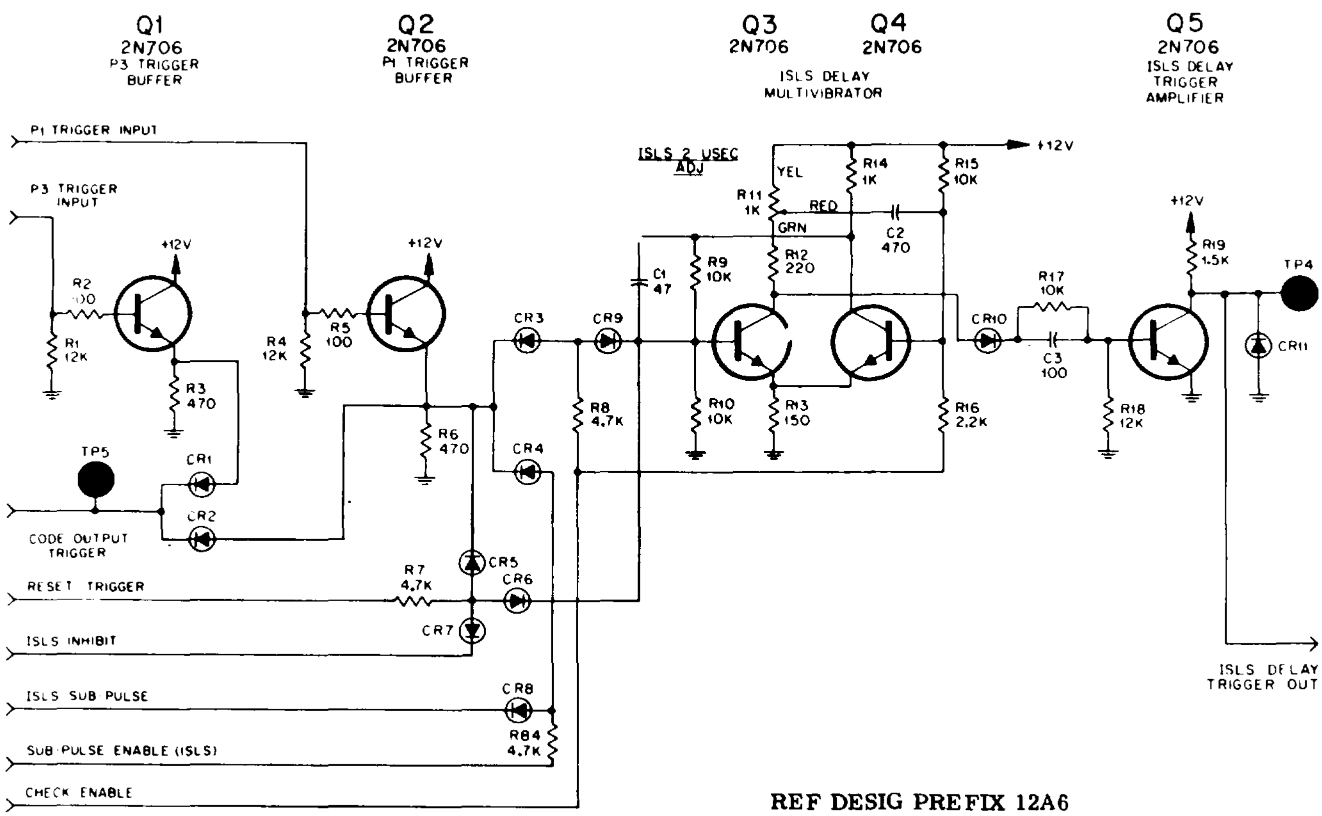


Figure 4-17. ISLS and Code Trigger Generating Circuits, Simplified Schematic Diagram

allows the first IFF interrogation pulse from PI trigger buffer 12A6Q2 to trigger ISLS delay multivibrator 12A6Q3/Q4. The multivibrator output is a pulse which follows the PI input by two microseconds. The output pulse is amplified and shaped by ISLS delay trigger amplifier 12A6Q5, ISLS blocking oscillator 12A4Q7 (in Blocking Oscillator Assembly 12A4), buffered by ISLS output emitter follower 12A4Q8, and sent simultaneously to RF Subassembly 12A5 as a modulation input to emitter follower 12A5Q5, and to connector 12J6 for modulating the main rf oscillator.

If an external signal is selected for triggering the ISLS pulse, the circuit function is the same as that for internal triggering except that an external trigger from the ISLS connector is used to trigger the ISLS delay multivibrator 12A6Q3/Q4 (figure 4-17). The ISLS connector 12J2 presents either a high impedance or a low impedance (75 ohms), depending upon the position of the associated terminating switch 12S3. The input trigger passes through switching diodes 12A4CR7 and 12A4CR8 (in Blocking Oscillator Assembly 12A4) which are turned on by the +12 volt bias from ISLS Selector 12S7A in the EXT position. The trigger pulse is then shaped by ISLS trigger emitter follower 12A4Q5, and amplified by ISLS trigger amplifier 12A4Q6 before being used to trigger ISLS blocking oscillator 12A4Q7.

1. CODE PULSE CIRCUITS. - To produce a set of code trigger pulses, (including the ISLS pulse when used) the triggers are combined in the circuits of Delay and Tag Generator Assembly 12A6. Included in the assembly is an ISLS delay multivibrator which produces a gate pulse two microseconds long which fires the ISLS blocking oscillator on the trailing edge (in any of the standard modes) which serves as the P2 (ISLS) trigger pulse (figure 4-17).

The P3 trigger input (from delay line 12A2DLI through Matrix Assembly 12A3) is applied to the base of P3 trigger buffer 12A6Q1. The output of 12A6Q1 will pass through coupling diode 12A6CR1 to the code triggers outline, which feeds it to internal blocking oscillator amplifier 12A4Q1 in Blocking Oscillator Assembly 12A4.

The P1 trigger input (from Matrix Assembly 12A3) is applied to the base of P1 trigger buffer 12A6Q2. The output of 12A6Q2 will pass through coupling diode 12A6CR2 to the code triggers out line where it will go along with the P3 pulse. This pair of pulses comprises the basic interrogation code pattern.

When an ISLS pulse (P2) is to be used, a positive enabling voltage is applied to the anodes of 12A6CR5 and 12A6CR6. When the diodes are forward-biased and conducting, the P1 trigger from 12A6Q2 will pass through 12A6CR5 and 12A6CR6 to the ISLS delay multivibrator 12A6Q3/Q4. When the cathode of 12A6CR7 is grounded (ISIS inhibit) the diode acts as a short circuit and the P1 is not allowed to reach 12A6Q3.

When a substitute pulse is to be used instead of the ISLS pulse, a positive ISLS sub pulse enable voltage is applied to the anodes of 12A6CR4 and 12A6CR8. This provides a path for the P1 pulse to go out to the substitute pulse circuits instead of to the ISLS delay multivibrator.

The ISLS Trigger pulse from the multivibrator (delayed 2 microseconds) is amplified by ISLS delay trigger amplifier 12A6Q5. The output of 12A6Q5 is fed out of the assembly to ISLS blockti. oscillator 12A4Q7 (in Blocking Oscillator Assembly 12A4) for shaping.

2. RESET TAG GENERATING CIRCUITS. - When reset “tag” pulses are selected, pairs of reset triggers from Matrix Assembly 12A3 are fed into reset trigger emitter follower 12 A6Q16 (figure 4- 18). The output of 12A6Q16 is fed through capacitor 12 A6C12 and diode 12A6CR18 to reset trigger amplifier 12 A6Q17. The output of 12A6Q17 is fed through steering diodes 12A6CR19 and 12A6CR20 to both sides of reset tag binary generator 12A6Q18/Q19 which puts out a single pulse for each pair fed into it. When a substitute reset pulse is used, a trigger is fed directly into 12A6Q17. The output pulses from 12A6QI 9 have a length equivalent to the spacings of the pulse pairs fed in. These pulses are applied to the base of tag buffer emitter follower 12A6Q20. The input to 12A6Q20 is gated on when the positive reset gate pulse is applied to the cathode of gating diode 12A6CR21. The output of 12 A6Q20 is coupled through capacitor 12 A6C17 to the emitter of tag amplifier 12A6Q21. The output of 12A6Q21 is coupled to tag output emitter follower 12A6Q22. The output from 12 A6Q22 is adjusted by tag amplitude control 12A6R69 and fed out through coupling diode 12A6CR22.

3. CODE/RESET GATE GENERATING CIRCUITS. - When reset pulses are selected, both a reset gate pulse and a reset gate pulse trigger are also required. This reset gate is essentially a pulse having opposite polarity and occurring alternately in time with the code gate pulse. Both gate pulses are produced by the circuits in Delay and Tag Generator Assembly 12A6 (figure 4-19).

The reset gate trigger input is applied to code gate trigger amplifier 12A6Q12, which shares a common collector load with 12A6Q13 (one half of the code reset gate multivibrator 12A6Q13/Q14). The output from 12A6Q12 is coupled to code gate emitter follower output 12A6Q11 from where it is put out as a negative-going 12-volt code gate pulse.

The output from 12A6Q12 is also coupled to 12A6Q13 which is one half of code/reset gate multivibrator 12A6Q13/Q14. The output of 12A6Q14, a positive-going pulse starting where the code gate leaves off, is coupled to tag gate emitter follower output 12A6QI 5, from where it is routed out of the assembly.

4. DELAYED RECYCLE TRIGGER CIRCUITS. - When a composite reply video signal containing mode identification tags, SIF code pulses, and reset pulses is to be simulated, the interrogation pulse pattern must be developed for mode identification, the SIF code pulses must be put into place, and then, after a proper delay, the reset pulses must be put into place. To accomplish this, the interrogation pulses are developed by delay line 12A2DL1 as usual, a 40-usec delay trigger is used to trigger the SIF Coder, and then, 24 microseconds after the last SIF pulse, a recycle action is started to allow the interrogation code delay line to produce

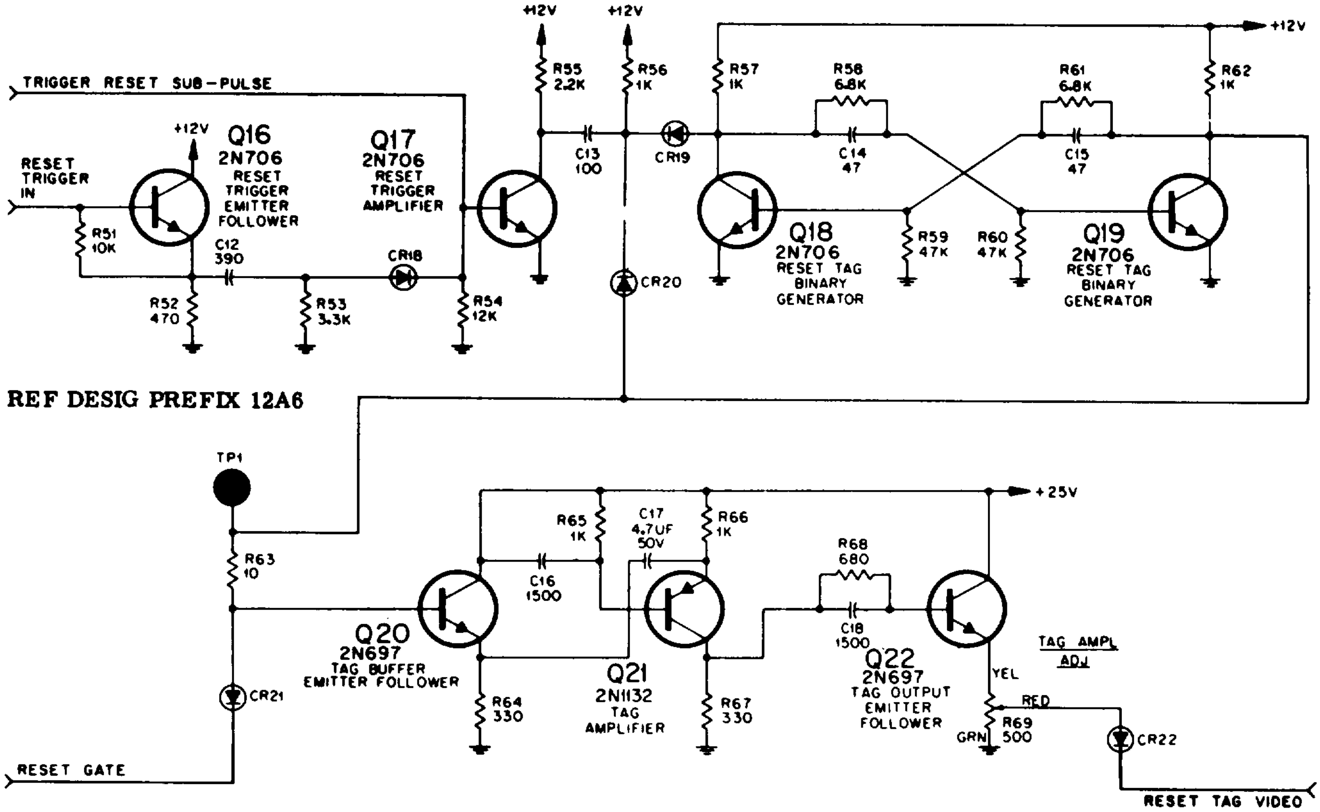


Figure 4-18. Reset Pulse Generating Circuits, Simplified Schematic Diagram

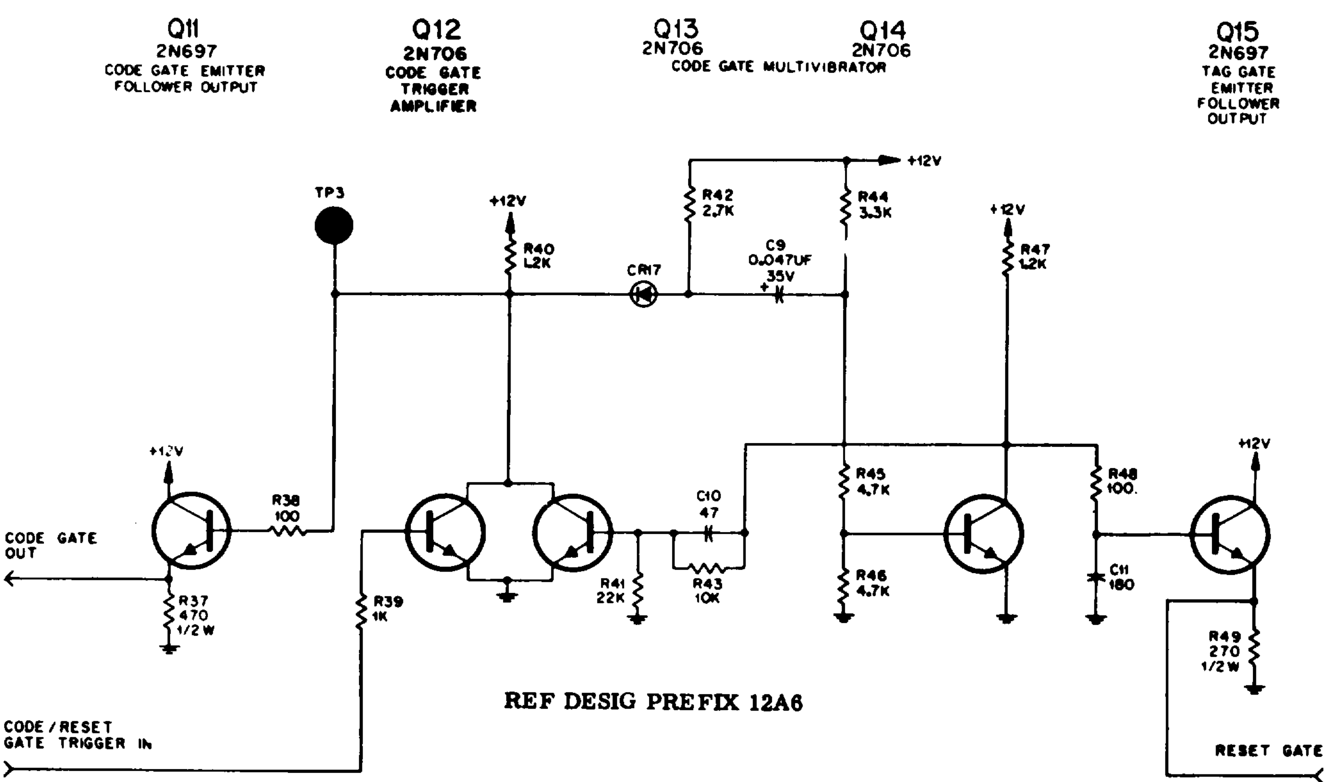


Figure 4-19. Reset Gate Generating Circuits, Simplified Schematic Diagram

a second set of pulses, this time consisting of pulse pairs used to make three reset tag pulses. Starting this recycling action at the proper time is done by integrating the SIF pulse train, so that the recycle multivibrator will be actuated by the voltage level appearing 21 microseconds after the last SIF pulse (figure 4-20).

The SIF reply video signal is fed into the integrating circuit made up of 12A6Q23, 12A6Q24, 12A6Q25, and 12 A6Q26. The time constant of the 12A6Q23/Q24 collector circuit is adjusted by 21 usec DELAY ADJ 12A6R76 to set the spacing of the first reset pulse 24 microseconds from the last pulse in the SIF reply pulse train. The negative pulse appearing at the collectors of 12A6Q23/24 back-biases 12A6CR24 and causes 12A6Q25 to cut off, causing capacitor 12A6C20 to charge up. When the charge on 12A6C20 reaches a sufficiently high potential, 12A6Q25 is again allowed to conduct. The resulting pulse is passed through 12A6Q26 and on to the contacts of VIDEO selector switch 12S8 for distribution as a delayed recycle trigger pulse.

(e) CONTROL CIRCUITS. -

1. VIDEO SELECTOR 12S8. - This switch (figure 4-21) distributes +12 volt enabling potentials as described below:

"CODE" POSITION - Connects +12 volts to Mode Selector 12S5, permitting normal selection of coded interrogations. Applies disabling ground to delayed recycle trigger line and reset gate trigger line.

"RESET" POSITION - Removes disabling ground from reset gate trigger line and delayed recycle trigger line, permitting reset line drive pulse to reach switch diode pairs 12 A3CR29 and 12A3CR30 ("6 usec"), 12A3CR25 and 12A3CR26 ("10 usec"), 12A3CR17 and 12A3CR18 ("15 usec"), 12A3CR9 and 12A3CR10 ("17 usec"), and 12A3CR3 and 12A3CR4 ("25 usec") to permit the generation of reset tag pulses. At the same time, the trigger line to the 40-usec delay trigger amplifier 12A6Q6 is broken to prevent production of the 40-usec trigger. Also applies disabling ground to Mode Selector 12S5 to prevent the generation of interrogate ion pulses. Connects reset gate trigger to recycle trigger amplifier 12A1Q2.

"BOTH" POSITION - Permits application of enabling reset gate pulse to same switch diodes as in RESET, permitting generation of reset pulses. Applies delayed

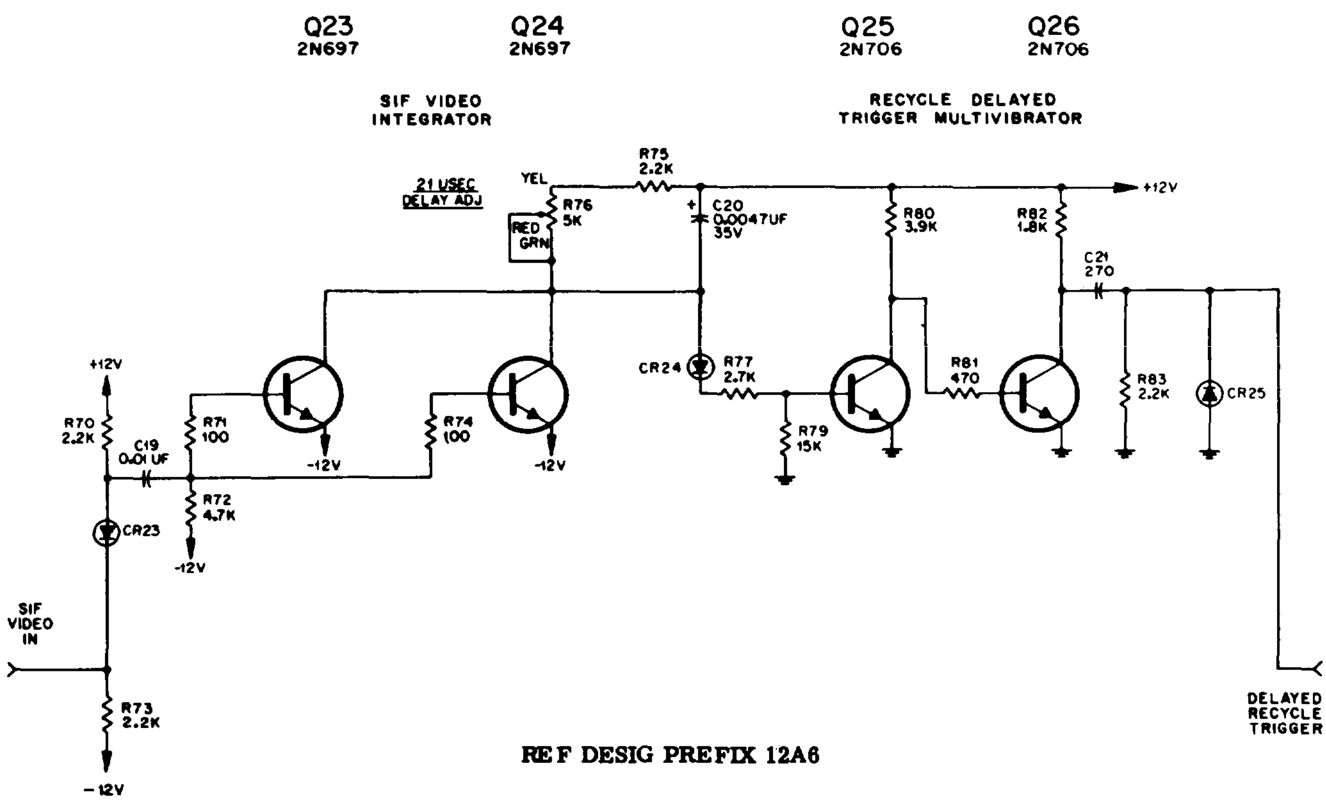
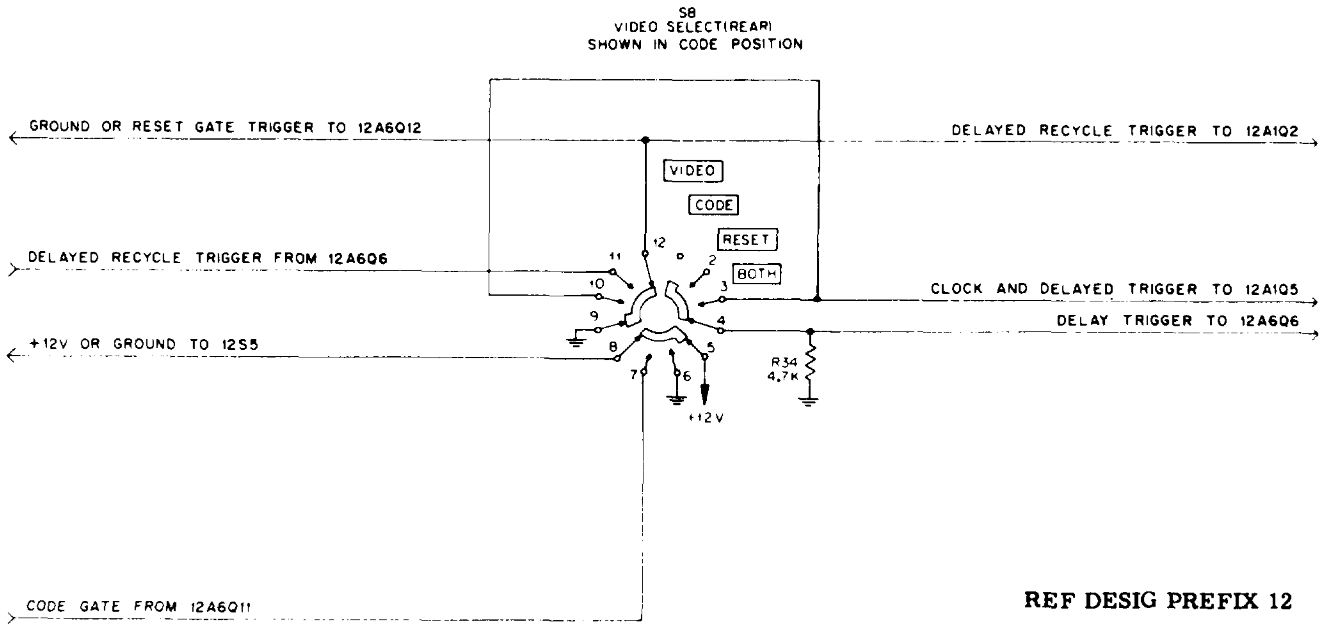


Figure 4-20. Delay Recycle Trigger Generator Circuits, Simplified Schematic Diagram



Figur 4-21. Video Selector, Simplified Schematic Diagram

recycle trigger to recycle trigger amplifier 12A1Q2 to initiate reset part of cycle. Also connects code gate line to Mode Selector 12S5, permitting generation of normal code interrogations (for use as mode identification tags). Connects clock and delayed trigger line to delay trigger input to 40-usec delay trigger circuit to develop a 40-usec delayed trigger for use by one SIF Coder.

2. MODE SELECTOR 12S5.- This switch (figure 4-22) distributes +12 volt enabling potentials to appropriate switch diodes in Matrix Assembly 12A3, and to the sub pulse circuits in Clock and Recycle Assembly 12A1

"SYNC M4" POSITION -In this position, the mode 4 enabling voltage is connected to diode

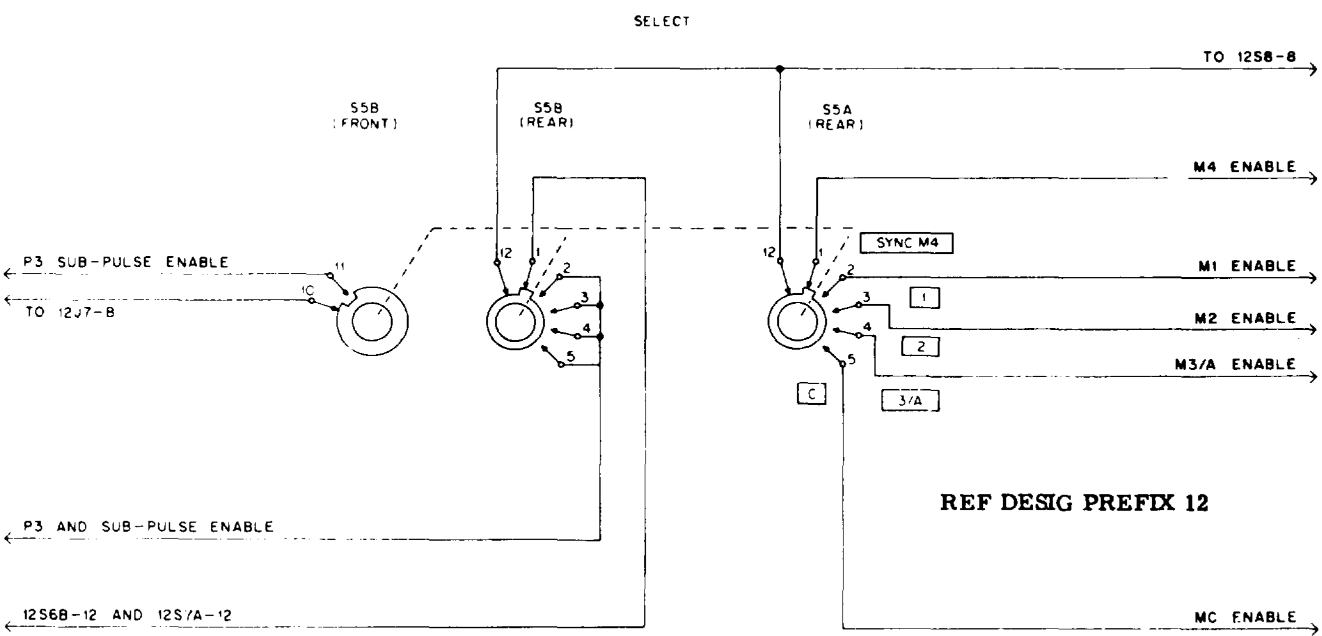


Figure 4-22. Mode Selector Control Circuits, Simplified Schematic Diagram

switch pairs 12A3CR53 and 12A3CR54, 12A3CR44 and 12A3CR45, and 12A3CR40 and 12A3CR41 in Matrtx Assembly 12A3, permitting the passage of the 2 microsecond, 4 microsecond, and 6 microsecond mode 4 synchronizing pulses from the delay line. An enabling voltage is also connected to switch diodes 12A3CR70 and 12A3CR72 enabling the normal P3 pulse for use as the first mode 4 sync pulse. At the same time, an enabling voltage is applied to the sub pulse circuits in Clock and Line Drive Assembly 12A1.

"1" POSITION - Enabling voltages are connected to switch diode pair 12A3CR50 and 12A3CR51 to enable the mode 1 P1 Pulse, and to 12A3CR64 and 12A3CR65 to enable the P3 pulse.

"2" POSITION - Enabling voltages are connected to switch, diode pair 12A3CR47 and 12A3CR43 to enable the mode 2 P1 pulse and to 12A3CR64 and 12A3CR65 to enable the P3 pulse.

"3/A" POSITION - Enabling voltages are connected to switch diode pairs 12A3CR31 and 12A3CR32 to enable the mode 3/A P1 pulse and to 12A3CR64 and 12A3CR65 to enable the P3 pulse.

"C" POSITION - Enabling voltages are connected to switch diode pair 12A3CR6 and 12A3CR7 to enable the mode C P1 pulse and to 12A3CR64 and 12A3CR65 to enable the P3 pulse.

3. ISLS SELECTOR 12S7 - This switch determines the selection of ISLS triggering sources by distributing enabling voltages and ground connections as described below: (figure 4-23)

"OUT" POSITION - No connections are made and no ISLS pulses are used, and the 300 volt source is removed from the ISLS tubes.

"EXT" POSITION - Applies enabling voltage to switch diode pair 12A4CR7 and 12A4CR8, permitting an external trigger signal from ISLS connector 12J2 to be placed on the base of ISLS trigger emitter follower 12A4Q5. The 300 volt source is connected to the ISLS tubes.

"CHECK" POSITION - Applies +12 volt check enable voltage to the anodes of diodes 12A6CR3 and 12A6CR9, permitting the passage of a P1 trigger pulse from P1 trigger buffer 12A6Q2 to ISLS delay multivibrator 12A6Q3/Q4. Also applies 12 volt check enable potential to 12A6Q4, causing it to conduct and produce a 0.3 to 0.6 microsecond delayed ISLS output trigger. This results in the ISLS pulse coinciding with the P1 pulse for the purpose of checking "zero beat" of the two rf signal generators.

"2 usec" POSITION - Applies an enabling voltage to the junction of diodes 12A6CR5, 12A6CR6, and 12A6CR7 through resistor 12A6R7,

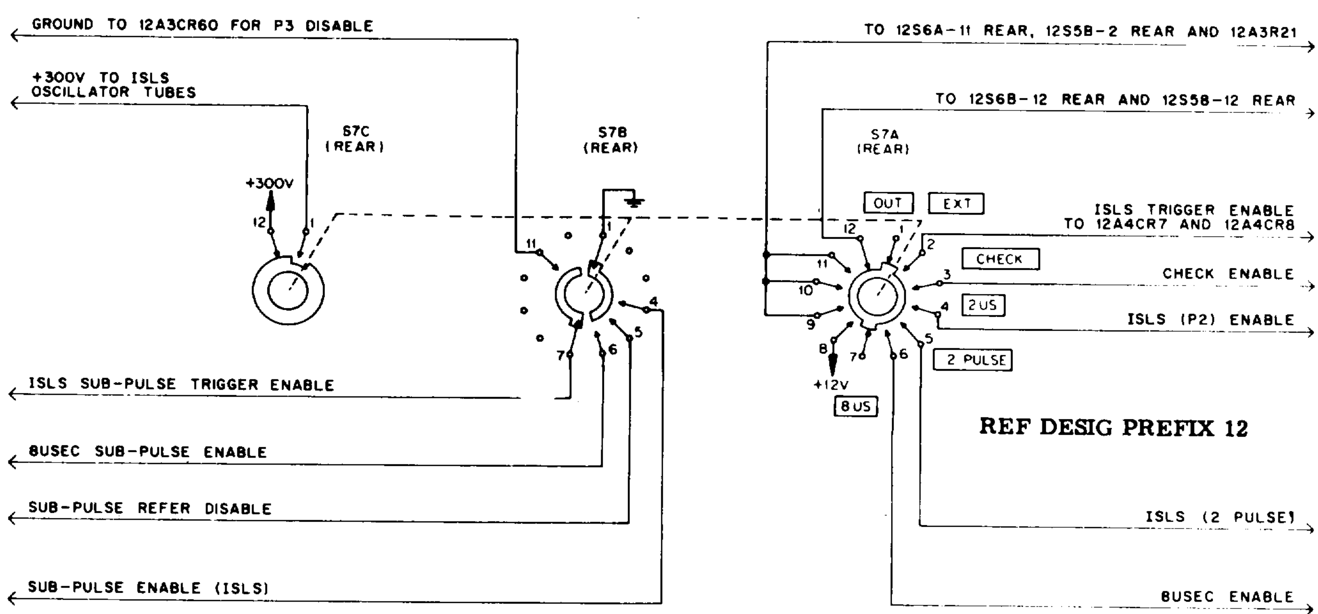


Figure 4-23. ISLS Control Circuits, Simplified Schematic Diagram

allowing PI pulse from PI trigger buffer 12A6Q2 to trigger the normal ISLS delay multivibrator operation. Connects Substitute Pulse Selector 12S6 for use if desired.

"2 PULSE" POSITION - Applies enabling voltage to switch diodes 12A3CR62 and 12A3CR63 , allowing the 0 microsecond reference pulse to be used as the ISLS trigger. Also supplies a ground connection through 12A3CR69 to switch diodes 12A3CR64 and 12A3CR65 to prevent normal IFF P3 pulse generation and connects sub pulse enable line for use if desired.

''8 usec" POSITION - Applies enabling voltage to switch diodes 12A3CR74 and 12A3CR75, enabling the production of the mode 4 ISLS pulse from the "+2 usec" delay line tap. (A fifth pulse placed 2 usec after the fourth mode 4 sync pulse.) Connects sub pulse enable line for use if desired.

4. SUBSTITUTE PULSE SELECTOR 12S6. - This switch determines the position in the interrogation pulse train into which a substitute pulse will be inserted (figure 4-24),

"OUT" POSITION - All lines connected to 12S6 are disconnected, disabling the sub pulse circuit.

"P2" POSITION - Enabling voltage is applied to switch diodes 12A6CR4 and 12A6CR8, permitting the use of a substitute pulse for the P2 (ISLS) pulse. Applies inhibiting ground to diode 12A6CR7.

"P3" POSITION - Applies disabling ground to switch diodes 12A3CR64 and 12A3CR65 (through 12A1CR68) to prohibit normal IFF P3 pulse generation. Applies enabling voltage to switch diodes 12A3CR55 and 12 A3CR56 (through 12A3CR59) to permit use of 2 usec "reference" pulse for generation of a P3 substitute pulse.

''8 usec" POSITION - Applies enabling voltage to switch diodes 12A3CR60 and 12A3CR61 to permit the passage of the P3 ("0 usec") trigger for use as the mode 4 (8-microsecond ISLS) substitute pulse "reference". Also applies enabling voltage (through contacts 6 and 7 of 12S7B rear) to switch diodes 12A1CR16 and 12A1CR21, enabling the substitute pulse delayed trigger. The

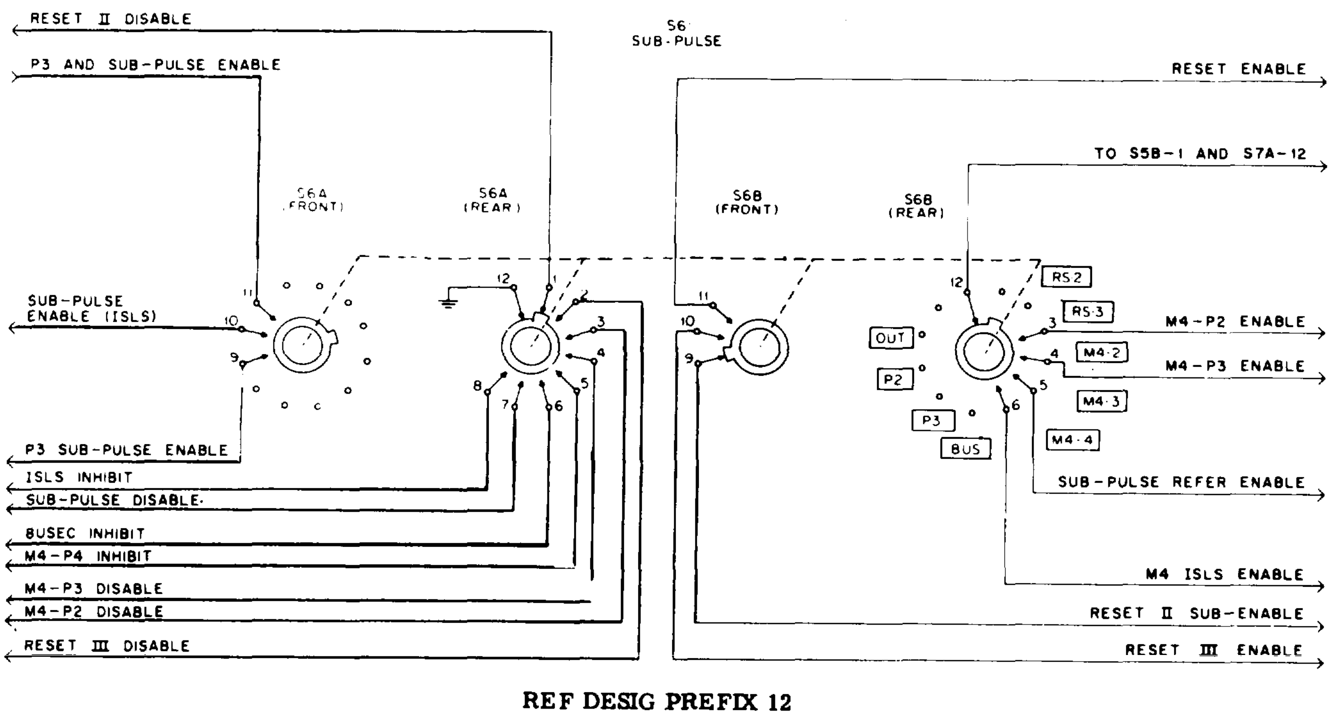


Figure 4-24. Substitute Pulse Selector Control Circuits, Simplified Schematic Diagram

normal mode 4, 8 usec ISLS pulse is inhibited by the application of a ground to switch diodes 12A3CR74 and 12A3CR75 through 12A3CR76.

"M4 SYNC" (4th) POSITION- Applies enabling volt age to switch diodes 12A3CR55 and 12A3CR56 (through 12A3CR58) to permit the passage of the "2 usec" trigger for use as the mode 4 sync pulse number 4 substitute pulse "reference". Applies disabling ground through 12A3CR73 to switch diodes 12A3CR70 and 12A3CR72 to inhibit the "0" usec normal mode 4 sync pulse number 4.

"M4 SYNC" (3rd) POSITION - Applies enabling voltage to switch diodes 12A3CR47 and 12A3CR48 to permit the passage of the ''4 usec" trigger for use as the mode 4 sync pulse number 3 substitute pulse "reference". Applies a disabling ground through diode 12A3CR52 to switch diodes 12A3CR53 and 12A3CR54 to inhibit the "2 usec" normal mode 4 sync pulse number 3.

"M4 SYNC" (2nd) POSITION - Applies enabling voltage to switch diodes 12A3CR36 and 12A3CR37 to permit the passage of the "6 usec" trigger for use as the mode 4 sync pulse number 2 substitute pulse "reference". Applies disabling ground through 12A3CR46 to switch diodes 12A3CR44 and 12A3CR45 to inhibit the "4 usec" normal mode 4 sync pulse number 2.

"RESET" (3rd) POSITION - Contacts of 12S6B connect reset gate from tag gate emitter follower output 12A6Q15 to reset number 3 sub enable line, which applies it to switch diodes 12A3CR33 and 12A3CR34 and 12A3CR23 and 12A3CR24, permitting the "8 usec" and "12 usec" pulses to pass on to the reset substitute trigger line and to the base of sub pulse tag emitter follower 12A1Q11 for the generation of a 4-usec long pulse, located 2 usec ahead of the normal time. Applies a disabling ground to diodes 12A3CR27 and 12A3CR28 to inhibit the normal 3rd reset pulse pair from the "6 usec" and "10 usec" delay line taps.

"RESET" (2nd) POSITION - Contacts of 12S6 connect reset gate from 12A6Q15 to reset number 2 sub enable line, which applies it to switch diodes 12A3CR15 and 12A3CR16 and 12A3CR13 and 12A3CR14, permitting the "15 usec" and "17 usec" pulses to pass on to the reset substitute trigger line and to the base of 12A1Q11 for the generation of a 2 usec long pulse, located 2 usec ahead of the normal time. Applies disabling ground to diodes 12A3CR19 and 12A3CR20 to inhibit the normal 2nd reset pulse pair from the "15 usec" and "13 usec" delay line taps.

5. FUNCTION SELECTOR 12S4 . This switch determines the several types and combinations of signals to be supplied by the Interrogation Coder. Its primary function is to select the types of signals to be used in modulating the main rf signal generator on the SM-197A chassis. These include modulating signals from external sources and from the coder and reset pulse circuits of the Interrogation Coder itself. As a secondary function, the selector switches these signals from the rf oscillator to the CODER OUTPUT connector 12J5 for test and monitoring purposes, also making available the ISLS pulses (if in use) at this point. Switch positions are **as** follows (figure 4-25).

"MOD-HIGH" POSITION - Used when the external modulating signal (at MOD connector 12J3) is between 30 and 50 volts in amplitude. Output of modulation emitter follower 12AIQ18 is routed directly to input of pulse amplifier 12V1. Output of modulator cathode follower 12V3 is routed through 12J6-1 to the main rf oscillator.

"MOD- LOW" POSITION - Used when the external modulating signal is between 5 and 30 volts. Output of modulation emitter follower 12A1Q18 is routed to external blocking oscillator amplifier 12A4Q2 and the output of output emitter follower 12A4Q4 to the input of pulse amplifier 12V1. A ground is connected to the clock inhibit line to prevent interference of clock signals with weak modulation signals. The output of modulator cathode follower 12V3 is fed out through 12J6-1.

"MOD-INT" POSITION - Internally connects the interrogation signal selected by Mode Selector 12S5 to the main rf oscillator. The inhibiting ground is removed from the clock inhibiting line. The output from Output Emitter Follower 12A4Q4 (internal modulating signal) is fed to pulse amplifier 12V1. The out put from modulator cathode follower 12V3 is fed out through 12J6-1.

"MOD- MIX" POSITION - Mixed modulating signals including interrogation, reset, substitute

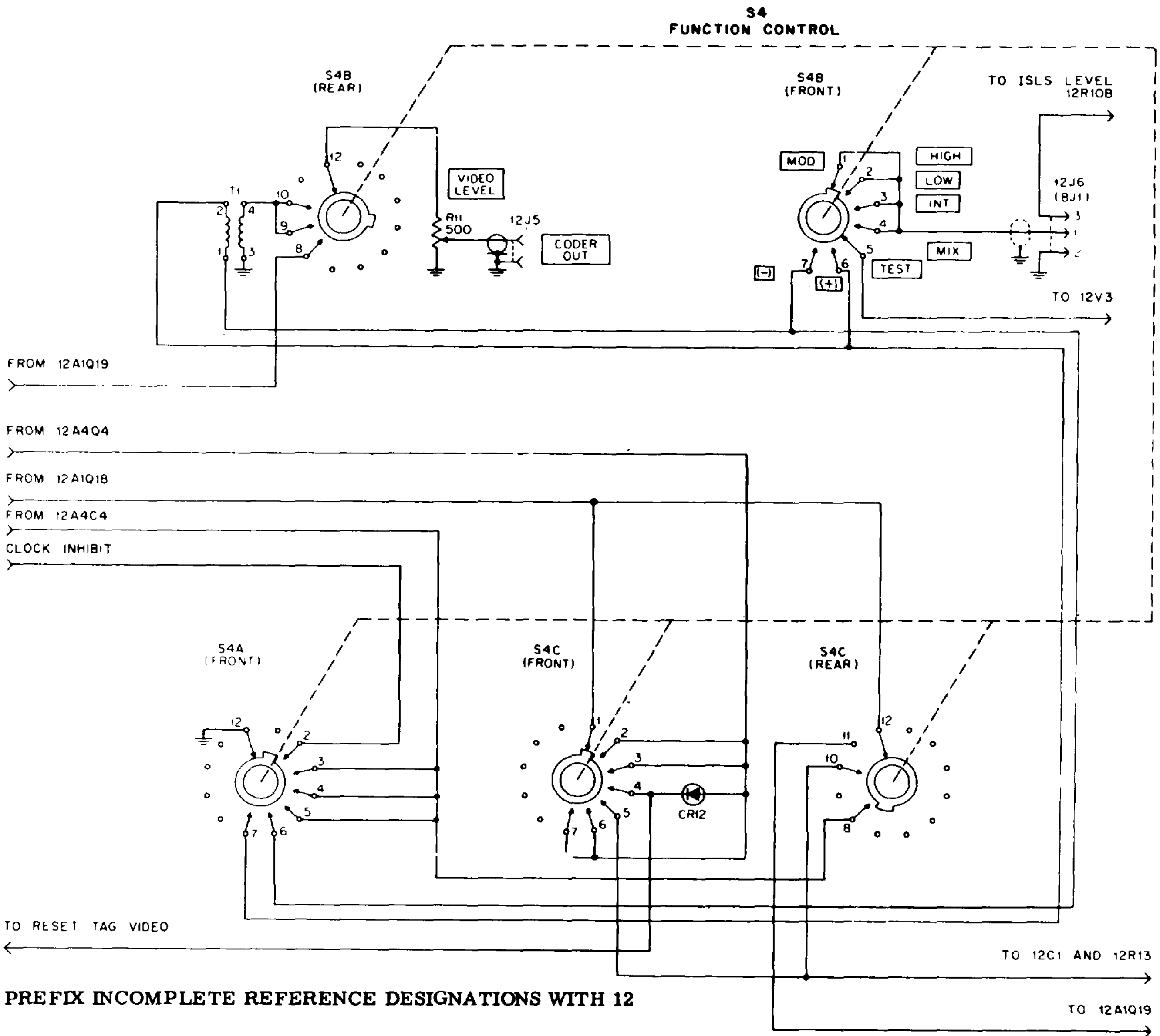


Figure 4-25. Function Selector Control Circuits, Simplified Schematic Diagram

pulses, and external modulating signals (such as IISIF) are made available for modulating the main rf oscillator. The output from modulation emitter follower 12A1Q18 is connected to pulse amplifier 12V1 (through CODE LEVEL control 12R12) along with the reset "tag" video from 12A6Q22. Also, the output of output emitter follower 12A4Q4 (internal modulation) is fed to 12V1. The output of modulator cathode follower 12V3 is fed out through 12J6-1.

"TEST" POSITION - Composite video signal from output emitter follower 12AIQ19 is routed to the CODER OUT connector through VIDEO LEVEL control 12R11 for test purposes. No connection is made to 12V1 and no output is connected to 12J6. External modulating signal from modulation emitter follower 12A1Q18 is connected to output emitter follower 12A1Q19.

"(+)" POSITION - Makes available positive-going signal to CODER OUT connector 12J5. Connects output emitter follower 12A4Q4 to 12V1 input. Connects ground to terminal 1 of transformer 12T1 primary. Connects

signal from 12V3 to terminal 2 of transformer T1 primary, providing a positive output at 12J5.
"(-)" POSITION - Same as "(+)", but ground and signal connections reversed on 12T1, giving negative output at 12J5.

6. TYPICAL CONTROL SETTING. - As an example, the Interrogator Coder controls will be described as set up to simulate an interrogation in mode 4, using an ISLS (8 usec) pulse, for which a variable-position pulse will be substituted. Controls will be set as follows:

Step 1. Mode Selector 12S5 is set to the M4 SYNC position to obtain the four mode 4 synchronizing pulses. (Mode 4 information pulses are not produced internally). Switch sect ion 12S5A places a +12 volt enabling potential on the diodes which act as switches between the '60" delay line tap and the P3 trigger out line and on the diodes acting as switches between the "2 usec" tap, the "4 usec" tap, and the "6 usec" tap and the P1 trigger out line. This provides the four normal mode 4 synchronizing pulses. 12S5B places a +12 volt enabling potential on the sub pulse ISLS trigger enable line and also makes it available to the contacts of ISLS Selector 12S7. 12S5 also removes the disabling voltage from the switch diode 12A3CR69 in the "0 usec" reference line.

Step 2. ISLS Selector 12S7 is set to the 8 usec position to obtain the mode 4 ISLS pulse. Switch section 12S7C applies +300 volts to the ISLS circuits. 12S7A ties the 8 usec enable line to the contacts of Substitute Pulse Selector 12S6B and Mode Selector 12S5B. Switch section 12S7B ties the 8 usec enable line to the Sub ISLS trigger enable line.

Step 3. Substitute Pulse Selector 12S6 is set to the 8 usec position to remove the normal 8 usec pulse and substitute a variable-position pulse. Switch section 12S6B ties the sub pulse enable line to the cent acts of 12S5B and 12S7A which connect it to the 8 usec enable line. 12S6A puts a disabling ground on the 8 usec disable line, "turning off" the diodes which act as switches between the -2 usec tap and the ISLS trigger line and thus removing the normal ISLS pulse. 12S6A also puts a ground on the sub pulse disable line (for "no disable"),

(f) POWER SUPPLY. - A separate power supply section in the Interrogation Coder furnishes the regulated +12 volt and +25 volt collector potentials and the -12 volt emitter potential required by the Interrogation Coder transistor circuits. Figure 4-26 is a simplified schematic diagram of this power supply.

1. INPUT POWER. - The Interrogate ion Coder power supply requires inputs of 6.3 volts ac and -30 volts dc which are obtained from the power supply section of the SM-197A chassis.

2 . POSITIVE 25 VOLT REGULATED SUPPLY. - The 6.3 volt ac input power is applied to the primary of step-up transformer 12T2. The output from the secondary of 12T2 is full-wave rectified by diodes 12CR9 and 12 CR10, then filtered by capacitors 12C10, 12C11, and 12C12. The filtered current is passed through +25V series regulator transistor 12Q1 to the +25 volt output. Variations in output voltage due to load variations will appear across the voltage divider consisting of 12R23, 12R24, and 12R25, and are "sensed" by regulator amplifier 12Q2. Voltage regulation is with respect to the reference voltage established by reference Zener diode 12VR2. The nominal output voltage is set by means of +25 V adjust potentiometer 12R24. The variations in 12Q2 collector voltage resulting from load changes are applied to the base of series regulator 12Q1, causing corresponding changes in the amount of voltage dropped and thus compensating for load voltage variations.

3. POSITIVE 12 VOLT REGULATED SUPPLY. - This voltage is taken from the +25 volt regulated output line. Further regulation is provided in the +12 volt branch by means of the voltage divider comprised of resistors 12R26, 12R32, and 12R33, Zener diode 12VR3, and +12V series regulator 12Q3, which function in a manner similar to that of the +25 volt regulator circuit to compensate for output voltage variations. Nominal output voltage is set by +12 Volt Adjust potentiometer 12R32.

4. NEGATIVE 12 VOLT SUPPLY. - The -12 volt potential is obtained from a voltage divider consisting of resistor 12R27 and Zener diode 12VR4 across the main-30 volt line. Since little current is drawn from this line, the Zener diode provides sufficient regulation. Filtering is provided by capacitor 12C16.

(2) CALIBRATION- CONTROL UNIT .- As shown in the block diagram, figure 4-27, the ALC rectifier output is fed through connector 9P1-11 to input integrator diode 9CR1. The partially integrated output signal is amplified by first video amplifier 9V1A, second video amplifier 9V1B, and third video amplifier 9V2A. (Waveforms for the Calibration-Control unit are given in figure 4-28. Voltage readings are given in table 4-2 and resistance readings are given in table 4-3.) The amplified ALC signal is applied to the input of cathode follower 9V3A which serves as a low impedance driver for final integrator diode 9CR2. The integrator output signal is amplified by dc amplifier 9V2B and applied to clamper diode 9CR3 and to the input of ALC output tube 9V3B. The dc output voltage developed by 9V3B is proportional to the peak pulse amplitude of the signal generator and is used in the modulator section for automatic level control. The ALC circuit maintains the output of the signal

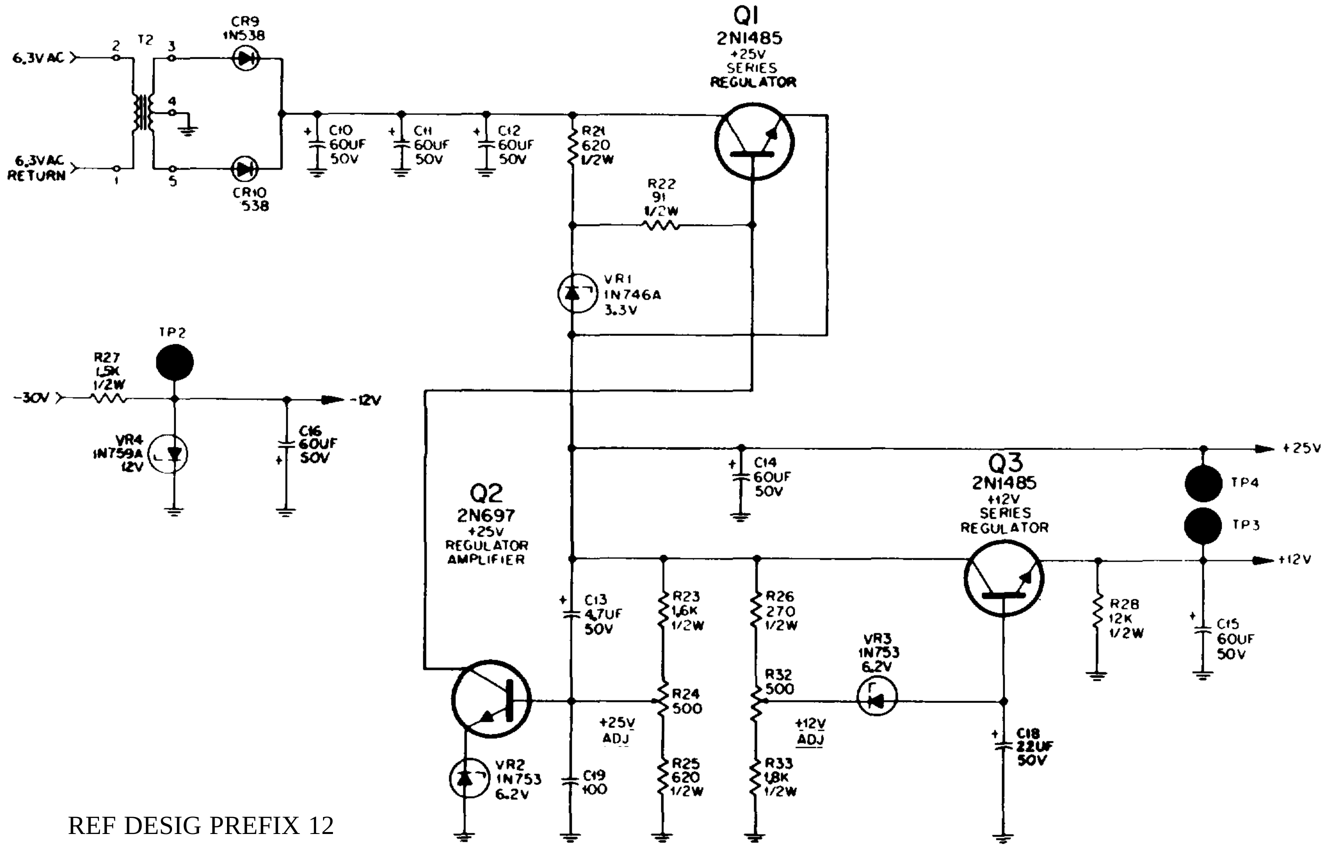


Figure 4-26. Interrogation Coder Power Supply, Simplified Schematic Diagram

TABLE 4-2. CALIBRATION- CONTROL UNIT VOLTAGE READINGS

TUBE NO.	TUBE PIN NUMBERS 1	2	3	4	5	6	7	8	9
9V1	+34	+7.5	+7.8	0	0	+44	0	+1.2	FIL
9V2	+49	+0.9	+32	0	0	+92	+1.9	+7. 8	+6
9V3	+300	0	+19	FIL	FIL	+300	+93	+107	FIL
9V4	-21	NC	0	FIL	0	NC	+103	--	--
9V5	+195	-5	+16	0	0	+10	+5.6	FIL	+155
9V6	+18	-0.4	+38	0	FIL	+41	+0. 2	0	+0.2
9V7	+102	0	+6.6	0	0	+30	0	+1.3	FIL

NOTES: 1. Voltage measurements taken using an electronic multimeter with unit removed but connected with a service cable.

2. All panel controls in ccw position.

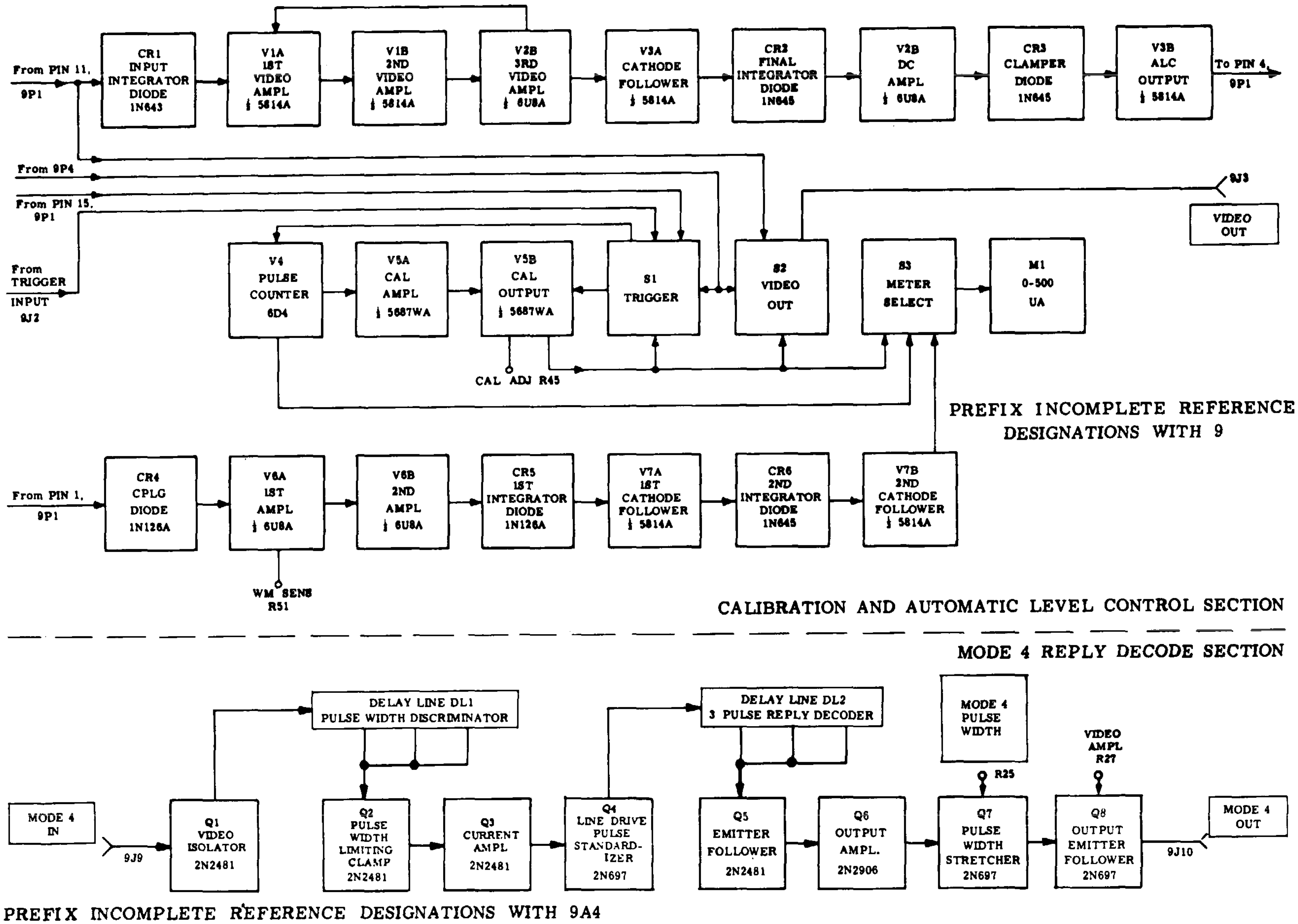


Figure 4-27. Calibration-Control Unit, Block Diagram

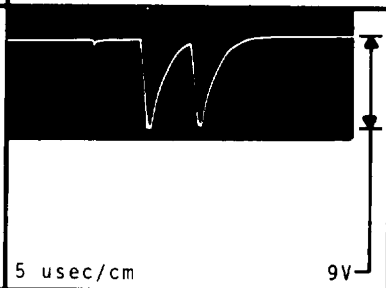
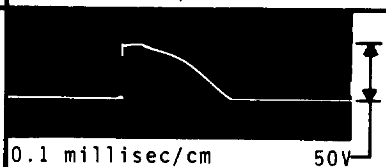
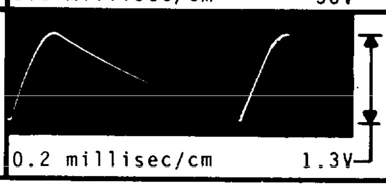
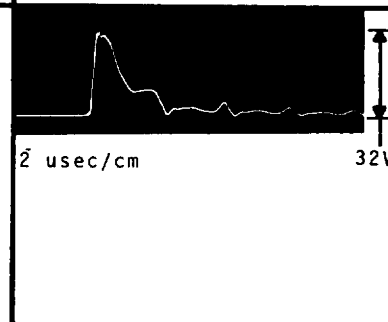
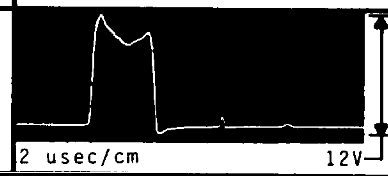
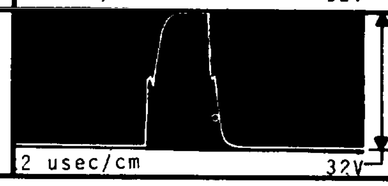
NO	TEST POINT	WAVEFORM	REMARKS
1	9V6 -9		VIDEO OUT on SG MON position. INTERROGATION CODER adjusted for Mode 2 internal modulation. WAVEMETER FREQ tuned to SG FREQ
2	9V6 -6		Same as 1 PLUS: WAVEMETER sensitivity set max C.W.
3	9V7 -3		Same as No. 2
4	9V6 -7		Same as No. 2
5	9V4 -1		TRIGGER: INT. METER SELECT: CAL. VIDEO OUT: CAL 50. INTERROGATION CODER set for Mode 2 internal Mode, and WAVEMETER tuned to SG FREQ.
6	9V4 -5		Same as No. 5
7	9V5 -9		Same as No. 5

Figure 4-28. Calibration-Control Unit Waveforms

TABLE 4-3. CALIBRATION-CONTROL UNIT RESISTANCE READINGS

TUBE NO.	TUBE PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
9V1	60K	80K	2.3K	∞	∞	60K	400K	850	∞
9V2	62K	1 Meg	13K	∞	∞	300K	620	2.2K	900K
9V3	900K	400K	22K	∞	∞	90K	16K	58K	∞
9V4	60K	NC	∞	∞	380	NC	75K	--	--
9V5	1.7K	∞	480	∞	∞	480	36K	∞	100K
9V6	85K	1 Meg	140K	∞	∞	65K	100	0	8K
9V7	22K	70K	22K	∞	∞	18K	650K	∞	∞

NOTES: 1. Resistance measurements taken to chassis ground with unit removed and disconnected.

2. All panel controls in ccw position.

generator at a constant level over the frequency *range* of 925 to 1225 megahertz.

When METER SELECT switch 9S3 is set to the WM position, wavemeter measurements can be made regardless of the settings of TRIGGER selector 9S1 and VIDEO OUT switch 9S2. The output of the wavemeter detector is fed through connector 9P1-1 and coupling diode 9CR4 to the input of first amplifier 9V6A. First and second amplifiers 9V6A and 9V6B provide sufficient output signal amplitude to properly drive first integrator diode 9CR5 The partially integrated output of 9CR5 is applied to first cathode follower 9V7A which functions as a low impedance driver for second integrator diode 9CR6. The integrated dc output is applied to second cathode follower 9V7B. The output from second cathode follower 9V7B is applied to meter 9M1 through METER SELECT switch 9S3. Wavemeter detector output voltage is at maximum and current is at a minimum at the wavemeter resonance frequency, so meter 9M1 will indicate a current minimum. WM SENS control 9R51 adjusts the circuit gain to give a meter indication at a convenient level.

When VIDEO OUT switch 9S2 is set to the POWER position, the demodulated output is available regardless of the settings of TRIGGER selector 9S1 and METER SELECT switch 9S3. The demodulated (video) output is supplied through connector 9P4 and VIDEO OUT switch 9S2 to VIDEO OUT connector 9J3. The circuit constants for this output provide proper peak pulse amplitude response for rf pulse power measurements, but do not maintain true pulse shape (see Calibration-Control waveforms in figure 4-28).

When VIDEO OUT switch 9S2 is set to the SHAPE position, demodulated output is available regardless of the settings of TRIGGER selector 9S1 and METER SELECT switch 9S3. Demodulated output is supplied through connector 9P4 and VIDEO OUT switch 9S2 to VIDEO OUT connector 9J3. The circuit constants for this output provide proper frequency and phase response for pulse shape observat ion, but do not maintain true pulse amplitude response.

When VIDEO OUT switch 9S2 is set to the SC MON position, the demodulated output is available for signal generator monitoring regardless of the settings of TRIGGER selector 9S1 and METER SELECT switch 9S3. This video output is supplied through connector 9P1 and VIDEO OUT switch 9S2 to VIDEO OUT connector 9J3.

When TRIGGER selector 9S1 is set to INT and METER SELECT switch 9S3 is set to 500 PRF, meter 9M1 indicates the internal trigger pulse repetition frequency (prf) in pulses per second (pps) up to the full scale reading of 500. The setting of VIDEO OUT switch 9S2 has no effect on this test function. The internal trigger signal is supplied from connector 9P1 and TRIGGER selector 9S1 to pulse counter 9V4. The integrated output of pulse counter 9V4 is applied to meter 9M1 through METER SELECT switch 9S3.

When TRIGGER selector 9S1 is set to INT and METER SELECT switch 9S3 is set to 5000 PRF, meter 9MI indicates the internal trigger prf up to the full scale reading of 5000. The principle of operation is basically the same as that described in the preceding paragraphs.

When TRIGGER selector 9S1 is set to EXT and METER SELECT switch 9S3 is set to 500 PRF, meter 9M1 indicates external trigger prf up to the full scale reading of 500, The setting of VIDEO OUT switch 9S2 has no effect on this test function. The external trigger signal is supplied through TRIGGER INPUT connector 9J2 and TRIGGER selector 9S1 to pulse counter 9V4. The integrated output of pulse counter 9V4 is applied to meter 9M1 through METER SELECT switch 9S3.

When TRIGGER selector 9S1 is set to EXT, and METER SELECT switch 9S3 is set to 5000 PRF, meter 9M1 indicates the prf of any external trigger input up to the maximum full scale reading of 5000. The principle of operation is basically the same as that described in the preceding paragraphs.

When TRIGGER selector 9S1 is set to INT, VIDEO OUT switch 9S2 is set to 50, and METER SELECT switch 9S3 is set to CAL, a 50-volt calibration pulse output is made available. The internal trigger signal is supplied through connector 9PI and TRIGGER selector 9S1 to pulse counter 9V4. Pulse counter 9V4 is a gas triode tube which produces a rectangular output pulse regardless of the waveform of the input pulse. This pulse signal is amplified by calibrator amplifier 9V5A and calibrator output tube 9V5B and supplied to VIDEO OUT connector 9J3 through VIDEO OUT switch 9S2. The integrated output signal from calibrator output tube 9V5B is supplied to meter 9M1 through METER SELECT switch 9S3. CAL ADJ control 9R45 is used to adjust the gain of calibrator output amplifier 9V5B for a full scale indication on meter 9M1.

When TRIGGER selector 9S1 is set to INT and METER SELECT switch 9S3 is set to CAL, VIDEO OUT switch 9S2 can be set for the desired peak-to-peak output pulse amplitude. The principle of operation is basically the same as that described in the preceding paragraph. VIDEO OUT switch 9S2 permits the selection of an output level of 50, 10, 5, 2, 1, 0.5, or O. 1 volts, peak-to-peak.

When TRIGGER selector 9S1 is set to EXT and METER SELECT switch 9S3 is set to CAL, VIDEO OUT switch 9S2 can be set for the desired peak-to-peak output pulse amplitude. The external trigger is supplied through TRIGGER INPUT *con*nector 9J2 and TRIGGER selector 9S1 to the input of pulse counter 9V4. The pulse counter and circuits which follow function as described in the preceding paragraphs.

When TRIGGER selector 9S1 is set to DEMOD, VIDEO OUT switch 9S2 is set to POWER, and METER SELECT switch 9S3 is set to 5000 PRF, demodulated (video) output is made available and meter 9M1 indicates the prf up to the full scale indicat ion of 5000. Demodulated output is supplied through connector 9P4 and VIDEO OUT switch 9S2 to VIDEO OUT connector 9J3. Demodulated output is also supplied through connector 9P4 and TRIGGER selector 9S1 to the input of calibration output amplifier 9V5B.

The amplified pulse from calibrator output amplifier 9V5B is supplied through TRIGGER selector 9S1 to the input of pulse counter 9V4. The integrated output of pulse counter 9V4 is applied to meter 9M1 through METER SELECT switch 9s3 .

When TRIGGER selector 9S1 is set to DEMOD, VIDEO OUT switch 9S2 is set to POWER, and METER SELECT switch 9S3 is set to 500 PRF, demodulated output is made available and meter 9M1 indicates the prf up to the maximum full scale reading of 500. Basic operation is the same as that described in the preceding paragraphs.

When TRIGGER selector 9S1 is set to DEMOD, VIDEO OUT switch 9S2 is set to SHAPE, and METER SELECT switch 9S3 is set to 5000 PRF, demodulated output is made available and meter 9M1 indicates the prf up to the full scale reading of 5000.

When TRIGGER selector 9S1 is set to DEMOD, VIDEO OUT switch 9S2 is set to SHAPE, and METER SELECT switch 9S3 is set to 500 PRF, demodulated output is made available and meter 9M1 indicates the prf up to the full scale reading of 500.

When TRIGGER selector 9S1 is set to DEMOD, VIDEO OUT switch 9S2 is set to SG **MON,** and METER SELECT switch 9S3 is set to 5000 PRF, ALC rectifier video output is made available for monitoring, and meter 9M1 indicates the prf of the demodulator video output up to the full scale reading of 5000. The ALC rectifier video output is supplied through connector 9P1-11 and VIDEO OUT switch 9S2 to VIDEO OUT connector 9J3. Demodulator video output is supplied through connector 9P4-1 and TRIGGER selector 9S1 to the input of calibrator output amplifier 9V5B. The amplified pulse from calibrator output amplifier 9V5B is supplied through TRIGGER selector 9S1 to the input of pulse counter 9V4. The integrated output of pulse counter 9V4 is applied to meter 9M1 through METER SELECT switch 9S3.

When TRIGGER selector 9S1 is set to DEMOD, VIDEO OUT switch 9S2 is set to SG MON, and METER SELECT switch 9S3 is set to 500 PRF, ALC rectifier video output is available for signal generator monitoring and meter 9M1 indicates the demodulator video output prf up to the full scale reading of 500. Basic operation is the same as that described in the preceding paragraph.

(a) ALC CIRCUIT DESCRIPTION. - The circuit of the ALC section is shown in figure 4-29. The negative-going voltage from the ALC rectifier is coupled to the ALC circuit in the Calibration-Control unit through pin 11 of 9P1. This voltage is applied to input integrator diode 9CR1 through capacitor 9C3. The cathode **of** 9CR1 is set at a positive potential by the voltage divider composed of resistor 9R4 and ALC AIM potentiometer 9R3. When the negative pulse applied to diode 9CR1 is lower than the bias, no conduction occurs. When the negative input pulse exceeds the bias voltage, diode 9CRI conducts, charging capacitor 9C4.

When the trailing edge of the negative input pulse falls below the bias level, 9CR1 stops conducting and 9C4 discharges through 9R5 and 9R8. Because 9CR1. presents a high back resistance, the discharge time-constant is greater than the charging time-constant. Thus, the output pulse from capacitor 9C4 is integrated, and is longer in duration than the input pulse to diode 9CR1. The rf oscillator level at which the ALC system operates is established by ALC ADJ potentiometer 9R3 which sets the cathode bias on 9CRI.

The integrated pulse from 9C4 is applied to a three-stage video amplifier consisting of tubes 9V1A, 9VIB, and 9V2A. Negative feedback is used between third video amplifier 9V2A and first video amplifier 9V1A to obtain the required frequency response and stability characteristics. The output from third video amplifier 9V2A is coupled through capacitor 9C8 to the grid of cathode follower 9V3A.

The pulses at the cathode of 9V3A are fed through final integrator diode 9CR2 to charge capacitors 9C11 and 9C12. The voltage at the cathode of 9CR2 is essentially a dc voltage of positive polarity which is applied to the control grid of dc amplifier 9V2B.

A rise in voltage at the grid of 9V2B causes a decrease in the voltage applied to the grid of the A LC output cathode follower 9V3 B, which causes a reduction in the voltage at the cathode of 9V3B. Consequently, a lower voltage is fed to the ALC clipper in the Interrogation Coder through terminal 4 of 9PI. Clamper diode 9CR3 prevents the grid of 9V3B from rising above the positive level set by the voltage divider consisting of resistors 9R70 and 9R71.

The internal OPER-CHECK toggle switch 9S4 is accessible from the right side of the Calibration-Control unit. When this switch is in the CHECK posit ion, a fixed positive voltage is applied to the grid of 9V3B which causes the cathode voltage of 9V3B to remain high. This switch is useful for applying a “go-no-go” test to the ALC section.

Capacitive feedback is provided from the output of ALC output tube 9V3B to the input of dc amplifier 9V2B through 9C11 to eliminate "hunting" (spurious oscillation of the output around the desired level).

(b) PULSE COUNTER. - Pulse counter 9V4 counts pulses from any of three sources; pulses from calibrator output tube 9V5B, delayed trigger pulses from the Crystal Mark and Sync unit, or trigger pulses from external equipment. TRIGGER selector 9S1 enables the operator to select any one of these three pulse sources. Pulse repetition frequencies in the ranges of 0-500 and 0-5000 can be measured by using the appropriate position of METER SELECT switch 9S3. Figure 4-30 shows the pulse counter circuit.

Pulse counter 9V4 is non-conducting until an incoming positive pulse is applied to its grid through capacitor 9C13 and TRIGGER selector 9S1A (rear). Upon application of a positive trigger pulse, gas triode 9V4 conducts rapidly, discharging the capacitor connected between 9V4 plate and ground. (When METER SELECT switch 9S3 is in the 5000 PRF position, the capacitor used is 9C30; when 9S3 is in the 500 PRF position, the capacitor used is 9C29.) As the capacitor discharges, the 9V4 plate voltage falls below the level required to maintain ionization, and conduction stops.

When 9V4 stops conducting, the capacitor connected between its plate and ground is recharged from the +105 volt supply through a resistor network. When METER SELECT switch 9S3 is in the 5000 PRF position, the charging network consists of 9R30 and potentiometer 9R31. When 9S3 is in the 500 PRF position, the charging network consists of 9R29 and potentiometer 9R31. A pulse of current flows through meter 9M1 and resistor

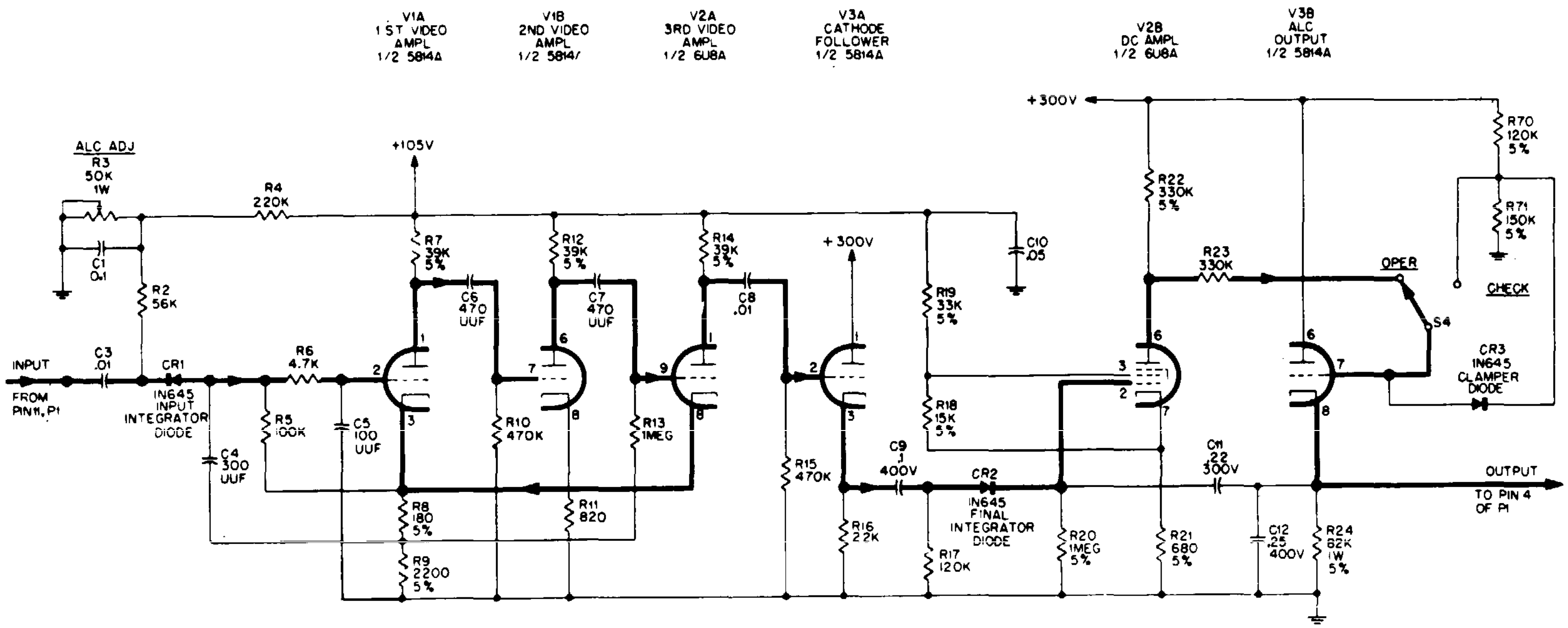


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FIGURE 4-29. ALC Section, Simplified Schematic Diagram

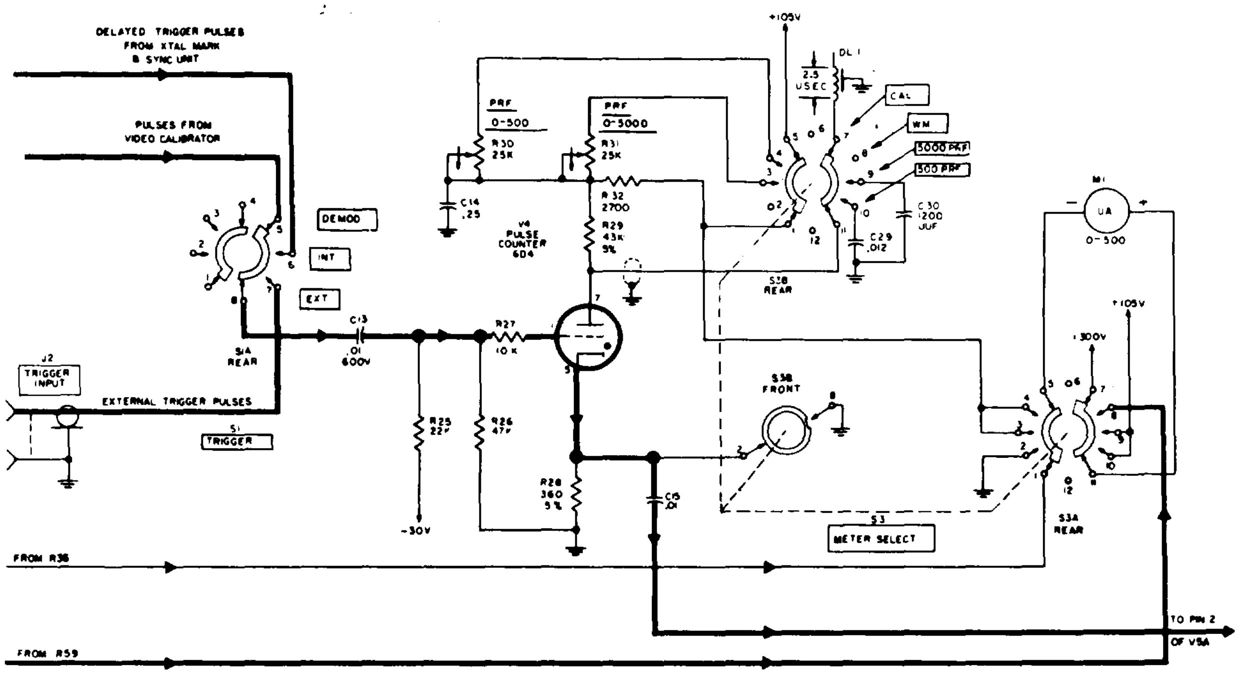

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Figure 4-30. Pulse Counter, Simplified Schematic Diagram

9R32 each time an input trigger pulse fires gas triode 9V4. The average current through meter 9M1 is proportional to the pulse repetition frequency. Potentiometers 9R30 and 9R31 are screwdriver adjusted potentiometers used to calibrate each prf range.

(c) VIDEO CALIBRATOR.- The video calibrator supplies output pulses of known amplitude at VIDEO OUT connector 9J3 on the Calibration-Control unit. The outputs available and the appropriate switch settings are described in paragraph 4-3(b), above. The circuits which produce the video calibrator pulses are shown in figures. 4-30 and 4-31.

The video calibrator pulses are generated by pulse counter 9V4 (figure 4-30) and amplified by calibrator amplifier 9V5A and calibrator output amplifier 9V5B. Positive input triggers from the trigger source are fed to the grid of 9V4 through capacitor 9C13 and resistor 9R27, causing 9V4 to fire. When the gas tube fires, a negative pulse appears at its plate. The unterminated delay line 9DL1 causes a reflected pulse to appear 2.5 microseconds later. lowering the plate voltage below the value required to maintain conduction. The conduction period of 9V4 is thus maintained at 2.5 ±0.5 microseconds for each trigger pulse.

The positive pulses developed across resistor 9R28 in the cathode circuit of pulse counter 9V4 are fed to calibrator amplifier 9V5A through capacitor 9C15. Calibrator amplifier 9V5A and calibrator output amplifier 9V5B provide two stages of amplification and inversion so that the pulses are still positive when they appear at the plate of 9V5B.

The seven different video calibrator pulse amplitudes are obtained by changing the plate load circuit of 9V5B and the output circuit from 9V5B to VIDEO OUT receptacle 9J3. The components comprising these circuits for each calibrator pulse amplitude are listed in table 4-4.

Regardless of which of the seven pulse amplitudes is used, meter 9M1 gives an indication of the measured amplitude of the pulses. Resistor 9R35 and capacitor 9C28 perform an integrating function for the meter so that a steady dc level is read. For the 50-volt pulses, peaking coil 9L2, peaking coi1 9L3, and damping resistor 9R72 are used to preserve the waveshape. For the l-volt, 0.5 volt, and 0.1 volt pulses, a voltage divider consisting of precision resistors 9R47, 9R64, 9R65, and 9R66 is used across the output of 9V5B, with a dc blocking capacitor 9C27 in series with the

S2

VIDEO OUT	
POSITION	FUNCTION
1(CCW)	50
2	10
3	5
4	2
5	1
6	0.5
7	0.1
8	POWER
9	SHAPE
10(CW)	SG MON

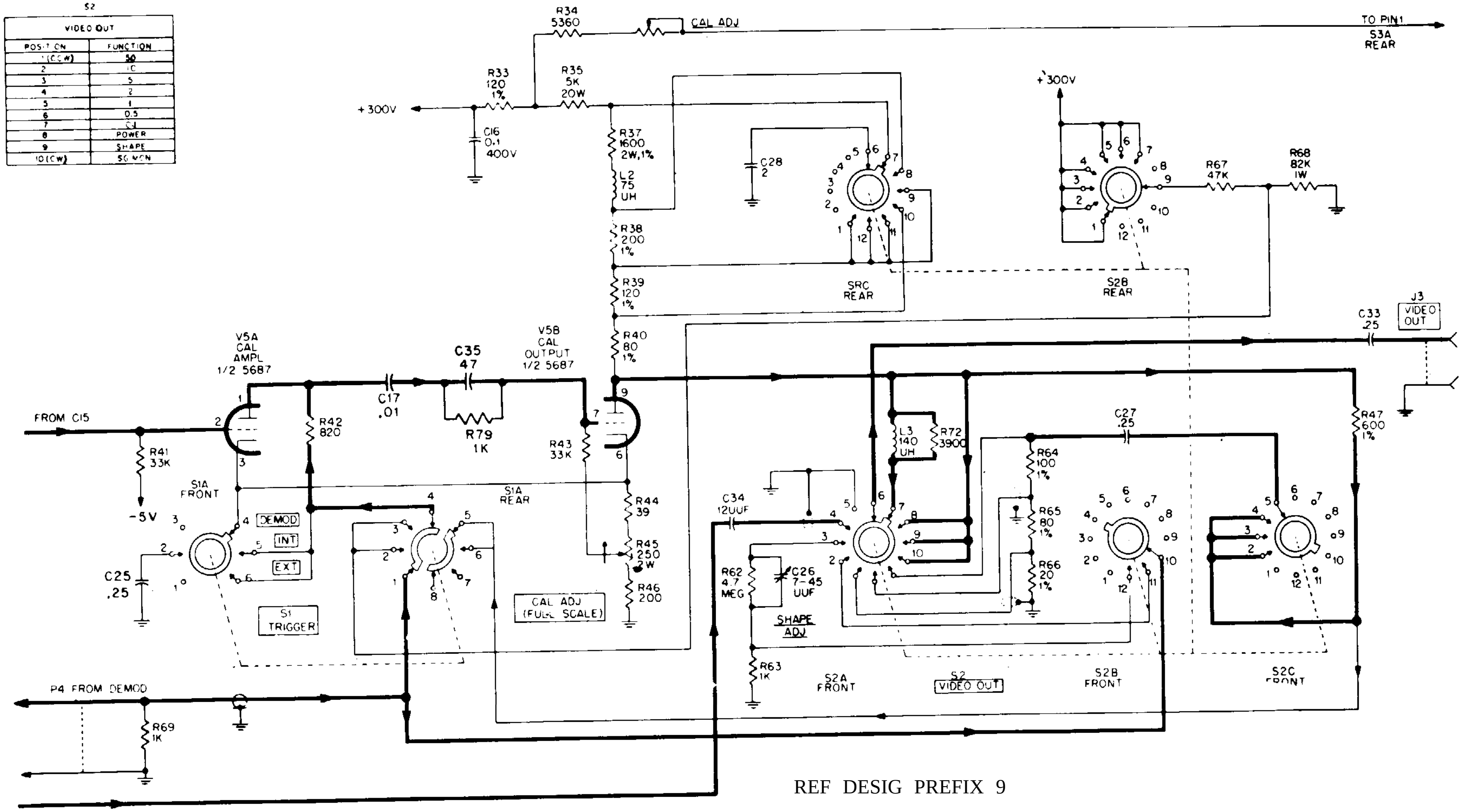

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Figure 4-31. Calibrator Amplifier, Simplified Schematic Diagram circuit. All video calibrator pulses are coupled to the VIDEO OUT receptacle 9J3 through capacitor 9C33.

(d) WAVEMETER INTEGRATOR.- The rectified output of the wavemeter is applied to an integrator circuit containing tubes 9V6 and 9V7. The output of the final stage of the integrator provides indication of wavemeter resonance by a meter connected in the cathode circuit. METER SELECT switch 9S3 must be in the WM position for wavemeter operation. The wavemeter integrator circuit is shown in figure 4-32.

The wavemeter negative polarity output pulse is applied through pin 1 of 9P1, capacitor 9C18, and coupling diode 9CR4 to the grid of first amplifier 9V6A which produces an amplified positive pulse at the arm of WM SENS control 9R51. This pulse is applied to capacitor 9C20 which is charged through grid conduction of second amplifier 9V6B. When the pulse decays, capacitor 9C20 discharges at a relatively slow rate through resistor 9R52, resulting in an integrated negative pulse being applied to the grid of 9V6B.

TABLE 4-4. Video Calibrator Circuit Components

VIDEO OUT SWITCH POSITION	9V5B PLATE LOAD CIRCUIT COMPONENTS	COMPONENTS IN OUTPUT CIRCUIT FROM 9V5B to 9J3
50	9R37, 9L2, 9R38, 9R39, 9R40	9R72, 9L3, 9C33
10	9R38, 9R39, 9R40	9C33
5	9R39, 9R40	9C33
2	9R40	9C33
1	9R39, 9R40	9R47, 9C27, 9R64, 9R65, 9R66, 9C33
5	9R39, 9R40	9R47, 9C27, 9R64, 9R65, 9R66, 9C33
.1	9R39, 9R40	9R47, 9C27, 9R64, 9R65, 9R66, 9C33

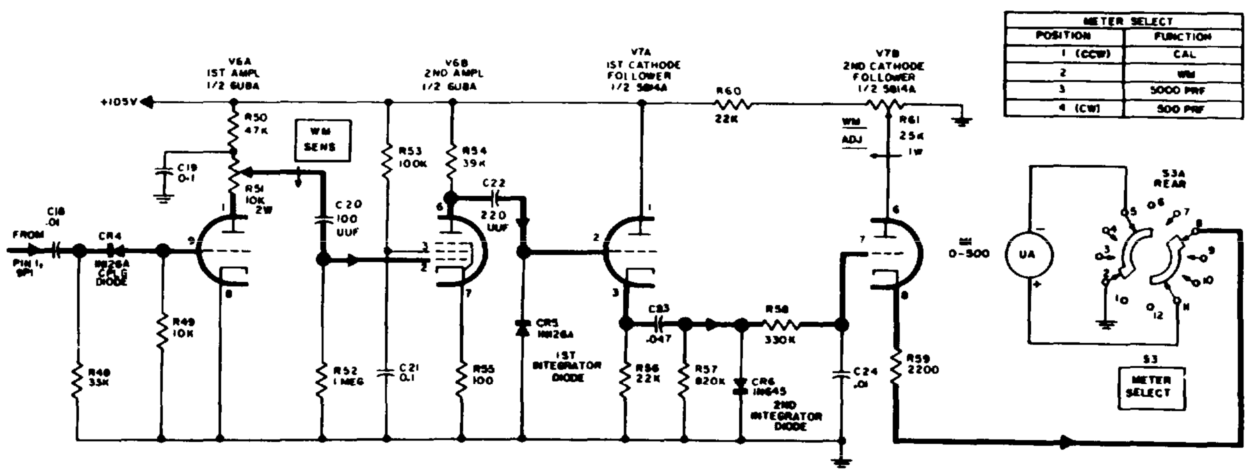

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Figure 4-32. Wavemeter Integrator, Simplified Schematic Diagram

The negative integrated pulse applied to 9V6B grid produces an extended waveform of positive polarity at 9V6B plate and first cathode follower 9V7A grid. The discharge of capacitor 9C22 in the grid circuit further extends the pulse duration and tends to make the grid of 9V7A go negative. This is prevented by first integrator diode 9CR5 which clips the negative portion of the pulse and effectively increases the positive portion, resulting in added sensitivity. Further integration of the positive pulse takes place in the cathode circuit of 9V7A. The positive voltage across resistor 9R56 charges capacitor 9C23 through second integrator diode 9CR6. When the pulse decays, capacitor 9C23 discharges at a relatively slow rate through resistor 9R57.

When the METER SELECT switch 9S3 is in the WM position, meter 9M1 is connected between 9V7B cathode and ground. WM ADJ potentiometer 9R61 permits adjustment of the plate voltage of 9V7B so that meter 9M1 indicates full scale with zero signal applied to the wavemeter input.

When the wavemeter is tuned to resonance, the negative voltage across 9R57 is applied to the grid of 9V7B, thereby reducing its plate current. Resonance of the wavemeter is reached when meter 9M1 indicates minimum current, WM SENS control 9R51 in the plate circuit of 9V6A controls the magnitude of the meter dip.

(e) MODE 4 REPLY DECODING CIRCUITS. - This function is performed by Reply Decoder Subassembly 9A4 in the Calibration-Control Unit which is electrically independent of the rest of the circuits in the unit. This transistorized circuit (figure 4-33) is designed to provide pulse width discrimination and sharp rejection characteristics for pulse position errors as listed below:

NARROW PULSES – Pulses less than O.25 usec in width will definitely be rejected while pulses less than O. 3 usec may or may not be rejected.

WIDE PULSES – Pulses wider than O. 8 usec will definitely be rejected while pulses more than O.7 usec may or may not be rejected.

PULSE SPACING – If the pulse spacing error between the first pulse and the second and third pulses is less than O.2 usec, the group will definitely be accepted. If the spacing error is greater than O. 2 usec but less than 0.4 usec, the group may or may not be rejected. If the error is 0. 4 usec or greater, the group will definitely be rejected.

Pulse width discrimination is provided by delay line 9A4DL1 in conjunction with pulse width limiting clamp 9A4Q2, current amplifier 9A4Q3, and line drive pulse standardizer 9A4Q4. The delay line assembly drives two diode groups, the three-diode AND gate providing rejection of pulses narrower than O.3 usec, and the six-diode AND gate providing an output if the pulses are O. 65 usec or more in width. Pulses wider than 0.3 usec are amplified by 9A4Q3 and coupled via the differentiating capacitor 9A4C2 to the base of 9A4Q4. For pulses of normal width this narrow pulse output is coupled to the decode delay line 9A4DL2. If the input pulse is O.7 usec or more in width, the input into the 9A4Q3 base from 9A4Q2 will “kill” the 9A4Q3 output, preventing the output of a pulse to decode delay line 9A4DL2.

Pulse group decoding is accomplished by means of a passive delay line 9A4DL2 and by coincident pulse detect ion. The narrow (approximately O.3 usec) pulse output of line drive pulse standardizer 9A4Q4 is employed directly as delay line drive with pulse width (and potential coincidence zone) expansion provided by pairs of taps at the 1.73 usec and 1.86 usec and the 3.56 and 3.69 usec time positions feeding into an OR gate. This provides a narrow slot reference and an effective pulse width at the taps of approximately 0.4 usec. Isolation of the delay line tap outputs is provided by emitter follower 9A4Q5. Output amplifier 9A4Q6 is the final stage of the decoder proper. Pulse width stretcher 9A4Q7 acts to increase the nominal O. 15 to O. 2 usec decode input to the specified nominal value of O. 5 usec. Pulse width may be adjusted by means of Pulse Width control 9A4R25. Output emitter follower 9A4Q8 provides buffered output signal to low impedance loads (70 ohms nominal) at levels up to 5 volts. Output level may be adjusted by means of Video Amplitude Control 9A4R27. This pulse decoder circuit may be used for such purposes as making a “go-no-go” check of demodulated transponder outputs and the processing of receiver video outputs.

(3) SM-197A PANEL-CHASSIS ASSEMBLY. - As shown in the block diagram of the SM-197A Panel-Chassis Assembly (figure 4-34), the two functional sections in this assembly are the power supply and the rf section.

(a) POWER SUPPLY GENERAL DESCRIPTION. - The power supply section of the Panel- Chassis Assembly furnishes regulated plate potentials of +300 volts and +105 volts, regulated bias potentials of -30 and -5 volts, and 6.3 volt filament potentials to Coder Simulator SM-197A/UPM-98.

(b) RF SECTION GENERAL DESCRIPTION. - This section contains the main rf signal generator, the ALC rectifier, the demodulator, and the wavemeter.

1. MAIN RF SIGNAL GENERATOR. - The signal generator produces a signal by means of rf oscillator 8V2, which is modulated by the pulses brought in through 8J1. The output amplitude is adjusted by the ATTENUATION control and the output frequency is adjusted by the SC FREQUENCY control. The pulsed rf output is available at SC OUT connector 8J6.

2. ALC RECTIFIER. - ALC rectifier 8V1 is part of the automatic level control system. The pulsed rf output of 8V2 is fed to 8V1 where the signal is demodulated and then fed to the automatic level control amplifier in the Calibration-Control unit.

3. DEMODULATOR. - The demodulator converts pulsed rf signals to video pulses. The pulsed rf signal can be supplied either from external equipment or internally from 8V2. The demodulating function is performed by demodulator tube 8V3. The resulting video pulses are brought out through 8J18.

4. WAVEMETER. - The wavemeter is used for accurate measurement of the frequency of the signal produced internally or of

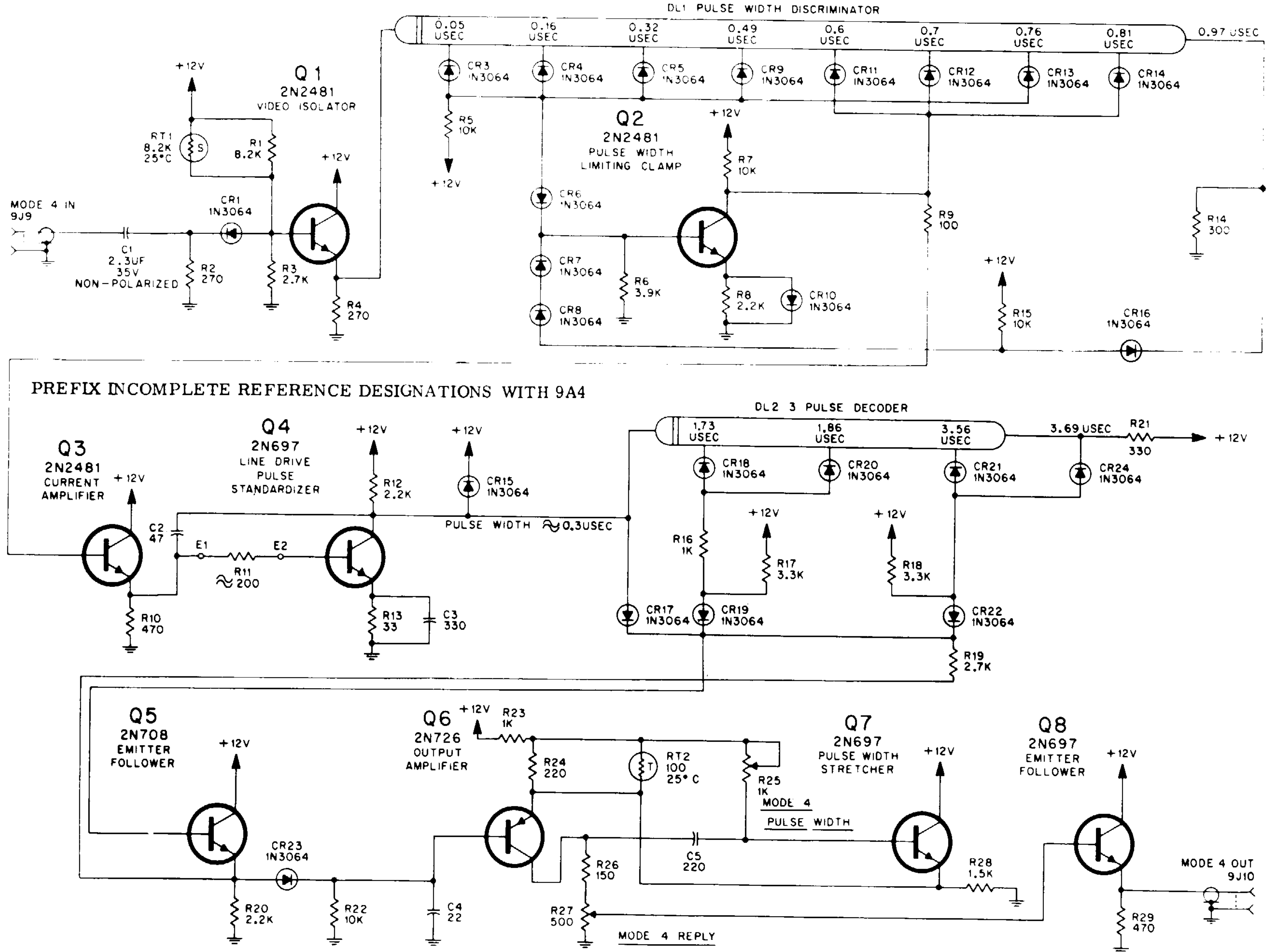

Figure 4-33. Mode 4 Reply Decode Circuit, Simplified Schematic Diagram

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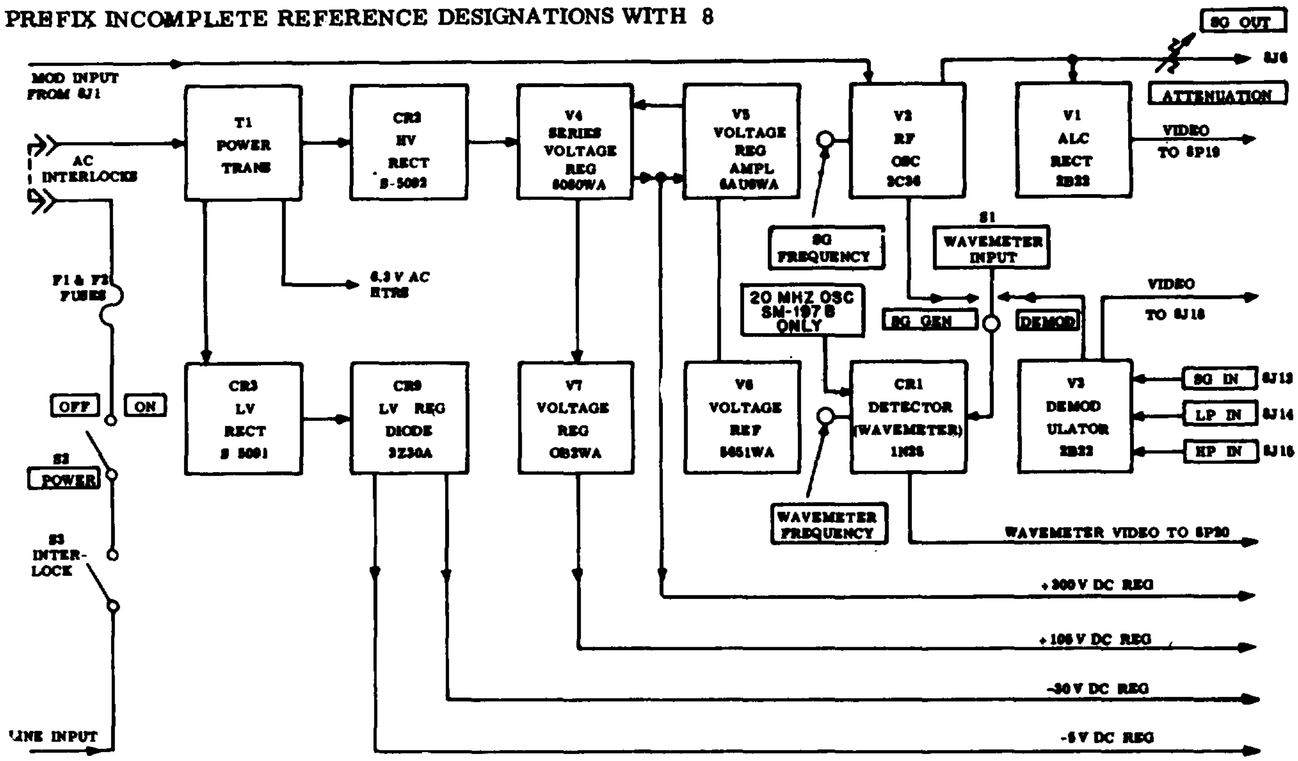

Figure 4-34. Coder Simulator SM-197A/UPM-98 and SM-197B/UPM-98 panel-chassis Assembly, Block Diagram

signals from an external source. The wavemeter tuning is adjusted by means of the WAVEMETER FREQUENCY control. When the modulated rf signal from the modulator is to be measured, it is fed to the demodulator from where a sample is fed to the Calibration-Control unit. Wavemeter resonance is indicated by a meter needle dip on the Calibration-Control meter.

(c) POWER SUPPLY CIRCUIT DE DESCRIPTION. - The power supply section on the Coder Simulator Panel -Chassis Assembly furnishes regulated plate potentials of +300 volts and +105 volts, regulated bias potentials of -30 and -5 volts, and 6.3 volt ac filament potentials for all circuits in the Coder Simulator. This power supply is shown in the overall panel-chassis schematic diagram (figure 5-64). Table 4-5 shows voltage measurements and table 4-6 shows resistance measurements taken on the power supply.

1. LINE INPUT. - Primary power is brought in through 8P21, interlock switch 8S3, POWER switch 8S2, fuses 8F1 and 8F2, and the ac interlocks located in the Calibration-Control and Interrogation Coder units. (See figure 5-64 for the detailed ac power distribution.) The primary power is then applied to transformer 8T1.

Table 4-5. Coder Simulator Chassis Voltage Readings

TUBE NO.	TUBE PIN NUMBERS							
	1	2	3	4	5	6	7	8
8V4	+262	+403	+302	+262	+403	+302	Fil	Fil
8V5	+8	NC	NC	NC	+105	NC	0	--
8V6	+83	NC	NC	NC	+83	NC	0	--
8V7	+105	NC	NC	NC	+105	NC	0	--

NOTE: Voltage measurements taken with plug-in units connected.

Table 4-6. Coder Simulator Chassis Resistance Readings

TUBE NO.	TUBE PIN NUMBERS							
	1	2	3	4	5	6	7	8
8V4	5.2 Meg	550K	500K	3.5 Meg	550K	520K	490K	490K
8V5	250K	250K	500K	500K	5.5 Meg	550K	2 Meg	--
8V6	2 Meg	NC	NC	NC	2 Meg	NC	0	--
8V7	600K	NC	NC	NC	600K	NC	0	--

NOTE: Resistance measurements taken to chassis ground with plug-in units removed.

2. POSITIVE 300 VOLT REGULATED PLATE SUPPLY. - The high voltage secondary of 8T1 at terminals 10 and 11 is rectified by full-wave bridge rectifier 8CR2 and filtered by inductor 8L11 and capacitor 8C16. Figure 4-35 is a schematic diagram showing the filter and regulator circuits. The filtered output is connected to series voltage regulator 8V4 and then to the +300 volt load. Regulator shunt resistor 8R29 is connected In parallel with 8V4 to carry a portion of the load current and reduce the plate dissipation of 8V4. Regulation of the +300 volt supply is accomplished by voltage regulator amplifier 8V5, voltage reference 8V6, and series voltage regulator 8V4, The +300 V ADJ potentiometer 8R35 sets the nominal level of the output voltage. The voltage drop across 8V4 is determined by the magnitude of the nominally +300 volt output. A regulating action is performed since a voltage rise causes an increased voltage drop across 8V4 and tends to restore the +300 volt output to its former level. A fall in the +300 volt output causes a decreased voltage drop across 8V4 and tends to increase the output.

3. POSITIVE 105 VOLT REGULATED PLATE SUPPLY. - Figure 4-35 shows that the same circuit is used to provide the +105 volt output and the +300 volt output. The .105 volts is obtained from the +300 volt output through resistor 8R37 and voltage regulator 8V7. Regulation to compensate for load variation is provided by 8V7.

4. NEGATIVE 30 VOLT REGULATED BIAS SUPPLY. - Figure 4-36 shows the circuit used to obtain this regulated voltage. The current from a low voltage winding of transformer 8T1 is rectified by 8CR3 and filtered by the network consisting of resistor 8R19 and capacitor 8C15. The -30 volt output is regulated by resistor 8R20 and Zener diode 8CR9. Capacitor 8C16 bypasses to ground the noise generated by 8CR9,

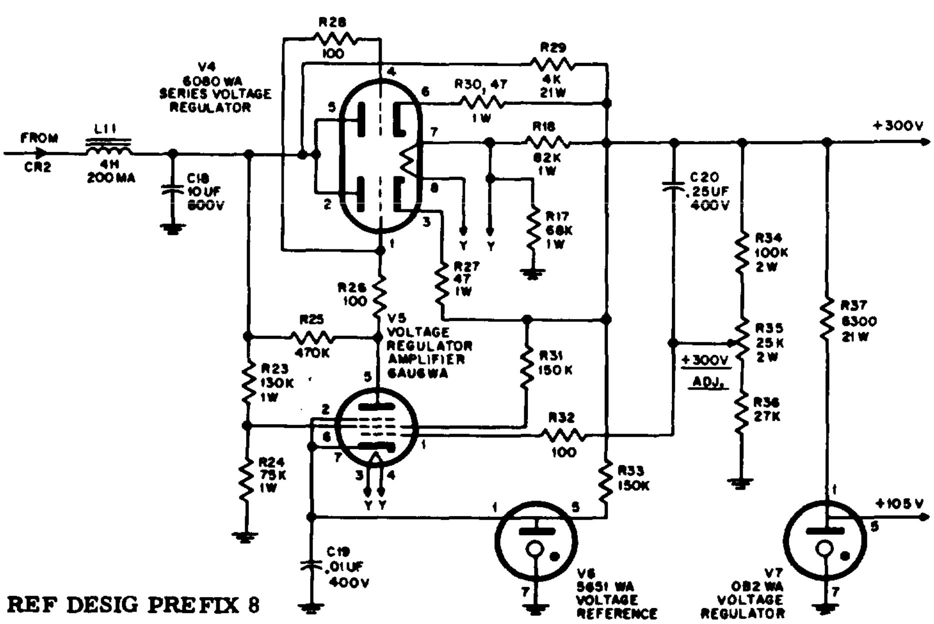

Figure 4-35. Coder Simulator Voltage Regulators, Simplified Schematic Diagram

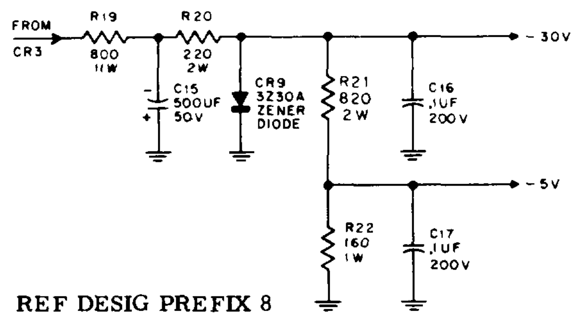

Figure 4-36. Bias Regulator, Simplified Schematic Diagram

5. NEGATIVE 5 VOLT SUPPLY. - This voltage is obtained through a voltage divider on the -30 volt output consisting of resistors 8R21 and 8R22 (figure 4-36). Only a very slight current is drawn from this network so the -5 volt output is relatively stable. Capacitor 8C17 bypasses to ground the noise generated by 8CR9.

(d) RF SECTION CIRCUIT DESCRIPTION. - This section contains RF Oscillator Assembly 8A1, ALC Attenuator Assembly 8A2, Demodulator Assembly 8A4, Wavemeter Assembly 8A3, WAVEMETER INPUT switch 8S1, Directional Coupling 8A9, and the associated rf plumbing. Refer to figure 5-64 for the overall schematic diagram covering this section.

1. RF OSCILLATOR, - Rf oscillator 8V2 is a type 2C36 planar triode tube in a tuned plate, tuned cathode circuit. Its construction is shown in figure 4-37. The tuning elements are one-quarter wave-length coaxial lines tuned by shorting plungers. For purposes of compactness, the cathode line is arranged inside, and concentric with, the plate line. The frequency can be varied from 925 to 1225 megahertz by changing the position of the shorting plungers, The oscillator is capable of responding to the short pulse duration and pulse spacing of the modulating pulse train from the SIF Coder. The feedback required to maintain oscillation is provided by a built-in feedback probe in the 8V2 tube plus an external feedback probe. These probes enable the oscillator to respond within the short time interval required for SIF Coder modulation.

The type 2C36 tube used is designed as a zero-bias pulsed oscillator. It operates in this capacity with only the pulse modulation voltage applied to its plate. The rf oscillator has two electrostatic output coupling probes, one for coupling to the wavemeter, and the other for coupling to ALC rectifier 8V1 and the output-attenuator waveguide.

Filters and shields are used to confine the radio frequency energy to the coaxial lines feeding the wavemeter and the output circuits. The oscillator plate connection has filter 821 installed at the entrance to the line. The plate end of the oscillator tube is shielded by a removable threaded cap. The tube filament is fed through filter 823 from the 6.3 volt ac source. Leakage through the plunger actuating rods is eliminated by means of the back shield and the rod shorting fingers.

2. ALC RECTIFIER. - ALC Rectifier 8V1 in the ALC/Attenuator Assembly 8A2, is a part of the automatic level control system, The purpose of the ALC system is to maintain a substantially constant rf oscillator output level for a given setting of the ATTENUATION dial over the entire oscillator frequency range of 925 to 1225 megahertz. A functional view of ALC/Attenuator Assembly 8A2 is shown in figure 4-38.

Rf oscillator output is picked up electrostatically and fed through a section of RG-55/U coaxial cable to a metal disc in the ALC rectifier housing where it connects to the plate of the type 2B22 ALC rectifier 8V1. Rectified output is fed through low pass filter 822 to be used in the Calibration-Control unit. (See figure 4-29 for schematic diagram of the automatic level control amplifier in the Calibration-Control unit.)

3. ATTENUATOR. - The attenuator waveguide in the ALC/Attenuator Assembly 8A2 controls the level of the rf signal appearing at SC OUT connector 8J6. The rf oscillator output is fed to the metal disc, which connects to the plate cap of ALC rectifier 8Vl This metal disc and tube 8V1 are concentric within a cylindrical waveguide in which a piston is driven by a lead screw mechanically geared to the ATTENUATION indicator dial and controlled by the ATTENUATION knob. The metal disc functions as an rf radiator in the waveguide. An rf pickup probe is located at the end of the piston in the waveguide. The pickup probe is terminated by 47 ohm resistor 8R2.

The waveguide, which contains the piston and pickup probe, is of such dimensions as to operate below the cutoff frequency of the rf signal; hence, it attenuates the signal by an amount depending upon the distance between the metal disc and the probe on the piston. Variable attenuation is provided by moving the piston in or out. The pickup probe is connected to SG OUT coaxial connector 8J6 through a length of RG-55/U cable. The level of rf signal output can be varied from -21 to -121 db below one volt (feeding into a 53.5 ohm load), and can be read on the ATTENUATION dial on the front panel.

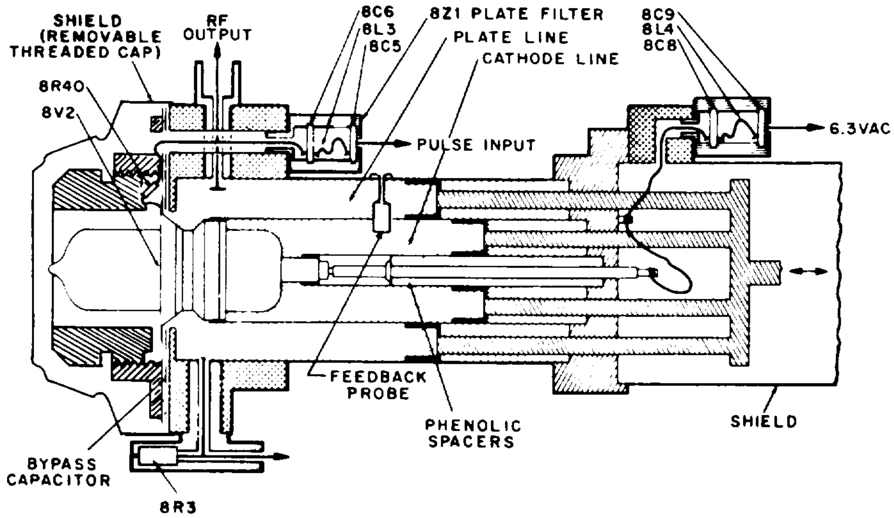

Figure 4-37. RF Oscillator Assembly 8A1, Cutaway Drawing

4. DEMODULATOR ASSEMBLY 8A4. - The demodulator converts pulsed rf signals to pulsed video signals. It consists of diode 8V3 and associated circuitry. The demodulator operates over the frequency range from 925 to 1225 megahertz, producing a signal which is useful for checking waveshapes and making power measurements. A functional view of the demodulator is given in figure 4-39.

Either externally or internally generated rf signals can be demodulated. For an externally generated rf signal, the demodulator input is fed through either LP IN connector 8J14 if the power level O. 5 to 35 peak watts, or through HP IN connector 8J15 if the power level is 35 to 3500 peak watts. A small portion of the externally generated signal is applied to the input of the wavemeter

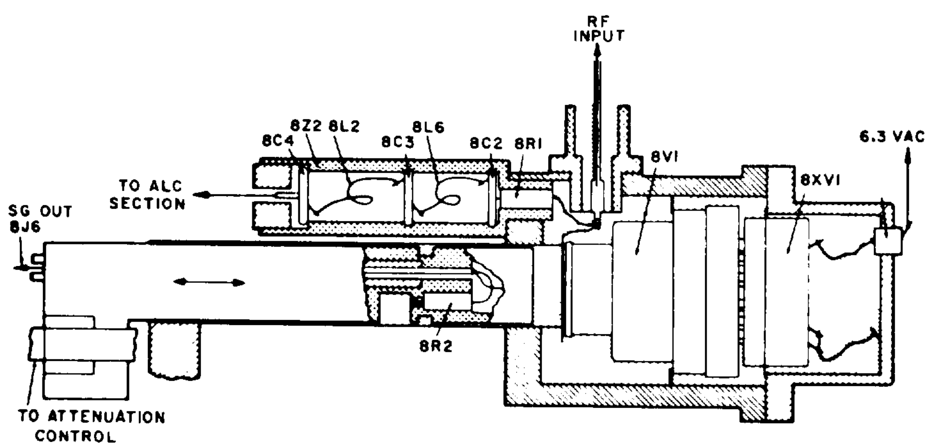

Figure 4-38. ALC/Attenuator Assembly 8A2, Cutaway Drawing

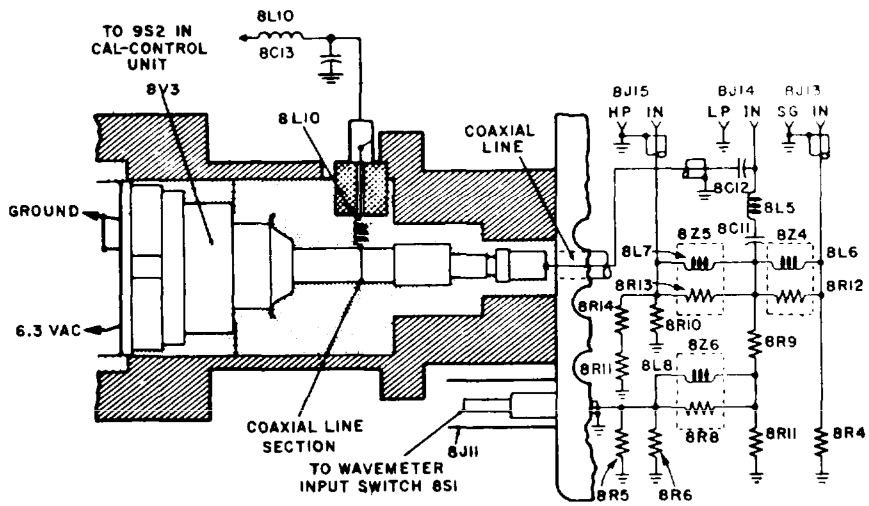

Figure 4-39. Demodulator Assembly 8A4, Functional Drawing

through 8Jll so that frequency measurements can be made. Attenuation between 8J15 and 8V3 is provided by the attenuation network shown in the overall schematic diagram of figure 5-64.

When the internally generated rf signal from Coder Simulator SM-197A/UPM-98 is to be demodulated, the modulated rf signal is fed into the demodulator through SG IN connector 8J13. An attenuated output from the rf signal generator is available at 8J14 and 8J15 for this purpose. Approximately 13 db of attenuation between 8J13 and 8J14 is provided by the attenuation network. Attenuation of approximately 37 db between 8J13 and 8J15 is provided by the same attenuation network.

For either externally or internally generated rf signals, the rf energy is coupled through 8C12 and transmission line 8TL1 to the plate of 8V3 (2B22 lighthouse-type diode). The resulting negative pulses are fed on through rf chokes 8L9 and 8L10. The demodulator output then goes through 8J18 to VIDEO OUT switch 9S2 in the Calibration-Control unit.

In order to provide the correct termination impedance, the dummy load 8P15 (attached) must be inserted into the HP IN connector when LP IN is connected to external equipment; similarly, 8P15 must be inserted into the LP IN connector when HP IN is connected to external equipment.

5. WAVEMETER ASSEMBLY 8A3. - The wavemeter, which is of the tuned cavity type, is used for accurate measurement of rf signal frequencies in the range from 925 to 1225 megahertz. It may be used to measure the frequency of the signal produced by internal rf oscillator 8V2 or of signals from external sources. To measure the frequency of the 8V2 output, WAVEMETER INPUT switch 8S1 is placed in the SIG GEN (signal generator) position. To measure the frequency of a signal from an external rf source, the signal is brought in through LP IN-connector 8J14 or HP IN connector 8J15 and WAVE METER INPUT switch 8S1 is placed in the DEMOD position. The wavemeter is tuned by means of the WAVE METER FREQUENCY control to match its resonance characteristics to the incoming signal frequency. This condition is indicated by a needle dip in the Calibration-Control front panel meter. The SM-197A wavemeter accuracy is +0,7 megahertz when used in conjunction with the calibration charts furnished with the equipment. The accuracy of the SM-197B direct frequency indicator is ±0.2 mHz through the range of 995 to 1125 mHz and ±0.5 mHz through the ranges of 925 to 995 and 1125 to 1225 mHz. A drawing showing the construction of the wavemeter assembly is given in figure 4-40.

The wavemeter consists of a cavity with a mechanically driven tuning rod. Rf energy is coupled into the coaxial line section by inductive 1oop 8L13. Tuning is accomplished by shortening or increasing the length of the tuning rod in the cavity to obtain a quarter-wave spacing with respect to the end cap. This is done by means of a screw-driven plunger which is connected through a gear train to a digital indicator-type dial (and knob) labeled WAVEMETER FREQUENCY on the front panel. Invar alloy, which has a very low thermal coefficient of expansion, is used in the construction of the center conductor and in the rear housing structure of the line section to keep resonance frequency shift with temperature change at a low value. The main outer conductor is made of brass, since changes in its dimensions will cause no significant change in frequency. When the tuning rod is adjusted to give a spacing which is one-quarter wavelength of the input signal, rf energy is transferred to the output pickup loop 8L12. This rf signal is rectified by diode 8CR1 so that the output of the wavemeter consists of negative pulses. These negative pulses are applied through connectors 8J12, 8J20, and 8J23 to 9P1 in the Calibration-Control unit where they are amplified, integrated by the wavemeter integrator, and their amplitude measured by a meter.

(e) ELAPSED TIME METER CIRCUIT DESCRIPTION. - The elapsed time meter, supplied on Coder Simulator SM-197A/UPM-98 only, is

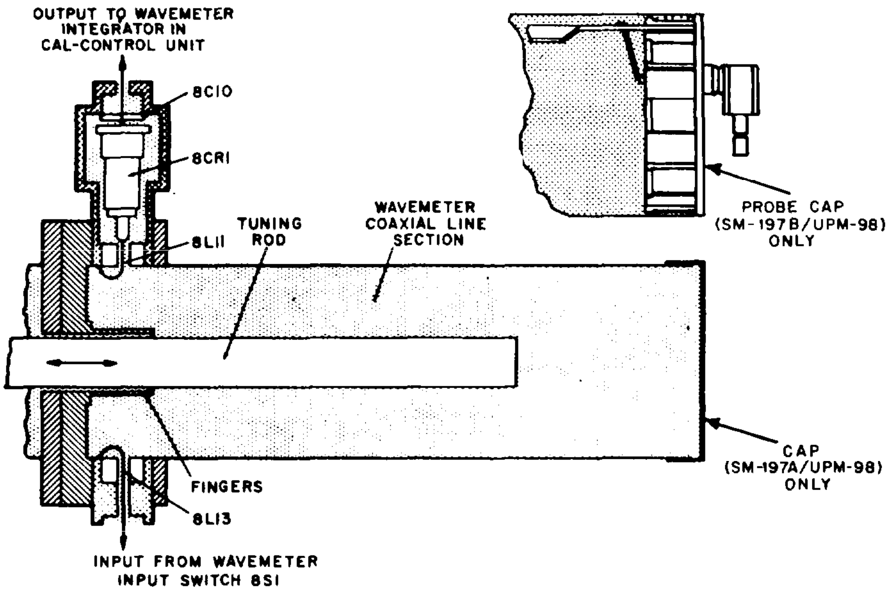

Figure 4-40. Wavemeter Assembly 8A3, Cutaway Drawing

of a type which is independent of input power frequency, since it is powered by dc. A special dc supply is included in the Equipment Case CY-2796A/UPM-98 for this purpose. (See Schematic diagrams of SM-197A/UPM-98 chassis, figure 5-64 and Equipment Case, figure 5-57.) The power supply consists of transformer 7AIT1, a rectifier bridge made up of diodes 7AlCR1 through 7A1CR4, and a filter made up of resistor 7AlR1 and capacitor 7AlC1. Regulation at 27 volts is provided by breakdown diode 7A1VR1.

4-5. FUNCTIONAL SECTION DESCRIPTION, RADAR TEST SET TS-1253A/UP.

OVERALL RADAR TEST SET TS-1253A/UP DISCRIPTION. - Radar Test Set TS-1253A/UP is made up of a panel-chassis assembly in the form of a drawer containing power supply circuits and four plug-in units (see block diagram in figure 4-41):

(1) Display Unit,
(2) Sweep and Intensity Mark Unit,
(3) Crystal Mark and Sync Unit,
(4) SIF Coder

The pulse generator circuits of the Crystal Mark and Sync unit operate from externally generated trigger pulses (either positive or negative) or from internally-generated trigger pulses. Positive suppressor, zero delay (0), and delayed trigger output signals are supplied at panel connectors,

The delayed trigger pulse is also provided at the input power connector of the unit for triggering the Interrogation Coder in the Coder Simulator, and for use within the TS-1253A unit. Internal connections supply output triggers from this unit to the Sweep and Intensity Mark unit. Internal connections also supply video marker output from the Crystal Mark and Sync unit to the Display unit, providing an accurate time calibration on the display sweep.

The Sweep and Intensity Mark unit contains a triggered sweep generator and an intensity marker generator. Horizontal sweep output is supplied to the cathode ray tube of the Display unit. Intensity marker output is also supplied to the cathode ray tube to provide time-scale markers for the different sweep durations. Appropriate trigger inputs are selected by operator controls. All connections to the Sweep and Intensity Mark unit are internal.

The Display unit contains a cathode-ray tube, an rf-type high voltage supply, and an amplifier for the input video signal. Video markers, intensity markers, horizontal sweep voltage, and power are supplied from the other units of the test set for operation of the Display unit. A panel connector is provided for video input.

The SIF Coder requires an external positive trigger to initiate the generation of a pulse train. Operator controls permit code number selection and output amplitude adjustment. Continuously variable low level output is supplied at the VARI OUTPUT panel connector. High level output is supplied at the

MOD DRIVE panel connector. A two-position switch controls the relative output levels from both panel connectors. The Crystal Mark and Sync unit, or other external equipment, supplies the input trigger to the panel connector of the SIF Coder. With the exception of the power supply, this unit is a complete, self-contained pulse train generator.

The TS-1253A panel-chassis assembly contains the power, control, rectifier, and regulator circuits for Radar Test Set TS-1253A/UP. It also provides mountings and interconnections for the modular units of the test set.

b. RADAR TEST SET TS-1253A/UP TEST DATA. - Test data for Radar Test Set TS-1253A/UP is given in the data for the individual functional sections. This data includes waveforms and voltage and resistance readings,

RADAR TEST SET TS-1253A/UP CIRCUIT DE DESCRIPTION

(1) CRYSTAL MARK AND SYNC UNIT. - The circuit functions of the Crystal Mark and Sync unit are shown in the block diagram figure 4-42 and are described below. Waveforms for this unit are shown in figure 4-43 and voltage and resistance readings are given in tables 4-7 and 4-8.

TABLE 4-7. CRYSTAL MARK AND SYNC UNIT VOLTAGE READINGS

TUBE NO.	TUBE PIN NUMBERS 1	2	3	4	5	6	7	8	9
3V1	0.54	0	FIL	FIL	+235	+110	0		
3V2	+250	-27	+0.04	FIL	FIL	0	-18.5	FIL	+250
3V3	+240	0	+6.2	FIL	FIL	+240	0	+5.6	FIL
3V4	+200	-44	0	FIL	FIL	+70	+3.3	+3.3	FIL
3V5	+250	-15	+4.3	FIL	FIL	+250	-35	+0.03	FIL
3V6	FIL	+0.1	-16.5	+250	0	+250	-16	0	FIL
3V7	+250	40	0	FIL	FIL	-50	-49	FIL	-40
3V8	+12.3	-34	0	FIL	FIL	+220	+0.3	+3.2	FIL
3V9	+195	+12.3	+14.5	FIL	FIL	+145	+48	+14.5	FIL
3V10	+220	0	+3	FIL	FIL	+7.7	+.77 to -34	0	FIL
3V11	FIL	0 to 3.2	+14.4 to -16	+220	0	+220	-14.6	0 to 0.34	FIL
3V12	+160 to +210	+46.5	+47	FIL	FIL	+190	-7.8 to +9.2	+47	FIL

Notes - (1) Voltage measurements taken with unit removed from chassis, but connected with a 24-conncctor service cable.

(2) SYNC SELECT switch in EXT (+) Position

(3) Electronic Multimeter used for voltage measurements

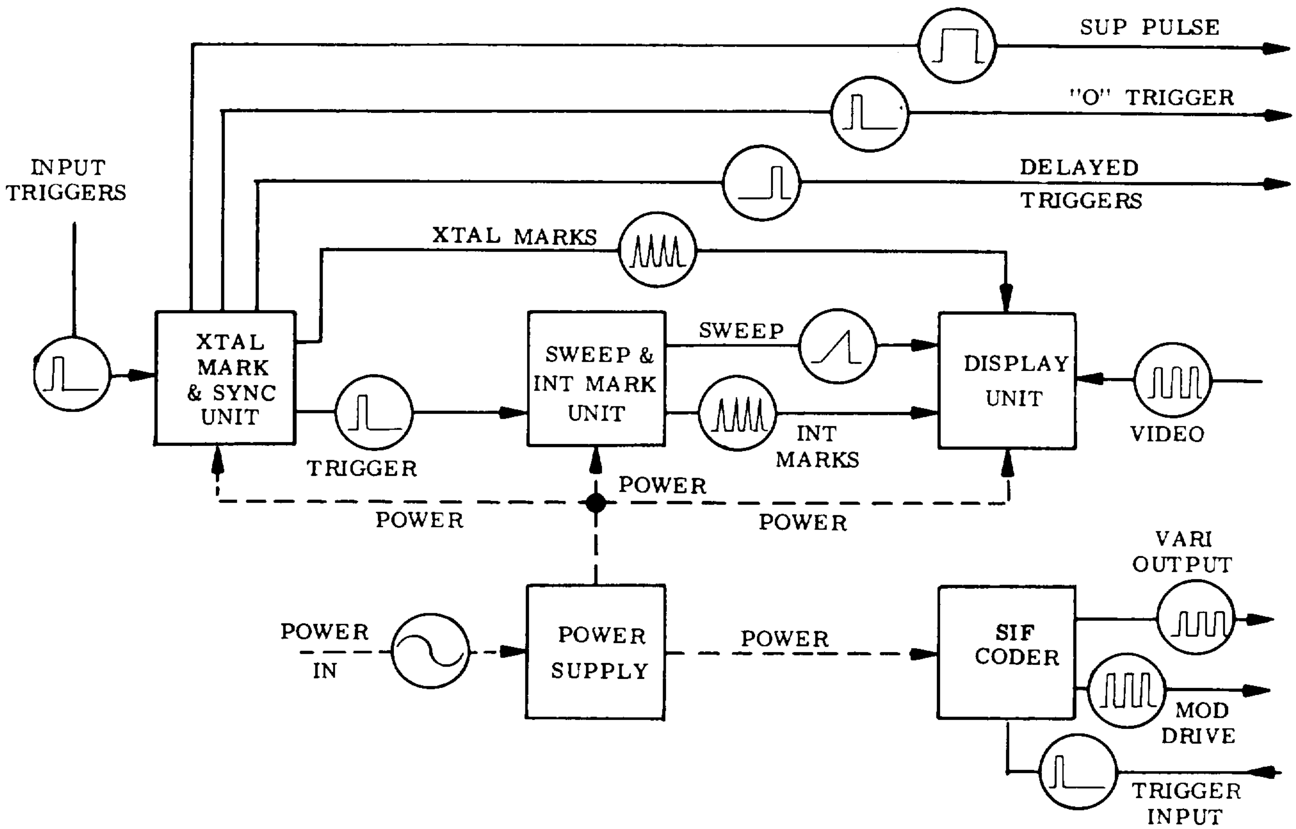

Figure 4-41. Radar Test Set TS-1253A/UP, Block Diagram

TABLE 4-8, CRYSTAL MARK AND SYNC UNIT RESISTANCE READINGS

TUBE NO.	TUBE PIN NUMBERS 1	2	3	4	5	6	7	8	9
3V1	47K	0	∞	∞	33K	80K	0	---	---
3V2	35K	3.7K	480	∞	∞	0	2.7K	∞	35K
3V3	110K	4.7K	10K	∞	∞	35K	1.3 Meg	4.8K	∞
3V4	45K	52K	500	∞	∞	45K	450	390	∞
3V5	45K	15K	270	∞	∞	35K	4.5 Meg	85	∞
3V6	∞	180	47K	35K	0	35K	4.5 Meg	470	∞
3V7	35K	90K	470	∞	∞	2.8K	400K	∞	90K
3V8	220K	550K	0	∞	∞	35K	1K △	750	∞
3V9	40K	220K	3.6K	∞	∞	40K	32K	3.6V	∞
3V10	35K	100△	750	∞	∞	220K	600K	0	∞
3V11	∞	470	6.8K	35K	0	35K	6.8K	470	∞
3V12	45K	30K	3.6K	∞	∞	40K	220K	3.6K	∞

Notes: 1. Resistance measurements taken to chassis ground with unit removed and disconnected.

2.△ Indicates that diode in circuit will cause readings to vary.

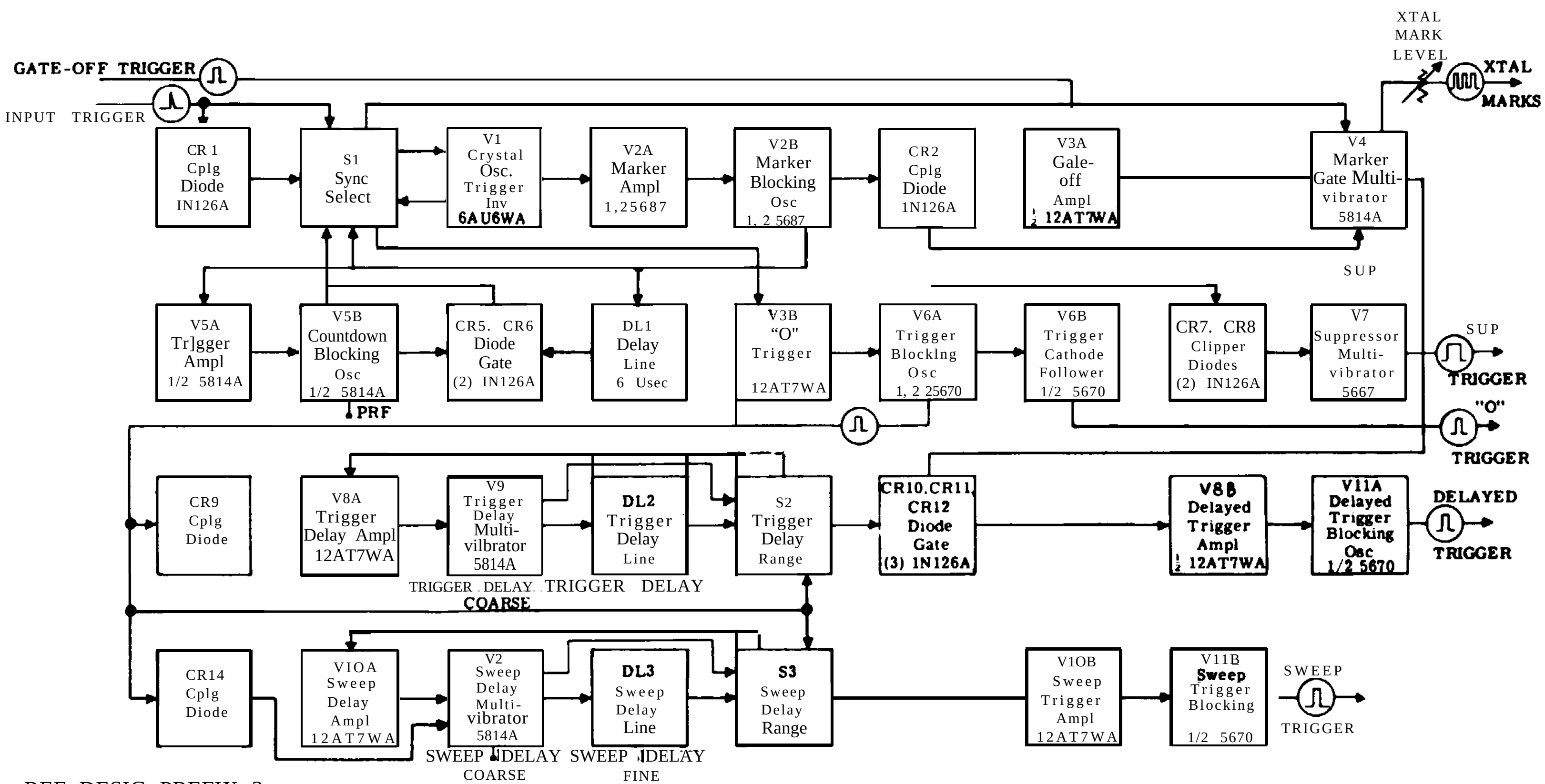

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Figure 4-42. Crystal Mark and Sync Unit, Block Diagram

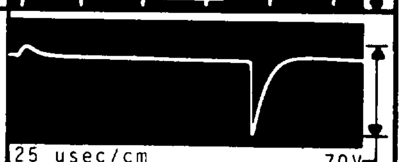
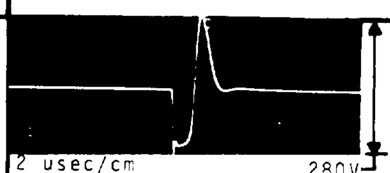
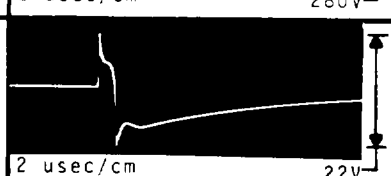
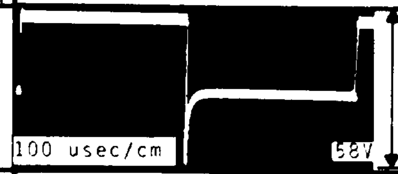
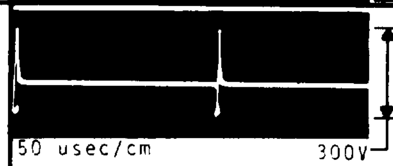
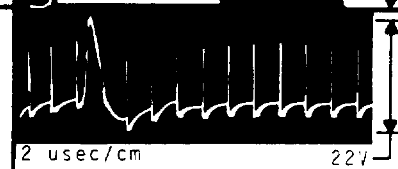
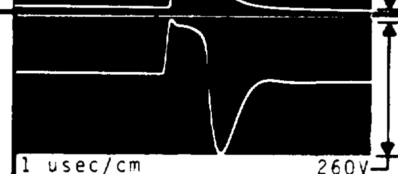
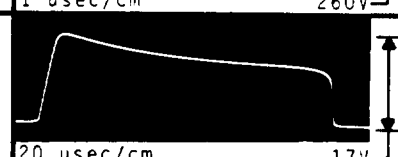
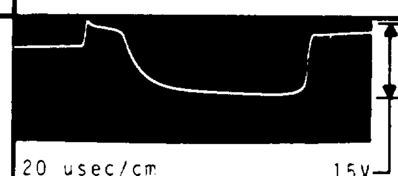
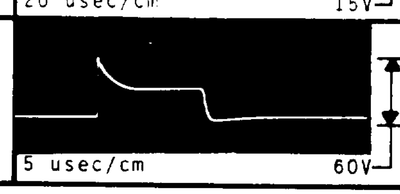
NO	TEST POINT	WAVEFORM	REMARKS
1	3V1 -1		External positive trigger applied to INPUT TRIGGER jack J301. Trigger de-layed in respect to sweep approx 25 usec by ex-ternal pulse gen.
2	3V1 -5		SYNC SELECT at INT:1.45
3	3V2 -3		Same as No. 2
4	3V2 -9 and 3V2 -1		Same as No. 2
5	3V3 -1		External positive trigger ap-plied to INPUT TRIG-GER jack J301. SYNC SELECT: Ext. Nega-tive pulse is gate-off to V304 as set by SWEEP SPEED on SWEEP module
6	3V3 -6		Same as No. 1
7	3V3 -7		Same as No. 1
8	3V4 -2		SWEEP SPEED on SWEEP & INTEN MARK: 1-30. SYNC SELECT INT 1.45
9	3V5 -1 and 3V5 -6		SYNC SELECT INT PRF: As re quired
10	3V5 -1		SYNC SELECT INT 1 PRF: As re quired
11	3V5 -2		SYNCSELECT: INT:i PRF:Max cw
12	3V6 -2		SYNC SELECT EXT. Supply Trigger with desired PRF to INPUT jack
13	3V6 -7		Same as No. 12
14	3V7 -3		Same as No. 12 Adjust SUP control 1/8 turn from full ccw
15	3V7 -6		Same as No. 14
16	3V8 -1		Same as No. 14

Figure 4-43 Crystal Mark and Sync Unit, Waveforms (Sheet 1 of 2)

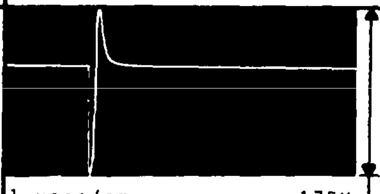
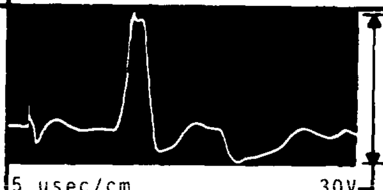
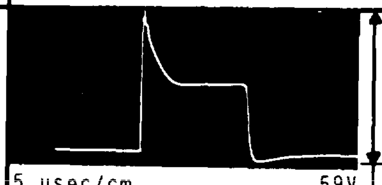
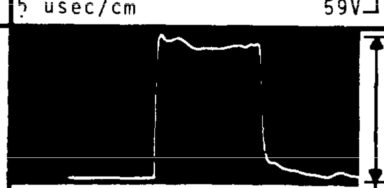
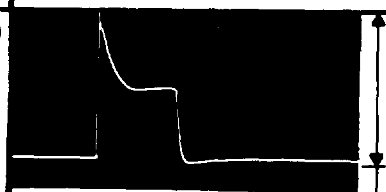
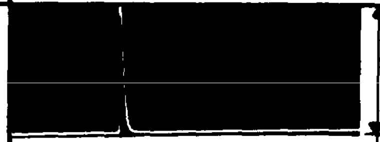
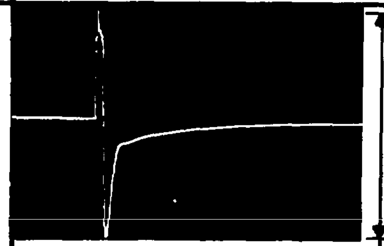
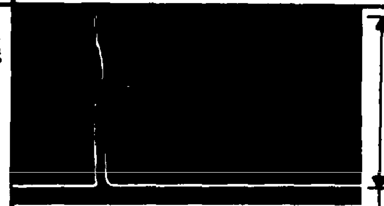
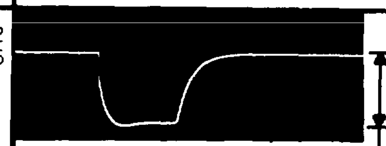
NO	TEST POINT	WAVEFORM	REMARKS
17	3V8 -6	 1 usec/cm 175V	Position of pulse varies with setting of TRIG DELAY control
18	3V8 -7	 5 usec/cm 30V	XTAL UNIT Triqqer Delay:11 usec Sync Select EXT Supply trigger with desired PRF to INPUT jack
19	3V9 -2	 5 usec/cm 59V	Same as No. 18
20	3V9 -6	 5 usec/cm 56V	Width of pulse varies with setting of Trigger Delay Range and Coarse controls
21	3V10 -1 and 3V11 -6	 5 usec/cm 200V	Same as No. 20
22	3V10 -6	 5 usec/cm 60V	Same as No. 20
23	3V11 -2	 5 usec/cm 50V	Delay of pulse varies with setting of Trigger Delay controls
24	3V11 -7	 5 usec/cm 240V	Same as No. 23
25	3V11 -8	 5 usec/cm 64V	Delay of pulse varies with setting of Sweep Delay controls
26	3V12 -1	 5 usec/cm 54V	Same as No. 25
27	3V12 -6	 5 usec/cm 56V	Same as No. 25

Figure 4-43. Crystal Mark and Sync Unit, Waveforms (Sheet 2 0f 2)

When SYNC SELECT switch 3S1 is set to EXT + the positive input trigger is supplied through the INPUT TRIGGER connector, through switch 3S1, and to the input of O trigger amplifier 3V3B. The amplified trigger output from 3V3B drives trigger blocking oscillator 3V6A. Trigger blocking oscillator 3V6A generates O (zero-delay) triggers having the required pulse characteristics regardless of the waveform of the input trigger being used. Trigger cathode follower 3V6B provides a low impedance O trigger ouput for operation of external equipment,

When SYNC SELECT switch 3S1 is set to EXT -, the negative input trigger is supplied through the INPUT TRIGGERS connector, through coupling diode 3CR1, switch 3S1, trigger inverter 3V1, back through switch 3S1 , and to the input of O trigger amplifier 3V3B. The rest of the O trigger generation process is as previously described.

When the SYNC SELECT switch is set to INT, count-down blocking oscillator 3V5B produces a positive trigger signal, the frequency of which is set by the PRF control. The output from countdown blocking oscillator 3V5B is applied to the input of O trigger amplifier 3V3B through switch 3S1. The remaining O trigger generation process is as previously described.

When SYNC SELECT switch 3S1 is set to INT 1.45 (or INT 1.00), crystal oscillator 3V1 drives marker amplifier 3V2A, which in turn triggers marker blocking oscillator 3V2B. The resulting output is crystal-controlled marker pulses. The marker pulses are amplified by trigger amplifier 3V5A and then used to trigger count-down blocking oscillator 3V5B. The countdown ratio is determined by the setting of the PRF control. The output from countdown blocking oscillator 3V5B controls a gate circuit consisting of diodes 3CR5 and 3CR6. The output from marker blocking oscillator 3V2B is applied to the diode gate circuit through delay line 3DL1. The first marker pulse passed on to 3S1 during the gate-on interval functions as a trigger pulse for generation of the O trigger output. The rest of the O trigger generation process is as previously described.

When SYNC SELECT switch 3S1 is set to INT 1.45 (or INT 1.00), marker gate multivibrator 3V4 is placed in operation. A gate-off trigger signal from the Sweep and Intensity Mark unit is amplified by gate-off amplifier 3V3A and applied to marker gate multivibrator 3V4 through coupling diodes 3CR3 and 3CR4. The gate-off trigger causes marker gate multivibrator 3V4 to switch conduction from one triode section to the other at the end of each sweep interval. Marker input through coupling diode 3CR2 is then passed on by marker gate multivibrator 3V4 during every other sweep cycle. The amplitude of the crystal marker output signal passed on to the Display unit video amplifier circuits is set by the XTAL MARK LEVEL control. Gate pulse output from marker gate multivibrator 3V4 opens a diode gate circuit consisting of diodes 3CR11 and 3CR12. This provides delay trigger output for equipment under test and provides video input to the Display unit during the alternate sweep cycles.

When SYNC SELECT switch 3S1 is set to INT, EXT +, or EXT - marker gate multivibrator 3V4 is disabled. There is no crystal marker output, but the diode gate consisting of diodes 3CR11 and 3CR12 remains open continuously. The delay trigger output to equipment under test thus provides video input to the Display unit during every sweep cycle. The output signal from trigger blocking oscillator 3V6A is clipped by diodes 3CR7 and 3CR8 before being used to trigger suppressor multivibrator 3V7, The duration of the positive SUP TRIGGERS pulse from 3V7 is adjustable by means of the SUP control.

The output from trigger blocking oscillator 3V6A is coupled to the input of trigger delay amplifier 3V8A through capacitor 3C31. The amplified trigger output drives trigger delay multivibrator 3V9. The multivibrator output drives trigger delay line 3DL2. TRIGGER DELAY RANGE switch 3S2 selects the circuit and pulse source to obtain the desired time delay. Zero delay is provided by direct use of the O delay trigger signal.

The output from TRIGGER DELAY RANGE switch 3S2 is applied to a diode gate consisting of diodes 3CR11 and 3CR12. When SYNC SELECT switch 3S1 is set to INT 1.45 (or INT 1.00) the gate pulse output from marker gate multivibrator 3V4 opens the diode gate circuit during alternate Display unit sweep cycles. This triggers the equipment under test during the alternate sweep cycles. As was previously explained, every other sweep cycle is used for crystal marker display.

When SYNC SELECT switch 3S1 is set to INT, EXT +, or EXT -, marker gate multivibrator 3V4 is disabled and the diode gate circuit remains open continuously. Display unit sweep is used only for video display, no crystal markers being present.

Diode gate output is applied to the input of delayed trigger amplifier 3V8B. The amplified trigger output drives delayed trigger blocking oscillator 3V11A. Delayed trigger blocking oscillator 3V11A generates a delayed trigger output having the required pulse characteristics regardless of input waveform changes for different settings of TRIGGER DELAY RANGE switch 3S2. Delayed trigger output is supplied to the equipment under test through a front panel connector. The output from trigger blocking oscillator 3V6A is coupled to the input of sweep delay amplifier 3V10 by coupling capacitor 3C41. Amplified trigger output drives sweep delay multivibrator 3V12. Multivibrator output drives sweep delay line 3DL3. SWEEP DELAY RANGE switch 3S3 selects the circuits and pulse source to obtain the desired time delay. Zero delay is provided by direct use of the O delay trigger. The short delay range uses sweep delay line 3DL3 which can be adjusted by means of the SWEEP DELAY FINE control.

Output from SWEEP DELAY RANGE switch 3S3 is applied to the input of sweep trigger amplifier 3V10B. Amplified trigger output drives sweep trigger blocking oscillator 3V11 B. Sweep trigger blocking oscillator 3V11B generates a sweep trigger output having the required pulse characteristics regardless of input waveform changes for different settings of SWEEP DELAY RANGE switch 3S3. Sweep trigger output is supplied to the Sweep and Intensity Mark unit through internal connections.

(a) O TRIGGER GENERATOR CIRCUIT. - When SYNC SELECT switch 3S1 is set to EXT +, as shown in figure 4-44, the positive input

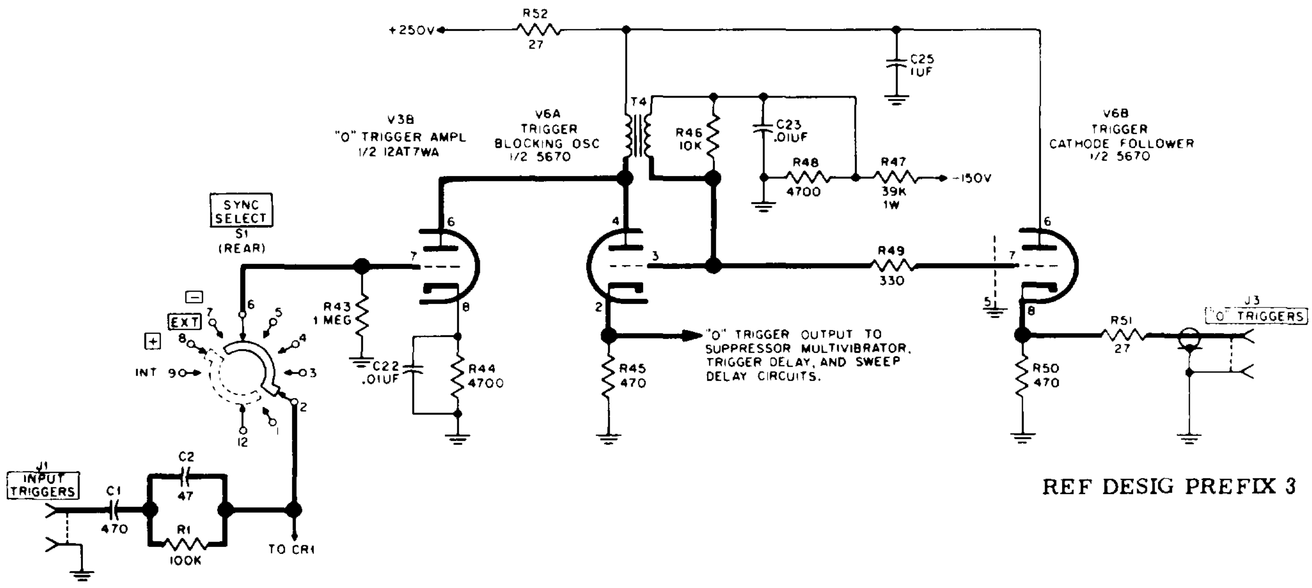


Figure 4-44. “0” Trigger Generator, Simplified Schematic Diagrarn

trigger from INPUT TRIGGERS connector 3J1 is differentiated by a network consisting of capacitor 3C1, capacitor 3C2, resistor 3R1, and the input-circuit impedance of 0 trigger amplifier 3V3B. This differentiator action provides proper equipment synchronization with various input trigger pulse durations. A common plate load circuit couples the output from 0 trigger amplifier 3V3B to trigger blocking oscillator 3V6A. Single-shot operation provides a regenerated output trigger for each input trigger. This output trigger has the required pulse characteristics regardless of the waveform of the input trigger being used, The 0 trigger output developed across cathode load resistor 3R45 is used by the circuits within the test set. The 0 trigger voltage at grid pin 3 of trigger blocking oscillator 3V6A is used to drive trigger cathode follower 3V6B. Low impedance output at 0 TRIGGERS connector 3J3 is used for operation of external equipment. Output loading at this point does not affect the internal functions of the test set.

(b) TRIGGER INVERTER CIRCUIT.- When SYNC SELECT switch 3S1 is set to EXT -, as shown in figure 4-45, the negative input trigger from INPUT TRIGGERS connector 3J1 is differentiated by a network. consisting of capacitor 3C1, capacitor 3C2, resistor 3R1, and the input circuit impedance of trigger inverter 3V1. This differentiator action provides proper equipment synchronization with various input trigger pulse durations. While positive input triggers are properly routed through the

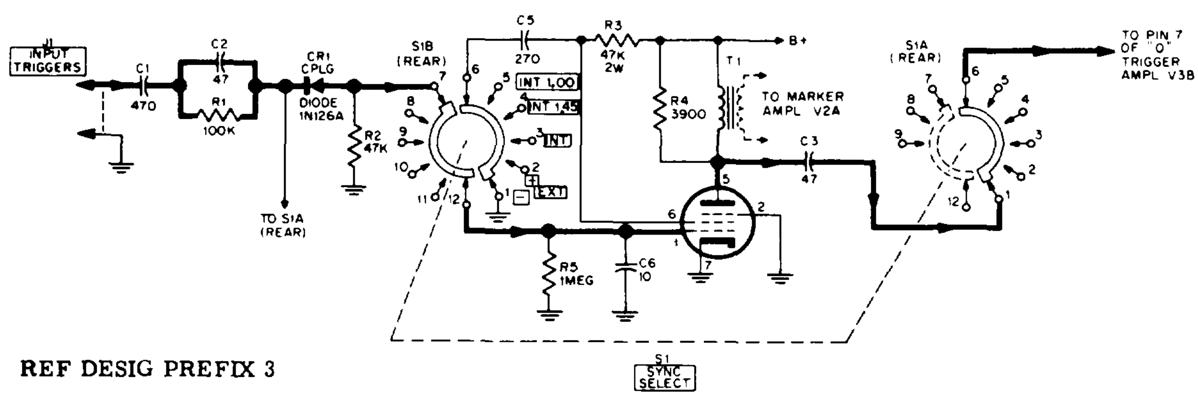


Figure 4-45. Trigger Inverter, Simplified Schematic Diagram.

contacts of SYNC SELECT switch 3S1, coupling diode 3CR1 is used to convey negative input triggers to grid resistor 3R5.

Resistor 3R3 and capacitor 3C6, used for oscillator operation of tube 3V1, have no significant circuit function in this particular mode of operation. The screen grid (pin 6) of tube 3V1 is bypassed by capacitor 3C5 through the contacts of SYNC SELECT switch 3S1. Positive trigger output from trigger inverter 3V1 is coupled through capacitor 3C3 and the contacts of SYNC SELECT switch 3S1 to the input of O trigger amplifier 3V3B. The remaining O trigger generation process is as previously described.

(c) PRF CONTROL CIRCUIT. - See figure 4-46. The grid circuit time-constant determines the free running frequency of countdown blocking oscillator 3V5B. It can be adjusted by means of PRF control 3R38A. Prf Range Adjustment potentiometer 3R40 is a service adjustment. It is normally set for a maximum prf of 4100 pps. Positive trigger output, developed across cathode load resistor 3R34. is applied to the grid of O trigger amplifier 3V3B through the contacts of SYNC SELECT switch 3S1. The remaining O trigger generation process is as previously described. Marker diode 3CR5, gate diode 3CR6, and trigger amplifier 3V5A are inoperative for this particular mode of operation.

(d) CRYSTAL OSCILLATOR CIRCUIT. - When SYNC SELECT switch 3S1 is set to INT 1.45 (or INT 1.00), as shown in figure 4-47, the screen of crystal controlled oscillator 3V1 functions as the anode of a tube in a Pierce oscillator circuit. The output from oscillator 3V1 is fed to marker amplifier 3V2 by transformer 3T1. Damping resistor 3R4 prevents circuit ringing.

(e) MARKER GENERATOR CIRCUIT. - Output from transformer 3T1 drives marker amplifier 3V2A into conduction to initiate production of an amplified marker trigger. (See figure 4-48.) A common plate load circuit couples the output of marker amplifier 3V2A to marker blocking oscillator 3V2 B. The blocking oscillator single-shot operation provides a regenerated output pulse having the required characteristics for use as a video marker. The pulse output developed across cathode load resistors 3R12 and 3R13 is fed to the input of trigger amplifier 3V5A. The pulse output developed across resistor 3R13 is applied to the input of marker gate multivibrator 3V4.

(f) MARKER GATE CIRCUIT. - When SYNC SELECT switch 3S1 is set to INT 1.45 (or INT 1.00), as shown in figure 4-49, the switch contacts across pins 7 and 8 (grid and cathode) of marker gate multivibrator 3V4 are open and the

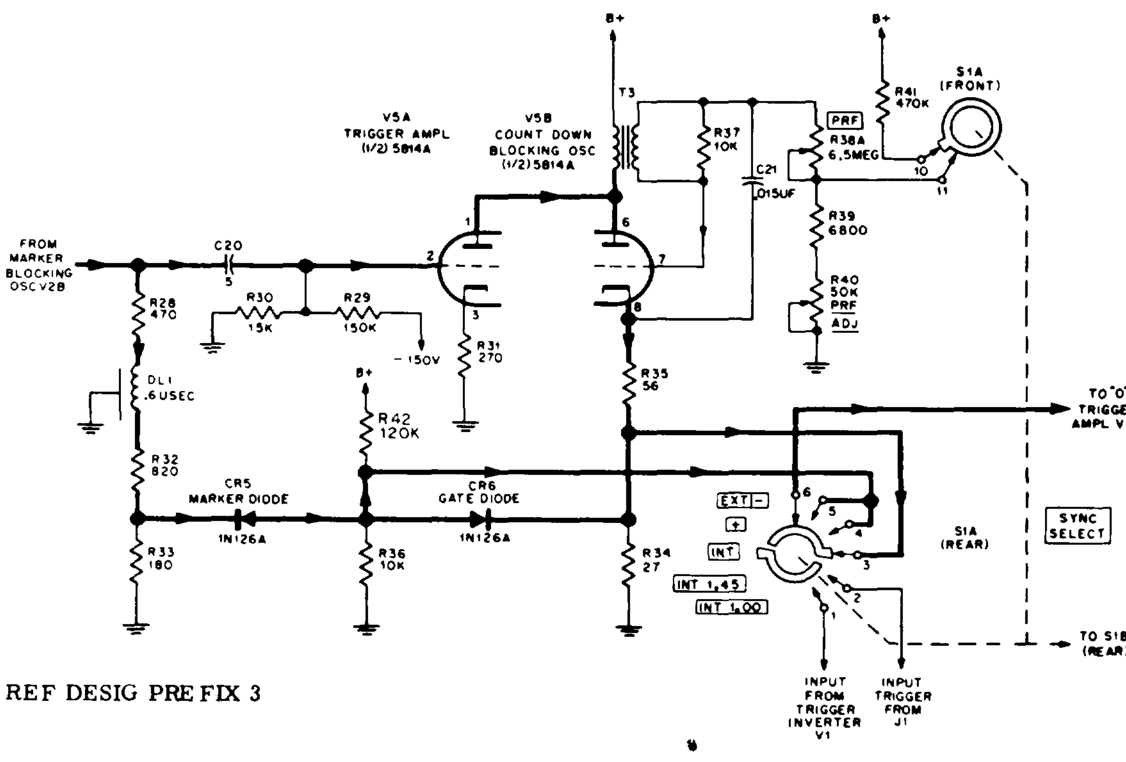


Figure 4-46. PRF Control Circuit, Simplified Schematic Diagram

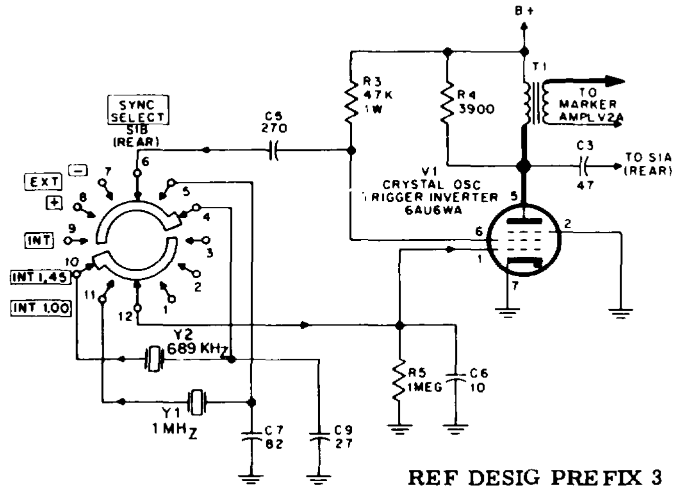


Figure 4-47. Crystal Controlled Oscillator Circuit, Simplified Schematic Diagram

marker gate circuit is in operation. A positive gate-off pulse is supplied by the Sweep and Intensity Mark unit at the end of each sweep interval. This pulse is applied to the grid of gate-off amplifier 3V3A. The output of gate-off amplifier 3V3A is coupled to the grids of marker gate multivibrator 3V4 by means of capacitors 3C59 and 3C60. The negative gate-off pulse causes the conducting section of the tube to cut off, which in turn drives the other section into conduction. Since marker gate multivibrator 3V4 is a bistable circuit, each gate-off pulse will switch conduction from one tube section to the other.

Output from marker blocking oscillator 3V2B is coupled to grid pin 2 of marker gate multivibrator 3V4 by means of capacitor 3C13, coupling diode 3CR2, and resistor 3R18. Cathode-follower marker output is developed across XTAL MARX LEVEL control 3R64 during conduction of this tube section. This adjustable marker output is supplied to the Display unit.

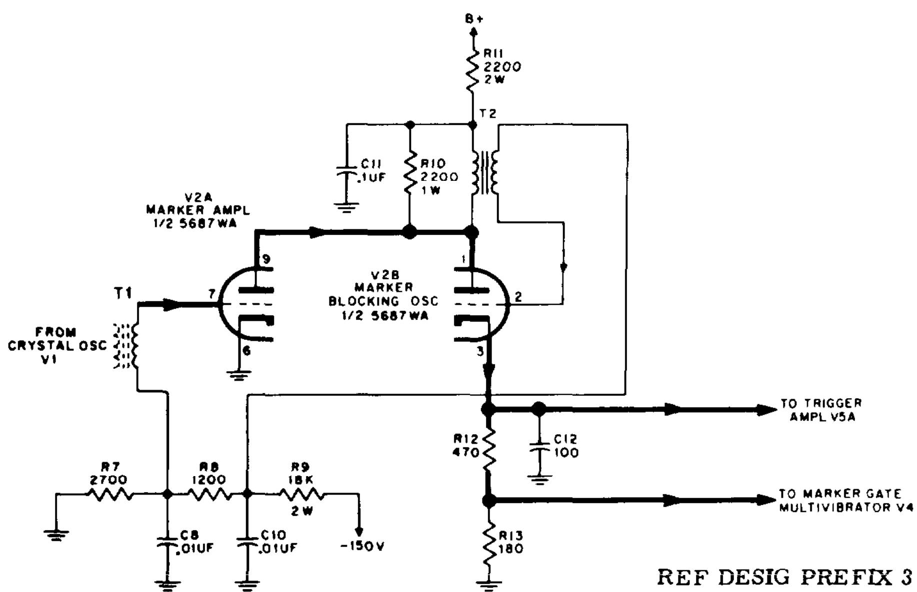


Figure 4-48. Marker Generator Circuit, Simplified Schematic Diagram

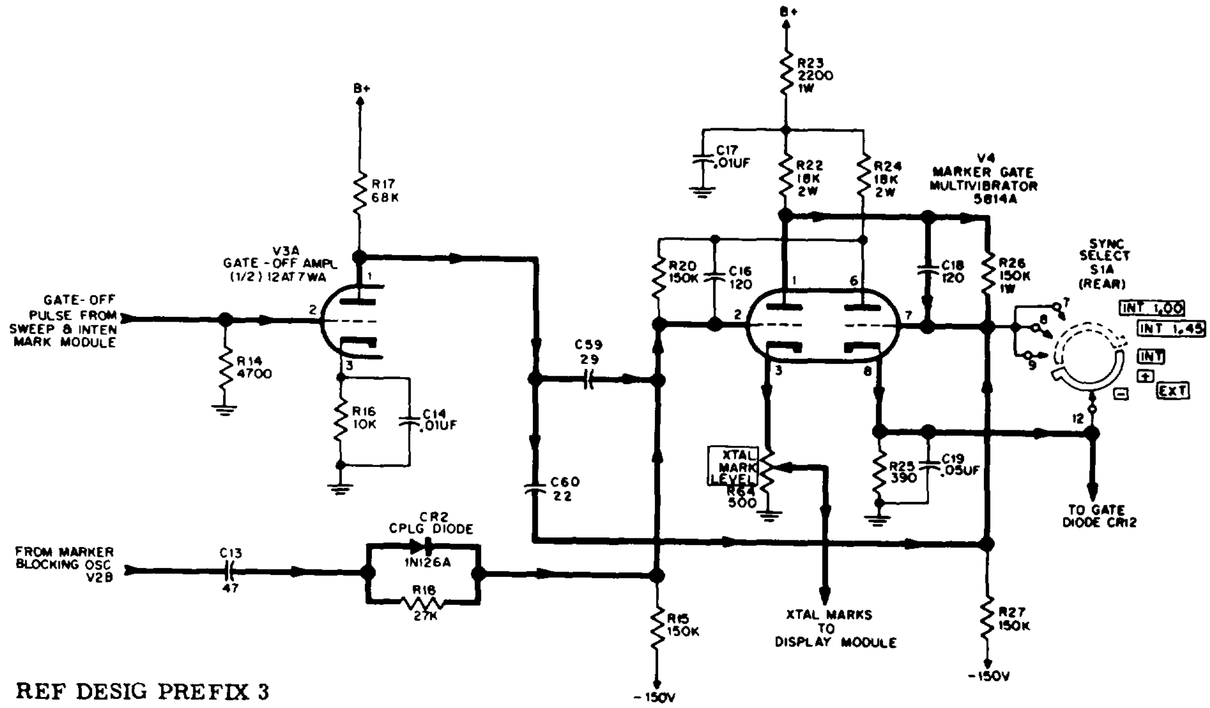


Figure 4-49. Marker Gate Circuit, Simplified Schematic Diagram

The gate-off pulse at the end of the sweep interval causes marker gate multivibrator 3V4 to switch conduction to the other section. A positive gate output developed across load resistor 3R25 is applied to gate diode 3CR12 in the delayed-trigger circuit. This makes available a delayed trigger signal for the equipment under test. There is no marker output at this time. The gate-off pulse at the end of this video display sweep interval will again cause marker gate multivibrator 3V4 to switch conduction to the other section and markers will again be displayed during the sweep interval, but no delayed trigger will be supplied. Marker gate multivibrator 3V4 thus supplies crystal markers and delayed trigger gate pulses during alternate sweep intervals.

When SYNC SELECT switch 3S1 is set to EXT -, EXT +, or INT, the grid and cathode (pins 7 and 8) of marker gate multivibrator 3V4 are shorted together, removing bias from this tube section and causing it to conduct continuously. Continuous conduction of this section gives a continuous positive "gate" output. Since the other tube section cannot conduct, there is no marker output.

(g) SUPPRESSOR PULSE GENERATOR. - The suppressor pulse generator shown in figure 4-50 functions for all modes of operation. The 0 trigger from trigger blocking oscillator 3V6A is coupled into the circuit by capacitor 3C24. The negative undershoot is removed by clipper diode 3CR7. Diode bias supplied by divider resistors 3R55 and 3R56 determines the positive clipping level, Capacitor 3C27 couples the clipped pulse to cathode (pin 6) of suppressor multivibrator 3V7. The positive 250-volt and negative 150-volt supplies together provide an effective 400-volt plate supply solely for the input triode section of suppressor multivibrator 3V7. This supply arrangement also makes the plate (pin 9) operating voltage suitable for direct coupling to grid (pin 2) of the output section. SUP control 3R38B adjusts the time constant for the desired pulse width between 2 and 220 microseconds. Conduction of the output section develops suppressor pulse output across cathode load resistor 3R63. This output is supplied to SUP TRIGGERS connector 3J2 on the front panel of the unit.

(h) TRIGGER DELAY CIRCUIT. - When TRIGGER DELAY RANGE switch 3S2 is set to 0 (zero delay) as shown in figure 4-51, 0 trigger input from divider resistors 3R81 and 3R82 (from trigger blocking oscillator 3V6A) is fed on to clipper diode 3CR10 through the 3S2B switch contacts 1 and 5 and the trigger delay circuit is not in use.

When TRIGGER DELAY RANGE switch 3S2 is set to 1-11, the zero trigger input is applied to coupling diode 3CR9 and the positive trigger output from trigger delay amplifier 3V8A drives the input section of trigger delay multivibrator 3V9 into conduction. Trigger delay multivibrator 3V9 functions as a single-shot multivibrator. Damping resistor 3R76 and delay line 3DL2 make up the plate load of the output section. Resistors 3R79 and inductor 3L2 make up the delay line termination.

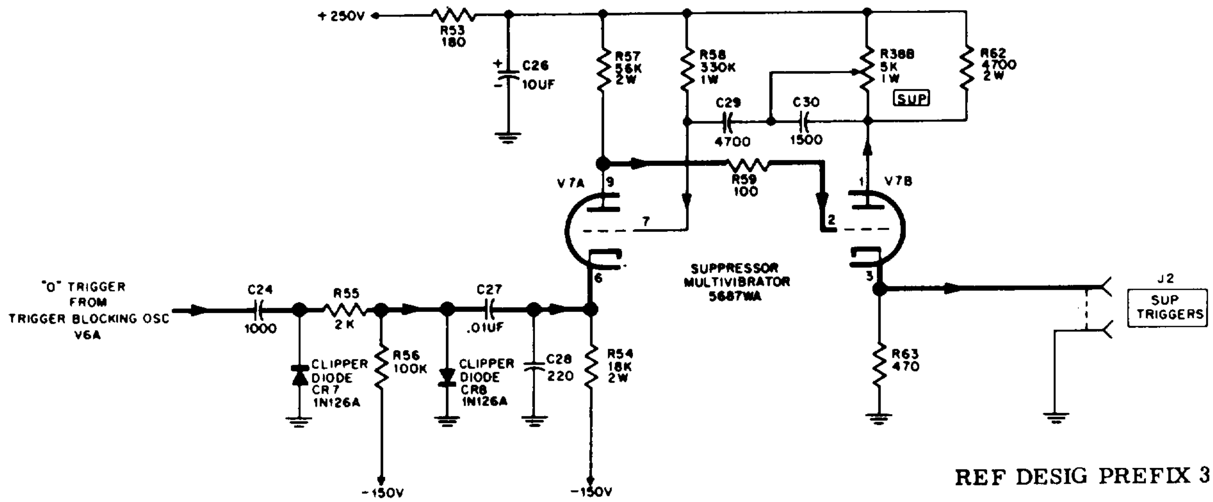


Figure 4-50. Suppressor Pulse Generator, Simplified Schematic Diagram

The TRIGGER DELAY FINE control varies the position of pickup coil 3L3 on the delay line, thus determining the amount of time delay to be added to that provided by the multivibrator. The trailing edge of the multi vibrator output pulse is differentiated, produring in a positive delay line output pulse that triggers the circuits which follow. In this switch position, the output of the first section of 3V9 is coupled directly to the second section, by-passing the TRIGGER DELAY COARSE control. For this reason, TRIGGER DELAY COARSE control 3R72 has no effect on operation when TRIGGER DELAY

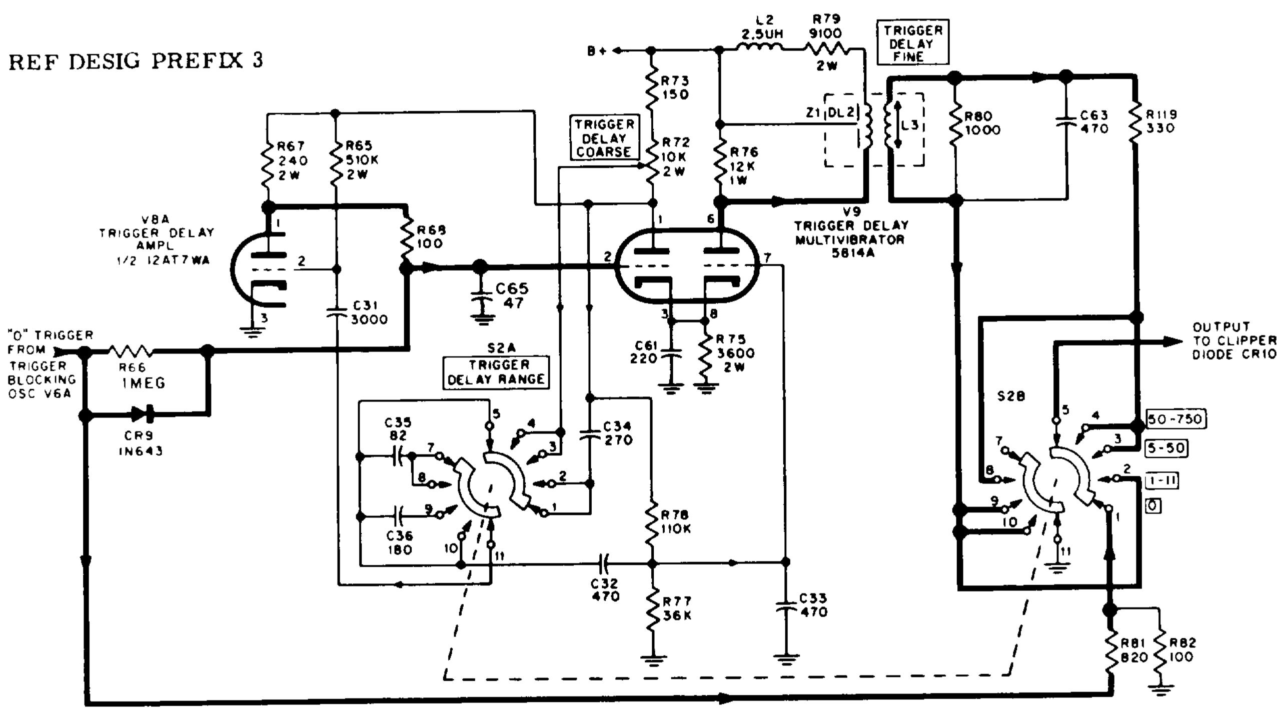


Figure 4-51. Trigger Delay Circuit, Simplified Schematic Diagram

RANGE switch 3S2 is set to l-11.

When TRIGGER DELAY RANGE switch 3S2 is set to 5-50, coupling diode 3CR9 and trigger delay amplifier 3V8A function as previously described. The basic function of trigger delay multivibrator 3V9 is also unchanged. However, the capacitance in the multivibrator circuit is increased by switching 3C36 into the circuit, in series with 3C31. This lengthens the time constant of the coupling network, holding off conduction of trigger delay amplifier 3V8A and maintaining conduction of the input section of trigger delay multivibrator 3V9. This lengthens the multivibrator output pulse and Increases the delay of the trigger derived from its trailing edge. TRIGGER DELAY RANGE switch 3S2 is in the circuit and will have an effect on the delay in this switch position.

When TRIGGER DELAY RANGE switch 3S2 is set to 50-750, the circuit functions as previously described. However, the effective capacitance of series-connected capacitors 3C31 and 3C36 is increased to the value of 3C31 (by shorting out capacitor 3C36) obtaining a still longer time constant.

(i) DELAY TRIGGER GENERATOR. The pulse signal from the trigger delay circuit is applied to the junction of trigger diode 3CR1 1 and clipper diode 3CR10. Clipper diode 3CR10 clips off the negative pulses from the trigger delay circuit (see figure 4-52). Trigger diode 3CR11 and gate diode 3CR12 conduct because of bias current supplied through resistor 3R85. When no gate pulse is present, gate diode 3CR12 returns the trigger pulse to chassis ground through the low impedance cathode circuit of marker gate multivibrator 3V4 (see figure 4-49).

When a positive gate pulse is applied, diode 3CR12 stops conducting due to reverse bias, allowing the trigger pulse from 3CR11 to reach the grid of 3V8B. This diode gate circuit supplies delayed trigger pulses for alternate sweep intervals when SYNC SELECT switch 3S1 is set to INT 1.45 (or INT 1.00). The gate circuit supplies delayed triggers for every sweep interval when SYNC SELECT switch 3S1 is set to INT, EXT -, or EXT +.

The positive trigger input to delayed trigger amplifier 3V8B produces a negative output trigger in the conventional manner. A common plate load circuit couples the output trigger to delayed trigger blocking oscillator 3V11A. Single-shot operation provides an output trigger for each input trigger. This output trigger has the required pulse characteristics regardless of the waveform of the input trigger being used. The trigger signal developed across cathode load resistor 3R87 is supplied to external equipment through DELAYED TRIGGERS connector 3J4. It is supplied to the Sweep and Intensity Mark unit through internal connections.

(j) SWEEP DELAY CIRCUIT. - When SWEEP DELAY RANGE switch 3S3 is set to 0 (zero delay) as shown in figure 4-53, 0 trigger input from trigger blocking oscillator 3V6A is fed to divider resistors 3R109 and 3R110 from where it is passed through the switch contacts and on to sweep trigger amplifier V10B. The sweep delay circuit is not in use.

When SWEEP DELAY RANGE switch 3S3 is set to 1-11, the zero trigger input is applied to coupling diode 3CR14 and the positive trigger output from sweep delay amplifier 3V10A drives the input section of sweep delay multivibrator 3V12 into conduction. Sweep delay multivibrator 3V12 functions as a single-shot multivibrator. Damping resistor 3R104 and delay line 3DL3 make up the plate load of the output section. Resistor 3R107 and inductor 3L4 comprise the delay line termination. The SWEEP DELAY FINE control varies the position of pickup coil 3L5 on the delay line, thus determining the amount of time delay to be added to that provided by the multivibrator. The trailing edge of the multivibrator output pulse is differentiated, producing a positive delay line output pulse that triggers the

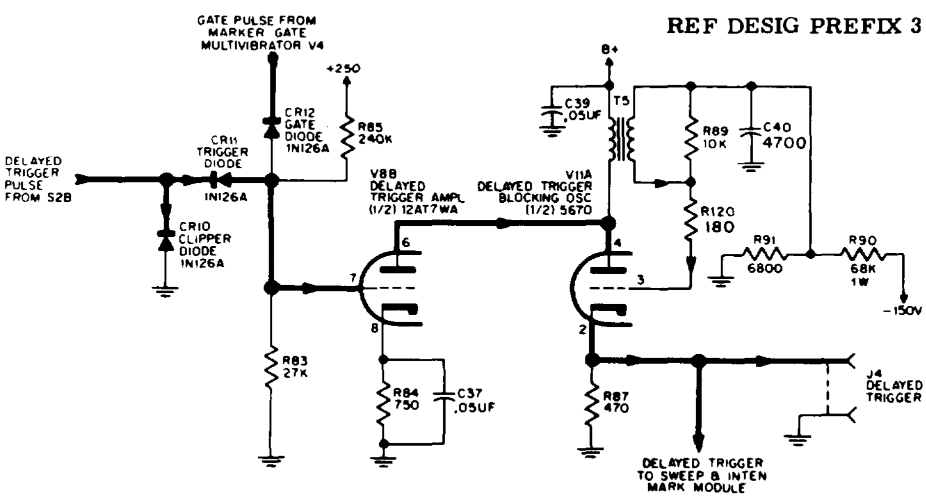


Figure 4-52, Delay Trigger Generator, Simplified Schematic Diagram

REF DESIG PREFIX 3

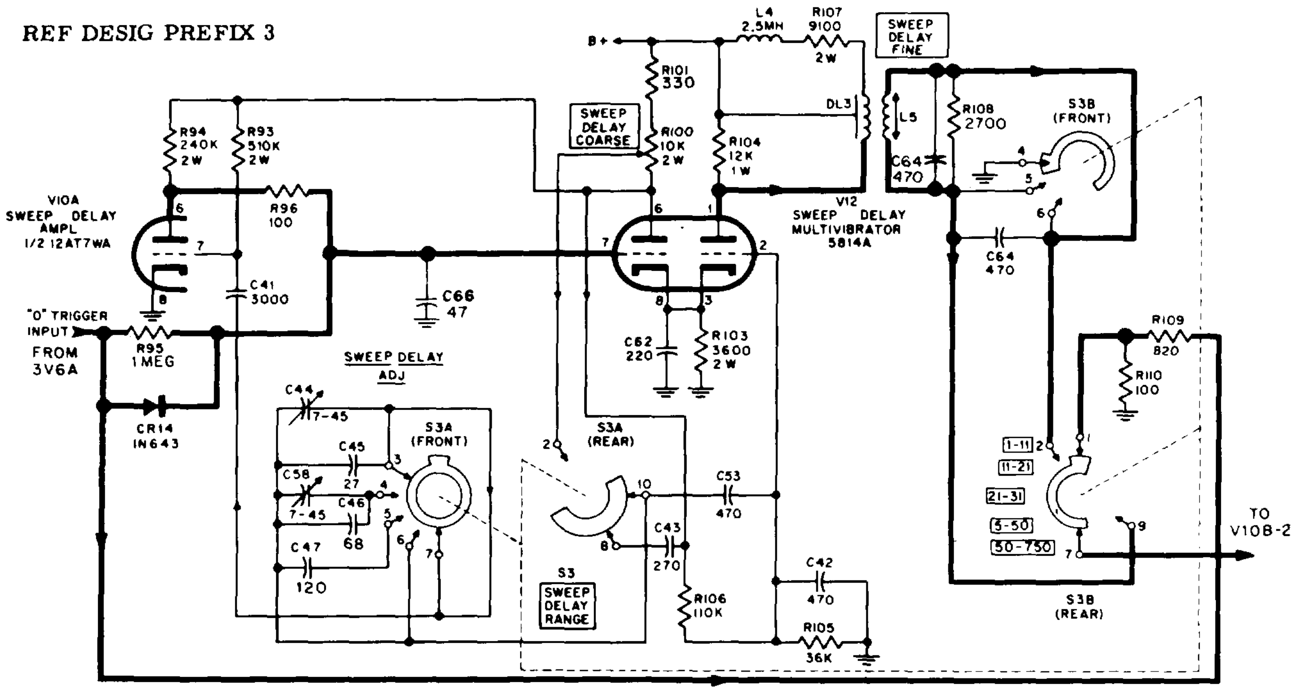


Figure 4-53. Sweep Delay Circuit, Simplified Schematic Diagram

circuits which follow. In this position of 3S3, the output of the firs-t section of 3V12 is coupled directly to the second section, by-passing the SWEEP DELAY COARSE control. For this reason SWEEP DELAY COARSE control 3R100 has no effect on operation when SWEEP DELAY RANGE switch 3S3 is set to 1-11.

When SWEEP DELAY RANGE switch 3S3 is set to 11-21, coupling diode 3CR14 and sweep delay amplifier 3V10A function as previously described. Sweep delay multivibrator 3V12 functions as a single-shot multivibrator. The coupling network between plate pin 6 and grid pin 2 of multivibrator 3V10 consists of SWEEP DELAY COARSE control 3R100, resistor 3RI0I, resistor 3R105, resistor 3R106, capacitor 3C43, capacitor 3C53, and capacitor 3C42. Again SWEEP DELAY COARSE control 3R100 has no effect since its variable tap is connected to an open contact on SWEEP DELAY RANGE switch 3S3A. The multivibrator provides a ten-microsecond fixed delay since the output trigger is derived from the trailing edge of the ten-microsecond output pulse.

When SWEEP DELAY RANGE switch 3S3 is set to 21-31, coupling diode 3CR14 and sweep delay amplifier 3V10A function as previously described. The basic function of sweep delay multivibrator 3V12 is also unchanged. However, capacitors 3C46 and 3C58 are added in parallel with capacitors 3C44 and 3C45 to increase the effective capacitance. This lengthens the time constant of the coupling network, holding off conduction of sweep delay amplifier 3V10A and maintaining conduction of the input section of sweep delay multivibrator 3V12. This lengthens the multivibrator output pulse and increases the delay of the trigger derived from its trailing edge.

When SWEEP DELAY RANGE switch 3S3 is set to 5-50, coupling diode 3CR14 and sweep delay amplifier 3V10A function as previously described. The basic function of sweep delay multivibrator 3V12 is also unchanged. However, the delay multivibrator coupling network is modified by means of the contacts on switch 3S3. Capacitor 3C43 is switched out. Capacitor 3C53 and associated components are switched directly to the variable tap on SWEEP DELAY COARSE control 3R100. Capacitor 3C46 is switched out and replaced by capacitor 3C47 which has a larger capacitance value. This provides coarse sweep delay adjustment since the sweep delay output pulse is derived from the trailing edge of the multivibrator output pulse.

When SWEEP DELAY RANGE switch 3S3 is set to 50-750, the function of coupling diode 3CR14 and sweep delay multivibrator 3V12 remains the same as on the 5-50 SWEEP DELAY RANGE setting. However, the parallel capacitor network in series with capacitor 3C41 is shorted out to use the full capacitance of 3C41 for coupling. This lengthens the time constant of the coupling network, holding off conduction of sweep delay amplifier 3V10A and maintaining conduction of the input section of sweep delay multivibrator 3V12. This lengthens the multlvibrator output pulse and increases the delay of the trigger derived from its trailing edge.

(k) SWEEP TRIGGER GENERATOR - (See figure 4-54.) Positive trigger output from sweep delay multivibrator 3V12 is coupled through 3S3B to grid pin 2 of sweep trigger amplifier 3V10B. The resulting negative output trigger is

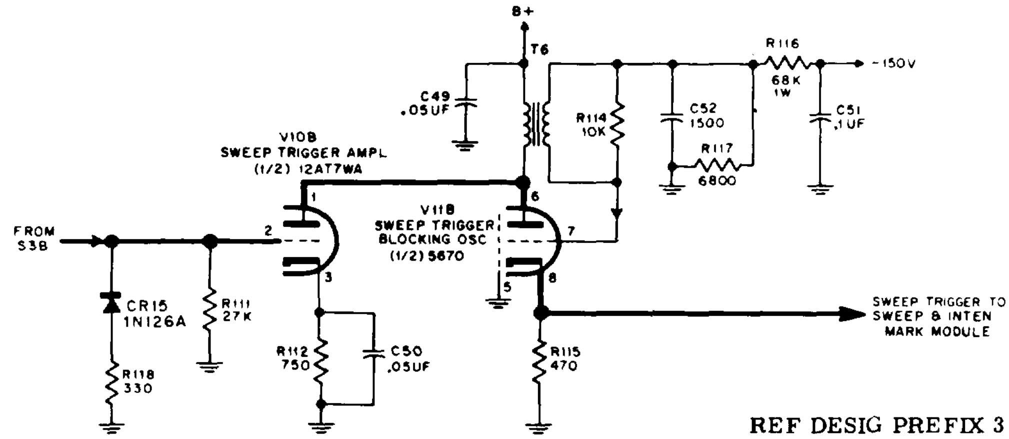


Figure 4-54. Sweep Trigger Generator, Simplified Schematic Diagram

coupled to sweep trigger blocking oscillator 3V11B by means of a common plate load circuit. Single-shot operation produces a regenerated output trigger for each input trigger. This output trigger has the required pulse characteristics regardless of the waveform of the input trigger being used. Sweep trigger output developed across cathode load resistor 3R115 is supplied to the Sweep and Intensity Mark unit through internal equipment connections.

(2) SWEEP AND INTENSITY MARK UNIT. - The circuit functions of the Sweep and Intensity Mark unit are shown in the block diagram (figure 4-55) and are described below. Waveforms for this unit are shown in figure 4-56. Voltage and resistance readings are given in tables 4-9 and 4-10.

All interconnections between the Sweep and Intensity Mark unit and other circuits of the test set are made by means of internal connectors. Sweep Trigger input from the Crystal Mark and Sync unit is normally supplied to the input of the sweep trigger amplifier 2V2A through the normally-closed contacts of DELAY STROBE SWEEP switch 2S4 and DELAY STROBE TRIGGER SWITCH 2S1. The trigger amplifier output is used to trigger sweep gate multivibrator 2V3. Clipper diode 2CR6 helps maintain the desired waveform. Output from sweep gate multivibrator 2V3 controls the conduction cycle of switch diode 2V5A. Output from sweep gate miltivibrator 2V3 is fed back to neutralize the plate-cathode capacitance effects of switch diode 2V5A.

TABLE 4-9. SWEEP AND INTENSITY MARK UNIT VOLTAGE READINGS

Tube No.	Tube Pin Numbers								
	1	2	3	4	5	6	7	8	9
2V1	+86 to +227	0 to -28	-58	FIL	FIL	-50	-62	FIL	+168
2V2	+230	-10.4	0	FIL	FIL	+250	-47	-35	FIL
2V3	-62	-97	-97	FIL	FIL	-97	-110	FIL	0 to +0.6
2V4	+250	-62	-47	FIL	FIL	+250	-15 to -30	0 to +0.2	FIL
2V5	-48	+250	FIL	FIL	+250	0	-47	--	--
2V6	+102	-63	-58	FIL	FIL	-50	-62	FIL	+168
2V7	+242	+13	+20	FIL	FIL	+140	+10	+13	FIL
2V8	+170	0 to -5	+2.7	FIL	FIL	+92	0	+2.9	FIL
2V9	+250	-4.5	+190	FIL	FIL	+250	0	0	-35
2V10	+250	0	+120	FIL	FIL	+245	+1.75	0	-43
2V11	+250	-13 to -24	0.1 to +0.5	FIL	FIL	+250	-14	+0.05	FIL

Notes: 1. Voltage measurements taken with unit connected.
2. Electronic multimeter used for measurements.

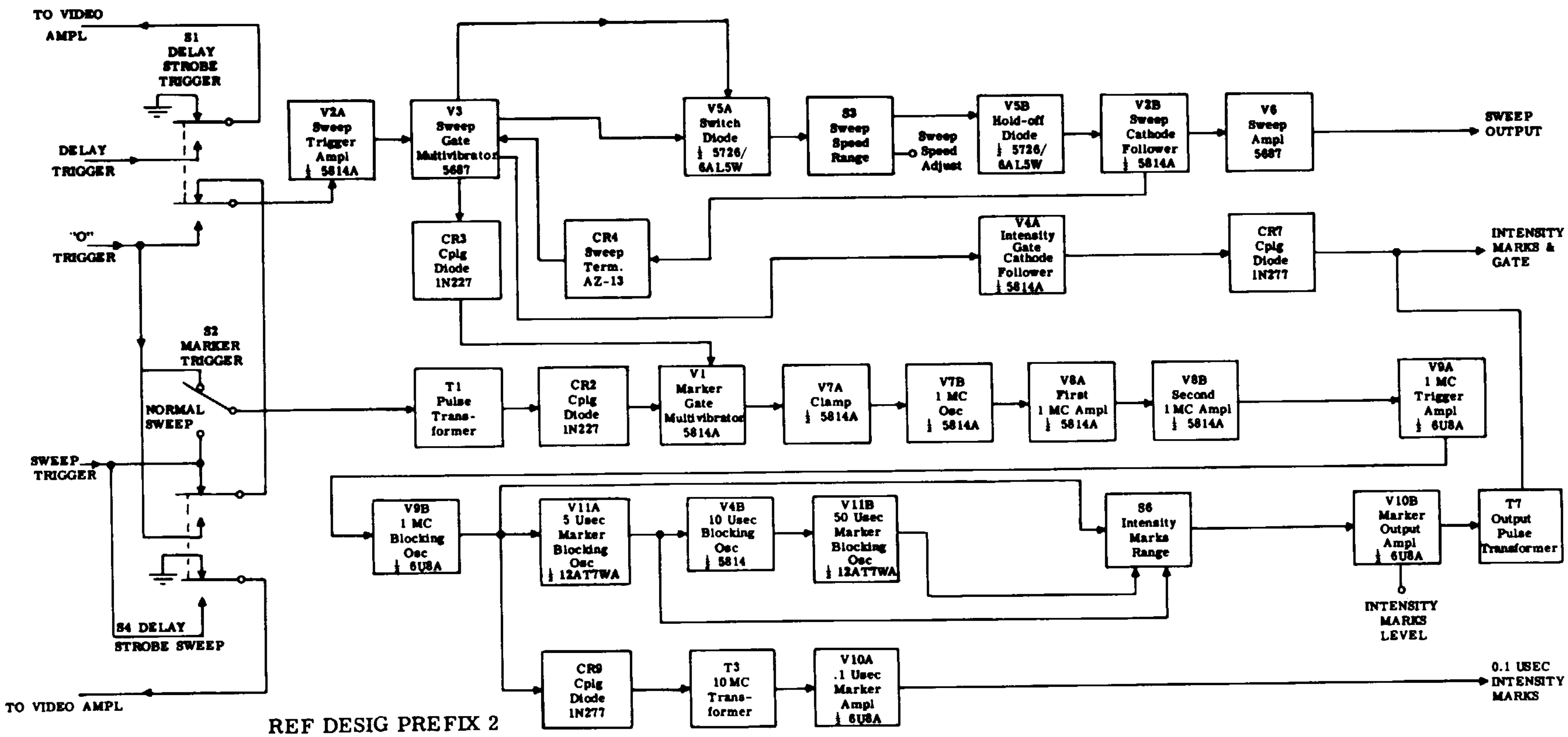


Figure 4-55. Sweep and Intensity Mark Unit, Block Diagram

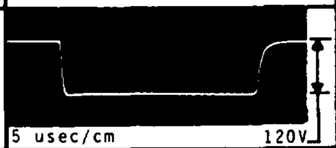
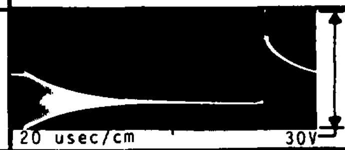
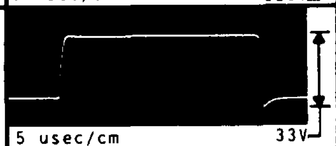
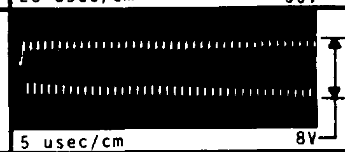
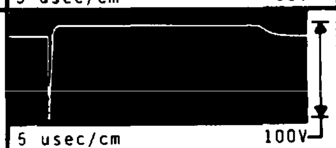
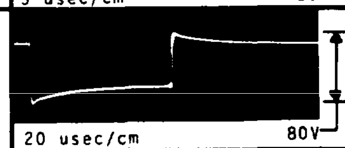
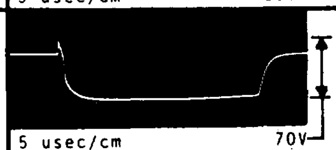
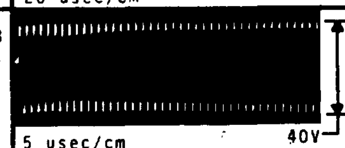
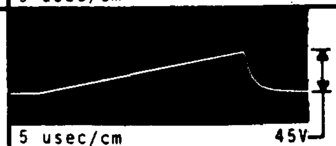
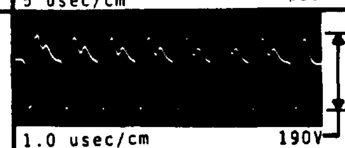
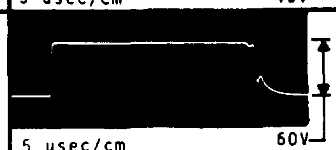
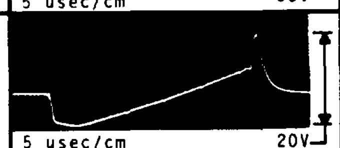
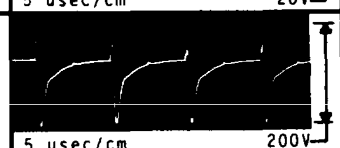
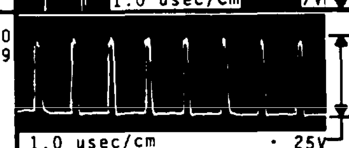
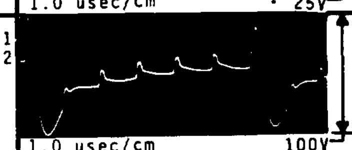
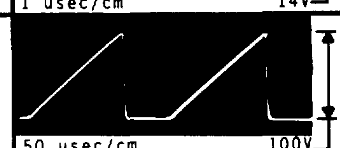
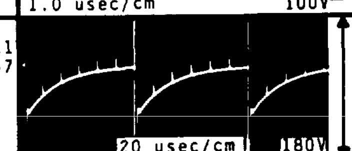
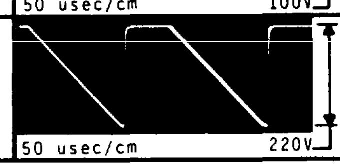
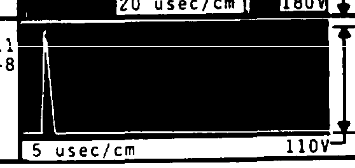
NO	TEST POINT	WAVEFORM	REMARKS	NO	TEST POINT	WAVEFORM	REMARKS
1	2V1 -6	 5 usec/cm 120V	SWEEP UNIT RANGE: 200	12	2V7 -2	 20 usec/cm 30V	Same as No. 2 Range: 30
2	2V1 -7	 5 usec/cm 33V	SWEEP UNIT RANGE: 20 usec	13	2V7 -1	 5 usec/cm 8V	XTAL MARK & SYNC must be on INT. Duration of train varies with setting of SWEEP SPEED RANGE
3	2V2 -1	 5 usec/cm 100V	Same as No. 2	14	2V7 -7	 20 usec/cm 80V	Range: 50
4	2V2 -2	 5 usec/cm 70V	Same as No. 2	15	2V8 -1	 5 usec/cm 40V	Range: 15 XTAL MARK & SYNC must be on INT.
5	2V2 -7	 5 usec/cm 45V	Same as No. 2	16	2V9 -6	 1.0 usec/cm 190V	Same as No. 15
6	2V3 -1	 5 usec/cm 60V	Same as No.2	17	2V10 -1	 1.0 usec/cm 100V	Range: 1-3 Inten Marks: 5 Level: Max cw
7	2V3 -2	 5 usec/cm 20V	Same as No. 2	18	2V10 -6	 1.0 usec/cm 7V	INTEN MARK Inten: 1 & .1 Range: 1-3 XTAL MARK & SYNC Sup Delay:0 Trig Delay: 0
8	2V4 -8	 5 usec/cm 200V	Same as No. 2	19	2V10 -9	 1.0 usec/cm 25V	INTEN MARKS RANGE switch at 1 & .1 or .1
9	2V4 -8	 1 usec/cm 14V	Same as No. 2	20	2V11 -2	 1.0 usec/cm 100V	Same as No. 19
10	2V6 -1	 50 usec/cm 100V	Same as No. 2 Range: 30	21	2V11 -7	 20 usec/cm 180V	Same as No. 19 except Range: 100 usec
11	2V6 -9	 50 usec/cm 220V	Same as No. 1 Range: 100	22	2V11 -8	 5 usec/cm 110V	Same as No. 19

Figure 4-56. Sweep and Intensity Mark Unit, Waveforms

TABLE 4-10. SWEEP AND INTENSITY MARK UNIT RESISTANCE READINGS

Tube No.	Tube Pin Numbers								
	1	2	3	4	5	6	7	8	9
2V1	30K	1.5K △	-58	FIL	FIL	-50	-62	∞	40K
2V2	24K	45K	0	∞	∞	17K	∞	33K	∞
2V3	4.6K △	40K	--	12K	12K	19K	45K	--	4.7K △
2V4	17K	4.6K △	32K	∞	∞	17K	17K	68	∞
2V5	5K △	17K	∞	∞	∞	0	∞	--	--
2V6	40K	1.3 Meg	24K	∞	∞	26K	45K	∞	40K
2V7	18K	700	1.6K	∞	∞	29K	750K	700	∞
2V8	25K	330K	220	∞	∞	+92	0	1K	∞
2V9	17K	50K	33K	∞	∞	17K	0	470	12K
2V10	19.5K	0	27K	∞	∞	∞	180	0	140K
2V11	17K	--	150	∞	∞	17K	70K	190	∞

Note: 1. Resistance measurements taken to chassis ground with unit removed and disconnected.
2. A Indicates that diode in circuit will cause readings to vary.

SWEEP SPEED RANGE switch 2S3 and the SWEEP SPEED ADJUST control 2R29 provide coarse and fine sweep duration adjustment. Sweep cathode follower 2V2B provides a low impedance sweep voltage output, The output from sweep cathode follower 2V2B is applied to the input of sweep amplifier 2V6. Push-pull sweep voltage from sweep amplifier 2V6 is sufficient to drive the horizontal deflection plates of the cathode ray tube in the Display unit of the test set.

The output from sweep gate multivibrator 2V3 is also supplied to marker gate multivibrator 2V1 through coupling diode 2CR3. When MARKER TRIGGER switch 2S2 is in the NORMAL position, O triggers are fed through switch 2S2 pulse transformer 2TI and coupling diode 2CR2 to marker gate multivibrator 2V1. When the MARKER TRIGGER switch 2S2 is set to SWEEP, sweep trigger pulses replace the O trigger pulses. The trigger pulse to 2V1 through 2CRZ is a negative-going pulse which causes a negative-going gate pulse to be generated by 2V1 and fed to clamp tube 2V7A. When the sweep gate pulse generated by 2V3 ends, a negative pulse from 2V3 is fed to 2V1 which causes the negative marker gate pulse generated by 2V1 to end.

During the time that the negative marker gate is applied to clamp 2V7A, this tube cuts off and permits oscillator 2V7B to oscillate. 2V7B oscillates at a frequency of 1 mHz, generating the basic one-microsecond intensity markers, and is the reference for the O. 1, 5, and 50-microsecond intensity markers generated by the Sweep and Intensity Mark unit. The sinewave signal generated by 2V7B is amplified by 2V8A and 2V8B, and further amplified by one- megahertz trigger amplifier 2V9A. The output pulses of this stage are used to f ire the one-megahertz blocking oscillator 2V9B. The output of this stage is fed to INTENSITY MARKS RANGE switch 2S6.

The output of 2V9B also drives five-microsecond blocking oscillator 2V11A and transformer 2T3 through coupling diode 2CR9. Output from 2V11A is fed to switch 2S6, and also to ten-microsecond blocking oscillator 2V4B, which divides the prf by two. The output of 2V4B then drives fifty microsecond marker blocking oscillator 2V11 B which divides it by five. The output of 2V11B is fed to INTENSITY MARKS RANGE switch 2S6.

The one-microsecond pulses fed to transformer 2T3 cause the primary of this transformer to “ring” at its resonant frequency. The ten megahertz signal thus generated is amplified by 2V10A and fed out of the Sweep and Intensity Mark unit to the Display unit as 0.1 microsecond intensity markers.

INTENSITY MARKS RANGE switch 2S6 has six positions which are: OFF, .1, 1 & .1, 1, 5, and 50. These switch positions select the desired intensity markers to be fed to the Display unit through the subsequent stages, and in the case of the O, 1 microsecond intensity markers, by switching the plate voltage to the one-tenth microsecond marker amplifier 2V10A.

Intensity markers from switch 2S6 are fed to marker output amplifier 2V10B and output pulse transformer 2T7. The INTENSITY MARKS LEVEL control 2R95 provides adjustment of bias on 2V10B so that the 1, 5, or 50-microsecond (but not the O. 1) intensity marker amplitude can be adjusted. A positive sweep gate from 2V3 is fed through intensity gate cathode follower 2V4A and coupling diode 2CR7 to the same connection as the 1, 5, and 50-microsecond intensity markers. Thus the intensity markers applied to the Display unit are on the same gate pulse which illuminates the horizontal sweep and extinguishes the horizontal retrace.

(a) SWEEP TRIGGER AMPLIFIER. - When DELAY STROBE TRIGGER switch 2S1 and DELAY STROBE SWEEP switch 2S4 are both in their normal (upper) positions as shown in figure

4-57, sweep trigger input from the Crystal Mark and Sync unit is fed in through the closed switch contacts and coupled to the grid of sweep trigger amplifier 2V2A through capacitor 2C6,

Pressing DELAY STROBE TRIGGER switch 2S1 downward causes O trigger input from the Crystal Mark and Sync unit to be coupled to sweep trigger amplifier 2V2A through another set of closed contacts of switch 2S1 and through coupling capacitor 2C6. Delay trigger input from the Crystal Mark and Sync unit is attenuated by divider resistors 2R1 and 2R2 and fed to the video amplifier circuits of the Display unit through the switch contacts. This permits display of a negative delay trigger pulse on a zero delay sweep trace. Releasing the switch permits it to return to its normal (upper) position.

Pressing the DELAY STROBE SWEEP switch 2S4 downward causes O trigger input from the Crystal Mark and Sync unit to be coupled to the sweep trigger amplifier through the now closed contacts of switch 2S4, through the contacts of 2S1, and through coupling capacitor 2C6. Sweep trigger input from the Crystal Mark and Sync is attenuated by divider resistors 2R43 and 2R44 and fed to the video amplifier circuits of the Display unit through the 2S4 switch contacts. This permits the display of a positive sweep trigger pulse on a zero-delay sweep trace. Releasing the switch permits it to return to its normal (upper) position.

Positive trigger input to sweep trigger amplifier 2V2A produces an amplified negative trigger output which is used to trigger sweep gate multlvibrator 2V3 (figure 4-58) and initiate a cycle of sweep operation. Sweep gate multivibrator 2V3 returns a negative gate pulse to the grid of sweep trigger amplifier 2V2A through resistor 2R1O. This gates off sweep trigger amplifier 2V2A, making it inoperative during the sweep trace interval.

(b) SWEEP GATE MULTIVIBRATOR. - Sweep gate multivibrator 2V3 is shown in figure 4-58. The input trigger from sweep trigger amplifier 2V2A is applied to the first grid (pin 2) of the multivibrator. The first tube section cuts off, delivering a positive-going gate pulse through 2R26 to the cathode of switch diode 2V5A; and the second section goes into conduction, delivering a negative-going neutralizing pulse through 2C12 to the anode of switch diode 2V5A. The positive-going output from the cut off section also drives intensity gate cathode follower 2V4A. The negative-going pulse output from the plate load of the conducting section is also supplied to gate-off sweep trigger amplifier 2V2A during this sweep trace interval.

After one cycle, the multivibrator returns to its normal state; the first section conducting and the second section cut off. A positive 250-volt plate supply and a negative 150-volt cathode return provides an effective 400-volt plate supply. This arrangement permits clipper diodes 2CR5 and 2CR6 to clip positive-going plate pulses at approximately chassis ground potential (the pulse level required for operation of associated circuits).

(c) SWEEP GENERATOR CIRCUITS. - Before the arrival of a gate pulse at switch diode 2V5A, this diode is in a conductive state. During this time, sweep capacitor 2C17 is able to charge toward the +250 volt B+ potential through the path from ground consisting of 2R27, 2V5A, and 2R35 and 2R36 in parallel. The side of 2C17 connected to the grid of sweep cathode follower 2V2B is negatively charged. The potential at the cathcxfe of 2V2B also becomes negative. This negative potential is coupled to the grid of the first section of sweep amplifier 2V6, to be amplified and used as a sweep voltage.

When a positive gate pulse from 2V3 is applied to the cathode of switch diode 2V5A, this diode is cut off, breaking the charging path to ground for 2C17. Capacitor 2c17 now starts to discharge. A discharge path is found through the contacts of SWEEP RANGE switch 2S3, through 2R31 (or other

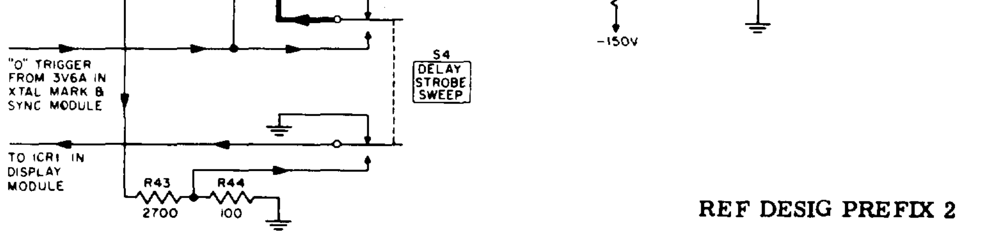


Figure 4-57. Sweep Trigger Amplifier, Simplified Schematic Diagram

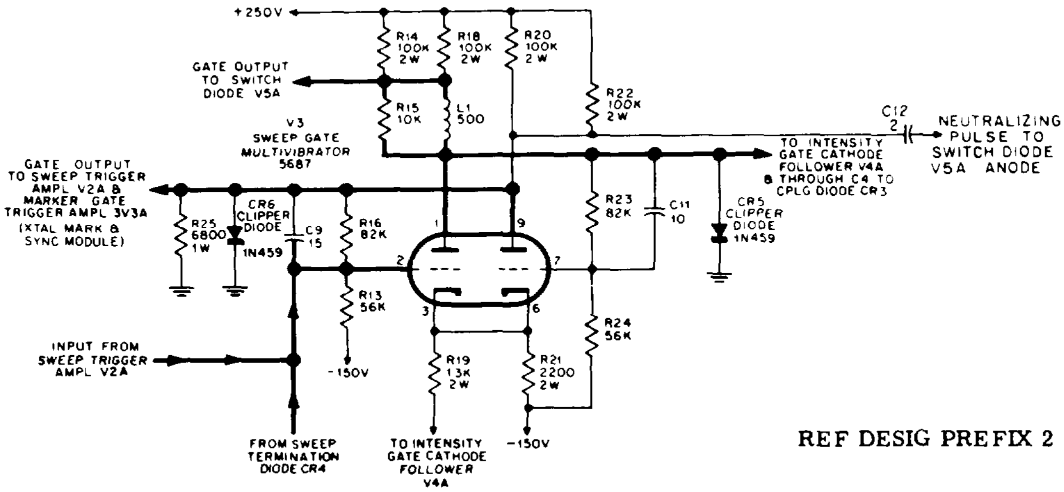


Figure 4-58. Sweep Gate Multivibrator, Simplified Schematic Diagram

resistors selected by 2S3, including variable resistor R29A or B), through hold-off diode 2V5B back to B+, and eventually to ground. Since the time constant of the discharge network is relatively long, capacitor 2C17 will discharge slowly, forming the slope of a sawtooth voltage pulse. The side of 2C17 connected to the grid of sweep cathode follower 2V2B gradually becomes more positive, causing 2V2B to increase conduction accordingly. The potential at the cathode of 2V2B also goes positive following the same pattern. This increasing positive voltage is coupled to the grid of the first section of sweep amplifier 2V6, to be amplified and used as a sweep voltage.

To terminate the sweep action, a portion of the 2V2B cathode voltage is tapped off the cathode load (from 2R33) and returned to the grid of the first section of sweep gate multivibrator 2V3 through sweep terminating diode 2CR4. When the voltage reaches the proper positive level, it causes the first section of the multivibrator to conduct and the second section to cut off, thus terminating the *sweep* gate. SWEEP AMP potentiometer 2R33 permits adjustment of the amplitude of the voltage picked off, thus adjusting the sweep gate and thus the sweep length,

When SWEEP SPEED RANGE switch 2S3 is in the 1-3 position (as shown in figure 4-59) SWEEP SPEED ADJUST control 2R29B is in the discharge circuit, and the sweep time is variable from one to three microseconds. When the switch is in the 1-30 position, the circuit is the same except that 2R29A is substituted for 2R29B, giving a sweep time up to 30 microseconds. In the next three switch positions, additional capacitors are switched into the circuit to obtain longer time constants and the associated longer sweep times.

(d) SWEEP AMPLIFIER. - Sweep cathode follower 2V2B drives the grid of sweep amplifier 2V6 as shown in figure 4-60. The positive 250-volt plate supply and the negative 150-volt supply provide a 400-volt plate-to-cathode potential for this stage. While providing a high effective plate supply voltage, this arrangement also results in operating plate voltages which permit the use of a direct-coupled output circuit.

When an increasingly positive sweep potential from 2V2B is applied to the grid (pin 7) of the first section of sweep amplifier 2V6, conduction is increased and the potential at the plate (pin 9) of that section becomes increasingly negative. This voltage is fed out as one of the sweep voltages. The second section of 2V6 is cathode-fed from the cathode of the first section, thus it acts as an inverter stage (inverting with respect to the waveform at the first plate); its conduction decreases and the output goes correspondingly positive. The two opposing sweep outputs are used to drive a push-pull deflection system. The dc bias on the grid of the second section of 2V6 (provided by the -150 volt supply) is variable by means of the HOR control located on the Display unit. This permits centering the sweep trace on the CRT. Capacitor 2C22 provides a signal grounding path for the grid of this stage. Capacitor 2C21 acts as a decoupling capacitor for the -150 volt line.

(e) INTENSITY GATE CATHODE FOLLOWER. - The purpose of intensity gate cathode follower 2V4A (figure 4-61) is to permit a trace to be displayed during the horizontal sweep, and to blank out the retrace.

(f) MARKER GATE MULTIVIBRATOR. - Marker gate multivibrator 2V1 is a bistable multivibrator with symmetrical grid and plate circuits (figure 4-62). Under static conditions 2V1A (pins 1, 2, and 3) is conducting and 2V1B (pins 6, 7, and 8) is cut off. When the positive 0 trigger or sweep trigger pulse is applied to the circuit. It is routed through MARKER TRIGGER switch 2S2, resistors 2R104, 2R105 and 2R106 and transformer 2TI to the grid of 2V1A, The transformer interts the pulse so the negative pulse causes 2V1A to cut

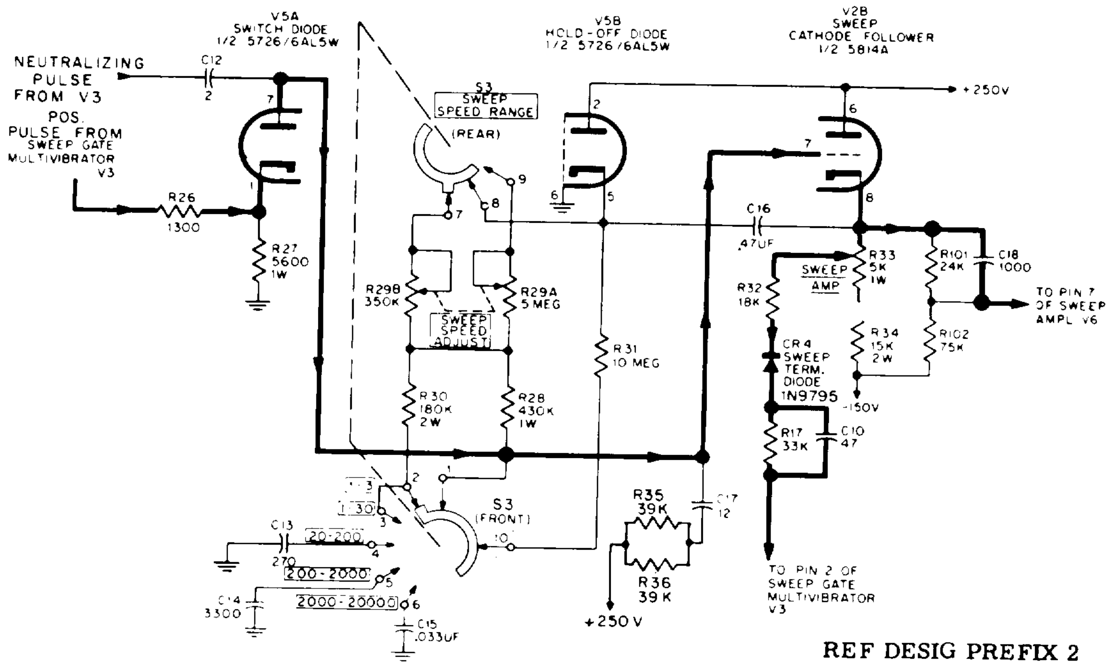


Figure 4-59. Sweep Generator, Simplified Schematic Diagram

off, driving 2V1 B into conduction. The output at the plate of 2V1B is a negative-going rectangular marker gate pulse. This plate potential remains low, continuing the negative-going gate pulse, until the negative-going sweep gate trailing edge from the first plate (pin 1) of sweep gate multivibrator 2V3 arrives at the 2V1B grid (pin 7) through 2C4 and coupling diode 2CR3. At this time 2V1B cuts off and the negative-going marker gate pulse being generated at the 2V1B plate (pin 6) is ended. The width of this marker gate is adjustable from approximately one microsecond to approximately 20,000 microseconds, depending upon the sweep duration and sweep delay.

Coupling diodes 2CR2 and 2CR3 prevent unwanted pulses of the wrong polarity from feeding back to the circuits which feed the marker

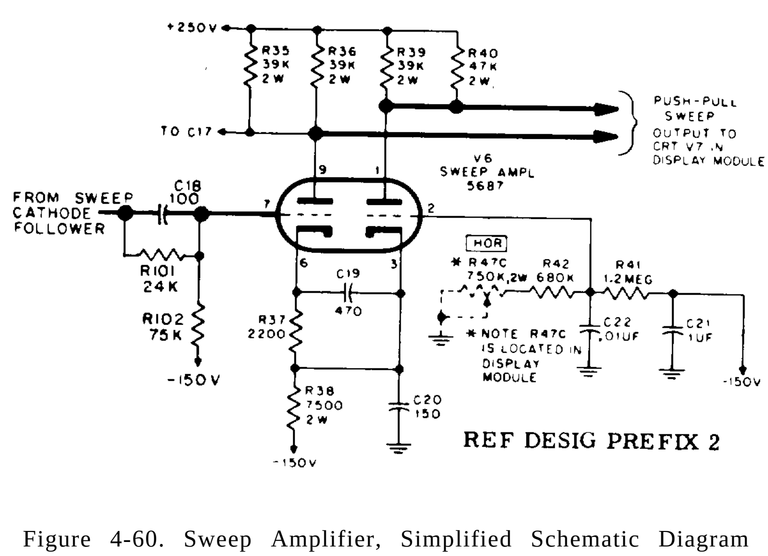


Figure 4-60. Sweep Amplifier, Simplified Schematic Diagram

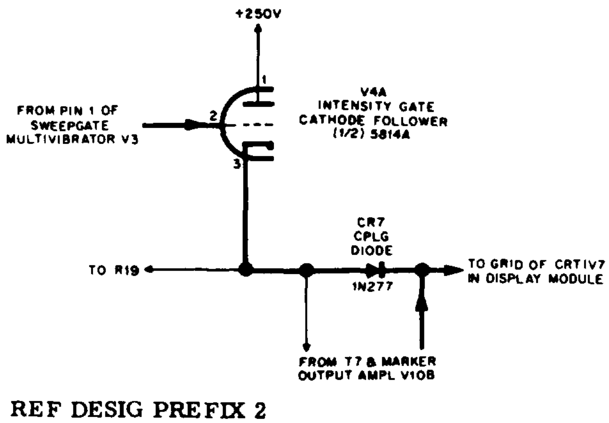


Figure 4-61. Intensity Gate Cathode Follower, Simplified Schematic Diagram

gate multivibrator. Pulse transformer 2T1 is used as a coupling and inverting device between the marker gate multivibrator and the sweep trigger sources.

(g) CLAMP AND ONE MHZ OSCILLATOR, - The clamp and 1 mHz oscillator are comprised of a twin triode tube 2V7 (see figure 4-63). The purpose of these two stages is to generate and control 1 mHz oscillations. The 1 mHz signal is the source of the one microsecond pulses used as intensity markers on the CRT, and also as a reference for the 0, 1, 5, and 50-microsecond intensity markers.

One mHz oscillator 2V7B is basically a Hartley oscillator circuit with the refinements necessary for the required stability. A feedback adjustment, 2R50 is provided to permit adjustment for constant output amplitude. The oscillator tank circuit consisting of 2L2 and 2C27 is enclosed in a thermostatically controlled oven for a high degree of temperature stability. Thermostat 2S5 maintains an oven temperature of 85 degrees centigrade (185 degrees Fahrenheit).

The operation of the clamp and one mHz oscillator is as follows: Under static conditions, one mHz oscillator 2V7B will not oscillate because clamp 2V7A is drawing heavy cathode current through tank coil 2L2. When the negative-going gate pulse from marker gate multivibrator 2V1 arrives, 2V7A cuts off and 2V7B is allowed to oscillate. Since the grid of 2V7B was positive at the start, oscillation begins with a negative swing at the grid of 2V7B and on a positive swing at the plate of 2V7A. This oscillation continues until the negative gate applied to the clamp tube is ended. At this time 2V7A again draws heavy cathode current through the tank coil which causes the oscillation to stop.

(h) FIRST AND SECOND ONE MHZ AMPLIFIERS. - The first and second one mHz amplifiers are in a single twin triode tube, 2V8 (see figure 4-64). These triodes are capacitance-coupled and provide a combined gain of approximately 15. Since the two stages are cascaded, the output polarity of the second stage is the same as the input polarity of the first stage. Output from second stage 2V8B is fed to clipper diode 2CR8 through coupling capacitor 2C32 and then to 1 mHz trigger amplifier 2V9A.

(i) ONE MHZ TRIGGER AMPLIFIER AND BLOCKING OSCILLATOR. - Trigger amplifier 2V9A and blocking oscillator 2V9B are in a single tube envelope (figure 4-65). Under static conditions, the 2V9A grid is biased with approximately -5 volts, and the 2V9B grid is biased beyond cutoff with -35 volts. When the signal from the second one megahertz amplifier is fed to 2V9A, clipper diode 2CR8 clips the negative portion of this signal.

This clipped signal is amplified by 2V9A and applied to the grid circuit of 2V9B through

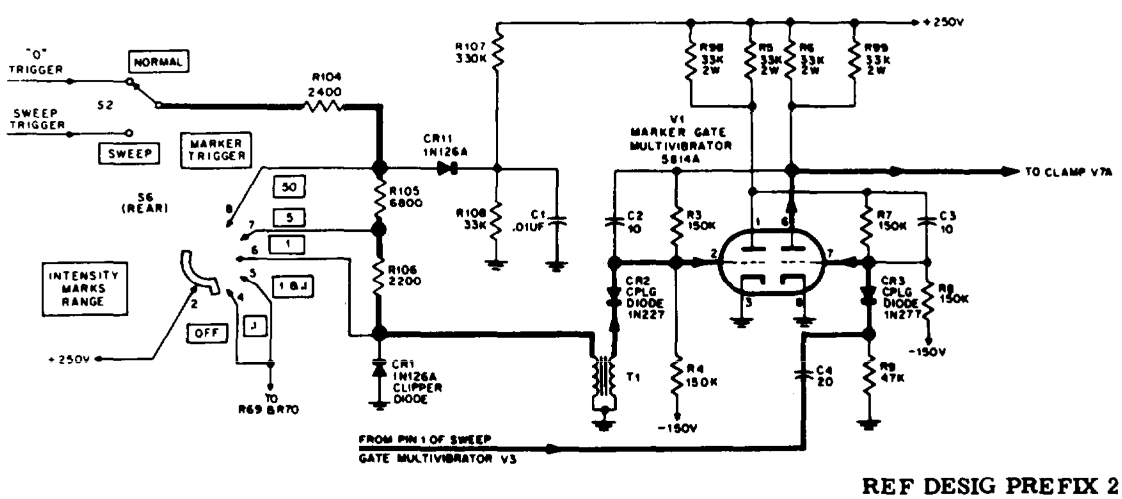


Figure 4-62. Marker Gate Multivibrator, Simplified Schematic Diagram

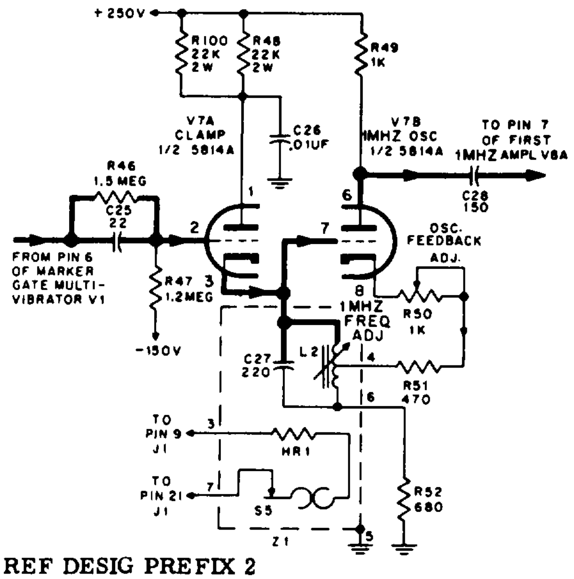


Figure 4-63. Clamp and 1 mHz Oscillator, Simplified Schematic Diagram

blocking oscillator transformer 2T2. At this time blocking "oscillator 2V9B fires and produces a positive-going pulse across its cathode load resistor 2R64.

The positive-going output pulses of 2V9B are fed to switch 2S6 for application to the cathode ray tube in the Display unit as one-microsecond intensity markers. The one-microsecond pulses are also fed to the O. 1 and 5-microsecond marker generator circuits to initiate these markers.

Clipper diode 2CR10 in series with resistor 2R67 is placed across the secondary winding of blocking oscillator transformer 2T2 to prevent circuit ringing. This feature assures that the output signal will not contain any unwanted transients.

(j) ONE-TENTH MICROSECOND MARKER AMPLIFIER, - One-microsecond markers are fed from one mHz blocking oscillator 2V9B through capacitor 2C35 and coupling diode 2CR9 to transformer 2T3 (see figure 4-66). The primary of transformer 2T3 in parallel with 2C36 is sharply resonant at 10 mHz, and when fed a pulse every microsecond, will continuously deliver a ten mHz sine wave output to 2V10A. Marker amplifier 2V10A amplifies this 10 mHz signal to provide pulses which are used as 0.1 microsecond intensity markers on the CRT sweep in the Display unit. These marker pulses are fed to the CRT on a separate line from the other markers to prevent degradation.

Resistor 2R69 and peaking coil 2L3 are the plate load for the amplifier. The voltage gain of this stage is approximately four. The output from this stage is fed to the CRT in the Display unit through internal connections.

(k) FIVE-MICROSECOND MARKER BLOCKING OSCILLATOR. - Five-microsecond blocking oscillator 2V11A is non-conducting under static conditions due to a negative cutoff bias from the voltage divider consisting of 2R76 and 2R74 (figure 4-67A). This circuit is driven by positive-going one-microsecond pulses from one mHz blocking oscillator 2V9B. When the oscillator tube conducts, a positive pulse is developed across cathode load resistor 2R77. These positive output pulses are fed to switch 2S6 for application to Marker amplifier 2V10B and then to the CRT in the Display unit as five-microsecond intensity markers. These positive five-microsecond pulses also drive the 10-microsecond blocking oscillator 2V4B.

(1) TEN-MICROSECOND AND FIFTY- MICROSECOND BLOCKING OSCILLATORS. - The positive pulse output from the five microsecond blocking oscillator 2V11A is used to drive the ten-microsecond blocking oscillator 2V4B, which in turn drives the fifty-microsecond blocking oscillator 2V11B, (figure 4-67 B). In this manner a count-down of two to one (division by 2) followed by a

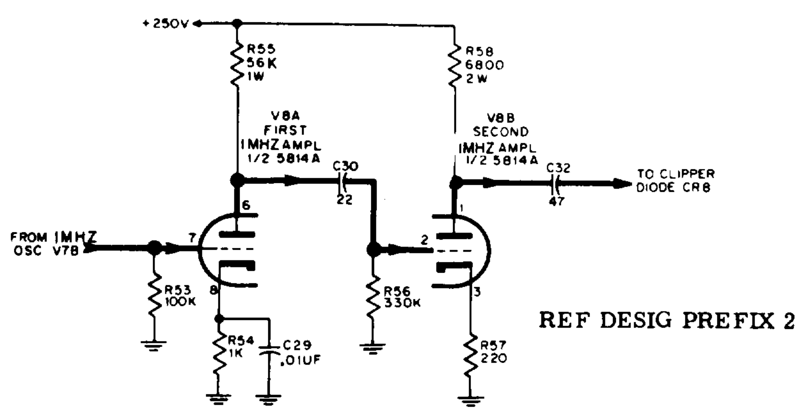


Figure 4-64. 1st and 2nd 1 mHz Amplifier, Simplified Schematic Diagram

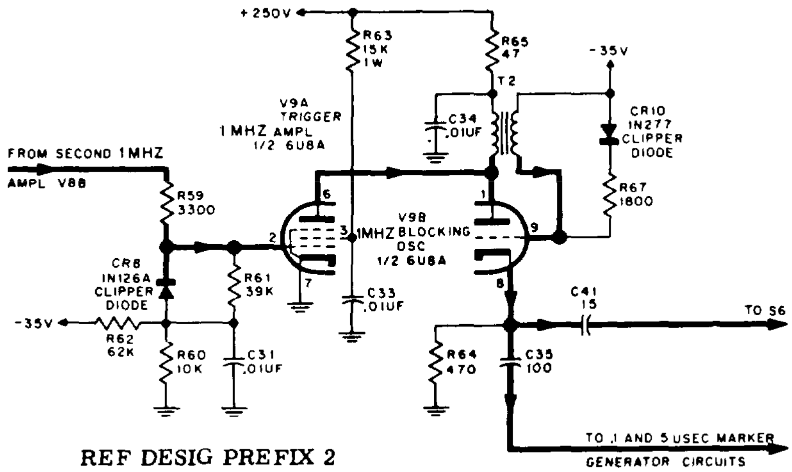


Figure 4-65. 1 mHz Trigger Amplifier and Blocking Oscillator, Simplified Schematic Diagram

count-down of five to one produces an over-all count-down of ten to one (from the five-microsecond blocking oscillator to the fifty microsecond Mocking oscillator). Both ten-microsecond blocking oscillator 2V4B and fifty microsecond blocking oscillator 2V11B are biased beyond cutoff in their static conditions and driven into conduction by the positive input pulses. There is no provision for adjusting the grid circuit time-constant in 2V4B since the count-down is only two to one. However, fifty-microsecond blocking oscillator 2V1lB has 50 usec adjust potentiometer 2R86 in its grid circuit so that the count-down of this stage may be adjusted to exactly five to one.

The output from 2V1lB is obtained from across the cathode load resistor 2R91. The output at this point is a positive-going pulse signal which is fed to switch 2S6 and marker output amplifier 2V1OB to pr"oduce 50-microsecond intensity markers for use in the Display unit.

(m) MARKER OUTPUT AMPLIFIER. - Marker output amplifier. 2V1OB (figure 4-67C) contains INTENSITY MARKS RANGE switch 2S6 in its grid circuit for selection of the various intensity markers for application to intensity gate cathode follower 2V4A. Marker output amplifier 2VIOB is biased beyond cutoff. INTENSITY MARKS LEVEL control 2R95 allows the operator to adjust this bias between approximately -20 and -45 volts. Application of the positive-going markers causes 2V1OB to

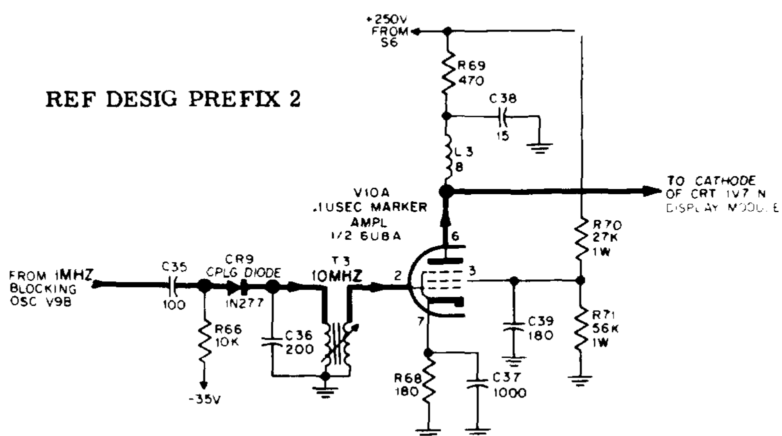
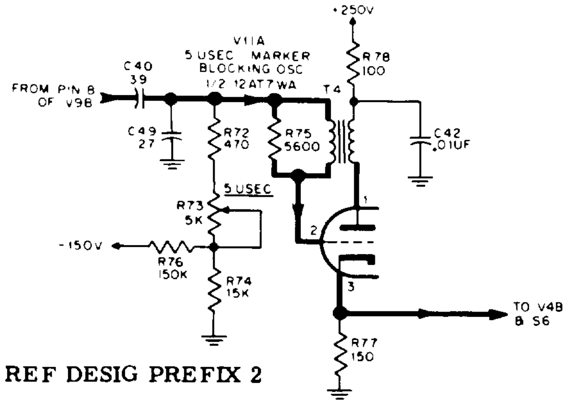
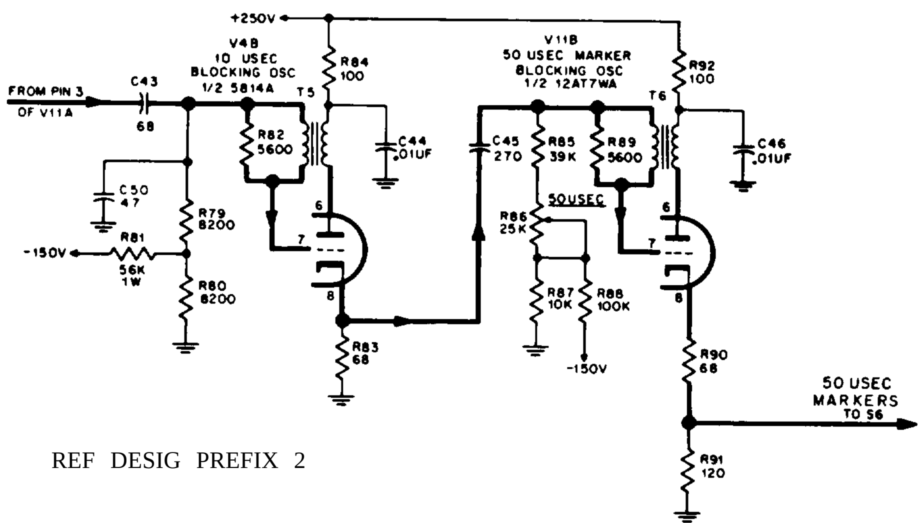


Figure 4-66. 0.1-usec Marker Amplifier, Simplified Schematic Diagram



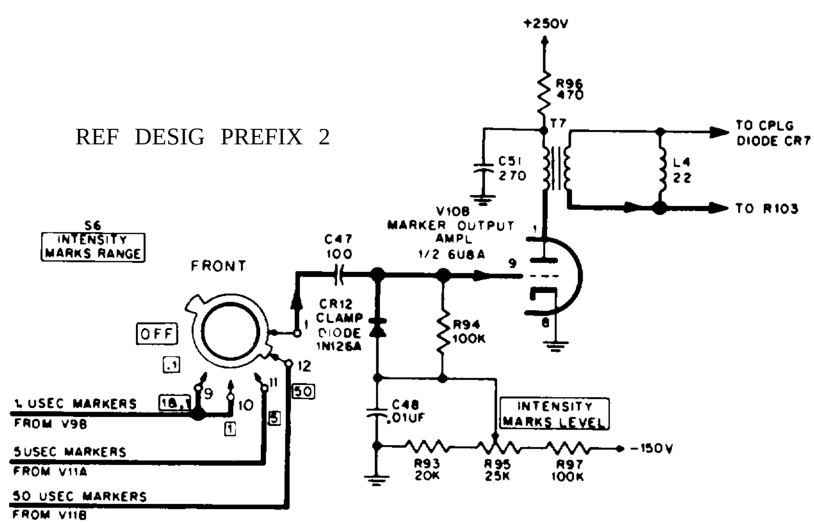
A. 5-μsec Marker Blocking Oscillator



REF DESIG PREFIX 2

B. 10-μsec and 50-μsec Marker Blocking Oscillator

REF DESIG PREFIX 2



C. Marker Output Amplifier

Figure 4-67. Marker Blocking Oscillator and Output Circuits, Simplified Schematic Diagram conduct for the duration of the pulse and produce in its plate Circuit a sharp spike by means of pulse transformer 2T7. The output pulse amplitude will be reduced as the negative bias on the grid of the tube is increased by means of the INTENSITY MARKS LEVEL control.

Clamp diode 2CR12 prevents grid leak bias from developing across resistor 2R94 in the event the incoming positive pulses are of sufficient amplitude to drive the grid of 2V10B positive. This is necessary because the only bias applied to the grid of 2V10B is the bias at the arm of the INTENSITY MARKS LEVEL control,

The INTENSITY MARKS RANGE switch 2S6 has five positions. It should be noted that when the switch is placed in the .1 position no 0.1 microsecond markers are fed through 2S6, but the routing of the 0.1 microsecond markers is through another path, which is more suitable for transmission of the high frequency pulses. When the switch is in the 1 and , 1 or 1 position, 1 micro-second markers are fed through the switch. (In either the .1 or the 1 and .1 position, +250 volts is switched to the one-tenth microsecond marker am-plifier 2V10A by other contacts of the same switch, thus enabling this stage to function.) When 2S6 is in the 5 or 50 position, the appropriate markers are fed through and +250 is switched to the proper stages.

(3) DISPLAY UNIT, - The circuit func-tions of the Display unit are shown in figure 4-68 and are described below. Display unit waveforms are given in figure 4-69, voltage measurements are given in table 4-11, and resistance readings are given in table 4-12.

The VIDEO input jack lJ1 (figure 4-70) is a front panel connector. A 75-ohm termination can be switched in or out as required, Video gain adjust-ment is made by means of the VOLTS/IN (volts-per-inch) step attenuator switch and the VIDEO SENS (sensitivity) control. First video amplifier 1V2B also drives video phase inverter lVIA to provide a push-pull video output. Four stages of push-pull video amplification provide the required vertical deflection voltage for cathode ray tube 1V7. Coupling diodes ICR1, 1CR2, and 1CR3 apply video mark pulses to video driver triodes 1V3B and 1V4A to provide a baseline time scale.

High voltage oscillator 1V8 provides ac power for an rf-type power supply. Negative 1500 volts from rectifier 1V9 and positive 1500 volts from rec-tifier 1V10 in combination provide a 3000-volt supply for cathode ray tube 1V7. Output from oscillator 1V8 is rectified by bias rectifier 1CR5 and 1CR6, provid-ing bias for cathode ray tube intensity control.

The SCALE control 1R59B adjusts the brightness of reticle illumination lamp lDS1. The

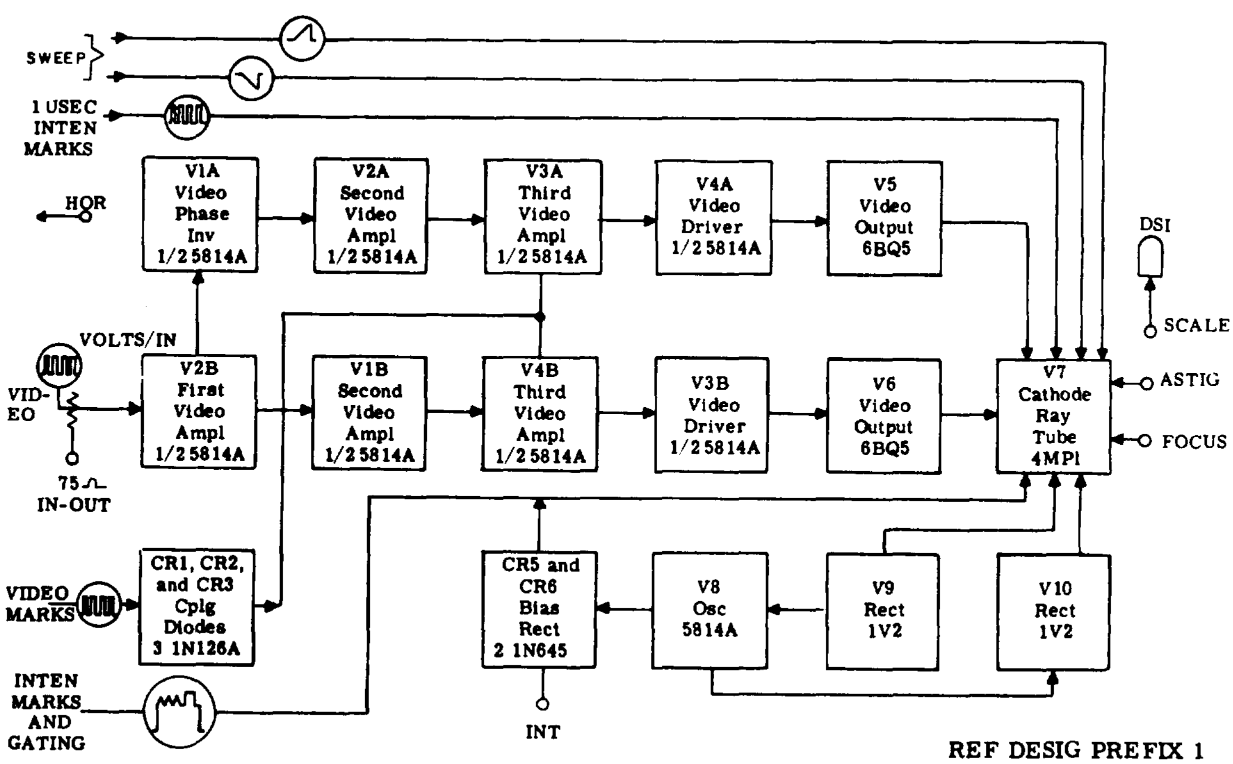


Figure 4-68. Display Unit, Block Diagram

TABLE 4-11. DISPLAY UNIT VOLTAGE READINGS

Tube	TUBE PIN NUMBERS																
No.	1	2	3	4	5	6	7	8	9	10	11	12	D1	D2	D3	D4	A1	A2
1V1	+250	+108	+110	FIL	FIL	+107	0	+1.8	FIL	--	--	--	--	--	--	--	--	--
1V2	0	+108	+18	FIL	FIL	+210	+107	+110	FIL	--	--	--	--	--	--	--	--	--
1V3	+82	0	+0.73	FIL	FIL	+200	+81	+84	FIL	--	--	--	--	--	--	--	--	--
1V4	+81	0	+0.73	FIL	FIL	+210	+82	+85	FIL	--	--	--	--	--	--	--	--	--
1V5	NC	+3.25	+10.4	FIL	FIL	NC	+170	NC	+250	--	--	--	--	--	--	--	--	--
1V6	NC	+3.6	+10.4	FIL	FIL	NC	+155	NC	+250	--	--	--	--	--	--	--	--	--
1V7 (CRT)	FIL	-1500	-1440	-1030	--	--	--	--	--	--	--	FIL	+180	+83	+170	+150	+1500	+155
1V8	+235	-2.2	0	FIL	FIL	+235	-22	0	FIL	--	--	--						
1V9	--	--	--	0	0	-1460	--	--	--	--	--	--						
1V10	0	--	--	+1500	+1500	+1500	--	--	--	--	--	--						

TABLE 4-12. DISPLAY UNIT RESISTANCE READINGS

Tube	TUBE PIN NUMBERS																
No.	1	2	3	4	5	6	7	8	9	10	11	12	D1	D2	D3	D4	A1	A2
1V1	480K	480K	480K	∞	∞	480K	0	120	∞	--	--	--						
1V2	480K	2.5K	120	∞	∞	480K	480K	480K	∞	--	--	--						
1V3	480K	2.2 Meg	70	∞	∞	480K	480K	6K	∞	--	--	--						
1V4	480K	2.2 Meg	70	∞	∞	480K	480K	6K	∞	--	--	--						
1V5	NC	1.3 Meg	150	∞	∞	NC	480K	NC	480K	--	--	--						
1V6	NC	1.1 Meg	150	∞	∞	NC	480K	NC	480K	--	--	--						
1V7 (CRT)	∞	8 Meg	5.6 Meg	3.8 Meg	--	--	--	--	--	--	--	∞	∞	∞	480K	480K	45 Meg	380K
1V8	480K	2.3K	0	∞	∞	480K	2.3K	0	∞	--	--	--						
1V9	--	--	--	80	80	--	--	--	5.5 Meg	--	--	--						
1V10	80	--	--	45 Meg	45 Meg	45 Meg	--	--	--	--	--	--						

Notes: 1. Resistance measurements taken to chassis ground with unit removed and disconnected

2. All panel controls in ccw position.

ASTIG (astigmatism) and FOCUS control potentiometers adjust the cathode ray tube voltages from the power supply. The VERT (vertical) centering control adjusts the vertical deflection voltages on the display tube by the control action of video output tubes 1V5 and 1V6. The HOR (horizontal) centering control functions in a similar manner through the action of sweep amplifier 2V6 in the Sweep and Intensity Mark unit.

(a) VIDEO INPUT CIRCUIT. - When 75Ω termination switch 1S1 is set to IN (figure 4-70) the 75 ohm resistor 1R6 is connected across VIDEO input connector lJ1 on the Display unit front panel. (Pulse waveforms can be observed and amplitudes measured at the terminated end of a video cable.) When 75Ω termination switch 1S1 is set to OUT, as shown in figure 4-70, resistor lR1 and the shunt impedance of the Display module input attenuator present a high impedance load across VIDEO input connector lJ1. This setting is used for video probe input with calibrated attenuation ratios. This setting can also be used for direct video input to the Display unit input attenuator.

When VOLTS/IN (volts per inch)

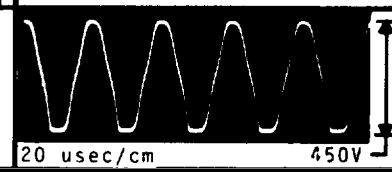
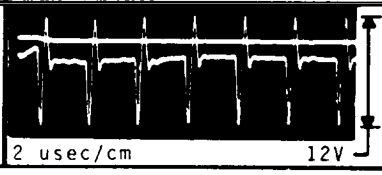
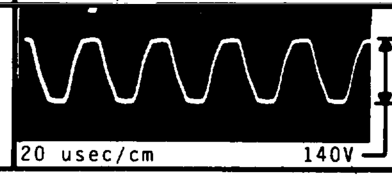
NO	TEST POINT	WAVEFORM	REMARKS	NO	TEST POINT	WAVEFORM	REMARKS
1	1V5 -7		XTAL MARK on INT:1.00 XTAL MARKS LEVEL fully cw	3	1V8 -1		Approx. 30KC
2	1V6 -7		Same as No. 1	4	1Z1 -6		Varies with setting of Intensity Control Approx. 30KC

Figure 4-69. Display Unit, Waveforms

switch 1S2 is set to .05, video input is coupled directly through capacitor 1C4 and the contacts of switch 1S2 to the grid (pin 2) of first video amplifier 1V2B. Input loading and grid return is provided by resistor lR1l. Direct connection provides a one-to-one attenuation ratio, and the greatest vertical deflection sensitivity 0.05 volts per inch. (The video probe when used in this position provides a choice of overall sensitivities of 0.05, 0, 5, and 5 volts per inch.)

When VOLTS/IN switch 1S2 is set to .1, (figure 4-70) video input is coupled through capacitor 1C4 and the contacts of switch wafer 1S2C to an attenuator network. Resistors 1R4 and 1R5 form a two-to-one voltage divider. The attenuator network output is connected to the grid (pin 2) of first video amplifier 1V2B through the contacts of switch wafer 1S2B. Unused attenuator networks are shorted to chassis ground through the contacts of switch wafer 1S2A to prevent possible interaction through stray capacitance.

When VOLTS/IN switch 1S2 is set to .2, the basic circuit functions are the same as those for a switch setting of .1 described in the preceding paragraph. However, a four-to-one attenuator network is switched into the circuit. Similarly, attenuation switch settings of .5, 1, 2, 5, 10, and 20 provide attenuation ratios of 10:1, 20:1, 40:1, 100:1, 200:1, and 400:1, respectively. The output signal from the attenuator is amplified by first video am. plifier 1V2B and the plate output is fed to second video amplifier lV1B (figure 4-70). First video amplifier 1V2B also functions as a cathode follower which drives video phase inverter lVIA. Since the cathode follower has no phase inversion, the lVIA output is inverted with respect to that obtained from the plate of first video amplifier 1V2B, which does have a phase inversion. First video amplifier 1V2B and video phase inverter lAIA are direct-driven and their outputs serve as push-pull video signals for the stages which follow.

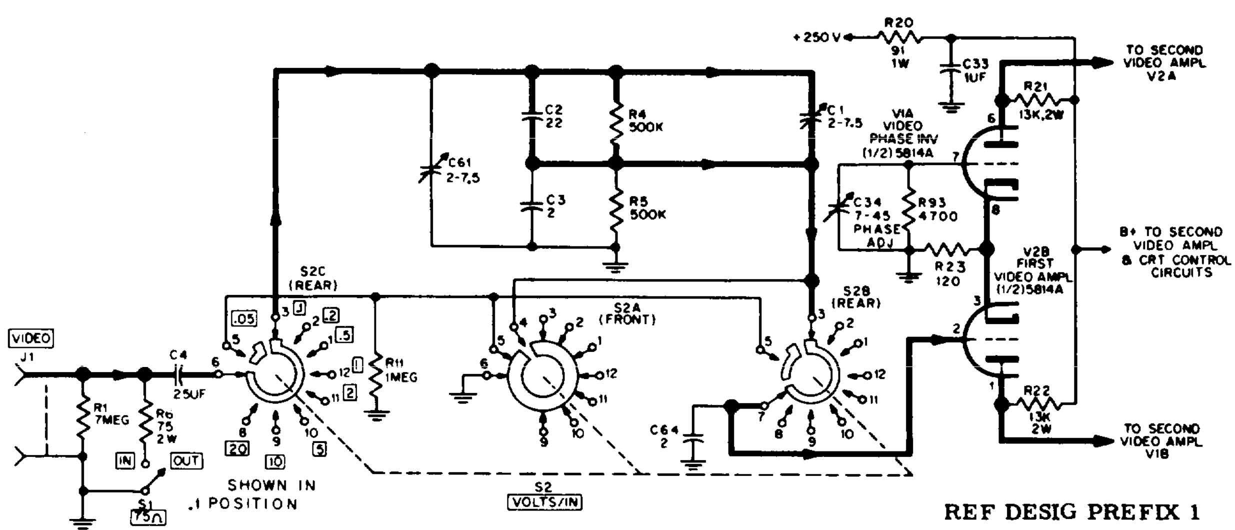


Figure 4-70. Video Input Circuit, Simplified Schematic Diagram

(b) VIDEO AMPLIFIER CIRCUIT.- Second video amplifier 1V1B and second video amplifier 1V2A function as a push-pull video amplifier as shown in figure 4-71. The use of push-pull tube sections in different envelopes prevents capacitance coupling effects. Frequency adjust capacitor 1C36 and resistors 1R28, 1R94 are used for negative feedback from third video amplifier lV4B to second video amplifier lV1B.

Third video amplifier 1V3A develops cathode bias across resistor 1R33 and third video amplifier 1V4B develops cathode bias across resistor 1R35. The two cathodes are separated by resistor 1R34 to permit separate input coupling to the cathodes. Coupling diode lCR1 and resistor 1R62 provide sweep strobe coupling to the cathode to third video amplifier 1V3A to permit display of the delayed sweep trigger on a zero delay sweep trace. Coupling diode 1CR3 and resistor 1R64 provide crystal marker pulse coupling to the cathode of third video amplifier 1V3A to produce 1.00 or 1.45 microsecond markers on the sweep trace. Push-pull video output from third video amplifier lV3A/lV4B is direct-coupled to the grids of video driver lV4A/1V3B.

Video driver lV4A/lV3B functions as a conventional push-pull video amplifier with gain control provided by cathode degeneration. Cathode bias for 1V4A is developed across resistor 1R37. Increased series resistance increases degeneration and reduces stage gain. Gain Cal adjustment 1R40 is a maintenance adjustment for calibration of video deflection sensitivity. VIDEO SENS control 1R41 is a front-panel sensitivity control.

(c) VIDEO OUTPUT AND DISPLAY CIRCUIT. - Video output amplifier lV5/lV6 is a conventional amplifier with negative feedback provided by resistors 1R43 and 1R45 and load compensation provided by the two series peaking coils which make up 1T2 shunted by resistors 1R65 and 1R66 (figure 4-72). The push-pull video output is sufficient to drive the vertical deflection plates of cathode ray tube 1V7. Resistor 1R44 and VERT potentiometer 1R47AA act as a voltage divider for the positive grid bias for video output tube 1V5 through 1R46 while resistor 1R44 and VERT potentiometer 1R47AB act as a voltage divider for the positive bias for video output tube 1V6 through 1R48.

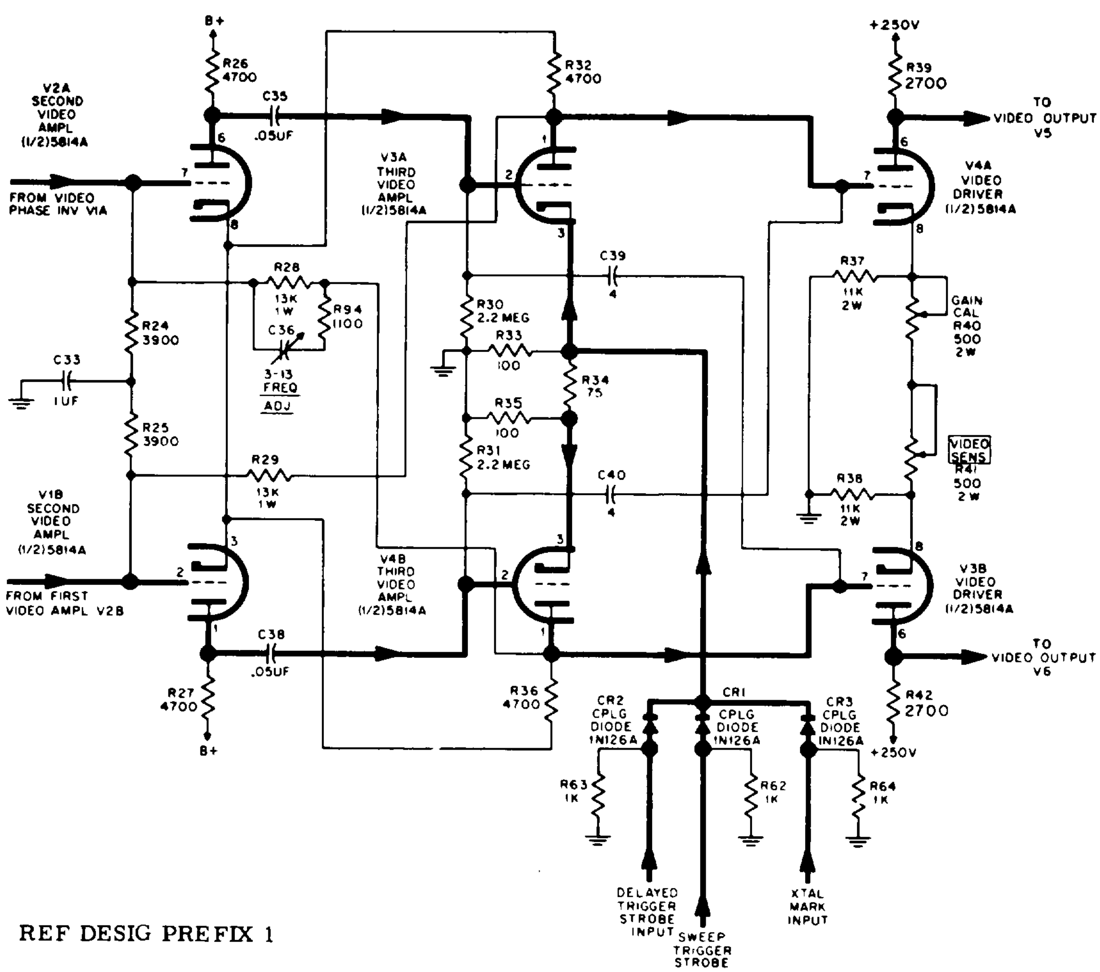


Figure 4-71. Video Amplifier Circuit. Simplified Schematic Diagram

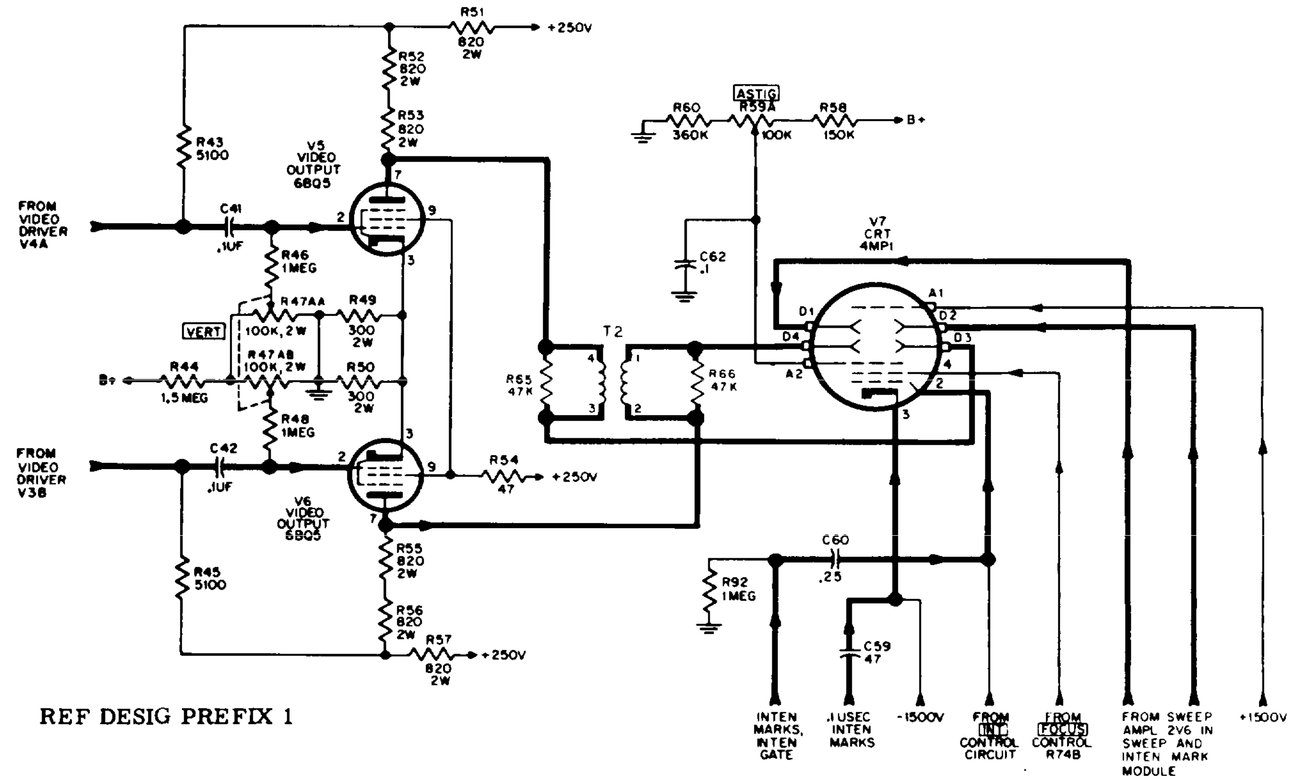


Figure 4-72. Video Output and Display Circuits, Simplified Schematic Diagram

VERT control 1R47 shifts the bias (and thus the plate voltage) on the output tubes in opposite directions. The output tube plate voltage is direct-coupled to the cathode ray tube vertical deflection plates for vertical centering purposes. The cathode ray tube 1V7 used for video display is of the post-deflection acceleration type.

A negative 1500-volt cathode potential and a positive 1500 volt post-deflection accelerator Al potential (with respect to chassis ground), provide an effective post-deflection accelerator potential of 3000 volts. Capacitor 1C59 couples the 0.1 microsecond intensity marker pulses to the cathode ray tube cathode. Capacitor 1C60 couples the 1 microsecond, 5 microsecond, and 50 microsecond intensity marker pulses to the intensity-modulation grid of the cathode ray tube along with the Intensity gate pulses. Anode voltage adjustment is made by means of ASTIG potentiometer 1R59A. The intensity grid and focus electrode voltages are obtained from control circuits associated with the rf-type anode voltage supply. Sweep amplifier 2V6, in the Sweep and Intensity Mark unit, supplies sweep deflection voltages for the cathode ray tube horizontal deflection plates.

(d) ACCELERATOR AND ANODE VOLTAGE SUPPLY CIRCUIT. - The rf-type power supply, shown in figure 4-73, is the dc power source for cathode ray tube 1V7. Oscillator 1V8 functions as a 40 kHz power source with output adjustment provided by anode set potentiometer 1R70. Transformer lT1 supplies voltage to the two half-wave rectifiers. Rectifier 1V9 supplies a negative, 1500-volt circuit while rectifier 1V10 supplies a positive 1500-volt circuit to meet the 3000-volt post-deflection accelerator requirement of the cathode ray tube.

(e) ACCELERATOR VOLTAGE FILTER AND INTENSITY BIAS CIRCUIT. - The filter and bias circuits are shown in figure 4-74. Plug-in filter network 1Z1 and capacitor 1C58 filter the accelerator voltage supply. Resistors 1R79, 1R80, 1R81 , and 1R82 act as a bleeder for the positive side of the circuit. FOCUS potentiometer 1R74B and resistors 1R87, 1R90, and 1R91 act as a bleeder for the negative side. The voltage center-tap of the supply is grounded so that the cathode ray tube anode and deflection plates are near the chassis ground potential. Cathode return resistor 1R88 permits the insertion of 0.1 microsecond intensity marker input into the cathode ray tube. The plate of oscillator 1V8 is also coupled to INTEN (intensity) potentiometer 1R74 by capacitor 1C46. This provides an adjustable ac input voltage for the intensity bias control circuit. Capacitor 1C50, capacitor 1C56, bias rectifier 1CR5, and bias rectifier 1CR6 are connected as a

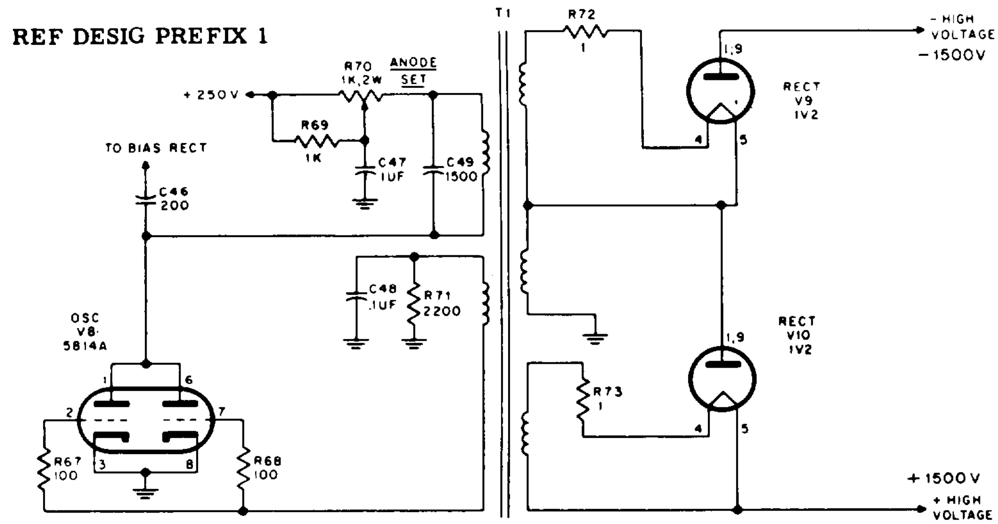


Figure 4-73. Accelerator and Anode Voltage Supply Circuit, Simplified Schematic Diagram

voltage-doubler rectifier system. The associated pi-network filter and bleeder circuit consists of capacitor 1C56, capacitor 1C57, resistor 1R83, and resistor 1R86. Clipper diode 1CR7, resistor 1R84, and resistor 1R85 are in the cathode ray tube grid return path as a dc restorer. Diode 1CR7 and resistor 1R84 provide sufficiently fast recovery to prevent cathode ray tube cut-off on high repetition rates.

(4) SIF CODER. -The SIF (Selective Identification Feature) code train generated by the SIF Coder consists of two framing pulses, up to 12 information pulses, and when selected, either an X pulse or an ID pulse. (In mode C the pulse corresponding to the ID Pulse is called "SPI".) As shown in figure 3-2, the time interval between adjacent pulses is 1.45 microseconds (except for the ID pulse, which is positioned 4.35 microseconds after the last framing pulse). The various pulse code combinations are selected by means of controls on the front panel of the SIF Coder.

The twelve information pulses are each positioned in time with reference to the first framing pulse. They are divided into four interlaced groups (A, B, C, D) associated with the four digits of the standard SIF numbers. Each group has three pulses and each pulse of the group is spaced 2.90 microseconds from the others. Each pulse is

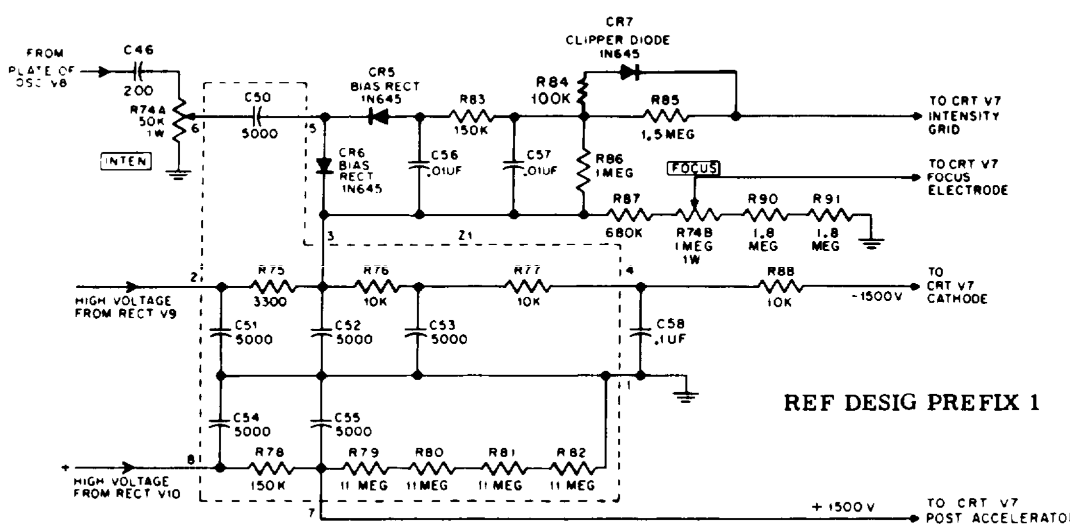


Figure 4-74. Accelerator Voltage Filter and Intensity Bias Circuit, Simplified Schematic Diagram

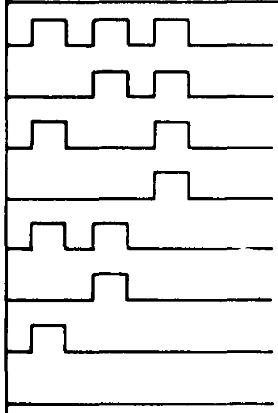
identified by a number (1, 2, or 4) referring to its value in the binary number system.

For example: Code number 2435 consists of pulse 2 of group A, pulse 4 of group B, pulses 1 and 2 of group C, and pulses 1 and 4 of group D. The pulse code train for 2435 will, therefore, have information pulses at the first, third, fourth, eighth, eleventh, and twelfth information pulse positions (not counting the unused "X" space as an information pulse position). Table 4-13 shows how the digit represented by each pulse group is obtained from the sum of the pulse values.

Since there is a possibility of eight digits (0 through 7) for each group, and the digits of each group can be combined with the digits of the other groups, a total of 4096 (8 x 8 x 8 x 8) different coded numbers is possible. The train having pulses in all information positions represents the number 7777 while the train having no pulses in any information position represents 0000.

(a) BLOCK DIAGRAM. - The circuit functions of the SIF Coder are shown in the block diagram, figure 4-75, and in the schematic diagram, figure 5-63, and are described below. Waveforms are given in figure 4-76 and voltage and resistance measurements are given in tables 4-14 and 4-15.

TABLE 4-13. CODING OF DIGITS IN GROUPS A, B, C, AND D



PULSE TRAIN (SIMPLIFIED)	BINARY VALUES	DIGIT REPRESENTED
	1 + 2 + 4	7
	2 + 4	6
	1 + 4	5
	4	4
	1 + 2	3
	2	2
	1	1
	None	0

TABLE 4-14. SIF CODER VOLTAGE READINGS

TUBE NO.	TUBE PIN NUMBERS 1	2	3	4	5	6	7	8	9
4V1	+7.1	+6	+4.3	FIL	FIL	+250	-35	+0.23	FIL
4V2	+250	-4	0	FIL	FIL	0 to +0.2	-35	FIL	+250
4V3	+250	-35	0 to +0.2	FIL	FIL	0 to +0.2	-35	FIL	+250
4V4	+0.7	+3.1	FIL	FIL	+250	+90	+3.1	--	--
4V5	FIL	0	-15	+250	0	+250	-15	0	FIL
4V6	+0.1	+3.1	FIL	FIL	+250	+99	+3.1	--	--
4V7	0	+5.8	FIL	FIL	+142	+142	+5	--	--
4V8	+240	+142	+142	FIL	FIL	+250	-6.5	0	FIL
4V9	+1.15	+1.37	+1.15	FIL	FIL	FIL	+180	+115	+1.15
4V10	+250	+250	FIL	FIL	-30	-30	-16	--	--
4V11	+250	-15	+0.57	FIL	FIL	+0.57	-16	FIL	+250
4V12	+250	-16	+0.57	FIL	FIL	+0.57	-16	FIL	+250

NOTES: 1. Voltage measurements taken with unit removed and connected with service cable to main chassis.

2. Voltages taken with electronic multimeter.

A trigger signal from Jl is coupled to the grid of trigger amplifier 4V2A through coupling diode 4CR6 (figures 4-75 and 4-77). The amplified triggers from 4V2A are fed to blocking oscillator 4V3. The blocking oscillator output then drives the coder delay line assembly 4A1 consisting of delay line sections 4DL3, 4DL4, 4DL5, 4DL6, and 4DL7. Outputs at successive points along the coder delay line provide pulses at progressive time intervals (figure 4-78). Code number selection is accomplished by switching in the desired pulse outputs to trigger the code-train generator circuits.

When FUNCTION selector 4S1 is set to N (normal) the normal code number selection and generation functions are performed. The first pulse taken from the delay line is passed through coupling diode 4CR20. This start (framing or bracket) pulse will always be present regardless of the code number switch settings. The next six consecutive output pulses from the delay line are information pulses which are passed through switch diodes 4CR21 through 4CR26, inclusive (when switched on). The diode switching functions for these pulses are controlled by CODE number selector switch C(4S4B) and CODE number selector switch A (4S5A). The information pulses which have been selected are shown by indicator lamps 4DS1 through 4DS6, inclusive (figure 4-79). After the first six information pulses, the next pulse would be the X pulse (if used) which is passed through switch diode 4CR27. Indicator lamp 4DS7 will be lighted when the X pulse is selected.

TABLE 4-15. SIF CODER RESISTANCE READINGS

TUBE NO.	TUBE PIN NUMBERS								
	1	2	3	4	5	6	7	8	9
4V1	115K	175K	1K	∞	∞	16K	100K	330	∞
4V2	14K	33K	0	∞	∞	14K	3.3K	180K	∞
4V3	14K	4.5K	40	∞	∞	∞	4.5K	∞	14K
4V4	7.5K	330	∞	∞	14K	9K	330	--	--
4V5	∞	270	2.6K	14K	0	14K	2.6K	180	∞
4V6	1.4K	330	∞	∞	14K	9K	330	--	--
4V7	3.3K	330	∞	∞	12K	10K	330	--	--
4V8	16K	10K	10K	∞	∞	14.5K	250K	0	∞
4V9	27	160	27	∞	∞	∞	19K	35K	27
4V10	14K	14K	∞	∞	400K	400K	1.5K	--	--
4V11	1.5K	1.5K	520	∞	∞	520	1.5K	∞	14K
4V12	14K	1.5K	520	∞	∞	520	1.5K	∞	14K

NOTES: 1. Resistance measurements taken to chassis ground with unit removed and disconnected.

2. All panel controls in ccw position.

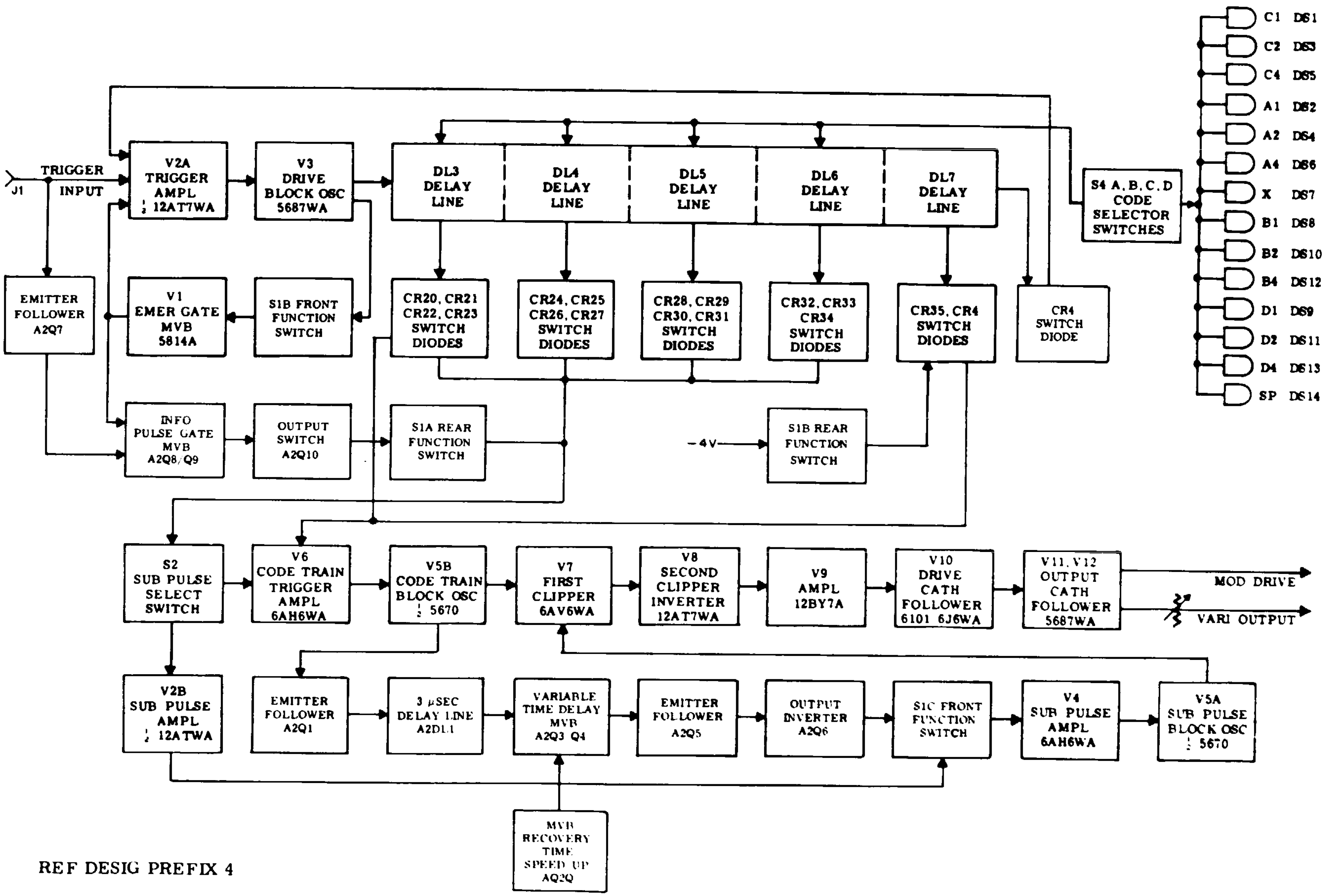


Figure 4-75. SIF Coder. Block Diagram

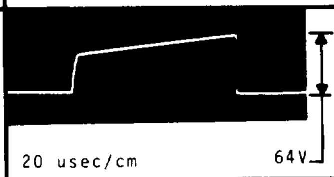
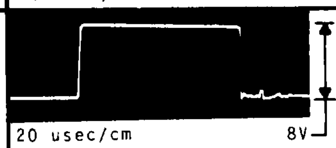
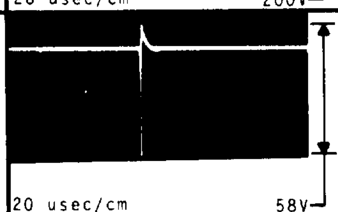
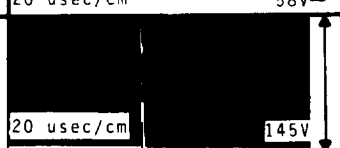
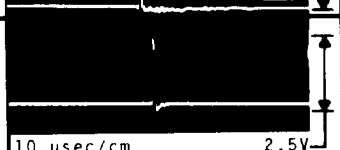
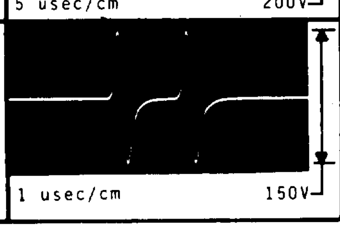
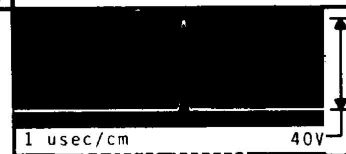
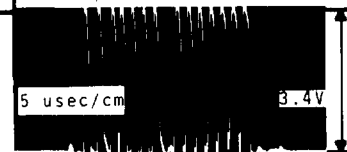
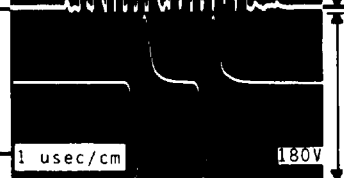
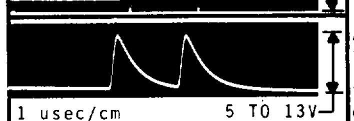
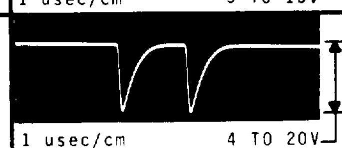
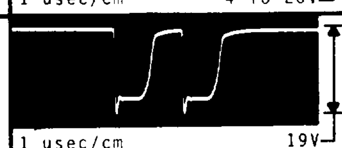
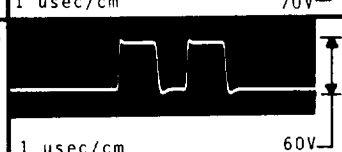
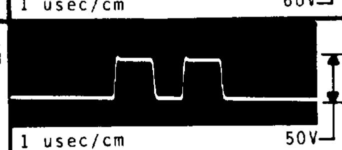
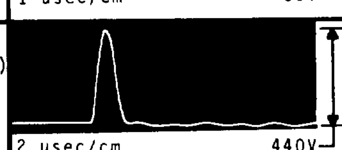
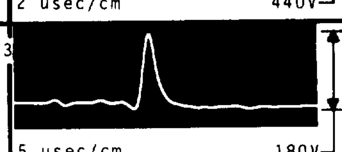
NO	TEST POINT	WAVEFORM	REMARKS
1	4V1 -1	 20 usec/cm 64V	Function Switch at "EMER" or "EMER +". Trigger injected into Trigger Input jack.
2	4V1 -3	 20 usec/cm 20V	Same as No. 1
3	4V1 -8	 20 usec/cm 8V	Same as No. 1
4	4V2 -1	 20 usec/cm 200V	Same as No. 1
5	4V2 -6	 20 usec/cm 58V	Substitute pulse; location depends on the Sub Pulse Select and Sub Pulse Pos control settings
6	4V3 -3	 20 usec/cm 145V	Function: N Trigger injected into Trigger Input jack
7	4V4 -1	 10 usec/cm 2.5V	Same as No. 5
8	4V4 -5	 5 usec/cm 200V	Same as No. 5
9	4V5 -3	 1 usec/cm 150V	First framing pulse and C1 pulse
10	4V5 -8	 1 usec/cm 40V	Same as No. 5
11	4V6 -1	 5 usec/cm 3.4V	Function: N Code:7777
12	4V6 -5	 1 usec/cm 180V	Same as No. 9
13	4V7 -1	 1 usec/cm 5 TO 13V	Same as No. 9 Amplitude varies with setting of Pulse Width control
14	4V7 -5	 1 usec/cm 4 TO 20V	Same as No. 9
15	4V8 -6	 1 usec/cm 19V	Same as No. 9
16	4V9 -7	 1 usec/cm 70V	Same as No. 9
17	4V10 -7	 1 usec/cm 60V	Same as No. 9
18	4V11 -3	 1 usec/cm 50V	Same as No. 9
19	4T2 (Top)	 2 usec/cm 440V	Delay Line Drive Pulse
20	4R123	 5 usec/cm 180V	End of Delay Line

Figure 4-76. SIF Coder Waveforms

The next six consecutive information pulses are supplied through switch diodes 4CR28 through 4CR33, inclusive. The switching functions of these diodes are controlled by CODE number selector switch B(4S5B) and CODE number selector switch D (4S4A). The information pulses selected are shown by indicator lamps 4DS8 through 4DS13 inclusive. The next pulse taken from the delay line is a stop (second framing or bracket) pulse which is passed through coupling diode 4CR34. Since this framing pulse is always present regardless of the information pulses used, the associated indicator lamp 4DS14 is connected directly to the power source. The next pulse taken from the delay line is the emergency redrive pulse which is fed to a diode circuit consisting of diodes 4CR3 and 4CR4, and coupled through 4CR5 to the trigger amplifier 4V2A. The emergency redrive pulse plays no part in the information pulse coding, but is used to cause a repetition of the framing pulses for an emergency signal, This gate is inoperative during normal operation and does not pass the redrive pulse. The last pulse from the line would be the ID pulse (if used) which is supplied through switch diode 4CR35. This circuit is also disabled during normal operation. When FUNCTION selector 4S1 is set to ID (identification of position) switch diode 4CR35 is made conductive and the ID pulse output is passed through. When FUNCTION switch 4S1 is set to X, switch diode 4CR27 is made conductive and the X pulse is passed through.

When FUNCTION selector 4S1 (figure 4-80) is set to EMER (emergency), driver blocking oscillator 4V3 supplies a trigger pulse to the front half of emergency gate multivibrator 4V1 through the contacts of FUNCTION selector 4S1. The output of the first half of 4V1 is coupled to the second half through capacitor 4C3 and diode 4CR1 (figure 4-86). The function of capacitor 4C4 is to charge up when the prf of the trigger signal is excessively high (as it may be with emergency signals) placing a back bias on coupling diode 4CR1 and thus limiting the multivibrator action to a repetition rate of approximately 1000 pps. Clipper diode 4CR2 removes any negative spikes from the pulse.

The resulting gate pulse opens the gate circuit consisting of diodes 4CR3 and 4CR4. The gate remains open long enough for three redrive pulses (in addition to the normal trigger pulse) to pass through 4CR5 and 4C5 (figure 4-77) to the grid of trigger amplifier 4V2A. The initial trigger pulse and each of the following three redrive pulses permit the production of a pair of bracket pulses. The result is a series of four consecutive pairs of pulses for each input trigger pulse. The first pair of bracket pulses produced during EMER operation will contain whatever information pulses have been selected. The three pairs of pulses which follow, however, will contain no information pulses.

When FUNCTION selector 4S1 is set to EMER+X (emergency plus X), the emergency pulse train described above is obtained with the X pulse added to the information pulses.

Coupling diode 4CR20 and switch diode 4CR35 (figure 4-78) feed pulses directly to delay line 4DL2 at the input to the code train trigger amplifier 4V6 (figure 4-81). This delay line gives a fixed delay of 2 microseconds for the signal. Clipper diode 4CR14 removes any negative spikes. Other code pulses are fed to this point through the contacts of SUB PULSE SELECT switch 4S2. The output of delay line 4DL2 is passed through coupling diode 4CR37 to code train trigger amplifier 4V6. Further negative clipping is performed by diode 4CR13. The amplified trigger output from 4V6 drives code train blocking oscillator 4V5B which provides an output having the required pulse shape and amplitude characteristics.

When SUB PULSE SELECT switch 4S2 is set to the designation of any code pulse already selected (as shown by the indicator lamp), that particular code pulse is removed from the input of delay line 4DL2 and switched to coupling diode 4CR9 at the input to subpulse trigger amplifier 4V2B (figure 4-85). This removes the normal pulse from the cede pulse train and substitutes a separately generated pulse which can be adjusted in time with respect to the normal pulse time. The output from coupling diode 4CR9 is amplified by sub pulse trigger amplifier 4V2B and then applied to delay line 4DL1 which provides up to 4 microseconds of adjustable delay. The output from delay line 4DL1 is coupled through diodes 4CR10 and 4CR8, passed through the contacts of 4S1 (in all but 1 position), and amplified by sub pulse trigger amplifier 4V4. The amplified trigger output from 4V4 drives the sub pulse blocking oscillator 4V5A which supplies a substitute pulse output having the required pulse shape and amplitude characteristics.

The output from code train blocking oscillator 4V5B (figure 4-81) and the output from sub pulse blocking oscillator 4V5A (figure 4-85) are applied to first clipper 4V7 (figure 4-82) through coupling diodes 4CR15 and 4CR12 respectively. The output from 4V5B is also routed to emitter follower 4A2Q1 for use in the interleave circuits (figure 4-88). PULSE WIDTH control 4R49 (figure 4-82) adjusts the width of the pulses in the code train for both signals. The pulse output from first clipper 4V7 is again clipped by second clipper 4V8, further clipped by clipper diode 4CR16, and then inverted by amplifier 4V9.

When LEVEL switch 4S3 is set to LO, the output from amplifier 4V9 is clipped by diode 4CR18, clipped again by diode 4CR19 (figure 4-83) and then applied to both sect ions of driver cathode follower 4VI0. The output from 4V10 is sufficient to drive the output cathode follower stages using 4Vl1 and 4V12 in parallel. Tubes 4V11 and 4V12 deliver the required output power level at the MOD DRIVE and VARI OUTPUT connectors. Full output is available at the MOD DRIVE panel connector, while the low level VARI OUTPUT can be adjusted by means of the AMPLITUDE control.

When LEVEL switch 4S3 is set to HI, clipper diode 4CR18 is disconnected and the output cathode follower load impedance is increased. The increased output is thus obtained at some sacrifice in pulse shape (rise and decay time) characteristics. MOD DRIVE output approximately doubles while VARI OUTPUT increases by approximately one-third.

(b) CODE TRAIN DELAY LINE DRIVER CIRCUITS. - Figure 4-77 is a partial schematic diagram of trigger amplifier 4V2A and driver blocking oscillator 4V3. Under static conditions 4V3 is biased at cutoff from the -35 volt bias

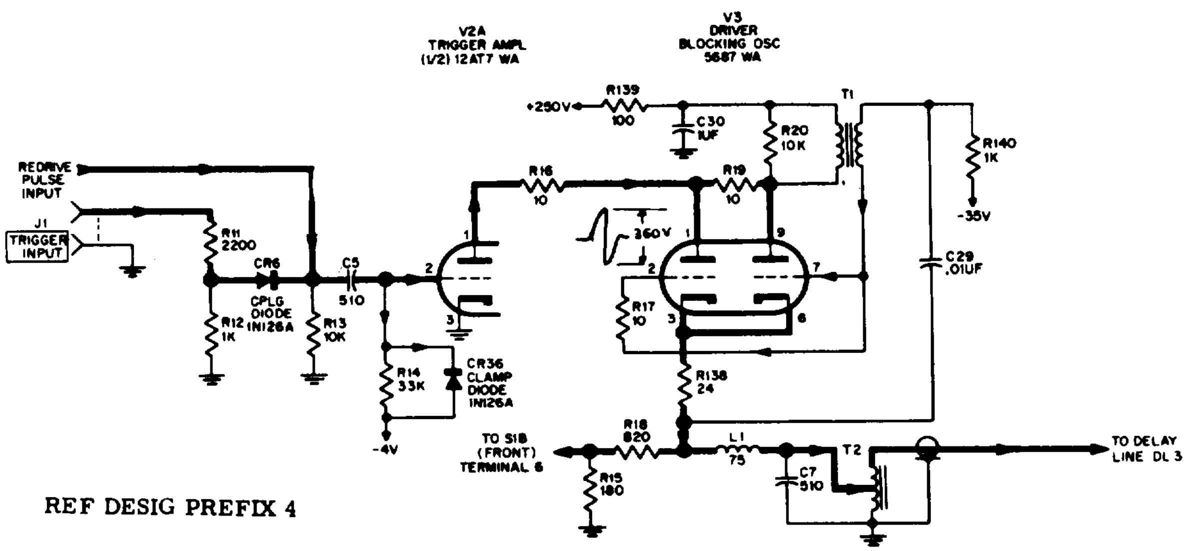


Figure 4-77. Trigger Amplifier and Driver Blocking Oscillator, Simplified Schematic Diagram

supply through the secondary of blocking oscillator transformer 4T1 and resistor 4R140.

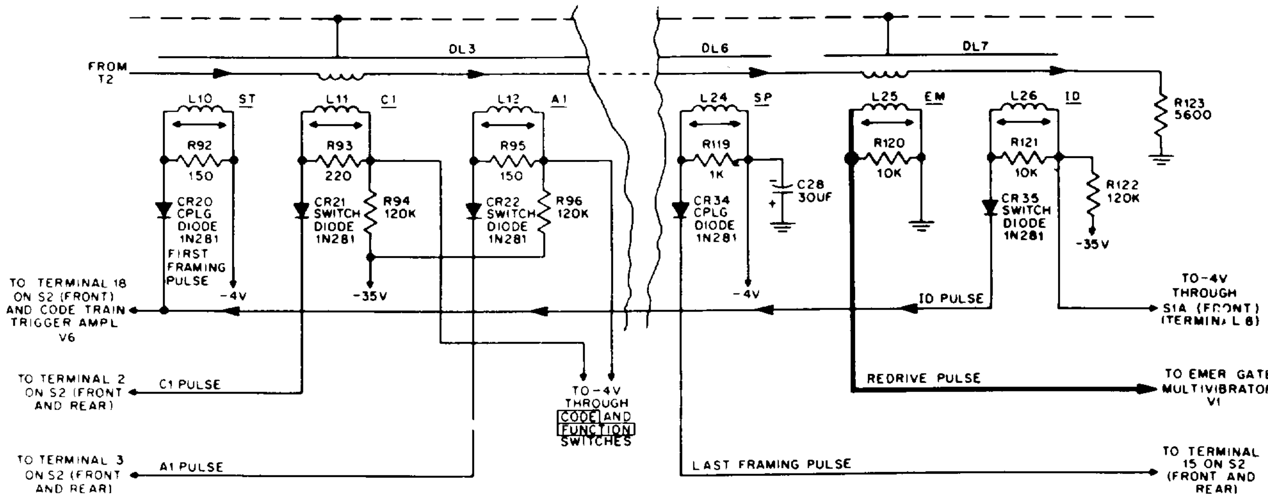
A positive trigger pulse is coupled to the grid of 4V2A through diode 4CR6 and capacitor 4C5. The amplified and inverted pulse output from 4V2A triggers blocking oscillator 4V3 into conduction. The signal path for this negative trigger pulse is through transformer 4T1 to the paralleled grids of 4V3. The pulse appearing at the grids of 4V3 is positive, and 4V3 is driven into conduction for a very short time, depending upon the characteristics of 4T1 and the time constant of the grid circuit, which is very low. This sudden sharp conduction of 4V3 produces a positive pulse at the cathode of 4V3, which is fed through 4L1 to the tap on 4T2. Since 4T2 functions as an autotransformer, the peak voltage at the top of 4T2 is approximately four times the peak voltage at the cathode of 4V3. A high voltage pulse of this amplitude is required to drive the cede train delay lines.

Diode 4CR6 is connected in the circuit so that only positive pulses will pass to the grid of 4V2A. Resistors 4R16, 4R17, and 4R19 are inserted between the paralleled plates and grids of tubes 4V2A and 4V3 for the purpose of suppressing parasitic oscillations. Coil 4L1, capacitor 4C7, and autotransformer 4T2 have a resonance characteristic which aids in shaping and peaking the output waveform of this circuit. When the FUNCTION selector is in the EMER (emergency) or EMER +X position, a portion of the positive pulse at the junction of the cathode resistors 4R18 and 4R15 is applied to emergency gate multivibrator 4V1 in order to initiate operation of the emergency circuits.

(c) CODE TRAIN DELAY LINES. - Figure 4-78 is a simplified schematic diagram of the delay lines and associated circuitry used to generate the SIF code train. Refer to the overall schematic diagram of the SIF Coder (figure 5-63) for the complete circuitry. Under static conditions, the anodes of the switching diodes are biased at either -4 volts or -35 volts. The high-amplitude positive pulse from autotransformer 4T2 is fed to cascaded delay lines 4DL3 through 4DL7. Pick-off coils 4L10 through 4L26 are located within the magnetic fields of these delay lines. The time delay of the voltage induced in an individual pick-off coil is dependent upon its location with respect to the input end of the cascaded delay lines. In the absence of a drive pulse from 4T2, there will be no output pulse occurring at any of the coupling and switching diodes, 4CR20 through 4CR35.

When a -35 volt bias is applied to the anode of one of the switching diodes, the pulse induced in the pick-off coil is not of sufficient amplitude to pass through the associated diode. However, the pulse is of sufficient amplitude to overcome a a bias of only -4 volts. Individual code pulses are selected in the following manner: normally, -35 volt bias is applied to the 4CR21 anode (to use the Cl diode as an example) through 4R94 and pick-off coil 4L11. The output at the cathode of this diode will then be zero even though a pulse is induced into pick-off coil 4L11. However, if the -4 volt bias is connected to the junction of 4R94 and 4L11 through the CODE and FUNCTION selectors, the positive pulse from 4L11 will overcome the -4 volt bias, and the positive Cl pulse will pass through 4CR21 to SUB PULSE SELECT switch 4S2.

Note that pick-off coils 4 L10 (for start pulse) and 4L24 (for stop pulse) are permanently connected to the -4 volt bias, and there is no provision for the application of -35 volt bias. This means that these coils will pass the bracket pulses through their coupling diodes, 4CR20 and 4CR34, whenever a drive pulse is applied to the input of the code t rain delay



REF DESIG PREFIX 4

Figure 4-78. Code Train Delay Lines, Simplified Schematic Diagram

lines. The redrive pulse from 4L25 (occurring after the stop pulse) is passed directly to trigger diode 4CR4 gate circuit at the output of emergency gate multivibrator 4V1.

The pick-off coils, 4L10 through 4L26, are each physically adjustable so that they may be set at a precise position with respect to the start of the delay lines. Resistors 4R94, 4R96, and the other delay line resistors having similar functions in this circuit prevent the -4 volt bias supply from loading the -35 volt supply when the -4 volt bias is switched to the switching diodes. Resistor 4R123 terminates the delay line in its characteristic impedance, thus preventing pulse reflection in the line.

(d) CODE SELECTOR SWITCH CIRCUIT ANALYSIS. - Figure 4-79 is a simplified schematic diagram of several of the CODE number selectors in the SIF Coder. The function of the switches illustrated in figure 4-79 is typical of the others in this unit. (Refer to the overall schematic diagram of the SIF Coder, figure 5-63.) As mentioned previously, the code train switching diodes (which can be turned off or on), are biased with a -35 volt potential when off. In this condition, a positive pulse from a pick-off coil is not of sufficient amplitude to allow the pulse to pass through the diode. However, when this -35 volt bias is raised to -4 volts, the positive pulse from the pick-off coil will overcome this bias and the pulse will pass through the diode. The purpose of CODE selector section 4S4BB is to replace the -35 volt bias with a -4 volt bias. The use of -4 volt bias for the "on" state rather than zero prevents the passage of spurious low level pulses.

CODE selector 4S4 is shown in position 0, therefore none of the diodes are "turned on" by 'the application of the -4 volt bias. When the selector is turned to position 1, -4 volts is applied to diode 4CR21 through terminals 6 and 9 of 4S4BB (front). When the selector is turned to position 2, diode 4CR23 is "turned on" through terminals 5 and 9 of 4S4BB (front). When the selector is turned to position 3, diodes 4CR21 and 4CR23 are both turned on through terminals 4, 8, and 9 of 4S4BB (front). Setting the selector to position 4, 5, 6, or 7 turns on the correct diodes to produce SIF code pulses representing numerals 4, 5, 6, or 7 in the "C" grouping of the SIF code system. The -4 volt bias is supplied to 4S4 from output switch 4A2Q10. During normal operation this bias remains at -4 volts; in emergency signal production, however, the bias. will change to -35 volts during the emergency pulse train, eliminating information pulses from the three pairs of "bracket" pulses following the normal train.

CODE selector section 4S4BA turns on neon lamps 4DS1, 4DS3, and 4DS5, the "Cl", "C2", and "C4" lamps, respectively. The sum of the values of the lamps which are on corresponds to the SIF coded number selected. For example, when lamps 4DS1 (Cl) and 4DS3 (C2) are on, the number indicated for the C group is 3. When 4DS3 (C2) and 4DS5 (C4) are on, the number indicated is 6. The lamps are turned on by grounding one of their terminals through the contacts of CODE selector 4S4B.

The neon CODE lamps, 4DS1 through 4DS14 (shown in the overall schematic diagram, figure 5-63) are type NE-2 lamps which light at approximately 90 volts dc. Resistors 4R124, 4R125, and 4R126, and the other resistors with a similar function, are used for limiting current through the neon lamps since they are powered from the regulated 150 volt power supply. Resistors 4R93, 4R95, and 4R97, and the other resistors with a similar function, located across the pick-off coils in the delay line assembly (figure 4-78) are used to limit the voltage across their respective coils. Notice that the first pick-off coil is loaded with 150 ohm resistor 4R92. The next coil, 4L11 is locaded with 220 ohm resistor 4R93, 4R93, and 4L12 is loaded with 150 ohm resistor 4R95.

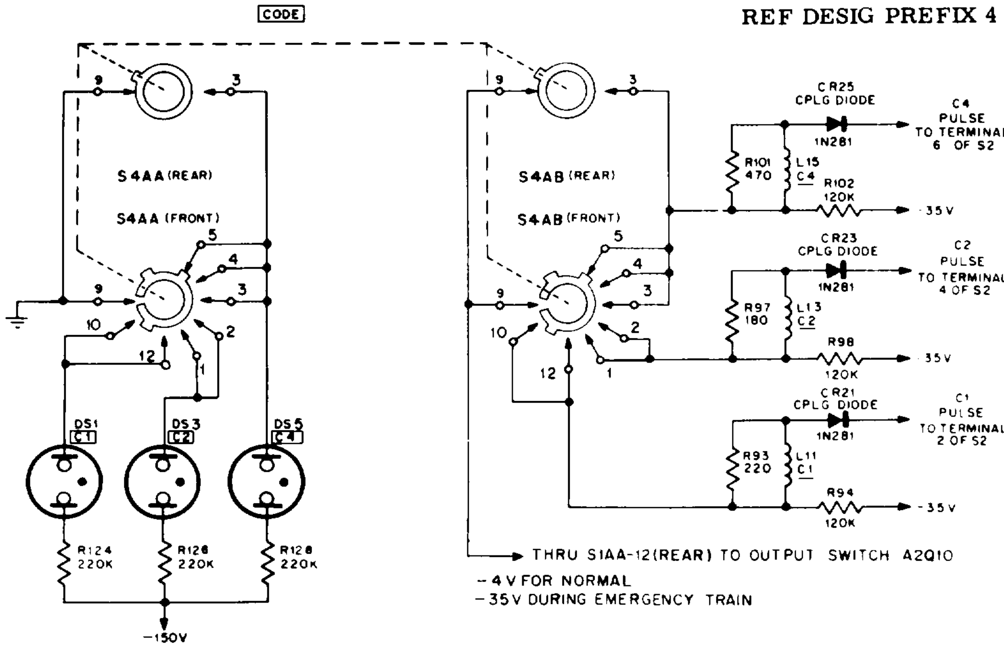


Figure 4-79. Code Number Selector, Simplified Schematic Diagram

Table 4-16 indicates which code train switching diodes (and associated indicator lamps) are "turned on" by the four CODE selectors. For example, suppose that code number 1234 is chosen by setting the CODE selectors to "1234". The switch diodes turned on would be: 4CR22, 4CR30, 4CR21, 4CR23, and 4CR33. The lamps which are lit would be: 4DS2. 4DS10, 4DS1, 4DS3, and 4DS13. Refer to the schematic diagram of the SIF Coder for identification of all the switching diodes and neon lamps.

(e) FUNCTION SELECTOR CIRCUIT ANALYSIS. - Figure 4-80 is a simplified schematic diagram of the circuits associated with FUNCTION selector 4S1. The purpose of this three- section switch is to switch the ground connection for the neon code lamps, to apply the -4 volt bias for '(turning on" the code train delay line switching diodes, to apply the -4 volt bias for "turning on" the "X" pulse and ID pulse switching diodes, and to apply a trigger pulse to the emergency gate multivibrator.

The FUNCTION selector provides the following circuit connections:

1. N (Normal) Position -4 volt, -35 volt, and ground connections are not altered, so normal cede pulse production is permitted. The sub pulse line from SUB PULSE SELECT switch 4S2 is connected to sub pulse amplifier 4V2B, permitting pulse substitution if desired.

2. ID Position - This is the same as the N position with one exception: A -4 volt bias replaces the -35 volt bias applied to ID pulse switching diode 4CR35 causing the ID pulse to appear after the code pulse train.

3. X Position - This is the same as the N position with the following exceptions: A -4 volt bias replaces the -35 volt bias applied to X pulse switching diode 4CR27, causing the X pulse to appear in the middle of the code pulse train, and a ground is applied to " X" pulse neon lamp 4DS7.

4. EMER +X Position - This is the same as the X position with one exception: A trigger pulse is fed to emergency gate multivibrator 4V1 through 4S1 (front), causing the bracket pulses to be repeated three times following the main code pulse train.

5. EMER Position - This is same as the EMER +X position, except that the -4 volt bias and ground are not applied to the X pulse switching diode 4CR27 (and X pulse lamp 4DS7) so the X pulse is removed from the code train.

6. I Position - In this position, functions are the same as for the N position, except that the output of code train blocking oscillator 4V5B is also fed to emitter follower 4A2Q1 in the interleave circuit. The resulting interleave pulse train is passed through contacts 1 and 7 of 4S1C, front, and fed to sub pulse trigger amplifier 4V4. The substitute pulse circuits do not perform their normal function in this position. The repeated (interleaved) code train produced can be adjusted in position by means of the INTERLEAVE control.

(f) CODE TRAIN CIRCUITS.

1. CODE TRAIN TRIGGER AMPLIFIER 4V6 AND CODE TRAIN 13 LOCKING OSCILLATOR 4V5B. - Figure 4-81 is a simplified schematic diagram of the first two stages of the code train circuit. [n the absence of pulses from the code train delay line, code train blocking oscillator 4V5B is cut off by approximately -18 volts of bias from a voltage divider consisting of resistors 4R26 and 4R30.

Incoming code pulses are fed to the

Table 4-16. Code Number Selector Chart

CODE SELECTOR	4CR21	4CR22	4CR23	4CR24	4CR25	4CR26	4CR28	4CR29	4CR30	4CR31	4CR32	4CR33	4DS1(C1)	4DS3(C2)	4DS5(C4)	4DS2(A1)	4DS4(A2)	4DS6(A4)	4DS8(B1)	4DS10(B2)	4DS12(B4)	4DS9(D1)	4DS11(D2)	4DS13(D4)
A1		X														X								
A2				X													X							
A3		X		X												X	X							
A4						X												X						
A5		X				X										X		X						
A6				X		X											X	X						
A7		X		X		X										X	X	X						
B1							X												X					
B2									X											X				
B3							X		X										X	X				
B4											X										X			
B5							X				X								X		X			
B6									X		X									X	X			
B7							X		X		X								X	X	X			
C1	X												X											
C2			X											X										
C3	X		X										X	X										
C4					X										X									
C5	X				X								X		X									
C6			X		X									X	X									
C7	X		X		X								X	X	X									
D1								X														X		
D2										X													X	
D3								X		X												X	X	
D4												X												X
D5								X				X										X		X
D6										X		X											X	X
D7								X		X		X										X	X	X

NOTE

Diode 4CR27 switches “X” pulse, 4CR34 couples SP (last framing pulse), and 4CR35 switches “ID” pulse. Neon lamps 4DW (“X”) and 4DS14 (SP) not shown above for clarity. Refer to schematic diagram of SIF Coder unit.

grid of 4V6 which has a voltage gain of approximately 50. The amdified and inverted pulses from the plate of 4V6 are-coupled to the grid of 4V5B through blocking oscillator transformer 4T5. Tube 4V5B conducts for less than one microsecond. As a result of this heavy surge of plate current, sharp positive pulses, one for each code train pulse, are generated at the cathode of 4V5B. At the conclusion of each pulse, 4V5B returns to the cutoff condition, awaiting the next positive pulse to appear at its grid.

Clipper diodes 4CR13 and 4CR14 bypass negative portions of the code train pulses coming from 4CR20, 4CR35, and 4S2. Delay line 4DL2 causes a two-microsecond delay of the code train pulses before they appear at the grid of 4V6. This is done to provide a two microsecond reference for substitute pulse generation. Fixed cathode bias on 4V6 is provided by the voltage divider consisting of 4R39, 4R40, and 4R41. The screen voltage of 4V6 is also held essentially constant by this voltage divider. Capacitor 4C16 bypasses the cathode of 4V6, and effectively holds the cathode at ground for ac. The cathode bias for 4V6 is common with the cathode of sub pulse trigger amplifier 4V4, since 4R4l is the cathode resistor for both stages. Resistor 4R46 in the grid circuit of 4V5B limits the grid current of this tube. The positive output pulses at the junction of 4R43 and 4R44 are fed through coupling diode 4CR15 through Width Adj 4R47, and capacitor 4C20 to first clipper 4V7 (figure 4-82). Diode 4CR15 prevents positive pulses from passing back to the cathode circuit of 4V5B.

2. FIRST CLIPPER 4V7, SECOND CLIPPER -INSERTER 4V8, AND AMPLIFIER 4V9. - The next four stages discussed in the code train circuits are shown in figure 4-82. First clipper 4V7 is biased by a voltage divider consisting of resistors 4R52 and 4R53 to provide peak clipping of the incoming code pulses. In addition, a voltage amplification of approximately four times is accomplished. The cathode bias for second clipper 4V8A is the same

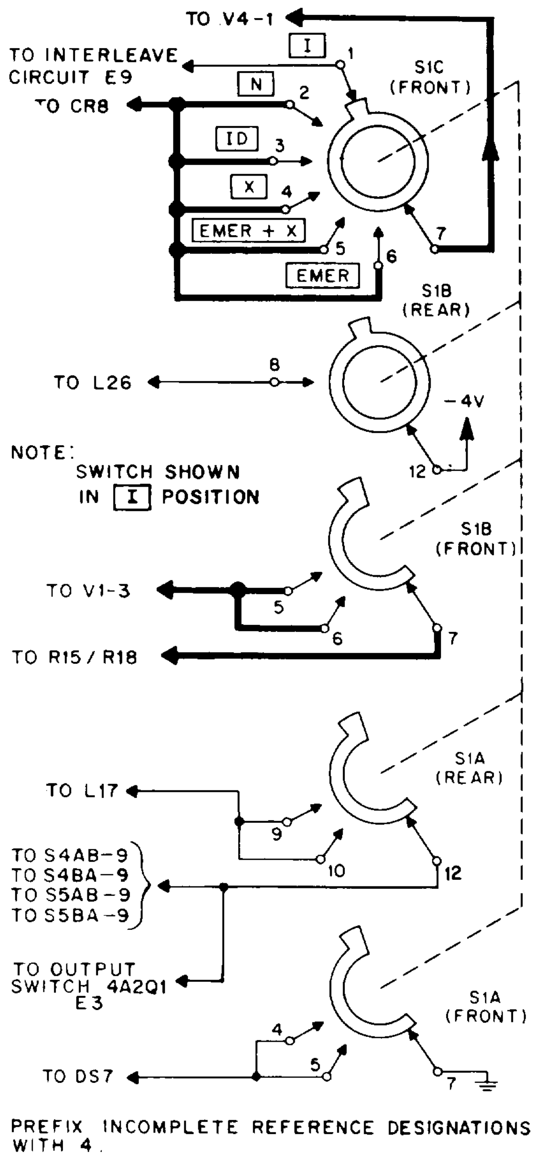


Figure 4-80. Function Selector Connection, Simplified Schematic Diagram

as the screen voltage for the preceding tube, 4V7, and the control grid of 4V8A is coupled to the plate of 4V7, This arrangement places a substantial positive bias on the cathode with respect to the grid voltage, and results in negative peak clipping. Inverter 4V8B is operated with approximately 6.4 volts of fixed bias derived from the junction of a voltage divider consisting of resistors 4R60 and 4R62. This stage inverts and amplifies the positive code pulses appearing at control grid pin 7. The voltage gain of this stage is approximately four.

Amplifier 4V9 functions as a video amplifier, providing a voltage gain of approximately two and half times. When the LEVEL switch is in the LO position, clipper diode 4CR18 is in parallel with resistors 4R64 and 4R65 and peaking coil 4L7.

Negative clipping provided by diode 4CR18 results in excellent square pulse waveform at some sacrifice in gain. When the LEVEL switch is placed in the HI position, however, clipper diode 4CR18 is disconnected. The absence of clipping increases the stage output approximately 50 percent, at some sacrifice in pulse squareness.

3. DRIVER CATHODE FOLLOWER 4V10 AND OUTPUT CATHODE FOLLOWER 4V11/4V12, - Figure 4-83 is a simplified schematic diagram of driver cathode follower 4V10 and output cathode follower 4V11/4V12. The purpose of these stages is to provide the necessary power and adequate isolation between the preceding code train circuits and the load, and also to present the output at a suitable impedance to match the load circuits. Two parallel-connected tubes (each consisting of two triode sections also connected in parallel) are used to provide sufficient power at the output to drive the external circuits using these code pulses for a source of modulating signal.

The positive output pulses from 4V9 are passed on through coupling capacitor 4C26 to negative peak clipper 4CR19 and to driver cathode follower 4V10. Any significant undershoot which might occur at this point is removed by clipper diode 4CR19. The cathode load circuit of 4V10 contains a peaking coil 4L9 which improves high frequency response. Direct-coupled input to the paralleled grids of the cathode follower stage is used.

Two output connectors are provided on the front panel of the SIF Coder. VARI OUTPUT connector 4J3 provides an output for examination and utilization of the code pulses. The output signal level at this point is adjustable from zero to maximum by means of AMPLITUDE control 4R91. The MOD DRIVE connector 4J2 provides an output connection to the pulse modulator circuits of a UHF oscillator. The LEVEL switch shorts out one of the cathode load resistors when in the LO position, and permits resistor 4R89 to be part of the cathode load circuit when it is in the HI position. The unloaded output voltage at the VARI OUTPUT connector is continuously variable from zero to approximately 20 volts when the LEVEL switch is set to LO, and from zero to approximately 30 volts when the LEVEL switch is set to HI. The unloaded output at the MOD DRIVE connector is approximately 40 volts when the LEVEL switch is set to LO, and approximately 80 volts when the LEVEL switch is set to HI.

(g) SUBSTITUTE PULSE CIRCUITS

1. SUB PULSE SELECT SWITCH 4S2. - SUB PULSE SELECT switch 4S2 permits the operator to eliminate one of the code pulses from the code train and substitute a pulse which can be adjusted ±1.6 microseconds in position with respect to the normal position. Figure 4-84 is a simplified schematic diagram of the SUB PULSE SELECT switch circuits, The pulse from 4CR20 (first framing pulse), and the pulse from 4CR35 (ID pulse)

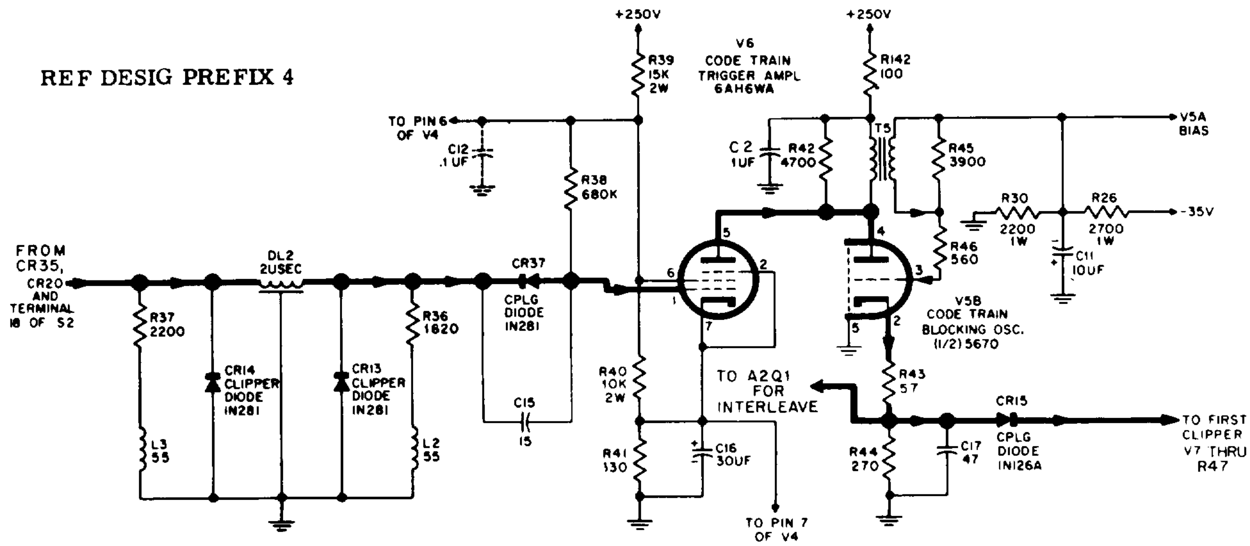


Figure 4-81. Code Train Trigger Amplifier and Blocking Oscillator, Simplified Schematic Diagram

are fed directly to code train trigger amplifier 4V6 so that no substitution can be made. All other substitute pulses are subject to selection by the SUB PULSE SELECT switch. This switch is shown in the OFF position, consequently no pulse is being eliminated and none being fed to sub pulse amplifier 4V2B. However, when the switch is set to any active code pulse position, that particular pulse is not fed to code train trigger amplifier 4V6, but is fed to sub pulse amplifier 4V2B. No substitute pulse is produced when the SUB PULSE SELECT switch is set to an inactive code pulse position. When using the interleaved train function, 4S2 must be left in the OFF position, otherwise a pulse will be removecf from both the normal and the delayed pulse train but no variable pulse will be substituted.

2. SUB PULSE AMPLIFIER 4V2B, SUB PULSE TRIGGER AMPLIFIER 4V4, AND SUB PULSE BLOCKING OSCILLATOR 4V5A. - Figure 4-85 is a simplified schematic diagram of the substitute pulse circuits. Sub pulse amplifier 4V2B is cathode biased. This stage amplifies and inverts the pulse arriving from SUB PULSE SELECT switch 4S2. Sub pulse trigger amplifier 4V4 is a high-gain pentode tube which amplifies the pulse from 4V2B. Cathode bias for 4V4 is provided by the same cathode resistor used by cede train trigger amplifier 4V6. Since the average cathode bias

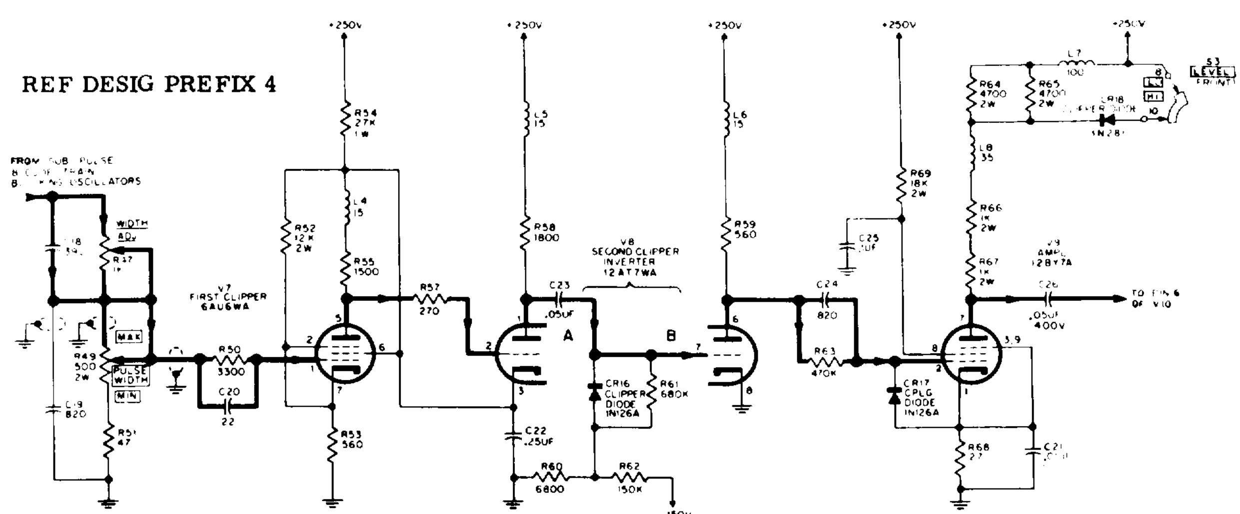


Figure 4-82. 1st Clipper, 2nd Clipper -Inserter, and Amplifier, Simplified Schematic Diagram

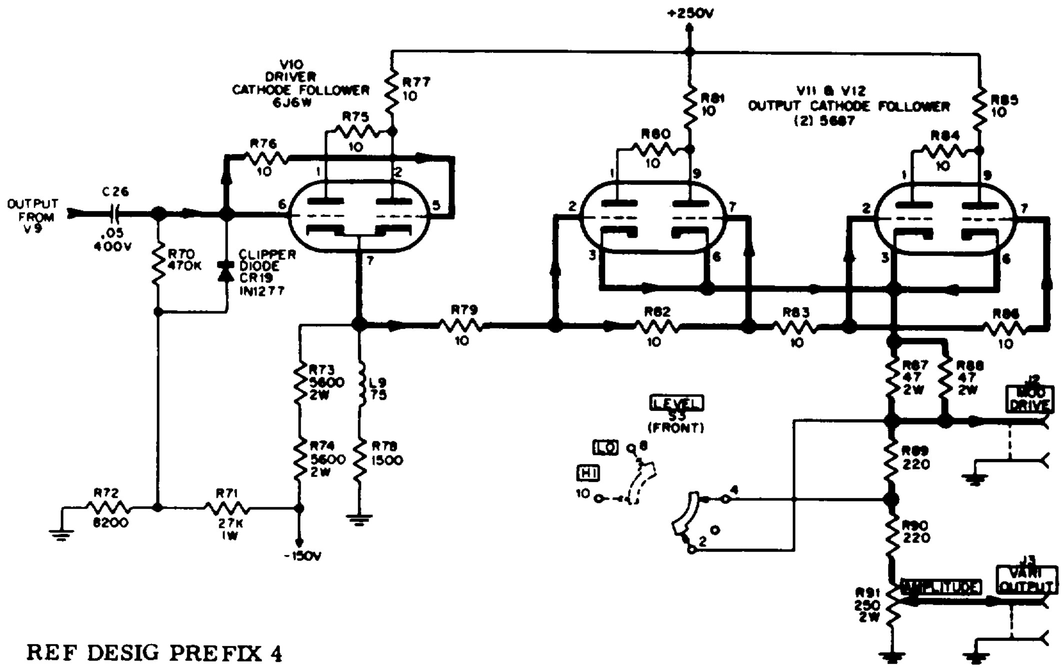


Figure 4-83. Driver and Output Cathode Followers, Simplified Schematic Diagram

voltage across this common cathode resistor 4R41 is not only a function of the current from ground through 4R41, 4R40, and 4R39, but is also a function of the duty cycle of the signal (determined by the-total number of pulses in the code train). The bias of both stages (4V6 and 4V4), is automatically adjusted to the same level. This has the effect of providing essentially constant and similar output amplitudes from both the normal code train circuit and the substitute pulse circuit.

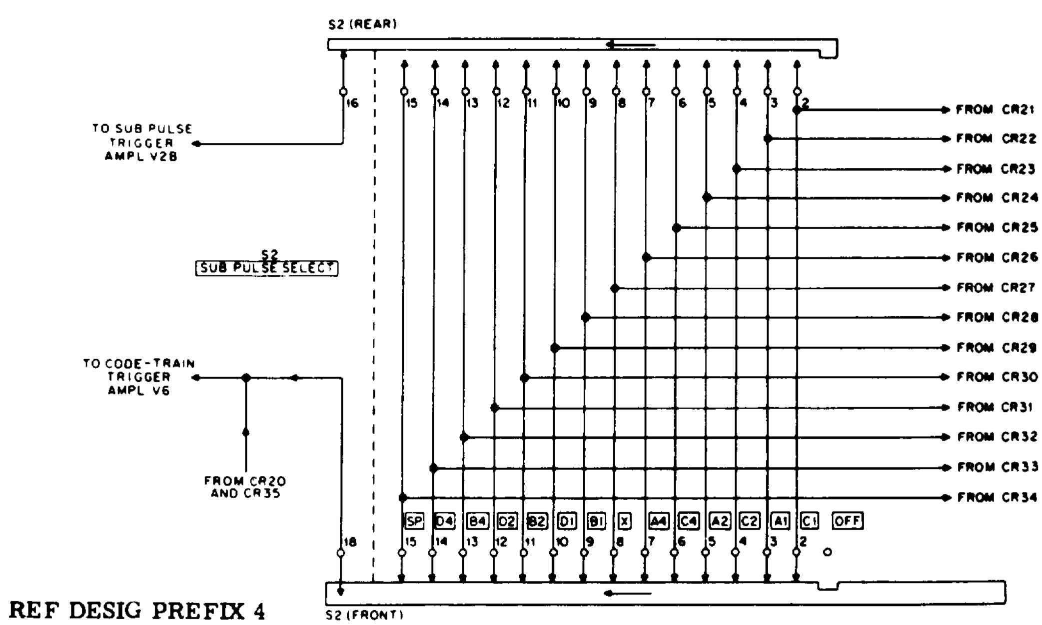


Figure 4-84. Sub Pulse Select Switch, Simplified Schematic Diagram

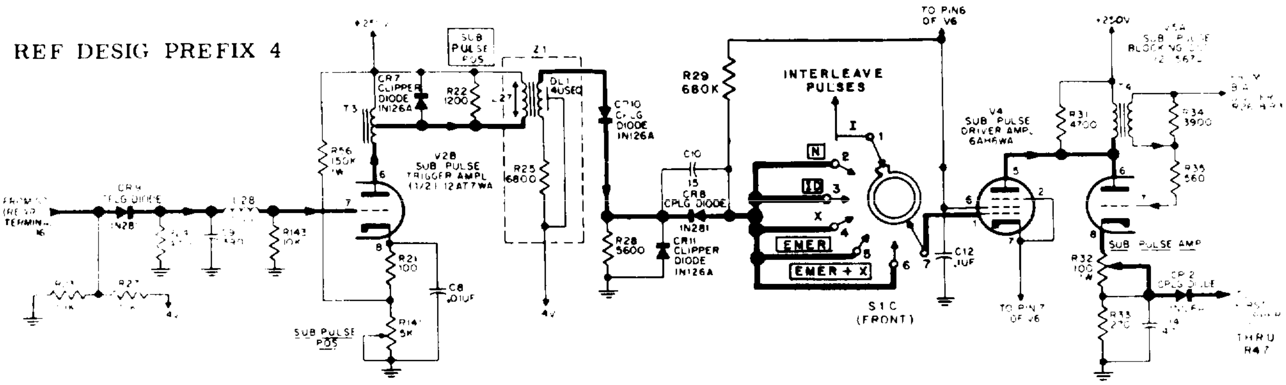


Figure 4-85, Sub Pulse Amplifier. Trigger Amplifier, and Blocking Oscillator. Simplified Schematic Diagram

Sub pulse blocking oscillator 4V5A is biased beyond cot off by approximately -20 volts of bias. This stage remains idle until triggered by the sub pulse trigger amplifier, at which time it goes through one cycle of operation to produce a single pulse at its cathode circuit. This stage then rcmains cut off until triggered again.

Coupling diode 4CR9 will pass positive pulses from the SUB PULSE SELECT switch to the grid of 4V2B but will block undesired negative undershoots. The plate circuit of 4V2B contains an auto-transformer 4T3 which is coupled to delay line 4DL1 by coil 4L27. Coil 4L27 and 4DL1 from a transformer for feeding the output pulse into the grid circuit of sub pulse trigger amplifier (through the contacts of 4S2). Coil 4L27 is adjustable inl position along 4DL1, providing a means of setting the time delay of the pulse to 4V4 from approximately zero to approximately four microseconds. This coil adjustment is the SUB PULSE POS (position) control located on the front panel of the SIF Coder. Figure 4-81 shows delay line 4L)L2 which is used to delay the entire code train by two microseconds. If SUB PULSE POS control 4L27 is adjusted for a minimum delay; the skubstitute pulse appearing in the code train occurs approximately two microseconds sooner than the normal, position of the pulse it replaces. Similarly, if the SUB PULSE POS control is set for maximum delay . then the substitute pulse appears approximately two microseconds later than the position of the pulse it replaces. The nominal limits of the SUB PULSE POS control on the front panel are marked -1.5, -1.0, -.5, 0, and +.5, +1. and +1.5.

(h) EMERGENCY CODE TRAIN CIRUCITS. - When the SIF Coder Function selector is in either the EMER or the EMER +X position, the coder produces a simulated emergency reply signal consisting of one pair of bracket pulses containing the selected information pulses, followed by three empty pairs of “bracket” pulses. This is accomplished by means of the emergency gate multivibrator 4V1 (figure 4-86) which permits the passage, 01 a total of four “ bracket” pulse pairs, and by the information pulse gating multivibrator 4A2Q8/Q9 which permits the coded information pulses to be inserted into the first pair of brackets but gates them out of the three pairs which follow.

1. EMERGENCY GATE: MULTIVIBRATOR 4V1. -The purpose of emergency gate multivibrator 4V1, shown in figure 4-86, is to allow one input trigger pulse to the SIF coder to produce four consecutive sets of bracket-type pulses. This is accomplished by generating a rectangular gate pulse which will allow three additional consecutive redrive pulses (from the 4L25 pick-off coil on the code train delay line) to serve as trigger pulses for the code train delay line driver circuits after the normal trigger pulse actuation. Emergency gate multivibrator 4V1 is a monostable multivibrator which, in its quiescent state, has one section (section ‘‘A”, pins 1. 2, and 3) conducting heavily due to the positive bias on the control grid. This bias is provided by voltage dropping resistors 4R1 and 4R2 and Emergency Code Adjust potentiometer 4R147. The right hand section of 4V1 (section "B" pins 6, 7, and 8) is cut off due to the -35 volt bias applied to its control grid through 4R9. Also at this time, diodes 4CR3. 4CR4, and 4CR5 are conducting due to the positive bias supplied through resistor 4R10.

At the end of each code pulse train a positive redrive pulse appears at the cathode of 4CR4, and passes through the conducting diode, but is normally short-circuited to ground through resistor 4R5 because 4CR3 is conducting. This prevents the redrive pulse from passing through 4CR5 to act as a trigger for trigger amplifier 4V2A.

When FUNCTION selector 4S1 is placed in the EMER or EMER +X position, a positive trigger pulse from driver blocking oscillator 4V3 is applied to the cathode of the conducting “A” section of 4V1. This cuts off 4V1A, and the plate of 4V1A produces a positive pulse which is fed through 4C3 and coupling diode 4CR1 to the grid of 4V1B, causing this section of the tube to conduct. When this occurs, a positive rectangular pulse

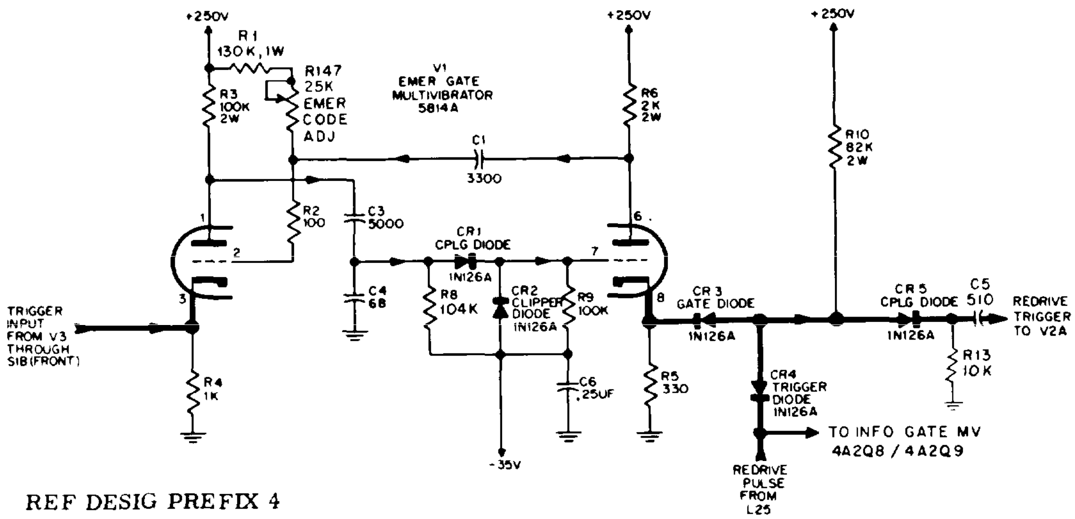


Figure 4-86. Emergency Gate Multivibrator, Simplified Schematic Diagram

appears at the cathode of 4V1B, diode 4CR3 is cut off, and the redrive pulses are not shorted out but are, allowed to pass on through 4CR4 and 4CR5 to trigger amplifier 4V2A.

The time constants of the emer - gency gate multi vibrator circuit are such that the width of the gate pulse generated is between approx- imately 70 and 90 microseconds. Since each SIF code pulse train is approximately 20 to 25 micro- seconds long. the width of the gate pulse is suffi- cient to allow three, but no more than three. con- secutive redrive pulses to substitute as trigger pulses for the code train delay line driver circuits. When the gate pulse comes to an end, the SIF Coder remains inactive until it is again activated by an external trigger pulse. When the prf of the trigger Input to 4V1 is excessive. capacitor 4C4 charges up, reverse-biasing 4CR1, and limiting the multi- vibrator action to approximately 1000 pps.

2. INFORMATION PULSE GATING MULTIVIBRATOR. - Information pulse gating multivibrator 4A2Q8/Q9 (located on the Inter- leaved Code Train Generator Subassembly A2) pro- duces a gate pulse which, when applied to the code train diodes, allows the information pulses to be placed in the first pair of bracket pulses and then blocks them so that they do not appear in the second, third, or fourth pair of pulses in the emergency train. Gating action is started by the trigger pulse from TRIGGER INPUT connector 4J1 (figure 4-87). This trigger pulse is fed through emitter follower 4A2Q7 and then limited to approximately 2 volts by the series string of diodes 4A2CR8, 4A2CR9. and 4A2CR10. The positive pulse is passed through diode 4A2CR11 to the base of 4A2Q8 in the bistable multivibrator, The multivibrator changes conductive states, producing the leading edge of a negative pulse at the collector of 4A2Q8. The trail- ing edge of this gate pulse is formed at the 4A2Q8 collector when the redrive pulse (also used to ini - tiate a second pair of “bracket” pulses) is applied to 4A2Q9, causing the multivibrator to return to its original state. The output pulse from the 4A2Q8 collector is coupled through 4A2C10 and 4A2R30 to output switch 4A2Q10. This stage is normally non- conducting and so its emitter voltage, which is applied to the code train switching diodes, is -35 volts, which back-biases the diodes into non-con- duction. When the gate pulse is applied to the base of 4A2Q10, however, it conducts and the emitter voltage rises to -4 volts. This voltage applied to the switching diodes permits diodes to conduct when a code pulse is also present.

(i) INTERLEAVED CODE OUTPUT CIRCUITS. - The SIF Coder can produce an output signal which contains a normal pulse train in com- bination with a second train slightly delayed from and interleaved with the first. This is accomplished by the circuits on Interleaved Code Train Generator Subassembly 4A2.

The normal SIF code train signal is picked up from the cede train blocking oscillator 4V5B cathode resistors 4R43 and 4R44 (figure 4-81) and is fed to emitter follower 4A2Q1 (figure 4-88). The output from the 4A2Q1 emitter is limited to approximately two volts by the series string of diodes 4A2CR1, 4A2CR2, and 4A2CR3. A fixed de- lay of 0. 3 microsecond is introduced by delay line 4A2DL1. The output of 4A2DL1 is coupled through 4A2C2 and diode 4A2CR5 to the variable time delay multivibrator 4A2Q3/Q4. The duration of the ‘(on” time of 4A2Q3/Q4 is controlled by the time con- stant of capacitor 4A2C3 and resistors 4A2R9 and 4A2R8. This time constant is controlled by vary- ing the INTERLEAVE control 4R148, in parallel with 4A2R8. This network is connected to +12 volts pro- vided by a separate power supply on the 4A2 sub- assembly. The recovery time for the multivibrator is shortened by multivibrator recovery time speedup stage 4A2Q2, which supplies a low resistance dis- charge path for capacitor 4A2C3 during the switch- back period. The output from 4A2Q4 is fed to the

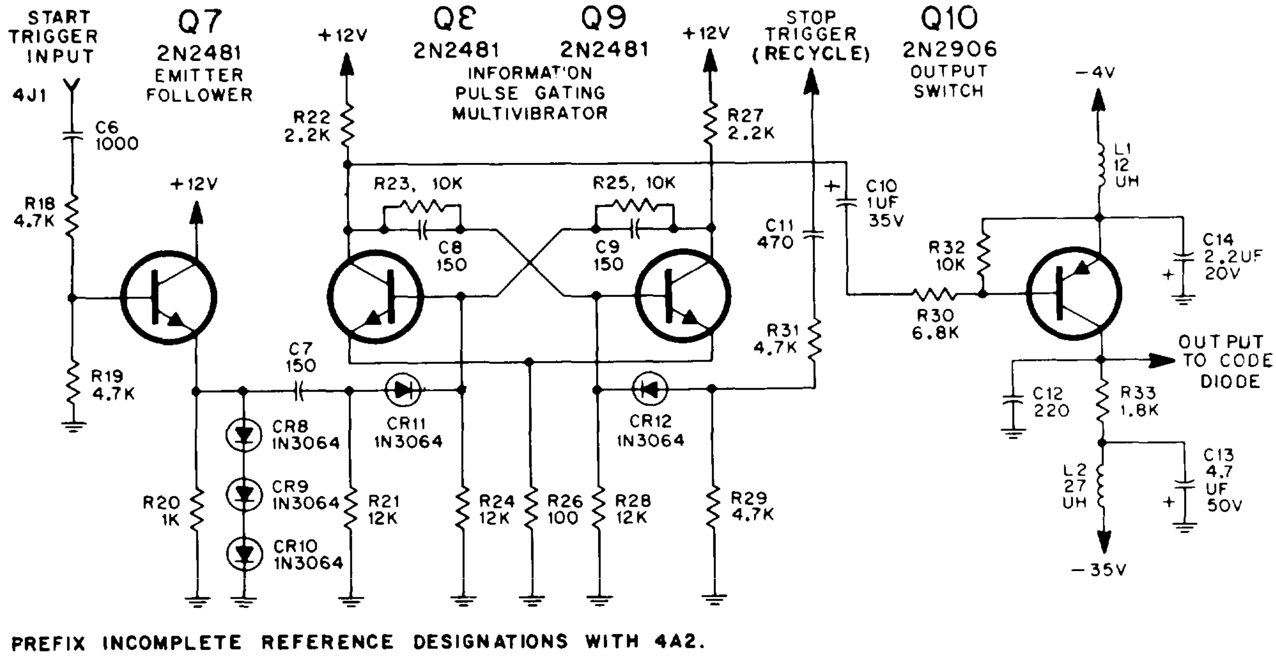


Figure 4-87. Information Pulse Gating Circuit, Simplified Schematic Diagram

isolating emitter follower 4A2Q5, from which it is applied to the differentiating network consisting of resistor 4A2R15 and capacitor 4A2C5. Diode 4A2CR7 passes only the negative-going trailing edge of the differentiated pulse (delayed by the length of the pulse) on to the output inverter 4A2Q6. The positive output signal from 4A2Q6 collector, consisting of a trigger for each pulse of the code train, is connected to the FUNCTION selector contacts, from where it is routed (when the selector is in the I position) to sub pulse trigger amplifier 4V4 (figure 4-85). The trigger pulses actuate the sub pulse blocking oscillator 4V5A in the same manner as normal substitute pulse triggers, and the " interleave" pulses are processed from here on in the same manner as the substitute pulses.

(5) TS-1253A PANEL-CHASSIS ASSEMBLY. - The circuit functions of the panel-chassis assembly are shown in the block diagram in figure 4-89 and are described below. Voltage readings are given in table 4-17 and resistance readings in table 4-18. Further details on power distribution in the assembly may be found in figure 5-59.

The ac power input (at 5J1 pins E and F) is automatically turned off in the event that an excessively high temperature causes thermostatic switch 5S1 to open (figure 5-59). Thermostatic switch 5S1 will close, restoring the input power, when temperatures within the equipment return to normal. The ac power to associated equipment (at 5J1 pins C and D) is also turned off by operation of the thermostatic switch 5S1. Removal of the panel-chassis assembly from its electrical equipment case causes interlock switch 5S2 to open, removing power from the TS-1253A unit. However, this interlock does not interrupt the ac power fed to associated equipment (at 5J1 pins C and D). Power is applied to the TS-1253A circuits through POWER switch 5S3. Line fuses 5F1 and 5F2 provide primary power overload protection, with neon bulbs 5DS2 and 5DS3 serving as blown fuse indicators. Primary power is applied to power transformer 5T1 through a series of interlock jumpers in each of the four plug-in units. The secondary windings of transformer 5T1 supply ac power to all rectifier and heater circuits in the TS-1253A. Power to the equipment case Mower is fed out (from a point after the fuses) through thermostatic switch 5S4 and through 5J1 pins A and B.

High voltage rectifier bridge 5CR1 supplies a positive 350 volt unregulated output. High voltage regulator control 5V3A adjusts the conduction of high voltage regulators 5VI and 5V2, enabling them to supply the required load current at a regulated positive output of 250 volts. Low voltage regulator 5V4 provides the reference voltage for operating high voltage regulator control 5V3A.

Low voltage bridge rectifier 5CR2 supplies a negative output voltage to low voltage regulator 5V4. Output voltage variations are amplified by error amplifier 5V6B, and applied through

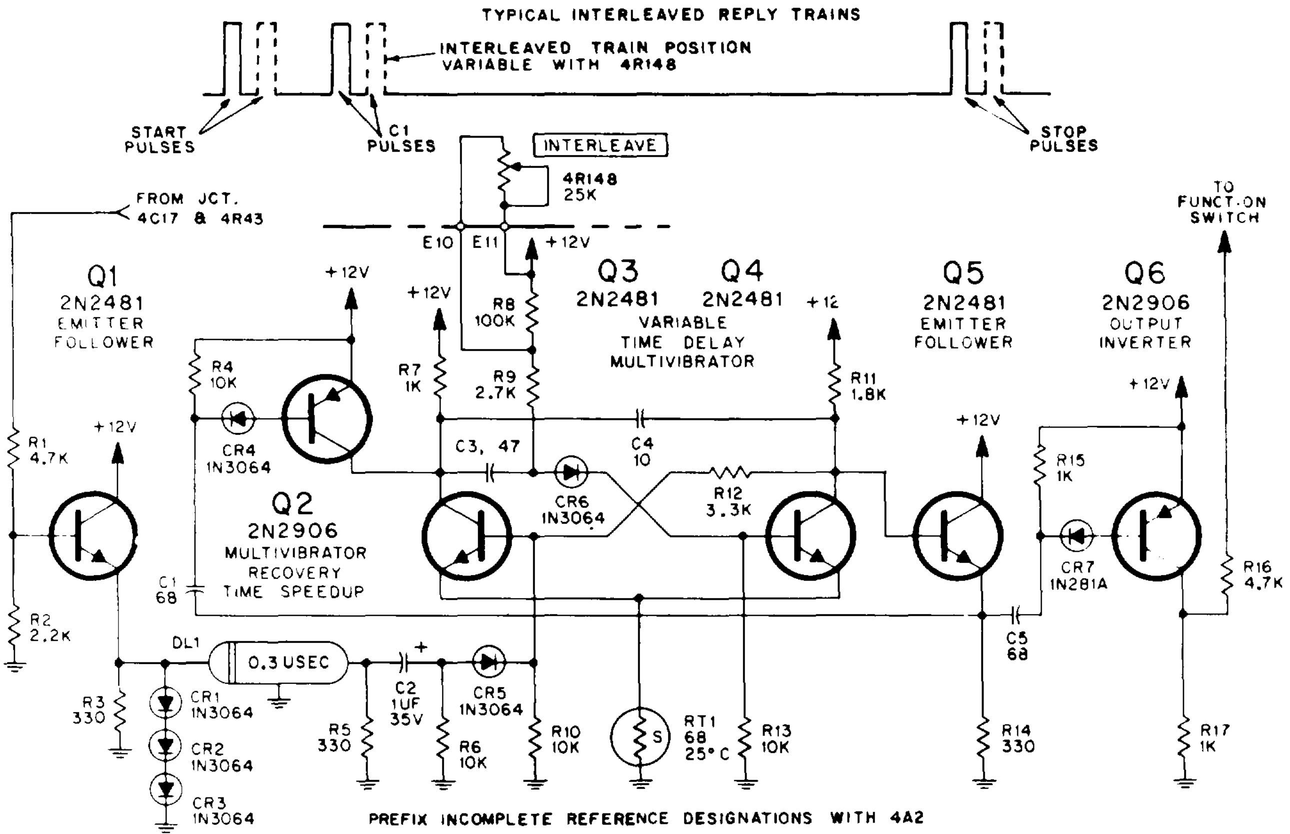


Figure 4-88. Interleave Circuit, Simplified Schematic Diagram

coupling diode 5V7 to low voltage regulator control 5V6A. Low voltage regulator control 5V6A adjusts the output of low voltage regulator 5V4 to provide a regulated negative 150-volt output. Reference diode 5V5 supplies a reference voltage for operation of error amplifier 5V6B and low voltage regulator control 5V6A. An input adjustment to error amplifier 5V6B permits setting the regulator output to the desired negative 150-volt value.

The regulated negative 150-volt supply is used as the source voltage for the regulator diode 5CR3 and regulator diode 5CR4. These two shunt regulator diodes provide regulated negative 4-volt output from regulator diode 5CR4 and regulated negative 35-volt output from regulator diode 5CR3.

(a) 115 VOLT INPUT CIRCUIT ANALYSIS. - The test set is designed to operate on 115-volt, 45 to 420 Hz power. Power is connected into the test set at connector 5J1 located in the TS-1253A panel-chassis assembly. Figure 4-89 is a block diagram of the panel-chassis assembly, showing the routing of ac power to power transformer 5TI Thermostat 5S1 is provided to open the input power circuit when the case temperature rises above 74°C (166°F). Thermostat 5S4 opens the blower circuit when the temperature drops below -29°C (-20 F). Interlock 5S2 opens the power transformer primary circuit when the equipment is removed from the cabinet, This interlock has a lock pin which can be set to hold the interlock closed when the equipment is being serviced out of the case. Fuses 5F1 and 5F2 are rated at 5 amperes, and their holders are equipped with neon lamps which glow when the fuses are open. Terminals 1 and 3 on power transformer 5T1 (figure 5-59) are normally connected to the ac line for operation between 102 and 127 volts. When the line voltage is below 102 volts, terminals 1 and 2 are used. When the line voltage is above 127 volts, terminals 1 and 4 are used.

(b) NEGATIVE 150-VOLT CIRCUIT ANALYSIS. - Figure 4-90 is a schematic diagram of the negative dc supply circuit. Regulated voltages of -150, -35, and -4 volts are provided by this circuit for use as bias voltages in the test set. Low voltage bridge rectifier 5CR2 is connected across the 260 volt ac winding of transformer 5T1 (figure 5-59). Silicon rectifiers are used in 5CR2 because they provide high efficiency, low internal voltage drop, low heat dissipation, and greater compactness than could be obtained with other types of rectifiers. The rectifier output is filtered by reactor 5L2 and capacitors 5C1B and 5C4A. Resistors 5R15, 5R16, 5R35, and 5R36 limit the initial surge of charging current through rectifier 5CR2 into 5C18 when power is first applied to the unit. These surge-limiting resistors are necessary when a capacitor-input filter is used in order to prevent damage to the rectifier from the initial charging surge into the capacitor.

The positive output voltage of the recitifer is fed to the plate 01 series low voltage

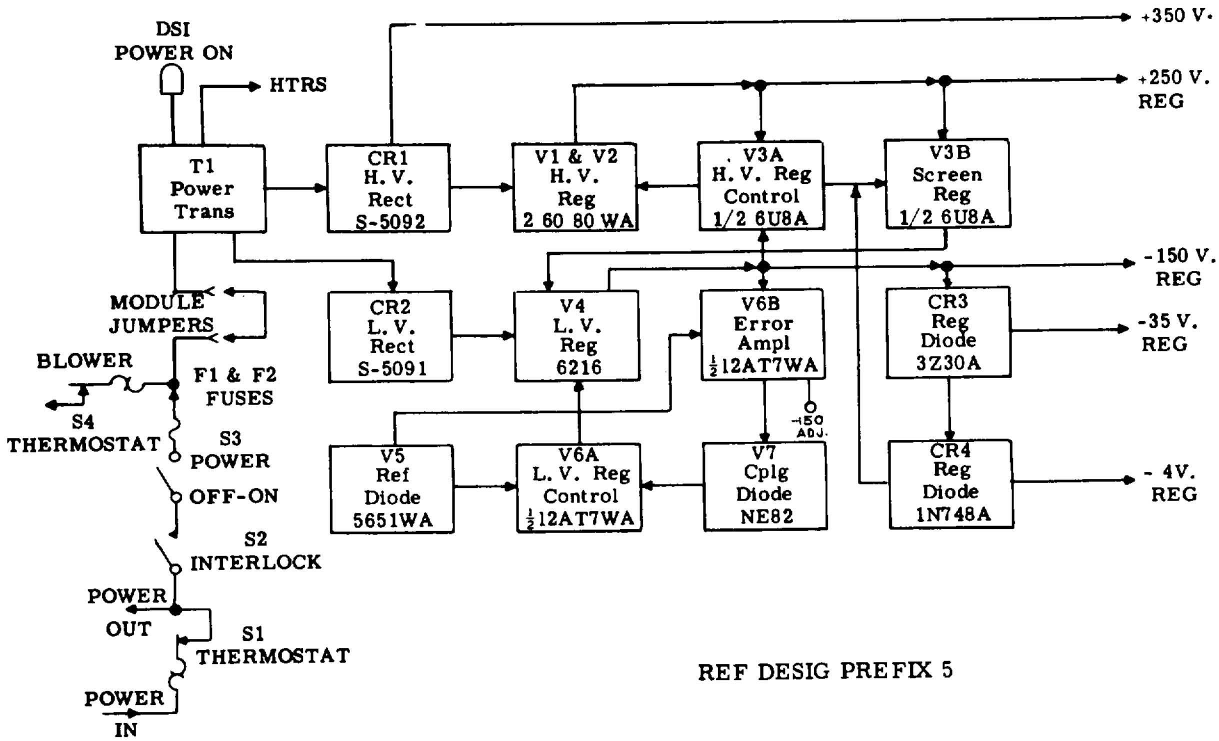


Figure 4-89. TS-1253A/UP Panel-Chassis Assembly, Block Diagram

regulator 5V4 and resistor 5R17 in parallel in the ground leg of the circuit. Under typical operating conditions, the voltage drop across 5V4 and 5R17 is in the vicinity of 100 volts. Tube 5V4 functions as a variable resistance which increases when the line voltage rises or the load current drops, and conversely decreases when the line voltage drops or the load current increases. This internal resistance and the resulting voltage drop of 5V4 is a function of its grid bias. The grid bias voltage is derived from a sample of the negative output of the voltage supply.

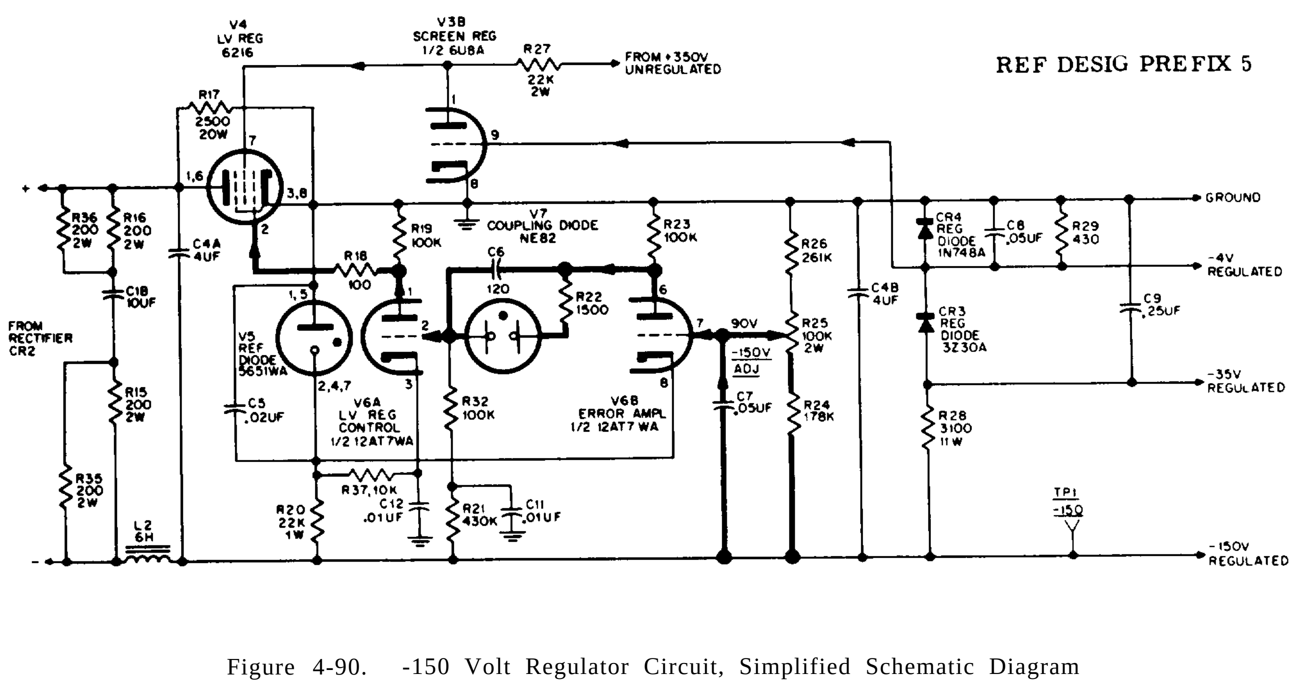


Figure 4-90. -150 Volt Regulator Circuit, Simplified Schematic Diagram

TABLE 4-17. TS-1253A CHASSIS VOLTAGE READINGS

TUBE NO.	TUBE PIN NUMBERS 1	2	3	4	5	6	7	8	9
5V1	+240	+340	+255	+240	+350	+255	FIL	0	--
5V2	+240	+340	+255	+240	+350	+255	FIL	0	--
5V3	+150	-13	-270	FIL	FIL	+240	0	0	-4
5V4	+115	-7.7	0	FIL	FIL	+115	+150	0	NC
5V5	0	-88	NC	88	0	NC	-88	--	--
5V6	-7.7	-90	-88	0	0	-28	-90	-88	FIL

NOTES: 1. Voltage measurelments taken with plug-in modules in place and connected

2. Measurements made with electronic multimeter.

TABLE 4-18. TS-1253A CHASSIS RESISTANCE READINGS

TUBE NO.	TUBE PIN NUMBERS 1	2	3	4	5	6	7	8	9
5V1	Over 100K*	Over 100K*	Over 100K*	Over 100K*	Over 100K*	Over 100K*	0	0	--
5V2	Over 100K*	Over 100K*	Over 100K*	Over 100K*	Over 100K*	Over 100K*	0	0	--
5V3	Over 100K*	220K	Over 100K*	0	0	Over 100K*	0	0	430Δ
5V4	18K	100K	0	0	0	18K	Over 100K*	0	NC
5V5	0	70K	NC	70K	0	NC	70K	--	--
5V6	100K	800K	240K	0	0	100K	170K*	70K	0

NOTES: 1. Resistance measurements taken with all plug-in units removed and disconnected.

2. * Indicates that resistance readings will depend upon electrolytic capacitor leakage and upon ohmmeter polarity and voltage.

3. Δ Indicates that diode in circuit will cause reading to vary.

All voltages used in the following discussion are referenced to chassis ground. The cathodes of error amplifier 5V6B and low voltage regulator control 5V6A are maintained at -85 volts with respect to chassis ground; therefore, any change in their grid voltage (with respect to their cathodes) will have the effect of changing the current through the tube. Note that the grid of 5V6A is connected to the plate of 5V6B through coupling gas diode 5V7. This is done to transfer the change of voltage at the plate of 5V6B to the grid of 5V6A and at the same time maintain the cathode-to-grid voltage of 5V6A at the proper level for linear operation of 5V6A.

Assume static conditions whereby the output of the supply is -150 volts. Voltages on the various tube elements will be approximately as given in table 4-17. Further assume that the load on the -150 volt supply has increased, which would have the effect of making the output voltage drop from -150 volts to a smaller negative value. Since the full voltage output of the regulated supply is divided across 5R24, 5R25, and 5R26, the voltage at the grid of 5V6B will change from about -90 volts to a smaller negative value, Since the cathode of this tube is held at a constant value by 5V5, current through 5V6B will increase, and the voltage drop across its plate resistor 5R23 will increase, thereby changing the plate output voltage to a greater negative value. This change in potential at the plate of 5V6B is transferred to the grid of 5V6A, through the coupling diode 5V7, and appears as a change to a greater negative value. Since the cathode of 5V6A is also held at a constant value by 5V5, plate current through this tube decreases, as does the voltage drop across its plate resistor 5R19. Therefore, the voltage at the plate of 5V6A changes to a smaller negative (more positive) value.

This change in voltage is coupled to the control grid of low voltage regulator 5V4 through resistor 5R18. This effectively decreases the 5V4 grid bias and lowers the internal resistance of the tube. The lowered resistance of 5V4 causes the supply voltage to the load to rise to the preset 150 volt level. At this time the grid voltage of 5V6B changes back to the original -90 volts and a condition of equilibrium exists once again. Potentiometer 5R25 is used to adjust for the nominal -150 volt output voltage.

Regulated bias potentials of -4 and -35 volts are provided by Zener regulator diodes. The characteristics of these diodes enable them to maintain a specific voltage drop under conditions of varying load current. Diode 5CR4 maintains a 4-volt drop, and 5CR3 maintains an additional drop of 31 volts.

(C) POSITIVE 250 VOLT CIRCUIT ANALYSIS. - Figure 4-91 is a schematic diagram of the +250 volt power supply regulator circuit. High voltage rectifier 5CR1 (figure 5-59) is a full-wave silicon bridge rectifier having general characteristics similar to 5CR2 in the negative low voltage supply. The input to the rectifier is nominally 400 volts ac. Reactor 5L1 and capacitor 5C1A filter the voltage from rectifier 5CR1.

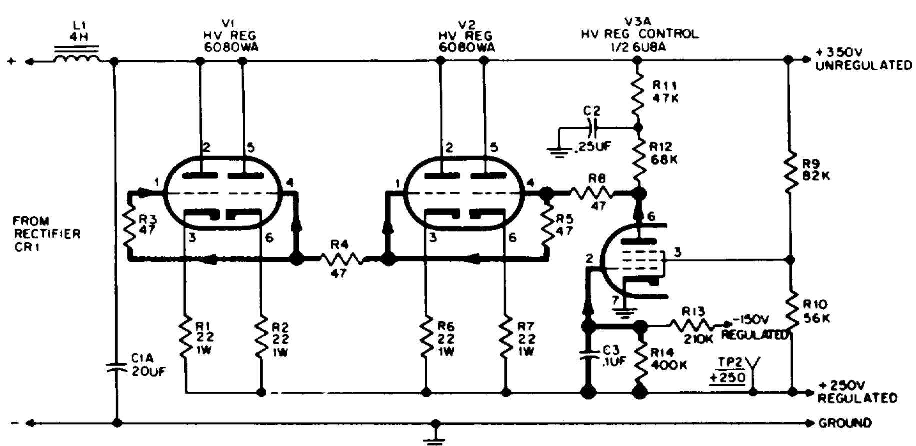
The unregulated output of the rectifier and filter is approximately +350 volts. Although connected to each of the four plug-in units in the TS-1253A/UP unit, this voltage is not used in these units. A source of regulated +250 volts is provided by high voltage regulators 5V1 and 5V2 and high voltage regulator control 5V3A. The load on the regulated +250 volt supply is effectively connected in series with parallel-connected tubes 5V1 and 5V2.

Operation of this circuit is as follows: Since the load current flows through tubes 5V1 and 5V2, a change in their internal resistance will change the voltage drop across them and thereby change the load voltage. The control of the internal resistance of these tubes is a function of the plate voltage of high voltage control 5V3A, and the plate voltage of 5V3A is a function of the control-grid-to-cathode potential of that tube. Note that the control grid of this tube is tied between regulated -150 volts and regulated +250 volts through resistors 5R13 and 5R14. This places the grid at a potential of approximately -15 volts dc, and allows the tube to act as an amplifier. If the +250 volt supply voltage tends to drop as a result of increased load current or decreased line voltage, the control grid becomes more negative, and the plate current of the tube decreases. This decrease in plate current through 5R11 and 5R12 causes the plate voltage of the tube to rise slightly toward the +350 volt supply. This upward shift of voltage is transferred to the paralleled grids of the high voltage regulators 5V1 and 5V2, reducing their plate resistance. A decrease in plate resistance of these tubes reduces the voltage drop across them, and the +250 volt regulated line potential rises again to the nominal value, Should the +250 volt line output tend to rise instead of drop, the action of the circuit is the reverse of that outlined above. Resistors 5R1 through 5R8 are connected in the grid and cathode leads of the parallel-connected high voltage regulators to prevent the occurrence of parasitic oscillations.

The +250 volt regulated supply does not have separate output voltage adjustment such as 5R25 in the -150 volt regulated supply, but instead is dependent upon the adjustment of the -150 volt supply. Bypass capacitors 5C2 and 5C3 remove high frequency ac components in the supply load circuit and thereby make the circuit responsive only to low frequency and dc changes in power supply output voltage.

(d) FILAMENT CIRCUIT ANALYSIS. - Power transformer 5T1 has three 6.3 volt and two 12.6 volt filament (tube heater) windings (figure 5-59). The two 12.6 volt windings are center tapped and are connected as two 6.3 volt windings in series. The power from these filament windings is distributed to the tubes in the power supply and to the four plug-in units in the TS-1253A/UP assembly through inter-unit connectors 5J2 through 5J5.

(e) DC CIRCUIT ANALYSIS. -Refer to figure 5-59 for the overall schematic diagram of the TS-1253A panel-chassis assembly. The five dc potentials of the power supply, -4, -35, -150, +250



REF DESIG PREFIX 5

Figure 4-91. +250 Volt Regulator Circuit, Simplified Schematic Diagram and +350 volts, are connected to each of the four plug-in units through the inter-unit connectors. Although available, the unregulated +350 volt potential is not used in any of the four units. The +250 volt terminals on the Display, Sweep and Intensity Mark. Crystal Mark and Sync, and the SIF Coder units are decoupled from the other units by separate filters consisting of 5R30 and 5C10A, 5C10B, and 5R31 and 5C10C, respectively, This decoupling is used to suppress interaction of pulse currents and voltages generated in the units.

(f) SIGNAL AND CONTROL CIRCUIT ANALYSIS, - Several signal and control circuits in the TS-1253A/UP assembly are connected via the unit connectors. These connections are shown in figure 4-92. The crystal markers from the Crystal Mark and Sync unit are fed to the Display unit for presentation on the screen of the CRT. The delayed and sweep trigger pulses are fed from the Sweep and Intensity Mark unit to the Display unit for display purposes when the DELAY STROBE SWEEP and STROBE TRIGGER switches on the front panel **of** the Sweep and Intensity Mark unit are momentarily depressed. One connection enables the HOR (horizontal) centering control, located on the front panel of the Display Unit, to control a dc voltage to the sweep circuits in the Sweep and Intensity Mark unit for the purpose of controlling the horizontal centering of the oscilloscope pattern. Marker gate pulses from the Sweep and Intensity Mark unit to the Crystal Mark and Sync unit, delayed and sweep trigger pulses from the Crystal Mark and Sync unit to the Sweep and Intensity Mark unit are also connected through the interunit connectors. The delayed and O trigger pulses from the Crystal Mark and Sync unit are also fed to the SIF Coder, but are not internally connected beyond this point. The delayed trigger pulses from the Crystal Mark and Sync unit are fed to terminal J on 5J1 for application to the Interrogation Coder.

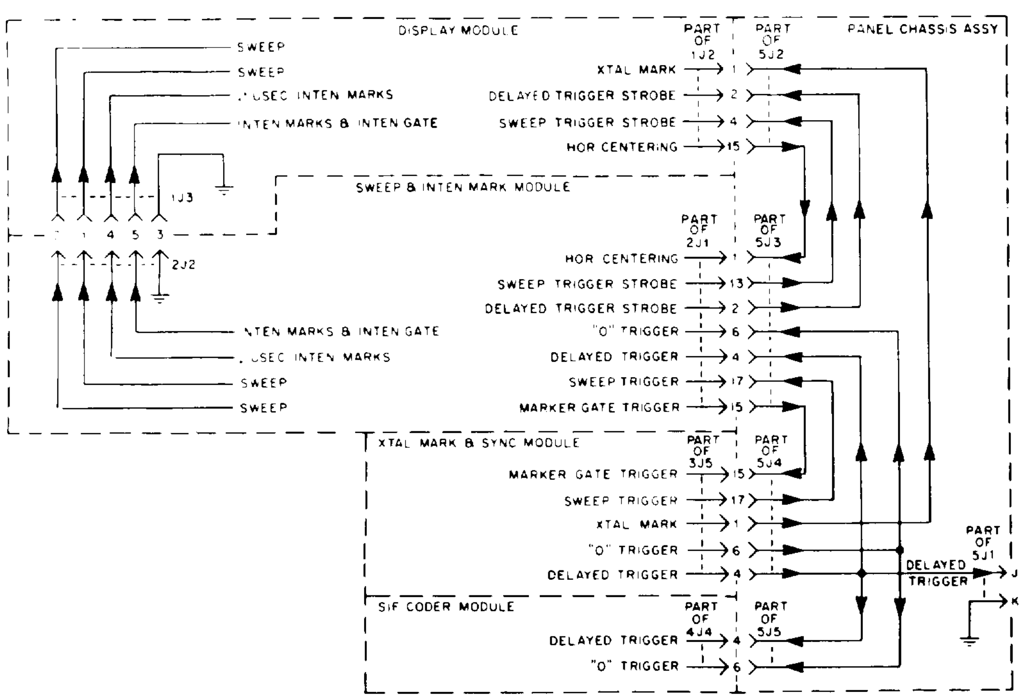


Figure 4-92. TS-1253A/UP Interunit Signal and Control Circuit, Simplified Schematic Diagram

TABLE 4-19. AN/UPM-98A SERVICE ADJUSTMENTS

NAME	REF. DESIG.	LOCATION	FUNCTION
		DISPLAY UNIT	
0.1 volts/ In Trimmer	1C1	".1" contacts of VOLTS/IN switch 1S2	Input attenuator equalizing
20 volts/ In Padder	1C5	"20" contacts of VOLTS/IN switch 1S2	Input attenuator equalizing
20 volts/ In Trimmer	1C8	Across 1C6 in "20" attenuator network	Input attenuator equalizing
0.2 volts/ In Padder	1C9	To ground from 1S2 ".2" contact	Input attenuator equalizing
0.2 volts/ In Trimmer	1C12	".2" contacts of 1S2	Input attenuator equalizing
10 volts/ In Padder	1C13	To ground from 1S2 "10" contact	Input attenuator equalizing
10 volts/ In Trimmer	1C16	Across 1C14 in "10" attenuator network	Input attenuator equalizing
0.5 volts/ In Padder	1C17	To ground from 1S2 " 5" contact	Input attenuator equalizing
0.5 volts/ In Trimmer	1C20	Across 1C18 in ".5" attenuator network	Input attenuator equalizing
2 volts/ In Padder	1C21	To ground from 1S2 "2" contact	Input attenuator equalizing
2 volts/ In Trimmer	1C24	Across 1C30 in "2" attenuator network	Input attenuator equalizing
1 volt/ In Padder	1C25	To ground from 1S2 "1" contact	Input attenuator equalizing
1 volt/ In Trimmer	1C28	Across 1C26 in "1" attenuator network	Input attenuator equalizing
5 volts/ In Padder	1C29	To ground from 1S2 "5" contact	Input attenuator equalizing
5 volts/ In Trimmer	1C32	Across 1C22 in "5" attenuator network	Input attenuator equalizing
Phase Adjust	1C34	Grid of Video Phase Inverter 1V1A	Adjusts phase relationship at the input to the video amplifier
Freq. Adjust	1C36	Between plate of 1V4B and grid of 1V2A	Adjusts frequency response by means of feed back to video drivers
0.1 volts/ In Padder	1C61	To ground from 1S2 ".1" contact	Input attenuator equalizing
Gain Calibrate	1R40	In series with VIDEO SENS control 1R40	Adjusts video driver gain
Anode Set	1R70	Primary of 1T1	Adjusts CRT anode voltage

TABLE 4-19. AN/UPM-98A SERVICE ADJUSTMENTS (Continued)

NAME	REF. DESIG.	LOCATION	FUNCTION
		SWEEP AND INTEN. MARK UNIT	
1 mHz Freq. Adjust	2L2	Grid of 1 mHz Osc. 2V7B	Adjusts frequency of 1 mHz Osc. 2V7B
Sweep Amplitude	2R33	Cathode of 2V2B	Adjusts feedback from 2V2B to sweep gate MV 2V3 to vary length of horizontal CRT trace
Osc. Feed-back Adj.	2R50	Cathode of 1 mHz Osc. 2V7B	Adjusts cathode feedback to 1 mHz Osc. 2V7B
5 usec Adjust	2R73	Grid of 2V11A	Varies bias on grid of 2V11A to adjust 5 usec countdown
50 usec Adjust	2R86	Grid of 2V11B	Adjusts bias on grid of 2V11B
10 mHz Adjust	2T3	Grid of 2V10A	Adjusts tuned circuit in grid of 2V10A
		XTAL MARK AND SYNC UNIT	
Sweep Delay Adj.	3C44	"1-11" contact of Sweep Delay switch 3S3	Sets minimum sweep time delay for positions 3-5 of sweep delay range
Sweep Delay Adj.	3C58	"11-21" contact of 3S3	Same as above for "11-21" range
PRF Adjust	3R40	In series with PRF control 3R38A	Adjust range of PRF count-down circuit
		SIF CODER	
Delay line Pickoff Coils	4L10-4L26	On 4DL3-7	Adjust delay at each pick-off point
Sub Pulse Ampl.	4R32	Cathode of 4V5A	Adjusts substitute pulse height
Width Adj.	4R47	In series with Pulse Width control 4R49	Sets range of code pulse width adjustment
Sub Pulse Pos. Adj.	4R141	Cathode of Sub Pulse Ampl 4V2B	Sets range of Sub Pulse position adjustment
Emergency Code Adj.	4R147	Grid of Emer. Gate MV 4V1	Adjusts gate length
		TS- 1253A CHASSIS	
-150 V Adjust	5R25	Grid of Error Ampl. 5V6B	Adjusts voltage on 5V6B grid to set nominal output voltage

TABLE 4-19. AN/UPM-98A SERVICE ADJUSTMENTS (Continued)

NAME	REF. DESIG.	LOCATION	FUNCTION
		SM - 197A CHASSIS	
+300 V Adjust	8R35	Grid of Reg. Ampl. 8V5	Adjusts voltage on 8V5 grid to set nominal output voltage
		CAL - CONTROL UNIT	
Shape Adj.	9C26	Lug No. 3 of 9S2A	Compensates for test lead capacitance
ALC Adj.	9R3	Input Integrator diode 9CR1 Cathode	Sets ALC input threshold
Pulse Width Adj.	9A4R25	Base of Pulse Width Stretcher 9A4Q7	Adjust pulse width
Mode 4 Ampl. Adj.	9A4R27	Base of Output Emitter Follower 9A4Q8	Sets Mode 4 decode output level
PRF 0-500	9R30	Plate of Cal. Ampl. 9V4A	Adjusts voltage to meter for calibration of 0-500 PRF scale
PRF 0-5000	9R31	Plate of Cal. Ampl. 9V4A	Adjusts voltage to meter for calibration of 0-5000 PRF scale
CAL Adjust	9R36	Meter Select switch 9S3	Supplies meter calibrating voltage
WM Adjust	9R61	Plate of 9V7B	Adjusts gain of wave meter cathode follower 9V7B
		INTERROGATION CODER	
Clock Timing Adj.	12A1C8	Across 12A1L1 in collector of 12A1Q6	Tunes clock oscillator
	12A5C5	Collector of Osc. 12A5Q1	Tunes Osc. Transformer 12A5T1
	12A5C9	Collector of Buffer 12A5Q2	Tunes buffer transformer 12A5T2
	12A5C12	Collector of 1st Gated Ampl. 12A5Q3	Tunes amplifier transformer 12A5T3
	12A5C19	Collector of 2nd Gated Ampl. 12A5Q4	Series-tunes 12A5L2
	12A5C22	In series with 12A5L4	Series-tunes 12A5L4
	12A5C23	In series with 12A4L3	Adjusts coupling
	12A5C24	From 12A5L5 to ground	Series-tunes 12A5L5
	12A5C25	Between 12A5L4 and 12A5L6	Series-tunes 12A5L6

TABLE 4-19. AN/UPM-98A SERVICE ADJUSTMENTS (Continued)

NAME	REF. DESIG.	LOCATION	FUNCTION
		INTERROGATION CODER (Cont.)	
	12A5C26	12A5L14 to ground	Series-tunes 12A5L14
	12A5C28	12A5T6 primary to ground	Series-tunes 12A5T6 primary
	12A5C29	12A5T6 secondary to ground	Series-tunes 12A5T6 secondary
	12A5C32	12A5V2 cathode to 12A5L14	Series-tunes 12A5L14
	12A5C33	12A5V2 cathode to ground	Tunes 12A5V2 cathode
	12A5Z1	12A5V2 plate cavity	Tunes RF ampl. plate circuit
ISLS 2 usec Adj.	12A6R11	Collector of 12A6Q3	Adjusts length of ISLS Delay MV pulse
40 usec Adj.	12A6R21	Collector of 12A6Q6/Q7	Adjusts length of 40 usec delay MV pulse
Tag Ampl. Adj.	12A6R69	Emitter of 12A6Q22	Adjusts amplitude of reset pulses
Reset Tag Delay Adj.	12A6R76	Collector of 12A6Q23/Q24	Adjusts length of delay MV pulse
ISLS Balance Adj.	12R9	In series with ISLS Level Control 12R10A	Adjusts range ISLS level control
+25V Adj.	12R24	Base of 12Q2	Adjusts voltage on 12Q2 to set nominal output voltage
+12V Adj.	12R32	Base of 12Q3	Adjusts voltage on 12Q3 to set nominal output voltage
		20 MHZ GATED OSCILLATOR 8A10 (AN/UPM-98B, AN/&)M-98C ONLY)	
	8A10L1	Q8 Drain	20 mHz osc. tuning
	8A10L2	Q5 Drain	Gated amp. tuning
	8A10L5	Q6 Collector	Driver ampl tuning
	8A10L8	Q7 Collector	Output ampl tuning
	8A10C16	Output network	Output tuning

TABLE 4-20. TEST POINTS

NUMBER	LOCATION	FUNCTION MONITORED
	SWEEP AND INTENSITY MARK UNIT	
2TP1 (2J3)	2P1 pin 10	+250 V
2TP2 (2J4)	2P1 pin 20	-35 V
2TP3 (2J5)	2P1 pin 8	-150 V
	XTAL MARK AND SYNC UNIT	
3TP1 (3J6)	3P1 pin 10	+250 V
3TP2 (3J7)	3P4 pin 8	-150 V
	SIF CODER	
4TP1 (4J5)	4P4 pin 10	+250 V
4TP2 (4J6)	4P4 pin 20	-35 V
4TP3 (4J7)	4P4 pin 8	-150 V
4TP4 (4J8)	4P4 pin 3	-4 V
	UPPER CHASSIS	
5TP1 (5J6)	Junction 5L2, 5C4A	-150 V
5TP2 (5J7)	Junction 5V2 cathode resistors 5R6, 5R7	+250 V
	LOWER CHASSIS	
8TP1 (8J27)	Junction 8R20, 8C16	-30 V
8TP2 (8J26)	Junction 8R21, 8R22	-5 V
8TP3 (8J24)	Junction 8V4 cathode resistors 8R30, 8R27	+300 V
8TP4 (8J25)	Junction 8R41, 8J23-5	+105 V
	20 MHZ GATED OSCILLATOR (AN/UPM-98B, AN/UPM-98C)	
8A10TP1	Emitter of 8A10Q4	Sync
8A10TP2	Emitter of 8A10Q9	Oscillator output (TEST)

TABLE 4-20. TEST POINTS (Cont.)

NUMBER	LOCATION	FUNCTION MONITORED
	CAL-CONTROL UNIT	
9TP1 (9J5)	9P1 pin 3	+300 V
9TP2 (9J6)	9P1 pin 5	+105 V
9TP3 (9J7)	9P1 pin 10	-30 V
9TP4 (9J8)	9P1 pin 12	-5 V
12A1TP1	Collector of clock output Amplifier 12A1Q9	Clock pulses
12A1TP2	Emitter of Sub Pulse Blocking Oscillator 12A1Q13	Substitute pulses
12A1TP3	Base of Recycle Trigger Amplifier 12A1Q2	Recycle triggers
12A1TP4	Emitter of Line Drive Blocking Oscillator 12A1Q3	Line drive
12A1TP5	Collector of Sub Pulse Shaper 12A1Q16	Substitute pulses
12A2TP1	Termination of Delay Line 12A2DL1	Delay line output
12A2TP2	Input to Delay Line 12A2DL1	Delay line drive
12A6TP1	Collector of Reset Tag Binary Generator 12A6Q19	Reset tag pulses
12A6TP2	Collector of 40 μsec Delay MV 12A6Q8	40 μsec delayed trigger
12A6TP3	Collector of 12A6Q12/12A6Q13	Code trigger gate
12A6TP4	Collector of 12A6Q5	ISLS delayed trigger
12A6TP5	Cathode of 12A6CR1 and 12A6CR2	Code output trigger
12TP1	Conn. 12J2 pin 10	-30 volts
12TP2	Anode of 12VR4	-12 volts
12TP3	Emitter of 12Q3	+12 volts
12TP4	Emitter of 12Q1	+25 volts
12TP5	Conn. 12J2 pin 3	+300 volts

4-6. DIRECT-READING WAVEMETER (AN/UPM-98B, AN/UPM-98C ONLY)

a. GENERAL, The wavemeter frequency indicator used in the Radar Test Set AN/UPM–98B, and AN/UPM–98C includes features which make it more accurate and more simple to operate. Inherent tracking discrepancies between the cavity tuning and the readout system are corrected by means of spot-calibration of the digital indicator at any point in the frequency range which is a multiple of 20 mHz. The calibrating signal is supplied by a special 20 mHz Gated Oscillator 8A10. A unique mechanical system permits correcting the indicator dials exactly to display the exact frequency.

b. 20-MHZ GATED OSCILLATOR 8A10. See figure 5-64A for a schematic diagram of the 20-mHz Gated Oscillator. This circuit may be divided for discussion into four main functional sections; the oscillator, the gating section, the amplifier section, and the gate pulse generating section. The transistor oscillator Q8 is basically a crystal-controlled Colpitts circuit using a Field Effect Transistor (FET) of the Insulated Gate (IGFET) type (sometimes called MOSFET for Metta Oxide Semiconductor FE T). This type of transistor has an extremely low gate-to-drain leakage and makes a very stable oscillator controlled by crystal Y1, connected to the gate (pin 3) of Q8. Inductor L1 in the drain line of Q8 is tuned to the same frequency. A sample of the oscillator signal is fed out through Q9 and TP2 for monitoring. The rest of the signal is applied to one of the two gates (inputs) of dual-gate IGFET gated amplifier Q5. This amplifier serves as an AND gate, requiring a second input signal for the oscillator signal to pass.

The second signal is the gating pulse signal produced by PRF Generator Multivibrator Q1/Q2. This pulse signal is shaped by the pulse shaper Q3 and fed through isolating emitter follower Q4 to the gate (pin 2) of Q5. The gated output of Q5 (consisting of pulses approximately I0 microseconds wide at a prf of approximately 1500 pps) is amplified by driver amplifier Q6 and output amplifier Q7, then fed to the wavemeter. At the wavemeter, the 20-mHz signal is passed through the impedance matching network and harmonic generating varactor diode CR10. The resulting harmonica (multiples of 20 mHz) are injected into the wavemeter cavity.

c. DIRECT READOUT FREQUENCY INDICATOR. The mechanism used to drive the wavemeter tuning shaft, and at the same time the direct-reading digital indicator, is specially designed to permit the correction of small tracking errors between cavity tuning and frequency indication. This is done by coupling the indicator drive system to the tuning shaft by means of a metallic tape wound on a spring-loaded drum. This tape normally turns the tape storage drum (which drives the digital indicator) an amount determined by the rotation of the take-up drum fastened to the tuning shaft. However, a tine control of the amount of tape passed (and thus the rotation of the last indicator dial) can be effected by pulling aside a small amount of the tape between the two drums. This is done by varying the position of a small idler wheel over which the tape passes. The error correction is made using a signal having a known frequency, adjusting the wavemeter cavity resonance to match, and then using the CAL knob to make the digital readout agree precisely. Harmonics of the 20-mHz Gated Oscillator fundamental frequency are provided over the entire range of the wavemeter, making it possible to spot-calibrate the digital indicator at any multiple of 20 mHz within the range.

d. TROUBLESHOOTING 20-MHZ GATED OSCILLATOR. If no wavemeter calibrating signal appears to be present, make the following checks to locate the trouble.

Step 1. Using an oscilloscope (or the Display until) check for a signal at plug P56 at the wavemeter, If signal is present, the trouble probably is in the wavemeter probe. Replace the cap and probe assembly.

Step 2. If no signal is present at P56, check at 8A10J1 for a signal. If signal is present, trouble is in the cable assembly,

Step 3. If no signal is present at 8AI0J1, check at TP1 and TP2 for signals. If both are present, the trouble is in the gate and amplifier stages. Trace backward to locate the point at which signal appears. If no signal appears until the input of Q5, transistor Q5 is probably faulty and should be replaced.

CAUTION

Transistors Q6 and Q8 are of the MOSFET type. The metal oxide gate insulation of these transistors is very delicate and is susceptible to damage even from normal static electrical charges on the worker's body and equipment. When reinstalling a MOSFET transistor, it is advisable to take precautions to leak off such static charges when possible and to avoid touching the gate lead to ground before the substrate and source leads make contact.

Step 4. If there is no signal at TP2, transistor Q8 is probably bad and should be replaced.

Step 5. If there is no signal at TP1, trace backward to locate the point at which signal appears. If there is none, check transistors Ql, Q2, Q3, and Q4 and associated parts to locate the malfunction.

Step 6. If there is no signal at either TP1 or TP2, it is likely that one of the operating voltages is missing. Check terminal El for +25 volts and E2 for +12 volts.

SECTION 5

GENERAL SUPPORT AND DEPOT MAINTENANCE

5-1. FAILURE , AND PERFORMANCE AND OPERATIONAL REPORTS.

Failure Reports and Performance and Operational Reports are to be accomplished for designated equipments to the extent required by existing directives. All failures shall be reported for those equipments requiring Failure Reports.

5-2. PREVENTIVE MAINTENANCE.

a. MAINTENANCE STANDARDS. - Performance criteria to to used as maintenance standards are given with the various minimum performance tests in this section. When the equipment has normal indications in all the performance tests, it meets these standards. If a test results in an abnormal indication, perform the appropriate trouble -analysis procedures (Section 4) to locate the cause of the malfunction. When the abnormal indication has been corrected to meet these standards, the equipment is ready for return to service.

(1) TEST EQUIPMENT REQUIRED. - Many internal adjustments of the Radar Test Set AN/UPM-98A can be accomplished by using the oscilloscope, trigger generator, pulse counter and other facilities of the radar test set itself, if the required section is operating properly. Otherwise, external test equipment must be used. Separate test equipment is also required to make some of the internal adjustments. Table 1-7 lists all test equipment required for the various maintenance procedures in this section.

(2) TEST SETUP. - Separate test setup procedures and diagrams are given as required for each of the main functional sections.

b. INSPECTION. - Instructions are provided for examination of the assemblies, subassemblies, and parts for damage, wear, deterioration, and defects. Carefully make a visual examination of the chassis of all the plug-in units and major components. Table 5-1 provides guide lines for visual and mechanical examination of electrical and electronic parts. Final determination of whether or not the part is properly functioning can be made only by an operational check of the assembly or the complete equipment.

When inspecting and testing the unite of Radar Test Set AN/UPM-98A, avoid moving the wiring unless absolutely necessary. Any excessive change in position of the wiring may cause undesirable cross-talk between the various circuits of the equipment. Many circuits in the e equipment are affected by than es in tube constants, therefore, unnecessary interchanging of tubes should be avoided. If tubes are changed unnecessarily, extensive readjustment and recalibration of the test set may be required

Guidelines for inspection of mechanical parts and assemblies subject to wear and damage are given in following paragraphs.

(1) RADAR TEST SET TS-1253A/UP. - After visual examination of the electrical and electronic parts on each chassis in accordance with instructions in table 5-1, proceed with the examination of mechanical parts and assemblies as described in following subparagraphs.

(a) DISPLAY UNIT.

Step 1. Check that VIDEO SENS control shaft protruding through the attenuator assembly is firmly fastened by setscrews to the flexible extension shaft inside the unit attaching to Video Sens potentiometer 1R41. Check that the flexible shaft is in good condition.

Step 2. Check that the stop spring on the 1R41 mounting bracket engages the groove on the stop cam on the flexible shaft when the VIDEO SENS knob is in the fully cw position (cAL).

Step 3. Check that tube retainers of 1V5 and 1V6 are held firmly in place by their springs.

Step 4. Check that the five wire connections to contacts on the CRT neck are well made.

(b) SWEEP AND INTENSITY MARK UNIT. - There are no mechanical parts or assemblies on this unit which are subject to wear; therefore, a careful check of general condition of the chassis will suffice.

(c) CRYSTAL MARK AND SYNC UNIT.

Step 1. Check that controls of delay line assemblies 3Z1 and 3Z2 turn without excessive binding through entire range of pickoff coil travel.

Step 2. Check that stop screws with fiber bushings in the slot on the delay line assemblies are not bent or damaged. Check that wires at ends of delay lines and on pickoff coils are not broken.

Step 3. Check that U-shaped wire clips joining variable resistor shafts to associated switch shafts are

Table 5-1. Visual and Mechanical Inspection of Electronic Parts

NO.	PART	METHOD OF INSPECTION
1	Resistors, Composition	Replace if discolored, cracked or burned
2	Resistors, Variable	Replace if shaft is excessively loose, stops not operative, or binding occurs when turned.
3	Resistors, Wirewound	Replace if burned and/or discolored
4	Capacitors, Paper Dielectric	Replace if wire leads loose or body cracked
5	Capacitors, Mica Dielectric	Replace if leads loose or body cracked
6	Capacitors, Electrolytic	Replace if there is evidence of electrolytic leakage
7	Transformers	Replace if leads loose or mechanically damaged
8	Coils	Replace if there is evidence of coil being overheated
9	Delay Lines	Replace if leads are broken or excessively loose
10	Switches	Replace if any contacts are broken or switch cannot be set to all positions without excessive binding. Also, replace if detented positions do not lock in properly.
11	Connectors	Replace if any contacts are broken or insulator body is cracked or damaged
12	Electrical Wiring	Replace or repair if insulation is broken or wire is too short to reach connection without tension
13	Tube Sockets	Replace or repair if contacts are broken or insulator body cracked or burned

firmly in place and not distorted.

Step 4. Check that retainers on sockets for crystals 3Y1 and 3Y2 are not bent and that the crystals are retained properly.

(d) SIF CODER.

Step 1. Check that SUB PULSE POS control can be turned through its range without binding.

Step 2. Check that the knob seats firmly in the five detent positions (-. 7, -.2, 0, +.2, and +.7 microseconds.)

Step 3. Check that the stop screws with fiber washers in the slot of delay line assembly 4Z1 are not bent and that they operate properly.

Step 4. Check that pickoff coil locknuts on delay lines 4DL3 through 4DL7 are tight. Do not move any of the coils; if they are moved, complicated readjustment will be required to restore the test set to proper operation.

(2) CODER SIMULATOR SM-197A/UPM-98.- After visual examination of the electrical and electronic parts on the chassis in accordance with instruct ions in table 5-2, proceed with detailed examination of assemblies and subassemblies as described in following subparagraphs.

(a) RF OSCILLATOR ASSEMBLY 8A1. - The proper operation of the rf oscillator depends upon the presence of modulation pulses from modulator tube 12V3 at the plate of rf oscillator tube 8V2. The presence of modulation pulses can be checked directly at 8V2 by removing the screw cap at rear of oscillator housing and connecting the oscilloscope probe to the plate of 8v2. For this test, set oscilloscope sensitivity to 20 volts per inch and use Test Lead MX-268 l/UP (video probe) with attenuation switch in 10:1 position. The amplitude of the modulation pulse is variable up to about 175 volts, depending upon the ALC setting. If a modulation pulse is present at the plate, and 8V2 filament is heated by 6.3 vat, the absence of rf oscillator output can be caused by failure of parts and contacts within the rf oscillator assembly.

After disassembly of the rf oscillator, inspect every part for excessive wear or damage. Refer to table 5-2 for the method of inspection and allowable limits.

(b) ALC/ATTENUATOR ASSEMBLY 8A2. -If the rf output level at SG OUT connector 8J6 is incorrect with respect to the setting of the output ATTENUATION dial, the trouble may be traced to a malfunction in the automatic level control circuitry. This circuitry includes ALC tube 8V1 inside ALC/ Attenuator Assembly, and tubes 9V1 through 9V3, in the Cal-Control unit. Missing or erratic output at SC OUT connector also can be caused by worn contacts or other mechanical failures in the ALC/Attenuator Assembly. Table 5-3 provides inspection procedures and allowable limits.

(c) WAVEMETER ASSEMBLY 8A3. - The wavemeter is a precisely calibrated device and

Table 5-2. Inspection of RF Oscillator 8Al Parts

IDENT. NO. (Figure 5-5)	PART	METHOD OF INSPECTION
4	Insulating Screws	Replace if out of shape or threads are stripped.
8	Insulator Ring	Replace if broken or distorted.
9	Terminal Stud	Replace if bent or insulation broken.
10	Contact Ring	If operation intermittent because of lack of spring action in fingers, carefully increase diameter of contact finger ring by gently bending each contact finger. Replace entire contact ring if some fingers are broken or contact surface is corroded.
11	Contact Ring	Same as item 10 above.
12	Tuning Rods	Replace if rods are bent or contact surface is corroded.
13	Tuning Rods	Same as item 12 above.
14	Cavity	If contact surfaces are slightly corroded or scratched, restore surface by polishing with a piece of soft leather. Remove deeper blemishes by re-honing, followed up by new silver plating. Otherwise, replace entire cavity.
19	Filter Body	Replace if filter fits into cavity extremely loosely and causes rf leakage.
20	Wire	Replace if too short to reach terminal stud (item 9) without tension.
24	Coupling Assembly	Replace if shorted or internal resistor 8R3 measures other than 47 ohms ±10%.
25	Cable Assembly 8W7	Inspect for loose rf cable fit into termination. Tighten clamp nut. Check for short between center and outer conductors.
27	Terminal Stud	Replace if bent or broken.
28	Wire	Replace if too short.
29	Contact Rod	Replace if bent or damaged.
33	Contact Spring	Replace if out of shape, worn, or corroded.
37	Lead Screw	Replace if, with backlash nut properly adjusted, torque varies or shaft starts binding in spots.
39	Backlash Nut	Similar to item 37 above.
42	Tuning Shaft	Similar to item 37 above.
43	Ball Bearings	Replace in the inner ring does not turn freely or there is evidence of side play.
46	Filter Body	Same as item 19 above.
55	Packing Gland	Replace if out of shape or worn.

is constructed for long and reliable service. However, if, after prolonged use or storage in adverse conditions, a lack of sharpness in tuning is experienced, it may be caused by low "Q' in the wavemeter cavity as a result of dirt or corrosion. Changes in calibration may also occur due to mechanical wear or damage. Low amplitude of wavemeter output which appears without loss of tuning sharpness is usually due to a faulty crystal 8CR1 or defective wavemeter integrator circuitry associated with 9V6 and 9V7.

If the attenuator shaft cannot be turned through its range without exceeding the specified torque or if the shaft starts binding in certain spots, with proper setting of the backlash nut, the lead screw and/or the threaded tuning shaft must be replaced. Check other parts of the wavemeter for excessive wear or mechanical damage.

(d) DEMODULATOR ASSEMBLY 8A4. - The demodulator assembly consists basically of the demodulator tube 8v3 encased in a suitable mounting and connected through a small capacitor to the LP IN connector on the front panel. An attenuation network of a rather complex design is also included in the assembly so that the demodulator tube can be fed a signal at a reduced level from the HP IN connector. The attenuation network is assembled in a very

Table 5-3. Inspection of ALC/Attenuator 8A2 Parts

IDENT NO. (Figure 5-6)	PART	METHOD OF INSPECTION
5	Tube Socket	Replace if insulator is cracked or damaged.
8	Contact Ring	If contact fingers do not fit tightly around electron tube, bend fingers gently to tighten. Replace contact ring if fingers are broken or excessively corroded,
10	Cable Assembly	Inspect for loose rf cable fit into termination. Tighten clamp nut. Check for short between center and outer conductors.
12	Contact Assembly	Replace if star-shaped contact is broken or distorted, or metal contact strip is damaged.
13	Insulating Spacer	Replace if damaged.
15	Filter Body	Replace if filter makes extremely loose fit with cavity and causes rf leakage.
16	Resistor 8R1	Replace if lead has been cut too short to reach proper contact (item 12).
22	Contact	Replace if worn or corroded. Also inspect inside of plunger cavity.
25	Contact Assembly	Replace if distorted or insulator is cracked or damaged
26	Resistor 8R2	Replace if lead is too short or distorted to form a proper coupling loop as shown in figure 5-6.
29	Plunger	Replace if (with backlash nut properly adjusted and both sections of assembly properly aligned) torque varies or shaft binds in spots.
32	Backlash Nut	Same as item 29 above.
35	Lead Screw	Same as item 29 above.
36	Ball Bearings	Replace if the inner ring does not turn freely or there is evidence of side-play.

precise manner to obtain favorable standing wave conditions at the input connectors. If any of the electrical parts of the attenuator require replacement, be careful to install the new parts in the same positions as the old ones. Do not disturb the placement of any parts on the plate assembly. There are no moving parts subject to wear in the demodulator assembly, so replacement will be necessary only in case of mechanical damage or breakage of contact fingers.

(e) iNTERROGATION CODER.

Step 1. Check that SUB PULSE POS control can be turned throughout its range without binding.

Step 2, Check that the kmob locks in the five detented positions at -.7, -.2, 0, +.2, and +.7 scale markings.

Step 3, Check that the stop screws with fiber washers in the slot of the delay line assembly are not bent and that they operate properly.

Step 4. Check that U-shaped wire clip joining variable resistor shaft to associated switch shaft is firmly in place and not distorted,

(f) CALIBRATION-CONTROL UNIT. - See paragraph 5-2b(l)(d) step 4.

c. CLEANING. - Assemblies and subassemblies should be cleaned thoroughly after disassembly.

(1) CLEANING ELECTRICAL CHASSIS. - Clean both sides of all chassis containing electrical and electronic parts by brushing away dust and dirt with a soft brush. Because the wiring on all chassis has been installed during production so that interaction between sensitive circuits is kept to a minimum, be careful not to disturb wires during cleaning operations. Finish the cleaning of the chassis by using compressed air jet of moderate pressure (25 to 35 lb) to blow out any dust or dirt particles remaining between the parts.

(2) CLEANING MECHANICAL PARTS. - Wash mechanical parts needing cleaning in a bath of dry-cleaning solvent type 11 per specification P-S-661 (Federal Stock No. WM9160-S-4718-10). Use a small plastic or hair brush for loosening any embedded dirt or corrosion products on the parts. Sensitive parts, such as cavities, contacts, and contact fingers having corrosion products which cannot be removed by gentle brushing must be replaced. Do not use rough abrasives to clean these parts, as they will destroy polished surfaces and plating.

5-3, INTERNAL ADJUSTMENTS AND CALIBRATION.

a. GENERAL. - The functions of all the internal service adjustments in Radar Test Set AN/UPM-98A are listed in table 4-19. The locations of these adjustments maybe found by referring to the parts location illustrations in this section. The internal service adjustments are not intended to be used during operation of the test set. These adjustments should be made only by qualified maintenance personnel equipped with the specified test equipment. To insure proper operation of the test set, follow each procedure exactly as described. The notes between procedures indicate adjustments which are interrelated and must be performed in the given order.

b. SPECIAL TOOLS AND TEST EQUIPMENT REQUIRED. - No special tools are required to accomplish the procedures described in this technical manual. The assembly aid for assembling the pickoff coils on delay lines 3DL2, 3DL3, 4DL1, and 12DL1 can be fabricated locally from the information given in figure 5-1.

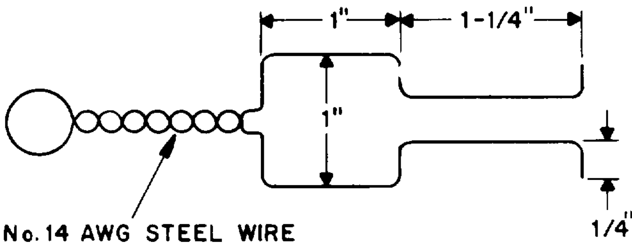


Figure 5-1. Pickoff Coil Assembly Aid

c. CABLE FABRICATION FOR SERVICING. - To align and calibrate the four plug-in units of Radar Test Set TS-1253A/UP, four servicing cable assemblies (figure 1-7) are required which normally are supplied with the equipment, but in some cases may be fabricated locally.

(1) CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4963/UPM. - This is a servicing cable for connecting the removed plug-in units to their appropriate connectors in the panel-chassis of TS-1253A/UP. The cable assembly is of a special molded construction to insure ruggedness and durability.

(2) CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-4964/UPM. - This cable assembly is used to establish connection between two contact plates on the sides of the Display unit and the Sweep and Intensity Mark plug-in units of TS-1253A/UP when the units have to be operated while removed from the TS-1253A/UP panel-chassis. The cable consists of an assembly of two special connecting devices and 30 inches of specially spaced wiring harness. This cable assembly cannot be easily fabricated locally and should be procured in the assembled form

(3) CABLE ASSEMBLY, SPECIAL PURPOSE, ELECTRICAL CX-6092/U. - This cable assembly is used to connect either the plug-in Cal-Control unit or the Interrogation Coder to the SM-197A Panel-Chassis Assembly when the unit has been removed for servicing. The cable assembly is of a special molded construction to insure ruggedness and durability.

d. RADAR TEST SET TS-1253A/UP ADJUSTMENTS. - To make service adjustments on plug-in units of the Radar Test Set TS-1253A/UP, pull out the applicable unit and connect it to the panel-chassis with cable assembly CX-4963/UPM which is supplied as an accessory with Radar Test Set AN/UPM-98A. If a connection is required between the two connector plates, 1P3 and 2J2 on the Display and Sweep and Intensity Mark units, respectively, use cable assembly CX-4964/UPM. Before making adjustments, allow a 15-minute warmup time’ and place all operating controls in the preliminary settings listed in table 2-1. Procedures for making service adjustments on Radar Test Set TS-1253A, UP are given in table 5-4.

e. CODER SIMULATOR SM-197A/UPM-98 ADJUSTMENTS. - To make internal adjustments on the plug-in units of the coder simulator, pull out the applicable unit and connect it to the panel-chassis with cable assembly CX-6092/U which is supplied as an accessory with Radar Test Set AN/UPM-98A. Allow at least a 15-minute warmup time. Set all the controls to the preliminary control settings listed in table 2-1, unless otherwise indicated in the adjustment pcocedure. Procedures for making service adjustments on Coder Simulator SM-97A UPM-98 are given in table 5-5.

Table 5-4. Radar Test Set TS-1253A/UP, Adjustment Procedures

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
PANE L-CHASSIS ASSEMBLY			
1	-150V ADJ (5R25)	Multimeter	1. Set multimeter to read negative volts. 2. Connect multimeter positive lead to 5TP1 (-150 V), and negative lead to chassis ground. 3. Adjust 5R25 for indication of -150 vdc.

Table 5-4. Radar Test Set TS-1253A/UP, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
			DISPLAY UNIT
2	ANODE SET (1R70)	VTVM with HV Probe	1. Turn INT control fully ccw. 2. Connect VTVM negative lead to chassis ground and HV probe to terminal A1 of 1V7. 3. Adjust 1R70 for indication of +1500 vdc.
3*	FREQ ADJ (1C36) PHASE ADJ (1C34) GAIN CAL (1R40)	Square Wave Generator	1. Connect square wave generator output to VIDEO connec - tion. 2. Set generator for 1000 Hz, 0.05 volt peak output. 3. Turn VOLTS/IN switch to .05. 4. Turn VIDEO SENS control to CAL. 5. Adjust SWEEP SPEED controls for single pulse display. 6. Adjust 1C34 and 1C36 for flat-topped pulse reproduction with 4% overshoot. 7. Adjust 1R40 for one-inch vertical deflection.
4*	Input Attenuate] Alignment lC1 1C12 1C20 1C28 1C32 1C24 1C16 1C8	Square Wave Generator	1. Set VOLTS/lN switch in positions indicated, then make capacitor adjustments described in steps 2 and 3 below: .1 - 1C1 2 - 1C24 .2 - 1C12 5 - 1C32 .5 - 1C20 10 - 1C16 1 - 1C28 20 - 1C8 2. For each setting of VOLTS/IN switch, adjust square wave generator output for one-inch deflection. 3. Adjust applicable capacitor indicated in step 1 above for true reproduction of square wave.
5*	Test Lead MX-2681/UP Adjustments 6C3 (10:1) 6C1 (100:1)	Square Wave Generator	1. Set VOLTS/IN switch to .05. 2. Connect video probe cable connector to VIDEO connector on Display unit. 3, Apply video probe tip to output connector of square wave generator. 4. Set probe attenuator control to 10:1. 5. Set square wave generator for 1000 Hz, O. 5 volt peak out put . 6. Remove white button on probe body and adjust 6C3 for true reproduction of square wave. 7. Set probe attenuator to 100:1. 8. Increase generator output to 5 volts. 9. Adjust 6C 1 for one-inch vertical deflection by removing the probe tip and using an Allen wrench.

Table 5-4. Radar Test Set TS-1253A/UP, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
			DISPLAY UNIT (Cont.)
6*	Input Attenuator Equalizing 1C61 1C9 1C17 1C25 1C29 1C21 1C13 1C5	Square Wave Generator	1. Set VOLTS/IN switch to positions indicated, then make capacitor adjustments described in steps 2 through 5 below: .1 - 1C61 2 - 1C21 .2 - 1C9 5 - 1C29 .5 - 1C17 10 - 1C13 1 - 1C25 20 - 1C5 2. Leave video probe connected between VIDEO connector and square wave generator. 3. Set probe attenuator to 10:1. 4. Adjust square wave generator output for one-inch deflection. 5. For each setting of the VOLTS/IN switch, adjust applicable capacitor indicated in step 1 above for true reproduction of square wave.
			SWEEP AND INTENSITY MARK UNIT
7	SWEEP AMP (2R33)	Oscilloscope	1. Connect VIDEO input to pin 9 of 2V6. 2. Set SWEEP SPEED RANGE switch to 200-2000. 3. Turn SWEEP SPEED ADJUST control to mid-range. 4. Adjust 2R33 for 110 volt sweep amplitude.
8*	OSC FEEDBACK ADJ (2R50) 1 µsec Adjustment (2L2)	Oscilloscope	1. Set INTENSITY MARKS RANGE to 1, and INTENSITY MARKS LEVEL fully cw. 2. Set SWEEP SPEED RANGE to 200-2000. 3. Connect oscilloscope input 1 to pin 5 of 2J2. 4. Adjust oscilloscope to observe intensity gate pulse with superimposed l-microsecond intensity markers. 5. Adjust PRF and SWEEP SPEED ADJUST so that intensity gate pulse duration is 1200 microseconds. 6. Turn 2R50 fully ccw, then slowly turn it cw until intensity markers appear on entire intensity gate pulse. 7. Connect oscilloscope input 2 to pin 3 of 3V2 in Crystal Mark and Sync unit. 8. Set SYNC SELECT switch to INT 1.00. 9. Adjust oscilloscope sweep speed control for 1 microsecond per 2 cm. Adjust oscilloscope delay time control for delay range of 0 to 1000 µsec. 10. Note any time difference between crystal markers and intensity markers. Begin turning oscilloscope sweep delay adjustment out to approximately 1000 microseconds. If a time difference between the crystal markers and intensity markers becomes apparent, adjust 2L2 to obtain zero time difference between both sets of markers. Continue turning oscilloscope time delay out to 1000 µsec. At 1000 µsec time, difference between both sets of marker should be less than 2 µsec.

Table 5-4. Radar Test Set TS-1253A/UP, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
SWEEP AND INTENSITY MARK UNIT (Cont.)			
			11. If intensity markers disappear before 1000 #see delay is reached, turn 2R50 slowly cw until intensity markers appear and continue for approximately an additional 10 degrees; repeat step 10. 12. Disconnect pin 3 of 3V2 from oscilloscope input 2.
9*	0.1 µsec Adjustment (2T3)	Oscilloscope	1. Connect oscilloscope to pin 6 of 2V10. 2. Set INTENSITY MARK RANGE to .1. 3. Set oscilloscope sweep time for 1 µsec per 10 cm. 4. Adjust 2T3 for maximum amplitude of one .1 µsec marker for each cm on the oscilloscope.
10*	5 µsec Adjustment (2R73)	Oscilloscope	1. Calibrate oscilloscope for 1 µsec per cm. 2. Set INTENSITY MARKS RANGE control to .5. 3. Adjust 2R73 until one 5 µsec intensity marker coincides with each 5 cm graduation on the oscilloscope.
11*	50 µsec Adjustment (2R86)	Oscilloscope	1. Calibrate the oscilloscope for 10 µsec per cm. 2. Set INTENSITY MARKS RANGE to 50. 3. Adjust 2R86 until there is one 50 µsec intensity marker for each 5 cm graduation over a range of 1000 micro-seconds.
CRYSTAL MARK AND SYNC UNIT			
12	PRF ADJ (3R40)	Counting Type Frequency Meter	1. Set SYNC SELECT switch to INT. 2. Connect frequency meter input to 0 TRIGGERS connector. 3. Turn PRF control on the Crystal Mark and Sync unit fully cw. 4. Adjust 3R40 for a frequency indication slightly over 4100 pps, 5. Set PRF control fully ccw. Frequency meter indication should be 15 cps or less; if not, readjust 3R40 and repeat step 4.
,3	SWEEP DELAY ADJ(3C44)	Oscilloscope (Dual Trace)	1. Set SWEEP DELAY RANGE switch to 11-21. 2. Set SWEEP DELAY FINE control fully CW. 3. Connect oscilloscope input 1 to pin 8 of 3V11. 4. Connect oscilloscope input 2 to O TRIGGERS connector. 5. Adjust 3C44 for 21 µsec delay.

Table 5-4. Radar Test Set TS-1253A/UP, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
		SIF CODER	
14	Pulse Position Adjustment ST (4L10) Cl (4L11) Al (4L12) C2 (4L13) A2 (4L14) C4 (4L15) A4 (4L16) X (4L17) B1 (4L18) D1 (4L19) B2 (4L20) D2 (4L21) B4 (4L22) D4 (4L23) SP (4L24) EM (4L25) ID (4L26)	None	1. Set PULSE WIDTH control to ,45. 2. Set AMPLITUDE control fully cw. 3. Connect TRIGGER INPUT connector on SIF Coder to DELAYED TRIGGER connector on Crystal Mark and Sync unit. 4. Connect VARI OUTPUT connector on SIF Coder to VIDEO on Display unit. 5. Set INTENSITY MARKS RANGE to 1. 6. Set SWEEP SPEED RANGE to 1-30. 7. Set SWEEP SPEED ADJUST so that four intensity markers appear on trace. 8. Set VOLTS/IN and VIDEO SENS controls for one-inch pulse height. 9. Adjust 4L10 so that ST (Start) pulse appears 3 to 4 µsec after input trigger pulse. 10. Set SYNC SELECT switch to INT 1.45. 11. Adjust XTAL MARK LEVEL for visible markers. 12. Set FUNCTION selector to X. 13. Set four CODE selectors to 7777. 14. Adjust TRIGGER DELAY controls for coincidence of ST pulse and 1.45 µsec marker. 15. Adjust 4L11 to bring leading edge of the Cl pulse into coincidence with the next marker. 16. Adjust 4 L12 through 4 L24 so that the leading edge of each successive pulse in the train is coincident with its corresponding 1.45 #see marker. 17. Set FUNCTION selector to EMER and align SP ("stop") pulse with a 1.45 µsec marker. 18. Adjust 4 L25 so that ST pulse of the following pulse train is spaced 4.35 µsec (or 3 markers) from SP pulse of the preceding train. 19. Turn FUNCTION selector to ID and again align SP pulse with 1.45 µsec marker. 20. Adjust 4L26 so that ID pulse is spaced 4.35 #see (or 3 markers) from SP pulse.
15	PULSE WIDTH ADJ (4R47) SUB PULSE WIDTH (4R32)	None	1. Set FUNCTION selector to N. 2. Set INTENSITY MARKS RANGE switch to .1. 3. Set SWEEP SPEED RANGE switch to 1-30 and adjust SWEEP SPEED ADJUST control so that Cl pulse occupies most of display. 4. Set INTENSITY MARKS LEVEL control for visible markers. 5. Set the PULSE WIDTH control fully ccw 6. Adjust 4R47 for O. 3 #see pulse. 7. Set PULSE WIDTH control fully cw. Pulse width should now be over 1 µsec.

Table 5-4. Radar Test Set TS-1253A/UP, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
SIF CODER (Cont.)			
15 (Cont.)			8. Adjust PULSE WIDTH control for 0.45 µsec pulse, loosen knob, set indicator at .45, and tighten knob. Note exact position of C 1 pulse. 9. Turn SUB PULSE SELECT switch to Cl. 10. Adjust 4R32 for 0.45 #see width of the substituted C 1 pulse.
16	SUB PULSE POS (4R141) SUB PULSE Delay Line (4DL1)	Oscilloscope	1. Leave controls as in step 10 above. 2. Set 4R141 to center position. 3. Set pickoff coil on 4DL1 (approximate center) so that sub pulse falls in exact coincidence with C 1 pulse. 4. Set SUB PULSE POS control to 0 and tighten the two larger Allen head setscrews. If a slight readjustment of the sub pulse position is required after setscrews have been tightened, loosen LINE LOCK *screw* on rear end of delay line, adjust the core and readjust until the two pulses fall in exact coincidence. 5. Repeat step 4 for minimum shift between substitute pulses and the pulses to be replaced. 6. Set the SUB PULSE POS knob to detented positions and tighten small setscrews on knob.

These adjustments must be performed in sequence as presented.
The l-mkz oscillator tank circuit is located in a temperature controlled oven. The oven cover must be removed before adjustment of 2L2 can be made. This is done by loosening the retaining strap, pulling the oven assembly out of its socket, removing the cover, and reinserting the oven assembly without the cover into its socket. A11ow at least ten minutes warmup time before making adjustments.

Table 5-5. Coder Simulator SM-197A/UPM-98, Adjustment Procedures

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
1	+300 V ADJ (8R35)	Voltmeter	1. Connect positive lead of voltmeter to +300 V test point TP3; negative lead to chassis. 2. Adjust 8R35 for +300 volts.
CALIBRATION-CONTROL UNIT			
2	WM ADJ (9R61)	None	1. Set METER SELECT to WM. 2. With no signal input to wavemeter, adjust WM ADJ 9R61 for full scale meter deflection.
3	ALC ADJ (9R3)	RF Power Meter	1. Set ATTENUATION dial to 021.0. 2* Connect rf power meter to SG OUT receptacle. 3. Provide a modulation signal for the rf signal generator. 4. Tune signal generator to approximately 1050 mHz. Adjust 9R3 until the rf power-meter indicates -8.3 dbm.

Table 5-5. Coder Simulator SM - 197 A/UPM-98, Adjustment Procedures (Cent.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
CALIBRATION-CONTROL UNIT (Cont.)			
4	CAL ADJ (9R36)	Oscilloscope	1. Set METER SELECT switch to CAL. 2. Set VIDEO OUT switch to 10. 3. Set TRIGGER switch to INT. 4. Connect oscilloscope input to VIDEO OUT connection. 5. Adjust external CAL ADJ control for full scale deflection on meter. 6. Adjust oscilloscope for a convenient display of the pulse. 7. Adjust 9R36 until the pulse height (measured on the oscilloscope) is 10 volts. 8. Turn VIDEO OUT switch to 50 and check that pulse height is 50 volts and that meter reads full scale. A slight readjustment of 9R36 and the external CAL ADJ control may be necessary.
5	PRF 0-500 (9R30)	Frequency Counter	1. Set TRIGGER switch to INT. 2. Set METER SELECT switch to 500 PRF. 3. Connect the counter to the O TRIGGER connector on the Crystal Mark and Sync unit. 4. Adjust the PRF control until the counter indicates 500. 5. Adjust 9R30 until meter indicates 500.
6	PRF 0-5000 (9R31)	Frequency Counter	1. Set METER SELECT switch to 5000 PRF. 2. Adjust the PRF control until the counter indicates 4000. 3. Adjust 9R31 until meter indicates 4000.
7	SHAPE ADJ (9C26)	Square Wave Generator Oscilloscope	1. Connect generator output to 9P4 of the Calibration-Control unit. . 2. Connect input 1 of the oscilloscope to the generator output. 3, Connect input 2 of the oscilloscope to VIDEO OUT connector on the Calibration-Control unit. 4. Set VIDEO OUT switch to SHAPE position. 5. Adjust generator frequency to about 1000 Hz. 6. Adjust generator amplitude to about 1 volt. 7. Observing the two square wave traces on the oscilloscope, adjust 9C26 for best matching of both forms.
8	Mode 4 Decode Pulse AMPL. (9A4R27)	None	1. Hook up AN/UPM-98A as in figure 2-3A to obtain simulated Mode 4 reply. Perform Mode 4 Reply Decoding 2-8c(2)(b), steps 1 through 11. 2. Hook Up AN/UPM-98A as in figure 2-3B to inject signal into decoder, and perform steps 12 through 14 of 2-8c(2)(b) 3. If amplitude of output pulse is more than 5 volts or less than 2 volts, adjust MODE 4 AMPL potentiometer 9A4R27 for an output of 4 volts.

Table 5-5. Coder Simulator SM-197A/UPM-98, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
			CALIBRATION-CONTROL UNIT (Cont.)
9	Mode 4 Decode PULSE WIDTH (9A4R25)	None	1. Perform same procedure as in steps 1 and 2 of adjustment number 8 above. 2. If width of output pulse is outside the tolerance limits of 0.5±0. 1 µsec, adjust MODE 4 PULSE WIDTH potentiometer for an output pulse width of 0. 5 µsec.
			INTERROGATION CODER
10	-25V ADJ (12R24)	Multimeter AN/PSM-4	1. Connect positive lead of voltmeter to +25 V test point 12TP4, negative lead to chassis. 2. Adjust 12R24 for +25 volts.
11	+12V ADJ (12R32)	Multimeter AN/PSM-4	1. Connect positive lead of voltmeter to +12 V test point 12TP3, negative lead to chassis. 2. Adjust 12R32 for +12 volts.
12	12A1R8 (Selected Resistor normally 39 ohms)	Oscilloscope AN/USM-l05A	Connect oscilloscope to TP4. If pulse width is not 0.95 to 1.1 µsec, select a value for 12A1R8 which will give a pulse within above limits.
13	Clock Timing ADJ (12A1C8)	Oscilloscope AN/USM-l05A	Connect oscilloscope to Clock Output test point 12A1TP1 and adjust 12A1C8 for pulses spaced 1 microsecond apart.
14	12 A1R36 (Selected Resistor normally 470 ohms)	Oscilloscope AN/USM-l05A	Connect oscilloscope to TP2. If pulse width is not 0.95 to 1.1 µsec, select a value for R36 which will give a pulse within above limits.
15	RF OSCILLATOR ADJ		CAUTION Do not attempt the following adjustments of the RF Oscillator 12A5 unless it has definitely been determined that the circuits are out of alignment. Careless turning of any of the adjustment screws may make a lengthy alignment procedure necessary.
	12A5C5 12A5C9 12A5C12 12A5C19 12A5C22 12A5C23 12A5C24 12A5C25 12A5C26 12A5C28 12A5C29 12A5C32 12A5C33 12A5Z1		1. Remove upper side cover from subassembly 12A5 by removing 5 screws. 2. Connect servicing cable CG-3380/U from connector 12J11 on Interrogation Coder to LP on on SM-197A/UPM-98. Connect cable from VIDEO OUT on Calibration-Control unit to VIDEO input on Display. Set VIDEO OUT switch on Cal-Control unit to DEMOD POWER to observe demodulated rf pulse. 3. Place POWER switch on SM-197A/UPM-98 in the ON position and connect a video cable from the TRIG connector on the Interrogation Coder to the DELAYED TRIGGERS connector on the Crystal Mark and Sync unit. 4. Set Function Selector on Interrogation Coder to TEST. 5. Set Mode Selector on Interrogation Coder to 2. 6. Adjust Crystal Mark and Sync unit for a prf of 1000 pps.

Table 5-5. Coder Simulator SM-197A/UPM-98, Adjustment Procedures (Cont.)

N0.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
			INTERROGATION CODER (Cont.)
15	RF OSCILLATOR ADJ (Cont.)		7. Set ISLS Selector to 2 µsec. 8. Turn ISLS Level control and CAL adjustment maximum cw and measure output power on Calibration-Control unit. Power should be 10 watts minimum. 9. If output is less than 10 watts, align oscillator output circuit and buffer stage to the crystal frequency by carefully touching up 12A5Z1, 12A5C5, 12A5C9, 12A5C12, 12A5C19, 12A5C22, 12A5C23, 12A5C24, 12A5C25, 12A5C26, 12A5C28, 12A5C29, 12A5C32, 12A5C39, and repeat 12A5Z1 for maximum output. Use an insulated alignment tool for this adjustment. If no output or a very low output is seen in step 8 above, proceed with adjustment 16 below.
16	RF Oscillator Adjustments to correct for low output power. 12A5C5 12A5C9 12A5C12 12A5C19 12A5C22 12A5C23 12A5C24 12A5C25 12A5C26 12A5C28 12A5C29 12A5C32 12A5C33 12A5Z1	oscilloscope AN/USM-105A, (with special probe adapter, figure 5-2) RF Signal Generator AN/UPM-41A	1. Inductively couple the special oscilloscope probe to 12A5L6. 2. Carefully adjust 12A5C5, 12A5C9, 12A5C12, 12A5C19, 12A5C22, 12A5C23, 12A5C24, and 12A5C25 for maximum output, taking care not to adjust the doubler and tripler to the incorrect harmonic. 3. Check for correct frequency by loosely coupling signal generator output into 12A5L6 and varying the frequency between 343 mHz and 687 mHz. A distinct “zero beat” should be seen on the oscilloscope at 515 mHz. 4. Remove the special oscilloscope probe from 12A5L6. 5. Check output power as in step 2 and adjust 12A5C25, 12A5C28, 12A5C29, 12A5C26, 12A5C32, 12A5C33, and cavity 13A5Z1 for maximum power out.
17	RF oscillator Adjustments to correct frequency. 12A5Z1 12A5C5 12A5C9 12A5C12 12A5C19 12A5C22 12A5C23 12A5C24 12A5C25 12A5C26 12A5C28 12A5C28 12A5C32 12A5C33	oscilloscope AN/USM-105A	1. Set WAVEMETER INPUT to DEMOD. 2. Set METER SELECT to WM. 3. Using WAVEMETER FREQUENCY control, Check that output of rf subassembly is 1030 ±0.7 mhz. If it is not, repeat adjustment 15, step 9. 4. Turn off power. Remove test cables. Replace cover on rf subassembly.

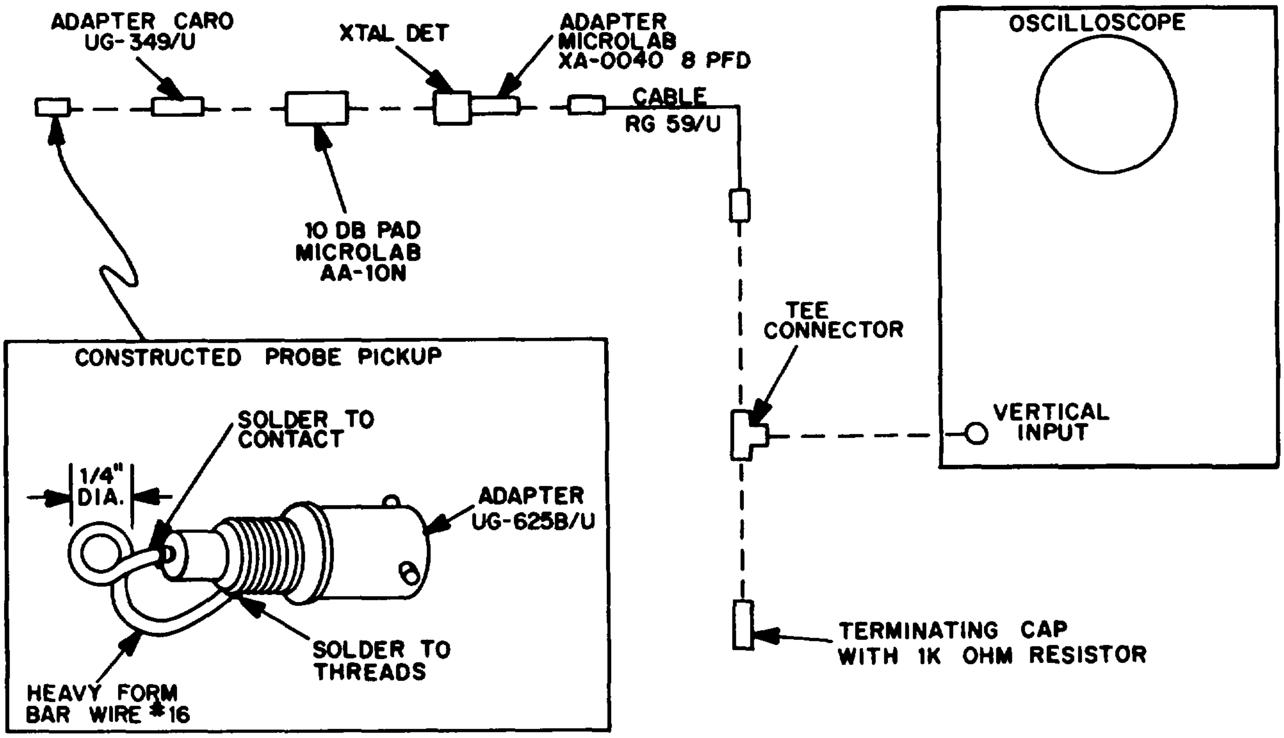


Figure 5-2. Special Probe Adapter for Alignment of RF (ISLS) Subassembly 12A5

Table 5-5. Coder Simulator SM-197A/UPM-98, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
			INTERROGATION CODER (Cont.)
18	ISLS CAL (Balance) Adjustment (12R9)	Transponder Receiver (tuned to 1030 mHz) Oscilloscope AN/USM-105A	1. Connect SG OUT to a receiver tuned to 1030 mHz with a gain of 40 db min. 2. Connect the demodulated output of receiver (video) to the Display Unit VIDEO connector. Set the Interrogation Coder and Display Unit controls for a mode 3/A interrogation with an ISLS pulse on the display. Adjust the signal level so that the receiver is not saturated. (A signal-to-noise ratio of 2 or 3 to 1 is usually below saturation.) 3. Turn ISLS Level control fully clockwise. Using CAL adjust, set ISLS level on display so that ISLS pulse amplitude is about 1-1/2 db above that of the interrogation pulses. 4. Turn ISLS Level control counterclockwise. When pulse amplitudes are equal, loosen knob setscrew, set knob pointer to 0 index mark, and tighten setscrew. 5. Continue turning knob counterclockwise. When ISLS pulse level is 9 db below the interrogation pulses, loosen setscrew on index disk and rotate until -9 db index mark is under knob pointer. Tighten setscrews on index disk.

Table 5-5. Coder Simulator SM-197A/UPM-98, Adjustment Procedures (Cont.)

NO.	ADJUSTMENT	TEST EQUIPMENT	PROCEDURE
			INTERROGATION CODER (Cont.)
19	ISLS 2 µsec ADJ (12A6Rll)	Oscilloscope AN/USM-lo5A	1. Connect oscilloscope to CODER OUT connector Interrogation Coder. 2. Set Interrogation Coder and oscilloscope controls to display Mode 3/A interrogation with 2 µsec ISLS pulse 3. Adjust 12A6Rll so that6 ISLS pulse (P2) follows first Interrogation pulse (Pi) by 2 microseconds.
20	40 µsec ADJ 12A6R21) 12A6R30 (Selected Resistor, normally 89 ohms)	Oscilloscope AN/USM-lo5A	1. Connect oscilloscope so that its sweep is started by the same pulse which triggers the Interrogation Code. 2. Connect the OUT connector on the Interrogation Coder to the oscilloscope input. S. Adjust 12A6R21 so that the trigger from the OUT connector follows the input trigger by 40 microseconds. If the trigger pulse width is not 1 ±0.1 µsec, select a value for 12A6R30 to give a width within these limits.
21	TAG AMPL. ADJ (12A6R69)	None	1. Connect SIP coder MOD DRIVE connector to MOD (modulation) connector on Interrogation Coder. 2. Connect Interrogation Coder OUT (40 µsec delayed trigger) connector to TRIGGER INPUT connector on SIF Coder. 9. Connect display unit VIDEO input to Interrogation Coder CODER OUT connector. 4. Set Function Selector on Interrogation Coder to MOD-MIX position. 5. Set VIDEO selector on Interrogation Coder to RESET position. 6. Set SWEEP SPEED ADJUST control on Sweep and Intensity Mark unit to show the three reset tag pulses. 7. Set LEVEL switch on SIF Coder to HI position and CODE selectors to 7777. 8. Set VIDEO selector on Interrogation Co&m to BOTH position. Note that the SIF repIy pulse train is followed by three reset pulses. 9. Set VIDEO LEVEL control fully cw and check reset pulse amplitude. If amplitude is not 5 volts, adjust 12A6R69 for en amplitude of 5 volts. Leave equipment set for next test.
22	RESET TAG DELAY ADJ (12A6R76)	None	L With equipment controls set as step 9 above, check spacing between leading edge of last pulse in reply pulse train and leading edge of first reset pulse. 2. If spacing is not within 2422 µsec, adjust 12A6R76 for a spacing of 24 µsec.

5-4. REMOVAL AND REASSEMBLY OF PARTS AND SUBASSEMBLIES.

a. GENERAL. - This section contains instructions for repair and replacement of parts. Repair instructions which are obvious and instructions for parts which cannot be economically repaired by normal maintenance techniques are not included. Such parts shall be replaced as higher subassemblies as listed in Section 6, Parts List.

The procedure for removal of most subassemblies and parts in the radar test set is obvious and does not require special detailed instructions. Removal of parts should be done carefully in order to prevent damage not only to the parts involved, but also to adjacent parts. Be especially careful of tubes, and in particular, the cathode ray tube in the Display unit. When unsoldering wires from parts, make a note of the location of the wires and other affected parts, especially if a similar unit is not available for comparison of lead dress and parts location. This is particularly important when unsoldering and removing parts which have numerous wires connected to them, such as multi-gang switches.

(1) CHASSIS-MOUNTED TERMINAL STUDS. - Most of the small parts in the test units, such as resistors, capacitors, diodes, etc., are mounted on small chassis-mounted terminal studs. Any broken or damaged standoff or feedthru terminal studs must be replaced. They can be removed from the chassis by pressing on the teflon insulator part with a suitable blunt instrument. To install the teflon insulated terminal studs, use a short length of metal rod, approximately 1/4 inch in diameter with a 3/8-inch deep, 3/16-inch diameter hole in its end. Use this rod to press the teflon insulating part of the stud into the hole in the chassis. These terminals can be damaged or broken when attempting to remove soldered wires from them. When removing wires from the terminals, heat the soldered joint, and carefully unwrap the wire from the stud with long nosed pliers or with a tool designed especially for this purpose. Also exercise care when wrapping new leads around the terminal studs .

(2) SEMICONDUCTOR DIODES. - When replacing semiconductor (crystal) diodes, be careful to connect the replacements into the circuitry in the same polarity as the old ones. The cathode end of the diode is usually marked with a bar, a a" -" sign, or a “k” letter. On the chassis, the connection point for the anode of a semiconductor diode usually is marked with a “+” sign. When soldering semiconductor diodes into the circuit, leave sufficient lead length to permit handling and hold the lead with a pair of pliers between the body and the wire end to be soldered so that heat will not be conducted through the wire lead to the diode element.

(3) MECHANICAL PARTS. - If an inspection performed in accordance with instructions In this technical manual reveals the need for replacement of any mechanical parts in Radar Test Set AN/UPM-98A, refer to the removal instructions given here. Replacement and adjustment of the new parts is described in later paragraphs.

b. REMOVAL OF MAJOR UNITS,

(1) RADAR TEST SET TS-1253A/UP,

(a) Loosen the five large captive screws around the front panel holding the drawer to the case.

(b) Withdraw the drawer partially from the case so that interunit cable connection 5J1(7P2) located at the right-hand side of the drawer can be seen.

(c) Disconnect the interunit cable plug 7P2 by disengaging the two fastening springs on the sides of it.

(d) Pull the panel-chassis out until it is stopped by the two safety devices on the sides of the chassis.

(e) Disengage the safety holders by depressing the levers, and remove the panel-chassis from the case. Because of the weight of the unit, two men should perform the task of removing it from the case.

(f) To replace the panel-chassis, reverse the removal procedure.

(2) CODER SIMULATOR SM-197A/UPM-98.- Remove the coder simulator from the equipment case in the same manner as the TS-1253A/UP, except be sure to disconnect 7P3 from 8J21 when removing the chassis. Because of the weight of the unit, two men should lift it from the case.

c. REMOVAL AND REPLACEMENT OF TS-1253A PLUG-IN UNITS.

(1) REMOVAL. - To remove the TS-1253A plug-in units, proceed as follows:

(a) Loosen and turn the four fasteners (bridge clamps) holding the plug-in unit front panels to the panel-chassis assembly.

(b) Pull each unit out by the handle on the bottom of the front panel. When removing the Sweep and Intensity Mark unit, use care to avoid damaging connector 2J2 at the left side rear.

(2) REPLACEMENT. - To install the four plug-in units into the panel-chassis of Radar Test Set TS-1253A/UP, Insert each unit into the proper cutout in the front panel of the panel-chassis, push gently into position, and tighten the wing-type fasteners.

CAUTION

If a unit will not go into place with only moderate effort, do not attempt to force it in, because the “blue ribbon” type connectors may be damaged, necessitating complicated repairs. In such cases, loosen the two nuts on the locating pins for the plug-in unit. (The nuts are accessible from the bottom of the panel-chassis). Carefully insert the plug-in unit so that its blue plug mates with its connector without binding, then re-tighten the nuts on the locating pins.

d. REMOVAL AND REPLACEMENT OF SM-197A PLUG-IN UNITS.

(1) REMOVAL OF CALIBRATION-CONTROL UNIT. - Turn four bridge clamps that hold the front panel of the plug-in init. Pull unit from panel-chassis assembly with handle at front of unit.

(2) REMOVAL OF INTERROGATION CODER. - Removal procedures for this unit are the same as for the Calibration-Control unit described above.

(3) REPLACEMENT OF PLUG-IN UNITS. Replace the Calibration-Control unit and the Interrogation Coder by reversing the removal processes.

e. DISASSEMBLY OF TS-1253A PLUG-IN UNITS.

(1) DISPLAY UNIT.

(a) REMOVAL OF CATHODE-RAY TUBE 1V7.

Step 1. Remove the 12-pin tube socket 1XV7 from the end of the CRT and detach the five wires with clip contacts from the neck of the CRT. Also, disconnect high voltage connector from side of tube.

Step 2. Remove clamp holding socket end of CRT by unscrewing two machine screws.

Step 3. Remove two machine screws holding CRT neck shield to mounting bracket on chassis.

Step 4. Remove CRT and shield from the unit by lifting up.

(b) INSTALLATION OF CATHODE-RAY TUBE.

Step 1. Place Display unit on workbench with front panel down.

Step 2, Place gasket (Admiral Part No. 512B159) in the cutout on rear of the front panel).

Step 3. Place on top of gasket installed in step 2 CRT scale (Admiral Part No. 521C18-1), CRT light filter (Admiral Part No. 521C18-2), and bumper gasket (Admiral Part No. 512B160), in that order.

Step 4. Apply a small amount of Glyptol to one side of a strip of rubber (Admiral Part No. 512B18-56) and place it on center of the edge of bumper gasket in front of scale light IDS 1.

Step 5. Slip cathode-ray tube into shield assembly so that the contacts on the neck appear in the cutout on the neck shield.

Step 6. Place face of the CRT on the bumper gasket so that high voltage connector is on the left hand side and rubber strip installed in step 4 is located between edge of cutout on front panel and side of CRT.

Step 7. Fasten the ears of the CRT neck shield to mounting bracket with two machine *screws* and markers, so that the face of the CRT is centered and pushed flat against the bumper gasket.

Step 8. Apply Glyptol to one edge of three more rubber strips (Admiral Part No. 512B18-56) and glue them to the bumper gasket by pushing down between sides of CRT and front panel at square cutouts provided on three sides of CRT shield.

Step 9. Route wire with the rubber-capped high voltage connector between CRT and its shield so it reaches contact A 1 on the side of CRT. Lift and “jiggle” CRT shield to facilitate passage of the rubber cap.

Step 10. Connect the five wires with electrical clips to contacts on neck of CRT as follows:

White -blue wire from 1J3 to D2
White-green-blue wire from 1J3 to D1
White-orange wire to A2
White-blue wire to D3
White-green-blue wire to D4

(c) REMOVAL OF ATTENUATOR ASSEMBLY, - To remove the attenuator assembly (including VOLTS/IN switch 1S2) proceed as follows:

Step 1. Unsolder attenuator wires from center of VIDEO connector lJ1 and pin 2 of 1XV2.

Step 2. Loosen two setscrews inside the chassis attaching the flexible shaft of VIDEO SENS control 1R41 to attenuator. Remove center shaft from attenuator by pulling it out with VIDEO SENS knob.

Step 3. Remove 1S2 mounting nut and lockwasher from front of front plate.

Step 4. Remove tubes lV1 and 1V2 with their shields. The attenuator assembly now is free to be lifted out.

(d) INSTALLATION OF ATTENUATOR ASSEMBLY. - The procedure for reinstallation of attenuator assembly is the reverse of removal as described above.

NOTE

When installing VIDEO SENS shaft through attenuator assembly, make certain that the groove on stop cam of variable resistor 1R41 engages the stop spring when resistor shaft is in the extreme clockwise position, then install VIDEO SENS knob with the white marker pointing to front panel screening position marked CAL.

(2) CRYSTAL MARK AND SYNC UNIT.

(a) DELAY LINES 3DL2 AND 3DL3.

1. REMOVAL.

Step 1. Unsolder all wires connected to the delay line assembly, taking note of the connections so that the new or repaired delay line assembly will be wired correctly.

Step 2. Remove knob by loosening Allen setscrew.

Step 3. Pull off the calibrated dial. Note positions of three small planetary gears, internal tooth gear on calibrated shaft, and small central gear which is part of the shaft.

Step 4. Remove three sets of screws, plain washers and plastic washers on which the three planetary gears are mounted. Front end of delay line is now free of front panel.

Step 5. Remove the two screws and lockwashers holding the rear end of the delay line to the chassis frame. The delay line is now” free to be removed.

2. DISASSEMBLY.

Step 1. Loosen and remove screw and lockwasher adjacent to the LINE LOCK label,

Step 2. Carefully pull delay line core from de lay line assembly. Do not damage wire leads.

Step 3. Remove three remaining sets of screws and lockwashers from rear end of delay line assembly.

Step 4. Remove two screws, one crimped solder lug, two flat washers, and two fiber bushings from helical slot on delay line assembly.

Step 5. Pull pickoff coil, bobbin, and loading spring out of inner cylinder.

3. REASSEMBLY

Step 1. Place bobbins on pickoff coils with loading spring locked between them in the holes provided for this pur - pose. See figure 5-3A.

Step 2. Secure pickoff coil and bobbin as shown in figure 5-3B. Fabricate the assembly aid from a length of No. 14 steel wire in accordance with figure 5-1.

Step 3. Push pickoff coil leads through the helical slot in the inner cylinder.

Step 4. Insert pickoff coil, bobbin, and assembly aid into inner cylinder, and align threaded holes on pickoff coil and bobbin with helical slot in inner cylinder.

Step 5. Attach two sets of screws, flat washers, and tubing into threaded holes as shown in figure 5-3 C. A solder lug is used to secure pickoff coil lead previously fed through helical slot.

Step 6. Remove assembly aid.

Step 7. Replace end cap, attaching screws, and lockwashers. The longest *screw* is used in the hole adjacent to the LINE LOCK label. Do not tighten this screw at this time.

Step 8. Loop solder lug around pickoff coil lead, but do not crush lead.

Step 9. Lock lead in place with “C” spring. Be sure two tabs on “C” spring fit into two holes on assembly provided for this purpose. See figure 5-3C.

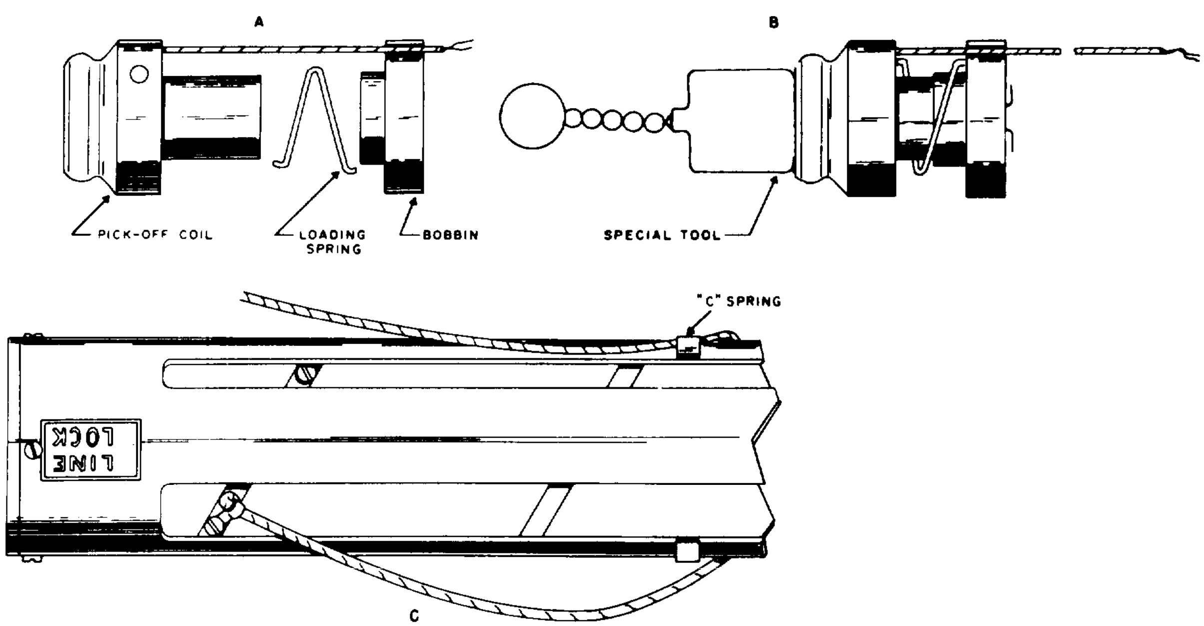


Figure 5-3. Reassembly of Delay Line Pickoff Coils

Step 10. Turn delay line shaft from stop to stop and check for binding, excessive looseness, and wire lead jamming.

Step 11. Apply a thin coat of molybdenum disulphide (Molycote type Z, by Alpha Corp. , Greenwich, Connecticut); Admiral Part No. 551 B7-16 to the surface of the delay line.

Step 12. Insert delay line into assembly. Use a slight "wiggling" motion so that delay line will seat at panel end of assembly. Tighten LINE LOCK screw until delay line is held firmly in place, but do not tighten down all the way. The delay line will be positioned electrically in another procedure.

4. INSTALLATION.

Step 1. Set delay line assembly in place in the unit, and attach to the front panel with three fillister head screws.

Step 2. Secure rear end of delay line assembly with two screws and lockwashers provided for this purpose.

Step 3. Solder delay line and pickoff coil leads to correct terminals. If necessary, refer to the schematic diagram for the unit.

Step 4. Place three flat washers and plastic washers over the heads of the screws installed in step 1. Place the three planetary gears on top of the washers.

Step 5. Turn the delay line assembly shaft fully ccw, and set the calibrated dial on the panel so that it meshes with the planetary gears, and figure 1 on the dial is aligned with the index mark on the panel.

Step 6. Set the knob on the shaft, and tighten the setscrew. Turn the knob from stop to stop and check that there is no irregular movement of the control,

5. ADJUSTMENT.

Step 1. Connect the Crystal Mark and Sync unit to the power supply in the panel-chassis assembly using the 24-pin servicing cable CX-4963/UPM.

Step 2. Set the operating controls on the front panel of the TS-1253A/UP to the preliminary control positions shown in table 2-1, then start the equipment.

NOTE

The following steps 3 thru 7 apply to adjustment of trigger delay line 3DL2. For adjustment of sweep delay line 3DL3, use DELAY STROBE SWEEP, SWEEP DELAY RANGE, and SWEEP DELAY FINE controls instead of the trigger controls.

Step 3. Set TRIGGER DE LAY RANGE switch to 1-11 and TRIGGER DELAY FINE control to 1.

Step 4. Set INTENSITY MARKS RANGE to 1 and adjust INTENSITY MARKS LEVEL control for presence of one-microsecond intensity markers.

Step 5. Depress and hold down DE LAY STROBE TRIGGER switch and note the position of delayed trigger. It should be coincident with the first intensity marker after the start of the sweep.

Step 6. If the delayed trigger is not spaced exactly 1 µsec from the start of the sweep, loosen the LINE LOCK screw at the end of the delay line and move the core of the delay line until the delayed trigger appears in coincidence with the appropriate intensity marker.

Step 7. Tighten the LINE LOCK screw holding the core,

(3) SIF CODER.

(a) DELAY LINE 4DL1.

1. REMOVAL.

Step 1. Loosen but do not remove the two large and the five small Allen setscrews on the SUB PULSE POS knob (figure 5-4). Pull the knob from the shaft.

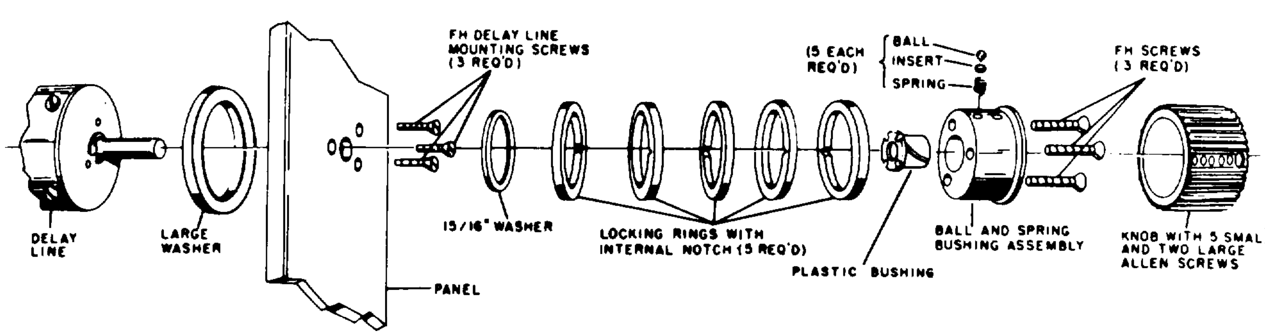


Figure 5-4. Delay Line Knob Detent Mechanism

Step 2. Remove three 6-32 flat-head machine screws holding the detent assembly. Pull assembly from shaft. Remove the 15/16 -inch washer.

Step 3. If it is necessary to disassemble the detent assembly, proceed with step 4. If disassembly is not required, omit step 4 and proceed with step 5.

Step 4. Snap off the first of the five locking rings from the ball-and-spring bushing as shown in figure 5-4. Take care not to lose balls, plastic inserts, or springs. Remove remaining four locking rings in a similar manner.

Step 5. Unsolder the seven wires connecting the delay line and the pickoff coil into the circuitry.

Step 6. Remove delay line assembly DL501 from panel by unscrewing three remaining 6-32 flat-head machine screws.

2. DISASSEMBLY, - Disassembly of delay line 4DL1 is the same as the procedure for delay lines 3DL2 and 3DL3.

3. REASSEMBLY. - Reassembly of delay line 4DL1 is the same as steps 1 through 5 of the procedure for delay line 3DL2 and 3DL3.

4. INSTALLATION. ‘

Step 1. To install delay line 4DL1 in the SIF Coder, place the 15/16-inch washer on the delay line shaft, insert the shaft through the hole in the front panel, and secure the delay line with three 6-32 flat-head screws.

Step 2. If the detent assembly has been disassembled, refer to figure 5-4 and replace parts in the following manner: insert five sets of springs and plastic inserts into five holes provided on the ball-and-spring bushing assembly. Place a ball in the hole nearest the end of the ball-and-spring bushing assembly with three countersunk screw holes, and press locking ring onto bushing so that notch on inner surface engages the ball. Replace the remaining balls in the same manner. It is important that notches on inner surface of locking rings engage their associated balls.

Step 3. Place 15/16-inch diameter washer on shaft and slide detent assembly onto shaft so that the three countersunk holes are away from the panel. Secure with three 6-32 flat-head screws.

Step 4. Slide knob over detent assembly, but do not tighten setscrews at this time.

5. ADJUSTMENT. - Adjustment of the core of delay line 4DL 1 is dependent upon adjustment of the internal SUB PULSE POS control 4R141 and should be performed in conjunction with it (see step 16 of table 5-5).

f. DISASSEMBLY OF SM-197A/UPM-98 UNITS.

(1) CALIBRATION-CONTROL UNIT. - No detailed disassembly procedure is given for the Calibration-Control unit, since the method is obvious.

(2) INTERROGATION CODER. - No detailed disassembly procedure is given for the Interrogation Coder, since the method is obvious.

(3) REMOVAL AND REPLACEMENT OF 8V2, 8V3, and 8CR1. - The following procedures do not require that the support base plate be removed from the coder simulator chassis. Access to rf oscillator tube 8V2 is gained by unscrewing the cap on the rear of the assembly and unscrewing the tube mounting bushing. The tube now can be removed with a gentle twisting and pulling motion. Demodulator tube 8v3 is held to the assembly by two clamps. Loosen these clamps and remove the tube and socket together, then pull the tube from the socket. Wavemeter detector diode 8CR1 can be removed by first disconnecting 8P12 from the wavemeter assembly and then loosening the Allen setscrew which permits the diode holder to be unscrewed. The wavemeter detector diode can now be pulled from the socket. In each of the above cases replacement is the reverse of removal.

(4) RF PLUMBING ASSEMBLIES. -RF Oscillator Assembly 8A1, ALC/Attenuator Assembly 8A2, Wavemeter Assembly 8A3, wavemeter input switch 8S1, and the associated indicators and gears are mounted on a supporting base plate inside the coder simulator chassis. Access to the wavemeter or to the wavemeter input switch is possible only after the support base plate has been removed from the chassis. To remove the support base plate from the coder simulator chassis, proceed as follows:

Step 1. Remove SC FREQUENCY, WAVEMETER FREQUENCY, WAVEMETER INPUT, and ATTENUATION front panel knobs.

Step 2. Disconnect connectors 8P19 and 8P20 from the power supply, and 8P7 and 8P3 from the rf oscillator assembly.

Step 3. Unsolder ALC rectifier filament lead at 8C1 lug on the back of attenuator assembly.

Step 4. Remove four machine screws holding SC OUT connector 8J6 to the front panel.

Step 5. Remove four machine screws from the front panel and five machine screws from the bottom of the chassis. The support base plate can now be lifted from the chassis.

Step 6. To replace the base plate, reverse the removal process.

NOTE

Perform disassembly only to the extent necessary for maintenance and repair. Further disassembly of the individual rf assemblies may make recalibration of the assembly necessary.

(5) WAVEMETER INPUT SWITCH 8S1.

(a) To remove the wavemeter input switch 8S1 from the support base plate, proceed as follows :

Step 1. Disconnect 8P8, 8P9, and 8P10 from the wavemeter input switch.

Step 2. Loosen the two Allen setscrews from the spring-retaining collar and remove the spring-retaining collar and spring from the wavemeter input switch shaft.

Step 3. Remove the two machine screws that fasten the wavemeter input switch to the support base plate. The wavemeter input switch can now be pulled free from the rear of the support base plate.

(b) To replace the wavemeter input switch 8S1, proceed as follows:

Step 1. Place the spring in position on the wave meter input switch shaft with one end inserted into the hole provided on the support base plate and the other fitted into the collar.

Step 2. Tighten the Allen setscrews so that the spring-retaining collar mounts securely to the wavemeter input switch shaft.

Step 3. Rotate the wavemeter input switch and spring-retaining collar clockwise so that the spring makes two and one-quarter turns around the wavemeter input switch Shaft .

Step 4. Mount the wavemeter input switch to the support base plate with two machine screws and associated washers.

Step 5. Reconnect 8P8, 8P9, and 8P10 to the wavemeter input switch.

(6) RF OSCILLATOR ASSEMBLY 8A1,

(a) REMOVAL FROM BASE PLATE ASSEMBLY. - By loosening the two Allen head setscrews that hold the spur gear onto the center shaft, the spur gear can be removed Loosen these two screws and remove the two screws and washers that attach the rear of the oscillator assembly to the base plate. Disconnect 8P3 (cable 8W7) from J3, and disconnect 8P4 (cable 8W1) from J4 on oscillator assembly.

(b) DISASSEMBLY. - To disassemble the rf oscillator (figure 5-5), proceed as follows:

Step 1. Unscrew and remove cap (item 1) and tube retaining ring (item 2) from top of oscillator tube 8V2 (item 3).

Step 2. Remove oscillator tube 8V2 by rocking slightly and pulling. If the tube is very tightly seated, use a rubber tube puller or wind a length of electrical insulating tape around top of the tube to provide a better grip.

Step 3. Unsolder wire (item 20) from terminal stud (item 9) on the plate contact ring (item 7).

Step 4. Loosen setscrew (item 18) and remove oscillator plate filter assembly 8Z1 (item 19) containing capacitors 8C5 and 8C6 (items 23 and 21), and wire coil 8L3 (item 58) inside spacer sleeve (item 22).

Step 5. Loosen setscrew and remove coupling and connector 8J4 assembly (item 24).

Step 6. Unscrew five black nylon screws (item 4), remove plate contact ring (item 7) and insulator ring (item 8).

Step 7. Remove five screws and washers (item 44) holding housing and cavity together.

Step 8. Hold housing in one hand so that the cavity (item 14) is pointing downward. With the other hand turn oscillator tuning shaft clockwise until the two parts disengage and separate.

Step 9. Unscrew plug screw with washer (item 26) and using an Allen head wrench, remove feedback probe (item 17).

Step 10. Using a pair of long-nose pliers, remove feedback contact (item 15) from the inner cavity by gently pulling it off.

Step 11. Remove feedback probe nylon bushing (item 16) from the wall of the larger cavity by pushing it out from inside.

Step 12. If cable assembly 8W9 (item 25) has not yet been removed, remove it by loosening its setscrew.

Step 13. Unscrew six contact rod nuts (item 38) with washers and remove lead screw (item 37) with backlash nut (item 39) and stop stud (item 36).

Step 14. Remove both cavity contact rings (items 10 and 11) by pushing out tuning rods (items 12 and 13) from rear of the housing with a suitable round tool. The tuning rods can be removed from contact rings by carefully unscrewing so as not to distort or damage the contact ring fingers.

Step 15. Remove three sets of three-prong contacts (item 33) by removing screws with washers (item 34).

Step 16. Unsolder the short length of wire (item 28) from terminal lug

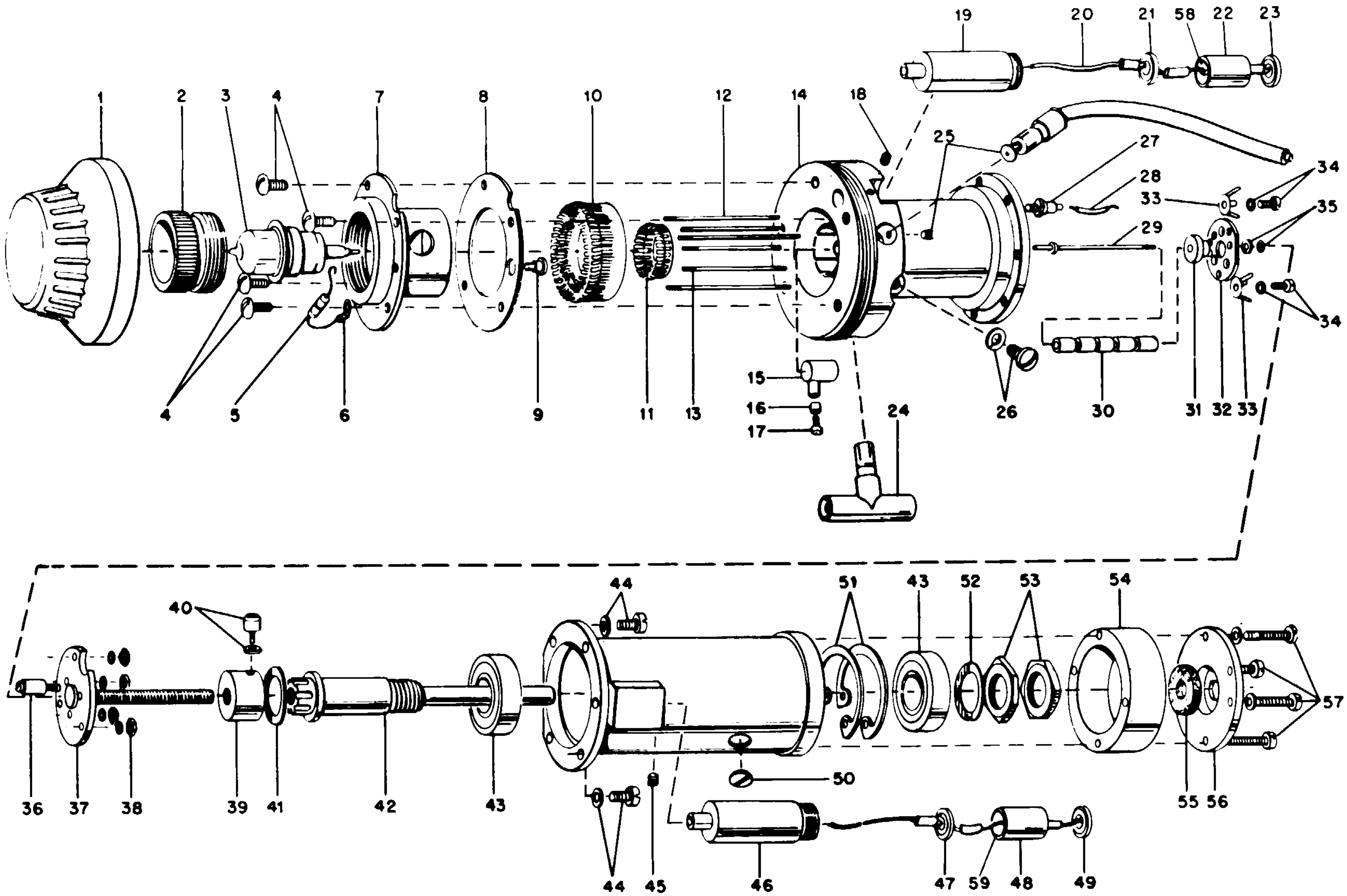


Figure 5-5. Oscillator Assembly 8A1, Exploded View

Table 5-6. RF Oscillator Assembly 8A1, parts Identification

Call Out No. (Figure 5-5)	Description	Admiral Part/Dwg No.
1	Cap	520C110
2	Tube Retaining Ring	527A380
3	Electron Tube (8V2)	2C36
4	Machine Screw (Nylon)	501C68-4
5	Resistor (8R40)	RC20GF150J
6	Terminal Lug	MS35431-1
7	Plate Contact Ring	527C485
8	Insulator Ring	532B295
9	Terminal Stud	510B3-5
10	Contact Ring	GA439-2
11	Contact Ring	GA439-1
12	Tuning Rod	527A131-2
13	Tuning Rod	527A131-1
14	Cavity	GB258-2
15	Feedback Contact	527B486-1
16	Insulator Bushing	529A7-53
17	Feedback Probe	501D42-8
18	Setscrew	AN565DC6H3
19	Filter Body	527A119
20	Wire (MIL-W-76A)	MW-C-20(10)U1
21	Capacitor, 25 µµf (8C6)	565C7-4
22	Spacer	529D4-5
23	Capacitor, 25 µµf (8C5)	565C7-3
24	Coupling Assembly	GB220
	Setscrew	AN565DC6H3
25	Cable Assy (8W6)	GC4752
26	Screw	582-187-C2-52
	Washer	MS35338-80
27	Terminal Stud	509A13
28	Wire	595C2-15
29	Contact Rod	527A113
30	Sleeve Insulator	529A6-2
31	Insulator Bushing	532A68
32	Contact Plate	515A146
33	Contact Spring	518A36
34	Machine Screw	542-312 -C2-52
	Washer	MS35338-78
35	Nut	AN340C3
	Washer	503B1-32
36	Stop Stud	527A112
37	Lead Screw	GA252
38	Nut	AN340C3
	Washer	503B1-32
39	Backlash Nut	527A136
40	Setscrew	527A100
	Washer	MS35333-71
41	Spring Washer	504C1-4
42	Tuning shaft	GA257
43	Ball Bearing	530C20-1
44	Screw	562-312-C2-52
	Washer	MS35338-79
45	Setscrew	AN565DC6H3
46	Filter Body	527A119
47	Capacitor, 500 µµf (8C8)	565C7-6
48	Spacer	529D4-5
49	Capacitor, 500 µµf (8C9)	565C7-5
50	Plug	537B133-2
51	Truarc Ring	5000-112W
52	Spring Washer	504C1-4
53	Locknut	502A24-1
54	Spacer	527A129
55	Packing Gland	504A12-2
56	Rear Cover	527A130
57	Machine Screw	562-875-C2-52
	Washer	MS35338-79
58	Coil (8L3, 3 turns)	MW-C-20(10)U1 Wire
59	Coil (8L4, 3 turns)	MW-C-20(10)U1 Wire

(item 27).

Step 17. Remove "center contact rod (item. 29) with contact plate (item 32) and insulators (items 30 and 31). This assembly can be taken apart by unsoldering the other end of wire (item 28) and removing nut (item 35).

Step 18. To remove oscillator tuning shaft from housing, unscrew four screws with washers (item 57) holding the rear cover with packing gland and rear cover (items 55 and 56). Remove cover (item 56) and spacer (item 54).

Step 19. Loosen and remove two locking nuts (item 53) and washer (item 52). The tuning shaft (item 42) now can be removed from inside the housing.

Step 20. Remove both ball bearings (item 43) by pushing them out with a wooden or similar soft tool. The two Truarc retaining rings (item 51) can be removed by expanding their ends with a pair of long-nose pliers or similar tool.

Step 21. Remove filament filter assembly 8Z3 (item 46) by loosening setscrew (item 45) and pulling the wire unsoldered from terminal stud (item 27) out of the housing. Capacitors 8C8 and 8C9 (items 47 and 49) and coil 8L4 (item 59) 'located inside spacer (item 48) can be then further disassembled if required.

(c) REASSEMBLY AND MOUNTING TO BASE PLATE. - To reassemble and mount the rf oscillator assembly (figure 5-5), proceed as follows:

Step L Assemble filament contact rod (item 29), plate (item 32), four insulating spacers (item 30), insulator bushing (item 31), and nut with washer (item 35).

Step 2. Insert this assembly into cavity (item 14) and secure by placing contacts (item 33) under each of the three screws and washers (item 34). See that locating edges of the contacts are in holes provi&d for them on plate (item 32).

Step 3. Install terminal stud (item 27) and solder one end of the short length of wire with sleeving (item '28) to contact rod (item 29) and the other end to terminal stud (item 27).

Step 4. Assemble tuning rods (item 12) to contact ring (item 10) and tuning rods (item 13) to contact ring (item 11).

step 5. Apply a thin coat of molybdenum disulphite (Molycots type Z, by Alpha Corp. , Greenwich, Corm. ; Admiral @t number 551B7-16) to contact areas of both contact rings (items 10 and 11).

Step 6. Insert contact ring assemblies into cavity (item 14). Push out the tuning rods of both contacts as far as possible and apply molybdenum disuphite to pointa of contact with three -prong contacts (item 33).

Step '1. Move contact ring assemblies (items 10 and 11) in and out several times to assure that they slide without excessive binding.

Step 8. Attach travel stop (item 36) to brazed plate of lead screw (item 37) and then to protruding tuning rods using six nuts and washers (item 38). Make certain that the half-round cutout on the plate is located above terminal stud (item 27).

Step 9, Apply molybdenum disulphite to thread of lead screw (item 37) and screw on backlash nut (item 39) with setscrew and washer (item 40) in place.

step 10. With spring washer (item 41) in place, screw the shaft onto lead-screw, bringing backlash nut into contact with the shaft until spring washer is partly compressed. Adjust the compression of the spring washer until the shaft can be turned with 5 to 7 inch-ounce torque, then tighten setscrew (item 40) so that it enters one of the notches on the shaft body.

Step 11. Install two Truarc rings (item 51) and both ball bearinga into housing. Make certain that ball bearings are well seated.

Step 12. Install assembled plate filter (item 46) by pulling wire inside housing and tightening setscrew (item 45).

Step 13. Depress tuning rods completely and insert cavity assembly (item 14) into housing with the shaft protruding through ball bearinge. Solder wire from filter (item 46) to terminal stud (item 27). Dress wire so it will not short to other parts of the assembly.

Step 14. Align flange flats on cavity and housing, pull threaded portion of tuning shaft through ball bearings, and fasten with five screws and washers (item 44).

Step 15. Place spring washer (item 52) with its convex side against bearing. Adjust and tighten locknuts (item 53) so that the shaft has no end play and can be turned with torque between 15 and 20 inch-ounces.

Step 16. Install packing gland (item 55) into rear cover (item 56), and spacer (item 54), and fasten them to housing with screws and washers (item 57).

Step 17. Install teflon insulator (item 16) into hole in center tubs of cavity by pushing it into place from outer side. Slide feedback contact into place on inner tubs. Fasten both with feedback probe (item 17) using an Allen wrench. Install cover screw with washer (item 26).

Step 18. Place teflon insulator (item 8) with terminal stud (item 9) installed on top of cavity, add plate contact ring (item 7), and fasten with five nylon screws (item 4). Place lug (item 6) under nylon screw next to stud (item 9). Connect and solder resistor 8R40 (item 5) between lug and terminal stud.

Step 19. Install assembled filter 8 Z 1 (item 19), fasten setscrew (item 18), and solder wire (item 20) to terminal stud (item 9).

Step 20. Insert tubs 8V2 (item 3), screw in retainer ring (item 2) and add cap (item 1).

Step 21. Install coupling (item 24) and tighten setscrew.

Step '22. To mount the rf oscillator assembly to the base plate, reverse the procedure in paragraph 5-4f(6)(a).

(7) ALC/ATTENUATOR ASSEMBLY 8A2.

(a) REMOVAL FROM BASE PLATE ASSEMBLY. - Remove four screws that hold rear of assembly to base plate. Remove three screws with washers that hold front of assembly to base plate. Loosen two Allen head setscrews that hold spur gear on assembly center shaft at front of base plate. Dis - connect cable 8W6 (8P53) from J53 on Directional Coupler Assembly 8A9. Remove attenuator assembly by grasping it at front and rear and carefully pulling it out of rear of base plate assembly.

(b) DISASSEMBLY. - To disassemble ALC/Attenuator Assembly (figure 5-6), proceed as follows :

Step 1. Remove four screws and washers (item 11) and remove housing cap and socket assembly (item 2) by pulling it off the tube.

Step 2. If required, remove two tube socket mounting screws (item 6). This makes accessible tube socket (item 5), capacitor 8C1 (item 3), and grounding wire with lug (item 4).

Step 3. Remove tube 8V1 (item 7) by gently rocking and pulling.

Step 4. Remove three screws with washers (item 9) and remove contact ring (item 8) by sliding it out.

Step 5. Unsolder from contact plate (item 12) center wire of signal input cable assembly (item 10) and lead of resistor 8R1 (item 16).

Step 6. Remove four screws and washers (item 11) and remove input cable assembly (item 10).

Step 7. Loosen setscrew (item 14) and remove filter assembly 8Z2 (item 15). This makes accessible resistor 8R1 (item 16), capacitors 8C2, 8C3, and 8C4 (items 17, 19, and 21), and spacers containing coils 8L1 and 8L2 (items 18 and 20).

Step 8. Loosen setscrew (item 24) and remove plunger assembly (item 29) from the cavity by pulling it out with all the parts attached to it, including lead screw clamp (item 23).

Step 9. If required, remove contact plate (item 12) by pushing it out with a suitable round tool through plunger cavity. Insulating spacer (item 13) can be removed by carefully pulling it off its mounting lip.

Step 10. Remove sliding contact (item 22) and lead screw clamp (item 23) from plunger by unscrewing.

Step 11. To gain access to resistor 8R2 (item 26) or coaxial cable connection to cavity coupling contact (item 25), loosen setscrew (item 28). Apply the tip of a hot soldering iron to edge of the cutout near the end of the plunger opposite resistor 8R2 (item 26), and push coaxial cable through plunger and sleeve (item 33) forward as shown on enlarged sectional view of figure 5-6. Remove resistor 8R2 by heating tip of contact (item 25) and unsoldering outer conductor of coaxial cable. After removing conical retainer (item 27), coaxial cable can be withdrawn for replacement, if necessary.

Step 12, Loosen two locking nuts (item 38), and separate attenuator shaft from mounting bracket (item 37).

Step 13. Remove two ball bearings (item 36) by knocking them out from inside of the mounting bracket (item 37) with a suitable tool made of wood or similar material.

(c) REASSEMBLY AND MOUNTING TO BASE PLATE. - To reassemble and mount the ALC/ attenuator assembly, proceed as follows (figure 5-6):

Step 1. Install ball bearings (item 36) into mounting bracket (item 37). Insert tuning shaft (item 35) and tighten one locknut (item 38) until the shaft has no end-play and can be turned with no more than 5 inch-ounces of torque. Carefully tighten second locknut and recheck end-play and torque.

Step 2. Thread backlash nut (item 32) on lead screw full length of thread to make certain there are no tight spots.

Step 3. Reassemble plunger assembly (item 29) by inserting resistor 8R2 (item 26) into hole provided for it and soldering the resistor lead protruding into cutout on plunger. Slide sleeve (item 33) onto coaxial cable from SC OUT connector (item 34) and pull cable through plunger (item 29). Strip the dielectric and braiding back 5/8 inch from end of cable, exposing center conductor. Strip off an additional 3/8 inch of outside insulation and comb out braid. Insert conical retainer (item 27) under combed portion of braid. Insert conical retainer until combed portion of braid is flush with dielectric, pull coaxial cable back in until flush with end of plunger and trim off any protruding braid. Tighten setscrew (item 28). Slip lead screw clamp (item 23) onto plunger. Bend the offset center conductor of coaxial cable as indicated in enlarged cutout in figure 5-6. Form resistor lead into pickup loop around coaxial conductor as s hewn and solder both together. Feed coaxial cable center conductor through contact (item 25), thread on sliding contact (item 22), and solder flush with top of contact. Remove sliding contact (item 22), apply Glyptol to threads on plunger and replace contact, threading on finger -tight.

Step 4. Install insulator ring (item 13)

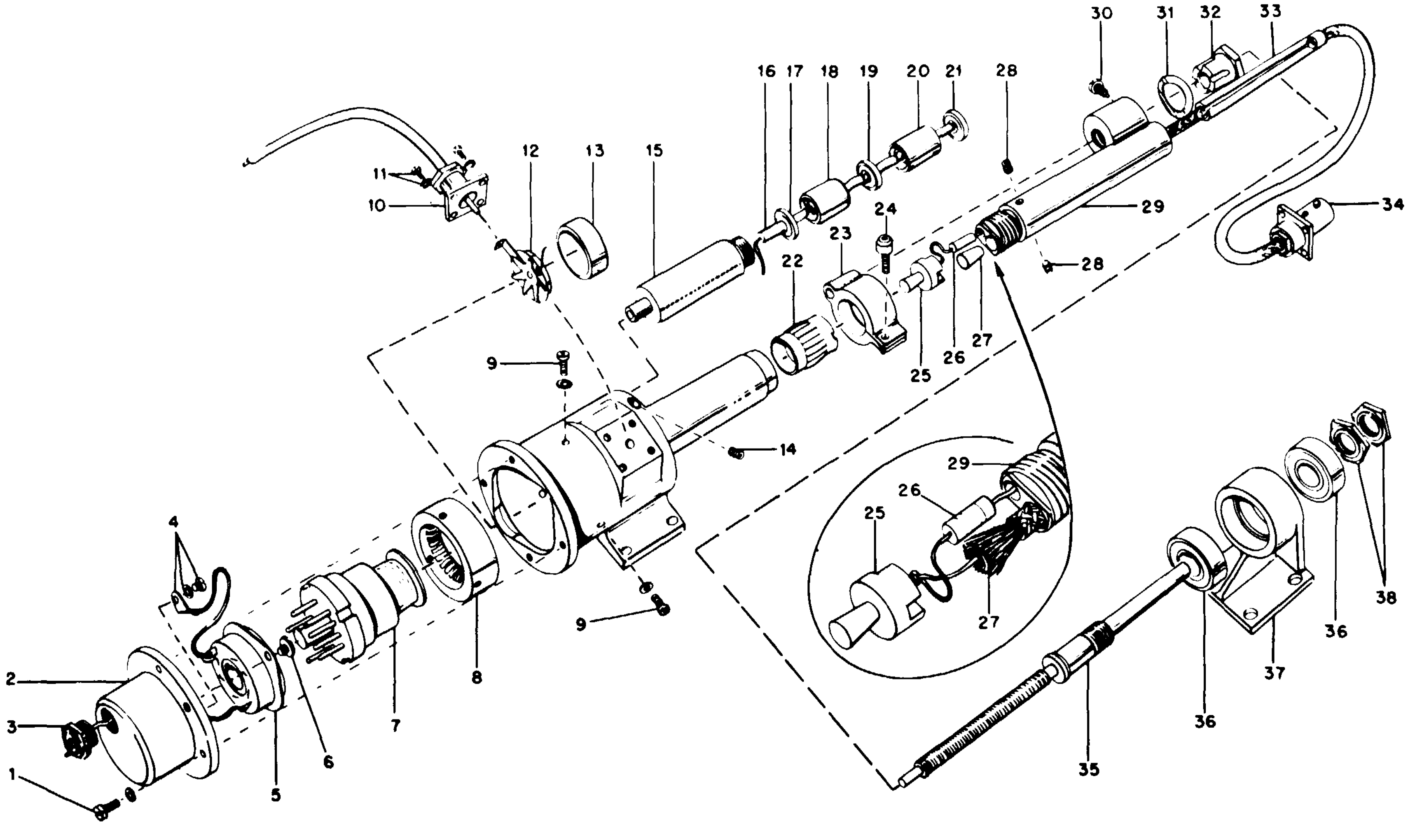


Figure 5-6. ALC/Attenuator Assembly 8A2, Exploded View

Table 5-7. ALC/Attenuator Assembly 8A2, Parts Identification

Call Out No. Figure 5-6)	Description	Admiral Part/Dwg No.
1	Machine Screw	542-312-C2-52
	Washer	MS35337-78
2	Shield	520B112
3	Capacitor, 200 µµf (8C1]	565A11
4	Terminal Lug	MS35431-1
	Machine Screw	542-187-C2-52
	Washer	MS35337-78
5	Tube Socket	587B9-2
6	Machine Screw	565-125-C2-52
7	Electron Tube (8V1)	2B22
8	Contact Ring	GA293
9	Machine Screw	542-312-C2-52
	Washer	MS35337-78
10	Cable Assembly (8W6)	GC4752
11	Machine Screw	522-281-C2-52
	Washer	MS35337-77
12	Contact Assembly	GA299
13	Insulating Spacer	529A6-3
14	Setscrew	AN565DC6H3
15	Filter Body	527A170
16	Resistor (8R1)	RC20GF150J
17	Capacitor, 25 µµf (8C2)	565C7-3
18	Spacer	529C3-10-44

Call Out No. (Figure 5-6)	Description	Admiral Part/Dwg No.
19	Capacitor, 25 µµf (8C3)	565C7-4
20	Spacer	529C3-11-44
21	Capacitor, 25 µµf (8C4)	565B7-3
22	Contact	GA295
23	Lead Screw Clamp	520B111
24	Hexagon Cap Socket Hd Screw	6-32NC-3A(3/8)
25	Contact	GA313
26	Resistor (8R2)	RC20GF470J
27	Retainer	527A166
28	Setscrew	501A7-2
29	Plunger	GA292
30	Lock Screw	50lA17
	LockWasher	MS35337-78
31	Spring Washer	504C1-5
32	Backlash Nut	527A164
33	Sleeve	527A162
34	Connector (8J6)	UG-291A/U
35	Lead Screw	527A161
36	Ball Bearing	530C20-4
37	Mounting Bracket	520A27
38	Locknuts	502A24-3

and star-shaped contact (item 12) into housing. Secure with phenoweld adhesive cement by applying to end of insulator. Do not allow any cement to adhere to sides of insulator.

Step 5. Install coupling assembly (item 10) using four screws and washers (item 11). Solder protruding end of coaxial cable center conductor to metal strip on contact (item 12).

Step 6. Install filter assembly 8Z2 (item 15), fasten setscrew (item 14), and solder lead of resistor 8R1 (item 16) to nearest point on contact (item 12).

Step 7. Install ring contact (item 8) and fasten with three screws and washers (item 9).

Step 8. Assemble housing cap (item 2), tube socket (item 5), grounding lug (item 4), and capacitor 8C1 (item 3). Insert tube 8V1 (item 7) into tube socket. Install entire assembly into housing, orient properly, and fasten using screws and washers (item 1).

Step 9. Assemble lead screw assembly completed in step 2 to plunger assembly completed in step 3 with spring washer (item 31) in between. Adjust backlash nut for 4 to 6-inch ounce torque on lead screw. Tighten lockscrew (item 30).

Step 10. Insert assembly completed in step 9 into assembly completed in step 8. Do not tighten setscrew of lead screw clamp (item 24).

Step 11. Mount complete ALC/Attenuator assembly loosely on cast mounting plate and align plunger assembly with cavity assembly by operating lead screw clamp setscrew (item 24). Recheck for free movement of lead screw through entire range.

(8) WAVEMETER ASSEMBLY 8A3.

(a) REMOVAL FROM BASE PLATE ASSEMBLY. - Loosen two Allen head setscrews that hold spur gear to wavemeter center shaft at front of base plate. Unscrew three screws with washers that hold assembly to front of base plate. Unscrew two screws with washers that hold center portion of assembly to base plate. Carefully lift assembly from base plate.

(b) DISASSEMBLY. - To disassemble wavemeter assembly (figure 5-7), proceed as follows:

Step 1. Remove spacer (item 2). Unscrew five screws with washers (item 22) which hold together housing (item 7) and cavity (item 23).

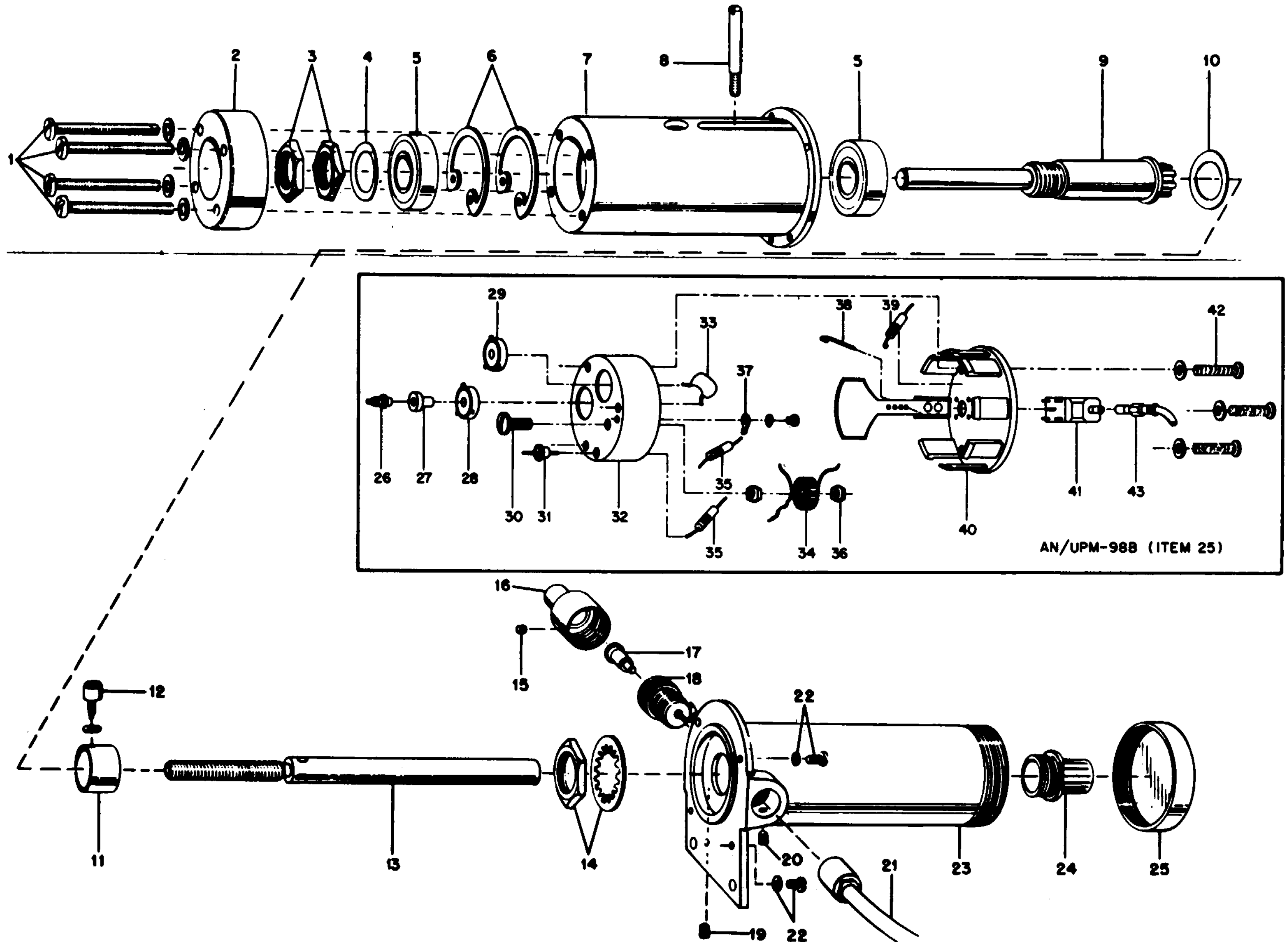


Figure 5-7. Wavemeter Assembly 8A3, Exploded View

Table 5-8. Wavemeter Assembly 8A3, Parts Identification

Call Out No. (Figure 5-7)	Description	Admiral Part/Dwg No.
1	Machine Screws	185-437-C2-3
	Washer	503A5-36-3
2	Spacer	527A474
3	Locknut	502A24-1
4	Spring Washer	504C1-4
5	Ball Bearing	530C20-2
6	Retaining Ring	MS16625-4112
7	Housing	527B134
8	Anti-rotate Pin	527A121
9	Tuning Shaft	GA256
10	Spring Washer	504C1-4
11	Backlash Nut	527A120
12	Cup Head Screw	527A1OO
	Washer	MS35337-71
13	Lead Screw	527A128
14	Nut	502A128
	Lockwasher	503B-79-78
15	Setscrew	501C1-1
16 & 18	Crystal Holder Assy (Cap and Body) (8Z7)	GB222
17	Crystal Diode (8CR1	1N25
19	Setscrew	AN565DC6H3
20	Setscrew	AN565DC6H3
21	Cable Assy (8W2)	GC5124
22	Machine Screw	542-312-C2–52
	Washer	MS35338-135
23	Cavity	GB275
24	Plunger Contact	527A118
25	Cover (AN/UPM-98A)	527A122
25	Probe Assy (8MP39) (AN/UPM-98B, AN/UPM-98C)	GC5061
26	Semiconductor Diode (8CR10)	593A85
27	Contact Post	527B898
28	Capacitor, Fixed (8C23)	CB11ND271J
29	Capacitor, Fixed (8C21)	CB11ND270J
30	Screw Machine	501B39-6
31	Terminal, Feedthru (8E11)	510C31-1
32	Housing, Probe	527C895
33	Capacitor, Fixed (8C22)	CM05FD101K03
34	Transistor, RF (8T2)	572D44
35	Resistor, Fixed (8R42, 8R43)	RC07GF222J
36	Nut, Plain, Hexagon	502B133-1
37	Terminal Lug	509C4-1
38	Spring, Contact	518B365
39	Resistor, Fixed (8R44)	RC07GF820J
40	Housing, Probe	GC5130-1
41	Connector, Receptacle (8J56)	588C232
42	Screw Machine	125-562-C2-78
43	Cable Assembly (8W10)	GB5123

(Items 26 thru 43 are used on AN/UPM-98B only)

Pull the two parts apart. Do not damage the tuning stub protruding into the cavity.

Step 2. Remove plunger anti-rotate screw (item 8) with a screwdriver.

step 3. Remove two locknuts (item 3) and washer (item 4), if present. Pull out attenuator shaft (item 9) and tuning stub (item 13) assembly. Separate the two by unscrewing.

Step 4. Loosen setscrew (item 15), unscrew crystal holder cap (item 16), and remove crystal diode 8CR1 (item 17) from crystal holder (item 18).

Step 5. Loosen setscrew (item 19) and remove crystal holder body (item 18) by unscrewing.

Step 6. Loosen setscrew (item 20) and pull out input cable assembly 8W2 (item 21).

step 7. Remove cover (item 5), unscrew nut with lockwasher (item 14), and remove tuning stub contact (item 24).

c. REASSEMBLY AND MOUNTING TO BASE PLATE. To reassemble the wavemeter 8A3 (figure 5-7), processed as follows:

Step 1. Apply some of molybdenum disulphite grease to threads of lead screw (item 13). Thread on backlash nut (item 11) with setscrew and washer (item 12) in place.

Step 2. Place spring washer (item 10) on shoulder of shaft (item 9) and thread half way on lead screw. Tighten backlash nut (item 11) until the shaft can be turned with 5 to 7 inch-ounce torque. Tighten backlash setscrew (item 12) *so* that it enters a slot on the shaft. Recheck torque.

step 3. Insert Truarc retaining rings (item 6) into housing and install ball bearings (item 5) seating against the retaining rings.

step 4. Install shaft and lead screws into housing. Tighten locknuts (item 3) so that shaft has no end-play and torque is between 15 to 20 inch-ounce.

step 5. Install anti-rotate screw (item 8) through slot in housing.

Step 6. Install contact (item 24) into cavity (item 23) and fasten with nut and lockwasher (item 14).

Step 7. Apply a thin coat of molybdenum disulphite to tuning stub (item 13) protruding from housing. With flanges as in figure 5-7, insert tuning stub into contact (item 24). Fasten cavity and housing together with five screws and washers (item 22).

Step 8. Inspect the wire loop on the marrow end of crystal holder body (item 18). Do not distort the loop; a No. 22 drill should slip through it, Thread the crystal holder into cavity (item 23), orient coupling loop, parallel to axis of the tuning stub; with grounded part of the loop toward the gear train. Fasten setscrew (item 19). Insert crystal 8CR1.

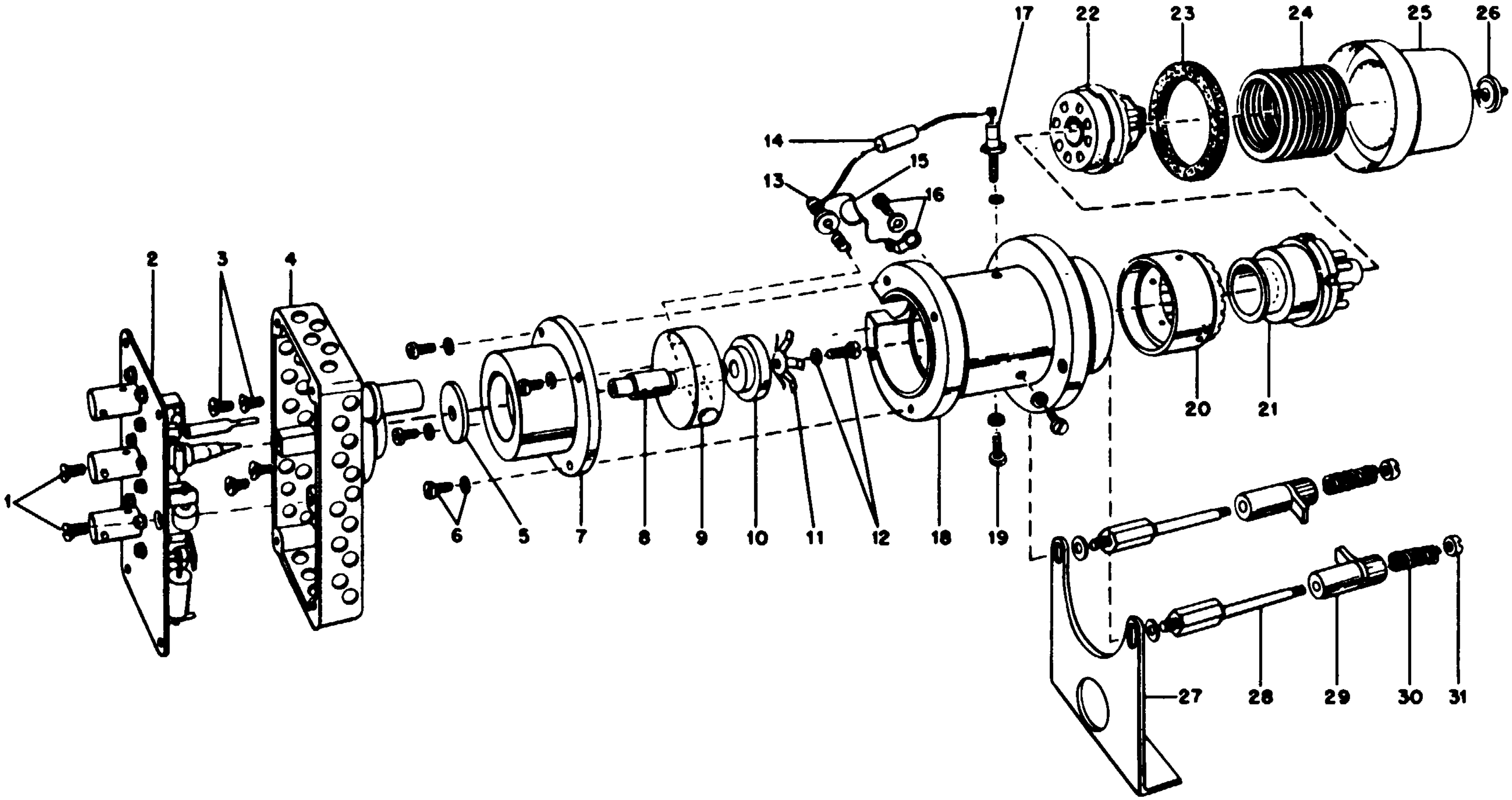


Figure 5-8. Demodulator Assembly 8A4, Exploded View

Table 5-9. Demodulator Assembly 8A4, Parts Identification

Call Out No. Figure 5-8)	Description	Admiral Part/Dwg No.
1	Machine Screw	LL54J62S6
2	Front Plate Assembly	GD287-3
3	Machine Screw	561-625-C2-52
4	Housing	GB284-3
5	Insulator	532A79
6	Machine Screw	542-375-C2-52
	Washer	MS35338-78
7	Spacer	527A156
8	Sleeve	527A144
9	Insulator	532A81
10	Tube Stop	527A145
11	Contact Spring	518A37
12	Machine Screw	142-375-C2-42
	Washer	503A5-33-42
13	Terminal Stud and RF Coil Assembly (8L9)	GA278
14	RF Coil, 3.3 µh(8L10)	569C22-3
15	Capacitor, 2.2 µµf (8C13) (Centralab)	TB60229DCOK

Call Out No. (Figure 5-8)	Description	Admiral Part/Dwg No.
16	Terminal Lug	MS35431-1
	Machine Screw	542-375-C2-52
	LockWasher	MS35338-78
17	Terminal Stud	509B58
18	Cavity	527B154-2
19	Machine Screw	542-375-C2-2
	Washer	MS35338-78
20	Contact Ring	GA283
21	Electron Tube (8v3)	2B22
22	Tube Socket	587B52
23	Wire Mesh	536A27-2
24	Spring	519C12-52
25	Tube Socket Shield	585B22
26	Capacitor, 100 µµf (8C14) (MIL-C-10950)	CB11ND101K
27	Mounting Bracket	515A162-3
28	Tube Retainer Stud	527A150-2
29	Tube Retainer	GA280
30	Spring	519A19
31	Round Nut	527A157

(item 17) in holder, thread on crystal holder cap (item 16) until finger-tight, and tighten setscrew (item 15).

Step 9. Install 8P12 termination of cable 8W4 (item 21) in a reamer similar to that described in step 8, and tighten setscrew (item 20).

Step 10. Taking care not to force anti-rotate pin (item 8) against end of slot, rotate shaft and observe tuning stub through end opening of cavity to make certain it does not wobble.

Step 11. Thread cover (item 25) into place.

Step 12. To mount the assembly to the base plate, reverse the procedure in paragraph 5-4f(7)(a).

(9) DEMODULATOR ASSEMBLY 8A4.

(a) REMOVAL. - Unscrew four screws with washers that hold assembly to front panel. Disconnect 8P11 from 8J11 on demodulator.- Unsolder filament lead at rear of assembly. Remove two screws that hold assembly mounting bracket to base plate. Carefully lift assembly out of panel-chassis assembly.

(b) DISASSEMBLY. - To disassemble demodulator assembly (figure 5-8), proceed as follows:

Step 1. Unscrew two flat head screws (item 1) and remove demodulator front plate assembly (item 2) by pulling it straight away from the housing.

Step 2. Unscrew four flat head screws (item 3) and remove front plate housing (item 4) and plastic insulator ring (item 5).

Step 3. Unscrew four screws and washers (item 6) and remove spacer part of the housing (item 7).

Step 4. Unsolder coil 8L10 (item 14) from terminal stud (item 17) and remove screw (item 16) holding a lug on one end of capacitor 8C13 (item 15).

Step 5. Remove insulator disk (item 9) assembled with parts attached to it. Proceed with steps 6 and 7 if it is necessary to further disassemble the insulator disk and contact assembly; otherwise skip to step 8.

Step 6. Remove screw with washer (item 12) and contact spring (item 11) with tube stop (item 10).

Step 7. Apply tip of pencil type soldering tool to sleeve (item 8) through hole in the plastic insulator ring item 9) opposite terminal stud (item 13) with attached coil 8L9. After solder melts, withdraw terminal stud with coil and remove sleeve (item 8).

Step 8. Turn two tube retainers (item 29) and remove tube socket shield assembly (item 25) and demodulator tube 8V3 (item 21) by gently pulling and rocking them.

Step 9. Unscrew terminal stud (item 17) and two remaining mounting screws with washers (item 19). Slide out contact

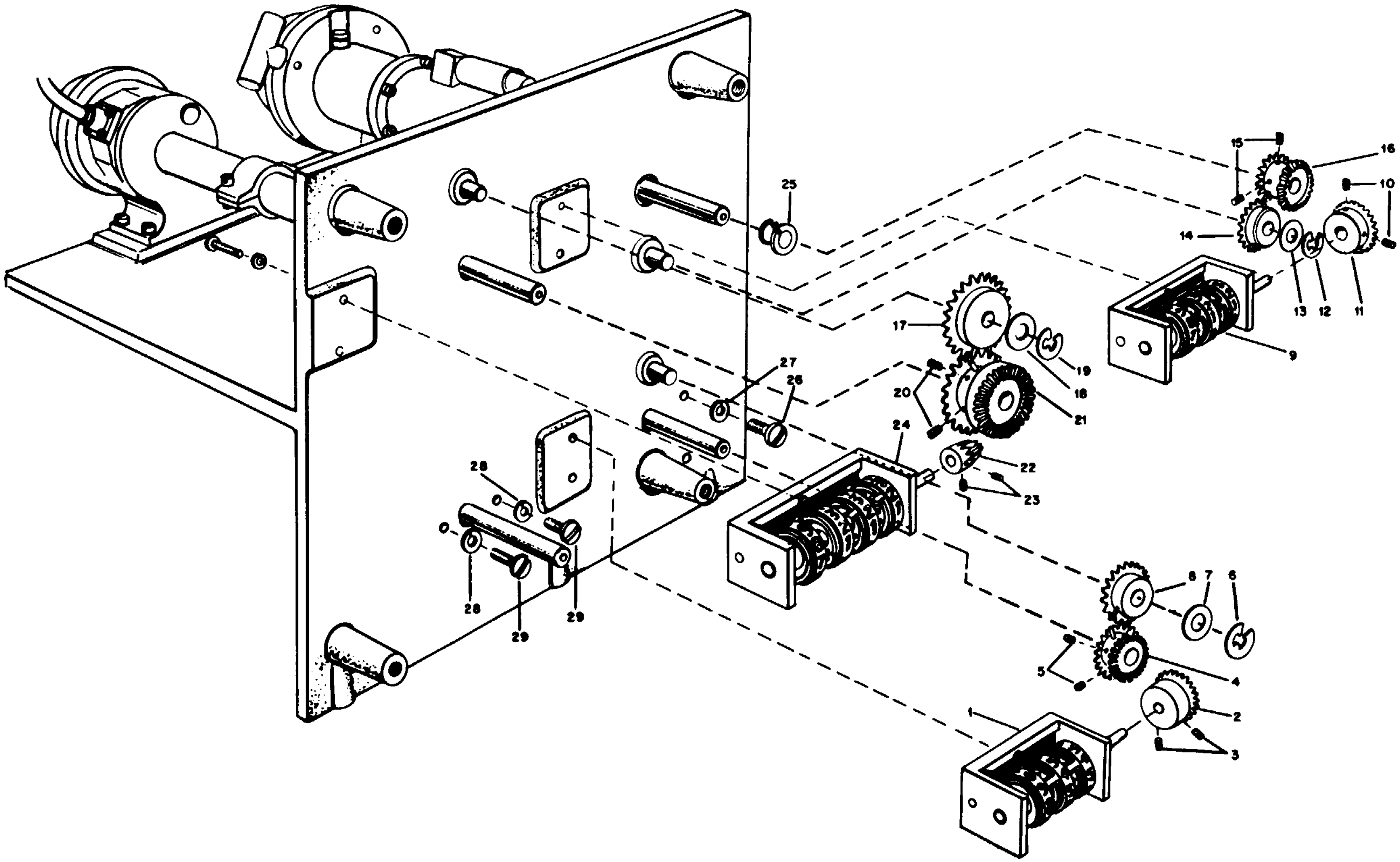


Figure 5-9. Base Plate Assembly, Exploded View

Table 5-10. Base Plate Assembly, Parts Identification

Call Out No. (Figure 5-9)	Description	Admiral Part/Dwg No.	Call Out No. (Figure 5-9)	Description	Admiral Part/Dwg No.
1	Rotating Counter	559B18	17	Spur Gear Assembly	GB1618
2	Bevel Gear	530C62-8	18	Flat Washer, #10	504A2-16-52
3	Setscrew, #2-56x 1/8	501C1-70-70	19	"E" Ring	518B29-7-102
4	Compound Gear Assy	GB1616	20	Setscrew, #4-40 x 1/8	501 C1-1-102
5	Setscrew, #4-40 x 1/8	501C1-1-102	21	Compound Gear Assy	GB1615
6	Flat Washer, #10	504A2-16-52	22	Bevel Gear	53 0B101
7	"E" Ring	518B29-7-102	23	Setscrew, #2-56 x 1/8	501C1-70-70
8	Spur Gear Assy	GB1619	24	Rotating Counter	559B19
9	Rotating Counter	559B18	25	Bearing Sleeve, Nylon	530B99-6
10	Setscrew, #2-56 x 1/8	501C9-70-70	26	Machine Screw, BH #8-32 X 1-1/2	585-1500-C2-52
11	Bevel Gear	530C62-8	27	#8 Split LockWasher	503A1-66
12	Flat Washer, #10	504A2-16-52	28	#6 Split LockWasher	503A1-35
13	"E" Ring	518B29-7-102	29	Machine Screw, #6-32 X 7/16	565-437-C2-52
14	Spur Gear Assy	GB1620			
15	Setscrew, #4-40 x 1/8	501C1-1-102			
16	Compound Gear Assy	GB1617			

ring (item 20).

Step 10. Using a small screwdriver, remove round nuts (item 31) at the end of each tube retainer and slide off retainers (item 29) with springs (item 30) inside them.

Step 11. Press the tubs socket (item 22) into shield (item 25) and turn so that the two flat sides of the socket can pass the stops on the shield, and socket is pushed out of the shield by spring (item 24). This makes accessible the parts inside the tube shield.

(c) REASSEMBLY AND MOUNTING. - To reassemble and mount the demodulator assembly (figure 5-8), proceed as follows:

Step 1. Assemble the tube socket (item 22), wire mesh (item 23), spring (item 24), and tube socket shield (item 25). Align the flats on the socket with corresponding flats on the shield, compress the spring, and rotate the socket to engage the stops on theretainer.

Step 2. Fit retainers (item 29) and springs (item 30) onto tube retainer studs (item 28). Fasten with round nuts (item 31).

Step 3. Slide contact ring (item 20) into cavity (item 18). Screw two mounting screws with washers (item 19) and terminal stud (item 17) into the cavity.

Step 4. Insert demodulator tube (item 21) into tube socket shield assembly (item 25). Turn tube retainers (item 29) to secure the tube in posit ion.

Step 5. Insert sleeve (item 8) into insulator disk (item 9). Insert terminal stud and coil (item 13) into insulator disk. Make sure that coil 8L9 is in contact with sleeve (item 8). Apply tip of pencil-type soldering iron to sleeve through hole in insulator disk. Check coil 8L9 for proper electrical connect ion.

Step 6. Assemble tube stop (item 10) and contact spring (item 11) to insulator disk and sleeve with screw and washer (item 12). Place the insulator disk (item 9) with assembled parts in the cavity (item 18).

Step 7. Fasten mounting lug (item 13) to cavity. Fasten other end of capacitor 8C13 (item 15) to cavity with screw and washer (item 16). Solder coil 8L10 (item 14) to terminal stud (item 17).

Step 8. Assemble spacer portion of housing (item 7) to cavity with four screws and washers (item 6).

Step 9. Connect front plate housing (item 4) and plastic insulator ring (item 5) to assembled cavity with four flat head screws (item 3).

Step 10. Carefully install the demodulator front plate assembly (item 2) to front plate housing with two flat head screws (item 1).

Step 11. Carefully set the assembly in place. Fasten the mounting bracket (item 27) with two screws provided. Connect and solder the filament lead to the rear of the assembly. Connect 8P11 to 8J11 on demodulator. Secure assembly to front panel with four screws and washers provided.

(10) REASSEMBLY AND INSTALLATION OF RF BASE PLATE ASSEMBLY. - When one or more of the rf assemblies on the base plate have been repaired or replaced, it becomes necessary to recalibrate and realign the unit mechanically and electrically as explained in paragraph 5-51. To install the counting mechanisms on the base plate assembly, proceed as follows:

(a) REASSEMBLY.

Step 1. Turn tuning shaft of ALC/Attenuator Assembly 8A2 counterclockwise to end of rotation, then turn clockwise 1/4 turn. Assemble compound gear (figure 5-9, item 21) to attenuator shaft. Insert setscrews (item 20) into gear but do not tighten. Install spur gear (item 17), flat washer (item 18), and retaining “E” ring (item 19) on the short shaft just above the attenuator shaft. Reinstall the rotating counter (item 24) on the base plate. Place bevel gear (item 22) on counter shaft; place setscrews (item 23) in gear but do not tighten. Without the gear teeth meshing, place the stops as illustrated in figure 5-9. Manipulate the gears until they mesh. Be sure that the positions of the stops are not disturbed. Slide the bevel gear to the right to see if it meshes with the compound gear (item 21). Do not tighten setscrews (item 23) on the bevel gear. Tighten the setscrews (item 20) on the compound gear (item 21),

Step 2. Install nylon bearing sleeve (item 25) on base plate. Rotate rf oscillator tuning shaft fully counterclockwise. Place compound gear (item 16) on rf oscillator shaft. Insert but do not tighten setscrews (item 15), Install bevel gear (item 11) on rotating counter shaft after installing rotating counter onto base plate. Install setscrews (item 10) on gear but do not tighten. Place spur gear (item 14), flat washer (item 13), and retaining “E” ring (item 12) on short shaft just below rf oscillator tuning shaft. Align the compound gear (item 16) and the spur gear (item 14) as shown in figure 5-9. Check to see that the teeth on the gears mesh and that the stops are correctly positioned. Slide the bevel gear to the right to see that the teeth mate with the teeth on the compound gear. Do not tighten setscrews (item 10) on bevel gear (item 11) but tighten setscrews (item 15) on compound gear (item 16).

Step 3. Install rotating counter (item 1) on baseplate. Turn wavemeter shaft fully counterclockwise. Place bevel gear (item 2) on rotating counter shaft. Insert set - screws (item 3) into bevel gear but do not tighten. Install setscrews (item 5) into the compound gear (item 4). Place compound gear (item 4) on short shaft just above wavemeter tuning shaft. Install spur gear (item 8), flat washer (item 7), and “E” ring (item 6) on wavemeter tuning shaft. Align the gears (items 4 and 8) so that gear stops are positioned as shown in figure 5-9. Manipulate the gears so that the teeth are engaged. Be careful that the position of the gear stops is not disturbed.

Step 4. Connect base assembly with installed rf units to Radar Test Set AN/UPM-98A and external test equipment for preinstallation calibration and alignment as in paragraph 5-51.

(b) INSTALLATION. - After alignment and calibration, install the base plate assembly into Coder Simulator SM-197A/UPM-98 as follows:

Step 1. Check to see that assemblies 8A1, 8A2, and 8A3 are fastened firmly to base plate assembly.

Step 2, Fasten base plate assembly to coder simulator front panel with four machine screws. Fasten to chassis bottom with five machine screws.

Step 3. Fasten SG OUT connector 8J6 to front panel with four machine screws.

Step 4. Connect and solder filament leads to rf oscillator and ALC/Attenuator assemblies. Connect 8P19 and 8P20 to power supply. Connect 8P7 and 8P3 to rf oscillator assembly. Connect 8P5 to 8J5 on ALC/Attenuator. Connect 8P12 to 8J12 on wavemeter. Connect cable 8W6 between ALC/ Attenuator and directional coup-. ler, and cable 8W9 between directional coupler and rf oscillator.

Step 5. Mount SC FREQUENCY, WAVEMETER FREQUENCY, WAVEMETER INPUT, and ATTENUATION front panel knobs in their proper places.

(11) DIRECTIONAL COUPLER ASSEMBLY 8A9.

(a) REMOVAL. - Remove SM-197A/UPM-

98 drawer from Radar Test Set AN/UPM-98A. Stand drawer on end for access to both top and bottom of drawer. Disconnect coaxial cables 8W8 and 8W6 from connectors 8A9J52 and 8A9J53. On the Directional Coupler Assembly, disconnect cable 8W9 from Oscillator Assembly 8A1 by loosening setscrew (item 18, figure 5-5). Remove two screws with lockwashers and nuts mounting assembly to chassis, and remove Directional Coupler Assembly 8A9.

(b) REPLACEMENT. - Remount Directional Coupler Assembly using two screws, lockwashers, and nuts, with the nuts on the top surface of the chassis. Reconnect the three coaxial cables making sure that cable 8W6 connected to 8A9J53 goes to the 8A2 assembly, and cable 8W8 connected to 8A9J52 goes to connector 8J53.

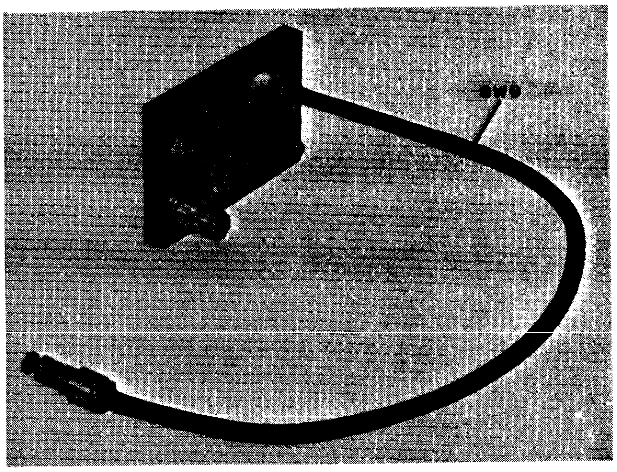


Figure 5-10. Directional Coupler Assembly 8A9

REASSEMBLY OF RADAR TEST SET AN/UPM-98A. - To reassemble components of Radar Test Set AN/UPM-98 into an operating unit, proceed as follows :

Step 1. Route ac power cable through access opening on rear wall lower compartment of Electrical Equipment Case CY-2726A/UPM-98 opposite the blower. With cable not connected to main power source, connect its conductors to terminals 2 and 3 on 7TB3 inside the cabinet.

Step 2. Slide Coder Simulator SM-197A/UPM-98 halfway into the lower part of Electrical Equipment Case CY-2726A/UPM-98. Mate 8J21 with 7P3; check action of interlock switch 8S3. Tighten the five heavy captive screws around the front panel so that the sealing gasket is evenly compressed around the unit.

Step 3. Similarly, install Radar Test Set TS-1253A/UP into the upper part of Electrical Equipment Case CY-2726A/UPM-98. Before closing the gap between front panel and the case, connect power distribution cable plug 7P2 to receptacle 5J1 on right hand side of Radar Test Set TS-1253A/UP. Check action of interlock switch 5S2. Tighten five captive screws around front panel so that sealing gasket is evenly compressed around the unit. Radar Test Set AN/UPM-98A is now ready for final examination and testing.

5-5. ELECTRICAL TESTING.

a. TESTING DISPLAY UNIT. - To test calibrate, and adjust a repaired Display unit, connect it to an operating Radar Test Set TS-1253A/UP using cable assembly CX-4963/UP and CX-4964/UP. Turn power on, allow five minutes of warmup time, and proceed as follows:

Step 1. Measure voltage at pin 10 of rear connector 1P2. Voltage should be 250 ±10 vdc.

Step 2. Using high voltage meter probe, measure voltage at pin 7 of 1XZ1. Adjust ANODE SET internal control 1R70 for +1500 vdc.

Step 3. Turn INTEN control fully clockwise. CRT trace should become very bright. Return control to a point giving a normal trace without signs of blooming.

Step 4. Adjust FOCUS and ASTIG controls for sharpest, most even trace.

Step 5. If trace is not parallel to horizontal grid lines, loosen CRT mounts and rotate CRT as required. Tighten mounts.

Step 6. Check that trace can be moved by turning VERT control to move it at least 1.5 inch below and above center line.

Step 7. Check to see that the trace fills the face of CRT with HORIZ control approximately in mid-range. If it does not, readjust ANODE SET control 1R70.

Step 8. Check to see that both ends of trace line can be moved to within one inch of center of CRT screen by turning HORIZ control.

Step 9. Check operation of SCALE control. Scale light should be adjustable from completely out to a bright red glow.

Step 10. Connect oscilloscope to VIDEO connector using a video cable. Set oscilloscope AMPLITUDE CALIBRATOR to 50 millivolts, VOLTS/IN switch to .05, and VIDEO SENS control to CAL. Adjust sweep speed controls so that a single pulse is displayed.

Step 11. Adjust PHASE ADJ (1C34) and FREQ ADJ (1C36) internal controls for best square wave.

Step 12. Adjust GAIN control 1R40 for one-inch pattern height on Display unit CRT.

Step 13. Set oscilloscope AMPLITUDE CALIBRATOR to .1 volts, set VOLTS/IN switch on Display unit to . 1, and adjust 1C1 for a true square wave presentation.

Step 14 Adjust the following trimmer capacitors for true square wave presentation with control settings as listed:

AMPLITUDE CALIBRATOR	VOLTS/IN	ADJUST
.2 volts	.2	1C12
. 5 volts	.5	1C20
1 volt	1	1C28
2 volts	2	1C24
5 volts	5	1C32
10 volts	10	1C16
20 volts	20	1C8

Step 15 Remove cable between oscilloscope and VIDEO connector, Set Test Lead MX-2681/UP (video probe) attenuation switch to 10:1, connect cable to VIDEO connector, and connect probe tip to center of CAL OUT connector on oscilloscope.

Step 16. Set oscilloscope AMPLITUDE CALIBRATOR control to .5 volts and VOLTS/IN switch on display unit to .05. Remove white button on side of video probe MX-2681VP and adjust trimmer capacitor for display presentation of a true square wave.

Step 17. Set MX-2681/UP attenuation switch to 100:1 and oscilloscope AMPLITUDE CALIBRATOR control to 5 volts. Remove probe tip, and using an Allen wrench, adjust trimmer capacitor 6C1 inside the tip for one-inch pattern height on Display unit CRT.

Step 18. Set MX-2681/UP attenuation switch to 10:1. Adjust attenuator padder capacitors for true square wave display with AMPLITUDE CALIBRATOR and VOLTS/IN control settings as follows:

AMPLITUDE CALIBRATOR	VOLTS/IN	ADJUST
1 volt	.1	1C61
2 volts	.2	1C9
5 volts	.5	1C17
10 volts	1	1C25
20 volts	2	1C21
50 volts	5	1C29
100 volts	1 0	1C13
100 volts	20	1C5

Step 19. Disconnect oscilloscope. Turn power off. Disconnect servicing cables from Display unit.

b. TESTING SWEEP AND INTENSITY MARK UNIT. - To test and adjust the Sweep and Intensity Mark unit. connect it to an operating Radar Test Set TS-1253A/UP with cable assemblies CX-4963/UP and CX-4964/UP. Turn power on, allow five minutes of warmup time, and proceed as follows:

Step 1. Measure voltages at following test points:

Test Point	Voltage
2TP1	+250 +10 vdc
2TP2	-35 + 3 vdc
2TP3	-150 + 2 vdc

Step 2. Turn SWEEP AMPL internal control 2R33 fully counterclockwise. Connect oscilloscope input to pin 9 of 2V5. Turn SWEEP AMPL (2R33) control clockwise until sweep sawtooth starts malfunctioning. Amplitude of sawtooth should reach a minimum of -140 volts without malfunction.

Step 3. Set SWEEP AMPL (2R33) for sweep sawtooth amplitude of 110 volts.

Step 4. Measure sweep duration and trailing edge jitter. Jitter should not exceed 10% of sweep duration. The sawtooth waveshape should be linear throughout.

Step 5. Connect oscilloscope to pin 1 of 2V5. Sweep sawtooth waveshape of opposite polarity as in step 3 should appear. Amplitude shall be ±10 volts of waveshape in step 3.

Step 6. Turn SWEEP SPEED RANGE switch on Sweep and Intensity Mark unit to all positions. Sweep should appear in all positions. Adjust SWEEP SPEED controls for sweep duration of approximately 1200 μsec.

Step 7. Turn OSC FEEDBACK ADJ (2R50) fully counterclockwise. Remove cover from oven 2Z1 for access to 1 mHz FREQ ADJ 2L2. Turn 2L2 fully counterclockwise. Connect oscilloscope input A to cathode of 2CR7. Adjust PRF control so that time between sweeps equals sweep duration. Set INTENSITY MARKS RANGE to 1 and INTENSITY MARKS LEVEL fully clockwise.

Step 8. Turn OSC FEEDBACK ADJ control 2R50 clockwise until intensity marks appear along entire top of intensity gate on oscilloscope display. Turn 2R50 approximately 5 to 10 degrees beyond this point.

Step 9. Connect oscilloscope input B to pin 3 of 3V2 in Crystal Mark and Sync unit. This can be done with a short length of insulated wire routed between front panel and the plug-in unit. Crystal marks should appear on the B trace of the oscilloscope.

Step 10. Set SYNC SELECT switch on Crystal Mark and Sync unit to INT 1.00.

Step 11. Adjust oscilloscope TIME/CM controls for sweep speed of 1 μsec per 2 cm. Adjust oscilloscope DELAY

TIME control for a delay range of 0 to 1000 µsec.

Step 12. Adjust oscilloscope DELAY TIME MULTIPLIER control so that the first intensity mark on top of intensity gate on trace A is coincident with first crystal mark on B trace. Scan slowly to 1000 µsec, adjusting 2L2 so that crystal marks and intensity marks maintain coincidence. At 1000 µsec time delay, difference between both sets of markers should be less than 2 µsec. At completion of this step, tighten locknut on 2L2 and replace oven cover. Tighten locknut on 2R50.

NOTE

If intensity markers disappear before 1000 µsec delay is reached, turn 2R50 slowly clockwise until intensity markers appear, continue turning slowly for an additional 10 degrees, then repeat step 12.

Step 13. Set INTENSITY MARKS RANGE control to 5. Set 5 µsec internal adjustment 2R73 so that intensity markers appear at 5 µsec intervals over 1000 µsec range.

Step 14. Set INTENSITY MARKS RANGE control to 50. Set 50 µsec internal adjustment 2R86 so that intensity marks appear at 50 µsec intervals over 1000 µsec range.

Step 15. Calibrate oscilloscope for 0. 1 µsec sweep speed per cm. Connect oscilloscope to pin 6 of 2V10. Adjust 10 mHz transformer 2T3 for maximum amplitude of 0. 1 µsec markers.

Step 16. Connect oscilloscope to pin 13 of power connector 2P1. Depress SWEEP DELAY STROBE. A positive pulse should appear.

Step 17. Connect oscilloscope to pin 2 of power connector 2P1. Depress DELAY STROBE TRIGGER. A positive pulse should appear.

Step 18. Disconnect oscilloscope. Turn off power. Disconnect Sweep and Intensity Mark unit.

c. TESTING CRYSTAL MARK AND SYNC UNIT. - To adjust and test the repaired Crystal Mark and Sync unit, connect it to an operating Radar Test Set TS-1253A/UP with a cable assembly CX-4963/UP. Set operating controls as follows:

Control	Setting
SWEEP DE LAY RANGE	1-11
SWEEP DELAY COARSE and FINE	fully ccw
TRIGGER DE LAY RANGE	0
TRIGGER DELAY COARSE and FINE	fully ccw
SYNC SELECT	INT 1.00
XTAL MARK LEVEL	fully ccw
PRF	fully ccw
SUP	fully ccw

Turn power on, allow five minutes of warmup time, and proceed as follows:

Step 1. Measure following voltages:

Test Point	Voltage
3TP1	±250 ±10 vdc
3TP2	-150 ±2 vdc

step 2. Connect input of frequency counter to pin 3 of 3V2 and count crystal marker frequency. Frequency should be between 999, 500 and 1,000, 500 Hz.

Step 3. Set SYNC SELECT switch to INT 1.45 and count crystal marker frequency. Frequency should be between 689,310 and 690, 000 Hz.

Step 4. Connect frequency counter input to 0 TRIGGERS connector. Set SYNC SELECT control to INT. Turn PRF control fully clockwise. Adjust PRF ADJ internal control 3R40 for trigger pulse repetition frequency of 4100 pps or slightly more,

Step 5. Turn PRF control fully ccw. Count Prf of triggers. It should be 15 pps or less. If necessary, repeat. step 4. Disconnect frequency meter.

Step 6. Set SYNC SELECT control to EXT +. Connect SYNC OUT jack of signal generator to oscilloscope TRIGGER IN - PUT. Connect PULSE OUT of pulse generator to INPUT TRIGGERS connector of Crystal Mark and Sync unit and to oscilloscope input A. Delay the output of the pulse generator slightly to show the leading edge of the pulse on oscilloscope.

Step 7. Connect oscilloscope input B to 0 TRIGGERS connector. Measure delay between input trigger and 0 trigger pulses. Delay should be 0. 25 µsec maximum.

Step 8. Disconnect oscilloscope input B from 0 TRIGGERS and connect to DELAYED TRIGGERS connector. Maximum delay between the two pulses should be 0. 25 µsec.

Step 9. Set TRIGGER DELAY RANGE to 1-11. Measure delay. Delay should be less than 1 µsec.

Step 10. Turn TRIGGER DELAY FINE control fully cw. Delay should be 11 µsec minimum.

Step 11. Set TRIGGER DELAY RANGE switch to 5-50 and TRIGGER DELAY FINE control fully ccw. The trigger delay should be 5 µsec maximum. Set TRIGGER DELAY FINE control fully cw. The trigger delay should be 50 µsec minimum.

Step 12. Set TRIGGER DELAY RANGE switch to 50-750 and COARSE and FINE controls fully ccw. The trigger delay should be 50 µsec minimum. Set COARSE and FINE controls fully cw.

The trigger delay should be 750 µsec minimum.

Step 13. Return TRIGGER DELAY RANGE control to 0. Connect a load consisting of 75 ohms paralleled by 1100 pf to DELAYED TRIGGERS connector (in parallel with existing oscilloscope connection). Measure following trigger pulse characteristics:

Characteristic	Acceptable Reading
Amplitude	20 v min
Duration	0.5 to 3 µsec
Rise Time	0.2 µsec max
Decay Time	1 µsec min

Step 14. Disconnect oscilloscope from DELAYED TRIGGERS and move to SUP TRIGGERS connector. Pulse duration should be 2 µsec minimum.

Step 15. Turn SUP control fully clockwise. Measure following pulse characteristics :

Characteristic	Acceptable Reading
Duration	220 µsec min
Amplitude	3 v min
Rise Time	0.4 µsec max
Decay Time	0.4 µsec max

Step 16. Disconnect oscilloscope from SUP TRIGGERS and move to pin 8 of 3V11. Set SWEEP DELAY RANGE control to 1-11. Measure delay between 0 trigger and sweep trigger. Delay should be 1 #see or less.

Step 17. Turn SWEEP DELAY FINE control fully cw. Delay should be 11 #see minimum.

Step 18. Set SWEEP DELAY RANGE switch to 11-21. Adjust SWEEP DELAY ADJ internal control 3C44 so that delay is 21 #see or greater. (Delay of 11-21 range equals delay of 1-11 range plus 10 ±0. 5 µsec.)

Step 19. Turn SWEEP DELAY FINE control fully ccw. Delay should be 11 µsec minimum.

Step 20. Set SWEEP DELAY RANGE control to 21-31, and turn SWEEP DELAY FINE fully cw. Adjust SWEEP DELAY ADJ internal control 3C58 so that delay is 31 µsec or greater.

Step 21. Set SWEEP DELAY RANGE control to 5-50. Measure delay. Delay should be 50 µsec minimum.

Step 22. Turn SWEEP DELAY COARSE and FINE controls fully ccw. Measure delay. Delay should be 5 µsec maximum.

Step 23. Set SWEEP DELAY RANGE control to 50-750, Measure delay. Delay should be 50 µsec maximum.

Step 24. Turn SWEEP DELAY COARSE and FINE controls fully cw. Measure delay. Delay should be 750 µsec minimum.

Step 25. Disconnect oscilloscope. Turn power off and disconnect Crystal Mark and sync unit.

d. TESTING SIF CODER. - To adjust and test SIF Coder, connect it to an operating Radar Test Set TS-1253A/UP with a cable assembly CX-4963/UP. Set operating controls as follows:

Control	Setting
CODE	0000
FUNCTION	N
LEVEL	LO
AMPLITUDE	fully cw
PULSE WIDTH	.45
SUB PULSE POS	o
SUB PULSE SELECT	OFF

Turn power on, allow five minutes warmup time, and proceed as follows:

step 1. Measure voltages at following test points :

Test Point	Voltage
4TP1 (4J5)	+250 ±10 vdc
4TP2 (4J6)	-35 ±3 vdc
4TP3 (4J7)	-150 ± 2 vdc
4TP4 (4J8)	-4 +0. 5 vdc

Step 2. Connect oscilloscope input A to VARI OUTPUT receptacle. Calibrate oscilloscope for 5 #see/cm. Two pulses should appear on the oscilloscope.

Step 3. Set FUNCTION selector to ID. An additional pulse following the two pulses should appear.

Step 4. Set FUNCTION selector to X. A pulse should appear which is centered between the first two pulses.

Step 5. Calibrate oscilloscope for 20, µsec/cm. Set FUNCTION selector to EMER + X. Four pulse trains like the one in step 4 but with the center pulse in only the first train should appear.

Step 6. Set FUNCTION selector to EMER. The center pulse observed in step 4 should disappear from the first code train.

Step 7. Return FUNCTION selector to X. Calibrate oscilloscope for 5 µsec/cm.

Step 8. Turn each of the four CODE selectors from O through 7 and check to see that pulses appear and disappear correctly. (See table 4-18 and figure 3-2).

Step 9. Set CODE selectors to 7777. Turn SUB PULSE SELECT switch through all positions. No pulses should disappear; however, a slight shift in position of the substitute pulses may be noticeable. Return SUB PULSE SELECT switch to OFF.

Step 10. Calibrate oscilloscope for 0. 1 µsec/cm. Observe Cl pulse. Set WIDTH ADJ internal control 4R47 for 0.45 µsec pulse width at 50% amplitude.

Step 11. Turn PULSE WIDTH control fully ccw. Measure pulse width. Width should be 0. 3 µsec maximum.

Step 12. Turn PULSE WIDTH control fully cw. Measure pulse width. Width should be 1 µsec minimum.

Step 13. Return PULSE WIDTH control to .45. Set SUB PULSE SELECT switch to Cl. Adjust SUB PULSE AMP internal control 4R32 for substitute pulse width of 0. 45 µsec.

Step 14. Connect oscilloscope input A to TRIGGER JNPUT using a "T" connector, and input B to a wire connected to pin 3 of 3V2 in Crystal Mark and Sync unit. Set SYNC SELECT control on Crystal Mark and Sync unit to INT 1.00. Calibrate oscilloscope for 0.2 µsec/cm. Using TRIGGER DELAY controls on Crystal Mark and Sync unit, adjust for coincidence between input trigger and a 1 µsec crystal mark.

Step 15. Connect oscilloscope input A to VARI OUTPUT receptacle, Adjust pickoff coil 4 L10 so that ST (start) pulse appears approximately 3.5 µsec after input trigger pulse.

Step 16. Set SYNC SELECT control on crystal Mark and Sync unit to INT 1.45. Use TRIGGER DELAY controls to adjust for coincidence between ST pulse and a 1.45 µsec crystal mark.

Step 17. Adjust pickoff coil 4L11 to bring leading edge of C1 pulse into coincidence with the next 1.45 µsec marker.

Step 18. Adjust pickoff coils 4L12 through 4L24 so that the leading edge of each successive pulse in the train is coincident with its corresponding 1.45 µsec marker.

Step 19. Set FUNCTION selector to EMER. Use trigger delay controls to align stop pulse (SP) with a 1.45 µsec marker. Adjust EMER REDRIVE pickoff coil 4L25 so that start pulse of the next train occurs 4.35 µsec (third 1.45 ,µsec marker) after stop pulse of preceding train.

Step 20. Set FUNCTION selector to ID. Adjust ID pulse pickoff coil 4L26 so that ID pulse coincides with third 1.45 µsec marker after stop pulse.

Step 21. Observe C1 pulse on oscilloscope. Set SUB PULSE SELECT switch to Cl. Loosen locking screw on substitute pulse delay line 4DL1 and adjust core for coincidence of C 1 pulse and substitute C 1 pulse.

Step 22. Observe stop pulse in train. Replace with substitute (SP) pulse by means of SUB PULSE SELECT switch. Adjust SUB PULSE POS internal control 4R141 so that position of stop pulse and substitute (SP) pulse are coincident.

Step 23. Repeat steps 21 and 22 until minimum substitute pulse shift is evident for both C 1 and SP pulses.

Step 24. Turn SUB PULSE SELECT switch through all positions and check for substitute pulse shift.

NOTE

It may become necessary to repeat steps 21 through 23 and change setting of C1 pulse position in order to minimize substitute pulse shift over the entire pulse train.

Step 25. Again observe Cl pulse. Replace it with substitute pulse. Set SUB PULSE POS control to -.7, -.2, +.2, and +.7 detent positions and check that the pulse is shifted -0.7, -0.2, +0.2 and +0, 7 µsec in relation to the original pulse position. Readjust detent settings if necessary.

Step 26. Calibrate oscilloscope for 0.1 µsec/cm. Check that substitute pulse characteristics are as follows:

Characteristic	Acceptable Measurement
Rise Time	0. 05 µsec max
Decay Time	0. 1 µsec max
Amplitude	5 v min

Step 27. Set LEVEL switch to HI and check the following pulse characteristics:

Characteristic	Acceptable Measurement
Rise Time	0. 1 µsec max
Decay Time	0. 12 µsec max
Amplitude	7 v min

Step 28. Connect oscilloscope input A to MOD DRIVE connector. Check following pulse characteristics:

	Acceptable Measurement	
Characteristic	LEVEL at LO	LEVEL at HI
Rise Time	0. 1 µsec max	0. 1 µsec max
Decay Time	0. 15 µsec max	0. 2 µsec max
Amplitude	25 v min	45 v min

Step 29. Disconnect oscilloscope. Turn power off. Disconnect SIF Coder from servicing cable.

e. TESTING RADAR TEST SET TS-1253A/UP POWER SUPPLY. - In preparing Radar Test Set TS-1253A/UP for testing, it is necessary to apply input power to it. This can be done either by partly inserting the panel-chassis into Electrical Equipment Case CY-2726A/UPM-98, and connecting the interunit power plug to receptacle 5J1, or by applying 115 vac power directly to pins E and F of receptacle 5J1. If adjustment has to be made on the plug-in units, remove the applicable unit from the panel-chassis and reconnect it to its power plug with a CX-4963/UPM cable assembly (figure 2-3). With all subassemblies installed in the panel-chassis assembly, make the following power supply checks:

Test Point	Acceptable Reading
5TP1 (5J6)	-15032 volts
5TP2 (5J7)	+250 ±10 volts
Pine 3 on 5J2, 5J3, 5J4, and 5J5	-4 ±0.5 volts
Pin 20 on 5J2, 5J3, 5J4, and 5J5	-35 ±3 volts

NOTE

Although +350 volts is available in the power supply, it is not used directly by circuits in the test set. This voltage need only be checked if the +250 volt and -150 volt legs of the power supply cannot be adjusted to within the tolerances.

See table 5-4, step 1, for the adjustment procedure for the negative leg of the power supply.

f. TESTING SM-197A/UPM-98 POWER SUPPLY. Energize the SM-197A/UPM-98 assembly by applying ac input power to pins C and D on 8J21. Lift interlock lever associated with the switch, press roller arm down, and press button (behind roller arm) down until it clicks. Allow several minutes warmup time, then make the following voltage checks:

Test Point	Acceptable Reading
8TP1 (8J27)	-30 +3 volts
8TP2 (8J26)	-5 ±0.5 volts
8TP3 (8J24)	+300 ±30 volts
8TP4 (8J25)	+105 ±15 volts

NOTE

Refer to table 5-5, step 1, for adjustment procedure for the +300 volt leg of the power supply.

g. TESTING INTERROGATION CODER. - The Interrogation Coder circuitry of Coder Simulator SM-197A/UPM-98 can be tested and adjusted using either a suitable external oscilloscope or the oscilloscope of a properly operating Radar Test Set TS-1253A/UP. For the procedure described below, a TS-1253A/UP is used.

Step 1. Remove the Interrogation Coder from “ the panel-chassis and reconnect with Cable Assembly CX-6092/U. Measure the following voltages:

Test Point	Acceptable Reading
12TP1	-30 +3 volts
12TP2	-12 volts
12TP3	+12 volts
12TP4	+25 volts
12TP5	+300 +30 volts

Remove Cable Assembly CX-6092/U and reinstall Interrogation Code r in the panel-chassis assembly.

Step 2. Connect CODER OUT connector on Interrogation Coder to VIDEO connector on TS-1253A/UP Display unit with a video cable. Connect DELAYED TRIGGERS on Crystal Mark and Sync unit to TRIG connector on Interrogation Coder.

Step 3. Set operating controls on TS-1253A/UP as follows:

Control	Setting
VOLTS/IN	20
SWEEP DELAY RANGE	1-11
SWEEP DE LAY FINE	as required
INTENSITY MARKS RANGE	l and.1
SYNC SELECT	INT
PRF	approx. 1000 pps
TRIGGER DELAY RANGE	1-11
TRIGGER DELAY FINE	as required
SWEEP SPEED RANGE	1-30
SWEEP SPEED ADJUST	as required
75 Ω	IN

Step 4. On Interrogation Coder, set Function Selector 12S2 to (+) position. On Display unit, set VIDEO SENS control to CAL position and VOLTS/IN switch to 20. Change the settting of the VID)-EO LEVEL control to check for a pulse amplitude of 35 volts minimum.

Step 5. Set Mode Selector 12S1 to 2 position. Check for pulse spacing of 5 ±0.05 μsec.

Step 6. Set Substitute Pulse Position control to the following detent positions and record time shift of first pulse with respect to the 0 position.

Pulse Position	Time Shift
-, 2	.2 ±0. 05 µsec
-. 7	.7 ±O. 05 µsec
+. 2	.2 ±0. 05 µsec
+.7	.7 ±0. 05 µsec

Return Substitute Pulse Position control to O position.

Step 7. Set Mode Selector 12S1 to 1 position. Check for pulse spacing of 3 ±O. 05 µsec.

Step 8. Set Mode Selector 12S1 to 3/A position. Check for pulse spacing of 8 ±0.05 µsec.

Step 9. Set Mode Selector 12S1 to C position. Check for pulse spacing of 21 ±0. 05 µsec.

Step 10. Set Mode Selector 12S1 to SYNC M4 position. Check for four pulses spaced 2 ±0. 05 µsec apart.

Step 11. Set Mode Selector 12S1 to 1 position. Set SWEEP SPEED RANGE to 1-20. Set CODE WIDTH control to maximum counterclockwise position. Check for following output pulse characteristics:

Duration	- 0.35 µsec max
Rise Time	- 0.11 µsec max
Decay Time	- 0.2 µsec max

Step 12. Set CODE WIDTH control to maximum clockwise position. Check the following output pulse characteristics:

Duration	- 1.3 µsec min
Rise Time	- 0.11 µsec max
Decay Time	- 0.2 µsec max

If necessary, adjust WIDTH ADJ control 12R42 inside the Interrogation Coder for correct pulse duration (width),

step 13. Set Function Selector to (-) position. Measure and record pulse characteristics as in step 12.

step 14. Connect output of external pulse generator to MOD connector (12J3) on Interrogation Coder. On Calibration-Control unit, set TRIGGER Selector 9S1 to DEMOD and VIDEO OUT switch 9S2 to SC MON. Set the SC FREQUENCY to approximately 1000 mHz and Function Selector on Interrogation Coder to MOD-HIGH position. Connect an rf cable from VIDEO OUT on Calibration-Control unit to VIDEO INPUT on Display unit.

Step 15. Set prf of external pulse generator to approximately 1000 pps at output amplitude of 30 to 50 volts. Check pulse display on CRT.

Step 16. Set generator output to 5 to 30 volt level. Set Function Selector on Interrogation Coder to MOD- LOW. Check pulse display on CRT.

h. TESTING CALIBRATION-CONTROL UNIT.

Step 1. Remove unit from panel-chassis, reconnect with Cable Assembly CX-6092/U, and measure the following voltages:

Test Point	Acceptable Reading
9TP1 (9J5)	+300 ±30 volts
9TP2 (9J6)	+105 ±15 volts
9TP3 (9J7)	-30 ±3 volts
9TP4 (9J8)	-5 ±0.5 volts

Reinstall Calibration-Control unit in panel-chassis assembly.

Step 2 Connect test equipment as shown in figure 5-11. Set METER SELECT switch 9S3 to 500 PRF position. Set TRIGGER Selector 9S1 to EXT position. Set pulse triggering rate of pulse generator to 500 prf. If necessary, adjust 0-500 PRF control 9R30 for an indication of 500 on the meter.

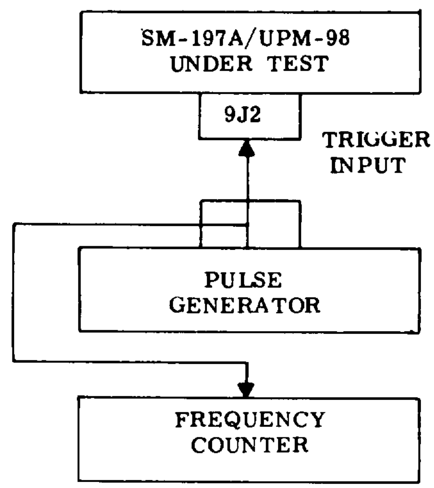


Figure 5-11. Calibration-Control Unit Pulse Counter Test Setup

Step 3. Set METER SELECT switch to 5000 PRF position. Set triggering rate of pulse generator to 5000 pps. If necessary, adjust 0-5000 PRF control 9R31 for an indication of 500 on the meter.

Step 4. Disconnect cable from TRIGGER INPUT on Cal-Control unit. Set TRIGGER selector 9S1 to INT position. Connect cable from VIDEO OUT on Cal-Control unit to VIDEO input on Display unit. Set 75 Ω switch on Display unit to OUT and VOLTS/IN switch to 20. Set METER SELECT switch on Calibration-Control unit to CAL and VIDEO OUT switch to 50. Set cal ADJ (FULL SCALE) control 9R45 to mid-rotation.

Check for full scale deflection on the meter. If necessary, adjust CAL ADJ control 9R36 for full scale deflection. Make the following control settings on the Crystal Mark and Sync unit:

Control	Setting
TRIGGER DELAY	0
SWEEP DELAY	1-11
INTENSITY MARKS	l & .1

Measure the following:

Pulse amplitude	50 volts ±1.5 v
Pulse duration	2.5 +0.5 µsec
Rise Time	0.2 µsec max
Decay Time	0.5 µsec max
Overshoot	10% of pulse amplitude max

Table 5-11. Calibration-Control Unit Output Pulse Characteristics

VIDEO OUT SETTING*	10	5	2	1
Volts	10 ±0.3	5 ±0.15	2 ±0.06	1 ±0.03
Rise Time	0.11 µsec max	0.07 µsec max		
Decay Time	0.2 µsec max	0.11 µsec max		
Pulse Duration	2.5 ±0.5 µsec			
Overshoot	10% max			

*Set VOLTS/IN switch for usable vertical deflection for each step.

Step 5. Repeat measurements of step 4 for following settings of VIDEO OUT switch (in each setting readjust CAL ADJ (FULL SCALE) control for a full scale indication on the meter).

Step 6. Connect output of external signal generator to LP IN connector. Set TRIGGER Selector 9S1 to DE MOD position and VIDEO OUT Selector 9S2 to POWER position. Set signal generator to a, frequency between 925 and 1225 mHz modulated at approximately 400 pps. Check for pulse on screen of Display unit.

Step 7. Set vIDEO OUT Selector to SHAPE position. Check for well-shaped pulse on screen of Display unit.

i. TESTING AND CALIBRATING RF OSCILLATOR.

1. TESTING RF OSCILLATOR. - To test the assembled rf oscillator, proceed as follows:

Step 1. Turn tuning shaft from stop-to-stop. It should turn without binding through the entire range (a minimum of 22 fu1l turns).

Step 2. Check torque required to turn shaft both ways. Torque should be not less than 15 inch+ounces and not greater than 20 inch-ounces.

Step 3. rum tuning shaft 20 times from stop-to-stop. Recheck torque. Torque shall be within 10% of reading obtained in step 2. If torque is not acceptable, readjust backlash nut (figure 5-5, item 39) by gaining access to its setscrew (item 40) through hole covered by screw (item 50). Operate the assembly from Stop-to-stop three times in each direction and recheck torque.

Step 4. Check shaft for end play by pulling and pushing.

Step 5. Remove cap (item 1), retainer ring (item 2), and tube 8V2 (item 3). Measure resistance from center contact of capacitor 8C9 (item 49) to ground. It should be infinite.

Step 6. Measure resistance from center contact of capacitor 8C5 (item 23) to ground. It should be infinite.

Step 7. Apply 400 vdc between center contact of capacitor 8C5 (item 23) and housing for one minute, then repeat step 6.

Step 8. Measure resistance between center contact of capacitor 8C5 (item 23) and contact ring (item 7). It should be 15 ohms ±5%.

Step 9. Install tube 8V2 (item 3) and measure resistance from center contact of capacitor 8C9 (item 49) to ground. It should be between 1.5 and 2.5 ohms. Replace retainer ring (item 2) and tube 8V2 (item 3).

Step 10. Connect rf oscillator assembly to an operating Radar Test Set AN/UPM-98A and external 1 test equipment as shown in figure 5-12.

Step 11. Adjust Radar Test Set AN/UPM-98A for Mode 3/A interrogation at a prf rate of 1000.

step 12. Turn rf oscillator tuning shaft fully clockwise. Measure oscillator frequency at this position. Frequency should be above 1235 mHz,

Step 13. Turn rf oscillator tuning shaft fully counter clockwise. Measure frequency. It should be below 910 mHz

Step 14. Set rf oscillator frequency to 920 mHz and measure the following:

Function	Measured On	Acceptable Reading
Power Output	Power Meter	-21 db min
Delay start of oscillation	Oscilloscope	0.3 µsec max
Rise Time	Oscilloscope	0.07 µsec max

Step 15. Tune rf oscillator through range and observe output on oscilloscope. There

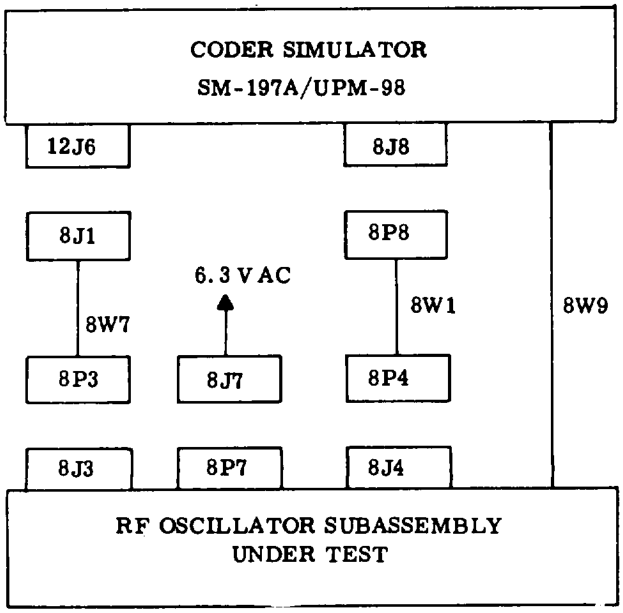


Figure 5-12. RF Oscillator Assembly 8A1, Test Setup

should be no appreciable change in size and shape of output pulse, or excessive pulse jitter.

Step 16. Set Radar Test Set AN/UPM-98A for modulation of rf oscillator with SIF Code number 0000 and pulse width of 0.45 µsec. Adjust rf oscillator to 1075 mHz.

Step 17. While observing the last bracket pulse in the train, switch SIF Coder to 7777 one switch step at a time. During all this switching the last pulse should not shift more than 0.05 µsec.

Step 18. Observe pulses D4 and B4. Using SUB PULSE POS control on SIF coder, delay pulse D4 to a point just before it merges with pulse B4 into a single pulse. Measure spacing between leading edges of the two pulses. It should be not more than 1.0 µsec.

2. CALIBRATING RF OSCILLATOR.

Step 1. Set WAVEMETER FREQUENCY control to 920 mHz using Wavemeter Calibration Curve.

Step 2. Set WAVEMETER INPUT switch to SIG GEN position and METER SELECT switch to WM.

Step 3. Turn SC FREQUENCY crank for maximum dip on meter, adjusting WM SENS control as required to obtain meter deflection of approximately 75% of full scale.

Step 4. Adjust rf oscillator counter to indicate 0000 and fasten setscrews.

Step 5. Record counter readings at 920, 950, 1000, 1050, 1100, 1150, 1200, and 1230 mHz. Correct oscillator calibrator curve accordingly.

j. TESTING AND CALIBRATING ALC/ATTENUATOR ASSEMBLY.

1. TESTING ALC/ATTENUATOR. - To test the assembled A LC/Attenuator, proceed as follows:

Step 1. Check resistance between center contact of capacitor 8C1 (figure 5-6, item 3) and ground. Resistance should be 0.5 to 1.5 ohms.

Step 2. Check resistance between center pin of SG OUT connector (item 34) and ground. It should be 47 ohms +5%.

Step 3. Check resistance between center contact of capacitor 8C4 (item 21) and ground. Resistance should be infinite.

Step 4. Check resistance between center contact of capacitor 8C4 (item 21) and center conductor of rf cable (item 10). Resistance should be 15 ohms ±5%.

Step 5. Measure VSWR at SC OUT connector (item 34) by connecting ALC/Attenuator to test equipment as shown in figure 5-13. With attenuator plunger in center of its trave1 range, VSWR should be less than 1.18:1 (1.4 db) over a frequency range from 925 to 1225 mc.

2. CALIBRATING ALC/ATTENUATOR ASSEMBLY.

Step 1. Set internal modulation of Radar Test Set with Mode 3/A interrogation at prf of approximately 2000 pps. Set OPER-CHECK switch 9S4 on rear of Calibration-Control unit chassis to CHECK position. Set VIDEO OUT switch to SC MON. Connect VIDEO OUT to VIDEO input connector on Display unit.

Step 2. Observe demodulated rf output pulse on oscilloscope tube. Turn SC FRE - QUENCY control from its full counterclockwise position to full clockwise position while continuously observing pulse amplitude. Note dial setting which gives lowest pulse amplitude. After reaching end **of** clockwise travel, return shaft to point of lowest pulse amplitude. Record that amplitude figure.

Step 3. Set OPER-CHECK switch to OPER position and adjust ALC ADJ internal control 9R3 on other side of chassis for same pulse amplitude as recorded in step 2. Check to see that pulse amplitude now is constant through the entire frequency range. Return setting to approximately 1050 mHz.

Step 4. Connect test equipment as shown in figure 5-14. Set TS-1253A for external triggering. Tune SC FREQUENCY to approximately 1050 mHz and set ATTENUATION control so that RF Power Meter indicates a power output

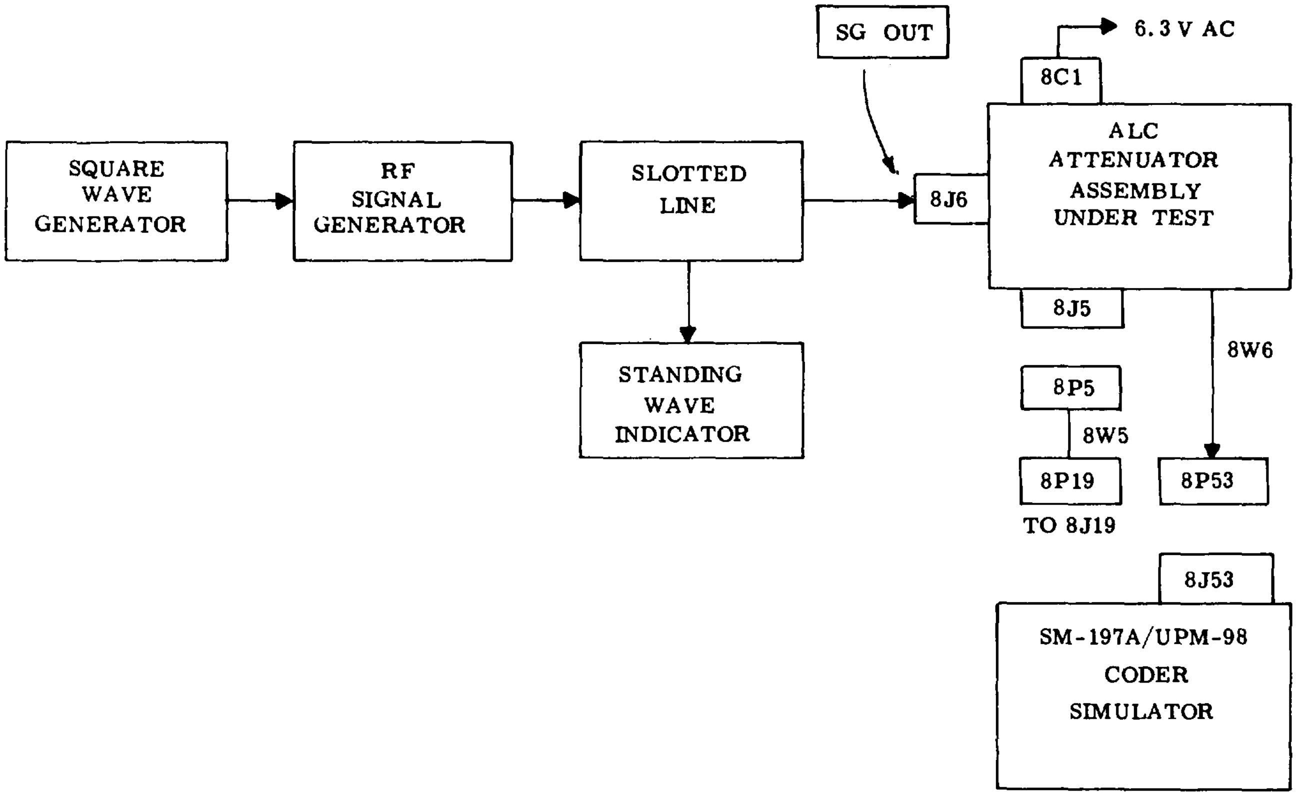


Figure 5-13. ALC/Attenuator Assembly 8A2, Test Setup

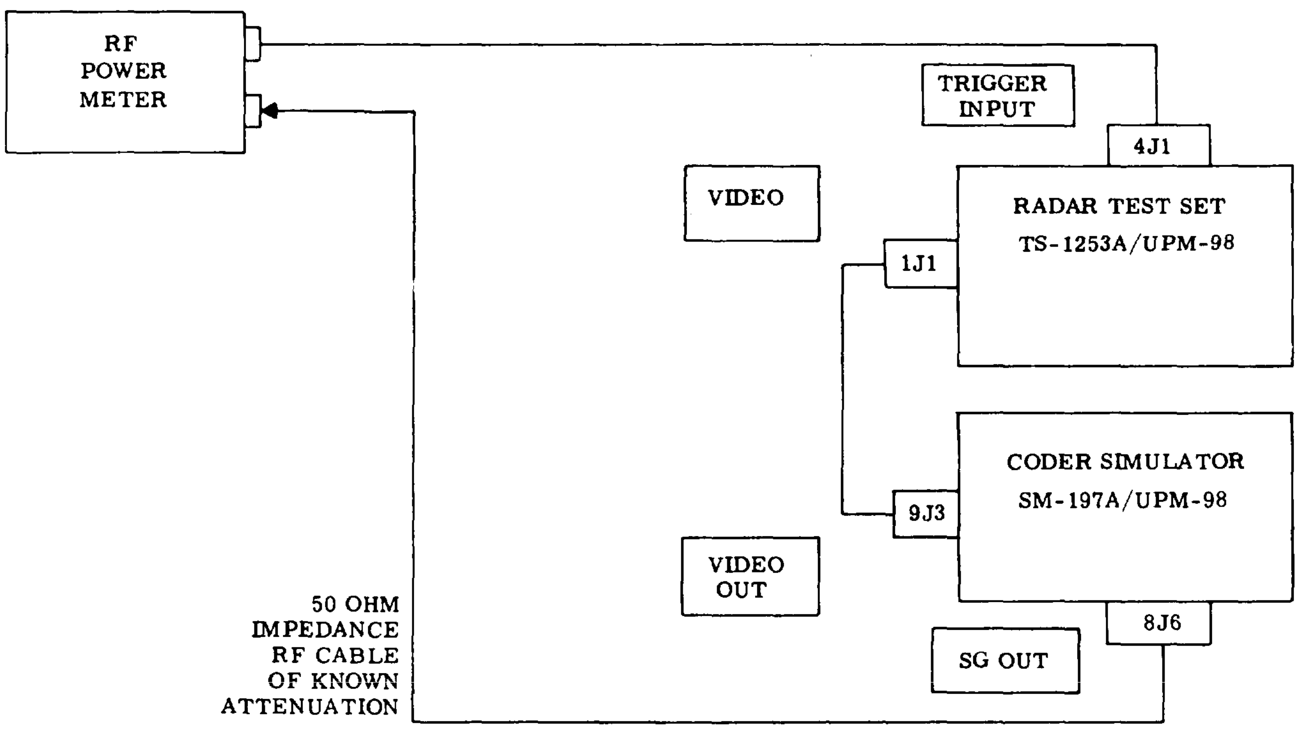


Figure 5-14. ALC/Attenuator 8A2, Calibration Test Setup

of -8.3 dbm plus the attenuation of the rf cable assembly used. (Attenuation of a 5 ft. long RG-223/U rf cable is approximately 1.1 dbm at 1050 mHz).

Step 5. Loosen setscrew on attenuator shaft gear and, without changing attenuator setting, set counter to indicate 021. Q Fasten setscrews.

Step 6. Check power output of set under test in a manner similar to steps 4 and 5 at frequencies of 925, 1030, 1090, and 1225 mHz. Attenuator accuracy should be within the following limits:

Frequency	Accuracy
925 mHz	±3 db
1030 mHz	±1.5db
1090 mHz	±1.5 db
1225 mHz	±3 db

k. TESTING AND CALIBRATING WAVEMETER ASSEMBLY.

1. TESTING WAVEMETER ASSEMBLY. - To test the assembled wavemeter assembly, proceed as follows :

Step 1. Remove cover (figure 5-7, item 25) and inspect interior of the cavity. Walls and tuning stub should be polished to a mirror finish without any scratches.

Step 2. Turn tuning shaft throughout its travel range. The shaft should make not less than 26 complete turns in both directions without binding, using a torque between 12 and 20 inch-ounces.

Step 3. Turn tuning shaft 20 times from stop-to-stop. Recheck torque. The torque should be within 10% of the reading obtained in step 2. If torque is not acceptable, readjust backlash nut (figure 5-7, item 11) through opening in housing. Operate the tuning shaft three times between stops and again check torque.

Step 4. Check shaft for end play. There should be no noticeable end play with either a 10 lb pressure or pull on the shaft.

Step 5. With cover (figure 5-7, item 25) removed, check that both coupling loops are in line with the axis of the tuning stud. The tops of the loops should just be seen within the cavity. Replace cover.

Step 6. Connect wavemeter assembly to Radar Test Set AN/UPM-98A and external test equipment as shown in figure 5-15.

Step 7. Adjust signal generator for a O. 5 µsec wide pulse at prf of 47 pps and 150 millivolts peak output at approximate 1050 mHz.

Step 8. Set METER SELECT control on Radar

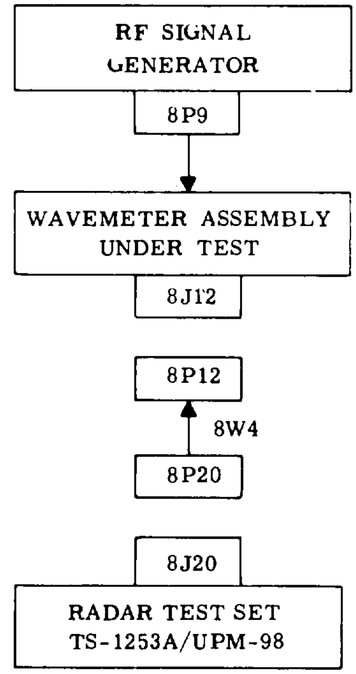


Figure 5-15. Wavemeter Assembly 8A3, Test Setup

Test Set AN/UPM-98A to WM. Set WM SENS control to maximum clockwise position. Turn wavemeter tuning shaft until AN/UPM-98A meter needle dips. indicating resonance. Meter needle should drop to less than 50% of scale at maximum resonance point.

Step 9. Alternately apply approximately 10 lbs of pressure and pull on wavemeter shaft and check for any difference in meter indication. Indication of step 8 should not change more than 25% and it should return to within 5% of original indication.

Step 10. Turn wavemeter tuning shaft maximum clockwise. Tune signal generator until AN/UPM-98A meter needle dips. This frequency should be 1240 mHz or more.

2. CALIBRATING WAVEMETER ASSEMBLY.

Step 1. Connect Radar Test Set AN/UPM-98A and test equipment as shown in figure 5-16. For this procedure set POWER switch on SM-197A/UPM-98 in OFF position.

Step 2. Set signal generator to 900 mHz at average power output of approximately zero dbm.

Step 3. Tune wavemeter for a peak indication on milliammeter.

Step 4. Using frequency counter, tune transfer oscillator to exactly 150 mHz.

Step 5. Tune signal generator to produce a near-zero beat indication on the transfer oscillator oscilloscope.

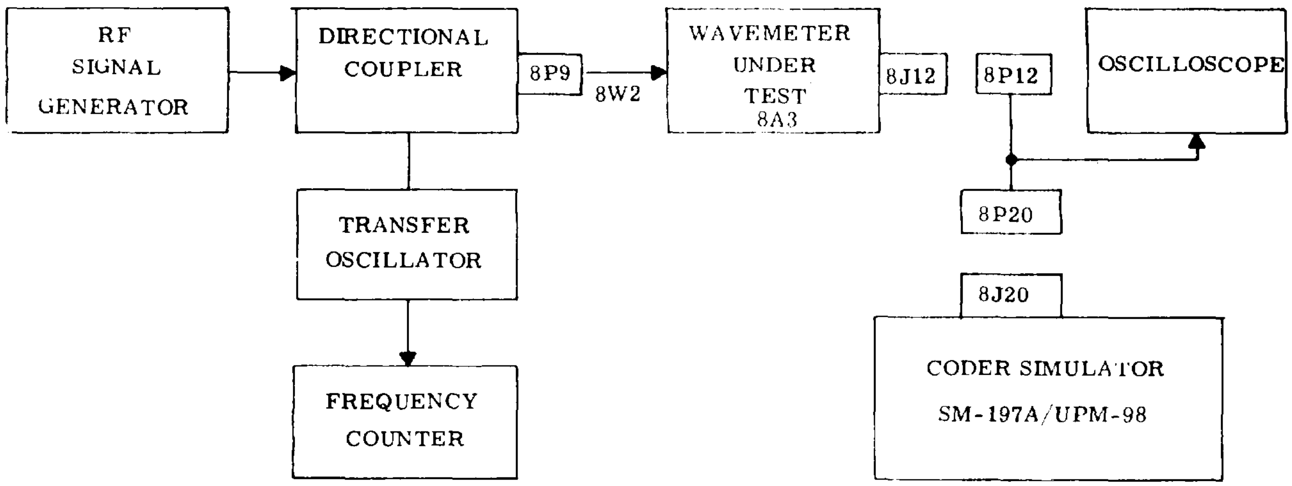


Figure 5-16. Wavemeter Assembly 8A3, Calibration Test Setup

Make certain that the beat indication observed is with the sixth harmonic of the 150 mHz transfer oscillator signal.

Step 6. Use fine frequency vernier control of the transfer oscillator to obtain a true zero beat indication.

Step 7. Carefully tune wavemeter for maximum indication on the milliammeter.

Step 8. Record wavemeter dial indication and transfer oscillator frequency.

Step 9. Calculate exact signal generator frequency by multiplying transfer oscillator frequency by six. Record this frequency.

Step 10. Repeat steps 4 through 9 with all transfer oscillator frequencies given in table 5-12.

Step 11. If necessary, plot new wavemeter calibration curves similar to those given in pages 1 through 9 of Book of Calibration Charts, using figures given in table 5-12.

1. TESTING AND CALIBRATING DEMODULATOR ASSEMBLY.

1. TESTING DEMODULATOR ASSEMBLY. - To test assembled demodulator, proceed as follows:

Step 1. Check resistance between following points:

Test Point	Acceptable Reading
SG IN connector to ground	20 ohms ±10%
SG IN connector to LP IN connector	infinite
SG IN connector to HP IN connector	less than O. 5 ohm
SG IN connector to 8J11 connector	22 ohms ±10%
LP IN connector to ground	infinite
LP LN connector to HP LN connector	infinite
LP IN connector to 8Jll (connector	infinite
HP IN connector to ground	20 ohms ±l0%
HP LN connector to 8J11 connector	25 ohms ±10%
Terminal stud (figure 5-8, item 17) to ground	infinite
Center of 8C14 (figure 5-8, item 26) to ground	0.5 to 1.5 ohms

Table 5-12. Wavemeter Frequency Calibration Settings

NOMINAL SG FREQ	NOMINAL TRANS OSC FREQ	NOMINAL SG FREQ	NOMINAL TRANS OSC FREQ
900	150.000	1080	180.000
910	151.667	1090	181.667
920	153.333	1100	183.333
930	155.000	1110	185.000
940	156.667	1120	186.667
950	158.333	1130	188.333
960	160.000	1140	190.000
970	161.667	1150	191.667
980	163.333	1160	193.333
990	165.000	1170	195.000
1000	166.667	1180	196.667
1010	168.333	1190	198.333
1020	170.000	1200	200.000
1030	171.667	1210	201.667
1040	173.333	1220	203.333
1050	175.000	1230	205.000
1060	176.667	1240	206.667
1070	178.333	1250	208.333

Step 2. Connect demodulator and test equipment as shown in figure 5-17. Check VSWR alignment of SG IN, LP IN, and HP IN connectors with signal frequencies from 900 to 1250 mHz at 50 mHz intervals. Make certain that unused connectors are terminated with a 50-ohm dummy load. VSWR of all connectors at all frequencies should be less than 1.4:1 (3. 0 db).

be between 11.5 and 4.5 db.

Step 6. Connect signal generator output to SG IN and directional coupler input to LP IN on demodulator. Terminate HP IN connector with a 50-ohm load. Repeat steps 4 and 5. Result is the attenuation between DEMODULATOR SG IN and LP IN connectors. The attenuation should be between 35 and 39 db.

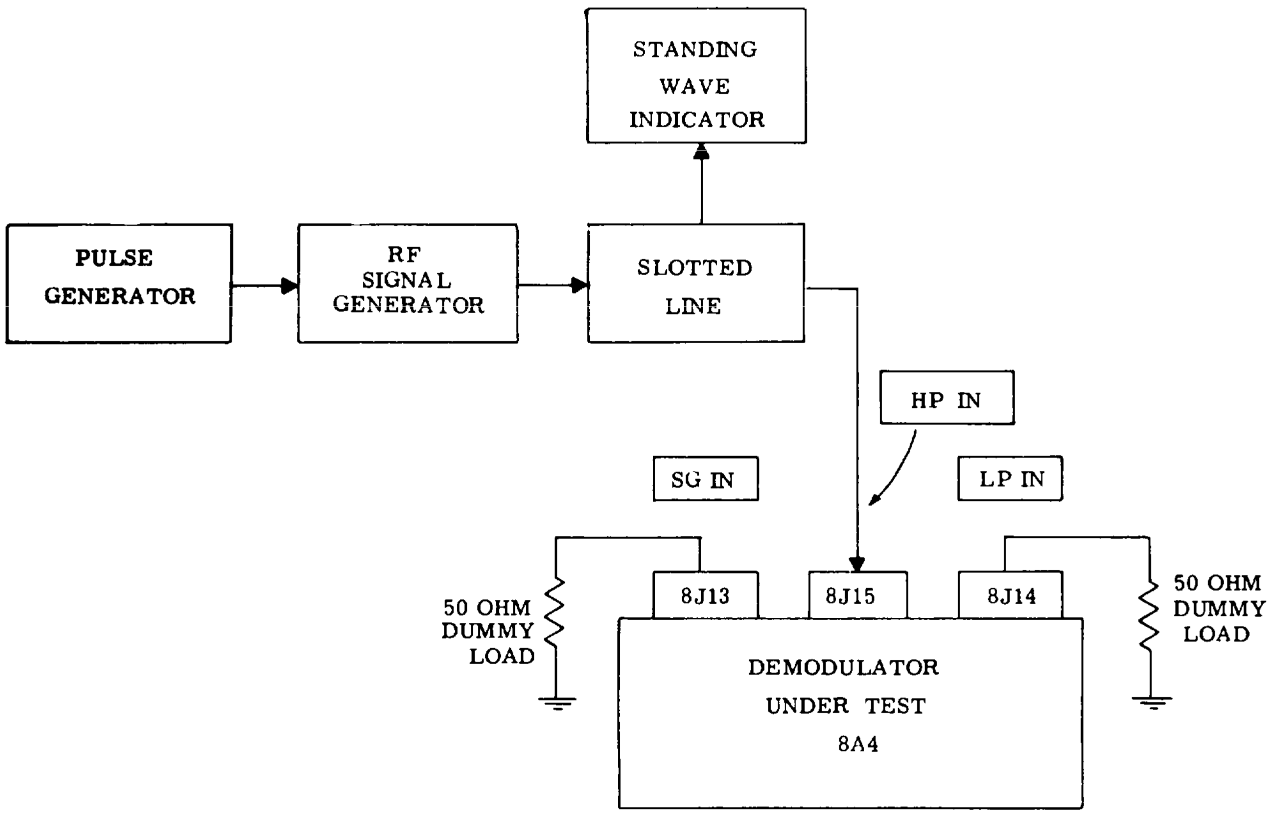


Figure 5-17. Demodulator Assembly 8A4, VSWR Test Setup

Step 3. Connect demodulator and test equipment as shown in figure 5-18. Set prf of pulse generator to 1000 pps. Set signal generator to 1050 mHz at a power output level which provides a convenient reading without pulse jitter on the standing wave indicator.

Step 4. Record power level of signal generator output and the reading on standing wave indicator.

Step 5. Disconnect cables from SG IN and HP IN connectors on demodulator and join them using connector adapter UG-914/U. Adjust signal generator for an indication on standing wave meter the same as that recorded in step 4. Subtract reading of step 4 from reading of step 5. Result is demodulator attenuation between connectors SG IN and HP IN. It should

2. CALIBRATING DEMODULATOR ASSEMBLY.

Step 1. Connect Radar Test Set AN/UPM-98A and test equipment as shown in figure 5-19.

Step 2. Set signal generator output for 1075 mHz at a power level between 3900 and 3500 watts (approximately 36 db above one milliwatt). If necessary, use rf attenuator pad to reduce power output .

Step 3. Set VIDEO OUT switch on Calibration-Control unit to POWER position. Accurately measure and record amplitude (in volts) of the pulse on Dis - play unit oscilloscope.

Step 4. Disconnect rf cable from HP IN connector on Coder Simulator SM-197A/UPM-98 under test and connect it to RF IN receptacle of pulse power calibrator. Accurately measure and

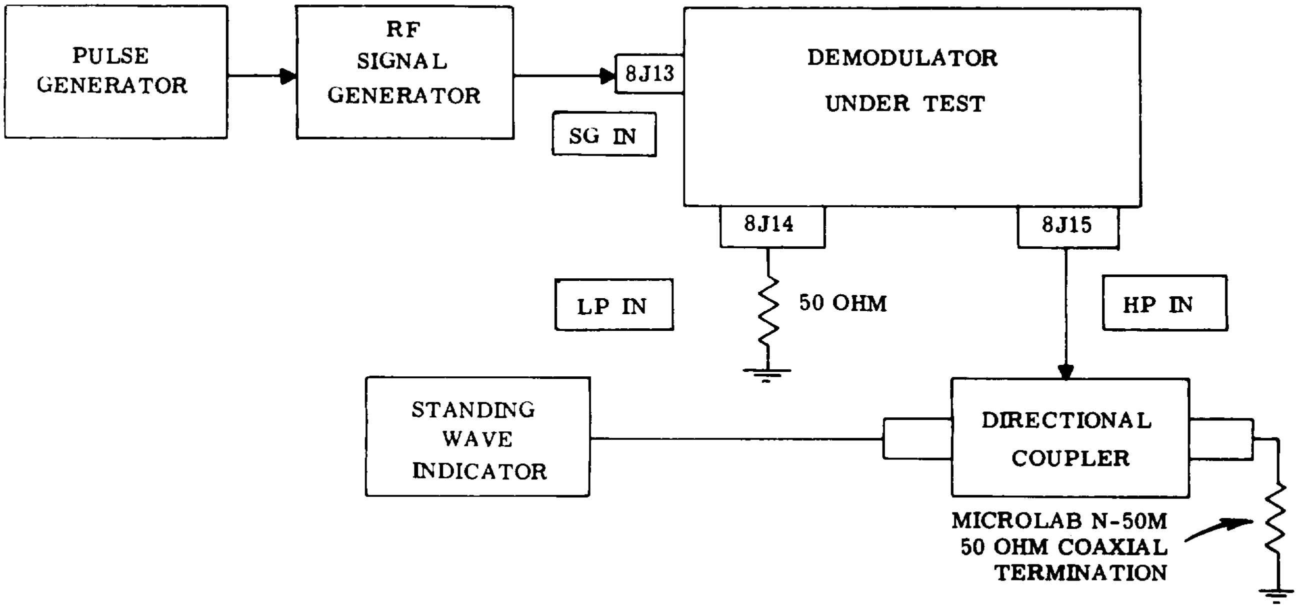


Figure 5-18. Demodulator Assembly 8A4, Attentuation Test Setup

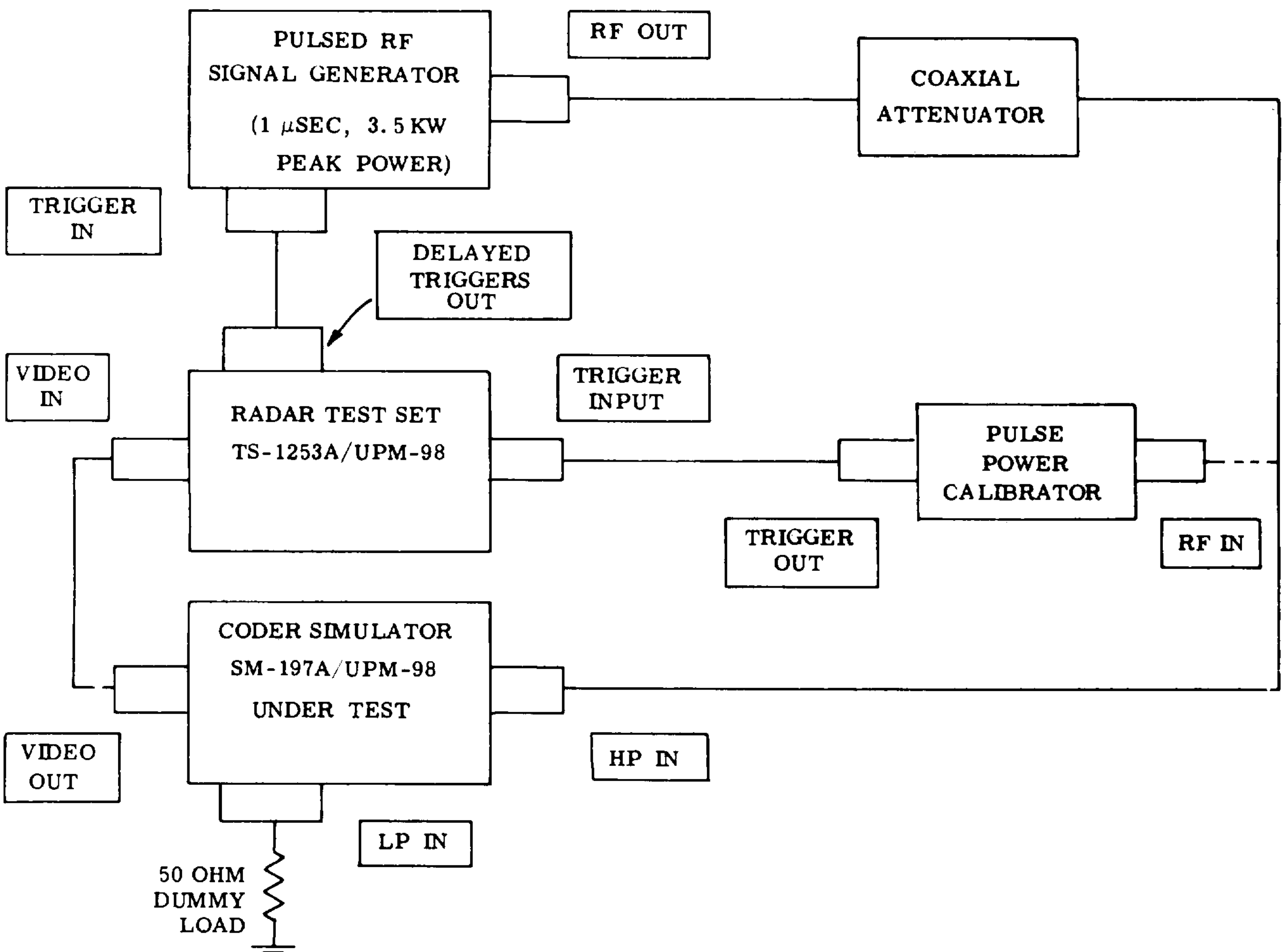


Figure 5-19. Demodulator Assembly 8A4, Calibration Test Equipment Setup

record rf power in dbm.

Step 5. Mark a dot on volts and power coordinate crossover point on Demodulator Calibration Curve Chart for HP IN receptacle on page 2 of Book of Calibration Charts supplied with the equipment under test.

Step 6. Add a 3 db attenuator pad between signal generator output and test set input. Repeat steps 3 through 5.

Step 7. Repeat step 6, each time adding a 3 db attenuator and recording output level until pulse power calibrator reading reaches approximately 46 db above one milliwatt. Draw a curve across all dots marked on Demodulator Calibration Curve chart.

Step 8. connect signal generator output attenuated to approximately 46 db above one milliwatt to LP IN receptacle and terminate HP IN with a 50 ohm dummy load.

Step 9. Continue recording readings as in steps 3 through 7 to plot a Demodulator Calibration Curve for LP IN receptacle until the power measured on pulse power calibrator is approximately 27 db above one milliwatt.

(3) DEMODULATOR FREQUENCY CORRECTION,

Step 1. connect Radar Test Set AN/UPM-98A and test equipment as shown in figure 5-20.

Step 2. Turn gain control of standing wave indicator completely counterclockwise. Set signal generator for a frequency of 925 mHz, square wave modulated at 1 kHz.

Step 3. Adjust signal generator output so that microwave power meter indicates +3 db.

Step 4. Disconnect rf cable from thermistor mount and connect to HP IN connector on unit under test. Terminate LP IN connector with 50 ohm dummy load plug. Connect SC IN to SC OUT with jumper cable.

Step 5. Turn gain control of standing wave indicator clockwise until meter indicates zero db.

Step 6. Reconnect rf cable from HP IN to thermistor mount. Set signal generator frequency to 950 mHz and adjust its output to +3 db on microwave power meter.

Step 7. Disconnect rf cable from thermistor mount and connect it to HP IN. Do not touch standing wave indicator controls. Record meter indication.

Step 8. Repeat steps 6 and 7 with signal

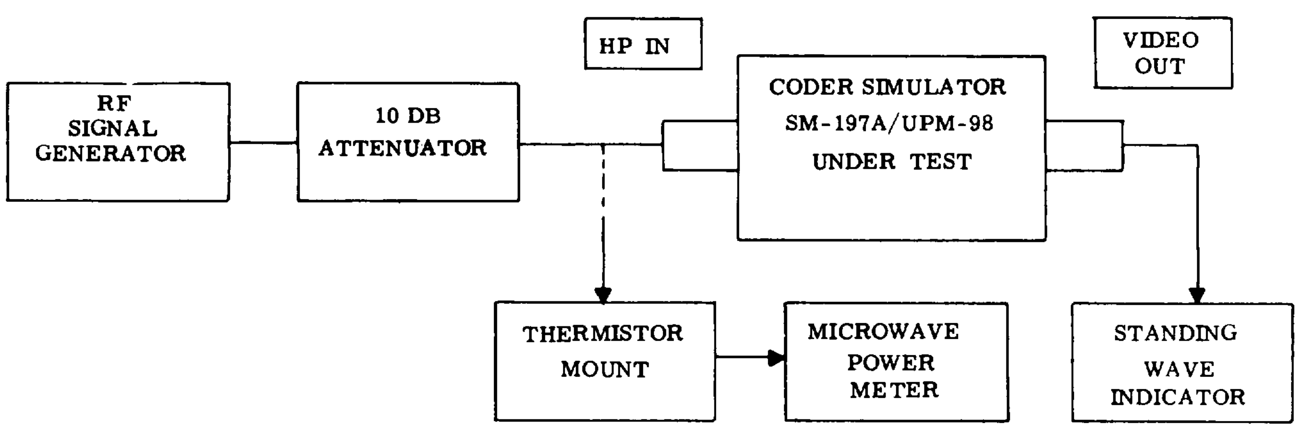


Figure 5-20. Demodulator Assembly 8A4, Frequency Correction Test Equipment Setup

generator frequencies of 975, 1000, 1025, 1050, 1075, 1100, 1125, 1150, 1175, 1200, and 1225 mHz.

Step 9. Add reading obtained at 1075 mHz frequency to all readings recorded in steps 7 and 8. This will provide the demodulation frequency correction, which will be zero at 1075 mHz, negative at lower frequencies, and positive above 1075 mHz. Correct accordingly the correction chart printed underneath the Demodulator Calibration Curve for the HP IN connector.

Step 10. Repeat step 4 through 9 with rf signal input to LP IN connector and correct Demodulator Calibration Curve for LP IN connector correction chart.

Step 11. Connect AN/UPM-98A and test equipment as shown in figure 5-18 for demodulator attenuation test. Set prf of square wave generator to 1000 Hz.

Step 12. Set signal generator frequency to” 1020 mHz at a power level which provides convenient reading without pulse jitter on standing wave indicator.

Step 13. Record power level of signal generator output and reading on standing wave indicator.

Step 14. Disconnect cables from SG IN and HP IN connectors and join them using connector adapter UG-914/U. Adjust signal generator to provide an indication on standing wave indicator identical to the one recorded in step 13. Subtract signal generator power reading obtained in step 13 from reading of step 14. Result is demodulator attenuation constant between SC IN and HP IN receptacles at 1020 mHz. Enter it on table printed underneath Oscillator Calibration Curve in Book of Calibration Charts.

Step 15. Repeat steps 12 through 14 with signal generator frequencies of 1030, 1090, and 1100 mHz.

Step 16. Connect signal generator output to SC IN connector and directional coupler input to LP IN connector. Terminate HP IN connector with 50 ohm dummy load. Repeat attenuation measurements as in step 12 through 15 with signal generator set to 1020, 1030, 1090, and 1100 mHz.

m. PRE-INSTALLATION ALIGNMENT OF RF BASE PLATE ASSEMBLY.

(1) GENERAL. - When one or more of the three rf assemblies mounted on the base plate assembly of Coder Simulator SM-197 A/UPM-98 is repaired or replaced, it is necessary to recalibrate and realign the unit. Connect equipment as in figure 5-21.

(2) RF OSCILLATOR ASSEMBLY 8A1 ALIGNMENT.

Step 1. Set the signal generator frequency to 925 mHz and the ATTENUATION control for maximum output.

Step 2. Set oscilloscope for display of input signal at input A. Check that the attenuator shaft is set to the full counterclockwise position.

Step 3. Set Radar Test Set AN/UPM-98A for an internal triggering prf of 1000 Hz, and rf oscillator modulated with mode 3/A interrogation.

Step 4. Turn rf oscillator tuning shaft counterclockwise to end of rotation, then start turning clockwise until zero-beat effect is observed on oscilloscope.

Step 5. Engage bevel gear (figure 5-9, item 11) and compound gear (item 16). Tighten setscrews (item 10). Rotate tuning shaft counterclockwise until the gear stops engage. The counter should now indicate 000. Readjust position of gears (items 14 and 16) if necessary, to have 000 indicated on counter when gear stops engage.

Step 6. Turn rf oscillator shaft fully clockwise. Obtain zero beat indication with the signal generator to check that oscillator frequency is above 1250 mHz.

Step 7. Turn signal generator off; set oscilloscope for alternate display of traces at inputs A and B.

Step 8. Compare modulation pulses and detected rf pulses appearing on oscilloscope. They should not differ appreciably in shape and there should be no excessive delay or jitter.

(3) WAVEMETER ASSEMBLY 8A3 ALIGNMENT.

Step 1. Set WAVEMETER INPUT switch 8S1 on base plate assembly under test to DE MOD (counterclockwise) position. Set Calibration-Control METER SELECT switch to WM, and WM SENS control fully clockwise.

Step 2. Set signal generator to 900 mHz, modulation pulse width to 6 µsec, and prf to 400 pps.

Step 3. Turn wavemeter tuning shaft fully counterclockwise, then slowly turn clockwise until maximum needle dip is obtained on meter.

Step 4. Set wavemeter counter to indicate 0410. Engage bevel gear (figure 5-9, item 2) and compound gear (item 4). Loosen setscrews (item 5) and set gear stop so that counterclockwise travel of the tuning shaft is stopped when counter indicates 000. Tighten setscrews (items 3 and 5).

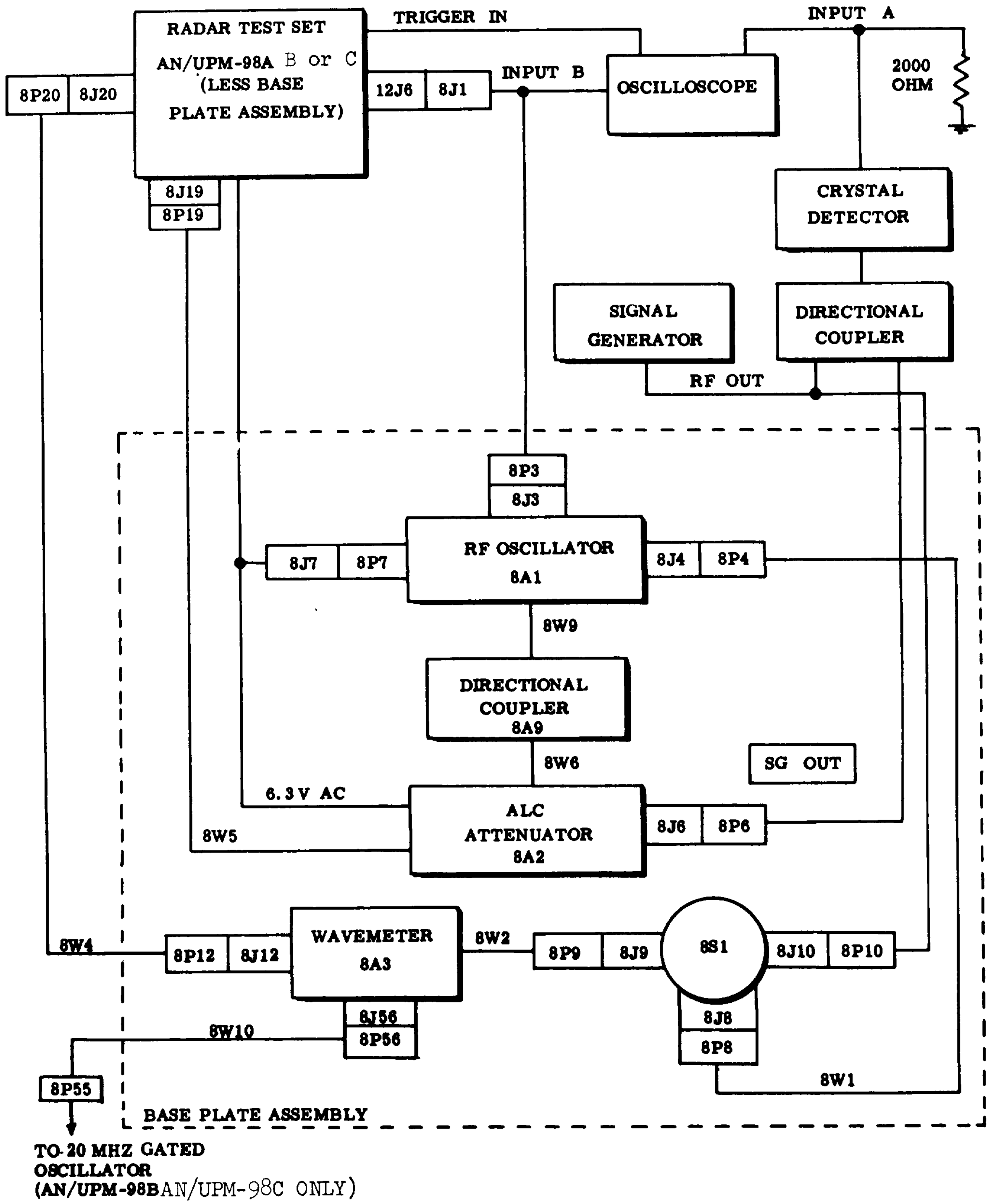


Figure 5-21. RF Base Plate Assembly, Pre-installation Alignment Setup

Step 5. Set signal generator frequency to 1250 mHz.
Step 6. Turn wavemeter shaft clockwise until maximum dip is obtained on meter. Counter dial should read approximately 2250.
Step 7. Turn shaft further clockwise to check that stops on gears engage before wavemeter shaft reaches end of its travel. At this point the counter should read above 2300.
Step 8. Set signal generator frequency to 1050 mHz.
Step 9. Adjust wavemeter tuning shaft for maximum dip of meter needle.
Step 10. Set wavemeter input switch 8S1 on base plate assembly in SIG GEN position.
Step 11. Set Radar Test Set AN/UPM-98A internal trigger prf to 47 pps, mode to 3/A, and WM SENS control maximum clockwise.
Step 12. Adjust rf oscillator tuning shaft for maximum dip of meter needle. Meter indication should be less than 50% of full scale. Adjust coupling loop of crystal 8CR1 to obtain a greater-dip if it is not adequate.
Step 13. Apply Molycote lubricant (or equivalent) to all gear teeth. Operate tuning mechanisms so that lubricant is well distributed. Wipe off any excess lubricant.

5-6. CHECKING WAVEMETER CALIBRATION OSCILLATOR 8A10 (AN/UPM-98B and AN/UPM-98C).

a. FREQUENCY CHECK.

Step 1. Check the fundamental frequency of the wavemeter calibration oscillater by connecting the electronic frequency counter to TEST connector 8A10J3 (TP2) on the 20 mHz Gated Oscillator. The freqency should be 20 ±.001 mHz.
Step 2. Press the WAVEMETER CAL MKR stitch down to the CAL MKR position. Turn the WAVEMETER FREQUENCY knob clockwise (from 1030 mHz setting) and note the first dip on the Calibration - Control meter. This should occur at 1040.0 mHz within +0.2 mHz on the indicator. Turn-the WAVEMETER FREQUENCY knob counterclockwise. The next meter dip should occur at 1020.0 within ±0. 2 mHz.

b. OUTPUT AMPLITUDE CHECK.

Step 1. Check the amplitudes of all wavemeter calibrating markers (at multiples of 20 mHz) by holding WAVEMETER CAL MKR switch in the CAL MKR position while turning WAVEMETER FREQUENCY knob through the range of 920 to 1220 mHz and observing the resonance dip indicating each marker (harmonic of 20 mHz signal) on the calibration-control meter. AU markers should give a dip of at least 25’% of full scale.
Step 2. If one or more markers cause a deflection less than 25’%, make one or more of the following adjustments as required to raise the marker output.

(1) In the 20 mHz Gated oscillator Assembly, readjust T1 and C16 in the output stage to increase the strength of the weakest marker.

(2) Replace rectifier diode CR1 in the wavemeter assembly and check for an increase in output amplitude.

(3) Remove the varactor diode in the 20 mHz infection probe assembly (at 8J56 on the wavemeter assembly) to avoid damaging it and carefully unsolder the varactor retaining spring. Move the spring up to the next higher hole in the probe arm and resolder. Readjust the spring for proper tension against the varactor diode, reassemble, and check for an increase in marker output.

NOTE

The angle and spacing of the probe arm has been precisely set at the factory and should not require field adjustment.

5-7. WAVEMETER DIRECT FREQUENCY INDICATOP ASSEMBLY (AN/UPM-98B, AND AN/UPM-98C).

a. REMOVAL FROM TEST SET.

Loosen setscrews (items 78 and 76) in both WAVEMETER FREQUENCY and CAL knobs (items 77 and 75) and remove knobs. Refer to figure 5-21A.
Step 2. Loosen four captive screws (item 74) and remove cover (item 71).
Step 3. Reinstall WAVEMETER FREQUENCY knob (item 77) and rotate counterclockwise until mechanical stop is reached, with about one turn of tape on drum (item 21). Insert small pin (Allen wrench may be used) into hole on plate (item 59) for locking takeup drum (item 54). Rotate knob back and forth until pin can be pushed into bole tn drum.
Step 4. Rotate knob clockwhw so that block (item 25) can be taken off by removing screw and lockwasher (items 24 and 23). Tape will now fall free. Loosen two setscrews

(item 22) and remove tuning drum (item 21) from shaft.

Step 5. Remove four screws and lockwashers (items 3 and 4) and lift assembly with gasket (item 1) from front of test set. Be careful not to let lock pin drop out of takeup drum hole.

b. DISASSEMBLY OF INDICATOR ASSEMBLY. - Various pints and subassemblies can be removed as explained below. However, do not remove parts or assemblies unnecessarily, since difficult adjustments may be required during and after reassembly. Refer to the following paragraphs for replacement of specific items and the adjustments required.

Step 1. Counter (item 11): Loosen four screws (item 7) and remove counter along with bevel pinion gear (item 12).

Step 2. CAL shaft and arm assembly (items 27 through 38): Loosen two screws (item 6). Remainder of assembly can be disassembled in the obvious order.

Step 3. Wavemeter extension shaft (item 20): Loosen setscrews (item 19).

Step 4. Wavemeter shaft clamp block (item 15): Remove screw and lockwasher (items 17 and 18).

c. REPLACING TAPE. - If the tape is broken, the spirator spring (item 46) will have driven the tape drum (item 54) and the counter (item 11) to the completely unwound position (830.0 on counter).

Step 1. Rewind the spirator spring assembly (items 42 through 56) by pulling the tape (item 55) and/or rotating the gear (item 42) counterclockwise with the left thumb and holding in this position with the right fingers or thumb on the gears (items 63 or 66) or the last counter wheel. When the end is reached (about 1400.0) lock the drive in place by inserting a pin in the hole on the top plate (item 59) as in 5-7a, step 3.

Step 2. Install the new tape (item 55) by fastening it on the takeup drum (item 54) with block and screw (items 52 and 53). Remove pin and let tape wind up slowly until end is reached. Lay tape over roller and arm assembly (items 27 through 38) and fasten this end on the tuning drum with block (item 25) and lockwasher and screw (items 23 and 24).

d. REPLACING SPIRATOR SPRING. - If the spirator spring is broken, the assembly must be removed.

Step 1. Remove Indicator Assembly from test set as in para. 5-7a, except wind up tape (item 55) on tuning drum (item 21), disconnecting it from takeup drum (item 54) by removing block and screw (items 52 and 53). Then remove tuning drum with tape as in para. 5-7a.

Step 2. Remove three screws (item 60) and lift plate (item 59) off. Remove three screws, lockwashers, and nut (items 6, 48, and 49) and lift out complete rewind assembly (items 42 through 56).

Step 3. Remove takeup drum (item 54) by loosening setscrews (item 56). Slip off washers (items 51 and 50) and remove spirator spring (item 46) by prying out rivet (item 43).

Step 4. Install new spring and reassemble parts in reverse order, being sure to install all parts as shown in the exploded view.

Step 5. Rewind the spirator spring (item 46) as in para. 5-7c, step 1 and attach the tape (item 55) to the takeup drum (item 54) as in para. 5-7c, step 2.

Step 6. Loosen setscrews (item 62) in spur gear (item 63) and rotate counter to read approximately 830.0. Reposition spur gear (item 63) on shaft (item 64) for proper vertical alignment and tighten setscrews (item 62).

e. ADJUSTMENT AND CALIBRATION.

Step 1. Set the CAL arm of the Indicator Assembly to the center of the adjustment range. If necessary, readjust the screw on the CAL adjust shaft so the torque required to turn the shaft Is sufficient to withstand the *normal pull* from the tuning tape.

Step 2. Set the WAVEMETER FREQUENCY knob to indicate resonance at 1030 mHz ISLS oscillator signal as follows:

(1) If a new tape has been installed or tracking is badly off, establish the initial tape reference setting. Loosen setscrews on tuning drum, unwind all tape, and starting with scribe mark on drum pointing down, rewind 18-3/4 turns of tape onto the tuning drum. Retighten setscrews.

(2) Remove the Interrogation Coder from the lower drawer and reconnect it to its main chassis connector, using extender cable CX-6092/U. Use cable CG-3380/U to connect 12J11 at back of the Interrogation Coder to the LP IN connector on front panel of the lower drawer.

(3) For proper termination, connect SG IN to SG OUT.

(4) Set WAVEMETER INPUT selector to DEMOD position.

(5) Set METER SELECT switch to WM.

(6) Apply power to the test set and adjust the Interrogation Coder as follows: ISLS Selector switch to EXT. Substitute Pulse Selector to OUT. Function Selector switch to TEST. ISLS level control fully clockwise.

(7) Connect the DELAYED TRIGGER from the Crystal Mark and Sync module to the ISLS jack on the Interrogation Coder.

(8) Adjust WAVEMETER FREQUENCY knob for maximum meter dip. Use WAVEMETER SENS control to adjust maximum meter dip cup to approximately mid-scale.

(9) Loosen the unpainted setscrews on the spur gear and set the digital WAVEMETER FREQUENCY counter to exactly 1030.0 (with CAL knob in center of range.) Tighten setscrews on spur gear.

Step 3. Adjust frequency drive and readout tracking as follows:

CAUTION

Be sure the frequency calibration adjustment is not moved during the following tracking procedure.

(1) Press the WAVEMETER CAL MKR switch down to the CAL MKR position. Turn the WAVEMETER FREQUENCY knob clockwise and note the first dip on the Calibration-Control meter. This should occur at approximately 1040.0 mHz on the counter.

(2) Continue to turn the FREQUENCY knob clockwise until a frequency of 1220.0 is indicated on the counter. Rotating the FREQUENCY knob in either direction from this frequency, locate the frequency at which there is a maximum dip on the CAL-CONTROL meter. (This dip should occur between 1210.0 and 1230.0 on the counter.) Note the frequency.

(3) Subtract 1220.0 from this reading and record this exact value.

(4) Turn the FREQUENCY knob counterclockwise until a frequency of 920.0 is indicated on the counter. Rotating the FREQUENCY knob in either direction from this frequency, locate the frequency at which there is a maximum dip on the CAL-CONTROL meter. (This dip should occur between 910.0 and 930.0 on the counter.) Note the frequency.

(5) Subtract this reading from 920.0 and record this exact value.

(6) Add the value in substep (5) to the recorded value obtained from the high frequency setting in substep (3) and record the results.

Example = (Substep 2 Freq - 1220) +

(920 - Substep 4 Freq.) = ±(R)

If the resultant (R) is greater than ±0. 7 proceed with steps 4 and 5 as required If the resultant is ±0.7 or less steps 4 and 5 are optional. However, the frequency readout will become' more accurate the closer this resultant (R) is to zero (0).

Step 4. If the resultant is a positive value, loosen the setscrews on the tuning drum and rotate the drum approximately 1/4 turn counterclockwise.

If the resultant is a negative value, loosen the setscrews on the tuning drum and rotate the drum approximately 1/4 turn clockwise.

Retighten the setscrews on the tuning drum. Repeat steps 2 and 3 of paragraph 5-7e.

Step 5. If further realignment is required, repeat step 4. The amount of rotation of the tuning drum can be varied as required until the smallest resultant or zero value is obtained.

Step 6. Remove the 1030 mHz connections and ret urn equipment to normal condition.

Step 7. Remove the two knobs from the frequency indicator assembly.

Step 8. Place the cover assembly over the indicator assembly so that the window on the cover is over the number wheels. Fasten the cover by tightening down the four captive hold-down screws.

Step 9. Replace the two knobs on the indicator assembly and tighten the setscrews.

f. CHECKING ACCURACY OF WAVEMETER INDICATIONS (AN/UPM-98B, AN/UPM-98C).

Step 1. Connect electronic frequency counter with transfer oscillator to SC OUT connector on front panel to measure the frequency of the signal generator in the radar test set.

Step 2. Spot-calibrate the wavemeter indicator at 940 mHz by holding the WAVEMETER CAL MKR switch down and adjusting the WAVEMETER FREQUENCY knob for the maximum dip on the calibration-control meter (nearest 940.0 mHz), then setting the CAL knob on the WAVEMETER FREQUENCY indicator so that the WAVEMETER FREQUENCY reading is exactly 940.0 mHz. Release the WAVEMETER CAL MKR switch.

Step 3. Check the frequency of the itnternal signal generator at 940 mHz by adjusting the SC FREQUENCY knob for the maximum meter dip nearest 940 mHz. Measure the frequency on the frequency counter. It should be 940 mHz, ±0. 5 mHz of the frequency shown on the WAVE METER

FREQUENCY indicator.

Step 4. Check the wavemeter indicator accuracy at 930 mHz by setting the indicator to exactly 930.0 and adjusting the SG FREQUENCY knob for a maximum meter dip. Measure the frequency on the electronic counter. It should be 930 mHz +0.5 mHz of frequency shown on the WAVEMETER FREQUENCY indicator.

Step 5. Repeat steps 2 through 4 above for frequencies up to 1220 mHz in ten mHz steps, spot-calibrating at each multiple of 20 mHz, then checking a non-calibrated frequency point ten mHz lower. The frequency indicated should be within 0.2 mHz of the measured frequency in all cases between 995 and 1125 mHz, and within 0.5 mHz from 925 to 995 mhz and from 1125 to 1225 mHz.

Step 6. If the frequency indications are out of tolerance at one or more points, the error may be corrected by one of the following methods.

(1) Pull out or push in the sampling probe on the signal generator cavity assembly (near 8J4) in increments of 1/32 inch as required. Check that the frequency error has been brought within tolerance.

(2) Pull out or push in the loop probe (8W2 connection) on the wavemeter in increments of 1/32 inch, as required. Check that the frequency error has been brought within tolerance.

5-8. REPLACEMENT PARTS STANDARDS.

There are no special minimum acceptable standards for selecting replacement parts during maintenance of Radar Test Set AN/UPM-98A. Usually, standard stock items will provide satisfactory operation of the test set. Applicable electron tubes should be replaced when successive preventive maintenance check-off readings gradually approach the lower limit of performance.

In cases where minor value changes of components have been made on equipments delivered under different contracts, the schematic diagrams in this manual show the latest values. For other values used on earlier equipment serial numbers refer to the parts list in section 6 of this manual. In all cases, the values shown on the schematic diagrams are preferred for replacement during maintenance.

5-9. SCHEMATIC DIAGRAMS.

Schematic diagrams for troubleshooting and circuit tracing purposes are provided in figures 5-57 through 5-67. Refer to section 4 of this manual for voltage and resistance charts and waveform illustrations for significant points in the test set.

5-10. PARTS LOCATION.

Figures 5-22 through 5-56 are photographs and drawings showing the locations of parts in the equipment.

5-11. CLEANING AIR FILTER. - The aluminum mesh air Intake filter should be cleaned at least once every month under normal operating conditions. If the equipment is operated in environments with a higher than normal duet or dirt content, the filter should be checked more often. To remove the filter element, unscrew the eight machine screws holding the air intake cover and pull it out. The filter is then easily removed. Wash the filter element in a warm mild soap solution. After cleaning, allow filter to dry, then coat with filter coating adhesive (Super Filter Coat; Research Products Corp. , Madison, Wisconsin or equivalent) by spraying or dipping. Return filter and intake cover to intake port and fasten with original screws.

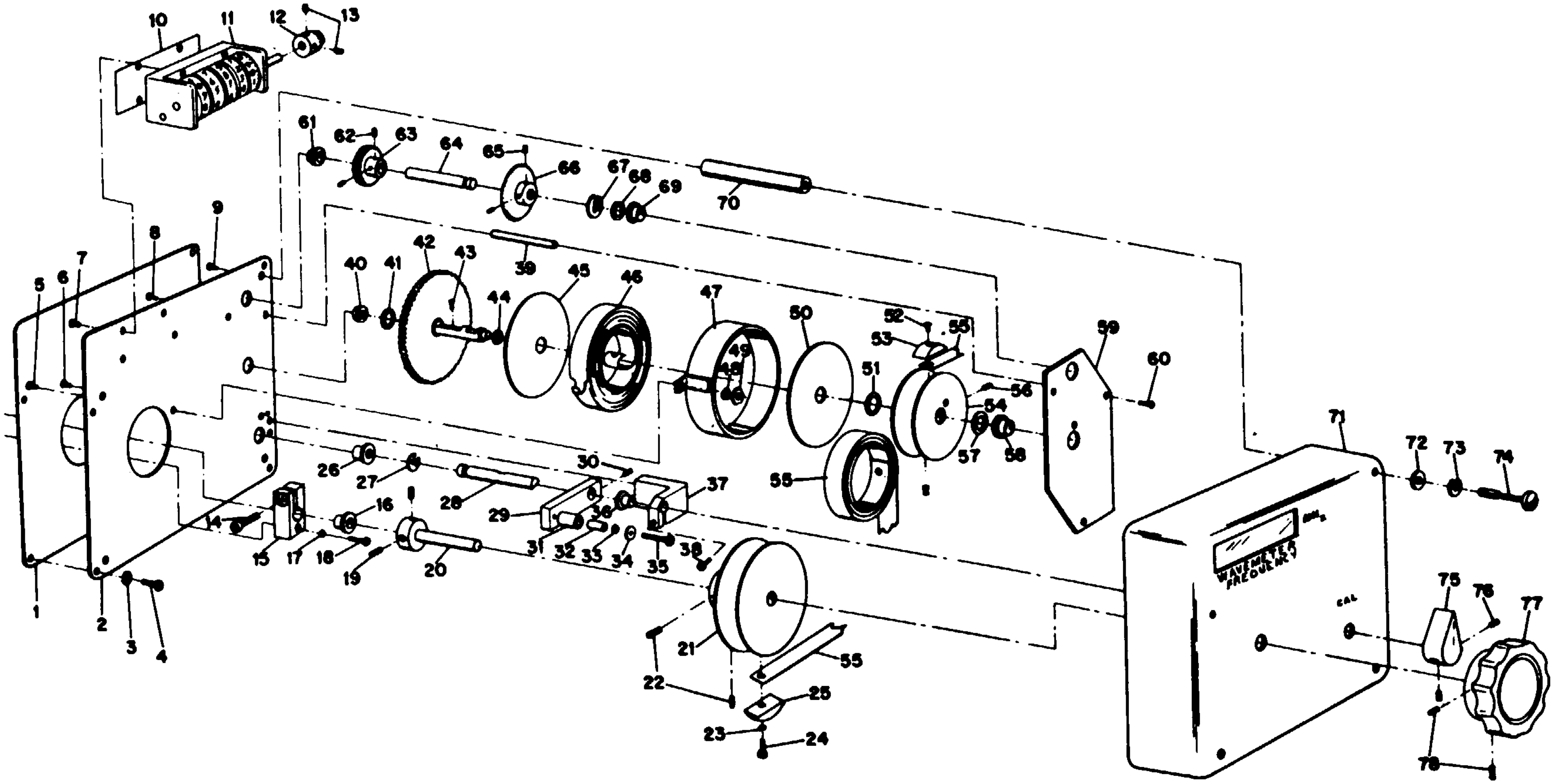


Figure 5-21A. Direct-Reading Wavemeter Indicator Assembly (AN/UPM-98B, AN/UPM-98C Only)

Table 5-13. Direct Reading Wavemeter Indicator, Parts Identification (AN/UPM-98B and AN/UPM-98C).

Call Out No. (Figure 5-21A)	Description	Admiral Part/Dwg No.	Call Out No. (Figure 5-21A)	Description	Admiral Part/Dwg No.
1	Gasket	512B358	40	Bushing	530D38-53
2	Base Plate	514D220-2	41	Washer	504B70-1
3	Lockwasher (#4 Split)	MS35338-135	42	Gear and Shaft	GB5068
4	Screw (Pan Hd 4-40 x 5/16)	MS35233-14	43	Rivet	506C16-13
5	Screw (Fl Hd 4-40 x 1/4)	501D70-102	44	Washer	504B70-2
6	Screw (Fl Hd 4-40 x 5/16)	AN507C440-5	45	Washer	504B69
7	Screw (Fl Hd 4-40 x 5/16)	AN507C440-5	46	Spirator Spring	518C362
8	Screw (Fl Hd 4-40 x 1/4)	501D70-102	47	Housing	515C2378
9	Screw (Fl Hd 6-32 x 5/16)	AN507C6-32-5	48	Lockwasher (#4 Split)	MS35338-135
10	Plate	515B2380	49	Nut (Hex 4-40)	NAS671C4
11	Counter	559B46	50	Washer	504B69
12	Pinion, Bevel	530B326	51	Washer	504B70-2
13	Setscrew	MS51021-9	52	Screw (Pan Hd 2-56 x 1/8)	MS35233-1
14	Screw (Socket Hd 4-40 x 3/8)	MS16995-10	53	Clamp Block	516B691-2
15	Block	516B690	54	Drum (Takeup)	517B8
16	Bushing	530C328-B-2	55	Tape Assembly	GB5069
17	Lockwasher (#4 Split)	MS35338-135	56	Setscrew	
18	Screw (Pan Hd 4-40 x 3/8)	MS35233-15		(Hex Socket 6-32 x 3/16)	MS51021-22
19	Setscrew		57	Washer, Shim	504B70-1
	(Hex Socket 8-32 x 3/16)	MS51021-31	58	Bushing	530D38-53
20	Shaft	528B299	59	Plate	514D220-3
21	Drum (Tuning)	517B7	60	Screw (Fl Hd 4-40 x 1/4)	501D70-102
22	Setscrew		61	Bushing	530D38-53
	(Hex Socket 8-32 x 3/16)	MS51021-31	62	Setscrew	
23	Lockwasher (#2 Split)	MS35338-134		(Hex Socket 4-40 x 1/8)	MS51021-9
24	Screw (Pan Hd 2-56 x 5/16)	MS35233-4	63	Gear, Spur	530C65-133
25	Clamp Block	516B691-1	64	Shaft	528B298
26	Bushing	530C328-B-12	65	Setscrew	
27	Retainer	MS16633-4018		(Hex Socket 4-40 x 1/8)	MS51021-9
28	Shaft	528B297	66	Gear, Bevel	530C327
29	Arm	516B688	67	Retainer	MS16633-4018
30	Setscrew		68	Washer, Flat	504B70-1
	(Hex Socket 6-32 x 3/16)	MS51021-22	69	Bushing	530D38-53
31	Roller	533B362	70	Post	529B225
32	Bushing	527B884	71	Cover Assembly	GC5073-1
33	Washer	MS15795-802	72	Washer, Flat (#4)	MS15795-803
34	Washer	MS35337-77	73	Lockwasher (#5 Split)	503B1-4
35	Screw (Pan Hd 2-56 x 5/8)	MS35233-8	74	Screw (Pan Hd 6-32 x 5/8 spec)	501B176
36	Bushing	530C328-B-2	75	Knob	MS91528-1P2B
37	Support Block	516B689	76	Setscrew (4-40)	(P/o item 75)
38	Screw (Socket Hd 4-40 x 3/8)	MS16995-10	77	Knob	MS91531-3N2B
39	Post	514D220-4	78	Setscrew (8-32)	(P/o item 77)

Items 27 thru 35 Comprise Arm Assembly P/N GB5071

Items 42 thru 56 Comprise Counter Rewind Assembly P/N GC5070

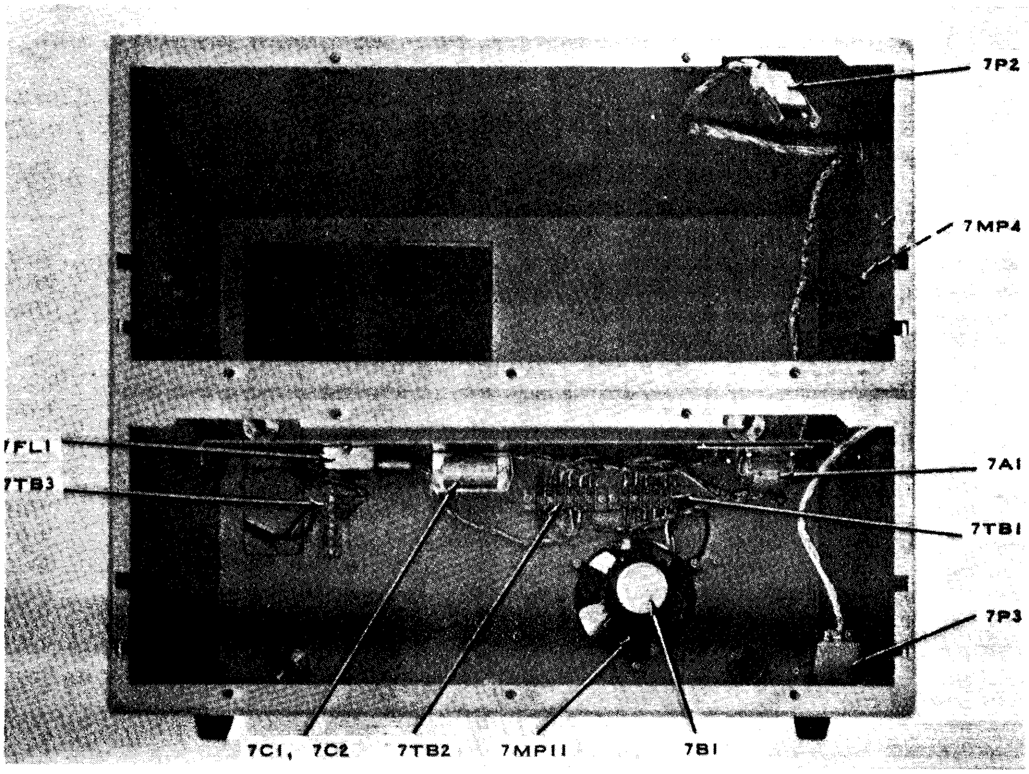


Figure 5-22. Electrical Equipment Case CY-2726A/UPM, Parts Location (AN/UPM-98A and AN/UPM-98C only)

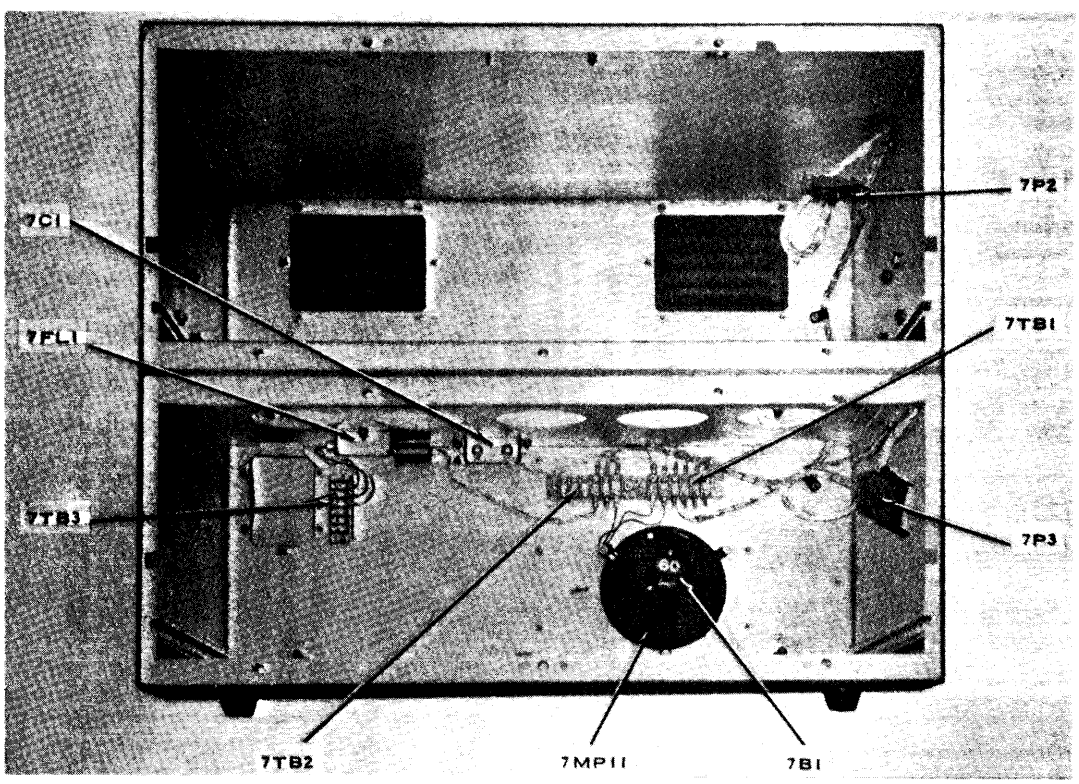
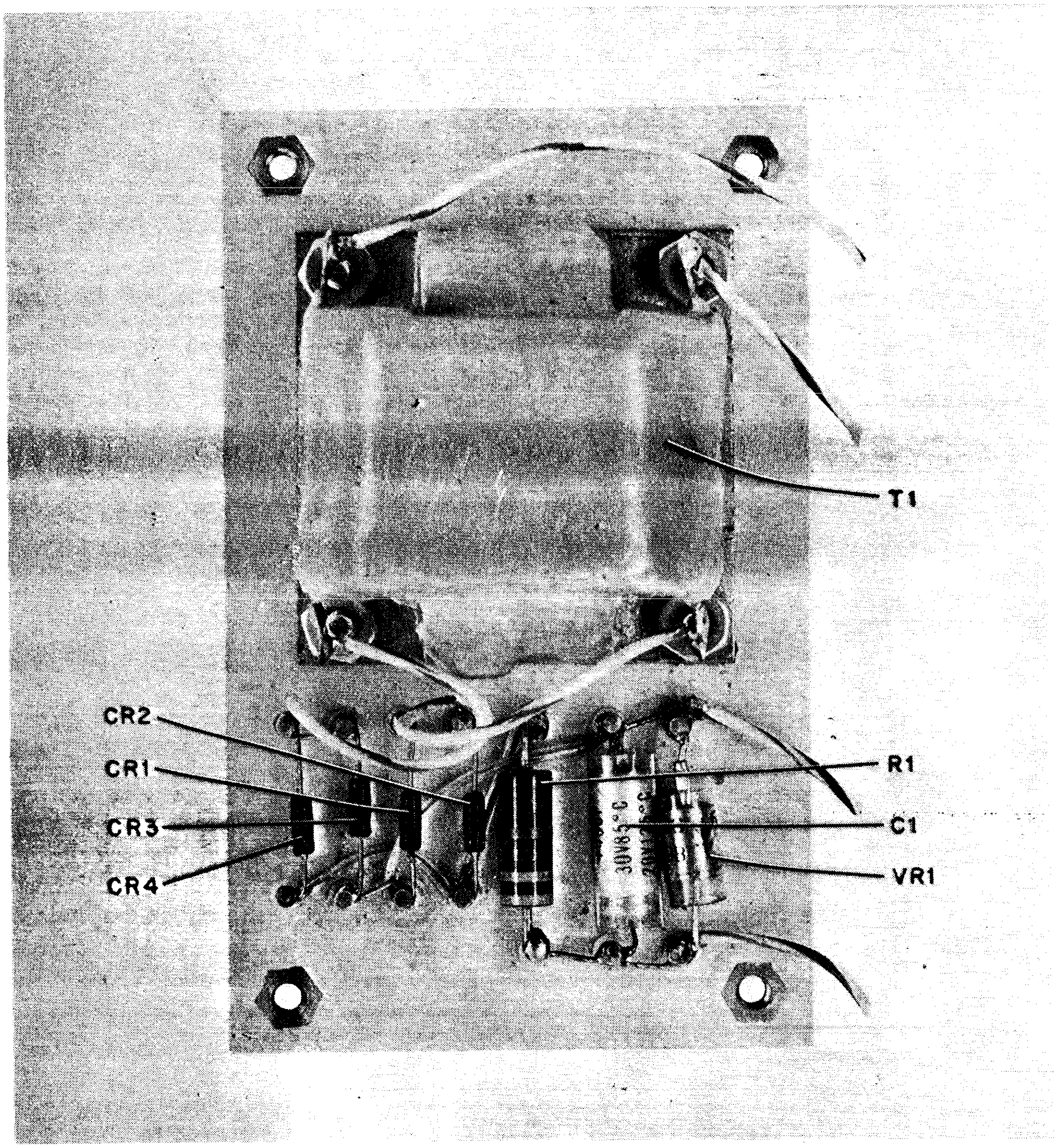


Figure 5-22A. Electrical Equipment Case CY-2726/UPM, Parts Location (AN/UPM-98B only)



REF DESIG PREFIX 7A1

Figure 5-23. Elapsed Time Meter Power Supply 7A1, Parts Location (AN/UPM-98A only)

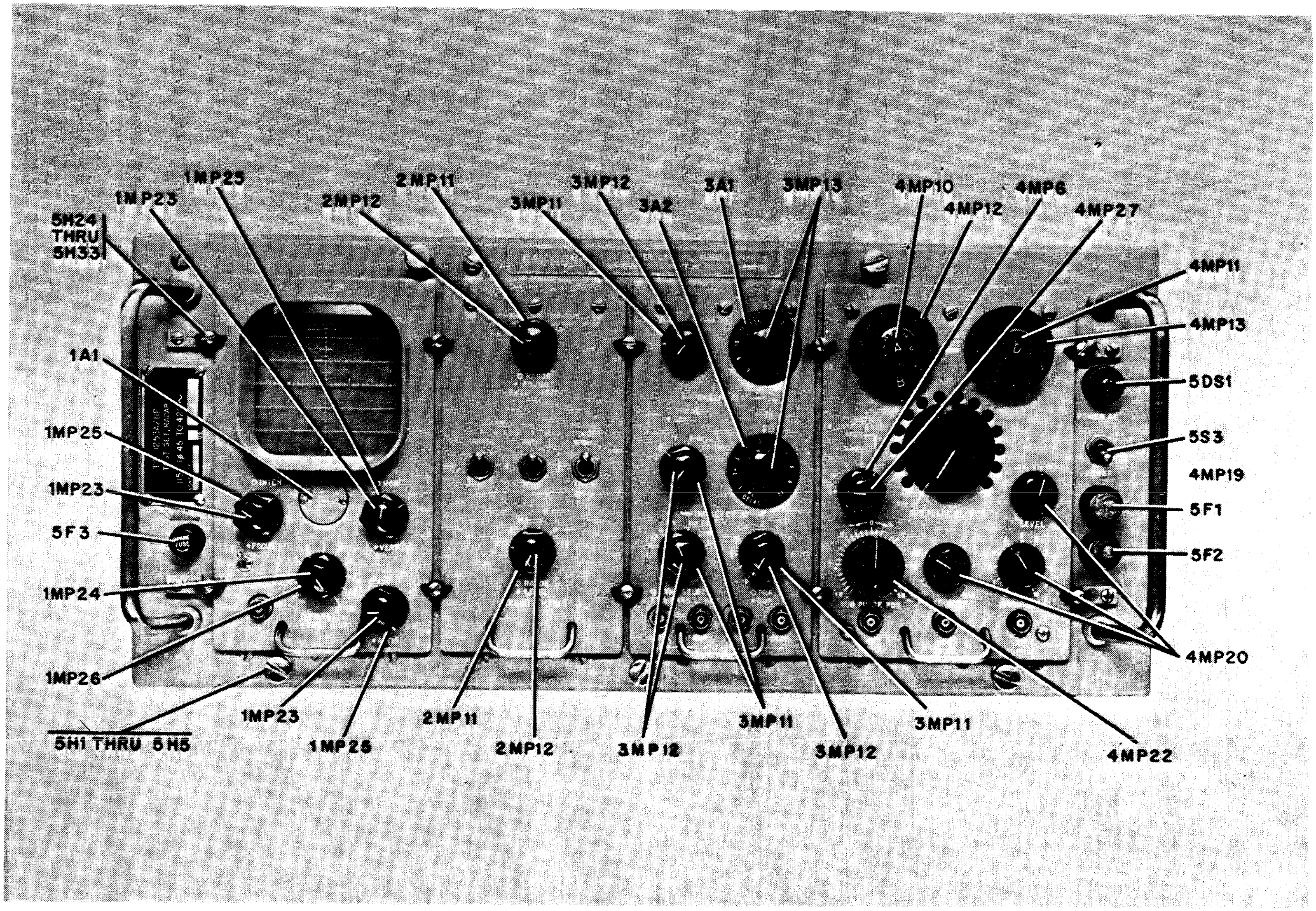
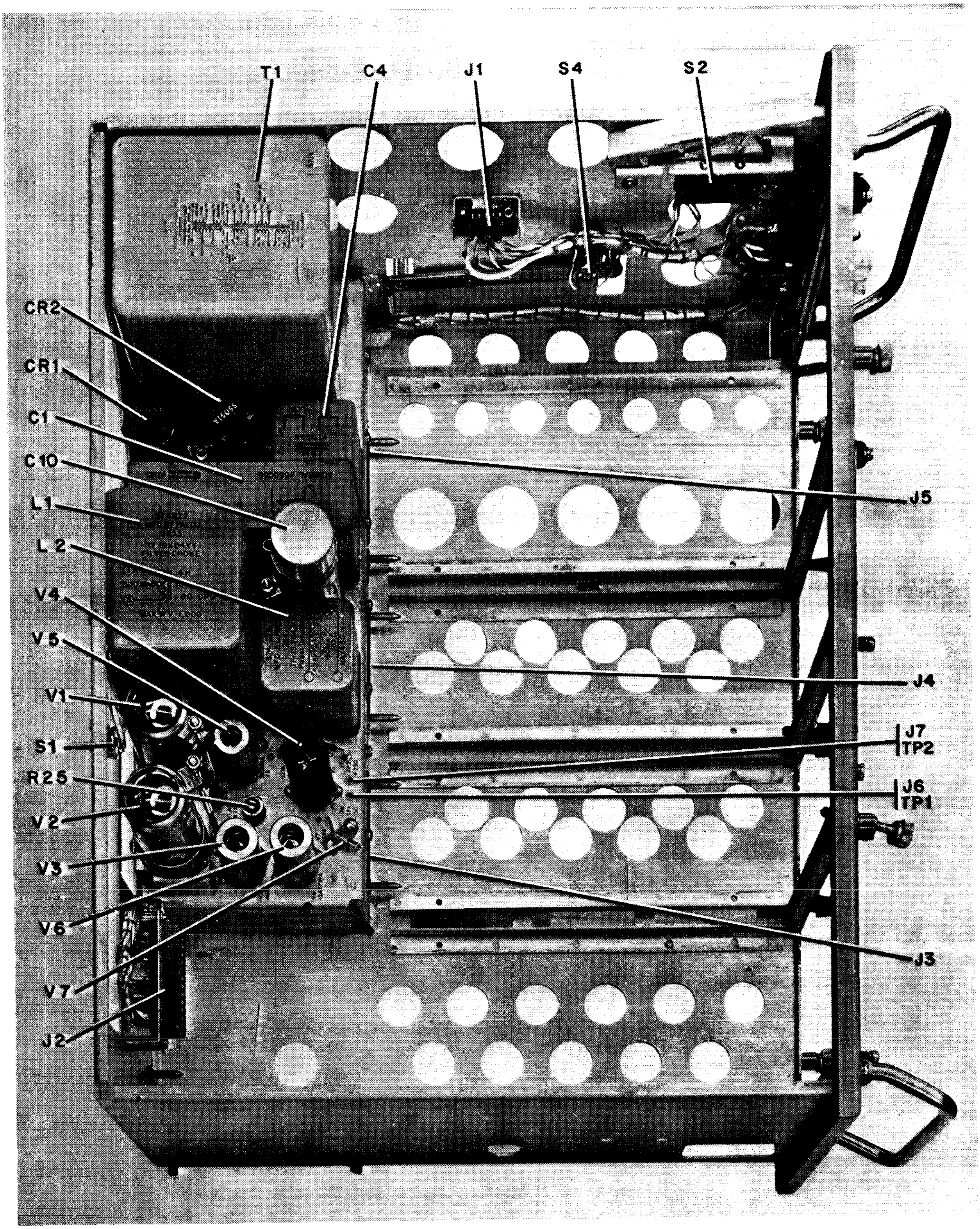
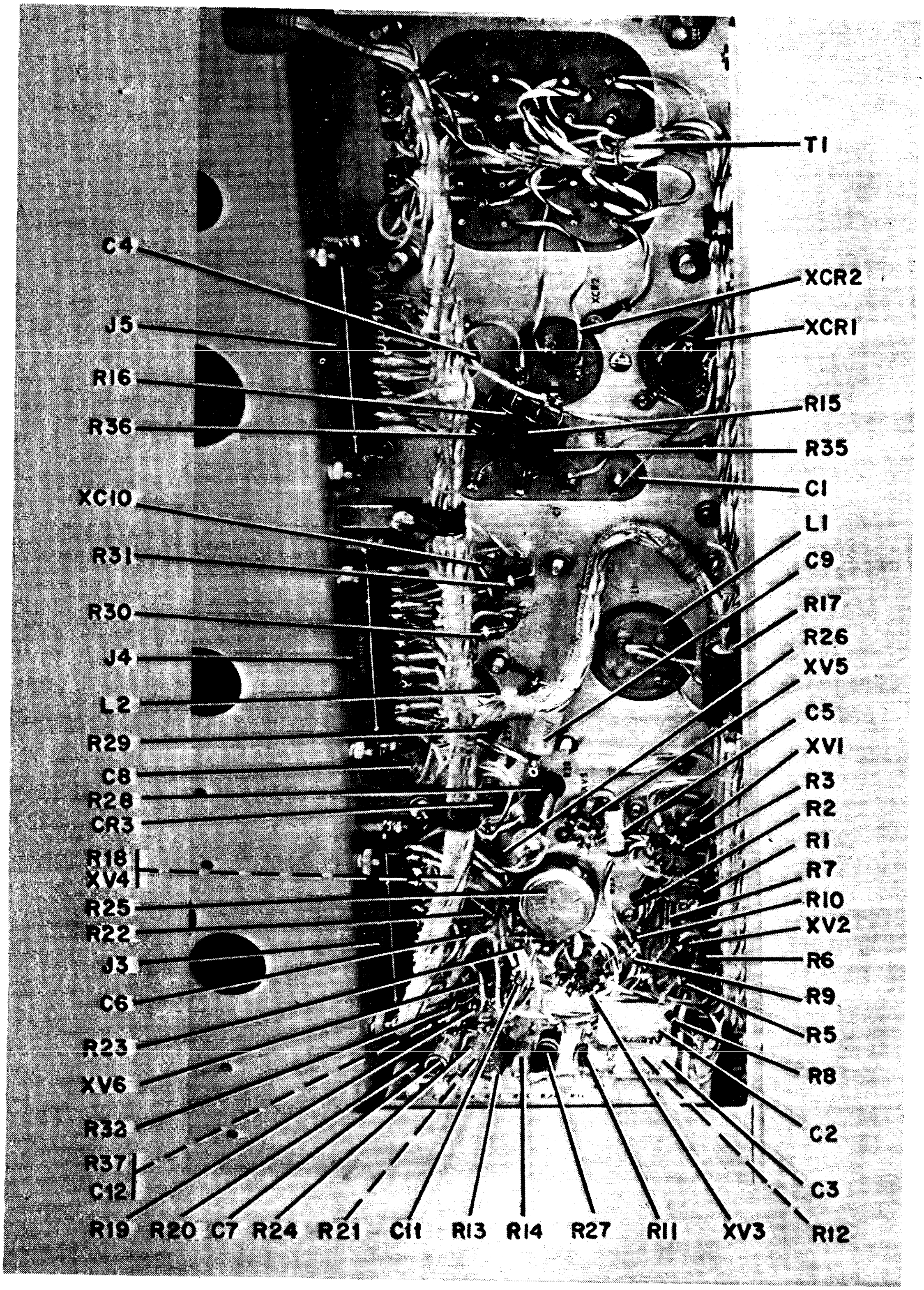


Figure 5-24. TS-1253A/UP, Front View, Parts Location



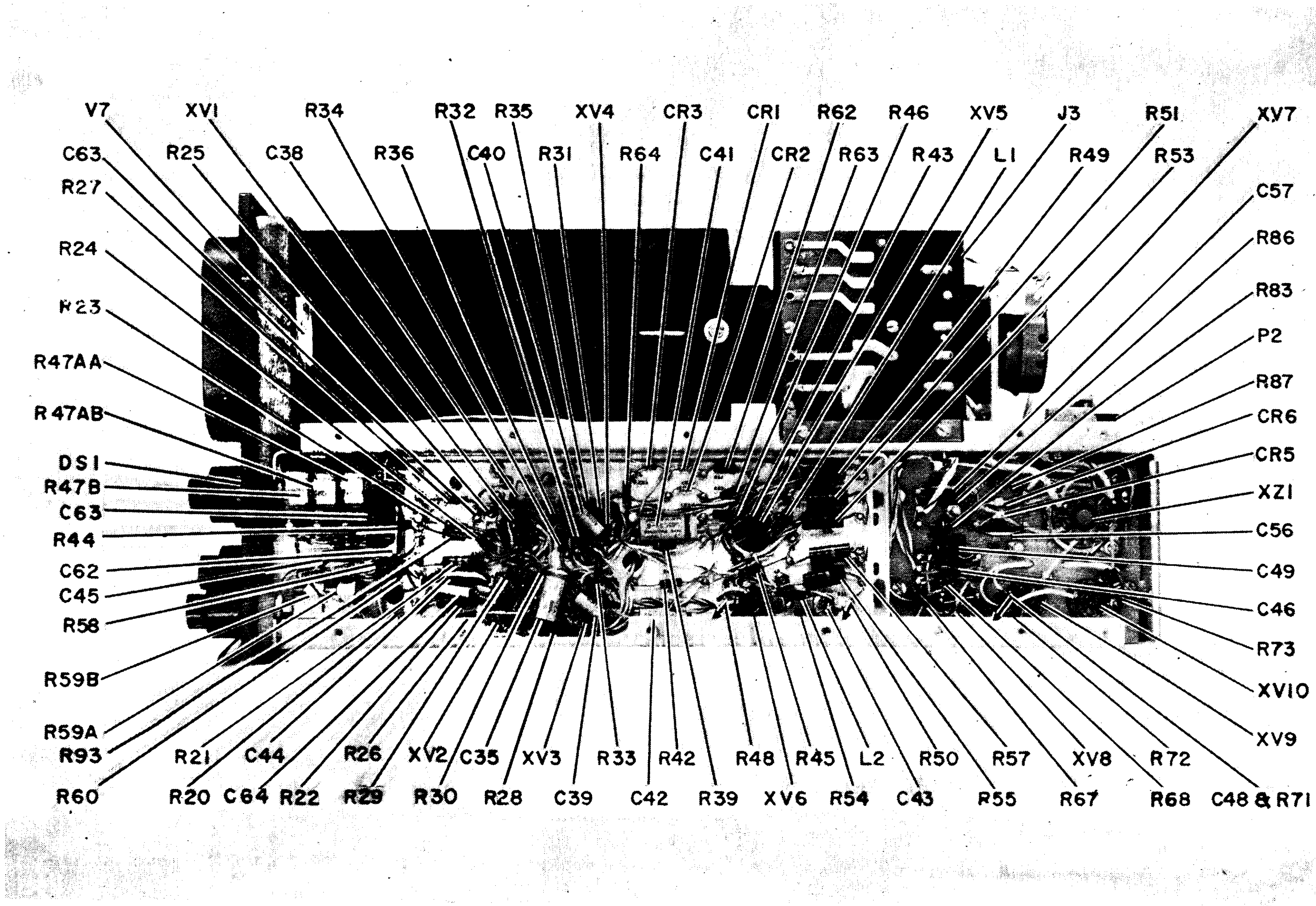
REF DESIG PREFIX 5

Figure 5-25. TS-1253A/UP, Panel-Chassis, Top, Parts Location



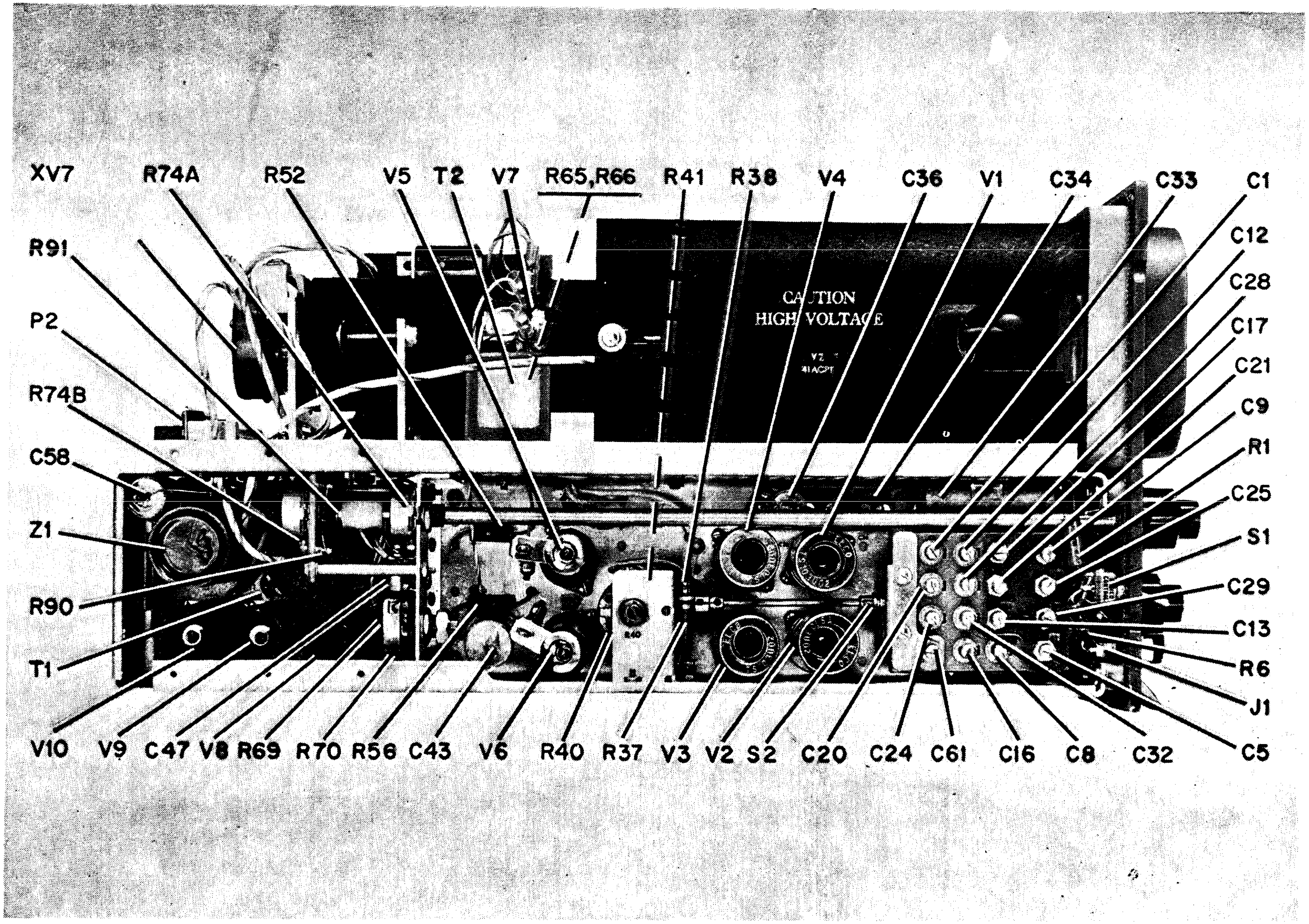
REF DESIG PREFIX 5

Figure 5-26. TS- 1253A/UP, Panel-Chassis, Bottom, Parts Location



REF DESIG PREFIX 1

Figure 5-27. Display Unit, Right Side, Parts Location



REF DESIG PREFIX 1

Figure 5-28. Display Unit, Left Side, Parts Location

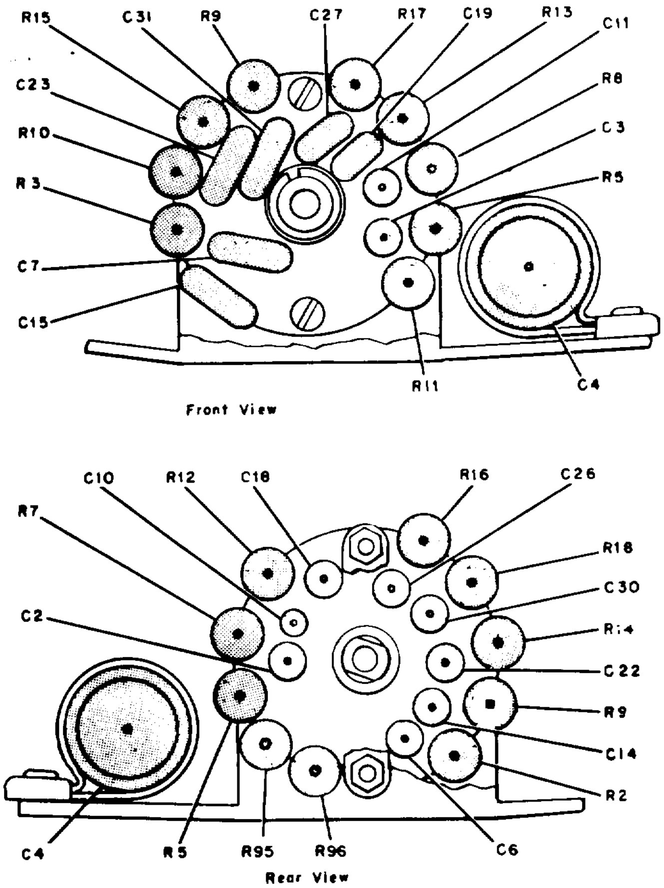
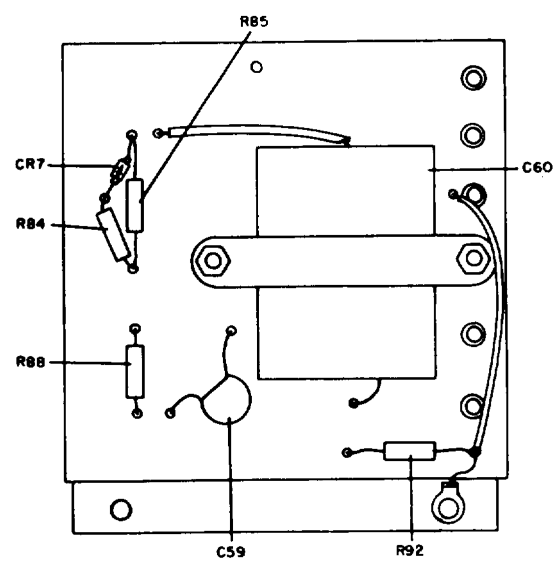
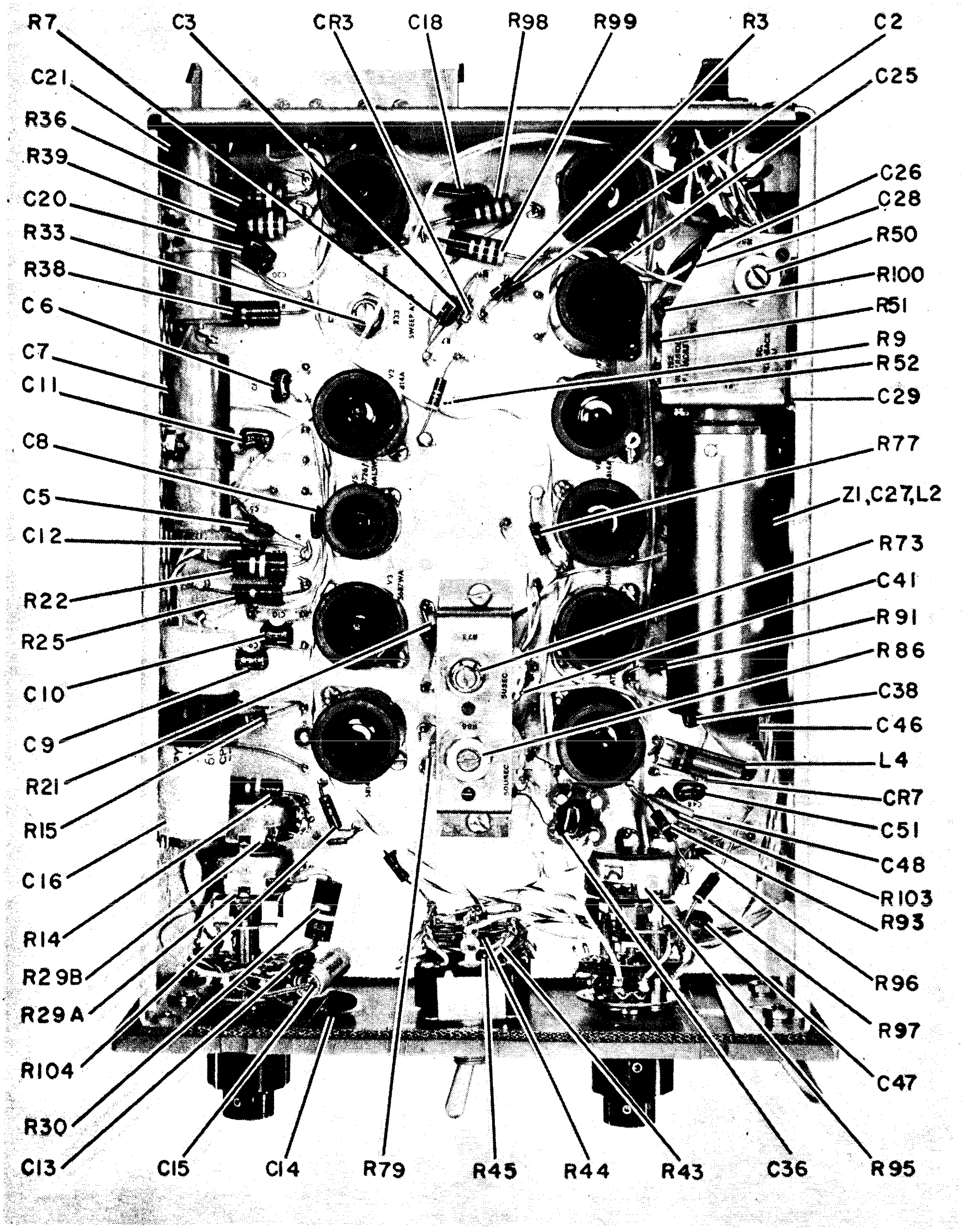


Figure 5-29. Display Unit, Video Attenuator Assembly, Parts Location



REF DESIG PREFIX 1

Figure 5-30. Display Unit, Contact Plate Assembly, Parts Location



REF DESIG PREFIX 2

Figure 5-31. Sweep and Intensity Mark Unit, Right Side, Parts Location (Sheet 1 of 2)

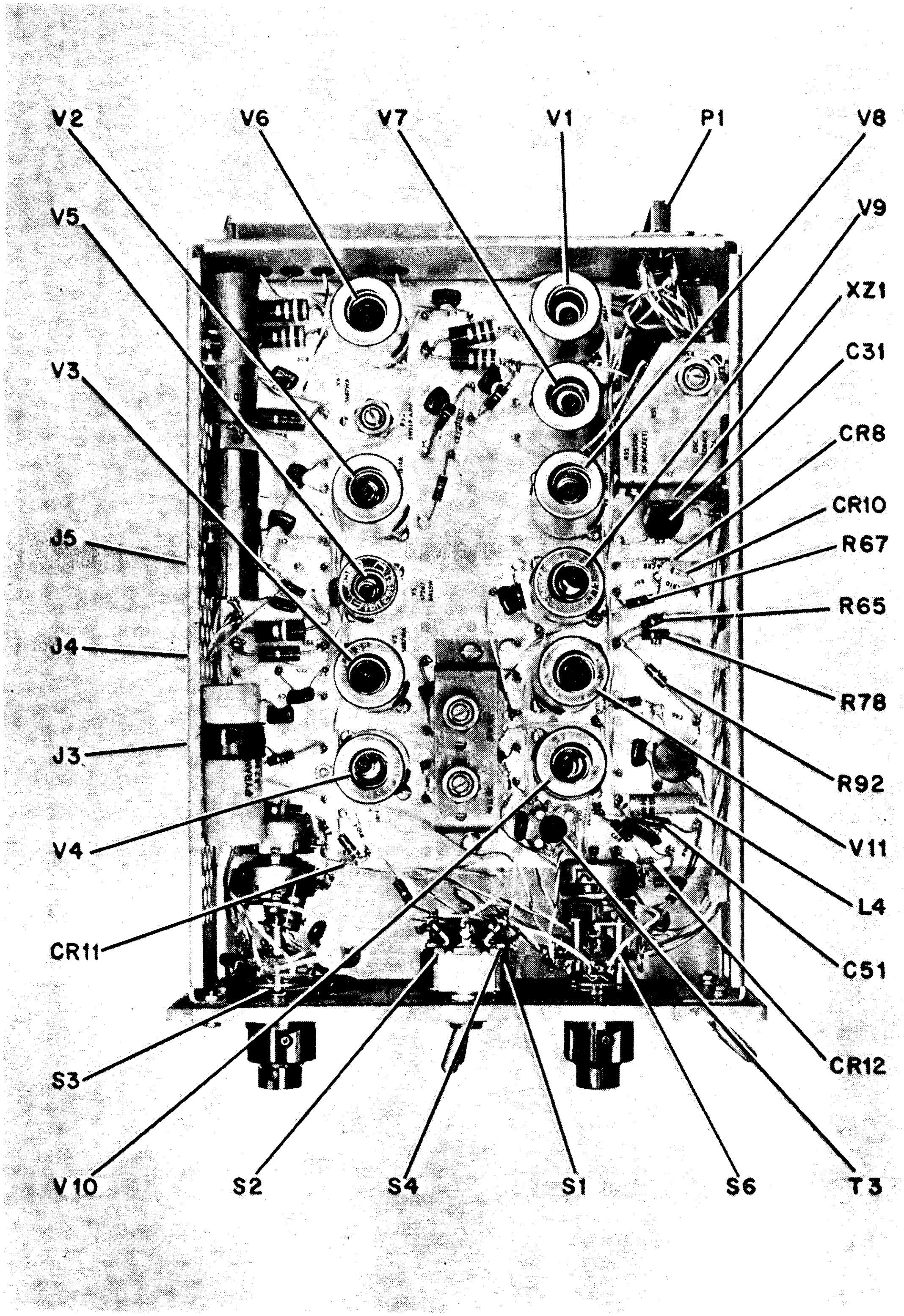


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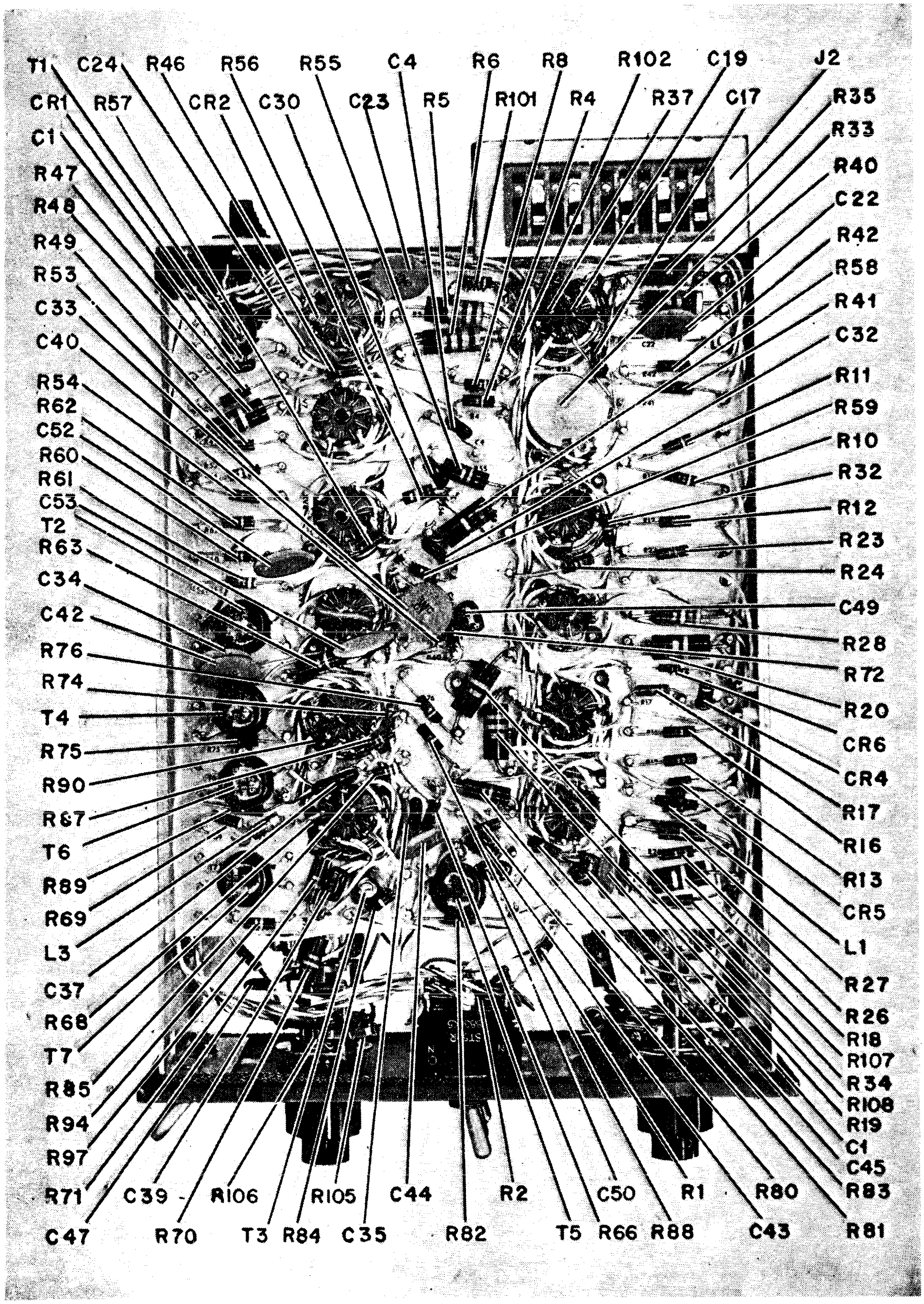
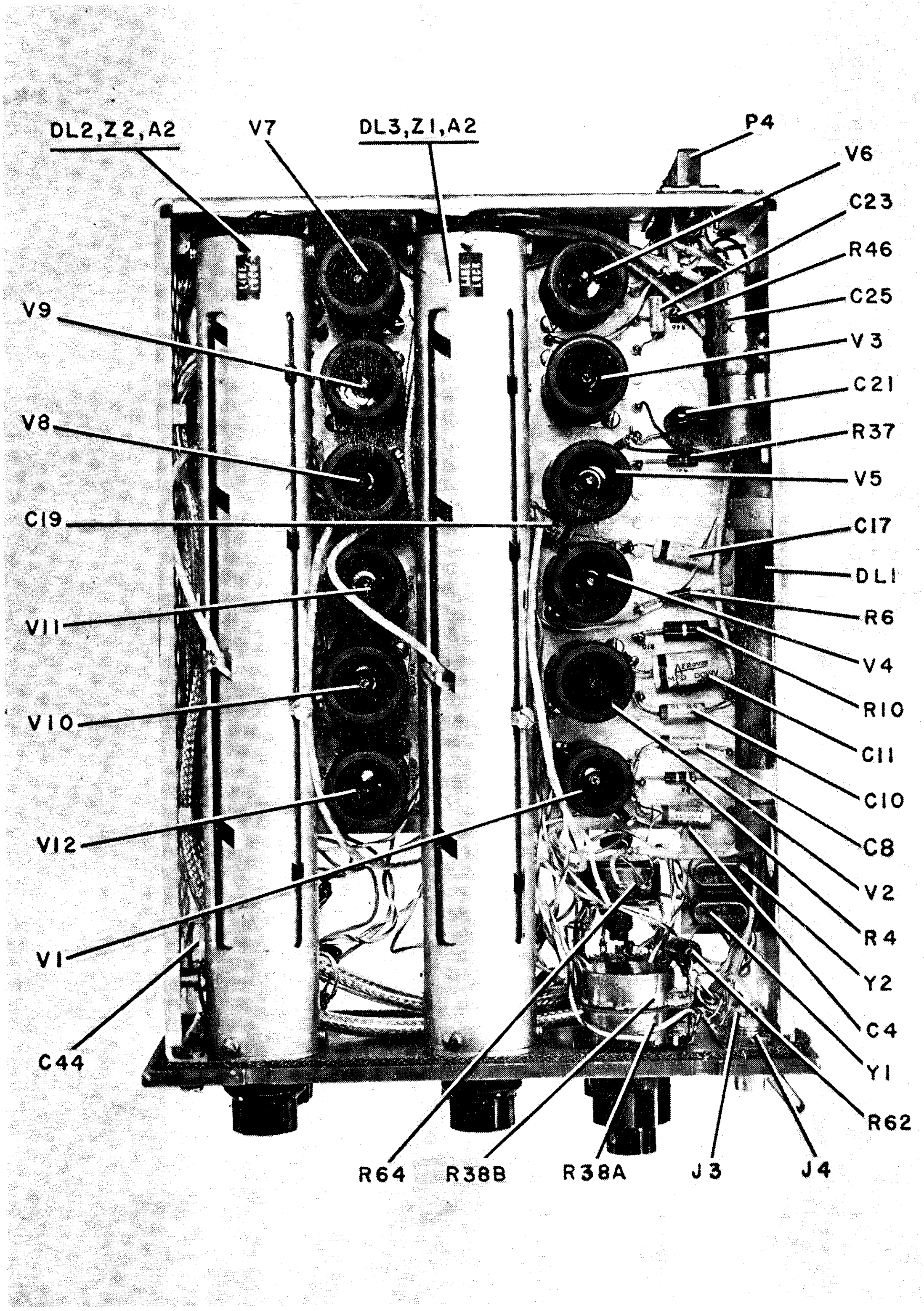
Figure 5-31. Sweep and Intensity Mark Unit, Right Side, Parts Location (Sheet 2 of 2)



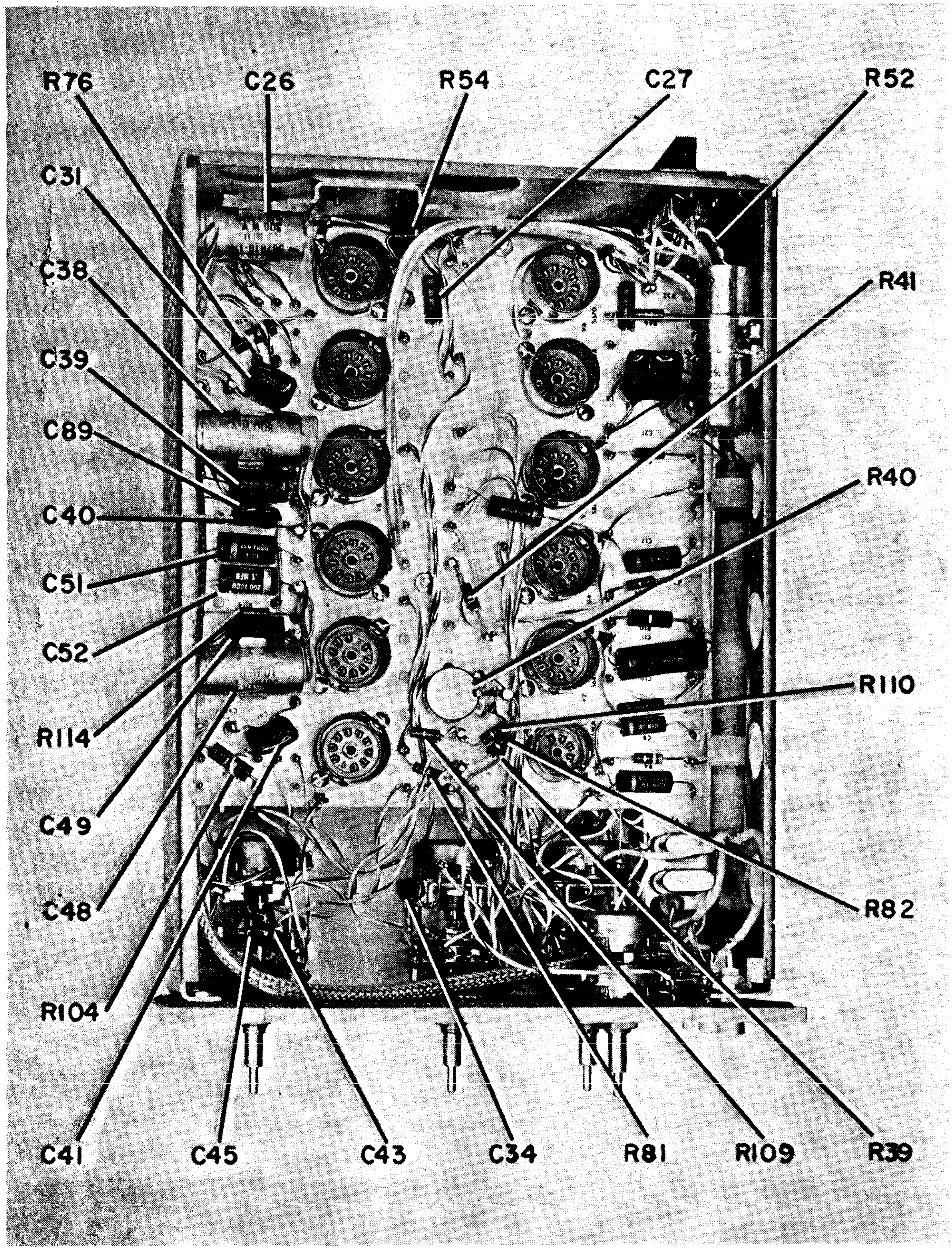
REF DESIG PREFIX 2

Figure 5-32. Sweep and Intensity Mark Unit, Left Side, Parts Location



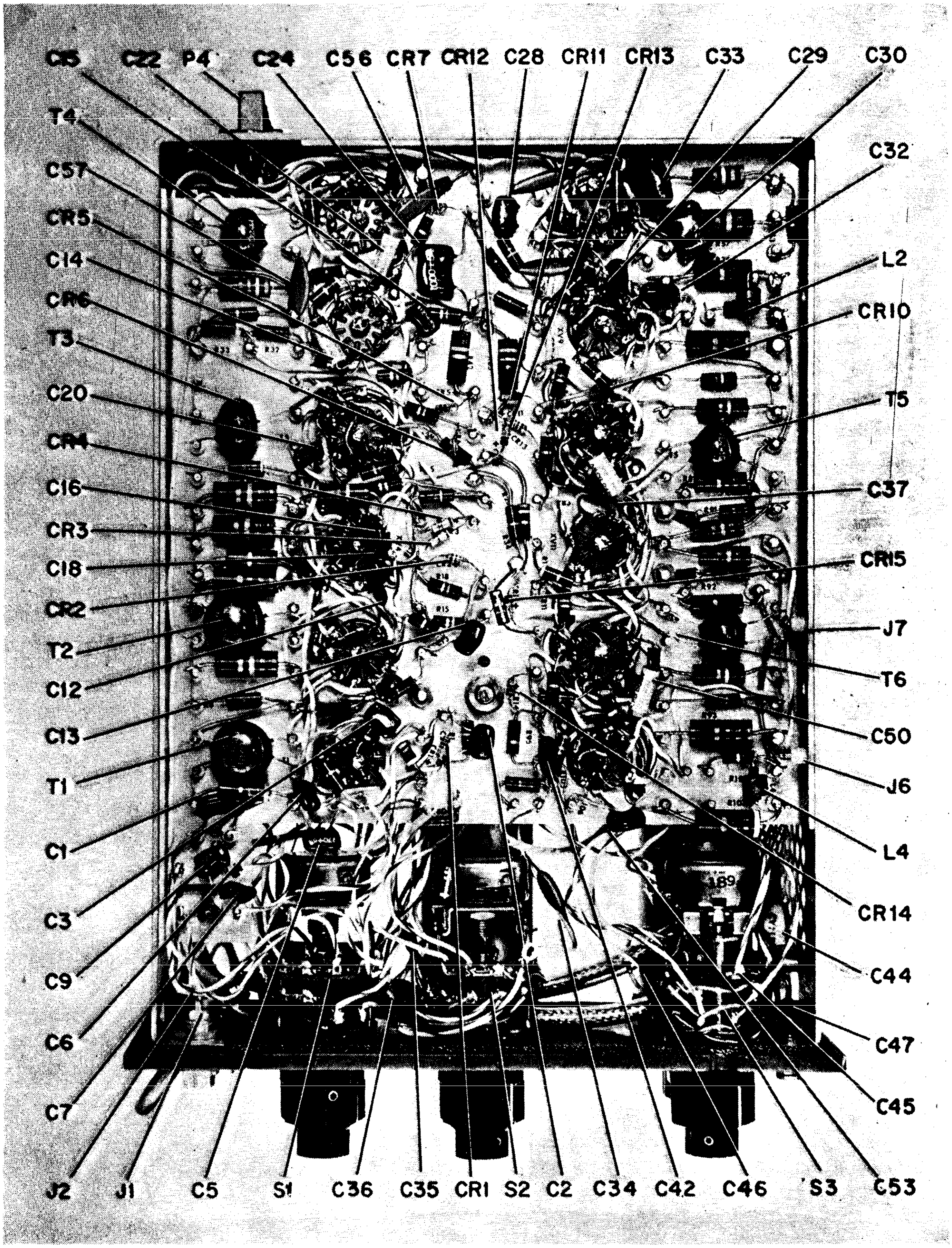
REF DESIG PREFIX 3

Figure 5-33. Crystal Mark and Sync Unit, Right Side, Parts Location (Sheet 1 of 2)



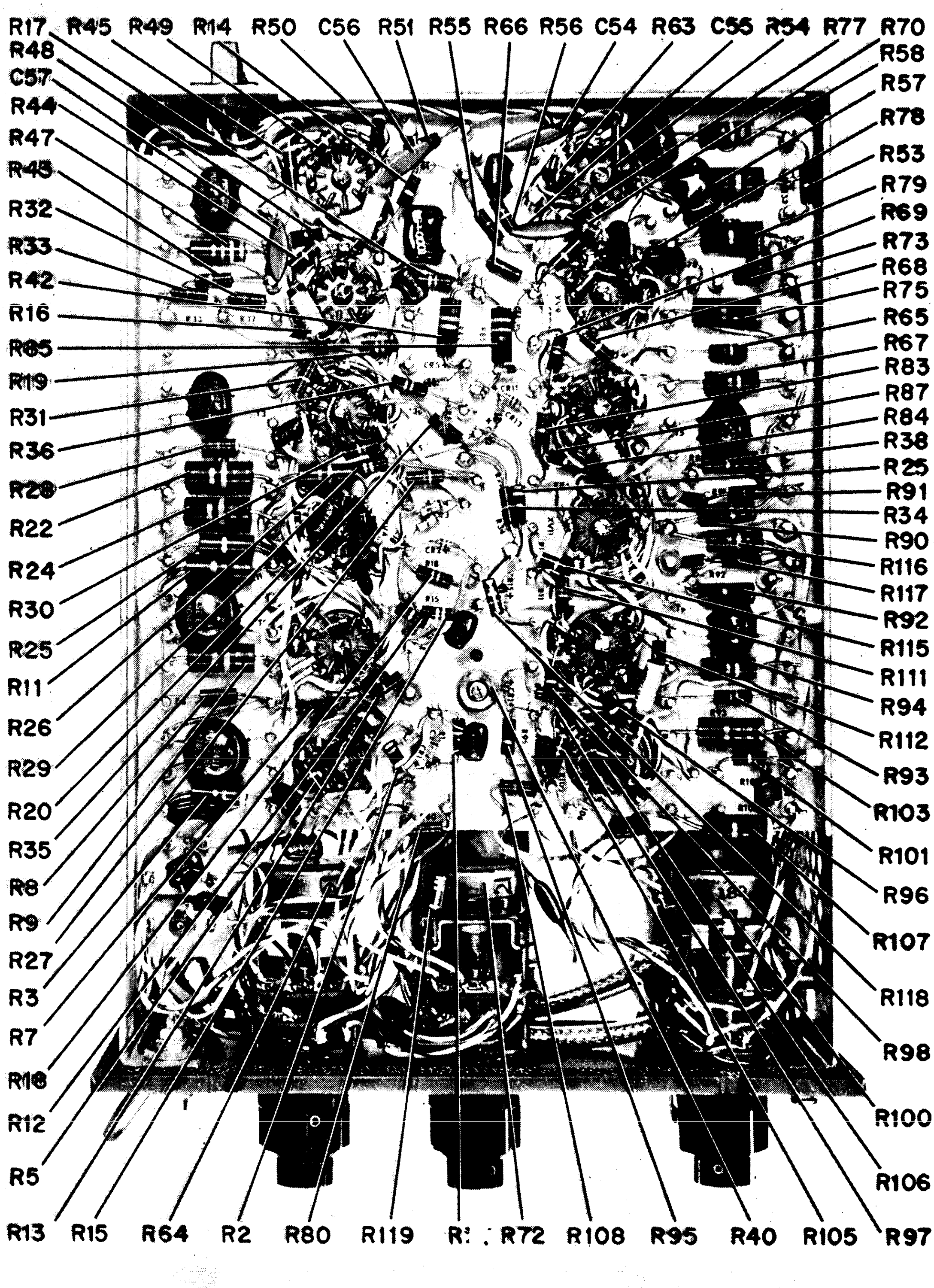
REF DESIG PREFIX 3

Figure 5-33. Crystal Mark and Sync Unit, Right Side, Parts Location (Sheet 2 0f 2)



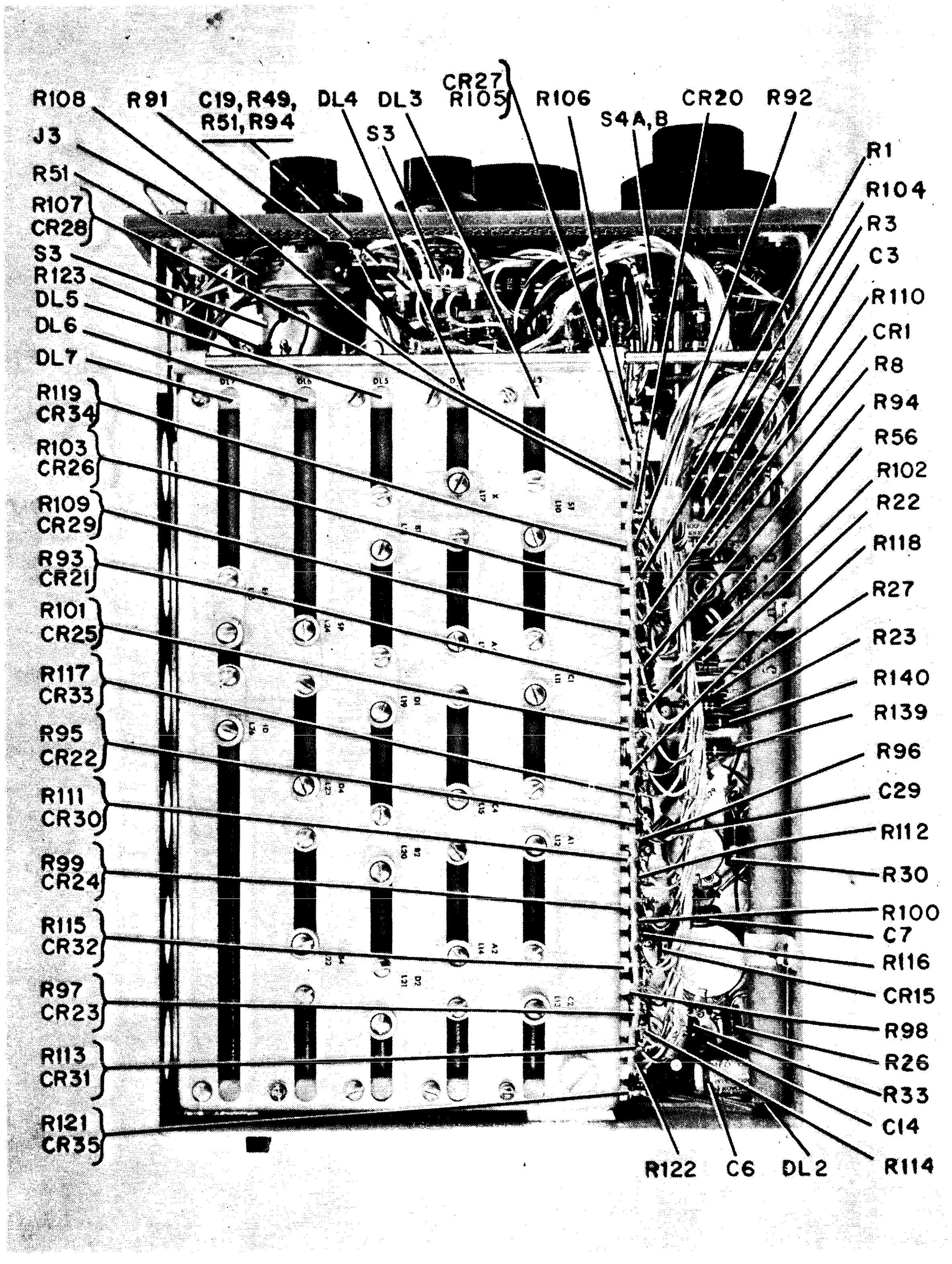
REF DESIG PREFIX 3

Figure 5-34. Crystal Mark and Sync Unit, Left Side, Parts Location (Sheet 1 of 2)



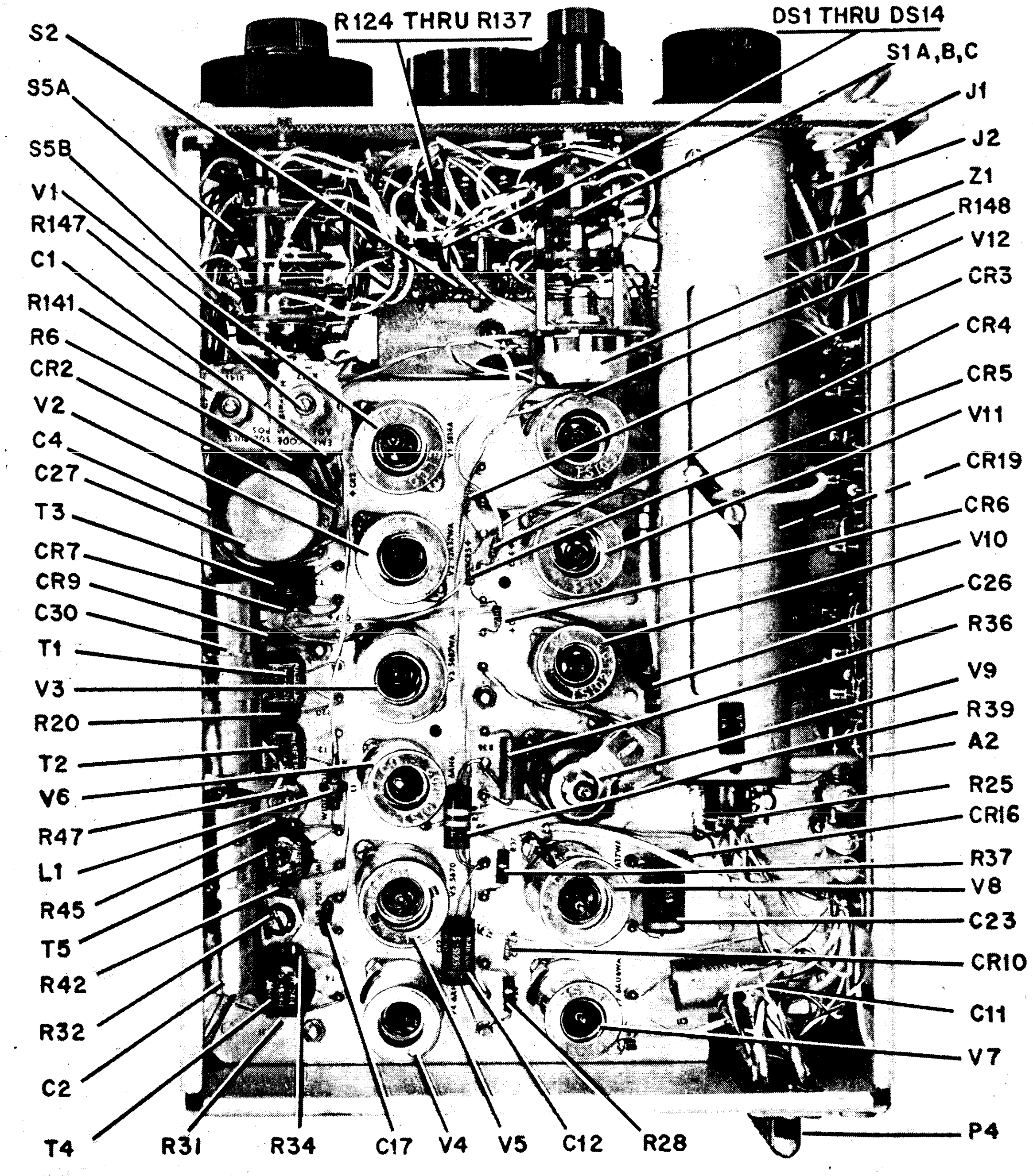
REF DESIGN PREFIX 3

Figure 5-34. Crystal Mark and Sync Unit, Left Side, Parts Location (Sheet 2 of 2)



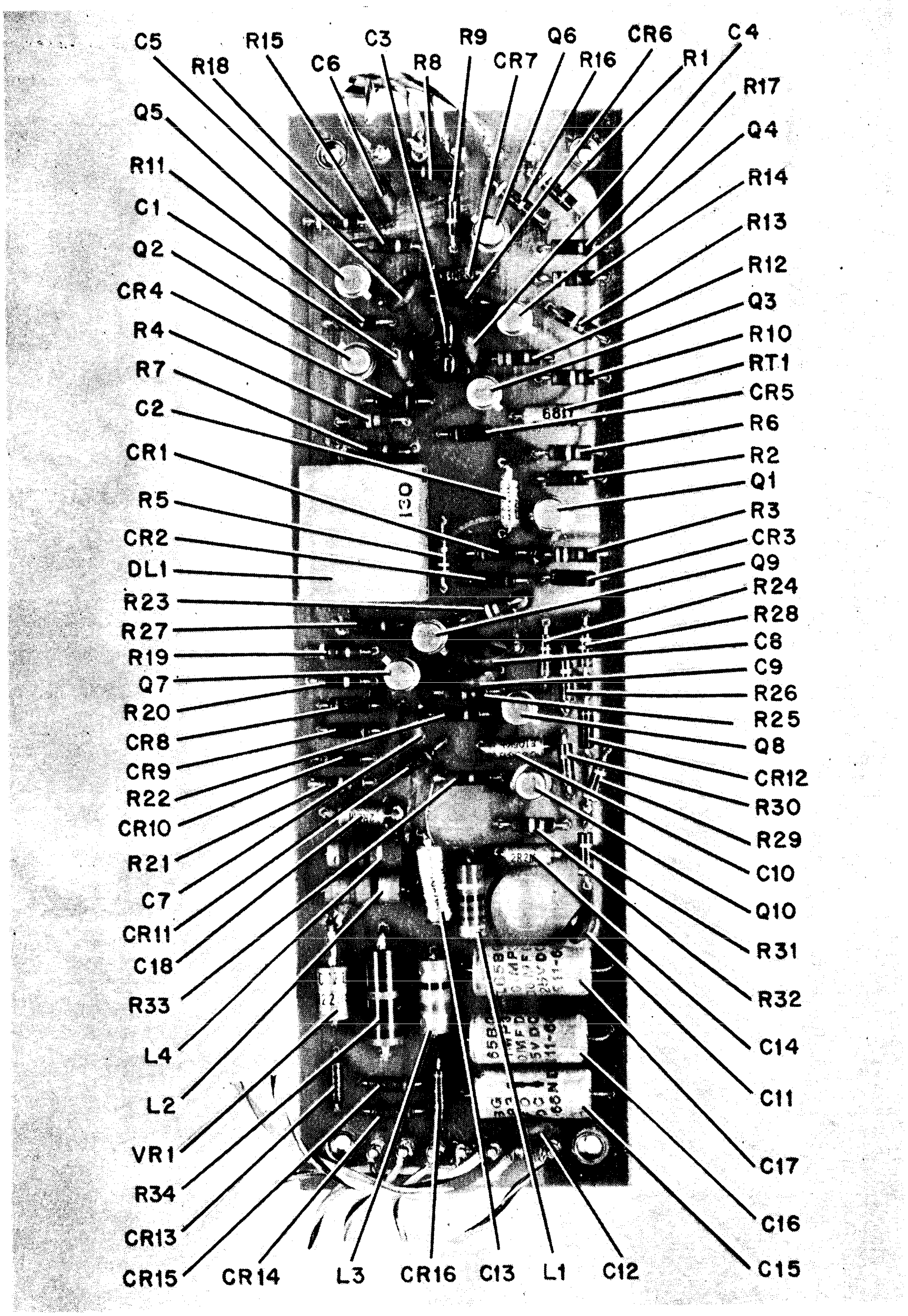
REF DESIG PREFIX 4

Figure 5-35. SIF Coder, Right Side, Parts Location



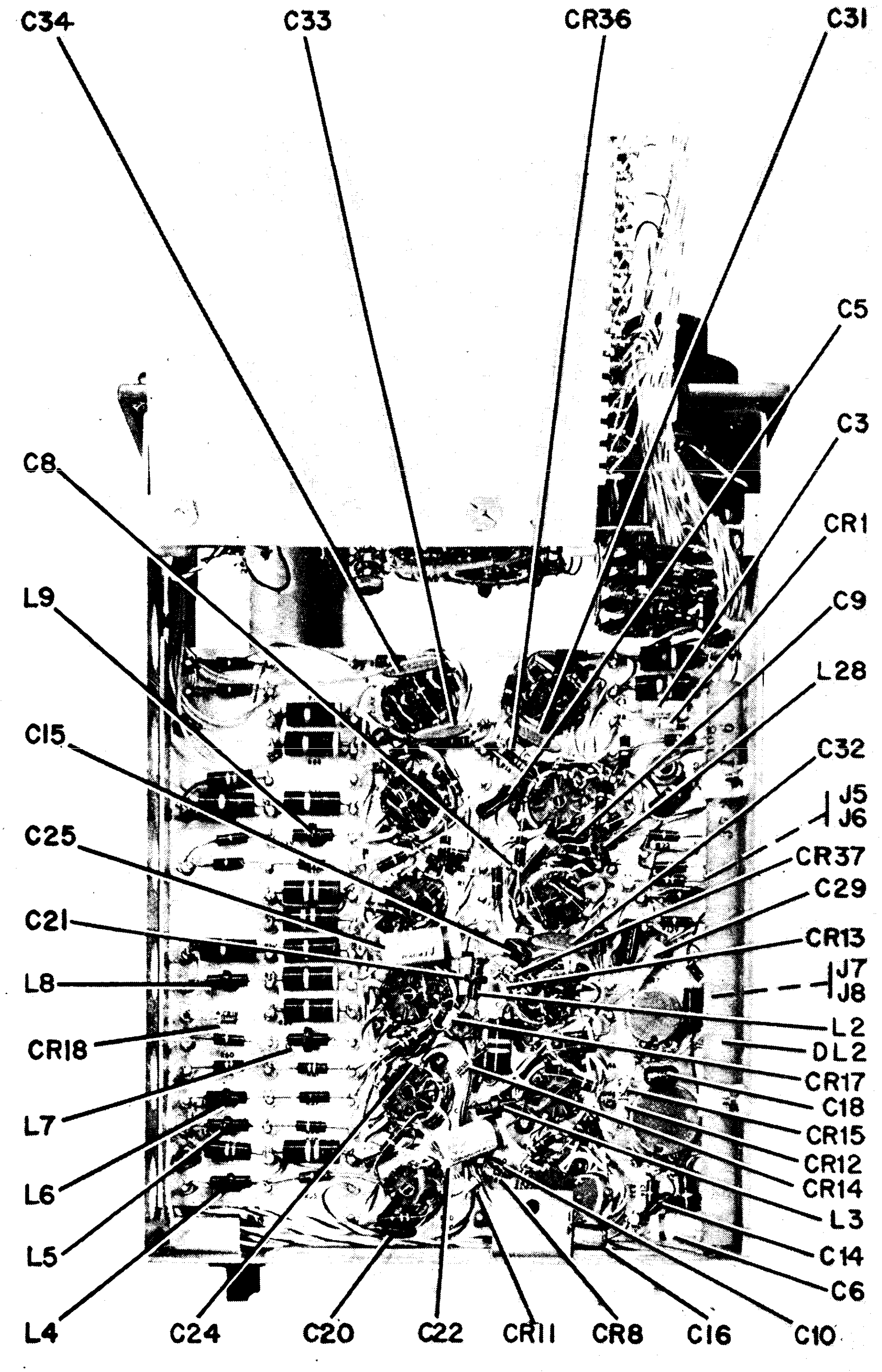
REF DESIG PREFIX 4

Figure 5-36. SIF Coder, Left Side, Parts Location



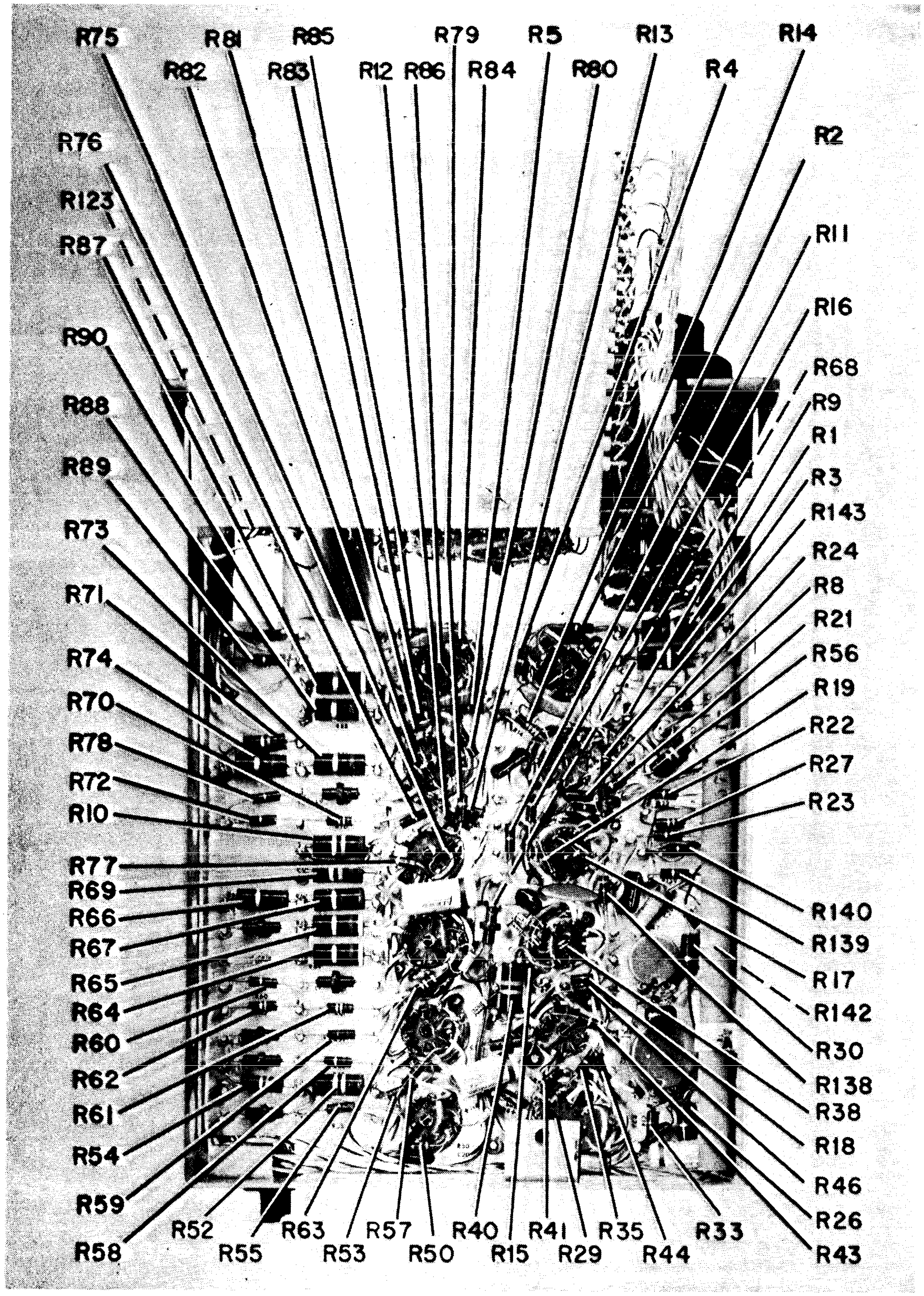
REF DESIG PREFIX 4A2

Figure 5-37. Interleave Assembly 4A2, Parts Location



REF DESIG PREFIX 4

Figure 5-38. SIF Coder, Delay Lines Raised, Parts Location (Sheet 1 of 2)



REF DESIG PREFIX 4

Figure 5-38. SIF Coder, Delay Lines Raised, Parts Location (Sheet 2 0f 2)

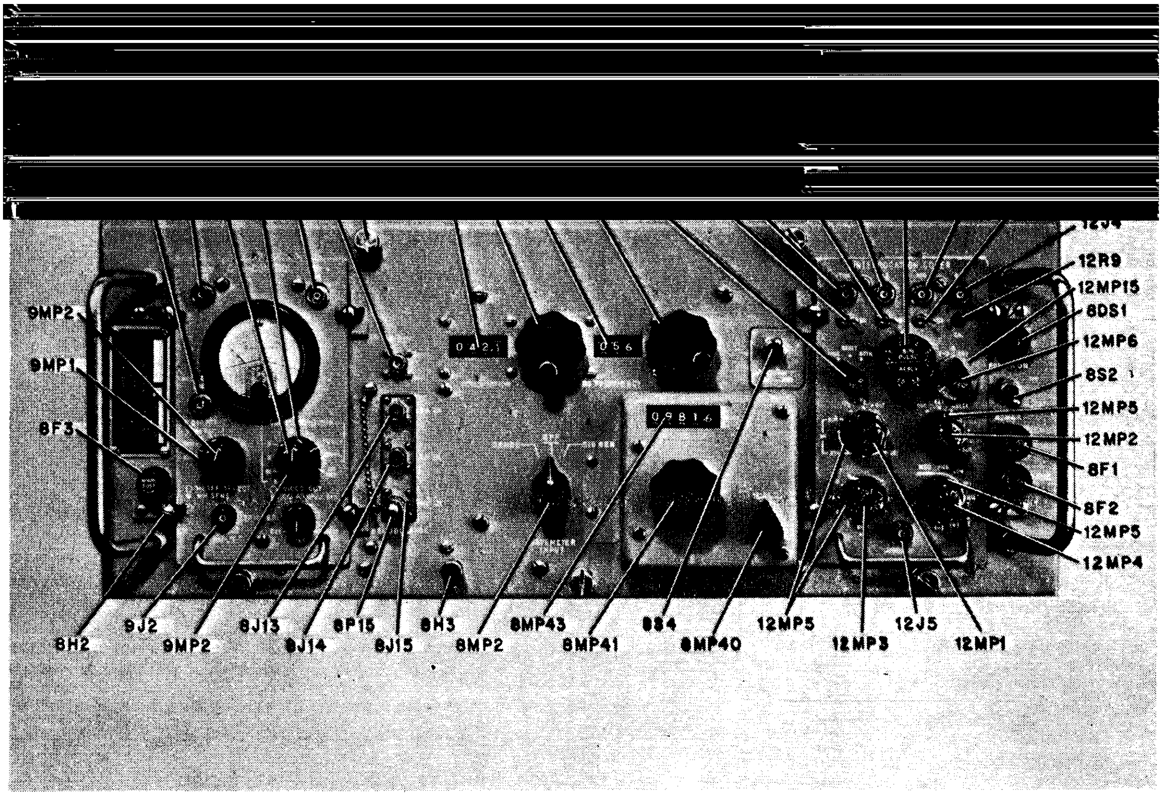


Figure 5-39. Coder Simulator SM-197A/UPM-98, Front Panel, Parts Location

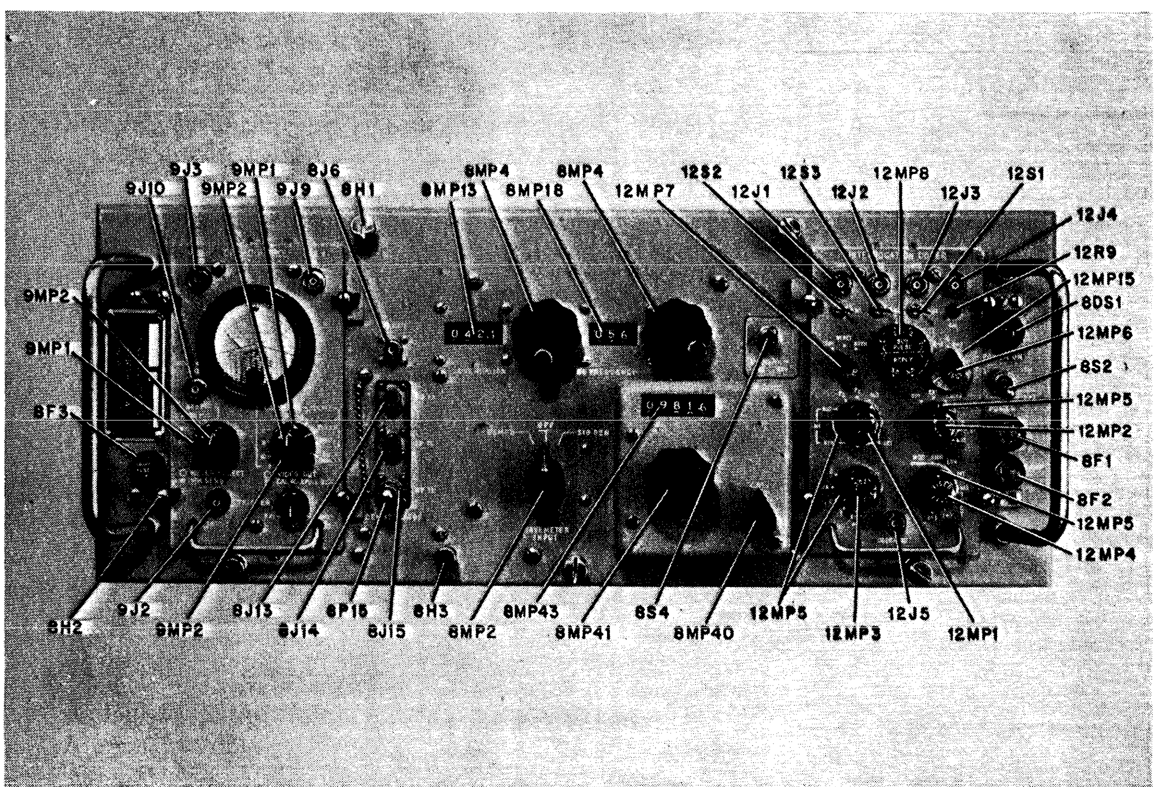
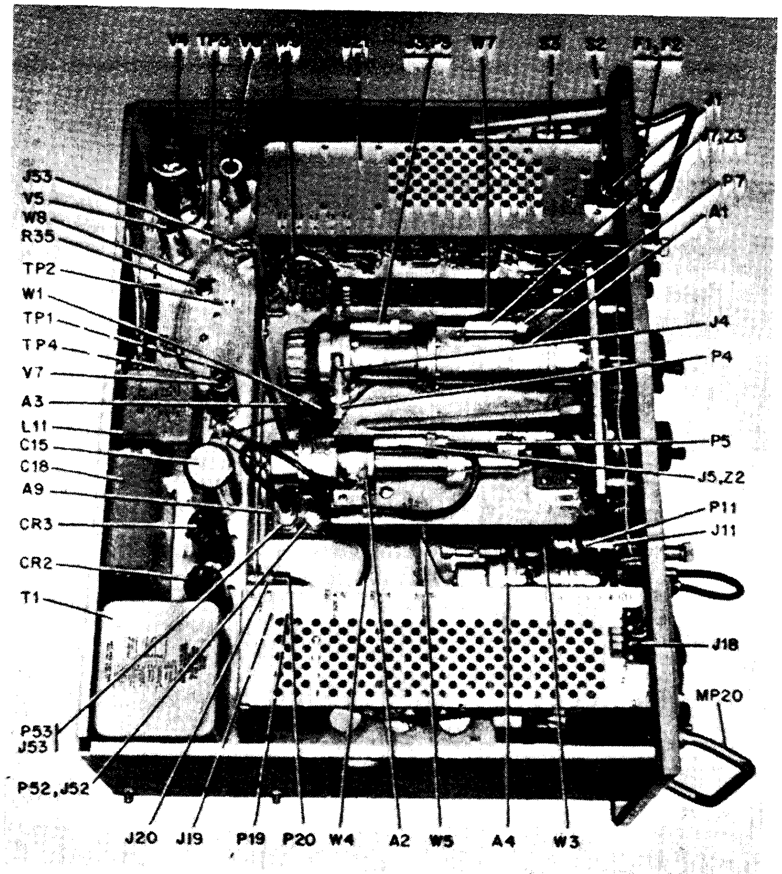
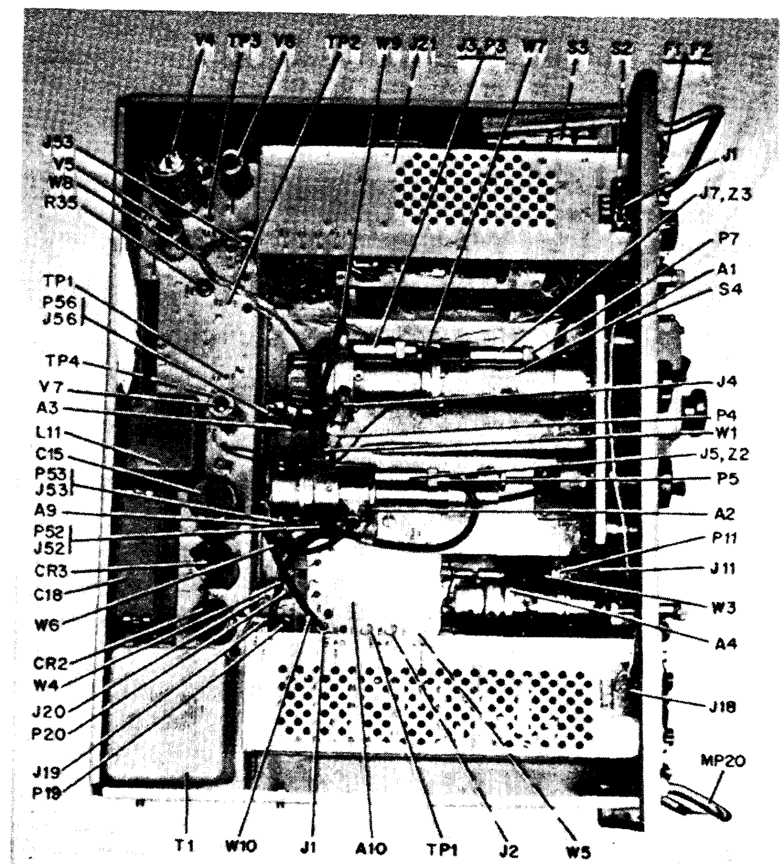


Figure 5-39A. Coder Simulator SM-197B/UPM-98, Front Panel, Parts Location



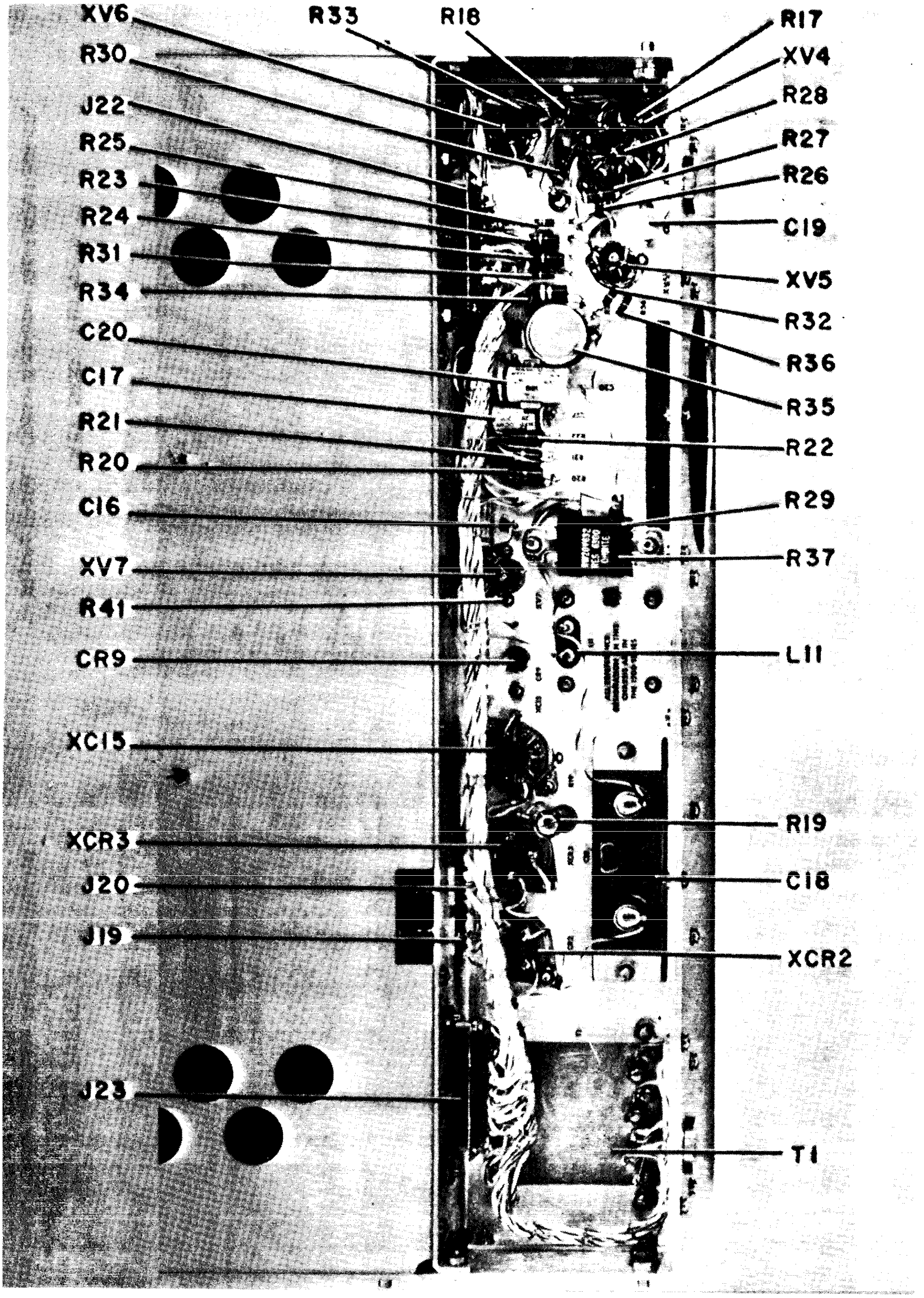
REF DESIG PREFIX 8

Figure 5-40. Coder Simulator SM-197A/UPM-98, Panel Chassis, Top, Parts Location



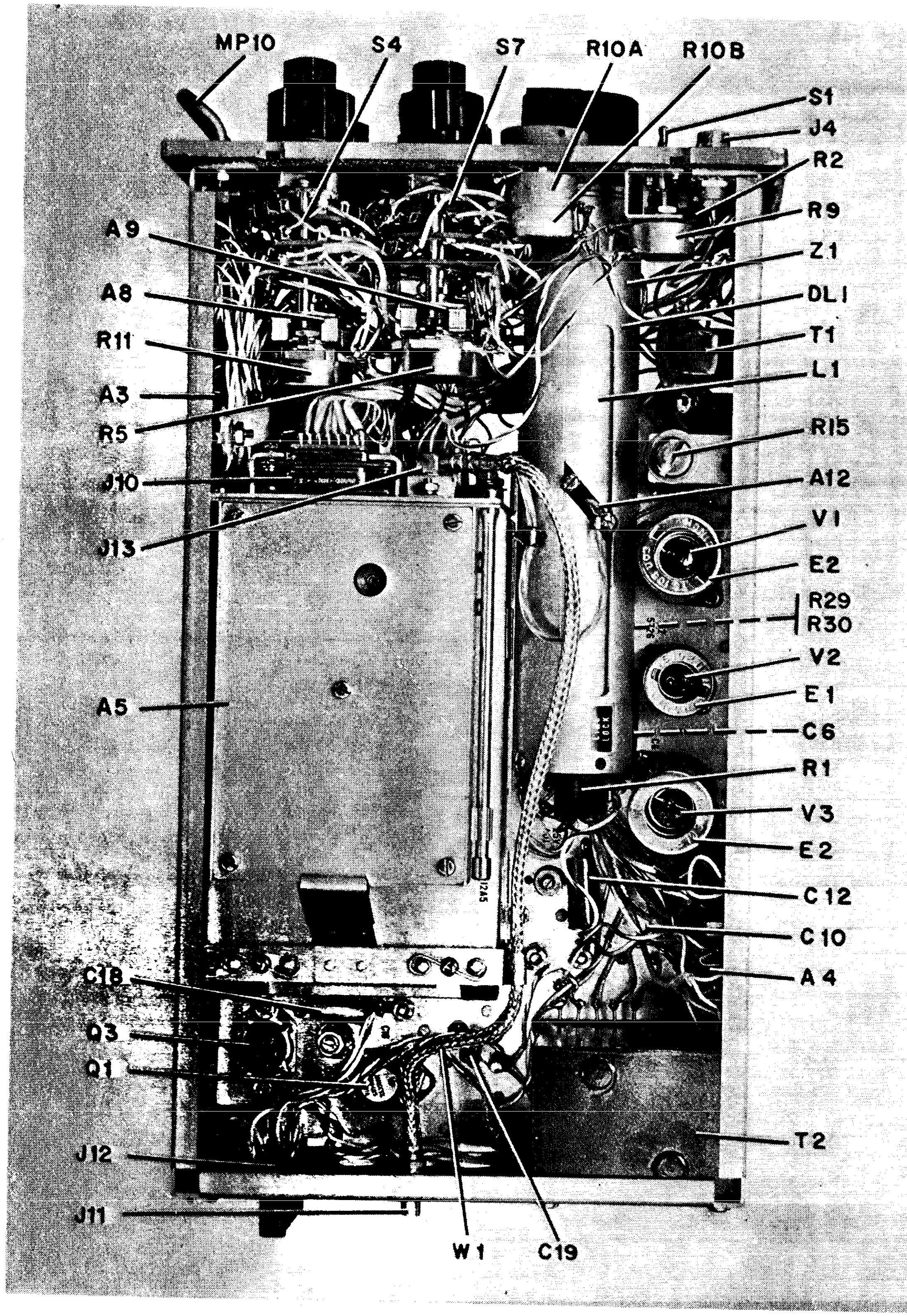
REF DESIG PREFIX 8

Figure 5-40A. Coder Simulator SM-197B/UPM-98, Panel Chassis, Top, Parts Location



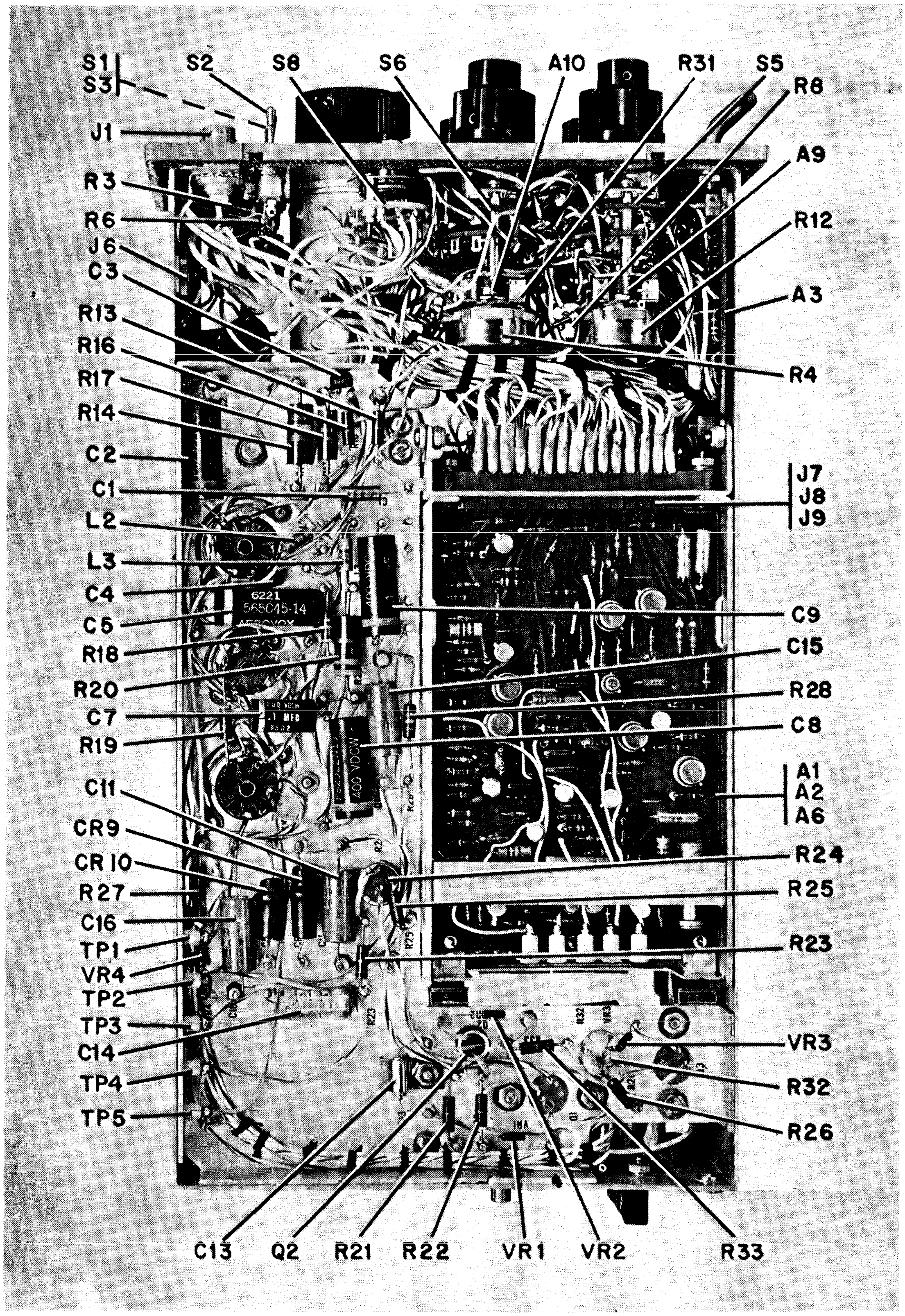
REF DESIG PREFIX 8

Figure 5-41 Coder Simulator SM-197A, Panel Chassis, Bottom, Parts Location



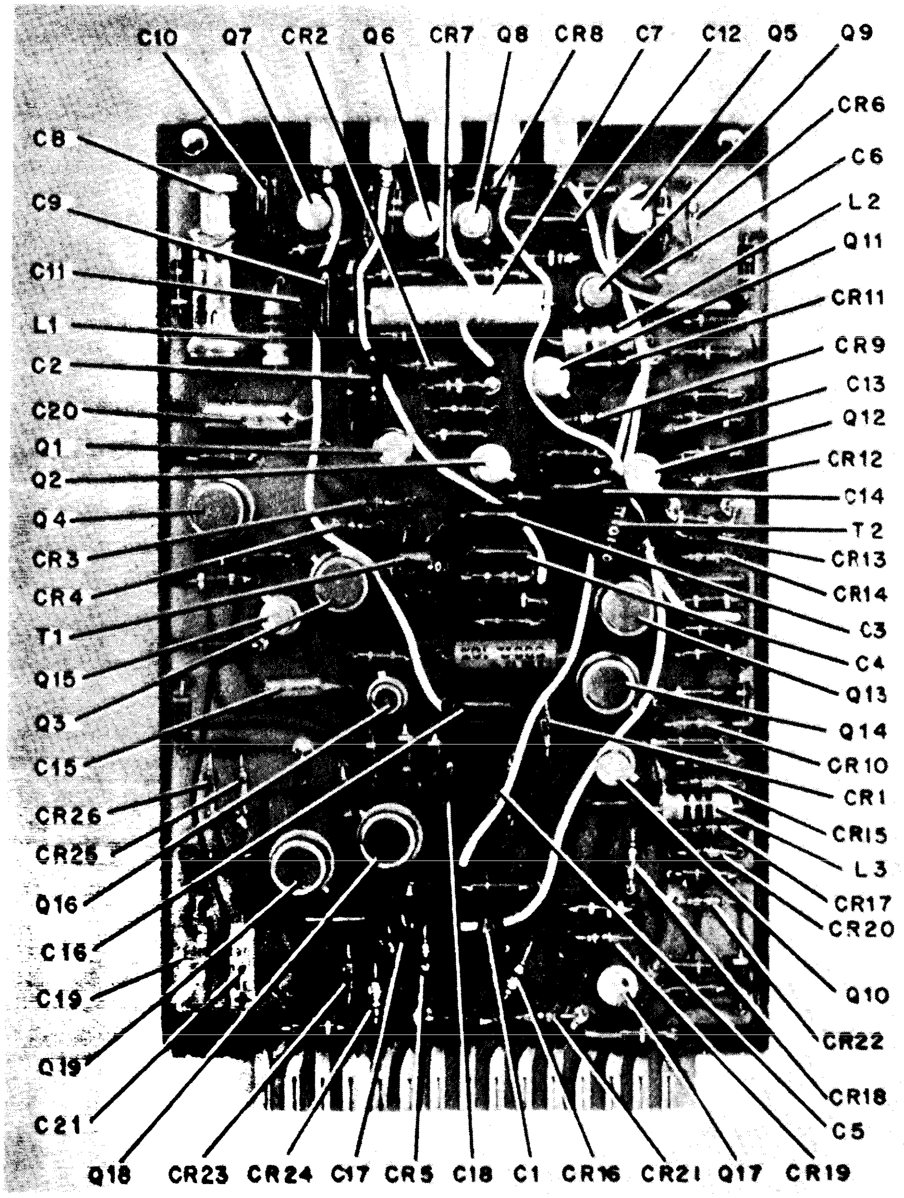
REF DESIG PREFEX 12

Figure 5-42. Interrogation Coder, Right Side, Parts Location



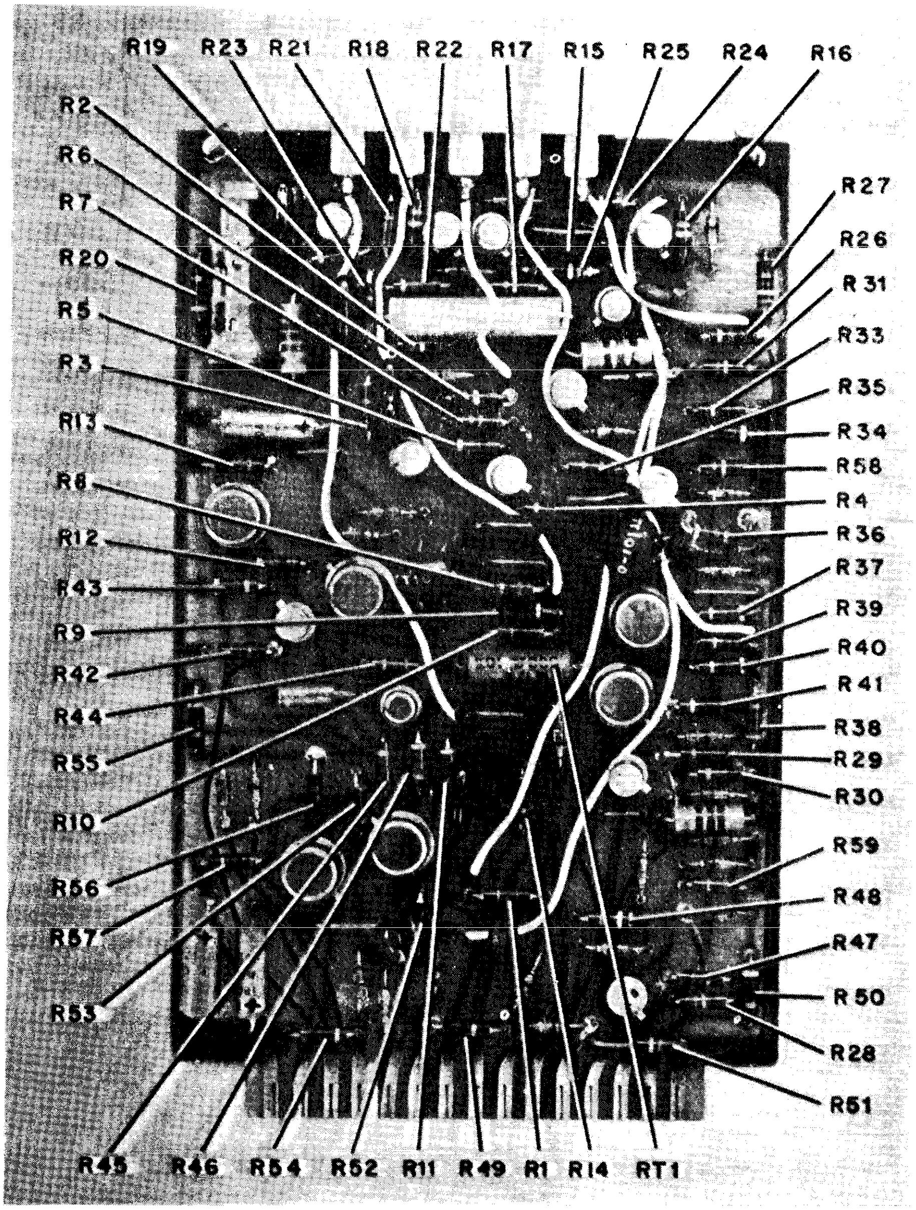
REF DESIG PREFIX 12

Figure 5-43. Interrogation Coder, Left Side, Parts Location



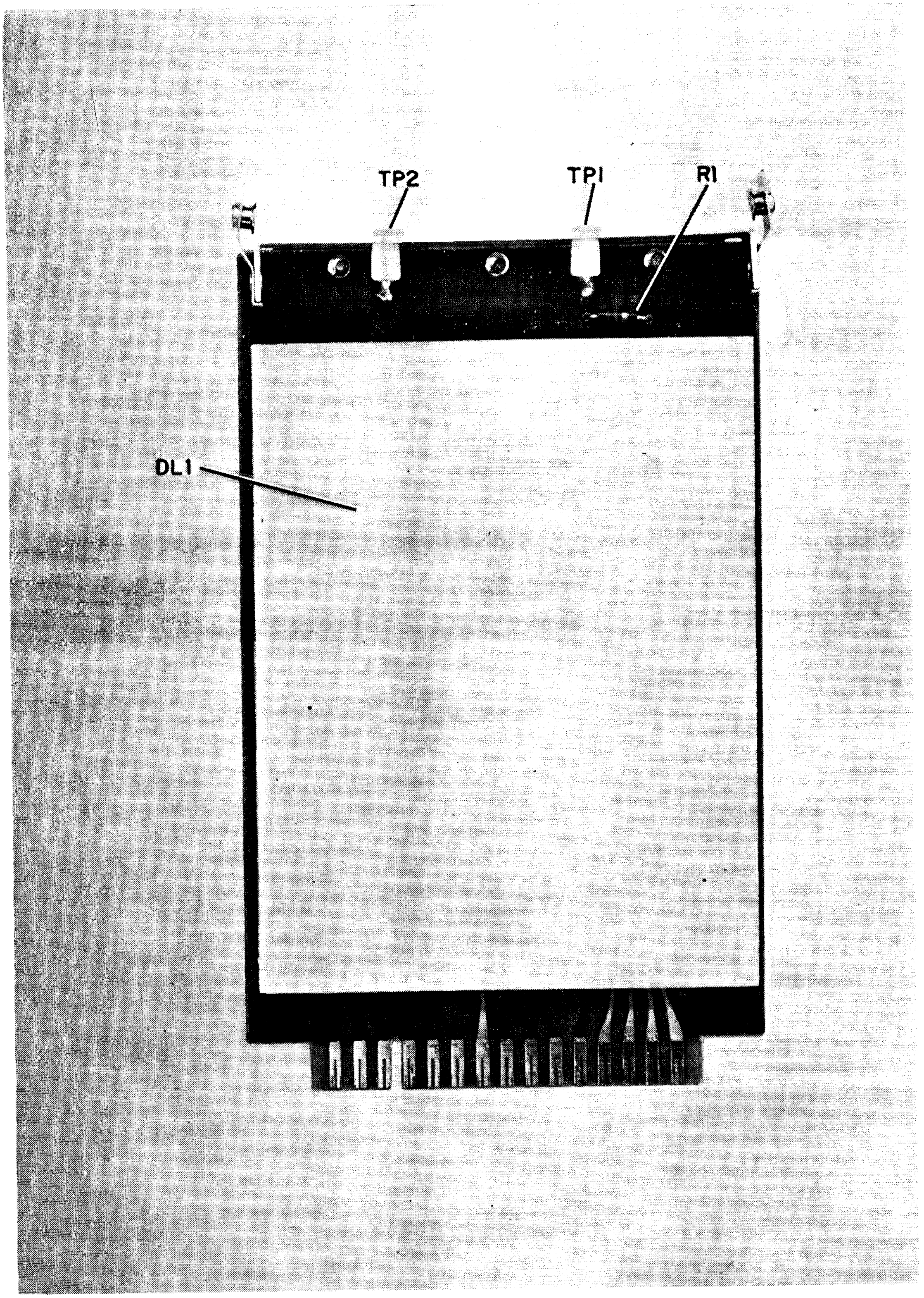
REF DESIG PREFIX 12A1

Figure 5-44. Clock and Line Drive Assembly 12A1, Parts Location (Sheet 1 of 2)



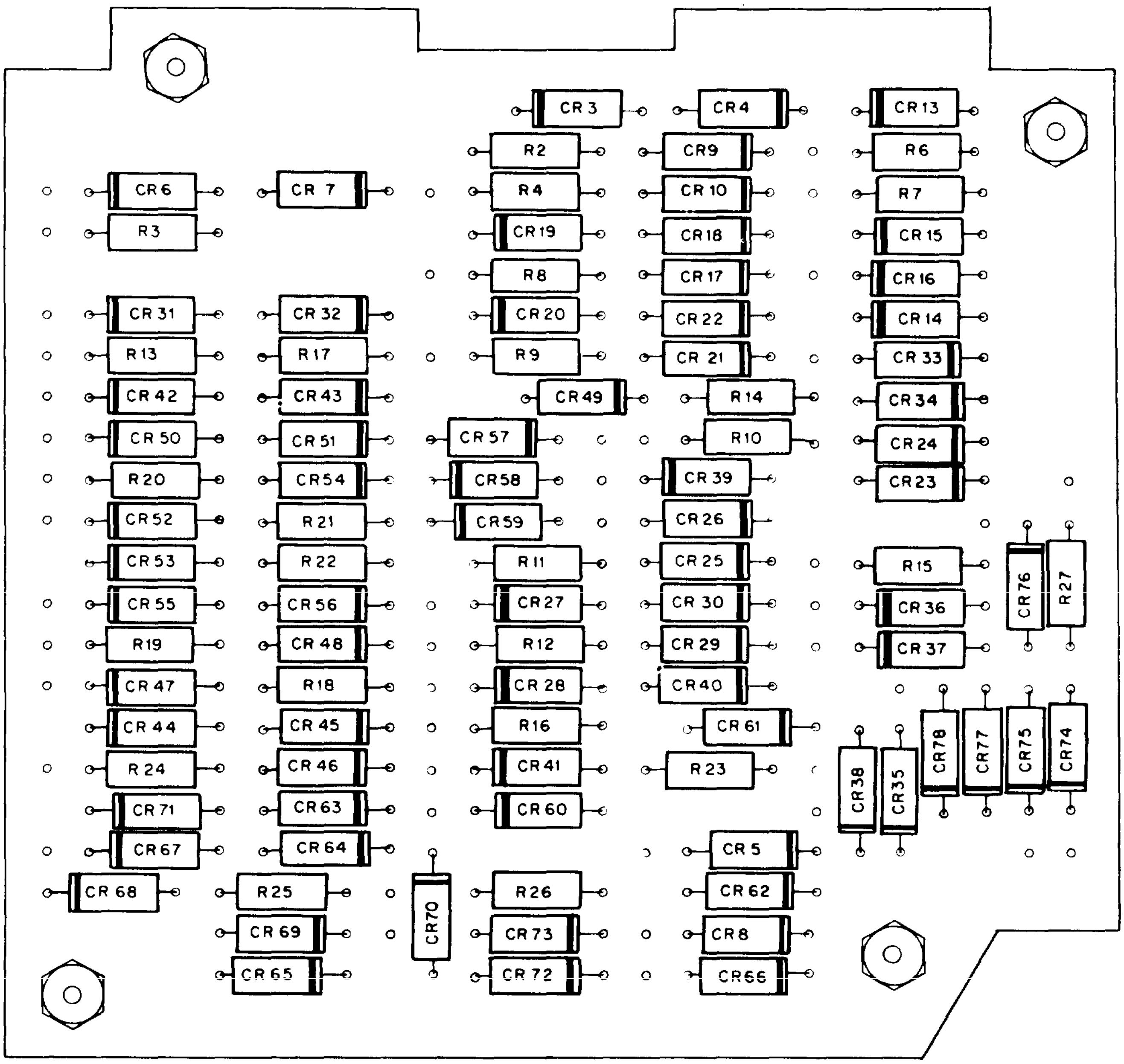
REF DESIG PREFIX 12A1

Figure 5-44. Clock and Line Drive Assembly 12A1, Parts Location (Sheet 2 of 2)



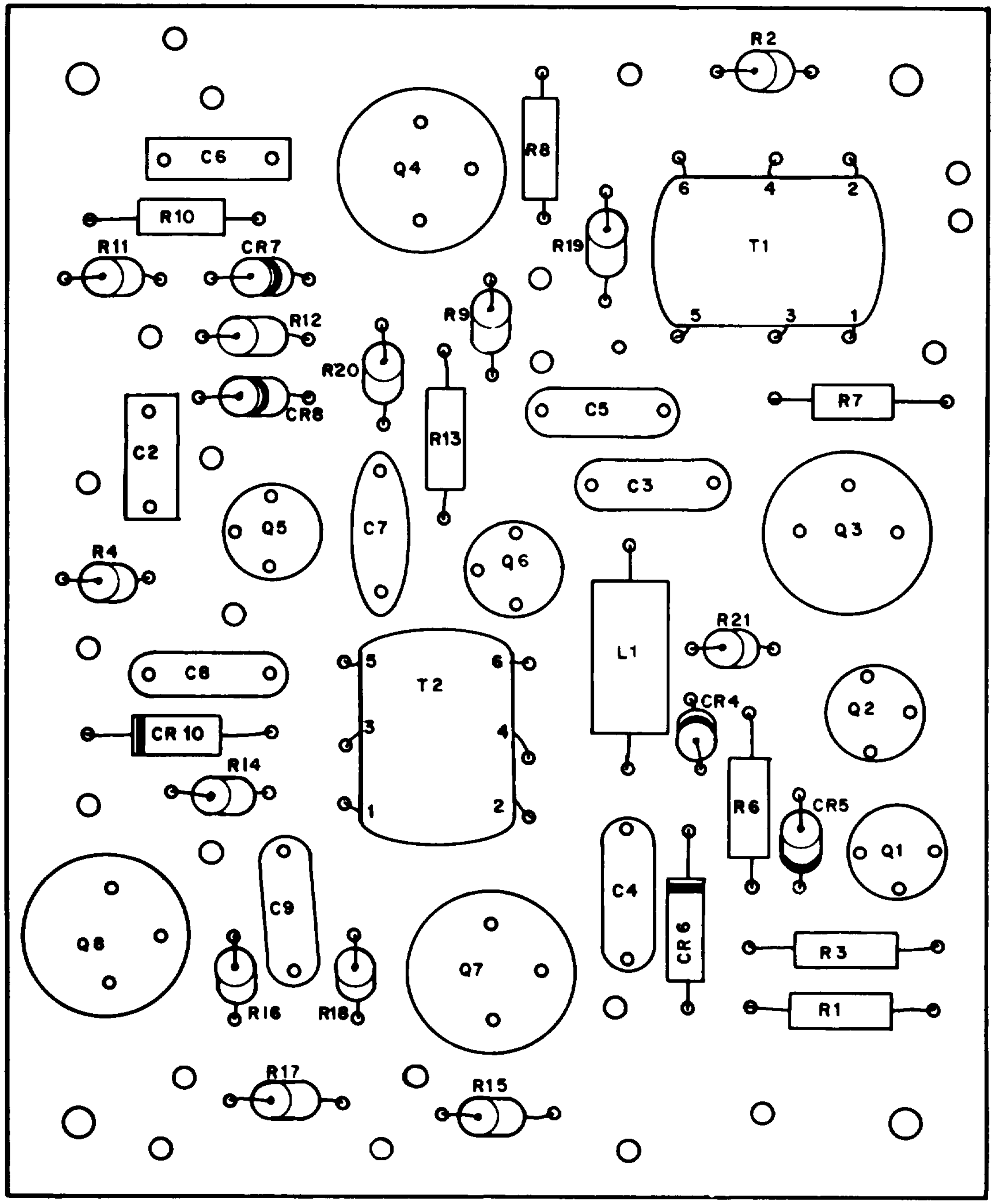
REF DESIG PREFIX 12A2

Figure 5-45. Delay Line Assembly 12A2, Parts Location



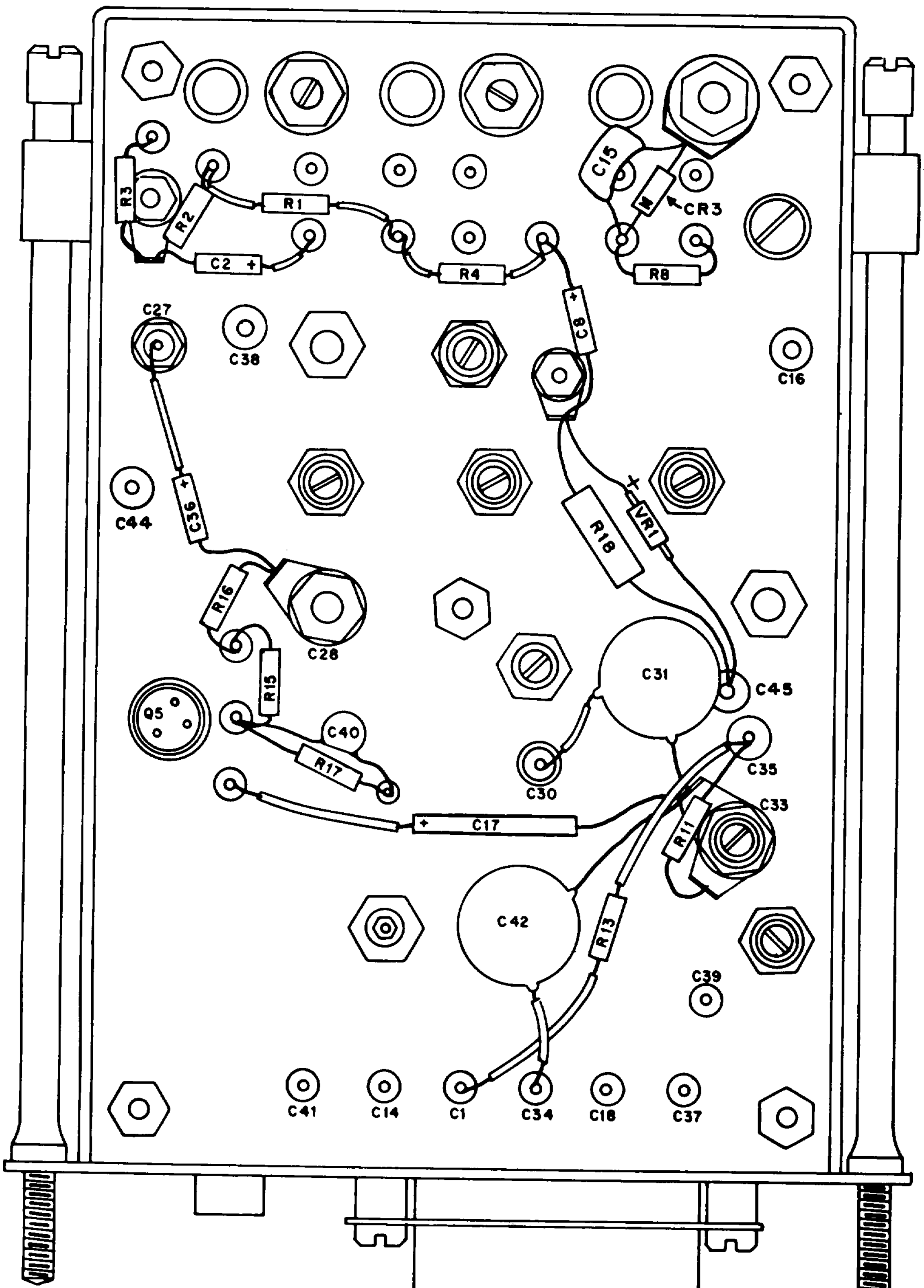
REF DESIG PREFIX 12A3

Figure 5-46. Matrix Assembly 12A3, Parts Location



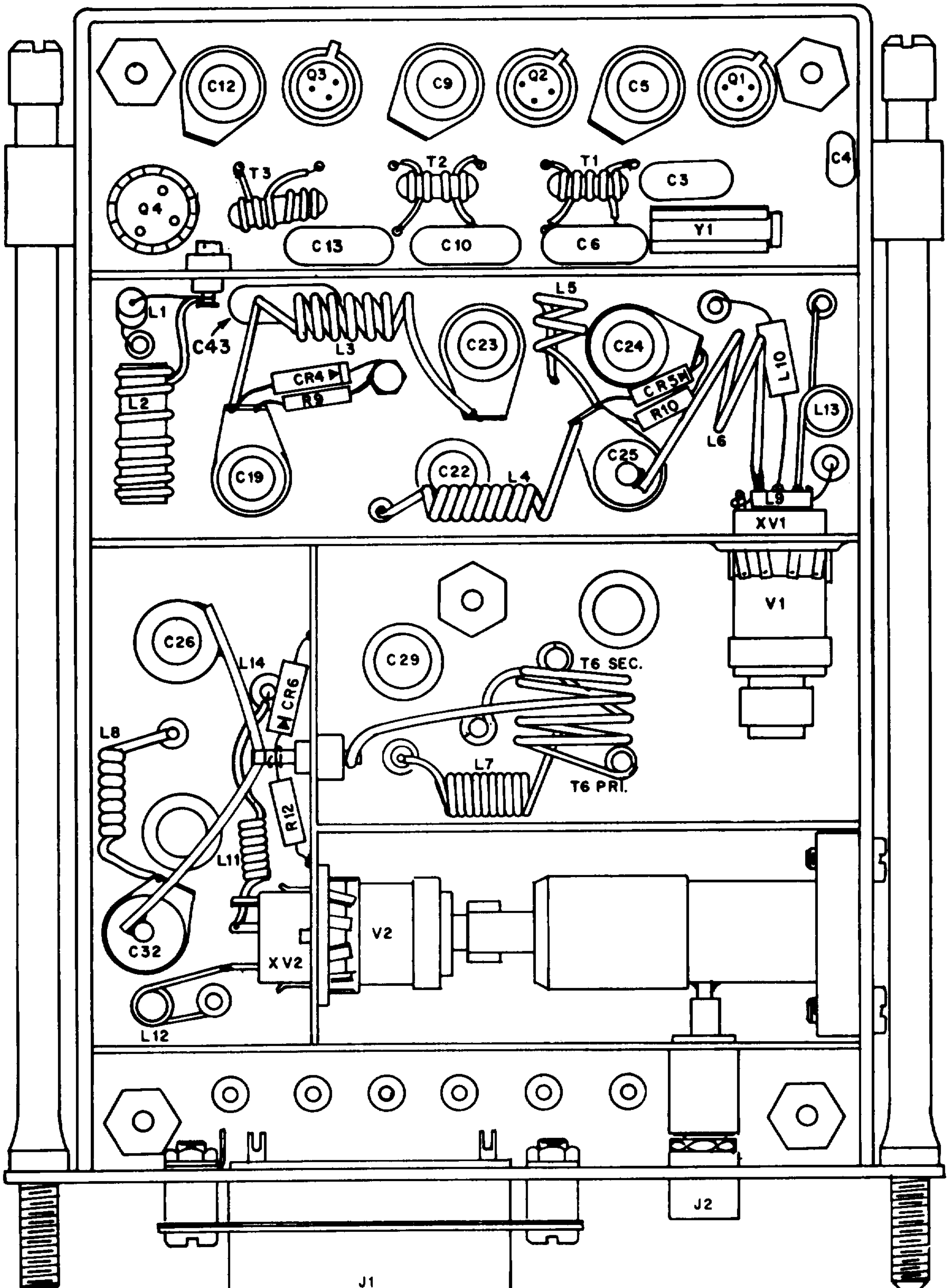
REF DESIG PREFIX 12A4

5-47. Blocking Oscillator Assembly 12A4, Parts Location



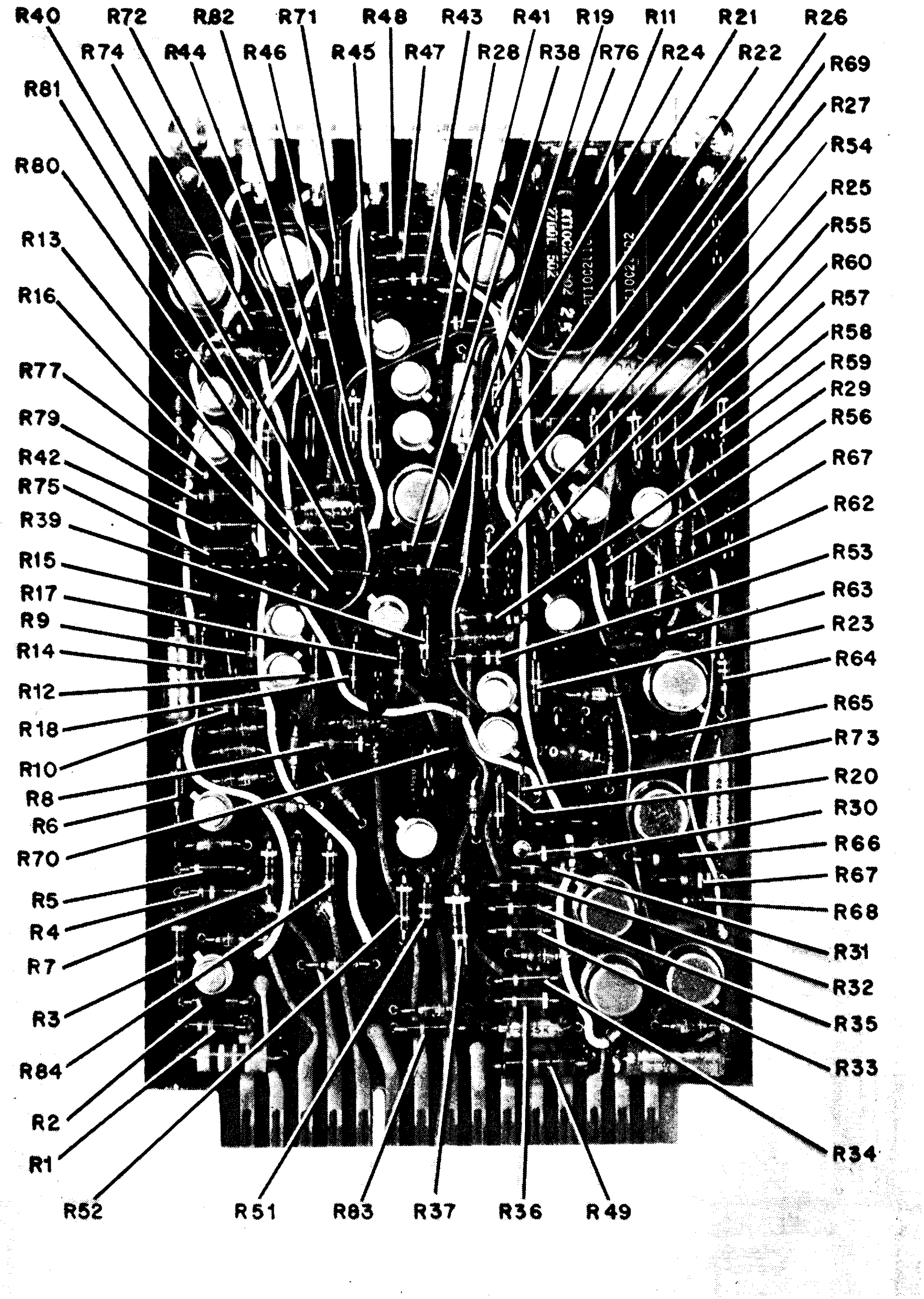
REF DESIG PREFIX 12A5

Figure 5-48. RF Subassembly 12A5, Right Side, Parts Location



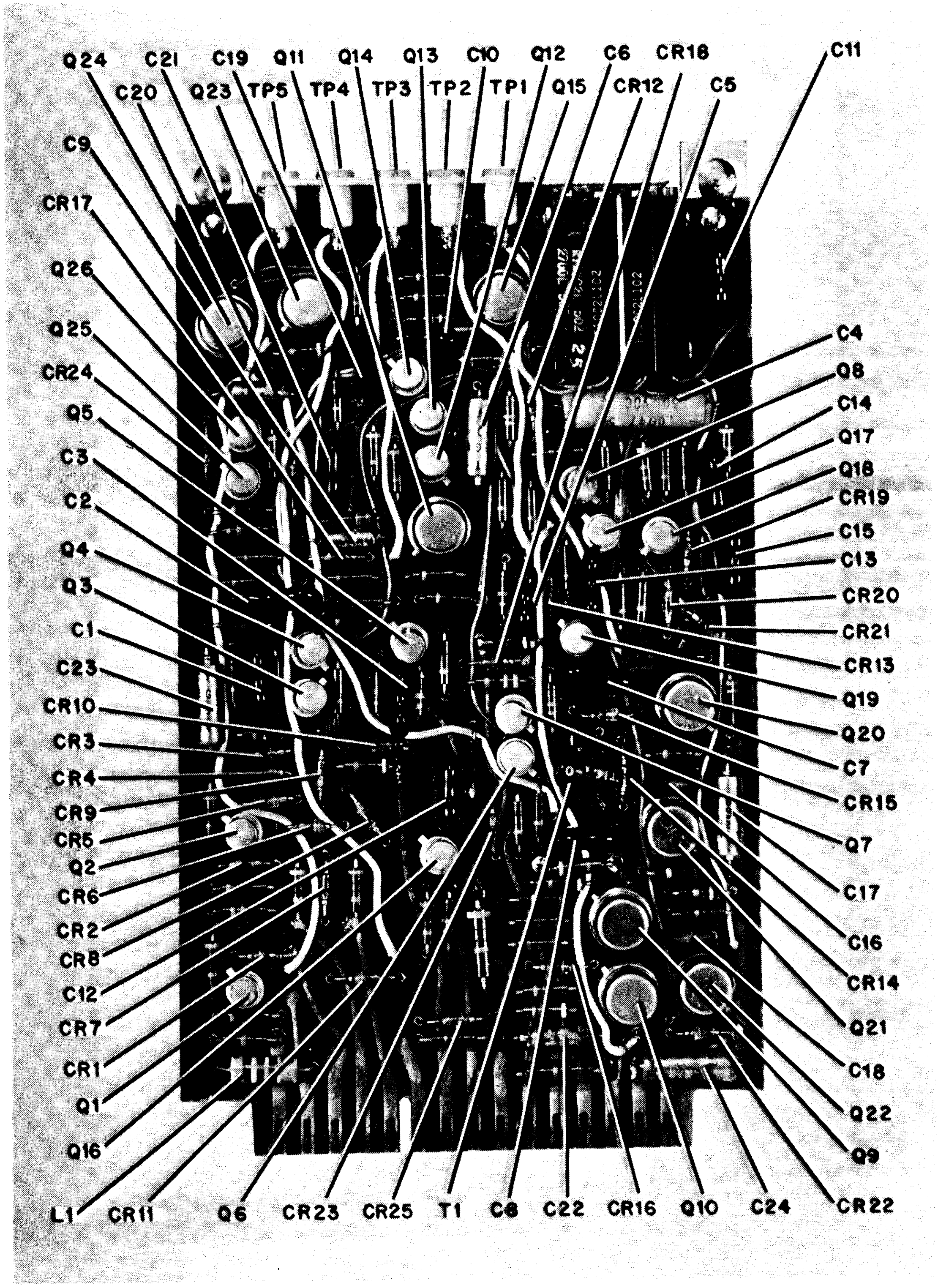
REF DESIG PREFIX 12A5

Figure 5-49. RF Subassembly 12A5, Left Side, Parts Location



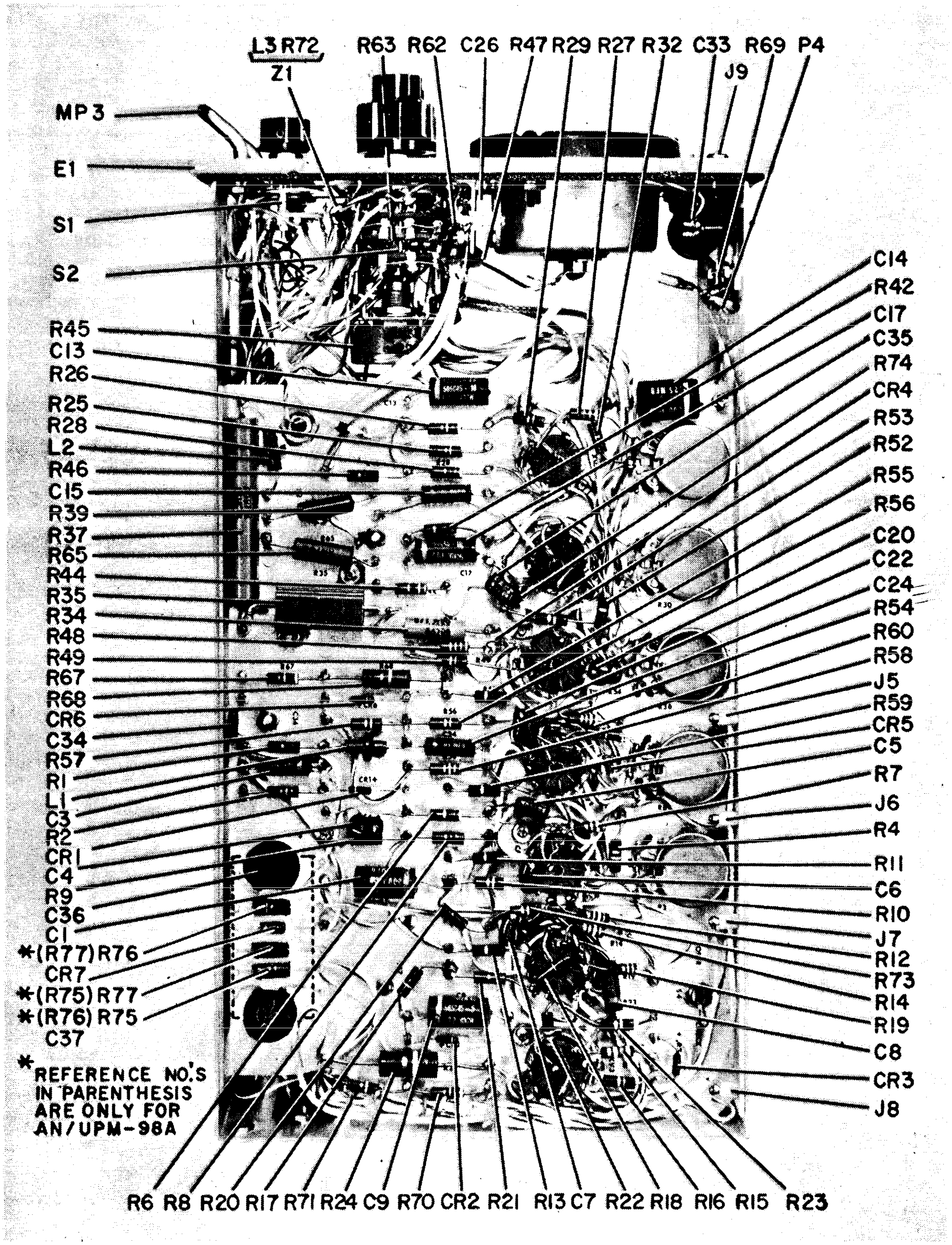
REF DESIG PREFIX 12A6

Figure 5-50. Delay and Tag Generator Assembly 12A6, Parts Location (Sheet 1 of 2)



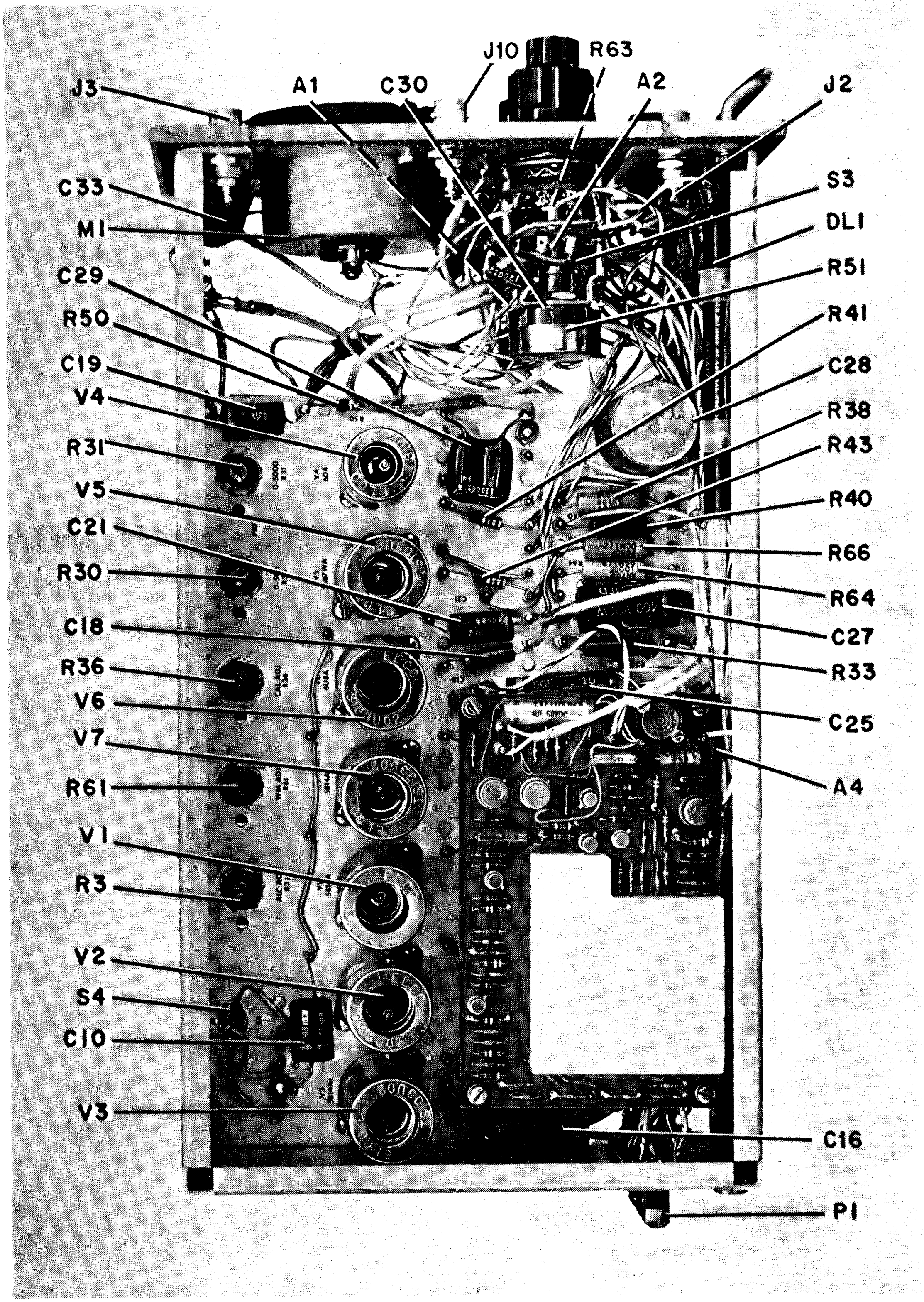
REF DESIG PREFIX 12A6

Figure 5-50. Delay and Tag Generator Assembly 12A6, Parts Location (Sheet 2 of 2)



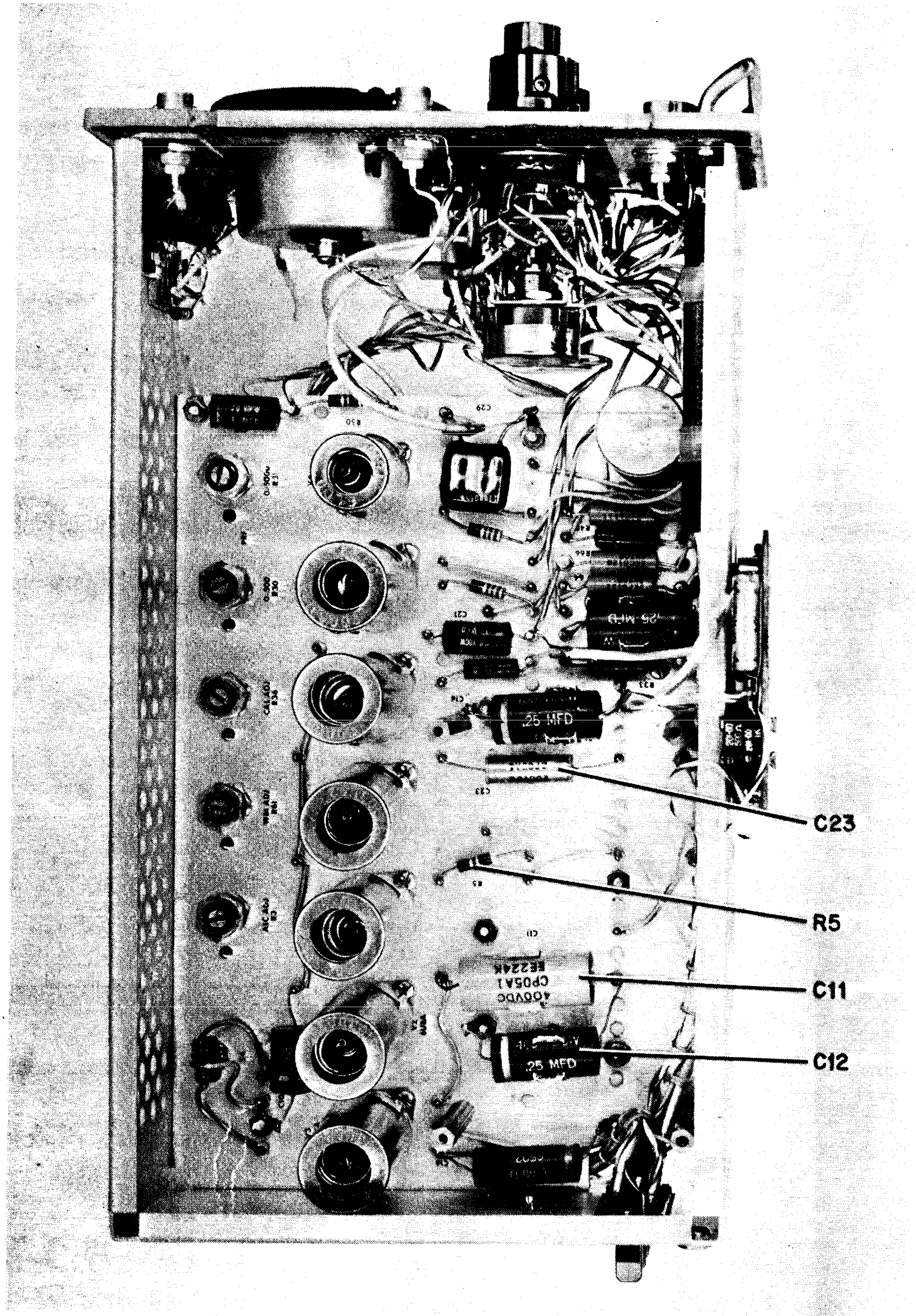
REF DESIG PREFIX 9

Figure 5-51. Calibration-Control Unit, Right Side, Parts Location



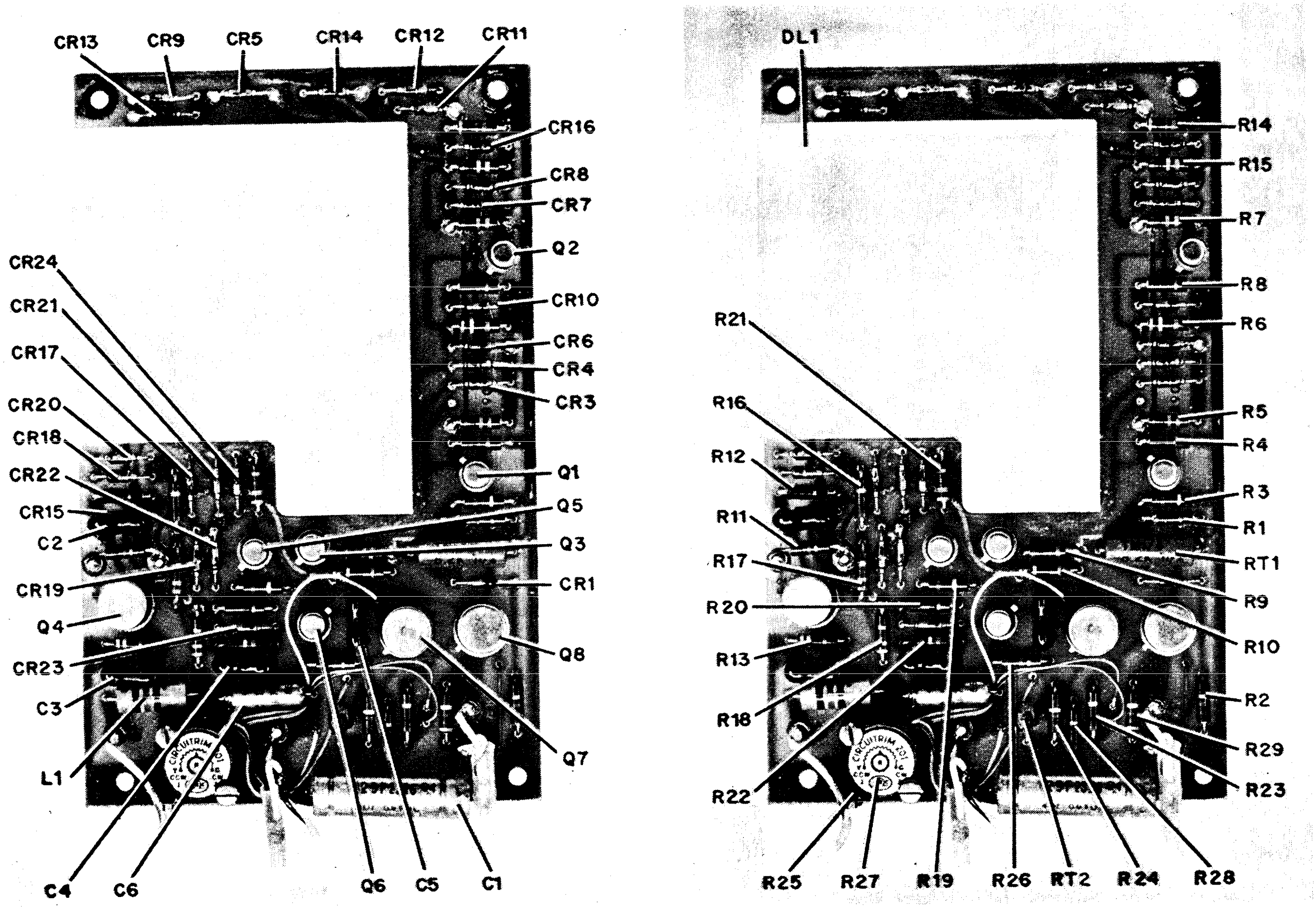
REF DESIG PREFIX 9

Figure 5-52. Calibration-Control Unit, Left Side, Parts Location



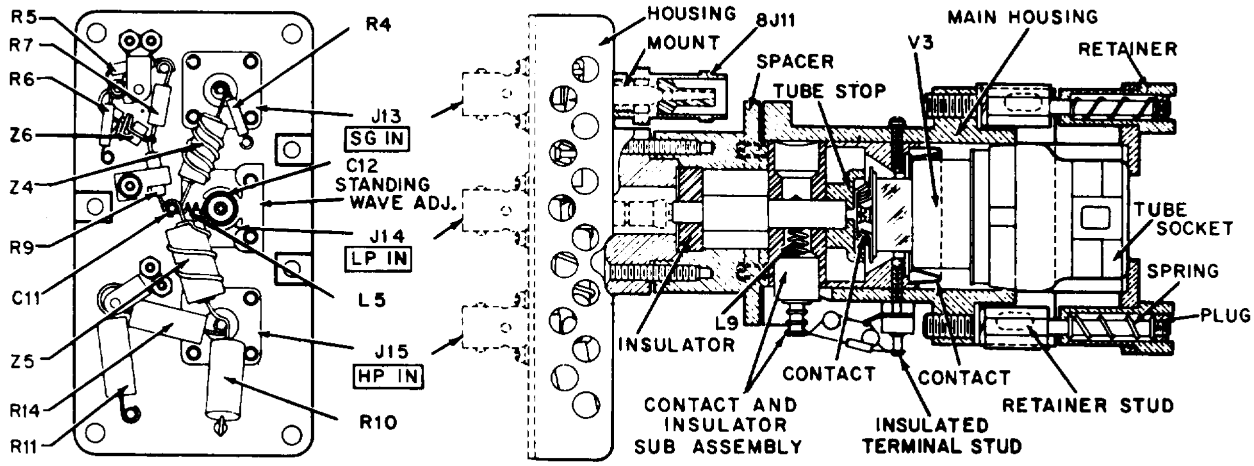
REF DESIG PREFIX 9

Figure 5-53. Calibration- Control Unit, Subassembly 9A4 Removed, Parts Location



REF DESIG PREFIX 9A4

Figure 5-54. Reply Decoder Subassembly 9A4, Parts Location



REF DESIG PREFIX 8

Figure 5-55. Sectional View of Demodulator Subassembly

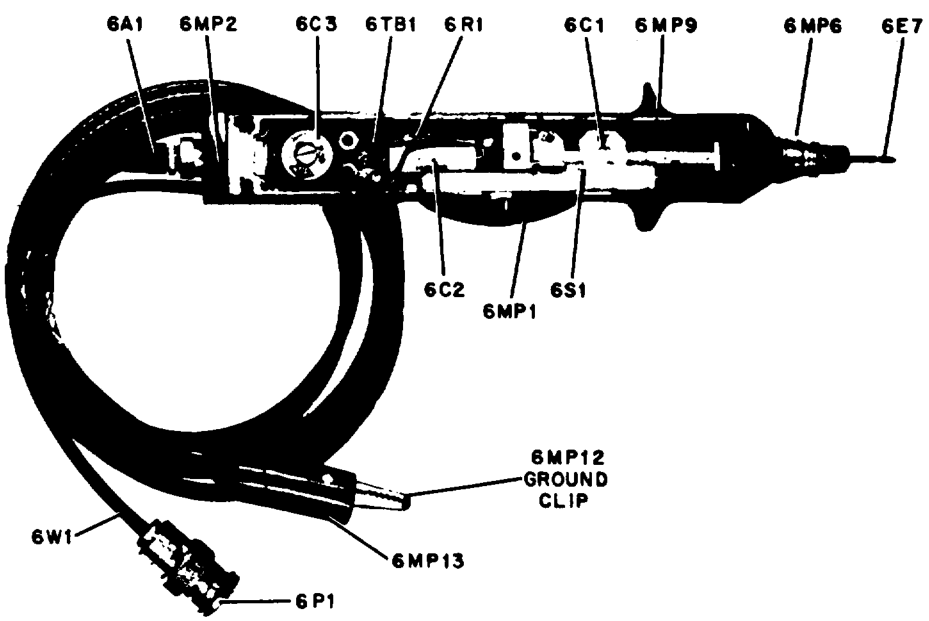
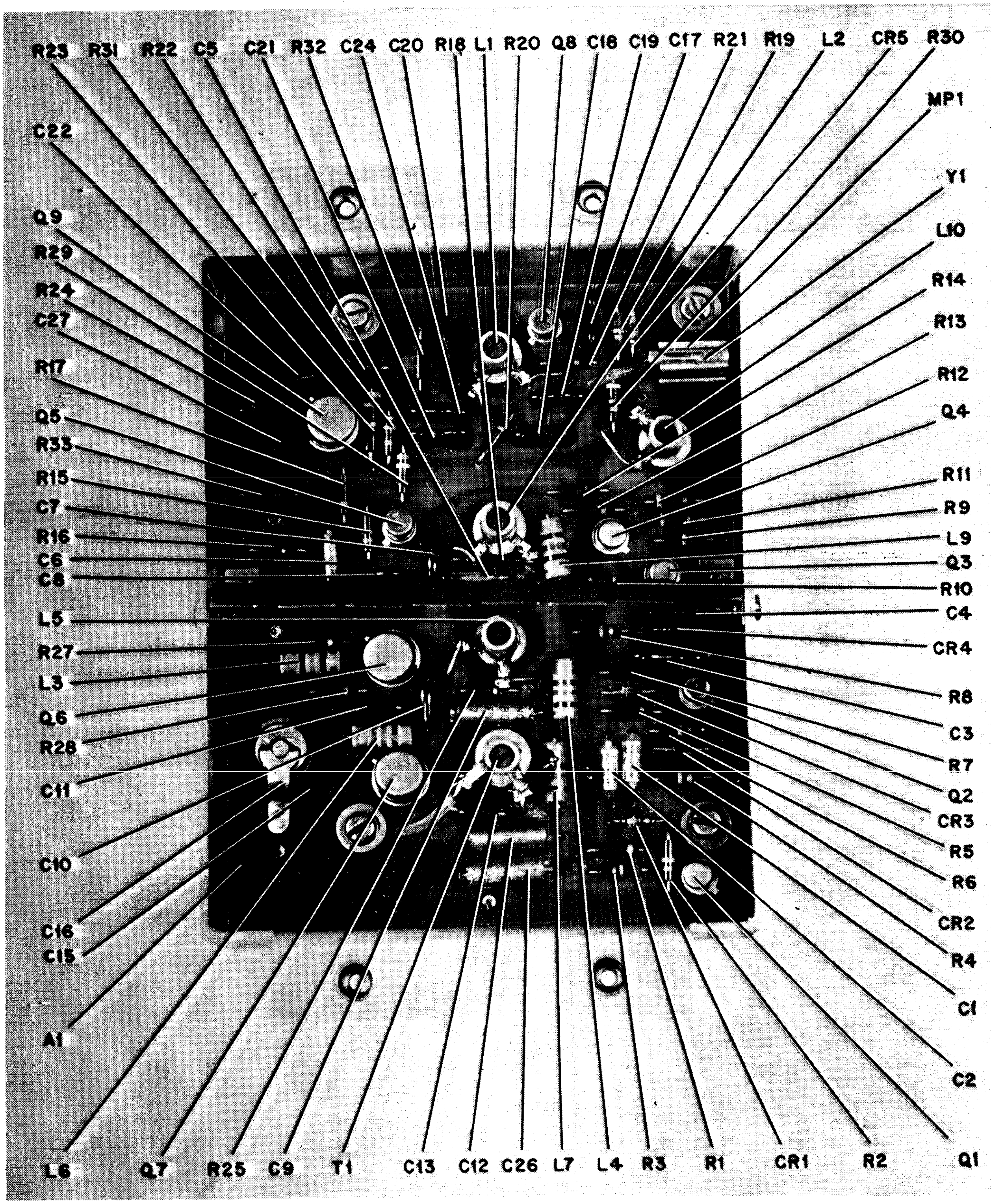
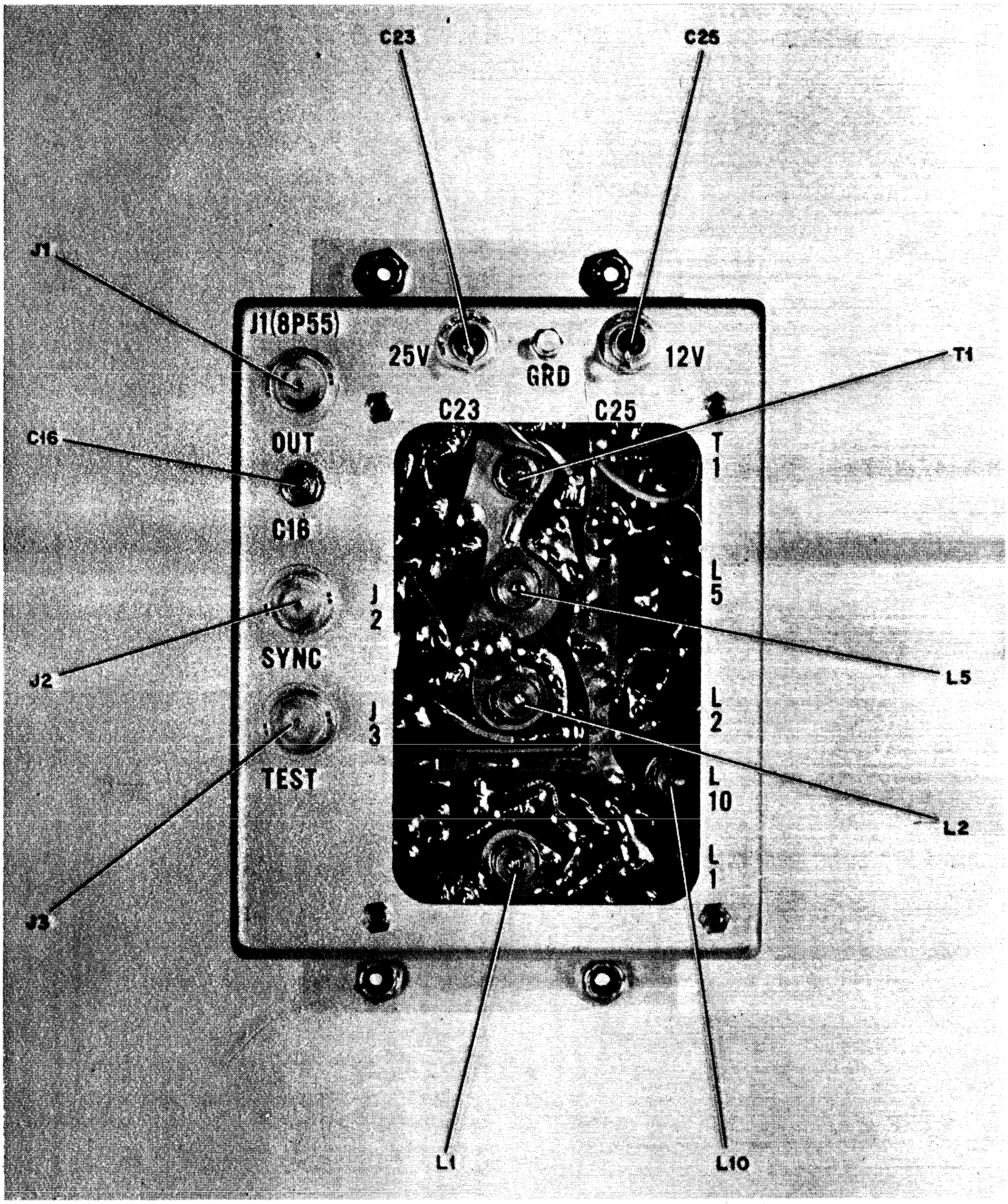


Figure 5-56. Test Lead MX-2681/UP, Internal Parts Location



REF DESIG PREFIX 8A10

Figure 5-56A. 20 MHz Gated Oscillator, Parts Location (Sheet 1 of 2)



REF DESIG PREFIX 8A1O

Figure 5-56A. 20 MHz Gated Oscillator, Parts Location (Sheet 2 of 2)

(Pages 5-91 and 5-92 are foldouts located at the back of this manual.)

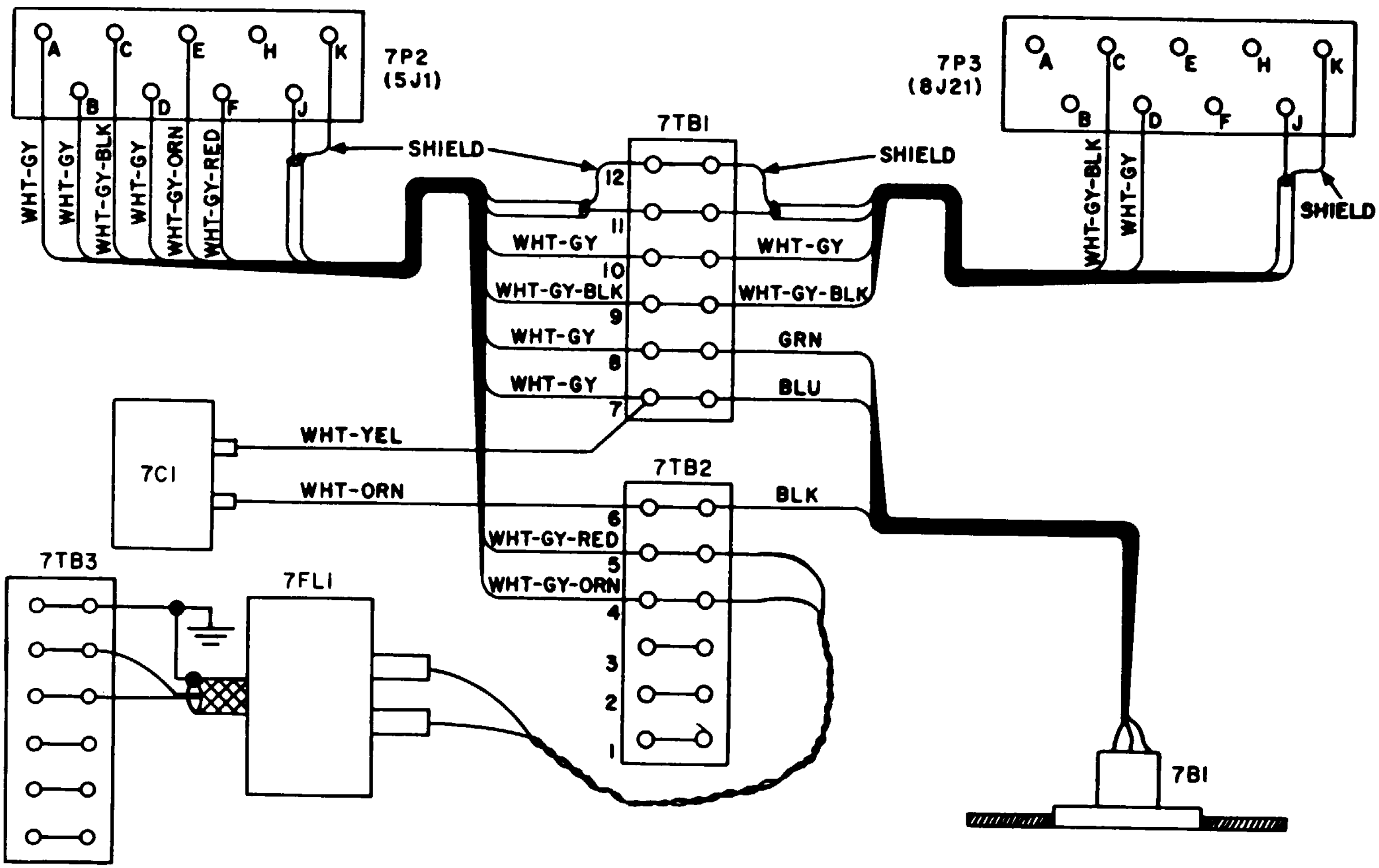


Figure 5-57A. Electrical Equipment Case CY-2726/UPM-98, Schematic Diagram

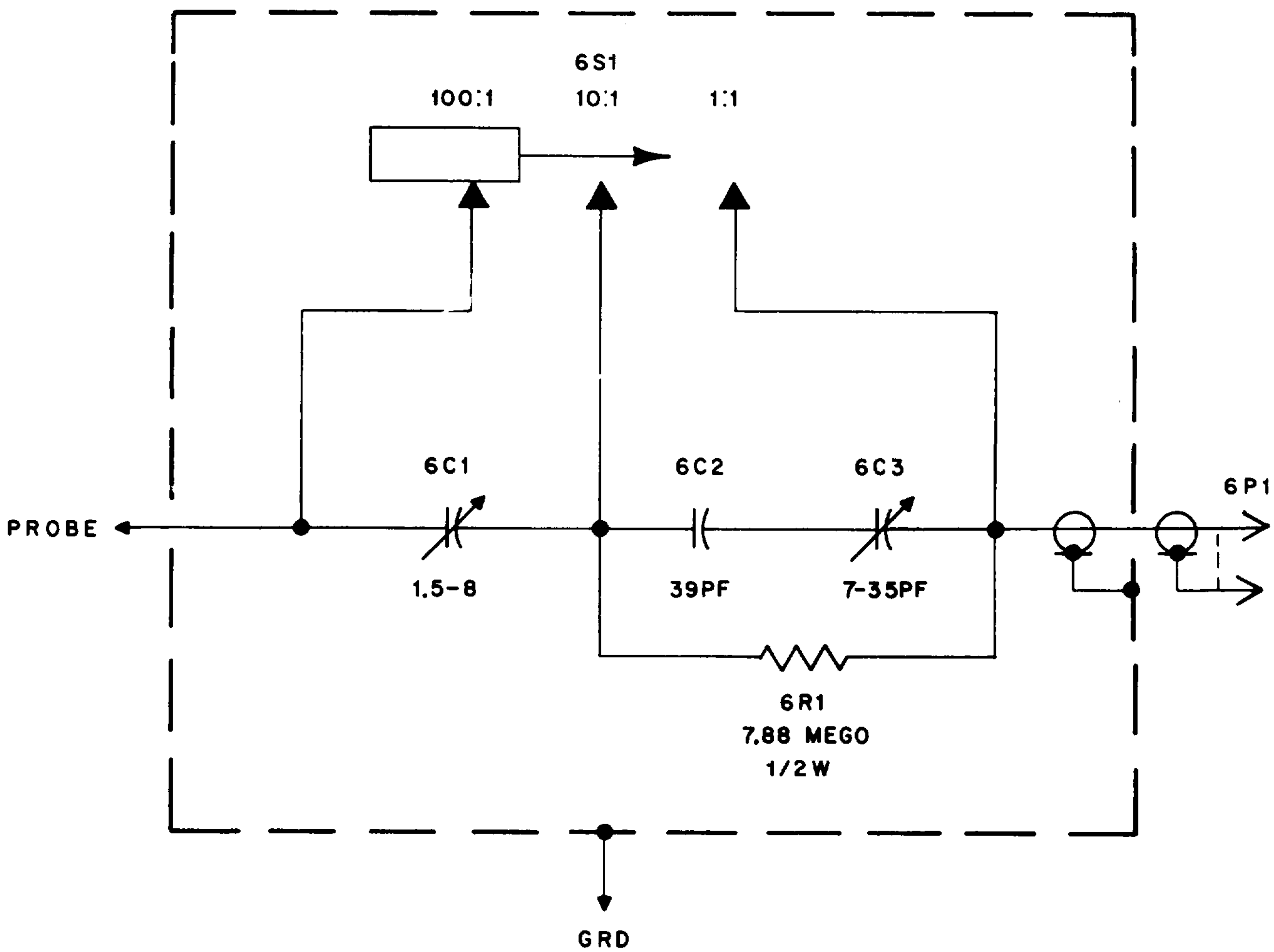


Figure 5-58. Test Lead MX-2631/UP,
Schematic Diagram

(Pages 5-95 through 5-518 are foldouts located at the back of this manual.)

SECTION 6

DEPOT OVERHAUL STANDARDS

6-1. Applicability of Depot Overhaul Standards

The tests outlined in this chapter are designed to measure the performance capability of a repaired equipment. Equipment that is to be returned to stock should meet the standards given in these tests.

6-2. Applicable References

a. Repair Standards. Applicable procedures of the depots performing these tests, and the general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355–3 form a part of the requirements for testing this equipment.

b. Modification Work Orders. Perform all modification work orders applicable to this equipment *before* making the tests specified. Test Set, Radar AN/UPM-98 has been modified by MWO 11–6625–403–45/1 to convert it so that it has the same capabilities as Test Set, Radar AN/UPM-98A. The modified AN/UPM–98 nomenclature is changed to AN/UPM-98B, The depot overhaul tests in this section are applicable to the AN/UPM-98A, AN/UPM-98B, and AN/UPM-98C. Check DA Pam 310-7 to determine if any additional MWO's have been released covering the equipment.

6-3. Test Facilities Required

The test equipment and material listed below are required for depot testing of Test Sets, Radar AN/UPM-98A , AN/UPM-98B, and AN/UPM-98C.

Item	Technical manual	Common name
Multimeter TS-352B/U	TM 1l-6625-366-15	VoIt-ohm-multimeter
Oscilloscope AN/USM-281A	TM 11-6625-1703-15	Oscilloscope
Counter, Electronic, Digital Readout AN/USM-207.	TM 11-6625-700-10	Frequency counter
Frequency Comparator CM-77A/USM	TM 11–6625–493–15	Transfer oscillator
Signal Generator AN/UPM-15		Pulse generator
Signal Generator AN/URM-127	TM 11-6625-683-15	Signal generator
Test Set, Radar AN/UPM-98 ( ) (calibrated for use as a standard).	TM 11-6625-403-15-1	RF pulse power calibrator
Radar Simulator AN/APN-245		3-pulse generator
Radar Recognition Set AN/APX-6		Transponder
Wattmeter AN/URM-98	TM 11-6625-433-15	RF wattmeter
Dummy load (1;100 µµf and 25 ohms in parallel).		Dummy load
Directional Coupler—Hewlett-Packard Model 766.		Directional coupler

6-4 General Test Requirements

a. Most of the tests will be performed under the conditions given below. Testing will be simplified if all controls are set initially as shown below and modifications are made for the individual tests.

b. Set controls on AN/UPM-98A, or AN/UPM–98B, or AN/UPM-98C units as indicated below.

Radar Test Set TS–1253A/UP

Control	*Position*
Main chassis:	
POWER switch	As directed
Display unit:	
INTEN control	Adjusted for even display with maximum possible sharpness of trace centered on crt face.
FOCUS control	
ASTIG control	
HOR control	
VERT control	
75 Ω switch	OUT
VOLTS/IN switch	Z
VIDEO SENS control	CAL
'SUAI-E control	Fully ccw
Sweep and inten mark unit:	
SWEEP SPEED RANGE	20-200
SWEEP SPEED ADJUST	Fully ccw
MARKER TRIGGER	NORMAL
(INTENSITY MARKS RANGE	OFF
INTENSITY MARKS LEVEL	Fu1ly ccw
Xtal mark and sync unit:	
SWEEP DELAY RANGE	0
SWEEP DELAY, COARSE	Fully ccw
SWEEP DELAY, FINE	Fully ccw
TRIGGER DELAY RANGE	0
TRIGGER DELAY, COARSE	Fu1ly ccw
TRIGGER DELAY, FINE	Fully ccw
SYNC SELECT switch	INT
XTAL MARK LEVEL	Fully ccw
PRF control	Approx midposition
SUP control	Fu1ly cw
SIF coder unit:	
CODE	0000
FUNCTION selector	N
SUB PULSE SELECT switch	OFF
LEVEL switch	LO
SUB PULSE POS control	0
PULSE WIDTH	45
AMPLITUDE control	Midran&

Coder Simulator SM-197A/UPM-98

-Main chassis:	
ATTENUATION control	Fullyccw
WAVEMETER INPUT switch	OFF
Cal-control unit:	
METER SELECT switch	WM
WM SENS control	Fully cw
VIDEO OUT switch	SG MON
CAL ADJ (FULL SCALE)	Fully ccw
TRIGGER SWITCH	INT
Interrogation coder unit:	
TRIG input 75 Ω switch	0FF
MOD input 75 Ω switch	0FF
SUB PULSE position control	0
Mode selector	3/A
Function selecter	M0D-INT
CODE WIDTH control	Midrange
CODE LEVEL control	Fully ccw
ISLS selector	OUT
Substitute Pulse selector	OUT
VIDEO	CODE
VIDEO LEVEL	2/3 cw

c. Always allow at least 5 minutes for all equipments to stabilize after applying power.

6-5. Power Supplies Tests

a. Turn POWER switch on TS–1253A/UP and SM–197A/UPM to ON. The blower shall start operating.

b. Remove all fuses and check fuse values.

c. Replace empty fuse holders. The fuse failure indicator lamps should light.

d. Replace all fuses in their respective holders.

e. Check the value of the spare fuse.

f. At the SIF coder module, measure the following voltages:

Test point	*Limits*
J5	+250 vdc ±10
J6	–35 vdc ±3
J7	+l50 vdc ±2 (adjust R25, if necessary)
J8	4 vdc ±0.5

g. Using an oscilloscope, measure the ripple voltage at the –150 vdc and +250 vdc test points. The peak-to-peak ripple voltage shall not exceed *0.2* volt.

h. On Coder-Simulator SM-197A/UPA, SM-197B/UPA, and SM-l97C/UPA, measure the following voltages:

Test point	*Voltage and limits*
On cal-control module:	
TP3	–30 vdc ±K3
TP4	–5 vdc ±0.5
TP2	+,105 vdc ± 15
TP1	+300 vdc ± 10 (adjust R35, if necessary)
On interrogation coder module:	
TP3	+12 vdc ±0.5
TP2	–l2 vdc ±0.5
TP4	+25 vdc ±2.0

i. Using oscilloscope, measure the ripple voltage at the + 300 vdc and + 105 vdc test points. The peak-to-peak ripple voltage shall not exceed 0.2 volt.

6. Cathode Ray Tube Control Test

a. On the xtal mark and sync module set the PRF control fully clockwise.

b. Set HOR and VERT controls to center the trace line.

c. Set the INTEN control for normal viewing brightness of crt trace and adjust FOCUS and ASTIG controls for sharp horizontal trace. The trace shall be parallel to the horizontal grid line.

d. Set the VERT control fully clockwise. The trace shall move at least 1 inch above the centerline.

e. Set the VERT control fully counterclockwise. The trace shall move at least 1 inch below the centerline. Reset the horizontal trace to center position.

f. Set the HOR control fully clockwise. The trace shall start not more than 1 inch to the left of the vertical centerline.

g. Set the HOR control fully counterclockwise. The trace shall end not more than 1 inch to the right of the vertical centerline. Recenter the control.

h. Set the INTEN control maximum counterclockwise; there shall be no trace on the crt.

i. Set the INTEN control maximum clockwise. A high intensity trace shall be observed on the crt. Reset the INT control for normal trace brightness.

j. Set the SWEEP SPEED RANGE control at 20,000 and be sure the trace brightness is uniform throughout.

6-7. Trigger Output Test

a. Connect input of electronic counter to “0” TRIGGERS on xtal mark and sync module. Set SYNC SELECT control to INT, and PRF fully counterclockwise. Measure and record prf. It shall be 15 or less.

b. Turn PRF control fully clockwise. Measure and record prf. It shall be 4,100 or more.

c. Connect test equipment as shown in figure 6–1. Set SYNC SELECT Control to EXT +. Set pulse generator output for a pulse width of 1 µsec and prf of approximately 1,000.

d. Starting with pulse generator output amplitude at zero, slowly increase the amplitude until trigger pulse appears on oscilloscope. At that point, the pulse generator output amplitude shall be not more than 5 volts.

e. Set pulse generator output amplitude to 20 volts. Measure the following “0” TRIGGER pulse characteristics as displayed on oscilloscope. They shall be within the following limits:

Characteristic	*Limit*
Amplitude	.20 volt minimum
Duration	0.5 to 3.0 µsec
Risetime	0.2 µsec maximum
Decay time	l.0 µsec maximum
Polarity	Positive

f. Set SYNC SELECT switch successively to INT, INT 1.45, and INT l.00 and be sure “0” TRIGGER pulse is within limits listed in *e* above. (Set oscilloscope for internal sync.)

6-8. Suppressor Pulse Output lost

a. Connect test equipment as showm in figure 6-1, except move oscilloscope channel A input to SUP TRIGGERS jack on xtal mark and sync module. Set pulse repetition frequency of pulse generator, to approximately 500. Set SYNC SELECT switch to EXT.

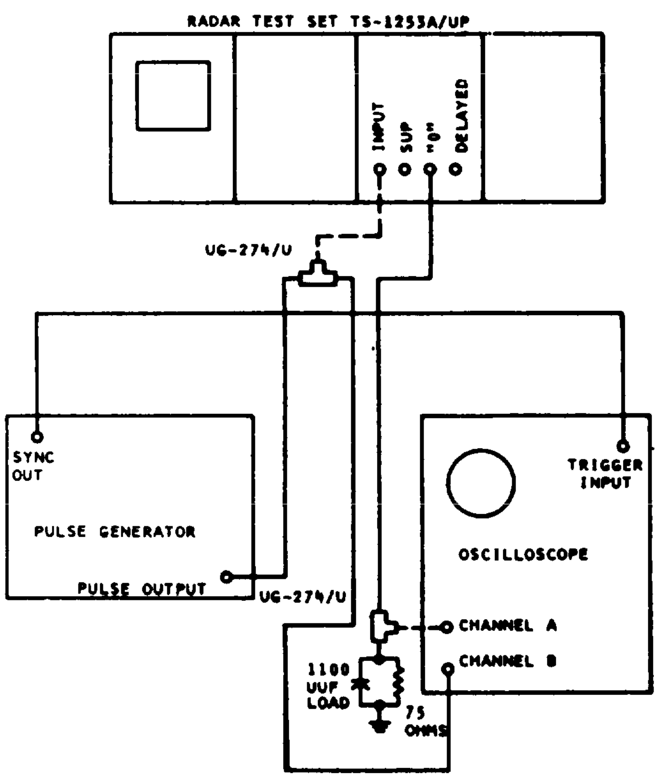
b. Set SUP control fully counterclockwise. Measure and record suppressor pulse width. It shall be 2 µsec maximum.

c. Set SUP control fully clockwise. Measure and record suppressor pulse width. It shall be 220 µsec minimum.

d. Set SUP control for a 2-µsec wide pulse on oscilloscope channel A.

e. Measure and record following parameter of the suppressor pulse:

Characteristic	*Limits*
Amplitude	8 volts minimum
Risetime	0.4 µsec maximum from 10% to 3 volt level.
Decay time	0.4 µsec maximum from 3volt level to 10% amplitude.
Polarity	Positive



NOTE: ALL INTERCONNECTING CABLES ARE TYPE CG-538/U

EL6625-403-15-1-C1-TM-1.

Figure 6-1. Trigger and suppressor pulse test setup.

&9. Trigger Delay Test

a. Connect test equipment as shown in figure 3-1. Set SYNC SELECT switch on xtal mark and sync module to EXT + and TRIGGER DELAY RANGE to 0. Set prf of pulse generator to approximately 1,000.

b. Adjust oscilloscope so that A and B pulses are above each other. Measure delay between 50% amplitude points of A and B pulses (input and “0” triggers). Delay shall be 0.25 µsec maximum.

c. Move oscilloscope channel B input from tee at TRIGGER INPUT to DELAYED TRIGGER jack on xtal mark and sync module. Measure delay between pulses (“0” trigger and delayed triggers). Delay shall be 0.25 µsec maximum with TRiGGER DELAY RANGE at 0.

d. Set TRIGGER DELAY RANGE to 1-11, TRIGGER DELAY COARSE and FINE controls fully counterclockwise. Depress the DELAY STROBE TRIGGER switch and turn TRIGGER DELAY FINE control, On display module crt, the trigger delay marker shall appear at the left end of the trace and shall move to right when the delay control is turned. Release switch.

e. Set TRIGGER DELAY FINE completely CCW. Measure delay. It shall be .1 µsec maximum.

f. Turn TRIGGER DELAY FINE control fully clockwise. Delay shall be 11 µsec minimum. (COARSE control is not operative in this range.)

g. Set TRIGGER DELAY RANGE to 5-50 and TRIGGER DELAY FINE fully counterclockwise. Delay shall be 5 µsec maximum.

h. Turn TRIGGER DELAY COARSE and FINE controls fully clockwise. Delay shall be 50 µsec minimum.

i. Set TRIGGER DELAY RANGE to 50-750 and turn TRIGGER DELAY COARSE and FINE controls fully counterclockwise. Delay shall be 50 µsec maximum.

j. Turn TRIGGER DELAY COARSE and FINE controls fully clockwise. Delay shall be 500 µsec minimum.

6-10. Crystal Marker lost

a. Remove xtal mark and sync module from chassis and connect to the drawer chassis by means of special servicing cable MX-4963/UPM. Set PRF control to approximately 1/3 from its extreme counterclockwise position.

NOTE

Observe caution on overheating. Install cardboard or plate over panel opening.

b. Using a lead with a clip, connect the input of electronic counter to pin 3 of tube V2. Set SYNC SELECT control to INT. 1.45. Measure and record the crystal frequency. It shall be between 689,310 and 690,000 cps.

c. Set SYNC SELECT control to INT. 1.00. Measure and record the crystal frequency. It shall be between 999,500 and 1,000,500 cps.

d. Disconnect electronic counter. Replace xtal mark and sync module into the drawer chassis. Observe the crystal markers on crt of the display unit while operating XTAL MARK LEVEL control. The markers shall be continuously variable in amplitude from 0 to 0.25 in. and independent of VOLTS/IN control setting.

e. Set SWEEP SPEED RANGE control on sweep and inten mark module to 1-3 and SWEEP SPEED ADJUST control for 1 µsec per 2 inches. Adjust PRF control to approximately 500, Measure the half-amplitude width of the crystal marker video pips. It shall be 0.06 µsec maximum.

6-11. Intensity Marker Test

a. Set PRF control on xtal mark and sync module to approximately midposition. On sweep and inten mark module, set SWEEP SPEED RANGE control to 200–2000, SWEEP SPEED ADJUST fully clockwise, INTENSITY MARKS RANGE to 1, INTENSITY MARKS LEVEL to midposiion, and MARKER TRIGGER switch to SWEEP. SWEEP DELAY COARSE to 1-11.

b. Connect oscilloscope channel A input to pin 3 of V2 on mark and sync module, and channel B input to pin 4 of T7 in sweep and inten mark module. Trigger oscilloscope from “0” TRIGGERS jack on xtal mark and sync module, Set the oscilloscope for 0 to 1000 µ,sec on delayed sweep.

c. Note the spacing between the associated intensity and crystal markers. Scan the oscilloscope out to 1,000 µsec while constantly observing spacing between the two sets or markers. The difference at 1,000 µsec shall not be greater than + 1.5 µsec.

d. Set oscilloscope for 1 µsec per cm. Set INTENSITY MARKS range control to 5. There should be five crystal markers for every intensity marker. Repeat c above except that difference shall not be greater than ± 2.5 µsec.

e. Set INTENSITY MARKS range control to 50. Repeat *c* above. There shall be 21 intensity markers within the 1,000 µsec range and the last one shall be ± 5.0 µsec from the 1000th crystal mark.

f. Set oscilloscope display for approximately 0.5 µsec/2 cm. Connect channel B input to junction of L3 and pin 6 of V10 on sweep and inten mark module. Count 0.1 µsec intensity markers between two 1 µsec crystal markers. The first and llth markers shall coincide with two consecutive 1-µsec crystal markers.

g. Remove all connections from xtal mark and sync module, but set SYNC SELECTOR switch to INT, Adjust IN TEN control on display module and INTENSITY MARKS LEVEL control on sweep and inten mark for brightest usable display. Readjust FOCUS and ASTIG controls for sharpest trace. The brilliance of the intensity markers shall be greater than that of the sweep trace.

h. Set INTEN control for a medium bright trace. Turn INTENSITY MARKS LEVEL completely counterclockwise. There shall be no intensity marks visible.

i. Calibrate display module for sweep speed of 1 µsec per 2 inches. Adjust INTEN, FOCUS, and ASTIG controls for optimum presentation of .1 intensity marks. The width of the individual intensity marks shall be equal to or less than the spaces between them.

6-12. Sweep Duration Test

a. Set sweep and inten mark module INTENSITY MARKS RANGE control to 1 and .1, SWEEP SPEED RANGE switch to 1–3, MARKER TRIGGER to NORMAL, and ADJUST control fully counterclockwise. Set SWEEP DELAY RANGE switch on xtal mark and sync module to 1–11, COARSE control fully counterclockwise, and adjust FINE control to align a l-µsec intensity marker with the dirst vertical line on display module crt graticule.

b. Measure and record sweep length to last vertical line. It shall be 1 ± 0.5 µsec.

c. Turn SWEEP SPEED ADJUST control fully clockwise. Measure the record sweep length, It shall be 3 µsec minimum.

d. Set SWEEP SPEED RANGE to 1-30, and SWEEP SPEED ADJUST fully counterclockwise. Measure and record sweep length. It shall be 1 ± 0.5 µsec.

e. Set INTENSITY MARKS RANGE to 5 and SWEEP SPEED ADJUST fully clockwise. Align a 5-µsec marker with first graticule line. Measure and record sweep length. It shall be 30 µsec minimum.

f. Set SWEEP SPEED RANGE to 20-200 and turn SWEEP SPEED ADJUST fully counterclockwise. Measure and record sweep length. It shall be 20 ± 5 µsec.

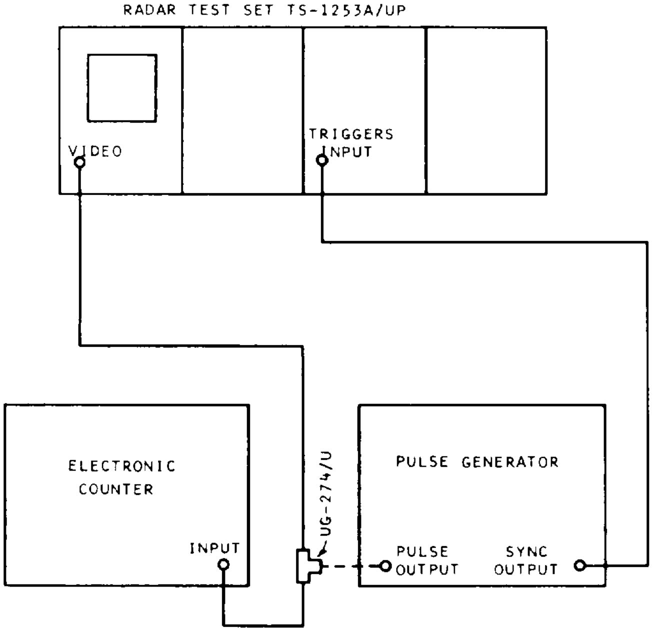
g. Turn SWEEP ADJUST fully clockwise, and INTENSITY MARKS RANGE to 50. Align a 50-µsec marker with first graticule line. Measure and record sweep length. It shall be 200 µsec minimum.

h. Set SWEEP SPEED RANGE to 200–2000 and SWEEP SPEED ADJUST fully counterclockwise. Measure and record sweep length. It shall be 200 ± 50 µsec.

i. Turn SWEEP SPEED ADJUST fully clockwise. Measure and record sweep length. It shall be 2,000 µsec minimum.

j. Set SWEEP SPEED RANGE to 2000-20,000 and 'SWEEP SPEED ADJUST fully counterclockwise. Measure and record sweep length. It shall be 2,000 µsec maximum.

k. Set up test equipment as shown in figure 6–2. Turn SWEEP SPEED ADJUST control on sweep and inten mark module fully clockwise. Align a pulse on the display with the first vertical line of the graticule pattern. Adjust pulse generator prf until the next pulse appears coincident with the last vertical line. Read electronic counter indication of frequency. It shall be 50 cps ±5.



NOTE: ALL INTERCONNECTING CABLES ARE TYPE CG-530/U.

Figure 6-2. Sweep duration test setup.

6-13. Sweep Delay Test

a. Connect test equipment as shown in figure 6–3. Set SYNC SELECT switch to INT. Measure and record time delay between the leading edges of the oscilloscope A and B pulses. (This shows delay between sweep trigger and sweep start with internal synchronization.) Delay shall be 0.25 µsec maximum.

b. On xtal mark and sync module, set SWEEP DELAY RANGE to 1-11, and SWEEP DELAY FINE fully counterclockwise. Depress DELAY STROBE SWEEP switch and turn SWEEP DELAY FINE control. The sweep delay strobes marker shall appear on the display crt at the left end of trace and shall move to the right when the delay control is turned clockwise.

c. Return the SWEEP DELAY FINE control fully CCW. Measure the delay between the 50% amplitude points of the leading edges on the two pulses on the oscilloscope. The delay shall be 1 µsec maximum.

d. Turn SWEEP DELAY FINE fully clockwise. Delay shall be 11 µsec minimum.

e. Set SWEEP DELAY RANGE to 11–21 and SWEEP DELAY FINE fully counterclockwise. Delay shall be 11 µsec maximum.

f. Turn SWEEP DELAY FINE fully clockwise. Delay shall be 21 µsec minimum.

g. Set SWEEP DELAY RANGE to 21-31 and SWEEP DELAY FINE fully counterclockwise. Delay shall be 21 µsec maximum.

h. Turn SWEEP DELAY FINE fully clockwise. Delay shall be 31 µsec minimum.

i. Set SWEEP DELAY RANGE to 5–50, and SWEEP DELAY COARSE and FINE controls fully counterclockwise. Delay shall be 5 µsec maximum.

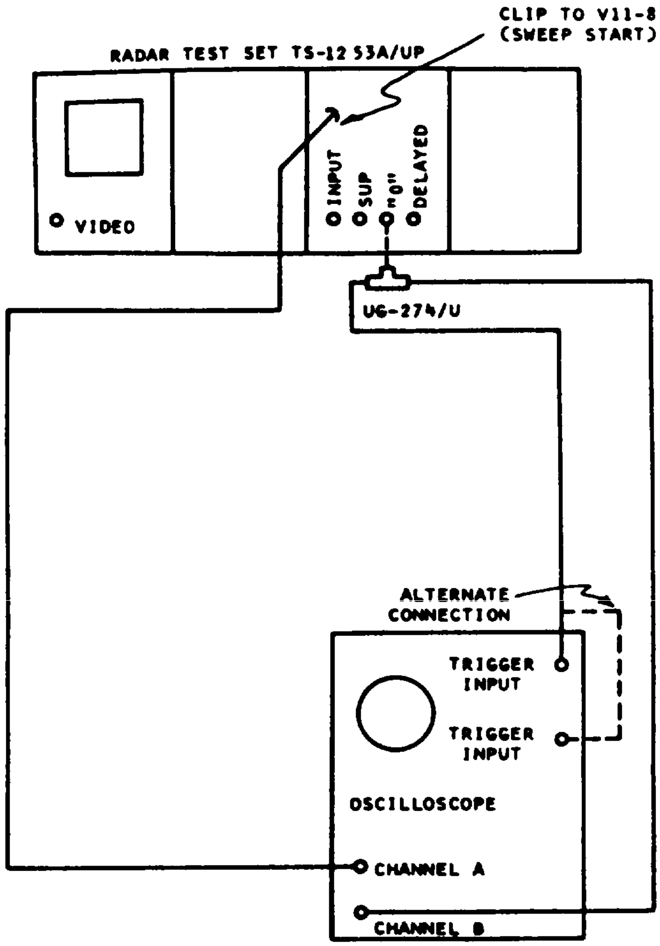
j. Turn SWEEP DELAY COARSE and FINE controls fully clockwise. Delay shall be 50 µsec minimum.

k. Set SWEEP DELAY RANGE to 50–750, and COARSE and FINE controls fully counterclockwise. Delay shall be 50 µsec maximum.

1. Turn SWEEP DELAY COARSE and FINE controls fully clockwise. Delay shall be 750 µsec minimum.

6-14. Display Amplitude Accuracy and Linearity Tests

a. Set up equipment as shown in figure 6–4. On xtal mark and sync module, set SYNC SELECT switch to EXT +. Set output of pulse generator for exactly l-volt amplitude at 1 µsec width.



NOTE: ALL INTERCONNECTING CABLES ARE TYPE CG-530/U
EL6625-403-15-1-C1-TM-3

Figure 6-3. Sweep delay test setup.

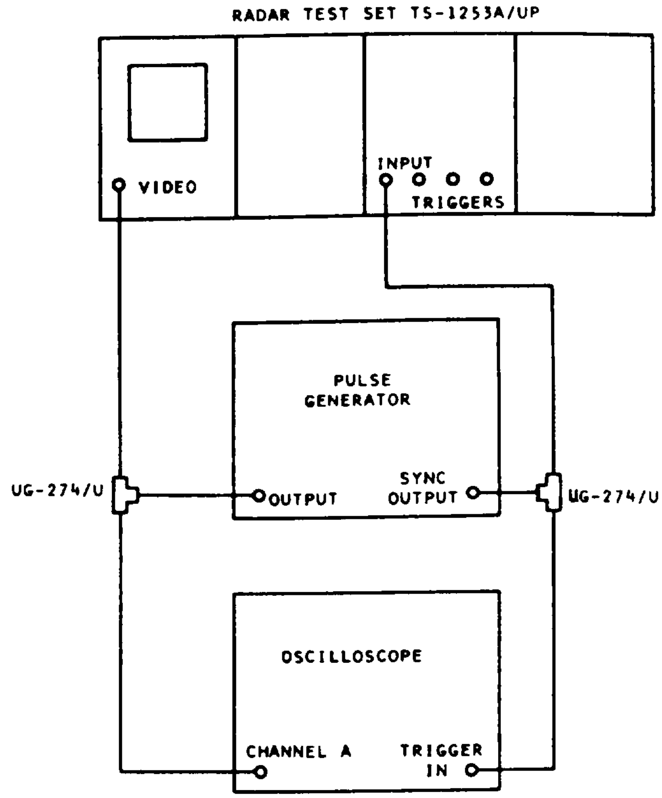
b. On display module, set VOLTS/IN control to 1 and VIDEO SENS control to CAL. Set SWEEP SPEED controls on sweep and inten mark module so the displayed pulse is 2 inches wide. Adjust internal gain cal control R40 so the displayed pulse is exactly l inch high.

c. Set the VIDEO SENS to CAL. Set the VOLTS/IN switch successively to positions .05, .1, .2, 5, 1, 2,5, 10, and 20, and adjust the output amplitude of the pulse generator (as measured on oscilloscope) to same voltage for each setting. In each instance, the trace on the display module crt shall be 1 inch ±0.035 in amplitude.

d. Set VOLTS/IN switch to 1. Adjust output of signal generator to 0.5 volt. Pulse on display unit crt shall be 0.5 inch ±0.025.

e. Adjust output of signal generator to 2 volts. Pulse on crt shall be 2 inches ±0.1.

f. Set pulse generator polarity switch to negative and repeat d and e above.



NOTE: ALL INTERCONNECTING CABLES ARE TYPE CG-530/U
EL6625-403-15-1-C1-TM-4

Figure 6-4. Video sensitivity test setup.

6-15. Test Lead MX-2681/UP (Probe) Test

a. Set up equipment as shown in figure 6-4.

b. On display module set VOLTS/IN switch to 5. Set MX-2681/UP probe to 10:1. Adjust signal generator output to 50 volts at 1- to 2-µsec pulse width. Height of trace shall be 1 inch ±0.035 high and be essentially flat.

c. Set VOLTS/IN switch to .5 and probe attenuation to 100:1. Height of trace shall remain 1 inch ±0.035.

d. If test lead is out of limits, recalibrate in accordance with procedure in this manual.

6-16. SIF Coder Test

a. Connect DELAYED TRIGGERS jack on xtal mark and sync module to TRIGGER INPUT on SIF coder. Connect VARI OUTPUT of SIF coder to VIDEO on display module. Set SYNC SELECT to INT. Set SWEEP SPEED RANGE to 1-30, SWEEP SPEED ADJUST for a sweeptime of approximately 25 #cc, FUNCTION to N, and coder switches to 0000.

b. On Display module, set VOLTS/IN to 5. Observe two framing pulses on display module crt.

c. Set CODE switches on SIF coder to 7777. Observe two framing pulses and 12 information pulses.

d. Set FUNCTION switch to X and observe that x pulse appears. Set SWEEP SPEED RANGE to 1-3. Set SYNC SELECT to 1.00 µsec and calibrate display for 1 µsec/2 inch. Change SYNC SELECT to 1.45 µsec and scan pulses through entire train, using SWEEP DELAY COARSE or FINE control.

Pulse	*Spacing (µsec)*
First framing pulse	0(reference point)
Cl	1.45 ± 0.05
A1	2.90 ± 0.05
C2	4.35 ± 0.05
A2	5.80 ± 0.05
C4	7.25 ± 0.05
A4	8.70 ± 0.05
X	10.15 ± 0.05
B1	11.60 ± 0.05
D1	13.05 ± 0.05
B2	14.50 ± 0.05
D2	15.95 ± 0.05
B4	17.40 ± 0.05
D4	18.85 ± 0.05
Second framing pulse	20.30 ± 0.10

e. Set FUNCTION switch to ID. Display shall be same as in *d* above plus an additional pulse spaced 24.65 µsec ±0. 1 after the first framing pulse.

f. Set SWEEP SPEED RANGE to 20-200 and SWEEP SPEED ADJUST for approximately 100 µsec sweep.

g. Set FUNCTION switch to EMER + X. The display shall consist now of a code 7777 pulse train followed by three sets of bracket pulses with a spacing of 4.35 µsec ±0.1 between the leading edges of the last and first bracket pulses. The code train shall contain the two bracket pulses, 12 information pulses, and the X pulse

h. Set FUNCTION switch to EMER The center X pulse shall disappear from the code train.

i. Set 75Ω switch on display module to IN. Measure and record any amplitude variation between the pulses on all four trains. The amplitude of each pulse shall not vary more than 2% from the average amplitude of ail the pulses in the trains.

j. Set FUNCTION switch to X. Vary the setting of the PRF control from 15 to 4,100 cycles per second and observe the pulse train on display. A full pulse train shall be always visible.

k. Set FUNCTION to N, SWEEP DELAY RANGE to 1-11, and SYNC SELECT to INT 1.00. Calibrate display module for 1µsec per 2 inches. Adjust SWEEP DELAY FINE so that the first pulse of the train is displayed.

1. Set PULSE WIDTH control fully counterclockwise. Measure and record pulse width. It shall be 0.3 µsec maximum.

m. Set PULSE WIDTH control fully clockwise. Measure and record pulse width. It shall be 1 µsec minimum.

n. Set PULSE WIDTH control to .45. Set 75 Ω switch on display module to IN. Measure following characteristics of the pulse at VARI OUTPUT and MOD DRIVE jacks:

VARI OUTPUT	*AMPLITUDE CONTROL SETTING* *HI*	*LO*
Amplitude	.7.0 v minimum	5.0 v minimum
Risetime	0.1 µsec max	0.07 µsec max
Decay time	0.12 µsec max	0.1 µsec max
MOD DRIVE		
Amplitude	45.0 v minimum	20.0 v minimum
Risetime	0.1 µsec max	0.07 µsec max
Decay time	0.12 µsec max	0.1 µsec max

o. Set SWEEP SPEED RANGE control to 1-30. Adjust for a display of a complete pulse train on display module. Set SUB PULSE SELECT control in succession to ail its 13 positions and observe substitute pulses appear for all pulses in the train. There shall be l substitute pulse of same characteristics as the deleted pulse for ail pulses in the train, except the first framing pulse.

p. Set SUB PULSE SELECT switch to SP. Set SUB PULSE POS control to each detented position as shown below and measure the substitute pulse position in relation to the nominal position.

SUB PULSE POSITION Control position	**SUBSTITUTE PULSE** Relation to deleted pulse
0	±0.02µsec
+0.2	+0.2µsec ±0.05
+.7	+0.7 µsec ±0.05
-.2	-0.2± µsec ±0.05
-.7	-0.7 µsec ± 0.05

q. On SIF coder, set CODE switches to 7700, FUNCTION switch to I, INTERLEAVE control clockwise and SUB PULSE SELECT switch to OFF. Observe crt for 16 pulses (two 8-pulse trains). The identical interleavedpulses shall follow the normal train pulses within 1.3 to 2.3 µsec as measured at the 50% amplitude points of the corresponding pulses. (Calibrate display for 1 µsec/2 inches.)

r. Turn INTERLEAVE control fully counterclockwise.

s. The interleave pulse train delay shall move so that it follows the normal pulse train by 0.1 to 0.7 µsec.

6- 7. (Calibration Video Pulse Test

NOTE

Do not run this test unless procedures in paragraphs 6–14 and 6-15 have been performed.

a. On display unit, set 75 Ω switch to OUT, VIDEO SENS control to CAL, and VOLTS/IN to 5. On xtal mark and sync module, set SYNC SELECT to INT.

b. On Cal-control module, set TRIGGER switch to INT, VIDEO OUT switch to 50, METER SELECT to CAL, and CAL ADJ (full scale) so that meter indicates 500.

c. Set video probe for 10:1 attenuation, and connect it between VIDEO OUT on cal-control and VIDEO on display module. Measure the following parameters of the pulse on crt:

Characteristics	Limits
Amplitude (l")	.50 volts within 3%
Duration	2.52.5 µsec ±0.5
Pulse slope	Not detectable

d. While observing pulse on display module, vary PRF control on xtal mark and sync module from 15 to 4,100 cps. Throughout the prf range, the characteristics of the pulse shall stay within limits given in c above.

e. Remove probe and connect VIDEO OUT an cd-control module to VIDEO on display module with a short UG–530/U cable. 'Rotate the cal-control VIDEO OUT switch and the display VOLTS/IN switch simultaneously to the corre-spending 10, 5, 2, 1, .5, and .1 volt positions. Observe that the amplitude of the pulse on the crt is 1 inch ±3%.

6-18. Pulse Counter Test.

a. Connect input of electronic counter through a T-adaptor to pulse output of pulse generator and to TRIGGER INPUT jack on cd-control module. Set pulse generator output for a pulse 1 µsec wide at prf of 50 cps.

b. On Cal-control module, set METER SELECT switch to 500 PRF and TRIGGER switch to EXT. Meter indication shall be 50 ± 5.

c. Set pulse generator prf to 500. Meter indication shall be 500 ± 25.

d. Set METER SELECT switch to 5000 PRF. Meter indication shall be 500 ± 50.

e. Set pulse generator prf to 5000. Meter indication shall be 5000 ± 250 (meter reads 500, multiply by 10).

f. Connect input of electronic counter through a T-adaptor to DELAYED TRIGGERS jack on xtal mark and sync module and to TRIGGER INPUT jack on interrogation coder module. On interrogation coder module, set MODE SELECT switch to 1 and function selector switch to MOD-INT. On xtal mark and sync module, set SYNC SELECT switch to INT and PRF control for 50 cps. Meter indication with TRIGGER switch on cd-control module in INT position shall be 50 ± 5.

g. Set PRF control for 500 cps. Meter indication with TRIGGER switch in INT position shall be 500 ± 25.

h. Set METER SELECT switch to 5000 PRF. Meter indication shall be 500 ± 50.

i. Set PRF control for 4100 cps. Meter indication shall be 4,100 ± 205.

6-19. Mode 4 Reply Decoder Test

NOTE

Set radar simulator to produce 3 pulses 0.5 µsec wide, spaced 1.8 µsec at amplitude of 6 volts ±0.5.

a. Connect the mode 4 (3-pulse) simulator to the MODE 4 IN receptacle on the interrogation coder and the MODE 4 OUT receptacle to the oscilloscope.

b. Observe oscilloscope for one output pulse 0.5 ± 1 µsec duration for each 3-pulse train input.

6-20. Interrogation Coder Test

a. Connect DELAYED TRIGGERS jack on xtal mark and sync module to TRIGGER INPUT on interrogation coder module and CODER OUT to VIDEO on display module. On xtal mark and sync module, set SYNC SELECT to INT 1:00 and PRF to approximately 1000.

b. On interrogation coder module, set CODE LEVEL and VIDEO LEVEL and ISLS level controls for convenient viewing. Set CODE WIDTH control for approximately 0.5 µsec. Function selector switch to TEST and substitute pulse selector switch to OUT. Set and ISLS selector switches successively to positions listed below and, using 1-µsec crystal marks, measure spacing between the 50% amplitude points. Pulse spacing shall be as follows:

Mode selector position	ISLS selector position	PI to Pa (µsec)	Spacing P1 to P2
1	2 µsec	3 ± 0.05	2 ± 0.05
2	2µsec	5 ± 0.05	2 ± 0.05
3/A	2µsec	8 ± 0.05	2 ± 0.05
C	2 µsec	21 ± 0.05	2 ± 0.05
Sync M4	8 µsec	2 ± 0.05 (four pulses)	8 ± 0.05 (1st to 5th pulse)

c. In modes 1, 2, 3/A, and C, temporarily turn ISLS selector switch to 2 PULSE. The ISLS pulse shall replace the second pulse of the interrogation and shall be controlled in amplitude and width by the ISLS level and ISLS WIDTH controls. The level should be adjustable to make the ISLS pulse equal in amplitude to the interrogation pulses. The width should be adjustable between 0.5 and 1.0 ±sec minimum.

d. Set ISLS selector to CHECK. The ISLS pulse shall move to the left so that it partially overlaps with the P1 pulse. Return control to 2 µsec.

e. Turn substitute pulse selector switch to P3 and SUB PULSE switch to “0”. Change mode selector through all positions. Pulse spacing shall remain in all modes as listed in *b* above.

f. Set mode selector switch to position C. (Function selector remains in TEST and substitute pulse selector in P3.) Set SUB PULSE control to 0 and measure delay from P1 pulse. It shall be 21 µsec &0.05. Set the SUB PULSE position switch to the other positions. The time shift of second pulse with respect to its zero position shall be within following limits:

Pulse pos control setting	Pulse shift from O position
-.2	0.2 ± 0.05 µsec
-.7	0.7 ± 0.05 µsec
+.2	0.2 ± 0.05 µsec
+.7	0.7 ± 0.05 µsec

g. Set substitute pulse selector to position P2. When SUB PULSE control is completely counterclockwise, the leading edge of the P2 (ISLS) pulse shall be 1.75 µsec maximum from the leading edge of P1 pulse. When SUB PULSE control is completely clockwise, the ISLS pulse shall be 2.25 µsec minimum from the leading edge of P1.

h. Set mode selector to 3/A and CODE LEVEL and VIDEO LEVEL controls maximum clockwise. Measure characteristics of the CODER OUT pulses on display module with 75 Ω switch at IN. Amplitude shall be 18 volts minimum. Risetime shall be 0.1 µsec maximum. Pulse width shall be 0.5 µsec maximum with CODE WIDTH control counterclockwise and 1.5 µsec minimum with CODE WIDTH clockwise. The ISLS pulse shall be less than 0.5 usec wide with ISLS WIDTH control counterclockwise, and at least 1 µsec wide when it is in clockwise position.

i. Set function selector to (+) position. Amplitude shall be 35 volts minimum. In (–) position, the pulse shall reverse in polarity. Return function selector to TEST.

j. Set mode selector to SYNC M4, ISLS to 8 usec and substitute pulse selector to M4, SYNC 4, 6, and 8 µsec. in each position, the substitute pulse shall replace the corresponding M4 sync pulse and be adjustable by SUB PULSE control as in *d* above. Return control to OUT.

k. On interrogation coder, move trigger input from TRIG jack to ISLS jack. Set ISLS selector to EXT. At CODER OUT only the ISLS pulse shall appear; the amplitude and width are controlled by the ISLS level and ISLS WIDTH knobs. Return trigger input to TRIG jack.

l. Set up equipment as shown in figure 6-5.

m. On interrogation coder set VIDEO switch to BOTH, mode selector to 3/A, function selector to TEST, substitute pulse selector to OUT, and ISLS selector to 2 µec.

n. On SIF coder, set FUNCTION switch to N, CODE switches to 7700, LEVEL to HI, and PULSE WIDTH to .45.

o. Adjust oscilloscope controls for proper display of the composite video signal at the CODER OUT jack. The pulse train shown in figure 6–6 except "O" TRIG pulse shall appear on scope.

p. Using l-µsec crystal marks, measure following spacings on the crt display:

C	40 µsec ±4
E	24.0 µsec ±2
F	8.0 µsec ± 0.25
G	10.0 µsec ±0.1
H	2.0 µsec ±0.25
J	15.0 µsec ±0.1
K	4.0 µsec ± 0.25

q. On SIF coder, set FUNCTION switch to EMER. Leading edge of the first tag pulse R1 shall now appear 24 µsec ±2 after the leading edge of the last bracket pulse of the emergency SIF train.

r. On interrogation coder, set VIDEO switch to RESET. The display shall now contain only the tag pulses RI through R3 moved up in timing to start approximately concurrently with the “0” trigger pulse.

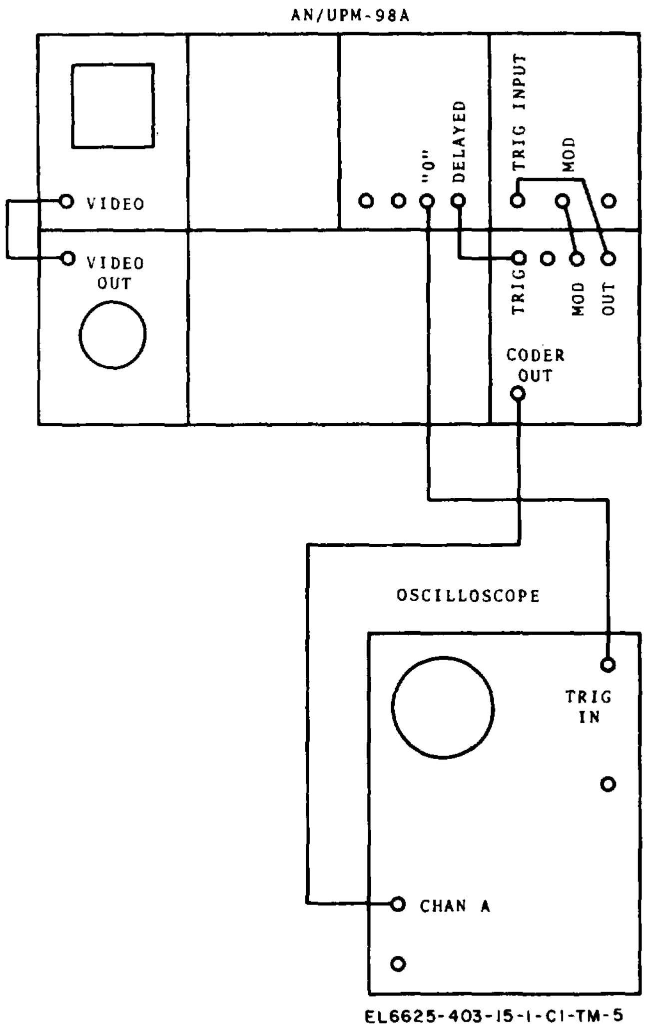


Figure 6-5. *Interrogation coder test setup.*

NOTE

To check interrogation coder as a modulation source for the SM-197A/UPM RF signal output, see RF generator test.

6-21. RF Generator Test

a. Leave controls as described in paragraph *6-20l* through *o,* except set function selector on interrogation coder to MIX and ISLS selector to OUT. On Cal-control module, see that VIDEO OUT switch is at SG MON.

b. Adjust display module controls for display of a composite demodulated pulse train. Be certain that display VIDEO 75 Ω switch is at OUT. The display shall contain all pulses shown in paragraph 6–200 except “0” trig and P2 pulses.

c. Set interrogation coder function selector to INT. The demodulated video display shall consist now of the interrogation pulse pair only. The SIF code and the identification and reset tags shall not be visible.

d. Set function selector to MOD HI. The video display shall consist of SIF code train only.

e. On SIF coder, set LEVEL control to LO. On interrogation coder, set function selector to LOW. Display shall be as in *d* above.

6-22. Attenuator Test

a. Connect DELAYED TRIGGERS jack on XTAL TRIGIGERS jack on xtal mark and sync module to TRIGGER INPUT on interrogation coder module. Set function selector switch to INT, and mode selector to 3/A.

b. Set SG FREQUENCY for approximately 925 mc, and ATTENUATION to 021.3.

c. Connect input of notch wattmeter to SG OUT jack. Measure and record peak RF power output. It shall be –21.3 dbv ± 3 db.

d. Set SG FREQUENCY at 1030, 1090, and 1225 mc. Measure RF power output.

(1) RF output at 1,030 and 1,090 mc shall be –21.3 dbv & 1.5 db.

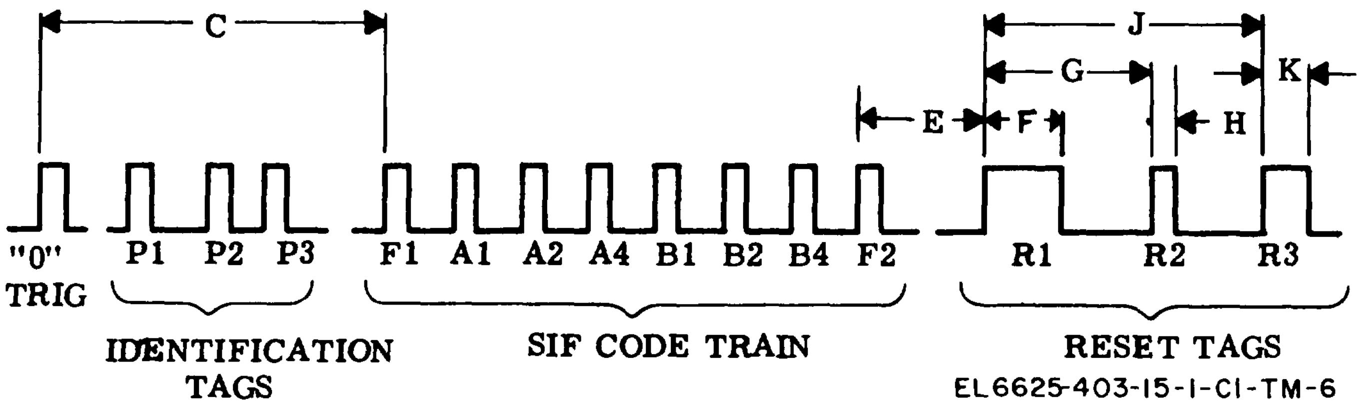


Figure 6-6 SIF coder test.

(2) RF output at other frequencies shall be –21.3 dbv ± 3 db.

6-23. Wavemeter Accuracy Test

a. Set up equipment as in figure 6-7. Set function selector switch on interrogation coder to MIX.

b. Using calibration charts, set wavemeter FREQUENCY control to 925 MHz. Tune signal generator to wavemeter, observing cd-control meter for maximum dip (zero beat).

c. Adjust transfer oscillator for zero beat on P1 pulse as indicated on oscilloscope. Measure frequency on frequency counter and multiply by appropriate harmonic on transfer oscillator for exact frequency. The frequency shall be 925 ±0.7 MHz.

6-24. ISLS Pulse Tests

a. Frequency Accuracy.

(l) Set up equipment as in paragraph 6-23, except set ISLS selector switch to 2 µsec position. Observe that pulse appears in P2 position on oscilloscope.

(2) Adjust transfer oscillator for zero beat on P2 pulse as indicated on oscilloscope. Measure frequency an frequency counter and multiply by appropriate harmonic on transfer oscillator for exact frequency, Frequency shall be 1030±0.2 MHz.

b. Output Amplitude.

(1) On CAL CONTROL module, set VIDEO OUT switch to SG MON. On interrogation coder, set function selector to MOD INT; ISLS selector to CHECK. (Pl and P2 now appeara superimposed on the oscilloscope.)

NOTE

CODE WIDTH control on interrogation coder should be turned sufficiently clockwise to easily observe zero beat.

(2) Adjust SG FREQUENCY control on lower panel of AN/UPM-98A to zero beat the signal generator signal with this ISLS oscillator signal. This indicates that the interrogation pulse pair frequency is set at the ISLS pulse frequency as checked in a above.

(3) Set ISLS selector to 2 µsec, mode selector to 3/A, ISLS level control to “0”, and video select switch to CODE. Oscilloscope display shall now consist of a 3-pulse train (mode 3/A interrogation pulses P1 and P3, and ISLS pulse P2).

(4) Set ISLS level knob to “0”. All three pulses on display shall be of same amplitude, within ± 0.5 db, as determined from a standard decibel conversion table. Set ISLS level knob to -9 position. The ISLS pulse shall now be 9 db ± 1.0 below the level of the interrogation pulses. If the ISLS pulse amplitudes are not within above limits, proceed with (5), (6), and (7) below.

(5) Turn ISLS level control fully clockwise. Using CAL adjust, set ISLS amplitude so that P2 pulse is about 1.5 db above P1.

(6) Turn ISLS level control counterclockwise. When pulse amplitudes are equal, loosen knob setscrew, set knob pointer to O index mark, and tighten setscrew.

(7) Continue turning knob counterclockwise. When ISLS pulse level is 9 db below the P1-P3 pulses, loosen setscrew on index disk and rotate disk until –9-db index mark is under knob pointer. Tighten setscrew an index disk. Disconnect all equipment.

c. ISLS Pulse Characteristics.

(1) Using UG-530/U cables, connect “O” TRIGGERS jack of xtal mark and sync module to trigger input of oscilloscope and DELAYED TRIGGERS to TRIG input of interrogation coder module. Connect CODER OUT jack of interrogation coder to channel A input of oscilloscope. Set interrogation coder function selector to TEST.

(2) Measure the spacing between 50% amplitude points of pulses PI and P2. It shall be 2 µsec ±0.05.

(3) Turn ISLS WIDTH control fully counterclockwise. The width of P2 shall be not more than 0.5 µsec.

(4) Turn ISLS WIDTH control fully clockwise. The width of P2 shall be not less than 1.0

(5) Set substitute pulse selector to P2 position. Vary SUB PULSE con'ol and observe-that P2 pulse position moves accordingly.

(6) Set ISLS selector to 2-PULSE position. Vary ISLS level control to verify that the amplitude of the second pulse on display is controlled by it. Return ISLS level control to 0.

(7) Set substitute pulse selector to P3 position. Vary SUB PULSE control and observe that second pulse position varies accordingly.

(8) Set mode selector switch to M4 SYNC. The display shall consist of four pulses spaced 2 µsec apart between leading edges.

(9) Set ISLS selector switch to 8 US. A 5th pulse shall appear. Vary ISLS level control and observe that amplitude of the 5th pulse varies accordingly,

(10) Set substitute pulse selector control to M4 8 µsec position. Vary SUB PULSE control and observe that the 5th pulse position varies accordingly.

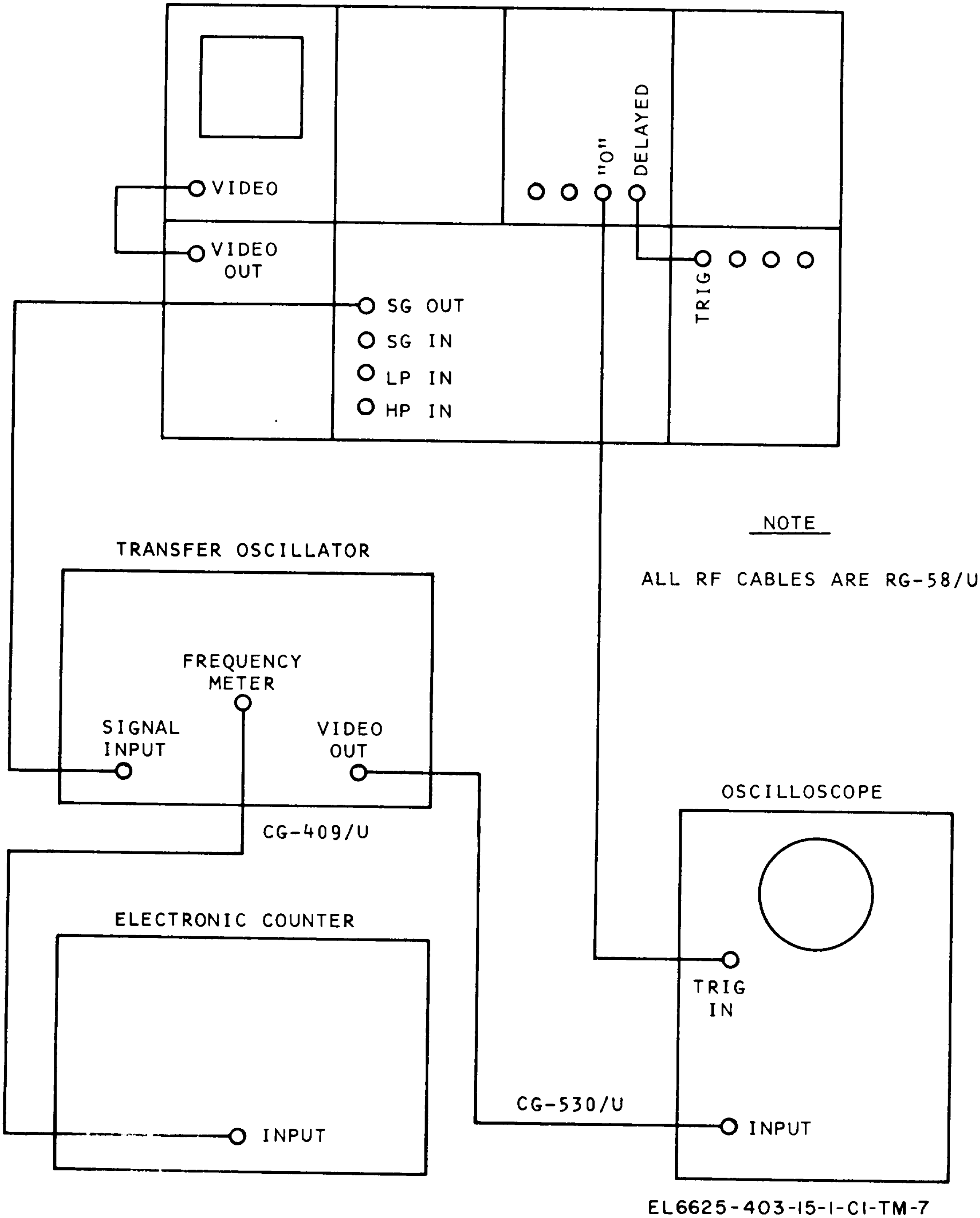


Figure 6-7. Wavemeter and ISLS frequency test setup.

d. External ISLS Triggering.

(1) Connect interrogation coder ISLS jack to DELAYED TRIGGERS on xtal mark and sync module. Place a UG-274/U "T" adapter on "0" TRIGGERS jack and connect UG–530/U cables to TRIG input of interrogation coder and EXT TRIGGERS of oscilloscope.

(2) Set ISLS selector to EXT. The oscilloscope delay shall consist of three pulses and the P2 (ISLS) pulse shall be adjustable in position by the TRIGGER DELAY controls of the xtal mark and sync module.

(3) Turn ISLS selector to OUT. The ISLS (P2) pulse shall disappear from display.

6-25. RF Power Measuring Accuracy Test

NOTE

To check the accuracy of the RF power measuring capability of the AN/UPM–98A, two IFF signals of known peak power (one between 0.5 and 35 watts and the other one between 35 to 3,500 watts) within the frequency range of 925 and 1,225 MHz are required. Such signals can be obtained from available operational IFF interrogators and/or transponders or other sources. If necessary, appropriate coaxial attenuators should be used to decrease a higher level signal to 0.5 to 35 watts acceptable at the LP IN jack.

a. Measure the peak power of the RF source into a 50-ohm load with a calibrated Radar Test Set AN/UPM–98A or AN/UPM–98B, a peak Pulse Power Calibrator AN/USM–177, or equivalent test equipment with accuracy of ± 1 db or more.

b. Connect the known pulsed RF signal of peak power between 0.5 and 35 watts, using same interconnecting cable used in a above, to the LP IN jack on SM–197A/UPM–98. Terminate the HP IN jack with the 50-ohm dummy load attached to front panel of SM–197A/UPM–98.

c. Connect VIDEO OUT jack of cd-control module to VIDEO jack on display module. On display module, set the 75 Ω switch to IN, VIDEO SENS to CAL, and VOLTS/IN for a display that can be conveniently measured using the graticule markings.

d. Read the peak amplitude of the demodulated pulses in volts on the display module crt.

e. Convert the voltage reading obtained in d above to db above 1 watt by using the demodulator calibration curve and correction chart for LP IN jack in the book of calibration charts supplied with the applicable AN/UPM–98A set. Obtain the power in watts from the conversion chart on same page as the calibration curve. The power in watts thus obtained shall be within ± 1 db of the reading obtained in *a* above.

f. Repeat *a* through *e* above with a signal of 35 to 3,500 watts applied to HP IN jack with the LP IN jack terminated with the 50-ohm dummy load.

APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7,8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U. S. Army Equipment Index of Modification Work Orders.
SB 38-100	Preservation, Packaging and Packing Materials, Supplies, and Equipment Used by the Army.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 33-750	Amy Equipment Record Procedures.

APPENDIX B

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

B-1. Scope

This appendix lists repair parts required for performance of organizational, direct support, and general support maintenance of the AN/UPM-98C. This appendix is current as of May 1976.

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. Not applicable.

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 alphanumeric sequence, of all part numbers appearing in the listings. National stock number 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.
XD–	A support item that is not stocked. When required, item will be procured through normal supply channels.
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.

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.
D–	Support items that are removed, replaced, used at depot, mobile depot, specialized repair activity only.

(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/Expanation*
O–	The lowest maintenance level capable of complete repair of the support item is the organizational level.
H –	The lowest maintenance level capable of complete repair of the support item is the general support level.
D–	The lowest maintenance level capable of complete repair of the support item is the depot level, performed by depot.
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 unserviceable, condemn and dispose at the level indicated in position 3.
H –	Reparable item. When uneconomically reparable, condemn and dispose at the general support level.
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 the characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify any 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 SB 708-42 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.

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 alphabetic 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 breakdown 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 within which the repair part belongs. This is necessary since illustrations are prepared for functional groups and listings are divided into the same groups.

(2) *Second.* Find the illustration covering the functional group 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 alphameric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second*. After finding the figure and item number, locate the figure and item number in the repair parts list.

B-6. Abbreviations

Not applicable.

(Next printed page is B-4)

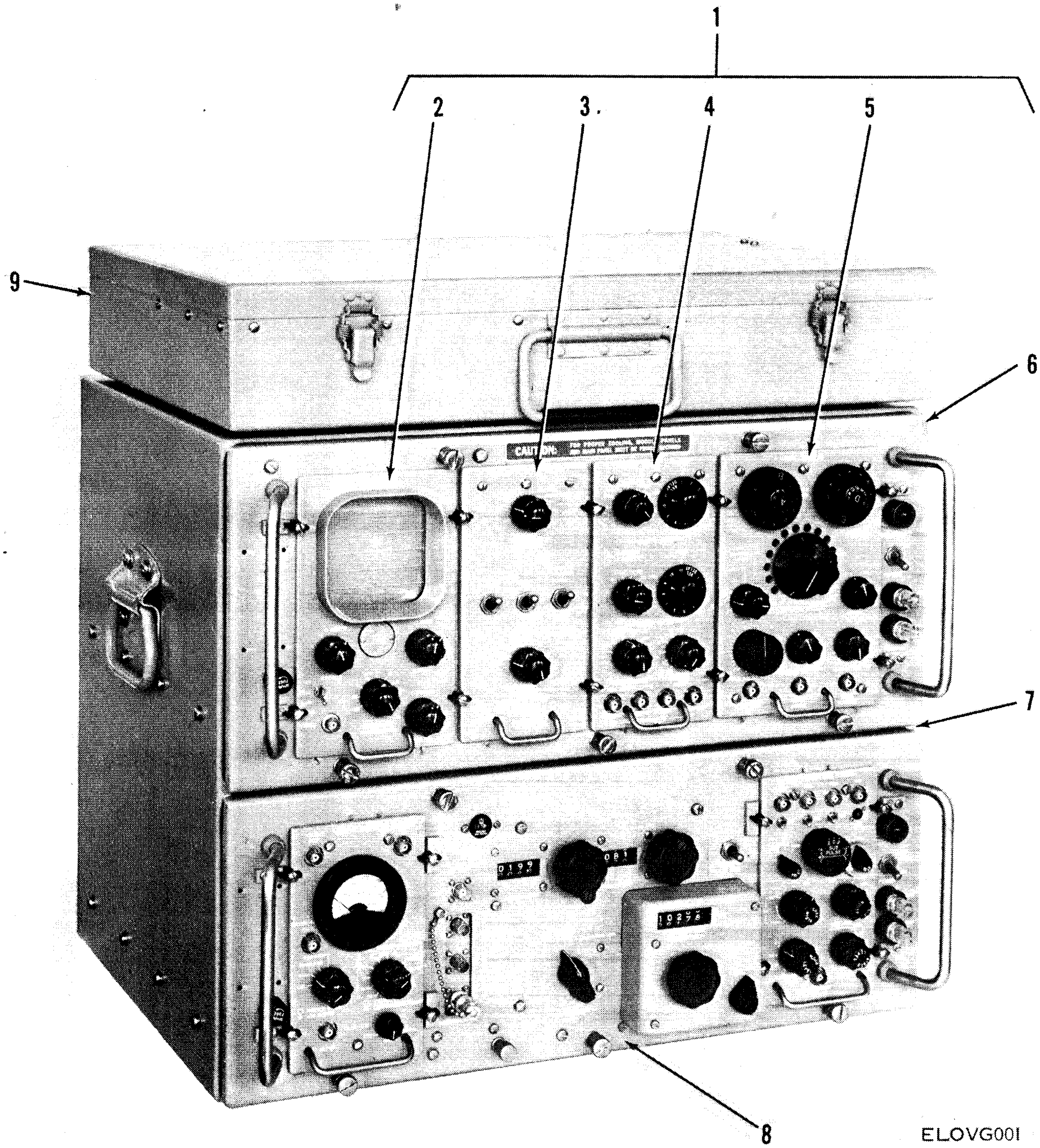


Figure B-1. Radar Test Set TS-1253A/UP.

SECTION TV REPAIR PARTS LIST

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 01 - RADAR TEST SET TS-1253A/UP		
B-1	1	PDODD	6625-00-933-4746	TS-1253A/UP	80058	TEST SET, RADAR	EA	1
B-1	2	XDHHH		GJ4897	70117	DISPLAY MODULE MAIN ASSEMBLY (SEE FIGURE B-2 FOR BREAKDOWN)	EA	1
B-1	3	XDHHH		GE2072-6	70117	SWEEP AND INTENSITY MARK UNIT (SEE FIGURE B-9 FOR BREAKDOWN)	EA	1
B-1	4	XDHHH		GE2057-6	70117	CRYSTAL MARK AND SYNC MODULE (SEE FIGURE B-13 FOR BREAKDOWN)	EA	1
B-1	5	XDHHH		GJ4873	70117	SIF CODER (SEE FIGURE B-20 FOR BREAKDOWN)	EA	1
B-1	6	XDHHH		GJ4910	70117	MAIN CHASSIS ASSEMBLY (SEE FIGURE B-28 FOR BREAKDOWN)	EA	1
B-1	7	PDHHH	6625-00-973-0955	CY2726AUPM98	80058	ELECTRICAL EQUIPMENT CASE CY-2726A/UPM-98 (SEE FIGURE B-31 FOR BREAKDOWN)	EA	1
B-1	8	PDOHH	6625-00-933-4840	SM197CUPM98	80058	CODER SIMULATOR SM-197C/UPM-98 (SEE FIGURE B-33 FOR BREAKDOWN)	EA	1
B-1	9	PAOZZ	6625-00-973-0957	CY2725UPM98	80058	CASE, ACCESSORIES CY-2725/UPM-98	EA	1

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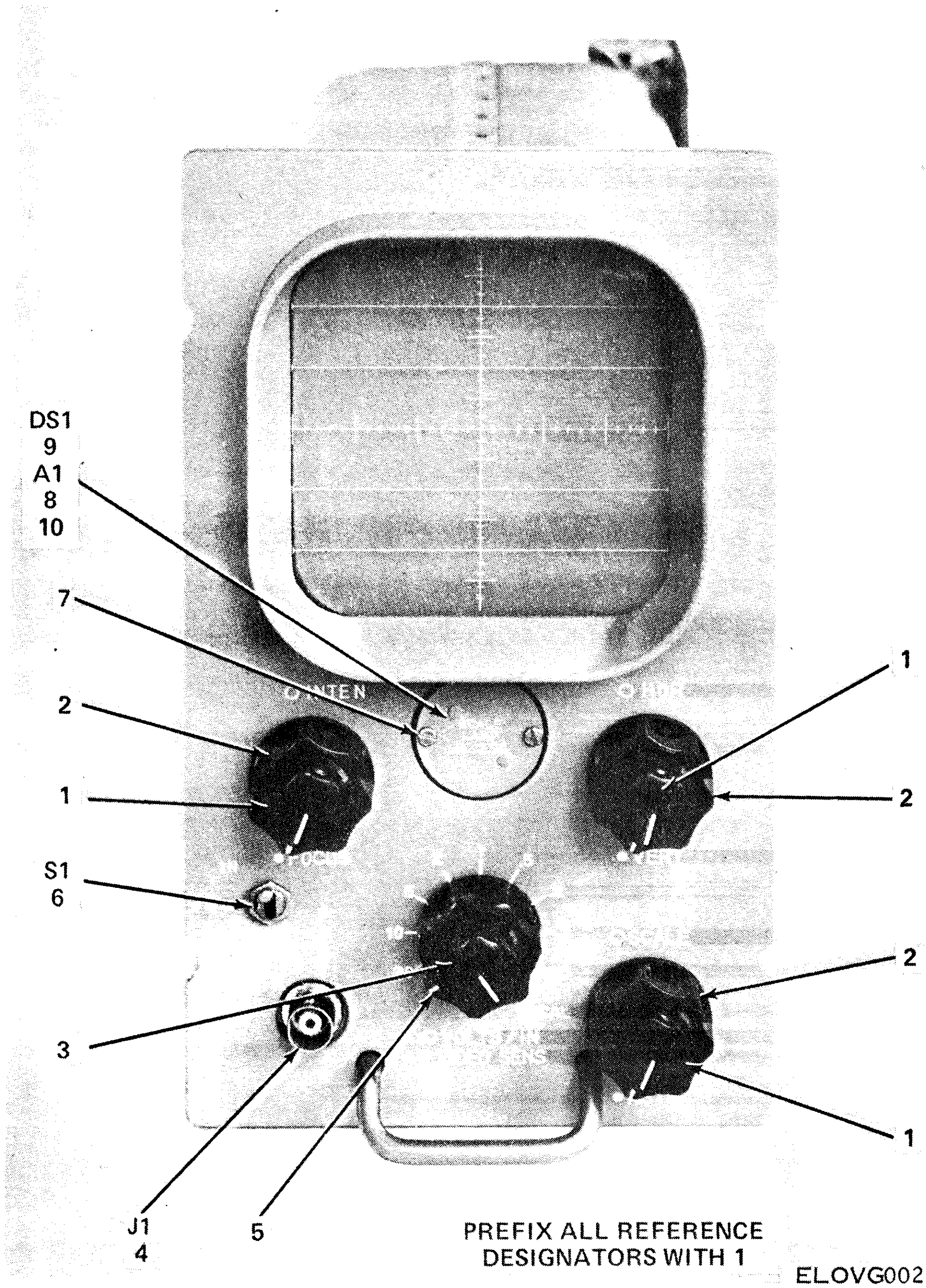

Figure B2. ① Display module main assembly (sheet 1 of 6).

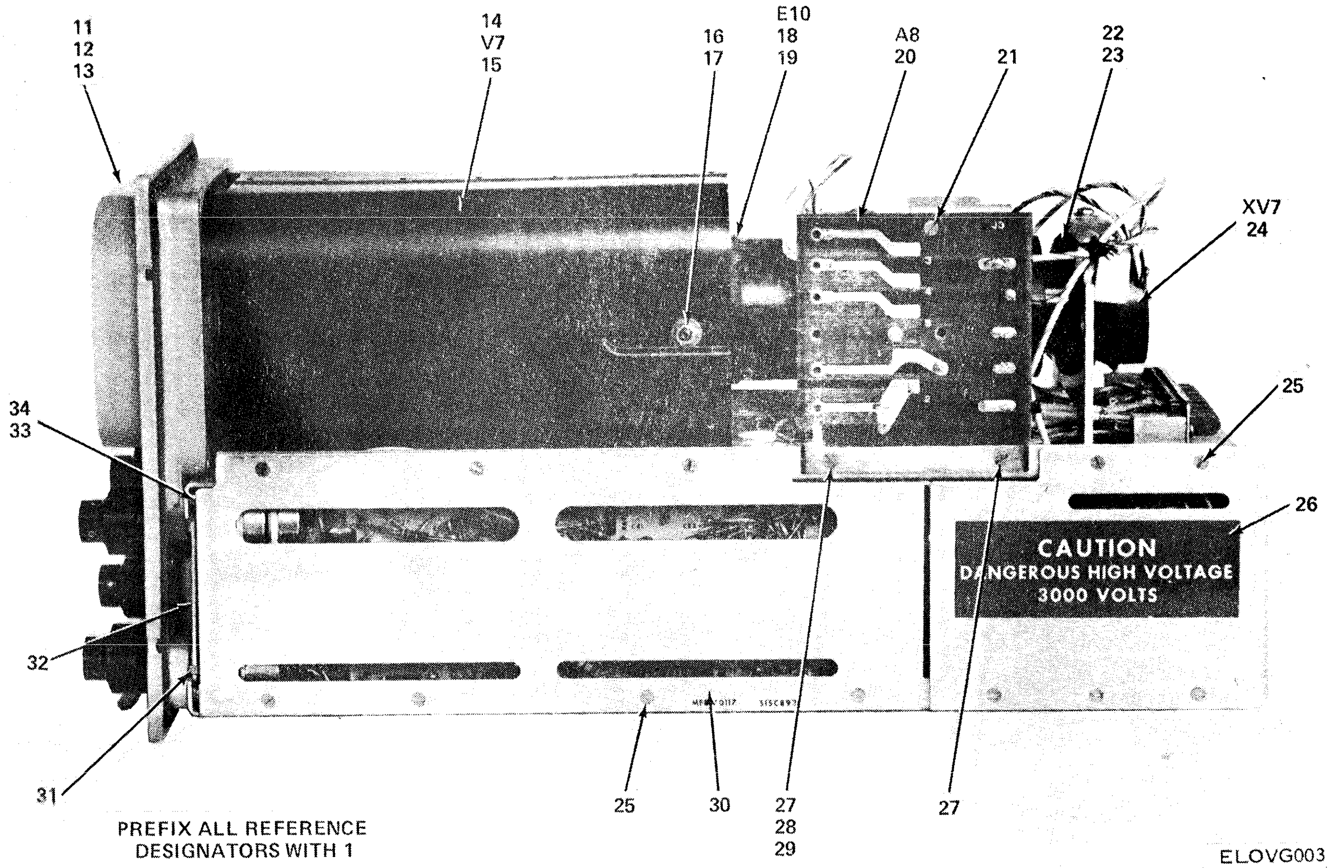

Figure B-2. ② Display module main assembly (sheet 2 of 6).

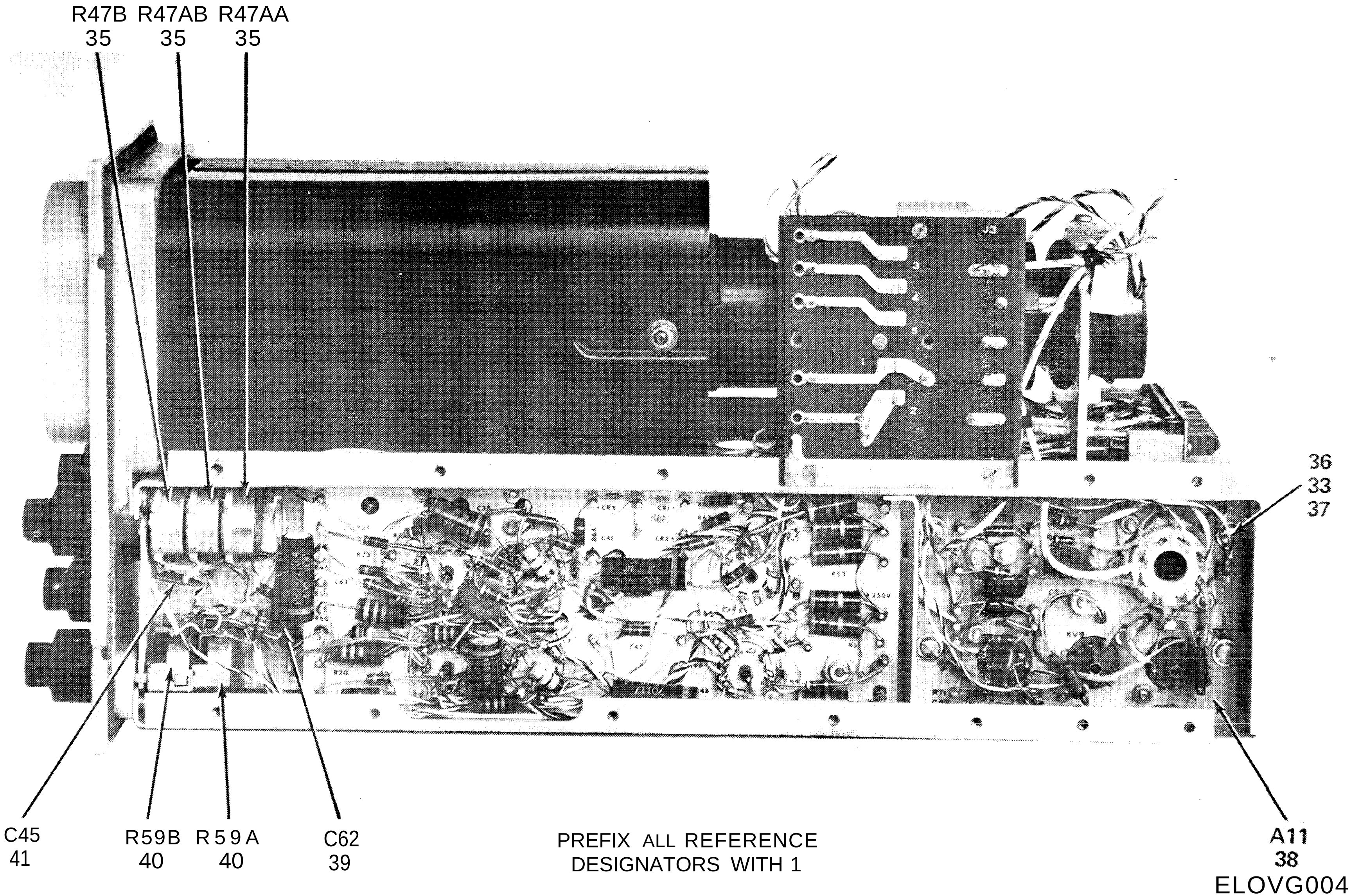

Figure B-2.③ Display module main assembly (Sheet 3 of 6).

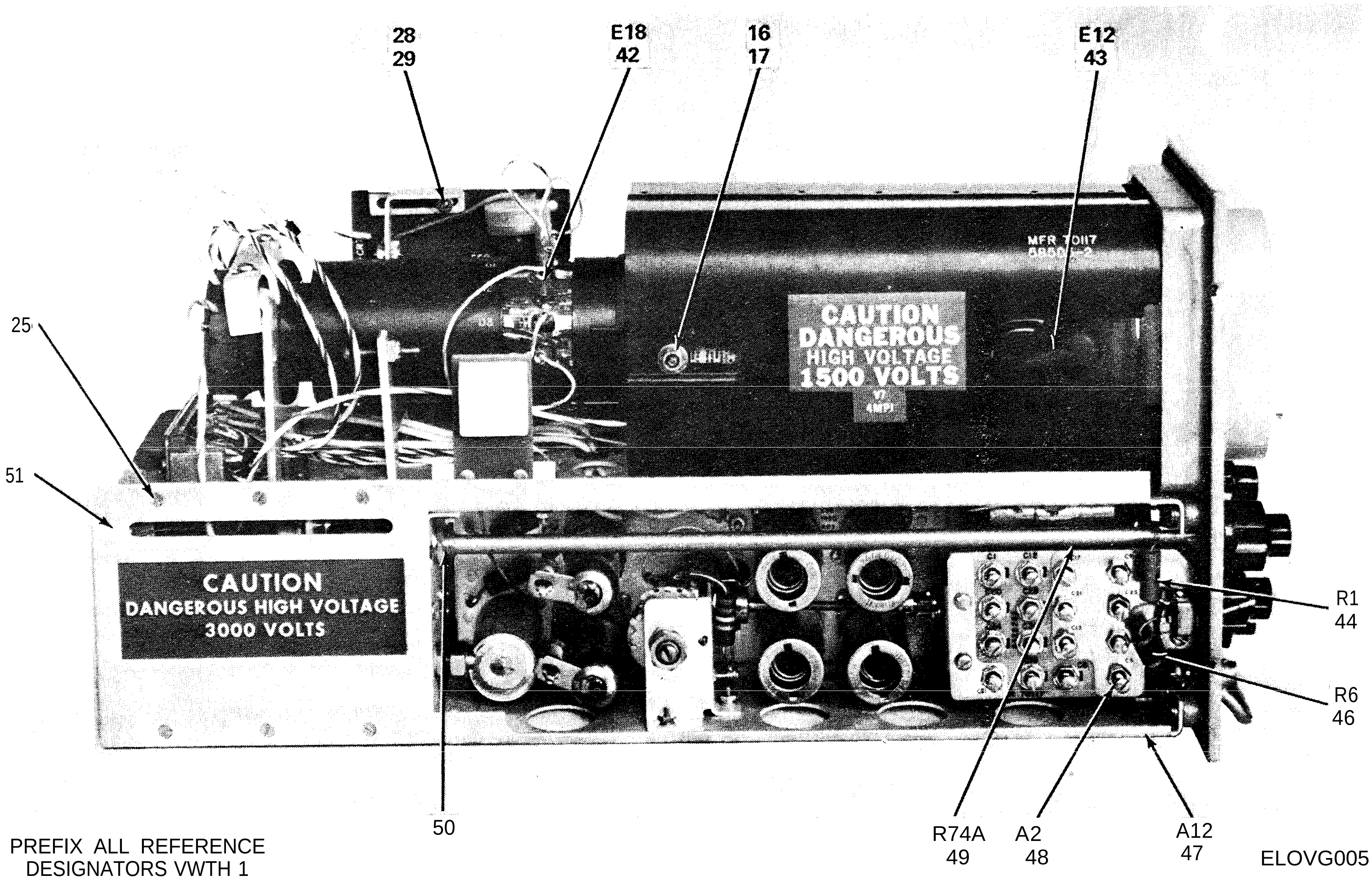

Figure B-2. ④ Display module main assembly (sheet 4 of 6).

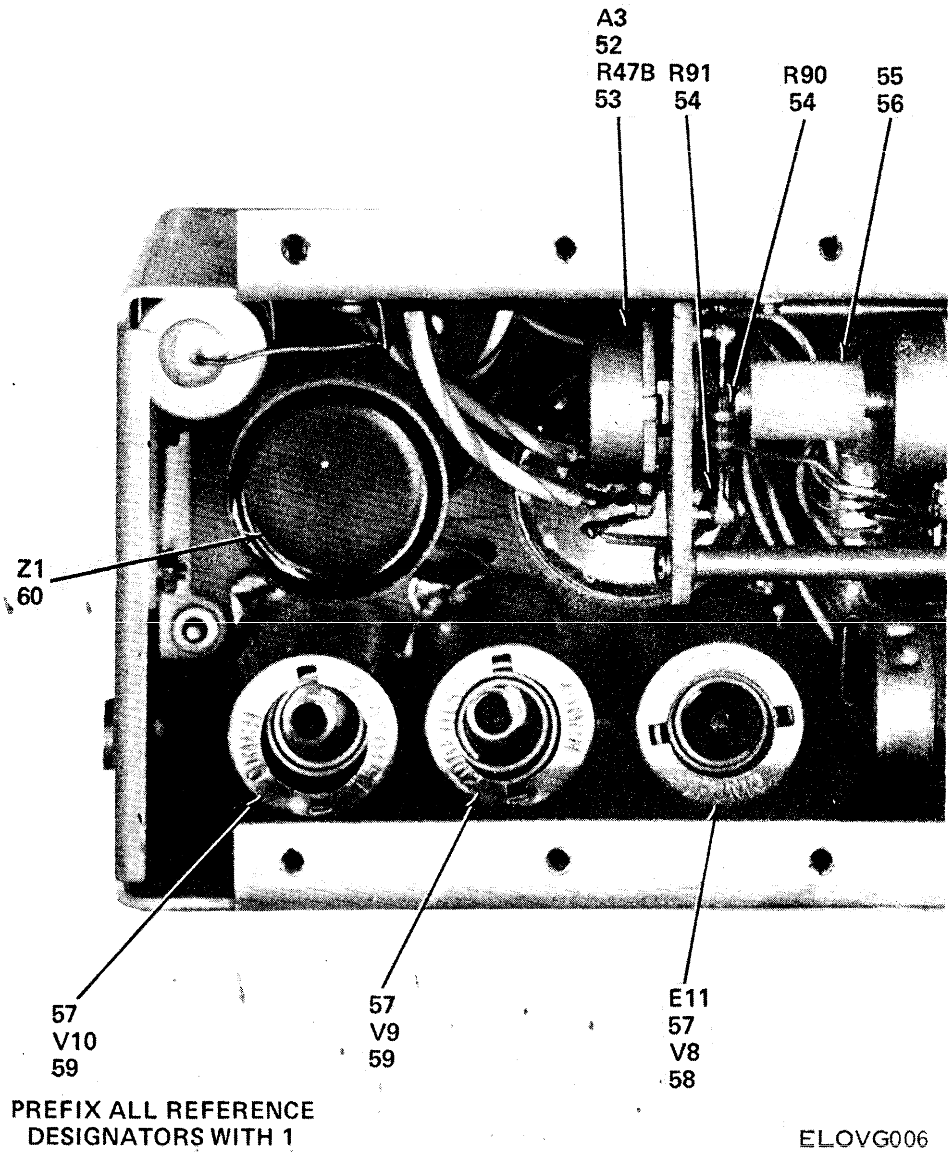

Figure B-2. ⑤ Display module main assembly (sheet 5 0f 6).

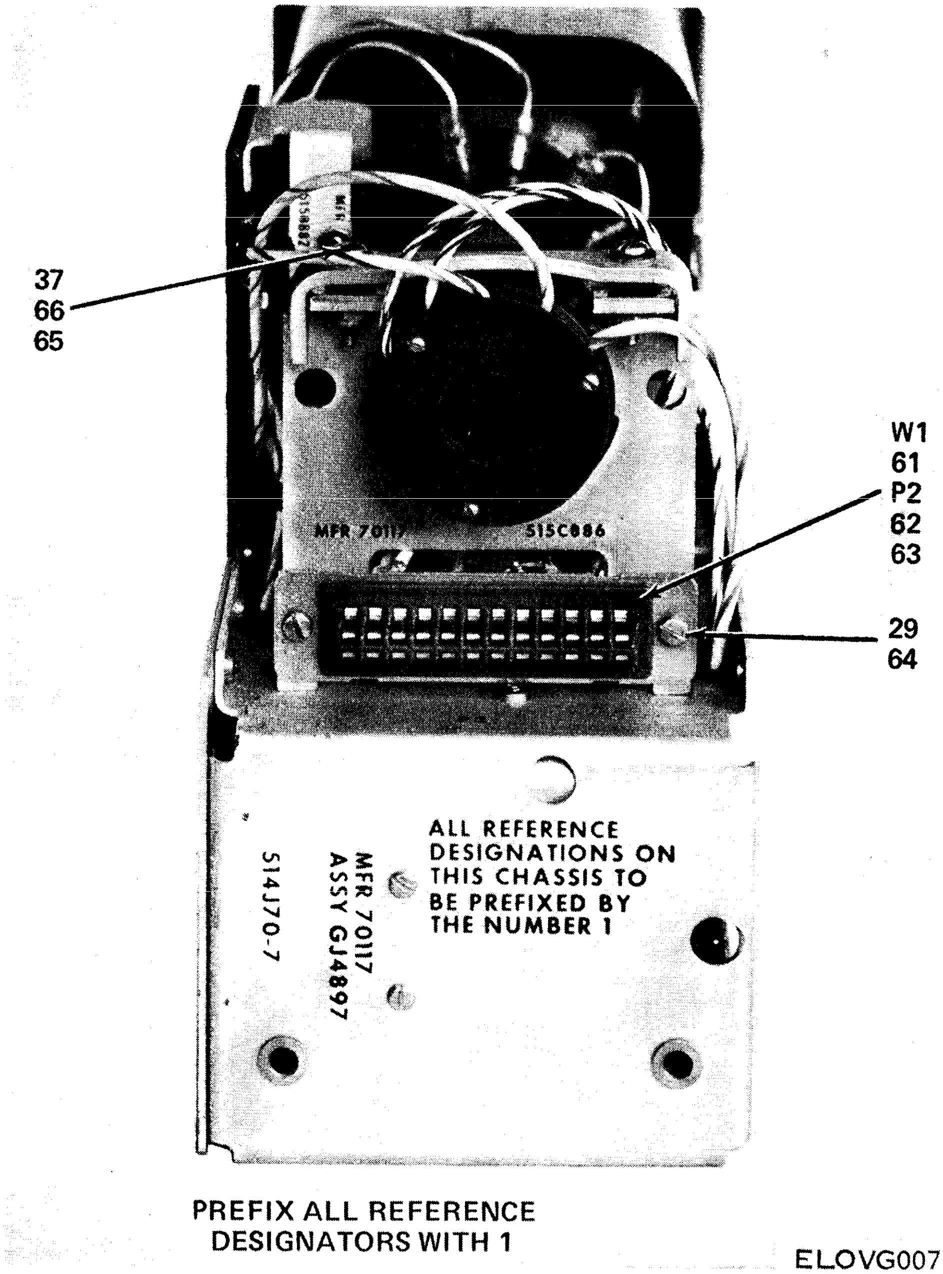

Figure B-2. ⑥ Display module main assembly (sheet 6 of 6).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0101 - DISPLAY MODULE		
B-2		XDHHH		CJ4897	70117	DISPLAY MODULE ASSEMBLY (SEE FIGURE B-1 FOR NHA)		
B-2	1	PAHZZ	5355-00-739-8152	533A98-1	70117	KNOB: BLACK BAKELITE	EA	3
B-2	2	PAHZZ	5355-00-753-5164	S645-5LBB538	75376	KNOB: BLACK BAKELITE	EA	3
B-2	3	PAHZZ	5355-00-576-5470	S645-5LBB	75376	KNOB: BLACK BAKELITE	EA	1
B-2	4	PAHZZ	5935-00-835-0510	M39012-21-0001	81349	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-2	5	PAHZZ	5355-00-819-0067	533A98-3	70117	KNOB: BLACK BAKELITE	EA	1
B-2	6	PAHZZ	5930-00-739-8156	TSA16	04009	SWITCH, TOGGLE	EA	1
B-2	7	PAHZZ	5305-00-054-5637	MS35233-3	96906	SCREW, MACHINE: PNH, NO. 2-56 x 1/4 IN. LG	EA	2
B-2	8	XDHZZ	6625-00-797-2692	GC1586-1	70117	MOUNTING ASSEMBLY, SCALE LIGHT	EA	1
B-2	9	PAOZZ	6240-00-274-4015	328R	08806	LAMP, INCANDESCENT: 6 VOLT, 0.2 AMPS,T-1-3/4 BULB	EA	1
B-2	10	PAHZZ	5330-00-892-4173	512A140	70117	GASKET, LAMP	EA	1
B-2	11	PAHZZ	5840-00-820-1619	521C18-1	70117	SCALE, CATHODE RAY TUBE	EA	1
B-2	12	PAHZZ	5840-00-820-0115	521C18-2	70117	FILTER, LIGHT, CRT	EA	1
B-2	13	PAHZZ	5330-00-892-4176	512B159	70117	GASKET	EA	1
B-2	14	PAHZZ	5960-00-474-3836	585D5-2	70117	SHIELD, TUBE	EA	1
B-2	15	PAHZZ	5960-00-809-7582	4MP1	81349	ELECTRON TUBE	EA	1
B-2	16	XDHZZ		96NTM62	72962	NUT, SELF-LOCKING HEXAGON NO. 6-32	EA	4
B-2	17	XDHZZ	5310-00-903-5575	504C2-2-52	70117	WASHER, FLAT	EA	2
B-2	18	PAHZZ	5960-00-420-3633	585C6-6	70117	SHIELD, TUBE	EA	1
B-2	19	PAHZZ	9390-00-882-2029	512A63-7	70117	RUBBER, CHANNEL	EA	1
B-2	20	XDHHH		GD4896	70117	DISPLAY MODULE SUBASSEMBLY (SEE FIGURE B-3 FOR BREAKDOWN)	EA	1
B-2	21	PAHZZ	5305-00-770-2580	MS35249-23	96906	SCREW, MACHINE: FH, CSK, NO. 4-40 x 7/16 IN. LG	EA	1
B-2	22	PAHZZ	5960-00-056-2968	515B885	70117	RETAINER	EA	1
B-2	23	PAHZZ	5325-00-229-3696	512B280-3	70117	GROMMET	EA	1
B-2	24	PAHZZ	5935-00-240-8166	9470-12	71785	SOCKET, ELECTRON TUBE	EA	1
B-2	25	PAHZZ	5305-00-770-2533	MS35249-20	96906	SCREW, MACHINE: FH, CSK, NO. 4-40 x 1/4 IN. LG	EA	18
B-2	26	XDHZZ		515B896	70117	COVER, POWER SUPPLY	EA	1
B-2	27	PAHZZ	5305-00-770-2579	MS51959-15	96906	SCREW, MACHINE: FH, CSK, NO. 4-40 x 3/8 IN. LG	EA	2
B-2	28	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	6
B-2	29	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK-SPRING: NO. 4	EA	13
B-2	30	XDHZZ		515C893	70117	PLATE	EA	1
B-2	31	XDHZZ		529C3-48	70117	SPACER, SLEEVE	EA	1
B-2	32	XDHZZ		515A1207	70117	LOCK PLATE	EA	1
B-2	33	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK-SPRING: NO. 6	EA	13
B-2	34	XDHZZ	5305-00-054-6650	MS51957-26	96906	SCREW, MACHINE: PNH, NO. 6-32 x 1/4 IN. LG	EA	6
B-2	35	PAHZZ	5905-00-802-6121	575B25	70117	RESISTOR, VARIABLE	EA	1
B-2	36	XDHZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE: PNH, NO. 6-32 x 3/8 IN. LG	EA	5

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-2	37	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6 CRES	EA	9
B-2	38	XDHHH		GD4909	70117	POWER SUPPLY ASSEMBLY (SEE FIGURE B-4 FOR BREAKDOWN)	EA	1
B-2	39	PAHZZ	5910-00-164-2076	M39022-01-1721	81249	CAPACITOR, FIXED PAPER DIELECTRIC: 0.1 UF, 400V, PORM 20%	EA	1
B-2	40	PAHZZ	5905-00-725-8212	575B26	70117	RESISTOR, VARIABLE	EA	1
B-2	41	PAHZZ	5910-00-109-1987	CK63AY103M	71450	CAPACITOR, FIXED CERAMIC DIELECTRIC: 10 K MMF PORM 20%, 500 VDCW	EA	1
B-2	42	PAHZZ	5950-00-111-0518	506B32	70117	CONTACT, ELECTRICAL	EA	1
B-2	43	XDHZZ		590A5-1	70117	CLIP, ELECTRICAL	EA	1
B-2	44	XDHZZ	5355-00-474-3837	H545B10B	71450	BUSHING, MACHINE, THREAD	EA	1
B-2	45	PAHZZ	5905-00-681-4328	560C29-120	70117	RESISTOR, FIXED FILM	EA	1
B-2	46	PAHZZ	5905-00-147-0389	RCR42G750JS	81349	RESISTOR, FIXED COMPOSITION: 75 OHMS, PORM 5% 2 WATTS	EA	1
B-2	47	XDHZZ		GE4898	70117	CHASSIS ASSEMBLY (SEE FIGURE B-5 FOR BREAKDOWN)	EA	1
B-2	48	XDHZZ		GC2015-2	70117	SWITCH ASSEMBLY (SEE FIGURE B-6 FOR BREAKDOWN)	EA	1
B-2	49	PAHZZ	5905-00-442-4986	GB4020	70117	RESISTOR, VARIABLE	EA	1
B-2	50	XDHZZ		032X375X562BRS	70117	WASHER, FLAT	EA	1
B-2	51	XDHZZ		GB1683	70117	COVER, POWER SUPPLY	EA	1
B-2	52	XDHZZ		GB2002	70117	RESISTOR ASSEMBLY	EA	1
B-2	53	PAHZZ	5905-00-865-7842	575D3-82	70117	RESISTOR, VARIABLE	EA	1
B-2	54	PAHZZ	5905-00-115-3560	RCR07G183JS	81349	RESISTOR, FIXED COMPOSITION: 1.8 MEG OHMS, PORM 5%, .25 WATT	EA	2
B-2	55	PAHZZ	3010-00-818-2347	527B462	70117	COUPLING, SHAFT	EA	1
B-2	56	PAHZZ	5315-00-286-4888	MS171435	96906	PIN, SPRING: CRES	EA	2
B-2	57	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	3
B-2	58	PAOZZ	5960-00-262-0210	5814A	81349	ELECTRON TUBE	EA	1
B-2	59	PAOZZ		IV2USN	81349	ELECTRON TUBE	EA	2
B-2	60	PAHZZ	5915-00-713-8456	2348	71436	FILTER ASSEMBLY	EA	1
B-2	61	XDHZZ		GC3008	70117	WIRING HARNESS	EA	1
B-2	62	PAHZZ	5935-00-623-7199	26-4100-24P	02660	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-2	63	PAHZZ	5325-00-813-5390	807	75543	GROMMET, RUBBER	EA	1
B-2	64	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: PNH, NO. 4-40 X 1/4 IN. LG	EA	2
B-2	65	PAHZZ	5325-00-286-6047	54G	70485	GROMMET, RUBBER	EA	2
B-2	66	XDHZZ	5305-00-054-6656	MS51957-32	96906	SCREW, MACHINE: PNH, NO. 6-32 X 3/4 IN. LG	EA	5

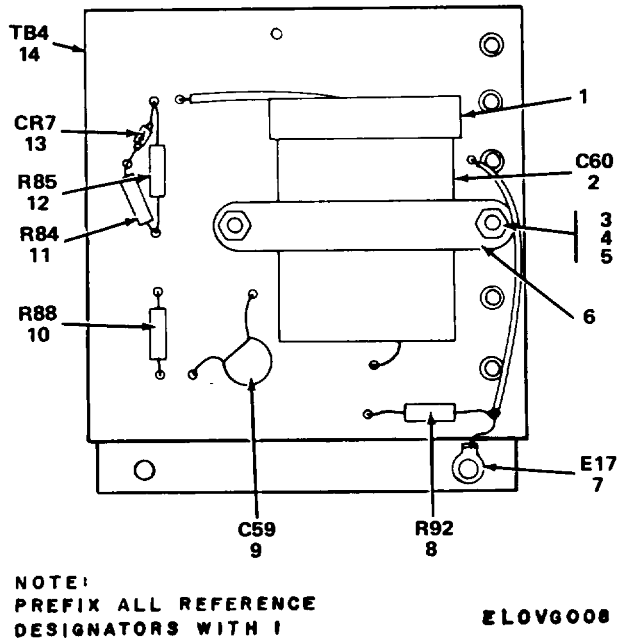

Figure B-3. Display module subassembly.

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-3		XDHHH		GD4896	70117	DISPLAY MODULE SUBASSEMBLY (SEE FIGURE B-2 FOR NHA)	EA	REF
B-3	1	XDHZZ	5999-00-806-1536	533B186-1	70117	CAP, PLASTIC INSULATING	EA	1
B-3	2	PAHZZ	5910-00-820-6615	OF20-254KT	99120	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-3	3	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN HEXAGON NO. 4-40	EA	1
B-3	4	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK, NO. 4	EA	1
B-3	5	XDHZZ	5305-00-022-7058	MS35249-22	96906	SCREW, MACHINE FLAT HEAD NO. 4-40 X 3/8 IN. LG SST	EA	1
B-3	6	XDHZZ	5910-00-474-3838	519B49	70117	CLAMP	EA	1
B-3	7	XDHZZ	5940-00-159-1252	2522-4	78189	TERMINAL LUG	EA	1
B-3	8	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR, FIXED, COMPOSITION: 1.0 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-3	9	PAHZZ	5910-00-682-3774	565C1-11	70117	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-3	10	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10 K OHMS, PORM 5%, .50 WATT	EA	1
B-3	11	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: 10 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-3	12	PAHZZ	5905-00-116-8558	RCR20G155JS	81349	RESISTOR, FIXED, COMPOSITION: 1.5 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-3	13	PAHZZ	5961-00-087-6047	1N645	81349	SEMICONDUCTOR DEVICE DIODE	EA	1
B-3	14	XDHZZ		GB1581	70117	TERMINAL BOARD	EA	1

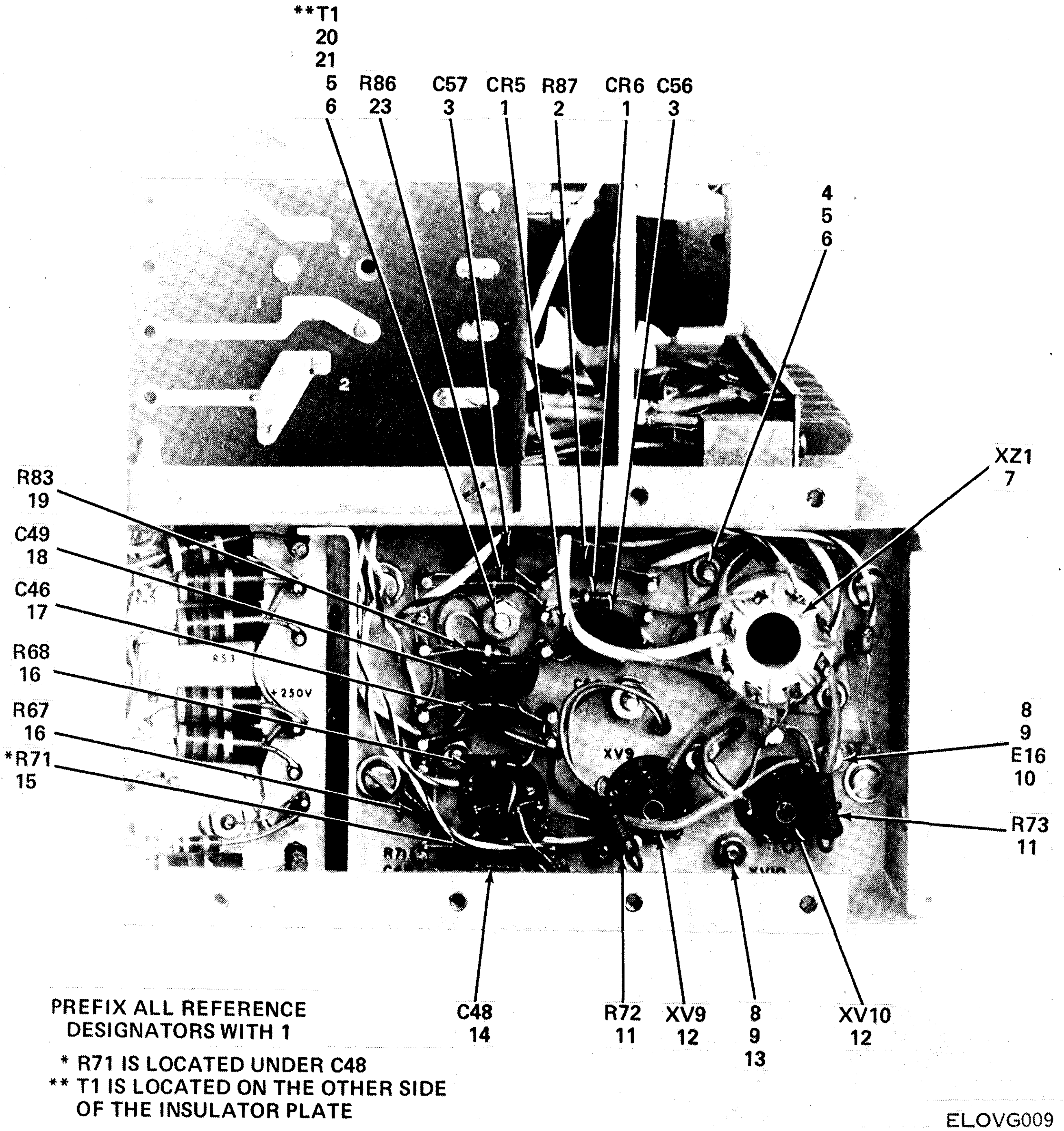

Figure B-4. Power supply assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-4		XDHHH		GD4909	70117	POWER SUPPLY ASSEMBLY (SEE FIGURE B-2 FOR NHA)	EA	REF
B-4	1	PAHZZ	5961-00-087-6047	1N645	81349	SEMICONDUCTOR DEVICE, DIODE	EA	2
B-4	2	PAHZZ	5905-00-114-5456	RCR20G684JS	81349	RESISTOR, FIXED, COMPOSITION: 680 K OHMS, PORM 5%, .5 WATT	EA	1
B-4	3	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 K MMF, 500 VDCW	EA	2
B-4	4	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE: PNH, NO. 6-32 X 7/16 IN. LG	EA	2
B-4	5	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING, NO. 6	EA	4
B-4	6	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	4
B-4	7	PAHZZ	5935-00-129-9358	TS101P02	81349	SOCKET, ELECTRON TUBE	EA	1
B-4	8	PAHZZ	5310-00-934-9748	MS35649-44	96906	NUT, PLAIN, HEX: NO. 4-40	EA	6
B-4	9	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING NO. 4	EA	6
B-4	10	XDHZZ	5940-00-159-1252	2522-4	78189	TERMINAL, LUG	EA	3
B-4	11	PAHZZ		RW69G1R0	81349	RESISTOR, FIXED, WIREWOUND: 1 OHM	EA	2
B-4	12	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE: 9 PIN	EA	3
B-4	13	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	4
B-4	14	PAHZZ	5910-00-024-7546	M39022-01-1673	81349	CAPACITOR,FIXED, PAPER DIELECTRIC: 0.1 UF, PORM 20%, 200 VDCW	EA	1
B-4	15	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2 K OHMS, PORM 5%, .5 WATT	EA	1
B-4	16	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .5 WATT	EA	2
B-4	17	PAHZZ	5910-00-891-2155	CM05F201J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 200 PF, PORM 5%, 500 VDCW	EA	1
B-4	18	PAHZZ	5910-00-781-1154	CM06F152J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 1.5 K PF, PORM 5%, 500 VDCW	EA	1
B-4	19	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: 150 K OHMS, PORM 5%, .5 WATT	EA	1
B-4	20	PAHZZ	5950-00-713-6940	EP6367	97722	TRANSFORMER, RADIO FREQUENCY	EA	1
B-4	21	PAHZZ	5310-00-934-9761	MS35649-64	96906	NUT, PLAIN, HEX: NO. 6-32	EA	2
B-4	22	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR, FIXED, COMPOSITION: 1 MEG. OHMS, PORM 5%, .5 WATT	EA	1

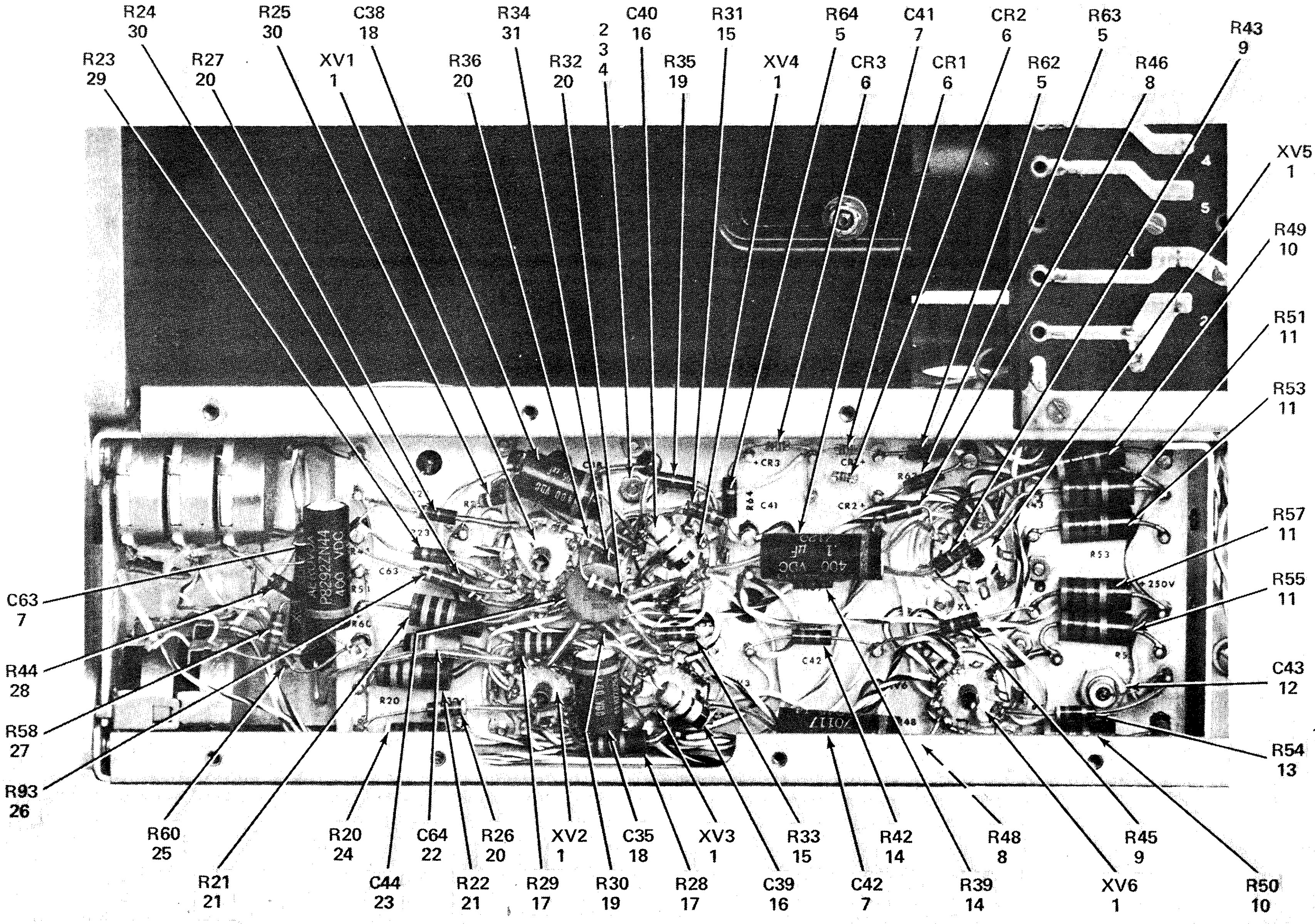

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Figure B-5. ① Chassis assembly, unit 1(sheet 1 of 3).

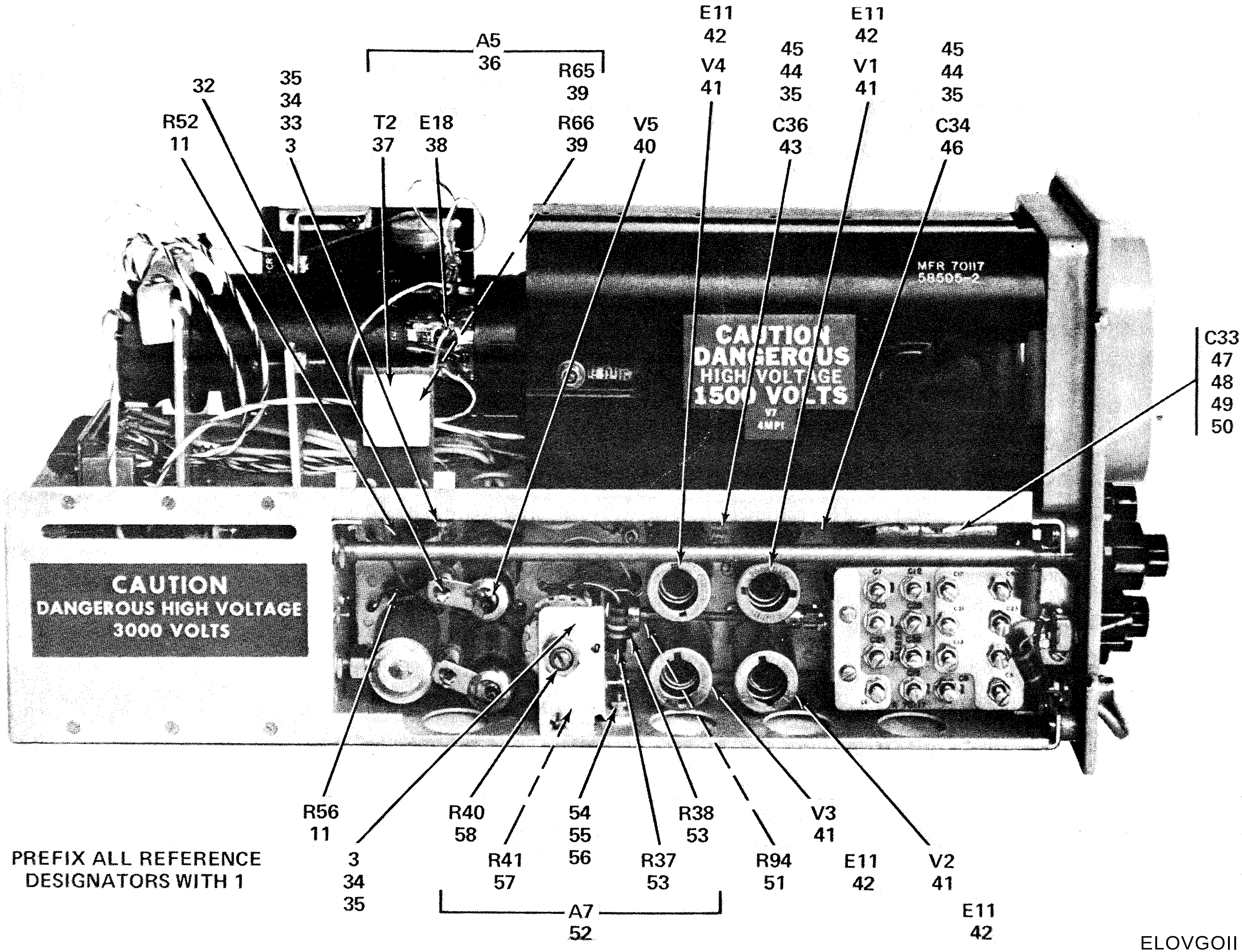

Figure B-5.② Chassis assembly, unit 1 (sheet 2 of 3).

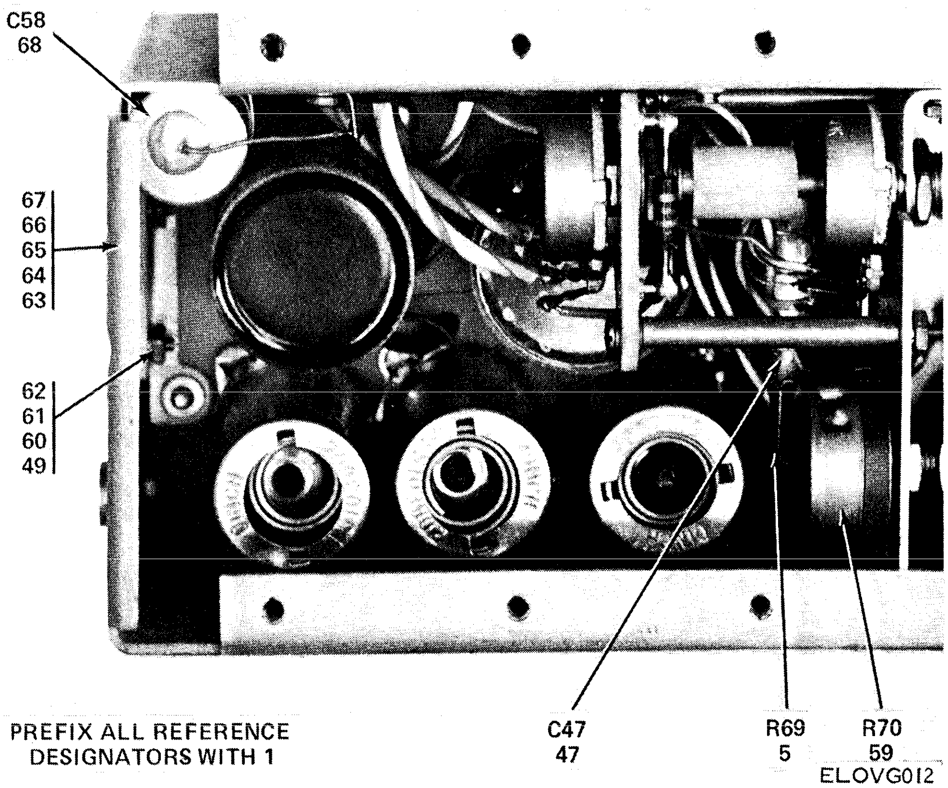

Figure B-5. ③ Chassis assembly, unit (sheet 3 of 3).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-5		XDHHH		GE4898	70117	CHASSIS ASSEMBLY (SEE FIGURE B-2 FOR NHA)	EA	REF
B-5	1	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE: 9 PIN	EA	2
B-5	2	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: NO. 4-40 X 1/4 IN. LG	EA	12
B-5	3	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	33
B-5	4	XDHZZ	5310-00-550-3715	MS35333-70	96906	WASHER, LOCK: NO. 4	EA	12
B-5	5	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1 K OHMS,PROM 5%,.50 WATT	EA	4
B-5	6	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE DIODE	EA	3
B-5	7	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED,PAPER DIELECTRIC: 0.1UF, 400 VDCW, PORM 20%	EA	3
B-5	8	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR,FIXED,COMPOSITION: 1.0 MEG OHMS,PORM 5%, .50 WATT	EA	2
B-5	9	PAHZZ	5905-00-111-4744	RCR20G512JS	81349	RESISTOR, FIXED, COMPOSIYION: 5,100 OHMS PORM 5%, .50 WATT	EA	2
B-5	10	PAHZZ	5905-00-147-0388	RCR42G301JS	81349	RESISTOR, FIXED, COMPOSITION: 300 OHMS, PORM 5%, .50 WATT	EA	2
B-5	11	PAHZZ	5905-00-175-8508	RCR42G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, .50 WATT	EA	6
B-5	12	PAHZZ	5910-00-852-8633	CP11A3KE105K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 MMF, 400 VDCW, PORM 10%	EA	1
B-5	13	PAHZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .50 WATT	EA	1
B-5	14	PAHZZ	5905-00-141-1130	RCR20G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 5%, .50 WATT	EA	2
B-5	15	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .50 WATT	EA	2
B-5	16	PAHZZ	5910-00-192-2255	CC21CH040C	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 4.0 MMF, PORM .25 MMF, 500 VDCW	EA	2
B-5	17	PAHZZ	5905-00-195-9108	RCR32G133JS	81349	RESISTOR, FIXED, COMPOSITION: 13K OHMS, PORM 5%, 1 WATT	EA	2
B-5	18	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF,400 VDCW, PORM 20%	EA	2
B-5	19	PAHZZ	5905-00-114-5398	RCR20G225JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2 MEG OHMS, PORM 5%, .50 WATT	EA	2
B-5	20	PAHZZ	5905-00-141-0595	RCR20G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .50 WATT	EA	4
B-5	21	PAHZZ	5905-00-500-9152	RCR42G133JS	81349	RESISTOR, FIXED, COMPOSITION: 13 K OHMS, PORM 5%, 2 WATT	EA	2
B-5	22	PAHZZ	5910-00-722-3539	CC21CK020C	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2.0 MMF, PORM .25 MMF, 500 VDCW	EA	1
B-5	23	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR,FIXED, CERAMIC DIELECTRIC: 10 K MMF, PORM 10%, 500 VDCW	EA	1
B-5	24	PAHZZ	5905-00-532-0595	RCR32G910JS	81349	RESISTOR, FIXED, COMPOSITION: 91 OHMS, PORM 5%, 1 WATT	EA	1
B-5	25	PAHZZ	5905-00-141-0725	RCR20G364JS	81349	RESISTOR, FIXED, COMPOSITION: .36 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-5	26	PAHZZ	5905-00-141-1116	RCR20G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5,600 OHMS, PORM 5%, .50 WATT	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-5	27	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: 15 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-5	28	PAHZZ	5905-00-116-8558	RCR20G155JS	81349	RESISTOR, FIXED, COMPOSITION: 1.5 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-5	29	PAHZZ	5905-00-114-5361	RCR20G121JS	81349	RESISTOR, FIXED, COMPOSITION: 120 OHMS, PORM 5%, .50 WATT	EA	1
B-5	30	PAHZZ	5905-00-110-0310	RCR20G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .50 WATT	EA	2
B-5	31	PAHZZ	5905-00-116-8567	RCR20GF750JS	81349	RESISTOR, FIXED, COMPOSITION: 75 OHMS, PORM 5%, .50 WATT	EA	1
B-5	32	PAHZZ	5960-00-888-7732	2E	07387	RETAINER, ELECTRON TUBE	EA	2
B-5	33	XDHZZ	5305-00-054-5649	MS51957-15	96906	SCREW, MACHINE: NO. 4-40 X 3/8 IN. LG	EA	2
B-5	34	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	5
B-5	35	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN HEX: NO. 4-40	EA	21
B-5	36	XDHZZ		GB4802	70117	CHASSIS SUBASSEMBLY	EA	1
B-5	37	PAHZZ	5950-00-403-9725	GB4801	70117	TRANSFORMER RADIO FREQUENCY	EA	1
B-5	38	PAHZZ	5950-00-111-0518	506B32	70117	CONTACT ELECTRICAL	EA	2
B-5	39	PAHZZ	5905-00-141-0717	RCR07G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47 K OHMS, PORM 5%, .25 WATT	EA	2
B-5	40	PAOZZ	5960-00-852-0235	6BQ5	81349	ELECTRON TUBE	EA	2
B-5	41	PAOZZ	5960-00-262-0210	5814A	81349	ELECTRON TUBE	EA	4
B-5	42	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	4
B-5	43	PAHZZ	5910-00-126-1613	CV11B130	81349	CAPACITOR, VARIABLE	EA	1
B-5	44	XDHZZ	5305-00-947-2169	MS35275-217	96906	SCREW, MACHINE: NO. 4-40 X 1/2 IN. LG	EA	4
B-5	45	XDHZZ		505D1-4	70117	WASHER, NONMETAL	EA	8
B-5	46	PAHZZ	5910-00-668-4582	CV11D450	81349	CAPACITOR, VARIABLE	EA	1
B-5	47	PAHZZ	5910-00-946-7626	CH12A3NE105K	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 MFD, PORM 10%, 400 VDCW	EA	2
B-5	48	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX: NO. 6-32	EA	2
B-5	49	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK SPRING: NO. 6	EA	9
B-5	50	XDHZZ	5310-00-209-1366	MS35335-58	96906	WASHER, LOCK: EXT NO. 6	EA	2
B-5	51	PAHZZ	5905-00-106-9352	RCR20G112JS	81349	RESISTOR, FIXED, COMPOSITION: 1.1 K OHMS, PORM 5%, .50 WATT	EA	1
B-5	52	XDHZZ		GC1998-2	70117	BRACKET ASSEMBLY	EA	1
B-5	53	PAHZZ	5905-00-279-1972	RC42GF113J	81349	RESISTOR, FIXED, COMPOSITION: 11 K OHMS, PORM 5%, 2 WATT	EA	2
B-5	54	PAHZZ	6625-00-958-8809	3X5K6341C	57711	SHAFT, DRIVE, FLEXIBLE	EA	1
B-5	55	XDHZZ		MS51053-312	96906	SETSCREW: NO. 4-40 X 1/8 IN. LG	EA	4
B-5	56	PAHZZ	5360-00-739-1370	518A209	70117	SPRING	EA	1
B-5	57	PAHZZ	5905-00-542-8055	RVNAYSB501A	70117	RESISTOR, VARIABLE	EA	1
B-5	58	PAHZZ	5905-00-539-4897	RV4LAYSA501A	81349	RESISTOR, VARIABLE: 500 OHMS, PORM 10%	EA	1
B-5	59	PAHZZ	5905-00-646-5958	RV4LAYSA102A	81349	RESISTOR, VARIABLE L.0 K OHMS, PORM 10%	EA	1
B-5	60	XDHZZ	5910-00-868-0352	511A60-1	70117	RETAINER, CAPACITOR	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-5	61	XDHZZ	5305-00-054-6650	MS51957-26	96906	SCREW, MACHINE: NO. 6-32 x 1/4 IN. LG	EA	3
B-5	62	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	1
B-5	63	PAHZZ	5325-00-286-6047	54G	70485	GROMMET, RUBBER	EA	7
B-5	64	PAHZZ	6625-00-628-7426	512B280-2	70117	GROMMET SECTION	EA	1
B-5	65	PAHZZ	5325-00-619-7261	8051	75543	GROMMET, RUBBER	EA	3
B-5	66	PAHZZ	5340-00-813-5391	210M	75543	GASKET	EA	2
B-5	67	PAHZZ	5325-00-813-5390	807	75543	GROMMET, RUBBER	EA	1
B-5	68	PAHZZ	5910-00-816-6612	P88827	56289	CAPACITOR, FIXED, PAPER DIELECTRIC	EA	1

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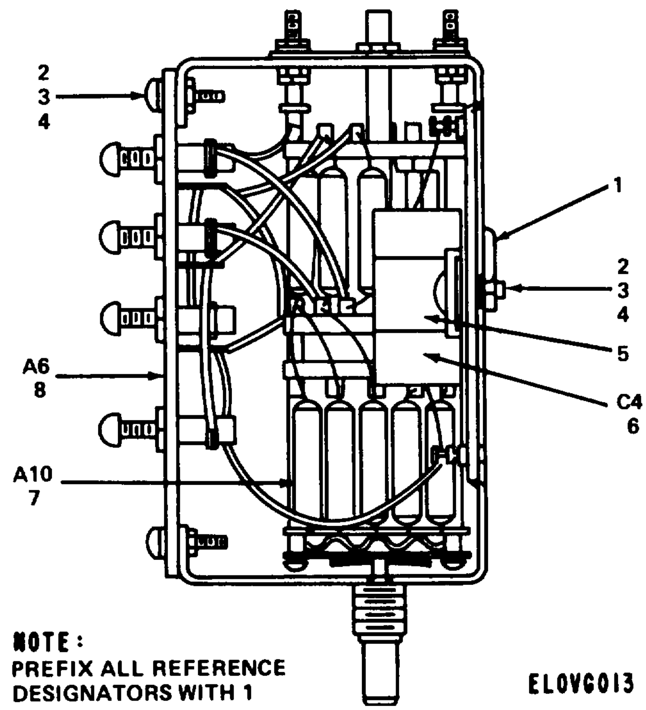

Figure B-6. Switch assembly, side view.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-6		XDHHH		GC2015-2	70117	SWITCH ASSEMBLY (SEE FIGURE B-2 FOR NHA)	EA	REF
B-6	1	PAHZZ	5325-00-286-6047	54G	70485	GROMMET, RUBBER	EA	1
B-6	2	PAHZZ	5310-00-934-9748	MS35649-44	96906	NUT, PLAIN HEXAGON: NO. 4-40	EA	1
B-6	3	PAHZZ	5305-00-054-5650	MS35233-16	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/16 IN. LG	EA	5
B-6	4	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK SPRING: NO. 4	EA	5
B-6	5	XDHZZ		WC5-8-6	95987	CLAMP, LOOP	EA	1
B-6	6	PAHZZ	5910-00-280-5297	P8292ZN29	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, 600V, PORM 20%	EA	1
B-6	7	XDHZZ		GD4899	70117	SWITCH ASSEMBLY (SEE FIGURE B-7 FOR BREAKDOWN)	EA	1
B-6	8	PAHZZ	5910-00-901-1449	GC1751	70117	CAPACITOR ASSEMBLY (SEE FIGURE B-8 FOR BREAKDOWN)	EA	1

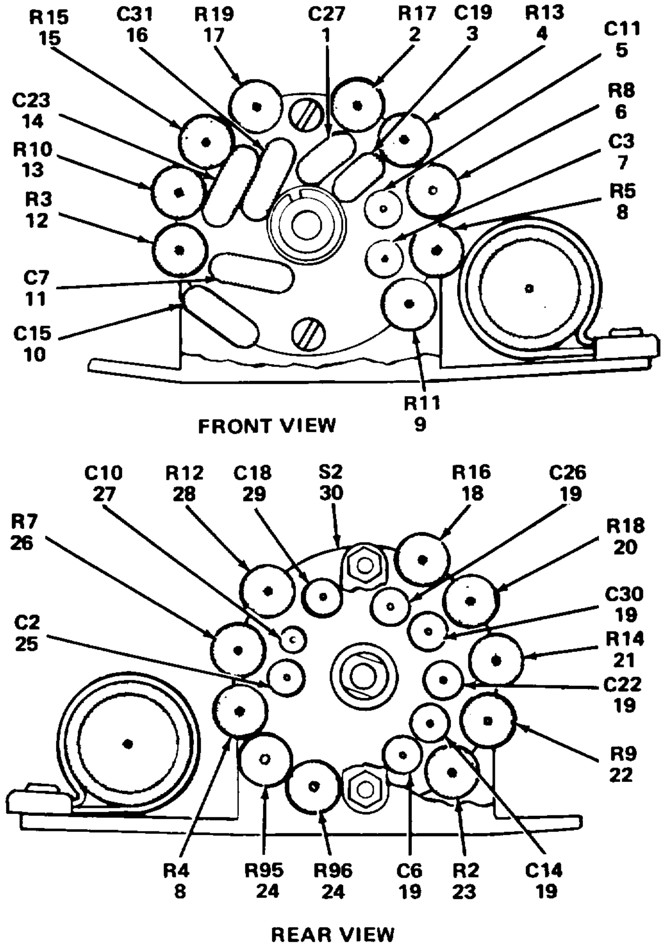

Figure B-7. Switch assembly, front and rear view.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-7		XDHHH		GD4899	70117	SWITCH ASSEMBLY (SEE FIGURE B-6 FOR NHA)	EA	REF
B-7	1	PAHZZ		CM05F221G03	81349	CAPACITOR, FIXED, DIELECTRIC: 220 MMF, PORM 2%	EA	1
B-7	2	PAHZZ	5905-00-433-1321	RNC70K4992FS	81349	RESISTOR, FIXED, FILM: 50 K OHMS, PORM 1% .5 WATT	EA	1
B-7	3	PAHZZ	5910-00-781-7929	CM05F910G03	81349	CAPACITOR, FIXED, DIELECTRIC: 91 MMF, PORM 2%	EA	1
B-7	4	PAHZZ	5905-00-329-6085	RNC70K1003FS	81349	CAPACITOR FIXED, FILM: 100 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	5	PAHZZ	5910-00-660-7502	CC21CH240G	81349	CAPACITOR, FIXED, DIELECTRIC: 24 MMF, PORM 2%, 500 VDCW	EA	1
B-7	6	PAHZZ	5905-00-430-2232	RNC70K2493FS	81349	RESISTOR, FIXED, FILM: 250 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	7	PAHZZ	5910-00-722-3539	CC21CK020C	81349	CAPACITOR, FIXED, DIELECTRIC: 2.0 MMF, PORM .25% 500 VDCW	EA	1
B-7	8	PAHZZ	5905-00-340-9787	RNC70K4993FS	81349	RESISTOR, FIXED, FILM: 500 K OHMS, PORM 1%, .5 WATT	EA	2
B-7	9	PAHZZ	5905-00-233-0852	RNC70K1004FS	81349	RESISOTR, FIXED FILM: 1 MEG OHMS, PORM 1%, .5 WATT	EA	1
B-7	10	PAHZZ	5910-00-728-1583	CM06F242G03	81349	CAPACITOR, FIXED, DIELECTRIC: 2400 MMF, PORM 2%, 500 VDCW	EA	1
B-7	11	PAHZZ	5910-00-079-5253	CM06F472G03	81349	CAPACITOR, FIXED, DIELECTRIC: 4700 MMF, PORM 2%, 500 VDCW	EA	1
B-7	12	PAHZZ	5905-00-341-1036	RNC70K2491FS	81349	RESISTOR, FIXED, FILM: 2.5 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	13	PAHZZ	5905-00-236-1360	RNC70K4991FS	81349	RESISTOR, FIXED, FILM: 5 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	14	PAHZZ	5910-00-880-6080	CM06F122G03	81349	CAPACITOR, FIXED, DIELECTRIC: 1200 MMF, PORM 2%, 500 VDCW	EA	1
B-7	15	PAHZZ	5905-00-201-6784	RNC70K1002FS	81349	RESISTOR, FIXED, FILM: 10 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	16	PAHZZ	5910-00-717-0167	CM06F471G03	81349	CAPACITOR, FIXED, DIELECTRIC: 470 MMF, PORM 2%, 500 VDCW	EA	1
B-7	17	PAHZZ	5905-00-009-2980	RNC70K2492FS	81349	RESISTOR, FIXED, FILM: 25 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	18	PAHZZ	5905-00-959-4569	RN70D9533F	81349	RESISTOR, FIXED, FILM: 950 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	19	PAHZZ	5910-00-543-0820	CC21CH070C	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 7.0 MMF, PORM .25%, 500 VDCW	EA	5
B-7	20	PAHZZ	5905-00-340-9710	RNC70K9763FS	81349	RESISTOR, FIXED, FILM: 975 K OHMS. PORM 1%, .5 WATT	EA	1
B-7	21	PAHZZ	5905-00-233-0852	RNC70K1004FS	81349	RESISTOR, FIXED, FILM: 1 MEG OHMS. PORM 1%, .5 WATT (REPLACES 990 K OHMS)	EA	1
B-7	22	PAHZZ	5905-00-233-0852	RNC70K1004FS	81349	RESISTOR, FIXED FILM: 1 MEG OHMS, PORM 1%, .5 WATT (REPLACES 995 K OHMS)	EA	1
B-7	23	PAHZZ	5905-00-233-0852	RNC70K1004FS	81349	RESISTOR, FIXED FILM: 1 MEG OHMS, PORM 1%, .5 WATT (REPLACES 997 K OHMS)	EA	1
B-7	24	PAHZZ	5905-00-133-0382	RC07GF6R8J	81349	RESISTOR FIXED, COMPOSITION: 6.8 OHMS, PORM 5%, .125 WATT	EA	2
B-7	25	PAHZZ	5910-00-681-9437	CC21CH220G	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 22 MMF, PORM 2%, 500 VDC	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-7	26	PAHZZ	5905-00-112-7183	RNC70K7503FS	81349	RESISTOR, FIXED, FILM: 750 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	27	PAHZZ	5910-00-726-8696	CC22CH120G	81349	CAPACITOR, FIXED, DIELECTRIC: 12.0 MMF, PORM 2%, 500 VDCW	EA	1
B-7	28	PAHZZ	5905-00-430-6019	RNC70K9093FS	81349	RESISTOR, FIXED, FILM: 900 K OHMS, PORM 1%, .5 WATT	EA	1
B-7	29	PAHZZ	5910-00-577-7916	CC21CH080C	81349	CAPACITOR, FIXED, DIELECTRIC: 8.0 MMF, PORM .25%, 500 VDCW	EA	1
B-7	30	PAHZZ	5930-00-691-0512	195657F3C	76854	SWITCH, ROTARY	EA	1

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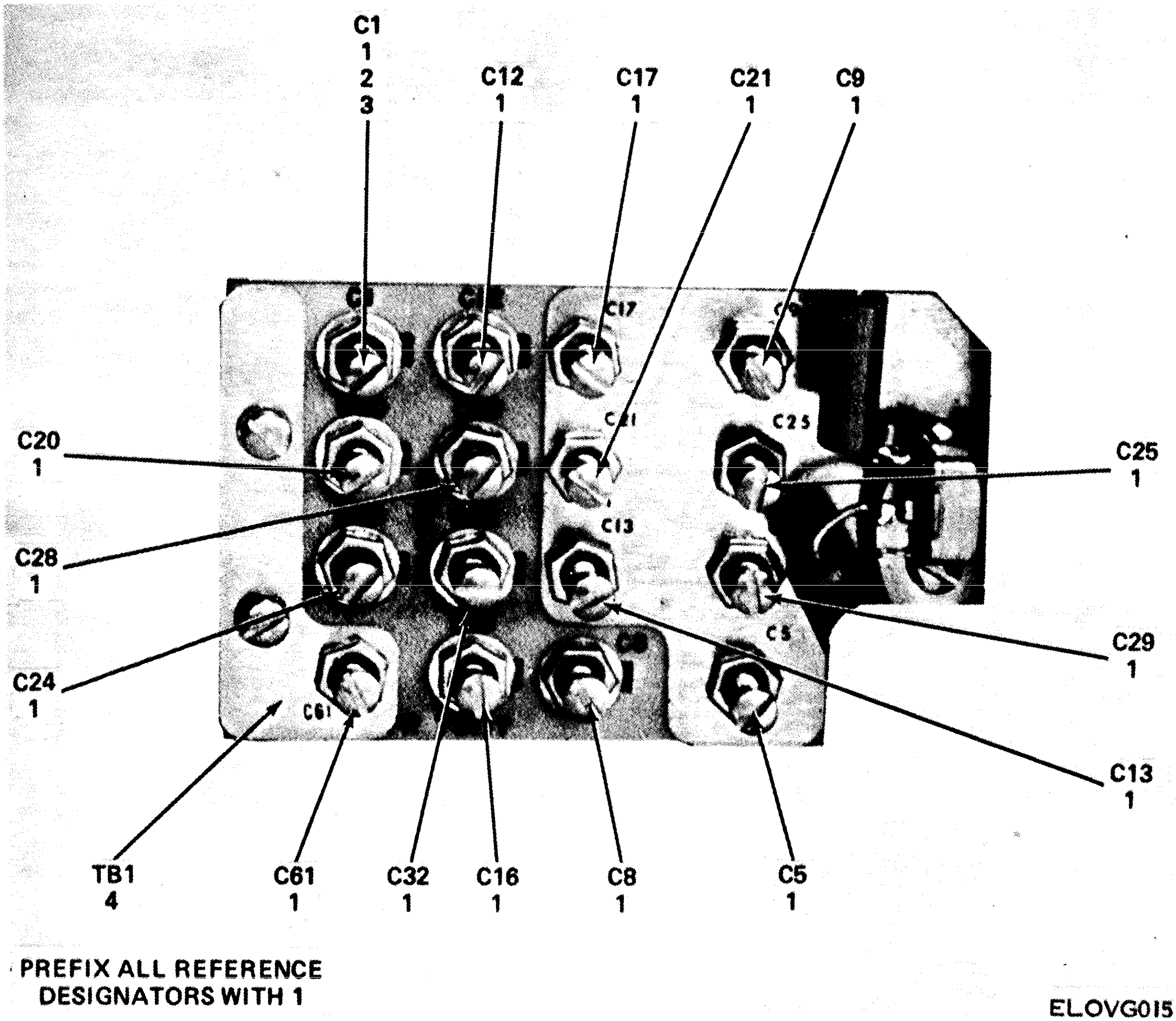

Figure B-8. Capacitor assembly.

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-8		PAHZZ	5910-00-901-1449	GC1751	70117	CAPACITOR ASSEMBLY (SEE FIGURE B-6 FOR NHA)	EA	REF
B-8	1	PAHZZ	5910-00-105-7613	DA1053-002	71590	CAPACITOR, VARIABLE	EA	16
B-8	2	XDHZZ		6T32	77122	NUT, STAMPED	EA	16
B-8	3	XDHZZ	5305-00-043-2245	6-32X562F1LHSST	70117	SCREW, MACHINE	EA	16

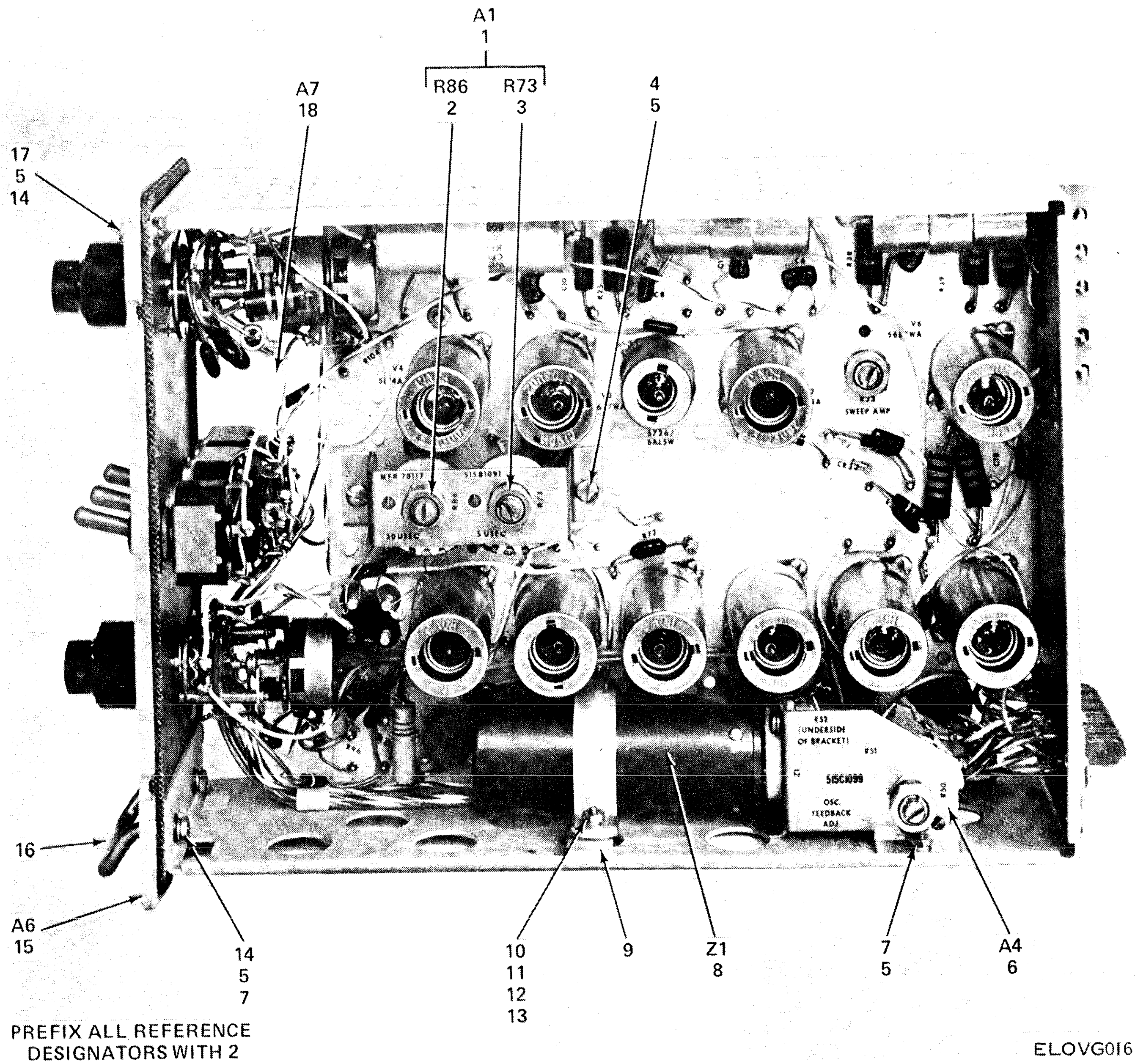

Figure B-9. ① Sweep and intensity mark unit (sheet l of 4).

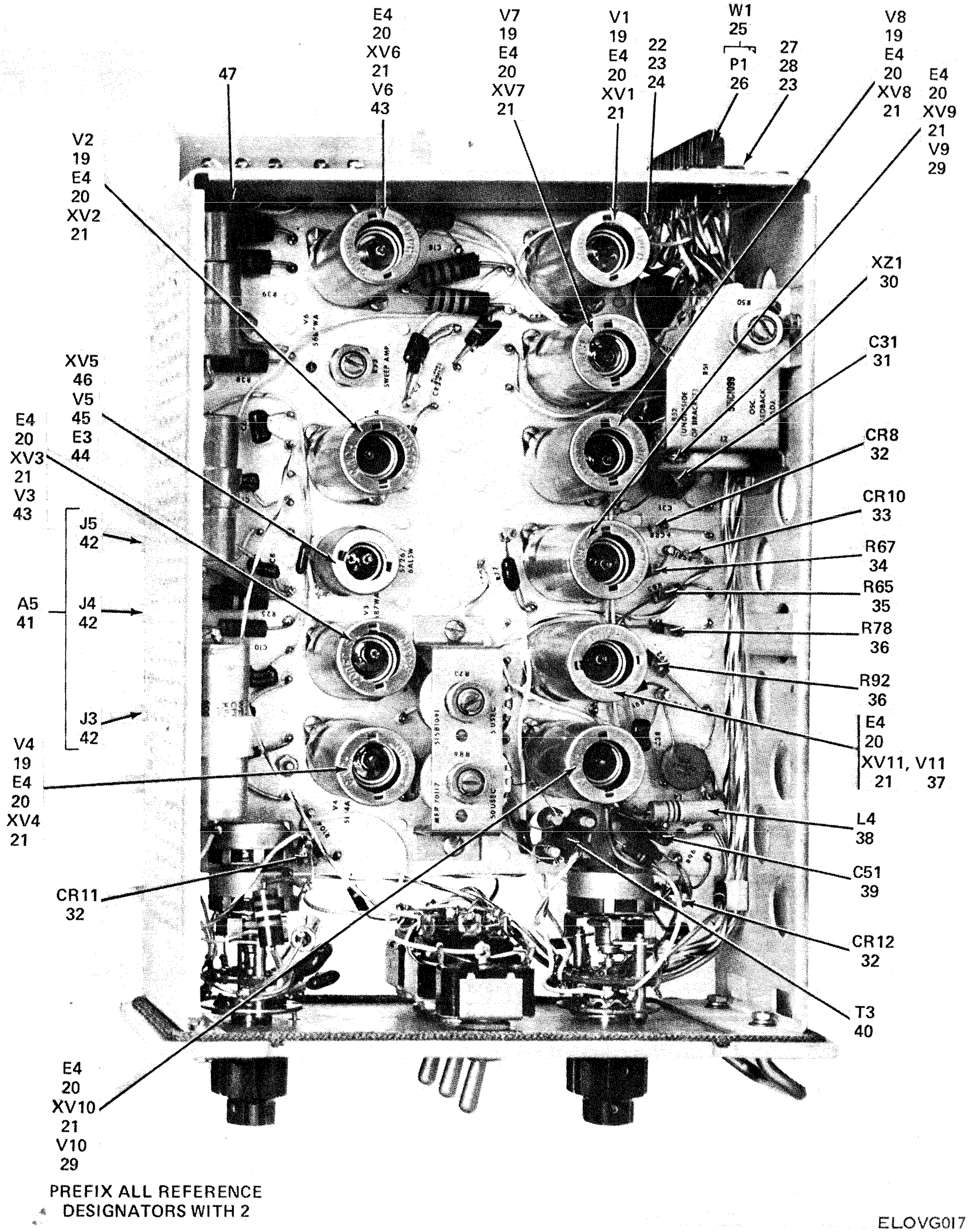

Figure B-9. ② Sweep and intensity mark unit (sheet 2 0f 4).

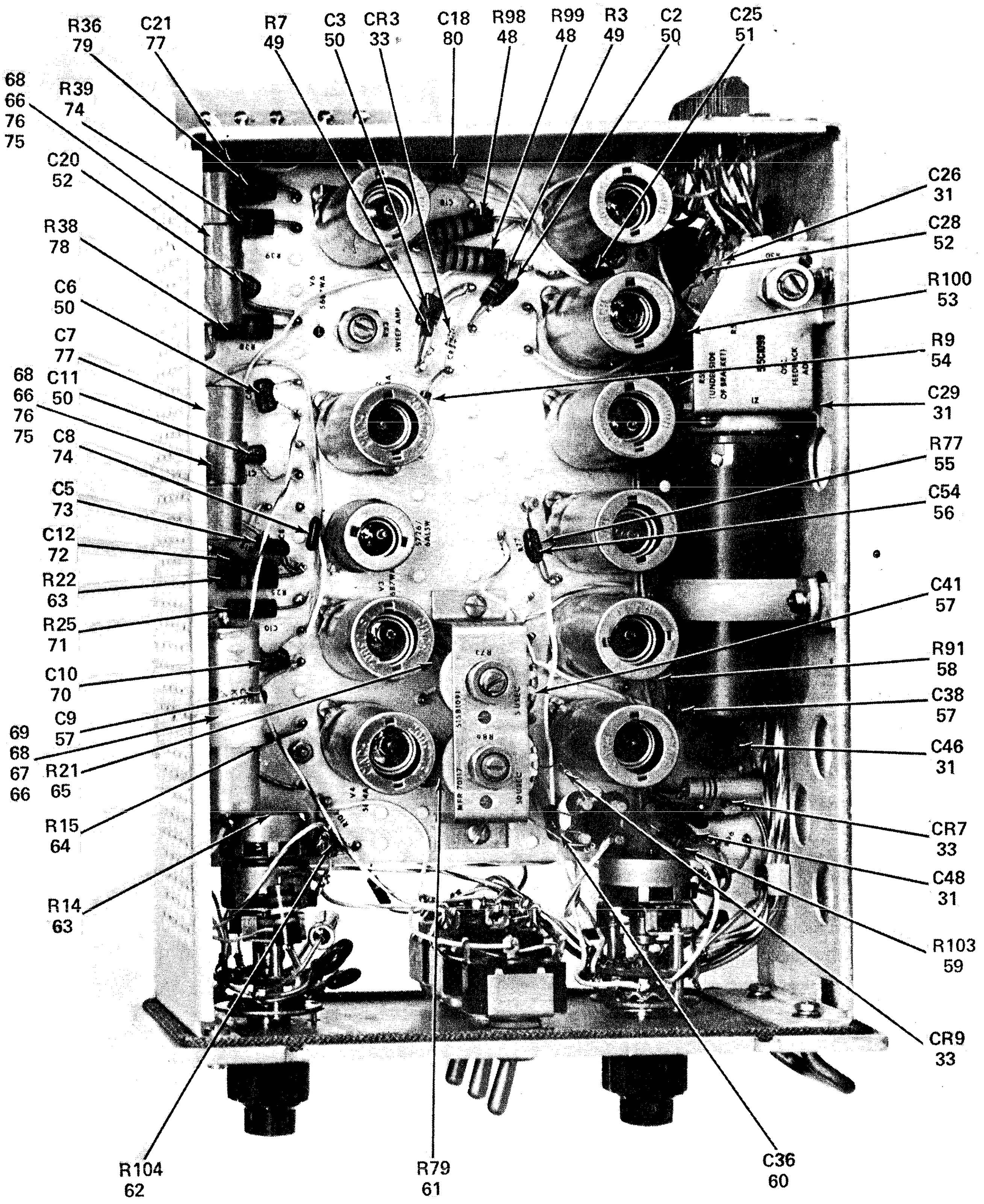

Figure B-9. ③ Sweep and intensity mark unit (sheet 3 of 4).

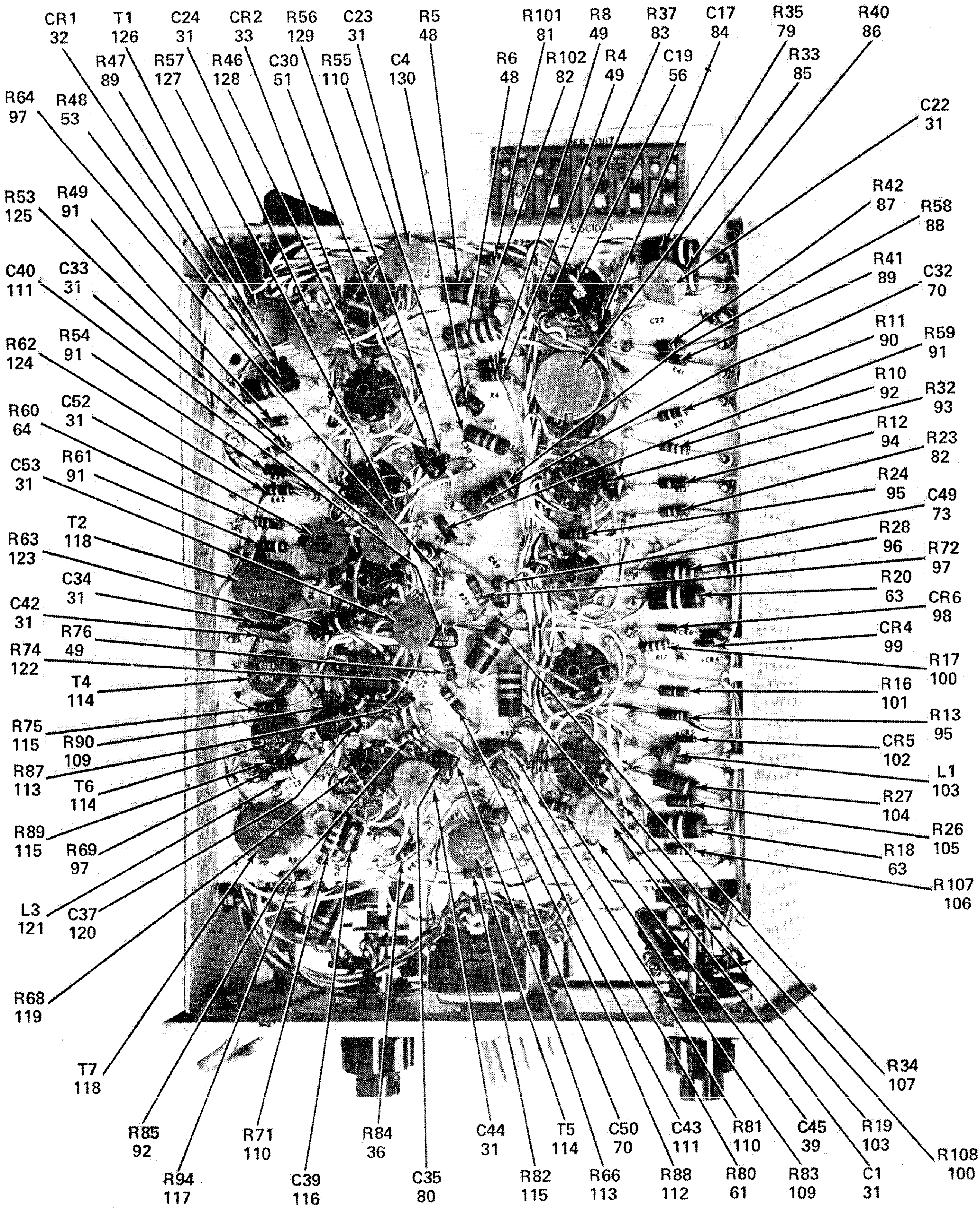

Figure B-9. ④ Sweep and intgensity mark unit (sheet 4 of 4).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0102 - SWEEP AND INTENSITY MARK UNIT		
B-9		XDHHH		GE2072-6	70117	SWEEP AND INTENSITY MARK UNIT	EA	REF
B-9	1	XDHHH		GB2068	70117	RESISTOR ASSEMBLY	EA	1
B-9	2	PAHZZ	5905-00-686-4108	RV2LAYSA253A	81349	RESISTOR VARIABLE: 25 K OHMS, PORM 10%	EA	1
B-9	3	PAHZZ	5905-00-722-3822	RV2LAYSA502A	81349	RESISTOR, VARIABLE: 5 K OHMS, PORM 10%	EA	1
B-9	4	XDHZZ	5305-00-054-6650	MS51957-26	96906	SCREW, MACHINE: NO. 6-32 X 1/4 IN. LG	EA	2
B-9	5	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: NO. 6	EA	13
B-9	6	XDHHH		GC2071-2	70117	RESISTOR ASSEMBLY (SEE FIGURE B-10 FOR BREAKDOWN)	EA	1
B-9	7	PAHZZ	5310-00-934-8761	MS35649-264	96906	NUT, PLAIN, HEX: NO. 6-32	EA	6
B-9	8	PAHHH	5950-00-626-2826	GC1932-2	70117	RADIO FREQUENCY, TRANSFORMER ASSEMBLY (SEE FIGURE B-11 FOR BREAKDOWN)	EA	1
B-9	9	XDHZZ		WC1-1-4-6	95987	CLAMP, LOOP	EA	1
B-9	10	PAHZZ	5305-00-054-5650	MS35233-16	96906	SCREW, MACHINE: NO. 4-40 X 7/16 IN. LG	EA	1
B-9	11	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	1
B-9	12	XDHZZ	5340-00-416-9292	D6-128	95987	WASHER, FLAT: NO. 4	EA	1
B-9	13	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	1
B-9	14	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	7
B-9	15	XDHZZ		GD2070-5	70117	PANEL ASSEMBLY (SEE FIGURE B-12 FOR BREAKDOWN)	EA	1
B-9	16	PAHZZ	5340-00-880-4853	537B70-1	70117	HANDLE, BOW	EA	1
B-9	17	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE: NO. 6-32 X 7/16 IN. LG	EA	3
B-9	18	XDHHH		GJ4906	70117	CHASSIS ASSEMBLY	EA	1
B-9	19	PAOZZ	5960-00-262-0210	5814A	81349	ELECTRON TUBE	EA	5
B-9	20	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	10
B-9	21	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE	EA	10
B-9	22	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: NO. 4-40 X 1/4 IN. LG	EA	22
B-9	23	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	35
B-9	24	XDHZZ	5310-00-550-3715	MS35333-70	96906	WASHER, LOCK: NO. 4	EA	22
B-9	25	XDHZZ		GD2104	70117	WIRING ASSEMBLY	EA	1
B-9	26	PAHZZ	5935-00-623-7199	26-4100-24P	02660	CONNECTOR, RECEPTACLE, ELECTRICAL: 24 PIN	EA	1
B-9	27	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: NO. 4-40 X 5/16 IN. LG	EA	2
B-9	28	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	13
B-9	29	PAOZZ	5960-00-729-6963	6U8A	81349	ELECTRON TUBE	EA	2
B-9	30	PAHZZ	5935-00-129-9358	TS101P02	81349	SOCKET, ELECTRON TUBE	EA	1
B-9	31	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 K MMF, 500 VDCW	EA	15
B-9	32	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	4
B-9	33	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	5
B-9	34	PAHZZ	5905-00-141-0593	RCR20G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .5 WATT	EA	1
B-9	35	PAHZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 10%, .5 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-9	36	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 10%, .5 WATT		EA	3
B-9	37	PAOZZ	5960-00-262-0161	12AT7WA	81349	ELECTRON TUBE		EA	1
B-9	38	PAHZZ	5950-00-079-6045	MS91189-29	96906	COIL, RADIO FREQUENCY: 22 UF		EA	1
B-9	39	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW		EA	2
B-9	40	PAHZZ	5950-00-086-0236	572C13-1	70117	TRANSFORMER, RADIO FREQUENCY		EA	1
B-9	41	XDHHH		GD1596-2	70117	CHASSIS ASSEMBLY		EA	1
B-9	42	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP		EA	3
B-9	43	PAOZZ	5960-00-179-4749	5687WB	81349	ELECTRON TUBE		EA	2
B-9	44	PAHZZ	5960-00-858-5172	TS103U01	81349	SHIELD, ELECTRON TUBE		EA	1
B-9	45	PAOZZ	5960-00-879-5078	5726	81349	TUBE, ELECTRON		EA	1
B-9	46	PAHZZ	5935-00-132-2405	TS102P01	81349	SOCKET, ELECTRON TUBE		EA	1
B-9	47	PAHZZ	5325-00-286-6047	54G	70485	GROMMET, RUBBER		EA	5
B-9	48	PAHZZ	5905-00-222-2144	RCR42G333JS	81349	RESISTOR, FIXED, COMPOSITION: 33 K OHMS, PORM 5%, 2 WATT		EA	4
B-9	49	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: .15 MEG OHMS, PORM 5%, .5 WATT		EA	5
B-9	50	PAHZZ	5910-00-902-0335	CM05C100K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 10 PF, PORM 10%, 500 VDCW		EA	4
B-9	51	PAHZZ	5910-00-051-4612	CM05E220J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 22 PF, PORM 5%, 500 VDCW		EA	2
B-9	52	PAHZZ	5910-00-954-5500	CM05FD151G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 150 PF, PORM 5%, 500 VDCW		EA	2
B-9	53	PAHZZ	5905-00-140-6155	RCR42G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22 K OHMS, PORM 5%, 2 WATT		EA	2
B-9	54	PAHZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47 K OHMS, PORM 10%, .5 WATT		EA	1
B-9	55	PAHZZ	5905-00-108-6922	RCR20G151JS	81349	RESISTOR, FIXED, COMPOSITION: 150 OHMS, PORM 5%, .5 WATT		EA	1
B-9	56	PAHZZ		DM15F471J0	72136	CAPACITOR, FIXED, MICA DIELECTRIC: 470 PF, PORM 5%, 500 VDCW		EA	2
B-9	57	PAHZZ		DM15C150J0	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 15 PF, PORM 5%, 500 VDCW		EA	3
B-9	58	PAHZZ	5905-00-114-5361	RCR20G121JS	81349	RESISTOR, FIXED, COMPOSITION: 120 OHMS, PORM 5%, .5 WATT		EA	1
B-9	59	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .5 WATT		EA	1
B-9	60	PAHZZ	5910-00-088-1624	CM05F221J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 220 PF, PORM 5%, 500 VDCW		EA	1
B-9	61	PAHZZ	5905-00-141-0600	RCR20G822JS	81349	RESISTOR, FIXED, COMPOSITION: 8,200 OHMS, PORM 5%, .5 WATT		EA	2
B-9	62	PAHZZ	5905-00-111-4741	RCR20G242JS	81349	RESISTOR, FIXED, COMPOSITION: 2,400 OHMS, PORM 5%, .5 WATT		EA	1
B-9	63	PAHZZ	5905-00-759-8896	RCR42G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG OHMS PORM 10%, 2 WATT		EA	4
B-9	64	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10 K OHMS, PORM 10%, .5 WATT		EA	2

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-9	65	PAHZZ	5905-00-145-9617	RCR42G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, 2 WATT	EA	1
B-9	66	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN HEX: NO. 6-32	EA	3
B-9	67	XDHZZ	5310-00-903-5575	504C2-2-52	70117	WASHER, FLAT: NO. 6	EA	1
B-9	68	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: NO. 6	EA	3
B-9	69	XDHZZ		WC3-4-6NA	95987	CLAMP, LOOP	EA	1
B-9	70	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	3
B-9	71	PAHZZ	5905-00-244-7911	RCR32G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, 1 WATT	EA	1
B-9	72	PAHZZ	5910-00-681-9336	DM15C020D0	72136	CAPACITOR, FIXED, MICA DIELECTRIC: 2 PF, 500 VDCW	EA	1
B-9	73	PAHZZ	5910-00-067-5697	CM05E270J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC, 27 PF, PORM 5%, 500 VDCW	EA	2
B-9	74	PAHZZ	5910-00-902-0031	CM05C050K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 5 PF, PORM 10%, 500 VDCW	EA	1
B-9	75	PAHZZ	5305-00-763-6963	MS35249-35	96906	SCREW, MACHINE: NO. 6-32 X 3/8 IN. LG	EA	2
B-9	76	PAHZZ	5310-00-614-3552	MS35335-59	96906	WASHER, LOCK: EXT. NO. 8	EA	2
B-9	77	PAHZZ	5910-00-946-7626	CH12A3NE105K	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 1.0 MFD, PORM 10%, 400 VDCW	EA	2
B-9	78	PAHZZ	5905-00-185-8530		81349	RESISTOR, FIXED, COMPOSITION: 7,500 OHMS, PORM 5%, 2 WATT	EA	4
B-9	79	PAHZZ	5905-00-005-2868	RCR42G393JS	81349	RESISTOR, FIXED, COMPOSITION: 39 K OHMS, PORM 5%, 2 WATT	EA	4
B-9	80	PAHZZ	5910-00-984-7588	CM05F101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, PORM 5%, 500 VDCW	EA	2
B-9	81	PAHZZ	5905-00-111-4753	RCR20G243JS	81349	RESISTOR, FIXED, COMPOSITION: 24 K OHMS, PORM 5%, .5 WATT	EA	1
B-9	82	PAHZZ	5905-00-113-4854	RCR20G753JS	81349	RESISTOR, FIXED, COMPOSITION: 75 K OHMS, PORM 5%, .5 WATT	EA	2
B-9	83	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .5 WATT	EA	1
B-9	84	PAHZZ	5910-00-936-7372	CM05C120K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 12 PF, PORM 10%, 500 VDCW	EA	1
B-9	85	PAHZZ	5905-00-722-3822	RV2LAYSA502A	81349	RESISTOR, VARIABLE: 5 K OHMS, PORM 10%	EA	1
B-9	86	PAHZZ	5905-00-874-0147	RCR42G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47 K OHMS, PORM 5%, 2 WATT	EA	1
B-9	87	PAHZZ	5905-00-114-5456	RCR20G684JS	81349	RESISTOR, FIXED, COMPOSITION: .68 MEG OHMS, PORM 5%, .5 WATT	EA	1
B-9	88	PAHZZ	5905-00-650-9808	RCR42G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, 2 WATT	EA	1
B-9	89	PAHZZ	5905-00-111-4732	RCR20G125JS	81349	RESISTOR, FIXED, COMPOSITION: 1.2 MEG OHMS, PORM 5%, .5 WATT	EA	2
B-9	90	PAHZZ	5905-00-141-1071	RCR20G474JS	81349	RESISTOR, FIXED, COMPOSITION: .47 MEG OHMS, PORM 5%, .5 WATT	EA	1
B-9	91	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1 K OHMS, PORM 5%, .5 WATT	EA	3
B-9	92	PAHZZ	5905-00-141-0599	RCR20G393JS	81349	RESISTOR, FIXED, COMPOSITION: 39 K OHMS, PORM 5%, .5 WATT	EA	3

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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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-9	93	PAHZZ	5905-00-935-8545	RCR20G183JS	81349	RESISTOR, FIXED, COMPOSITION: 18 K OHMS, PORM 5%, .5 WATT	EA	1
B-9	94	PAHZZ	5905-00-141-0594	RCR20G622JS	81349	RESISTOR, FIXED, COMPOSITION: 6,200 OHMS, PORM 5%, .5 WATT	EA	1
B-9	95	PAHZZ	5905-00-114-5441	RCR20G563JS	81349	RESISTOR, FIXED, COMPOSITION: 56 K OHMS, PORM 5%, .5 WATT	EA	2
B-9	96	PAHZZ	5905-00-494-5140	RCR32G434JS	81349	RESISTOR, FIXED, COMPOSITION: .43 MEG OHMS, PORM 5%, 1 WATT	EA	1
B-9	97	PAHZZ	5905-00-111-4858	RCR20G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .5 WATT	EA	3
B-9	98	PAHZZ	5961-00-752-5351	1N643	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-9	99	PAHZZ		1N979B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-9	100	PAHZZ	5905-00-104-8330	RCR20G333JS	81349	RESISTOR, FIXED, COMPOSITION: 33 K OHMS, PORM 5%, .5 WATT	EA	2
B-9	101	PAHZZ	5905-00-114-5489	RCR20G823JS	81349	RESISTOR, FIXED, COMPOSITION: 82 K OHMS, PORM 5%, .5 WATT	EA	1
B-9	102	PAHZZ	5961-00-543-0490	1N459	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-9	103	PAHZZ	5950-00-023-8109	573B11-40	70117	COIL, RADIO FREQUENCY	EA	1
B-9	104	PAHZZ	5905-00-247-8733	RCR32G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5,600 OHMS, PORM 5%, 1 WATT	EA	1
B-9	105	PAHZZ	5905-00-114-5366	RCR20G132JS	81349	RESISTOR, FIXED, COMPOSITION: 1,300 OHMS, PORM 5%, .5 WATT	EA	1
B-9	106	PAHZZ	5905-00-104-8346	RCR20G334JS	81349	RESISTOR, FIXED, COMPOSITION: .33 MEG OHMS, PORM 5%, .5 WATT	EA	1
B-9	107	PAHZZ	5905-00-005-2867	RCR42G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15 K OHMS, PORM 5%, 2 WATT	EA	1
B-9	108	PAHZZ	5905-00-500-9152	RCR42G133JS	81349	RESISTOR, FIXED, COMPOSITION: 13 K OHMS, PORM 5%, 2 WATT	EA	1
B-9	109	PAHZZ	5905-00-116-8566	RCR20G680JS	81349	RESISTOR, FIXED, COMPOSITION: 68 OHMS, PORM 5%, .5 WATT	EA	2
B-9	110	PAHZZ	5905-00-247-8735	RCR32G563JS	81349	RESISTOR, FIXED, COMPOSITION: 56 K OHMS, PORM 5%, 1 WATT	EA	3
B-9	111	PAHZZ	5910-00-957-8577	CM05E680J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 68 PF, PORM 5%, 500 VDCW	EA	2
B-9	112	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG OHMS, PORM 5%, .50 WATT	EA	1
B-9	113	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10 K OHMS, PORM 5%, .5 WATT	EA	2
B-9	114	PAHZZ	5950-00-713-6941	EP12415	99772	TRANSFORMER, PULSE	EA	3
B-9	115	PAHZZ	5905-00-141-1116	RCR20G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5,600 OHMS, PORM 5%, .5 WATT	EA	3
B-9	116	PAHZZ	5910-00-954-5498	CM05F181J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 180 PF, PORM 5%, 500 VDCW	EA	1
B-9	117	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG OHMS, PORM 10%, .5 WATT	EA	1
B-9	118	PAHZZ	5950-00-844-5445	574C34-1	70117	TRANSFORMER, PULSE	EA	2
B-9	119	PAHZZ	5905-00-935-8544	RCR20G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 5%, .5 WATT	EA	1
B-9	120	PAHZZ	5910-00-965-9441	CM06F102J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 1 K PF, PORM 5%, 500 VDCW	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-9	121	PAHZZ	5950-00-724-6209	MS75008-39	96906	COIL, RADIO FREQUENCY		EA	1
B-9	122	PAHZZ	5905-00-106-1273	RCR20G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15 K OHMS, PORM 5%, .5 WATT		EA	1
B-9	123	PAHZZ	5905-00-104-8352	RCR32G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15 K OHMS, PORM 5%, 1 WATT		EA	1
B-9	124	PAHZZ	5905-00-116-8565	RCR20G623JS	81349	RESISTOR, FIXED, COMPOSITION: 62 K OHMS, PORM 5%, .5 WATT		EA	1
B-9	125	PAHZZ	5905-00-141-0600	RCR20G822JS	81349	RESISTOR, FIXED, COMPOSITION: 8,200 OHMS, PORM 10%, .5 WATT		EA	1
B-9	126	PAHZZ	5950-00-846-1338	574C35-2	70117	TRANSFORMER, PULSE		EA	1
B-9	127	PAHZZ	5905-00-104-8350	RCR20G221JS	81349	RESISTOR, FIXED, COMPOSITION: 22 OHMS, PORM 5%, .5 WATT		EA	1
B-9	128	PAHZZ	5905-00-116-8558	RCR20G155JS	81349	RESISTOR, FIXED, COMPOSITION: 1.5 MEG OHMS, PORM 5%, .5 WATT		EA	1
B-9	129	PAHZZ	5905-00-104-8346	RCR20G334JS	81349	RESISTOR, FIXED, COMPOSITION: .33 MEG OHMS, PORM 10%, .5 WATT		EA	1
B-9	130	PAHZZ	5910-01-012-2522	CM05D200J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 20 PF, PORM 5%, 500 VDCW		EA	1

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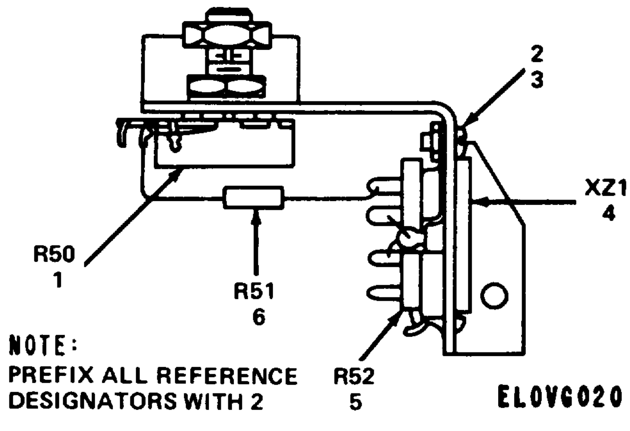

Figure B-10. Resistor assembly,

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-10		XDHHH		GC2071-2	70117	RESISTOR ASSEMBLY (SEE FIGURE B-9 FOR NHA)	EA	1
B-10	1	PAHZZ	5905-00-577-7136	RV2LAYSA102A	81349	RESISTOR, VARIABLE: 1 K OHMS, PORM 10%	EA	1
B-10	2	XDHZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE: PNH, NO. 6-32 X 3/8 IN. LG	EA	2
B-10	3	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPLIT, NO. 6	EA	2
B-10	4	PAHZZ	5935-00-129-9358	TS101P02	81349	SOCKET, ELECTRON TUBE	EA	1
B-10	5	PAHZZ	5905-00-235-3534	RCR32G681JS	81349	RESISTOR, FIXED, COMPOSITION: 680 OHMS, PORM 5%, 1 WATT	EA	1
B-10	6	PAHZZ	5905-00-111-4858	RCR20G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .5 WATT	EA	1

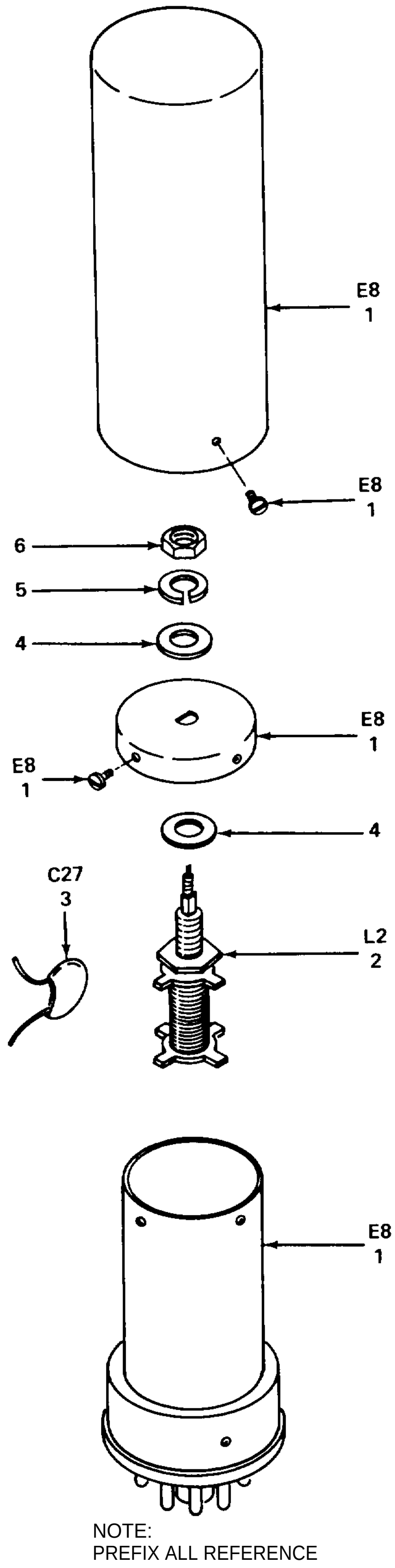

Figure B-11. Radiofrequency transformer assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-11		PAHHH	5950-00-626-2826	GC1932-2	70117	RADIO FREQUENCY TRANSFORMER ASSEMBLY (SEE FIGURE B-9 FOR NHA)	EA	REF
B-11	1	PAHZZ	6625-00-813-5415	574D58	70117	OVEN, TUNED CIRCUIT	EA	1
B-11	2	PAHZZ		ESO-NO-704	99800	TRANSFORMER, RADIO FREQUENCY	EA	1
B-11	3	PAHZZ	5910-00-088-1624	CM05F221J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 220 PF, PORM 5%, 500 VDCW	EA	1
B-11	4	XDHZZ		032X200X340SST	70117	WASHER, FLAT	EA	2
B-11	5	XDHZZ	5310-00-933-8120	MS35338-138	96906	WASHER, LOCK: SPLIT, NO. 10	EA	1
B-11	6	XDHZZ	5310-00-934-9765	MS35650-304	96906	NUT, PLAIN HEX: NO. 10-32	EA	1

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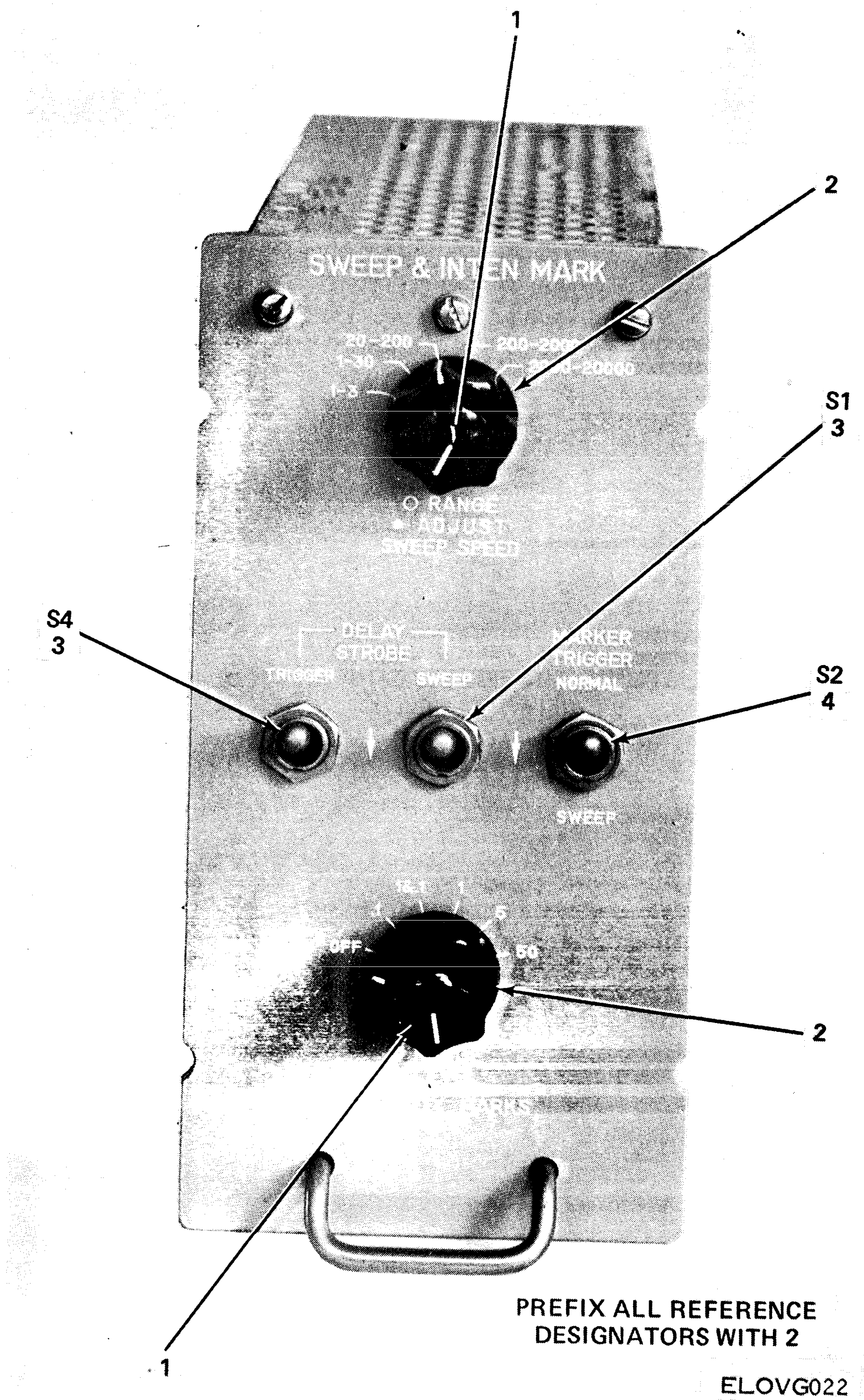

Figure B-12. ① Panel assembly, unit 2 (sheet 1 of 2).

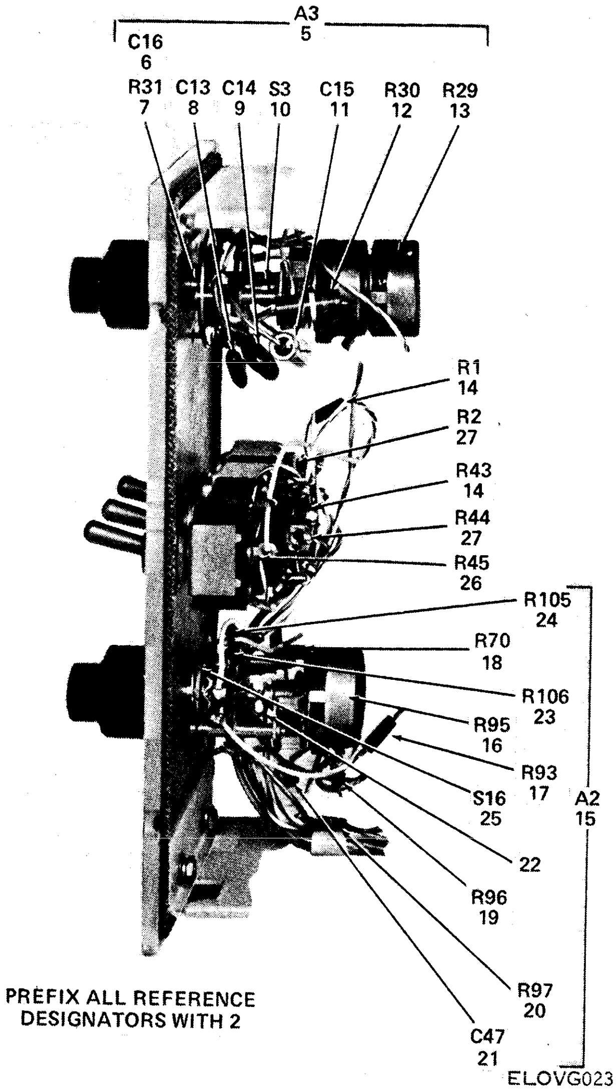

Figure B-12. ② Panel assembly, unit 2 (sheet 1 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-12		XDHHH		GD2070-5	70117	PANEL ASSEMBLY (SEE FIGURE B-9 FOR NHA)	EA	REF
B-12	1	PAHZZ	5355-00-576-5470	S645-5LBB	75376	KNOB	EA	2
B-12	2	PAHZZ	5355-00-819-0067	533A98-3	70117	KNOB	EA	2
B-12	3	PAHZZ	5930-00-615-7880	MS35059-26	96906	SWITCH, TOGGLE	EA	2
B-12	4	PAHZZ	5930-00-655-1515	MS35058-23	96906	SWITCH, TOGGLE	EA	1
B-12	5	XDHHH		GC2064-3	70117	SWEEP SPEED CONTROL ASSEMBLY	EA	1
B-12	6	PAHZZ	5910-00-823-1695	CP05A1KF474K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: .47 MFD, PORM 10%, 600 VDCW	EA	1
B-12	7	PAHZZ	5905-00-121-9859	RCR20G106JS	81349	RESISTOR, FIXED, COMPOSITION: 10 MEG OHMS, PORM 5%, .5 WATT	EA	1
B-12	8	PAHZZ	5910-00-056-7976	CM05FD271G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	1
B-12	9	PAHZZ	5910-00-717-3539	CM06FD332G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 3.3 K PF, PORM 5%, 500 VDCW	EA	1
B-12	10	PAHZZ	5930-00-713-8471	102651F1	76854	SWITCH, ROTARY	EA	1
B-12	11	PAHZZ	5910-00-821-7071	CP05AKE333K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 33K, PORM 10%, 400 VDCW	EA	1
B-12	12	PAHZZ	5905-00-482-7691	RCR42G184JS	81349	RESISTOR, FIXED, COMPOSITION: .18 MEG. OHMS, PORM 5%, 2 WATT	EA	1
B-12	13	PAHZZ	5905-00-725-7129	575C4-7	70117	RESISTOR, VARIABLE	EA	1
B-12	14	PAHZZ	5905-00-141-1130	RCR20G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 10%, .5 WATT	EA	2
B-12	15	XDHHH		GC2056-2	70117	INTENSITY MARK CONTROL ASSEMBLY	EA	1
B-12	16	PAHZZ	5905-00-646-5981	RV4NAYSB253A	81349	RESISTOR, VARIABLE	EA	1
B-12	17	PAHZZ	5905-00-141-1187	RCR20G203JS	81349	RESISTOR, FIXED, COMPOSITION: 20 K OHMS, PORM 5%, .5 WATT	EA	1
B-12	18	PAHZZ	5905-00-152-8373	RCR42G272JS	81349	RESISTOR, FIXED, COMPOSITION: 27 K OHMS, PORM 5%, 2 WATT	EA	1
B-12	19	PAHZZ	5905-00-111-4741	RCR20G242JS	81349	RESISTOR, FIXED, COMPOSITION: 2,400 OHMS, PORM 5%, .5 WATT	EA	1
B-12	20	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG OHMS, PORM 5%, .5 WATT	EA	1
B-12	21	PAHZZ	5910-00-984-7588	CM05F101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, PORM 5%, 500 VDCW	EA	1
B-12	22	PAHZZ	3010-00-623-7447	519B65	70117	COUPLING	EA	1
B-12	23	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .5 WATT	EA	1
B-12	24	PAHZZ	5905-00-141-1165	RCR20G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, .5 WATT	EA	1
B-12	25	PAHZZ		19477F1	76854	SWITCH, ROTARY	EA	1
B-12	26	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%. .5 WATT	EA	1
B-12	27	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .5 WATT	EA	2

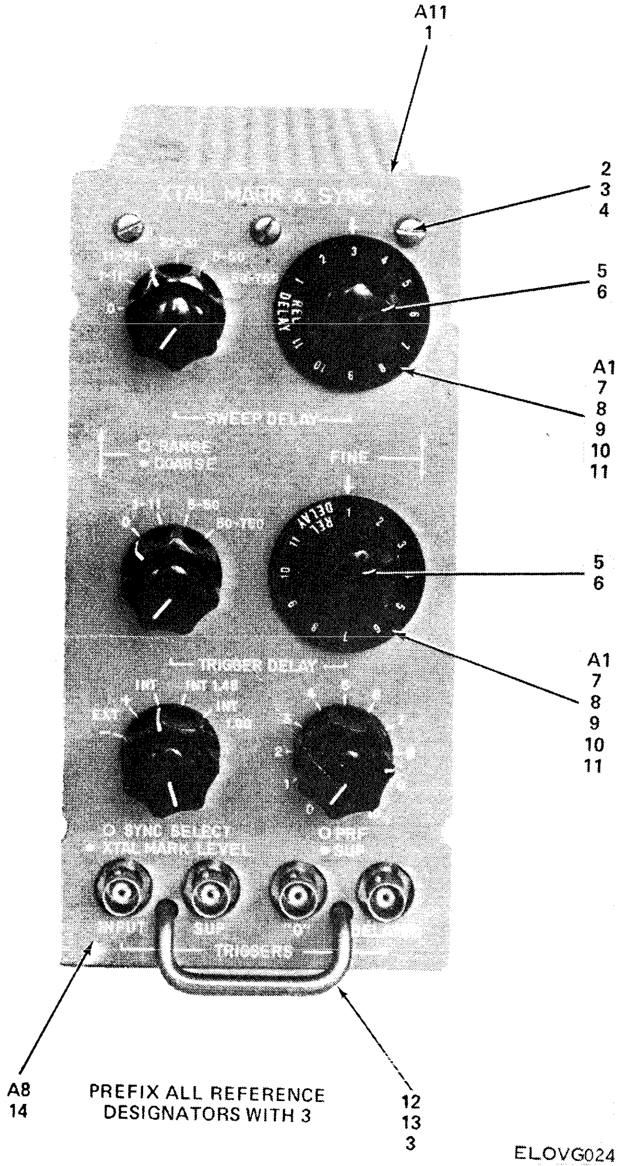

Figure B-13. ① *Crystal mark and sync module (sheet 1 of 2).*

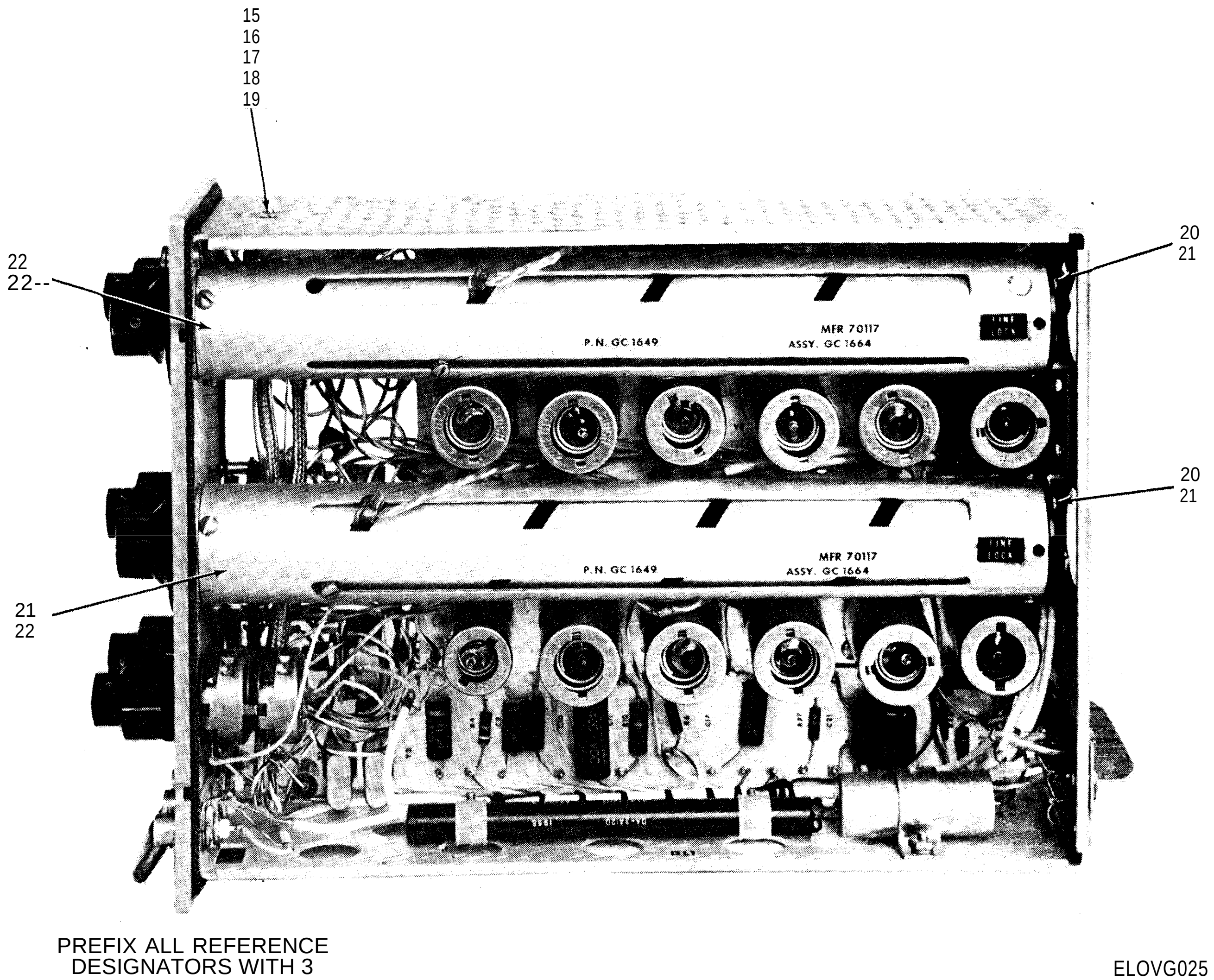

Figure B-13.② Crystal mark and sync module (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0103 - CRYSTAL MARK AND SYNC MODULE		
B-13		XDHHH		GE2057-6	70117	CRYSTAL MARK AND SYNC MODULE (SEE FIGURE B-1 FOR NHA)	EA	REF
B-13	1	XDHHH		GJ4893	70117	CHASSIS ASSEMBLY (SEE FIGURE B-14 FOR BREAKDOWN)	EA	1
B-13	2	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREWM MACHINE: PNH 6-32 X 7/16 IN. LG	EA	3
B-13	3	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPLIT, NO. 6	EA	5
B-13	4	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	3
B-13	5	PAHZZ	5355-00-473-5857	S647-4LBB	75376	KNOB	EA	2
B-13	6	XDHZZ		505D1-49	70117	WASHER, NONMETALLIC	EA	4
B-13	7	XDHZZ	5355-00-474-3843	GB1606	70117	DIAL SCALE ASSEMBLY	EA	2
B-13	8	XDHZZ		505D1-57	70117	WASHER, NONMETALLIC	EA	2
B-13	9	PAHZZ	3020-00-065-0118	530B59-5	70117	GEAR, SPUR	EA	6
B-13	10	XDHZZ		505-D1-56	70117	WASHER, NONMETALLIC	EA	6
B-13	11	XDHZZ		4-40X5-16FILH BR	70117	SCREW, MACHINE: FILH, NO. 4-40 X 5/16 IN. LG BRASS	EA	6
B-13	12	PAHZZ	5340-00-880-4853	537B70-1	70117	HANDLE, BOW	EA	1
B-13	13	PAHZZ	5310-00-934-9761	MS35649-64	96906	NUT, PLAIN HEX: NO. 6-32	EA	2
B-13	14	XDHZZ		GD2051-5	70117	PANEL ASSEMBLY (SEE FIGURE B-15 FOR BREAKDOWN)	EA	1
B-13	15	PAHZZ	5310-00-934-9748	MS35649-44	96906	NUT, PLAIN HEX: NO. 4-40	EA	2
B-13	16	PAHZZ	5305-00-727-8831	MS35249-26	96906	SCREW, MACHINE: FH, NO. 4-40 X 3/4 IN. LG	EA	2
B-13	17	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	2
B-13	18	XDHZZ		505D1-4	70117	WASHER, NONMETALLIC	EA	4
B-13	19	XDHZZ		529C3-15-92	70117	SPACER, SLEEVE	EA	2
B-13	20	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: PNH, NO. 4-40 X 5/16 IN. LG	EA	4
B-13	21	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPLIT, NO. 4	EA	4
B-13	22	PAHZZ	6625-00-797-2696	GC1664	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-18 FOR BREAKDOWN)	EA	2

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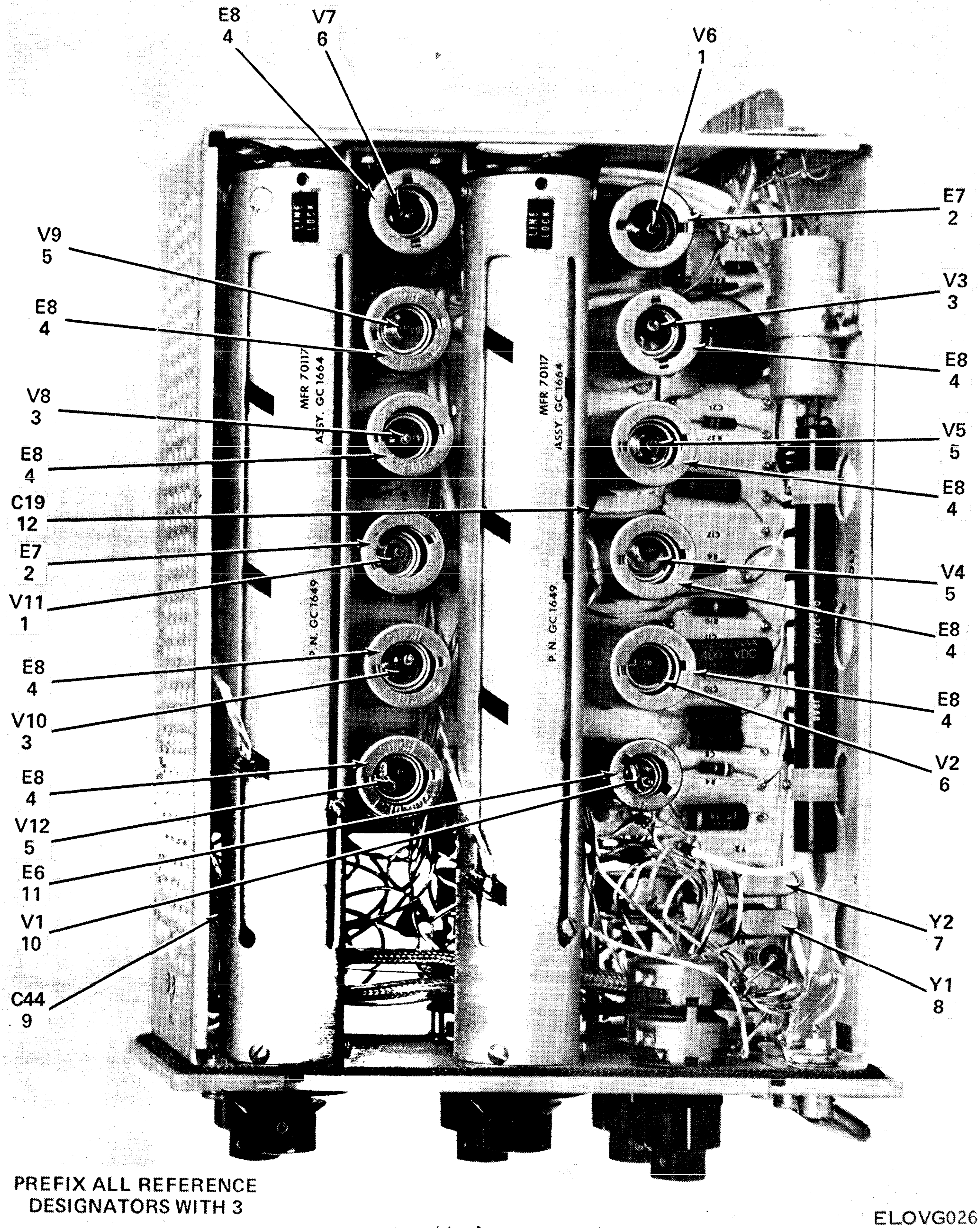

Figure B-14. ① Chassis assembly, unit 3 (sheet 1 of 4).

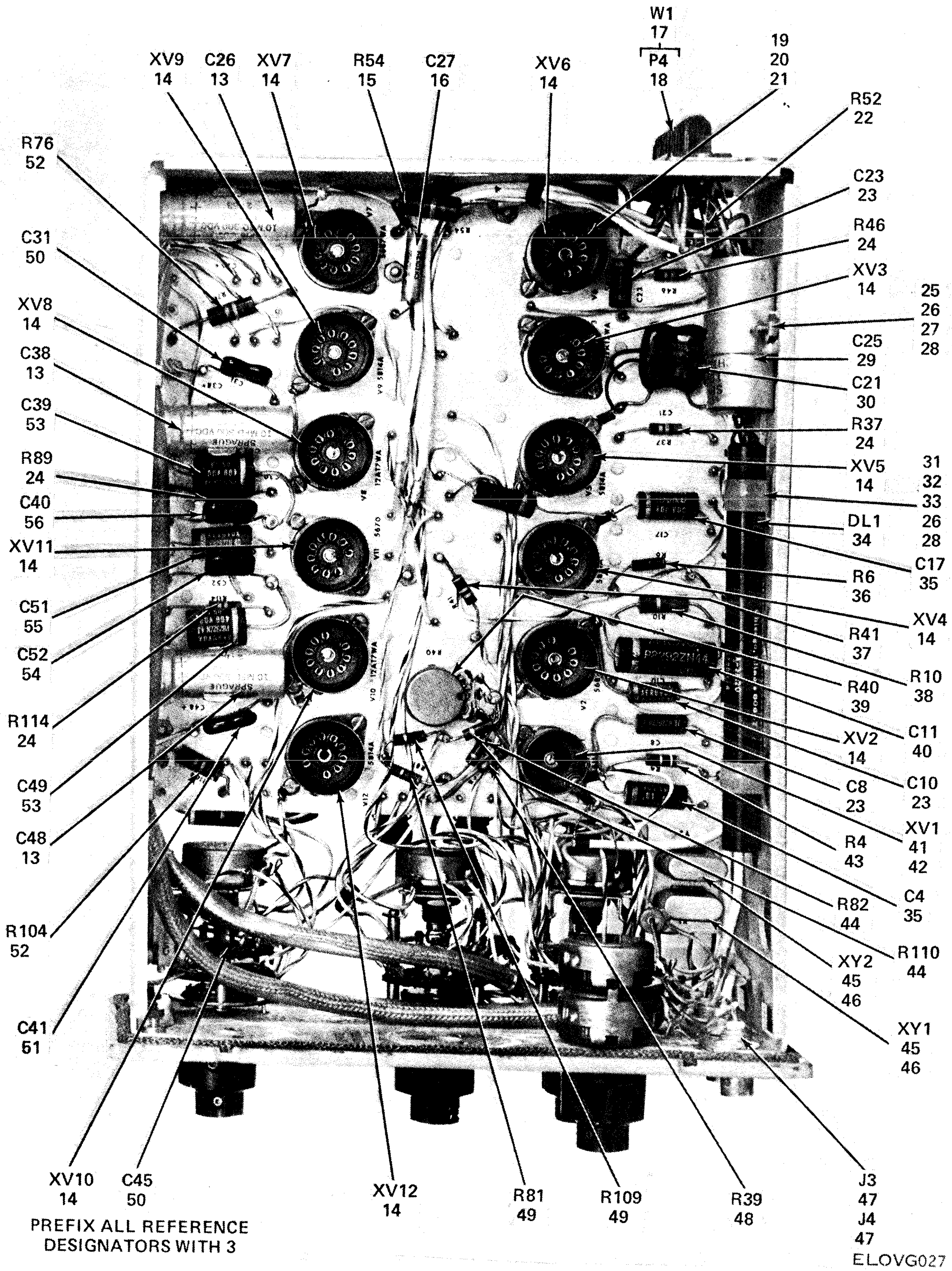

Figure B-14. ② Chassis assembly, unit 3 (sheet2 of 4).

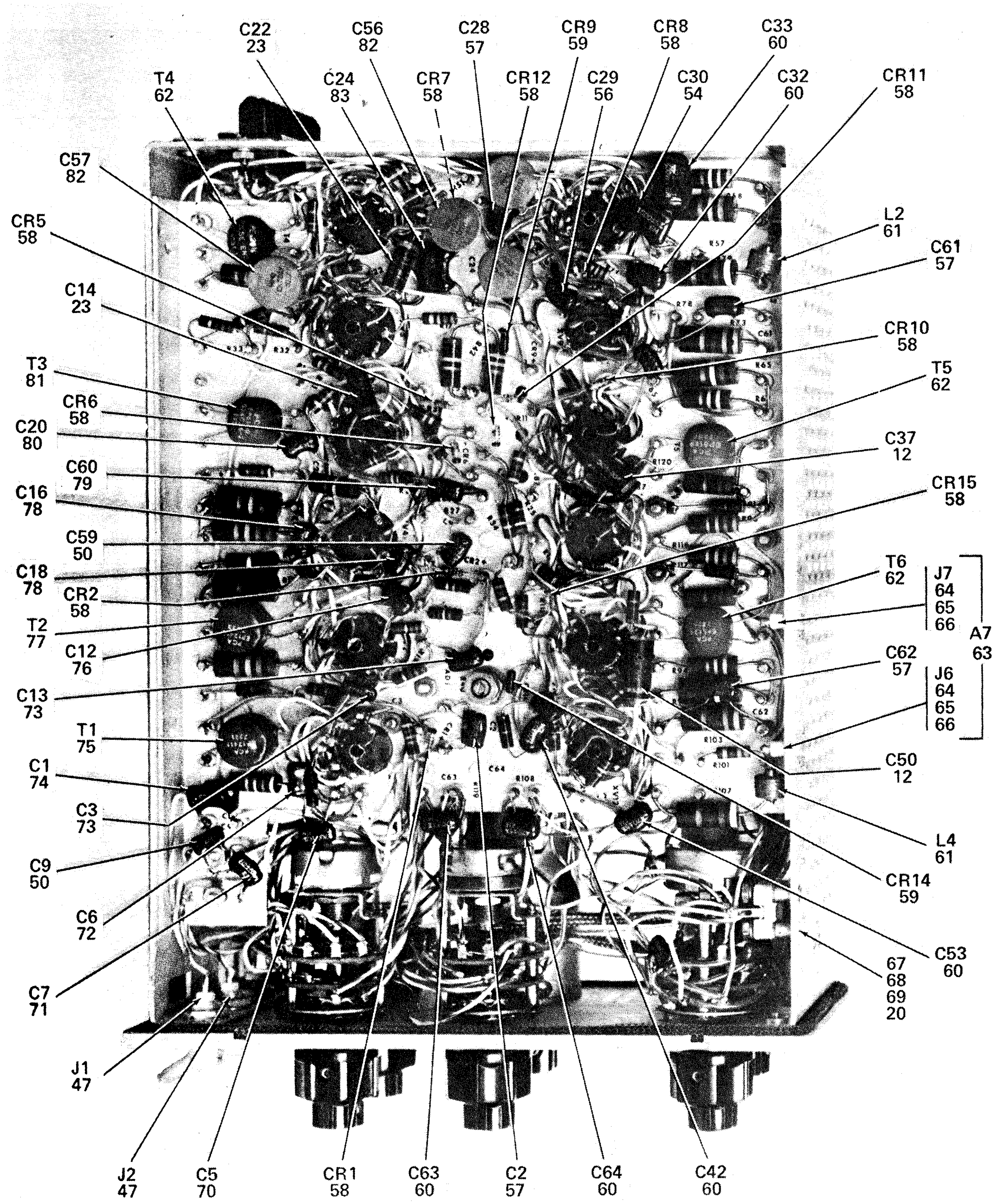

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Figure B-14. ③ Chassis assembly, unit 3 (sheet 3 of 4).

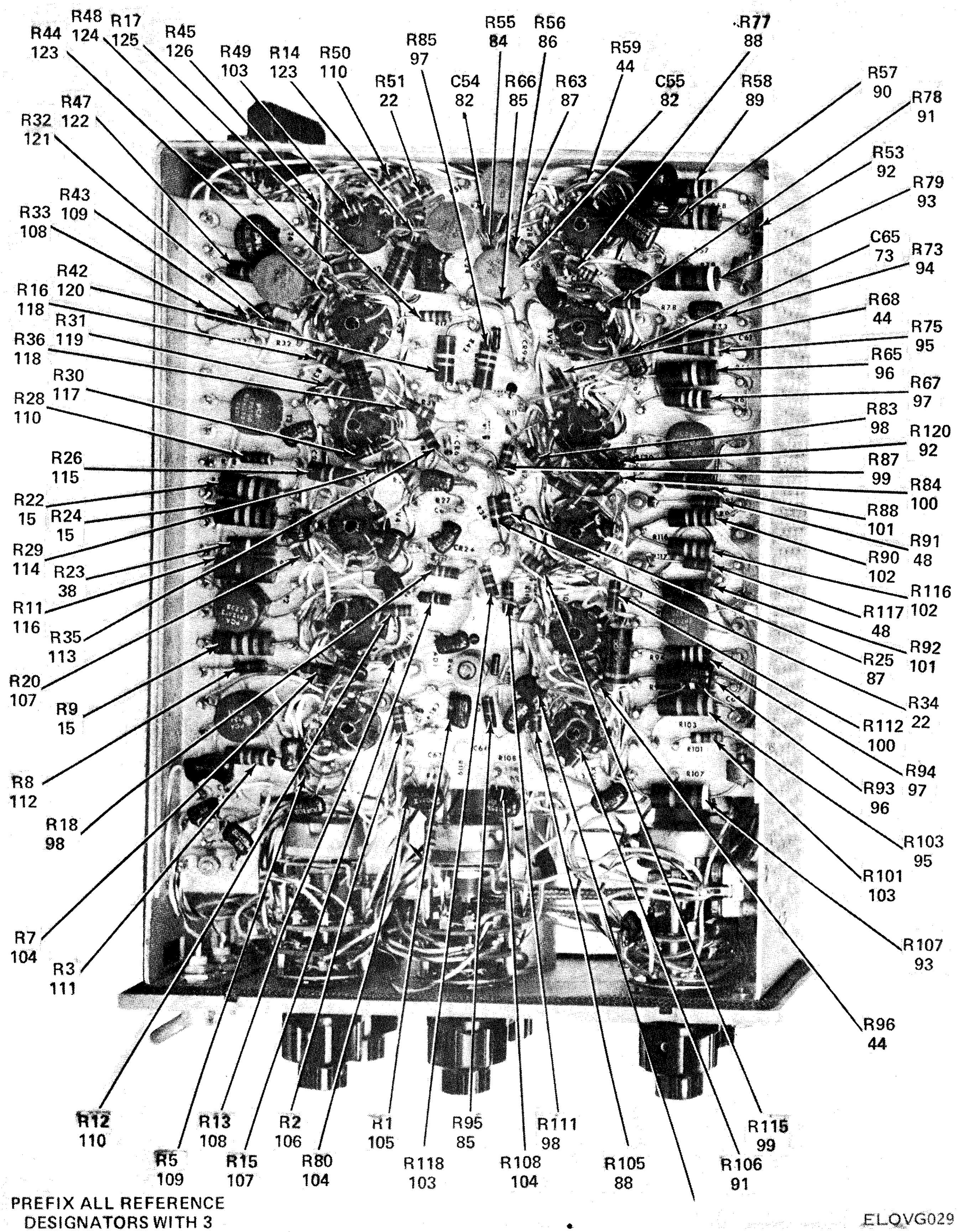

Figure B-14. ④ Chassis assembly, unit 3 (sheet4 of 4).

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-14		XDHHH		GJ4893	70117	CHASSIS ASSEMBLY (SEE FIGURE B-13 FOR NHA)	EA	REF
B-14	1	PAOZZ	5960-00-134-5994	5670	81349	ELECTRON TUBE	EA	2
B-14	2	PAHZZ	5960-00-866-2712	M24251-6-4	81349	SHIELD, ELECTRON TUBE	EA	2
B-14	3	PAOZZ	5960-00-262-0161	12AT7WA	81349	ELECTRON TUBE	EA	3
B-14	4	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	9
B-14	5	PAOZZ	5960-00-262-0210	5814A	81349	ELECTRON TUBE	EA	4
B-14	6	PAOZZ	5960-00-179-4749	5687WB	81349	ELECTRON TUBE	EA	2
B-14	7	PAHZZ	5955-00-973-2204	593A26	70117	CRYSTAL UNIT QUARTZ	EA	1
B-14	8	PAHZZ	5955-00-951-8937	CR18AU1-000000MHZ	81349	CRYSTAL UNIT QUARTZ	EA	1
B-14	9	PAHZZ	5910-00-668-4582	CV11D450	81349	CAPACITOR VARIABLE DIELECTRIC	EA	1
B-14	10	PAOZZ	5960-00-681-9802	6AU6WB	81349	ELECTRON TUBE	EA	1
B-14	11	PAHZZ	5960-00-860-7709	M24251-6-2	81349	SHIELD, ELECTRON TUBE	EA	1
B-14	12	PAHZZ	5910-00-802-9423	P8292ZN9	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.05 UF, PORM 10%, 200 VDCW	EA	3
B-14	13	PAHZZ	5910-00-724-8404	CE13C100N	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	3
B-14	14	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE	EA	11
B-14	15	PAHZZ	5905-00-001-3031	RCR42G183JS	81349	RESISTOR, FIXED, COMPOSITION: 18 K OHMS, PORM 5%, 2 WATT	EA	4
B-14	16	PAHZZ	5910-00-821-4702	CP05A1KE103K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 MFD, PORM 10%, 400 VDCW	EA	1
B-14	17	XDHZZ		GC3365	70117	WIRING ASSEMBLY	EA	1
B-14	18	PAHZZ	5935-00-623-7199	26-4100-24P	02660	CONNECTOR RECEPTACLE ELECTRICAL: 24 PIN	EA	1
B-14	19	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: PNH, NO. 4-40 X 5/16 IN. LG	EA	4
B-14	20	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN HEX: NO. 4	EA	20
B-14	21	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPLIT, NO. 4	EA	40
B-14	22	PAHZZ	5905-00-116-8561	RCR20G270JS	81349	RESISTOR, FIXED, COMPOSITION: 27 OHMS, PORM 10%, .5 WATT	EA	3
B-14	23	PAHZZ	5910-00-681-6247	P8292ZN6	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, PORM 20%, 200 VDCW	EA	5
B-14	24	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10 K OHMS, PORM 5%, .5 WATT	EA	4
B-14	25	PAHZZ	5305-00-763-6963	MS35249-35	96906	SCREW, MACHINE: FH, NO. 6-32 X 3/8 IN. LG	EA	1
B-14	26	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPLIT, NO. 6	EA	3
B-14	27	XDHZZ	5310-00-209-1366	MS35335-58	96906	WASHER, LOCK: NO. 6	EA	1
B-14	28	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN HEX: NO. 6	EA	3
B-14	29	PAHZZ	5910-00-946-7626	CH12A3NE105K	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 MFD, PORM 10%, 400 VDCW	EA	1
B-14	30	PAHZZ	5910-00-044-4122	CM07F153J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 15 K PF, PORM 5%, 500 VDCW	EA	1
B-14	31	PAHZZ	5305-00-719-5064	MS35249-37	96906	SCREW, MACHINE: FH, NO. 6-32 X 1/2 IN. LG	EA	2
B-14	32	XDHZZ	5310-00-655-9401	D4-140	95987	WASHER, FLAT: TYPE "D"	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-14	33	XDHZZ		WC7-16-4-NA	71616	CLAMP, LOOP	EA	2
B-14	34	PAHZZ	5840-00-027-8970	572D11-8	70117	DELAY LINE	EA	1
B-14	35	PAHZZ	5910-00-755-5583	P8292ZN15	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, PORM 20%, 400 VDCW	EA	2
B-14	36	PAHZZ	5905-00-106-9352	RCR20G112JS	81349	RESISTOR, FIXED, COMPOSITION: 1,100 OHMS, PORM 5%, .5 WATT	EA	1
B-14	37	PAHZZ	5905-00-141-1071	RCR20G474JS	81349	RESISTOR, FIXED, COMPOSITION: .47 MEG OHMS, PORM 10%, .5 WATT	EA	1
B-14	38	PAHZZ	5905-00-111-8372	RCR32G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 10%, 1 WATT	EA	2
B-14	39	PAHZZ	5905-00-617-2606	RV5LAYSB503A	81349	RESISTOR VARIABLE: 50 K OHMS, PORM 10%	EA	1
B-14	40	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, PORM 20%, 400 VDCW	EA	1
B-14	41	PAHZZ	5935-00-132-2405	TS102P01	81349	SOCKET, ELECTRON TUBE	EA	1
B-14	42	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: PNH, NO. 4-40 X 1/4 IN. LG	EA	24
B-14	43	PAHZZ	5905-00-110-0310	RCR20G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 10%, .5 WATT	EA	1
B-14	44	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 10%, .5 WATT	EA	5
B-14	45	PAHZZ	5935-00-581-6941	TS0205C01	81349	SOCKET, CRYSTAL UNIT QUARTZ	EA	2
B-14	46	PAHZZ	5340-00-474-3982	518A104-2	70117	CLIP, SPRING TENSION	EA	2
B-14	47	PAHZZ	5935-00-835-0510	M39012-21-0001	81349	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	4
B-14	48	PAHZZ	5905-00-141-1165	RCR20G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, .5 WATT	EA	3
B-14	49	PAHZZ	5905-00-116-8569	RCR20G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 10%, .5 WATT	EA	2
B-14	50	PAHZZ	5910-00-067-5697	CM05E270J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 27 PF, PORM 5%, 500 VDCW	EA	3
B-14	51	PAHZZ	5910-00-781-4511	CM06F302J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 3 K PF, PORM 5%, 500 VDCW	EA	2
B-14	52	PAHZZ	5905-00-228-6084	RCR32G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12 K OHMS, PORM 5%, 1 WATT	EA	2
B-14	53	PAHZZ	5910-00-833-6443	P8292ZN18	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.05 UF, PORM 10%, 400 VDCW	EA	2
B-14	54	PAHZZ	5910-00-781-1154	CM06F152J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 1,500 PF, PORM 5%, 500 VDCW	EA	2
B-14	55	PAHZZ	5910-00-024-7546	M39022-01-1673	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, PORM 20%, 200 VDCW	EA	1
B-14	56	PAHZZ	5910-00-079-5253	CM06F472G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 4,700 PF, PORM 2%, 500 VDCW	EA	2
B-14	57	PAHZZ	5910-00-088-1624	CM05F221J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 220 PF, PORM 5%, 500 VDCW	EA	4
B-14	58	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE DIODE	EA	10
B-14	59	PAHZZ	5961-00-752-5351	1N643	81349	SEMICONDUCTOR DEVICE DIODE	EA	2
B-14	60	PAHZZ		DM15F471J0	72136	CAPACITOR, FIXED, MICA DIELECTRIC: 470 PF, PORM 5%, 500 VDCW	EA	6
B-14	61	PAHZZ	5950-00-820-5362	573B11-46	70117	COIL, RADIO FREQUENCY	EA	2

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-14	62	PAHZZ	5950-00-713-6944	EP6129	97722	TRANSFORMER, PULSE	EA	3
B-14	63	XDDDD		GD1600-2	70117	CHASSIS ASSEMBLY	EA	1
B-14	64	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	2
B-14	65	PAHZZ	5340-00-229-3676	E50003-054	80033	CLIP, SPRING TENSION	EA	3
B-14	66	XDHZZ		506C2-32-102	70117	RIVET, TUBULAR	EA	3
B-14	67	XDHZZ		529C3-15-92	70117	SPACER, SLEEVE	EA	4
B-14	68	XDHZZ		505D1-4	70117	WASHER, NONMETALLIC: NO. 4	EA	10
B-14	69	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	8
B-14	70	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	1
B-14	71	PAHZZ	5910-00-071-1642	CM05E820J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 82 PF, PORM 5%, 500 VDCW	EA	1
B-14	72	PAHZZ	5910-00-902-0335	CM05C100K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 10 PF, PORM 10%, 500 VDCW	EA	1
B-14	73	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	4
B-14	74	PAHZZ	5910-00-717-0167	CM06FD471G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	1
B-14	75	PAHZZ	5950-00-713-3935	EP12411	97722	TRANSFORMER PULSE	EA	1
B-14	76	PAHZZ	5910-00-984-7588	CM05F101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, PORM 5%, 500 VDCW	EA	1
B-14	77	PAHZZ	5950-00-739-8103	EP12413	97722	TRANSFORMER PULSE	EA	1
B-14	78	PAHZZ	5910-00-954-5504	CM05F121J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 120 PF, PORM 5%, 500 VDCW	EA	2
B-14	79	PAHZZ	5910-00-051-4612	CM05E220J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 22 PF, PORM 5%, 500 VDCW	EA	1
B-14	80	PAHZZ	5910-00-902-0031	CM05C050K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 5 PF, PORM 10%, 500 VDCW	EA	1
B-14	81	PAHZZ	5950-00-846-1338	574C35-2	70117	TRANSFORMER, PULSE	EA	1
B-14	82	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 K MMF, 500 VDCW	EA	4
B-14	83	PAHZZ	5910-00-965-9441	CM06F102J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 1 K PF, PORM 5%, 500 VDCW	EA	1
B-14	84	PAHZZ	5905-00-935-8539	RCR20G202JS	81349	RESISTOR, FIXED, COMPOSITION: 2 K OHMS, PORM 5%, .5 WATT	EA	1
B-14	85	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR, FIXED, COMPOSITION: 1.5 MEG. OHMS, PORM 5%, .5 WATT	EA	2
B-14	86	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG. OHMS, PORM 5%, .5 WATT	EA	1
B-14	87	PAHZZ	5905-00-111-4742	RCR20G391JS	81349	RESISTOR, FIXED, COMPOSITION: 390 OHMS, PORM 10%, .5 WATT	EA	2
B-14	88	PAHZZ	5905-00-104-8340	RCR20G363JS	81349	RESISTOR, FIXED, COMPOSITION: 36 K OHMS, PORM 5%, .5 WATT	EA	2
B-14	89	PAHZZ	5905-00-247-8724	RCR32G334JS	81349	RESISTOR, FIXED, COMPOSITION: 33 MEG. OHMS, PORM 5%, 1 WATT	EA	1
B-14	90	PAHZZ	5905-00-140-5653	RCR42G563JS	81349	RESISTOR, FIXED, COMPOSITION: 56 K OHMS, PORM 5%, 2 WATT	EA	1
B-14	91	PAHZZ	5905-00-116-8557	RCR20G114JS	81349	RESISTOR, FIXED, COMPOSITION: .11 MEG. OHMS, PORM 5%, .5 WATT	EA	2

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-14	92	PAHZZ	5905-00-935-8544	RCR20G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 10%, .5 WATT	EA	2
B-14	93	PAHZZ	5905-00-430-2696	RCR42G912JS	81349	RESISTOR, FIXED, COMPOSITION: 9,100 OHMS, PORM 5%, 2 WATT	EA	2
B-14	94	PAHZZ	5905-00-108-6922	RCR20G151JS	81349	RESISTOR, FIXED, COMPOSITION: 150 OHMS, PORM 5%, .5 WATT	EA	1
B-14	95	PAHZZ	5905-00-195-6750	RC42GF362J	81349	RESISTOR, FIXED, COMPOSITION: 3,600 OHMS, PORM 5%, 2 WATT	EA	2
B-14	96	PAHZZ	5905-00-480-5458	RCR42G514JS	81349	RESISTOR, FIXED, COMPOSITION: .51 MEG. OHMS, PORM 5 %, 2 WATT	EA	2
B-14	97	PAHZZ	5905-00-247-8720	RCR32G244JS	81349	RESISTOR, FIXED, COMPOSITION: .24 MEG. OHMS, PORM 5%, 1 WATT	EA	3
B-14	98	PAHZZ	5905-00-106-9351	RCR20G273JS	81349	RESISTOR, FIXED, COMPOSITION: 27 K OHMS, PORM 10%, .5 WATT	EA	3
B-14	99	PAHZZ	5905-00-111-4858	RCR20G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 10%, .5 WATT	EA	2
B-14	100	PAHZZ	5905-00-104-8337	RCR20G751JS	81349	RESISTOR, FIXED, COMPOSITION: 750 OHMS, PORM 5%, .5 WATT	EA	2
B-14	101	PAHZZ	5905-00-484-0267	RCR32G112JS	81349	RESISTOR, FIXED, COMPOSITION: 1,100 OHMS, PORM 5%, 1 WATT	EA	2
B-14	102	PAHZZ	5905-00-247-8737	RCR32G683JS	81349	RESISTOR, FIXED, COMPOSITION: 68 K OHMS, PORM 5%, 1 WATT	EA	2
B-14	103	PAHZZ	5905-00-104-8334	RCR20G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 10%, .5 WATT	EA	3
B-14	104	PAHZZ	5905-00-141-1130	RCR20G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 5%, .5 WATT	EA	3
B-14	105	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG. OHMS, PORM 10%, .5 WATT	EA	1
B-14	106	PAHZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47 K OHMS, PORM 10%, .5 WATT	EA	1
B-14	107	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: .15 MEG. OHMS, PORM	EA	3
B-14	108	PAHZZ	5905-00-935-8544	RCR20G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 5%, .5 WATT	EA	2
B-14	109	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR, FIXED, COMPOSITION: 1.0 MEG. OHMS, PORM 10%, .5 WATT	EA	2
B-14	110	PAHZZ	5905-00-111-4858	RCR20G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .5 WATT	EA	3
B-14	111	PAHZZ	5905-00-369-6929	RCR32G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47 K OHMS, PORM 10%, 1 WATT	EA	1
B-14	112	PAHZZ	5905-00-141-0592	RCR20G122JS	81349	RESISTOR, FIXED, COMPOSITION: 1,200 OHMS, PORM 5%, .5 WATT	EA	1
B-14	113	PAHZZ	5905-00-104-8345	RCR20G560JS	81349	RESISTOR, FIXED, COMPOSITION: 56 OHMS, PORM 10%, .5 WATT	EA	1
B-14	114	PAHZZ	5905-00-104-8333	RCR20G184JS	81349	RESISTOR, FIXED, COMPOSITION: .18 MEG. OHMS, PORM 5%, .5 WATT	EA	1
B-14	115	PAHZZ	5905-00-104-8351	RCR32G154JS	81349	RESISTOR, FIXED, COMPOSITION: 150 K OHMS, PORM 5%, 1 WATT	EA	1
B-14	116	PAHZZ	5905-00-145-9617	RCR42G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, 2 WATT	EA	1
B-14	117	PAHZZ	5905-00-106-1273	RCR20G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15 K OHMS PORM 5%, .5 WATT	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-14	118	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10 K OHMS, PORM 10%, .5 WATT	EA	2
B-14	119	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 10%, .5 WATT	EA	1
B-14	120	PAHZZ	5905-00-247-8700	RCR32G124JS	81349	RESISTOR, FIXED, COMPOSITION: .12 MEG. OHMS, PORM 10%, 1 WATT	EA	1
B-14	121	PAHZZ	5905-00-116-8569	RCR20G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, .5 WATT	EA	1
B-14	122	PAHZZ	5905-00-252-1050	RCR32G393JS	81349	RESISTOR, FIXED, COMPOSITION: 39 K OHMS, PORM 5%, 1 WATT	EA	1
B-14	123	PAHZZ	5905-00-141-0595	RCR20G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .5 WATT	EA	2
B-14	124	PAHZZ	5905-00-141-0595	RCR20G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .5 WATT	EA	1
B-14	125	PAHZZ	5905-00-106-9345	RCR20G683JS	81349	RESISTOR, FIXED, COMPOSITION: 68 K OHMS, PORM 10%, .5 WATT	EA	1
B-14	126	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .5 WATT	EA	1

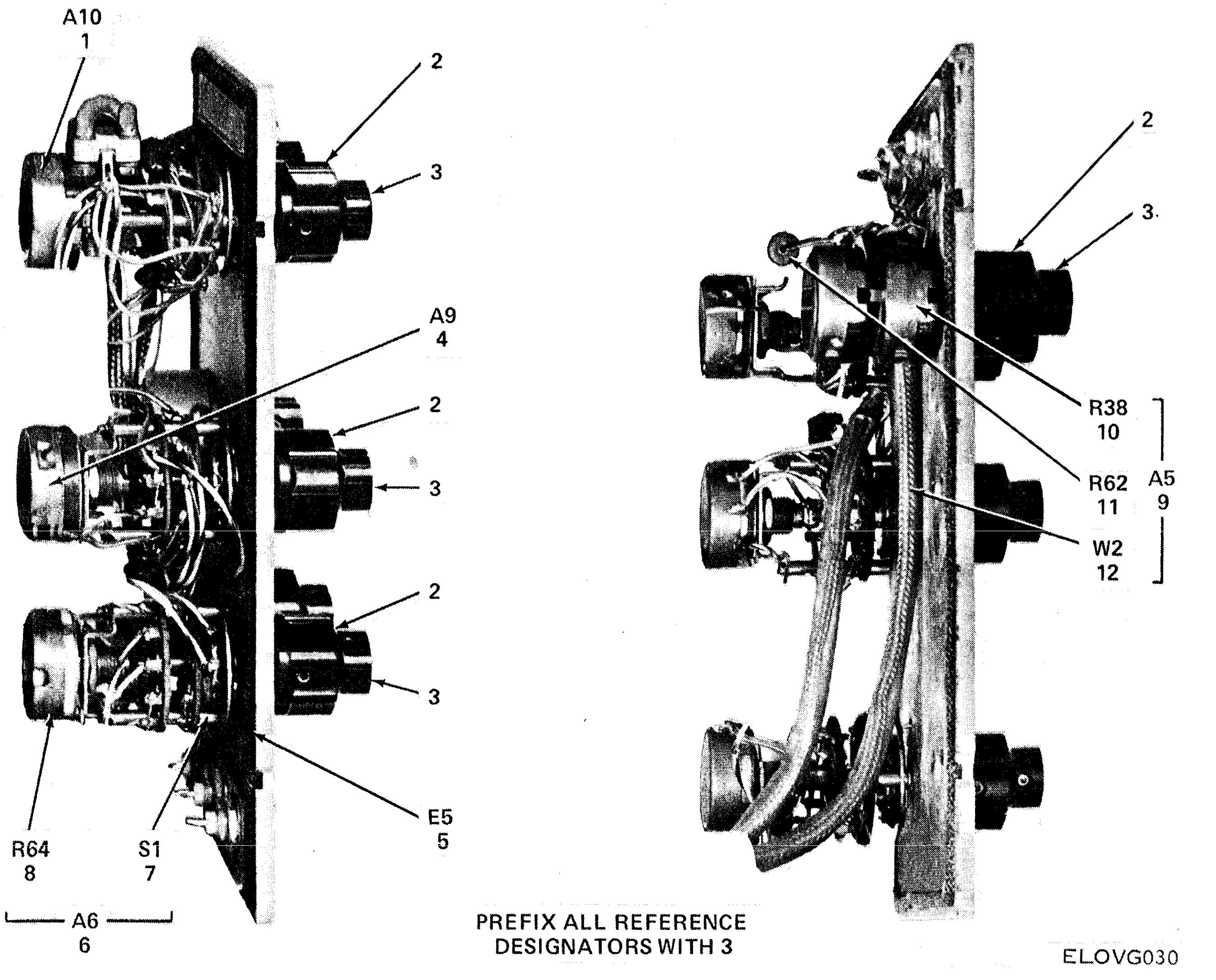

Figure B-15. Panel assembly, unit 3.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-15				GD2051-5	70117	PANEL ASSEMBLY (SEE FIGURE B-13 FOR NHA)	EA	REF
B-15	1	XDHHH		GD4793	70117	SWEEP DELAY SELECTOR SWITCH ASSEMBLY (SEE FIGURE B-16 FOR BREAKDOWN)	EA	1
B-15	2	PAHZZ	5355-00-819-0067	533A98-3	70117	KNOB	EA	4
B-15	3	PAHZZ	5355-00-576-5470	S645-5LBB	75376	KNOB	EA	4
B-15	4	XDHHH		GD4792	70117	TRIGGER DELAY SELECTOR SWITCH ASSEMBLY (SEE FIGURE B-17 FOR BREAKDOWN)	EA	1
B-15	5	PAHZZ	5999-00-825-6450	536B28-2	70117	SHIELDING GASKET, ELECTRICAL	EA	1
B-15	6	XDHHH		GC2047	70117	SYNC SELECTOR SWITCH ASSEMBLY	EA	1
B-15	7	PAHZZ	5930-00-713-8470	94775F2	76854	SWITCH, ROTARY	EA	1
B-15	8	PAHZZ	5905-00-542-8055	RV4NAYSB501A	81349	RESISTOR, VARIABLE: 500 OHMS, PORM 10%	EA	1
B-15	9	XDHHH		GC2052	70117	RESISTOR, ASSEMBLY	EA	1
B-15	10	PAHZZ	5905-00-725-7512	575C9-3	70117	RESISTOR, VARIABLE	EA	1
B-15	11	PAHZZ	5905-00-767-0944	RCR42G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4.7 K OHMS, PORM 10%, 2 WATT	EA	1
B-15	12	PAHZZ	5995-00-257-1244	GC2054	70117	CABLE ASSEMBLY, SPECIAL PURPOSE ELECTRICAL	EA	1

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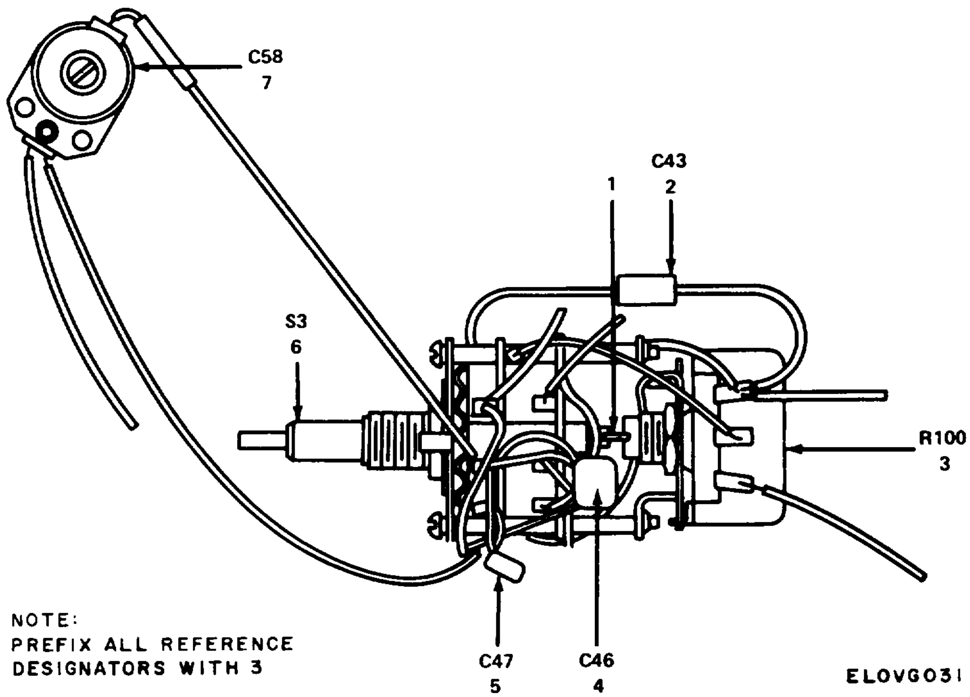

Figure B-16. Sweep delay selector switch assembly

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-16		XDHHH		GD4793	70117	SWEEP DELAY SELECTOR SWITCH ASSEMBLY (SEE FIGURE B-15 FOR NHA)	EA	REF
B-16	1	PAHZZ	3010-00-623-7447	519B65	70117	COUPLING	EA	1
B-16	2	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	1
B-16	3	PAHZZ	5905-00-646-5957	RV4NAYSB103A	81349	RESISTOR, VARIABLE: 10 K OHMS, PORM 10%	EA	1
B-16	4	PAHZZ	5910-00-957-8577	CM05E680J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 68 PF, PORM 5%, 500 VDCW	EA	1
B-16	5	PAHZZ	5910-00-954-5504	CM05F121J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 120 PF, PORM 5%, 500 VDCW	EA	1
B-16	6	PAHZZ	5930-00-086-3771	94773F2	76854	SWITCH, ROTARY	EA	1
B-16	7	PAHZZ	5910-00-668-4582	CV11D450	81349	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC	EA	1

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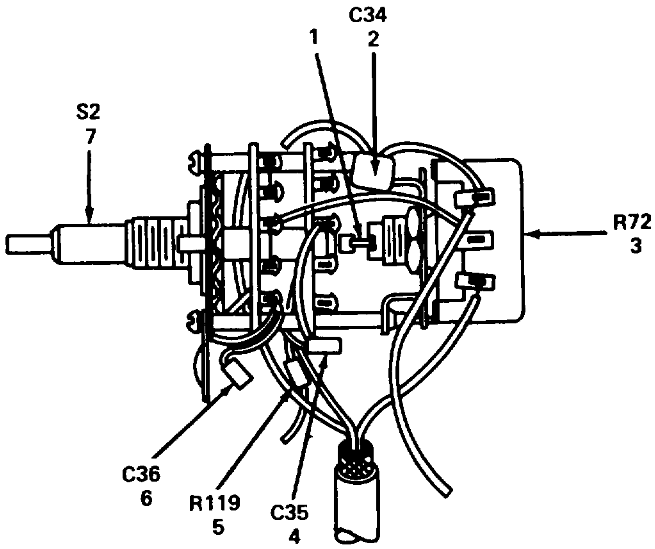

Figure B-17. Trigger delay selector switch assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-17		XDHHH		GD4792	70117	TRIGGER DELAY SELECTOR SWITCH ASSEMBLY (SEE FIGURE B-15 FOR NHA)	EA	REF
B-17	1	PAHZZ	3010-00-623-7447	519B65	70117	COUPLING	EA	1
B-17	2	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	1
B-17	3	PAHZZ	5905-00-646-5957	RV4NAYSB103A	81349	RESISTOR, VARIABLE: 10 K OHMS, PORM 10%	EA	1
B-17	4	PAHZZ	5910-00-071-1642	CM05E820J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 82 PF, PORM 5%, 500 VDCW	EA	1
B-17	5	PAHZZ	5905-00-104-8334	RCR20G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 10%, .5 WATT	EA	1
B-17	6	PAHZZ	5910-00-954-5498	CM05F181J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 180 PF, PORM 5%, 500 VDCW	EA	1
B-17	7	PAHZZ	5930-00-751-7789	194774F2	76854	SWITCH, ROTARY	EA	1

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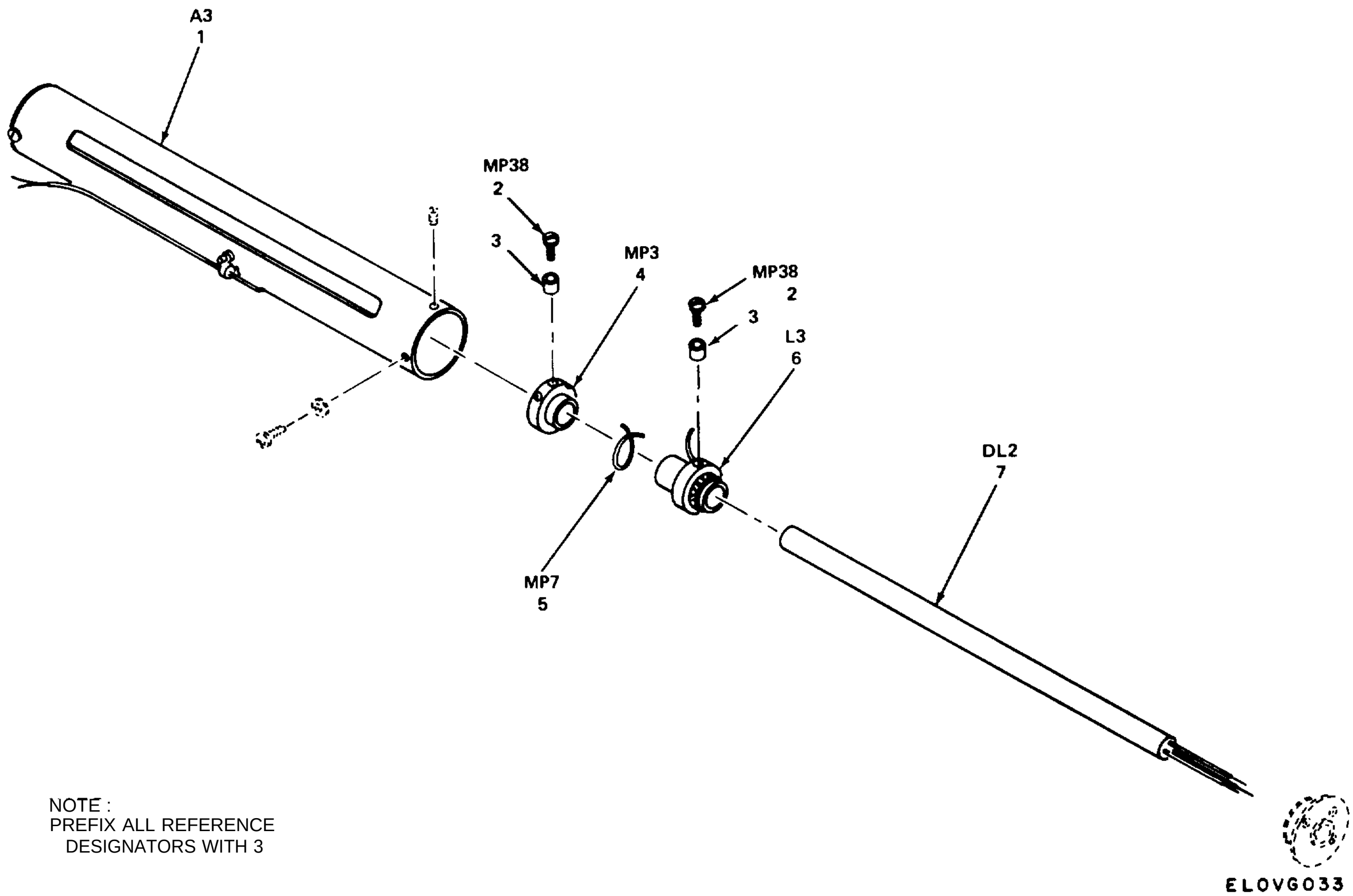

Figure B-18. Delay line assembly, unit 3.

(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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-18		PAHZZ	6625-00-797-2696	GC1664	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-13 FOR NHA)	EA	REF
B-18	1	XDDDD		GC1649	70117	VERNIER ASSEMBLY (SEE FIGURE B-19 FOR BREAKDOWN)	EA	1
B-18	2	PAHZZ	5305-00-054-5650	MS35233-16	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/16 IN. LG	EA	2
B-18	3	XDHZZ		529C6-39	70117	SPACER, SLEEVE	EA	2
B-18	4	XDHZZ	6625-00-797-2694	512A150	70117	BOBBIN, SLEEVE	EA	1
B-18	5	PAHZZ	6625-00-797-2695	519C12-38	70117	SPRING, COIL	EA	1
B-18	6	PAHZZ	5821-00-473-1639	569C32-3	70117	COIL, RADIO FREQUENCY	EA	1
B-18	7	PAHZZ	6625-00-020-8265	572D11-2	70117	DELAY LINE	EA	1
B-18	8	PAHZZ	5940-00-159-1252	2522-4	78189	TERMINAL LUG	EA	1

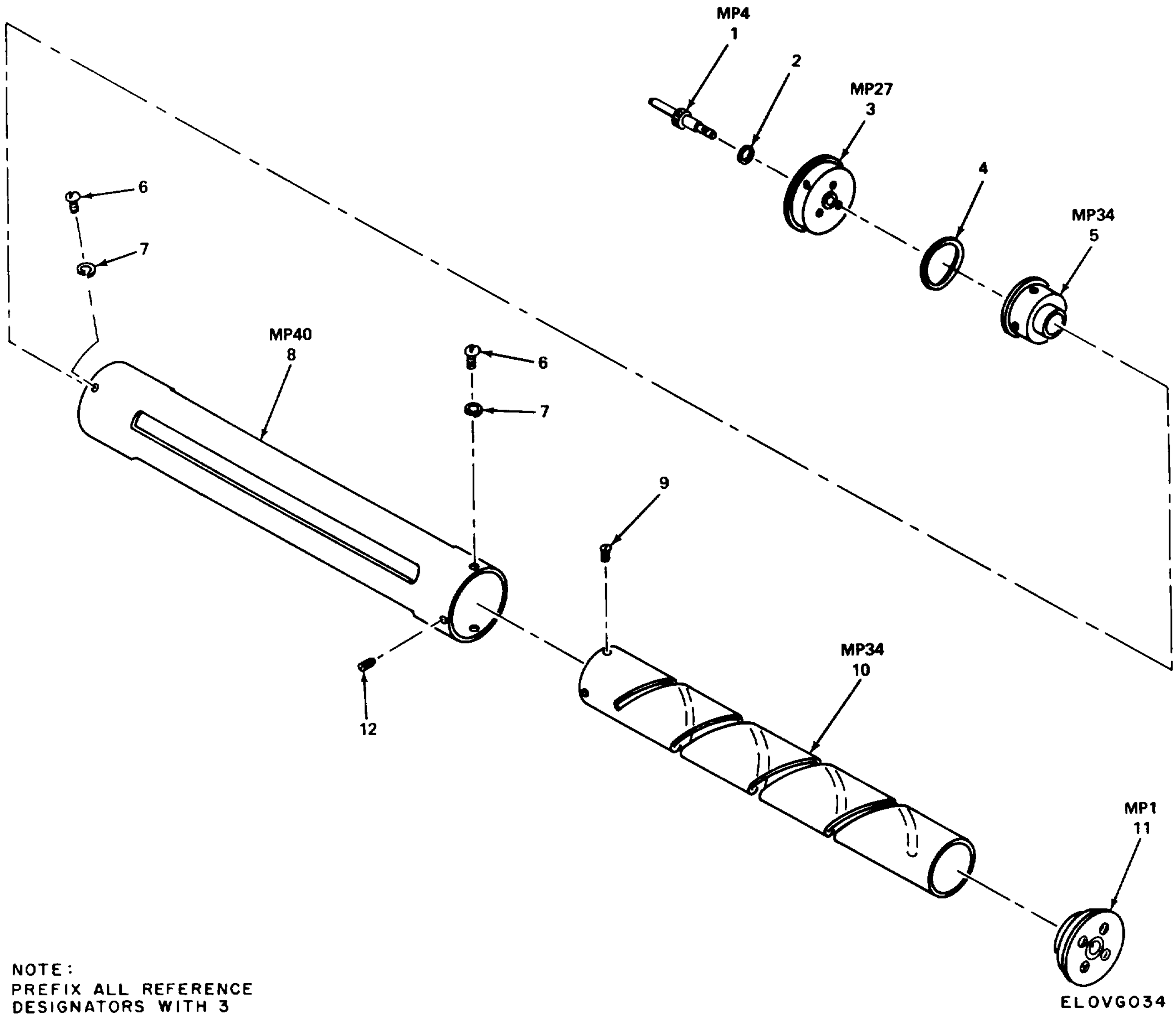

Figure B-19. Vernier assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-19		XDDDD		GC1649	70117	VERNIER ASSEMBLY (SEE FIGURE B-18 FOR NHA)	EA	REF
B-19	1	PADZZ	6625-00-874-7754	528A83	70117	GEAR, SPUR	EA	1
B-19	2	XDDZZ		032X200X340SST	70117	WASHER, FLAT	EA	1
B-19	3	XDDZZ		527A477	70117	PLUG, FRONT	EA	1
B-19	4	XDDZZ		504C1-32	70117	WASHER, SPRING TENSION	EA	1
B-19	5	XDDZZ		529B70	70117	HELIX	EA	1
B-19	6	XDDZZ		4-40X375BHSST	70117	SCREW, MACHINE: BH, NO. 4-40 x 3/8 IN. LG	EA	6
B-19	7	XDDZZ		4MEDSPLITSST	70117	WASHER, LOCK: NO. 4 MED. SPLIT, SST	EA	6
B-19	8	XDHZZ		529C72	70117	SHELL, OUTER	EA	1
B-19	9	XDDZZ		2-56X312BHSST	70117	SCREW, MACHINE: BH, NO. 2-56 X 5/16 IN. LG	EA	3
B-19	10	XDDZZ		529B70	70117	HELIX	EA	1
B-19	11	XDDZZ		512A152	70117	PLUG, REAR	EA	1
B-19	12	XDDZZ		4-40X7-16CUPPTSST	70117	SETSCREW: CUP PT, NO. 4-40 X 7/16 IN. LG SST	EA	1

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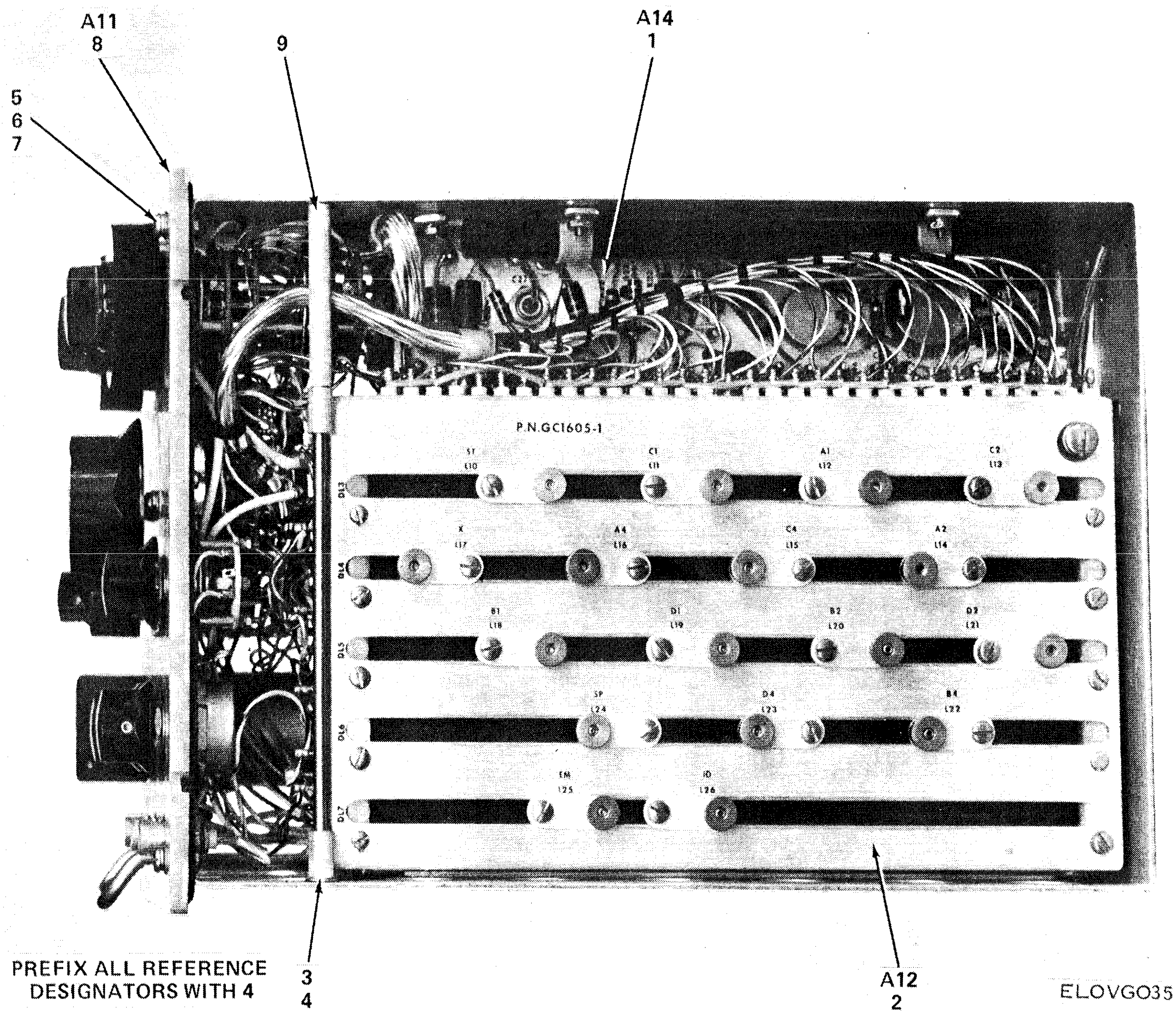

Figure B-20. ① SIF coder (sheet 1 of 2).

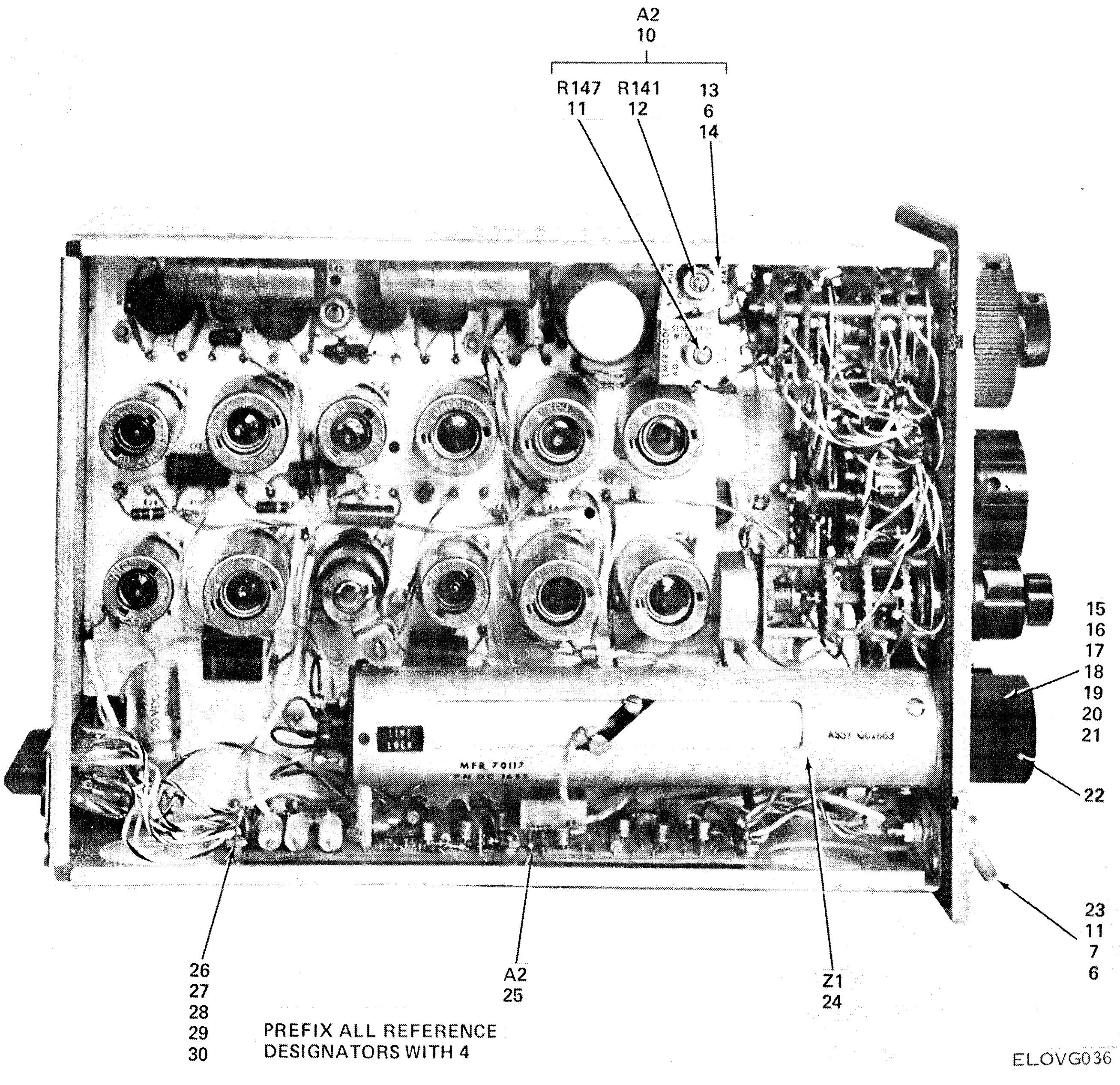

Figure B-20. ② SIF coder (sheet 2 of 2).

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0104 - SIF CODER		
B-20		XDHHH		GJ4873	70117	SIF CODER (SEE FIGURE B-1 FOR NHA)	EA	REF
B-20	1	XDHHH		GJ4874	70117	CHASSIS ASSEMBLY (SEE FIGURE B-21 FOR BREAKDOWN)	EA	1
B-20	2	XDHHH		GE4876	70117	CODING LINE ASSEMBLY (SEE FIGURE B-22 FOR BREAKDOWN)	EA	1
B-20	3	XDHZZ		4-40X1375FHSST	70117	SCREW, MACHINE: FH, 100°, NO. 4-40 X 5/16 IN. LG SST	EA	2
B-20	4	XDHZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT: NO. 8	EA	1
B-20	5	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE: PNH, NO. 6-32 X 7/16 IN. LG	EA	5
B-20	6	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING, NO. 6	EA	9
B-20	7	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	9
B-20	8	XDHHH		GD4875	70117	PANEL ASSEMBLY (SEE FIGURE B-24 FOR BREAKDOWN)	EA	1
B-20	9	XDHZZ		529C3-74	70117	SPACER, SLEEVE	EA	1
B-20	10	XDHHH		GB3144	70117	RESISTOR ASSEMBLY	EA	1
B-20	11	PAHZZ	5905-00-644-9545	RV5LAYSB253A	81349	RESISTOR, VARIABLE: 25 K OHMS, PORM 10%	EA	1
B-20	12	PAHZZ	5905-00-583-5130	RV5LAYSB502A	81349	RESISTOR, VARIABLE: 5 K OHMS, PORM 10%	EA	1
B-20	13	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX: NO. 6-32	EA	3
B-20	14	XDHZZ	5310-00-209-1366	MS35335-38	96906	WASHER, LOCK: EXT, NO. 6	EA	1
B-20	15	PAHZZ		533B106-1	70117	KNOB	EA	1
B-20	16	XDHZZ		2-56X1-8SO CHDCRES	70117	SETSCREW: FLUTED SOC HD, NO. 2-56 X 1/8 IN. LG CRES	EA	5
B-20	17	PAHZZ	5305-00-727-8831	MS35249-26	96906	SCREW, MACHINE: FH, NO. 4-40 X 3/4 IN. LG	EA	3
B-20	18	XDHZZ	3120-00-887-0562	527A481	70117	BUSHING, DETENT	EA	1
B-20	19	PAHZZ		530B5-8	70117	BEARING, BALL, ANNULAR	EA	5
B-20	20	XDHZZ	6625-00-907-6548	533A115	70117	BEARING, BUTTON	EA	5
B-20	21	PAHZZ	5360-00-739-1367	519C12-37	70117	SPRING, HELICAL COMPRESSION	EA	5
B-20	22	XDHZZ		6-32X1-4CUPPTSST	70117	SETSCREW: HEX. SOC HD, CUP POINT, NO. 6-32 X 1/4 IN. LG SST	EA	2
B-20	23	PAHZZ	5340-00-880-4853	537B70-1	70117	HANDLE, BOW	EA	1
B-20	24	XDHHH	6625-00-797-2698	GC1663	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-26 FOR BREAKDOWN)	EA	1
B-20	25	XDHHH		GE4884	70117	SIF CODER SUBASSEMBLY (SEE FIGURE B-27 FOR BREAKDOWN)	EA	1
B-20	26	XDHZZ		AN507C440-8	88044	SCREW, MACHINE: FH, 100°, 4-40 X 1/2 IN. LG	EA	5
B-20	27	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN HEX: NO. 4-40	EA	6
B-20	28	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING, NO. 4	EA	6
B-20	29	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	5
B-20	30	XDHZZ		529C3-103	70117	SPACER, SLEEVE	EA	5

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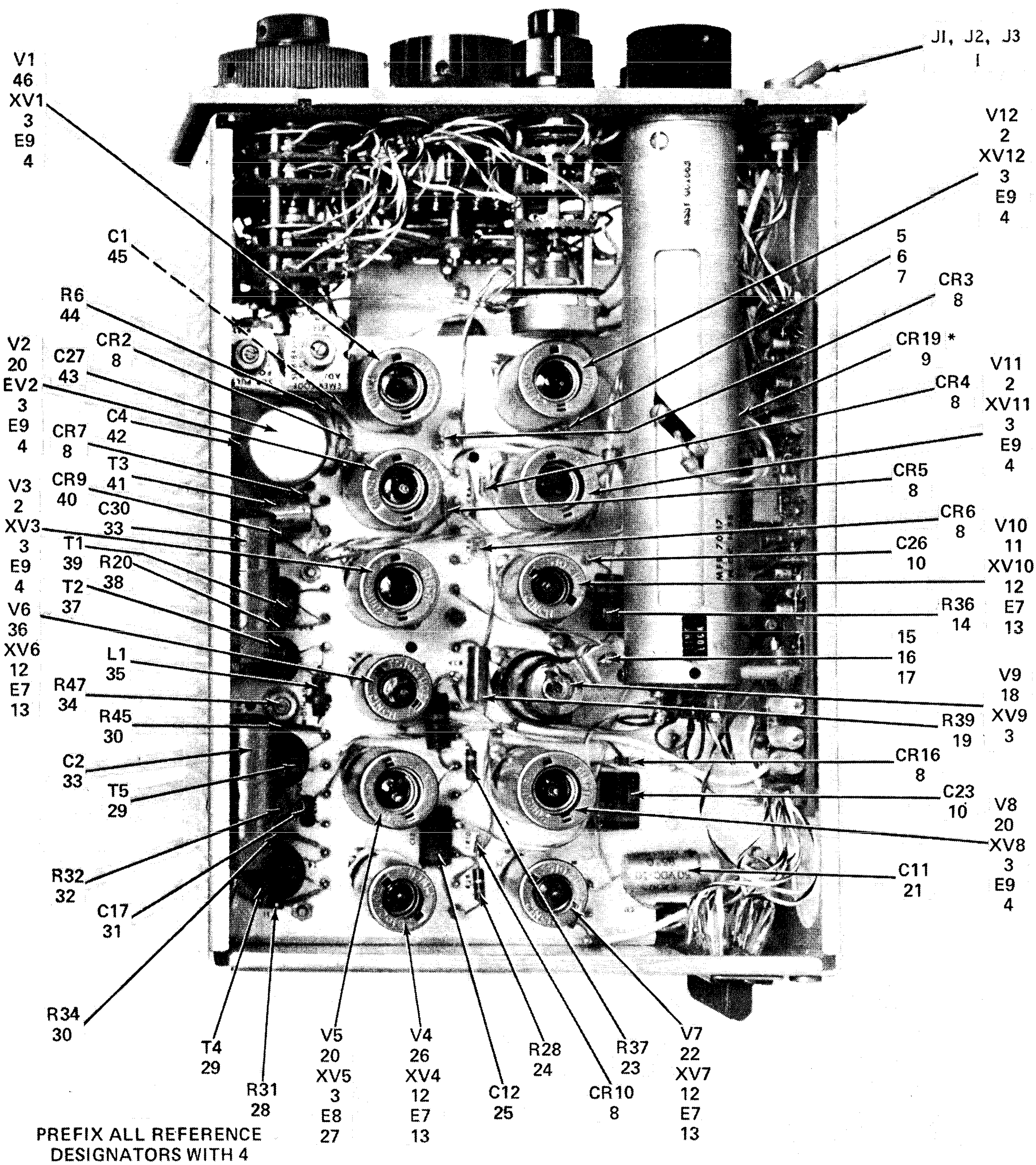

Figure B-21. ① Chassis assembly, unit 4 (sheet 1 of 3).

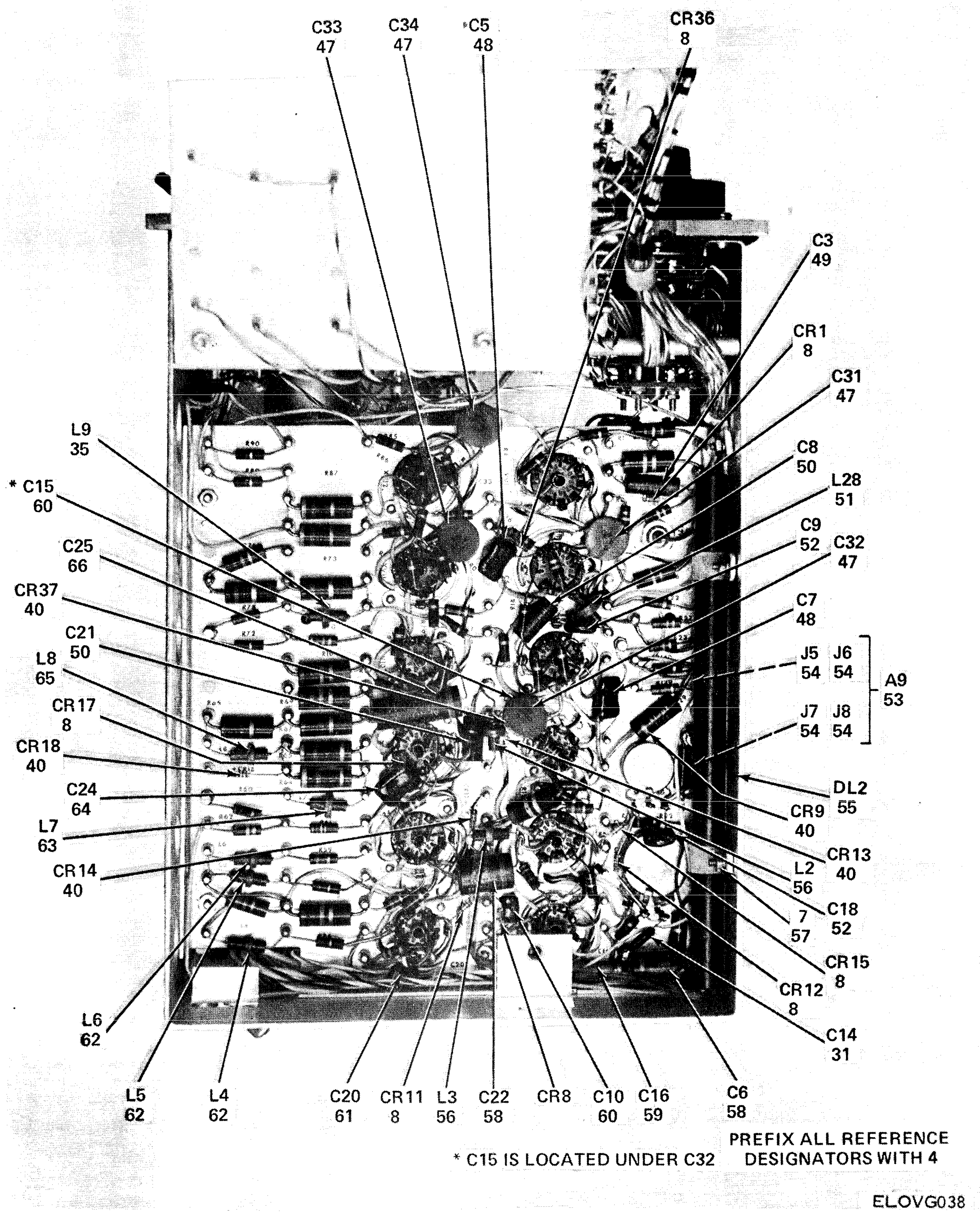

Figure B-21. ② Chassis assembly, unit 4 (sheet 2 of 3).

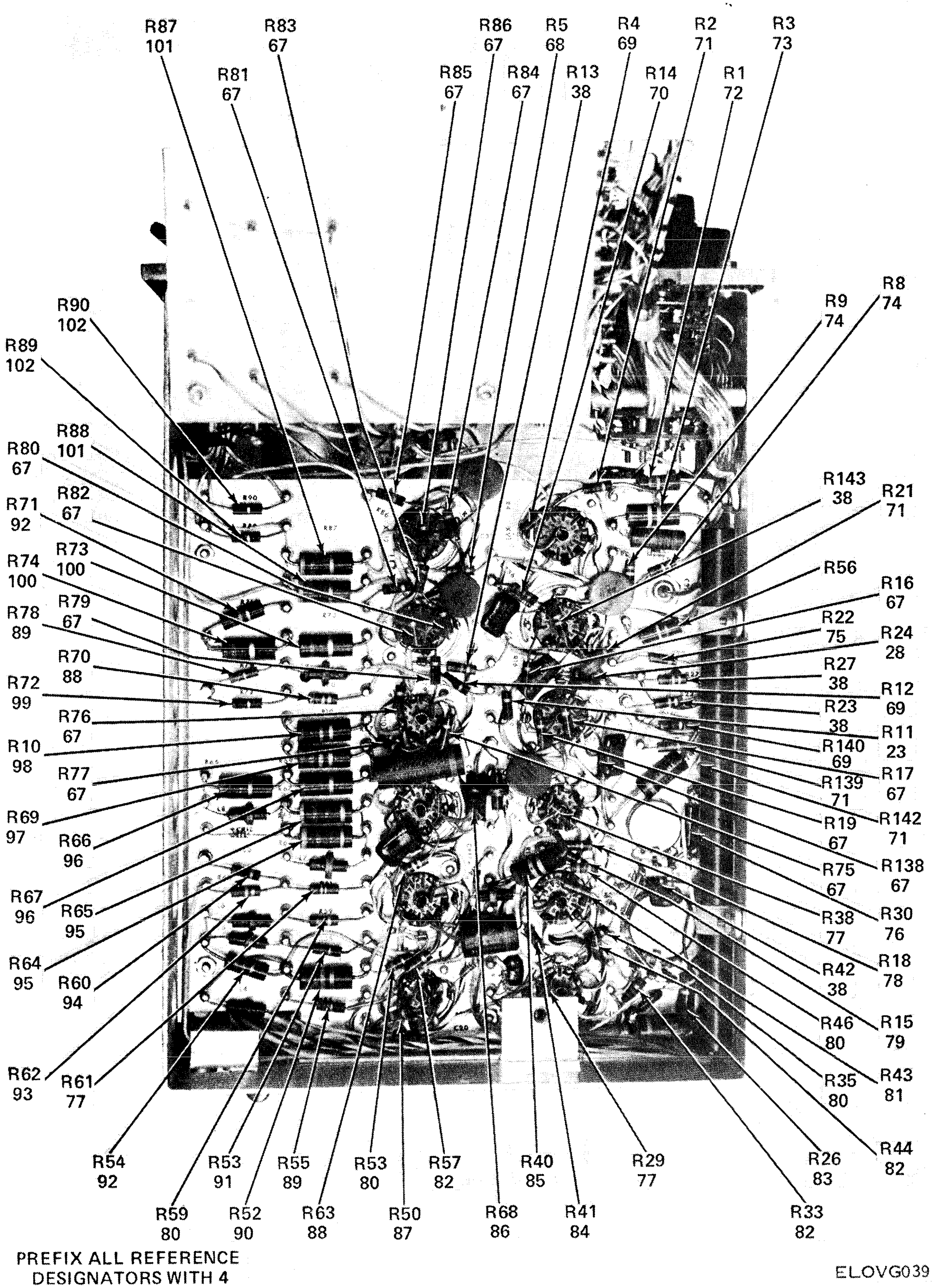

Figure B-21. ③ Chassis assembly, unit 4 (sheet 3 of 3).

SECTION IV REPAIR PARTS LIST (CONTINUED).

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-21	1	PAHZZ	5935-00-835-0510	M39012-21-0001	81349	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	3
B-21	2	PAOZZ	5961-00-179-4749	5687WB	81349	ELECTRON TUBE	EA	3
B-21	3	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE	EA	8
B-21	4	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	6
B-21	5	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: PNH, NO. 4-40 X 1/4 IN. LG.	EA	24
B-21	6	XDHZZ	5310-00-550-3715	MS35333-70	96906	WASHER, LOCK: I.T., NO. 4	EA	24
B-21	7	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING, NO. 4	EA	39
B-21	8	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	14
B-21	9	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-21	10	PAHZZ	5910-00-833-6443	P8292ZN18	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.5 UF, PORM 10%, 400 VDCW	EA	2
B-21	11	PAOZZ	5960-00-134-6021	6J6WA	81349	ELECTRON TUBE	EA	1
B-21	12	PAHZZ	5935-00-132-2405	TS102P01	81349	SOCKET, ELECTRON TUBE	EA	4
B-21	13	PAHZZ	5960-00-860-7709	M24251-6-2	81349	SHIELD, ELECTRON TUBE	EA	4
B-21	14	PAHZZ	5905-00-517-4593	RNC70K1621FS	81349	RESISTOR, FIXED, FILM: 1620 OHMS, PORM 0.05%, .5 WATT, 350 V	EA	1
B-21	15	PAHZZ	5960-00-284-4189	2D2	07387	RETAINER, ELECTRON TUBE	EA	1
B-21	16	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: PNH, 4-40 X 5/16 IN. LG.	EA	3
B-21	17	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN HEX: NO. 4-40	EA	15
B-21	18	PAOZZ	5960-00-052-8984	12BY7A	81349	ELECTRON TUBE	EA	1
B-21	19	PAHZZ	5905-00-005-2867	RCR42G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15K OHMS, PORM 10%, 2 WATT	EA	1
B-21	20	PAOZZ	5960-00-262-0161	12AT7WA	81349	ELECTRON TUBE	EA	2
B-21	21	PAHZZ	5910-00-768-2470	CL65CJ100KP3	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-21	22	PAOZZ	5960-00-681-9802	6AU6WB	81349	ELECTRON TUBE	EA	1
B-21	23	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2K OHMS, PORM 10%, .5 WATT	EA	2
B-21	24	PAHZZ	5905-00-141-1116	RCR20G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5.6K OHMS, PORM 10%, .5 WATT	EA	1
B-21	25	PAHZZ	5910-00-024-7546	M39022-01-1673	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, PORM 20%, 200 VDCW	EA	1
B-21	26	PAOZZ	5960-00-542-7004	6AH6WA	81349	ELECTRON TUBE	EA	2
B-21	27	PAHZZ	5960-00-866-2712	M24251-6-4	81349	SHIELD, ELECTRON TUBE	EA	1
B-21	28	PAHZZ	5905-00-141-0595	RCR20G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4.7K OHMS, PORM 10%, .5 WATT	EA	3
B-21	29	PAHZZ	5950-00-844-5445	574C34-1	70117	TRANSFORMER, PULSE	EA	2
B-21	30	PAHZZ	5905-00-110-0310	RCR20G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3.9K OHMS, PORM 10%, .5 WATT	EA	2
B-21	31	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 470 PF, PORM 5%, 500 VDCW	EA	2

SECTION IV REPAIR PARTS LIST (continued)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-21	32	PAHZZ	5905-00-577-7137	RV2LAYSA101A	81349	RESISTOR, VARIABLE: 100 OHMS, PORT 10%	EA	1
B-21	33	PAHZZ	5910-00-946-7626	CH12A3NE105K	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 1 MFD, PORM 10% 400 VDCW	EA	2
B-21	34	PAHZZ	5905-00-617-2730	RV5LAYSB102A	81349	RESISTOR, VARIABLE: 1K OHMS, PORM 10%	EA	1
B-21	35	PAHZZ	5950-00-023-7284	573B11-36	70117	COIL, RADIO FREQUENCY	EA	2
B-21	36	PAOZZ	5960-00-681-9802	6AU6WB	81349	ELECTRON TUBE	EA	1
B-21	37	PAHZZ	5950-00-846-1339	EP6102	97722	TRANSFORMER, PULSE	EA	1
B-21	38	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 10%, .5 WATT	EA	5
B-21	39	PAHZZ	5950-00-713-8503	EP6101	97722	TRANSFORMER, PULSE	EA	1
B-21	40	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	6
B-21	41	PAHZZ	5950-00-713-3937	EP12420	97722	TRANSFORMER, PULSE	EA	1
B-21	42	PAHZZ	5910-00-957-8577	CM05E680J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 68 PF, PORM 5%, 500 VDCW	EA	1
B-21	43	PAHZZ	5910-00-805-1017	D2Q3405	93110	CAPACITOR, FIXED, PLASTIC DIELECTRIC	EA	1
B-21	44	PAHZZ	5905-00-763-9752	RCR42G202JS	81349	RESISTOR, FIXED, COMPOSITION: 2K OHMS, PORM 5%, 2 WATT	EA	1
B-21	45	PAHZZ	5910-00-717-3539	CM06FD332G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 3,300 PF, PORM 5%, 500 VDCW	EA	1
B-21	46	PAOZZ	5960-00-262-0210	5814A	81349	ELECTRON TUBE	EA	1
B-21	47	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10K MMF, 500 VDCW	EA	4
B-21	48	PAHZZ	5910-00-060-1196	CM06F511J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 510 PF, PORM 5%, 500 VDCW	EA	2
B-21	49	PAHZZ	5910-00-958-7307	P8292ZNO-005 UF400VPORM20PCT	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.005 UF, 400 VDCW	EA	1
B-21	50	PAHZZ	5910-00-681-6247	P8292ZN6	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, PORM 20% 200 VDCW	EA	2
B-21	51	PAHZZ	5950-00-086-1984	573B11-32	70117	COIL, RADIO FREQUENCY	EA	1
B-21	52	PAHZZ	5910-00-957-9909	CM05FD391G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 390 PF, PORM 5%, 500 VDCW	EA	2
B-21	53	XDHZZ		GD1602-4	70117	CHASSIS ASSEMBLY	EA	1
B-21	54	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	4
B-21	55	PAHZZ	5840-00-027-8969	572D11-6	70117	DELAY LINE	EA	1
B-21	56	PAHZZ	5950-00-023-8110	573B11-35	70117	COIL, RADIO FREQUENCY	EA	2
B-21	57	XDHZZ	5310-00-672-2178	D4-128	95987	WASHER, FLAT	EA	2
B-21	58	PAHZZ	5910-00-879-6957	MPY2P25-10PCT	93790	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, PORM 20%, 200 VDCW	EA	2
B-21	59	PAHZZ	5910-00-148-4886	CL35BB300MP3	81349	CAPACITOR, FIXED, ELECTROLYTIC:	EA	1
B-21	60	PAHZZ		DM15C150J0	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 15 PF, PORM 5%, 500 VDCW	EA	2
B-21	61	PAHZZ	5910-00-051-4612	CM05E220J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 2 PF, PORM 5%, 500 VDCW	EA	1
B-21	62	PAHZZ	5950-00-023-8112	573B11-31	70117	COIL, RADIO FREQUENCY	EA	3
B-21	63	PAHZZ	5950-00-023-9662	573B11-37	70117	COIL, RADIO FREQUENCY	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-21	64	PAHZZ	5910-00-043-2933	CM06F821J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 820 PF, PORM 5%, 500 VDCW	EA	1
B-21	65	PAHZZ	5950-00-086-1984	573B11-32	70117	COIL, RADIO FREQUENCY	EA	1
B-21	66	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, PORM 20%, 400 VDCW	EA	1
B-21	67	PAHZZ	5905-00-104-5755	RCR20G100JS	81349	RESISTOR, FIXED, COMPOSITION: 10 OHMS, PORM 10%, .5 WATT	EA	14
B-21	68	PAHZZ	5905-00-104-8334	RCR20G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 10%, .5 WATT	EA	1
B-21	69	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 10%, .5 WATT	EA	3
B-21	70	PAHZZ	5905-00-104-8330	RCR20G333JS	81349	RESISTOR, FIXED, COMPOSITION: 33K OHMS, PORM 10%, .5 WATT	EA	1
B-21	71	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 10%, .5 WATT	EA	4
B-21	72	PAHZZ	5905-00-247-8705	RCR32G134JS	81349	RESISTOR, FIXED, COMPOSITION: 130K OHMS, PORM 5%, 1 WATT	EA	1
B-21	73	PAHZZ	5905-00-759-8896	RCR42G104JS	81349	RESISTOR, FIXED, COMPOSITION: 100K OHMS, PORM 10%, 2 WATT	EA	1
B-21	74	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: 100K OHMS, PORM 10%, .5 WATT	EA	2
B-21	75	PAHZZ	5905-00-141-0592	RCR20G122JS	81349	RESISTOR, FIXED, COMPOSITION: 1.2K OHMS, PORM 10%, .5 WATT	EA	1
B-21	76	PAHZZ	5905-00-111-8372	RCR32G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2K OHMS, PORM 10%, 1 WATT	EA	1
B-21	77	PAHZZ	5905-00-114-5456	RCR20G684JS	81349	RESISTOR, FIXED, COMPOSITION: 680K OHMS, PORM 10%, .5 WATT	EA	3
B-21	78	PAHZZ	5905-00-116-8569	RCR20G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 10%, .5 WATT	EA	1
B-21	79	PAHZZ	5905-00-935-8544	RCR20G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 10%, .5 WATT	EA	1
B-21	80	PAHZZ	5905-00-141-0598	RCR20G561JS	81349	RESISTOR, FIXED, COMPOSITION: 560 OHMS, PORM 10%, .5 WATT	EA	4
B-21	81	PAHZZ	5905-00-114-5438	RCR20G510JS	81349	RESISTOR, FIXED, COMPOSITION: 51 OHMS, PORM 5%, .5 WATT	EA	1
B-21	82	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 10%, .5 WATT	EA	3
B-21	83	PAHZZ	5905-00-106-1245	RCR32G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2.7K OHMS, PORM 10%, 1 WATT	EA	1
B-21	84	PAHZZ	5905-00-104-8334	RCR20G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 5%, .5 WATT	EA	1
B-21	85	PAHZZ	5905-00-184-7703	RCR42G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 10%, 2 WATT	EA	1
B-21	86	PAHZZ	5905-00-116-8561	RCR20G270JS	81349	RESISTOR, FIXED, COMPOSITION: 27 OHMS, PORM 10%, .5 WATT	EA	1
B-21	87	PAHZZ	5905-00-104-8348	RCR20G332JS	81349	RESISTOR, FIXED, COMPOSITION: 3.3K OHMS, PORM 10%, .5 WATT	EA	1
B-21	88	PAHZZ	5905-00-141-1071	RCR20G474JS	81349	RESISTOR, FIXED, COMPOSITION: 470K OHMS, PORM 10%, .5 WATT	EA	2
B-21	89	PAHZZ	5905-00-111-4738	RCR20G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1.5K OHMS, PORM 10%, .5 WATT	EA	2

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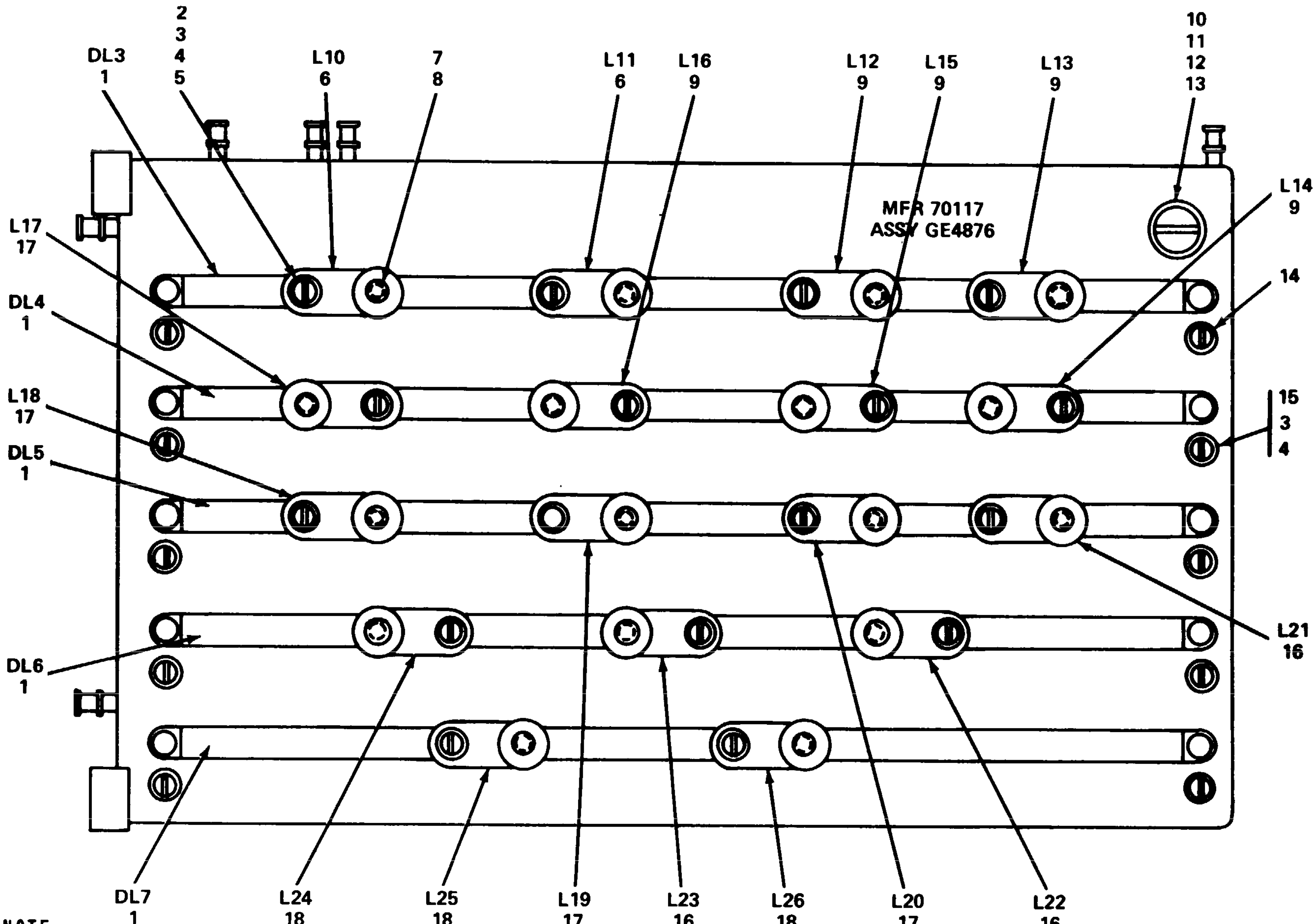
SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-21	90	PAHZZ	5905-00-160-5945	RCR42G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12K OHMS, PORM 10%, 2 WATT	EA	1
B-21	91	PAHZZ	5905-00-141-0593	RCR20G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1.8K OHMS, PORM 10%, .5 WATT	EA	1
B-21	92	PAHZZ	5905-00-106-9351	RCR20G273JS	81349	RESISTOR, FIXED, COMPOSITION: 27K OHMS, PORM 10%, .5 WATT	EA	2
B-21	93	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: 150K OHMS, PORM 10%, .5 WATT	EA	1
B-21	94	PAHZZ	5905-00-141-1165	RCR20G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6.8K OHMS, PORM 10%, .5 WATT	EA	1
B-21	95	PAHZZ	5905-00-767-0944	RCR42G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4.7K OHMS, PORM 10%, 2 WATT	EA	2
B-21	96	PAHZZ	5905-00-138-4927	RCR42G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 10%, 2 WATT	EA	2
B-21	97	PAHZZ	5905-00-001-3031	RCR42G183JS	81349	RESISTOR, FIXED, COMPOSITION: 18K OHMS, PORM 10%, 2 WATT	EA	1
B-21	98	PAHZZ	5905-00-759-8556	RCR42G823JS	81349	RESISTOR, FIXED, COMPOSITION: 82K OHMS, PORM 10%, 2 WATT	EA	1
B-21	99	PAHZZ	5905-00-141-0600	RCR20G822JS	81349	RESISTOR, FIXED, COMPOSITION: 8.2K OHMS, PORM 10%, .5 WATT	EA	1
B-21	100	PAHZZ	5905-00-407-2388	RCR42G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5.6K OHMS, PORM 10%, 2 WATT	EA	2
B-21	101	PAHZZ	5905-00-477-1201	RCR42G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 10%, 2 WATT	EA	2
B-21	102	PAHZZ	5905-00-104-8350	RCR20G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 10%, .5 WATT	EA	2

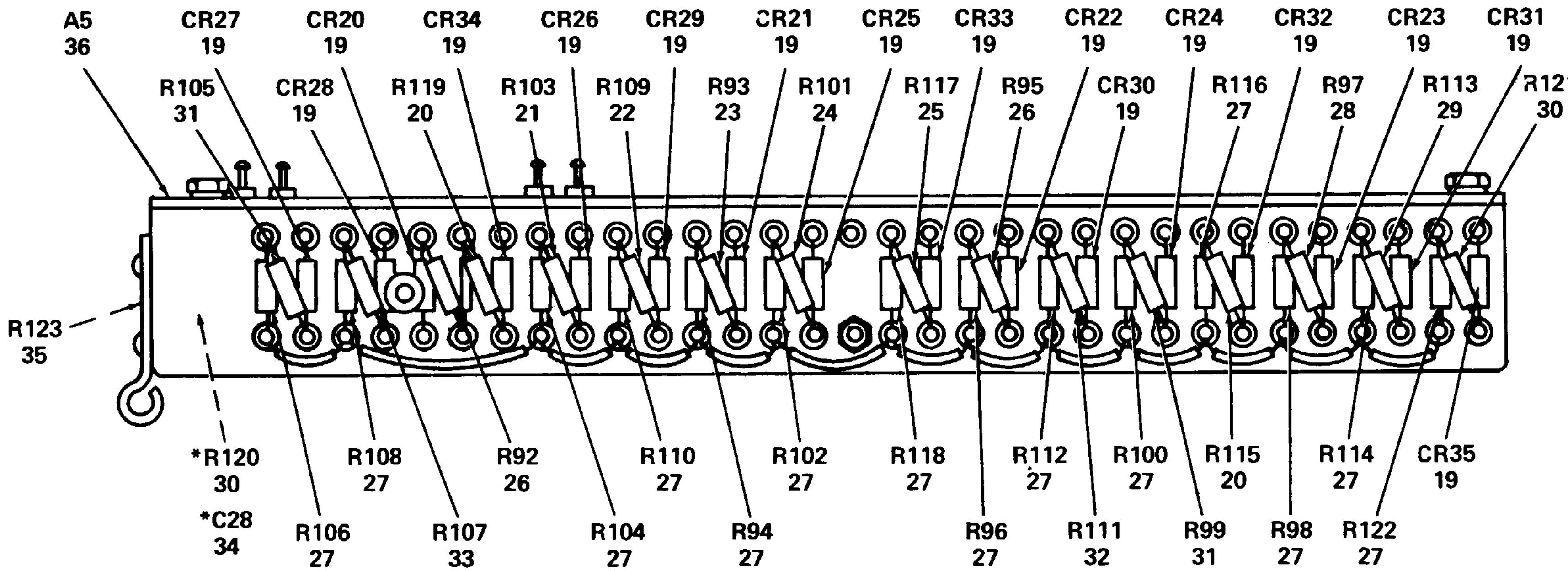


NOTE:

PREFIX ALL REFERENCE DESIGNATORS WITH 4

Figure B-22. ① Coding line assembly (sheet 1 of 2).

TM 11-6625-403-15-1



*C28 AND R120 ARE LOCATED ON OPPOSITE END.

NOTE:

PREFIX ALL REFERENCE DESIGNATORS WITH 4

ELOVC041

Figure B-22. ② Coding line assembly (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-22		XDHHH		GE4876	70117	CODING LINE ASSEMBLY (SEE FIGURE B-20 FOR NHA)	EA	REF
B-22	1	PAHZZ	6625-00-803-8782	572D11-5	70117	DELAY LINE	EA	5
B-22	2	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: PNH, NO. 4-40 X 1/4 IN. LG.	EA	17
B-22	3	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING, NO. 4	EA	30
B-22	4	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	23
B-22	5	XDDZZ		515A859-2	70117	PLATE	EA	17
B-22	6	PAHZZ	5950-00-626-2809	569C29-7	70117	COIL, RADIO FREQUENCY	EA	2
B-22	7	XDHZZ		AN565DC4H8	88044	SETSCREW: HEADLESS, HEX SOC, NO. 4-40 X 1/2 IN. LG.	EA	17
B-22	8	XDHZZ		502A41-11-3	70117	NUT, KNURLED: NO. 4-40	EA	17
B-22	9	PAHZZ	5950-00-713-8483	569C29-3	70117	COIL, RADIO FREQUENCY	EA	5
B-22	10	XDHZZ		10-32X1437BHSST	70117	SCREW, MACHINE: BH, NO. 10-32 X 1-7/16 IN. LG. SST	EA	1
B-22	11	XDHZZ	5310-00-933-8120	MS35338-138	96906	WASHER, LOCK: SPRING NO. 10	EA	1
B-22	12	XDHZZ	5310-00-619-1148	MS15795-808	96906	WASHER, FLAT: NO. 10	EA	1
B-22	13	PAHZZ	5330-00-618-6025	MS9021-007	96906	PACKING, PREFORMED	EA	1
B-22	14	PAHZZ	5305-00-054-5656	MS35233-22	96906	SCREW, MACHINE: PNH, NO. 4-40 X 1-1/4 IN. LG.	EA	4
B-22	15	PAHZZ	5305-00-054-5654	MS35233-20	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/8 IN. LG.	EA	6
B-22	16	PAHZZ	5950-00-713-8485	569C29-1	70117	COIL, RADIO FREQUENCY	EA	3
B-22	17	PAHZZ	5950-00-713-8484	569C29-4	70117	COIL, RADIO FREQUENCY	EA	4
B-22	18	PAHZZ	5950-00-713-8486	569C29-5	70117	COIL, RADIO FREQUENCY	EA	3
B-22	19	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	16
B-22	20	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .25 WATT	EA	2
B-22	21	PAHZZ	5905-00-116-2394	RCR07G511JS	81349	RESISTOR, FIXED, COMPOSITION: 510 OHMS, PORM 5%, .25 WATT	EA	1
B-22	22	PAHZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1.8K OHMS, PORM 5%, .25 WATT	EA	1
B-22	23	PAHZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 5%, .25 WATT	EA	1
B-22	24	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	1
B-22	25	PAHZZ	5905-00-131-1255	RCR07G122JS	81349	RESISTOR, FIXED, COMPOSITION: 1.2K OHMS, PORM 5%, .25 WATT	EA	1
B-22	26	PAHZZ	5905-00-119-8811	RCR07G151JS	81349	RESISTOR, FIXED, COMPOSITION: 150 OHMS, PORM 5%, .25 WATT	EA	2
B-22	27	PAHZZ	5905-00-400-4528	RCR07G124JS	81349	RESISTOR, FIXED, COMPOSITION: 120K OHMS, PORM 10%, .25 WATT	EA	14
B-22	28	PAHZZ	5905-00-141-0742	RCR07G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 5%, .25 WATT	EA	1
B-22	29	PAHZZ	5905-00-119-8768	RCR07G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, .25 WATT	EA	1
B-22	30	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .25 WATT	EA	2
B-22	31	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED, COMPOSITION: 390 OHMS, PORM 5%, .25 WATT	EA	2

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-22	32	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2K OHMS, PORM 5%, .25 WATT	EA	1
B-22	33	PAHZZ	5905-00-106-1356	RCR07G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1.5K OHMS, PORM 5%, .25 WATT	EA	1
B-22	34	PAHZZ	5910-00-148-4886	CL35BB300MP3	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-22	35	PAHZZ	5905-00-141-0744	RCR07G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5.6K OHMS, PORM 5%, .25 WATT	EA	1
B-22	36	XDHHH		GC2641	70117	CODING LINE COVER ASSEMBLY (SEE FIGURE B-23 FOR BREAKDOWN)	EA	1

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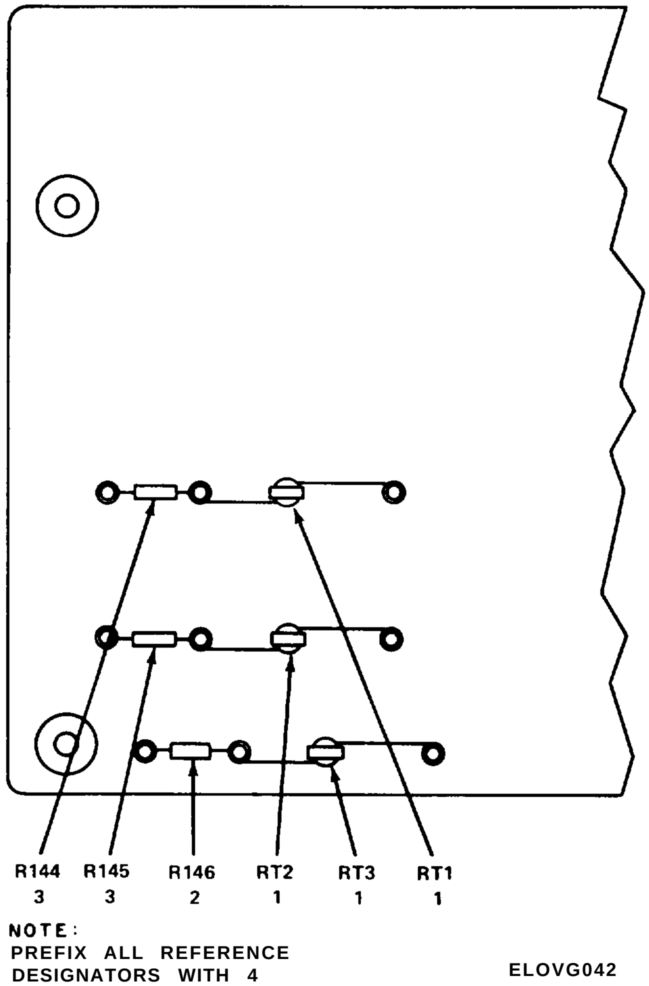

Figure B-23. Coding line cover assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-23		XDHHH		GC2641	70117	CODING LINE COVER ASSEMBLY (SEE FIGURE B-22 FOR NHA)	EA	REF
B-23	1	PAHZZ	5905-00-830-4439	24D2101	04239	RESISTOR, THERMAL	EA	3
B-23	2	PAHZZ	5905-00-110-0388	RCR07G104JS	81349	RESISTOR, FIXED, COMPOSITION: 100 K OHMS, PORM 5%, .5 WATT	EA	1
B-23	3	PAHZZ	5905-00-119-3505	RCR07G683JS	81349	RESISTOR, FIXED, COMPOSITION: 68 K OHMS, PORM 5%, .5 WATT	EA	2

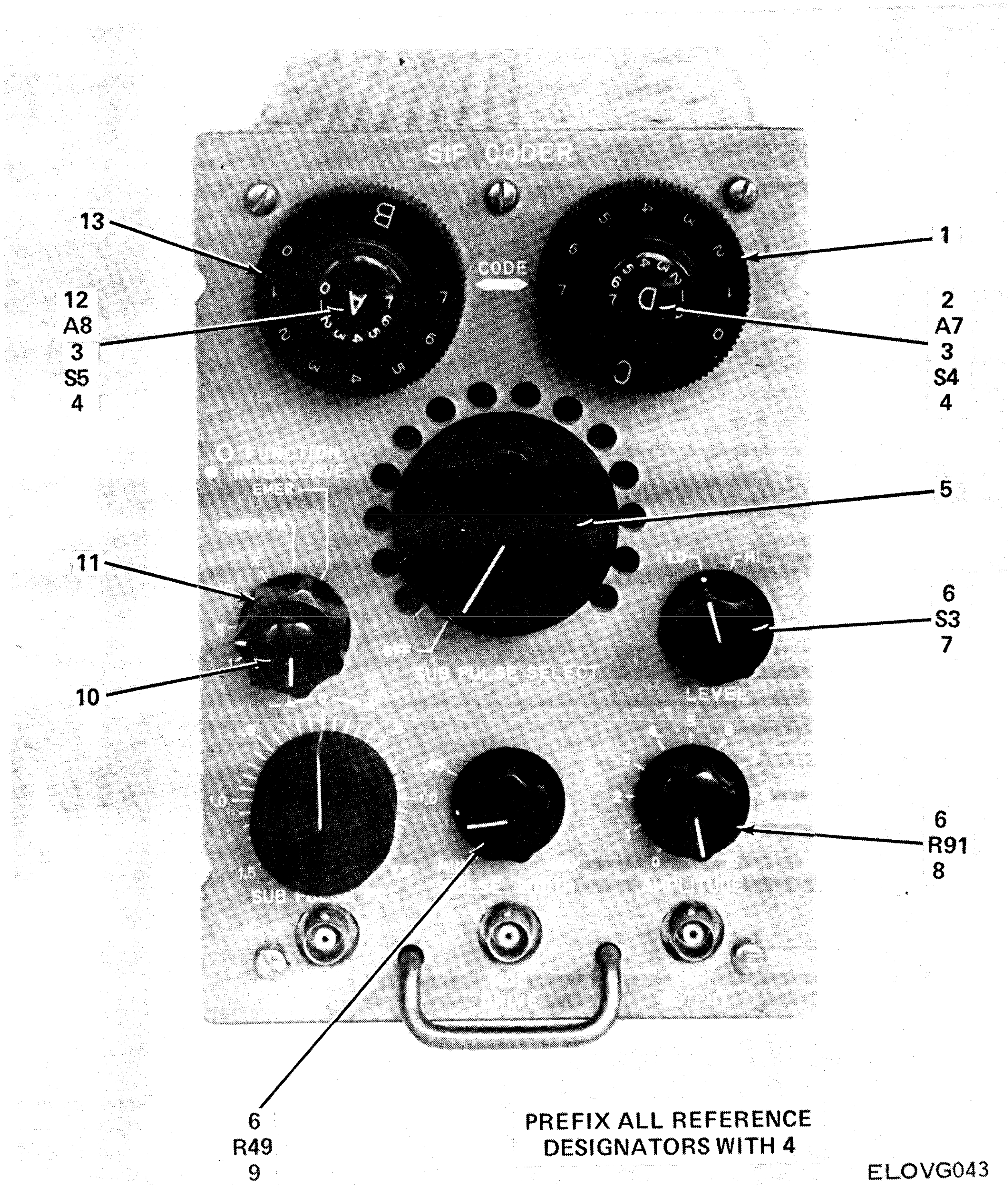

Figure B-24. ① Panel assembly, unit 4 (sheet 1 of 2).

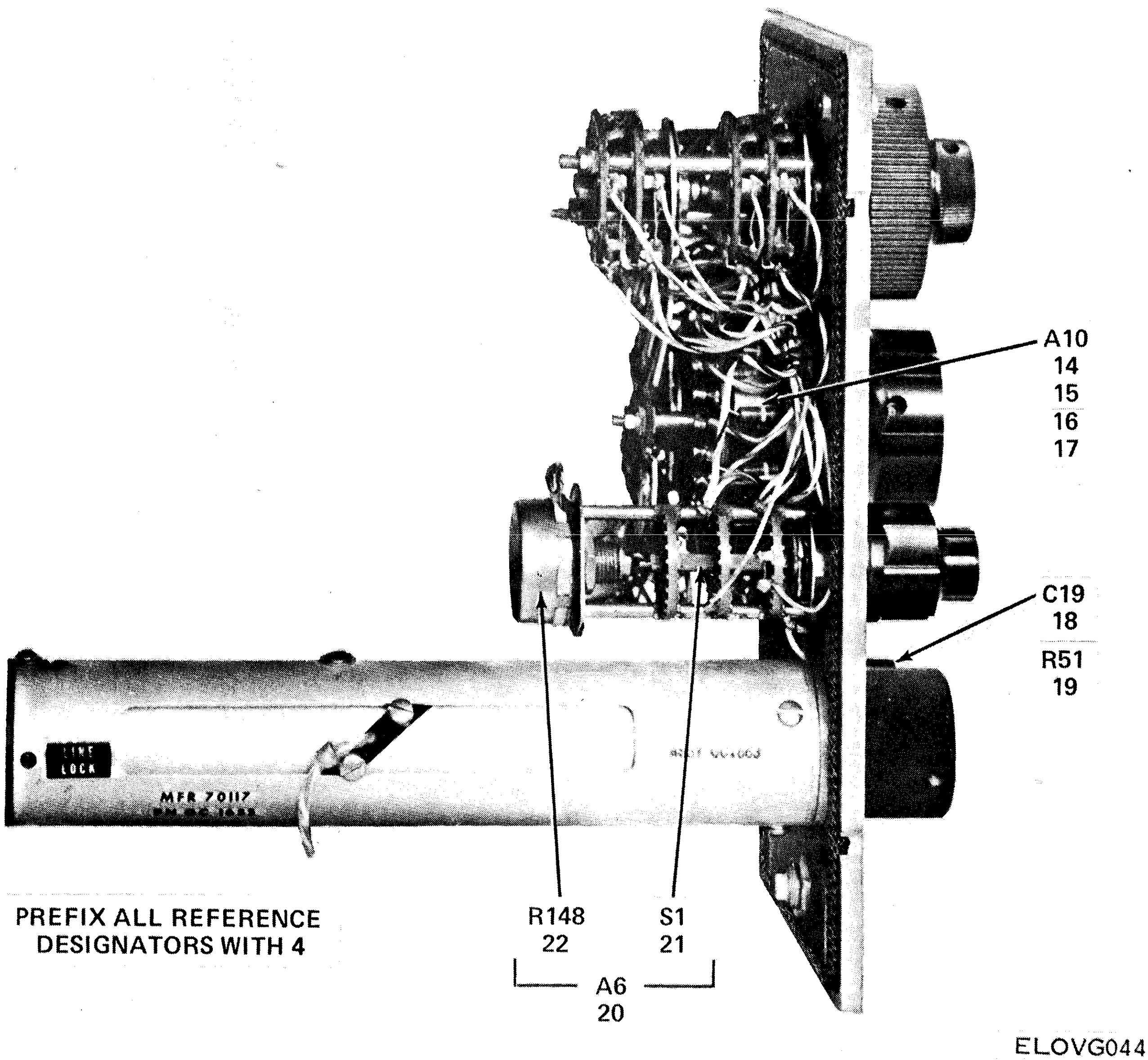

Figure B-24. ② Panel assembly, unit 4 (sheet 2 of 2).

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-24		XDHHH		GD4875	70117	PANEL ASSEMBLY (SEE FIGURE B-20 FOR NHA)	EA	REF
B-24	1	PAHZZ	5355-00-978-9045	533C261-2	70117	DIAL, CONTROL	EA	1
B-24	2	PAHZZ	5355-00-985-1988	533C260-2	70117	DIAL, CONTROL	EA	1
B-24	3	XDHHH		GC5003	70117	CODE SWITCH ASSEMBLY	EA	2
B-24	4	PAHZZ	5930-00-751-9483	196661F4	76854	SWITCH, ROTARY	EA	1
B-24	5	PAHZZ	5355-00-668-4634	S649-3LBB	75376	KNOB	EA	1
B-24	6	PAHZZ	5355-00-519-9375	S647-3LBB	75376	KNOB	EA	3
B-24	7	PAHZZ	5930-00-713-6942	95655A1	76854	SWITCH, ROTARY	EA	1
B-24	8	PAHZZ	5905-00-539-5000	RV4NAYSD251A	81349	RESISTOR, VARIABLE: 250 OHMS, PORM 20%	EA	1
B-24	9	PAHZZ	5905-00-552-2859	RV4NAYSD501A	81349	RESISTOR, VARIABLE: 500 OHMS, PORM 20%	EA	1
B-24	10	PAHZZ	5355-00-576-5470	S645-5LBB	75376	KNOB	EA	1
B-24	11	PAHZZ	5355-00-819-0067	533A98-3	70117	KNOB	EA	1
B-24	12	PAHZZ	5355-00-985-1989	533C260-1	70117	DIAL, CONTROL	EA	1
B-24	13	PAHZZ	5355-00-978-9044	533C261-1	70117	DIAL, CONTROL	EA	1
B-24	14	XDHHH		GD1895-2	70117	SUB PULSE SELECTOR ASSEMBLY (SEE FIGURE B-25 FOR BREAKDOWN)	EA	1
B-24	15	PAHZZ	5305-00-054-6654	MS35233-30	96906	SCREW, MACHINE: PNH, NO. 6-32 X 1/2 IN. LG.	EA	2
B-24	16	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	2
B-24	17	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING, NO. 6	EA	2
B-24	18	PAHZZ	5910-00-578-8485	DM15F821J03	72136	CAPACITOR, FIXED, MICA DIELECTRIC: 820 PF, PORM 5%, 300 VDCW	EA	1
B-24	19	PAHZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 10%, .5 WATT	EA	1
B-24	20	XDHHH		GC4931	70117	FUNCTION SWITCH ASSEMBLY	EA	1
B-24	21	PAHZZ	5930-00-105-7605	576C199	70117	SWITCH, ROTARY	EA	1
B-24	22	PAHZZ	5905-00-646-5981	RV4NAYSB253A	81349	RESISTOR, VARIABLE: 25K OHMS, PORM 20%	EA	1

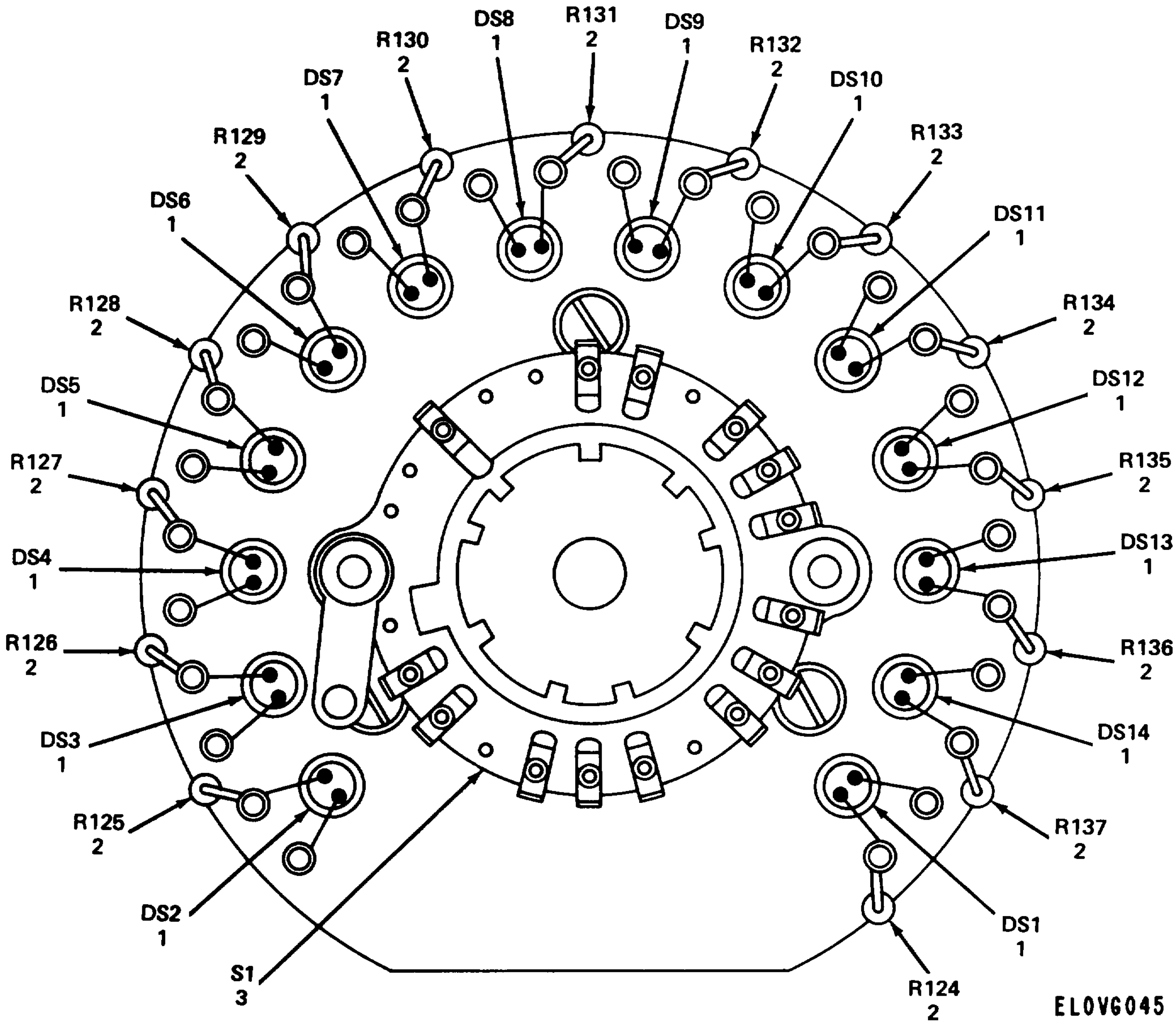

Figure B-25. Sub pulse selector assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-25		XDHHH		GD1895-2	70117	SUB PULSE SELECTOR ASSEMBLY (SEE FIGURE B-24 FOR NHA)	EA	REF
B-25	1	PAOZZ	6240-00-295-1368	NE2A	08806	LAMP, GLOW	EA	14
B-25	2	PAHZZ	5905-00-114-5393	RCR20G224JS	81349	RESISTOR , FIXED, COMPOSITION : 220 K OHMS, PORM 10%, 1 WATT	EA	14
B-25	3	PAHZZ	5930-00-751-7789	194774F2	76854	SWITCH , ROTARY	EA	1

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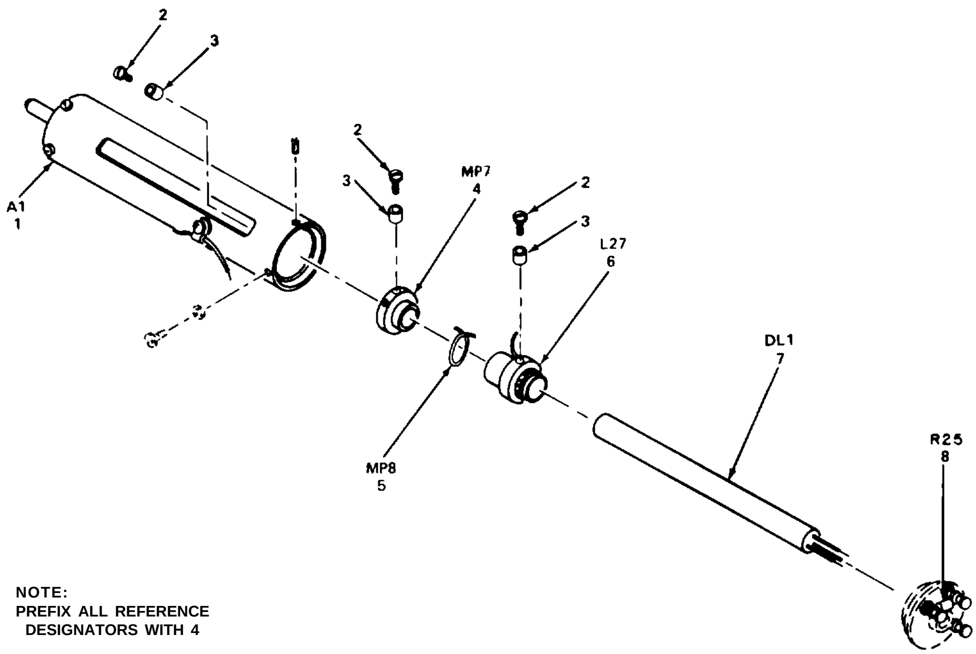

Figure B-26. Delay line assembly, unit 4.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-26		XDHHH	6625-00-797-2698	GC1663	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-20 FOR NHA)	EA	REF
B-26	1	PAHZZ	5840-00-774-9698	GC1655	70117	DELAY LINE	EA	1
B-26	2	PAHZZ	5305-00-054-5650	MS35233-16	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/16 IN. LG.	EA	2
B-26	3	XDHZZ		529C6-39	70117	SPACER, SLEEVE	EA	2
B-26	4	XDHZZ	6625-00-797-2694	512A150	70117	BOBBIN, SLEEVE	EA	1
B-26	5	PAHZZ	5360-00-820-0113	519C12-36	70117	SPRING, COIL	EA	1
B-26	6	PAHZZ	5950-00-713-8498	569C32-1	70117	COIL, RADIO FREQUENCY	EA	1
B-26	7	PAHZZ	6625-00-027-8967	572D11-3	70117	DELAY LINE	EA	1
B-26	8	PAHZZ	5905-00-141-1165	RCR20G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6.8K OHMS, PORM 10%, .5 WATT	EA	1

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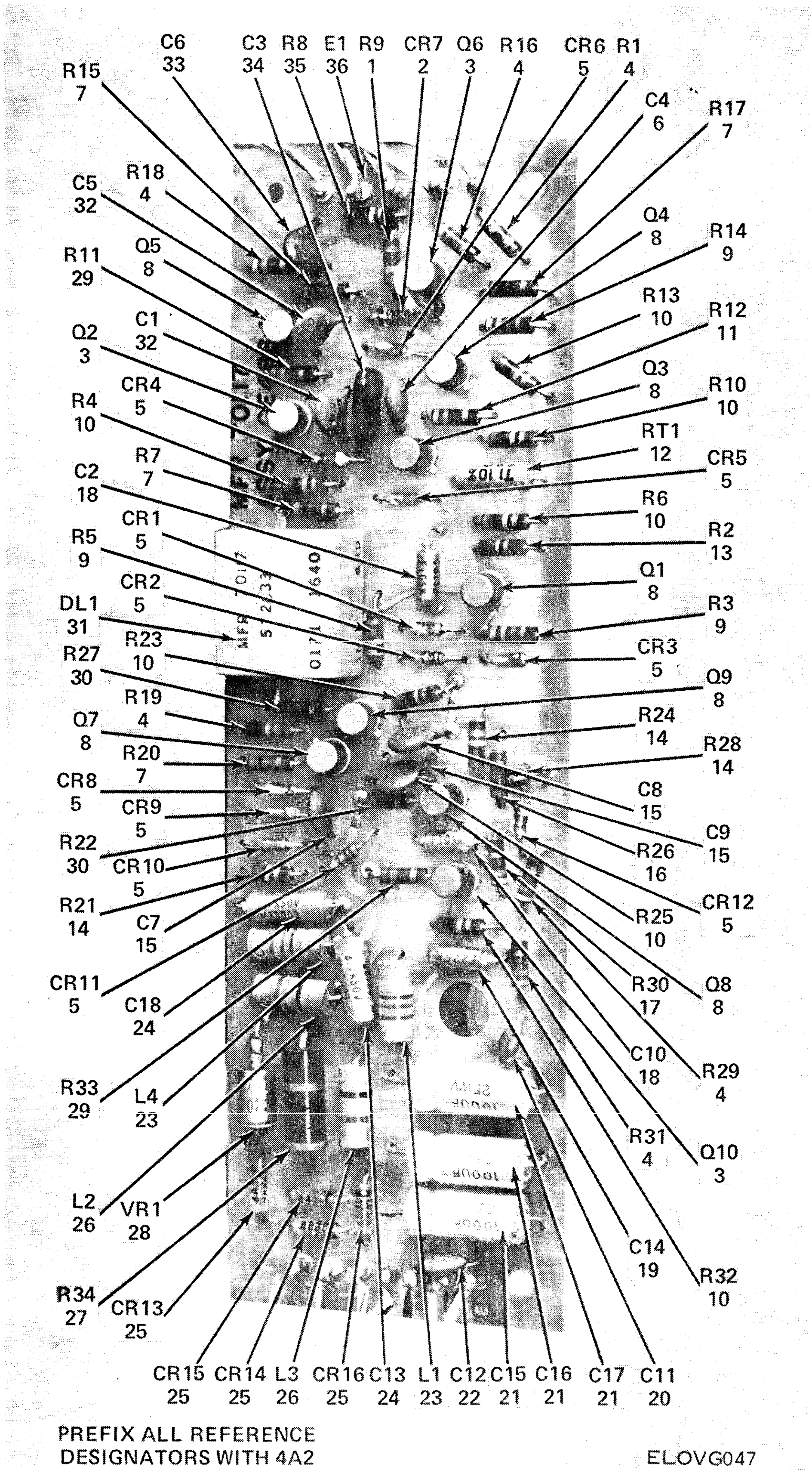

Figure B-27. SIF coder subassembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-27		XDHHH		GE4884	70117	SIF CODER SUBASSEMBLY (SEE FIGURE B-20 FOR NHA)	EA	REF
B-27	1	PAHZZ	5905-00-111-4727	RCR07G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 5%, .25 WATT	EA	1
B-27	2	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE,DIODE	EA	1
B-27	3	PAHZZ	5961-00-946-2023	2N2906	81349	TRANSISTOR	EA	3
B-27	4	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	6
B-27	5	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE,DIODE	EA	11
B-27	6	PAHZZ	5910-00-983-5388	CK60BX100K	81349	CAPACITOR, FIXED, DIELECTRIC: 10 MMF, PORM 10%, 500 VDCW	EA	1
B-27	7	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .25 WATT	EA	4
B-27	8	PAHZZ	5961-00-926-0135	2N2481	81349	TRANSISTOR	EA	7
B-27	9	PAHZZ	5905-00-114-0710	RCR07G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 5%, .25 WATT	EA	3
B-27	10	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .25 WATT	EA	7
B-27	11	PAHZZ	5905-00-126-6683	RCR07G332JS	81349	RESISTOR, FIXED, COMPOSITION: 3,300 OHMS, PORM 5%, .25 WATT	EA	1
B-27	12	PAHZZ		TM1-8-680HM-1-8WPORM10PCT	06228	RESISTOR, THERMAL: 68 OHMS, PORM 10%, .125 WATT	EA	1
B-27	13	PAHZZ	5905-00-116-8556	RCR07G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 5%, .25 WATT	EA	1
B-27	14	PAHZZ	5905-00-106-1278	RCR07G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12K OHMS, PORM 5%, .25 WATT	EA	3
B-27	15	PAHZZ	5910-00-822-3767	CK60BX151K	81349	CAPACITOR, FIXED, DIELECTRIC: 150 MMF, PORM 10%, 500 VDCW	EA	3
B-27	16	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	1
B-27	17	PAHZZ	5905-00-110-7622	RCR07G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, .25 WATT	EA	1
B-27	18	PAHZZ	5910-00-787-2109	CS13BF105K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 1.0 UF, PORM 10%	EA	2
B-27	19	PAHZZ	5910-00-007-2002	CS13BE225K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 2.2 UF, PORM 10%	EA	1
B-27	20	PAHZZ	5910-00-821-5215	CK60AX471K	81349	CAPACITOR, FIXED, DIELECTRIC: 470 MMF, PORM 10%, 500 VDCW	EA	1
B-27	21	PAHZZ	5910-00-006-6972	CL65BG101MP3	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	3
B-27	22	PAHZZ	5910-00-822-3766	CK60AX221K	81349	CAPACITOR, FIXED, DIELECTRIC: 220 MMF, PORM 10%, 500 VDCW	EA	1
B-27	23	PAHZZ	5950-00-892-8209	MS75008-41	96906	COIL, RADIO FREQUENCY	EA	2
B-27	24	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 UF, 500 V, PORM 10%	EA	2
B-27	25	PAHZZ	5961-00-840-5466	1N483B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	4
B-27	26	PAHZZ	5950-00-051-4532	MS75008-45	96906	COIL, RADIO FREQUENCY	EA	2
B-27	27	PAHZZ	5905-00-131-1256	RCR32G820JS	81349	RESISTOR, FIXED, COMPOSITION: 82 OHMS, PORM 5%, 1 WATT	EA	1
B-27	28	PAHZZ	5961-00-836-0382	1N3022B	81349	SEMICONDUCTOR DEVICE, DIODE ZENER	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-27	29	PAHZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .25 WATT	EA	2
B-27	30	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	2
B-27	31	PAHZZ	6625-00-110-5015	572C33	70117	DELAY LINE	EA	1
B-27	32	PAHZZ	5910-00-842-3814	CK60BX680K	81349	CAPACITOR, FIXED, DIELECTRIC: 68 MMF, PORM 10%, 500 VDCW	EA	2
B-27	33	PAHZZ	5910-00-838-9421	CK60AW102M	81349	CAPACITOR, FIXED, DIELECTRIC: 1,000 MMF, PORM 20%, 500 VDCW	EA	1
B-27	34	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	1
B-27	35	PAHZZ	5905-00-110-0388	RCR07G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG OHMS, PORM 5%, .25 WATT	EA	1
B-27	36	XDHZZ		GD4911	70117	PRINTED WIRING BOARD	EA	1

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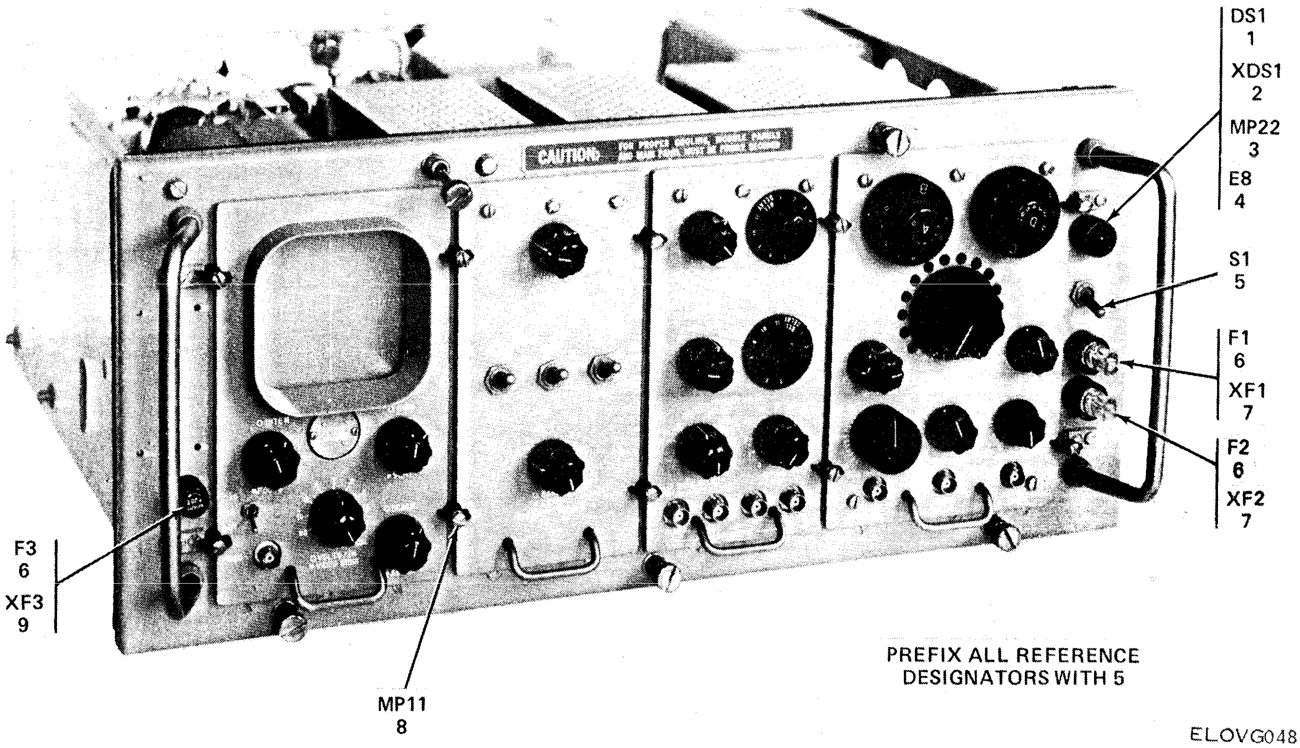

Figure B-28. ① Chassis assembly, unit 5 (sheet 1 of 2).

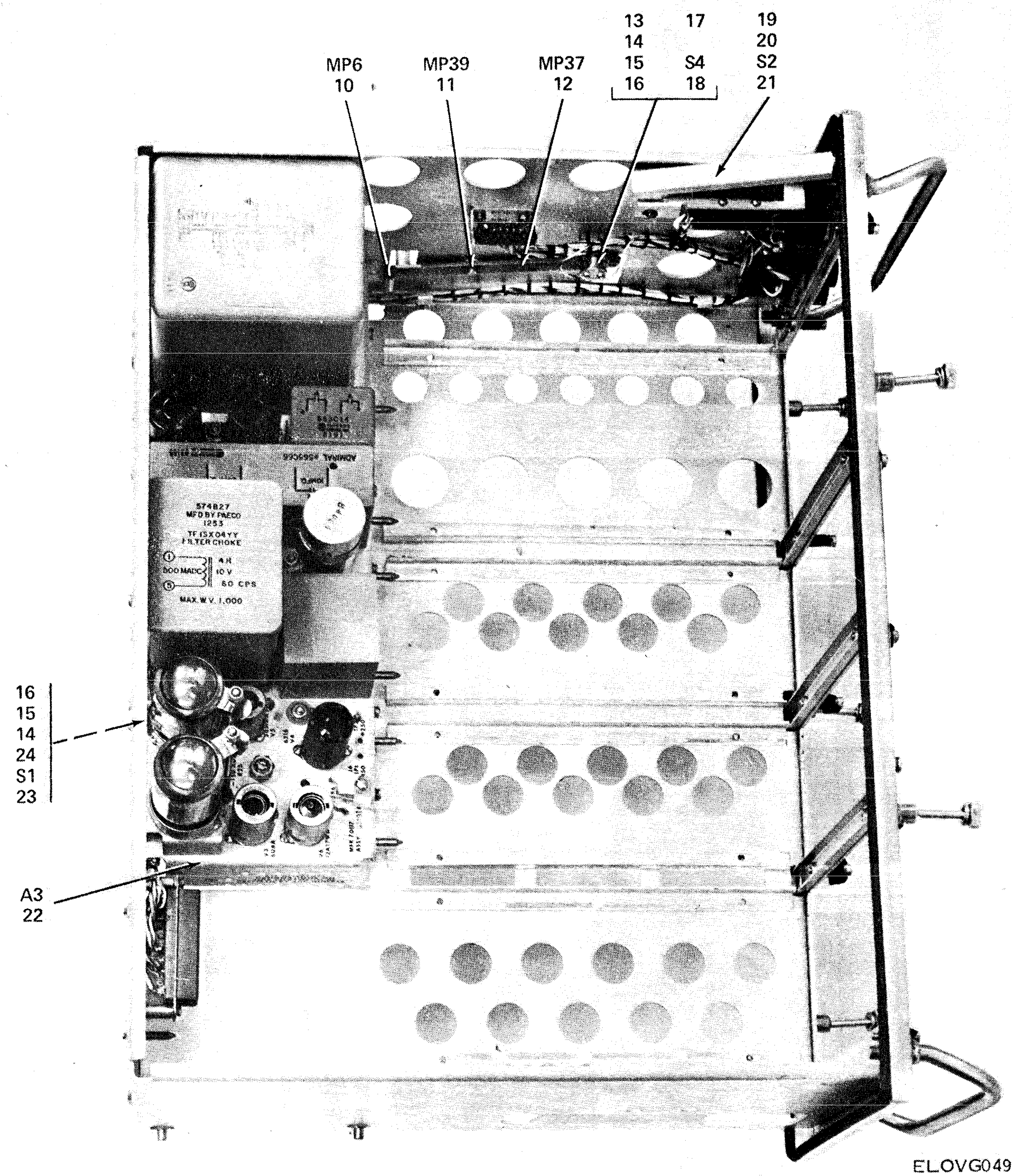

Figure B-28. ② Chassis assembly, unit 5 (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0105 - CHASSIS ASSEMBLY		
B-28		XDHHH		GJ4910	70117	MAIN CHASSIS ASSEMBLY (SEE FIGURE B-1 FOR NHA)	EA	REF
B-28	1	PAOZZ	6240-00-155-8706	MS15571-2	96906	LAMP, INCANDESCENT	EA	1
B-28	2	PAHZZ	6210-00-144-4689	208-0410-0131-201	72619	LIGHT, INDICATOR	EA	1
B-28	3	PAOZZ	6210-00-064-0271	208-0131-200	72619	LENS, INDICATOR	EA	1
B-28	4	PAHZZ	6210-00-295-1915	207-0410-01-201	72619	LAMPHOLDER	EA	1
B-28	5	PAHZZ	5930-00-655-1575	MS35059-22	96906	SWITCH, TOGGLE	EA	1
B-28	6	PAOZZ	5920-00-281-0225	F02A250V6AS	81349	FUSE, CARTRIDGE: 6 AMP, 250 V	EA	3
B-28	7	PAHZZ		HKLXE90-250V	71400	FUSEHOLDER	EA	2
B-28	8	PAHZZ	5340-00-754-2324	533A103	70117	CLAMP, BRIDGE	EA	10
B-28	9	PAHZZ	5920-00-892-9311	HKPAEJQRW	71400	FUSEHOLDER	EA	1
B-28	10	PAHZZ	5360-00-474-3850	519C12-2	70117	SPRING, HELICAL, COMPRESSION	EA	1
B-28	11	PAHZZ	5365-00-721-7680	MS16633-1025	96906	RING, RETAINING	EA	1
B-28	12	PAHZZ	6625-00-961-6663	GA188-2	70117	STOP ASSEMBLY	EA	1
B-28	13	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN HEX: NO. 4-40	EA	3
B-28	14	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING NO. 4	EA	12
B-28	15	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	8
B-28	16	XDHZZ		505D1-4	70117	WASHER, NONMETALLIC	EA	6
B-28	17	XDHZZ		529C6-34	70117	SPACER, SLEEVE	EA	2
B-28	18	PAHZZ	5930-00-250-9605	577B43	70117	SWITCH, THERMOSTATIC	EA	1
B-28	19	XDHZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE: PNH, NO. 6-32 X 3/8 IN. LG	EA	20
B-28	20	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING NO. 6	EA	36
B-28	21	PAHZZ	6625-00-961-6664	GB1500	70117	SWITCH, INTERLOCK	EA	1
B-28	22	XDHZZ		GJ4914	70117	POWER SUPPLY (SEE FIGURE B-29 FOR BREAKDOWN)	EA	1
B-28	23	PAHZZ	5930-00-963-6293	577B43-5	70117	SWITCH, THERMOSTATIC	EA	1
B-28	24	PAHZZ	5305-00-054-5654	MS35233-20	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/8 IN. LG	EA	2

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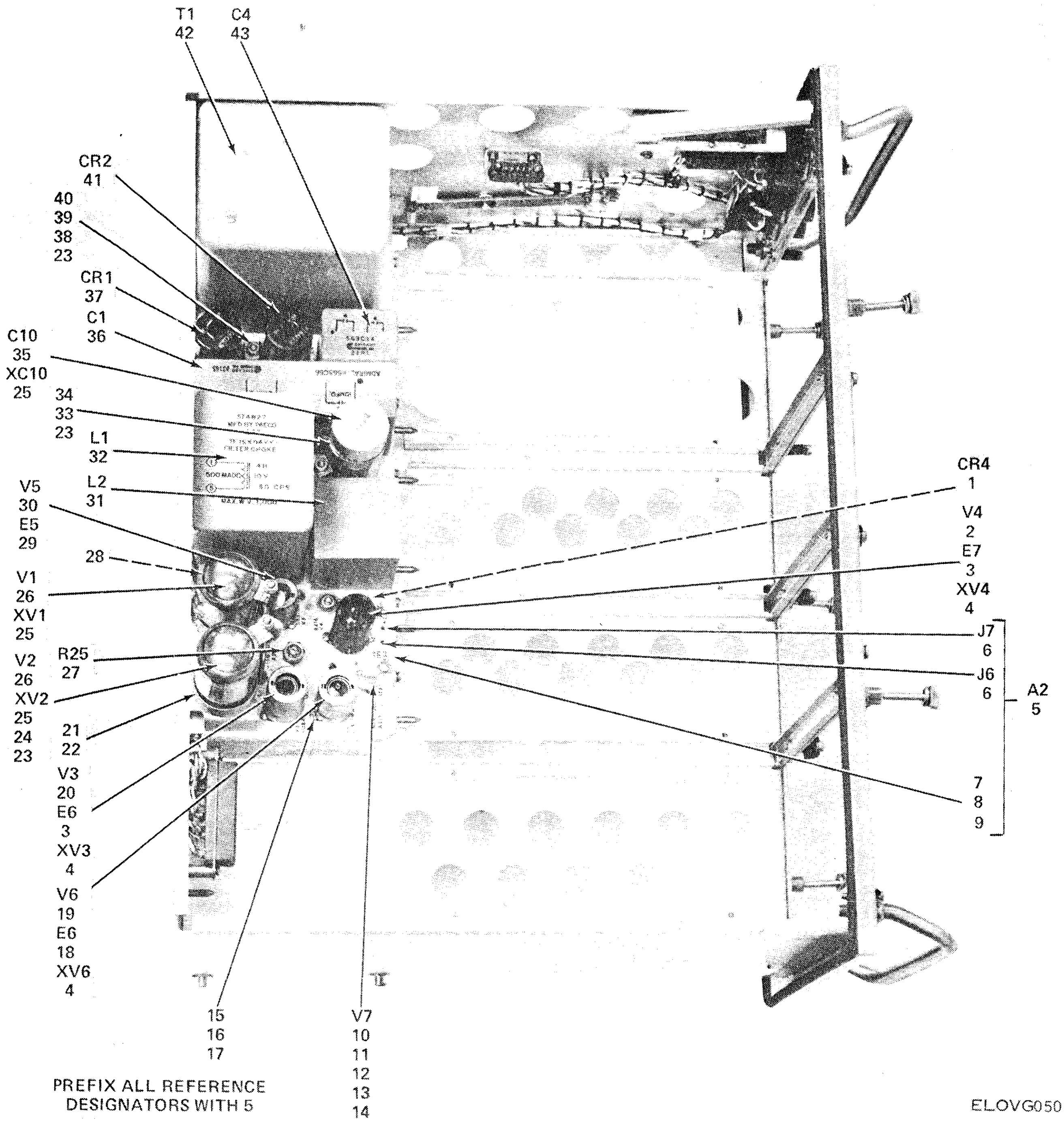

Figure B-29. ① Power supply, unit 5 (sheet 1 of 2).

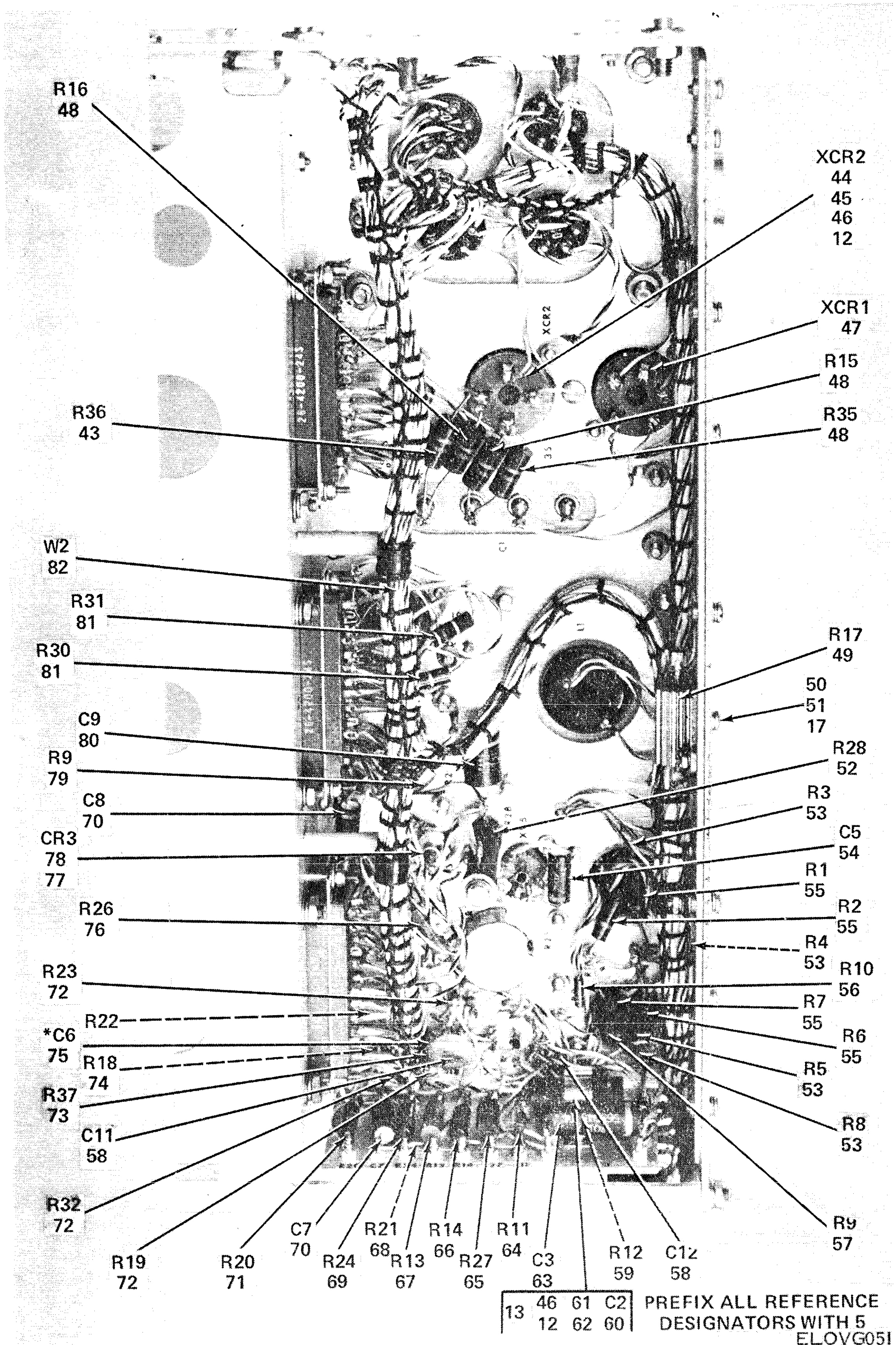

Figure B-29. ② Power supply, unit 5 (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-29		XDHZZ		GJ4914	70117	POWER SUPPLY (SEE FIGURE B-28 FOR NHA)	EA	REF
B-29	1	PAHZZ	5961-00-847-5246	1N748A	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-29	2	PAOZZ	5960-00-296-3420	6216	81349	ELECTRON TUBE	EA	1
B-29	3	PAHZZ	5960-00-578-8285	TR6-6025H	98978	SHIELD, ELECTRON TUBE	EA	1
B-29	4	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE	EA	3
B-29	5	XDHZZ		GD1626-2	70117	CHASSIS ASSEMBLY	EA	1
B-29	6	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	2
B-29	7	PAHZZ	5310-00-837-8435	CLS832-2	46384	NUT, SELF-LOCKING HEXAGON: NO. 8-32	EA	5
B-29	8	PAHZZ	5310-00-725-4719	CLS632-2	46384	NUT, SELF-LOCKING HEXAGON: NO. 6-32	EA	12
B-29	9	PAHZZ	5325-00-027-0322	MS21266-3N	96906	GROMMET, PLASTIC	EA	2
B-29	10	PAOZZ	6240-00-820-1705	NE86	08806	LAMP, GLOW	EA	1
B-29	11	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE: PNH, NO. 6-32 X 7/16 IN. LG	EA	1
B-29	12	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPLIT, NO. 6	EA	30
B-29	13	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	8
B-29	14	PAHZZ	5340-00-828-8737	CPC1953-4B	71616	CLAMP, LOOP	EA	1
B-29	15	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: PNH, NO. 4-40 X 5/16 IN. LG	EA	8
B-29	16	XDHZZ	5310-00-550-3715	MS35333-70	96906	WASHER, LOCK: I.T., NO. 4	EA	8
B-29	17	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPLIT, NO. 4	EA	11
B-29	18	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	2
B-29	19	PAOZZ	5960-00-262-0161	12AT7WA	81349	ELECTRON TUBE	EA	1
B-29	20	PAOZZ	5960-00-729-6963	6U8A	81349	ELECTRON TUBE	EA	1
B-29	21	PAHZZ	5960-00-064-2731	511D64-2NH	70117	RETAINER, ELECTRON TUBE	EA	2
B-29	22	XDHZZ	5310-00-811-3494	MS20365-832A	96906	NUT, PLAIN HEX: NO. 8-32	EA	2
B-29	23	XDHZZ	5310-00-934-9759	MS35649-284	96906	NUT, PLAIN HEX: NO. 8-32	EA	18
B-29	24	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: SPLIT, NO. 8	EA	20
B-29	25	PAHZZ	5935-00-129-9358	TS101P02	81349	SOCKET, ELECTRON TUBE	EA	3
B-29	26	PAOZZ	5960-00-543-1001	6080WA	81349	ELECTRON TUBE	EA	2
B-29	27	PAHZZ	5905-00-665-4992	RV4LAYSA104A	81349	RESISTOR, VARIABLE: 100K OHMS, PORM 10%	EA	1
B-29	28	PAOZZ	5325-00-286-6047	54G	70785	GROMMET, RUBBER	EA	1
B-29	29	PAHZZ	5960-00-860-7709	M24251-6-2	81349	SHIELD, ELECTRON TUBE	EA	1
B-29	30	PAOZZ	5960-00-262-0286	5651WA	81349	ELECTRON TUBE	EA	1
B-29	31	PAHZZ	5950-00-023-9961	574C28	70117	REACTOR	EA	1
B-29	32	PAHZZ	5950-00-023-9960	574B27	70117	REACTOR	EA	1
B-29	33	PAHZZ	5960-00-628-7424	511D64-7NH	70117	RETAINER, ELECTRON TUBE	EA	1
B-29	34	PAHZZ	5960-00-420-3625	926C218	07387	RETAINER, ELECTRON TUBE	EA	1
B-29	35	PAHZZ	5910-00-949-7357	CE53C350P	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-29	36	PAHZZ	5910-00-856-1030	565C66	70117	CAPACITOR, FIXED, PAPER DIELECTRIC	EA	1
B-29	37	PAHZZ		S5092A	84970	RECTIFIER, METALLIC	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-29	38	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: SPLIT, NO. 8	EA	20
B-29	39	XDHZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT: NO. 8	EA	5
B-29	40	PAHZZ	6625-00-961-6693	515B1341	70117	RETAINER	EA	1
B-29	41	PAHZZ	6130-00-713-6946	S5091	84970	RECTIFIER, METALLIC	EA	1
B-29	42	PAHZZ	5950-00-135-9486	580C23-2	70117	TRANSFORMER, POWER, STEPDOWN - STEPUP	EA	1
B-29	43	PAHZZ	5910-00-725-7133	2191	71436	CAPACITOR, FIXED, PAPER DIELECTRIC	EA	1
B-29	44	PAHZZ	5935-00-079-5905	77M1P4T	02660	SOCKET, ELECTRON TUBE	EA	1
B-29	45	XDHZZ	5305-00-054-6651	MS51957-27	96906	SCREW, MACHINE: PNH, NO. 6-32 X 5/16 IN. LG	EA	5
B-29	46	XDHZZ		6-32X1-4X5-64 SST	70117	NUT, PLAIN HEX: NO. 6-32, SST	EA	17
B-29	47	PAHZZ	5935-00-023-8309	77M1P5TM1	02660	SOCKET, ELECTRON TUBE	EA	1
B-29	48	PAHZZ	5905-00-146-8423	RCR42G201JS	81349	RESISTOR, FIXED, COMPOSITION: 200 OHMS, PORM 5%, 2 WATT	EA	4
B-29	49	PAHZZ		RE70G1801	81349	RESISTOR, FIXED, WIREWOUND	EA	1
B-29	50	XDHZZ	5305-00-022-7058	MS35249-22	96906	SCREW, MACHINE: FH, NO. 4-40 X 3/8 IN. LG	EA	2
B-29	51	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	3
B-29	52	PAHZZ	5905-00-542-9510	RW29V312	81349	RESISTOR, FIXED, WIREWOUND	EA	1
B-29	53	PAHZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 10%, .5 WATT	EA	4
B-29	54	PAHZZ	5910-00-081-3871	P95ZN4	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.02 UF, PORM 20%, 200 VDCW	EA	1
B-29	55	PAHZZ	5905-00-247-8710	RCR32G220JS	81349	RESISTOR, FIXED, COMPOSITION: 22 OHMS, PORM 5%, 1 WATT	EA	4
B-29	56	PAHZZ	5905-00-114-5441	RCR20G563JS	81349	RESISTOR, FIXED, COMPOSITION: 56K OHMS, PORM 10%, .5 WATT	EA	1
B-29	57	PAHZZ	5905-00-114-5489	RCR20G823JS	81349	RESISTOR, FIXED, COMPOSITION: 82K OHMS, PORM 10%, .5 WATT	EA	1
B-29	58	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10K MMF, 500 VDCW	EA	2
B-29	59	PAHZZ	5905-00-106-9345	RCR20G683JS	81349	RESISTOR, FIXED, COMPOSITION: 68K OHMS, PORM 10%, .5 WATT	EA	1
B-29	60	PAHZZ	5910-00-231-3370	P8292ZN20	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, PORM 20%, 400 VDCW	EA	1
B-29	61	PAHZZ	5910-00-057-3705	511A60-2	70117	RETAINER, CAPACITOR	EA	1
B-29	62	PAHZZ	5305-00-763-6962	MS35249-34	96906	SCREW, MACHINE: FH, NO. 6-32 X 5/16 IN. LG	EA	6
B-29	63	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED, PAPER DIELECTRIC:	EA	1
B-29	64	PAHZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47K OHMS, PORM 10%, .5 WATT	EA	1
B-29	65	PAHZZ	5905-00-140-6155	RCR42G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 10%, 2 WATT	EA	1
B-29	66	PAHZZ	5905-00-574-4312	RNC70K4023FS	81349	RESISTOR, FIXED, FILM	EA	1
B-29	67	PAHZZ	5905-00-467-1393	RNC70K2153FS	81349	RESISTOR, FIXED, FILM	EA	1
B-29	68	PAHZZ	5905-00-435-6564	RCR20G434JS	81349	RESISTOR, FIXED, COMPOSITION: 430K OHMS, PORM 5%, .5 WATT	EA	1
B-29	69	PAHZZ	5905-00-993-4559	RN70D1783F	81349	RESISTOR, FIXED, FILM	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-29	70	PAHZZ	5910-00-802-9423	P8292ZN9	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.05 UF, PORM 10%, 200 VDCW	EA	2
B-29	71	PAHZZ	5905-00-369-6923	RCR32G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 10%, 1 WATT	EA	1
B-29	72	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: 100K OHMS, PORM 10%, .5 WATT	EA	3
B-29	73	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .5 WATT	EA	1
B-29	74	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 10%, .5 WATT	EA	1
B-29	75	PAHZZ	5910-00-954-5504	CM05F121J03	81349	CAPACITOR,FIXED, MICA DIELECTRIC: 120 PF, PORM 5%, 500 VDCW	EA	1
B-29	76	PAHZZ	5905-00-308-6479	RNC70K2613FS	81349	RESISTOR, FIXED, FILM	EA	1
B-29	77	PAOZZ	5325-00-171-5733	SE64	61957	EYELET, METALLIC	EA	2
B-29	78	PAHZZ	5961-00-849-4183	1N2989B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-29	79	PAHZZ	5905-00-121-9922	RCR20G431JS	81349	RESISTOR, FIXED, COMPOSITION: 430 OHMS, PORM 5%, .5 WATT	EA	1
B-29	80	PAHZZ	5910-00-879-6957	MPY2P25-10PCT	93790	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, PORM 20%, 200 VDCW	EA	1
B-29	81	PAHZZ	5905-00-113-7346	RCR32G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 10%, 1 WATT	EA	2
B-29	82	XDHZZ		GJ4915	70117	WIRING HARNESS (SEE FIGURE B-30 FOR BREAKDOWN)	EA	1

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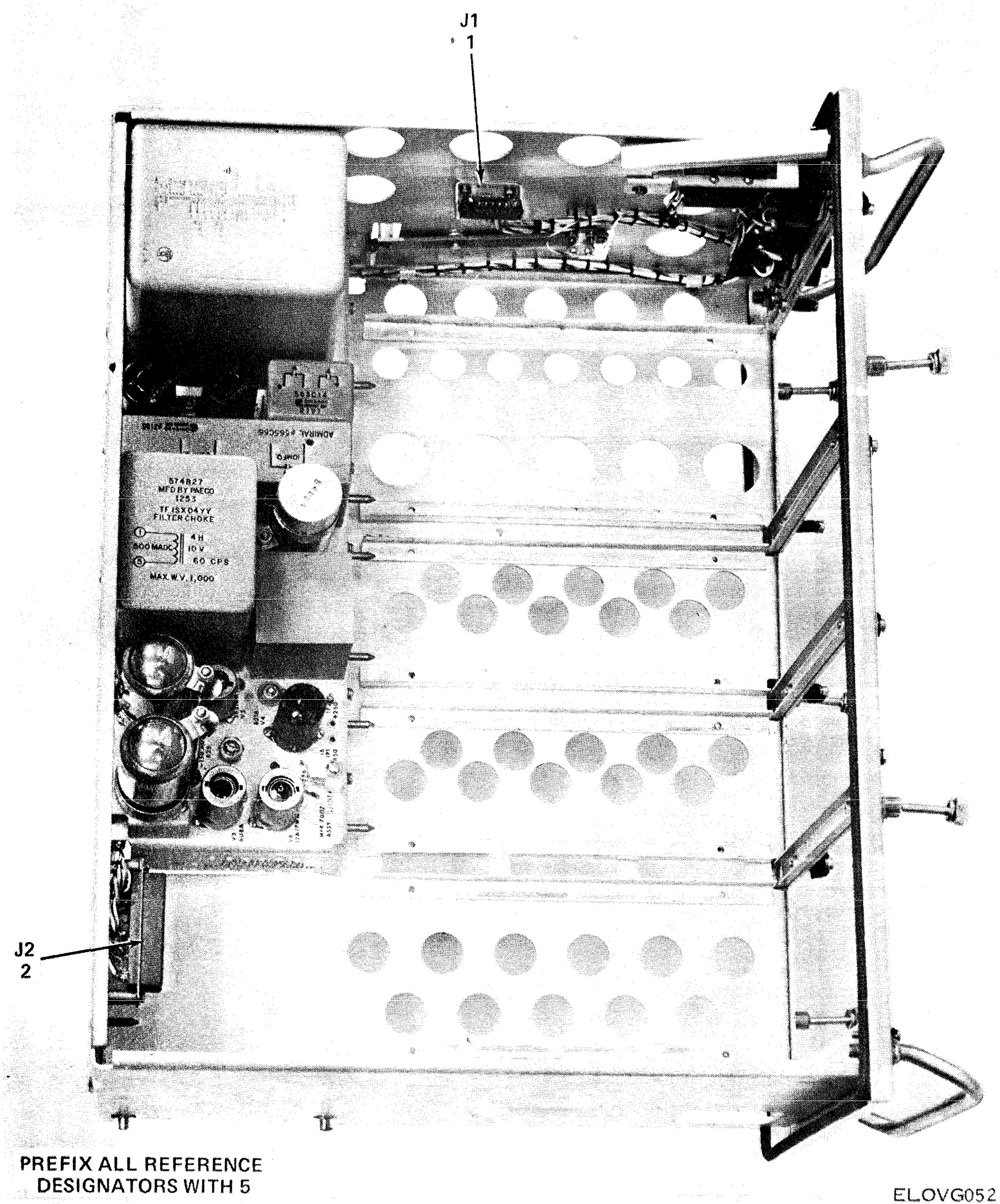

Figure B-30. ① Wiring harness assembly (sheet 1 of 2).

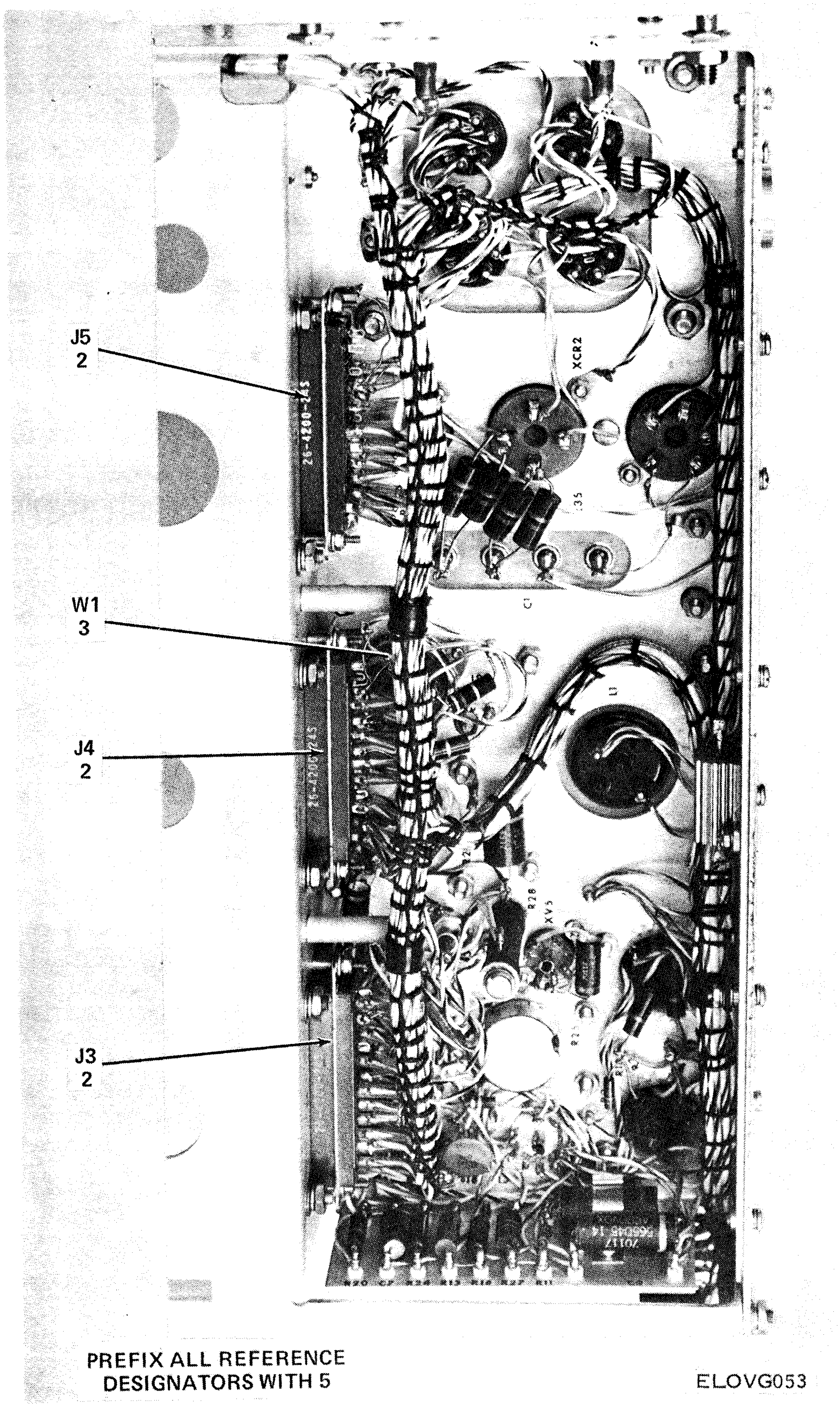

Figure B-30. ② Wiring harness assembly (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-30		XDHZZ		GJ4915	70117	WIRING HARNESS (SEE FIGURE B-29 FOR NHA)	EA	REF
B-30	1	PAHZZ	5935-00-713-6950	MRA9PGV	02660	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-30	2	PAHZZ	5935-00-624-9820	26-4200-24S	02660	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	4
B-30	3	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY	EA	1

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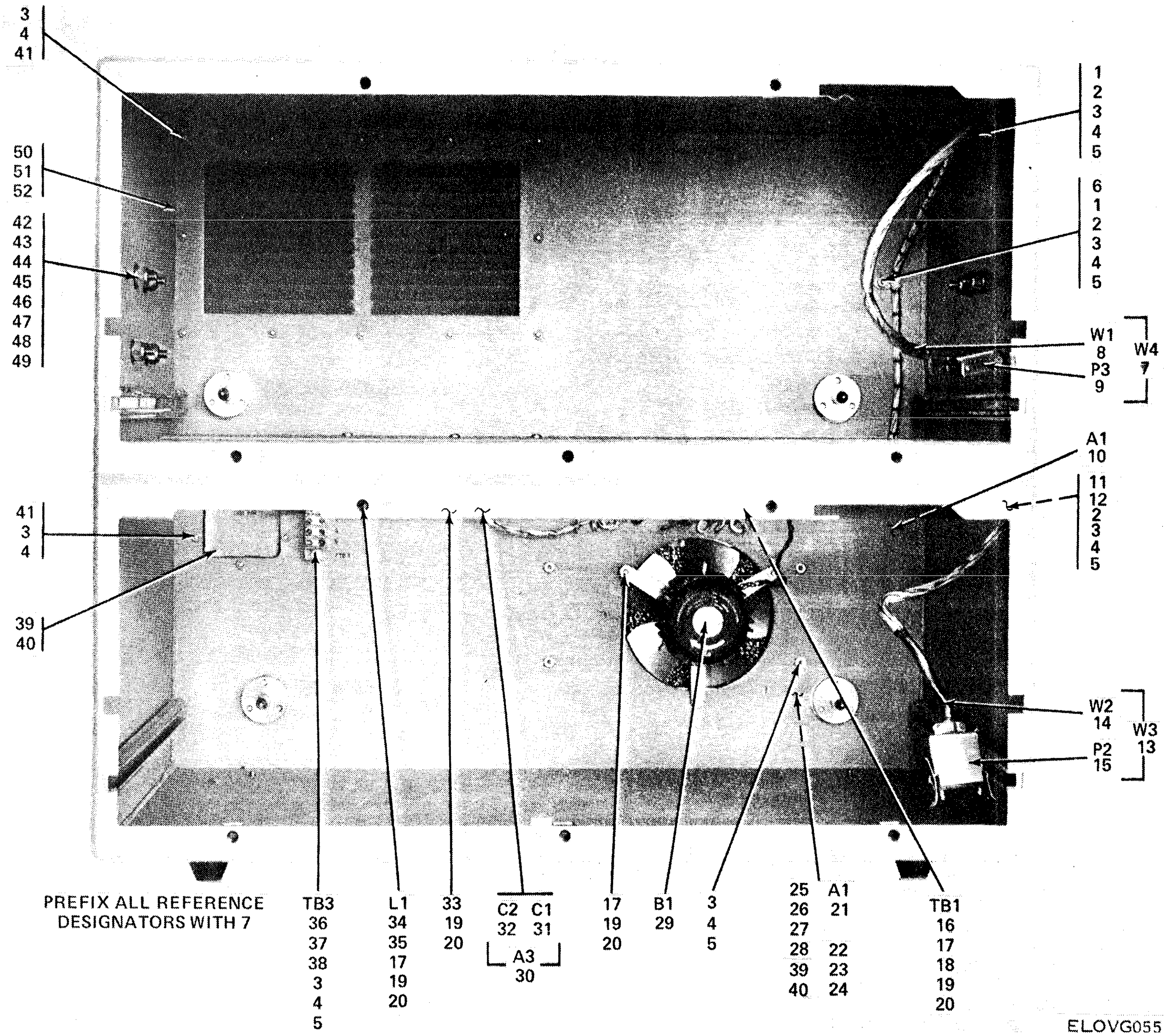

Figure B-31. Electrical equipment case.

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) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 02 - ELECTRICAL EQUIPMENT CASE		
B-31		XDHHH		GJ4707	70117	ELECTRICAL EQUIPMENT CASE (SEE FIGURE B-1 FOR NHA)	EA	REF
B-31	1	PAHZZ	5340-00-860-1778	CPC1953-5B	71616	CLAMP, LOOP	EA	2
B-31	2	PAHZZ	5305-00-054-6654	MS35233-30	96906	SCREW, MACHINE NO. 6-32 X 1/2 IN. LG	EA	5
B-31	3	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT NO. 6	EA	55
B-31	4	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK NO. 6	EA	48
B-31	5	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX NO. 6-32	EA	30
B-31	6	PAHZZ	5340-00-828-8737	CPC1953-4B	71616	CLAMP, LOOP	EA	[illegible]
B-31	7	PAHZZ	5995-00-627-0049	GD4918	70117	CABLE ASSEMBLY, SP ELECTRICAL	EA	1
B-31	8	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY	EA	1
B-31	9	PAHZZ	5935-00-993-3045	MRA9SGHVL	81312	CONNECTOR PLUG, ELECTRICAL	EA	1
B-31	10	XDHHH		GC4892	70117	POWER SUPPLY (SEE FIGURE B-32 FOR BREAKDOWN)	EA	1
B-31	11	XDHZZ		WC3-16-4	95987	CLMAP, LOOP	EA	1
B-31	12	XDHZZ		WC7-16-4	95987	CLAMP, LOOP	EA	1
B-31	13	PAHZZ	5995-00-625-3913	GD4916	70117	CABLE ASSEMBLY, SP ELECTRICAL	EA	1
B-31	14	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY	EA	1
B-31	15	PAHZZ	5935-00-993-3045	MRA9SGHVL	81312	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-31	16	PAHZZ	5940-00-542-8546	8TB6	81349	TERMINAL BOARD	EA	2
B-31	17	PAHZZ	5305-00-054-6672	MS35233-47	96906	SCREW, MACHINE 8-32 X 3/4 IN. LG	EA	7
B-31	18	XDHZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT NO. 8	EA	20
B-31	19	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK NO. 8	EA	23
B-31	20	XDHZZ	5310-00-934-9759	MS35649-284	96906	NUT, PLAIN, HEXAGON NO. 8-32	EA	11
B-31	21	XDHZZ		GC2235-2	70117	COVER ASSEMBLY, FILTER	EA	1
B-31	22	PAOZZ	4130-00-779-0845	9200X	82866	FILTER, AIR CONDITIONING	EA	1
B-31	23	PAOZZ	4130-00-725-4823	AF1952B	82866	FILTER, AIR CONDITIONING	EA	1
B-31	24	XDHZZ	5305-00-054-6656	MS51957-32	96906	SCREW, MACHINE NO. 6-32 X 3/4 IN. LG	EA	2
B-31	25	PAHZZ	5305-00-054-6655	MS35233-31	96906	SCREW, MACHINE NO. 6/32 X 5/8 IN. LG	EA	1
B-31	26	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT NO. 6	EA	3
B-31	27	XDHZZ	5310-00-081-8087	MS20365-632A	96906	NUT, SELF-LOCKING HEXAGON	EA	3
B-31	28	PAHZZ	9390-00-627-1491	512A63-26	70117	RUBBER CHANNEL	EA	1
B-31	29	PAHZZ	4140-00-106-0117	53-11428	02598	FAN, AXIAL	EA	4
B-31	30	PAHZZ	4320-00-465-3895	GC4942	70117	CAPACITOR ASSEMBLY	EA	1
B-31	31	PAHZZ	5910-00-879-1215	CP04A1KF684K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC	EA	1
B-31	32	PAHZZ		CP04A1KF564K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC	EA	1
B-31	33	PAHZZ	5305-00-054-6668	MS35233-43	96906	SCREW, MACHINE NO. 8-32 X 3/4 IN. LG	EA	3
B-31	34	PAHZZ	5915-00-959-0469	14S437D	56289	FILTER, RADIO FREQUENCY INTERFERENCE	EA	1
B-31	35	PAHZZ	5305-00-765-4257	MS35249-50	96906	SCREW, MACHINE NO. 8-32 X 3/8 IN. LG	EA	1
B-31	36	PAHZZ	5940-00-752-5893	26TB6	81349	TERMINAL BOARD	EA	1
B-31	37	PAHZZ	5305-00-054-6655	MS35233-31	96906	SCREW, MACHINE NO. 6-32 X 5/8 IN. LG	EA	2

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-31	38	XDHZZ	5310-00-616-3555	MS35333-71	96906	WASHER, LOCK, IT	EA	1
B-31	39	PAHZZ	5330-00-874-7749	512A72	70117	RUBBER CHANNEL	EA	1
B-31	40	XDHZZ		515A333-1	70117	PLATE	EA	1
B-31	41	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE NO. 6-32 X 7/16 IN. LG	EA	18
B-31	42	PADZZ	5340-00-857-3613	1205-4	57068	HANDLE, BOW	EA	2
B-31	43	PAHZZ	5305-00-082-6721	MS35233-81	96906	SCREW, MACHINE 1/4-20 X 3/4 IN. LG	EA	6
B-31	44	PAHZZ	5305-00-071-1315	MS35233-79	96906	SCREW, MACHINE 1/4-20 X 1/2 IN. LG	EA	2
B-31	45	XDHZZ		031X265X500SST	70117	WASHER, FLAT 1/4 IN. I.D.	EA	2
B-31	46	XDHZZ	5310-00-582-5677	MS15795-810	96906	WASHER, FLAT 1/4	EA	14
B-31	47	XDHZZ		505D1-109	70117	WASHER, NONMETAL 1/4 IN. I.D.	EA	8
B-31	48	PAHZZ	5310-00-727-5223	79NTU040	72962	NUT, SELF-LOCKING, HEX 1/4-20	EA	6
B-31	49	XDHZZ	5310-00-275-1785	1-4-20X7-16X1-8SST	70117	NUT, PLAIN, HEX 1/4-20	EA	2
B-31	50	XDHZZ		515D1520-1	70117	LOUVRE	EA	1
B-31	51	PAHZZ	5330-00-961-6694	512C222	70117	GASKET, EXHAUST	EA	1
B-31	52	XDHZZ		536C49	70117	WIRE, FABRIC	EA	1

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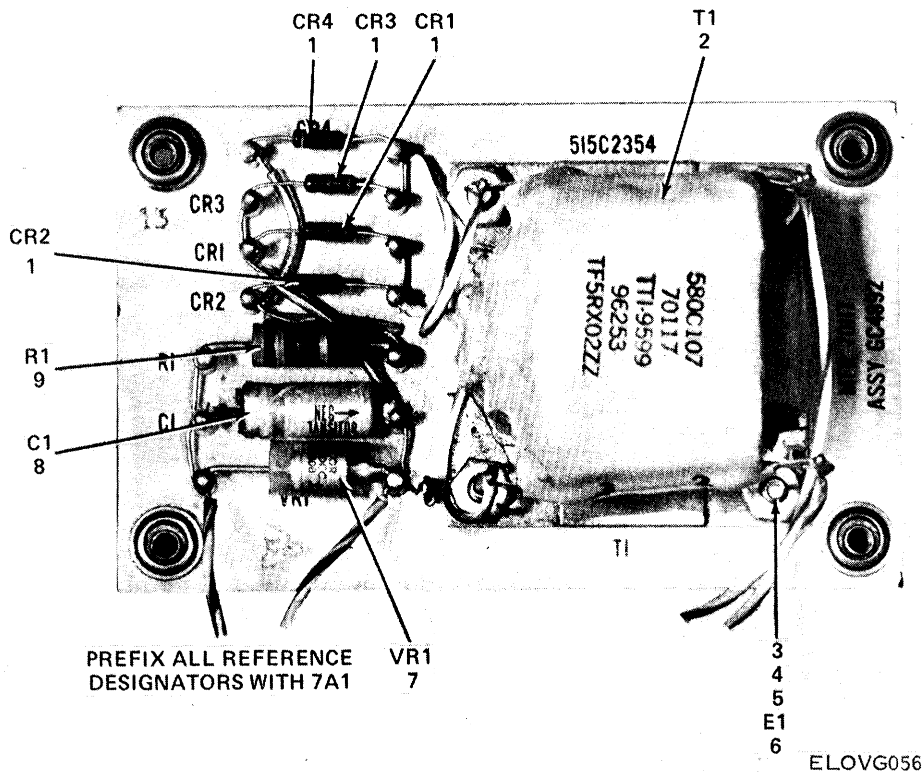

Figure B-32. Power supply, unit 7A1.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0201 - POWER SUPPLY UNIT 7A1		
B-32		XDHHH		GC4892	70117	POWER SUPPLY ASSEMBLY (SEE FIGURE B-31 FOR NHA)	EA	REF
B-32	1	PAHZZ	5961-00-840-5466	1N483B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	4
B-32	2	PAHZZ	5950-00-105-3773	580C107	70117	TRANSFORMER, POWER STEPDOWN	EA	1
B-32	3	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEXAGON: NO. 6-32	EA	4
B-32	4	XDHZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE: PH, NO. 6-32 X 3/8 IN. LG	EA	4
B-32	5	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING NO. 6	EA	4
B-32	6	XDHZZ		2522-6	78189	TERMINAL, LUG	EA	1
B-32	7	PAHZZ	5961-00-752-6178	1N3030B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-32	8	PAHZZ	5910-00-010-8156	CL65BH400MP3	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-32	9	PAHZZ	5905-00-228-6088	RCR32G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 5%, 1 WATT	EA	1

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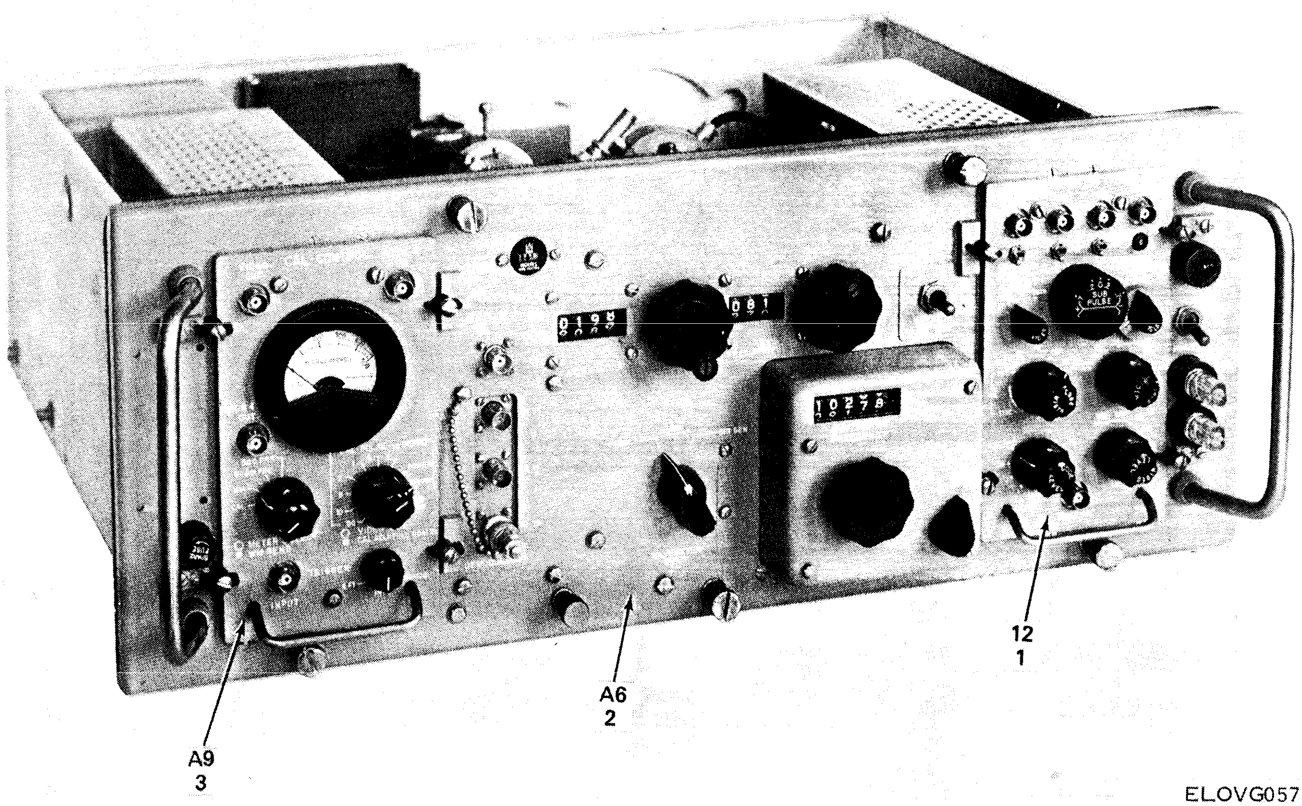

Figure B-33. Coder Simulator SM-197C/UPM-98.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 03 - CODER SIMULATOR		
B-33		PDOHH	6625-00-933-4840	SM197CUPM98	80058	CODER SIMULATOR, SM-197C/UPM-98 (SEE FIGURE B-1 FOR NHA)	EA	REF
B-33	1	XDHHH		GJ4901	70117	INTERROGATION CODER (SEE FIGURE B-34 FOR BREAKDOWN)	EA	1
B-33	2	XDHHH		GJ4846-1	70117	CHASSIS ASSEMBLY (SEE FIGURE B-43 FOR BREAKDOWN)	EA	1
B-33	3	XDHHH		GJ4839-1	70117	CALIBRATION CONTROL UNIT (SEE FIGURE B-54 FOR BREAKDOWN)	EA	1

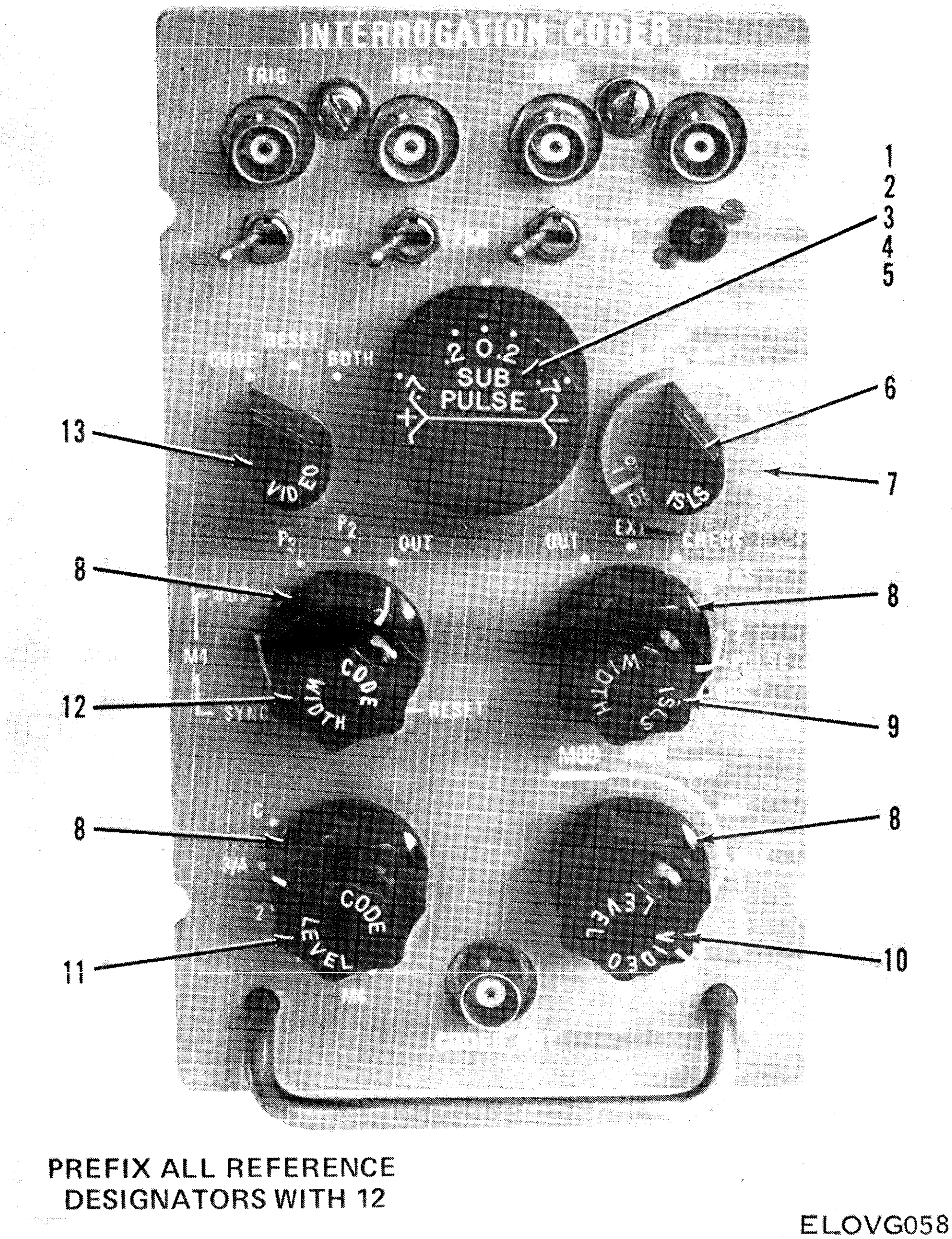

Figure B-34 ① Interrogation coder (sheet 1 of 3).

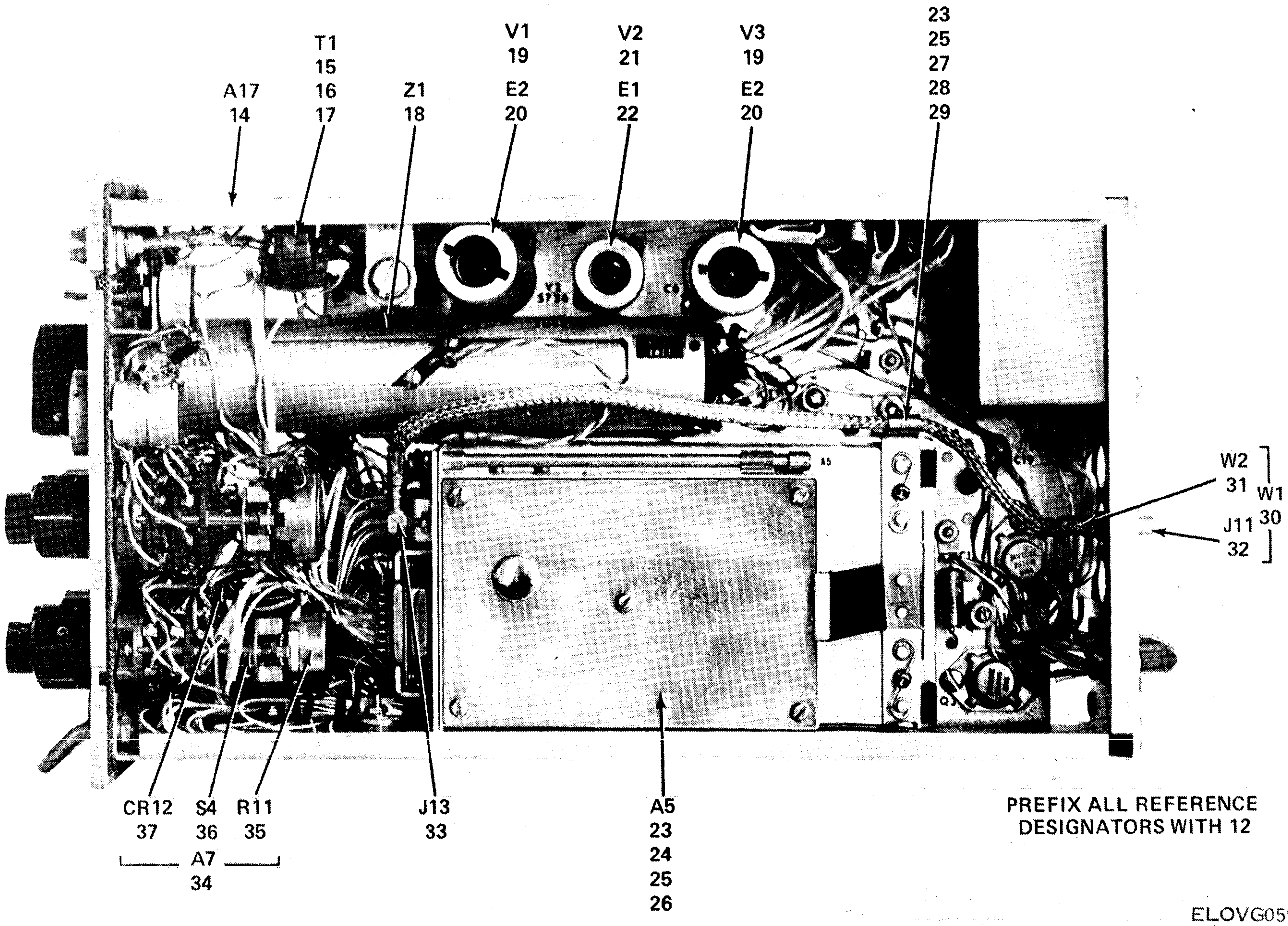

Figure B-34. ② Interrogation coder (sheet 2 of 3).

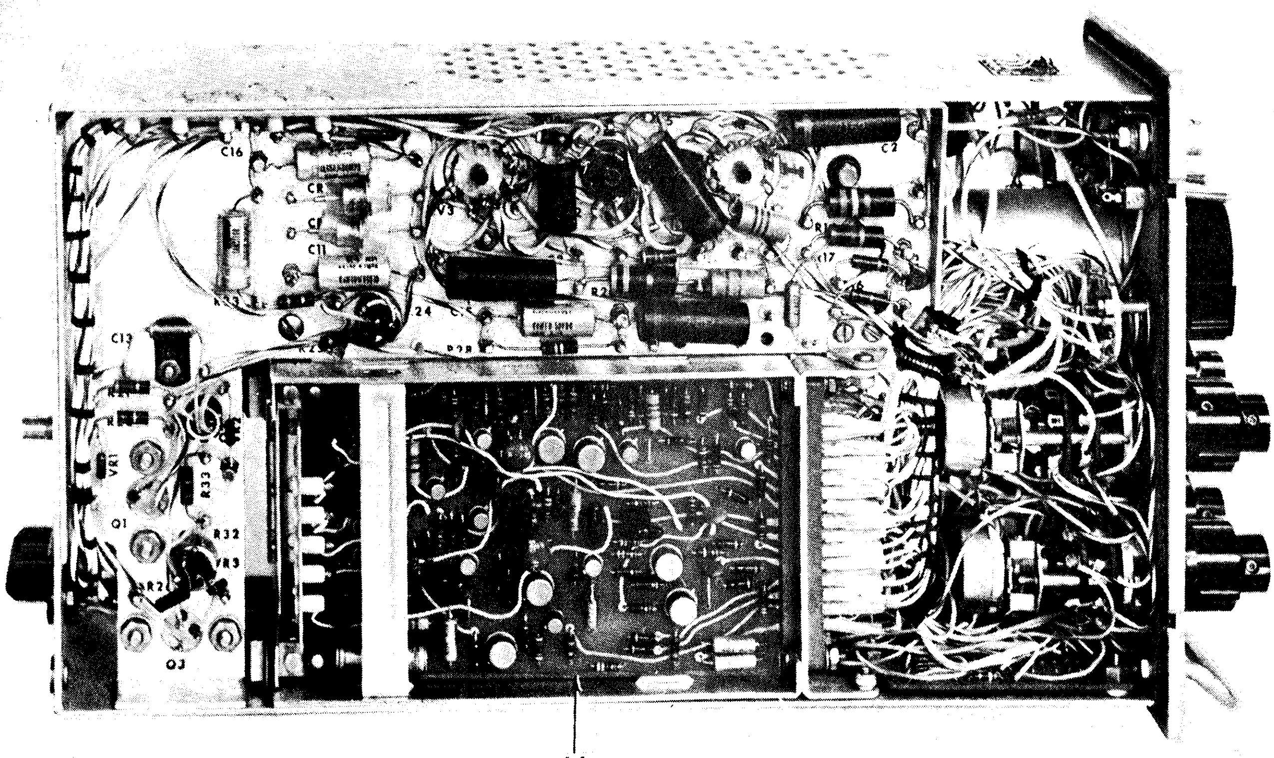

Figure B-34. ③ Interrogation coder (sheet 3 of 3).

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0301 - INTERROGATION CODER		
B-34		XDHHH		GJ4901	70117	INTERROGATION CODER (SEE FIGURE B-33 FOR NHA)	EA	REF
B-34	1	PAHZZ		533B106-3	70117	KNOB	EA	1
B-34	2	XDHZZ		2-56X1-8SOCHDCRE	70117	SETSCREW, HEX SOC HD: NO. 2-56 X 1/8 IN. LG, CRES	EA	5
B-34	3	XDHZZ	6625-00-907-6548	533A115	70117	BEARING, BUTTON	EA	5
B-34	4	XDHZZ		530B5-8	70117	BEARING, BALL ANNULAR	EA	5
B-34	5	PAHZZ	5360-00-739-1367	519C12-37	70117	SPRING, HELICAL COMPRESSION	EA	5
B-34	6	PAHZZ	5355-00-229-0445	533B327-2	70117	KNOB	EA	1
B-34	7	PAHZZ	5355-00-229-0438	525B6	70117	DIAL, CONTROL	EA	1
B-34	8	PAHZZ	53550-00-819-0067	533A98-3	70117	KNOB	EA	4
B-34	9	PAHZZ	5355-00-229-0441	533B99-7	70117	KNOB	EA	1
B-34	10	PAHZZ	5355-00-177-5233	533B99-9	70117	KNOB	EA	1
B-34	11	PAHZZ	5355-00-229-0442	533B99-8	70117	KNOB	EA	1
B-34	12	PAHZZ	5355-00-229-0439	533B99-6	70117	KNOB	EA	1
B-34	13	PAHZZ	5355-00-229-0446	533B327-3	70117	KNOB	EA	1
B-34	14	XDHHH		GJ4925	70117	CHASSIS AND MAIN HARNESS ASSEMBLY (SEE FIGURE B-35 FOR BREAKDOWN)	EA	1
B-34	15	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX: NO. 6-32	EA	2
B-34	16	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPLIT, NO. 6	EA	2
B-34	17	PAHZZ	5950-00-779-6420	579C25	70117	TRANSFORMER, PULSE	EA	1
B-34	18	XDDDD		GC4741	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-38 FOR BREAKDOWN)	EA	1
B-34	19	PAHZZ	5960-00-296-3420	6216	81349	ELECTRON TUBE	EA	2
B-34	20	PAHZZ	5960-00-284-4352	TS103U03	81349	SHIELD, ELECTRON TUBE	EA	2
B-34	21	PAHZZ	5960-00-879-5078	5726	81349	ELECTRON TUBE	EA	1
B-34	22	PAHZZ	5960-00-858-5172	TS102U01	81349	SHIELD, ELECTRON TUBE	EA	1
B-34	23	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 6-32	EA	3
B-34	24	PAHZZ	5305-00-969-6495	AN507C632-5	88044	SCREW, MACHINE: FH, NO. 6-32 X 5/16 IN. LG	EA	2
B-34	25	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING, NO. 4	EA	3
B-34	26	XDHHH		GJ4930	70117	RADIO FREQUENCY OSCILLATOR (SEE FIGURE B-39 FOR BREAKDOWN)	EA	1
B-34	27	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4, CRES	EA	1
B-34	28	XDHZZ	5305-00-282-8524	AN507C440-5	88044	SCREW, MACHINE: FH, 100°, NO. 4-40 X 5/16 IN. LG	EA	2
B-34	29	XDHZZ		759SS3	83930	CLAMP, LOOP	EA	1
B-34	30	XDHZZ	5995-00-107-1649	GC4567	70117	CABLE ASSEMBLY	EA	1
B-34	31	PAHZZ	6145-00-918-9494	RG316U	81349	CABLE, RADIO FREQUENCY	EA	1
B-34	32	PAHZZ	5935-00-903-8018	52-009-0000	98291	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-34	33	PAHZZ	5935-00-992-5081	52-012-0000	98291	CONNECTOR, RECEPTACLE	EA	1
B-34	34	XDHZZ		GD4954	70117	FUNCTION SWITCH ASSEMBLY	EA	1
B-34	35	PAHZZ	5905-00-542-8055	RV4NAYSB501A	81349	RESISTOR, VARIABLE: 500 OHMS, PORM 10%	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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-34	36	PAHZZ	5930-00-109-5942	576C174	70117	SWITCH, ROTARY	EA	1
B-34	37	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-34	38	XDDDD	6625-00-110-5017	GD4820	70117	CLOCK AND RECYCLE ASSEMBLY (SEE FIGURE B-40 FOR BREAKDOWN)	EA	1
B-34	39	XDHHH	6625-00-110-5020	GD4815	70117	ILS & TAG ASSEMBLY (SEE FIGURE B-41 FOR BREAKDOWN)	EA	1
B-34	40	PAHZZ	6625-00-122-6363	GB4806	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-42 FOR BREAKDOWN)	EA	1

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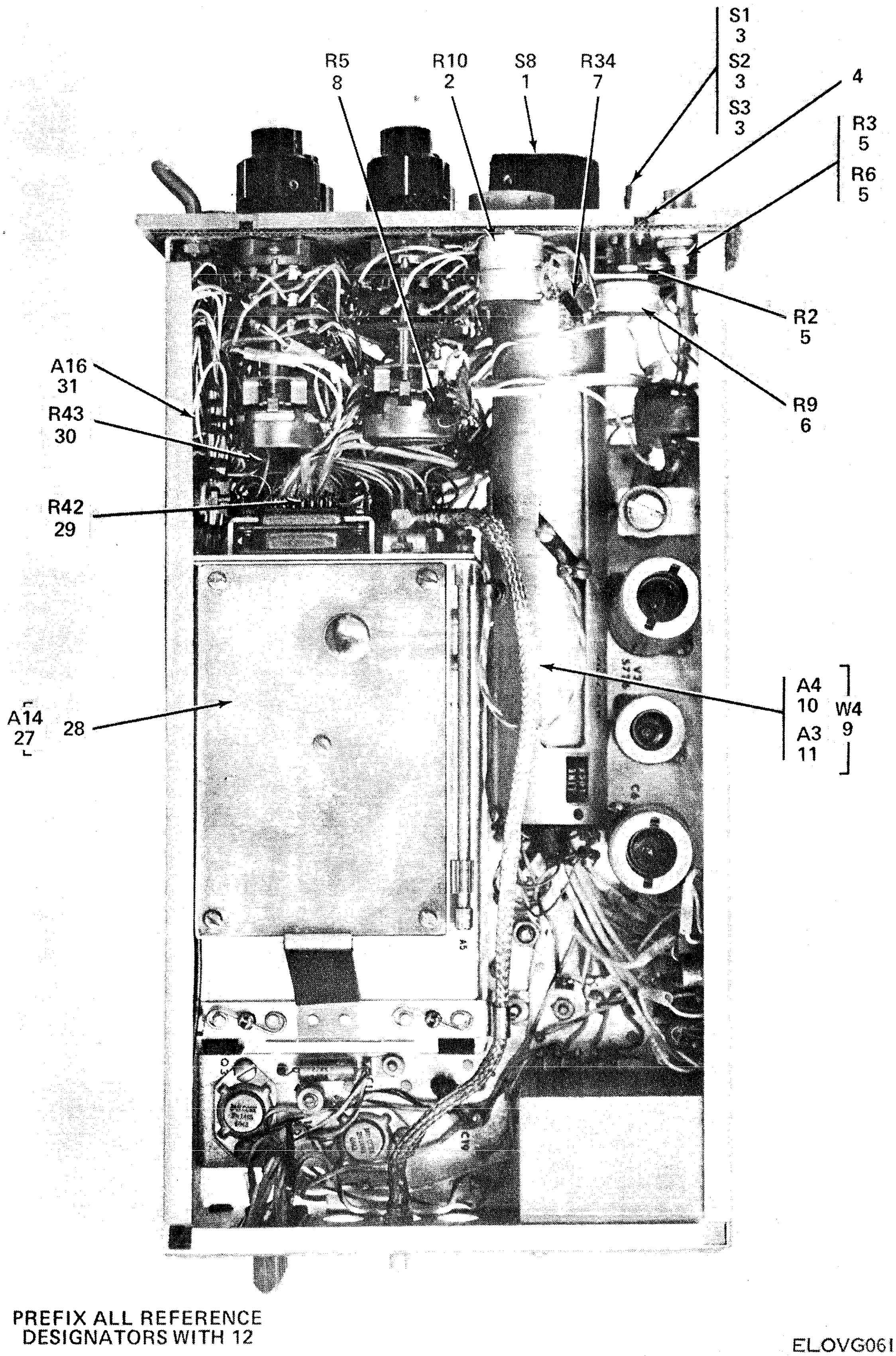

Figure B-35 ① Chassis and main harness assembly (sheet 1 of 4).

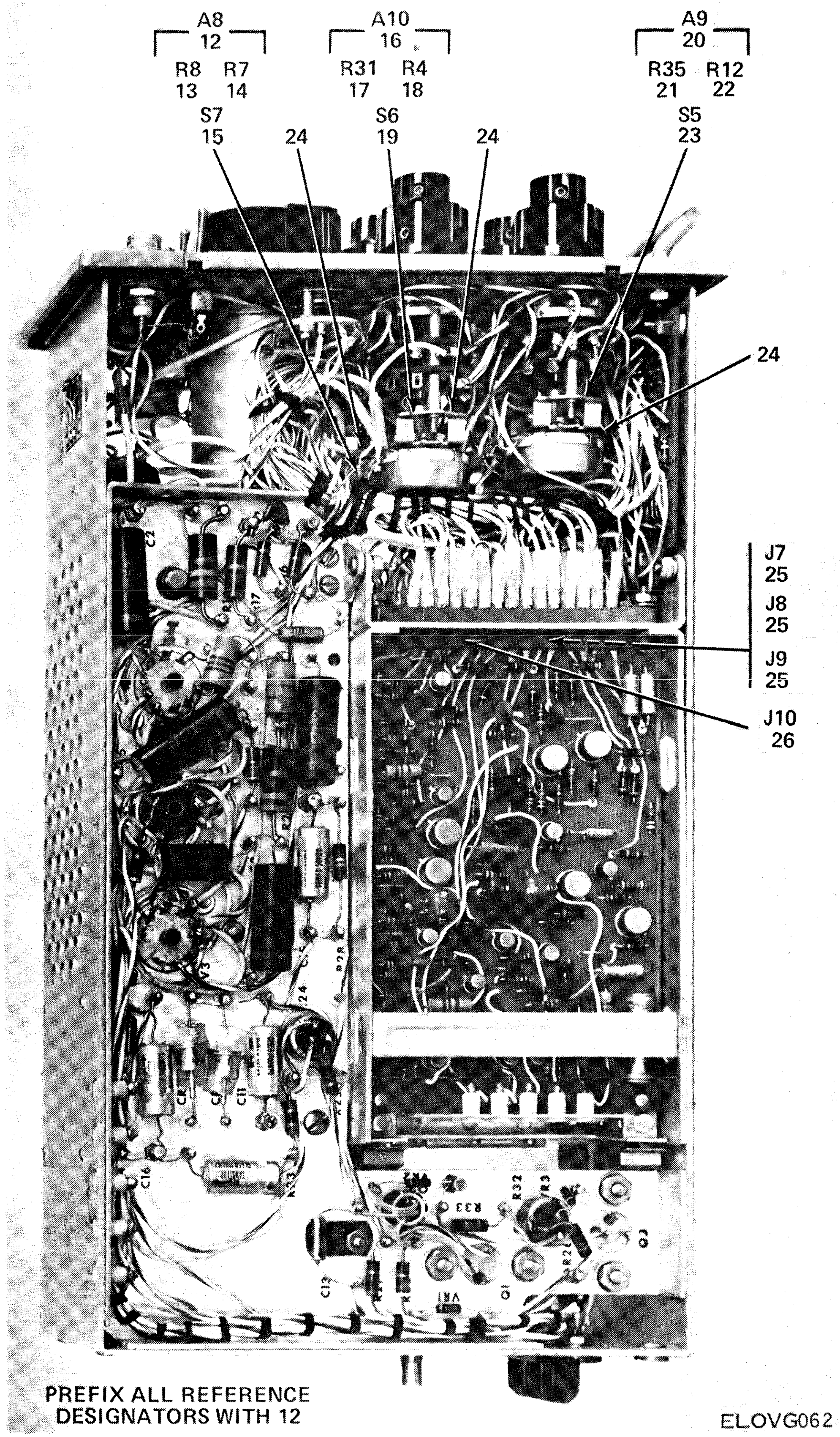

Figure B-35. ① Chassis and main harness assembly (sheet 2 of 4).

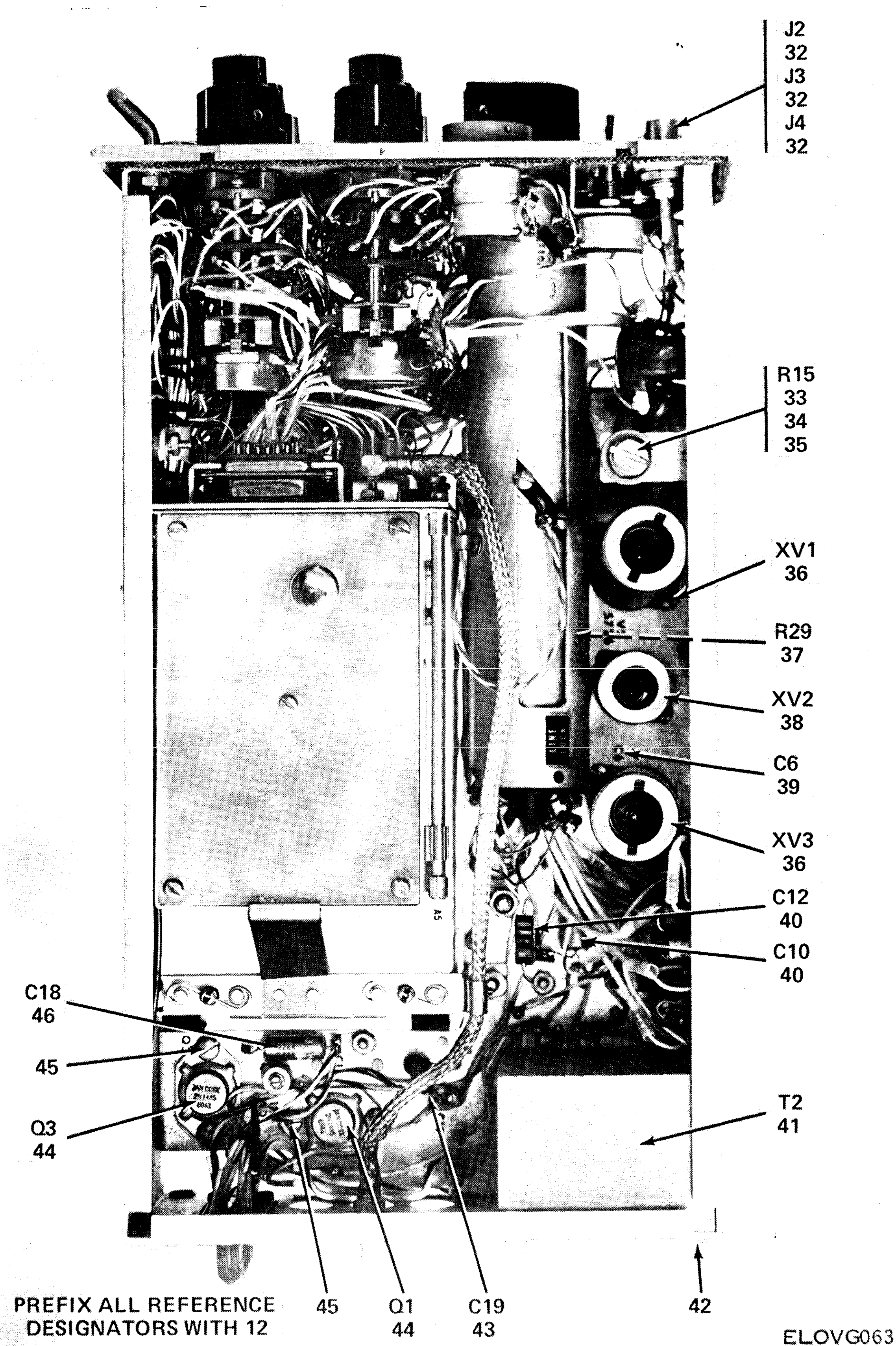

Figure B-35. ③ Chassis and main harness assembly (sheet 3 of 4).

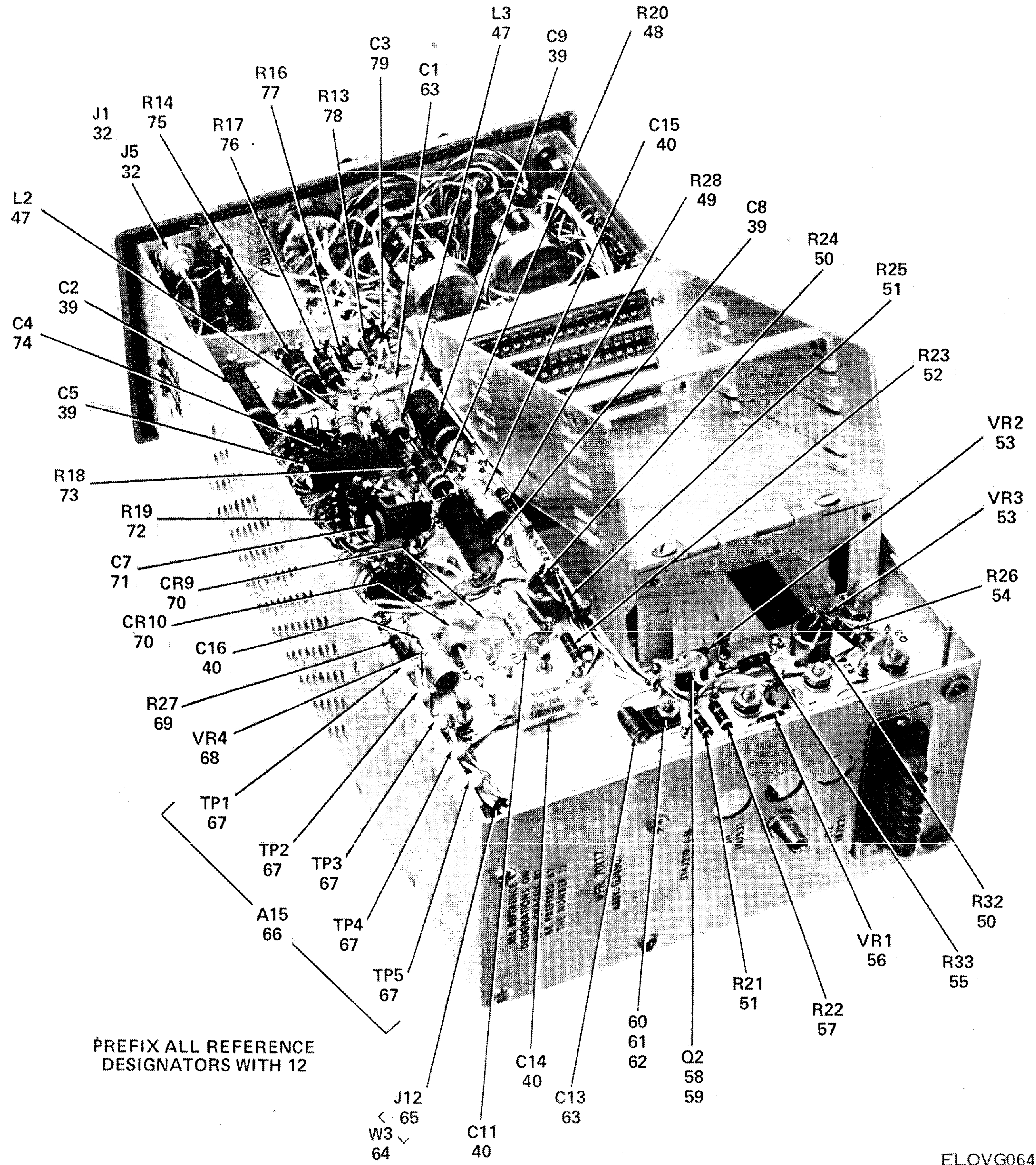

Figure B-35. ④ Chassis and main harness

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-35		XDHHH		GJ4925	70117	CHASSIS AND MAIN HARNESS ASSEMBLY (SEE FIGURE B-34 FOR NHA)	EA	REF
B-35	1	PAHZZ	5930-00-109-5943	576C175	70117	SWITCH, ROTARY	EA	1
B-35	2	PAHZZ	5905-00-105-7564	BF63508	11236	RESISTOR, VARIABLE	EA	1
B-35	3	PAHZZ	5930-00-739-8156	TSA16	04009	SWITCH, TOGGLE	EA	3
B-35	4	PAHZZ	5325-00-286-6047	54G	96906	GROMMET, RUBBER	EA	1
B-35	5	PAHZZ	5905-00-147-0389	RCR42G750JS	81349	RESISTOR, FIXED, COMPOSITION: 75 OHMS, PORM 5%, 2 WATT	EA	3
B-35	6	PAHZZ	5905-00-105-7565	500R104A	11239	RESISTOR, VARIABLE	EA	1
B-35	7	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	1
B-35	8	PAHZZ	5905-00-114-5361	RCR20G121JS	81349	RESISTOR, FIXED, COMPOSITION: 120 OHMS, PORM 5%, .5 WATT	EA	1
B-35	9	XDHZZ		GJ4819	70117	WIRING HARNESS	EA	1
B-35	10	XDHHH		GC4926	70117	BLOCKING OSCILLATOR (SEE FIGURE B-36 FOR BREAKDOWN)	EA	1
B-35	11	XDHZZ		GD4816	70117	DIODE MATRIX (SEE FIGURE B-37 FOR BREAKDOWN)	EA	1
B-35	12	XDDDD		GB4809	70117	SWITCH ASSEMBLY	EA	1
B-35	13	PAOZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITION 1K OHMS, PORM 5%, .5 WATT	EA	1
B-35	14	PAOZZ	5905-00-557-9254	RV4NAYSB251A	81349	RESISTOR, VARIABLE: 250 OHMS, PORM 10%	EA	1
B-35	15	PAOZZ	5930-00-105-7604	576C198	70117	SWITCH, ROTARY	EA	1
B-35	16	XDDDD		GB4810	70117	SWITCH ASSEMBLY	EA	1
B-35	17	PAOZZ	5905-00-119-3503	RCR07G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .25 WATT	EA	1
B-35	18	PAOZZ	5905-00-557-9254	RV4NAYSB251A	81349	RESISTOR, VARIABLE	EA	1
B-35	19	PAHZZ	5930-00-105-7603	576C197	70117	SWITCH, ROTARY	EA	1
B-35	20	XDDDD		GB4811	70117	SWITCH ASSEMBLY	EA	1
B-35	21	PAHZZ	5905-00-116-8556	RCR07G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 5%, .25 WATT	EA	1
B-35	22	PAOZZ	5905-00-542-8055	RV4NAYSB501A	81349	RESISTOR, VARIABLE: 500 OHMS, PORM 10%	EA	1
B-35	23	PAOZZ	5930-00-105-7602	576C196	70117	SWITCH, ROTARY	EA	1
B-35	24	PAHZZ	5935-00-942-7818	MS21097-11-02	96906	KEY, CONNECTOR	EA	3
B-35	25	PAHZZ	5935-00-431-5226	80-6030-1106-00	95354	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	3
B-35	26	PAHZZ	5935-00-763-0311	DAMF15SC37	71468	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-35	27	XDHZZ		GC4822	70117	CHASSIS SUBASSEMBLY	EA	1
B-35	28	PAHZZ	5360-01-004-4070	518B360	70117	SPRING, FLAT	EA	1
B-35	29	PAHZZ	5905-00-141-0595	RCR20G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .5 WATT	EA	1
B-35	30	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	1
B-35	31	XDHZZ		GJ4496-2	70117	CHASSIS ASSEMBLY	EA	1
B-35	32	PAHZZ	5935-00-835-0510	M39012-21-0001	81349	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	5

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-35	33	PAHZZ	5905-00-433-5751	560A52	70117	RESISTOR, FIXED, WIREWOUND	EA	1
B-35	34	XDHZZ	5305-00-071-2099	MS51958-89	96906	SCREW, MACHINE: 1/4-28 X 2-1/4 IN. LG	EA	1
B-35	35	XDHZZ	5310-00-582-5677	MS15795-810	96906	WASHER, FLAT: NO. 1/4	EA	1
B-35	36	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE: 9 PIN	EA	2
B-35	37	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .5 WATT	EA	1
B-35	38	PAHZZ	5935-00-132-2405	TS102P01	81349	SOCKET, ELECTRON TUBE	EA	1
B-35	39	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, 400 VDCW, PORM 20%	EA	5
B-35	40	PAHZZ		CL65BJ600MP3	81349	CAPACITOR, FIXED, ELECTROLYTIC: 60 UF, 50 VDCW	EA	6
B-35	41	PAHZZ	5950-00-107-2532	580D100	70117	TRANSFORMER, POWER STEPUP	EA	1
B-35	42	XDHZZ	5305-00-054-6651	MS51957-27	96906	SCREW, MACHINE: FH, NO. 6-32 X 5/16 IN. LG	EA	4
B-35	43	PAHZZ	5910-00-984-7588	CM05D101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, 500 VDCW, PORM 5%	EA	1
B-35	44	PAHZZ	5961-00-081-4816	2N1485	81349	TRANSISTOR	EA	2
B-35	45	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE: PNH, NO. 6-32 X 7/16 IN. LG	EA	4
B-35	46	PAHZZ	5910-00-779-8390	CS13BF226K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 22 UF, 35 VDCW, PORM 10%	EA	1
B-35	47	PAHZZ	5950-00-943-6506	MS75053-1	96906	COIL, RADIO FREQUENCY	EA	2
B-35	48	PAHZZ	5905-00-478-4327	RCR42G332JS	81349	RESISTOR, FIXED, COMPOSITION: 3,300 OHMS, PORM 5%, 2 WATT	EA	1
B-35	49	PAHZZ	5905-00-110-0993	RCR20G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12K OHMS, PORM 10%, .5 WATT	EA	1
B-35	50	PAHZZ	5905-00-665-4947	RV6LAYSA501A	81349	RESISTOR, VARIABLE: 500 OHMS, PORM 10%	EA	2
B-35	51	PAHZZ	5905-00-141-0723	RCR20G621JS	81349	RESISTOR, FIXED, COMPOSITION: 620 OHMS, PORM 5%, .5 WATT	EA	2
B-35	52	PAHZZ	5905-00-141-1268	RCR20G162JS	81349	RESISTOR, FIXED, COMPOSITION: 1,600 OHMS, PORM 5%, .5 WATT	EA	1
B-35	53	PAHZZ	5961-00-752-6121	1N753A	81349	SEMICONDUCTOR DEVICE, DIODE: 6.2 V	EA	2
B-35	54	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .5 WATT	EA	1
B-35	55	PAHZZ	5905-00-141-0593	RCR20G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .5 WATT	EA	1
B-35	56	PAHZZ	5961-00-805-7873	1N746A	81349	SEMICONDUCTOR DEVICE, DIODE: 3.3 V	EA	1
B-35	57	PAHZZ	5905-00-141-1144	RCR20G910JS	81349	RESISTOR, FIXED, COMPOSITION: 91 OHMS, PORM 5%, .5 WATT	EA	1
B-35	58	PAHZZ	5961-00-837-7262	2N697	81349	TRANSISTOR	EA	1
B-35	59	PAHZZ	5999-00-904-3486	TXB2P032-037	98978	RETAINER, TRANSISTOR	EA	1
B-35	60	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	14
B-35	61	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	20
B-35	62	XDHZZ		447SS3-6	83930	CLAMP, LOOP	EA	1
B-35	63	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 UF, 50 VDCW, PORM 10%	EA	2
B-35	64	XDHZZ	6625-00-135-9114	GC4673	70117	CABLE ASSEMBLY	EA	1

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-35	65	PAHZZ	5935-00-258-5811	26-4100-16P	02660	CONNECTOR, RECEPTACLE ELECTRICAL	EA	1
B-35	66	XDHZZ		GD4495-2	70117	CHASSIS ASSEMBLY	EA	1
B-35	67	PAHZZ	5935-00-752-2974	SKT2BC	98291	TIP, JACK	EA	5
B-35	68	PAHZZ	5961-00-892-1009	1N963B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-35	69	PAHZZ	5905-00-111-4738	RCR20G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1,500 OHMS, PORM 5%, .5 WATT	EA	1
B-35	70	PAHZZ	5961-00-577-6214	1N538	81349	SEMICONDUCTOR DEVICE, DIODE	EA	2
B-35	71	PAHZZ	5910-00-024-7546	M39022-01-1673	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, 200 VDCW, PORM 20%	EA	1
B-35	72	PAHZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .5 WATT	EA	1
B-35	73	PAHZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47K OHMS, PORM 5%, .5 WATT	EA	1
B-35	74	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, 500 VDCW, PORM 5%	EA	1
B-35	75	PAHZZ	5905-00-140-5653	RCR42G563JS	81349	RESISTOR, FIXED, COMPOSITION: 56K OHMS, PORM 5%, 2 WATT	EA	1
B35	76	PAHZZ	5905-00-104-8347	RCR32G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, 1 WATT	EA	1
B-35	77	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2K OHMS, PORM 5%, .5 WATT	EA	1
B-35	78	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .5 WATT	EA	1
B-35	79	PAHZZ	5910-00-838-9421	CK60AW102M	81349	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 1,000 PFD, 1,000 VDCW, PORM 20%	EA	1

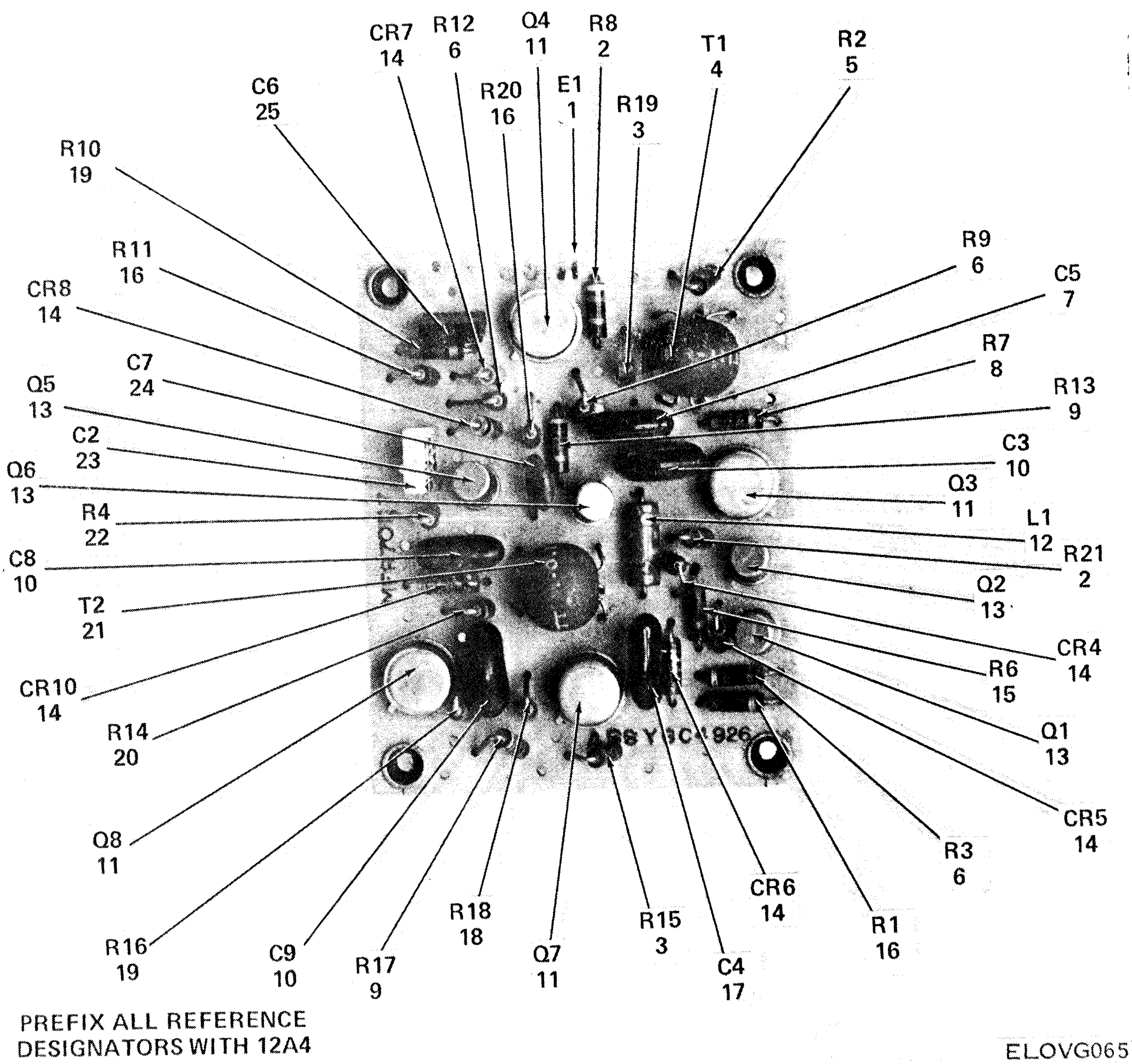

Figure B-36. Blocking oscillator.

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-36		XDHHH		GC4926	70117	BLOCKING OSCILLATOR (SEE FIGURE B-35 FOR NHA)	EA	1
B-36	1	XDHZZ		GB4927	70117	PRINTED WIRING BOARD	EA	1
B-36	2	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .25 WATT	EA	2
B-36	3	PAHZZ	5905-00-107-0656	RCR07G100JS	81349	RESISTOR, FIXED, COMPOSITION: 10 OHMS, PORM 5%, .25 WATT	EA	2
B-36	4	PAHZZ	5950-00-105-7606	579D46-5	70117	TRANSFORMER, PULSE	EA	1
B-36	5	PAHZZ	5905-00-106-3668	RCR07G220JS	81349	RESISTOR, FIXED, COMPOSITION: 22 OHMS, PORM 5%, .25 WATT	EA	1
B-36	6	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	3
B-36	7	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	1
B-36	8	PAHZZ	5905-00-119-8811	RCR07G151JS	81349	RESISTOR, FIXED, COMPOSITION: 150 OHMS, PORM 5%, .25 WATT	EA	1
B-36	9	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	2
B-36	10	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	3
B-36	11	PAHZZ	5961-00-837-7262	2N697	81349	TRANSISTOR	EA	4
B-36	12	PAHZZ	5950-00-772-5984	MS18130-26	96906	COIL, RADIO FREQUENCY	EA	1
B-36	13	PAHZZ	5961-00-842-6937	2N706	81349	TRANSISTOR	EA	4
B-36	14	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	6
B-36	15	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS PORM 5%, .25 WATT	EA	1
B-36	16	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1,000 OHMS, PORM 5%, .25 WATT	EA	3
B-36	17	PAHZZ	5910-00-984-7588	CM05F101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, PORM 5%, 500 VDCW	EA	1
B-36	18	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED, COMPOSITION: 390 OHMS, PORM 5%, .25 WATT	EA	1
B-36	19	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	2
B-36	20	PAHZZ	5905-00-135-3975	RCR07G680JS	81349	RESISTOR, FIXED, COMPOSITION: 68 OHMS, PORM 5%, .25 WATT	EA	1
B-36	21	PAHZZ	5950-00-058-1034	579D46-1	70117	TRANSFORMER, PULSE	EA	1
B-36	22	PAHZZ	5905-00-116-8556	RCR07G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 5%, .25 WATT	EA	1
B-36	23	PAHZZ	5910-00-143-0501	M39014-02-1332	81349	CAPACITOR, FIXED, CERAMIC: 4,700 MMF, PORM 10%	EA	1
B-36	24	PAHZZ	5910-00-781-3802	CK60AW471M	81349	CAPACITOR, FIXED, CERAMIC: 470 MMF, PORM 20%, 500 VDCW	EA	1
B-36	25	PAHZZ	5910-00-116-8653	CK06CW103K	81349	CAPACITOR, FIXED, CERAMIC: 10K MMF, PORM 10%	EA	1

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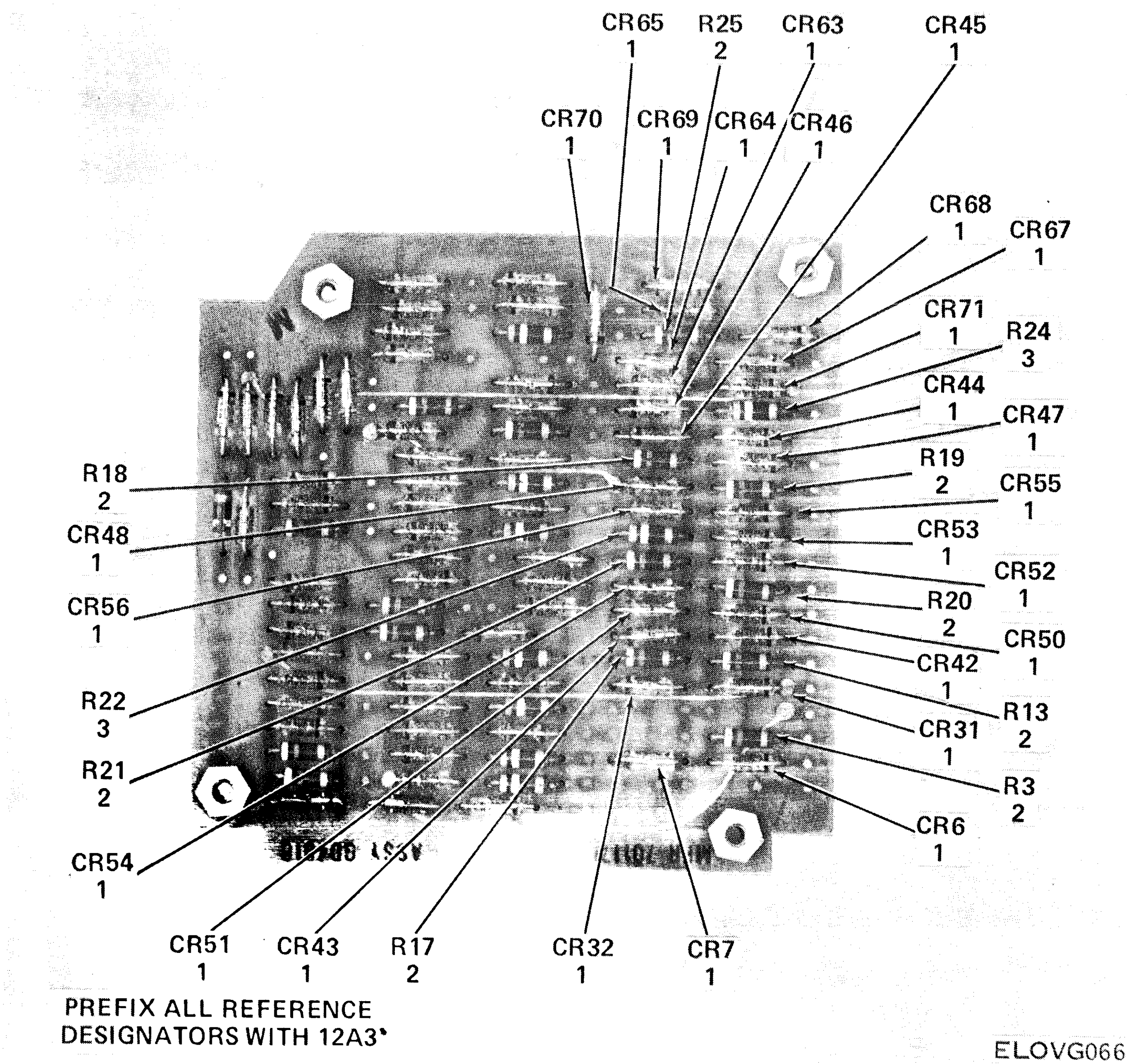


Figure B-37. ① Diode matrix (sheet 1 of 2).

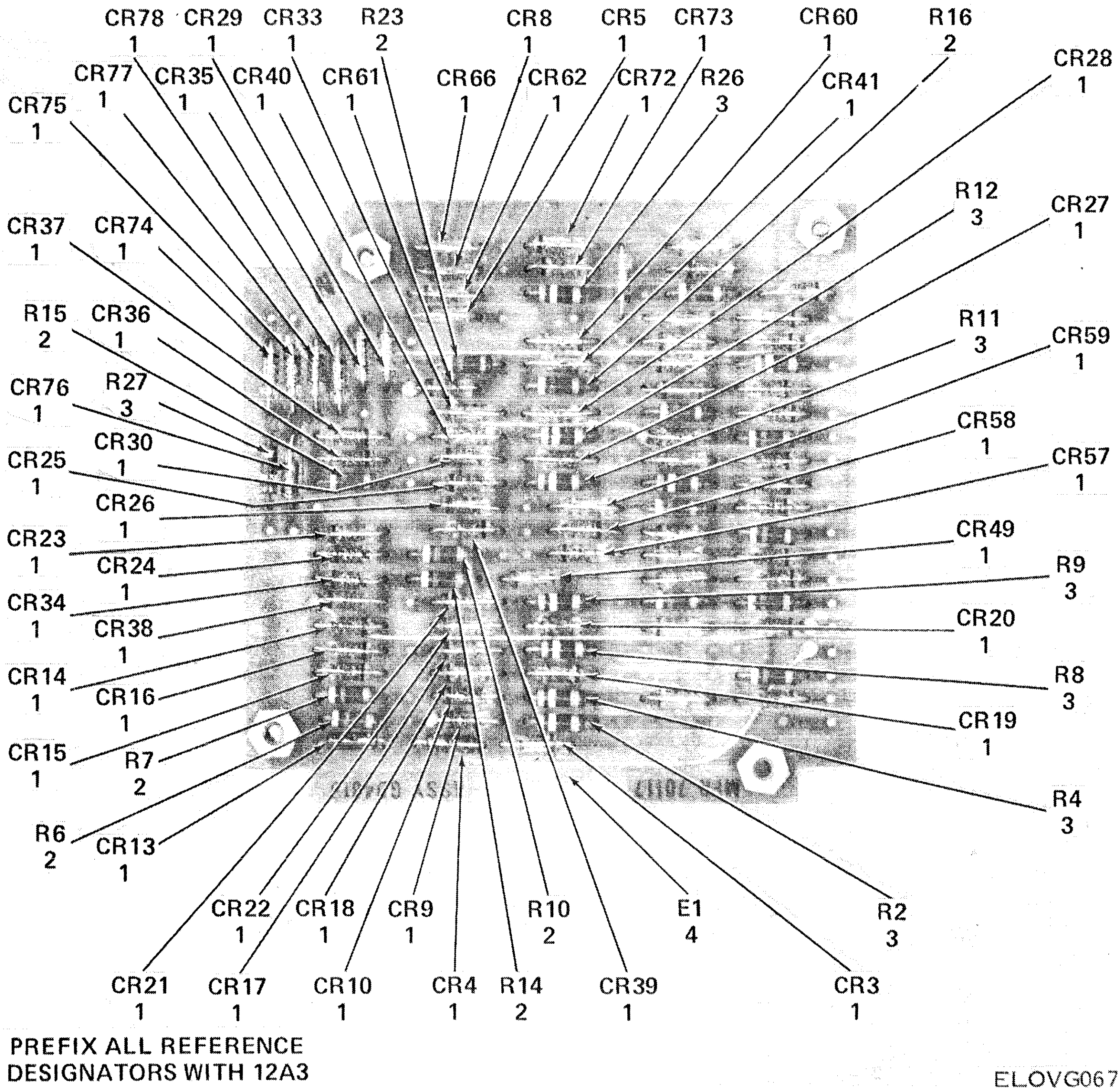


Figure B-37. ② Diode matrix (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-37		XDHZZ		GD4816	70117	DIODE MATRIX (SEE FIGURE B-35 FOR NHA)	EA	REF
B-37	1	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	74
B-37	2	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	15
B-37	3	PAHZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .25 WATT	EA	10
B-37	4	XDHZZ		GB4944	70117	PRINTED WIRING BOARD	EA	1

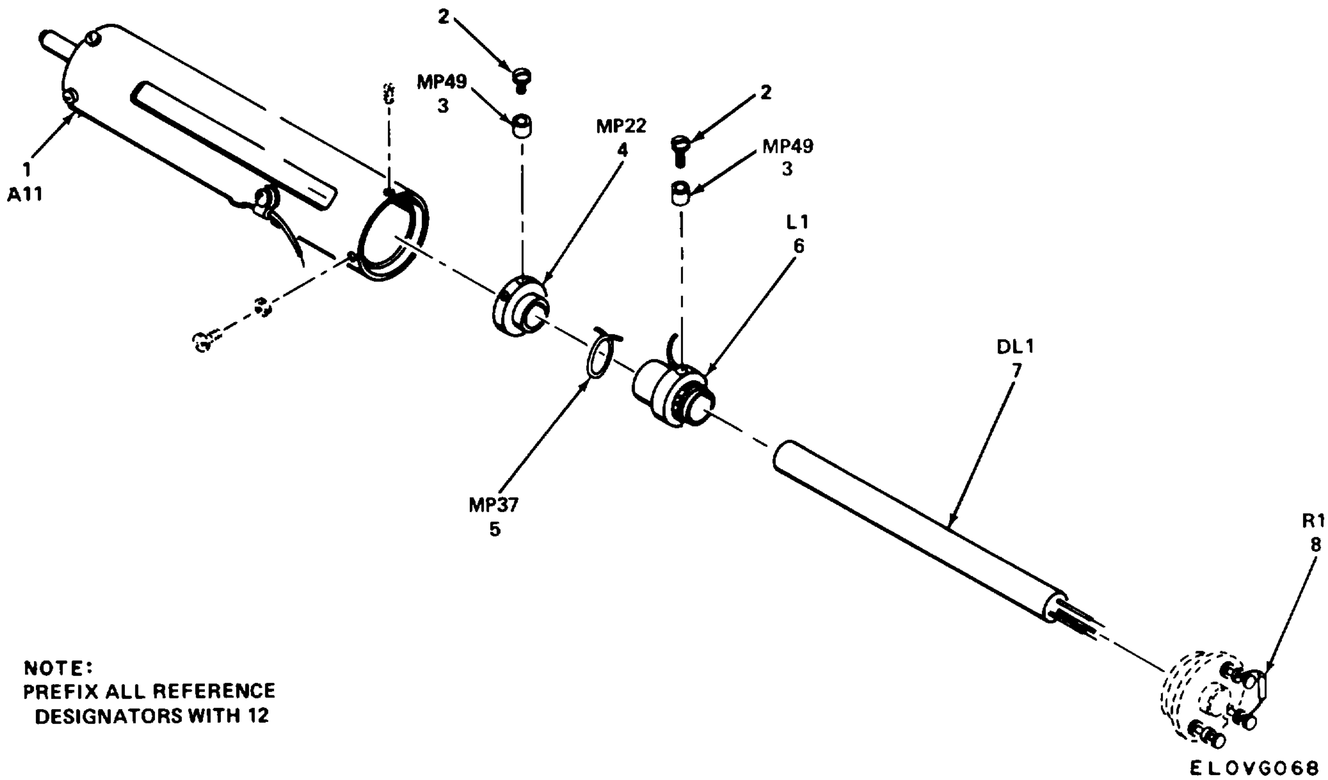
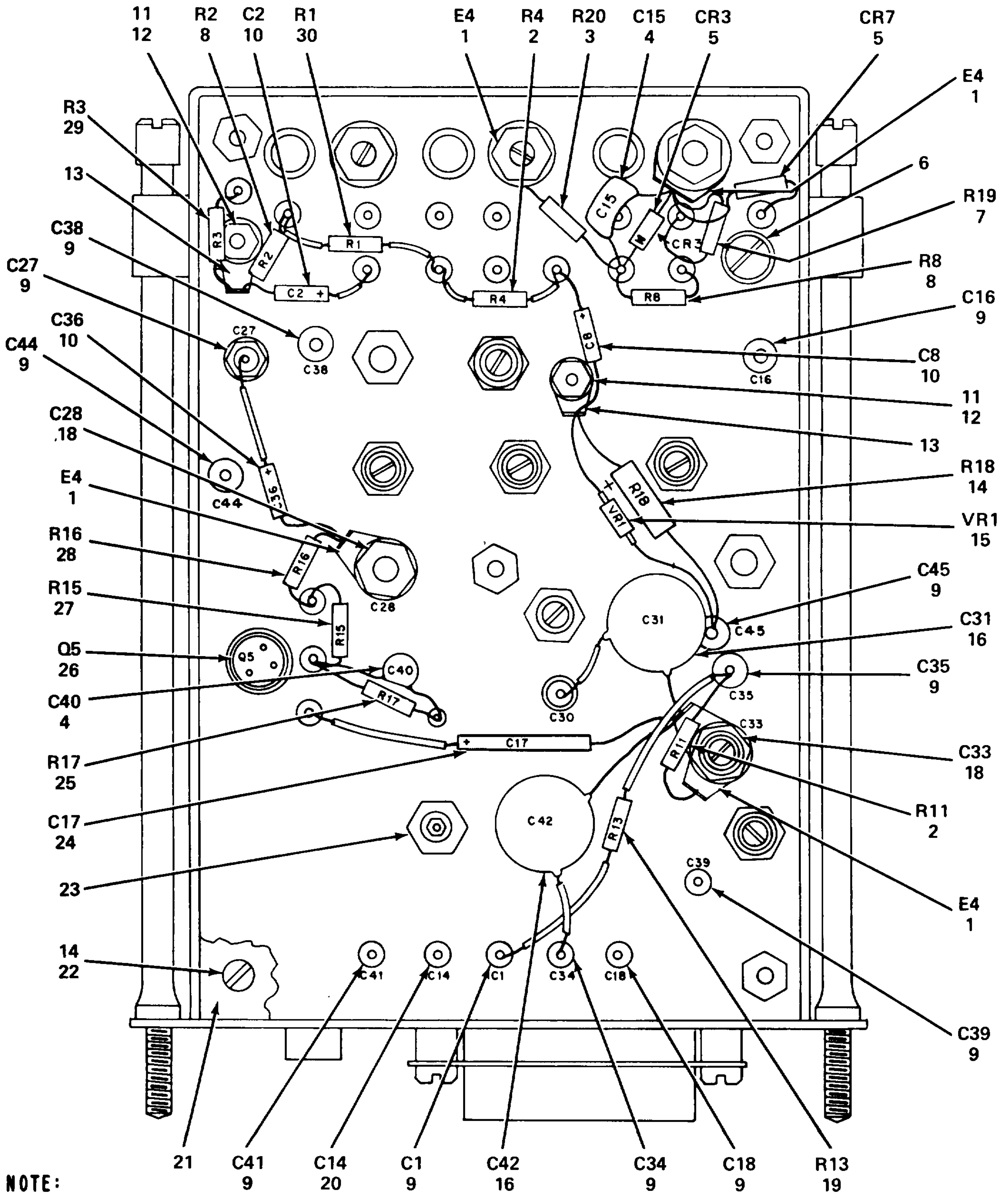


Figure B-38. Delay line assembly, unit 12.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-38		XDDDD		GC4741	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-34 FOR NHA)	EA	REF
B-38	1	PADZZ	5840-00-774-9698	GC1655	70117	DELAY LINE	EA	1
B-38	2	PAHZZ	5305-00-054-5650	MS35233-16	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/16 IN. LG	EA	2
B-38	3	XDDZZ		529C6-39	70117	SPACER, SLEEVE	EA	2
B-38	4	XDDZZ	6625-00-797-2694	512A150	70117	BOBBIN, SLEEVE	EA	1
B-38	5	PADZZ	5360-00-820-0113	519C12-36	70117	SPRING, COIL	EA	1
B-38	6	PADZZ	5950-00-713-8498	569C32-1	70117	COIL, RADIO FREQUENCY	EA	1
B-38	7	PADZZ	6625-00-027-8967	572D11-3	70117	DELAY LINE	EA	1
B-38	8	PADZZ	5905-00-141-1116	RCR20G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5.6K OHMS, PORM 5%, .5 WATT	EA	1



NOTE:
PREFIX ALL REFERENCE DESIGNATORS WITH 12A5.

Figure B-39 ① Radio frequency oscillator, unit 12A5 (sheet 1 of 2).

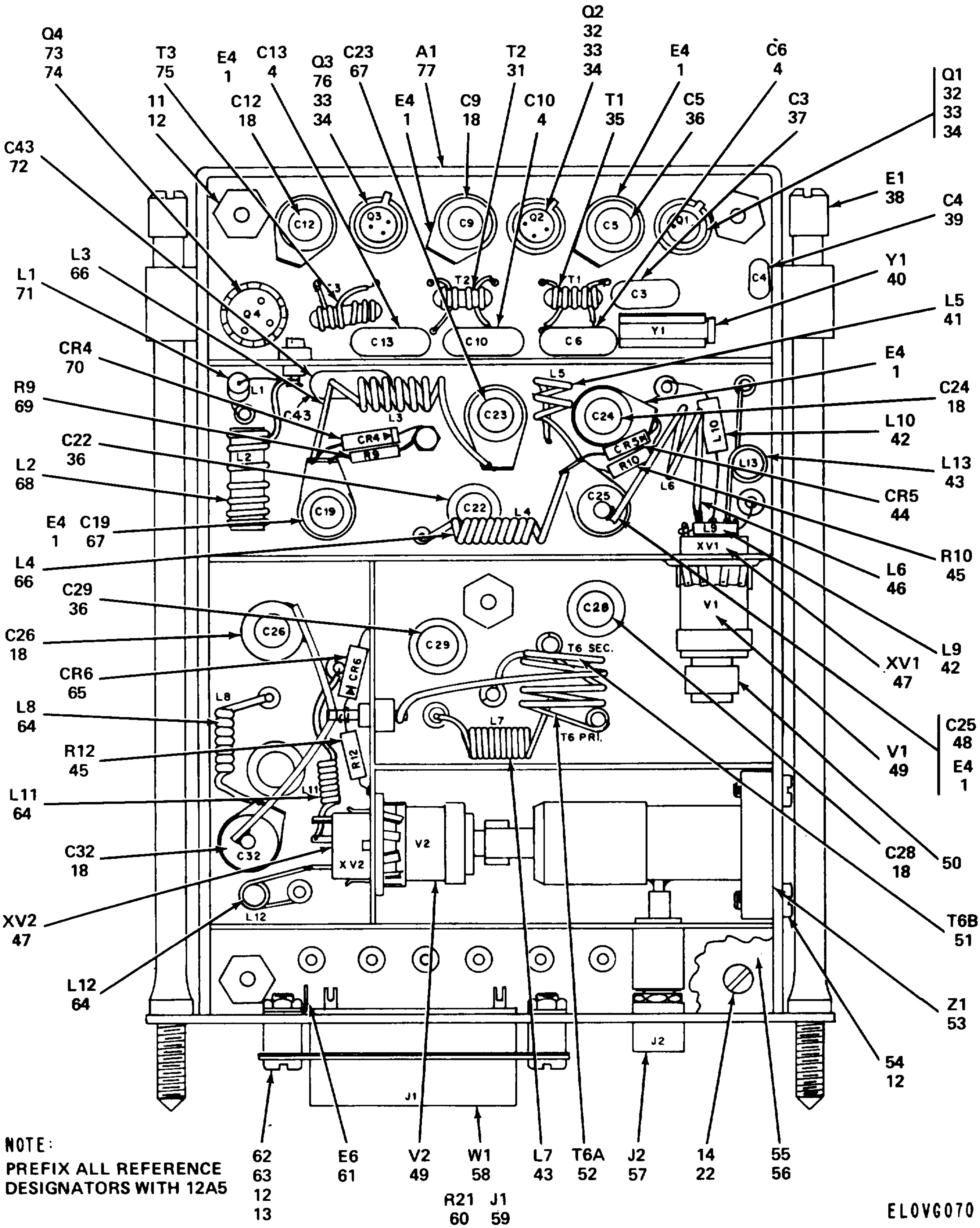


Figure B-39. ② Radio frequency oscillator, unit 12A5 (sheet 2 of 2).

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-39		XDHHH		GJ4930	70117	RADIO FREQUENCY OSCILLATOR (SEE FIGURE B-34 FOR NHA)	EA	REF
B-39	1	XDHZZ		2506-10	78189	TERMINAL LUG	EA	9
B-39	2	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	2
B-39	3	PAHZZ	5905-00-119-8812	RCR07G121JS	81349	RESISTOR, FIXED, COMPOSITION: 120 OHMS, PORM 5%, .25 WATT	EA	1
B-39	4	PAHZZ		CM05C271K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 10%, 500 VDCW	EA	5
B-39	5	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE DIODE	EA	2
B-39	6	PAHZZ	5999-00-904-3486	TXB2P032-037	98978	RETAINER, TRANSISTOR	EA	1
B-39	7	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .25 WATT	EA	1
B-39	8	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .25 WATT	EA	2
B-39	9	PAHZZ	5910-00-065-9997	2482001SW5V-0-1	72872	CAPACITOR, FIXED, DIELECTRIC	EA	12
B-39	10	PAHZZ	5910-00-007-2002	CS13BE225K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 2.2 UF, 500 V, PORM 10%	EA	3
B-39	11	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	7
B-39	12	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	16
B-39	13	XDHZZ	5940-00-614-0537	MS35431-1	96906	TERMINAL LUG	EA	2
B-39	14	PAHZZ	5905-00-235-3534	RCR32G681JS	81349	RESISTOR, FIXED, COMPOSITION: 680 OHMS, PORM 5%, 1 WATT	EA	1
B-39	15	PAHZZ	5961-00-071-7429	1N4962	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-39	16	PAHZZ	5910-00-822-5683	CK63AW103M	81349	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 10K MMF, PORM 20%, 500 VDCW	EA	2
B-39	17	XDHZZ	5940-00-204-8976	123	79963	TERMINAL LUG, PLAIN	EA	1
B-39	18	PAHZZ	5910-00-869-4821	VCJ2109	73899	CAPACITOR, VARIABLE GLASS, DIELECTRIC	EA	6
B-39	19	PAHZZ	5905-00-135-6046	RCR07G681JS	81349	RESISTOR, FIXED, COMPOSITION: 680 OHMS, PORM 5%, .25 WATT	EA	1
B-39	20	PAHZZ	5910-00-254-2261	2482-001X5U-0-101GMV	72982	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-39	21	XDHZZ		515B3216-2	70117	COVER, CHASSIS REAR	EA	1
B-39	22	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: NO. 4-40 X 5/16 IN. LG	EA	10
B-39	23	XDHZZ	5305-00-043-2544	C316	00141	SETSCREW: 8-32 X 7/16 IN. LG	EA	1
B-39	24	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 UF, 500 V, PORM 10%	EA	1
B-39	25	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	1
B-39	26	PAHZZ	5961-00-837-7262	2N697	81349	TRANSISTOR	EA	1
B-39	27	PAHZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .25 WATT	EA	1
B-39	28	PAHZZ	5905-00-106-1356	RCR07G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1,500 OHMS, PORM 5%, .25 WATT	EA	1
B-39	29	PAHZZ	5905-00-682-4107	RCR07G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 5%, .25 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-39	30	PAHZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .25 WATT	EA	1
B-39	31	PAHZZ	5950-00-105-7601	573B70	70117	TRANSFORMER, RADIO FREQUENCY	EA	1
B-39	32	PAHZZ	5961-00-926-0135	2N2481	81349	TRANSISTOR	EA	2
B-39	33	XDHZZ	5961-00-868-3742	P31034-1	08289	MOUNTING, TRANSISTOR	EA	3
B-39	34	XDHZZ		FP10	08289	PAD, TRANSISTOR	EA	3
B-39	35	PAHZZ	5950-00-868-4308	573B74	70117	TRANSFORMER, RADIO FREQUENCY	EA	1
B-39	36	PAHZZ	5910-00-974-5642	VC950	73899	CAPACITOR, VARIABLE, GLASS DIELECTRIC	EA	3
B-39	37	PAHZZ	5910-00-902-0031	CM05C050K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 5 PF, PORM 10%, 500 VDCW	EA	1
B-39	38	PAHZZ	5305-01-004-0299	527C721-7	70117	SCREW, MOUNTING	EA	2
B-39	39	PAHZZ	5910-00-832-8080	CM05C180K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 18 PF, PORM 10%, 500 VDCW	EA	1
B-39	40	PAHZZ		CR56AU85-833	81349	CRYSTAL UNIT, QUARTZ: 85.833 MC	EA	1
B-39	41	PAHZZ	5950-00-868-4301	569B94	70117	COIL, RADIO FREQUENCY	EA	1
B-39	42	PAHZZ	5950-00-059-5918	1025-04	99800	COIL, RADIO FREQUENCY	EA	2
B-39	43	PAHZZ	5950-00-868-4295	569B100	70117	COIL, RADIO FREQUENCY	EA	2
B-39	44	PAHZZ	5961-00-089-4287	MA4325D	96341	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-39	45	PAHZZ	5905-00-110-0388	RCR07G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEG OHMS, PORM 5%, .25 WATT	EA	2
B-39	46	PAHZZ	5950-00-868-4296	569B101	70117	COIL, RADIO FREQUENCY	EA	1
B-39	47	PAHZZ	5935-00-924-1013	133-65-10-041	71785	SOCKET, ELECTRON TUBE	EA	2
B-39	48	PAHZZ	5910-00-869-4822	VCJ679A	73899	CAPACITOR, VARIABLE, GLASS DIELECTRIC	EA	2
B-39	49	PAHZZ	5960-00-983-5464	8627	95303	ELECTRON TUBE	EA	2
B-39	50	XDHHH	5999-00-845-3137	100-200-4A14	99378	CLIP, SPRING TENSION	EA	1
B-39	51	PAHZZ	5950-00-105-7599	569B97	70117	COIL, RADIO FREQUENCY	EA	1
B-39	52	PAHZZ	5950-00-105-7600	569B98	70117	COIL, RADIO FREQUENCY	EA	1
B-39	53	PAHZZ	5960-00-105-7598	GC4476	70117	ANODE LINE ASSEMBLY	EA	1
B-39	54	PAHZZ	5305-00-054-5646	MS35233-12	96906	SCREW, MACHINE: NO. 4-40 X 3/16 IN. LG	EA	2
B-39	55	XDHZZ		515C3216-1	70117	COVER, CHASSIS FRONT	EA	1
B-39	56	XDHZZ		GB4546	70117	SHIELD ASSEMBLY	EA	1
B-39	57	PAHZZ	5935-00-882-2800	52-046-0069	98291	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-39	58	XDHZZ		GC4472-2	70117	CONNECTOR ASSEMBLY	EA	1
B-39	59	PAHZZ	5935-00-057-2690	DAM15PC37	71468	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-39	60	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .25 WATT	EA	1
B-39	61	XDHZZ	5940-00-159-1252	2522-4	78189	TERMINAL LUG	EA	1
B-39	62	XDHZZ	5305-00-054-5649	MS51957-15	96906	SCREW, MACHINE: NO. 4-40 X 3/8 IN. LG	EA	2
B-39	63	XDHZZ		529D4-95	70117	SPACER, SLEEVE	EA	2
B-39	64	PAHZZ	5950-00-868-4302	569B95	70117	COIL, RADIO FREQUENCY	EA	3

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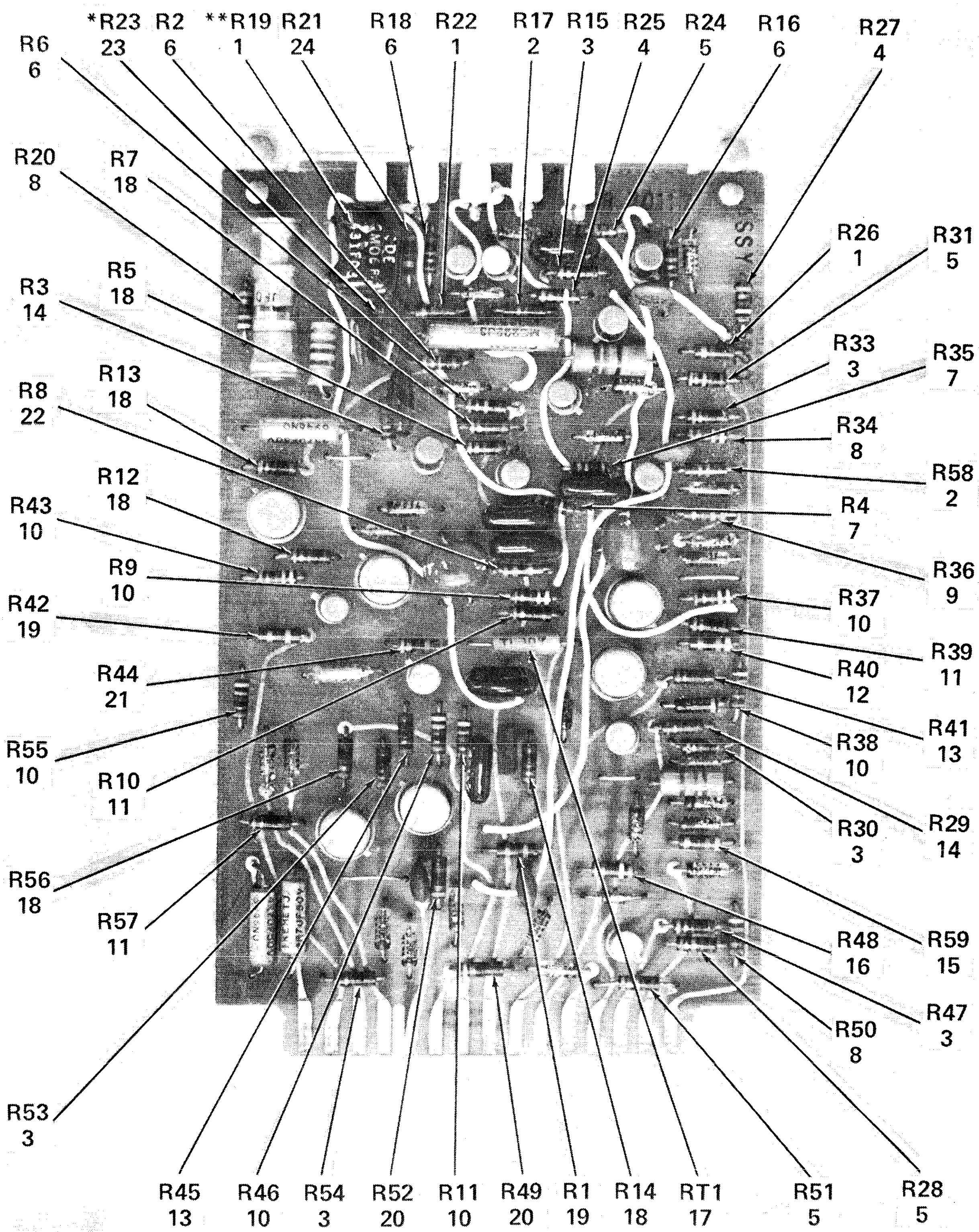
(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-39	65	PAHZZ	5961-00-089-4285	MA4326D1	96341	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-39	66	PAHZZ	5950-00-868-4300	569B93	70117	COIL, RADIO FREQUENCY	EA	2
B-39	67	PAHZZ	5910-00-869-4820	VCJ1839	73899	CAPACITOR, VARIABLE, GLASS DIELECTRIC	EA	2
B-39	68	PAHZZ	5950-00-868-4299	569B90	70117	COIL, RADIO FREQUENCY	EA	1
B-39	69	PAHZZ	5905-00-118-4559	RCR07G333JS	81349	RESISTOR, FIXED, COMPOSITION: 33K OHMS, PORM 5%, .25 WATT	EA	1
B-39	70	PAHZZ	5961-00-089-4286	MA4325E	96341	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-39	71	PAHZZ	5950-00-921-3414	MS18130-13	96906	COIL, RADIO FREQUENCY	EA	1
B-39	72	PAHZZ	5910-00-902-0335	CM05C100K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 10 PF, PORM 10%, 500 VDCW	EA	1
B-39	73	PAHZZ	5961-00-837-6481	2N3553	81349	TRANSISTOR	EA	1
B-39	74	XDHZZ		MW375-118	91766	WASHER, NONMETALLIC	EA	2
B-39	75	PAHZZ	5950-00-868-4307	573B71	70117	TRANSFORMER, RADIO FREQUENCY	EA	1
B-39	76	PAHZZ	5961-00-226-8584	2N2222	81349	TRANSISTOR	EA	1
B-39	77	XDHZZ		GC4932	70117	CASE ASSEMBLY	EA	1



*R23 IS LOCATED UNDER C9.
**R19 IS LOCATED UNDER C10.
PREFIX ALL REFERENCE DESIGNATORS WITH 12A1.

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Figure B-40. ① Clock and recycle assembly (sheet 1 of 3).

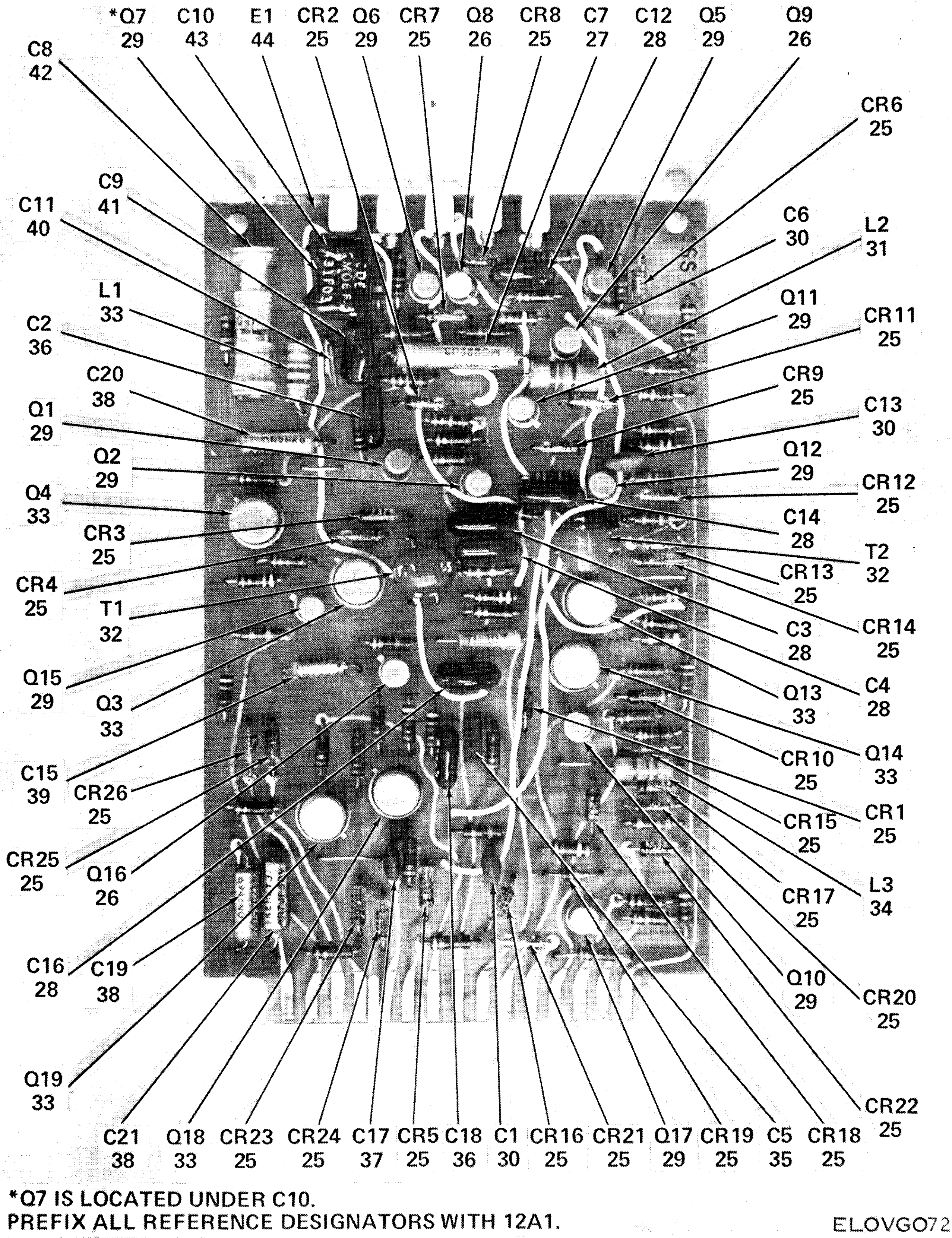
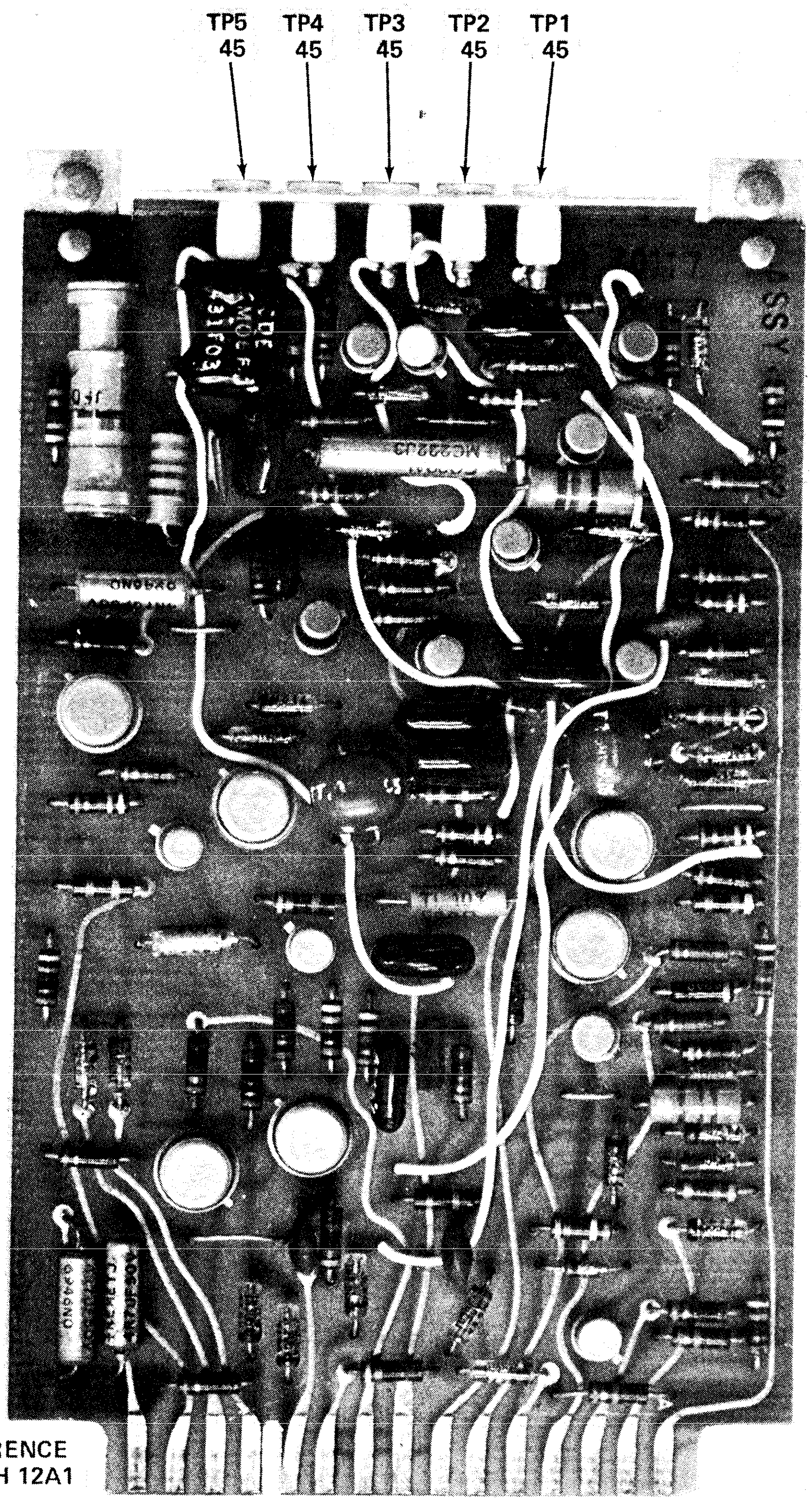


Figure B-40. ② Clock and recycle assembly (sheet 2 of 3).



PREFIX ALL REFERENCE DESIGNATORS WITH 12A1

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Figure B-40. ③ Clock and recycle assembly (sheet 3 of 3).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-40		XDHDD	6625-00-110-5017	GD4820	70117	CLOCK AND RECYCLE ASSEMBLY (SEE FIGURE B-34 FOR NHA)	EA	REF
B-40	1	PAHZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 5%, .25 WATT	EA	3
B-40	2	PAHZZ	5905-00-116-8556	RCR07G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 5%, .25 WATT	EA	2
B-40	3	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .25 WATT	EA	6
B-40	4	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED, COMPOSITION: 390 OHMS, PORM 5%, .25 WATT	EA	2
B-40	5	PAHZZ	5905-00-106-1278	RCR07G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12K OHMS, PORM 5%, .25 WATT	EA	4
B-40	6	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .25 WATT	EA	4
B-40	7	PAHZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .25 WATT	EA	2
B-40	8	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	3
B-40	9	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED, COMPOSITION: 390 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	9	PAHZZ	5905-00-135-3974	RCR07G431JS	81349	RESISTOR, FIXED, COMPOSITION: 430 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	9	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	9	PAHZZ	5905-00-116-2394	RCR07G511JS	81349	RESISTOR, FIXED, COMPOSITION: 510 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	9	PAHZZ	5905-00-105-7768	RCR07G561JS	81349	RESISTOR, FIXED, COMPOSITION: 560 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	9	PAHZZ	5905-00-136-3891	RCR07G621JS	81349	RESISTOR, FIXED, COMPOSITION: 620 OHMS, PORM 5%, .25 WATT	EA	1
B-40	10	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	7
B-40	11	PAHZZ	5905-00-107-0656	RCR07G100JS	81349	RESISTOR, FIXED, COMPOSITION: 10 OHMS, PORM 5%, .25 WATT	EA	3
B-40	12	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .25 WATT	EA	1
B-40	13	PAHZZ	5905-00-106-1356	RCR07G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1,500 OHMS, PORM 5%, .25 WATT	EA	2
B-40	14	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	2
B-40	15	PAHZZ	5905-00-110-7622	RCR07G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, .25 WATT	EA	1
B-40	16	PAHZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .25 WATT	EA	1
B-40	17	PAHZZ		TM1-4-5000OHM 1-4WPORM10PCT	06228	RESISTOR, THERMAL: 500 OHMS, PORM 10%, .25 WATT	EA	1

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-40	18	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	6
B-40	19	PAHZZ	5905-00-141-0744	RCR07G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5,600 OHMS, PORM 5%, .25 WATT	EA	2
B-40	20	PAHZZ	5905-00-111-4727	RCR07G272JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	2
B-40	21	PAHZZ	5905-00-105-7768	RCR07G561JS	81349	RESISTOR, FIXED, COMPOSITION: 560 OHMS, PORM 5%, .25 WATT	EA	1
B-40	22	PAHZZ	5905-00-126-6698	RCR07G360JS	81349	RESISTOR, FIXED, COMPOSITION: 36 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	22	PAHZZ	5905-00-113-4861	RCR07G390JS	81349	RESISTOR, FIXED, COMPOSITION: 39 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	22	PAHZZ	5905-00-115-2223	RCR07G430JS	81349	RESISTOR, FIXED, COMPOSITION: 43 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	22	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	22	PAHZZ	5905-00-106-1249	RCR07G510JS	81349	RESISTOR, FIXED, COMPOSITION: 51 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	22	PAHZZ	5905-00-133-0440	RCR07G560JS	81349	RESISTOR, FIXED, COMPOSITION: 56 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-40	22	PAHZZ	5905-00-126-6692	RCR07G620JS	81349	RESISTOR, FIXED, COMPOSITION: 62 OHMS, PORM 5%, .25 WATT	EA	1
B-40	23	PAHZZ	5905-00-131-1255	RCR07G122JS	81349	RESISTOR, FIXED, COMPOSITION: 1,200 OHMS, PORM 5%, .25 WATT	EA	1
B-40	24	PAHZZ	5905-00-119-8768	RCR07G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, .25 WATT	EA	1
B-40	25	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	26
B-40	26	PAHZZ	5961-00-946-2023	2N2906	81349	TRANSISTOR	EA	3
B-40	27	PAHZZ	5910-00-069-6104	CQ09A1MC222J3	81349	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-40	28	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	5
B-40	29	PAHZZ	5961-00-842-6937	2N706	81349	TRANSISTOR	EA	10
B-40	30	PAHZZ	5910-00-838-9421	CK60AW102M	81349	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 1K MMF, PORM 20%, 500 VDCW	EA	3
B-40	31	PAHZZ	5950-00-892-8209	MS75008-41	96906	COIL, RADIO FREQUENCY	EA	1
B-40	32	PAHZZ	5950-00-066-4127	TT101-0-05	97722	TRANSFORMER PULSE	EA	2
B-40	33	PAHZZ	5961-00-837-7262	2N697	81349	TRANSISTOR	EA	6
B-40	34	PAHZZ	5950-00-111-8343	1537-78	99800	COIL, RADIO FREQUENCY	EA	2
B-40	35	PAHZZ	5910-00-116-8653	CK06CW103K	81349	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 10K MMF, PORM 10%, 500 VDCW	EA	1
B-40	36	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	2

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-40	37	PAHZZ	5910-00-821-5215	CK60AX471K	81349	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 470 MMF, PORM 10%, 500 VDCW	EA	1
B-40	38	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, DIELECTRIC	EA	3
B-40	39	PAHZZ	5910-00-007-2002	CS13BE225K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 2.2 UF, PORM 10%	EA	1
B-40	40	PAHZZ	5910-00-885-2025	CC64UG201G	86335	CAPACITOR, FIXED, CERAMIC, DIELECTRIC: 200MMF, PORM 5%, 500 VDCW	EA	1
B-40	41	PAHZZ	5910-00-954-5500	CM05FD151G03	81349	CAPACITOR, FIXED, MICA, DIELECTRIC: 150 PF, PORM 5%, 500 VDCW	EA	1
B-40	42	PAHZZ	5910-00-235-3260	PC43J280	81349	CAPACITOR, VARIABLE, GLASS DIELECTRIC	EA	1
B-40	43	PAHZZ	5910-00-762-7886	CM06F431J03	81349	CAPACITOR, FIXED, MICA, DIELECTRIC: 430 MMF, PORM 5%, 500 VDCW	EA	1
B-40	44	XDHZZ		GB4807	70117	PRINTED WIRING BOARD	EA	1
B-40	45	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	5

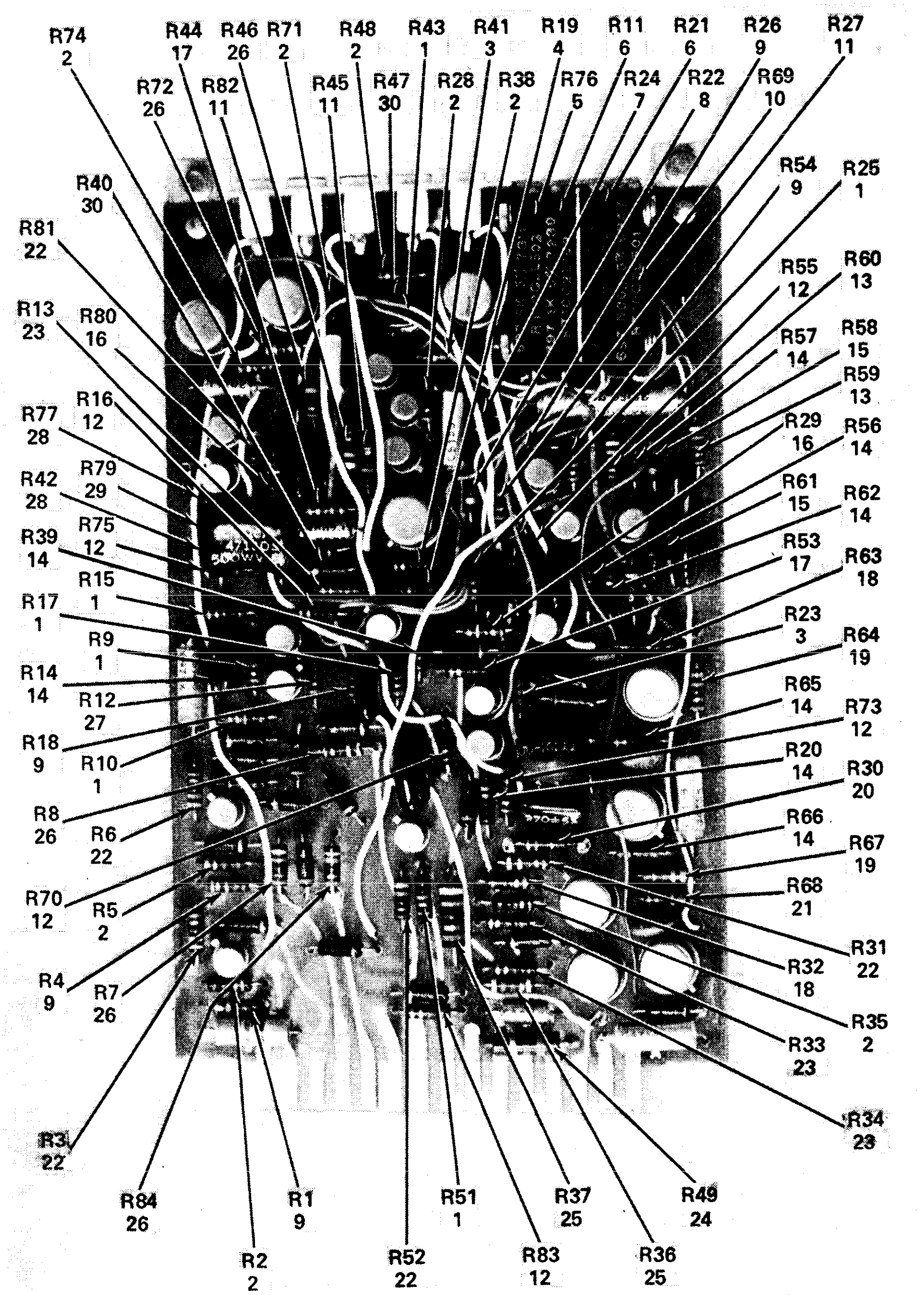

Figure B-41. ① *ILS and tag assembly (sheet l of 2).*

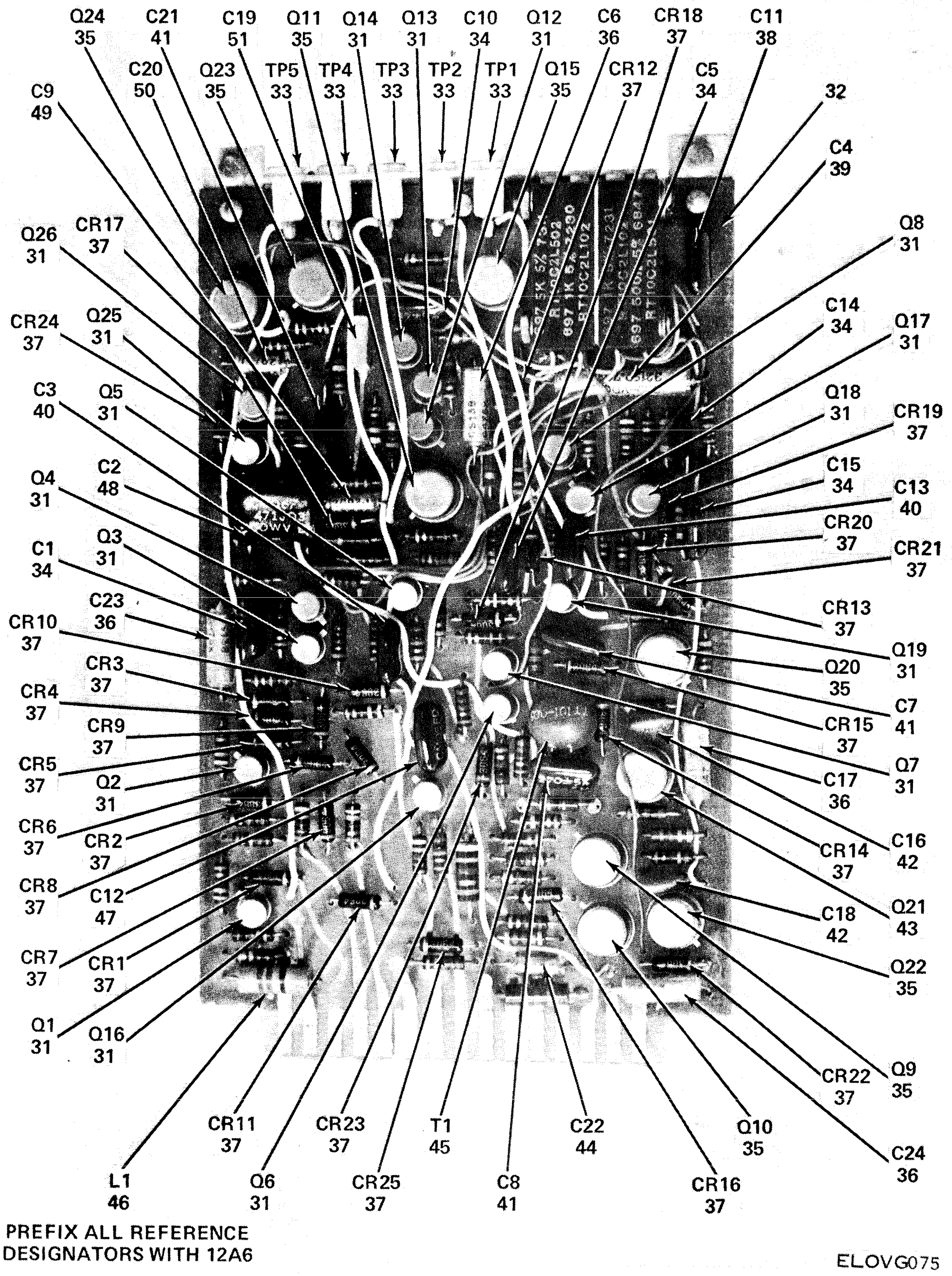

Figure B-41. ② ILS and tag assembly (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-41		XDHHH	6625-00-110-5020	GD4815	70117	ILS AND TAG ASSEMBLY (SEE FIGURE B-34 FOR NHA)	EA	REF
B-41	1	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .25 WATT	EA	7
B-41	2	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	8
B-41	3	PAHZZ	5905-00-119-3504	RCR07G273JS	81349	RESISTOR, FIXED, COMPOSITION: 27K OHMS, PORM 5%, .25 WATT	EA	2
B-41	4	PAHZZ	5905-00-106-1356	RCR07G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1,500 OHMS, PORM 5%, .25 WATT	EA	1
B-41	5	PAHZZ	5905-00-763-7186	RT10C2L502	81349	RESISTOR, VARIABLE	EA	1
B-41	6	PAHZZ	5905-00-052-1794	RT10C2L102	81349	RESISTOR, VARIABLE	EA	2
B41	7	PAHZZ	5905-00-115-3560	RCR07G183JS	81349	RESISTOR, FIXED, COMPOSITION: 18K OHMS, PORM 5%, .25 WATT	EA	1
B41	8	PAHZZ	5905-00-119-8768	RCR07G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, .25 WATT	EA	1
B41	9	PAHZZ	5905-00-106-1278	RCR07G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12K OHMS, PORM 5%, .25 WATT	EA	5
B-41	10	PAHZZ	5905-00-781-8779	RT10C2L501	81349	RESISTOR, VARIABLE	EA	1
B-41	11	PAHZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .25 WATT	EA	3
B-41	12	PAHZZ	5905-00-105-7764	RCR07G222JS	81340	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	6
B-41	13	PAHZZ	5905-00-141-0717	RCR07G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47K OHMS, PORM 5%, .25 WATT	EA	2
B-41	14	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .25 WATT	EA	8
B-41	15	PAHZZ	5905-00-110-7622	RCR07G682JS	81349	RESISTOR, FIXED, COMPOSITION: 6,800 OHMS, PORM 5%, .25 WATT	EA	2
B-41	16	PAHZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .25 WATT	EA	2
B-41	17	PAHZZ	5905-00-126-6683	RCR07G332JS	81349	RESISTOR, FIXED, COMPOSITION: 3,300 OHMS, PORM 5%, .25 WATT	EA	2
B-41	18	PAHZZ	5905-00-107-0656	RCR07G100JS	81349	RESISTOR, FIXED, COMPOSITION: 10 OHMS, PORM 5%, .25 WATT	EA	2
B-41	19	PAHZZ	5905-00-114-0710	RCR07G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 5%, .25 WATT	EA	2
B-41	20	PAHZZ	5905-00-126-6698	RCR07G360JS	81349	RESISTOR, FIXED, COMPOSITION: 36 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-41	20	PAHZZ	5905-00-113-4861	RCR07G390JS	81349	RESISTOR, FIXED, COMPOSITION: 39 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-41	20	PAHZZ	5905-00-115-2223	RCR07G430JS	81349	RESISTOR, FIXED, COMPOSITION: 43 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-41	20	PAHZZ	5905-00-104-8368	RCR07G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-41	20	PAHZZ	5905-00-106-1249	RCR07G510JS	81349	RESISTOR, FIXED, COMPOSITION: 51 OHMS, PORM 5%, .25 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-41	20	PAHZZ	5905-00-133-0440	RC07G560JS	81349	RESISTOR, FIXED, COMPOSITION: 56 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-41	20	PAHZZ	5905-00-126-6692	RCR07G620JS	81349	RESISTOR, FIXED, COMPOSITION: 62 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-41	20	PAHZZ	5905-00-135-3975	RCR07G680JS	81349	RESISTOR, FIXED, COMPOSITION: 68 OHMS, PORM 5%, .25 WATT	EA	1
B-41	21	PAHZZ	5905-00-135-6046	RCR07G681JS	81349	RESISTOR, FIXED, COMPOSITION: 680 OHMS, PORM 5%, .25 WATT	EA	1
B-41	22	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	6
B-41	23	PAHZZ	5905-00-119-8811	RCR07G151JS	81349	RESISTOR, FIXED, COMPOSITION: 150 OHMS, PORM 5%, .25 WATT	EA	3
B-41	24	PAHZZ	5905-00-114-5407	RCR20G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .50 WATT	EA	1
B-41	25	PAHZZ	5905-00-111-4858	RCR20G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .50 WATT	EA	1
B-41	26	PAHZZ	5905-00-114-0711	RCR07G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4,700 OHMS, PORM 5%, .25 WATT	EA	5
B-41	27	PAHZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 5%, .25 WATT	EA	1
B-41	28	PAHZZ	5905-00-111-4727	RCR07G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 5%, .25 WATT	EA	2
B-41	29	PAHZZ	5905-00-116-8555	RCR07G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15K OHMS, PORM 5%, .25 WATT	EA	1
B-41	30	PAHZZ	5905-00-131-1255	RCR07G122JS	81349	RESISTOR, FIXED, COMPOSITION: 1,200 OHMS, PORM 5%, .25 WATT	EA	2
B-41	31	PAHZZ	5961-00-842-6937	2N706	81349	TRANSISTOR	EA	17
B-41	32	XDDZZ		GB4808	70117	PRINTED WIRING BOARD	EA	1
B-41	33	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	5
B-41	34	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	5
B-41	35	PAHZZ	5961-00-837-7262	2N697	81349	TRANSISTOR	EA	8
B-41	36	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 UF, 500 V PORM 10%	EA	4
B-41	37	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	25
B-41	38	PAHZZ	5910-00-954-5498	CM05F181J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 180 PF, PORM 5%, 500 VDCW	EA	1
B-41	39	PAHZZ	5910-00-951-4832	CQ09A1MC472JS	81349	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-41	40	PAHZZ	5910-00-984-7588	CM05D101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, PORM 5%, 500 VDCW	EA	2
B-41	41	PAHZZ	5910-00-060-1189	CM05F271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	3
B-41	42	PAHZZ	5910-00-837-2577	CK60AW152M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1,500 MMF, PORM 20%, 500 VDCW	EA	2
B-41	43	PAHZZ	5961-00-855-1551	2N1132	81349	TRANSISTOR	EA	1
B-41	44	PAHZZ	5910-00-007-2002	CS13BE225K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 22 UF, PORM 10%	EA	1
B-41	45	PAHZZ	5950-00-066-4127	TT101-0-05	97722	TRANSFORMER, PULSE	EA	1
B-41	46	PAHZZ	5950-00-892-8209	MS75008-41	96926	COIL, RADIO FREQUENCY	EA	1

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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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-41	47	PAHZZ	5910-00-957-9909	CM05FD391G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 390 PF, PORM 5%, 500 VDCW	EA	1
B-41	48	PAHZZ	5910-00-717-0167	CM06FD471G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 470 PF, PORM 5%, 500 VDCW	EA	1
B-41	49	PAHZZ	5910-00-189-6651	CSR13G473KL	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-41	50	PAHZZ	5910-00-182-7512	CSR13G472KL	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-41	51	PAHZZ	5910-00-116-8653	CK06CW103K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 10K MMF, PORM 10%	EA	1

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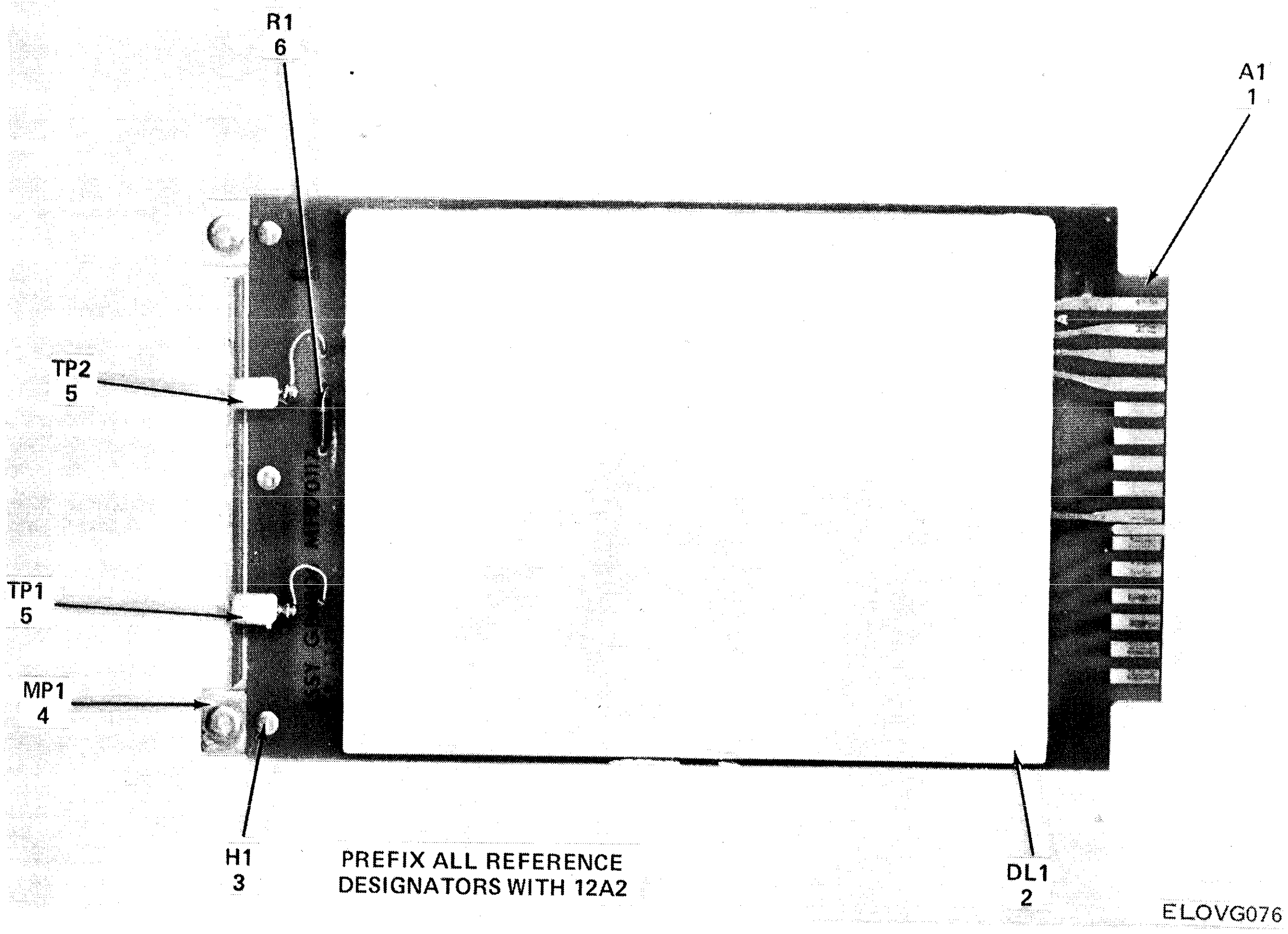

Figure B-42. Delay line assembly, unit 12A2.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-42		PAHZZ	6625-00-122-6363	GB4806	70117	DELAY LINE ASSEMBLY (SEE FIGURE B-34 FOR NHA)	EA	REF
B-42	1	XDHZZ		GB4805	70117	DELAY LINE	EA	1
B-42	2	PAHZZ	6625-00-570-4527	572D39	70117	DELAY LINE	EA	1
B-42	3	XDDZZ		506C2-13-7	70117	RIVET, TUBULAR	EA	3
B-42	4	XDHZZ		GB4804-3	70117	BRACKET ASSEMBLY	EA	1
B-42	5	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	2
B-42	6	PAHZZ	5905-00-116-2394	RCR07G511JS	81349	RESISTOR, FIXED, COMPOSITION: 510 OHMS, PORM 5%, .25 WATT	EA	1

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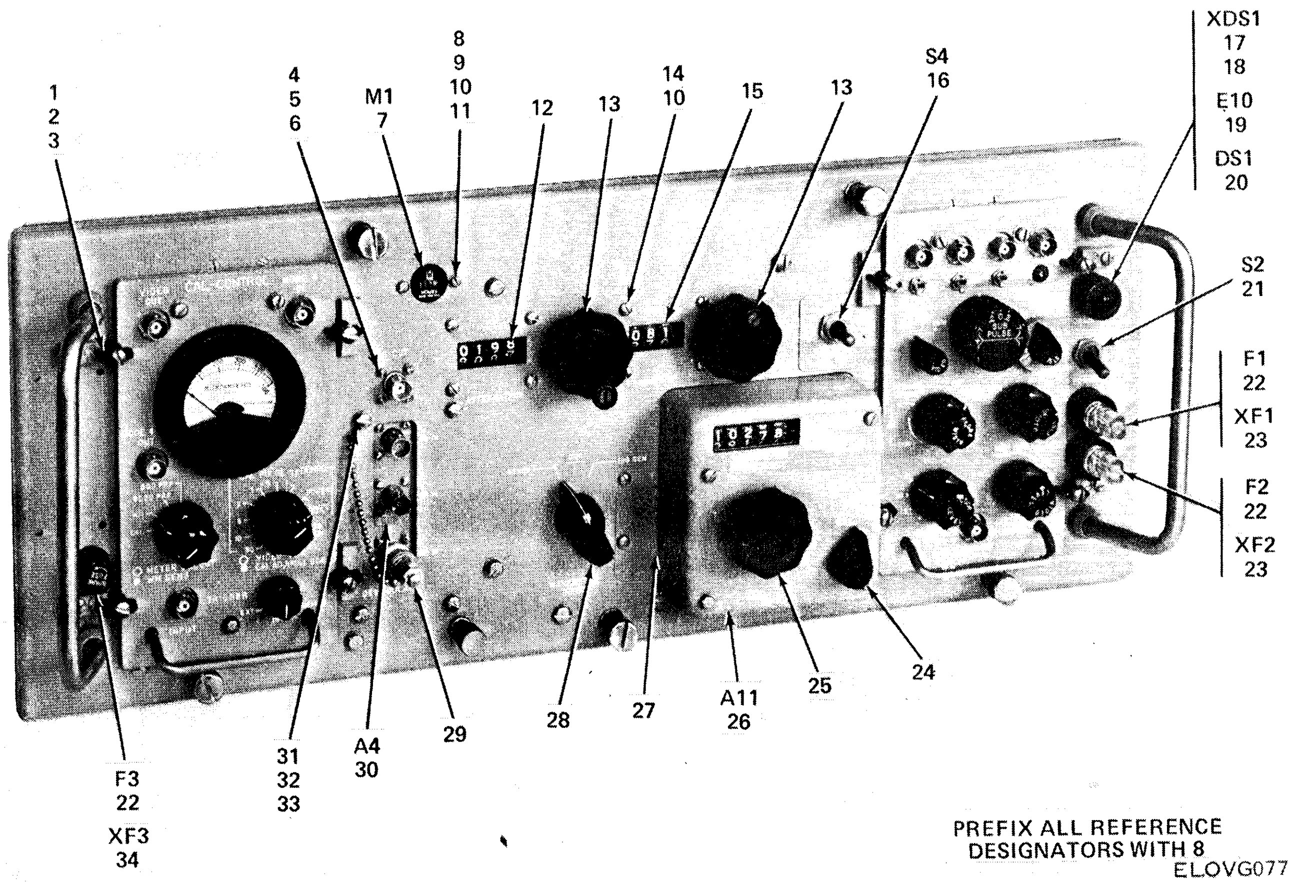

Figure B-43. ① chassis assembly, unit 8 (sheet 1 of 2).

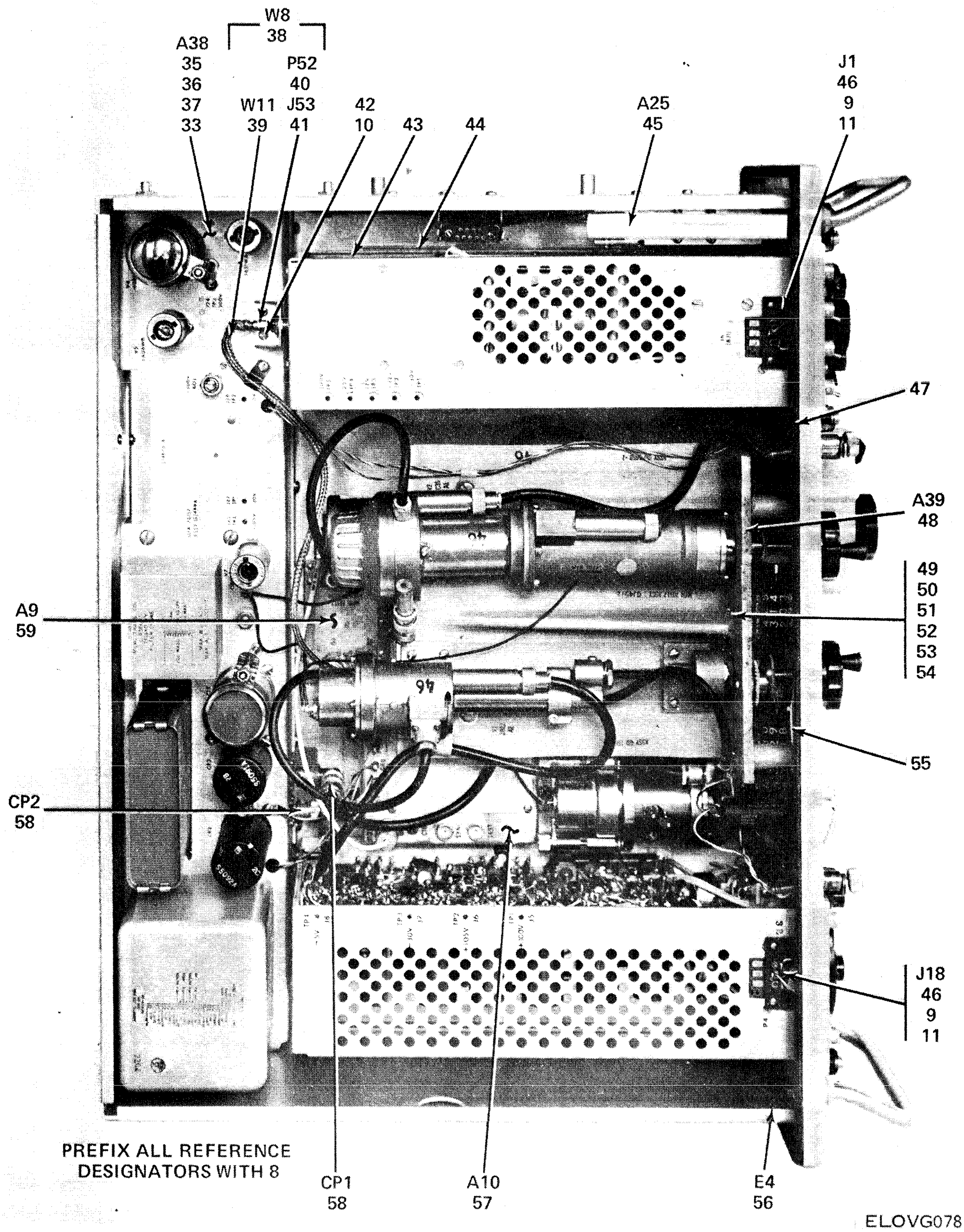

Figure B-43. ② Chassis assembly, unit 8 (sheet 2 of 2).

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) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0302 - CHASSIS ASSEMBLY		
B-43		XDHHH		GJ4846	70117	CHASSIS ASSEMBLY (SEE FIGURE B-33 FOR NHA)	EA	REF
B-43	1	PAHZZ	5340-00-754-2324	533A103	70117	CLAMP, BRIDGE	EA	8
B-43	2	XDHZZ	5305-00-655-7438	5102-875F2-52	70117	SCREW, MACHINE: FILH NO. 10-32 X 7/8 IN. LG, SST	EA	8
B-43	3	XDHZZ		062X196X094SST	70117	WASHER, FLAT: NO. 10, SST	EA	8
B-43	4	XDHZZ		3-48X312FILHSST	70117	SCREW, MACHINE: FILH NO. 3-48 X 5/16 IN. LG, SST	EA	4
B-43	5	XDHZZ		3LTSPLITSST	70117	WASHER, LOCK: NO. 3, SST	EA	4
B-43	6	XDHZZ		015X109X187SST	70117	WASHER, FLAT: NO. 3, SST	EA	4
B-43	7	PAHZZ	6645-00-255-1370	MS17321-1	96906	METER, TIME TOTALIZING	EA	1
B-43	8	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: PNH, NO. 4-40 X 5/16 IN. LG	EA	6
B-43	9	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	21
B-43	10	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT: NO. 4	EA	14
B-43	11	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEX: NO. 4-40	EA	16
B-43	12	PAHZZ	5355-00-867-3591	521A21	70117	WINDOW, DIAL	EA	1
B-43	13	PAHZZ	5355-00-739-8153	SCH309-70BB	75376	KNOB, SPINNER	EA	2
B-43	14	PAHZZ	5305-00-054-5650	MS35233-16	96906	SCREW, MACHINE: PNH, NO. 4-40 X 7/16 IN. LG	EA	8
B-43	15	PAHZZ	5355-00-867-3590	521A20	70117	WINDOW DIAL	EA	1
B-43	16	PAHZZ	5930-00-655-1520	MS35058-28	96906	SWITCH, TOGGLE	EA	1
B-43	17	PAHZZ	6210-00-144-4689	208-0410-0131-201	72619	LIGHT, INDICATOR	EA	1
B-43	18	PAHZZ	6210-00-064-0071	208-0131-200	72619	LENS, INDICATOR	EA	1
B-43	19	PAHZZ	6210-00-295-1915	207-0410-11-201	72619	LAMPHOLDER	EA	1
B-43	20	PAHZZ	6245-00-155-8706	MS15571-2	96906	LAMP, INCANDESCENT	EA	1
B-43	21	PAHZZ	5930-00-655-1575	MS35059-22	96906	SWITCH, TOGGLE	EA	1
B-43	22	PAHZZ	5920-00-281-0210	F02A250V4AS	81349	FUSE, CARTRIDGE: 4 AMPS	EA	3
B-43	23	PAHZZ		HKLXE90-250V	71400	FUSEHOLDER	EA	2
B-43	24	PAHZZ	5355-00-616-9604	MS91528-1P2B	96906	KNOB, CALIBRATION	EA	1
B-43	25	PAHZZ	5355-00-614-0400	MS91531-3N2B	96906	KNOB, TUNING	EA	1
B-43	26	XDDDD		GD5078-2	70117	COUNTER ASSEMBLY (SEE FIGURE B-44 FOR BREAKDOWN)	EA	1
B-43	27	PAHZZ	5330-01-004-0342	512B358	70117	GASKET	EA	1
B-43	28	PAHZZ		S246-3LBB	75376	KNOB, POINTER	EA	1
B-43	29	PAHZZ	5985-00-841-1735	6850	74868	DUMMY LOAD, ELECTRICAL	EA	1
B-43	30	PADDD	6625-00-392-5464	GC1770-1	70117	DETECTOR, RADIO FREQUENCY ASSY (SEE FIGURE B-45 FOR BREAKDOWN)	EA	1
B-43	31	PAHZZ	5305-00-054-6654	MS35233-30	96906	SCREW, MACHINE: PNH, NO. 6-32 X 1/2 IN. LG	EA	6
B-43	32	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: NO. 6	EA	55
B-43	33	XBHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT: NO. 6	EA	41
B-43	34	PAHZZ	5920-00-892-9311	HKPAEJQRW	71400	FUSEHOLDER	EA	1
B-43	35	XDHHH		GJ4894-1	70117	POWER SUPPLY (SEE FIGURE B-47 FOR BREAKDOWN)	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-43	36	XDHZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE: PNH, NO. 6-32 X 3/8 IN. LG	EA	31
B-43	37	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX: NO. 6-32	EA	21
B-43	38	XDHZZ		GC4566	70117	CABLE ASSEMBLY	EA	1
B-43	39	PAHZZ	6145-00-918-9494	RG316U	81349	CABLE, RADIO FREQUENCY	EA	1
B-43	40	PAHZZ	5935-00-059-1109	819T1800	94375	CONNECTOR PLUG, ELECTRICAL	EA	1
B-43	41	PAHZZ	5935-00-416-6003	52-015-0007023	61957	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-43	42	XDHZZ	5305-00-054-5649	MS51957-15	96906	SCREW, MACHINE: PNH, NO. 4-40 X 3/8 IN. LG	EA	3
B-43	43	PADZZ	5360-00-474-3850	519C12-2	70117	SPRING, HELICAL, COMPRESSION	EA	1
B-43	44	PAHZZ	6625-00-961-6663	GA188-2	70117	STOP ASSEMBLY	EA	1
B-43	45	PAHZZ	6625-00-961-6664	GB1500	70117	SWITCH INTERLOCK	EA	1
B-43	46	PAHZZ	5999-00-400-2676	GB4285	70117	CONTACT ASSEMBLY	EA	2
B-43	47	PAHZZ	5330-00-892-4185	512A149	70117	GASKET	EA	2
B-43	48	XDHHH		GJ4912-1	70117	SUPPORT ASSEMBLY (SEE FIGURE B-48 FOR BREAKDOWN)	EA	1
B-43	49	PAHZZ	5305-00-054-6670	MS35233-45	96906	SCREW, MACHINE: PNH, NO. 8-32 X 1/2 IN. LG	EA	5
B-43	50	PAHZZ	5305-00-054-6669	MS35233-44	96906	SCREW, MACHINE: PNH, NO. 8-32 X 7/16 IN. LG	EA	8
B-43	51	PAHZZ	5305-00-764-0066	MS35249-51	96906	SCREW, MACHINE: NO. 8-32 X 7/16 IN. LG	EA	6
B-43	52	PAHZZ	5305-00-059-3659	MS35234-63	96906	SCREW, MACHINE: NO. 10-32 X 1/2 IN. LG	EA	2
B-43	53	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: NO. 8	EA	15
B-43	54	XDHZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT: NO. 8	EA	10
B-43	55	PAHZZ	5330-00-874-7748	512A40	70117	GASKET	EA	1
B-43	56	PAHZZ	5340-00-855-2131	537B71-2	70117	SHIELDING GASKET, ELECTRICAL	EA	1
B-43	57	XDHFD		GC5056	70117	OSCILLATOR, RADIO FREQUENCY (SEE FIGURE B-49 FOR BREAKDOWN)	EA	1
B-43	58	PAHZZ	5935-00-847-2600	MS35368-306B	96906	ADAPTER, CONNECTOR	EA	2
B-43	59	PAHZZ	5985-00-133-9241	GC4290	70117	COUPLER, DIRECTIONAL	EA	1

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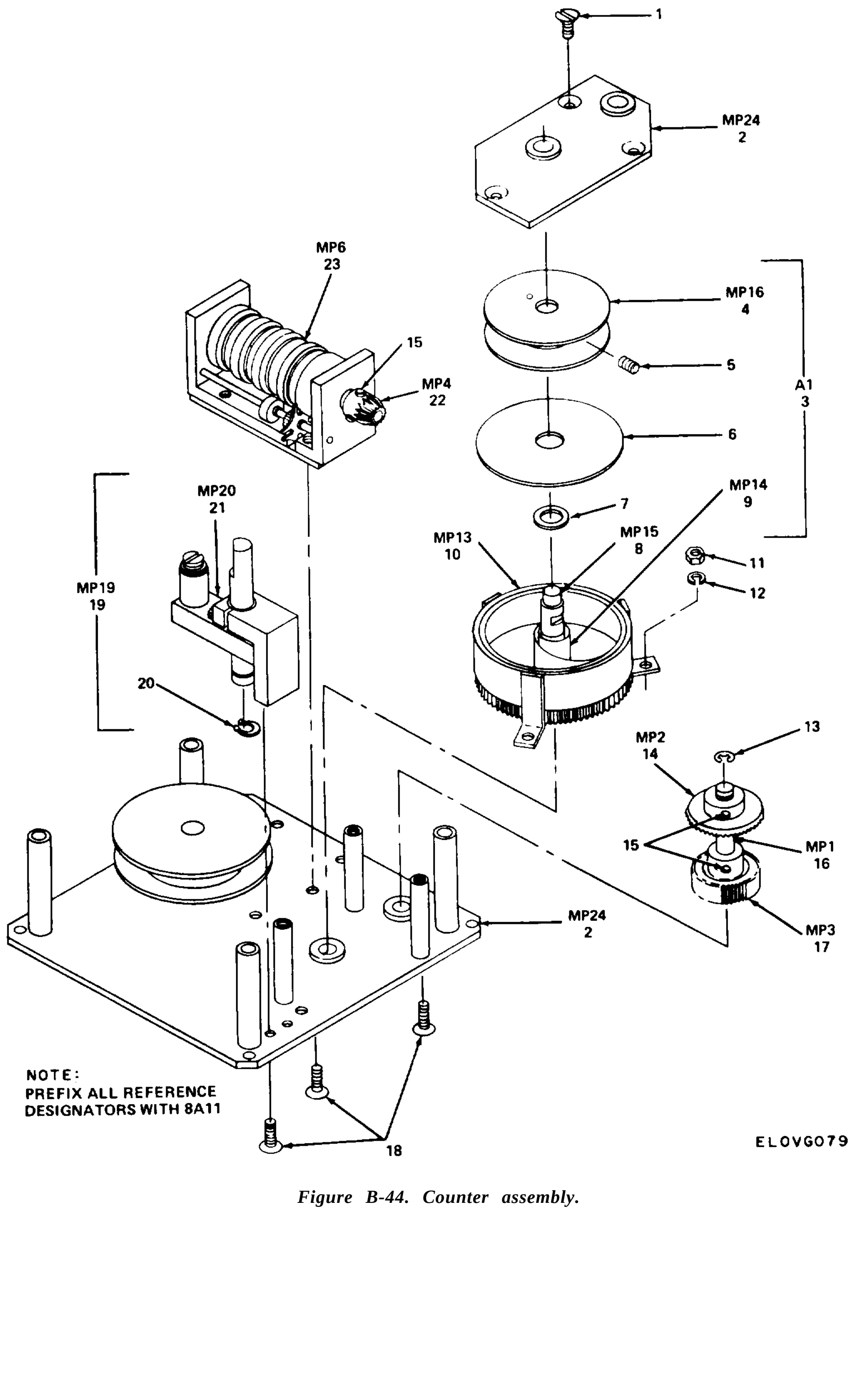

Figure B-44. Counter assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-44		XDDDD		GD5078-2	70117	COUNTER ASSEMBLY (SEE FIGURE B-43 FOR NHA)	EA	REF
B-44	1	XDHZZ	5305-00-282-8524	AN507C440-5	88044	SCREW, MACHINE: FH, 100°, NO. 4-40 X 5/16 IN. LG	EA	5
B-44	2	XDHZZ		514D220	70117	CHASSIS	EA	1
B-44	3	XDHZZ		GC5070	70117	COUNTER REWIND ASSEMBLY	EA	1
B-44	4	PAHZZ	6625-00-628-7330	517B8	70117	DRUM, TAPE	EA	1
B-44	5	PAHZZ	5305-00-576-7266	MS51021-22	96906	SETSCREW: HEX SOC, NO. 6-32 X 3/16 IN. LG	EA	2
B-44	6	XDHZZ		504B69	70117	WASHER, FLAT	EA	2
B-44	7	XDHZZ		504B70-2	70117	WASHER, SHIM	EA	2
B-44	8	PAHZZ	3040-00-623-7469	GB5068	70117	GEARSHAFT, SPUR	EA	1
B-44	9	PAHZZ		518C362	70117	SPRING, SPIRATOR	EA	1
B-44	10	XDHZZ	6625-00-628-7324	515C2378	70117	HOUSING, SPRING	EA	1
B-44	11	XDHZZ	5310-00-208-3786	NAS671C4	80205	NUT, PLAIN, HEX: NO. 4-40	EA	3
B-44	12	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING, NO. 4	EA	3
B-44	13	PAOZZ	5365-00-725-0969	MS16633-4018	96906	RING, RETAINING	EA	1
B-44	14	PADZZ	3020-00-370-1797	530C327	70117	GEAR, BEVEL	EA	1
B-44	15	PAHZZ	5305-00-800-7261	MS51021-9	96906	SETSCREW: NO. 4-40 X 1/8 IN. LG	EA	6
B-44	16	PAOZZ	3040-00-623-7458	528B298	70117	SHAFT GEAR	EA	1
B-44	17	PAHZZ		530C65-133	70117	GEAR, SPUR	EA	1
B-44	18	XDHZZ	5305-00-637-5964	AN507C440-4	88044	SCREW, MACHINE: FH, 100°, NO. 4-40 X 1/4 IN. LG	EA	4
B-44	19	XDHZZ		GB5071	70117	ARM ASSEMBLY	EA	1
B-44	20	PAOZZ	5365-00-725-0969	MS16633-4018	96906	RING, RETAINING	EA	1
B-44	21	PAHZZ	6625-00-628-7346	516B688	70117	ARM, CALIBRATION	EA	1
B-44	22	PAHZZ	3020-00-370-1904	530B326	70117	GEAR, BEVEL	EA	1
B-44	23	PAHZZ	6680-00-627-0368	559B46	70117	COUNTER, ROTATING, FIXED MOUNTING	EA	1

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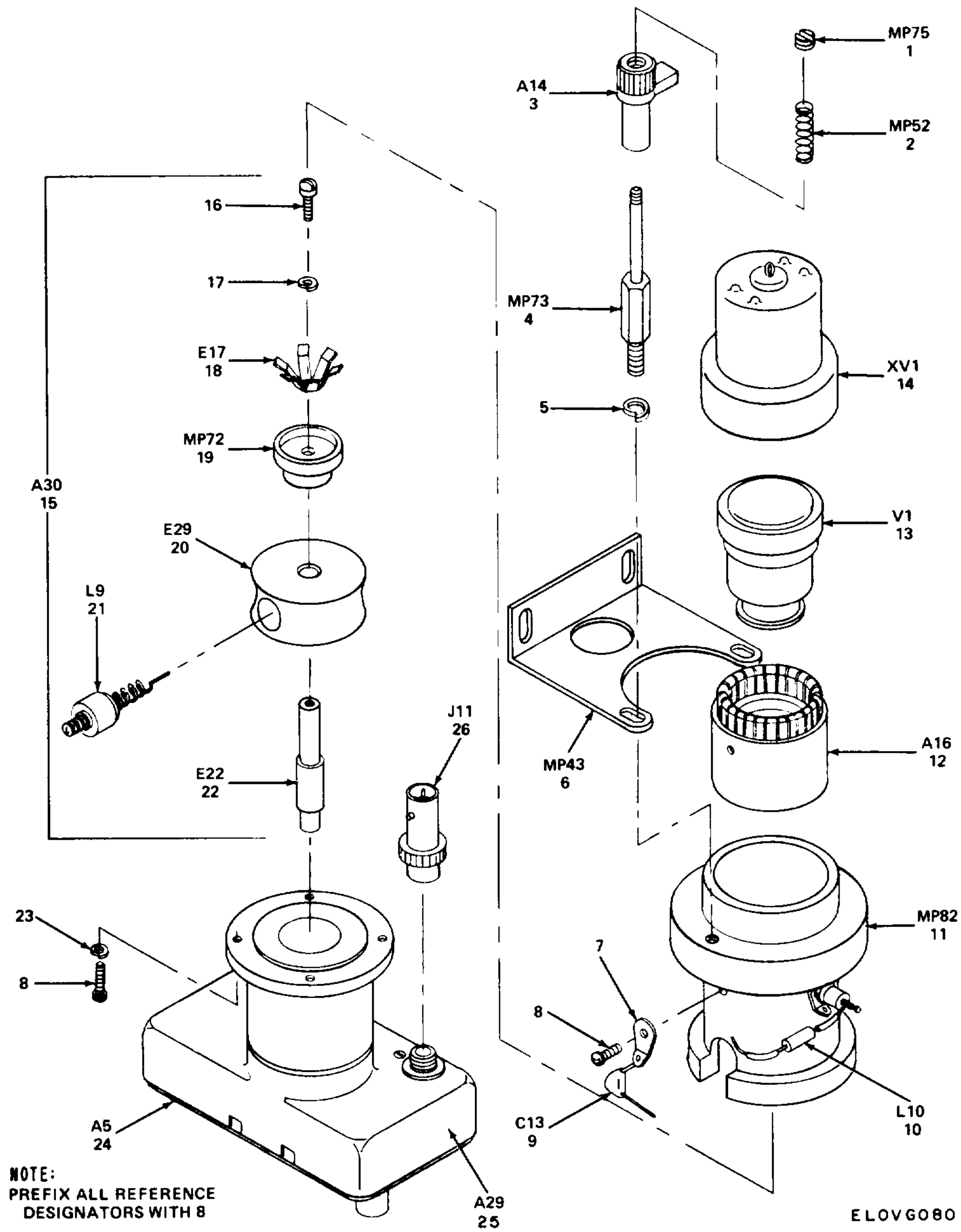

Figure B-45. Detector radio frequency assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-45		PADDD	6625-00-392-5464	GC1770-1	70117	DETECTOR RADIO FREQUENCY ASSEMBLY (SEE FIGURE B-43 FOR NHA)	EA	REF
B-45	1	XDDZZ	6625-00-392-5464	527A157	70117	PLUG	EA	2
B-45	2	PADZZ	5360-00-333-3392	519A19	70117	SPRING, HELICAL COMPRESSION	EA	2
B-45	3	XDHZZ		GA280	70117	BODY ARM ASSEMBLY	EA	2
3-45	4	XDDZZ		527A150-2	70117	STUD	EA	2
B-45	5	XDDZZ	5310-00-933-8120	MS35338-138	96906	WASHER, LOCK: SPRING NO. 6	EA	2
B-45	6	XDHZZ		515A162-2	70117	BRACKET	EA	1
B-45	7	XDDZZ	5940-00-614-0537	MS35431-1	96906	TERMINAL LUG	EA	2
B-45	8	XDDZZ		4-40X375FILHSST	70117	SCREW, MACHINE: FILH, NO. 4-40 X 3/8 IN. LG SST	EA	7
B-45	9	PADZZ		CC21CK2R2D	81349	CAPACITOR, FIXED, CERAMIC, DIELECTRIC	EA	1
B-45	10	PADZZ	5950-00-964-4651	MS75008-23	96906	COIL, RADIO FREQUENCY	EA	1
B-45	11	XDDZZ		527B154-2	70117	HOUSING	EA	1
B-45	12	PADZZ	6625-00-628-7388	GA283	70117	CONTACT ASSEMBLY	EA	1
B-45	13	PADZZ	5960-00-188-0847	2B22	81349	ELECTRON TUBE	EA	1
B-45	14	PADZZ	5935-00-820-0125	GB2208	70117	SOCKET, ELECTRON TUBE	EA	1
B-45	15	PADZZ	5845-00-309-2455	GB285	70117	CONTACT ASSEMBLY	EA	1
B-45	16	XDDZZ		4-40X375RHB RASSSILPL	70117	SCREW, MACHINE: RH, NO. 4-40 X 3/8 IN. LG BRASS	EA	1
B-45	17	XDDZZ		4MEDSPLITBRASS SILPL	70117	WASHER, LOCK: SPLIT, NO. $, BRASS	EA	1
B-45	18	PADZZ	5999-00-628-7404	518A37	70117	CONTACT	EA	1
B-45	19	XDDZZ		527A145	70117	STOP	EA	1
B-45	20	XDDZZ		532A81	70117	INSULATOR	EA	1
B-45	21	PADZZ		GA278	70117	COIL, RADIO FREQUENCY	EA	1
B-45	22	PADZZ	5990-00-628-7399	527A144	70117	CONTACT	EA	1
B-45	23	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING, NO. 4	EA	9
B-45	24	XDDZZ	6625-00-806-1528	GD287-2	70117	DEMODULATOR PLATE ASSEMBLY (SEE FIGURE B-46 FOR BREAKDOWN)	EA	1
B-45	25	XDDZZ		GB284-2	70117	HOUSING ASSEMBLY	EA	1
B-45	26	PADZZ	5935-00-628-7360	588A22-3	70117	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1

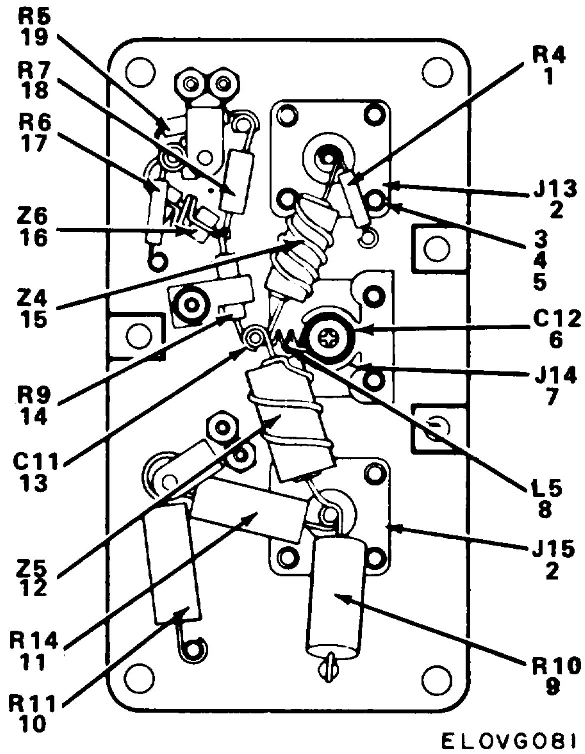

Figure B-46. Plate assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-46		XDDZZ	6625-00-806-1528	GD287-2	70117	PLATE ASSEMBLY (SEE FIGURE B-45 FOR NHA)	EA	REF
B-46	1	PADZZ	5905-00-116-8567	RCR20G750JS	81349	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	2	PADZZ	5935-00-628-7421	588A2-1	70117	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	2
B-46	3	XDDZZ		3-56X3-16X1-16 BRSSILPL	70117	NUT, HEXAGON: DOUBLE CHAMFER, NO. 3-56	EA	2
B-46	4	XDDZZ		3-48X187FILHSST	70117	SCREW, MACHINE: FILH, NO. 3-48 X 3/16, SST	EA	10
B-46	5	XDDZZ		3LTSPLITSST	70117	WASHER, LOCK: SPLIT, NO. 3, SST	EA	10
B-46	6	PADDD	5910-00-788-8649	GA251	70117	CAPACITOR ASSEMBLY	EA	1
B-46	7	PADZZ	5935-00-628-7360	588A2-2	70117	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-46	8	PADZZ	5950-00-779-0844	573A3	70117	COIL, RADIO FREQUENCY	EA	1
B-46	9	PADZZ	5905-00-751-7256	560A41	70117	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	10	PADZZ	5905-00-843-7049	560A42	70117	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	11	PADZZ	5905-00-175-8665	RC42GF220J	81349	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	12	PADZZ	6625-00-628-8960	GA254	70117	INDUCTANCE ASSEMBLY	EA	1
B-46	13	XDDZZ	5940-00-642-3962	950034	78616	TERMINAL STUD	EA	1
B-46	14	PADZZ	5905-00-131-9395	RCR20G131JS	81349	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	15	PADZZ	5915-00-284-4411	GA253	70117	INDUCTANCE ASSEMBLY	EA	1
B-46	16	PADZZ	6625-00-628-8959	GA255	70117	INDUCTANCE ASSEMBLY	EA	1
B-46	17	PADZZ	5905-00-111-4736	RCR20G161JS	81349	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	18	PADZZ	5905-00-141-1269	RCR20G110JS	81349	RESISTOR, FIXED, COMPOSITION	EA	1
B-46	19	PADZZ	5905-00-111-4736	RCR20G161JS	81349	RESISTOR, FIXED, COMPOSITION	EA	1

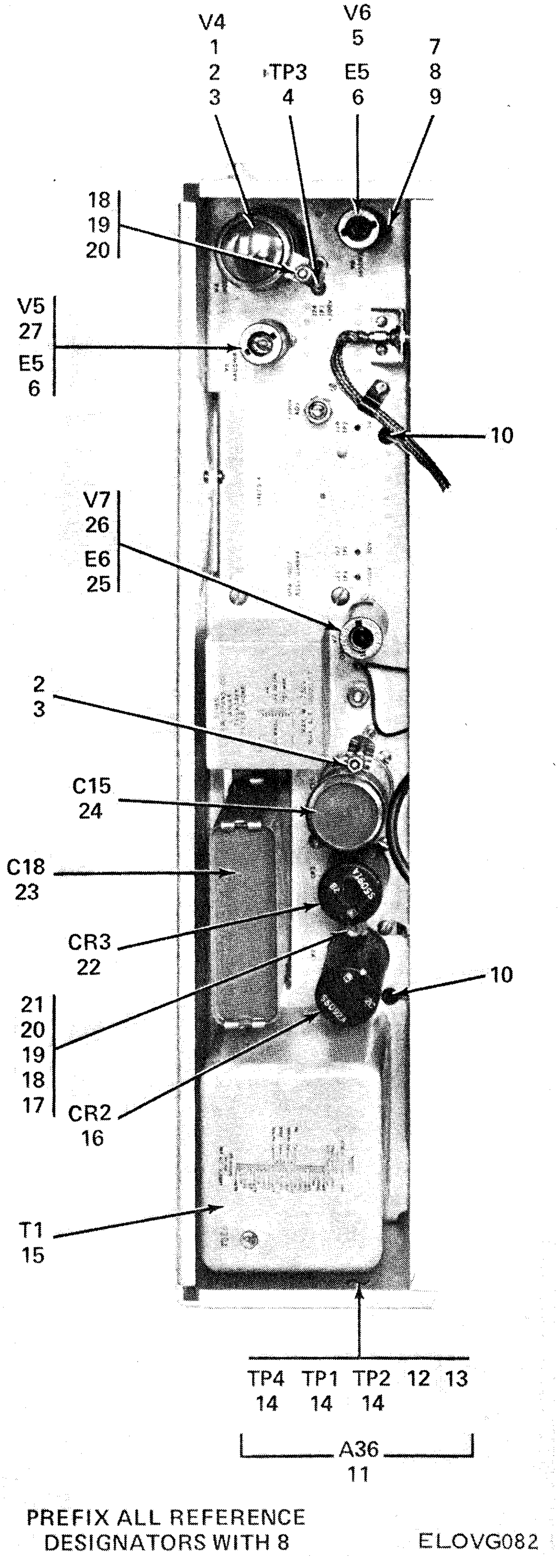

Figure B-47. ① Power supply, unit 8 (sheet l of 2).

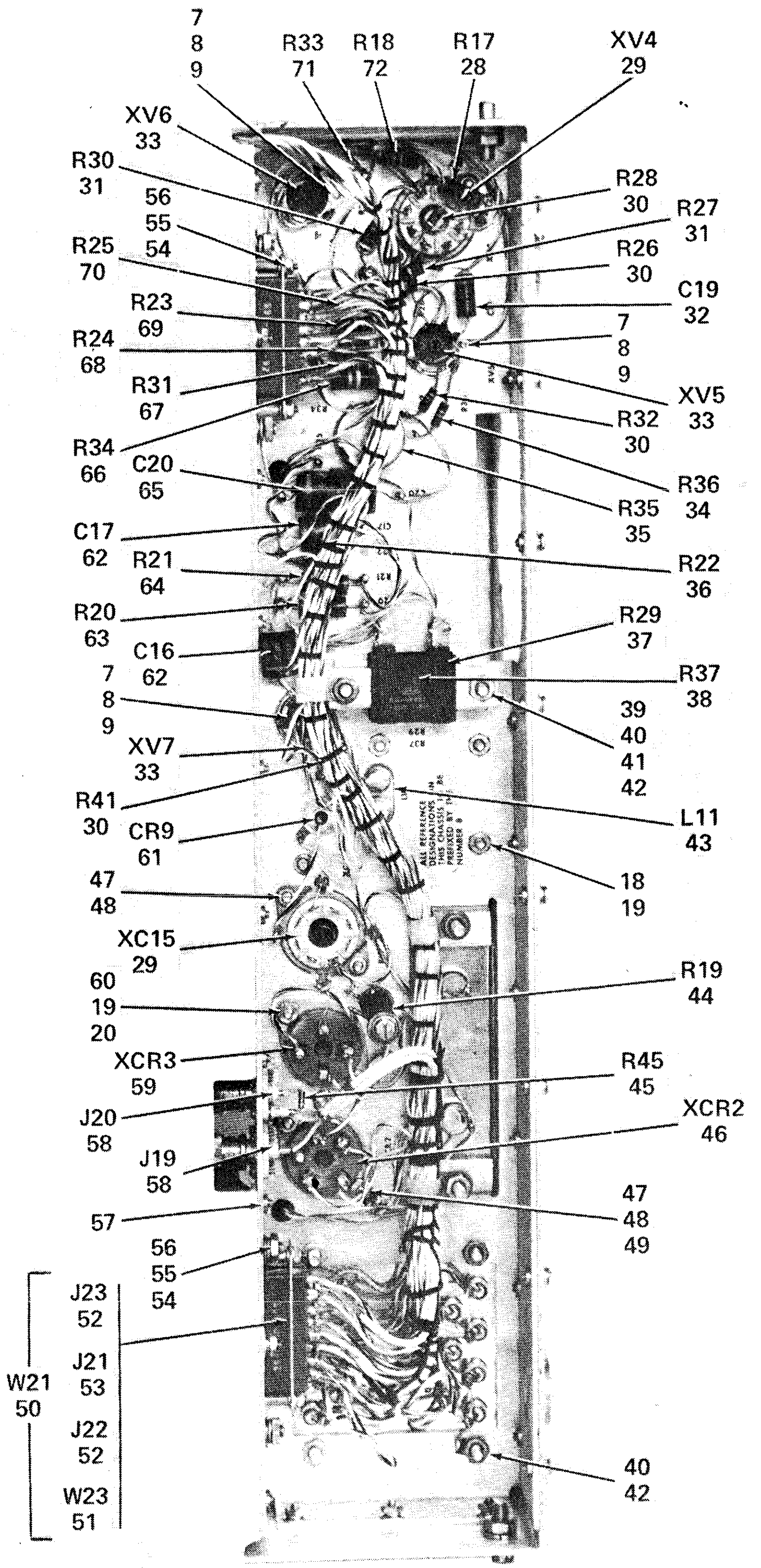

Figure B-47. ② Power supply, unit 8 {sheet2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-47		XDHHH		GJ4894-1	70117	POWER SUPPLY (SEE FIGURE B-43 FOR NHA)	EA	REF
B-47	1	PAOZZ	5960-00-543-1001	6080WA	81349	ELECTRON TUBE	EA	1
B-47	2	XDHZZ		42025-17	88245	RETAINER, POST	EA	2
B-47	3	XDHZZ		3T17	88245	RETAINER, CAP	EA	2
B-47	4	PAHZZ	5935-00-539-2045	MS16108-2	96906	JACK, TIP	EA	1
B-47	5	PAHZZ	5960-00-262-0286	5651WA	81349	ELECTRON TUBE	EA	1
B-47	6	PAOZZ	5960-00-860-7709	M24251-6-2	81349	SHIELD, ELECTRON TUBE	EA	2
B-47	7	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: NO.-40 X 1/4 IN. LG	EA	8
B-47	8	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	7
B-47	9	XDHZZ	5310-00-550-3715	MS35333-70	96906	WASHER, LOCK: IT NO. 4	EA	6
B-47	10	PAHZZ	5325-00-286-6047	54G	70485	GROMMET, RUBBER	EA	2
B-47	11	XDHZZ		GD1738-5	70117	CHASSIS ASSEMBLY	EA	1
B-47	12	PAHZZ	5340-00-229-3671	E50001-054	80033	CLIP, SPRING TENSION	EA	1
B-47	13	XDHZZ		MS20450CBB5	96906	RIVET, TUBULAR	EA	1
B-47	14	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	3
B-47	15	PAHZZ	5950-00-113-3614	580C25-2	70117	TRANSFORMER, POWER STEPDOWN - STEPUP	EA	1
B-47	16	PAHZZ		S5092A	84970	RECTIFIER, METALLIC	EA	1
B-47	17	XDHZZ	6625-00-961-6693	515B1341	70117	RETAINER, RECTIFIER	EA	1
B-47	18	XDHZZ	5310-00-934-9759	MS35649-284	96906	NUT, PLAIN, HEX: NO. 6-32	EA	7
B-47	19	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: NO. 8	EA	8
B-47	20	XDHZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT: NO. 8	EA	2
B-47	21	PAHZZ	5305-00-054-6676	MS35233-51	96906	SCREW, MACHINE: NO. 8-32 X 1/2 IN. LG	EA	1
B-47	22	PAHZZ	6130-00-713-6946	S5091	84970	RECTIFIER, METALLIC	EA	1
B-47	23	PAHZZ	5910-00-280-8271	CP70B1FF106K1	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 10 MFD, PORM 10%, 2000 V	EA	1
B-47	24	PAHZZ	5910-00-840-1702	CE51C501G	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	1
B-47	25	PAOZZ	5960-00-868-4365	M24251-6-3	81349	SHIELD, ELECTRON TUBE	EA	1
B-47	26	PAOZZ	5960-00-624-4718	OB2WA	81349	ELECTRON TUBE	EA	1
B-47	27	PAOZZ	5960-00-681-9802	6AU6WB	81349	ELECTRON TUBE	EA	1
B-47	28	PAHZZ	5905-00-247-8737	RCR32G683JS	81349	RESISTOR, FIXED, COMPOSITION: 68K OHMS, PORM 10%, 1 WATT	EA	1
B-47	29	PAHZZ	5935-00-129-9358	TS101P02	81349	SOCKET, ELECTRON TUBE	EA	2
B-47	30	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 10%, .5 WATT	EA	4
B-47	31	PAHZZ	5905-00-113-7346	RCR32G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .5 WATT	EA	2
B-47	32	PAHZZ	5910-00-755-5583	P8292ZN15	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, PORM 20%, 400 VDCW	EA	1
B-47	33	PAHZZ	5935-00-132-2405	TS102P01	81349	SOCKET, ELECTRON TUBE	EA	3
B-47	34	PAHZZ	5905-00-106-9351	RCR20G273JS	81349	RESISTOR, FIXED, COMPOSITION: 27K OHMS, PORM 5%, .5 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-47	35	PAHZZ	5905-00-501-7314	RV4LAYSA253A	81349	RESISTOR, VARIABLE: 25K OHMS, PORM 10%	EA	1
B-47	36	PAHZZ	5905-00-494-5137	RCR32G161JS	81349	RESISTOR, FIXED, COMPOSITION: 160 OHMS, PORM 5%, 1 WATT	EA	1
B-47	37	PAHZZ	5905-00-882-2823	RW20V392	81349	RESISTOR, FIXED, WIREWOUND	EA	1
B-47	38	PAHZZ	5905-00-879-1166	RW20V622	81349	RESISTOR, FIXED, WIREWOUND	EA	1
B-47	39	XDHZZ		10-32X1375BHSST	70117	SCREW, MACHINE: BH, NO. 10-32 X 1-3/8 IN. LG, SST	EA	2
B-47	40	XDHZZ	5310-00-933-8120	MS35338-138	96906	WASHER, LOCK: NO. 10	EA	12
B-47	41	XDHZZ	5310-00-619-1148	MS15795-808	96906	WASHER, FLAT: NO. 10	EA	7
B-47	42	XDHZZ	5310-00-934-9765	MS35650-304	96906	NUT, PLAIN, HEX: NO. 10-32	EA	12
B-47	43	PAHZZ	5950-00-023-9956	574B30	70117	REACTOR	EA	1
B-47	44	PAHZZ	5905-00-808-1718	RW29V801	81349	RESISTOR, FIXED, WIREWOUND	EA	1
B-47	45	PAHZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 5%, .25 WATT	EA	1
B-47	46	PAHZZ	5940-00-683-4339	77M1P5T	02660	SOCKET, ELECTRON TUBE	EA	1
B-47	47	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE: NO. 6-32 X 7/16 IN. LG	EA	8
B-47	48	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: NO. 6	EA	9
B-47	49	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX: NO. 6-32	EA	4
B-47	50	XDHZZ		GJ4913	70117	WIRING HARNESS	EA	1
B-47	51	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY	EA	1
B-47	52	PAHZZ	5935-00-082-0481	26-4200-16S	02660	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	2
B-47	53	PAHZZ	5935-00-713-6950	MRA9PGV	02660	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-47	54	PAHZZ	5305-00-054-5653	MS35233-19	96906	SCREW, MACHINE: NO. 4-40 X 3/4 IN. LG	EA	4
B-47	55	PAHZZ	5310-00-656-0317	22NTM40	72962	NUT, SELF-LOCKING HEX: NO. 4-40	EA	4
B-47	56	XDHZZ	5940-00-050-2308	529C3-33-92	70117	SPACER, SLEEVE	EA	4
B-47	57	XDHZZ		3-56X312RHSST	70117	SCREW, MACHINE: RH, NO. 3-56 X 5/16 IN. LG, SST	EA	8
B-47	58	PAHZZ	5935-00-201-3511	UG290AU	81349	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	2
B-47	59	PAHZZ	5935-00-079-5905	77M1P4T	02660	SOCKET, ELECTRON	EA	1
B-47	60	XDHZZ	5305-00-054-6681	MS51957-54	96906	SCREW, MACHINE: NO. 8-32 X 2-1/4 IN. LG	EA	1
B-47	61	PAHZZ	5961-00-849-4183	1N2989B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-47	62	PAHZZ	5910-00-879-6957	MPY2P25-10PCT	93790	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, 200V, PORM 20%	EA	2
B-47	63	PAHZZ	5905-00-504-6770	RCR42G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 5%, 2 WATT	EA	1
B-47	64	PAHZZ	5905-00-175-8508	RCR42G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, 2 WATT	EA	1
B-47	65	PAHZZ	5910-00-231-3370	P8292ZN20	00656	CAPACITOR, FIXED, COMPOSITION: 0.25 UF, 400 V, PORM 20%	EA	1
B-47	66	PAHZZ	5905-00-759-8896	RCR42G104JS	81349	RESISTOR, FIXED, COMPOSITION: .10 MEGOHMS, PORM 10%, 2 WATT	EA	1
B-47	67	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: .15 MEGOHMS, PORM 5%, .5 WATT	EA	1
B-47	68	PAHZZ	5905-00-484-0294	RCR32G753JS	81349	RESISTOR, FIXED, COMPOSITION: 75K OHMS, PORM 5%, 1 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-47	69	PAHZZ	5905-00-247-8705	RCR32G134JS	81349	RESISTOR, FIXED, COMPOSITION: .13 MEGOHMS, PORM 5%, 1 WATT	EA	1
B-47	70	PAHZZ	5905-00-141-1071	RCR20G474JS	81349	RESISTOR, FIXED, COMPOSITION: .47 MEGOHMS, PORM 10%, .5 WATT	EA	1
B-47	71	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: .15 MEGOHMS, PORM 10%, .5 WATT	EA	1
B-47	72	PAHZZ	5905-00-247-8749	RCR32G823JS	81349	RESISTOR, FIXED, COMPOSITION: 82K OHMS, PORM 10%, 1 WATT	EA	1

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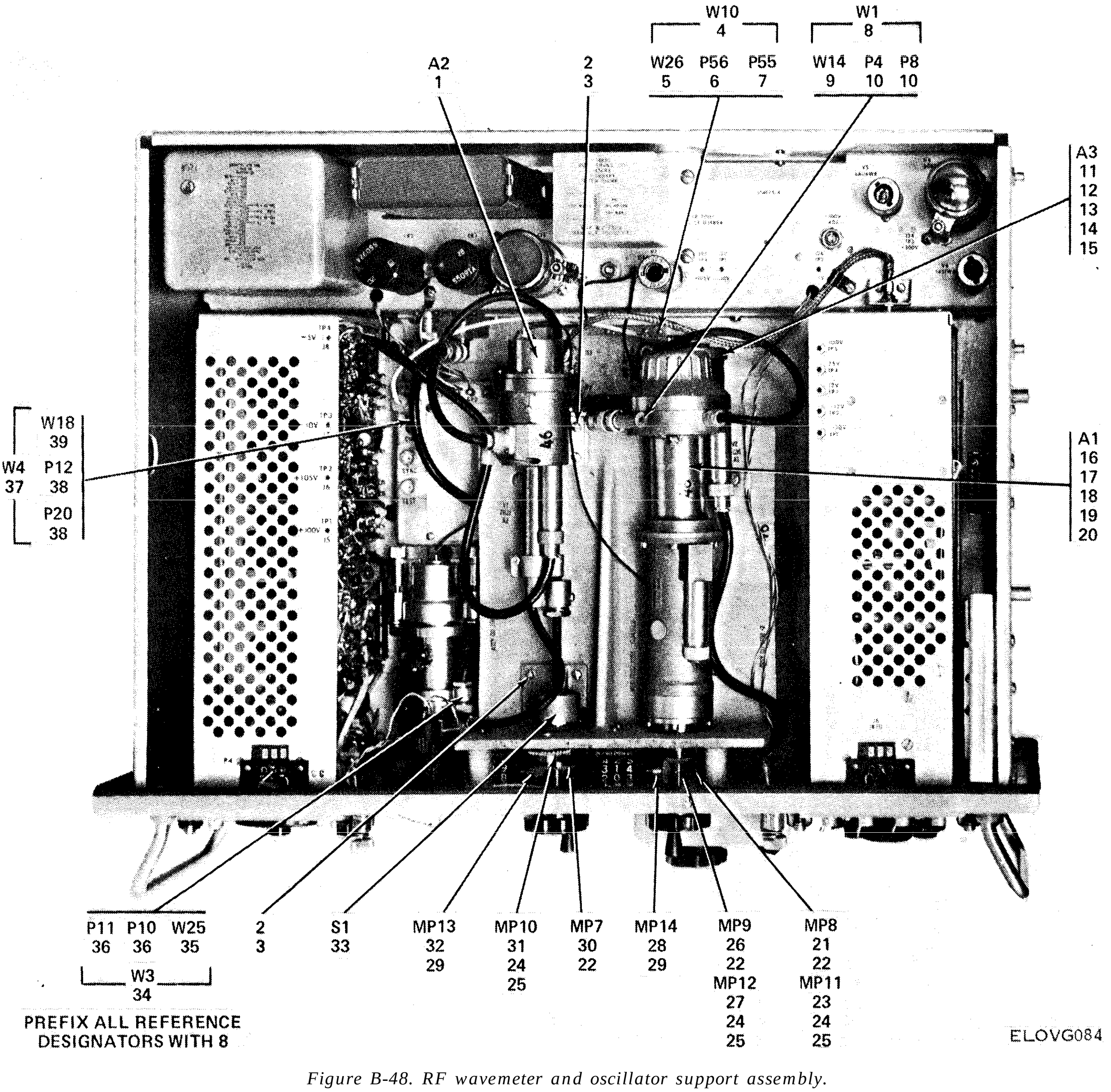

Figure B-48. RF wavemeter and oscillator support assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-48		XDHHH		GJ4912-1	70117	RF WAVEMETER AND OSCILLATOR SUPPORT ASSEMBLY (SEE FIGURE B-43 FOR NHA)	EA	REF
B-48	1	XDHDD		GD1662-4	70117	ATTENUATOR ASSEMBLY (SEE FIGURE B-51 FOR BREAKDOWN)	EA	1
B-48	2	XDHZZ		6-32X500FILHSST	70117	SCREW, MACHINE: FILH, NO. 6-32 X 1/2 IN. LG, SST	EA	7
B-48	3	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING, NO. 6	EA	7
B-48	4	PAHZZ		GB5123	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-48	5	PAHZZ	6145-00-918-9494	RG316U	81349	CABLE, RADIO FREQUENCY	EA	1
B-48	6	PAHZZ	5935-00-053-4793	819B1800W	94375	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-48	7	PAHZZ	5935-00-221-8342	L6901-000-819	94375	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-48	8	PAHZZ	6625-00-059-5980	GC2026-15	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-48	9	PAHZZ	6145-00-681-7849	RG223U	81349	CABLE, RADIO FREQUENCY	EA	9
B-48	10	PAHZZ	5935-00-823-0487	UG88EU	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-48	11	XDHDD		GD213-4	70117	WAVEMETER ASSEMBLY (SEE FIGURE B-53 FOR BREAKDOWN)	EA	1
B-48	12	PAHZZ	5305-00-054-6676	MS35233-51	96906	SCREW, MACHINE: PNH, NO. 8-32 X 1-1/2 IN. LG	EA	3
B-48	13	PAHZZ	5305-00-054-6670	MS35233-45	96906	SCREW, MACHINE: PNH, NO. 8-32 X 1/2 IN. LG	EA	2
B-48	14	XDHZZ	5310-00-934-9759	MS35649-284	96906	NUT, PLAIN, HEX: NO. 8-32	EA	2
B-48	15	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: SPRING, NO. 8	EA	5
B-48	16	PAHDD	6625-00-799-9062	GD1658-1	70117	OSCILLATOR ASSEMBLY (SEE FIGURE B-52 FOR BREAKDOWN)	EA	1
B-48	17	PAHZZ	5305-00-054-6674	MS35233-49	96906	SCREW, MACHINE: PNH, NO. 8-32 X 1 IN. LG	EA	1
B-48	18	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: SPRING, NO. 8	EA	2
B-48	19	XDHZZ		8-32X812BHSST	70117	SCREW, MACHINE: BH, NO. 8-32 X 13/16 IN. LG SST	EA	1
B-48	20	XDHZZ		031X171X312SST	70117	WASHER, FLAT: NO. 8, SST	EA	1
B-48	21	PAHZZ	3020-00-623-7520	530B336-1	70117	GEAR, BEVEL	EA	1
B-48	22	XDHZZ	5305-00-717-6950	MS51963-9	96906	SETSCREW: HEX SOC CUP PT	EA	6
B-48	23	PAHZZ	3020-00-779-0840	GB1619	70117	GEAR, SPUR	EA	1
B-48	24	XDHZZ	5365-00-200-6707	5133-18	79136	RETAINING RING	EA	3
B-48	25	XDHZZ		01X193X375SST	70117	WASHER, FLAT: NO. 10 SST	EA	3
B-48	26	PAHZZ	3020-00-565-1673	GB1617	70117	GEAR, BEVEL	EA	1
B-48	27	PAHZZ	3020-00-779-0839	GB1620	70117	GEAR, SPUR	EA	1
B-48	28	PAHZZ	3020-00-020-1308	530C62-8	70117	GEAR, BEVEL	EA	1
B-48	29	XDHZZ	5305-00-717-6955	MS51963-1	96906	SETSCREW: HEX SOC CUP PT	EA	6
B-48	30	PAHZZ	3020-00-565-1674	GB1615	70117	GEAR, BEVEL	EA	1
B-48	31	PAHZZ	3020-00-788-8606	GB1618	70117	GEAR, SPUR	EA	1
B-48	32	PAHZZ	3020-00-020-1307	530B101	70117	GEAR, BEVEL	EA	1
B-48	33	PAHZZ	5985-00-105-3774	576C122-3	70117	SWITCH, RF TRANSMISSION LINE	EA	1
B-48	34	PAHZZ	6625-00-135-9118	GC2026-3	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-48	35	PAHZZ	6145-00-681-7849	RG223U	81349	CABLE, RADIO FREQUENCY	EA	1
B-48	36	PAHZZ	5935-00-823-0487	UG88EU	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2

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SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-48	37	PAHZZ	5995-00-868-4168	GC2026-14	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-48	38	PAHZZ	5935-00-850-9157	M39012-16-0002	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-48	39	PAHZZ	6145-00-161-0913	RG62AU	81349	CABLE, RADIO FREQUENCY	EA	1

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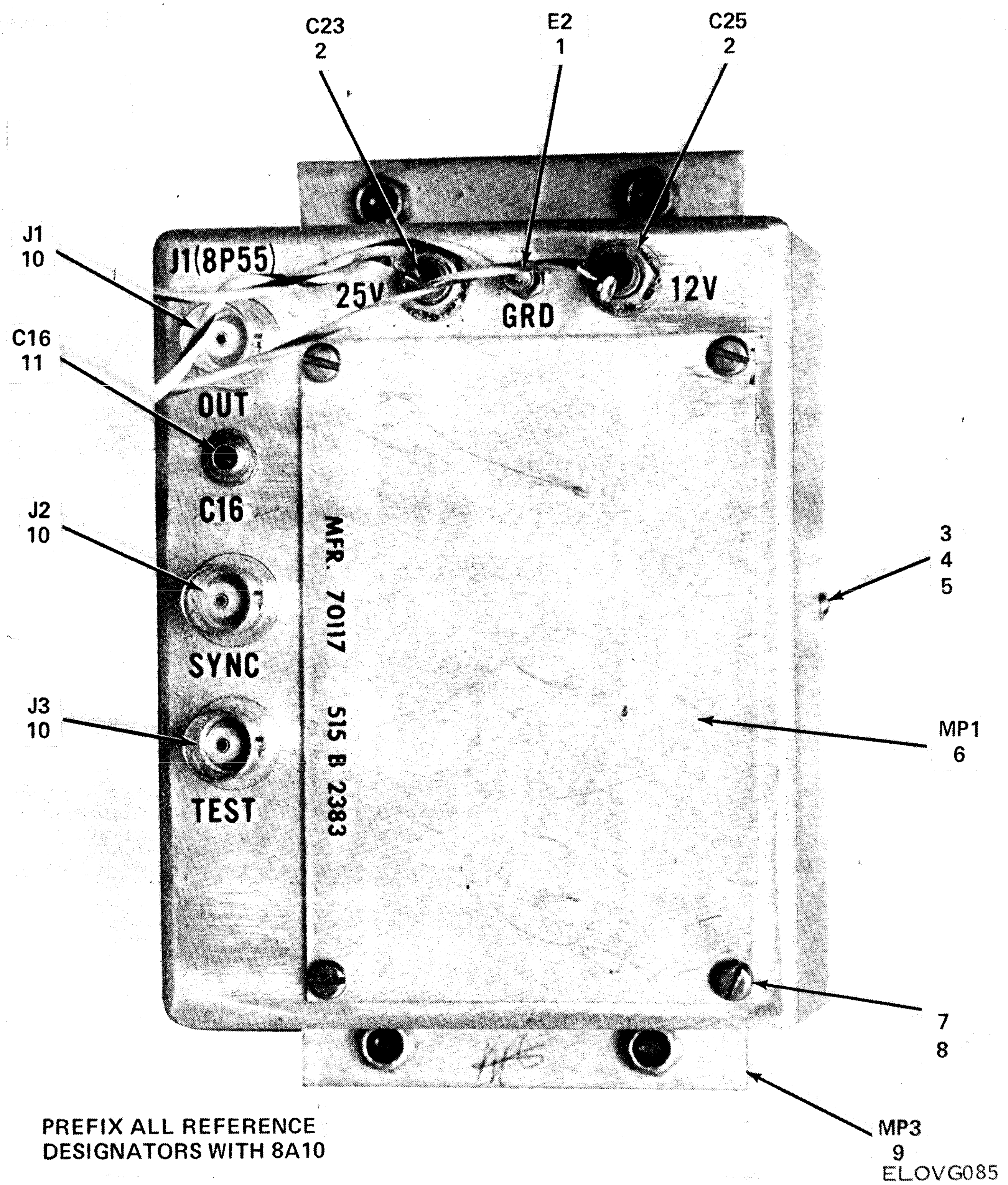

Figure B-49. ② Radio frequency oscillator, unit 8A10 (sheet 1 of 2).

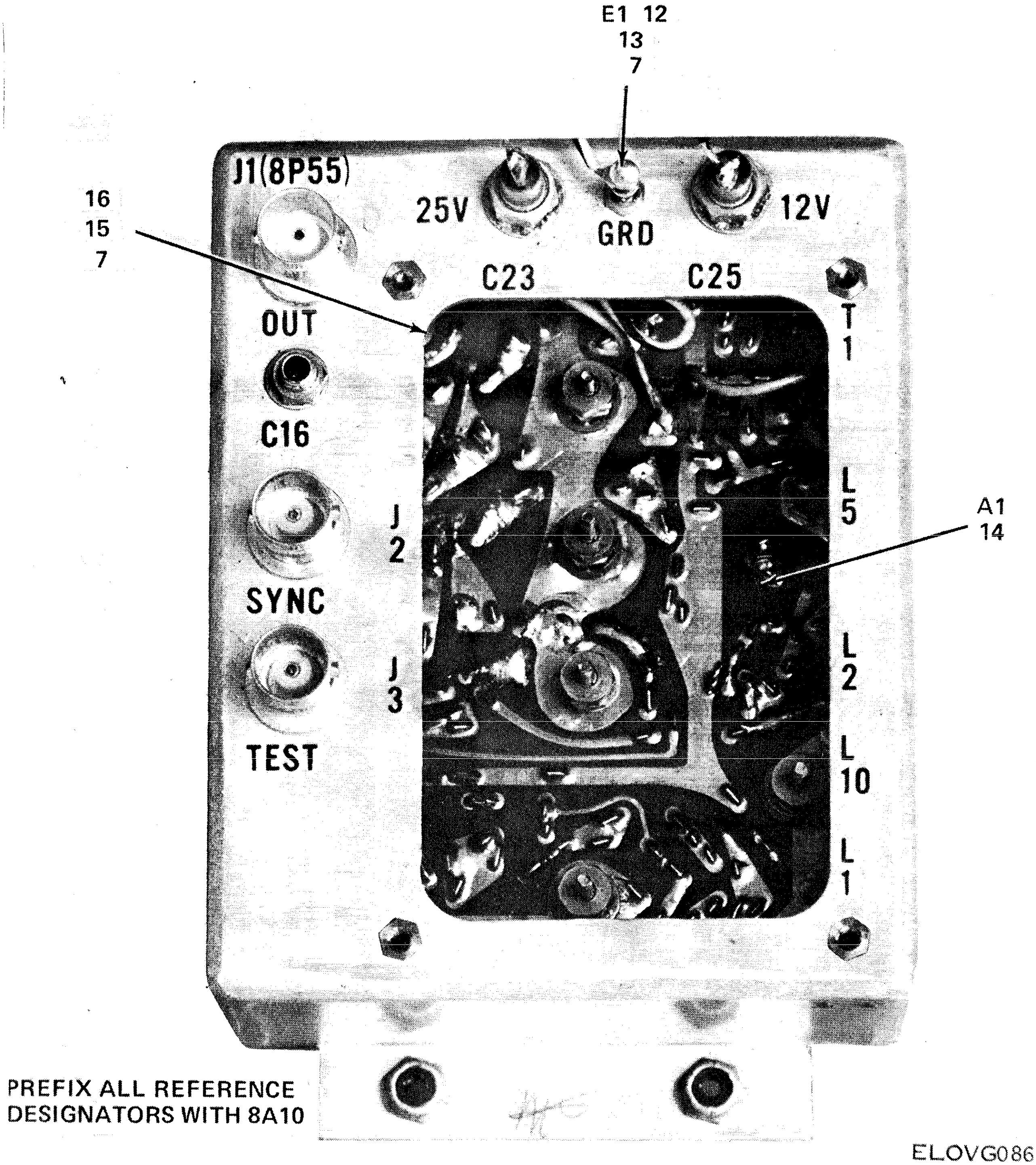

Figure B-49. ② Radio frequency oscillator, unit 8A10 (sheet 2 of 2).

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-49		XDHHH		GC5056	70117	OSCILLATOR RADIO FREQUENCY (SEE FIGURE B-43 FOR NHA)	EA	REF
B-49	1	XDHZZ	5940-00-713-8496	509B30-6	70117	TERMINAL STUD	EA	1
B-49	2	PAHZZ	5910-00-804-7566	CK70AW102M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC	EA	2
B-49	3	XDHZZ	5310-00-938-2013	MS35649-224	96906	NUT, PLAIN HEXAGON NO. 2-56	EA	2
B-49	4	PAHZZ	5305-00-054-5637	MS35233-3	96906	SCREW, MACHINE NO. 2-56 X 1/4 IN. LG	EA	2
B-49	5	XDHZZ	5310-00-543-4652	MS35333-69	96906	WASHER, LOCK NO. 2-56	EA	2
B-49	6	XDHZZ		515B2383	70117	COVER PLATE	EA	1
B-49	7	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK NO. 4	EA	4
B-49	8	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE NO. 4-40 X 5/16 IN. LG	EA	4
B-49	9	XDHZZ		GC5055	70117	COVER	EA	1
B-49	10	PAHZZ	5935-00-835-0510	M39012-21-0001	96906	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	3
B-49	11	PAHZZ	5910-00-913-1352	MC604Y	73899	CAPACITOR, VARIABLE	EA	1
B-49	12	XDHZZ	5940-00-159-1252	2522-4	78189	TERMINAL LUG	EA	1
B-49	13	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEXAGON NO. 4-40	EA	1
B-49	14	PDHHH		GD5094-2	70117	CIRCUIT CARD ASSEMBLY (SEE FIGURE B-50 FOR BREAKDOWN)	EA	1
B-49	15	XDHZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT NO. 4	EA	4
B-49	16	PAHZZ	5305-00-054-5652	MS35233-18	96906	SCREW, MACHINE NO. 4-40 X 5/8 IN. LG	EA	4

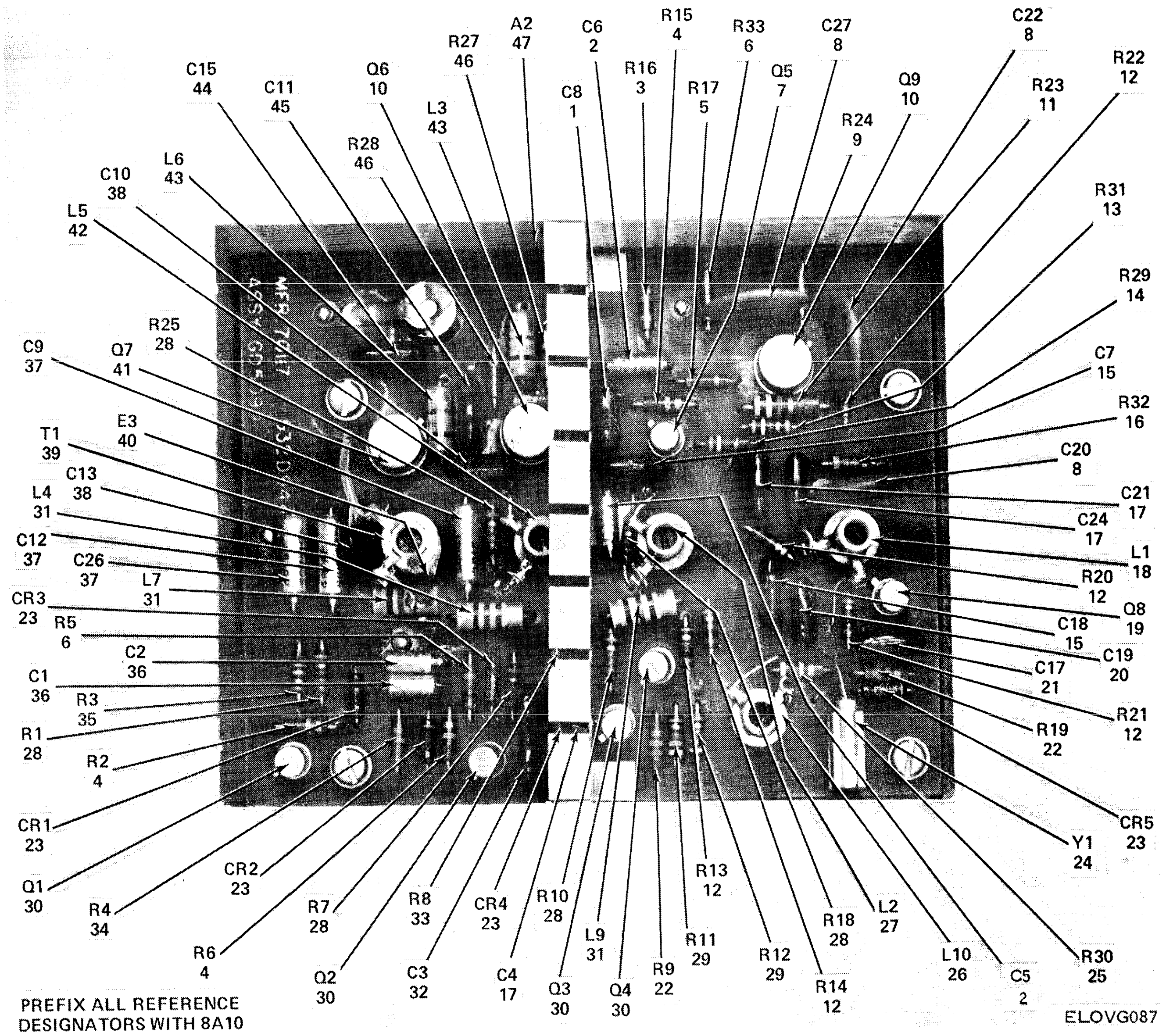

Figure B-50. Circuit card assembly.

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-50		XDHHH		GD5094-2	70117	CIRCUIT CARD ASSEMBLY (SEE FIGURE B-49 FOR NHA)	EA	REF
B-50	1	PAHZZ	5910-00-921-0568	CM05D820J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 82 PF, PORM 5%, 500 VDCW	EA	1
B-50	2	PAHZZ	5910-00-007-2002	CS13BE225K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 2.2 UF, PORM 10%	EA	2
B-50	3	PAHZZ	5905-00-114-5343	RCR07G182JS	81349	RESISTOR, FIXED, COMPOSITION: 1,800 OHMS, PORM 5%, .25 WATT	EA	1
B-50	4	PAHZZ	5905-00-116-8556	RCR07G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22,000 OHMS, PORM 5%, .25 WATT	EA	3
B-50	5	PAHZZ	5905-00-104-8358	RCR07G822JS	81349	RESISTOR, FIXED, COMPOSITION: 8,200 OHMS, PORM 5%, .25 WATT	EA	1
B-50	6	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .25 WATT	EA	2
B-50	7	PAHZZ	5961-00-242-5729	593A83-1	70117	TRANSISTOR	EA	1
B-50	8	PAHZZ	5910-00-109-1987	CK63AY103M	81349	CAPACITOR, FIXED, CERAMIC: 10K MF, PORM 20% 500 VDCW	EA	3
B-50	9	PAHZZ	5905-00-133-0440	RCR07G560JS	81349	RESISTOR, FIXED, COMPOSITION: 56 OHMS, PORM 5%, .25 WATT	EA	1
B-50	10	PAHZZ	5961-00-813-9360	2N1613	81349	TRANSISTOR	EA	2
B-50	11	PAHZZ	5905-00-104-8334	RCR20G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 5%, .50 WATT	EA	1
B-50	12	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	5
B-50	13	PAHZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .25 WATT	EA	1
B-50	14	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED, COMPOSITION: 390 OHMS, PORM 5%, .25 WATT	EA	1
B-50	15	PAHZZ	5910-00-889-4975	CM05D620J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 62 PF, PORM 5%, 500 VDCW	EA	2
B-50	16	PAHZZ	5905-00-135-6046	RCR07G681JS	81349	RESISTOR, FIXED, COMPOSITION: 680 OHMS, PORM 5%, .25 WATT	EA	1
B-50	17	PAHZZ	5910-00-902-0335	CM05C100K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 10 PF, PORM 10%, 500 VDCW	EA	3
B-50	18	PAHZZ	5950-00-420-1205	569D108-1	70117	COIL, RADIO FREQUENCY	EA	1
B-50	19	PAHZZ	5961-00-104-8426	2N3823	81349	TRANSISTOR	EA	1
B-50	20	PAHZZ	5910-00-681-1332	CM05D390J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 39 PF, PORM 5%, 500 VDCW	EA	1
B-50	21	PAHZZ	5910-00-067-5697	CM05D270J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 27 PF, PORM 5%, 500 VDCW	EA	1
B-50	22	PAHZZ	5905-00-119-3504	RCR07G273JS	81349	RESISTOR, FIXED, COMPOSITION: 27K OHMS, PORM 5%, .25 WATT	EA	2
B-50	23	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	5
B-50	24	PAHZZ	5955-00-253-7179	593A84	70117	CRYSTAL, QUARTZ	EA	1
B-50	25	PAHZZ	5905-00-105-7767	RCR07G474JS	81349	RESISTOR, FIXED, COMPOSITION: 0.47 MEGOHMS, PORM 5%, .25 WATT	EA	1
B-50	26	PAHZZ	5950-00-498-6724	569D108-4	70117	COIL, RADIO FREQUENCY, ADJUSTABLE	EA	1
B-50	27	PAHZZ	5950-00-420-1204	569D108-2	70117	COIL, RADIO FREQUENCY, ADJUSTABLE	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-50	28	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	5
B-50	29	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	2
B-50	30	PAHZZ	5961-00-926-0135	2N2481	81349	TRANSISTOR	EA	4
B-50	31	PAHZZ	5950-00-899-9359	MS18130-21	96906	COIL, RADIO FREQUENCY	EA	3
B-50	32	PAHZZ	5910-00-725-4794	CM06D222J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 2,200 PF, PORM 5%, 500 VDCW	EA	1
B-50	33	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .25 WATT	EA	1
B-50	34	PAHZZ	5905-00-106-1278	RCR07G123JS	81349	RESISTOR, FIXED, COMPOSITION: 12K OHMS, PORM 5%, .25 WATT	EA	1
B-50	35	PAHZZ	5905-00-115-3560	RCR07G183JS	81349	RESISTOR, FIXED, COMPOSITION: 18K OHMS, PORM 5%, .25 WATT	EA	1
B-50	36	PAHZZ	5910-00-071-9803	CSR13G333KM	81349	CAPACITOR, FIXED, ELECTROLYTIC	EA	2
B-50	37	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 UF, 500 V, PORM 10%	EA	3
B-50	38	PAHZZ		CM05D880J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 88 PF, PORM 5%, 500 VDCW	EA	2
B-50	39	PAHZZ	5950-00-420-1206	572D43-1	70117	TRANSFORMER, RADIO FREQUENCY, ADJUSTABLE	EA	1
B-50	40	XDHZZ	5940-00-838-2651	MS35431-6	96906	TERMINAL LUG	EA	1
B-50	41	PAHZZ	5961-00-853-2601	JAN2N1893	81349	TRANSISTOR	EA	1
B-50	42	PAHZZ	5950-00-420-1207	569D108-3	70117	COIL, RADIO FREQUENCY, ADJUSTABLE	EA	1
B-50	43	PAHZZ	5950-00-730-1786	MS18130-25	96906	COIL, RADIO FREQUENCY, MOLDED: 27 UF	EA	2
B-50	44	PAHZZ	5910-00-056-7976	CM05D271J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 270 PF, PORM 5%, 500 VDCW	EA	1
B-50	45	PAHZZ	5910-00-954-5504	CM05D121J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 120 PF, PORM 5%, 500 VDCW	EA	1
B-50	46	PAHZZ	5905-00-111-4727	RCR07G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 5%, .25 WATT	EA	2
B-50	47	XBHZZ		GD5094-1	70117	PRINTED WIRING BOARD	EA	1

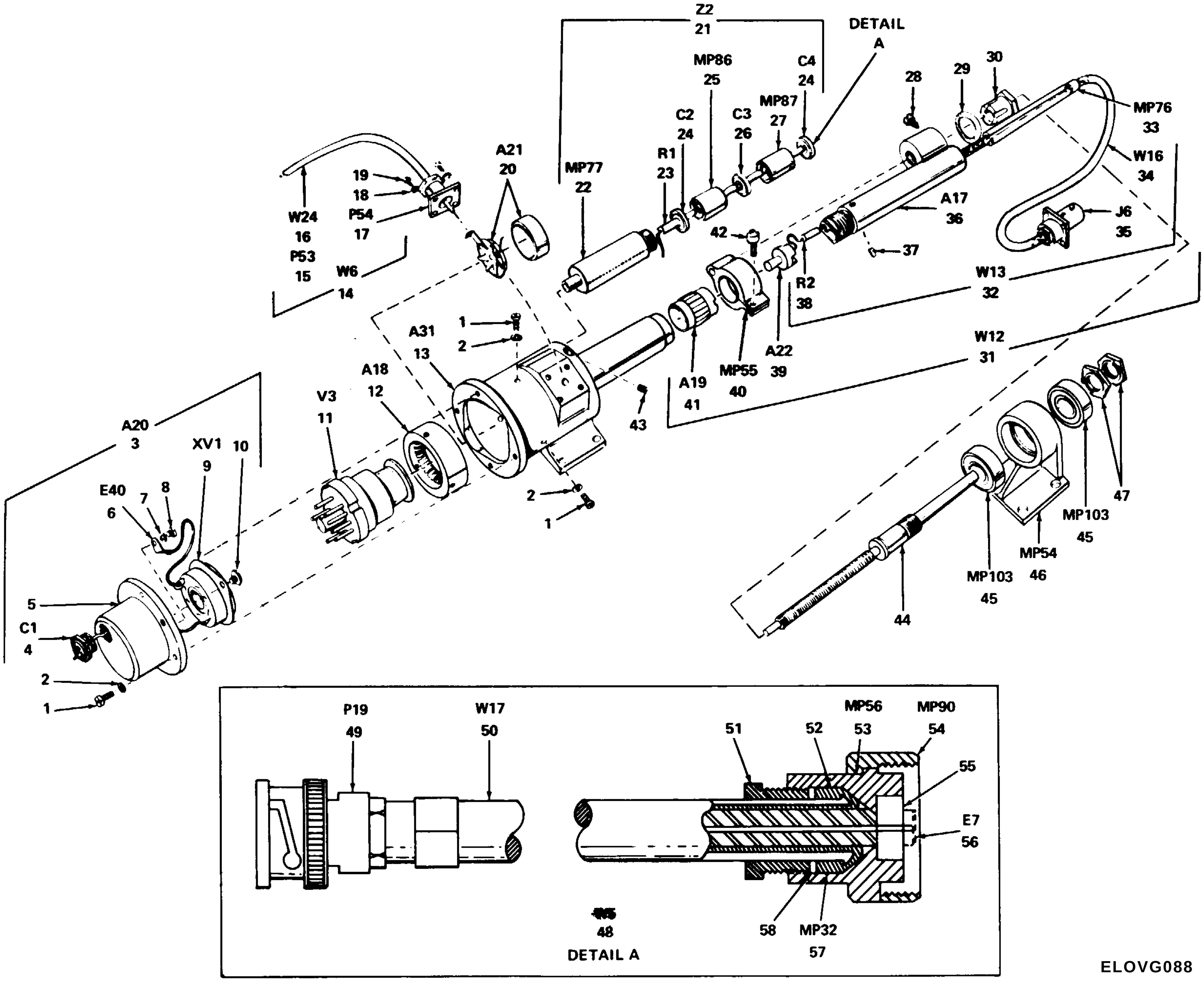

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Figure B-51. Attenuator assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-51		XDHDD		GD1662-4	70117	ATTENUATOR ASSEMBLY (SEE FIGURE B-48 FOR NHA)	EA	REF
B-51	1	XDHZZ		4-40X312FILHSST	70117	SCREW, MACHINE: FILH NO. 4-40 X 5/16 IN. LG, SST	EA	7
B-51	2	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: SPRING NO. 4	EA	8
B-51	3	XDHZZ		GA298-2	70117	SOCKET ASSEMBLY	EA	1
B-51	4	PAHZZ	5910-00-807-8911	DA908-001	71590	CAPACITOR, FIXED, MICA DIELECTRIC	EA	1
B-51	5	XDHZZ		520B112	70117	CAP, SOCKET ASSEMBLY	EA	1
B-51	6	XDHZZ	5940-00-614-0537	MS35431-1	96906	TERMINAL LUG	EA	1
B-51	7	PAHZZ	5310-00-933-8118	MS35337-78	96906	WASHER, LOCK: NO. 4	EA	1
B-51	8	XDHZZ		4-40X187FILHSST	70117	SCREW, MACHINE: FILH, NO. 4-40 X 3/16 IN. LG	EA	1
B-51	9	PAHZZ	5935-00-321-5113	59-103-200	02660	SOCKET, ELECTRON TUBE: EIGHT PIN, TWO HOLE MTG 1-1/2 MTG CRT	EA	1
B-51	10	XDHZZ		6-32X125BHSST	70117	SCREW, MAUHINE: BH, NO. 6-32 X 1/8 IN. LG, SST	EA	2
B-51	11	PAHZZ	5960-00-188-0847	2B22	81349	ELECTRON TUBE	EA	1
B-51	12	PAHZZ	6625-00-338-7942	GA293	70117	TUBE RING ASSEMBLY	EA	1
B-51	13	XDHZZ		GB294-2	70117	HOUSING ASSEMBLY	EA	1
B-51	14	PAHZZ	6625-00-135-9119	GC4752	70117	CABLE ASSEMBLY, ATTENUATOR INPUT	EA	1
B-51	15	PAHZZ	5935-00-895-0147	1PC77175	74868	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-51	16	PAHZZ	6145-00-681-7849	RG223U	81349	CABLE, RADIO FREQUENCY	EA	1
B-51	17	PAHZZ	5935-00-628-7423	537B72	70117	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-51	18	XDHZZ		2-56X281FILHSST	70117	SCREW, MACHINE: FILH, NO. 2-56 X 9/32 IN. LG, SST	EA	4
B-51	19	XDHZZ	5310-00-928-2690	MS35338-134	96906	WASHER, LOCK: SPRING NO. 2	EA	4
B-51	20	PAHZZ	5999-00-622-5766	GA299	70117	PLATE SPRING ASSEMBLY	EA	1
B-51	21	PAHZZ	6625-00-793-3012	GB301-2	70117	CABLE ASSEMBLY, NO. 1	EA	1
B-51	22	XDHZZ		527A170	70117	HOUSING	EA	1
B-51	23	PAHZZ	5905-00-126-6691	RCR20G150JS	81349	RESISTOR, FIXED, COMPOSITION: 15 OHMS, FORM 5%, .5 WATT	EA	1
B-51	24	PAHZZ	5910-00-276-6827	651-00218A0250K	72982	CAPACITOR, FIXED, MICA DIELECTRIC: 25 UF	EA	2
B-51	25	XDHZZ		529C3-10-44	70117	SPACER, SLEEVE	EA	1
B-51	26	PAHZZ	5910-00-813-6212	653-00218A0250K	72982	CAPACITOR, FIXED, MICA DIELECTRIC: 25 UF	EA	1
B-51	27	XDHZZ		529C3-11-44	70117	SPACER, SLEEVE	EA	1
B-51	28	XDHZZ	5305-00-206-3951	501A17	70117	SCREW, MACHINE	EA	1
B-51	29	PAHZZ	5310-01-003-9681	504C1-5	70117	WASHER, SPRING, TENSION	EA	2
B-51	30	XDHZZ	5310-00-392-8227	527A164	70117	NUT	EA	1
B-51	31	PAHZZ	6625-00-191-9352	GB309-2	70117	CABLE ASSEMBLY, NO. 3	EA	1
B-51	32	PAHZZ	5995-00-625-3914	GB311-2	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-51	33	PAHZZ	5340-01-004-0368	527A162	70117	CLAMP, LOOP	EA	1
B-51	34	PAHZZ	6145-00-681-7849	RG55BU	81349	CABLE, RADIO FREQUENCY	EA	1
B-51	35	PAHZZ		MS35175	96906	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-51	36	PAHZZ	6625-00-628-8962	GA292	70117	PISTON ASSEMBLY	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-51	37	XDHZZ		501A7-2	70117	SETSCREW	EA	1
B-51	38	PAHZZ	5905-00-111-4734	RCR20G470JS	81349	RESISTOR, FIXED, COMPOSITION: 47 OHMS, PORM 5%, .5 WATT	EA	1
B-51	39	PAHZZ	6625-00-628-8964	GA313	70117	TERMINAL ASSEMBLY	EA	1
B-51	40	PAHZZ	6625-00-628-8963	520B111	70117	SUPPORT	EA	1
B-51	41	PAHZZ	6625-00-136-1231	GA295	70117	CONTACT ASSEMBLY	EA	1
B-51	42	XDHZZ		501D35-24	70117	SCREW, CAP HEXAGON HEAD: NO. 6-32 NC 3 X 3/8 IN. LG	EA	1
B-51	43	XDHZZ	5305-00-282-5806	AN565DC6H3	88044	SETSCREW	EA	1
B-51	44	PAHZZ	3040-00-383-0472	527A161	70117	SCREW, TUNING	EA	1
B-51	45	PAHZZ	3110-00-155-8416	S3KDD	86174	BEARING, BALL ANNULAR	EA	2
B-51	46	PAHZZ		520A127	70117	BEARING BLOCK	EA	1
B-51	47	XDHZZ		502A24-3	70117	LOCKNUT	EA	2
B-51	48	PAHZZ	6625-00-135-9120	GB2124-1	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-51	49	PAHZZ	5935-00-850-9157	M39012-16-0002	81349	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-51	50	PAHZZ	6145-00-161-0913	RG62AU	81349	CABLE, RADIO FREQUENCY	EA	1
B-51	51	PAHZZ		502A15-1-42	70117	PACKING NUT	EA	1
B-51	52	XDHZZ		260-10	04073	CUP, WASHER	EA	1
B-51	53	XDHZZ		527A126-1	70117	HOUSING, BODY	EA	1
B-51	54	XDHZZ		527A125-1	70117	NUT	EA	1
B-51	55	XDHZZ		529C6-1	70117	SPACER, SLEEVE	EA	1
B-51	56	PAHZZ	5999-00-806-1519	527A133	70117	CONTACT ELECTRICAL	EA	1
B-51	57	PAHZZ	5330-01-004-0343	512C1-61	70117	GASKET	EA	1
B-51	58	XDHZZ		020X250X328 BRSSILPL	70117	WASHER, FLAT	EA	2

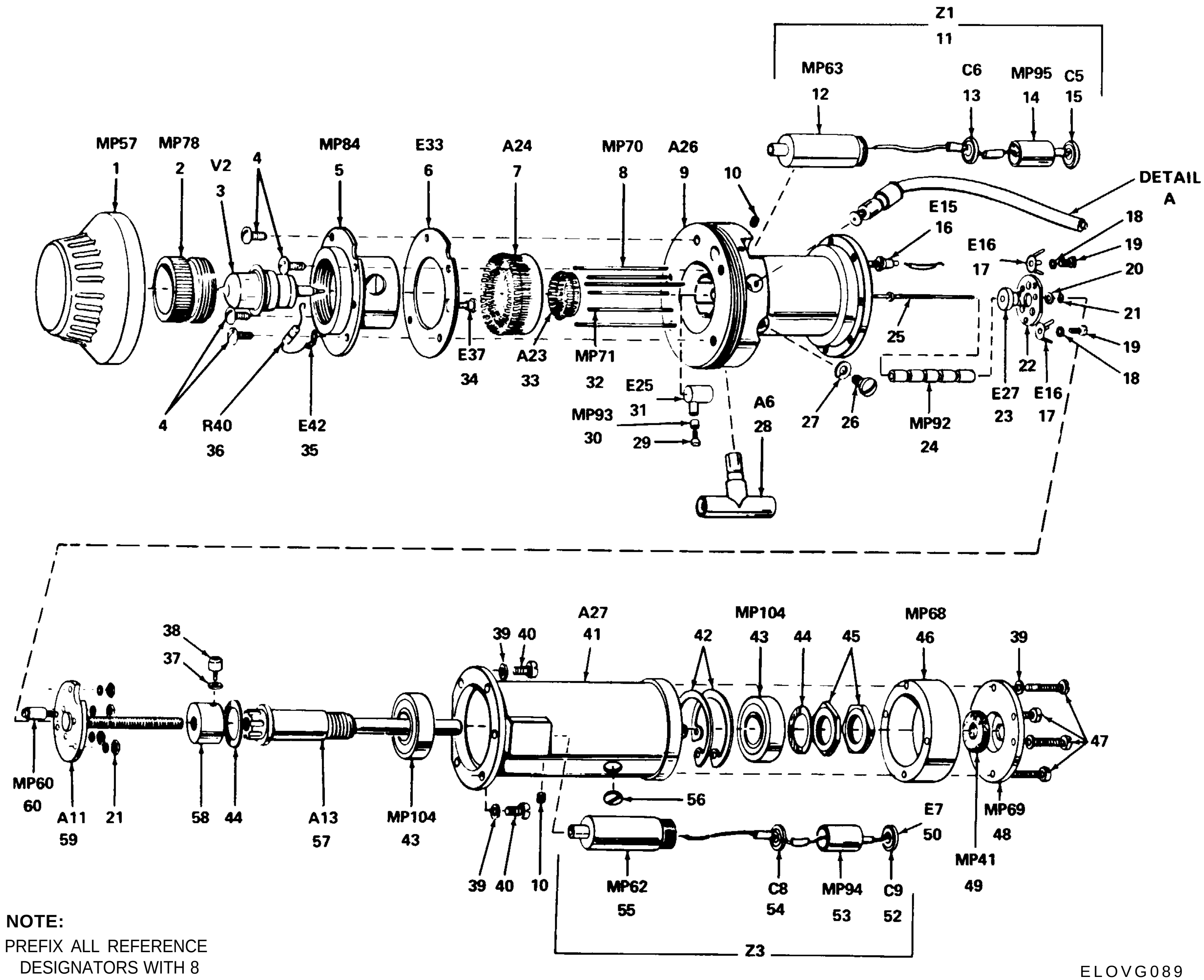
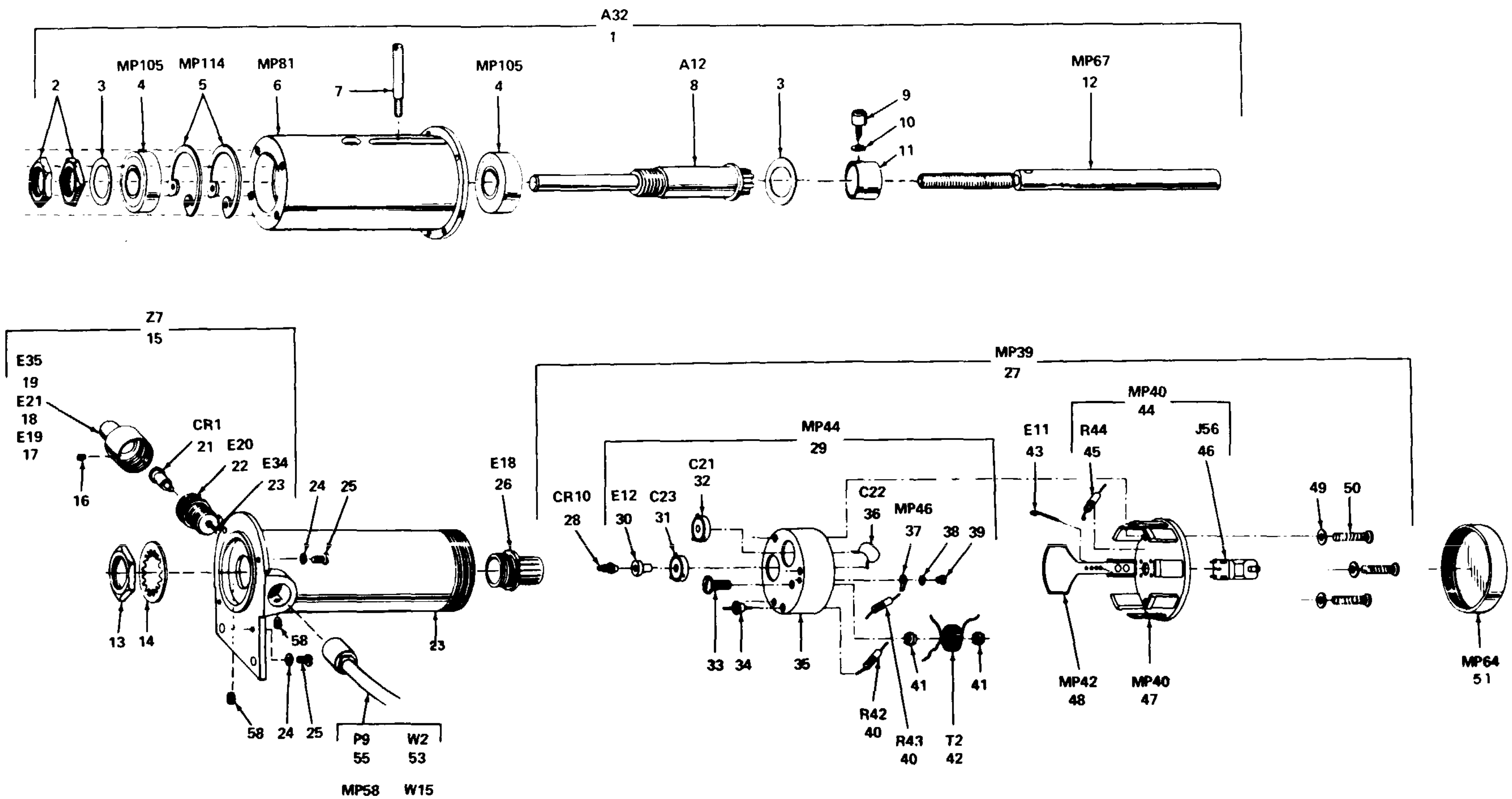


Figure B-52. Oscillator assembly (sheet 1 of 2).

Figure B-62. ② Oscillator assembly (sheet 2 of 2).

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-52		PAHDD	6625-00-799-9062	GD1658-1	70117	OSCILLATOR ASSEMBLY (SEE FIGURE B-48 FOR NHA)		
B-52	1	XDHZZ		520C110	70117	CAP	EA	1
B-52	2	PAHZZ	6625-00-797-2699	527A380	70117	BUSHING, MACHINE THREAD	EA	1
B-52	3	PAHZZ	5960-00-166-7686	2C36	81349	ELECTRON TUBE	EA	1
B-52	4	XDHZZ		6-32X312FHNYLON	70117	SCREW, MACHINE: FH, NO. 6-32 X 5/16 IN. LG, NYLON	EA	5
B-52	5	XDHZZ		527C485	70117	FILTER PLATE	EA	1
B-52	6	XDHZZ		532B295	70117	INSULATOR PLATE	EA	1
B-52	7	PAHZZ	6625-00-400-2684	GA439-2	70117	CONTACT ASSEMBLY	EA	1
B-52	8	XDHZZ		527A131-1	70117	TUNING ROD	EA	1
B-52	9	PAHDD		GB258-2	70117	CAVITY ASSEMBLY	EA	1
B-52	10	XDHZZ	5305-00-282-5806	AN565DC6H3	88044	SETSCREW	EA	4
B-52	11	XDHZZ	5915-00-503-4467	GB296-1	70117	FILTER ASSEMBLY	EA	1
B-52	12	PAHZZ	5915-00-632-7809	527A119	70117	FILTER BODY	EA	1
B-52	13	PAHZZ	5910-00-813-6212	653-00218A0250K	72982	CAPACITOR, FIXED, MICA DIELECTRIC: 25 UF	EA	1
B-52	14	XDHZZ		529D4-5	70117	SPACER, SLEEVE	EA	1
B-52	15	PAHZZ	5910-00-276-6827	651-00218A0250K	72982	CAPACITOR, FIXED, MICA DIELECTRIC: 25 UF	EA	1
B-52	16	XDHZZ		509A13	70117	TERMINAL STUD	EA	1
B-52	17	PAHZZ	5999-00-622-5760	518A36	70117	CONTACT FINGER	EA	3
B-52	18	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK	EA	3
B-52	19	XDHZZ		4-40X312FILHSST	70117	SCREW, MACHINE: FILH, NO. 4-40 X 5/16 IN. LG, SST	EA	3
B-52	20	XDHZZ		3MEDSPLITSST	70117	WASHER, LOCK: SPLIT, NO. 3, MEDIUM	EA	7
B-52	21	XDHZZ	5310-00-167-1374	AN340C3	88044	NUT, PLAIN HEX: NO. 3-48	EA	7
B-52	22	XDHZZ	5310-00-335-5513	515A146	70117	WASHER	EA	1
B-52	23	XDHZZ		532A68	70117	INSULATOR	EA	1
B-52	24	XDHZZ		529C6-2	70117	SPACER, SLEEVE	EA	5
B-52	25	PAHZZ	6625-00-451-5762	527A113	70117	FILAMENT ROD	EA	1
B-52	26	XDHZZ		8-32X187FILHSST	70117	SCREW, MACHINE: FILH, NO. 8-32 X 3/32 IN. LG, SST	EA	1
B-52	27	XDHZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK: SPRING, NO. 8	EA	1
B-52	28	PAHDD	6625-00-323-0495	GB220	70117	COUPLING ASSEMBLY	EA	1
B-52	29	XDHZZ		501D42-8	70117	SCREW, SPECIAL	EA	1
B-52	30	XDHZZ		529C7-53	70117	NUT, SLEEVE	EA	1
B-52	31	PAHZZ	5999-00-135-9116	527B486-1	70117	CONTACT ASSEMBLY	EA	1
-52	32	XDHZZ		527A131-2	70117	TUNING ROD	EA	1
-52	33	PAHZZ	5999-00-400-2683	GA439-1	70117	CONTACT ASSEMBLY	EA	1
-52	34	XDHZZ	5940-00-553-2471	RSTSM1TUR	98291	TERMINAL STUD	EA	1
-52	35	PAHZZ	5940-00-050-2308	MS35431-3	96906	TERMINAL LUG: SOLDER TYPE	EA	1
-52	36	PAHZZ	5905-00-126-6691	RCR20G150JS	81349	RESISTOR, FIXED, COMPOSITION: 15 OHMS, PORM 5%, .5 WATT	EA	1

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-52	37	XDHZZ	5310-00-616-3555	MS35333-71	96906	WASHER, LOCK: IT	EA	2
B-52	38	XDHZZ		527A100	70117	SETSCREW	EA	1
B-52	39	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK: SPRING, NO. 6	EA	9
B-52	40	XDHZZ		6-32X312FILHSST	70117	SCREW, MACHINE: FILH, NO. 6-32 X 5/16 IN. LG, SST	EA	5
B-52	41	XDHZZ		GB259-1	70117	HOUSING, OSCILLATOR	EA	1
B-52	42	XDHZZ	5365-00-598-1774	MS16625-4112	96906	RING, RETAINING	EA	2
B-52	43	PAHZZ	3110-00-155-8432	S5KDD	86174	BEARING, BALL ANNULAR	EA	2
B-52	44	XDHZZ		504C1-4	70117	WASHER, SPRING TENSION	EA	2
B-52	45	XDHZZ		502A24-1	70117	LOCKNUT	EA	2
B-52	46	XDHZZ		527A129	70117	CAP, OSCILLATOR CAVITY	EA	1
B-52	47	XDHZZ		6-32X875FILHSST	70117	SCREW, MACHINE: FILH, NO. 6-32 X 7/8 IN. LG, SST	EA	4
B-52	48	XDHZZ		527A130	70117	GLAND	EA	1
B-52	49	XDHZZ		504A12-2	70117	PACKING	EA	1
B-52	50	PAHZZ	5999-00-806-1519	527A133	70117	CONTACT ELECTRICAL	EA	1
B-52	51	XDHZZ	6625-00-820-5500	GB297-2	70117	FILTER ASSEMBLY	EA	1
B-52	52	PAHZZ	5910-00-276-6827	651-02	72982	CAPACITOR, FIXED, MICA DIELECTRIC: 500 UF	EA	1
B-52	53	XDHZZ		529D4-5	70117	SPACER, SLEEVE	EA	1
B-52	54	PAHZZ	5910-00-813-6213	653-501K	72982	CAPACITOR, FIXED, MICA DIELECTRIC: 500 UF	EA	1
B-52	55	PAHZZ	5915-00-632-7809	527A119	70117	FILTER, BODY	EA	1
B-52	56	XDHZZ		SS48192	61864	PLUG, BUTTON	EA	1
B-52	57	XDHZZ		GA257	70117	SHAFT ASSEMBLY	EA	1
B-52	58	XDHZZ	5310-00-392-8219	527A136	70117	NUT, SPECIAL	EA	1
B-52	59	PAHZZ	5305-00-244-2925	GA252	70117	SCREW ASSEMBLY	EA	1
B-52	60	XDHZZ		527A112	70117	STOP	EA	1
B-52	61	PAHZZ	6625-00-191-9353	GA493-2	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-52	62	PAHZZ	6145-00-161-0913	RG62AU	81349	CABLE, RADIO FREQUENCY	EA	1
B-52	63	XDHZZ		588B21-5	70117	PACKING GLAND NUT	EA	1
B-52	64	XDHZZ		527A126	70117	BODY, CONNECTOR	EA	1
B-52	65	XDHZZ		529C6-1	70117	SPACER, SLEEVE	EA	1
B-52	66	PAHZZ	5999-00-806-1519	527A133	70117	CONTACT ELECTRICAL	EA	1
B-52	67	XDHZZ	5310-00-857-0721	527A125-2	70117	NUT, HOUSING	EA	1



NOTE:
PREFIx ALL REFERENCE
DESIGNATORS WITH 8

Figure B-53. Wavemeter assembly.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-53		XDHDD		GD213-4	70117	WAVEMETER ASSEMBLY (SEE FIGURE B-48 FOR NHA)	EA	REF
B-53	1	XDHZZ		GB310-3	70117	REAR HOUSING ASSEMBLY	EA	1
B-53	2	XDHZZ		502A24-1	70117	LOCKNUT	EA	2
B-53	3	XDHZZ		504C1-4	70117	WASHER, SPRING TENSION	EA	2
B-53	4	PAHZZ	3110-00-155-8432	S5KDD	86174	BEARING, BALL ANNULAR	EA	2
B-53	5	XDHZZ	5365-00-598-1774	MS16625-4112	96906	RING, RETAINING	EA	2
B-53	6	XDHZZ		527B134-2	70117	HOUSING, REAR	EA	1
B-53	7	XDHZZ		527A121	70117	SCREW	EA	1
B-53	8	PAHZZ	6625-00-628-8974	GB256-1	70117	SPINDLE ASSEMBLY	EA	1
B-53	9	XDHZZ		527A100	70117	SETSCREW, SOCKET HEAD	EA	1
B-53	10	XDHZZ	5310-00-616-3555	MS35333-71	96906	WASHER, LOCK, SPLIT	EA	1
B-53	11	XDHZZ		527A120	70117	NUT, BACKLASH	EA	1
B-53	12	PAHZZ	6625-00-628-8971	527A128	70117	PLUNGER	EA	1
B-53	13	XDHZZ		502A23-3	70117	NUT, HEX	EA	1
B-53	14	XDHZZ	5310-00-639-7431	1928	78189	WASHER, LOCK, IT	EA	1
B-53	15	PAHHH	6625-00-392-5467	GB222	70117	CRYSTAL ASSEMBLY	EA	1
B-53	16	XDHZZ		4-40X1-8CUPPTSST	70117	SETSCREW, CUP POINT NO. 4-40 X 1/8 IN. LG	EA	1
B-53	17	PAHZZ	5999-00-248-1165	527A137	70117	CONTACT,ELECTRICAL	EA	1
B-53	18	PAHZZ	5999-00-248-1167	527A139	70117	CONTACT,ELECTRICAL	EA	1
B-53	19	PAHZZ	6625-00-004-2556	595A7-2	70117	LEAD, ELECTRICAL	EA	1
B-53	20	PAHZZ	5910-00-666-6191	370CH501-2	72982	CAPACITOR, FIXED, MICA DIELECTRIC	EA	1
B-53	21	PAHZZ	5961-00-262-0316	1N25	93332	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-53	22	PAHZZ	5999-00-248-1166	527A138	70117	CONTACT, ELECTRICAL	EA	1
B-53	23	PAHZZ	6625-01-004-2557	595A7-1	70117	LEAD, ELECTRICAL	EA	1
B-53	24	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	5
B-53	25	XDHZZ		4-40X312FILHSST	70117	SCREW, WASHER	EA	5
B-53	26	PAHZZ	5999-00-624-8143	527A118	70117	CONTACT, ELECTRICAL	EA	1
B-53	27	PAHHH	6625-00-409-2094	GC5061	70117	PROBE ASSEMBLY	EA	1
B-53	28	PAHZZ	5961-00-532-2580	593A85	70117	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-53	29	XDHZZ		GC5129	70117	PROBE SUBASSEMBLY	EA	1
B-53	30	PAHZZ	5935-00-632-7810	527B898	70117	CONTACT, ELECTRICAL	EA	1
B-53	31	PAHZZ	5910-00-401-7344	CB11ND271J	81349	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-53	32	PAHZZ	5910-00-532-2583	CB11ND270J	81349	CAPACITOR, FIXED,DIELECTRIC	EA	1
B-53	33	XDHZZ		2-56X3-8NYLON-FLATSLOTHD	70117	SCREW, MACHINE NO. 2-56 X 3/8 IN. LG	EA	1
B-53	34	XDHZZ	5940-00-052-9699	1145SW40	97814	TERMINAL STUD	EA	1
B-53	35	XDHZZ		527C894	70117	HOUSING, PROBE	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-53	36	PAHZZ	5910-00-460-0868	CM05FD101J03	81349	CAPACITOR, FIXED, DIELECTRIC	EA	1
B-53	37	XDHZZ	5940-00-259-9057	4476	71785	TERMINAL LUG	EA	1
B-53	38	XDHZZ	5310-00-928-2690	MS35338-134	96906	WASHER, LOCK	EA	4
B-53	39	PAHZZ	5305-00-054-5636	MS35233-2	96906	SCREW, MACHINE	EA	1
B-53	40	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	2
B-53	41	XDHZZ		2-56X3-16X3-32NY	70117	NUT, PLAIN, HEXAGON, NYLON	EA	2
B-53	42	PAHZZ	5950-00-437-3745	572D44	70117	TRANSFORMER, RADIO FREQUENCY	EA	1
B-53	43	PAHZZ		518B365	70117	CONTACT, SPRING	EA	1
B-53	44	PAHZZ		GC5130-2	70117	PROBE SUBASSEMBLY	EA	1
B-53	45	PAHZZ	5905-00-111-4743	RCR20G820JS	81349	RESISTOR, FIXED, COMPOSITION: 82 OHMS, PORM 5%, .25 WATT	EA	1
B-53	46	PAHZZ	5935-00-221-8341	G6997AA9	94375	CONNECTOR, RECEPTACLE	EA	1
B-53	47	XDHZZ		GC5130-1	70117	HOUSING, PROBE	EA	1
B-53	48	PAHZZ	6625-00-628-8969	527B896	70117	ARM, PROBE	EA	1
B-53	49	XDHZZ	5310-00-928-2690	MS35338-134	96906	WASHER, LOCK NO. 2	EA	3
B-53	50	XDHZZ		2-56X9-16BHB RASSSILVERPL	70117	SCREW, MACHINE NO. 2-56 X 9/16 IN. LG	EA	3
B-53	51	XDHZZ		527B897	70117	CAP, PROBE	EA	1
B-53	52	PAHHH	6625-00-628-8967	GB275	70117	CAVITY ASSEMBLY	EA	1
B-53	53	PAHZZ	6625-00-409-2097	GC5124	70117	CABLE ASSEMBLY	EA	1
B-53	54	PAHZZ	6145-00-681-7849	RG223U	81349	CABLE, RADIO FREQUENCY	EA	1
B-53	55	PAHZZ	5935-00-823-0487	UG88EU	81349	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-53	56	PAHZZ	5330-01-004-0343	512C1-61	70117	GASKET	EA	1
B-53	57	PAHZZ	5905-00-286-5305	RNC55K49R9FS	81349	RESISTOR, FIXED, FILM	EA	1

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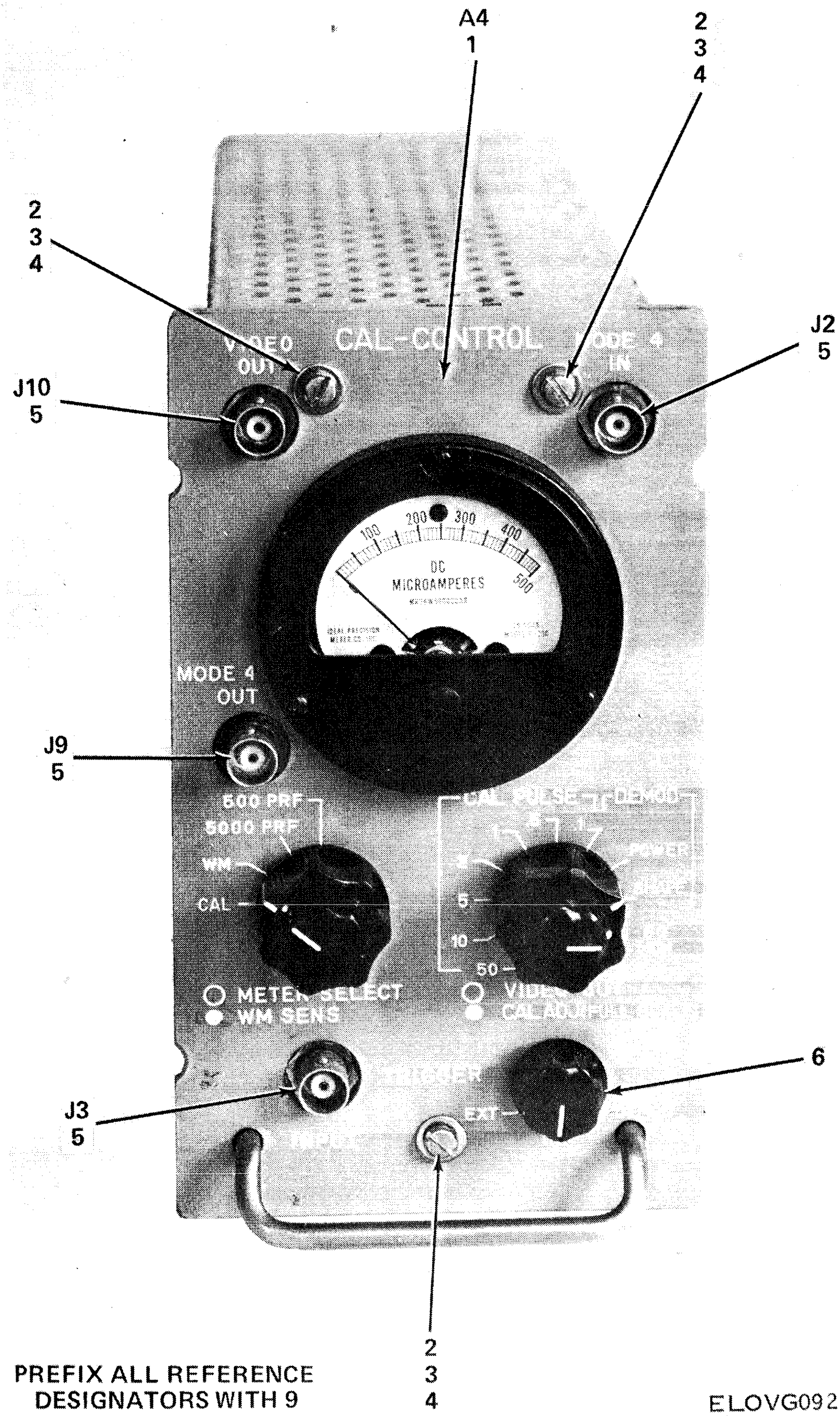

Figure B-54. ① Calibration control unit (sheet 1 of 2).

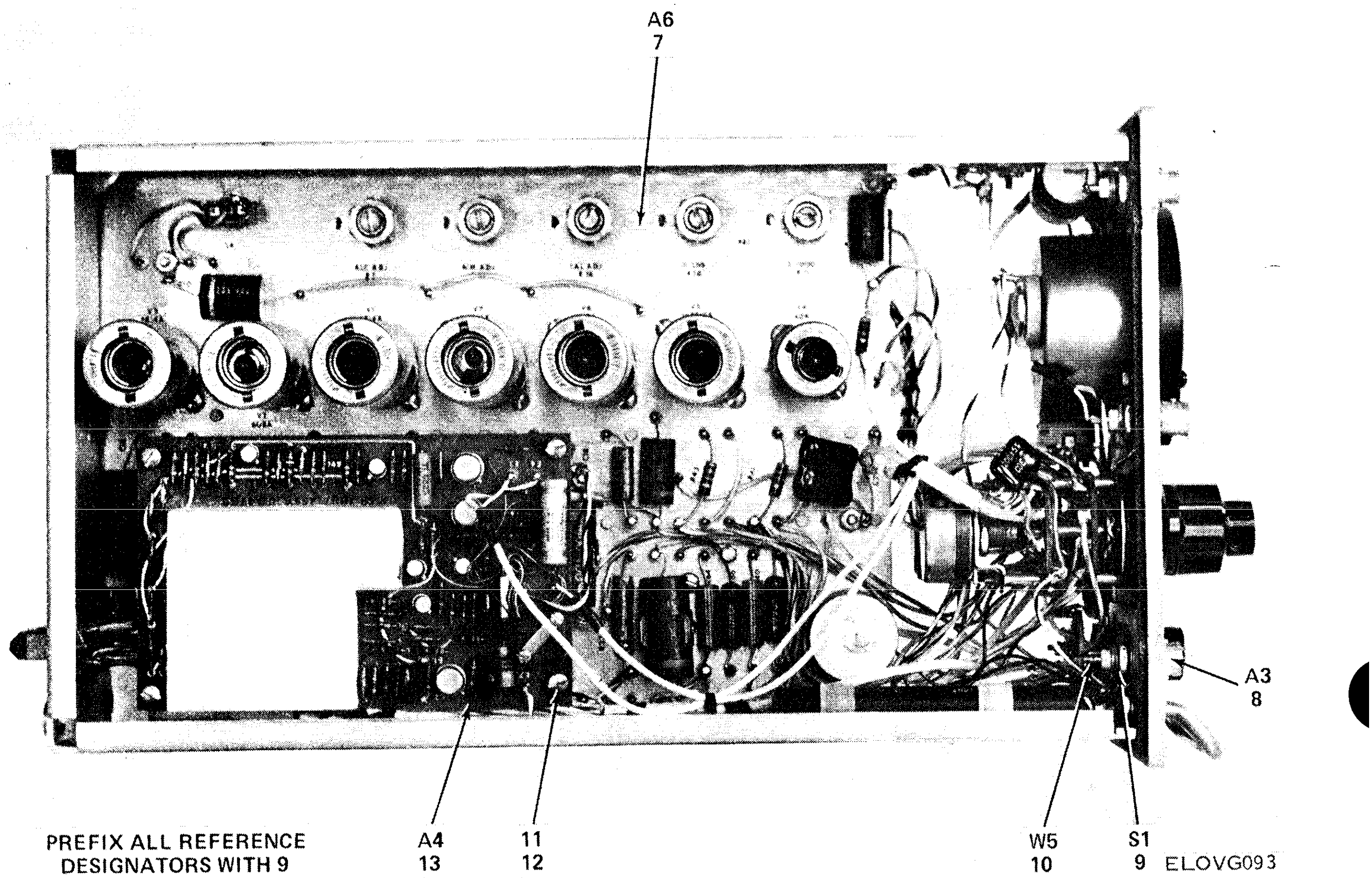

Figure B-54. ② Calibration control unit (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 0303 - CALIBRATION-CONTROL UNIT		
B-54		XDHHH		GJ4839-1	70117	CALIBRATION-CONTROL UNIT (SEE FIGURE B-33 FOR NHA)	EA	REF
B-54	1	XDHHH		GD4840-1	70117	FRONT PANEL ASSEMBLY (SEE FIGURE B-55 FOR BREAKDOWN)	EA	1
B-54	2	PAHZZ	5305-00-054-6653	MS35233-29	96906	SCREW, MACHINE NO. 6-32 X 7/16 IN. LG	EA	3
B-54	3	XDHZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT NO. 6	EA	4
B-54	4	XDHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK NO. 6	EA	5
B-54	5	PAHZZ	5935-00-835-0510	M39012-21-0001	81349	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	4
B-54	6	PAOZZ	5355-00-753-5171	S645-5LBB	75376	KNOB	EA	1
B-54	7	XDHHH		GJ4841-1	70117	CHASSIS ASSEMBLY (SEE FIGURE B-56 FOR BREAKDOWN)	EA	1
B-54	8	XDHZZ		GC4979	70117	SWITCH ASSEMBLY	EA	1
B-54	9	PAHZZ	5930-00-970-5021	96267AA1	76854	SWITCH,ROTARY	EA	1
B-54	10	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY: 10 IN. LG	EA	1
B-54	11	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE NO. 4-40 X 1/4 IN. LG	EA	8
B-54	12	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK NO. 4	EA	8
B-54	13	XDHHH		GD4789	70117	CALIBRATE CONTROL ASSEMBLY (SEE FIGURE B-57 FOR BREAKDOWN)	EA	1

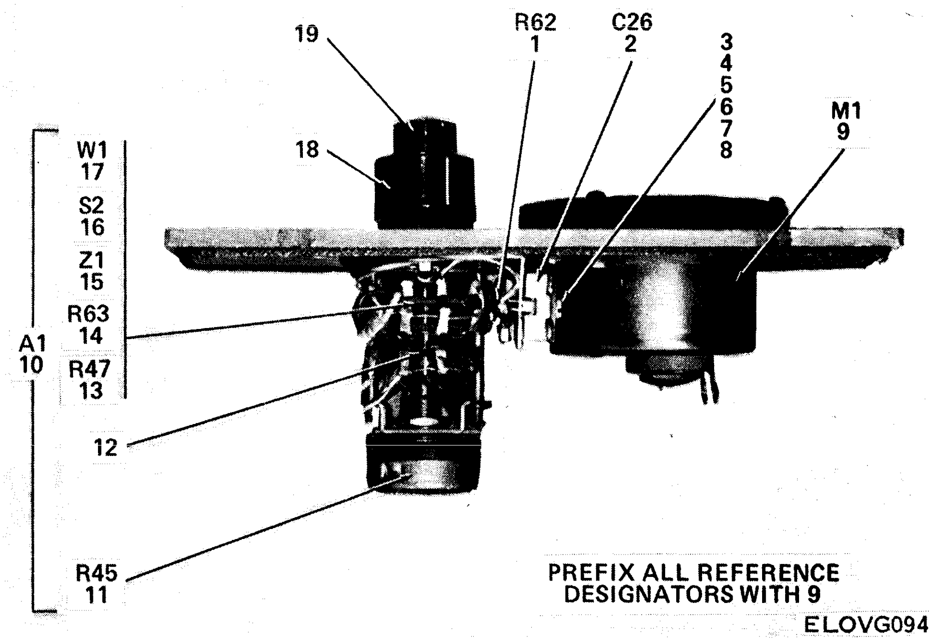

Figure B-55. ① Front panel assembly (sheet 1 of 2).

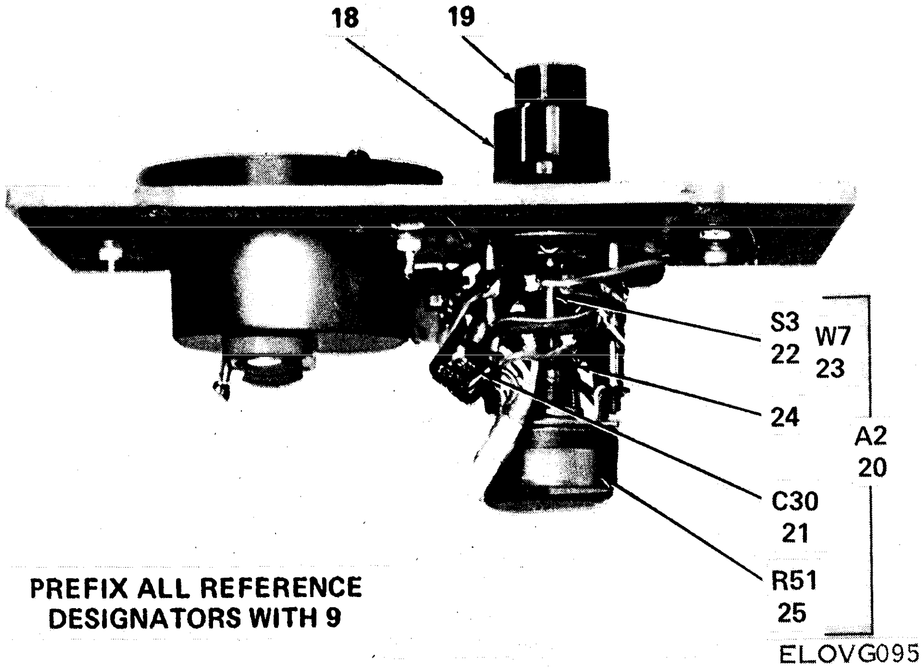

Figure B-55. ② Front panel assembly (sheet 2 of 2).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-55		XDHHH		GD4840-1	70117	FRONT PANEL ASSEMBLY (SEE FIGURE B-54 FOR NHA)	EA	1
B-55	1	PAHZZ	5905-00-104-8332	RCR20G475JS	81349	RESISTOR, FIXED, COMPOSITION: 4.7 MEGOHMS, PORM 10%, .50 WATT	EA	1
B-55	2	PAHZZ	5910-00-668-4582	CV11D450	81349	CAPACITOR, VARIABLE DIELECTRIC	EA	1
B-55	3	PAHZZ	5305-00-054-5651	MS35233-17	96906	SCREW, MACHINE: NO. 4-40 X 1/2 IN. LG	EA	2
B-55	4	PAHZZ	5310-00-934-9748	MS35649-44	96906	NUT, PLAIN, HEX: NO. 4-40	EA	2
B-55	5	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK: NO. 4	EA	3
B-55	6	XDHZZ		505D1-4	70117	WASHER, NONMETALLIC	EA	4
B-55	7	XDHZZ	5310-00-058-3599	MS35335-57	96906	WASHER, LOCK: EXT, NO. 4 CRS	EA	1
B-55	8	XDHZZ	5940-00-614-0537	MS35431-1	95906	TERMINAL LUG	EA	1
B-55	9	PADZZ	6625-00-585-5288	MR26W500DCUAR	81349	AMMETER	EA	1
B-55	10	PAHZZ		GD4981-1	70117	SWITCH-RESISTOR ASSEMBLY	EA	1
B-55	11	PAHZZ	5905-00-557-9254	RV4NAYSB251A	81349	RESISTOR VARIABLE: 250 OHMS, PORM 10%	EA	1
B-55	12	PAHZZ	3010-00-623-7447	519B65	70117	COUPLING	EA	1
B-55	13	PAHZZ	5905-00-250-5114	RNC70K6040FS	81349	RESISTOR, FIXED, FILM: 600 OHMS, .50 WATT, PORM 0.05%, 350 V	EA	1
B-55	14	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR,F IXED, COMPOSITION: 1K OHMS, PORM 10%, .50 WATT	EA	1
B-55	15	PAHZZ	5915-00-023-5154	573B11-45	81349	SUPPRESSOR, PARASITIC	EA	1
B-55	16	PAHZZ	5930-00-779-3628	96625F3	76854	SWITCH, ROTARY	EA	1
B-55	17	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY: 30 IN. LG	EA	1
B-55	18	PAOZZ	5355-00-819-0067	533A98-3	70117	KNOB	EA	2
B-55	19	PAOZZ	5355-00-576-5470	S645-5LBB	75376	KNOB	EA	2
B-55	20	PAHZZ	6625-00-628-7323	GD4982-1	70117	SWITCH-RESISTOR ASSEMBLY	EA	1
B-55	21	PAHZZ	5910-00-880-6080	CM06F122J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 1,200 PF, PORM 5%, 500 VDCW	EA	1
B-55	22	PAHZZ	5930-00-779-3627	96624F2	76854	SWITCH, ROTARY	EA	1
B-55	23	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY	EA	1
B-55	24	PAHZZ	3010-00-623-7447	519B65	70117	COUPLING	EA	1
B-55	25	PAHZZ	5905-00-646-5992	RV4NAYSB252A	81349	RESISTOR VARIABLE: 2.5K OHMS, PORM 10%	EA	1

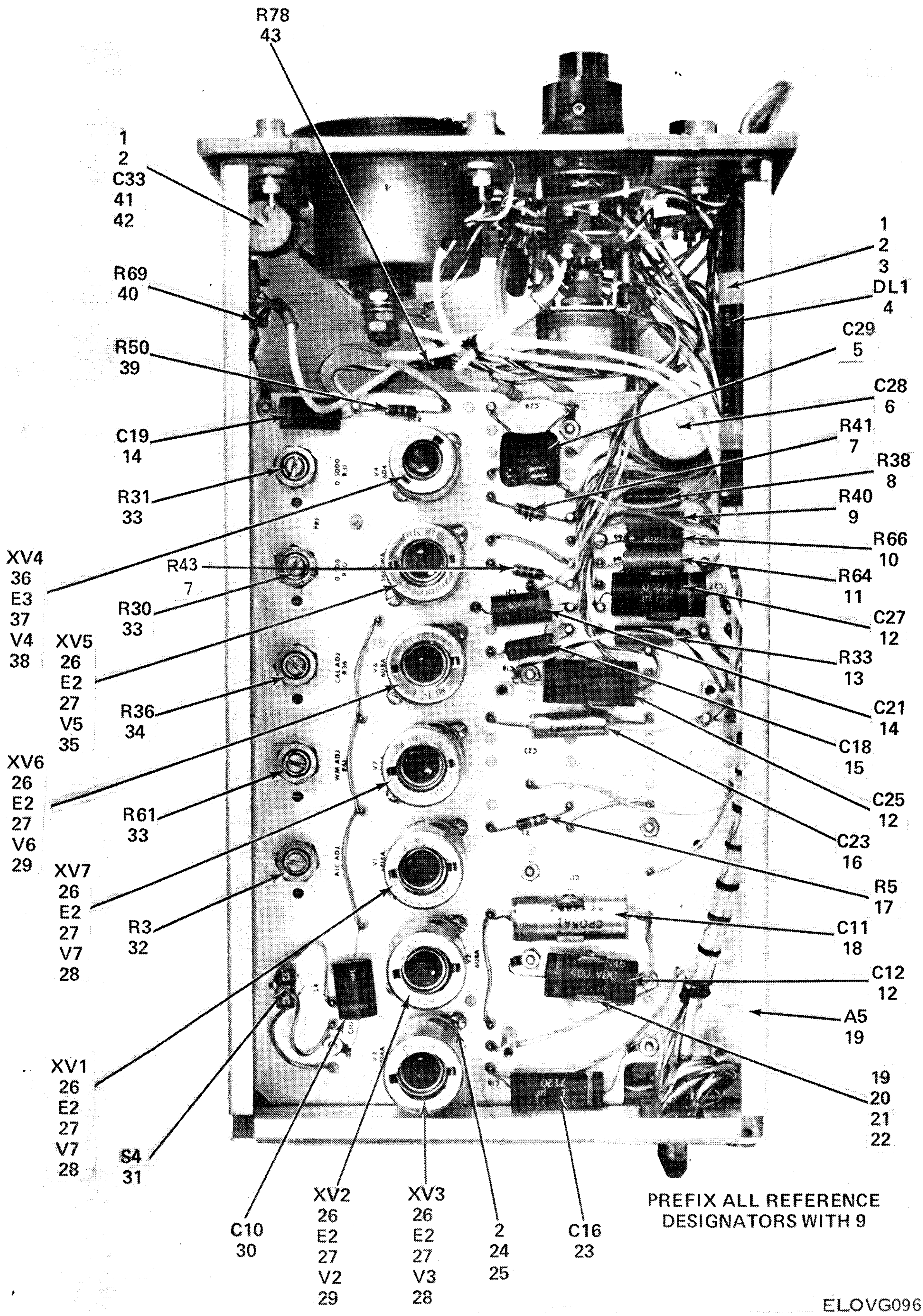

Figure B-56. ① Chassis assembly; unit 9 (sheet 1 of 3).

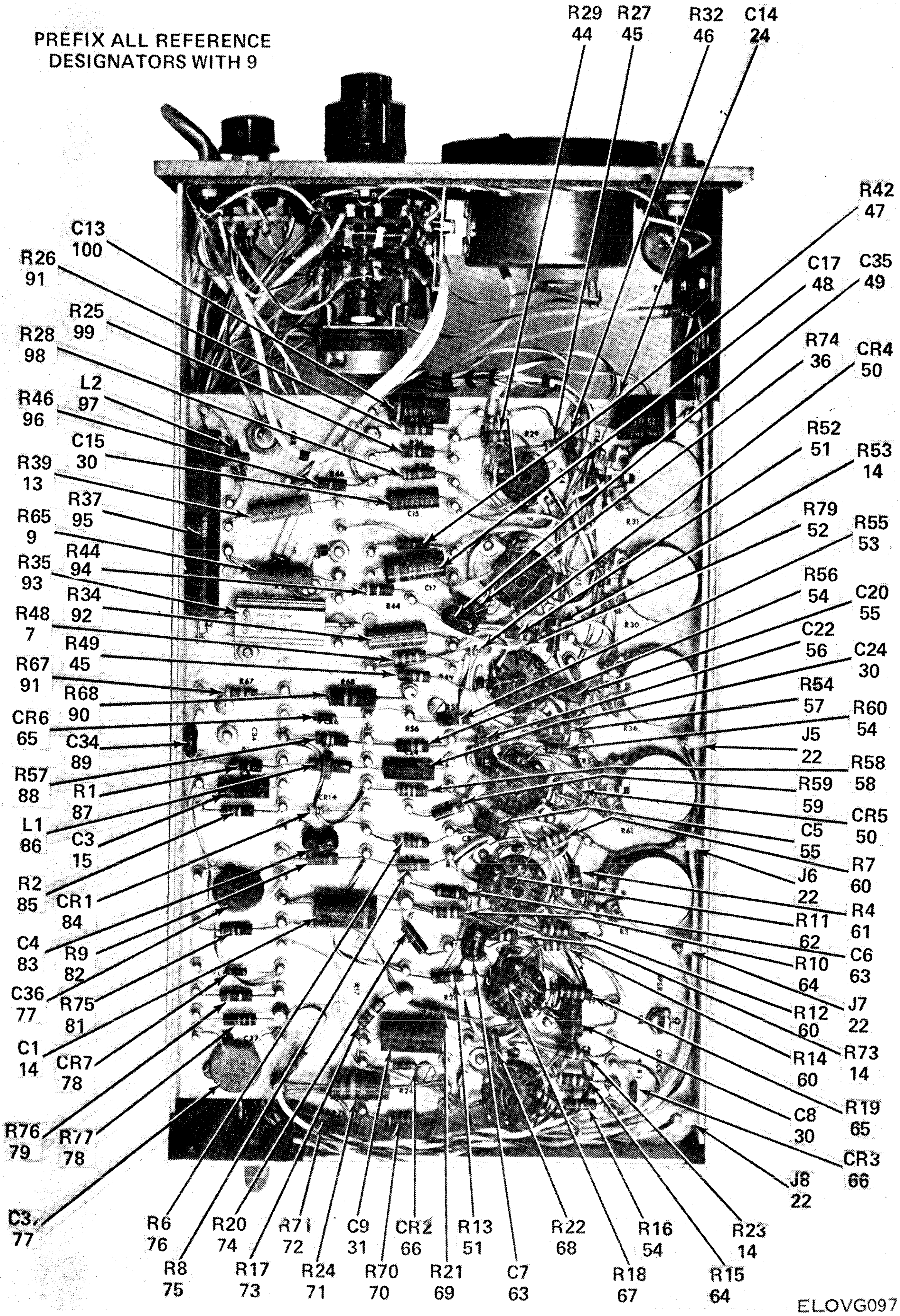

Figure B-56. ② Chassis assembly, unit 9 (sheet 2 of 3).

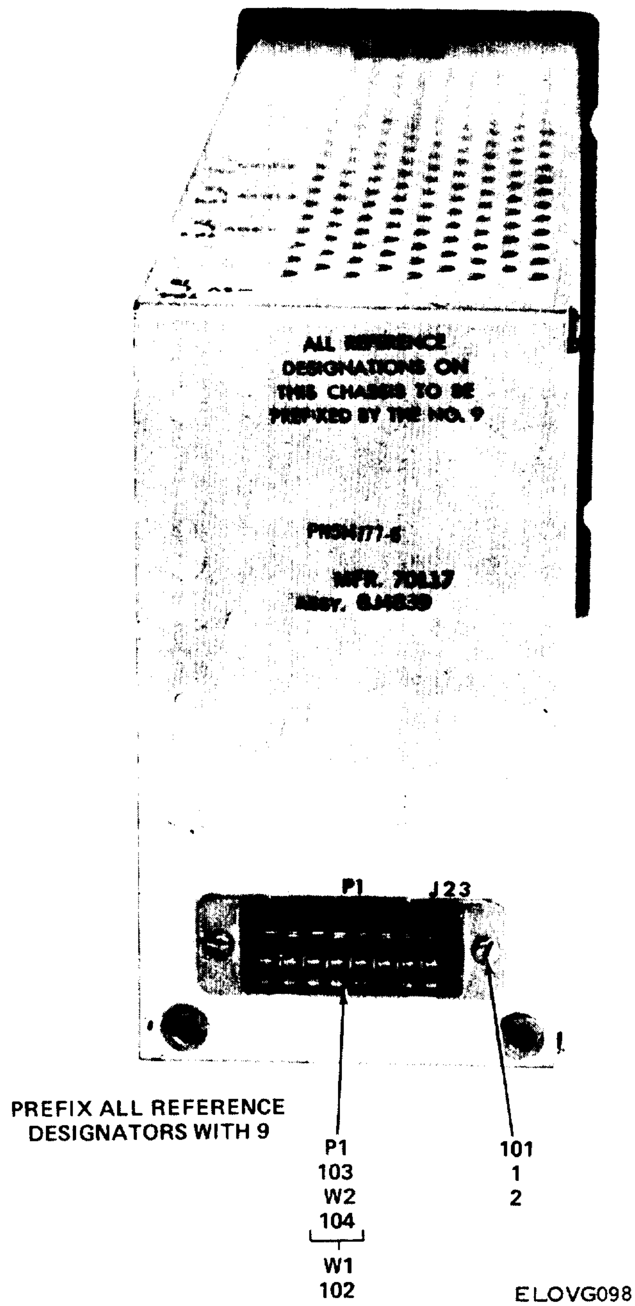

Figure B-56. ③ Chassis assembly, unit 9 (sheet 3 of 3).

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-56		XDHHH		GJ4841-1	70117	CHASSIS ASSEMBLY (SEE FIGURE B-54 FOR NHA)	EA	REF
B-56	1	XDHZZ	5310-00-934-9748	MS35649-244	96906	NUT, PLAIN, HEXAGON: NO. 4-40	EA	19
B-56	2	PAHZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK SPLIT: NO. 4	EA	33
B-56	3	XDHZZ	5310-00-672-2178	D4-128	95987	WASHER, FLAT: NO. 4	EA	2
B-56	4	PAHZZ	5840-00-027-8968	572D14-1	70117	DELAY LINE	EA	1
B-56	5	PAHZZ	5910-00-764-1271	CM07F123J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 12K PF, PORM 5%, 500 VDCW	EA	1
B-56	6	PAHZZ	5910-00-578-8292	XG1897NT10	72928	CAPACITOR, FIXED, PAPER DIELECTRIC	EA	3
B-56	7	PAHZZ	5905-00-104-8330	RCR20G333JS	81349	RESISTOR, FIXED, COMPOSITION: 33K OHMS, PORM 10%, .5 WATT	EA	3
B-56	8	PAHZZ	5905-00-285-1986	RNC70K2000FS	81349	RESISTOR, FIXED, FILM: 200 OHMS, PORM 0.05% .5 WATT, 350 V	EA	1
B-56	9	PAHZZ	5905-00-988-6284	RN70D8OR6F	81349	RESISTOR, FIXED, FILM: 8 OHMS, PORM 0.05%, .5 WATT, 350 V	EA	2
B-56	10	PAHZZ	5905-00-204-7523	RNC70K20R0FS	81349	RESISTOR, FIXED, FILM: 20 OHMS, PORM 0.05% .5 WATT, 350 V	EA	1
B-56	11	PAHZZ	5905-00-233-0849	RNC70K1000FS	81349	RESISTOR, FIXED, FILM: 100 OHMS, PORM 0.05% .5 WATT, 350 V	EA	1
B-56	12	PAHZZ	5910-00-231-3370	P8292ZN20	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, 400 V, PORM 10%	EA	3
B-56	13	PAHZZ	5905-00-547-8430	RNC70K1210FS	81349	RESISTOR, FIXED, FILM: 120 OHMS, PORM 0.05%, .5 WATT, 350 V	EA	2
B-56	14	PAHZZ	5910-00-681-6247	P8292ZN6	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, 200 V, PORM 20%	EA	4
B-56	15	PAHZZ	5910-00-081-3871	P95ZN4	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.02 UF, 200 V, PORM 20%	EA	5
B-56	16	PAHZZ	5910-00-819-5745	CP35A1KC473K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.047 UF, 200 V, PORM 10%	EA	1
B-56	17	PAHZZ	5905-00-104-8336	RCR20G104JS	81349	RESISTOR, FIXED, COMPOSITION: 10 MEGOHMS, PORM 10%, .5 WATT	EA	4
B-56	18	PAHZZ	5910-00-822-2579	CP05A1KE224K3	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.22 UF, 400 V, PORM 10%	EA	1
B-56	19	XDHZZ		GD4908-1	70117	CHASSIS ASSEMBLY	EA	1
B-56	20	PAHZZ	5340-00-229-3676	E50003-054	80033	CLIP, SPRING TENSION	EA	4
B-56	21	XDHZZ		MS2045CBB4	96906	RIVET, TUBULAR	EA	4
B-56	22	PAHZZ	5935-00-752-2974	SKT2BC	98291	JACK, TIP	EA	4
B-56	23	PAHZZ	5910-00-164-2076	M39022-01-1721	81349	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.1 UF, 400 V, PORM 20%	EA	1
B-56	24	XDHZZ	5305-00-054-5647	MS51957-13	96906	SCREW, MACHINE: NO. 4-40 X 1/4 IN. LG	EA	14
B-56	25	XDHZZ	5310-00-550-3715	MS35333-70	96906	WASHER, LOCK: IT NO. 4	EA	14
B-56	26	PAHZZ	5935-00-222-9828	TS103P01	81349	SOCKET, ELECTRON TUBE	EA	6
B-56	27	PAHZZ	5960-00-860-7710	TS103U02	81349	SHIELD, ELECTRON TUBE	EA	6
B-56	28	PAOZZ	5960-00-262-0210	5814A	81349	ELECTRON TUBE	EA	3
B-56	29	PAOZZ	5960-00-729-6963	6U8A	81349	ELECTRON TUBE	EA	2

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-56	30	PAHZZ	5910-00-879-6957	MPY2P25-10PCT	93790	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, 200 V, PORM 20%	EA	2
B-56	31	PAHZZ	5930-00-739-8156	TSA16	04009	SWITCH, TOGGLE	EA	1
B-56	32	PAHZZ	5905-00-676-8669	RV2LAYSA503A	81349	RESISTOR, VARIABLE: 50K OHMS, PORM 10%	EA	1
B-56	33	PAHZZ	5905-00-686-4108	RV2LAYSA253A	81349	RESISTOR, VARIABLE: 25K OHMS, PORM 10%	EA	3
B-56	34	PAHZZ	5905-00-577-7136	RV2LAYSA102A	81349	RESISTOR, VARIABLE: 1K OHMS, PORM 10%	EA	1
B-56	35	PAOZZ	5960-00-179-4749	5687WB	81349	ELECTRON TUBE	EA	1
B-56	36	PAHZZ	5935-00-132-2405	TS102P01	81349	SOCKET, ELECTRON TUBE	EA	1
B-56	37	PAHZZ	5960-00-860-7709	M24251-6-2	81349	SHIELD, ELECTRON TUBE	EA	1
B-56	38	PAOZZ	5960-00-108-0263	6D4	81349	ELECTRON TUBE	EA	1
B-56	39	PAHZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47K OHMS, PORM 10%, .5 WATT	EA	1
B-56	40	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITON: 1K OHMS, PORM 10%, .5 WATT	EA	2
B-56	41	PAHZZ	5910-00-280-5297	P8292ZN29	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.25 UF, 600 V, PORM 20%	EA	1
B-56	42	PAHZZ	5999-00-105-5515	GB4284	70117	CONTACT ASSEMBLY, ELECTRICAL	EA	1
B-56	43	PAHZZ	5905-00-141-0600	RCR20G822JS	81349	RESISTOR, FIXED, COMPOSITION: 8.2K OHMS, PORM 5%, .5 WATT	EA	1
B-56	44	PAHZZ	5905-00-114-5430	RCR20G433JS	81349	RESISTOR, FIXED, COMPOSITION: 43K OHMS, PORM 5%, .5 WATT	EA	1
B-56	45	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 10%, .5 WATT	EA	2
B-56	46	PAHZZ	5905-00-141-1130	RCR20G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2.7K OHMS, PORM 5%, .5 WATT	EA	1
B-56	47	PAHZZ	5905-00-116-8569	RCR20G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820 OHMS, PORM 5%, .5 WATT	EA	1
B-56	48	PAHZZ	5910-00-755-5583	P8292ZN15	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, 400 VDCW, PORM 20%	EA	1
B-56	49	PAHZZ	5910-00-044-4355	CM05E470J03	81349	CAPACITOR,FIXED, MICA DIELECTRIC: 47 PF, PORM 5%, 500 VDCW	EA	1
B-56	50	PAHZZ	5961-00-669-6884	JAN1N277	81349	SEMICONDUCTOR DEVICE, DIODE	EA	2
B-56	51	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR, FIXED, COMPOSITION: 1 MEGOHMS, PORM 10%, .5 WATT	EA	2
B-56	52	PAHZZ	5905-00-110-0196	RCR20G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1K OHMS, PORM 5%, .5 WATT	EA	1
B-56	53	PAHZZ	5905-00-106-9344	RCR20G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 10%, .5 WATT	EA	1
B-56	54	PAHZZ	5905-00-106-1282	RCR20G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 10%, .5 WATT	EA	3
B-56	55	PAHZZ	5910-00-984-7588	CM05F101J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 100 PF, PORM 5%, 500 VDCW	EA	2
B-56	56	PAHZZ	5910-00-088-1624	CM05F221J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 220 PF, PORM 5%, 500 VDCW	EA	1
B-56	57	PAHZZ	5905-00-141-0599	RCR20G393JS	81349	RESISTOR, FIXED, COMPOSITION: 39K OHMS, PORM 10%, .5 WATT	EA	1
B-56	58	PAHZZ	5905-00-104-8346	RCR20G334JS	81349	RESISTOR, FIXED, COMPOSITION: 33 MEGOHMS, PORM 10%, .5 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-56	59	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2K OHMS, PORM 10%, .5 WATT	EA	1
B-56	60	PAHZZ	5905-00-141-0599	RCR20G393JS	81349	RESISTOR, FIXED, COMPOSITION: 39K OHMS, PORM 5%, .5 WATT	EA	3
B-56	61	PAHZZ	5905-00-114-5393	RCR20G224JS	81349	RESISTOR, FIXED, COMPOSITION: .22 MEGOHMS, PORM 10%, .5 WATT	EA	1
B-56	62	PAHZZ	5905-00-116-8569	RCR20G821JS	81349	RESISTOR, FIXED, COMPOSITION: 820K OHMS, PORM 10%, .5 WATT	EA	1
B-56	63	PAHZZ		DM15F471J0	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 470 MMF, PORM 5%, 500 VDCW	EA	2
B-56	64	PAHZZ	5905-00-141-1071	RCR20G474JS	81349	RESISTOR, FIXED, COMPOSITION: .47 MEGOHMS, PORM 10%, .5 WATT	EA	2
B-56	65	PAHZZ	5905-00-104-8330	RCR20G333JS	81349	RESISTOR, FIXED, COMPOSITION: 33K OHMS, PORM 5%, .5 WATT	EA	1
B-56	66	PAHZZ	5961-00-087-6047	1N645	81349	SEMICONDUCTOR DEVICE, DIODE	EA	3
B-56	67	PAHZZ	5905-00-106-1273	RCR20G153JS	81349	RESISTOR, FIXED, COMPOSITION: 15K OHMS, PORM 5%, .5 WATT	EA	1
B-56	68	PAHZZ	5905-00-104-8346	RCR20G334JS	81349	RESISTOR, FIXED, COMPOSITION: .33 MEGOHMS, PORM 5%, .5 WATT	EA	1
B-56	69	PAHZZ	5905-00-111-8357	RCR20G681JS	81349	RESISTOR, FIXED, COMPOSITION: 680 OHMS, PORM 5%, .5 WATT	EA	1
B-56	70	PAHZZ	5905-00-111-4735	RCR20G913JS	81349	RESISTOR, FIXED, COMPOSITION: 91K OHMS, PORM 5%, .5 WATT	EA	1
B-56	71	PAHZZ	5905-00-140-5653	RCR42G563JS	81349	RESISTOR, FIXED, COMPOSITION: 56K OHMS, PORM 5%, 2 WATT	EA	1
B-56	72	PAHZZ	5905-00-106-9348	RCR20G154JS	81349	RESISTOR, FIXED, COMPOSITION: .15 MEGOHMS, PORM 5%, .5 WATT	EA	1
B-56	73	PAHZZ	5905-00-104-8335	RCR20G124JS	81349	RESISTOR, FIXED, COMPOSITION: .12 MEGOHMS, PORM 5%, .5 WATT	EA	1
B-56	74	PAHZZ	5905-00-104-5756	RCR20G105JS	81349	RESISTOR, FIXED, COMPOSITION: 1 MEGOHM, PORM 5%, .5 WATT	EA	1
B-56	75	PAHZZ	5905-00-935-8544	RCR20G181JS	81349	RESISTOR, FIXED, COMPOSITION: 180 OHMS, PORM 5%, .5 WATT	EA	1
B-56	76	PAHZZ	5905-00-141-0595	RCR20G472JS	81349	RESISTOR, FIXED, COMPOSITION: 4.7K OHMS, PORM 10%, .5 WATT	EA	1
B-56	77	PAHZZ	5910-00-822-5683	CK63AW103M	81349	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10K MMF, PORM 20%, VDCW	EA	2
B-56	78	PAHZZ	5905-00-141-0591	RCR20G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .5 WATT	EA	1
B-56	79	PAHZZ	5905-00-141-1116	RCR20G562JS	81349	RESISTOR, FIXED, COMPOSITION: 5.6K OHMS, PORM 5%, .5 WATT	EA	1
B-56	80	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-56	81	PAHZZ	5905-00-114-5489	RCR20G823JS	81349	RESISTOR, FIXED, COMPOSITION: 82K OHMS, PORM 5%, .5 WATT	EA	1
B-56	82	PAHZZ	5905-00-141-1168	RCR20G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2.2K OHMS, PORM 5%, .5 WATT	EA	1
B-56	83	PAHZZ	5910-00-989-6427	CM05F301J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 300 PF, PORM 5%, 500 VDCW	EA	1
B-56	84	PAHZZ	5961-00-752-5351	1N643	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-56	85	PAHZZ	5905-00-114-5441	RCR20G563JS	81349	RESISTOR,FIXED, COMPOSITION: 56K OHMS, PORM 5%, .5 WATT	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-56	86	PAHZZ	5950-00-023-9662	573B11-37	70117	COIL, RADIO FREQUENCY	EA	1
B-56	87	PAHZZ	5905-00-141-0598	RCR20G561JS	81349	RESISTOR, FIXED, COMPOSITION: 560 OHMS, PORM 5%, .5 WATT	EA	1
B-56	88	PAHZZ	5905-00-104-8339	RCR20G824JS	81349	RESISTOR, FIXED, COMPOSITION: .82 MEGOHMS, PORM 10%, .5 WATT	EA	1
B-56	89	PAHZZ	5910-00-936-7372	CM05C120K03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 12 PF, PORM 10%, 500 VDCW	EA	1
B-56	90	PAHZZ	5905-00-247-8749	RCR32G823JS	81349	RESISTOR, FIXED, COMPOSITION: 82K OHMS, PORM 5%, 1 WATT	EA	1
B-56	91	PAHZZ	5905-00-141-0596	RCR20G473JS	81349	RESISTOR, FIXED, COMPOSITION: 47K OHMS, PORM 5%, .5 WATT	EA	2
B-56	92	PAHZZ	5905-00-981-8126	RN70D5361F	81349	RESISTOR, FIXED, FILM: 5,360 OHMS, PORM .05%, .5 WATT, 350 V	EA	1
B-56	93	PAHZZ	5905-00-824-0689	RE70G4991	81349	RESISTOR, FIXED, WIREWOUND: 4,990 OHMS	EA	1
B-56	94	PAHZZ	5905-00-141-1118	RCR20G390JS	81349	RESISTOR, FIXED, COMPOSITION: 39 OHMS, PORM 10%, .5 WATT	EA	1
B-56	95	PAHZZ	5905-00-806-0641	RN80B1621F	81349	RESISTOR, FIXED, FILM: 1.6K OHMS, PORM .05%, 2 WATT, 750 V	EA	1
B-56	96	PAHZZ	5905-00-141-0727	RCR20G201JS	81349	RESISTOR, FIXED, COMPOSITION: 200 OHMS, PORM 5%, .5 WATT	EA	1
B-56	97	PAHZZ	5950-00-023-7284	573B11-36	70117	COIL, RADIO FREQUENCY	EA	1
B-56	98	PAHZZ	5905-00-116-8562	RCR20G361JS	81349	RESISTOR, FIXED, COMPOSITION: 360 OHMS, PORM 5%, .5 WATT	EA	1
B-56	99	PAHZZ	5905-00-106-1282	RCR20G223JS	81349	RESISTOR, FIXED, COMPOSITION: 22K OHMS, PORM 5%, .5 WATT	EA	1
B-56	100	PAHZZ	5910-00-845-9311	P8292ZN24	00656	CAPACITOR, FIXED, PAPER DIELECTRIC: 0.01 UF, 600 VDCW, PORM 20%	EA	1
B-56	101	XDHZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE: NO. 4-40 X 5/16 IN. LG	EA	2
B-56	102	XDHZZ		GD4940-2	70117	WIRING HARNESS ASSEMBLY	EA	1
B-56	103	PAHZZ	5935-00-258-5811	26-4100-16P	02660	CONNECTOR, RECEPTACLE, ELECTRICAL	EA	1
B-56	104	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY: 30 IN. LG	EA	1

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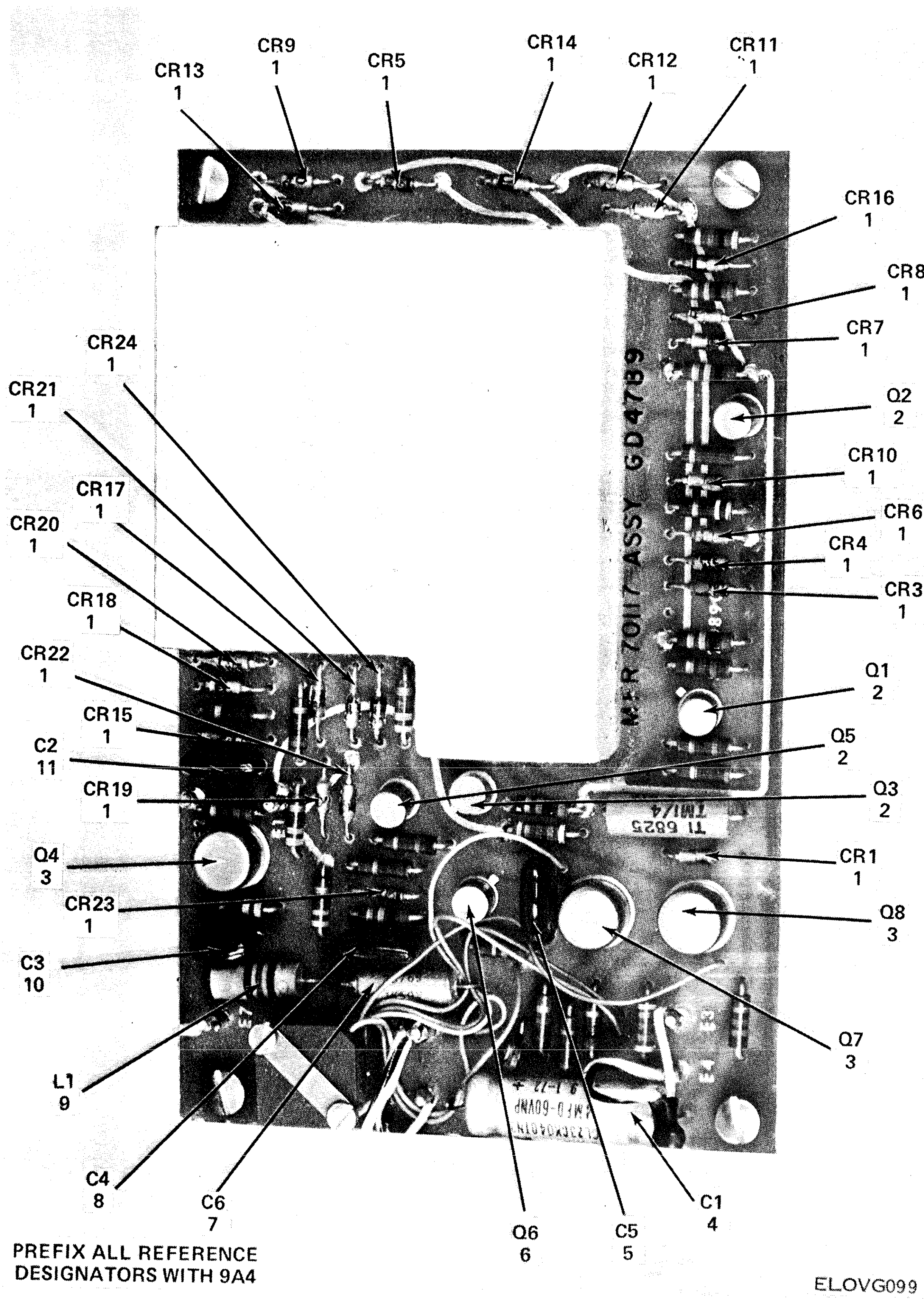

Figure B-57. ① Calibrate control assembly (sheet 1 of 2).

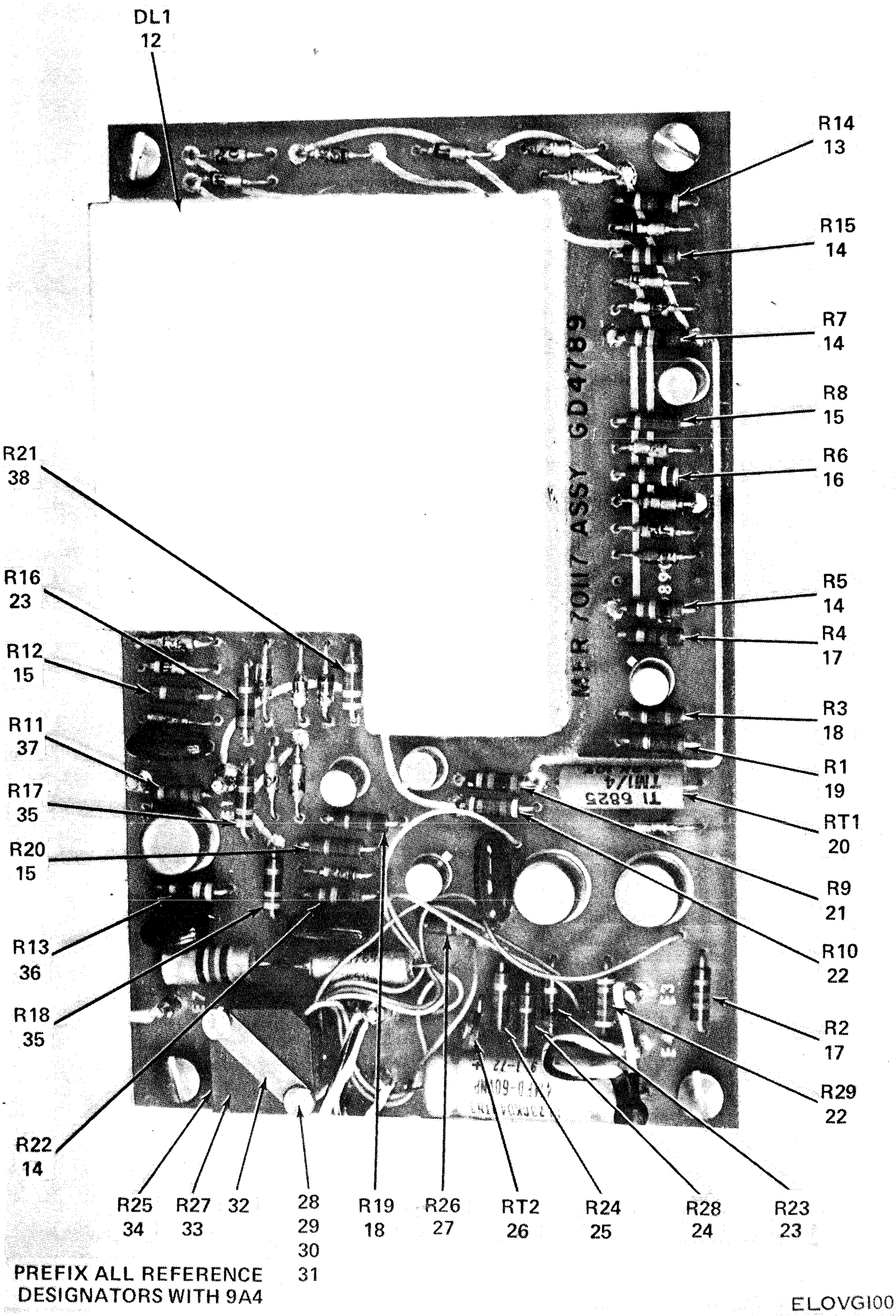

Figure B-57. ② Calibrate control assembly (sheet 2 of 2).

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-57		XDHHH		GD4789	70117	CALIBRATION CONTROL ASSEMBLY (SEE FIGURE B-54 FOR NHA)	EA	REF
B-57	1	PAHZZ	5961-00-814-0768	1N3064	81349	SEMICONDUCTOR DEVICE, DIODE	EA	23
B-57	2	PAHZZ	5961-00-926-0135	2N2481	81349	TRANSISTOR	EA	4
B-57	3	PAHZZ	5961-00-837-7262	2N697	81349	TRANSISTOR	EA	1
B-57	4	PAHZZ	5910-00-080-7538	CL23CK040TN3	81349	CAPACITOR, FIXED, ELECTROLYTIC: 6 OV 4 UF PLUS 50%, MINUS 15%	EA	1
B-57	5	PAHZZ	5910-00-995-0614	CM05D221J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 220 PF, 500 V PORM 5%	EA	1
B-57	6	PAHZZ	5961-00-946-2023	2N2906	81349	TRANSISTOR	EA	1
B-57	7	PAHZZ	5910-00-007-2004	CS13BG475K	81349	CAPACITOR, FIXED, ELECTROLYTIC: 4.7 UF, 500 V, PORM 10%	EA	1
B-57	8	PAHZZ	5910-00-051-4612	CM05D220J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 22 PF, MINUS 500 V, PORM 5%	EA	1
B-57	9	PAHZZ	5950-00-892-8209	MS75008-41	96906	COIL, RADIO FREQUENCY: 12 UH MOULDED	EA	1
B-57	10	PAHZZ	5910-00-702-8057	CM05FD331G03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 330 PF, 500 V, PORM 5%	EA	1
B-57	11	PAHZZ	5910-00-044-4355	CM05D470J03	81349	CAPACITOR, FIXED, MICA DIELECTRIC: 47 PF, 500 V, PORM 5%	EA	1
B-57	12	PAHZZ	6625-00-628-7248	GD4788	70117	DELAY, LINE	EA	1
B-57	13	PAHZZ	5905-00-111-4750	RCR07G301JS	81349	RESISTOR, FIXED, COMPOSITION: 300 OHMS, PORM 5%, .25 WATT	EA	1
B-57	14	PAHZZ	5905-00-106-3666	RCR07G103JS	81349	RESISTOR, FIXED, COMPOSITION: 10K OHMS, PORM 5%, .25 WATT	EA	4
B-57	15	PAHZZ	5905-00-105-7764	RCR07G222JS	81349	RESISTOR, FIXED, COMPOSITION: 2,200 OHMS, PORM 5%, .25 WATT	EA	3
B-57	16	PAHZZ	5905-00-141-0743	RCR07G392JS	81349	RESISTOR, FIXED, COMPOSITION: 3,900 OHMS, PORM 5%, .25 WATT	EA	1
B-57	17	PAHZZ	5905-00-119-3503	RCR07G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .25 WATT	EA	2
B-57	18	PAHZZ	5905-00-111-4727	RCR07G272JS	81349	RESISTOR, FIXED, COMPOSITION: 2,700 OHMS, PORM 5%, .25 WATT	EA	2
B-57	19	PAHZZ	5905-00-104-8358	RCR07G822JS	81349	RESISTOR, FIXED, COMPOSITION: 8,200 OHMS, PORM 5%, .25 WATT	EA	1
B-57	20	PAHZZ	5905-00-416-5981	TM1-4-8200-OHMS1-4WFORM10PCT	06228	RESISTOR, THERMAL: 8,200 OHMS, PORM 10%, .25 WATT	EA	1
B-57	21	PAHZZ	5905-00-141-1183	RCR07G101JS	81349	RESISTOR, FIXED, COMPOSITION: 100 OHMS, PORM 5%, .25 WATT	EA	1
B-57	22	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	2
B-57	23	PAHZZ	5905-00-110-7620	RCR07G102JS	81349	RESISTOR, FIXED, COMPOSITION: 1,000 OHMS, PORM 5%, .25 WATT	EA	2
B-57	24	PAHZZ	5905-00-106-1356	RCR07G152JS	81349	RESISTOR, FIXED, COMPOSITION: 1,500 OHMS, PORM 5%, .25 WATT	EA	1
B-57	25	PAHZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 5%, .25 WATT	EA	1
B-57	26	PAHZZ	5905-00-900-6988	KB21J1	02606	RESISTOR, THERMAL: 100 OHMS, PORM 10%, 25° C	EA	1

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-57	27	PAHZZ	5905-00-119-8811	RCR07G151JS	81349	RESISTOR, FIXED, COMPOSITION: 150 OHMS, PORM 5%, .25 WATT	EA	1
B-57	28	PAHZZ	5305-00-054-5642	MS35233-8	96906	SCREW, MACHINE: NO. 2-56 X 5/8 IN. LG	EA	2
B-57	29	XDHZZ	5310-00-938-2013	MS35649-224	96906	NUT, PLAIN HEX: NO. 2-56	EA	
B-57	30	XDHZZ	5310-00-928-2690	MS35338-134	96906	WASHER, LOCK, SPRING: NO. 2, CRES	EA	2
B-57	31	XDHZZ	5310-00-595-6761	MS15795-802	96906	WASHER, FLAT: NO. 2, CRES	EA	2
B-57	32	XDHZZ	5905-00-957-1998	H25	80294	BRACKET	EA	1
B-57	33	PAHZZ	5905-00-140-6150	RT22C2L501	81349	RESISTOR, VARIABLE: 500 OHMS	EA	1
B-57	34	PAHZZ	5905-00-486-9005	RT22C2L102	81349	RESISTOR, VARIABLE: 1,000 OHMS	EA	1
B-57	35	PAHZZ	5905-00-126-6683	RCR07G332JS	81349	RESISTOR, FIXED, COMPOSITION: 3,300 OHMS, PORM 5%, .25 WATT	EA	2
B-57	36	PAHZZ	5905-00-135-6045	RCR07G330JS	81349	RESISTOR, FIXED, COMPOSITION: 33 OHMS, PORM 5%, .25 WATT	EA	1
B-57	37	PAHZZ	5905-00-111-4845	RCR07G201JS	81349	RESISTOR, FIXED, COMPOSITION: 200 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-135-3973	RCR07G221JS	81349	RESISTOR, FIXED, COMPOSITION: 220 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-435-1718	RCR07G241JS	81349	RESISTOR, FIXED, COMPOSITION: 240 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-119-3503	RCR07G271JS	81349	RESISTOR, FIXED, COMPOSITION: 270 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-111-4750	RCR07G301JS	81349	RESISTOR, FIXED, COMPOSITION: 300 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-114-0710	RCR07G331JS	81349	RESISTOR, FIXED, COMPOSITION: 330 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-104-8370	RCR07G361JS	81349	RESISTOR, FIXED, COMPOSITION: 360 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-121-9932	RCR07G391JS	81349	RESISTOR, FIXED, COMPOSITION: 430 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-135-3974	RCR07G431JS	81349	RESISTOR, FIXED, COMPOSITION: 430 OHMS, PORM 5%, .25 WATT	EA	1
						OR		
B-57	37	PAHZZ	5905-00-120-9154	RCR07G471JS	81349	RESISTOR, FIXED, COMPOSITION: 470 OHMS, PORM 5%, .25 WATT	EA	1

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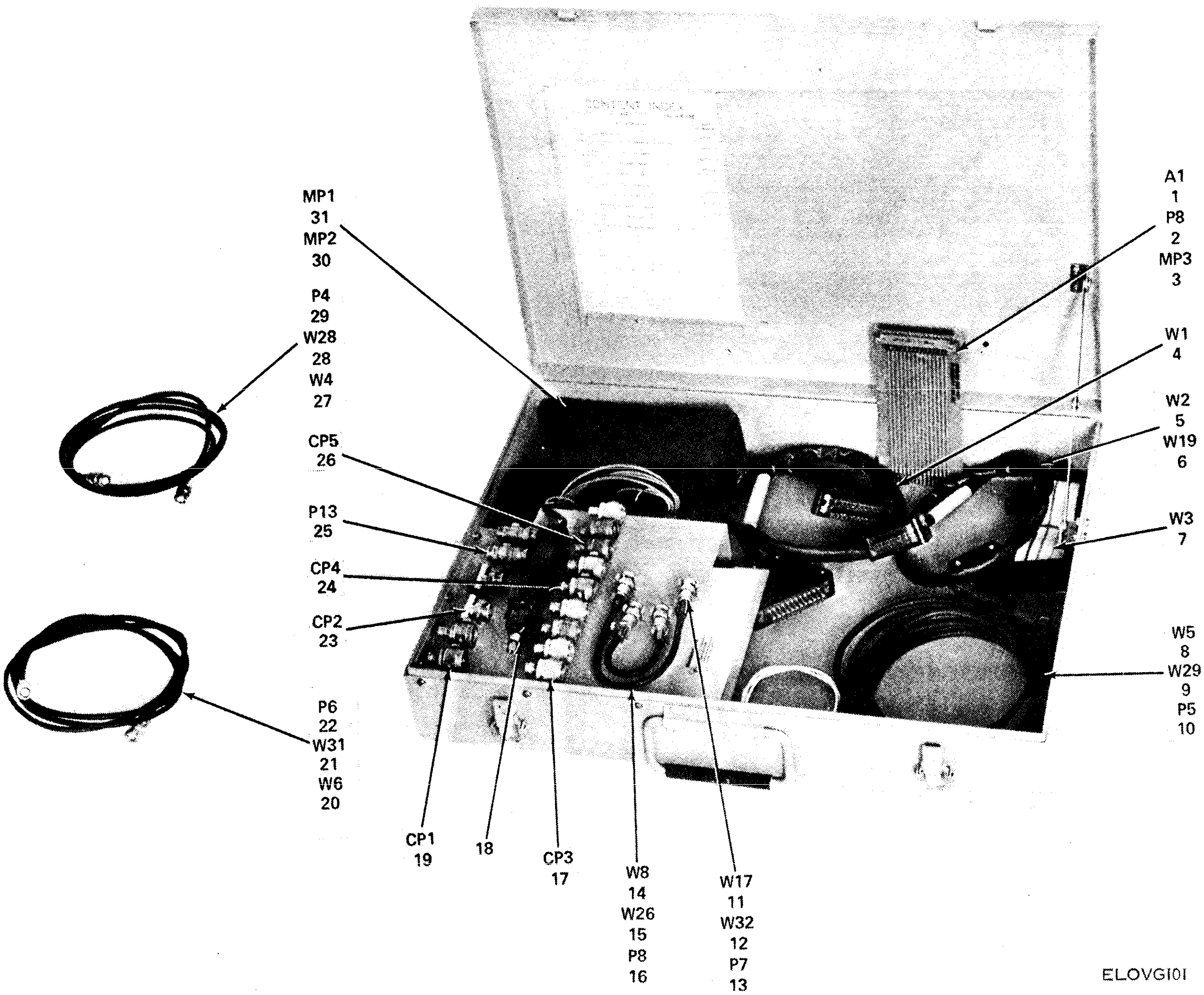
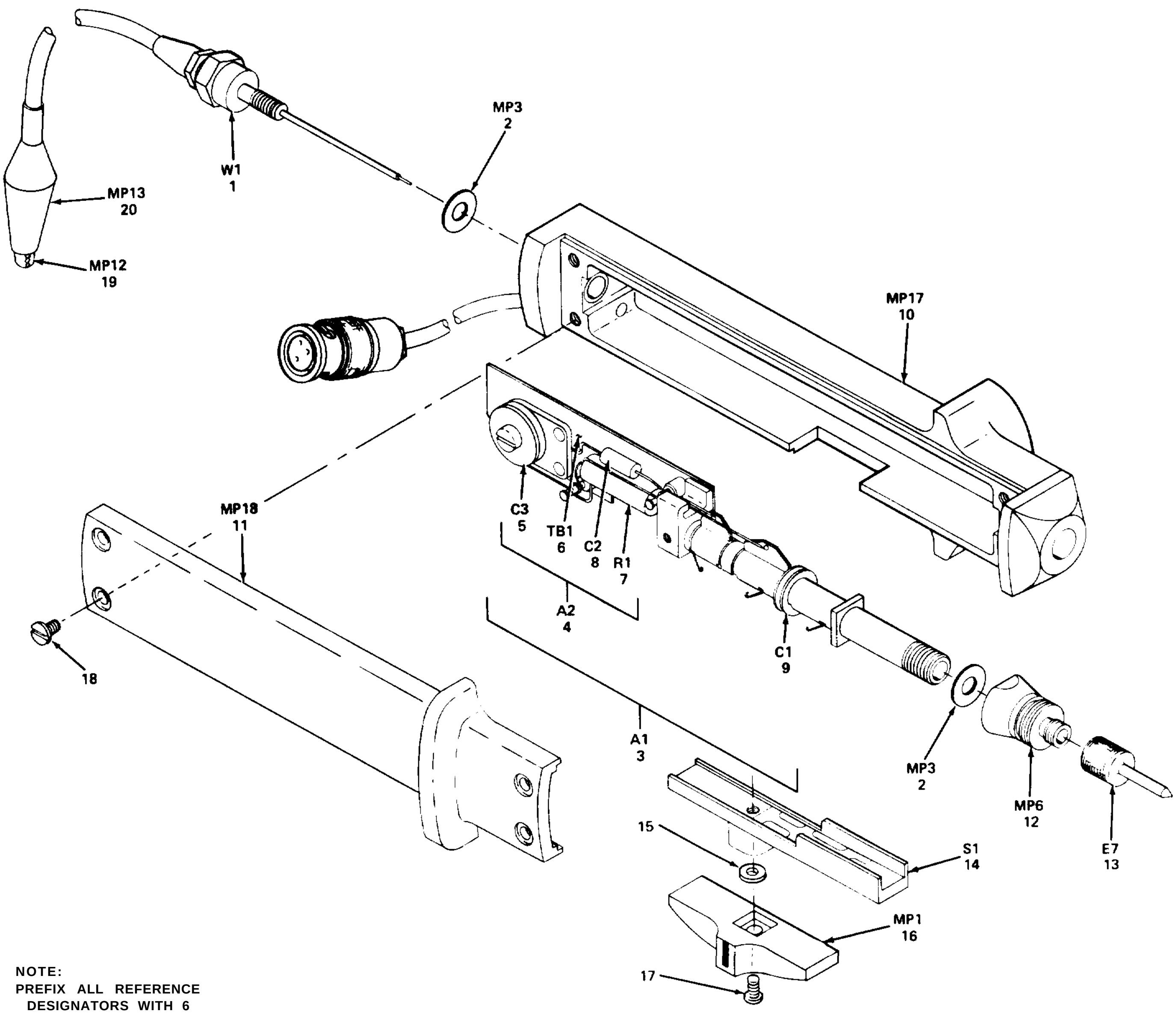


Figure B-58. Accessories.

SECTION IV REPAIR PARTS LIST (CONTINUED)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 04 - ACCESSORIES		
B-58	1	PAHZZ	6625-00-116-7361	GB4825	70117	ADAPTER, TEST	EA	1
B-58	2	PAHZZ	5935-00-105-7669	80-6030-3406-00	95354	CONNECTOR, PLUG, ELECTRICAL	EA	1
B-58	3	PAHZZ	5935-00-942-7818	M21097-11-02	96906	KEY, CONNECTOR	EA	1
B-58	4	PAHZZ	5995-00-889-1047	GD2530-6	70117	CABLE ASSEMBLY, SPECIAL ELECTRICAL, CX-4963/UPM	EA	1
B-58	5	PAHZZ	5995-00-889-1048	GD2531-3	70117	CABLE ASSEMBLY, SPECIAL ELECTRICAL, CX-6092/U	EA	1
B-58	6	PAHZZ	6145-00-984-6262	RG179BU	81349	CABLE, RADIO FREQUENCY	EA	1
B-58	7	PAHZZ	6625-00-793-2142	GD2392-4	70117	CABLE ASSEMBLY, SPECIAL ELECTRICAL, CX-4964/UPM	EA	1
B-58	8	XDHHH		GC2026-26	70117	CABLE ASSEMBLY, RADIO FREQUENCY, CG-409E/U	EA	1
B-58	9	PAHZZ	6145-00-542-6092	RG58CU	81349	CABLE, RADIO FREQUENCY	EA	1
B-58	10	PAHZZ	5935-00-823-0487	UG88EU	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-58	11	PAHZZ	5995-00-179-8365	GC2026-28	70117	CABLE ASSEMBLY, RADIO FREQUENCY, CG-530 F/U	EA	1
B-58	12	PAHZZ	6145-00-161-0913	RG62AU	81349	CABLE, RADIO FREQUENCY	EA	1
B-58	13	PAHZZ	5935-00-850-9157	M39012-16-0002	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-58	14	XDHHH	5995-00-889-1049	CG2026-3	70117	CABLE ASSEMBLY, RADIO FREQUENCY, CG-1848/U	EA	1
B-58	15	PAHZZ	6145-00-681-7849	RG223U	81349	CABLE, RADIO FREQUENCY	EA	1
B-58	16	PAHZZ	5935-00-823-0487	UG88EU	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-58	17	PAHZZ	5935-00-557-9862	UG636AU	81349	ADAPTER, CONNECTOR	EA	4
B-58	18	PAHHH	6625-00-870-7053	MX2681UP	80058	LEAD, TEST, MX-2681/UPM (SEE FIGURE B-59 FOR BREAKDOWN)	EA	1
B-58	19	PAHZZ	5935-00-149-3535	UG309U	81349	ADAPTER, CONNECTOR	EA	2
B-58	20	XDHHH		GC2026-27	70117	CABLE ASSEMBLY, RADIO FREQUENCY, CG-530F/U	EA	4
B-58	21	PAHZZ	6145-00-161-0913	RG62AU	81349	CABLE, RADIO FREQUENCY	EA	1
B-58	22	PAHZZ	5935-00-850-9157	M39012-16-0002	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-58	23	PAHZZ	5935-00-683-7892	UG274BU	81349	ADAPTER, CONNECTOR	EA	2
B-58	24	PAHZZ	5935-00-842-9614	UG201AU	81349	ADAPTER, CONNECTOR	EA	2
B-58	25	PAHZZ	5935-00-257-8018	588B87-2	70117	DUMMY LOAD, ELECTRICAL, DA-232/U	EA	2
B-58	26	PAHZZ		UG273U	70117	ADAPTER, CONNECTOR	EA	3
B-58	27	XDHHH		GC2026-25	70117	CABLE ASSEMBLY, RADIO FREQUENCY, CG-409E/U	EA	2
B-58	28	PAHZZ	6145-00-542-6092	RG58CU	81349	CABLE, RADIO FREQUENCY	EA	1
B-58	29	PAHZZ	5935-00-823-0487	UG88EU	81349	CONNECTOR, PLUG, ELECTRICAL	EA	2
B-58	30	PAHZZ	4730-00-961-8909	511B44	70117	CLAMP, VISOR	EA	1
B-58	31	XDHZZ		512D144-3	70117	VISOR, CRT, MX-2593/UPM	EA	1



NOTE:
PREFIX ALL REFERENCE
DESIGNATORS WITH 6

Figure B-59. Test Lead MX-2681/UP.

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) UNIT OF MEAS	(8) QTY INC IN UNIT
B-59		PAHHH	6625-00-870-7053	MX2681UP		TEST LEAD, MX-2681/UP (SEE FIGURE B-58 FOR NHA)	EA	1
B-59	1	PAHZZ	6625-00-135-9122	GC1483	70117	CABLE ASSEMBLY, RADIO FREQUENCY	EA	1
B-59	2	PAHZZ	5330-00-260-9311	010-9078D	25184	GASKET	EA	2
B-59	3	XDHZZ		GB1679	70117	TEST LEAD SUBASSEMBLY	EA	1
B-59	4	XDHZZ		GB1680	70117	TEST LEAD SUBASSEMBLY	EA	1
B-59	5	PAHZZ		557-038N750-8-50	72982	CAPACITOR, VARIABLE, CERAMIC DIELECTRIC	EA	1
B-59	6	XDHZZ		GB1677	70117	TERMINAL BOARD	EA	1
B-59	7	PAHZZ	5905-00-085-0459	560C29-99	70117	RESISTOR, FIXED, COMPOSITION	EA	1
B-59	8	PAHZZ	5910-00-137-1041	M23269-01-3061	81349	CAPACITOR, FIXED, GLASS DIELECTRIC	EA	1
B-59	9	PAHZZ	5910-00-474-3851	GB2525	70117	CAPACITOR, VARIABLE, GLASS DIELECTRIC	EA	1
B-59	10	PAHZZ	6625-00-474-3858	534J22-1	70117	BODY, PROBE	EA	1
B-59	11	PAHZZ	6625-00-628-8975	534J22-2	70117	BODY, PROBE	EA	1
B-59	12	PAHZZ	6625-00-820-0116	527B455	70117	TIP, TEST PROD	EA	1
B-59	13	PAHZZ	6625-00-628-8995	527B91	70117	TIP, TEST PROD	EA	1
B-59	14	PAHZZ	5999-00-713-8475	GB1502	70117	CONTACT, ELECTRICAL	EA	1
B-59	15	XDHZZ		505D1-4	70117	WASHER, NONMETALLIC	EA	1
B-59	16	PAHZZ	5355-00-474-3856	533C93	70117	KNOB	EA	1
B-59	17	XDHZZ	5305-00-416-6037	501C68-3	70117	SCREW, NYLON	EA	1
B-59	18	XDHZZ		501C68-5	70117	SCREW, MACHINE	EA	6
B-59	19	PAHZZ	5999-00-195-9699	60	76545	CLIP, ELECTRICAL	EA	1
B-59	20	PAHZZ	5975-00-503-1440	62	76543	INSULATOR HOOD	EA	1

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SECTION VI NATIONAL STOCK NUMBER AND PART NUMBER INDEX

NOTE: LATEST NATIONAL STOCK NUMBER ASSIGNMENTS ARE INCLUDED AT END OF INDEX

STOCK NUMBER	FIG. NO.	ITEM NO.
3010-00-818-2347	B-2	55
3020-00-020-1307	B-48	32
3020-00-020-1308	B-48	28
3020-00-065-0118	B-13	9
3020-00-370-1797	B-44	14
3020-00-565-1673	B-48	26
3020-00-565-1674	B-48	30
3020-00-779-0839	B-48	27
3020-00-779-0840	B-48	23
3020-00-788-8606	B-48	31
3040-00-383-0472	B-51	44
3110-00-155-8416	B-51	45
3110-00-155-8432	B-52	43
3110-00-155-8432	B-53	4
3120-00-887-0562	B-20	18
4140-00-106-0117	B-31	29
4730-00-961-8909	B-58	30
5305-00-022-7058	B-3	5
5305-00-022-7058	B-29	50
5305-00-043-2544	B-39	23
5305-00-043-2245	B-8	3
5305-00-054-5636	B-53	39
5305-00-054-5637	B-2	7
5305-00-054-5637	B-49	4
5305-00-054-5642	B-57	28
5305-00-054-5646	B-39	54
5305-00-054-5647	B-2	64
5305-00-054-5647	B-5	2
5305-00-054-5647	B-9	22
5305-00-054-5647	B-14	42
5305-00-054-5647	B-21	5
5305-00-054-5647	B-22	2
5305-00-054-5647	B-47	7
5305-00-054-5647	B-54	11
5305-00-054-5647	B-56	24
5305-00-054-5648	B-9	27
5305-00-054-5648	B-13	20
5305-00-054-5648	B-14	19
5305-00-054-5648	B-21	16
5305-00-054-5648	B-29	15
5305-00-054-5648	B-39	22
5305-00-054-5648	B-43	8
5305-00-054-5648	B-49	8
5305-00-054-5648	B-56	101
5305-00-054-5649	B-5	33
5305-00-054-5649	B-39	62
5305-00-054-5649	B-43	42
5305-00-054-5650	B-6	3
5305-00-054-5650	B-9	10
5305-00-054-5650	B-18	2
5305-00-054-5650	B-26	2
5305-00-054-5650	B-38	2
5305-00-054-5650	B-43	14
5305-00-054-5651	B-55	3
5305-00-054-5652	B-49	16
5305-00-054-5653	B-47	54
5305-00-054-6650	B-2	34
5305-00-054-6650	B-5	61
5305-00-054-6650	B-9	4
5305-00-054-6651	B-29	45
5305-00-054-6651	B-35	42
5305-00-054-6652	B-2	36
5305-00-054-6652	B-10	2
5305-00-054-6652	B-28	19
5305-00-054-6652	B-32	4
5305-00-054-6652	B-43	36
5305-00-054-6653	B-4	4
5305-00-054-6653	B-9	17
5305-00-054-6653	B-13	2
5305-00-054-6653	B-20	5
5305-00-054-6653	B-29	11
5305-00-054-6653	B-31	41
5305-00-054-6653	B-35	45
5305-00-054-6653	B-47	47
5305-00-054-6653	B-54	2
5305-00-054-6656	B-2	66
5305-00-054-6656	B-31	24
5305-00-054-6669	B-43	50
5305-00-054-6670	B-43	49
5305-00-054-6670	B-48	13
5305-00-054-6681	B-47	60
5305-00-071-1315	B-31	44
5305-00-071-2099	B-35	34
5305-00-206-3951	B-51	28
5305-00-282-5806	B-51	43
5305-00-282-5806	B-52	10
5305-00-282-8524	B-34	28
5305-00-282-8524	B-44	1
5305-00-416-6037	B-59	17
5305-00-637-5964	B-44	18
5305-00-655-7438	B-43	2
5305-00-717-6950	B-48	22
5305-00-717-6955	B-48	29
5305-00-763-6962	B-29	62
5305-00-763-6963	B-9	75

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5305-00-763-6963	B-14	25
5305-00-764-0066	B-43	51
5305-00-770-2579	B-2	27
5305-00-947-2169	B-5	44
5310-00-058-3599	B-55	7
5310-00-081-8087	B-31	27
5310-00-167-1374	B-52	21
5310-00-208-3786	B-44	11
5310-00-209-1366	B-5	50
5310-00-209-1366	B-14	27
5310-00-209-1366	B-20	14
5310-00-275-1785	B-31	49
5310-00-335-5513	B-52	22
5310-00-392-8219	B-52	58
5310-00-392-8227	B-51	30
5310-00-543-4652	B-49	5
5310-00-550-3715	B-5	4
5310-00-550-3715	B-9	24
5310-00-550-3715	B-21	6
5310-00-550-3715	B-29	16
5310-00-550-3715	B-47	9
5310-00-550-3715	B-56	25
5310-00-582-5677	B-31	46
5310-00-582-5677	B-35	35
5310-00-595-6211	B-4	13
5310-00-595-6211	B-5	34
5310-00-595-6211	B-13	17
5310-00-595-6211	B-14	69
5310-00-595-6211	B-20	29
5310-00-595-6211	B-22	4
5310-00-595-6211	B-28	15
5310-00-595-6211	B-34	27
5310-00-595-6211	B-43	10
5310-00-595-6211	B-49	15
5310-00-595-6761	B-57	31
5310-00-616-3555	B-31	38
5310-00-616-3555	B-52	37
5310-00-616-3555	B-53	10
5310-00-619-1148	B-22	12
5310-00-619-1148	B-47	41
5310-00-639-7431	B-53	14
5310-00-655-9401	B-14	32
5310-00-656-0317	B-47	55
5310-00-672-2178	B-21	57
5310-00-672-2178	B-56	3
5310-00-722-5998	B-2	37
5310-00-722-5998	B-4	6
5310-00-722-5998	B-5	62
5310-00-722-5998	B-9	14

STOCK NUMBER	FIG. NO.	ITEM NO.
5310-00-722-5998	B-13	4
5310-00-722-5998	B-20	7
5310-00-722-5998	B-24	16
5310-00-722-5998	B-29	13
5310-00-722-5998	B-31	3
5310-00-722-5998	B-31	26
5310-00-722-5998	B-43	33
5310-00-722-5998	B-54	3
5310-00-725-4719	B-29	8
5310-00-811-3494	B-29	22
5310-00-837-8435	B-29	7
5310-00-857-0721	B-52	67
5310-00-880-5978	B-20	4
5310-00-880-5978	B-29	39
5310-00-880-5978	B-31	18
5310-00-880-5978	B-43	54
5310-00-880-5978	B-47	20
5310-00-903-5575	B-2	17
5310-00-903-5575	B-9	67
5310-00-928-2690	B-51	19
5310-00-928-2690	B-53	38
5310-00-928-2690	B-53	49
5310-00-928-2690	B-57	30
5310-00-929-6395	B-2	33
5310-00-929-6395	B-4	5
5310-00-929-6395	B-5	49
5310-00-929-6395	B-9	5
5310-00-929-6395	B-9	68
5310-00-929-6395	B-10	3
5310-00-929-6395	B-13	3
5310-00-929-6395	B-14	26
5310-00-929-6395	B-20	6
5310-00-929-6395	B-24	17
5310-00-929-6395	B-28	20
5310-00-929-6395	B-29	12
5310-00-929-6395	B-31	4
5310-00-929-6395	B-32	5
5310-00-929-6395	B-34	16
5310-00-929-6395	B-43	32
5310-00-929-6395	B-47	48
5310-00-929-6395	B-48	3
5310-00-929-6395	B-52	39
5310-00-929-6395	B-54	4
5310-00-933-8119	B-29	24
5310-00-933-8119	B-29	38
5310-00-933-8119	B-31	19
5310-00-933-8119	B-43	53
5310-00-933-8119	B-47	19
5310-00-933-8119	B-48	15

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5310-00-933-8119	B-48	18
5310-00-933-8119	B-52	27
5310-00-933-8120	B-11	5
5310-00-933-8120	B-22	11
5310-00-933-8120	B-45	5
5310-00-933-8120	B-47	40
5310-00-934-9748	B-2	28
5310-00-934-9748	B-3	3
5310-00-934-9748	B-5	35
5310-00-934-9748	B-9	13
5310-00-934-9748	B-9	28
5310-00-934-9748	B-14	20
5310-00-934-9748	B-20	27
5310-00-934-9748	B-21	17
5310-00-934-9748	B-28	13
5310-00-934-9748	B-29	51
5310-00-934-9748	B-34	23
5310-00-934-9748	B-35	60
5310-00-934-9748	B-39	11
5310-00-934-9748	B-43	11
5310-00-934-9748	B-49	13
5310-00-934-9748	B-56	1
5310-00-934-9759	B-29	23
5310-00-934-9759	B-31	20
5310-00-934-9759	B-47	18
5310-00-934-9759	B-48	14
5310-00-934-9761	B-4	21
5310-00-934-9761	B-13	13
5310-00-934-9765	B-11	6
5310-00-934-9765	B-47	42
5310-00-938-2013	B-49	3
5310-00-938-2013	B-57	29
5315-00-286-4888	B-2	56
5315-00-027-0322	B-29	9
5325-00-171-5733	B-29	77
5325-00-229-3696	B-2	23
5325-00-286-6047	B-2	65
5325-00-286-6047	B-5	63
5325-00-286-6047	B-6	1
5325-00-286-6047	B-9	47
5325-00-286-6047	B-29	28
5325-00-286-6047	B-35	4
5325-00-286-6047	B-47	10
5325-00-619-7261	B-5	65
5325-00-813-5390	B-2	63
5325-00-813-5390	B-5	67
5330-00-260-9311	B-59	2
5330-00-618-6025	B-22	13
5330-00-874-7748	B-43	55
5330-00-874-7749	B-31	39
5330-00-892-4173	B-2	10
5330-00-892-4176	B-2	13
5330-00-892-4185	B-43	47
5330-00-961-6694	B-31	51
5340-00-229-3671	B-47	12
5340-00-229-3676	B-14	65
5340-00-229-3676	B-56	20
5340-00-416-9292	B-9	12
5340-00-474-3982	B-14	46
5340-00-754-2324	B-28	8
5340-00-754-2324	B-43	1
5340-00-813-5391	B-5	66
5340-00-857-3613	B-31	42
5355-00-177-5233	B-34	10
5355-00-229-0438	B-34	7
5355-00-229-0439	B-34	12
5355-00-229-0441	B-34	9
5355-00-229-0442	B-34	11
5355-00-229-0445	B-34	6
5355-00-229-0446	B-34	13
5355-00-473-5857	B-13	5
5355-00-474-3837	B-2	44
5355-00-474-3843	B-13	7
5355-00-474-3856	B-59	16
5355-00-519-9375	B-24	6
5355-00-576-5470	B-2	3
5355-00-576-5470	B-12	1
5355-00-576-5470	B-15	3
5355-00-576-5470	B-24	10
5355-00-576-5470	B-55	19
5355-00-614-0400	B-43	25
5355-00-616-9604	B-43	24
5355-00-668-4634	B-24	5
5355-00-739-8152	B-2	1
5355-00-739-8153	B-43	13
5355-00-753-5164	B-2	2
5355-00-819-0067	B-2	5
5355-00-819-0067	B-12	2
5355-00-819-0067	B-15	2
5355-00-819-0067	B-24	11
5355-00-819-0067	B-34	8
5355-00-819-0067	B-55	18
5355-00-867-3590	B-43	15
5355-00-867-3591	B-43	12
5355-00-978-9044	B-24	13
5355-00-985-1989	B-24	12
5360-00-333-3392	B-45	2

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5360-00-474-3850	B-28	10
5360-00-474-3850	B-43	43
5360-00-739-1367	B-20	21
5360-00-739-1367	B-34	5
5360-00-739-1370	B-5	56
5360-00-820-0113	B-26	5
5360-00-820-0113	B-38	5
5365-00-200-6707	B-48	24
5365-00-598-1774	B-52	42
5365-00-598-1774	B-53	5
5365-00-721-7680	B-28	11
5821-00-473-1639	B-18	6
5840-00-027-8968	B-56	4
5840-00-027-8969	B-21	55
5840-00-027-8970	B-14	34
5840-00-774-9698	B-26	1
5840-00-774-9698	B-38	1
5840-00-820-0115	B-2	12
5840-00-820-1619	B-2	11
5845-00-309-2455	B-45	15
5905-00-001-3031	B-14	15
5905-00-001-3031	B-21	97
5905-00-005-2867	B-9	107
5905-00-005-2867	B-21	19
5905-00-005-2868	B-9	79
5905-00-009-2980	B-7	17
5905-00-052-1794	B-41	6
5905-00-085-0459	B-59	7
5905-00-104-5755	B-21	67
5905-00-104-5756	B-3	8
5905-00-104-5756	B-4	22
5905-00-104-5756	B-5	8
5905-00-104-5756	B-14	85
5905-00-104-5756	B-14	109
5905-00-104-5756	B-56	51
5905-00-104-4756	B-56	74
5905-00-104-8330	B-9	100
5905-00-104-8330	B-21	70
5905-00-104-8330	B-56	7
5905-00-104-8330	B-56	65
5905-00-104-8332	B-55	1
5905-00-104-8333	B-14	114
5905-00-104-8334	B-14	103
5905-00-104-8334	B-17	5
5905-00-104-8334	B-21	68
5905-00-104-8334	B-21	84
5905-00-104-8334	B-50	11
5905-00-104-8335	B-56	73
5905-00-104-8336	B-3	11
5905-00-104-8336	B-9	112
5905-00-104-8336	B-9	117
5905-00-104-8336	B-12	20
5905-00-104-8336	B-14	105
5905-00-104-8336	B-21	74
5905-00-104-8336	B-29	72
5905-00-104-8336	B-56	17
5905-00-104-8337	B-14	100
5905-00-104-8339	B-56	88
5905-00-104-8340	B-14	88
5905-00-104-8345	B-14	113
5905-00-104-8346	B-9	106
5905-00-104-8346	B-9	129
5905-00-104-8346	B-56	58
5905-00-104-8346	B-56	68
5905-00-104-8347	B-35	76
5905-00-104-8348	B-21	87
5905-00-104-8350	B-9	127
5905-00-104-8350	B-21	102
5905-00-104-8351	B-14	115
5905-00-104-8352	B-9	123
5905-00-104-8358	B-50	5
5905-00-104-8358	B-57	19
5905-00-104-8368	B-36	2
5905-00-104-8368	B-39	7
5905-00-104-8368	B-39	60
5905-00-104-8368	B-40	12
5905-00-104-8368	B-41	20
5905-00-104-8370	B-57	37
5905-00-105-7564	B-35	2
5905-00-105-7565	B-35	6
5905-00-105-7764	B-22	32
5905-00-105-7764	B-27	30
5905-00-105-7764	B-35	30
5905-00-105-7764	B-36	15
5905-00-105-7764	B-40	14
5905-00-105-7764	B-41	12
5905-00-105-7764	B-50	28
5905-00-105-7764	B-53	40
5905-00-105-7767	B-50	25
5905-00-105-7768	B-40	9
5905-00-105-7768	B-40	21
5905-00-106-1245	B-21	83
5905-00-106-1249	B-40	22
5905-00-106-1249	B-41	20
5905-00-106-1273	B-9	122
5905-00-106-1273	B-14	117
5905-00-106-1273	B-56	67
5905-00-106-1278	B-27	14
5905-00-106-1278	B-40	5
5905-00-106-1278	B-41	9

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STOCK NUMBER	FIG. NO.	ITEM NO.
5905-00-106-1278	B-50	34
5905-00-106-1282	B-56	54
5905-00-106-1282	B-56	99
5905-00-106-1356	B-22	33
5905-00-106-1356	B-39	28
5905-00-106-1356	B-40	13
5905-00-106-1356	B-41	4
5905-00-106-1356	B-57	24
5905-00-106-3666	B-22	30
5905-00-106-3666	B-27	10
5905-00-106-3666	B-40	6
5905-00-106-3666	B-41	1
5905-00-106-3666	B-50	33
5905-00-106-3666	B-57	14
5905-00-106-3668	B-36	5
5905-00-106-9344	B-4	16
5905-00-106-9344	B-5	15
5905-00-106-9344	B-9	36
5905-00-106-9344	B-12	27
5905-00-106-9344	B-14	44
5905-00-106-9344	B-21	71
5905-00-106-9344	B-29	74
5905-00-106-9344	B-47	30
5905-00-106-9344	B-56	53
5905-00-106-9345	B-14	125
5905-00-106-9345	B-29	59
5905-00-106-9348	B-4	19
5905-00-106-9348	B-5	27
5905-00-106-9348	B-9	49
5905-00-106-9348	B-14	107
5905-00-106-9348	B-21	93
5905-00-106-9348	B-47	67
5905-00-106-9348	B-47	71
5905-00-106-9348	B-56	72
5905-00-106-9351	B-14	98
5905-00-106-9351	B-21	92
5905-00-106-9351	B-47	34
5905-00-106-9352	B-5	51
5905-00-106-9352	B-14	36
5905-00-107-0656	B-36	3
5905-00-107-0656	B-40	11
5905-00-107-0656	B-41	18
5905-00-108-6922	B-9	55
5905-00-108-6922	B-14	94
5905-00-110-0196	B-5	5
5905-00-110-0196	B-9	91
5905-00-110-0196	B-21	69
5905-00-110-0196	B-35	13
5905-00-110-0196	B-35	78
5905-00-110-0196	B-55	14
5905-00-110-0196	B-56	40
5905-00-110-0196	B-56	52
5905-00-110-0310	B-5	30
5905-00-110-0310	B-14	43
5905-00-110-0310	B-21	30
5905-00-110-0388	B-23	2
5905-00-110-0388	B-27	35
5905-00-110-0388	B-39	45
5905-00-110-0993	B-35	49
5905-00-110-7620	B-22	20
5905-00-110-7620	B-27	7
5905-00-110-7620	B-36	16
5905-00-110-7620	B-39	8
5905-00-110-7620	B-40	3
5905-00-110-7620	B-41	14
5905-00-110-7620	B-50	6
5905-00-110-7620	B-57	23
5905-00-110-7622	B-27	17
5905-00-110-7622	B-40	15
5905-00-110-7622	B-41	15
5905-00-111-4727	B-27	1
5905-00-111-4727	B-40	20
5905-00-111-4727	B-41	28
5905-00-111-4727	B-50	46
5905-00-111-4727	B-57	18
5905-00-111-4732	B-9	89
5905-00-111-4734	B-5	13
5905-00-111-4734	B-9	35
5905-00-111-4734	B-24	19
5905-00-111-4734	B-29	53
5905-00-111-4734	B-35	72
5905-00-111-4734	B-51	38
5905-00-111-4735	B-56	70
5905-00-111-4736	B-46	17
5905-00-111-4736	B-46	19
5905-00-111-4738	B-21	89
5905-00-111-4738	B-35	69
5905-00-111-4741	B-9	62
5905-00-111-4741	B-12	19
5905-00-111-4742	B-14	87
5905-00-111-4743	B-53	45
5905-00-111-4744	B-5	9
5905-00-111-4750	B-57	13
5905-00-111-4750	B-57	37
5905-00-111-4753	B-9	81
5905-00-111-4845	B-57	37
5905-00-111-4858	B-9	97
5905-00-111-4858	B-10	6
5905-00-111-4858	B-14	99
5905-00-111-4858	B-14	110

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

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
5905-00-111-4858	B-41	25	5905-00-115-2223	B-41	20
5905-00-111-8357	B-56	69	5905-00-115-3560	B-2	54
5905-00-111-8372	B-14	38	5905-00-115-3560	B-41	7
5905-00-111-8372	B-21	76	5905-00-115-3560	B-50	35
5905-00-111-7183	B-7	26	5905-00-116-2394	B-22	21
5905-00-113-4854	B-9	83	5905-00-116-2394	B-40	9
5905-00-113-4861	B-40	22	5905-00-116-2394	B-42	6
5905-00-113-4861	B-41	20	5905-00-116-8555	B-41	29
5905-00-113-7346	B-29	81	5905-00-116-8556	B-27	13
5905-00-113-7346	B-47	31	5905-00-116-8556	B-35	21
5905-00-114-0710	B-27	9	5905-00-116-8556	B-36	22
5905-00-114-0710	B-41	19	5905-00-116-8556	B-40	2
5905-00-114-0710	B-57	37	5905-00-116-8556	B-50	4
5905-00-114-0711	B-27	4	5905-00-116-8557	B-14	91
5905-00-114-0711	B-35	7	5905-00-116-8558	B-3	12
5905-00-114-0711	B-36	6	5905-00-116-8558	B-5	28
5905-00-114-0711	B-37	2	5905-00-116-8558	B-9	128
5905-00-114-0711	B-40	8	5905-00-116-8561	B-14	22
5905-00-114-0711	B-41	26	5905-00-116-8561	B-21	86
5905-00-114-5343	B-22	22	5905-00-116-8562	B-56	98
5905-00-114-5343	B-27	29	5905-00-116-8565	B-9	124
5905-00-114-5343	B-39	30	5905-00-116-8566	B-9	109
5905-00-114-5343	B-40	7	5905-00-116-8567	B-5	31
5905-00-114-5343	B-41	11	5905-00-116-8567	B-46	1
5905-00-114-5343	B-50	3	5905-00-116-8569	B-14	49
5905-00-114-5361	B-5	29	5905-00-116-8569	B-14	121
5905-00-114-5361	B-9	58	5905-00-116-8569	B-21	78
5905-00-114-5361	B-35	8	5905-00-116-8569	B-56	47
5905-00-114-5366	B-9	105	5905-00-116-8569	B-56	62
5905-00-114-5393	B-25	2	5905-00-118-4559	B-39	69
5905-00-114-5393	B-56	61	5905-00-119-3503	B-35	17
5905-00-114-5398	B-5	19	5905-00-119-3503	B-57	17
5905-00-114-5407	B-9	59	5905-00-119-3503	B-57	37
5905-00-114-5407	B-12	26	5905-00-119-3504	B-41	3
5905-00-114-5407	B-14	119	5905-00-119-3504	B-50	22
5905-00-114-5407	B-14	126	5905-00-119-3505	B-23	3
5905-00-114-5407	B-21	82	5905-00-119-8768	B-22	29
5905-00-114-5407	B-35	54	5905-00-119-8768	B-40	24
5905-00-114-5407	B-41	24	5905-00-119-8768	B-41	8
5905-00-114-5430	B-56	44	5905-00-119-8811	B-22	26
5905-00-114-5438	B-21	81	5905-00-119-8811	B-36	8
5905-00-114-5441	B-9	95	5905-00-119-8811	B-41	23
5905-00-114-5441	B-29	56	5905-00-119-8811	B-57	27
5905-00-114-5441	B-56	85	5905-00-120-9154	B-22	24
5905-00-114-5456	B-4	2	5905-00-120-9154	B-36	9
5905-00-114-5456	B-9	87	5905-00-120-9154	B-39	2
5905-00-114-5456	B-21	77	5905-00-120-9154	B-40	9
5905-00-114-5489	B-9	101	5905-00-120-9154	B-40	10
5905-00-114-5489	B-29	57	5905-00-120-9154	B-41	22
5905-00-114-5489	B-56	81	5905-00-120-9154	B-50	29
5905-00-115-2223	B-40	22	5905-00-120-9154	B-57	22

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STOCK NUMBER	FIG. NO.	ITEM NO.
5905-00-120-9154	B-57	37
5905-00-121-9859	B-12	7
5905-00-121-9922	B-29	79
5905-00-121-9932	B-22	31
5905-00-121-9932	B-36	18
5905-00-121-9932	B-40	4
5905-00-121-9932	B-40	9
5905-00-121-9932	B-50	14
5905-00-121-9932	B-57	37
5905-00-126-6683	B-27	11
5905-00-126-6683	B-41	17
5905-00-126-6683	B-57	35
5905-00-126-6691	B-51	23
5905-00-126-6691	B-52	36
5905-00-126-6692	B-40	22
5905-00-126-6692	B-41	20
5905-00-126-6698	B-40	22
5905-00-126-6698	B-41	20
5905-00-131-1255	B-22	25
5905-00-131-1255	B-40	23
5905-00-131-1255	B-41	30
5905-00-131-1256	B-27	27
5905-00-131-9395	B-46	14
5905-00-133-0382	B-7	24
5905-00-131-0440	B-40	22
5905-00-131-0440	B-41	20
5905-00-131-0440	B-50	9
5905-00-135-3973	B-22	23
5905-00-135-3973	B-40	1
5905-00-135-3973	B-41	27
5905-00-135-3973	B-47	45
5905-00-135-3973	B-57	25
5905-00-135-3973	B-57	37
5905-00-135-3974	B-40	9
5905-00-135-3974	B-57	37
5905-00-135-3975	B-36	20
5905-00-135-3975	B-41	20
5905-00-135-6045	B-57	36
5905-00-135-6046	B-39	19
5905-00-135-6046	B-41	21
5905-00-135-6046	B-50	16
5905-00-136-3891	B-40	9
5905-00-138-4927	B-21	96
5905-00-140-5653	B-14	90
5905-00-140-5653	B-35	75
5905-00-140-5653	B-56	71
5905-00-140-6150	B-57	33
5905-00-141-0591	B-3	10
5905-00-141-0591	B-9	64
5905-00-141-0591	B-9	113
5905-00-141-0591	B-14	24
5905-00-141-0591	B-14	118
5905-00-141-0591	B-21	38
5905-00-141-0591	B-29	73
5905-00-141-0591	B-35	37
5905-00-141-0591	B-56	45
5905-00-141-0591	B-56	78
5905-00-141-0592	B-14	112
5905-00-141-0592	B-21	75
5905-00-141-0593	B-9	34
5905-00-141-0593	B-21	91
5905-00-141-0593	B-35	55
5905-00-141-0594	B-9	94
5905-00-141-0595	B-5	20
5905-00-141-0595	B-14	123
5905-00-141-0595	B-14	124
5905-00-141-0595	B-21	28
5905-00-141-0595	B-35	29
5905-00-141-0596	B-9	54
5905-00-141-0596	B-14	106
5905-00-141-0596	B-29	64
5905-00-141-0596	B-35	73
5905-00-141-0596	B-56	39
5905-00-141-0596	B-56	91
5905-00-141-0598	B-21	80
5905-00-141-0598	B-56	87
5905-00-141-0599	B-9	92
5905-00-141-0599	B-56	57
5905-00-141-0599	B-56	60
5905-00-141-0600	B-9	61
5905-00-141-0600	B-9	125
5905-00-141-0600	B-21	99
5905-00-141-0600	B-56	43
5905-00-141-0717	B-5	39
5905-00-141-0717	B-41	13
5905-00-141-0723	B-35	51
5905-00-141-0725	B-5	25
5905-00-141-0727	B-56	96
5905-00-141-0742	B-22	28
5905-00-141-0742	B-39	29
5905-00-141-0743	B-37	3
5905-00-141-0743	B-39	27
5905-00-141-0743	B-40	16
5905-00-141-0743	B-41	16
5905-00-141-0743	B-50	13
5905-00-141-0743	B-57	16
5905-00-141-0744	B-22	35
5905-00-141-0744	B-40	19
5905-00-141-1071	B-9	90
5905-00-141-1071	B-14	37

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5905-00-141-1071	B-21	88
5905-00-141-1071	B-47	70
5905-00-141-1071	B-56	64
5905-00-141-1116	B-5	26
5905-00-141-1116	B-9	115
5905-00-141-1116	B-21	24
5905-00-141-1116	B-38	8
5905-00-141-1116	B-56	79
5905-00-141-1118	B-56	94
5905-00-141-1130	B-5	14
5905-00-141-1130	B-12	14
5905-00-141-1130	B-14	104
5905-00-141-1130	B-56	46
5905-00-141-1144	B-35	57
5905-00-141-1165	B-12	24
5905-00-141-1165	B-14	48
5905-00-141-1165	B-21	94
5905-00-141-1165	B-26	8
5905-00-141-1168	B-4	15
5905-00-141-1168	B-9	83
5905-00-141-1168	B-12	23
5905-00-141-1168	B-21	23
5905-00-141-1168	B-35	77
5905-00-141-1168	B-56	59
5905-00-141-1168	B-56	82
5905-00-141-1183	B-27	16
5905-00-141-1183	B-36	19
5905-00-141-1183	B-39	25
5905-00-141-1183	B-40	18
5905-00-141-1183	B-41	2
5905-00-141-1183	B-50	12
5905-00-141-1183	B-57	21
5905-00-141-1187	B-12	17
5905-00-141-1268	B-35	52
5905-00-141-1269	B-46	18
5905-00-145-9617	B-9	65
5905-00-145-9617	B-14	116
5905-00-146-8423	B-29	48
5905-00-147-0388	B-5	10
5905-00-147-0389	B-2	46
5905-00-147-0389	B-35	5
5905-00-152-8373	B-12	18
5905-00-160-5945	B-21	90
5905-00-175-8508	B-5	11
5905-00-175-8508	B-47	64
5905-00-184-7703	B-21	85
5905-00-185-8530	B-9	78
5905-00-195-6750	B-14	95
5905-00-195-9108	B-5	17
5905-00-201-6784	B-7	15
5905-00-204-7523	B-56	10
5905-00-222-2144	B-9	48
5905-00-228-6084	B-14	52
5905-00-228-6088	B-32	9
5905-00-233-0849	B-56	11
5905-00-233-0852	B-7	9
5905-00-233-0852	B-7	21
5905-00-233-0852	B-7	22
5905-00-233-0852	B-7	23
5905-00-235-3534	B-10	5
5905-00-235-3534	B-39	14
5905-00-236-1360	B-7	13
5905-00-244-7911	B-9	71
5905-00-247-8700	B-14	120
5905-00-247-8705	B-21	72
5905-00-247-8705	B-47	69
5905-00-247-8710	B-29	55
5905-00-247-8720	B-14	97
5905-00-247-8724	B-14	89
5905-00-247-8733	B-9	104
5905-00-247-8735	B-9	110
5905-00-247-8737	B-14	102
5905-00-247-8737	B-47	28
5905-00-247-8749	B-47	72
5905-00-247-8749	B-56	90
5905-00-250-5114	B-55	13
5905-00-252-1050	B-14	122
5905-00-279-1972	B-5	53
5905-00-285-1986	B-56	8
5905-00-286-5305	B-53	57
5905-00-308-6479	B-29	76
5905-00-329-6085	B-7	4
5905-00-340-9710	B-7	20
5905-00-340-9787	B-7	8
5905-00-341-1036	B-7	12
5905-00-369-6923	B-29	71
5905-00-369-6929	B-14	111
5905-00-400-4528	B-22	27
5905-00-407-2388	B-21	100
5905-00-416-5981	B-57	20
5905-00-430-2232	B-7	6
5905-00-430-2696	B-14	93
5905-00-430-6019	B-7	28
5905-00-433-1321	B-7	2
5905-00-433-5751	B-35	33
5905-00-435-1718	B-57	37
5905-00-435-6564	B-29	68

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STOCK NUMBER	FIG. NO.	ITEM NO.
5905-00-442-4986	B-2	49
5905-00-467-1393	B-29	67
5905-00-477-1201	B-21	101
5905-00-478-4327	B-35	48
5905-00-480-5458	B-14	96
5905-00-482-7691	B-12	12
5905-00-484-0267	B-14	101
5905-00-484-0294	B-47	68
5905-00-486-9005	B-57	34
5905-00-494-5137	B-47	36
5905-00-494-5140	B-9	96
5905-00-500-9152	B-5	21
5905-00-500-9152	B-9	108
5905-00-501-7314	B-47	35
5905-00-504-6770	B-47	63
5905-00-517-4593	B-21	14
5905-00-532-0595	B-5	24
5905-00-539-4897	B-5	58
5905-00-539-5000	B-24	8
5905-00-542-8055	B-5	57
5905-00-542-8055	B-15	8
5905-00-542-8055	B-34	35
5905-00-542-8055	B-35	22
5905-00-547-8430	B-56	13
5905-00-552-2859	B-24	9
5905-00-557-9254	B-35	14
5905-00-557-9254	B-35	18
5905-00-557-9254	B-55	11
5905-00-574-4312	B-29	66
5905-00-577-7136	B-10	1
5905-00-577-7136	B-56	34
5905-00-577-7137	B-21	32
5905-00-583-5130	B-20	12
5905-00-617-2606	B-14	39
5905-00-617-2730	B-21	34
5905-00-644-9545	B-20	11
5905-00-646-5958	B-5	59
5905-00-646-5981	B-12	16
5905-00-646-5992	B-55	25
5905-00-650-9808	B-9	88
5905-00-665-4947	B-35	50
5905-00-665-4992	B-29	27
5905-00-676-8669	B-56	32
5905-00-681-4328	B-2	45
5905-00-686-4108	B-9	2
5905-00-686-4108	B-56	33
5905-00-722-3822	B-9	3
5905-00-722-3822	B-9	85
5905-00-725-7129	B-12	13
5905-00-725-7512	B-15	10
5905-00-725-8212	B-2	40
5905-00-751-7256	B-46	9
5905-00-763-7186	B-41	5
5905-00-763-9752	B-21	44
5905-00-759-8556	B-21	98
5905-00-759-8896	B-9	63
5905-00-759-8896	B-21	73
5905-00-759-8896	B-47	66
5905-00-767-0944	B-15	11
5905-00-767-0944	B-21	95
5905-00-781-8126	B-56	92
5905-00-781-8779	B-41	10
5905-00-802-6121	B-2	35
5905-00-806-0641	B-56	95
5905-00-824-0689	B-56	93
5905-00-830-4439	B-23	1
5905-00-843-7049	B-46	10
5905-00-845-9311	B-56	100
5905-00-865-7842	B-2	53
5905-00-874-0147	B-9	86
5905-00-879-1166	B-47	38
5905-00-882-2823	B-47	37
5905-00-900-6988	B-57	26
5905-00-935-8539	B-14	84
5905-00-935-8544	B-9	119
5905-00-935-8544	B-14	92
5905-00-935-8544	B-14	108
5905-00-935-8544	B-21	79
5905-00-935-8544	B-56	75
5905-00-935-8544	B-9	93
5905-00-957-1998	B-57	32
5905-00-959-4569	B-7	18
5905-00-988-6284	B-56	9
5905-00-993-4559	B-29	69
5910-00-006-6972	B-27	21
5910-00-007-2002	B-27	19
5910-00-007-2002	B-30	10
5910-00-007-2002	B-40	39
5910-00-007-2002	B-41	44
5910-00-007-2002	B-50	2
5910-00-007-2004	B-27	24
5910-00-007-2004	B-35	63
5910-00-007-2004	B-39	24
5910-00-007-2004	B-40	38
5910-00-007-2004	B-41	36
5910-00-007-2004	B-50	37
5910-00-007-2004	B-57	7
5910-00-010-8156	B-32	8

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5910-00-024-7546	B-4	14
5910-00-024-7546	B-14	55
5910-00-024-7546	B-21	25
5910-00-024-7546	B-35	71
5910-00-043-2933	B-21	64
5910-00-044-4355	B-9	70
5910-00-044-4355	B-14	73
5910-00-044-4355	B-21	31
5910-00-044-4355	B-27	34
5910-00-044-4355	B-35	74
5910-00-044-4355	B-36	7
5910-00-044-4355	B-40	36
5910-00-044-4355	B-41	34
5910-00-044-4355	B-56	49
5910-00-051-4612	B-57	8
5910-00-056-7976	B-12	8
5910-00-057-3705	B-29	61
5910-00-060-1189	B-9	39
5910-00-060-1189	B-14	70
5910-00-060-1189	B-16	2
5910-00-060-1189	B-17	2
5910-00-060-1189	B-36	10
5910-00-060-1189	B-40	28
5910-00-060-1189	B-41	41
5910-00-060-1196	B-21	48
5910-00-065-9997	B-39	9
5910-00-067-5697	B-9	73
5910-00-067-5697	B-14	50
5910-00-069-6104	B-40	27
5910-00-071-1642	B-14	71
5910-00-071-1642	B-17	4
5910-00-071-9803	B-50	36
5910-00-081-3871	B-29	54
5910-00-081-3871	B-56	15
5910-00-105-7613	B-8	1
5910-00-109-1987	B-2	41
5910-00-109-1987	B-4	3
5910-00-109-1987	B-5	23
5910-00-109-1987	B-9	31
5910-00-109-1987	B-14	82
5910-00-109-1987	B-21	47
5910-00-109-1987	B-29	58
5910-00-109-1987	B-50	8
5910-00-126-1613	B-5	43
5910-00-137-1041	B-59	8
5910-00-143-0501	B-36	23
5910-00-148-4886	B-21	59
5910-00-148-4886	B-22	34
5910-00-164-2076	B-2	39
5910-00-164-2076	B-5	7
5910-00-164-2076	B-5	18
5910-00-164-2076	B-14	40
5910-00-164-2076	B-21	66
5910-00-164-2076	B-29	63
5910-00-164-2076	B-35	39
5910-00-164-2076	B-56	23
5910-00-182-7512	B-41	50
5910-00-189-6651	B-41	49
5910-00-192-2255	B-5	16
5910-00-231-3370	B-29	60
5910-00-231-3370	B-47	65
5910-00-231-3370	B-56	12
5910-00-235-3260	B-40	42
5910-00-254-2261	B-39	20
5910-00-276-6827	B-52	52
5910-00-280-5297	B-6	6
5910-00-280-5297	B-56	47
5910-00-460-0868	B-53	36
5910-00-474-3838	B-3	6
5910-00-474-3851	B-59	9
5910-00-532-2583	B-53	32
5910-00-543-0820	B-7	19
5910-00-577-7916	B-7	29
5910-00-578-8292	B-56	6
5910-00-578-8485	B-24	18
5910-00-660-7502	B-7	5
5910-00-666-6191	B-53	20
5910-00-668-4582	B-5	46
5910-00-668-4582	B-14	9
5910-00-668-4582	B-16	7
5910-00-668-4582	B-55	2
5910-00-681-6247	B-14	23
5910-00-681-6247	B-21	50
5910-00-681-6247	B-56	14
5910-00-681-9437	B-7	25
5910-00-682-3774	B-3	9
5910-00-702-8057	B-57	10
5910-00-717-0167	B-14	74
5910-00-717-0167	B-41	48
5910-00-717-3539	B-12	9
5910-00-717-3539	B-21	45
5910-00-722-3539	B-5	22
5910-00-722-3539	B-7	7
5910-00-724-8404	B-14	13
5910-00-725-4794	B-50	32
5910-00-726-8696	B-7	27
5910-00-755-5583	B-14	35
5910-00-755-5583	B-47	32
5910-00-755-5583	B-56	48

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5910-00-762-7886	B-40	43
5910-00-779-8390	B-35	46
5910-00-781-1154	B-4	18
5910-00-781-1154	B-14	54
5910-00-781-3802	B-36	24
5910-00-781-4511	B-14	51
5910-00-787-2109	B-27	18
5910-00-788-8649	B-46	6
5910-00-802-9423	B-14	12
5910-00-802-9423	B-29	70
5910-00-804-7566	B-49	2
5910-00-805-1017	B-21	43
5910-00-807-8911	B-51	4
5910-00-813-6212	B-51	26
5910-00-813-6212	B-52	13
5910-00-813-6213	B-52	54
5910-00-816-6612	B-5	68
5910-00-820-6615	B-3	2
5910-00-821-4702	B-14	16
5910-00-821-5215	B-27	20
5910-00-821-5215	B-40	37
5910-00-822-2579	B-56	18
5910-00-822-3766	B-27	22
5910-00-822-3767	B-27	15
5910-00-822-5683	B-39	16
5910-00-822-5683	B-56	77
5910-00-823-1695	B-12	6
5910-00-832-8080	B-39	39
5910-00-833-6443	B-14	53
5910-00-833-6443	B-21	10
5910-00-837-2577	B-41	42
5910-00-838-9421	B-27	33
5910-00-838-9421	B-35	79
5910-00-838-9421	B-40	30
5910-00-842-3814	B-27	32
5910-00-852-8633	B-5	12
5910-00-856-1030	B-29	36
5910-00-868-0352	B-5	60
5910-00-869-4820	B-39	67
5910-00-869-4821	B-39	18
5910-00-869-4822	B-39	48
5910-00-879-1215	B-31	31
5910-00-879-6957	B-21	58
5910-00-879-6957	B-29	80
5910-00-879-6957	B-47	62
5910-00-879-6957	B-56	30
5910-00-880-6080	B-55	21
5910-00-885-2025	B-40	40
5910-00-891-2155	B-4	17
5910-00-901-1449	B-6	8
5910-00-901-1449	B-8	
5910-00-902-0031	B-9	74
5910-00-902-0031	B-14	80
5910-00-902-0031	B-39	37
5910-00-902-0335	B-9	50
5910-00-902-0335	B-14	72
5910-00-902-0335	B-39	72
5910-00-902-0335	B-50	17
5910-00-913-1352	B-49	11
5910-00-936-7372	B-9	84
5910-00-936-7372	B-56	89
5910-00-946-7626	B-5	47
5910-00-946-7626	B-9	77
5910-00-946-7626	B-14	29
5910-00-946-7626	B-21	33
5910-00-949-7357	B-29	35
5910-00-951-4832	B-41	39
5910-00-954-5498	B-9	116
5910-00-954-5498	B-17	6
5910-00-954-5498	B-41	38
5910-00-954-5500	B-9	52
5910-00-954-5500	B-40	41
5910-00-954-5504	B-14	78
5910-00-954-5504	B-16	5
5910-00-954-5504	B-29	75
5910-00-957-8577	B-9	111
5910-00-957-8577	B-16	4
5910-00-957-8577	B-21	42
5910-00-957-9909	B-21	52
5910-00-957-9909	B-41	47
5910-00-958-7307	B-21	49
5910-00-965-9441	B-9	120
5910-00-965-9441	B-14	83
5910-00-974-5642	B-39	36
5910-00-983-5388	B-27	6
5910-00-989-6427	B-56	83
5910-00-995-0614	B-57	5
5915-00-023-5154	B-55	15
5915-00-284-4411	B-46	15
5915-00-503-4467	B-52	11
5915-00-713-8456	B-2	60
5915-00-959-0469	B-31	34
5920-00-281-0210	B-43	22
5920-00-281-0225	B-28	6
5920-00-892-9311	B-28	9
5920-00-892-9311	B-43	34
5930-00-086-3771	B-16	6
5930-00-105-7602	B-35	23
5930-00-105-7603	B-35	19
5930-00-105-7604	B-35	15
5930-00-105-7605	B-24	21

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STOCK NUMBER	FIG. NO.	ITEM NO.
5930-00-105-7605	B-24	21
5930-00-109-5942	B-34	36
5930-00-109-5943	B-35	1
5930-00-250-9605	B-28	18
5930-00-615-7880	B-12	3
5930-00-655-1515	B-12	4
5930-00-655-1520	B-43	16
5930-00-655-1575	B-28	5
5930-00-655-1575	B-43	21
5930-00-691-0512	B-7	30
5930-00-713-8470	B-15	7
5930-00-713-8471	B-12	10
5930-00-739-8156	B-2	6
5930-00-739-8156	B-35	3
5930-00-739-8156	B-56	31
5930-00-751-7789	B-17	7
5930-00-751-7789	B-25	3
5930-00-751-9483	B-24	4
5930-00-779-3627	B-55	22
5930-00-779-3628	B-55	16
5930-00-963-6293	B-28	23
5930-00-970-5021	B-54	9
5935-00-023-8309	B-29	47
5935-00-053-4793	B-48	6
5935-00-057-2690	B-39	59
5935-00-059-1109	B-43	40
5935-00-082-0481	B-47	52
5935-00-105-7669	B-58	2
5935-00-129-9358	B-47	6
5935-00-132-2405	B-9	46
5935-00-132-2405	B-14	41
5935-00-132-2405	B-21	12
5935-00-132-2405	B-35	38
5935-00-132-2405	B-47	33
5935-00-132-2405	B-56	36
5935-00-221-8341	B-53	46
5935-00-221-8342	B-48	7
5935-00-222-9828	B-4	12
5935-00-222-9828	B-5	1
5935-00-222-9828	B-9	21
5935-00-222-9828	B-14	14
5935-00-222-9828	B-21	3
5935-00-222-9828	B-29	4
5935-00-222-9828	B-35	36
5935-00-222-9828	B-56	26
5935-00-240-8166	B-2	24
5935-00-257-8018	B-58	24
5935-00-258-5811	B-35	65
5935-00-258-5811	B-56	103
5935-00-321-5113	B-51	9
5935-00-416-6003	B-43	41
5935-00-431-5226	B-35	25
5935-00-539-2045	B-47	4
5935-00-581-6941	B-14	45
5935-00-623-7199	B-2	62
5935-00-623-7199	B-9	26
5935-00-623-7199	B-14	18
5935-00-624-9820	B-30	2
5935-00-713-6950	B-30	1
5935-00-713-6950	B-47	53
5935-00-752-2974	B-9	42
5935-00-752-2974	B-14	64
5935-00-752-2974	B-21	54
5935-00-752-2974	B-29	6
5935-00-752-2974	B-35	67
5935-00-752-2974	B-40	45
5935-00-752-2974	B-41	33
5935-00-752-2974	B-42	5
5935-00-752-2974	B-47	14
5935-00-752-2974	B-56	22
5935-00-763-0311	B-35	26
5935-00-820-0125	B-45	14
5935-00-835-0510	B-2	4
5935-00-835-0510	B-14	47
5935-00-835-0510	B-21	1
5935-00-835-0510	B-35	32
5935-00-835-0510	B-49	10
5935-00-835-0510	B-54	5
5935-00-842-9614	B-58	24
5935-00-847-2600	B-43	58
5935-00-850-9157	B-48	38
5935-00-850-9157	B-51	49
5935-00-850-9157	B-58	13
5935-00-850-9157	B-58	22
5935-00-882-2800	B-39	57
5935-00-895-0147	B-51	15
5935-00-903-8018	B-34	32
5935-00-924-1013	B-39	47
5935-00-942-7818	B-35	24
5935-00-992-5081	B-34	33
5935-00-993-3045	B-31	9
5935-00-993-3045	B-31	15
5940-00-050-2308	B-47	56
5940-00-052-9699	B-53	34
5940-00-159-1252	B-3	7
5940-00-159-1252	B-4	10
5940-00-159-1252	B-18	8
5940-00-159-1252	B-39	61

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5940-00-159-1252	B-49	12
5940-00-204-8976	B-39	17
5940-00-259-9057	B-53	37
5940-00-542-8546	B-31	16
5940-00-553-2471	B-52	34
5940-00-614-0537	B-39	13
5940-00-614-0537	B-45	7
5940-00-614-0537	B-51	6
5940-00-614-0537	B-55	8
5940-00-642-3962	B-46	13
5940-00-683-4339	B-47	46
5940-00-713-8498	B-49	1
5940-00-752-5893	B-31	36
5940-00-838-2651	B-50	40
5950-00-023-7284	B-21	35
5950-00-023-7284	B-56	97
5950-00-023-8109	B-9	103
5950-00-023-8110	B-21	56
5950-00-023-8112	B-21	62
5950-00-023-9662	B-21	63
5950-00-023-9662	B-56	86
5950-00-023-9956	B-47	43
5950-00-023-9960	B-29	32
5950-00-023-9961	B-29	31
5950-00-051-4532	B-27	26
5950-00-058-1034	B-36	21
5950-00-059-5918	B-39	42
5950-00-066-4127	B-40	32
5950-00-066-4127	B-41	45
5950-00-079-6045	B-9	38
5950-00-086-0236	B-9	40
5950-00-086-1984	B-21	51
5950-00-086-1984	B-21	65
5950-00-105-3773	B-32	2
5950-00-105-7599	B-39	51
5950-00-105-7600	B-39	52
5950-00-105-7601	B-39	31
5950-00-105-7606	B-36	4
5950-00-111-0518	B-2	42
5950-00-111-0518	B-5	38
5950-00-111-8343	B-40	34
5950-00-135-9486	B-29	42
5950-00-403-9725	B-5	37
5950-00-420-1204	B-50	27
5950-00-420-1205	B-50	18
5950-00-420-1206	B-50	39
5950-00-420-1207	B-50	42
5950-00-437-3745	B-53	42
5950-00-498-6724	B-50	26
5950-00-713-3935	B-14	75
5950-00-713-3937	B-21	41
5950-00-713-6940	B-4	20
5950-00-713-6941	B-9	114
5950-00-713-6944	B-14	62
5950-00-713-8498	B-26	6
5950-00-713-8498	B-38	6
5950-00-713-8503	B-21	39
5950-00-724-6209	B-9	121
5950-00-730-1786	B-50	43
5950-00-739-8103	B-14	77
5950-00-772-5984	B-36	12
5950-00-779-0844	B-46	8
5950-00-820-5362	B-14	61
5950-00-844-5445	B-9	118
5950-00-84405445	B-21	29
5950-00-846-1338	B-9	126
5950-00-846-1338	B-14	81
5950-00-846-1339	B-21	37
5950-00-868-4295	B-39	43
5950-00-868-4296	B-39	46
5950-00-868-4300	B-39	66
5950-00-868-4301	B-39	41
5950-00-868-4302	B-39	64
5950-00-868-4307	B-39	75
5950-00-868-4308	B-39	35
5950-00-892-8209	B-27	23
5950-00-892-8209	B-40	31
5950-00-892-8209	B-41	46
5950-00-892-8209	B-57	9
5950-00-899-9359	B-50	31
5950-00-921-3414	B-39	71
5950-00-943-6506	B-35	47
5955-00-253-7179	B-50	24
5955-00-951-8937	B-14	8
5955-00-973-2204	B-14	7
5960-00-052-8984	B-21	18
5960-00-056-2968	B-2	22
5960-00-064-2731	B-29	21
5960-00-105-7598	B-39	53
5960-00-108-0263	B-56	38
5960-00-134-5994	B-14	1
5960-00-134-6021	B-21	11
5960-00-166-7686	B-52	3
5960-00-179-4749	B-9	43
5960-00-179-4749	B-14	6
5960-00-179-4749	B-21	2
5960-00-179-4749	B-56	35
5960-00-188-0847	B-45	13
5960-00-188-0847	B-51	11

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5960-00-262-0161	B-9	37
5960-00-262-0161	B-14	3
5960-00-262-0161	B-21	20
5960-00-262-0161	B-29	19
5960-00-262-0210	B-2	58
5960-00-262-0210	B-5	41
5960-00-262-0210	B-9	19
5960-00-262-0210	B-14	5
5960-00-262-0210	B-21	46
5960-00-262-0210	B-56	28
5960-00-262-0286	B-29	30
5960-00-262-0286	B-47	5
5960-00-284-4189	B-21	15
5960-00-284-4352	B-34	20
5960-00-296-3420	B-29	2
5960-00-296-3420	B-34	19
5960-00-420-3625	B-29	34
5960-00-474-3836	B-2	14
5960-00-542-7004	B-21	26
5960-00-543-1001	B-29	26
5960-00-543-1001	B-47	1
5960-00-624-4718	B-47	26
5960-00-681-9802	B-14	10
5960-00-681-9802	B-21	22
5960-00-681-9802	B-21	36
5960-00-681-9802	B-47	27
5960-00-729-6963	B-9	29
5960-00-729-6963	B-29	20
5960-00-729-6963	B-56	29
5960-00-809-7582	B-2	15
5960-00-852-0235	B-5	40
5960-00-858-5172	B-9	44
5960-00-858-5172	B-34	22
5960-00-860-7709	B-14	11
5960-00-860-7709	B-21	13
5960-00-860-7709	B-29	29
5960-00-860-7709	B-47	6
5960-00-860-7709	B-56	37
5960-00-860-7710	B-2	57
5960-00-860-7710	B-5	42
5960-00-860-7710	B-9	20
5960-00-860-7710	B-14	4
5960-00-860-7710	B-21	4
5960-00-860-7710	B-29	18
5960-00-860-7710	B-56	27
5960-00-866-2712	B-14	2
5960-00-866-2712	B-21	27
5960-00-868-4365	B-47	25
5960-00-879-5078	B-9	45
5960-00-879-5078	B-34	21
5960-00-983-5464	B-39	49
5961-00-081-4816	B-35	44
5961-00-087-6047	B-3	13
5961-00-087-6047	B-4	1
5961-00-087-6047	B-56	66
5961-00-089-4285	B-39	65
5961-00-089-4286	B-39	70
5961-00-089-4287	B-39	44
5961-00-242-5729	B-50	7
5961-00-532-2580	B-53	28
5961-00-543-0490	B-9	102
5961-00-577-6214	B-35	70
5961-00-669-6884	B-5	6
5961-00-669-6884	B-9	32
5961-00-669-6884	B-9	33
5961-00-669-6884	B-14	58
5961-00-669-6884	B-21	8
5961-00-669-6884	B-21	9
5961-00-669-6884	B-21	40
5961-00-669-6884	B-22	19
5961-00-669-6884	B-27	2
5961-00-669-6884	B-56	50
5961-00-752-5351	B-9	98
5961-00-752-5351	B-14	59
5961-00-752-5351	B-56	84
5961-00-752-6121	B-35	53
5961-00-837-6481	B-39	73
5961-00-842-6937	B-36	13
5961-00-842-6937	B-40	29
5961-00-842-6937	B-41	31
5961-00-853-2601	B-50	41
5961-00-868-3742	B-39	33
5975-00-503-1440	B-59	20
5985-00-105-3774	B-48	33
5985-00-841-1735	B-43	29
5995-00-107-1649	B-34	30
5995-00-257-1244	B-15	12
5995-00-868-4168	B-48	37
5995-00-889-1047	B-58	4
5995-00-889-1048	B-58	5
5995-00-889-1049	B-58	14
5999-00-105-5515	B-56	42
5999-00-135-9116	B-52	31
5999-00-195-9699	B-59	19
5999-00-248-1165	B-53	17
5999-00-248-1166	B-53	22
5999-00-248-1167	B-53	18
5999-00-400-2676	B-43	46
5999-00-400-2683	B-52	33

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

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
5999-00-622-5760	B-52	17	6625-00-027-8967	B-38	7
5999-00-622-5766	B-51	20	6625-00-110-5015	B-27	31
5999-00-624-8143	B-53	26	6625-00-110-5017	B-34	38
5999-00-713-8475	B-59	14	6625-00-110-5017	B-40	
5999-00-806-1519	B-51	56	6625-00-110-5020	B-34	39
5999-00-806-1519	B-52	50	6625-00-110-5020	B-41	
5999-00-806-1519	B-52	66	6625-00-116-7361	B-58	1
5999-00-806-1530	B-3	1	6625-00-122-6363	B-34	40
5999-00-825-6450	B-15	5	6625-00-122-6363	B-42	
5999-00-845-3137	B-39	50	6625-00-135-9114	B-35	64
5999-00-904-3486	B-35	59	6625-00-135-9118	B-48	34
5999-00-904-3488	B-39	6	6625-00-135-9119	B-51	14
6130-00-713-6946	B-29	41	6625-00-135-9120	B-51	48
6130-00-713-6946	B-47	22	6625-00-135-9122	B-59	1
6145-00-161-0913	B-48	39	6625-00-136-1231	B-51	41
6145-00-161-0913	B-51	20	6625-00-191-9352	B-51	31
6145-00-161-0913	B-58	12	6625-00-191-9353	B-52	61
6145-00-161-0913	B-58	21	6625-00-323-0495	B-52	28
6145-00-542-6092	B-58	9	6625-00-338-7942	B-51	12
6145-00-542-6092	B-58	28	6625-00-392-5467	B-53	15
6145-00-681-7849	B-48	9	6625-00-400-2684	B-52	7
6145-00-681-7849	B-48	35	6625-00-409-2094	B-53	27
6145-00-681-7849	B-51	16	6625-00-451-5762	B-52	25
6145-00-681-7849	B-53	54	6625-00-474-3858	B-59	10
6145-00-681-7849	B-58	15	6625-00-585-5288	B-55	9
6145-00-918-9494	B-34	31	6625-00-793-2142	B-58	7
6145-00-918-9494	B-43	39	6625-00-793-3012	B-51	21
6145-00-918-9494	B-48	5	6625-00-797-2692	B-2	8
6145-00-984-6262	B-30	3	6625-00-797-2694	B-18	4
6145-00-984-6262	B-31	8	6625-00-797-2694	B-26	4
6145-00-984-6262	B-31	14	6625-00-797-2694	B-38	4
6145-00-984-6262	B-47	51	6625-00-797-2695	B-18	5
6145-00-984-6262	B-54	10	6625-00-797-2696	B-13	22
6145-00-984-6262	B-55	17	6625-00-797-2696	B-18	
6145-00-984-6262	B-55	23	6625-00-797-2698	B-20	24
6145-00-984-6262	B-56	104	6625-00-797-2698	B-26	
6145-00-984-6262	B-58	6	6625-00-797-2699	B-52	2
6210-00-064-0271	B-28	3	6625-00-799-9062	B-48	16
6210-00-064-0271	B-43	18	6625-00-799-9062	B-52	
6210-00-295-1915	B-28	4	6625-00-803-8782	B-22	1
6210-00-295-1915	B-43	19	6625-00-806-1528	B-45	24
6240-00-155-8706	B-28	1	6625-00-806-1528	B-46	
6240-00-274-4015	B-2	9	6625-00-813-5415	B-11	1
6240-00-295-1368	B-25	1	6625-00-820-0116	B-59	12
6240-00-820-1705	B-29	10	6625-00-820-5500	B-52	51
6245-00-155-8706	B-43	20	6625-00-870-7053	B-58	18
6625-00-020-8265	B-18	7	6625-00-870-7053	B-59	
6625-00-059-5980	B-48	8	6625-00-907-6548	B-20	20
6625-00-027-8967	B-26	7	6625-00-907-6548	B-34	3

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

STOCK NUMBER	FIG. NO.	ITEM NO.
6625-00-933-4746	B-1	1
6625-00-958-8809	B-5	54
6625-00-961-6663	B-28	12
6625-00-961-6663	B-43	44
6625-00-961-6664	B-28	21
6625-00-961-6664	B-43	45
6625-00-961-6693	B-47	17
6645-00-255-1370	B-43	7
9390-00-882-2029	B-2	19

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
AF1952B	82866	B-31	23
AN340C3	88044	B-52	21
AN507C440-4	88044	B-44	18
AN507C440-5	88044	B-34	28
AN507C440-5	88044	B-44	1
AN507C440-8	88044	B-20	26
AN507C632-5	88044	B-34	24
AN565DC4H8	88044	B-22	7
AN565DC6H3	88044	B-51	43
AN565DC6H3	88044	B-52	10
BF63508	11236	B-35	2
CB11ND270J	81349	B-53	32
CB11ND271J	81349	B-53	31
CC21CH040C	81349	B-5	16
CC21CH070C	81349	B-7	19
CC21CH080C	81349	B-7	29
CC21CH220G	81349	B-7	25
CC21CH240G	81349	B-7	5
CC21CK020C	81349	B-5	22
CC21CK020C	81349	B-7	7
CC21CK2R2D	81349	B-45	9
CC22CH120G	81349	B-7	27
CC64UG201G	86335	B-40	40
CE13C100N	81349	B-14	13
CE51C501G	81349	B-47	24
CE53C350P	81349	B-29	35
CG2026-3	70117	B-58	14
CH12A3NE105K	81349	B-5	47
CH12A3NE105K	81349	B-9	77
CH12A3NE105K	81349	B-14	29
CH12A3NE105K	81349	B-21	33
CK06CW103K	81349	B-36	25
CK06CW103K	81349	B-40	35
CK06CW103K	81349	B-41	51
CK60AW102M	81349	B-27	33
CK60AW102M	81349	B-35	79
CK60AW102M	81349	B-40	30
CK60AW152M	81349	B-41	42
CK60AW471M	81349	B-36	24
CK60AX221K	81349	B-27	22
CK60AX471K	81349	B-27	20
CK60AX471K	81349	B-40	37
CK60BX100K	81349	B-27	6
CK60BX151K	81349	B-27	15
CK60BX680K	81349	B-27	32
CK63AW103M	81349	B-39	16
CK63AW103M	81349	B-56	77
CK63AY103M	81349	B-2	41
CK63AY103M	81349	B-4	3
CK63AY103M	81349	B-5	23
CK63AY103M	81349	B-9	31
CK63AY103M	81349	B-14	82
CK63AY103M	81349	B-21	47
CK63AY103M	81349	B-29	58
CK63AY103M	81349	B-50	8
CK70AW102M	81349	B-49	2
CLS632-2	46384	B-29	8
CLS832-2	46384	B-29	7
CL23CK040TN3	81349	B-57	4
CL35BB300MP3	81349	B-21	59
CL35BB300MP3	81349	B-22	34
CL65BG101MP3	81349	B-27	21
CL65BH400MP3	81349	B-32	8
CL65BJ600MP3	81349	B-35	40
CL65CJ100KP3	81349	B-21	21
CM05D270J03	81349	B-50	21
CM05D271J03	81349	B-50	44
CM05D390J03	81349	B-50	20
CM05D470J03	81349	B-57	11
CM05D620J03	81349	B-50	15
CM05D820J03	81349	B-50	1
CM05D880J03	81349	B-50	38
CM05E220J03	81349	B-9	51
CM05E220J03	81349	B-14	79
CM05E220J03	81349	B-21	61
CM05E270J03	81349	B-9	73
CM05E270J03	81349	B-14	50
CM05E470J03	81349	B-9	70
CM05E470J03	81349	B-14	73
CM05E470J03	81349	B-21	31
CM05E470J03	81349	B-27	34
CM05E470J03	81349	B-35	74
CM05E470J03	81349	B-36	7
CM05E470J03	81349	B-40	36
CM05E470J03	81349	B-41	34
CM05E470J03	81349	B-56	49
CM05E680J03	81349	B-9	111
CM05E680J03	81349	B-16	4
CM05E680J03	81349	B-21	42
CM05E820J03	81349	B-14	71
CM05E820J03	81349	B-17	4
CM05FD101J03	81349	B-53	36
CM05FD151G03	81349	B-9	52
CM05FD151GC3	81349	B-40	41
CM05FD271G03	81349	B-12	8
CM05FD331G03	81349	B-57	10
CM05FD391G03	81349	B-21	52
CM05FD391G03	81349	B-41	47
CM05F101J03	81349	B-9	80
CM05F101J03	81349	B-12	21

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
CM05F101J03	81349	B-14	76
CM05F101J03	81349	B-36	17
CM05F101J03	81349	B-56	55
CM05F121J03	81349	B-14	78
CM05F121J03	81349	B-16	5
CM05F121J03	81349	B-29	75
CM05F181J03	81349	B-9	116
CM05F181J03	81349	B-17	6
CM05F181J03	81349	B-41	38
CM05F201J03	81349	B-4	17
CM05F221G03	81349	B-7	1
CM05F221J03	81349	B-9	60
CM05F221J03	81349	B-11	3
CM05F221J03	81349	B-14	57
CM05F221J03	81349	B-56	56
CM05F271J03	81349	B-9	39
CM05F271J03	81349	B-14	70
CM05F271J03	81349	B-16	2
CM05F271J03	81349	B-17	2
CM05F271J03	81349	B-36	10
CM05F271J03	81349	B-40	28
CM05F271J03	81349	B-41	41
CM05F301J03	81349	B-56	83
CM05F910G03	81349	B-7	3
CM06D222J03	81349	B-50	32
CM06FD332G03	81349	B-12	9
CM06FD332G03	81349	B-21	45
CM06F102J03	81349	B-9	120
CM06F102J03	81349	B-14	83
CM06F122G03	81349	B-7	14
CM06F122J03	81349	B-55	21
CM06F152J03	81349	B-4	18
CM06F152J03	81349	B-14	54
CM06F242G03	81349	B-7	10
CM06F302J03	81349	B-14	51
CM06F431J03	81349	B-40	43
CM06FD471G03	81349	B-14	74
CM06FD471G03	81349	B-41	48
CM06F471G03	81349	B-7	16
CM06F472G03	81349	B-7	11
CM06F472G03	81349	B-14	56
CM06F511J03	81349	B-21	48
CM06F821J03	81349	B-21	64
CM07F123J03	81349	B-56	5
CM07F153J03	81349	B-14	30
CM05C050K03	81349	B-9	74
CM05C050K03	81349	B-14	80
CM05C050K03	81349	B-39	37
CM05C100K03	81349	B-9	50
CM05C100K03	81349	B-14	72
CM05C100K03	81349	B-39	72
CM05C100K03	81349	B-50	17
CM05C120K03	81349	B-9	84
CM05C120K03	81349	B-56	89
CM05C180K03	81349	B-39	39
CM05C271K03	81349	B-39	4
CM05D101J03	81349	B-35	43
CM05D101J03	81349	B-41	40
CM05D121J03	81349	B-50	45
CM05D200J03	81349	B-9	130
CM05D220J03	81349	B-57	8
CM05D221J03	81349	B-57	5
CPC1953-4B	71616	B-29	14
CPC1953-4B	71616	B-31	6
CPC1953-5B	71616	B-31	1
CP04A1KF564K3	81349	B-31	32
CP04A1KF684K3	81349	B-31	31
CP05AKE333K3	81349	B-12	11
CP05A1KE103K3	81349	B-14	16
CP05A1KE224K3	81349	B-56	18
CP05A1KF474K3	81349	B-12	6
CP11A3KE105K3	81349	B-5	12
CP35A1KC473K3	81349	B-56	16
CP70B1FFF106K1	81349	B-47	23
CQ09A1MC222J3	81349	B-40	27
CQ09A1MC472J3	81349	B-41	39
CR18AU1-000000MHZ	81349	B-14	8
CR56AU85-833	81349	B-39	40
CSR13G333KM	81349	B-50	36
CSR13G472KL	81349	B-41	50
CSR13G473KL	81349	B-41	49
CS13BE225K	81349	B-27	19
CS13BE225K	81349	B-39	10
CS13BE225K	81349	B-40	39
CS13BE225K	81349	B-41	44
CS13BE225K	81349	B-50	2
CS13BF105K	81349	B-27	18
CS13BF226K	81349	B-35	46
CS13BG475K	81349	B-27	24
CS13BG475K	81349	B-35	63
CS13BG475K	81349	B-39	24
CS13BG475K	81349	B-40	38
CS13BG475K	81349	B-41	36
CS13BG475K	81349	B-50	37
CS13BG475K	81349	B-57	7
CS16	00141	B-39	23
CV11B130	81349	B-5	43
CV11D450	81349	B-5	46
CV11D450	81349	B-14	9
CV11D450	81349	B-16	7

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
CV11D450	81349	B-55	2
DAMF15SC37	71468	B-35	26
DAM15PC37	71468	B-39	59
DA1053-002	71590	B-8	1
DA908-001	71590	B-51	4
DM15C020D0	72136	B-9	72
DM15C150J0	81349	B-9	57
DM15C150J0	81349	B-21	60
DM15F471J0	72136	B-9	56
DM15F471J0	72136	B-14	60
DM15F471J0	72136	B-56	63
DM15F821J03	72136	B-24	18
D2Q3405	93110	B-21	43
D4-128	95987	B-21	57
D4-128	95987	B-56	3
D4-140	95987	B-14	32
D6-128	95987	B-9	12
EP12411	97722	B-14	75
EP12413	97722	B-14	77
EP12415	99772	B-9	114
EP12420	97720	B-21	41
EP6101	97722	B-21	39
EP6102	97722	B-21	37
EP6129	97722	B-14	62
EP6367	97722	B-4	20
ESO-NO	99800	B-11	2
E50001-054	88033	B-47	12
E50003-054	80033	B-14	65
E50003-054	80033	B-56	20
FP10	08289	B-39	34
F02A250V4AS	81349	B-43	22
F02A250V6AS	81349	B-28	6
GA188-2	70117	B-28	12
GA188-2	70117	B-43	44
GA251	70117	B-46	6
GA252	70117	B-52	59
GA253	70117	B-46	15
GA254	70117	B-46	12
GA255	70117	B-46	16
GA257	70117	B-52	57
GA278	70117	B-45	21
GA280	70117	B-45	3
GA283	70117	B-45	12
GA292	70117	B-51	36
GA293	70117	B-51	12
GA295	70117	B-51	41
GA298-2	70117	B-51	3
GA299	70117	B-51	20
GA313	70117	B-51	39
GA439-1	70117	B-52	33
GA439-2	70117	B-52	7
GA493-2	70117	B-52	61
GB1500	70117	B-28	21
GB1500	70117	B-43	45
GB1502	70117	B-59	14
GB1581	70117	B-3	14
GB1606	70117	B-13	7
GB1615	70117	B-48	30
GB1617	70117	B-48	26
GB1618	70117	B-48	31
GB1619	70117	B-48	23
GB1620	70117	B-48	27
GB1677	70117	B-59	6
GB1679	70117	B-59	3
GB1680	70117	B-59	4
GB1683	70117	B-2	51
GB2002	70117	B-2	52
GB2068	70117	B-9	1
GB2124-1	70117	B-51	48
GB2208	70117	B-45	14
GB220	70117	B-52	28
GB222	70117	B-53	15
GB2525	70117	B-59	9
GB256-1	70117	B-53	8
GB258-2	70117	B-52	9
GB259-1	70117	B-52	41
GB275	70117	B-53	52
GB284-2	70117	B-45	25
GB285	70117	B-45	15
GB294-2	70117	B-51	13
GB296-1	70117	B-52	11
GB297-2	70117	B-52	51
GB301-2	70117	B-51	21
GB309-2	70117	B-51	31
GB310-3	70117	B-53	1
GB311-2	70117	B-51	32
GB3144	70117	B-20	10
GB4020	70117	B-2	49
GB4284	70117	B-56	42
GB4285	70117	B-43	46
GB4546	70117	B-39	56
GB4801	70117	B-5	37
GB4802	70117	B-5	36
GB4804-3	70117	B-42	4
GB4805	70117	B-42	1
GB4806	70117	B-34	40
GB4806	70117	B-42	
GB4807	70117	B-40	44
GB4808	70117	B-41	32
GB4809	70117	B-35	12

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
GB4810	70117	B-35	16
GB4811	70117	B-35	20
GB4825	70117	B-58	1
GB4927	70117	B-36	1
GB4944	70117	B-37	4
GB5068	70117	B-44	8
GB5071	70117	B-44	19
GB5123	70117	B-48	4
GC1483	70117	B-59	1
GC1586-1	70117	B-2	8
GC1649	70117	B-18	1
GC1649	70117	B-19	
GC1655	70117	B-26	1
GC1655	70117	B-38	1
GC1663	70117	B-20	24
GC1663	70117	B-26	
GC1664	70117	B-13	22
GC1664	70117	B-18	
GC1751	70117	B-6	8
GC1751	70117	B-8	
GC1770-1	70117	B-43	30
GC1770-1	70117	B-45	
GC1932-2	70117	B-9	8
GC1932-2	70117	B-11	
GC1998-2	70117	B-5	52
GC2015-2	70117	B-2	48
GC2015-2	70117	B-6	
GC2026-14	70117	B-48	37
GC2026-15	70117	B-48	8
GC2026-25	70117	B-58	27
GC2026-26	70117	B-58	8
GC2026-27	70117	B-58	20
GC2026-28	70117	B-58	11
GC2026-3	70117	B-48	34
GC2047	70117	B-15	6
GC2052	70117	B-15	9
GC2054	70117	B-15	12
GC2056-2	70117	B-12	15
GC2064-3	70117	B-12	5
GC2071-2	70117	B-9	6
GC2071-2	70117	B-10	
GC2235-2	70117	B-31	21
GC2641	70117	B-22	36
GC2641	70117	B-23	
GC3008	70017	B-2	61
GC3365	70117	B-14	17
GC4472-2	70117	B-39	58
GC4476	70117	B-39	53
GC4566	70117	B-43	38
GC4567	70117	B-34	30
GC4673	70117	B-35	64
GC4741	70117	B-34	18
GC4741	70117	B-38	
GC4752	70117	B-51	14
GC4822	70117	B-35	27
GC4673	70117	B-35	64
GC4741	70117	B-34	18
GC4741	70117	B-38	
GC4752	70117	B-51	14
GC4822	70117	B-35	27
GC4892	70117	B-31	10
GC4892	70117	B-32	
GC4926	70117	B-35	10
GC4926	70117	B-36	
GC4931	70117	B-24	20
GC4932	70117	B-39	77
GC4942	70117	B-31	30
GC4979	70117	B-54	8
GC5003	70117	B-24	3
GC5055	70117	B-49	9
GC5056	70117	B-43	57
GC5056	70117	B-49	
GC5061	70117	B-53	27
GC5070	70117	B-44	3
GC5124	70117	B-53	53
GC5129	70117	B-53	29
GC5130-1	70117	B-53	47
GC5130-2	70117	B-53	44
GD1596-2	70117	B-9	41
GD1600-2	70117	B-14	63
GD1602-4	70117	B-21	53
GD1626-2	70117	B-29	5
GD1658-1	70117	B-48	16
GD1658-1	70117	B-52	
GD1662-4	70117	B-48	1
GD1662-4	70117	B-51	
GD1738-5	70117	B-47	11
GD1895-2	70117	B-24	14
GD1895-2	70117	B-25	
GD2051-5	70117	B-13	14
GD2051-5	70117	B-15	
GD2070-5	70117	B-9	15
GD2070-5	70117	B-12	
GD2104	70117	B-9	25
GD213-4	70117	B-48	11
GD213-4	70117	B-53	
GD2392-4	70117	B-58	7
GD2530-6	70117	B-58	4
GD2531-3	70117	B-58	5
GD287-2	70117	B-45	24
GD287-2	70117	B-46	
GD4495-2	70117	B-35	66
GD4788	70117	B-57	12
GD4789	70117	B-54	13
GD4789	70117	B-57	
GD4792	70117	B-15	4
GD4792	70117	B-17	
GD4793	70117	B-15	1

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
GD4793	70117	B-16	
GD4815	70117	B-34	39
GD4815	70117	B-41	
GD4816	70117	B-35	11
GD4816	70117	B-37	
GD4820	70117	B-34	38
GD4820	70117	B-40	
GD4840-1	70117	B-54	1
GD4840-1	70117	B-55	
GD4875	70117	B-20	8
GD4875	70117	B-24	
GD4896	70117	B-2	20
GD4896	70117	B-3	
GD4899	70117	B-6	7
GD4899	70117	B-7	
GD4908-1	70117	B-56	19
GD4909	70117	B-2	38
GD4909	70117	B-4	
GD4911	70117	B-27	36
GD4916	70117	B-31	13
GD4918	70117	B-31	7
GD4940-2	70117	B-56	102
GD4954	70117	B-34	34
GD4981-1	70117	B-55	10
GD4982-1	70117	B-55	20
GD5078-2	70117	B-43	26
GD5078-2	70117	B-44	
GD5094-1	70117	B-50	47
GD5094-2	70117	B-49	14
GD5094-2	70117	B-50	
GE2057-6	70117	B-1	4
GE2057-6	70117	B-13	
GE2072-6	70117	B-1	3
GE2072-6	70117	B-9	
GE4876	70117	B-20	2
GE4876	70117	B-22	
GE4884	70117	B-20	25
GE4884	70117	B-27	
GE4898	70117	B-2	47
GE4898	70117	B-5	
GJ4496-2	70117	B-35	31
GJ4704	70117	B-31	
GJ4819	70117	B-35	9
GJ4839-1	70117	B-33	3
GJ4839-1	70117	B-54	
GJ4841-1	70117	B-54	7
GJ4841-1	70117	B-56	
GJ4846-1	70117	B-33	2
GJ4846	70117	B-43	
GJ4873	70117	B-1	5
GJ4873	70117	B-20	
GJ4874	70117	B-20	1
GJ4893	70117	B-13	1
GJ4893	70117	B-14	
GJ4894-1	70117	B-43	35
GJ4894-1	70117	B-47	
GJ4897	70117	B-1	2
GJ4897	70117	B-2	
GJ4901	70117	B-34	1
GJ4901	70117	B-34	
GJ4906	70117	B-9	18
GJ4910	70117	B-1	6
GJ4910	70117	B-28	
GJ4912-1	70117	B-43	48
GJ4912-1	70117	B-48	
GJ4913	70117	B-47	50
GJ4914	70117	B-28	22
GJ4914	70117	B-29	
GJ4915	70117	B-29	82
GJ4915	70117	B-30	
GJ4925	70117	B-34	14
GJ4925	70117	B-35	
GJ4930	70117	B-34	26
GJ4930	70117	B-39	
G6997AA9	94375	B-53	46
HKLXE90-250V	71400	B-28	7
HKLXE90-250V	71400	B-43	23
HKPAEJQRW	71400	B-28	9
HKPAEJQRW	71400	B-43	34
H25	80294	B-57	32
H545B10B	71450	B-2	44
IV2USN	81349	B-2	59
JAN1N277	81349	B-5	6
JAN1N277	81349	B-9	32
JAN1N277	81349	B-9	33
JAN1N277	81349	B-14	58
JAN1N277	81349	B-21	8
JAN1N277	81349	B-21	9
JAN1N277	81349	B-21	40
JAN1N277	81349	B-22	19
JAN1N277	81349	B-27	2
JAN1N277	81349	B-56	50
JAN2N1893	81349	B-50	41
KB21J1	02606	B-57	26
L6901-000-819	94375	B-48	7

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
MA4325D	96341	B-39	44
MA4325E	96341	B-39	70
MA4326D1	96341	B-39	65
MC604Y	73899	B-49	11
MPY2P25-10PCT	93790	B-21	58
MPY2P25-10PCT	93790	B-29	80
MPY2P25-10PCT	93790	B-47	62
MPY2P25-10PCT	93790	B-56	30
MRA9PGV	02660	B-30	1
MRA9PGV	02660	B-47	53
MRA9SGHVL	81312	B-31	9
MRA9SGHVL	81312	B-31	15
MR26W500DCUAR	81349	B-55	9
MS15571-2	96906	B-28	1
MS15571-2	96906	B-43	20
MS15795-802	96906	B-57	31
MS15795-803	96906	B-4	13
MS15795-803	96906	B-5	34
MS15795-803	96906	B-13	17
MS15795-803	96906	B-14	69
MS15795-803	96906	B-20	29
MS15795-803	96906	B-22	4
MS15795-803	96906	B-28	15
MS15795-803	96906	B-34	27
MS15795-803	96906	B-43	10
MS15795-803	96906	B-49	15
MS15795-805	96906	B-2	37
MS15795-805	96906	B-4	6
MS15795-805	96906	B-5	62
MS15795-805	96906	B-9	14
MS15795-805	96906	B-13	4
MS15795-805	96906	B-20	7
MS15795-805	96906	B-24	16
MS15795-805	96906	B-29	13
MS15795-805	96906	B-31	3
MS15795-805	96906	B-31	26
MS15795-805	96906	B-43	33
MS15795-805	96906	B-54	3
MS15795-807	96906	B-20	4
MS15795-807	96906	B-29	39
MS15795-807	96906	B-31	18
MS15795-807	96906	B-43	54
MS15795-807	96906	B-47	20
MS15795-808	96906	B-22	12
MS15795-808	96906	B-47	41
MS15795-810	96906	B-31	46
MS15795-810	96906	B-35	35
MS16108-2	96906	B-47	4
MS16625-4112	96906	B-52	42
MS16625-4112	96906	B-53	5
MS16633-1025	96906	B-28	11
MS16633-4018	96906	B-44	13
MS16633-4018	96906	B-44	20
MS171435	96906	B-2	56
MS17321-1	96906	B-43	7
MS18130-13	96906	B-39	71
MS18130-21	96906	B-50	31
MS18130-25	96906	B-50	43
MS18130-26	96906	B-36	12
MS20365-632A	96906	B-31	27
MS20365-832A	96906	B-29	22
MS2045CBB4	96906	B-56	21
MS20450CBB5	96906	B-47	13
MS21097-11-02	96906	B-35	24
MS21266-3N	96906	B-29	9
MS27035-625B	96906	B-49	10
MS35058-23	96906	B-12	4
MS35058-28	96906	B-43	16
MS35058-28	96906	B-44	16
MS35059-22	96906	B-28	5
MS35059-22	96906	B-43	21
MS35059-26	96906	B-12	3
MS35175	96906	B-51	35
MS35233-12	96906	B-39	54
MS35233-16	96906	B-6	3
MS35233-16	96906	B-9	10
MS35233-16	96906	B-18	2
MS35233-16	96906	B-26	2
MS35233-16	96906	B-38	2
MS35233-16	96906	B-43	14
MS35233-17	96906	B-55	3
MS35233-18	96906	B-49	16
MS35233-19	96906	B-47	54
MS35233-20	96906	B-22	15
MS35233-20	96906	B-28	24
MS35233-22	96906	B-22	14
MS35233-29	96906	B-4	4
MS35233-29	96906	B-9	17
MS35233-29	96906	B-13	2
MS35233-29	96906	B-20	5
MS35233-29	96906	B-29	11
MS35233-29	96906	B-31	41
MS35233-29	96906	B-35	45
MS35233-29	96906	B-47	47
MS35233-29	96906	B-54	2
MS35233-2	96906	B-53	39
MS35233-30	96906	B-24	15
MS35233-30	96906	B-31	2
MS35233-30	96906	B-43	31
MS35233-31	96906	B-31	25

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
MS35233-31	96906	B-31	37
MS35233-3	96906	B-2	7
MS35233-3	96906	B-49	4
MS35233-43	96906	B-31	33
MS35233-44	96906	B-43	50
MS35233-45	96906	B43	49
MS35233-45	96906	B-48	13
MS35233-47	96906	B-31	17
MS35233-49	96906	B-48	17
MS35233-51	96906	B-47	21
MS35233-51	96906	B-48	12
MS35233-79	96906	B-31	44
MS35233-81	96906	B-31	43
MS35233-8	96906	B-57	28
MS35234-63	96906	B-43	52
MS35249-20	96906	B-2	25
MS35249-22	96906	B-3	5
MS35249-22	96906	B-29	50
MS35249-23	96906	B-2	21
MS35249-26	96906	B-13	16
MS35249-26	96906	B-20	17
MS35249-34	96906	B-29	62
MS35249-35	96906	B-9	75
MS35249-35	96906	B-14	25
MS35249-37	96906	B-14	31
MS35249-50	96906	B-31	35
MS35249-51	96906	B-43	51
MS35275-217	96906	B-5	44
MS35333-69	96906	B-49	5
MS35333-70	96906	B-5	4
MS35333-70	96906	B-9	24
MS35333-70	96906	B-21	6
MS35333-70	96906	B-29	16
MS35333-70	96906	B-47	9
MS35333-70	96906	B-56	25
MS35333-71	96906	B-31	38
MS35333-71	96906	B-52	37
MS35333-71	96906	B-53	10
MS35335-57	96906	B-55	7
MS35335-58	96906	B-5	50
MS35335-58	96906	B-14	27
MS35335-58	96906	B-20	14
MS35335-59	96906	B-9	76
MS35337-78	96906	B-51	7
MS35338-134	96906	B-51	19
MS35338-134	96906	B-53	38
MS35338-134	96906	B-53	49
MS35338-134	96906	B-57	30
MS35338-135	96906	B-2	29
MS35338-135	96906	B-3	4
MS35338-135	96906	B-4	9
MS35338-135	96906	B-5	3
MS35338-135	96906	B-6	4
MS35338-135	96906	B-9	11
MS35338-135	96906	B-9	23
MS35338-135	96906	B-13	21
MS35338-135	96906	B-14	21
MS35338-135	96906	B-20	28
MS35338-135	96906	B-21	7
MS35338-135	96906	B-22	3
MS35338-135	96906	B-28	14
MS35338-135	96906	B-29	17
MS35338-135	96906	B-34	25
MS35338-135	96906	B-35	61
MS35338-135	96906	B-39	12
MS35338-135	96906	B-43	9
MS35338-135	96906	B-44	12
MS35338-135	96906	B-45	23
MS35338-135	96906	B-47	8
MS35338-135	96906	B-49	7
MS35338-135	96906	B-51	2
MS35338-135	96906	B-52	18
MS35338-135	96906	B-53	24
MS35338-135	96906	B-54	12
MS35338-135	96906	B-55	5
MS35338-135	96906	B-56	2
MS35338-136	96906	B-2	33
MS35338-136	96906	B-4	5
MS35338-136	96906	B-5	49
MS35338-136	96906	B-9	5
MS35338-136	96906	B-9	68
MS35338-136	96906	B-10	3
MS35338-136	96906	B-13	3
MS35338-136	96906	B-14	26
MS35338-136	96906	B-20	6
MS35338-136	96906	B-24	17
MS35338-136	96906	B-28	20
MS35338-136	96906	B-29	12
MS35338-136	96906	B-33	5
MS35338-136	96906	B-35	16
MS35338-136	96906	B-43	32
MS35338-136	96906	B-47	48
MS35338-136	96906	B-48	3
MS35338-136	96906	B-52	39
MS35338-136	96906	B-54	4
MS35338-137	96906	B-29	24
MS35338-137	96906	B-29	38
MS35338-137	96906	B-31	19
MS35338-137	96906	B-43	53
MS35338-137	96906	B-47	19

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
MS35338-137	96906	B-48	15
MS35338-137	96906	B-48	18
MS35338-137	96906	B-52	27
MS35338-138	96906	B-11	5
MS35338-138	96906	B-22	11
MS35338-138	96906	B-45	5
MS35338-138	96906	B-47	40
MS35431-1	96906	B-39	13
MS35431-1	96906	B-45	7
MS35431-1	96906	B-51	6
MS35431-1	96906	B-55	8
MS35431-3	96906	B-52	35
MS35431-6	96906	B-50	40
MS35649-224	96906	B-49	3
MS35649-224	96906	B-57	29
MS35649-244	96906	B-2	28
MS35649-244	96906	B-3	3
MS35649-244	96906	B-5	35
MS35649-244	96906	B-9	13
MS35649-244	96906	B-9	28
MS35649-244	96906	B-14	20
MS35649-244	96906	B-20	27
MS35649-244	96906	B-21	17
MS35649-244	96906	B-28	13
MS35649-244	96906	B-29	51
MS35649-244	96906	B-34	23
MS35649-244	96906	B-35	60
MS35649-244	96906	B-39	11
MS35649-244	96906	B-43	11
MS35649-244	96906	B-49	13
MS35649-244	96906	B-56	1
MS35649-264	96906	B-5	48
MS35649-264	96906	B-9	7
MS35649-264	96906	B-9	66
MS35649-264	96906	B-14	28
MS35649-264	96906	B-20	13
MS35649-264	96906	B-31	5
MS35649-264	96906	B-32	3
MS35649-264	96906	B-34	15
MS35649-264	96906	B-43	37
MS35649-264	96906	B-47	49
MS35649-284	96906	B-29	23
MS35649-284	96906	B-31	20
MS35649-284	96906	B-47	18
MS35649-284	96906	B-48	14
MS35649-44	96906	B-4	8
MS35649-44	96906	B-6	2
MS35649-44	96906	B-13	15
MS35649-44	96906	B-55	4
MS35649-64	96906	B-4	21

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
MS35649-64	96906	B-13	13
MS35650-304	96906	B-11	6
MS35649-304	96906	B-47	42
MS51021-22	96906	B-44	5
MS51021-9	96906	B-44	15
MS51053-312	96906	B-5	55
MS51957-13	96906	B-2	64
MS51957-13	96906	B-5	2
MS51957-13	96906	B-9	22
MS51957-13	96906	B-14	42
MS51957-13	96906	B-21	5
MS51957-13	96906	B-22	2
MS51957-13	96906	B-47	7
MS51957-13	96906	B-54	11
MS51957-13	96906	B-56	24
MS51957-14	96906	B-9	27
MS51957-14	96906	B-13	20
MS51957-14	96906	B-14	19
MS51957-14	96906	B-21	17
MS51957-14	96906	B-29	15
MS51957-14	96906	B-39	22
MS51957-14	96906	B-43	8
MS51957-14	96906	B-49	8
MS51957-14	96906	B-56	101
MS51957-15	96906	B-5	33
MS51957-15	96906	B-39	62
MS51957-15	96906	B-43	42
MS51957-26	96906	B-2	34
MS51957-26	96906	B-5	61
MS51957-26	96906	B-9	4
MS51957-27	96906	B-29	45
MS51957-27	96906	B-35	42
MS51957-28	96906	B-2	36
MS51957-28	96906	B-10	2
MS51957-28	96906	B-28	19
MS51957-28	96906	B-32	4
MS51957-28	96906	B-43	36
MS51957-32	96906	B-2	66
MS51957-32	96906	B-31	24
MS51957-54	96906	B-47	60
MS51958-89	96906	B-35	34
MS51959-15	96906	B-2	27
MS51963-1	96906	B-48	29
MS51963-9	96906	B-48	22
MS75008-23	96906	B-45	10
MS75008-39	96906	B-9	121
MS75008-41	96906	B-27	23
MS75008-41	96906	B-40	31
MS75008-41	96906	B-41	46
MS75008-41	96906	B-57	9

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MS75008-45	96906	B-27	26
MS75053-1	96906	B-35	47
MS9021-007	96906	B-22	13
MS91189-29	96906	B-9	38
MS91528-1P2B	96906	B-43	24
MS91531-3N2B	96906	B-43	25
MW375-118	91766	B-39	74
M21097-11-02	96906	B-58	3
M23269-01-3061	81349	B-59	8
M24251-6-2	81349	B-14	11
M24251-6-2	81349	B-21	13
M24251-6-2	81349	B-29	29
M24251-6-2	81349	B-47	6
M24251-6-2	81349	B-56	37
M24251-6-3	81349	B-47	25
M24251-6-4	81349	B-14	2
M24251-6-4	81349	B-21	27
M39012-16-0002	81349	B-48	38
M39012-16-0002	81349	B-51	49
M39012-16-0002	81349	B-58	13
M39012-16-0002	81349	B-58	22
M39012-21-0001	81349	B-2	4
M39012-21-0001	81349	B-14	47
M39012-21-0001	81349	B-21	1
M39012-21-0001	81349	B-35	32
M39012-21-0001	81349	B-49	10
M39012-21-0001	81349	B-54	5
M39014-02-1332	81349	B-36	23
M39022-01-1673	81349	B-4	14
M39022-01-1673	81349	B-14	55
M39022-01-1673	81349	B-21	25
M39022-01-1673	81349	B-35	71
M39022-01-1721	81349	B-2	39
M39022-01-1721	81349	B-5	7
M39022-01-1721	81349	B-5	18
M39022-01-1721	81349	B-14	40
M39022-01-1721	81349	B-21	66
M39022-01-1721	81349	B-29	63
M39022-01-1721	81349	B-35	39
M39022-01-1721	81349	B-56	23
NAS671C4	80205	B-44	1
NE2A	08806	B-25	1
NE86	08806	B-29	10
OB2WA	81349	B-47	26
OF20-254KT	99120	B-3	2
PC43J280	81349	B-40	42
P31034-1	08289	B-39	33
P8292ZN0-005UF 400VPORM20PCT	00656	B-21	49
P8292ZN15	00656	B-14	35
P8292ZN15	00656	B-47	32
P8292ZN15	00656	B-56	48
P8292ZN18	00656	B-14	53
P8292ZN18	00656	B-21	10
P8292ZN20	00656	B-29	60
P8292ZN20	00656	B-47	65
P8282ZN20	00656	B-56	12
P8292ZN24	00656	B-56	100
P8292ZN29	00656	B-6	6
P8292ZN29	00656	B-56	41
P8292ZN6	00656	B-14	23
P8292ZN6	00656	B-21	50
P8292ZN6	00656	B-56	14
P8292ZN9	00656	B-14	12
P8292ZN9	00656	B-29	70
P88827	56289	B-5	68
P95ZN4	00656	B-29	54
P95ZN4	00656	B-56	15
RCR07G100JS	81349	B-36	3
RCR07G100JS	81349	B-40	11
RCR70G100JS	81349	B-41	18
RCR07G101JS	81349	B-27	16
RCR07G101JS	81349	B-36	19
RCR07G101JS	81349	B-39	25
RCR07G101JS	81349	B-40	18
RCR07G101JS	81349	B-41	2
RCR07G101JS	81349	B-50	12
RCR07G101JS	81349	B-57	21
RCR07G102JS	81349	B-22	20
RCR07G102JS	81349	B-27	7
RCR07G102JS	81349	B-36	16
RCR07G102JS	81349	B-39	8
RCR07G102JS	81349	B-40	3
RCR07G102JS	81349	B-41	14
RCR07G102JS	81349	B-50	6
RCR07G102JS	81349	B-57	23
RCR07G103JS	81349	B-22	30
RCR07G103JS	81349	B-27	10
RCR07G103JS	81349	B-40	6
RCR07G103JS	81349	B-41	1
RCR07G103JS	81349	B-50	33
RCR07G103JS	81349	B-57	14
RCR07G104JS	81349	B-23	2
RCR07G104JS	81349	B-27	35
RCR07G104JS	81349	B-39	45
RCR07G121JS	81349	B-39	3
RCR07G122JS	81349	B-22	25
RCR07G122JS	81349	B-40	23
RCR07G122JS	81349	B-41	30
RCR07G123JS	81349	B-27	14
RCR07G123JS	81349	B-40	5
RCR07G123JS	81349	B-41	9
RCR07G123JS	81349	B-50	34
RCR07G124JS	81349	B-22	27

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RCR07G151JS	81349	B-22	26
RCR07G151JS	31349	B-36	8
RCR07G151JS	31349	B-41	23
RCR07G151JS	81349	B-57	27
RCR07G152JS	81349	B-22	33
RCR07G152JS	81349	B-39	28
RCR07G152JS	81349	B-40	13
RCR07G152JS	81349	B-41	4
RCR07G152JS	81349	B-57	24
RCR07G153JS	81349	B-41	29
RCR07G181JS	81349	B-22	28
RCR07G182JS	81349	B-22	22
RCR07G182JS	81349	B-27	29
RCR07G182JS	81349	B-39	30
RCR07G182JS	81349	B-40	7
RCR07G182JS	81349	B-41	11
RCR07G182JS	81349	B-50	3
RCR07G183JS	81349	B-2	54
RCR07G183JS	81349	B-41	7
RCR07G183JS	81349	B-50	35
RCR07G201JS	81349	B-57	37
RCR07G220JS	81349	B-36	5
RCR07G221JS	81349	B-22	23
RCR07G221JS	81349	B-40	1
RCR07G221JS	81349	B-41	27
RCR20G221JS	81349	B-47	45
RCR20G221JS	81349	B-57	25
RCR07G221JS	81349	B-57	37
RCR07G222JS	81349	B-22	32
RCR07G222JS	81349	B-27	30
RCR07G222JS	81349	B-35	30
RCR07G222JS	81349	B-36	15
RCR07G222JS	81349	B-40	14
RCR07G222JS	81349	B-41	12
RCR07G222JS	81349	B-50	28
RCR07G222JS	81349	B-53	40
RCR07G222JS	81349	B-57	15
RCR07G223JS	81349	B-27	13
RCR07G223JS	81349	B-35	21
RCR07G223JS	81349	B-36	22
RCR07G223JS	81349	B-40	2
RCR07G223JS	81349	B-50	4
RCR07G241JS	81349	B-57	37
RCR07G271JS	81349	B-35	17
RCR07G271JS	81349	B-57	17
RCR07G271JS	81349	B-57	37
RCR07G272JS	81349	B-27	1
RCR07G272JS	81349	B-40	20
RCR07G272JS	81349	B-41	28
RCR07G272JS	81349	B-51	46
RCR07G272JS	81349	B-57	18
RCR07G273JS	81349	B-41	3
RCR07G273JS	81349	B-50	22
RCR07G301JS	81349	B-57	13
RCR07G301JS	81349	B-57	37
RCR07G330JS	81349	B-57	36
RCR07G331JS	81349	B-27	9
RCR07G331JS	81349	B-41	19
RCR07G331JS	81349	B-57	37
RCR07G332JS	81349	B-27	11
RCR07G332JS	81349	B-41	17
RCR07G332JS	81349	B-57	35
RCR07G333JS	81349	B-39	69
RCR07G360JS	81349	B-40	22
RCR07G360JS	81349	B-41	20
RCR07G361JS	81349	B-57	37
RCR07G390JS	81349	B-40	22
RCR07G390JS	81349	B-41	20
RCR07G391JS	81349	B-22	31
RCR07G391JS	81349	B-36	18
RCR07G391JS	81349	B-40	4
RCR07G391JS	81349	B-40	9
RCR07G391JS	81349	B-50	14
RCR07G391JS	81349	B-57	37
RCR07G392JS	81349	B-37	3
RCR07G392JS	81349	B-39	27
RCR07G392JS	81349	B-40	16
RCR07G392JS	81349	B-41	16
RCR07G392JS	81349	B-50	13
RCR07G392JS	81349	B-57	16
RCR07G430JS	81349	B-40	22
RCR07G430JS	81349	B-41	20
RCR07G431JS	81349	B-40	9
RCR07G431JS	81349	B-57	37
RCR07G470JS	81349	B-36	2
RCR07G470JS	81349	B-39	7
RCR07G470JS	81349	B-39	60
RCR07G470JS	81349	B-40	12
RCR07G470JS	81349	B-40	22
RCR07G470JS	81349	B-41	20
RCR07G471JS	81349	B-22	24
RCR07G471JS	81349	B-36	9
RCR07G471JS	81349	B-39	2
RCR07G471JS	81349	B-40	9
RCR07G471JS	81349	B-40	10
RCR07G471JS	81349	B-41	22
RCR07G471JS	81349	B-50	29
RCR07G471JS	81349	B-57	22
RCR07G471JS	81349	B-57	37
RCR07G472JS	81349	B-27	4
RCR07G472JS	81349	B-35	7

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
RCR07G472JS	81349	B-36	6
RCR07G472JS	81349	B-37	2
RCR07G472JS	81349	B-40	8
RCR07G472JS	81349	B-41	26
RCR07G473JS	81349	B-5	39
RCR07G473JS	81349	B-41	13
RCR07G474JS	81349	B-50	25
RCR07G510JS	81349	B-40	22
RCR07G510JS	81349	B-41	20
RCR07G511JS	81349	B-22	21
RCR07G511JS	81349	B-40	9
RCR07G511JS	81349	B-42	6
RCR07G560JS	81349	B-40	22
RCR07G560JS	81349	B-41	20
RCR07G560JS	81349	B-50	9
RCR07G561JS	81349	B-40	9
RCR07G561JS	81349	B-40	21
RCR07G562JS	81349	B-22	35
RCR07G562JS	81349	B-40	19
RCR07G620JS	81349	B-40	22
RCR07G620JS	81349	B-41	20
RCR07G621JS	81349	B-40	9
RCR07G680JS	81349	B-36	20
RCR07G680JS	81349	B-41	20
RCR07G681JS	81349	B-39	19
RCR07G681JS	81349	B-41	21
RCR07G681JS	81349	B-50	16
RCR07G682JS	81349	B-27	17
RCR07G682JS	81349	B-40	15
RCR07G682JS	81349	B-41	15
RCR07G683JS	81349	B-23	3
RCR07G821JS	81349	B-22	29
RCR07G821JS	81349	B-40	24
RCR07G821JS	81349	B-41	8
RCR07G822JS	81349	B-50	5
RCR07G822JS	81349	B-57	19
RCR20G100JS	81349	B-21	67
RCR20G101JS	81349	B-4	16
RCR20G101JS	81349	B-5	15
RCR20G101JS	81349	B-9	36
RCR20G101JS	81349	B-12	27
RCR20G101JS	81349	B-14	44
RCR20G101JS	81349	B-21	71
RCR20G101JS	81349	B-29	74
RCR20G101JS	81349	B-47	30
RCR20G101JS	81349	B-56	53
RCR20G102JS	81349	B-5	5
RCR20G102JS	81349	B-9	91
RCR20G102JS	81349	B-21	69
RCR20G102JS	81349	B-35	13
RCR20G102JS	81349	B-35	78
RCR20G102JS	81349	B-56	14
RCR20G102JS	81349	B-56	40
RCR20G102JS	81349	B-56	52
RCR20G103JS	81349	B-3	10
RCR20G103JS	81349	B-9	64
RCR20G103JS	81349	B-9	113
RCR20G103JS	81349	B-14	24
RCR20G103JS	81349	B-14	118
RCR20G103JS	81349	B-21	38
RCR20G103JS	81349	B-29	73
RCR20G103JS	81349	B-35	37
RCR20G103JS	81349	B-56	45
RCR20G103JS	81349	B-56	78
RCR20G104JS	81349	B-3	11
RCR20G104JS	81349	B-9	112
RCR20G104JS	81349	B-9	117
RCR20G104JS	81349	B-12	20
RCR20G104JS	81349	B-14	86
RCR20G104JS	81349	B-14	105
RCR20G104JS	81349	B-21	74
RCR20G104JS	81349	B-29	72
RCR20G104JS	81349	B-56	17
RCR20G105JS	81349	B-3	8
RCR20G105JS	81349	B-4	22
RCR20G105JS	81349	B-5	8
RCR20G105JS	81349	B-14	85
RCR20G105JS	81349	B-14	109
RCR20G105JS	81349	B-56	51
RCR20G105JS	81349	B-56	74
RCR20G106JS	81349	B-12	7
RCR20G110JS	81349	B-46	18
RCR20G112JS	81349	B-5	51
RCR20G112JS	81349	B-14	36
RCR20G114JS	81349	B-14	91
RCR20G121JS	81349	B-5	29
RCR20G121JS	81349	B-9	58
RCR20G121JS	81349	B-35	8
RCR20G122JS	81349	B-14	112
RCR20G122JS	81349	B-21	75
RCR20G123JS	81349	B-35	49
RCR20G124JS	81349	B-56	73
RCR20G125JS	81349	B-9	89
RCR20G131JS	81349	B-46	14
RCR20G132JS	81349	B-9	105
RCR20G150JS	81349	B-51	23
RCR20G150JS	81349	B-52	36
RCR20G151JS	81349	B-9	55
RCR20G151JS	81349	B-14	94
RCR20G152JS	81349	B-21	89

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

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
RCR20G152JS	81349	B-35	69
RCR20G153JS	81349	B-9	122
RCR20G153JS	81349	B-14	117
RCR20G153JS	81349	B-56	67
RCR20G154JS	81349	B-4	19
RCR20G154JS	81349	B-5	27
RCR20G154JS	81349	B-9	49
RCR20G154JS	81349	B-14	107
RCR20G154JS	81349	B-21	93
RCR20G154JS	81349	B-47	67
RCR20G154JS	81349	B-47	71
RCR20G154JS	81349	B-56	72
RCR20G155JS	81349	B-3	12
RCR20G155JS	81349	B-5	28
RCR20G155JS	81349	B-9	128
RCR20G161JS	81349	B-46	17
RCR20G161JS	81349	B-46	19
RCR20G162JS	81349	B-35	52
RCR20G181JS	81349	B-9	119
RCR20G181JS	81349	B-14	92
RCR20G181JS	81349	B-14	108
RCR20G181JS	81349	B-21	79
RCR20G181JS	81349	B-56	75
RCR20G182JS	81349	B-9	34
RCR20G182JS	81349	B-21	91
RCR20G182JS	81349	B-35	55
RCR20G183JS	81349	B-9	93
RCR20G184JS	81349	B-14	14
RCR20G201JS	81349	B-56	96
RCR20G202JS	81349	B-14	84
RCR20G203JS	81349	B-12	17
RCR20G221JS	81349	B-9	127
RCR20G221JS	81349	B-21	102
RCR20G222JS	81349	B-4	15
RCR20G222JS	81349	B-9	83
RCR20G222JS	81349	B-12	23
RCR20G222JS	81349	B-21	23
RCR20G222JS	81349	B-35	77
RCR20G222JS	81349	B-56	59
RCR20G222JS	81349	B-56	82
RCR20G223JS	81349	B-56	54
RCR20G223JS	81349	B-56	99
RCR20G224JS	81349	B-25	2
RCR20G224JS	81349	B-56	61
RCR20G225JS	81349	B-5	19
RCR20G242JS	81349	B-9	62
RCR20G242JS	81349	B-12	19
RCR20G243JS	81349	B-9	81
RCR20G270JS	81349	B-14	22
RCR20G270JS	81349	B-21	86
RCR20G271JS	81349	B-9	59
RCR20G271JS	81349	B-12	26
RCR20G271JS	81349	B-14	119
RCR20G271JS	81349	B-14	126
RCR20G271JS	81349	B-35	54
RCR20G271JS	81349	B-41	24
RCR20G272JS	81349	B-5	14
RCR20G272JS	81349	B-12	14
RCR20G272JS	81349	B-14	104
RCR20G272JS	81349	B-56	46
RCR20G273JS	81349	B-14	98
RCR20G273JS	81349	B-21	92
RCR20G273JS	81349	B-47	34
RCR20G331JS	81349	B-14	103
RCR20G331JS	81349	B-17	5
RCR20G331JS	81349	B-21	68
RCR20G331JS	81349	B-21	84
RCR20G331JS	81349	B-50	11
RCR20G332JS	81349	B-21	87
RCR20G333JS	81349	B-9	100
RCR20G333JS	81349	B-21	70
RCR20G333JS	81349	B-56	7
RCR20G333JS	81349	B-56	65
RCR20G334JS	81349	B-9	106
RCR20G334JS	81349	B-9	129
RCR20G334JS	81349	B-56	58
RCR20G334JS	81349	B-56	68
RCR20G361JS	81349	B-56	98
RCR20G363JS	81349	B-14	88
RCR20G364JS	81349	B-5	25
RCR20G390JS	81349	B-56	94
RCR20G391JS	81349	B-14	87
RCR20G392JS	81349	B-5	30
RCR20G392JS	81349	B-14	43
RCR20G392JS	81349	B-21	30
RCR20G393JS	81349	B-9	92
RCR20G393JS	81349	B-56	57
RCR20G393JS	81349	B-56	60
RCR20G431JS	81349	B-29	79
RCR20G433JS	81349	B-56	14
RCR20G434JS	81349	B-29	68
RCR20G470JS	81349	B-5	13
RCR20G470JS	81349	B-9	35
RCR20G470JS	81349	B-24	19
RCR20G470JS	81349	B-29	53
RCR20G470JS	81349	B-35	72
RCR20G470JS	81349	B-51	38
RCR20G471JS	81349	B-9	97
RCR20G471JS	81349	B-10	6
RCR20G471JS	81349	B-14	99

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

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
RCR20G471JS	81349	B-14	110
RCR20G471JS	81349	B-41	25
RCR20G472JS	81349	B-5	20
RCR20G472JS	81349	B-14	123
RCR20G472JS	81349	B-14	124
RCR20G472JS	81349	B-21	28
RCR20G472JS	81349	B-35	29
RCR20G472JS	81349	B-56	76
RCR20G473JS	81349	B-9	54
RCR20G473JS	81349	B-14	106
RCR20G473JS	81349	B-29	64
RCR20G473JS	81349	B-35	73
RCR20G473JS	81349	B-56	39
RCR20G473JS	81349	B-56	91
RCR20G474JS	81349	B-9	90
RCR20G474JS	81349	B-14	37
RCR20G474JS	81349	B-21	88
RCR20G474JS	81349	B-47	70
RCR20G474JS	81349	B-56	64
RCR20G475JS	81349	B-55	1
RCR20G510JS	81349	B-21	81
RCR20G512JS	81349	B-5	9
RCR20G560JS	81349	B-14	113
RCR20G561JS	81349	B-21	80
RCR20G561JS	81349	B-56	87
RCR20G562JS	81349	B-5	26
RCR20G562JS	81349	B-9	115
RCR20G562JS	81349	B-21	24
RCR20G562JS	81349	B-38	8
RCR20G562JS	81349	B-56	79
RCR20G563JS	81349	B-9	95
RCR20G563JS	81349	B-29	56
RCR20G563JS	81349	B-56	85
RCR20G621JS	81349	B-35	51
RCR20G622JS	81349	B-9	94
RCR20G623JS	81349	B-9	124
RCR20G680JS	81349	B-9	109
RCR20G681JS	81349	B-56	69
RCR20G682JS	81349	B-12	24
RCR20G682JS	81349	B-14	48
RCR20G682JS	81349	B-21	94
RCR20G682JS	81349	B-26	8
RCR20G683JS	81349	B-14	125
RCR20G683JS	81349	B-29	59
RCR20G684JS	81349	B-4	2
RCR20G684JS	81349	B-9	87
RCR20G684JS	81349	B-21	77
RCR20G750JS	81349	B-5	31
RCR20G750JS	81349	B-46	1
RCR20G751JS	81349	B-14	100
RCR20G753JS	81349	B-9	82
RCR20G820JS	81349	B-53	45
RCR20G821JS	81349	B-14	49
RCR20G821JS	81349	B-14	121
RCR20G821JS	81349	B-21	78
RCR20G821JS	81349	B-56	47
RCR20G821JS	81349	B-56	62
RCR20G822JS	81349	B-9	61
RCR20G822JS	81349	B-9	125
RCR20G822JS	81349	B-21	99
RCR20G822JS	81349	B-56	43
RCR20G823JS	81349	B-9	101
RCR20G823JS	81349	B-29	57
RCR20G823JS	81349	B-56	81
RCR20G824JS	81349	B-56	88
RCR20G910JS	81349	B-35	57
RCR20G913JS	81349	B-56	70
RCR32G101JS	81349	B-35	76
RCR32G112JS	81349	B-14	101
RCR32G123JS	81349	B-14	52
RCR32G124JS	81349	B-14	120
RCR32G133JS	81349	B-5	17
RCR32G134JS	81349	B-21	72
RCR32G134JS	81349	B-47	69
RCR32G153JS	81349	B-9	123
RCR32G154JS	81349	B-14	115
RCR32G161JS	81349	B-47	36
RCR32G220JS	81349	B-29	55
RCR32G222JS	81349	B-14	38
RCR32G222JS	81349	B-21	76
RCR32G223JS	81349	B-29	71
RCR32G244JS	81349	B-14	97
RCR32G272JS	81349	B-21	83
RCR32G331JS	81349	B-32	9
RCR32G334JS	81349	B-14	89
RCR32G393JS	81349	B-14	122
RCR32G434JS	81349	B-9	96
RCR32G470JS	81349	B-29	81
RCR32G470JS	81349	B-47	31
RCR32G470JS	81349	B-14	111
RCR32G562JS	81349	B-9	104
RCR32G563JS	81349	B-9	110
RCR32G681JS	81349	B-10	5
RCR32G581JS	81349	B-39	14
RCR32G682JS	81349	B-9	71
RCR32G683JS	81349	B-14	102
RCR32G683JS	81349	B-47	28
RCR32G753JS	81349	B-47	68
RCR32G820JS	81349	B-27	27
RCR32G823JS	81349	B-47	72

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
RCR32G823JS	81349	B-56	90
RCR32G910JS	81349	B-5	24
RCR32G910JS	81349	B-21	96
RCR42G103JS	81349	B-21	85
RCR42G104JS	81349	B-9	63
RCR42G104JS	81349	B-21	73
RCR42G104JS	81349	B-47	66
RCR42G123JS	81349	B-21	90
RCR42G133JS	81349	B-5	21
RCR42G133JS	81349	B-9	108
RCR42G153JS	81349	B-9	107
RCR42G153JS	81349	B-21	19
RCR42G181JS	81349	B-47	63
RCR42G183JS	81349	B-14	15
RCR42G183JS	81349	B-21	97
RCR42G184JS	81349	B-12	12
RCR42G201JS	81349	B-29	48
RCR42G202JS	81349	B-21	44
RCR42G222JS	81349	B-9	65
RCR42G222JS	81349	B-14	116
RCR42G223JS	81349	B-9	53
RCR42G223JS	81349	B-29	65
RCR42G273JS	81349	B-12	18
RCR42G301JS	81349	B-5	10
RCR42G332JS	81349	B-35	48
RCR42G333JS	81349	B-9	48
RCR42G393JS	81349	B-9	79
RCR42G470JS	81349	B-21	101
RCR42G472JS	81349	B-15	11
RCR42G472JS	81349	B-21	95
RCR42G473JS	81349	B-9	86
RCR42G514JS	81349	B-14	96
RCR42G562JS	81349	B-21	100
RCR42G563JS	81349	B-14	90
RCR42G563JS	81349	B-35	75
RCR42G563JS	81349	B-56	71
RCR42G682JS	81349	B-9	88
RCR42G750JS	81349	B-2	46
RCR42G750JS	81349	B-35	5
RCR42G821JS	81349	B-5	11
RCR42G821JS	81349	B-47	64
RCR42G823JS	81349	B-21	98
RCR42G912JS	81349	B-14	93
RC07GF6R8J	81349	B-7	24
RC20GF750J	81349	B-5	31
RC42GF113J	81349	B-5	53
RC42GF220J	81349	B-46	11
RC42GF362J	81349	B-14	95
RC42GF752J	81349	B-9	78
RE70G1801	81349	B29	49
RE70G4991	81349	B-56	93
RG179BU	81349	B-30	3
RG179BU	81349	B-31	8
RG179BU	81349	B-31	14
RG179BU	81349	B-47	51
RG179BU	81349	B-54	10
RG179BU	81349	B-55	17
RG179BU	81349	B-55	23
RG179BU	81349	B-56	104
RG179BU	81349	B-58	6
RG223U	81349	B-48	9
RG223U	81349	B-48	35
RG223U	81349	B-51	16
RG223U	81349	B-53	54
RG223U	81349	B-58	15
RG316U	81349	B-34	31
RG316U	81349	B-43	39
RG316U	81349	B-48	5
RG55BU	81349	B-51	34
RG58CU	81349	B-58	9
RG58CU	81349	B-58	28
RG62AU	81349	B-48	39
RG62AU	81349	B-51	50
RG62AU	81349	B-52	62
RG62AU	81349	B-58	12
RG62AU	81349	B-58	21
RNC55K49R9FS	81349	B-53	57
RNC70K1000FS	81349	B-56	11
RNC70K1002FS	81349	B-7	15
RNC70K1003FS	81349	B-7	4
RNC70K1004FS	81349	B-7	9
RNC70K1004FS	81349	B-7	21
RNC70K1004FS	81349	B-7	22
RNC70K1004FS	81349	B-7	23
RNC70K1210FS	81349	B-56	13
RNC70K1621FS	81349	B-21	14
RNC70K20R0FS	81349	B-56	10
RNC70K2000FS	81349	B-56	8
RNC70K2153FS	81349	B-29	67
RNC70K2491FS	81349	B-7	12
RNC70K2492FS	81349	B-7	17
RNC70K2493FS	81349	B-7	6
RNC70K2613FS	81349	B-29	76
RNC70K4023FS	81349	B-29	66
RNC70K4991FS	81349	B-7	13
RNC70K4992FS	81349	B-7	2
RNC70K4993FS	81349	B-7	8
RNC70K6040FS	81349	B-55	13
RNC70K7503FS	81349	B-7	26
RNC70K9093FS	81349	B-7	28

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
RNC70K9763FS	81349	B-7	20
RN70B20R0F	81349	B-56	10
RN70D1783F	81349	B-29	69
RN70D5361F	81349	B-56	92
RN70D80R6F	81349	B-56	9
RN70D9533F	81349	B-7	18
RN80B1621F	81349	B-56	95
RSTSM1TUR	98291	B-52	34
RT10C2L102	81349	B-41	6
RT10C2L501	81349	B-41	10
RT10C2L502	81349	B-41	5
RT22C2L102	81349	B-57	34
RT22C2L501	81349	B-57	33
RV2LAYSA101A	81349	B-21	32
RV2LAYSA102A	81349	B-10	1
RV2LAYSA102A	81349	B-56	34
RV2LAYSA253A	81349	B-9	2
RV2LAYSA253A	81349	B-56	33
RV2LAYSA502A	81349	B-9	3
RV2LAYSA502A	81349	B-9	85
RV2LAYSA503A	81349	B-56	32
RV4LAYSA102A	81349	B-5	59
RV4LAYSA104A	81349	B-29	27
RV4LAYSA253A	81349	B-47	35
RV4LAYSA501A	81349	B-5	58
RV4NAYSB103A	81349	B-16	3
RV4NAYSB103A	81349	B-17	3
RV4NAYSB251A	81349	B-35	14
RV4NAYSB251A	81349	B-35	18
RV4NAYSB251A	81349	B-55	11
RV4NAYSB252A	81349	B-55	25
RV4NAYSB253A	81349	B-12	16
RV4NAYSB253A	81349	B-24	22
RV4NAYSB501A	81349	B-5	57
RV4NAYSB501A	81349	B-15	8
RV4NAYSB501A	81349	B-34	35
RV4NAYSB501A	81349	B-35	22
RV4NAYSD251A	81349	B-24	8
RV4NAYSD501A	81349	B-24	9
RV5LAYSB102A	81349	B-21	34
RV5LAYSB253A	81349	B-20	11
RV5LAYSB502A	81349	B-20	12
RV5LAYSB503A	81349	B-14	39
RV6LAYSA501A	81349	B-35	50
RW20V392	81349	B-47	37
RW20V622	81349	B-47	38
RW29V312	81349	B-29	52
RW29V801	81349	B-47	44
RW69G1R0	81349	B-4	11
SCH309-70BB	75376	B-43	13
SE64	61957	B-29	77
SKT2BC	98291	B-9	42
SKT2BC	98291	B-14	64
SKT2BC	98291	B-21	54
SKT2BC	98291	B-29	6
SKT2BC	98291	B-35	67
SKT2BC	98291	B-40	45
SKT2BC	98291	B-41	33
SKT2BC	98291	B-42	5
SKT2BC	98291	B-47	14
SKT2BC	98291	B-56	22
SS48192	61864	B-52	56
S246-3LBB	75376	B-43	28
S3KDD	86174	B-51	45
S5091	84970	B-29	41
S5091	84970	B-43	22
S5092A	84970	B-29	37
S5092A	84970	B-47	16
S5KDD	86174	B-52	43
S5KDD	86174	B-53	4
S645-5LBB538	75376	B-2	2
S645-5LBB	75376	B-2	3
S645-5LBB	75376	B-12	1
S645-5LBB	75376	B-15	3
S645-5LBB	75376	B-24	10
S645-5LBB	75376	B-54	6
S645-5LBB	75376	B-55	19
S647-3LBB	75376	B-24	6
S647-4LBB	75376	B-13	5
S649-3LBB	75376	B-24	5
TM1-4-5000OHM1-4W PORM10PCT	06228	B-40	17
TM1-4-8200-OHMS 1-4WPORM10PCT	06228	B-57	20
TM1-8-68OHM-1-8W PORM 10PCT	06228	B-27	12
TR6-6025H	98978	B-29	3
TSA16	04009	B-2	6
TSA16	04009	B-35	3
TSA16	04009	B-56	31
TS0205C01	81349	B-14	45
TS101P02	81349	B-4	7
TS101P02	81349	B-9	30
TS101P02	81349	B-10	4
TS101P02	81349	B-29	35
TS101P02	81349	B-47	29
TS102P01	81349	B-9	46
TS102P01	81349	B-14	41
TS102P01	81349	B-21	12
TS102P01	81349	B-35	38

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TS102P01	81349	B-47	33
TS102U01	81349	B-9	44
TS102U01	81349	B-34	22
TS103P01	81349	B-4	12
TS103P01	81349	B-5	1
TS103P01	81349	B-9	21
TS103P01	81349	B-14	14
TS103P01	81349	B-21	3
TS103P01	81349	B-29	4
TS103P01	81349	B-35	36
TS103P01	81349	B-51	26
TS103U02	81349	B-2	57
TS103U02	81349	B-5	42
TS103U02	81349	B-9	20
TS103U02	81349	B-14	4
TS103U02	81349	B-21	4
TS103U02	81349	B-29	18
TS103U02	81349	B-56	27
TS103U03	81349	B-34	20
TT101-0-05	97722	B-40	32
TT101-0-05	97722	B-41	45
TXB2P032-037	98978	B-35	59
TXB2P032-037	98978	B-39	6
UG201AU	81349	B-58	24
UG273U	70117	B-58	26
UG274BU	81349	B-58	23
UG290AU	81349	B-47	58
UG309U	81349	B-58	19
UG636AU	81349	B-58	17
UG88EU	81349	B-48	10
UG88EU	81349	B-48	36
UG88EU	81349	B-53	55
UG88EU	81349	B-58	10
UG88EU	81349	B-58	16
UG88EU	81349	B-58	29
VCJ1839	73899	B-39	67
VCJ2109	73899	B-39	18
VCJ679A	73899	B-39	48
VC950	73899	B-39	36
WC1-1-4-6	95987	B-9	9
WC3-16-4	95987	B-31	11
WC3-4-6NA	95987	B-9	69
WC5-8-6	95987	B-6	5
WC7-16-4-NA	71616	B-14	33
WC7-16-4	95987	B-31	12
XG1897NT10	72928	B-56	6
010-9078D	70117	B-59	2
015X109X187SST	70117	B-43	6
01X193X375SST	70117	B-48	25
020X250X328 BRSSILPL	70117	B-51	58
031X171X312SST	70117	B-48	20
031X265X500SST	70117	B-31	45
032X200X340SST	70117	B-11	4
032X200X340SST	70117	B-19	2
032X375X562BRS	70117	B-2	50
062X196X296SST	70117	B-43	3
100-200-4A14	99378	B-39	50
1025-04	99800	B-39	42
102651F1	76854	B-12	10
10-32X1375BHSST	70117	B-47	39
10-32X1437BHSST	70117	B-22	10
1145SW40	97814	B-53	34
1205-4	57068	B-31	42
123	79963	B-39	17
12AT7WA	81349	B-9	37
12AT7WA	81349	B-14	3
12AT7WA	81349	B-21	20
12AT7WA	81349	B-29	19
12BY7A	81349	B-21	18
133-65-10-041	71785	B-39	47
1-4-20X7-16X1-8SST	70117	B-31	49
14S437D	56289	B-31	34
1537-78	99800	B-40	34
1928	78189	B-53	14
194774F2	76854	B-17	7
194774F2	76854	B-25	3
19477F1	76854	B-12	25
195657F3C	76854	B-7	30
196661F4	76854	B-24	4
1N25	93332	B-53	21
1N277	81349	B-9	53
1N277	81349	B-21	9
1N2989B	81349	B-29	78
1N2989B	81349	B-47	61
1N3022B	81349	B-27	28
1N3030B	81349	B-32	7
1N3064	81349	B-27	5
1N3064	81349	B-34	37
1N3064	81349	B-36	14
1N3064	81349	B-37	1
1N3064	81349	B-39	5
1N3064	81349	B-40	25
1N3064	81349	B-41	37
1N3064	81349	B-50	23
1N3064	81349	B-56	80
1N3064	81349	B-57	1
1N459	81349	B-9	102
1N483B	81349	B-27	25
1N483B	81349	B-32	1
1N4962	81349	B-39	15

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
1N538	81349	B-35	70
1N643	81349	B-9	98
1N643	81349	B-14	59
1N643	81349	B-56	84
1N645	81349	B-3	13
1N645	81349	B-4	1
1N645	81349	B-56	66
1N746A	81349	B-35	56
1N748A	81349	B-29	1
1N753A	81349	B-35	53
1N963B	81349	B-35	68
1N979B	81349	B-9	99
1PC77175	74868	B-51	15
207-0410-01-201	72619	B-28	4
207-0410-01-201	72619	B-43	19
208-0131-200	72619	B-28	3
208-0131-200	72619	B-43	18
208-0410-0131-201	72619	B-28	2
208-0410-0131-201	72619	B-43	17
210M	75543	B-5	66
2191	71436	B-29	43
22NTM40	72962	B-47	55
2348	71436	B-2	60
2482001SW5V-0-1	72872	B-39	9
2482-001X5U-0-101GMV	72982	B-39	20
24D2101	04239	B-23	1
2-56X281FILHSST	70117	B-51	18
2506-10	78189	B-39	1
2522-4	78189	B-3	7
2522-4	78189	B-4	10
2522-4	78189	B-18	8
2522-4	78189	B-39	61
2522-4	78189	B-49	12
2522-6	78189	B-32	6
2-56X1-850 CHDCRES	70117	B-20	16
2-56X1-8 SOCHDCRE	70117	B-34	2
2-56X312BHSST	70117	B-19	9
2-56X3-16X3-32NY	70117	B-53	41
2-56X3-8NYLON-FLATSLOTHD	70117	B-53	33
2-56X9-16BH BRASSILVERPL	70117	B-53	50
260-10	04073	B-51	52
26-4100-16P	02660	B-35	65
26-4100-16P	02660	B-56	103
26-4100-24P	02660	B-2-	62
26-4100-24P	02660	B-9	26
26-4100-24P	02660	B-14	18
26-4200-16S	02660	B-47	52
26-4200-24S	02660	B-30	2
26TB6	81349	B-31	36
2B22	81349	B-45	13
2B22	81349	B-51	11
2C36	81349	B-52	3
2D2	07387	B-21	15
2E	07387	B-5	32
2N1132	81349	B-41	43
2N1485	81349	B-35	44
2N1613	81349	B-50	10
2N2222	81349	B-39	76
2N2481	81349	B-27	8
2N2481	81349	B-39	32
2N2481	81349	B-50	30
2N2481	81349	B-57	2
2N2906	81349	B-27	3
2N2906	81349	B-40	26
2N2906	81349	B-57	6
2N3553	81349	B-39	73
2N3823	81349	B-50	19
2N697	81349	B-35	58
2N697	81349	B-36	11
2N697	81349	B-39	26
2N697	81349	B-40	33
2N697	81349	B-41	35
2N697	81349	B-57	3
2N706	81349	B-36	13
2N706	81349	B-40	29
2N706	81349	B-41	31
328R	08806	B-2	9
3-48X187FILHSST	70117	B-46	4
3-48X312FILHSST	70117	B-43	4
3-56X312RHSST	70117	B-47	57
3-56X3-16X1-16 BRSSILPL	70117	B-46	3
370CH501-2	72982	B-53	20
3X5K6341C	57711	B-5	54
3LTSPLITSST	70117	B-43	5
3LTSPLITSST	70117	B-46	5
3MEDSPLITSST	70117	B-52	20
3T17	88245	B-47	3
42025-17	88245	B-47	2
4-40X1375FHSST	70117	B-20	3
4-40X187FILHSST	70117	B-51	8
4-40X1-8CUPPTSST	70117	B-53	16
4-40X312FILHSST	70117	B-51	1
4-40X312FILHSST	70117	B-52	19
4-40X312FILHSST	70117	B-53	25
4-40X375BHSST	70117	B-19	6
4-40X375FILHSST	70117	B-45	8

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
4-40X375RH			
BRASSILPL	70117	B-45	16
4-40X5-16FILHBR	70117	B-13	11
4-40X7-16CUPP			
TSST	70117	B-19	12
4476	71785	B-53	37
447SS3-6	83930	B-35	52
4MEDSPLIT			
BRASSILPL	70117	B-45	17
4MEDSPLITSST	70117	B-19	7
4MP1	81349	B-2	15
500R104A	11239	B-35	6
501A17	70117	B-51	28
501A7-2	70117	B-51	37
501C68-3	70117	B-59	17
501C68-5	70117	B-59	18
501D35-24	70117	B-51	42
501D42-8	70117	B-52	29
502A15-1-42	70117	B-51	51
502A23-3	70117	B-53	13
502A24-1	70117	B-52	45
502A24-1	70117	B-53	2
502A24-3	70117	B-51	49
502A41-11-3	70117	B-22	8
504A12-2	70117	B-52	49
504B69	70117	B-44	6
504B70-2	70117	B-44	7
504C1-32	70117	B-19	4
504C1-4	70117	B-52	44
504C1-4	70117	B-53	3
504C1-5	70117	B-51	29
504C2-2-52	70117	B-2	17
504C2-2-52	70117	B-9	67
505D1-109	70117	B-31	47
505D1-49	70117	B-13	6
505D1-4	70117	B-5	45
505D1-4	70117	B-13	20
505D1-4	70117	B-14	68
505D1-4	70117	B-28	16
505D1-4	70117	B-55	6
505D1-4	70117	B-59	15
505D1-56	70117	B-13	10
505D1-57	70117	B-13	8
506B32	70117	B-2	42
506B32	70117	B-5	38
506C2-13-7	70117	B-42	3
506C2-32-102	70117	B-14	66
509A13	70117	B-52	16
509B30-6	70117	B-49	1
5102-875F2-52	70117	B-43	2

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
511A60-1	70117	B-5	60
511A60-2	70117	B-29	61
511B44	70117	B-58	30
511D64-2NH	70117	B-29	21
511D64-7NH	70117	B-29	33
512A140	70117	B-2	10
512A149	70117	B-43	47
512A150	70117	B-18	[illegible]
512A150	70117	B-26	4
512A150	70117	B-38	4
512A152	70117	B-19	11
512A40	70117	B-43	55
512A63-26	70117	B-31	28
512A63-7	70117	B-2	19
512A72	70117	B-31	39
512B159	70117	B-2	13
512B280-2	70117	B-5	64
512B280-3	70117	B-2	23
512B358	70117	B-43	27
512C222	70117	B-31	51
512C1-61	70117	B-51	57
512C1-61	70117	B-53	56
512D144-3	70117	B-58	31
5133-18	79136	B-48	24
514D220	70117	B-44	2
515A1207	70117	B-2	32
515A146	70117	B-52	52
515A162-2	70117	B-45	6
515A333-1	70117	B-31	40
515A859-2	70117	B-22	5
515B1341	70117	B-29	40
515B1341	70117	B-47	17
515B2383	70117	B-49	6
515B3216-2	70117	B-39	21
515B885	70117	B-2	22
515B896	70117	B-2	26
515C2378	70117	B-44	10
515C3216-1	70117	B-39	55
515C893	70117	B-2	30
515D1520-1	70117	B-31	50
516B688	70117	B-44	21
517B8	70117	B-44	4
518A104-2	70117	B-14	46
518A209	70117	B-5	56
518A36	70117	B-52	17
518A37	70117	B-45	18
518B360	70117	B-35	28
518C362	70117	B-44	9
518B365	70117	B-53	43
519A19	70117	B-45	2

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
519B49	70117	B-3	6
519B65	70117	B-12	22
519B65	70117	B-16	1
519B65	70117	B-17	1
519B65	70117	B-55	12
519B65	70117	B-55	24
519C12-2	70117	B-28	10
519C12-2	70117	B-43	43
519C12-36	70117	B-26	5
519C12-36	70117	B-38	5
519C12-37	70117	B-20	21
519C12-37	70117	B-34	5
519C12-38	70117	B-18	5
52-009-0000	98291	B-34	32
52-012-0000	98291	B-34	33
52-015-0007023	61957	B-43	41
52-046-0069	98291	B-39	57
520A127	70117	B-51	46
520B111	70117	B-51	40
520B112	70117	B-51	5
520C110	70117	B-52	1
521A20	70117	B-43	15
521A21	70117	B-43	12
521C18-1	70117	B-2	11
521C18-2	70117	B-2	12
525B6	70117	B-34	7
527A100	70117	B-52	38
527A100	70117	B-53	9
527A112	70117	B-52	60
527A113	70117	B-52	25
527A118	70117	B-53	26
527A119	70117	B-52	12
527A119	70117	B-52	55
527A120	70117	B-53	11
527A121	70117	B-53	7
527A125-1	70117	B-51	54
527A125-2	70117	B-52	67
527A126-1	70117	B-51	53
527A126	70117	B-52	64
527A128	70117	B-53	12
527A129	70117	B-52	46
527A130	70117	B-52	48
527A131-1	70117	B-52	8
527A131-2	70117	B-52	32
527A133	70117	B-51	56
527A133	70117	B-52	50
527A133	70117	B-52	66
527A136	70117	B-52	58
527A137	70117	B-53	17
527A138	70117	B-53	22
527A139	70117	B-53	18
527A144	70117	B-45	22
527A145	70117	B-45	19
527A150-2	70117	B-45	4
527A157	70117	B-45	1
527A161	70117	B-51	44
527A162	70117	B-51	33
527A164	70117	B-51	30
527A170	70117	B-51	22
527A380	70117	B-52	2
527A477	70117	B-19	3
527A481	70117	B-20	8
527B134-2	70117	B-53	6
527B154-2	70117	B-45	11
527B455	70117	B-59	12
527B462	70117	B-2	55
527B486-1	70117	B-52	31
527B896	70117	B-53	48
527B897	70117	B-53	51
527B898	70117	B-53	30
527B91	70117	B-59	13
527C485	70117	B-52	5
527C721-7	70117	B-39	38
527C894	70117	B-53	35
528A83	70117	B-19	1
528B298	70117	B-44	16
529B70	70117	B-19	5
529B70	70117	B-19	10
529C3-103	70117	B-20	30
529C3-10-44	70117	B-51	25
529C3-11-44	70117	B-51	27
529C3-15-92	70117	B-14	67
529C3-33-92	70117	B-47	56
529C3-48	70117	B-2	31
529C3-74	70117	B-20	9
529C6-1	70117	B-51	55
529C6-1	70117	B-52	65
529C6-2	70117	B-52	24
529C6-34	70117	B-28	17
529C6-39	70117	B-18	3
529C6-39	70117	B-26	3
529C6-39	70117	B-38	3
529C72	70117	B-19	8
529C7-53	70117	B-52	30
529D4-5	70117	B-52	14
529D4-5	70117	B-52	53
529D4-95	70117	B-39	63
530B101	70117	B-48	32
530B326	70117	B-44	22
530B336-1	70117	B-48	21

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
530B5-8	70117	B-20	19
530B5-8	70117	B-34	4
530B59-5	70117	B-13	9
530C327	70117	B-44	14
530C62-8	70117	B-48	28
530C65-133	70117	B-44	17
53-11428	02598	B-31	29
532A68	70117	B-52	23
532A81	70117	B-45	20
532B295	70117	B-52	6
533A103	70117	B-28	8
533A103	70117	B-43	1
533A115	70117	B-20	20
533A115	70117	B-34	3
533A98-1	70117	B-2	1
533A98-3	70117	B-2	5
533A98-3	70117	B-12	2
533A98-3	70117	B-15	2
533A98-3	70117	B-24	11
533A98-3	70117	B-34	8
533A98-3	70117	B-55	18
533B106-1	70117	B-20	15
533B106-3	70117	B-34	1
533B186-1	70117	B-3	1
533B327-2	70117	B-34	6
533B327-3	70117	B-34	13
533B99-6	70117	B-34	12
533B99-7	70117	B-34	9
533B99-8	70117	B-34	11
533B99-9	70117	B-34	10
533C260-1	70117	B-24	12
533C260-2	70117	B-24	2
533C261-1	70117	B-24	13
533C261-2	70117	B-24	1
533C93	70117	B-59	16
534J22-1	70117	B-59	10
534J22-2	70117	B-59	11
536B28-2	70117	B-15	5
536C49	70117	B-31	52
537B70-1	70117	B-9	16
537B70-1	70117	B-13	12
537B70-1	70117	B-20	23
537B71-2	70117	B-43	56
537B72	70117	B-51	17
54G	70485	B-2	65
54G	70485	B-5	63
54G	70485	B-6	1
54G	70485	B-9	47
54G	70485	B-29	28
54G	70485	B-35	4
54G	70485	B-47	10
557-038N750-8-50	72982	B-59	5
559B46	70117	B-44	23
560A41	70117	B-46	9
560A42	70117	B-46	10
560A52	70117	B-35	33
560C29-120	70117	B-2	45
560C29-99	70117	B-59	7
5651WA	81349	B-29	30
5651WA	81349	B-47	5
565C1-11	70117	B-3	9
565C66	70117	B-29	36
5670W	81349	B-14	1
567WB	81349	B-9	43
567WB	81349	B-14	6
567WB	81349	B-21	2
567WB	81349	B-56	35
569B100	70117	B-39	43
569B101	70117	B-39	46
569B90	70117	B-39	68
569B93	70117	B-39	66
569B94	70117	B-39	41
569B95	70117	B-39	64
569B97	70117	B-39	51
569B98	70117	B-39	52
569C29-1	70117	B-22	16
569C29-3	70117	B-22	9
569C29-4	70117	B-22	17
569C29-5	70117	B-22	18
569C29-7	70117	B-22	6
569C32-1	70117	B-26	6
569C32-1	70117	B-38	6
569C32-3	70117	B-18	6
569D108-1	70117	B-50	18
569D108-2	70117	B-50	27
569D108-3	70117	B-50	42
569D108-4	70117	B-50	26
5726	81349	B-9	45
5726	81349	B-34	21
572C13-1	70117	B-9	40
572C33	70117	B-27	31
572D11-2	70117	B-18	7
572D11-3	70117	B-26	7
572D11-3	70117	B-38	7
572D11-5	70117	B-22	1
572D11-6	70117	B-21	55
572D11-8	70117	B-14	34
572D14-1	70117	B-56	4
572D39	70117	B-42	2
572D43-1	70117	B-50	39
572D44	70117	B-53	42
573A3	70117	B-46	8

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PART NUMBER	FSCM	FIG. NO.	ITEM NO.
573B11-31	70117	B-21	62
573B11-32	70117	B-21	51
573B11-32	70117	B-21	65
573B11-35	70117	B-21	56
573B11-36	70117	B-21	35
573B11-36	70117	B-56	97
573B11-37	70117	B-21	63
573B11-37	70117	B-56	86
573B11-40	70117	B-9	103
573B11-45	81349	B-55	15
573B11-46	70117	B-14	61
573B70	70117	B-39	31
573B71	70117	B-39	75
573B74	70117	B-39	35
574B27	70117	B-29	32
574B30	70117	B-49	43
574C28	70117	B-29	31
574C34-1	70117	B-9	118
574C34-1	70117	B-21	29
574C35-2	70117	B-9	126
574C35-2	70117	B-14	81
574D58	70117	B-11	1
575B25	70117	B-2	35
575B26	70117	B-2	40
575C4-7	70117	B-12	13
575C9-3	70117	B-15	10
575D3-82	70117	B-2	53
576C122-3	70117	B-48	33
576C174	70117	B-34	36
576C175	70117	B-35	1
576C196	70117	B-35	23
576C197	70117	B-35	19
576C198	70117	B-35	15
576C199	70117	B-24	21
577B43-5	70117	B-28	23
577B43	70117	B-28	18
579C25	70117	B-34	17
579D46-1	70117	B-36	21
579D46-5	70117	B-36	4
580C107	70117	B-32	2
580C23-2	70117	B-29	42
580C25-2	70117	B-47	15
580D100	70117	B-35	41
5814A	81349	B-2	58
5814A	81349	B-5	41
5814A	81349	B-9	19
5814A	81349	B-14	5
5814A	81349	B-21	46
5814A	81349	B-56	28
585C6-6	70117	B-2	18
585D5-2	70117	B-2	14
588A2-1	70117	B-46	2
588A2-2	70117	B-46	7
588A22-3	70117	B-45	26
588B21-5	70117	B-52	63
588B87-2	70117	B-58	25
590A5-1	70117	B-2	43
59-103-200	02660	B-51	9
593A26	70117	B-14	7
593A83-1	70117	B-50	7
593A84	70117	B-50	24
593A85	70117	B-53	28
595A7-1	70117	B-53	23
595A7-2	70117	B-53	19
5960-543-1001	81349	B-29	26
5960-543-1001	81349	B-47	1
60	76545	B-59	19
6216	81349	B-29	2
6216	81349	B-34	19
62	76543	B-59	20
6-32X125BHSST	70117	B-51	10
6-32X1-4CUPPTSST	70117	B-20	22
6-32X1-4X5-64SST	70117	B-29	46
6-32X312FHNYLON	70117	B-52	4
6-32X312FILHSST	70117	B-52	40
6-32X500FILHSST	70117	B-48	2
6-32X562FILHSST	70117	B-8	3
6-32X875FILHSST	70117	B-52	47
651-00218A0250K	72982	B-51	24
651-00218A0250K	72982	B-52	15
651-02	72982	B-52	52
653-00218A0250K	72982	B-51	26
653-00218A0250K	72982	B-52	13
653-501K	72982	B-52	54
6850	74868	B-43	29
6AH6WA	81349	B-21	26
6AU6WB	81349	B-14	10
6AU6WB	81349	B-21	22
6AU6WB	81349	B-21	36
6AU6WB	81349	B-47	27
6BQ5	81349	B-5	40
6D4	81349	B-56	38
6J6WA	81349	B-21	11
6T32	77122	B-8	2
6U8A	81349	B-9	29
6U8A	81349	B-29	20
6U8A	81349	B-56	29
759SS3	83930	B-34	29
77M1P4T	02660	B-29	44
77M1P4T	02660	B-47	59

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
77M1P5T	02660	B-47	46
77M1P5TM1	02660	B-29	47
79NTU040	72962	B-31	48
8051	75543	B-5	65
80-6030-1106-00	95354	B-35	25
80-6030-3406-00	95354	B-58	2
807	75543	B-2	63
807	75543	B-5	67
819B1800W	94375	B-48	6
819T1800	94375	B-43	40
8-32X187FILHSST	70117	B-52	56
8-32X812BHSST	70117	B-48	19
8627	95303	B-39	49
8TB6	81349	B-31	16
9200X	82866	B-31	22
926C218	07387	B-29	34
9470-12	71785	B-2	24
94773F2	76854	B-16	6
94775F2	76854	B-15	7
950034	78616	B-46	13
95655A1	76854	B-24	7
96267AA1	76854	B-54	9
96624F2	76854	B-55	22
96625F3	76854	B-55	16
96NTM62	72962	B-2	16

LATEST NATIONAL STOCK NUMBER ASSIGNMENTS

STOCK NUMBER	FIG. NO.	ITEM NO.
3010-00-623-7447	B-12	22
3010-00-623-7447	B-16	1
3010-00-623-7447	B-17	1
3010-00-623-7447	B-55	12
3010-00-623-7447	B-55	24
3020-00-623-7520	B-48	21
3040-00-623-7458	B-44	16
3040-00-623-7469	B-44	8
4130-00-725-4823	B-31	23
5305-00-054-5654	B-22	15
5305-00-054-5654	B-28	24
5305-00-054-5656	B-22	14
5305-00-054-6654	B-24	15
5305-00-054-6654	B-31	2
5305-00-054-6654	B-43	31
5305-00-054-6655	B-31	25
5305-00-054-6655	B-31	37
5305-00-054-6672	B-31	17
5305-00-054-6674	B-48	17
5305-00-054-6676	B-47	21
5305-00-054-6676	B-48	12
5305-00-059-3659	B-43	52

STOCK NUMBER	FIG. NO.	ITEM NO.
5305-00-082-6721	B-31	43
5305-00-576-7266	B-44	5
5305-00-719-5064	B-14	31
5305-00-727-8831	B-13	16
5305-00-727-8831	B-20	17
5305-00-770-2533	B-2	25
5305-00-770-2580	B-2	21
5305-00-800-7261	B-44	15
5305-00-969-6495	B-34	24
5310-00-614-3552	B-9	76
5310-00-727-5223	B-31	48
5310-00-933-8118	B-2	29
5310-00-933-8118	B-3	4
5310-00-933-8118	B-4	9
5310-00-933-8118	B-5	3
5310-00-933-8118	B-6	4
5310-00-933-8118	B-9	11
5310-00-933-8118	B-9	23
5310-00-933-8118	B-13	21
5310-00-933-8118	B-14	21
5310-00-933-8118	B-20	28
5310-00-933-8118	B-21	7
5310-00-933-8118	B-22	3
5310-00-933-8118	B-28	14
5310-00-933-8118	B-29	17
5310-00-933-8118	B-34	25
5310-00-933-8118	B-35	61
5310-00-933-8118	B-39	12
5310-00-933-8118	B-43	9
5310-00-933-8118	B-44	12
5310-00-933-8118	B-45	23
5310-00-933-8118	B-47	8
5310-00-933-8118	B-49	7
5310-00-933-8118	B-51	2
5310-00-933-8118	B-51	7
5310-00-933-8118	B-52	18
5310-00-933-8118	B-53	24
5310-00-933-8118	B-54	12
5310-00-933-8118	B-55	5
5310-00-933-8118	B-56	2
5310-00-934-9748	B-4	8
5310-00-934-9748	B-6	2
5310-00-934-9748	B-13	15
5310-00-934-9748	B-55	4
5310-00-934-9761	B-5	48
5310-00-934-9761	B-9	7
5310-00-934-9761	B-9	66
5310-00-934-9761	B-14	28
5310-00-934-9761	B-20	13
5310-00-934-9761	B-31	5
5310-00-934-9761	B-32	3
5310-00-934-9761	B-34	15
5310-00-934-9761	B-43	37
5310-00-934-9761	B-47	49
5340-00-828-8737	B-29	14
5340-00-828-8737	B-31	6

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

STOCK NUMBER	FIG. NO.	ITEM NO.
5340-00-855-2131	B-43	56
5340-00-860-1778	B-31	1
5340-00-880-4853	B-9	16
5340-00-880-4853	B-13	12
5340-00-880-4853	B-20	23
5355-00-978-9045	B-24	1
5355-00-985-1988	B-24	2
5360-01-004-4070	B-35	28
5365-00-725-0969	B-44	13
5365-00-725-0969	B-44	20
5905-00-119-8812	B-39	3
5905-00-140-6155	B-9	53
5905-00-140-6155	B-29	65
5905-00-175-8665	B-46	11
5905-00-542-9510	B-29	52
5905-00-646-5957	B-16	3
5905-00-646-5957	B-17	3
5910-00-080-7538	B-57	4
5910-00-280-8271	B-47	23
5910-00-401-7344	B-53	31
5910-00-681-9336	B-9	72
5910-00-717-0167	B-7	16
5910-00-725-7133	B-29	43
5910-00-840-1702	B-47	24
5910-00-880-6080	B-7	14
5915-00-632-7809	B-52	12
5915-00-632-7809	B-52	55
5930-00-713-6942	B-24	7
5935-00-079-5905	B-29	44
5935-00-079-5905	B-47	59
5935-00-129-9358	B-4	7
5935-00-129-9358	B-9	30
5935-00-129-9358	B-10	4
5935-00-129-9358	B-29	25
5935-00-129-9358	B-47	29
5935-00-628-7260	B-46	7
5935-00-628-7421	B-46	2
5935-00-628-7423	B-51	17
5935-00-942-7818	B-58	3
5940-00-050-2308	B-52	35
5950-00-107-2532	B-35	41
5950-00-113-3614	B-47	15
5950-00-626-2809	B-22	6
5950-00-626-2826	B-9	8
5950-00-626-2826	B-11	
5950-00-868-4299	B-39	68
5950-00-964-4651	B-45	10
5960-00-578-8285	B-29	3
5960-00-628-7424	B-29	33
5960-00-888-7732	B-5	32
5961-00-814-0768	B-27	5

STOCK NUMBER	FIG. NO.	ITEM NO.
5961-00-814-0768	B-34	37
5961-00-814-0768	B-36	14
5961-00-814-0768	B-37	1
5961-00-814-0768	B-39	5
5961-00-814-0768	B-40	25
5961-00-814-0768	B-41	37
5961-00-814-0768	B-50	23
5961-00-814-0768	B-56	80
5961-00-814-0768	B-57	1
5990-00-628-7399	B-45	22
5995-00-179-8365	B-58	11
5995-00-625-3913	B-31	13
5995-00-625-3914	B-51	32
5995-00-627-0049	B-31	7
5999-00628-7404	B-45	18
6145-00-681-7849	B-51	34
6210-00-144-4689	B-28	2
6210-00-144-4689	B-43	17
6625-00-004-2556	B-53	19
6625-00-392-5464	B-43	30
6625-00-392-5464	B-45	
6625-00-570-4527	B-42	2
6625-00-628-7248	B-57	12
6625-00-628-7323	B-55	20
6625-00-628-7324	B-44	10
6625-00-628-7330	B-44	4
6625-00-628-7346	B-44	21
6625-00-628-8967	B-53	52
6625-00-628-8971	B-53	12
6625-00-628-8975	B-59	11
6625-00-628-8995	B-59	13
6625-01-004-2557	B-53	23
6680-00-627-0368	B-44	23
9390-00-627-1491	B-31	28

NOTE

See page B-268 for additional latest National stock number and part number assignments

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

STOCK NUMBER	FIG. NO.	ITEM NO.
3020-00-370-1904	B-44	22
4130-00-779-0845	B-31	22
4320-00-465-3895	B-31	30
5305-00-244-2925	B-52	59
5305-01-004-0299	B-39	38
5310-00-934-9761	B-43	37
5310-01-003-9681	B-51	29
5330-01-004-0342	B-43	27
5330-01-004-0343	B-51	57
5330-01-004-0343	B-53	56
5340-01-004-0368	B-51	33
5355-00-753-5171	B-54	6
5905-00-808-1718	B-47	44
5910-00-044-4122	B-14	30
5910-00-044-4355	B-57	11
5910-00-051-4612	B-9	51
5910-00-051-4612	B-14	79
5910-00-051-4612	B-21	61
5910-00-056-7976	B-50	44
5910-00-067-5697	B-50	21
5910-00-079-5253	B-7	11
5910-00-079-5253	B-14	56
5910-00-088-1624	B-9	60
5910-00-088-1624	B-11	3
5910-00-088-1624	B-14	57
5910-00-088-1624	B-56	56
5910-00-116-8653	B-36	25
5910-00-116-8653	B-40	35
5910-00-116-8653	B-41	51
5910-00-276-6827	B-51	24
5910-00-276-6827	B-52	15
5910-00-681-1332	B-50	20
5910-00-728-1583	B-7	10
5910-00-764-1271	B-56	5
5910-00-768-2470	B-21	21
5910-00-781-7929	B-7	3
5910-00-819-5745	B-56	16
5910-00-821-7071	B-12	11
5910-00-889-4975	B-50	15
5910-00-921-0568	B-50	1
5910-00-954-5504	B-50	45
5910-00-984-7588	B-9	80
5910-00-984-7588	B-12	21
5910-00-984-7588	B-14	76
5910-00-984-7588	B-35	43
5910-00-984-7588	B-36	17
5910-00-984-7588	B-41	40
5910-00-984-7588	B-56	55
5910-01-012-2522	B-9	130
5935-00-149-3535	B-58	19
5935-00-201-3511	B-47	58
5935-00-557-9862	B-58	17
5935-00-628-7360	B-45	26
5935-00-632-7810	B-53	30
5935-00-683-7892	B-58	23
5935-00-823-0487	B-48	10
5935-00-823-0487	B-48	36
5935-00-823-0487	B-53	55
5935-00-823-0487	B-58	10
5935-00-823-0487	B-58	16
5935-00-823-0487	B-58	29
5935-00-942-7818	B-58	3
5950-00-713-8483	B-22	9
5950-00-713-8484	B-22	17
5950-00-713-8485	B-22	16
5950-00-713-8486	B-22	18
5950-00-779-6420	B-34	17
5960-00-420-3633	B-2	18
5961-00-071-7429	B-39	15
5961-00-104-8426	B-50	19
5961-00-226-8584	B-39	76
5961-00-262-0316	B-53	21
5961-00-752-6178	B-32	7
5961-00-805-7873	B-35	56
5961-00-813-9360	B-50	10
5961-00-836-0382	B-27	28
5961-00-837-7262	B-35	58
5961-00-837-7262	B-36	11
5961-00-837-7262	B-39	26
5961-00-837-7262	B-40	33
5961-00-837-7262	B-41	35
5961-00-837-7262	B-57	3
5961-00-840-5466	B-27	25
5961-00-840-5466	B-32	1
5961-00-847-5246	B-29	1
5961-00-849-4183	B-29	78
5961-00-849-4183	B-47	61
5961-00-855-1551	B-41	43
5961-00-892-1009	B-35	68
5961-00-926-0135	B-27	8
5961-00-926-0135	B-39	32
5961-00-926-0135	B-50	30
5961-00-926-0135	B-57	2
5916-00-946-2023	B-27	3
5961-00-946-2023	B-40	26
5961-00-946-2023	B-57	6
5985-00-133-9241	B-43	59
6145-00-161-0913	B-52	62
6625-00-392-5464	B-45	
6625-00-409-2097	B-53	53

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

STOCK NUMBER	FIG. NO.	ITEM NO.
6625-00-628-7388	B-45	12
6625-00-628-7426	B-5	64
6625-00-628-8959	B-46	16
6625-00-628-8960	B-46	12
6625-00-628-8962	B-51	36
6625-00-628-8963	B-51	40
6625-00-628-8964	B-51	39
6625-00-628-8969	B-53	48
6625-00-628-8974	B-53	8
6625-00-874-7754	B-19	1
6625-00-933-4840	B-1	8
6625-00-933-4840	B-33	
6625-00-973-0955	B-1	7
6625-00-973-0957	B-1	9

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
CY2725UPM98	80058	B-1	9
CY2726AUPM98	80058	B-1	7
MX2681UP	80058	B-58	18
MX2681UP	80058	B-59	
SM197CUPM98	80058	B-1	8
SM197CUPM98	80058	B-33	
TS-1253A/UP	80058	B-1	1

STOCK NUMBER	FIG. NO.	ITEM NO.

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APPENDIX C

MAINTENANCE ALLOCATION

Section 1. INTRODUCTION

C–1. General

This appendix provides a summary of the maintenance operations for AN/UPM-98 A,B,C. It authorizes categories of maintenance for specific maintenance functions on reparable 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., DMWR) 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 material 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.* When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

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 assurante/quality control time in addition 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– Organizational
F– Direct Support
H – General Support
D – Depot

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

C-4. 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 manufacturers (5-digit) in parentheses.

SECTION II MAINTENANCE ALLOCATION CHART
FOR
TEST SET, RADAR AN/UPM-98A, B, C

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQUIPMENT
01	TEST SET, RADAR TS-1253/UP	Inspect		0.2				
		Service		0.5				
		Replace		0.3				17
		Test				0.8		1,11
		Adjust				0.4		13-16
		Align				0.4		
		Repair				0.4		
		Rebuild					2.0	1-12,14,15,16
0101	DISPLAY MODULE ASSY	Test				0.3		1-11
		Repair				0.3		13-16
0102	SWEEP/INTENSITY MARK UNIT	Test				0.3		1-11
		Repair				0.3		13-16
0103	CRYSTAL MARK & SYNC MODULE	Test				0.3		1-11
		Repair				0.3		13-16
0104	SIF CODER	Test				0.3		1-11
		Repair				0.3		13-16
0105	CHASSIS ASSY	Test				0.3		1-11
		Repair				0.3		13-16
02	CASE, ELECTRICAL EQUIPMENT	Inspect		0.2				17
		Service		0.2				
		Test				0.5		
		Repair				0.4		6,16
0201	POWER SUPPLY	Test				0.3		
		Repair				0.3		6,16
03	SIMULATOR SM-197/UPM-98	Inspect		0.2				
		Service		0.5				
		Replace		0.3				17
		Test				0.8		
		Adjust				0.5		
		Align				0.5		
		Repair				0.4		
		Rebuild					2.0	1-12,14,15,16
0301	INTERROGATION CODER	Test				0.3		1-11
		Repair				0.3		13-16
0302	CHASSIS	Test				0.3		1-11
		Repair				0.3		13-16
0303	CALIBRATION CONTROL UNIT	Test				0.3		1-11
		Repair				0.3		13-16
04	ACCESSORIES	Repair				0.3		16

TABLE 1. TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
TEST SET, RADAR AN/UPM-98A, B, C

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H,D	COMPARATOR, FREQUENCY CM-77/USM	6625-00-080-7204	
2	H,D	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207	6625-00-911-6368	
3	H,D	GENERATOR, SIGNAL AN/URM-64A	6625-00-553-0433	
4	H,D	GENERATOR, SIGNAL AN/URM-127	6625-00-783-5965	
5	H,D	INDICATOR, STANDING WAVE RATIO AN/USM-37	6625-00-814-8357	
6	H,D	MULTIMETER AN/USM-223	6625-00-999-7465	
7	H,D	MULTIMETER ME-26/U	6625-00-360-2493	
8	H,D	PROD, TEST MX-2517/U	6625-00-511-5383	
9	H,D	OSCILLOSCOPE AN/USM-281C	6625-00-053-3112	
10	H,D	SLOTTED LINE, COAXIAL IM-92/U	6625-00-692-6558	
11	H,D	PULSE GENERATOR SET AN/UPM-15	6625-00-643-5969	
12	D	TEST SET, ELECTRON TUBE TV-2/U	6625-00-669-0263	
13	H	TEST SET, ELECTRON TUBE TV-7/U	6625-00-820-0064	
14	H,D	TEST SET, TRANSISTOR TS-1836/U	6625-00-893-2628	
15	H,D	WATTIMETER AN/URM-98	6625-00-566-4990	
16	H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
17	O	TOOLS AND TEST EQUIPMENT AVAILABLE TO THE ORGANIZATIONAL REPAIRMAN BECAUSE OF HIS ASSIGNED MISSION		

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HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington D. C., 18 July 1969

TM 11-6625-403-15-1 is published for the use of all concerned.

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11-38	29-205
11-56	29-245
11-57	29-247
11-97	29-500
11-98	37
11-117	44-2
11-127	44-12
11-155	44-85
11-156	44-86
11-157	44-236
11-158	44-535
11-500(AA-AC)	(RL,RM,RP,RR,RS,RT,RV)
11-587	44-545
11-592	44-546
11-597	44-547
17	44-548
29-1	55-89
29-11	55-99
29-15	55-405
29-16	55-407
29-21	55-457
29-25	55-458
29-35	57
29-36	57-100
29-41	67
29-51	77-100
29-55	55-536

NG: State AG (3) Units--Same as active Army except allowance is one (1) copy per unit.

USAR: None.

For explanation of abbreviations used. see *NOTE:* (this reference is unreadable in original)

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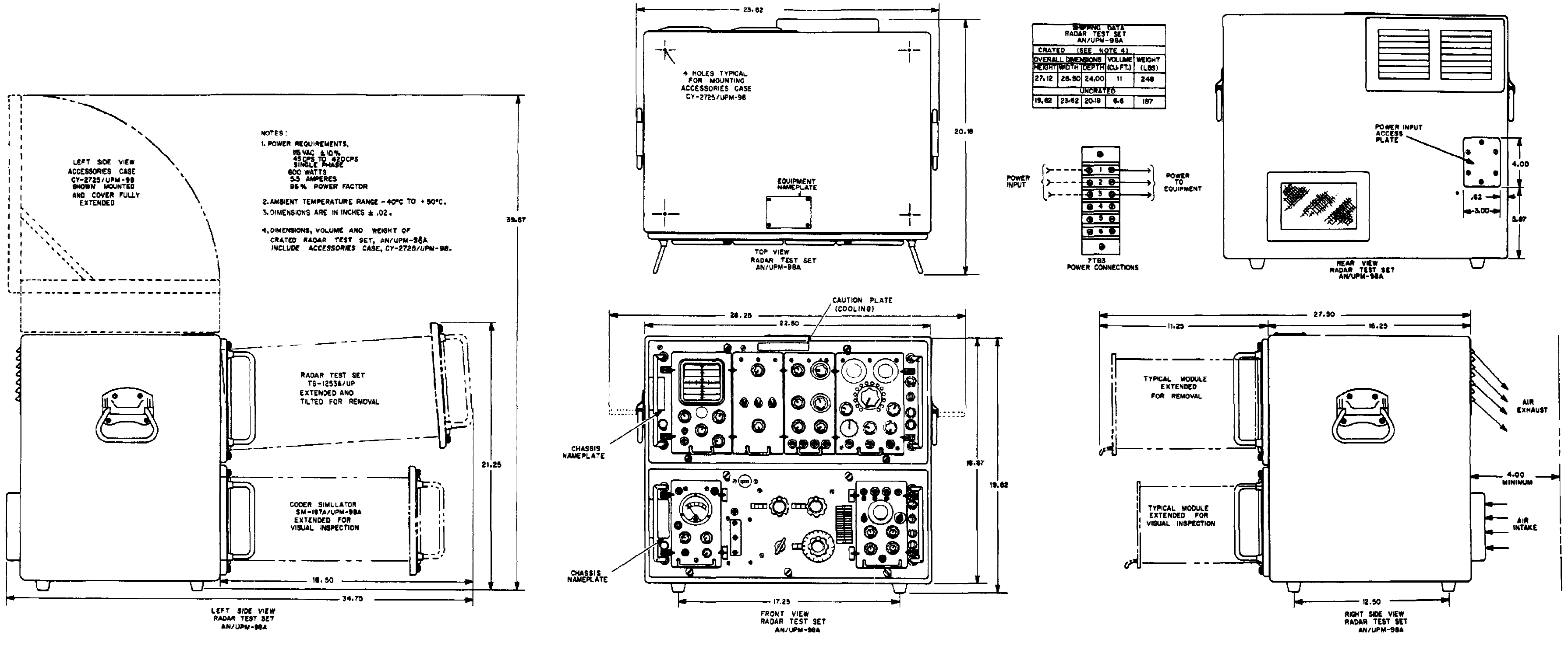
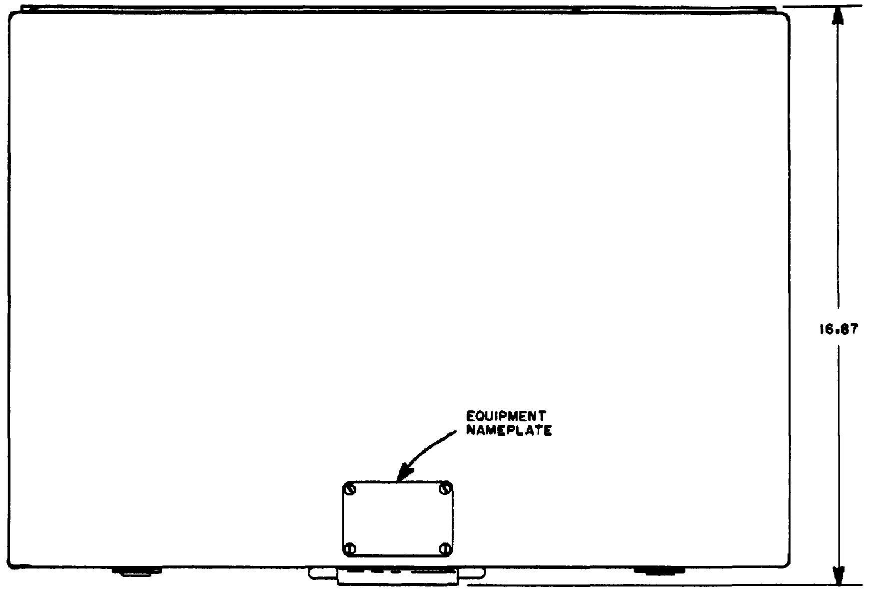


Figure 2-1. Radar Test Set AN/UPM-98A Outline Drawing

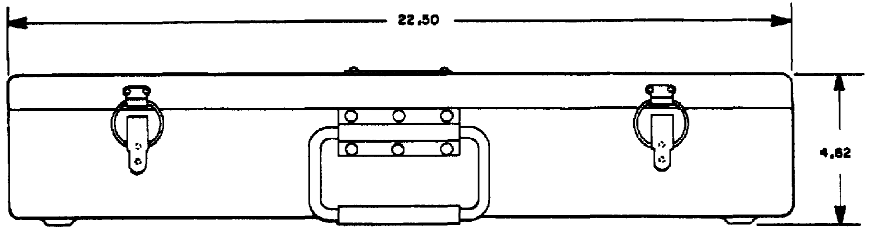
NOTE:

1. DIMENSIONS ARE IN INCHES ± .02.

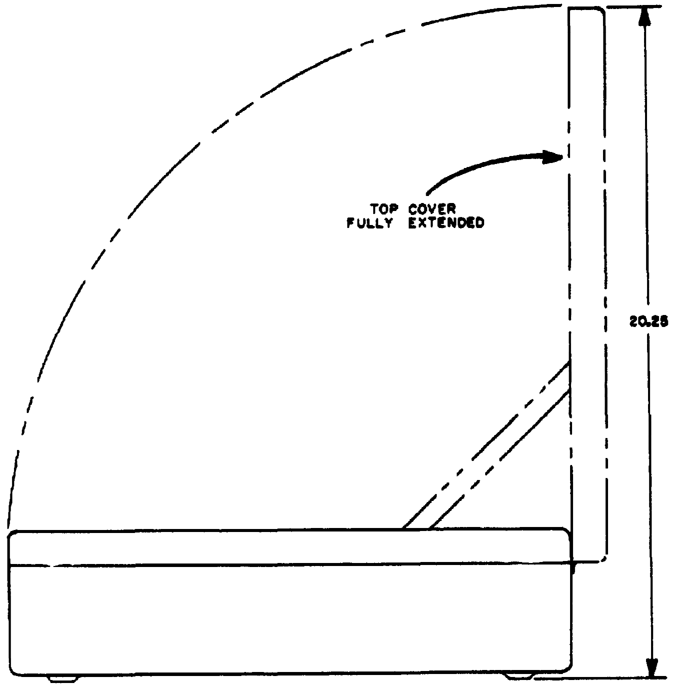
CASE, ACCESSORIES CY-2725/UPM-98				
UNCRATED				
OVERALL DIMENSIONS			VOLUME (CU. FT)	WEIGHT (LBS)
HEIGHT	WIDTH	DEPTH		
4.62	22.50	16.87	1.0	37



TOP VIEW
CASE, ACCESSORIES
CY-2725/UPM-98



FRONT VIEW
CASE, ACCESSORIES
CY-2725/UPM-98



RIGHT SIDE VIEW
CASE, ACCESSORIES
CY-2725/UPM-98

Figure 2-2. Accessories Case CY-2725/UPM-98 Outline Drawing

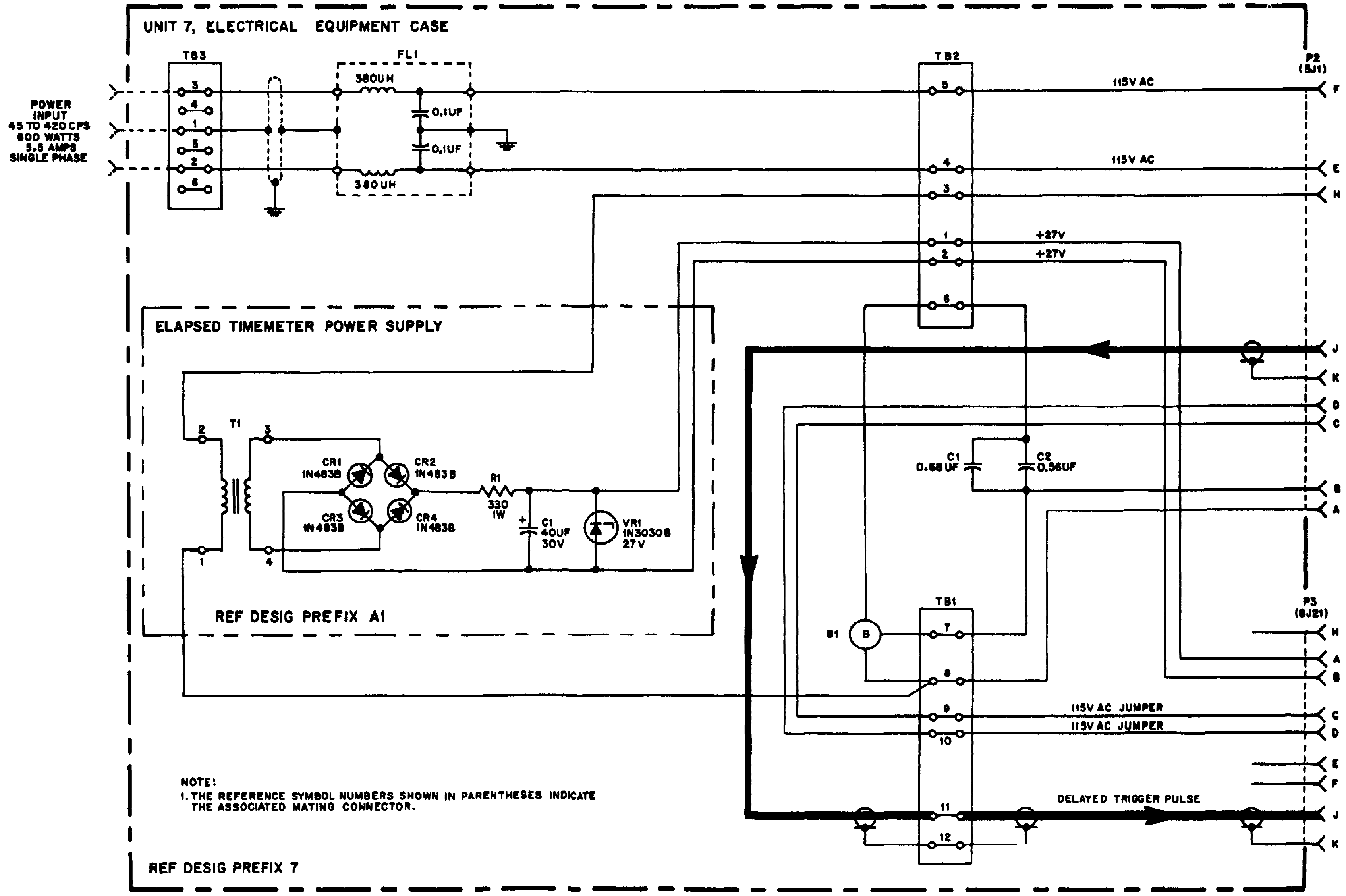


Figure 5-57. Electrical Equipment Case CY-2726A/UPM-98, Schematic Diagram

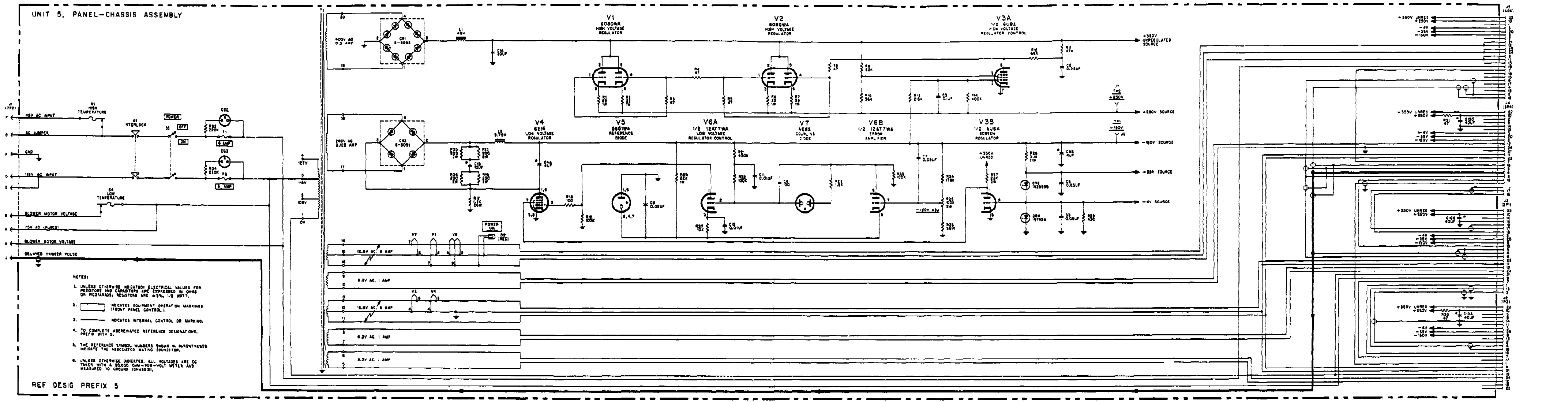


Figure 5-59. TS-1253A/UP Panel-Chassis Assembly, Schematic Diagram

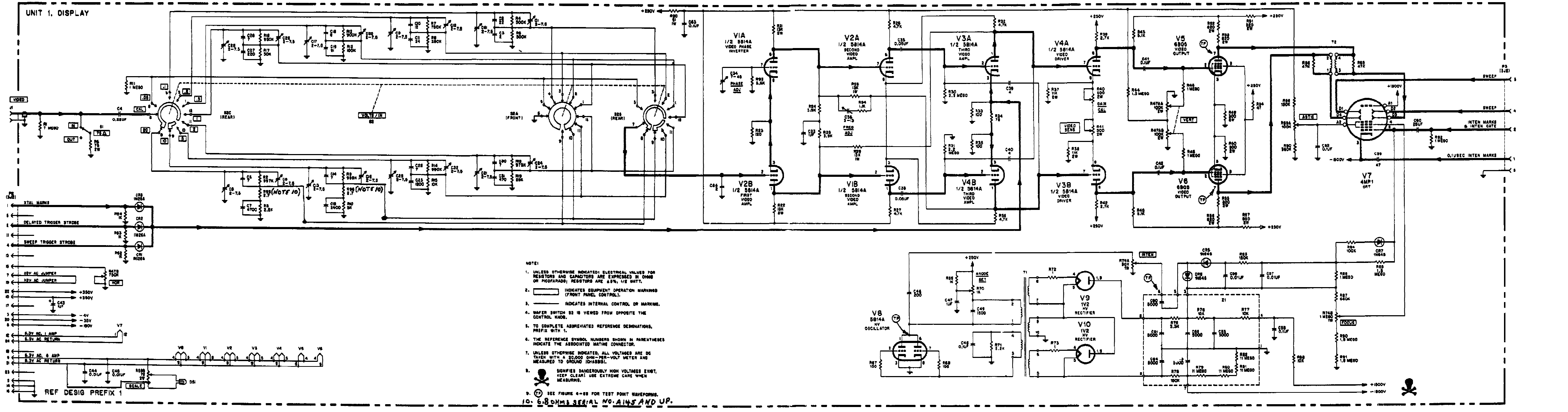


Figure 5-60. Display Unit, Schematic Diagram

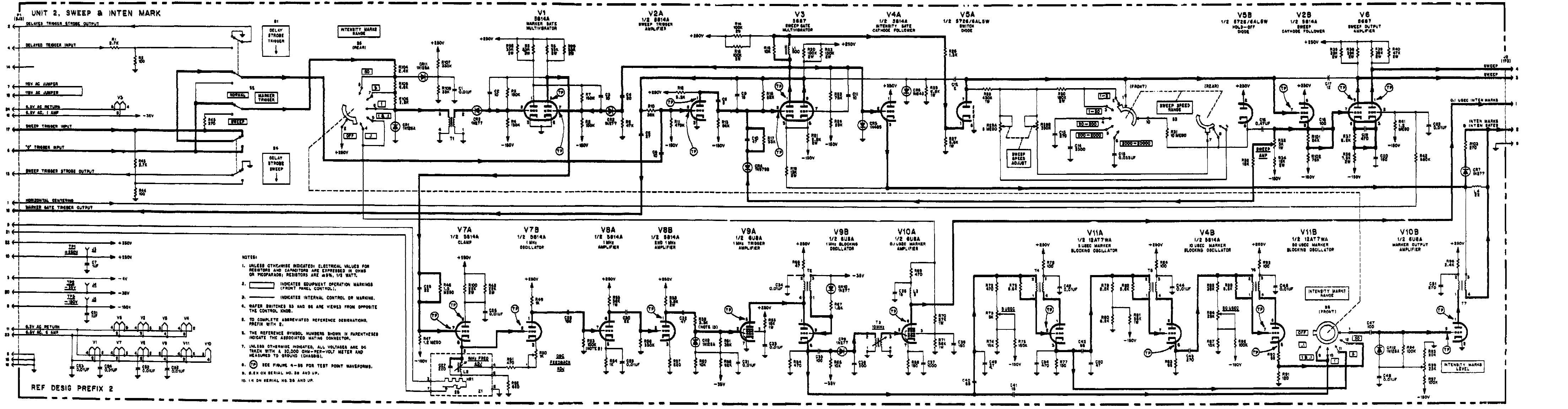


Figure 5-61. Sweep and Intensity Mark Unit, Schematic Diagram

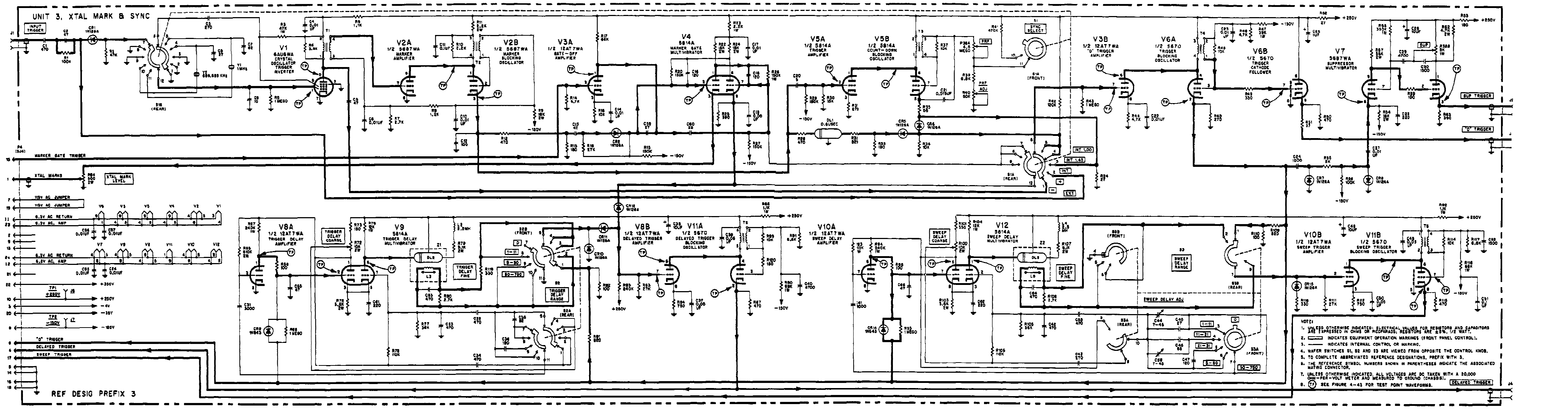


Figure 5-62. Crystal Mark and Sync Unit, Schematic Diagram

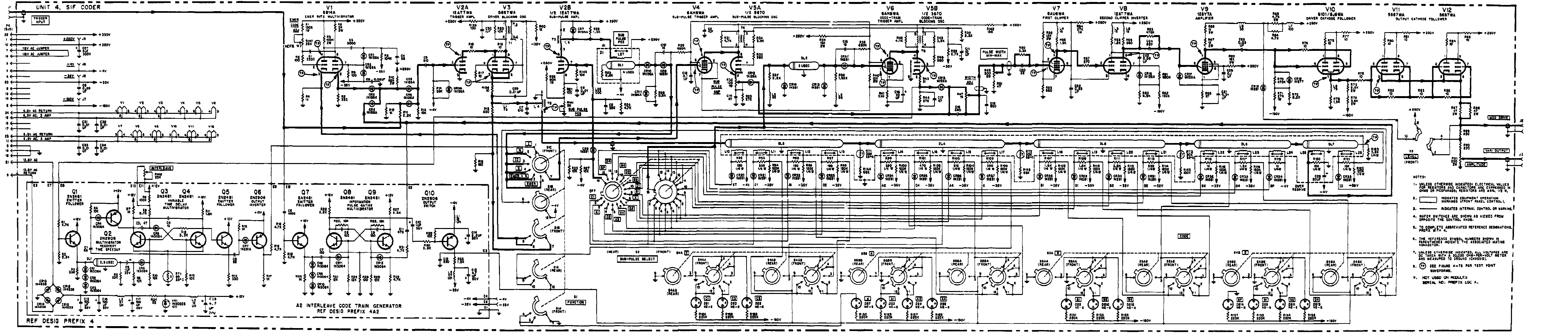


Figure 5-63. SIF Coder, Schematic Diagram

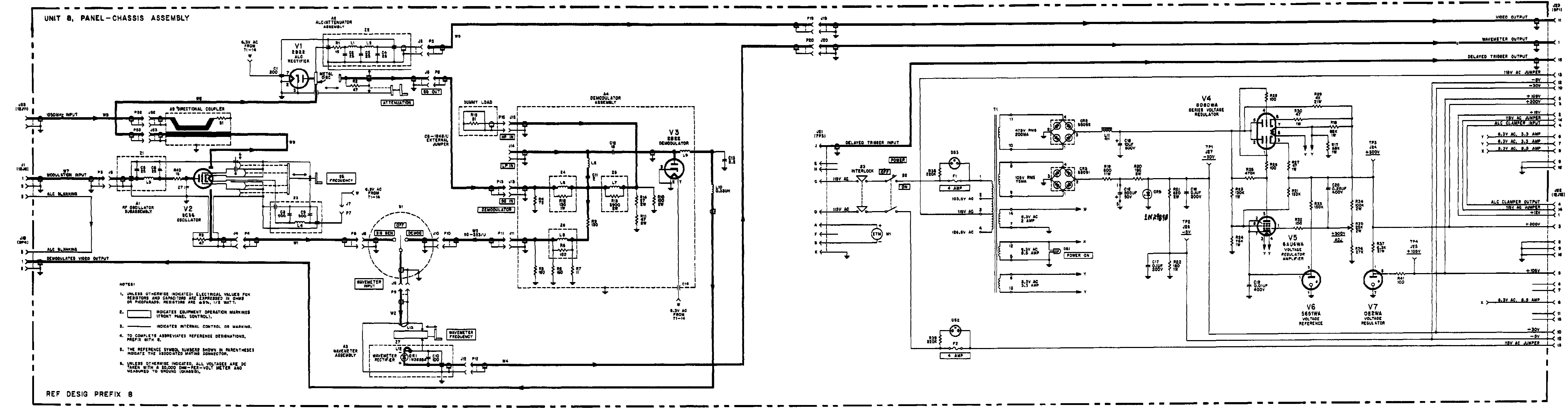


Figure 5-64. SM-197A/UPM-98, Panel-Chassis Assembly, Schematic Diagram

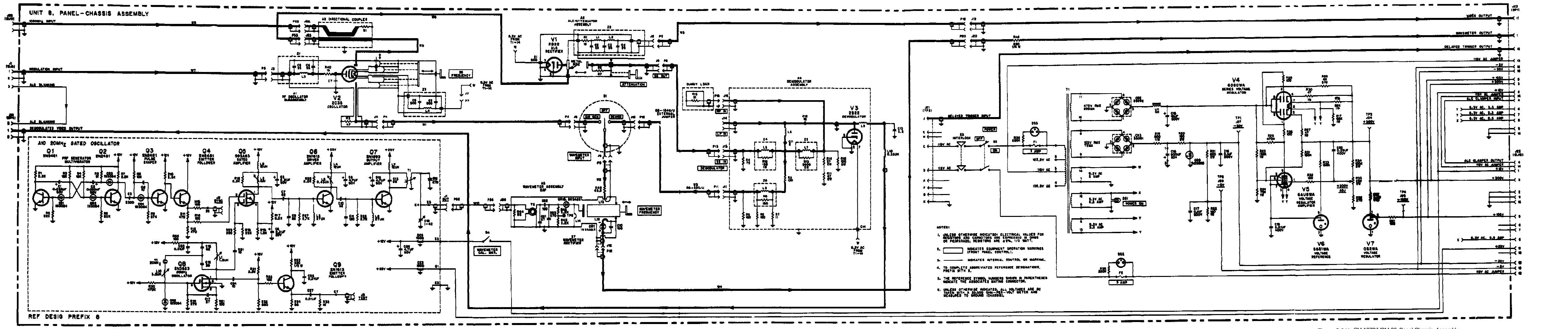


Figure 5-64A. SM-197B/UPM-98 Panel-Chassis Assembly,
Schematic Diagram

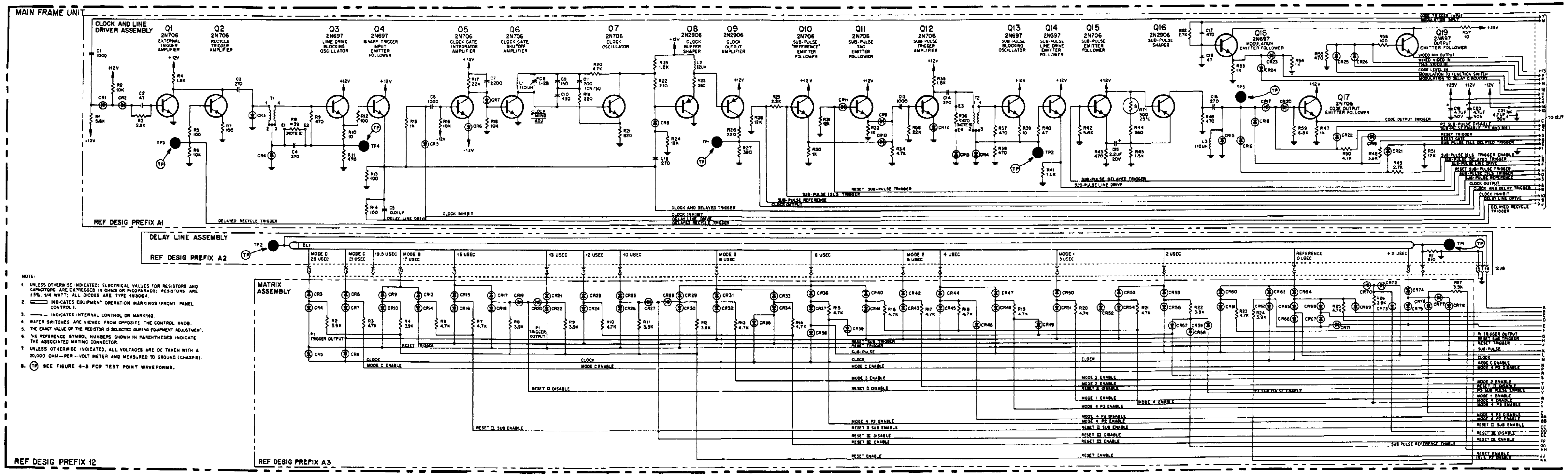


Figure 5-65. Interrogation Coder, Schematic Diagram (Sheet 1 of 4)

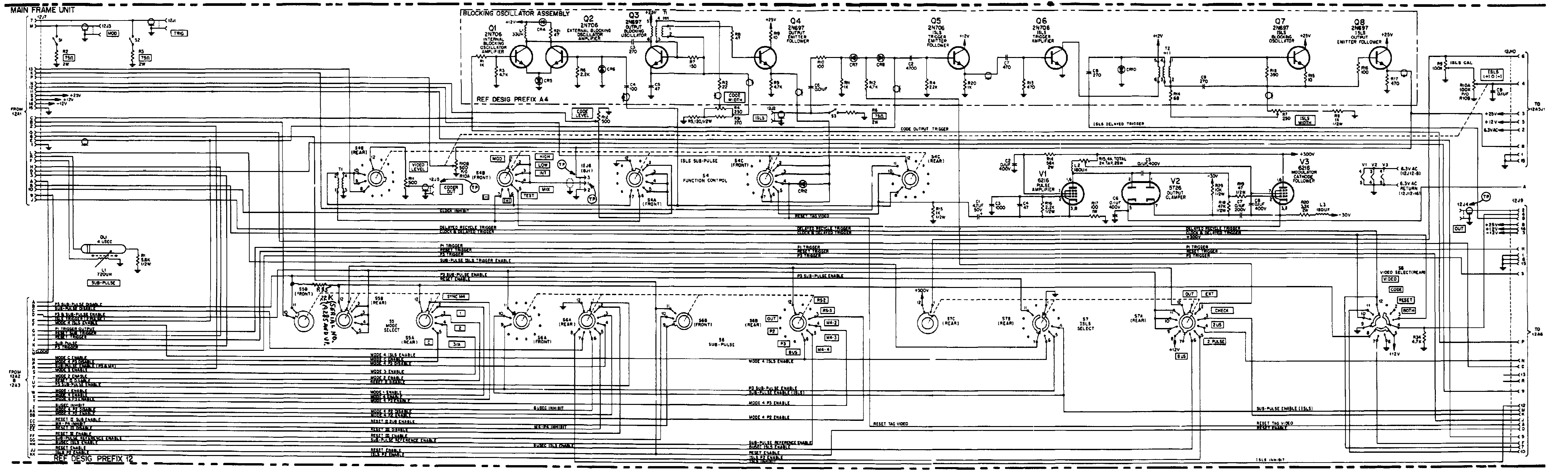


Figure 5-65. Interrogation Coder, Schematic Diagram (Sheet 2 of 4)

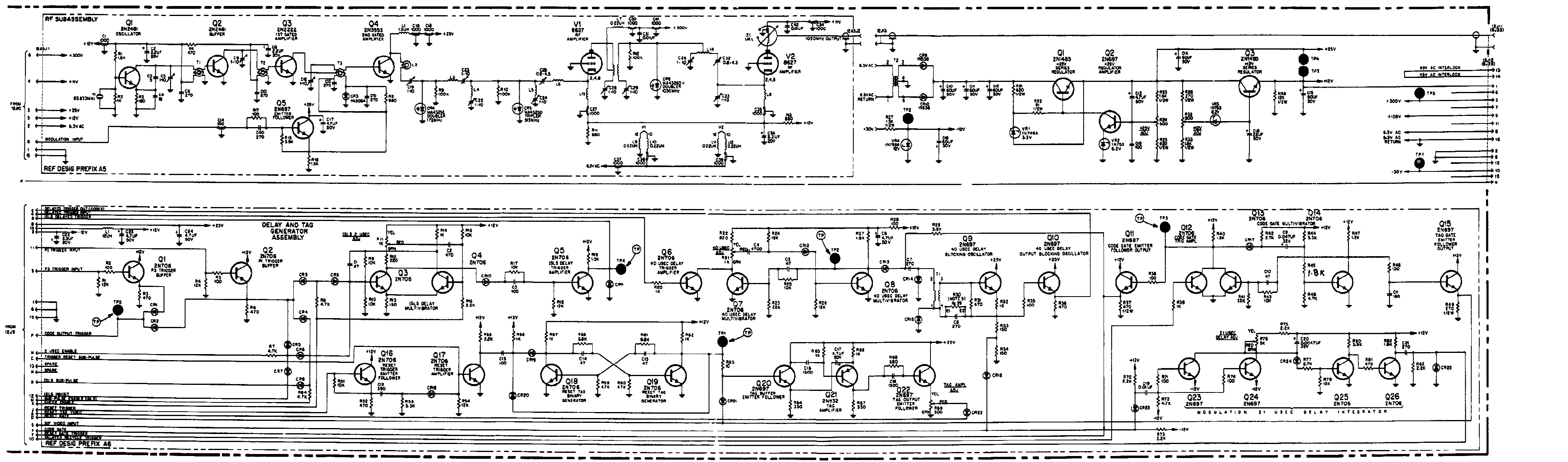


Figure 5-65. Interrogation Coder, Schematic Diagram (Sheet 3 of 4)

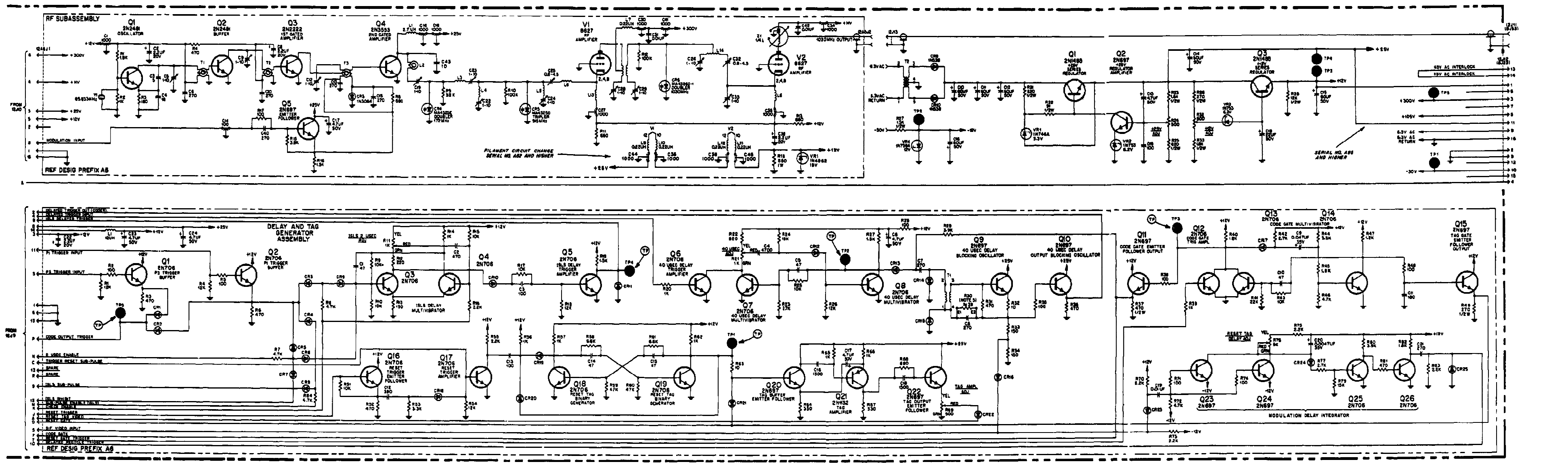
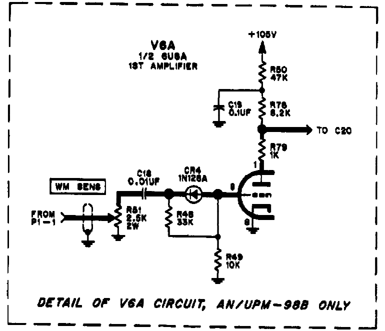


Figure 5-65. Interrogation Coder, Schematic Diagram (Sheet 4 of 4)



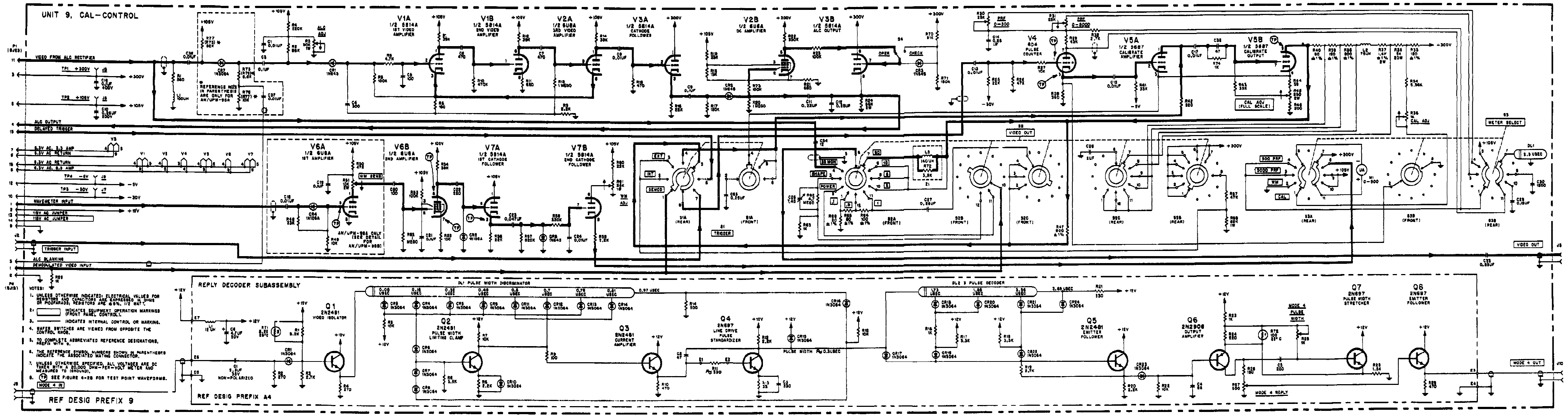


Figure 5-66. Calibration-Control Unit, Schematic Diagram

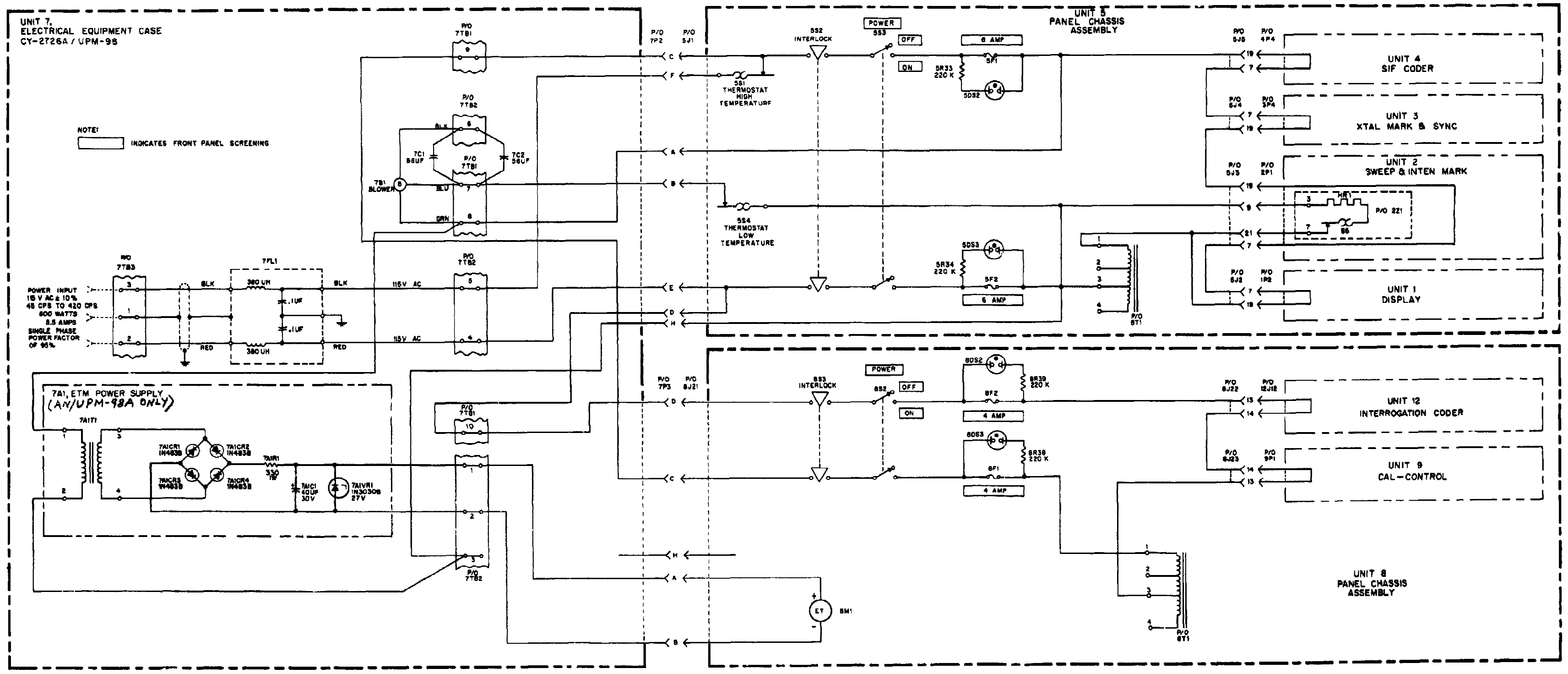


Figure 5-67. Radar Test Set AN/UPM-98A, Power Distribution Diagram

PIN : 023227-000